CED POLARIZATION

AND

LLING RESULTS

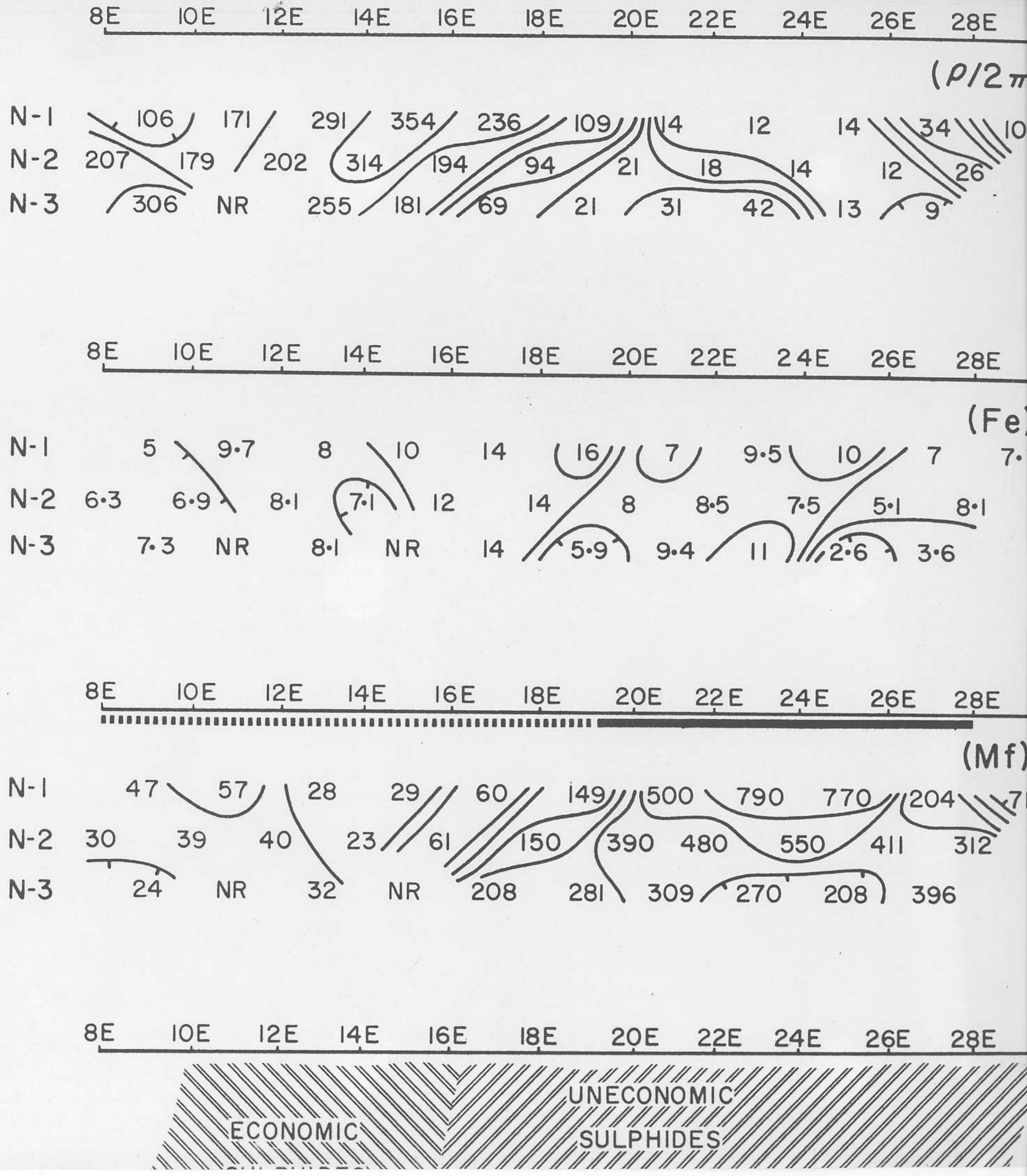
FROM

INE LAKE AREA

B. C.

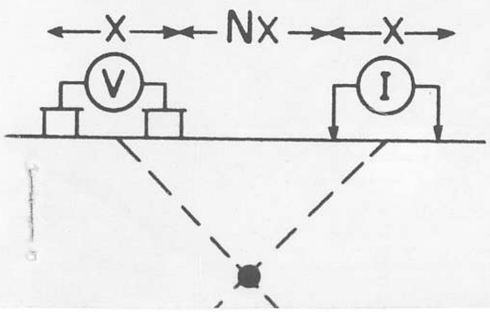
WE PROPERTY

830217



LINE - 12 N

EQUENCIES - 0·31 & 5·0 CPS.



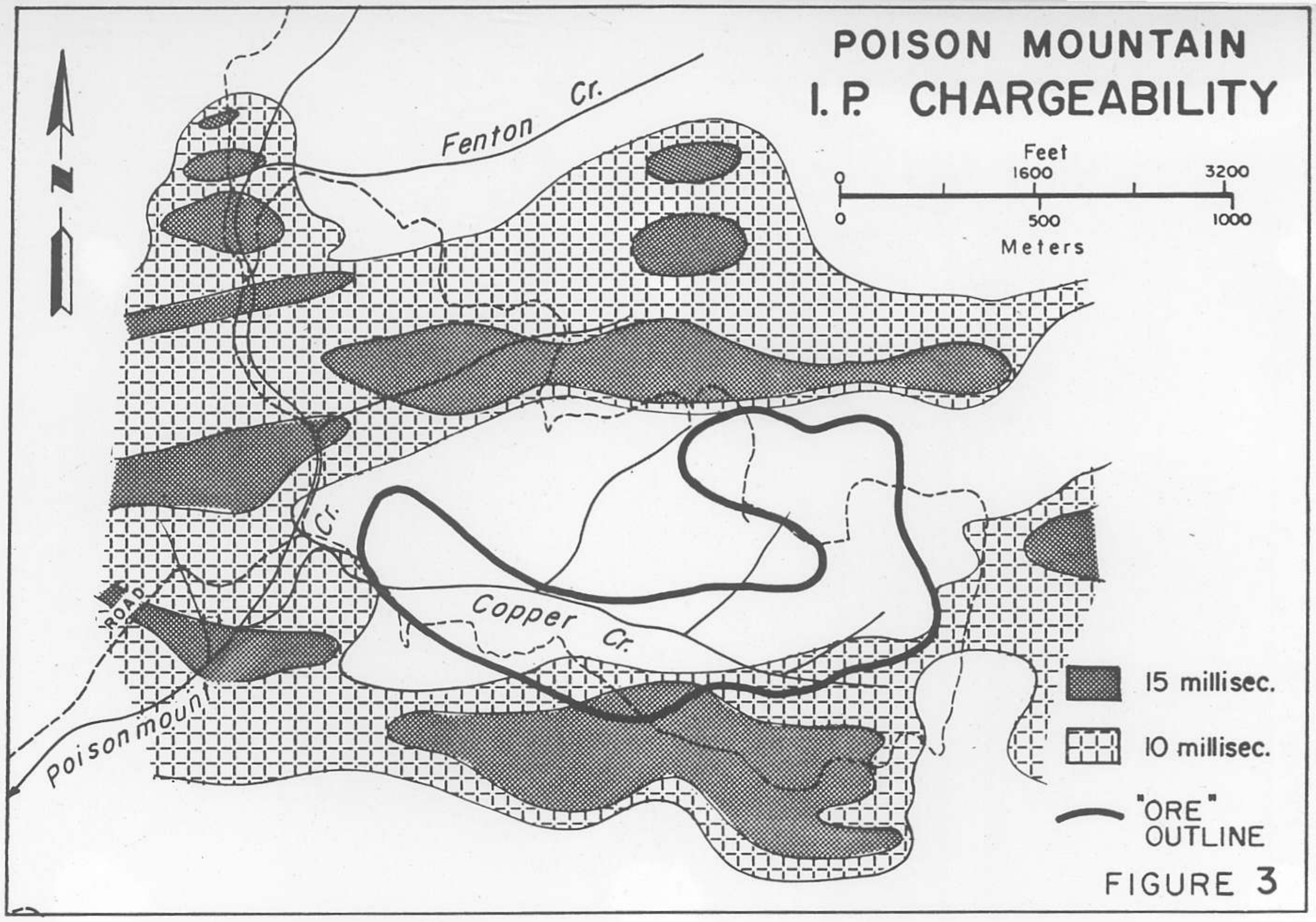


FIGURE 3 — Poison Mountain IP Chargeability.

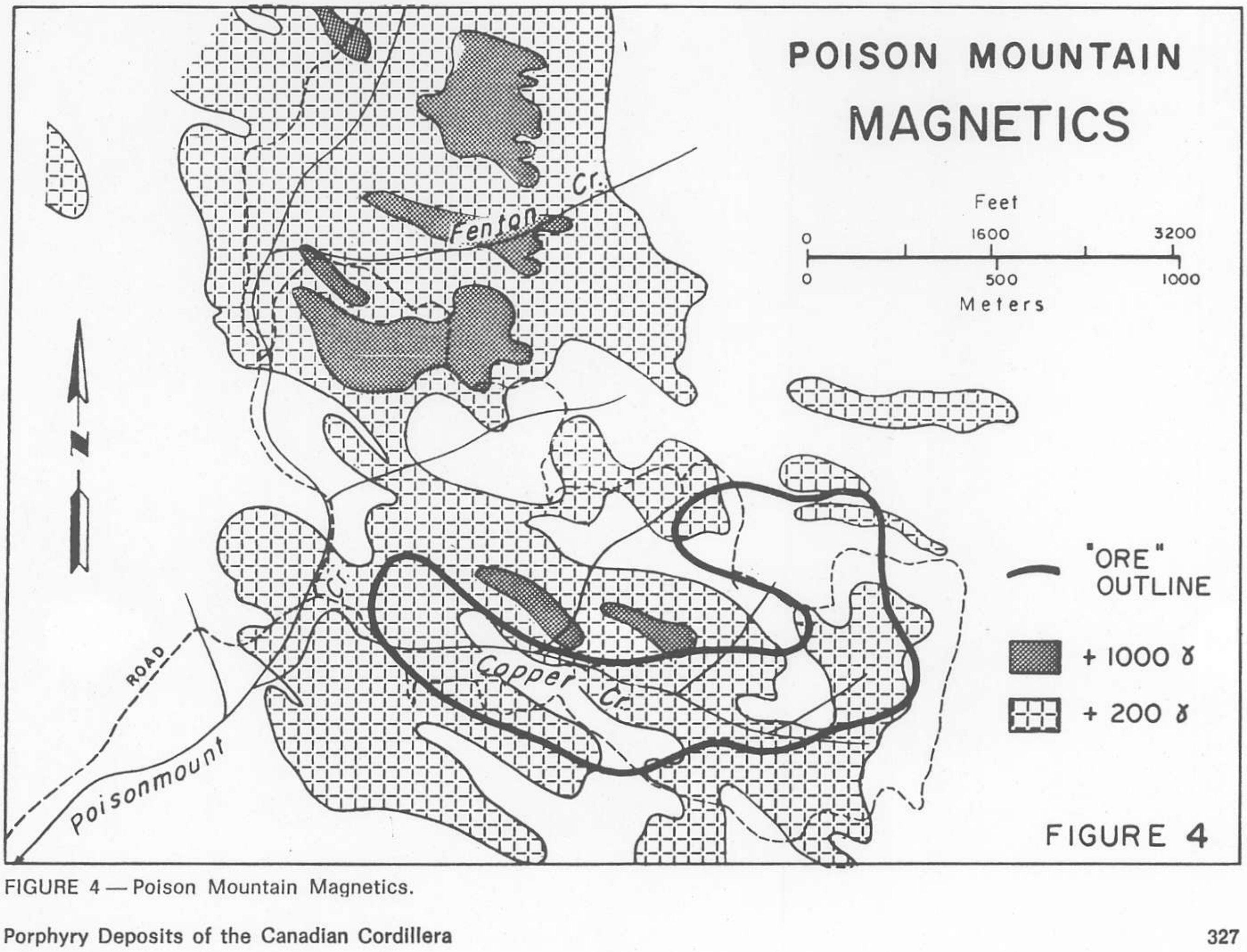


FIGURE 4 — Poison Mountain Magnetics.

to regional trends (Northcote, 1970). The fourth trend has not been recognized on a regional scale or in the pit.

Two prominent fault zones cut the rocks in the pit area (Fig. 9). The End Creek fault, which corresponds to the third set of air-photo linears, strikes west-northwest and forms a steeply dipping zone approximately 60 m wide. Because there is an abrupt change in alteration across this zone and an almost total lack of copper mineralization south of it, movement on the fault is believed to be younger than mineralization. Direction and magnitude of offset are unknown.

A second prominent fault zone west of the Yellow Dog breccia trends N 65°E and dips steeply (Fig. 9). It is 30 to 60 m wide. The magnitude and direction of offset across this fault is unknown. The relationship between this fault zone and the Yellow Dog breccia is also unknown.

ORE ZONE

Geometry

The orebody may be divided into the hanging-wall and footwall ore zone (Fig. 4). The hanging-wall ore zone is better defined due to the geometry of the deposit. It is a roughly tabular body 60 to 180 m wide and approximately 1700 m long, and continues essentially unchanged to a depth of 300 m below the ground surface. The ore zone plunges deeper below the ground surface at the ends of the planned pit. It is not known whether this double plunge is a primary structural characteristic of the ore zone or was superimposed by subsequent tectonism.

The footwall ore zone is in the footwall volcanic rocks adjacent to the porphyry dyke. Because it is farther from the surface, it is not as well defined.

A small amount of ore occurs within the dyke; however, most quartz-feldspar porphyry is unmineralized.

Mineralogy

Chalcopyrite and molybdenite are the only sulphide minerals recovered at the Island Copper mine. Pyrite is the most abundant sulphide mineral. Sphalerite and galena occur erratically in carbonate veinlets within and peripheral to the ore zone. Bornite has been observed in the ore zone in negligible quantities.

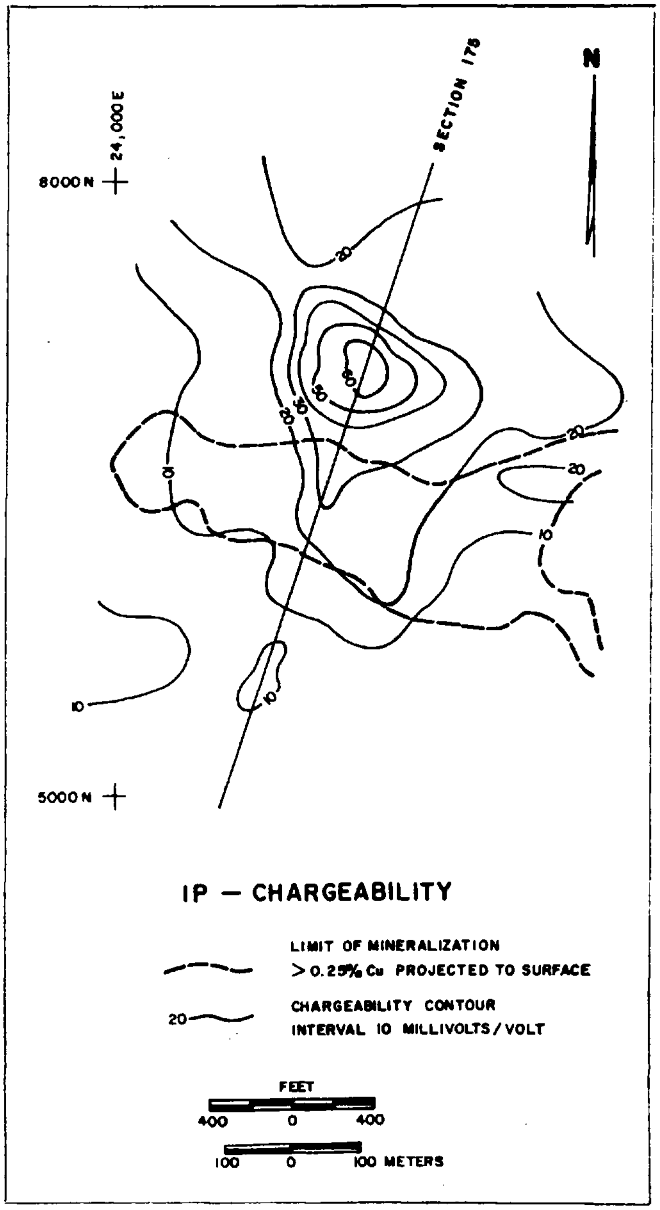


FIGURE 5 — Induced polarization — chargeability.

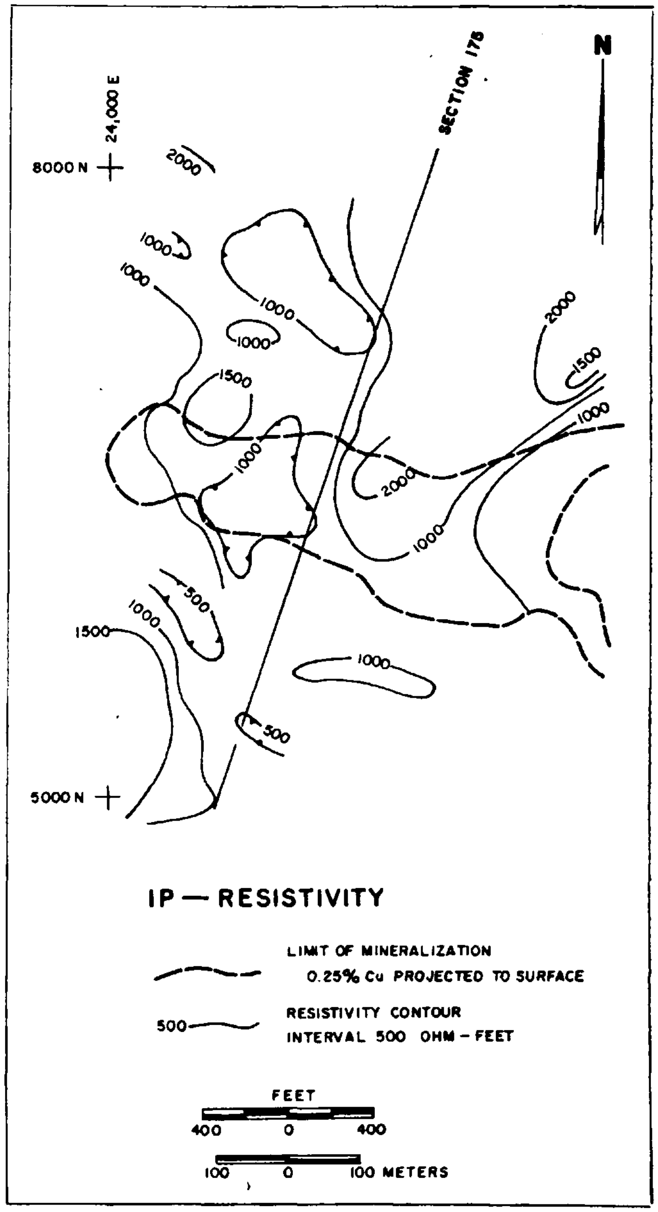


FIGURE 6 — Induced polarization — resistivity.

A second hydrothermal alteration feature was observed in a petrographic study (Simpson, 1970) of the saussuritized plagioclase across the Pollyanna and Gibraltar East zones. It was noted that the amount of sericite relative to epidote in the saussuritized plagioclase could be correlated reasonably well to the copper grade. A pervasive increase in sericite or potassium associated with a sulphide zone is a typical chemical feature of a porphyry copper stockwork.

Mineral Zoning

Within the pluton, the detailed consideration must be restricted to the exposed or mined area. The area encompassing the pits is about 4 km long from west to east and about 1.6 km wide from north to south. Porphyritic rocks are found most commonly in the center of the main mineralized zones (Fig. 3). Induced polarization surveys (Fig. 5) show that the sulphide zone is peripheral to the area in which leucocratic porphyritic rocks are most commonly found. The pattern essentially shows a low induced polarization (about 1 per cent frequency effect), surrounded by a higher-IP rim (5 to 10 PFE). The rough elliptical shape indicates that, in part, the sulphide zone is guided by the regional foliation.

The effect of the dip of the regional foliation can be seen in Figure 6. Although the individual veins parallel and crosscut the foliation, the over-all dip of the mineralization is about 30 degrees to the south. Figure 6 is a north-south section through the Pollyanna zone on the north and the Granite Lake zone on the south and illustrates the mineral zoning that is present. Starting on the north, the south-dipping pyrite zone contains pyrite and minor chalcopyrite and corresponds to an IP response of 6 to 10 per cent frequency effect. The Pollyanna pit is located inward from the pyrite zone, as the chalcopyrite/pyrite ratio increases toward the core. The IP response decreases across the Pollyanna pit. On passing into the low-sulphide porphyry-bearing core area, the mineral assemblage changes to chalcopyrite and bornite, with only trace amounts of pyrite. IP response in the core area is about 1 to 2 PFE. The same sequence is repeated in reverse across the Granite Lake pit, except that the pyrite zone and the IP response are more pronounced to the south of the Granite Lake pit, because the pyrite zone now lies close to the surface.

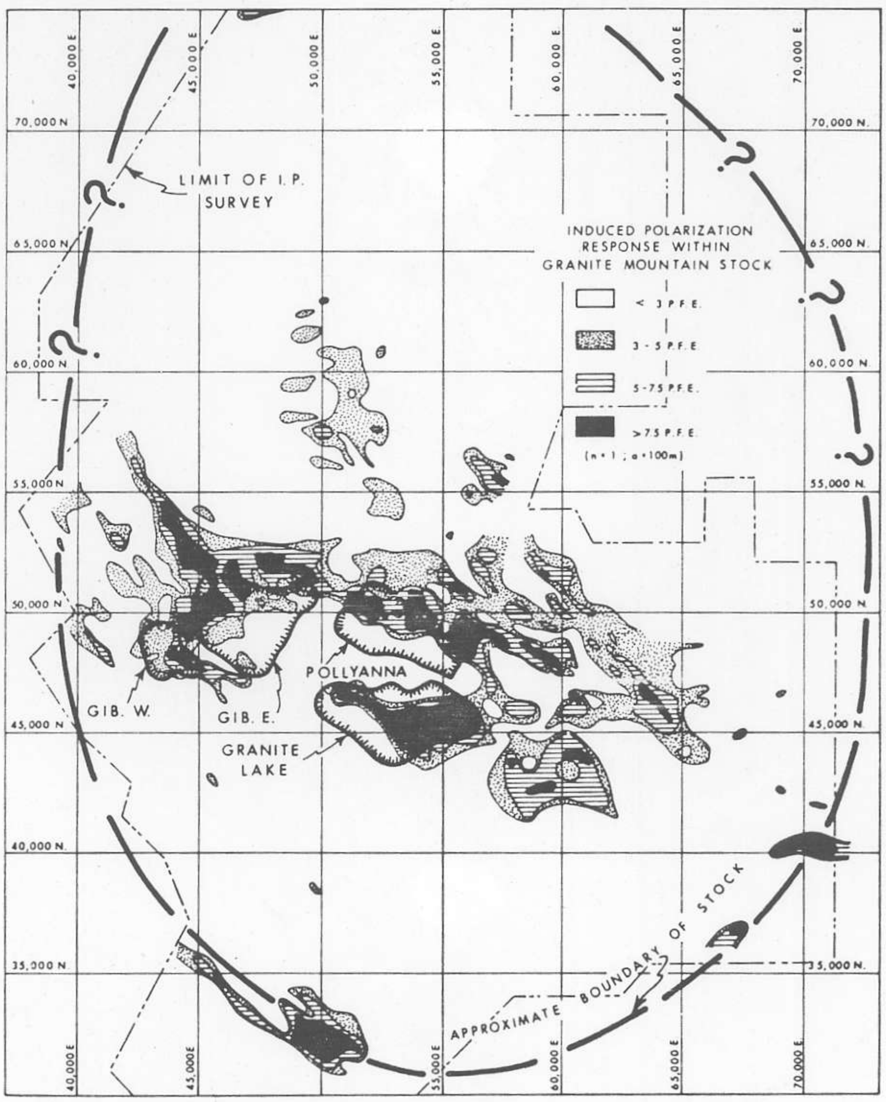


FIGURE 5 — Induced polarization response within the Granite mountain stock.

GIBRALTAR

displacement (the "landslide" on Figure 23(3) of Preto, 1973) (Fig. 7). Apparent displacement on this fault is 30-40 m.

THE SUPERGENE EVENT

Partial leaching of the Afton deposit and its conversion to a different mineralogy in the supergene zone occurred without effect on the sulphide-bearing wall rocks. Under circumstances outlined in (3) of the Discussion that follows, aerated ground water channelled downward through the intensely fractured hypogene deposit and caused coincident oxidation of magnetite to hematite and reduction of bornite, chalcopyrite and minor pyrite to chalcocite and metallic copper. Excess sulphur and soluble salts were removed by the departing ground water, together with a fraction of the copper in the affected zone. Cuprite and hematite coatings on the principal minerals formed probably simultaneously with minor copper carbonates, etc., during some later episode of limited oxidation. Coexistence of magnetite and high-sulphur copper minerals was probably essential to formation of the unusual supergene assemblage by facilitating the necessary oxidation-reduction process. Other important factors were the intensely localized fracturing, proximity to a much lower base-level, and a wet climate, which all promoted the passage of abundant oxygenated and chemically active waters through the orebody. Trenholme (1973) suggested that high ground temperatures due to adjacent volcanic activity may also have played a part.

Geochemical Surveys

Soil samples were collected at the "B" horizon about 20 cm deep and analyzed for total copper. A population of background values in samples distant from known mineralization, and chiefly representing Nicola volcanic and sedimentary terrain south of the pluton, has a normal distribution with a mode of 85 ppm copper, a mean of 88 ppm and a standard deviation of 21 ppm. A very large anomalous area defined by values greater than 200 ppm copper reflects mainly the southwestern pyrite zone, but is broadened eastward because of glacial dispersion. This anomaly encloses the eastern part of the Afton orebody and extends southeastward to Pothook Lake [Fig. 11(a)]. Within this broad area, several more intense anomalies are defined by the 500-ppm copper contour. Three are shown, of which the largest is 600 m south of the Afton orebody and coincides with abundant outcrops containing minor widely distributed sulphides. The orebody lacks a directly overlying soil anomaly because of a thick glacial cover at the western end, Eocene strata elsewhere and the presence of the salt pond. Immediately to the east, however, two parallel anomalies, each 300 m long in a S 65°E direction, reflect glacial dispersion of ore around a central hump of bedrock situated at the eastern limit of the orebody.

Overburden drilling was done in 1973 in the hope of providing a classic example of basal till sampling down-ice from an orebody. It was rendered useless because the line of percussion drill holes encountered the bedrock hump a mere 150 m down-ice from the orebody. Here, a narrow anomalous layer

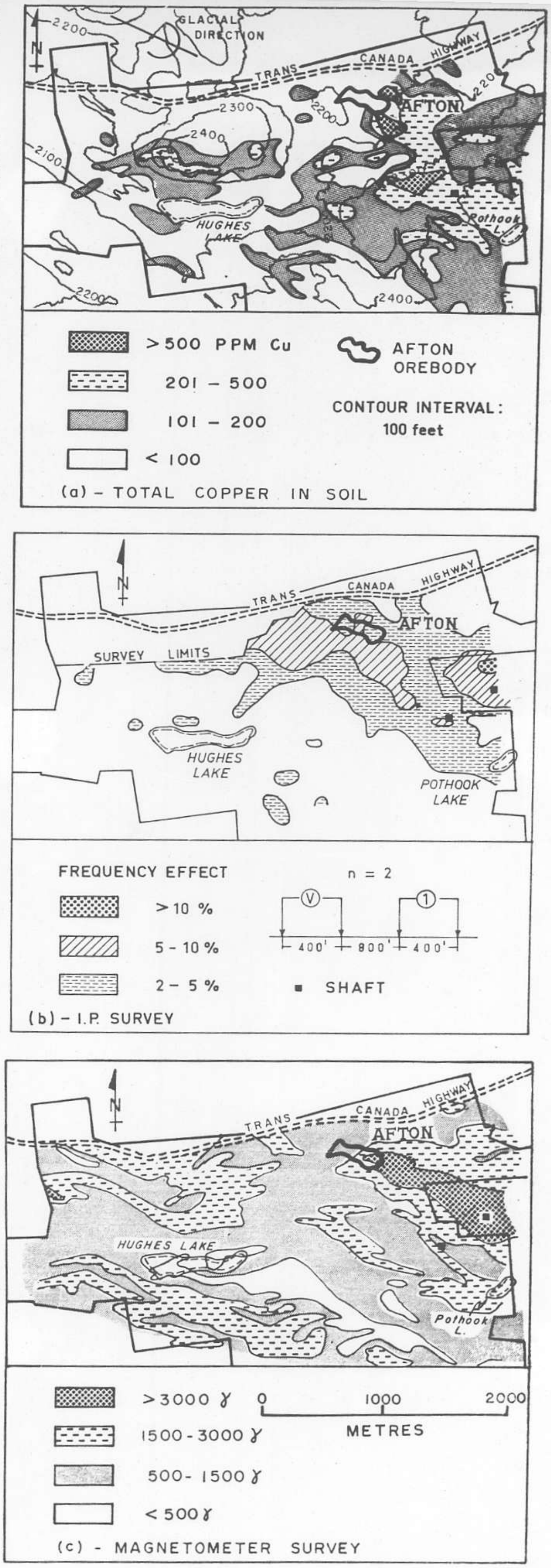


FIGURE 11 — (right) — Geochemical and geophysical plans of the Afton property: (a) total copper in soil; (b) I P survey; (c) magnetometer survey.

AFTON

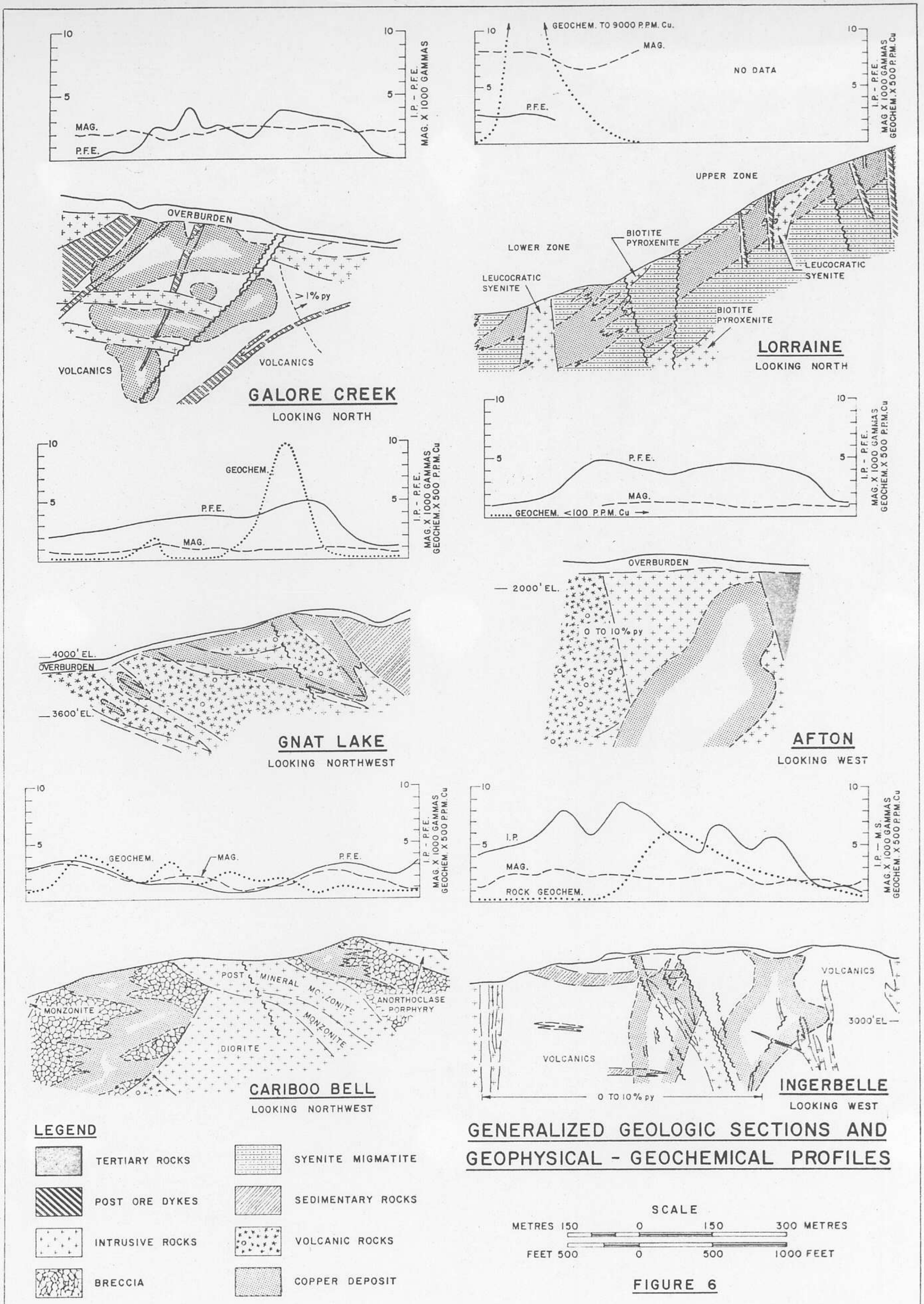


FIGURE 6 — Generalized geologic sections and geophysical-geochemical profiles.