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chlorite, sericite and quartz. Chlorite-quartz-biotite alteration is most often associated with relatively higher copper grades; chlorite-quartz-biotitized dacite porphyry between 820 feet and 907.7 feet, for instance, averages 0.35%.

Drill hole BSW-8 (TD 566 feet), was drilled to test a small, intense VIP anomaly for an hypothetical, near-surface, high-grade chalcocite enrichment blanket. The hole provided an explanation for the anomaly--but failed to find the anticipated ore body--in penetrating 92.8 feet of oxidized and quartz-sericitized quartz latite porphyry and quartz-sericite rock, 20 feet of enriched, quartz-sericitized intrusion breccia, averaging 0.3% Cu, and 456 feet of quartz-sericitized intrusion breccia and quartz-feldspar porphyry averaging about 10 volume percent pyrite, and 0.05% Cu as chalcopyrite and cupriferous pyrite.

Drilling, geologic mapping, geochemical sampling and induced polarization have shown Buckskin Southwest to be a tight porphyry copper sulfide system with abnormally steep alteration and mineralization gradients. The system has been penetrated by only one deep hole (BSW-7), which bored through a 510 foot zone averaging nearly 0.2% Cu. Alteration within this zone is highly complex, alternating between varieties of quartz-biotitization and quartz-sericitization. Such an alteration pattern suggests that BSW-7 penetrated the transition zone between the potassic core of the system and its quartz-sericite halo. The unusually steep mineralization gradients suggest that ore grade copper mineralization might occur in the potassic core within a few hundred feet laterally of BSW-7.

An hypothetical Buckskin Southwest ore body would be relatively small--100 to 200 million tons--but high grade, probably in the 0.8 to 1% range. The deposit would most likely be situated north, northwest, or northeast of BSW-7, and would be concealed beneath 750 feet to 1,000 feet of barren quartz-sericite rock and/or postmineral cover.

RECOMMENDATIONS

The writer recommends deepening two shallow drill holes completed in 1970--BSW-1 (TD 292 feet) and BSW-2 (TD 200 feet)--to 2,000 feet. Completion of these two proposed drill holes will provide a definitive test of the target hypothesis outlined under "Summary and Conclusions".

for cc blanket + IP

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1972 DRILLING

Two diamond drill holes were completed at Buckskin Southwest during 1972. The deeper of the two, BSW-7, was drilled to test for the presence of a deep-primary porphyry copper deposit, vertically zoned beneath a quartz-sericite "lithocap". Buckskin Southwest 8 was drilled to test a small, but highly intense, VIP anomaly for an hypothetical, near-surface, high-grade chalcocite enrichment blanket.

Deeper

Buckskin Southwest 8 was completed, with discouraging results, at a depth of 566 feet (Figure 7). The hole penetrated 92.8 feet of oxidized and quartz-sericitized quartz-latite porphyry and quartz-sericite rock, 20 feet of enriched, quartz-sericitized intrusion breccia, averaging 0.3% Cu as chalcocite, and 456 feet of quartz-sericitized intrusion breccia and quartz-feldspar porphyry averaging ~~0.5%~~ .05 Cu and cupriferous pyrite and chalcopyrite.

probably should read .05% Cu RWR

Buckskin Southwest 7 (TD 1,715 feet), completed in mid-1972, penetrated beneath 750 feet of quartz-sericitized intrusion breccia, a 510-foot zone of complexly altered dacite porphyry, intrusion breccia and quartz-feldspar porphyry averaging 0.16% Cu as chalcopyrite. All rock types within this zone are heavily quartz-veined and altered to various combinations of biotite, chlorite, sericite, and quartz. Chlorite-quartz-biotite alteration is most often associated with relatively higher copper grades; chlorite-quartz-biotitized dacite porphyry between 820 feet and 907.7 feet, for instance, averages 0.35% Cu.

EXPENSES

Drilling	$25,395.35
Assaying	1,562.19
Temporary salaries and wages	990.07
Travel and expenses	1,629.55
Materials and supplies	408.28
Freight and haulage	77.68
Licenses and fees	257.75
Roads and drill sites	798.00
Rent	35.00
Utilities	20.50
	$31,174.37

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Drill hole BSW-8 (TD 1,125 feet), was drilled to test an intense VIP anomaly for a hypothetical, near-surface, high-grade chalcocite enrichment blanket. The hole provided an explanation for the anomaly, but failed to find the anticipated ore body, in penetrating 92.8 feet of oxidized and quartz-sericitized quartz latite porphyry and quartz-sericite rock, 20 feet of enriched, quartz-sericitized volcanic breccia, averaging 0.3% Cu, and 1,012 feet of quartz-sericitized volcanic breccia, and quartz-feldspar porphyry averaging about 7 volume percent pyrite, and 0.02% Cu as chalcopyrite (Figure 6).

or 45.6' of .05% Cu

NORTHWEST DISTRICT

Summary Drill Hole Log

Name *BUCKSKIN SOUTHWEST*

Code *05-01-0411*

Purpose of hole *TEST OF HYPOTHETICAL CHALCOCITE ENRICHMENT BLANKET & SHALLOW VIP ANOMALY*

BSW 8

DRILL HOLE NO. *BSW-8* PAGE *1* OF *1*

BEARING *VERTICAL* DIP *"*

LOCATION: N. *10,670'* E. *11,340' (Approximate)*

COLLAR ELEV. *APP. 5290'*

TOTAL DEPTH *566'* BY *J.B. Hulen*

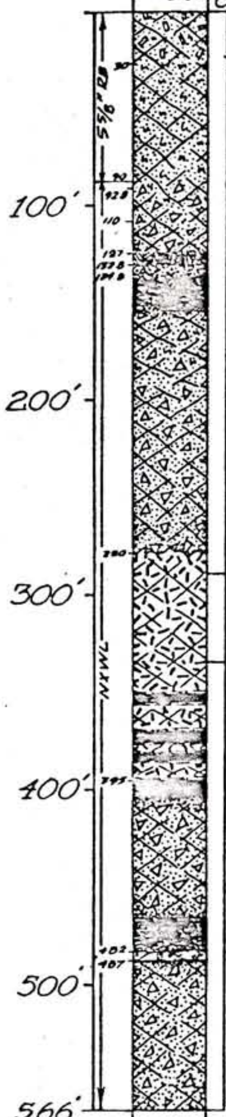
START *5/11/72* COMPLETED *5/25/72*

drafted by J.B. Hulen

Scale: 1" = *100'*

Est. of final depth

GRAPHIC GEOLOGY — DESCRIPTIVE LOG



0-30' QUARTZ LATITE PORPHYRY; qtz.-sericitized, but relict texture readily apparent; mod. abund. stockwork qtz. vnlts.; goethite-jarosite-pitch limonite leached capping

30-90' QUARTZ-CLAY-SERICITE ROCK; relict texture obscured; otherwise same as 0-30'

90-280' INTRUSION BRECCIA; depending on intensity of alteration, original texture varies from completely apparent to very obscure; moderately abundant stockwork quartz veinlets throughout interval; base of oxidation at 92±'; beneath zone of oxidation, sulfides (gn, sp, py, cpy) occur primarily as diss., anhedral to subhedral grains, but also as µvnlts (together or in various combinations) and as diss. grains and irregular masses in stockwork qtz. veinlets.

92.8-110': 0.1-0.5% cc. as partial to complete pseudomorphs of primary sulfide minerals; a tr. cc persists to 170'.

127-132±': quartz-pyrite-sphalerite vein

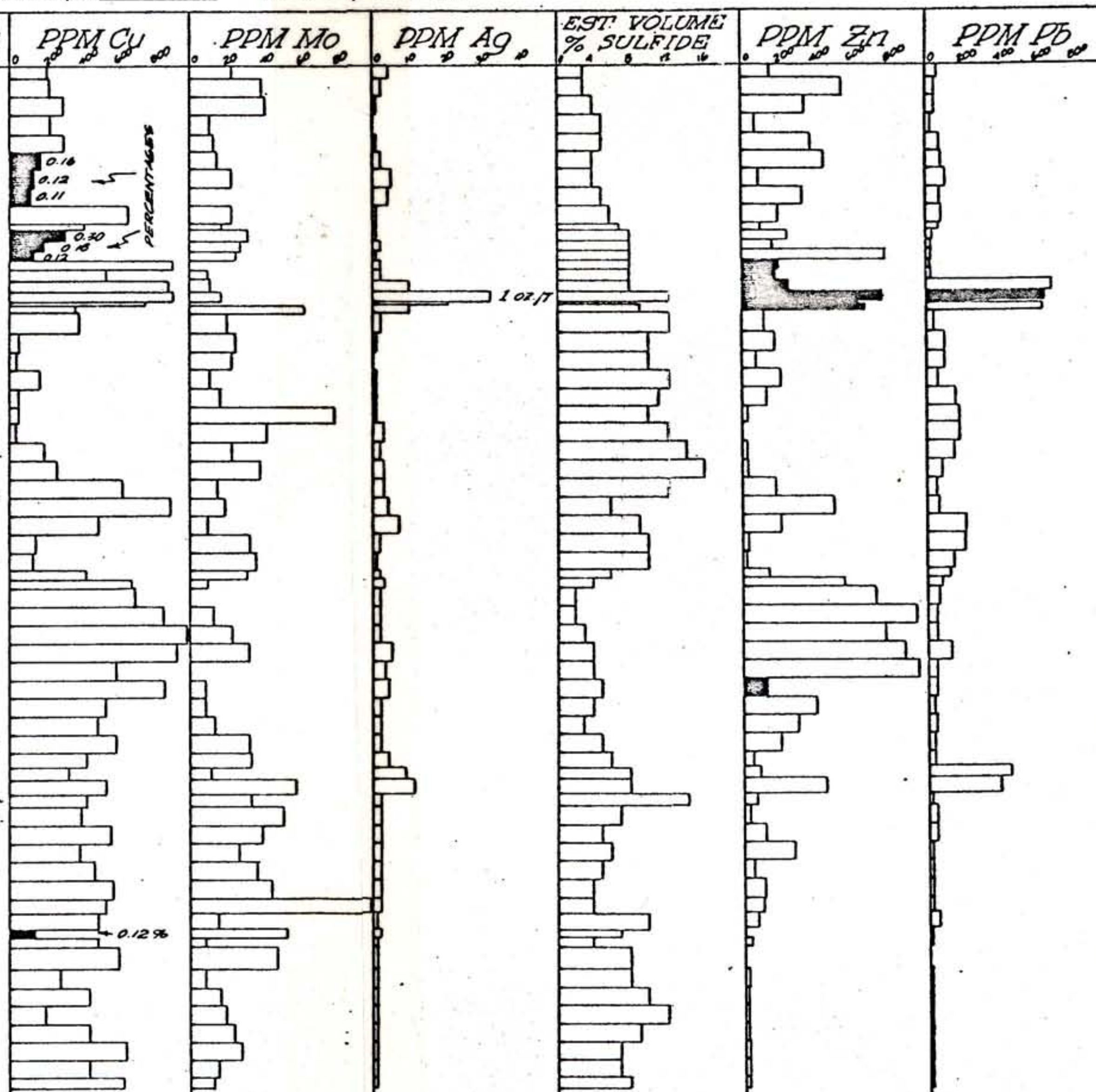
132±-134±': hornblende biotite dacite porphyry dike.

280-395' QUARTZ-FELDSPAR PORPHYRY; intense alteration precludes determination of original composition; moderately abundant stockwork quartz veinlets; sulfides texturally similar to 90-280'

395-566' INTRUSION BRECCIA, same as 90-280'

482-487': hornblende biotite dacite porphyry dike.

END OF HOLE



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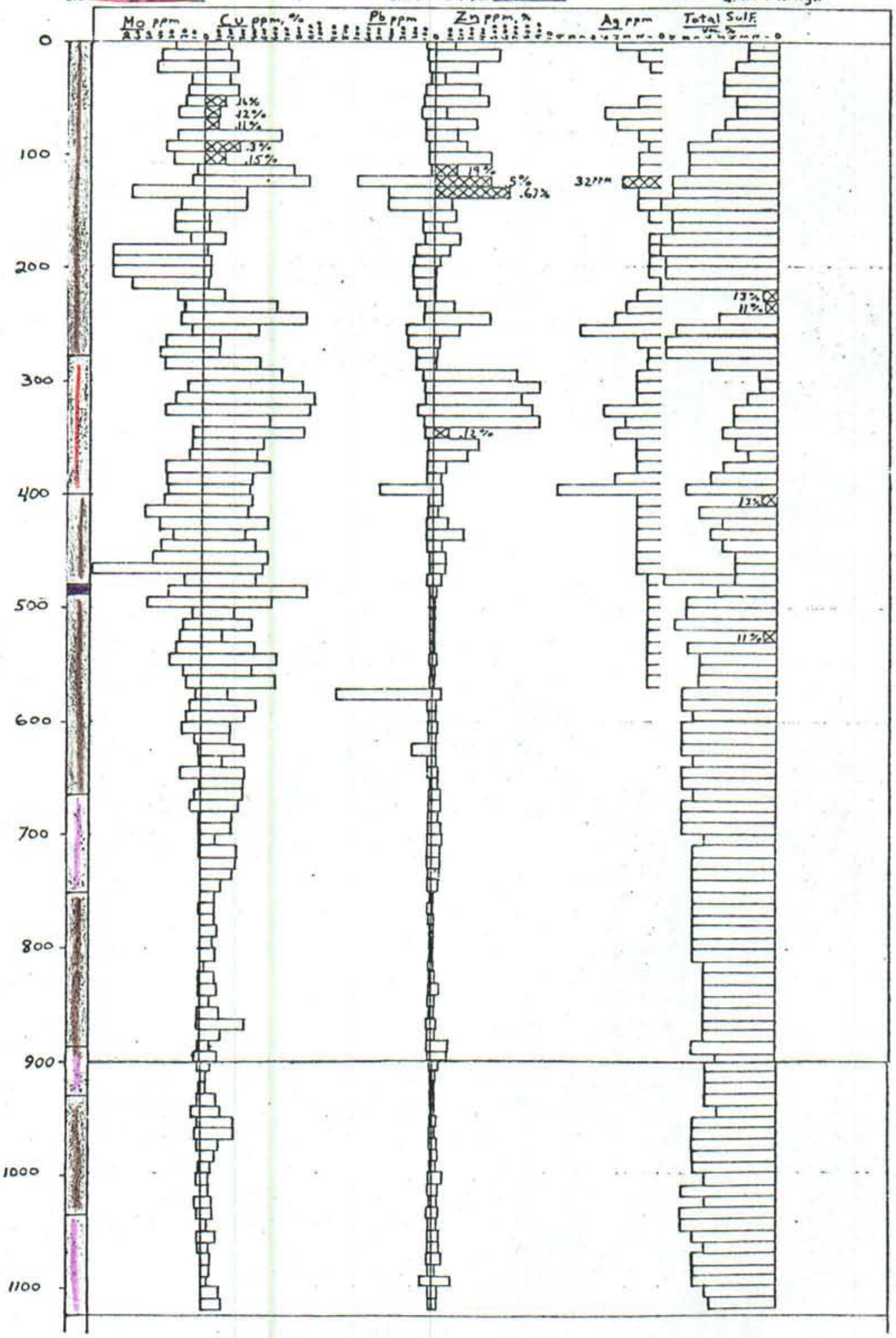
NORTHWEST DISTRICT
Summary Drill Hole Log

Name BUCKSKIN SOUTHWEST
Code 005-01-0411
DOUGLAS CO, NEV.

DRILL HOLE NO BSW-8 PAGE ___ OF ___
BEARING ___ DIP 90°
LOCATION: N. ___ E. ___
COLLAR ELEV. ≈ 5290
TOTAL DEPTH 1125' BY ___
START ___ COMPLETED ___

BSW - 8

Scale: 1" = ___ Est. of final depth 1125' DATA: G.R. Heinemeyer



SEE FIGURE (5) FOR EXPLANATION OF LITHOLOGY

BEAR CREEK MINING COMPANY NORTHWEST DISTRICT	DATA BY GRH	REVISED	BUCKSKIN SOUTHWEST	FIGURE
SCALE 0 75' 150' 300'	DWN. BY: SKM		DRILL LOG 8	6
	DATE: July 26, 1974		DOUGLAS CO., NEVADA	

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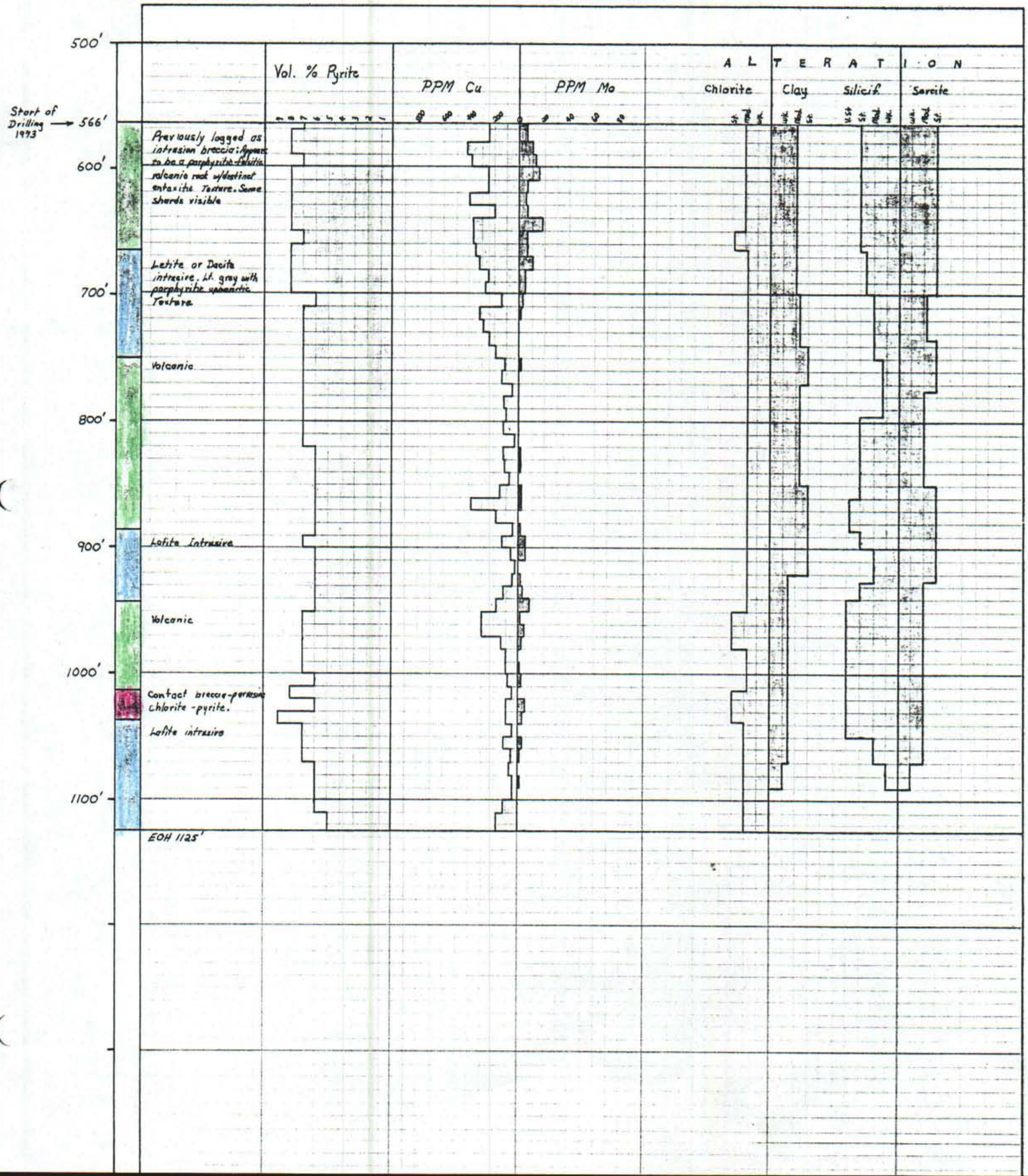
NORTHWEST DISTRICT
Summary Drill Hole Log

Name: Buckskin Southwest
Code: 005-01-0411
Purpose of hole: To complete assessment work for 1973

DRILL HOLE NO. 8 PAGE ___ OF ___
BEARING ___ DIP 90°
LOCATION: N. ___ E. ___
COLLAR ELEV. 5290'
TOTAL DEPTH 1125', BY ___
START 8/4/73 COMPLETED 8/20/73

Scale: 1" = 100'
Est. of final depth 1125'



BEAR CREEK - ~~NWD~~ - SAMPLER'S LOG   SAMPLER T.A. ROGERS

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* SHATTERED : > 20 PCS./FT.

Core Size	From	To	Interval	CORE RECOVERY Feet	%	Max. Lgth. Ft.	UNITS PER FOOT FRACTURES 0-30°	30-60°	60-90°	No. Pcs.	Ft. Grvl.
NC	460'	464'	4.0'	2.0'	50	0.29'	SHATTERED *				
NXWL	464'	470'	6.0'	6.0'	100	0.36'		"			
↑	470'	480'	10.0'	10.0'	100	0.33'		"			
	480'	490'	10.0'	10.0'	100	0.49'		"			
	490'	495'	5.0'	5.0'	100	0.40'		"			
	495'	504'	9.0'	9.0'	100	0.39'		"			
	504'	514'	10.0'	10.0'	100	0.43'		"			
	514'	521'	7.0'	7.0'	100	0.42'		"			
	521'	531'	10.0'	10.0'	100	0.39'		"			
	531'	538'	7.0'	7.0'	100	0.36'		"			
	538'	545'	7.0'	7.0'	100	0.41'		"			
	545'	548'	3.0'	3.0'	100	0.42'		"			
	548'	550'	2.0'	2.0'	100	0.13'		"			
	550'	552'	2.0'	1.0'	50	0.20'		"			
	552'	555'	3.0'	3.0'	100	0.32'		"			
	555'	557'	2.0'	2.0'	100	0.25'		"			
	557'	567'	10.0'	10.0'	100	0.38'		"			
	567'	572'	5.0'	5.0'	100	0.33'		"			
	572'	577'	5.0'	5.0'	100	0.30'		"			
	577'	583'	6.0'	6.0'	100	0.36'		"			
	583'	592'	9.0'	9.0'	100	0.39'		"			
	592'	599'	7.0'	7.0'	100	0.45'		"			
	599'	605'	6.0'	6.0'	100	0.30'		"			
	605'	612'	7.0'	7.0'	100	0.46'		"			
	612'	618'	6.0'	4.0'	66	0.40'		"			
	618'	623'	5.0'	5.0'	100	0.36'		"			
	623'	628'	5.0'	5.0'	100	0.36'		"			
	628'	635'	7.0'	7.0'	100	0.56'		"			
	635'	642'	7.0'	7.0'	100	0.41'		"			
	642'	651'	9.0'	9.0'	100	0.33'		"			
	651'	653'	2.0'	2.0'	100	0.24'		"			
	653'	658'	5.0'	5.0'	100	0.40'		"			
	658'	662'	4.0'	4.0'	100	0.35'		"			
	662'	667'	5.0'	5.0'	100	0.39'		"			
	667'	671'	4.0'	4.0'	100	0.33'		"			
↓	671'	673'	2.0'	2.0	100	0.21"		"			
	673'	682'	9.0'	9.0	100	0.43'		"			

BEAR CREEK NWD - SAMPLER'S LOG SAMPLER J. A. ROGERS

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Core Size	From	To	Interval	Core Recovery Feet	Core Recovery %	Max. Lgth. Ft.	Units per Foot: Fractures 0-30°	Fractures 30-60°	Fractures 60-90°	No. Pcs.	Ft. Grvl.
NXWL	682	687'	5.0'	5.0'	100	0.46'	SHATTERED				
↑	687	691'	4.0'	4.0'	"	0.35'		"			
	691	696'	5.0'	5.0'	"	0.39'		"			
	696	698'	2.0'	2.0'	"	0.27'		"			
	698'	704'	6.0'	6.0'	"	0.41'		"			
	704	707'	3.0'	3.0'	"	0.36'		"			
	707	709'	2.0'	2.0'	"	0.25'		"			
	709	713.5	4.5'	4.5'	"	0.32'		"			
	713.5	721'	7.5'	7.5'	"	0.27'		"			
	721	726'	5.0'	5.0'	"	0.26'		"			
	726	730'	4.0'	4.0'	"	0.31'		"			
	730	740'	10.0'	10.0'	"	0.39'		"			
	740	747'	7.0'	7.0'	"	0.31'	exc. 742-747 1	" 8	0	31	
	747	755'	8.0'	8.0'	"	0.51'	5	8	20	65	
	755	764'	9.0'	9.0'	"	0.40'	14	9	26	78	
	764	774'	10.0'	10.0'	"	0.45'	9	12	25	83	
	774	784'	10.0'	10.0'	"	0.48'	4	15	12	97	
	784	790'	6.0'	6.0'	"	0.55'	SHATTERED				
	790	795'	5.0'	5.0'	"	0.61'		"			
	795	804'	9.0'	9.0'	"	0.53'		"			
	804	809'	5.0'	5.0'	"	0.51'		"			
	809	815'	6.0'	6.0'	"	0.62'		"			
	815	824'	9.0'	9.0'	"	0.53'		"			
	824	831'	7.0'	7.0'	"	0.41'		"			
	831	840'	9.0'	9.0'	"	0.68'		"			
	840	845'	5.0'	5.0'	"	0.50'		"			
	845	850'	5.0'	5.0'	"	0.40'		"			
	850	860'	10.0'	10.0'	"	0.61'	(2	", except 855-858.7' 4	16	48)	
	860	866'	6.0'	6.0'	"	0.48'	0	8	9	43	
	866	869'	3.0'	3.0'	"	0.65'	SHATTERED				
	869	871'	2.0'	2.0'	"	0.31'		"			
	871	872'	1.0'	0.33'	33	0.11'		"			
	872	875'	3.0'	3.0'	100	0.32'		"			
	875	876'	1.0'	1.0'	"	0.17'		"			
	876	880'	4.0'	4.0'	"	0.32'		"			
	880	882'	2.0'	2.0'	"	0.25'		"			
↓	882	883'	1.0'	0.33'	33	0.11'		"			

BEAR C[illegible] - NWD - SAMPLER'S LOG

SAMPLER J. A. ROGERS

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Core Size	From	To	Interval	Core Recovery Feet	Core Recovery %	Max. Lgth. Ft.	Units per Foot: Fractures 0-30°	Fractures 30-60°	Fractures 60-90°	No. Pcs.	Ft. Grvl.
NXWL	883	885'	2.0'	2.0'	100	0.32		SHATTERED			
↑	885	890'	5.0'	5.0'	"	0.39'		"			
	890	893'	3.0'	3.0'	"	0.26'		"			
	893	898'	5.0'	5.0'	"	0.36'		"			
	898	902'	4.0'	4.0'	"	0.35'		"			
	902	907'	5.0'	5.0'	"	0.29'		"			
	907	912'	5.0'	5.0'	"	0.23'		"			
	912	917'	5.0'	1.0'	20	0.23'		"			
	917	919'	2.0'	2.0'	100	0.30'		"			
	919	924'	5.0'	5.0'	"	0.50'		"			
	924	929'	5.0'	5.0'	"	0.36'		"			
	929	932'	3.0'	3.0'	"	0.30'		"			
	932	937'	5.0'	5.0'	"	0.32'		"			
	937	942'	5.0'	5.0'	"	0.29'		"			
	942	947'	5.0'	5.0'	"	0.29'		"			
	947	953'	6.0'	6.0'	"	0.72'		"			
	953	958'	5.0'	5.0'	"	0.69'		"			
	958	963'	5.0'	5.0'	"	0.51'		"			
	963	967.5'	4.5'	4.5'	"	0.48'		"			
	967.5	972.5'	5.0'	5.0'	"	0.61'		"			
	972.5	977'	4.5'	4.5'	"	0.61'		"			
	977	982	5.0'	5.0'	"	0.47'		"			
	982	987	5.0'	5.0'	"	0.45'		"			
	987	992	5.0'	5.0'	"	0.38'		"			
	992	997	5.0'	5.0'	"	0.21'		"			
	997	1002	5.0'	5.0'	"	0.43'		"			
	1002	1007'	5.0'	5.0'	"	0.45'		"			
	1007	1012'	5.0'	5.0'	"	0.32'		"			
	1012	1017'	5.0'	5.0'	"	0.38'		"			
	1017'	1020'	3.0'	3.0'	"	0.29'		"			
	1020	1025'	5.0'	5.0'	"	0.27'		"			
	1025	1030'	5.0'	5.0'	"	0.44'		"			
	1030	1035'	5.0'	5.0'	"	0.26'		"			
	1035	1040'	5.0'	5.0'	"	0.13'		"			
	1040	1044'	4.0'	4.0'	"	0.16'		"			
	1044	1049'	5.0'	5.0'	"	0.30'		"			
↓	1049	1055'	6.0'	6.0'	"	0.40'		"			

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BEAR CREEK -NWD- SAMPLER'S LOG SAMPLER J. A. ROGERS

Core Size	From	To	Interval	Core Recovery Feet	Core Recovery %	Max. Lgth. Ft.	Units per Foot: Fractures 0-30°	Fractures 30-60°	Fractures 60-90°	No. Pcs.	Ft. Grvl.
NXWL	1055	1062'	7.0'	7.0'	100	0.11'	SHA	TTE	RED		
↑	1062	1066'	4.0'	4.0'	"	0.20'		"			
	1066	1071'	5.0'	3.0'	60	0.34'		"			
	1071	1075'	4.0'	4.0'	100	0.21'		"			
	1075	1080'	5.0'	5.0'	"	0.19'		"			
	1080	1084'	4.0'	4.0'	"	0.39'		"			
	1084	1091'	7.0'	7.0'	"	0.32'	12	5	4	71	
	1091	1098'	7.0'	7.0'	"	0.41'	13	10	8	62	
	1098	1100'	2.0'	2.0'	"	0.40'	17	14	7	50	
	1100	1103'	3.0'	3.0'	"	0.41'	8	3	2	26	
	1103	1107'	4.0'	4.0'	"	0.50'	7	2	9	35	
	1107	1112'	5.0'	5.0'	"	0.45'	6	4	11	46	
	1112	1117'	5.0'	5.0'	"	0.25'	SHA	TTE	RED		
	1117	1122'	5.0'	5.0'	"	0.36'		"			
	1122	1127'	5.0'	5.0'	"	0.34'		"			
	1127	1130'	3.0'	3.0'	"	0.33'		"			
	1130	1135'	5.0'	5.0'	"	0.28'		"			
	1135	1138'	3.0'	3.0'	"	0.45'		"			
	1138	1141'	3.0'	3.0'	"	0.40'		"			
	1141	1146'	5.0'	5.0'	"	0.28'		"			
	1146	1151'	5.0'	5.0'	"	0.47'		"			
	1151	1156'	5.0'	5.0'	"	0.50'	4	16	13	53	
	1156	1160'	4.0'	4.0'	"	0.46'	SHA	TTE	RED		
	1160	1165'	5.0'	5.0'	"	0.39'		"			
	1165	1169'	4.0'	4.0'	"	0.35'		"			
	1169	1174'	5.0'	5.0'	"	0.40'		"			
	1174	1179'	5.0'	5.0'	"	0.33'		"			
	1179	1184'	5.0'	5.0'	"	0.47'	23	9	6	62	
	1184	1189'	5.0'	5.0'	"	0.41'	21	11	7	69	
	1189	1194'	5.0'	5.0'	"	0.67'	SHA	TTE	RED		
	1194	1198'	4.0'	4.0'	"	0.52'		"			
	1198	1203'	5.0'	5.0'	"	0.33'		"			
	1203	1208'	5.0'	5.0'	"	0.43'		"			
	1208	1210'	2.0'	2.0'	"	0.34'		"			
	1210	1215'	5.0'	5.0'	"	0.40'		"			
	1215	1220'	5.0'	5.0'	"	0.41'	9	5	1	11	
↓	1220	1225'	5.0'	5.0'	"	0.44'	8	6	4	22	

BEAR CREEK - ~~NWD~~ - SAMPLER'S LOG SAMPLER J. A. ROGERS

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Core Size	From	To	Interval	Core Recovery Feet	Core Recovery %	Max. Lgth. Ft.	Units per Foot Fractures 0-30°	30-60°	60-90°	No. Pcs.	Ft. Grvl.
NXWL	1225	1230'	5.0'	5.0'	100	0.43'	10	6	4	19	
↑	1230	1240'	10.0'	10.0'	100	0.56'	9	13	8	36	
	1240	1250'	10.0'	10.0'	"	0.54'	13	6	12	52	
	1250	1260'	10.0'	10.0'	"	0.41'	8	9	10	46	
	1260	1266'	6.0'	6.0'	"	0.28'	SHA	TTE	RED		
	1266	1275'	9.0'	9.0'	"	0.42'		"			
	1275	1282'	7.0'	6.0'	86	0.42'		"			
	1282	1292'	10.0'	10.0'	100	0.45'		"			
	1292	1302'	10.0'	10.0'	"	0.54'		"			
	1302	1311'	9.0'	9.0'	"	0.38'		"			
	1311	1321'	10.0'	10.0'	"	0.25'		"			
	1321	1331'	10.0'	10.0'	"	0.29'		"			
	1331	1341'	10.0'	10.0'	"	0.40'		"			
	1341	1351'	10.0'	10.0'	"	0.36'		"			
	1351	1361'	10.0'	10.0'	"	0.36'		"			
	1361	1371'	10.0'	10.0'	"	0.45'		"			
	1371	1380'	9.0'	9.0'	"	0.42'		"			
	1380	1390'	10.0'	10.0'	"	0.43'		"			
	1390	1400'	10.0'	10.0'	"	0.36'		"			
	1400	1410'	10.0'	10.0'	"	0.39'		"			
	1410	1420'	10.0'	10.0'	"	0.52'		"			
	1420	1425'	5.0'	5.0	"	0.29'		"			
	1425	1435'	10.0'	10.0'	"	0.35'		"			
	1435	1445'	10.0'	10.0'	"	0.40'		"			
	1445	1455'	10.0'	10.0'	"	0.50'		"			
	1455	1465'	10.0'	10.0'	"	0.42'		"			
	1465	1475'	10.0'	10.0'	"	0.28'		"			
	1475	1485'	10.0'	10.0'	"	0.59'		"			
	1485	1495'	10.0'	10.0'	"	0.61'		"			
	1495	1505'	10.0'	10.0'	"	0.45'		"			
	1505	1513'	8.0'	8.0'	"	0.48'		"			
	1513	1523'	10.0'	10.0'	"	0.51'		"			
	1523	1533'	10.0'	10.0'	"	0.61'		"			
	1533	1539'	6.0'	6.0'	"	0.48'		"			
	1539	1549'	10.0'	10.0'	"	0.37'		"			
	1549	1559'	10.0'	10.0'	"	0.52'		"			
↓	1559	1565'	6.0'	6.0'	"	0.46'					

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BEAR CREEK - NWD - SAMPLER'S LOG SAMPLER J. A. ROGERS

Core Size	From	To	Interval	CORE RECOVERY		Max. Lgth.	UNITS PER FOOT				
				Feet	%	Ft.	FRACTURES 0-30°	30-60°	60-90°	No. Pcs.	Ft. Grvl.
NXWL	1565	1575'	10^{0}'	10^{0}'	100	0^{51}'	SHA	TTE	RED		
↑	1575	1585'	10^{0}'	10^{0}'	"	0^{52}'		"			
	1585	1595'	10^{0}'	10^{0}'	"	0^{50}'		"			
	1595	1605'	10^{0}'	10^{0}'	"	0^{50}'		"			
	1605	1612'	7^{0}'	7^{0}'	"	0^{48}'		"			
	1612	1622'	10^{0}'	10^{0}'	"	0^{44}'		"			
	1622	1628'	6^{0}'	6^{0}'	"	0^{50}'		"			
	1628	1635'	7^{0}'	7^{0}	"	0^{60}'	2	6	5	32	
	1635	1645'	10^{0}'	10^{0}'	"	0^{51}'	3	8	4	38	
	1645	1655'	10^{0}'	10^{0}'	"	0^{77}'	5	7	3	42	
	1655	1665'	10^{0}'	10^{0}'	"	0^{60}'	4	6	3	28	
	1665	1675'	10^{0}'	10^{0}'	"	0^{51}'	SHA	TTE	RED		
	1675	1685'	10^{0}'	10^{0}'	"	0^{46}'		"			
	1685	1695'	10^{0}'	10^{0}'	"	0^{68}'		"			
	1695	1702'	7^{0}'	7^{0}'	"	0^{55}'		"			
	1702	1710'	8^{0}'	8^{0}'	"	0^{37}'		"			
↓	1710	1715'	5^{0}'	5^{0}'	"	0^{41}'		"			
	END										
		OF									
			HOLE								

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BEAR CREEK - NWD - SAMPLER'S LOG BSW-8 SAMPLER J. A. ROGERS

SHATTERED : > 20 PCS./FT.

Core Size	From	To	Interval	CORE RECOVERY Feet	CORE RECOVERY %	Max. Lgth. Ft.	UNITS PER FOOT FRACTURES 0-30	30-60	60-90	No. Pcs.	Ft. Grvl.
NXWL	90'	92.8'	2.8'	2.8'	100	0.30'	SHATTERED			*	
↑	92.8'	100'	7.2'	7.2'	100	0.35'		"			
	100'	105'	5.0'	5.0'	100	0.20'		"			
	105'	110'	5.0'	5.0'	100	0.25'		"			
	110'	115'	5.0'	5.0'	100	0.32'		"			
	115'	118'	3.0'	3.0'	100	0.46'		"			
	118'	121'	3.0'	3.0'	100	0.27'		"			
	121'	124.5'	3.5'	3.5'	100	0.50'		"			
	124.5'	127'	2.5'	2.5'	100	0.72'	10	16	14	49	
	127'	132'	5.0'	3.9'	78	0.13'	SHATTERED				
	132'	140'	8.0'	7.5'	94	0.82'	2	9	21	51	
	140'	144'	4.0'	3.0'	75	0.22'	SHATTERED				
	144'	148'	4.0'	4.0'	100	0.45'		"			
	148'	155'	7.0'	5.6'	80	0.28'		"			
	155'	160'	5.0'	4.5'	90	0.56'		"			
	160'	168'	8.0'	8.0'	100	0.77'	0	14	31	106	
	168'	172'	4.0'	4.0'	100	0.41'	SHATTERED				
	172'	179'	7.0'	7.0'	100	0.51'		"			
	179'	186'	7.0'	6.0'	86	0.46'		"			
	186'	193'	7.0'	7.0'	100	0.32'		"			
	193'	201.5'	8.5	8.5'	100	0.62'		"			
	201.5'	211.5'	10.0'	10.0'	100	0.83'		"			
	211.5'	221	9.5'	9.5'	100	0.36'		"			
	221	231	10.0'	10.0'	100	0.41'		"			
	231	235	10.0'	10.0'	100	0.26'		"			
	235	241	6.0'	6.0'	100	0.51'		"			
	241	251	10.0'	10.0'	100	0.36'		"			
	251	259	8.0'	8.0'	100	0.42'		"			
	259	269	10.0'	10.0'	100	0.28'		"			
	269	275	6.0'	6.0'	100	0.26'		"			
	275	285	10.0'	10.0'	100	0.42'		"			
	285	295	10.0'	10.0'	100	0.43'		"			
	295	305	10.0'	10.0'	100	0.56'		"			
	305	312	7.0'	7.0'	100	0.41'		"			
	312	315	3.0'	3.0'	100	0.46'		"			
	315	325	10.0'	10.0'	100	0.61'	5	7	27	62	
↓	325	335	10.0'	10.0'	100	0.32'	SHATTERED				

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FEAR CREEK - NWO - SAMPLER'S LOG BSW-8 SAMPLER J. A. ROGERS

Core Size	From	To	Interval	CORE RECOVERY Feet	CORE RECOVERY %	Max. Lgth. Ft.	UNITS PER FOOT FRACTURES 0-30	FRACTURES 30-60	FRACTURES 60-90	No. Pcs.	Ft. Grvl.
NXWL	335'	345'	10.0'	10.0'	100	0.46'	SHATTERED				
↑	345'	355'	10.0'	10.0'	100	0.33'		"			
	355'	365'	10.0'	10.0'	100	0.27'		"			
	365'	373'	8.0'	8.0'	100	0.36'		"			
	373'	383'	10.0'	10.0'	100	0.23'		"			
	383'	388'	5.0'	5.0'	100	0.25'		"			
	388'	395'	7.0'	2.0'	28.6	0.22'		"			
	395'	397'	2.0'	2.0'	100	0.20'		"			
	397'	405'	8.0'	8.0	100	0.39'		"			
	405'	408'	3.0'	3.0'	100	0.34'		"			
	408'	415'	7.0'	7.0'	100	0.27'		"			
	415'	425'	10.0'	10.0'	100	0.25'		"			
	425'	435'	10.0'	10.0'	100	0.40'		"			
	435'	443'	8.0'	8.0'	100	0.31'		"			
	443'	452'	9.0'	9.0'	100	0.24'		"			
	452'	459'	7.0'	7.0'	100	0.24'		"			
	459'	466'	7.0'	7.0'	100	0.52'		"			
	466'	471'	5.0'	4.0'	80	0.31'		"			
	471'	476'	5.0'	3.5'	70	0.31'		"			
	476'	485'	9.0'	9.0'	100	0.28'		"			
	485'	493'	8.0'	4.0'	50	0.31'		"			
	493'	496'	3.0'	3.0'	100	0.34'		"			
	496'	505'	9.0'	9.0'	100	0.26'		"			
	505'	512'	7.0'	7.0'	100	0.23'		"			
	512'	521'	9.0'	9.0'	100	0.31'		"			
	521'	529'	8.0'	8.0'	100	0.29'		"			
	529'	536'	7.0'	7.0'	100	0.33'		"			
	536'	542'	6.0'	6.0'	100	0.34'		"			
	542'	551'	9.0'	9.0'	100	0.41'		"			
	551'	560'	9.0'	9.0'	100	0.40'		"			
↓	560'	566'	6.0'	6.0'	100	0.28'		"			

BP = fbhp on map

Drill Hole No. BSW 7 | Elevation | Inclination | Page No. 1 of
Collar Coords. | Bearing | Logged by: Quick log | Date

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Mineralization	Core Rec.	~~Ground Cond.~~	Geology	Analyses
	464		464 – 542 bxa – volcanic? textures difficult to see because of very strong Qtz-Sericite alteration. various rock types present but all look volcanic to me. strong pyrite. 5–10% ore ~ 6–7% (dissem 90%)	
	542–562		542 – 562 MVB silicified extreme silicification of a vfg rock – prob a felsite breccia TS? 3–5% py	
	60		562 – 626 MVB bxa frags very distinct 577–579 – still looks like a volcanic matrix to me. (571–576) very ground up – possibly faulted) high sulfide – Aulem log seems good on Est. M. strong sil-ser. Note Selective pyritization of frags.	
	600			
	20		626 – 653 MVB still bxa but in a foliated volcanic matrix – looks like dry bone. bone like. extreme sericitization here	
	40		650–689 ground up – poss. fault. – intermittent unbroken zones	
str ser	60–80		(694–707) definite fault gouge – 707 – 740 + highly broken – usually only small pieces recov	
	700			
	20		653 – ~732 MVB – as before	
Mod ser	40		740 – 784 MV bxa tapering off until no more frags readily visible at 7?1	
		MV lithic tuff?	740–752 – greenish – otherwise same. 752–784 – Dark brown – grainy texture – almost silty or sandy volcanic – or lithic tuff	
BLP →	60	MV	BLP dike or DP 764–765 – bxa on upper margin. a few veinlets but >90% of py in diss. similar to the DP of BCMC in BSW 1 – but bird marks gone – also like BLP in Bue 1+2	
chl	800	HAMV	784 – 803 HA hornblende andesite (BCMC = HBDP) still a volcanic to me.	
	13 / 80	MVB BLP MVB (foliated fault gouge)	803–809 – fault Qtz – py ± (black mineral) veins increasing – mostly vertical qpy seen. chl alt	
			809–813 MVB	
			813–816 BLP dike – cuts bxa – chloritized	
			816 – 826 MVB	

Drill Hole No. 7 | Elevation | Inclination | Page No. 2 of

Collar Coords. | Bearing | Logged by: | Date

Mineralization	Core Rec.	Ground Cond.	Geology	Analyses
	820		826-842 - dike BLP some on BSW / DP at 456	
	40			
	60		842-872 MVB & (AH) mixed	
MVB	80		872-890 Fault Bxa - some competent pieces	
			890-904 MVB strongly broken - v. small frags - no arg or gouge so prob not a fault per se.	
	900		904-908 Sericitized rock - prob. in fault zone - crushed. white - orig a volc. ??	
		ser	908-917 MV - as before (re some chl some ser in veins + weak-mod stockwork of veining	
	20		917-936 faulted MV or MVB - clay present indicating some fault gouge.	
	40		936-940 MV-MVb	
			940-945 Fault Gouge	
alt. dike →	60		945 - MV dark to light green - chl - portion are like the HA earlier described - include HA in MV some qtz veining apparent foliation ~45° to ca	
MV	80		952-953 Small qtz-ser alt dike - a porphyry - similar to BLP but may not be same.	
	1000		988-1000 - fault zone - high silica low py	
	20		1002-1039 faulted - intermittently sericitized clayey small islands of unbroken material - slides etc seen	
	40		1039-1096 fault gouge - clay + ser - white	
	60	gouge		
HA-FPA?	80		1096-1100 MVB sericitized + silicified, some large qtz veins - veins often broken therefore ∴ brecciation took place after some mineralization	
Dike	1100	FPA ← FPA	1100-1107 - Fine porphyritic andesite 1 mm phenos of plag in brown aphanitic gm.	
	20		1107-1149 MVB - intermittently rebrecciated - some gouge in places	
	40			
	60		1149-1166 MV - foliated ~55° - of medium? - also broken but less than preceding zone.	
	80		1166-1175 stockwork veined + altered rock - HA? - possibly HA foliated? - HA + FPA Maybe same rock w/ different alt	
	1200		1175-1191 Good HA grading into good FPA at 1191 but HA seems has clots of biot that standout some qtz veins. - S	
			1191-1200 - FPA more veining in FPA than HA - perhaps they are composite + transitional.	

Drill Hole No. 7 | Elevation ______ | Inclination ______ | Page No. 3 of ______

Collar Coords. ______ | Bearing ______ | Logged by: ______ | Date ______

Mineralization					Core Rec.	Ground Cond.	Geology	Analyses		
					1200		1200 – 1203 – HA w/ melanite? – black to dark green			
							1203-4 – calcite vein w/ py + po			
							1204 – 1235+ FPA brownish – w/ calcite in matrix + in veins			

SCALE ________ LOGGED BY ________ COORDINATES ________ LOCATION ________ PROJECT ________ Page ___ of ___
START ________ COMPLETION ________ DRILLER ________ BEARING ________ DIP ________ ELEVATION ________ DRILL HOLE # BSW 7
REMARKS TOTAL DEPTH 1715
INTERVAL 1240 to 1373

Σ py	ASSAYS BCMC	LITH.	GEOLOGY Rock Type, Alteration, Mineralization, Structure	ALTERATION PERVASIVE (Ser / Clay)	VEINS (Q / Cal / Gyp)
		1240			
		FPA stockwork Qtz perv ser (50)	1240 – 1261 FPA Fine porphyritic Andesite – normally dark brn w/ fsp xtal ⅓ mm ~10-15% 4-10% biotite clumps or books – up to 3mm – lost w/ strong alt. Alt. Strong perv. ser & Very strong Qtz veining – strong stockwork Qt/inch Minz vein-stray – py & Qtz py + Qtz hem-py TS 3-4%	S / S	Strong stockwork
		60 flt?	1261 – 1266 Fault Gouge? – strong ser – small pieces – no solid core –	S	
		70 Blp? highly broken	1266 – 1289 B/P Broken fsps-clay & mafics – highly altered) – ser & clay – (Some hnb present?) whitish – greenish when wet some Qtz veining – 2-3/foot 1/32 to 1/8"	S m-s / S m-s	weak veining
		80		S ms	
		90	1289 – 1301 B/P? Brownish – tan – also a little finer grained & more competent – Alt – Ser – perv. no clay. TS ~1% some ⅛" vein – ie 1287	S	
		1300	this rock cuts the stockwork in the Fine grained volcanics – (or HAZ) (to FPA) (the contact NO – see 1382) it is also cut by later Qtz veinlets		
		stockwork MV?	1301 – 1310 MV? stockwork Strong Qtz vein stockwork in fine grained volcanic(?) cut by B/P above Many barren Qtz veins cut & offset by later steep Qtz-py veinlets stockwork is early – may be assoc w/ the emplacement of the MV or the whichever it is. TS-2-3%	S	Strong stockwork
		10 Blp?	1310 – 1315 B/P(?) – prob B/P 1312 but some strange silicification that is extremely selective & it occurs bound on a side by a Qtz vein is very confusing – almost look like another rock for the color is so different – but it basically //'s a ½" calcite vein.	S	
		20	1315 – 1323 fault gouge & bxa stockwork Qtz from 1312 to fault at 1315 – earlier (1301) it clearly postdates the stockwork. (is this an older look alike?)	S	weak? stockwork
		30	1323 – 1361 B/p – as in BSW1 Alt – Strong ser to chl + wk ser – (Remnant chl ?) ' strong Mag in Biot in weaker alt zones. TS · 1-2% – vein – maybe 2-3% in stronger sericite zones. w/ arsenopy also.	S / W M / S / W M / S	
		40			
		50			
		60 MV? or MV?	1361 – 1368 MV – stockwork Qtz Fine grained stockworked volcanic? or intrusive – stockwork has been refaulted – offset veins	S	Stockwork
			1368 – 1373 B/P – as before – strong ser	S	

SCALE ______ LOGGED BY ______ COORDINATES ______ LOCATION ______ PROJECT ______

START ______ COMPLETION ______ DRILLER ______ BEARING ______ DIP ______ ELEVATION ______

REMARKS

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DRILL HOLE # BSW 7

TOTAL DEPTH ______

INTERVAL 1373 to 1510

ASSAYS	LITH.	GEOLOGY — Rock Type, Alteration, Mineralization, Structure	ALTERATION — PERVASIVE (Ser, chl, clay, Sil)	ALTERATION — VEIN (Q, Cal, qtz)
	73	1373 – 1380 MV · Stockwork qtz in aphanitic volcanics cut by FPA at 1380 Strong Ser	S	
		1380 - 1382 FPA - FPA dikelet clearly cuts volcanics & stockwork - but is offset itself by many small flat fractures (w/ hem.).	m	SW
1-2	80	1382 - 1410? MV - stockwork - some silicification as well as sericitization TS - 1-2%	W	
	90			
	1400			
	10	1410 - ~1457±? FPA brown turning bleached at 1444 & losing some texture - argl? some veining - late offsets by small fracts - a fraction to several inches displacement TS ≤ 1% V. very broken w/ slicks from 47 to 57	S	
±1	20	FPA brown some vein some chl	Tr mixed W?	
	30			
	40			
	1450	broken FPA - bleached	m	
		1457 - 1459? Bxa w/ strong calcite (Fault?)		
	60	cal - 1459 - 1480 Fault gouge & Bxa - Strong Ser TS ≤ 1%		
	70			
	80	1480 - 1510 PBL Porphyritic biotite Latite — similar to BLP except for fewer plag phenos & more biotite phenos - weak foliation 20-30° to CA, Mag present (could be phase of BLP) dissem & vein py & cpy - prob same rock as BSW8 at 1125'	S	
	90	strong Ser to 1496 - then weak ser + arg. of plag. then weaker ser strong from 1508 TS ~ 1-2% stronger cpy visible esp at 1511	S	
	1500		m-w W	
			W?	
	10		W W	

SCALE ______ LOGGED BY ______ COORDINATES ______ LOCATION ______ PROJECT ______

START ______ COMPLETION ______ DRILLER ______ BEARING ______ DIP ______ ELEVATION ______

REMARKS

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DRILL HOLE # BSW 7

TOTAL DEPTH ______

INTERVAL 1510 to 1650

ASSAYS		LITH.	GEOLOGY Rock Type, Alteration, Mineralization, Structure	ALTERATION PERVASIVE (Ser, chl, Arg, Sil)	VEIN (Q, Chl, gyp)
1-2	1510	PbL	1510 - 1553 PBL as before - grey - biot essentially unalt - some wk chl		
			TS < 2% vf dissem some v. small py fractures	Ser W, chl W	Q V, gyp S
	1520		1556 ½" Qtz py-cpy vein (flat-20° to CA)		
			strong gyp		
	30		chill zone at 1553 2" but can't see contact w/ andesite (MV?)		S
	40	?		S, S	S
		PbL	1533 - 1570 Mva: Andesite - vfg w/ 4-7% dissem py + cpy	chl W	Q ✓, gyp S
	1550	MVa, 50° py vein			
4-7	60			chl W	S
		MVA	1570-1572 Bxa - MVb or fault? no good core to see		S
	70	MVB? flt and core	1572 - 1592 PbL as before grey - a few Qtz veins + strong gyp		
			can't see contact w/ BLP - Robbed?		Q W, gyp S
2-4	80				
					S
	90	≈ PBhp	1592 - 1650 BLP same as before in this hole - but note a difference between BLP of BSW 7 + BLP of BSW 1 at 456' - there is a slight textural difference and there are the rare Qtz phenos present in BSW 7.		
1-3	1600		fsp - 20-25% 2-7mm black biot 1-2mm - 4-6% (weakly chloritized) mag present		M
			Alt - weakly chloritized - mostly black biot + shiny plag - rare Qtz phenos		M
	10		Mnz - 1-3% py - dissem + on hairline fractures		
1-2			1631 - ¼" Qtz-py veinlet w/ bleached ser halo.		M
	20				
1-3					M
	30				
					M
1-2	40				W
	50				

SCALE ______ LOGGED BY ______ COORDINATES ______ LOCATION ______ PROJECT ______

START ______ COMPLETION ______ DRILLER ______ BEARING ______ DIP ______ ELEVATION ______

REMARKS

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DRILL HOLE # BSW 7

TOTAL DEPTH 1715

INTERVAL 1650 to 1715

	ASSAYS	Depth	LITH.	GEOLOGY — Rock Type, Alteration, Mineralization, Structure	ALTERATION — PERVASIVE	VEIN
1-2		50		1650-1698 Blp as before - sparsely	chl V W	
		60				
		70				
		80				
		90				
4-7		1700	steep smooth contact	1698-1712 MVa (MVB)[1710-1712] dark brown mostly w/ 4-7% dissem py — one or two reentrants of Blp (~2")		
1				1712-1715 TD-Bottom Blp as before.		

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chlorite, sericite and quartz. Chlorite-quartz-biotite alteration is most often associated with relatively higher copper grades; chlorite-quartz-biotitized dacite porphyry between 820 feet and 907.7 feet, for instance, averages 0.35%.

Drill hole BSW-8 (TD 566 feet), was drilled to test a small, intense VIP anomaly for an hypothetical, near-surface, high-grade chalcocite enrichment blanket. The hole provided an explanation for the anomaly--but failed to find the anticipated ore body--in penetrating 92.8 feet of oxidized and quartz-sericitized quartz latite porphyry and quartz-sericite rock, 20 feet of enriched, quartz-sericitized intrusion breccia, averaging 0.3% Cu, and 456 feet of quartz-sericitized intrusion breccia and quartz-feldspar porphyry averaging about 10 volume percent pyrite, and 0.05% Cu as chalcopyrite and cupriferous pyrite.

BSW 7

Drilling, geologic mapping, geochemical sampling and induced polarization have shown Buckskin Southwest to be a tight porphyry copper sulfide system with abnormally steep alteration and mineralization gradients. The system has been penetrated by only one deep hole (BSW-7), which bored through a 510 foot zone averaging nearly 0.2% Cu. Alteration within this zone is highly complex, alternating between varieties of quartz-biotitization and quartz-sericitization. Such an alteration pattern suggests that BSW-7 penetrated the transition zone between the potassic core of the system and its quartz-sericite halo. The unusually steep mineralization gradients suggest that ore grade copper mineralization might occur in the potassic core within a few hundred feet laterally of BSW-7.

alt

An hypothetical Buckskin Southwest ore body would be relatively small--100 to 200 million tons--but high grade, probably in the 0.8 to 1% range. The deposit would most likely be situated north, northwest, or northeast of BSW-7, and would be concealed beneath 750 feet to 1,000 feet of barren quartz-sericite rock and/or postmineral cover.

RECOMMENDATIONS

The writer recommends deepening two shallow drill holes completed in 1970--BSW-1 (TD 292 feet) and BSW-2 (TD 200 feet)--to 2,000 feet. Completion of these two proposed drill holes will provide a definitive test of the target hypothesis outlined under "Summary and Conclusions".

EXPLANATION
BSW-7 & 8

LITHOLOGY

- HORNBLENDE BIOTITE DACITE PORPHYRY (Post-mineral below 1592 in BSW-7)
- QUARTZ-FELDSPAR PORPHYRY (ALTERATION PRECLUDES DETERMINATION OF ORIGINAL COMP.)
- jasperoid
- QUARTZ-SERICITE ROCK
- INTRUSION BRECCIA
- BIOTITE HORNBLENDE QUARTZ LATITE PORPHYRY

STRUCTURE

- FAULT ZONE
- MINOR FAULT
- STOCKWORK FRACTURING
- QUARTZ-CALCITE VEIN
- QUARTZ VEIN

EXPLANATION OF GRAPHIC ALTERATION LOG

CHLORITE-QUARTZ-BIOTITE Complete alteration of original rock mafic minerals — partial alteration of original rock feldspar to a fine crystalline aggregate of dark brown biotite and dark grayish-green chlorite, moderate to intense stockwork quartz veining (veinlets range from <1 mm to 10 cm, avg. 2 mm, in width); moderate silicification as well as quartz veinlets; minor sericite, clay, calcite, specular hematite, and potash feldspar, singly or in various combinations, may be locally present.

QUARTZ-BIOTITE Same as chlorite-quartz-biotite except minor to nonexistent secondary chlorite.

SERICITE-QUARTZ-BIOTITE Same as chlorite-quartz-biotite, except no chlorite; moderately abundant, fine crystalline light gray sericite texturally similar to the biotite and chlorite of chlorite-quartz-biotite alteration.

QUARTZ-SERICITE All original minerals replaced with a fine crystalline quartz-sericite aggregate; weak to intense stockwork quartz veining; specular hematite and potash feldspar locally present.

CHLORITE-QUARTZ-SERICITE Same as quartz-sericite, except moderately abundant light-dark grayish-green chlorite.

CLAY-SERICITE Original rock feldspar partially-completely altered to very fine crystalline, light gray to white clay-sericite aggregates; original mafic minerals partially-completely altered to light-dark grayish-green chlorite, occasionally with minor clay and/or sericite; minor gypsum veinlets and calcite locally present.

PROPYLITIC Original rock mafic minerals altered to fine-crystalline, light-dark grayish-green chlorite; original rock feldspars partially altered to calcite and lightly dusted with clay and sericite along cleavage planes; minor gypsum and/or epidote locally present.

BCMC-NVD

J. B. HULEN 6/18/72

35
Item 15

EXPLANATION
BSW-7 & 8

LITHOLOGY

HORNBLENDE BIOTITE DACITE PORPHYRY (Post-mineral below 1592' in BSW-7)

QUARTZ-FELDSPAR PORPHYRY (ALTERATION PRECLUDES DETERMINATION OF ORIGINAL COMP.)

QUARTZ-SERICITE ROCK (jasperoid)

INTRUSION BRECCIA

BIOTITE HORNBLENDE QUARTZ LATITE PORPHYRY

STRUCTURE

FAULT ZONE

MINOR FAULT

STOCKWORK FRACTURING

QUARTZ-CALCITE VEIN

QUARTZ VEIN

EXPLANATION OF GRAPHIC ALTERATION LOG

CHLORITE-QUARTZ-BIOTITE Complete alteration of original rock mafic minerals — partial alteration of original rock feldspars — to a fine crystalline aggregate of dark brown biotite and dark grayish-green chlorite, moderate to intense stockwork quartz veining; veinlets range from <1 mm to 10 cm, avg. 2 mm, in width; moderate silicification at depth; [illegible] veinlets; minor sericite, clay, calcite, specular hematite, and potash feldspar, singly or in various combinations, may be locally present.

QUARTZ-BIOTITE Same as chlorite-quartz-biotite except minor to nonexistent secondary chlorite.

SERICITE-QUARTZ-BIOTITE Same as chlorite-quartz-biotite, except no chlorite; moderately abundant, fine crystalline light gray sericite texturally similar to the biotite and chlorite of chlorite-quartz-biotite alteration.

QUARTZ-SERICITE All original minerals replaced with a fine crystalline quartz-sericite aggregate, weak to intense stockwork quartz veining; specular hematite and potash feldspar locally present.

CHLORITE-QUARTZ-SERICITE Same as quartz-sericite, except moderately abundant light-dark grayish-green chlorite.

CLAY-SERICITE Original rock feldspar partially-completely altered to very fine crystalline, light gray to white clay-sericite aggregates; original mafic minerals partially-completely altered to light-dark grayish-green chlorite occasionally with minor clay and/or sericite; minor gypsum veinlets and calcite locally present.

PROPYLITIC Original rock mafic minerals altered to fine-crystalline, light-dark grayish-green chlorite; original rock feldspars partially altered to calcite and lightly dusted with clay and sericite along cleavage planes; minor gypsum and/or epidote locally present.

BCMC-NWD

J. B. HULEN 6/16/72

NORTHWEST DISTRICT

Summary Drill Hole Log

Name BUCKSKIN SOUTHWEST

Code 05-01-0411

DRILL HOLE NO. BSW-7 PAGE 1

BEARING VERTICAL DIP

LOCATION: N. 10,000' E. 10,000

COLLAR ELEV. APP 5440'

TOTAL DEPTH 1715' ,BY J.B

START 4/25/72 COMPLETED 6

Purpose of hole TEST OF DEEP, PRIMARY, PORPHYRY COPPER ORE TARGET

BSW 7

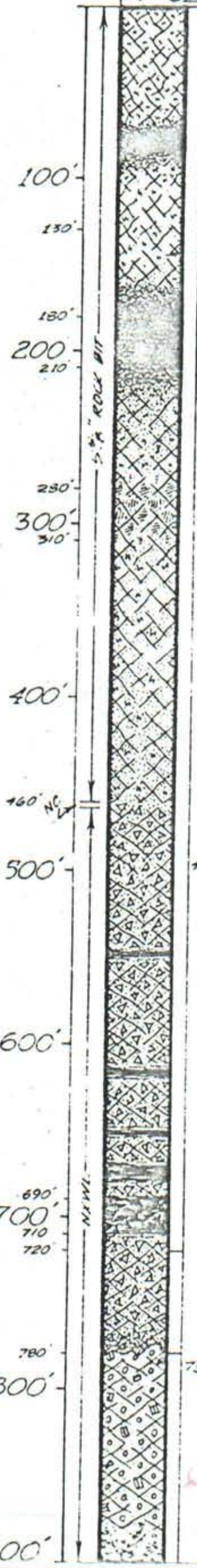
35 Item 15

Scale: 1"= 100'

Est. of final depth

drafted

GRAPHIC GEOLOGY	DESCRIPTIVE LOG	PPM Cu	PPM Mo	PPM Ag	EST % SU



0-180' QUARTZ-SERICITE ROCK, v. lt gray-white, fine-crystalline (individual grains avg. <0.5 mm in dia.); rock is almost certainly an altered QTZ. LATITIC INTRUSION BRECCIA (small relict fragments in a few of the cuttings); hole penetrates some JASPEROID, lt. gray to reddish-gray, fine-xline. JAROSITIC LEACHED CAPPING TO 130' - Avg >90% lt. grayish-yellow jarosite w/tr. hem & goethite; capping rock is laced w/ narrow, disc., white kaolinite vnlts.; ZONE OF SUPERGENE ENRICHMENT from 180' - overall 0.1-0.3% cc, as partial to complete repl. of diss. py (avg ~7% by vol.)

180-210' JASPEROID, v lt brownish-gray, cryptocrystalline; distinct microbx. text. 0.5-1% diss py, tr. diss cpy, up to 0.1% diss., dk brownish-gray metallic minrl. (sp?); mod. abund. stkwk. tr. vnlts

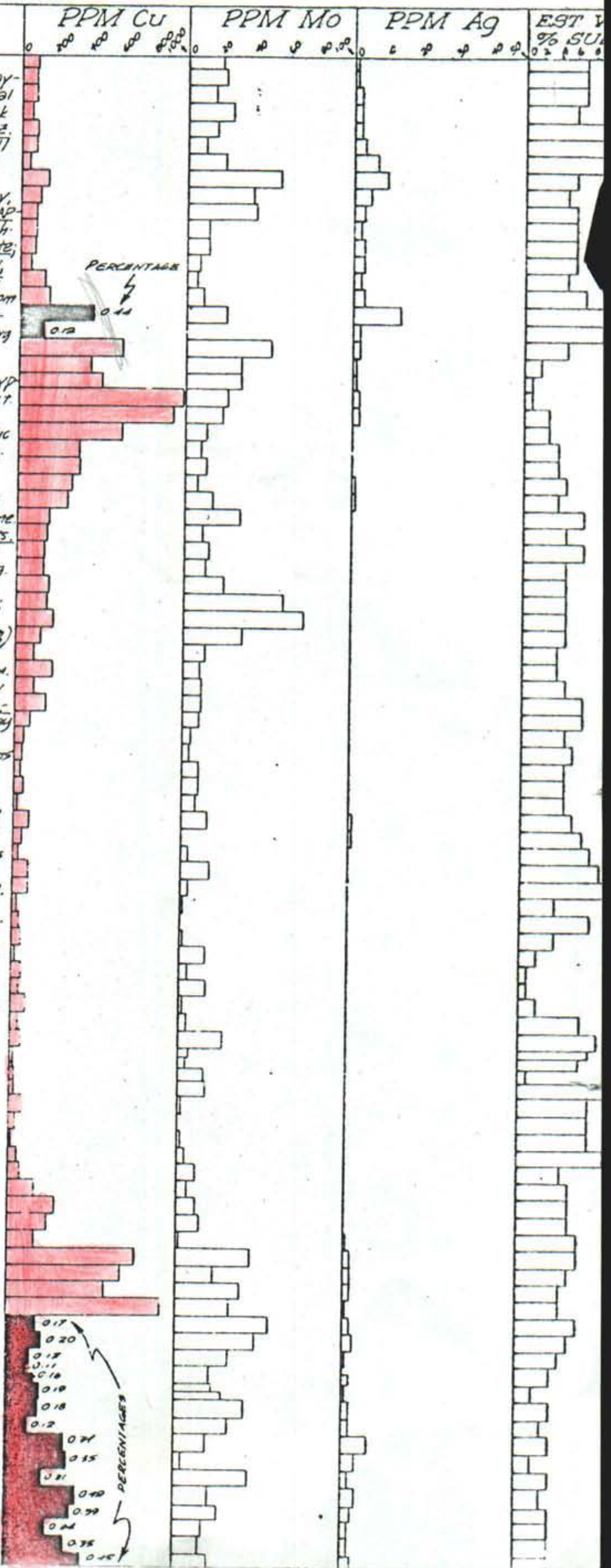
210-460' QUARTZ-SERICITE ROCK, lt.-med. bluish to greenish-gray, v. fine-xline a few narrow, irreg., disc. qtz vnlts. tr. diss chl locally; 3-7% (avg. 5) py as anh.-subh grains <0.1-3 (avg. 0.3-0.5 mm in dia.), tr-0.2% (avg <0.1% diss. cpy, text. similar to py; (both py & cpy also occur as rare microvnlts); up to 0.3% (avg. <0.1%) diss. anh grains of dk. brownish-gray submetallic mineral, <0.1 mm. avg dia., which may be sp; below 270', tr-1% (avg 0.5%) specular hematite, as anh.-subh. dk. reddish gray diss. grains, avg. <0.1 mm. in dia., & as irreg. aggregates of these grains up to 0.5-0.1 mm. in dia.

280-310': abt. 50% of the rock consist of lt. grayish-pink 2nd Kspar. as narrow, irreg vnlts & small irregular shreds & patches

460-780' INTRUSION BRECCIA, mottled lt gray, med. gray, greenish-gray, & brownish-gray; rock is a fine-xline aggregate of qtz & ser. locally w/minor chl. qtz. and ser. also occur singly or together often w/sulfides, as narrow, irregular vnlts; erratically dist. spec hem., same as 210-460'; texture of rock is obscure, but apparent; py and cpy texturally similar to py and cpy 210-460'. fault zone, 690-710'.

720-780': alteration changes from qtz-ser. to qtz-ser-2nd bte.

780-907' HORNBLENDE BIOTITE DACITE PORPHYRY; 40-45% phenocrysts (plag, qtz, bte, & hbl.) embedded in an aphanitic to v. fine-xline groundmass; bte. & hbl are totally altered to a fine-xline aggregate of bte and chl.; bte also partially to totally replaces the aphanitic groundmass (highly variable and erratic dist. of bte); abundant qtz.-py-cpy-hem veinlets



DISTRICT	Name BUCKSKIN SOUTHWEST
Drill Hole Log	Code 05-01-0411

TEST OF DEEP, PRIMARY, PORPHYRY COPPER

BSW 7 (35) Item 15

DRILL HOLE NO. BSW-7 PAGE 1 OF 2
BEARING VERTICAL DIP —
LOCATION: N. 10,000' E. 10,000' (Approx)
COLLAR ELEV. APP. 5440'
TOTAL DEPTH 1715' BY J.B. Hulen
START 4/25/72 COMPLETED 6/25/72

Est. of final depth

*NOTE: BLACKED-IN INTERVALS INDICATE 10X INCREASE IN GRAPHED VALUES

drafted by J.B. Hulen

GRAPHIC LITHOLOGY / DESCRIPTIVE LOG

-180' QUARTZ-SERICITE ROCK, v. lt gray-white, fine-crystalline (individual grains avg. < 0.5 mm. in dia.); rock is almost certainly an altered QTZ. LATITIC INTRUSION BRECCIA (small relict fragments in a few of the cuttings); hole penetrates some JASPEROID, lt. gray to reddish-gray, fine-xline; JAROSITIC LEACHED CAPPING TO 130' - Avg >90% lt. grayish-yellow jarosite w/tr. hem & goethite; capping rock is laced w/ narrow, disc., white kaolinite vnlts.; ZONE OF SUPERGENE ENRICHMENT from 180' - overall 0.1-0.3% cc, as partial to complete repl of diss. py (avg ~7% by vol.)

-210' JASPEROID, v lt. brownish-gray, cryptocrystalline; distinct microbx. text 0.5-1% diss py, tr. diss cpy, up to 0.1% diss, dk brownish-gray metallic minrl. (sp.?), mod. abund. stkwk. qtz. vnlts

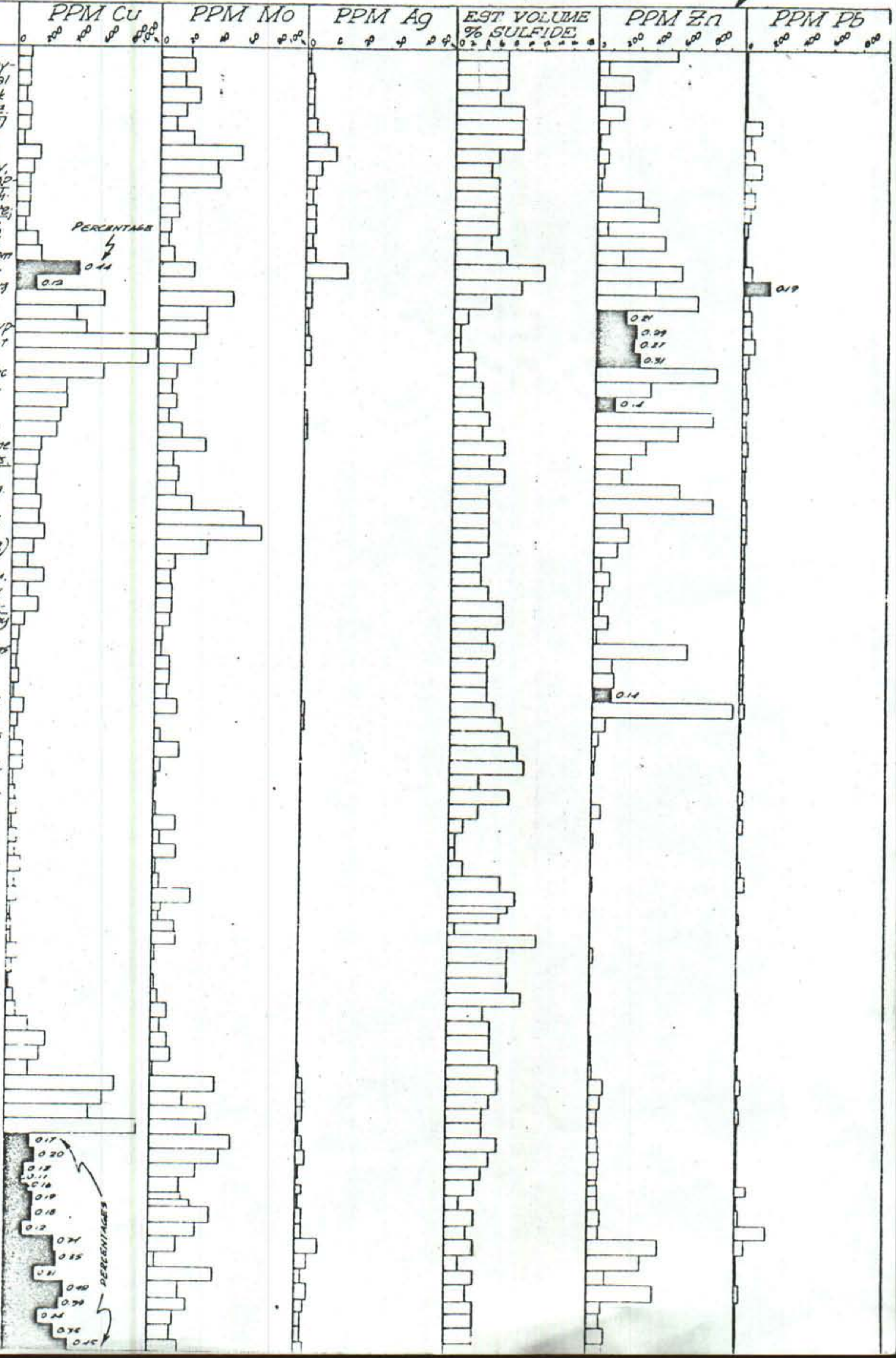
-460' QUARTZ-SERICITE ROCK, lt.-med bluish to greenish-gray, v fine-xline a few narrow, irreg., disc qtz vnlts. tr diss chl locally; 3-7% (avg 5) py as anh - subh grains <0.1-3 (avg. 0.3-0.5 mm in dia., tr - 0.2% (avg <0.1% diss. cpy, text similar to py; (both py & cpy also occur as rare microvnlts"; up to 0.3% (avg. <0.1%) diss. anh grains of dk brownish-gray submetallic mineral, < 0.1 mm. avg dia., which may be sp; below 270', tr-1% (avg 0.5%) specular hematite, as anh.- subh. dk reddish-gray diss grains, avg. < 0.1 mm. in dia., & as irreg. aggregates of these grains up to 0.5-0.7 mm. in dia.

280-310': abt. 50% of the rock consist of lt. grayish-pink 2nd Kspar, as narrow, irreg vnlts & small irregular shreds & patches

-780' INTRUSION BRECCIA, mottled lt gray, med. gray, greenish-gray, & brownish-gray; rock is a fine-xline aggregate of qtz & ser., locally w/minor chl. qtz. and ser. also occur singly or together often w/sulfides, as narrow, irregular vnlts; erratically dist. spec hem., same as 210-460'; texture of rock is obscure, but apparent; py and cpy texturally similar to py and cpy 210-460'; fault zone, 690-710'.

720-780': alteration changes from qtz-ser. to qtz-ser-2nd btc.

-1007' HORNBLENDE BIOTITE DACITE PORPHYRY; 40-45% phenocrysts (plag, qtz., bte, & hbl.) embedded in an aphanitic to v. fine-xline groundmass; bte. & hbl are totally altered to a fine-xline aggregate of bte and chl.; bte also partially to totally replaces the aphanitic groundmass (highly variable and erratic dist. of bte), abundant qtz-py-cpy-hem veinlets



NORTHWEST DISTRICT

Summary Drill Hole Log

Name *BUCKSKIN SOUTHW.*

Code *05-01-0411*

DRILL HOLE NO. *BSW-1* PAGE *2* OF *2*

BEARING *** DIP ***

LOCATION: N. *** E. ***

COLLAR ELEV. ***

TOTAL DEPTH *1715'* BY *J.B. Hulen*

START *** COMPLETED ***

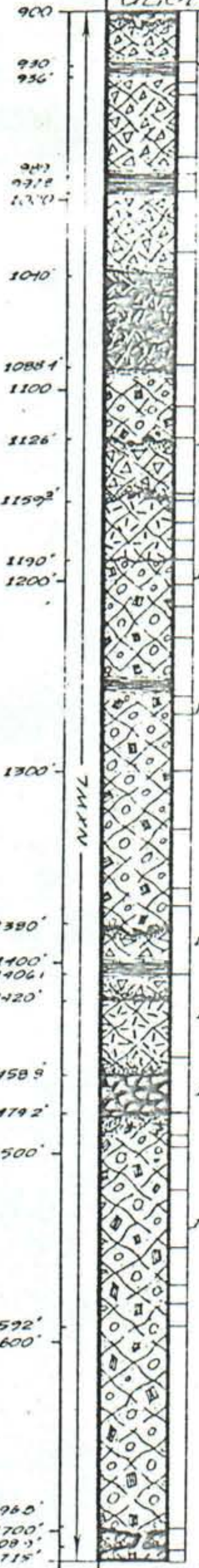
Purpose of hole *SEE PAGE 1 **

Scale: 1" = *100'*

Est. of final depth

drafted by J.B. Hulen

GRAPHIC GEOLOGY



DESCRIPTIVE LOG

907±-1040' INTRUSION BRECCIA, same as 460-780', alteration extremely erratic, varying from qtz-ser to qtz bte; original texture of rock obscure, but apparent, faults: 930-936', 969-997±; moderate to abundant stockwork qtz vnlts

1040-1088± FAULT ZONE, fragments of qtz-sericitized intrusion breccia embedded in a matrix of quartz, calcite, sulfides, & comminuted rock debris; abund narrow, irreg calcite & qtz vnlts, all fragments < 10 mm in dia

1088±-1126' HORNBLENDE BIOTITE DACITE PORPHYRY, same as 780-907±

1126-1159±' INTRUSION BRECCIA, same as 460 780';

1159±-1190' QUARTZ-FELDSPAR PORPHYRY, 25-30% ah feldspar phenocrysts, anh-subh, avg 1 mm length or dia.; 1-2% qtz phenocrysts, anh, avg. 1 mm or less in dia., aphanitic to v fine-xline groundmass

1190-1380' HORNBLENDE BIOTITE DACITE PORPHYRY, same as 780-907± Sharp decrease in cpy percentage below 1260' coincident w/ sharp gradation from qtz-bte to clay-ser alteration. Fault 1261-1267

1380-1420' INTRUSION BRECCIA, same as 460 780'; fault 1400-1406'

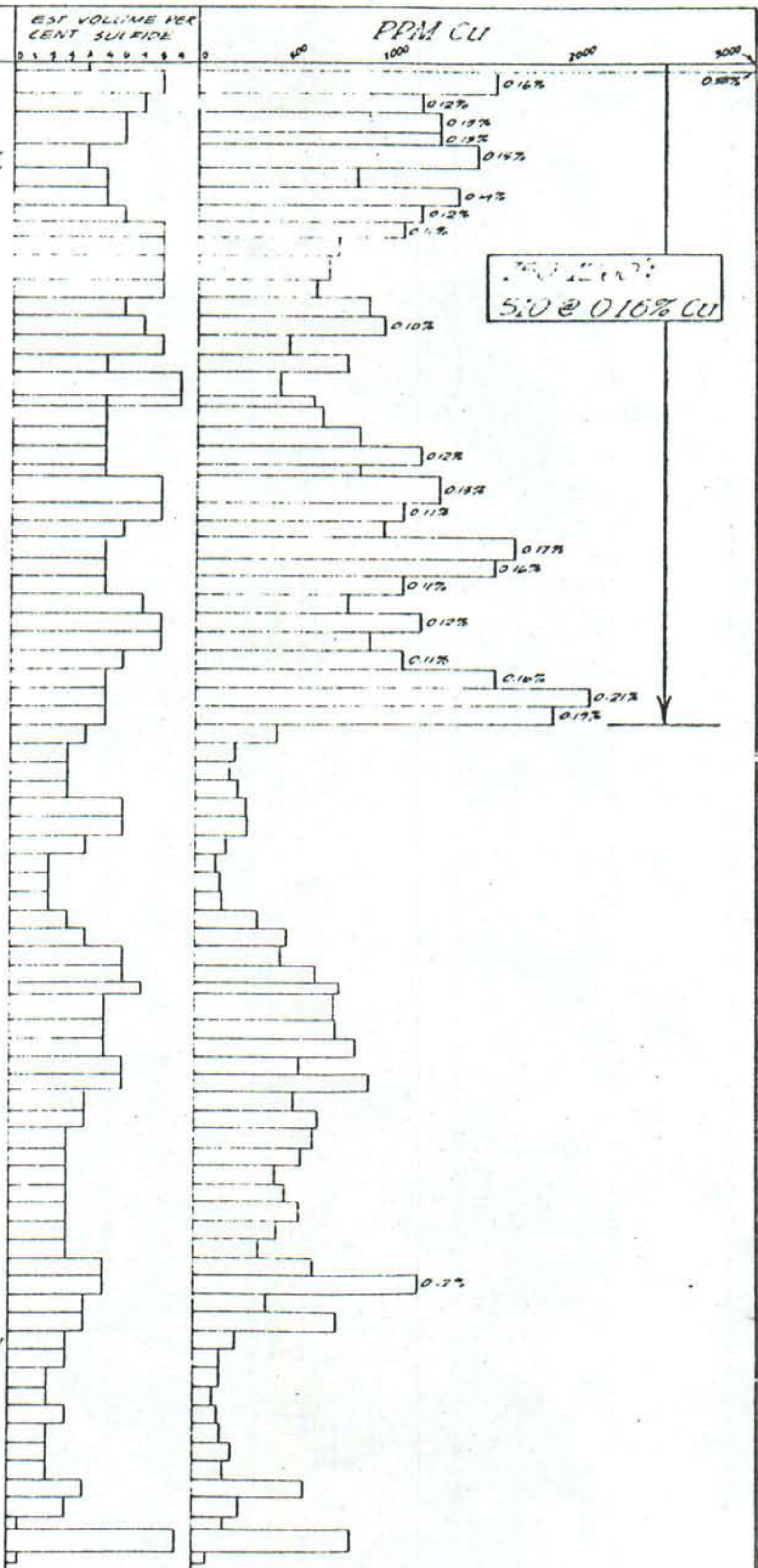
1420-1458±' QUARTZ-FELDSPAR PORPHYRY, same as 1159±-1190'

1458±-1479±' CALCITE-QUARTZ VEIN: clasts of qtz-sericitized qtz-feldspar pry (same as 1420-1458±) embedded in a matrix of qtz & calcite, w/ minor diss. sp, gl, tr py & cpy

1479±-1715' HORNBLENDE BIOTITE DACITE PORPHYRY, same as 780-907±, total sulfides, cpy, & alt. intensity sharply decreasing downhole below 1592'; suspect the porphyry below 1592' is identical to that above 1592', but is post-mineral — a second phase of porphyry intrusion

1696±-1700±': XENOLITH of CHLORITE-QUARTZ-BIOTITE ROCK, fine-xline, no discernible relict texture, laced w/ vnlts, lenses, & irreg masses of transl white qtz; high total sulfides & increase in cpy.

END OF HOLE



CODE NO.: 05-01-0411

35 Item 15

Logged by
JEFFREY B. HULEN

BUCKSKIN SOUTHWEST EXAMINATION
DOUGLAS COUNTY, NEVADA

DRILL HOLE BSW-7 & BSW-8
-EXPLANATION-

GRAPHIC GEOLOGY

Rock Types

- QUARTZ-SERICITE ROCK
- QUARTZ VEIN
- JASPEROID
- SECONDARY POTASH FELDSPAR
- QUARTZ LATITE PORPHYRY
- INTRUSION BRECCIA
- HORNBLENDE BIOTITE DACITE PORPHYRY
- ALTERED QUARTZ-FELDSPAR PORPHYRY OF INDETERMINATE COMPOSITION

Alteration Mineralogy: Alteration Intensity Graphs

- ← INTENSE ALTERATION
- ← MODERATELY INTENSE ALTERATION
- ← WEAK ALTERATION

Structure

- STOCKWORK FRACTURING
- MINOR FAULTS
- FAULT ZONE

BSW-7: DESCRIPTION OF LITHOLOGY, STRUCTURE, MINERALIZATION, AND ALTERATION IN IMMEDIATE VICINITY OF DRILL SITE		
	Quartz-sericitized INTRUSION BRECCIA, oxidized, formerly sulfide-bearing; color varies from lt. yellowish gray to lt.-med. reddish gray; original texture is largely obscured through alteration, but essentially 25-30% clasts, angular to subrounded, embedded in a finely porphyritic (or fragmental) matrix; clasts range in size from 2-3 mm. to at least 50 mm. in dia., and range in texture (relict) from aphanitic to porphyritic; rock is now a fine-xline aggregate of qtz., ser., and clay (prob. kaolinite) — all three minerals also occur singly or together as narrow, irregular, discontinuous veinlets; small, irregular pods of dense, lt. yellowish to reddish-gray jasperoid are locally present; small (up to 25 mm. in dia), irregular vugs in the jasperoid are commonly lined with minute, water-clear, euhedral quartz crystals; rock has oxidized to form a jarositic leached capping; jarosite occurs as 1) diss., resinous, lt. yellowish to orange brown grains & grain aggregates partially to totally filling former sulfide sites — which range in size from < 0.1 mm. to 5 mm. (avg. 0.5 mm.) in dia. #2) irreg., discontinuous veinlets, lt. yellowish-brown, up to 15 mm. (avg. 1 mm.) in dia., filling stockwork fractures; distance between these fractures/veinlets averages about 50 mm.; a little lt. reddish to purplish hematite is locally present w/the jarosite; a little diss., fine-xline. pyrite, commonly w/chalcocite microrims, is locally present in the jasperoid pods; CONT'D.	Est. former sulfide content in vicinity of drill site avg. about 7%; a little lt. grayish-blue turquoise, powdery, is locally present as narrow, discontinuous veinlets, commonly with jarosite; one small (~6" wide) dike of hornblende biotite dacite porphyry at the drill site; this porphyry is lt. brownish-gray, clay-sericitized, w/about 4% diss. goethite.

CODE NO.: 05-01-0411

BEAR CREEK MINING COMPANY— ~~NORTHWEST~~ DISTRICT

Started April 25, 1972 Completed June 6, 1972 Project Buckskin Southwest Hole No. BSW-7 Page 1 Of 13

Coords: N. " E. " Collar Elev. App. 5440' Bearing " Vertical Angle 90° Total Depth

Descriptive Location: Approximately 1900' N29°E of the SE corner of section 11, T.13 N., R.23 E., southwestern Buckskin Range, Douglas Co., Nevada

Objective: Deep test of hypothetical primary porphyry copper ore target, allegedly concealed beneath 1000-1500' of cupriferous quartz-sericite rock

Stopped Because

Scale: 1" = 10' (0-60'), 1" = 20' (60-70') Logged By: J.B. Hulen

* former sulfide content

Core Recovery: Size & Interval	% Rec	PY	CC	Vol. % Sulf. Est.	Geology: Interval	Description	Thin Section Location & Description	Analyses: Interval	ppm Cu	ppm Mo	ppm Pb	ppm Zn	ppm Ag	ppm Au	Sample Nos.
0-10' 5⅛" RB-2	not applicable	tr.	tr.	4-6 *	0-10'	Oxidized, formerly pyritic QUARTZ-SERICITE ROCK, varies from lt. gray to yellowish to brownish-gray (& orange-brownish); v. fn. xline qtz.-ser. aggr.; mod. abund. jarositic limonite, varies from 8J, 2G, to all J; these limonites occ. as partial-compl. pseud. after S='s, avg. gr. size ~ 0.1-0.5 mm., and as narrow (< 1 mm.) vnlts, comm. w/qtz.; a few narrow (< 1mm.) qtz. vnlts, some w/a little pitch limonite; tr. cc in more siliceous chips, as diss. gr. < 0.5 mm. in dia.; tr. diss. hem.; tr. diss. & vnlt. clay		0-10'	85	20	10	540	1 (0.03 oz/T)	-0.1	A2126
10-20'		tr.	tr.	5-7 *	10-20'	SAME AS 0-10' % of orange-brownish gray chips ("flooded" w/ limonite decreases from ~ 10% (0-10') to about 5% in this interval; rock is almost certainly altered INTRUSION BRECCIA; a few chips contain < 0.5% diss., bright greenish-gray micaceous material, prob. either chlorite or biotite; cc may be sl. more abund., but still only tr.		10-20'	80	22	10	65	1 (0.03 oz/T)	-0.1	A2127
20-30'		tr.	tr.	5-7 *	20-30'	SAME AS 0-10' Except appearance of pitch limonite in ~ 15% of the chips; this limonite occurs as diss. irreg. grns. < 1 mm. in dia., and as open irreg. vnlts., in which the limonite forms dk. reddish-brown, resinous, botryoidal crusts on the vein walls; some of the more siliceous chips (prob. jasp.) contain up to 0.5% cc, but cc overall is prob. ~ 0.1% (maybe more acc. ~ 0.05%)		20-30'	80	16	10	240	2 (0.06 oz/T)	-0.1	A2128
30-40'		tr.	tr.	4-6 *	30-40'	SAME AS 20-30' Except cc (or a dark gray metallic mineral which greatly resembles cc) has increased to ~ 0.2% overall; cc is generally assoc. w/those chips that are more siliceous and usually laced w/v. narrow qtz. vnlts.		30-40'	55	26	-10	40	2 (0.06 oz/T)	-0.1	A2129
40-50'		tr.	tr.	7-9 *	40-50'	SAME AS 0-10' cc has dramatically decreased to tr. overall— prob. contamination from above (20-40'); 20% (app) of the chips contain 3-5% extr. fine-xline brown micaceous minrl. (bte.?) (disseminated)		40-50'	85	17	120	175	2 (0.06 oz/T)	-0.1	A2130
50-60'		tr.	tr.	7-9 *	50-60'	SAME AS 40-50'		50-60'	80	11	50	70	3 (0.09 oz/T)	-0.1	A2131
60-70'		tr.	tr.	7-9 *	60-70'	SAME AS 40-50'		60-70'	40	22	70	15	7 (0.20 oz/T)	-0.1	A2132

BEAR CREEK MINING COMPANY — *NORTHWEST* DISTRICT

SCALE 1" = 20'

Logged By J.B. Hulen — Project Buckskin Southwest — Hole No. BSW-7 — From 70' To 210'

F* former sulfide content

Size & Interval	% Rec.	Vol % Sulf Est	py	cpy	cc	bn	Moly	gn	sp	Interval	Description	Thin Section Location & Description
70-80' 5½" RB	not applicable	* 4-6	tr		tr					70-80'	QTZ.-SER. ROCK, same as 0-10', exc. appearance of a little py, coated w/dk. gray steely cc, in abt. 5% of the chips; abt. 10% of the chips are actually siliceous enough as to be sericitic JASPEROID. These chips laced w/narrow, irreg. qtz. vnlts; a few waxy, lt. gray, irreg. clay vnlts. present in some chips.	
80-90'		* 3-5	tr		tr					80-90'	This interval ~ 60% QTZ.-SER. ROCK (same as 70-80') and ~ 40% JASPEROID, lt. gray, extr. dense, w/~ 3% diss., v. fine-xline py, partially-totally replaced w/dk. gray steely cc	
90-100'		4-* 6	tr		tr					90-100'	Same as 70-80', exc. no py or cc, plus addition of ~ 5% pitch limonite, texturally similar to that occurring in the interval 20-30; 10-20% of the qtz.-ser. chips contain ~ 1% unid. lt. brown transl.-opaque minl. as diss. gr. aggregates up to 0.5 mm. in dia. (ind. grns. < 0.1 mm. dia) - aggregates are irregular	
100-110'		4-6 *	tr		tr					100-110	Same as 90-100'	
110-120'		1-6 *	tr		tr					110-120'	Same as 90-100'; The unid. lt. brown transl.-opaque grain aggregates may be andalusite, as found a mile or two south in qtz.-ser. INTRUSION BRECCIA at the Blue Danube mine; may also be rutile? doubt it.	
120-130'		1-6 *	tr		tr					120-130'	Same as 90-100'. A number of the qtz.-ser. chips show a def. porphyritic (relict) texture - phenos. are anh.-subh., < 1 mm. in dia., commonly lath-shaped; these fragments are probably cut from altered clasts in INTRUSION BRECCIA.	** Base of oxidation at ~130' **
130-140'		3-5	3-5	tr	tr	tr?			tr	130-140'	QTZ.-SER. ROCK, unox., lt.-med. gray, v. fine-xline (< 0.1 mm); qtz. makes up about 85%± of the total rock; for alt. description, refer to 0-10'; 3-5% py, as diss. anh. grains & grain aggregates from < 0.1 mm. to 1.5 mm. (avg. ~ 0.5 mm.); a few of these py grains are microrimmed w/dk. gray steely cc; unid. minl. of 90-100' still present - may be 2nd bte in part - at any rate, this minrl. may be repl. of orig. mafics in the BRECCIA.	
140-150'		5-7	5-7	tr	tr	tr?			tr	140-150'	Same as 130-140', exc. py, w/cc microrims, has increased to 5-7%	
150-160'		10-12	9-10	tr	?0.3-0.5	tr?		0.1-0.3	tr-0.1	150-160'	Same as 130-140', exc. py/w/cc increasing to 10-12%; cc much more abund. - some py grains totally replaced w/dk. gray steely cc; many py grains are tarnished reddish to purplish metallic color (bn microrims?); ~ 15% of sample is mottled, ppytic.-appearing JASP, laced w/narrow, clear qtz. vnlts, and < 1% py	
160-170'		7-9	6-7	tr	?0.1-0.8	tr?			tr-0.1	160-170'	Same as 130-140', exc. total S= decreasing to 7-9%; the rock is totally devoid of relict texture - just an extr. fine-xline aggr. of qtz. and ser. (and S=); one chunk of solid cc in this interval 1x2x2 mm. in dimension; one py grain 3 mm. in dia.	
170-180'		JASP. → <0.5; OVERALL → 3-5	3-5	tr	<0.1	tr?	tr		tr-0.1	170-180'	Appearance of 25-30% jasperoid, v. lt. gray-white, cryptocrystalline, laced w/tiny, irreg. qtz. vnlts., diss. w/ < 0.5% total sulfide (py, tr. cpy); drilling extr. slow in this rock; sample otherwise same as 130-140 w/~ 15% contamination from the oxide zone; hard to distinguish cupriferous py from valid cpy w/extr. small grains - both yel.-brass color.	
180-190'		1.5-2	1.5-2	tr	tr	tr?	tr		0.3-0.5	180-190'	JASPEROID, same description as 170-180'; tr. cc as microrims on py and cpy; some (5-10%) contamination from oxide & overlying sulfide zones; drilling continues extremely difficult; estimated total sulfides in jasp. have increased to 1.5-2%	
190-200'		0.5-1	0.5-1	tr	tr		tr		0.3-0.5	190-200'	Same as 180-190'; JASPEROID has distinct microbrecciated texture; contains a tr. ser. & chl.; a few small (< 0.5 mm. dia.) vugs are present in the jasperoid - these are lined w/minute, water-clear qtz. xls.; ∴ suspect jasperoid is epithermal.	related to intrusion of T. dacite ppy?
200-210'		0.5-1	0.5-1	tr	tr				0.3-0.5	200-210'	Same as 180-190'	

Analyses

Interval	ppm Cu	ppm Mo	ppm Pb	ppm Zn	ppm Ag	ppm Au	Sample Nos.
70-80'	155	55	120	70	10 (0.29 oz/T)	0.003 oz/T	A2133
80-90'	105	39	50	40	5 (0.15 oz/T)	-0.1	A2134
90-100'	85	41	80	25	3 (0.09 oz/T)	-0.1	A2135
100-110'	85	13	50	315	2 (0.06 oz/T)	-0.1	A2136
110-120'	80	13	20	425	3 (0.09 oz/T)	-0.1	A2137
120'-130'	55	8	10	70	3 (0.09 oz/T)	-0.1	A2138
130-140'	140	6	10	475	2 (0.06 oz/T)	-0.1	A2139
140-150'	170	10	60	180	3 (0.09 oz/T)	-0.1	A2140
150-160'	*0.44%*	23	*0.19%*	590	14 ** (0.41 oz/T)	-0.1	A2141
160-170'	*0.12%*	-1	110	410	2 (0.06 oz/T)	-0.1	A2142
170-180'	610	50	50	700	2 (0.06 oz/T)	-0.1	A2143
180-190'	425	33	60	*0.21%*	1 (0.03 oz/T	-0.1	A2144
190-200'	490	33	60	*0.29%*	1 (0.03 oz/T)	-0.1	A2145
200-210'	970	25	90	*0.27%*	2 (0.06 oz/T)	-0.1	A2146

BEAR CREEK MINING COMPANY – *NORTHWEST* DISTRICT

SCALE: 1" = 20'

From 210' To 350'

Logged By J.B. Hulen Project Buckskin Southwest Hole No. BSW-7

Core Recovery: Size & Interval	% Rec.	Graphic Mineral (%): py	cpy	MoS2	sp	Vol % Sulf Est	Interval	Geology: Description	Thin Section: Location & Description
210-220' 5 1/2" RB	not applicable	2-3	tr		0.1-0.3?	JASP: 0.5-1; OVERALL: 1-2	210-220'	~50% of sample is dense, lt. gray jasperoid, same as 180-190'; Rest of sample is chloritic(?) QTZ.-SER. ROCK, text. similar to that from 130' to 140', but lt. grayish-green, w/<1% v. fine-xline chl. or darker ser.; rock has mottled appearance (irreg. distr. of chl. or ser.), but no relict text. discernible; a few chips of bull qtz. present; tr. cpy	
220-230'		2-3	tr		tr-0.1	2-3	220-230'	chloritic (?) QTZ.-SER. ROCK – same as 210-220' (including jasp.)	
230-240'		3-4	tr		tr-0.1	3-4	230-240'	Same as 220-230', exc. py increasing; several clots of dk. green, fine-xline chl. present in a few chips; one chip cut by bull qtz. vnlt. w/a few flattened, irreg. grains of an unknown, lt. gray metallic minrl.	
240-250'		3-4	tr		0.1-0.3	3-4	240-250'	Same as 220-230', exc. chl. appears to be decreasing * NOTE: py occurs as diss., anh. grains, avg. < 0.5 mm. in dia. cpy, v. rare, text. similar to py	
250-260'		4-5	tr		tr-0.1	4-5	250-260'	Same as 220-230'; cpy is principally confined to those chips that are relatively deficient in chl.; one cpy grain – elongate, lensoid, 2 x 0.5 mm. max. dimensions in X-section; another cpy grain, 1 mm. dia., on margin of qtz. vnlt. (1.5-2 mm. wide)	
260-270'		3-4	tr		tr-0.1	3-4	260-270'	same as 220-230'	
270-280'		5-7	tr	tr	tr-0.1	5-7	270-280'	QTZ.-SER. ROCK, lt. gray, fine-xline; tr. diss. chl.; a few dk. grayish-green, fine-xline, irreg. chl. vnlts.; a few irreg. qtz. vnlts; tr. diss. kaolinite(?); 5-7% diss., anh., v. fine-xline py; a few irreg. py vnlts < 0.5 mm. wide; some diss. cpy, text. similar to py; tr. diss., fine-xline (<0.1 mm) grain aggregates (0.1-1 mm. dia) of unkn., dk. reddish-gray metallic mineral	ADDITIONAL NOTES ↓
280-290'		4-5	tr		tr	Q-SER: 5-7; K-SP: 3-4; OVERALL (4-5)	280-290'	55-65% of sample same as above (270-280'); 35-40% of sample is mottled pinkish-gray and lt. gray rock; lt. gray portion is qtz-ser. rock, same as above; pinkish-gray portion may be K-spar – is fairly hard, shows some cleavage; this rx. contains 1-3% diss. v. fine-xline, dk. brownish-gray mineral, prob. both 2nd bte. and specular hematite; cpy ↗	seems to be much more abund. in this rock type; cpy may be just cupriferous py!
290-300'		5-7	tr		tr	5-7	290-300'	Same as 280-290', exc. K-spar(?)-qtz. rock has decreased to ~20% of total sample; Diss. specular hematite accounts for ~2% of all chips – hem is text. similar to py; cpy continues to be most commonly assoc. w/the qtz.-K-spar rock (this rock is commonly porphyritic-appearing – could it be qtz. monz. ppy? ↗	some qtz-rich chips contain up to 15% diss. sulfide plus 2% diss. spec. hematite
300-310'		4-5	tr		tr-0.1	4-5	300-310'	Same as 280-290'; qtz.-Ksp & combination qtz-Ksp-qtz-ser rock → may have increased slightly, to ~50-60%; spec. hem. disseminated in all chips; Some of the qtz-Ksp alteration exhibits an apparent micrographic texture; cpy (or anomalously yellowish cupriferous py has apparently increased	
310-320'		4-5	tr		tr-0.1	4-5	310-320'	Same as 280-290', except qtz.-Kspar-sericite rock has decreased to abt. 5%; cpy has also decreased; remainder of sample is qtz-ser. rock (same as 270-280'); spec. hem. has also dramatically decreased – varies directly w/% of qtz.-Kspar-sericite rock	↖ SKETCH OF QTZ-SER—QTZ-KSP ROCK CHIP
320-330'		4-5	tr	tr	tr	4-5	320-330'	Same as 310-320', exc. % of qtz. in qtz-ser. rock apparently increasing; 2nd Ksp accounts for an average 5% of most chips, is diss., & in fine, irreg. patches & vnlts; spec. hem. may be increasing; avg. sulfide grain size gradually increasing (≤ 0.5 mm.?)	
330-340'		4-5	tr	tr	tr-0.1	4-5	330-340'	Same as 320-330'	
340-350'		4-5	tr	tr	tr	4-5	340-350'	Same as 320-330', except spec. hem. has increased to ~1%; 2nd K-spar practically nonexistent.	

Analyses

Interval	PPM Cu	PPM Mo	PPM Pb	PPM Zn	PPM Ag	PPM Au	Sample Nos.
210-220'	915	22	40	* 0.31% *	2 (0.06 oz/T)	-0.1	A2147
220-230'	610	13	20	825	-1	-0.1	A2148
230-240'	355	10	20	385	-1	-0.1	A2149
240-250'	365	13	30	* 0.14% *	-1	-0.1	A2150
250-260'	315	8	40	800	1 (0.03 oz/T)	-0.1	A2151
260-270'	285	17	30	570	1 (0.03 oz/T)	-0.1	A2152
270-280'	180	33	40	350	-1	-0.1	A2153
280-290'	165	11	30	250	-1	-0.1	A2154
290-300'	155	15	20	195	-1	-0.1	A2155
300-310'	150	13	20	590	-1	-0.1	A2156
310-320'	185	23	30	800	-1	-0.1	A2157
320-330'	175	59	30	195	-1	-0.1	A10292
330-340'	205	71	30	240	-1	-0.1	A2158
340-350'	135	35	20	165	-1	-0.1	A2159

DESCRIPTION OF SPOT CORE SAMPLE, 460-464'

QUARTZ-SERICITE ROCK, mottled lt. gray, med. gray, & lt. brownish-gray; rock is a fine-crystalline aggregate of quartz and sericite w/ disseminated py, tr. cpy, and ~ 0.5% specular hematite; qtz greatly predominates over ser — but relative % of qtz. & ser. varies throughout, as irregular patches; qtz and ser. occur singly or together, often with sulfides, as narrow irregular discontinuous veinlets; a few of the qtz. vnlts. are locally open, and lined with tiny (< 1mm. in length), water-clear, euhedral qtz. crystals; 5-7% pyrite, anomalously yellowish (cupriferous?), as diss., euh.-subh. grains, avg. ~ 0.3 mm. in dia. (<0.1 - 2 mm. in dia.), and as narrow, irreg., disc. veinlets, with or without qtz and or ser.; chalcopyrite, text. similar to pyrite; ~ 0.5% dark metallic gray speculer hematite, as diss. grains, subh.-euh., <0.1 mm. in dia., and as aggregates of these grains up to 1 mm. in dia.; poss. tr. 2nd bte. (could be ultrafine-gr. spec. hem.; rock appears to be an intensely altered INTRUSION BRECCIA; fragmental texture, though, badly obscured.

BEAR CREEK MINING COMPANY — *NORTHWEST* DISTRICT

Logged By *J.B. Hulen* Project *Buckskin Southwest* Hole No. *BSW-7*

From *350'* To *490'*

Core Recovery Size & Interval	% Rec.	Graphic Mineral (%) py	cpy	MoS_2	sp	Vol. % Sulf. Est.	GEOLOGY Interval	GEOLOGY Description	Thin Section Location & Description	Analyses Interval	PPM Cu	PPM Mo	PPM Pb	PPM Zn	PPM Ag	PPM Au	Sample Nos.
350-360' 5 5/8" RB	not applicable	3-4	tr			3-4	350-360'	QTZ.-SER. ROCK, lt. greenish-grey to lt. gray, v. fine-xline; 3-4% diss., fine-xline py & tr. cpy; <1% diss. spec. hem; <1% diss., v. fine-xline, greenish-gray chl.; possible tr. diss. 2nd Kspar; cpy tends to be associated w/both chl. & hem., both diss. & vnlt.; both py and rare cpy occur as anh-subh. grains, <0.1-2 (avg ~0.5) mm. dia., and as rare microvnlts.		350-360'	100	13	20	50	-1	-0.1	A2160
360-370'		3-4	tr			3-4	360-370'	Same as 350-360'		360-370'	205	10	20	105	-1	-0.1	A2161
370-380'		4-5	tr			4-5	370-380'	Same as 350-360', exc. py increasing & chl. decreasing; qtz. may also be increasing; spec. hem. occurs as diss. aggregates, up to 1 mm. (avg. ~ 0.1 mm) of almost cryptocrystalline scales, just barely visible under high power		370-380'	100	11	20	65	-1	-0.1	A2162
380-390'		6-7	tr			6-7	380-390'	Same as 370-380, exc. dramatic increase in py; more cpy; perhaps a little more spec. hem.		380-390'	175	11	10	35	-1	-0.1	A2163
390-400'		6-7	tr			6-7	390-400'	Same as above, exc. up to 1% spec. hem. in some chips; a few chips contain up to 20% total sulfide		390-400'	80	10	20	100	-1	-0.1	A2164
400-410'		4-5	tr			4-5	400-410'	Same as above, exc. py decreasing; chl. virtually nonexistent at this level		400-410'	50	5	10	25	-1	-0.1	A2165
410-420'		5-6	tr	tr-0.1		5-6	410-420'	Same as above, exc. py found more commonly as microvnlts — perhaps 10-15% microvnlt, 85-90% diss.; also, spec. hem. has decreased to < 0.1%		410-420'	45	4	20	650	-1	-0.1	A2166
420-430'		4-5	tr	tr		4-5	420-430'	QTZ.-SER. ROCK, v. lt. gray, v. fine-xline; a few v. narrow (<0.5 mm. wide) qtz. vnlts, generally w/a little py; tr. diss., dk. greenish-gray chl., v. fine-xline; <0.5% diss. spec. hem. (same as 370-380'); % of qtz. in qtz-ser. rock has increased over higher intervals; diss. & microvnlt. py & tr. cpy; rock becoming incr. harder to drill; ~15% contamination		420-430'	40	13	20	130	-1	-0.1	A2167
430-440'		4-5	tr	tr		4-5	430-440'	Same as 420-430', exc. no chl.; qtz. continues to increase.		430-440'	55	10	20	155	-1	-0.1	A2168
440-450'		4-5	tr	0.1-0.3		4-5	440-450'	Same as 420-430'; several chips of qtz.-cpy-MoS_2 veinlet present; quartz still seems to have increased even more.		440-450'	20	8	20	* 0.14% *	-1	-0.1	A2169
450-460'		5-6	tr	0.1-0.3		5-6	450-460'	Same as 420-430'		450-460'	85	15	30	960	-1	-0.1	A2170
460-464' NC	50	6-7				6-7	460-	Refer to description of spot core sample, 460-464'. Entire interval is similar —INTRUSION BRECCIA—		460-470'	45	-1	10	90	1	—	A2161 (2')
464-470' NXWL	100																
470-480' NXWL	100	7-8	tr			7-8	470-480'	Same as 460-470', exc. ~1% diss. spec. hem.; a few irregular bands in which hem. occurs as lensoid to irregular-elongate masses, up to 1.5 x 0.5 mm. in x-section, consisting of extremely tiny xls. (<< 0.1 mm. in dia.); also tr. diss., fine-xline chl.		470-480'	35	4	-10	45	-1	—	A2262
480-490' NXWL	100	8-9	tr			8-9	480-490'	Same as 460-470'; py v. erratic in distribution; varying, in individual areas, from ~1% to 25% — est. overall ~9%.		480-490'	75	17	-10	25	-1	—	A2263

BEAR CREEK MINING COMPANY — *NORTHWEST* DISTRICT

Logged By J.B. Hulen   Project Buckskin Southwest   Hole No. BSW-7   From 490' To 630'

Core Recovery

Size & Interval	% Rec.
490-495'	100
495-504'	100
504'-514'	100
514-521'	100
521-531'	100
531-538'	100
538-545'	100
545-548'	100
548-550'	100
550-552'	50
552-555'	100
555-557'	100
557-567' (NXWL)	100
567-572'	100
572-577'	100
577-583'	100
583-592'	100
592-599'	100
599-605'	100
605-612'	100
612-618'	66
618-623'	100
623-628'	100
628-635'	100

GEOLOGY / Analyses

Graphic Mineral (%) py	cpy	Vol % Sulf Est	Interval	Description	Thin Section Location & Description	Analyses Interval	ppm Cu	ppm Mo	ppm Pb	ppm Zn	ppm Ag	ppm Au	Sample Nos.
9-10	tr	9-10	490-500'	Quartz-sericitized INTRUSION BRECCIA; for full description see description of spot core sample, 460-464', preceding page 4; fault: 491-492.5'; stress-py is erratically distributed, varies fr. 2% to 30%, but avg. 9-10%.		490-500'	75	5	10	10	-1	—	A2264
3-4	tr	3-4	500-510'	Same as 490-500', except ultrafine-granular qtz. has greatly increased relative to ser.; spec. hem. has dropped out; total sulfides have decreased; poss. tr. 2nd bte.; py increasing somewhat toward base of interval.		500-510'	20	1	10	5	-1	—	A2265
7-8	tr	7-8	510-520'	Same as 490-500', exc. no spec. hem between 510' & 515'; a few flts, < 1cm. wide, are locally present; again: py very erratic in distribution — locally up to 40-45%.		510-520'	30	-1	30	5	-1	—	A2266
3-4	tr	3-4	520-530'	Same as 500-510', exc. a little spec. hem. appears at 528'.		520-530'	35	1	10	65	-1	—	A2267
1-2	tr	1-2	530-540'	Same as 500-510', exc. tr. 2nd bte., as diss, v. fine-xline flakes, and as narrow, irregular, discontinuous vnlts. consisting of these flakes mixed w/ qtz. & ser. Fault: 538-538?'		530-540'	15	15	30	5	-1	—	A2268
0.5-1	tr	0.5-1	540-550'	Fine-granular qtz., totally silicified rock; 0.5-1% py, texturally similar to that in intervals above; irreg. clots of cpy up to 7 mm. in dia.; abundant qtz. vnlts. Faults: 543-545', 546.6-550'		540-550'	50	5	-10	20	-1	—	A2269
0.5-1	tr	0.5-1	550-560'	Same as 540-550' to 557.5' Same as 530-540' to 560' from 557.5' Entire interval badly shattered		550-560'	35	15	-10	5	-1	—	A2270
1-2	tr	1-2	560-570'	Same as 530-540', exc. more qtz., qtz. vnlts Entire interval is badly shattered		560-570'	75	2	20	5	-1	—	A2271
6-7	tr	6-7	570-580'	Quartz-sericitized INTRUSION BRECCIA; for full description, refer to description of spot core sample, 460-464', preceding p. 4; Sulfides increase from 2% at top of interval to 9% at base of interval, avg. 6-7%.		570-580'	45	4	50	10	-1	—	A2272
8-9	tr	8-9	580-590'	Same as 570-580', except color is mottled lt. grey, lt. brownish-gray, & greenish-grey (traces of diss. chl. & 2nd bte.); a few small, irreg. patches, up to 2 mm. in dia., of intense blue, translucent, fairly hard mineral; spec. hem. appears again	*** Fault: 581-581?', 584±-585±'	580-590'	50	26	-10	-5	-1	—	A2273
7-8	tr	7-8	590-595'	Same as 580-590' Fault: 593?-593?'		590-595'	15	6	-10	-5	-1	—	A2274
6-7	tr	6-7	595-602'	Same as 580-590', except ~ 0.5-1% of the blue mineral, also though, it occurs in narrow, irreg. discontinuous vnlts., and in irregular clots up to 10 mm. in dia.		595-602'	15	4	10	5	-1	—	A2275
0.5-1	tr	0.5-1	602-610'	Same as 540-550'		602-610'	20	15	-10	5	-1	—	A2276
11-12	tr	11-12	610-620'	Quartz-sericitized INTRUSION BRECCIA (see 460-464') Fault zone to 615.5'; a little of the blue mineral (580-590'), as diss. grains up to 3 mm. in dia.		610-620'	20	16	10	-5	-1	—	A2277
7-8	tr	7-8	620-630'	Same as 610-620', a few fragments of qtz.-ser. schist ?? or extremely well-foliated qtz.-ser. rock		620-630'	60	2	-10	25	-1	—	A2278

Logged By J.B.Hulen Project Buckskin Southwest Hole No. BSW-7

Core Recovery (NXWL, 628'–774')

Size & Interval	% Rec.
628-635'	100
635-642'	86
642-651'	100
651-653'	100
653-658'	100
658-662'	100
662-667'	100
667-671'	100
671-673'	100
673-682'	100
682-687'	100
687-691'	100
691-696'	100
696-698'	100
698-704'	83
704-707'	100
707-709'	100
709-713.5'	100
713.5-721'	100
721-726'	100
726-730'	100
730-740'	100
740-747'	100
747-755'	100
755-764'	100
764-774'	100

Graphic Alteration columns: silic., ser., clay, qtz. vnlts, chl., 2nd bte, spec. hem.

Interval	Graphic Mineral (%) py	cpy	MoS2	gn	sp	Vol. % Sulf Est
630-640'	7-8	tr				7-8
640-650'	7-8	tr				7-8
650-660'	9-10	tr				9-10
660-670'	4-5	tr				4-5
670-680'	5-6	tr				5-6
680-690'	5-6	tr				5-6
690-700'	5-6	tr				5-6
700-710'	6-7	tr				6-7
710-720'	6-7	0.3-0.5	tr		tr	6-7
720-730'	5-6	0.3-0.5				5-6
730-740'	4-5	tr-0.1	tr			4-5
740-750'	4-5	0.3-0.5	tr			4-5
750-760'	6-7	0.5-0.7	tr			6-7
760-770'	5-6	0.5-0.7	tr			5-6

Interval	GEOLOGY Description	Thin Section Location & Description	Analyses Interval	ppm Cu	ppm Mo	ppm Pb	ppm Zn	ppm Ag	ppm Au	Sample Nos.
630-640'	INTRUSION BRECCIA, lt. grey, fine-xline, qtz-ser. aggregate; py as diss. anh-subh grains up to 1 mm. in dia. (avg ~05 mm.) & as rarer microvnlts; cpy texturally similar to py; a few qtz. vnlts, up to 2 mm. (avg. < 1 mm.) wide; extremely well foliated to 638'; fault: 639-640'; py increases from ~6% at top of interval to ~10% at base of interval (avg. ~8%).		630-640'	35	-1	-10	5	-1	—	A2279
640-650'	same as 630-640' fault: 645^{6}-647'; otherwise interval badly shattered		640-650'	10	2	-10	-5	-1	—	A2280
650-660'	Same as 630-640', exc. a little spec. hem. below 653'; py is extremely erratic in distr., varies from 3 to 25% in individual patches — averages ≈ 9-10% faults: 650-653', 657^{3}-657^{1}', 655^{3}-656^{3}', 658^{2}-660'		650-660'	40	4	10	10	-1	—	A2281
660-670'	Same as 630-640' faults: 665^{2}-666^{3}'		660-670'	55	10	4	5	-1	—	A2282
670-680'	Same as 630-640', exc. tr. 2nd bte. as diss., v. fine-xline flakes; Entire interval badly shattered; fault: 671-673', 673^{3}-673^{5}', 674-680'. Rock has mottled lt. grey, lt. brownish-gray, and lt. greenish-gray appearance.		670-680'	135	6	10	5	-1	—	A2283
680-690'	Same as 630-640' fault: 684-687^{2}'		680-690'	265	11	10	10	-1	—	A2284
690-700'	Same as 630-640', exc. color changes from lt. greenish-gray to lt. brownish gray below 695' faults: 690^{1}-691^{1}', 699^{6}-700', 692^{8}-698'		690-700'	215	13	-10	10	2	—	A2285
700-710'	Same as 630-640', except a little chl & 2nd bte. as diss. fine-xline flakes, below 703'; breccia texture very obscure; entire interval is actually a fault zone! total sulfides increase from ~5% to ~8% from top to base of interval.		700-710'	140	1	10	25	1	—	A2286
710-720'	Same as 700-710' faults: 713-714^{3}', 715^{1}-718' chl. & bte. increase below 717'. Qtz. vnlts. have increased somewhat.		710-720'	740	44	30	100	2	—	A2287
720-730'	INTRUSION BRECCIA, qtz-bte-(ser-chl.) alteration; lt.-med. grayish-brown; all these minerals fine-xline – forming a dense aggregate; a few narrow qtz. vnlts – some vis. MoS2 & cpy in these; bx texture v. obscure, but relict clasts locally visible; entire interval badly shattered — faults: 720-721', 722^{8}-723		720-730'	660	22	10	80	2	—	A2288
730-740'	Same as 720-730' faults: 731^{9}-732^{8}', 733^{2}-733^{6}', 733^{8}-735' otherwise badly shattered		730-740'	570	38	20	60	2	—	A2289
740-750'	Same as 720-730', exc. str. bte; str. chl. below 747' faults: 742^{5}-743^{3}', 746^{3}-747^{2}, 748' (2 cm. @ 36° to core axis)		740-750'	900	32	10	60	1	—	A2290
750-760'	Same as 720-730', exc. a little more bte., rock fairly competent		750-760'	*0.17%*	55	10	70	2	—	A2291
760-770'	Same as 750-760' 761-762^{8}': hbl. (← PPX) dacite porphyry dikes, irregular, anastamosing; 764^{1}-766^{1}': tr. bn in a few of the qtz. vnlts.		760-770'	*0.20%*	47	10	75	3	—	A2292

SUPPLEMENT

780-784': HORNBLENDE BIOTITE DACITE (possibly QUARTZ LATITE) PORPHYRY, lt. greenish to brownish-grey, strongly altered; original rock texture consists of 40-45% phenocrysts (plagioclase, biotite, hornblende, and quartz) embedded in a very fine-crystalline groundmass; plagioclase phenocrysts are stubby, anhedral to subhedral, and average 2 mm. in dia. or length (<1-4 mm. range); biotite books (avg. ~5%) are subhedral-euhedral, and average 2 mm. in dia.; hornblende prisms (1-2%) are subhedral to euhedral, and average 1 X 2 mm. in cross-section (longitudinal section); quartz phenocrysts (<1%) are anhedral, rounded, commonly embayed, and average <1 mm. in dia.

* plag. 30-35%

Bte (primary) and hbl. are totally altered to fine-crystalline aggregate of dk. brown 2nd biotite and dark grayish-green chlorite — these 2 minerals also sparsely replace plagioclase phenocrysts and matrix feldspar; large amounts of silica have apparently been added to the groundmass; rock is laced w/ translucent quartz vnlts. up to 1 cm. (avg 1 mm.) in width; pyrite and chalcopyrite occur as ① diss., anh. grains, <0.1-2 (avg ~0.3) mm. in dia., ② as grains and selvages in quartz veins, ③ singly or together as microveinlets w/o quartz

note: additional presence of slightly reddish-gray metallic mineral, texturally similar to pyrite & cpy (enargite? tetrahedrite?)

BEAR CREEK MINING COMPANY — *NORTHWEST* DISTRICT

Logged By J.B. Hulen Project Buckskin Southwest Hole No. BSW-7 From 770' To 910'

Core Recovery

Size & Interval	% Rec.
764-774'	100
774-784'	100
784-790'	100
790-795'	100
795-804'	100
804-809'	100
809-815'	100
815-824'	100
824-831'	100
831-840' NXWL	100
840-845'	100
845-850'	100
850-860'	100
860-866'	100
866-869	100
869-871'	100
871-872	[illegible]
872-875'	100
875-876	[illegible]
876-880'	100
880-882'	100
882-883'	[illegible]
883-885'	100
885-890'	100
890-893'	100
893-898'	100
898-902'	100
902-907'	100
907-912'	100

Graphic Mineral (%) and Geology

Py	Cpy	MoS2	Gn	Sp	Vol % Sulf Est	Interval	Description
4-5	0.1-0.3	tr			4-5	770-780'	INTRUSION BRECCIA, same as 720-730'; Entire interval badly shattered
3-4	0.3-0.5				3-4	780-784'	HORNBLENDE BIOTITE DACITE PORPHYRY * Refer to supplement *
3-4	0.3-0.5				3-4	784-790'	Same as 780-784'; exc. intrusion breccia below 788'
1-2	0.5-0.7				1-2	790-800'	Same as 780-784'; exc. total sulfide % has dropped to 1-2%
2-3	0.3-0.5	tr			3-4	800-810'	same as 780-784', except strong qtz vning.
1-2	1-1.2	tr			2-3	810-820'	810-815½': same as 780-784' 815½-820': INTRUSION BRECCIA, qtz-chlorite alteration, w/ ~4% of the reddish-gray metallic described under 780-784 supplement.
3-4	1-1.2		tr-0.1	tr-0.1	3-4	820-830'	820-827: same as 815½-820' 827-830': same as 780-784'
1-2	1-1.2			tr-0.1	1-2	830-840'	Same as 780-784', exc. no 2nd bx. below 834' (just qtz.-chl.)
2-3	0.5-0.7	tr		tr	3-4	840-850'	Same as 780-784'; ppytic. texture obscure, but apparent; 2nd btx to 846'; just qtz.-chl. alt. (w/ a little spec. hem) from 846' to 850'; intense qtz. vning.
1-2	1-1.2			tr-0.1	2-3	850-860'	Same as 780-784'; ppytic texture obscure; cpy has definitely increased; intense qtz. vning.
2-3	1-1.2			tr	3-4	860-870'	same as 850-860'
2-3	0.5-0.7				3-4	870-880'	Same as 850-860'
2-3	1-1.2				3-4	880-890'	Same as 850-860' Faults: 880³-885', 886-887², 887⁴-888⁵' Reddish-gray metallic mineral (refer to 780-784' supplement) moderately abundant — is this tetrahedrite or enargite?
2-3	1.2-1.5			tr	3-4	890-900'	Same as 850-860' Faults: 890-890⁵', 890⁸-891⁷', 896⁵-897⁷' Abund. 2nd btx.
3-4	1-1.2	tr		tr	4-5	900-907⁷'	Same as 850-860' above 903⁸', w/ 0.1' qtz-cpy vn.-901-901³' Below 903⁸': qtz-ser. fault breccia w/ clasts of dacite ppy & an unknown fine-xline ppy & abund. calcite
					7-8	907⁷-920	REFER TO PAGE 8

Analyses

Interval	PPM Cu	PPM Mo	PPM Pb	PPM Zn	PPM Ag	PPM Au	Sample Nos.
770-780'	* 0.13% *	32	10	70	1	—	A2293
780-784'	* 0.11%	20	10	60	-1	—	A2294
784-790'	* .14 0.16%	31 22	52 80	63 65	1 2	—	A2295
790-800'	* 0.19% *	29	10	65	1	—	A2296
800-810'	* 0.18% *	41	20	90	2	—	A2297
810-820'	* 0.12% *	32	10	85	2	—	A2298
820-830'	* 0.34% *	19	210	490	8	—	A2299
830-840'	* 0.35% *	5	60	370	4	—	A2300
840-850'	* 0.21% *	44	10	125	2	—	A 20101
850-860'	* 0.42% *	20	30	455	4	—	A 20102
860-870'	* 0.39% *	26	10	100	3	—	A 20103
870-880'	* 0.24% *	17	10	85	2	—	A 20104
880'-890'	* 0.35% *	15	10	115	2	—	A 20105
890-900'	* 0.45% *	20	10	105	3	—	A 20106
900-907⁷'	* 0.38% *	38	100	280	12	—	A20107
907⁷-920'	.2447	34	40	163	7		A20108

BEAR CREEK MINING COMPANY – ~~NORTHWEST~~ DISTRICT

Logged By J.B. Hulen Project Buckskin Southwest Hole No. BSW-7

From 910' To 1050'

Core Recovery

Size & Interval	% Rec.
907-912'	100
912-917'	20
917-919'	100
919-924'	100
924-929'	100
929-932'	100
932-937'	100
937-942'	100
942-947'	100
947-953'	100
953-958'	100
958-963'	100
963-967^{5}'	100
967^{5}-972^{5}'	100
972^{5}-977'	100
977-982'	100
982-987'	100
987-992'	100
992-997'	100
997-1002'	100
1002-1007'	100
1007-1012'	100
1012-1017'	100
1017-1020'	100
1020-1025'	100
1025-1030'	100
1030-1035'	100
1035-1040'	100
1040-1044'	100
1044-1049'	100

NXWL (907–1049')

Graphic Mineral (%) / Geology

REVISION: DEF. INT. BX.

py	cpy	MoS$_2$	gn	sp	Vol % Sulf Est	Interval	Description
7-8	0.3-0.5	tr			7-8	907^{7}-920'	QUARTZ-FELDSPAR PPY of unknown character (too badly altered), but probably the matrix ppy of the intrusion bx. described above; rock is now a fine-xline qtz.-ser.-bte. aggregate (varying proportions of these minerals); what relict phenocrysts are apparent seem to be fragmental; calcite as tiny vnlts. & some diss. grains; total sulfide % varies from 15 to 5%, but averages ~8%.
6-7	0.3-0.5	tr	<0.1	<0.1	6-7	920-930'	same as 907^{7}'-920', exc. bx. texture much more apparent. Fault: 922-924'
5-6	0.3-0.5		<0.1	<0.1	5-6	930-940'	Same as 907^{7}-920'. Faults: 930-932'; 932^{7}-934^{7}' ← abund gn & sp in this fault zone; 935^{7}-936'
5-6	0.3-0.5			tr	5-6	940-947'	Same as 907^{7}-920'
3-4	0.3-0.5			tr	3-4	947-960'	CHLORITE-QUARTZ-BIOTITE ROCK, dk. grayish to greenish-brown, v. fine-xline; relict texture completely obscured for the most part; where dimly apparent, appears to be same as 907^{7}'-920'; qtz-sericitized between 951^{6}' & 952^{8}' — texture more apparent here. rock is speckled w/dk. brown, irregular, bte-rich patches up to 10 mm. in dia.; locally some chl.-rich areas
4-5	0.3-0.5				4-5	960-970'	same as 947-960'. Qtz.-ser. from 962^{5}' to 965^{3}'
4-5	0.3-0.5				4-5	970-980'	Same as 947-960', exc. no bte. between 976' & 979.'
5-6	0.3-0.5				5-6	980-989'	INTRUSION BRECCIA (Refer to 460-464 supplement); bte drops out at 982'. 983^{8}-985^{5}: transl. white qtz. vn.
7-8	0.3-0.5				7-8	989-997^{8}'	FAULT ZONE; clasts of qtz.-sericitized intrusion breccia embedded in gouge; qtz. vein from 989-989^{6}' & 997-997^{4}' w/anomalous cpy
7-8	0.1-0.3				7-8	997^{8}-1007'	Same as 980-989'. Faults: 1003^{7}-1004^{2}'; 1005-1005^{8}'. tr. 2nd bte.
7-8	0.1-0.3				7-8	1007-1020'	Same as 980-989'. Faults: 1014^{6}-1016'; 1016^{5}-1017'
7-8	0.1-0.3				7-8	1020-1030'	Same as 980-989'. Fault: 1020-1023'
5-6	0.3-0.5				5-6	1030-1040'	Same as 980-989'. Fault: 1033-1035'; rest of interval extr. shattered. <0.5% hem. betw. 1037' & 1039'
6-7	0.3-0.5	tr			6-7	1040-1050'	FAULT ZONE; fragments of qtz.-sericitized intrusion breccia embedded in a matrix of qtz., calcite, sulfides, & comminuted rock debris; abund., irreg. calcite vnlts.; few qtz vnlts.; fragments <10 mm. in dia., angular

Thin Section – Location & Description: (none)

Analyses

Interval	PPM Cu	PPM Mo	PPM Pb	PPM Zn	PPM Ag	PPM Au	Sample Nos.
907^{7}-920'	* 0.16% *	32	20	90	4	—	A20108
920-930'	0.12% *	25	20	75	3	—	A20109
930-940'	* 0.13% *	35	300	540	5	—	A20110
940-947'	* 0.13% *	15	30	105	4	—	A20111
947-960'	* 0.15% *	6	30	205	1	—	A20112
960-970'	850	10	10	80	1	—	A20113
970-980'	* 0.14% *	29	10	70	1	—	A20114
980-989'	* 0.12% *	19	10	40	1	—	A20115
989-997^{8}'	* 0.11% *	15	10	30	1	—	A20116
997^{8}-1007'	* 750	29	10	45	1	—	A2011
1007-1020'	700	4	10	25	-1	—	A2011
1020-1030'	630	1	20	60	2	—	A2011
1030-1040'	905	10	10	25	-1	—	A2012
1040-1050'	* 0.10% *	32	10	25	1	—	A2012

BEAR CREEK MINING COMPANY – *NORTHWEST* DISTRICT

ALTERATION SUPPLEMENT → Logged By J. B. Hulen Project Buckskin Southwest Hole No. BSW-7 Page 9 Of 13 From 1050 To 1190'

Core Recovery (Size & Interval; % Rec. 100):
1049-1055', 1055-1062', 1062-1066', 1066-1071', 1071-1075', 1075-1080', 1080-1084', 1084-1091', 1091-1098', 1098-1100', 1100-1103', 1103-1107', 1107-1112', 1112-1117', 1117-1122', 1122-1127', 1127-1130', 1130-1135', 1135-1138', 1138-1141', 1141-1146', 1146-1151, 1151-1156', 1156-1160', 1160-1165, 1165-1169', 1169-1174', 1174-1179', 1179-1184', 1184-1189'

Graphic Alteration columns: silicif., ser., clay, qtz. vnts., chl., 2nd bte, calcite, 2nd Ksp
Graphic Mineral (%) columns: py, cpy, Moly, gn, sp, gypsum

py	cpy	Moly / other	Vol % Sulf Est	Interval	Geology Description	Thin Section Location & Description	Interval	PPM Cu	PPM Mo	PPM Pb	PPM Zn	PPM Ag	PPM Au	Sample Nos.
7-8	0.1-0.3		7-8	1050-1060'	Same as 1040-1050'; exc. some of the clasts below 1059' contain a little 2nd bte.		1050-1060'	480	1	20	65	2	—	A20122
4-5	0.1-0.3		2-3 / 7-8	1060-1070'	Below 1065': Same as 1040-1550' exc. w/a few vnlts. of waxy white clay. Above 1065': QUARTZ-FELDSPAR PPY DIKE, qtz.-chl.-bte. altn.		1060-1070'	800	28	20	65	1	—	20123A
8-9	0.1-0.3		8-9	1070-1081.4'	Same as 1040-1050'		1070-1081.4'	430	20	20	30	1	—	20124A
8-9	0.1-0.3	tr	8-9	1081.4-1088.4'	Same as 1040-1050'		1081.4-1088.4'	610	30	30	90	2	—	20125A
4-5	0.1-0.3		4-5	1088.4-1100'	HORNBLENDE BIOTITE DACITE PPY, altered, lt. brownish-grey; mafics altered to bte-clay-ser (bte. predominates) aggregate; feldspars altered to qtz-ser-clay aggregate; cut by narrow, irreg., vnlts of qtz (some rose), granular qtz-Ksp (up to 10 cm. wide), & qtz.-calcite; a few stellate masses, up to 0.5 mm. in dia., of radiating, acicular, dull black xls. (TOURMALINE?) A few waxy white clay vnlts.; sulfides texturally similar to 780-784' — some supergene enrichment, w/ development of sooty cc prints, esp. on cpy.	supergene enrichment, w/ development of sooty cc prints, esp. on cpy.	1088.4-1100'	665	20	10	60	1	—	20126A
4-5	0.1-0.3		4-5	1100-1110'	Same as 1088.4-1100'; exc. 1102.5-1103', 1103.9-1105', 1106.5-1107': clay-sericitized, w/ abund. qtz.-dol.-calcite-sp-cpy-py vnlts; 1107.7-1108': rose qtz.-py-cpy vein; 1109.9-1110': ", w/ vugs lined w/ euh. qtz xls. up to 2 mm. long		1100-1110'	870	28	30	30	3	—	20127A
4-5	0.1-0.3	tr	4-5	1110-1120'	Same as 1088.4-1100', exc. a little diss. & vnlt. chl., v. little 2nd Ksp.		1110-1120'	* 0.12% *	30	10	60	1	—	20128A
4-5	0.1-0.3	tr	4-5	1120-1126'	Same as 1110-1120'		1120-1126'	865	41	10	40	2	—	20129A
7-8	0.1-0.3	tr, tr, tr	7-8	1126-1140'	INTRUSION BRECCIA, qtz.-sericitized, v. lt. gray; heavy AFU qtz vning. badly shattered; Fault: 1138-1139'. wk.-mod. qtz-calcite vnlts, same as 1088.4-1100'. S* grain size avg. < 0.1 mm. in dia.		1126-1140'	* 0.13% * (117)	57 (57)	140 (101)	130 (103)	5 (4)	—	20130A
7-8	0.1-0.3	tr	7-8	1140-1150'	Same as 1126-1140'; badly shattered; many flts. < 10 mm. wide; tr. cc		1140-1150'	* 0.11% *	36	10	35	3	—	20131A
5-6	0.1-0.3		5-6	1150-1159.2'	Same as 1126-1140', exc. a little 2nd bte & mod. chl appear at 1155; interval is badly shattered. A few narrow, irreg., lt. brownish-pink dolomite-py-cpy-sp vnlts.		1150-1159.2'	* 0.10% *	25	10	50	4	—	20132A
4-5	0.3-0.5	tr	4-5	1159.2-1170'	QUARTZ-FELDSPAR PPY, too badly altered for determination of orig. comp. by binoc. mic. examination; 25-30% alt. fspar phen., anh.-subh., avg. 7 mm. length or dia; 1-2% qtz phen., anh., avg. 1 mm. dia; aphanitic to v. f. xline gmass; hybrid alt. → qtz-ser-chl-bte in roughly equal prop.; relict mafic sites mostly alt. to chl-bte. aggr.; some diss. & vnlt. calcite. — Tr. 2nd Ksp w/ qtz. as vnlts.	Tr. 2nd Ksp w/ qtz. as vnlts.	1159.2-1170'	* 0.17% *	76	10	35	2	—	20133A
4-5	0.3-0.5	tr	4-5	1170-1180'	Same as 1159.2-1170', exc. a little less bte. bte, here as above, occurs as (1) diss. scattered, fine-xline flakes, (2) in microvnlts w/ or wo/ qtz & 2nd Ksp, (3) as fine-xline chl.-bte. aggregates replacing original mafics.		1170-1180'	* 0.16% *	45	10	35	2	—	20134A
4-5	0.3-0.5			1180-1190'	Same as 1159.2-1170', exc. appearance of a few gypsum vnlts. up to 5 mm. wide. Ppy. begins to resemble DACITE PPY., but unsure as yet. ppytic texture more apparent.		1180-1190'	* 0.11% *	28	10	40	1	—	20135A

BEAR CREEK MINING COMPANY – *NORTHWEST* DISTRICT

ALTERATION SUPPLEMENT

Logged By *J.B. Hulen* Project *Buckskin Southwest* Hole No. *BSW-7*

From *1190'* To *1330'*

Core Recovery

Size & Interval	% Rec.
1189-1194'	100
1194-1198'	"
1198-1203'	"
1203-1208'	"
1208-1210'	"
1210-1215'	"
1215-1220'	"
1220-1225'	"
1225-1230'	"
1230-1235'	"
1235-1240'	"
1240-1250'	"
1250-1260'	"
1260-1266'	"
1266-1275'	"
1275-1282'	85
1282-1292'	100
1292-1302'	"
1302-1311'	"
1311-1321'	"
1321-1331'	"

NXWL

Graphic Geology | Graphic Alteration: silicif., ser., clay, qtz. vns., chl., 2nd bte, calcite

Graphic Mineral (%)

Interval	py	cpy	MoS2	gn	sp		gypsum	Vol % Sulf Est
1190-1200'	6-7	0.1-0.3	tr					6-7
1200-1210'	7-8	0.3-0.5	tr	0.1-0.3	0.3-0.5			7-8
1210-1220'	7-8	0.1-0.3						7-8
1220-1230'	5-6	0.1-0.3	tr					5-6
1230-1240'	4-5	0.3-0.5	tr					4-5
1240-1250'	4-5	0.5-0.7						4-5
1250-1260'	4-5	0.5-0.7						4-5
1260-1270'	3-4	<0.1						3-4
1270-1280'	2-3	<0.1						2-3
1280-1290'	2-3	tr		tr	tr			2-3
1290-1300'	2-3	tr		tr	0.1-0.3			2-3
1300-1310'	5-6	<0.1						5-6
1310-1320'	5-6	<0.1						5-6
1320-1330'	3-4	tr						3-4

GEOLOGY

Interval	Description	Thin Section Location & Description
1190-1200'	HORNBLENDE BIOTITE DACITE PORPHYRY; Refer to 780-784' supplement for rock description; alteration same as 1159½-1170', exc. considerably less 2nd bte. 1192-1194', 1198-1200': chl.-qtz.-ser. altn. 1199±': 35 mm. qtz-py-cpy vn.	
1200-1210'	Same as 1190-1200', exc. 2nd bte & chl. drop out at 1203' mod. abund., narrow, lt. brownish-pink dolomite-sp-cpy vnlts. & galena!	
1210-1220'	Same as 1190-1200' — 2nd bte. begins at 1214⁵' — mod. abund. $CO_3^=$ vnlts, some w/a little sp	
1220-1230'	Same as 1190-1200', exc. only tr. chl. and a few kaolinite vnlts.	
1230-1240'	Same as 1190-1200', exc. less ser, silic., more bte. (2nd); <0.1% unknown slightly reddish, grey, metallic (tetrahedrite?)(enargite?), as diss. agg. of fine-xline grains, and w/ qtz & cpy in vnlts. cpy increasing! A few narrow (<1 mm) kaolinite vnlts.	
1240-1250'	Same as 1230-1240'	
1250-1260'	Same as 1230-1240'	
1260-1270'	see 780-784' → H B DACITE PPY, clay-sericitized, sharp upper contact w/ bte-qtz rock; feldspars partially to totally altered to clay-ser (ser > clay) aggregates; mafics to chl-ser. aggregates (chl > ser); wk-mod. qtz. vning, some gypsum vnlts. Faults: 1261⁸-1266', 1266⁵-1266⁸', 1268⁴-1269³'	
1270-1280'	Same as 1260-1270'	
1280-1290'	Same as 1260-1270', exc. mafics alt. to ser. Faults: 1280-1282⁶', 1284-1285'	
1290-1300'	Same as 1280-1290'	
1300-1310'	Same as 1260-1270', exc. ① intense qtz.-ser. alteration ② " qtz. vning. ③ mafics totally alt. to qtz.-ser. aggregate. <0.1 gn & sp, as diss. anh. grains assoc w/ calcite. Faults: 1303-1306', 1306⁵-1306⁴'	
1310-1320'	Same as 1300-1310' Faults: 1316-1320'	
1320-1330'	Same as 1280-1290' Faults: 1322³-1322⁶', 1323 - 1325'	

Analyses

Interval	PPM Cu	PPM Mo	PPM Pb	PPM Zn	PPM Ag	PPM Au	Sample Nos.
1190-1200'	805	35	10	30	1	—	20136A
1200-1210'	* 0.12% *	39	* 0.13% *	* 0.30% *		—	20137A
1210-1220	925	23	20	50	2	—	20138A
1220-1230'	* 0.11% *	32	10	25	1	—	20139A
1230-1240'	* 0.16% *	35	20	45	1	—	20140A
1240-1250'	* 0.21% *	17	40	65	5	—	20141A
1250-1260'	* 0.19% *	8	10	30	2	—	20142A
1260-1270'	435	4	20	40	2	—	20143A
1270-1280'	205	1	10	25	1	—	20144A
1280-1290'	180	1	20	40	1	—	20145A
1290-1300'	220	2	100	140	3	—	20146A
1300-1310'	270	1	230	505	3	—	20147A
1310-1320'	275	3	20	45	2	—	20148A
1320-1330'	160	-1	40	85	2	—	20149A

ALTERATION SUPPLEMENT

BEAR CREEK MINING COMPANY – NORTHWEST DISTRICT

Logged By J.B. Hulen Project Buckskin Southwest Hole No. BSW-7

From 1330' To 1470'

Core Recovery

Size & Interval	% Rec.
1331-1341'	100
1341-1351'	″
1351-1361'	″
1361-1371'	″
1371-1380'	″
1380-1390'	″
1390-1400'	″
1400-1410'	″
1410-1420'	″
1420-1425'	″
1425-1430'	″
1430-1435'	″
1435-1445'	″
1445-1455'	″
1455-1465'	″
1465-1475'	″

Graphic Mineral (%), Vol % Sulf Est., Geology, Analyses

py	cpy	MoS2	gn	sp	Vol % Sulf Est.	Interval	Description	Thin Section Location & Description	Analyses Interval	PPM Cu	PPM Mo	PPM Pb	PPM Zn	PPM Ag	PPM Au	Sample Nos.
1-2	<0.1				1-2	1330-1340'	HORNBLENDE BIOTITE DACITE PPY (see 780-784'); mafics totally altered to dk. greyish-green chl.; fspars fresh to wkly. altered to clay-ser.; abund calcite — aft. fspars (diss.) & in vnlts. w/or w/o qtz.; wk. 2nd Ksp as narrow, irreg. vnlts w/ or w/o qtz. & as "flooding" adj. to vnlts. in irreg. patches up to 30 mm. in dia.; fresh, primary, locally octahedral magnetite grains, up to 0.5 mm. in dia., throughout the interval		1330-1340'	110	-1	10	30	-1	—	20150A
1-2	<0.1				1-2	1340-1350'	same as 1330-1340'; exc. mod. abundant 2nd Ksp & some fresh primary bte books		1340-1350'	135	1	10	50	-1	—	20151A
1-2	<0.1				1-2	1350-1360'	same as 1340-1350'		1350-1360'	140	-1	20	110	-1	—	20152A
2-3	<0.1				2-3	1360-1370'	HB DACITE PPY., intense clay-sericitization of fspars & hbl., but bte only chloritized, total S= increased slightly.		1360-1370'	330	2	80	105	.06 [2]	—	20153A
3-4	<0.1				3-4	1370-1380'	same as 1360-1370'; exc. strong quartz-sericitization, no chl. Faults: 1379½-1380'; 1375-1376'		1370-1380'	475	8	40	65	.03 [1]	—	20154A
5-6	<0.1				5-6	1380-1390'	INTRUSION BRECCIA; strong quartz-sericitization; tr. diss. bte. (2nd) in these intervals {1380-1382', 1384½-1384⅘, 1387-1388'} Fault: 1383-1383½		1380-1390'	450	29	10	25	.03 [1]	—	20155A
5-6	<0.1				5-6	1390-1400'	same as 1380-1390'; exc. a little more 2nd bte.		1390-1400'	630	8	10	30	.03 [1]	—	20156A
6-7	<0.1				6-7	1400-1406½'	Fault zone; clasts of qtz-sericitized intrusion breccia in a matrix of calcite & comminuted rock debris.		1400-1406½'	765	15	50	95	.18 [6]	—	20157A
4-5	<0.1				4-5	1406½-1420'	INTRUSION BRECCIA; hybrid chl-qtz-ser-bte alteration, same as 1159⅔-1170'		1406½-1420'	740	16	10	25	.03 [1]	—	20158A
4-5	<0.1				4-5	1420-1430'	QUARTZ-FELDSPAR PPY of undecipherable original composition (SAME AS 1159⅔-1170' Alteration same as 1406½-1420'		1420-1430'	745	19	10	35	.03 [1]	—	20159A
4-5	<0.1				4-5	1430-1440'	Same as 1420-1430'		1430-1440'	855	79	10	25	—	—	20160A
5-6	<0.1				5-6	1440-1450'	Same as 1420-1430'; exc. less 2nd bte. Faults: 1446½-1448'; 1449½-1450'		1440-1450'	550	26	70	300	.15 [5]	—	20161A
5-6	<0.1				5-6	1450-1458⁸'	Same as 1420-1430', exc. quartz-sericitized (no chl., no bte.) abundant calcite vnlts, many w/sp & tr gn.		1450-1458⁸'	925	52	100	185	.23 [8]	—	20162A
3-4	tr		tr	<0.1	3-4	1458⁸-1470'	CALCITE-QUARTZ-SPHALERITE VEIN; clasts of qtz.-sericitized porphyry (see 1420-1430') in a matrix of quartz & calcite, w/minor sphalerite, tr. galena, some cpy, & py		1458⁸-1470'	510	47	130	235	.44 [15]	—	20163A

BEAR CREEK MINING COMPANY – NORTHWEST DISTRICT

Logged By J.B. Hulen Project Buckskin Southwest Hole No BSW-7 Page 12 Of 19 From 1470 To 1610

ALTERATION SUPPLEMENT

* REFER TO 700-704' SUPPLEMENT FOR RX. DESCRIPTION

Core Recovery: Size & Interval	% Rec.
1465-1475'	100
1475-1485'	
1485-1495'	
1495-1505'	
1505-1513'	
1513-1523'	
1523-1533'	
1533-1539'	
1539-1549' (NXWL)	
1549-1559'	
1559-1565'	
1565-1575'	
1575-1585'	
1585-1595'	
1595-1605'	
1605-1612'	

Graphic Mineral (%) PY	CPY	MoS2	gn	sp	2nd Ksp	gypsum	Vol % Sulf Est	Interval	GEOLOGY Description	Thin Section Location & Description	Analyses Interval	ppm Cu	ppm Mo	ppm Pb	ppm Zn	ppm Ag	ppm Au	Sample Nos.
3-4	tr			<0.1			3-4	1470-1479.2'	Same as 1458.2-1470'		1470-1479.2'							20164A
2-3	0.1-0.3						2-3	1479.2-1490' * * *	HORNBLENDE BIOTITE DACITE PPY. * ; 2nd btz. as fine-xline diss. flakes — mostly after amph. minerals, also after mafics; local patches within which plag. phenos are totally argillized; calcite mainly after plag. & groundmass minerals; chl text. similar to btz (2nd); py as diss., anh. grains avg. 0.5 mm. in dia. & as microvnlts; cpy text. similar to py, exc. slightly smaller grain size; hem as diss., irreg. masses < 0.5 mm. in dia., and as µvnlts; qtz. vnlts. up to 25 mm. in dia. poss. tr. 2nd Ksp.		1479.2-1490'	625	1	10	40	2	—	20165A
2-3	0.1-0.3						2-3	1490-1500'	Same as 1479.2-1490', exc. qtz.-sericitized to 1496'		1490-1500'	560	4	10	25	1	—	20166A
2-3	0.1-0.3			tr			2-3	1500-1510'	Same as 1479.2-1490', exc. no clay/plag. phenos. rock much more dense		1500-1510'	425	5	60	120	4	—	20167A
2-3	0.1-0.3						2-3	1510-1520'	Same as 1479.2-1490' exc. no clay, no hem.; a few gypsum vnlts. up to 10 mm. wide; local 2nd Ksp as "flooding" in patches up to 35 mm. dia., and w/qtz. in vnlts., thusly (qtz., ksp)		1510-1520'	475	23	-10	30	-1	—	20168A
2-3	0.1-0.3						2-3	1520-1530'	Same as 1510-1520', exc. no Ksp.		1520-1530'	550	3	20	50	-1	—	20169A
2-3	0.1-0.3						2-3	1530-1540'	Same as 1510-1520' exc. no Ksp. Faults: 1535.5-1535.8', 1536.1-1537.1'		1530-1540'	435	13	20	30	-1	—	20170A
2-3	0.1-0.3						2-3	1540-1550'	Same as 1510-1520, exc. v. wk. alt. exc. no Ksp		1540-1550'	345	5	10	30	-1	—	20171A
4-5	0.1-0.3						4-5	1550-1560'	Highly altered, fine-xline GRANODIORITE (?); alteration same as 1479.2-1490', exc. perhaps less calcite.		1550-1560'	630	10	10	35	1	—	20172A
4-5	0.1-0.3	tr					4-5	1560-1570'	Same as 1550-1560'		1560-1570'	* 0.12% *	32	10	60	2	—	20173A
3-4	0.1-0.3						3-4	1570-1580'	HORNBLENDE BIOTITE DACITE PORPHYRY; alteration same as 1479.2-1490'		1570-1580'	390	4	10	50	1	—	* 20175A
3-4	0.1-0.3						3-4	1580-1590'	Same as 1570-1580'		1580-1590'	760	26	10	35	1	—	* 20174A
2-3	<0.1						2-3	1590-1600'	HORNBLENDE BIOTITE DACITE PORPHYRY; same as 1570-1580' to 1592'; below 1592': mafics are altered to dk. grayish-green chlorite-calcite aggregates (chl. >> calcite); a few transl. gypsum vnlts.; cpy has markedly decreased! bah! bah!		1590-1600'	220	-1	-10	20	-1	—	* 20177A
2-3	<0.1						2-3	1600-1610'	Same as 1590-1600' poss. tr. epidote/chl.; hbl. & btz.		1600-1610'							* 20178A

BEAR CREEK MINING COMPANY – NORTHWEST DISTRICT

Logged By: J.B. Hulen · Project: Buckskin Southwest · Hole No.: BSW-7

From 1610' To 1715'

Core Recovery

Size & Interval	% Rec.
1605-12'	100
1612-1622'	"
1622-1628'	"
1628-1635'	"
1635-1645'	"
1645-1655'	"
1655-1665'	"
1665-1675'	"
1675-1685'	"
1685-1695'	"
1695-1702'	"
1702-1710'	"
1710-1715'	40

Geology and Analyses

py	cpy	Vol. % Sulf. Est.	Interval	Description	Thin Section Location & Description	Analysis Interval	ppm Cu	ppm Mo	ppm Pb	ppm Zn	ppm Ag	ppm Au	Sample Nos.
1-2	tr.	1-2	1610-1620'	HORNBLENDE BIOTITE DACITE PORPHYRY; Refer to supplement, 780-784; for rock description; Practically unaltered, exc. mafics totally replaced w/ fine-xline chl.-calcite aggregates (chl. > calcite; calcite also partially replaces plag.; a few narrow (< 5 mm) gyp. vnlts; LOOKS @ ** GRIM!; 0.5-1% magnetite, as diss.	irreg. grains up to 0.5 mm in dia.	1610-1620'	140	-1	-10	30	-1	—	20176A
1-2	tr.	1-2	1620-1630'	same as 1610-1620', exc. some fresh primary bte. & diss. epidote below 1623'		1620-1630'	100	1	10	20	—	—	20179A
2-3	tr.	2-3	1630-1640'	same as 1610-1620'; rock is relatively unfractured		1630-1640'	125	-1	20	110	—	—	20180A
1-2	tr.	1-2	1640-1650'	same as 1610-1620'	*** NOTE: BELOW 1620' CHALCOPYRITE OCCURS ONLY AS DISS. GRAINS IN DACITE PPY.	1640-1650'	145	-1	10	30	—	—	20181A
1-2	tr.	1-2	1650-1660'	same as 1610-1620'		1650-1660'	195	1	10	30	—	—	20182A
1-2	tr.	1-2	1660-1670'	same as 1610-1620', exc. some fresh bte (primary) & diss. epidote below 1667'		1660-1670'	155	-1	10	25	—	—	20183A
3-4	tr.	3-4	1670-1680'	same as 1610-1620', exc. total S= increase		1670-1680'	580	-1	10	15	.03	—	20184A
2-3	tr.	2-3	1680-1690'	same as 1610-1620', exc. a little clay & ser along cleavage planes of chloritized mafics above 1616'		1680-1690'	240	1	10	40	—	—	20185A
<0.5	tr.	<0.5	1690-1696^{8}'	same as 1610-1620', exc. some fresh bte & diss. epidote		1690-1696^{8}'	845	44	10	25	.03	—	20186A
9-10	0.1-0.3	9-10	1696^{8}-1708^{9}'	XENOLITH of QTZ-CHL-BTE ROCK (fine-xline aggregate of these minerals w/ minor ser. & spec. hem); no relict texture; def. pre-dates dacite ppy above and below; laced w/ veinlets, lenses and irreg. masses of transl. white qtz.; may be fragment of original core zone		1696^{8}-1708^{9}'	70	-1	10	50	—	—	20187A
<0.5	tr.	<0.5	1708^{9}-1715'	same as 1690-1696^{8}'		1708^{9}-1715'							20188A
				END OF HOLE									

NORTHWEST DISTRICT

Summary Drill Hole Log

Name BUCKSKIN SOUTHWEST

Code 005-01-0411

DOUGLAS CO., NEV.

DRILL HOLE NO. BSW-7 PAGE ___ OF ___

BEARING ___ DIP 90°

LOCATION: N. ___ E. ___

COLLAR ELEV. ≈ 5440'

TOTAL DEPTH 1715' , BY ___

START ___ COMPLETED ___

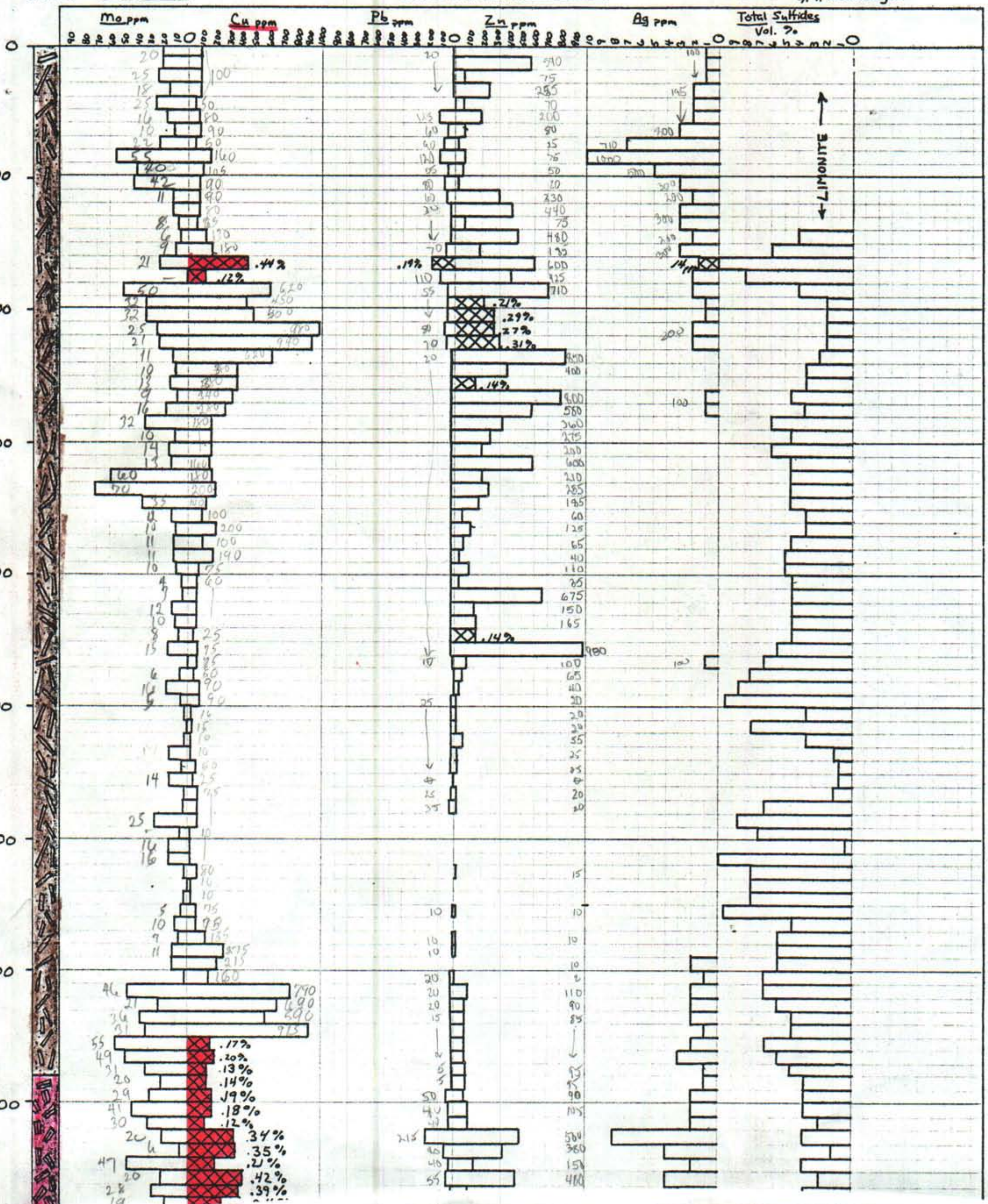
(35)

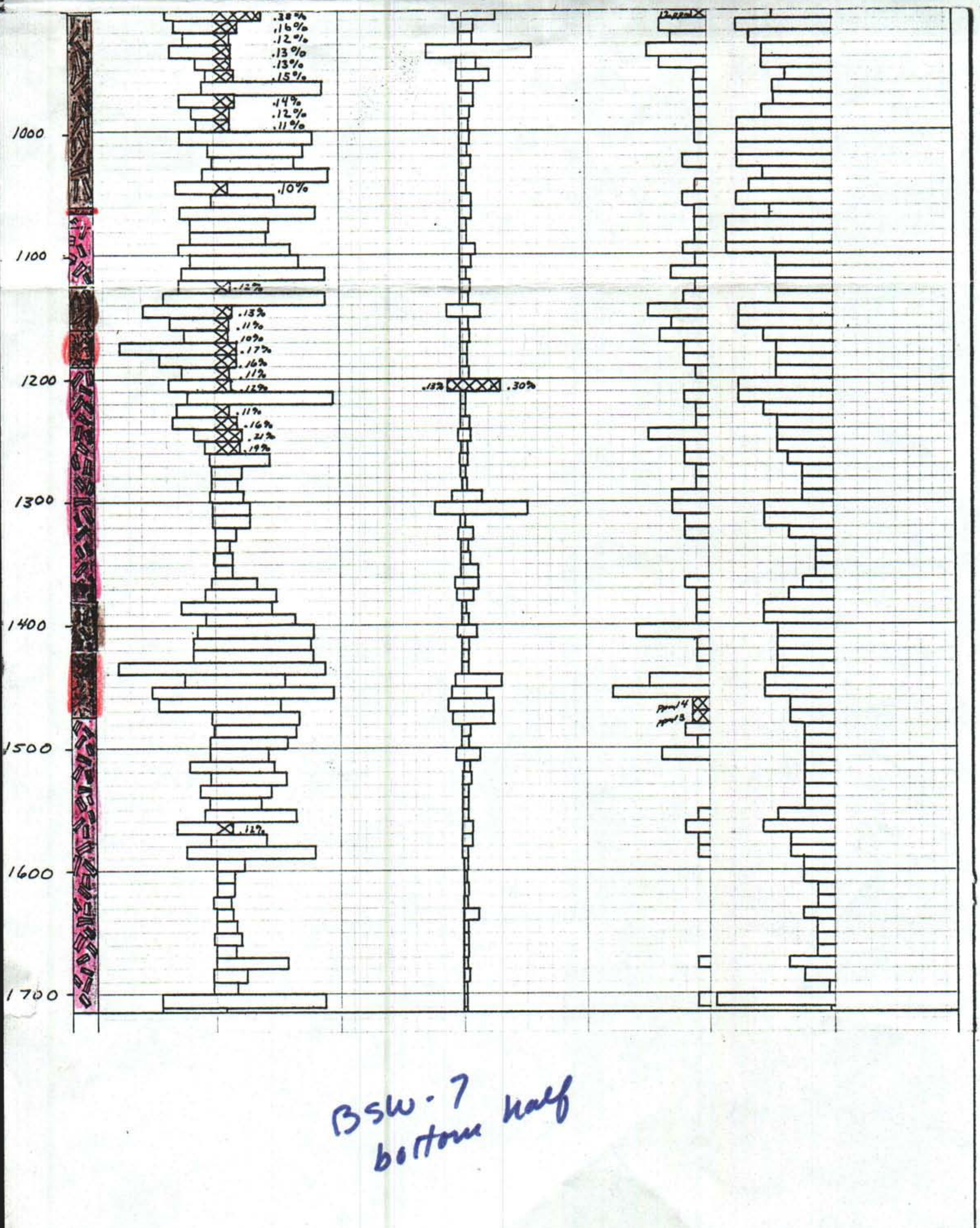
Item 15

Scale: 1" = ___

Est. of final depth 1715'

DATA: G. R. Heinemeyer





BSW-7
bottom half

(33) Item 15

510′ ~ .16

88′ of .35 at 820′

Drill hole BSW-7 (TD 1,715 feet), the deepest of three holes completed at Buckskin Southwest, was drilled to test for the presence of a deep primary porphyry copper deposit, vertically zoned beneath a quartz-sericite "lithocap". The hole penetrated, beneath 750 feet of quartz sericite rock above a 510-foot zone of complexly altered dacite porphyry, volcanic breccia, and quartz-feldspar porphyry averaging 0.16% Cu as chalcopyrite (Figure 5). All rock types within this zone are heavily quartz-veined and altered with the addition of various amounts and combinations of biotite, chlorite, sericite and quartz. Chlorite-quartz-biotite alteration is most often associated with relatively higher copper grades; chlorite-quartz-biotitized dacite porphyry between 820 feet and 907.7 feet, for instance, averages 0.35% Cu.

(35) Item 15

xxxx 89510

July 22, 1977

R. C. Babcock, Jr.
District Manager
Bear Creek Mining Company
Box 9, Dishman Branch
Spokane, Washington 99213

Dear Russ:

The sample numbers for hole BSW-7 at the Buckskin project are listed below as per our phone conversation last week. Also listed are the sample numbers for hole BSW-9 which we did not discuss but I would appreciate it if these pulps were also made available for Mr. Bamford's analyses. Could you please send the pulps to Mr. Bamford in Salt Lake City at your convenience?

We believe the analysis of these pulps will be useful in delineating a porphyry target at Buckskin, and appreciate your cooperation.

Also enclosed for your files is Bamford's report on the sulfide and limonite study he conducted on the entire Buckskin project this spring.

Pulp Sample Numbers:	BSW-7	A2126 - 2170
		A2261 - A2300
		A20101 - A20188
	BSW-9	28317 - 28399
		28400 - 28450
		28651 - 28660

Sincerely,

William M. Oriel
Geologist

pb
Enc.

Buckskin Project

BSW-7

(35) Item 15

~~THE GOLDFIELD CORPORATION~~

100' Composites

~~GETCHELL MINES DIVISION~~

Month of ____________ 19___ Journal Voucher No. ____________

ACCOUNT	Cu	Mo	V	Pb	Zn	Ag	V
0-100	71	27		52	124	4	
200	766	19		233	817	3	
300	432	17		32	.11%	-1	
400	151	26		22	235	-1	
5	53	8		14	349	-1	
6	37	7		16	12	-1	
7	86	8		4	8	-1	
8	.1131	32		17	67	2	
9	.3050	24		38	202	3	
1000	.1472	22		21	150	3	
1100	618	16		18	41	1	
12	.1172	41		20	52	3	
13	987	13		155	349	2	
14	298	5		47	105	-1	
15	690	28		41	104	4/.18	
16	893	12		15	43	-1	
17/15	236	3		10	38	-1	
1715							

BSW 6

(35)
Item 15

ROCK DESCRIPTION	Interval	Cu (ppm)	Mo (ppm)
0-10' ALLUVIUM. Same as 0-20' in BSW-3 (fig. 7).	0-10'	NO SAMPLE	
10-70' TUFFACEOUS SILTSTONE. Same as 20-60' in BSW-3 (fig. 7).	10-20'	50	1
	20-30'	55	2
	30-40'	25	-1
	40-50'	10	-1
	50-60'	15	-1
	60-70'	15	2

(GEOCHEMISTRY: Interval, Cu, Mo)

Figure 10. Summarized rotary drill hole log, BSW-6.

DISCUSSION AND GEOLOGIC HISTORY

Geologic history of the southwestern Buckskin Range can be hypothetically reconstructed from field evidence in the following sequence:

(1) Extrusion of eugeosynclinal, Triassic intermediate lavas.

(2) Burial and regional thermal metamorphism of the Triassic intermediate volcanic sequence, possibly accompanied by gentle, open folding. Such thermal metamorphism, of lower greenschist grade in the southwestern Buckskin Range, resulted in extensive alteration of primary mafic minerals and plagioclase to chlorite and/or epidote and calcite-dolomite. Rocks thus altered closely resemble hyrothermally propylitized varieties.

(3) Emplacement of irregular plutons of fine-crystalline granodiorite, probably during Early Cretaceous (or possibly Late Jurassic) time, with attendant contact metamorphism of Triassic metavolcanic rocks.

BSW 5

(35)
Item 15

ROCK DESCRIPTION	GEOCHEMISTRY Interval	Cu (ppm)	Mo (ppm)
0-10' ALLUVIUM. Same as 0-20' in BSW-3 (fig. 7).	0-10'	NO SAMPLE	
10-60' TUFFACEOUS SILTSTONE. Same as 20-60' in BSW-3 (fig. 7).	10-20'	65	2
	20-30'	90	6
	30-40'	50	-1
	40-50'	30	-1
	50-60'	50	3

Figure 9. Summarized rotary drill hole log, BSW-5.

Log BSW 4

ROCK DESCRIPTION	Interval	GEOCHEMISTRY Cu (ppm)	Mo (ppm)
0-10' ALLUVIUM. Same as 0-20' in BSW-3 (fig. 7).	0-10'	NO SAMPLE	
10-85' TUFFACEOUS SILTSTONE. Same as 20-60' in BSW-3 (fig. 7).	10-30'	10	-1
	30-40'	15	5
85-90' HORNBLENDE BIOTITE DACITE PORPHYRY, lt. greenish-gray. 25-30% subh.-euh. plagioclase phenocrysts, avg. 2 mm. in length, 9-10% subh.-euh. biotite books, avg. 2 mm. in diameter, 1-2% subh. hornblende phenocrysts, avg. 2 mm. in length, and 1% anhedral, rounded, translucent qtz. phenocrysts, avg. 2-3 mm. in diameter, embedded in an aphanitic groundmass. Hornblende and biotite phenocrysts are partially altered to chlorite and/or epidote aggregates.	40-50'	30	9
	50-60'	30	5
	60-70'	30	-1
	70-80'	35	1
	80-85'	30	1
	85-90'	35	1

Figure 8. Summarized rotary drill hole log, BSW-4.

ROCK DESCRIPTION	Interval	GEOCHEMISTRY Cu (ppm)	Mo (ppm)
0-10' ALLUVIUM. Same as 0-20' in BSW-3 (fig. 7).	0-10'	NO SAMPLE	
10-60' TUFFACEOUS SILTSTONE. Same as 20-60' in BSW-3 (fig. 7).	10-20'	65	2
	20-30'	90	6
	30-40'	50	-1
	40-50'	30	-1
	50-60'	50	3

Figure 9. Summarized rotary drill hole log, BSW-5.

DRILLING

Between late fall 1970 and early spring 1971, six short air rotary holes, for a total of 830 feet, were drilled at Buckskin Southwest to perfect 32 lode claims. Summarized drill hole logs for the six holes are presented in figures 5 through 10. Drill holes BSW-4, 5, and 6 — drilled subsequent to completion of the Buckskin Southwest geologic map (pl. 2) — are collared in Quaternary pediment gravels a few hundred feet west of the western edge of the area mapped (pl. 2).

ROCK DESCRIPTION

0-20' ALLUVIUM. Pebbles, cobbles and boulders of all pre-alluvial rock types exposed in the southern Buckskin Range, with minor quartz monzonite from the Pine Nut Range, to the west.

20-60' TUFFACEOUS SILTSTONE, semi-consolidated, white to lt. gray. Tr. manganese oxide locally present along fractures. Tr. shredded plant debris toward base of interval.

60-118' HORNBLENDE ANDESITE PORPHYRY, lt. greenish-gray where unoxidized. 15-17% stubby, anh.-subh. plagioclase phenocrysts, avg. 1-2 mm. in length, and 2-3% anh.-subh. hornblende phenocrysts, avg. 1 mm. in length or diameter set in an aphanitic groundmass. Less than 0.5% diss., fine-xline., anh. <u>py</u> below 100'. From 60' to 100', <u>py</u> is partially to totally oxidized to powdery, yellowish-brown goethite.

GEOCHEMISTRY

Interval	Cu (ppm)	Mo (ppm)	Ag (ppm)
0-20'	NO SAMPLE		
20-30'	45	5	-1
30-40'	40	-1	-1
40-50'	35	6	-1
50-60'	45	9	3
60-70'	45	9	3
70-80'	60	5	2
80-90'	70	3	2
90-100'	85	7	1
-----Base of Oxidation----			
100-110'	60	5	2
110-118'	50	3	1

Figure 7. Summarized rotary drill hole log, BSW-3.

Log BSW 2

35
Item 15

ROCK DESCRIPTION

0-200' HORNBLENDE QUARTZ LATITE PORPHYRY, strongly altered, light greenish-gray. Relict texture almost totally obscured by alteration.
Hematitic leached capping from 0 to 120'. Porphyry in this interval is altered to a fine-xline. qtz.-ser. aggregate, w/2-3% diss., fine-xline, anh.-subh. magnetite, 2-3% diss., fine-xline., anh.-subh. secondary biotite, 1% diss., fine-xline., anh.-subh. chlorite, 3-5% narrow (less than 2 mm. in width), banded (epithermal?), transl. stockwork qtz. vnlts., 1-2% goethite (as diss., fine-xline., anh. grains and, less commonly, as narrow, stockwork vnlts.), and 4-7% powdery, dark reddish-gray hematite, as diss., fine-xline., anh.-subh. pseudomorphs after primary sulfides and as narrow (less than 1 mm. wide) stockwork vnlts. in association with one or more of the minerals goethite, pitch limonite, quartz, turquoise, and "neotocite".
Zone of supergene enrichment from 120' to 150'. From 120' to 140', rock is texturally and compositionally similar to that cut between 0 and 120', but contains 0.5-1% dark gray, sooty cc, as diss. fine-xline., anh.-subh. pseudomorphs after primary sulfides. From 140' to 150', rock contains 4-5% diss., fine-xline. py, partially replaced by dk. gray sooty cc.(0.5-0.7%).
Primary sulfide zone from 150' to 200'. Rock is texturally and compositionally similar to that cut between 0 and 120' but contains 4-7% diss., fine-xline. anh.-subh. py, and less than 0.2% diss., fine-xline. anh. cpy.

GEOCHEMISTRY

Interval	Cu	Mo	Ag
0-10'	0.12%	20	6
10-20'	990	23	10
20-30'	0.12%	16	7
30-40'	0.11%	11	3
40-50'	0.14%	15	4
50-60'	0.23%	17	5
60-70'	0.21%	11	3
70-80'	0.23%	19	2
80-90'	0.17%	19	3
90-100'	970	16	17
100-110'	0.15%	41	11
110-120'	0.16%	8	11
----Base of Oxidation-----			
120-130'	0.41%	1	11
130-140'	1.20%	10	6
140-150'	0.29%	20	4
--Base of Supergene Enrichment--			
150-160'	515	15	5
160-170'	0.12%	13	7
170-180'	820	26	6
180-190'	815	16	4
190-200'	690	22	2

All values reported in ppm unless otherwise noted.

Figure 6. Summarized rotary drill hole log, BSW-2.

BSW 2 [illegible]

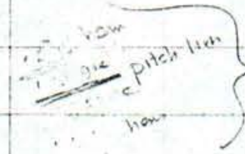
((

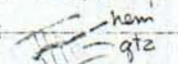
At surface – minor bleached, v. lt. greenish-brown flaky mica along a few fracs, prud. diss. — may have been chl. or bte. —
also cracked morv. along fracs., minor diss Cu-mineral (green, amorphous)

BSW 2

0–10' Rx. is primarily granular qtz. w/minor clay (lt. greenish-gray to lt. brownish-gray), poss. some sericite; a few qtz. veinlets, ≤1 mm. in width; 7–9% hematite, occurs as minute diss. grains & as veinlets (irreg.) ≤ 1 mm. in width.; ~1% goethite, mostly along fracs (some pitch limonite), but some as pseudomorphs/sulfides, generally < 0.5 mm. in dia.; tr. unknown lt. green Cu(?) mineral as thin crusts along fracs.; poss. tr. cc along fracs ** hem. appears dk. metallic gray on fresh surface — streaks intense brick reddish-brown.; poss. tr. MnO (Cu-bearing?) along fracs

10–20' Same as above, exc. a few more qtz. veinlets (up to 2 mm wide – some appear epithermal [cockade structure])



} one frag. shows this relationship ; some of the hem post-dates introd. of qtz. veinlets 

;

% goethite sl. increasing. ; a few veinlets of translucent bluish-gray clay present (< 1 mm. wide)

20–30' Same as above

30–40' same as above, exc. several frags. of bte. dacite EPY, fresh black bte., feldspars argillized. – some relict qtz. phenos –; minor diss. goe. pseudos ; % hem dropping to ~5% in rx. other than Dp.

BSW2

40-50' – same rock type, but app of several chunks w/ < 1% diss. hem.; fewer qtz. veinlets present

50-60' – same, except a few crusts of metallic-appearing dk gray mineral along fracs – streak med. brown to black. (may be cc.) — hint of relict ppytic texture in a few frags. – few qtz. veinlets present.

60-70' – same – a few veinlets of v. fine granular hem. present up to 1.5 mm. wide

70-80 "

80-90 "

90-100' same rx. type, exc. most frags. more intensely bleached [illegible] a bit more clay in rx.; 2-3% diss. hem., most appears brick-red – but a few grains are ~~diss~~ bluish gray metallic. — goethite same as 0-10'

100-110 same – a few more pcs. w/ almost no minlz.

110-120 same – exc. 35-50% of chips contain < 1% casts/pseudos – a few [illegible] w/ up to 1% cc(?) (dk. gray metallic)

120-130' same [illegible] appearance of thoroughly argillized Dp [illegible] qtz. rx frags contain up to 1% cc(?)

BSW2

130-140' >75% of sample is argillized & chloritized Dp w/ ~1-1.5% cc (may be micronite) and <0.1% brilliant orange-red amorphous mineral (cinnabar, realgar?); euhedral btc books are converted to dk. green chlorite; rest of sample is granular qtz. rock, also w/ 1% diss cc (?)

140-150' granular qtz-clay-(chl) rock, v. fine-gr., lt.-med. slty. greenish-gray; no relict texture discernible; ~3% diss. v. fine-gr (<0.5 mm.) py - minor py along tiny irreg. fracs.; a few small white clay veinlets. ~0.3-0.5% diss. dk. grey metallic mineral similar in texture to py.

150-160 - same as above, exc. less chl. (?) more qtz. poss. tr. 2nd btc.

160-170 - same as above

170-180 - "

180-190 - " exc. 2nd btc appears to be increasing.

BSW1 100' average assays (35)

Item 15

	Cu	Mo	Pb	Zn	Ag	
0-100	294	13	NA	NA	1.6	2
-200	678	12	NA	NA	4.1	4
300	283	6.	NA	NA	1.9	2
400	919	19	29	154	2.5	2½
500	998	10	19	136	1.5	1
600	294	2	86	335	1.8	2
700	652	9	43	180	2.6	2½
800	871	30	23	109	2	2
900	806	14	32	115	3.8	4
1000	616	13	33	131	1.4	1
1100	537	19	35	66	0.8	1
1200	658.	24	23	43	0.5	–
1313	293	22	24	67	0.3	–

700-710 = .7 Au

35
Item 15

Drill hole BSW-1 (TD 1,313 feet - 1974) was drilled in hopes of intersecting a thicker and higher grade interval of copper mineralization than was encountered in BSW-7 (1972). Drilling encountered 450 feet of quartz-sericitized volcanic flows and breccias with a 100-foot zone of 0.16% Cu between 350 and 450 feet. At 450 feet, a dacite porphyry sill, which persisted to a depth of 690 feet and is evidently the source of the copper mineralization at Buckskin Southwest, was intercepted. Beneath this sill and extending to the bottom of the hole, drilling encountered 600 feet of strongly altered (varying degrees of quartz-sericite-chlorite) volcanics which contained seven spotty, 10-foot intervals of 0.10 to 0.16% Cu. Nearly all of these occurrences in the lower volcanic section are directly associated with narrow dacite porphyry sills. Again, as was noted in the drilling results of BSW-7, the highest copper values are closely associated with quartz-chlorite-biotite altered volcanics and relatively unaltered dacite sills directly beneath.

Log BSW 1

35
Item 15

ROCK DESCRIPTION

0-292' INTRUSIVE BRECCIA, intensely qtz.-sericitized, lt. greenish to brownish-gray. Relict fragmental texture almost totally obscured by alteration. Base of oxidation at about 110'. Base of supergene enrichment at about 150'. Where unoxidized and unenriched, rock is uniformly a fine-xline., qtz.-ser. aggregate w/4-7% diss., fine-xline., anh.-subh. py, 0.1-0.3% diss., fine-xline., anh. cpy, 1-3% diss., fine-xline., lt.-med. grayish-brown, anh.-subh. andalusite, tr. diss., fine-xline. anh. magnetite and hematite, and a few narrow (less than 1 mm.) transl. qtz. and lt.-med. grayish-brown dolomite (or ankerite) vnlts. Where supergene enriched (110-150'), py and cpy are partially replaced by dark gray, sooty cc (avg. 0.1-0.2%). Within zone of oxidation (0-110') ser. is partially replaced by white to lt. bluish-gray kaolinite: Sulfides in this interval have been thoroughly oxidized, with resultant formation of lt. yellowish-brown jarosite (as stockwork vnlts., often admixed with qtz., and as fine-xline. aggregates partially filling sulfide casts), and local traces of goethite, pitch limonite, and hematite: A few, narrow (less than 1 mm.), powdery, light grayish-blue-green turquoise vnlts. are erratically distributed throughout this interval.

GEOCHEMISTRY

Interval	Cu (ppm)	Mo (ppm)	Ag (ppm)
0-10'	245	28	1
10-20'	470	14	4
20-30'	515	3	1
30-40'	400	1	-1
40-50'	365	16	-1
50-60'	305	14	1
60-70'	170	12	1
70-80'	55	15	2
80-90'	80	8	3
90-100'	340 (294)	17 (13)	3 (1.6)
100-110'	390	14	2
------Base of Oxidation-----			
110-120'	965	10	2
120-130'	0.22% (892ppm)	13	1
130-140'	655	6	1
140-150'	715	8	3
--Base of Supergene Enrichment--			
150-160'	270	16	9
160-170'	350	16	6
170-180'	465	15	7
180-190'	380	12	8
190-200'	395	11	4
200-210'	390	14	3
210-220'	345	7	3
220-230'	155	1	1
230-240'	430	1	1
240-250'	375	8	2
250-260'	215	6	1
260-270'	165	1	1
270-280'	380	13	4
280-292'	235	10	3

All values reported in ppm unless otherwise noted.

Figure 5. Summarized rotary drill hole log, BSW-1.

BEAR CREEK MINING CO. SPOKANE OFFICE

Project: BUCKSKIN SOUTHWEST — County: DOUGLAS — State: NEVADA — Drill Hole No. BSW-1 — Page 1 of

Objective: — Bearing: — Dip:

Drilled by: HIMES DRILLING CO. — Started: 4/29/74 — Completed: — Coords: N — E

Scale: 1" = 10' — Logged by: Gary R. Heinemeyer — Collar Elev. 5500' — Total Depth:

35 Item 15

GEOLOGY

290 — Drilled prior to 1974

Notes: ↑ Hole rotary drilled 292' in 1971

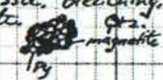
Int. 294' to 440.5' — Est. tot. sulf.: 2%

VOLCANIC BRECCIA (Previously mapped as INTRUSION BRECCIA) with the original texture largely destroyed by alteration. Fragmental aspects are also largely destroyed. Original rock was probably an autobreccia with the fragments being similar in appearance to the matrix. Alteration is so complete that original phenos appear only as 'ghost' images - dark specks of some mafic mineral also are present. Extremely fine grained. ALTERATION - Consists of intense quartz-sericite with zones of chlorite especially around breccia fragments. Some of the breccia fragments appear to be more intensely silicified. Considerable open spaced fracturing exists from 294 to 326 - fractures are filled with a fine siliceous material which is both rodded in places (is not calcareous) - very hard & cherty. MINERALIZATION consists of disseminated and vein associated pyrite (2-4%). Abundant magnetite veinlets and associated w/ qtz. veinlets is also present. Flakes of chalcopyrite are present and assoc. with quartz veinlets. (2ndy biotite present in sparse amounts)?

Est. tot. sulf.: 2.5% (300–310)

← Core badly broken

Est. tot. sulf.: 2.5% (310–320)

318.5' Abundant, barren white quartz veinlets (14 per foot) - very minor assoc. bleaching. Much of the pyrite present is enclosed in a rim of magnetite.  Qtz. veins are perp. to axis of core.

321' - Strong magnetite veining (parallel to axis of core) — Notes: 321' TS

323' - Small (1mm) quartz - magnetite - pyrite - chlorite - chalcopyrite vnlt. Core of vein is composed of red(?) ?unknown mineral?

324 - Strong quartz - magnetite veining with occasional cpy. grains in quartz vnlts. Sparse grains of specularite hematite.

Est. tot. sulf.: 3% (320–330)

329' - 1" wide zone of quartz flooding

329 - 336.5 - Zone of strong secondary biotite - no magnetite

Est. tot. sulf.: 2.5% (330–340)

335 - magnetite present as vnlts and as dissemination - increasing again

332-338 - Good zone showing — Notes: 336' TS

338' 1 inch wide zone showing post mineralization and brecciation

Est. tot. sulf.: 3.5% (340–350)

347' - 6" zone of stockwork pyrite veining

349' - Strong chlorite

351' - Strong magnetite veining

Est. tot. sulf.: 4.0% (350–360)

ANALYSES

Int.	Core Rec.	Cu	Mo	Pb	Zn	Au	Ag	Sample No.
294 to 300	60% / 80%	140	1	30	120	-.1	-1	26201
300 to 310	80%	410	8	40	380	-.1	1	26202
310 to 320	100%	285	6	30	95	-.1	1	26203
320 to 330	100%	890	15	40	200	-.1	2	26204
330 to 340	100%	805	25	30	130	-.1	3	26205
340 to 350	100%	740	17	30	85	-.1	2	26206
350 to 360		.10%	26	20	70	-.1	2	26207

Project: Buckskin SW. Logged by: G. R. Heinemeyer Drill Hole No. BSW-[illegible] Page 2 of [illegible]

DEPTH & SIZE | Graphic Geology | ALTERATION (Silicification, Sericite, Clay, Chlorite, Zeol., Biotite, Qz veining) | MINERALIZATION (Py, Cpy, MoS2, Magnetite) | EST. TOT. SULF. Vol.% | GEOLOGY (Int., Description) | NOTES | CORE REC. | ANALYSES

Depths: 355, 365, 375, 385, 395, 405, 415, 425

Mineralization marks: Tr (approx. 360'), Tr (approx. 376'), Tr (approx. 390'), Tr Tr (approx. 402'), Tr (approx. 420')

Est. Tot. Sulf. Vol.%: 4% (approx. 360'); 3.0% (approx. 372'); 3.0% (approx. 380'); 3.0% (approx. 390'); 3.0% (approx. 400'); 2.5% (approx. 412'); 2.5% (approx. 420'); 2.5% (approx. 428')

GEOLOGY — Description

VOLCANIC BRECCIA & VOLCANIC FLOWS CONT. – Original texture still obscured by alteration.

353-359' – Abundant quartz veining (barren) 6 per foot
359' – 1" wide barren qtz. vein.
351-358' – Zone of strong secondary biotite
363-[redacted] 372' – Zone of very weak alteration – original texture of rock is more clearly visible. Texture is porphyritic aphanitic with most of the feldspar phenos altered to sericite. Rock type is probably a latite porphyry, i.e. most of the drill core previously logged would seem to be a LATITE PORPHYRY with some brecciated zones. Some sparse secondary biotite is also present

372' – Degree of Silicification increases again,

376' – Zone of quartz flooding and 7mm. qtz. vein with fine grains of MoS2
376-378 Core badly broken.

Cpy may be intergrown with fine grained pyrite?

384' – Zone of large secondary biotite blebs.

388' – 1' zone of extremely intense clay sericite alteration with abundant secondary biotite.

396' – Evidence of several stages of quartz veining – one is truncated and another cuts the truncated vlt. Abundant secondary biotite blebs.

402-404' – Possible fragmental intrusive rock in fine grained silicified volcanics. Numerous 1 to 6 mm quartz vnlts with magnetite rims. Also traces of Cpy and MoS2. Blebs of secondary biotite.
A number of the quartz vnlts are truncated and offset by chlorite – pyrite vnlts

407' – Abundant secondary biotite

NOTE: Intrusive appearing zones in the core with abundant secondary biotite are becoming more common. These zones are not necessarily fragment but could be dikelets (alteration obscures identity). Possibly APPROACHING CONTACT of VOLCANIC ROCK WITH INTRUSIVE ROCK.

413-414' – Apparent dikelet of Diorite (?) porphyry

417-421' – Moderate quartz veining – Considerable magnetite assoc. with this veining. Two ages of qtz. veining apparent. Irregular zones of abundant secondary Biotite blebs.

Core badly broken

NOTES

- 357' TS
- 370.5' TS

CORE REC.

100% (approx. 360'); 100% (approx. 373'); 100% (approx. 387'); 100% (approx. 401'); 100% (approx. 415')

ANALYSES

Int.	Cu	Mo	Pb	Zn	Au	Ag	Sample No.
350 to 360	.10%	26	20	70	-.1	2	26207
360 to 370	.11%	23	20	130	-.1	2	26208
370 to 380	.14%	19	30	130	-.1	4	26209
380 to 390	.17%	42	30	195	-.1	6	26210
390 to 400	860	10	20	120	-.1	2	26211
400 to 410	.13%	15	30	150	-.1	3	26212
410 to 420	.16%	10	30	170	-.1	3	26213
420 to 430	.26%	32	40	210	-.1	3	26214

Project: Buckskin Southwest — Logged by: G. R. Heinemeyer — Drill Hole No. BSW-1 — Page 3 of

DEPTH & SIZE	MINERALIZATION	EST. TOT. SULF. Vol.%	GEOLOGY Int.	GEOLOGY Description	NOTES	CORE REC.	ANALYSES Int.	Cu	Mo	Pb	Zn	Au	Ag	Sample No.
430		2.5%		VOLCANIC ROCK CONT. (Altered) - numerous zones of intrusive appearing dikelets - approaching contact. 3 quartz vnlts per foot (barren). Considerable secondary biot. (strong). [VOLCANIC ROCK SO FAR LOGGED COULD REPRESENT CLOSE-TO-SOURCE AGGLOMERATE.] Magnetite assoc. w/ quartz vnlts. Most quartz veins are barren!			430 to 440	.312	29	20	145	-.1	4	26215
440	Tr	0%	440.5' to 693.3'	QUARTZ DIORITE PORPHYRY. 20-25% - white phenocrysts (.25-2mm across) of plagioclase. 10% - phenocrysts of altered (chlorite) hornblende (.5-1.5mm across). 10% - phenocrysts of partially altered biotite (.5-2mm across). 55% - Groundmass which contains considerable quartz and feldspar. ALTERATION - Hornblende phenocrysts are strongly altered to chlorite and the feldspar phenocrysts are weakly altered to clay-sericite. Biotite grains are very weakly sericitized.	440.5' TS		440 to 450	965	3	20	170	-.1	2	26216
450	Tr	Tr.		MINERALIZATION - NONE! 440.5-451' - Interval of alternating contacts between VOLCANICS and QUARTZ DIORITE PORPHYRY. QUARTZ DIORITE PORPHYRY definitely cuts VOLCANICS (i.e. truncates structure and quartz veinlets in volcanics.) HOWEVER VOLCANICS contains abundant fragments of definite intrusive rock. They may represent a pre-volcanic intrusive whose fragments were incorporated in the over-deposited volcanic flows (not intrusive breccia). Then flow cut by Quartz Diorite Porphyry.			450 to 460	90	-1	10	125	-.1	-1	26217
460	Tr; Tr Tr	Tr; Tr		Minor fractures with clay-chlorite filling. 461.5' 3-5mm quartz vein - contains minor pyrite. Moderate disseminated magnetite has become apparent. 469' 1-2mm quartz vnlt. with trace pyrite & trace cpy.			460 to 470	165	4	10	115	-.1	-1	26218
470	Tr Tr; Tr Tr Tr; Tr Tr Tr; Tr Tr	Tr		472.5' - Conspicuous Cpy, Py, quartz vnlt. (1mm wide). Numerous hairline vnlts. with py, Cpy. 474 - Qtz, Cpy vnlt. 476.5 fracture-vein surface with py & Cpy - Also possible secondary K-spar. [Veinlets all perpendicular to the axis of the core!] MINOR EPIDOTE? is associated with most Qtz, cpy, py vnlts.	473.5' TS		470 to 480	50	-1	10	70	-.1	-1	26219
480	Tr Tr Tr	Tr		Weak clay-sericite alteration becomes apparent - Core badly fractured most alteration (clay-sericite) associated with fracturing. 486.5' - 2-4mm open space quartz vnlt. with pyrite and a trace of MoS_2?, Cpy and sphalerite? 488 - 1" wide fault zone.			480 to 490	45	-1	10	90	-.1	-1	26220
490		Tr; .50%; .75%		493' 3-6mm open space quartz vein with weak pyrite. Pyrite replaces occasional mafic mineral adjacent to quartz vnlt.  495-498 - Zone of weak clay-sericite alteration - associated with extensive fracturing. Slight silicification evident in a few zones. Original texture is destroyed partially. Disseminated pyrite is present. Silicification is mostly in the form of quartz flooding adjacent to fractures. Minor brecciation is also present along fractures. Pyrite is disseminated. Clay			490 to 500	70	4	10	115	-.1	-1	26221
500	Tr	Tr		fault gouge with slickensides present. Pyrite mostly [illegible] on the [illegible] of the fault zone.			500 to 510	110	2	10	125	-.1	-1	26222

Project BUCKSKIN SOUTHWEST Logged by G. R. Heinemeyer Drill Hole No. [illegible] Page 4 of

DEPTH & SIZE	EST. TOT. SULF. Vol.%
505	1%
	Tr
515	1%
	1.5%
	1.5%
525	1.5%
	1.0%
535	.5%
	.25%
	.50%
	.50%
545	.25%
	.25%
	.25%
	.50%
	1.0%
	[redacted]
555	2.0%
	1.5%
	.25%
	.25%
565	.25%
	1.0%
	.25%
	1.0%
575	.25%
	.25%
	.25%

ALTERATION: silicif., sericite, clay, qtz veins, chlorite, 2nd Biot, 2nd K-spar — MINERALIZATION: Py, cpy, MoS2, magnetite (Py .25, Tr; cpy .05%, .025%, .50%; Tr entries at 2nd Biot, 2nd K-spar and cpy columns)

GEOLOGY — Description

QUARTZ (?) DIORITE PORPHYRY CONT. (See description Page 3 440.5 feet)

Alteration - consists of weak clay - sericite partially replacing feldspar phenocrysts. Hornblende grains are almost always converted to chlorite. Biotite grains are partially altered to chlorite. Hairline fractures are quite sparse.

508' - 4-8mm [redacted] quartz vein, - 4" zone on each side contains .05 to .1% chalcopyrite!

Core is very slightly bleached - this is the result of an increase in argillic and slight sericite alteration. The rock texture is substantially "blurred"; mafic minerals are altered to to chlorite. magnetite content .25 to 1%. THIS SLIGHT BLEACHING IS ACCOMPANIED [redacted] BY SPOTTY, CONCENTRATED ZONES OF ABUNDANT CHALCOPYRITE (.025 to .05%).

517.5' to 518.5 - Hairline veinlets with chalcopyrite and magnetite. - Rock is moderately silicified. Occasional feldspars are altered to secondary K-feld.

523 - Cpy along veinlt. Intermittent bleaching cont.

524 - 6" interval showing what appears to be a chilled portion of the Qtz. diorite porphyry

528 - Fault zone - 1 foot wide - brecciation and gouge. Abundant pyrite introduced along fault zone. Trace sphalerite?

529 - fine-grained Py & Cpy along fracture

533.5' - Cpy vnlt. - distinctly cutting across feldspar phenocryst - vnlt. about 65° to axis of core. - magnetite assoc. w/ vnlt.

534.5' - Qtz - cpy vnlt. Trace pyrite.

SERICITE ALTERATION SEEMS TO BE ON A SLIGHT INCREASE.

Pyrite present along fractures in strongly broken zones. 538' 2mm qtz. vein.

541' - Hairline Qtz. - cpy vnlt.

543 - 2-4mm Qtz - Cpy vnlt. - very slight silica flooding and bleaching adj. to qtz. vnlt.

544.3' - 1-3mm qtz-py-Cpy vnlt. - bleaching of core. These vnlts. are parallel to axis of core.

549' - Fragment (grey - fine grained) in quartz diorite porphyry. Moderate disseminated cpy.

550' - Fracture lined with cpy.

552' - hairline pyrite vnlt. However nearly pyrite is associated w/ fracturing.

553-558 - Irregular zones of bleaching and introduced silica. This introduced silica has partially destroyed the original texture of the rock. Feldspar phenocrysts are altered to sericite. Considerable pyrite has been introduced with the silica. - Also a trace of Cpy. - Some minor Magnetite destruction

NOTES: ↑ silicif.

555 & 556 - Two 1-2mm. Qtz. - cpy vnlts.

558 - Increase in hairline qtz. - cpy veinlets 2-4 per foot. - Increase in cpy vnlts. seems to be closely assoc. with slightly higher silicification and minor K-feldspar alteration.

559 - Unknown red mineral on fracture

561 - Trace of Epidote w/ cpy.

562 - cpy vnlt. Biotite nearly unaltered.

563 - " " - Hornblende phenos. are oriented in clusters occasionally "mafic clots"

564.5 - Mafic clot - mafic minerals altered to epidote?

566 - Fracture coated with cpy - also minor K-feldspar alteration along fracture.

567-571 - Fractured and Brecciated zone with introduced pyrite.

573'-574.5' - 6-10 qtz vnlts per foot (mostly barren) Considerable quartz flooding is also present. Pyrite has been introduced with silica - Original rock texture is also partially destroyed.

574.5 - LARGE 4mm hornblende crystal showing cross-sectional view

Slight increase in hairline qtz - cpy - magnetite vnlts

576-580 - 3-5 quartz - cpy - magnetite vnlts per foot. Pyrite lining occasional fracture surfaces.

ANALYSES

Int.	Cu	Mo	Pb	Zn	Au	Ag	Sample No.
500 to 510	110	2	10	125	-.1	-1	26222
510 to 520	175	2	30	170	-.1	1	26223
520 to 530	140	-1	60	340	-.1	2	26224
530 to 540	145	3	20	115	-.1	1	26225
540 to 550	120	5	20	160	-.1	-1	26226
550 to 560	285	-1	40	130	-.1	2	26227
560 to 570	240	-1	10	135	-.1	1	26228
570 to 580	455	4	10	140	-.1	2	26229

Project ______ Logged by ______ Drill Hole No. ______ Page ______ of ______

DEPTH & SIZE	EST. TOT. SULF. Vol. %	Alteration / Mineralization
580	.5%	
	.5%	Tr ?
	.25%	
590		
	.50%	Tr, Tr
	.25%	
600	.25%	Tr ?
	.25%	
610	.25%	
	.25%	Tr ?
620	.50%	
	.75%	Tr, Tr
630	.50%	Tr
	.75%	Tr, Tr, Tr
640	.75%	
	.75%	Tr
650	.75%	Tr, Tr

GEOLOGY — Description

CONTINUED

QUARTZ DIORITE PORPHYRY (see description page 3&4) Equivalent to J. B. Hutens Hornblende Granodiorite or Hornblende Quartz latite porphyry.

581.5 – Qtz-cpy-magnetite vnlt.

580-593 – IMPORTANT zone of stockwork (10-25 vnlts per foot) quartz-cpy-magnetite veining. Minor pyrite adjacent to veinlets also. Most of the veinlets are parallel to the axis of the core. *

.4% copper?

591.3 – Conspicuous magnetite vnlt with cpy

593-597 – Zone of decrease in silicif. however increase in sericite & clay – considerable pyrite cpy still present in qtz. vnlts. Bleaching – magnetite destruction. Original text. destruction.

595, 3' Conspicuous [redacted] vnlt. with [redacted] interspersed pyrite and some disseminated pyrite near the vein.

597-601 – 10 to 15 qtz-cpy vnlts per foot – magnetite also on vnlts. Rock again shows original texture. with increased silicif. and weak secondary K-spar

601-621 – 2-20 hairline cpy vnlts per foot – interval could possibly run .2% copper. Occasional pyrite-qtz veinlets but much more several than qtz-cpy vnlts. – magnetite still strong 2-7%. – Some zones are stockwork qtz. veining. Texture of rock is very well preserved. Secondary K-spar is present mostly along fractures & vnlts. *

Occurrences of Cpy-vnlts decreases as does the presence of Silicification and Secondary K-spar. Some quartz veining does remain however. Core becomes more broken and brecciated – sericite and clay content increases. Pyrite to Cpy ratio increases. Texture of rock is 'blurred' in certain zones (625.3)

626 – possible MoS₂ in qtz. veinlt.

626.5 – Qtz-cpy vnlt.

627 – " " "

628 – " " "

In general pyrite is increasing at expense of cpy., many fractures are coated with a combination of chlorite & pyrite.

632 – Qtz.-cpy vnlt – parall to axis of core

633.5'–635.5' Fault-Breccia-Gouge zone, – minor introduced pyrite.

637.5 – Qtz-cpy vnlt. – parallel w/axis of core.

CORE BADLY BROKEN – strong sericite alteration (also clay) only intermittent silicified qtz-cpy zones

642 – Qtz-cpy magnetite vnlt.

643 – " " "

646 – Qtz-cpy vnlt. also pyrite present

Occasional Fault-Breccia-Gouge zones also considerable sericite, Original texture of Qtz diorite is destroyed.

NOTES: -580'-TS

ANALYSES

Int.	Cu	Mo	Pb	Zn	Au	Ag	Sample No.
580 to 590	670	1	20	135	-.1	3	26230
590 to 600	780	1	640	.19%	.1	6	26231
600 to 610	.10%	2	30	215	-.1	3	26232
610 to 620	800	1	20	160	-.1	2	26233
620 to 630	770	13	20	150	.1	2	26234
630 to 640	450	10	20	120	-.1	1	26235
640 to 650	910	8	20	115	-.1	3	26236
650 to 660	420	4	40	170	-.1	5	26237

Project: Buckskin Southwest — Logged by: G. R. Achemeyer — Drill Hole No. BSW-? — Page 6 of

DEPTH & SIZE | Graphic Geology | ALTERATION (Silicif., Sericite, Clay, Qtz Veins, Chlorite, 2nd Biot., 2nd K-spar, Calcite) | MINERALIZATION (Py, Cpy, MoS2, magnetite) | EST. TOT. SULF. Vol.% | GEOLOGY (Int., Description) | NOTES | CORE REC. | ANALYSES

Geology

Depth	Est. Tot. Sulf. Vol.%	Int.	Description
655	.5%		QUARTZ DIORITE PORPHYRY Cont. [J.B. Hulens Hornblende Granodiorite?]
			Core completely altered to sericite
	.25%		658' – Qtz-cpy vnlts.
			659' Qtz-cpy vnlt.
			662-664 Fault-Breccia-Gouge zone – Some introduced pyrite.
	.25%		663 – Core becomes more silicified – weak 2nd K-spar alt.
665			665 – Qtz-cpy vnlts
			666 " " "
	.5%		668 – " " "
			670 – Qtz-pyrite vnlts – Core moderately silicified.
	.5%		673' – Qtz-cpy-py vnlt. parallel to axis of core.
675			675 – Qtz-chlorite vnlt cuts a .5mm barren qtz vein.
	.5%		678.5 – Occasional calcite vnlts.
	.75%		681.5 – Chlorite present on many of the fractures.
685	1%		684' – Silicification decreases drastically – However quartz veins are still persistent (5-15 per foot) Rock becomes completely sericitized.
	.75%		686 Phenocryst outlines are still distinct. Biotite bleached & converted to sericite. Pyrite and minor cpy is introduced along some qtz veins. "INTENSE SERICITE" & most magnetite destroyed → Due to nearness of contact
	1.0%		→ Core very badly broken. Stockwork veining – no or little cpy
	1.5%		
695	2.0%	693.3' to [redacted] 778	HORNBLENDE PORPHYRY? – Could be intrusive or volcanic – most likely volcanic [redacted] ALTERATION consists of intense silicification which has destroyed origional rock texture. Hornblende phenocrysts are completely replaced by chlorite – magnetite and pyrite. In places the rock appears to be a breccia but it is very difficult to be sure. Could be J.B. Hulens HORNBLENDE DACITE PORPHYRY which contained good copper values?
	3.0%		MINERALIZATION – Consists of 3-4% introduced pyrite which is present as disseminations and along vnlts. Some pyrite looks quite yellow – may be cupiferous? Considerable introduced magnetite
	5.0%		COLOR – varies from a med. gray to a med. gray green.
	6.0%		703 → Some faulting & Brecciation.
705	6.0%		
	5.0%		706 – 5-10 qtz-pyrite-(tr.) cpy vnlts per foot
	5.0%		710-715 – Core badly broken – Some sericite & clay gouge –
715	5.0%		5-10 qtz-py vnlts per foot
	6.0%		Core becomes more consolidated
	6.0%		Pyrite is present as disseminations and associated with quartz veinlets. Some of the pyrite is quite "yellow" i.e. there could be some cpy intergrown.
	6.0%		Magnetite veinlets decrease. – Qtz veinlets also decrease slightly
725	6.0%		727' – Fracture with cpy & pyrite

Notes: -696-TS

Mineralization column: Tr noted at intervals throughout; "?" at several intervals below 700.

Analyses

Int.	Cu	Mo	Pb	Zn	Au	Ag	Sample No.
650 to 660	420	4	40	170	-.1	5	26237
660 to 670	570	10	220	585	-.1	3	26238
670 to 680	235	10	10	95	-.1	-1	26239
680 to 690	430	8	20	90	-.1	4	26240
690 to 700	935	28	30	100	-.1	3	26241
700 to 710	990	26	30	105	.7	2	26242
710 to 720	.11%	39	20	135	-.1	2	26243
720 to 730	915	38	20	95	-.1	2	26244

Project BUCKSKIN SOUTHWEST   Logged by G. R. Heinemeyer   Drill Hole No. BSW-1   Page 7 of

Depth & Size	Est. Tot. Sulf. Vol.%	Int.	Geology – Description	Notes
730	6.0% / 6.0% / 6.0%		HORNBLENDE PORPHYRY Cont. Hornblende Diorite Porphyry ?? *Intense silicification has destroyed original texture - mafic minerals (hornblende, biotite?) are replaced with chlorite, magnetite and pyrite. MINERALIZATION consists mostly of pyrite (4-6%) which is present predominantly as disseminations and occasionally as fracture fillings and quartz veins. Occasional magnetite veinlets are also present.	
			739' - 'Ghost' texture visible? - intense silicification - minor sericite. Abundant pyrite vnlts with chlorite envelopes also plain chlorite vnlts.	
740	6.0%		744-747 - 4-10 qtz vns. per foot - increased silicif. & qtz flooding - Trace of secondary K-feld?	
			747.5 - Zone of "EXCEPTIONAL MAGNETITE VEINING" - magnetite veins are nearly parallel and only .25-1 mm apart. They are in turn cut by cyp bearing (only traces) quartz veins.	
750	5.0% / 5.0%		750 to 756 - Fault zone - strong brecciation and core is badly broken. Rock is well bleached and fractures and open spaces have been filled with gouge. Magnetite is destroyed. Chlorite destroyed. Pyrite slightly diminished.	
760	5.0% / 6.0%		763 - Blebs of chlorite start to diminish in favor of an increase in secondary biotite. NOTE - One gets the impression that the blebs of chlorite could have previously been 2ndary biotite? prior to the introduction of silica which added to the intense silicif. just previous to this point. Silica has decreased. Some chlorine could have been added along [redacted] with silicification.	
			768' - MoS_2? along qtz vnlt.	
770	6.0%		Abundant secondary biotite blebs	
			774'-5" wide fault-breccia zone. Slight bleaching of rock approaching diklet	
	.5%	778 to 781	Dike of Qtz. Diorite Porphyry - Intense sericite alteration - minor inclusion of Hornblende porphyry. Moderate disseminated pyrite.	
780	6.0% / 6.0%	781 to 794	HORNBLENDE PORPHYRY CONT. - Probably volcanic	
			783-786 - blebs and envelopes of specular hematite, this mineralization occupys the same occurrence as magnetite and is therefore probably altered magnetite.	
			1-3 qtz vnts per foot.	
790	6.0%		792 - Trace of Cpy in qtz. vnlt. 2-4 qtz vnlts per foot	
	5.0%	794 to 802	Dike of QUARTZ DIORITE PORPHYRY? - distinctly different from interval 778' to 781'. Considerably smaller - but contains more pyrite. Also contains chlorite and is almost entirely unbleached. - looks much like the rock in the bottom of BSW-8. Interval contains abundant inclusions of hornblend porphyry volcanic rock. Some "migmatitic flowage" along contact zone (778)	
800	5.0%		Qtz vnlts 2-8 per foot	801.5'-TS
	6.0%	802 to 819	HORNBLENDE PORPHYRY CONT? - Rock texture completely destroyed - hornblende sites are now chlorite-pyrite blebs.	

Analyses

Int.	Cu	Mo	Pb	Zn	Au	Ag	Sample No.
730 to 740	805	35	20	110	-.1	2	26245
740 to 750	.11%	47	20	140	-.1	2	26246
750 to 760	865	28	30	205	-.1	4	26247
760 to 770	760	26	30	105	-.1	1	26248
770 to 780	530	17	20	50	-.1	2	26249
780 to 790	880	16	20	60	-.1	2	26250
790 to 800	765	26	20	85	-.1	1	26251
800 to 810	900	23	30	95	-.1	2	26252

Project BUCKSKIN SOUTHWEST | Logged by G. R. Heinemeyer | Drill Hole No. BSW-1 | Page 8 of

DEPTH & SIZE	EST. TOT. SULF. Vol.%	Int.	GEOLOGY Description	NOTES
805	6.0%		HORNBLENDE PORPHYRY CONT. - Original rock texture destroyed by silicification. Original hornblende sites are now chlorite-pyrite blebs with some magnetite. Sericite is also abundant	
	5.0%		809.3 - 7mm qtz. vnlt. with spec. hematite. 2-4 qtz vnlts per foot. 810.5 - 8mm barren qtz. vnlt.	
815	5.0%			
	.75%	819 to 821	Quartz Diorite Porphyry - intense sericite alteration	
	5.0%	821 to 834.5	821 to 834.5 • ZONE of INTENSE BRECCIATION - strong clay-sericite alteration. Fragments appear to be the Hornblende Porphyry and in several places the matrix could be the Qtz Diorite porphyry. Pyrite is quite abundant as disseminations	
825	5.0%		Some (1-2 per foot) post-brecciation quartz veins cut the rock.	
	5.0%			
835	5.0%	834.5 to 859	HORNBLENDE PORPHYRY VOLCANIC CONT. - TEXTURE destroyed. 837' - barren qtz. vnlt. with several grains of cpy and a resinous-radiating reddish mineral which appears [redacted] to be Hübnerite (W)	NOTE: MAY RUN FOR (W)
	5.0%		843 - Distinct 'spotted' appearance - the blebs or 'spots' consist of quartz-pyrite set in a matrix of sericite & clay. 844 - Sphalerite & pyrite in brecciated zone.	
845	5.0%		CORE BADLY BROKEN - Considerable bleaching (strong) - 0 to 2 qtz. vnlts/foot. 851' - Beginning of increase in amount of Secondary biotite. - Many instances in which several periods of qtz. veining and faulting are evident. 3-4 qtz. vnlts/foot. Pyrite is present as dissemination and in qtz. vnlts. Little or none of the original texture remains.	
855	5.0%			
	6.5%	859 to 862	859 - 862 - Intensely Brecciated zone - fragments are the Hornblende Porphyry in a matrix of gouge & strong clay-sericite alt. - 5-6% py	
	5.0%	862 to 922.5	HORNBLENDE PORPHYRY VOLCANIC? CONT.: Very indistinct texture. Some evidence of {eutaxitic texture? Distinct increase in chlorite.	
865	5.0%		Rock quite fine grained with little texture evident.	
			873.7' - Abundant qtz-py vnlts (2-4 per foot) which are offset by sericite bearing fractures. Some brecciation.	
875	5.0%		Increase of qtz-chlorite vnlts. Also calcite vnlts	
	5.0%		878 - Rapid increase in secondary biotite. Certain zones have coarser grained appearance.	

ANALYSES

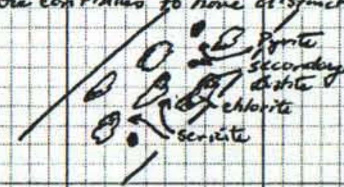
CORE REC.	Int.	Cu	Mo	Pb	Zn	Au	Ag	Sample No.
800 to 810 →		900	23	30	95	-.1	2	26252
	810 to 820	840	16	30	120	-.1	4	26253
	820 to 830	670	17	30	75	-.1	5	26254
	830 to 840	685	10	30	105	-.1	3	26255
	840 to 850	575	13	50	180	-.1	5	26256
	850 to 860	850	10	50	205	-.1	8	26257
	860 to 870	715	20	30	70	-.1	4	26258
	870 to 880	.11%	11	30	100	-.1	5	26259

Project BUCKSKIN SOUTHWEST — Logged by G.R. Heinemeyer — Drill Hole No. BSW-1 — Page 7 of

DEPTH & SIZE	Graphic Geology	ALTERATION (Silicif., Sericite, clay, Qtz. veilts, chlorite, 2nd Biot., 2nd K-spar, Calcite veilts)	MINERALIZATION (Py, cpy, MoS2, magnetite)	EST. TOT. SULF. Vol. %
880			cpy: Tr	5.0%
				5.0%
890				5.0%
				6.0%
900				6.0%
910				6.0%
				6.0%
920				6.0%
				Tr
				6.0%
930				6.0%
				6.0%
940				6.5%
				6.0%
950				6.0%

GEOLOGY

Int.	Description
	HORNBLENDE PORPHYRY – VOLCANIC ROCK? CONT. – To call this rock a hornblende porphyry is somewhat misleading – Texture and recognition of mafic minerals is virtually impossible, – fine grained volcanic
	magnetite veining in irregular zones
886'	– Abundant 2ndary biotite – Relict texture apparently visible but still too altered to define definite phenocryst boundaries. Rock seems to be a medium to fine grained volcanic. 2–6 qtz. veilts per foot – abundant calcite veilts.
888'	Spotted appearance to core. 'Spots' consists of blebs of chlorite – pyrite – magnetite and minor secondary biotite. Also sericite.
888 to 922.5	→ Core continues to have distinct 'spotted' appearance. Spots are blebs of chlorite and secondary brown biotite. The groundmass around these blebs is mostly sericite. Blebs have elongate appearance (relict textury texture?) and are 1–5 mm across. These blebs vary in distance from one another from 2 to 10mm.
	SAME AS ABOVE
903'	– Chlorite, calcite, sericite – pyrite veilts. offset by barren qtz. veilt. Slight increase in pyrite.
	2–5 qtz. veilts per foot
	Same as above
919	– 1 foot zone of brecciation
922.5 to 924	Qtz Diorite Porphyry dikelet – very fresh w/ 2nd Biot. Some sericite in groundmass – feldspars fresh.
924	Core continues to show 'spotted' appearance as in 888 to 922.5 interval above. Strong secondary biotite, sericite and chlorite. Pyrite present as disseminations and in qtz. veilts.
	Irregular zones of secondary biotite
	Some areas where feldspar outlines can be seen – texture is fine to med. grained.
	2–6 quartz veilts per foot. Many are barren some contain pyrite
	Intense secondary biotite.
	Seems to be increase in silicif.
	Specular hematite on fractures. Increase in magnetite – source for hematite?
952	– Specular hematite on fracture



NOTES: -888'-TS

CORE REC.

ANALYSES

Int.	Cu	Mo	Pb	Zn	Au	Ag	Sample No.
880 to 890	905	8	20	90	-.1	1	26260
890 to 900	820	16	20	110	-.1	1	26261
900 to 910	720	13	20	85	-.1	1	26262
910 to 920	.11%	28	30	105	-.1	2	26263
920 to 930	905	15	20	105	-.1	1	26264
930 to 940	570	16	20	115	-.1	1	26265
940 to 950	660	3	20	100	-.1	1	26266
950 to 960	540	15	20	170	-.1	1	26267

Project BUCKSKIN SOUTHWEST   Logged by G.K. Heinemeyer   Drill Hole No. [illegible]   Page [illegible]   of

DEPTH & SIZE	EST. TOT. SULF. Vol.%	Int.	GEOLOGY Description	NOTES
			Cont:	
955	6.0%		NON-DESCRIPT Volcanic Rock (HORNBLENDE PORPHYRY) – Abundant secondary biotite sericite and chlorite. 5-6% pyrite is present in veinlets and disseminated. CORE STILL HAS DEFINATE "DOTTED" APPEARANCE – 'spots' consist of secondary biot. chlorite and occasional pyrite & magnetite. Core moderately magnetic .5-2%	
	5.0%			
965	6.0%		966' – Numerous quartz-chlorite-pyrite veinlets. UNALTERED feldspar phenocrysts are now visible. Abundant secondary biotite in groundmass. Feldspars are .2 to 2 mm across (Average .75 mm)	965.5' TS
			Core quite magnetic in certain irregular zones.	
975	5.0%		974-991 – Badly brecciated and bleached zone – Abundant clay-sericite. Wk. secondary biotite still remains in lower zones.	
	5.0%			
	6.0%			
985	6.0%			
	5.0%		991' – Strong secondary biotite becomes once more apparent.	
			Core badly broken.	
995			Core consists entirely of sericite, chlorite and secondary biotite – pyrite is closely associated with the chlorite. Some secondary biotite seems to be silicified along fractures.	
	5.0%		Decreasing qtz. veinlets.	
	4.5%		Strong fracturing with increasing bleaching of core. Drop in secondary biot. and chlorite. Slight increase in silicif. Pyrite content drops slightly. magnetite also decreases.	
1005	5.0%		Qtz. veinlets decrease in favor of calcite veinlets.	
			1011.8' – Trace of galena in clay-sericite fracture zone. Core very soft.	
1015	5.0%			
	4.5%		Core extremely fractured.	
	5.0%			
1025	2.0%	1027–1028.5	Qtz Diorite Porphyry dike – wk-2nd Biot. Fresh primary biot. & feldspars	
		1028.5–1034	Non-descript volcanics.	

Int.	Cu	Mo	Pb	Zn	Au	Ag	Sample No.
950 to 960	540	15	20	170	-.1	1	26267
960 to 970	580	6	20	125	-.1	1	26268
970 to 980	350	8	70	230	-.1	3	26269
980 to 990	350	16	70	200	-.1	2	26270
990 to 1000	390	13	40	80	-.1	1	26271
1000 to 1010	505	19	30	55	-.1	-1	26272
1010 to 1020	435	13	50	90	-.1	2	26273
1020 to 1034	390	17	30	80	-.1	1	26274

Project BUCKSKIN SOUTHWEST Logged by G. R. Heinemeyer Drill Hole No. BSW-? Page 11 of

GEOLOGY

Depth	Est. Tot. Sulf. Vol.%	Int.	Description
1030	5.0%		HORNBLENDE PORPHYRY VOLCANIC ROCK CONT.
	1.0% / 1.5%	1034 to 1041	Qtz. DIORITE PORPHYRY DIKE – Rock relatively fresh. Some wk. silicif. and wk. chlorite. Abundant magnetite in matrix. Possible trace of 2nd K-feld on fractures. Trace diss-eminated cpy to .1%? PYRITE AND CHALCOPYRITE ARE DISSEMINATE AND ON HAIR-LINE VNLTS THROUGHOUT THE CORE.
1040	1.0% / 5.0% / 5.0%	1041 to	Non distinct volcanic rock (fine grained) cont. (HORNBLENDE PORPHYRY) magnetite occurrences are irregular. 1-2 qtz units (barren or w/ small amounts of pyrite) per foot. CORE BROKEN, BRECCIATED AND FRACTURED
1050	4.5% / 4.5%		Definite increase in silicification. Pyrite is closely associated with chlorite envelopes adjoint to fractures and qtz. units. Core BECOMING VERY HARD AND VERY FINE GRAINED
1060	5.0% / 6.0%		1068 – minor fault zone w/ Breccia...
1070	6.0% / 6.0%		Occasional feldspar pheno. outline can be seen. Pyrite is considerable more fine grained.
1080	6.0% / 6.0%		0-4 qtz. units per foot. SAME AS ABOVE – Very dense med gray volcanic rock – moderate to strong silicif. – chlorite is disseminated throughout core and on fractures. Pyrite is very fine grained
1090	5.0% / 5.0%		Occasional calcite units.
1100	5.0%		

NOTES: 1083.5 – TS

ANALYSES

Int.	Cu	Mo	Pb	Zn	Au	Ag	Sample No.
1020 to 1034	390	17	30	80	-.1	1	26274
1034 to 1041	590	15	20	70	-.1	-1	26275
1041 to 1050	360	16	40	90	-.1	1	26276
1050 to 1060	670	29	40	95	-.1	2	26277
1060 to 1070	870	29	20	45	-.1	2	26278
1070 to 1080	420	11	20	45	-.1	-1	26279
1080 to 1090	485	17	20	50	-.1	-1	26280
1090 to 1100	645	25	80	45	-.1	-1	26281
1100 to 1110	490 / 465	16 / 29	20 / 30	35 / 50	-.1 / -.1	-1 / -1	26282

Project BUCKSKIN SOUTHWEST — Logged by G.R. Heinemeyer — Drill Hole No. BSW-1 — Page 72 of

DEPTH & SIZE	EST. TOT. SULF. Vol.%
1105	4.5%
	5.0%
1115	5.0%
	5.0%
1125	4.0%
	5.0%
1135	5.0%
	5.0%
1145	5.0%
	5.0%
1155	5.0%
	5.0%
1165	5.0%
	5.0%
1175	5.0%

Alteration (columns: silicic, sericite, clay, chlorite, 2nd biot., K-spar, gypsum): Tr near 1118
Mineralization (columns: Py, Cpy, MoS2, magnetite): Cpy Tr at 1121', Cpy Tr at 1145'

GEOLOGY — Description

NON-DESCRIPT VOLCANIC ROCK – (Previously called Hornblende Porphyry)
Original texture mostly destroyed by alteration. Only faint outlines of feldspar and mafic minerals outlines can be seen. Occasional eutaxitic textures can be seen.
Alteration 60% sericite — mineralization 4-5% pyrite
30% chlorite — trace chalcopyrite (occasionally)
10% silicif. — Rock color – med. grey.

minor qtz.-calcite veining is present.
Irregular zones display better relict textures.

*NOTE – Many of the "calcite" units are probably "anhydrite" units ← Gypsum * (Gypsum *)

1121' – fracture with trace of cpy (paint)
Abundant calcite units 2-6/foot — [PYRITE OCCURRENCES CLOSELY ASSOCIATED WITH CHLORITE OCCURRENCES ← *

1129-1132' – Zone of Faulting – brecciation and clay gouge – visible anhydrite or gypsum?
1133' – Rock has "spotted" appearance – Probably preference of diff. alteration types to attack diff. minerals in original rock.
1134' – 1-4 mm wide gypsum units
Slight increase in bleaching (corresponds to increase in sericite?)

magnetite where present is situated along veinlets and fractures and not disseminated.

1145' – Trace cpy along units (also associated (earthy) specular hematite) – 6-15 hairline qtz units per foot.
1147' – Zones of specular and earthy hematite along fractures.
Slight increase in silicification

most of the rock fractures are lined or coated with gypsum

1159' – Irregular masses of Gypsum

Pyrite is mostly present as very fine grained dissemination.

1169' – 10-15 mm. wide gypsum units.
1170' – "Ghost" eutaxitic textures?

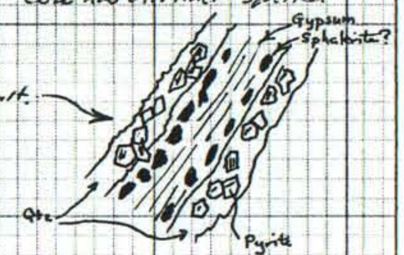
NOTES: –1172.6' TD

ANALYSES

CORE REC.	Int.	Cu	Mo	Pb	Zn	Au	Ag	Sample No.
1100 To	1100 To 1110	490 / 465	16 / 29	20 / 30	35 / 50	-.1 / -.1	-1 / -1	26282
	1110 To 1120	410	11	20	60	-.1	-1	26283
	1120 To 1130	630	19	40	80	-.1	-1	26284
	1130 To 1140	.16%	26	20	50	-.1	1	26285
	1140 To 1150	310	29	10	20	-.1	-1	26286
	1150 to 1160	.14%	41	50	60	-.1	2	26287
	1160 to 1170	510	29	20	30	-.1	1	26288
	1170 to 1180	395	26	10	25	-.1	-1	26289

Project BUCKSKIN SOUTHWEST Logged by Gary R. Heinemeyer Drill Hole No. BSW-1 Page 13 of

Depth & Size	Est. Tot. Sulf. Vol. %	Mineralization	Geology – Description	Notes	Int.	Cu	Mo	Pb	Zn	Au	Ag	Sample No.
1180	6.0% / 6.0%	Tr	NON-DESCRIPT VOLCANIC ROCK CONT. (Formally Hornblende Porphyry) - med to lt. gray in color Alteration - 40% sericite, 30% chlorite, 25% silicif - very spotty, 5% gypsum Mineralization 4-5% pyrite, Trace MoS_2, Sphalerite 1195' Trace of MoS_2 assoc. w/ gypsum vnlt.		1180 to 1190	335	19	20	25	-.1	-1	26290
1190	5.0% / 5.0%	Tr	Numerous hairline gypsum vnlts. (2-15 per foot) 1199 to 1201' - Zone of abundant secondary biotite - core has distinct spotted appearance.		1190 to 1200	500	28	20	45	-.1	1	26291
1200	3.0% / 3.0% / 3.0%	Tr	1204' - 15mm wide qtz, pyrite, gypsum, sphalerite vnlt. 1205' - fracture lined with gypsum and clay - has appearance of slickensides. Sharp decrease in pyrite content - where pyrite does occur it is associated with blebs of secondary biotite. Good example (1213') Rock lt. gray in color.		1200 to 1210	350	20	50	185	-.1	2	26292
1210	2.0% / 3.0% / 4.0%	Tr	Rock color lt gray to tan. Pyrite picks up again		1210 to 1220	170	23	20	60	-.1	-1	26293
1220	4.0% / 4.0%	Tr	Zones of stockwork gypsum veining!! Original rock texture completely destroyed.		1220 to 1230	205	25	10	45	-.1	-1	26294
1230	4.0% / 4.0%	Tr	1231' - 2mm pyrite vnlt. Slight increase in silicif.		1230 to 1240	130	20	20	35	-.1	-1	26295
1240	4.0% / 4.0%	Tr / Tr	1242' - cpy & pyrite in qtz vnlt. - Minor hematite associated with the mineralization. Trace MoS_2 1246.5 - 1249 - Zone of mod. to strong (30-60%) secondary biotite - in certain portions core has "spotted" appearance - secondary biot. forms "spots". 2-7 gypsum vnlts per foot (up to 1/2" wide) some gypsum vnlts have pyrite envelopes.		1240 to 1250	375	10	20	55	-.1	-1	26296
1250	4.0%	Tr Tr	1254 - Trace MoS_2 - cpy - py - along qtz vnlt.	1254 TS	1250 to 1260	335	41	40	75	-.1	-1	26297



Project BUCKSKIN SOUTHWEST Logged by G.R. Heinemeyer Drill Hole No. BSW-1 Page 14 of

DEPTH & SIZE	EST. TOT. SULF. Vol.%	Mineralization notes
1255	4.5%	
	4.5%	
1265	4.0%	Tr Tr
	4.0%	
1275	4.5%	
	5.0%	Tr ?
1285	5.0%	Tr
	5.0%	
1295	5.0%	Tr
	5.0%	
1305	5.0%	
	5.0%	
1315		

GEOLOGY — Description

NON-DISTINGUISHABLE VOLCANIC ROCK (Formerly Hornblende Porphyry) Some areas of fairly distinct texture. Porphyritic aphanitic med to lt. gray in color (qtz. latite porphyry)
ALTERATION 60% silicification, 35% sericite. MINERALIZATION 4-5% pyrite.

*NOTE: Increase in silicif.

1263': Rock very broken - minor brecciation and fault gouge.

1267' - Trace MoS_2 - Cpy on qtz-py vnlt.

Gypsum veining does persist but veining has decrease somewhat, Phenocrysts of original texture barely visible.

1286 - Possible trace cpy in Qtz. vnlt.

1291' - Small blebs of hematite after magnetite

1295' - Qtz veinlet with extremely strong MoS_2 also trace cpy

Silicification seems to be holding and increasing slightly

1311' - Qtz vnlt. with extremely fine grained MoS_2 Coating qtz vnlt, Also trace cpy.

ANALYSES

Int.	Cu	Mo	Pb	Zn	Au	Ag	Sample No.
1250 to 1260	335	41	40	75	-.1	-1	26297
1260 to 1270	285	16	30	95	-.1	2	26298
1270 to 1280	510	20	20	60	-.1	-1	26299
1280 to 1290	335	22	20	50	-.1	-1	26300
1290 to 1300	340	25	20	50	-.1	-1	26301
1300 to 1313	280	26	20	45	-.1	-1	26302

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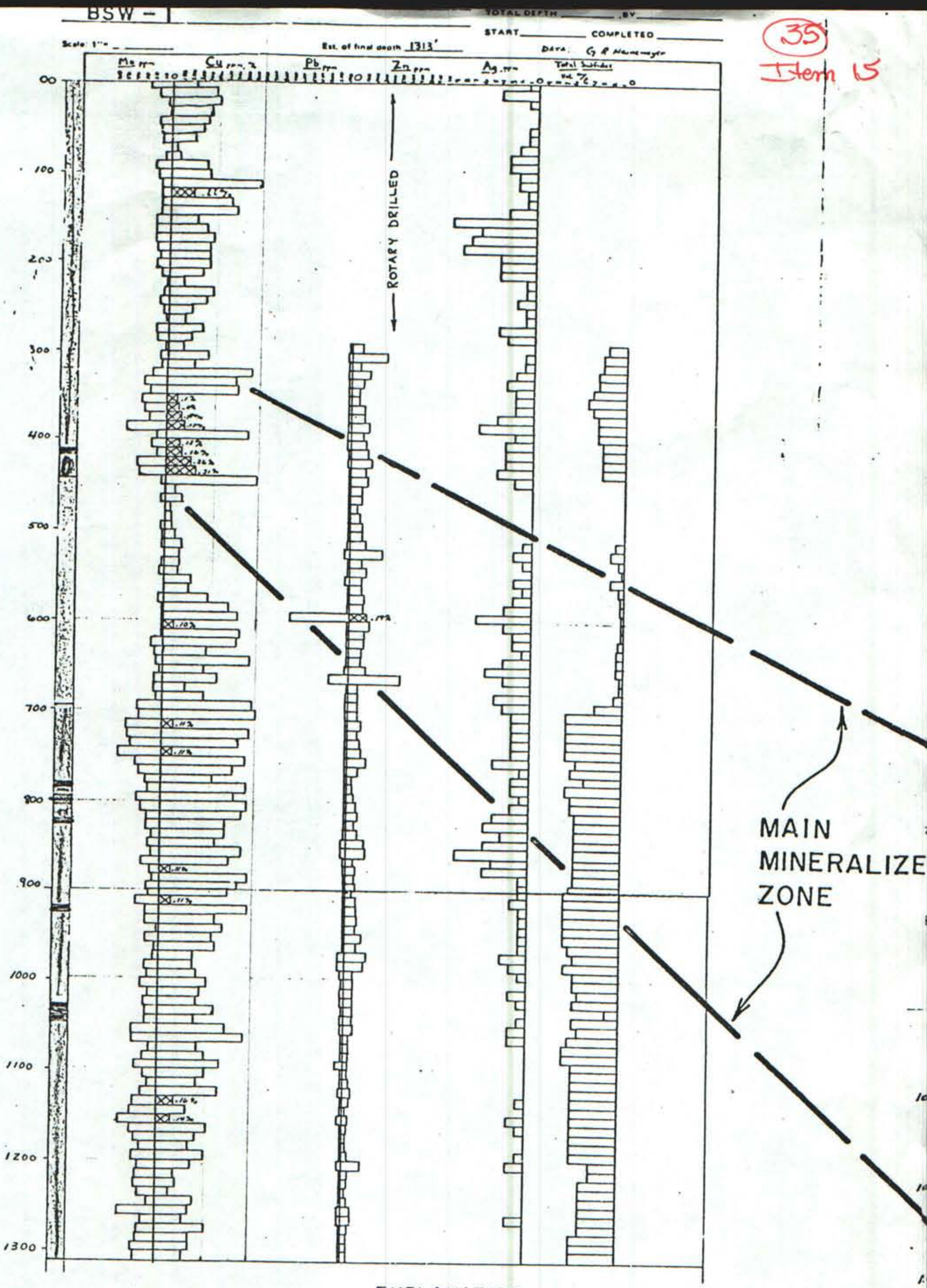
Item 15



EXPLANATION

- **Qal** Alluvium
- **Qoal** Older Alluvium
- **Ts** Semi-consolidated tuffaceous sedimentary rocks
- **Trt** Rhyolitic ash-flow tuff
- **Tqlp** Biotite, Hornblende, Quartz latite porphyry flows
- **Kdp₁ / Kdp₂** Hornblende biotite Dacite porphyry (Kdp_1 – syn-mineral) (Kdp_2 – post-mineral)
- Quartz – Feldspar porphyry (Intrusive) (Indeterminate original composition)
- **Kgrd** Hornblende granodiorite
- Intermediate Metavolcanic Rocks (Predominantly flow breccias) (Including metaquartzites)

BEAR CREEK MINING CO
NORTHWEST DISTRICT
SCALE: 0 75 150

SCALE 1" = 20'
START
REMARKS

LOGGED BY [illegible]
COMPLETION 1972
Quick Log, 1976

COORDINATES
DRILLER

LOCATION
BEARING

DIP

PROJECT
ELEVATION

DRILL HOLE # BSW 1
TOTAL DEPTH 1313
INTERVAL 294 to 430

(35) Item 15

Depth	LITH.	GEOLOGY — Rock Type, Alteration, Mineralization, Structure	ALTERATION — PERVASIVE (Ser, Chl, ...)
290		294 - 364 Mv + Mvb undif. fine grained volcanics w- 2-5% dissem py (vfg) - light grey color Alt - chl - occas ser some qtz veining - uncommon - 319 - some brown hot spgs deposits ?	M
300	Mvu		
10			
20			
30			
40	Mvu		
50			
60		369 - 373± FPA (MV?) possible contact at 369 - but can't see it at ~373 where it apparently grades back into Mv or Mva. Resembles FPA in XSW 7 but not certain / perhaps it is a cooling unit	W?
70	FPA?		
80	MVu	373 - 430 Mv as before	
90			
400	MV	foliation ~35-40°	
10			M
20			M
30			M

ASSAYS

VEIN

Page 2 of

SCALE	LOGGED BY	COORDINATES	LOCATION
START	COMPLETION	DRILLER	BEARING
REMARKS			

PROJECT · DIP · ELEVATION

DRILL HOLE # BSW 1
TOTAL DEPTH
INTERVAL 430 to 570

ASSAYS — % Py: ½% (430–470)

LITH.: Mvu; Fbhp; mvu; 10° ctc; Fbhp; Fbhp (500–540)

GEOLOGY
Rock Type, Alteration, Mineralization, Structure

430-440 Mvu as before py-cpy veinlets 438 - hem. also

440-441 BLP as described below
441-443 Mvu as above
443-570 Blp(H) - Biotite Latite Porphyry (half way between Blp of BSW 7 & Pbl of BSW 7)
ctc ~10° to CA.
Bio 1-2½ mm - 3-5%
FSP 15-25% 1-7MM possibly some small hb? << 1mm rare qtz phenos
Alt - weakly sericitized plag - mostly fresh looking
scattered chl after biot
Min - <½% py + no qtz veins - py all on fractures.
476 & 482 - another phase of the porphyry or possibly late pre-crystalline movement in the xtal mush - anyway ½ to 1" zones of lighter porphyry cut across foliation
444 - dominant foliation ~35° & mush zone 20° to CA in opposite sense.

cpy veinlets w/ K spar (~475)
some hb present - up to ½" (~480)

ALTERATION — PERVASIVE: Ser / Chl / Arg; VEIN: clay
- 430–440: Chl M; clay ✓
- 443–570: Ser W, Chl W
- ~555: Arg W

SCALE ______ LOGGED BY ______ COORDINATES ______ LOCATION ______ PROJECT ______ DRILL HOLE # BSW 1

START ______ COMPLETION ______ DRILLER ______ BEARING ______ DIP ______ ELEVATION ______ TOTAL DEPTH ______

REMARKS ______ INTERVAL 570 to 710

Py	ASSAYS	Depth	LITH.	GEOLOGY: Rock Type, Alteration, Mineralization, Structure	ALTERATION – PERVASIVE (K, Chlorite, Silica)	VEINS (Q, K, Cal)
		570		BIP 570-693 as before but more Qtz veining → strong stockwork 584-590		
				Qtz - cpy - py + mag veins - mag in center -		Tr
1/2		580		Alt – thin pink selvages - possibly Kspar. Some chl selvages along fractures		
				Structure: numerous micro faults - offset 1/4 to 1" of Qtz etc veins. Faults dip 20-35° to CA.		1-3/ft
				foliation 50-60° [illegible] - 590		W Tr
		590		possible fault 614-620		Tr
1-2%					S	W 2-3/ft
		600				1-2/ft
		610				
		620		Texture becomes slightly finergrained - more biot + fewer feldspars	M, S	
		630			W	
		640		Very few Qtz veins	M, S	
1/2		650			M-W, S, S	
		660			W, S	
		670				
		680			M?, M-S	
				684-693	M, M, S	
2-3		690		Nearly pure sericite - rock loses texture almost completely. vfg dissem py - 2-3%	VVS, Sericite, VVS, W	
3-5		700	MV	silicified – 693-710 MV - vfg silicified volcanics - py - vfg diss. 3-5%	M, Silica	

SCALE ______ LOGGED BY ______ COORDINATES ______ LOCATION ______ PROJECT ______

START ______ COMPLETION ______ DRILLER ______ BEARING ______ DIP ______ ELEVATION ______

REMARKS

DRILL HOLE # BSW1

TOTAL DEPTH ______

INTERVAL 710 to 851

ASSAYS	LITH.	GEOLOGY — Rock Type, Alteration, Mineralization, Structure	ALTERATION — PERVASIVE (Ser, Chl, Arg, Sil) / VEIN (Q, Cal)
	MV	**710-778** MV greenish grey vfg. Qtz veins more common 3-4/foot up to 7mm wide Stringy throughout volcanics except in sericitized + silicified zones.	Chl W; Sil M
			Ser W, S, M (750)
	Blp	**778-780.5** Blp (?) Strongly sericitized + bleached - can't see contacts - rock broken & filled w/ vuggy calcite on bottom side - so probably faulted in. MV is sericitized also on either side	M, S, S, S
	MV	**780.5-819** MV as below (797 - fol ~ 35°)	M, W
	Blp	795-6" Blp dike) c/c 35°	
	Blp	799 - " " " w/ inclusions of MV	
	Blp	801-802 " " dark green - same chl as veins	
	MV	814 - steep 60° fault? - displaces MV against a felsic intrusive-looking rock - not intrusive because veins of different orientation on either side end abruptly at fault which is filled by 1/8" Qtz veinlet. no gouging or clay. 816 other side of fault	M
	Blp?	**819-821?** Blp dike altered strongly-ser w/ some superimposed silica-sericite along a Qtz-cal vein.	M, S, VS
	Bxa	**821-827±** Bxa or fault Bxa - too altered to discern	
	MVB?	**827-834** BXA - volcanic matrix - subvolcanic intrusion? or fault bxa? can't tell. could even be a flow bxa.	VS
	MV	**834-846** f.g. slightly porphyritic bleached andesite? - appears to be the matrix for the bxa above. resembles a finer grained FPA.	S
	MVA?	**846-851** - Bxa - open space - filled w/ vuggy calcite + dolomite?	S

Left margin notes (assay column): Py 3; 3; 2-3; 2½; 2-3; 2-3; 2-3

Depth marks: 710, 20, 30, 40, 750, 60, 70, 80, 90, 800, 10, 20, 30, 40, 50

SCALE ______ LOGGED BY ______ COORDINATES ______ LOCATION ______ PROJECT ______ DRILL HOLE # RSW 1
START ______ COMPLETION ______ DRILLER ______ BEARING ______ DIP ______ ELEVATION ______ TOTAL DEPTH 1313
REMARKS INTERVAL 851 to 990

ASSAYS	Depth	LITH.	GEOLOGY Rock Type, Alteration, Mineralization, Structure	ALTERATION PERVASIVE (Ser / chl / Arg / Sil)	VEIN (Q / chl)	
4	851'	FPA	852-857 - FPA? dike?			
			853-881' MVb+MV volcanic bxa - mottled streaked w/ high sulfides - 4-6% and MV - foliated or flow banded	S	W 1-2/foot	
	60					860
2-3				S		
	70			S		
				M		
	80		881-974 F.P.A. veined & chloritized - reddish brown near top to greenish black in rest. strong mag.			880
		FPA				
	90					
	900					900
	10					
	20					20
	30		930 - 1/4 to 3/4 vuggy Qtz-py-cpy-mag-chl veins. 35°			
	40	TS - see Biot				40
3-4	950					950
	60					
2-3			973 - fossil-like object in FPA			
	70		974-990 Mvb w/fpa matrix? Perhaps FPA is just a porphyritic andesite in the MV sequence. (except for a dike or sill face + there) Looks more like a flow bxa to me than an intrusive bxa but I could be wrong.			70
3-4		MvL		S		
	80					
	90			M		

SCALE ______ LOGGED BY ______ COORDINATES ______ LOCATION ______ PROJECT ______ DRILL HOLE # BSW1

START ______ COMPLETION ______ DRILLER ______ BEARING ______ DIP ______ ELEVATION ______ TOTAL DEPTH 1313

REMARKS ______ INTERVAL 990 to 1130

ASSAYS	LITH.	GEOLOGY Rock Type, Alteration, Mineralization, Structure	ALTERATION PERVASIVE Ser / Chl / Arg / Sil	VEIN Cal / gyp
1-2	990	990 - 1027 MVb (FPA matrix??) as before Ser, Elongated frags = 35° dip	S	
	1000		S	
	10 MVB		S	
	20			
	35° BLP	1027-1028 BLP dike hem on fracts sericite mod to strong	S	
	30 MVB	1028-1034 Mvb as before	S	
1%	BLP	1034-1042 BLP - sericitized can't see etc.	M S	
	40 fault broken & slicks	1042-1055 faulted - sericitized - argillized		
	50			
3-4	60 MVB silicified	1055-1089 Mvb silicified & sericitized	M	
	70			
	80		Tr	
	MVb BLP(?)	1089.5-1090 - BLPq - strongly chloritized - fuzzy gm - silicified? - some Qtz & remnants of fine bnt resembles Blp but I don't think it is.		W
	90	1091-1091.6 - " as above		
2-3	MV	1091-1100 MVb as before some steep gyp veins		
	1100 FPA	1100-1114 FPA as before	M	W 1100
	10	1114-1130 Mvb as before	M	M
	20		M	M - ie 1-4/ft steep
	30			

SCALE ________ LOGGED BY ______ COORDINATES ________ LOCATION ________ PROJECT ________ DRILL HOLE # BSW1

START ________ COMPLETION ________ DRILLER ________ BEARING ________ DIP ________ ELEVATION ________ TOTAL DEPTH ________

REMARKS ________ INTERVAL 1130 to 1270

Depth	LITH.	GEOLOGY — Rock Type, Alteration, Mineralization, Structure	ALTERATION — PERVASIVE (Ser / Chl / Arg / Sil)	VEIN
1130		1130 - 1185±		
		Mvb as before - more gyp - light grey color - Ser? or Sil-Ser	Ser: M W; Sil: W	
40				
1150				
60				
70				
80		1185 - 1206 - MVa or FPa - fine grained volcanic		
90				
1200				
	MV or FPA?	1206± - FPA or possibly MV - gradational etc		
10		some foliation - 35° Strong gyp		
		some MVb mixed in as at 1261		
		Alt - ? bleached - no mag - some ser + occasional silica-pervasive		
20				
30				
40				
1250				
60		fault 1260-1261 gouge		
70				

Left margin (Py): 2-3, 2, 3

SCALE ____ LOGGED BY ____ COORDINATES ____ LOCATION ____ PROJECT ____

START ____ COMPLETION ____ DRILLER ____ BEARING ____ DIP ____ ELEVATION ____

REMARKS

DRILL HOLE # BSW1

TOTAL DEPTH 1313

INTERVAL 1270 to 1313

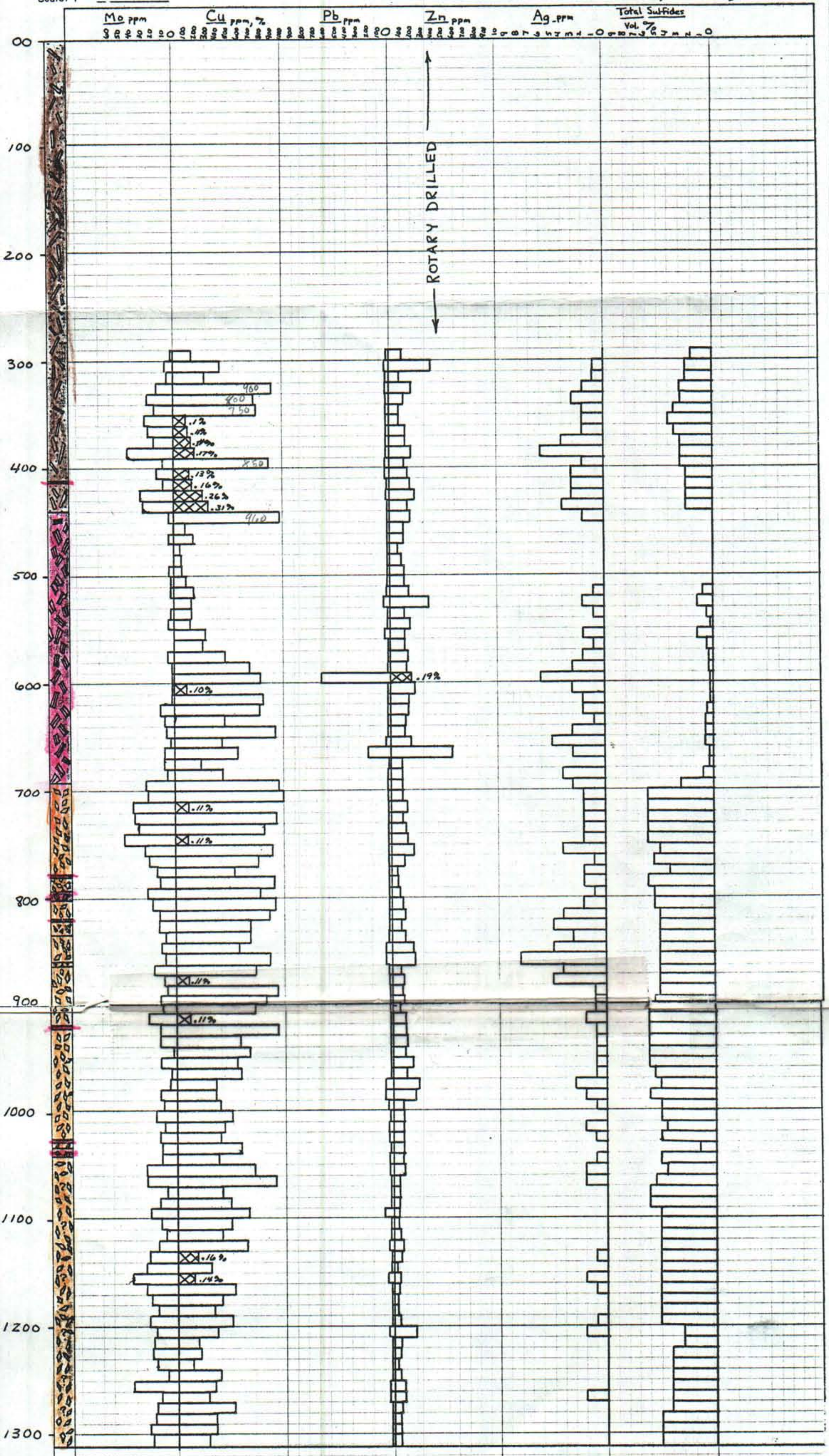
ASSAYS		LITH.	GEOLOGY Rock Type, Alteration, Mineralization, Structure	ALTERATION PERVASIVE	VEIN
	1270		1270-1302 MV & MVb — as before		
	80				
	90				
	1300		1302 – 1313 FPA? or MV		
			Feels like we've gone thru a sequence of flows & flow bxas stacked on top of one another w/ the occasional sill & dike (of much younger age.)		
	10	— moly	FPA is prob a coarser grained volcanic that may also sill out.		
			Gyp has increased steadily & is strongest at bottom of hole.		
			Only moly found is at bottom of hole on a qtz-moly hairline fracture.		
			If this hole was ever to be interesting it would have to be deepened drastically. We are too high in the system. (and probably off target to boot.)		
			ἰmo		

NORTHWEST DISTRICT
Summary Drill Hole Log

Name BUCKSKIN SOUTHWEST
Code 005-01-0411
DOUGLAS CO., NEV.

DRILL HOLE NO. BSW-1 PAGE ___ OF ___ (35) Item 15
BEARING ___ DIP 90°
LOCATION: N. ___ E. ___
COLLAR ELEV. ≈ 5560'
TOTAL DEPTH ___ , BY ___
START ___ COMPLETED ___

Scale: 1" = ___
Est. of final depth 1313'
DATA: G. R. Heinemeyer



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BSW #1

0-10' Qtz.-ser rock:

0.7-1% diss. dk. gray, partially metallic(?) mineral irreg. grains < 0.5 mm. dia. — streak mostly dk. grayish-red, but some relict gray metallic areas — ~~[illegible]~~ may be almost completely oxidized cc (—hem. w/ tiny cc. relicts)
minor turquoise and/or variscite

minor kaol. in body of rx; montmorillonite along fracs.
minor — ~0.5% pitch goethite along fracs; dk. reddish-brown to black — often reniform incrustations.

→ 2-5% casts, most < 0.5 mm. in dia. — most irreg. some partially filled w/ bright yellowish brn jarosite (jar. often ~~[illegible]~~ translucent.

10-20' ~45-55% of sample is translucent lt. bluish-gray kaolinite w/ ~5% diss. irreg. grains — ~~[illegible]~~ dark (slt.) bluish-gray metallic mineral same as above — exc. more of the grains appear to be relict cc. — rest of sample same as above.

20-30' clay-ser rx. w/ minor qtz. — minor pitch limonite (same as 0-10' [prob < 0.5%]; dk. gray (reddish) metallic mineral decreasing (prob. to ~0.5-0.7%) → prob. new addition is clay-ser. rx w/ 2-5% sulf. casts, partially filled w/ jar. (same as 0-10')

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BSW #1

30-40' – new appearance – clayrock, lt.-med. gray – traces of reddish-brown – poss. a few relict feldspar phenocrysts – rock is probably altered rhyodacite intrusive bx. ; ~0.5% pitch limonite along fracs. – (same as 0-10'); < 0.5% metallic gray mineral (same as 0-10')

40-50' – same as 30-40', exc. ~1-1.5% bluish-gray metallic mineral; irreg. grains up to 1 mm. in dia. – no hem ; rest is comprised of frags – of 10-40'

50-60' – qtz-ser. rx. w/minor clay – 3-5% sulf. casts – same as 0-10' – < 0.3% metallic gray mineral (same as 0-10') rest of sample – frags – 10-50')

60-70' same as 50-60' exc. only tr. of met. reddish-gray mineral prob. ser. > qtz.

70-80' same as 60-70', exc. 2-3% sulfide (casts) & a few tiny qtz veinlets < 0.5 mm. in dia.

80-90'; same as 70-80' - exc. only tr. cc(?)
tr. qtz. veinlets (same as 70-80')

90-100': same as 80-90', exc. 5-7% sulfide casts - most
partially filled w/ jarosite[+] - but puts ~ 0.5%
slightly hematitic; ** perhaps limonite
becoming slightly more goethitic (up to 25% G)

100-110' same as 90-100' except a few chips w/ 5% sulf. casts
up to 1.5% dk. gray metallic (same distribution as
jar. sulf. casts)

110-120' appearance of ~4% py, 0.5-0.7% cc(?)
some chunks w/ up to 3% dk. gray metallic

120-130' (appears) mottled (dk. blackish-gray to greenish to gray & lt. gray) clay-(qtz?)-chlorite rock w/ 2-3% diss.
anh.-subh. py, 0.5-0.7% py along tiny fractures
[illegible] dist.) ~0.5% diss dk. gray (maybe) metallic minrl. ? (covellite?)
pares easily w/ knife

130-140' same as above

140-150' same as 120-130'

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small & a few chips w/

150-160' clay-(ser.?)-qtz. rock w/ ~ 5% py, 0.3-0.5% cc(?) anyway dk. sly. coppish-to bluish gray metallic diss. ~~? clots up to 1.5 mm. dia.

160-170' same as above exc. uniform ~ 0.5% cc(?)

170-180' same as above exc. 1 clot cpy ~ 0.5 mm. dia. (anhedral). & prob. 0.5-0.7% cc(?)

180-190' same as above

190-200' same above except a few pc. clay-qtz. chlor. rock – a few chips of dk. gray metallic mineral w/ reddish streak

200-210'. same as above, except < 0.3% metallic mineral

RECONNAISSANCE GEOLOGY OF THE BUCKSKIN RANGE, NEVADA

Donald M. Hudson
December, 1977

35
Item 15

RECONNAISSANCE GEOLOGY

OF THE

BUCKSKIN RANGE, NEVADA

Donald M. Hudson
Continental Oil Company
Minerals Department
Reno District
December, 1977

Figure 1. Looking generally northwest at several low angle Basin and Range faults in the southern Buckskin Range. Note that the attitude of the of the faults vary from east dipping to west dipping. Explanation of symbols is given on plate 1.

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LIST OF ILLUSTRATIONS

SUMMARY

Approximately 18,000 feet of stratigraphic section is exposed in the Buckskin Range in west-central Nevada. Metavolcanic rocks, carbonates, and clastic sediments of the Upper Triassic Oreana Peak Formation and carbonates and sediments of the Lower Jurassic Gardnerville Formation are overthrust by andesitic metavolcanic rocks of the Lower Jurassic Artesia Sequence and dacitic to quartz latitic metavolcanic rocks of the Lower Jurassic to Lower Cretaceous Churchill Canyon Sequence. The Lower Mesozoic rocks are intruded by Jurassic granodiorite and quartz monzonite.

Oligocene ash-flow tuffs of the Guild Mine Tuff, Weed Heights, Singatse Tuff, Nine Hill Tuff, and Eureka Canyon Tuff unconformably overlie the Mesozoic rocks. Miocene andesites, Plio-Pleistocene lake sediments, and Quarternary alluvium unconformably overlie the ash-flow tuffs. Numerous varieties of Miocene andesitic to dacitic dikes and stocks intrude the older rocks of the Buckskin Range.

Gently dipping Basin and Range faults which underlie steeply westward dipping Tertiary ash-flow tuffs and Mesozoic metavolcanic rocks, were originally steeply dipping normal faults. The strata were probably tilted westward by the low angle faults and/or by later steeply dipping normal faults.

Most of the rocks in the Buckskin Range were hydrothermally altered to propylitic, sericitic, and aluminophyllic alteration facies by Miocene alteration events and to a lesser extent by Mesozoic alteration events.

INTRODUCTION

Location:

The Buckskin Range is in Douglas and Lyon Counties in west central Nevada, approximately 90 road miles southeast of Reno and 10 miles west of Yerington. The Buckskin Range lies between the Pine Nut Range to the west and the Singatse Range to the east, in Townships 13 and 14 north, Ranges 23 and 24 east (Figure 2). Dirt roads, which are periodically graded, ring the range and a paved road approaches the range at the Minnesota Mine from U.S. 95 to the east. Very few roads penetrate the range. The climate is arid with very few trees and mostly low brush. The range has relatively low relief with a maximum elevation of 6,915 feet.

History and Previous Work

According to some reports the Buckskin district was discovered in 1904 by a prospector who found gold in veins on or near the present "Red Top" patented claims. The mine proved to be unsuccessful. Pyrophyllite was explored at the Blue Danube Mine, but was impure and was not mined. Iron ore was mined from the Minnesota open pit mine from 1944 to 1966 and produced nearly $17,000,000.

Exxon, Anaconda, Bear Creek Mining Co., Phelps Dodge, and Conoco have drilled the southern and eastern portions of the range (drill hole locations shown on Plate 3). Anaconda currently holds unpatented claims on most of the southern and eastern Buckskins. Conoco holds claims in the south central Buckskins. There are several small blocks of unpatented claims held by prospectors in the northern Buckskins.

Published geologic mapping was done by Moore (1969) and Proffett (1977) and there is an unpublished thesis by Castor (1972). Bear Creek Mining Co.

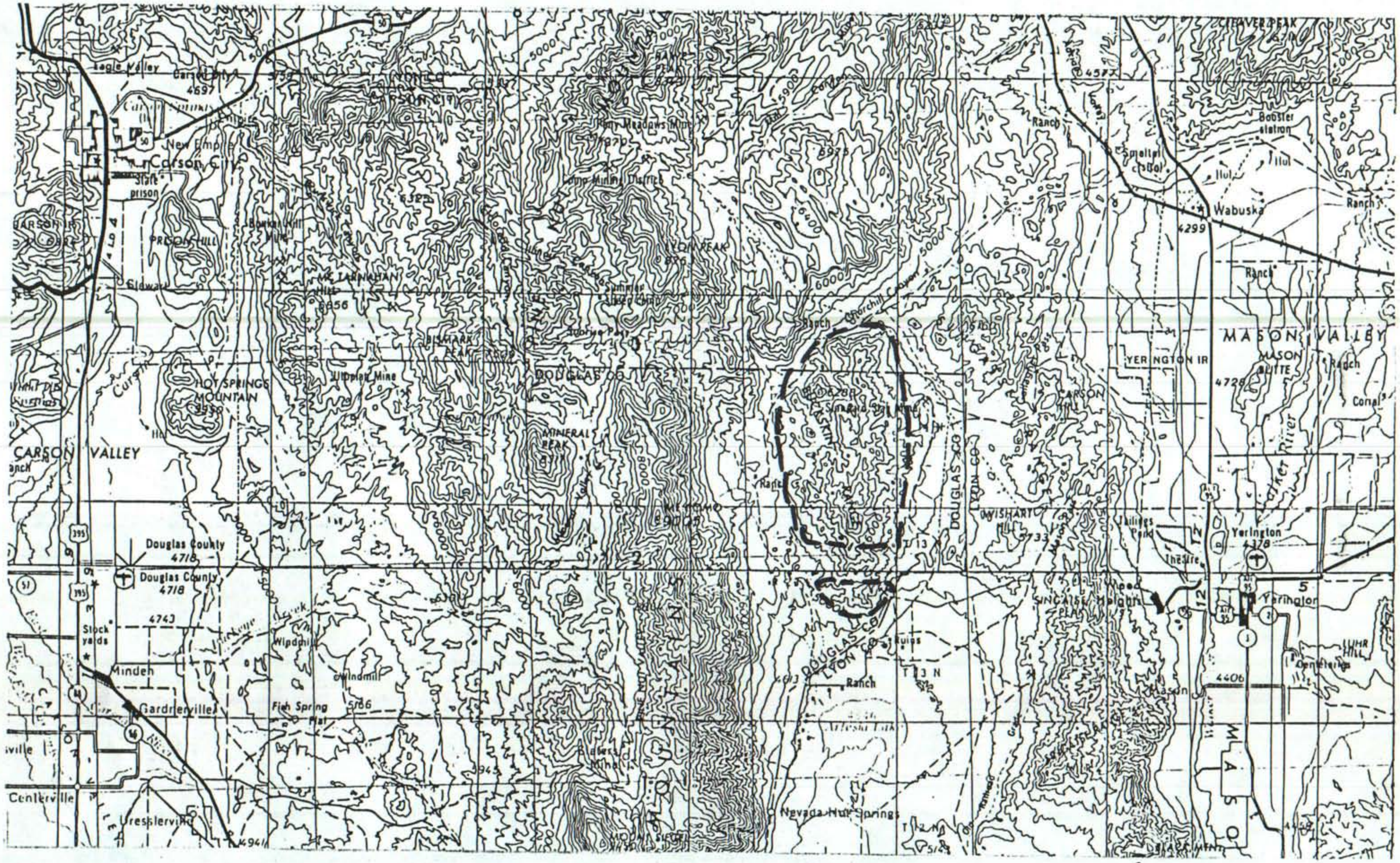


Figure 2. Location map of the Buckskin Range and the surrounding region in west-central Nevada (scale 1:250,000). Outlined area is area shown on plate 1.

and Anaconda have mapped portions of the Buckskins but their maps have proven to be largely inaccurate due to the complex Tertiary history of the Buckskin Range and the Yerington area. The Conoco holdings and immediately surrounding area was mapped in detail by Conoco geologist W. M. Oriel in 1976. John Geisman of Stanford University is mapping the range as a thesis project, with support from Anaconda.

Methods of Investigation

The Buckskin Range was mapped at a scale of 1:12000 using blown up U. S. G. S. Como and Wellington 15' quadrangle topographic maps. Aerial photographs at 1:24000 and 1:6000 were mapped on for most of the area. About 120 thin sections and several X-ray diffraction patterns were used in defining stratigraphy, mineralogy, and alteration mineralogy.

The igneous rock classification of Travis (1955) is used in this report. The Tertiary time scale used by Proffett and Proffett (1976) and the Mesozoic time scale of Van Eysinga (1970) are used in this report.

Acknowledgement

Ken Howard of the Anaconda Co. gave permission to map on Anaconda claims. Edward C. Bingler of the Nevada Bureau of Mines was extremely helpful in correlating Mesozoic and Tertiary stratigraphy. Bill Oriel of the Conoco staff was very helpful in orientation to the Buckskin Range and in constructive criticism during the course of the work.

STRATIGRAPHY

Mesozoic Rocks

Oreana Peak Formation (₮o)

The base of the stratigraphic section exposed in the Buckskin Range, along Churchill Canyon (Plate 1), is the Upper Triassic (Norian) Oreana Peak Formation of Noble (1962). About 1400 feet of Oreana Peak is exposed in two main units.

The lower unit (₮op) consists of at least 1200 feet of interfingering beds of volcanic rocks and conglomerate (₮opv) and limestone (₮opl) in beds a few inches to 25 feet thick. The volcanics consist of felsic pyroclastics, finely varved water-lain tuffs, tuffaceous sediments, and dense aphanitic basalts with elongate amygdules up to 20 cm long and 2 cm thick. Coarse conglomerates and massive grey limestones are interbedded with the volcanics.

The overlying carbonate unit (₮oc) of the Oreana Peak Formation (Upper carbonate member of Noble, 1962) contains about 200 feet of massive-to-medium bedded grey limestone with 1/2 to 3 inch, (often pinkish) siltstone partings. The limestone locally contains abundant fossil fragments. It is occasionally oolitic and locally dolomitic.

Gardnerville Formation (Jg)

The Gardnerville Formation (Noble 1962) of uppermost Triassic and Lower Jurassic age, conformably overlies the Oreana Peak Formation. One hundred and fifty to 1200 feet of Gardnerville Formation is exposed in the northern Buckskins (Plate 1). The sequence is composed primarily of grey, locally pyritic, ashy(?), calcareous siltstone interbedded with thin green-grey locally pyritic shale (Jgs). The siltstones break parallel to bedding and contain impressions of ammonites. The Gardnerville contains several discontinuous lensoidal or patchy massive grey limestones that locally contain "fossil hash" and are locally oolitic. The limestones are from 1 to 20 feet thick. Occasionally the limestones contain thin interbeds of crossbedded calcarenite.

Contact metamorphism of the Gardnerville Formation by adjacent Mesozoic and Tertiary intrusions converts the siltstones to a dense drak grey hornfels with a fine varved "chert" appearance. The hornfels fractures across bedding. The limestones are strongly recrystallized though rarely marbleized. The break between hornfels and apparently unmetamorphosed Gardnerville can be very abrupt.

Artesia Sequence

The Artesia Sequence of probable uppermost Lower Jurassic age is named for Artesia Mountain in the central Buckskin Range. About 2000 feet of the Artesia Sequence is exposed south of Churchill Canyon (Plate 1) while up to 6000 feet of the Artesia Sequence is exposed in the southern Buckskins. The Artesia Sequence lies in thrust contact with underlying rocks. The majority of the Artesia Sequence is composed of dark lavender, red-lavender, and greenish andesitic to dacitic volcanic flows (Jav) with occasional volcanic breccia and conglomerate-sandstone interbeds. The volcanics are typically porphyritic with 10 to 40% phenocrysts up to 3 mm in length; however, they generally are less than 1 mm long. Phenocrysts of pyroxene (?), hornblende, biotite and weakly to strongly zoned plagioclase (An 55-35) occur, with rounded quartz phenocrysts up to 0.5 mm in some flows in the upper portion of the sequence. Some flows completely lack phenocrysts.

The aphanitic groundmass contains plagioclase, hornblende, biotite and rare quartz, where the groundmass is not recrystallized by metamorphism or alteration.

Felsic breccias (Jafb) occur strataconformably in about the middle of the Artesia Sequence in the southern Buckskins (Plate 1). The white-to-buff felsic unit which is up to 2000 feet thick, is often flow banded and contains rounded felsic fragments up to 20 cm in diameter. The composition of the unit may be rhyolite or quartz latite.

A thick sandstone and conglomerate unit (Jas) occurs in the Upper Artesia Sequence in the central and southern Buckskin Range (Plate 1). About 500 feet of the clastic unit is present in NE 1/4, Sec. 3, T13N, R23E and it thins to the north, south, and east. It is apparently absent in the northernmost Buckskins. The clastic unit is coarsest in the west central Buckskins with clasts up to 15 cm. The clast size becomes progressively finer as the unit thins. The unit contains rounded clasts of Artesia volcanics grading upward into feldspathic sandstone in usually well defined graded beds 1 cm to 1 meter thick.

A series of andesitic to dacitic volcanic flows up to 1200 feet thick (Fulstone Formation of Anaconda terminology) overlies the clastic unit in the central Buckskin Range. These flows thin rapidly to the north and south and are completely absent in the northern Buckskins. These flows are essentially the same composition as the rest of the Artesia Sequence except that the phenocrysts are up to 5 mm in length.

Thick, discontinuous, nearly strataconformable quartz "reefs" are a distinctive part of the Artesia in the central and southern Buckskins (Plate 3). Many of the quartz "reefs" contain breccias or have protobrecciation. Original textures are usually obscured. The quartz "reefs" rarely occur above the thick clastic unit (Jas). They probably represent epigenetic selective silification associated with local hydrothermal activity.

The Artesia Sequence is regionally metamorphosed to the greenschist facies containing epidote, sericite, calcite, chlorite and clays with slight albitization of the plagioclase.

Churchill Canyon Sequence (Jcc)

The Churchill Canyon Sequence, named for exposures just south of Churchill Canyon (Plate 1), conformably overlies the Artesia Sequence. Possibly as much as 3000 feet of Churchill Canyon Sequence is exposed in the Buckskin Range. A thin conglomerate unit (Jccs) usually lies along the contact between the Artesia Sequence and the Churchill Canyon Sequence. The conglomerate is 1 to 3 feet and rarely up to 7 feet thick. It contains clasts of both Artesia and Churchill Canyon lithologies.

Lithologically, the Churchill Canyon Sequence consists of dacitic to quartz latitic flows and crystal rich tuffs (Jccv) with associated porphyritic intrusions (Jcci) of essentially the same composition. The exposed portion of the sequence contains primarily ash-flow tuffs in the northernmost Buckskins and dominately flows in the southern and central Buckskins. The ash-flow tuffs and flows interfinger in the north-central Buckskins. Both rock types are present throughout the range although structural and erosional complications expose only a small portion of the Churchill Canyon Sequence in the southern Buckskins. Quartz phenocrysts up to 10 mm in diameter are distinctive of the Churchill Canyon Sequence. The quartz phenocrysts are usually strongly resorbed, rounded and rarely bipyramidal. Not all flows and intrusions contain quartz phenocrysts.

The ash flow tuffs are usually tan to greenish light brown, containing 20 to 60% phenocrysts. Phenocrysts include 0 to 4% hornblende, 1 to 4% biotite, 0 to 10%(?) sanidine, 1/2 to 7% quartz. The remaining phenocrysts are plagioclase (generally AN35-25) with weak oscillatory zonation. Crystals are usually broken and often bent. Flattened pumice fragments up to 5 cm long are often seen in thin section. Tuff breccias occur in the sequence and are composed of up to 50% deformed fragments of tuff that are strongly welded into a tuff breccia.

The volcanic flows of the Churchill Canyon Sequence are grey to grey-green, and generally are thin bedded (5 to 30 feet thick). Occasional conglomerate or breccia interbeds up to 1-1/2 feet thick are present between some flows. The flows contain 5 to 40% subhedral to anhedral, often broken phenocrysts of 1 to 5% biotite, 0 to 5% oxyhornblende(?), 0 to 4% quartz, weakly zoned plagioclase (generally AN30-40) and occasional large pink sanidine. Phenocrysts up to 1 cm and rarely 3 cm in length with hiatial (sharp break in size between phenocrysts and groundmass) texture are set in an aphanitic groundmass of plagioclase, sanidine(?), and quartz microlites with possible glass.

Intrusions (Jcci) which are very similar in texture and composition to the Churchill Canyon volcanic rocks intrude the Churchill Canyon Sequence. They are difficult to distinguish from the flows except where crosscutting relationships exist. Where intrusives and volcanics are indistinguishable they are mapped as Jccu (Plate 1).

The Churchill Canyon Sequence is regionally metamorphosed to the green-schist facies containing calcite, sericite, epidote, clinozoisite, chlorite and quartz with slight albitization of the plagioclase.

Both the Artesia Sequence and Churchill Canyon Sequence are probably correlative to the Double Springs Formation of Noble (1962). Ammonites collected from the Double Springs Formation near Topaz Lake indicate an uppermost Lower Jurassic age of the Double Springs Formation (H. F. Bonham, oral comm.). Age dates on hornblende obtained by Castor (1972) from Churchill Canyon Sequence type rocks in the Pine Nut Range yielded dates of 146 m.y. and 124 m.y. The age dates would indicate an Upper Jurassic to Lower Cretaceous age for the Artesia and Churchill Canyon Sequences. However, the dates may have been reset by subsequent intrusions and/or by metamorphism. Although the correlation of the Artesia and Churchill Canyon Sequences with the Double Springs Formation is tentative, an uppermost Lower Jurassic age for the sequences is used in this report.

Cenozoic Rocks

The Oligocene is represented by a series of ash-flow tuffs and tuffaceous sediments which are thoroughly discussed by Proffett and Proffett (1976) from the Singatse Range. Only brief descriptions are given here to note local variations in the tuff units.

Guild Mine Tuff (Tgmt)

About 1000 to 2000 feet of brown to lavender buff, moderately welded, crystal rich ash-flow tuff of the Guild Mine Tuff unconformably overlies the Mesozoic rocks in the Buckskin Range. The Guild Mine Tuff contains 20 to 35% phenocrysts, up to 2.5 mm in length, of quartz, sanidine, plagioclase, and 1 to 3% biotite. Rare fragments of petrified wood occur at the base of the Guild Mine Tuff, overlain by 5 to 25 feet of black vitrophyre. The vitrophyre is overlain by 700 to 900 feet of moderately welded and occasionally densely welded tuff with moderately abundant small pumice fragments. The top of the Guild Mine Tuff consists of 200 to 300 feet of buff colored vapor phase tuff with abundant large pumice fragments and frequently large irregular blocks of deep red jasper.

Weed Heights Tuff (Twht)

Two hundred and fifty to 300 feet of lavender to reddish brown, moderately welded, moderately crystal rich ash-flow tuff of the Weed Heights Tuff conformably overlies the Guild Mine Tuff. The Weed Heights Tuff contains 5 to 25% phenocrysts including plagioclase, sanidine, quartz, and 1 to 2% biotite. Abundant large white pumice fragments are distinctive of the unit. There appears to have been a very short cooling break between the Guild Mine Tuff and the Weed Heights Tuff in the Buckskin Range as evidenced by the lack of intervening sedimentary units which are present in the Singatse Range (Map Units 4 and 5 of Proffett and Proffett, 1976).

Fifty to 75 feet of rhyolitic sediments overlie the Weed Heights Tuff and are mapped with it. The lower portion is usually bright red while the upper portion is yellowish green. The uppermost sediments contain abundant fragments of petrified wood and sparse leaf impressions.

Singatse Tuff (Tst)

About 2500 feet of brown to red-brown, locally lavender, strongly to moderately welded, crystal rich ash-flow tuff of the Singatse Tuff conformably overlies the Rhyolitic sediments. The Singatse Tuff contains 30 to 45% phenocrysts of plagioclase, quartz, sanidine, hornblende, and 3 to 6% biotite up to 5 mm in length. Hornblende, abundant biotite, large phenocrysts, and its massive nature are distinctive of the Singatse Tuff. The unit contains sparse pumice fragments and 1 to 4% lithic fragments except local zones slightly above the base where the unit contains up to 30% lithic fragments. Five to 10 feet of black vitrophyre occurs locally at the base.

Nine Hill Tuff (Tnht)

About 100 feet(?) of deep lavender to buff, poorly welded to non-welded, crystal poor ash-flow tuff and tuff breccia of the Nine Hill Tuff of E. C. Bingler (oral comm.) conformably overlies the Singatse Tuff. The Nine Hill Tuff is part of the Bluestone Mine Tuff of Proffett and Proffett (1976). The tuff contains less than 5% phenocrysts of plagioclase, quartz, sanidine, and trace quantities of biotite. White flattened pumice fragments up to 20 cm across are distinctive of the unit. Locally, the Nine Hill Tuff is a tuff breccia.

Eureka Canyon Tuff (Tect)

Fifty feet(?) of bright red-orange, poorly to non-welded, crystal poor tuff of the Eureka Canyon Tuff of E. C. Bingler (oral comm.) conformably overlies the Nine Hill Tuff. The Eureka Canyon Tuff is also part of the Bluestone Mine Tuff of Proffett and Proffett (1976). The tuff contains sparse pumice fragments and less than 5% phenocrysts of plagioclase, quartz, sanidine, and trace biotite.

Andestic Volcanics (Tv)

Miocene andesitic volcanic flows and flow breccias overlie the Oligocene ash-flow tuffs in angular unconformity. More than 1000 feet of andesite is present in north Churchill Canyon while only small exposures crop out on the east flank of the Buckskin Range. More than 5000 feet of andesite is present north of Lincoln Flat (Proffett and Proffett, 1976). Many of the flows are oxyhornblende and augite rich andesitic porphyries (Tvhpa) and probably were derived from a volcanic intrusive center of the same composition and texture in the northern Buckskins (see discussion on Tertiary intrusive rocks).

A few flows of possibly younger oxyhornblende biotite andesite porphyry (Tvhba) crop out south of the Minnesota Mine.

Lake Sediments (QTs)

At least 250 feet of pliocene to Pleistocene lacustrine sediments occur on the west flank of the Buckskin Range. These lie with angular unconformity on Miocene to Mesozoic rocks. The lacustrine sediments are white and rarely green, finely to thinly bedded shales, siltstones, and fine grained quartz arenites.

Older Alluvium (Qoal)

Fifty or more feet of coarse unsorted, unconsolidated conglomerate of older Quarternary alluvium lie conformably or slightly unconformably on the lake sediments. The conglomerate contains moderately rounded pebbles to boulders. Most of the clasts are granitic material that is foreign to the Buckskins with a lesser amount of locally derived material.

INTRUSIVE ROCKS

Mesozoic Intrusions

Granodiorite (Jgd)

Fine to medium-grained, equigranular, phaneritic granodiorite is probably the oldest intrusion exposed in the Buckskin Range. It may be equivalent to the Black Mountain Granodiorite in the Singatse and Wassuk Ranges (E. C. Bingler, oral comm.). The granodiorite contains crystals up to 1 mm in length but they are usually 0.7 mm or less. It contains 1 to 3% biotite, trace hornblende, 8 to 12% interstitial quartz, 10 to 15% orthoclase and the remainder unzoned plagioclase locally varying from An35 to An45. South of the Minnesota Mine a small body of coarser grained granodiorite (Jgdc) intrudes the fine granodiorite. The rock is essentially the same mineralogically except that it contains about 10% biotite and 1 to 2% hornblende with crystals up to 5 mm.

Diorite

Several exposures of black, fine-grained diorite that may be older or younger than the granodiorite crop out along Churchill Canyon (Plate 1). The diorite contains 4 to 10% augite, 1 to 2% quartz, trace orthoclase, and Plagioclase (An45-55) in very weakly zoned crystals.

Quartz Monzonite (Jqmp)

A pinkish brown quartz monzonite porphyry intrudes the granodiorite just east of the Minnesota Mine (Plate 1). Subhedral plagioclase (oligoclase?) and biotite phenocrysts up to 5 mm long occur in seriate texture with groundmass minerals up to 0.4 mm. Overall the rock contains 1 to 3% biotite, about 15% quartz, 50 to 55% plagioclase, 30 to 35% orthoclase, 1 to 2% magnetite, and trace pyrite. The quartz monzonite porphyry is cut by abundant quartz-magnetite-pyrite veins. A coarse-grained quartz monzonite breccia (Jqmb) containing clasts of quartz monzonite porphyry in an aphanitic igneous matrix is exposed just south of the Minnesota Mine (Plate 1).

Microgranodiorite (KJmgd)

A small body of buff colored subequigranular microgranodiorite intrudes the Artesia Sequence west of Fulstone Spring No. 1 (Plate 1).

Plagioclase is up to 1 mm long, but the crystals are mainly less than 0.4 mm. The rock contains 15 to 20% anhedral quartz, 10 to 15% anhedral orthoclase, and subhedral to anhedral unzoned plagioclase, (An35-40). The exact age is unknown except that it is upper Mesozoic.

Churchill Canyon Intrusives (Jcci)

The Churchill Canyon Intrusives are discussed under Churchill Canyon Sequence.

Latite Porphyry Dikes (KJlp)

Latite porphyry dikes intrude the older Mesozoic rocks throughout the Buckskin Range. They contain subhedral 1 to 3 cm K-feldspar phenocrysts with small hornblende, biotite, plagioclase, and about 1% quartz phenocrysts in an aphanitic groundmass. Several dikes in the northern Buckskins are essentially identical in texture and mineralogy but contain about 5% quartz phenocrysts (Kqlp). The dikes are similar in composition to Churchill Canyon Sequence intrusions but they are distinctive enough in appearance to map separately. The latite porphyry dikes could be a later phase of Churchill Canyon intrusive activity, based upon intrusive relationships, but may be considerably younger.

Tertiary Intrusions

Numerous Tertiary dikes and stocks are present in the Buckskin Range. Relative ages are given where known but otherwise the Tertiary intrusions are assumed to be Miocene based upon intrusive relationship and age dates. Several intrusives in the southern Buckskins are not described here and are described by W. M. Oriel (1976).

Biotite Pyroxene Diorite (Tbpd)

A few small stocks of dense, black, fine-grained diorite crop out on the north end of the Buckskin Range (Plate 1). The diorite contains 5 to 7% shreddy, greenish-brown biotite less than 0.05 mm in length, usually in magmatic reaction with augite, 7 to 10% subhedral augite up to 2 mm long, less than 2% quartz, weakly zoned subhedral plagioclase (An50-55) up to 2 mm in length, and about 1% magnetite. The rock shows strong foliation in thin section but it is not evident in hand sample.

Hornblende Pyroxene Diorite Porphyry (Thpdp)

Phaneritic diorite porphyry and locally porphyritic diorite underlies the north end of the Buckskin Range and intrudes the biotite pyroxene diorite. Phases of the diorite vary widely in texture and composition and are generalized here. The rock contains 10 to 40% Phenocrysts of hornblende that are commonly 5 to 10 mm in length but range up to 3 cm in length. Plagioclase phenocrysts are up to 5 mm in length and rarely reach 10 mm. The phenocrysts grade downward in size in a seriate texture to a groundmass generally 0.01 to 0.5 mm. The diorite contains 5 to 25% euhedral to subhedral green to green-brown zoned hornblende with numerous inclusions, 3 to 7% subhedral augite, 2 to 3% quartz, oscillatory normally zoned plagioclase

An50-40), and trace sphene and apatite. The diorite is often foliated with subparallel plagioclase and hornblende phenocrysts.

Numerous andesitic dikes and small stocks related to the hornblende pyroxene diorite porphyry intrude the northern portion of the Buckskin Range. They have variable compositions and highly variable textures. These have been generalized into 2 groups: those with less than 25% phenocrysts (Thppa), and those with 25 to 50% phenocrysts (Thpap). The rocks are similar in composition to the hornblende pyroxene diorite porphyry but have an aphanitic groundmass of plagioclase, augite, and a small amount of quartz, and phenocrysts of plagioclase, hornblende and usually augite. These intrusives are green to greenish-grey and many have weakly developed columnar jointing.

Several intrusive breccias (Timb) crop out in Sec. 22, T14N, R23E. These have a matrix of hornblende pyroxene porphyritic andesite with angular to highly rounded pebbles to boulders of hornblende pyroxene porphyritic andesite, hornblende pyroxene andesite and diorite porphyry, various ash-flow tuffs, and Mesozoic metavolcanic rocks as well as granitic rocks not exposed in the Buckskin Range.

The hornblende pyroxene andesite and diorite porphyries, hornblende pyroxene porphyritic andesites, and intrusive breccias form a large Miocene intrusive complex in the northern Buckskin Range. This diorite-andesite intrusive complex is Miocene because dikes of the complex intrude Tertiary ash-flow tuffs across Basin and Range faults. Some of the faults have post-intrusive displacement, however. The intrusives may have volcanic equivalents in the Lincoln Flat Andesite (17 to 10 m. y.), Proffett and Proffett (1976) but may be younger, because most of the Basin and Range faults cut by the intrusives do not show later movement.

Biotite Hornblende Andesite Porphyry (Tbhap)

Several dikes of coarse grained biotite hornblende andesite porphyry intrude the older rocks in and around the Minnesota Mine (Plate 1). The andesite contains 45 to 50% phenocrysts of euhedral biotite up to 1.2 cm across in books up to 1 cm thick, euhedral hormblende up to 5 mm long and subhedral plagioclase to 1 cm in length. The phenocrysts are in hiatial texture with an aphanitic groundmass of glass, plagioclase, microlites, and quartz. The rock contains 7 to 10% biotite, 2 to 3% hornblende, 2 to 4% quartz, 5 to 10% brown glass, and weakly oscillatory normally zoned plagioclase (An 43-38). The biotite hornblende andesite porphyry is apparently younger than the sheared hornblende pyroxene andesite porphyry exposures in the Minnesota Mine.

Porphyritic Hornblende Dacite (Tphd)

An intrusive porphyritic hornblende dacite crops out extensively in the southern Buckskin Range (Plate 1). The unit contains 15 to 25% phenocrysts of plagioclase and hornblende up to 1 cm and rarely up to 3 cm in length, although locally as much as 40% phenocrysts may be present. The plagioclase usually has epidotized cores. Locally the dacite contains rounded quartz "eyes" up to 3 mm (Tphdp) and locally occurs as an autobreccia (Tphdb). One to 2% biotite occurs locally in the dacite in Sections 2, 3, 10, and 11, T13N, R23E (Plate 1). The rock contains 2 to 8% hornblende, up to 10%(?) K-feldspar, 0 to 7% quartz, and weakly zoned plagioclase (An 30-35?). The groundmass contains K-feldspar and plagioclase microlites with or without quartz and hornblende.

Conflicting evidence indicates possibly both Tertiary and Mesozoic ages for the porphyritic hornblende dacite. In exposures in Sections 11, 12, 13, and 14, T13N, R23E, (in Conoco's project area) the dacite lies along low angle Basin and Range faults with very altered Tertiary ash-flow tuffs above the dacite and highly altered Mesozoic metavolcanic rocks below. The dacite is weakly propylitized. The difference in alteration suggests a late Tertiary age for the dacite in these outcrops. In Sections 2 and 3 N1/2 Sec. 15, NW1/4 Sec. 11, and NE1/4 Sec. 10, T13N, R23E (Plate 1), the dacite is locally highly stericitized, intruded by highly altered Tertiary dikes (N1/2, NE1/4, Sec. 10, T13N, R23E), and apparently may not intrude the Tertiary ash-flow tuffs. This evidence, along with its similar appearance to the intrusives of the Churchill Canyon Sequence, indicates a Mesozoic age for these porphyritic hornblende dacite occurrences. Although the dacite is, for the most part, probably an intrusive portion of the Churchill Canyon Sequence, some of the dacite may be Tertiary. The Tertiary and Mesozoic dacites are indistinguishable in the field because they have identical composition and textures.

Hornblende Biotite Andesite Porphyry (Thbap)

Several intrusions of grey hornblende biotite andesite porphyry crop out in the southern Buckskins (Plate 1). Phenocrysts make up 25 to 35% of the rock with 4 to 6% hornblende with thin magnetite rims, 4 to 5% biotite, and osciallatory zoned subhedral to anhedral plagioclase (An 42-48). The phenocrysts are up to 1 cm in length and occur in an aphanitic groundmass of plagioclase, 1 to 4% mafics, up to 4% quartz, 1 to 2% magnetite and trace apatite. The rock generally is propylitized and rarely is sericitized. A large mass of hornblende biotite andesite porphyry in Sec. 2, T13N, R23E (Plate 1) may be either extrusive or intrusive although contact relationships, where seen, seem to indicate that it is extrusive.

Biotite Hornblende Sanidine Dacite Porphyry (Tbhsdp)

Several biotite hornblende sanidine dacite porphyry dikes crop out on the southern tip of the Buckskin Range (Plate 1). Phenocrysts make up to 60% of the rock, in seriate texture. They consist of subhedral oscillatory normally zoned plagioclase (An52-39) up to 10 mm long, rounded sanidine up to 5 mm making up 2 to 3% of the phenocrysts, 4 to 6% biotite up to 5 mm across, and 4 to 6% strongly zoned oxyhornblende up to 4 mm long with magnetite rims. The aphanitic groundmass contains 1 to 2% sanidine, plagioclase microlites, and minor amounts of glass.

Hornblende Andesite Porphyry (Thap)

Dikes of hornblende andesite porphyry intrude along faults in the southern Buckskins (Plate 1). The dark green andesites contain 30 to 40% phenocrysts, in seriate texture, composed of 30 to 35% hornblende up to 10 mm long and 10 to 20% subhedral plagioclase up to 15 mm in length.

Basalt (Tb)

A few black, dense, aphanitic basalt dikes crop out in the southern Buckskins (Plate 1). These are probably the youngest intrusives in the range but their exact age is uncertain.

STRUCTURE

The Buckskin Range has two distinct types and ages of deformation: Mesozoic thrust faulting and Cenozoic Basin and Range faults. The Basin and Range faults are of two types: Older gently dipping faults which may have been originally steeply dipping, and younger steeply dipping faults.

Mesozoic Deformation

A thrust fault is exposed in several locations in the northern Buckskin Range (Plate 1), bringing the Artesia Sequence in contact with the Gardnerville Formation. Evidence of this thrust is abundant. Assuming that the Artesia and Churchill Canyon Sequences are correlative with the Double Springs Formation, at least 8000 feet of stratigraphic section are absent from the Buckskins. They consist of the upper Gardnerville Formation, Preachers Formation, Veta Grande Formation, all of which are present in the southern Pine Nut Range (Noble, 1962). The upper Gardnerville, 150 to 300 feet of Ludwig limestone, about 600 feet of gypsum, and up to 1400 feet of Preachers Formation (which are the uppermost exposed Mesozoic units in the Singatse Range) are present near Ludwig (E. C. Bingler, written comm.) but are absent from the Buckskins.

Further evidence of the thrust fault lies in thickness and textures in various exposures of the Gardnerville Formation. About 150 to 200 feet of Gardnerville lies between the Oreana Peak Formation and the Artesia Sequence (Figure 3) in the middle of Sec. 11, T14N, R23E (Plate 1). A limestone unit of the Gardnerville is highly sheared and recrystallized with clasts of Artesia Sequence and Churchill Canyon Sequence intrusives occurring within the limestone several feet below the contact with the Artesia Sequence. Just to the south, in Section 11 (Plate 1) along strike in the Gardnerville Formation, at least 800 feet of Gardnerville Formation is exposed below the

Artesia, also along a sheared contact. Elsewhere, where the contact between the Gardnerville and Artesia is exposed, the rocks within the Gardnerville below the contact with the Artesia are usually strongly sheared.

The Buckskin Thrust postdates most of the Churchill Canyon Sequence and is probably uppermost Lower Jurassic to Middle Jurassic in age. In the vicinity of the Minnesota Mine a few Churchill Canyon Sequence affinity intrusions cut the Gardnerville. Although none of these intrusions were observed crosscutting the Buckskin Thrust, they appear to have been a pulse of magmatism following the emplacement of the thrust sheet. Assuming that the intrusions in the lower plate do represent a late pulse of Churchill Canyon Sequence type rocks, the thrust would then probably be uppermost Lower Jurassic.

The direction of thrusting is unknown as well as its areal extent. It is not present in the southern Pine Nut Range, however, a structural discontinuity similar to that in the northern Buckskin Range has been found in the northern Pine Nut Range southeast of Carson City (E. C. Bingler, oral comm.). A thrust contact there is as yet unproved.

Several faults with small displacement, probably of Mesozoic age, occur in the vicinity of the Minnesota Mine (Plate 1). They originally were normal faults with an east-west trend, except one just south of the Minnesota Mine, which was a reverse fault. Tertiary westward tilting has rotated the strata that the faults displace so that the originally dip slip faults now resemble east-west trending strike slip faults.

There may have been some pre-Tertiary folding in the Buckskin Range. The Churchill Canyon and Artesia Sequences lie in an angular unconformity

Figure 3. Looking south at the north end of the Buckskin Range showing the Buckskin Thrust (BT) and low angle Basin and Range faults (N).

Figure 4. Looking northwest at low angle Basin and Range faults and accompanying drag folds in Tertiary ash-flow tuffs in the northern Buckskin Range.

of about 30° with the overlying Guild Mine Tuff near Fulstone Spring No. 1 (Plate 1). The Guild Mine Tuff overlies the Artesia Sequence in the SW 1/4 Sec. 26, T14N, R23E (Plate 1). Elsewhere, the Guild Mine Tuff overlies highly variable thicknesses of the Churchill Canyon Sequence. This evidence implies pre-Tertiary folding but could be explained by Tertiary erosion with highlands to the west and a river valley to the east (Proffett and Proffett, 1976).

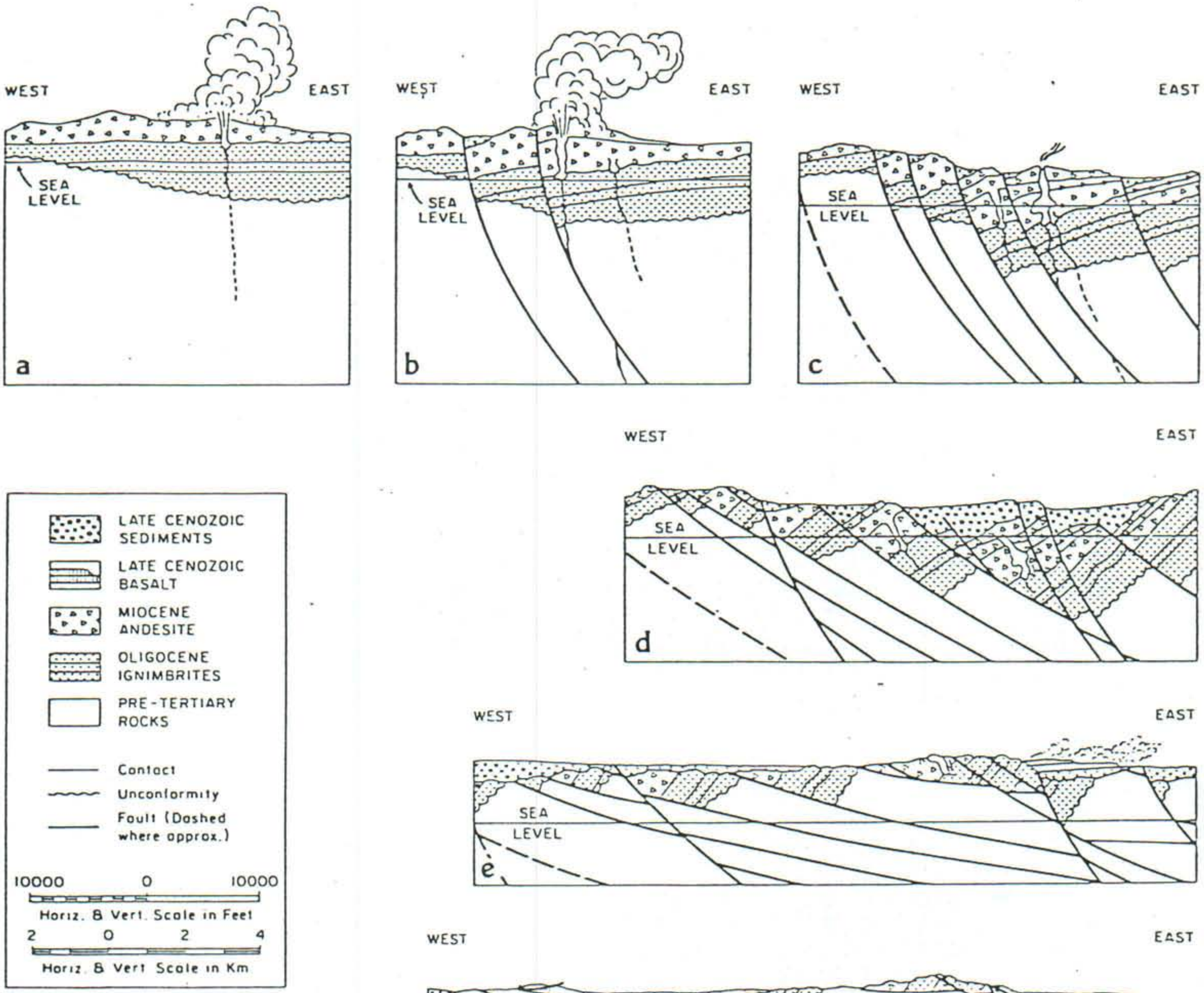
Tertiary Deformation

By far, the dominant structural elements in the Buckskin Range are low angle Basin and Range faults. These faults generally dip 5 to 15 degrees east although faults dipping up to 7 degrees west and 25 degrees east also occur (Plate 2). The low angle faults are generally easily recognizable where they displace Mesozoic rocks because of the lack of distinctive marker horizons. All of these faults have normal dip slip movement. The faults are generally subparallel with a northerly strike and frequently intersect each other. In cross sections drawn parallel to strike, the faults are generally crescent shaped with the concave surface up. Individual fault blocks are 100 to perhaps 1500 feet thick and 1000 to 15,000 feet long parallel to strike.

The average dip of the Tertiary ash-flow tuffs is 75 to 90 degrees to the west, except adjacent to the low angle Tertiary faults where intense drag folding occurs. This dip clearly indicates drastic rotation of the Buckskin Range and the ash-flow tuffs serve as good control for fault displacement. Offsets as small as 50 feet can be clearly seen, with maximum observed displacements of 6000 feet, all with displacement directed to the east.

Intense drag folding is usually found adjacent to the low angle faults, and often is accompanied by thick fault gouge. Drag folding is usually difficult to observe in the Mesozoic rocks but, in NE1/4, Sec. 11, T14N, R23E (Plate 1), limestones of the Oreana Peak Formation are folded up to 90 degrees and they lie parallel to the fault where the Churchill Canyon and Artesia Sequences are dropped down against the Oreana Peak. The best examples of drag folding occur where the highly competent Singatse Tuff is faulted against the incompetent Weed Heights, particularly in the NE 1/4, Sec. 26, T14N, R23E (Figure 4). While the dip of the Singatse may vary from 90 degrees at a distance from the fault to about 70 degrees west adjacent to it, the Weed Heights changes dip from about 70 degrees west far from the fault to 3 degrees west adjacent to the fault, with intense, closely spaced slickensides developed, completely grinding up the pumice fragments. Up to 100 feet of fault gouge is exposed by Anaconda bulldozer cuts in the southern Buckskins and it is not uncommon to find boulders of Mesozoic rocks in fault gouge between Tertiary ash-flow tuffs.

Proffett (1972, 1977) envisions progressive westward tilting of fault blocks by rotation on younger faults in the Yerington area (Figure 5). According to Proffett's model, the gently dipping faults which underlie the steeply dipping Tertiary volcanic rocks were originally steeply dipping Basin and Range faults. In the vicinity of the Buckskin Range, the only younger east dipping faults which could account for the rotation of the range are the frontal faults on the east flank of the Pine Nut Range. Although displacements along these faults are younger than the low angle Basin and Range faults, their displacements probably do not exceed 10,000 feet between the Pine Nuts and the Buckskins. A steep frontal fault on the



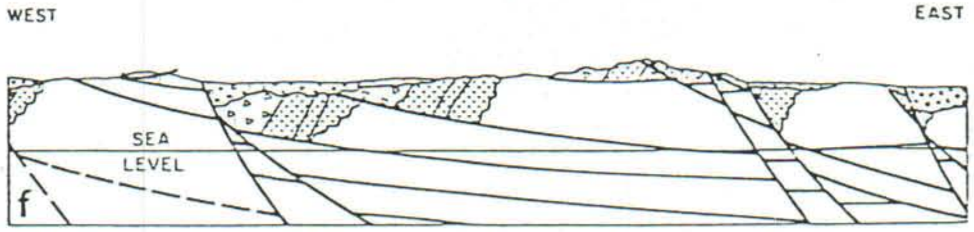


Figure 15. Cenozoic geologic history of Yerington district, Nevada, shown on east-west cross section. Various stages have been reconstructed by sequentially unfaulting and untilting present cross section (f). Sea level estimated for diagrams a through e. a, Late Oligocene through early Miocene; deposition of ignimbrite sequence followed by beginning of deposition of hornblende andesite, 18 to 19 m.y. ago. b, Early Miocene, 17 to 18 m.y. ago; continued eruption of andesite and beginning of Basin and Range faulting and tilting. c, Early Miocene, 17 m.y. ago; end of andesite volcanism and continued Basin and Range faulting with erosion of up-faulted blocks. d, Early and middle Miocene, 11 to 17 m.y. ago; continued faulting, tilting, erosion of ranges, and deposition of sediments in basins. Early faults rotated to such a flat dip that they are no longer in favorable orientation for continued faulting. New steeper faults form to take their place. e, Eight to 11 m.y. ago; all early faults tilted to gentle dips and inactive, but faulting and tilting continues on newly formed steep faults; erosion of ranges and deposition of sediments and locally basalt in basins. f, Present time; continued faulting and tilting along steep range-front faults, erosion of ranges and deposition in basins.

Figure 5. Cenozoic structural history of the Yerington area from Proffett, 1977.

east flank of the Buckskins may have a few thousand feet of displacement near the south end of the Range but the displacement is probably minor along the north-east flank of the Range. Basin and Range faults elsewhere in the Basin and Range Province usually do not appear to have intense drag folding and thick gouge zones associated with them. All of this suggests that Proffett's model may be incomplete, however, no better model can be offered at this time. Extensive, drastic westward tilting and crustal extension in the Yerington area, however, cannot be disputed.

A few west dipping normal faults are present in the northwestern Buckskins (Plate 1) but appear to be minor elements in the structure of the range. One of the faults is intruded by a Tertiary hornblende pyroxene andesite porphyry dike with extensive breccia adjacent to the dike. Most of the breccia is composed of fragments of Mesozoic rocks, including granitic rocks not exposed in the Buckskins. This is probably an intrusive breccia without igneous matrix.

Unresolved Structural Problems

A major disconformity exists between the Artesia Sequence and underlying metavolcanic rocks in the southeastern Buckskin Range. The rocks of the lower sequence (Tv, Plate 1) consist of andesitic volcanic flows with small phenocrysts and occasional "chicken track" andesite. These rocks may be correlative with a Lower Triassic metavolcanic sequence exposed in McConnell Canyon in the Singatse Range (Figure 2). These metavolcanic rocks are older than the Lower Jurassic Artesia Sequence, since they are intruded by granodiorite which is provisionally correlated with the Lower Jurassic granodiorite of Black Mountain. Foliations in the lower sequence rocks generally strike east-west and dip to the north. The Artesia Sequence strikes approximately north-south and dips to the west. The contact between the Artesia Sequence and the lower metavolcanic sequence may be part of the Buckskin Thrust but insufficient exposure prevents determination of the type of contact.

The large area of Churchill Canyon Sequence exposed in the northwestern Buckskins (Plate 1) undoubtedly does not represent a single Basin and Range fault block, based upon the tectonic style in the Buckskin Range. Lack of stratigraphic control and poor outcrop inhibited the mapping of low angle Basin and Range faults which certainly are present.

The large area of Tertiary hornblende biotite andesite porphyry in Sec. 1 and 2, T13N, R23E (Plate 1) may be a fault block with a low angle fault beneath it (Plate 2, Cross Section G-G'). A bulldozer trench along the contact on the ridge in NW1/4 Sec. 1, T13N, R23E reveals a low angle fault contact. This fault relationship could not be definitely traced around the block of hornblende biotite andesite porphyry (Thbap), however. A low angle Basin and Range fault under the porphyry is indicated, but not proven.

The fault block of Tertiary ash-flow tuff and intrusions north of the Minnesota Mine (Plate 1) appears to have been emplaced following the intrusion of the Tertiary hornblende pyroxene andesite porphyry dikes (Cross Section B-B'). No Tertiary dikes cut the low angle fault on the west side of the block and dikes near the fault have locally intense shearing. Additionally, the tuffs and some of the intrusions are strongly altered adjacent to the fault while the limestones to the west of the fault contain only very weak recrystallization. This strongly suggests that the Tertiary ash-flow tuffs and intrusions were faulted into place after intrusion and alteration.

A major fault paralleling the trend of Churchill Canyon (about N25E) (Plate 1) has been shown by Moore (1969) to explain the much lower elevation of Miocene volcanics north of the Canyon in contrast to the higher elevation of Mesozoic rocks south of the Canyon. No evidence was found to support a large fault but rather there may have been much deeper erosion to the north of the Buckskin Range before the Miocene volcanics were deposited. Regionally, the lineament through Churchill Canyon appears to be a major break between Tertiary volcanic rocks to the north and Mesozoic rocks to the south and may in fact be a fault. Insufficient exposure prevents confirmation.

ALTERATION

Propylitic Alteration

Most of the rocks exposed in the Buckskin Range have varying degrees of propylitization. Propylitic alteration is difficult to determine in the Mesozoic rocks, because they have been metamorphosed to the greenschist facies, except where they are more sericite and epidote rich. The Tertiary ash-flow tuffs are highly propylitized in the southern and northern Buckskins near Tertiary intrusions and become less altered in the west-central Buckskins. Alteration minerals are clays, calcite, sericite, and minor quantities of epidote. The tuffs, particularly the Singatse Tuff, often become whitish-lavender when propylitically altered. Tertiary intrusive rocks in the northern Buckskins are generally not propylitized although a few Tertiary hornblende pyroxene andesite porphyry dikes north of the Minnesota Mine are moderately propylitized. The only Tertiary intrusives that are not altered in the southern Buckskins are the basalt, the biotite hornblende sanidine dacite porphyry, the hornblende andesite porphyry and the exposure of hornblende biotite andesite porphyry in Sec. 22, T13N, R23E.

Sericitic Alteration

Sericitic alteration is present in much of the Buckskin Range, and is particularly abundant in the east and south. Several types of sericitic alteration were used in field identification: Strong sericitic (ss, Plate 3) where the rock is completely altered to sericite and quartz with little clay; moderate sericitic (ms, Plate 3) where there is partial sericitization with little clay; strong sericite-clay (ssc, Plate 3) where the rock is completely altered to sericite with relatively abundant clay; moderate sericite-clay (msc, Plate 3) where the rock is partially altered to sericite and clay; and weak sericite-clay (wsc, Plate 3) where the rock is slightly altered to visible sericite and clay. The dominant clay present is kaolinite, although some montmorillonite may occur. The Mesozoic rocks are seriticized over much of the range while sericitization in Tertiary rocks is more restricted. A few of the Tertiary hornblende pyroxene andesite porphyry intrusions are highly seriticized and are presumably the earliest phases of hornblende pyroxene andesite and diorite porphyry intrusive activity because adjacent hornblende pyroxene andesite and diorite porphyry intrusives are fresh. The Tertiary ash-flow tuffs in the northern Buckskins are highly stericized, particularly adjacent to the Tertiary hornblende pyroxene diorite porphyry intrusions. Sericitic alteration is also widespread in the Tertiary ash-flow tuffs in the southern Buckskins except at the extreme southern end of the Range.

Aluminophyllic Alteration

Two areas of aluminophyllic alteration were found in the Buckskin Range. Aluminophyllic alteration, a subtype of advanced argillic alteration, is defined as an assemblage consisting of quartz, ordered kaolinite group minerals, pyrophyllite, andalusite, diaspore, corundum $\pm$ topaz and fluorite. The area around the Blue Danube Mine contains predominately quartz, pyrophyllite, and diaspore with some andalusite and topaz. An assemblage of quartz, pyrophyllite and diaspore was found just west of the Minnesota Mine. In both cases extreme recrystallization of the original rock accompanied aluminophyllic alteration.

Silification

Strong silification (si, Plate 3) is largely restricted to the Artesia

Sequence except for a small area in the Jurassic granodiorite in Sec. 24, T13N, R23E. In general, the silification in the Artesia Sequence is nearly strataform with lensoidal quartz "reefs" which locally crosscut bedding. The silicified bodies often contain up to 15% sericite.

Tourmaline Breccias

Several small outcrops of tourmaline breccia (Tbx, Plate 3) were found in the Buckskins. They are usually ovoid in outcrop and generally less than 30 feet in length. The tourmaline breccias are generally peripheral to major centers of alteration and contain weakly altered rock and/or quartz fragments in a matrix of tourmaline. Often veinlets of tourmaline radiate from the breccias into the country rock.

Biotite veinlets

One exposure of coarse biotite veinlets was found in nearly fresh Artesia Sequence in the center of Section 1,T13N, R23E. The biotite veinlets are one to 30 mm wide and irregular in trend with biotite flakes up to five mm across.

Age of Alteration

Most of the alteration in the Buckskin Range appears to be Miocene in age because the Tertiary ash-flow tuffs and intrusions are altered. The silicification in the Artesia Sequence and some of the associated alteration is Mesozoic. An altered and mineralized intrusive complex in the southern Buckskin Range, one dike of which has been dated at 15.7 m.y. (Oriel, 1976), has a pervasive alteration halo in the surrounding Mesozoic rocks. This, together with alteration associated with Miocene intrusions in the northern Buckskins, indicates there is a Miocene alteration overprint on most of the Mesozoic rocks in the Buckskin Range.

MINERALIZATION

Limonites

Goethite occurs in varying concentrations, both as disseminations and fracture coatings. Goethite is present throughout areas with sericitic and aluminophyllic alteration and in silicified bodies. There appears to be little correlation in most areas between the intensity of alteration and the quantity of goethite.

Jarosite occurs in a number of areas as both disseminated grains and fracture coatings. The jarosite is impure and is mixed with goethite and hematite. Only areas where jarosite exceeds 50% of the total limonites are outlined on Plate 4; jarosite is indicated by the letter "J" where its concentration is greater than 25%, (Plate 4).

Strong lavender hematite was found in a few areas but it never exceeded about 20% of the total limonite content. Brick red hematite stains are common near some fault zones. A few veins of black specular hematite (SH, Plate 4) were found in the eastern south-central Buckskins. It occurs in veins up to two feet wide, occasionally accompanied by quartz, and as thin fracture fillings. The significance of the specular hematite is unknown.

Minnesota Mine

A magnetite-copper skarn in the limestone unit of the Oreana Peak Formation was mined at the Minnesota Mine. Massive magnetite with stringers and blobs of pyrite and rarely chalcopyrite replace the limestone parallel to bedding. Essentially pure magnetite-pyrite bodies up to 30 feet wide are exposed in the mine with smaller bodies of magnetite-pyrite stringers in the limestone. The limestone is strongly recrystallized with a weak development of epidote, clinozoisite(?), tremolite-actinolite, and some pyroxenes. Some marble is locally present. Numerous Mesozoic and Tertiary dikes are exposed in the mine. The Tertiary dikes are fresh and have no spatial relationship to the ore. Mesozoic dikes of Jurassic quartz monzonite porphyry also seem to have no direct correlation to the ore. Ore often occurs on one side of a quartz monzonite dike and recrystallized limestone occurs on the other. The rocks are complexly sheared by low angle Basin and Range faults. The Jurassic quartz monzonite porphyry contains quartz veins just east of the mine. Pyrite and magnetite occur both in the veins and disseminated in the porphyry. The quartz monzonite porphyry thus appears to be the mineralizing intrusion. Weak copper staining is often present where the Jurassic granodiorite comes in contact with limestone of the Oreana Peak and Gardnerville Formations in the vicinity of the Minnesota Mine.

GEOCHEMISTRY

Rock chip geochemical samples were collected from outcrop or sub-outcrop in the Buckskin Range. Ten to 14 small chips were collected from about a 20 foot diameter area from outcrops and from float of local origin for each sample.

Geochemical background (in ppm) for various unaltered rock types is summarized as follows, based upon relatively few samples (refer to Plate 5).

	Tertiary Volcanics	Tertiary Intrusions	Mesozoic Volcanics	Mesozoic Sediments	Mesozoic Intrusions
Cu	-10	10 to 30	5 to 15	35 to 60	10 to 20
Mo	1 to 4	-1 to 5	1 to 2	-1	1 to 4
Zn	10 to 75	40 to 100	30 to 70	20 to 160	40 to 100
Ag	-1	-1	-1	-1	-1
As	-10	-10	-10	-10	-10

The Singatse Tuff tends to be higher in zinc (45 to 75 ppm) than the other tuffs (25 to 40 ppm) but is similar in its content of other elements. Altered tuffs are about the same or lower in Cu, Mo and Zn than fresh tuffs.

The area where Anaconda has drilled intensively (S1/2 of S1/2, Section 36, T14N, and N1/2, Section 1, T13N, R23E, Plate 3) is, in general, relatively lower in Cu, Mo and Zn and higher in As than the surrounding areas.

The Tertiary hornblende diorite porphyry related intrusions are relatively zinc rich and this is often reflected in adjacent wall rocks (77-BR-568, 579, 660, 679, etc., Plate 5).

Sample 77-BR-345 (157996) (Plate 5) is very high in Cu, Zn, and Ag.

The sample comes from vapor-phase Guild Mine Tuff with no apparent surrounding alteration. The sample may have been mislabeled as the rock does not have the appearance of any mineralization.

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Item 15

1976 ANNUAL PROGRESS REPORT BUCKSKIN COPPER PROSPECT DOUGLAS AND LYON COUNTIES, NEVADA

William M. Oriel
Continental Oil Company
Reno, Nevada

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Item 15

1976

ANNUAL PROGRESS REPORT

BUCKSKIN COPPER PROSPECT

DOUGLAS AND LYON COUNTIES,

NEVADA

W. M. Oriel
Geologist
Continental Oil Company
Minerals Department
Reno District Office
May, 1977

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NOTE: The Plates noted with * may be found in the roll which accompanies this report.

SUMMARY

The Buckskin property is a large intensely altered, mineralized, and geologically young porphyry copper prospect that covers nearly 3.75 square miles. Several generations of exploration began in 1967, but only on small parcels on the fringes of the area. Conoco drilled hole BC-1 to 1994 feet in late 1976 with encouraging geochemical results. The results of drilling, geochemistry, induced polarization surveys, geologic mapping and sampling combine to give at least two strong porphyry copper target areas and probably a third (Figures 1, 10, and 11).

Induced potential surveys at Buckskin indicate a large area of sulfide mineralization approximately 9000 feet wide by 12,000 feet long, containing a centrally located elongated zone of apparently more abundant sulfides (Figure 20). Drilling results and limonite mapping largely confirm this pattern. Pyrite is the predominant sulfide in all drill holes, occurring as very fine grained disseminations and in veinlets rarely two inches wide and commonly 1/32" to 1/8" wide. The pattern indicates several geologically permissible models involving a general decrease in volume percent sulfides at depths approximating the limits of the technique (2500-3000 feet).

The large system of mineralization at Buckskin is undoubtedly related to the mineralized later Tertiary porphyry dikes that Bear Creek has dated at 15.7 $\pm$ 1.5 million years in BSW-9. Conoco's mapping indicates a similar age for these dikes. Older Mesozoic(?) phaneritic quartz monzonites crop out on the east flank of the range, however, and are uniformly high in copper. Therefore, it is possible to speculate that there are two widely

separated ages of mineralization at the prospect, but age dates are needed to establish the relationships. If this interpretation is true, then the deep IP anomaly on the down thrown side of the eastern Basin and Range fault could become a separate target for mineralization similar in age to the Yerington deposits.

Because of the nature, age and pattern of the bulk of the mineralization and the geologic environment, it is reasonable to interpret the present erosion surface at Buckskin as the top of a porphyry system that is either upright or tilted westerly, possibly as much as 45 degrees.

The first target area (Figure 1) has the highest probability of (1) being centered over the top of the system and (2) approaching the target closest to the surface. It is between holes BC-1 and BSW-7 (Figure 10) and is strongly altered to clay and sericite and weakly veined with quartz and clay. A breccia pipe and a small pebble dike occur near this area also. Hole BSW-7 encountered 510 feet of 0.16% copper beneath a zinc halo. The copper may have been in the intermediate potassic zone, as may occur at Red Mountain, Arizona (Corn, 1975). The target could be below BSW-7 or to the east because of regional tilting and faulting. It is probable that the target is greater than 1500 feet deep and possibly is much deeper.

The second area should be drilled either contemporaneously or following the drilling of the first target. Structural complexities permit the second target to be located east of hole BC-1.

The third target is on the east flank of the prospect. Uniform copper mineralization in older tilted quartz monzonites near a mineralized Tertiary dike swarm provide intriguing geologic possibilities of either (1) separate but overlapping mineralized episodes or (2) downfaulted mineralized quartz monzonites along the east range. The depth of burial after faulting, and the weaker alteration products overlying the area are reasons for the lower priority of this target. The values of copper in these eastern rocks, however, are very high for the intensity of alteration and in comparison to the other areas of the prospect.

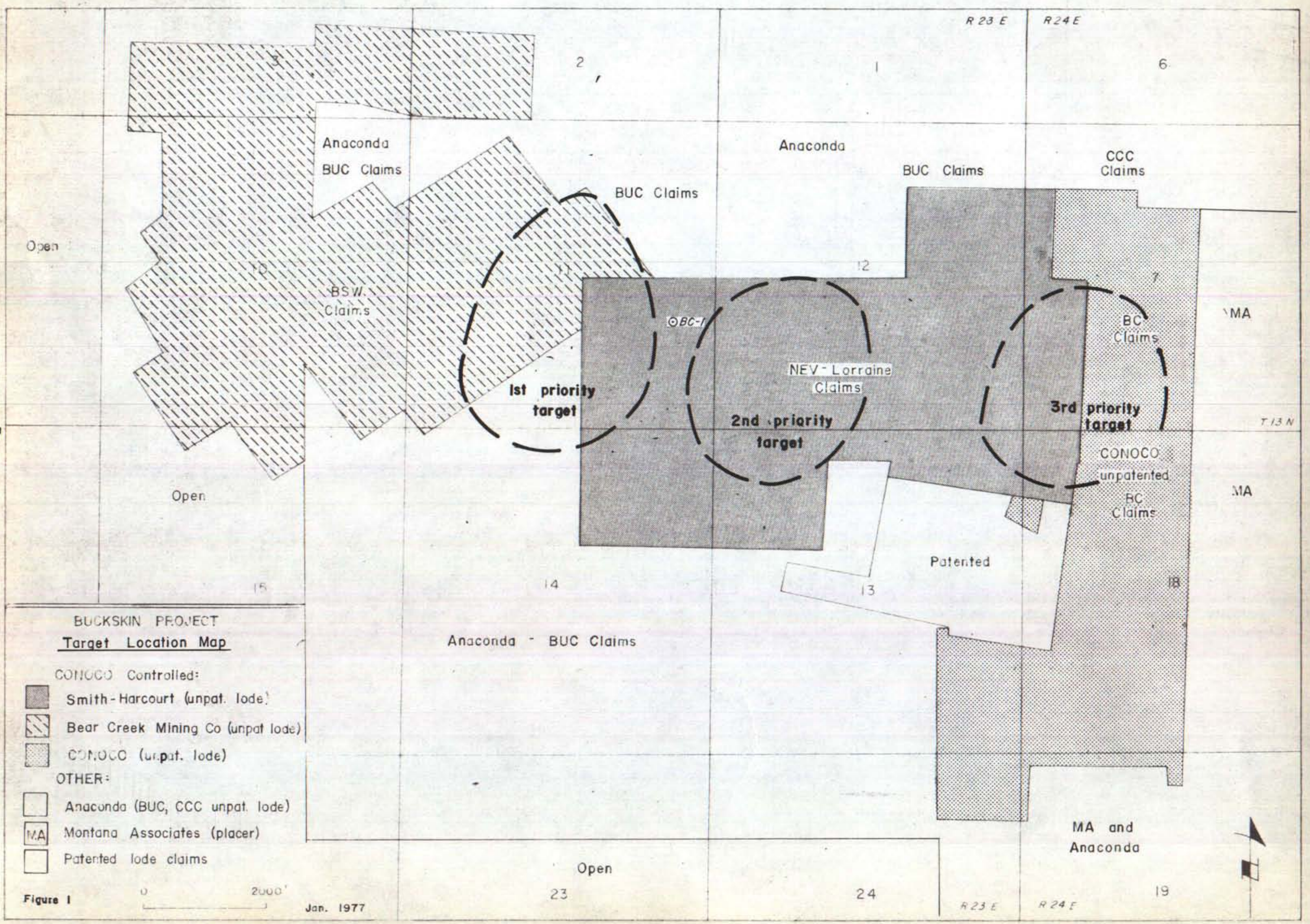
RECOMMENDATIONS

It is recommended that Conoco drill two holes in the first target area to depths of at least 2000 feet in 1977. The area should not be abandoned until at least one hole has been drilled to approximately 4000 feet.

The second target area could be drilled consecutively with the first target area, finances permitting. Otherwise it should be drilled following the results of the primary drilling target.

The third target area deserves consideration in the future, but need not be acted upon promptly. Age dates of the older phaneritic intrusives would meanwhile be useful for geologic interpretation.

Obligations to the contract with Bear Creek Mining Company require that we drill at least 1500 feet upon the BSW claims during 1977. These obligations can be met by drilling within the primary target area as recommended.



R 23 E
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Anaconda
BUC Claims
Anaconda
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Claims
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BUCKSKIN PROJECT
Target Location Map
Anaconda - BUC Claims
CONOCO Controlled:
Smith-Harcourt (unpat. lode)
Bear Creek Mining Co (unpat lode)
CONOCO (unpat. lode)
OTHER:
Anaconda (BUC, CCC unpat. lode)
MA Montana Associates (placer)
Patented lode claims
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Anaconda
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Figure 1
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R 23 E
R 24 E
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INTRODUCTION

Location

The Buckskin district is in Douglas County in west central Nevada, approximately 95 road miles southeast of Reno and 10 miles west of Yerington (Figures 2 and 3). The prospect is in Township 13 North, Ranges 23 and 24 East, in the south central portion of the Buckskin Range. It is easily accessible by dirt roads that are periodically graded throughout the year. The climate is arid and only a few juniper trees exist in the area. The range has relatively low relief and a maximum elevation of 6915 feet.

Property and Ownership

Conoco controls 128 contiguous unpatented lode claims containing approximately 2300 acres spanning the Buckskin Range from east to west. Forty-seven (47) claims are controlled through a joint venture with Bear Creek Mining Co. (BCMC) and 43 are under option from two local residents, Smith and Harcourt. Conoco staked 38 unpatented claims on open ground at the eastern edge of the range as a result of IP data and permissive geology (Figure 4).

Anaconda controls unpatented claims on the north and south margins of our claim block and Montana Associates, a small group of local investors, controls unpatented placer claims adjoining Conoco on the east.

All claims are on public domain lands controlled by the Bureau of Land Management.

A small group of patented claims surround the Buckskin mine at the southeastern portion of our claim group. They are not of interest to

Conoco at the present time.

Holding Costs and Obligations

<u>Bear Creek Joint Venture.</u> Conoco must have spent $200,000 by December 13, 1981 to earn 51% interest. Conoco also must drill 1500 feet yearly upon the BCMC claims (BSW group) until the 51% has been earned.

<u>Smith-Harcourt.</u> An expenditure of $500,000 in annual payments and/or royalty payments to the owners before 1992 will purchase 100% of the 43 "Nev-Lorraine" claims.

Conoco is responsible for assessment obligations for the Bear Creek and Smith-Harcourt claims as well as our own 38 unpatented "BC" claims, on which no assessment work is required until September 1, 1978. No obligations or special requirements exist, other than those imposed upon us by the BLM.

Total payments and expenditures in 1976 were as follows:

<u>Smith-Harcourt</u>: $39,001.60 payed to owners and applicable to the $500,000 end price.

<u>BCMC</u>: Conoco spent $58,178.36 in drilling and other exploration activities which is applicable toward the $200,000 buy-in price.

History and Previous Work

According to some reports the Buckskin district was discovered in 1904 by a prospector who found gold in veins on or near the present "Red Top" patented claims. Subsequently, copper was found below the oxidized gold zones and considerable excitement arose. This resulted in the building of a townsite and the construction of pumping and metallurgical plants. Very little ore was produced, and most activity ceased in 1907 except for the floating of large amounts of stock. The district was rediscovered and re-evaluated in the early 1930's, and as late as 1974 a head frame and mill building were erected. Drilling, however, apparently found no ore and the site is now abandoned.

A more successful mining operation was carried out on combined iron-copper ore in the northern part of the Buckskin range. Iron ore was mined from the Minnesota open pit mine from 1944 to 1966, producing nearly $17,000,000, which is 99.5% of the total values of the district. Exploration and drilling have been carried out sporadically in the district since 1966 and Anaconda currently holds claim to much of the north-eastern part of the Buckskin range. The only published geologic mapping was done by Moore (1969) and recently by Proffett (1977). Both Bear Creek Mining Co., and Anaconda mapped portions of the project area, but the scale and detail were largely inadequate, due to the intense degree of weathering and the complex Tertiary history of the Buckskin Range.

The Yerington, or Weed Heights open pit copper mine has been operating since 1952. It is a porphyry copper mine associated with Mesozoic intrusives. It contained about 200 million tons of about 0.6% copper. Other porphyry copper deposits near Yerington include the Mickey Pass (Ann Mason), Bear, Airport, and Lyon (Pumpkin Hollow) (Figures 3 and 5).

Recent Exploration

Exploration for porphyry copper ore at the Buckskin prospect apparently began in 1966 or 1967 when Phelps Dodge acquired large acreage, including the "Nev" claims, in the eastern part of the property. They drilled holes BUE-1 and BUE-2 to depths of less than 1000 feet on the east flank of the prospect, and BUL-9 to 734 feet in the central portion of the prospect.

Anaconda had control of the "Nev" group until the autumn of 1975. They drilled two holes within our claim group (DH 281 and 289) and several holes bordering our property about which we have no information. Anaconda dropped the property before a large land payment was due.

In 1969, Bear Creek Mining Co., staked claims on the west flank of the range around a turquoise showing. They mapped the prospect and took some rock chip samples which were anomalous. Nine holes were drilled by BCMC, five of which were diamond drill holes centered around their geochemical anomalies, and four others were shallow rotary holes drilled in 1970 in the alluvium to the west. Two of their deep holes, BSW-1 and BSW-7, intersected anomalous mineralization and alteration. Because of their geologic interpretation they tried to follow the mineralization unsuccessfully to the west with drill hole BSW-9.

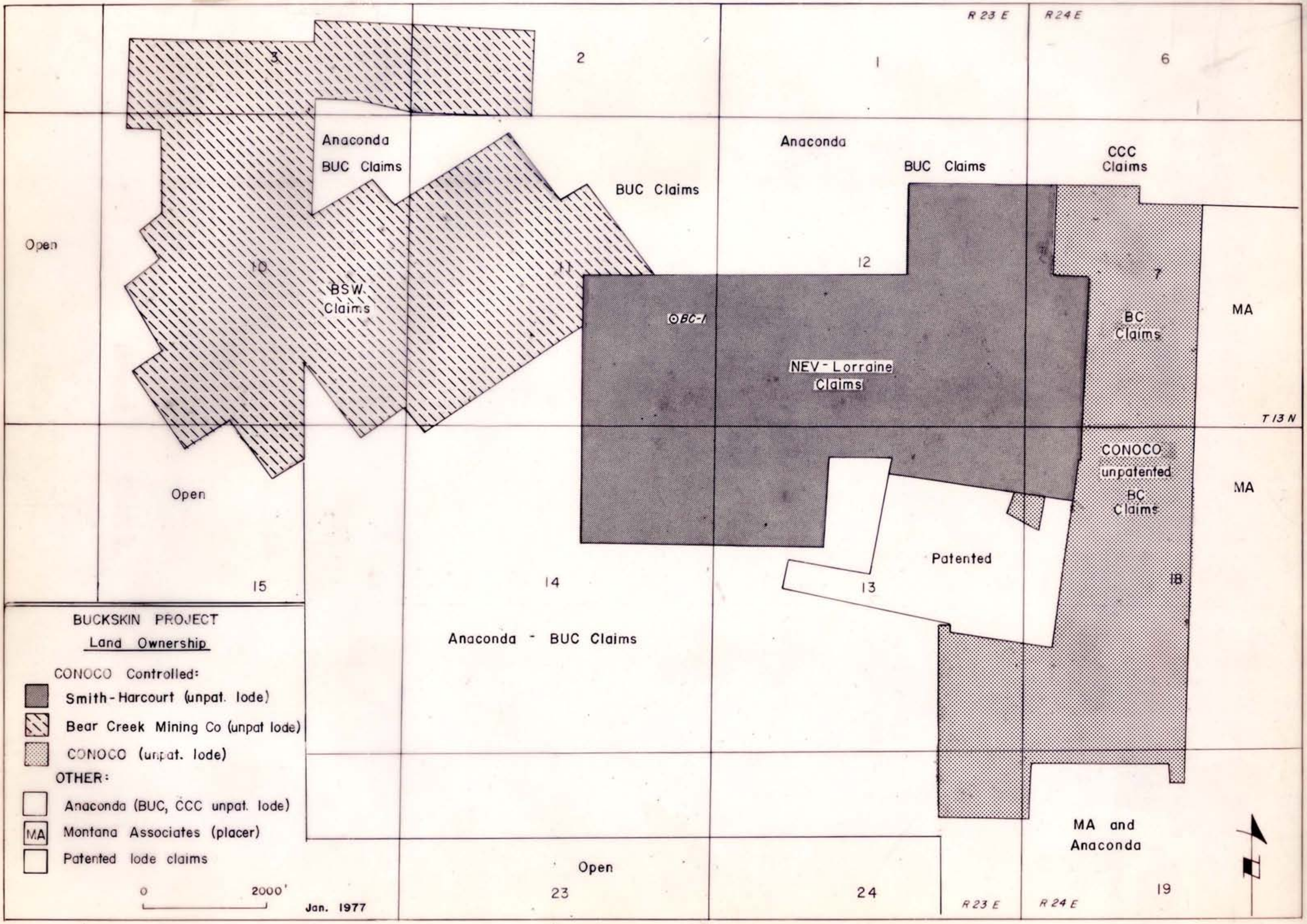
Present Program

Conoco's involvement is partially the result of the fortuitous availability of both the Bear Creek claims and the "Nev-Lorraine" claims. The Conoco staff had the ability to recognize the potential of a large complex sulfide system that had been looked at only in bits and pieces previously.

When the property became available in late 1975 and early 1976, we secured our interests with letters of intent and began a large soil geochemical program to outline the anomalous areas. Detailed geologic mapping and extensive IP surveys were conducted in the summer and fall of 1976, and Conoco began drilling hole BC-1 in September, to a depth of 1994 feet. This report is a summary and interpretation of the mapping, geophysics, geochemistry and drilling conducted during 1976.

Acknowledgements

Mr. P. H. Kirwin was able to act quickly to examine and acquire the two halves of the property when they became available in late 1975. Bear Creek Mining Co., and Kennecott Research have been very cooperative and helpful since we acquired the property. Aubrey J. Beck assisted mapping for several weeks on the Buckskin area and Karen Kling and Pat Brioady helped with drafting and design of the plates and figures. The Conoco staff was helpful in its constructive criticism.



R 23 E
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Anaconda
BUC Claims
Anaconda
BUC Claims
BUC Claims
CCC
Claims
Open
10
11
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7
BSW
Claims
BC-1
NEV - Lorraine
Claims
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CONOCO
unpatented
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Claims
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Open
Patented
15
14
13
18
BUCKSKIN PROJECT
Land Ownership
CONOCO Controlled:
Smith-Harcourt (unpat. lode)
Bear Creek Mining Co (unpat lode)
CONOCO (unpat. lode)
OTHER:
Anaconda (BUC, CCC unpat. lode)
MA Montana Associates (placer)
Patented lode claims
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2000'
Jan. 1977
Anaconda - BUC Claims
MA and
Anaconda
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23
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19
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GENERAL GEOLOGY

The Buckskin prospect is in the southern half of the Buckskin Range at the western edge of the Great Basin Province and near the western margin of the Walker Lane structural zone. It is bounded by a moderately steep east dipping fault on the east flank of the range but is dissimilar to classical basin ranges because it was formed by progressive late Tertiary westward tilting. Crustal extension on the margins of the province possibly caused the tilting (Proffett, 1977). According to Proffett (1977), westward tilting and extension ceased about 11 million years ago and is an important consideration in exploring for mineralized intrusives older than 11 million years.

Metamorphosed Mesozoic volcanic and sedimentary rocks make up the underlying country rock (Moore, 1969). They are intruded by intermediate intrusive rocks in the Yerington area, which are mostly Jurassic in age and often are mineralized. There are extensive mineralized late Tertiary porphyritic dikes and sills locally at Buckskin. They intrude voluminous late Oligocene ash flow tuffs that overlie the Mesozoic volcanics. The porphyry dikes and sills at Buckskin have not been recognized previously for their true age or significance.

PROSPECT GEOLOGY

Mesozoic Volcanic Rocks

The oldest rocks exposed in the vicinity of the Buckskin prospect are undifferentiated Triassic and Jurassic metavolcanic rocks and metasedimentary rocks. They consist of interlayered sandstones, limestones, shales, and felsic and intermediate metavolcanic rocks (Castor, 1971) in the Northern Buckskin Range. In the southern portion of the range, the rocks are primarily andesitic flows, metavolcanic breccias, and tuffs, with rare discontinuous lenses of siltstones and arkoses. Some of the andesites are probably semiconcordant intrusive sills in the volcanic pile. The volcanics all are similar in composition, however, and they are difficult to correlate over small distances even with detailed mapping, because of metamorphism, the superimposition of hydrothermal alteration and Cenozoic faulting. Only the volcanic breccias in the west side of the prospect are distinctive enough to correlate with any confidence. Most of the older rocks have undergone weak regional greenschist-facies metamorphism, causing chloritization and epidotization of the andesites. Because these minerals are principle constituents of the propylitic hydrothermal alteration assemblage surrounding typical porphyry copper deposits, some uncertainties can arise when mapping alteration effects.

Numerous field names were used in mapping the volcanics. They were mostly textural descriptions used to correlate rocks throughout the prospect. Undifferentiated Mesozoic metavolcanics (Mvu) is the dominant variety and consists predominantly of non-descript, very fine grained, weakly foliated andesites. The andesites are probably flows that possessed a weak primary foliation that formed roughly parallel to the ground surface during deposition (pseudo-bedding) that has been enhanced by alteration effects. Mvu was also applied to any metavolcanic rock whose original texture was destroyed by surface weathering or intense alteration.

Fine grained andesite (Mva) is the most abundant volcanic rock other than the undifferentiated Mesozoic volcanics. The plagioclases are generally recognizable in these rocks as opposed to the undifferentiated volcanic rocks. The andesite is probably a less altered rock of equivalent composition.

Metavolcanic breccia (Mvb) consists of elongate clasts several millimeters to rarely a foot long in a fine grained foliated volcanic matrix. The best exposures are in the western portion of the range where they are traceable for thousands of feet. Here they dip moderately to steeply westward and are 300 to 500 feet thick. The foliation in the surrounding volcanics closely mimics the strike of the breccia unit, lending strong support for a primary origin of the foliation.

Silicified volcanics (Mvs) occur throughout the prospect but tend to be concentrated in the western portion of the prospect. Although they were mapped on the photo, they were not shown as specific units on the printed geological map because of doubts about their origin as primary depositional features. They may be included on an alteration map in the future because most of the evidence indicates that they may have been formed by silica metasomatism. The silicious rocks (Mvs) cap hills and form ridges because of their resistance to erosion. They are generally 90% to 100% silica, and some may be replacements of originally porous silicious volcanic rocks. Several outcrops show distinct relict crystals which may be feldspars. The silicified volcanic rocks form discontinuous ridges parallel to foliation but occasionally they are parallel to fractures that cross-cut the pseudo-bedding foliation. In at least one case, the silicification appears to be an altered sedimentary sandstone.

Several breccia units (Mvsb) appear to be the result of silicification of a tectonic breccia.

Several other textural and compositional varieties of volcanics were mapped. Most, however, are merely un-noteworthy variations that are to be expected in a thick volcanic pile. A few varieties such as fine quartz rhyolite (fqr), and fine latite porphyry with quartz (flpq), may have been felsic tuffs or crystal tuffs, but they are rare. Other textural and mineralogical varieties are as follow:

Mvfpa	Fine porphyritic andesite - usually foliated with greater variation in feldspar sizes than other andesites.
Mvpfa	Porphyritic, strongly foliated andesite - uncommon.
Mvha	Hornblende andesite.
Mvhap	Hornblende andesite porphyry - $\geq$ 25% pheno.
Mvpha	Porphyritic hornblende andesite - $\leq$ 25% pheno.

Some of the andesitic rocks can be traced for short distances and some appear to be sill-like intrusive bodies. This is not surprising in a volcanic pile, nor is it surprising that they are difficult to recognize after metamorphism and subsequent hydrolitic alteration.

Mesozoic(?) Intrusives

The oldest mapped intrusive rocks are exposed on the east flank of the prospect. Fine quartz monzonite (Fqm) is the major map unit. Other textural varieties are speckled quartz monzonite (Sqm), fine grained monzonite (Fqm) and medium grained quartz monzonite (Mqm). They are mostly fine grained phaneritic quartz monzonites with slightly varying amounts of mafic minerals and quartz phenocrysts. Although several more varieties exist in drill holes, they are not clearly recognizable on the surface and will not be discussed separately. No contacts can be found between units on the surface and the variations are probably the normal ones found within many intrusive bodies. The intrusive rocks are predominately altered to a moderately pervasive chlorite - calcite - sericite assemblage within the prospect area.

The Mesozoic(?) intrusives are a small pluton which has been tilted approximately 90 degrees westward and which has been truncated by recent Basin and Range faulting (Figures 10 and 11).

Mesozoic(?) Dikes

Several steep dikes, termed coarse latite porphyry (Clp), coarse hornblende - biotite - latite (Chblp) and coarse latite porphyry with quartz (Clpq) intrude the phaneritic quartz monzonite and the Mesozoic volcanics. The dikes are undoubtedly from the same intrusive event but possess minor textural and compositional variations. They are characterized by large, one-half to one inch, K-feldspar phenocrysts with hornblende and biotite in varying amounts and sizes. Smaller ($\leq$ 4 mm) quartz phenocrysts are visible occasionally, but they are always less than one percent in hand specimen. Some of the field name variations are the result of destruction of the fabric by strong sericitization. All other porphyritic dikes in the prospect area are younger and do not possess the characteristic large feldspars.

Tertiary Ash Flow Tuffs

An extensive erosion surface was formed during early Tertiary or possibly Late Cretaceous time, and large volumes of ash flow tuff were later deposited on it. The basal Tertiary deposits, which are probably less than 30 million years old (Proffett, 1976), were rhyolitic ash flow tuffs. They were partially eroded before great volumes of Oligocene to Miocene age ash flow tuffs were deposited (Proffett, 1972, 1976, 1977). Only the basal rhyolites (Trt and Tqrt) and the lower Mickey Pass tuff (Tbt) are preserved at the Buckskin prospect. They dip steeply westward and are locally vertical as a result of progressive regional tilting and faulting. The rhyolitic tuffs are pervasively sericitically altered, and weakly pyritized (±1%). They have been intruded by younger mineralized porphyritic dikes that are associated with most of the hydrolitic alteration and mineralization in the area.

The ash flow tuffs are definitely pre-mineral, although they are not a good host for mineralization or alteration. They thus set parameters for the age of the porphyry system as well as helping decipher the structural problems at Buckskin.

Tertiary Igneous Rocks - Mineralized

Mineralized porphyritic dikes, plugs, and sills occur throughout the prospect and largely post-date the faulting. One dike (Fbhp) was dated at about 15 million years old. Detailed mapping (Plate 2) shows that the mineralized intrusive rocks intrude late Oligocene to Miocene ash flow tuffs and cross-cut the tilted Basin and Range faults (see structural section). They are latitic to dacitic in composition with varying amounts of phenocrystic quartz, hornblende, and biotite. Strong pyritization and sericitic, argillic and propylitic alteration affect the dikes and the country rocks enclosing them (see alteration section).

Some compositional and textural trends occur from east to west. Phenocrystic quartz-rich dikes occur almost exclusively in the east. Dikes of biotite latite quartz porphyry with hornblende (Blqph) form a dike swarm at the east flank of the range and dikes of biotite hornblende porphyry with quartz (Bhpq) and fine quartz biotite porphyry (Fqbp) are also concentrated in the east. Phenocrystic quartz-poor rocks (Fbhp, Hbp and Bhp) are dominant in the central and western portions of the district. The dikes on the west tend to be fine grained also and the biotites are less stacked than in the dikes on the east and central parts of the prospect.

Fine biotite quartz porphyry (Fbqp) is perhaps the oldest of the mineralized Tertiary porphyries. It occurs only on the east flank of the range as several small dikes up to 100 feet wide and 600 feet long. In thin section, 2-3 mm rounded quartz phenocrysts and biotite books 2 mm thick and 4 to 5 mm long are set in a felted groundmass. Microlites of plagioclase and K-feldspar are normally ½ to 1 mm long. Hornblende

(±0.2 mm) is widespread in the groundmass and sphene and apatite are common accessories.

Biotite-hornblende porphyry (Bhp) and hornblende-biotite porphyry (Hbp) are compositional variations of the same rock. They occur as small dikes and irregular sills up to 2500 feet long and 600 feet wide in the central area. Stacked biotite phenocrysts 3 to 5 mm wide characterize both these rocks. The hornblende-biotite porphyry megascopically has more large hornblende crystals, however. Feldspars are as large as 5 mm but are subdued by alteration. Quartz is rare in both these rocks with the possible exception of biotite-hornblende-porphyry with quartz (Bhpq).

Biotite-hornblende-porphyry with quartz (Bhpq) is similar to the above rocks except for containing 5% quartz phenocrysts and having more hornblende in thin section. A gradational contact to Bhp was mapped in the field but should be re-examined this summer.

Fine-grained biotite-hornblende porphyry (Fbhp) is compositionally very similar to biotite-hornblende porphyry (Bhp) and may be texturally gradational into it. It can be distinguished by the much smaller biotite phenocrysts that are distinctly less stacked. These dikes occur exclusively in the west portion of the district and have been dated by K-Ar methods at 15.7 ± 1.5 million years in hole BSW-7 (Nielsen, 1975).

Biotite, latite quartz-porphyry with hornblende (Blqph), is a common rock in the eastern area and is probably one of the youngest of the mineralized porphyries. Large, rounded and embayed quartz phenocrysts 3 to 6 mm long, stacked biotite books 3 to 5 mm high, and large plagioclase and feldspar phenocrysts 4 to 5 mm long are characteristic for field identification. Quartz phenocrysts are not common and can be lacking altogether in thin section. One or two in a fist-sized specimen is typical, and smaller, one mm crystals are common.

Fine-foliated hornblende quartz dacite porphyry (Fhqdp) occurs as small east-west trending dikes in the central and eastern parts of the property. They are very young and cut most of the mineralized porphyries except Blqph with which it doesn't come in contact. These rocks are very dark and fresh looking on the surface, and at first they were thought to be post-mineral. Thin sections reveal very fine disseminations of up to 5% pyrite and greater alteration than previously recognized.

Quartz biotite hornblende dacite porphyry (Qbhdp) forms dark dikes that are weakly chloritized but apparently are not mineralized with sulfides. These are among the latest dikes as determined through mapping.

Breccias

Breccias are limited to the western side of the prospect. A small pipe-like tectonic breccia containing porphyry and volcanic fragments in a rock flour matrix crops out about 500 feet northeast of hole BSW-1 (Plate 2). Float mapping indicated its dimensions as approximately 400 feet by 100 feet. A small pebble dike containing rounded silicified fragments of metavolcanics crops out east of the breccia. It is about six inches to a foot wide and dips 52 degrees to the east.

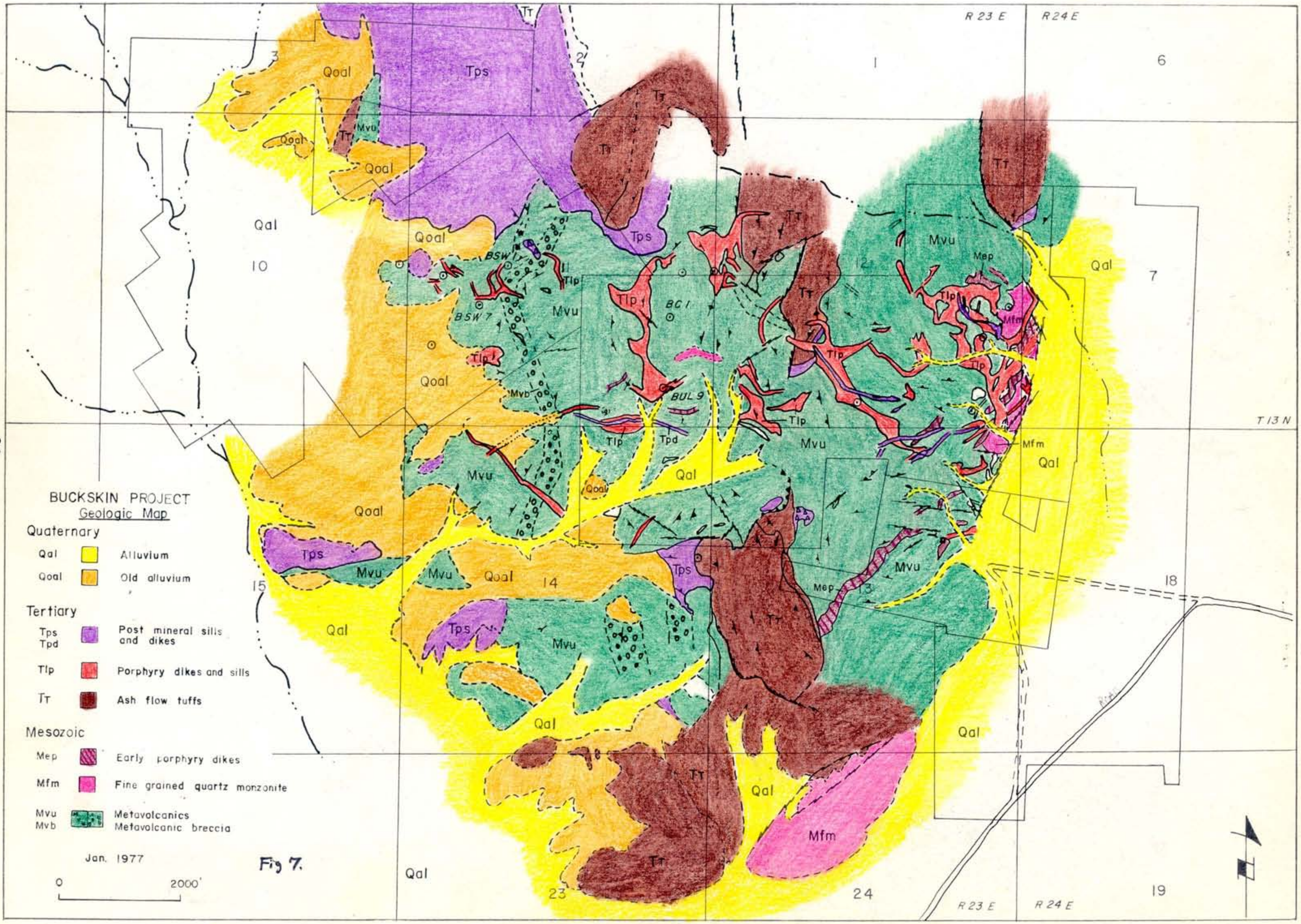
A small outcrop of breccia with a questionable porphyritic matrix with biotite hornblende porphyry and fine grained phaneritic(?) igneous fragments occurs southwest of hole BUE-9. It is highly altered to sericite and clay, and the nature of the matrix is difficult to distinguish.

Tertiary(?) Lake Sediments

Slightly westward tilted lake sediments fringe the western margins of the prospect. Their gentle dip implies they are probably 11 million years old or younger.

Quaternary Alluvium

Quaternary alluvial deposits can be separated into older and younger products of erosion. The old (Qoal) deposits are distinguished by granitic cobbles foreign to the Buckskin area. Recent alluvium fills valleys and covers gentle slopes.


BUCKSKIN PROJECT
Geologic Map
Quaternary
Qal Alluvium
Qoal Old alluvium
Tertiary
Tps Tpd Post mineral sills and dikes
Tlp Porphyry dikes and sills
Tт Ash flow tuffs
Mesozoic
Mep Early porphyry dikes
Mfm Fine grained quartz monzonite
Mvu Mvb Metavolcanics Metavolcanic breccia
Jan. 1977
Fig 7.
0 2000'
R 23 E
R 24 E
T 13 N
Qal
Qoal
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Tlp
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Mvu
Mvb
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Mfm
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STRUCTURE

Proffett (1972, 1976, 1977) studied the Cenozoic structure of the Yerington area in detail for several years while working for Anaconda. He concluded that Basin and Range faulting accompanied regional westward tilting from Late Oligocene through at least early Miocene (Figure 13). This resulted in steeply dipping recent Basin and Range faults, mostly on the east flanks of ranges, but strongly tilted older inactive Basin and Range faults that are so gently dipping that they were earlier presumed to be gravity slide blocks.

Conoco's detailed mapping strongly supports Proffetts work. There are several older Basin and Range faults in the Buckskin area possessing gentle dips in the order of 20 to 30 degrees east (Figures 10, 11, and 13). They are easily recognized and traced where erosional remnants of the Oligocene ash flow tuffs are preserved. Faults within the metavolcanic country rocks, however, are extremely difficult to locate in the immediate vicinity of the prospect. Tertiary mineralized porphyry dikes have intruded along and across most faults and cut the ash flow tuffs (Plate 2, Figure 14).

Numerous other smaller presumed fault blocks which are defined best by juxtaposition of foliations within the metavolcanics are present within the large tilted Basin and Range fault blocks. Many of the bounding faults are only presumed to be present because of the lack of outcrop. The foliations in the Mesozoic country rocks dip moderately to steeply west and strike north-south except in the eastern quarter of the prospect where they strike east-west and dip mostly north 45 to 65 degrees. There is no apparent folding and the postulated structural feature responsible for the large change in foliation does not fit well into the Cenozoic pattern of faulting. It is possible that it is a pre-Tertiary structure.

Most of the metavolcanics apparently were not disturbed by faulting until after the Oligocene ash flow tuffs were deposited. Foliations mimicking pseudo-bedding in the volcanics are nearly parallel to the ash flow tuffs that were deposited horizontally upon them. In the southwest part of the prospect the old pre-Oligocene erosion surface can be traced and hills and gullys preserving older ignimbrites are recognizable.

Some gentle folding of the metavolcanics can be seen in the breccia units on the west flank of the range (Plate 2). The fold axes trend west-northwest nearly coincident with the outcrop appearance of turquoise. The folding is also subparallel to the moderate and strong IP anomalous trends, suggesting it may be involved in some way with the mineralization event. It is probable that the turquoise is formed late as a result of supergene activity controlled by the fold axes.

An apparent thrust fault dipping gently west at the south-central edge of the property has emplaced Mesozoic volcanics over Tertiary ash flow tuffs. From present information it is not possible to determine if it is a true thrust fault or a gravity slide from the higher hill to the east. There does not appear to be an extensive gouge zone developed although much of the fault is covered by alluvium.

The trends of the faults are mostly north-south, northeast and west-northwest. The northerly trending faults are the traces of the old eastward, steeply dipping Basin and Range faults which are now tilted to the west so that the fault plane dips gently to the east (Figures 11, 12, and 13). Because of the trough-like nature of the old Basin and Range faults, they usually curve into north-west trending boundaries on the south ends of the blocks and trend to the northeast on the north end of the blocks (Proffett, 1977). Often these blocks are terminated by later northeast and northwest trending faults (Figure 11).

Most of the later northeast and west-northwest faults displace Mesozoic(?) dikes and possibly some Tertiary dikes in a right lateral sense. In a series of west-northwest trending faults which disect a Mesozoic (Clp) dike, some of the interior fault blocks have moved their segments of the dike right laterally farther to the east than adjacent faults and thereby locally producing an apparent left lateral sense of motion of several hundred feet.

Tilting and reduction of dip and curvature of early normal fault (fault of Fig. 8) by tilting due to displacement on later normal fault. Note that vertical displacement as well as tilting are due to hanging-wall block adjusting in shape to fill a potential void resulting from horizontal extension between hanging wall and footwall. Hanging wall could have adjusted to its new shape by development of antithetic faults instead of tilting, as has clearly been shown by Hamblin (1965), but in Yerington district tilting was dominant.

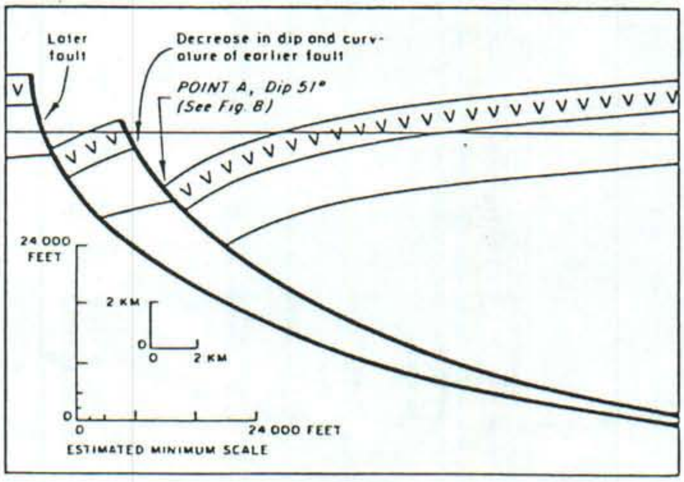
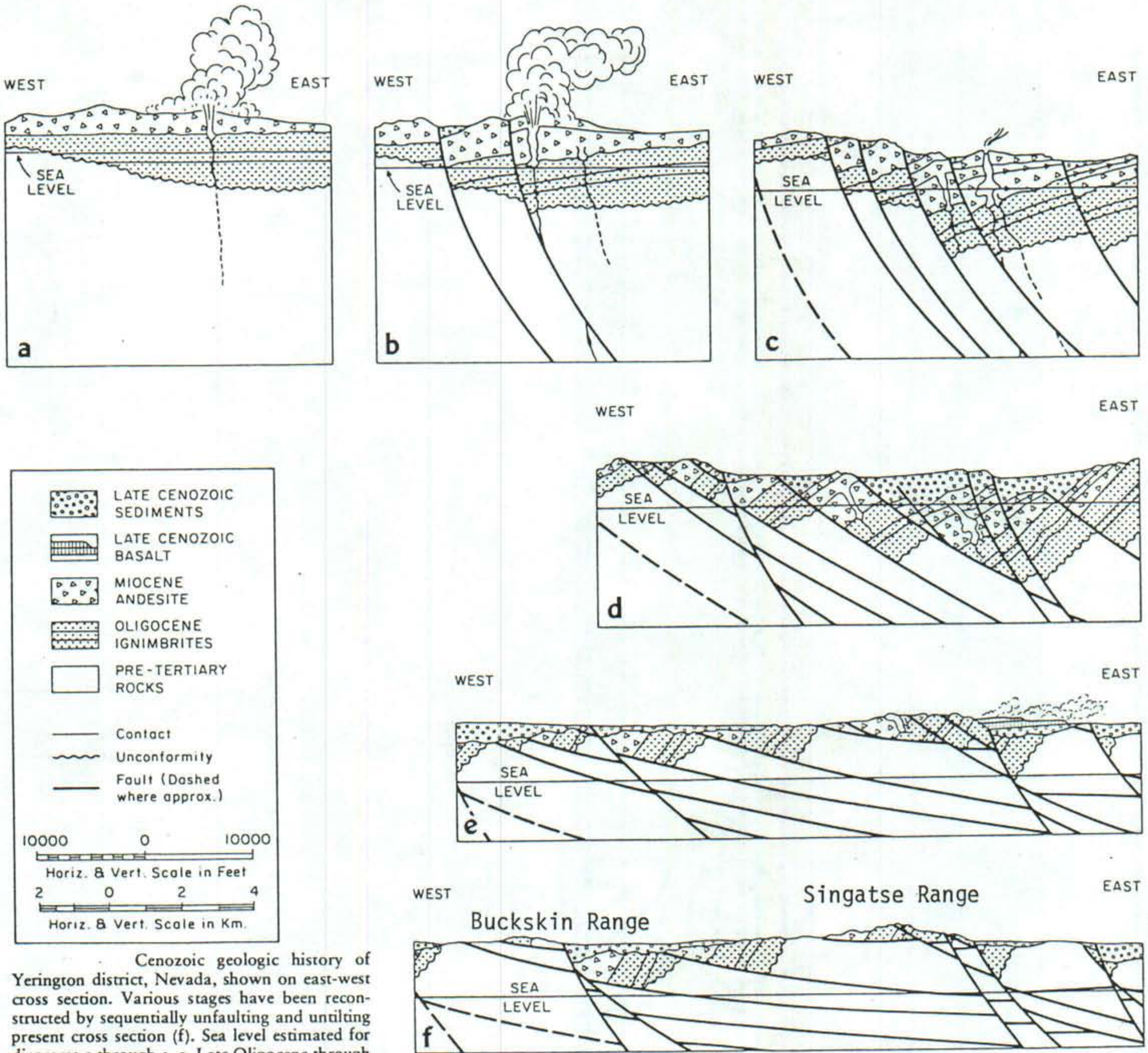


Figure 12

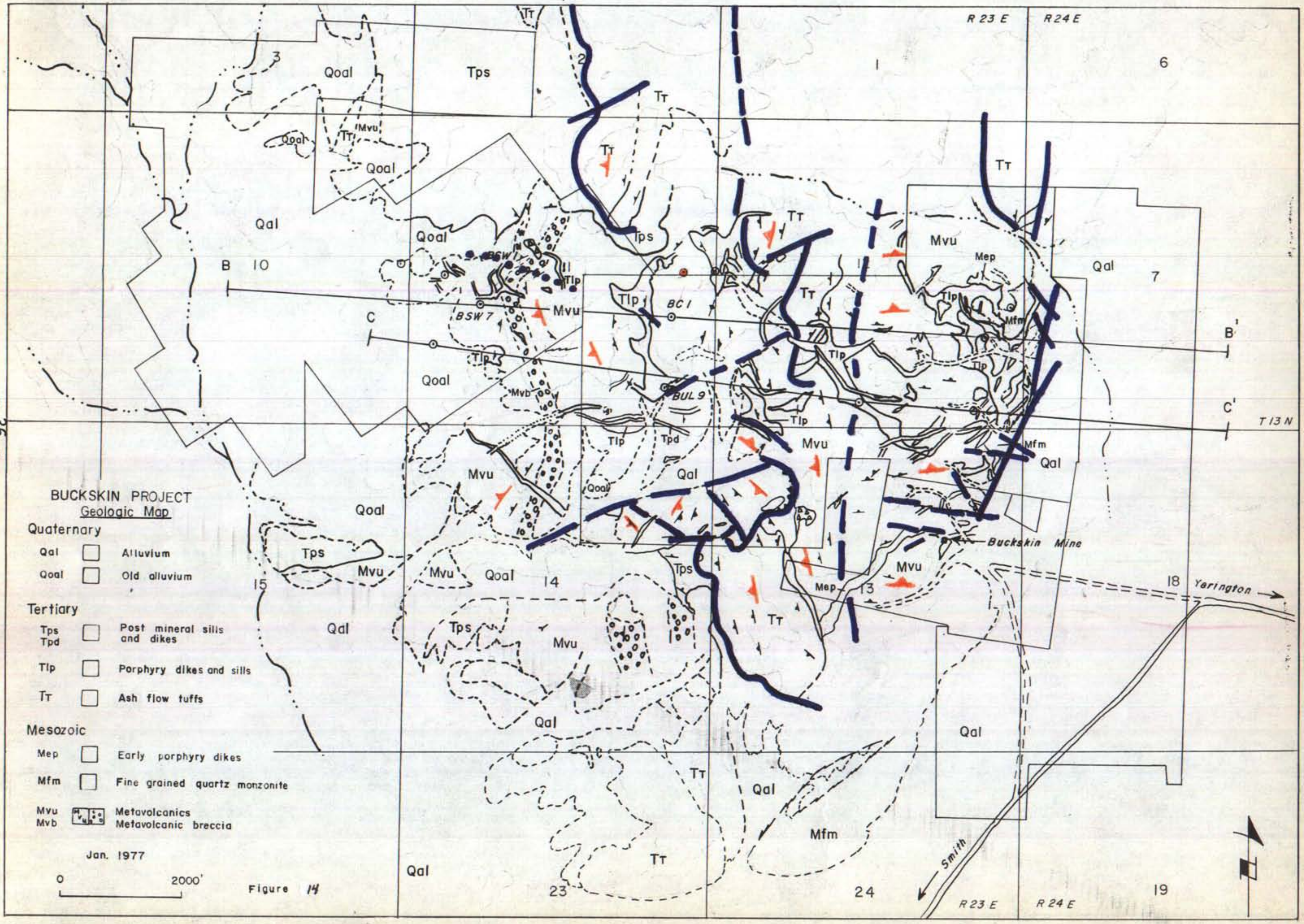
Tilting of Basin and Range faults
From Proffett, 1977



Cenozoic geologic history of Yerington district, Nevada, shown on east-west cross section. Various stages have been reconstructed by sequentially unfaulting and untilting present cross section (f). Sea level estimated for diagrams a through e. a, Late Oligocene through early Miocene; deposition of ignimbrite sequence followed by beginning of deposition of hornblende andesite, 18 to 19 m.y. ago. b, Early Miocene, 17 to 18 m.y. ago; continued eruption of andesite and beginning of Basin and Range faulting and tilting. c, Early Miocene, 17 m.y. ago; end of andesite volcanism and continued Basin and Range faulting with erosion of up-faulted blocks. d, Early and middle Miocene, 11 to 17 m.y. ago; continued faulting, tilting, erosion of ranges, and deposition of sediments in basins. Early faults rotated to such a flat dip that they are no longer in favorable orientation for continued faulting. New steeper faults form to take their place. e, Eight to 11 m.y. ago; all early faults tilted to gentle dips and inactive, but faulting and tilting continues on newly formed steep faults; erosion of ranges and deposition of sediments and locally basalt in basins. f, Present time; continued faulting and tilting along steep range-front faults, erosion of ranges and deposition in basins.

Figure 13

Cenozoic Structural History
From Proffett, 1977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Jan. 1977
0 2000'
R 23 E
R 24 E
T 13 N
B
B'
C
C'
BSW 7
BC 1
BUL 9
Buckskin Mine
Yarington
Smith
3
2
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11
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19
Qoal
Tps
TT
Qal
Mvu
Tlp
Mvb
Tpd
Mep
Mfm
Figure 14

ALTERATION

Field observations defined the following pervasive mineral assemblages which appear to form alteration zones: sericite, strong clay-sericite, weak clay-sericite, mixed sericite-chlorite and chlorite-epidote. Field alteration studies of weathered outcrop are of necessity general and occasionally unreliable. Thin section studies of 112 surface and 134 drilling samples tend to confirm the patterns established in the field at Buckskin, however.

The sericite zone covers most of the prospect. It extends to the southwest and the northeast beyond our property line but has a relatively sharp north-south trending boundary with the mixed sericite-chlorite (propylitic) zone on the east (Figure 19). This boundary is interrupted in the north and west portions of the prospect by patches of clay-sericite (argillic to advanced argillic) and mixed sericite-chlorite. The feldspars and the groundmass in this zone are typically 80% or more replaced by sericite. Accessories such as sphene and apatite are relatively unaltered. Strong surface leaching of the sulfides is everywhere apparent within the sericite zone. The limonites are predominately jarosite even where the initial sulfide content was low.

The largest clay-sericite alteration zone is in the west. Sericite and low birefringence clays are pervasive in this zone. Rarely the K-feldspars are only 50% altered. Some silicification of the groundmass occurs and quartz and clay veins are most common in these localities. The surface boundaries of this alteration zone were defined by the presence of sparse clay and alunite veining. Preliminary X-ray diffraction data by Mr. Bamford indicate that the western and largest area of strong clay-sericite may represent advanced argillic alteration as defined by the presence of natro-alunite, diaspore and pyrophyllite. The central elongate strong clay-sericite zone centered about hole BC-1 probably does not represent advanced argillic alteration. The clay veins here are metahalloysite, and alunite is apparently not present. The clay veins are probably supergene products.

The weak clay-sericite alteration has been studied in hand specimen only. It is found in the ash flow tuffs of the Mickey Pass sequence and is defined by a greater percentage of clay than is present in the strong clay-sericite zones and yet weaker intensity of alteration. Rock type may be an important factor in this zone because the original tuff apparently contained a great deal of clay. It is not immediately obvious what the significance of this zone is.

The mixed sericite-chlorite zone forms most of the eastern part of the prospect and possibly more of the central portions of the prospect than previously was recognized. On the surface it is characterized by weak to strong sericite mixed intimately with weak to moderate chlorite both microscopically and megascopically. Thin sections reveal a chlorite - sericite - calcite - epidote alteration assemblage in both dikes and volcanic country rock. The intensity or thoroughness of the alteration varies considerably from about 15 volume percent chlorite - calcite - sericite to greater than 90%. Mapping of the intensity from thin sections has not been undertaken at this time.

Propylitic alteration is found in the northern and southern portions of the property in late Tertiary sills and plugs. It also occurs in relatively fresh looking Mesozoic andesites. Regional metamorphism probably accounts for the propylitic assemblage in the older volcanics. The alteration appears to be deuteric in the younger sills and dikes and is probably unrelated to the overall hydrothermal system which produced the other suites of minerals.

Bear Creek drilled five diamond drill holes in the western part of the prospect. A moderate to strong pervasive sericite - clay - quartz ± chlorite and calcite assemblage occurs in BSW-1 to about 600 feet depth. This assemblage surrounds the highest copper interval in the hole from 320 to 450 feet. Minor secondary biotite with chlorite alteration of mafics occurs in a dike at about 660 feet and again in a smaller dike at 820 feet. It is uncommon and does not appear to be related to higher copper values. The first dike also has strong sericite and occasionally moderate chlorite and calcite alteration to about 700 feet. Strong quartz-sericite (phyllic) alteration continues to about 1100 feet and decreases in intensity to the bottom of the hole at 1313 feet. Traces of calcite and chlorite alteration are also present near the bottom of the hole.

There is no core from the surface to 464 feet in BSW-7 but Bear Creek logs indicate there is mixed sericite - chlorite pervasive alteration. Extreme to very strong pervasive quartz - sericite - pyrite (phyllic) alteration occurs from about 400 feet to 780 feet. Pervasive biotite - chlorite - sericite (intermediate potassic) alteration from 780 feet to 860 feet coincides with the highest copper values. Late chlorite (±calcite) veinlets are prominent in this zone and are associated with most opaques in detail. Overall, however, there is a strong association of copper and the secondary biotite - sericite - chlorite assemblage. Strong quartz-sericite occurs from 860 to about 1500 feet and then gives way to weak to moderate chloritization to the bottom at 1715 feet. Some quartz veins and numerous late chlorite - calcite ± pyrite veinlets are common throughout the hole. Gypsum veinlets occur from 700 feet to the bottom of the hole.

Hole BSW-9 encountered moderate to strong pervasive chlorite and sericite alteration both above and below the higher copper interval, from 750 to 1050 feet. This alteration assemblage is associated with high zinc values as it also is in drill holes BSW-7, BSW-1 and BC-1. The higher copper interval contained moderate to strong pervasive sericite - chlorite and siderite(?) alteration but no secondary biotite as in BSW-7.

Conoco's hole BC-1 encountered moderate to strong pervasive sericite - chlorite - calcite alteration in the top 1000 feet of the hole associated with strong lead-zinc mineralization. Clay veins (metahalloysite), quartz - calcite - chlorite veinlets and late chlorite veinlets also are common. The clay veins may be a surface weathering product and may not be representative of hypogene alteration. Epidote - chlorite - calcite - actinolite alteration is strong and pervasive from 1000 to 1650 feet with occasional massive epidote lenses occurring to the bottom of the hole. Zones of strong quartz sericite alteration, one inch to several feet wide, overlap the epidote - chlorite - amphibole alteration from 1650 feet to 1994 feet accompanying an increase in lead and zinc and total sulfides. Vein and disseminated tourmaline occur at 1942 feet.

Overall the hole has mostly a propylitic alteration assemblage with increasing amphibole, tourmaline(?) and strong quartz - sericite zones near the bottom of the hole. Mr. Bamford's X-ray diffraction of the 100 feet composite pulps from hole BC-1 show the presence of orthoclase from 1200 to 1960 feet. His total X-ray results are shown below.

Interval of composite pulps in feet	Quartz	Sericite	Chlorite	Calcite	Amphibole	Orthoclase
20 - 100	x	x				
100 - 200	x	x				
200 - 300	x	x	x			
300 - 400	x	x	x	x		
400 - 500	x	x	x	x		
500 - 600	x	x	x	x		
600 - 700	x	x	x	x		
700 - 800	x	x	x	x		
800 - 900	x	x	x	x		
900 - 1000	x	x	x	x		
1000 - 1100	x		x	x	x	?
1100 - 1200	x	x			x	?
1200 - 1300	x	x	x		x	x
1300 - 1400	x	x	x	x	x	x
1400 - 1500	x	x	x	x		x
1500 - 1600	x	x	x	x	x	x
1600 - 1700	x	x	x	x		x
1700 - 1800	x	x	x	x		x
1800 - 1900	x	x	x	x	x	x
1900 - 1960	x	x	x	x		x

Holes Bue-1, Bue-2, D-281, and D-289 on the eastern portion of the property all have alteration assemblages roughly corresponding to surface samples. Pervasive mixed sericite - chlorite - calcite ± epidote alteration occurs in varying proportions and mostly with weak to moderate intensity. No definite trends of intensity or proportion of alteration minerals can be determined at this time.

Although the extreme eastern area shows no clear trends the holes in the west, including hole BC-1 show rough alteration zoning trends. Hole BSW-7 encountered a sericite - chlorite zone (propylitic?) high in the hole associated with a strong zinc anomaly. This alteration passes into a very strong quartz - sericite - pyrite zone which gives way to a chlorite -

biotite - sericite assemblage associated with the highest hypogene copper values yet drilled on the property. This assemblage is by no means the "core" potassic zone of a classic porphyry system, but may instead be the outer margins of what may be termed an intermediate potassic zone such as is found at Red Mountain, Arizona (Corn, 1975). Alteration decreased below the chlorite - biotite zone (intermediate potassic) to a mixed sericite - chlorite (propylitic) assemblage again. This possibly indicates that the hypogene system may be slightly tilted and therefore plunging, perhaps steeply, to the east; or possibly the alteration is following a structural zone of weakness that is tapping the main system to the east.

Holes BSW-9 and BSW-1 lack the extreme quartz-sericite alteration and the chlorite - biotite assemblage of BSW-7. Therefore it appears that the system does not extend to the north, west or southwest, and hence must lie east or southeast of BSW-7. Surface alteration mapping also indicates an area east or southeast of BSW-7, centered near the advanced argillic alteration zone, as the primary target area (Figure 19). Hole BC-1 has an expanded sericite - chlorite (propylitic) zone with increasing amounts of amphibole and orthoclase near the bottom. This could indicate that either the hole was drilled very high over the top of the system or obliquely down the side of the target. If the latter is the case, then BC-1 would have to be northerly (north, northeast, or northwest) of the target due to geolocical, geophysical and geochemical evidence. 9

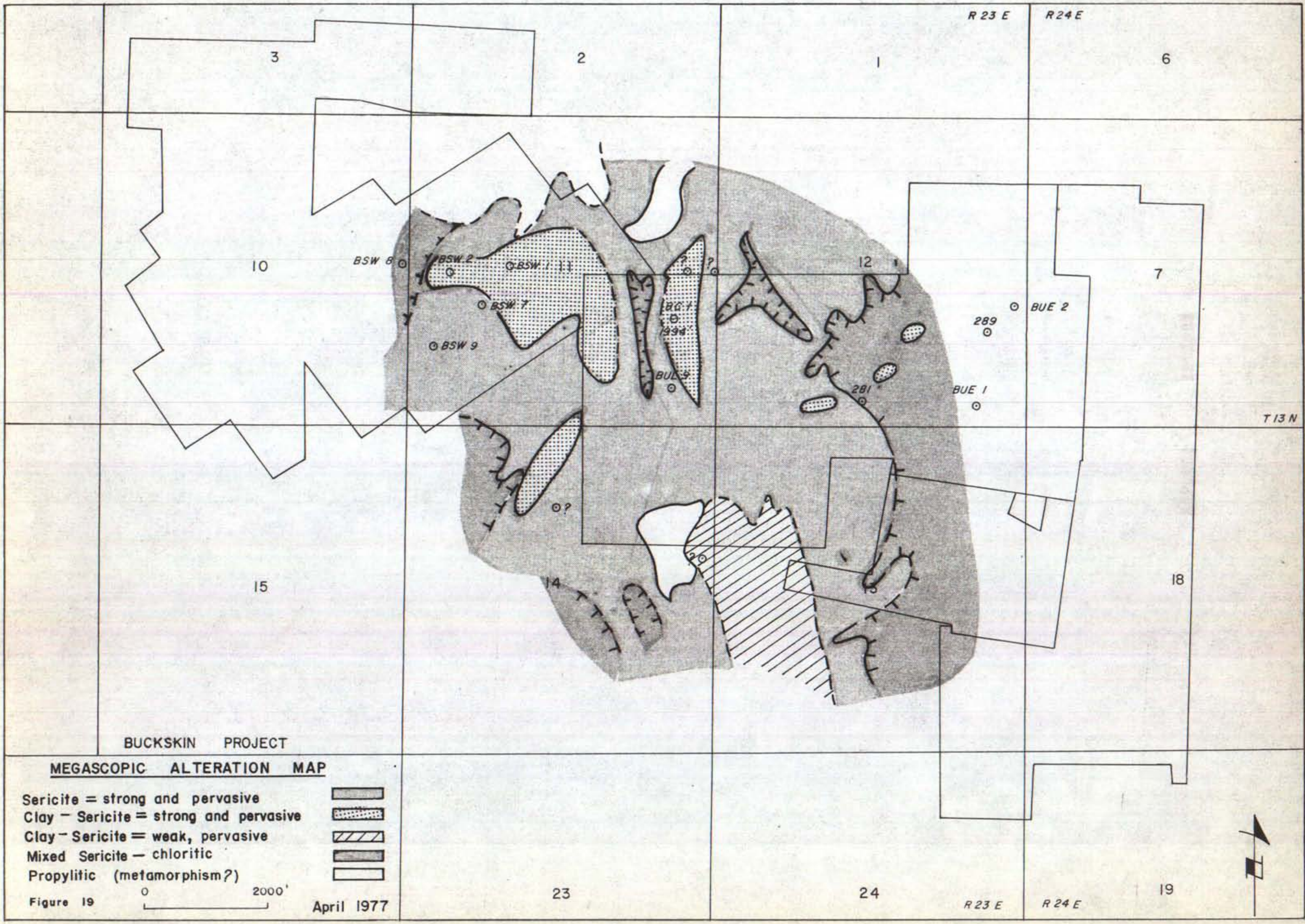


Figure 19

April 1977

LIMONITE CAPPING

Surface mineralization consists predominately of limonites that formed after pyrite. A few patches of less weathered rocks bearing fresh disseminated pyrite occur randomly throughout the prospect. Figure 35 is a volume intensity summary map of surface limonites. It depicts only my visual estimates of "moderately" abundant limonites on fractures, combined with a jarosite content generally greater than 75% of the total limonite volume. Its shape and size agree fairly well with the moderate IP response, which represents about four to five percent pyrite in drill holes (see discussion on Induced Polarization).

Hematite stains are scattered everywhere, but in a manner that is not amenable to mapping. Typical "lavender" hematite after chalcocite can be seen in a few places and drilling in holes BSW-1, 2, 7 and 8 indicates there is a small amount of secondarily enriched copper beneath the surface staining. "Brick red" hematite stains are also common and usually are associated with small fractures or fault zones. This color and type of occurrence is not related to copper mineralization.

Jarosite is typical of the thoroughly leached zones overlying moderate to strong pyritization and usually occurs in areas of sericitic and/or argillic alteration, possibly because leaching is favored by these alteration products.

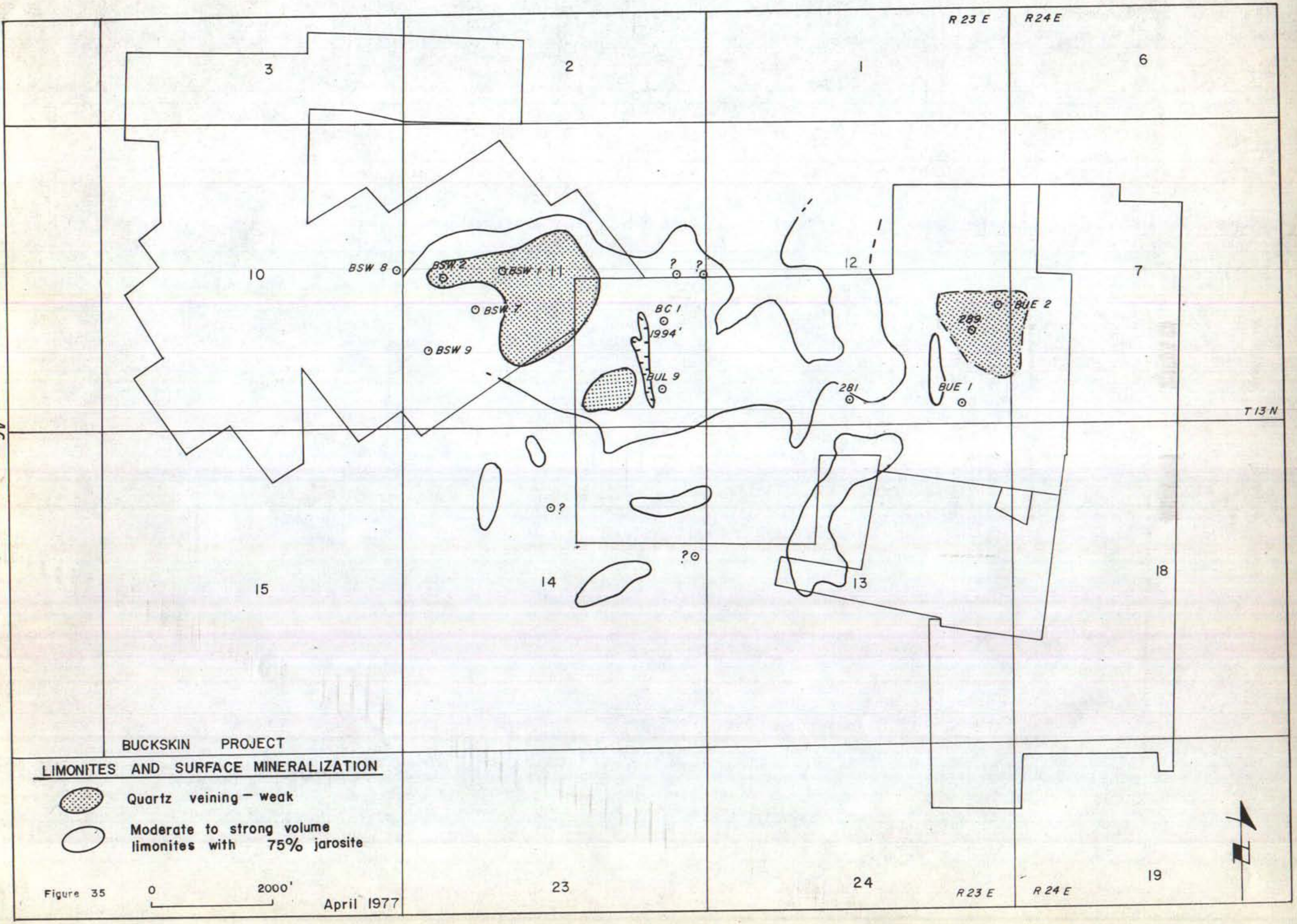
Goethite stains on fractures are found in less altered rock indicating generally less disseminated pyrite than the area of predominately jarositic limonites. Goethite is more abundant in the propylitically altered volcanics on the east flank of the prospect.

All three limonites can be found on separate fractures in practically the same hand specimen, but they are characteristically fairly pure. Jarosite is usually 90% pure (estimated) and only occasionally has more than 10 to 20% blended hematite and/or goethite. The same is true for the hematite stains. Goethite may have more mixtures of jarosite and hematite, but it is more difficult to estimate the impurities in goethite.

Turquoise veinlets are abundant in roughly linear west-northwest trending zones on the eastern and western sides of the property. They do not quite join in the center of the prospect (Plate 8).

Outcrops showing malachite, azurite and "neotocite" (Mn-Cu oxide) are sparse. These minerals can be found along small veinlets and fractures. They occur in weakly altered and mineralized fringe areas where strong leaching has not taken place. Their presence is not related to, or representative of, soil geochemistry.

Small quartz veinlets invade the Mesozoic volcanics in the vicinity of the Bear Creek holes BSW-2, 7, and 1, and locally on the east (Figure 35). They are not abundant and do not form the typical stockwork veining of many porphyry copper systems.



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BUCKSKIN PROJECT

LIMONITES AND SURFACE MINERALIZATION

Quartz veining — weak

Moderate to strong volume limonites with 75% jarosite

Figure 35

April 1977

GEOCHEMISTRY

Soil Geochemistry

Soil samples were collected over a large area for geochemical analysis early in 1976 as a first step in defining the Buckskin system. To this end the program was entirely successful.

Approximately five hundred samples were collected on a 600 by 300 foot grid and assayed for copper, molybdenum, lead, zinc, and silver. The property has only a thin to non-existent soil horizon overlying a few inches to several feet of decomposed bedrock. The samplers tried to consistently collect the finer material from the top of the decomposed bedrock. Quaternary alluvium was also sampled and serves as a rough guide to background values. Contour intervals were selected by comparision of frequency histograms of the values of each element.

All elements have closely similar outer limits defining the geochemically anomalous areas. Only the distribution of the higher values changes significantly within this pattern. It should be noted that the geochemically anomalous values do not coincide directly with the strongest alteration. Although the values generally define a large roughly east-west trending system, three areas (western, central and eastern) can be separately discussed.

The western anomaly was drilled by Bear Creek before 1973. It consists of a copper anomaly with weak zinc and silver anomalies. The outer or western part of the central lead anomaly just touches this area. Widespread thin veinlets of turquoise may account for the high copper values, but a thin blanket of supergene chalcocite 120 to 170 feet deep underlies the surface anomaly.

The central anomaly is a large bulbous shaped area containing high values of lead and silver, moderate zinc and low copper. Its eastern boundary is roughly defined by decreasing values in the vicinity of a large tilted Basin and Range fault which drops Tertiary ash flow tuffs down against Mesozoic metavolcanics. These ash flow tuffs are sericitically altered but are apparently a poor host for mineralization. Drilling indicates the high lead-zinc values are representative of the underlying bedrock, but the anomalous zone may dive westerly beneath the western geochemical anomaly.

The eastern anomaly is characterized mostly by northeasterly trending linear zones of higher values of copper, lead, and zinc, within a broad area of moderately anomalous values. Lead is a possible exception in that its linear elements form a roughly arcuate zone. This linearity may in part be due to drainage. Most drainages, however, trend easterly and not northeasterly. The soil survey terminated to the east in alluvium parallel to the fault that bounds the range. Not much is presently known about the controls of mineralization in the east or exactly how it relates to the central and western soil anomalies.

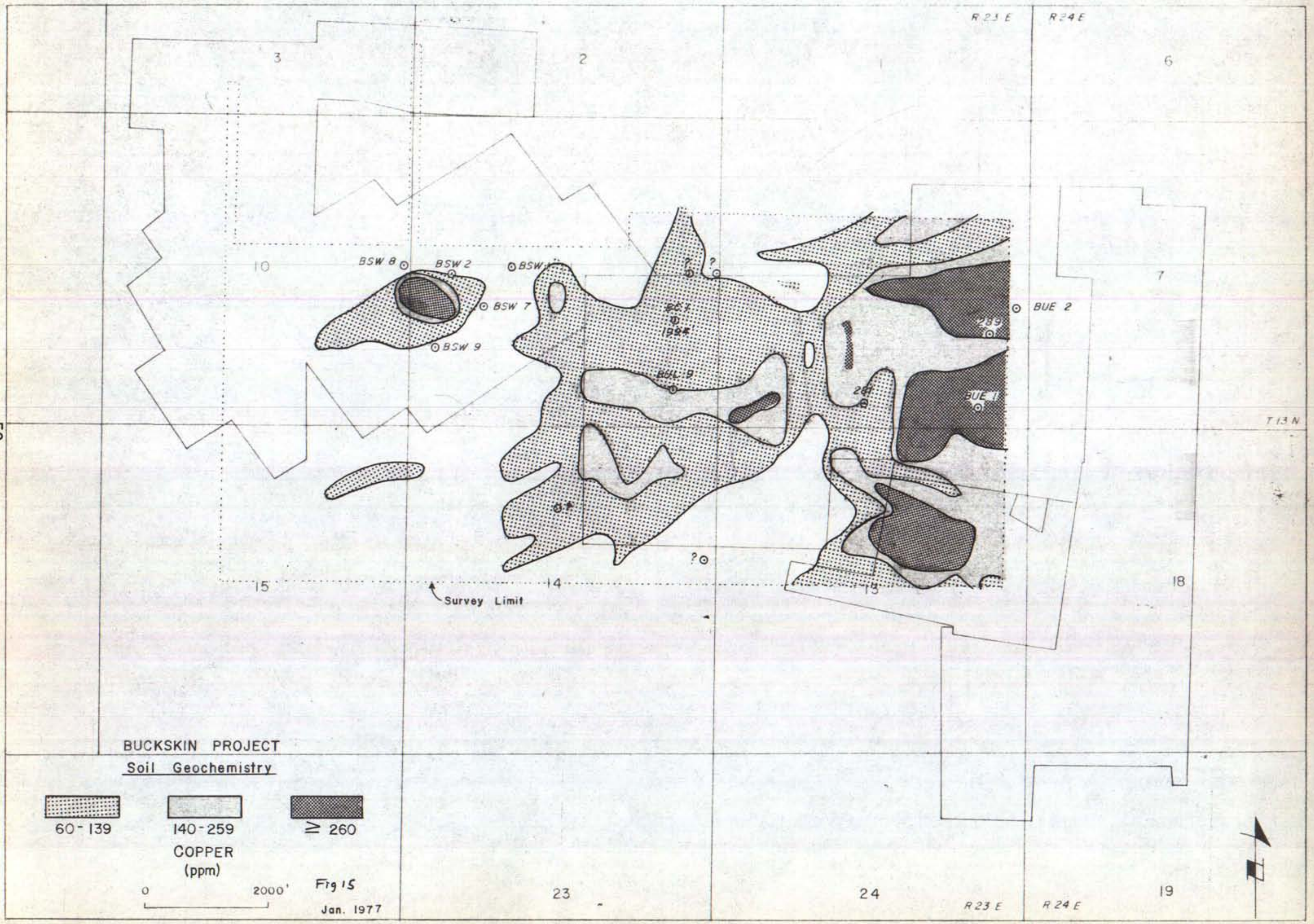
Soil geochemistry has many deficiencies due to both sampling technique and dispersion effects by ground water and local drainages. It is, however, a relatively quick and easy way of defining large geochemically anomalous areas and is essentially an averaging technique.

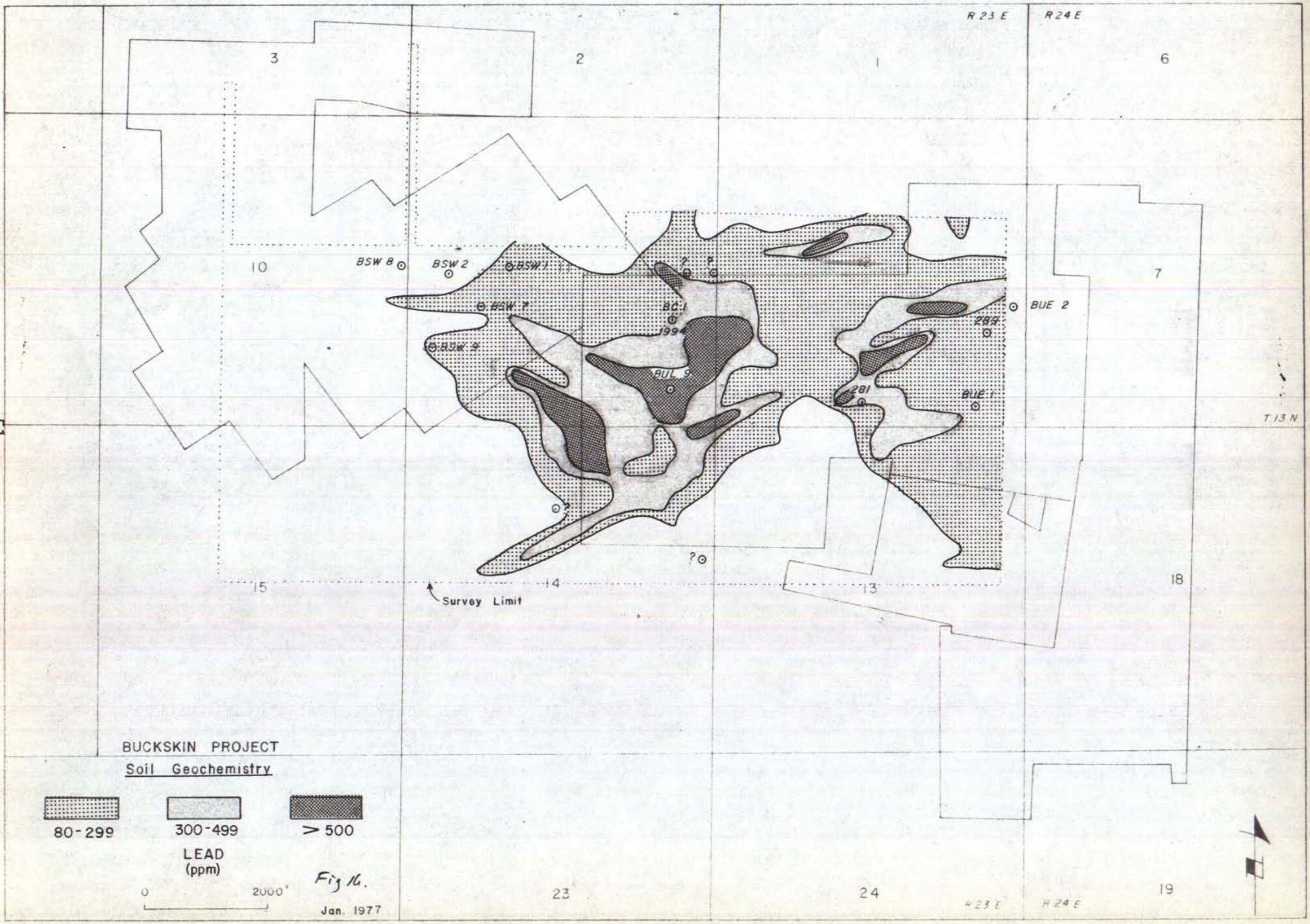
Rock Chip Geochemical Sampling

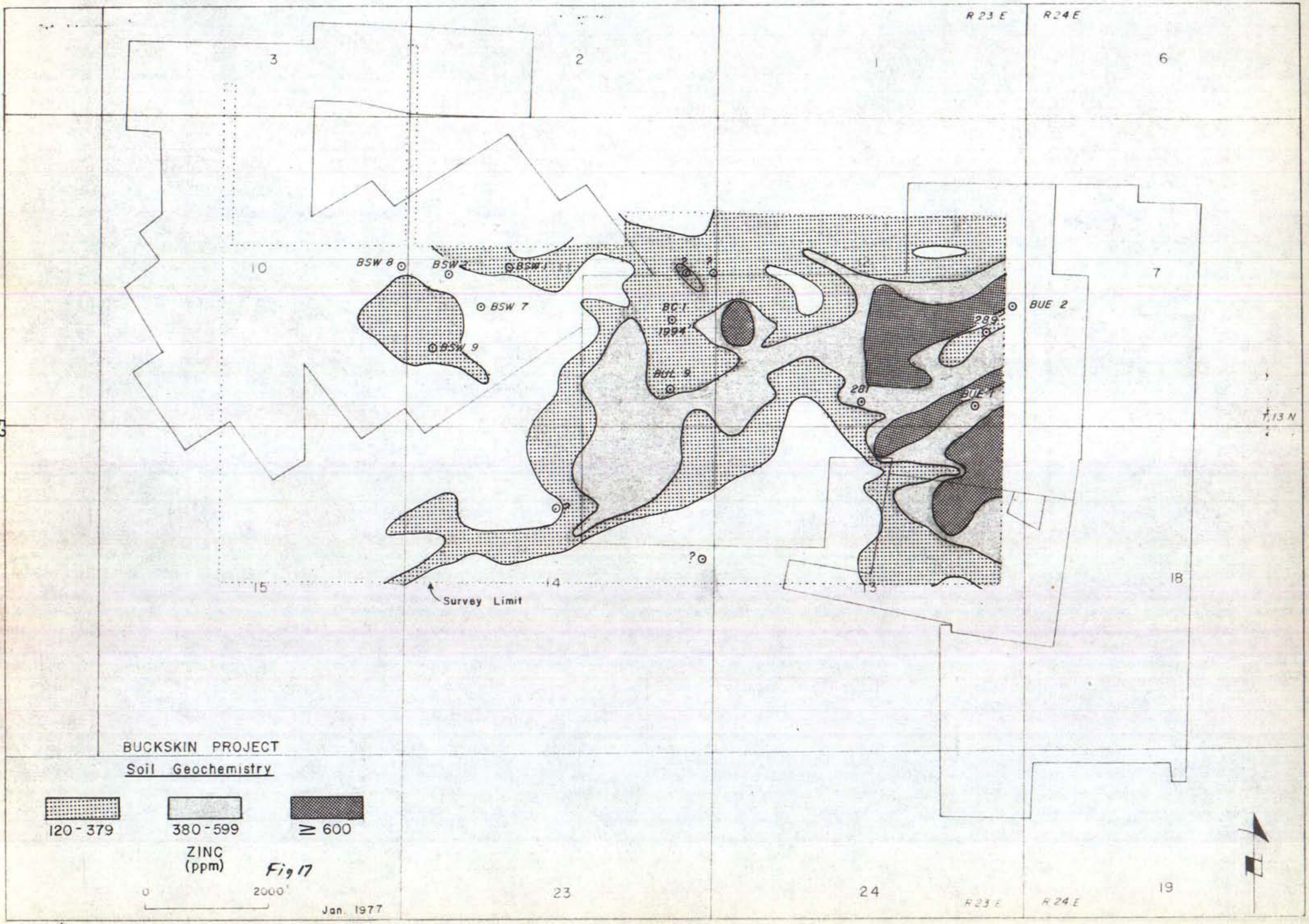
Rock chip sampling is less subject to the many errors of soil sampling.

The samples, however, are more tedious to collect, especially where large amounts of land are covered by alluvium as at Buckskin.

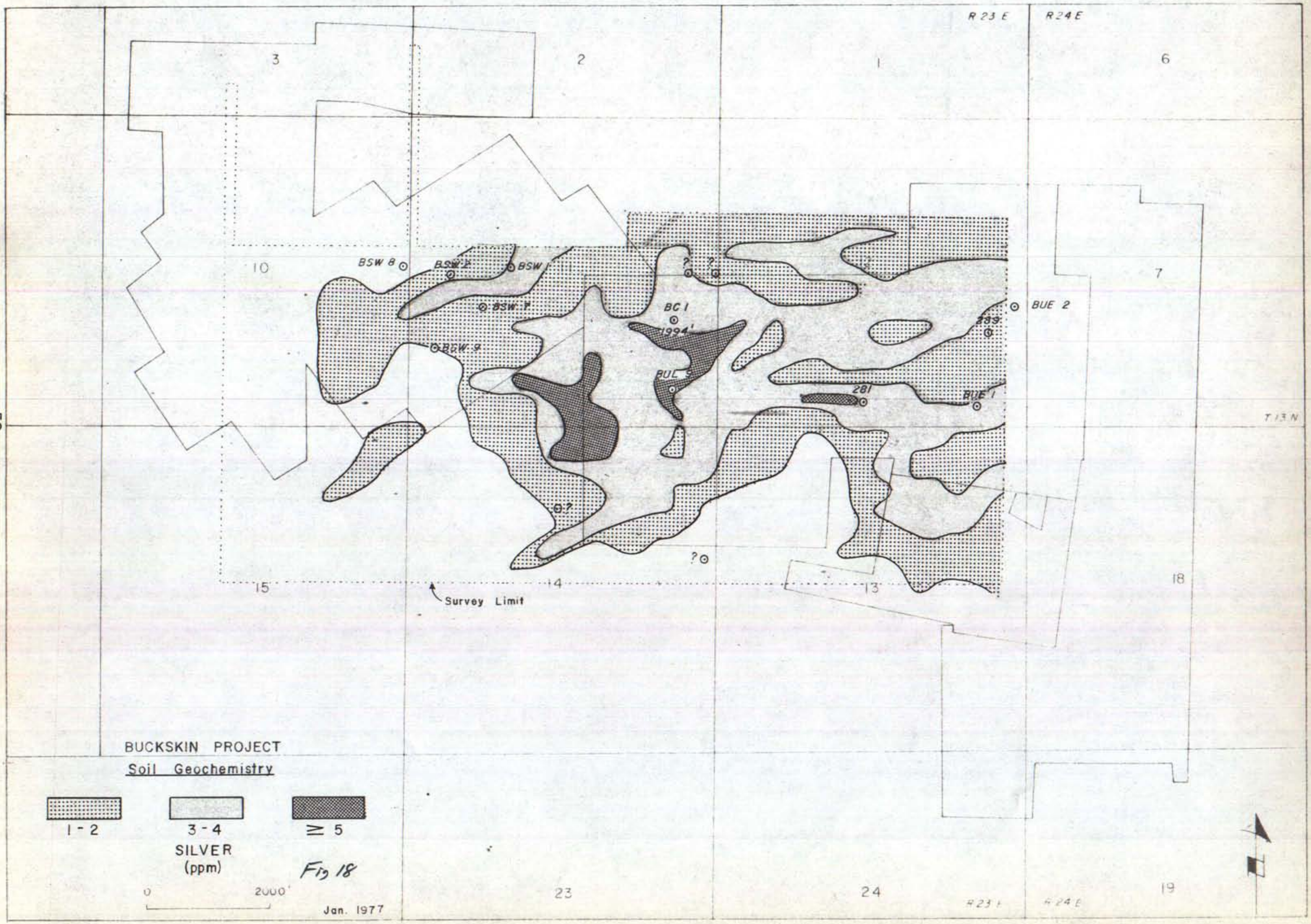
Because of the timely availability of Mr. Bob Bamford, formerly Senior Research Geologist with Kennecott, it has been decided to retain him to conduct a rock chip limonite geochemical study of the Buckskin area. Mr. Bamford hopes to use the techniques and interpretive data developed by him at Kennecott in the last three years to predict the direction and depth to the core zone of the hydrothermal system. Mr. Bamford will not complete his program until after this report has been finished; unfortunately, we cannot discuss his methods and results at this time.


BUCKSKIN PROJECT
Soil Geochemistry
60-139
140-259
≧ 260
COPPER
(ppm)
0
2000'
Fig 15
Jan. 1977
Survey Limit
BSW 8
BSW 2
BSW 7
BSW 9
BUE 2
BUE 1
BUL 9
R 23 E
R 24 E
T 13 N
3
2
1
6
10
7
15
14
13
18
23
24
19


BUCKSKIN PROJECT
Soil Geochemistry
80-299
300-499
> 500
LEAD
(ppm)
0
2000'
Fig 16.
Jan. 1977
Survey Limit
R 23 E
R 24 E
T 13 N
BSW 8
BSW 2
BSW 1
BSW 7
BSW 9
BC 1
1994
BUL 9
BUE 2
BUE 1
289
281
3
2
1
6
10
7
15
14
13
18
23
24
19


R 23 E
R 24 E
3
2
1
6
10
7
BSW 8
BSW 2
BSW 1
BSW 7
BSW 9
BC 1
1994
BUL 9
BUE 2
289
281
BUE 1
T 13 N
15
14
13
18
Survey Limit
BUCKSKIN PROJECT
Soil Geochemistry
120 - 379
380 - 599
≥ 600
ZINC
(ppm)
Fig 17
0
2000'
Jan. 1977
23
24
19
R 23 E
R 24 E

52



R 23 E
R 24 E
3
2
1
6
10
7
BSW 8
BSW 2
BSW 1
BSW 7
BSW 9
BC 1
1994'
BUL 5
281
BUE 2
389
BUE 1
T 13 N
15
14
13
18
Survey Limit
BUCKSKIN PROJECT
Soil Geochemistry
1 - 2
3 - 4
≥ 5
SILVER
(ppm)
0
2000'
Jan. 1977
23
24
19

Fig 18

- 53 -

GEOPHYSICS

Induced Polarization (IP)

Conoco ran approximately 23 line miles of IP consisting of two east-west and six north-south lines in 1976 to complement and confirm IP data obtained from Bear Creek and Phelps Dodge. Lines 10W and 20N had 2000 foot dipole-dipole spacing; all the rest had 1000 foot dipole-dipole spacing. Mining Geophysical Surveys conducted the survey of the two east-west lines, and a Conoco crew collected the data for the north-south lines. Joe Anzman was hired as a consultant to interpret all the new data and the interpretation, which is summarized below, is based on his report and several hours of personal consultation.

The IP surveys are summarized on Figure 20 and Plate 13. The data indicate a large anomalous area 9000 by 12,000 feet elongated east-west and extending to at least 3000 feet in depth. Within this area is a "moderate" anomaly 2500 feet wide, 11,000 feet long and at least 2000 feet deep. The strongest anomaly extends 4000 feet east-west and is about 1000 feet wide and approximately 1500 feet deep. It is in a central position relative to the lesser anomalies and apparently has steep boundaries. The presence of sulfides as the source of the anomalies has been confirmed by drill holes.

Extensive discussions with Mr. Anzman pointed out several areas that were not clear in his report. The "strong" anomaly of Mr. Anzman's interpretation may or may not be significant to the interpretation of the entire system. Drill holes outside the "strong" anomaly (BSW-7 and Bue-9) have abundant sulfides but not necessarily of an amount or pattern to support the existence of the strong anomaly as anything more than a statistical boundary.

His belief that the sulfides (IP anomalous area) decrease significantly at depth was not stated clearly in his text. The "anomalous" response decreases somewhere below a depth of 3000 feet and the "moderate" anomaly decreases at 2000 to 3000 feet in depth. Drill hole BC-1 confirms the presence of sufficient sulfides to cause the "moderate" anomaly to at 2000 feet. Although Mr. Anzman feels he can interpret data to about 2500 to 3000 feet with 2000 foot dipoles, at best there can be but a fuzzy picture at such depths. Therefore, he finds it permissible that the apparent sulfide-decrease could be the center of a porphyry system containing lower overall sulfides but a higher chalcopyrite to pyrite ratio, as in a classic "porphyry" system. Other interpretations are possible, but the lack of detailed geologic knowledge at depth allows only optimistic interpretations that are permissible with the known geology.

Line 20N, the east-west line which was run with 2000 foot dipoles, indicates a deep anomaly on the downthrown side of the Basin and Range fault on the east flank of the range. Conoco has staked this area and will direct future efforts to explain this anomaly (Figures 10 and 20).

The IP surveys show that a large sulfide system is present at the Buckskin prospect. Its limits are probably approximated by the anomalous area of Mr. Anzman's interpretation, as indicated by previous drilling. The sulfide system trends east-west, transects all local geology and structure, and appears to be decreasing at the depth limits of the IP method. It cannot be determined whether this decrease is permanent or local, or exactly what patterns the sulfides define at depth, but the geology suggests that the Buckskin ground surface is near the top of a large, strong, porphyry-type sulfide system. The decreasing sulfides at depth may be the core of the system and the target area for copper.

Until more drilling has been accomplished, it must suffice to note merely that Conoco controls nearly all of the geophysically anomalous ground, especially the "moderate" and "strong" anomalies. Specific target location based solely upon IP is not feasible with the information presently available.

Local Airborne Magnetic Survey

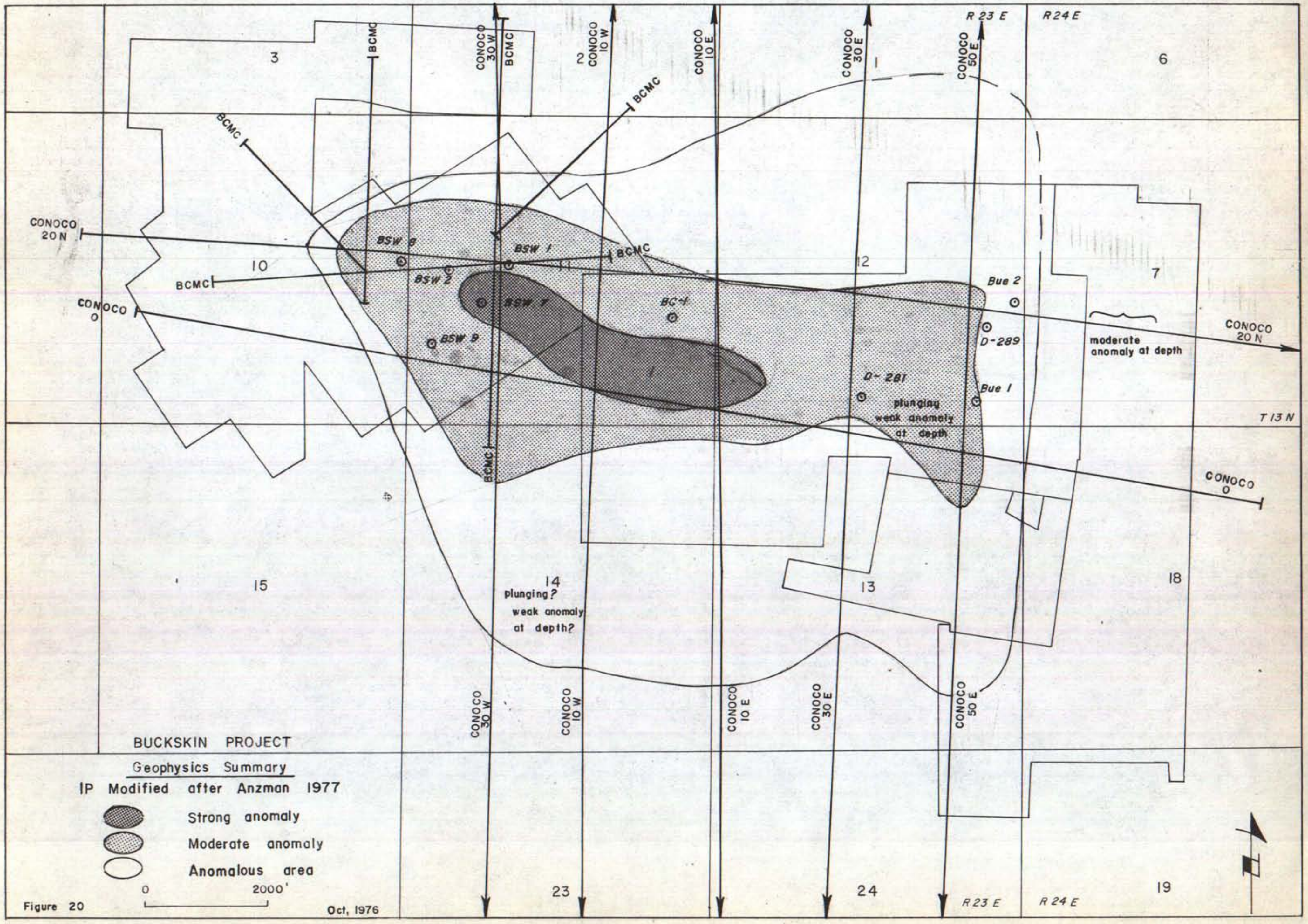
Conoco flew an aeromagnetic survey over the Buckskin Range with a line spacing of 650 feet in the fall of 1976. No official interpretation was performed by a geophysicist. Joe Anzman looked briefly at the data while examining the IP results and concluded that it was not generally suggestive of any pattern relating to the known geology or the IP responses and hence was not very useful. The Conoco Reno geological staff has noted, however, that there is a large, quiescent area of relatively low magnetic values roughly correlative to the surface exposure of the mineralized rocks. It appears to trend northeasterly and is partially surrounded by small positive anomalies (Figure 21). Some of the high magnetic values are not readily explained because they occur over the altered Mesozoic volcanics instead of late Tertiary andesites. The high response in the southeast portion, however, may be coincident with relatively unaltered Mesozoic andesites.

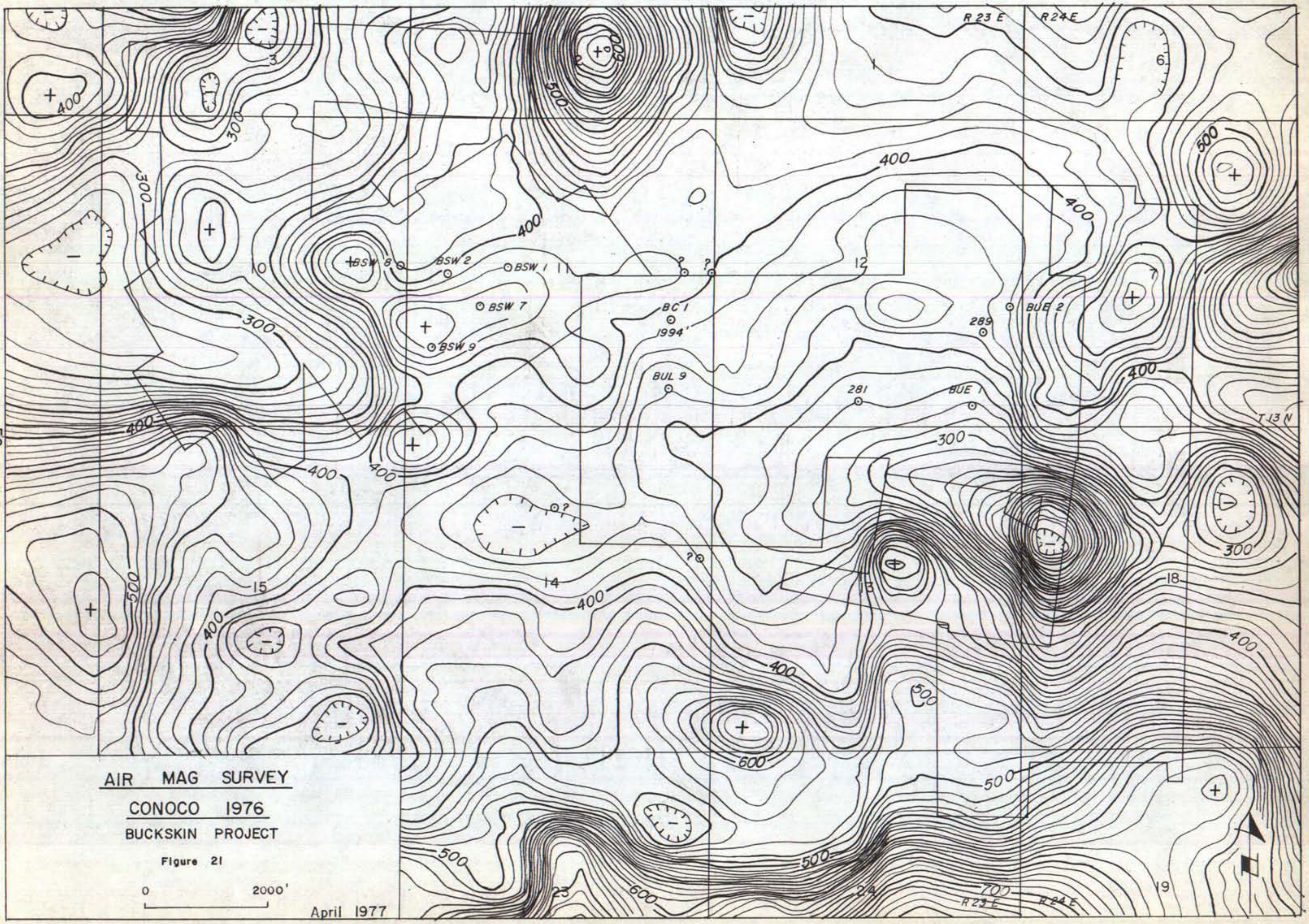
Regional Airborne Magnetic Survey

A regional aeromagnetic survey was completed by the USGS in 1971

(Figure 22). It shows a roughly east-west trending, broad magnetic low which nearly completely contains the Buckskin prospect. It is difficult to determine if Conoco's detailed air mag would generally conform to this pattern without more lines to the west of our present survey. The Minnesota iron mine and the Pumpkin Hollow (Lyon) iron-copper district have definite positive magnetic expressions whereas the Yerington porphyry copper open pit is within the north end of a negative magnetic anomaly. Other deep porphyry copper deposits found by Anaconda lie on the margin of the same large magnetic depression.

In general both the local and regional negative magnetic anomalies at the Buckskin prospect are correlative and are probably caused by hydrothermal destruction of pre-existing magnetic minerals.


BUCKSKIN PROJECT
Geophysics Summary
IP Modified after Anzman 1977
Strong anomaly
Moderate anomaly
Anomalous area
0
2000'
Figure 20
Oct, 1976
CONOCO 30 W
CONOCO 10 W
CONOCO 10 E
CONOCO 30 E
CONOCO 50 E
CONOCO 20 N
CONOCO 0
BCMC
BSW 8
BSW 1
BSW 2
BSW 7
BSW 9
BC-1
D-281
D-289
Bue 1
Bue 2
plunging weak anomaly at depth
plunging? weak anomaly at depth?
moderate anomaly at depth
R 23 E
R 24 E
T 13 N
3
2
1
6
10
11
12
7
15
14
13
18
23
24
19



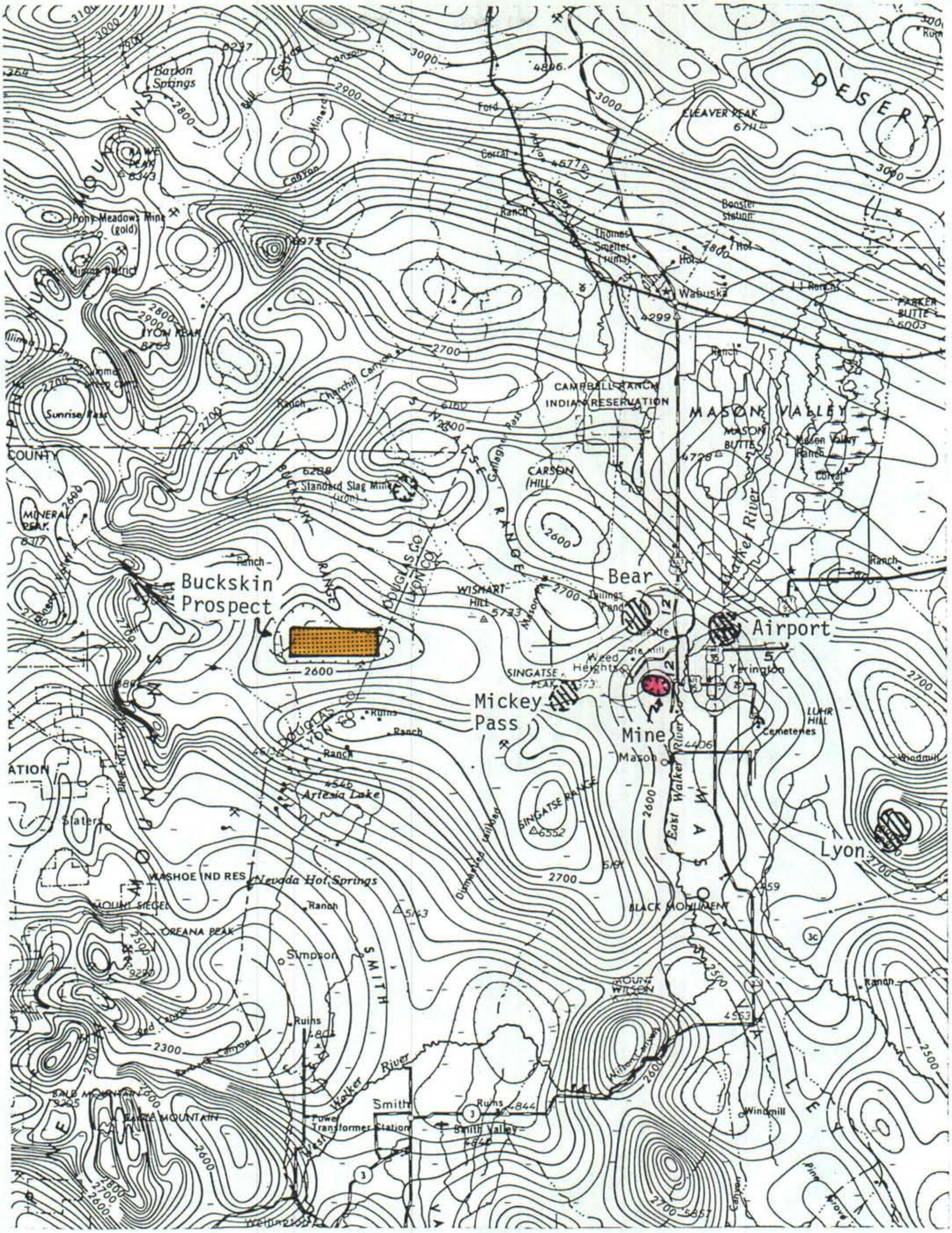
AIR MAG SURVEY

CONOCO 1976

BUCKSKIN PROJECT

Figure 21

April 1977



REGIONAL AIR MAG SURVEY

BUCKSKIN REGION

Scale = 1:250,000

Figure 22.

Taken from G.P. 751; USGS, 1971

DIAMOND DRILL RESULTS

Western Drilling

By far the best copper assays are in drill hole BSW-7 near the west side of the prospect (Figure 25). An interval of 510 feet averaged 0.16% copper from 750 to 1260 feet and 88 feet within that interval averaged 0.35% copper. Fine grained chalcopyrite is disseminated in faulted and broken metavolcanics. One small dike is within the ore zone, but most of the dikes are just below the high copper interval. Secondary biotite and sericite accompany the sulfide mineralization, but it is not my opinion or that of Bear Creek that the "core" or "potassic zone" of a porphyry system has been drilled here. Instead, the hole appears to be above the potential target. A small zinc anomaly (110 feet of 0.145% zinc) was drilled high above the copper interval. Although no core is now available from this specific interval, sphalerite accounts for the zinc elsewhere at Buckskin.

More than 0.1% copper was encountered in hole BSW-1 in two intervals from about 350 feet to 450 feet and 700 feet to 900 feet. The rest of the hole contained about 500 ppm copper. Lead, zinc, and silver were not as abundant in BSW-1 as in other western and central holes. Hole BSW-9 was drilled 1000 feet southwest of BSW-7 to follow up on the high grade interval in BSW-7. Bear Creek drilled there because they believed the mineralization in BSW-7 was related to a west dipping "intrusion breccia." Conoco's mapping indicates that this breccia is a volcaniclastic breccia that is conformable to the rest of the volcanics and only fortuitously acted as a good host for mineralization in BSW-7. BSW-9 did contain a small 150 foot interval of about 0.1% copper in a fine biotite hornblende porphyry (Figure 29). A zinc anomaly similar to that in hole BSW-7 is also present high above this copper zone.

Bear Creek encountered a chalcocite enrichment blanket and holes BSW-8 and BSW-2 were drilled specifically to test for it. The best enrichment was about 30 feet of 0.64% copper in BSW-2, although holes BSW-1, 7, and 8 also encountered some small enrichment.

Central Area Drilling

Conoco's diamond drill hole BC-1 was completed December 20, 1976 at a vertical depth of 1994 feet. It was located in the northerly part of the central geochemical anomaly and in the center of the moderate IP anomaly (Figure 20). It intercepted anomalous but weak copper and molybdenum mineralization but had a very strong zone of lead and zinc from 70 to 1100 feet. Lead and zinc increase again from 1650 feet to the bottom.

	Copper	Zinc	Lead
200 feet - 1100 feet	202 ppm	1416 ppm	830 ppm
1100 feet - 1600 feet	262 ppm	284 ppm	143 ppm
1600 feet - 1994 feet	228 ppm	509 ppm	273 ppm

Sphalerite and galena are finely disseminated in the porphyry dikes but are almost entirely on fractures in the metavolcanics. Porphyry sills are near strong lead-zinc mineralization in most cases and are probably the local source. Sericite, clay veins, and weak epidote and chlorite are associated with the mineralization in the upper 600 feet of the hole, whereas in the lower portion of the hole the chlorite and epidote are more abundant and some potassium feldspar veinlets occur. Several large gouge zones or faults are present high in the hole, but mineralization tends to overlap and generally disregard them. The hole appears to have intersected an outer lead-zinc halo in the propylitic zone, high and probably off to the side of the core of the "porphyry" system.

Mr. Robert Bamford, while working for Kennecott, recently conducted analyses of sulfide concentrates from 100 foot composite pulps from drill hole BC-1. His method involves analyzing for about 15 elements in a total sulfide concentrate. Kennecott's research indicates that the elemental distribution within the sulfides, combined with X-ray diffraction identification of alteration minerals, tends to reflect the hypogene zoning pattern of a porphyry copper deposit much better than whole rock analyses. The elements were chosen by Mr. Bamford from comparison data he developed by studying several porphyry systems in widely varying environments over a period of several years. His specific models are confidential information owned by Kennecott but the principles and patterns he developed are apparently his to use privately in a consulting capacity.

His results are presented in Figure 24 and Plate 16. He believes the data indicate that the hole was drilled toward the inner zoning of a porphyry sulfide system. This conclusion is drawn from the increasing gradients of bismuth, tellurium, tin and possible arsenic; and the decreasing gradients of lead, zinc and possibly silver (Figure 24). Copper is fairly uniform but because molybdenum seems to decrease downward rather than increasing, he believes we are not directly over the top of the target area but are off to one side. His X-ray diffraction analyses indicate a similar trend as shown by the presence of potassium feldspar near the bottom of the hole in an otherwise typically propylitic assemblage.

From our geologic mapping, he believes we could be skimming the top of a tilted system or obliquely penetrating the side of a nearly upright, but possible deep, sulfide system. The alteration pattern of the core at the bottom of hole BC-1 and the detailed geological mapping have indicated to me that the upright model is the more likely, given our present knowledge. Although future drilling plans at Buckskin may not change significantly, it was valuable work performed for us by Kennecott and the method could be very useful in the future because very little is known about the tops of porphyry systems and almost nothing is published. It is inherently a good idea and reasonable that Kennecott, with its large inventory of drilled porphyry copper systems, should have developed it first.

The results from BC-1 and the patterns of sulfides in holes BSW-7 and 9 indicate strong target potential in the area between BSW-7 and BC-1. The area east of BC-1 cannot be ruled out as a target area, however, because of our direct lack of knowledge about the system at depth and the complex structure.

Eastern Drilling

Phelps Dodge and Anaconda drilled four holes in the east portion of the prospect, all less than 1000 feet deep. Hole Bue-1 (Figure 31) was drilled to 838 feet and averaged about 0.05% copper except for a small supergene enriched zone of 0.1% copper and a 150 foot interval of chalcopyrite that assayed approximately 0.15% copper. Lead and zinc decreased gradually until the last 28 feet where zinc increased significantly. Molybdenum also appeared to be increasing for the last 78 feet.

Bue-2 was drilled by Phelps Dodge in 1967 to a depth of 893 feet. It also encountered a 10 foot interval of enriched copper but otherwise averaged a little less than 0.1% copper in chalcopyrite for the entire hole. Mesozoic(?) quartz monzonites were the predominant host rocks. Pyrite increased to about 6% for the last 100 feet with traces of molybdenum and silver.

Anaconda drilled holes 281 and 289 in 1971 and 1972. Hole 289 was drilled to 958 feet in Mesozoic(?) quartz monzonites intruded by numerous porphyry dikes. Anaconda assayed only certain intervals, unfortunately, and these assays do not show any definite trends. The hole appears to average more than 0.05% copper, however.

Hole 281 was a short hole (446 feet) that averaged about 0.05% copper in Mesozoic metavolcanics.

The holes in the eastern portion are very intriguing. The Mesozoic(?) phaneritic quartz monzonites are uniformly high in copper and two holes show apparent increasing gradients in lead, zinc, and total sulfides. Late Tertiary dikes are well mineralized also and occasionally appear to control locally higher assays. Most of the mineralization in these holes, however, appears to be genetically related to the older quartz monzonites.

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Item 15

EXPLORATION OF ENHANCED SULFIDE MINERALIZATION AT THE BUCKSKIN PORPHYRY COPPER PROSPECT

DOUGLAS & LYON COUNTIES
NEVADA

by
William M. Oriel

March, 1978

35

Item 15

EXPLORATION OF ENHANCED SULFIDE MINERALIZATION AT THE BUCKSKIN PORPHYRY COPPER PROSPECT

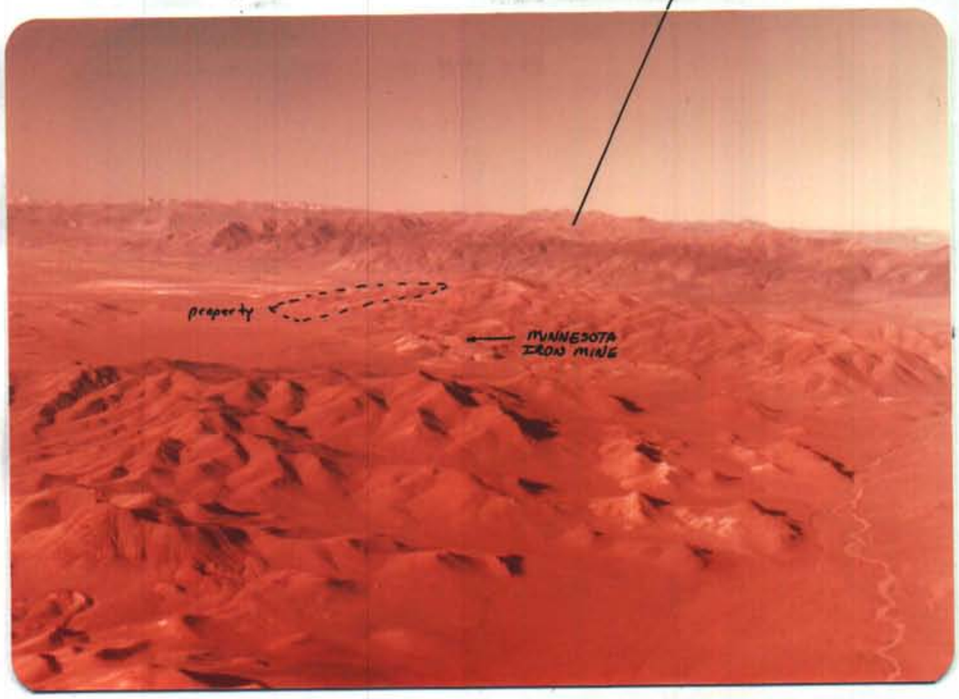
DOUGLAS & LYON COUNTIES

NEVADA

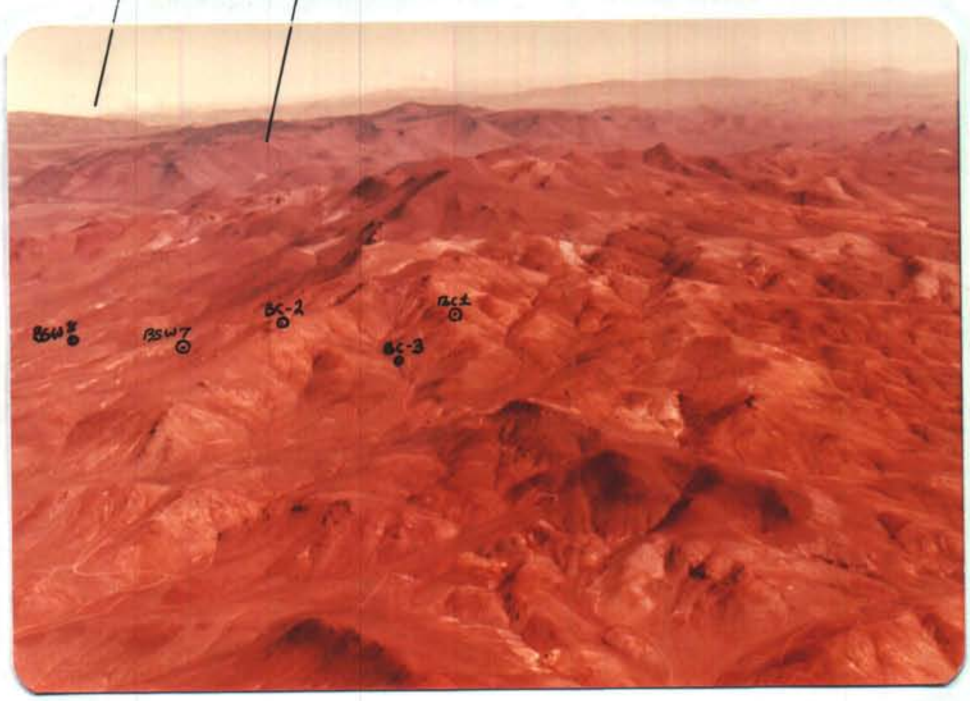
by

William M. Oriel

2nd Annual Report
Reno District Metals Office
Reno, Nevada
March, 1978



Buckskin Range Looking Southwest



Buckskin Range in Foreground - Looking North

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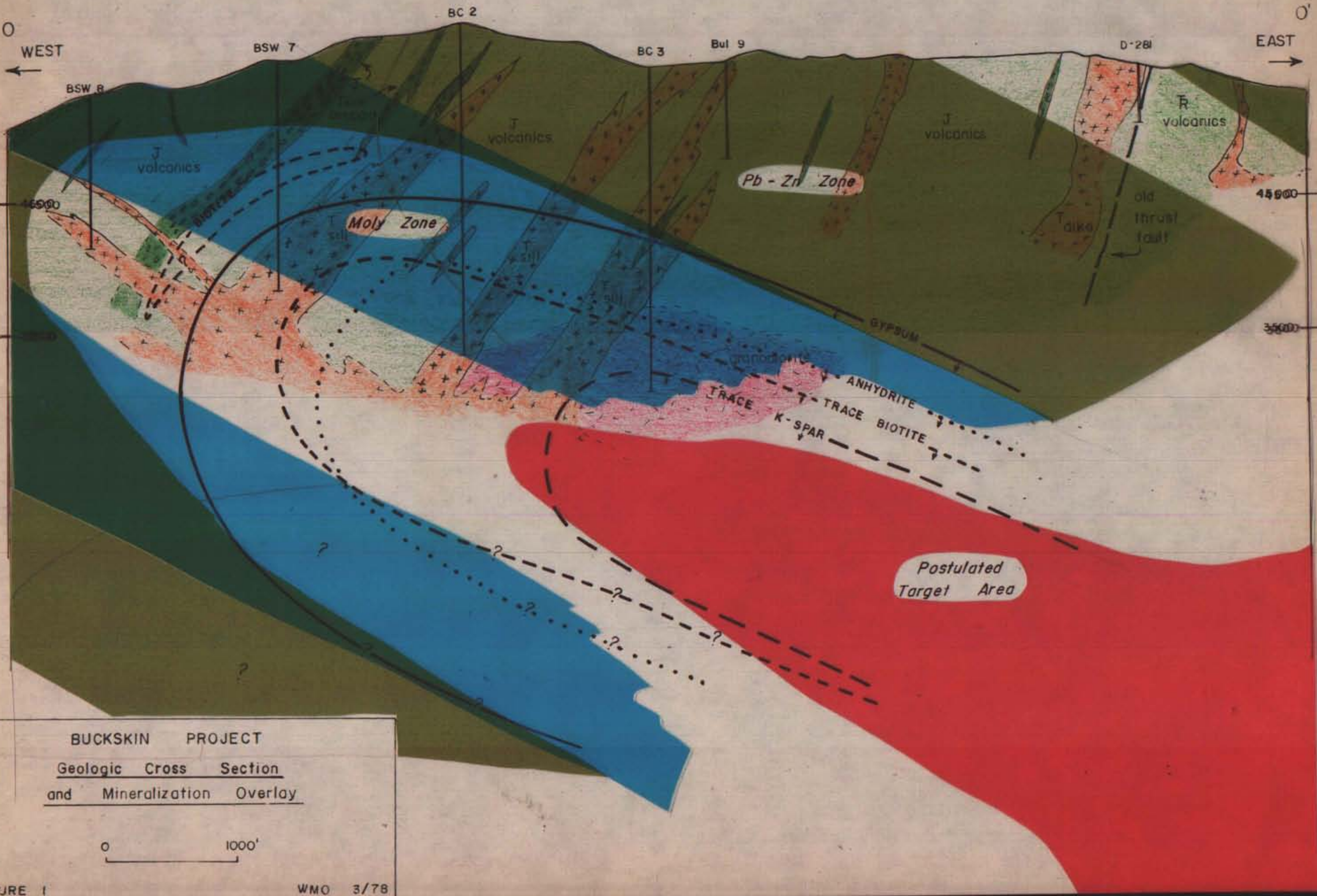
NOTE: The plates listed above may be found in the roll which accompanies this report, or may be requested from the Reno office.

BUCKSKIN PORPHYRY SYSTEM

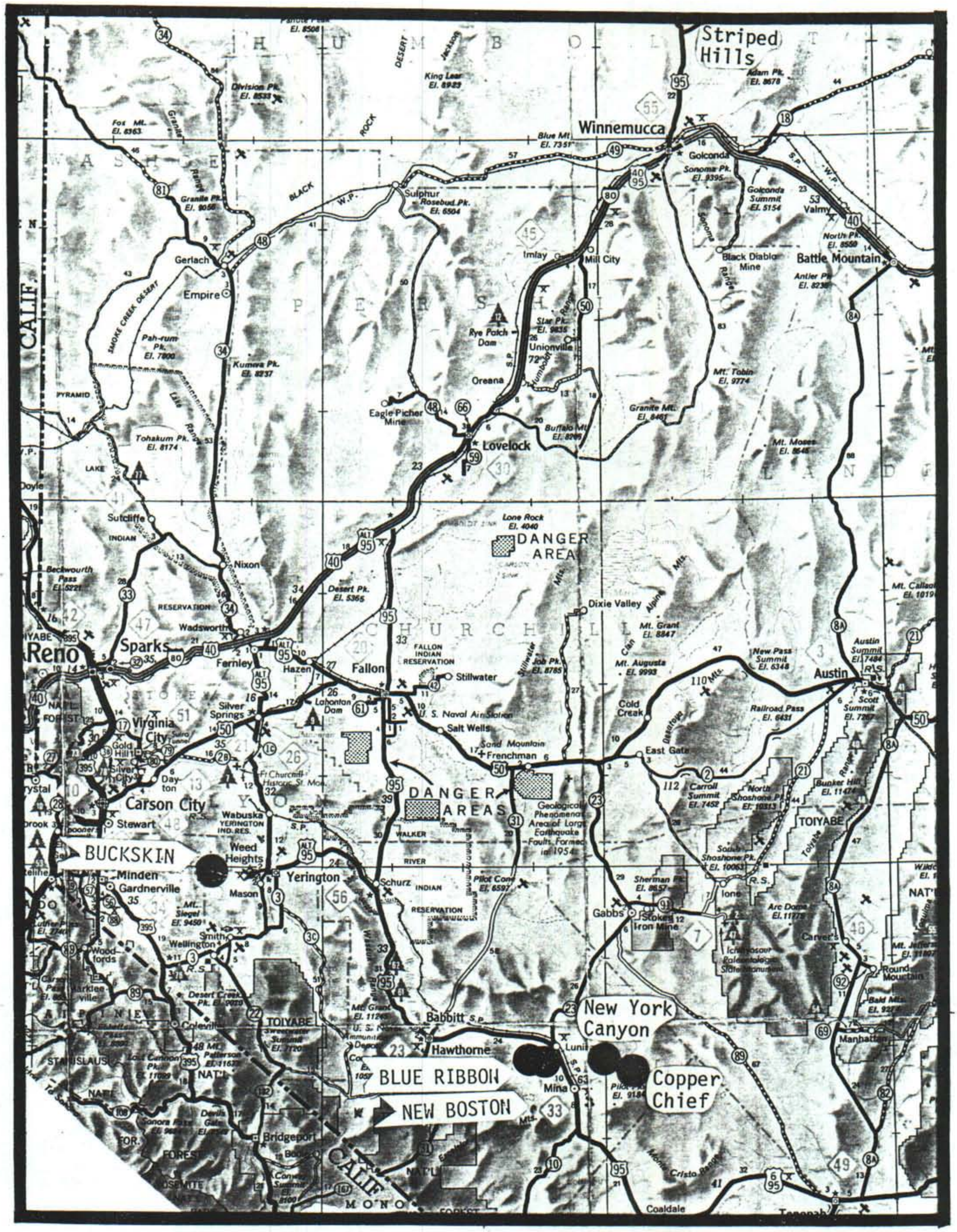


BUCKSKIN PROJECT

Geologic Cross Section and Mineralization Overlay

0 1000'

FIGURE 1 WMO 3/78



INDEX MAP - NEVADA HIGHWAY

Figure 2

SUMMARY

The Buckskin project is 95 miles southeast of Reno, Nevada, in the Buckskin Range in Douglas County, Nevada, Township 13 North, Ranges 23 and 24 East. Conoco controls approximately 2400 acres on 128 contiguous unpatented lode mining claims partly through a joint venture with Bear Creek Mining Company.

After securing the properties early in 1976, Conoco conducted an extensive grid geochemical survey that successfully outlined a large hydrothermal system. Following this, all previously drilled holes were geologically logged and thin section studies undertaken. Detailed geologic mapping with emphasis on alteration and limonite maps proceeded in 1976, coincident with 23 line miles of IP and an airborne magnetometer survey. IP data outlined an anomaly 9,000 feet by 12,000 feet, mostly coincident with the geochemical soil anomaly. A separate deep IP anomaly was discovered east of our properties which resulted in the staking of the Conoco claims. Gravity profiles were conducted over this deep eastern anomaly in 1977 to determine the depth to bedrock.

Many altered and mineralized porhyritic and phaneritic dikes, sills, and plugs intrude broken and structurally separate blocks of strongly altered Triassic and Jurassic metavolcanics. The oldest and easternmost intrusives (Mesozoic granodiorites, etc.) have been tilted steeply westward by Basin and Range normal faults, and then were intruded by a swarm of altered and mineralized Tertiary porphyritic dikes and plugs of varying composition. Irregular Tertiary sills and dikes, and Mesozoic

metavolcanics in the central portion of the prospect are altered and leached to clay and sericite with limonite mixtures nearly obliterating rock textures. A series of small dikes and a small intrusive plug, which is mostly covered by alluvium, are present to the west, where Bear Creek has previously conducted some exploration. There is reason to speculate that the Tertiary plugs and sills originate from a common source between the western and eastern areas. They also show chemical and textural variations that indicate a common evolving source. Late post mineral dikes and sills intruded along apparent structural zones with a preferential east-west strike.

The soil geochemical survey conducted in the spring of 1976 showed three areas of interest. The westernmost anomaly is a small copper anomaly where Bear Creek drilled several holes in 1972 and 1973. The central anomaly contains high lead-zinc-silver values in the vicinity of several large sills. The eastern anomaly consists of higher copper, moly, zinc, and lead values overlying a complex swarm of porphyritic dikes which intrude Mesozoic granodiorites and quartz monzonites. It is separated from the central anomaly by Tertiary ash flow tuffs, which have been tilted, overturned, and dropped down to the east. The patterns of alteration and geochemistry derived from 1977 drilling (holes BC-2 and BC-3) indicate that the western anomaly is the uppermost exposed portion of a single tilted system that includes the central geochemical anomaly and possibly the eastern anomaly. The deep eastern IP anomaly is still speculative.

Hole BC-2 was drilled in the central lead-zinc-silver geochemical anomaly to a depth of 1994 feet late in 1976. It encountered strong lead-zinc mineralization in both sericitically and propylitically altered volcanic country rocks, which are cut by a few prophyry sills.

In 1977 holes BC-2 and BC-3 were drilled to 2500 and 2463 feet, respectively, and also intersected strong lead-zinc halo-type mineralization indicative of the fringes of a porphyry copper system.

The geochemical results of Conoco's drilling last summer were recently compiled and alteration in the two holes was studied in thin section. A series of cross sections were drawn to accommodate the new information from holes BC-2 and BC-3. Cross sections containing 100 foot averages of Conoco's analyses of Cu, Mo, Pb, Zn, and Ag show consistent and almost classical patterns for a large porphyry copper system. Lead and zinc form parallel zones of high geochemical values external to a strong molybdenum and a weak but downward increasing copper zone. Additionally, the alteration and mineralogical zoning parallel the geochemical zones in an equally classical pattern. Holes BC-2 and BC-3 show progressive increases in gypsum, anhydrite and secondary biotite toward the bottom of the holes. Secondary orthoclase and albite and anhydrite increase easterly toward and below hole BC-3 (Figure 1).

All Conoco data coincide to indicate that holes BC-2 and BC-3 were drilled into the top half of a porphyry copper system dipping 15 to 35 degrees easterly. The copper-rich zone was not entered but only approached by holes BC-2 and BC-3. Whether or not this system is strong enough to become an economic success now or in the future can only be determined by additional drilling.

The Reno office contracted Mr. Robert Bamford (formerly of Kennecott Research) to conduct a surface limonite analysis program and a sulfide concentrate analysis technique of our drill core. His technique is inherently correct and his data-base of 12 known and drilled Kennecott porphyry systems in various environments could be a valuable addition to

Conoco's exploration expertise. Buckskin provided a good opportunity to test his techniques because Conoco had good geologic and geochemical control of the system. We are still awaiting the geochemical analyses and zoning evaluation by Bamford on the additional holes at Buckskin. The analyses he has performed to date support Conoco's geochemical patterns and will likely provide additional supporting evidence and hopefully some clues about his geochemical zoning data base for other porphyry systems. His data will be integrated with all other geological and geophysical data.

RECOMMENDATIONS

It is recommended that Conoco complete contract obligations to Bear Creek Mining Company by extending hole BC-2 another 1500 feet. Conoco should also drill two additional holes into the proposed target (Figure 1) eastward of hole BC-3 to depths approximating 4000 feet.

The eastern portion of the prospect should not be tested before 1978 drilling has been completed and evaluated. Ultimately, the eastern portion of the prospect should have at least two deep holes collared on bedrock and one hole in alluvium over the deep IP response before surrendering the property.

INTRODUCTION

Location

The Buckskin district is in Douglas County in west central Nevada, approximately 95 road miles southeast of Reno and 10 miles west of Yerington (Figure 2). The prospect is in Township 13 North, Ranges 23 and 24 East, in the south central portion of the Buckskin Range. It is easily accessible by dirt roads that are periodically graded throughout the year. The climate is arid and vegetation is sparse. The range has relatively low relief and a maximum elevation of 6915 feet.

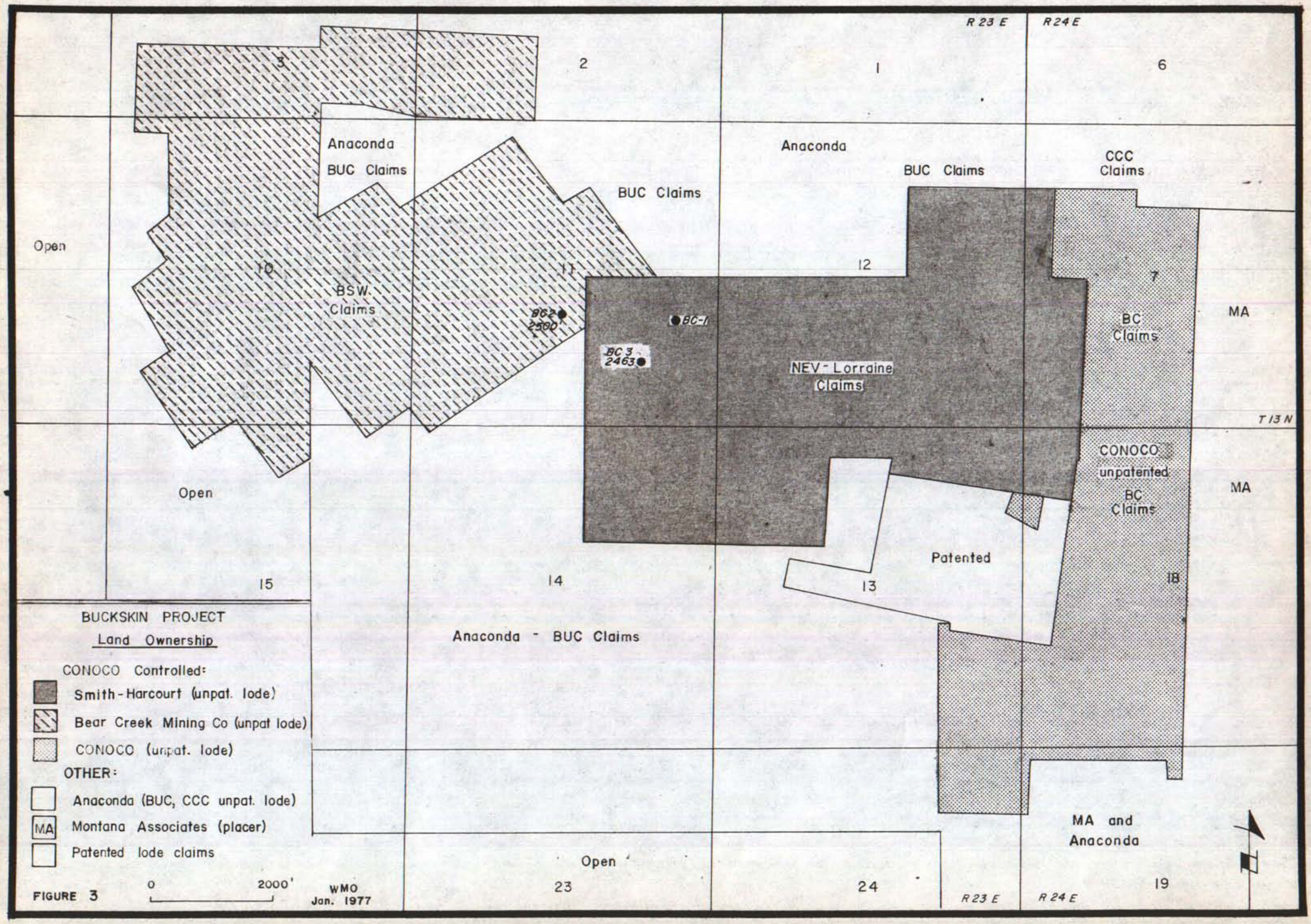
Property and Ownership

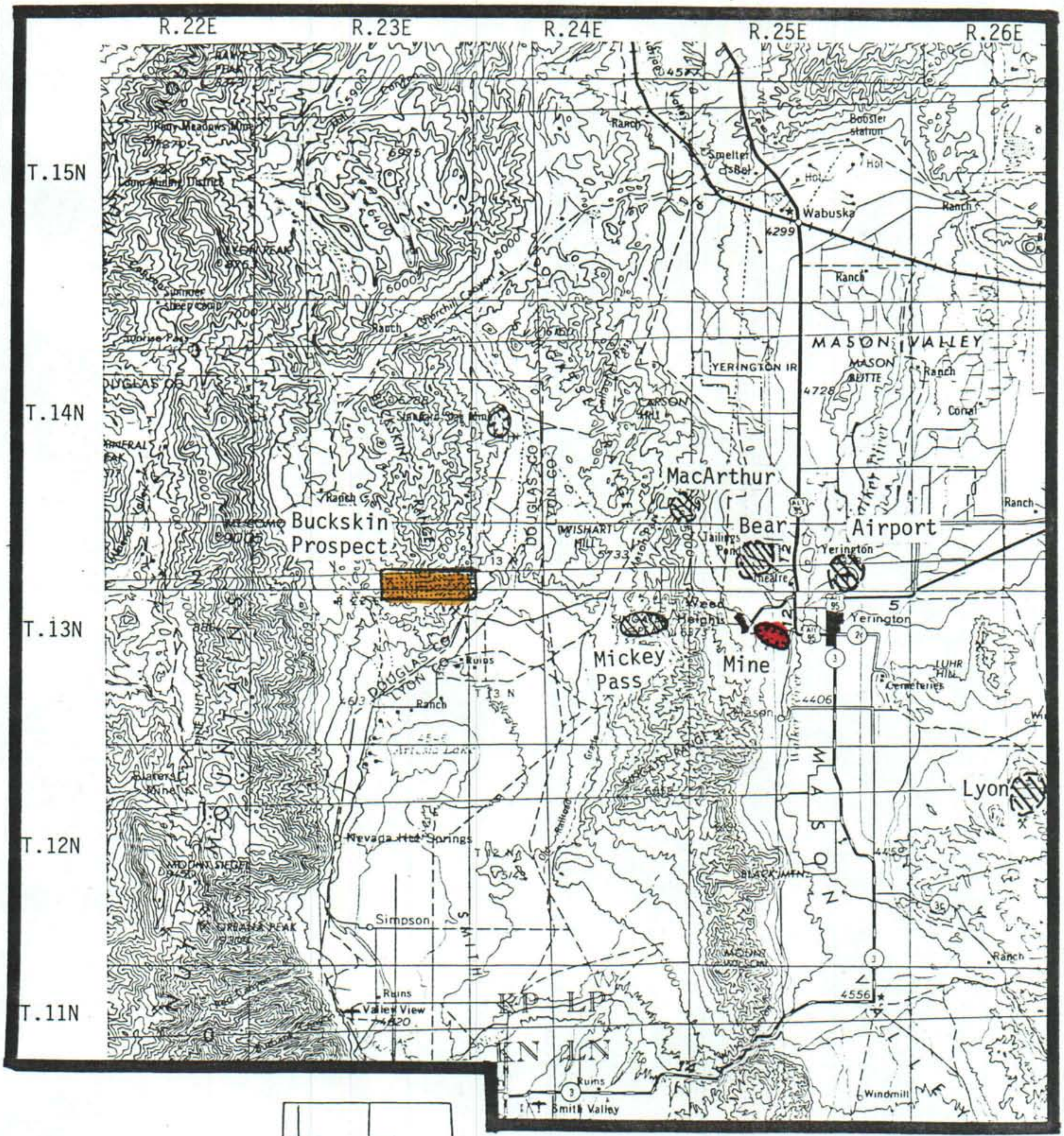
Conoco controls 128 contiguous unpatented lode claims containing approximately 2400 acres spanning the Buckskin Range from east to west (Figure 3). Forty-seven (47) claims are controlled through a joint venture with Bear Creek Mining Co. (BCMC) and 43 are under option from two local residents, Smith and Harcourt. Conoco staked 38 unpatented claims on open ground at the eastern edge of the range as a result of IP data and permissive geology.

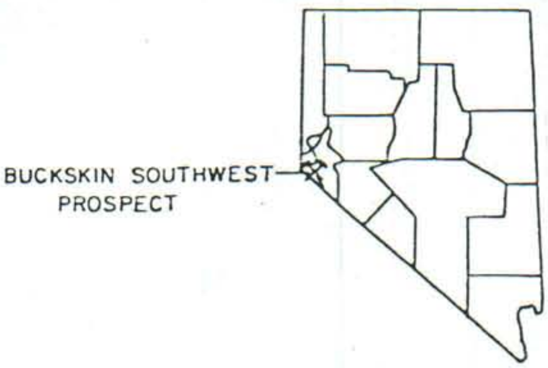
Anaconda controls unpatented claims on the north and south margins of our claim block and Montana Associates, a small group of local investors, controls unpatented placer claims adjoining Conoco on the east.

All claims are on public domain lands controlled by the Bureau of Land Management.

A small group of patented claims surround the Buckskin mine at the southeastern portion of our claim group. They are not of interest to


R 23 E
R 24 E
3
2
1
6
Anaconda
BUC Claims
Anaconda
BUC Claims
BUC Claims
CCC
Claims
Open
10
BSW.
Claims
11
12
7
BC2
2500
BC-1
BC 3
2463
NEV- Lorraine
Claims
BC
Claims
MA
T 13 N
CONOCO
unpatented
BC
Claims
MA
Open
Patented
15
14
13
18
Anaconda - BUC Claims
BUCKSKIN PROJECT
Land Ownership
CONOCO Controlled:
Smith-Harcourt (unpat. lode)
Bear Creek Mining Co (unpat lode)
CONOCO (unpat. lode)
OTHER:
Anaconda (BUC, CCC unpat. lode)
MA Montana Associates (placer)
Patented lode claims
MA and
Anaconda
Open
FIGURE 3
0
2000'
WMO
Jan. 1977
23
24
R 23 E
R 24 E
19





INDEX MAP - YERINGTON AREA

TOPOGRAPHY

Scale 1:250,000

Figure 4

Conoco at this time; however, should an economic ore body be discovered, the claims would have to be acquired.

Holding Costs and Obligations

Bear Creek Joint Venture. Conoco must have spend $200,000 by December 13, 1981 to earn 51% interest in Bear Creek's 47 claims. Conoco also must drill 1500 feet yearly upon the BCMC claims (BSW group) until the 51% has been earned. The cost of drilling the obligatory 1500 feet in 1978 and other geologic work should be sufficient to earn Conoco the 51% interest before year end.

Conoco has spent $171,996.02 through 1977, applicable toward the $200,000 buy-in.

Smith-Harcourt. An expenditure of $500,000 in annual payments and/or royalty payments to the owners before 1992 will purchase 100% of the 43 "Nev-Lorraine" claims. Total payments and expenditures to Smith and Harcourt through 1977 were $172,261.83, of which ~~is~~ $55,300.12 is applicable to the $500,000 end price.

A cost summary sheet is included as Appendix A at the end of this report.

Conoco is responsible for assessment obligations for the Bear Creek and Smith-Harcourt claims as well as our own 38 unpatented "BC" claims on which no assesment work is required until September 1, 1978. No obligations or special requirements exist, other than those imposed upon us by the BLM.

History and Previous Work

According to some reports, the Buckskin district was discovered in 1904 by a prospector who found gold in veins on or near the present

"Red Top" patented claims (Plate 2A). Subsequently, copper was found below the oxidized gold zones and considerable excitement arose. This resulted in the building of a townsite and the construction of pumping and metallurgical plants. Very little ore was produced, and most activity ceased in 1907 except for the floating of large amounts of stock. The district was rediscovered and re-evaluated in the early 1930's, and as late as 1974 a head frame and mill building were erected. Drilling, however, apparently found no ore and the site is now abandoned.

Pyrophyllite exploration at the Blue Danube Mine in the southwest portion of the range indicated that the pyrophyllite was impure and thus no commercial development occurred.

A more successful mining operation was carried out on combined iron-copper ore in the northern part of the Buckskin Range. Iron ore was mined from the Minnesota open pit mine from 1944 to 1966, producing nearly $17,000,000, which is 99.5% of the total values of the district. Exploration and drilling have been carried out sporadically in the district since 1966 and Anaconda currently holds claim to much of the north-eastern part of the Buckskin Range. The only published geologic mapping was done by Moore (1969) and recently by Proffett (1977). Both Bear Creek Mining Co. and Anaconda mapped portions of the project area, and although Conoco has these maps, the scale and detail were inadequate, and the geology possessed gross errors and was mostly incorrect. Mapping was also hindered by the intense degree of weathering, alteration, and the complex structural history of the Buckskin Range.

Eight miles east of Buckskin, the Yerington, or Weed Heights, open-pit copper mine has operated since 1952, but is due to close in June, 1978. It is a porphyry copper mine which contained about 200 million tons of

0.6%± copper. Ore is associated with Mesozoic intrusives. Other porphyry copper deposits near Yerington include the Mickey Pass (Ann Mason), Bear, Airport, and Lyon (Pumpking Hollow) (Figures 4 and 5). Mr. R. Babcock (V.P. - BCMC) has recently stated that 30 million tons of 2% copper were drilled at the Lyon deposit.

Recent Exploration

Exploration for porphyry copper ore at the Buckskin prospect apparently began in 1966 or 1967 when Phelps Dodge acquired large acreage, including the "Nev" claims, in the eastern part of the property. They drilled holes Bue-1 and Bue-2 to depths of less than 1000 feet on the east flank of the prospect, and Bul-9 to 734 feet in the central portion of the prospect. Anaconda had control of the "Nev" claim group until the autumn of 1975. They drilled two holes within our claim group (DH-281 and DH-289) and several holes bordering our property about which we have no information. Anaconda dropped the property in late 1975 before a large land payment was due.

In 1969, Bear Creek Mining Co. staked claims on the west flank of the range around a turquoise showing. They mapped the prospect and took some rock chip samples which were geochemically anomalous. Nine holes were drilled by BCMC, five of which were diamond drill holes centered around their geochemical anomalies, and four others were shallow rotary holes drilled in 1970 in the alluvium to the west. Two of their deep holes, BSW-1 and BSW-7, intersected anomalous mineralization and alteration. Because of their geologic interpretation, they tried to follow the mineralization to the west with drill holes BSW-8 and BSW-9. They never offset their best hole (BSW-7) to the east.

Oxide and Sulphide Ore Mined, Grade of Ore, Copper Production, Waste Stripped, and Recovery of Copper at Anaconda Company's Yerington Mine from 1970 through First Six Months of 1975

Year	Ore Processed, Tons	Percent Copper	Recovery, Percent	Waste Stripped, Tons	Total Copper Production, Tons
			SULPHIDE		
1970	4,347,000	0.68	85.47	10,802,045	
1971	4,738,000	0.58	83.58	11,774,805	
1972	4,777,000	0.53	84.09	14,316,043	
1973	4,885,000	0.53	85.65	8,274,550	
1974	4,815,000	0.53	82.89	7,724,803	20,693[4] (37,969)[1]
1975[2]	2,403,000	0.52	78.41	4,000,000[3]	
			OXIDE		
1970	4,282,000	0.52	77.72		42,437[1]
1971	4,514,000	0.51	79.51		42,541[1]
1972	4,578,000	0.51	77.60		41,218[1]
1973	5,673,000	0.36	72.83		35,835[1]
1974	5,887,000	0.38	69.36		17,276[4] (37,969)[1]
1975[2]	2,995,000	0.37	67.86		18,997[1]

1. Both oxide and sulphide ores. 2. First six months 1975 3. Estimated. 4. First six months 1974

Yerington district will be a major future porphyry copper producer

It's hard to take a choice.

Many call it the Tuscon of the west.

And there are many more that call it the Highland Valley of the west.

Yes, that's the Yerington, Nevada porphyry copper district.

There is only one mine in production now, **Anaconda Company's** Yerington pit and sulphide flotation mill at Weed Heights, which has been operating since 1954. It started out as an oxide mine, leaching plant, and tin can precipitation plant. The flotation mill was added as mining deepened into the primary sulphides. Recent production at the Yerington mine is shown in accompanying table. Total production has been over 100,000,000 tons, about 75 percent of which has been oxide.

Reserves at the Yerington mine proper as of June 30, 1975 were 27,000,-000 tons assaying 0.33 percent acid soluble copper and 30.600.000 tons of sulphide assaying 0.48 percent.

There are five additional known deposits in the Yerington district as follows:

Ann Mason which is 3 miles west of the Yerington mine. The deposit does not crop out and is buried under 300 to 1,500 feet of alluvium and post ore cover. Drilling has indicated 495,000,000 tons of sulphides assaying 0.40 percent copper. Mining will probably have to be by underground methods. Recent drilling has discovered shallower and higher grade copper which could be mined by open pitting at a higher price for copper.

Airport does not crop out and was found by **Phelps Dodge Corporation.** Very little data has been published on this deposit. (500,000,000)

The *Bear* is 2 miles north of the Yerington mine, does not crop out, and is deeply buried. Deep drilling, only a few holes, indicates about 500,000,000 tons assaying 0.40 percent copper with molybdenum and precious metal contents. Much additional drilling and geological study must be made to define and sample this deposit.

Lyon, about 10 miles east of the Yerington mine, was discovered by the **United States Steel Corporation** using airborne geophysics which picked up an anomaly due to its magnetite content This was another deposit which did not crop out. The Anaconda Company has been drilling under an agreement with United States Steel. Drill indicated reserves for underground mining are estimated at 25,000,000 tons assaying 0.40 percent total copper

The *MacArthur*, four miles northwest of the Yerington pit, contains 13,000,000 tons assaying 0.43 percent total copper. About half the deposit can be economically mined by open pitting Anaconda has made plans to mine the deposit and truck the ore to the Yerington leaching plant after the Yerington oxide has been mined out.

There's a lot of copper in the Yerington copper district It is high cost copper and it's typical of where tomorrow's copper production will come from.

Figure 5

Yerington District Deposits
Taken from World Mining Journal,
July, 1976

Present Program

Conoco's involvement is partially the result of the fortuitous availability of both the Bear Creek claims and the "Nev-Lorraine" claims. The Conoco staff recognized the potential of a large complex sulfide system that had been looked at only in bits and pieces previously.

When the property became available in late 1975 and early 1976, we secured our interests with letters of intent and began a large soil geochemical program to outline the anomalous areas in the spring of 1976. Detailed geologic mapping, including limonite and alteration and sulfide mapping, and extensive IP surveys were conducted in the summer and fall of 1976. Conoco began drilling hole BC-1 in September; total depth of the hole was 1994 feet. Holes BC-2 and BC-3 were drilled to 2500 feet and 2463 feet respectively, in 1977. This report is a summary and interpretation of the mapping, geophysics, geochemistry and drilling conducted through 1977.

Acknowledgements

Mr. P. H. Kirwin was able to quickly acquire the two halves of the property when they both became available in late 1975 after he and Ron Long visited the property. Bear Creek Mining Co. (Spokane Office) and Kennecott Research have been very cooperative and helpful since we acquired the property. Aubrey J. Beck assisted mapping for three weeks on the prospect in 1976, and Don Hudson conducted important reconnaissance geologic mapping around the project during the summer of 1977. Karen Kling and Pat Brioady helped with drafting and design of the plates and figures. The Conoco staff, especially Mr. P. H. Kirwin and Ron Long, were helpful through constructive criticism. Mr. Robert Bamford also provided stimulating discussions and ideas.

GENERAL GEOLOGY

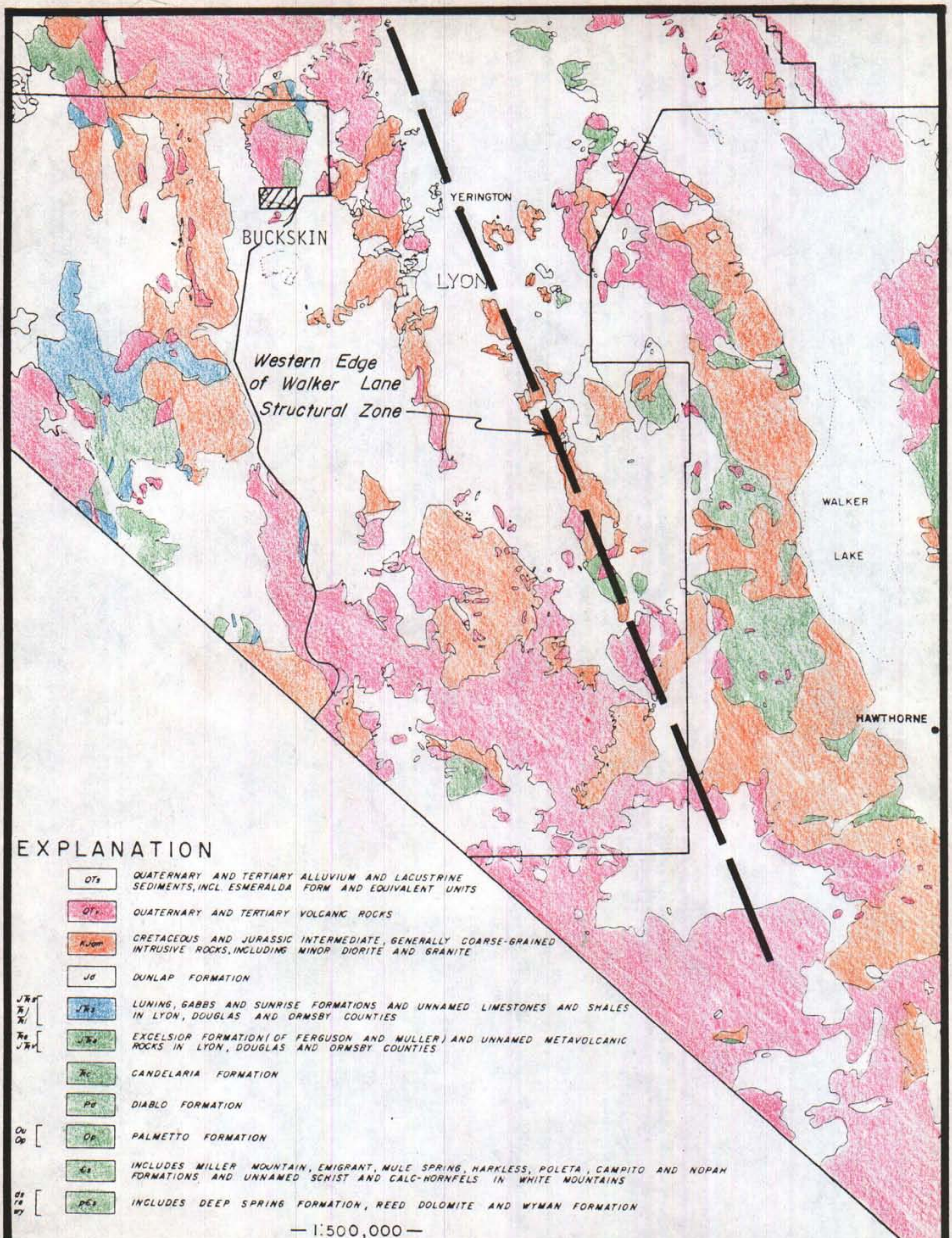
The Buckskin prospect is in the southern half of the Buckskin Range at the western edge of the Great Basin Province and near the western margin of the Walker Lane structural zone (Figure 6).

Approximately 18,000 feet of stratigraphic section is exposed in the Buckskin Range. Triassic metavolcanic rocks are superseded by carbonate and clastic sediments of the Upper Triassic Oreana Peak Formation and carbonates and sediments of the Lower Jurassic Gardnerville Formation. These are overthrust by andesitic metavolcanic rocks of the Lower Jurassic Artesia sequence and dacitic to quartz latitic metavolcanic rocks of the Lower Jurassic to Lower Cretaceous Churchill Canyon sequence.

Oligocene ash-flow tuffs of the Guild Mine Tuff, Weed Heights, Singatse Tuff, Nine Hill Tuff, and Eureka Canyon Tuff unconformably overlie the Mesozoic rocks. Miocene andesites, Plio-Pleistocene lake sediments, and Quaternary alluvium unconformably overlie the ash-flow tuffs.

The Lower Mesozoic rocks are intruded by Jurassic granodiorite and quartz monzonite. Numerous varieties of Miocene andesite dikes, and mineralized dacitic and latitic porphyry dikes and stocks intrude the older rocks of the Buckskin Range, especially in the prospect area. The porphyry dikes and sills at Buckskin have not been recognized previously for their true age or significance.

Most of the rocks in the Buckskin Range were hydrothermally altered to propylitic, sericitic, or aluminophyllic alteration facies by Miocene alteration events and to a lesser extent by Mesozoic alteration events.



GENERALIZED GEOLOGIC MAP
OF THE
WALKER LANE REGION

FIGURE 6

Structure is dominated by gently-dipping Basin and Range(?) faults which were originally steeply-dipping normal faults. These faults underlie steeply westward dipping Tertiary ash-flow tuffs and Mesozoic volcanic rocks. The strata were probably tilted westward by the low angle faults and/or by later steeply-dipping normal faults. According to Proffett (1977), westward tilting and extension began 18 m.y. ago and ended between 11 and 7 m.y. ago. The recognition of Tertiary structure is an important consideration in exploring for mineralized intrusives older than 11 million years.

Mesozoic thrust faulting is also documented in the northern Buckskin Range (Hudson, 1977) bringing the Artesia sequence in contact with the Gardnerville Formation, eliminating at least 8000 feet of stratigraphic section from the Buckskin Range. It is possible that a large structural unconformity identified in the eastern portion of the Conoco project area is also a Mesozoic thrust fault bringing Triassic metavolcanics into contact with Artesia group metavolcanics.

PROSPECT GEOLOGY

STRATIGRAPHY

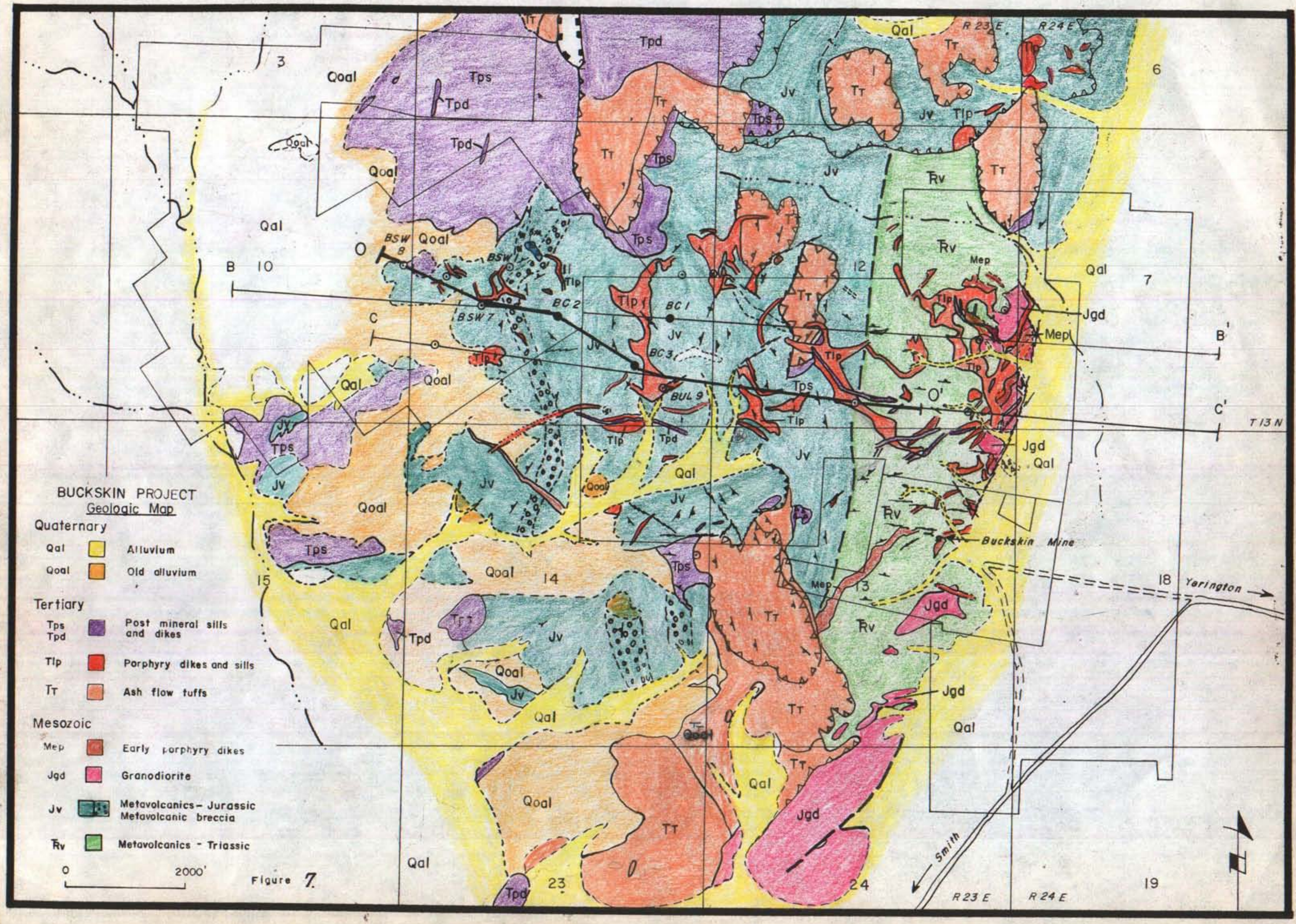
MESOZOIC ROCKS

Triassic Metavolcanics (₮ v)

The oldest rocks exposed in the prospect vicinity as well as in the entire range are Triassic "chicken track" meta-andesites (₮ v) on the east flank of the prospect (Figures 7 and 8). These metavolcanics are tentatively correlated with a continuous section at nearby McConnel Canyon in the Singatse Range and are believed to underlie the Triassic Oreana Peak limestones. Approximately 1300 feet of felsic flows and angular breccias are missing from the Buckskin area. The andesites have mostly fine-grained, dark green groundmass with small, white feldspars occasionally forming a "chicken track" pattern. These rocks are older than the Lower Jurassic Artesia sequence, which they resemble because they are intruded by granodiorite which is provisionally correlated with the Lower Jurassic granodiorite of Black Mountain (Bingler, oral communication, 1977). Foliations in the lower sequence rocks generally strike east-west and dip to the north. The contact between the Artesia sequence to the west and the Triassic metavolcanic sequence may be part of the Buckskin thrust but insufficient exposure prevents exact determination.

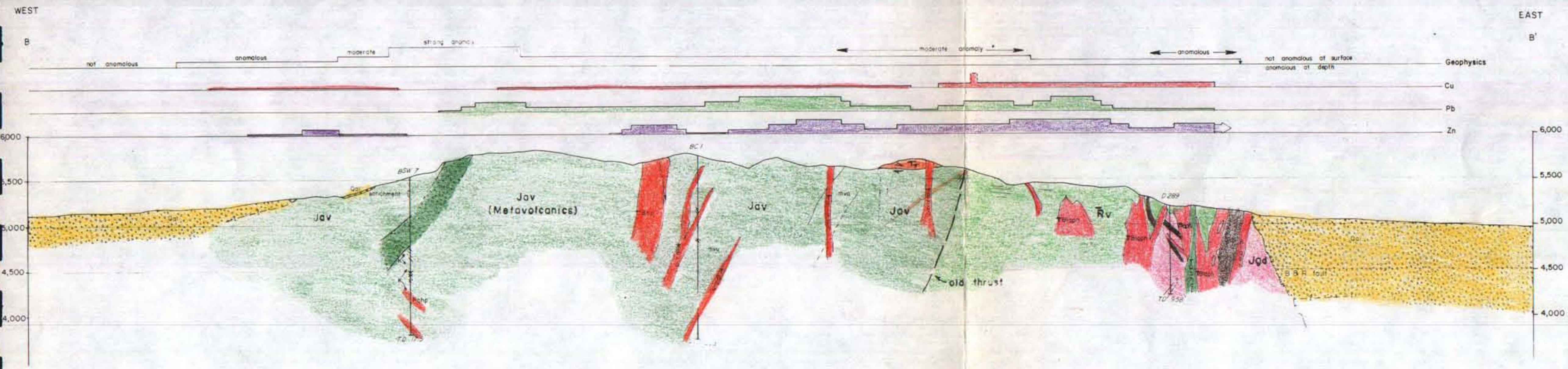
Triassic Sediments

The Triassic Oreana Peak Formation (₮ op) and Jurassic Gardnerville Formation (Jg) present in the northern part of the range (see Appendix B) are absent in the southern half of the range. The Buckskin thrust in the



BUCKSKIN PROJECT
Geologic Map
Quaternary
Qal Alluvium
Qoal Old alluvium
Tertiary
Tps Tpd Post mineral sills and dikes
Tlp Porphyry dikes and sills
Tт Ash flow tuffs
Mesozoic
Mep Early porphyry dikes
Jgd Granodiorite
Jv Metavolcanics - Jurassic Metavolcanic breccia
Ћv Metavolcanics - Triassic
0 2000'
R 23 E
R 24 E
T 13 N
Buckskin Mine
Yerington
Smith
BSW 8
BSW 7
BC 2
BC 1
BC 3
BUL 9

Figure 7.



BUCKSKIN PROJECT

GEOLOGIC CROSS SECTION B - B'

0 500'

Figure 8

WMO 3/77

northern Buckskin Range eliminates 8000 feet of stratigraphic section above the Gardnerville and may also be responsible for the missing section in the southern Buckskin Range.

Artesia Sequence (Jav)

The bulk of Conoco's claims are underlain by Lower Jurassic Artesia metavolcanics, which are up to 6000 feet thick in the southern Buckskin Range. The rocks strike northerly and dip predominately eastward, 50° to 85°. Artesia metavolcanics lie in thrust contact with underlying rocks where observed in the northern Buckskin Range. There is evidence to support the same conclusions in the prospect area (see Structure). The volcanics are repetitious andesitic to dacitic flows and occasional rhyolitic flow breccias within the prospect area. They are fine grained, foliated and usually weakly porphyritic (see Appendix B). They are also characterized by discontinuous "reefs" of silica which form resistant craggy outcrops. Extreme alteration in the prospect area usually destroys the fabric but in some cases enhances the foliation. Foliations are always parallel to small-bedded sandstone and arkose lenses and flow breccias, and represent primary pseudo-bedding features. Some of the andesitic volcanics are probably semi-concordant intrusive sills, in the volcanic pile, but are difficult to correlate, even over small distances with detailed mapping, because of similar composition, metamorphism, the super-imposition of hydrothermal alteration, and Cenozoic faulting.

Churchill Canyon Sequence (Jcc)

The Churchill Canyon sequence, named for exposures just south of Churchill Canyon (Plate 1), conformably overlies the Artesia sequence metavolcanics. In the prospect area, they lie 2000 feet west of Bear Creek's most westerly diamond drilling and are not encountered in any drill holes. As much as 3000 feet of dacitic to quartz latitic flows, tuffs, and associated porphyritic intrusions is exposed in the Buckskin Range (Hudson, 1977). The exposed portion of the sequence contains primarily ash-flow tuffs in the northernmost Buckskin Range and dominately flows in the southern and central Buckskin Range. Quartz phenocrysts up to 10 mm in diameter are distinctive of the sequence, though not all flows and intrusions contain them (see Appendix B).

Both the Artesia sequence and Churchill Canyon sequence are probably correlative to the Double Springs Formation of Noble (1962). Ammonites collected from the Double Springs Formation near Topaz Lake indicate an uppermost Lower Jurassic age of the Double Springs Formation (F. G. Bonham, oral communication). Age dates on hornblende obtained by Castor (1972) from Churchill Canyon sequence type rocks in the Pine Nut Range yielded dates of 146 m.y. and 124 m.y. The age dates would indicate an Upper Jurassic to Lower Cretaceous age for the Artesia and Churchill Canyon sequences.

All of the preceeding volcanic units are regionally metamorphosed to the greenschist facies containing epidote, sericite, calcite, chlorite, and clays with slight albitization of the plagioclase. The units described were primarily mapped as textural varieties of andesites (Oriel, 1977) until the excellent regional mapping and correlation by Don Hudson in 1977.

CENOZOIC ROCKS

The Oliogocene is represented by a series of ash-flow tuffs and tuffaceous sediments which are thoroughly discussed by Proffett and Proffett (1976) from the Singatse Range. Only brief descriptions of the units immediately in the prospect vicinity are given here to note local variations in the units. More complete descriptions can be found in Appendix B.

Guild Mine Tuff (Tgmt)

About 1000 to 2000 feet of moderately-welded, crystal-rich ash-flow tuff of the Guild Mine Tuff unconformably overlies the Mesozoic rocks in a normal section in the Buckskin Range. It is a light brown to buff crystal-rich tuff consisting of 5 to 25 feet of basal vitrophyre with petrified wood fragments overlain by 200 to 900 feet of pumice fragment rich moderately-welded tuff and 300 feet of vapor phase tuff with rare blocks of red jaspar. It is sericitically altered to a white or tan within the prospect area.

Weed Heights Tuff (Twht)

The Weed Heights Tuff conformably overlies the Guild Mine Tuff. It consists of 300 feet of lavender, moderately-welded, crystal-rich tuff topped by 50 to 75 feet of rhyolitic sediments. Abundant large white pumice fragments in the main tuff unit are distinctive.

Singatse Tuff (Tst)

About 2500 feet of brown to red-brown, locally lavender, strongly-to-moderately-welded, crystal-rich ash-flow tuff of the Singatse Tuff conformably overlies the rhyolitic sediments of the Weed Heights Tuff.

It is distinguished by its massive nature, normally reddish tint and the presence of sparse hornblende phenocrysts in its crystal-rich matrix. It has been altered to a brown color within the prospect area.

Other Tertiary volcanics which are listed below are present in the Buckskin Range but not in the prospect area. They are described in Appendix B.

Nine Hill Tuff (Tnht) - 100 feet - overlies Singatse Tuff (part of Bluestone Mine Tuff of Proffett and Proffett, 1969)

Eureka Canyon Tuff (Tect) - 50 feet - from E. C. Bingler - also part of Bluestone Mine Tuff.

Andesitic Volcanics (Tv) -

Lake Sediments (QTs)

At least 250 feet of Pliocene to Pleistocene lacustrine sediments occur on the west flank of the Buckskin Range. These lie with angular unconformity on Miocene to Mesozoic rocks and are tilted as much as 20^{o} westward.

Older Alluvium (Qoal)

Fifty or more feet of coarse unsorted, unconsolidated conglomerate of older Quaternary alluvium lie conformably or slightly unconformably on the lake sediments. The conglomerate contains moderately-rounded pebbles to boulders. Most of the clasts are granitic material that is foreign to the Buckskin Range with a lesser amount of locally-derived material.

Ferricrete (Qfc)

Small patches of bright orange ferruginous breccia (limonite and manganese cemented alluvium) are developed along fault margins on the east flank of the southeastern portion of the Buckskin Range. They both overlie and are locally overlain by recent alluvium (Qal).

INTRUSIVE ROCKS

MESOZOIC IGNEOUS ROCKS

Jurassic Granodiorite (Jg)

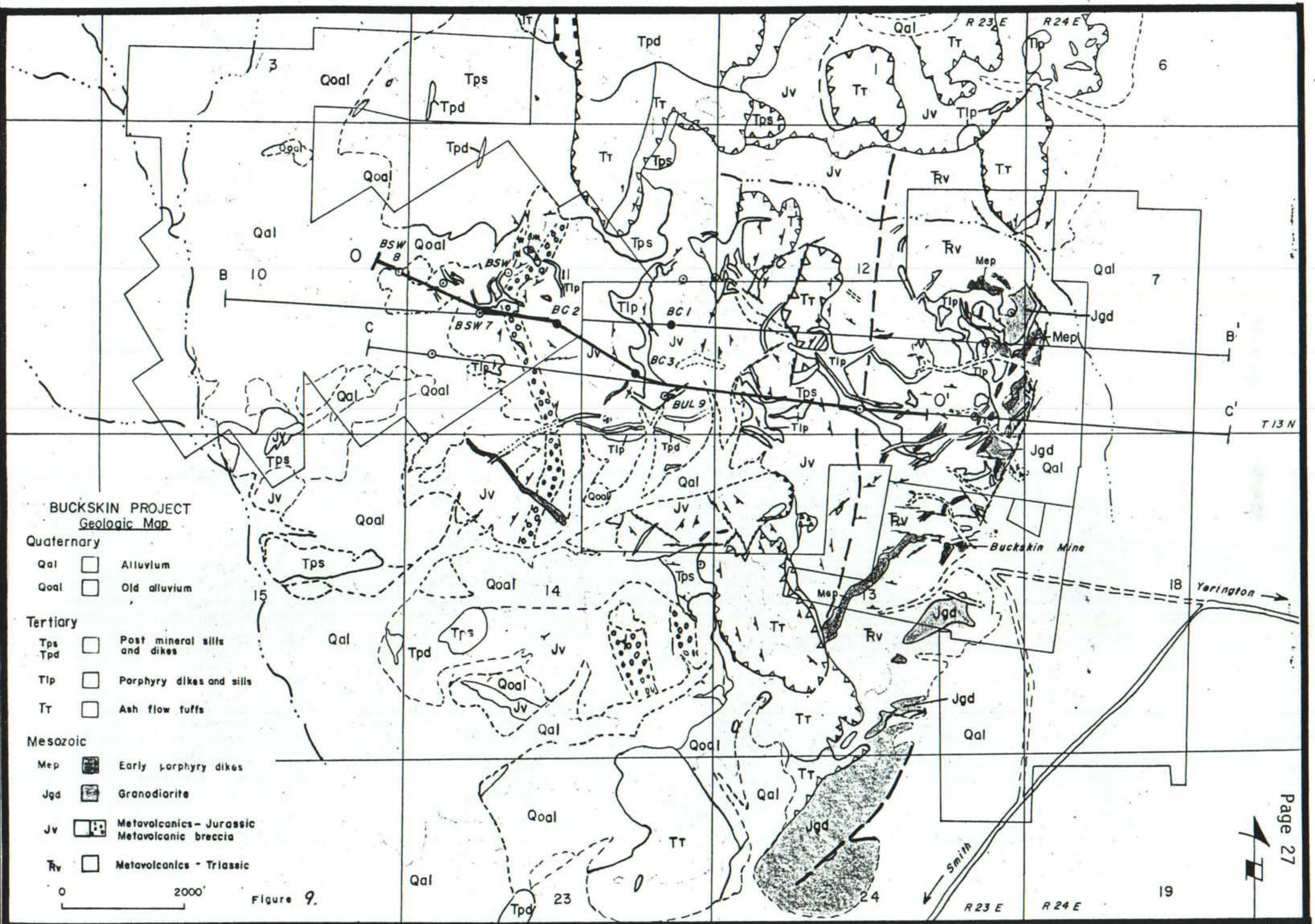
Several textural varieties of Jurassic granodiorite intrude the Triassic "chicken track" metavolcanic (TR rv) along the east flank of the prospect. The granodiorite is a fine to medium grained, equigranular, phaneritic intrusion and is the oldest exposed in the Buckskin Range (Jgd on Figures 7 and 9). It has been tentatively correlated with the Jurassic Black Mountain Granodiorite in the Singatse and Wassuk ranges (E. C. Bingler, 1977, oral communication). This correlation is also useful in defining the Triassic age and correlation of the unit.

Previous field descriptions and drill log descriptions of these rocks were labeled as varieties of quartz monzonites and granites: i.e. fine quartz monzonite (fqm), speckled quartz monzonite (sqm), fine-grained granite (fg), medium-grained quartz monzonite (mqm), etc. These designations can still be found in early drill logs but should be regarded as textural variations of the Jurassic Granodiorite (Jgd).

The Jurassic granodiorite on Conoco's property appears to form a small discrete stock or plug that has been tilted westward approximately 80° and truncated by recent Basin and Range faulting. Some copper mineralization, discussed in later sections, may be associated with this stock.

Latite Porphyry Dikes (KJlp)

Mesozoic latite porphyry dikes intrude the older Mesozoic rocks throughout the Buckskin Range (Map on Figures 7 and 9). They are


BUCKSKIN PROJECT
Geologic Map
Quaternary
Qal Alluvium
Qoal Old alluvium
Tertiary
Tps Tpd Post mineral sills and dikes
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Tт Ash flow tuffs
Mesozoic
Mep Early porphyry dikes
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Jv Metavolcanics - Jurassic
Metavolcanic breccia
Ꞧv Metavolcanics - Triassic
0 2000'
Buckskin Mine
Yerington
Smith
R 23 E
R 24 E
T 13 N
B
B'
C
C'
O
O'
BSW 8
BSW 7
BC 1
BC 2
BC 3
BUL 9
Figure 9.

characterized by large subhedral 3 to 7 cm K-feldspar phenocrysts and about 1% quartz pheoncrysts in an aphanitic groundmass. Varying amounts of hornblende, biotite and plagioclase occur in the groundmass. Several dikes in the northern Buckskin Range are essentially identical in texture and mineralogy but contain about 5% quartz phenocrysts (Kqlp). The dikes are similar in composition to Churchill Canyon sequence intrusions (see Appendix B) but they are distinctive enough in appearance to map separately. The latite porphyry dikes could be a later phase of Churchill Canyon intrusive activity, based upon intrusive relationships, but may be considerably younger. All other intrusive rocks cut the latite porphyry dikes except the granodiorite mentioned previously.

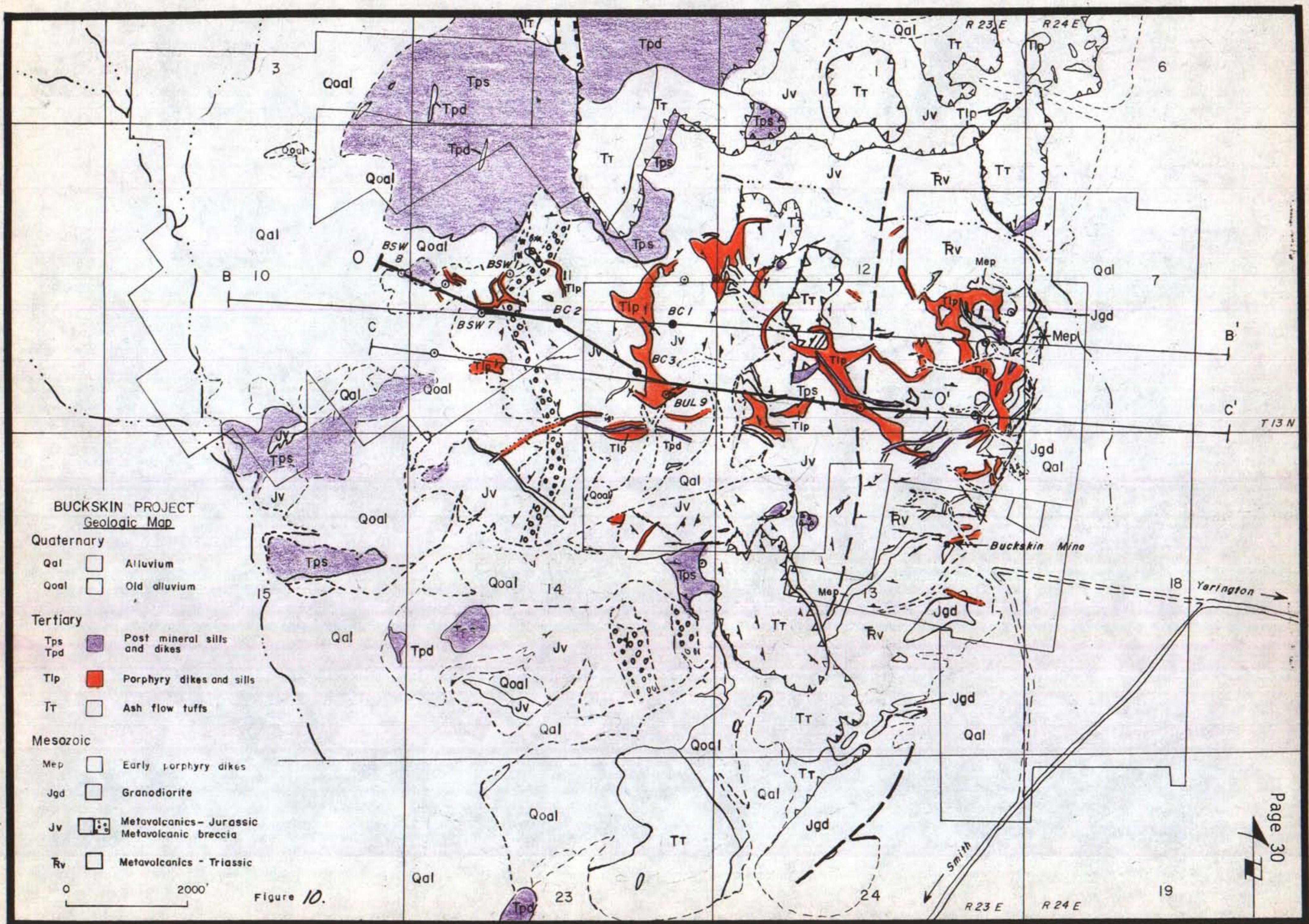
TERTIARY INTRUSIVE ROCKS

Mineralized Igneous Rocks

Mineralized porphyritic dikes, plugs, and sills occur throughout the prospect and largely post-date the faulting (Tlp on Figure 10). One mineralized dike (TFbhp) was dated at about 16 million years by Bear Creek Mining Co. Detailed mapping (Plate 2 and Figure 7) shows that some mineralized intrusive rocks intrude late Oligocene to Miocene ash-flow tuffs and a few may cross-cut tilted normal faults (see Structure). They are latitic to dacitic in composition with varying amounts of phenocrystic quartz, hornblende, and biotite. Stong pyritization and sericitic, argillic and propylitic alteration effect the dikes and the country rocks enclosing them (see Alteration).

Some interesting east-west trending compositional and textural variations were recognized through detailed mapping. Closely-related Tertiary dikes are older, contain significantly more phenocrystic quartz and larger, more well developed stacked biotites in the east than in the west. The changes take place gradually over the entire length of the range and are possibly related to an evolving porphyry system subsequently tilted so that it is now nearly horizontal. The bottom of the system is in the east and the top is in the west. Although we are uncertain of the relationship of the parameters mentioned, other geochemical and mineralogical data strongly support a westward-tilted, elongate porphyry copper geochemical and geological system (discussed in Drilling and Geochemistry).

Fine biotite quartz porphyry (Tfbqp) is perhaps the oldest of the mineralized Tertiary porphyries. It occurs only on the east flank of the range as several small dikes up to 100 feet wide and 600 feet long.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0 2000'
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Yerington
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BSW 8
BSW 7
BC 1
BC 2
BC 3
BUL 9
B
B'
C
C'
O
O'
3
6
1
10
11
12
7
15
14
13
18
23
24
19

Figure 10.

In thin section 2-3 mm rounded quartz phenocrysts and biotite books 2 mm thick and 4-5 mm long are set in a felted groundmass. Microlites of plagioclase and K-feldspar are normally 1/2 to 1 mm long. Hornblende (±0.2mm) is widespread in the groundmass, and sphene and apatite are common accessories.

Biotite-hornblende porphyry (Tbhp) occurs as small dikes and irregular sills up to 2500 feet long and 600 feet wide in the central area of the prospect. Stacked biotite phenocrysts 3-5 mm wide characterize this rock. Hornblende rarely is more abundant than biotite. Feldspars are as large as 5 mm but are visually subdued by alteration effects. Quartz phenocrysts are normally less than 1% of the rock, but gradational contacts with identical rocks containing as much as 5% quartz phenocrysts (Tbhpq) have been mapped on the surface.

Fine-grained biotite-hornblende porphyry (Fbhp) is compositionally very similar to biotite-hornblende porphyry (bhp) and may be texturally gradational into it. It can be distinguished by the much smaller biotite phenocrysts that are distinctly less stacked. These mineralized dikes occur exclusively in the west portion of the district. They have been dated by K-Ar methods at 15.7 ± 1.5 million years in hole BSW-7 (Nielsen, BCMC, 1975).

Biotite latite quartz-porphyry with hornblende (Tblqph) is a common rock in the eastern area and is probably one of the youngest of the mineralized porphyries. Large, rounded and embayed quartz phenocrysts 3-6 mm long, stacked biotite phenocrysts 3-5 mm high, and large plagioclase and feldspar phenocrysts 4-5 mm long are characteristic for field identification. Quartz phenocrysts are not common; one or two in a fist-sized specimen is typical. This porphyry normally contains greater than 1% pyrite and is strongly altered to sericite, calcite and chlorite.

Fine-foliated hornblende quartz dacite porphyry (Tfhqdp) occurs as small, east-west trending dikes in the central and eastern parts of the property. These dikes are very young and cut most of the mineralized porphyries except Tblqph with which it doesn't come in contact. These rocks (Tfhqdp) are very dark and fresh looking on the surface, and at first they were thought to be post-mineral. Thin sections reveal very fine disseminations of up to 5% pyrite and greater alteration than previously recognized.

Quartz biotite hornblende dacite porphyry (TQbhdp) forms dark dikes that are weakly chloritized and mineralized with pyrite. These are among the youngest dikes mapped.

Other Tertiary dikes occur within the prospect and elsewhere in the Buckskin Range. They are of minor significance, however, and their descriptions can be found in Appendix B or Hudson's reconnaissance report (1977).

Breccias

Breccias are limited to the western side of the prospect. A small, pipe-like tectonic breccia containing porphyry and volcanic fragments in a rock flour matrix crops out about 400 feet northeast of hole BSW-1 (Plate 2). Float mapping indicated its dimensions to be approximately 100 feet by 400 feet. A small pebble dike containing rounded silicified fragments of metavolcanics crops out east of the breccia. It is about six inches to a foot wide and dips 52^{o} to the east.

A small outcrop of breccia with a questionable porphyritic matrix containing biotite hornblende porphyry (Tbhp) and fine-grained phaneritic igneous fragments occurs southwest of hole Bue-9. It is highly altered to sericite and clay, and the nature of the matrix is difficult to distinguish. The presence of breccia pipes and pebble dikes in the vicinity of drill hole BSW-1 supports all other data relating to a tilted porphyry system with its top near hole BSW-1 (Figure 7, Plate 2, and Appendix D).

STRUCTURE

The Buckskin Range has two distinct types and ages of deformation: Mesozoic thrust faulting and Cenozoic Basin and Range faulting. The Basin and Range faults are of two types: older, gently-dipping to flat faults which may have been originally steeply dipping, and younger, steeply-dipping faults.

Mesozoic Deformation

A thrust fault is exposed in several locations in the northern Buckskin Range (Plate 3), bringing the Artesia sequence in contact with the Gardnerville Formation. Evidence of this thrust is abundant (Hudson, 1977). Although the direction of movement is unknown, the fault brings Jurassic Artesia sequence rocks into contact over Gardnerville Formation sediments. It has been roughly dated from middle to uppermost Lower Jurassic age.

In the prospect area there is a large, structural discontinuity between east-west striking, north-dipping foliated Triassic volcanics on the east and north trending, west-dipping Jurassic Artesia metavolcanics on the west. The similarity of the volcanics and lack of outcrop have combined to make it impossible to locate the fault exactly or determine its subsurface orientation. The Triassic volcanics to the east all lie at a lower elevation than the Jurassic Artesia metavolcanics permitting a thrust type fault with Jurassic volcanics overlying Triassic volcanics. It may be the same thrust fault identified by Hudson (1977) in the northern Buckskin Range that has merely moved down section. Some bulldozer trenching is planned next summer to investigate the nature of this fault.

Tertiary Deformation

The dominant structural elements in the Buckskin Range are low-angle Basin and Range faults. These faults generally dip 5 to 15 degrees, although some dip to 7° west and 25° east (Hudson, 1977). The low-angle faults are generally not recognizable where they displace Mesozoic rocks because of the lack of distinctive marker horizons, but are easily recognized and traced where erosional remnants of the Tertiary ash flows are preserved. All of these faults have normal dip slip movement and are generally subparallel with a northerly strike.

The average dip of the Tertiary ash-flow tuffs is 75 to 90 degrees to the west, except adjacent to the low-angle Tertiary faults where intense drag folding occurs. This dip clearly indicates drastic rotation of the Buckskin Range and the ash-flow tuffs serve as good control for fault displacement. Offsets as small as 50 feet and up to 6000 feet can be clearly observed; all displacement is to the east.

Proffett (1972, 1976, 1977) studied the Cenozoic structure of the Yerington area in detail for several years while working for Anaconda. He concluded that Basin and Range faulting accompanied regional westward tilting from Late Oligocene through at least early Miocene (Figures 11 and 12). This resulted in steeply-dipping recent Basin and Range faults, mostly on the east flanks of ranges, but strongly-tilted older, inactive Basin and Range faults that are presently so gently dipping that they were earlier presumed to be gravity slide blocks. Conoco's detailed and reconnaissance mapping strongly supports Proffett's work, but not necessarily his conclusions.

Another small thrust was mapped in the south central part of the prospect area which places Jurassic Artesia volcanics over near-vertical

Tilting and reduction of dip and curvature of early normal fault (fault of Fig. 8) by tilting due to displacement on later normal fault. Note that vertical displacement as well as tilting are due to hanging-wall block adjusting in shape to fill a potential void resulting from horizontal extension between hanging wall and footwall. Hanging wall could have adjusted to its new shape by development of antithetic faults instead of tilting, as has clearly been shown by Hamblin (1965), but in Yerington district tilting was dominant.

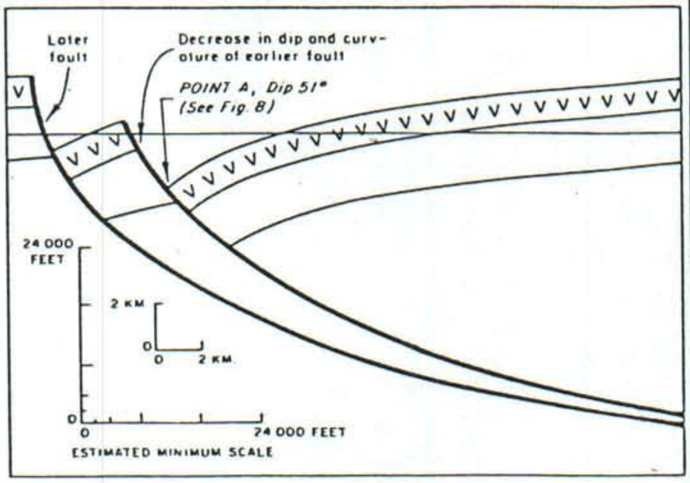
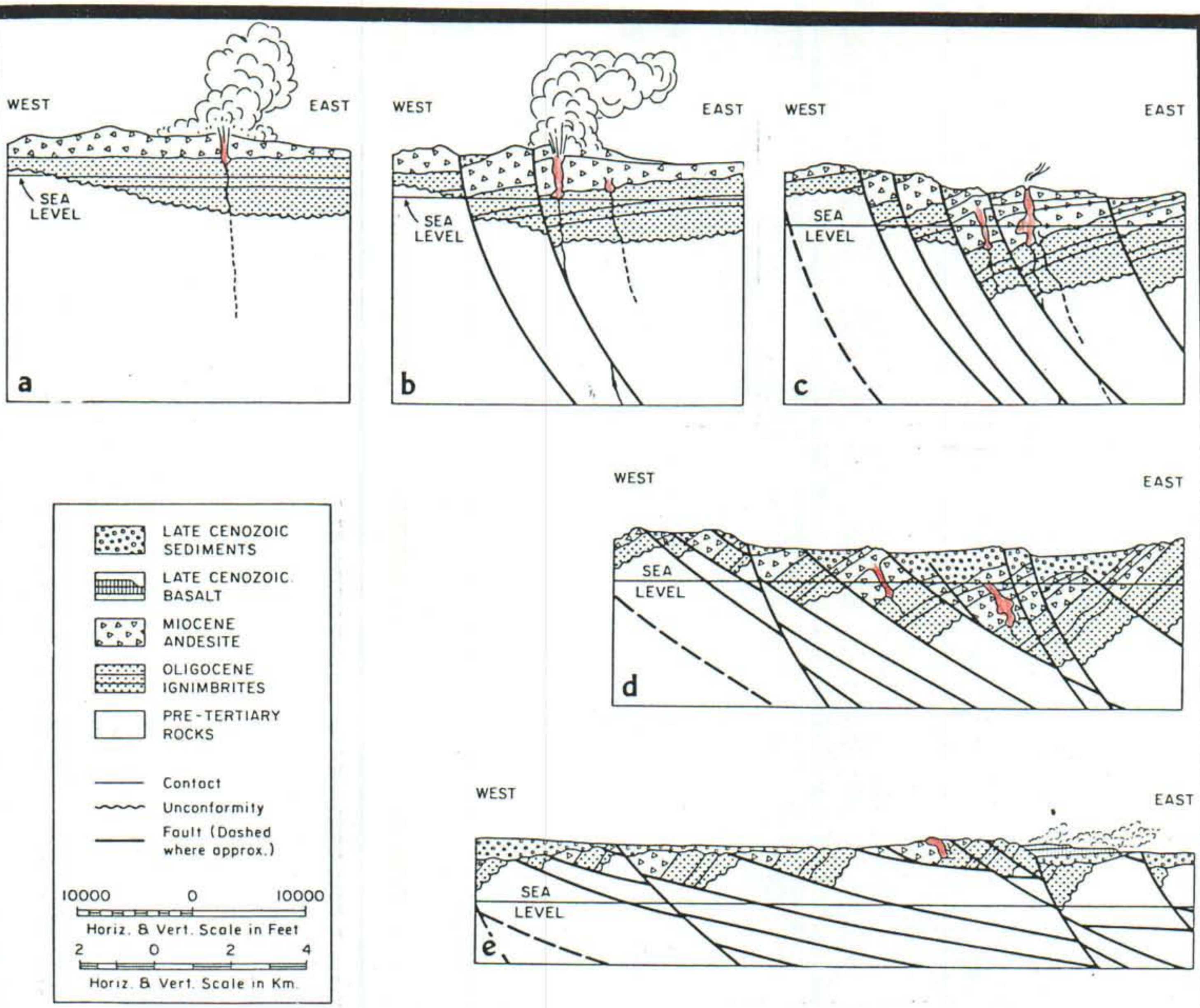


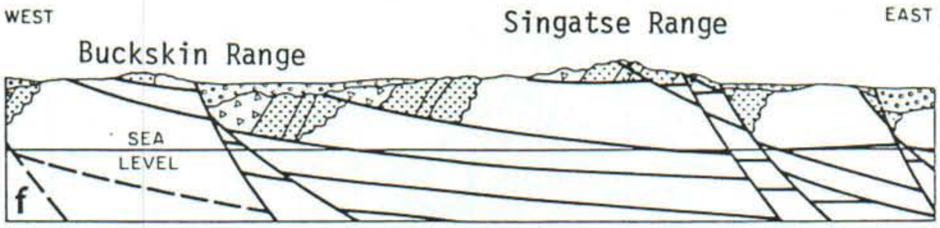
Figure 11

Tilting of Basin and Range faults
From Proffett, 1977

dipping Tertiary ash-flow tuffs. The extent of this fault is uncertain but it is probably local. Tertiary mineralized porphyry dikes have intruded along and across some faults and locally cut the ash-flow tuffs (Figure 13, Plate 2).

Numerous other smaller presumed fault blocks which are defined best by juxtaposition of foliation within the metavolcanics are present within the large tilted Basin and Range fault blocks. Many of the bounding faults can only be presumed present because of the lack of outcrop. The foliations in the Mesozoic country rocks dip moderately to steeply west and strike north-south except in the eastern quarter of the prospect where they strike east-west and dip mostly north 45 to 65 degrees. There is no apparent folding and the postulated structural feature responsible for the large change in foliation does not fit well into the Cenozoic pattern of faulting. It is possible that it is a pre-Tertiary structure, perhaps the Buckskin thrust as discussed earlier.

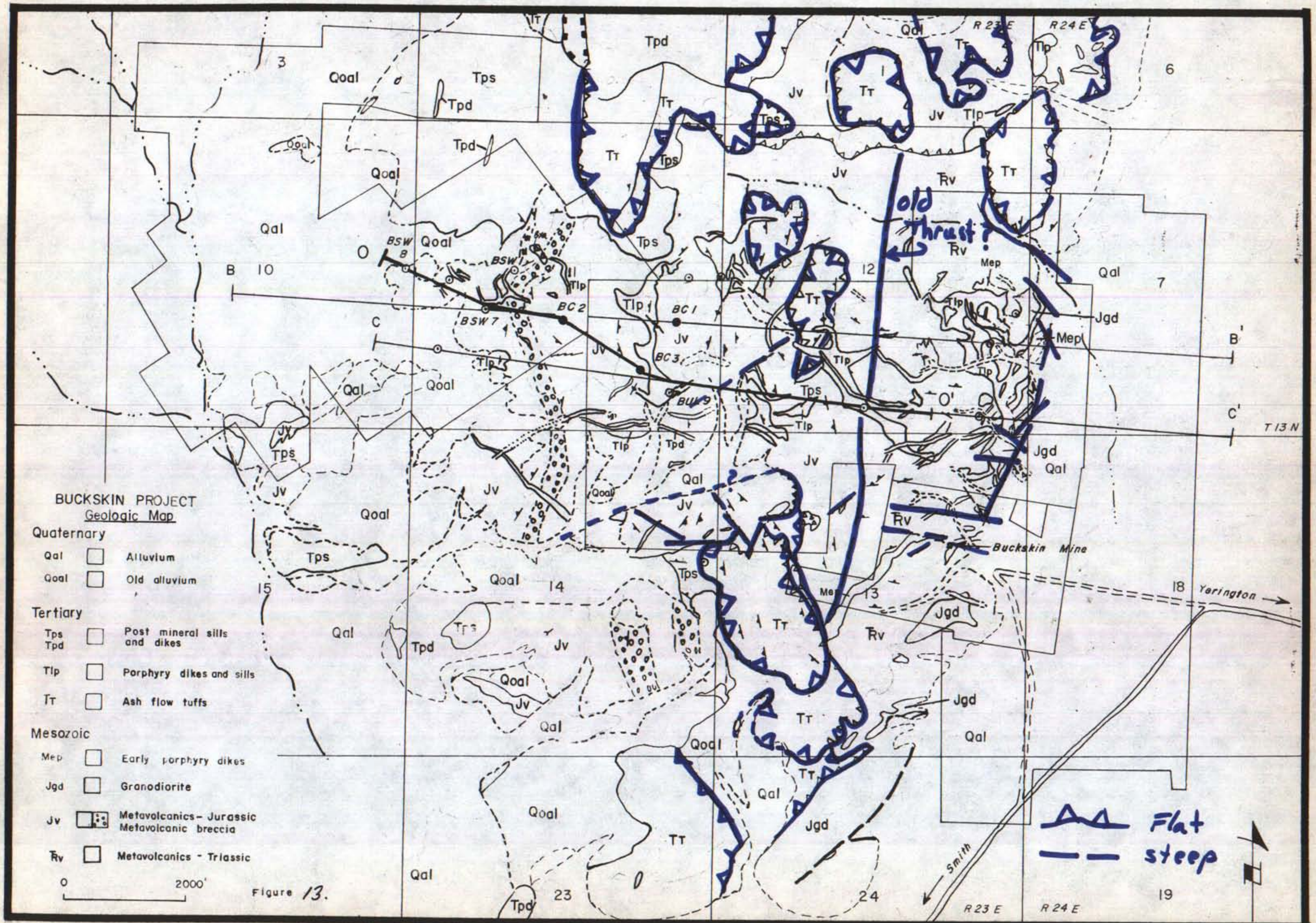




Cenozoic geologic history of Yerington district, Nevada, shown on east-west cross section. Various stages have been reconstructed by sequentially unfaulting and untilting present cross section (f). Sea level estimated for diagrams a through e. a, Late Oligocene through early Miocene; deposition of ignimbrite sequence followed by beginning of deposition of hornblende andesite, 18 to 19 m.y. ago. b, Early Miocene, 17 to 18 m.y. ago; continued eruption of andesite and beginning of Basin and Range faulting and tilting. c, Early Miocene, 17 m.y. ago; end of andesite volcanism and continued Basin and Range faulting with erosion of up-faulted blocks. d, Early and middle Miocene, 11 to 17 m.y. ago; continued faulting, tilting, erosion of ranges, and deposition of sediments in basins. Early faults rotated to such a flat dip that they are no longer in favorable orientation for continued faulting. New steeper faults form to take their place. e, Eight to 11 m.y. ago; all early faults tilted to gentle dips and inactive, but faulting and tilting continues on newly formed steep faults; erosion of ranges and deposition of sediments and locally basalt in basins. f, Present time; continued faulting and tilting along steep range-front faults, erosion of ranges and deposition in basins.

Figure 12

Cenozoic Structural History
From Proffett, 1977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Yerington
Smith
T 13 N
R 23 E
R 24 E
BSW 8
BSW 7
BC 1
BC 2
BC 3
B
B'
C
C'
O
O'
Figure 13.

Some gentle folding of the metavolcanics can be seen in the rhyolitic flow breccias on the west flank of the range. The fold axes trend west-northwest subparallel to the moderate and strong anomalous IP response.

The trends of the faults are mostly north-south, northeast and west-northwest. The northerly trending faults are the traces of the old eastward, steeply-dipping Basin and Range faults which are now tilted to the west so that the fault plane dips gently to the east (Figures 7, 11, 12, and 13). Because of the trough-like nature of these faults, they usually curve into northwest trending boundaries on the south ends of the blocks and trend to the northeast on the north end of the blocks (Proffett, 1977). Often these blocks are terminated by later northeast and northwest trending faults (Figure 13).

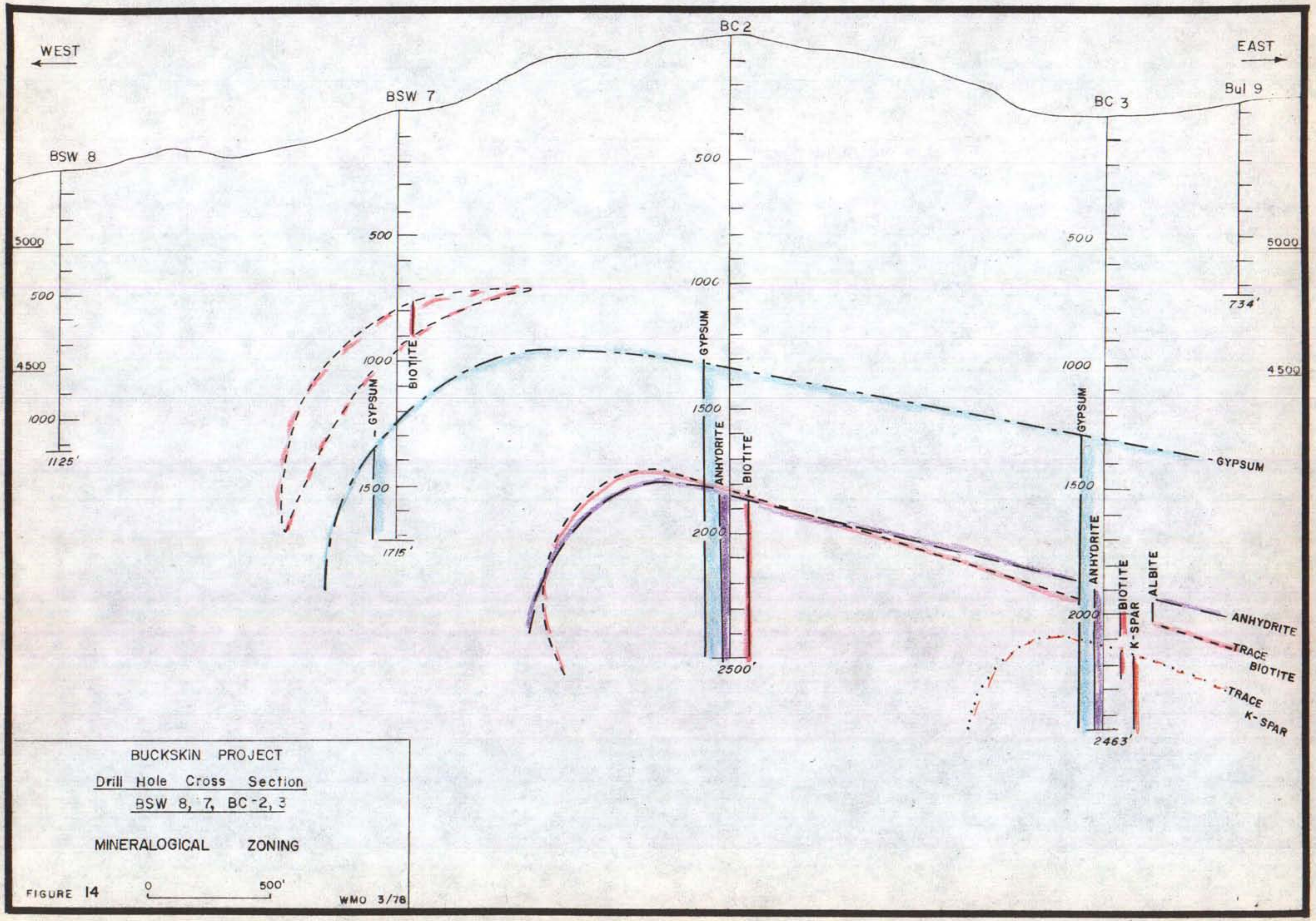
Most of the later northeast and west-northwest faults displace Mesozoic dikes and some Tertiary dikes in a right lateral sense. A series of west-northwest trending faults disect a Mesozoic (KJLP) dike, into fault blocks that have moved right laterally. An apparent left lateral sense of motion is locally observed as a result of differential movement along the faults.

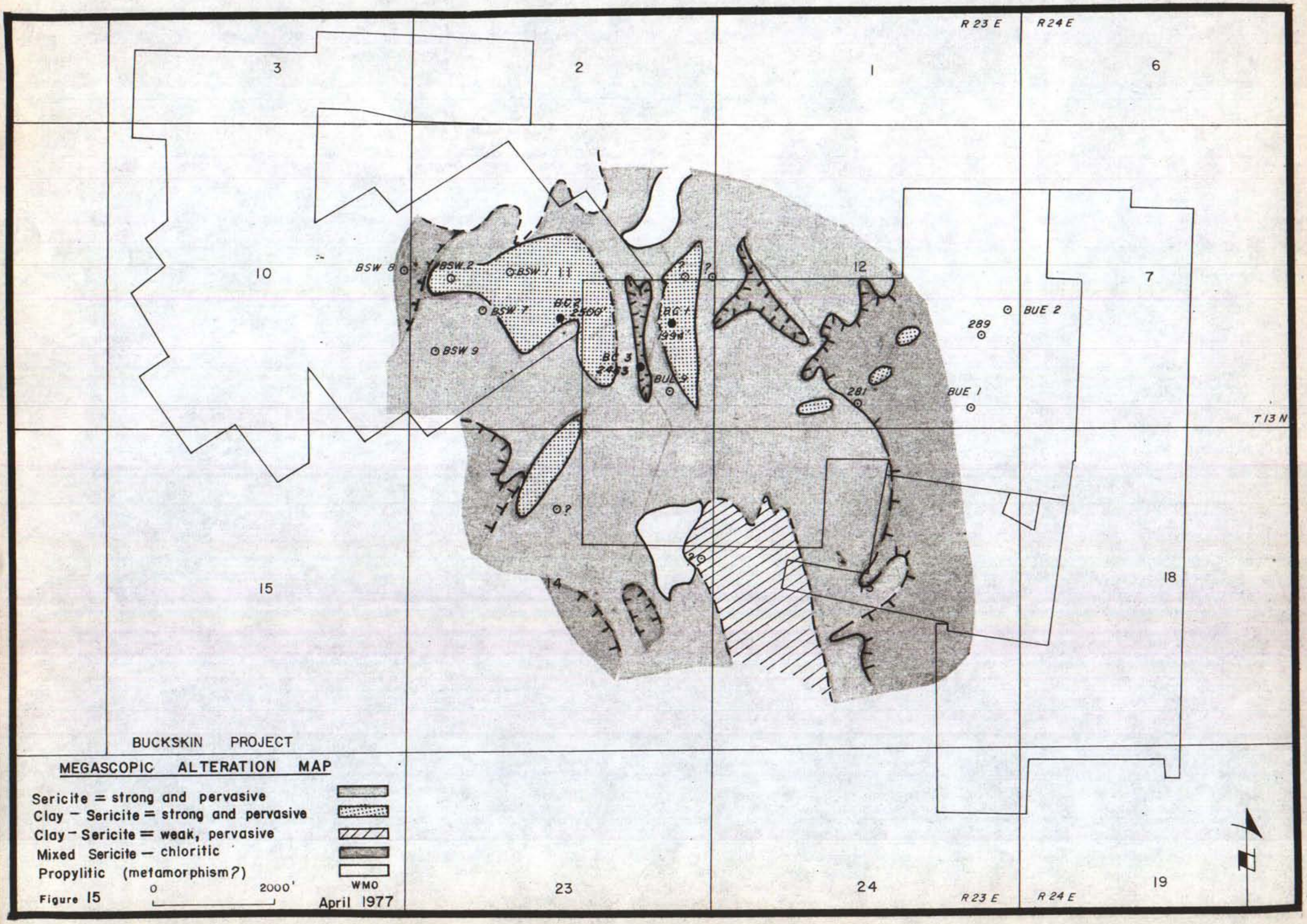
ALTERATION

Surface and drill core thin section studies have developed patterns which largely conform to those typical of a porphyry system when westward tilting and erosion are accounted for (Figures 1 and 14). Thin section studies of Conoco's holes BC-2 and BC-3 (see Drilling) have especially formed a pattern and model that integrates all Conoco geology, geochemistry, limonites, geophysics and alteration data into a coherent consistent porphyry copper model (Figure 14 and Appendix D). Mineralogical gradients of gypsum, anhydrite, secondary biotite, and secondary K-spar form patterns indicating a porphyry copper system that is only approached at depth by holes BC-2 and BC-3. Pervasive sericite is present on the surface and in all holes with varying amounts of silica, clay, chlorite, epidote, calcite, and occasionally other products such as biotite, pyrophyllite, diaspore and rutile. Details of the holes drilled prior to 1977 can be found in last year's Buckskin report (Oriel, 1977).

Field observations defined the following pervasive mineral assemblages which appear to form mappable alteration zones at the surface: sericite, strong clay-sericite, weak clay-sericite, mixed sericite-chlorite and chlorite-epidote (Figure 15). Thin section studies of 112 surface and 245 core samples revealed conforming surface and subsurface alteration and mineralization patterns.

The sericite zone covers most of the prospect. It extends to the southwest and the northeast beyond our property line, but has a relatively sharp north-south trending boundary with the mixed sericite-chlorite (propylitic) zone on the east. The feldspars and the groundmass in this


WEST
EAST
BSW 8
BSW 7
BC 2
BC 3
Bul 9
5000
500
4500
1000
1125'
500
1000
1500
1715'
GYPSUM
BIOTITE
500
1000
1500
2000
2500'
GYPSUM
ANHYDRITE
BIOTITE
500
1000
1500
2000
2463'
GYPSUM
ANHYDRITE
BIOTITE
K-SPAR
ALBITE
734'
5000
4500
GYPSUM
ANHYDRITE
TRACE BIOTITE
TRACE K-SPAR
BUCKSKIN PROJECT
Drill Hole Cross Section
BSW 8, 7, BC-2, 3
MINERALOGICAL ZONING
FIGURE 14
0
500'
WMO 3/78



R 23 E
R 24 E
3
2
1
6
10
11
12
7
15
14
13
18
23
24
19
T 13 N
BSW 8
BSW 2
BSW 1
BSW 7
BSW 9
BC 2
2500'
BC 1
1394'
BC 3
2493
BUE 3
BUE 2
BUE 1
289
281
BUCKSKIN PROJECT
MEGASCOPIC ALTERATION MAP
Sericite = strong and pervasive
Clay – Sericite = strong and pervasive
Clay – Sericite = weak, pervasive
Mixed Sericite – chloritic
Propylitic (metamorphism?)
Figure 15
0
2000'
WMO
April 1977

zone are typically 80% or more replaced by sericite. Accessories such as sphene and apatite are relatively unaltered. This zone is overlapped in the western portions of the prospect by patches of clay-sericite (argillic to advanced argillic) alteration.

The largest clay-sericite alteration zone is in the west. Sericite and low birefringence clays are generally pervasive in this zone. Some silicification of the groundmass occurs and quartz and clay veins are most common in these localities. The surface boundaries of this alteration zone were mostly defined by the presence of sparse clay veining, but thin section and X-ray diffraction data indicate that the western and largest area of strong clay-sericite occurrences may represent advanced argillic alteration as defined by the presence of natroalunite, diaspore and pyrophyllite. This mineralogic assemblage conforms well to the tilted porphyry copper model Conoco has developed. The central elongate strong clay-sericite alteration zone centered about hole BC-1 probably does not represent advanced argillic alteration. The clay veins here are metahalloysite, and are probably supergene products.

The weak clay-sericite alteration has been studied in hand specimen only. It is found in the ash-flow tuffs of the Mickey Pass sequence and is defined by a greater percentage of clay than is present in the strong clay-sericite alteration zones and yet weaker intensity of alteration. Rock type may be an important factor in this zone because the original tuff apparently contained a great deal of clay. The significance of this zone is not immediately obvious.

The mixed sericite-chlorite alteration zone forms most of the eastern part of the prospect. On the surface it is characterized by weak to strong sericite mixed intimately, both microscopically and megascopically, with weak to moderate chlorite. Thin sections reveal a chlorite-sericite-calcite-epidote alteration assemblage in both dikes and volcanic country rock. The intensity or thoroughness of the alteration varies considerably from about 15% chlorite-calcite-sericite to total replacement. Mapping of the intensity of alteration from thin sections has not been undertaken at this time, but the pattern conforms well to a propylitic-type alteration zone around the sides and base of a tilted porphyry copper system (Figure 15 and Drilling section).

Propylitic alteration is found in the northern and southern portions of the property in late Tertiary sills and plugs. It also occurs in relatively fresh-looking Mesozoic andesites. Regional metamorphism probably accounts for the propylitic assemblage in the older volcanics. The alteration appears to be deuteric in the younger sills and dikes and is probably unrelated to the overall hydrothermal system which produced the other suites of minerals.

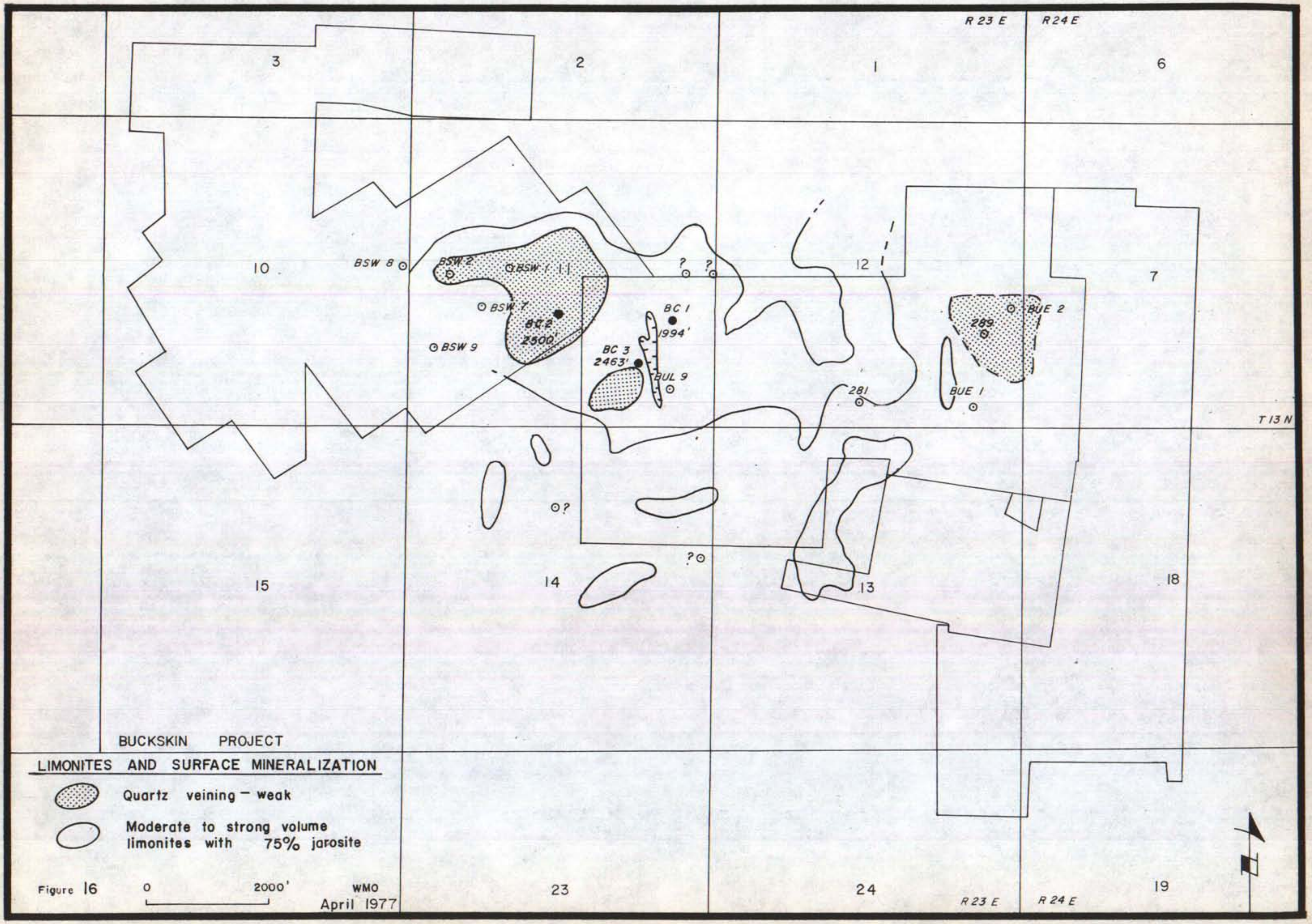
LIMONITE MINERALOGY

Surface mineralization consists predominately of limonites that formed after pyrite. A few patches of less-weathered rocks bearing fresh disseminated pyrite occur randomly throughout the prospect. Figure 16 is a volume intensity summary map of surface limonites. It depicts only visual estimates of "moderate" or "abundant" limonites on fractures, combined with a jarosite content generally greater than 75% of the total limonite volume. Its shape and size, however, agree remarkably well with the moderately anomalous IP zone (Figure 22), which represents about four to five percent pyrite in drill holes (see discussion on Induced Polarization).

Hematite stains are scattered everywhere, but do not form a mappable pattern. Typical "lavender" hematite after chalcocite can be seen in a few places, and drilling in holes BSW-1, 2, 7, and 8 indicates there is a small amount of secondarily enriched copper beneath the surface staining. "Brick red" hematite stains are also common and usually are associated with small fractures or fault zones. This color and type of occurrence is not necessarily related to copper mineralization.

Jarosite is typical of the thoroughly leached zones overlying moderate to strong pyritization and usually occurs in areas of sericitic and/or argillic alteration, possibly because leaching is favored by these alteration products.

Goethite stains on fractures are found in less-altered rock indicating generally less-disseminated pyrite than the area of predominately jarositic limonites. Goethite is more abundant in the propylitically-altered volcanics on the east flank of the prospect.


R 23 E
R 24 E
3
2
1
6
10
12
7
BSW 8
BSW 2
BSW 1
BSW 7
BSW 9
BC 2
2500'
BC 1
1994'
BC 3
2463'
BUL 9
281
289
BUE 2
BUE 1
?
T 13 N
15
14
13
18
BUCKSKIN PROJECT
LIMONITES AND SURFACE MINERALIZATION
Quartz veining – weak
Moderate to strong volume limonites with 75% jarosite
Figure 16
0
2000'
WMO
April 1977
23
24
19
R 23 E
R 24 E

All three limonites can be found on separate fractures in practically the same hand specimen, but they are characteristically fairly pure. Jarosite is usually 90% pure (estimated) and only occasionally has more than 20% blended hematite and/or goethite. The same is true for the hematite stains. Goethite may have more mixtures of jarosite and hematite, but it is more difficult to estimate the impurities in goethite.

Turquoise veinlets are abundant in roughly linear west-northwest trending zones on the eastern and western sides of the property. They do not quite join in the center of the prospect (Plate 8).

Outcrops showing malachite, azurite and "neotocite" (Mn-Cu oxide) are sparse. These minerals can be found along small veinlets and fractures. They occur in weakly-altered and mineralized fringe areas where strong leaching has not taken place. Their presence is not related to, or representative of soil geochemistry.

Veinlets of pure jarosite up to 1/2 inch wide invade the Mesozoic volcanics in the vicinity of the Bear Creek holes BSW-1 and BSW-7.

Weak quartz veining areas have been included on the limonite map for convenience because the alteration map was too crowded. The western area of veining is in the vicinity of holes BSW-1 and BSW-7, which is reasonable for the top of the porphyry system near the axis as has been interpreted from other geologic and geochemical data.

GEOCHEMISTRY

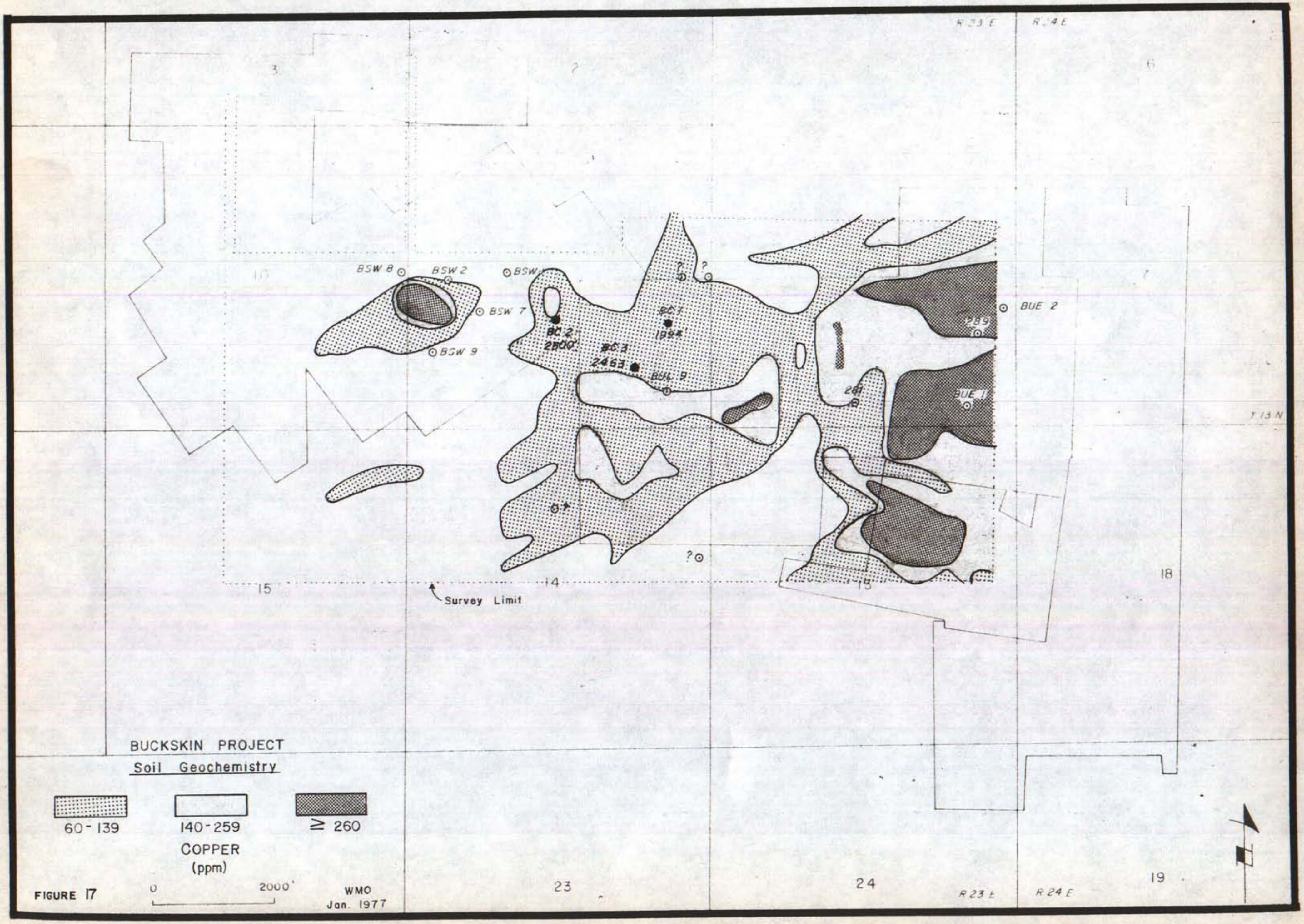
Soil Geochemistry

Soil samples were collected over a large area for geochemical analysis early in 1976 as a first step in defining the Buckskin system (Figures 17 through 21). To this end the program was entirely successful.

Approximately five hundred samples were collected on a 300 by 600 foot grid and assayed for copper, molybdenum, lead, zinc, and silver. The property has only a thin to non-existent soil horizon overlying a few inches to several feet of decomposed bedrock. The samplers tried to consistently collect the finer material from the top of the decomposed bedrock. Quaternary alluvium was also sampled and serves as a rough guide to background values. Contour intervals were selected by comparison of frequency histograms of the values of each element.

All elements have closely similar outer limits defining the geochemically anomalous areas. Only the distribution of the higher values changes significantly within this pattern. It should be noted that the geochemically anomalous values do not coincide directly with the strongest alteration. Although the values generally define a large roughly east-west trending system, three areas (western, central and eastern) can be separately discussed.

The western anomaly was drilled by Bear Creek before 1973. It consists of a copper and moly anomaly with weak zinc and silver anomalies. The outer or western part of the central lead anomaly just touches this area. Widespread thin veinlets of turquoise may account for the high copper values, but a thin blanket of supergene chalcocite 120 to 170 feet deep underlies the surface anomaly.



BUCKSKIN PROJECT

Soil Geochemistry

FIGURE 17

WMO
Jan. 1977

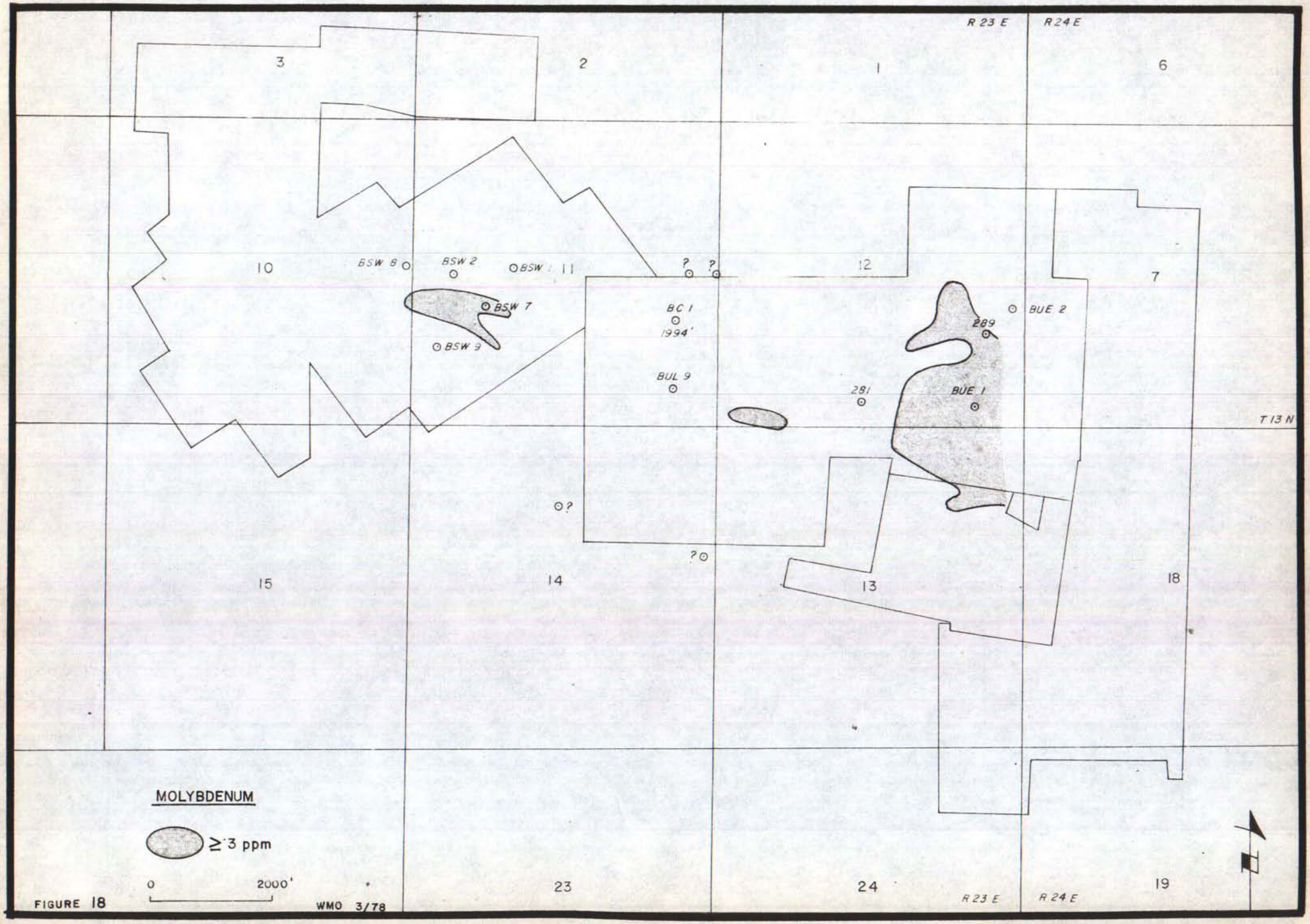
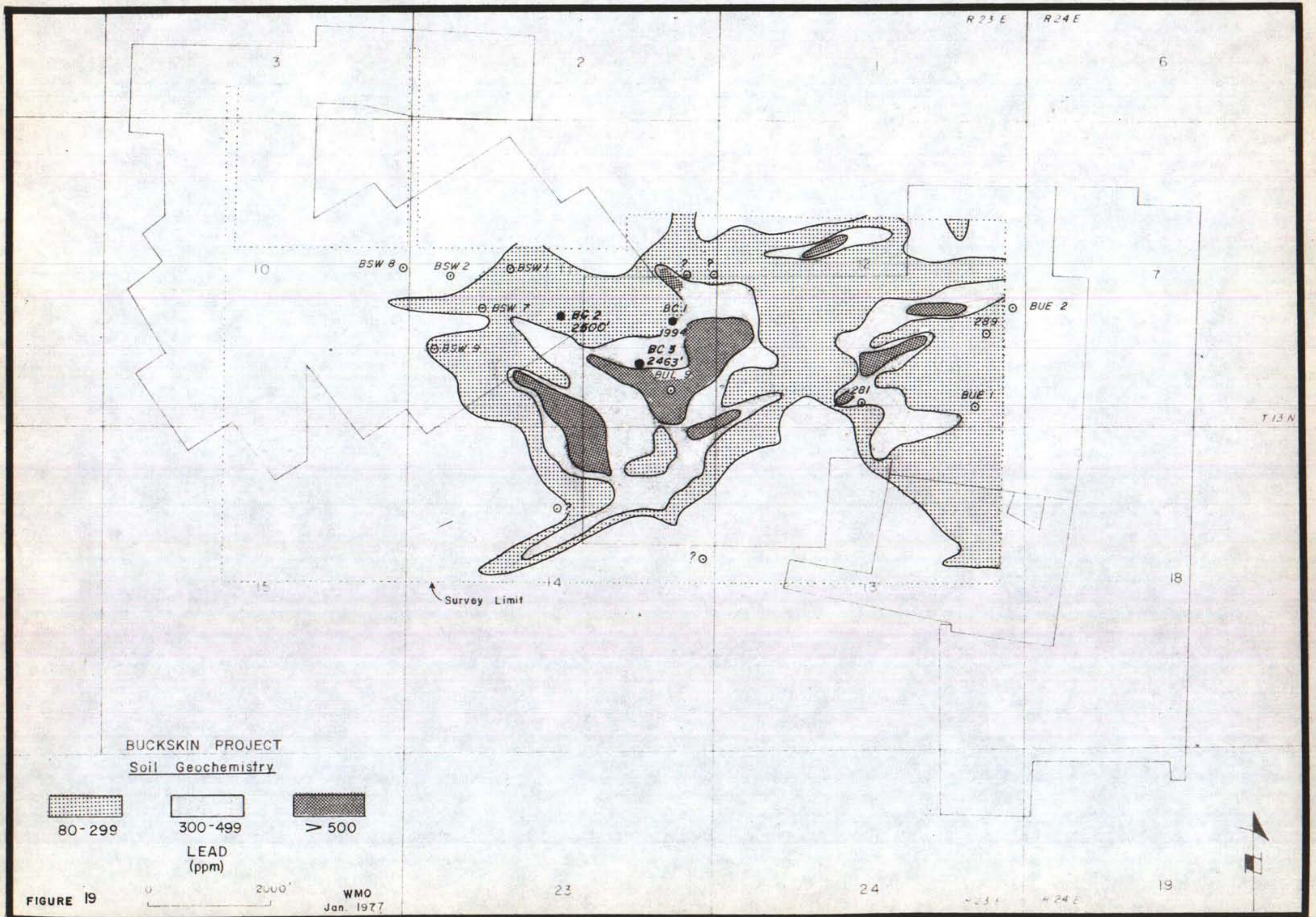


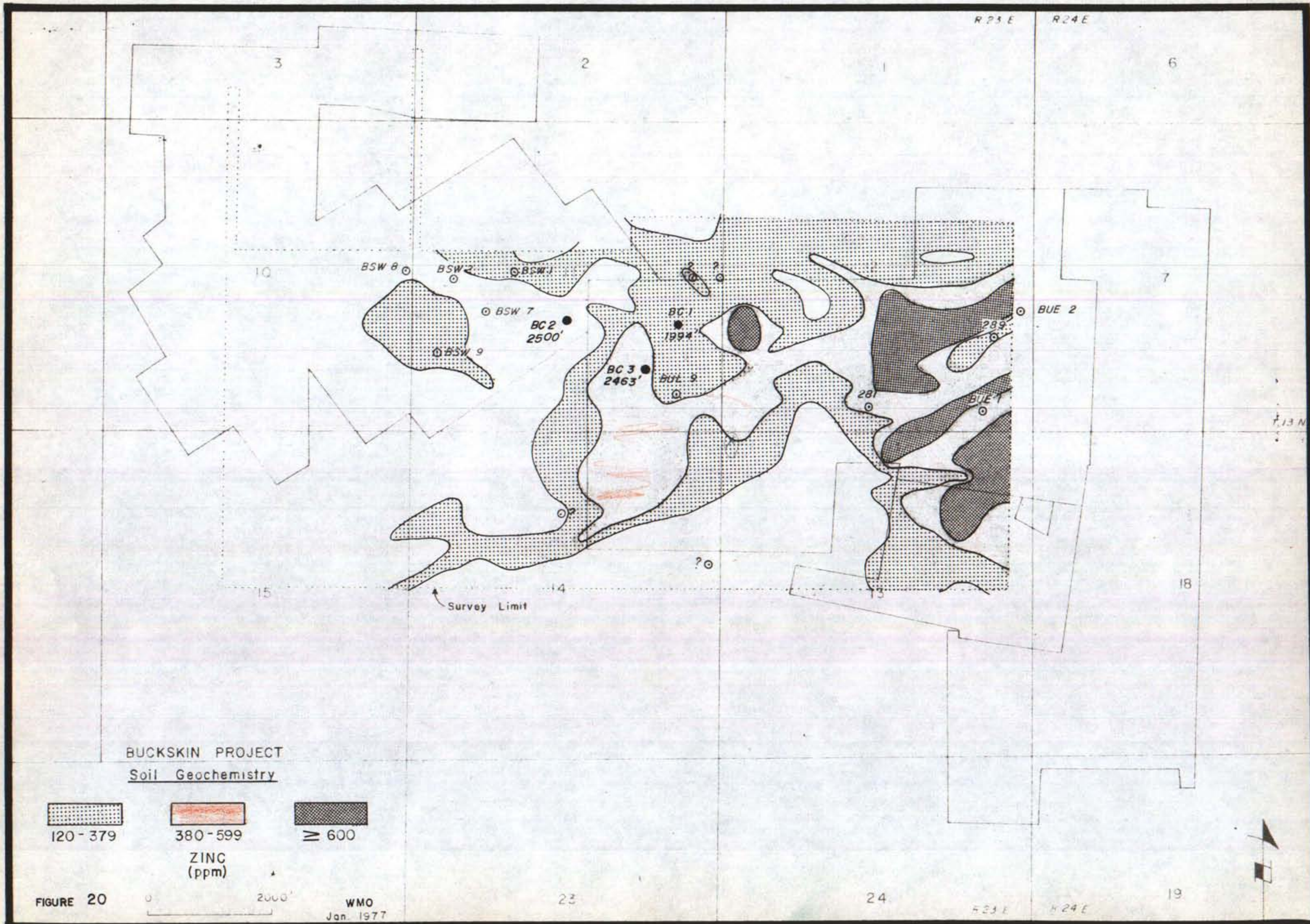
FIGURE 18

WMO 3/78



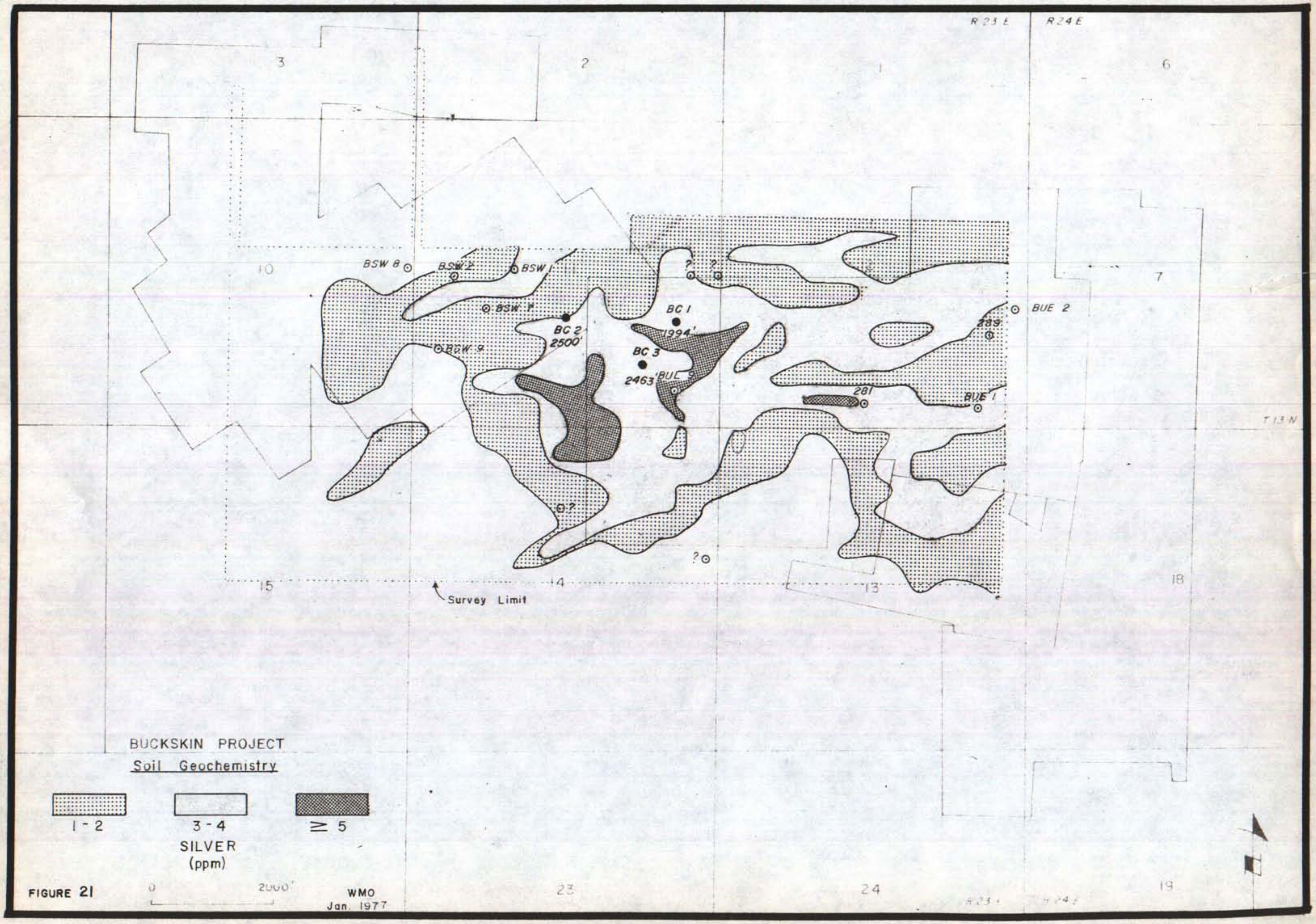
R 23 E
R 24 E
3
2
1
6
10
7
BSW 8
BSW 2
BSW 1
BSW 7
BSW 4
BC 2
2500'
BC 1
1994'
BC 3
2463'
BUL 9
BUE 2
289
281
BUE 1
T 13 N
15
14
13
18
Survey Limit
BUCKSKIN PROJECT
Soil Geochemistry
80-299
300-499
> 500
LEAD
(ppm)
0
2000'
WMO
Jan. 1977
23
24
19
R 24 E

FIGURE 19



3
2
1
6
R 23 E
R 24 E
10
7
BSW 8
BSW 2
BSW 1
BSW 7
BSW 9
BC 2
2500'
BC 1
1994'
BC 3
2463'
BUL 9
BUE 2
289
281
BUE 1
T. 13 N.
15
14
13
18
Survey Limit
BUCKSKIN PROJECT
Soil Geochemistry
120 - 379
380 - 599
≥ 600
ZINC
(ppm)
0
2000'
WMO
Jan. 1977
23
24
19
R 23 E
R 24 E

FIGURE 20



R 23 E
R 24 E
3
2
1
6
10
7
BSW 8
BSW 2
BSW 1
BSW 7
BSW 9
BC 2
2500'
BC 1
1994'
BC 3
2463'
BUL 9
BUE 2
289
281
BUE 1
T 13 N
15
14
13
18
Survey Limit
BUCKSKIN PROJECT
Soil Geochemistry
1 - 2
3 - 4
≥ 5
SILVER
(ppm)
0
2000'
WMO
Jan. 1977
23
24
19

FIGURE 21

The central anomaly is a large bulbous-shaped area containing high values of lead and silver, moderate to high zinc and low copper. Its eastern boundary is roughly defined by decreasing values in the vicinity of a large tilted Basin and Range fault which drops Tertiary ash-flow tuffs down against Mesozoic metavolcanics. These ash-flow tuffs are sericitically altered but are apparently a poor host for mineralization. Drilling indicates the high lead-zinc values are representative of the underlying bedrock, but the anomalous zone may dive westerly beneath the western geochemical anomaly.

The eastern anomaly is characterized mostly by northeasterly trending linear zones of higher values of copper, moly, lead, and zinc, within a broad area of moderately anomalous values. Lead is a possible exception in that its linear elements form a roughly-arcuate zone. This linearity may in part be due to drainage. Most drainages, however, trend easterly and not northeasterly. The soil survey terminated to the east in alluvium parallel to the fault that locally bounds the range. Not much is presently known about the controls of mineralization in the east or exactly how it relates to the central and western soil anomalies.

The three areas can be considered to form a pattern consistent with the porphyry-type sulfide system outlined by drilling and mapping. The western copper anomaly is where the axis of the system apparently breaches the present surface. The central lead-zinc anomaly conforms to the appearance of an east-dipping lead-zinc halo peripheral to the axis. The eastern anomaly should be the extreme periphery of the system at depth. Complications of geology, older possibly-mineralized intrusions, and lack of drilling, prevent a ready analysis or comparison of the eastern portion of the district.

Soil geochemistry has many deficiencies due to both sampling technique and dispersion effects by ground water and local drainages. It is, however, a relatively quick and easy way of defining large geochemically anomalous areas and is essentially an averaging technique; and in this case, it successfully outlined the system and gave us a rough idea of where in the geochemical zoning the surface lay.

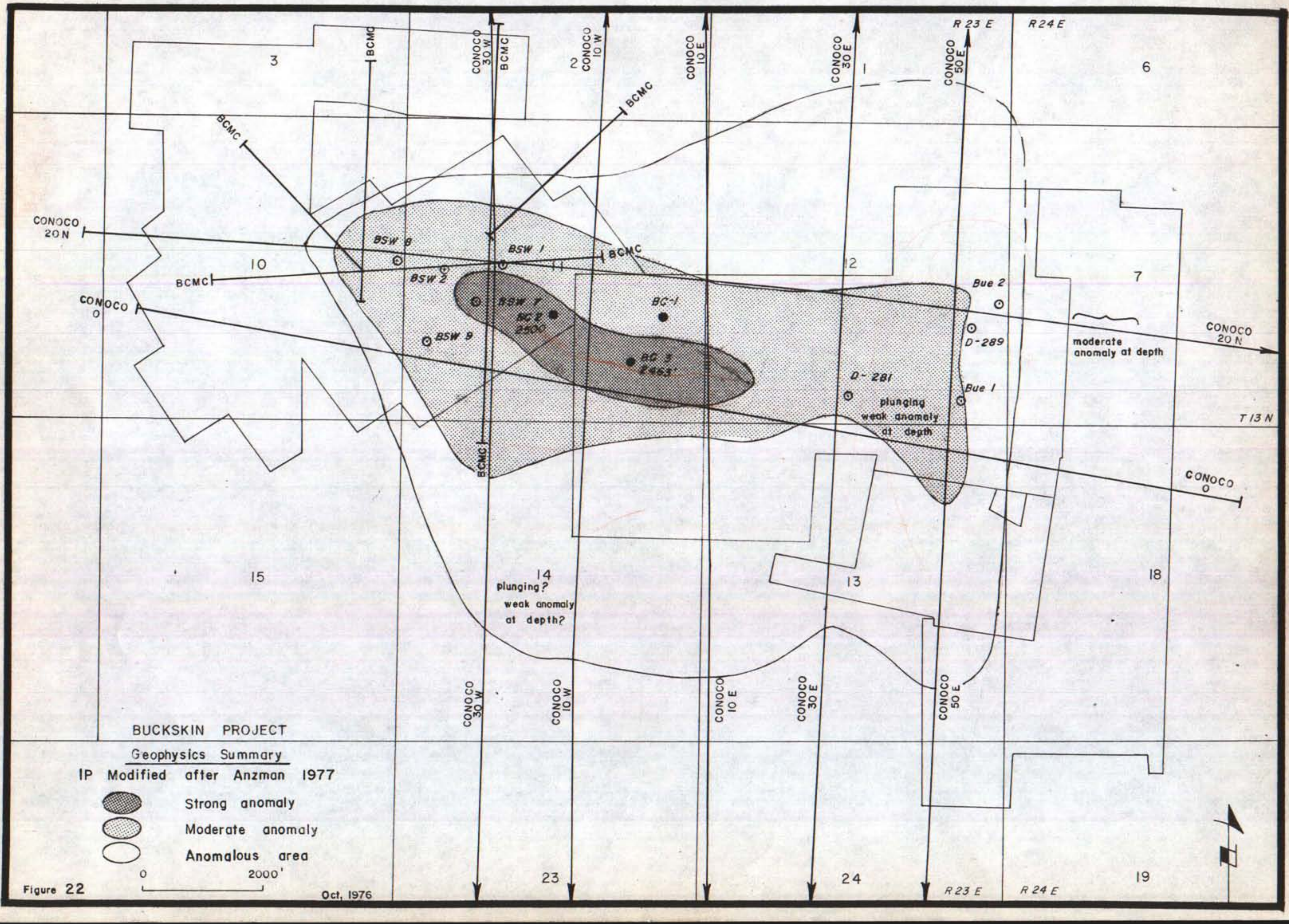
GEOPHYSICS

Induced Polarization (IP)

Conoco ran approximately 23 line miles of IP consisting of two east-west and six north-south lines in 1976 to complement and confirm IP data obtained from Bear Creek and Phelps Dodge. Lines 10W and 20N had 2000 foot dipole-dipole spacing; all the rest had 1000 foot dipole-dipole spacing. Mining Geophysical Surveys conducted the survey of the two east-west lines, and a Conoco crew collected the data for the north-south lines. Joe Anzman was hired as a consultant to interpret the data and Peter Kirwin and myself re-interpreted his results and made changes based upon drill hole sulfide content (Figure 22; Plate 13).

The data indicate a large anomalous area 9000 by 12,000 feet elongated east-west and extending to at least 3000 feet in depth. Within this area is a "moderate" anomaly 2500 feet wide, 11,000 feet long, and greater than 2000 feet deep. The strongest anomaly extends 4000 feet east-west and is about 1000 feet wide and approximately 1500 feet deep. It is in a central position relative to the lesser anomalies and apparently has steep boundaries. The presence of sulfides as the source of the anomalies has been confirmed by drill holes. Drilling indicates the strong anomaly represents greater than 5% total sulfides in what may be a "phyllic" shell of the classical porphyry modes. The moderate and weak anomalies reflect drilled sulfides of 2 to 4 percent and less than or equal to 2% total sulfides respectively.

The IP surveys show that a large sulfide system is present at the Buckskin prospect. Pyrite content of drill holes was used to refine the

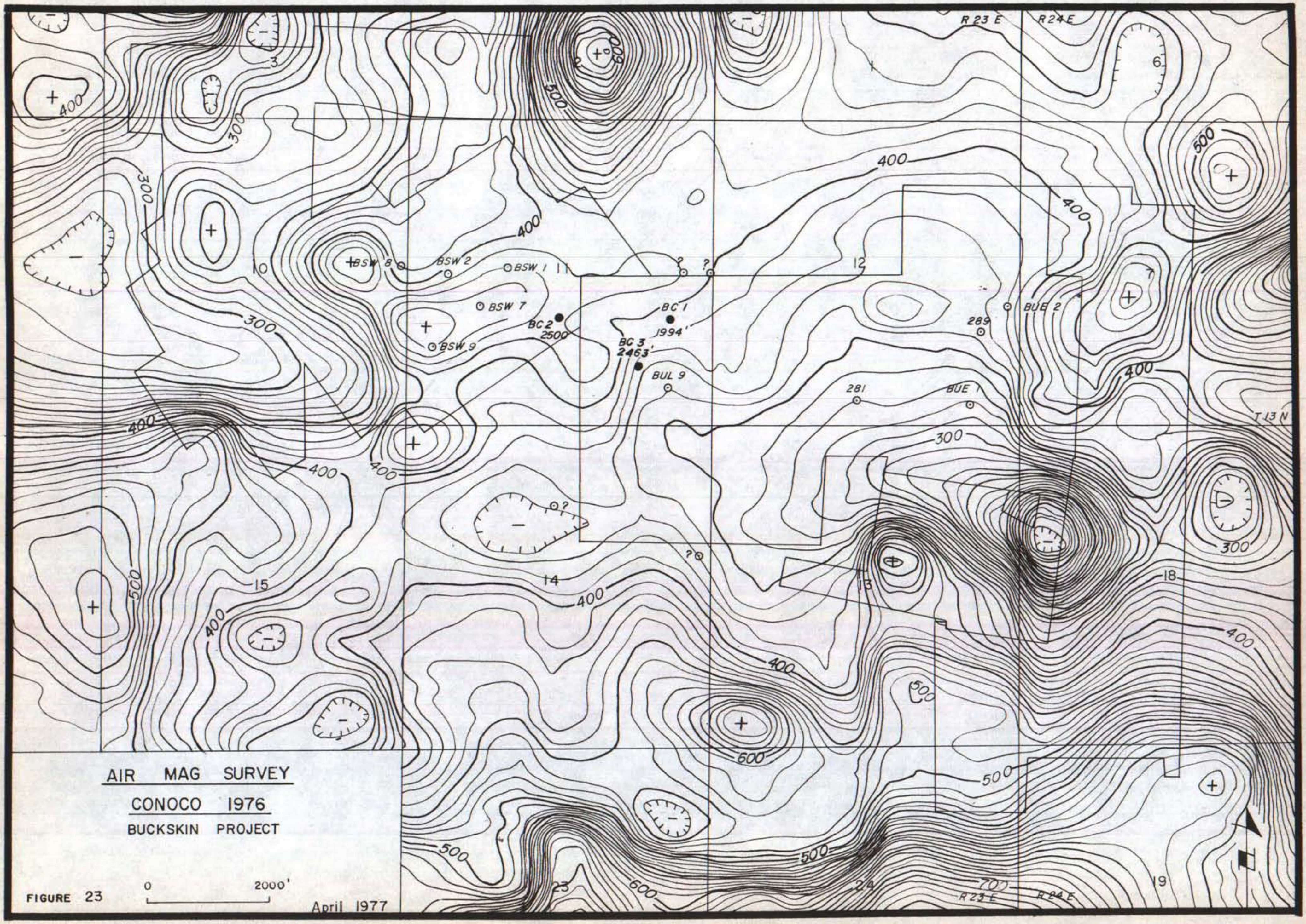

BUCKSKIN PROJECT
Geophysics Summary
IP Modified after Anzman 1977
Strong anomaly
Moderate anomaly
Anomalous area
0
2000'
Oct, 1976
R 23 E
R 24 E
T 13 N
CONOCO 20 N
CONOCO 0
CONOCO 30 W
CONOCO 10 W
CONOCO 10 E
CONOCO 30 E
CONOCO 50 E
BCMC
BSW 8
BSW 1
BSW 2
BSW 7
BC 2 2500
BC-1
BC 3 2463'
BSW 9
D-281
D-289
Bue 1
Bue 2
moderate anomaly at depth
plunging weak anomaly at depth
plunging? weak anomaly at depth?
3
2
1
6
10
11
12
7
15
14
13
18
23
24
19
Figure 22

boundaries of the anomalous zone. The sulfide system trends east-west, transects all local geology and structure, and appears to be decreasing at the depth limits of reliable IP data. It cannot be determined whether this decrease is permanent or local, or exactly what patterns the sulfides define at depth, but the geology and drilling suggest that the western Buckskin ground surface is near the top of a large, strong, tilted, porphyry-type sulfide system. Within the decreasing sulfides at depth may be the core of the system and the target area for economic copper mineralization. This system plunges to the east coincident with the anomalous IP zones.

Line 20N, the east-west line which was run with 2000 foot dipoles, indicates a deep anomaly on the down-thrown side of the Basin and Range fault on the east flank of the range. Conoco has staked this area and will direct future efforts to explain this anomaly. Gravity profiles indicate that depth to bedrock is less than 1000 feet over this anomaly (Aiken, 1978).

Local Airborne Magnetic Survey

Conoco flew an aeromagnetic survey over the Buckskin Range with a line spacing of 650 feet in the fall of 1976 (Figure 23). No interpretation has been performed by any geophysicist. Joe Anzman briefly examined the data and concluded that it was not generally suggestive of any pattern relating to the known geology or the IP responses and hence was not very useful. There is, however, a large quiescent area of relatively low magnetic values roughly correlative to the surface exposure of the mineralized rocks. It appears to trend northeasterly and is partially surrounded by small positive anomalies. Some of the high magnetic values are not readily explained because they occur over



AIR MAG SURVEY

CONOCO 1976

BUCKSKIN PROJECT

FIGURE 23

April 1977

the altered Mesozoic volcanics instead of late Tertiary andesites. The high response in the southeast portion, however, may be coincident with relatively unaltered Mesozoic andesites.

Regional Airborne Magnetic Survey

A regional aeromagnetic survey was completed by the USGS in 1971 (Figure 24). The Buckskin prospect is within a roughly east-west trending, broad magnetic low. It is difficult to determine if Conoco's detailed air mag would generally conform to this pattern without more lines to the west of our present survey. The Minnesota iron mine and the Pumpkin Hollow (Lyon) iron-copper district have definite positive magnetic expressions whereas the Yerington porphyry copper open pit is within the north end of a negative magnetic anomaly. Other deep porphyry copper deposits found by Anaconda lie on the margin of the same large magnetic depression.

In general both the local and regional negative magnetic anomalies at the Buckskin prospect are correlative and are possibly caused by hydrothermal destruction of pre-existing magnetic minerals.

Gravity

A limited Conoco gravity survey was performed late in 1977 over the deep IP anomaly on the east flank of the prospect. Results suggest that depth to bedrock over the anomaly "will not likely exceed 1000 feet" (Aiken, 1978).

REGIONAL AIR MAG SURVEY

BUCKSKIN REGION

Scale = 1:250,000

Figure 24.

Taken from G.P. 751; USGS, 1971

DRILLING RESULTS AND INTERPRETATION

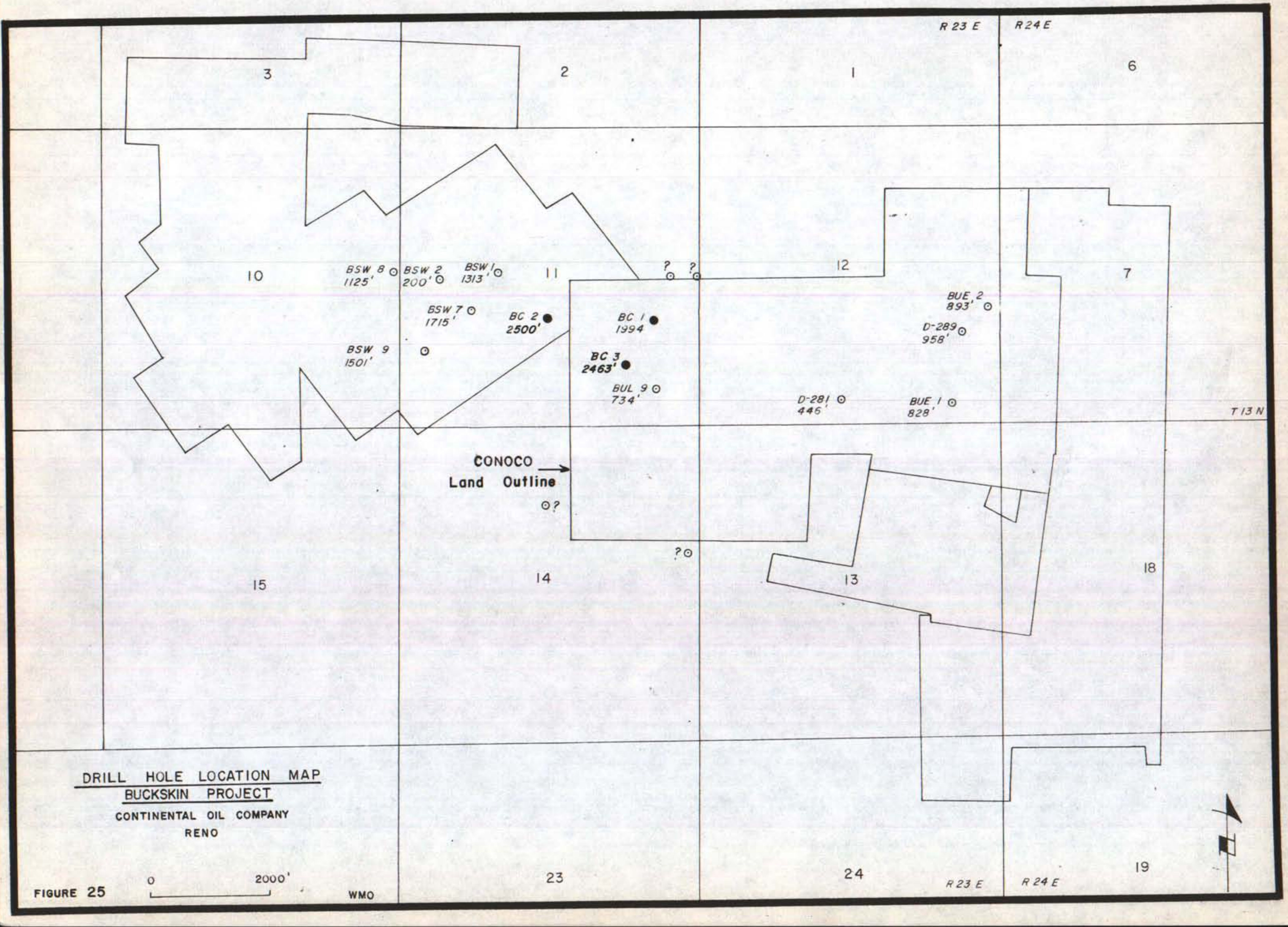
Holes BC-2 and BC-3, Conoco, 1977

In 1977 Conoco drilled holes BC-2 and BC-3 to 2500 and 2463 feet respectively. Both intersected strong lead-zinc halo-type mineralization indicative of the fringes of a porphyry copper system (Figure 25; Appendix C).

Geochemical Results

The geochemical results of Conoco's drilling last summer were recently compiled and alteration in the two holes was studied in thin section. A series of cross sections were drawn to accommodate the new information from holes BC-2 and BC-3 and BCMC holes BSW-7 and BSW-8 (Figures 26, 14, and 27). Cross sections containing 100 foot averages of Conoco's analyses of Cu, Mo, Pb, Zn, and Ag show consistent and almost classical patterns for a large porphyry copper system. Lead and zinc form parallel zones of high geochemical values external to a strong molybdenum zone and a weak but downward increasing copper zone. In BC-2 (Appendices C and D) total pyrite decreased from greater than 5% to 2-4% below 1900 feet. Copper inversely increased from less than about 300 ppm to as much as 1300 ppm for a 100 foot average assay below 1900 feet. Hole BC-3 (Appendices C and D) showed similar but lesser changes in pyrite vs. copper content.

Galena, spalerite and pyrite veins and veinlets occur sporadically throughout both holes, but are more common within the higher lead-zinc anomalies of both holes. A cross section through BCMC holes BSW-1, BSW-7, and BSW-9 (Figure 28) shows that the tip of the system may breach the present topography in the vicinity of hole BSW-1. This is indicated by



DRILL HOLE LOCATION MAP

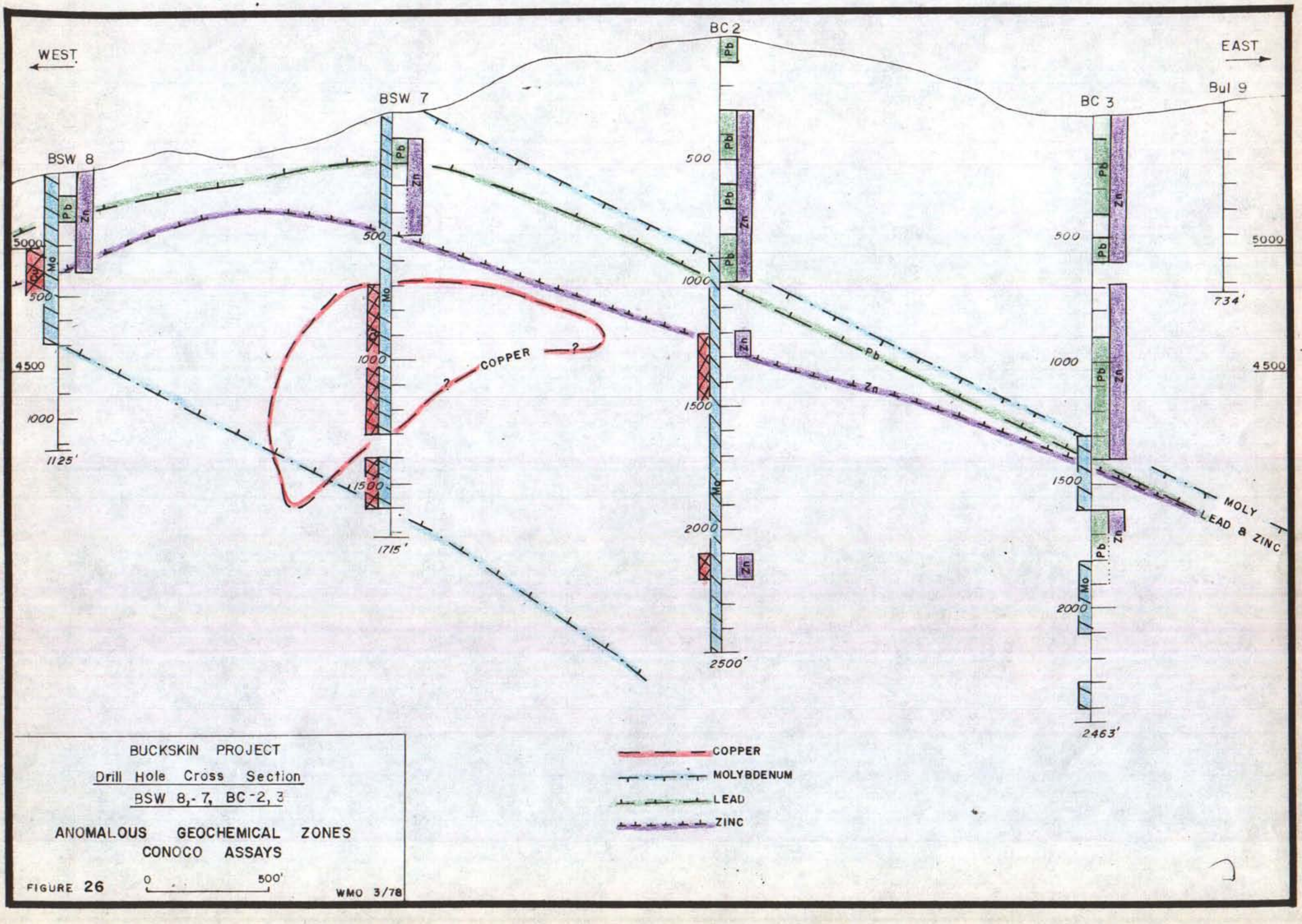
BUCKSKIN PROJECT

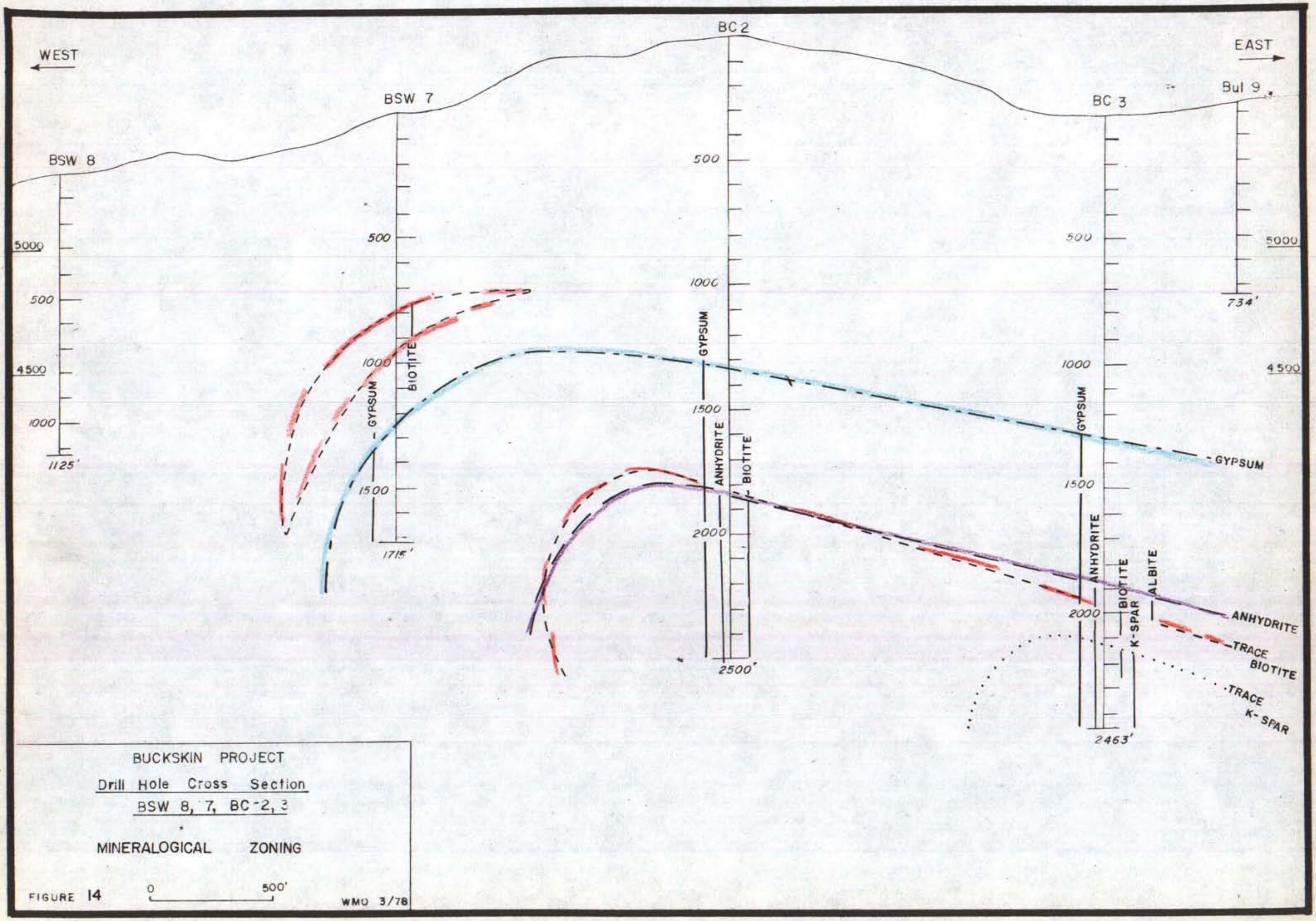
CONTINENTAL OIL COMPANY

RENO

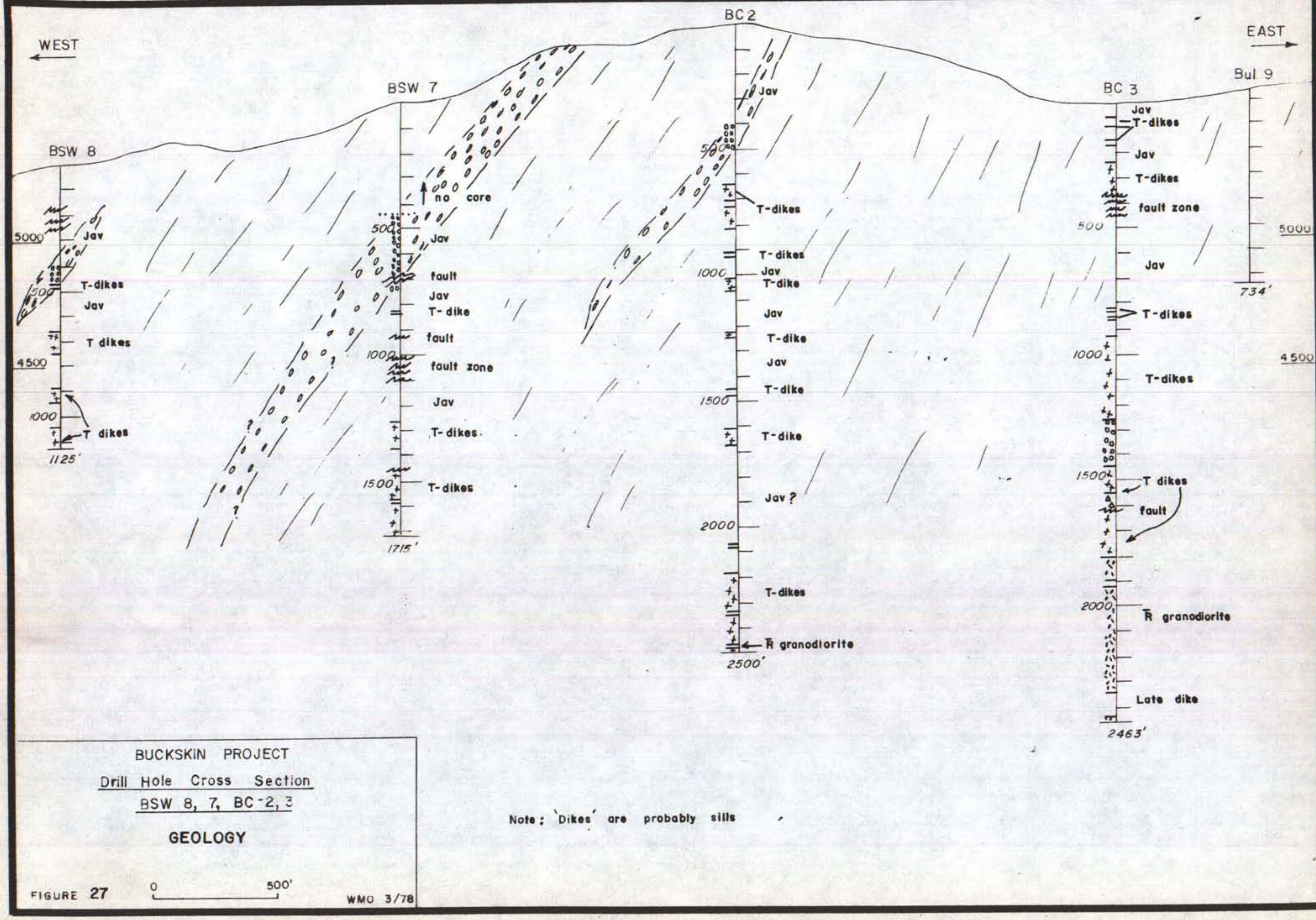
FIGURE 25

WMO


WEST
EAST
BSW 8
BSW 7
BC 2
BC 3
Bul 9
Pb
Zn
Mo
Cu
5000
4500
500
1000
1500
2000
1125'
1715'
2500'
2463'
734'
COPPER
?
Pb
Zn
MOLY
LEAD & ZINC
COPPER
MOLYBDENUM
LEAD
ZINC
BUCKSKIN PROJECT
Drill Hole Cross Section
BSW 8,- 7, BC -2, 3
ANOMALOUS GEOCHEMICAL ZONES
CONOCO ASSAYS
0
500'
WMO 3/78
FIGURE 26



WEST
EAST
BSW 8
BSW 7
BC 2
BC 3
Bul 9
5000
4500
500
1000
1125'
1500
1715'
2000
2500'
2463'
734'
GYPSUM
BIOTITE
ANHYDRITE
K-SPAR
ALBITE
TRACE BIOTITE
TRACE K-SPAR
BUCKSKIN PROJECT
Drill Hole Cross Section
BSW 8, 7, BC-2, 3
MINERALOGICAL ZONING
FIGURE 14
0
500'
WMO 3/78



BUCKSKIN PROJECT

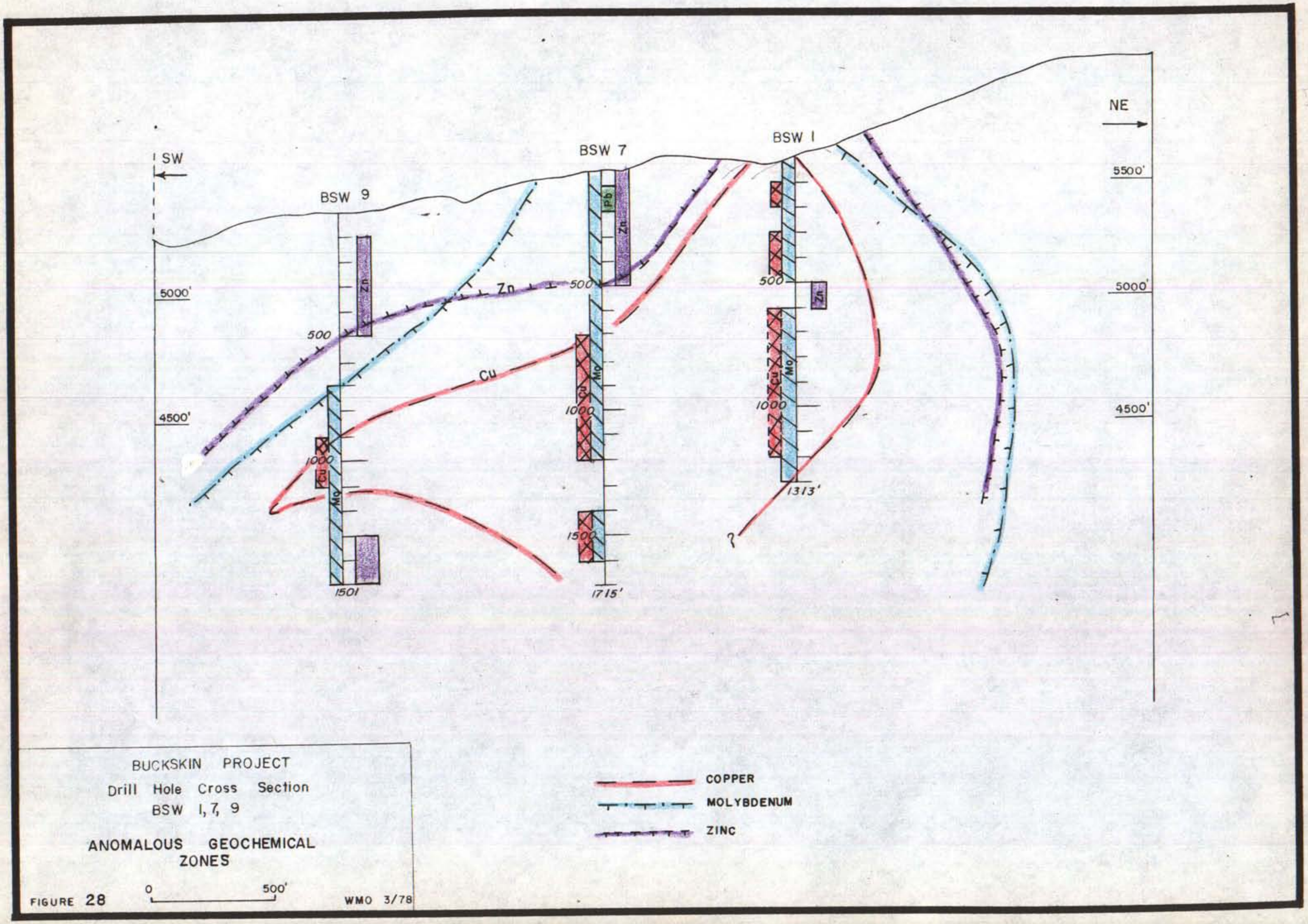
Drill Hole Cross Section

BSW 8, 7, BC-2, 3

GEOLOGY

FIGURE 27 — 0 — 500'

WMO 3/78



BUCKSKIN PROJECT
Drill Hole Cross Section
BSW 1, 7, 9

ANOMALOUS GEOCHEMICAL ZONES

FIGURE 28

WMO 3/78

the interior moly anomaly (with weak copper) rising toward the surface. Anticlinal doming of an intraformational volcanic conglomerate (Javb) (Figures 1, 7, and 29; Plate 2) takes place near hole BSW-1. Additional geologic manifestations of this trend and plunge of the system are shown by the presence of quartz.

Alteration and Minerology

The alteration and mineralogical zoning parallel the geochemical zones in an equally classical pattern. Holes BC-2 and BC-3 show progressive increases in gypsum, anhydrite and secondary biotite toward the bottom of the holes. Secondary orthoclase, albite and anhydrite increase easterly toward and below hole BC-3 (Figure 1, 14, Appendix C). Sericite is predominent throughout both holes, although chlorite with traces of epidote is widespread in both holes, especially in the lead and zinc rich rocks and in some late dikes.

Secondary biotite and orthoclase occurrences in holes BC-2 and BC-3 form consistent downward increasing zones, but should not be mistaken for the classical potassium-rich cores with which most copper ore is associated. Orthoclase and biotite are present in weak to trace amounts, usually recognizable in hand specimen after thin section identification. The true potassium-rich zone expected in such a system has not yet been drilled but forms the intriguing target for 1978 (Figure 1).

All Conoco data coincide to indicate that holes BC-2 and BC-3 were drilled into the top half of a porphyry copper system, dipping 15 to 35 degrees easterly. The copper-rich zone was not entered but only approached by holes BC-2 and BC-3.

BC-1 - 1994' - Conoco - 1976

Conoco's diamond drill hole BC-1 was completed December 20, 1976, at a vertical depth of 1994 feet (Appendix C). It is in the northerly part of the central geochemical anomaly and in the center of the moderate IP anomaly. It intercepted anomalous but weak copper and molybdenum mineralization, but had a very strong zone of lead and zinc from 70 to 1100 feet. Lead and zinc increase again from 1650 feet to the bottom. Sphalerite and galena are finely disseminated in the porphyry dikes, but are almost entirely on fractures in the metavolcanics. Porphyry sills are near strong lead-zinc mineralization in most cases, and are probably the local source. Sericite, clay veins, and weak epidote and chlorite are associated with the mineralization in the upper 600 feet of the hole. Chlorite and epidote are more abundant, and some potassium feldspar veinlets occur in the lower portion of the hole. Several large gouge zones or faults are present high in the hole, but mineralization tends to overlap and generally disregard them. The hole appears to have intersected an outer lead-zinc halo high and off to the side of the core of the "porphyry" system.

Conoco contracted Mr. Robert Bamford to conduct total sulfide analyses of concentrates from 100 foot average and composited pulps (Oriel, 1977; Bamford, 1977). Bamford completed hole BC-1 in early 1977, and the results are discussed in last year's report (Oriel, 1977) and presented in Appendix E. He believed the data indicated that hole BC-1 was drilled toward the inner zoning of a porphyry sulfide system. This conclusion was drawn from the increasing gradients of bismuth, tellurium, tin and possibly arsenic; and the decreasing gradients of lead, zinc and possibly silver. Copper is fairly uniform, but because molybdenum seems to decrease downward rather than increasing, he believed we were not directly over the top of the target area but off to one side. X-ray diffraction analyses indicate a similar trend as shown by the presence of potassium feldspar near the bottom of the hole. Conoco's data agrees with Bamford's (Appendix D).

The total sulfide analyses of holes BC-2 and BC-3 in Appendix E were compiled from Bamford's data (Bamford, 1977). They are not as well defined as Conoco's data, but show other elemental trends. We are presently awaiting his results for additional holes to complete the comparison of his and Conoco's data. Both sets of data indicate a westward-tilted porphyry system with the copper target eastward, southeastward, and/or below hole BC-3 (Figure 1).

BSW-1 - 1313' - BCMC - 1970 and 1974

More than 0.10% copper was encountered in hole BSW-1 in two intervals from about 350 feet to 450 feet and 700 feet to 900 feet. The rest of the hole contained about 400 ppm copper. Lead, zinc, and silver were not as abundant in BSW-1 as in other western and central holes. Strong sericitic alteration is present throughout the hole. Rare secondary biotite has been identified in this section.

BSW-2 - 200' - BCMC - 1970

Bear Creek encountered a chalcocite enrichment blanket and holes BSW-8 (1125') and BSW-2 (200') were drilled specifically to test for it. The best enrichment was about 30 feet of 0.6% copper in BSW-2, although holes BSW-1, 7, and 8 also encountered a thin, enriched zone.

BSW-7 - 1715' - BCMC - 1972

By far the best copper assays are in drill hole BSW-7 near the west side of the prospect (Appendix C). An interval of 510 feet averaged 0.16% copper from 750 to 1260 feet; and 88 feet within that interval averaged 0.35% copper. Fine-grained chalcopyrite is disseminated in faulted and broken metavolcanics. One small dike is within the ore zone, but most of the dikes are just below the high copper interval. Weak secondary biotite and strong silica-sericite accompany the sulfide mineralization. A small zinc anomaly (110 feet of 0.145% zinc) was drilled high above the copper interval. Although no core is now available from this specific interval, sphalerite accounts for the zinc elsewhere at the Buckskin prospect.

BSW-8 - 1125' - BCMC - 1972 and 1973

Hole BSW-8 was drilled to test for enrichment and primary copper to the northwest boundary of the small, strong IP anomaly BCMC had outlined. The hole possessed strong moly (up to 45 ppm for 100') and lead and zinc anomalies at the top of the hole. Copper was less than 600 ppm over 100' intervals except for the top of the hole where minor supergene enrichment exists.

BSW-9 - 1501' - BCMC - 1974

Hole BSW-9 was drilled 1000 feet southwest of BSW-7 to follow up on the high grade interval in BSW-7. Bear Creek drilled there because they believed the mineralization in BSW-7 was related to a west dipping "intrusion breccia". Conoco's mapping indicates that this breccia is a volcaniclastic breccia that is conformable to the rest of the volcanics and only fortuitously acted as a good host for mineralization in BSW-7.

BSW-9 did contain a small, 150 foot interval of about 0.1% copper in a fine biotite hornblende porphyry (Figure 29). A zinc anomaly similar to that in hole BSW-7 is also present high above this copper zone.

Other BSW holes #3, 4, 5, and 6 were shallow rotary holes drilled far to the west in alluvium (Hulen, 1972).

Bul-9 - 734' - Phelps Dodge - 1967(?)

Drill log data for hole Bul-9 was attained from Phelps Dodge in 1977. Assays show a lead-zinc anomaly in agreement with Conoco surface and drill data. No core is available and the Phelps Dodge geologic logs are incomplete and completely unreliable.

Bue-1 - 838' - Phelps Dodge - 1967

Phelps Dodge and Anaconda drilled four holes in the eastern portion of the prospect, all less than 1000 feet deep. Hole Bue-1 (Figure 31) was drilled to 838 feet and averaged about 0.05% copper, except for a small supergene-enriched zone of 0.1% copper and a 150 foot interval of chalcopyrite that assayed approximately 0.15% copper. Lead and zinc decreased gradually until the last 28 feet were zinc increased significantly. Molybdenum also appeared to be increasing for the last 78 feet.

Bue-2 - 893' - Phelps Dodge - 1967

Bue-2 was drilled by Phelps Dodge in 1967 to a depth of 893 feet. It also encountered a 10 foot interval of enriched copper but otherwise averaged a little less than 0.1% copper as chalcopyrite(?) for the entire hole. Mesozoic granodiorites are the predominant host rocks. Pyrite increased to about 6% for the last 100 feet with traces of molybdenum and silver

D-281 - 446' - Anaconda - 1971

Hole D-281 was a short hole (446 feet) that averaged about 0.05% copper in Mesozoic metavolcanics.

D-289 - 958' - Anaconda - 1972

Anaconda drilled holes D-281 and D-289 in 1971 and 1972. Hole D-289 was drilled to 958 feet in Mesozoic granodiorites intruded by numerous porphyry dikes. Anaconda assayed only certain intervals, unfortunately, and these assays do not show any definite trends. The hole appears to average more than 0.05% copper, however.

The holes in the eastern portion are very intriguing. The Mesozoic phaneritic granodiorites are uniformly high in copper and two holes show apparent downward increasing gradients in lead, zinc and total sulfides. Late Tertiary dikes are well mineralized also, and occasionally appear to control locally higher assays. Most of the mineralization in these holes, however, appears to be genetically related to the older granodiorite.

The soil and subsurface geochemistry of the eastern area poses some interesting problems. The strong copper and moly anomalies would indicate that the core of the system is closer in the eastern area. This hypothesis would first necessitate a fault that has upthrown the east flank. There is an old thrust(?) fault nearby, but the upward movement of the block is structurally anomalous in the region and in the Buckskin Range in particular. Additionally, the strong lead and zinc anomalies are coincident with the copper and moly anomalies, giving a different geochemical signature than observed in holes BC-3 and BC-2 and westward. Alteration also appears to be propylitic. Upward movement should have eliminated the propylitic zone through erosion, however, unless movement was extensive enough to erode to the bottom side of the system.

Another possibility is that these geochemical anomalies are related to an older Yerington-aged mineralizing event such as the intrusion of the granodiorites. Conoco does not presently have enough data to define the system on the eastern flank of the prospect, but will pursue the problem in the future.

Detailed written and graphic logs (WMO) 1" = 20' are available for all holes mentioned. Some written logs by BCMC and Phelps Dodge are also available for the appropriate holes, but the geologic interpretation has changed drastically with Conoco's relogging.

APPENDIX A

PROJECT COST SUMMARY AND PLANNING 1977

PROPERTY: Buckskin - Douglas & Lyon Counties, Nevada
Township 13 North, Range 23 & 24 East

Codes	Item	1 BCMC 1977	2 Smith & Harcourt 1977	3 Conoco 1977	4	5 TOTAL 1977
1,2,28	Salaries, casual labor, benefits	7776 54	7095 55	264 09		15617 27
26	Maps and reproductions	412 78	390 25	11 07		905 16
5	Travel, food and lodging	1203 56	1036 13	1905 28		4237 00
14 17 18 3 4 7 8 9	Office overhead and miscellaneous supplies	418 22	443 45	48 27		975 90
65 75	Office Overhead Clearance	17795 98	17705 56	489 77		11770 0
	OVERHEAD SUB-TOTAL					38298 80
40 41 42	Drilling and related (inc. Drill-in Capital)	64237 38	57507 39			162344 52
31	Geological contract work	6338 30	6338 28			12676 58
16 19 43 49	Roads and access (and environmental clean-up)					
25	Geochemical analyses (geological and drilling)	7654 46	7017 64			14672 10
	Contract services (staking, topo, etc.)					
23 50	Geophysics (in house)	308 05	308 05			978 10
	Geophysics (contract)					
	OPERATING SUB-TOTAL					190671 30
44 45 46	Property payments (inc. Land Capital)		20000 00			20000 00
21	Environmental permits and bonds					
27 11 12 13 14 15 16	Recording and legal fees	10 35	17 60	915 50		943 45
74	Land Clearance	114 67	445 22	617 11		37121 80
	LAND SUB-TOTAL					58065 25
	EXPENSE TOTAL	65670 54	98305 12			170449 38
	CAPITAL TOTAL (AFE'd)	(40599 75)	(20000 00)			60599 75
	GRAND TOTAL 1977	106270 29	118305 12	4613 09		231049 13
	CUMULATIVE TOTAL thru 1976	65725 93	53956 71	–		119682 64
	CUMULATIVE TOTAL thru 1977	171996 22	172261 83			350731 77

Contract Brief

Property Obligation

Owner	Claim Name	No.	Acres	Type
BCMC	BSW	47	900	Unpat'd
Smith & Harcourt	Nev & Lorraine	43	700	Unpat'd
Conoco	BC	38	554	Unpat'd

Lease Payments

Date	Amt.
1976	353 00
1977	200 00

Work Requirements

Year	Notes
1978 only	1500' drilling
	A/W only
	A/W only

APPENDIX B

DETAILED ROCK DESCRIPTIONS
(from Hudson, 1977)

MESOZOIC ROCKS

Oreana Peak Formation (Ꞧ op)

The lower unit of the Oreana Peak Formation consists of at least 1200 feet of interfingering beds of volcanic rocks and conglomerate (Ꞧ opv) and limestone (Ꞧ opl) in beds a few inches to 25 feet thick. The volcanics consist of felsic pyroclastics, finely-varved water-lain tuffs, tuffaceous sediments, and dense aphanitic basalts with elongate amygdules up to 20 cm long and 2 cm thick. Coarse conglomerates and massive grey limestones are interbedded with the volcanics.

The overlying carbonate unit (Ꞧ oc) of the Oreana Peak Formation (Upper carbonate member of Noble, 1962) contains about 200 feet of massive-to-medium bedded grey limestone with 1/2 to 3 inch, (often pinkish) siltstone partings. The limestone locally contains abundant fossil fragments. It is occasionally oolitic and locally dolomitic.

Gardnerville Formation (Jg)

The Gardnerville Formation (Noble, 1962) of uppermost Triassic and Lower Jurassic age, conformably overlies the Oreana Peak Formation. One hundred and fifty to 1200 feet of Gardnerville Formation is exposed in the northern Buckskin Range. The sequence is composed primarily of grey, locally pyritic, ashy(?), calcareous siltstone interbedded with thin, green-grey locally pyritic shale (Jgs). The siltstones break parallel to bedding and contain impressions of ammonites. The Gardnerville contains several discontinuous lensoidal or patchy massive grey limestones that locally contain "fossil hash" and are locally oolitic. The limestones are from 1 to 20 feet thick. Occasionally the limestones contain thin interbeds of crossbedded calcarenite.

Contact metamorphism of the Gardnerville Formation by adjacent Mesozoic and Tertiary intrusions converts the siltstones to a dense, dark grey hornfels with a fine varved "chert" appearance. The hornfels fractures across bedding. The limestones are strongly recrystallized though rarely marbleized. The break between hornfels and apparently unmetamorphosed Gardnerville can be very abrupt.

Artesia Sequence (Jav)

The Artesia sequence of probable uppermost Lower Jurassic age is named for Artesia Mountain in the central Buckskin Range. About 2000 feet of the Artesia sequence is exposed south of Churchill Canyon, while 6000 feet or more of the Artesia sequence metavolcanics is exposed in the southern Buckskin Range. These metavolcanics lie in thrust contact with underlying rocks. The majority of the Artesia sequence is composed of dark lavender, red-lavender, and greenish andesitic to dacitic volcanic flows (Jav) with occasional volcanic breccia and congolmerate-sandstone interbeds. The volcanics are typically porphyritic with 10 to 40% phenocrysts up to 3 mm in length; however, they generally are less than 1 mm long. Phenocrysts of pyroxene(?), hornblende, biotite and weakly-to-strongly zoned plagioclase (An 55-35) occur, with rounded quartz phenocrysts up to 0.5 mm in some flows in the upper portion of the sequence. Some flows completely lack phenocrysts.

The aphanitic groundmass contains plagioclase, hornblende, biotite and rare quartz, where the groundmass is not recrystallized by metamorphism or alteration.

Felsic breccias (Jafb) occur strataconformably in about the middle of the Artesia sequence in the southern Buckskin Range. The white-to-buff felsic unit, which is up to 2000 feet thick, is often flow banded and contains rounded felsic fragments up to 20 cm in diameter. The composition of the unit may be rhyolite or quartz latite.

A thick sandstone and conglomerate unit (Jas) occurs in the upper Artesia sequence in the central and southern Buckskin Range. About 500 feet of the clastic unit is present, in NE 1/4, Sec. 3, T13N, R23E, but thins to the north, south, and east. It is apparently absent in the northernmost Buckskin Range. The clastic unit is coarsest in the west central Buckskin Range with clasts up to 15 cm. The clast size becomes progressively finer as the unit thins. The unit contains rounded clasts of Artesia volcanics grading upward into feldspathic sandstone in usually well-defined graded beds 1 cm to 1 meter thick.

A series of andesitic to dacitic volcanic flows up to 1200 feet thick (Fulstone formation of Anaconda terminology) overlies the clastic unit in the central Buckskin Range. These flows thin rapidly to the north and south and are completely absent in the northern Buckskin Range. These flows are essentially the same composition as the rest of the Artesia sequence except that the phenocrysts are up to 5 mm in length.

Thick, discontinuous, nearly strataconformable quartz "reefs" are a distinctive part of the Artesia sequence in the central and southern Buckskin Range. Many of the quartz "reefs" contain breccias or have protobrecciation. Original textures are usually obscured. The quartz "reefs" rarely occur above the thick clastic unit (Jas), and probably represent epigenetic selective silification associated with local hydrothermal activity.

Churchill Canyon Sequence (Jcc)

The Churchill Canyon sequence, conformably overlies the Artesia sequence. Possibly as much as 3000 feet of Churchill Canyon volcanics is exposed. A thin conglomerate unit (Jccs) usually lies along the contact between the Artesia sequence and the Churchill Canyon sequence. The conglomerate is 1 to 3 feet and rarely up to 7 feet thick. It contains clasts of both Artesia and Churchill Canyon lithologies.

Lithologically, the Churchill Canyon sequence consists of dacitic to quartz latitic flows and crystal-rich tuffs (Jccv) with associated porphyritic intrusions (Jcci) of essentially the same composition. The exposed portion of the sequence contains primarily ash-flow tuffs in the northernmost Buckskin Range and dominately flows in the southern and central Buckskin Range. The ash-flow tuffs and flows interfinger in the north-central Buckskin Range. Both rock types are present throughout the range, although structural and erosional complications expose only a small portion of the Churchill Canyon sequence in the southern Buckskin Range. Quartz phenocrysts up to 10 mm in diameter are distinctive of the Churchill Canyon sequence. The quartz phenocrysts are usually strongly resorbed, rounded and rarely bipyramidal. Not all flows and intrusions contain quartz phenocrysts.

The ash-flow tuffs are usually tan to greenish light brown, containing 20 to 60% phenocrysts. Phenocrysts include 0 to 4% hornblende, 1 to 4% biotite, 0 to 10%(?) sanidine, 1/2 to 7% quartz. The remaining phenocrysts are plagioclase (generally An35-25) with weak oscillatory zonation. Crystals are usually broken and often bent. Flattened pumice fragments up to 5 cm long are often seen in thin section. Tuff breccias occur in the sequence and are composed of up to 50% deformed fragments of tuff that are strongly welded into a tuff breccia.

The volcanic flows of the Churchill Canyon sequence are grey to grey-green, and generally are thin bedded (5 to 30 feet thick). Occasional conglomerate or breccia interbeds up to 1-1/2 feet thick are present between some flows. The flows contain 5 to 40% subhedral to anhedral, often broken phenocrysts of 1 to 5% biotite, 0 to 5% oxyhornblende(?), 0 to 4% quartz, weakly-zoned plagioclase (generally An30-40) and occasional large, pink sanidine. Phenocrysts up to 1 cm and rarely 3 cm in length with hiatial (sharp break in size between phenocrysts and groundmass) texture are set in an aphanitic groundmass of plagioclase, sanidine(?), and quartz microlites with possible glass.

Intrusions (Jcci) which are very similar in texture and composition to the Churchill Canyon volcanic rocks, intrude the Churchill Canyon sequence. They are difficult to distinguish from the flows except where crosscutting relationships exist. Where intrusives and volcanics are indistinguishable, they are mapped as undifferentiated (Jccu).

Both the Artesia sequence and Churchill Canyon sequence are probably correlative to the Double Springs Formation of Noble (1962). Ammonites collected from the Double Springs Formation near Topaz Lake indicate an uppermost Lower Jurassic age of the Double Springs Formation (H.F. Bonham, oral comm.). Age dates on hornblende obtained by Castor (1972) from Churchill Canyon sequence type rocks in the Pine Nut Range yielded dates of 146 m.y. and 124 m.y. The age dates would indicate an Upper Jurassic to Lower Cretaceous age for the Artesia and Churchill Canyon sequences. However, the dates may have been reset by subsequent intrusions and/or metamorphism. Although the correlation of the Artesia and Churchill Canyon sequences with the Double Springs Formation is tentative, an uppermost Lower Jurassic age for the sequences is used in this report.

MESOZOIC INTRUSIONS

Granodiorite (Jgd)

Fine to medium grained, equigranular, phaneritic granodiorite is probably the oldest intrusion exposed in the Buckskin Range. It may be equivalent to the Black Mountain Granodiorite in the Singatse and Wassuk Ranges (E. C. Bingler, oral comm.). The granodiorite contains crystals up to 1 mm in length but they are usually 0.7 mm or less. It contains 1 to 3% biotite, trace hornblende, 8 to 12% interstitial quartz, 10 to 15% orthoclase and the remainder unzoned plagioclase locally varying from An35 to An45. South of the Minnesota Mine a small body of coarser-grained granodiorite (Jgdc) intrudes the fine granodiorite. The rock is essentially the same mineralogically expept that it contains about 10% biotite and 1 to 2% hornblende with crystals up to 5 mm.

Diorite (Jd)

Several exposures of black, fine-grained diorite that may be older or younger than the granodiorite crop out along Churchill Canyon. The diorite contains 4 to 10% augite, 1 to 2% quartz, trace orthoclase, and plagioclase (An45-55) in very weakly-zoned crystals.

Quartz Monzonite (Jqmp)

A pinkish-brown quartz monzonite porphyry intrudes the granodiorite just east of the Minnesota Mine (Plate 1). Subhedral plagioclase (oligoclase?) and biotite phenocrysts up to 5 mm long occur in seriate texture with groundmass minerals up to 0.4 mm. Overall, the rock contains 1 to 3% biotite, about 15% quartz, 50 to 55% plagioclase, 30 to 35% orthoclase, 1 to 2% magnetite, and trace pyrite. The quartz monzonite porphyry is cut by abundant quartz-magnetite-pyrite veins. A coarse-grained quartz monzonite breccia (Jqmb) containing clasts of quartz monzonite porphyry in an aphanitic igneous matrix is exposed just south of the Minnesota Mine (Plate 1).

Microgranodiorite (KJmgd)

A small body of buff subequigranular microgranodiorite intrudes the Artesia sequence west of Fulstone Spring No. 1 (Plate 1).

Plagioclase is up to 1 mm long, but the crystals are generally less than 0.4 mm. The rock contains 15 to 20% anhedral quartz, 10 to 15% anhedral orthoclase, and subhedral to anhedral unzoned plagioclase, (An35-40). The exact age is unknown except that it is upper Mesozoic.

Churchill Canyon Intrusives (Jcci)

The Churchill Canyon intrusives are discussed under Churchill Canyon sequence.

Latite Porphyry Dikes (KJlp)

Latite porphyry dikes intrude the older Mesozoic rocks throughout the Buckskin Range. They contain subhedral 1 to 3 cm K-feldspar phenocrysts with small hornblende, biotite, plagioclase, and about 1% quartz phenocrysts in an aphanitic groundmass. Several dikes in the northern Buckskin Range are essentially identical in texture and mineralogy, but contain about 5% quartz phenocrysts (Kqlp). The dikes are similar in composition to Churchill Canyon sequence intrusions, but they are distinctive enough in appearance to map separately. The latite porphyry dikes could be a later phase of Churchill Canyon intrusive activity, based upon intrusive relationships, but may be considerably younger.

CENOZOIC ROCKS

The Oligocene is represented by a series of ash-flow tuffs and tuffaceous sediments which are thoroughly discussed by Proffett and Proffett (1976) from the Singatse Range. Brief descriptions are given here to note local variations in the tuff units.

Guild Mine Tuff (Tgmt)

The Guild Mine Tuff is a lavender buff, moderately-welded, crystal-rich ash-flow tuff. It contains 20 to 35% phenocrysts, up to 2.5 mm in length, of quartz, sanidine, plagioclase, and 1 to 3% biotite. Rare fragments of petrified wood occur at the base of the Guild Mine Tuff, overlain by 5 to 25 feet of black vitrophyre. The vitrophyre is overlain by 700 to 900 feet of moderately-welded and occasionally densely-welded tuff with moderately abundant small pumice fragments. The top of the Guild Mine Tuff consists of 200 to 300 feet of buff vapor phase tuff with abundant large pumice fragments and frequently large irregular blocks of deep red jasper.

Weed Heights Tuff (Twht)

The Weed Heights Tuff is a lavender to reddish brown, moderately-welded, moderately-crystal rich ash-flow tuff. The tuff contains 5 to 25% phenocrysts including plagioclase, sanidine, quartz, and 1 to 2% biotite. Abundant large white pumice fragments are distinctive of the unit. There appears to have been a very short cooling break between the Guild Mine Tuff and the Weed Heights Tuff in the Buckskin Range as evidenced by the lack of intervening sedimentary units which are present in the Singatse Range (Map Units 4 and 5 of Proffett and Proffett, 1976).

Fifty to 75 feet of rhyolitic sediments overlie the Weed Heights Tuff and are mapped with it. The lower portion is usually bright red, whereas the upper portion is yellowish green. The uppermost sediments contain abundant fragments of petrified wood and sparse leaf impresions.

Singatse Tuff (Tst)

The Singatse Tuff is a brown to red-brown, strongly to moderately welded, crystal-rich ash-flow tuff. The tuff contains 30 to 45% phenocrysts of plagioclase, quartz, sanidine, hornblende, and 3 to 6% biotite up to 5mm in length. Hornblende, abundant biotite, large phenocrysts, and its massive nature are distinctive of the Singatse Tuff. The unit contains sparse pumice fragments and 1 to 4% lithic fragments except local zones slightly above the base where the unit contains up to 30% lithic fragments. Five to 10 feet of black vitrophyre occurs locally at the base.

Nine Hill Tuff (Tnht)

The Nine Hill Tuff is part of the Bluestone Mine Tuff of Proffett and Proffett (1976). It is a deep lavender to buff, poorly-welded to non-welded, crystal-poor ash-flow tuff and tuff breccia about 100 feet thick. The tuff contains less than 5% phenocrysts of plagioclase, quartz, sanidine, and trace quantities of biotite. White flattened pumice fragments up to 20 cm across are distinctive of the unit. Locally, the Nine Hill Tuff is a tuff breccia.

Eureka Canyon Tuff (Tect)

Fifty feet (?) of bright, red-orange, poorly to non-welded, crystal poor tuff of the Eureka Canyon Tuff of E. C. Binglet (oral comm.) conformably overlies the Nine Hill Tuff. The Eureka Canyon Tuff is also part of the Bluestone Mine Tuff of Proffett and Proffett (1976). The tuff contains sparse pumice fragments and less than 5% phenocrysts of plagioclase, quartz, sanidine, and trace biotite.

Andestic Volcanics (Tv)

Miocene andesitic volcanic flows and flow breccias overlie the Oligocene ash-flow tuffs in angular unconformity. More than 1000 feet of andesite is present in north Churchill Canyon, while only small exposures crop out on the east flank of the Buckskin Range. More than 5000 feet of andesite is present north of Lincoln Flat (Proffett and Proffett, 1976). Many of the flows are oxyhornblende and augite-rich andesitic porphyries (Tvhpa) and probably were derived from a volcanic intrusive center of the same composition and texture in the northern Buckskin Range. A few flows of possibly younger oxyhornblende biotite andesite porphyry (Tvhba) crop out south of the Minnesota Mine.

TERTIARY INTRUSIONS

Relative ages of numerous Tertiary dikes and stocks are given where known, but otherwise the Tertiary intrusions are assumed to be Miocene based upon intrusive relationship and age dates. Most intrusives in the southern Buckskin Range are described in the main text.

Biotite Pyroxene Diorite (Tbpd)

A few small stocks of dense, black, fine-grained diorite are present at the north end of the Buckskin Range (Plate 1). The diorite contains 5 to 7% shreddy, greenish-brown biotite less than 0.05 mm in length, usually in magmatic reaction with augite, 7 to 10% subhedral augite up to 2 mm long, less than 2% quartz, weakly-zoned subhedral plagioclase (An50-55) up to 2 mm in length, and about 1% magnetite. The rock shows strong foliation in thin section, but it is not evident in hand sample.

Hornblende Pyroxene Diorite Porphyry (Thpdp)

Phaneritic diorite porphyry and locally porphyritic diorite underlies the north end of the Buckskin Range and intrudes the biotite pyroxene diorite. Phases of the diorite vary widely in texture and composition and are generalized here. The rock contains 10 to 40% phenocrysts of hornblende that are commonly 5 to 10 mm in length but range up to 3 cm in length. Plagioclase phenocrysts are up to 5 mm in length and rarely reach 10 mm. The phenocrysts grade downward in size in a seriate texture to a groundmass generally 0.01 to 0.5 mm. The diorite contains 5 to 25% euhedral to subhedral green to green-brown zoned hornblende with numerous inclusions, 3 to 7% subhedral augite, 2 to 3% quartz, oscillatory normally-zoned plagioclase (An50-40), and trace sphene and apatite. The diorite is often foliated with subparalled plagioclase and hornblende phenocrysts.

Numerous andesitic dikes and small stocks related to the hornblende pyroxene diorite porphyry crop out in the northern portion of the Buckskin Range. They have variable compositions and highly variable textures. These have been generalized into two groups: those with less than 25% phenocrysts (Thppa), and those with 25 to 50% phenocrysts (Thpap). The rocks are similar in composition to the hornblende pyroxene diorite porphyry but have an aphanitic groundmass of plagioclase, augite, and a small amount of quartz, and phenocrysts of plagioclase, hornblende and usually augite. These intrusives are green to greenish-grey and many have weakly developed columnar jointing.

Several intrusive breccias (Timb) crop out in Sec. 22, T14N, R23E. These have a matrix of hornblende pyroxene porphyritic andesite with angular to highly rounded pebbles to boulders of hornblende pyroxene porphyritic andesite, hornblende pyroxene andesite and diorite porphyry, various ash-flow tuffs, and Mesozoic metavolcanic rocks as well as granitic rocks not exposed in the Buckskin Range.

The hornblende-pyroxene andesite and diorite porphyries, hornblende pyroxene porphyritic andesites, and intrusive breccias form a large Miocene intrusive complex in the northern Buckskin Range. This diorite-andesite intrusive complex is Miocene because dikes of the complex intrude Tertiary ash-flow tuffs across Basin and Range faults. Some of the faults have post-intrusive displacement, however. The intrusives may have volcanic equivalents in the Lincoln Flat Andesite (17 to 10 m.y.), Proffett and Proffett (1976) but may be younger, because most of the Basin and Range faults cut by the intrusives do not show later movement.

Biotite Hornblende Andesite Porphyry (Tbhap)

Several dikes of coarse-grained biotite hornblende andesite porphyry intrude the older rocks in and around the Minnesota Mine. The andesite contains 45 to 50% phenocrysts of euhedral biotite up to 1.2 cm across in books up to 1 cm thick, euhedral hornblende up to 5 mm long , and subhedral plagioclase to 1 cm in length. The phenocrysts are in hiatial texture with an aphanitic groundmass of glass, plagioclase, microlites, and quartz. The rock contains 7 to 10% biotite, 2 to 3% hornblende, 2 to 4% quartz, 5 to 10% brown glass, and weakly-oscillatory normally-zoned plagioclase (An43-38). The biotite hornblende andesite porphyry is apparently younger than the sheared hornblende pyroxene andesite porphyry exposures in the Minnesota Mine.

Porphyritic Hornblende Dacite (Tphd)

An intrusive porphyritic hornblende dacite crops out extensively in the southern Buckskin Range. The unit contains 15 to 25% phenocrysts of plagioclase and hornblende up to 1 cm and rarely up to 3 cm in length, although locally as much as 40% phenocrysts may be present. The plagioclase usually has epidotized cores. Locally the dacite contains rounded quartz "eyes" up to 3mm (Tphdp) and locally occurs as an autobreccia (Tphdb). One to 2% biotite occurs locally in the dacite in Sections 2, 3, 10, and 11, T13N, R23E (Plate 1). The rock contains 2 to 8% hornblende, up to 10%(?) K-feldspar, 0 to 7% quartz, and weakly-zoned plagioclase (An30-35?). The groundmass contains K-feldspar and plagioclase microlites with or without quartz and hornblende.

Conflicting evidence indicates possibly both Tertiary and Mesozoic ages for the porphyritic hornblende dacite. In exposures in Sections 11, 12, 13, and 14, T13N, R23E, (Conoco prospect) the dacite lies along low angle Basin and Range faults with very altered Tertiary ash-flow tuffs above the dacite and highly-altered Mesozoic metavolcanic rocks below. The dacite is only weakly propylitized. The difference in alteration suggests a late Tertiary age for the dacite in these outcrops. In Sections 2 and 3, N1/2 Sec. 15, NW1/4 Sec. 11, and NE1/4 Sec. 10, T13N, R23E (Plate 1), the dacite is locally highly stericitized, intruded by highly-altered Tertiary dikes (N1/2, NE1/4, Sec. 10, T13N, R23E), and apparently may not intrude the Tertiary ash-flow tuffs. This evidence, along with its similar appearance to the intrusives of the Churchill Canyon sequence, indicates a Mesozoic age for these porphyritic hornblende dacite occurrences. Most of the dacite is porbably an intrusive portion of the Churchill Canyon sequence. Some of the texturally-identical dacite is Tertiary in the prospect area. The Tertiary and Mesozoic dacites are indistinguishable in the field.

Hornblende Biotite Andesite Porphyry (Thbap)

Several intrusions of grey hornblende biotite andesite porphyry crop out in the southern Buckskin Range. Phenocrysts make up 25 to 35% of the rock with 4 to 6% hornblende with thin magnetite rims, 4 to 5% biotite, and oscialllatory-zoned subhedral to anhedral plagioclase (An42-48). The phenocrysts are up to 1 cm in length and occur in an aphanitic groundmass of plagioclase, 1 to 4% mafics, up to 4% quartz, 1 to 2% magnetite and trace apatite. The rock generally is propylitized and rarely is sericitized. A large mass of hornblende biotite andesite porphyry in Sec. 2, T13N, R23E (Plate 1) may be either extrusive or intrusive, although contact relationships, where seen, seem to indicate that it is extrusive.

Biotite Hornblende Sanidine Dacite Porphyry (Tbhsdp)

Several biotite hornblende sanidine dacite porphyry dikes crop out on the southern tip of the Buckskin Range. Phenocrysts make up to 60% of the rock, in seriate texture. They consist of subhedral oscillatory normally-zoned plagioclase (An52-39) up to 10 mm long, rounded sanidine up to 5 mm making up 2 to 3% of the phenocrysts, 4 to 6% biotite up to 5 mm across, and 4 to 6% strongly-zoned oxyhornblende up to 4 mm long with magnetite rims. The aphanitic groundmass contains 1 to 2% sanidine, plagioclase microlites, and minor amounts of glass.

Hornblende Andesite Porphyry (Thap)

Dikes of hornblende andesite porphyry intrude along faults in the southern Buckskin Range. The dark green andesites contain 30 to 40% phenocrysts, in seriate texture, composed of 30 to 35% hornblende up to 10 mm long and 10 to 20% subhedral plagioclase up to 15 mm in length.

Basalt (Tb)

A few black, dense, aphanitic basalt dikes crop out in the southern Buckskin Range. These are probably the youngest intrusives in the range, but their exact age is uncertain.

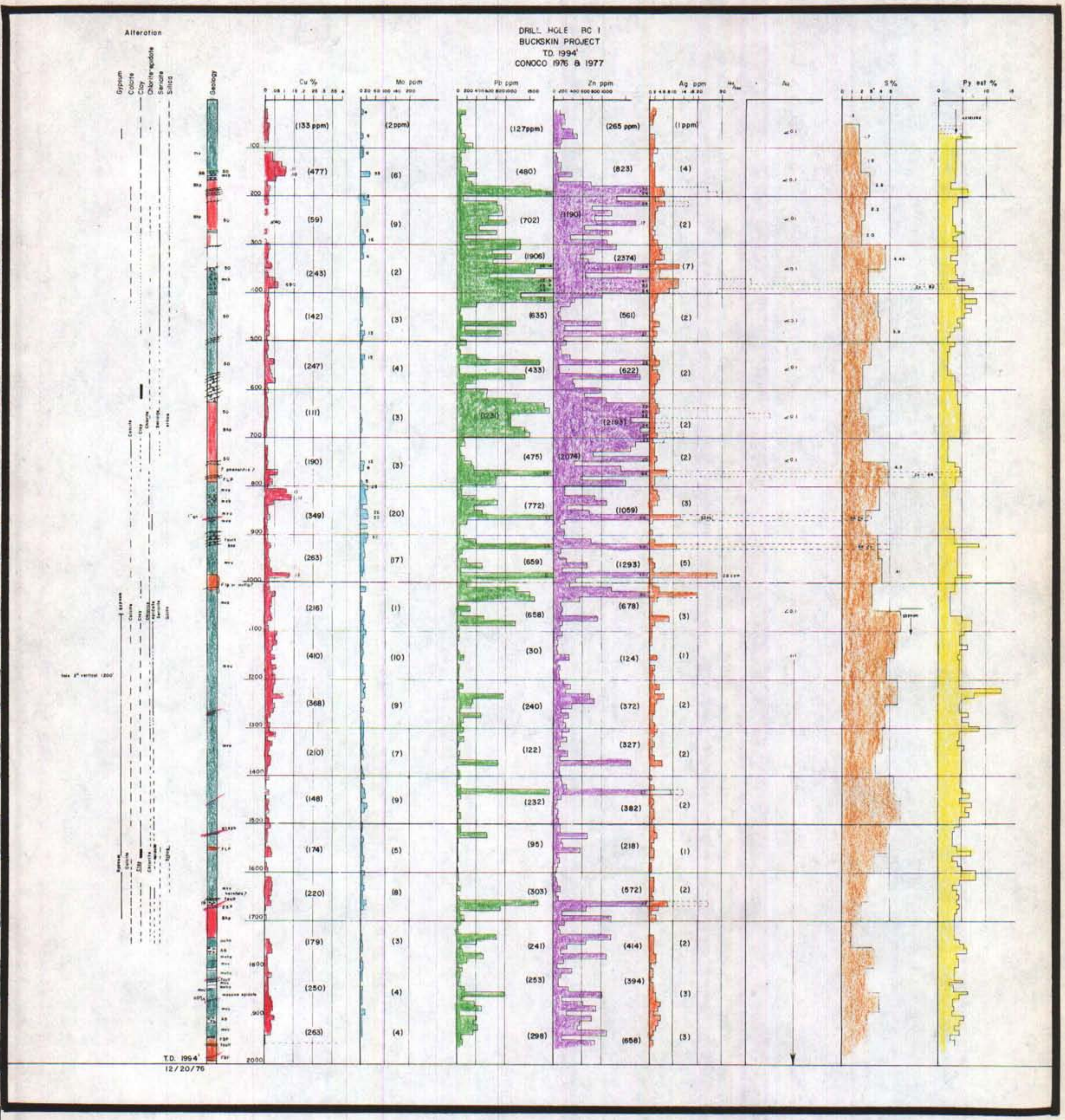
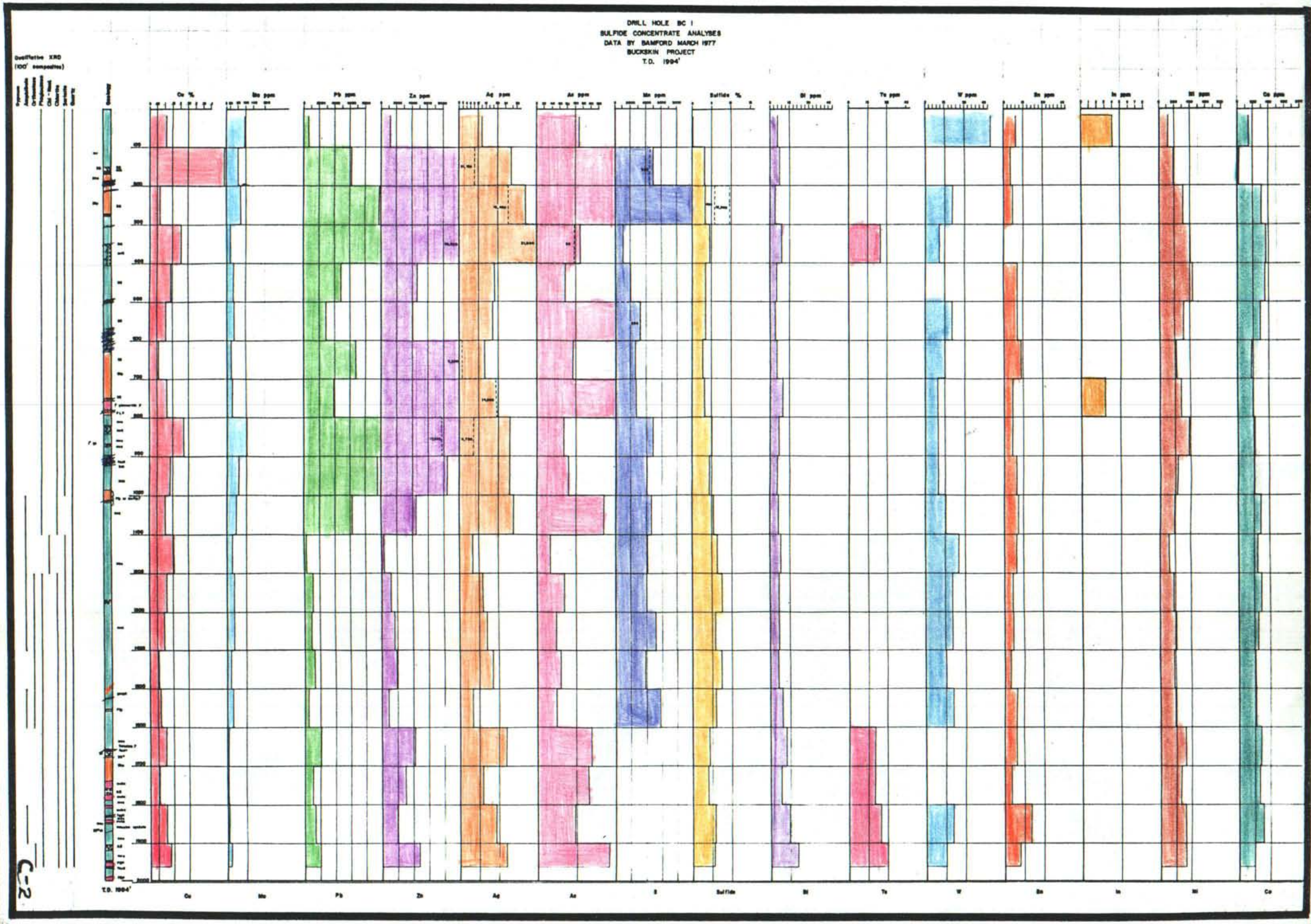
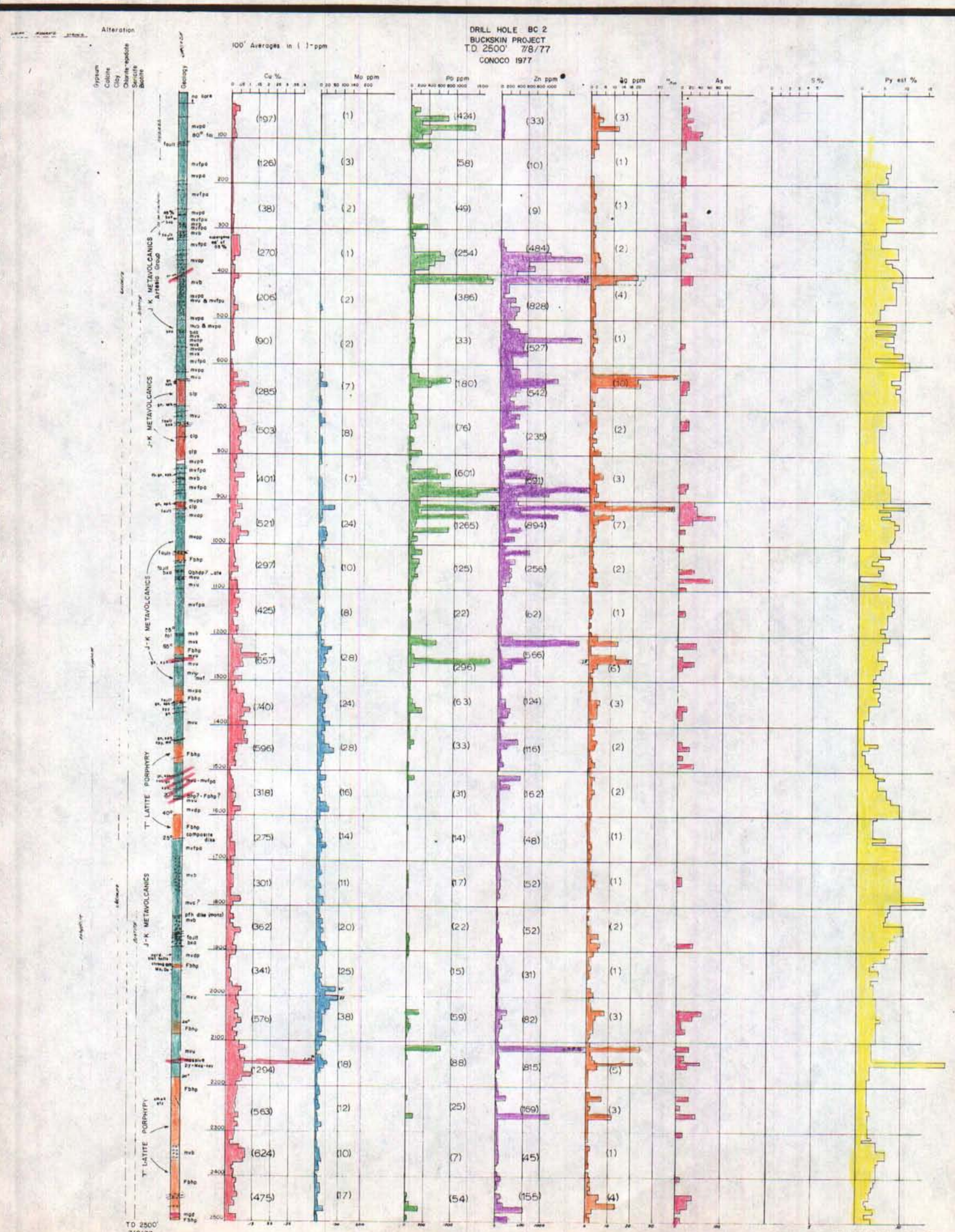

DRILL HOLE BC 1
BUCKSKIN PROJECT
T.D. 1994'
CONOCO 1976 & 1977
Alteration
Geology
Cu %
Mo ppm
Pb ppm
Zn ppm
Ag ppm
Au
S %
Py est %
T.D. 1994'
12/20/76

FIGURE C-1



DRILL HOLE BC 1
SULFIDE CONCENTRATE ANALYSES
DATA BY BAMFORD MARCH 1977
BUCKSKIN PROJECT
T.D. 1994'
Qualitative XRD
(100' composites)
Cu %
Sulfide %
T.D. 1994'
Cu
Mo
Pb
Zn
Ag
As
S
Sulfide
Bi
Te
W
Sn
In
Ni
Co
C-2



DRILL HOLE BC 2
BUCKSKIN PROJECT
T.D. 2500' 7/8/77
CONOCO 1977
100' Averages in ( ) - ppm
Alteration
Gypsum
Calcite
Clay
Chlorite-epidote
Sericite
Biotite
Geology
Cu %
Mo ppm
Pb ppm
Zn ppm
Ag ppm
As
S %
Py est %
J-K METAVOLCANICS
Artesia Group
J-K METAVOLCANICS
J-K METAVOLCANICS
T' LATITE PORPHYRY
J-K METAVOLCANICS
T' LATITE PORPHYTY
TD 2500'
7/8/77

FIGURE C-3

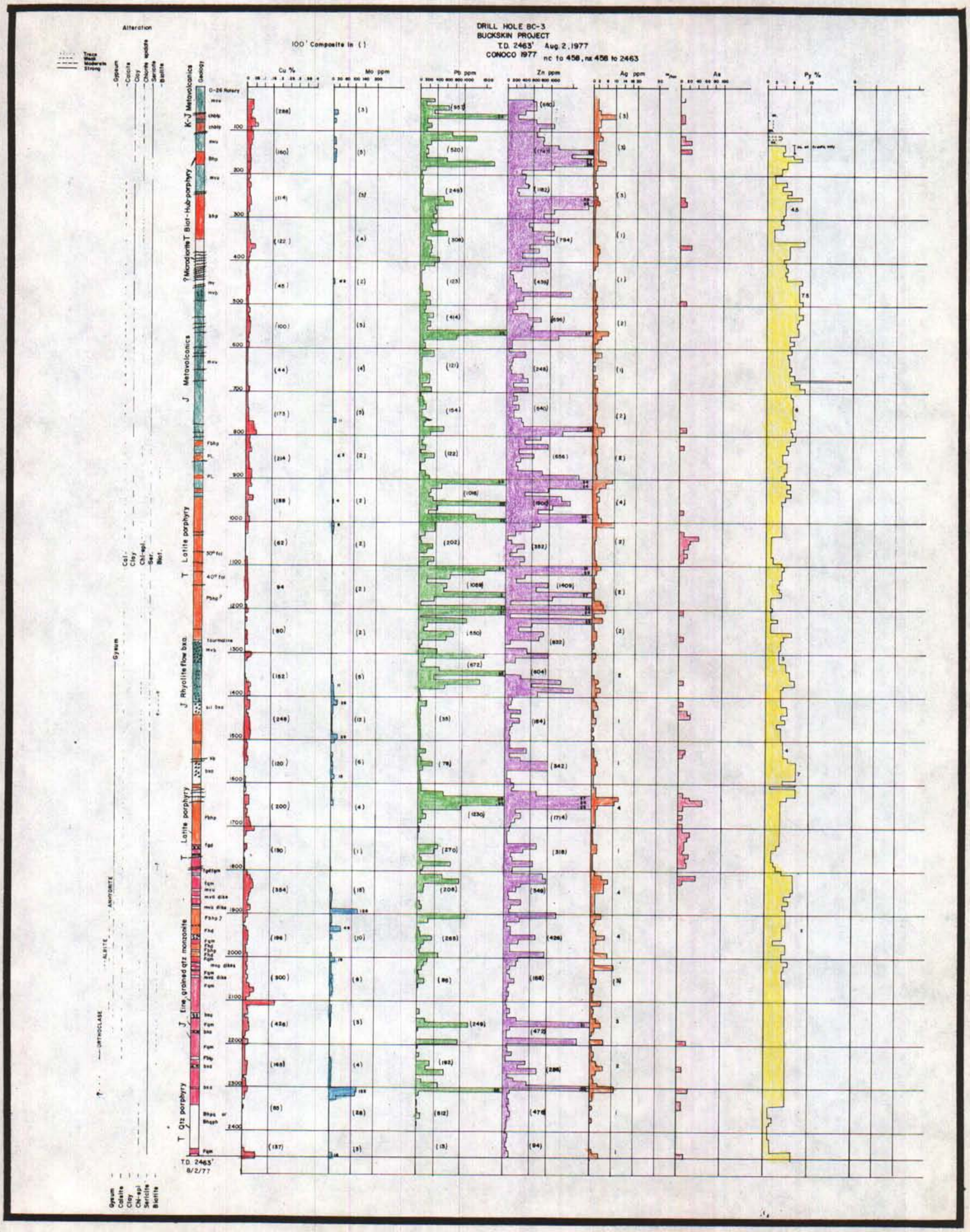

DRILL HOLE BC-3
BUCKSKIN PROJECT
T.D. 2463' Aug. 2, 1977
CONOCO 1977 nc to 458, nx 458 to 2463
100' Composite in ( )
Alteration
Geology
Cu %
Mo ppm
Pb ppm
Zn ppm
Ag ppm
As
Py %
K-J Metavolcanics
J Metavolcanics
T Latite porphyry
J Rhyolite flow bxa.
T Latite porphyry
J Fine grained qtz monzonite
T Qtz porphyry
T.D. 2463'
8/2/77
Gypsum
Calcite
Clay
Chl-epi
Sericite
Biotite
ORTHOCLASE
ALBITE
ANHYDRITE

FIGURE C-4

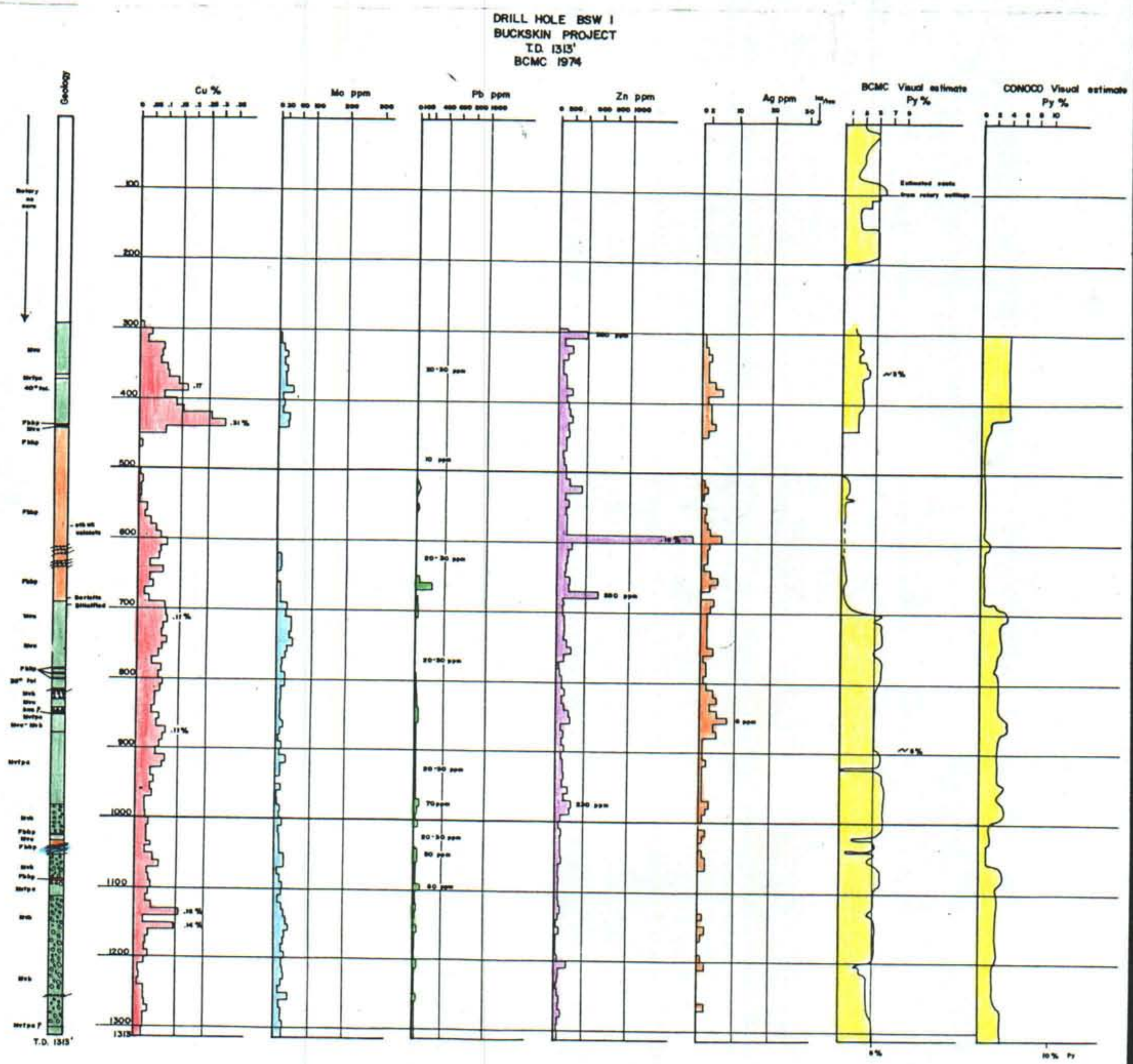

DRILL HOLE BSW I
BUCKSKIN PROJECT
T.D. 1313'
BCMC 1974
Geology
Cu %
Mo ppm
Pb ppm
Zn ppm
Ag ppm
BCMC Visual estimate
Py %
CONOCO Visual estimate
Py %
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1313
T.D. 1313'
.17
.31 %
.11 %
.11 %
.16 %
.14 %
20-30 ppm
10 ppm
70 ppm
50 ppm
300 ppm
330 ppm
~3%
~3%
Estimated coats from rotary cuttings

FIGURE C-5

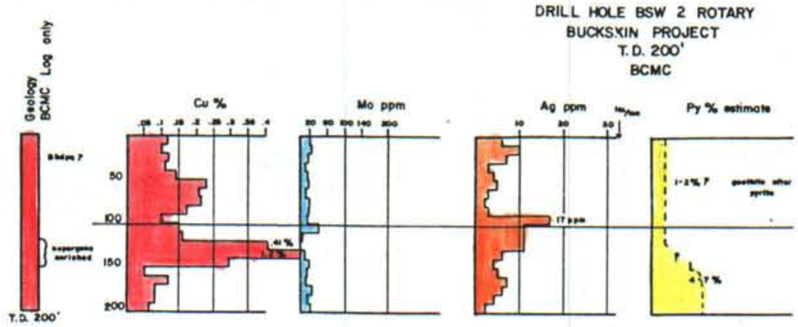

DRILL HOLE BSW 2 ROTARY
BUCKSKIN PROJECT
T.D. 200'
BCMC
Geology BCMC Log only
Cu %
Mo ppm
Ag ppm
Py % estimate
.05 .1 .15 .2 .25 .3 .35 .4
20 60 100 140 200
10 20 30
50
100
150
200
T.D. 200'
.41 %
17 ppm
1-2% ?
4-7 %

Figure C-6

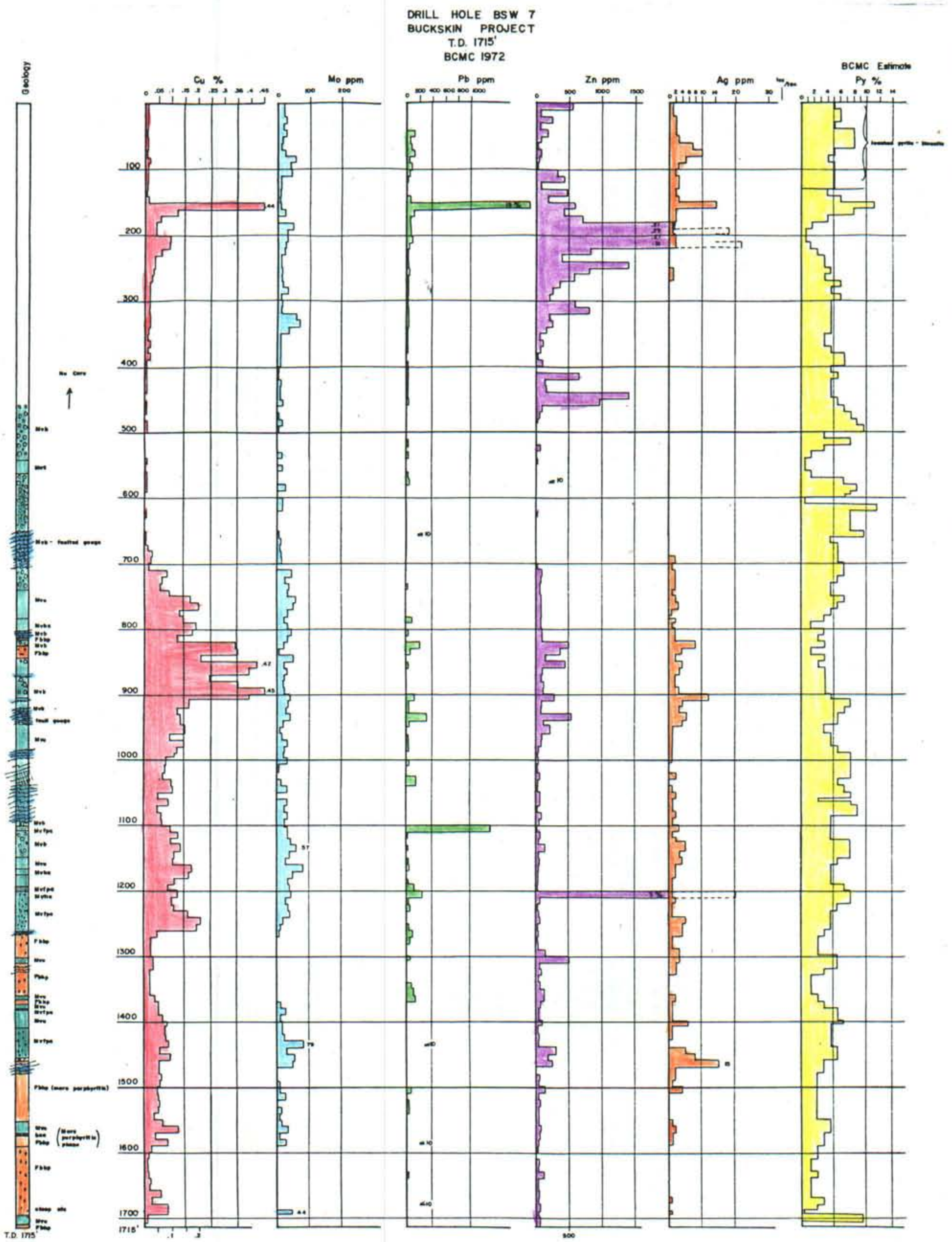

DRILL HOLE BSW 7
BUCKSKIN PROJECT
T.D. 1715'
BCMC 1972
Geology
Cu %
Mo ppm
Pb ppm
Zn ppm
Ag ppm
BCMC Estimate
Py %
T.D. 1715'

Figure C-7

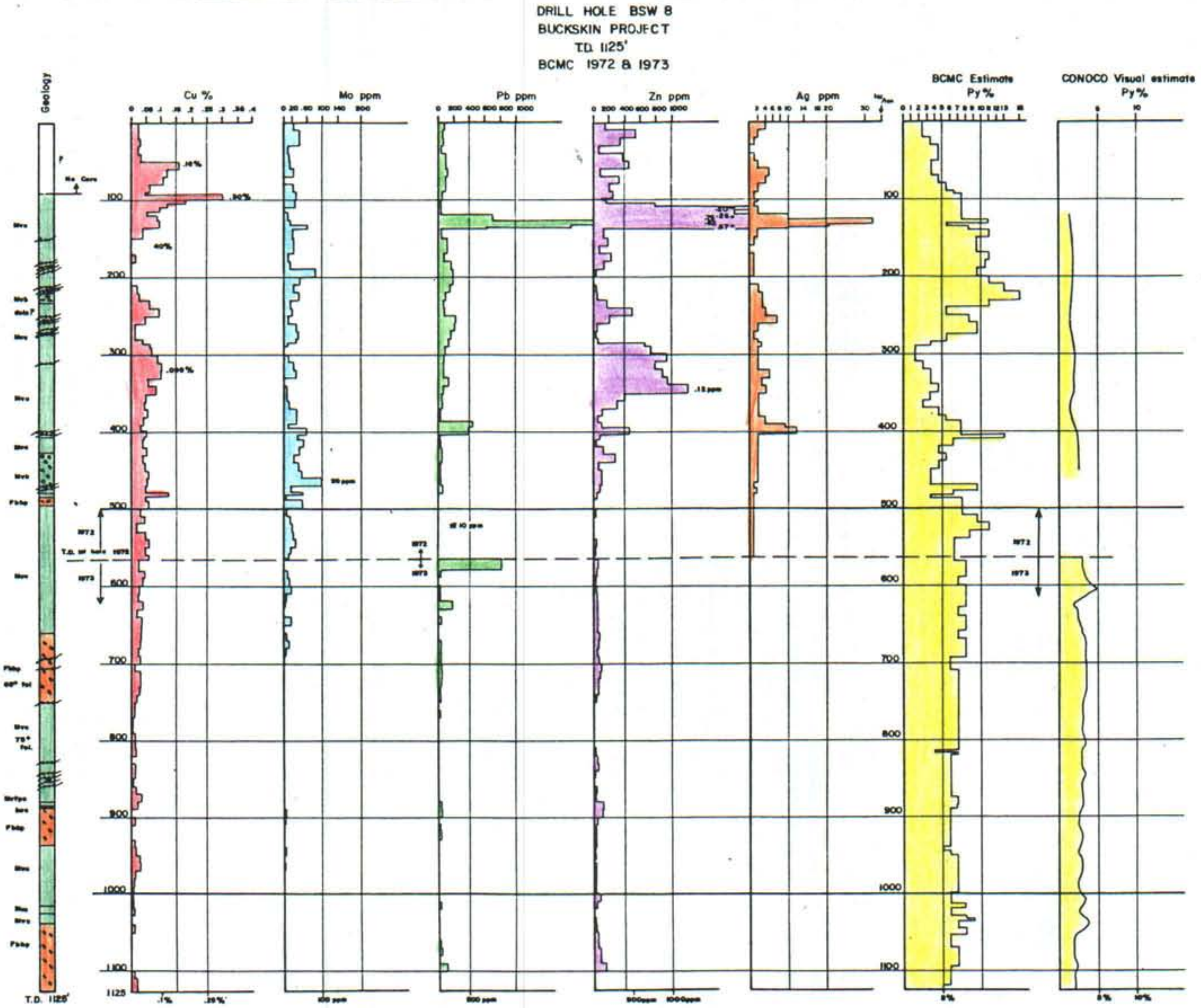
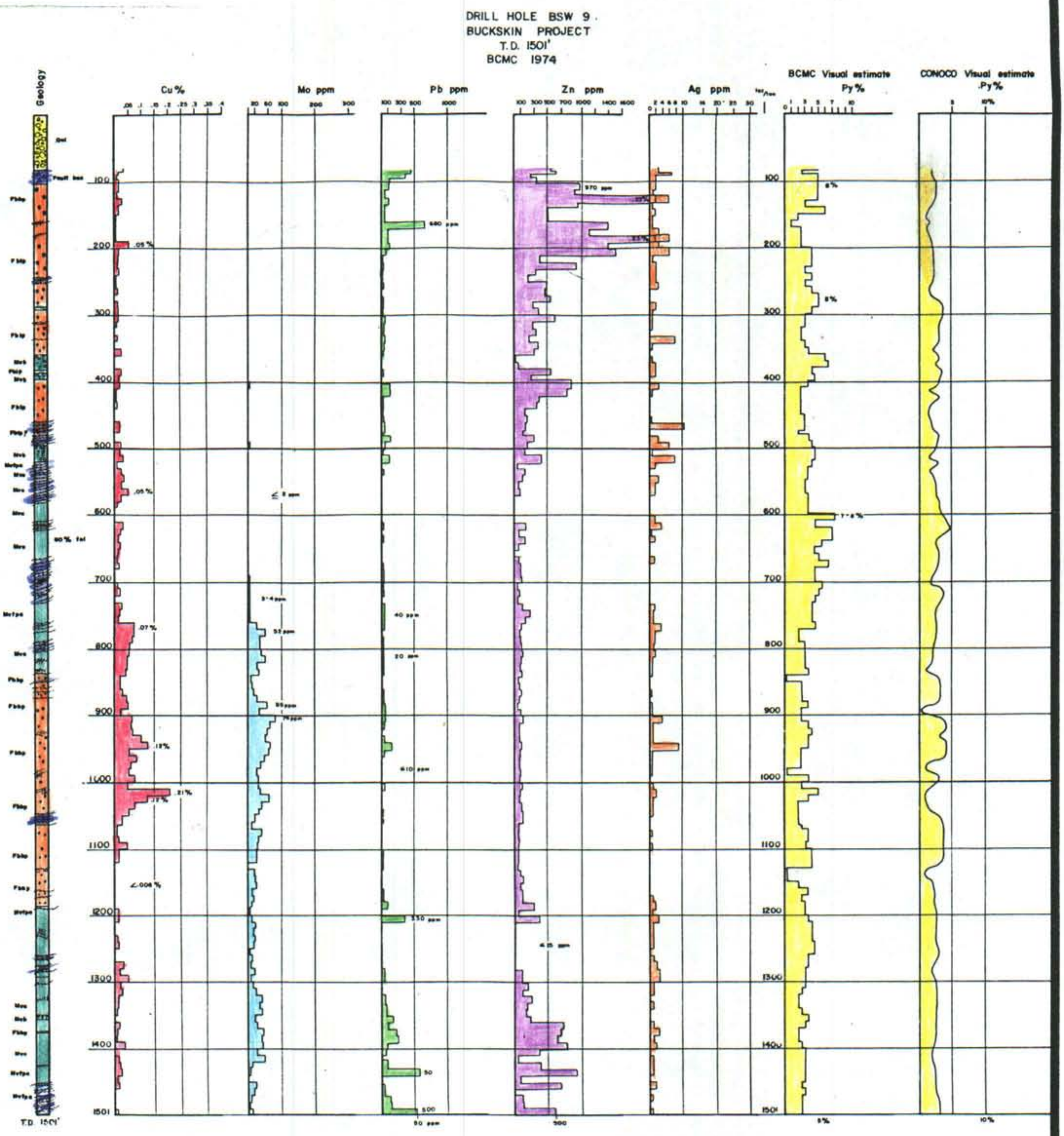

DRILL HOLE BSW 8
BUCKSKIN PROJECT
T.D. 1125'
BCMC 1972 & 1973
Geology
Cu %
Mo ppm
Pb ppm
Zn ppm
Ag ppm
BCMC Estimate
Py %
CONOCO Visual estimate
Py %
T.D. 1125'

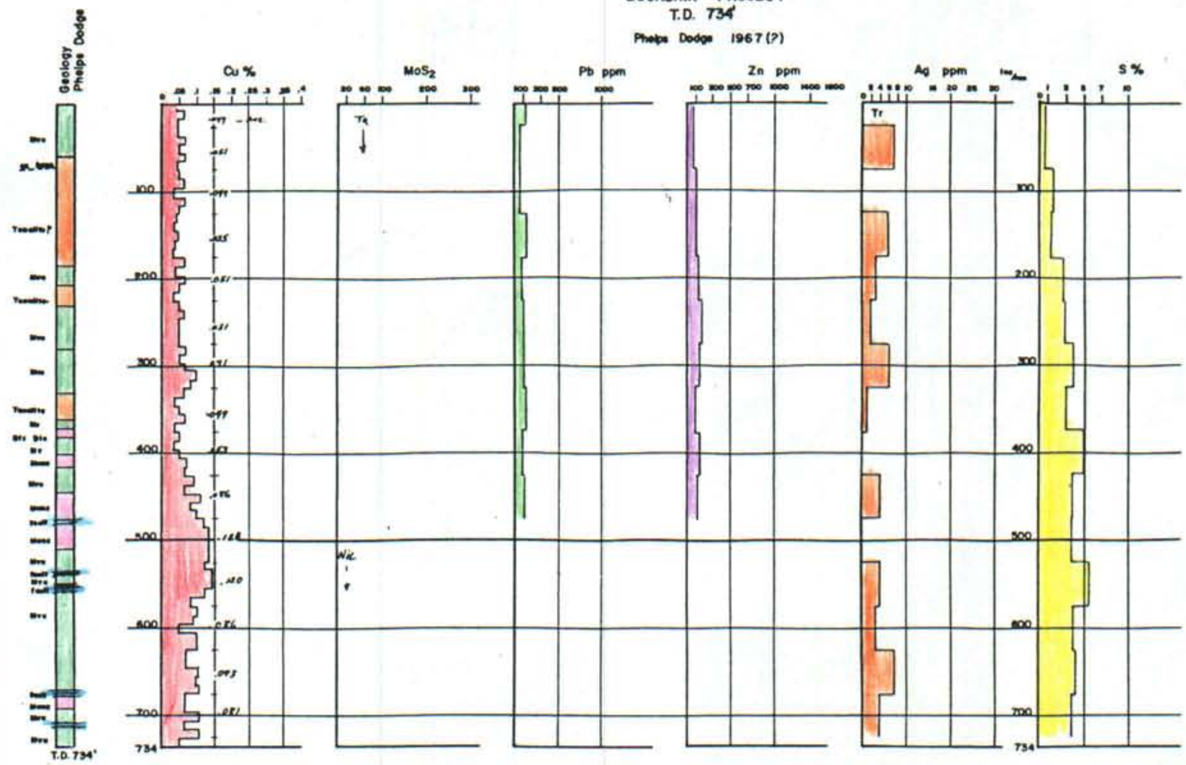
Figure C-8



DRILL HOLE BSW 9
BUCKSKIN PROJECT
T.D. 1501'
BCMC 1974
Geology
Cu %
Mo ppm
Pb ppm
Zn ppm
Ag ppm
BCMC Visual estimate Py %
CONOCO Visual estimate Py %
T.D. 1501'

Figure c-9

DRILL HOLE BUL 9
BUCKSKIN PROJECT
T.D. 734'
Phelps Dodge 1967(?)



NOTE - No core available for inspection, Hence no correlation can be made with other holes. Rock names remain as originally described by P.D. in 1967.

Figure c-10

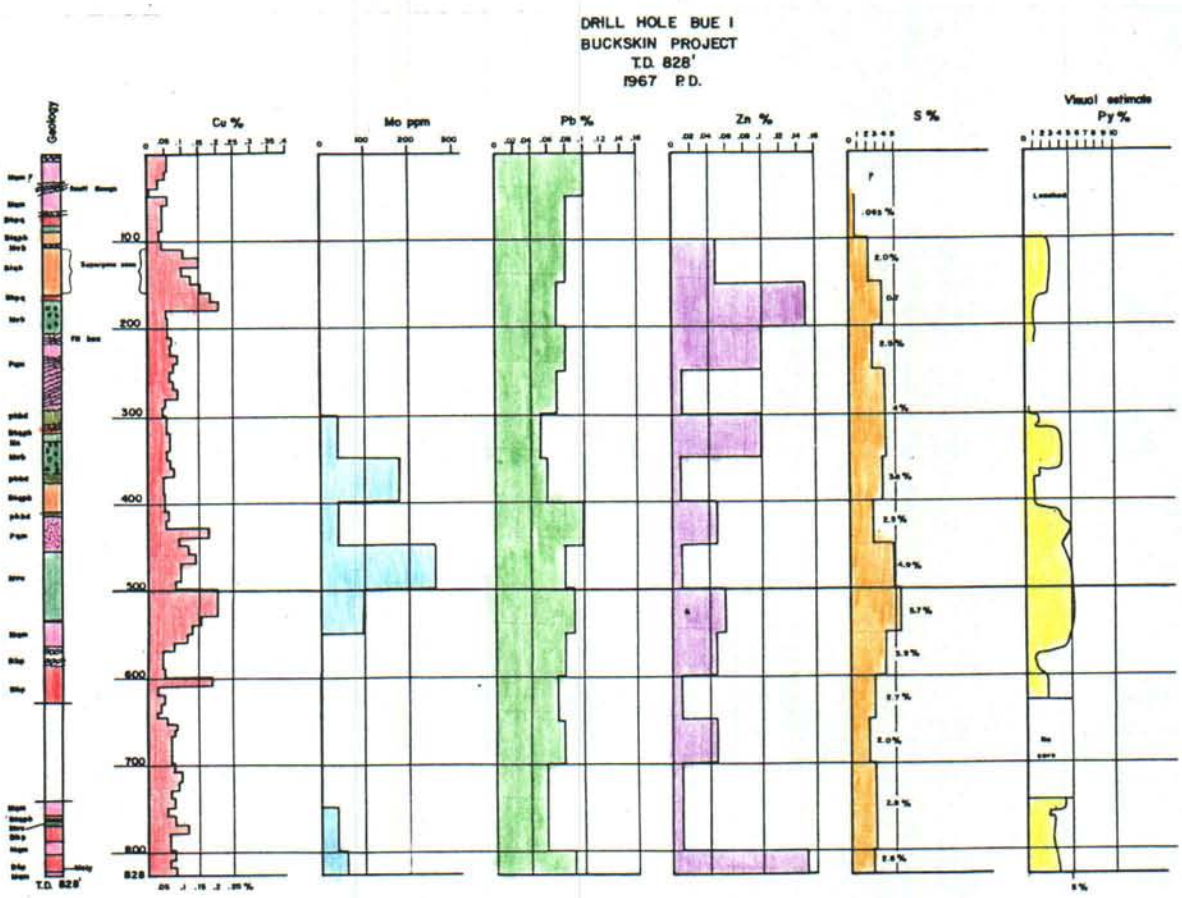

DRILL HOLE BUE I
BUCKSKIN PROJECT
T.D. 828'
1967 P.D.
Geology
Cu %
Mo ppm
Pb %
Zn %
S %
Visual estimate
Py %
100
200
300
400
500
600
700
800
828
T.D. 828'

Figure C-11

DRILL HOLE BUE 2
BUCKSKIN PROJECT
T.D. 893'
1967 P.D.

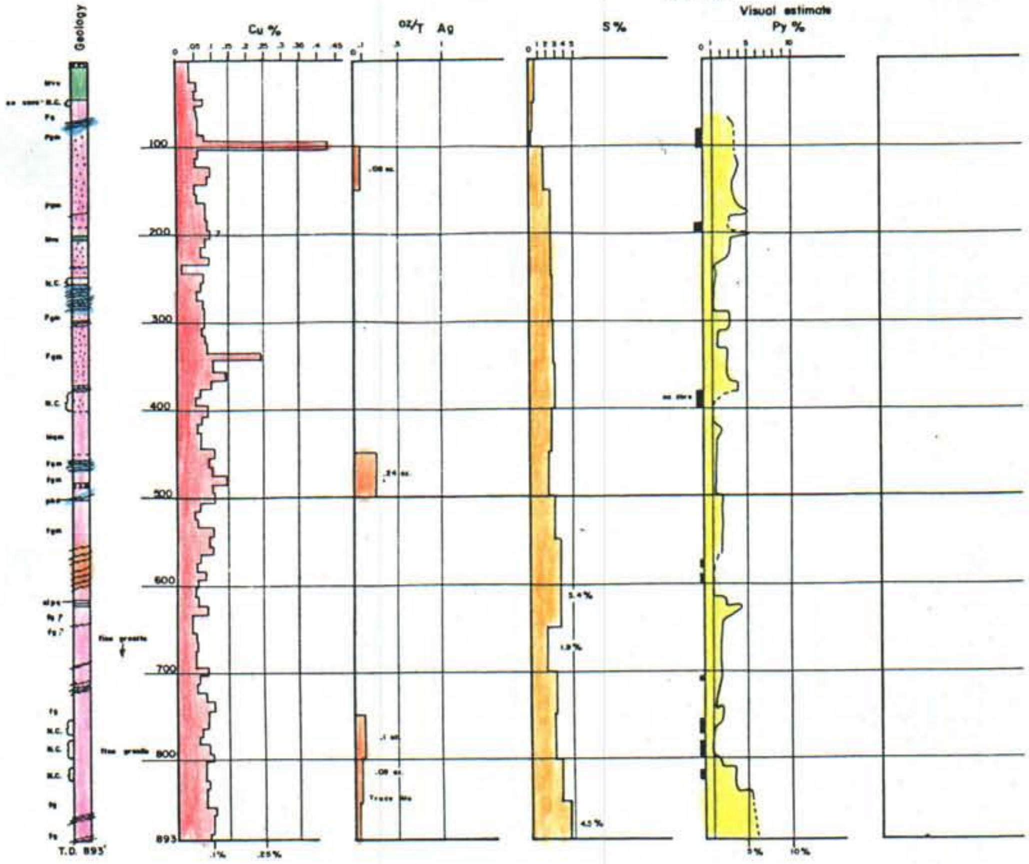
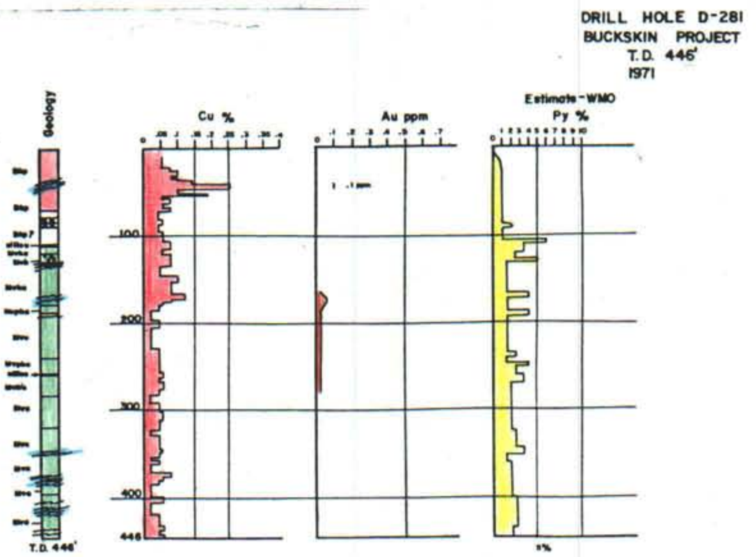


Figure c-12



DRILL HOLE D-281
BUCKSKIN PROJECT
T.D. 446'
1971
Geology
Cu %
Au ppm
Estimate-WMO
Py %
0
.1
.2
.3
.4
.5
.6
.7
0
1 2 3 4 5 6 7 8 9 10
100
200
300
400
446
T.D. 446'

Figure C-13

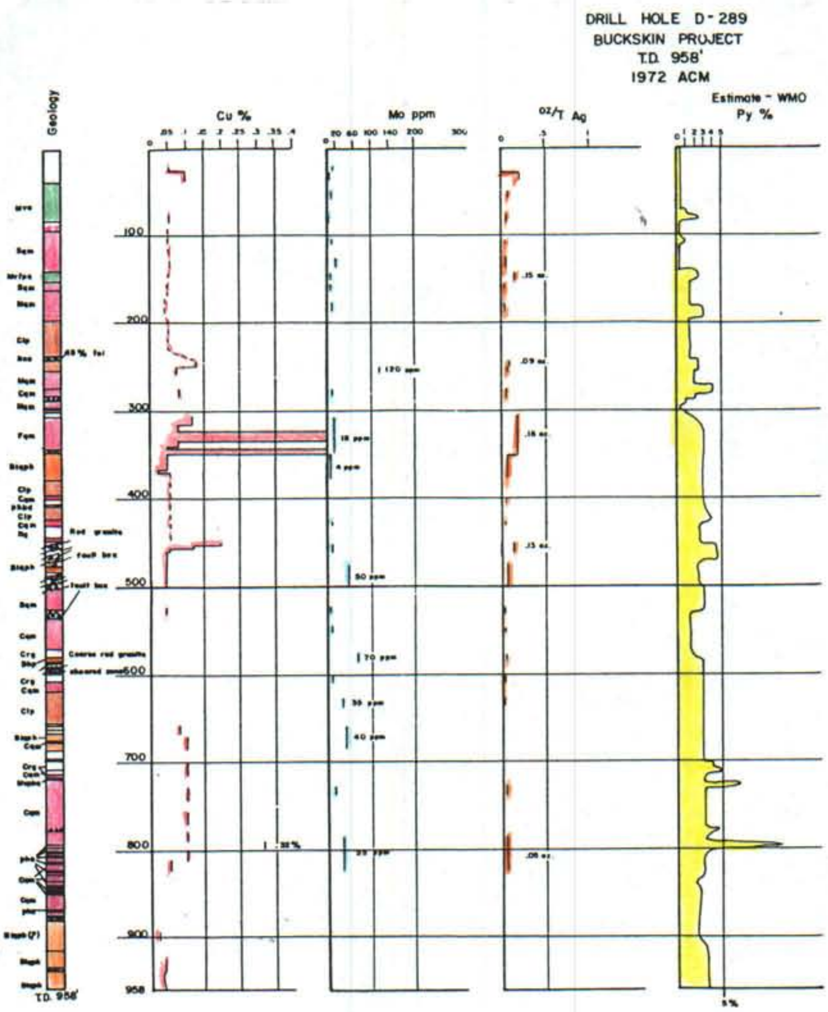
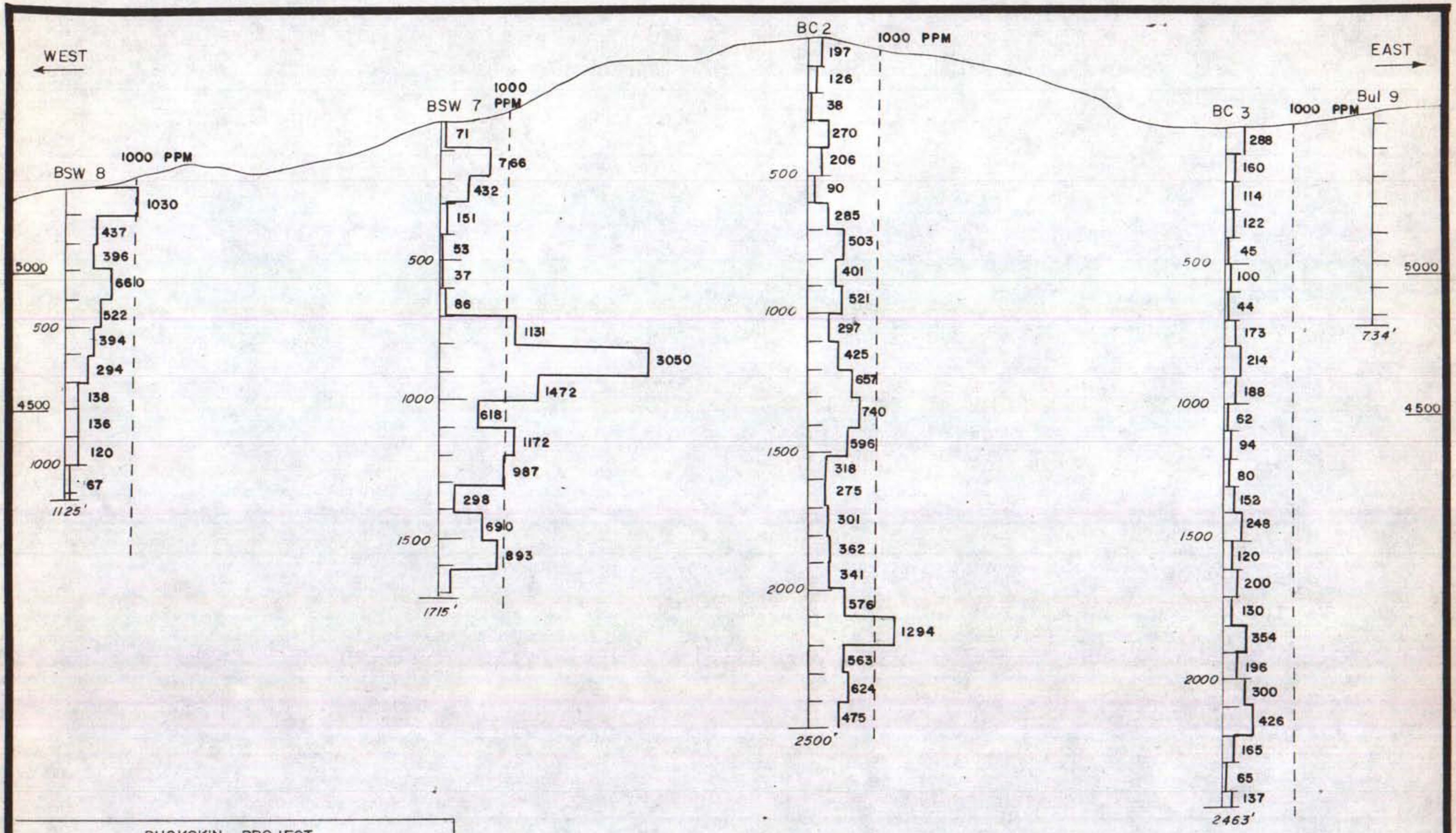

DRILL HOLE D-289
BUCKSKIN PROJECT
T.D. 958'
1972 ACM
Geology
Cu %
Mo ppm
oz/T Ag
Estimate - WMO
Py %
T.D. 958'

Figure C-14



BUCKSKIN PROJECT

Drill Hole Cross Section

BSW 8, 7, BC-2, 3

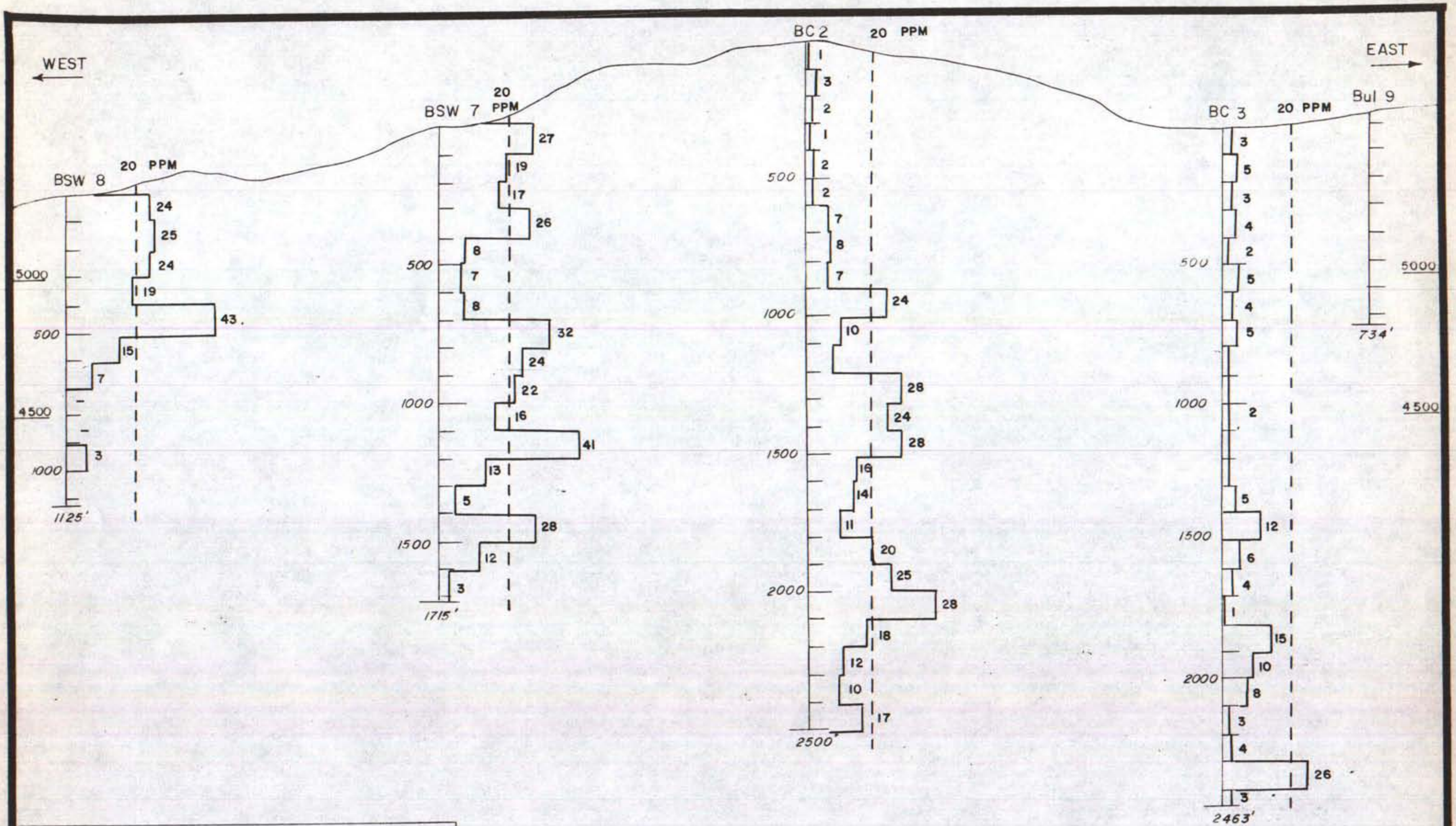
CONOCO . COMPOSITE ASSAYS-100'

Cu

APPENDIX D
FIGURE D-1

0 500'

WMO 3/78



BUCKSKIN PROJECT

Drill Hole Cross Section

BSW 8, 7, BC-2, 3

CONOCO COMPOSITE ASSAYS - 100'

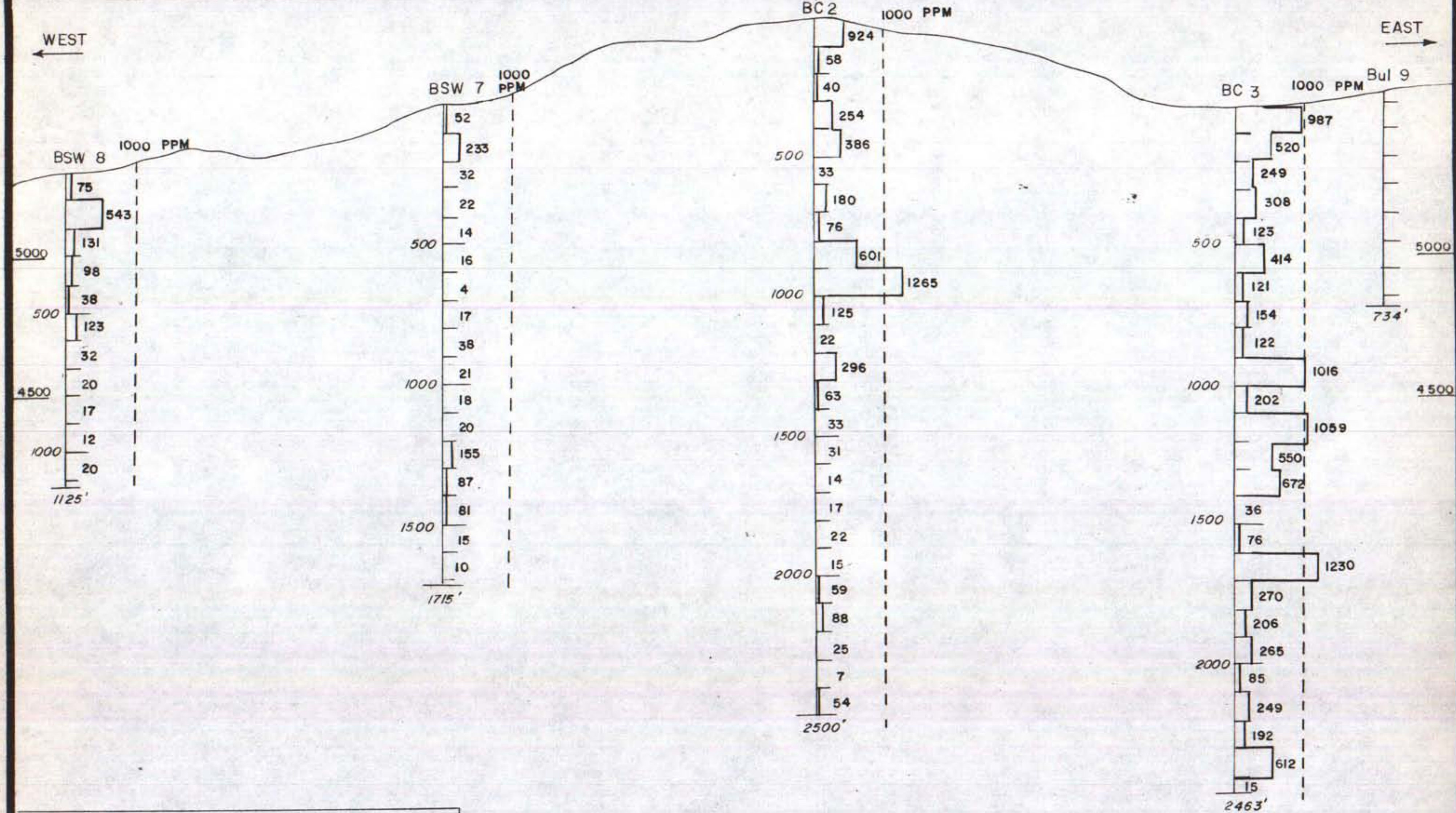
Mo

APPENDIX D

FIGURE D-2

0 500'

WMO 3/78



BUCKSKIN PROJECT

Drill Hole Cross Section

BSW 8, 7, BC-2, 3

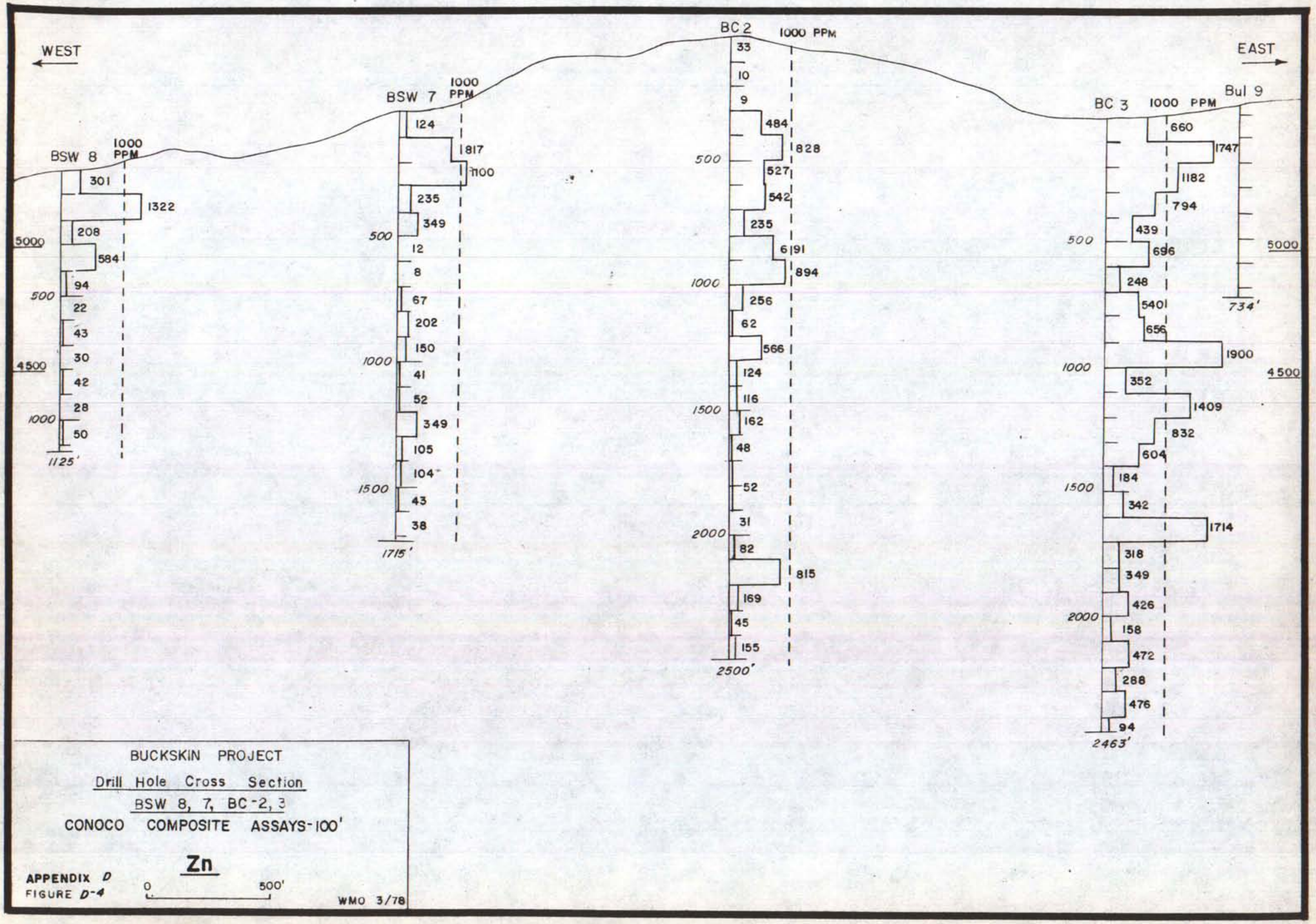
CONOCO COMPOSITE ASSAYS - 100'

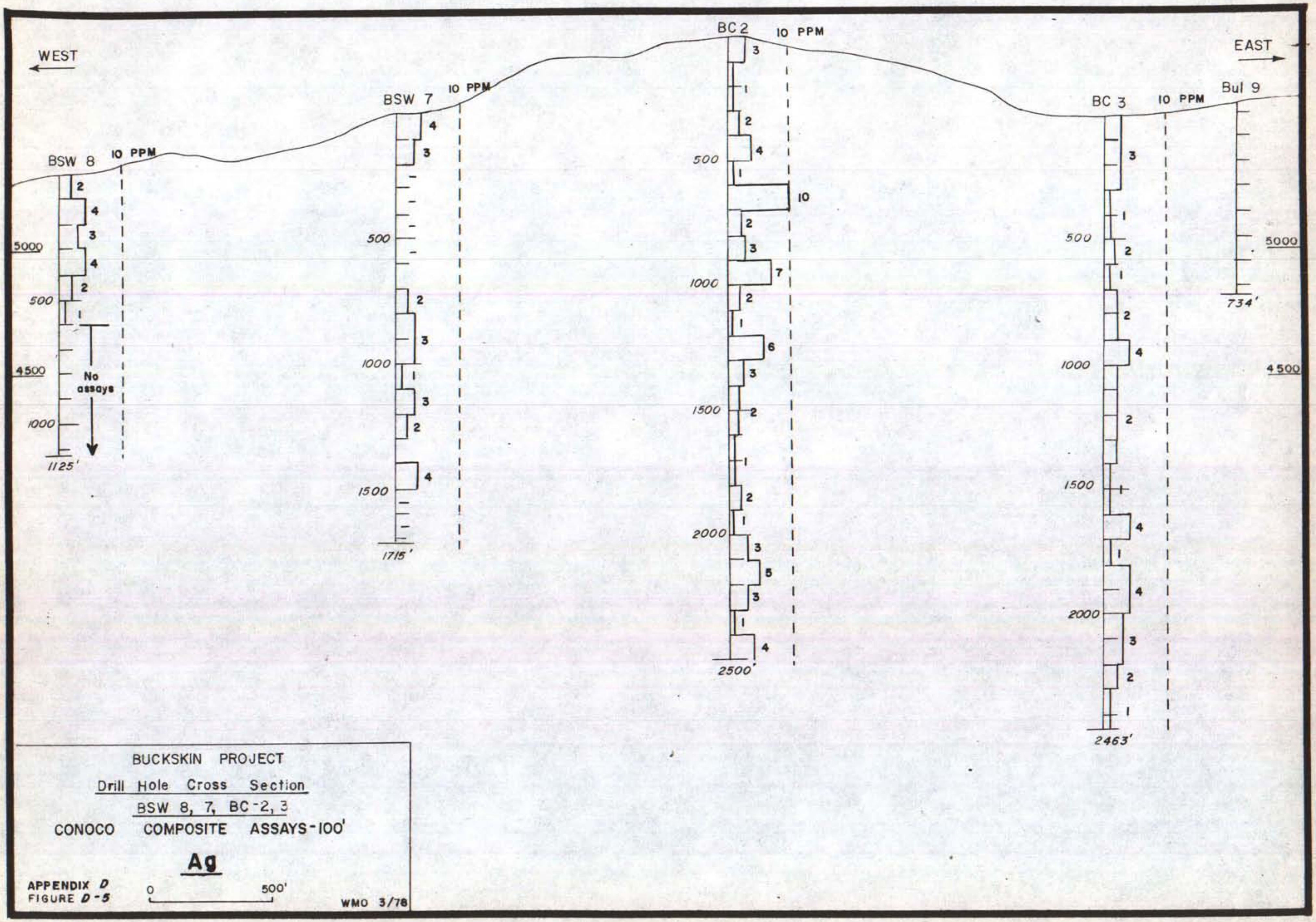
Pb

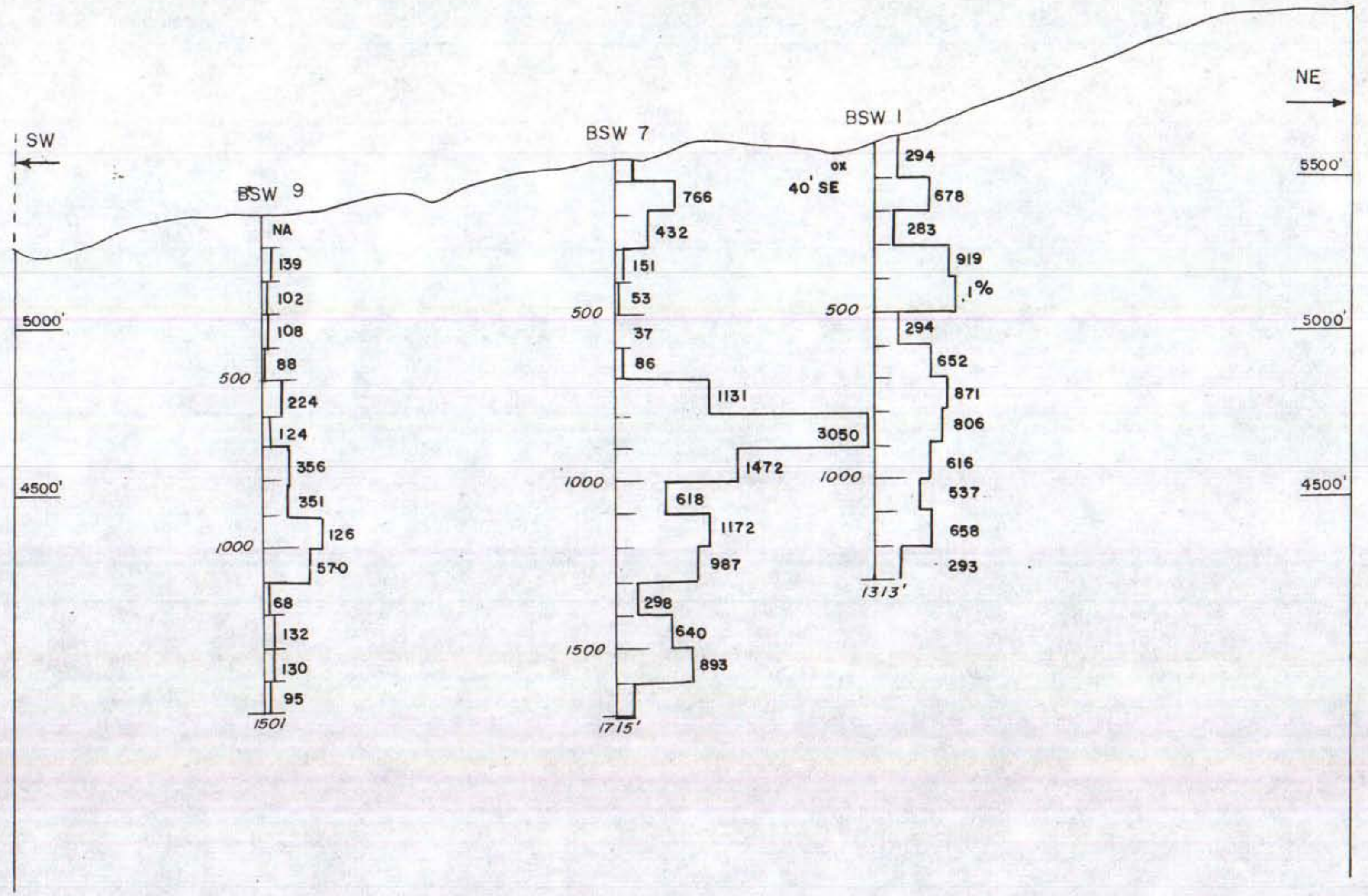
APPENDIX D
FIGURE D-3

0 500'

WMO 3/78


WEST
EAST
BSW 8
1000 PPM
301
1322
208
5000
584
94
500
22
43
30
4500
42
28
1000
50
1125'
BSW 7
1000 PPM
124
817
1100
235
349
500
12
8
67
202
150
1000
41
52
349
105
104
1500
43
38
1715'
BC 2
1000 PPM
33
10
9
484
500
828
527
542
235
691
1000
894
256
62
566
124
1500
116
162
48
52
31
2000
82
815
169
45
155
2500'
BC 3
1000 PPM
Bul 9
660
1747
1182
794
439
500
696
5000
248
540
656
734'
1900
1000
4500
352
1409
832
604
1500
184
342
1714
318
349
426
2000
158
472
288
476
94
2463'
BUCKSKIN PROJECT
Drill Hole Cross Section
BSW 8, 7, BC-2, 3
CONOCO COMPOSITE ASSAYS-100'
Zn
APPENDIX D
FIGURE D-4
0
500'
WMO 3/78


WEST
EAST
BSW 8
10 PPM
BSW 7
10 PPM
BC 2
10 PPM
BC 3
10 PPM
Bul 9
5000
4500
No assays
1125'
1715'
2500'
2463'
734'
BUCKSKIN PROJECT
Drill Hole Cross Section
BSW 8, 7, BC-2, 3
CONOCO COMPOSITE ASSAYS-100'
Ag
APPENDIX D
FIGURE D-5
0
500'
WMO 3/78



BUCKSKIN PROJECT

Drill Hole Cross Section

BSW 1, 7, 9

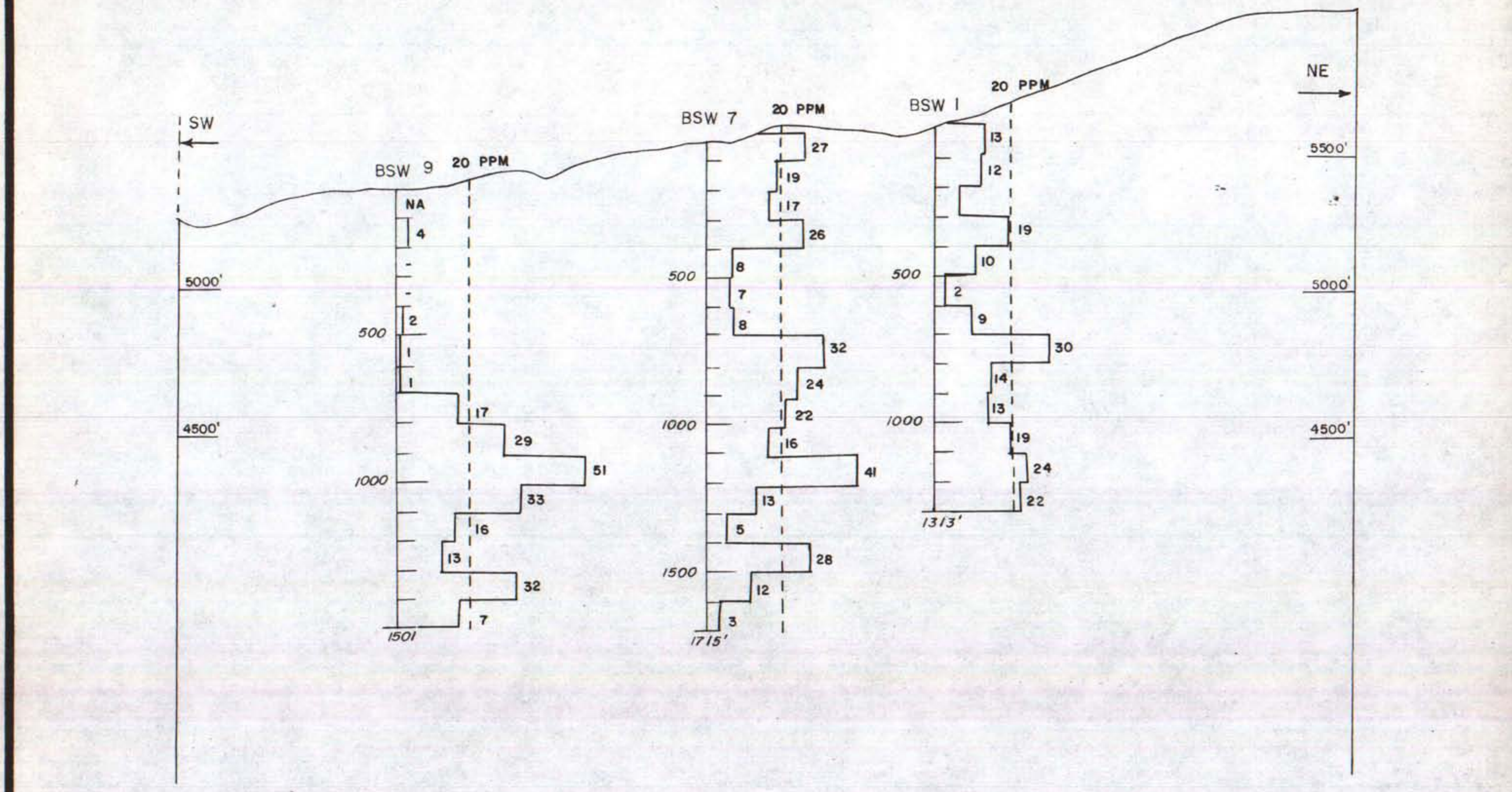
CONOCO COMPOSITE ASSAYS-100'

Cu

APPENDIX *D*
FIGURE *D - 6*

0 — 500'

WMO 3/78



BUCKSKIN PROJECT

Drill Hole Cross Section

BSW 1, 7, 9

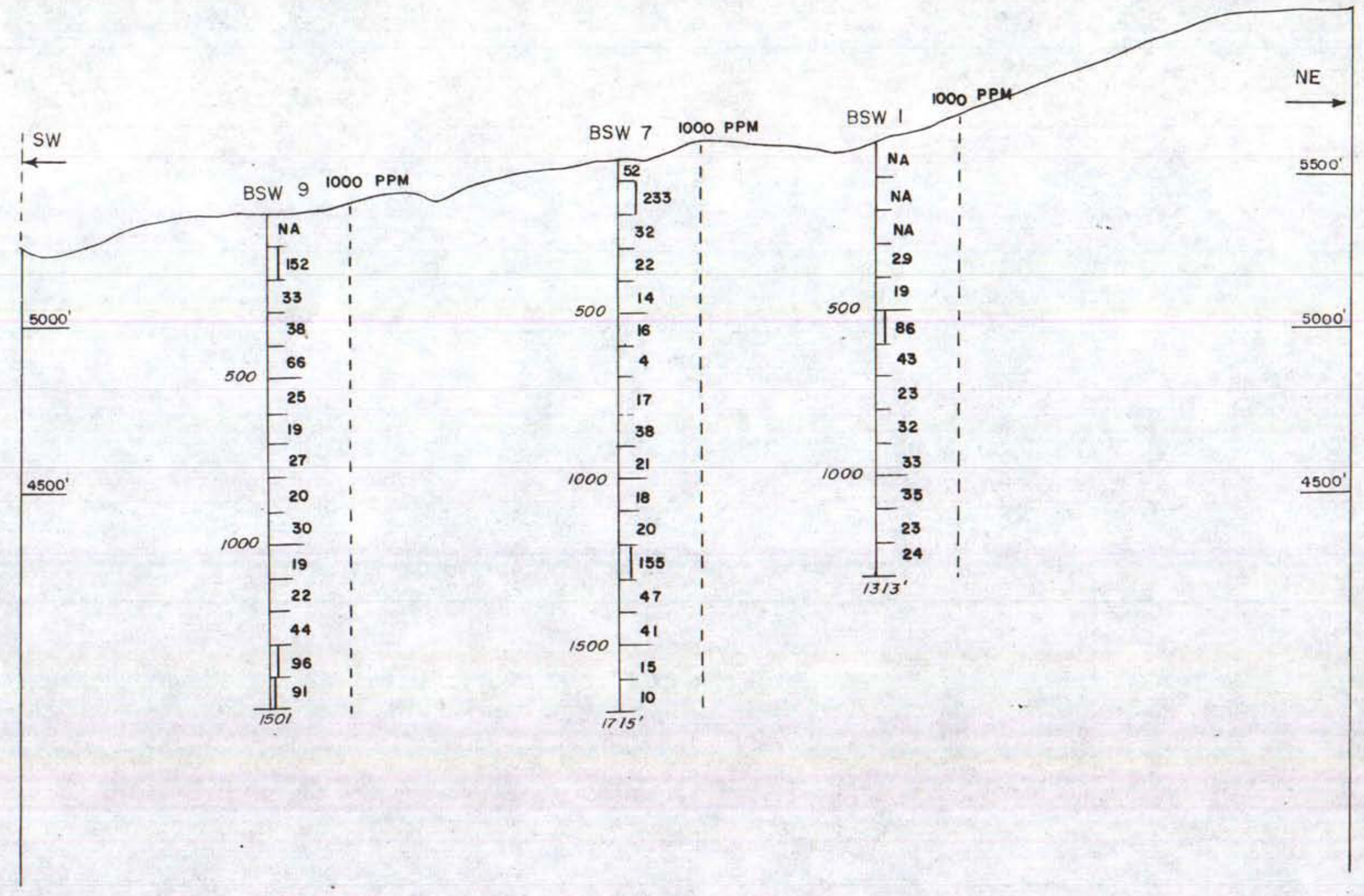
CONOCO COMPOSITE ASSAYS-100'

Mo

APPENDIX D
FIGURE D-7

0 500'

WMO 3/78



BUCKSKIN PROJECT

Drill Hole Cross Section

BSW 1, 7, 9

CONOCO COMPOSITE ASSAYS - 100'

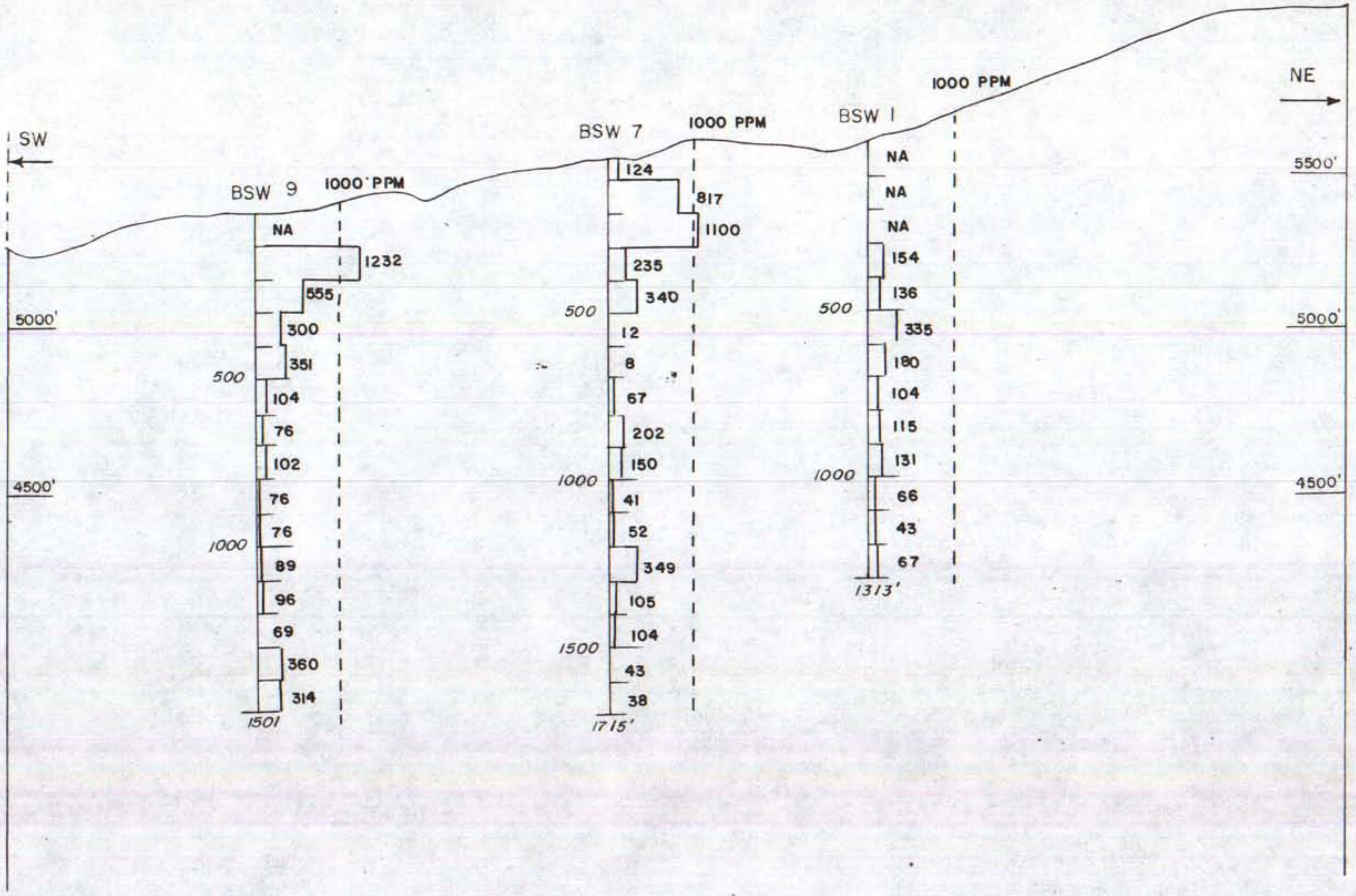
Pb

APPENDIX D

FIGURE D-8

0 500'

WMO 3/78



BUCKSKIN PROJECT

Drill Hole Cross Section

BSW 1, 7, 9

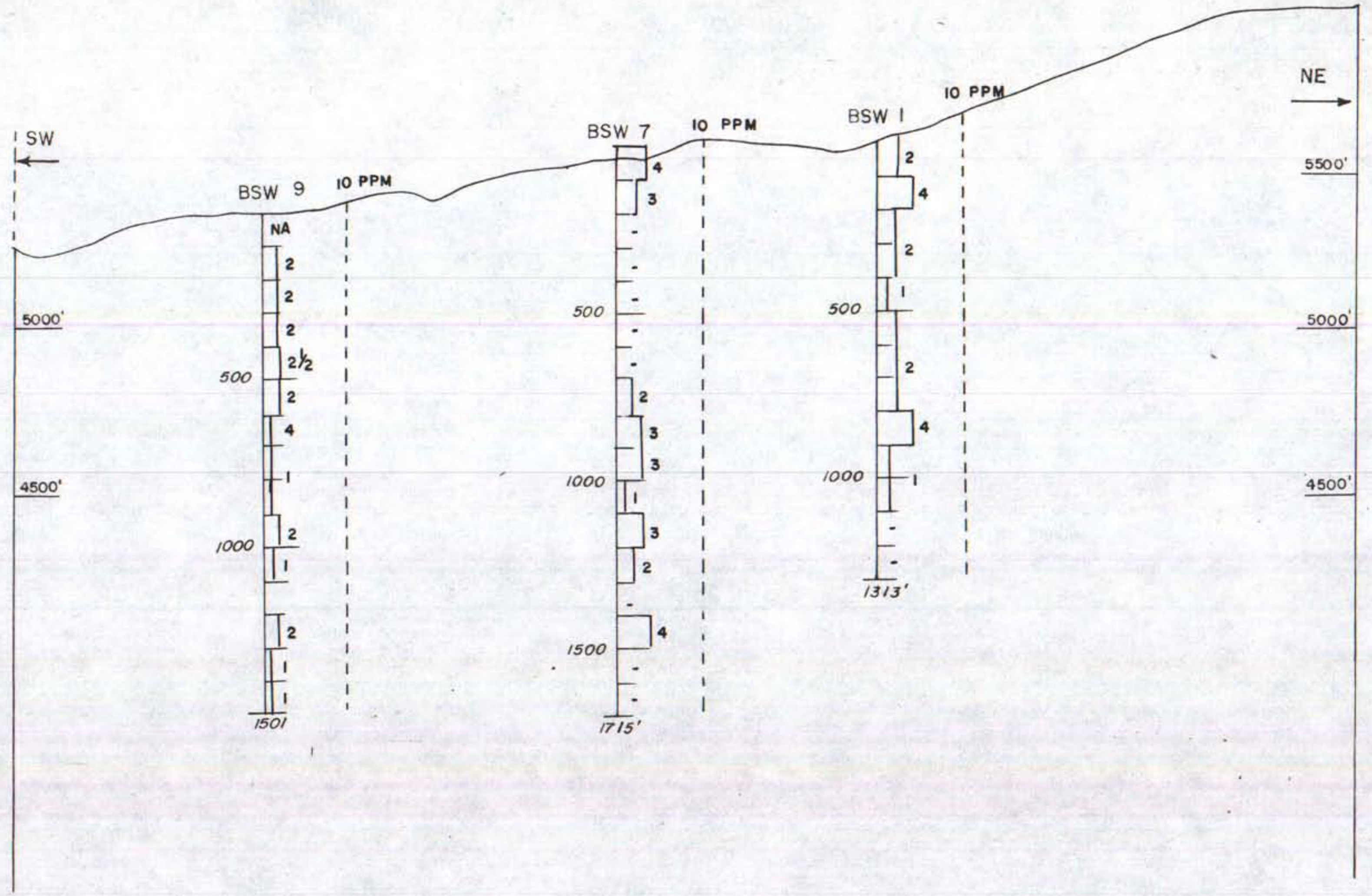
CONOCO COMPOSITE ASSAYS-100'

Zn

APPENDIX D
FIGURE D - 9

0 500'

WMO 3/78



BUCKSKIN PROJECT

Drill Hole Cross Section

BSW 1, 7, 9

CONOCO COMPOSITE ASSAYS - 100'

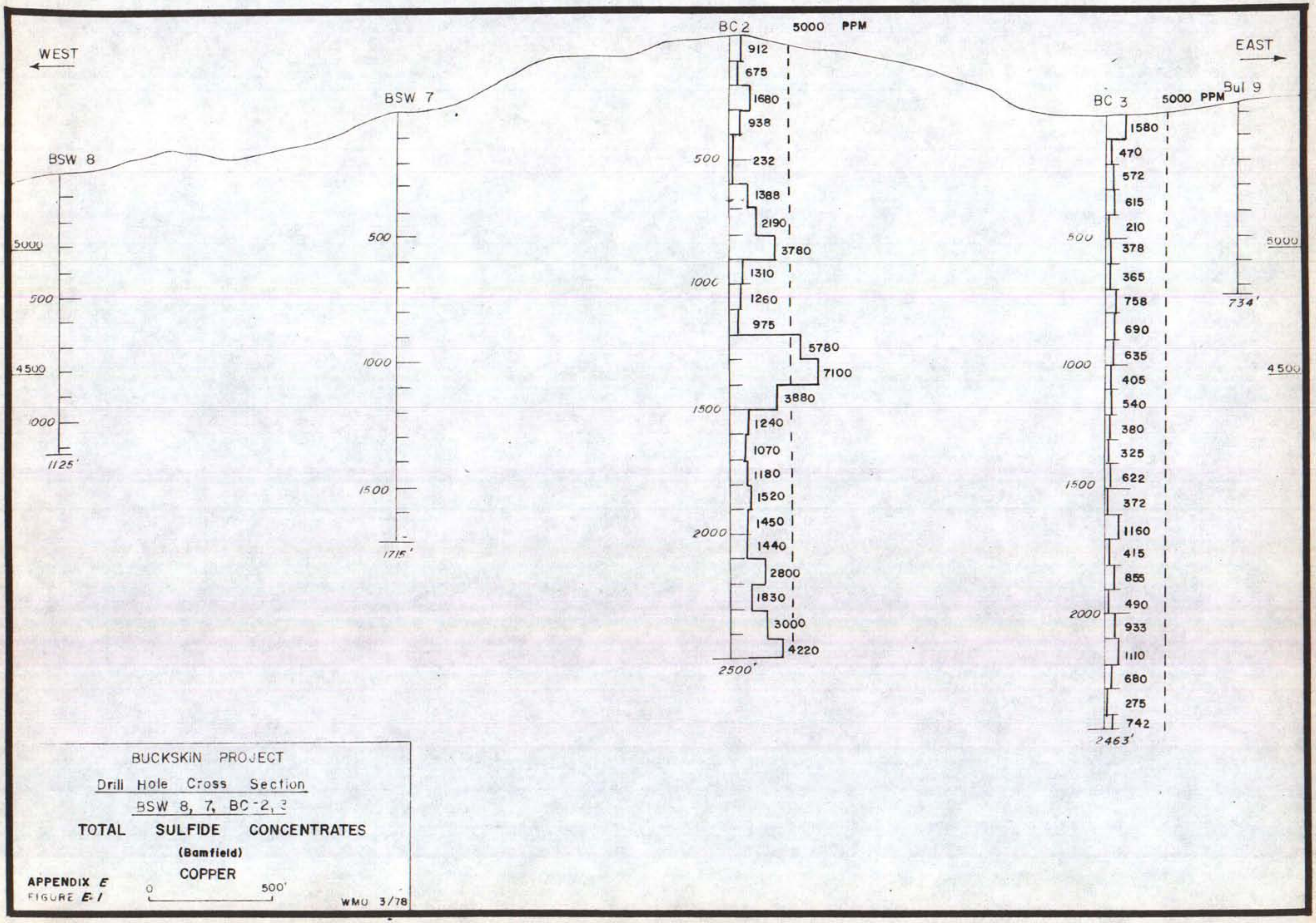
Ag

APPENDIX *D*

FIGURE *D-10*

0 500'

WMO 3/78



BUCKSKIN PROJECT

Drill Hole Cross Section

BSW 8, 7, BC-2, 3

TOTAL SULFIDE CONCENTRATES

(Bamfield)

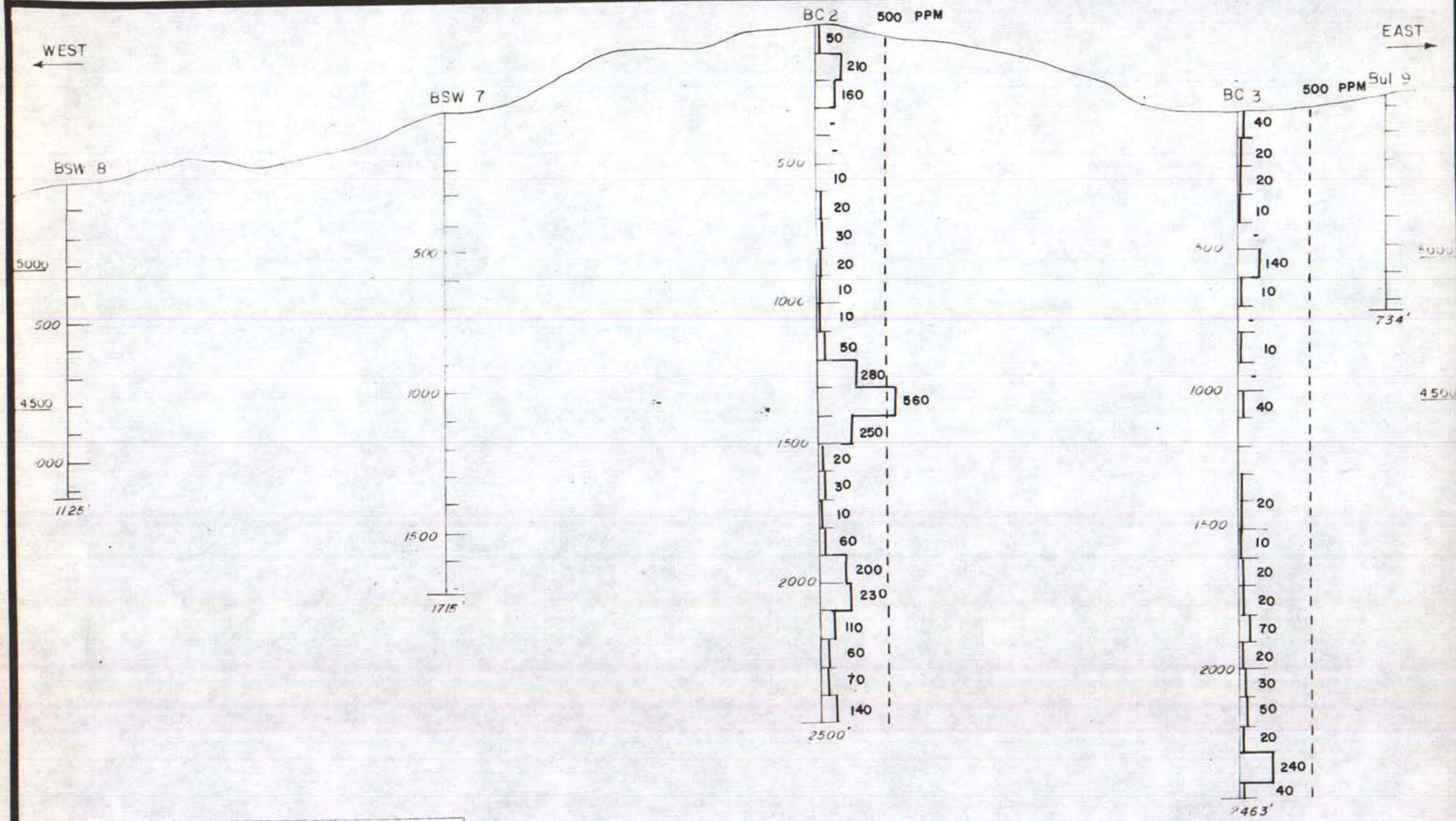
COPPER

0 500'

APPENDIX E

FIGURE E-1

WMO 3/78



BUCKSKIN PROJECT

Drill Hole Cross Section

BSW 8, 7, BC-2, 3

TOTAL SULFIDE CONCENTRATES

(Bamfield)

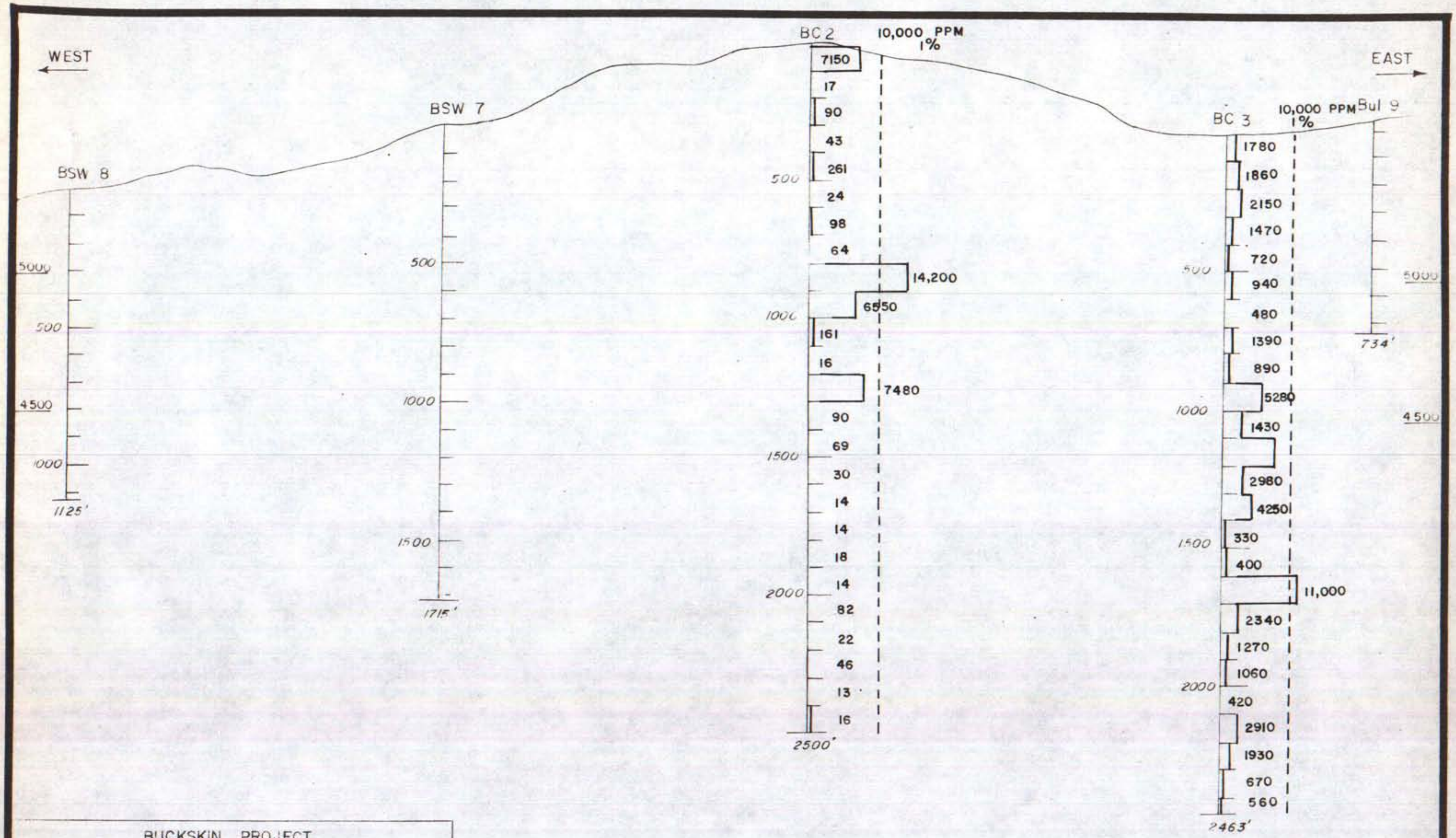
MOLYBDENUM

0 500'

APPENDIX E

FIGURE E 2

WMU 3/78



BUCKSKIN PROJECT

Drill Hole Cross Section

BSW 8, 7, BC-2, 3

TOTAL SULFIDE CONCENTRATES

(Bamfield)

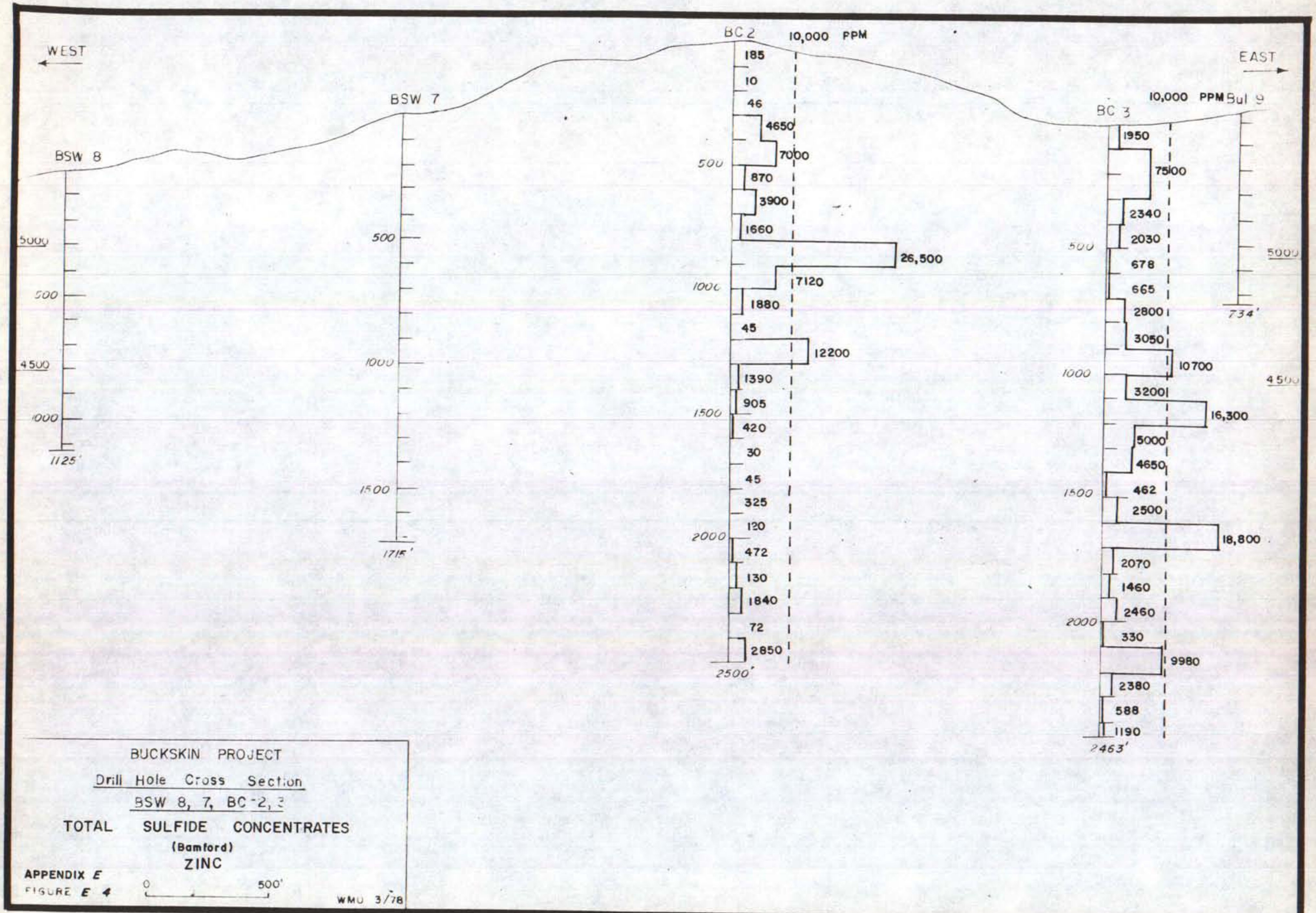
LEAD

0 500'

APPENDIX E

FIGURE E 3

WMO 3/78



BUCKSKIN PROJECT

Drill Hole Cross Section

BSW 8, 7, BC-2, 3

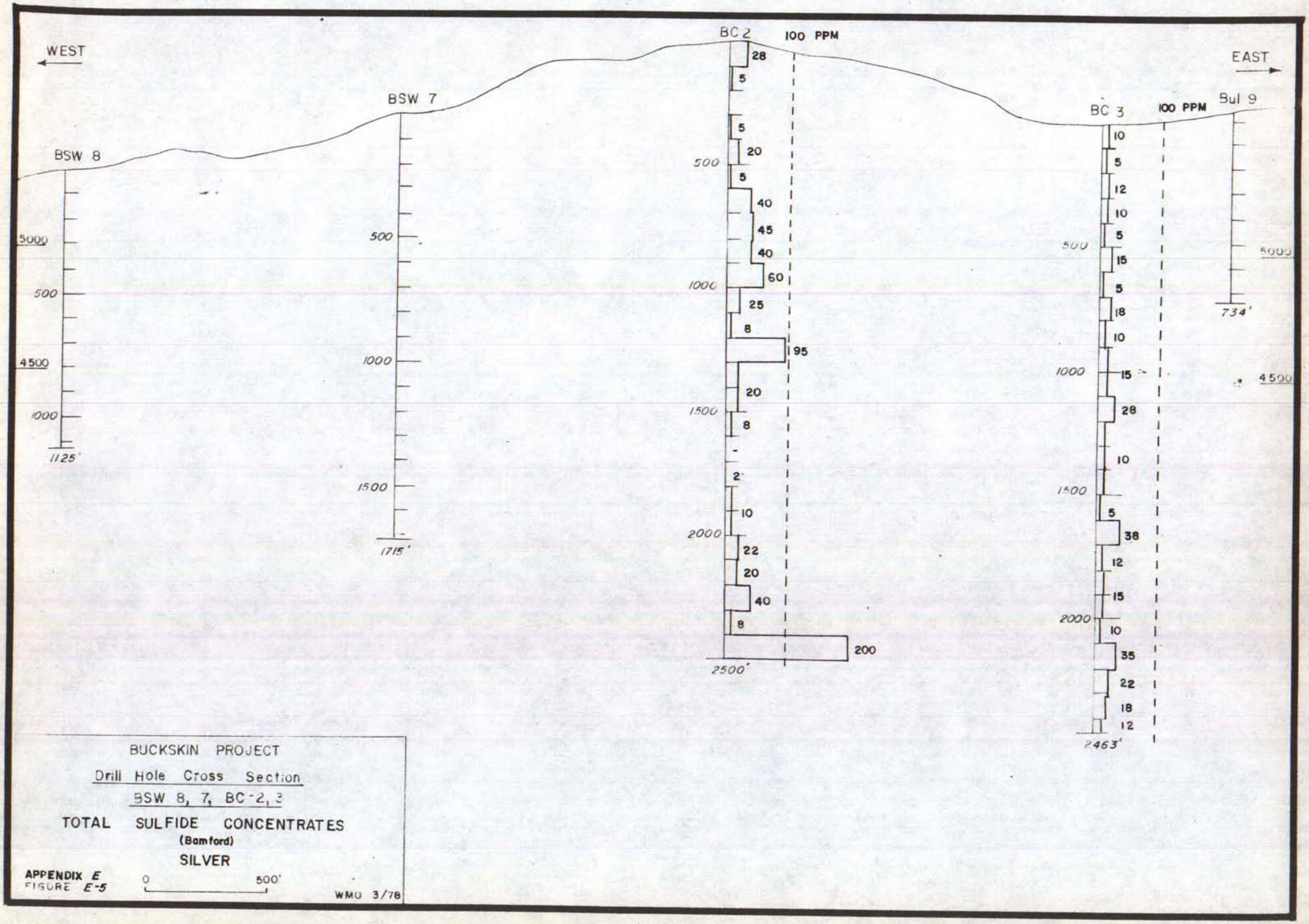
TOTAL SULFIDE CONCENTRATES

(Bamford)

ZINC

APPENDIX E

FIGURE E 4



BUCKSKIN PROJECT

Drill Hole Cross Section

BSW 8, 7, BC-2, 3

TOTAL SULFIDE CONCENTRATES

(Bamford)

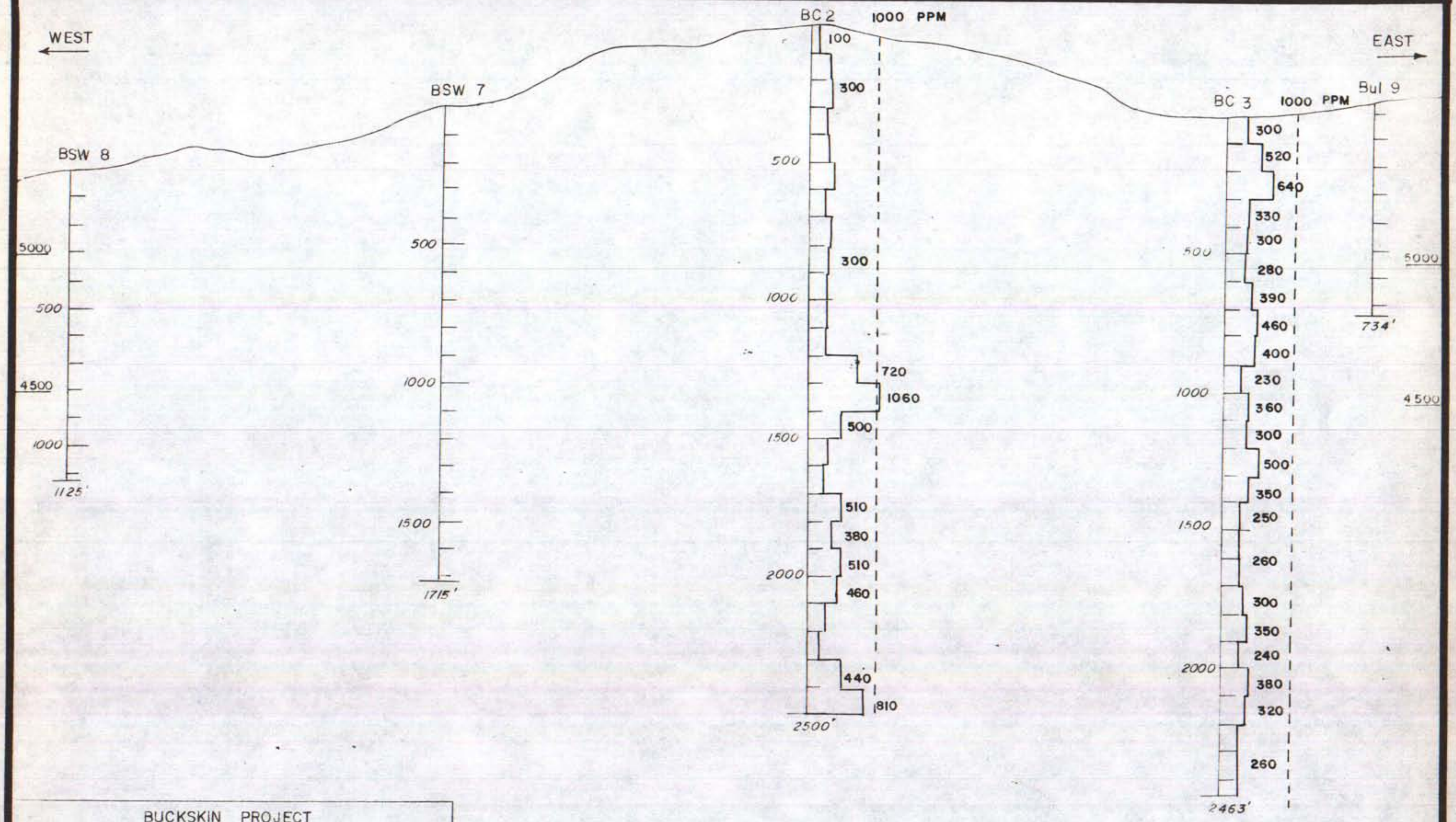
SILVER

APPENDIX E

FIGURE E-5

0 500'

WMO 3/78



BUCKSKIN PROJECT

Drill Hole Cross Section

BSW 8, 7, BC-2, 3

TOTAL SULFIDE CONCENTRATES

(Bamfield)

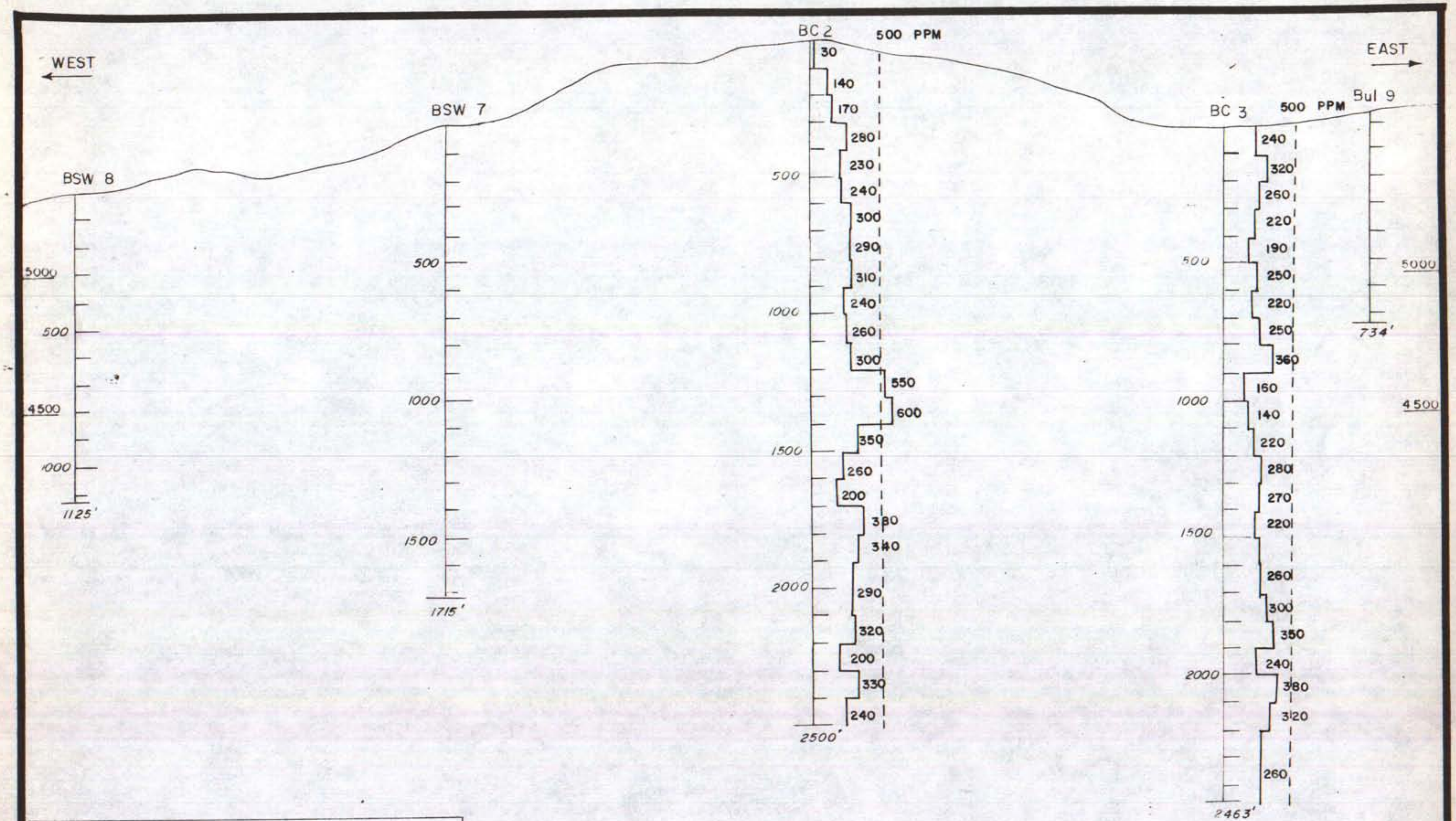
NICKEL

APPENDIX E

FIGURE E6

0 500'

WMO 3/78



BUCKSKIN PROJECT

Drill Hole Cross Section

BSW 8, 7, BC-2, 3

TOTAL SULFIDE CONCENTRATES

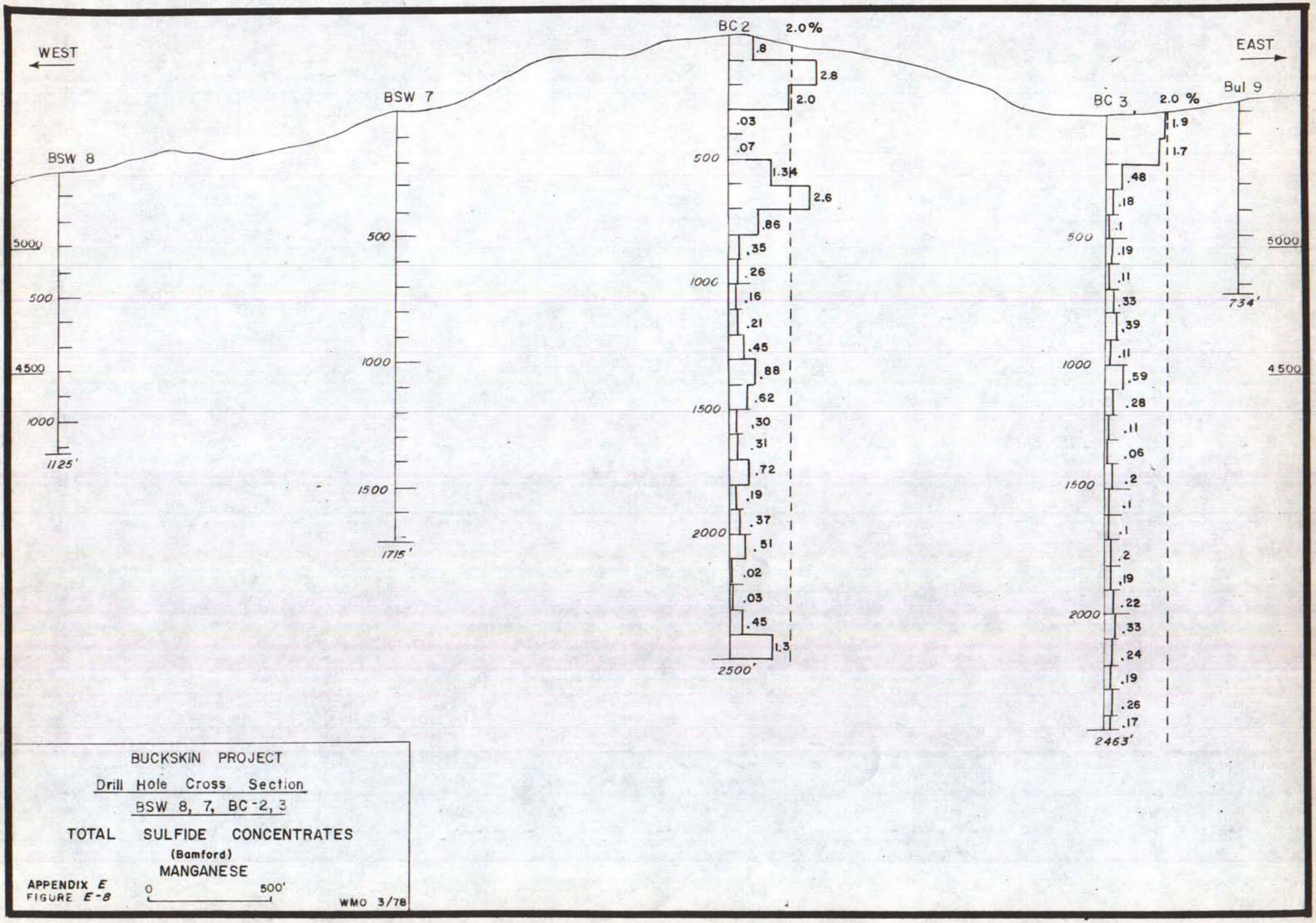
(Bamford)

COBALT

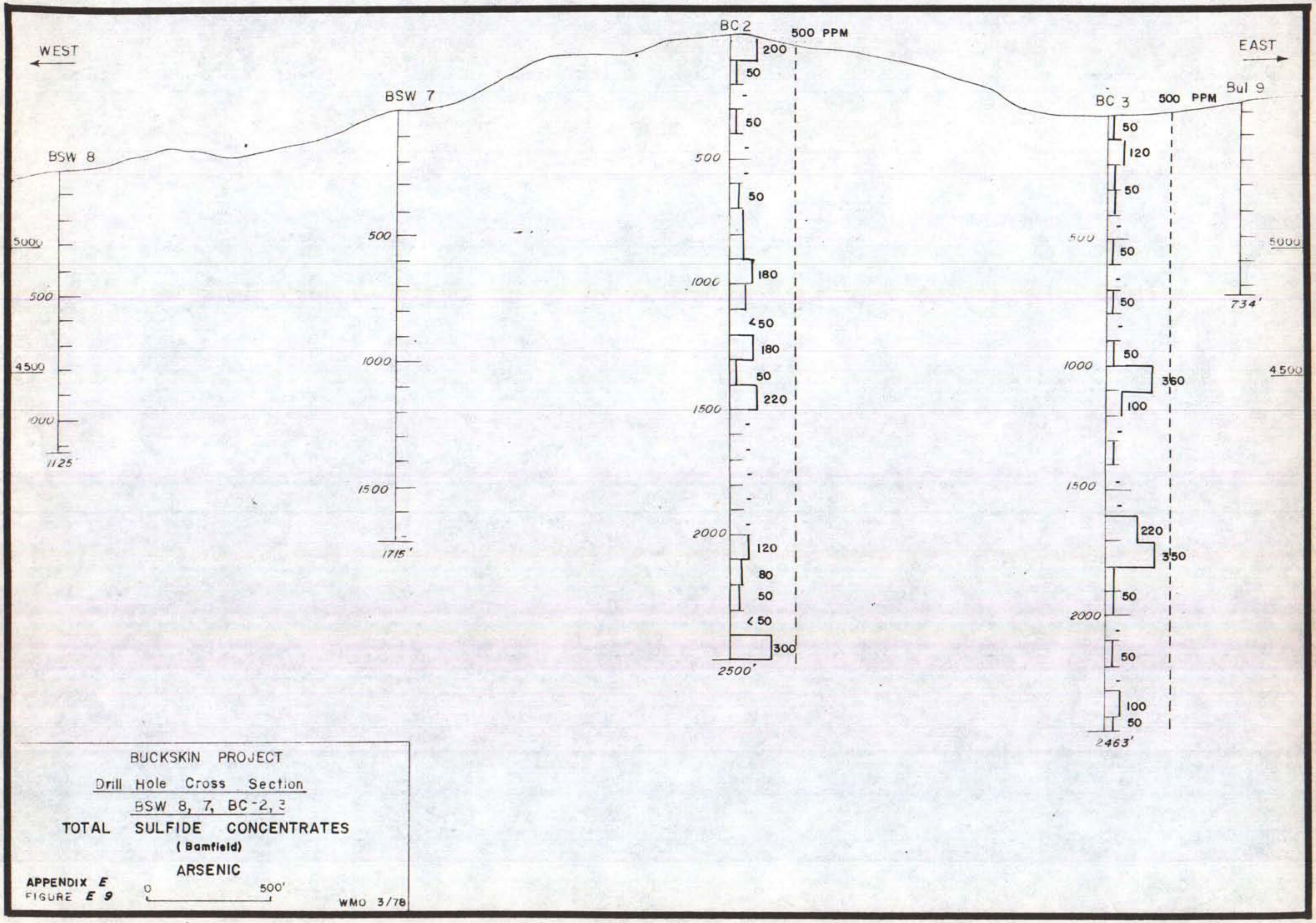
APPENDIX E
FIGURE E7

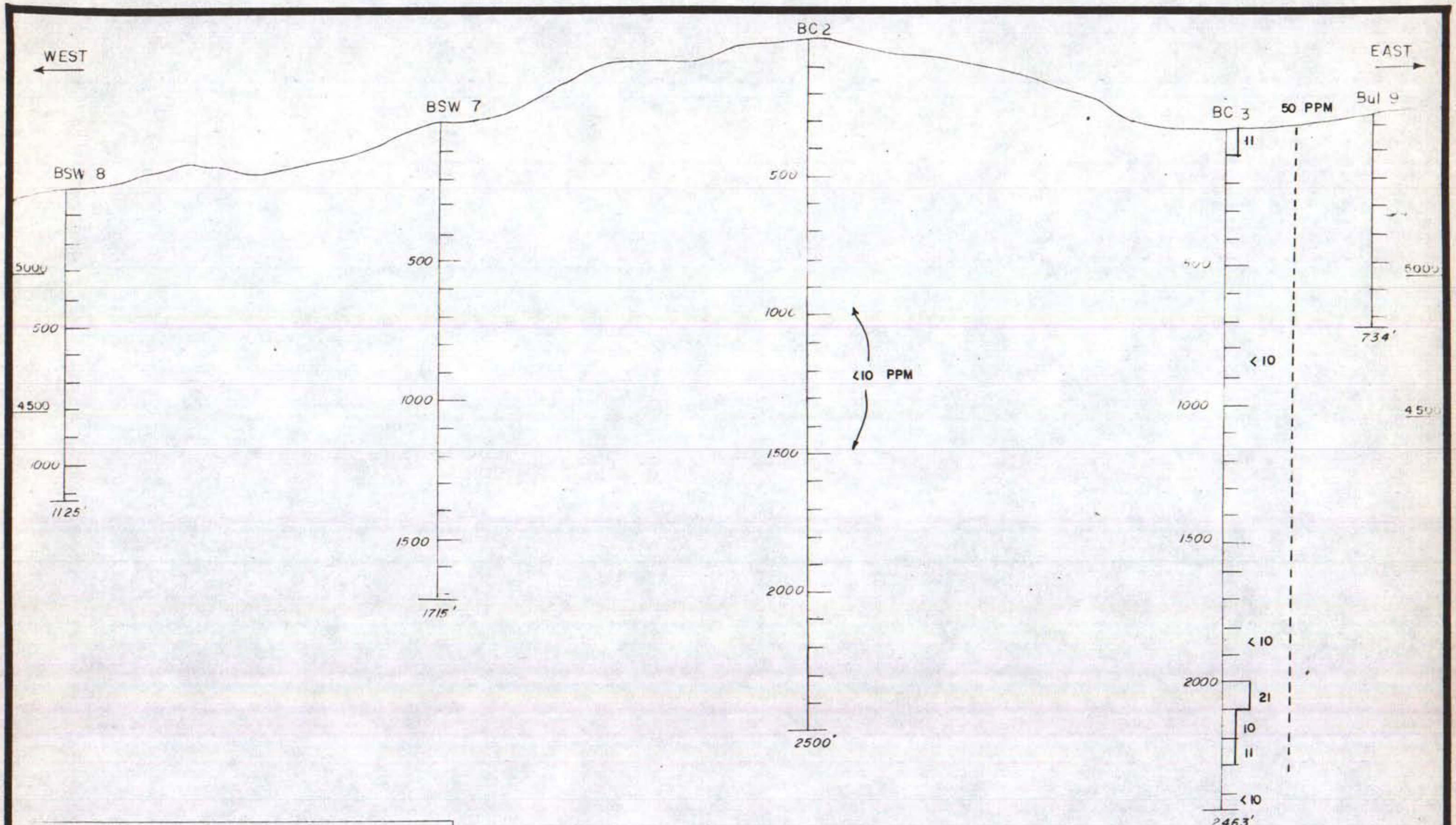
0 500'

WMO 3/78



WEST
EAST
BSW 8
BSW 7
BC 2
2.0%
BC 3
2.0 %
Bul 9
.8
2.8
2.0
.03
.07
1.34
2.6
.86
.35
.26
.16
.21
.45
.88
.62
.30
.31
.72
.19
.37
.51
.02
.03
.45
1.3
2500'
1.9
1.7
.48
.18
.1
.19
.11
.33
.39
.11
.59
.28
.11
.06
.2
.1
.1
.2
.19
.22
.33
.24
.19
.26
.17
2463'
5000
4500
500
1000
1125'
1500
1715'
2000
734'
BUCKSKIN PROJECT
Drill Hole Cross Section
BSW 8, 7, BC-2, 3
TOTAL SULFIDE CONCENTRATES
(Bamford)
MANGANESE
0
500'
APPENDIX E
FIGURE E-8
WMO 3/78


WEST
EAST
BSW 8
BSW 7
BC 2
500 PPM
BC 3
500 PPM
Bul 9
5000
4500
500
1000
1125'
1500
1715'
2000
2500'
2463'
734'
200
50
180
<50
220
120
80
< 50
300
350
100
BUCKSKIN PROJECT
Drill Hole Cross Section
BSW 8, 7, BC-2, 3
TOTAL SULFIDE CONCENTRATES
(Bamfield)
ARSENIC
APPENDIX E
FIGURE E 9
0
500'
WMO 3/78



BUCKSKIN PROJECT

Drill Hole Cross Section

BSW 8, 7, BC -2, 3

TOTAL SULFIDE CONCENTRATES

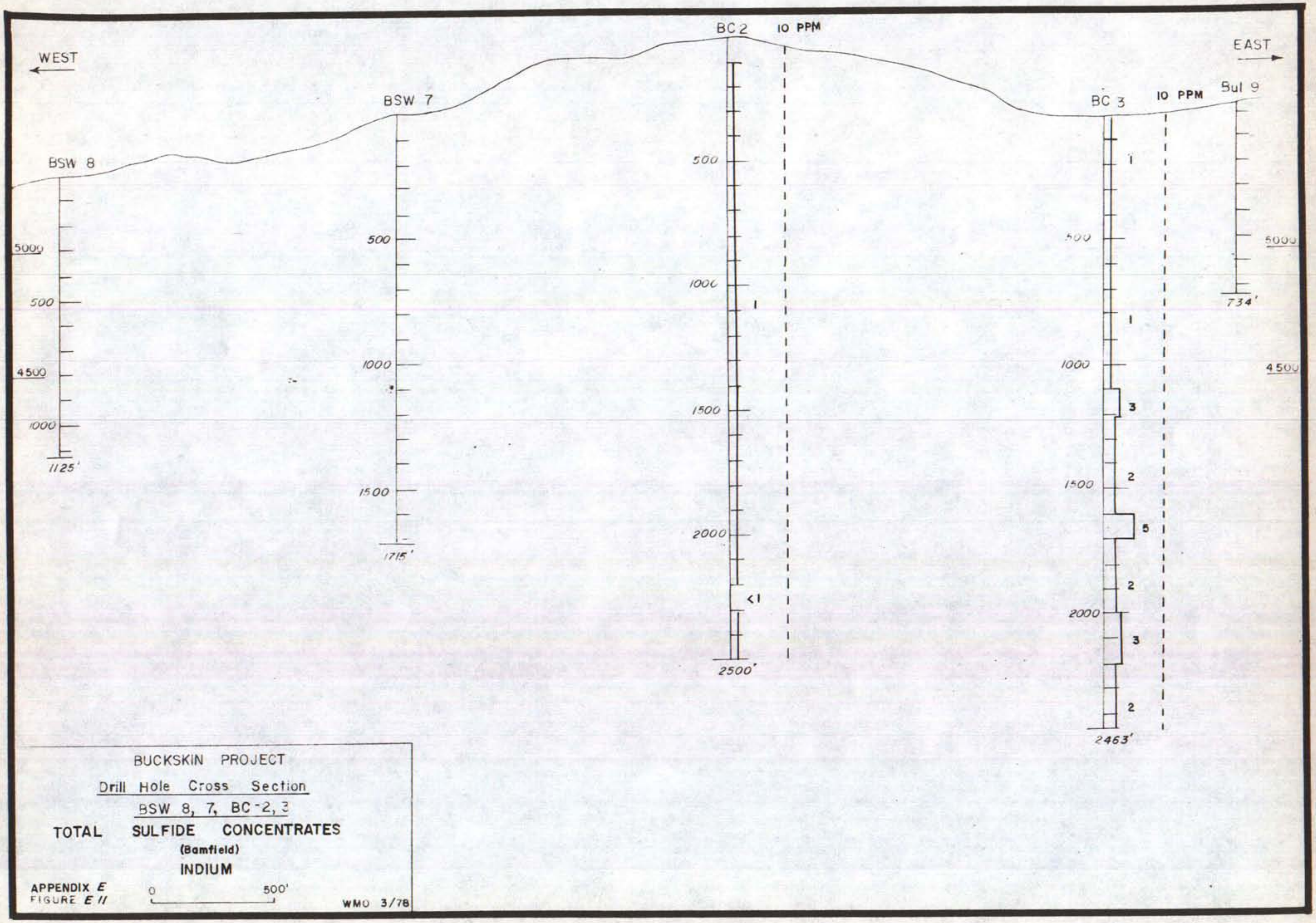
(Bamfield)

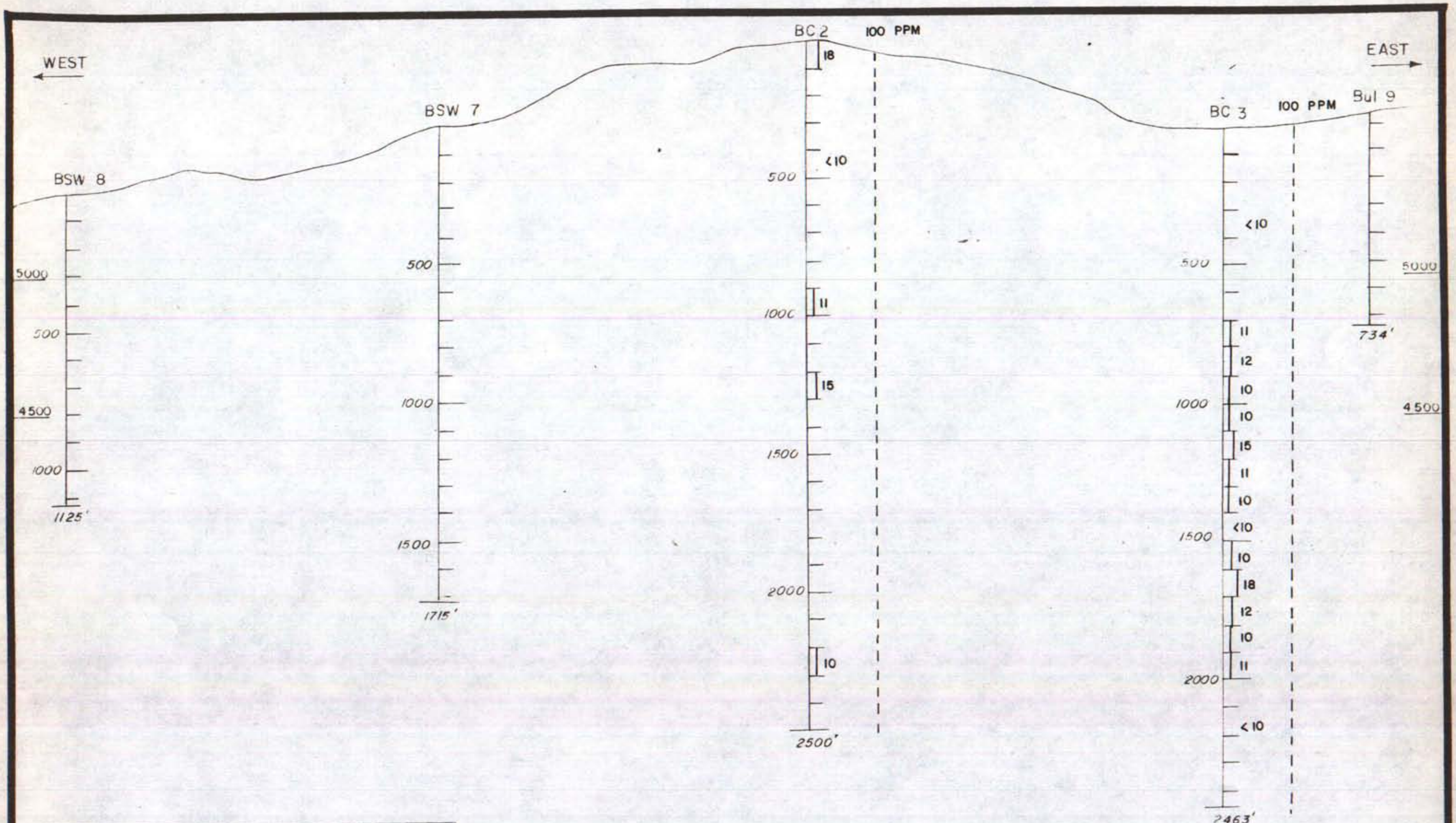
TUNGSTEN

APPENDIX E
FIGURE E 10

0 500'

WMO 3/78


WEST
EAST
BSW 8
BSW 7
BC 2
10 PPM
BC 3
10 PPM
Sul 9
5000
4500
500
1000
1500
2000
1125'
1715'
2500'
2463'
734'
1
<1
1
1
3
2
5
2
3
2
BUCKSKIN PROJECT
Drill Hole Cross Section
BSW 8, 7, BC-2, 3
TOTAL SULFIDE CONCENTRATES
(Bamfield)
INDIUM
APPENDIX E
FIGURE E 11
0
500'
WMO 3/78



BUCKSKIN PROJECT

Drill Hole Cross Section

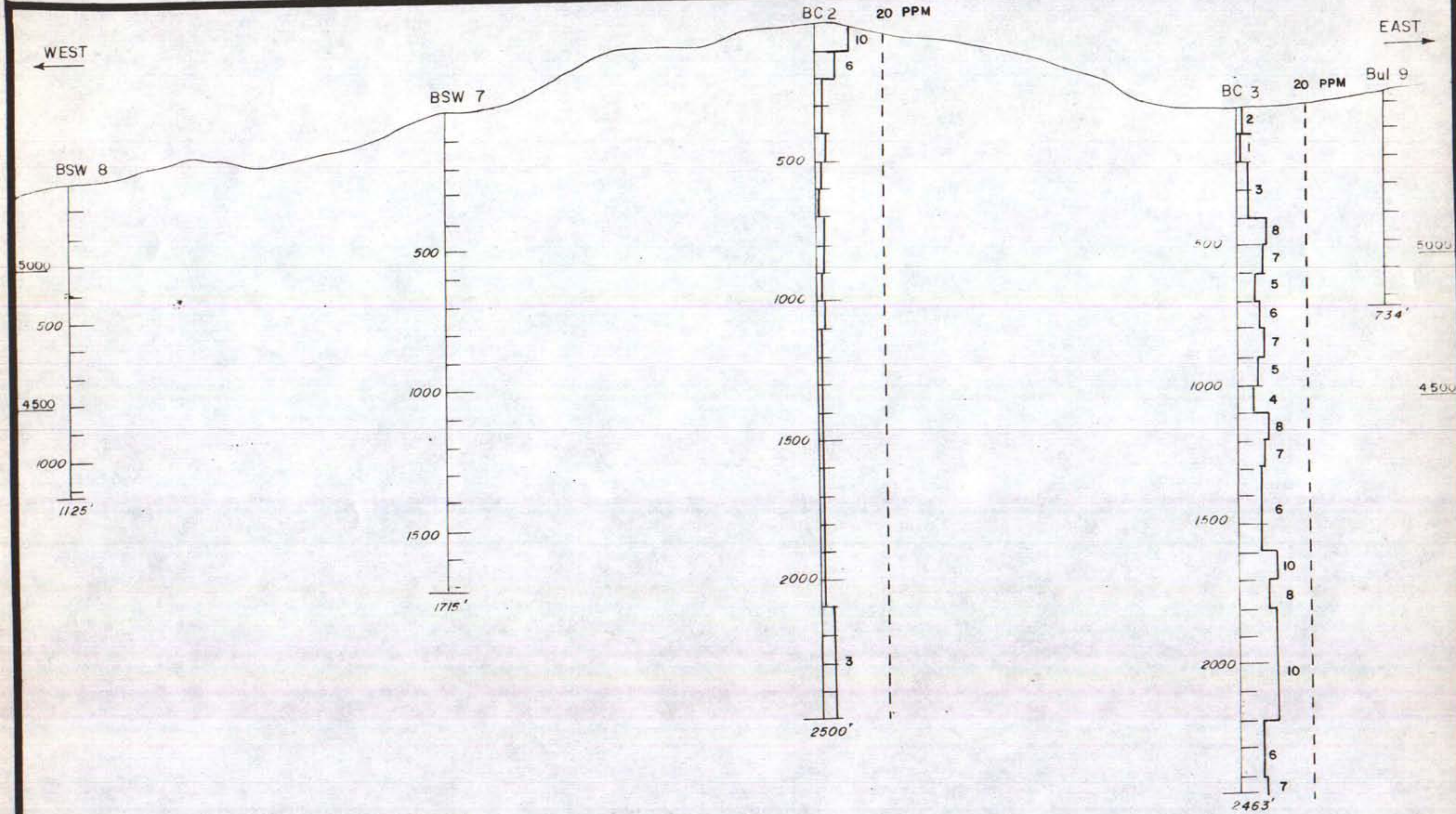
BSW 8, 7, BC-2, 3

TOTAL SULFIDE CONCENTRATES
(Bamford)
TELLURIUM

0 500'

APPENDIX E
FIGURE E 12

WMO 3/78



BUCKSKIN PROJECT

Drill Hole Cross Section

BSW 8, 7, BC-2, 3

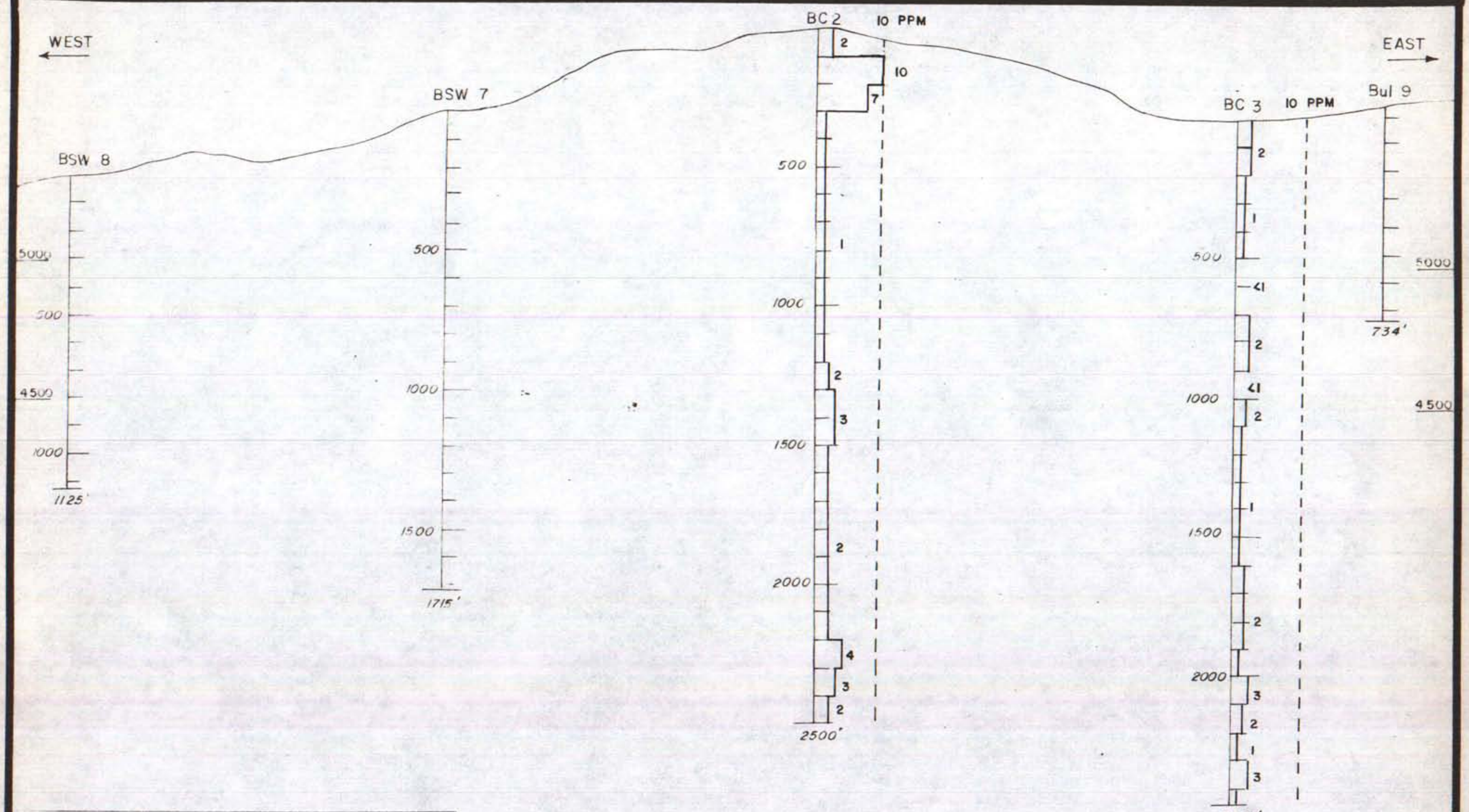
TOTAL SULFIDE CONCENTRATES
(Bamford)

BISMUTH

0 500'

APPENDIX E
FIGURE E-13

WMO 3/78



BUCKSKIN PROJECT

Drill Hole Cross Section

BSW 8, 7, BC-2, 3

TOTAL SULFIDE CONCENTRATES

(Bamfield)

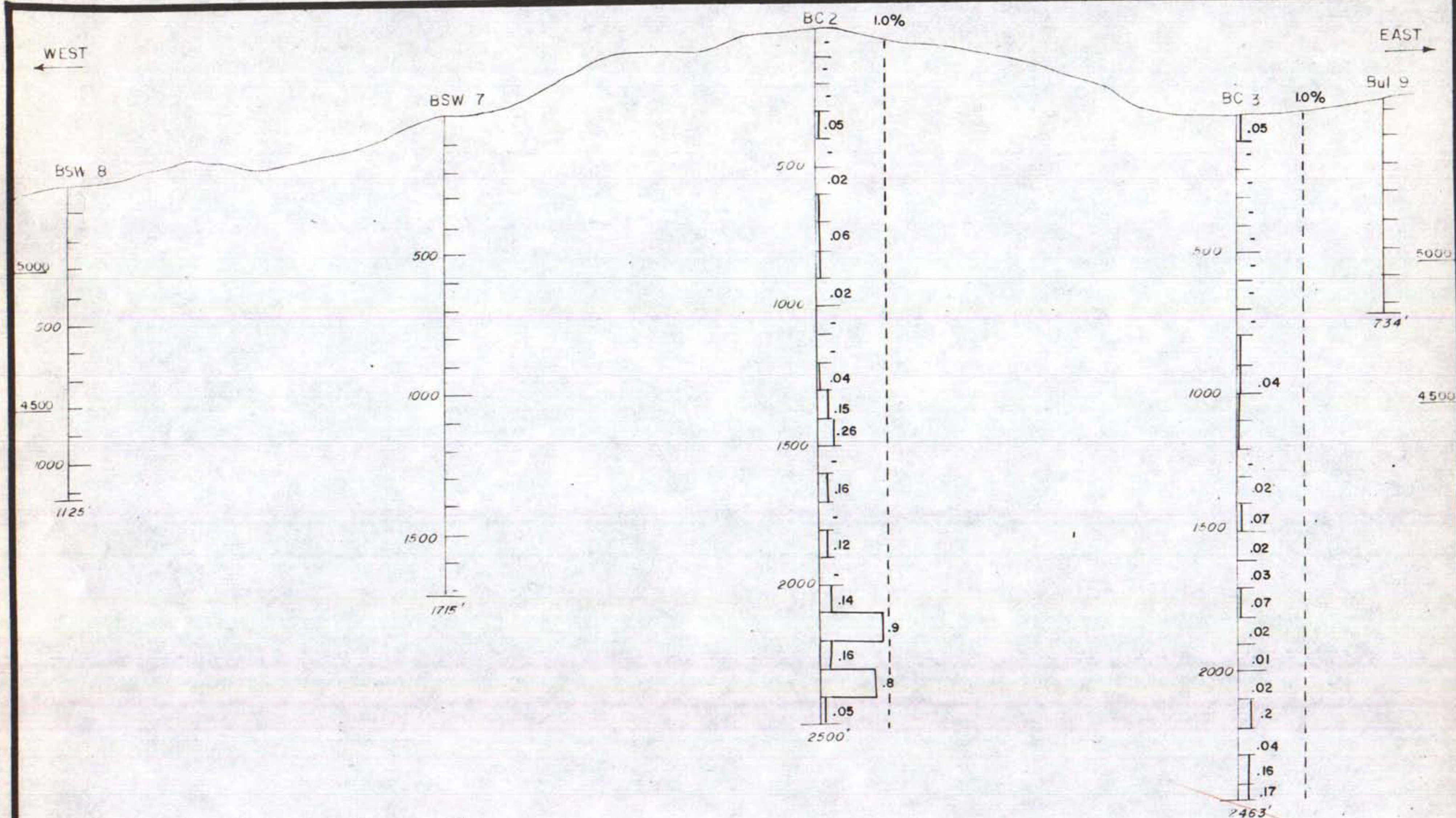
TIN

0 500'

APPENDIX E

FIGURE E 14

WMO 3/78



BUCKSKIN PROJECT

Drill Hole Cross Section

BSW 8, 7, BC-2, 3

TOTAL SULFIDE CONCENTRATES (Bomford) MAGNETITES

APPENDIX E

FIGURE E-15

0 500'

WMU 3/78

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