



United States Department of the Interior

BUREAU OF MINES

ALASKA FIELD OPERATIONS CENTER

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Dear Tom,

Enclosed is a first cut of the Chip-Loy short note. I'm unsure of exactly what you think should be in the report, so I made you senior author and did not structure the report beyond what I know about the Chip-Loy deposit.

I haven't seen the results of the DGGs sampling Tom Smith and Mary Albanese did, so that will have to be blended into the report. I've indicated where I obtained the initial samples and the corresponding sample results.

I feel we can speculate on a tonnage figure based on the mapping by Herreid; speculation on the grade is more chancy, but with the DGGs continuous chip sample we can indicate ranges. We can advance an "order of magnitude" estimate of grade and tonnage. For example, when I run the numbers out for the mineralized zone mapped by Herreid I get over a million tons. A representative grade is much more tenuous. Tell me what you think.

It would be neat if we could include a microphotograph of the Fe-Ni-Co sulfide set in flames of pyrite and pyrrhotite. Any photos would help.

In case you need to get a hold of me I am going up to Anchorage in early May and returning May 27. My days here in Juneau are numbered.

WSR

THE CHIP-LOY Fe-Ni-Cu DEPOSIT, McGRATH A-3 QUADRANGLE, CENTRAL ALASKA

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INTRODUCTION

The Chip-Loy and other prospects in the McGrath quadrangle were sampled as part of a mapping and resource evaluation program conducted by the Alaska Division of Geological and Geophysical Surveys. The U. S. Bureau of Mines contributed to the sampling and analysis of selected samples from the Chip-Loy prospect.

The Chip-Loy prospect is located in the McGrath A-3 quadrangle on the east side of Straight Creek, section 15, T24N, R28W, Seward meridian (figure 1). It outcrops on a very rugged slope and is difficult to traverse. After mapping the Chip-Loy prospect, Herreid (1968) stated that "the diabase dike on Straight Creek shows commercial possibilities."

In 1981 the Chip-Loy deposit was briefly visited and sampled by Bureau of Mines and DGGs personnel. Analyses of several grab samples indicated up to 2% Ni, 1% Cu, and 0.1% Co. The deposit was revisited in 1982 and several representative continuous chip samples were obtained. Samples from the Chip-Loy were analyzed by X-ray fluorescence, scanning electron microscopy, atomic absorption spectrophotometry, and X-ray diffraction.

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The dominant texture of the sulfides suggests deposit alteration with pyrrhotite altering to pyrite. The lack of pentlandite, and the presence of bravoite, is further evidence of sulfide alteration which may be due to hydrothermal alteration or incipient oxidation (Oelsner, 1966).

Kinked fractures and cleavage traces common within the flames suggest post emplacement stresses which may be due, in part, to alteration of the sulfide mineralogy. Hornfelsing of the host sediments indicate the intrusion of the dike occurred at considerable temperature and/or that there was a significant amount of volatiles associated with the intrusion.

Bravoite is difficult to see in reflective microscopy on freshly polished surfaces, however, it tarnishes relatively rapidly which aids in phase differentiation. Bravoite, in grains up to 1 mm diameter, generally lacks any distinctive cleavage traces in contrast to the pyrite-pyrrhotite flames. Hardness tests indicate it is considerably harder than chalcopyrite, slightly harder than pyrrhotite, and softer than pyrite. The optical and physical properties match closely with bravoite yet the stoichiometry leaves doubt as to the exact identity of the phase.

Tonnage and grade estimates are speculative and are based on surface mapping by Herreid (1968) and continuous chip sampling across the mineralization at one locality. The estimated tonnage of mineralized diabase is on the order of 1 million tons, however at those tonnages the Ni, Cu, and Co grades probably do not exceed x, y and z % respectively. Tonnage estimates for the higher grade massive sulfide zones are an order of magnitude less. The presence of a discrete Fe-Ni-Co sulfide suggests the nickel and cobalt may be recoverable if the deposit were mined.

TABLE 1.- Results of geochemical analyses of Chip-Loy samples^{1/}.

Sample Number...	Major Oxides, %								
	1	2	3	4	5	6	7	8	9
Analyses, wt %									
SiO ₂	49	---	---	---	---	---	---	---	---
Al ₂ O ₃	18	---	---	---	---	---	---	---	---
Fe ₂ O ₃	12	---	---	---	---	---	---	---	---
MgO	6	---	---	---	---	---	---	---	---
CaO	11	---	---	---	---	---	---	---	---
K ₂ O	3	---	---	---	---	---	---	---	---
TiO ₂	2	---	---	---	---	---	---	---	---
MnO	0.2	---	---	---	---	---	---	---	---
Trace Elements, ppm									
Co	---	49	---	860	---	1,050	---	---	---
Ni	150	540	10,000	8,000	20,000	11,500	---	---	---
Cu	50	590	10,000	11,500	1,000	700	---	---	---
Zn	150	41	1,000	185	---	47	---	---	---
Pb	---	55	---	57	---	29	---	---	---
Hg	---	L0.1	---	L0.1	---	0.1	---	---	---
Rb	100	---	---	---	---	---	---	---	---
Sr	900	---	---	---	---	---	---	---	---
Zr	650	---	---	---	---	---	---	---	---
Ba	1,000	---	---	---	---	---	---	---	---

--- Not analyzed
L Less than

Sample Number	Sample Type, Field Number, Analysis, & Description
1	grab sample; KW19457; X-ray fluorescence; diabase, no visible sulfides
2	grab sample; KW19458; atomic absorption; goethite/boxworks
3	grab sample; KW19459; X-ray fluorescence; massive sulfides, po, cpy
4	grab sample; KW19459; atomic absorption; massive sulfides, po, cpy
5	grab sample; KW19460; X-ray fluorescence; massive sulfides, po, cpy
6	grab sample; KW19460; atomic absorption; massive sulfides, po, cpy
7	continuous chip samples - DGGs sample length = ? ft
8	continuous chip samples - DGGs sample length = ? ft
9	continuous chip samples - DGGs sample length = ? ft

^{1/} Samples 1, 3, and 5 were analyzed by semi-quantitative X-ray fluorescence spectrometry, U.S.B.M., Juneau, AK. Total Fe is expressed as Fe₂O₃. Analysis of sample no. 1 is based on U.S.G.S. standard MRG-1. Samples 2, 4 and 6 were analyzed by atomic absorption spectrophotometry, TSL, Spokane, WA.

TABLE 2.- Results of scanning electron microscope-EDX analysis of Fe-Ni-Co sulfide (sample 5).

	Analyses, wt %	Atomic Proportions (normalized to S)	Empirical Formula
S	49	1.00	(Fe _{0.48} Ni _{0.32} Co _{0.04})S _{1.0}
Fe	12	0.48	
Co	6	0.04	
Ni	<u>11</u>	0.32	
	100		

NOTE.- Analysis by Jim Sjoberg, U. S. Bureau Mines, Reno Research Center.

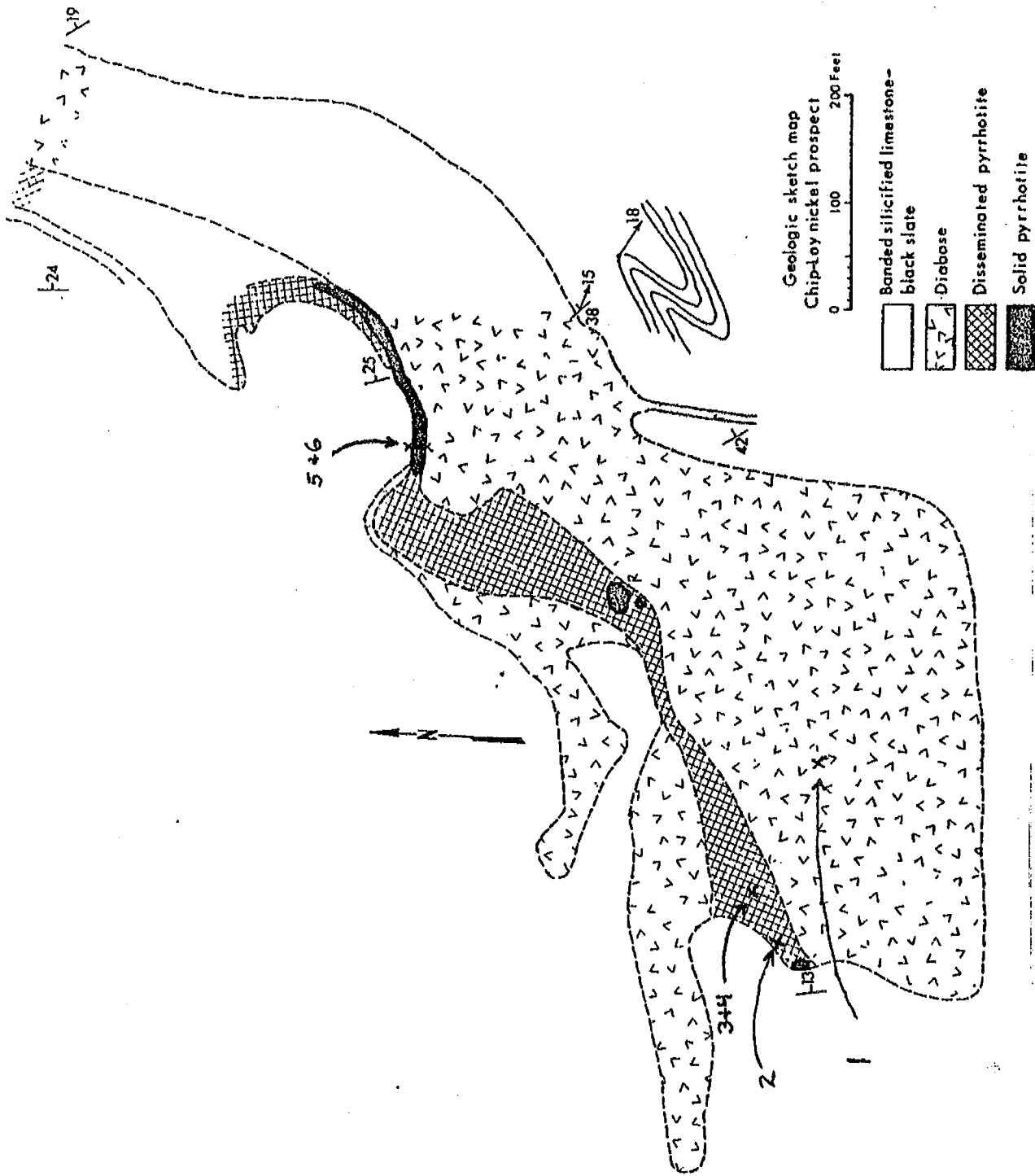


Figure 2.- Sample locations, Chip-Loy deposit. (Map from Howard, 1968)

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