

**WYOMING STATE GEOLOGICAL SURVEY
MINERAL REPORT MR95-2**

**RECONNAISSANCE OF THE CHARTER OAK MINE AND Cu-Ni-Au-
Ag-Pt-Pd MINERALIZATION ASSOCIATED WITH THE PUZZLER
HILL LAYERED MAFIC-ULTRAMAFIC COMPLEX, ENCAMPMENT
DISTRICT, SIERRA MADRE, WYOMING**

by

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Introduction

As a continuing investigation of the State's mineral resources, the Wyoming State Geological Survey initiated a reconnaissance study of the historic Encampment district in the Sierra Madre of southeastern Wyoming. The geology and mineralization of this district has been described in several publications: for further information the reader is referred to the overviews by Hausel (1986a,b, 1995), and the geological map by Houston and Graff (1995). According to Hausel (1995) more than 21 million pounds of copper with some gold, silver, zinc, and lead were produced from this district in the late 1800s and early 1900s.

The mineralization and geology of the Encampment district are favorable for the discovery of commercial base and precious metal deposits. In particular, this district has some of the highest potential in the State, for the discovery of a major metal deposit, and should be considered as a high-priority target in any exploration program. Recent investigations in the district, has shown that the region has significant, untapped mineralization. For instance, highly anomalous zinc, lead, copper, gold, and silver mineralization was identified by Hausel (1992a) at the Broadway deposit, and significant copper, gold, and silver mineralization was also identified at the historic Kurtz-Chatterton property (Hausel, 1992b).

In general, the southern and northern Sierra Madre are separated by a major shear zone known as the Cheyenne Belt. To the north, the Archean basement of the Wyoming Province, is overlain by metasedimentary rocks which includes quartz-pebble conglomerates equivalent to the Witwatersrand auriferous conglomerates in South Africa. To the south, rocks of the Colorado Province consist primarily of metavolcanic island arc schists and gneisses. In both of these terranes, there are several mafic and ultramafic massifs scattered throughout the region. This report concerns one of these massifs known as Puzzler Hill. The principal mine on Puzzler Hill was the Charter Oak.

Previous Investigations

According to the available historical reports, the Charter Oak mine was located in a northerly-trending, easterly-dipping quartz vein on the east side of a broad synform in granite-gneiss, schist, and diorite country rock. The vein was reported to contain

iron- and copper-sulfides which also impregnated the fractured country rock. Chalcopyrite, chalcocite, bornite, and azurite were identified in a gangue of quartz, jasperoid, schistose wall rock, calcite, and some chalcedony (Spencer, 1904). Some high-grade gold was also found on the property (Beeler, 1905).

The mineralized zone was traced 2 miles on the surface and varied in width from 14 feet at the Charter Oak shaft to 100 feet elsewhere. Where the mineralized structure was widest, the ore apparently consisted of quartz stringers mixed with low-grade material. An open cut near the top of Puzzler Hill showed a "huge ledge of mineralized diorite" stained with copper-carbonate (Beeler, 1906). It has been reported that the Charter Oak ores also carried significant cobalt (as much as 4 to 5% Co) (Armstrong, 1970). The Charter Oak shaft was sunk to a depth of 488 feet (Beeler, 1905) with a total of more than 1,570 feet of shafts and tunnels (Beeler, 1906).

Puzzler Hill layered mafic-ultramafic complex

Based on preliminary reconnaissance in 1994 by the author, Puzzler Hill is actually part of a layered mafic-ultramafic complex hosted by Late Archean gneiss located north of the Cheyenne Belt shear zones. The extent of the complex has not been determined as the complex continues to the northeast under sedimentary cover. Reconnaissance of the complex led to the identification of several cumulate-layered pyroxenites. The possibility that the mineralization is associated with cumulate zones will be investigated in future.

Fresh samples collected for whole rock analyses included sample CO1-94, a pyroxenite, which yielded 19.39 % MgO, and sample CO5-94, an actinolite-chlorite schist, which yielded 16.43% MgO (Table 1).

Table 1. Whole rock analyses of host rocks from the Puzzler Hill layered mafic-ultramafic complex.

Oxide/Element (Weight percent)	Sample number	
	CO1-94	CO5-94
SiO ₂	45.5	48.75
TiO ₂	0.59	0.44
Al ₂ O ₃	8.48	8.57
Fe ₂ O ₃	11.76	12.09
MnO	0.17	0.19
MgO	19.39	16.43
CaO	8.01	6.65
Na ₂ O	0.83	0.79
K ₂ O	0.07	0.09
P ₂ O ₅	0.05	<0.03
Cr ₂ O ₃	0.35	0.28
LOI	3.59	4.24
TOTAL	98.79	98.52
Au (ppb)	3	14
Pt (ppb)	8	<5
Pd (ppb)	15	8
Cu (ppm)	159	248
Ni (ppm)	343	178
Co (ppm)	29	28

The principal mine in the complex was the Charter Oak, located in section 24, T15N, R85W (Figure 1). This mine and the complex are located 6.5 miles northwest of Encampment. Puzzler Hill is a mafic-ultramafic layered complex with sporadic mineralization found in sections 24, 26, 35, and 36.

Samples collected from a group of mines and prospects in the complex contained highly anomalous base and precious metal values. The samples ranged from 0.01% to 4.43% Cu, 66 ppm to 3.72% Ni, 14 ppb to 0.29 opt Au, <5 ppb to 828 ppb Pt, 5 ppb to 0.12 opt Pd, <0.1 ppm to 0.19 opt Ag, 21 ppm to 831 ppm Co, 64 ppm to 294 ppm Cr, and trace Pb and Zn (Table 2).

These samples include limonite-stained breccia (CO2-94) collected from a mine dump in the S/2 section 26 that yielded anomalous copper, nickel, platinum and palladium (Figure 1). Samples of massive specular and earthy hematite with copper carbonate, minor bornite and chalcopyrite in chlorite-actinolite-talc schist from the Charter Oak mine dump (CO3-94 and CO4-94) yielded anomalous copper and gold. A sample (CO6-94) of quartz breccia cemented by sideritic limonite with fuchsite collected from a mine dump in the center of section 26, was poorly mineralized (Table 2).

Table 2. Assays from the Puzzler Hill massif (Analyses by Bondar-Clegg).

Sample No	Cu (%)	Ni (ppm)	Co (ppm)	Cr (ppm)	Au (ppb)	Pt (ppb)	Pd (ppb)	Ag (ppm)	Pb (ppm)	Zn (ppm)
CO2-94	4.43	37200	831	244	95	828	4042	2.9	57	55
CO3-94	3.52	66	27	71	7718	<5	11	3.8	10	14
CO4-94	2.39	127	82	64	9862	<5	14	6.6	9	9
CO6-94	0.01	162	21	294	14	<5	5	<0.1	-	-

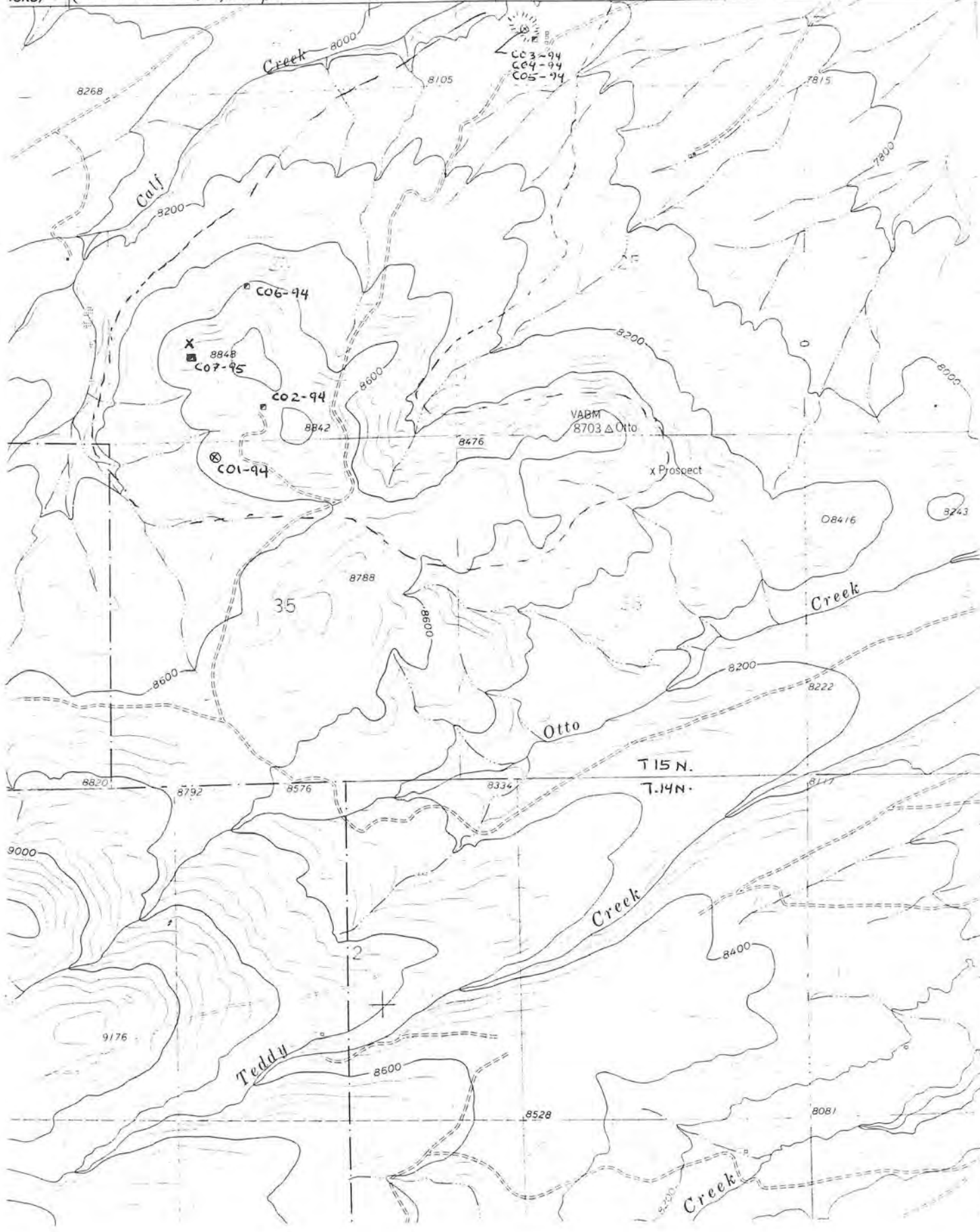
Based on the results of these samples, further detail investigations are highly recommended, as the complex contains significant copper, gold, silver, nickel, platinum, and palladium values. Other mafic and ultramafic massifs mapped by Houston and Graff in the Sierra Madre should also be evaluated.

As a final note, the author wishes to thank Stan Brooks for access to the property.

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SAMPLE NUMBER	ELEMENT UNITS	Ni PCT
R2 C02-94		3.720



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PAGE 1

SAMPLE NUMBER	ELEMENT UNITS	AU OPT	CU PCT
R2 CO2-94			4.43
R2 CO3-94	0.225		3.52
R2 CO4-94			2.39

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Geochemical Lab Report

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REPORT: R94-11104.1 (COMPLETE)

PROJECT: D1194

DATE PRINTED: 20-DEC-94 PAGE 1

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SAMPLE NUMBER	ELEMENT UNITS	AU PPB	Pt PPB	Pd PPB	Cu PPM	Ni PPM	Co PPM	Cr PPM	SI02 PCT	Ti02 PCT	Al2O3 PCT	Fe2O3* PCT	MnO PCT	MgO PCT	CaO PCT	Na2O PCT	K2O PCT	P2O5 PCT	LOI Total PCT	BaO PCT	Cr2O3 PCT	S Tot PCT	Ag PPM	Pb PPM	Zn PPM	V PPM	
201-94		3	8	15	159	343	29	810	45.50	0.59	8.48	11.76	0.17	19.39	8.01	0.83	0.07	0.05	3.59	98.79	0.005	0.35	<0.02	<.1			44
202-94		95	828	4042	>20000	>20000	831	244															2.9	57	55		
203-94		>10000	<5	11	>20000	66	27	71															3.8	10	14		
204-94		9862	<5	14	>20000	127	82	64															6.6	9	9		
205-94		14	<5	8	248	178	28	722	48.75	0.44	8.57	12.09	0.19	16.43	6.65	0.79	0.09	<.03	6.24	98.52	0.002	0.28	<0.02	<.1			
206-94		14	<5	5	135	162	21	294															<.1				