Poison Mountain

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Abstract

The Poison Mountain copper-molybdenum porphyry deposit lies at 1700 meters elevation in the Camelsfoot Range. Three porphyry bodies intrude a series of northwesterly striking Jura-Cretaceous sedimentary rocks. The porphyry complex has northwesterly and northerly trends, and is emplaced 3.2 kilometers to the northeast of the northwest-striking Yalakom fault. Two porphyry bodies, the Main and the North, are zoned, with hornblende-quartz monzonite cores and biotite-quartz monzonite perimeters, and both have associated copper-molybdenum sulphides. The mineral concentrations approach ore grade in an annular zone approximately coincident with the outer part of the biotite-quartz monzonite and the inner part of the biotite-hornfelsed wall rock. The east porphyry is a relatively unaltered and uniform body of coarse-grained plagioclase porphyry, with no related mineral deposits of importance known. It is probably the youngest of the intrusions.

Introduction

LOCATION

POISON MOUNTAIN (51°08′N, 122°36′W, NTS 92O/2W) is located 37 kilometers west of Big Bar, a cable ferry and post office on the east side of the Fraser River near Clinton. A road suitable for four-wheel-drive vehicles can be used from Big Bar during the summer months. An unimproved but more travelled road leads up the Yalakom River to Poison Mountain from the Lillooet-Bralorne road.

TOPOGRAPHY

Relief on the property is approximately 600 meters, from 1600 meters elevation on Churn Creek to 2200 meters on the summits of Buck and Poison mountains. The slopes are moderately steep. Timberline is at approximately 2000 meters elevation. Natural outcrop is restricted to the shoulders along the creeks and the ridge crests. Felsenmeer and talus are abundant above the timberline. Bulldozed cuts and drill holes show the rock types within the explored area.

Aerial photographs show that the mineralized area is coincident with a topographic basin formed by Copper and Fenton creeks (Fig. 2). The basin continues to the northwest across Poisonmount Creek beyond the area explored in detail.

HISTORY

The first lode claims at Poison Mountain were located in 1935. Copper showings were hand trenched prior to 1956, when H. Reynolds of Lillooet optioned the property to Granby Consolidated Mining Smelting and Power Company Ltd. Granby built an access road, trenched, and diamond drilled ten holes totalling 601 meters. New Jersey Zinc Exploration Company Ltd. optioned the ground in 1959, and conducted magnetometer and soil surveys, followed by trenching and 610 meters of diamond drilling in fifteen holes. H. Huestis and associates acquired the property in 1961 and optioned it to American Smelting and Refining Company, who completed an induced polarization survey and further trenching. Copper Giant Mining Corporation Ltd. acquired the property in 1966 and optioned it to Homestake Mineral Development Company. Canadian Superior Exploration Ltd. became associated with Homestake in a joint venture, and the two companies have completed magnetometer, induced polarization and geochemical surveys, accompanied by 5937 meters of diamond drilling in 40 holes and 4131 meters of percussion drilling in 62 holes.

RESERVES

The mineral resource is indicated to be in the order of 175 million tonnes averaging 0.33 per cent copper, 0.015 per cent molybdenum and 0.3 g/tonne of gold, using a cutoff grade of 0.25 per cent copper. The calculated stripping ratio is approximately 0.7 tonnes of waste to 1 tonne of mineral resource.

Geology

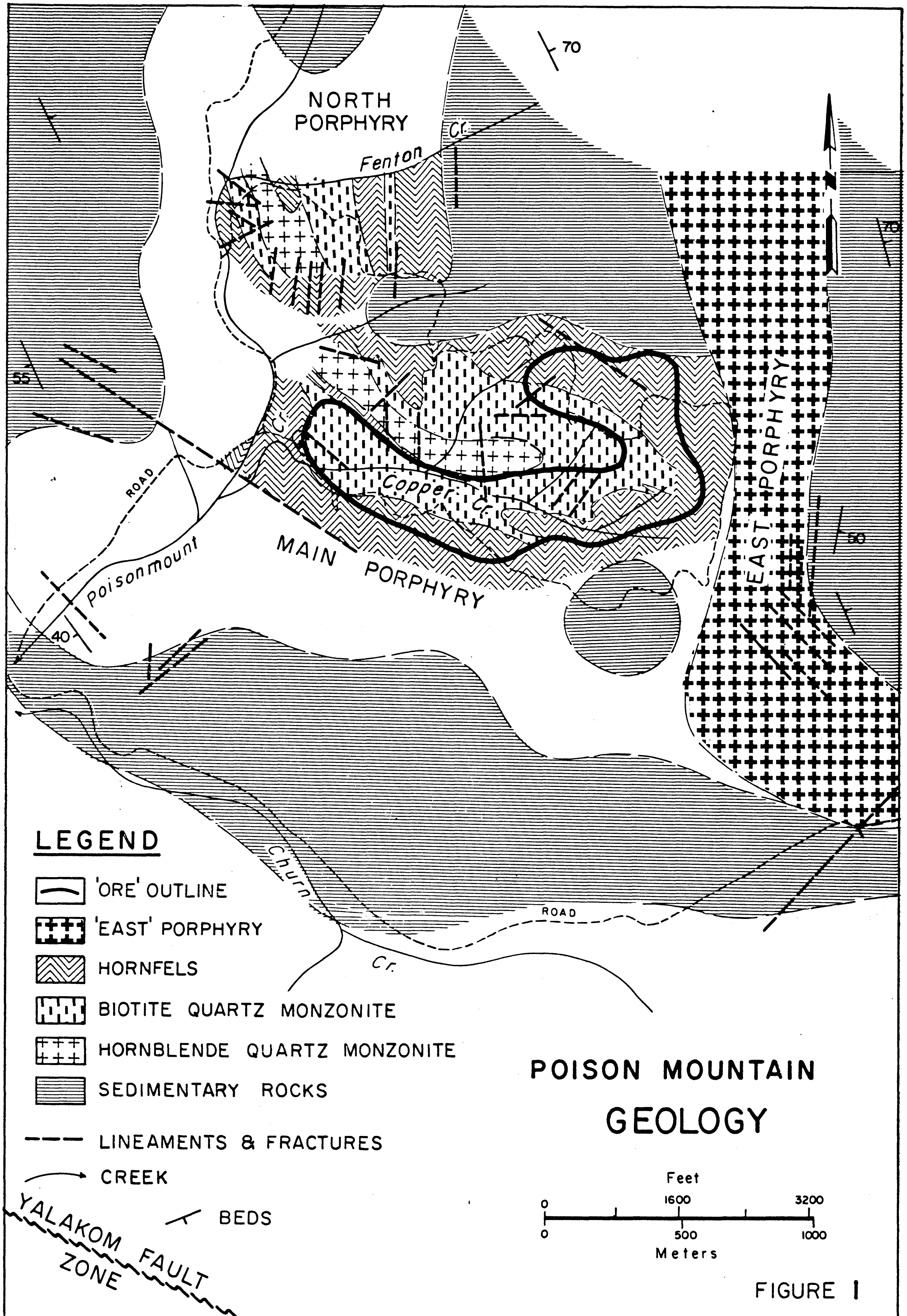
The regional geology of the area including the Poison Mountain mineral deposit has not been mapped completely. The "Taseko Lakes Area" (Tipper, 1963) includes ground to the north and west and "Geology of the Shulaps Range" (Leech, 1953) includes ground to the south and west.

The map and report show that a major northwest-trending fault, the Yalakom fault, cuts across the southwest corner of the claim group. The Yalakom fault is a right-lateral transcurrent fault that is believed to have an offset of more than 200 kilometers. Ultramafic rocks intruded by a few small porphyry plugs occupy an area of 20 by 60 kilometers in the Shulaps Range southwest of the fault. A thick sedimentary section, including greywacke, grit, conglomerate and siltstone, that is probably part of the Relay Mountain Group (Jeletzky and Tipper, 1968) is found on the northeast side of the fault. The sedimentary beds near the Poison Mountain property dip steeply, but changes in strike indicate considerable disruption produced by intrusion of the porphyry bodies.

HOST ROCKS

The Jura-Cretaceous sedimentary rocks exposed near the Poison Mountain property are typical of those northeast of the Yalakom fault. Greywackes, argillites and conglomerates are interbedded and well indurated. No marker beds were identified, and no attempt has been made to trace an individual stratum through the mapped area.

The greywackes and grits are grey to green, and some strata contain a relatively large amount of feldspar and chloritized mafic minerals. Locally, the greywacke approaches andesite in bulk composition. Where the greywacke has been metamorphosed or meta-


NORTH PORPHYRY
Fenton Cr.
70
55
70
50
40
EAST PORPHYRY
Copper Cr.
MAIN PORPHYRY
Poisonmount
ROAD
Cr.
Churn
ROAD
Cr.
LEGEND
'ORE' OUTLINE
'EAST' PORPHYRY
HORNFELS
BIOTITE QUARTZ MONZONITE
HORNBLENDE QUARTZ MONZONITE
SEDIMENTARY ROCKS
LINEAMENTS & FRACTURES
CREEK
BEDS
YALAKOM FAULT ZONE
POISON MOUNTAIN
GEOLOGY
Feet
0
1600
3200
0
500
1000
Meters
FIGURE 1

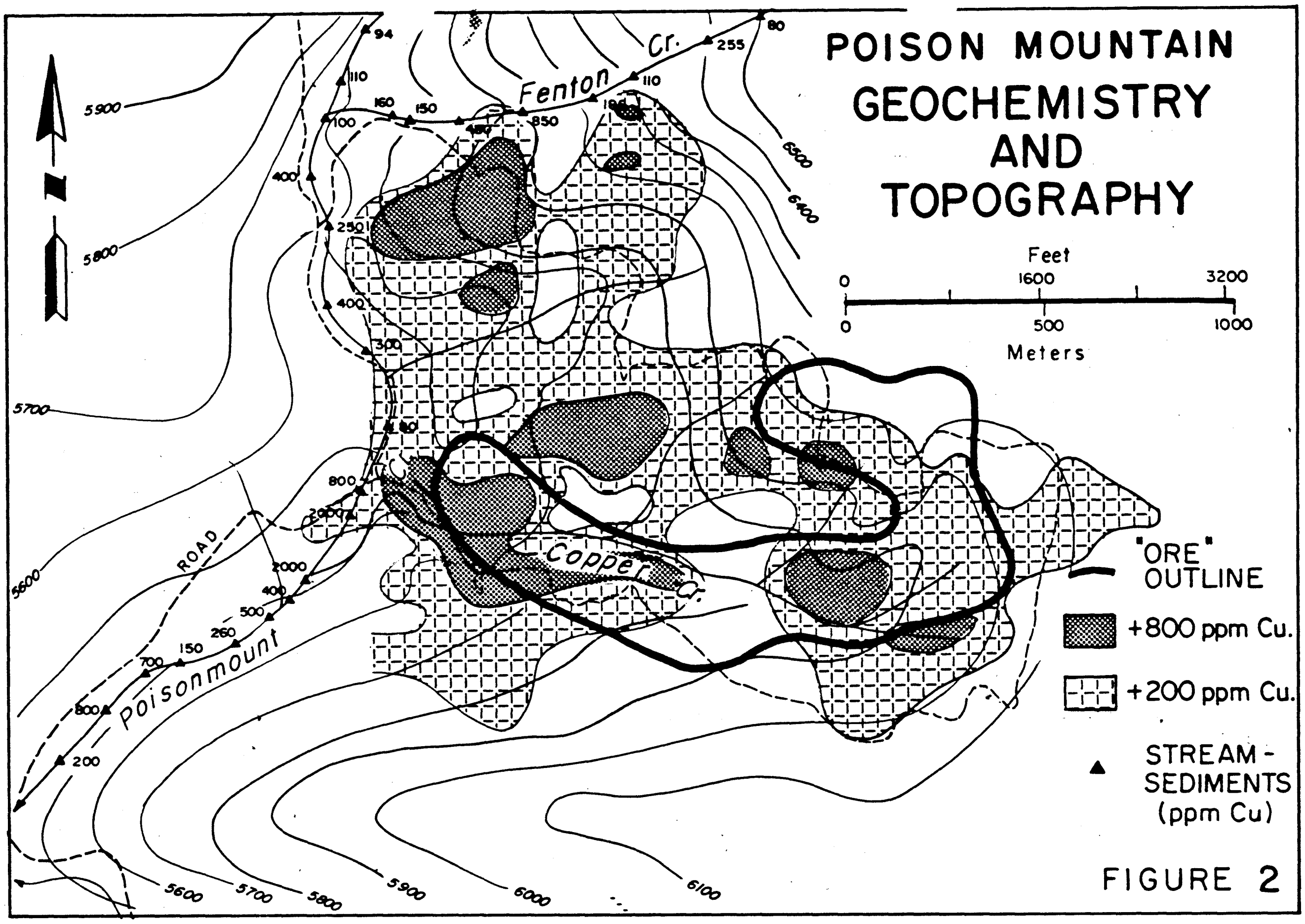


FIGURE 2 — Poison Mountain geochemistry and topography.

somatized close to the intrusions, the feldspar grains have increased in size, and the mafic minerals have been recrystallized as biotite. In these places, the greywacke approaches porphyry in both composition and appearance. Small rock fragments, however, generally permit easy identification of the greywacke, even where the mottling of the feldspar porphyroblasts makes these rocks superficially similar to porphyry. Bedding was not found in many of the thick sections of greywacke.

Several siltstone members are exposed within the explored area. The siltstone is commonly grey and black, and thin bedded, with beds averaging 2 centimeters thick. The bedding invariably dips steeply and strikes from north to N 60°W.

Conglomerate crops out north and west of the mapped area. It consists of well-rounded cobbles, up to a third of a meter or more in diameter, in a greywacke matrix. Some of the cobbles are granitoid, but none are porphyry similar to that containing copper and molybdenum sulphides.

PORPHYRY INTRUSIONS

Three porphyry intrusions are found at Poison Mountain: the Main Porphyry, which contains most of the important sulphide concentrations, the North Porphyry, which is similar but smaller, and the East Porphyry, which differs in composition and is almost barren of copper mineralization. The Main and North porphyry intrusions vary locally in composition and are irregular in configuration, and thus particularly difficult to map, so that the outlines shown on Figure 1 will undoubtedly be revised as exploration continues.

The Main and North porphyry intrusions are separated by hornfels at the surface, but may be joined at depth. They are both zoned and consist of similar core and border phases. The cores are composed of hornblende-quartz monzonite porphyry. Pale grey to cream-coloured plagioclase phenocrysts, up to 3 mm long, constitute approximately 55 per cent of the rock. The phenocrysts have strong to moderate oscillatory zoning, with anorthite content ranging from 40 to 55 per cent. Hornblende needles up to 3 mm long constitute 15 per cent of the rock. The grey matrix is composed of: quartz (up to 20 per cent of the total rock); sphene (4 per cent); opaques, consisting predominantly of magnetite and/or ilmenite with minor pyrite (4 per cent); and minor amounts of apatite, chlorite, carbonate, muscovite, epidote and rutile.

The porphyry in the core is generally fresh, with only limited replacement of hornblende by chlorite and a few patches of carbonate and clay-mineral alteration.

The border zones are very irregular and grade inward to the core and outward to the sedimentary host rocks. The parts which appear to be intrusive are biotite-quartz monzonite, consisting of a grey matrix in which are set irregular cream to grey plagioclase phenocrysts, up to 5 mm long, that occur locally in clusters up to 10 mm in diameter. The plagioclase phenocrysts constitute 40 to 50 per cent of the rock and have strong oscillatory zoning, with the anorthite content ranging from 20 to 50 per cent. Hornblende

FIGURE 1 — (left) — Geology of Poison Mountain.

is not evident megascopically; it appears originally to have formed 15 to 20 per cent of the rock, but is almost totally replaced by fine-grained green-brown biotite, minor magnetite, chalcopyrite and a few coarse grains of apatite. The grey groundmass is a fine-grained mosaic of quartz, plagioclase, magnetite, chalcopyrite, biotite and apatite. Principal alteration is that of hornblende to biotite. No K-feldspar has been identified. The plagioclase is sericitized only locally along fractures.

The East Porphyry pluton is distinctly different. It has a generally uniform composition and texture, with larger plagioclase phenocrysts and a paucity of associated copper sulphides. Phenocrysts of white plagioclase, up to 1.25 cm long, lie in a grey matrix of fine-grained feldspar, hornblende and epidote. The rock also contains pyrite, minor chalcopyrite and quartz veins where it is disrupted by the fracture system on the southeast trend of the Main Porphyry. Copper and molybdenum sulphides are too sparse to invite exploration.

Emplacement of the porphyry system has been accompanied by much shattering and minor faulting within both the perimeter of the intrusion and the surrounding hornfels. Irregular dykes of porphyry in hornfels, and hornfels breccia with a porphyry matrix are common. Fragments in the breccia invariably appear to be strongly granitized greywacke rather than originally intrusive in origin. Breccia clasts are a mosaic of quartz (40 per cent) and plagioclase (30 per cent), fine-grained biotite (15 per cent) and alkali feldspar (10 per cent). The matrix is typical biotite-quartz monzonite. Biotite, magnetite, chalcopyrite and apatite appear pseudomorphous after hornblende in both the fragments and the intrusive matrix.

Features of lithology and alteration which are uncommon are the strong biotite alteration and the lack of potash feldspar. Some fractures in and near the Main and North porphyries contain abundant gypsum. Poison Mountain is thus similar in lithology and alteration to the porphyries of the Babine Camp (Carson and Jambor, 1974) and to those of Fish Lake (Wolfhard, this volume).

AGE

No radiometric dating has been completed on the intrusive rocks. The porphyries are younger than the Jura-Cretaceous sedimentary rocks they intrude and, as they resemble the Babine porphyries, may be Eocene.

STRUCTURE

Three sets of fractures, faults and topographic lineaments are observed. The set which predominates, and which appears to control the emplacement of the Main Porphyry and the mineralization, strikes N 40°W to N 70°W and dips steeply. This set parallels the Yalakom fault (Fig. 1). The average strike of the sedimentary rocks and the elongation of the Main Porphyry intrusion are parallel. Many of the mineralized fractures and the over-all zone of mineralization also trend northwesterly. Disruption of sediments along Churn Creek indicates that a parallel zone of faulting also exists there.

A north-striking set of fractures and faults appears to control the emplacement of the North and East porphyries. This set is also evident throughout the main area of mineralization, but does not appear as important as the northwest set.

A third fracture set trending northeasterly is probably associated with the original cross jointing in the sedimentary rocks. A major northeasterly striking fault marks the south limit of the East Porphyry.

MINERALIZATION

Sulphides, in decreasing abundance, include pyrite, chalcopyrite, molybdenite and bornite. Quartz, gypsum and calcite are the main non-metallic hydrothermal minerals.

The sulphides exist as vein and fracture fillings and as disseminations. Pyrite is widespread and forms an irregular halo in the host rocks around the Main and North intrusions as well as occurring within these intrusions. It doubtless is responsible for most of the induced polarization anomalies (Fig. 3). Chalcopyrite, bornite and molybdenite are found closer to the intrusions, principally in and near the perimeter of the biotite-quartz monzonite porphyry. The chalcopyrite and bornite mineralization is estimated to be almost equally divided between dissemination, chiefly replacing mafic minerals, and fracture filling in quartz veins and 'dry' fractures. The molybdenite observed was invariably associated with fracture fillings with or without quartz.

The outline of the better-grade mineralization is shown in Figure 1. The North Porphyry contains very similar grades locally, and on further exploration may provide some small reserves at a slightly lower cutoff grade than those of the Main Porphyry.

SECONDARY PROCESSES

Weathering and oxidation extend to only a few meters depth over most of this deposit, so that no supergene enrichment is expected or observed.

Environmental and Feasibility Studies

No formal feasibility study has been prepared for this deposit. Further diamond drilling will probably be required to define and confirm the outline of the better-grade mineralization prior to making such a study. No studies have been made of future production waste disposal or of the effects of exploitation of the deposit on the environment.

Geochemistry

The property was explored geochemically by stream-sediment and soil surveys. The 80-mesh fraction was analyzed by the atomic absorption method. The stream-sediment survey distinctly outlined the area of copper mineralization, with analyses rising from a background of about 50 ppm to over 2000 ppm on the creek cutting the main mineralized zone (see Fig. 2). The anomalies on Poisonmount Creek, 150 and 200 ppm copper near the confluence with Churn Creek, are surprisingly low.

The "B" horizon, where present, was soil sampled at an average depth of a half meter at 60-meter (200-foot) intervals along lines spaced 250 meters (800 feet) apart. The area of known mineralization was outlined as shown by the 200-ppm copper contour in Figure 2. The gold content of the deposit is substantiated by old placer workings in Poisonmount Creek.

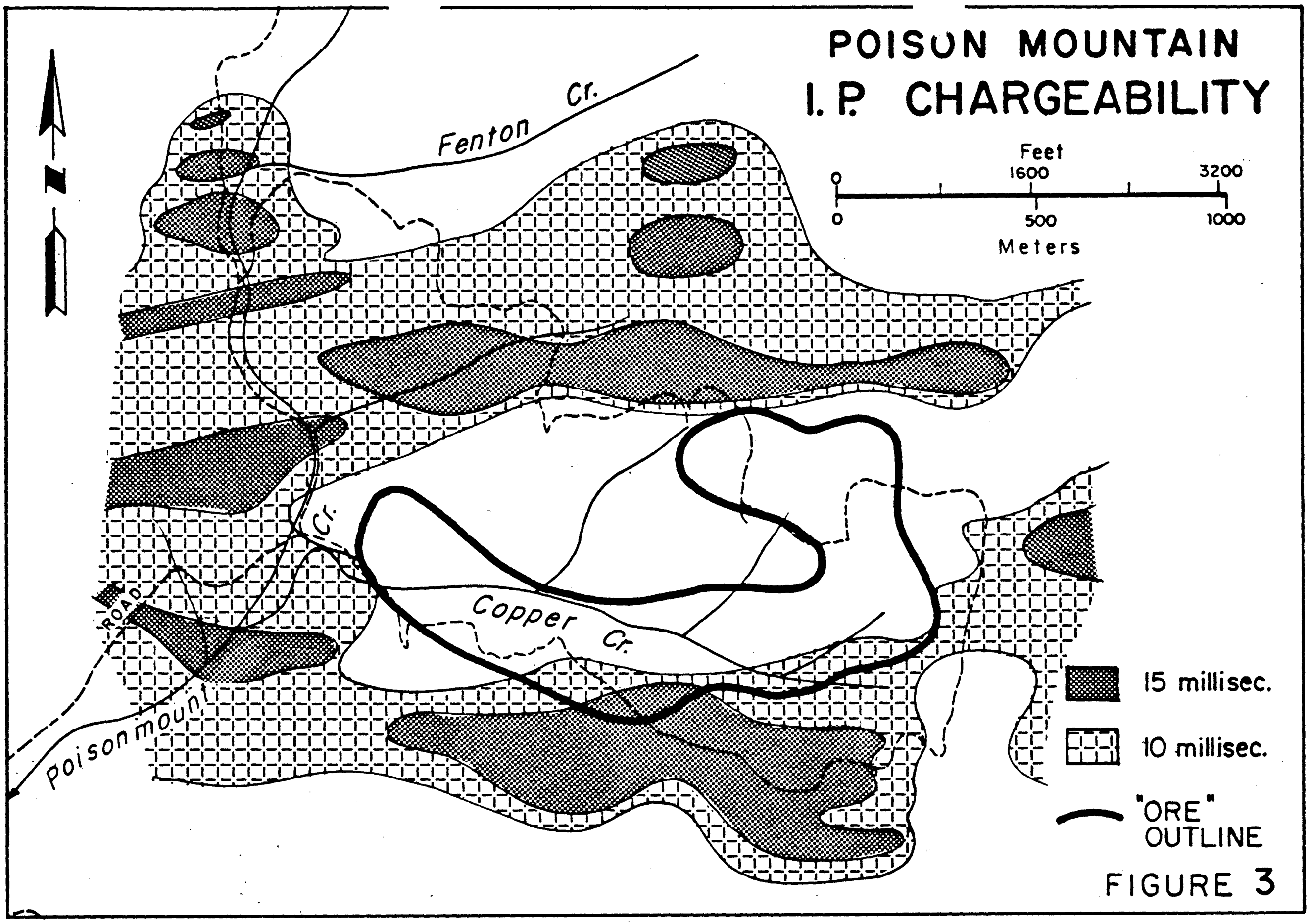


FIGURE 3 — Poison Mountain IP Chargeability.

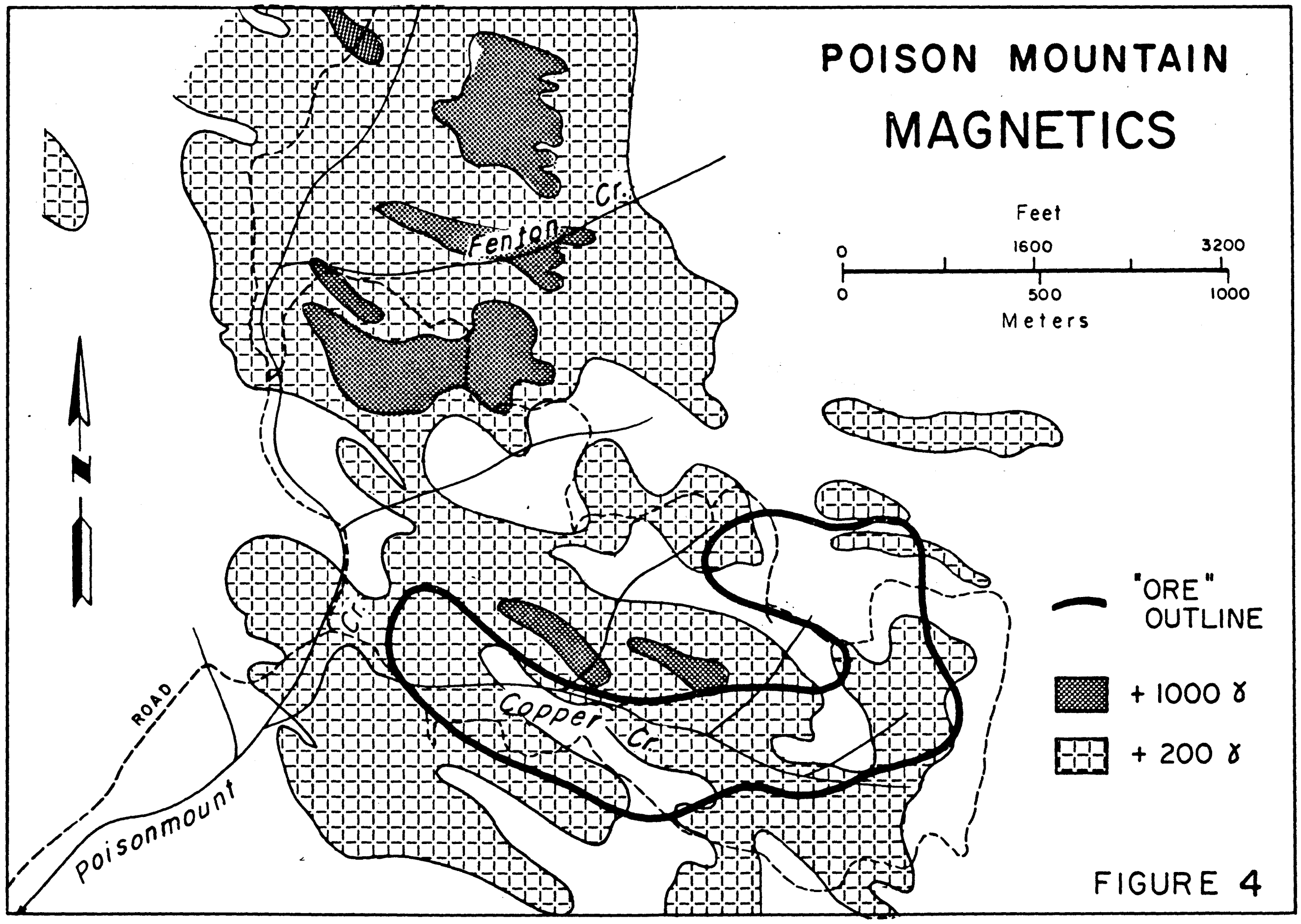


FIGURE 4 — Poison Mountain Magnetics.

Geophysics

The entire property was investigated by induced-polarization and magnetometer surveys, with detailed work completed in the area of mineralization. The time-domain method was used for the detailed IP, using a three-electrode array with spacings of 30 and 60 meters. A fluxgate magnetometer was used for the magnetic survey.

The IP survey shows a well-defined zone of high chargeability peripheral to the best copper mineralization (Fig. 3). This zone is coincident with and provides a classic example of a pyritic halo. Chargeabilities exceeding 15 milliseconds surround the main area of copper mineralization, which has chargeabilities of less than 10 milliseconds. Most of the better-grade copper-molybdenum mineralization occurs within the area providing a response of 5 to 10 milliseconds, in contrast to background levels of 4 milliseconds or less. The IP 'spreads' are not important, because oxidation extends to only a few meters of depth.

Magnetic variations have little obvious relation to sulphides. High magnetic response is obtained not only over the intrusive rocks, but also over some of the sedimentary rocks 100 meters north of the mineralized zones (Fig. 1).

Synthesis and Genesis

The Main and North porphyry intrusions are typical of the calc-alkalic suite, except for the paucity of K-feldspar. Although the intruded sedimentary rocks are not well exposed, evidence exists that intrusion was in part forceful (the sedimentary strata are warped around the intrusive core) and in part assimilative (the sedimentary rocks are metasomatized or granitized). The abundant biotite alteration is undoubtedly induced by the porphyry system, but it should be recognized that the original sediments contain all the elements necessary to form biotite, so it may well be of thermal metamorphic origin rather than hydrothermal or metasomatic. The oscillatory zoning of the plagioclase may indicate formation through a series of pulses of igneous (and associated hydrothermal?) activity.

The fault and fracture system is similar to that controlling the emplacement of many porphyry deposits (Seraphim and Hollister, this volume).

The nature of the mineralization and alteration and its spatial relation to the Main and North porphyries is also typical rather than unusual. The relation of the East Porphyry to the others has not been investigated in detail. It is probably slightly later in age.

Acknowledgments

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