FILE

824427

RECONNAISSANCE GEOLOGY

and

LITHOGEOCHEMISTRY

of the

BARRIERE AREA, B.C.
NTS 82M/4,5
NTS 92P/1,8

for

CORPORATION FALCONBRIDGE COPPER

February 5, 1984

John Watkins, MSc
Marilyn Atkinson, BSc

TABLE OF CONTENTS

Page

LIST OF FIGURES

LIST OF MAPS

APPENDICES

SUMMARY

The principal conclusions of this study of the Barriere area are as follows:

1. A volcano-sedimentary complex, characterized by a bimodal assemblage of mafic and felsic volcanic rocks, underlies the area.

2. Anomalous lithogeochemistry, characteristic of volcanic-hosted massive sulphide deposits, defines a 20 km long stratigraphic interval within the volcano-sedimentary complex. A restricted area of highly anomalous Ba within this interval, defines a top priority target area.

3. This anomalous stratigraphic interval can be defined lithologically by the presence of Q.F.P. domes, in part epiclastic, overlain stratigraphically by marine sediments. (infers tops to East in L. Fennell)

4. The potential for the discovery of volcanic-hosted massive sulphide deposits, along this favourable horizon is excellent and further study is strongly recommended.

5. On Mount Armour, anomalous concentrations of Cu, Au and Ag in syngenetic pyrite is spatially associated with Q.F.P., Na_2O and CaO depletion and SiO_2 enrichment. Detailed ground work is recommended.

1. INTRODUCTION

1.1 Location, Access and Physical Features

A program of reconnaissance geology was carried out in the Barriere-Adams Lake area 80 km north of Kamloops from October 17 to November 16, 1983. The area examined covers 1200 sq. km along the western edge of the rugged Adams Plateau, bounded by longitude 119° 45' and 120° 10', and latitude 51° 00' and 51° 25' (figure 1). The area exhibits features typical of intermontaine-plateau glaciation with maximum relief of 1500 meters. The valley of the North Thompson River defines the western edge and south central Adams Lake defines the northeastern edge of the study area.

Access into the area is excellent. Main, all-weather logging roads occupy all valleys with good access available into most of the high country where extensive clear-cut logging has been and is actively taking place.

1.2 The Current Study and Its Objectives

1. To prospect for and evaluate the potential for volcanigenic massive sulphide mineralization in Upper Paleozoic rocks of Fennell and Eagle Bay formations.

2. To carry out a lithogeochemical study of the Fennell and Eagle Bay volcanic rocks with the aim of identifying massive sulphide environments, and;

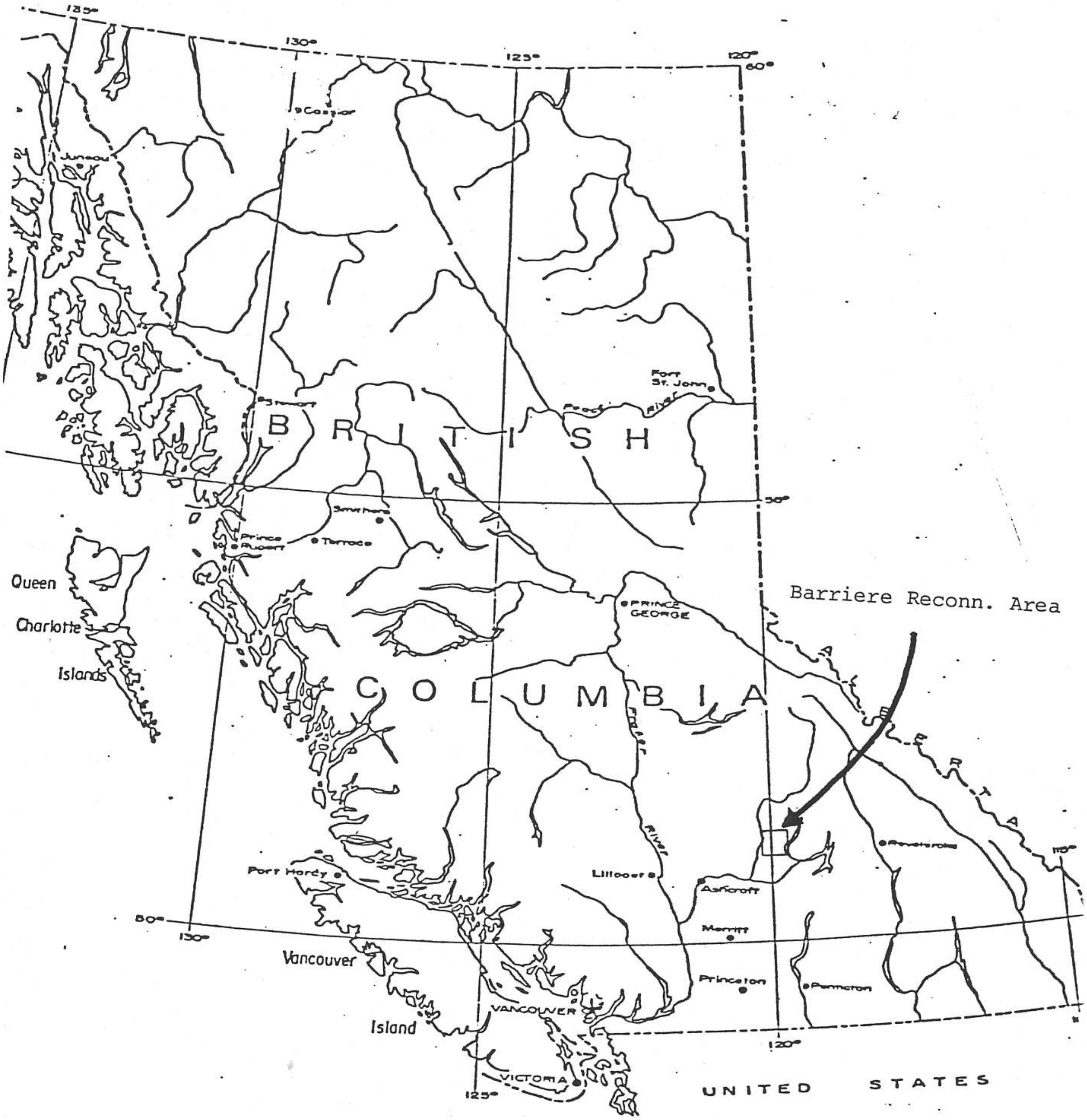


Figure 1 Location Map

3. To make recommendations for property acquisition, further work and to define priority targets.

In the field the program consisted of two, two-person crews, with four-wheel drive truck back-up, that made daily traverses along logging roads. Traverses were hampered by snow, especially in areas of greater than 4,000 feet elevation. Areas of poor road access were not examined. The program ended when access was restricted due to snow.

An orderly finish to the program was pre-empted by the Rea Gold Corp. massive sulphide discovery in the center of the study area resulting in a staking rush.

2. GEOLOGY

2.1 Regional Setting

The study area is underlain by volcanic and sedimentary rocks of the Late Devonian Fennell Formation and Late Devonian to Early Mississippian Eagle Bay Formation (Preto, 1979; Preto et al 1980). Fennell and Eagle Bay rocks define a discontinuous belt that has been correlated (Monger, 1975, 1977) with other semi-continuous volcanic terrains to define the Eastern Assemblage of Upper Paleozoic volcanic rocks of the North American Cordillera (figure 2). The Eastern Assemblage marks a transition from Devonian or older platformal sedimentary rocks to marine volcano-

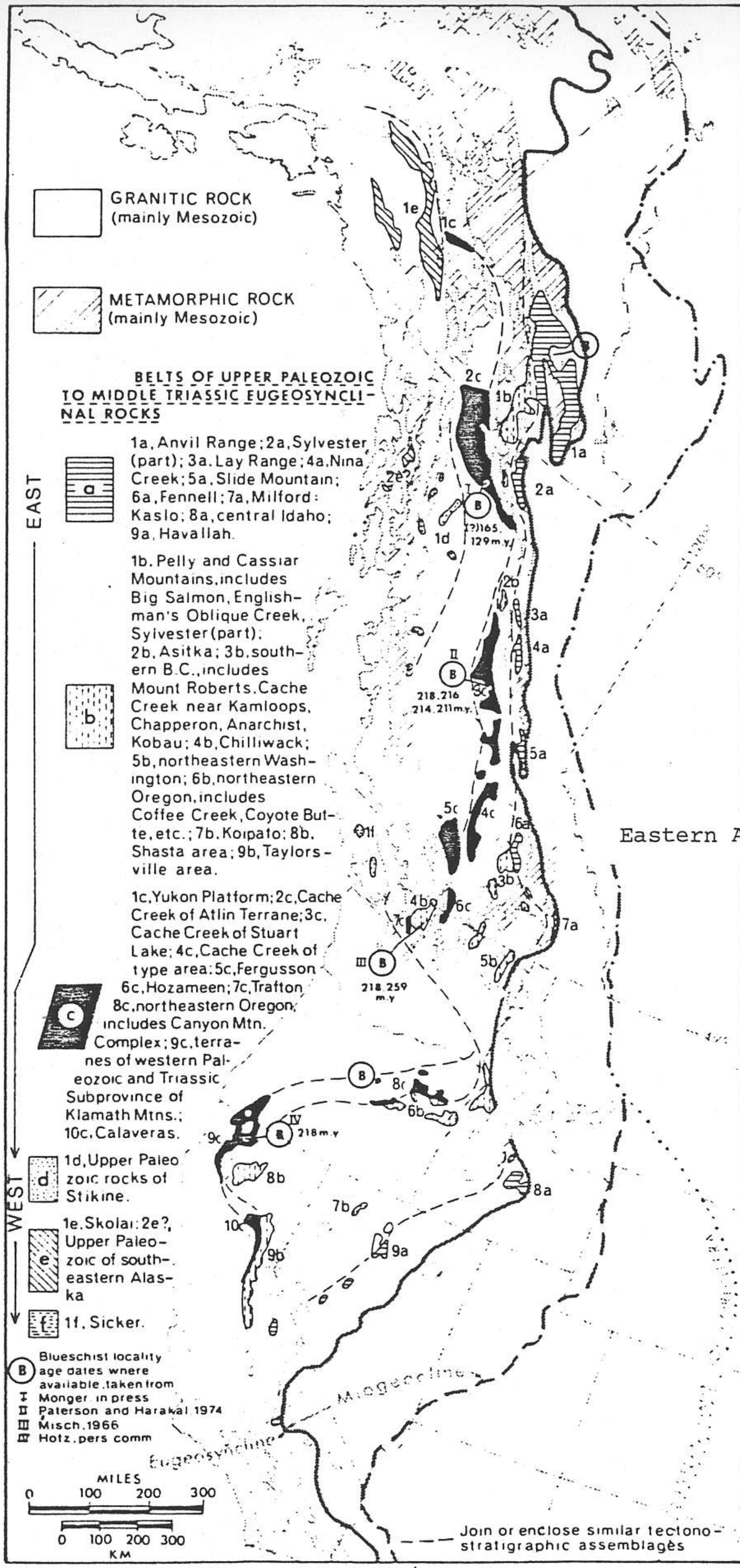


Figure 2 Belts of Upper Paleozoic to Middle Triassic eugeosynclinal rock of the North American Cordillera. (Monger, 1975)

sedimentary strata. In the Yukon and northern B.C. there is evidence that the Eastern Assemblage represents oceanic crust, thrust in the Late Triassic, onto a sedimentary succession lying close to a continental margin (Tempelman-Kluit, 1979). However, in central and southern B.C., post-Upper Devonian strata record a gradually deepening basin. Mafic volcanic rocks were deposited in a possible arch environment that formed marginal to an oceanic basin further west (Monger, 1977). A clear picture of the tectono-stratigraphic environment responsible for the formation of the Fennell-Eagle Bay terrain is lacking, and clearly more work is needed.

2.2 Study Area

The geology of the study area has most recently been described by Preto,1979; Preto et al, 1980.

Based on this reconnaissance examination, the study area can be divided into two structural domains lying north and south of the Barriere River and separated by a fault (Preto). Based on this study and as suggested by Preto several stratigraphic horizons can be traced from one structural domain into the other, or from Fennell volcanic rocks to Eagle Bay volcanic-sedimentary rocks.

The domain lying north of the Barriere River is a homoclinal sequence of steeply dipping, north striking, east topping pristine basaltic volcanic rocks, the Fennell Fm. It is overlain by rocks described as Eagle Bay Fm, ?

consisting of a prominent unit of black phyllite, grit and argillite which is in turn overlain to the east by a sequence of acid tuffs, basaltic to intermediate flows and tuffs, minor clastic sediments and discontinuous limestone units. The contact between Fennell and Eagle Bay rocks had previously been regarded as a low-angle fault, however, Preto(1979) describes the contact as conformable consisting of a gradual change westward from phyllite through a transition zone of interbedded massive basalt, phyllite, chert and chert (rhyolite?) breccia into massive and pillowed basaltic flows.

South of the Barriere River, rocks described by Preto as Eagle Bay are characterized by strong penetrative deformation that appears to be axial planar to shallow plunging, moderate to steep northeast dipping isoclinal folds. Correlation of stratigraphic units in Eagle Bay rocks south of the Barriere River with similar stratigraphic units in both Fennell and Eagle Bay rocks north of the river strongly suggests that Fennell and Eagle Bay rocks are stratigraphically equivalent. Quartz porphyry bodies within greenstone are traceable from Skwaam Bay on Adams Lake north-northwestward to the Barriere River. They are correlative, along strike, with a quartz prophyry horizon that lies within pristine basalt flows near the top of the Fennell Fm north of the Barriere River.

Black phyllite of the Eagle Bay Fm, lying stratigraphically on Fennell rocks, north of the Barriere River, can be traced south-southeast to Johnson Creek where argillite and greywacke are intercalated with quartz porphyritic volcaniclastic rocks near the Rea Gold showing. Quartz porphyritic bodies are present within mafic volcanic rocks in close proximity to phyllite-argillite from Johnson Creek to the north side of the study area, where they are terminated by the Cretaceous Baldy batholith.

In the southwest sector of the study area in the area of Barriere Mountain, Dixon Ridge, and the area between Sinmax Creek and Adams Lake, greenstones (mafic volcanic rocks) are intercalated with rocks described by Preto et al (1980) as interlayered grit, impure quartzite, phyllite and limestone. In this area all rocks have experienced strong penetrative deformation, totally obscuring primary features. These rocks are, at least in part, felsic volcanic as evidenced by quartz porphyry domes at Mount Armour and in the area immediately south of Skwaam Bay. This area may represent the core of a felsic volcano-sedimentary complex with a sharp lithologic transition from felsic to mafic volcanic rocks along the Barriere River. The 3000 gamma isomagnetic line, shown on Map 1, broadly defines the margins of the felsic volcano-sedimentary complex.

Post-tectonic granitic rocks of the Cretaceous Baldy batholith intrude Eagle Bay and Fennell formation rocks north of the Barriere River.

A succession of Late Tertiary flat-lying basaltic flows unconformably overlies phyllite/argillite in the center of the study area.

3. LITHOGEOCHEMISTRY

Samples for lithogeochemistry were collected from road cuts and near road outcrops. Samples were shipped to TerraMin Research Labs Ltd. in Calgary and analysed for SiO_2, Na_2O, CaO, Fe_2O_3, Ba, Cu and Zn. Sample descriptions and analytical results can be found in the appendices to this report. Histograms or cumulative probability plots for each element are displayed on figures 3 to 8. Results are plotted on three separate maps (maps 3 to 5).

Summaries of the individual elements are discussed below:

3.1 Silica SiO_2 Figure 3

Silica analyses are bimodally distributed as expected for a mafic-felsic volcanic terrain. A third population of greater than 80% SiO_2 may represent the introduction of hydrothermal SiO_2. Means for the two populations are 49.7% SiO_2, representative of a normal basalt, and 78.4% SiO_2 representative of a silicic rhyolite. Samples with values greater than 80% SiO_2 are colour coded on map 4.

3.2 Sodium Na_2O Figure 4

Sodium analyses give evidence of three populations, a normally distributed population typical of unaltered volcanic rocks, a population

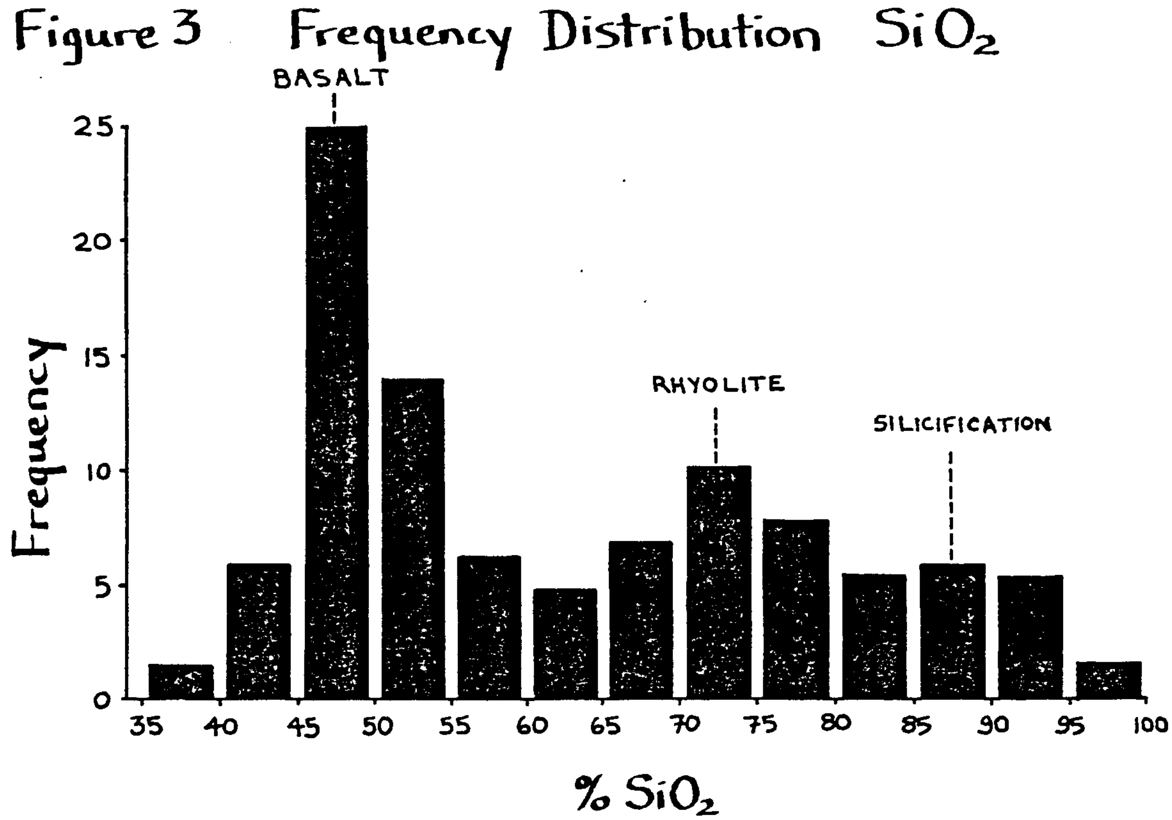


Figure 3 Frequency Distribution SiO2
BASALT
RHYOLITE
SILICIFICATION
Frequency
0
5
10
15
20
25
35
40
45
50
55
60
65
70
75
80
85
90
95
100
% SiO2

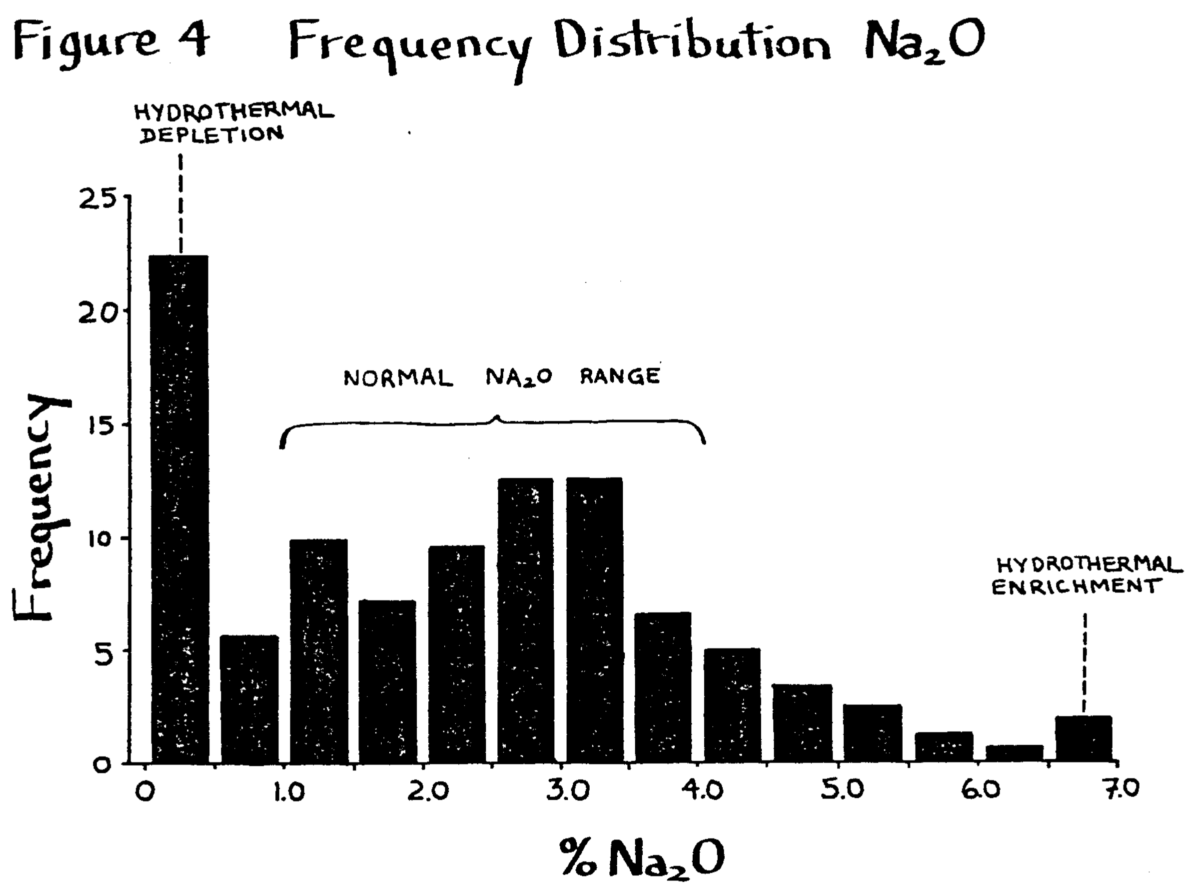


Figure 4 Frequency Distribution Na2O
HYDROTHERMAL DEPLETION
NORMAL NA2O RANGE
HYDROTHERMAL ENRICHMENT
Frequency
0
5
10
15
20
25
0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
% Na2O

of analyses less than 1.0% Na_2O representative of hydrothermal depletion, and a third population, greater than 6.5%, suggests enrichment of Na_2O. Samples with less than 1.0% Na_2O is colour coded on map 3.

3.3 Iron Fe_2O_3 Figure 5

Iron as Fe_2O_3 is bimodal and normally distributed. The two populations can be visually separated at 6.5% Fe_2O_3 with mean values for the two populations of 3.1% and 10.8%. Iron values less than 6.5% are colour coded on map 3.

3.4 Calcium CaO Figure 6

Calcium analyses are bimodally distributed with two populations separated at 7.0% CaO. Mean values for the two populations are 2.3% and 10.7%. Calcium values of less than 1.0% are colour coded on map 4.

3.5 Barium Ba Figure 7

The logarithms of the barium values were plotted on a cumulative frequency plot. The barium values are lognormally distributed with two populations as indicated by the inflection point at 94 cumulative percent which corresponds to 2500 ppm and represents the anomalous threshold. A

high

Figure 5 Frequency Distribution Fe_2O_3

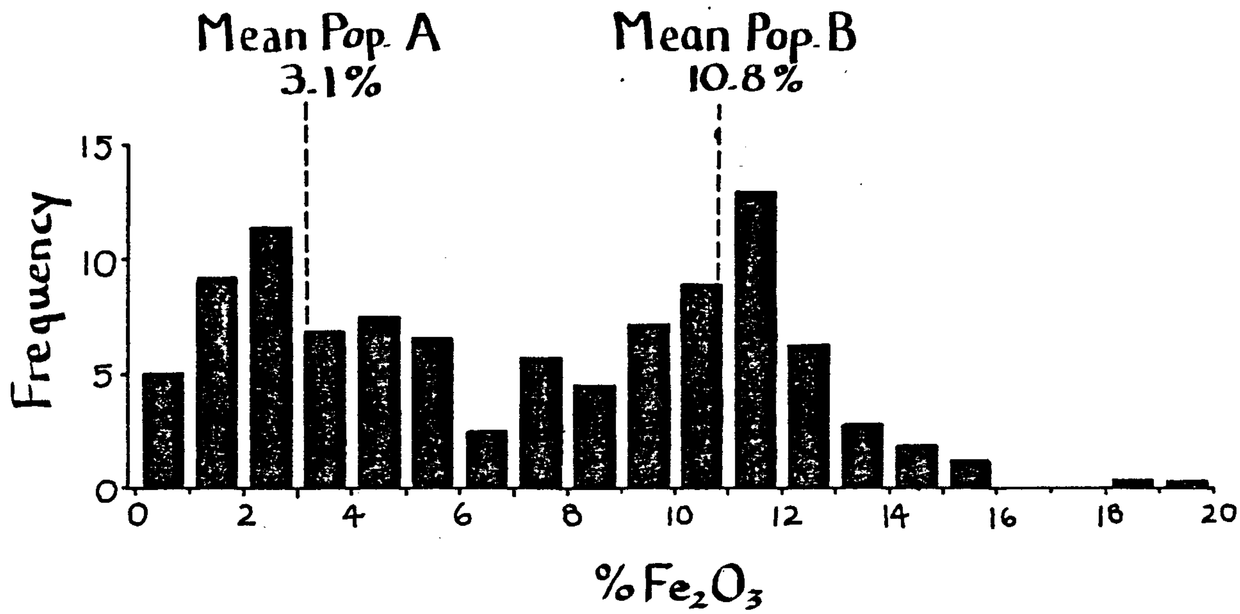
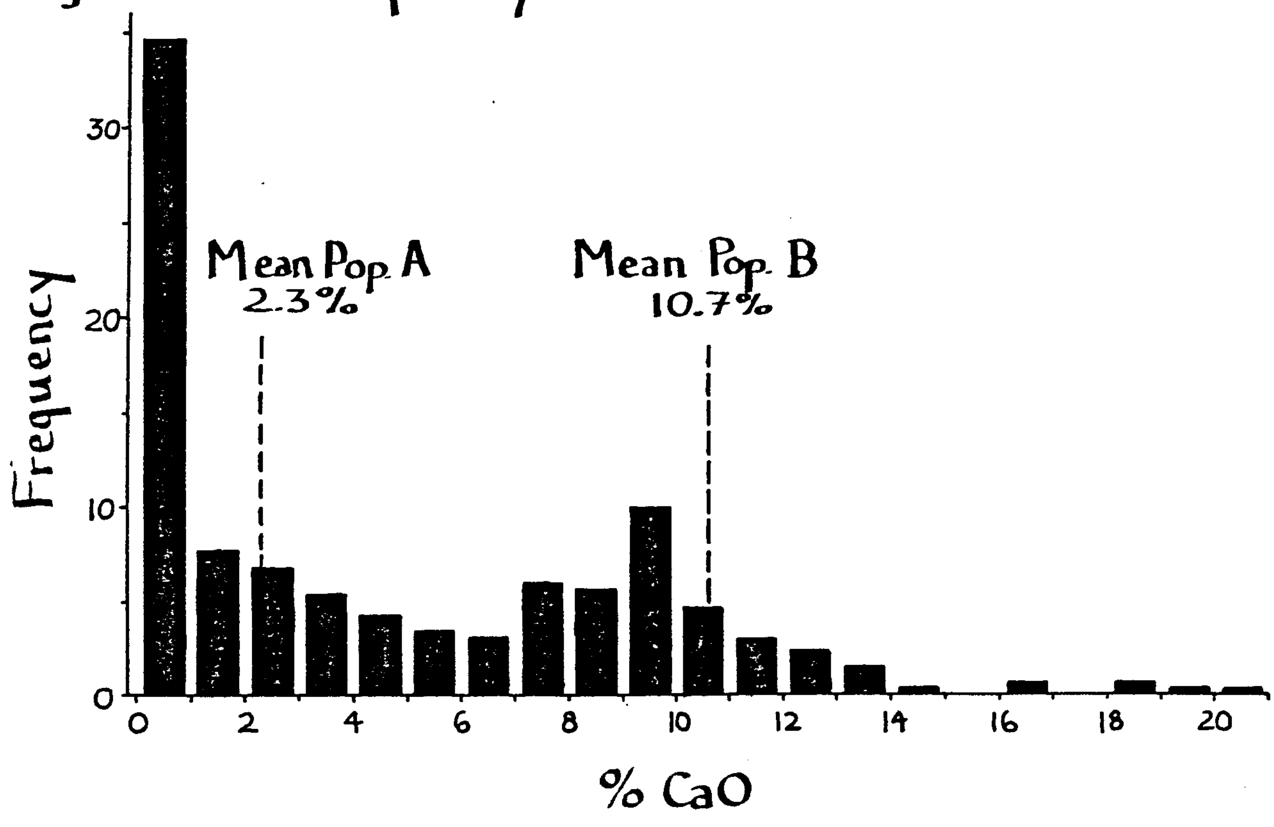


Figure 6 Frequency Distribution CaO



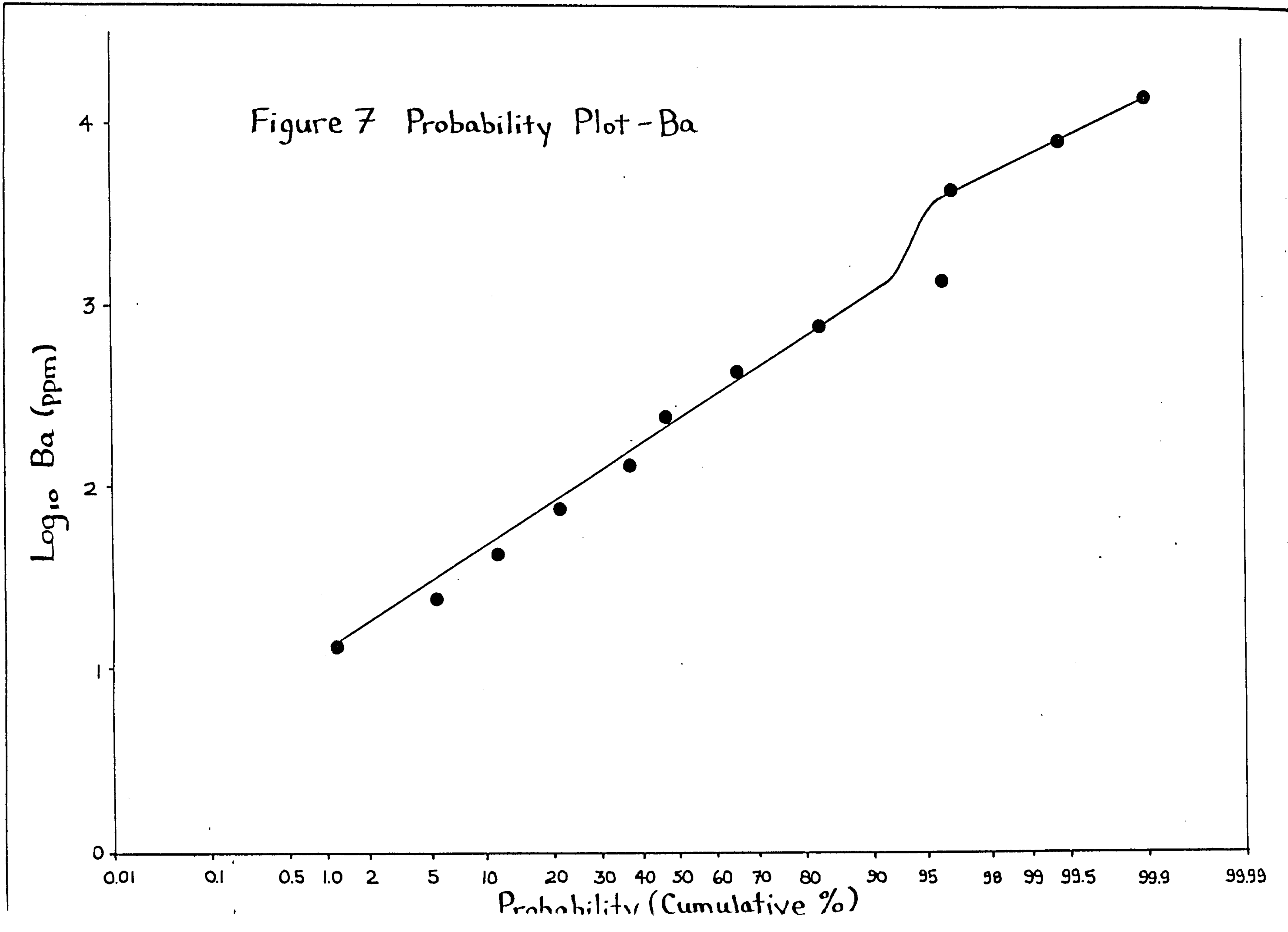


Figure 7 Probability Plot - Ba
Log10 Ba (ppm)
0
1
2
3
4
0.01
0.1
0.5
1.0
2
5
10
20
30
40
50
60
70
80
90
95
98
99
99.5
99.9
99.99
Probability (Cumulative %)

lower, background, threshold is estimated at 1100 ppm Ba corresponding to 90 percentile of the lower population. Barium values greater than 2500 ppm and those from 1100 ppm to 2500 ppm are colour coded on map 2.

3.6 Copper Cu Figure 8

The frequency distribution for copper is lognormally distributed reflecting a large background population and a small number of anomalous samples. A background threshold of 100 ppm was visually selected. The highly anomalous samples, those greater than 250 ppm are colour coded on map 2.

3.7 Zinc Zn Figure 9

Like copper, zinc analyses are lognormally distributed reflecting a large background population and a small number of anomalous samples. A background threshold of 100 ppm and anomalous threshold of 200 ppm were visually selected. The anomalous samples are colour coded on map 2.

3.8 Mount Armour Recce

Geology and results of the lithogeochemical survey on Mount Armour are

Figure 8 Frequency Distribution Zn

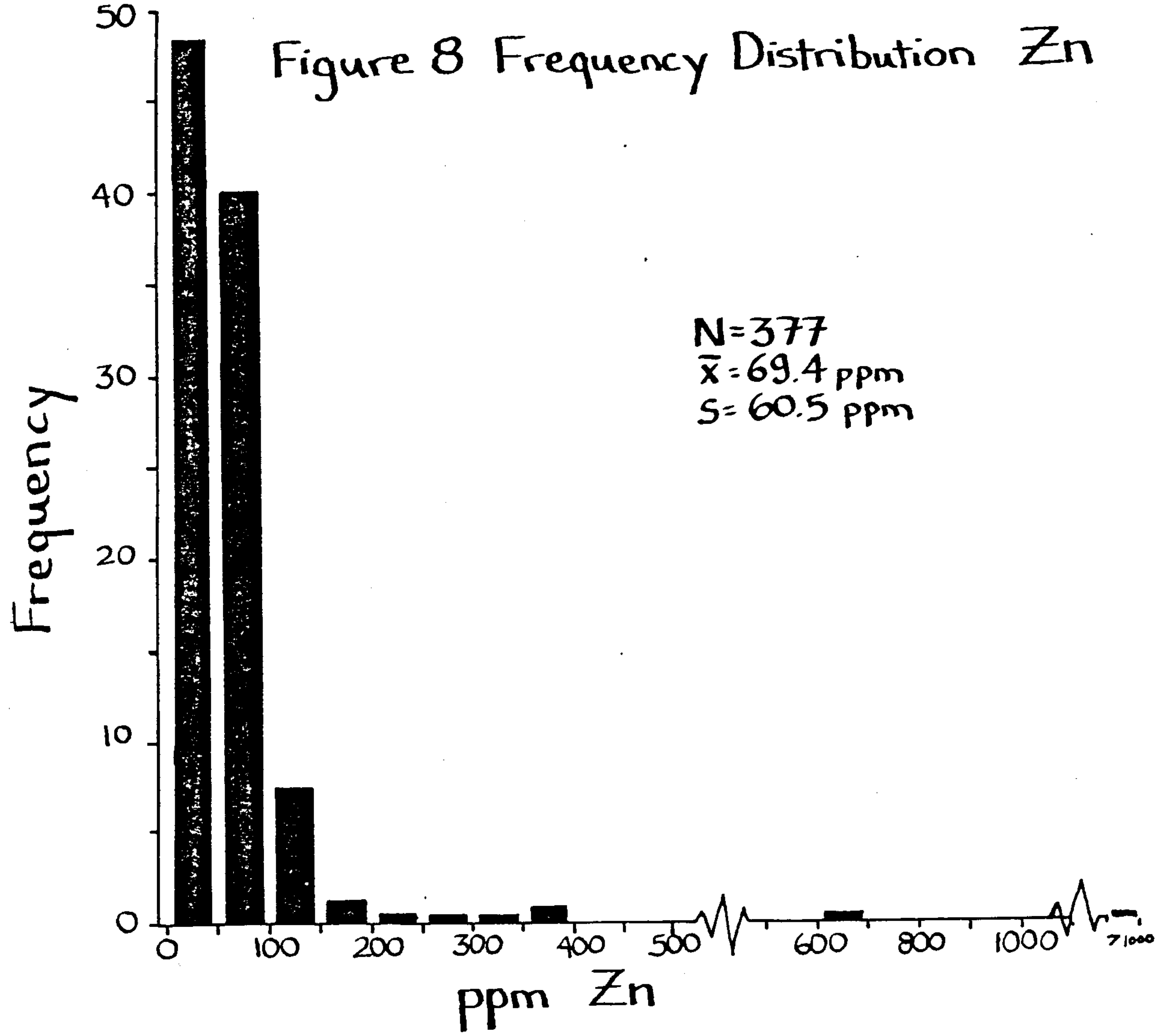
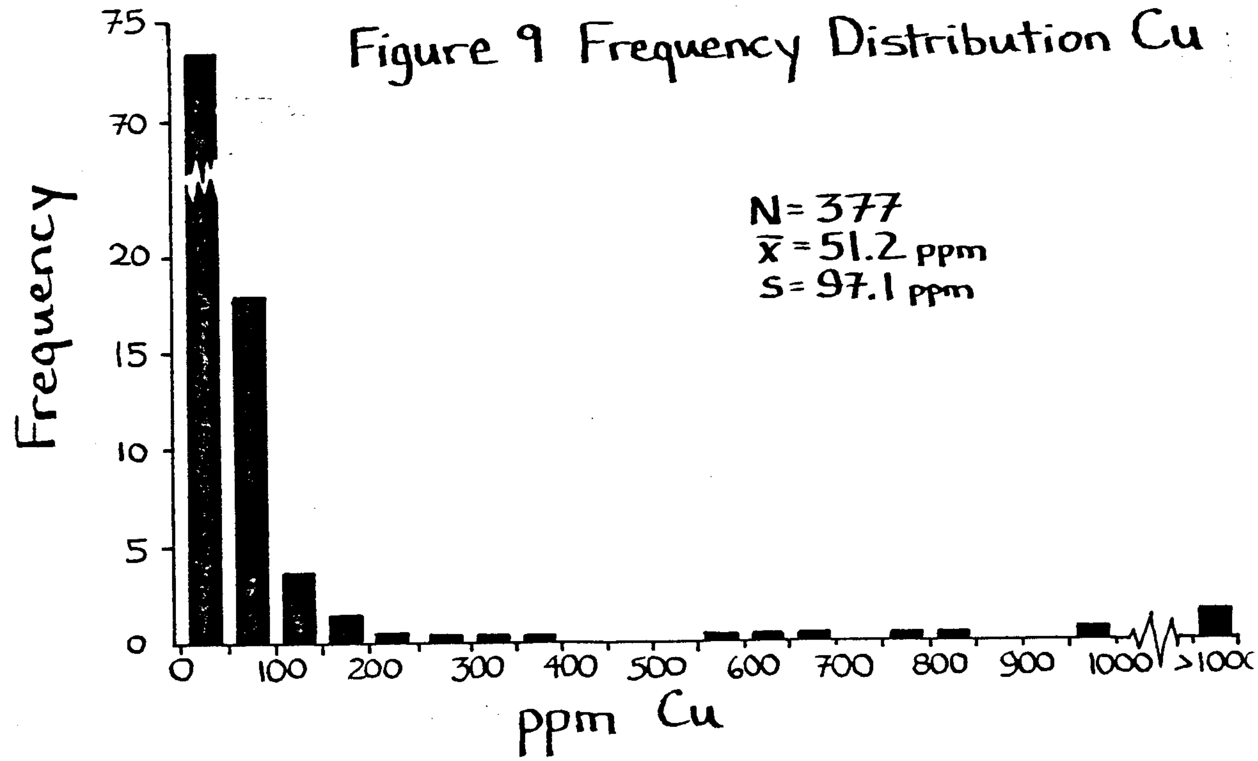
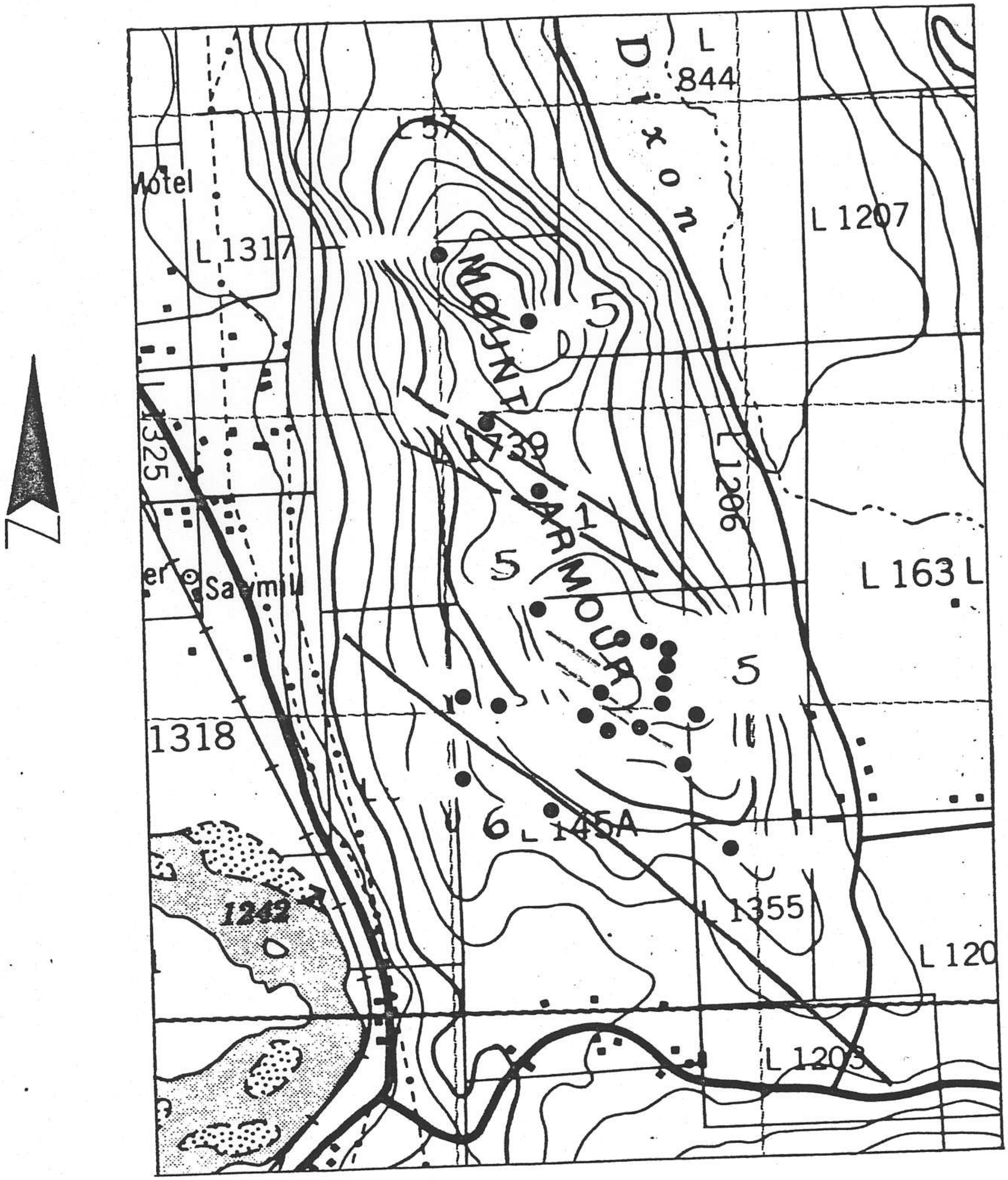


Figure 9 Frequency Distribution Cu





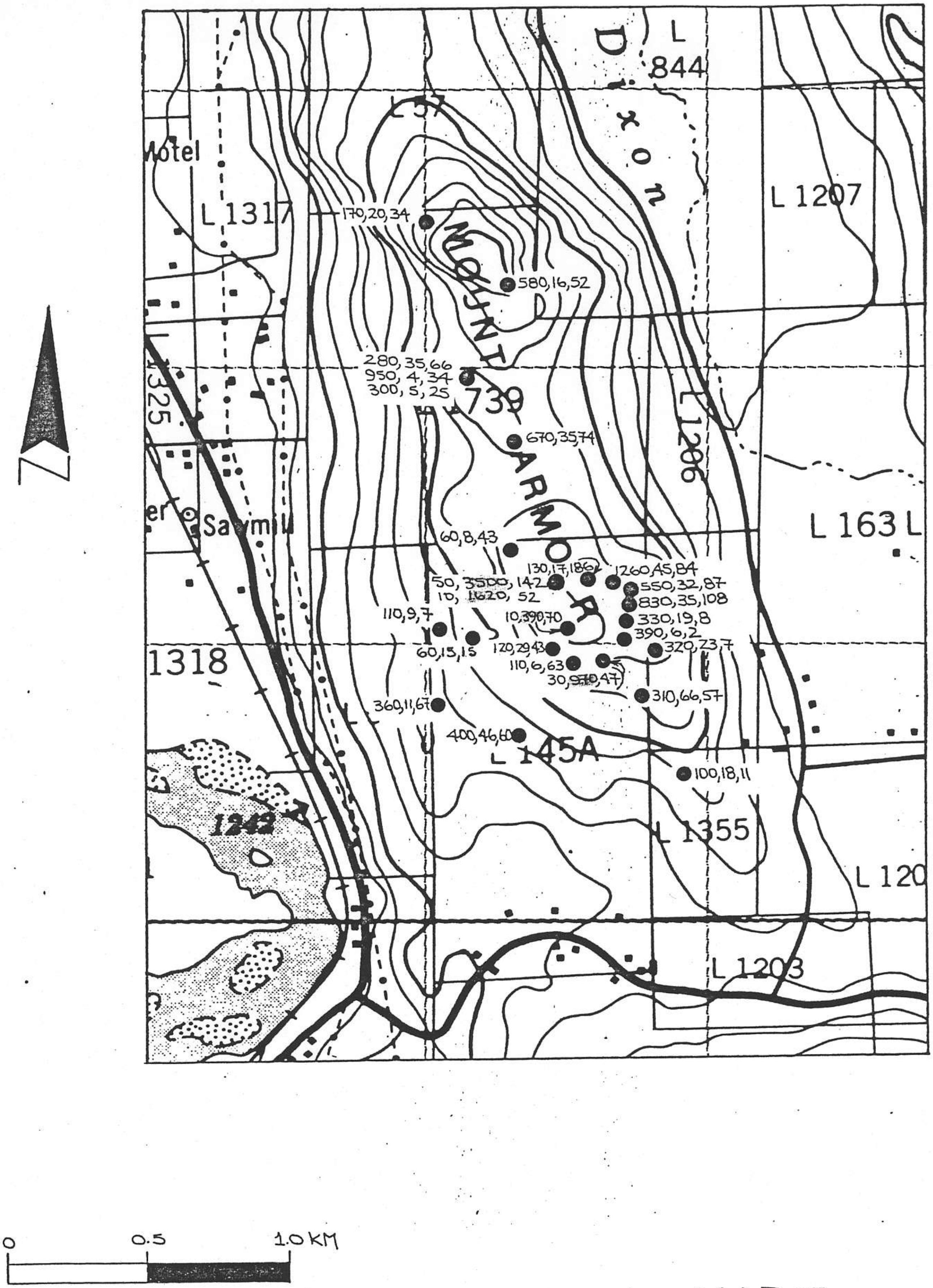
— syngenetic pyrite

'REFER TO LEGEND, MAP 1'

0 0.5 1.0 KM

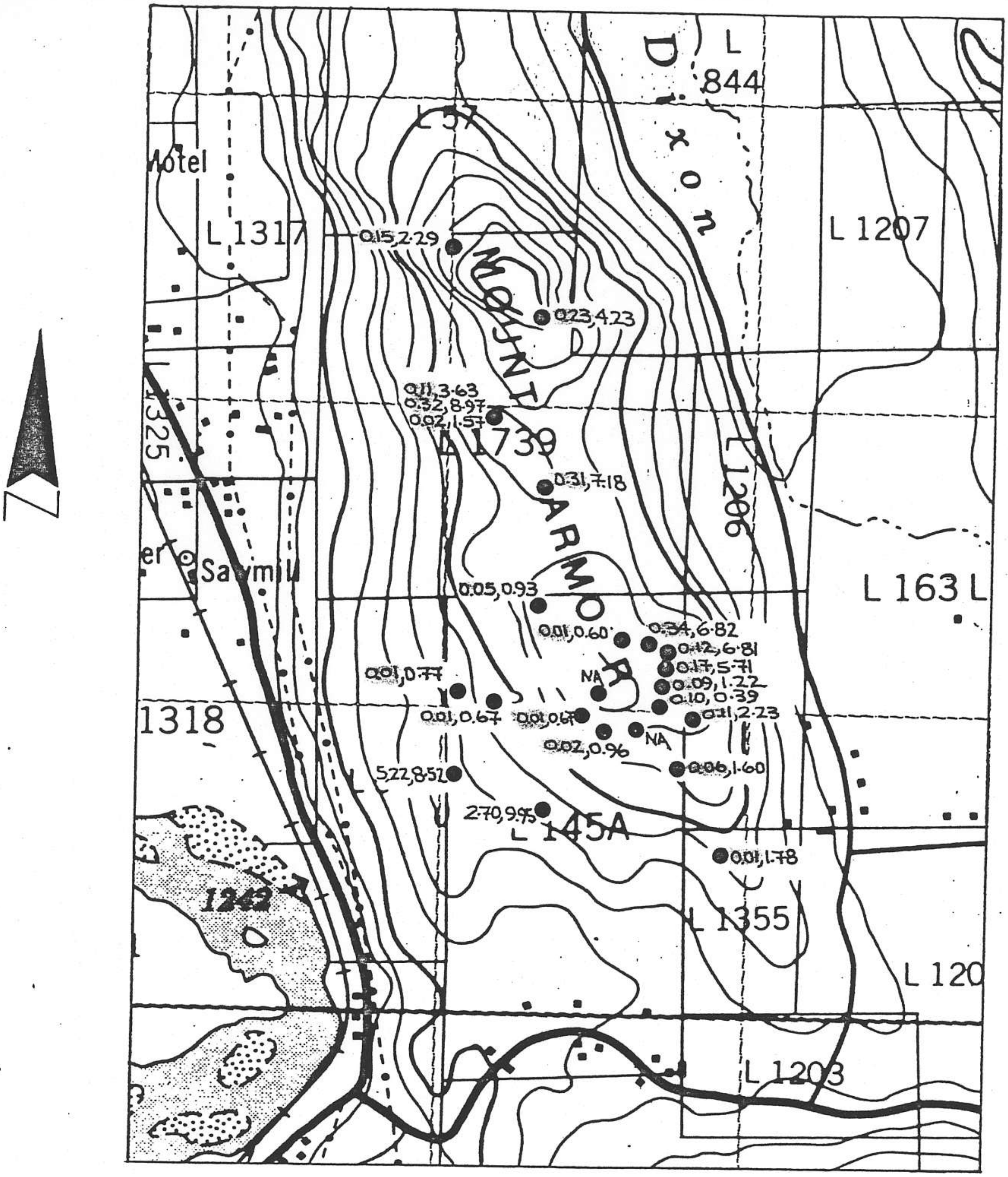
MAP 6

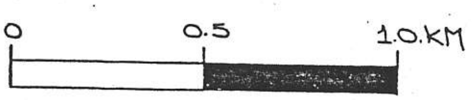
MOUNT ARMOUR RECCE. | GEOLOGY



MAP 7

MOUNT ARMOUR RECCE. | Ba, Cu, Zn DISTRIBUTION

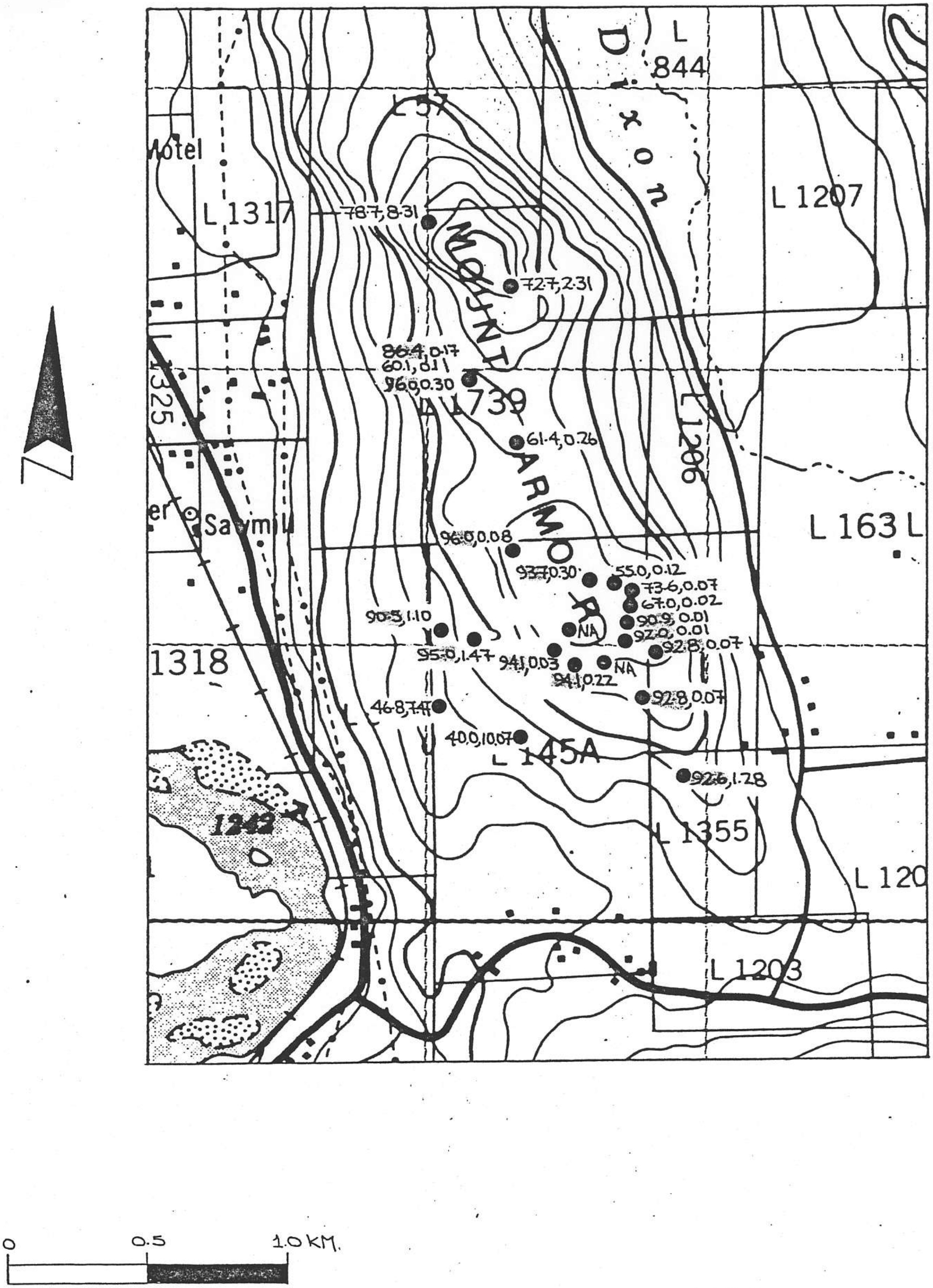




MAP 8

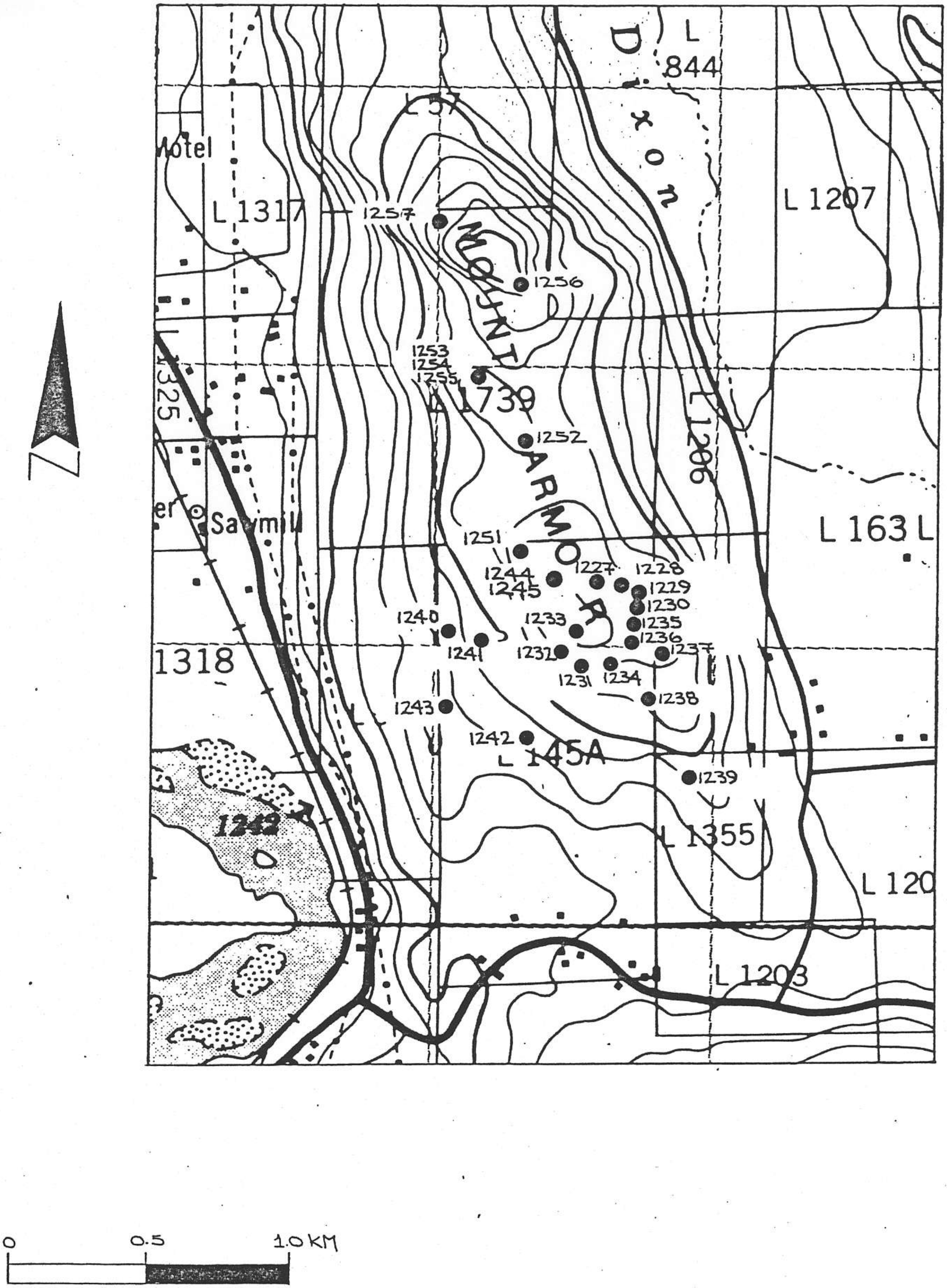
MOUNT ARMOUR RECCE.

Na_2O, Fe_2O_3 DISTRIBUTION



MAP 9

MOUNT ARMOUR RECCE.	SiO_2, CaO DISTRIBUTION



MAP 10

MOUNT ARMOUR RECCE.

SAMPLE LOCATIONS
- SAMPLE NUMBERS

shown on Maps 6, 7, 8, and 9. Lithogeochemical results were processed statistically with all other data from the Barriere study area and the same parameters define anomalies.

Three syngenetic pyrite showings were located, spatially associated with a mass of quartz feldspar porphyry and rhyolite that forms the core of the mountain. All of Mount Armour is characterized by strong Na_2O and CaO depletion and marked SiO_2 enrichment.

Trace element analyses from banded syngenetic pyrite returned:

Sample Number	Ba ppm	Cu ppm	Zn ppm	Au ppb	Ag ppb
1233	10	390	70	82	150
1234	30	970	47	220	1870
1244	50	3500	142	580	830
1245	10	1620	52	298	460

4. DISCUSSION

Results of the lithogeochemical survey, coupled with an understanding of lithologic relationships, will hopefully point toward areas of potential economic mineralization. It is proposed that the Barriere study area is a deformed relict of a felsic volcano-sedimentary complex flanked and overlain by mafic volcanic rocks.

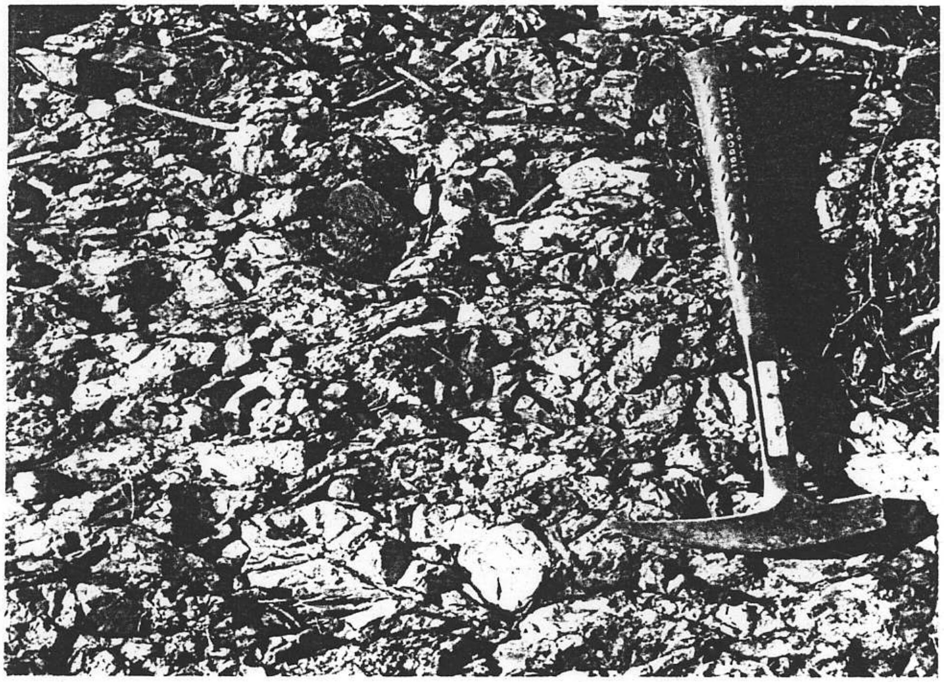
Anomalous lithogeochemistry defines a discontinuous, but correlatable band intimately associated with quartz porphyritic volcanic and volcaniclastic rocks intercalated with mafic volcanic flows lying at the stratigraphic top of the felsic volcano-sedimentary complex. This horizon is associated with a hiatus in extrusive volcanism as evidenced by a restricted sedimentary basin lying immediately above a large portion of this favourable horizon.

The anomalous horizon is lithochemically characterized by:

1. Highly anomalous concentrations of Ba
2. Anomalous concentrations of Cu and Zn
3. Marked Na_2O depletion
4. Marked CaO depletion
5. Marked SiO_2 enrichment
6. Relatively low Fe_2O_3

This anomalous horizon extends across the study area for a distance of 20 km and represents a priority target (map 5).

A discrete zone of highly anomalous barium values exists at the north end of this priority target horizon immediately south of the upper drainage of Birk Creek. It is spatially associated with a zone of sericitic quartz porphyry, intruded by a body of gabbro, and lies in close proximity to black phyllite. Isolated airborne EM anomalies (see map 1) are spatially associated with this anomaly. Cherty rhyolite breccias (figure 10),



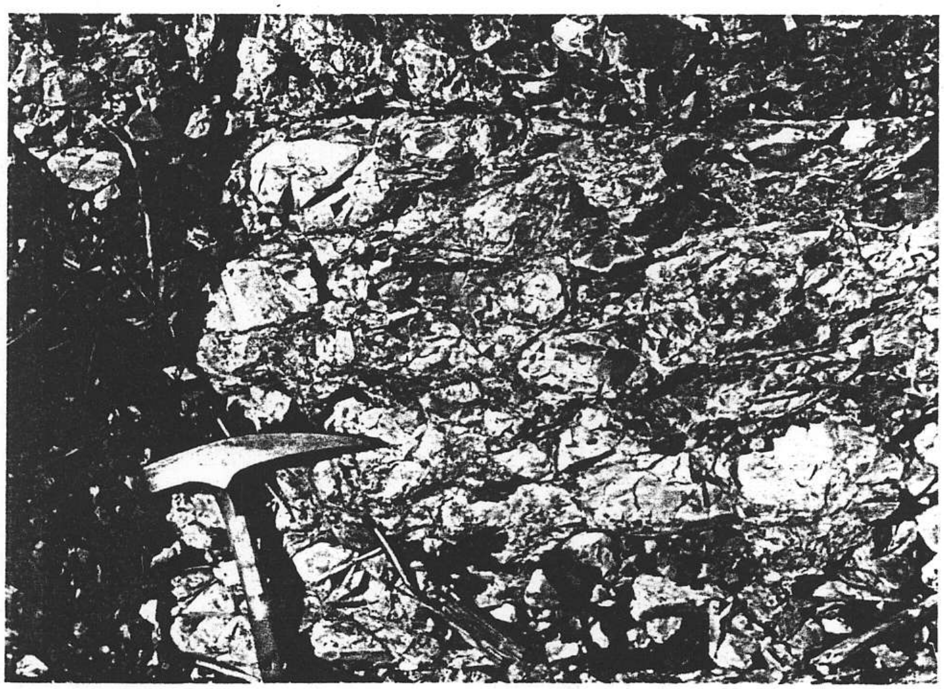


Figure 10 Rhyolite breccia from the Birk Creek top priority area. The area is lithogeochemically characterized by highly anomalous Ba, marked Na_2O and CaO depletion, and SiO_2 enrichment.

typical of many volcanic-associated stratabound massive sulphide environments, occur within this anomalous zone. This anomaly represents a top priority target (map 5).

On Mount Armour the association of anomalous trace elements (Cu,Au,Ag) in syngenetic pyrite, with high SiO_2, low Na_2O and CaO in close proximity to quartz feldspar porphyry, highlights this small area as a top priority target (map 5).

Within the interpreted felsic volcano-sedimentary complex a large area of marked Na_2O and CaO depletion contains local zones of high SiO_2. Trace elements are consistently low. This large anomalous zone is given a low priority target rating (map 5).

4. CONCLUSIONS AND RECOMMENDATIONS

This examination has attempted to interpret the geology of the Barriere area and to define, for further evaluation, areas favourable for hosting volcanigenic massive sulphide deposits.

It is proposed that the study area is a deformed relict of a volcano-sedimentary complex, hosting a bimodal assemblage of felsic and mafic volcanic rocks with a favourable environment for syngenetic ores toward the stratigraphic top of the complex. Quartz feldspar porphyry domes spatially associated with anomalous lithogeochemistry over a 20 km strike length define a priority target area. One highly anomalous area within this favourable horizon defines a high priority target.

It is recommended that further evaluation of the favourable horizon be made with the aim of defining more high priority target areas. Three hundred meter spaced rock and soil sampling traverses across the total length of the favourable horizon is recommended.

The high priority anomaly in the Birk Creek area found during this study is presently controlled by Craigmont Mines Ltd. through an agreement with Vestor Exploration Ltd. An effort should be made to acquire this ground.

Further evaluation, in the form of detailed geology and ground geophysics, is recommended for C.F.C.'s Mount Armour property.

6. REFERENCES

Monger, J. W. H., (1975): Correlation of Eugeosynclinal Tecton O-Stratigraphic belts in the North American Cordillera: Geoscience Canada, Vol.2, No. 1., pp.. 4-10.

Monger, J. W. H., (1977): Upper Paleozoic Rocks of the Western Canadian Cordillera and Their Bearing on Cordilleran Evolution: Can. Jour. Earth Sciences, Vol. 14, pp. 1832-1859.

Preto, V. A. (1979): Barriere Lakes-Adams Plateau Area: B.C.E.M.R., Geological Fieldwork, 1978, Paper 79-1, pp. 31-37.

Preto, V.A.; McLaren, G.P. and Schiarizza, P.A. (1980): Barriere Lakes-Adams Plateau Area: B.C.E.M.R., Geological Fieldwork, 1979, Paper 80-1, pp. 28-48.

Tempelman-Kluit, D.J. (1979): Transported Cataclasite, Ophiolite and Granodiorite in Yukon, Evidence of Arc-Continent Collision: Geol. Sur. Van., Pap. 79-14.