

Rock Geochemical Alteration Studies at the MacLellan Au-Ag Deposit, Lynn Lake, Manitoba

By M.A.F. Fedikow

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Winnipeg, 1992

Energy and Mines

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ABSTRACT

A geochemical study of the host rocks to the MacLellan Main Zone, Nisku and Rainbow Au $\pm$ Ag, Pb and Zn deposits is described. The basaltic volcanic and epiclastic sedimentary host rocks and associated iron formation characterize the Agassiz Metallotect, a 70 km long regional metallogenetic feature in the northern belt of the Lynn Lake greenstone belt. The study also includes a geochemical comparison between relatively unaltered equivalents to the host rocks at Arbour Lake, approximately 11 km northeast of the deposits along the metallotect. Geochemistry of the host rocks to the MacLellan, Nisku and Rainbow deposits indicates the rocks are subalkaline tholeiitic basalts of picritic affinity deposited in an oceanic island/island arc environment. The wall rocks to the MacLellan Main Zone mineralization are characterized by extensive multi-element geochemical haloes that extend for up to 200 m from the mineralized zone into structurally overlying and underlying rocks. Inter-element correlation matrices indicate the wall rocks have been chemically altered by potassic metasomatism, albitization, tourmalinization and carbonatization.

Block-averaged geochemical data from drill core samples indicate the MacLellan Main Zone and Nisku deposits are temporally related with respect to the latest alteration and mineralization process, whereas the Rainbow deposit is a discrete entity. The distribution of Cu, Zn, Co, Ba, Mn and As in the wall rocks also suggests a link between the Nisku and MacLellan Main Zone deposits. Variation in the patterns for Au concentrations suggest that Au mineralization in the host rocks extends to depths greater than that represented by the drill holes sampled for this study.

A geochemical comparison between picritic basalt and sedimentary rocks in the MacLellan Main Zone, to ascertain whether the sedimentary rocks are alteration products of the picritic basalt, indicates the presence of at least two kinds of "sedimentary" rocks. The first probably represents *bona fide* clastic sedimentary rocks (greywacke and siltstone), and the second, alteration products of the picritic basalt. The altered picritic volcanic rocks can be chemically differentiated from the sedimentary rocks on the basis of Ni and Cr concentrations.

Stepwise Discriminate function analysis successfully differentiates mineralized picritic basalts at the MacLellan deposit from basalts of similar composition at Arbour Lake. A statistically acceptable level of discrimination between the two groups was obtained by using only Sb in the analysis. However, the element group Sb, Fe₂O₃, P₂O₅, Na₂O, Cr and Zn attains a higher degree of success in distinguishing mineralized from nonmineralized picritic basalt with fewer misclassified samples.

Factor analysis of the data set identified chemical factors related to lithology, carbonatization, potassic metasomatism and mineralization. The technique failed to identify a broader zone of mineralization-related alteration than was recognized using single element plots. However, the importance of siliceous and biotite-rich zones that are interlayered with the picritic basalt as hosts to the bulk of the gold mineralization in the orebody is reaffirmed by this method.

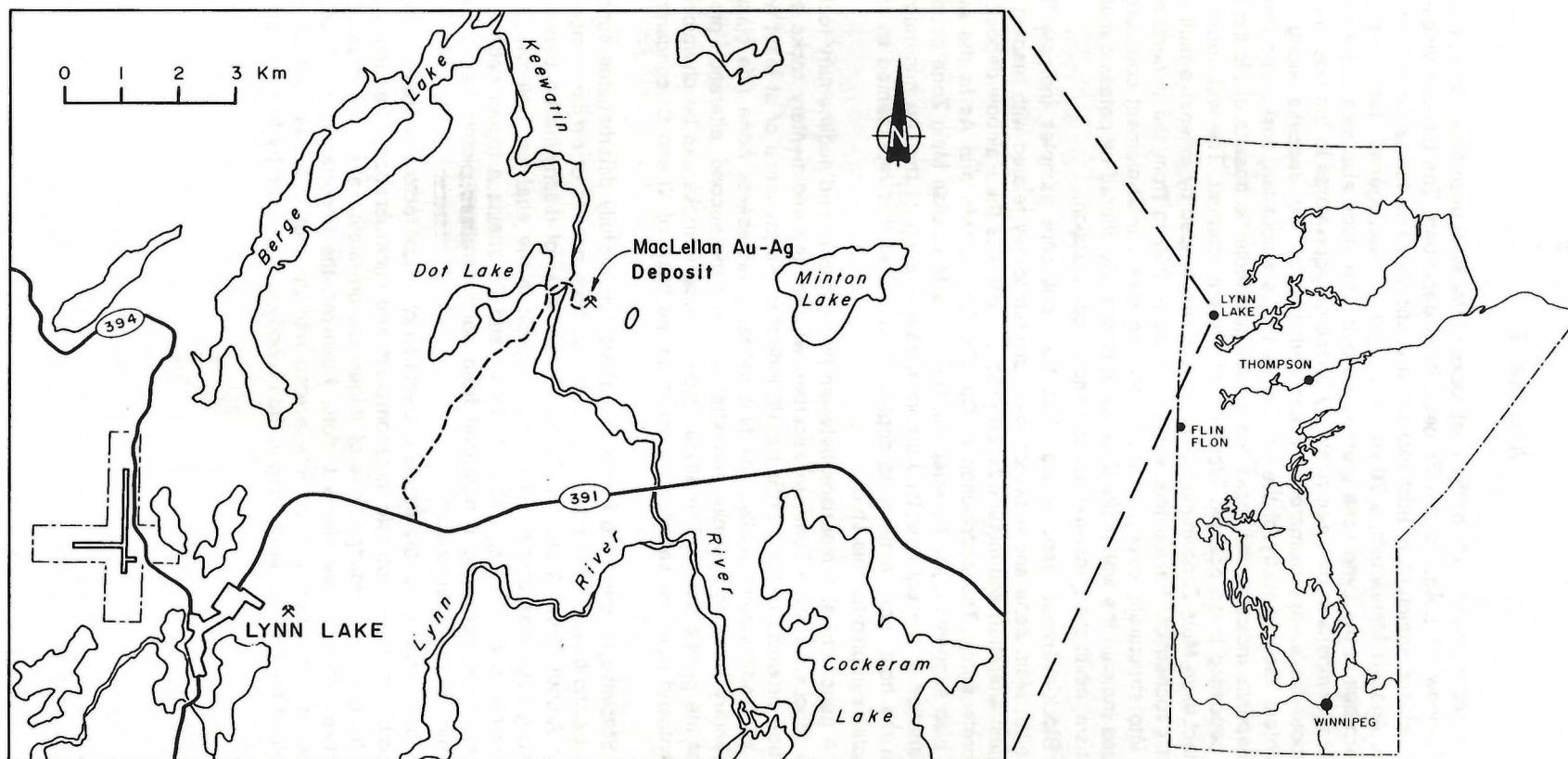


Figure 1: Location map for the study area.

INTRODUCTION

This rock geochemical study examines major and trace element geochemistry of the host rocks to the MacLellan Au-Ag deposit (Fig. 1). The project has been ongoing since 1982, when diamond drill core from the deposit was logged and sampled as part of the development of a mineral deposit data base for the Lynn Lake area (Fedikow and Gale, 1982). Sampling and logging of the drill core at the deposit continued until 1985 with geological and geochemical results reported at the Manitoba Energy and Mines Annual Meeting With Industry, in the annual Reports of Field Activities, as open file reports and in refereed publications in scientific journals.

A suite of mineralized host rocks collected in 1985 from the deposit formed the basis for a B.Sc. (Hons.) thesis by Bernhard Augsten at Carleton University. This study examined the semi-opaque and opaque mineralogy at the deposit (Augsten *et al.*, 1986) and provided valuable mineralogical evidence useful to metallurgical beneficiation of the MacLellan ore. Numerous spin-off projects resulted from the MacLellan study, including the recognition of a regionally extensive metallogenetic feature subsequently named the Agassiz Metallotect (Fedikow, 1983). Several vegetation and peat bog geochemical studies (Fedikow, 1984, 1985, 1986; Fedikow *et al.*, 1974) were initiated along with a regional, helicopter-assisted till sampling program (Fedikow, 1984; Nielsen and Graham, 1985; Nielsen and Fedikow, 1987) designed to evaluate surface geochemical exploration techniques for gold and base metal exploration along the metallotect. The Canada Centre for Remote Sensing has completed a multi-spectral remote sensing survey over the Agassiz Metallotect in an attempt to define areas of metal-induced vegetation stress utilizing airborne remote sensing systems. An open file report describes the results of this study at Farley Lake (Singh *et al.*, 1988, 1989) in proximity to recently discovered Au deposits. The results of geological, geophysical and geochemical investigations undertaken along the Agassiz Metallotect and all salient characteristics of this regional metallogenetic feature have been presented in a thematic map (Fedikow *et al.*, 1990). Mining development of the MacLellan deposit provided an opportunity to further study the mineralization and host rocks; these and other topics formed the basis for an M.Sc. thesis by J. Gagnon (1991).

This report will discuss the implications of the rock geochemical data acquired to date. The aims of this report are: 1) to examine and describe the abundance and distribution patterns of trace and major elements in the MacLellan host rocks; 2) to identify the extent and the chemical elements and compounds diagnostic of mineralization-related alteration; and 3) to determine the nature of the high Mg-Ni-Cr host basalts previously described as "tholeiitic picrite" (Fox and Johnston, 1981) and "basaltic to ultramafic komatiite" (Fedikow, 1986).

Accordingly, the approach to this study has been one of multi-element geochemistry utilizing a wide range of analytical techniques and instrumentation. Examination of geochemical data proceeds from inspection and examination of univariate statistical parameters to multivariate statistical techniques. Seven appendices accompany this report. They represent all rock geochemical data acquired, but not necessarily released, to date. Appendix I describes the analytical methods and specifications for this study. Appendix II lists geochemical data acquired from atomic absorption spectrophotometric, neutron activation, and X-ray fluorescence techniques. Appendix III provides trace and major element geochemical profiles through the MacLellan Main Zone, and Appendix IV gives histograms with descriptive statistics for elements determined in the various lithologic units. Appendix V is a detailed log of a drill hole from the Harbour Lake area from which relatively unaltered "picrite" was collected and subsequently used in comparison with the MacLellan picrite for the multivariable statistical section of this report. Normative mineralogies for MacLellan picritic basalt are given in Appendix VI, and a summary of correlation coefficients is listed in Appendix VII. The listing of the geochemical and other data in these appendices is meant to provide access for other workers interested in mineral deposit problems at the MacLellan, Nisku and Rainbow Au deposits.

Ultimately, these studies are designed to provide explorationists with rock geochemical exploration techniques applicable to the search for repetitions of stratabound gold mineralization associated with picritic basalt, interflow volcanoclastic, epiclastic and chemical sedimentary rocks, and late, overprinting shears and faults within the Agassiz Metallotect. The paucity of outcrop in the northern belt of the Lynn Lake greenstone belt may limit the application of these techniques to samples obtained from diamond drill core.

Prior to this study, only one silicate whole rock and trace element analysis representing MacLellan basalt had been presented (Gilbert *et al.*, 1980). This analysis (Appendix II, Part 4) was from basalt exposed at the east end of the Lynn Lake airport. Prior to 1982, the presence of a regionally extensive high Mg-Ni-Cr basalt in the northern belt of the Lynn Lake greenstone belt had not been recognized. The areal distribution of these basalts and their geochemical characteristics have been the focus of much attention since 1983 when the Agassiz Metallotect (Fedikow, 1983) was first recognized in Manitoba. Data contained within this report will describe the geochemical characteristics of the MacLellan basalts, and a series of 1:5 000 geology maps at selected sites along the metallotect (Parbery, *in press*) will document the areal distribution of these highly prospective rocks.

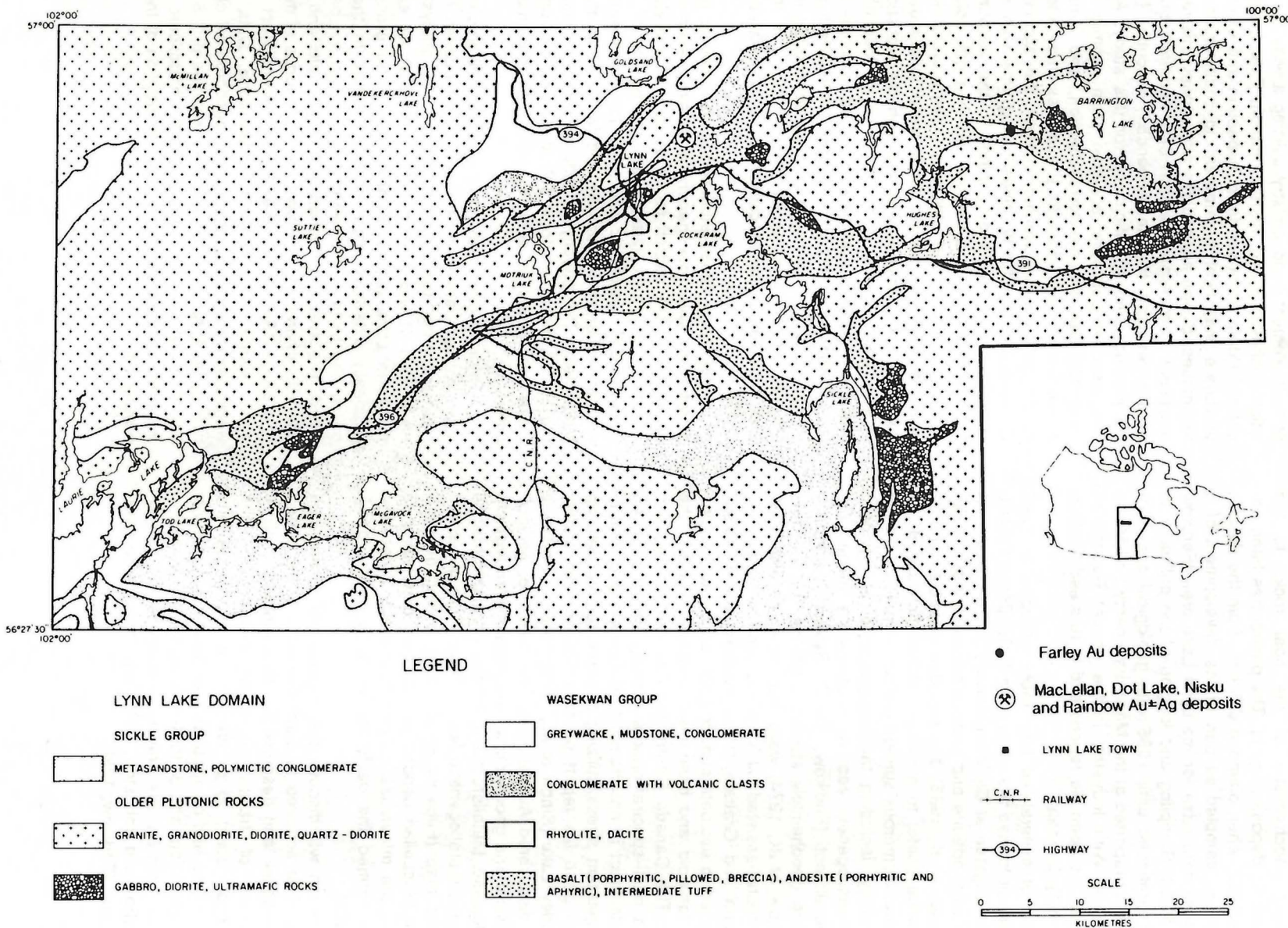


Figure 2: Regional geology of the Lynn Lake area (after Gilbert et al; 1981).

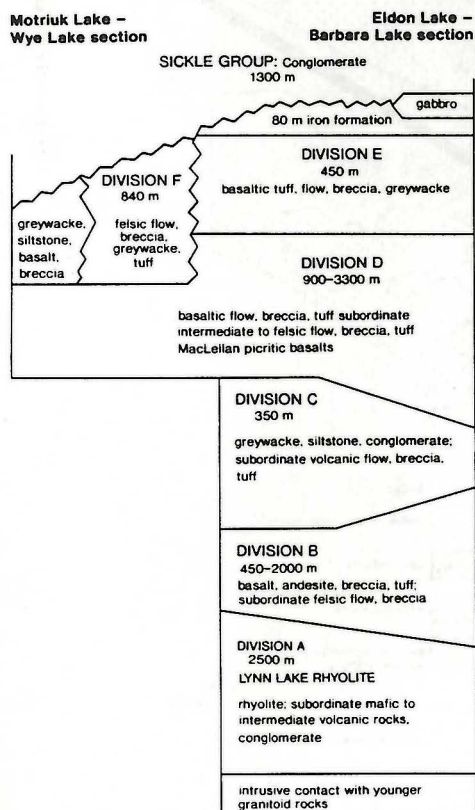
GEOLOGY AND MINERALIZATION

Regional geology of the Lynn Lake area is presented by Gilbert *et al.* (1980) (Fig. 2). The geological setting of the MacLellan Au-Ag deposit has been previously described in Fedikow *et al.* (1986) and Fedikow (1986). A brief geological overview is given here.

The MacLellan deposit occurs within Aphebian epiclastic and chemical sedimentary rocks and high Mg-Ni-Cr basalts in the northern belt of the Lynn Lake greenstone belt, northern Manitoba (Table 1, Fig. 3). These host rocks form a greater than 70 km long east-trending zone of coincident magnetic and electromagnetic anomalies (Fig. 4) that has been named the Agassiz Metallotect (Fedikow, 1983). The geophysical signature is attributable to the presence of stratiform solid iron and base metal sulphide layers, oxide facies chert-siltstone-magnetite iron formation, sulphide facies iron formation, and the magnetite-rich nature of the high Mg-Ni-Cr basalts within the MacLellan deposit stratigraphy. Figure 5 presents a summary of regional geology, airborne INPUT responses and gold deposits along the Agassiz Metallotect.

Table 1

Generalized stratigraphic section through the northern belt of the Lynn lake greenstone belt (modified from Syme, 1985)



Recent field investigations by mineral deposit geologists of Manitoba Energy and Mines indicate the presence of the high Mg-Ni-Cr MacLellan basalts to the west of the Dot Lake area as far as Motriuk Lake (Ferreira, 1986). An analysis of a basalt (analysis 82; Appendix II) collected from the east side of the Lynn Lake airport probably represents the picritic basalts, host rocks to the Au ± Ag deposits and part of the Agassiz Metallotect. The relationship of the Agassiz Metallotect to a string of "impersistent" ultramafic rocks that characterize the Lower Waddy Lake and Henry Lake areas in the Central Metavolcanic Belt within the LaRonge Domain in Saskatchewan is unknown. Fox and Johnston (1980) have described an 800 m thick sequence of ultramafic volcanic rocks that can be traced for approximately 150 km from Waddy Lake, Saskatchewan to the MacLellan deposit. If the high Mg-Ni-Cr basalts that characterize the Agassiz Metallotect are comparable to those described by Fox and Johnston (1980) and by Coombe *et al.* (1986), then approximately 210 km of highly prospective gold-bearing stratigraphy is indicated.

The Agassiz Metallotect stratigraphy is flanked to the north and south by aluminous ($\geq 18\%$ Al_2O_3) fragmental, pillowed, massive and amygdaloidal basalt and heterolithic mafic debris flows. Minor interbeds of epiclastic sedimentary rocks and oxide facies iron formation are present in these rocks.

Mineralization at the MacLellan deposit is characterized by disseminated to near solid iron and base metal sulphides hosted primarily by siliceous and biotite-rich epiclastic sedimentary rocks and high Mg-Ni-Cr basalts. Recent studies of the MacLellan deposit by Gagnon (1991) indicate that some siliceous and/or biotite-rich zones within the orebody may, in fact, represent intensely altered basalt, rather than discrete sedimentary layers. According to this hypothesis alteration has proceeded outwards from a shear zone ("North Shear") or subsidiary *en echelon* shears and mineralizing fluids have intensely silicified the host basalts. High Mg-Ni-Cr basalts also host gold mineralization associated with disseminated and solid layers of iron and base metal sulphide minerals. Both the epiclastic and basaltic rocks contain gold-bearing quartz-carbonate-polymetallic sulphide layers and veins that have been deformed into discontinuous lenses and laminae lying within the foliation. Gold and silver are preferentially associated with sulphide minerals although native gold, electrum and auriferous silver are present. Gold is also associated with sulphide mineralization in a series of late crosscutting quartz veins marked by iron sulphide- and sphalerite-coated internal fractures. This iron and base metal mineralization also occurs as a "rind" at the contact between the quartz vein and wallrock and has mineralized fractures in the quartz veins; this style of mineralization is considered to represent mobilizate. Augsten *et al.* (1986) describe the ore minerals and their interrelationships, and have identified the following semi-opaque and opaque minerals in the deposit: pyrite, pyrrhotite, arsenopyrite, sphalerite, galena, chalcopyrite, ilmenite, rutile, magnetite, tetrahedrite-freibergite, polybasite, pyrrargyrite,

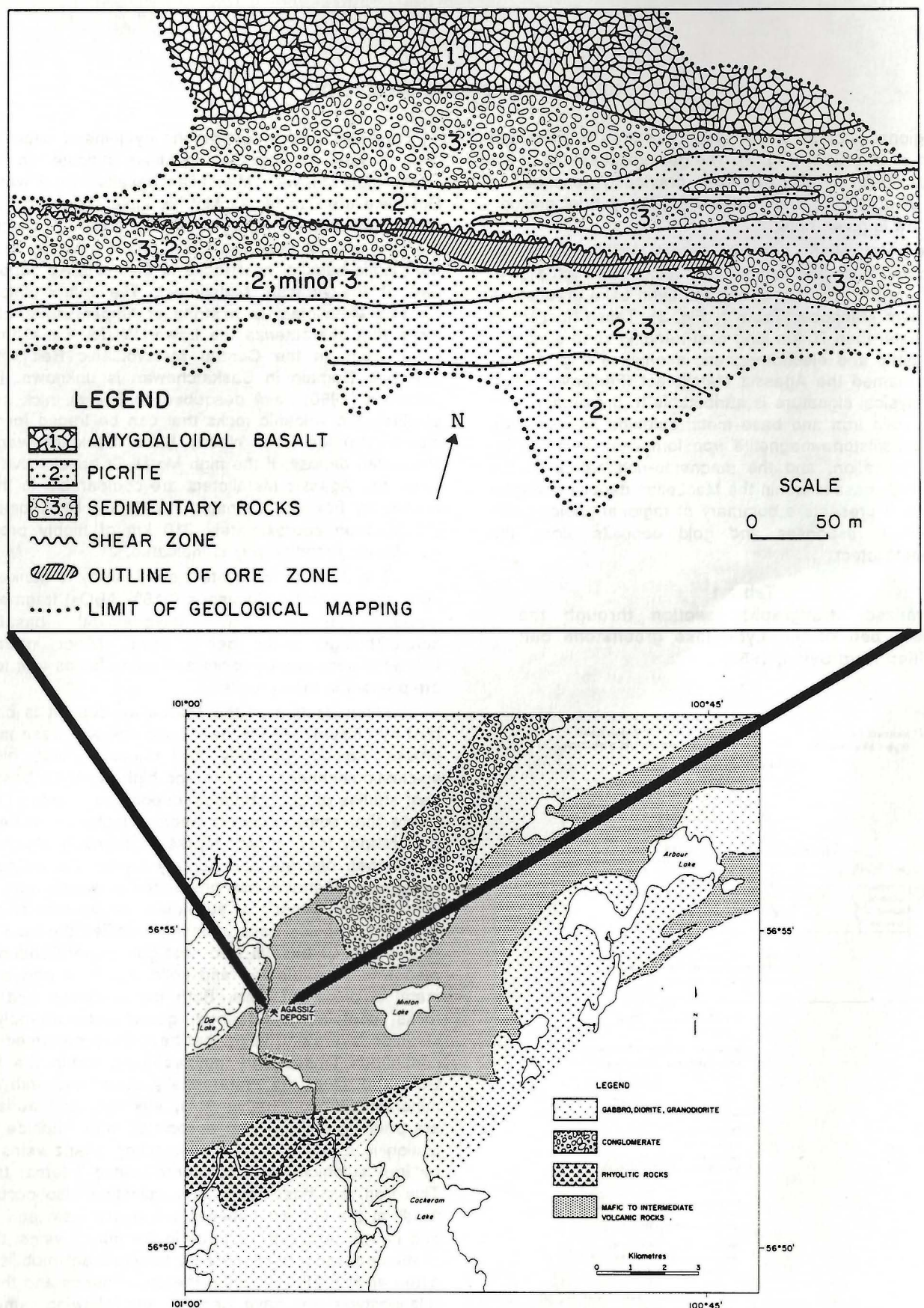


Figure 3: Local geology of Wasekwan Group rocks in the vicinity of the MacLellan Au-Ag deposit and a plan view of deposit geology.

geochronite, native gold, electrum, auriferous silver, pentlandite, argentopentlandite, breithauptite, ullmanite, titanite and gahnite. Overall, the ore was found to be enriched in Ni, As and Sb indicating, in part, derivation from ultramafic source rocks (Fedikow, 1986).

To date, the MacLellan Main Zone Au-Ag deposit contains reported reserves of 1 174 000 tonnes grading 6.51 g/t Au and 18.89 g/t Ag. The Nisku deposit, which occurs east

and immediately adjacent to the Main Zone deposit, contains 187 000 tonnes grading 6.51 g/t Au, 1.3% Zn and 0.8% Pb. The Rainbow deposit, which occurs west and immediately adjacent to the Main Zone deposit, contains 593 000 tonnes grading 8.57 g/t Au. Further west at Dot Lake (Fig. 6), seven gold zones have been discovered with a combined grade and tonnage of 1,248 000 tonnes grading 4.01 g/t Au.

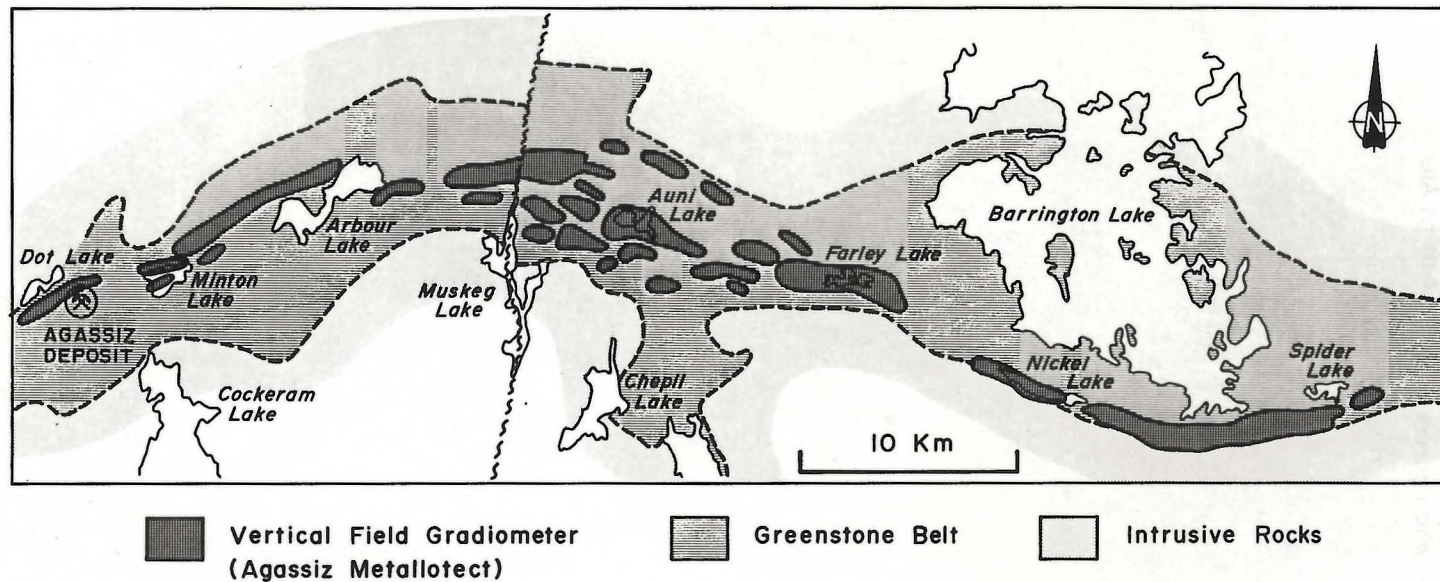


Figure 4: Location of the MacLellan (Agassiz) Au-Ag deposit along the Agassiz Metallotect. The deposit location is marked by the crossed hammer symbol in the Dot Lake area.

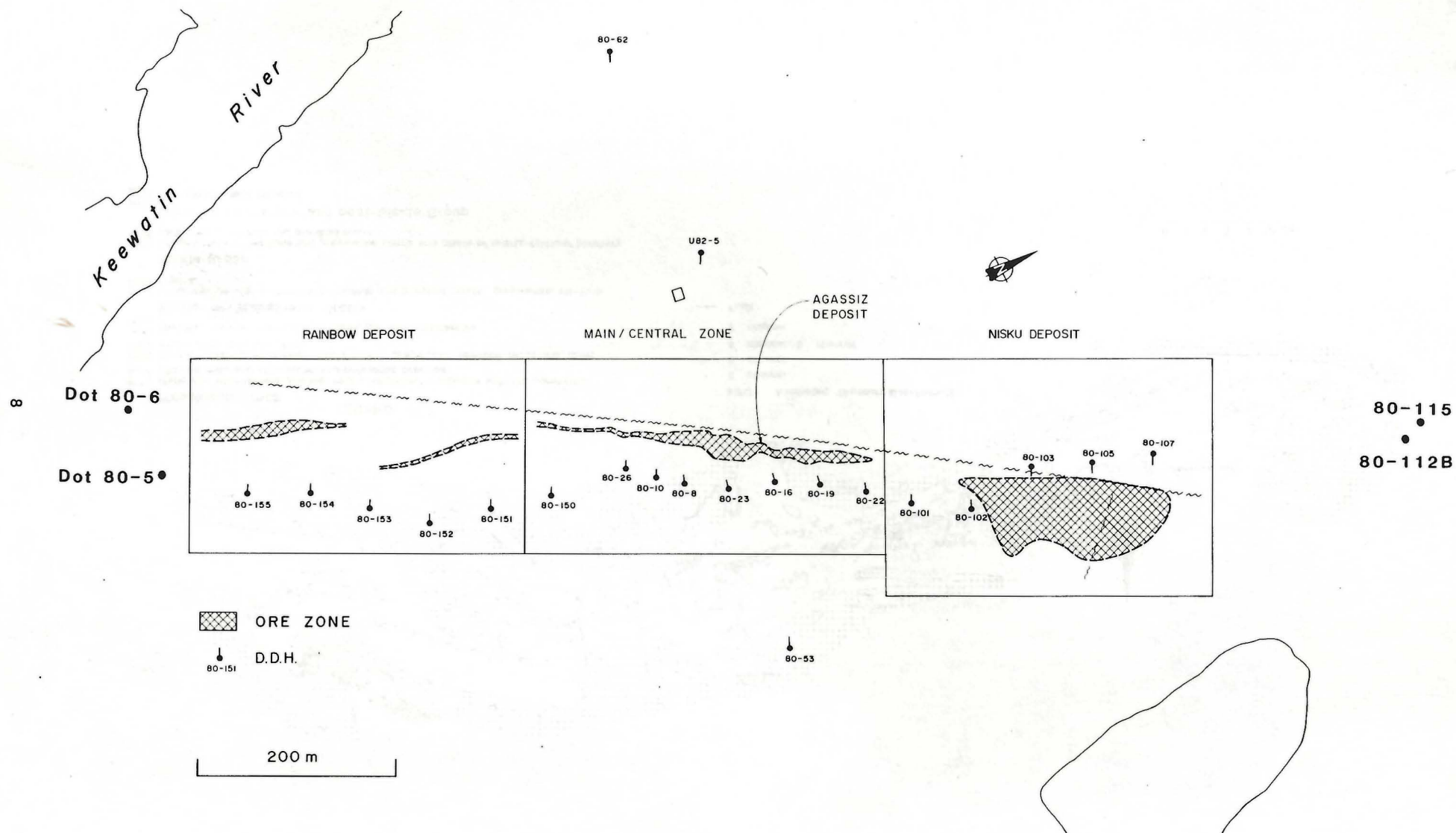


Figure 6: Diamond drill holes logged and sampled for this study and their relationships to the Rainbow, MacLellan Main Zone and Nisku deposits.

SAMPLE COLLECTION, PREPARATION AND ANALYSIS

Due to the paucity of the outcrop in the vicinity of the MacLellan Au-Ag deposit, the overwhelming majority of rock samples collected for this study represent diamond drill core composite chip samples. Six pieces of split diamond drill core, each 6 to 7 cm long and with core diameters varying with drill bit diameter, were collected over a 3 to 5 m interval or from each lithologic unit where the thickness of the unit was less than 3 to 5 m. The sample spacing is erratic due to the generally thin-bedded nature of the host rock units. Five pieces of core were jaw crushed to 5 mm chips and pulverized for 2 minutes in a tungsten carbide dish using a Tema Mill. The sixth piece of core was retained as a reference sample and for thin section studies. Obvious sulphide and carbonate minerals and other nonrepresentative material were avoided during sampling. A total of 511 samples were collected from 21 drill holes in this manner (Fig. 6).

A suite of 17 samples were collected from washed outcrops representing the Main Zone of the deposit. These samples were collected using a portable, water cooled GSC sampling drill. Each sample consists of five drill cores approximately 10 cm long drilled from sites within a 5 to 10 m² outcrop area. The five cores were bulked to give one composite sample. These samples were collected from the vicinity of the Main Zone deposit, and accordingly, contain visi-

ble iron sulphides and arsenopyrite. The locations of drill core samples from the MacLellan deposit are illustrated in Figures 7, 8 and 9. A sample suite collected from diamond drill core at Arbour Lake was consistent with the larger MacLellan data set in terms of collection and preparation, as are all other bedrock samples collected for this study. Duplicate, replicate and internal laboratory standards were included with the main sample population to monitor analytical variation and reproducibility of the analyses.

ANALYSIS

Major and trace element analyses were undertaken utilizing a variety of analytical techniques. The methods are summarized in Appendix I. Some analyses were contracted to commercial analytical laboratories owing to a demonstrated analytical expertise for particular elements and/or the presence of state-of-the-art technology in these laboratories. This allows the cost-effective, precise, accurate and rapid determination of specific elements at lower limits of detection than is possible in the Geological Services analytical laboratory. The standard analytical techniques of atomic absorption spectrophotometry (AAS) and neutron activation (INAA) formed the basis for the bulk of rock geochemical data for this study.

NISKU DEPOSIT

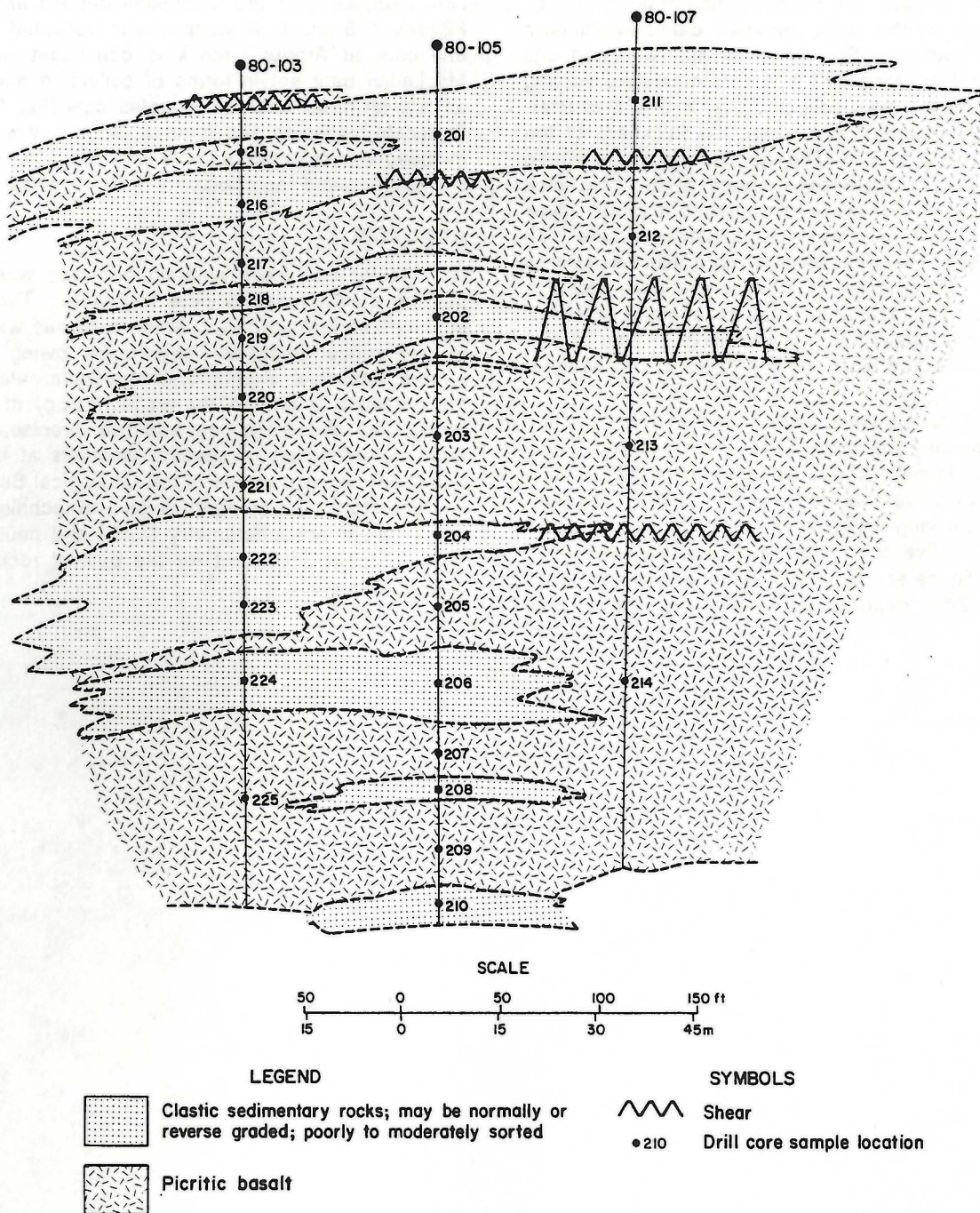


Figure 7: Simplified geologic section through the Nisku deposit. Location of drill core samples collected and the drill holes logged for this study are given in Figure 6.

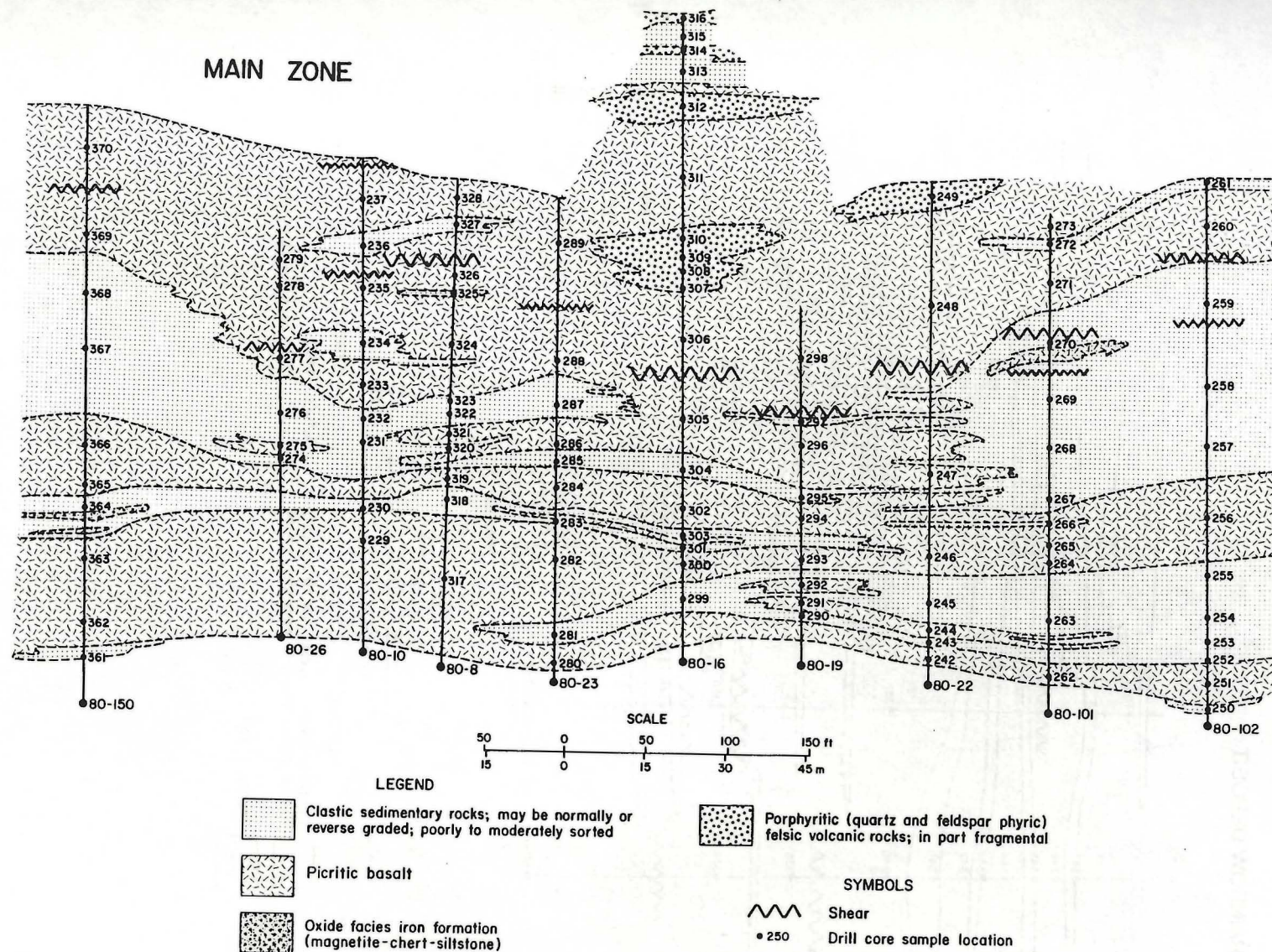


Figure 8: Simplified geologic section through the MacLellan Main Zone. Location of drill core samples collected and the drill holes logged for this study are given in Figure 6.

RAINBOW DEPOSIT

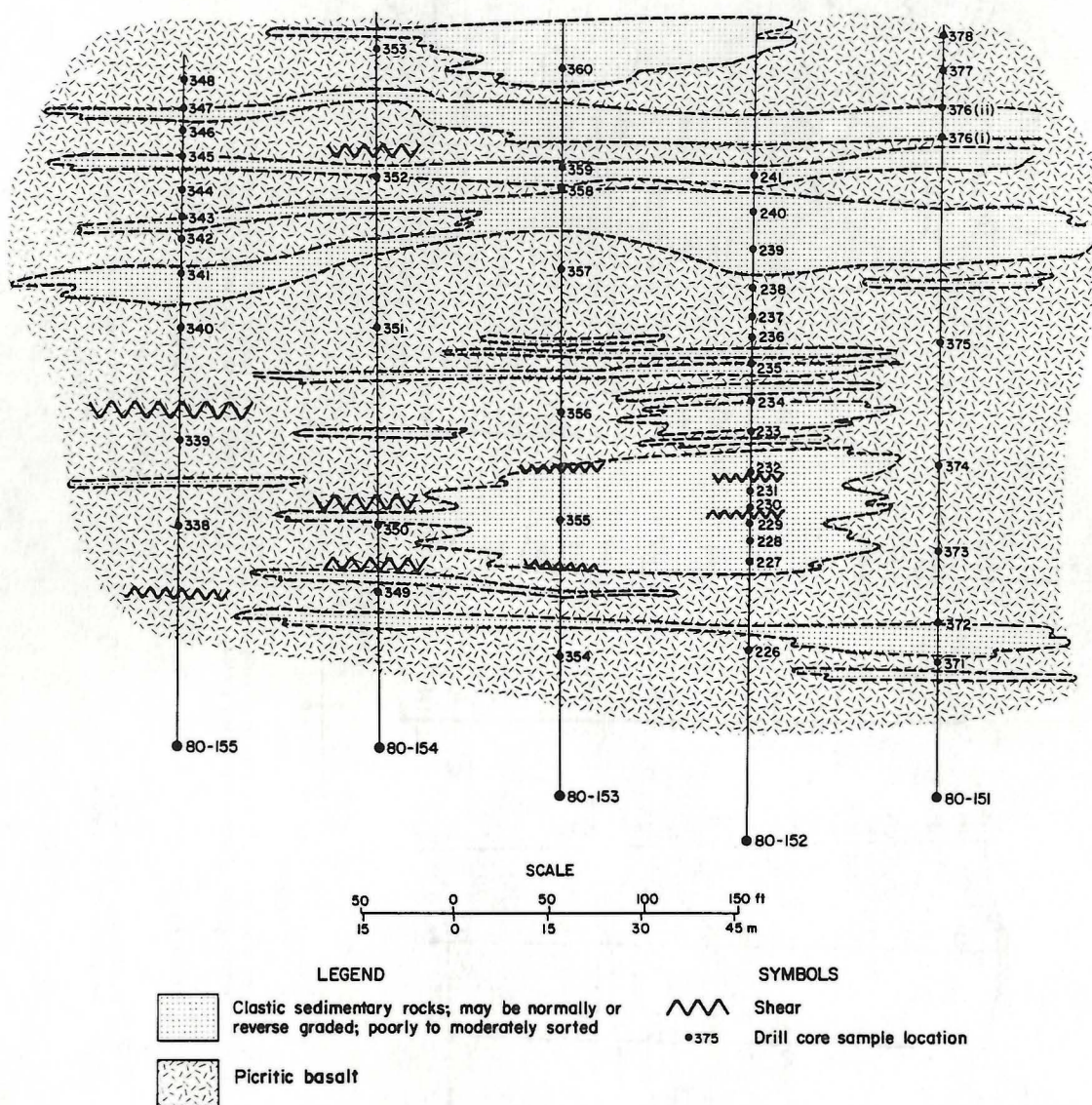


Figure 9: Simplified geologic section through the Rainbow deposit. Location of drill core samples collected and the drill holes logged for this study are given in Figure 6.

CHEMICAL COMPOSITION OF THE HOST ROCKS

INTRODUCTION

The chemical composition of the host rocks to the MacLellan, Nisku and Rainbow Au $\pm$ Ag deposits is described. The data are used to (i) document the composition of the host rocks to the deposit, and attempt to address the geochemical constraints on the possible tectonic setting of these rocks, (ii) compare altered and relatively less altered stratigraphic counterparts, and (iii) examine and compare the major and trace element chemistry of the MacLellan "picrite" and the siliceous and biotite-rich "sedimentary" rocks.

Two lithologic groups are discussed. These are the high Mg-Ni-Cr basalts, locally referred to as picritic basalts, and the clastic sedimentary rocks that host the bulk of the sulphide and gold mineralization. Although the title of this report infers that only the MacLellan deposit is discussed, the host rocks to the Nisku and Rainbow deposits are also discussed owing to the close spatial association of the three deposits.

Histograms with descriptive statistics for each of the units of interest at the respective deposits are given in Appendix IV.

Data were normalized to 100% before being utilized in plotting routines.

HIGH Mg-Ni-Cr BASALTS/PICRITIC BASALT ("PICRITE")

The high Mg-Ni-Cr basalt that hosts the MacLellan, Nisku and Rainbow Au $\pm$ Ag deposits is generally an olive to light green, fine- to coarse-grained, chlorite-rich rock unit with subordinate amounts of biotite, carbonate, garnet, magnetite and plagioclase. The granularity of these rocks serves as a basis for classifying this unit into fine-, medium- and coarse-grained picrite during field mapping. The granularity is due to the abundance of amphibole porphyroblasts, which is thought to reflect the degree of fluid flow and, therefore, alteration (D. Speakman, pers. comm.). The units are aphyric and commonly rusty weathered, carbonatized and silicified in outcrop. In the area of the MacLellan deposit, the picritic basalt has no primary depositional features, however, elsewhere in the northern belt tuffaceous, pyroclastic and pillowed varieties have been recognized (Parbery and Fedikow, 1987; Parbery, 1988).

Table 2 presents five silicate whole rock and trace element analyses for host picrites. These analyses indicate the diagnostic elements for "fingerprinting" the picrite are MgO (14.5 to 19.6%), Ni (543 to 861 ppm) and Cr (1165 to 1564 ppm). Low Na₂O (0.01 to 0.5%) and K₂O (not detected to 0.6%) are characteristic although undoubtedly some Na depletion resulted from the mineralizing process. The Ni contents are variable throughout the rocks due to the presence of nickeliferous pentlandite (Augsten *et al.* 1986). The high loss on ignition analyses reflect the hydrated phyllosilicate dominated mineralogy of these rocks and the presence of carbonate and sulphide in some samples.

Table 2

Representative major and trace element analyses of MacLellan basalts. Silicate whole rock results in weight %. Trace element concentrations represent total amounts by wet chemical dissolution (Cu, Zn, Ni, Cr) and x-ray fluorescence. AGC-68P contains 1200 ppb Au. All others are nonmineralized.

Sample No.	AGC-68P	AGC-225	AGC-273	AGC-557	AGC-564
SiO ₂	47.9	44.8	47.6	44.8	42.4
Al ₂ O ₃	9.2	8.4	9.8	8.2	8.4
TiO ₂	1.3	1.1	0.7	1.6	1.6
Fe ₂ O ₃ ^T	12.6	11.8	11.9	13.5	14.3
MnO	0.53	0.20	0.18	0.24	0.17
MgO	14.5	18.9	15.4	17.8	19.6
CaO	12.0	9.5	9.5	9.8	8.7
Na ₂ O	0.4	0.1	0.5	0.2	0.2
K ₂ O	0.2	0.1	0.6	0.1	nd
P ₂ O ₅	0.17	0.10	0.09	0.10	0.12
LOI	1.2	4.9	3.9	3.9	4.7
TOTAL	100.0	99.9	100.2	100.2	100.1

ppm

Ba	76	50	123	64	66
Zr	82	56	43	82	79
Sr	135	196	308	27	87
Rb	2.0	2.2	14	nd	nd
Y	14	10	8	15	16
Ni	543	736	582	861	816
Cr	1233	1464	1165	1564	1268
V	244	211	232	279	263
Nb	6	5	5	8	5
Zn	194	119	147	123	93
Cu	96	55	72	36	102

nd - not detected

Prior to this study the host rocks to the MacLellan deposit had been described by Fox and Johnston (1981) as tholeiitic picrite and by Fedikow (1986) as basaltic to ultramafic komatiite. The term "picrite" has been used by mineral explorationists working in the northern belt of the Lynn Lake greenstone belt. Standard petrochemical diagrams were used to attempt to classify these rocks with major and trace element analyses selected from Appendix I. The analyses utilized were from "least altered" samples, i.e., those samples with low base and precious metal contents and no visual carbonatization, silicification or iron-stained zones. An exception is analysis AGC-68P, a visibly unaltered picrite from the MacLellan Main Zone that contains 1200 ppb Au. The high gold analysis is interpreted to represent the presence of one or more grains of visible gold in the sample. Results for this classification are listed in Table 3.

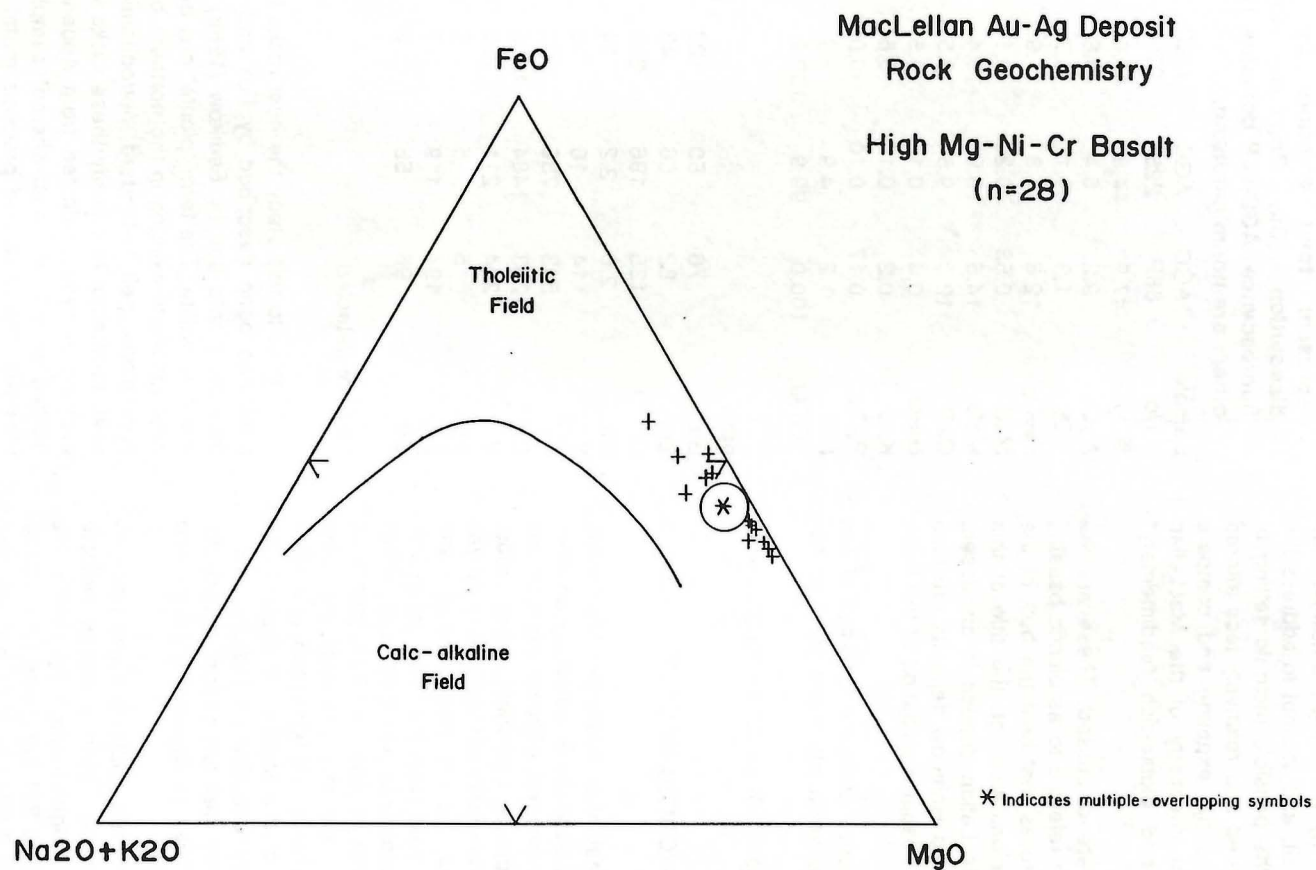


Figure 10: AFM plot for MacLellan picritic basalts (n=28). Nomenclature and field boundaries after Irvine and Barager (1971).

Table 3

Summary of trace and major element discrimination diagrams used to characterize the MacLellan "picritic" basalts

Plot	Reference	Result
1. Jensen Cation (Jensen, 1976)	Figure 13	Basaltic to ultramafic komatiite
2. Al_2O_3 -[FeO/(FeO/MgO)] (Na_2O+K_2O)/SiO ₂	Figure 12	Subalkaline komatiite
3. FeO-MgO-(Na_2O+K_2O) (Irvine and Baragar, 1971)	Figure 10	Tholeiitic
4. (TiO ₂ x100)-Cr-(Y+Zr) (Davies et al., 1979)	Figure 11	Tholeiitic
5. TiO ₂ -P ₂ O ₅ -K ₂ O (Pearce et al., 1975)	Figure 19	Oceanic
6. (Ti/100)-(Sr/Zr)-Zr (Pearce and Cann, 1973)	Figure 17	Ocean floor basalt (scattered data)
7. (Ti/100)-(Yx3)-Zr (Pearce and Cann, 1973)	Figure 18	Ocean island or continental basalt
8. Ti-Zr (Pearce, 1982)	Figure 20	Scatter between arc and within-plate lavas
9. Cr-Y (Pearce, 1982)	Figure 14	Picrite
10. Cu-Zn-Pb (this study)	Figure 15	Cu-rich relative to Pb and Zn
11. Au-Sb-As (this study)	Figure 16	Au-rich relative to As and Sb
12. Au-(Ni+Cr) (this study)	Figure 21	Highest gold in rocks with (Ni+Cr) <500 ppm

Ideally, the large ion lithophile elements (LILE) such as Cs, Rb, K, Ba, Sr, Th, U, Pb, La and Ce would be useful for the purposes of petrogenetic studies and classification since their relative abundances in a rock do not significantly depend on crystallizing mineral phases (Basaltic Volcanism Study Project, 1981). The elements Cs, Rb, K, Sr and U, however, have been demonstrated to be highly mobile during the seawater alteration of ocean floor basalts (Hart, 1971). Sr mobilization during epidotization has also been well documented (Humphris and Thompson, 1978). High field strength elements (HFSE), such as Zr, Hf, Ti, P, Nb and Ta have been considered immobile during basalt alteration (Saunders et al., 1980). The superimposition of ocean floor alteration on alteration accompanying the mineralizing process and alteration related to moderate to high grade metamorphism may very well have masked or obliterated any primary petrogenetic signature in these basalts.

Figure 10, a standard AFM diagram (Irvine and Baragar, 1971), classifies the rocks as tholeiitic as does the TiO₂ x 100-Cr-(Y+Zr) ternary diagram (Fig. 11) of Davies et al. (1979). Discrimination diagrams utilizing Al₂O₃, FeO and MgO (Fig. 12a) and Na₂O, K₂O and SiO₂ (Fig. 12b) indicate the basalts are subalkaline komatiite. A Jensen cation plot (Fig. 13; Jensen, 1976) classifies 52 samples as basaltic to ultramafic komatiite. Nevertheless, a plot of Cr vs. Y (Pearce (1982), immobile elements under most circumstances, from Pearce (1982), positions 48 samples above the picrite-basalt field boundary (Fig. 14), thereby identifying the rocks as picrite. Ternary diagrams for mineralization-related elements (Cu, Pb, Zn in Fig. 15 and Au, As, Sb in Fig. 16) indicate the rocks are relatively Cu- and Au-rich; in unaltered sam-

ples the concentration ranges for these elements are low (Cu: 36-102 ppm; Au: 1-28 ppb; sample AGC-68P contains 1200 ppb Au and represents mineralized rock from the MacLellan Main Zone).

The apparent discrepancy between a picrite and komatiite classification for these rocks may be addressed by comparing the average chemical composition of MacLellan basalt to published data for these rock types. Table 4 presents five silicate whole rock analyses and a suite of trace elements for picrite basalt from the Deccan Traps in western India (Krishnamurthy and Cox, 1977), eight analyses of komatiitic rocks (McIver et al, 1982), and a representative analysis for least-altered MacLellan basalt. Comparison of major element data between these two groups indicates good agreement for major elements between MacLellan and Deccan Trap picrite basalts. The possible exceptions are MnO, which is substantially higher in MacLellan rocks, and Na₂O, which is significantly lower. The causes for the differences in MnO and Na₂O are probably related to alteration accompanying the mineralization process at the MacLellan Main Zone. MnO enrichment has occurred in the wall rocks and forms widespread haloes about the ore zones (this study), whereas depleted Na₂O contents are reflected by many samples in the MacLellan Main Zone (some contain no measurable sodium). This general agreement in major element chemistry between the Deccan Trap and MacLellan "picrite" is not apparent in the trace element contents of the rocks. The MacLellan basalts contain lower Ba (64 vs. 210 to 545 ppm), Zr (82 vs. 95 to 185 ppm), Rb (n.d. vs. 9 to 33 ppm), Y (15 vs. 19 to 27 ppm) and Nb (8 vs. 26 to 50 ppm) than their Deccan Trap counterparts with generally comparable con-

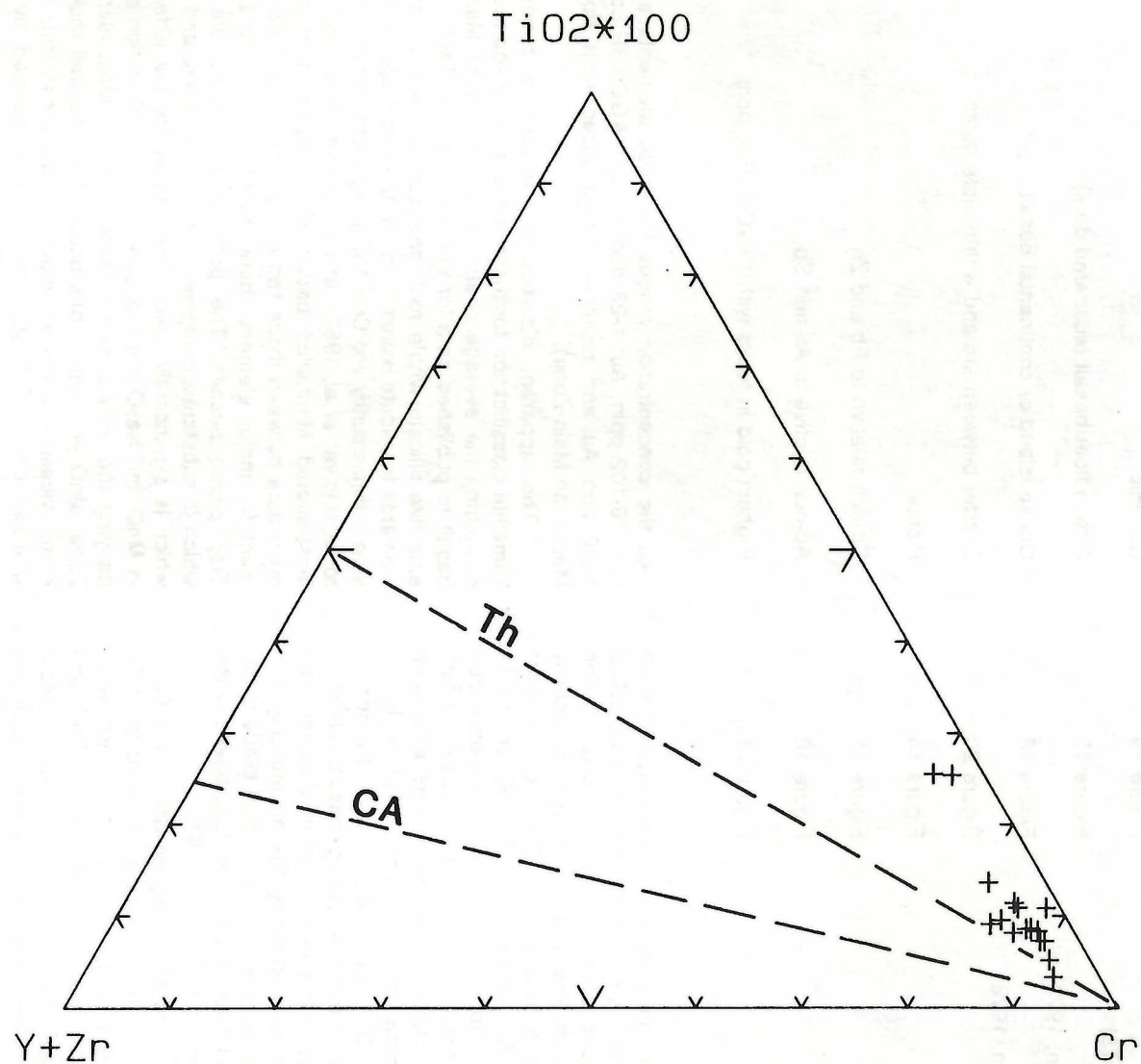
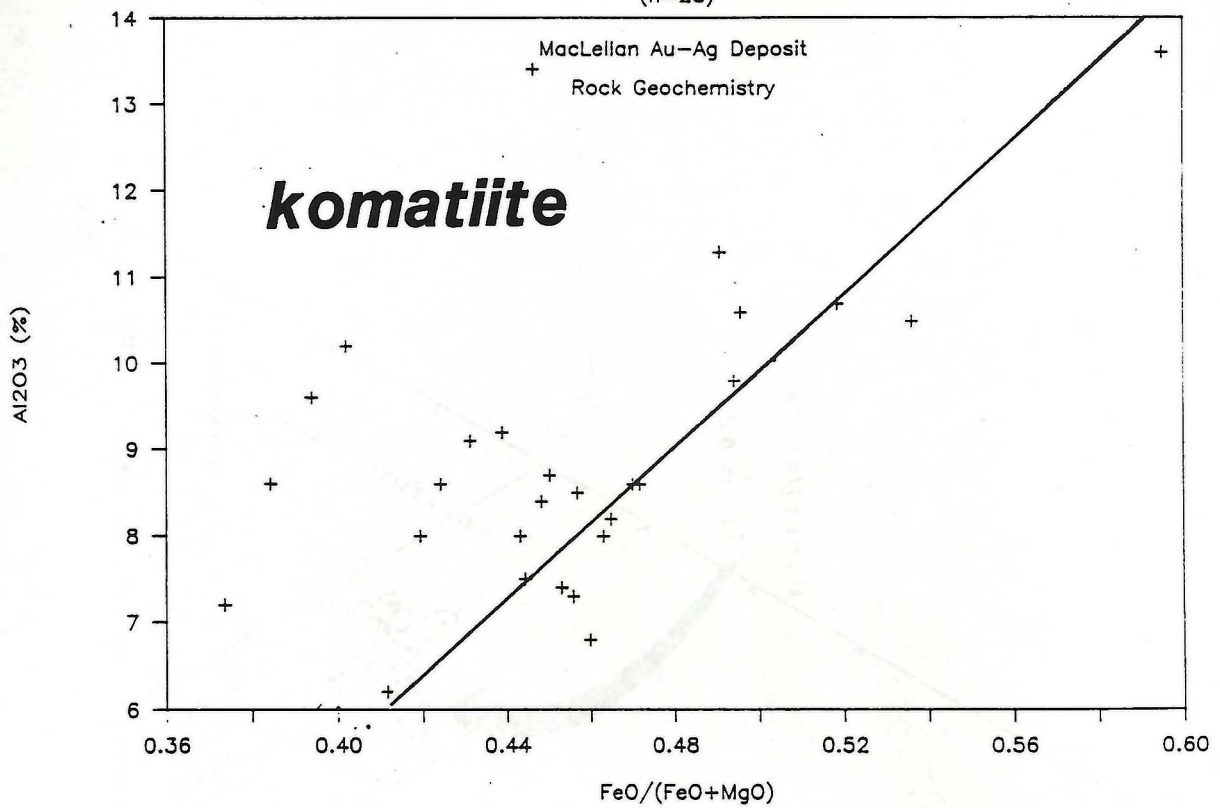


Figure 11: $(\text{TiO}_2 \times 100)$ - Cr -($\text{Y} + \text{Zr}$) discrimination plot for MacLellan picritic basalts ($n=16$). Field boundaries after Davies et al. (1979). Note Th-tholeiitic, CA-calc alkaline.

High Mg-Ni-Cr Basalt

(n=28)



High Mg-Ni-Cr Basalt

(n=28)

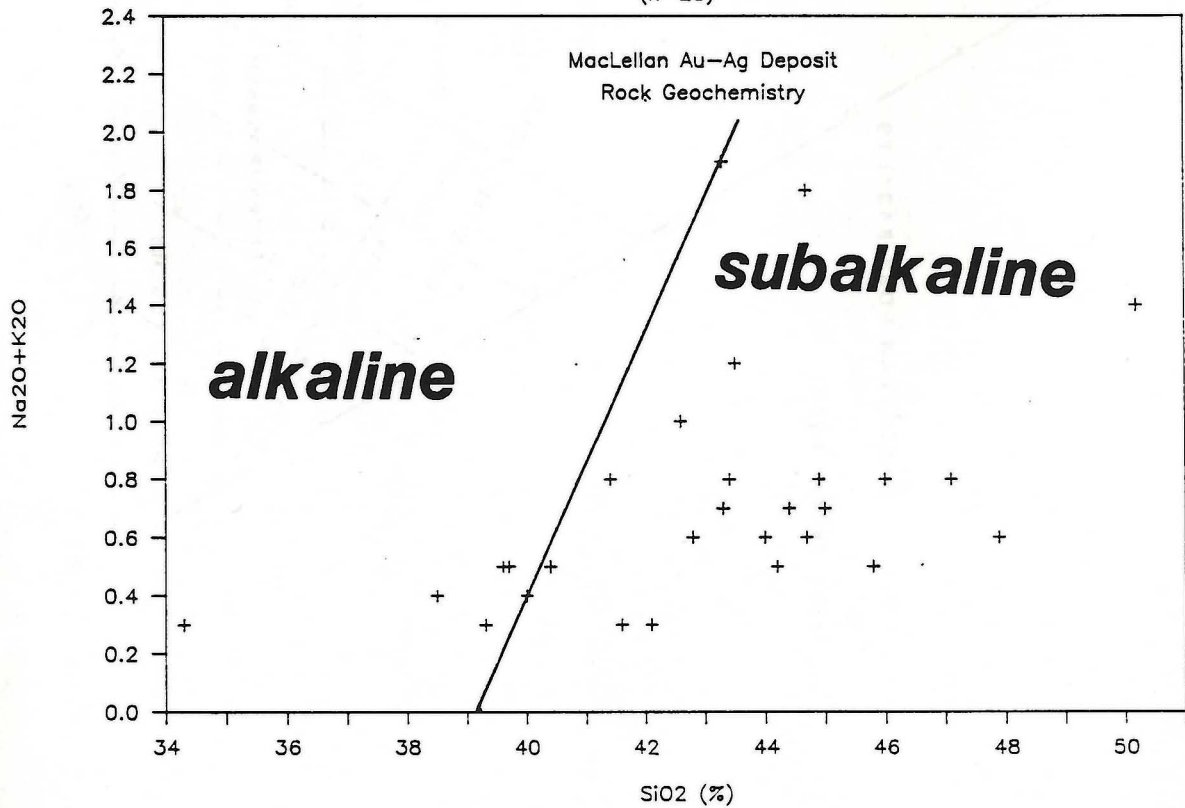


Figure 12: Plot of a) Al₂O₃ vs. FeO/(FeO+MgO) and b) Na₂O + K₂O vs SiO₂ for MacLellan picritic basalts.

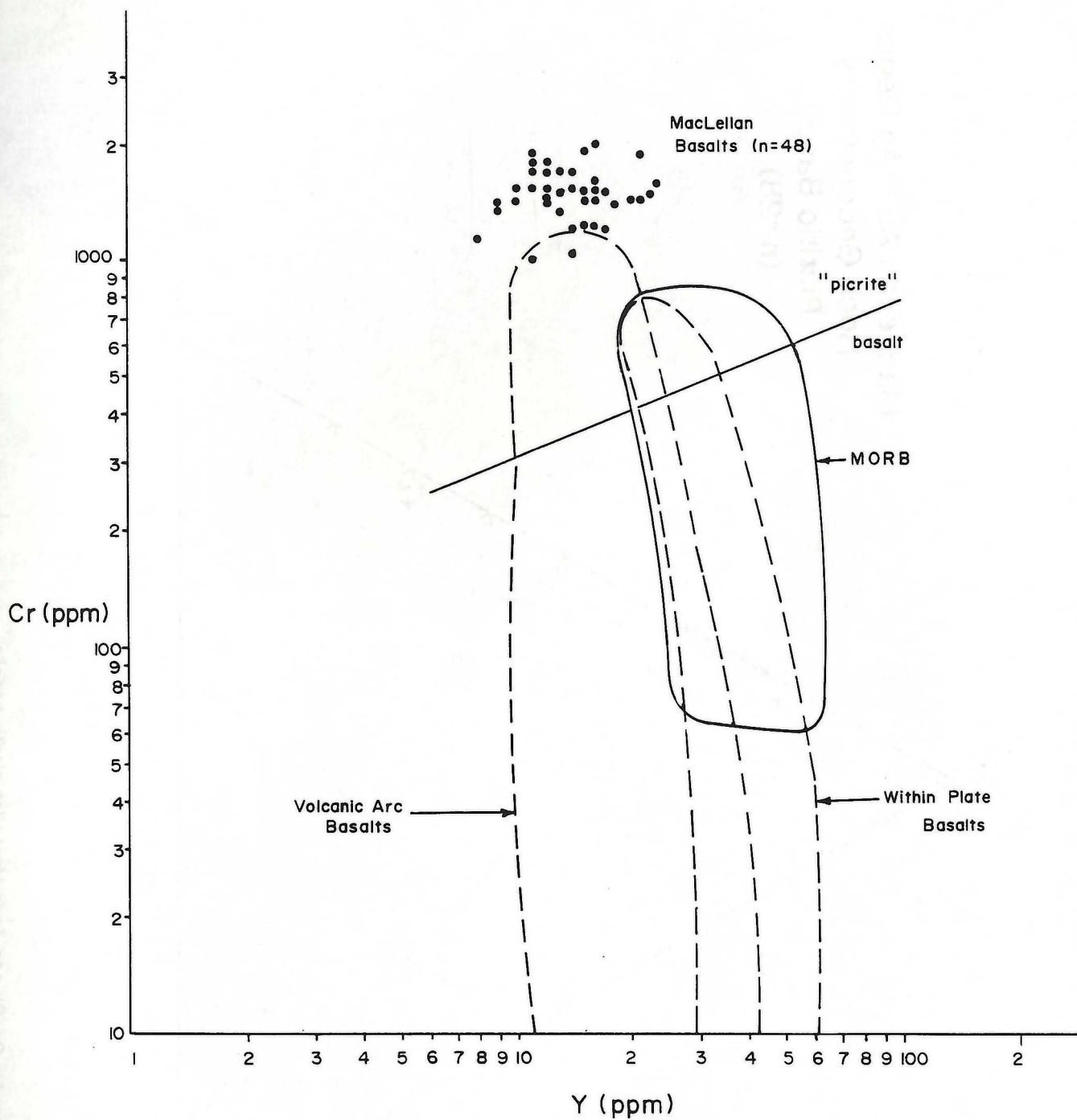


Figure 14: Plot of Cr vs. Y for MacLellan picritic basalts (n=48) utilizing field boundaries and nomenclature from Pearce (1982).

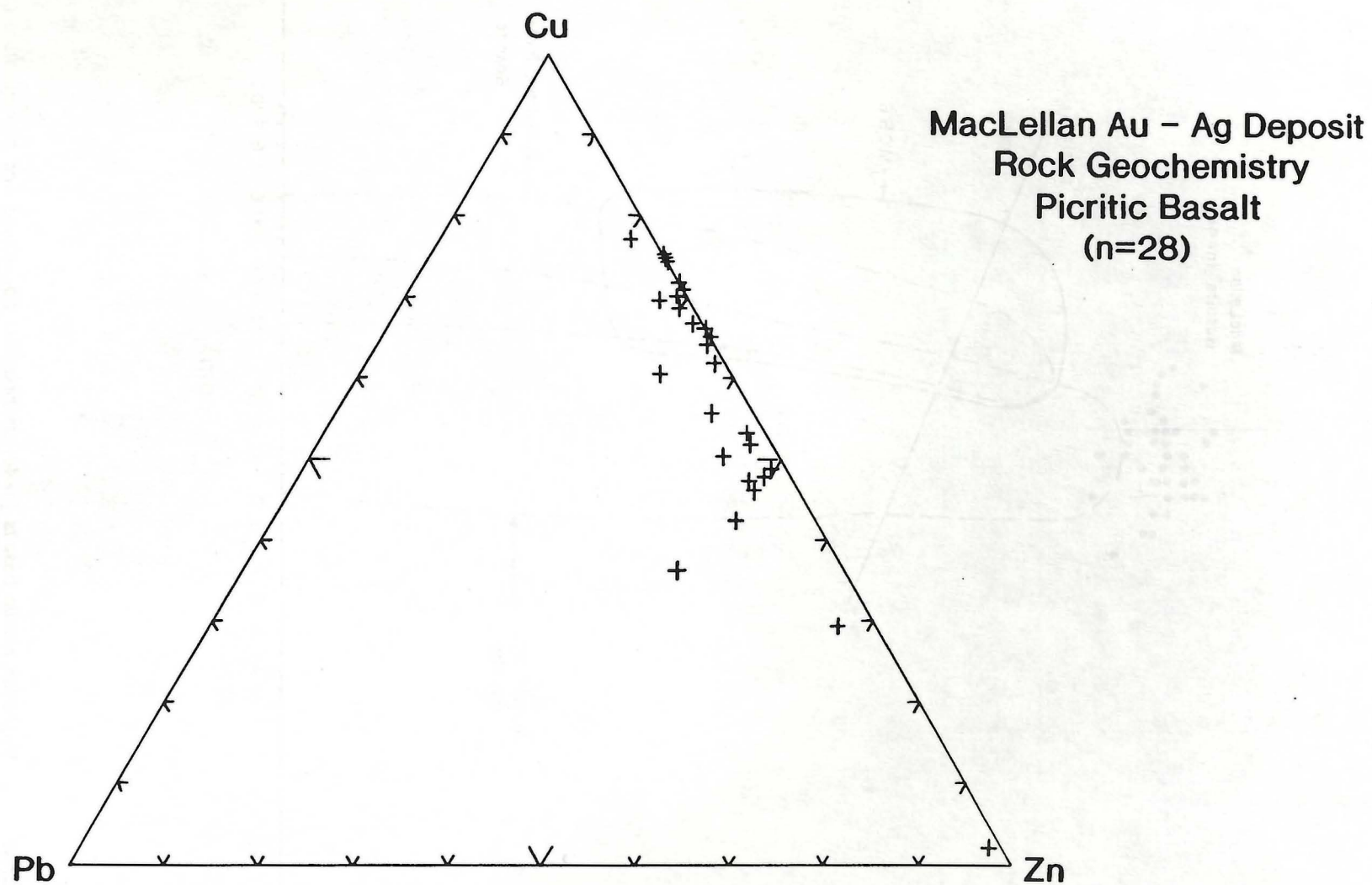


Figure 15: Ternary diagram for Cu, Pb and Zn in MacLellan picritic basalts.

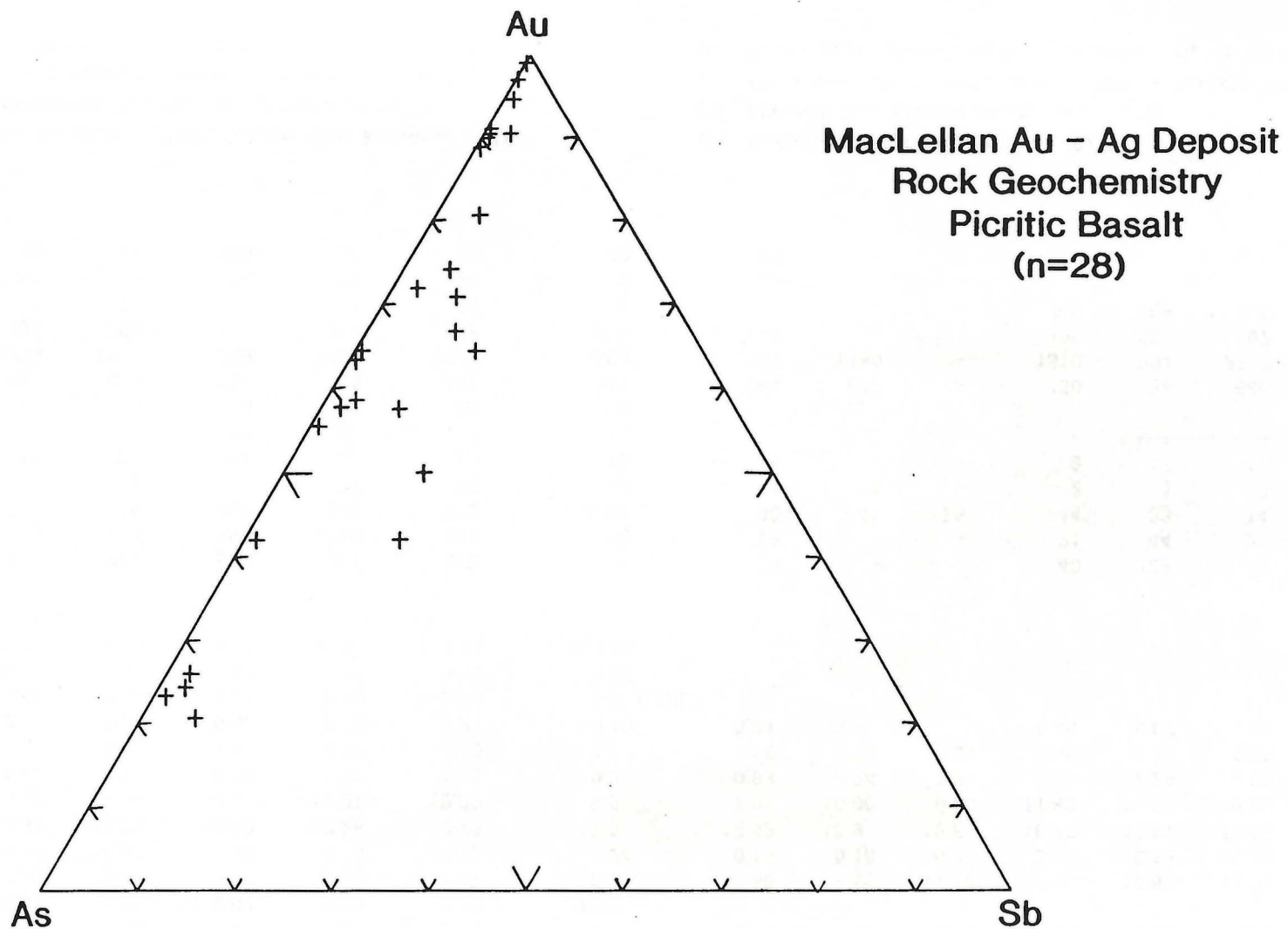


Figure 16: Ternary diagram for Au, As and Sb in MacLellan picritic basalts.

Table 4: Major and trace element analyses of picrite basalts from the Deccan Traps, Western India. Analyses from Krishnamurthy and Cox (1977). Average major element analysis for MacLellan basalt from this study (Appendix II, Part 2). Analyses of komatiitic rocks from McIver *et al.* (1982).

Sample	380	252	259	244	285	MacLellan Basalt (AGC-557)	1	2	3	4	5	6	7	8
Flow No.	W-1	D-11	D-10	D-12	D-6									
SiO ₂	44.15	46.44	44.95	46.60	46.90	44.8	49.02	48.30	47.20	47.93	52.92	47.96	49.50	49.90
Al ₂ O ₃	6.35	9.28	11.82	9.90	9.59	8.2	8.44	10.80	11.90	9.37	8.14	9.16	10.77	9.44
TiO ₂	1.44	1.99	2.46	1.97	2.02	1.6	1.04	0.62	0.43	0.46	0.50	0.52	0.63	0.73
Fe ₂ O ₃ ^T	2.96	4.80	5.63	3.98	6.28	13.5	-	-	-	-	-	-	-	-
FeO	7.38	3.37	5.81	6.94	4.57	12.15	10.66	9.55	11.12	11.50	10.80	12.58	12.53	11.70
MnO	0.19	0.17	0.16	0.14	0.17	0.24	0.18	0.18	0.20	0.34	0.19	0.24	0.20	0.21
MgO	22.37	15.23	10.42	12.98	12.78	17.8	14.42	13.9	12.6	16.76	11.81	18.05	17.80	16.40
CaO	8.33	11.11	12.11	12.97	12.22	9.8	7.91	10.00	9.90	11.83	11.53	9.89	7.54	9.54
Na ₂ O	0.64	1.75	2.08	1.62	1.42	0.2	0.83	2.24	1.91	0.77	2.29	0.60	0.84	1.59
K ₂ O	0.40	0.67	1.11	0.90	0.80	0.1	0.18	0.00	0.01	0.05	0.04	0.05	0.02	0.07
P ₂ O ₅	0.17	0.29	0.35	0.30	0.27	0.10	0.21	-	-	0.46	0.67	0.05	0.05	0.07
H ₂ O ⁺	5.50	2.34	3.31	2.49	2.84	3.9 (LOI)								
Cr ₂ O ₃	0.29	0.22	0.07	0.15	0.25	0.23								
Total	100.17	99.87	100.28	100.98	100.11	100.43								
ppm														
Ba	110	275	545	365	305	64	129	-	-	40	28	20	-	-
Zr	95	132	185	129	135	82	88	-	-	21	44	29	-	-
Sr	96	265	400	340	273	27	90	41	75	44	33	14	-	-
Rb	9	26	33	27	23	nd	1	1	-	2	1	2	-	-
Y	19	20	27	22	23	15	15	-	-	9	17	12	-	-
La	25	20	25	25	20	na								
Ce	20	20	70	30	25	na								
Ni	962	651	231	313	419	861	804	647	-	450	138	680	222	-
Cr	2005	1525	509	1051	1692	1564	1867	1460	-	1310	904	2280	706	-
V	199	234	327	274	276	279	196	-	-	190	238	197	-	-
Nb	26	32	50	37	30	8	4	-	-	2.5	2.5	1	-	-
Zn	85	87	76	75	78	72	86	-	-	-	-	-	-	-
Cu	80	86	109	102	89	42	88	-	-	-	-	-	-	-

na - not analyzed

nd - not detected

- (1) Average Meredale member (Table 5.1, analysis; McIver *et al.* 1982)
- (2) Olivine-rich pyroxenitic komatiite lava (Arndt *et al.* 1977)
- (3) Pyroxene-rich pyroxenitic komatiite lava (Arndt *et al.* 1977)
- (4) Belingwe 331/514 (Nesbitt *et al.* 1979)

- (5) Barerton 331/780 (Nesbitt *et al.* 1979)
- (6) Marshall Pool 331/529 (Nesbitt *et al.* 1979)
- (7) Pillow lava with skeletal olivine NG 120 (Nisbet *et al.* 1977)
- (8) Olivine-phyric pillow lava, 61231 (Franics & Hynes 1979)

centrations for the remainder of the trace elements listed in Table 4.

A comparison of trace element data representing komatiitic basalts (Table 4) indicates that MacLellan basalts are relatively enriched in TiO_2 (1.6 vs. 0.52%), Zr (82 vs. 29 ppm), Nb (8 vs. 1 ppm), Ba (64 vs. 20 ppm), Sr (27 vs. 14 ppm), Ni (861 vs. 680 ppm), V (279 vs. 197 ppm) and depleted in Cr (2280 vs. 1564 ppm) with respect to komatiite. This divergence in trace element content between MacLellan and komatiitic basalts at equivalent MgO concentrations is

probably related to the multiple alteration history of the MacLellan basalts. A representative analysis of MacLellan basalt (AGC-557) is compared to N-type MORB and primitive island arc tholeiite in Table 5 and to Archean tholeiitic basalts in Table 6. The MacLellan basalt has different major and trace element characteristics from other tabled basalts. Most notable of the differences are higher Ni (861 vs. 245 ppm), Cr (1564 vs. 569 ppm), TiO_2 (1.6 vs. 0.87%), MgO (17.8 vs. 10.35%) and lower Na_2O (0.2 vs. 2.46%), and Al_2O_3 (8.2 vs. 16.77%).

Table 5
Major and trace element comparison between MacLellan basalt, MORB and island arc tholeiite. Trace elements in ppm, all others weight percent. Zr/Nb ratio from Basaltic Volcanism Study Project (1981).

	N-type MORB (Sun <i>et al.</i> , 1979)	"Primitive" Island Arc Tholeiite (Lowder and Carmichael, 1970; Arth, 1981)	Representative MacLellan Basalt (this study, AGC-557)
SiO_2	47.79	52.42	44.8
Al_2O_3	16.77	14.91	8.2
$\text{Fe}_2\text{O}_3^{\text{T}}$	10.33	2.31	13.5
FeO	-	7.16	12.15*
CaO	10.98	10.84	9.8
MgO	10.35	7.42	17.8
Na_2O	2.46	2.36	0.2
K_2O	0.07	0.80	0.1
TiO_2	0.87	0.73	1.6
P_2O_5	0.06	0.17	0.10
MnO	0.18	0.18	0.24
H_2O	-	0.87	-
LOI	0.50	-	3.9
Total	99.86	100.16	100.2
Zr	50	40	82
Sr	114	300	27
Rb	1.0	15	nd
Ba	8	255	64
Ni	245	105	861
Cr	569	305	1564
V	196	340	279
Y	25	20	15
Sc	41	-	-
La_N/Yb_N	0.23	-	-
Zr/Nb	>30	-	≈10

*FeO calculated from $\text{Fe}_2\text{O}_3^{\text{T}}$

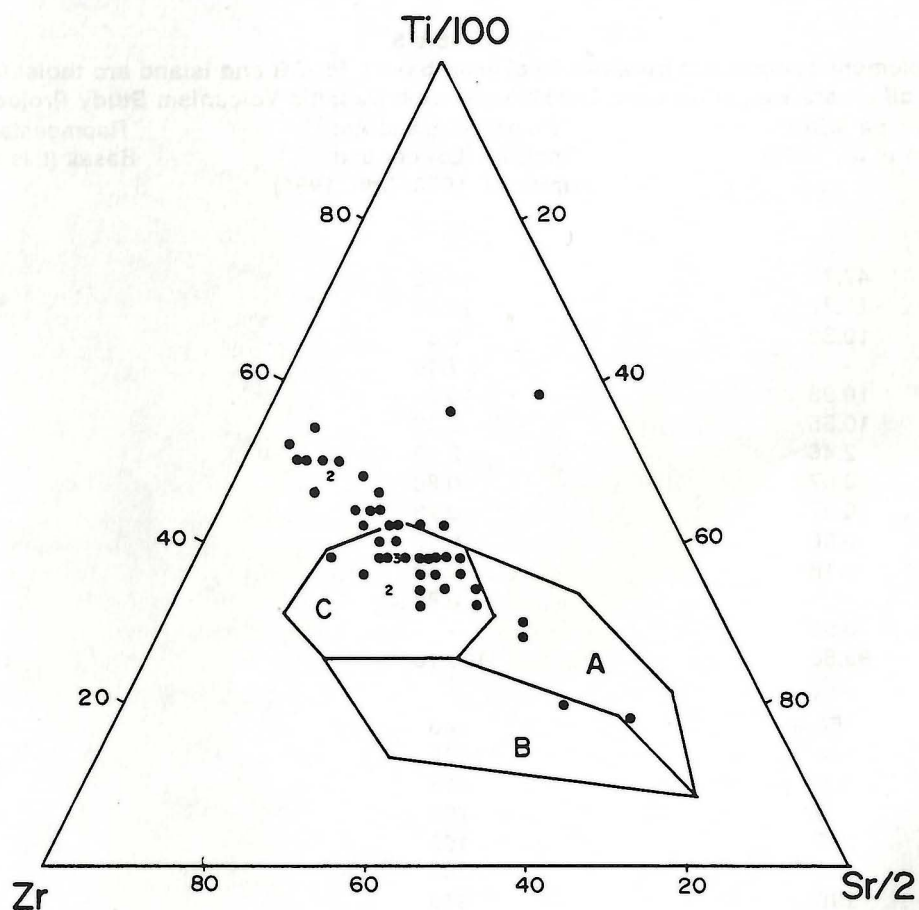


Figure 17: A discrimination plot of $(Ti/100)-(Sr/2)-Zr$ for MacLellan picritic basalts ($n=50$) utilizing nomenclature and field boundaries from Pearce and Cann (1973). The fields are as follows: A - low-K tholeiites, B - calc-alkali basalts, C - ocean floor basalts.

Table 6

Major and trace element comparison between MacLellan basalt and Archean tholeiitic basalts. Oxides in weight percent, all others ppm.

	K ₂ O	Rb	Sr	Ba	Ni	Cr	Zr	TiO ₂
Tholeiitic metabasalt ($<16.6\%$ Al ₂ O ₃ ; Gunn, 1976)	0.27	6	145	81	98	276	-	1.32
Depleted Archean tholeiite (Condie, 1976)	0.18	4	100	80	225	350	55	1.92
Enriched Archean tholeiite (Condie, 1976)	0.32	10	165	90	100	175	100	1.00
Canadian Archean basalts (Jahn <i>et al.</i> , 1975)	0.31	6	165	98	-	-	-	-
Superior Province (Goodwin, 1977)	0.33	-	149	99	162	256	108	1.16
Abitibi (Goodwin and Smith, 1980)	0.20	-	124	110	232	292	82	1.30
Bulawayo (Hawkesnorth and O'Nions, 1977)	-	-	-	-	180	438	-	-
Hayes River Group (Hubregtse, 1978)	0.27	-	180	130	124	364	-	1.04
MacLellan Basalt (AGC-557)	0.1	nd	27	64	861	1564	82	1.6

nd - not detected

GEOCHEMICAL CONSTRAINTS ON THE DEPOSITIONAL ENVIRONMENT

A series of standard discrimination plots commonly used to deduce a depositional environment for suites of rocks based on major and trace element chemistry are presented for the MacLellan basalts in Figures 17 through 20. Results have been summarized in Table 3.

The (Ti/100)-(Sr/2)-Zr and (Ti/100)-(Yx3)-Zr discrimination plots of Pearce and Cann (1973) are presented in Figures 17 and 18. Significant data scatter in Figure 17 make the results uninterpretable, however, Figure 18 overwhelmingly classifies the MacLellan basalts (42 samples out of 50) as ocean island or continental basalts, which tends to corroborate the "oceanic" classification of the MacLellan basalts using the TiO₂-P₂O₅-K₂O discrimination plot of Pearce *et al.* (1975), illustrated in Figure 19. Data scatter in the Ti-Zr plot (Fig. 20; Pearce, 1982) also renders this particular discrimination plot ineffective. The data points ($n = 42$) straddle the MORB boundary between arc and within-plate basic lavas. The MacLellan basalts plot, for the most part, outside of the MORB field and in a significantly different area of the Ti-Zr diagram than the Wasekwan Group as presented by Syme (1985). This difference reflects the high Ti and Zr contents of the MacLellan basalts. In addition, the MacLellan basalts contain higher Fe₂O₃^T, MgO, K₂O, P₂O₅, MnO, Rb, Ba, Ni, Cr and V, and lower Al₂O₃, Na₂O and Sr than MORB. The use of these discrimination diagrams for classification of the MacLellan basalts indicates an oceanic/ocean island or continental basalt setting for the deposition of the MacLellan basalts.

The similarities and differences of the continental Deccan Trap picrite basalts was discussed in the previous section. The differences in the trace element signatures between MacLellan and Deccan Trap basalts would seem to

argue against a similar continental tectonic environment for these two units. A more plausible explanation for a depositional environment for the MacLellan basalts is that of an oceanic depositional regime (Fig. 18 and 19). Recent observations of tuffaceous, fragmental and pillowed facies of the MacLellan basalts (Parbery and Fedikow, 1987; Parbery, 1988) and the position of this sequence of basalts in Division D of the northern belt of the Lynn Lake greenstone belt (Gilbert *et al.*, 1981) would support the ocean island/arc results of the discrimination plots.

PICRITE AND SEDIMENTARY ROCKS - A GEOCHEMICAL COMPARISON

A comparison based upon major and trace element chemistry between the picrite and sedimentary rocks in the MacLellan Main Zone is presented in Table 7. Figure 21 presents Au and (Ni + Cr) data for both rock units and demonstrates the absence of a linear relationship between picrite and sedimentary rocks.

The arithmetic mean for Au in both picrite and sedimentary rocks is presented adjacent to the range in brackets.

Table 7 illustrates the significant differences between the two units for most elements. In particular, elements such as aluminum (Al₂O₃), titanium (TiO₂), chromium (Cr) and zirconium (Zr), generally considered to be immobile under most geological circumstances are radically different between the two data groups. Additionally, Ni, Ba, K₂O, Na₂O, MgO, CaO and SiO₂ all reflect substantially different mineralogical components in the two units. The "ore-related" elements reflect the observation made during drill core logging that the sedimentary rocks contain the bulk of the mineralization. Au, As, Sb, Cu and Pb are all higher in the sedimentary rocks. In particular, Au appears to be concentrated in rocks with less than 500 ppm combined Ni and Cr (Fig. 21).

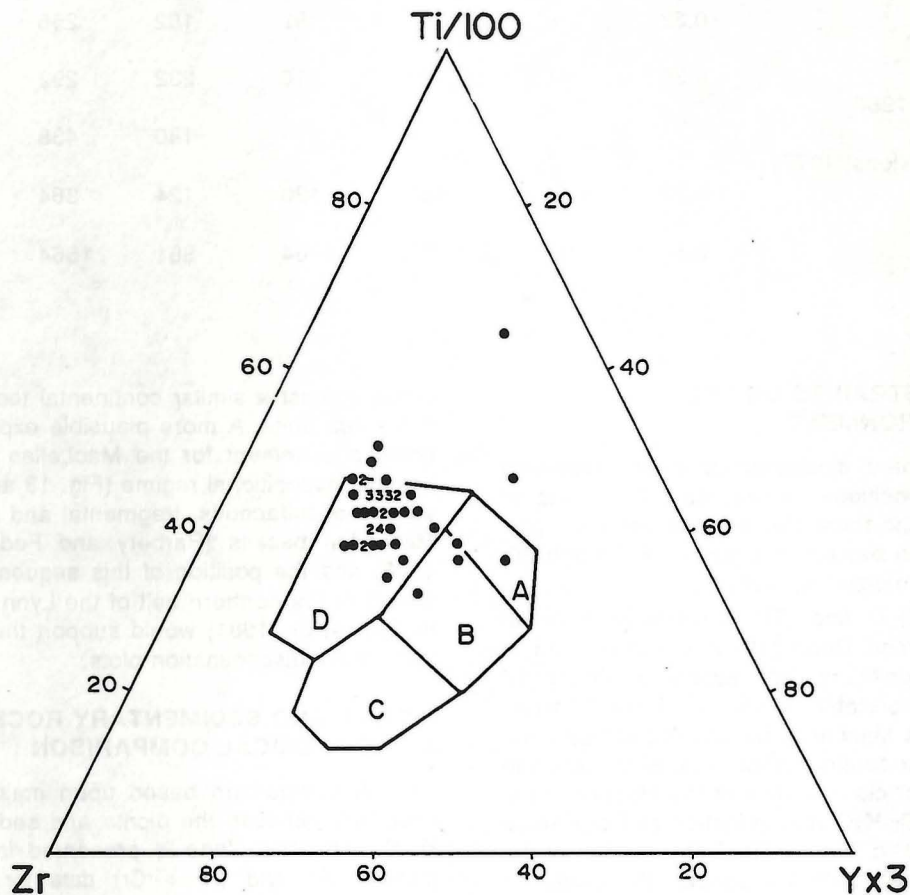


Figure 18: A discrimination plot of (Ti/100)-(Yx3)-Zr for MacLellan picritic basalts (n=50) utilizing nomenclature and field boundaries from Pearce and Cann (1973). The fields are as follows: A+B - low-K tholeiites, C+B - calc-alkali basalts, D - ocean island or continental basalts, B - ocean floor basalts.

Table 7
Comparison of ranges of major and trace element contents between "picrite" and "sedimentary rocks" from the MacLellan Main Zone between 393 m and 472 m, DDH U82-5. Corg - organic carbon

Element	MacLellan Main Zone	
	Picrite (n=9)	Sedimentary Rocks (n=10)
SiO ₂	39.3 - 47.9	44.1 - 60.0
Al ₂ O ₃	6.2 - 9.6	13.1 - 19.5
Fe ₂ O ₃ ^T	11.4 - 13.1	6.7 - 14.4
CaO	10.3 - 16.2	3.2 - 8.3
MgO	13.5 - 18.6	4.0 - 8.0
Na ₂ O	0.2 - 0.4	0.6 - 2.0
K ₂ O	0.0 - 0.4	1.9 - 3.9
TiO ₂	1.2 - 1.5	0.7 - 3.0
P ₂ O ₅	0.09 - 0.17	0.11 - 0.25
MnO	0.26 - 0.53	0.10 - 0.40
LOI	1.2 - 11.5	0.9 - 1.9
Ni	564 - 934	10 - 171
Cr	1014 - 1849	25 - 311
Ba	30 - 120	195 - 560
F	320 - 580	360 - 800
Zr	46 - 72	73 - 162
Cu	107 - 340	17 - 880
Pb	0 - 10	31 - 180
Zn	43 - 114	70 - 510
Au	17 - 4200 (792)	64 - 2400 (978)
As	28 - 120	3 - 6500
Sb	0.8 - 2.4	0 - 34
Corg	0.0 - 0.05	0.01 - 0.19

The picrites are olivine and clinopyroxene normative, and suggestions of cumulative differentiation mechanisms are indicated by increasing Ni and Cr concentrations from top to bottom in a particular picrite unit. For instance, in DDH 80-62 the Ni and Cr contents increase between 619 and 632 m in the following manner:

Ni (ppm)	Cr (ppm)	Depth of Sample (Down hole)
826	1423	619 m
899	1272	620 m
909	1510	623 m
976	1814	632 m

Except for a decrease in Cr at 620 m, the Ni and Cr contents indicate an enrichment that develops over 13 m in a picrite unit. However, elsewhere in the same drill hole, a reverse enrichment trend is observed, *i.e.*, between 655 and 666 m the Ni and Cr contents decrease:

Ni (ppm)	Cr (ppm)	Depth of Sample (Down hole)
880	1343	655 m
821	1283	665 m
685	1277	666 m

This interesting pattern may reflect a folded stratigraphy, whereby enrichment or cumulative characteristics are reversed on either limb of the fold, or the pattern may be spurious owing to rather large gaps in the sample spacings for the example from DDH 80-62.

Of the so-called immobile elements, it appears that only Sc offers potential as a chemical "datum" by which quantification of major and trace element gains and losses can be addressed. The limited analyses of Sc in Main Zone and background picrite, and biotite-rich and siliceous siltstone from the Main Zone are presented below:

Main Zone picrite (n=7): 24 to 42 ppm Sc (X=31 ppm)

Background picrite (n=16): 22 to 40 ppm Sc (X=30 ppm)

Biotite siltstone-Main Zone (n=10): 18 to 44 ppm Sc (X=36 ppm)

Siliceous Siltstone-Main Zone (n=7): 11 to 47 ppm Sc (X=28 ppm)

Although quantification of element gains and losses is not described in this report it appears that Sc concentrations in mineralized and nonmineralized picrite is relatively constant.

Background picrite samples described above were collected from Arbour Lake, Motriuk Lake, Muskeg Lake, Nickel Lake, Sheila Lake and Margaret Lake along the Agassiz Metallotect.

SUMMARY

The MacLellan host basalts have geochemical characteristics more closely related to picritic than to komatiitic basalts although some chemical divergence is apparent. The divergence is no doubt related to multiple alteration processes that have affected the MacLellan basalts. Titanium and Zr, elements normally considered immobile, are the most effective for classifying the MacLellan basalts as picritic.

The rare earth element (REE) contents of the MacLellan basalts are discussed in a later section, however, the differences in REE patterns between MacLellan basalts, normal Al₂O₃ basalts (Syme, 1985), and komatiitic basalts from the Tipasjarvi belt in Finland (Auvray *et al.*, 1982) warrant some discussion here. Normal Al₂O₃ basalts from the northern belt of the Lynn Lake greenstone belt have relatively flat or nonfractionated REE patterns with a somewhat pronounced Eu enrichment peak (*cf.* Fig 8b, Syme, 1985) whereas MacLellan basalts have steep to relatively steep REE profiles with pronounced LREE enrichment. The MacLellan profiles also differ significantly from the REE patterns of Archean Tipasjarvi komatiites. Auvray *et al.* (1982) describe the Finnish Tipasjarvi komatiites as having REE patterns characterized by; (1) strong LREE depletion and flat HREE, (2) nonfractionated REE, and (3) REE patterns with fractionated HREE but with variable LREE depletion.

Discrimination diagrams, based on a variety of trace and major element combinations, indicate the MacLellan basalts are subalkaline tholeiitic picritic basalts deposited in an ocean/ocean island tectonic setting, an interpretation not unlike that of Syme (1985) for the Lynn Lake greenstone belt. The basalts are easily fingerprinted using MgO-Ni-Cr analyses and would be classified as normal Al₂O₃ basalts using

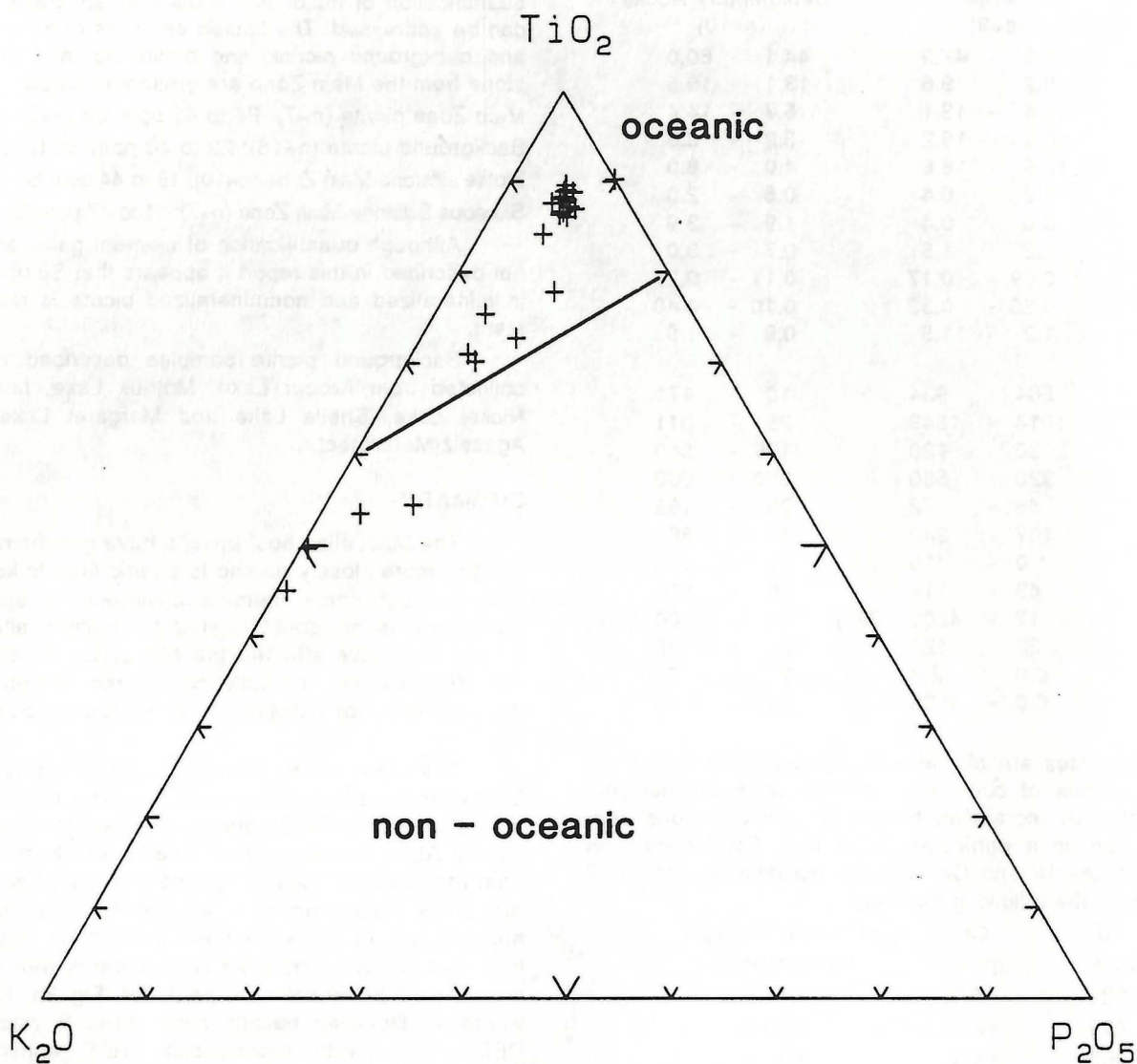


Figure 19: TiO_2 - P_2O_5 - K_2O discrimination plot for MacLellan picritic basalts ($n=28$). Field boundaries after Pearce et al. (1974).

the classification of Syme (1985) for the Lynn Lake greenstone belt. There is some suggestion of "fossil" cumulate differentiation characteristics in the picritic basalts based on patterns of Ni and Cr in individual units.

A comparison of major and trace element geochemistry between picritic basalt and the sedimentary rocks indicates radical chemical differences between the two units. Differences between Ti, Zr, Ni, Cr and Al contents are probably best explained by; (i) two chemically discrete lithologies, and (ii) chemical overprinting by multiple alteration episodes producing altered equivalents with some characteristics of sedimentary rocks. For instance, some of the biotite

siltstones described by Fedikow (1986) in the MacLellan Main Zone, Nisku and Rainbow deposits contain 4 to 8% MgO, 2.5 to 3.5% K₂O, 2.5 to 3.0% TiO₂, 107 to 121 ppm Ni and 119 to 156 ppm Cr. This unusual chemistry may reflect the remnants of a picritic precursor to alteration, a sedimentary rock derived from picritic basalt, or an altered sedimentary rock. The Zr and TiO₂ contents of biotite siltstone samples AGC-71, -72, and -73 (Appendix I) range from 136 to 162 ppm and 2.5 to 3.0%, respectively, and are higher than the average 82 ppm Zr and 1.6% TiO₂ quoted in Table 4 for MacLellan picritic basalt. These elements could reflect resistate mineralogy in clastic sedimentary rocks.

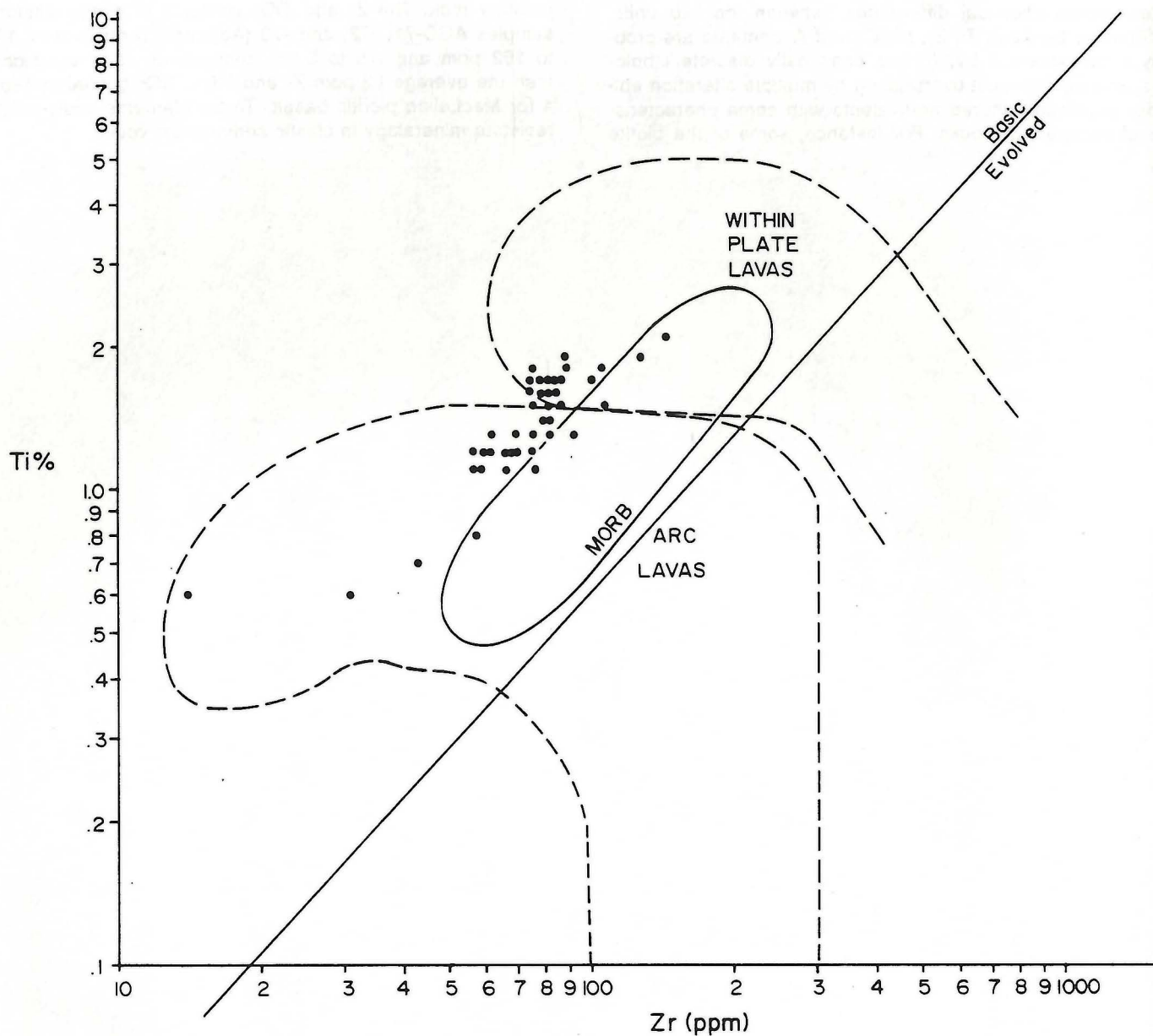


Figure 20: Plot of Ti vs. Zr for MacLellan picritic basalts ($n=42$) utilizing nomenclature and field boundaries after Pearce (1982). MORB: mid-ocean ridge basalt.

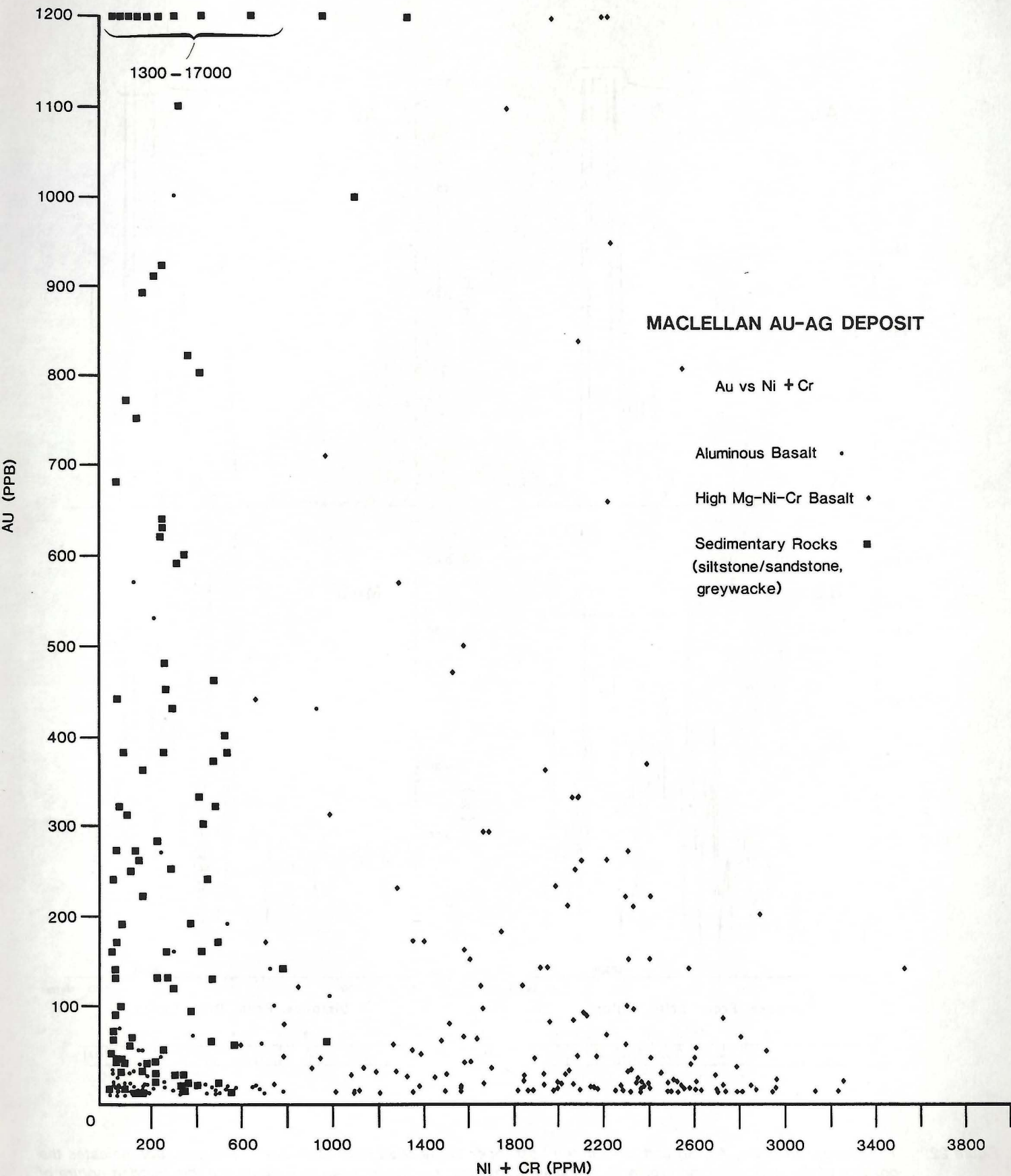


Figure 21: Plot of Au vs. (Ni + Cr) for aluminous basalts, sedimentary rocks and picritic basalts from the MacLellan Au-Ag deposit.

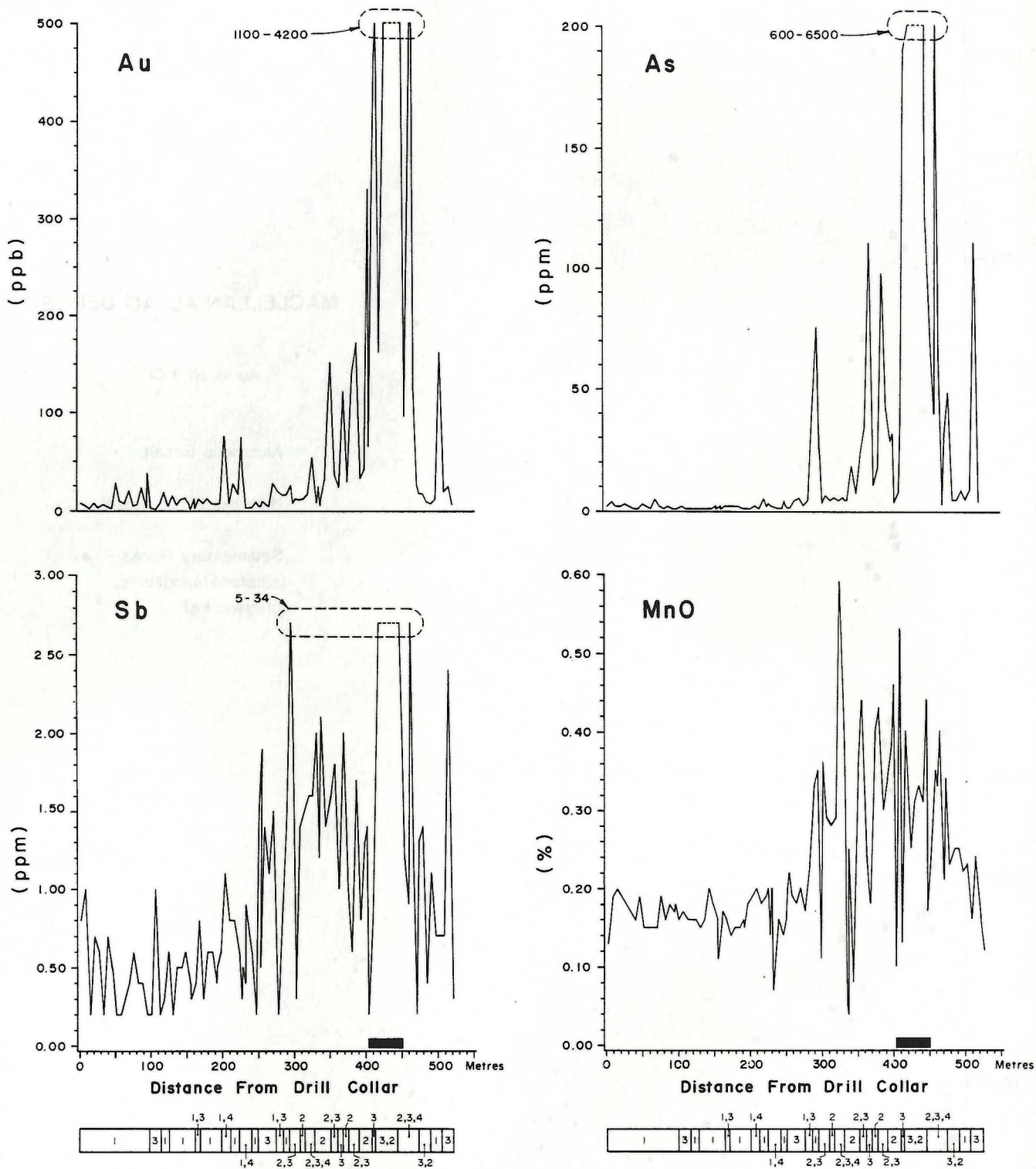


Figure 22: The dispersion of Au, As, Sb and MnO in the host rocks to the MacLellan Main Zone. The solid bar indicates the position of the deposit in the profile. A simplified geological section is given to indicate the thin bedded nature of the rock units. Symbols as follows: 1 - fragmental, massive, porphyritic and aygdaloidal aluminous basalt, 2 - picritic basalt, 3 - siliceous, biotite-rich and sulphidic clastic sedimentary rocks, 4 - chemical sedimentary rocks. Rock geochemical data from samples collected along DDH U82-5.

DISPERSION HALOES

Multi-element geochemical analysis of samples collected from DDH U82-5, 80-53 and 80-62 indicate well defined multi-element dispersion haloes have been developed in rocks that structurally overlie and underlie the MacLellan Main Zone. Profiles for Au, As, Sb, MnO and Pb, Zn, Ni and Co are presented in Figures 22 and 23, respectively. A geological section is provided at the base of the profiles. The characteristics of halo-forming elements, including those not illustrated in Figures 22 and 23, are described in Tables 8 and 9. The remainder of the profiles are presented in Appendix III.

Table 8

Summary of the characteristics of trace and minor element haloes about the MacLellan Main Zone orebody. Data from DDH U82-5. Abbreviations: a = anomaly; bkgd = background; (+) = enrichment; (-) = depletion.

Halo Forming Element/Compound	No. of Samples	Concentration Range	Extent (m) on U82-5 Profile
Au (+)	a = 56 bkgd = 56	a = 4-4200 ppb bkgd = 1-75 ppb	260 - 528 (268)
As (+)	a = 54 bkgd = 58	a = 4-6500 ppm bkgd = 1-5 ppm	280 - 528 (248)
Sb (+)	a = 58 bkgd = 54	a = 0.3-34.0 ppm bkgd = 0.2-1.1 ppm	250 - 528 (278)
MnO (+)	a = 56 bkgd = 56	a = 0.04-0.59% bkgd = 0.07-0.20%	250 - 528 (278)
Pb (+)	a = 57 bkgd = 55	a = 2-135 ppm bkgd = 2-34 ppm	265 - 495 (230)
Zn (+)	a = 53 bkgd = 59	a = 35-8900 ppm bkgd = 26-185 ppm	290 - 528 (238)
Co (+)	a = 56 bkgd = 56	a = 28-133 ppm bkgd = 18-50 ppm	260 - 510 (250)
B (+)	a = 8 bkgd = 104	a = 4-56 ppm bkgd = 4-56 ppm	400 - 430 (30)

Table 9

Summary of the characteristics of halo-forming elements and compounds about the MacLellan Main Zone orebody. Data from DDH U82-5. Conventions as in Table 8.

Halo Forming Element/Compound	No. of Samples	Concentration Range	Extent (m) on U82-5 Profile
Rb (+)	a = 45 bkgd = 67	a = 1-107 ppm bkgd = 1-40 ppm	325 - 528 (203)
Sr (-)	a = 14 bkgd = 98	a = 74-165 ppm bkgd = 53-472 ppm	415 - 475 (60)
CO ₂ (+)	a = 51 bkgd = 61	a = 0.02-10.60% bkgd = 0.01-1.47%	250 - 515 (265)
LOI (+)	a = 53 bkgd = 59	a = 0.70-11.50% bkgd = 0.20-2.00%	250 - 528 (278)
K ₂ O (+)	a = 45 bkgd = 67	a = 0.10-4.20% bkgd = 0.10-1.80%	325 - 528 (203)

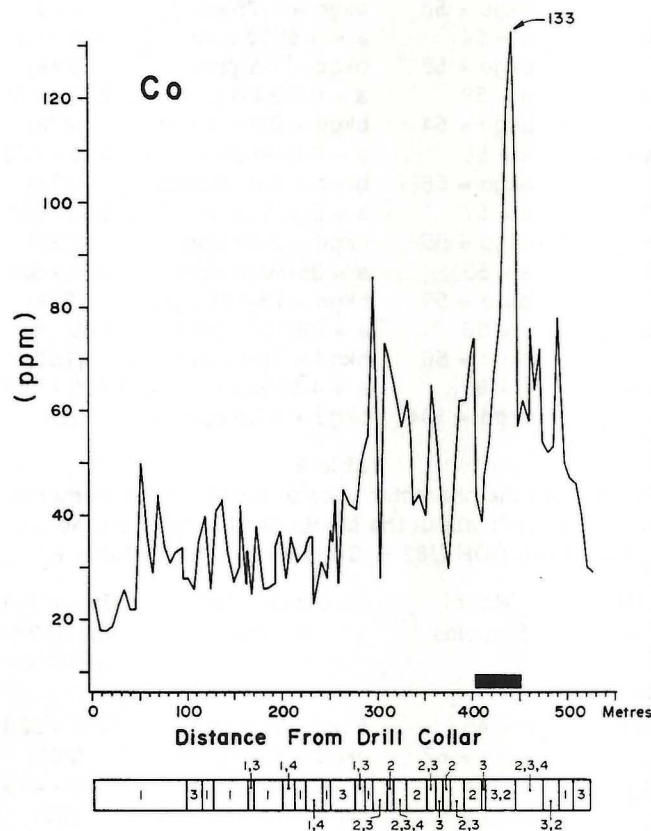
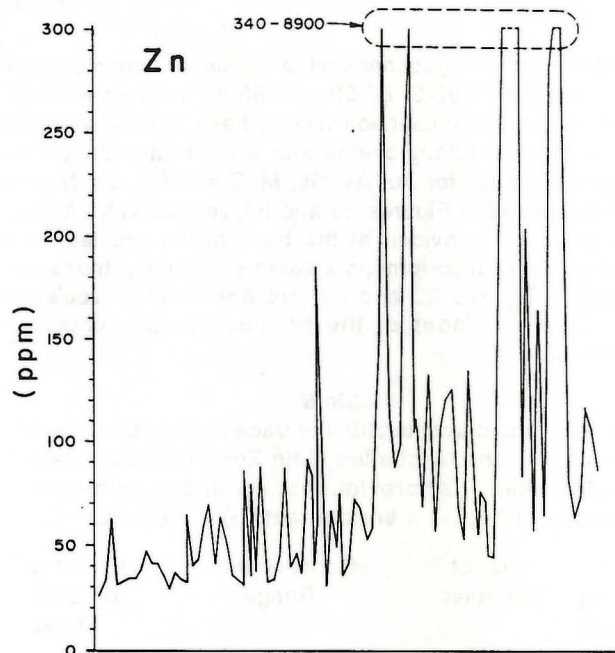
RESULTS

Variations in concentration

Variations in trace and major element concentrations between laterally equivalent mineralized and nonmineralized picrite and sedimentary rocks are apparent from visual examination of tabled geochemical data. Descriptive statistics, upon which the comparisons are based, are presented with histograms in Appendix IV-Part 1. Descriptive statistics are summarized and tabled for ease of inspection in Appendix IV-Part 2. Background samples to which the altered samples are compared were collected from relatively unaltered samples in drill core. The "background drill holes" were located to the east of the Nisku deposit ("Background east") and to the west of the Rainbow deposit ("Background west").

The altered picritic basalts differ from their relatively unaltered counterparts in their contents of ore- and alteration-related elements and compounds. Mineralized picrite contains; (a) higher Fe₂O₃^T, P₂O₅, TiO₂, Mn, Au, As, Pb, Ag, Zn, Cu, Sb, and Ni, (b) lower Na₂O and CaO, and (c) similar SiO₂, Al₂O₃, K₂O, MgO, LOI, Ba, Cr, and Co in comparison to background picrite. For many elements in the altered rocks the differences are evidenced by a greater concentration range accompanied by a peaked (high kurtosis) and strongly skewed (high skewness) data distribution. This non-normal data distribution indicates the presence of multiple data populations in the data set, namely, background and anomalous. The background data represents the original chemical composition of the host rocks and the anomalous population represents that portion of the element of interest added during alteration and mineralization. Of particular interest in the comparative data is the range in concentration for TiO₂ (0.3 to 2.8%) and P₂O₅ (0.01 to 1.13%) in mineralized picrite. This indicates the relative high mobility of Ti in altered picrite and the abundant P added during alteration. Ore-related elements, such as Au, As, Sb, Pb, Cu, Zn, total Fe and Mn, are expectedly higher in altered picrite; lower Na₂O represents an Na depletion effect related to alteration.

Sedimentary rocks have a greater range of enriched elements than picrite when altered and unaltered equivalents are examined. Mineralized and altered sedimentary rocks contain; (a) higher concentrations of Fe₂O₃^T, Au, As, Sb, Ag, Mo, Pb, Zn, Cu, Ni, Cr, Co, Mn, CaO, MgO, K₂O, TiO₂, and LOI, (b) lower Na₂O, and (c) similar SiO₂, Al₂O₃, Na₂O and P₂O₅. Data distributions for the enriched elements indicate the presence of at least two populations (background and anomalous) based on skewness and kurtosis statistics (Appendix IV-Part B). The higher Ni and Cr in mineralized sedimentary rocks suggests interaction, at some stage, of mineralizing fluids with picritic basalt to produce: (1) a sediment enriched in Ni and Cr derived from the picrite; (2) a sediment composed of detrital picritic material, thereby enriched in Ni and Cr, or (3) the sedimentary rocks with high Ni and Cr are not sedimentary deposits, but rather alteration along shears and fractures in the picrite (*cf.* Gagnon, 1987).



Haloës

Each element or compound depicted in Figures 22 and 23 delineates a zone of mineralization-related alteration about the Main Zone orebody. The chemical expression of this alteration extends from 30 m (B) to 278 m (Sb, MnO, LOI) about the ore zone. The ranking of the halo-forming elements with respect to their visually determined extent is: Sb = MnO = LOI > Au > CO₂ > Co > As > Zn > Pb > K₂O = Rb > Sr > B

The results for Ni (Fig. 23) and Cr and Mg (Appendix III) define the limits of the high Mg-Ni-Cr basalts in the stratigraphic section observed in DDH U82-5. Ni content increases from 50 ppm outside of the altered zone to 1070 ppm within the interlayered basaltic and epiclastic sedimentary rocks.

The shape or physical appearance of the alteration halo (Fig. 22 and 23) is not developed symmetrically about the Main Zone, but appears to be combined with a second discrete halo that occurs in structurally overlying rocks between 300 and 400 m in the U82-5 profile. Compared to the MacLellan Main Zone halo the "Adjacent" halo contains a lower range in concentration or lower mean concentration for Au (50 to 150 ppb vs. 25 to 4200 ppb), As (50 to 125 ppm vs. 125 to 6500 ppm), Co (50 to 80 ppm vs. 60 to 133 ppm), Rb (1 to 103 ppm vs. 1 to 107 ppm) and K₂O (1.65% vs. 1.01%). A comparison of the halo-forming elements for the MacLellan and the "Adjacent" zones is presented in Table 10. Descriptive statistics for halo elements in the two alteration zones are given in Table 11.

In addition to visual inspection and examination of descriptive statistics for samples in both the MacLellan and "Adjacent" halos the Mann-Whitney Test was utilized to differentiate these two haloës. The Mann-Whitney Test examines the hypothesis that two independent samples (MacLellan halo geochemical data versus "Adjacent" halo geochemical data) represent populations with the same distribution. The test is nonparametric, *i.e.*, it does not make

any assumption regarding the nature of the distribution of the data populations. The observations from both populations are combined then ranked from smallest to largest. In order to test the hypothesis that the two data distributions are equal, the sum of the ranks for both populations are used. If the two populations have the same distribution their rank distributions should be similar. A two-tailed probability level is calculated from which the hypothesis of similarity may or may not be rejected.

Examination of data in Table 12 indicates that the hypothesis of similarity is rejected for Au, As and K₂O, *i.e.*, the MacLellan halo is a statistically discrete entity in terms of population distribution for these three elements. The haloës are not statistically discrete with respect to the remainder of other elements in the test.

Table 10

Comparison of the extent of halo formation between the MacLellan Main Zone and "Adjacent" halo. Data from DDH U82-5. Element enrichment in the haloës is indicated by "+" and depletion by "-".

Element/ Compound	Total (m)	MacLellan (m)	Adjacent (m)
Sb (+)	278	128	150
MnO (+)	278	120	158
LOI (+)	278	128	150
Au (+)	268	168	100
CO ₂ (+)	265	205	60
Co (+)	250	130	120
As (+)	248	128	120
Zn (+)	238	138	100
Pb (+)	230	90	140
K ₂ O (+)	203	148	65
Rb (+)	203	148	65
Sr (-)	60	60	45
B (+)	30	30	-

Table 11

A summary of descriptive statistics comparing the MacLellan halo (Halo #1, n = 29) to the "Adjacent" halo (Halo #2, n = 22)

Element/ Compound	Arithmetic Mean		Standard Deviation		Variance	
	Halo #1	Halo #2	Halo #1	Halo #2	Halo #1	Halo #2
Au (ppb)	597	43	957	51	914696	2643
As (ppm)	661	24	1661	31	2757454	964
Sb (ppm)	5	2	10	0.6	96	0.3
Pb (ppm)	50	19	60	26	3598	698
Zn (ppm)	310	524	742	1873	550401	3508231
Co (ppm)	60	53	24	14	566	185
Rb (ppm)	39	25	34	29	1135	856
Sr (ppm)	162	154	85	87	7248	7612
B (ppm)	12	6	12	2	151	5
MnO (%)	0.27	0.29	0.11	0.14	0.01	0.02
K ₂ O (%)	1.65	1.01	1.21	1.25	1.46	1.56
CO ₂ (%)	2.27	2.13	2.32	1.67	5.39	2.80
LOI (%)	2.61	2.59	2.30	1.38	6.29	1.90

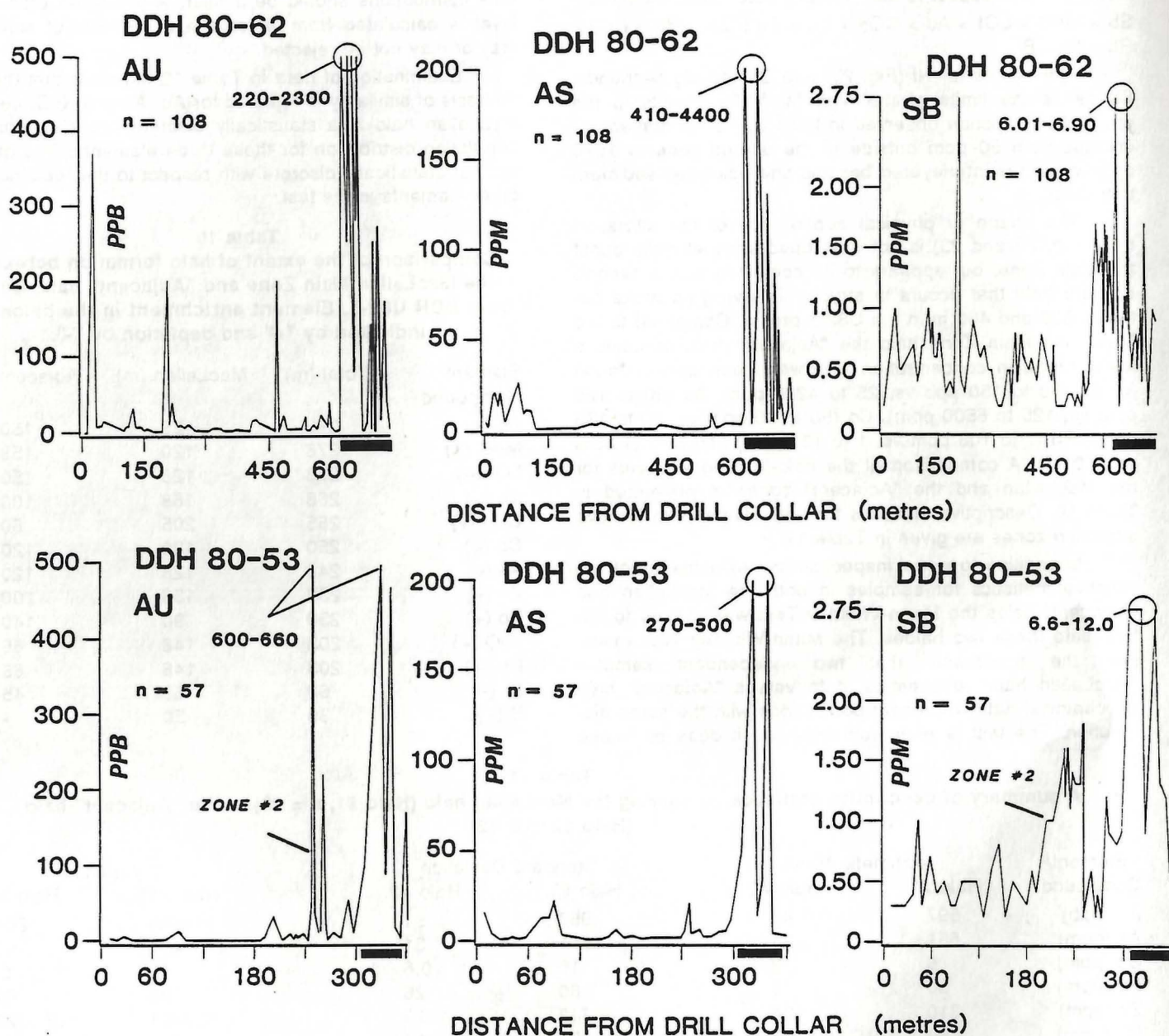


Figure 24: Dispersion profile diagram for Au, As and Sb in core from DDH 80-62 and DDH 80-53 MacLellan Main Zone is represented by the solid bar.

Table 12

Comparison of the MacLellan and "Adjacent" haloes in DDH U82-5 utilizing the Mann-Whitney nonparametric test. For this test the MacLellan halo contains $n = 29$ and for the adjacent halo $n = 22$. The asterisk represents elements that reject the hypothesis of similarity.

Element/Compound	2 - Tailed P
MnO	.4873
K ₂ O	*.0856
LOI	.1987
Pb	.8862
Zn	.5682
Co	.5237
Au	*.0120
As	*.0277
Sb	.8296
CO ₂	.8121
Rb	.2599
Sr	.6826
B	.2334

The selection of Au, As and K₂O as discriminators of the MacLellan and "Adjacent" haloes may be explained in terms of the proximity of the haloes to primary or secondary depositional sites (exhalative vent, structural feature) for the mineralization. For instance, K₂O is a common alteration indicator in rocks hosting gold mineralization, but is generally restricted to the more intense portions of the alteration halo. In this respect the MacLellan halo can be shown to be in proximity to the Main Zone mineralization where alteration is intense. Similarly, samples collected from DDH U82-5 represent, in part, MacLellan Main Zone mineralization and alteration, and the selection of Au and As as discriminators is not unexpected, and simply reflects proximity to the most intense alteration zone, *i.e.*, the MacLellan Main Zone deposit.

Visual and statistical examination of geochemical data from DDH U82-5 indicates the presence of broad zones of alteration developed about the MacLellan Main Zone. The haloes depicted in Figures 22 and 23 reflect the variable distribution and abundance of minerals delineated by Augusten *et al.* (1986) in the MacLellan ore and altered host rocks. The halo effect can be shown to be stacked, with the MacLellan halo differentiated from a structurally overlying halo on the basis of Au, As and K₂O. These three elements

seem to indicate the MacLellan halo is more proximal than the overlying halo.

The "Adjacent" halo represents the geochemical signature of a second or discrete zone of mineralization adjacent to the MacLellan Main Zone. If the assumption that the MacLellan Main Zone, Nisku and Rainbow deposits, which compose the MacLellan orebody, occur at the same stratigraphic level or are related to the same structure overprinting the stratigraphy (Fedikow, 1986) is valid, then the "Adjacent" halo may reflect alteration related to gold mineralization at Dot Lake or to discrete pods or zones of mineralization (within stacked shears?) in the Main Zone deposit. The Dot Lake gold mineralization occurs west of the MacLellan deposit at a higher stratigraphic level. If the Nisku or Rainbow deposits are at a stratigraphically higher level than the MacLellan Main Zone deposit, then the overlying "Adjacent" halo may be related to either of these mineralized zones.

Limited geochemical data from DDH 80-62 and 80-53 confirm the presence and the stacked nature of the geochemical haloes (Fig. 24). The Sb halo in rock samples from DDH 80-62 is discernible in structurally overlying rocks. Data from DDH 80-53 indicate a third discrete mineralized zone structurally underlying the MacLellan Main Zone. This anomaly occurs between 185-245 m and forms a discrete peak (1 to 1.75 ppm Sb) along the profile for DDH 80-53. A corresponding Au anomaly also occurs at this location, but the highest Au contents occur approximately 40 m down stratigraphy in the drill hole. These geochemical observations represent the geochemical signatures of shear zones identified in drill holes sampled for this study and depicted in Figures 7, 8 and 9.

Summary

A discrete zone of mineralization-related alteration has been identified in the stratigraphic sequence hosting the MacLellan mineralization. This chemical halo is many times larger than the deposit. Accompanying the obvious increases (or decreases) in the concentration of the halo-forming elements the scatter or variance of the data also increases from unaltered or non-halo rocks to rocks within the altered zone. There appears to be significant geochemical data to substantiate the interpretation of the presence of at least three discrete and stacked mineralized zones within the MacLellan-Nisku-Rainbow stratigraphy.

AREALLY RESTRICTED GEOCHEMICAL ANOMALIES

The geochemical profiles generated from the analysis of samples from DDH U82-5 through the MacLellan Main Zone deposit indicate broad dispersion phenomena for numerous elements. Additionally, spatially restricted or narrow zones of halo development centred on the Main Zone orebody are observed for many elements and compounds. Details of these restricted anomalies are given below; their profiles are presented in Appendix III.

COPPER

The Cu profile through the deposit is erratic; however, a narrow enrichment halo is observed centred on the Main Zone extending to about 25 m on either side of the orebody. Within this halo Cu varies from 17 to 880 ppm with an arithmetic mean of 245 ppm, compared to a range of 24 to 340 ppm with an arithmetic mean of 146 ppm outside of this halo.

SELENIUM

Within the Main Zone orebody between 460 and 472 m Se contents have a maximum range of 3.2 to 3.9 ppm. The highest Se analysis of 5.8 ppm was obtained from a sample of visually nonmineralized siltstone at the 88 m sample location, outside of the Agassiz Metaltect sequence.

TELLURIUM

Tellurium was detected in only two samples of biotite-rich clastic sedimentary rocks (altered high Mg-Ni-Cr basalt?) within the Main Zone. These samples contained 0.4 and 0.6 ppm Te and were collected between 430 and 436 m in DDH U82-5.

BISMUTH

Bismuth contents in rock samples from DDH U82-5 are below the limits of detection except for seven samples, all of which occur within the boundaries of the Agassiz Metaltect. The Bi contents vary directly with the intensity of alteration and the abundance of sulphide. For instance, four analyses with the range 1.0 to 4.0 ppm Bi occur within picritic basalts in the Main Zone between 430 and 461 m whereas three analyses of 0.2 ppm occur in samples peripheral to the Main Zone.

SILVER, MOLYBDENUM AND FLUORINE

Although a significant Ag content to the MacLellan ore has been described, its use as a halo-forming element in the host rocks is not demonstrated by this study. Silver was detected in 27 samples. Within the Main Zone 10 of 14 samples contain detectable Ag with concentrations varying from 1 to 9 ppm and an arithmetic mean of 3 ppm. Outside the Main Zone, but within the Agassiz Metaltect and structurally overlying the Main Zone, is a 36 m thick zone, occurring between 302 and 338 m, with 9 of 10 samples ranging from 1 to 3 ppm Ag. Interestingly, this 36 m zone of en-

riched Ag generally corresponds to the location of the "Adjacent" halo that is proximal to the Main Zone halo.

In addition to high Ag, this zone is characterized by high Cu (53 to 238 ppm), F (400 to 716 ppm) and Mo (1 to 2 ppm) and low Sr (1 to 213 ppm) concentrations. Anomalous contents of Au, As and K₂O were previously discussed with respect to the "Adjacent" halo.

In the MacLellan and "Adjacent" haloes Ag marks the zone of most intense alteration that also represents the site of mineralization. Ag, Mo and F do not form haloes comparable to Au, As and Sb although an unexplained increase in F contents from approximately 200 to 528 m is documented.

BARIUM

The trend for Ba through the DDH U82-5 profile is one of increasing concentration from approximately 300 to 528 m, i.e., from the stratigraphic/structural top of the Agassiz Metaltect to the stratigraphic/structural base of this sequence. The Main Zone orebody is situated between 420 and 460 m near the midpoint of this trend of increasing Ba concentration. Barium content in samples from the Main Zone do not reflect the Main Zone mineralization. The overall trend for Ba is similar, albeit less extensive, to that observed for F, and to some extent, Pb.

TITANIUM

The highest Ti concentrations in rocks sampled from DDH U82-5 are in biotite-rich siliceous layers within the Main Zone. Between 425 and 442 m these units contain an average of 2.6% TiO₂ (n=5) whereas outside of the mineralized zone these layers are marked by a range of 0.4 to 1.5% TiO₂. The explanation for these enrichments may be two-fold. Firstly, the picritic basalt contributed a significant portion of detritus to the epiclastic sedimentary rocks during their formation and subsequently resistate minerals such as rutile and ilmenite were concentrated and incorporated during sediment diagenesis. Lithic clasts and basalt detritus are present in thin sections from these epiclastic layers, and zones of basaltic breccia (reworked?) have also been documented (Fedikow, 1986). A second possible explanation for Ti enrichment utilizes the contentions of Gagnon (1987) that the siliceous and biotite-rich layers represent fractured and intensely altered picritic basalt. In this scenario, Ti would have been leached from the basalt and deposited with the Main Zone mineralization along with other "ultramafic-source" minerals described by Augsten *et al.* (1986). The absence of Ti depletion in the rocks adjacent to the Main Zone is noted.

THALLIUM

Thallium was measured in drill core and outcrop samples collected from a number of lithologies in the deposit. The concentrations are marked by a low range in values with all samples (n=90) between 0.2 ppm (lower limit of detection) and 0.8 ppm. Six outcrop samples from the Main

Zone contained negligible Tl (≤ 0.2 to 0.2 ppm). A suite of samples collected from DDH U82-5 indicate a low contrast Tl anomaly in the Main Zone with values ranging from 0.2 to 0.8 ppm and an arithmetic mean of 0.5 ppm, compared with values of 0.2 ppm or analyses below the limits of detection in rocks structurally overlying and underlying the Main Zone. The remainder of the samples analysed for this study indicate a correlation between Tl and the biotite- and sulphide-rich layers in the deposit, particularly where anomalous Au and Zn are reported from the sample. Picritic basalts generally contain Tl contents at or near the lower limit of detection. Contrast is low between unmineralized and mineralized rocks in the deposit and, as such, Thallium is not considered to be a good halo-forming element for this deposit. Thallium contents in interlayered greywacke-type sedimentary rocks and picritic basalts ($n=20$) are generally at or near the lower limit of detection with only two samples containing more than 0.2 ppm (0.6 and 0.4 ppm). Neither of these two samples contain anomalous Au, but, relative to adjacent rocks in the sampling profile, contain high Zn con-

tents (0.6 ppm Tl - 218 ppm Zn in picritic basalt and 0.4 ppm Tl - 138 ppm Zn in greywacke).

NON-CARBONATE CARBON (C_{org})

The content of noncarbonate carbon in the rock samples collected from DDH U82-5 is generally between 0.01 and 0.08%, with the exception of one sample of massive basalt at 52 m that contained 0.18% C_{org} and three samples of biotite-rich and siliceous sedimentary rocks within the Main Zone. These three samples at 430, 436 and 442 m contain 0.17, 0.19 and 0.17% C_{org} , respectively. The explanation for the single high C_{org} analysis within the basalt is unknown unless the determination is spurious. The siliceous units within the Main Zone containing the anomalous C_{org} are also anomalous with respect to Au, As, Se, Te, Bi, Hg, Mo, Ag, Cu, Pb, Zn, Co, as well as containing the highest Sb (34 ppm) detected in this study. The significance of the C_{org} anomalies restricted to the Main Zone is uncertain.

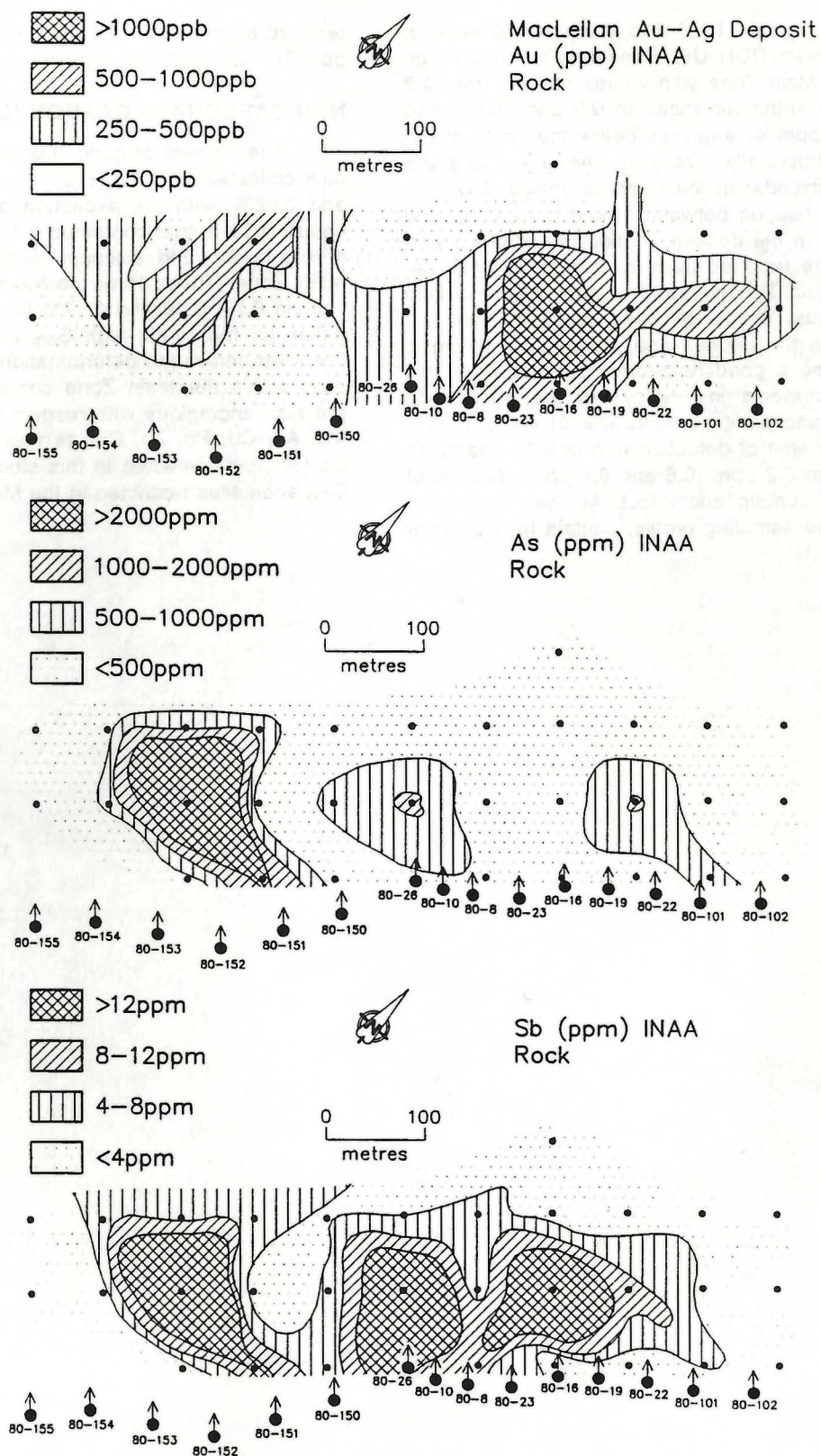


Figure 25: Contoured rock geochemical data for Au, As and Sb. Data from core samples collected from 15 DDH (n=154) that intersected the Nisku, MacLellan Main Zone and Rainbow deposits. Data reduced with block averaging.

INTERPRETATION OF ROCK GEOCHEMICAL PATTERNS UTILIZING BLOCK AVERAGING

The technique of block averaging has been applied to rock geochemical data derived from the analysis of drill core samples of host rocks collected from 21 diamond drill holes in the three deposits. This method of interpretation was attempted in order to observe the variation of trace elements from drill holes representing the Nisku, Rainbow and MacLellan Main Zone orebodies. Block averaging was selected as a method of data reduction to simplify the contouring procedure and subsequent interpretation. This technique has been utilized in a similar manner for the interpretation of rock geochemical surveys by Govett *et al.* (1975), Chork and Govett (1979), Govett and Pwa (1981), and Fedikow and Govett (1985). Details of the procedure are available in these publications.

PROCEDURE

The inclined drill holes illustrated in Figure 5 were rotated into the horizontal plane. In this way the sample locations along the drill core appear as surficial points with a position that may be described by utilizing x-y coordinates. A 76 m² (250' x 250') grid was placed over this point distribution and the arithmetic mean for the element of interest for all samples falling within a particular 76 m² (250' x 250') grid cell was calculated. The mean was assigned to the centre of the 76 m² cell and these values contoured. Results are presented in Figure 25 (Au, As, Sb), Figure 26 (Cu, Zn, Co) and in Figure 27 (Ba, Mn). Contour intervals were selected by inspection.

RESULTS

The contoured geochemical data in Figures 25, 26 and 27 illustrate various element associations within the deposits as well as the development of geochemical dispersion haloes associated with the gold mineralization. The high Au zone (greater than 1000 ppb) shown in Figure 25 clearly delineates the MacLellan Main Zone and is accompanied by Sb, Cu and Co anomalies (Figs. 25 and 26). Lower Au contents (500 to 1000 ppb) are present in the

areas of the Nisku and Rainbow deposits. The Nisku and Rainbow deposits exhibit different element associations than the Main Zone. The Rainbow deposit contains greater than 2000 ppm As in association with the Au mineralization, whereas the Nisku deposit is characterized by lower (500 to 1000 ppm) As and high Zn (≥ 750 ppm Zn). All three deposits have associated high Sb (≥ 12 ppm). In addition to the highest Au contents (≥ 1000 ppb) the Main Zone also contains high Cu (≥ 200 ppm) and Mn (≥ 1500 ppm). High Ba (≥ 200 ppm) is restricted to the Nisku deposit although an areally less extensive halo with equally high Ba contents occurs in association with the Rainbow deposit. A continuous zone of greater than 60 ppm Ba is associated with each of the three mineralized zones.

The forms or shapes of the contoured data allow for speculation or inference to be drawn between these mineralized zones. The distribution of Au suggests the MacLellan Main Zone and the Nisku deposit represent products of a single mineralizing process, whereas the Rainbow deposit is a discrete, isolated and separate entity. The connection between the MacLellan Main Zone and the Rainbow deposit becomes more apparent upon examination of the remainder of the geochemical data. Patterns for Cu, Zn and Co (Fig. 26) suggest a link between the MacLellan Main Zone and the Nisku deposit. The Rainbow deposit is unique in comparison to the Main Zone and Nisku deposits with respect to the patterns for Cu, Zn, Co (Fig. 26), Ba and Mn (Fig. 27) and As (Fig. 25). The results for Sb (Fig. 25) indicate that all three mineralized zones are enriched in Sb and are spatially and/or temporally(?) related. The patterns also suggest that gold mineralization extends to a level below that represented by the drill holes sampled for this study.

The extent of the anomalous concentrations of the elements indicated in Figures 25, 26 and 27 is difficult to ascertain since samples were collected from diamond drill holes collared within the mineralized zones. A geochemical halo of multi-element composition encompasses the mineralized zones with a two-dimensional extent of 750 m x 350 m.

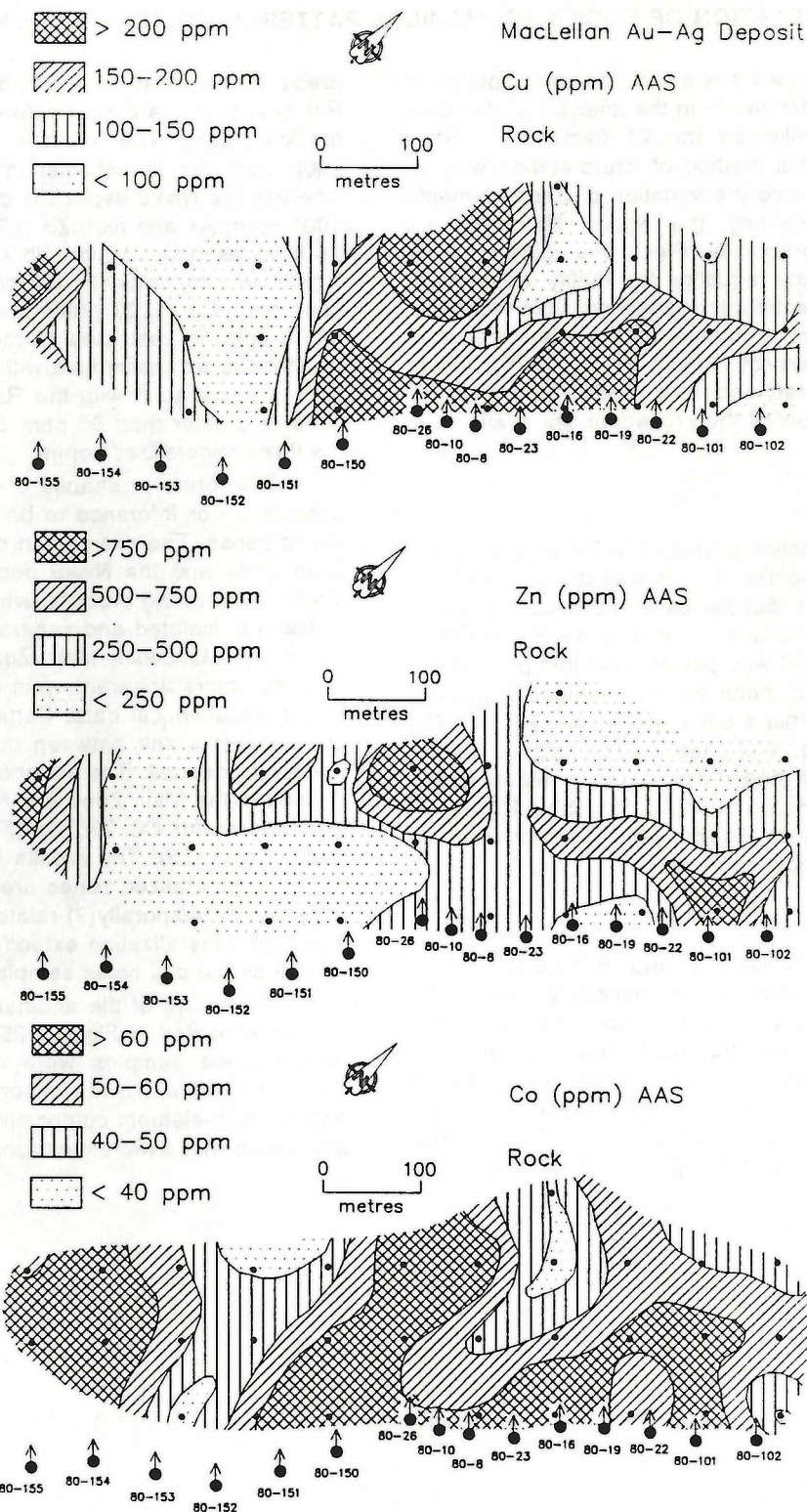


Figure 26: Contoured rock geochemical data for Cu, Zn and Co. Data from core samples collected from 15 DDH (n=154) that intersected the Nisku, MacLellan Main Zone and Rainbow deposits. Data reduced with block averaging.

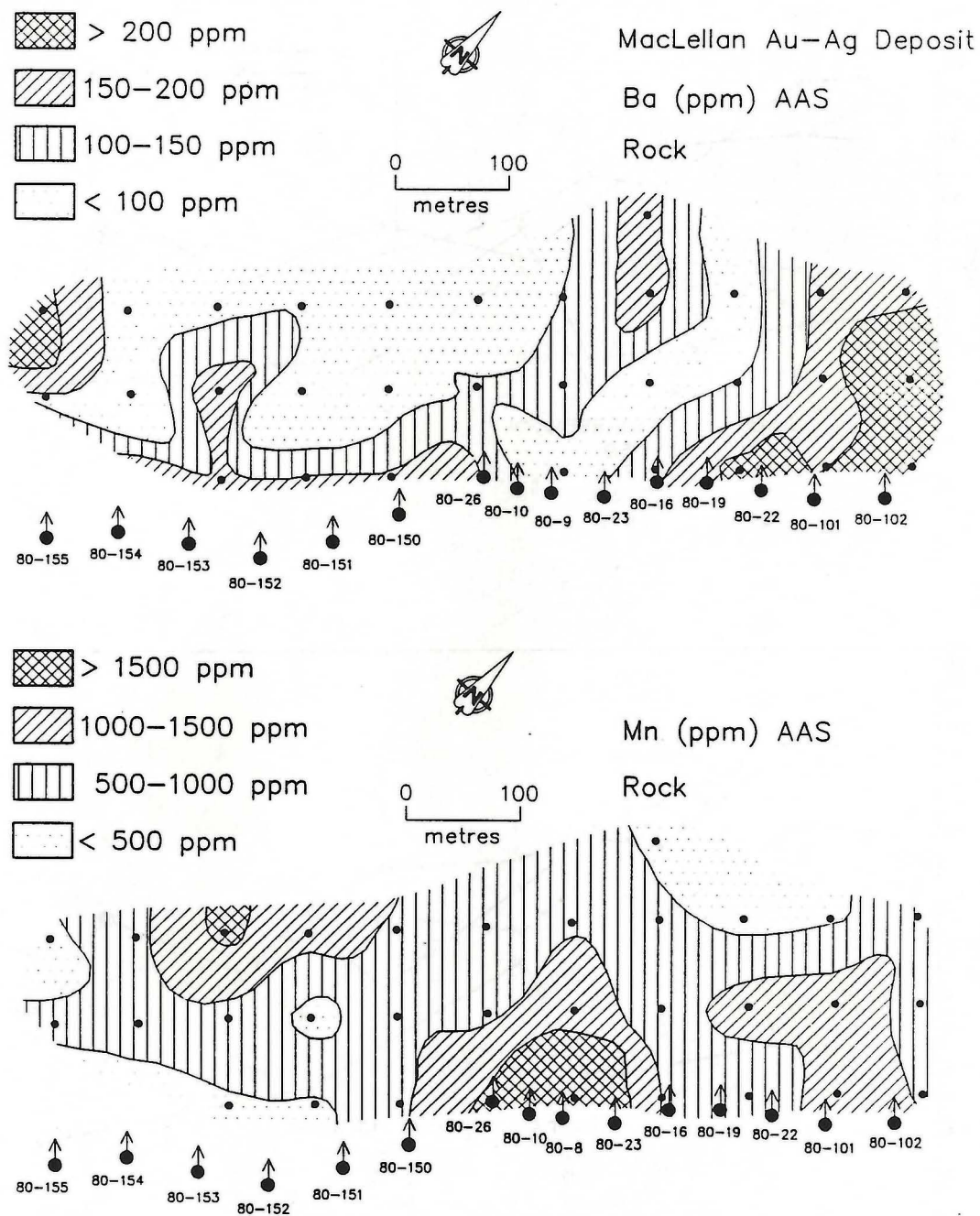


Figure 27: Contoured rock geochemical data for Ba and Mn. Data from core samples collected from 15 DDH (n=154) that intersected the Nisku, MacLellan Main Zone and Rainbow deposits. Data reduced with block averaging.

MacLellan Au-Ag Deposit - Main Zone

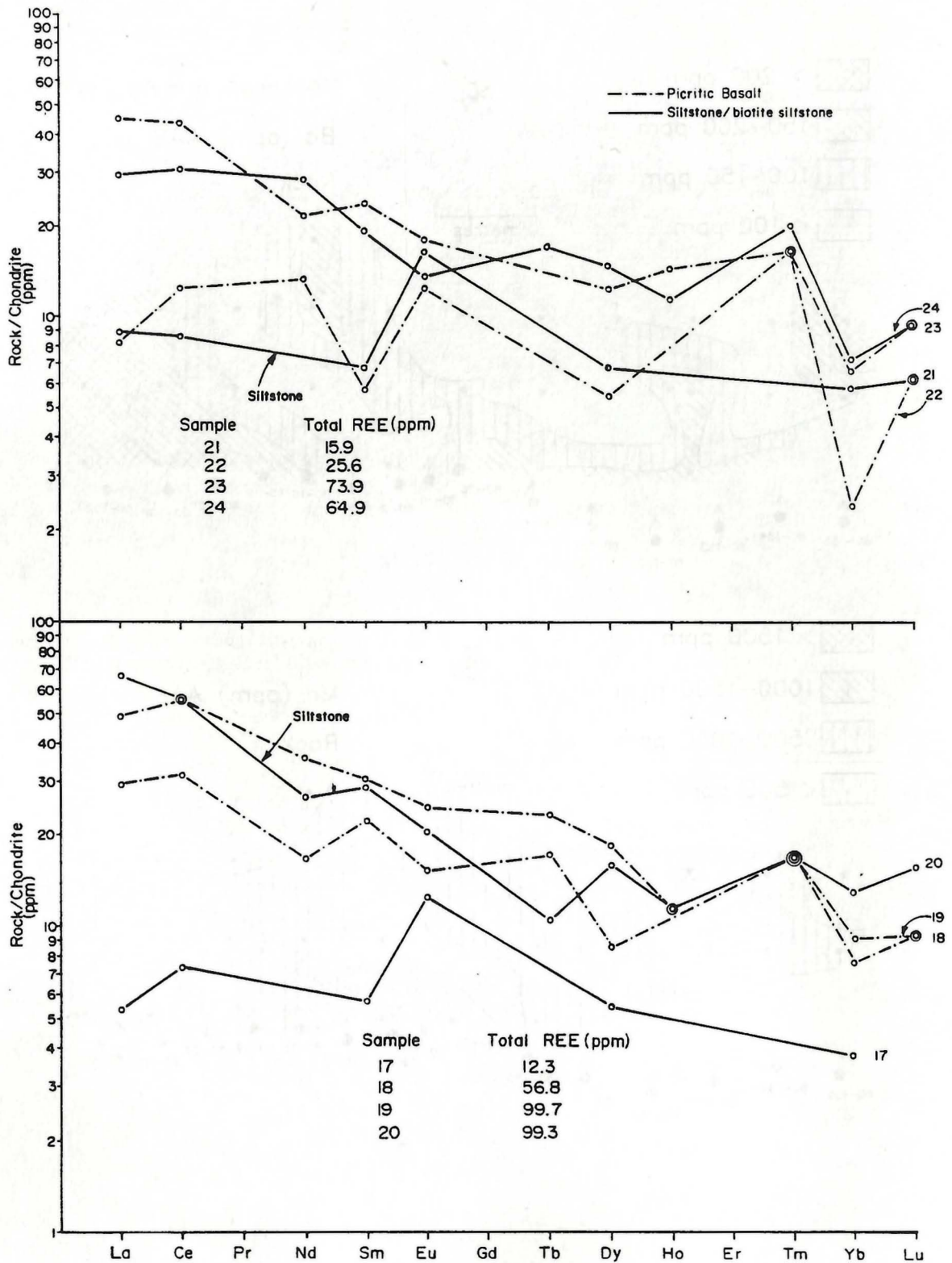


Figure 28: Chondrite-normalized REE profiles for picritic basalts and sedimentary rocks from the MacLellan Main Zone. Data for normalization from Masuda et al. (1973) and Haskin et al. (1968).

RARE EARTH ELEMENT GEOCHEMISTRY

This portion of the MacLellan rock geochemical study was undertaken to; (i) characterize the REE profiles for MacLellan basalts and to compare these profiles for altered and unaltered counterparts, (ii) compare the MacLellan basalt REE profiles to those of similar rock units along the Agassiz Metallotect in the northern belt, and (iii) compare REE profiles for the MacLellan basalts and the MacLellan "sedimentary" rocks.

The MacLellan basalts have been multiply altered as a result of; (i) seawater-basalt interaction during deposition producing low temperature (200°C) alteration and subsequent seafloor weathering, (ii) hydrothermal alteration accompanying formation of the deposit, and (iii) alteration related to mobilization during regional metamorphism. Hydrothermal alteration may be critical to REE interpretation for MacLellan basalts since the deposit represents focussed fluid flow - wallrock interaction.

In a petrochemical study of the Lynn Lake greenstone belt, Syme (1985) summarizes element mobility and the usefulness of specific major and trace elements in determining petrogenesis in Waskewan Group rocks. The elements Na, Ca, K, Fe, Sr, Pb and Ba are all rejected as useful petrogenetic indicators due to high mobilities during alteration, whereas MgO, Si, Al, Ti, P, Cr, Ni and REE were regarded as having application to petrogenetic interpretation. Previous studies (Augsten *et al.*, 1986; Fedikow, 1986) reveal the variability of Ni in these rocks resulting from the erratic distribution of pentlandite and Ni-bearing pyrrhotite in the MacLellan basalts. Accordingly, Ni is probably an unreliable petrogenetic indicator for this study. The conclusions of Syme (1985) indicate the relative immobility of REE in the rocks of the Lynn Lake greenstone belt. Wendlandt and Harrison (1979) have demonstrated experimentally, however, that REE are mobile when large volumes of water or CO₂-rich fluids are flushed through the rock.

Analysis of samples for Sc, Th, U, Ce, Dy, Er, Eu, Gd, Ho, La, Lu, Nd, Pr, Sm, Tb, Tm and Yb was undertaken by Becquerel Laboratories Ltd. (Mississauga). Raw data is presented in Appendix II, Part 3. Data for this discussion are chondrite normalized using REE values for the Leedy chondrite from Masuda *et al.* (1973); Tb, Tm and Ho values are from Haskin *et al.* (1968).

RESULTS

I. REE patterns for MacLellan picritic basalts

REE profiles for MacLellan basalts are presented in Figures 28, 29 and 30 for nine samples from the Main Zone. The profiles are erratic, indicating variable alteration intensity, but can be grouped into three categories of patterns. These are; (i) steep (samples 18, 19, 23, 34 and 36), (ii) moderately steep but with a more erratic character reflecting increased variance in the data (samples 29, 31 and 32), and (iii) a flat and irregular pattern (sample 22).

Total REE abundances are the lowest in sample 22 (25.6 ppm) and increase with increasing REE profile gradi-

ent, *i.e.*, moderately steep REE profile basalts (41.2-54.1 ppm) and steep REE profile basalts (56.8-99.7 ppm).

These patterns and the total REE concentration appear to be related to the degree of alteration in the rocks, particularly carbonatization. A range of 10.1 to 13.1% CaO is accompanied by a range of 1.2 to 6.1% LOI in the basalts (Table 13) and a concomitant decrease in REE indicates the alteration effects of carbonatization on the REE contents of these rocks. The highest CaO-CO₂-LOI-Au values correlate with the lowest total REE contents. No correlation exists between the steep, moderately steep and flat REE profiles and the Au or base metal contents of the rocks.

Table 13
Summary of some geochemical characteristics for carbonatized MacLellan picritic basalts analysed for REE

Sample No.	Total REE (ppm)	CaO (%)	CO ₂ (%)	LOI (%)	Au (ppb)
18 (AGC-50P)	56.8	10.1	0.70	1.4	7
19 (AGC-55)	99.7	11.9	1.13	1.3	7
22 (AGC-62)	99.3	10.2	1.03	2.8	28
23 (AGC-68P)	73.9	12.0	0.37	1.2	1200
29 (AGC-74P)	45.9	13.1	4.31	4.4	1100
31 (AGC-75)	41.2	12.0	4.49	5.6	94
32 (AGC-76P)	54.1	12.4	5.26	6.1	4200
34 (AGC-79P)	59.9	10.8	2.83	3.8	160

In comparison with chondrite-normalized REE profiles for northern belt high-Al₂O₃ and "normal" basalts (Syme, 1985), the MacLellan picrites tend to; (i) have more erratic profiles reflecting their altered nature, (ii) lack, or have obscured by their erratic REE profile, a distinctive Eu anomaly documented in both high Al₂O₃ and normal basalts (Syme, 1985; *cf.* Fig. 23), and (iii) more closely approximate the steeper gradient of the high-Al₂O₃ basalts.

II. MacLellan picritic basalts vs. other northern belt picritic basalts along the Agassiz Metallotect

The MacLellan basalt REE profiles are compared and contrasted with REE profiles obtained from picritic basalts at Nickel and Motriuk Lake, (Fig. 31), Arbour and Muskeg Lake (Fig. 32) and at Sheila and Margaret lakes (Fig. 33). Samples collected at Arbour Lake and one sample from Nickel Lake represent drill core; all others represent outcrop chip samples. The northern belt high-Mg basalts are generally characterized by shallow REE profile gradients with distinctive positive Eu anomalies and La enrichments or depletions. The exceptions to these characteristics are the Sheila and Margaret lakes picritic basalts, which are steep gradient REE profiles without the distinctive positive Eu anomaly (Fig. 33). These basalts also tend to have more erratic profiles with widely varying LREE and total REE (5.2-118.2 ppm) abundance. All of the picritic basalts along the Agassiz Metaltotect are carbonatized to variable degrees

MacLellan Au-Ag Deposit - Main Zone

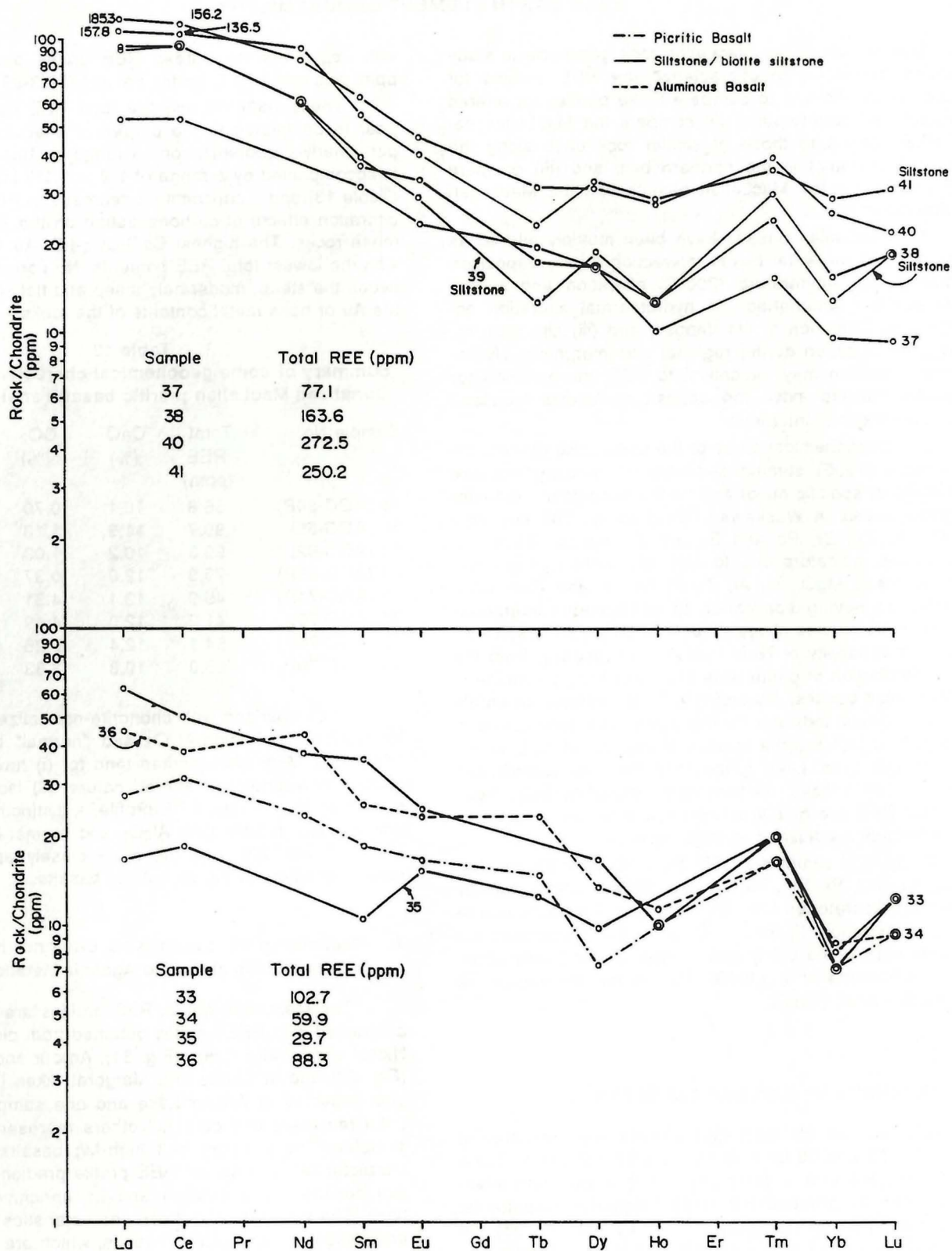


Figure 29: Chondrite-normalized REE profiles for picritic basalts and sedimentary rocks from the MacLellan Main Zone. Conventions as in Figure 28.

MacLellan Au-Ag Deposit - Main Zone

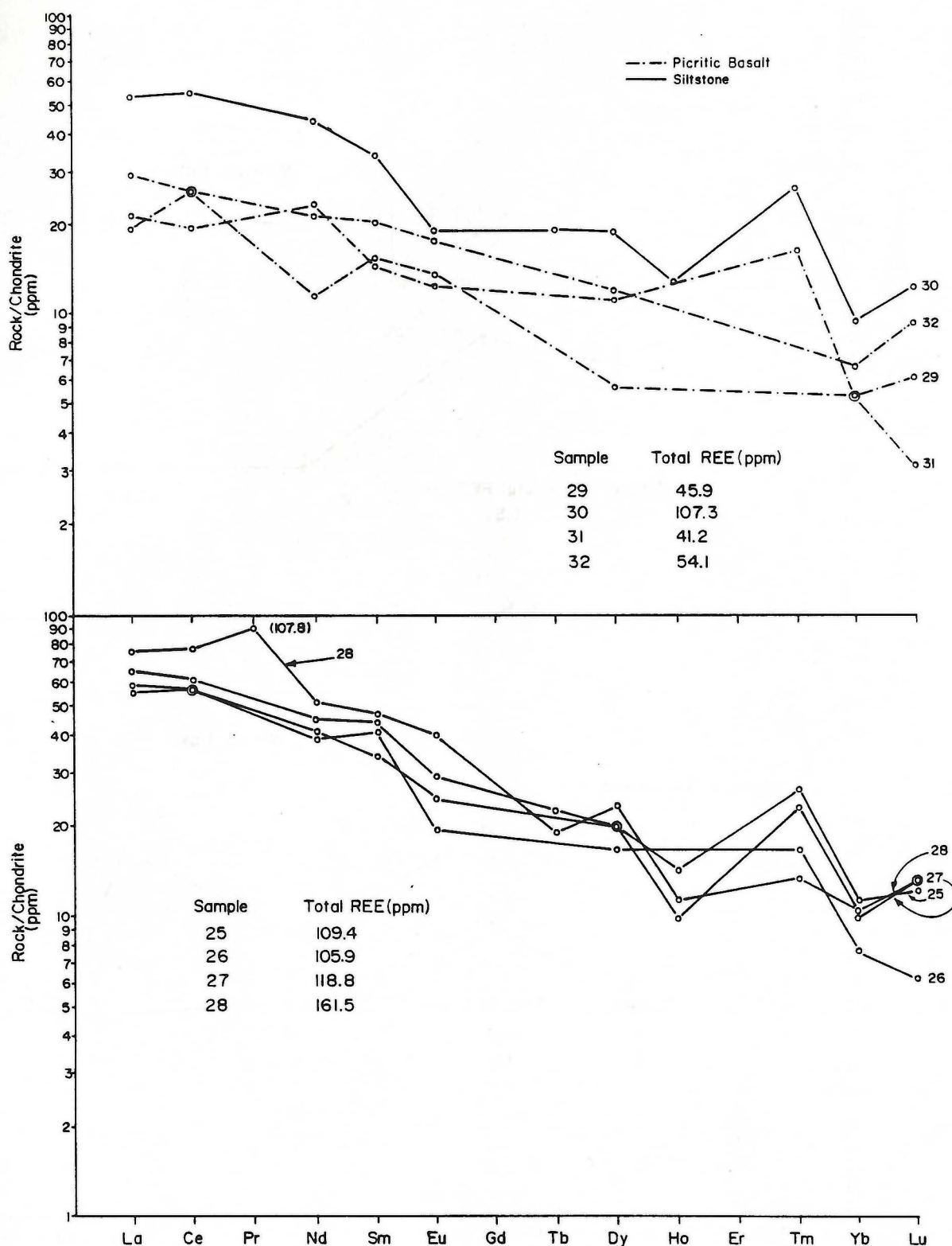


Figure 30: Chondrite-normalized REE profiles for picritic basalts and sedimentary rocks from the MacLellan Main Zone. Conventions as in Figure 28.

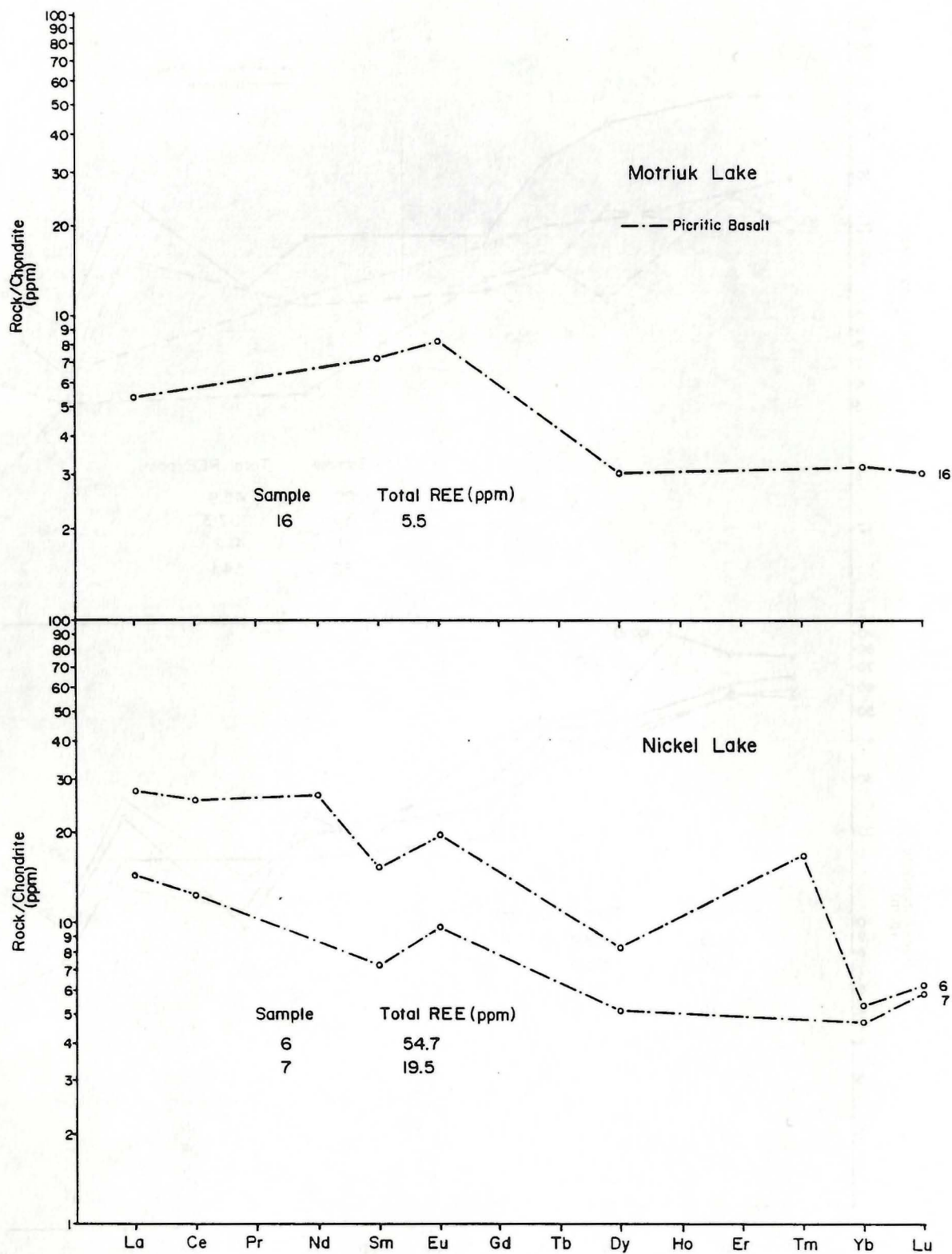


Figure 31: Chondrite-normalized REE profiles for Motriuk Lake and Nickel Lake picritic basalts. Conventions as in Figure 28.

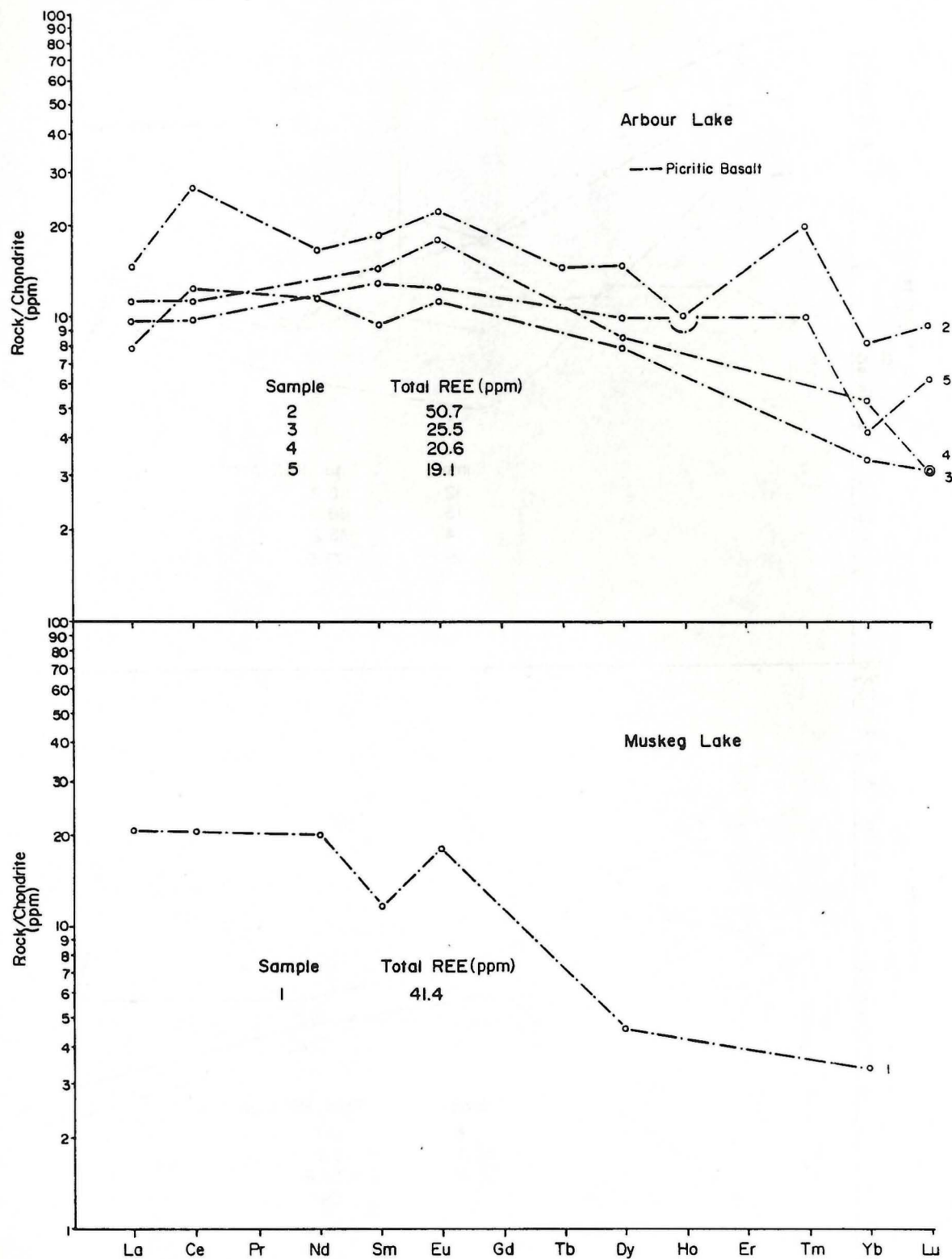


Figure 32: Chondrite-normalized REE profiles for Arbour Lake and Muskeg Lake picritic basalts. Conventions as in Figure 28.

Sheila-Margaret Lakes

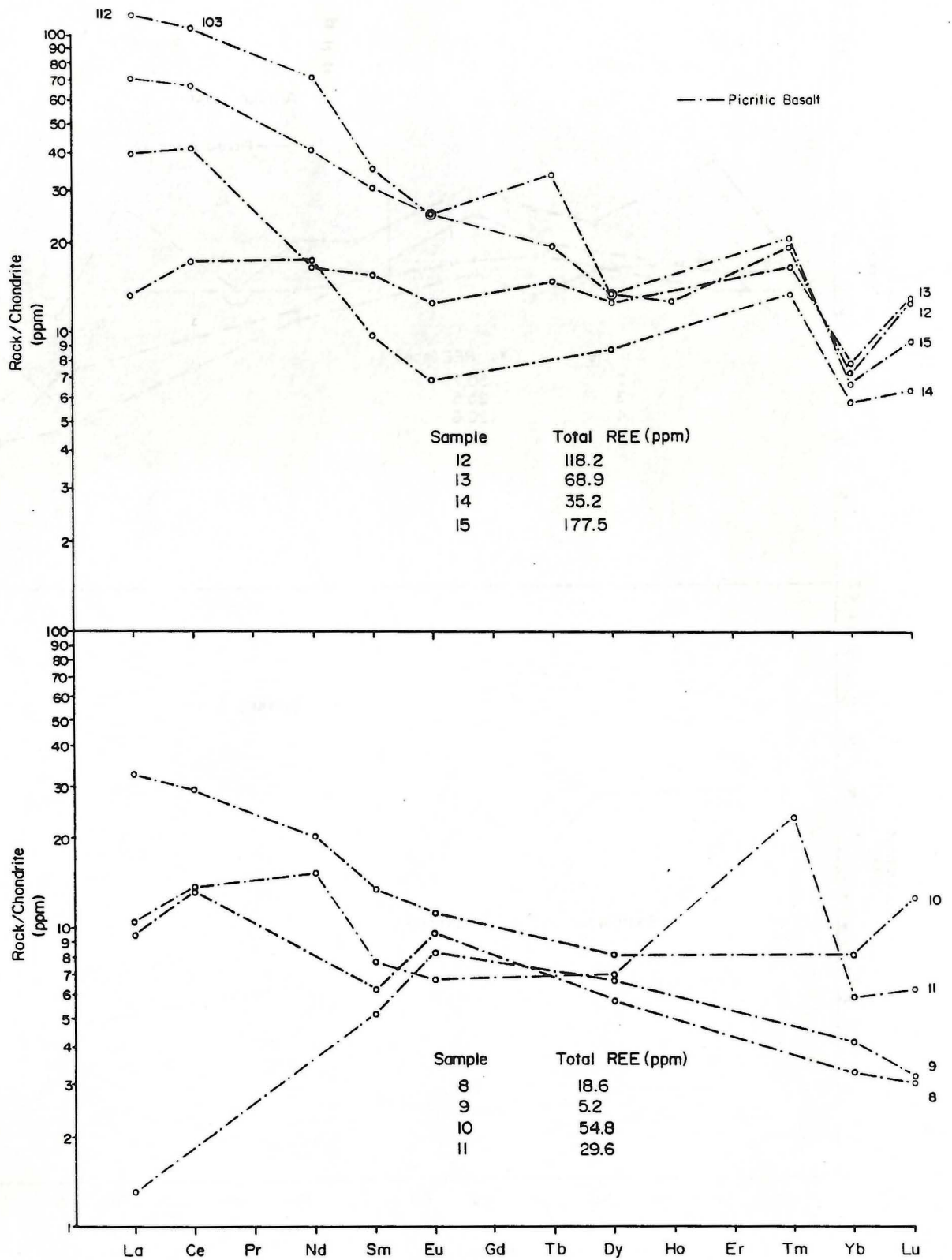


Figure 33: Chondrite-normalized REE profiles for picritic basalts from the Sheila-Margaret lakes area. Conventions as in Figure 28.

with CaO ranging from 11.4 to 18.7% and LOI varying from 3.4 to 9.9%. The samples from Motriuk Lake, Nickel Lake and Muskeg Lake are characterized by widely variable total REE contents, *i.e.*, Motriuk Lake, 5.5 ppm; Muskeg Lake, 41.4 ppm; and 19.5 and 54.7 ppm for two samples from Nickel Lake. The Arbour Lake samples contain total REE contents of 19.1 to 50.7 ppm. This is within the range of total REE for the other northern belt samples except for Motriuk Lake.

The area of the Motriuk Lake sample is marked by a base metal occurrence hosted within felsic pyroclastic volcanic rocks (Baldwin, 1989). The silicate whole rock data (Table 14) suggest the sample is not intensely carbonatized, although a low total analysis was obtained. No connection can be made between the Motriuk Lake sample, known iron and base-metal sulphide mineralization in the area of the sample, and low total REE contents similar to some of the MacLellan host basalts.

Table 14

Silicate whole rock analysis for the Motriuk Lake high-Mg basalt (30-86-1155-1) (contributed by K.J. Ferreira)

	Analysis (wt.%) 30-86-1155-1
SiO ₂	44.8
Al ₂ O ₃	6.2
FeO ¹	9.6
CaO	7.2
MgO	23.6
Na ₂ O	0.25
K ₂ O	0.06
TiO ₂	0.7
P ₂ O ₅	0.07
MnO	0.16
LOI	4.8
Total	97.44

III. MacLellan picritic basalts vs. MacLellan sedimentary rocks

Rare earth element profiles for the MacLellan sedimentary rocks are plotted together with those for MacLellan picritic basalts on Figures 28, 29, and 30. The sedimentary rocks have erratic REE profiles that are similar to the basalts, probably resulting from the multiple alteration history of the rocks in the MacLellan deposit. Samples 17 and 21 (Fig. 28) are characterized by a positive Eu anomaly similar to that described by Syme (1985) for the northern belt high-Al₂O₃ and "normal" basalts. Some of the sedimentary rocks (samples 25 to 28, Fig. 30) have a less erratic, albeit steep gradient, REE profile; whereas, in samples 37, 38, 40 and 41 (Fig. 29) the profiles are erratic and contain greatly elevated LREE and total REE abundances.

A single explanation for the positive Eu anomaly in samples 17 and 21 is difficult since it can be explained by: (1) the incorporation of Eu²⁺ during albitization resulting

from host rock alteration accompanying the mineralizing process; (2) an original REE signature of a now-altered basalt; that had incorporated plagioclase during crystallization; and (3) abundant detrital plagioclase derived from the MacLellan basalts during erosion in a shallow marine environment and subsequent deposition as clastic sediments. The absence of positive Eu anomalies in the remainder of the sedimentary rocks may be due to masking of the original REE profile by REE/LREE enhancement during alteration. If this explanation for the absence of the Eu anomaly is valid then the greatly elevated LREE abundances in samples 40 and 41 (La = 157.8 and 185.3 ppm, Ce = 136.5 and 156.2 ppm) indicate that: (1) these samples have been more intensely altered (albitized?) than samples 25 to 28. Samples 25 to 28 (silicified?) are from the Main Zone and samples 40 and 41 were collected south of the Main Zone in less intensely altered rocks; or (2) sedimentary units have a provenance other than the MacLellan basalts.

SUMMARY

Interpretation of the highly altered MacLellan basalts utilizing REE data and comparison with data from Syme (1985) and others is tenuous at best. A summary of standard comparative REE geochemical parameters is given in Table 15. From these limited data, it is apparent that rigid conclusions regarding petrogenesis would contradict the well documented observations by Syme (1985) while at the same time invoking new geochemical definitions for Divisions B and D in the northern belt basalts (Syme, 1985). For instance, the REE profiles suggest that the picritic basalt is geochemically fractionated, *i.e.*, LREE (La, Ce, Pr, Nd) are significantly enriched compared to HREE (Dy, Ho, Er, Tm, Yb, Lu), and REE are greatly enriched over the standard chondritic meteorite. This would contradict the petrochemical study of Syme (1985) and the stratigraphic study of Gilbert *et al.* (1981) who describe Division B northern belt basalts as geochemically more fractionated and evolved, and stratigraphically older than the more magnesian, less fractionated and younger Division D. The data from this study are highly erratic with La_n/Yb_n data from MacLellan basalts encompassing those for Divisions B and D high-alumina basalt, Hughes Lake basalt and Wasekwan Group calc-alkaline andesite (Table 15). The Arbour Lake basalts are probable stratigraphic equivalents to the MacLellan basalts, based on observations made from core drilled between the MacLellan Au-Ag deposit eastward to Arbour Lake. However, when REE data for the two suites of basalts are compared, the effects of alteration on REE geochemistry at the MacLellan deposit become obvious. The La_n/Yb_n of Arbour Lake basalt (1.8-2.3) agrees with the range for Division D high alumina basalts (1.7-4.6) and suggests the picritic Arbour Lake basalts are an integral part of Division D. The Sheila and Margaret lakes, Nickel Lake and Muskeg Lake basalt also reflect the variable nature of the REE data by the wide range of La_n/Yb_n (Table 15). The single picritic basalt sample from Motriuk Lake has comparable La_n/Yb_n and comparable HREE to Division D high alumina basalts.

Table 15
Summary of ranges of comparative REE geochemical data from Syme (1985) and this study

	La_n/Yb_n	HREE (ppm)
DIVISION B		
High-alumina basalt	3.1 - 4.3	10 ch
DIVISION D		
High-alumina basalt	1.7 - 4.6	5 - 10 ch
Normal-alumina basalt	0.9 - 1.5	10 - 15 ch
MacLellan basalt (8)	3.3 - 6.7	2 - 18 ch *
siliceous siltstone (n = 7)	1.4 - 7.1	6 - 33 *
biotite siltstone (n = 9)	4.1 - 7.7	7 - 31 *
Arbour Lake basalt (4)	1.8 - 2.3	3 - 15 *
Nickel Lake basalt (2)	1.8 - 2.3	3 - 15 *
Muskeg Lake basalt (1)	3.0 - 5.3	5 - 8 *
Sheila-Margaret lakes basalt (8)	0.2 - 16.7	3 - 13 *
Motriuk Lake basalt (1)	1.6	3.1 - 3.4 *
Hughes Lake basalt	2.9 - 5.1	
Wasekwan Group calc-alkaline andesite	3.7 - 6.0	
Average MORB	0.75	
Island Arc and Back Arc tholeiite	0.38 - 3.1	
(Hawkesworth <i>et al.</i> , 1977; Arth, 1981; Sun, 1980)		

Notes: Bracketed figure refers to number of samples.

* - Dy and Yb only

ch- chondrite

These data are divergent, albeit due to alteration effects, from normal LREE-depleted MORB patterns (Frey *et al.*, 1974; Basaltic Volcanism Study Project, 1981; Vierick *et al.*, 1989) and to the generally flat REE patterns for anomalous or enriched MORB (Bryan *et al.*, 1976). If REE enrichment patterns between island arc basalts (Kay, 1984) and MacLellan basalts are compared, there appears to be some agreement in HREE contents and divergence in LREE contents. The HREE in island arc basalts range from 9 to 25 times chondrite; MacLellan basalt HREE ranges from 3 to 33 times chondrite. The MacLellan basalt LREE may be examined in two parts, highly altered basalt and less altered basalt. The less altered basalt contains LREE that are 5 to 30 times chondrite (Arbour Lake, Motriuk Lake, Muskeg Lake and Nickel Lake), whereas the host basalts at the MacLellan Main Zone have LREE 8-80 times chondrite. Although erratic, the LREE contents of MacLellan basalts are lower than those of island arc basalts. The overall REE patterns for picritic basalt at Sheila and Margaret lakes are similar to those at the MacLellan Main Zone.

The comparison of REE data from samples of "siliceous" and "biotite-rich siltstone" to picritic basalt at the MacLellan deposit indicates significant differences between these three units. The La_n/Yb_n ranges from 3.3 to 6.7 for the basalt, 1.4 to 7.2 for siliceous siltstone and 4.1 to 7.7 for

biotite-rich siltstone. These units are enriched in HREE compared to chondrite by factors of 2 to 18, 6 to 33 and 7 to 31, respectively and together with the La_n/Yb_n ratios, illustrate significant geochemical contrast between these units. REE profiles for the basalts ($La_n/Yb_n = 3.3$ to 6.7) versus the biotite-rich siltstones ($La_n/Yb_n = 4.1$ to 7.7) are similar and do not preclude the biotite-rich siltstones as alteration facies of the basalt. The more erratic La_n/Yb_n and similar HREE enrichment range (6 to 33) for siliceous siltstone (1.4 to 7.1) compared to biotite-rich siltstone could be interpreted as decreased contents of La in the intensely silicified host rocks adjacent to mineralization. This would not, however, differentiate intensely silicified basalt from equivalently altered siltstone, since each rock would be effectively homogenized by the most intense portion of the alteration envelope.

For purposes of petrogenetic classification it appears that alteration has introduced significant variance into the data set and that this variance precludes rigid basalt classification. Of some interest is the similarity of REE patterns in picritic basalt at Sheila and Margaret lakes to the MacLellan Main Zone picritic basalt. The observation can be explained in terms of similarity in depositional and/or alteration (mineralization?) history.

INTER-ELEMENT CORRELATION COEFFICIENTS

Pearson correlation coefficient matrices were developed for each of the following data sets:

1. Main Zone Picritic Basalt
2. Nisku Deposit (East Zone) Picritic Basalt
3. Rainbow Deposit (West Zone) Picritic Basalt
4. Background Picritic Basalt East
5. Main Zone Sedimentary Rocks
6. Nisku Deposit (East Zone) Sedimentary Rocks
7. Rainbow Deposit (West Zone) Sedimentary Rocks
8. Background Sedimentary Rocks

Correlation coefficients calculated at the 95% and 99% confidence limits for these data after $\log_{10}$ transformation are summarized in Appendix VII. The picritic basalt element correlations are discussed separately from those for the sedimentary rocks. Both groups are compared to "background" data populations. Figure 34 illustrates the correlations between Au and selected elements in Main Zone picritic basalt and sedimentary rocks.

PICRITIC BASALT CORRELATIONS

Main Zone picritic basalt is characterized by more intense mineralization-related alteration and more abundant auriferous mineralization than either the Nisku or Rainbow deposits, and accordingly, the Main Zone is marked by a larger number of significant ore- and alteration-element correlations. All correlations can be broadly grouped under the headings of lithology, alteration and mineralization although some element correlations occur within more than one category.

Lithology

There are two consistent element correlations that characterize the picrite in each of the three mineralized zones. These two groups are; (i) MgO-Ni-Cr, and (ii) TiO_2 - P_2O_5 - Fe_2O_3 , both of which reflect the basic mineralogical and primary geochemical composition of the host rocks. Apatite may have been introduced into the host rocks with some of the ore-related elements. Other element correlations in the Main Zone include: (i) LOI with MgO-Ni-Cr reflecting the hydrated phyllosilicate dominated secondary mineralogy of the host rocks; (ii) Co-Ag-Sb-Li with Fe_2O_3 - TiO_2 , indicating the presence of pyrrhotite and probably pyrrhotite in the picrite; (iii) SiO_2 - Al_2O_3 - Na_2O , reflecting primary geochemistry of the picrite; and (iv) F-Sr with TiO_2 - P_2O_5 -Zn, indicating the presence of calcium carbonate in the rocks and thereby associated Sr and F (fluorite?). The Nisku deposit picritic basalt is marked by a Cu-Co correlation that reflects a chalcopyrite-pyrrhotite fraction in the picrite. The West Zone is characterized by a Cu (chalcopyrite)- TiO_2 - P_2O_5 grouping.

Alteration

Three element groupings in this category suggest three discrete alteration types in the host rocks of the three deposits. The grouping Al_2O_3 - Na_2O - K_2O -Ba-Rb-Li indicates that a linear relationship exists between potassic metasomatic alteration (K_2O -Ba-Rb-Li) in the rocks, the destruction of plagioclase feldspar (Na), and the formation of a secondary phyllosilicate dominated mineralogy (Al_2O_3). In the Rainbow deposit Cu was mobilized (as chalcopyrite) during this alteration event as evidenced by its correlation with the above grouping. A second, discrete alteration event is indicated by the grouping CaO-MnO-LOI- CO_2 -conductivity-Ni-Cr. This reflects an increase in loss on ignition and conductivity accompanying carbonatization. Selenium is included in this grouping, although the relatively few analyses of this element above the analytical limit of detection make this correlation tenuous. In the West Zone Na_2O is correlated with Cu-Pb-Zn-Ba, suggesting a possible link between albitization and/or Na depletion through feldspar destruction that accompanies a chalcopyrite-galena-sphalerite-barite mineralizing process.

Mineralization

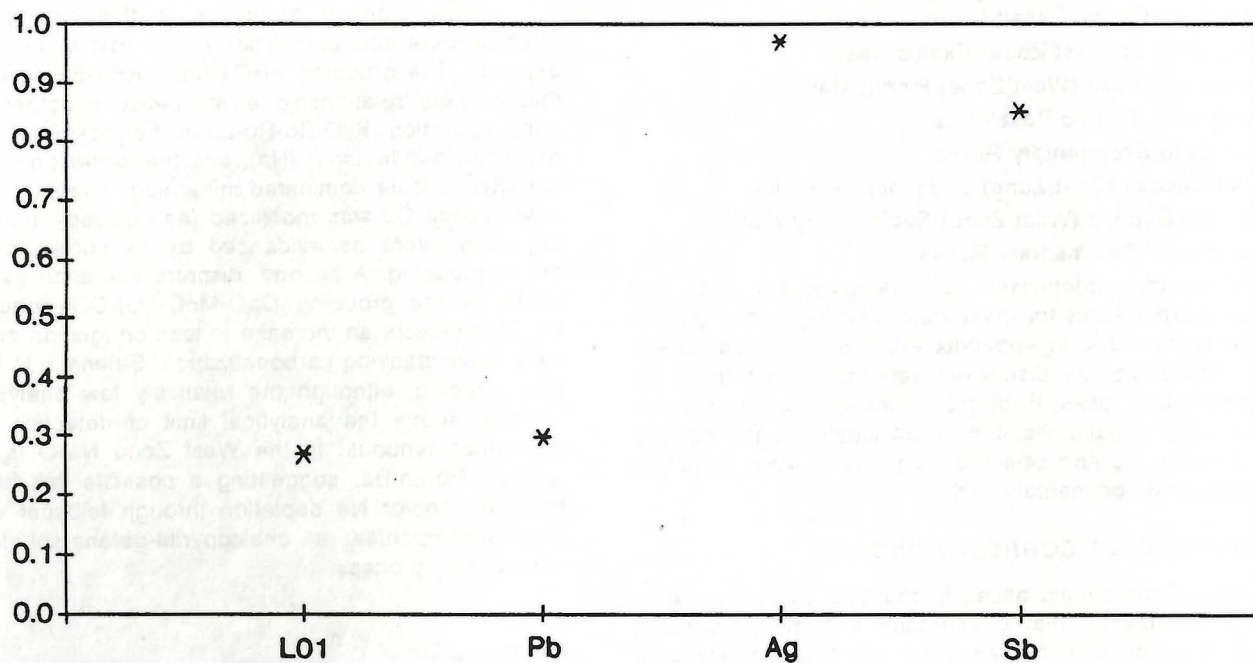
The large number of element correlations in this group is directly attributable to the presence of sulphides in the host rocks and their interrelationships with oxides, sulphosalts and Ni-Sb minerals and native metals identified in the deposit by Augsten *et al.* (1986). In the Main Zone the element correlations and their probable mineralogical associations are: (i) Co-Sb, pyrrhotite-tetrahedrite; (ii) Ag-Sb-Cd, pyrrhotite-sphalerite; (iii) Zn-Mn-Cd, sphalerite-pyrolusite (also in the Rainbow deposit); and (vi) Cu-Co-Ag-Se, pyrrhotite-chalcopyrite-pyrrhotite. Additionally, there is a curious lack of Au and As correlation in the Main Zone picritic basalt. This may be attributable to: (i) the presence of Au as relatively pure native gold in the rocks; (ii) the presence of non-auriferous arsenopyrite; and (iii) sampling error due to "nugget effect".

In the Nisku and Rainbow deposits the correlations are: (i) Au-As-Sb, native gold-arsenopyrite-geocronite-tetrahedrite; (ii) Pb-Zn-Ag-Cd, galena-sphalerite-pyrrhotite; and (iii) Mn-Cu-As-Au, pyrolusite-chalcopyrite-arsenopyrite-native gold. Additionally, the Rainbow deposit is marked by a Cu-Ba-Ag correlation that suggests a chalcopyrite-barite-pyrrhotite assemblage.

When these element correlations are compared to a suite of background rocks of the same composition, the preponderance of lithologically-related correlations over those of alteration and mineralization reflects the relatively unaltered state of the background rocks. Lithologically attributable correlations include: (i) Ni-Cr-MgO; (ii) SiO_2 - Al_2O_3 - Na_2O ; and (iii) Fe_2O_3 -MgO-Ni-Cu-Co. The background rocks are not devoid of alteration, however, and include the potassic metasomatic alteration correlation assemblage of

Correlation
Coefficient

MacLellan Main Zone Sedimentary Rocks



Correlation
Coefficient

MacLellan Main Zone Picritic Basalt

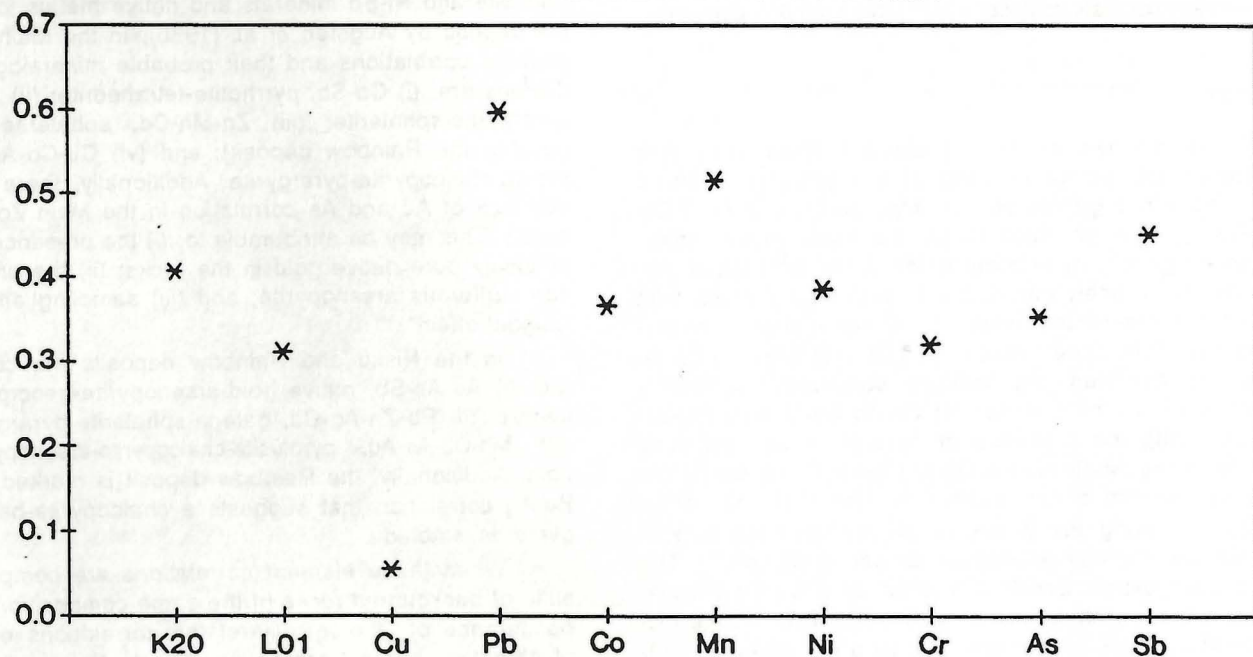


Figure 34: A comparison of element correlations with Au between Main Zone sedimentary rocks and picritic basalts.

K₂O-Ba and a carbonatization alteration assemblage of CaO-MnO-LOI. Mineralization-attributable correlations in the background rocks are represented by As-Sb (arsenopyrite-sulphosalt) and due to the much smaller number of correlatable elements reflects the relatively unaltered nature of these rocks.

SEDIMENTARY ROCK CORRELATIONS

The interpretation of element correlations for this group of rocks is more complex than for the picritic basalts since the sedimentary rocks may, in fact, represent intensely altered picritic basalt and, accordingly, have been affected by one more alteration type. Additionally, since the sedimentary rocks contain more sulphide mineralization than the picritic basalt (Fedikow, 1986) the mineralization element correlations are also more numerous.

Lithology

Of particular interest in this category is the correlation between Ni and Cr. If the sedimentary rocks are bona fide detrital rocks then a linear relationship between these elements would not be expected unless the detritus was derived from an actively eroding picrite source. The elements Rb (potassic metasomatism) and As and Co (arsenopyrite, pyrrhotite) are also correlated to Ni-Cr and suggest a sulphide "factor" to this grouping. Other significant positive element groupings for the Main Zone include: (i) Na₂O-P₂O₅; (ii) SiO₂-Na₂O-Zr; (iii) Fe₂O₃^T-MgO-TiO₂-CaO-MnO-Cu-Co-Cr (pyrrhotite and carbonate superimposed on a lithologic grouping); and (iv) P₂O₅-TiO₂-Zr-MnO-Co-F (pyrrhotite and carbonate).

The Nisku and Rainbow deposit correlations are: (i) SiO₂-Fe₂O₃^T; (ii) Al₂O₃-Na₂O-K₂O; and (iii) Fe₂O₃^T-TiO₂-P₂O₅-Ba. These are identical to the MacLellan Main Zone with trace elements suggestive of either alteration or mineralization.

Alteration

There are two dominant alteration element groupings in the sedimentary rock element correlations. These are a potassic metasomatic assemblage and a carbonatization assemblage each of which has a long string of associated ore and ore-related elements. Two discrete correlations identify a potassic metasomatism in these rocks: (i) Ba-Li-Rb-F; and (ii) Al₂O₃-MgO-K₂O-Li-Rb. A superimposition of carbonate alteration onto the potassic alteration (or vice versa) is implied by the association of CO₂-Cond-pH-MnO-LOI-F-As-Sb with (i) and (ii). The occurrence of As-Sb with the carbonate alteration element assemblage indicates an arsenopyrite-sulphosalt factor in this element assemblage. In addition, the element grouping of MnO-LOI-CO₂-Cond-pH-Ni-Cr-Pb-Zn-Co-Mo indicates the association of sphalerite, galena, pyrrhotite and molybdenite with both a lithologic factor (Ni-Cr) and a carbonate factor (MnO-LOI-CO₂-Cond-pH). This association suggests a link between the carbonatization of

the picritic basalt and the deposition or mobilization of the Pb-Zn-Mo-Fe mineralization. The overlap of lithologic alteration-mineralization element groupings in the Main Zone is apparent and is effectively maintained in both the Nisku and Rainbow deposits. Element groupings in these two zones include: (i) CaO-LOI-Cr; and (ii) Al₂O₃-Co (aluminosilicate-pyrrhotite) in the Nisku deposit and MnO-LOI-Ni-Cr in the Rainbow deposit.

Mineralization

Numerous sulphide-sulphosalt Ni-Sb mineral assemblages are implied by the element correlation groupings in the sedimentary rocks. As described in the picrite discussion these groupings can be explained in terms of the ore mineralogy in the three deposits. The Main Zone is characterized by: (i) Au-Ag-Sb (native gold-electrum-aurian silver and sulphosalt); and (ii) Pb-Zn-Mn-Au (galena-sphalerite-native gold) groupings, indicating at least a sulphosalt and base metal association for the Au in the Main Zone deposit. The grouping Hg-Bi suggests a low temperature (200-250 °C) deposition for these elements in the deposit, although there are only a small number of analyses for these elements since in most samples these elements are below the limits of detection.

The Nisku and Rainbow deposits are marked by element associations similar to the Main Zone. The groupings Zn-Mn-Ni-Cd (sphalerite-pyrrhotite), Cr-Au (native gold), Cu-Zn-Ag-Ni-Cr (chalcopyrite, sphalerite, aurian silver), As-Sb (arsenopyrite-sulphosalt) and LOI-Sb (phylllosilicate-sulphosalt) suggest a link for the ore-related elements to a Ni-Cr precursor, possibly the picritic basalt for the Rainbow deposit mineralization. In both the Nisku and Rainbow deposits B is correlated with Pb-Zn-Ag, which suggests that a tourmalinization process accompanied this base metal mineralization.

Element correlation groupings for background sedimentary rocks are dominated by lithologic factors: (i) CaO-MgO-Al₂O₃-TiO₂-MnO; and (ii) TiO₂-P₂O₅-MnO-Zn-Cu. The Zn and Cu correlation with the "lithologic" elements reflects sulphide mineralogy in the background sedimentary rocks. Additionally, a mineralization grouping of P₂O₅-Zn-Sb (apatite-sphalerite-sulphosalt) indicates some minor sulphide-sulphosalt mineralization has occurred in the background rock suite, but the small number of mineralization and alteration elements involved indicates the relatively unaltered state of the background rocks.

Similar elements are involved in the lithologic, alteration and mineralization groupings for the picritic basalt and sedimentary rocks within the three ore zones. It is apparent from this correlation coefficient examination of the chemical data that the rocks have been affected by: (i) carbonate alteration; (ii) potassic metasomatic alteration; (iii) albitization; and (iv) tourmalinization. Both (iii) and (iv) appear to be the less extensive of the alteration types present in the deposit. Base and precious metal mineralization can be spatially related to: (i) carbonate alteration (As-Sb/arsenopyrite-sulphosalt; Pb-Zn-Mo-Co/sulphide in sedimentary rocks and

picritic basalt); (ii) potassic alteration (Cu-chalcopyrite in the picritic basalt); (iii) tourmalinization (Pb-Zn-Ba/sulphide-barite(?) in the picritic basalt); and (iv) Na₂O-Cu-Pb-Zn-Ba (albitization/primary plagioclase destruction accompanying sulphide emplacement in the picritic basalt). Figure 34 reflects some of the variety of associations Au has in the Main Zone sedimentary and picritic basalt host rocks. Clearly the MacLellan Main Zone basalt has a greater number of element correlations with Au, i.e., potassic alteration (K₂O), sulphide and sulphosalt minerals, Mn (carbonate alteration) and Ni-Cr (native Au grains in picrite), than does the sedimentary rocks (sulphide/sulphosalt).

Unique by its absence is a correlation between SiO₂ and ore-related elements. If the sedimentary rocks are simply silicified picritic basalt then one might expect to see some indication of a linear relationship between mineralization and silicification, particularly if the "sedimentary rocks" contain the bulk of the sulphide minerals. Alternatively, some of the sedimentary rocks are indeed "silicified" picrite. The significant linear relationship between Ni and Cr and many of the elements characterizing the mineralization in the sedimentary rocks may indicate residual Ni and Cr that were not removed from picritic basalt during alteration, or a bona fide detrital signature from a picritic source.

STEPWISE DISCRIMINANT FUNCTION ANALYSIS

Introduction

Discriminant function analysis is a multivariate statistical technique used to distinguish groups of data or cases based on measured variables that are expected to be significantly different for each of the groups. The mathematical objective of this technique is to weigh and linearly combine the discriminating variables in such a manner as to optimize the statistical definition of the groups. The discriminant functions used in classification are expressed as:

$$X_i = x_{i1} Y_1 + x_{i2} Y_2 \dots x_{in} Y_n$$

where X_i = the score on the discriminant function i

x_{in} = weighting coefficients

Y_n = standardized values in the n th discriminating variable used in the analysis.

Discriminant function efficiency may be assessed by classifying the original set of cases to determine the number of correctly classified cases based on the available variables. This classification procedure involves the application of a separate linear combination of the discriminating variables for each group. The general equation for the classification of each group may be expressed as:

$$E_i = e_{i1} V_1 + e_{i2} V_2 \dots e_{in} V_n + e_{i0}$$

where E_i = the classification score for group i

e_{in} = the classification coefficients

e_{i0} = a constant

V_n = raw scores on the discriminating variables

In a case where more discriminating variables are available than are necessary to effectively discriminate between the groups, the most useful variables may be selected in a stepwise manner. In the stepwise method the first variable selected for the analysis is determined by performing a one-way analysis of variance calculated on each variable for the groups in the analysis. The results of this analysis are represented by the "F" statistic. The variable with the highest "F" statistic represents the variable that best discriminates between the groups under consideration. The initial variable selected is coupled with each of the remaining variables and the new "doublet" with the largest "F" statistic is selected for the discriminant function. The doublet is then coupled with each of the remaining variables to form a "triplet". The triplet with the highest F statistic determines which of the variables will be selected for the discriminant function. This iterative procedure continues until no additional variables provide an improvement in group separation. Summary tables listing the "F" statistic, the per cent correct classification of samples to their respective groups, and a multivariate statistic known as Wilks' Lambda or the U statistic, which represents an inverse measure of the discriminatory power in the original variables that have not yet been removed by the discriminant functions are given for each analysis. The larger the value for Wilks' Lambda the less information remains to be explained by the discriminant function.

Graphical representation of group separation is presented as a two-dimensional plot of canonical variables. The first canonical variable represents the linear combination of variables that best discriminates between the groups. The second canonical variable represents the second best linear combination of variables orthogonal to the first set of variables. If group discriminations can be effected on the basis of a single canonical variable then a histogram is plotted.

The stepwise discriminant function analysis used for this study was obtained from the SPSS/PC * Advanced Statistics Manual (Norusis, 1986). A practical application of the method is given by Fedikow and Turek (1983), from which much of this introduction is derived.

Results

This statistical method was applied to the geochemical data from the MacLellan picritic basalts and a suite of samples representing picritic basalt from the Arbour Lake area to determine the elements that most effectively delineate productive, *i.e.*, Au-bearing (MacLellan), from nonproductive (Arbour Lake) picritic basalts. The following elements/compounds were used in this analysis: SiO_2 , Al_2O_3 , Fe_2O_3^T , MgO , Na_2O , TiO_2 , P_2O_5 , LOI, Cu, Zn, Mn, Ni, Cr, Ba, Au, As and Sb; the geochemical data utilized for this study are from Appendix II. A total of 145 analyses of the MacLellan picritic basalts and 15 analyses of the Arbour Lake picritic basalts were used in this procedure. Data were $\log_{(10)}$ transformed. The option selected for the stepwise discriminant analysis procedure was to maximize the minimum Mahalanobis (D2) distance between groups.

The discriminant analysis was attempted for five separate element group combinations. The initial run, Test #1, utilized all 17 of the above-named elements and achieved 99.3% correct classification of samples (144 out of 145) in the MacLellan group and a perfect 15 of 15 correct classification for the Arbour Lake group. Clearly, the technique can successfully differentiate the two groups with a high degree of confidence; however, the number of elements required to accomplish this differentiation is great, thereby dramatically increasing the cost per sample of analysis. Accordingly, the number of elements used in subsequent tests of this method were reduced in the following manner. Test #2 was based on Sb, Fe_2O_3^T , P_2O_5 , Na_2O , Cr and Zn abundances since these elements were determined to be the six most effective differentiating element/compounds in Test #1. Test #3 utilized three elements/compounds; Sb, Fe_2O_3^T and P_2O_5 . Test #4 was based solely on Sb, and Test #5 used only the trace elements Sb, As, Cr, Ni, Zn, Au and Ba. Test #5 was undertaken to assess the method solely on the basis of trace elements, which tend to be least influenced by changes in bulk chemical composition. Tables 16 and 17 summarize the statistics for Tests #1 through #5, Table 18 illustrates the efficiency of the classification functions for

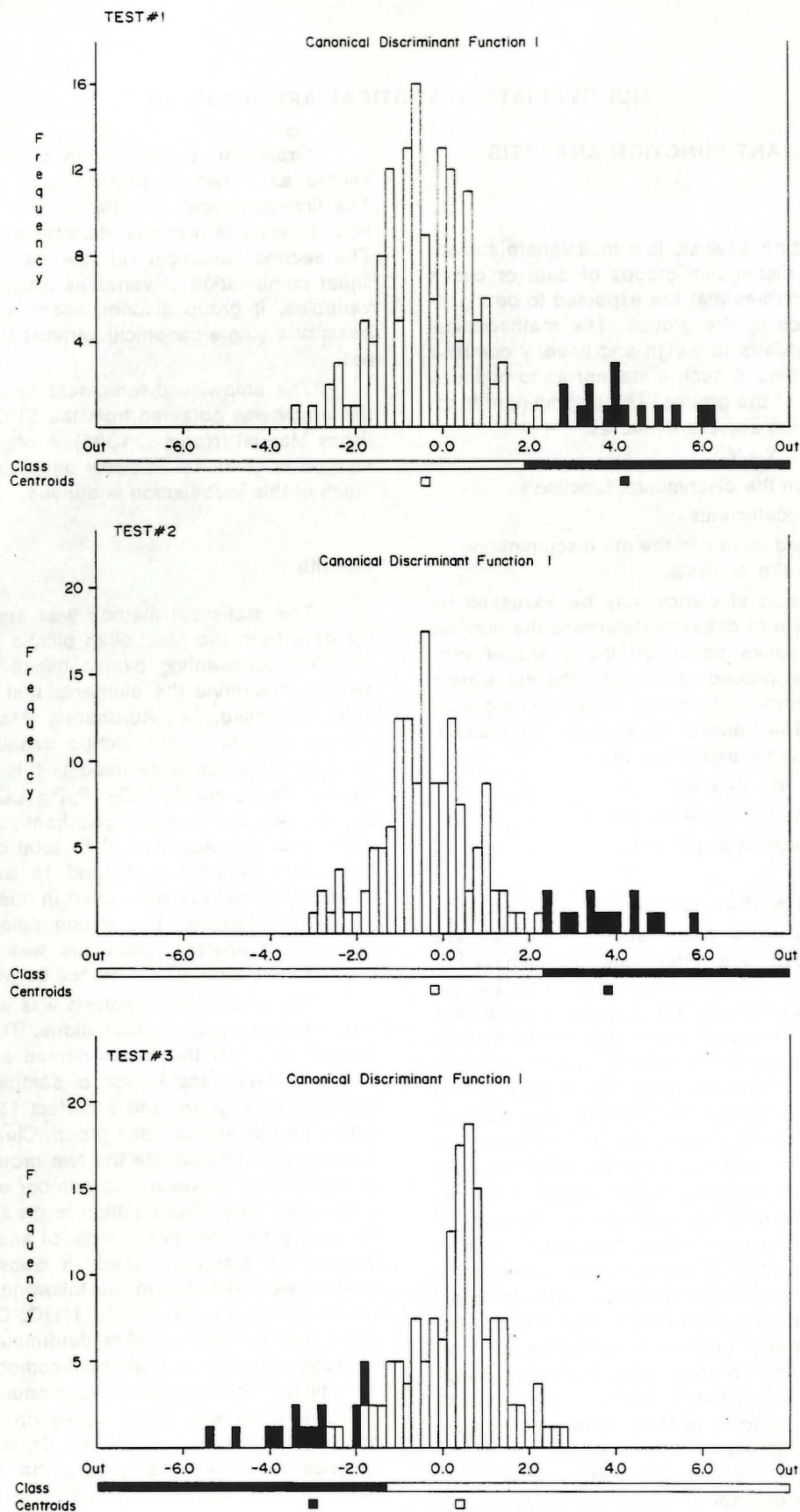


Figure 35: Histograms illustrating separation of MacLellan and Arbour Lake picritic basalts after Tests #1, 2 and 3, stepwise discriminant function analysis. Solid bars represent the Arbour Lake basalts, open bars represent MacLellan basalts.

Tests #1 through #5. Figures 35 and 36 graphically illustrate group separation for each test run.

Each of Tests #1 through #5 is capable of achieving 100% efficiency for classification of the Arbour Lake basaltic rocks regardless of the elements utilized in the analysis (Table 18). The success rate for MacLellan picritic basalt classification is excellent, ranging from a high of 99.3% in Test 1 to a low of 89.7% based on a single element (Sb) in Test #4. The decrease in the classification efficiency rate for the MacLellan picritic basalts is directly attributable to the reduction in numbers of analyzed variables.

Table 16

A summary table for stepwise discriminant analysis Test #1 between MacLellan and Arbour Lake picritic basalts. SiO₂, Ba and As were not included in the analysis due to insufficient F statistic levels. Discriminant analysis based on 14 variables.

Test #1	Step Number	Variable Entered	Wilk's Lambda	% Variance	Cumulative Variance
	1	Sb	.67319	11.3	
	2	Fe ₂ O ₃ ^T	.56100	9.4	20.7
	3	P ₂ O ₅	.50130	8.4	29.1
	4	Na ₂ O	.45972	7.7	36.8
	5	Cr	.41680	6.9	43.7
	6	Zn	.40171	6.7	50.4
	7	Al ₂ O ₃	.39131	6.6	57.0
	8	Cu	.38048	6.4	63.4
	9	Au	.37355	6.3	69.7
	10	LOI	.36894	6.2	75.9
	11	Ni	.36583	6.1	82.0
	12	MgO	.36035	6.0	88.0
	13	Mn	.35712	5.9	93.9
	14	TiO ₂	.35433	5.9	99.8

An efficiency rate of 85% is recommended as the minimum level for this kind of statistical manipulation so adequate statistical differentiation of MacLellan and Arbour Lake picritic basalts can be attained solely on the basis of Sb. The practicality of utilizing only Sb in the differentiation of MacLellan basalts from an "exploration" group of high Mg-Ni-Cr samples from along the Agassiz Metaltect may be questioned since 15 of 145 samples were misclassified in the Sb test run (Test #4).

Test #2 provides an attractive method with 98.6% efficiency on the MacLellan group, 100% efficiency on the Arbour Lake group and a small number of analytical variables (Sb, Fe₂O₃^T, P₂O₅, Na₂O, Cr and Zn).

Utilizing the stepwise discriminant function analysis with the coefficients for the discriminant function based on the variables listed in Test #2 offers a tool for comparing picritic basalts from a gold producer (MacLellan) with picritic basalts of unknown metal potential. If a suite of "exploration" rock samples are compared to the MacLellan basalts utilizing the derived discriminant function, then any sample from the "exploration" group misclassified as MacLellan basalt may be considered as having geochemical affinities (perhaps related to mineralization and associated alteration) to "productive" picritic basalts.

Table 17

Summary tables for stepwise discriminant analyses #Tests 2, 3, 4 and 5 between MacLellan and Arbour Lake picritic basalts.

Test #2	Step Number	Variable Entered	Wilk's Lambda	% Variance	Cumulative Variance
	1	Sb	.67319	22.3	
	2	Fe ₂ O ₃ ^T	.56100	18.6	40.9
	3	P ₂ O ₅	.50130	16.6	57.5
	4	Na ₂ O	.45972	15.3	72.8
	5	Cr	.41680	13.8	86.6
	6	Zn	.40171	13.3	99.9
Test #3	1	Sb	.67319	38.8	
	2	Fe ₂ O ₃ ^T	.56100	32.3	71.1
	3	P ₂ O ₅	.50130	28.9	100.0
Test #4	1	Sb	.67319		
Test #5	1	Sb	.67319	16.3	
	2	As	.63667	15.4	31.7
	3	Cr	.62186	15.1	46.8
	4	Ni	.56755	13.8	60.6
	5	Zn	.55386	13.4	74.0
	6	Au	.53949	13.1	87.1
	7	Ba	.53165	12.9	100.0

The causes for selection of "efficient element discriminators" from a large body of elements are relatively straightforward. Most discriminating elements comprise the mineralization and related alteration that characterize the MacLellan deposit. These elements make up the sulphide and oxide minerals described by Augsten *et al.* (1986) in the deposit and/or represent gangue mineral sources that form rock geochemical haloes about the mineralization.

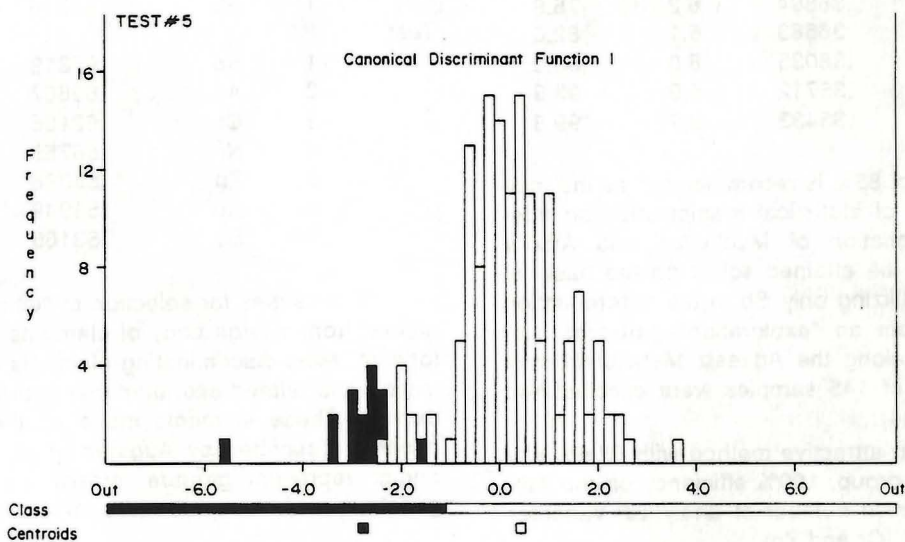
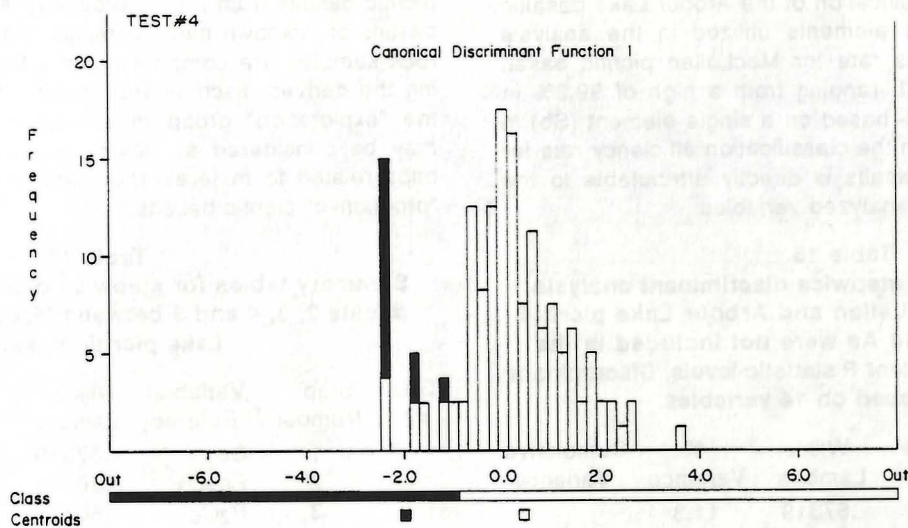


Figure 36: Histograms illustrating group separation of MacLellan and Arbour Lake picritic basalts after Tests #4 and 5, stepwise discriminant function analysis. Conventions as in Figure 35.

Table 18
Summary table for stepwise discriminant function test runs #1 through #5 illustrating efficiency of classification for MacLellan vs. Arbour Lake picritic basalts

Test	Actual Group	Predicted Group	
		Group 1	Group 2
#1 (Sb, Fe ₂ O ₃ ^T , P ₂ O ₅ , Na ₂ O, Cr, Zn, Al ₂ O ₃ , Cu, Au, LOI, Ni, MgO, Mn, TiO ₂)	Group 1 (MacLellan picritic basalts, n = 145)	144 (99.3%)	1 (0.6%)
	Group 2 (Arbour Lake picritic basalts, n = 15)	0 (0%)	15 (100%)
#2 (Sb, Fe ₂ O ₃ ^T , P ₂ O ₅ , Na ₂ O, Cr, Zn)	Group 1	143 (98.5%)	2 (1.4%)
	Group 2	0 (0%)	15 (100%)
#3 (Sb, Fe ₂ O ₃ ^T , P ₂ O ₅)	Group 1	139 (95.9%)	6 (4.1%)
	Group 2	0 (0%)	15 (100%)
#4 (Sb)	Group 1	130 (89.7%)	15 (10.3%)
	Group 2	0 (0%)	15 (100%)
#5 (Sb, As, Cr, Ni, Zn, Au, Ba)	Group 1	136 (93.8%)	9 (6.2%)
	Group 2	0 (0%)	15 (100%)

FACTOR ANALYSIS

Introduction

The multivariate statistical technique of factor analysis (Spearman, 1904) may be used to examine correlations within a data set by identifying a small number of factors that represent relationships between sets of interrelated variables. Correlations between variables may be investigated by using R-mode factor analysis and between objects by Q-mode factor analysis. R-mode factor analysis is used in this study to explain the covariance between analytical variables by combining in a linear fashion a certain number of factors. These factors can then be used to derive geological and genetic interpretations with respect to mineral deposits (Vogt and Kollenberg, 1987), or they can be used to define multivariate alteration haloes associated with mineralization (Selinus, 1983).

Procedure

The procedure for the factor analysis treatment of the MacLellan geochemical data for this study can be briefly described as follows:

1. separation of the data base into three groups comprising picrite (Group 1), sedimentary rocks (Group 2) and aluminous basalt (Group 3);
2. log₍₁₀₎ transformation of geochemical data;
3. calculation of the correlation matrix for all variables and the identification of correlatable elements or compounds;
4. calculation and extraction of factors required to explain the observed characteristics of the data set;
5. factor transformation by rotation to determine the best fit of factor axes to variables in n-space for ease of interpretation, and
6. calculation of factor scores for each sample for use in other exercises related to the study. For this study factors will be extracted from each data grouping in order to study the inter-element relationships. Additionally, factors will be plotted as profiles through the mineralized

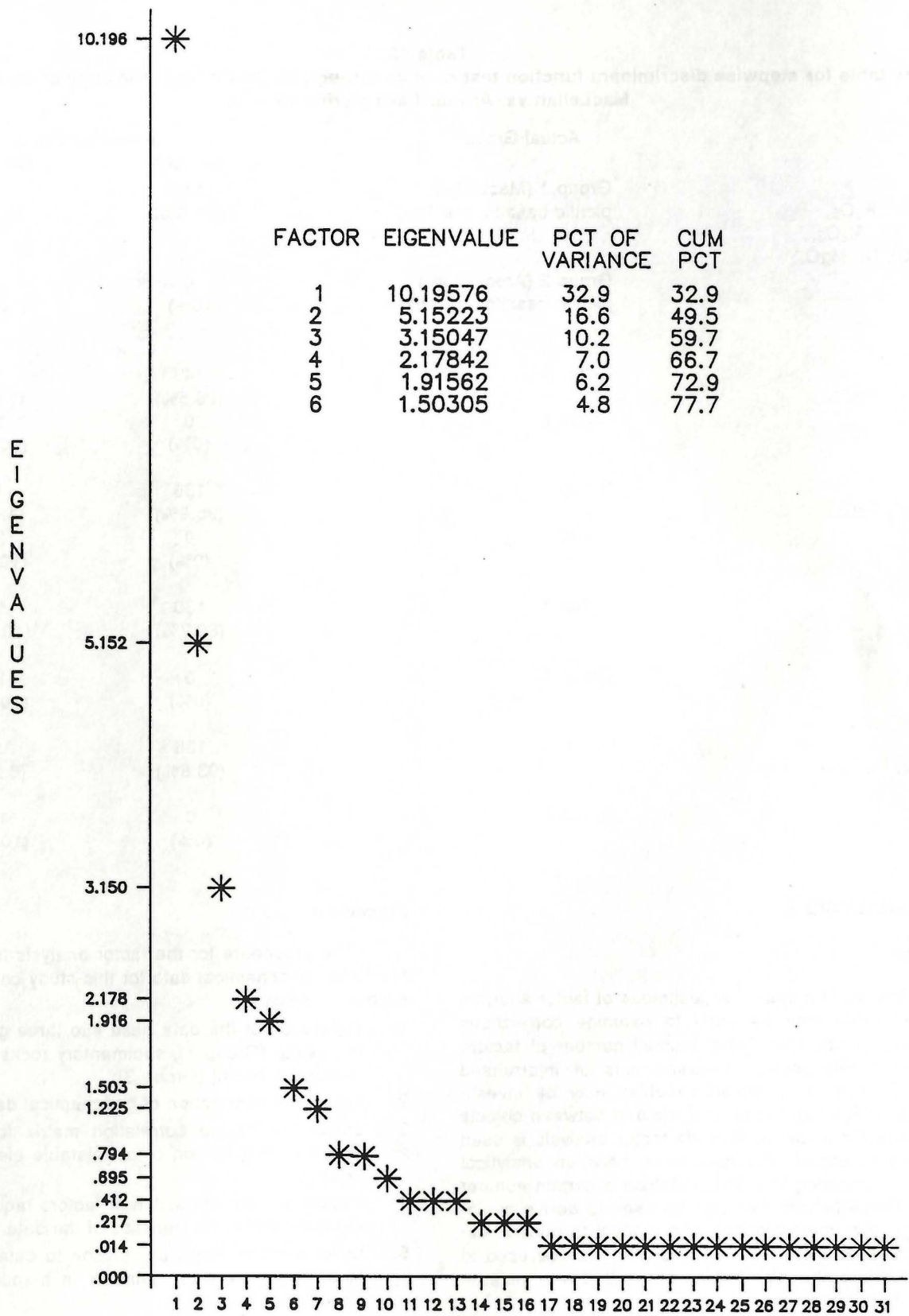


Figure 37: Eigenvalue plot reflecting per cent variance attributed to extracted factors after Varimax rotation.

zone to determine if any one factor represents a more extensive alteration indicator than a single chemical element/compound.

Results

Tables 19 and 20 present the factor score coefficient matrices for factors one through six from nonrotated and rotated axes, respectively. The correlation matrix for log₁₀-transformed geochemical data utilized in the factor analysis is given in Table 21. Factor scores for each sample analyzed from DDH U82-5 are listed in Table 22 accompanied by their group designations, *i.e.*, Group 1, picrite; Group 2, "sedimentary" rocks; Group 3, "normal" and aluminous basalts. An eigenvalue plot reflecting the significance of factors one through six in accounting for variance is presented in Figure 37.

The extracted factors and their characteristic loadings for each of the three groups are easily explained in terms of

lithology, mineralization and alteration (Table 23). Group 1 represents the picrite samples; accordingly, the most heavily loaded elements are Cr, MgO and Ni, which characterize this particular rock unit (Appendix II, Part 1). Lower, but significant loadings for this group are observed for Factor 2, predominantly a mineralization-related factor (As, Au, Sb, Cu, Co, Li, Zn). Single-sample high loadings are observed for Factors 3, 4, 5 and 6. Group 2, the sedimentary rocks, is heavily loaded by the mineralization-related elements As, Au, Sb, Cu, Co, Li and Zn. The remaining factors have lower loadings with Factor 5 (potassic metasomatism) ≥ Factor 3 (carbonatization) ≥ Factor 6 (mineralization and albitization) ≥ Factor 4 (lithology - detrital(?)) ≥ Factor 1 (lithology, *i.e.*, Cr, MgO, Ni). Group 3, the aluminous basalts, is heavily loaded by the potassic metasomatic element assemblage of Rb, Ba, K₂O, Sr, F and Li. Lower loadings for Group 3 factors are obtained for Factors 3, 4, 6, 1 and 2, respectively.

Table 19
Factor matrix for log₁₀-transformed geochemical data, DDH U82-5. Nonrotated axes.

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Ni	.85673	-.00522	-.24892	-.27452	-.24162	.03872
SiO ₂	-.85147	.24823	-.30596	.02337	-.00480	-.23437
MgO	.83202	-.12852	-.06231	-.28373	-.23804	.27315
Na ₂ O	-.83148	.01385	-.02158	.27354	.29922	.12566
CO ₂	.80086	-.10581	.03801	.42444	-.10092	-.21859
MnO	.79935	-.13068	.15013	.08976	.06783	.10828
Cr	.79129	-.10318	-.25067	-.30551	-.31454	.18342
LOI	.77557	-.02406	.12499	-.08463	-.18211	-.15915
Co	.69251	.42036	.02444	-.17638	.26455	-.04645
Al ₂ O ₃	-.69168	.11638	.58263	.12258	.20724	.04948
CaO	.68402	-.52220	.21777	.20634	-.15735	.17234
COND	.63579	-.16666	.17588	.62937	-.06622	-.15987
As	.60949	.59820	.19734	-.13002	.13029	-.20551
Mn	.58412	.30639	.51597	.20432	-.06636	-.18743
Sb	.54499	.53754	.04296	-.12514	.23714	-.15009
Au	.52514	.41764	.22393	-.24080	.22918	-.11407
Ba	-.16771	.75117	.19543	.15035	-.29333	.31833
F	.37065	.67676	-.37604	.22678	-.26105	.17233
K ₂ O	-.32039	.67137	.54388	.03873	-.26042	.12082
Zn	.38954	.62103	.14843	.02303	.08319	.01423
Rb	-.25477	.57512	.45055	.10596	-.46098	.12232
Li	-.26877	.53498	.40782	-.22230	.10131	.05710
Se	.16344	-.29037	-.00212	.17241	.22425	.28458
Zr	-.04242	.59849	-.70148	.21663	.02177	-.06289
P ₂ O ₅	.03128	.54961	-.60134	.39790	-.00029	.22315
B	-.31132	-.23266	.38319	.20724	.07036	.20198
pH	.46444	-.31409	.20766	.68933	-.03599	-.11377
Cu	.42792	.09346	.18546	-.14831	.63341	.21223
TiO ₂	.39139	.42414	-.37578	.35732	.48232	.23298
Fe ₂ O ₃ ^T	.53888	-.25503	.16241	-.04166	.27447	.58911
Sr	-.45138	-.04355	-.01256	-.01188	-.27209	.51582

Table 20
Factor matrix for log₁₀-transformed geochemical data, DDH U82-5. Varimax Rotated axes.

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6
Cr	.92826	.12209	.08350	.07946	-.11659	.14861
Ni	.88799	.28381	.14087	.12260	-.15167	.06532
MgO	.88093	.17930	.14078	-.03333	-.04024	.30612
Na ₂ O	-.81329	-.36189	-.25115	.11172	.04134	.05002
Al ₂ O ₃	-.76834	-.06963	-.13529	-.33532	.40392	.05259
LOI	.60857	.38020	.39165	-.11725	-.03623	-.00096
SiO ₂	-.58179	-.29075	-.44637	.24329	.02542	-.50362
MnO	.47024	.33492	.46504	-.05005	-.09715	.37610
B	-.36500	-.25967	.10935	-.28898	.16771	.24968
As	.26167	.83041	.13173	.13399	.21898	-.05552
Sb	.20923	.76059	.04926	.22570	.08065	.00941
Co	.34899	.75646	.06804	.19001	.00106	.15922
Au	.22324	.74442	.01644	-.00835	.11599	.07792
Zn	.11922	.59002	.08605	.26806	.35182	.04165
Cu	-.00068	.58408	-.03604	-.03328	-.14738	.57377
Mn	.17287	.56126	.54940	-.11661	.34962	.00332
Sr	-.06789	-.55087	-.29288	.03410	.34515	.17863
COND	.16542	.13823	.90650	.06175	-.06682	.11180
pH	.02306	-.03041	.89891	-.01605	-.10421	.16210
CO ₂	.39523	.26680	.79351	.10634	-.14976	.03678
CaO	.49783	-.07336	.62193	-.26402	-.13291	.39705
P ₂ O ₅	-.02069	-.01345	-.00716	.92714	.11177	-.00643
Zr	-.03814	.10028	-.15194	.88726	-.03016	-.28406
F	.34631	.20536	.09838	.76543	.34769	-.08669
TiO ₂	-.05159	.39842	.13760	.74085	-.12343	.38008
K ₂ O	-.26761	.16162	-.10710	-.03314	.89454	-.15032
Rb	-.11247	.00274	.00029	.00491	.88159	-.21791
Ba	-.08730	.08130	-.10242	.35212	.83082	-.03996
Li	-.28445	.34161	-.33033	-.10482	.51857	-.03278
Fe ₂ O ₃ ^T	.32387	.11768	.12786	-.09126	-.06390	.81143
Se	-.00116	-.10004	.16730	.00229	-.18412	.44735

Table 21
Spearman correlation matrix for log₁₀-transformed geochemical data, DDH U82-5.

	SiO ₂	Al ₂ O ₃	Fe ₂ O ₃ ^T	CaO	MgO	Na ₂ O	K ₂ O	TiO ₂	P ₂ O ₅	MnO	LOI	Cu
SiO ₂	1.00000											
Al ₂ O ₃	.40615	1.00000										
Fe ₂ O ₃ ^T	-.72011	-.22490	1.00000									
CaO	-.80317	-.38406	.54721	1.00000								
MgO	-.78022	-.68521	.57232	.63261	1.00000							
Na ₂ O	.67465	.69245	-.32757	-.52529	-.81198	1.00000						
K ₂ O	.25900	.58207	-.26321	-.39047	-.29330	.19158	1.00000					
TiO ₂	-.19347	-.26431	.32906	-.00707	.13777	-.00934	-.13866	1.00000				
P ₂ O ₅	.24527	-.22236	-.10708	-.25614	-.05952	.11808	.07560	.62187	1.00000			
MnO	-.74534	-.44163	.59394	.67627	.67147	-.61688	-.24882	.27516	-.03437	1.00000		
LOI	-.71404	-.54620	.32208	.48466	.60164	-.71764	-.18699	.11544	-.15932	.47755	1.00000	
Cu	-.43340	-.10935	.42244	.21419	.27701	-.20203	-.10195	.37143	-.06789	.29782	.25117	1.00000
Zn	-.23301	-.10482	.06950	-.05823	.17668	-.25782	.29287	.41352	.23912	.26228	.36754	.26911
Co	-.45928	-.40001	.29087	.16446	.47307	-.54358	-.00641	.49259	.11521	.49081	.47471	.51453
Mn	-.57916	-.08193	.17375	.35330	.25706	-.46776	.26626	.16221	-.05501	.48892	.65673	.24014
Ni	-.65822	-.80047	.36881	.52501	.87252	-.82653	-.35640	.24165	.06301	.59199	.68841	.20027
Cr	-.66400	-.78679	.42473	.57264	.90406	-.77001	-.36620	.15556	.05373	.56368	.61040	.16193
Ba	.20891	.24451	-.15106	-.36723	-.13383	.10998	.80617	.15858	.35994	-.19261	-.11813	-.05521
F	-.07142	-.40946	-.00708	-.06385	.30806	-.33153	.23820	.55194	.74724	.16244	.23148	.01783
Au	-.36828	-.15830	.16328	.12282	.39708	-.45829	.15779	.24537	.04784	.41824	.29774	.48847
As	-.38771	-.20860	.11347	.09779	.37999	-.49880	.27649	.36233	.17336	.44096	.45578	.40456
Sb	-.29880	-.23672	.15045	.11398	.32231	-.37929	.13463	.47742	.20744	.37971	.32490	.37753
Li	.21649	.50001	-.06192	-.44006	-.21553	.18275	.59770	-.01966	-.03736	-.28188	-.18558	.03235
Zr	.42686	-.31156	-.32216	-.47606	-.15638	.10798	.02196	.54808	.79656	-.20716	-.09356	-.12209
CO ₂	-.67580	-.51249	.27171	.66209	.51920	-.56822	-.30996	.32397	.02524	.58441	.72229	.21939
Rb	.21569	.39990	-.25556	-.27401	-.21147	.11460	.82966	-.16594	.09438	-.22344	-.12221	-.23311
Sr	.24536	.31802	-.13887	-.04855	-.19281	.46457	.21477	-.22319	.07698	-.37083	-.39901	-.16155
Se	-.26411	-.09010	.29208	.20847	.11993	-.07489	-.23904	.09988	-.06209	.13434	.17044	.18621
B	.08857	.35423	.04227	.03732	-.25888	.31431	.15394	-.22534	-.19882	-.07737	-.17657	-.03874
COND	-.55917	-.28205	.26992	.69311	.36498	-.38727	-.18521	.26151	.01320	.54351	.44255	.16669
pH	-.46370	-.16610	.26947	.67162	.24373	-.25761	-.20770	.15539	-.02444	.50578	.21886	.06496

Table 21 Cont'd

	Zn	Co	Mn	Ni	Cr	Ba	F	Au	As	Sb	Li	Zr
Zn	1.00000											
Co	.57271	1.00000										
Mn	.56207	.47970	1.00000									
Ni	.30004	.58070	.30935	1.00000								
Cr	.18491	.47482	.19096	.93821	1.00000							
Ba	.36340	.09522	.19525	-.16678	-.18056	1.00000						
F	.44286	.39183	.27251	.37362	.32924	.53269	1.00000					
Au	.36247	.60991	.44276	.36219	.27977	.11376	.28356	1.00000				
As	.50926	.70360	.62158	.45459	.34176	.26794	.45615	.74600	1.00000			
Sb	.45497	.63022	.42970	.44790	.34677	.13707	.39317	.60177	.82855	1.00000		
Li	.36342	.05624	.09413	-.25273	-.28114	.42009	.04458	.10760	.18408	.23131	1.00000	
Zr	.26173	.16949	-.12969	.07798	-.01077	.32760	.66060	.02929	.16694	.26478	.00775	1.00000
CO ₂	.28158	.39510	.59381	.58939	.49082	-.16307	.28154	.25987	.38397	.31953	-.33685	-.01802
Rb	.25561	-.00145	.28173	-.24075	-.24198	.74196	.25936	.11002	.14502	.00209	.42364	.05600
Sr	-.19630	-.42589	-.35961	-.28719	-.14863	.18637	-.08909	-.29347	-.37385	-.25136	.03516	-.04786
Se	-.00585	.05746	.10538	.07322	.02561	-.10770	-.10666	-.07807	-.16787	-.26220	-.24945	-.10219
B	-.21336	-.32114	-.04002	-.40353	-.31320	.01055	-.33327	-.22725	-.29552	-.26086	.04268	-.25690
COND	.14377	.26620	.46179	.35771	.30536	-.14137	.16654	.18207	.27287	.23962	-.26911	-.10814
pH	-.02245	.09204	.33051	.16581	.16005	-.20528	.02677	.04885	.07927	.06655	-.29765	-.22280
	CO ₂	Rb	Sr	Se	B	COND	pH					
CO ₂	1.00000											
Rb	-.19591	1.00000										
Sr	-.37884	.21220	1.00000									
Se	.17061	-.20926	-.14037	1.00000								
B	-.23831	.11914	.10814	.04114	1.00000							
COND	.87057	-.10445	-.27601	.11903	-.06938	1.00000						
pH	.67857	-.13571	-.24348	.12656	.09138	.89682	1.00000					

Table 22

Factor scores for each sample utilized from DDH U82-5. Group designations are as follows: 1. picrite/picritic basalt; 2. "sedimentary" rocks; 3. aluminous basalt.

Group	Sample Number	Factor Score 1	Factor Score 2	Factor Score 3	Factor Score 4	Factor Score 5	Factor Score 6
1	AGC-42P	1.26774	-.85316	.65390	.21161	-1.02224	-.19981
1	AGC-45	1.01077	-.31267	-1.25192	.56467	.41833	.97482
1	AGC-47	1.45790	-.10573	-.23726	.42680	-1.38381	.18043
1	AGC-48	1.35503	.61851	.21808	.14583	-.94560	.51536
1	AGC-49	.94414	.89550	.10975	.19061	-1.23787	.05208
1	AGC-50P	.96429	.73903	-.34040	.27555	-1.18817	.11737
1	AGC-51	1.44724	-.07546	.02613	.47089	-1.07459	.44294
1	AGC-51D	1.52638	-.06727	.37075	.49948	-1.02795	.26285
1	AGC-52	1.37825	-.24962	.15735	.50493	-.90757	.58307
1	AGC-53	1.25563	.02340	.07462	.50331	.13062	1.20020
1	AGC-54	1.26222	.96261	.93545	.18388	-.49942	.52308
1	AGC-55	1.15732	-.24784	-.13507	.96544	-.68985	.86402
1	AGC-56	1.23137	-.55485	.34670	1.02869	1.29147	.69602
1	AGC-58	1.55906	-.04395	.40564	.17355	-.36424	-.05322

Group	Sample Number	Factor Score 1	Factor Score 2	Factor Score 3	Factor Score 4	Factor Score 5	Factor Score 6
1	AGC-59	1.32920	.11495	.36649	.15318	-.12728	.19060
1	AGC-62	1.04579	.29137	.47127	-2.21020	.02798	-.59481
1	AGC-63	2.05972	.22158	.52044	-2.21039	.28715	-1.14787
1	AGC-64	.47125	1.29567	-.13675	-.92992	.44296	.02356
1	AGC-65	1.65747	.65905	.61575	-.17701	-1.53029	-.61523
1	AGC-66	.	.	.	.	.	.
1	AGC-67P	1.24923	.57348	.20967	-.02485	-1.62874	-.36404
1	AGC-68P	1.32563	.33384	-.60698	.05347	-.91291	.26823
1	AGC-74P	1.32812	1.07152	.97826	-.39634	.40212	-.38980
1	AGC-75	1.77750	.26813	.42832	-.06591	-1.23089	-.48247
1	AGC-76P	1.24310	1.24952	.68277	-.21750	-.62677	.55625
1	AGC-77	1.59615	.56324	1.41391	-.60173	-.94888	.18536
1	AGC-78	1.41987	.52830	.66115	.03414	-1.36820	.18558
1	AGC-79P	.72967	1.09494	.03771	.17486	-1.41085	1.34220
2	AGC-15	-.91662	-.54554	-.69585	.10030	-.55711	.72238
2	AGC-16	.	.	.	.	.	.
2	AGC-16B	-.82807	-.62043	-.90304	.01770	-.60344	.12119
2	AGC-26S	-.32981	.16761	-2.72395	-1.28727	.31735	-.60091
2	AGC-27S	-1.15833	-.50592	.31587	-.40115	.83865	.81099
2	AGC-28	-1.03257	-.21174	-.18283	-1.37235	-.90922	.04362
2	AGC-29S	-1.29884	.03256	.57917	-.83425	.59755	.31549
2	AGC-32S	-1.19805	.17690	-.37511	-1.45419	.96176	.60020
2	AGC-33	-1.35163	-.10227	-.19084	-1.00245	-1.09193	.76832
2	AGC-37	-.45170	-.28101	.68933	.28610	-.24735	.54858
2	AGC-38F	-1.27645	-.09284	-.59600	.80009	-1.46508	-.87946
2	AGC-39F	-1.52478	-.06924	.39248	1.02112	-2.07665	-4.81166
2	AGC-40	-1.50011	-.79556	1.21437	2.13072	-.75103	-.65448
2	AGC-40D	-1.31796	-.76597	.89965	2.17051	-1.50258	-1.58001
2	AGC-41	-1.52979	-.65738	.15562	2.13451	-1.35993	-1.19625
2	AGC-42F	-1.19065	-.45893	.82031	1.73667	-1.05942	-1.67784
2	AGC-44	-.83277	-.09084	.36974	.94968	-1.18187	.96628
2	AGC-46	.	.	.	.	.	.
2	AGC-50C	.78542	-.00990	-3.10815	.31134	.52237	-.76847
2	AGC-55F	.97189	.28817	-4.54203	.48212	.50068	-1.46175
2	AGC-56F	.47854	-.42455	-2.98485	.31550	.03487	-3.10620
2	AGC-57	-.92177	.31615	-.03041	.65982	1.33542	-.84675
2	AGC-60	.32802	.71377	1.08467	-2.02180	1.41383	-1.44656
2	AGC-60D	.60620	.13911	1.29745	-2.35266	1.72891	-2.06961
2	AGC-61	.09483	1.14226	1.61377	-2.14710	1.33166	-2.16347
2	AGC-67F	.	.	.	.	.	.
2	AGC-68F	1.13074	-.70589	-.85683	.14160	1.28098	-2.17973
2	AGC-69	-.16887	1.16113	.27644	-.04359	1.47374	.54122
2	AGC-70	-.34729	1.90486	.14009	.78121	1.36720	-.53336
2	AGC-70D	-.33067	2.01815	.62736	.44431	1.72639	-.20092
2	AGC-71	-.69912	3.23255	-.49620	.31290	1.21603	-.12781
2	AGC-72	-.79753	3.10067	.47761	.75928	1.00499	-.04783
2	AGC-73	-.70356	2.05579	.17933	1.03945	.88461	1.22937
2	AGC-74S	-.52545	2.92025	-2.85732	.75901	.06621	1.12368
2	AGC-76S	-.18356	2.53953	-.86686	.93372	-.19812	.82194

Group	Sample Number	Factor Score 1	Factor Score 2	Factor Score 3	Factor Score 4	Factor Score 5	Factor Score 6
2	AGC-79S	.83882	-.66663	-.37729	-.24643	2.24603	-.04111
2	AGC-81	-.91704	.91030	1.15373	1.37661	.99435	.56947
2	AGC-85	-.82397	.13034	-.11261	1.34332	.81643	.59195
2	AGC-86	-.05401	-.56216	1.68364	1.21001	1.71481	-.86235
2	AGC-87	-.84800	.62208	.99200	.96604	.80171	-1.52115
2	AGC-88	-.27720	-.20456	-1.43030	1.53917	.91564	-1.36794
3	AGC-1	-.87241	-.78693	-.19514	-1.00148	-.44921	.32530
3	AGC-2	.01660	-1.31925	-.45431	.18402	.04729	.59368
3	AGC-3	.56464	-2.13758	.90499	.32007	1.80738	.71057
3	AGC-4	.90955	-1.93921	-.13000	.42138	1.10804	-.35321
3	AGC-5	1.13035	-1.90912	-1.26258	.39626	1.26926	.20979
3	AGC-6	.61805	-1.88230	-.06018	.40396	1.17870	.33588
3	AGC-7	.73409	-2.14461	.07318	.62365	1.22448	.11879
3	AGC-8	.66515	-1.97777	.27720	.35799	1.02024	-.17090
3	AGC-9	-1.07736	-.35764	-.12264	-.19324	.31918	1.01970
3	AGC-10	-.68558	-.82477	-.77830	-.33286	.26688	.79619
3	AGC-10D	-.66005	-.55231	-1.16522	-.36393	.16102	.81201
3	AGC-11	-.72963	-1.02808	.27158	-.72628	.65490	.69586
3	AGC-12	-.91243	-.45767	.56132	-.77844	.19609	.67556
3	AGC-13	-.62137	-.63156	.42831	-1.01440	-.41343	.80003
3	AGC-14	.	.	.	.	.	.
3	AGC-17	.	.	.	.	.	.
3	AGC-18	.	.	.	.	.	.
3	AGC-19	-.50503	-.53807	.06435	-1.26133	-.00550	.13084
3	AGC-20	-.69606	-.51622	.14927	-1.01941	.25097	.52705
3	AGC-20D	-.74535	-.07769	-.93214	-1.16274	.43860	1.10428
3	AGC-21	-.75348	-.82070	.18641	-1.29546	.04519	.32895
3	AGC-22	.	.	.	.	.	.
3	AGC-23	.	.	.	.	.	.
3	AGC-24	-.36502	-.44835	-.48692	-1.31544	-.95617	-.02293
3	AGC-25	-.23703	-.45617	-.64192	-1.18149	-1.10315	-.01685
3	AGC-26	-.26565	-.81955	-.09507	-1.27904	-.51711	-.33442
3	AGC-27	-.32783	-.79796	-.31840	-1.32080	-.39735	-.33726
3	AGC-30	-1.48433	.12493	.75665	-1.57012	-1.82639	-.59616
3	AGC-30D	-1.21923	.04650	.67887	-1.45876	-1.50826	-.31974
3	AGC-31	-1.44783	.02517	-.29575	-1.31878	-.63869	.46395
3	AGC-32	-1.19691	-.23818	-.03619	-.90295	-.05283	.46898
3	AGC-34	-1.07338	.27308	-.51693	-1.08639	-.13713	1.17732
3	AGC-35	-1.09461	-.50663	-.85836	.03991	-.47973	.96173
3	AGC-36	-.96211	.12204	-1.15748	-.26854	-.17488	.83481
3	AGC-38M	-.55938	-.04387	.48943	.07038	-.41529	.48099
3	AGC-39	-.78542	-.38746	.51896	.81913	.39863	-.60259
3	AGC-42	-.34161	-.22973	.95561	.38269	-.26618	.66852
3	AGC-43	-.04788	-.26000	.19684	.49414	-1.14798	1.20923
3	AGC-80	-.49892	.64038	1.34784	.91949	1.28852	.19667
3	AGC-80D	.01095	.15336	1.27373	.28673	1.09848	-1.18355
3	AGC-82	.15848	-.76773	1.00675	.91268	.68044	.82529
3	AGC-83	-.07246	-.59641	.65128	1.35792	.44035	1.20542
3	AGC-84	.48218	-.72684	.10704	1.57487	.63170	1.31442

Table 23**Geological Interpretation of significant element loadings for derived factors after varimax rotation**

Factor	Significant Element Loadings	Interpretation
1	Cr, Ni, MgO	Lithology (picritic basalt)
2	As, Sb, Co, Au, Zn Cu, Mn	Mineralization
3	Conductivity, pH, CO ₂ , CaO	Carbonatization
4	P ₂ O ₅ , Zr, F, TiO ₂	Lithology-detrital (?)
5	K ₂ O, Rb, Ba, Li	Potassic metasomatism
6	Fe ₂ O ₃ , Se	Mineralization

The results of plotting sample factor scores for Factors 1 through 6 along sampling sites for DDH U82-5 are presented in Figures 38 through 43. The results, as expected, strongly resemble the profiles obtained for individual elements. For instance, Figure 38 shows the variation of Factor 1, which represents a lithology factor (picrite), through the mineralized zone. This factor is heavily loaded by Cr, MgO and Ni and provides no new information that was not indicated by single element Cr, MgO and Ni plots. The limits of the picrite along the profile are delineated by Factor 1. A trough of Factor 1 scores within the limits of the MacLellan Main Zone is flanked by very high factor scores and indicates the absence of high combined Cr, MgO and Ni. This may be related to the silicification of picrite and the removal of abundant Cr, MgO and Ni, or it may be due to the presence of a second lithology within the Main Zone, namely the sedimentary rocks.

Factor 2 comprises the mineralization-related elements As, Sb, Co, Au, Zn, Cu and Mn; the factor score plot (Fig. 39) delineates the MacLellan Main Zone. Significantly higher and more erratic Factor 2 scores are obtained within the limits of the picrite compared to the aluminous basalt. If

these elements, and therefore Factor 2, represent mineralization and related alteration (disseminated sulphides?) then it appears the alteration extends to the stratigraphic and structural boundaries between picrite and aluminous basalt. Higher background levels (i.e., a lithologic petrochemical control) of the constituent elements are indicated in the picrite than the flanking aluminous basalts. A single element plot of Sb (Fig. 22) delineates the Main Zone and other possible mineralized sites equally as well as the factor score plot for mineralization-related elements (Factor 2).

The remainder of the factor score profiles provide little extra information that is not already available from examination of single-element profiles. The character of the factor score profiles is strongly influenced by the most heavily loaded chemical variable. For instance, profiles for Factor scores 3 through 6 (Fig. 40-43) all reflect the variations of the most heavily loaded element, i.e., conductivity, P₂O₅, K₂O and Fe₂O₃, respectively, through the section containing the Main Zone deposit.

Summary

This factor analysis treatment of the geochemical data indicates that multivariate factors can be derived from the data set to explain lithologic, alteration and mineralization groupings. The technique effectively delineates picritic basalt, carbonatization, potassic metasomatism and mineralization factors within the data. However, the technique fails to extend the limits of previously documented alteration haloes through the MacLellan Main Zone section that were previously delineated using single-element determinations. Genetically, the method identifies the importance of the siliceous and biotite-rich layers within the MacLellan picritic basalts as hosts to the bulk of sulphide and ore-related mineralization.

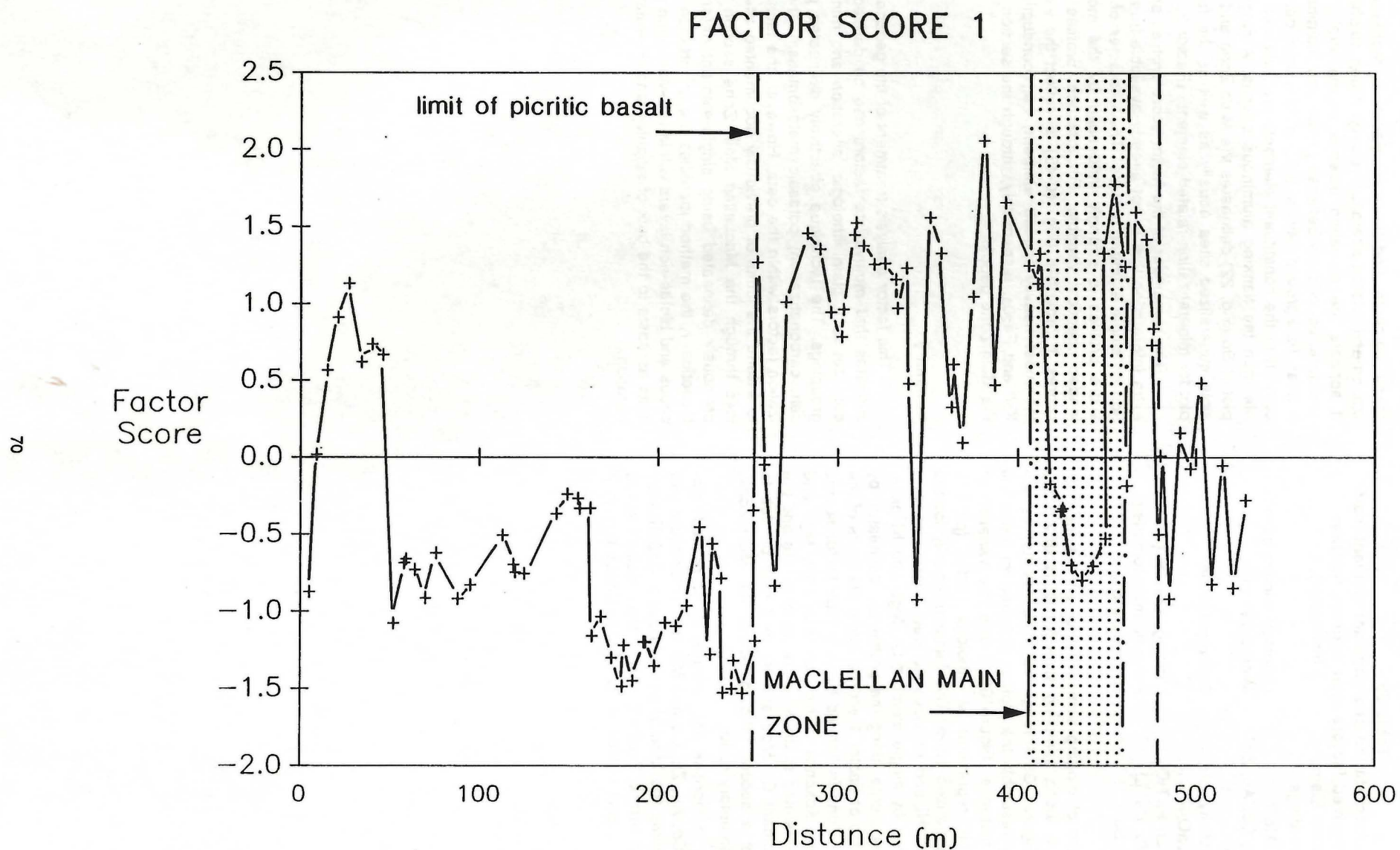


Figure 38: Factor score 1 profile through the MacLellan Main Zone. Significant element loadings for Factor 1 are Cr, MgO and Ni (lithology-picritic basalt).

FACTOR SCORE 2

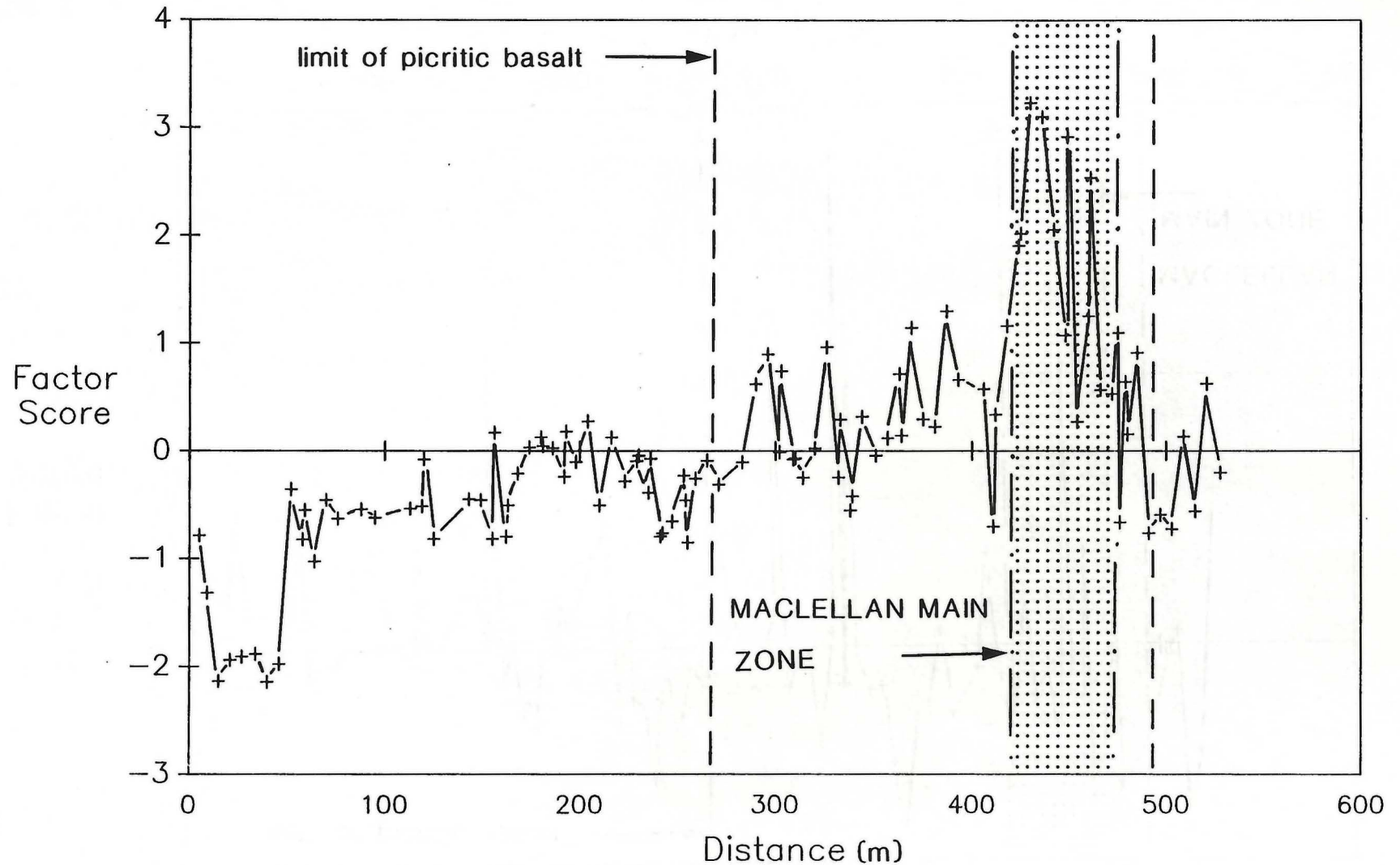


Figure 39: Factor score 2 profile through the MacLellan Main Zone. Significant element loadings for Factor 2 are As, Sb, Co, Au, Zn, Cu and Mn (mineralization).

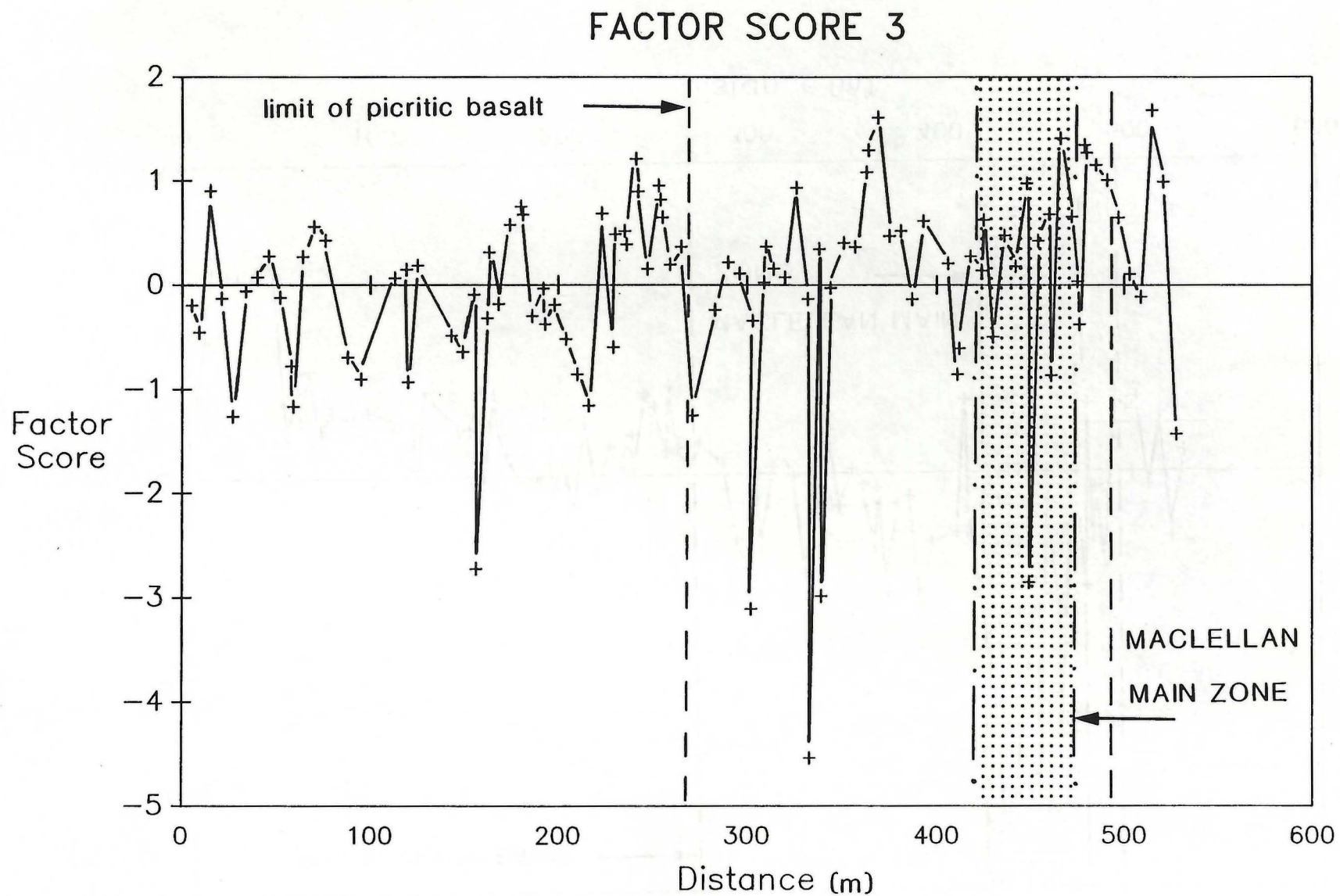


Figure 40: Factor score 3 profile through the MacLellan Main Zone. Significant element loadings for Factor 3 are conductivity, pH, CO₂ and CaO (carbonatization).

FACTOR SCORE 4

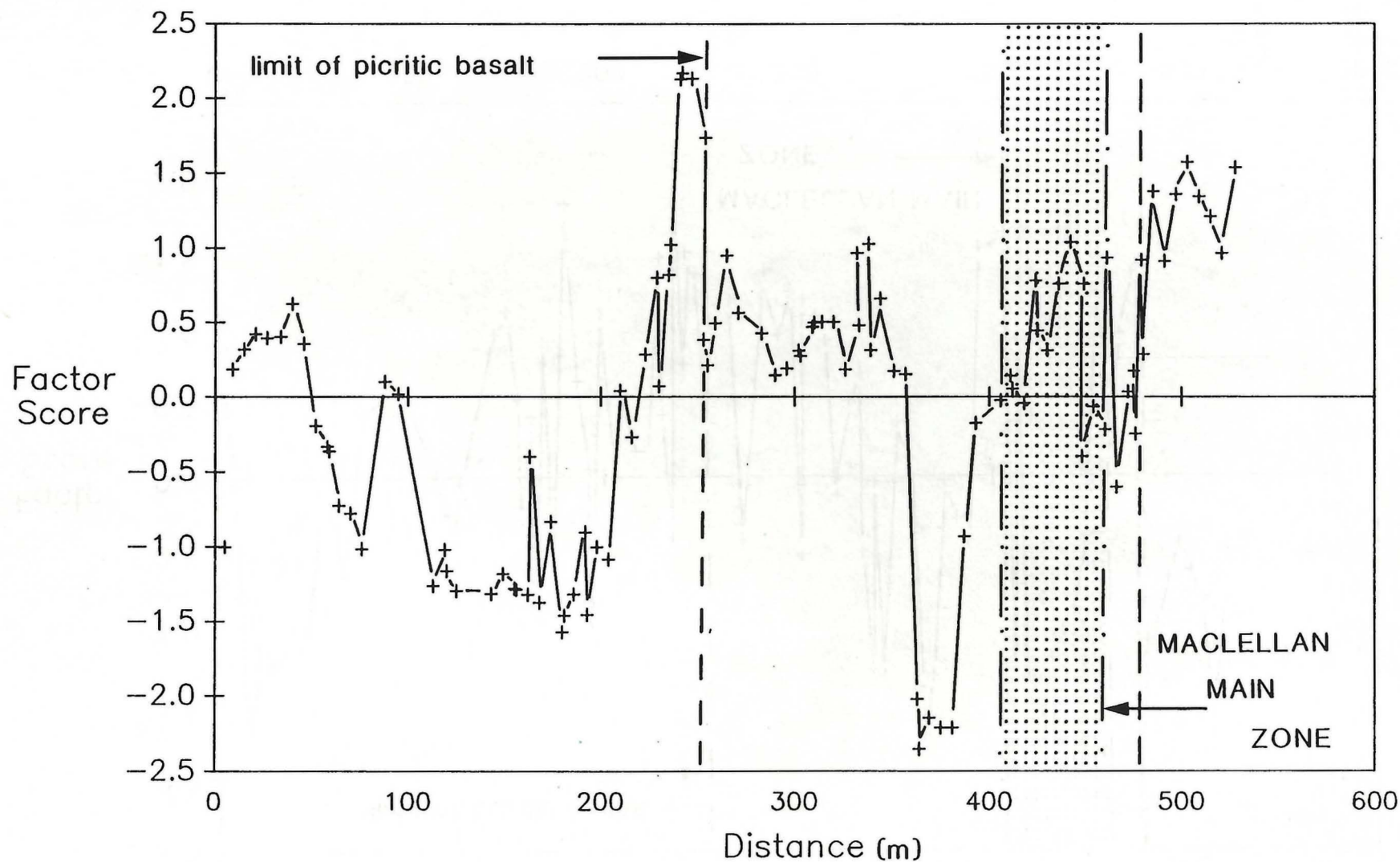


Figure 41: Factor score 4 profile through the MacLellan Main Zone. Significant element loadings for Factor 4 are P_2O_5 , Zr, F and TiO_2 (lithology).

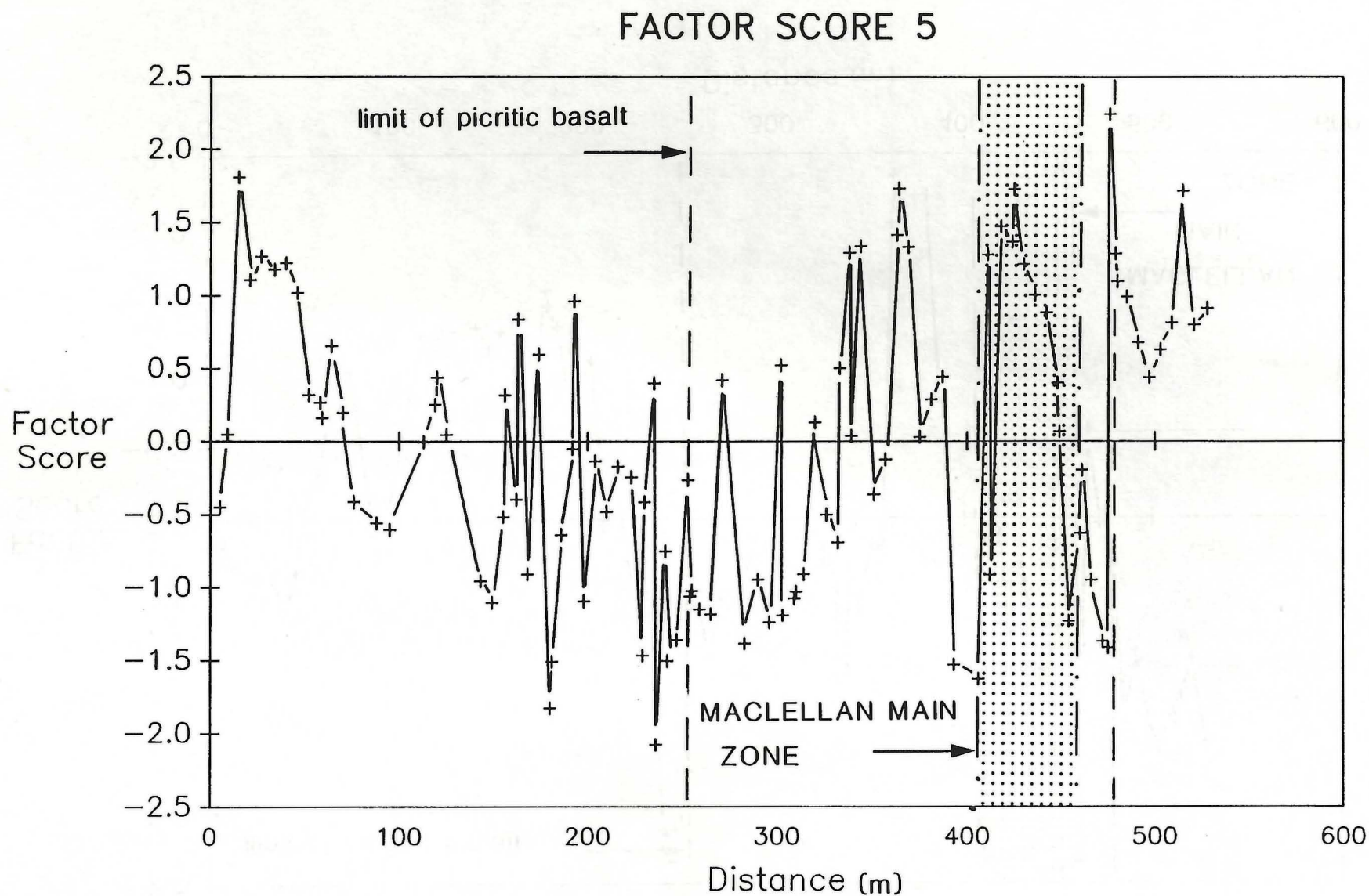


Figure 42: Factor score 5 profile through the MacLellan Main one. Significant element loadings for Factor 5 are K_2O , Rb, Ba and Li (alteration-potassic metasomatism).

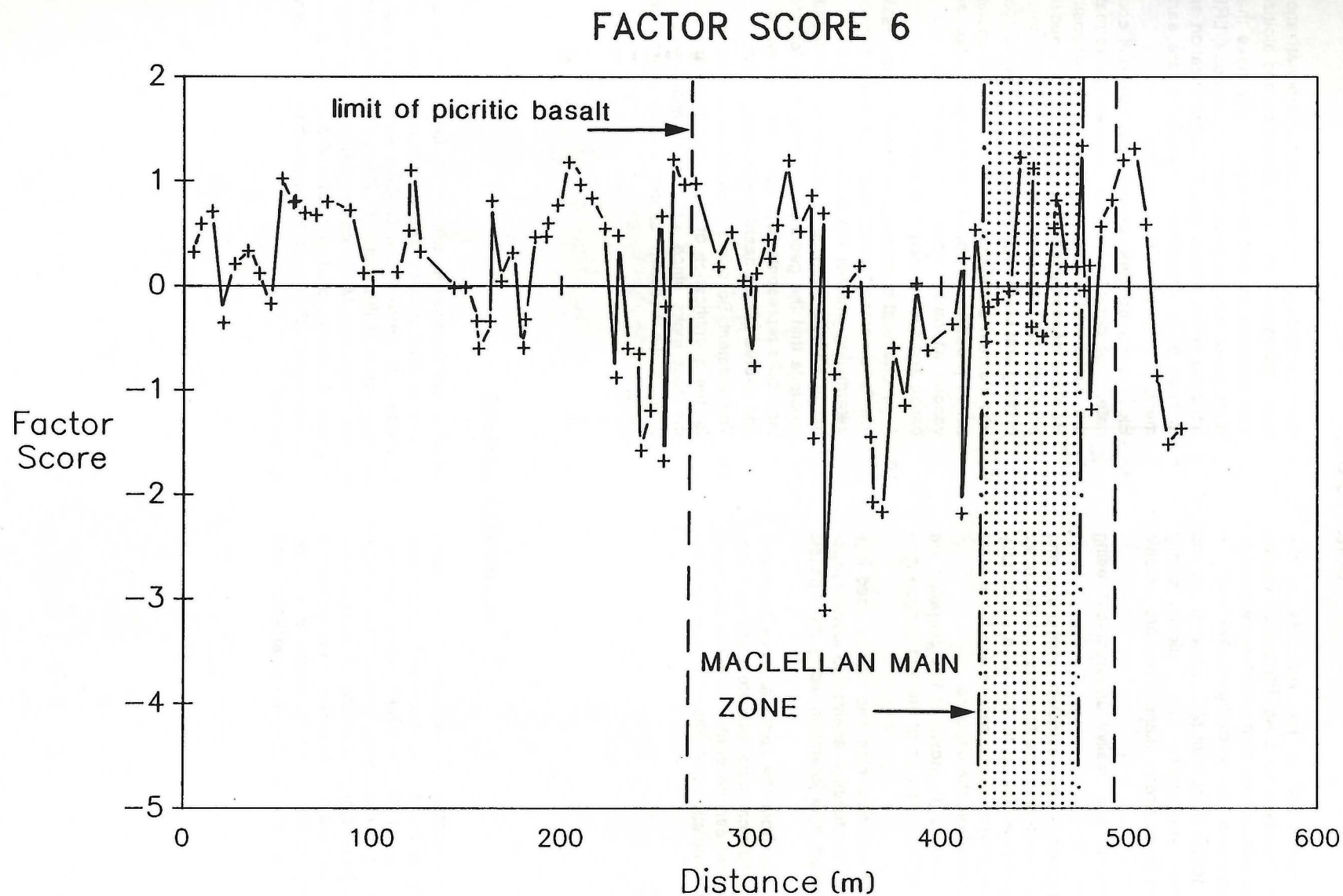


Figure 43: Factor score 6 profile through the MacLellan Main Zone. Significant element loadings for Factor 6 are Fe_2O_3 and Se (mineralization).

CONCLUSIONS

This geochemical study of the wallrocks to the MacLellan, Nisku and Rainbow Au $\pm$ Ag, Pb and Zn deposits has indicated the unique geochemical characteristics of the picritic basalt host rocks. The following are evident:

1. The host rocks to the MacLellan Main Zone, Nisku and Rainbow deposits are basalts with a picritic affinity probably formed in an ocean island/island arc tectonic environment.
2. The picritic basalts are easily "fingerprinted" using MgO, Ni and Cr.
3. Both areally extensive and restricted enrichment and depletion haloes related to the formation of the three deposits are developed for up to 200 m in structurally overlying and underlying picritic basalts and for at least 1500 m along strike from the deposits.
4. The chemical elements diagnostic of this alteration are directly related to the formation of ore and gangue minerals.
5. These diagnostic chemical elements can be used in a stepwise discriminant function analysis to identify repetitions of MacLellan type alteration along the Agassiz Metallotect.
6. Six factors derived from the factor analysis treatment of wallrock geochemical data indicate statistical variance in the dataset can be attributed to the presence of overlapping populations of chemical elements related to lithology, mineralization, carbonatization, potassic metasomatism, tourmalinization and albitization.
7. The alteration effects described in (6) make the interpretation of rare earth element data tenuous; LREE are enriched in the picritic basalt. Carbonatization appears to have been significant in mobilizing rare earth elements and distorting REE profiles.
8. Block averaged geochemical data from drill core indicate a temporal connection between the formation of the Nisku and MacLellan Main Zone deposits; the Rainbow deposit appears as a discrete chemical entity although this may have resulted from tectonic overprinting and boudinage along the mineralized zone.
9. Interelement correlations indicate the relationships between precious and base metal mineralization and the various alteration types that characterize the picritic basalt and sedimentary host rocks.
10. A geochemical comparison between picritic basalt and the "sedimentary" rocks was inconclusive insofar as determining whether the sedimentary rocks are simply highly altered equivalents of the picritic basalt. It is probable that the geochemical data base for sedimentary rocks represents both epiclastic sedimentary rocks and altered picritic basalt/sedimentary rocks.
11. The element Sc offers promise as a chemical datum for the quantification of elemental gains and losses in the host rocks since its concentration remains relatively static between altered and unaltered counterparts.

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APPENDIX I ANALYTICAL SPECIFICATIONS AND METHODOLOGY

SILICATE ANALYSIS:

A 0.2000 g sample is weighed into a graphite crucible and is fused with 1.5 g of lithium metaborate-tetraborate flux. The bead is dissolved in 100 ml of 2.5% HCl. All major and minor elements are determined on this solution as follows:

Element(s)	Technique
Fe ₂ O ₃ ^T , Na ₂ O, MnO:	The sample solution is aspirated directly into the air-acetylene flame of an atomic absorption spectrophotometer (Varian AA-6).
Al ₂ O ₃ , TiO ₂ :	An 8 ml aliquot of sample solution is buffered with 2 ml of iron-potassium buffer. An atomic absorption spectrophotometer (Varian AA-6) using a nitrous oxide flame was used for analysis.
CaO, MgO, K ₂ O:	The sample solution is diluted 10X and is buffered with LaO. This solution is aspirated into the air-acetylene flame of an atomic absorption spectrophotometer (Varian AA-6).
SiO ₂ , P ₂ O ₅ :	The sample solution is analyzed colourimetrically using a Bausch and Lomb Spectronic 100 spectrophotometer.
LOI:	A 1 g sample is heated in a platinum crucible and the weight loss determined.

CONDUCTIVITY AND PH:

100 ml of distilled water is added to 0.50 g of rock powder in a 150 ml tall form beaker. The mixture is stirred with a magnetic stirrer for two minutes. The conductivity of the solution was determined using a Radiometer CDM2E conductivity meter. The pH was then determined using a Fisher Accumet model 620 pH meter and a Fisher standard combination pH electrode.

NICKEL AND CHROMIUM

A 0.2 g sample is fused with a 1 g of lithium metaborate-tetraborate flux. The resulting bead is dissolved in 100 ml of dilute acid and analyzed by atomic absorption spectroscopy using a Varian AA975.

Element	Detection Limit	Operating Parameters
Chromium	25 ppm	air-acetylene flame
Nickel	10 ppm	air-acetylene flame

FLUORINE: (Detection Limit 80 ppm)

A 0.25 g sample is sintered in a nickel crucible with 1.25 g of sodium carbonate and potassium nitrate flux. After standing overnight with 10 ml of water in each crucible the contents are transferred to a 100 ml plastic volumetric flask. The crucible is rinsed twice with 10 ml portions of citric acid-sodium nitrate reagent. The solution is made to volume with water. A 50 ml aliquot is transferred to a polypropylene beaker and is mixed with 50 ml TISAB buffer, and is then stirred for two minutes. A Fisher Accumet pH meter operated in the expanded M.V. mode is used to determine fluoride concentration using an Orion specific ion electrode.

MOLYBDENUM: (Detection Limit, 1 ppm)

A 0.25 gm sample is digested with 0.5 ml of concentrated nitric acid and 1.5 ml of concentrated hydrochloric acid on a sand bath and the solution is taken to dryness. The residue is taken up with 2 ml concentrated HCl, and 8 ml of aluminum chloride solution is added which serves as an ionization buffer. The solution was analyzed by an AA975 atomic absorption spectrophotometer using a nitrous oxide flame.

Cu, Zn, Mn, Ag, Ba, Co, Pb, Fe:

A 0.2 g sample was digested with 0.5 ml concentrated nitric acid and 1.5 ml concentrated hydrochloric acid (aqua regia) for two hours at 95° to 100° C. The samples are made to a volume of 10 ml with distilled water and mixed on a Wortex mixer. The samples were allowed to stand for two hours in order for the sediment to settle before being analyzed by atomic absorption spectroscopy. A Varian AA975 was used for the analysis.

Element	Detection Limit	Operation Parameters
Cu	1 ppm	Air acetylene flame
Zn	1 ppm	Air acetylene flame
Mn	1 ppm	Air acetylene flame, background correction
Ag	1 ppm	Air acetylene flame, background correction
Co	1 ppm	Air acetylene flame, background correction
Pb	2 ppm	Air acetylene flame, background correction
Fe	50 ppm	Air acetylene flame, background correction
Ba	5 ppm	nitrous oxide flame

RUBIDIUM AND STRONTIUM:

A 1 g sample is digested overnight in a covered beaker on a steam bath using a mixture of hydrofluoric and perchloric acid. The next morning the covers are removed and the samples are heated on a hot plate to remove the hydrofluoric acid. The residues are heated briefly with concentrated hydrochloric acid. Water is added and the solution is heated for one to two hours on a steambath to dissolve the residues. The solution is quantitatively transferred to a 100 ml volumetric flask and the solution made to volume at 20°C. The solution is analyzed by atomic absorption spectroscopy using a Varian AA975.

Element	Detection Limit	Operating Parameters
Rb	2 ppm	air-acetylene flame, potassium chloride ionization buffer
Sr	3 ppm	nitrous oxide flame, potassium chloride ionization buffer

CARBON DIOXIDE:

A 1 g sample is heated in a Leco Induction Furnace (model 521-000). The volume of the CO₂ evolved is measured in a Leco (model 572-1000) carbon determinator. Carbon dioxide as low as 0.01% CO₂ is reported.

BARRINGER - MAGENTA:

BORON (B):

0.2 g of sample mixed with 1 g of Na₃CO₃ - KNO₃ - NaCl flux; digested with 43% HCl; made up to volume with deionized water; ICP analysis.

SELENIUM (Se):

0.5 g sample; Na borohydride reduction (heated quartz tube);

TELLURIUM (Te):

In nitric - perchloric digestion; made up to volume with deionized water; AAS analysis.

BISMUTH (Bi):

Dilute HCl; hydride generation; AAS analysis. Bondar Clegg (Vancouver).

THALLIUM (Tl):

1 g of rock powder was totally digested using an Hf-HNO₃-HClO₄ acid digestion in Teflon test tubes. The tubes are heated in an aluminum block to the point of generating perchloric acid vapour. The mixture is cooled, mixed with an HBr-Br solution and diluted to known volume using deionized water. This solution is aspirated into an AAS.

APPENDIX II

RAW DATA

PART 1: Drill Core, Outcrop and Muck Samples, MacLellan Au-Ag Deposit and Arbour Lake

LEGEND

Picrite	- P	biotitic	- bt
Basalt	- B	siliceous/silicified	- sl
Siltstone	- S	amygdaloidal	- a
Greywacke	- Gy	massive	- m
Mafic Tuff	- Mt	coarse grained	- cg
Felsic Tuff	- Ft	tuffaceous	- t
		garnetiferous	- g
		fragmental	- f
		intrusion	- i
		mixed	- /
		MacLellan Main Zone	- MMZ
		Nisku Deposit	- ND
		Rainbow Deposit	- RD

CONVENTIONS FOR REPORTING ELEMENT CONCENTRATION

- Major elements in weight %
- All trace elements in ppm except:
 - Au - ppb
 - CO₂ - %
 - Conductivity (COND.) - micromhos (μmhos)
 - Non-carbonate carbon - %

MACLELLAN MUCK SAMPLES - PLATINUM GROUP ELEMENTS

Element (ppb)	Sample					
	00604*			00605*		
	P			P		
Ru	-			-		
Rh	-			-		
Pd	-			-		
Re	-			-		
Os	-			-		
Ir	0.6			0.6		
Pt	45			35		
Au	137			132		
Sample	1000	2000	3000	4000	5000	6000
W (ppm)	P-sl	P-sl	P-sl	P-sl	P-sl	P-sl
	13	3	10	9	9	8

* Samples collected at random from MacLellan muck pile.

IMMEDIATE VICINITY MACLELLAN HEADFRAME

Sample No.	OUTCROP									
	AGO-1	AGO-2	AGO-3	AGO-4	AGO-5	AGO-6	AGO-7	AGO-8	AGO-9	AGO-10
Element	f B	bt S	f B	P	P	P	P	P	P	P
SiO ₂	51.7	51.5	50.3	43.5	41.3	46.2	44.2	43.6	44.0	44.0
Al ₂ O ₃	18.5	18.6	18.9	8.1	8.3	11.4	7.5	8.6	8.1	7.3
Fe ₂ O ₃ ^T	11.8	10.7	11.3	13.1	13.5	10.9	12.3	12.1	12.4	12.4
CaO	9.1	7.4	9.7	10.0	8.9	12.3	11.9	11.0	13.9	12.0
MgO	3.2	4.3	4.0	18.0	19.0	12.2	16.9	12.5	14.3	16.5
Na ₂ O	3.2	3.2	2.5	0.2	0.2	0.4	0.3	0.2	0.5	0.3
K ₂ O	0.3	0.8	0.5	0.1	0.1	0.9	0.1	1.4	0.1	0.1
TiO ₂	1.1	1.0	1.1	1.4	1.4	1.0	1.0	1.8	1.5	1.3
P ₂ O ₅	0.09	0.09	0.11	0.13	0.13	0.15	0.11	0.05	0.18	0.15
MnO	0.19	0.16	0.16	0.23	0.26	0.22	0.31	0.51	0.22	0.38
LOI	0.6	0.6	0.7	4.5	5.8	3.4	3.5	4.1	3.3	3.5
Total	99.8	98.4	99.3	99.3	98.9	99.1	98.1	98.5	98.5	97.9
Cu	55	24	143	199	125	102	96	102	86	213
Pb	-	-	-	-	-	12	-	21	8	2
Zn	60	80	33	46	97	78	102	122	45	103
Co	35	27	20	54	63	51	54	54	48	60
Mn	395	311	253	334	420	366	488	1620	295	484
Ni	1	9	4	687	650	264	614	507	573	644
Ba	10	120	85	20	5	135	5	55	20	5
Au(ppb)	4	1	15	18	81	12	280	350	8	250
As	18	57	1	21	46	320	15	950	7	32
Sb	1.8	0.6	0.4	0.9	0.7	2.5	1.9	19.0	1.2	1.9
Tl	-	-	-	<0.2	<0.2	-	<0.2	-	-	0.2

OUTCROP

Sample No.	AGO-11 a B	AGO-12 a B	AGO-13 f B	AGO-14 f B	AGO-15 P	AGO-16 P	AGO-17 f B
Element							
SiO ₂	51.8	51.5	50.1	51.4	42.7	46.1	46.3
Al ₂ O ₃	18.4	19.1	19.0	16.7	10.2	6.8	18.4
Fe ₂ O ₃ ^T	11.5	10.4	12.8	13.5	13.7	12.2	13.9
CaO	9.2	8.3	8.2	9.1	10.1	12.7	10.2
MgO	3.2	3.4	4.3	4.0	14.8	15.2	6.3
Na ₂ O	3.1	3.4	3.4	2.1	0.4	0.4	2.2
K ₂ O	0.3	0.5	0.4	0.6	0.1	0.1	0.5
TiO ₂	1.1	1.0	1.1	1.1	1.7	1.3	1.0
P ₂ O ₅	0.09	0.08	0.09	0.08	0.14	0.15	0.07
MnO	0.18	0.16	0.16	0.18	0.22	0.33	0.20
LOI	0.6	0.8	1.1	0.6	3.9	2.8	0.7
Total	99.5	98.7	100.7	99.4	98.1	98.1	99.8
Cu	87	79	116	215	143	77	62
Pb	-	-	-	-	3	-	-
Zn	30	39	45	39	60	61	55
Co	18	20	35	39	42	40	26
Mn	314	252	323	282	270	434	261
Ni	5	6	10	6	333	478	6
Ba	20	65	45	110	15	5	40
Au(ppb)	8	3	8	19	21	29	6
As	1	1	-	3	50	25	4
Sb	0.7	0.5	0.8	1.1	1.3	1.8	0.8
TI	-	-	-	-	0.2	<0.2	-

DISTANCE FROM COLLAR, DRILL CORE SAMPLES
DDH U82-5 MMZ

Sample No.	5 m AGC-1 cg B	9 m AGC-2 cg B	15 m AGC-3 cg B	21 m AGC-4 cg B	27 m AGC-5 cg B	34 m AGC-6 cg B	40 m AGC-7 cg B	46 m AGC-8 cg B	52 m AGC-9 m B	58 m AGC-10 m B
Element										
SiO ₂	49.5	49.5	45.9	50.2	50.9	50.5	51.0	50.6	52.0	52.8
Al ₂ O ₃	20.8	15.8	15.2	13.1	13.0	13.6	13.8	13.9	17.6	18.6
Fe ₂ O ₃ ^T	10.3	12.1	12.3	10.7	10.8	10.6	10.5	10.9	12.1	11.4
CaO	9.2	10.2	10.0	9.9	9.7	9.2	10.0	9.9	6.1	7.6
MgO	3.3	5.2	7.5	7.9	8.3	7.5	7.7	7.1	3.4	3.4
Na ₂ O	4.1	2.7	2.1	2.8	2.6	2.7	2.9	2.8	4.4	4.0
K ₂ O	0.5	0.4	1.8	1.0	0.9	1.1	1.0	0.9	1.0	0.7
TiO ₂	1.0	1.2	1.0	0.9	0.9	0.9	0.9	0.9	1.1	1.0
P ₂ O ₅	0.04	0.16	0.18	0.22	0.23	0.21	0.22	0.20	0.10	0.08
MnO	0.13	0.19	0.20	0.19	0.18	0.17	0.16	0.19	0.15	0.15
LOI	0.8	0.8	2.0	0.8	0.6	0.9	0.9	1.2	1.5	0.7
Total	99.7	98.3	98.2	97.7	98.1	97.4	99.1	97.7	99.5	100.4
Cu	112	65	32	37	49	81	37	45	194	138
Pb	-	-	4	-	-	-	-	-	-	-
Zn	26	33	63	31	32	34	34	38	47	39
Co	24	18	18	19	23	26	22	22	50	34
Mn	295	315	590	330	315	355	350	400	440	390
Ni	24	45	61	84	83	53	67	66	10	16
Cr	25	111	383	493	568	480	451	407	25	29
Ba	60	105	500	300	330	315	300	195	165	150
F	125	288	420	400	500	468	600	476	216	290
Ag	-	-	-	-	-	-	-	-	-	-
Mo	-	-	-	-	-	-	-	-	2	2
Au(ppb)	8	5	2	8	3	7	4	2	28	9
As	2	4	2	2	3	2	1	1	3	2
Sb	0.8	1.0	0.2	0.7	0.6	0.2	0.7	0.5	0.2	0.2
Hg	-	10	-	-	-	-	-	-	15	5
Li	8	10	21	13	16	14	13	13	13	11
Zr	28	62	65	81	68	61	70	65	52	41
CO ₂ (%)	0.47	0.16	1.42	0.43	0.10	0.47	0.44	0.50	0.25	0.15
Rb	6	7	40	21	25	24	23	17	25	18
Sr	341	302	310	439	472	438	420	387	289	268
Se	0.9	0.9	4.1	0.3	0.4	0.7	1.0	0.4	2.2	1.4
Te	-	-	-	-	-	-	-	-	-	-
Bi	-	-	-	-	-	-	-	-	-	-
B	15	13	15	10	12	13	15	15	13	15
Cond.(umhos)	21	19	32	23	11	25	25	28	25	15
Cd	-	-	-	-	-	-	-	-	-	-
pH	9.70	9.65	9.94	9.85	9.55	9.90	9.85	9.91	9.87	9.47
Corg.(%)	0.02	0.07	0.00	0.01	0.01	0.04	0.03	0.01	0.18	0.06
TI	-	-	-	-	-	-	-	-	-	-

DDH U82-5 MMZ

Sample No.	59 m AGC-10D m B	64 m AGC-11 m B	70 m AGC-12 cg B	76 m AGC-13 a B	82 m AGC-14 a B	88 m AGC-15 S	94 m AGC-16 S	95 m AGC-16B S	101 m AGC-17 a B	107 m AGC-18 m B
Element										
SiO ₂	52.7	48.6	48.3	49.2	54.5	55.1	50.4	53.8	50.9	50.7
Al ₂ O ₃	18.5	20.0	19.3	18.4	18.1	17.2	18.3	18.4	19.3	18.2
Fe ₂ O ₃ ^T	11.2	11.4	11.4	11.6	10.4	10.4	11.0	10.8	11.0	10.9
CaO	6.7	9.2	10.6	9.8	6.8	7.0	9.0	5.8	7.7	9.2
MgO	3.2	4.1	3.4	4.7	3.2	3.4	4.9	3.7	4.7	4.7
Na ₂ O	4.1	3.5	3.1	2.8	4.0	3.7	3.0	4.4	3.9	2.8
K ₂ O	0.9	1.0	0.8	0.5	0.3	0.6	0.7	0.2	0.1	0.3
TiO ₂	1.1	1.0	1.0	0.9	1.0	1.0	0.9	0.9	0.7	0.7
P ₂ O ₅	0.08	0.05	0.05	0.06	0.15	0.16	0.05	0.17	0.05	0.05
MnO	0.13	0.15	0.15	0.19	0.16	0.18	0.17	0.18	0.16	0.17
LOI	0.8	0.7	1.4	1.0	0.7	0.7	0.7	0.7	0.8	1.4
Total	99.4	99.7	99.5	99.2	99.3	99.4	99.1	99.1	99.3	99.1
Cu	152	106	130	85	77	96	79	54	39	46
Pb	-	-	-	-	-	-	-	-	4	2
Zn	42	41	36	29	37	34	32	65	40	43
Co	39	29	44	34	31	33	34	28	28	26
Mn	390	440	425	410	400	420	295	290	360	445
Ni	21	16	10	17	10	33	32	20	40	49
Cr	43	42	39	39	27	29	76	25	105	94
Ba	115	215	160	25	35	80	30	90	5	55
F	264	236	216	152	200	224	152	216	188	160
Ag	-	-	-	-	-	-	-	-	-	-
Mo	2	2	-	1	-	-	-	1	1	1
Au(ppb)	11	7	20	5	7	23	3	28	-	-
As	2	1	5	2	-	2	1	1	-	2
Sb	0.2	0.3	0.4	0.6	0.4	0.4	-	0.2	-	1.0
Hg	5	5	5	-	5	-	-	-	-	5
Li	13	12	9	10	9	10	13	16	17	16
Zr	43	24	26	30	92	93	26	104	25	23
CO ₂ (%)	0.12	0.39	0.68	0.35	0.12	0.13	0.30	0.15	0.17	0.77
Rb	17	25	18	6	3	5	1	6	1	5
Sr	250	247	212	242	231	168	216	137	227	164
Se	1.7	1.2	2.0	1.0	2.0	5.8	1.4	1.7	0.5	0.7
Te	-	-	-	-	-	-	-	-	-	-
Bi	-	-	-	-	-	-	-	-	-	-
B	13	17	17	20	16	16	13	14	11	11
Cond.(umhos)	13	26	30	25	7	13	22	11	16	32
Cd	-	-	-	-	-	-	-	-	-	-
pH	9.35	9.89	9.92	9.88	9.12	9.55	9.81	9.57	9.72	9.99
Corg.(%)	0.07	0.06	0.22	0.07	0.06	0.06	0.00	0.02	0.01	0.00
TI	-	-	-	-	-	-	-	-	-	-

DDH U82-5 MMZ										
Sample No.	113 m	119 m	120 m	125 m	131 m	137 m	143 m	149 m	155 m	156 m
	AGC-19	AGC-20	AGC-20D	AGC-21	AGC-22	AGC-23	AGC-24	AGC-25	AGC-26	AGC-26S
Element	m B	m B	m B	m B	m B	m B	a B	a B	a B	S
SiO ₂	50.2	51.8	51.4	50.6	52.2	50.1	51.1	50.7	51.5	56.0
Al ₂ O ₃	19.2	18.0	19.4	20.0	19.0	20.7	19.5	19.1	19.9	18.1
Fe ₂ O ₃ ^T	11.2	11.1	11.5	10.9	11.7	11.6	11.0	11.1	10.6	11.4
CaO	7.8	8.0	6.6	8.7	6.3	8.2	9.3	9.2	9.3	4.0
MgO	4.8	5.0	4.8	4.8	4.3	5.7	5.3	5.4	4.6	4.5
Na ₂ O	2.5	2.2	2.6	2.4	2.8	2.8	2.6	2.4	2.7	1.9
K ₂ O	0.6	0.8	1.1	0.6	0.6	0.5	0.3	0.3	0.3	1.3
TiO ₂	0.7	0.8	0.8	0.7	0.9	0.7	0.7	0.7	0.7	0.8
P ₂ O ₅	0.05	0.07	0.06	0.06	0.08	0.05	0.05	0.05	0.05	0.06
MnO	0.16	0.16	0.15	0.16	0.15	0.16	0.20	0.18	0.16	0.11
LOI	1.4	1.1	1.2	1.2	1.4	1.2	0.9	0.9	0.9	2.0
Total	98.6	99.0	99.6	100.1	99.4	101.7	101.0	100.0 1	00.7	100.2
Cu	93	139	219	77	165	105	87	89	55	63
Pb	11	10	12	7	-	-	2	5	-	-
Zn	60	64	74	41	63	50	35	33	30	86
Co	35	37	42	26	41	43	33	27	30	42
Mn	430	375	370	325	340	360	340	290	310	460
Ni	38	60	22	11	22	32	35	50	33	10
Cr	103	63	82	101	61	131	126	131	128	57
Ba	65	145	170	60	55	40	10	5	30	205
F	144	160	172	140	168	128	140	224	172	216
Ag	-	-	-	-	-	-	-	-	-	-
Mo	1	2	1	1	1	1	1	1	1	2
Au(ppb)	7	11	27	5	15	6	11	13	5	1
As	1	1	1	1	-	-	1	1	2	1
Sb	0.2	0.2	0.3	0.6	-	0.5	0.5	0.6	0.4	0.3
Hg	5	-	-	-	5	15	-	-	-	-
Li	25	22	26	20	19	19	16	21	17	28
Zr	29	26	28	25	36	29	31	30	14	27
CO ₂ (%)	0.55	0.47	0.16	0.42	0.05	0.03	0.15	0.24	0.36	0.01
Rb	7	11	15	7	9	7	3	2	4	21
Sr	176	142	156	181	170	201	204	207	223	91
Se	1.4	1.4	2.0	1.2	2.0	1.4	0.9	1.2	0.9	0.7
Te	-	-	-	-	-	-	-	-	-	-
Bi	-	-	-	-	-	-	-	-	-	-
B	16	39	41	54	11	12	9	7	7	12
Cond.(umhos)	27	29	15	27	12	19	22	20	27	4
Cd	-	-	-	-	-	-	-	-	-	-
pH	9.90	9.92	9.62	9.87	9.45	9.73	9.84	9.80	9.88	8.80
Corg.	0.03	0.04	0.05	0.01	0.04	0.01	0.03	0.01	0.02	0.03
TI	-	-	-	-	-	-	-	-	-	-

DDH U82-5 MMZ

Sample No.	162 m AGC- 27 m B	163 m AGC- 27S S	168 m AGC- 28 S	174 m AGC- 29S S	180 m AGC- 30 a B	181 m AGC- 30D a B	186 m AGC- 31 m B	192 m AGC- 32 m B	193 m AGC- 32S S	198 m AGC- 33 S
Element										
SiO ₂	49.8	52.2	50.0	50.1	52.3	50.6	51.3	49.9	48.8	50.4
Al ₂ O ₃	20.6	18.6	21.2	20.9	18.9	19.4	21.1	20.8	22.4	19.1
Fe ₂ O ₃ ^T	11.3	12.1	11.6	12.0	10.0	10.5	11.2	11.5	11.4	12.2
CaO	8.6	7.1	9.4	6.9	9.9	11.6	7.5	7.8	6.5	8.3
MgO	5.0	4.0	3.7	3.4	2.6	3.0	3.0	3.5	3.7	4.0
Na ₂ O	3.4	1.7	3.2	3.9	3.6	3.7	4.4	3.6	2.6	3.7
K ₂ O	0.4	1.8	0.3	1.5	0.2	0.1	0.3	0.5	1.8	0.2
TiO ₂	0.7	0.9	0.8	1.2	1.0	1.0	1.1	1.2	1.1	1.2
P ₂ O ₅	0.06	0.12	0.05	0.04	0.03	0.03	0.03	0.04	0.03	0.04
MnO	0.16	0.17	0.16	0.14	0.15	0.15	0.15	0.16	0.15	0.18
LOI	0.9	0.9	0.8	1.4	1.7	1.7	0.6	0.8	1.4	0.6
Total	100.9	99.6	101.2	101.5	100.4	101.8	100.7	99.8	99.9	99.9
Cu	51	145	106	121	144	128	168	128	123	133
Pb	4	-	-	10	-	-	-	4	10	8
Zn	35	79	37	87	32	34	45	45	87	39
Co	27	33	25	38	26	25	27	34	37	28
Mn	300	535	340	530	460	435	370	390	525	400
Ni	24	10	10	10	10	17	10	10	10	10
Cr	143	34	27	25	25	42	25	25	25	25
Ba	15	225	15	315	5	10	45	105	210	20
F	160	256	124	204	118	132	112	168	198	168
Ag	-	-	-	-	-	-	-	-	-	-
Mo	1	2	2	2	2	1	1	1	1	-
Au(ppb)	12	1	12	7	10	13	7	6	6	7
As	2	2	2	2	1	2	2	1	1	1
Sb	0.4	0.4	0.8	0.3	0.4	0.7	0.6	0.4	0.5	0.6
Hg	15	-	35	-	-	10	5	10	-	-
Li	15	30	19	29	15	17	23	27	45	26
Zr	28	58	22	25	18	21	20	31	26	25
CO ₂ (%)	0.22	0.27	0.37	0.95	1.67	1.45	0.35	0.42	0.18	0.43
Rb	5	19	2	23	1	2	7	9	35	1
Sr	229	128	254	131	150	161	195	206	122	199
Se	0.3	1.7	0.5	1.4	0.6	0.7	0.9	0.7	0.9	0.9
Te	-	-	-	-	-	-	-	-	-	-
Bi	-	-	-	-	-	-	-	-	-	-
B	24	56	9	9	10	12	11	12	53	16
Cond.(umhos)	23	26	24	34	35	34	23	27	16	25
Cd	-	-	-	-	-	-	-	-	-	-
pH	9.77	9.92	9.88	9.98	9.98	9.99	9.80	9.85	9.71	9.82
Corg.	0.02	0.05	0.02	0.02	0.03	0.02	0.03	0.02	0.05	0.03
TI	-	-	-	-	-	-	-	-	-	-

DDH U82-5 MMZ										
Sample No.	204 m		210 m		216 m		223 m		229 m	
	AGC-34		AGC-35		AGC-36		AGC-37		AGC-38F	
	a	B	m	B	a	B	S	S	m	B
Element										
SiO ₂	48.6		54.8		52.2		48.8		60.2	
Al ₂ O ₃	19.5		16.5		18.4		14.8		15.7	
Fe ₂ O ₃ ^T	13.5		12.6		12.5		11.9		5.5	
CaO	8.6		6.3		6.2		8.9		5.4	
MgO	4.4		4.0		4.2		6.2		4.5	
Na ₂ O	3.0		3.2		3.7		2.2		5.1	
K ₂ O	0.4		0.3		0.4		0.4		0.3	
TiO ₂	1.1		1.2		1.5		1.6		1.5	
P ₂ O ₅	0.04		0.14		0.07		0.14		0.20	
MnO	0.19		0.20		0.18		0.19		0.14	
LOI	0.6		0.3		0.7		2.0		0.3	
Total	99.9		99.5		100.1		97.1		98.8	
Cu	190		67		122		80		200	
Pb	7		-		4		34		16	
Zn	46		36		91		83		40	
Co	36		31		33		35		36	
Mn	435		320		340		455		155	
Ni	10		10		10		46		14	
Cr	51		25		25		162		39	
Ba	115		85		135		60		70	
F	146		198		256		352		336	
Ag	-		-		-		-		3	
Mo	1		1		-		1		4	
Au(ppb)	75		7		26		16		74	
As	1		2		1		5		2	
Sb	1.1		0.8		0.8		0.6		0.3	
Hg	-		5		15		5		-	
Li	26		22		28		19		10	
Zr	30		58		42		67		103	
CO ₂ (%)	0.30		0.18		0.18		1.47		0.30	
Rb	10		6		6		8		3	
Sr	173		174		197		127		141	
Se	1.2		2.7		0.9		3.2		0.7	
Te	-		-		-		-		-	
Bi	-		-		-		-		-	
B	13		15		8		14		8	
Cond.(umhos)	21		14		12		34		20	
Cd	-		-		-		-		-	
pH	9.79		9.61		9.62		10.00		9.80	
Corg.	0.01		0.02		0.01		0.02		0.02	
TI	-		-		-		-		-	

Sample No.	DDH U82-5 MMZ									
	247 m	253 m	254 m	255 m	259 m	265 m	271 m	277 m	283 m	290 m
	AGC-41	AGC-42	AGC-42F	AGC-42P	AGC-43	AGC-44	AGC-45	AGC-46	AGC-47	AGC-48
	S	m B	S	P	m B	S	P	S	P	P
Element										
SiO ₂	63.7	47.2	64.6	43.4	46.9	48.3	50.2	49.1	44.2	40.4
Al ₂ O ₃	13.5	13.9	11.5	9.1	13.2	14.1	10.5	14.5	8.0	8.5
Fe ₂ O ₃ ^T	7.7	12.9	7.2	11.8	14.1	13.6	14.0	13.7	13.8	14.3
CaO	4.0	11.0	5.1	12.6	11.0	7.9	8.7	6.6	10.0	12.3
MgO	2.4	6.2	2.7	14.0	7.3	4.3	10.9	7.2	15.6	15.3
Na ₂ O	4.9	2.5	3.1	0.7	2.1	4.1	0.9	3.8	0.4	0.4
K ₂ O	0.2	0.3	0.3	0.1	0.1	0.1	0.5	0.3	0.1	0.1
TiO ₂	2.0	2.0	1.6	1.6	1.9	2.5	1.9	2.5	1.7	1.8
P ₂ O ₅	0.45	0.06	0.40	0.1	0.14	0.18	0.12	0.18	0.11	0.11
MnO	0.14	0.22	0.16	0.20	0.19	0.18	0.20	0.17	0.23	0.33
LOI	0.2	2.3	0.9	3.8	2.0	2.0	0.7	0.7	3.0	4.0
Total	96.6	98.8	98.6	97.4	98.9	97.8	98.6	98.8	97.1	97.5
Cu	40	86	49	49	177	140	127	340	120	121
Pb	-	-	-	4	4	13	16	48	2	4
Zn	49	74	56	35	41	72	67	52	58	123
Co	35	43	37	27	45	42	41	50	55	86
Mn	230	510	370	405	395	445	265	175	260	665
Ni	10	118	15	742	256	79	624	127	873	1201
Cr	25	87	25	1552	424	52	1433	102	1610	2058
Ba	125	185	125	30	30	30	215	75	30	30
F	540	400	464	500	308	240	400	336	500	452
Ag	-	-	-	-	-	-	-	3	-	-
Mo	1	-	1	1	2	2	2	1	-	1
Au(ppb)	9	9	3	4	7	3	27	19	14	16
As	1	1	2	4	1	4	5	2	4	44
Sb	0.2	1.9	0.5	1.5	1.4	1.1	1.5	-	0.9	1.4
Hg	15	15	5	5	-	5	-	5	5	-
Li	12	14	12	13	22	19	34	22	15	18
Zr	352	84	370	64	91	144	93	117	74	76
CO ₂ (%)	0.39	2.89	1.12	2.85	2.18	2.14	0.25	0.33	2.12	3.89
Rb	6	5	7	1	1	2	20	13	1	1
Sr	82	138	95	117	205	288	204	309	108	120
Se	1.5	1.9	1.4	1.2	1.4	1.4	1.0	1.0	1.0	1.0
Te	-	-	-	-	-	-	-	-	-	-
Bi	-	-	-	-	-	-	-	-	-	-
B	4	13	7	16	11	6	7	5	5	12
Cond.(umhos)	25	38	31	34	36	36	22	21	33	33
Cd	-	-	-	-	-	-	-	-	-	-
pH	9.94	10.04	9.96	10.02	10.02	9.96	9.72	9.76	9.91	9.88
Corg.	0.01	0.02	0.02	0.01	0.02	0.05	0.02	0.04	0.03	0.04
TI	-	-	-	<0.2	-	-	<0.2	-	-	<0.2

Sample No.	DDH U82-5 MMZ									
	296 m	302 m	303 m	309 m	310 m	314 m	320 m	326 m	332 m	333 m
	AGC-49	AGC-50C	AGC-50P	AGC-51	AGC-51D	AGC-52	AGC-53	AGC-54	AGC-55	AGC-55F
Element	p	s	p	p	p	p	p	p	p	s
SiO ₂	44.9	56.6	47.1	44.0	42.8	44.7	42.6	39.6	44.4	64.6
Al ₂ O ₃	8.6	15.7	8.7	8.2	7.3	8.0	9.8	6.8	10.6	14.0
Fe ₂ O ₃ ^T	13.3	9.9	13.2	13.8	13.5	13.8	15.2	12.2	14.2	7.3
CaO	11.0	2.1	10.1	12.5	13.7	13.3	11.4	16.3	11.9	2.8
MgO	13.4	6.7	14.5	14.3	14.5	14.4	14.0	12.9	13.0	4.6
Na ₂ O	0.7	3.1	0.6	0.5	0.5	0.5	0.5	0.4	0.6	3.2
K ₂ O	0.1	0.8	0.2	0.1	0.1	0.1	0.5	0.1	0.1	1.1
TiO ₂	1.5	1.3	1.7	1.5	1.6	1.5	1.8	1.5	2.1	0.8
P ₂ O ₅	0.11	0.16	0.12	0.12	0.14	0.13	0.13	0.10	0.23	0.12
MnO	0.35	0.11	0.36	0.27	0.30	0.28	0.29	0.59	0.38	0.05
LOI	2.6	2.3	1.4	2.5	3.2	2.1	2.3	5.1	1.3	1.5
Total	96.6	98.8	98.0	97.8	97.6	98.8	98.5	95.6	98.8	100.1
Cu	144	53	132	158	142	182	270	200	98	110
Pb	14	32	5	3	2	-	12	121	10	7
Zn	146	490	111	95	78	98	239	8900	104	106
Co	56	28	73	68	70	64	57	62	55	42
Mn	520	375	320	400	510	370	480	1250	375	205
Ni	906	151	921	861	965	852	798	899	917	137
Cr	1553	237	1682	1870	1885	1546	1807	1707	1661	196
Ba	35	145	25	35	45	40	105	35	45	390
F	384	400	488	452	428	452	428	400	428	428
Ag	2	1	2	2	2	-	2	3	2	2
Mo	1	1	1	1	1	1	1	1	2	2
Au(ppb)	25	11	7	10	10	11	16	53	7	23
As	75	3	25	6	6	4	5	4	5	4
Sb	2.7	0.3	1.9	1.4	1.4	1.5	1.6	1.6	2.0	1.2
Hg	-	5	5	5	-	-	-	-	-	10
Li	20	27	22	11	11	9	12	16	18	42
Zr	101	99	66	76	74	73	68	87	121	590
CO ₂ (%)	2.57	0.13	0.70	2.25	3.59	2.27	2.02	6.16	1.13	0.08
Rb	1	28	3	2	2	4	13	1	3	33
Sr	87	225	50	159	146	158	178	166	185	367
Se	0.9	0.9	1.0	1.2	1.0	1.0	1.4	1.0	1.0	0.7
Te	-	-	-	-	-	-	-	-	-	-
Bi	-	-	-	-	-	-	-	-	-	-
B	8	4	7	4	4	7	5	10	5	4
Cond.(umhos)	33	5	29	36	36	36	35	41	33	5
Cd	1	-	2	-	-	-	-	107	1	1
pH	9.96	8.59	9.91	9.96	10.06	10.00	9.99	10.03	9.93	7.88
Corg.	0.00	0.01	-	0.03	-	0.01	0.04	0.02	-	0.03
TI	-	-	-	-	-	-	-	<0.2	-	-

Sample No.	DDH U82-5 MMZ									
	338 m	339 m	344 m	351 m	357 m	363 m	364 m	369 m	375 m	381 m
	AGC-56	AGC-56F	AGC-57	AGC-58	AGC-59	AGC-60	AGC-60D	AGC-61	AGC-62	AGC-63
Element	P	S	S	P	P	S	S	S	P	p
SiO ₂	43.3	72.9	56.1	46.0	45.0	46.1	45.9	44.2	43.5	41.4
Al ₂ O ₃	11.3	10.7	18.2	7.4	8.6	19.1	20.5	21.2	13.4	10.2
Fe ₂ O ₃ ^T	13.5	5.1	8.5	12.8	13.6	9.5	8.7	7.6	13.0	12.4
CaO	10.3	3.0	5.0	13.7	12.9	10.3	9.9	11.8	10.2	10.8
MgO	12.6	3.3	3.4	13.9	13.8	8.1	7.8	4.6	14.5	16.6
Na ₂ O	0.6	2.3	2.5	0.4	0.4	0.4	0.4	0.3	0.4	0.2
K ₂ O	1.3	1.0	3.0	0.4	0.3	3.1	3.5	4.2	0.8	0.6
TiO ₂	1.9	0.6	0.9	1.2	1.2	0.5	0.4	0.6	0.8	0.5
P ₂ O ₅	0.29	0.06	0.31	0.11	0.15	0.03	0.02	0.05	0.01	0.01
MnO	0.25	0.04	0.08	0.35	0.44	0.26	0.22	0.18	0.40	0.43
LOI	2.1	0.8	1.3	2.0	1.9	2.1	2.4	4.0	2.8	5.3
Total	97.6	99.8	99.3	98.3	98.3	99.5	99.7	98.7	99.8	98.4
Cu	87	33	129	129	103	88	24	106	30	60
Pb	42	15	5	3	6	26	24	14	4	7
Zn	110	68	132	56	106	128	111	125	68	52
Co	52	44	40	65	54	40	34	30	45	62
Mn	450	160	610	495	515	1250	1350	1400	590	750
Ni	551	55	10	830	577	103	95	162	406	710
Cr	1462	131	25	1483	1004	62	111	142	506	1209
Ba	260	205	345	70	90	205	230	145	85	135
F	716	320	740	520	460	304	272	228	140	260
Ag	3	-	-	-	-	-	-	-	-	-
Mo	1	-	1	-	-	-	-	-	-	-
Au(ppb)	11	4	30	150	35	30	13	120	28	140
As	4	4	18	7	23	36	32	110	10	17
Sb	2.1	1.8	1.4	1.6	1.8	1.0	0.9	2.0	1.0	0.6
Hg	5	-	-	-	-	5	-	-	-	-
Li	26	26	41	7	15	32	34	25	17	10
Zr	112	680	124	62	54	12	11	13	16	19
CO ₂ (%)	1.71	0.02	0.34	2.27	1.82	1.92	1.85	4.41	1.03	4.96
Rb	47	31	60	10	8	69	80	103	15	13
Sr	213	358	252	123	117	108	113	84	55	107
Se	0.9	0.5	1.0	1.0	1.2	0.9	1.5	0.5	2.6	0.9
Te	-	-	-	-	-	-	-	-	-	-
Bi	-	-	-	-	-	-	-	-	-	-
B	10	7	6	7	6	4	5	10	9	7
Cond.(umhos)	38	7	27	37	36	41	39	43	32	30
Cd	-	-	-	-	-	-	-	-	-	-
pH	10.03	9.03	9.91	9.98	9.99	10.04	10.03	10.06	9.91	9.92
Corg.	-	0.04	0.18	-	0.03	0.02	0.02	0.03	-	0.03
TI	-	-	-	-	-	-	-	-	-	-

Sample No.	DDH U82-5 MMZ									
	387 m	393 m	399 m	405 m	406 m	411 m	412 m	418 m	424 m	425 m
	AGC-64	AGC-65	AGC-66	AGC-67F	AGC-67P	AGC-68F	AGC-68P	AGC-69	AGC-70	AGC-70D
Element	P	P	P	bt S	P	bt S	P	bt S	bt S	bt S
SiO ₂	44.7	39.3	41.6	56.0	45.8	60.0	47.9	47.1	47.1	44.1
Al ₂ O ₃	13.6	8.6	9.6	18.3	8.4	15.3	9.2	17.0	18.9	17.9
Fe ₂ O ₃ ^T	16.5	12.9	13.0	9.4	13.0	6.7	12.6	11.5	10.2	11.7
CaO	8.4	10.7	10.3	4.3	11.5	7.1	12.0	8.1	6.2	7.1
MgO	10.1	18.6	18.0	5.0	14.4	6.6	14.5	8.0	7.2	7.5
Na ₂ O	1.0	0.2	0.3	1.5	0.4	0.6	0.4	1.3	2.0	1.6
K ₂ O	0.8	0.1	0.0	2.6	0.1	1.9	0.2	2.1	3.0	3.5
TiO ₂	1.0	1.3	1.2	1.1	1.3	0.7	1.3	1.5	2.5	2.1
P ₂ O ₅	0.07	0.10	0.13	0.11	0.11	0.21	0.17	0.14	0.21	0.18
MnO	0.30	0.34	0.38	0.10	0.46	0.13	0.53	0.40	0.24	0.25
LOI	1.8	6.1	4.5	1.3	2.2	0.9	1.2	1.5	1.3	1.9
Total	98.3	98.2	98.5	99.7	97.7	100.1	100.0	98.6	98.9	97.8
Cu	116	132	137	370	107	17	110	154	105	125
Pb	23	-	-	31	-	66	5	42	64	64
Zn	134	68	54	75	44	70	43	148	370	340
Co	62	71	74	44	48	39	54	68	72	83
Mn	455	725	635	420	495	330	390	725	775	1250
Ni	245	936	912	10	659	171	631	131	98	70
Cr	463	1849	1689	25	1404	311	1262	301	159	153
Ba	190	35	30	410	30	195	35	335	325	355
F	228	380	320	360	360	540	380	580	660	800
Ag	2	2	-	-	-	-	-	-	2	2
Mo	-	-	-	2	4	1	-	2	2	2
Au(ppb)	170	31	40	64	330	460	1200	160	630	2400
As	97	42	28	3	31	7	35	190	700	500
Sb	1.7	0.8	1.3	-	1.4	0.8	1.3	4.0	6.6	5.7
Hg	-	-	30	-	-	-	-	-	-	-
Li	49	6	8	36	8	25	9	36	40	39
Zr	32	69	66	76	69	107	72	73	138	114
CO ₂ (%)	1.20	4.50	3.12	0.08	1.64	0.26	0.37	0.86	1.07	2.18
Rb	22	1	1	77	1	68	2	50	95	107
Sr	78	60	53	362	75	366	145	141	165	160
Se	0.5	0.9	1.7	0.9	1.0	0.7	0.7	0.5	0.3	0.3
Te	-	-	-	-	-	-	-	-	-	-
Bi	-	0.2	-	-	-	-	-	-	-0.2	0.2
B	4	4	4	34	4	5	10	56	4	9
Cond.(umhos)	38	34	34	6	35	18	24	31	36	40
Cd	-	-	-	-	-	-	-	-	-	-
pH	9.98	9.99	9.99	8.53	9.95	9.56	9.77	9.91	9.90	9.99
Corg.	0.05	0.02	0.03	0.01	0.03	0.03	-	0.08	0.06	0.06
TI	-	-	-	0.5	<0.2	-	-	0.4	0.7	-

Sample No.	DDH U82-5 MMZ									
	430 m	436 m	442 m	448 m	449 m	454 m	460 m	461 m	466 m	472 m
	AGC-71	AGC-72	AGC-73	AGC-74P	AGC-74S	AGC-75	AGC-76P	AGC-6S	AGC-77	AGC-78
Element	bt S	bt S	bt S	P	bt S	P	P	bt S	P	P
SiO ₂	50.1	45.1	44.1	43.3	49.7	42.1	38.5	49.4	34.3	40.0
Al ₂ O ₃	17.7	19.5	19.2	7.5	17.8	7.2	8.6	13.1	6.2	8.0
Fe ₂ O ₃ ^T	11.5	11.5	12.9	12.0	10.8	11.4	13.1	14.4	11.9	12.6
CaO	5.1	8.3	8.2	13.1	3.2	12.0	12.4	7.0	16.2	12.9
MgO	5.6	4.0	6.2	13.5	7.3	17.2	16.0	7.8	15.3	15.7
Na ₂ O	0.9	1.8	1.1	0.3	1.9	0.2	0.3	0.8	0.2	0.3
K ₂ O	3.9	3.0	3.0	0.4	3.0	0.1	0.1	1.3	0.1	0.1
TiO ₂	2.5	2.8	3.0	1.2	2.5	1.2	1.5	2.2	1.2	1.4
P ₂ O ₅	0.22	0.25	0.25	0.09	0.21	0.09	0.10	0.21	0.07	0.09
MnO	0.31	0.33	0.31	0.44	0.17	0.26	0.33	0.35	0.40	0.32
LOI	1.9	1.8	1.1	4.4	1.5	5.6	6.1	1.5	11.5	6.0
Total	99.7	98.4	99.4	96.2	98.1	97.4	97.0	98.1	97.4	97.4
Cu	150	180	206	310	880	109	340	500	192	183
Pb	180	98	62	10	41	-	-	70	3	-
Zn	510	410	340	82	203	56	114	163	79	63
Co	117	133	94	57	62	58	76	64	45	72
Mn	1800	1750	955	1250	550	565	1000	315	2000	815
Ni	116	116	107	564	121	934	843	107	645	917
Cr	119	135	156	1218	137	1398	1372	206	1014	1588
Ba	295	285	385	120	560	30	35	550	35	35
F	612	568	720	520	688	580	416	616	392	520
Ag	2	2	3	3	9	1	2	4	-	-
Mo	2	4	2	2	2	-	-	-	-	-
Au(ppb)	910	920	1300	1100	640	94	4200	2300	120	17
As	4600	6500	210	120	780	74	39	5000	65	55
Sb	34.0	34.0	5.0	2.4	9.3	1.2	0.9	2.0	1.2	0.9
Hg	15	10	5	5	5	5	5	5	5	5
Li	30	26	35	10	55	7	10	24	7	8
Zr	138	149	162	62	136	60	66	124	46	67
CO ₂ (%)	0.28	1.76	0.76	4.91	0.13	4.49	5.26	1.09	10.60	5.02
Rb	72	74	10	82	1	1	35	1	1	1
Sr	74	122	125	101	136	121	85	158	124	77
Se	0.5	0.7	1.7	0.5	1.4	1.5	3.9	0.5	3.9	3.2
Te	0.4	0.6	-	-	-	-	-	-	-	-
Bi	4.0	3.2	-	-	1.0	-	-	1.2	-	-
B	37	4	7	14	4	9	5	4	10	6
Cond.(umhos)	16	33	35	40	9	34	42	32	40	35
Cd	1	1	-	-	-	-	-	1	-	-
pH	9.53	9.80	9.95	10.03	9.02	9.88	9.96	9.77	9.98	9.91
Corg.	0.17	0.19	0.17	0.05	0.06	-	-	0.07	0.02	0.02
TI	-	0.6	-	0.2	-	-	-	0.2	-	-

Sample No.	DDH U82-5 MMZ									
	475 m	476 m	479 m	480 m	485 m	491 m	497 m	503 m	509 m	515 m
	AGC-79P	AGC-79S	AGC-80	AGC-80D	AGC-81	AGC-82	AGC-83	AGC-84	AGC-85	AGC-86
Element	P	S	m B	m B	bt S	m B	m B	m B	S	S
SiO ₂	39.7	49.7	47.1	49.2	49.7	46.8	46.3	45.5	53.8	49.8
Al ₂ O ₃	10.7	18.6	15.0	16.3	17.3	13.7	14.6	13.8	14.5	15.0
Fe ₂ O ₃ ^T	16.4	9.4	10.5	8.3	9.3	13.1	13.9	14.6	13.3	10.3
CaO	10.8	8.4	10.2	9.6	8.0	9.6	9.6	9.3	4.9	9.8
MgO	13.7	7.6	4.6	5.1	3.7	8.4	6.1	9.4	5.6	4.6
Na ₂ O	0.4	0.4	2.4	2.7	3.5	1.9	2.5	1.2	1.3	1.2
K ₂ O	0.1	3.0	2.2	1.6	1.4	0.7	0.8	0.8	1.9	2.3
TiO ₂	1.9	0.7	2.1	1.3	2.6	1.9	2.5	2.6	2.0	1.8
P ₂ O ₅	0.14	0.10	0.21	0.14	0.19	0.18	0.23	0.26	0.30	0.31
MnO	0.34	0.21	0.21	0.24	0.25	0.25	0.22	0.23	0.16	0.24
LOI	3.8	0.8	2.9	3.3	1.8	2.0	1.5	1.3	1.0	3.4
Total	98.0	98.9	97.4	97.8	97.7	98.5	98.3	99.0	98.8	98.8
Cu	380	102	141	53	170	102	152	96	128	40
Pb	-	78	15	12	235	5	-	2	2	3
Zn	125	280	490	245	4100	81	62	73	116	104
Co	54	52	54	51	78	50	47	46	40	30
Mn	685	615	1300	950	805	545	545	315	325	905
Ni	528	87	109	83	108	126	91	128	10	45
Cr	1055	149	84	210	126	358	185	343	25	49
Ba	30	580	485	345	590	360	280	585	360	695
F	360	860	580	500	500	616	480	688	1020	1180
Ag	2	-	-	-	2	-	-	-	-	-
Mo	-	-	2	-	1	1	1	1	1	2
Au(ppb)	160	24	23	6	15	7	5	10	160	17
As	16	2	30	28	48	4	4	8	4	8
Sb	1.0	0.2	1.3	1.3	1.4	0.4	1.1	0.7	0.7	0.7
Hg	5	5	5	5	5	5	5	-	-	-
Li	15	32	24	20	14	11	10	15	22	23
Zr	79	37	121	73	136	104	125	142	178	183
CO ₂ (%)	2.83	0.36	4.75	3.66	2.75	2.11	2.06	0.96	0.34	3.53
Rb	1	92	45	33	30	14	23	12	41	61
Sr	76	381	174	178	213	161	269	213	117	174
Se	3.1	1.2	1.7	0.7	2.2	0.9	1.7	1.9	1.0	0.5
Te	-	-	-	-	-	-	-	-	-	-
Bi	-	-	-	-	0.2	-	-	-	-	-
B	4	5	7	6	9	28	4	4	18	12
Cond.(umhos)	32	21	42	39	47	44	38	35	27	43
Cd	-	-	1	-	33	-	-	-	-	-
pH	9.87	9.79	9.99	9.95	10.01	10.01	9.98	9.93	9.86	10.02
Corg.	0.02	0.02	0.00	0.02	0.03	0.01	0.02	0.02	0.04	0.00
TI	-	0.8	-	-	0.2	-	-	-	-	-

Sample No.	DDH U82-5 MMZ		80-105 ND		61 m AGC- 203 S	77 m AGC- 204 bt S	86 m AGC- 205 P	99 m AGC- 206 bt S	109 m AGC- 207 P	116 m AGC- 208 bt S
	521 m	528 m	19 m	41 m						
	AGC- 87 bt S	AGC- 88 sl S	AGC- 201 bt S	AGC- 202 bt S						
Element										
SiO ₂	58.9	60.7	49.7	51.9	43.1	63.4	44.3	60.4	43.5	49.2
Al ₂ O ₃	14.5	13.6	15.4	14.8	13.3	12.8	14.3	13.0	11.6	17.7
Fe ₂ O ₃ (T)	7.6	10.3	12.4	10.7	13.2	8.6	15.9	10.5	11.4	14.1
CaO	6.8	3.0	5.3	7.0	11.7	3.4	6.8	2.1	12.5	5.1
MgO	3.7	3.7	6.6	3.7	7.9	2.4	10.2	4.0	12.4	3.6
Na ₂ O	1.1	2.0	2.2	1.6	1.6	2.8	1.2	0.3	1.0	3.9
K ₂ O	2.3	2.2	2.1	2.7	0.7	2.1	0.9	3.3	0.8	1.1
TiO ₂	1.0	1.7	1.5	2.3	2.3	1.2	2.5	1.4	0.8	2.4
P ₂ O ₅	0.19	0.31	0.17	0.20	0.20	0.17	0.21	0.44	0.11	0.27
MnO	0.16	0.12	0.09	0.15	0.22	0.08	0.24	0.10	0.32	0.18
LOI	1.6	0.7	1.8	2.0	3.9	0.8	2.5	1.7	4.6	1.7
Total	97.9	98.3	97.3	97.1	98.1	97.8	99.1	97.3	99.0	99.3
Cu	247	42	330	237	94	95	177	176	106	196
Pb	2	-	5	32	25	4	14	36	25	11
Zn	85	121	122	126	196	132	355	74	330	135
Co	29	36	5	32	25	4	14	36	51	83
Mn	620	375	259	530	487	361	474	382	690	425
Ni	20	12	152	233	174	21	206	14	568	93
Cr	30	25	203	310	415	30	578	25	887	74
Ba	870	1015	145	235	140	400	255	240	140	340
F	900	1060								
Ag	-	-	2	2	1	1	2	2	1	2
Mo	2	2	2	4	2	4	4	4	2	-
Au(ppb)	23	4	18	380	56	42	79	240	19	360
As	110	3	2	860	41	2200	20	38	22	390
Sb	2.4	0.3	1.5	7.5	1.4	10.0	1.3	0.9	0.9	2.0
Hg	-	-								
Li	19	28								
Zr	404	287								
CO ₂ (%)	1.68	0.11								
Rb	41	47								
Sr	109	97								
Se	0.7	0.3								
Te	-	-								
Bi	-	-								
B	11	4								
Cond.(umhos)	39	10								
pH 10.01	9.26									
Cd	-	-								
Corg.	0.00	0.01								
TI	0.2	-								

Sample No.	DDH 80-105 ND			80-107 ND			80-103 ND			36 m
	124 m	134 m		13 m	34 m	67 m	133 m	13 m	21 m	
	AGC-209	AGC-210		AGC-211	AGC-212	AGC-213	AGC-214	AGC-215	AGC-216	AGC-217
Element	P	bt S		bt S	P	P	P	P	bt S	P
SiO ₂	43.3	48.0		50.4	45.9	44.1	42.9	46.8	43.5	47.9
Al ₂ O ₃	8.2	17.9		14.6	10.5	8.5	7.6	9.3	18.8	7.9
Fe ₂ O ₃ ^T	12.8	17.0		12.7	12.3	14.0	13.0	14.1	10.0	12.0
CaO	11.8	2.4		5.7	11.4	9.1	9.0	10.4	9.3	11.8
MgO	15.9	4.2		7.7	13.4	16.7	19.2	12.6	5.9	13.4
Na ₂ O	0.2	0.7		2.7	0.7	0.3	0.1	0.4	0.2	0.3
K ₂ O	0.1	4.2		1.4	0.9	0.2	0.2	0.5	4.1	0.3
TiO ₂	1.6	3.1		2.0	1.3	1.5	1.3	1.2	2.6	1.0
P ₂ O ₅	0.14	0.26		0.14	0.12	0.12	0.13	0.14	0.28	0.16
MnO	0.22	0.20		0.12	0.21	0.35	0.18	0.43	0.39	0.29
LOI	4.3	1.6		0.8	1.9	2.7	4.9	1.8	4.2	2.2
Total	98.6	99.6		98.3	98.6	97.6	98.5	97.7	99.3	97.3
Cu	146	162		48	110	168	141	350	61	190
Pb	-	30		-	7	4	-	50	45	77
Zn	100	77		76	118	88	58	635	1480	83
Co	48	79		42	58	70	60	65	66	63
Mn	370	285		156	303	315	280	564	1800	340
Ni	792	55		80	850	973	1048	685	123	826
Cr	1290	50		68	1426	1915	1758	1307	92	1505
Ba	10	325		160	210	20	150	70	385	30
Ag	-	2		1	1	4	1	3	2	15
Mo	-	1		-	1	-	-	1	2	1
Au(ppb)	40	310		3	9	200	3	180	10	210
As	18	5300		5	3	54	5	56	1300	39
Sb	1.4	28.0		1.5	1.6	12.0	1.1	6.0	12.0	8.5
Tl	-	-		-	-	-	-	-	0.5	-

Sample No.	DDH 80-103 ND							80-152 RD		
	42 m	51 m	62 m	75 m	87 m	96 m	116 m	27 m	45 m	47 m
	AGC-219	AGC-220	AGC-221	AGC-222	AGC-223	AGC-224	AGC-225	AGC-226	AGC-227	AGC-228
Element	m B	bt S	m B	bt S	bt S	bt S	P	m B	bt S	bt S
SiO ₂	47.8	44.4	34.9	55.1	48.0	59.7	44.8	49.7	51.6	51.4
Al ₂ O ₃	13.1	15.3	10.6	13.9	12.8	12.7	8.4	20.1	20.1	21.0
Fe ₂ O ₃ ^T	12.0	10.1	12.1	10.6	15.2	11.0	11.8	10.0	8.4	8.2
CaO	11.1	13.0	22.0	7.9	4.2	6.2	9.5	10.0	7.0	7.3
MgO	7.9	5.1	5.0	6.2	9.2	4.9	18.9	3.9	5.0	4.8
Na ₂ O	2.9	0.7	1.3	0.4	0.7	0.5	0.1	3.4	2.7	1.6
K ₂ O	0.1	2.9	0.3	1.7	2.9	2.6	0.1	0.7	2.1	2.7
TiO ₂	1.6	1.9	1.7	1.6	3.3	1.4	1.1	0.9	0.8	0.8
P ₂ O ₅	0.33	0.33	0.23	0.26	0.34	0.36	0.10	0.11	0.07	0.09
MnO	0.25	0.23	0.32	0.29	0.64	0.23	0.20	0.17	0.13	0.14
LOI	1.4	5.7	10.8	1.3	1.8	2.1	4.9	2.1	1.9	1.2
Total	98.5	99.7	99.3	99.3	99.1	101.7	99.9	101.1	99.8	99.2
Cu	176	70	103	77	295	51	73	128	69	132
Pb	17	30	31	78	116	1150	9	4	5	16
Zn	69	212	90	176	608	5560	56	69	106	126
Co	57	57	48	44	43	24	39	38	31	42
Mn	451	1280	1530	875	1170	1470	330	570	490	688
Ni	131	137	143	55	48	33	898	17	29	34
Cr	349	196	402	193	25	25	1463	25	25	25
Ba	10	425	95	225	260	590	5	100	215	215
Ag	4	-	1	1	-	5	-	-	-	1
Mo	4	2	2	2	2	1	-	1	1	2
Au(ppb)	20	7	43	49	320	440	6	17	9	680
As	12	12	19	750	38	40	12	11	33	1600
Sb	1.3	1.0	1.1	4.3	1.7	5.1	1.6	1.1	1.1	8.2
Tl	-	-	-	-	-	-	-	-	-	0.3

Sample No.	DDH 80-152 RD									
	50 m	53 m	56 m	59 m	64 m	70 m	76 m	82 m	84 m	88 m
	AGC- 229 bt S	AGC- 230 bt S	AGC- 231 bt S	AGC- 232 bt S	AGC- 233 bt S	AGC- 234 sl S	AGC- 235 P	AGC- 236 P	AGC- 237 P	AGC- 238 P
Element										
SiO ₂	47.6	48.8	49.9	40.2	47.0	61.1	48.1	35.3	42.8	40.5
Al ₂ O ₃	21.6	19.5	19.2	14.9	23.6	4.1	11.3	6.9	15.9	12.4
Fe ₂ O ₃ ^T	9.5	9.8	9.3	9.3	9.3	13.0	13.0	12.1	14.8	11.3
CaO	7.1	7.1	9.5	12.2	6.1	5.1	7.8	15.4	3.4	11.8
MgO	6.3	7.1	5.9	10.0	6.3	5.2	13.9	17.5	17.8	14.3
Na ₂ O	2.0	1.2	1.1	1.0	1.6	0.1	0.2	0.2	0.1	0.3
K ₂ O	2.6	2.6	2.0	2.2	3.3	0.3	0.8	0.0	0.0	1.5
TiO ₂	1.0	0.8	0.9	1.0	1.2	0.7	1.8	1.0	0.9	0.4
P ₂ O ₅	0.08	0.10	0.09	0.13	0.12	0.08	0.19	0.08	0.02	0.01
MnO	0.15	0.16	0.20	0.27	0.10	0.37	0.37	0.82	0.33	0.47
LOI	2.1	3.2	2.3	8.5	1.3	8.7	2.5	9.1	6.0	6.2
Total	100.0	100.4	100.4	99.7	99.9	98.8	100.0	98.4	102.1	99.2
Cu	142	50	50	17	184	51	110	132	26	62
Pb	12	7	13	8	18	377	18	3	3	27
Zn	130	103	94	88	92	142	221	108	373	258
Co	76	41	25	66	60	55	56	89	28	75
Mn	555	625	605	1500	460	1250	430	3400	605	1940
Ni	26	37	28	131	26	332	508	867	292	430
Cr	25	29	25	176	25	642	849	1536	1739	759
Ba	225	220	200	190	420	55	110	20	10	95
Ag	1	-	-	-	1	6	-	1	1	1
Mo	2	2	2	2	1	1	2	1	2	2
Au(ppb)	140	24	16	23	130	7700	170	220	23	25
As	1100	1100	76	1300	2700	55000	710	180	44	210
Sb	4.8	5.1	0.6	6.3	12.0	300.0	4.0	2.8	1.1	1.6
Tl	-	-	-	-	-	0.2	-	< 0.2	-	-

Sample No.	DDH 80-152 RD			80-22 MMZ						
	94 m	100 m	106 m	5 m	8 m	10 m	16 m	24 m	41 m	75 m
	AGC-239	AGC-240	AGC-241	AGC-242	AGC-243	AGC-244	AGC-245	AGC-246	AGC-247	AGC-248
	P	bt S	P	m B	bt S	bt S	bt. S	bt S	bt S	P
Element										
SiO ₂	43.3	45.4	40.5	45.9	65.1	44.8	62.7	45.5	50.4	43.3
Al ₂ O ₃	12.4	26.0	8.3	14.7	13.6	15.6	13.2	14.5	12.0	8.9
Fe ₂ O ₃ ^T	11.4	7.8	12.3	15.2	9.9	15.0	10.0	14.1	13.7	13.4
CaO	11.0	3.6	12.4	10.8	3.4	9.9	5.0	11.3	6.7	13.3
MgO	13.9	8.3	17.4	7.5	3.4	8.0	3.7	8.4	8.1	14.4
Na ₂ O	0.3	0.7	0.2	1.4	1.3	0.8	0.9	0.5	0.2	0.4
K ₂ O	1.0	5.3	0.1	0.8	2.1	1.7	1.9	1.0	2.8	0.1
TiO ₂	0.6	0.3	0.5	2.5	1.3	2.6	1.0	2.5	1.8	1.7
P ₂ O ₅	0.02	0.03	0.05	0.25	0.35	0.30	0.17	0.27	0.17	0.21
MnO	0.55	0.16	0.39	0.27	0.11	0.21	0.10	0.26	0.35	0.23
LOI	3.8	2.1	7.9	1.8	1.0	1.3	1.5	1.6	1.6	4.0
Total	98.3	99.8	100.0	101.1	101.6	100.2	100.2	99.9	97.8	99.9
Cu	80	26	33	226	88	171	170	90	360	93
Pb	72	359	5	26	4	33	36	84	62	-
Zn	344	224	88	116	104	145	197	168	434	51
Co	48	24	53	53	39	49	55	60	72	63
Mn	1430	980	1320	600	463	400	450	480	1520	490
Ni	237	89	543	68	18	81	49	162	340	1014
Cr	431	66	1614	63	25	114	25	345	770	1618
Ba	95	245	10	370	490	300	295	170	180	10
Ag	-	3	-	-	-	-	-	1	11	-
Mo	-	-	-	1	2	1	5	2	2	2
Au(ppb)	440	260	17	35	11	6	20	14	1000	4
As	2200	3100	180	7	14	6	170	20	1700	15
Sb	11.0	15.0	1.8	1.1	0.5	0.9	1.3	2.1	21.0	2.4
Tl	-	-	0.2	-	-	-	-	-	0.5	-

Sample No.	DDH 80-22 80-102 ND									
	91 m	4 m	8 m	12 m	17 m	22 m	29 m	39 m	52 m	64 m
	AGC-249	AGC-250	AGC-251	AGC-252	AGC-253	AGC-254	AGC-255	AGC-256	AGC-257	AGC-258
Element	Mt	bt S	m B	bt S	bt S	bt S	bt S	m B	Mt	bt S
SiO ₂	58.9	47.0	47.8	58.8	52.7	62.4	38.9	43.8	39.6	47.7
Al ₂ O ₃	12.5	15.0	14.4	14.3	10.5	15.7	11.5	13.9	13.3	17.0
Fe ₂ O ₃ ^T	13.0	16.2	15.2	11.6	8.4	7.5	15.1	13.3	13.2	12.8
CaO	4.4	5.9	8.8	3.8	13.3	4.4	16.0	11.8	16.5	8.5
MgO	3.5	7.7	6.6	3.7	4.1	4.0	6.8	6.9	6.2	6.4
Na ₂ O	2.2	1.9	3.5	3.5	0.2	0.3	0.3	1.2	0.7	0.7
K ₂ O	1.6	2.5	0.2	1.1	1.9	3.5	1.1	1.2	1.1	2.5
TiO ₂	1.6	2.9	2.4	1.3	0.5	0.8	1.8	2.1	2.1	2.4
P ₂ O ₅	0.21	0.32	0.25	0.31	0.14	0.16	0.21	0.23	0.25	0.23
MnO	0.09	0.38	0.17	0.10	0.36	0.13	0.22	0.26	0.26	0.20
LOI	1.6	1.3	1.0	0.9	8.3	1.3	5.5	4.8	7.2	1.4
Total	99.6	101.0	100.3	99.4	100.4	100.2	97.4	99.5	100.4	99.8
Cu	180	124	126	92	14	64	293	81	74	158
Pb	-	12	5	-	30	95	187	54	47	25
Zn	88	170	44	62	100	317	1430	236	116	134
Co	46	59	43	35	23	29	56	50	46	83
Mn	300	1100	360	319	1920	908	725	950	855	609
Ni	104	62	68	30	10	43	128	168	86	103
Cr	25	57	175	25	25	25	554	513	222	126
Ba	135	475	30	335	205	360	390	360	190	160
Ag	1	2	1	-	-	1	5	1	-	2
Mo	2	2	1	4	2	1	4	2	4	4
Au(ppb)	570	64	44	20	2	17	1300	1800	160	7
As	12	5	17	6	380	18	67	59	17	610
Sb	1.0	0.7	0.8	0.7	2.1	0.7	1.1	6.0	1.1	5.8
Tl	-	-	-	-	0.3	0.8	0.2	0.2	-	-

Sample No.	DDH 80-102 ND			80-101 ND						
	78 m	95 m	102 m	7 m	18 m	28 m	31 m	35 m	42 m	50 m
	AGC-259	AGC-260	AGC-261	AGC-262	AGC-263	AGC-264	AGC-265	AGC-266	AGC-267	AGC-268
Element	m B	P	S	Mt	bt S	m B	m B	S	bt S	bt S
SiO ₂	41.3	43.2	56.9	42.4	48.5	43.7	40.9	37.0	48.4	42.0
Al ₂ O ₃	13.9	8.6	14.6	14.1	15.4	12.8	13.3	12.4	14.6	20.0
Fe ₂ O ₃ ^T	12.2	13.8	12.9	14.9	10.7	14.2	16.3	13.3	11.8	10.8
CaO	12.5	12.1	4.6	12.7	9.5	12.9	13.9	15.4	11.2	10.0
MgO	7.9	14.7	4.9	8.8	6.3	7.7	6.4	7.8	4.7	5.1
Na ₂ O	0.4	0.4	2.9	0.3	0.3	0.5	1.3	0.4	0.4	1.1
K ₂ O	3.0	0.7	0.6	0.5	2.7	0.9	0.1	1.7	1.7	3.4
TiO ₂	2.4	1.3	1.3	2.0	1.8	1.9	2.2	1.9	2.2	2.6
P ₂ O ₅	0.41	0.16	0.35	0.23	0.24	0.22	0.26	0.23	0.22	0.26
MnO	0.35	0.20	0.11	0.41	0.58	0.23	0.19	0.62	0.30	0.33
LOI	4.8	3.2	1.4	2.4	2.8	3.0	5.0	6.4	1.8	3.2
Total	99.2	98.4	100.6	98.7	98.8	98.1	99.9	97.2	97.3	98.8
Cu	66	105	213	86	96	130	157	69	211	80
Pb	53	-	-	90	1940	33	21	1130	477	68
Zn	303	97	137	170	2640	168	73	555	537	252
Co	43	50	45	76	70	61	62	49	60	93
Mn	1600	419	265	905	2690	600	600	2350	1130	1310
Ni	53	601	45	197	165	163	239	129	73	98
Cr	67	1012	57	449	306	524	484	363	128	130
Ba	315	105	125	80	300	210	10	230	200	275
Ag	3	1	2	1	6	2	2	4	15	1
Mo	1	-	1	1	2	2	6	4	5	2
Au(ppb)	28	36	30	10	130	58	140	170	3700	24
As	30	5	4	2000	66	25	76	16	32	90
Sb	4.4	1.9	1.7	10.0	4.1	1.2	1.4	2.4	2.0	1.0
Tl	-	-	-	-	-	-	-	0.4	0.5	-

Sample No.	DDH 80-101 ND					80-26 MMZ					59 m AGC- 278 P
	60 m	72 m	81 m	87 m	91 m	32 m	34 m	42 m	51 m		
	AGC- 269	AGC- 270	AGC- 271	AGC- 272	AGC- 273	AGC- 274	AGC- 275	AGC- 276	AGC- 277		
	bt S	P	P	bt S	P	m B	P	m B	P		
Element											
SiO ₂	45.4	42.0	39.4	48.0	47.6	47.1	43.1	45.2	42.8	44.1	
Al ₂ O ₃	15.7	8.2	9.0	16.2	9.8	12.4	7.8	23.2	6.8	8.8	
Fe ₂ O ₃ ^T	13.7	17.5	13.9	10.6	11.9	11.4	17.0	7.6	16.8	15.9	
CaO	8.7	11.5	12.1	8.8	9.5	10.0	9.3	7.2	12.0	10.0	
MgO	7.7	13.0	15.7	6.9	15.4	10.4	15.3	7.3	14.4	12.9	
Na ₂ O	0.5	0.2	0.3	2.3	0.5	0.3	0.2	0.3	0.1	0.2	
K ₂ O	2.6	1.5	0.1	2.7	0.6	1.3	0.1	5.6	0.1	0.4	
TiO ₂	2.4	1.0	1.2	1.6	0.7	1.2	1.6	0.2	1.2	1.7	
P ₂ O ₅	0.29	0.06	0.13	0.10	0.09	0.07	0.05	0.09	0.07	0.18	
MnO	0.37	0.40	0.25	0.12	0.18	0.45	0.50	0.27	0.43	0.61	
LOI	1.5	4.0	6.1	3.0	3.9	2.9	3.2	2.9	2.5	2.3	
Total	98.9	99.4	98.2	100.3	100.2	97.5	98.2	99.9	97.2	97.1	
Cu	133	323	148	52	95	170	300	44	255	248	
Pb	211	29	-	-	-	34	3	86	3	157	
Zn	350	198	83	103	76	135	118	446	114	22000	
Co	63	66	67	34	48	54	81	48	119	102	
Mn	843	1780	606	489	388	1420	454	1970	680	606	
Ni	65	447	872	46	699	212	329	141	319	434	
Cr	84	503	1281	29	1008	328	954	174	1324	867	
Ba	195	125	15	370	85	90	5	120	210	15	
Ag	6	2	-	-	-	4	5	3	5	6	
Mo	2	2	1	2	1	2	1	2	1	1	
Au(ppb)	750	41	7	98	28	190	228	1000	180	570	
As	580	100	6	3	4	45	82	7900	76	23	
Sb	7.7	3.1	1.4	2.8	1.2	25.0	28.0	54.0	12.0	5.8	
Tl	-	-	-	-	-	-	< 0.2	-	-	0.2	

Sample No.	DDH 80-26 80-23 MMZ									
	70 m AGC- 279 P	4 m AGC- 280 P	9 m AGC- 281 bt S	20 m AGC- 282 P	30 m AGC- 283 Mt	36 m AGC- 284 P	42 m AGC- 285 S	47 m AGC- 286 P	54 m AGC- 287 S	66 m AGC- 288 P
Element										
SiO ₂	40.1	41.0	35.2	46.8	48.6	42.5	45.1	40.0	49.9	43.5
Al ₂ O ₃	8.4	7.1	19.7	6.8	25.8	8.2	22.2	6.9	21.4	8.0
Fe ₂ O ₃ ^T	13.6	11.1	10.2	12.0	6.3	12.0	10.8	11.4	7.3	15.8
CaO	11.4	15.9	12.1	12.2	10.0	14.1	5.6	14.4	5.7	10.2
MgO	15.7	15.2	7.5	15.5	6.6	14.5	11.1	15.4	7.4	14.2
Na ₂ O	0.2	0.2	0.2	0.2	0.4	0.2	0.3	0.1	0.3	0.2
K ₂ O	0.6	0.1	3.5	0.1	3.2	0.2	3.8	0.1	5.2	0.4
TiO ₂	1.1	1.0	2.4	1.0	0.4	0.8	0.4	0.8	0.6	1.6
P ₂ O ₅	0.15	0.11	0.26	0.12	0.16	0.07	0.04	0.03	0.11	0.19
MnO	0.40	0.83	1.22	0.49	0.15	0.62	0.34	0.75	0.24	0.64
LOI	7.8	6.3	5.4	2.7	1.2	5.2	3.1	7.6	1.9	2.6
Total	99.5	98.8	97.7	97.9	102.8	98.4	102.7	97.5	100.1	97.3
Cu	229	234	306	175	15	120	170	191	133	212
Pb	4	5	351	-	75	5	107	7	56	6
Zn	310	160	1530	160	283	159	620	140	272	203
Co	83	61	50	58	46	53	28	67	30	72
Mn	815	2300	5800	710	763	1470	1200	2600	1460	850
Ni	867	764	144	768	147	687	167	746	82	482
Cr	1655	1549	291	1448	271	982	257	1098	94	517
Ba	50	5	265	5	410	25	100	10	90	30
Ag	1	-	18	-	-	1	-	3	2	4
Mo	1	2	18	1	4	1	1	2	2	1
Au(ppb)	14	25	2000	65	13	290	330	120	890	310
As	3	28	1400	32	8	18	39	27	840	20
Sb	2.6	1.8	28.0	2.2	0.4	3.2	4.4	6.3	10.0	4.2
TI	0.3	-	-	< 0.2	-	-	0.6	-	0.6	-

Sample No.	DDH 80-23 80-19 MMZ									
	83 m	9 m	11 m	15 m	20 m	29 m	31 m	39 m	46 m	57 m
	AGC-289	AGC-290	AGC-291	AGC-292	AGC-293	AGC-294	AGC-295	AGC-296	AGC-297	AGC-298
Element	P	bt S	Mt	P	P	P	bt S	P	Mt	P
SiO ₂	43.7	50.1	43.3	46.9	44.9	37.0	49.6	41.8	53.3	43.3
Al ₂ O ₃	8.7	17.5	11.5	7.1	7.0	8.4	23.0	7.0	10.4	8.2
Fe ₂ O ₃ ^T	15.6	14.3	13.1	12.5	12.2	13.9	6.2	12.9	11.2	14.8
CaO	9.7	5.3	14.2	10.2	12.0	13.5	7.2	14.4	6.4	12.4
MgO	15.2	4.0	7.5	18.8	16.6	15.8	5.9	14.5	9.8	14.6
Na ₂ O	0.3	0.8	0.4	0.2	0.2	0.2	0.3	0.3	0.4	0.4
K ₂ O	0.4	2.3	0.6	0.0	0.3	0.3	4.7	0.1	2.4	0.1
TiO ₂	1.1	1.4	1.9	1.2	1.2	1.0	0.2	1.3	0.9	1.3
P ₂ O ₅	0.10	0.19	0.27	0.12	0.11	0.07	0.05	0.13	0.05	0.27
MnO	0.32	0.15	0.28	0.32	0.32	0.65	0.16	0.76	0.50	0.23
LOI	2.5	4.3	4.6	2.2	3.2	6.7	2.5	4.5	2.5	2.7
Total	97.6	100.3	97.7	99.5	98.0	97.5	99.8	97.7	97.9	98.3
Cu	927	540	128	160	142	284	86	234	253	183
Pb	3	138	45	-	-	15	131	4	89	-
Zn	178	343	217	113	133	195	1600	104	1950	67
Co	77	39	48	72	61	65	44	74	59	60
Mn	353	820	679	260	478	2400	794	1800	1810	314
Ni	605	114	117	970	1104	705	164	810	303	704
Cr	1013	112	319	1430	1298	1610	161	1415	633	1224
Ba	30	125	70	5	90	45	140	10	140	5
Ag	9	6	3	2	-	5	7	3	8	2
Mo	1	15	4	1	1	1	1	1	1	-
Au(ppb)	62	130	10	370	150	270	1100	1400	430	10
As	12	210	52	55	27	49	5300	52	220	7
Sb	4.0	2.8	2.0	1.7	2.4	2.8	31.0	3.6	7.5	2.1
Tl	-	-	-	-	-	-	0.6	0.2	-	-

Sample No.	DDH 80-16 MMZ									
	12 m	17 m	21 m	23 m	27 m	36 m	44 m	62 m	70 m	73 m
	AGC-299	AGC-300	AGC-301	AGC-302	AGC-303	AGC-304	AGC-305	AGC-306	AGC-307	AGC-308
Element	Mt	P	sl S	P	sl S	bt S	P	P	Ft	Ft
SiO ₂	50.4	43.1	61.1	40.2	65.2	59.6	46.3	46.3	56.8	57.4
Al ₂ O ₃	12.9	7.2	8.3	7.6	12.1	18.8	6.9	7.0	17.8	14.0
Fe ₂ O ₃ ^T	11.9	12.5	16.2	13.8	8.6	6.1	5.8	12.4	8.5	11.9
CaO	8.9	13.9	2.7	12.8	1.6	5.3	12.8	12.4	6.9	5.5
MgO	6.6	15.0	5.8	15.9	1.8	4.9	12.7	16.8	2.8	2.5
Na ₂ O	0.6	0.2	0.2	0.2	0.3	0.6	0.3	0.3	1.6	0.5
K ₂ O	2.0	0.0	1.3	0.1	3.3	3.8	0.2	0.1	4.0	3.8
TiO ₂	2.2	1.2	0.8	1.2	0.9	1.1	1.4	1.3	0.9	1.8
P ₂ O ₅	0.27	0.12	0.19	0.22	0.23	0.03	1.13	0.11	0.41	0.74
MnO	0.39	0.39	0.44	0.54	0.09	0.20	0.57	0.26	0.16	0.20
LOI	1.6	3.6	3.1	4.6	4.9	1.5	1.5	4.1	2.8	2.5
Total	97.8	97.2	100.1	97.2	99.0	101.9	99.6	101.1	102.7	100.8
Cu	305	160	736	291	95	131	318	93	11	59
Pb	359	2	16	-	755	161	7	-	34	42
Zn	173	96	460	156	189	2520	96	80	248	363
Co	67	57	117	73	39	31	68	50	28	28
Mn	1800	600	599	978	418	808	722	396	904	742
Ni	180	817	247	866	26	70	450	848	10	10
Cr	501	1224	132	1434	41	95	540	1373	39	25
Ba	290	5	120	30	70	185	15	10	275	250
Ag	8	2	7	3	208	5	4	1	1	1
Mo	4	1	6	-	1	1	1	-	2	4
Au(ppb)	1700	210	820	56	17000	360	110	89	28	38
As	420	47	15	24	620	34	45	8	24	30
Sb	7.6	1.2	0.8	3.0	120.0	8.9	2.3	1.0	2.6	2.0
Tl	-	-	-	-	0.3	0.3	-	-	-	-

Sample No.	DDH 80-16 MMZ								80-8 MMZ	
	76 m	79 m	91 m	104 m	111 m	115 m	117 m	120 m	15 m	31 m
	AGC-309	AGC-310	AGC-311	AGC-312	AGC-313	AGC-314	AGC-315	AGC-316	AGC-317	AGC-318
Element	Ft	Ft	P	bt S	S	bt S	Mt	bt S	P	bt S
SiO ₂	56.2	80.4	45.9	61.8	51.9	78.0	63.7	73.0	43.9	50.5
Al ₂ O ₃	18.2	9.9	7.4	14.0	15.6	9.7	14.3	11.6	7.1	17.9
Fe ₂ O ₃ ^T	8.6	2.5	13.1	11.8	8.5	4.7	11.1	7.3	13.7	13.5
CaO	6.2	2.2	14.6	3.7	8.9	2.6	4.1	3.6	11.3	4.9
MgO	3.1	0.7	13.8	3.4	6.3	1.8	2.7	1.6	17.0	4.7
Na ₂ O	1.4	2.3	0.4	1.2	0.8	0.8	0.9	0.9	0.2	3.1
K ₂ O	3.9	1.6	0.1	2.8	2.7	2.2	2.6	1.9	0.0	3.5
TiO ₂	0.9	0.5	1.4	1.5	1.2	0.6	1.2	1.2	1.5	1.1
P ₂ O ₅	0.43	0.10	0.18	0.36	0.20	0.10	0.44	0.70	0.40	0.07
MnO	0.15	0.03	0.22	0.23	0.18	0.07	0.15	0.12	0.34	0.09
LOI	2.7	2.2	4.1	1.2	3.8	1.2	1.0	1.1	4.2	1.8
Total	101.8	102.4	101.2	102.0	100.1	101.7	102.2	103.0	99.6	101.2
Cu	21	11	77	113	190	60	46	50	131	126
Pb	36	10	2	-	3	-	2	1	-	4
Zn	230	44	38	121	155	132	185	90	80	100
Co	26	46	47	47	57	27	30	35	80	45
Mn	880	211	337	474	670	286	293	320	575	518
Ni	10	10	847	26	78	18	18	33	897	143
Cr	33	25	1494	25	109	25	25	77	1682	311
Ba	305	25	15	270	210	80	195	95	15	335
Ag	-	-	-	-	-	-	-	-	3	2
Mo	1	-	-	1	1	-	-	-	-	-
Au(ppb)	22	4	14	82	35	1	7	55	140	240
As	13	7	13	17	390	17	3	13	14	22
Sb	2.9	1.8	2.3	3.2	2.6	2.1	2.1	2.5	2.1	1.5
Tl	-	-	-	-	-	0.2	-	-	-	0.8

Sample No.	DDH 80-8 MMZ									
	35 m	41 m	43 m	47 m	50 m	59 m	70 m	73 m	83 m	87 m
	AGC-319	AGC-320	AGC-321	AGC-322	AGC-323	AGC-324	AGC-325	AGC-326	AGC-327	AGC-328
Element	P	bt S	P	bt S	Mt	P	bt S	P	bt S	P
SiO ₂	43.2	49.7	36.2	57.3	36.8	45.8	58.0	41.4	44.0	42.8
Al ₂ O ₃	11.8	18.7	6.5	13.5	18.0	7.3	17.8	7.4	14.3	9.0
Fe ₂ O ₃ ^T	12.7	9.4	12.8	9.5	12.1	14.5	7.8	16.6	11.6	13.6
CaO	10.4	7.8	11.6	6.1	10.2	12.8	2.6	11.8	10.1	12.3
MgO	14.5	8.8	20.0	8.1	10.9	13.7	6.7	14.2	10.7	12.2
Na ₂ O	0.3	0.4	0.1	0.2	0.2	0.3	1.8	0.3	0.3	0.3
K ₂ O	0.5	2.9	0.0	2.5	3.0	0.2	3.3	0.2	2.7	0.6
TiO ₂	0.7	0.4	0.8	1.4	1.4	1.7	0.8	1.5	1.5	1.8
P ₂ O ₅	0.02	0.01	0.02	0.07	0.50	0.07	0.19	0.26	0.34	0.32
MnO	0.36	0.40	0.36	0.34	0.38	0.69	0.13	0.63	0.29	0.54
LOI	5.2	2.0	10.6	2.1	4.4	2.4	2.3	2.8	3.7	3.7
Total	99.7	100.5	99.0	101.1	97.9	99.5	101.4	97.1	99.5	97.2
Cu	131	157	117	202	167	108	80	273	79	192
Pb	20	90	-	74	44	4	38	-	30	13
Zn	210	365	83	353	535	97	1440	260	310	211
Co	58	51	73	47	44	56	22	82	66	104
Mn	830	750	1670	786	2530	863	740	1660	586	1660
Ni	692	164	848	92	122	268	163	484	335	1016
Cr	920	272	1713	183	122	812	117	1097	643	2513
Ba	40	120	20	115	180	20	370	40	150	70
Ag	2	3	2	4	2	3	6	5	-	2
Mo	-	-	-	-	1	-	-	-	1	1
Au(ppb)	150	300	810	480	270	22	450	64	61	140
As	38	18	17	120	29	13	9	17	3	20
Sb	4.9	7.4	3.0	24.0	6.8	5.5	6.8	4.7	1.7	8.4
Tl	-	-	<0.2	0.4	-	0.2	-	-	0.4	-

80-155 Sample No.	80-10 MMZ									
	20 m	27 m	36 m	43 m	50 m	58 m	67 m	77 m	85 m	31 m
	AGC- 329 P	AGC- 330 bt S	AGC- 331 bt S	AGC- 332 bt S	AGC- 333 P	AGC- 334 bt S	AGC- 335 P	AGC- 336 P	AGC- 337 P	AGC- 338 P
Element										
SiO ₂	46.6	47.3	50.9	53.0	40.0	50.7	47.1	47.5	43.9	44.3
Al ₂ O ₃	13.2	21.6	18.3	16.0	7.1	17.7	6.6	13.8	7.6	10.2
Fe ₂ O ₃ ^T	14.0	7.6	8.8	10.3	18.0	9.0	14.6	14.1	13.6	12.5
CaO	9.3	10.5	8.2	4.5	9.3	7.3	12.3	5.1	12.4	9.0
MgO	12.2	7.4	8.2	9.3	16.5	9.1	14.2	10.4	14.0	16.1
Na ₂ O	0.8	1.0	0.2	0.2	0.1	0.3	0.2	0.2	0.3	0.5
K ₂ O	0.5	1.7	3.5	3.0	0.0	3.7	0.1	2.1	0.2	0.4
TiO ₂	0.7	0.6	0.4	1.3	1.7	0.6	1.2	2.8	1.3	1.5
P ₂ O ₅	0.44	0.03	0.01	0.08	0.7	0.02	0.08	0.39	0.15	0.12
MnO	0.29	0.28	0.32	0.39	0.47	0.32	0.47	0.45	0.44	0.22
LOI	2.5	2.4	2.1	2.4	3.8	2.1	1.8	2.7	2.7	3.5
Total	100.5	100.4	100.9	100.5	97.0	100.8	98.7	99.5	97.6	98.3
Cu	206	95	339	130	92	80	193	296	240	163
Pb	7	127	220	134	-	42	-	515	3	-
Zn	168	272	478	380	90	332	93	830	520	201
Co	52	52	47	50	82	42	74	75	74	76
Mn	425	681	1860	660	756	835	485	485	540	362
Ni	213	286	119	58	458	126	438	463	803	761
Cr	638	184	177	47	834	408	1368	776	1370	1331
Ba	50	230	145	85	5	150	5	110	15	150
Ag	2	2	4	3	3	2	4	5	3	1
Mo	-	1	1	1	-	1	-	1	-	-
Au(ppb)	120	60	320	770	44	400	64	30	41	3
As	19	42	350	2000	10	260	13	8	5	9
Sb	5.8	11.0	35.0	33.0	4.2	9.4	4.0	3.1	2.0	1.1
Tl	-	-	-	-	-	-	-	-	-	-

Sample No.	80-155									
	49 m	65 m	75 m	81 m	85 m	90 m	94 m	99 m	102 m	108 m
Element	AGC-339	AGC-340	AGC-341	AGC-342	AGC-343	AGC-344	AGC-345	AGC-346	AGC-347	AGC-348
	P	P	sl S	P	bt S	P	bt S	P	P	P
SiO ₂	44.4	44.9	60.9	48.5	60.6	45.5	53.4	44.3	48.3	43.5
Al ₂ O ₃	9.6	10.3	7.0	7.2	6.4	9.6	13.6	9.0	11.6	7.1
Fe ₂ O ₃ ^T	13.6	11.0	17.3	11.9	14.9	15.1	16.8	12.9	13.1	12.2
CaO	10.9	10.8	2.7	12.4	5.6	9.9	2.1	8.4	7.3	10.5
MgO	10.2	15.7	5.6	15.5	8.3	15.5	7.7	18.7	11.4	18.7
Na ₂ O	0.6	0.2	0.2	0.2	0.2	0.3	0.2	0.1	0.5	0.1
K ₂ O	0.9	0.2	1.1	0.0	0.4	0.1	5.6	0.4	4.4	0.1
TiO ₂	0.9	0.4	0.6	1.1	0.8	1.4	1.9	1.3	1.3	0.9
P ₂ O ₅	0.02	0.01	0.18	0.25	0.12	0.17	0.24	0.15	0.17	0.11
MnO	0.27	0.23	0.32	0.40	0.38	0.28	0.05	0.18	0.13	0.20
LOI	5.4	5.1	3.1	1.9	3.6	3.0	0.8	5.8	2.7	8.0
Total	96.8	98.8	99.0	99.4	101.3	100.9	102.4	101.2	100.9	101.4
Cu	246	58	295	224	628	173	81	80	285	112
Pb	313	10	62	4	452	-	19	-	8	-
Zn	1610	250	200	173	5600	180	176	82	89	50
Co	95	46	55	66	65	90	41	48	56	47
Mn	770	510	600	550	745	340	192	336	415	522
Ni	402	453	136	625	504	753	116	1021	362	1009
Cr	1293	929	39	1466	838	1311	162	1676	961	1692
Ba	100	20	95	5	55	10	900	80	850	15
Ag	4	-	4	2	8	2	1	1	3	2
Mo	-	-	1	-	2	-	1	2	2	2
Au(ppb)	290	8	130	330	1200	41	160	22	20	5
As	770	110	210	190	350	33	8	32	9	50
Sb	4.8	2.2	1.7	3.3	6.3	1.0	0.3	1.3	1.1	1.3
Tl	-	-	-	-	0.2	-	<0.2	-	-	-

Sample No.	80-154 RD					80-153				
	27 m	51 m	69 m	88 m	108 m	24 m	44 m	65 m	84 m	99 m
	AGC-349	AGC-350	AGC-351	AGC-352	AGC-353	AGC-354	AGC-355	AGC-356	AGC-357	AGC-358
Element	P	P	P	P	P	Mt	bt S	P	P	P
SiO ₂	47.9	49.3	48.7	49.9	49.1	48.6	59.9	44.1	50.9	49.7
Al ₂ O ₃	9.2	9.6	10.9	8.8	7.4	20.8	16.6	8.7	4.3	9.1
Fe ₂ O ₃ ^T	13.0	12.1	12.1	12.5	12.0	10.0	8.2	12.7	13.1	11.7
CaO	12.5	12.1	9.3	12.1	13.0	8.2	5.6	12.4	11.0	8.3
MgO	11.7	13.0	16.6	13.9	15.2	5.5	4.0	15.5	17.5	15.4
Na ₂ O	0.5	0.3	0.2	0.3	0.3	3.2	1.4	0.2	0.1	0.3
K ₂ O	0.2	0.4	0.1	0.2	0.1	1.3	2.1	0.1	0.0	0.3
TiO ₂	1.2	0.6	0.6	1.2	1.3	0.9	0.8	1.0	0.8	0.9
P ₂ O ₅	0.13	0.03	0.02	0.08	0.11	0.09	0.12	0.08	0.05	0.02
MnO	0.39	0.43	0.27	0.39	0.54	0.16	0.13	0.48	0.29	0.23
LOI	4.8	4.3	3.7	2.2	2.6	1.2	1.4	6.2	3.3	5.4
Total	101.5	102.2	102.5	101.6	101.7	100.0	100.3	101.5	101.3	101.9
Cu	175	189	38	162	73	139	127	134	137	89
Pb	15	20	29	5	-	11	30	10	-	28
Zn	79	294	186	108	44	91	128	136	46	273
Co	90	62	73	65	49	35	30	60	133	66
Mn	712	840	365	446	590	270	412	1850	385	507
Ni	666	479	616	545	858	43	37	702	1249	758
Cr	1280	1108	1230	1562	1601	44	42	1360	1671	1237
Ba	25	65	10	5	5	285	285	5	5	35
Ag	1	1	-	-	-	-	-	2	1	-
Mo	2	-	-	-	-	1	2	1	1	2
Au(ppb)	360	500	20	260	-	40	190	83	49	13
As	1200	110	350	96	-	90	3000	170	590	99
Sb	6.8	1.5	2.7	3.1	-	0.8	15.0	2.3	4.4	1.7
Tl	-	-	-	-	-	-	-	-	-	0.2

Sample No.	80-153 RD		80-150 MMZ		29 m AGC- 363 P	33 m AGC- 364 S	40 m AGC- 365 Mb	49 m AGC- 366 P	66 m AGC- 367 bt S	81 m AGC- 368 bt S
	100 m	116 m	9 m	17 m						
	AGC- 359 bt S	AGC- 360 bt S	AGC- 361 bt S	AGC- 362 P						
Element										
SiO ₂	44.8	48.9	47.5	48.3	47.5	52.8	47.5	44.8	48.8	57.4
Al ₂ O ₃	23.4	17.3	16.4	10.6	10.0	15.6	13.8	10.7	17.8	17.8
Fe ₂ O ₃ ^T	8.1	7.5	10.5	12.8	13.0	13.2	14.3	11.6	8.8	7.4
CaO	9.8	9.4	7.8	11.5	10.1	5.7	10.3	11.5	10.7	5.6
MgO	6.6	5.0	7.5	13.8	15.2	7.8	9.7	12.3	7.8	6.4
Na ₂ O	0.3	0.7	0.8	0.3	0.2	0.7	1.0	0.3	0.4	0.5
K ₂ O	5.5	5.0	4.2	0.2	0.1	2.7	0.7	0.3	2.5	3.3
TiO ₂	0.3	1.2	1.4	1.2	1.1	1.4	1.0	0.4	0.3	0.6
P ₂ O ₅	0.02	0.09	0.28	0.17	0.13	0.15	0.09	0.01	0.02	0.05
MnO	0.19	0.26	0.29	0.49	0.44	0.18	0.33	0.32	0.27	0.19
LOI	3.3	4.3	3.0	2.0	3.2	2.7	2.0	6.9	2.6	1.7
Total	102.3	99.7	99.7	101.4	101.0	102.9	100.7	99.1	100.0	100.9
Cu	118	111	169	120	93	624	210	290	116	142
Pb	28	70	84	5	--	24	245	52	54	209
Zn	332	332	281	75	140	291	88	85	209	285
Co	46	30	38	70	61	98	68	84	45	27
Mn	960	2270	2360	400	483	465	525	783	836	798
Ni	271	34	77	718	650	185	256	643	118	10
Cr	211	80	236	1233	1371	193	490	1436	185	46
Ba	125	95	330	35	15	270	70	45	90	165
Ag	1	2	8	2	2	4	13	2	1	1
Mo	4	2	4	2	2	2	2	2	1	--
Au(ppb)	370	1400	590	140	--	190	100	200	430	37
As	470	1200	350	72	81	8	23	250	1700	5
Sb	2.8	14.0	17.0	3.1	3.9	0.8	2.6	2.5	8.4	0.3
Tl	0.6	0.8	-	-	<0.2	-	-	<0.2	-	0.4

Sample No.	80-150 MMZ		80-151RD		35 m AGC- 373 P	53 m AGC- 374 P	71 m AGC- 375 P	86 m AGC- 376 Mt	118 m AGC- 377 Mt	119 m AGC- 378 Mt
	92 m	106 m	18 m	25 m						
	AGC- 369	AGC- 370	AGC- 371	AGC- 372						
	P	P	bt S	bt S						
Element										
SiO ₂	43.2	42.1	53.3	51.4	46.3	45.8	41.6	46.6	43.5	44.9
Al ₂ O ₃	10.1	7.1	20.0	21.2	8.9	8.1	12.2	19.3	21.7	15.3
Fe ₂ O ₃ ^T	16.9	12.2	10.3	9.5	12.1	12.0	13.5	7.1	5.6	10.5
CaO	9.7	14.6	7.6	5.4	10.5	11.7	8.4	11.6	14.5	11.9
MgO	13.1	14.1	4.3	5.5	14.0	16.0	17.2	6.4	5.0	9.0
Na ₂ O	0.2	0.3	2.0	1.3	0.2	0.1	0.2	1.9	1.2	0.8
K ₂ O	0.3	0.2	1.9	3.8	0.2	0.1	0.1	2.7	3.0	1.8
TiO ₂	1.3	1.0	0.9	0.8	1.1	1.1	0.3	0.1	0.3	1.2
P ₂ O ₅	0.20	0.13	0.20	0.12	0.13	0.13	0.01	0.01	0.02	0.02
MnO	0.49	0.68	0.17	0.12	0.36	0.40	0.19	0.21	0.27	0.31
LOI	2.6	5.1	1.2	1.1	5.3	3.2	5.8	5.0	6.5	5.0
Total	98.1	97.5	101.9	100.2	99.1	98.6	99.5	100.9	101.6	100.7
Cu	132	154	37	84	125	82	3	41	23	85
Pb	988	3	5	8	85	--	--	37	80	63
Zn	157	97	85	93	113	59	96	301	315	308
Co	44	55	56	50	75	57	39	38	37	46
Mn	502	1530	434	442	583	425	367	886	2580	830
Ni	425	799	10	34	540	834	445	40	155	212
Cr	561	1189	25	25	977	1575	1051	113	167	179
Ba	25	10	180	285	25	5	5	105	135	75
Ag	8	2	--	--	2	--	--	--	--	--
Mo	--	--	2	1	--	--	1	2	2	2
Au(ppb)	710	38	49	270	79	41	2	52	530	67
As	60	10	990	4500	770	46	130	240	100	2100
Sb	7.3	2.8	4.8	25.0	6.9	1.0	1.7	2.2	1.5	12.0
Tl	--	--	0.2	0.3	--	--	--	--	--	--

Sample No.	DOT 80-6 17 m AGC- 379 P	26 m AGC- 380 P	29 m AGC- 381 P	31 m AGC- 382 S	33 m AGC- 383 S	37 m AGC- 384 P	43 m AGC- 385 P	46 m AGC- 386 P	64 m AGC- 387 P	80 m AGC- 388 P
Element										
SiO ₂	48.5	45.0	46.3	53.3	54.2	43.9	49.8	45.4	48.9	36.7
Al ₂ O ₃	13.7	10.4	10.2	19.7	20.0	9.2	6.6	8.1	9.5	7.5
Fe ₂ O ₃ ^T	12.0	12.0	13.0	10.2	9.6	13.6	15.6	13.1	10.9	10.9
CaO	8.4	11.6	10.6	4.7	4.8	12.3	9.9	11.3	9.4	19.9
MgO	13.1	9.9	14.9	4.4	3.3	12.4	8.4	15.7	14.9	7.3
Na ₂ O	0.2	0.2	0.4	5.8	6.2	0.4	0.4	0.5	1.2	0.6
K ₂ O	0.5	3.3	0.1	0.5	0.1	0.6	1.5	0.2	0.1	1.6
TiO ₂	1.1	1.1	1.4	1.1	1.0	1.9	0.9	1.3	1.1	1.7
P ₂ O ₅	0.14	0.14	0.16	0.16	0.16	0.16	0.1	0.15	0.23	0.21
MnO	0.2	0.17	0.22	0.15	0.12	0.22	0.15	0.20	0.17	0.21
LOI	3.0	5.8	3.0	1.2	1.5	4.9	2.8	3.5	3.4	12.9
Total	100.8	99.6	100.3	101.2	101.0	99.6	96.2	99.5	99.8	99.5
Cu	75	134	65	230	142	164	820	103	87	197
Pb	42	11	5	--	--	6	48	9	--	8
Zn	144	89	60	119	79	88	4330	155	188	82
Co	37	73	64	50	34	55	105	52	50	47
Mn	226	613	256	275	334	467	535	250	260	700
Ni	334	486	661	35	10	590	651	791	653	376
Cr	410	789	907	25	25	1080	1013	1525	1235	982
Ba	80	935	25	185	35	255	210	10	10	630
Ag	--	--	--	--	--	--	3	--	--	--
Mo	1	2	2	1	--	1	2	1	--	2
Au(ppb)	13	24	7	14	7	12	95	26	6	49
As	13	36	450	8	200	9	4	5	34	3
Sb	0.9	0.2	2.0	0.6	1.2	0.7	0.3	0.2	0.3	0.3
TI	--	--	--	--	--	--	0.4	--	<0.2	--

Sample No.	DOT 80-6	103 m	DOT 80-5	35 m	84 m	85 m	96 m	107 m	80-151	80-112B
	88 m		23 m						87 m	6 m
Element	AGC-389	AGC-390	AGC-391	AGC-392	AGC-393	AGC-394	AGC-395	AGC-396	AGC-376(2)	AGC-500
	P	m B	P	P	P	Mt	P	P	bt S	m B
SiO ₂	43.9	51.1	43.1	44.7	42.3	50.4	42.8	42.9	51.6	51.0
Al ₂ O ₃	11.0	12.8	8.2	7.7	7.6	21.4	8.9	6.4	25.5	19.7
Fe ₂ O ₃ ^T	15.3	8.9	14.8	13.1	13.4	10.0	13.6	13.3	4.4	11.0
CaO	9.9	8.9	10.2	10.3	9.2	2.5	9.5	11.0	7.4	5.8
MgO	11.6	8.5	16.1	17.2	19.2	6.4	17.0	17.6	2.4	4.2
Na ₂ O	1.6	1.9	0.3	0.2	0.1	5.6	0.2	0.1	1.6	3.7
K ₂ O	0.9	0.6	0.0	0.3	0.0	0.6	0.1	0.0	5.5	0.5
TiO ₂	2.0	1.1	1.3	1.2	1.1	1.1	1.3	0.9	0.3	1.1
P ₂ O ₅	0.22	0.18	0.11	0.11	0.10	0.18	0.13	0.10	0.14	0.05
MnO	0.17	0.15	0.34	0.22	0.22	0.12	0.27	0.28	0.16	0.08
LOI	0.8	5.2	3.7	3.4	5.0	2.8	4.7	4.4	2.1	1.4
Total	97.4	99.3	98.2	98.4	98.2	101.1	98.5	97.0	101.1	98.5
Cu	180	112	357	284	161	92	181	216	80	131
Pb	--	--	8	2	--	--	19	45	1380	--
Zn	54	68	239	104	191	177	147	167	2020	71
Co	49	49	70	86	103	35	94	111	24	37
Mn	193	428	426	300	455	460	486	518	570	262
Ni	462	351	881	987	1044	59	867	1036	43	18
Cr	1102	744	1592	1742	1821	25	1500	2195	105	--
Ba	200	145	5	60	5	155	10	15	75	85
Ag	--	--	--	--	--	--	--	--	8	--
Mo	--	1	1	1	1	2	1	2	2	--
Au(ppb)	11	6	--	84	6	380	14	4	2200	1
As	3	27	--	110	170	5	360	36	410	--
Sb	0.5	0.4	--	2.2	1.0	0.2	2.3	0.6	10.0	0.4
Tl	--	--	--	--	--	--	--	--	0.6	--

Sample No.	80-112B									
	12 m	18 m	24 m	37 m	43 m	49 m	58 m	67 m	73 m	79 m
	AGC-501	AGC-502	AGC-503	AGC-504	AGC-505	AGC-506	AGC-507	AGC-508	AGC-509	AGC-510
	Mt	Mt	Mt	g S	g S	g S	sl S	S	S	bt S
Element										
SiO ₂	50.2	48.2	53.3	61.0	59.4	62.2	61.1	52.5	54.6	58.7
Al ₂ O ₃	16.9	17.5	17.6	16.4	17.2	17.4	16.0	14.4	13.9	17.0
Fe ₂ O ₃ ^T	13.2	11.5	11.8	9.0	9.4	7.8	8.5	12.3	13.7	8.4
CaO	6.3	8.3	4.7	3.0	2.9	2.1	3.6	6.4	6.0	4.0
MgO	5.5	5.3	3.4	2.5	2.7	2.2	2.4	5.8	3.8	3.4
Na ₂ O	1.4	0.9	0.9	0.9	1.5	1.6	1.2	1.8	0.7	1.6
K ₂ O	1.7	2.2	2.9	3.4	2.9	3.0	2.4	0.9	1.4	3.1
TiO ₂	1.1	1.1	1.6	1.0	1.0	1.0	1.0	1.6	1.7	1.4
P ₂ O ₅	0.15	0.05	0.11	0.14	0.14	0.14	0.13	0.14	0.16	0.21
MnO	0.15	0.19	0.13	0.11	0.16	0.11	0.11	0.19	0.16	0.15
LOI	1.6	2.9	1.4	1.2	1.7	2.1	1.0	1.5	1.6	2.6
Total	98.2	98.1	97.8	98.7	99.0	99.7	97.4	97.5	97.7	100.6
Cu	94	182	178	18	8	5	35	19	97	45
Pb	--	--	--	--	--	--	--	--	3	4
Zn	91	142	142	109	93	84	91	175	155	361
Co	37	42	41	26	34	27	24	37	30	29
Mn	419	456	454	320	458	371	476	593	509	733
Ni	53	76	--	21	16	--	--	20	--	70
Cr	28	33	--	--	--	--	--	75	--	82
Ba	590	450	270	185	105	65	165	70	155	140
Au(ppb)	1	3	1	--	--	--	--	--	1	2
As	1	--	2	5	4	2	1	6	2	8
Sb	0.2	0.2	--	--	--	--	0.2	0.3	0.3	--
Tl	--	--	--	0.4	0.5	0.3	--	--	--	0.4

Sample No.	80-122B									
	85 m	91 m	98 m	104 m	113 m	119 m	122 m	128 m	134 m	140 m
	AGC-511 bt S	AGC-512 sl S	AGC-513 bt S	AGC-514 Mt	AGC-515 Mt	AGC-516 S	AGC-517 sl S	AGC-518 sl S	AGC-519 sl S	AGC-520 sl S
Element										
SiO ₂	49.7	55.8	51.6	47.2	45.2	53.9	73.1	63.8	55.0	58.1
Al ₂ O ₃	19.3	15.8	17.8	14.3	11.4	16.6	12.6	16.4	13.4	12.8
Fe ₂ O ₃ ^T	10.0	13.3	11.5	12.0	10.7	12.4	4.3	6.8	13.8	13.3
CaO	6.1	4.6	4.6	10.7	14.4	3.3	1.5	3.3	5.2	3.5
MgO	3.3	3.3	4.2	6.4	7.9	4.3	1.4	2.2	2.3	2.6
Na ₂ O	1.4	0.5	1.2	2.2	1.0	2.7	5.5	2.9	2.8	1.7
K ₂ O	3.1	1.9	3.3	0.4	1.2	1.3	0.5	2.4	0.6	1.7
TiO ₂	2.3	1.9	1.7	1.5	1.2	1.3	0.7	0.5	1.7	1.5
P ₂ O ₅	0.31	0.21	0.17	0.09	0.14	0.16	0.11	0.12	0.68	0.53
MnO	0.16	0.14	0.13	0.19	0.21	0.10	0.04	0.10	0.19	0.10
LOI	2.4	1.4	1.5	2.6	6.6	1.9	1.0	0.8	1.3	2.5
Total	98.1	98.9	97.7	97.6	100.0	98.0	100.8	99.3	97.0	98.3
Cu	58	99	113	110	72	140	36	46	86	147
Pb	10	12	2	--	--	--	--	--	--	--
Zn	286	313	251	124	103	274	115	205	281	251
Co	38	43	48	40	27	38	52	38	36	32
Mn	535	489	534	599	749	452	253	696	650	373
Ni	44	--	28	140	112	20	59	125	59	52
Cr	44	--	59	186	216	--	--	--	26	--
Ba	255	250	265	30	230	220	55	385	65	180
Au(ppb)	25	2	2	1	5	13	1	5	6	38
As	3	--	1	2	1	--	5	--	5	6
Sb	0.3	0.2	--	0.9	0.4	0.2	0.3	0.3	0.8	0.4
Tl	--	--	--	--	--	--	--	--	--	--

Sample No.	80-112B				80-115				
	146 m	152 m	158 m	165 m	171 m	18 m	26 m	30 m	37 m
	AGC-521	AGC-522	AGC-523	AGC-524	AGC-525	AGC-527	AGC-528	AGC-529	AGC-530
Element	bt S	P	P	P	P	bt S	sl S	S	bt S
SiO ₂	57.3	45.2	42.9	41.6	44.2	51.8	74.8	49.0	48.7
Al ₂ O ₃	17.4	9.6	7.4	6.0	7.1	20.3	11.7	20.4	21.1
Fe ₂ O ₃ ^T	9.2	12.8	11.9	11.3	12.3	11.1	4.1	11.7	12.3
CaO	3.4	9.2	14.8	20.7	15.8	5.4	0.8	7.5	5.6
MgO	4.1	16.8	15.0	14.3	14.2	3.6	0.6	4.7	4.4
Na ₂ O	0.7	0.3	0.3	0.3	0.3	1.8	0.6	1.4	2.1
K ₂ O	3.6	0.1	0.2	0.2	0.3	3.2	2.8	2.5	2.5
TiO ₂	0.8	1.5	1.2	1.0	1.1	1.1	0.6	1.0	1.2
P ₂ O ₅	0.12	0.12	0.11	0.08	0.10	0.07	0.16	0.04	0.06
MnO	0.14	0.20	0.32	0.28	0.27	0.15	0.05	0.17	0.17
LOI	1.5	2.7	4.9	6.8	4.6	0.9	2.0	1.4	1.4
Total	98.3	98.5	99.0	102.6	100.3	99.4	98.2	99.8	99.5
Cu	69	104	142	115	117	165		57	96
Pb	--	--	--	--	--	3		--	5
Zn	116	91	99	54	53	147		62	115
Co	34	51	50	39	34	48		44	35
Mn	702	261	679	798	590	449	177	595	
Ni	828	804	768	763		35		--	--
Cr	1329	1326	1242	1241		30		--	--
Ba	220	10	15	55	50	280		45	435
Au(ppb)	--	1	58	2	2	10		11	6
As	3	17	65	5	16	--		9	--
Sb	0.2	0.8	1.1	1.0	2.2	--		--	0.2
TI	0.4	--	--	--	--	0.4	--	--	--

Sample No.	80-115						80-53		
	43 m	49 m	73 m	79 m	85 m	9 m	18 m	27 m	37 m
	AGC-531	AGC-5323	AGC-534	AGC-535	AGC-536	AGC-537	AGC-538	AGC-539	AGC-540
Element	bt S	bt S	S	S	sl S	sl S	sl S	sl S	l S
SiO ₂	48.7	59.6	56.6	57.2	64.0	72.5	74.5	64.1	76.8
Al ₂ O ₃	21.1	17.5	17.3	15.6	17.0	13.8	12.1	16.8	10.3
Fe ₂ O ₃ (T)	12.3	6.8	12.9	12.4	6.8	3.8	4.3	5.2	2.0
CaO	5.6	4.8	4.0	6.2	4.0	1.1	1.7	3.3	1.7
MgO	4.4	2.3	3.4	2.9	2.0	2.1	2.2	3.9	1.6
Na ₂ O	2.1	2.4	1.0	0.9	1.7	0.5	1.3	0.4	0.9
K ₂ O	2.5	2.2	1.6	1.7	1.7	3.1	2.3	3.7	2.0
TiO ₂	1.2	0.9	1.1	1.3	0.5	0.3	0.3	0.4	0.2
P ₂ O ₅	0.06	0.15	0.17	0.17	0.10	0.04	0.08	0.06	0.03
MnO	0.17	0.09	0.24	0.21	0.10	0.03	0.05	0.18	0.04
LOI	1.4	1.5	1.9	2.7	1.7	1.9	1.3	1.7	1.4
Total	99.5	98.2	100.2	101.3	99.6	99.2	100.1	99.7	97.0
Cu	129	79	18	162	62	5	99	29	5
Pb	2	4	3	--	--	--	4	--	--
Zn	163	165	146	124	66	49	83	83	39
Co	38	35	56	42	36	26	50	39	61
Mn	460	458	652	769	468	233	333	1109	323
Ni	14	54	--	--	--	51	--	--	--
Cr	--	47	--	--	--	--	--	--	--
Ba	220	235	145	90	155	215	230	330	220
Au(ppb)	4	1	--	9	1	4	--	6	--
As	--	7	2	--	1	16	4	1	1
Sb	--	0.2	--	--	--	0.3	0.3	0.3	0.4
TI	0.5	0.5	--	--	--	--	0.3	0.4	--

Sample No.	80-53 MMZ									
	43 m	49 m	58 m	67 m	76 m	85 m	91 m	101 m	110 m	119 m
	AGC- 541	AGC- 542	AGC- 543	AGC- 544	AGC- 545	AGC- 546	AGC- 547	AGC- 548	AGC- 549	AGC- 550
	P	sl S	sl S	P	P	Mt	Mt	P	P	P
Element										
SiO ₂	38.7	76.2	76.2	46.3	41.9	47.7	48.9	44.0	40.8	40.7
Al ₂ O ₃	8.8	11.0	12.4	7.3	6.9	14.8	15.9	9.6	10.4	9.3
Fe ₂ O ₃ ^T	13.0	3.4	2.8	12.7	12.7	15.0	15.8	13.6	14.4	14.2
CaO	12.2	1.1	0.7	9.2	10.5	8.6	6.1	12.0	9.5	8.8
MgO	16.2	2.3	1.6	19.0	19.4	2.7	2.6	14.0	17.4	19.2
Na ₂ O	0.1	0.4	1.9	0.1	0.1	4.4	5.3	0.5	0.4	0.1
K ₂ O	0.1	2.9	2.3	0.0	0.0	0.1	0.1	0.1	0.2	0.0
TiO ₂	1.5	0.3	0.3	1.2	1.2	2.9	3.4	1.6	1.9	1.7
P ₂ O ₅	0.12	0.02	0.04	0.11	0.11	0.46	0.34	0.12	0.14	0.12
MnO	0.25	0.05	0.02	0.21	0.22	0.21	0.19	0.20	0.19	0.19
LOI	6.7	1.5	1.4	4.4	7.2	1.7	1.5	4.5	6.1	7.4
Total	97.7	99.2	99.7	100.5	100.2	98.6	100.1	100.2	101.5	101.7
Cu	109	12	49	44	110	100	140	191	192	112
Pb	--	--	12	--	--	--	--	--	--	--
Zn	72	80	56	69	67	111	147	59	84	70
Co	51	31	35	37	55	48	38	37	59	56
Mn	608	350	178	285	504	756	509	421	470	523
Ni	845	--	--	848	1033	10	82	685	797	971
Cr	1545	--	--	1513	1857	--	28	1293	1523	1736
Ba	15	180	175	10	10	15	50	85	215	15
Au(ppb)	1	--	1	3	--	8	14	1	1	--
As	2	1	2	7	13	13	22	3	2	1
Sb	1.0	0.3	0.7	0.4	0.5	0.3	0.3	0.5	0.5	0.3
Tl	0.2	--	0.2	--	--	--	--	--	--	--

Sample No.	80-53 MMZ									
	128 m	137 m	146 m	155 m	165 m	174 m	183 m	189 m	195 m	207 m
	AGC-551	AGC-552	AGC-553	AGC-554	AGC-555	AGC-556	AGC-557	AGC-558	AGC-559	AGC-560
Element	P	P	P	P	P	P	P	P	P	P
SiO ₂	43.5	47.6	43.6	44.3	40.0	35.8	44.8	44.5		46.2
Al ₂ O ₃	8.6	6.8	9.4	9.2	10.9	12.6	8.2	10.1		8.3
Fe ₂ O ₃ ^T	13.3	12.6	14.0	13.2	14.2	15.3	13.5	13.6		13.4
CaO	9.8	11.8	8.8	8.6	9.7	9.4	9.8	9.9		9.2
MgO	19.2	18.6	18.7	19.6	17.5	17.0	17.8	16.7		18.8
Na ₂ O	0.1	0.2	0.2	0.1	0.2	0.2	0.2	0.3		0.2
K ₂ O	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1		0.0
TiO ₂	1.5	1.3	1.6	1.7	2.3	2.1	1.6	1.7		1.6
P ₂ O ₅	0.10	0.09	0.11	0.10	0.17	0.15	0.10	0.12		0.10
MnO	0.19	0.17	0.20	0.19	0.25	0.24	0.24	0.23		0.17
LOI	5.8	3.7	4.0	4.6	5.7	7.7	3.9	3.6		2.9
Total	102.1	102.9	100.7	101.6	100.9	100.5	100.2	100.8		100.9
Cu	44	19	12	24	36	20	42	139	107	150
Pb	--	--	--	--	--	--	--	--	5	--
Zn	73	52	71	78	95	118	72	58	56	45
Co	49	34	38	48	42	60	46	42	47	46
Mn	420	221	237	240	546	689	398	382	982	190
Ni	988	958	913	933	579	625	897	846	608	985
Cr	1630	1518	1672	1750	1161	1377	1591	1551	1675	1607
Ba	15	10	20	10	15	15	15	90	850	40
Au(ppb)	--	--	--	--	--	--	1	--	4	33
As	--	1	1	2	6	2	3	2	1	2
Sb	0.2	0.6	0.8	0.2	0.5	0.4	0.3	0.6	0.4	1.0
Tl	--	--	--	--	--	--	--	--	--	--

Sample No.	80-53 MMZ									
	216 m	226 m	230 m	232 m	235 m	238 m	241 m	244 m	245 m	247 m
	AGC-561 P	AGC-562 P	AGC-563 P	AGC-564 P	AGC-565 P	AGC-566 P	AGC-567 P	AGC-568 P	AGC-569 P	AGC-570 P
Element										
SiO ₂	43.1	42.3	44.2	42.4	38.5	41.5	43.3	41.9	45.7	34.6
Al ₂ O ₃	9.6	10.0	8.5	8.4	7.8	8.4	10.4	10.5	8.5	8.0
Fe ₂ O ₃ ^T	14.2	13.2	14.3	14.3	12.8	13.6	13.2	13.4	12.9	13.3
CaO	10.8	10.6	9.2	8.7	10.3	10.0	10.5	10.7	11.2	13.9
MgO	20.4	17.8	18.4	19.6	20.2	20.2	16.2	18.0	15.9	16.5
Na ₂ O	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1
K ₂ O	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0
TiO ₂	1.8	1.9	1.7	1.6	1.3	1.4	1.5	1.7	1.4	1.3
P ₂ O ₅	0.12	0.13	0.10	0.12	0.16	0.11	0.14	0.14	0.16	0.08
MnO	0.16	0.17	0.18	0.17	0.21	0.19	0.23	0.32	0.30	0.42
LOI	4.7	4.7	4.1	4.7	9.7	6.1	4.7	5.0	2.4	9.9
Total	104.9	101.0	100.8	100.1	101.2	101.7	100.5	100.9	98.6	98.1
Cu	106	119	120	142	90	115	130	133	125	77
Pb	-	-	-	-	-	-	-	-	-	-
Zn	60	50	74	55	50	57	68	69	53	83
Co	60	56	54	57	54	48	52	46	61	73
Mn	162	291	293	318	530	356	452	638	418	1860
Ni	1093	925	1000	915	1089	985	649	648	638	1042
Cr	2042	1619	1535	1490	1725	1974	1352	1497	1029	1698
Ba	15	45	20	20	20	15	20	24	20	22
Au(ppb)	1	10	2	8	5	7	11	6	3	1
As	2	2	2	3	2	2	2	5	5	6
Sb	1.0	1.3	1.6	1.2	1.6	1.1	1.4	1.3	1.4	1.3
Tl	-	-	-	-	-	-	-	-	-	-

Sample No.	80-53 MMZ									
	251 m	252 m	255 m	259 m	262 m	265 m	268 m	270 m	271 m	279 m
	AGC-571	AGC-572	AGC-573	AGC-574	AGC-575	AGC-576	AGC-577	AGC-578	AGC-579	AGC-580
Element	P	bt S	bt S	bt S	S	S	bt S	bt S	sl S	bt S
SiO ₂	32.4	36.5	51.3	44.4	49.7	50.3	60.1	65.5	72.8	54.1
Al ₂ O ₃	18.9	18.6	15.4	18.6	15.9	16.0	15.1	15.1	11.8	16.3
Fe ₂ O ₃ (T)	18.2	21.6	14.0	16.0	13.4	14.0	12.0	6.6	6.0	11.6
CaO	7.0	4.8	4.4	7.9	8.9	8.2	3.7	3.4	1.8	6.0
MgO	13.2	6.3	6.4	4.2	4.2	3.3	3.0	2.3	2.2	5.6
Na ₂ O	0.2	0.4	0.3	0.5	2.9	2.4	0.9	2.0	0.3	0.1
K ₂ O	0.5	3.2	3.6	3.6	1.1	2.1	3.1	3.1	3.2	3.6
TiO ₂	2.4	2.9	1.9	2.0	1.7	1.8	1.0	0.7	0.3	1.8
P ₂ O ₅	0.21	0.17	0.21	0.16	0.15	0.14	0.12	0.21	0.03	0.19
MnO	0.46	0.17	0.22	0.34	0.28	0.28	0.10	0.06	0.09	0.17
LOI	5.8	4.4	1.5	1.6	1.8	2.1	0.9	1.1	1.3	0.9
Total	99.3	99.0	99.2	99.3	100.0	100.6	100.0	100.1	99.8	100.4
Cu	188	1020	246	91	50	24	93	8	59	52
Pb	-	9	-	-	-	-	3	-	6	33
Zn	210	121	143	145	118	138	119	107	159	204
Co	53	114	42	59	51	62	41	38	27	34
Mn	997	496	721	1660	908	1041	466	326	554	565
Ni	117	319	35	71	81	79	45	51	26	42
Cr	66	49	50	103	81	88	42	41	-	48
Ba	94	108	711	588	78	282	474	368	181	542
Au(ppb)	52	600	37	11	12	220	22	-	9	12
As	14	21	4	5	6	7	3	2	2	2
Sb	1.3	1.8	0.2	0.5	0.6	0.5	0.3	-	0.4	-
Tl	-	0.7	0.4	0.3	-	-	0.4	0.4	-	-

Sample No.	80-53 MMZ									
	284 m	287 m	296 m	302 m	314 m	328 m	332 m	338 m	344 m	351 m
	AGC-581	AGC-582	AGC-583	AGC-584	AGC-585	AGC-586	AGC-587	AGC-588	AGC-589	AGC-590
Element	bt S	P	P	Mt	P	bt S	P	P	P	Mt
SiO ₂	59.1	43.1	45.0	47.2	46.4	48.7	45.8	45.3	40.8	49.1
Al ₂ O ₃	14.4	11.2	9.6	14.2	7.7	18.5	7.0	8.3	6.9	13.0
Fe ₂ O ₃ ^T	10.3	15.2	15.2	13.3	12.8	11.3	13.0	15.4	17.8	14.0
CaO	5.5	11.0	10.5	11.6	11.5	6.8	12.6	12.0	13.0	8.2
MgO	4.7	13.6	14.9	7.4	16.3	4.9	16.0	14.0	14.2	9.0
Na ₂ O	0.1	0.1	0.2	0.8	0.1	1.5	0.2	0.2	0.2	0.9
K ₂ O	2.8	0.0	0.1	0.7	0.0	3.7	0.0	0.0	0.1	1.2
TiO ₂	0.9	1.6	1.4	2.3	1.2	2.5	1.1	1.2	1.5	1.6
P ₂ O ₅	0.11	0.08	0.05	0.11	0.07	0.15	0.06	0.06	0.07	0.17
MnO	0.25	0.37	0.22	0.23	0.28	0.17	0.37	0.53	0.84	0.29
LOI	1.5	2.3	2.4	2.0	2.2	1.7	2.3	1.3	1.7	1.2
Total	99.7	98.6	99.6	99.8	98.6	99.9	98.4	98.3	97.1	98.7
Cu	144	124	92	94	137	550	125	402	325	242
Pb	630	14	5	48	3	19	-	5	18	28
Zn	2200	327	176	133	119	150	115	171	193	298
Co	38	53	57	40	64	58	58	75	86	50
Mn	901	480	334	534	395	896	668	802	1730	782
Ni	24	352	402	85	851	126	819	755	408	83
Cr	44	766	868	175	1454	135	1409	1361	1132	268
Ba	311	25	18	327	15	230	15	26	19	247
Au(ppb)	7	5	54	10	98	380	660	89	470	16
As	3	5	5	11	47	500	14	35	270	4
Sb	1.2	0.9	0.8	0.9	2.9	12.0	0.9	1.5	6.6	1.3
Tl	0.2	-	-	-	<0.2	0.4	-	-	<0.2	-

Sample No.	80-53 MMZ			80-62 MMZ						
	357 m	363 m	366 m	6 m	12 m	24 m	30 m	37 m	43 m	49 m
	AGC-591	AGC-592	AGC-593	AGC-594	AGC-595	AGC-596	AGC-597	AGC-598	AGC-599	AGC-600
Element	P	P	P	Mt	P	f B	f B	f B	f B	f B
SiO ₂	40.2	45.5	41.1	53.5	54.5	47.6	47.3	46.5	50.4	49.9
Al ₂ O ₃	7.2	6.3	7.0	17.0	12.3	17.3	17.3	16.7	17.3	17.0
Fe ₂ O ₃ ^T	14.6	13.1	13.1	7.3	7.4	12.3	12.6	11.6	12.3	12.6
CaO	12.8	10.4	7.8	5.5	8.7	10.4	10.4	12.4	10.4	9.7
MgO	15.5	17.9	20.8	6.4	10.0	4.6	4.6	4.5	3.8	4.9
Na ₂ O	0.5	0.3	0.2	4.2	2.5	2.2	1.9	2.0	2.9	2.2
K ₂ O	0.0	0.0	0.0	1.8	1.0	0.7	1.0	0.6	0.3	0.6
TiO ₂	1.3	1.1	1.2	0.9	0.6	1.0	1.0	1.0	1.1	1.0
P ₂ O ₅	0.08	0.07	0.07	0.26	0.00	0.08	0.05	0.17	0.00	0.03
MnO	0.18	0.18	0.18	0.08	0.14	0.22	0.17	0.19	0.19	0.20
LOI	3.8	7.3	7.3	2.1	1.3	1.8	2.0	2.1	1.1	1.5
Total	98.0	98.7	98.8	99.0	98.4	98.2	98.3	97.8	99.8	99.6
Cu	154	138	90	57	6	152	344	74	88	110
Pb	3	-	-	-	-	-	-	2	-	-
Zn	52	62	69	79	64	97	96	79	77	86
Co	57	56	59	40	25	39	36	34	44	47
Mn	508	337	360	354	339	671	523	606	554	532
Ni	749	869	1114	89	286	-	-	17	-	-
Cr	1132	1538	1611	290	965	34	31	33	54	102
Ba	19	15	13	620	349	289	296	162	126	196
Au(ppb)	3	170	1	-	-	98	370	9	11	9
As	3	3	2	5	2	20	22	13	21	8
Sb	1.2	0.5	0.6	0.2	0.4	0.7	0.8	1.0	0.7	0.5
Tl	-	-	-	-	-	-	-	-	-	-

Sample No.	80-62 MMZ									
	54 m	85 m	98 m	104 m	110 m	116 m	128 m	134 m	140 m	145 m
	AGC-601	AGC-602	AGC-603	AGC-604	AGC-605	AGC-606	AGC-607	AGC-608	AGC-609	AGC-610
	f B	f B	f B	f B	f B	f B	f B	f B	f B	f B
Element										
SiO ₂	50.3	46.6	50.4	50.8	50.3	45.0	51.1	47.8	49.3	51.5
Al ₂ O ₃	17.6	18.5	17.1	17.9	16.4	17.0	18.5	17.8	18.1	19.3
Fe ₂ O ₃ ^T	12.5	11.0	11.2	12.0	13.3	13.1	12.3	15.6	15.0	11.7
CaO	10.2	13.5	9.6	11.3	10.8	12.3	9.7	10.5	9.0	8.6
MgO	3.7	3.0	4.5	3.3	4.2	4.0	3.9	4.8	4.4	4.8
Na ₂ O	2.2	2.8	3.3	2.2	2.0	3.0	2.3	2.5	2.9	3.5
K ₂ O	0.5	0.3	0.7	0.4	0.3	0.3	0.2	0.1	0.2	0.2
TiO ₂	1.2	1.1	1.2	0.8	1.1	0.8	1.1	1.4	1.2	1.1
P ₂ O ₅	0.00	0.02	0.03	0.01	0.02	0.03	0.02	0.02	0.06	0.09
MnO	0.18	0.18	0.17	0.17	0.19	0.20	0.18	0.22	0.22	0.19
LOI	1.8	1.7	1.8	1.7	1.8	3.3	0.9	0.6	0.5	0.6
Total	100.2	98.7	100.0	100.6	100.4	99.0	100.2	101.3	100.9	101.6
Cu	164	167	167	201	282	173	460	174	228	369
Pb	2	-	-	-	2	-	-	-	-	-
Zn	78	43	76	59	67	64	72	73	68	51
Co	46	32	41	71	72	56	37	29	37	31
Mn	482	537	550	383	531	772	581	657	665	360
Ni	-	-	-	-	-	22	-	-	-	-
Cr	38	-	-	-	-	-	-	-	-	60
Ba	280	87	222	145	121	78	36	24	22	29
Au(ppb)	15	6	3	3	9	9	32	6	6	7
As	5	27	9	12	12	11	1	1	-	-
Sb	0.5	0.7	0.4	0.5	0.7	0.7	1.0	0.7	0.9	0.6
Tl	-	-	-	-	-	-	-	-	-	-

Sample No.	152 m AGC-611 f B	158 m AGC-612 f B	177 m AGC-613 f B	189 m AGC-614 f B	192 m AGC-615 i	198 m AGC-616 i	212 m AGC-617 m B	216 m AGC-618 i	221 m AGC-619 f B	229 m AGC-620 f B
Element										
SiO ₂	48.5	47.3	52.7	48.8	52.0	51.6	48.6	57.7	52.0	47.0
Al ₂ O ₃	17.6	19.2	13.4	19.0	14.2	13.8	16.4	16.7	16.4	20.8
Fe ₂ O ₃ ^T	15.8	13.8	10.9	12.7	10.6	10.5	13.0	8.9	14.3	12.2
CaO	9.6	10.2	9.8	9.8	9.7	9.8	9.3	8.3	7.4	9.7
MgO	4.7	5.0	8.3	5.3	8.1	8.3	4.0	2.4	3.9	4.2
Na ₂ O	3.2	2.7	2.7	2.5	2.2	2.3	3.1	3.9	2.9	3.4
K ₂ O	0.3	0.8	0.5	0.8	1.0	1.0	1.6	0.5	1.1	1.2
TiO ₂	1.1	1.0	0.7	0.9	0.8	0.7	1.4	0.7	1.2	1.0
P ₂ O ₅	0.07	0.06	0.20	0.06	0.21	0.19	0.11	0.08	0.10	0.08
MnO	0.26	0.21	0.21	0.18	0.18	0.18	0.18	0.13	0.16	0.17
LOI	0.6	1.3	0.7	1.4	1.5	1.1	2.0	1.0	0.7	1.7
Total	101.7	101.6	100.2	101.4	100.5	99.5	99.7	100.3	100.2	101.4
Cu	94	227	8	170	64	48	2060	332	148	353
Pb	-	-	-	-	-	-	16	2	-	-
Zn	76	74	51	66	64	58	113	50	87	88
Co	31	52	21	44	27	28	41	56	40	43
Mn	815	643	460	514	501	438	773	522	557	619
Ni	-	-	68	-	50	59	-	10	-	-
Cr	-	36	493	26	354	398	-	-	-	-
Ba	27	142	114	271	270	336	495	143	508	281
Au(ppb)	2	5	-	3	-	2	200	11	42	16
As	1	2	1	2	1	1	3	2	1	2
Sb	0.6	0.8	0.3	0.4	0.4	0.3	3.4	0.5	0.4	0.3
Tl	-	-	-	-	-	-	-	-	-	-

Sample No.	80-62 MMZ									
	236 m	244 m	253 m	262 m	271 m	274 m	283 m	293 m	302 m	311 m
	AGC- 621	AGC- 622	AGC- 623	AGC- 624	AGC- 625	AGC- 626	AGC- 627	AGC- 6 28	AGC- 629	AGC- 630
	f B	f B	S	S	S	f B	f B	f B	Mt	f B
Element										
SiO ₂	49.8	48.6	50.3	48.9	48.6	47.8	48.4	49.6	53.8	48.9
Al ₂ O ₃	17.1	18.1	17.3	18.2	19.6	19.0	19.2	19.1	18.0	18.6
Fe ₂ O ₃ ^T	14.2	14.6	14.0	13.0	11.8	13.8	12.3	12.3	11.7	14.0
CaO	10.0	8.7	8.5	9.1	8.0	8.7	10.6	8.6	7.6	10.7
MgO	3.7	4.2	3.8	4.6	4.2	5.0	4.0	4.3	4.0	4.4
Na ₂ O	3.1	3.8	3.4	2.9	3.5	3.2	1.9	3.2	3.2	2.2
K ₂ O	0.3	0.8	0.4	0.9	1.2	0.8	1.6	0.7	0.4	0.3
TiO ₂	1.3	1.2	1.1	1.1	0.9	0.9	0.8	1.0	0.9	1.3
P ₂ O ₅	0.10	0.11	0.10	0.09	0.12	0.07	0.07	0.09	0.05	0.09
MnO	0.18	0.17	0.19	0.19	0.15	0.19	0.17	0.18	0.16	0.22
LOI	0.6	1.2	0.9	2.0	1.2	0.8	1.4	1.4	0.6	0.6
Total	100.4	101.5	99.9	101.0	99.3	100.3	100.4	100.5	100.4	101.3
Cu	156	167	163	167	181	163	222	177	86	64
Pb	-	-	-	-	-	-	-	-	-	-
Zn	55	73	58	78	72	80	80	67	60	65
Co	35	37	43	48	47	35	38	39	34	34
Mn	453	619	527	597	596	597	579	631	375	599
Ni	-	-	-	-	-	87	-	-	-	-
Cr	-	25	-	-	-	44	28	-	-	-
Ba	84	214	84	277	475	226	626	70	121	31
Au(ppb)	8	10	6	12	7	3	2	3	2	2
As	3	3	4	5	3	3	4	2	2	1
Sb	0.5	0.7	0.9	0.7	0.6	0.6	0.7	0.5	0.5	0.3
Tl	-	-	-	-	-	-	-	-	-	-

Sample No.	80-62 MMZ									
	320 m	329 m	338 m	344 m	352 m	357 m	366 m	369 m	375 m	378 m
	AGC-631	AGC-632	AGC-633	AGC-634	AGC-635	AGC-636	AGC-637	AGC-638	AGC-639	AGC-640
	S	S	S	S	S	S	S	S	S	S
Element										
SiO ₂	55.3	50.0	50.9	54.2	54.6	52.0	54.1	60.8	52.5	51.0
Al ₂ O ₃	15.2	15.6	18.9	19.4	19.2	19.3	18.6	15.6	15.9	20.6
Fe ₂ O ₃ ^T	10.1	13.0	11.8	9.7	10.0	10.7	10.8	9.0	10.4	11.0
CaO	8.3	8.6	7.9	8.2	9.2	8.8	8.5	7.0	7.6	10.5
MgO	3.1	5.3	3.8	2.8	2.5	2.9	3.2	2.0	5.1	2.9
Na ₂ O	3.4	2.7	3.7	3.8	3.1	3.6	3.5	3.4	3.2	2.7
K ₂ O	0.5	0.7	0.6	0.6	0.3	0.4	0.4	0.4	1.1	0.2
TiO ₂	1.1	1.0	0.9	0.8	0.9	0.9	0.9	0.9	1.0	0.8
P ₂ O ₅	0.12	0.13	0.08	0.03	0.11	0.06	0.10	0.19	0.10	0.07
MnO	0.16	0.18	0.14	0.14	0.15	0.16	0.15	0.11	0.16	0.16
LOI	1.3	0.8	1.4	0.9	0.6	0.8	1.0	1.0	1.7	0.5
Tota	98.7	98.0	100.1	100.5	100.6	99.7	101.2	100.4	98.8	100.4
Cu	271	200	294	54	65	143	267	310	290	102
Pb	-	-	-	-	-	-	9	9	-	3
Zn	65	76	53	43	32	47	48	34	68	41
Co	37	45	38	37	27	41	46	53	35	33
Mn	671	687	390	356	291	413	404	264	372	376
Ni	-	16	-	13	-	-	-	-	21	-
Cr	-	78	-	30	-	-	-	-	139	-
Ba	122	210	46	209	82	81	139	62	318	29
Au(ppb)	6	5	5	2	3	3	2	5	2	4
As	-	3	1	1	1	-	-	1	1	-
Sb	0.2	-	0.3	0.5	0.5	-	0.8	0.8	0.4	0.7
Tl	-	-	-	-	-	-	-	0.3	0.3	-

Sample No.	80-62 MMZ									
	384 m	390 m	396 m	405 m	411 m	418 m	427 m	436 m	445 m	466 m
	AGC-641	AGC-642	AGC-643	AGC-644	AGC-645	AGC-646	AGC-647	AGC-648	AGC-649	AGC-650
	S	f B	f B	S	S	Mt	S	S	S	S
Element										
SiO ₂	53.9	49.8	51.6	53.0	51.9	52.4	53.5	51.1	52.6	52.7
Al ₂ O ₃	19.1	20.2	18.2	18.6	19.1	19.5	18.9	18.5	16.7	18.1
Fe ₂ O ₃ ^T	10.5	12.3	11.5	10.5	10.7	11.5	9.6	11.5	10.3	10.9
CaO	10.5	10.7	11.4	7.0	11.3	8.6	9.7	9.2	8.2	9.0
MgO	3.0	3.7	3.1	3.5	3.1	3.1	2.9	3.4	3.4	3.3
Na ₂ O	2.5	3.1	2.7	4.4	2.5	4.0	3.2	3.5	3.6	2.9
K ₂ O	0.1	0.5	0.3	1.2	0.2	0.3	0.7	0.8	0.9	0.4
TiO ₂	0.8	1.0	1.1	0.9	0.8	0.8	0.8	0.9	0.8	0.9
P ₂ O ₅	0.11	0.07	0.09	0.09	0.06	0.06	0.06	0.09	0.09	0.08
MnO	0.17	0.20	0.17	0.14	0.16	0.16	0.13	0.14	0.14	0.16
LOI	0.5	0.7	1.0	1.5	0.9	0.7	1.4	1.2	1.3	0.6
Total	101.2	102.3	101.2	100.8	100.8	101.1	100.9	100.4	98.0	99.0
Cu	60	112	131	127	128	251	209	227	303	137
Pb	-	-	-	-	-	6	-	-	-	-
Zn	35	35	41	55	37	42	42	49	49	34
Co	32	33	38	25	40	60	76	54	48	38
Mn	302	312	383	353	360	374	280	351	394	315
Ni	-	-	-	22	22	34	32	16	15	15
Cr	-	-	-	-	-	-	-	-	-	-
Ba	13	63	44	262	42	44	204	229	242	128
Au(ppb)	2	1	1	2	3	16	18	12	11	4
As	1	1	-	-	-	-	4	2	3	2
Sb	0.8	0.6	0.6	0.5	0.6	0.5	0.4	0.8	0.7	0.4
Tl	-	-	-	-	-	-	-	-	-	-

Sample No.	80-62 MMZ									
	472 m	479 m	482 m	485 m	494 m	503 m	512 m	521 m	530 m	536 m
	AGC-651	AGC-652	AGC-653	AGC-654	AGC-655	AGC-656	AGC-657	AGC-658	AGC-659	AGC-660
Element	f B	S	S	S	S	Mt	Mt	i	i	S
SiO ₂	45.2	56.9	55.6	55.5	56.2	51.9	51.9	49.4	50.2	49.0
Al ₂ O ₃	18.9	17.0	17.5	16.6	16.2	17.4	17.3	18.9	20.2	18.9
Fe ₂ O ₃ ^T	11.5	10.4	10.9	11.2	10.8	10.7	10.8	11.4	10.6	12.2
CaO	12.9	5.9	4.9	5.2	6.6	8.8	9.9	10.2	9.7	8.8
MgO	3.9	3.0	3.5	3.8	3.2	5.6	4.9	2.9	3.0	4.9
Na ₂ O	1.9	4.2	4.5	4.0	3.7	2.8	2.2	3.6	3.3	1.9
K ₂ O	1.1	0.2	0.0	0.4	0.2	0.2	0.2	0.1	0.4	1.0
TiO ₂	1.0	0.9	0.9	0.9	0.9	0.8	0.8	0.9	0.9	1.1
P ₂ O ₅	0.06	0.19	0.19	0.21	0.19	0.07	0.07	0.05	0.05	0.07
MnO	0.21	0.14	0.16	0.14	0.18	0.15	0.18	0.18	0.15	0.19
LOI	1.6	0.7	1.1	1.1	1.1	1.1	1.2	1.2	1.5	1.1
Total	98.3	99.5	99.3	99.1	99.3	99.5	99.5	99.8	100.0	99.2
Cu	90	72	63	190	530	42	84	94	125	123
Pb	-	-	-	-	-	17	-	-	-	40
Zn	50	43	89	55	57	46	46	52	57	77
Co	24	29	34	37	35	26	28	36	26	42
Mn	410	273	257	231	362	300	377	515	413	368
Ni	11	11	26	-	-	24	49	-	-	18
Cr	40	-	33	37	-	134	140	-	55	47
Ba	164	31	8	124	125	30	16	4	73	186
Au(ppb)	1	200	1	5	22	3	4	4	4	4
As	3	-	-	-	-	-	-	1	1	1
Sb	0.7	0.2	0.3	-	-	0.2	0.3	0.3	0.2	0.3
Tl	-	<0.2	-	-	-	-	-	-	-	-

Sample No.	80-62 MMZ									
	549 m AGC-661 S	550 m AGC-662 sl S	558 m AGC-663 sl S	567 m AGC-664 sl S	576 m AGC-665 Mt	585 m AGC-666 P	594 m AGC-667 P	604 m AGC-668 S	607 m AGC-669 S	610 m AGC-670 P
Element										
SiO ₂	51.4	69.8	73.3	59.0	48.0	48.5	40.0	49.5	51.3	42.7
Al ₂ O ₃	16.5	13.8	11.8	14.4	12.4	11.4	7.2	14.2	17.2	10.1
Fe ₂ O ₃ ^T	13.5	3.6	6.2	11.0	13.8	14.2	13.2	11.9	11.1	13.0
CaO	7.3	4.3	2.5	4.8	10.9	9.8	16.8	9.4	7.4	13.0
MgO	5.0	1.2	1.1	2.4	7.1	10.8	13.1	8.3	5.2	11.8
Na ₂ O	2.5	2.1	2.7	3.5	1.9	1.3	0.4	2.2	3.1	0.8
K ₂ O	0.7	2.2	0.9	1.1	0.1	0.4	0.1	0.2	1.1	0.4
TiO ₂	1.3	0.4	0.3	1.8	1.6	1.7	1.6	1.0	1.0	1.4
P ₂ O ₅	0.11	0.08	0.10	0.73	0.17	0.20	0.17	0.23	0.09	0.12
MnO	0.19	0.07	0.08	0.12	0.20	0.21	0.27	0.21	0.17	0.26
LOI	1.2	1.7	0.9	1.3	2.5	1.4	5.7	1.4	1.3	3.9
Total	99.7	99.3	99.9	100.2	98.7	99.9	98.7	98.5	99.0	97.5
Cu	172	41	23	80	149	126	108	45	135	86
Pb	4	-	-	-	3	11	6	14	-	10
Zn	154	73	96	121	59	73	76	100	103	79
Co	41	50	39	39	49	36	57	41	42	52
Mn	376	309	191	196	390	290	520	406	412	431
Ni	-	28	-	-	283	518	940	105	97	702
Cr	-	-	-	-	498	983	2020	468	135	1232
Ba	169	68	139	147	-	127	39	64	413	55
Au(ppb)	20	2	2	10	4	23	17	5	40	21
As	2	10	9	2	3	4	6	4	5	4
Sb	0.2	0.5	0.3	0.4	0.9	1.7	1.3	1.5	0.8	1.7
Tl	-	-	-	-	-	0.2	<0.2	-	-	-

Sample No.	80-62 MMZ									
	613 m	616 m	619 m	620 m	623 m	632 m	637 m	639 m	640 m	649 m
	AGC-671	AGC-672	AGC-673	AGC-674	AGC-675	AGC-676	AGC-677	AGC-678	AGC-679	AGC-680
Element	bt S	P	P	P	P	P	S	P	bt S	bt S
SiO ₂	53.7	45.7	40.0	47.6	44.2	46.8	55.8	48.2	50.0	49.2
Al ₂ O ₃	17.5	7.8	10.2	6.6	9.9	8.3	15.4	6.4	22.0	16.0
Fe ₂ O ₃ ^T	8.0	13.2	13.9	12.1	16.2	14.0	9.2	13.9	7.3	12.1
CaO	7.3	14.1	12.7	12.8	10.8	12.0	4.8	12.0	5.6	5.2
MgO	2.8	14.2	15.1	16.3	13.0	15.4	8.1	14.5	5.8	9.6
Na ₂ O	2.7	0.5	0.6	0.4	0.5	0.3	0.3	0.2	0.3	0.3
K ₂ O	3.0	0.1	0.2	0.1	0.6	0.2	2.8	0.1	5.2	2.5
TiO ₂	0.7	1.3	1.5	1.2	1.6	1.4	0.7	1.3	0.5	0.8
P ₂ O ₅	0.35	0.11	0.12	0.10	0.13	0.14	0.02	0.10	0.02	0.06
MnO	0.10	0.31	0.28	0.25	0.30	0.34	0.35	0.96	0.22	0.35
LOI	3.2	2.6	4.1	2.8	1.6	1.6	2.1	1.3	3.3	2.2
Total	99.4	99.9	98.7	100.3	98.8	100.5	99.6	99.0	100.2	98.3
Cu	46	84	47	65	265	166	54	235	62	82
Pb	2	-	-	-	9	5	31	4	13	17
Zn	109	53	111	70	96	70	312	63	187	132
Co	37	52	42	44	82	71	54	83	25	50
Mn	516	360	457	273	311	307	597	660	1000	521
Ni	-	942	826	899	909	976	105	922	37	269
Cr	-	1440	1423	1272	1510	1814	158	1324	28	220
Ba	631	5	122	-	106	13	123	5	40	159
Au(ppb)	5	8	3	5	-	3	2300	950	1500	250
As	7	5	3	4	3	10	4400	410	3200	4
Sb	1.4	1.6	0.9	1.2	1.4	0.8	1.4	6.0	2.3	0.2
Tl	0.4	-	-	-	-	-	0.4	<0.2	-	-

Sample No.	80-62 MMZ									
	613 m	616 m	619 m	620 m	623 m	632 m	637 m	639 m	640 m	649 m
	AGC-671	AGC-672	AGC-673	AGC-674	AGC-675	AGC-676	AGC-677	AGC-678	AGC-679	AGC-680
Element	bt S	P	P	P	P	P	S	P	bt S	bt S
SiO ₂	53.7	45.7	40.0	47.6	44.2	46.8	55.8	48.2	50.0	49.2
Al ₂ O ₃	17.5	7.8	10.2	6.6	9.9	8.3	15.4	6.4	22.0	16.0
Fe ₂ O ₃ ^T	8.0	13.2	13.9	12.1	16.2	14.0	9.2	13.9	7.3	12.1
CaO	7.3	14.1	12.7	12.8	10.8	12.0	4.8	12.0	5.6	5.2
MgO	2.8	14.2	15.1	16.3	13.0	15.4	8.1	14.5	5.8	9.6
Na ₂ O	2.7	0.5	0.6	0.4	0.5	0.3	0.3	0.2	0.3	0.3
K ₂ O	3.0	0.1	0.2	0.1	0.6	0.2	2.8	0.1	5.2	2.5
TiO ₂	0.7	1.3	1.5	1.2	1.6	1.4	0.7	1.3	0.5	0.8
P ₂ O ₅	0.35	0.11	0.12	0.10	0.13	0.14	0.02	0.10	0.02	0.06
MnO	0.10	0.31	0.28	0.25	0.30	0.34	0.35	0.96	0.22	0.35
LOI	3.2	2.6	4.1	2.8	1.6	1.6	2.1	1.3	3.3	2.2
Total	99.4	99.9	98.7	100.3	98.8	100.5	99.6	99.0	100.2	98.3
Cu	46	84	47	65	265	166	54	235	62	82
Pb	2	-	-	-	9	5	31	4	13	17
Zn	109	53	111	70	96	70	312	63	187	132
Co	37	52	42	44	82	71	54	83	25	50
Mn	516	360	457	273	311	307	597	660	1000	521
Ni	-	942	826	899	909	976	105	922	37	269
Cr	-	1440	1423	1272	1510	1814	158	1324	28	220
Ba	631	5	122	-	106	13	123	5	40	159
Au(ppb)	5	8	3	5	-	3	2300	950	1500	250
As	7	5	3	4	3	10	4400	410	3200	4
Sb	1.4	1.6	0.9	1.2	1.4	0.8	1.4	6.0	2.3	0.2
Tl	0.4	-	-	-	-	-	0.4	<0.2	-	-

80-62 MMZ

Sample No.	652 m AGC- 681 S	655 m AGC- 682 P	665 m AGC- 683 P	666 m AGC- 684 P	674 m AGC- 685 bt S	677 m AGC- 686 bt S	686 m AGC- 687 P	690 m AGC- 688 P	696 m AGC- 689 P	696 m AGC- 690 P
Element										
SiO ₂	41.6	41.5	43.1	45.4	47.1	49.0	39.3	40.6	45.3	42.4
Al ₂ O ₃	17.6	7.5	7.3	9.2	18.1	19.2	7.6	8.4	9.6	8.9
Fe ₂ O ₃ ^T	18.6	12.0	11.7	15.7	11.6	10.9	12.5	13.2	13.5	13.1
CaO	2.6	14.9	15.0	11.4	7.4	5.2	14.1	9.4	10.3	13.3
MgO	8.9	15.0	14.7	12.9	4.1	5.8	15.7	19.6	15.8	16.6
Na ₂ O	0.7	0.2	0.3	0.4	1.6	1.1	0.2	0.1	0.2	0.2
K ₂ O	2.9	0.0	0.1	0.1	3.1	3.7	0.0	0.0	1.9	0.1
TiO ₂	1.3	1.1	1.1	1.1	2.5	2.5	1.1	1.1	1.6	1.4
P ₂ O ₅	0.12	0.08	0.07	0.11	0.24	0.23	0.09	0.09	0.11	0.08
MnO	0.18	0.60	0.70	0.48	0.23	0.27	0.70	0.26	0.20	0.38
LOI	3.9	5.2	4.6	2.1	1.6	1.9	7.1	6.7	2.0	4.8
Total	98.4	98.1	98.7	98.9	97.6	99.8	98.4	99.5	100.5	101.3
Cu	690	50	81	450	284	198	140	114	105	144
Pb	20	-	-	6	52	235	2	-	3	-
Zn	121	65	72	86	530	730	91	75	75	64
Co	62	62	55	72	72	72	62	62	56	45
Mn	500	1550	1630	467	666	705	2280	426	245	622
Ni	226	880	821	685	120	127	858	955	637	697
Cr	198	1343	1283	1277	114	125	1449	1309	1226	1151
Ba	132	-	-	9	393	217	-	-	669	-
Au(ppb)	800	260	840	79	280	620	220	-	1	14
As	18	22	83	87	550	710	61	4	130	5
Sb	0.3	0.4	1.1	0.9	1.3	6.9	0.8	0.5	0.7	0.8
Tl	-	-	-	-	-	-	-	<0.2	-	-

Sample No.	80-62 MMZ									
	701 m	704 m	707 m	710 m	713 m	716 m	719 m	728 m	738 m	742 m
	AGC-691	AGC-692	AGC-693	AGC-694	AGC-695	AGC-696	AGC-697	AGC-698	AGC-699	AGC-700
Element	B	B	P	sl S	P	P	bt S	bt S	bt S	bt S
SiO ₂	43.3	46.3	44.6	64.1	45.4	47.1	58.3	51.9	46.7	54.7
Al ₂ O ₃	10.6	14.8	11.4	13.2	11.7	12.5	12.9	17.3	16.8	15.8
Fe ₂ O ₃ ^T	12.0	14.8	15.3	8.7	15.8	14.8	10.4	15.4	18.3	11.6
CaO	15.3	10.6	10.1	5.4	10.2	10.6	6.4	3.5	5.7	4.1
MgO	8.3	7.0	12.8	3.1	12.7	10.6	3.6	3.7	3.1	5.1
Na ₂ O	0.2	0.5	0.1	0.2	0.2	0.5	0.2	0.3	0.5	0.6
K ₂ O	1.2	1.4	0.4	2.3	0.3	0.3	3.1	3.6	3.3	3.5
TiO ₂	1.2	2.2	1.7	0.8	1.8	1.8	1.1	2.1	2.8	1.8
P ₂ O ₅	0.14	0.21	0.16	0.14	0.16	0.18	0.11	0.25	0.40	0.32
MnO	0.50	0.31	0.41	0.15	0.37	0.31	0.25	0.30	0.39	0.39
LOI	6.9	1.4	2.7	1.2	1.5	1.3	1.0	1.3	2.0	2.3
Total	99.3	99.5	99.7	99.3	100.1	100.0	97.4	99.7	100.0	100.2
Cu	43	195	92	88	131	155	175	203	39	35
Pb	14	14	2	17	5	11	13	-	3	3
Zn	96	124	88	115	66	66	141	65	131	120
Co	38	63	53	50	53	50	46	64	59	44
Mn	2000	575	415	552	380	305	1740	531	786	830
Ni	108	112	325	39	380	245	90	52	18	38
Cr	269	671	680	82	826	541	48	71	40	41
Ba	287	427	62	323	101	25	125	404	333	367
Au(ppb)	95	140	3	250	2	43	270	16	170	41
As	4	5	86	6	55	11	19	3	11	28
Sb	0.5	0.6	1.0	0.4	1.0	1.4	1.7	0.2	0.8	1.0
Tl	-	-	-	-	-	-	-	0.6	-	-

80-62 MMZ

750 m

Sample

AGC-

701

P

Element

SiO ₂	45.5
Al ₂ O ₃	9.6
Fe ₂ O ₃ ^T	13.3
CaO	10.9
MgO	16.7
Na ₂ O	0.4
K ₂ O	0.1
TiO ₂	1.6
P ₂ O ₅	0.10
MnO	0.21
LOI	2.4
Total	100.8

Cu	82
Pb	-
Zn	36
Co	37
Mn	184
Ni	670
Cr	1143
Ba	5
Au(ppb)	3
As	3
Sb	0.9
Tl	<0.2

Sample No.	Arbour Lake DDH RO75-4									
	46 m	53 m	61 m	70 m	76 m	84 m	91 m	99 m	107 m	114 m
	AL- 6 P	AL- 8 P	AL- 9 P	AL- 10 P	AL- 11 P	AL- 12 P	AL- 13 P	AL- 14 P	AL- 15 P	AL- 16 P
Element										
SiO ₂	50.1	42.3	43.1	43.1	44.1	44.2	44.1	43.9	44.6	46.5
Al ₂ O ₃	6.2	8.8	8.2	7.0	9.0	8.5	10.5	8.8	9.6	5.9
Fe ₂ O ₃ ^T	10.1	18.0	18.2	14.9	14.7	13.5	13.8	14.2	13.3	17.0
CaO	17.1	12.1	10.1	12.5	11.1	10.2	11.8	11.5	13.0	8.6
MgO	13.3	13.0	14.1	16.5	14.8	17.5	14.2	15.4	14.4	16.8
Na ₂ O	0.3	1.0	1.0	0.6	1.0	0.7	1.3	1.0	1.3	0.5
K ₂ O	0.1	0.1	0.4	0.1	0.7	0.1	0.2	0.0	0.1	0.0
TiO ₂	0.2	2.1	1.7	1.2	1.7	1.5	1.7	1.6	1.7	2.6
P ₂ O ₅	0.01	0.11	0.07	0.06	0.06	0.13	0.06	0.06	0.04	0.10
MnO	0.30	0.32	0.52	0.27	0.38	0.23	0.42	0.29	0.26	0.55
LOI	3.3	1.2	1.1	2.9	1.6	2.6	1.0	1.8	1.1	1.5
Total	101.0	99.0	98.5	99.1	99.1	99.2	99.1	98.6	99.4	100.1
Cu	11	261	62	312	85	34	12	100	48	23
Pb	-	-	-	-	-	-	-	-	-	-
Zn	8	80	52	53	40	43	33	41	37	76
Co	11	38	31	38	25	30	10	22	33	14
Mn	288	318	573	375	342	260	308	282	386	260
Ni	270	842	767	1007	862	906	852	794	758	132
Cr	810	1354	1740	1811	2158	1758	2288	2068	2227	1336
Ba	90	15	20	15	100	15	25	10	10	10
Ag	2	2	2	-	2	2	2	2	-	-
Mo	1	8	4	5	2	4	2	4	2	2
Au(ppb)	-	13	-	12	2	1	11	6	7	17
As	-	3	-	1	-	1	1	2	3	-
Sb	-	0.3	0.2	-	0.2	-	0.4	0.5	0.3	-
Rb	9	9	22	5	22	8	6	8	8	8
Sr	46	83	55	55	68	39	54	70	100	20
Li	7	7	13	9	11	4	4	3	2	7
F	648	424	380	336	364	276	356	356	328	276
CO ₂	2.84	0.87	0.59	1.43	0.94	0.82	0.52	0.81	0.64	0.10
pH	9.89	9.82	9.52	9.85	9.85	9.84	9.79	9.88	9.85	9.37
Cond.	45	34	17	32	29	28	23	30	28	8
TI	-	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

Sample No.	Arbour Lake					
	DDH	RO75-4				
	122 m	130 m	136 m	148 m	203 m	433 m
	AL-17	AL-18	AL-19	AL-20	AL-21	AL-24
Element	P	P	P	P	P	P
SiO ₂	42.6	42.9	41.5	44.0	40.0	44.8
Al ₂ O ₃	8.2	8.7	6.8	5.5	11.5	8.1
Fe ₂ O ₃ ^T	16.5	18.0	14.2	11.9	25.2	13.5
CaO	9.8	9.2	12.4	10.7	3.7	12.1
MgO	16.6	15.3	16.5	20.2	9.4	15.5
Na ₂ O	0.7	0.9	0.6	0.3	0.4	0.7
K ₂ O	0.0	0.0	0.0	0.0	4.5	0.3
TiO ₂	1.8	1.5	1.3	1.0	1.7	1.3
P ₂ O ₅	0.07	0.02	0.01	0.00	0.21	0.10
MnO	0.32	0.51	0.25	0.19	0.22	0.25
LOI	2.2	1.4	4.9	5.0	2.7	2.2
Total	98.8	98.4	98.5	98.8	99.5	98.9
Cu	70	92	73	102	354	96
Pb	-	-	-	-	-	-
Zn	30	51	23	24	218	33
Co	23	40	27	40	42	41
Mn	267	392	462	372	950	322
Ni	1012	934	747	1077	202	730
Cr	1873	2055	2032	1714	849	1422
Ba	15	15	45	15	80	35
Ag	-	-	3	2	2	2
Mo	2	2	2	2	4	6
Au(ppb)	27	21	9	12	17	8
As	1	1	1	1	1	1
Sb	-	0.2	0.2	0.2	0.2	0.2
Rb	15	6	7	7	105	12
Sr	61	54	113	38	27	80
Li	6	6	5	3	35	11
F	424	380	192	126	1000	740
CO ₂	0.34	0.17	3.11	2.86	2.30	1.27
pH	9.68	9.57	9.93	9.73	9.89	9.89
Cond.	17	12	38	25	38	34
TI	<0.2	<0.2	<0.2	<0.2	0.6	<0.2

Sample No.	Arbour Lake								
	DDH	RO75-4							
	6 m	23 m	31 m	37 m	40 m	46 m	49 m	213 m	422 m
	AL- 1	AL- 2	AL- 3	AL- 4	AL- 5	AL- 6	AL- 7	AL- 22	AL- 23
Element	Gy	Gy	Gy	Gy	Gy	P	Gy	Gy	Gy
SiO ₂	48.6	47.2	49.8	45.4	47.7	50.1	63.5	52.0	57.0
Al ₂ O ₃	24.0	23.4	21.0	27.8	26.6	6.2	17.0	17.8	15.2
Fe ₂ O ₃ ^T	5.5	6.8	8.1	7.3	6.5	10.1	4.6	9.7	11.0
CaO	11.6	14.0	10.0	11.9	11.8	17.1	5.4	10.5	4.7
MgO	6.0	6.5	4.9	3.5	4.4	13.3	2.4	5.4	4.4
Na ₂ O	1.8	1.4	2.2	2.0	1.9	0.3	5.4	3.3	2.6
K ₂ O	0.5	0.4	0.9	0.7	0.5	0.1	1.0	0.5	3.2
TiO ₂	0.4	0.1	nd	nd	0.1	0.2	0.5	1.5	1.1
P ₂ O ₅	0.12	0.04	0.01	0.02	0.02	0.01	0.18	0.22	0.29
MnO	0.07	0.13	0.10	0.16	0.12	0.30	0.07	0.16	0.14
LOI	2.0	0.9	1.5	2.0	1.3	3.3	1.0	0.4	0.8
Total	100.6	100.9	98.5	100.8	100.9	101.0	101.1	101.5	100.4
Cu	8	37	221	42	58	11	34	97	313
Pb	-	-	-	-	-	-	-	-	-
Zn	33	25	31	71	37	8	46	18	138
Co	35	25	46	31	29	11	24	35	37
Mn	133	100	221	351	165	288	208	155	548
Ni	160	220	160	150	170	270	100	150	100
Cr	150	240	180	30	70	810	-	-	100
Ba	350	530	270	330	270	90	430	340	750
Ag	1	1	1	-	2	2	2	1	1
Mo	-	-	-	-	-	1	-	-	1
Au	-	-	-	-	-	-	-	-	-
As	-	-	-	-	-	-	-	-	-
Sb	-	-	-	-	-	-	-	-	-
Rb	11	12	23	22	14	9	32	10	100
Sr	83	66	73	157	134	46	600	304	188
Li	14	7	11	15	12	7	18	13	49
F	266	364	312	184	184	648	532	36	1100
CO ₂	0.11	0.17	0.83	0.60	0.45	2.84	1.02	0.17	0.59
pH	9.48	9.58	9.85	9.85	9.80	9.89	9.83	9.61	9.88
Cond.	17	20	39	44	35	45	37	18	40
TI	<0.2	-	<0.2	-	-	-	<0.2	<0.2	0.4

APPENDIX II

PART 2: Trace Element Analyses - Picritic Basalt X-ray Fluorescence Pressed Powder Pellets University of Windsor, Department of Geology (Analyst: T.E. Smith) All analyses in ppm unless otherwise noted

Sample Number	Sc	V	Cr	Co	Ni	Cu	Zn	Rb	Sr	Y	Zr	Nb	Ba	TiO ₂ (wt. %)	CaO (wt. %)
AGC-47	31	280	1513	94	792	102	236	0.3	113	17	84	7	75	1.7	10.0
AGC-49	27	227	1501	84	729	116	581	1.3	80	22	107	8	77	1.5	11.0
AGC-50P1C	33	267	1612	105	825	111	441	1.9	43	18	82	8	75	1.7	10.1
AGC51DUP	19	251	1584	90	688	135	446	3.0	147	10	82	11	99	1.6	13.7
AGC-53	27	219	1805	93	874	172	7638	nd	152	12	75	10	69	1.8	11.4
AGC-55	31	328	1929	100	819	82	368	1.8	185	21	144	16	134	2.1	11.9
AGC-56	35	297	1477	74	529	75	221	45	210	21	128	13	296	1.9	10.3
AGC-58	20	229	1399	93	812	105	281	9.4	116	9	68	8	99	1.2	13.7
AGC-59	26	269	1032	80	563	87	428	8.3	110	14	59	7	109	1.2	12.9
AGC-62	45	156	561	77	346	29	167	17	55	6	8	1	80	0.8	10.2
AGC-68P1C	27	244	1233	76	543	96	194	2.8	136	14	82	6	76	1.3	12.0
AGC-207	31	245	942	66	446	79	608	24	247	15	57	7	185	0.8	12.5
AGC-209	25	270	1380	81	662	104	230	1.5	182	13	79	7	64	1.6	11.8
AGC-212	28	268	1478	90	722	80	272	19	262	16	75	7	269	1.3	11.4
AGC-213	29	293	1882	84	848	124	323	2.8	148	12	75	6	92	1.5	9.1
AGC-214	20	236	1724	94	901	93	118	11	132	11	69	5	197	1.3	9.0
AGC-225	22	211	1464	75	736	55	119	2.2	196	10	56	5	50	1.1	9.5
AGC-273	33	232	1165	77	582	72	147	14	308	8	43	5	123	0.7	9.5
AGC-292	20	236	1801	88	783	117	362	0.1	36	11	69	6	57	1.2	10.2
AGC-293	21	237	1572	81	792	100	442	10	74	11	60	6	128	1.2	12.0
AGC-300	23	260	1458	76	658	121	385	nd	95	12	69	6	60	1.2	13.9
AGC-311	20	265	1509	88	717	66	167	nd	201	13	82	10	76	1.4	14.6
AGC-317	23	265	1701	91	828	101	253	nd	76	14	75	7	65	1.5	11.3
AGC-328	32	335	2014	110	943	146	832	19	137	16	105	12	160	1.8	12.3
AGC-333	40	302	841	101	353	72	257	nd	26	38	74	3	82	1.7	9.3
AGC-338	27	267	1466	86	652	113	367	12	73	15	81	6	196	1.5	9.0
AGC-342	19	227	1425	71	617	174	644	0.2	78	9	58	6	49	1.1	12.4
AGC-347	32	327	941	65	314	184	97	136	132	12	91	9	955	1.3	7.3

Sample Number	Sc	V	Cr	Co	Ni	Cu	Zn	Rb	Sr	Y	Zr	Nb	Ba	TiO ₂ (wt. %)	CaO (wt. %)
AGC-349	25	254	1208	73	511	131	235	2.5	91	17	75	6	83	1.2	12.5
AGC-350	45	213	1006	69	405	140	634	14	51	11	31	4	88	0.6	12.1
AGC-351	38	187	1334	62	514	33	365	1.3	30	9	14	1	34	0.6	9.3
AGC-352	57	302	1486	72	431	119	424	2.0	90	20	56	5	67	1.2	12.1
AGC-374	24	270	1557	79	677	62	191	nd	78	12	76	7	58	1.1	11.7
AGC-392	27	247	1716	83	771	173	223	8.1	75	13	68	8	103	1.2	10.3
AGC-393	21	231	1935	101	927	122	331	nd	92	11	66	6	53	1.1	9.2
AGC-544	23	234	1494	76	782	38	147	0.1	64	12	66	5	52	1.2	9.2
AGC-548	31	297	1209	80	639	148	102	2.6	220	17	84	8	142	1.6	12.0
AGC-552	17	240	1490	87	923	15	103	nd	39	15	61	7	51	1.3	11.8
AGC-553	31	282	1654	96	864	13	128	nd	31	16	82	6	65	1.6	8.8
AGC-554	26	263	1739	93	921	23	118	0.3	19	12	84	8	66	1.7	8.6
AGC-557	27	279	1564	96	861	36	123	nd	27	15	82	8	64	1.6	9.8
AGC-558	34	295	1554	92	857	109	93	3.7	53	12	86	8	153	1.7	9.9
AGC-560	26	271	1565	96	921	115	88	0.9	68	14	74	7	82	1.6	9.2
AGC-561	17	272	1966	109	1001	75	100	nd	54	15	89	7	67	1.8	10.8
AGC-562	28	288	1551	99	819	87	88	1.9	197	16	88	9	113	1.9	10.6
AGC-563	26	268	1438	95	910	88	130	nd	86	12	78	6	74	1.7	9.2
AGC-564	28	263	1268	101	816	102	93	nd	87	16	79	5	66	1.6	8.7
AGC-567	33	283	1247	86	580	96	110	0.6	128	15	86	10	85	1.5	10.5
AGC-568	35	318	1423	75	587	104	109	1.1	125	18	100	10	92	1.7	10.7
AGC-569	27	276	1064	85	542	84	108	nd	161	14	79	8	86	1.4	11.2

APPENDIX II

PART 3: Rare Earth Element Data (non-normalized) MacLellan Picritic Basalts and Sedimentary Rocks

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
La	6.6	4.7	2.5	3.5	3.1	8.8	4.5	3.0	0.4	10.0	3.3	22.1	12.6	4.2
Ce	17	22	10	9	8	21	10	11	nd	24	11	55	35	14
Pr	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Nd	12	10	7	nd	nd	16	nd	nd	nd	12	9	24	10	10
Sm	2.3	3.6	1.8	2.8	2.5	3.0	1.4	1.2	1.0	2.6	1.5	5.9	3.0	1.9
Eu	1.3	1.6	0.8	1.3	0.9	1.4	0.7	0.7	0.6	0.8	0.5	1.8	0.9	0.5
Gd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Tb	nd	0.7	nd	nd	nd	nd	nd	nd	nd	nd	nd	1.7	0.7	nd
Dy	1.5	4.8	2.6	2.8	3.2	2.7	1.7	1.9	2.2	2.7	2.2	4.3	4.2	2.8
Ho	nd	0.7	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.9	nd	nd
Er	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Tm	nd	0.6	nd	nd	0.3	0.5	nd	nd	nd	nd	0.7	0.6	0.5	0.4
Yb	0.7	1.7	0.7	1.1	0.9	1.1	1.0	0.7	0.9	1.7	1.2	1.5	1.6	1.2
Lu	nd	0.3	0.1	0.1	0.2	0.2	0.2	0.1	0.1	0.4	0.2	0.4	0.4	0.2
REE ^T	41.4	50.7	25.5	20.6	19.1	54.7	19.5	18.6	5.2	54.0	29.6	118.2	68.9	35.2
Sc	22	36	26	25	36	26	33	28	31	31	29	40	29	30
U	nd	0.5	nd	nd	nd	nd	nd	0.5	nd	0.8	nd	0.8	1.1	nd
Th	1.2	0.8	0.8	1.1	1.5	1.4	1.3	1.2	1.3	2.6	1.4	2.8	2.6	0.6

- 1 Muskeg Lake; outcrop chip sample; Basalt
- 2 Arbour Lake; DDH RO75-4; 61m; (AL-9); Basalt
- 3 Arbour Lake; DDH RO75-4; 70m; (AL-10); Basalt
- 4 Arbour Lake; DDH RO75-4; 76m; (AL-11); Basalt
- 5 Arbour Lake; DDH RO75-4; 91m; (AL-13); Basalt
- 6 Nickel Lake - West End; Basalt
- 7 Nickel Lake - Picrite Island, outcrop chip sample, Basalt.
- 8 Sheila Lake - Margaret Lake; 30-86-1002-3; Basalt
- 9 Sheila Lake - Margaret Lake; 30-86-1019-4; Basalt
- 10 Sheila Lake - Margaret Lake; 30-86-1025-2; Basalt
- 11 Sheila Lake - Margaret Lake; 30-86-1025-4; Basalt
- 12 Sheila Lake - Margaret Lake; 30-86-1060-2; Basalt
- 13 Sheila Lake - Margaret Lake; 30-86-1061-2; Basalt
- 14 Sheila Lake - Margaret Lake; 30-86-1069-1; Basalt

Note: all analyses in ppm

	15	16	17	18	19	20	21	22	23	24	25	26	27	28
La	35.3	1.7	1.7	9.4	15.5	21.0	2.8	2.6	14.2	9.4	17.8	18.7	20.6	23.4
Ce	84	nd	6	26	45	45	7	10	35	25	46	46	49	63
Pr	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	20
Nd	42	nd	nd	10	21	16	nd	8	13	17	26	24	27	31
Sm	6.9	1.4	1.1	4.3	5.9	5.6	1.3	1.1	4.5	3.7	6.7	8.0	8.6	9.1
Ei	1.8	0.6	0.9	1.1	1.8	1.5	1.2	0.9	1.3	1.0	1.8	1.4	2.1	2.9
Gd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Tb	0.9	nd	nd	0.8	1.1	0.5	nd	nd	nd	0.8	nd	nd	1.0	0.9
Dy	4.3	1.0	1.8	2.8	5.9	5.2	2.2	1.8	4.0	4.8	6.6	5.5	6.5	7.5
Ho	nd	nd	nd	nd	0.8	0.8	nd	nd	1.0	0.8	1.0	nd	0.7	0.8
Er	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
Tm	4.6	nd	nd	0.5	0.5	0.5	nd	0.5	0.5	0.6	0.8	0.5	0.7	0.4
Yb	1.4	0.7	0.8	1.6	1.9	2.7	1.2	0.5	1.4	1.5	2.3	1.6	2.2	2.1
Lu	0.3	0.1	nd	0.3	0.3	0.5	0.2	0.2	0.3	0.3	0.4	0.2	0.4	0.4
REE ^T	177.5	5.5	12.3	56.8	99.7	99.3	15.9	25.6	73.9	64.9	109.4	105.9	118.8	161.5
Sc	27	29	30	30	32	11	22	42	28	44	38	37	39	42
U	2.1	0.5	nd	nd	0.8	1.7	nd	nd	0.6	2.0	0.9	nd	nd	1.8
Th	5.3	1.3	nd	1.5	2.4	2.2	nd	0.6	1.7	0.7	1.0	1.4	1.7	1.5

15 Sheila Lake - Margaret Lake; 30-86-1099-1; Basalt

16 Motriuk Lake; 30-86-1155-1; Basalt

17 AGC-60; Main Zone; DDHU82-5; 363m; MacLellan Siltstone

18 AGC-50P; Main Zone; DDHU82-5; 303m; MacLellan Basalt

19 AGC-55; Main Zone; DDHU82-5; 332m; MacLellan Basalt

20 AGC-57; Main Zone; DDHU82-5; 344m; MacLellan Siltstone

21 AGC-61; Main Zone; DDHU82-5; 369m; MacLellan Siltstone

22 AGC-62; Main Zone; DDHU82-5; 375m; MacLellan Basalt

23 AGC-68P; Main Zone; DDHU82-5; 412m; MacLellan Basalt

24 AGC-69; Main Zone; DDHU82-5; 418m; MacLellan Biotite Siltstone

25 AGC-70; Main Zone; DDHU82-5; 424m; MacLellan Biotite Siltstone

26 AGC-71; Main Zone; DDHU82-5; 430m; MacLellan Biotite Siltstone

27 AGC-72; Main Zone; DDHU82-5; 436m; MacLellan Biotite Siltstone

28 AGC-73; Main Zone; DDHU82-5; 442m; MacLellan Biotite Siltstone

	29	30	31	32	33	34	35	36	37	38	39	40	41	Chondrite Normalizing Values ¹
La	6.7	16.9	6.2	9.3	19.9	8.8	5.3	14.7	16.4	28.9	29.9	58.4	49.7	0.315
Ce	16	44	21	21	42	26	15	32	43	78	77	127	111	0.813
Pr	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	
Nd	14	27	7	13	23	14	nd	26	nd	36	37	51	54	0.597
Sm	2.8	6.7	2.9	3.9	7.1	3.8	2.0	5.0	6.1	7.1	7.6	12.0	10.7	0.192
Eu	0.9	1.4	1.0	1.3	1.8	1.2	1.1	1.7	1.7	2.4	2.1	3.4	2.9	0.0722
Gd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	
Tb	nd	0.9	nd	nd	nd	0.7	0.6	1.1	0.9	0.8	0.6	1.5	1.1	0.047
Dy	3.7	6.3	1.9	3.9	5.5	2.4	3.2	4.4	5.5	5.4	6.8	10.1	10.7	0.325
Ho	nd	0.9	nd	nd	0.7	0.7	nd	0.8	0.7	0.9	0.9	1.9	2.0	0.07
Er	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	
Tm	0.5	0.8	nd	nd	0.6	0.5	0.6	0.5	0.5	0.8	0.9	1.2	1.1	0.03
Yb	1.1	2.0	1.1	1.4	1.7	1.5	1.5	1.8	2.0	2.7	3.2	5.3	6.0	0.208
Lu	0.2	0.4	0.1	0.3	0.4	0.3	0.4	0.3	0.3	0.6	0.6	0.7	1.0	0.0323
REE ^T	45.9	107.3	41.2	54.1	102.7	59.9	29.7	88.3	77.1	163.6	166.6	272.5	250.2	
Sc	27	37	24	31	40	34	47	35	34	32	31	18	24	
U	0.5	1.0	nd	nd	1.6	0.5	nd	2.0	1.3	1.1	1.0	2.2	1.3	
Th	0.8	1.5	nd	1.9	0.9	1.1	nd	1.2	1.4	2.8	2.0	6.3	4.1	

- 29 AGC-74P; Main Zone; 448m; DDHU82-5; MacLellan Basalt
 30 AGC-74S; Main Zone; 449m; DDHU82-5; MacLellan Biotite Siltstone
 31 AGC-75; Main Zone; 454m; DDHU82-5; MacLellan Basalt
 32 AGC-76P; Main Zone; 460m; DDHU82-5; MacLellan Biotite Siltstone
 33 AGC-76S; Main Zone; 461m; DDHU82-5; MacLellan Biotite Siltstone
 34 AGC-79P; Main Zone; 475m; DDHU82-5; MacLellan Basalt
 35 AGC-79S; Main Zone; 476m; DDHU82-5; MacLellan Siltstone
 36 AGC-80; Main Zone; 479m; DDHU82-5; MacLellan Aluminous Basalt
 37 AGC-81; Main Zone; 485m; DDHU82-5; MacLellan Biotite Siltstone
 38 AGC-85; Main Zone; 509m; DDHU82-5; MacLellan Siltstone
 39 AGC-86; Main Zone; 515m; DDHU82-5; MacLellan Siltstone
 40 AGC-87; Main Zone; 521m; DDHU82-5; MacLellan Biotite Siltstone
 41 AGC-88; Main Zone; 528m; DDHU82-5; MacLellan Siliceous Siltstone

¹ - Rare earth element (REE) values for Leedy chondrite from Masuda *et al.* (1973)

APPENDIX II

PART 4: Major and trace element analysis Gilbert *et al.* (1980) of a probable picritic basalt from the Lynn Lake area (Agassiz Metallotect).

Sample 82 - Basalt from the east side of the Lynn Lake Airport (Gilbert *et al.*; 1980)

SiO ₂	48.80
Al ₂ O ₃	15.45
Fe ₂ O ₃	1.84
FeO	7.81
CaO	11.44
MgO	10.01
Na ₂ O	1.76
K ₂ O	0.27
TiO ₂	0.46
P ₂ O ₅	0.11
MnO	0.25
H ₂ O	1.75
S	-
CO ₂	0.09

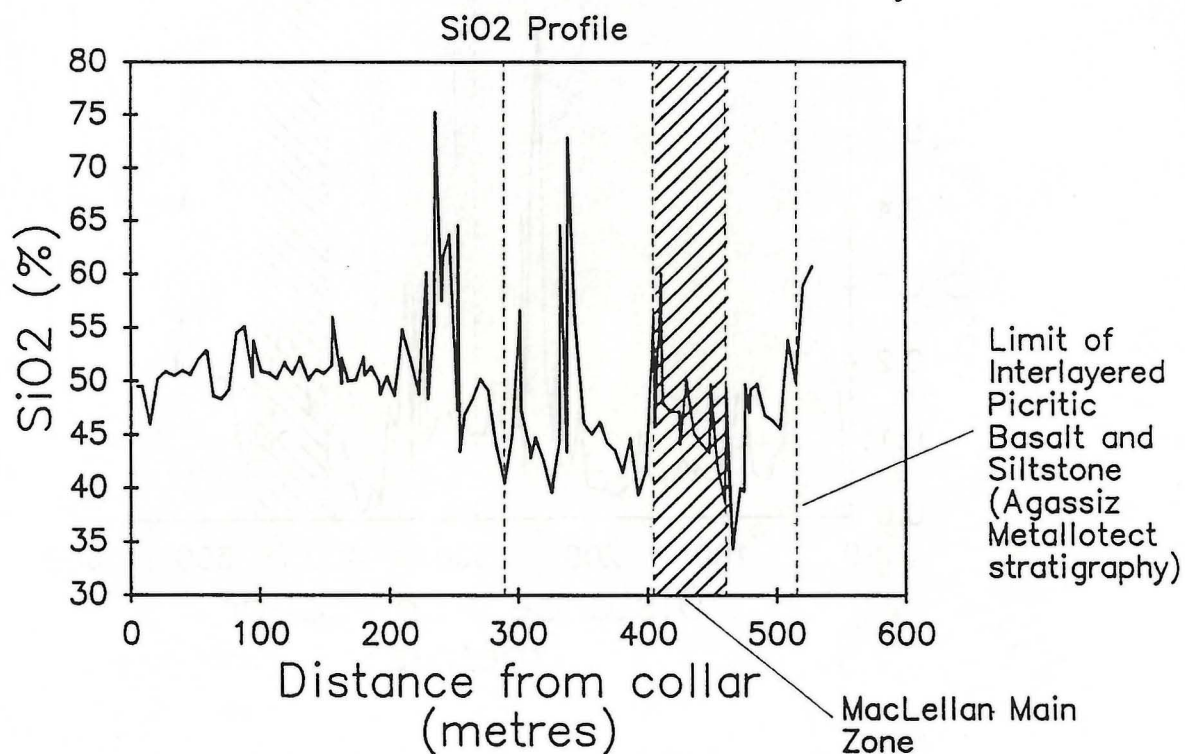
Total 100.04

Ni	156
Cr	490
Nb	5
Zr	23
Sr	116
Rb	1
Pb	3
Ga	14
Zn	66
Ni	68
Cu	61
Ba	17
V	243
Cr	289
Y	9

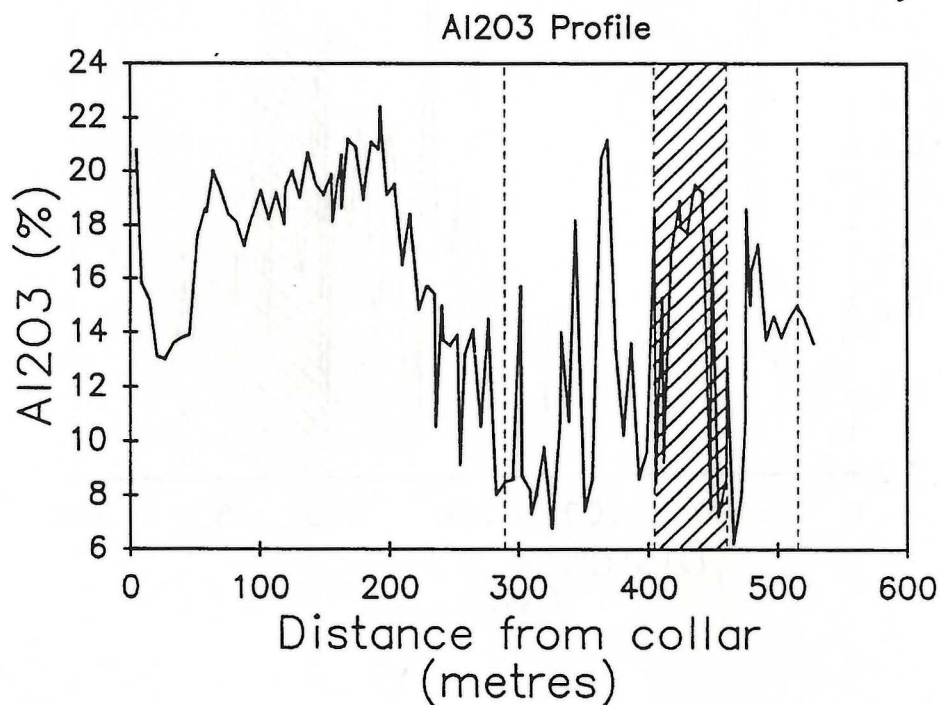
APPENDIX III

MAJOR AND TRACE ELEMENT PROFILES THROUGH THE MACLELLAN MAIN ZONE

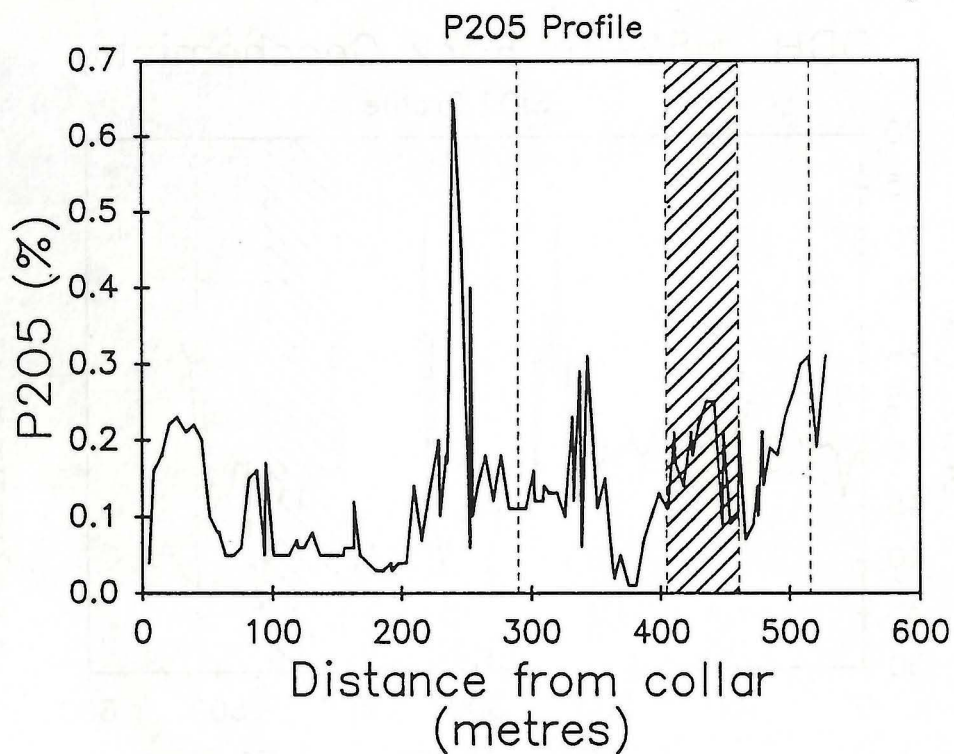
DDH U82-5 Rock Geochemistry



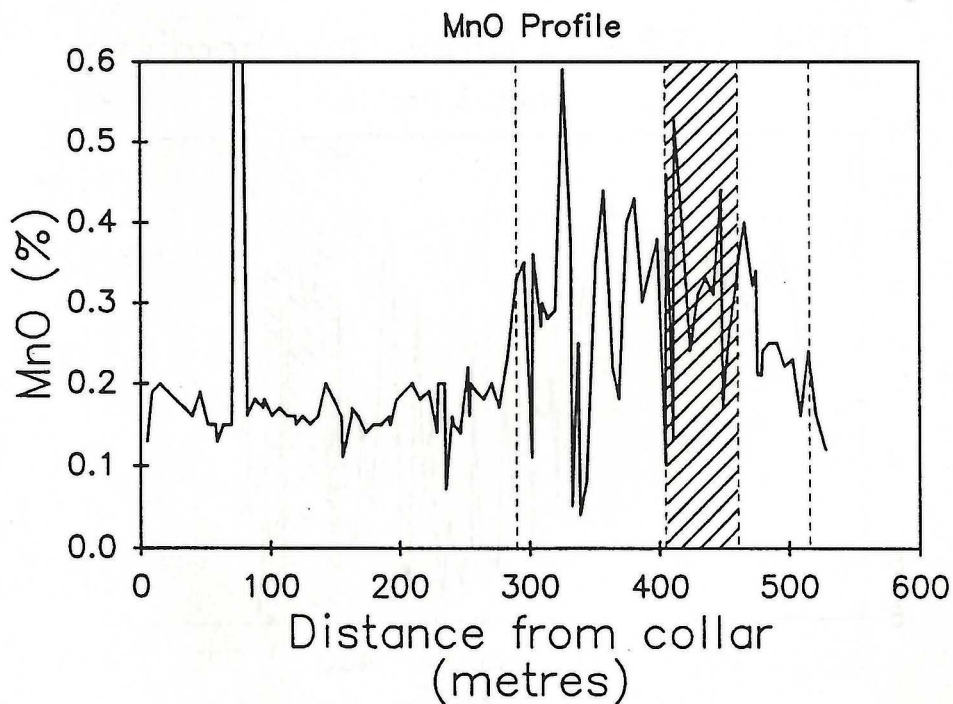
DDH U82-5 Rock Geochemistry



DDH U82-5 Rock Geochemistry

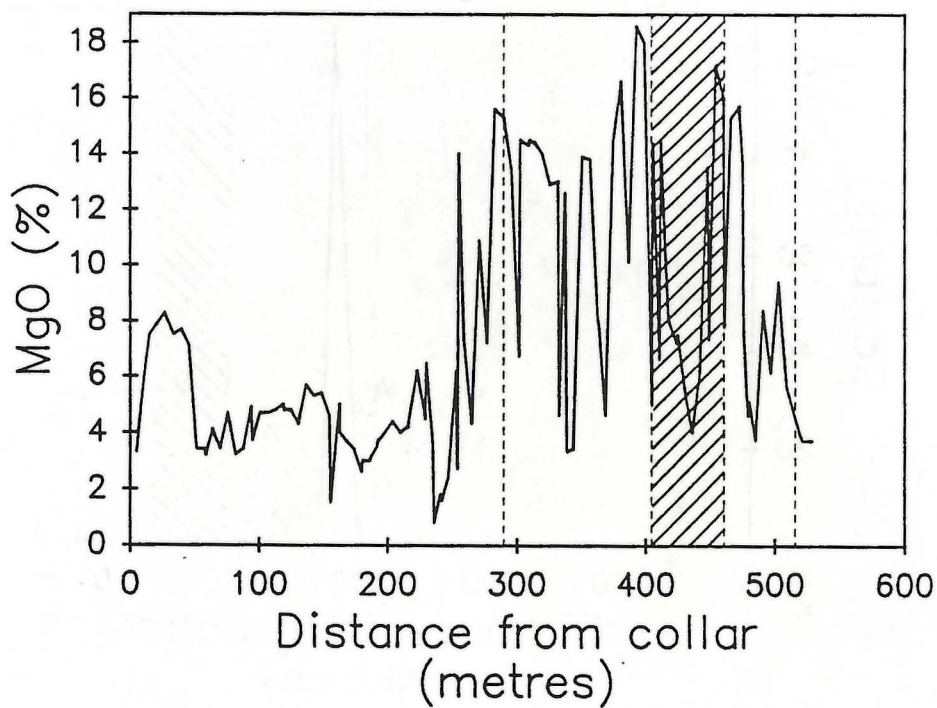


DDH U82-5 Rock Geochemistry



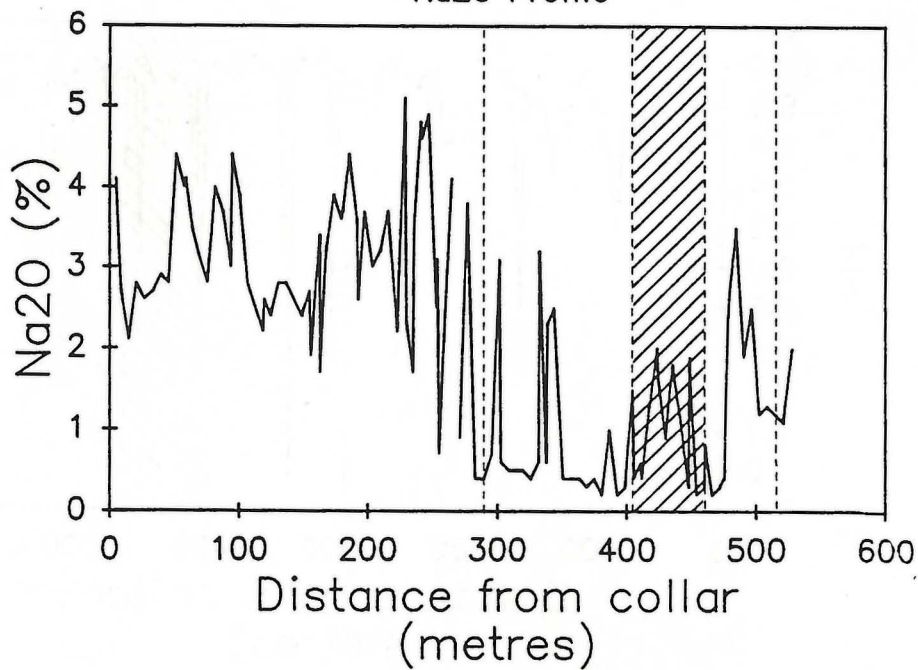
DDH U82-5 Rock Geochemistry

MgO Profile



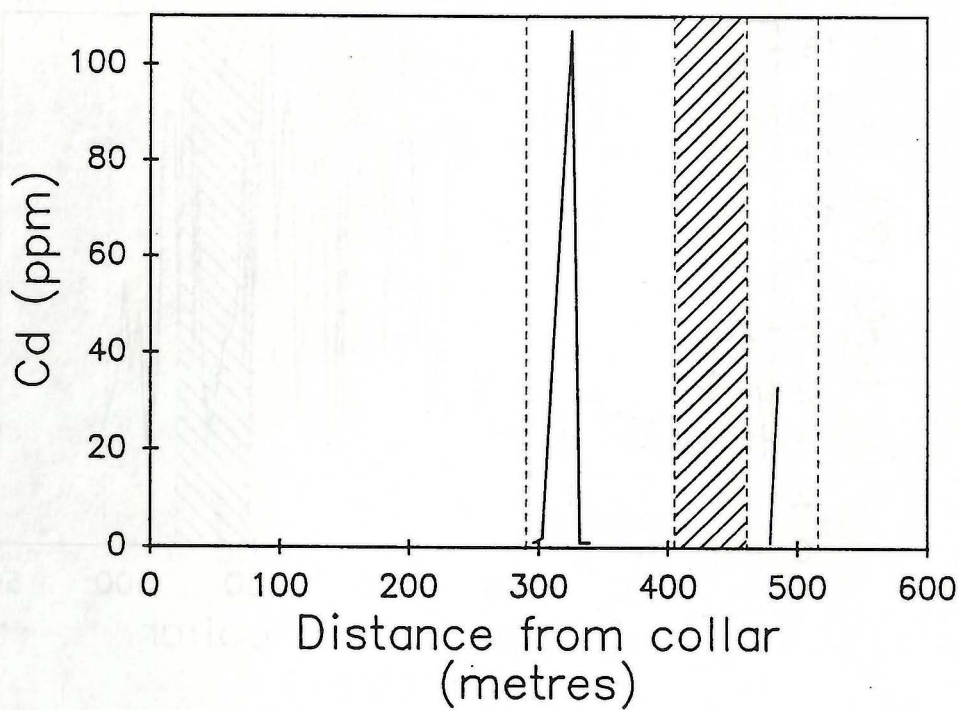
DDH U82-5 Rock Geochemistry

Na2O Profile



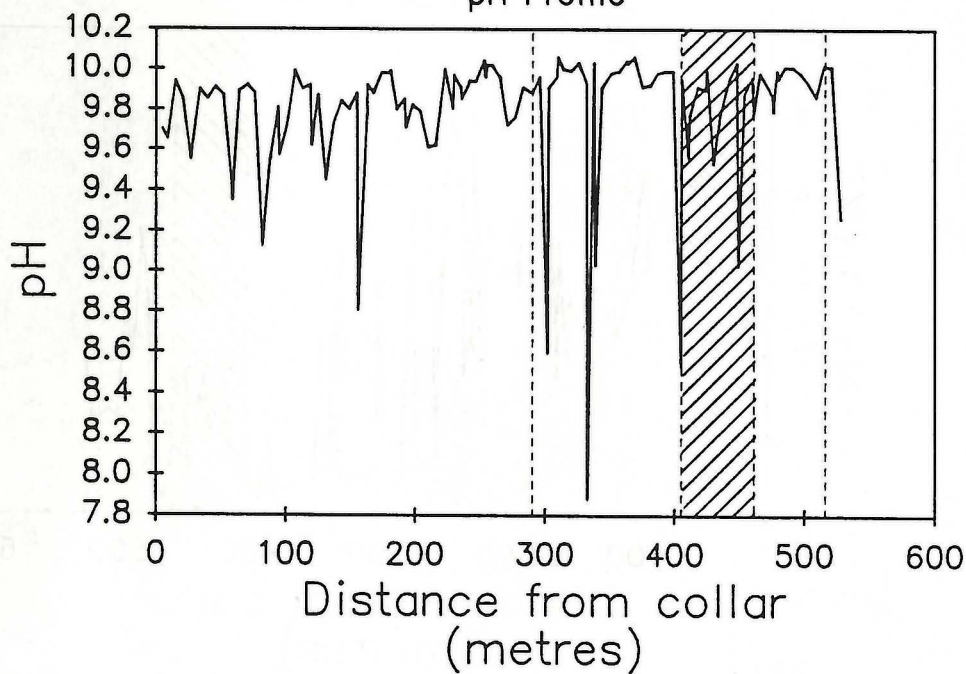
DDH U82-5 Rock Geochemistry

Cd Profile



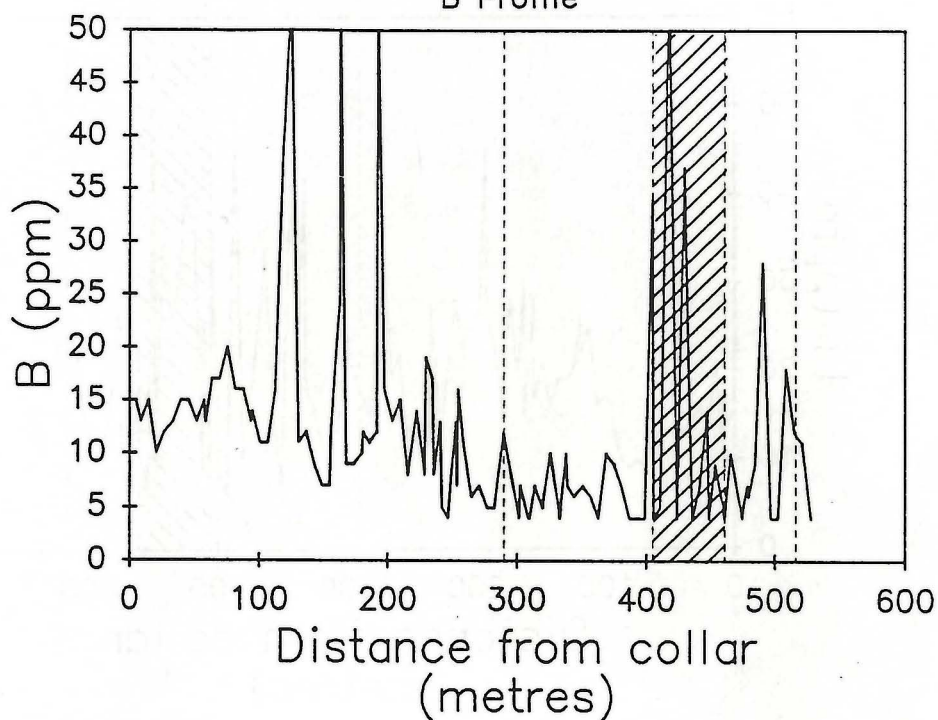
DDH U82-5 Rock Geochemistry

pH Profile



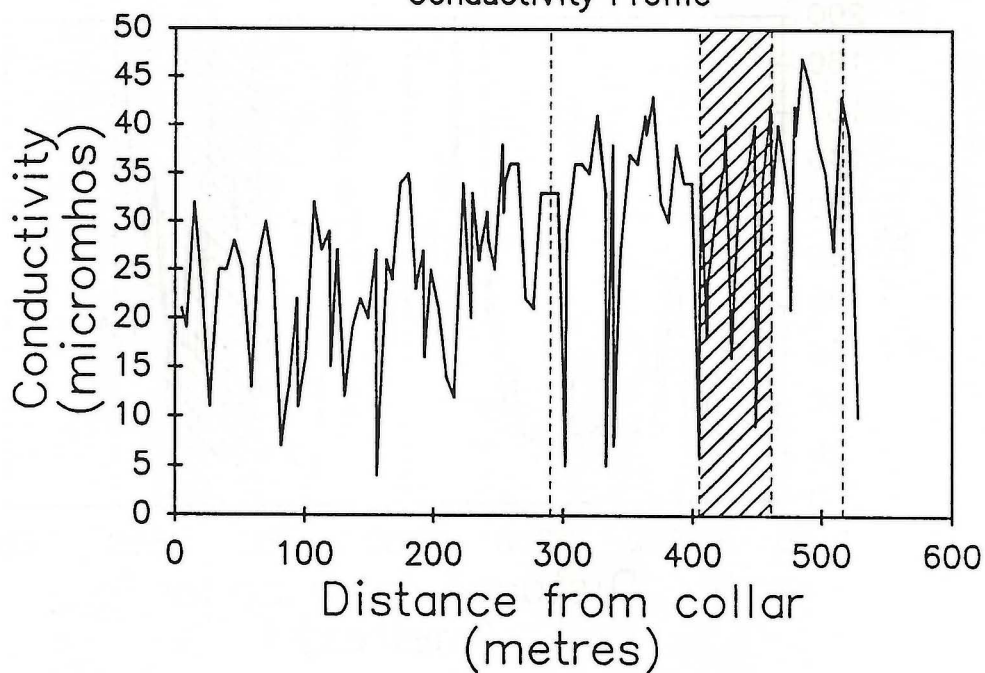
DDH U82-5 Rock Geochemistry

B Profile



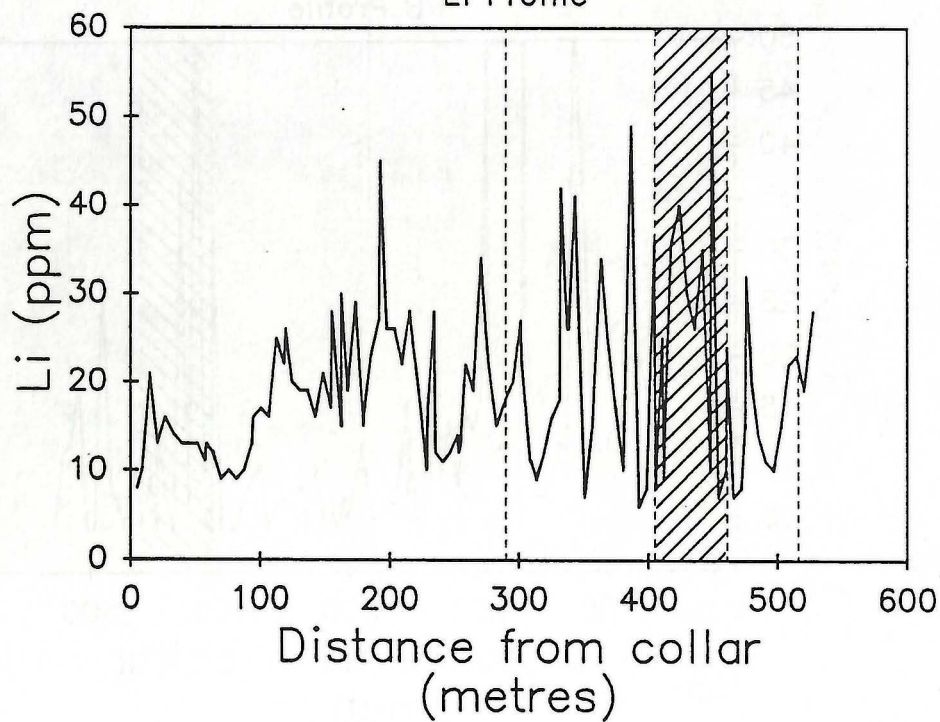
DDH U82-5 Rock Geochemistry

Conductivity Profile



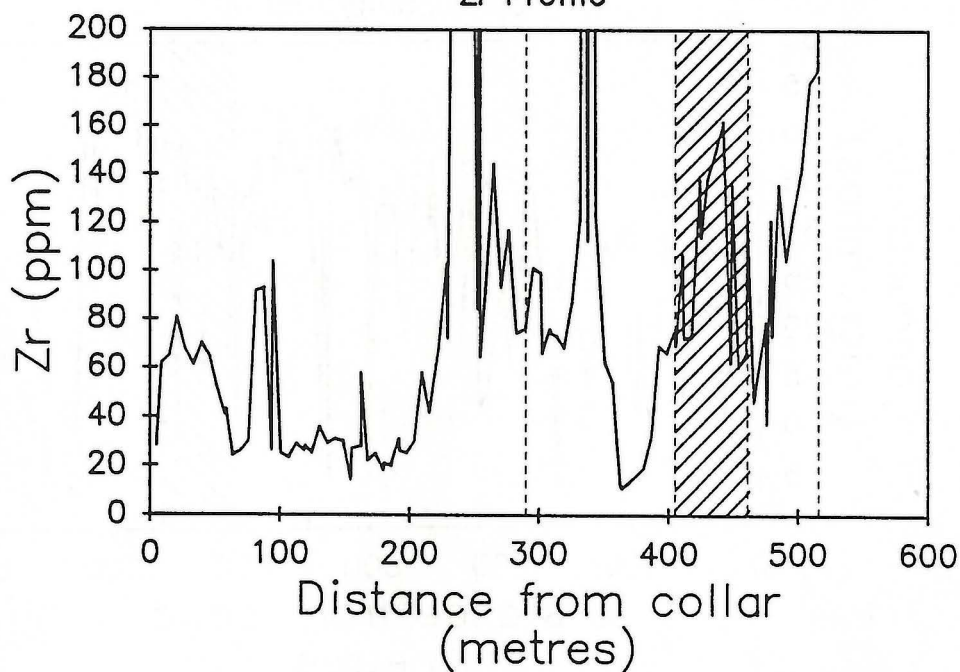
DDH U82-5 Rock Geochemistry

Li Profile

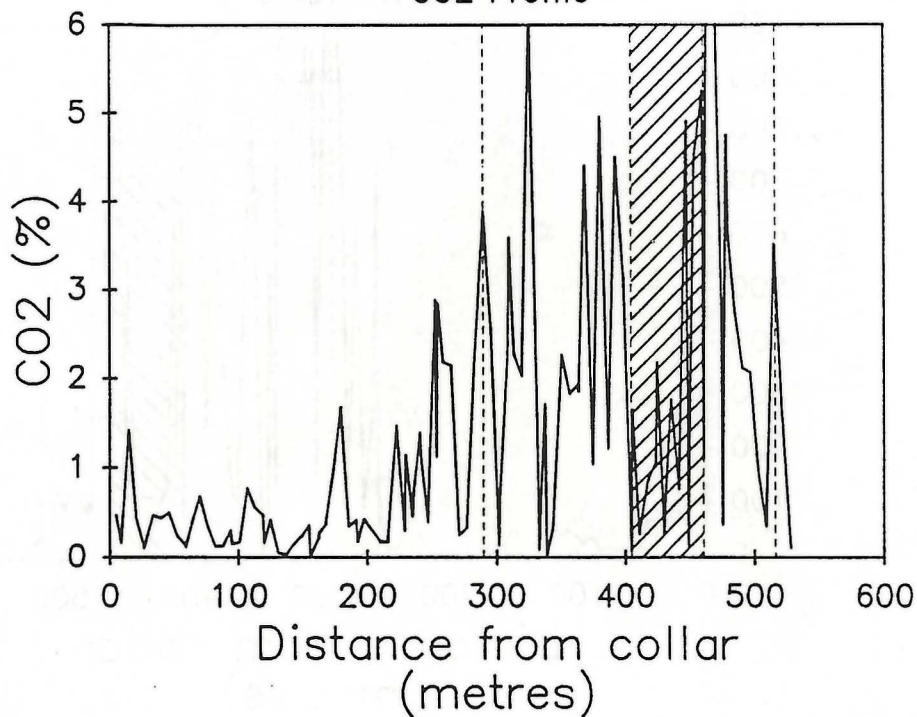


DDH U82-5 Rock Geochemistry

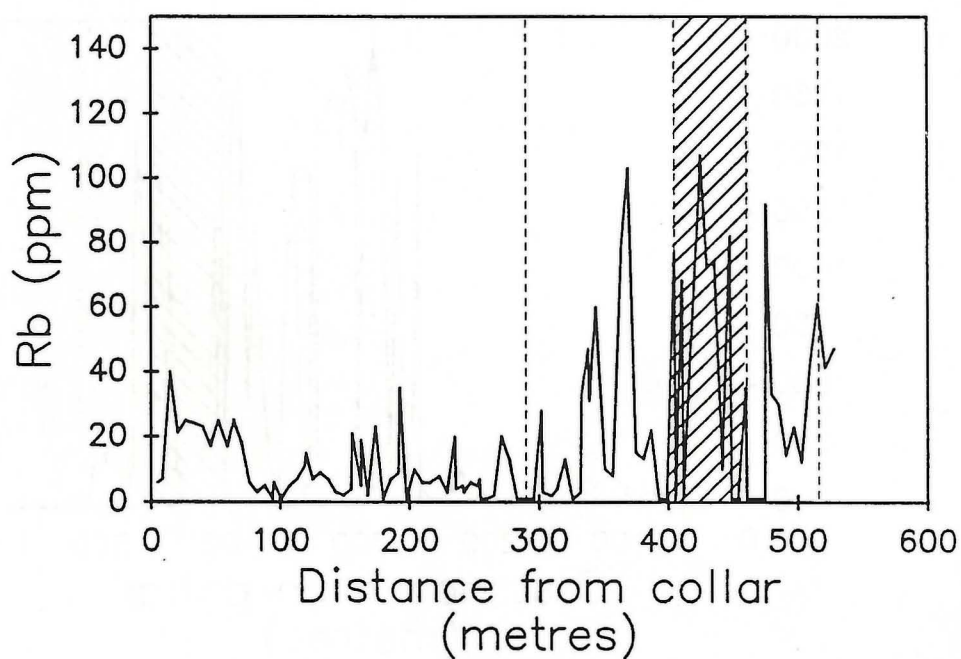
Zr Profile



DDH U82-5 Rock Geochemistry
CO₂ Profile

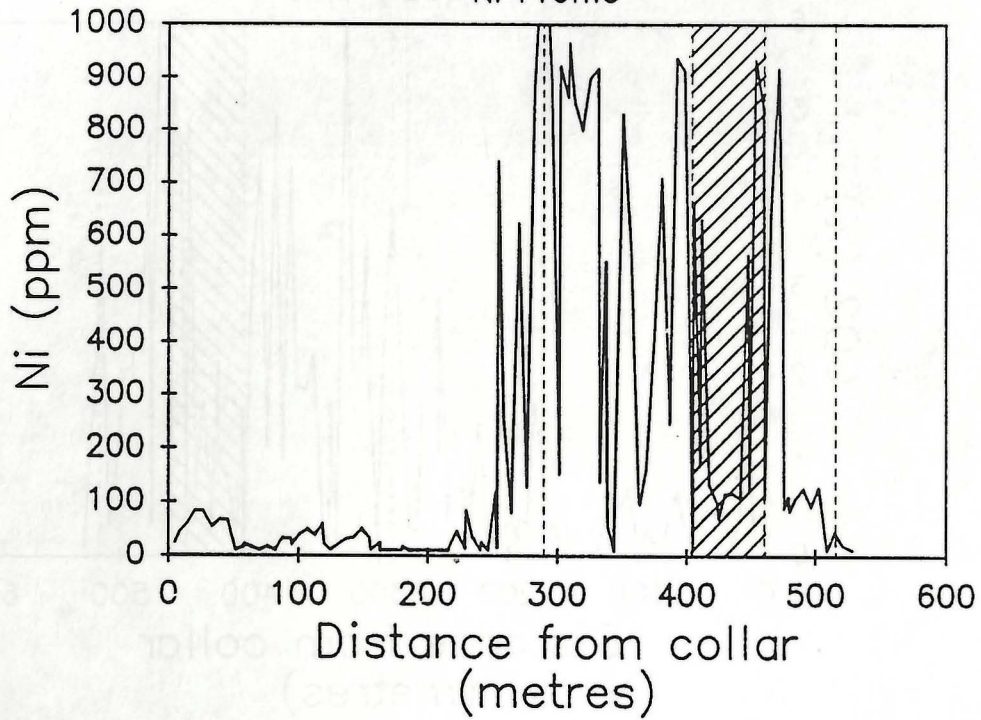


DDH U82-5 Rock Geochemistry
Rb Profile



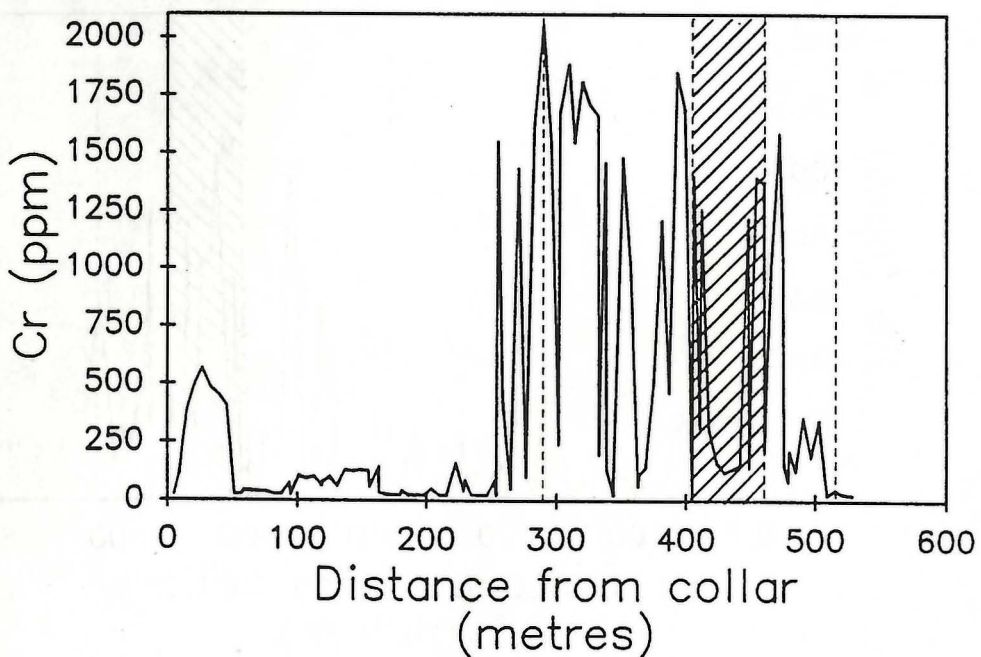
DDH U82-5 Rock Geochemistry

Ni Profile



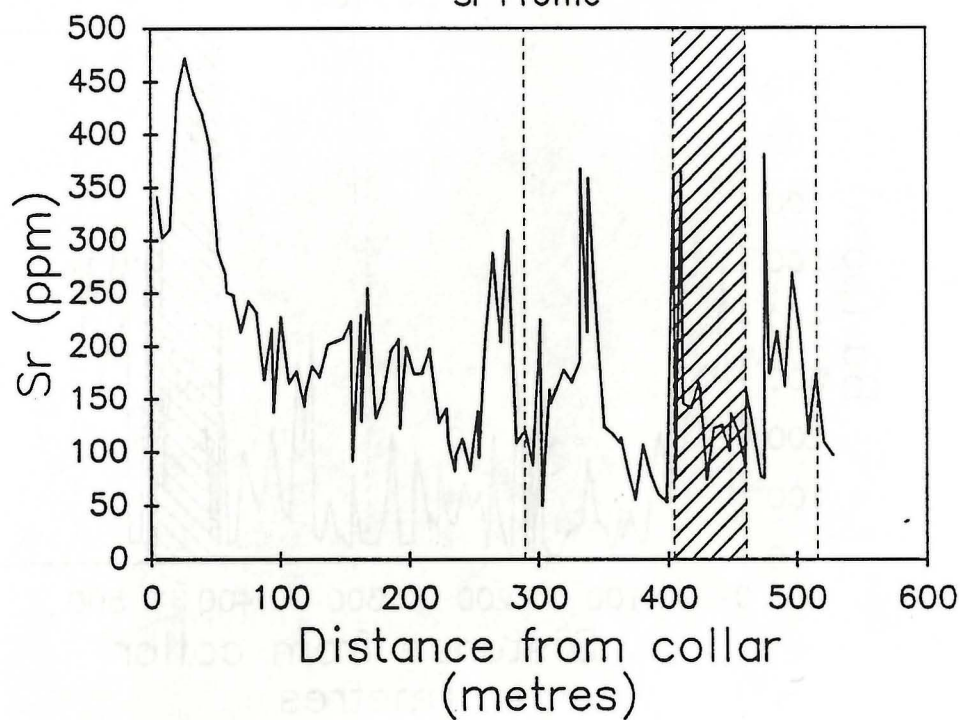
DDH U82-5 Rock Geochemistry

Cr Profile



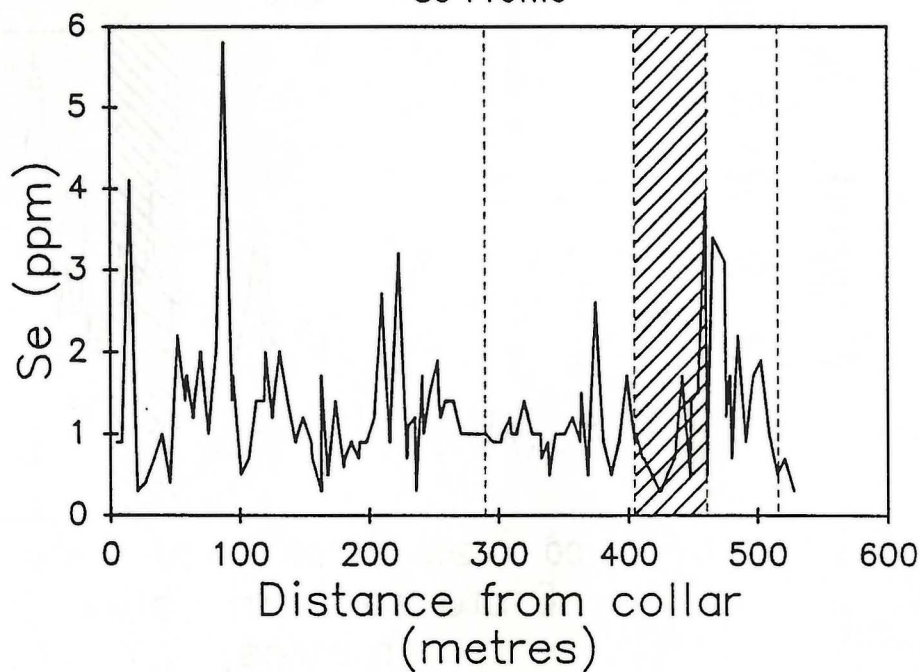
DDH U82-5 Rock Geochemistry

Sr Profile



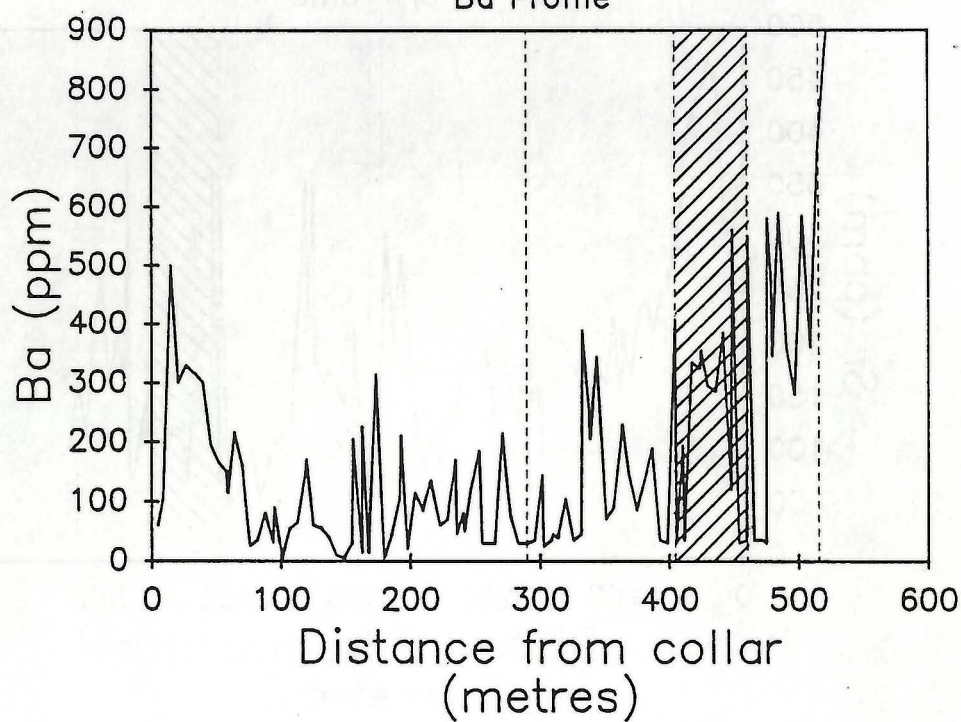
DDH U82-5 Rock Geochemistry

Se Profile



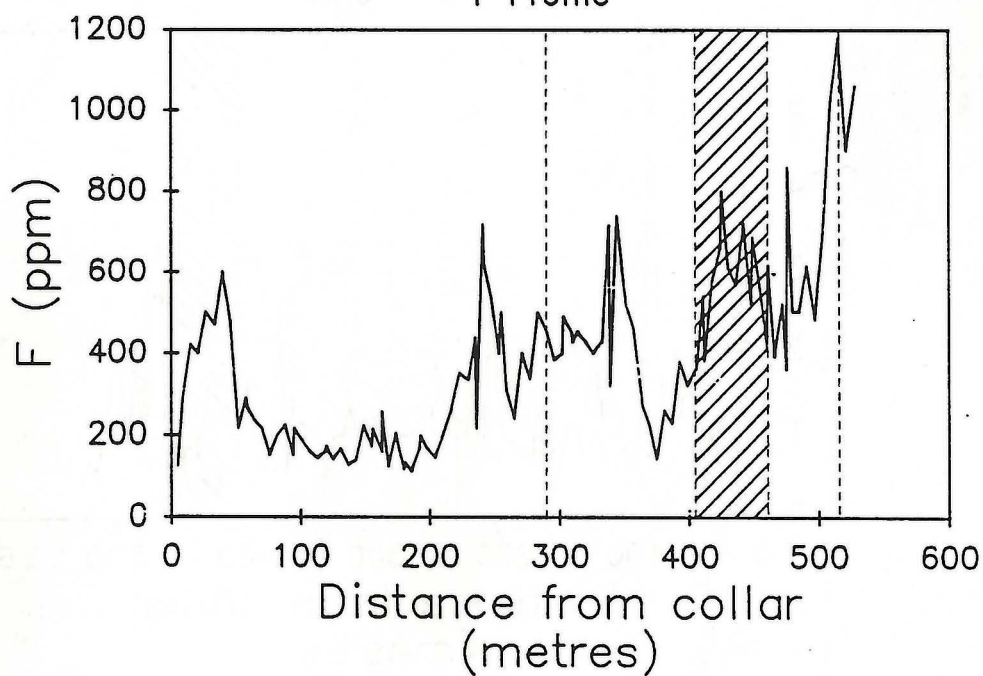
DDH U82-5 Rock Geochemistry

Ba Profile



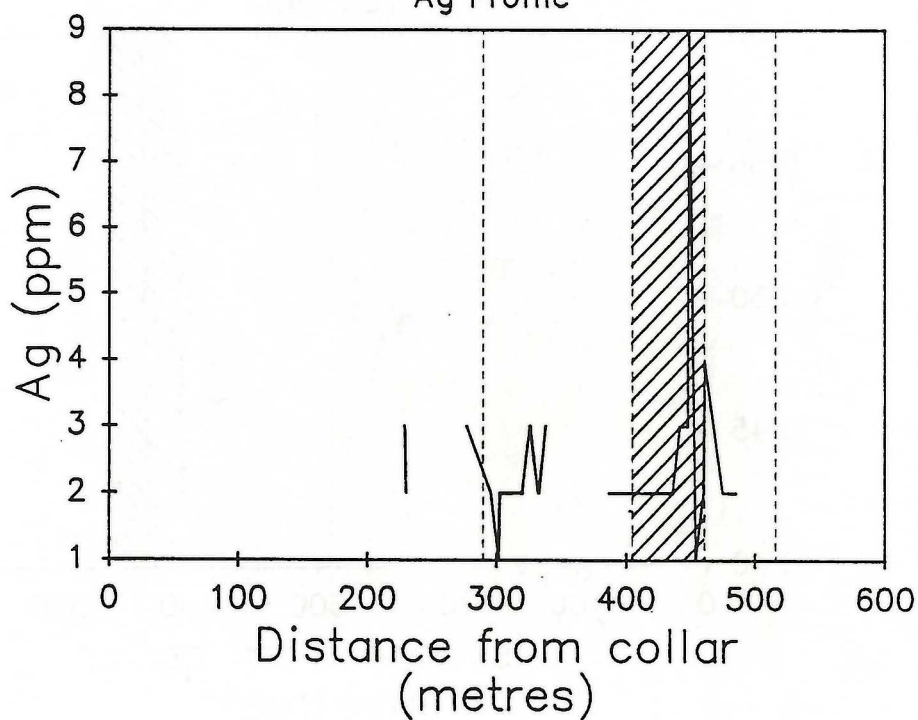
DDH U82-5 Rock Geochemistry

F Profile



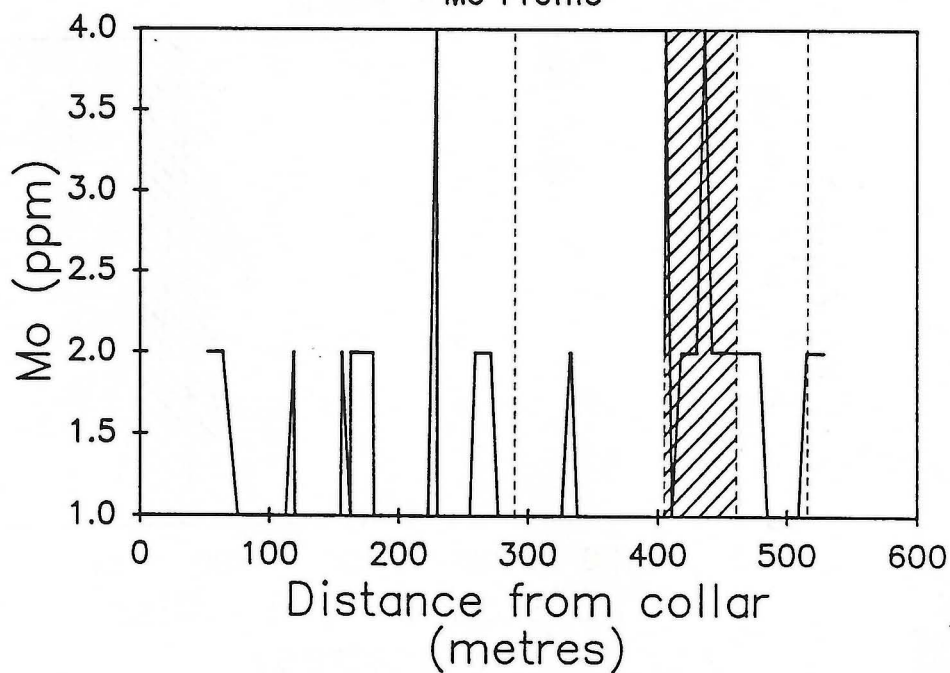
DDH U82-5 Rock Geochemistry

Ag Profile



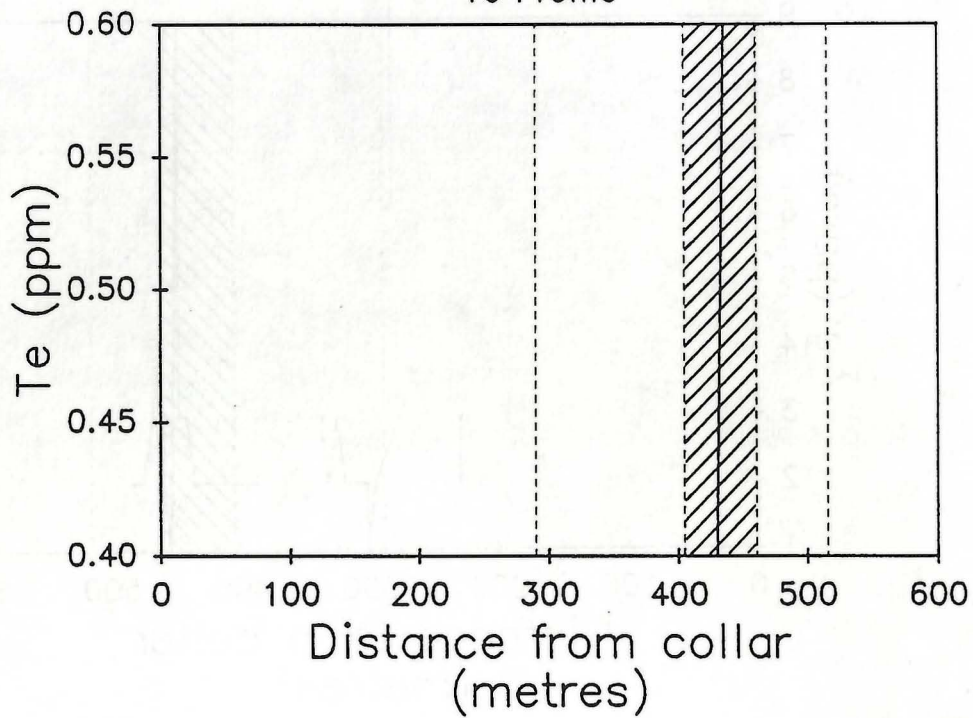
DDH U82-5 Rock Geochemistry

Mo Profile



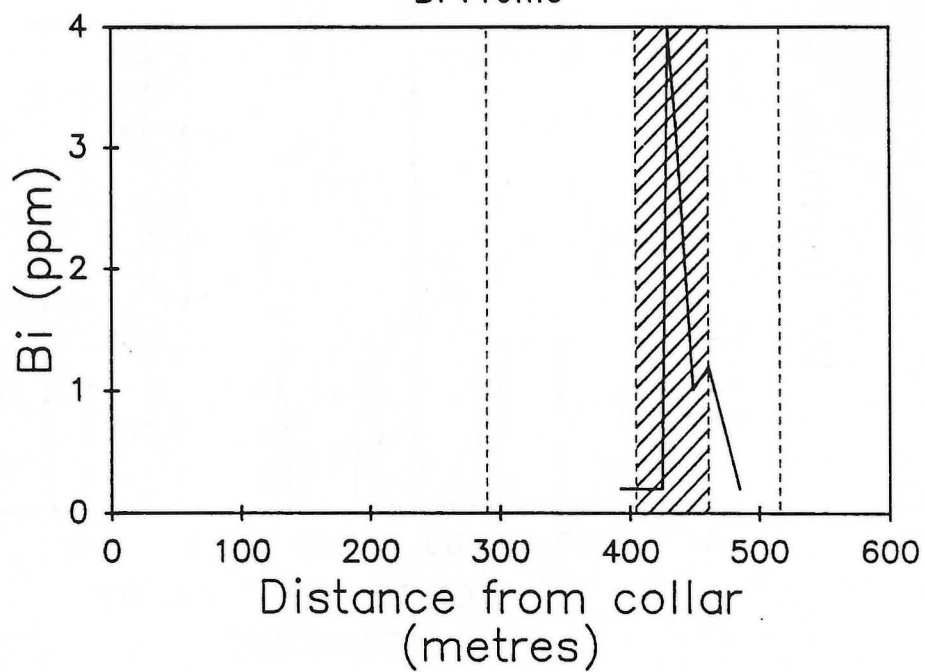
DDH U82-5 Rock Geochemistry

Te Profile



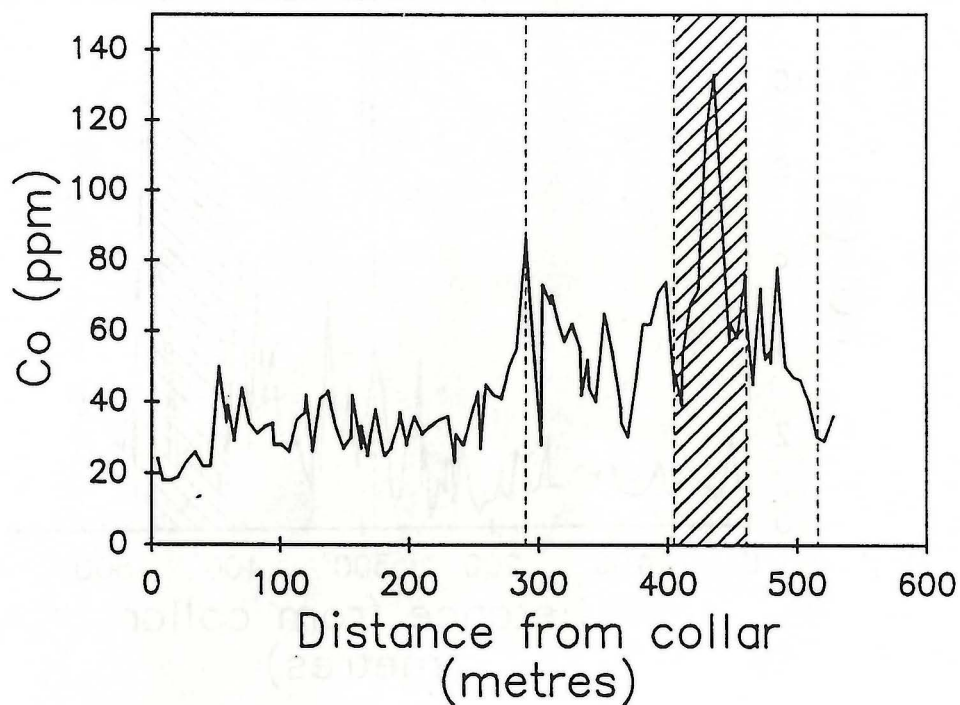
DDH U82-5 Rock Geochemistry

Bi Profile



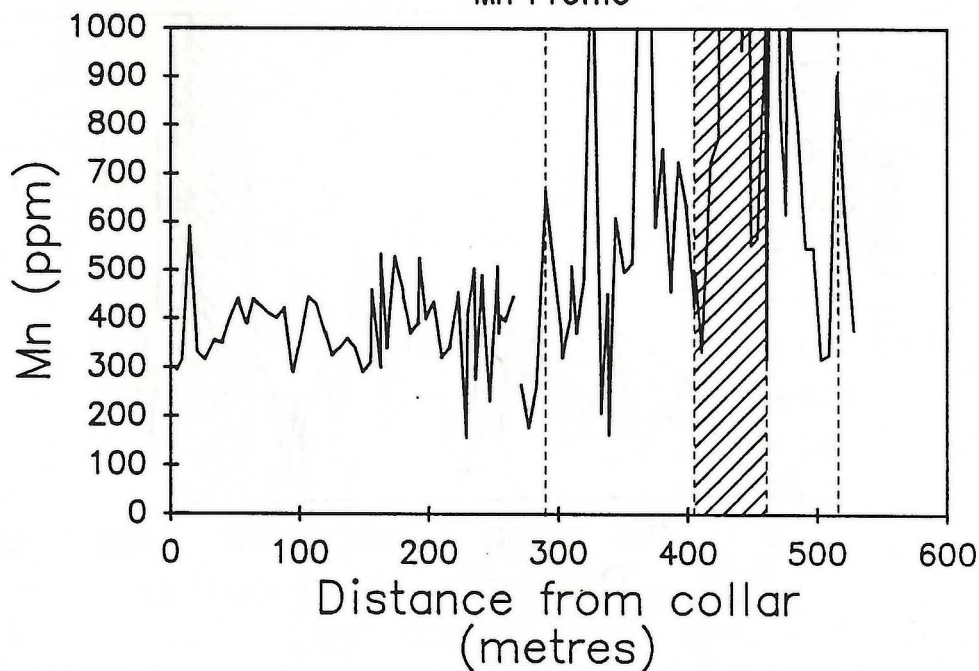
DDH U82-5 Rock Geochemistry

Co Profile



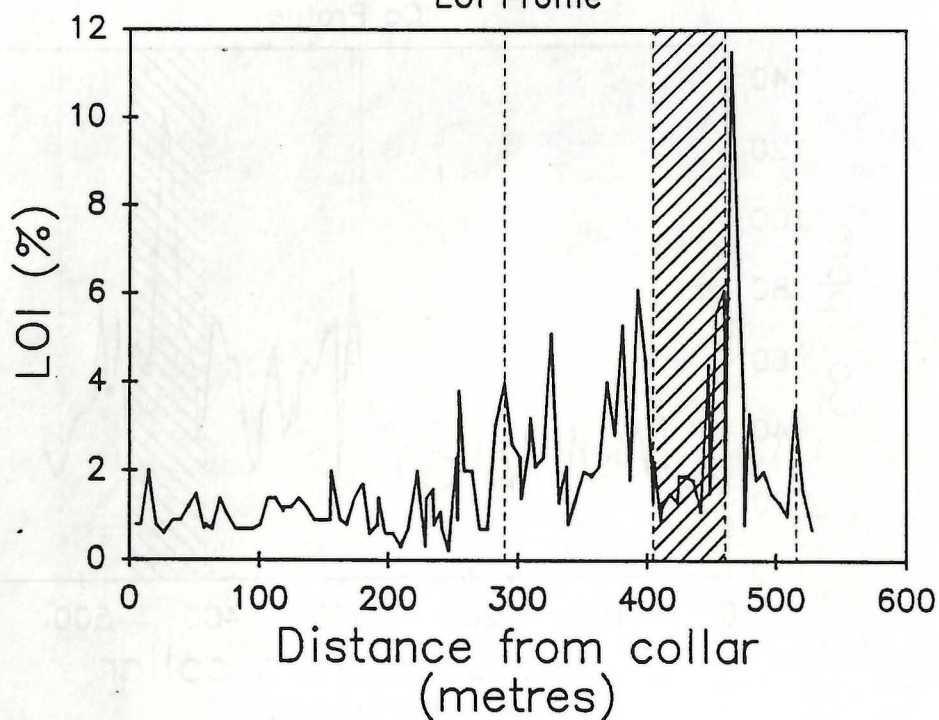
DDH U82-5 Rock Geochemistry

Mn Profile



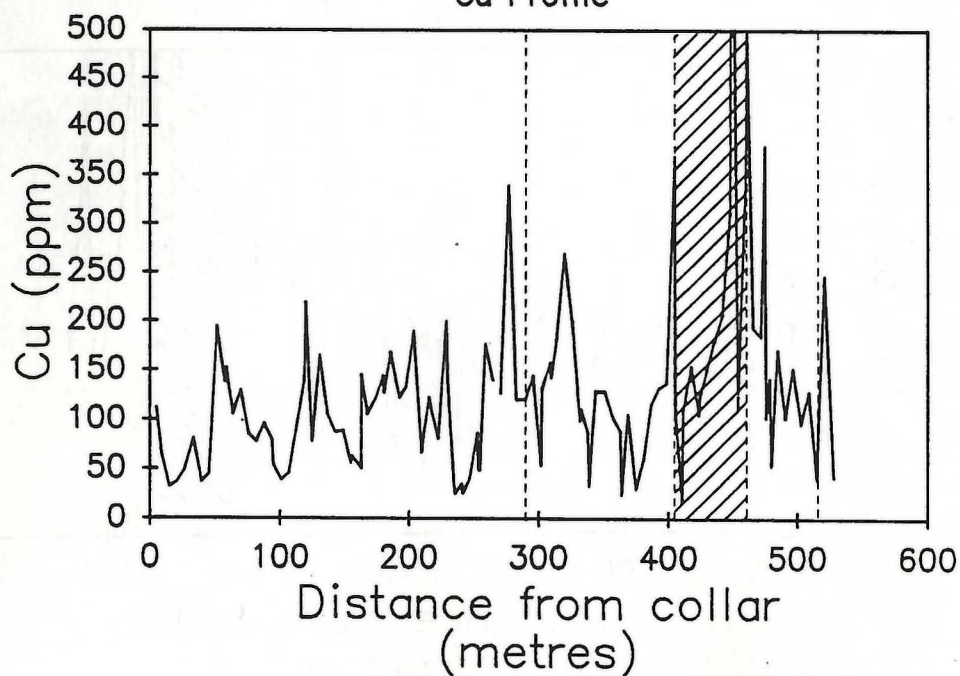
DDH U82-5 Rock Geochemistry

LOI Profile



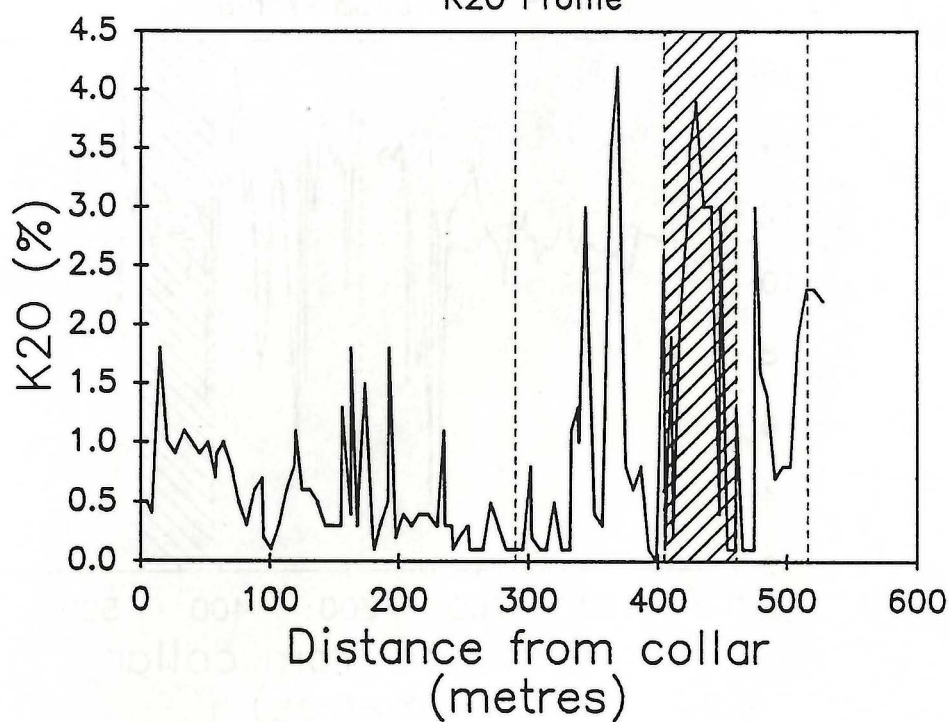
DDH U82-5 Rock Geochemistry

Cu Profile



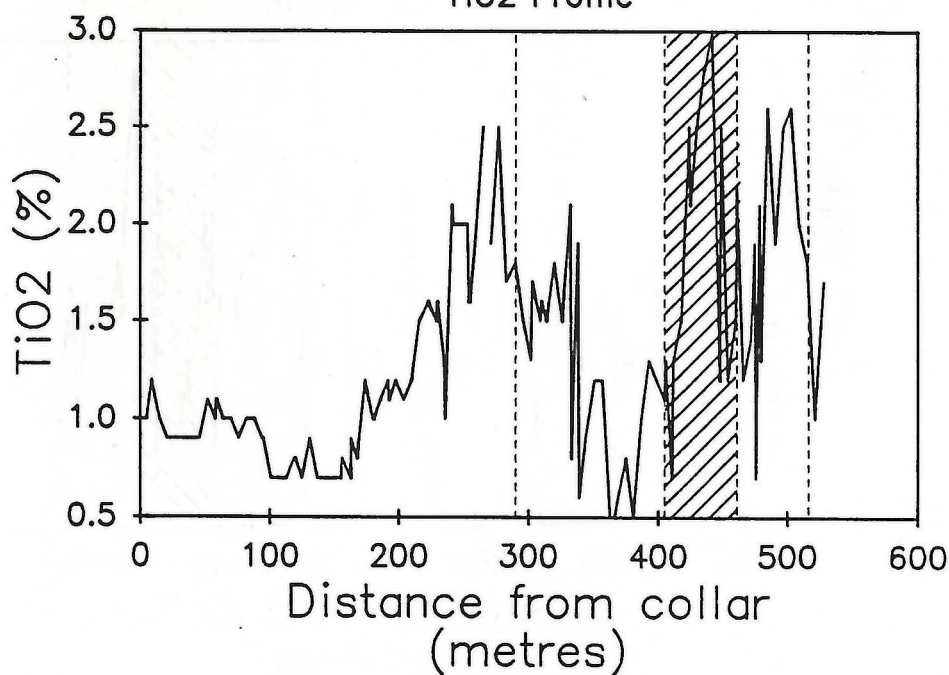
DDH U82-5 Rock Geochemistry

K2O Profile



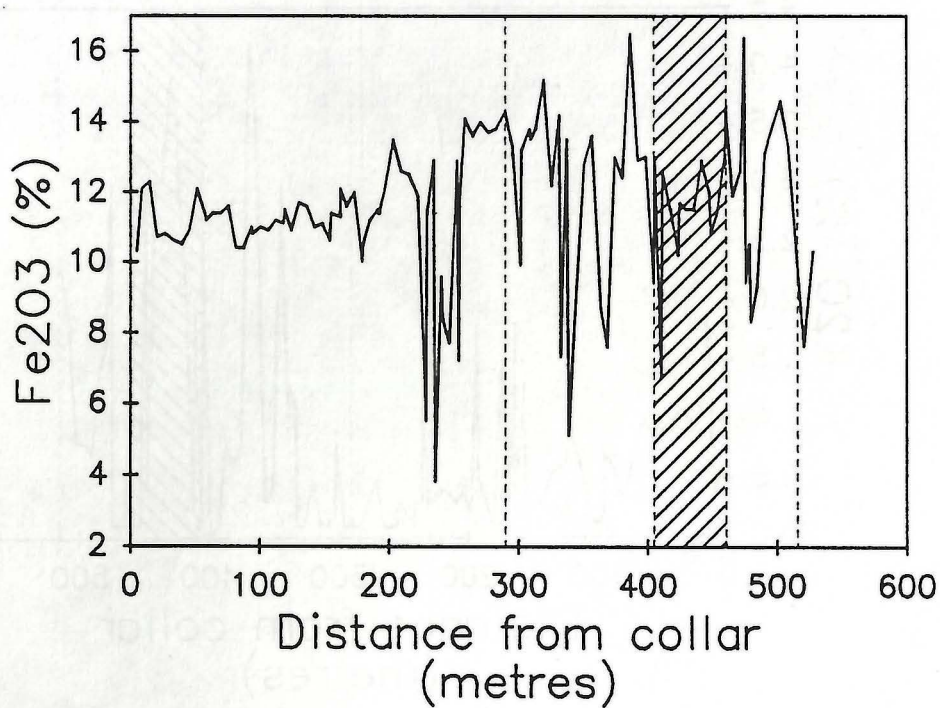
DDH U82-5 Rock Geochemistry

TiO2 Profile



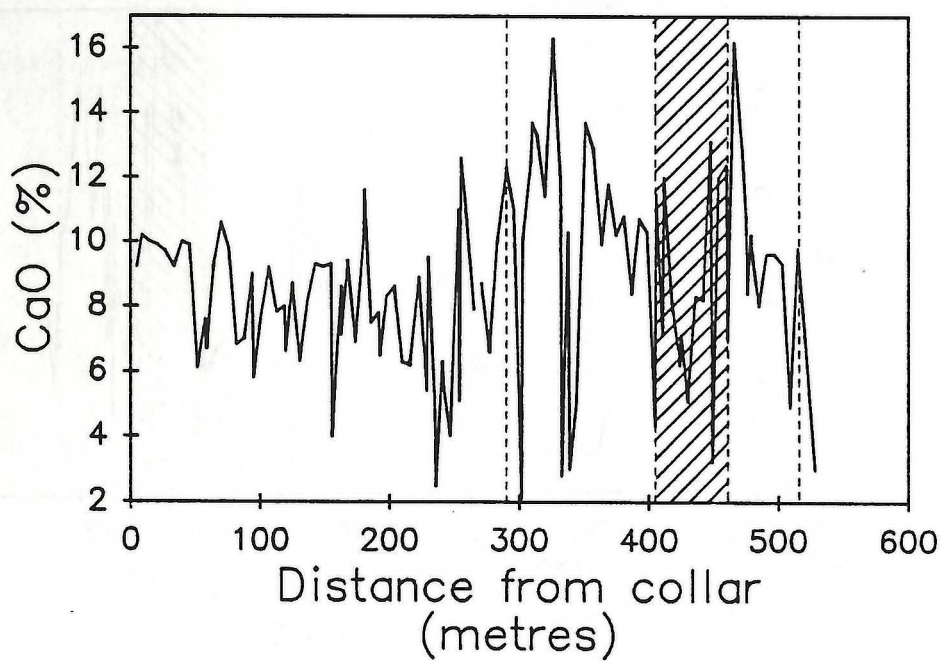
DDH U82-5 Rock Geochemistry

Fe2O3 Profile



DDH U82-5 Rock Geochemistry

CaO Profile



APPENDIX IV

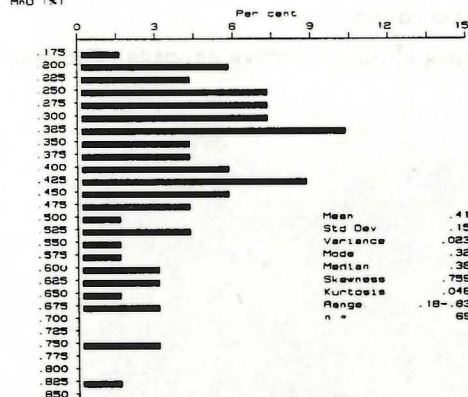
PART 1: Histograms with descriptive statistics for host and background rocks

Histograms and some descriptive statistics are provided for each rock type at the respective deposits. Grouped rock types are designated as follows:

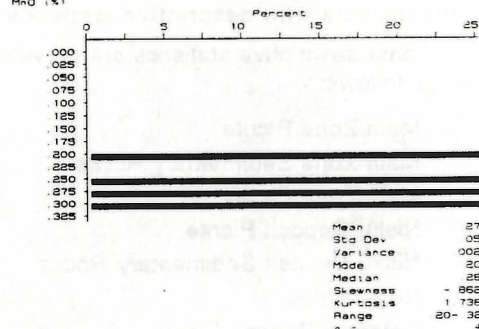
- Group 1: Main Zone Picrite
- Group 2: Main Zone Sedimentary Rocks
- Group 3: Main Zone Basalt
- Group 4: Nisku Deposit Picrite
- Group 5: Nisku Deposit Sedimentary Rocks
- Group 6: No samples
- Group 7: Rainbow Deposit Picrite
- Group 8: Rainbow Deposit Sedimentary rocks
- Group 9: No samples
- Group 10: Background Picrite East
- Group 11: Background Basalt East
- Group 12: Background Sedimentary Rocks East
- Group 13: Background Picrite West

"Background" samples were collected from drill core both east and west of the deposits for comparison with mineralized and altered counterparts.

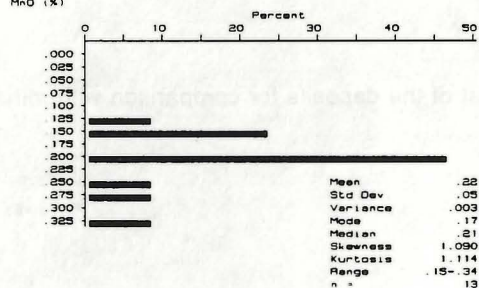
Group 1 - Main Zone Picrite



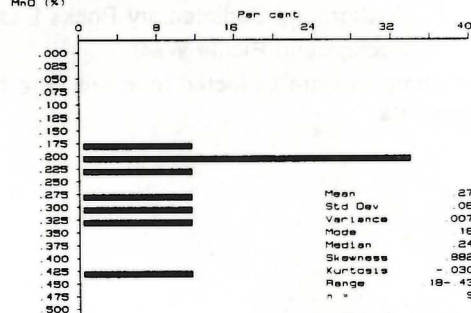
Group 10 - Background Picrite East



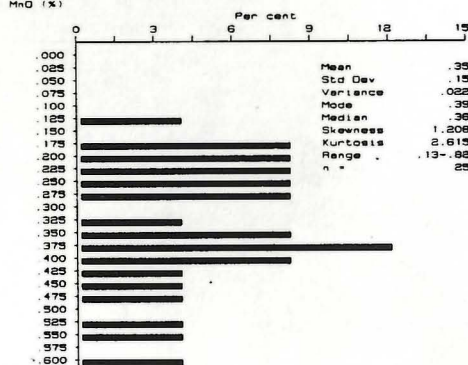
Group 13 - Background Picrite West



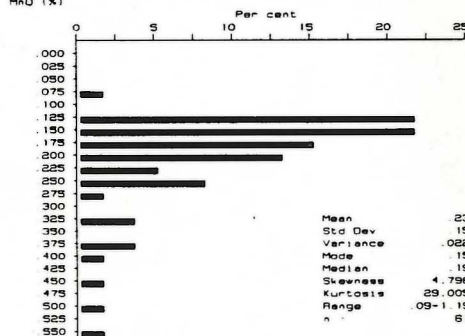
Group 4 - East Zone (Nisku) Picrite



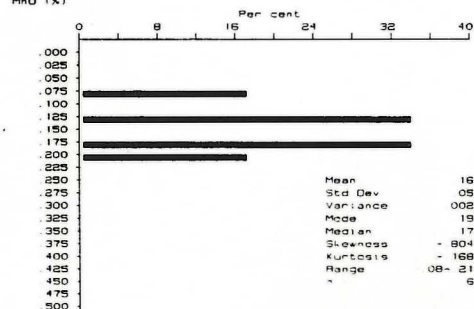
Group 7 - West Zone (Rainbow) Picrite



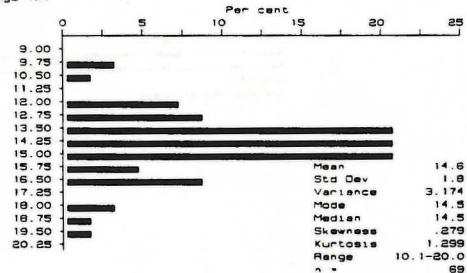
Group 3 - Main Zone Basalt



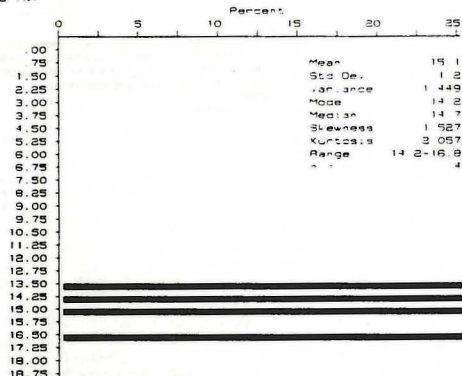
Group 11 - Background Basalt East



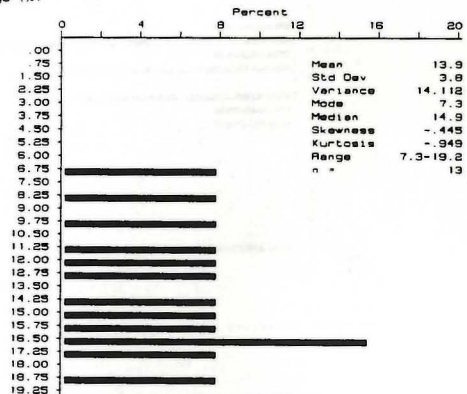
Group 1 - Main Zone Picrite
MgO (%)



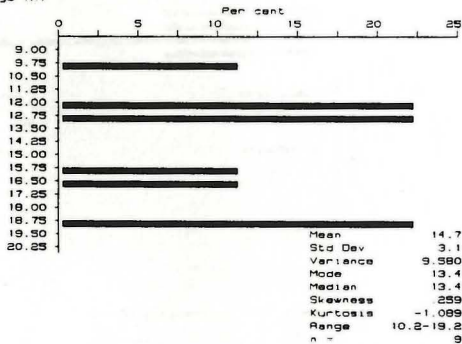
Group 10 - Background Picrite East
MgO (%)



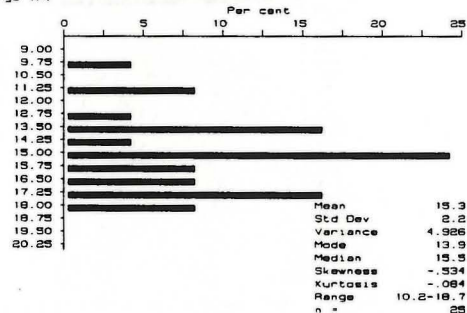
Group 13 - Background Picrite West
MgO (%)



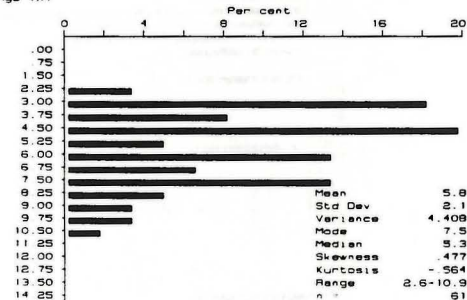
Group 4 - East Zone (Nisku) Picrite
MgO (%)



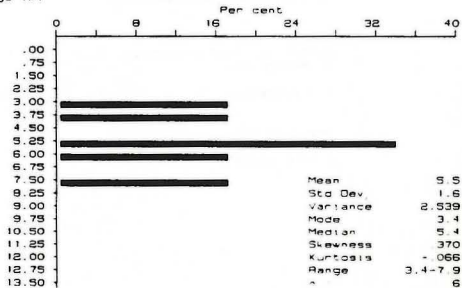
Group 7 - West Zone (Rainbow) Picrite
MgO (%)



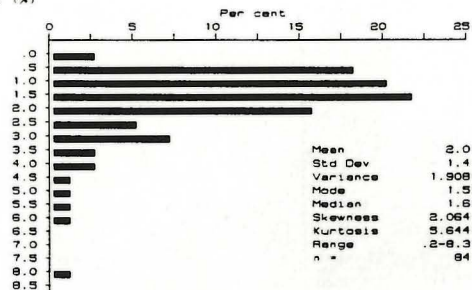
Group 3 - Main Zone Basalt
MgO (%)



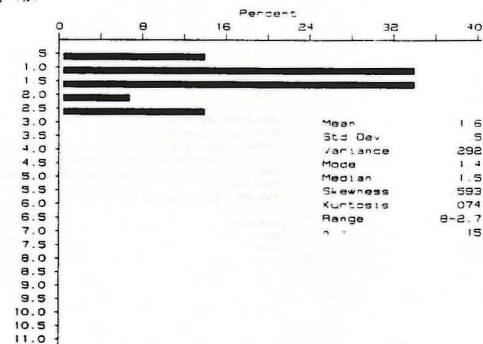
Group 11 - Background Basalt East
MgO (%)



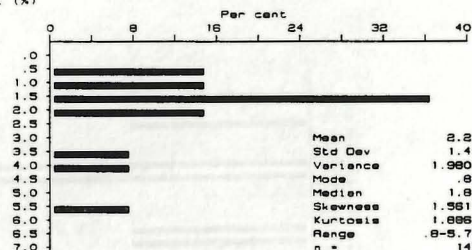
Group 2 - Main Zone Sedimentary Rocks
LOI (%)



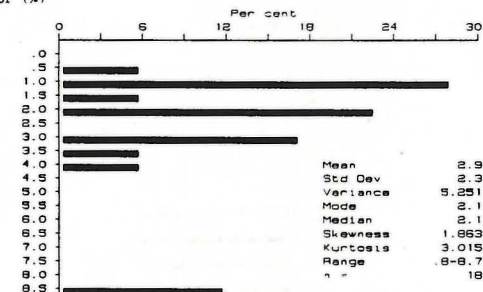
Group 12 - Background Sedimentary East
LOI (%)



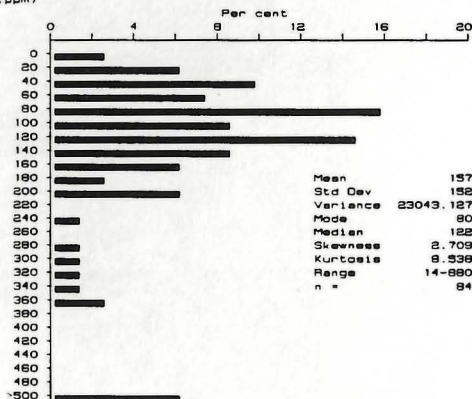
Group 5 - East Zone (Nisku) Sedimentary Rocks
LOI (%)



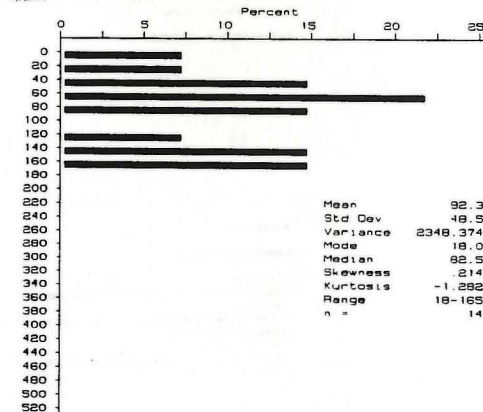
Group 8 - West Zone (Rainbow) Sedimentary Rocks
LOI (%)



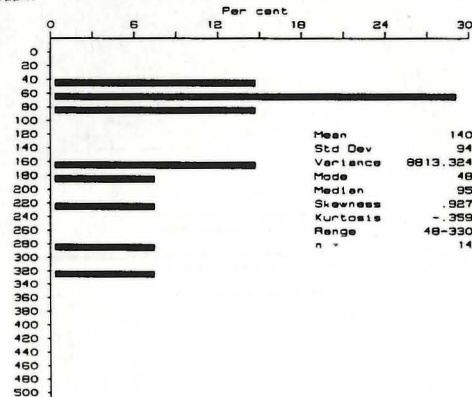
Group 2 - Main Zone Sedimentary Rocks
Cu (ppm)



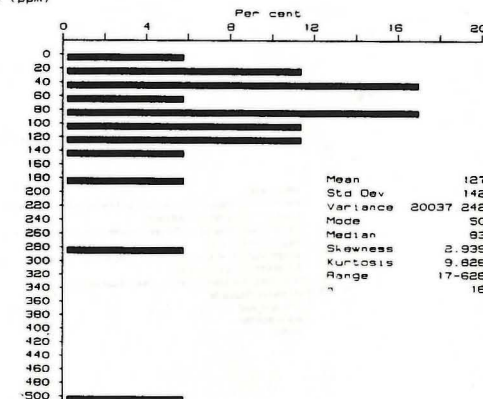
Group 12 - Background Sedimentary East
Cu (ppm)



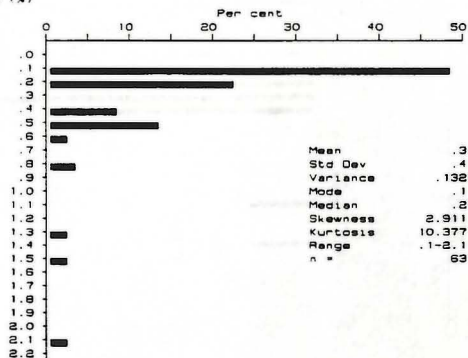
Group 5 - East Zone (Nisku) Sedimentary Rocks
Cu (ppm)



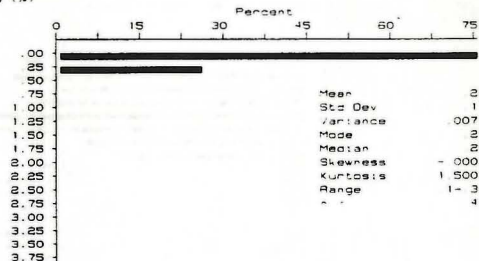
Group 8 - West Zone (Rainbow) Sedimentary Rocks
Cu (ppm)



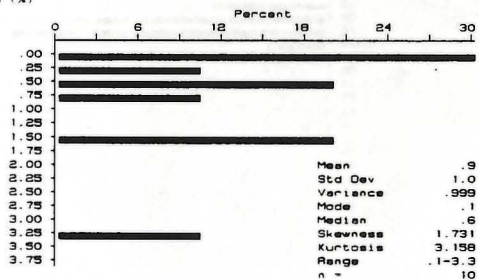
Group 1 - Main Zone Picrite
K20 (%)



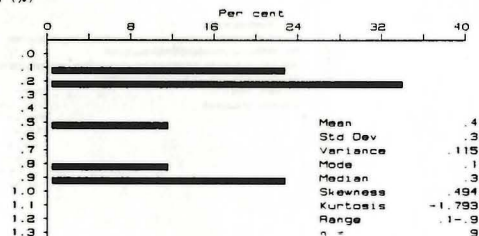
Group 10 - Background Picrite East
K20 (%)



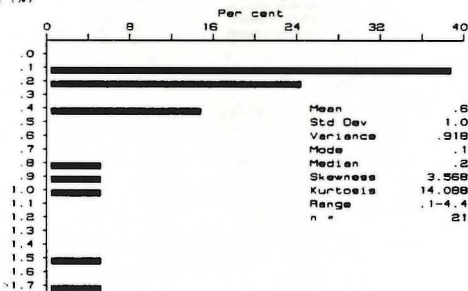
Group 13 - Background Picrite West
K20 (%)



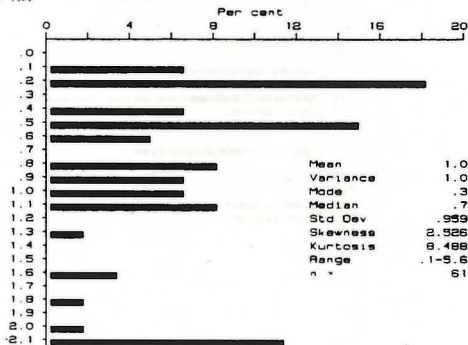
Group 4 - East Zone (Nisku) Picrite
K20 (%)



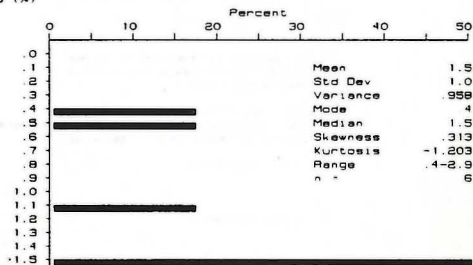
Group 7 - West Zone (Rainbow) Picrite
K20 (%)



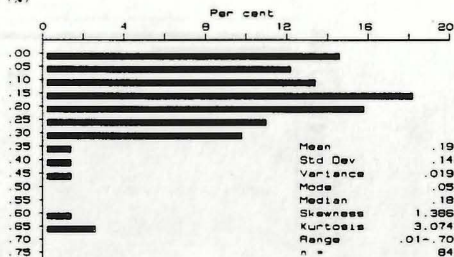
Group 3 - Main Zone Basalt
K20 (%)



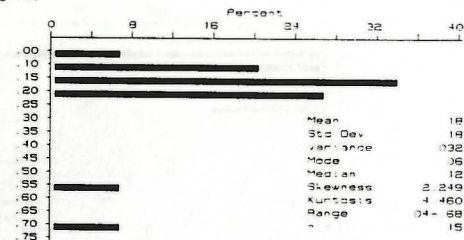
Group 11 - Background Basalt East
K20 (%)



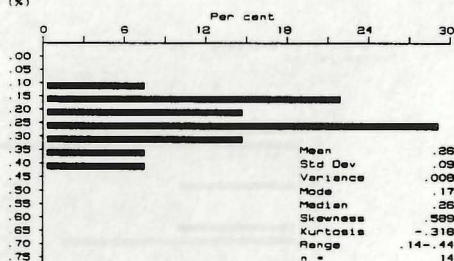
Group 2 - Main Zone Sedimentary Rocks
P205 (%)



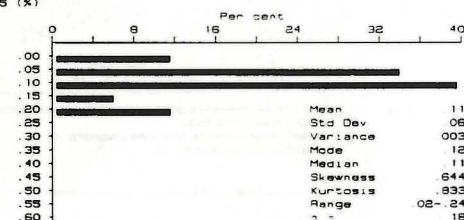
Group 12 - Background Sedimentary East
P205 (%)



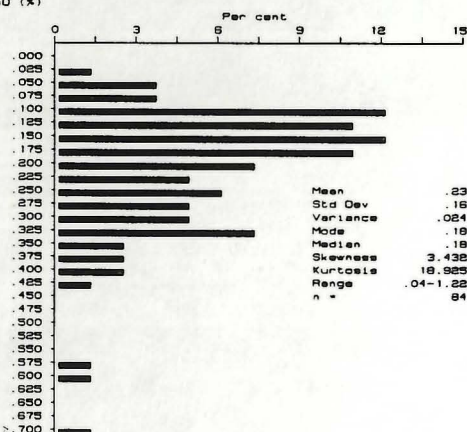
Group 5 - East Zone (Nisku) Sedimentary Rocks
P205 (%)



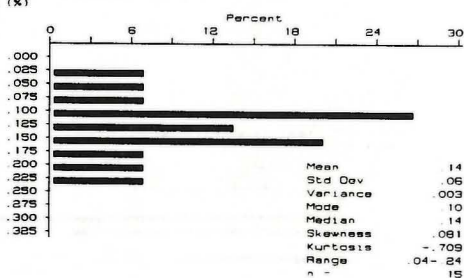
Group 8 - West Zone (Rainbow) Sedimentary Rocks
P205 (%)



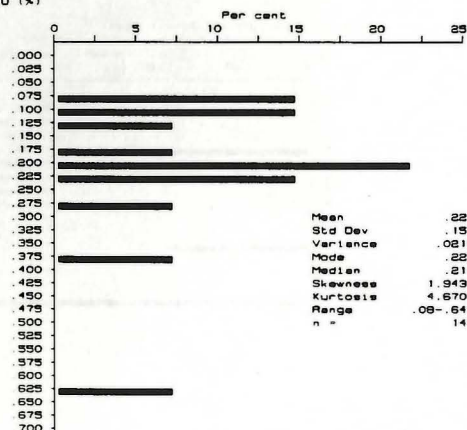
Group 2 - Main Zone Sedimentary Rocks
MnO (%)



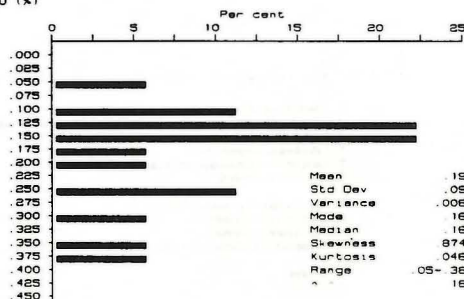
Group 12 - Background Sedimentary East
MnO (%)



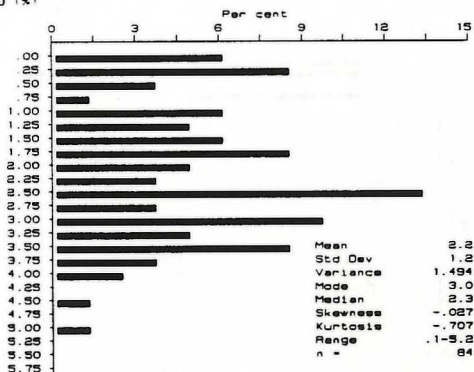
Group 5 - East Zone (Nisku) Sedimentary Rocks
MnO (%)



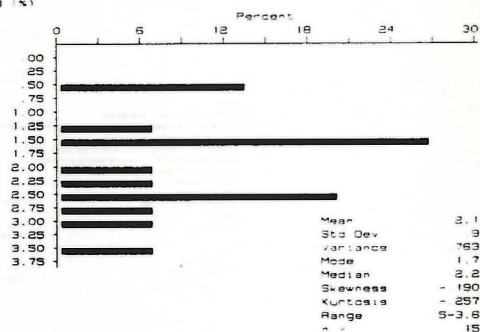
Group 8 - West Zone (Rainbow) Sedimentary Rocks
MnO (%)



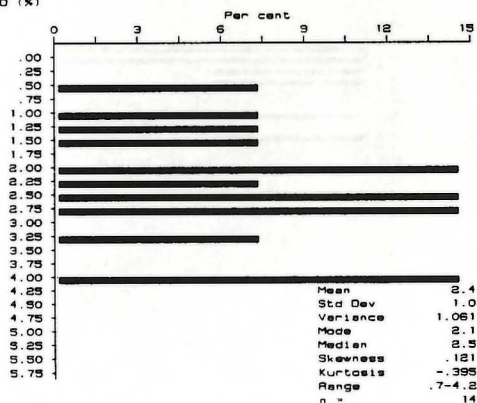
Group 2 - Main Zone Sedimentary Rocks
K20 (%)



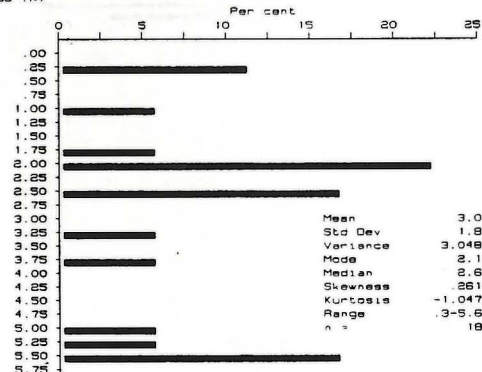
Group 12 - Background Sedimentary East
K20 (%)



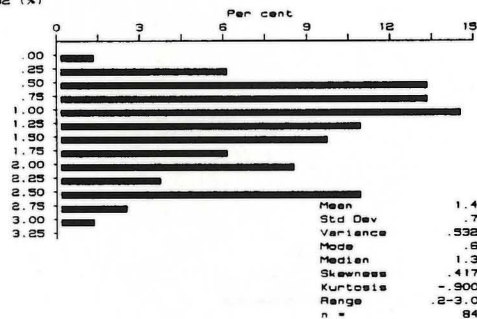
Group 5 - East Zone (Nisku) Sedimentary Rocks
K20 (%)



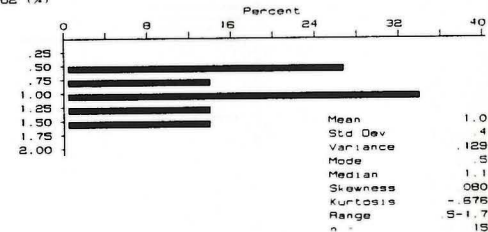
Group 8 - West Zone (Rainbow) Sedimentary Rocks
K20 (%)



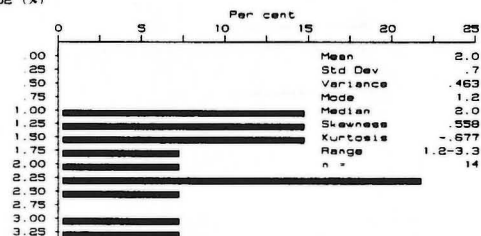
Group 2 - Main Zone Sedimentary Rocks
T102 (%)



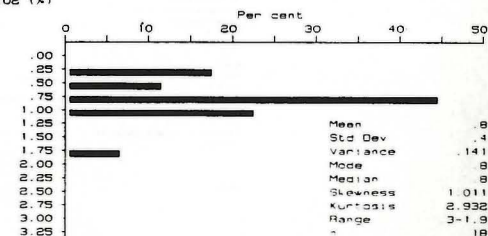
Group 12 - Background Sedimentary East
T102 (%)



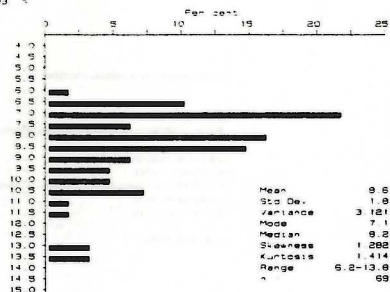
Group 5 - East Zone (Nisku) Sedimentary Rocks
T102 (%)



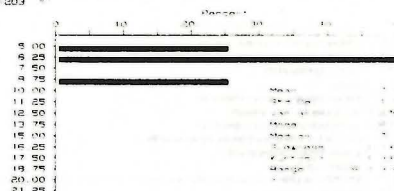
Group 8 - West Zone (Rainbow) Sedimentary Rocks
T102 (%)



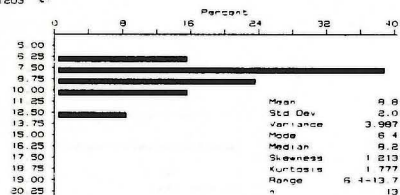
Group 1 - Main Zone Picrite
A1203 (%)



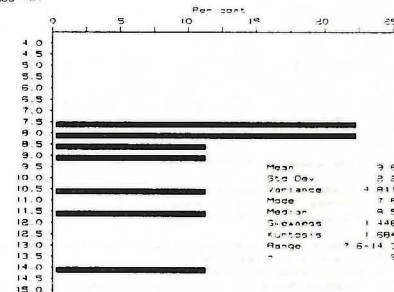
Group 10 - Background Picrite East
A1203 (%)



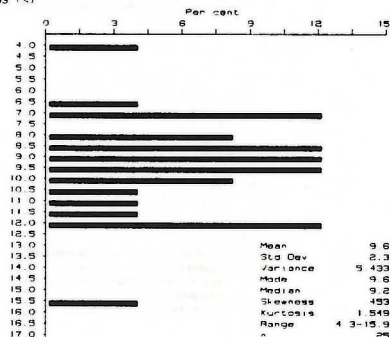
Group 13 - Background Picrite West
A1203 (%)



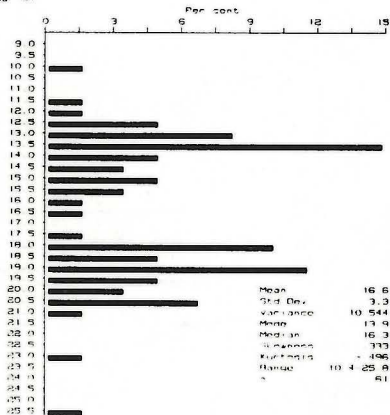
Group 4 - East Zone Nishu Picrite
A1203 (%)



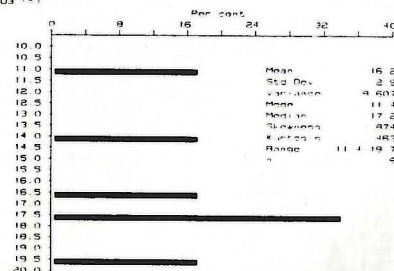
Group 7 - West Zone (Rainbow) Picrite
A1203 (%)



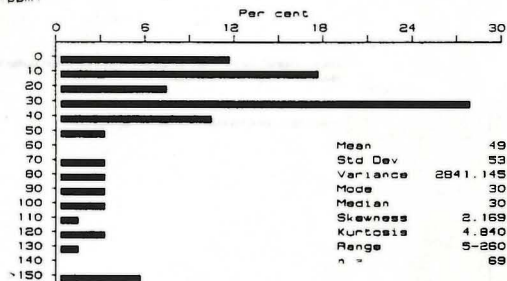
Group 3 - Main Zone Basalt
A1203 (%)



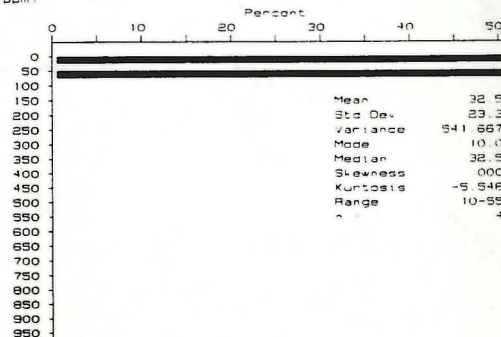
Group 11 - Background Basalt East
A1203 (%)



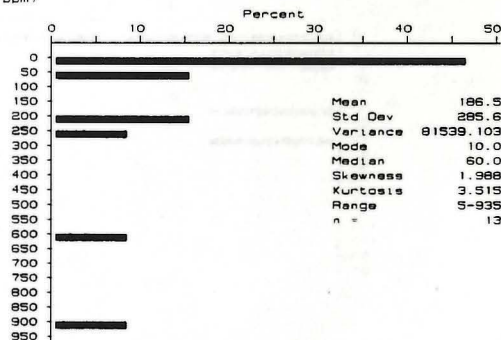
Group 1 - Main Zone Picrite
Ba (ppm)



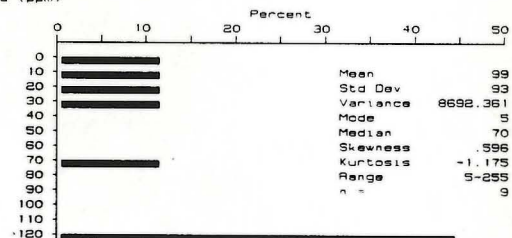
Group 10 - Background Picrite East
Ba (ppm)



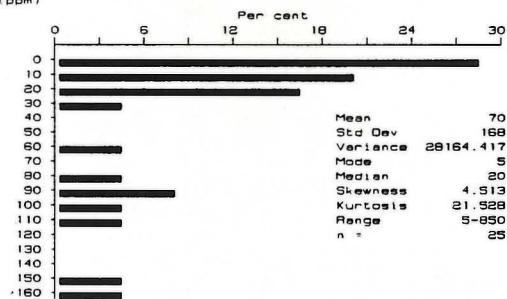
Group 13 - Background Picrite West
Ba (ppm)



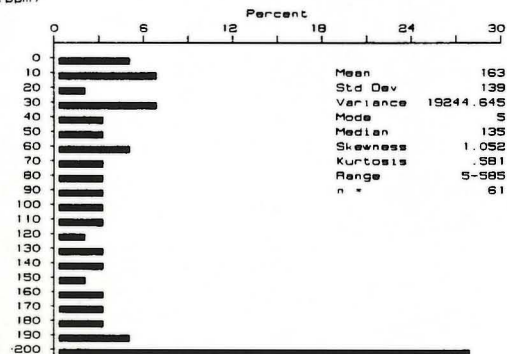
Group 4 - East Zone (Nisku) Picrite
Ba (ppm)



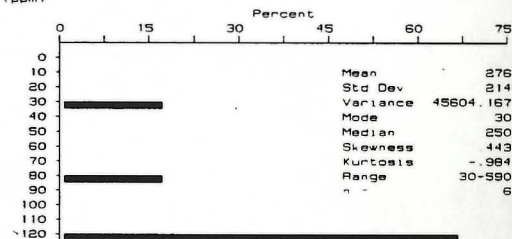
Group 7 - West Zone (Rainbow) Picrite
Ba (ppm)



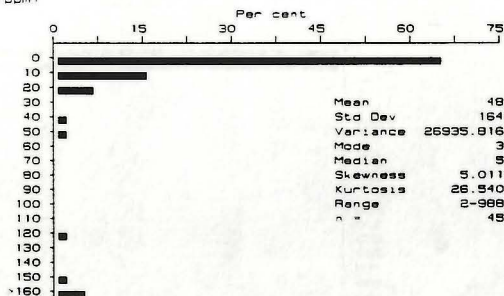
Group 3 - Main Zone Basalt
Ba (ppm)



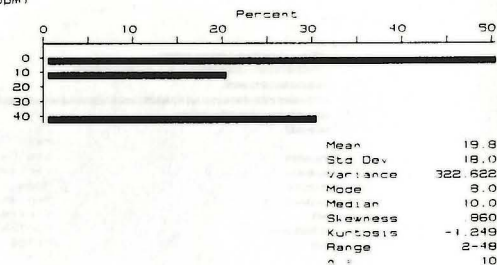
Group 11 - Background Basalt East
Ba (ppm)



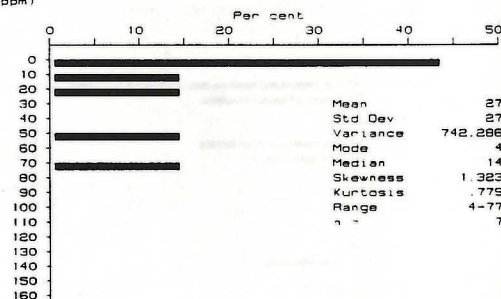
Group 1 - Main Zone Picrite
Pb (ppm)



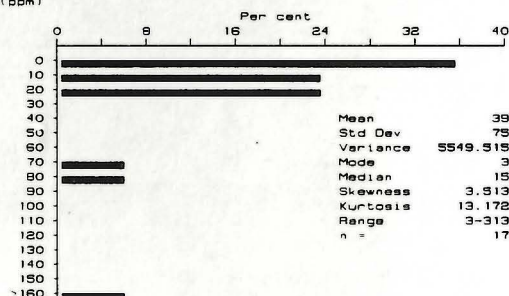
Group 13 - Background Picrite West
Pb (ppm)



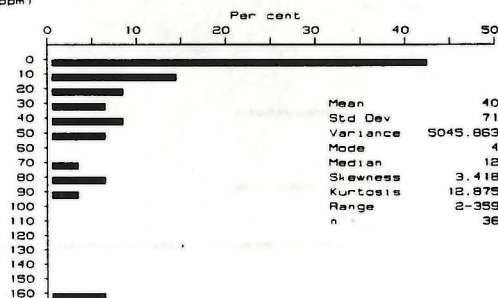
Group 4 - East Zone (Nisku) Picrite
Pb (ppm)



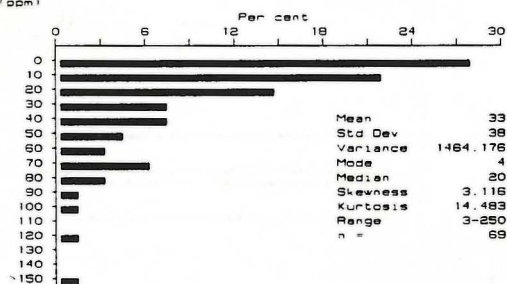
Group 7 - West Zone (Rainbow) Picrite
Pb (ppm)



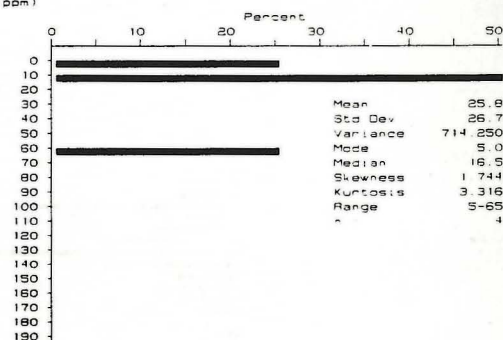
Group 3 - Main Zone Basalt
Pb (ppm)



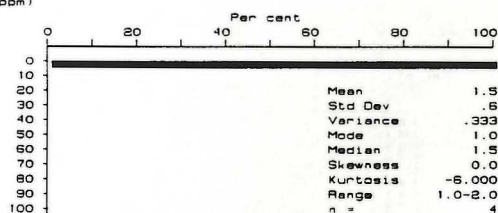
Group 1 - Main Zone Picrite
As (ppm)



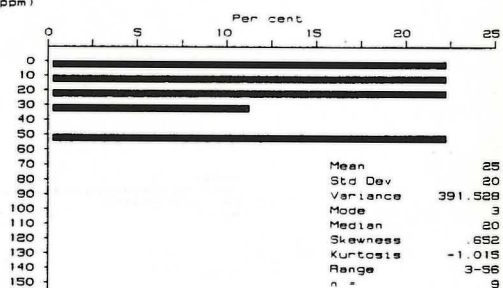
Group 10 - Background Picrite East
As (ppm)



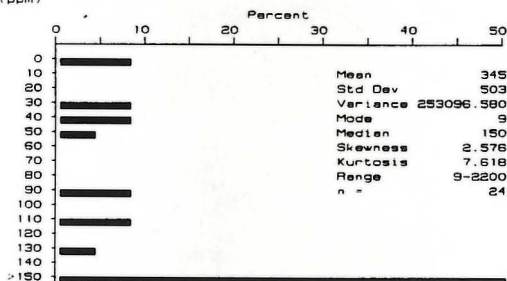
Group 11 - Background Basalt East
As (ppm)



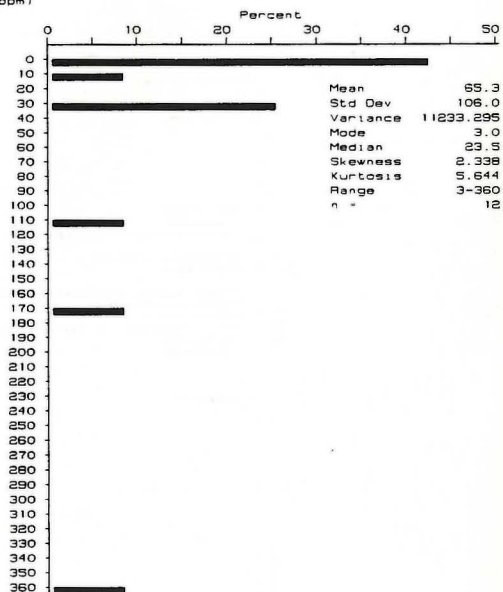
Group 4 - East Zone (Nisku) Picrite
As (ppm)



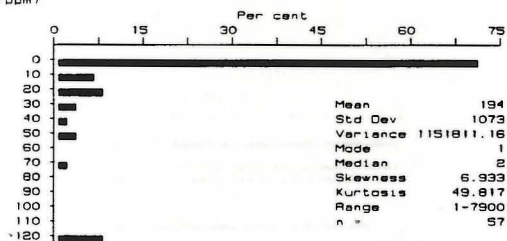
Group 7 - West Zone (Rainbow) Picrite
As (ppm)



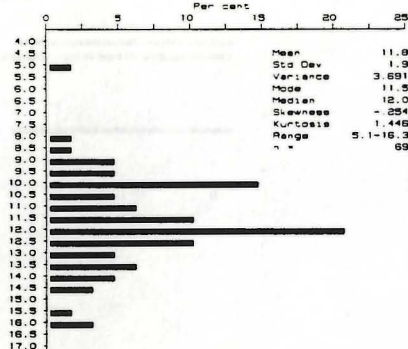
Group 13 - Background Picrite West
As (ppm)



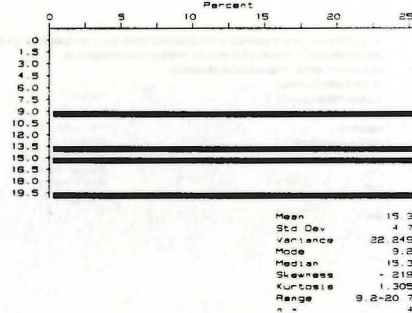
Group 3 - Main Zone Basalt
As (ppm)



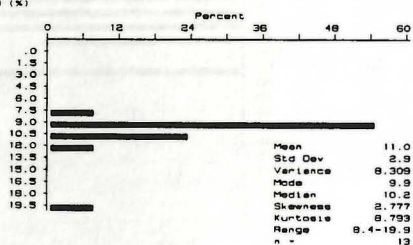
Group 1 - Main Zone Picrite
CaO (%)



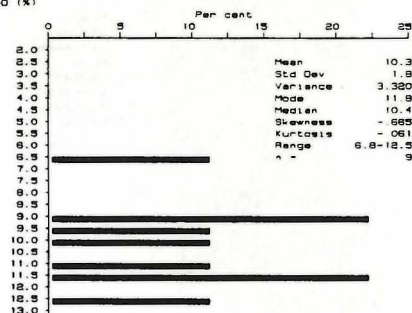
Group 10 - Background Picrite East
CaO (%)



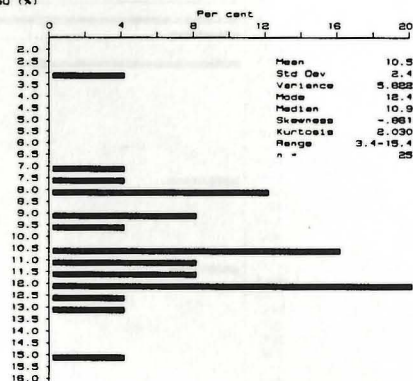
Group 13 - Background Picrite West
CaO (%)



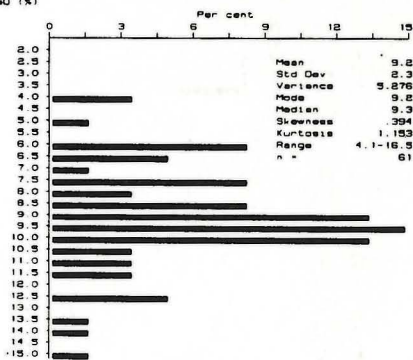
Group 4 - East Zone (Nisku) Picrite
CaO (%)



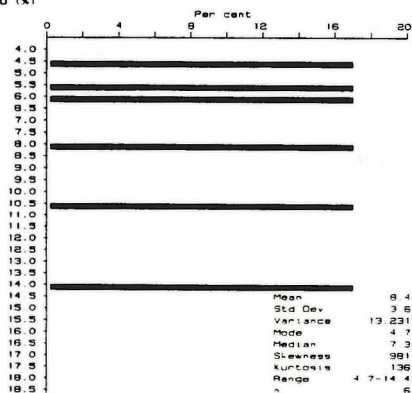
Group 7 - West Zone (Rainbow) Picrite
CaO (%)



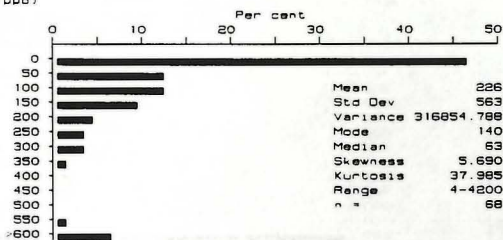
Group 3 - Main Zone Basalt
CaO (%)



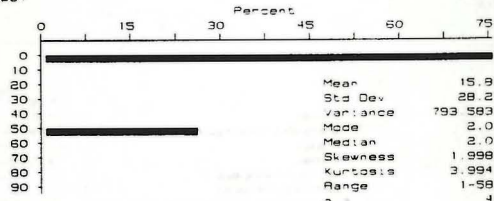
Group 11 - Background Basalt East
CaO (%)



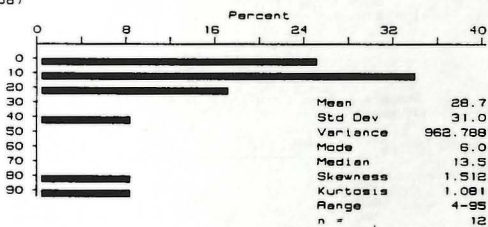
Group 1 - Main Zone Picrite
Au (ppb)



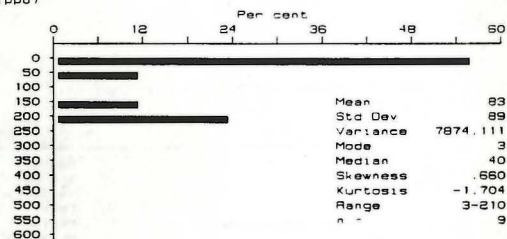
Group 10 - Background Picrite East
Au (ppb)



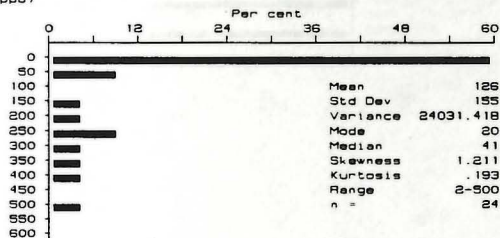
Group 13 - Background Picrite West
Au (ppb)



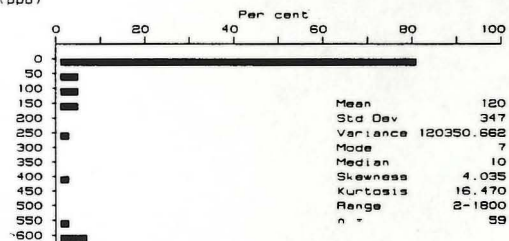
Group 4 - East Zone (Nisku) Picrite
Au (ppb)



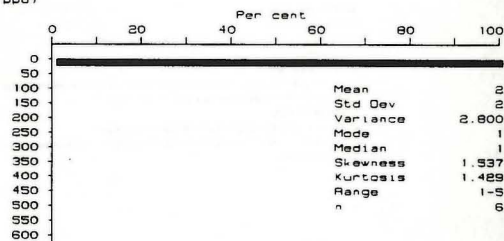
Group 7 - West Zone (Rainbow) Picrite
Au (ppb)



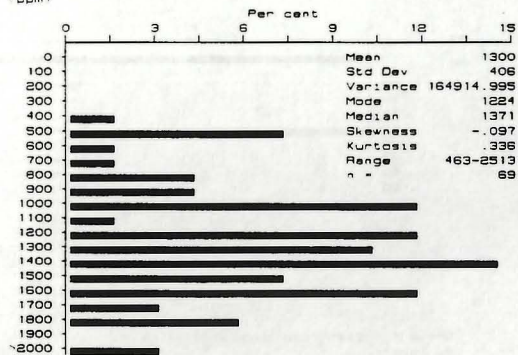
Group 3 - Main Zone Basalt
Au (ppb)



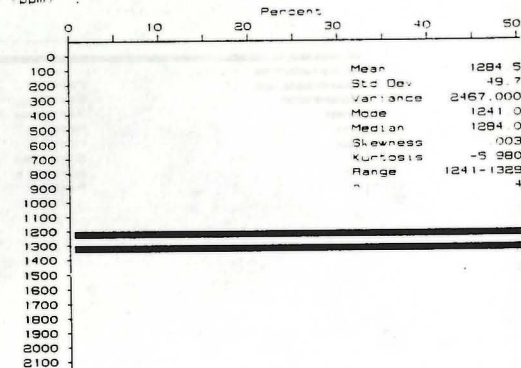
Group 11 - Background Basalt East
Au (ppb)



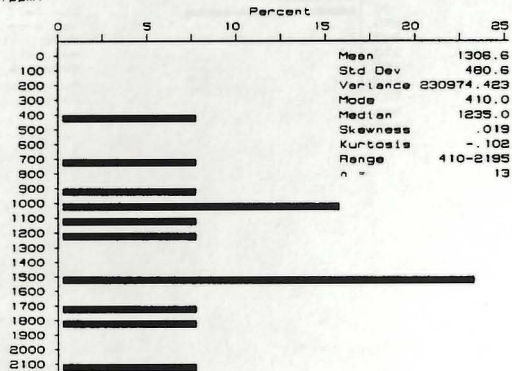
Group 1 - Main Zone Picrite
Cr (ppm)



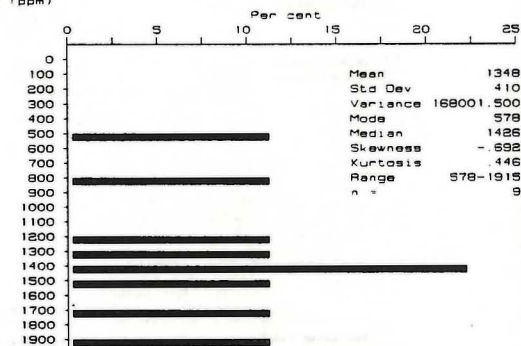
Group 10 - Background Picrite East
Cr (ppm)



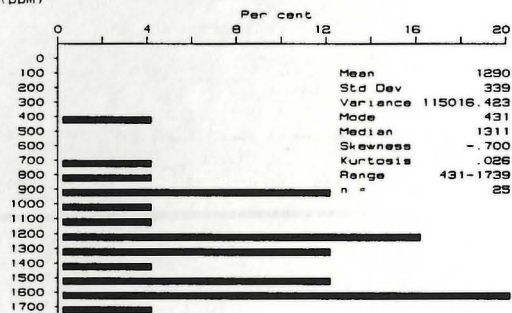
Group 13 - Background Picrite West
Cr (ppm)



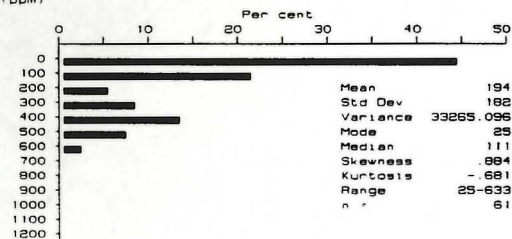
Group 4 - East Zone (Nisku) Picrite
Cr (ppm)



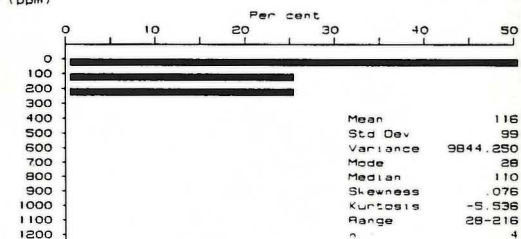
Group 7 - West Zone (Rainbow) Picrite
Cr (ppm)



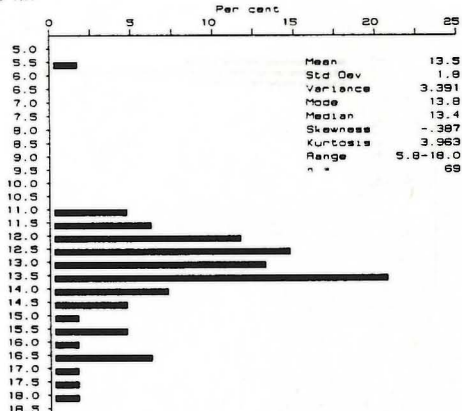
Group 3 - Main Zone Basalt
Cr (ppm)



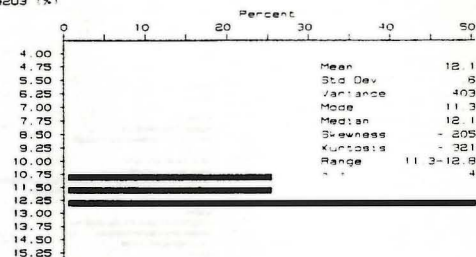
Group 11 - Background Basalt East
Cr (ppm)



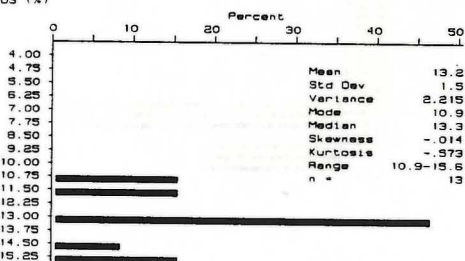
Group 1 - Main Zone Picrite
Fe2O3 (%)



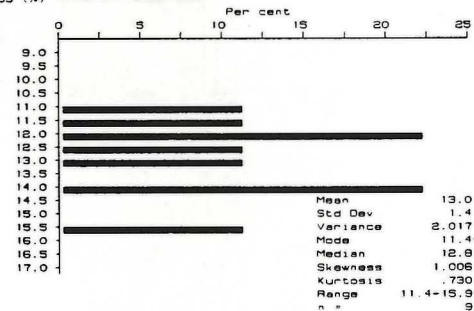
Group 10 - Background Picrite East
Fe2O3 (%)



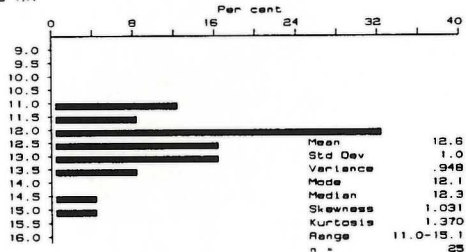
Group 13 - Background Picrite West
Fe2O3 (%)



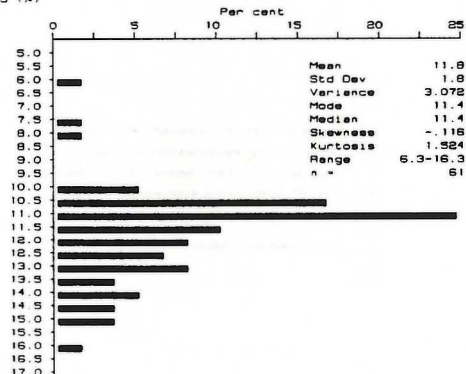
Group 4 - East Zone (Nisku) Picrite
Fe2O3 (%)



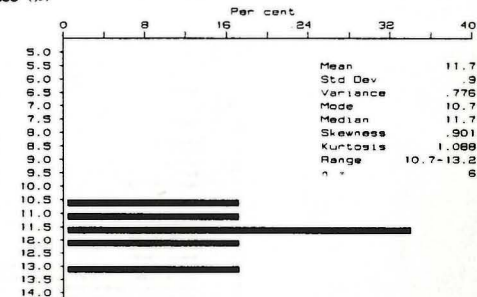
Group 7 - West Zone (Rainbow) Picrite
Fe2O3 (%)



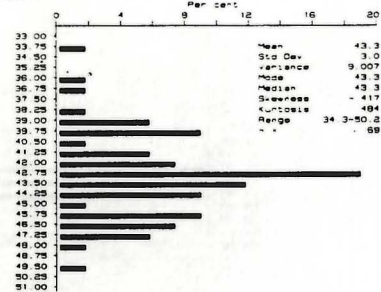
Group 3 - Main Zone Basalt
Fe2O3 (%)



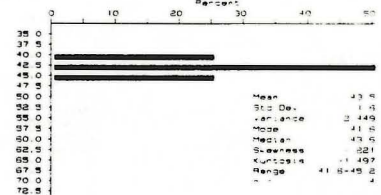
Group 11 - Background Basalt East
Fe2O3 (%)



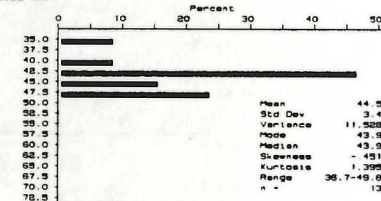
Group 1 - Main Zone Placite
SIDE (X)



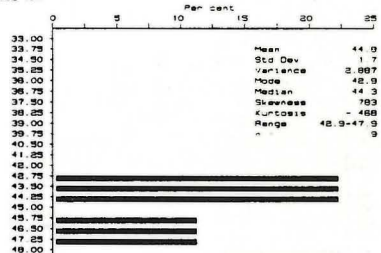
Group 10 - Background Placite East
SIDE (X)



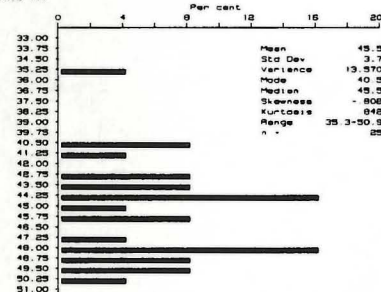
Group 13 - Background Placite West
SIDE (X)



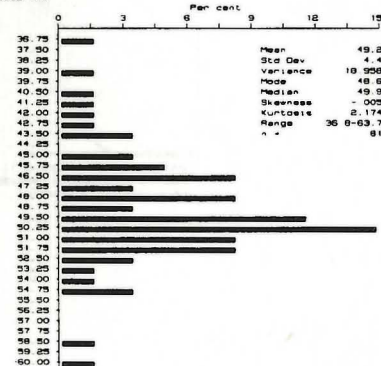
Group 4 - East Zone (Niskau) Placite
SIDE (X)



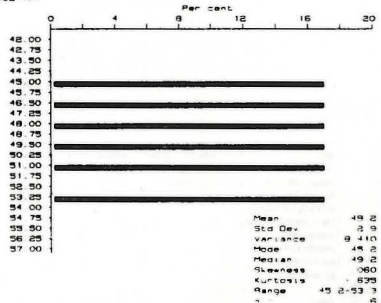
Group 7 - West Zone (Rainbow) Placite
SIDE (X)



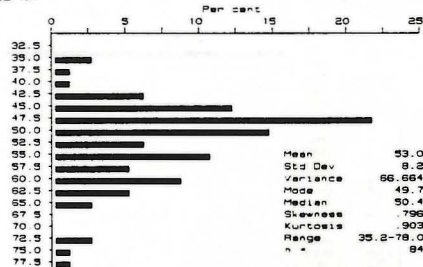
Group 3 - Main Zone Basalt
SIDE (X)



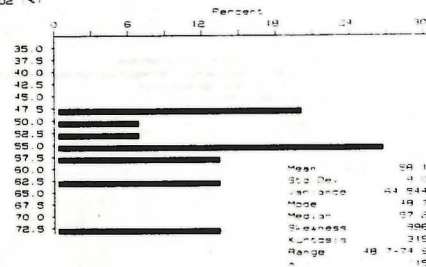
Group 11 - Background Basalt East
SIDE (X)



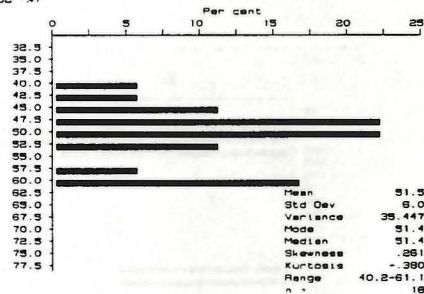
Group 2 - Main Zone Sedimentary Rocks
SiO₂ (%)



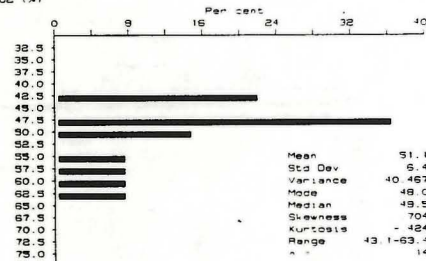
Group 12 - Background Sedimentary East
SiO₂ (%)



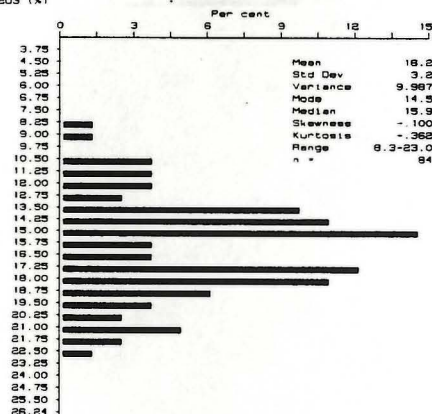
Group 9 - West Zone (Rainbow) Sedimentary Rocks
SiO₂ (%)



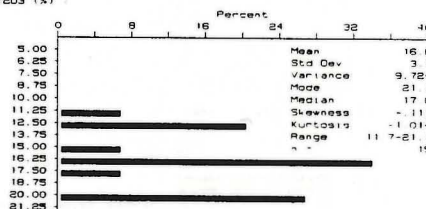
Group 9 - East Zone (Nisku) Sedimentary Rocks
SiO₂ (%)



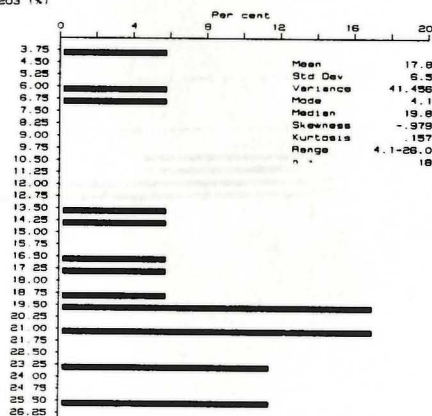
Group 2 - Main Zone Sedimentary Rocks
Al₂O₃ (%)



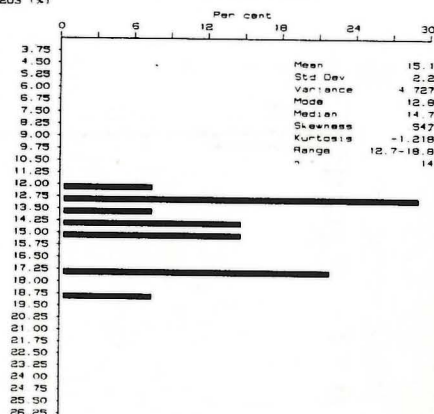
Group 12 - Background Sedimentary East
Al₂O₃ (%)



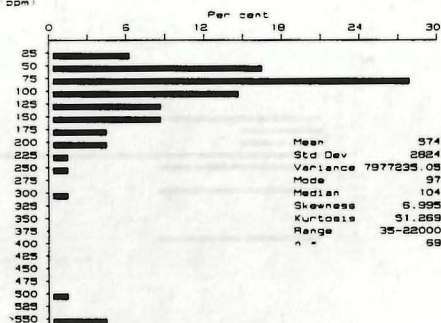
Group 9 - West Zone (Rainbow) Sedimentary Rocks
Al₂O₃ (%)



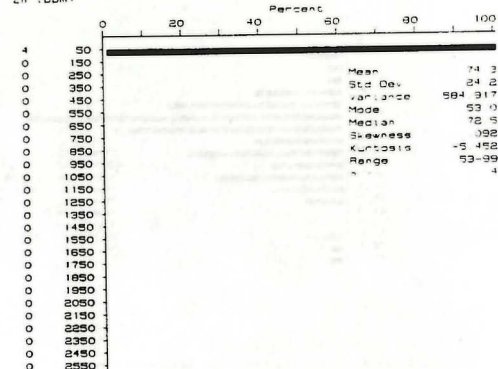
Group 9 - East Zone (Nisku) Sedimentary Rocks
Al₂O₃ (%)



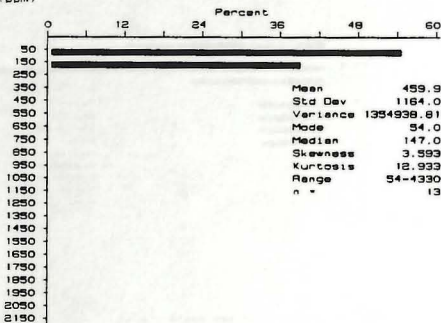
Group 1 - Main Zone Picrite
Zn (ppm)



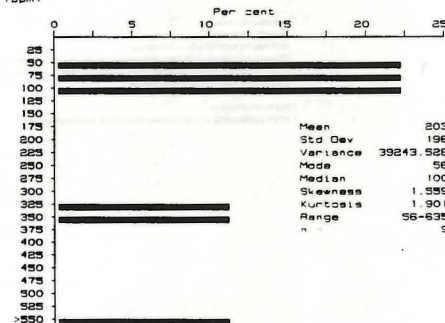
Group 10 - Background Picrite East
Zn (ppm)



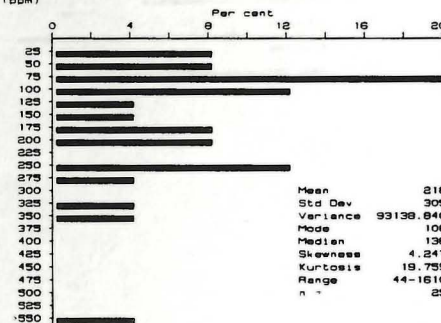
Group 13 - Background Picrite West
Zn (ppm)



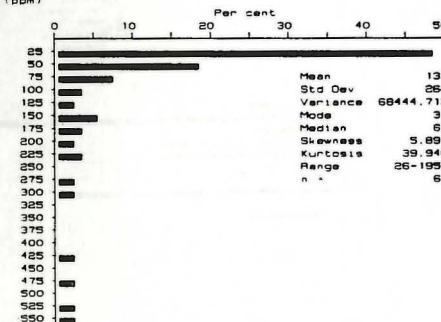
Group 4 - East Zone (Nisku) Picrite
Zn (ppm)



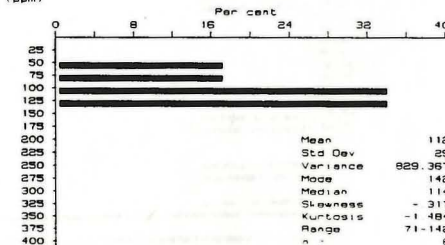
Group 7 - West Zone (Rainbow) Picrite
Zn (ppm)



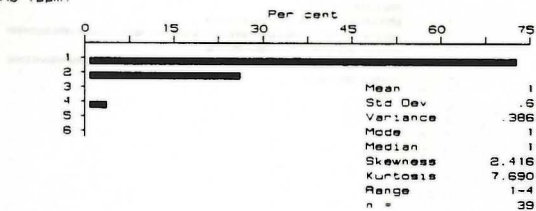
Group 3 - Main Zone Basalt
Zn (ppm)



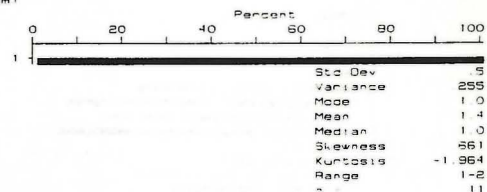
Group 11 - Background Basalt East
Zn (ppm)



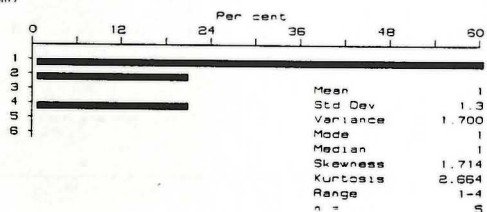
Group 1 - Main Zone Picrite
Mo (ppm)



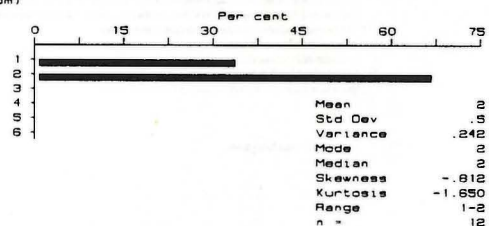
Group 13 - Background Picrite West
Mo (ppm)



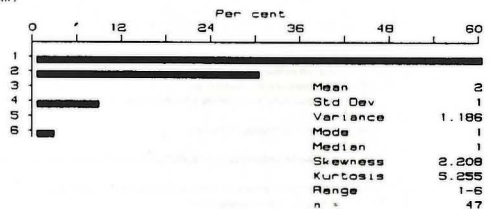
Group 4 - East Zone (Nisku) Picrite
Mo (ppm)



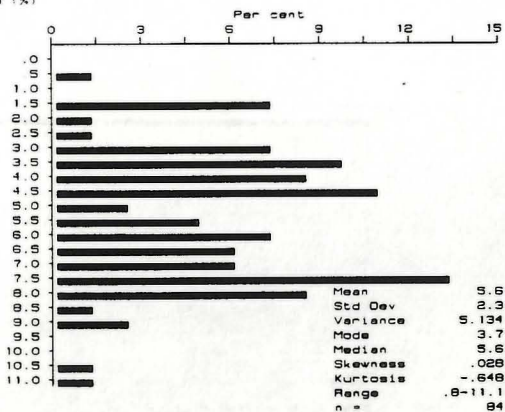
Group 7 - West Zone (Rainbow) Picrite
Mo (ppm)



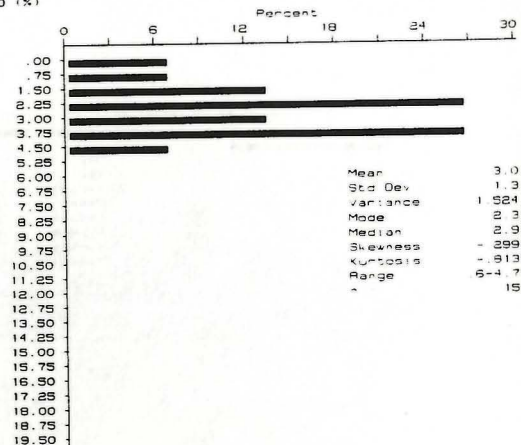
Group 3 - Main Zone Basalt
Mo (ppm)



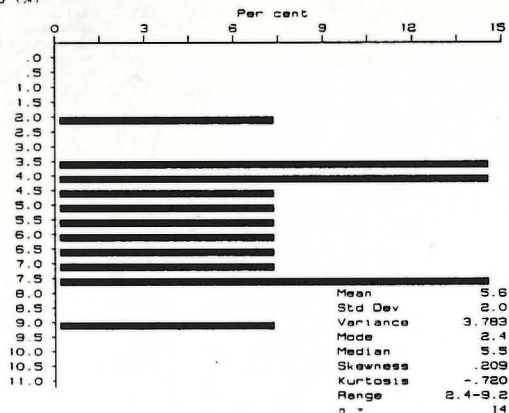
Group 2 - Main Zone Sedimentary Rocks
MgO (%)



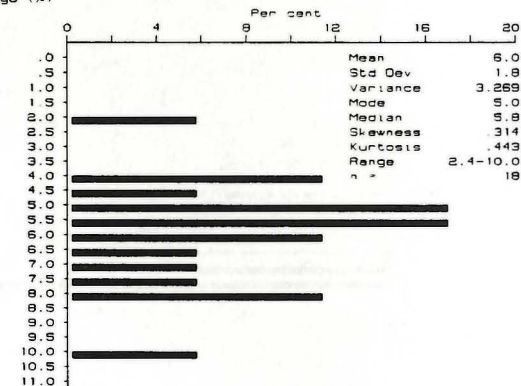
Group 12 - Background Sedimentary East
MgO (%)



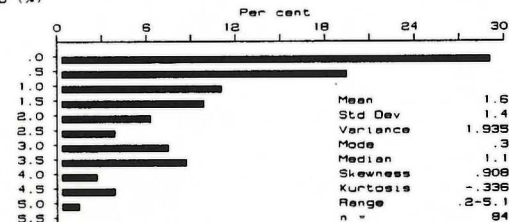
Group 5 - East Zone (Nisku) Sedimentary Rocks
MgO (%)



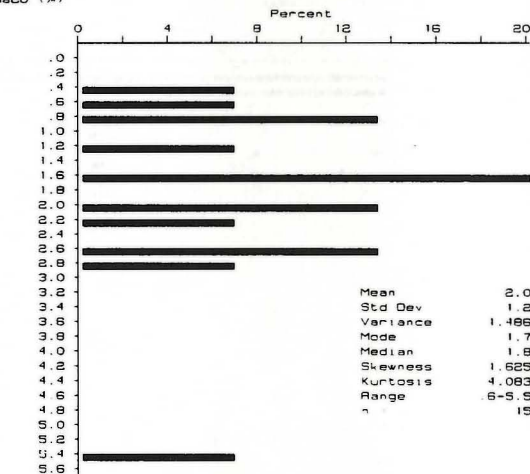
Group 8 - West Zone (Rainbow) Sedimentary Rocks
MgO (%)



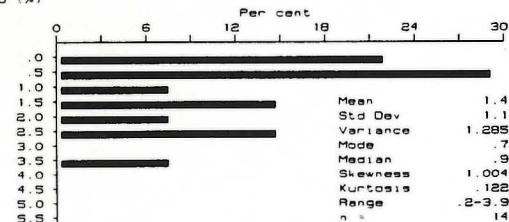
Group 2 - Main Zone Sedimentary Rocks
Na2O (%)



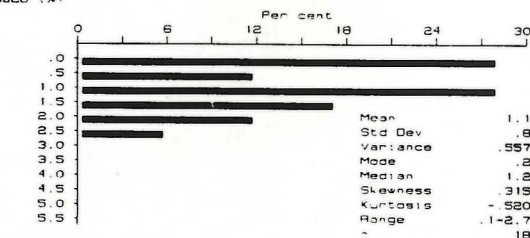
Group 12 - Background Sedimentary East
Na2O (%)



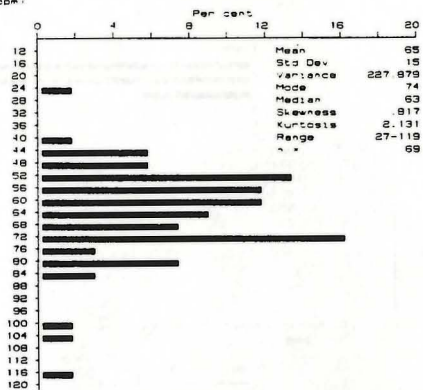
Group 5 - East Zone (Nisku) Sedimentary Rocks
Na2O (%)



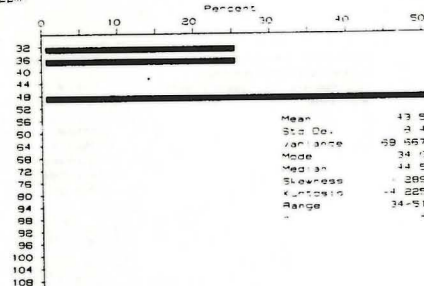
Group 8 - West Zone (Rainbow) Sedimentary Rocks
Na2O (%)



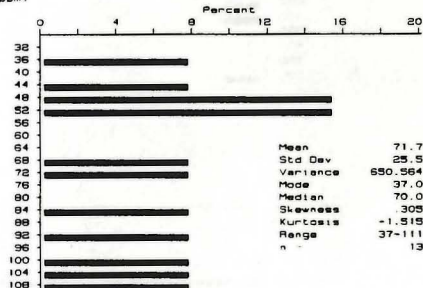
Group 1 - Main Zone Picrite
Co (ppm)



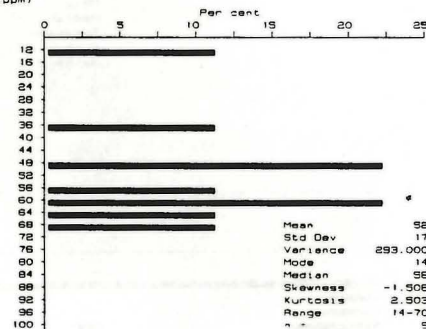
Group 10 - Background Picrite East
Co (ppm)



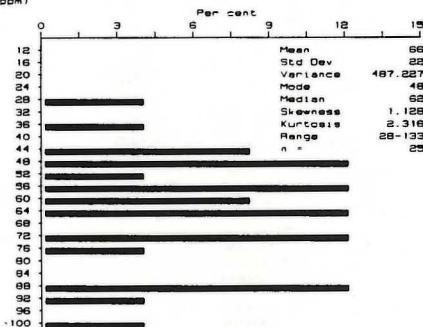
Group 13 - Background Picrite West
Co (ppm)



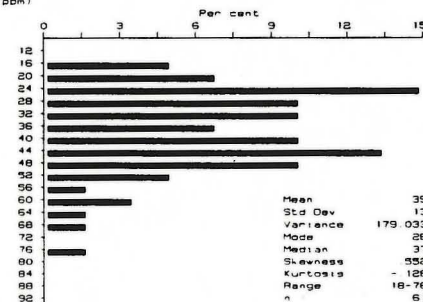
Group 4 - East Zone (Nisku) Picrite
Co (ppm)



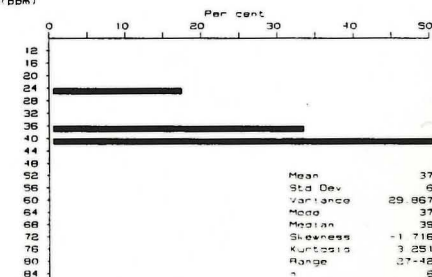
Group 7 - West Zone (Rainbow) Picrite
Co (ppm)



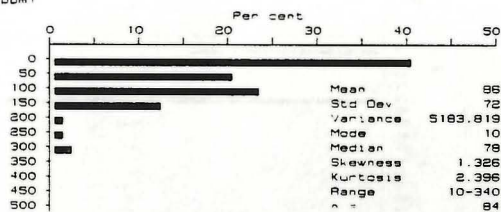
Group 3 - Main Zone Basalt
Co (ppm)



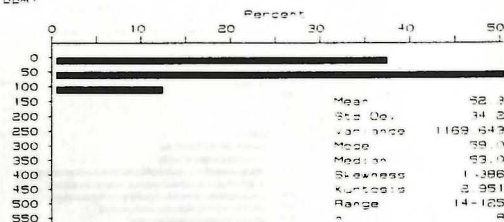
Group 11 - Background Basalt East
Co (ppm)



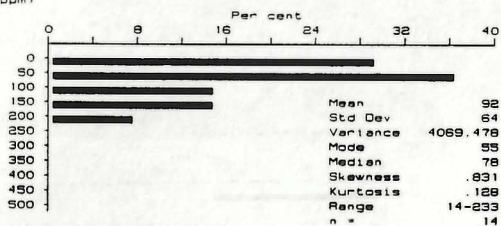
Group 2 - Main Zone Sedimentary Rocks
Ni (ppm)



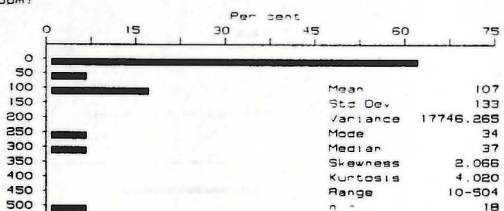
Group 12 - Background Sedimentary East
Ni (ppm)



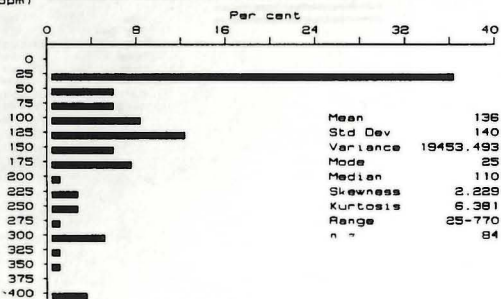
Group 5 - East Zone (Nisku) Sedimentary Rocks
Ni (ppm)



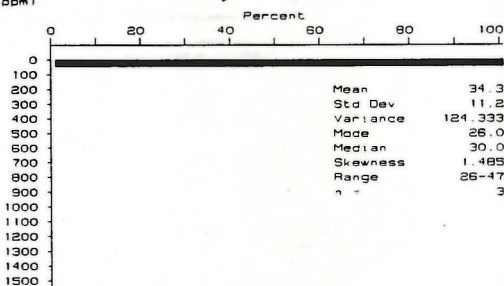
Group 8 - West Zone (Rainbow) Sedimentary Rocks
Ni (ppm)



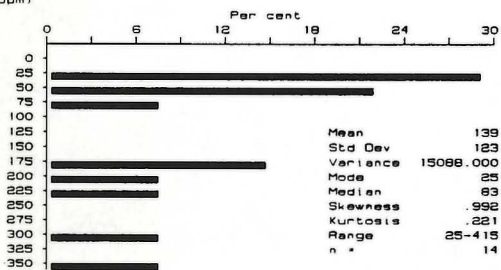
Group 2 - Main Zone Sedimentary Rocks
Cr (ppm)



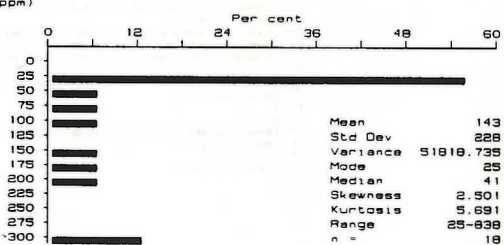
Group 12 - Background Sedimentary East
Cr (ppm)



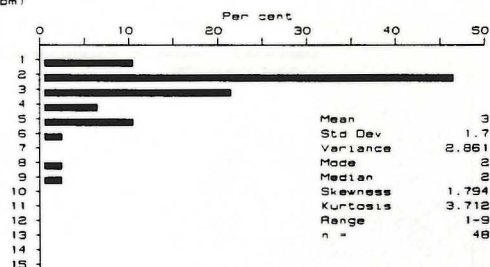
Group 5 - East Zone (Nisku) Sedimentary Rocks
Cr (ppm)



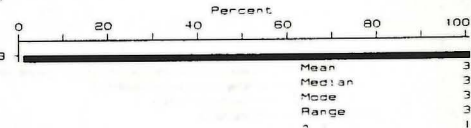
Group 8 - West Zone (Rainbow) Sedimentary Rocks
Cr (ppm)



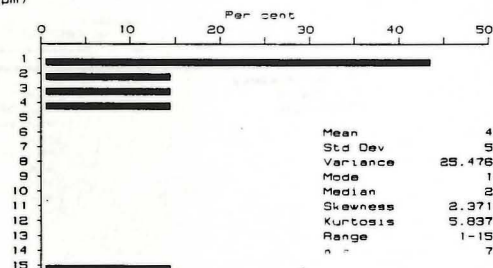
Group 1 - Main Zone Picrite
Ag (ppm)



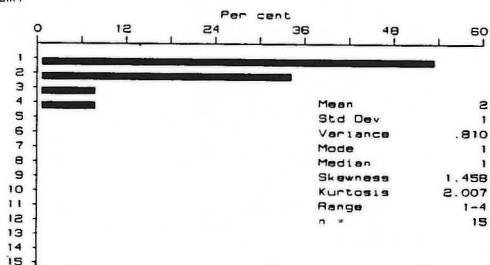
Group 13 - Background Picrite West
Ag (ppm)



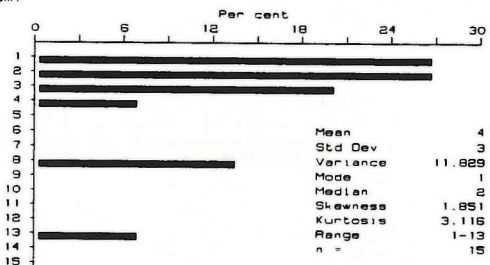
Group 4 - East Zone (Nisku) Picrite
Ag (ppm)



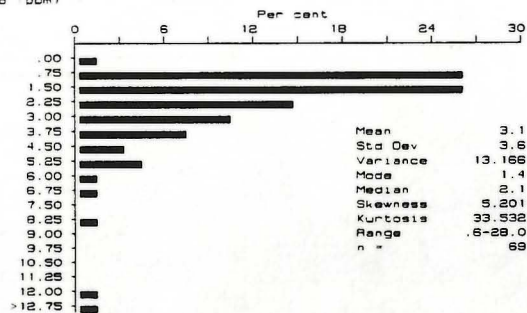
Group 7 - West Zone (Rainbow) Picrite
Ag (ppm)



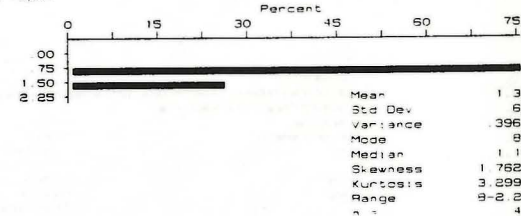
Group 3 - Main Zone Basalt
Ag (ppm)



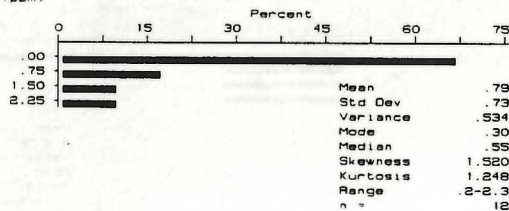
Group 1 - Main Zone Picrite
Sb (ppm)



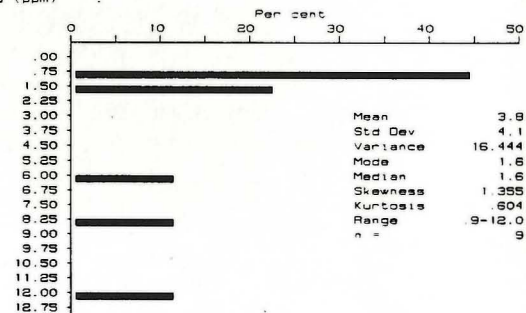
Group 10 - Background Picrite East
Sb (ppm)



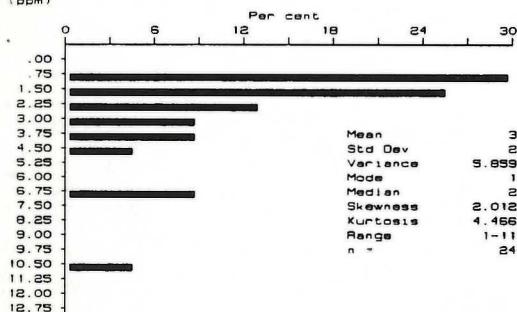
Group 13 - Background Picrite West
Sb (ppm)



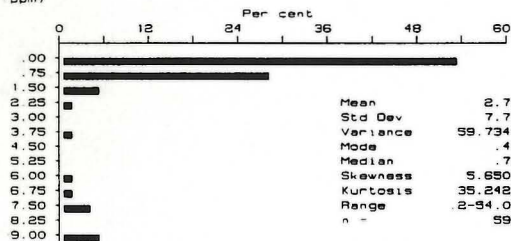
Group 4 - East Zone (Nisku) Picrite
Sb (ppm)



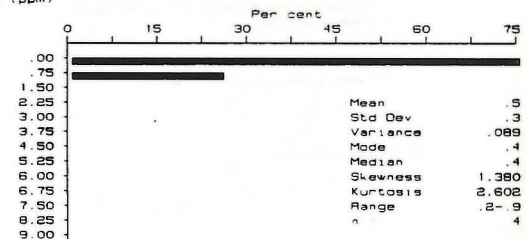
Group 7 - West Zone (Rainbow) Picrite
Sb (ppm)



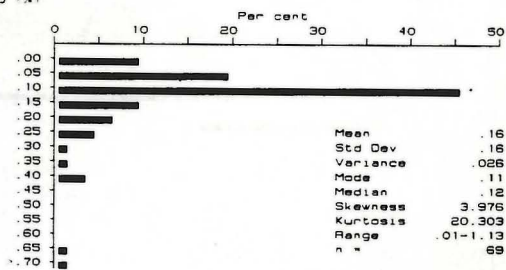
Group 3 - Main Zone Basalt
Sb (ppm)



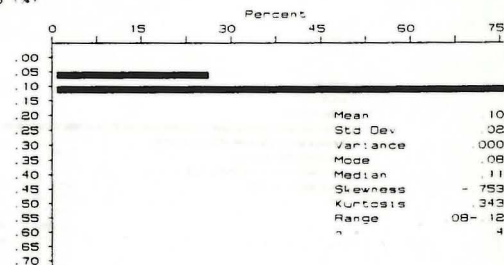
Group 11 - Background Basalt East
Sb (ppm)



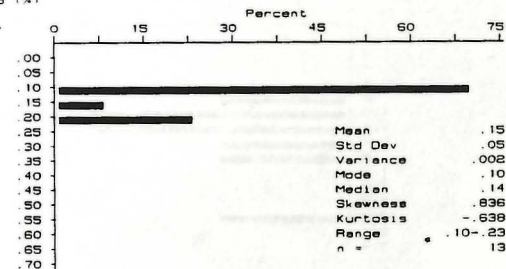
Group 1 - Main Zone Picrite
P205 (%)



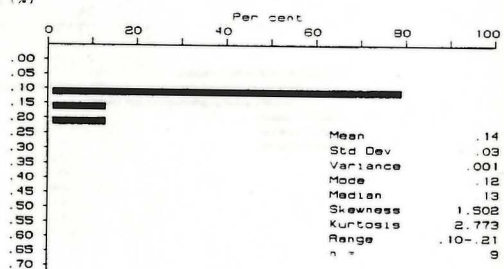
Group 10 - Background Picrite East
P205 (%)



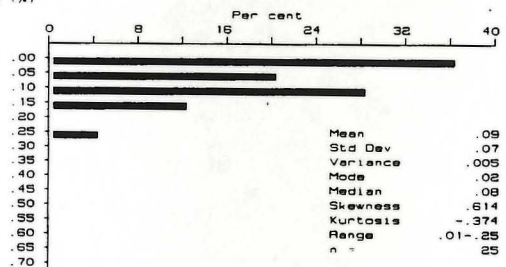
Group 13 - Background Picrite West
P205 (%)



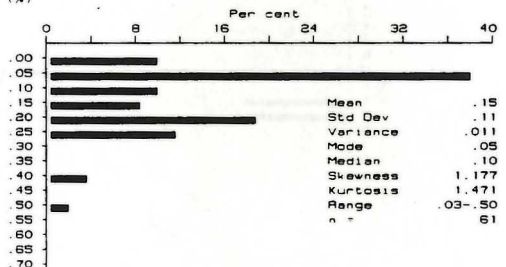
Group 4 - East Zone (Nisku) Picrite
P205 (%)



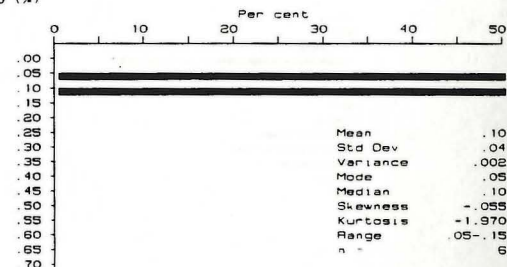
Group 7 - West Zone (Rainbow) Picrite
P205 (%)



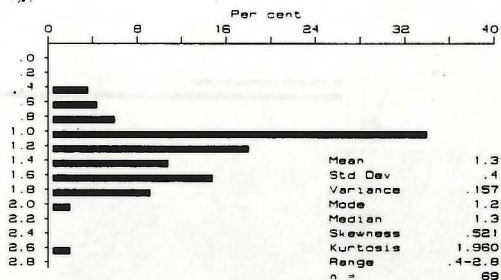
Group 3 - Main Zone Basalt
P205 (%)



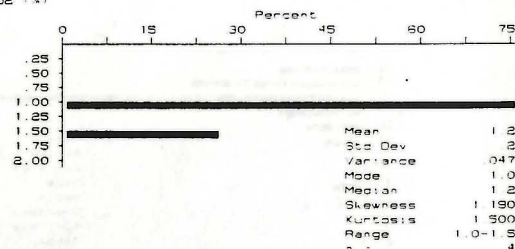
Group 11 - Background Basalt East
P205 (%)



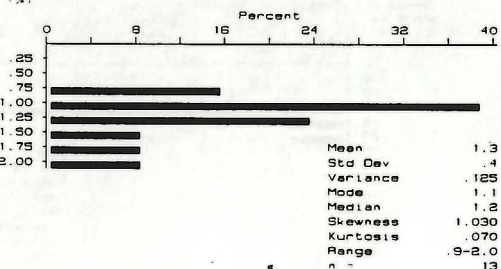
Group 1 - Main Zone Picrite
T102 (%)



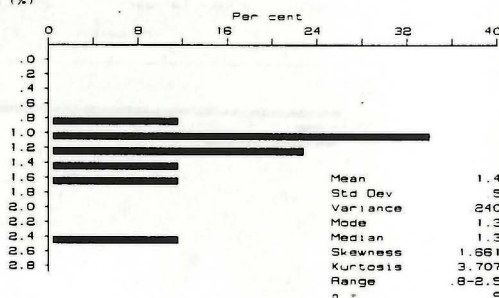
Group 10 - Background Picrite East
T102 (%)



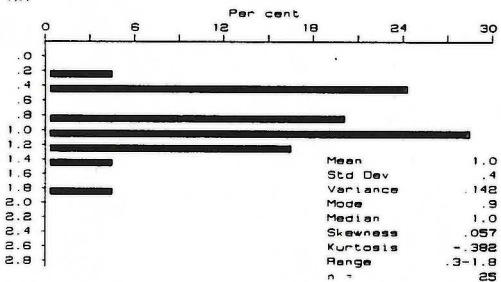
Group 13 - Background Picrite West
T102 (%)



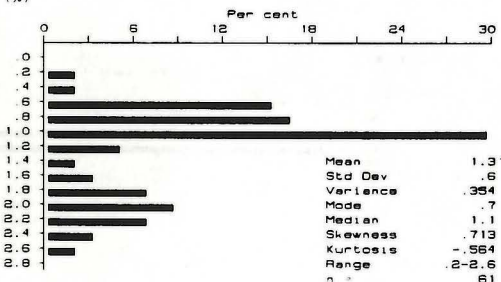
Group 4 - East Zone (Nisku) Picrite
T102 (%)



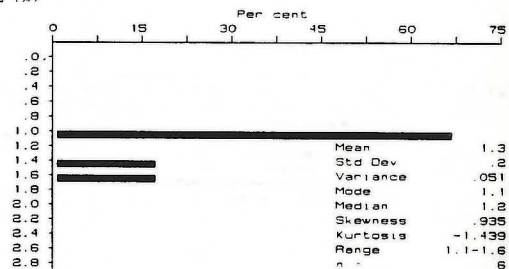
Group 7 - West Zone (Rainbow) Picrite
T102 (%)



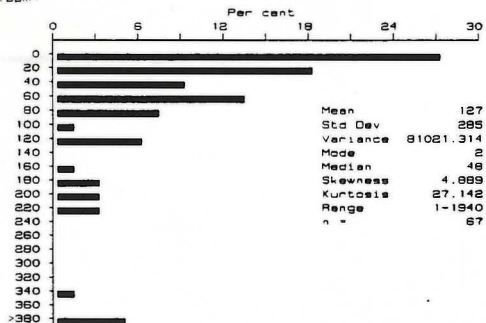
Group 3 - Main Zone Basalt
T102 (%)



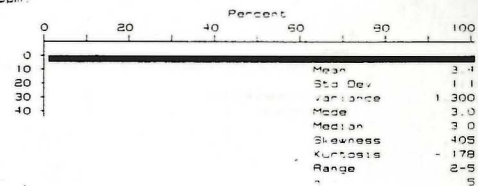
Group 11 - Background Basalt East
T102 (%)



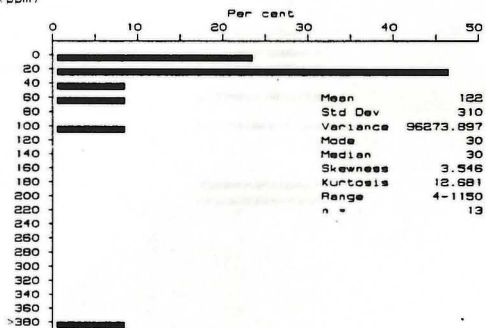
Group 2 - Main Zone Sedimentary Rocks
Pb (ppm)



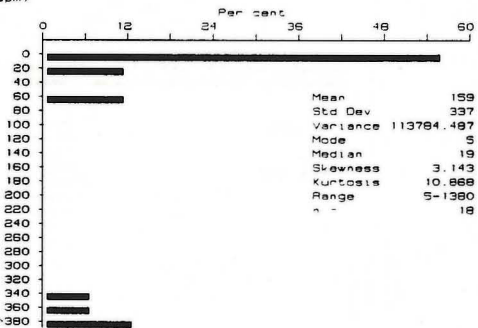
Group 12 - Background Sedimentary East
Pb (ppm)



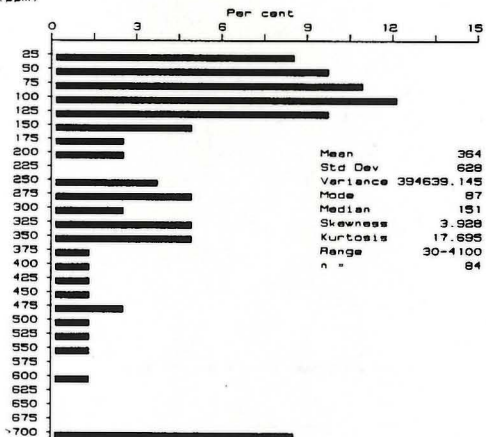
Group 5 - East Zone (Nisku) Sedimentary Rocks
Pb (ppm)



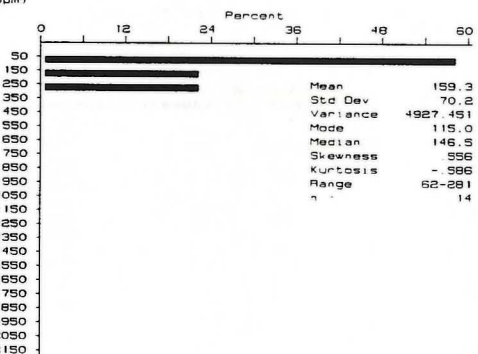
Group 8 - West Zone (Rainbow) Sedimentary Rocks
Pb (ppm)



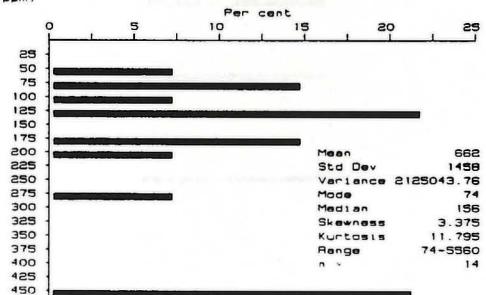
Group 2 - Main Zone Sedimentary Rocks
Zn (ppm)



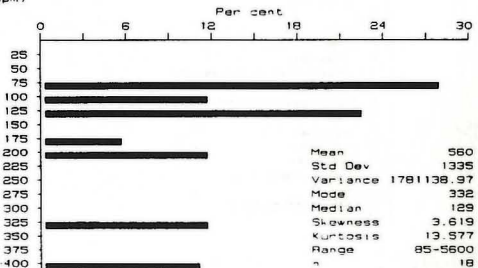
Group 12 - Background Sedimentary East
Zn (ppm)



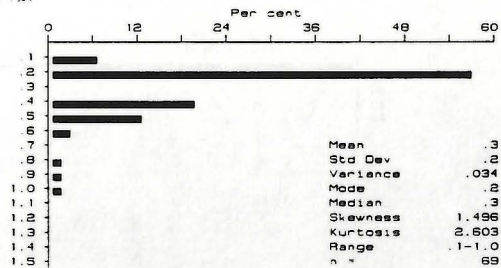
Group 5 - East Zone (Nisku) Sedimentary Rocks
Zn (ppm)



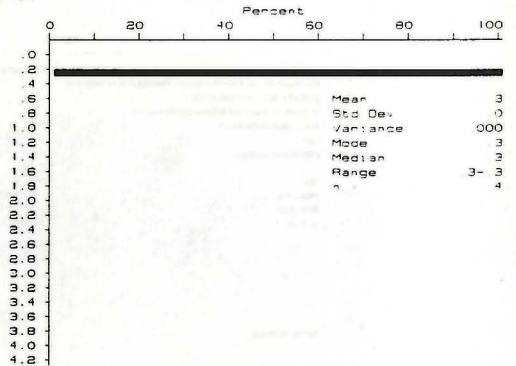
Group 8 - West Zone (Rainbow) Sedimentary Rocks
Zn (ppm)



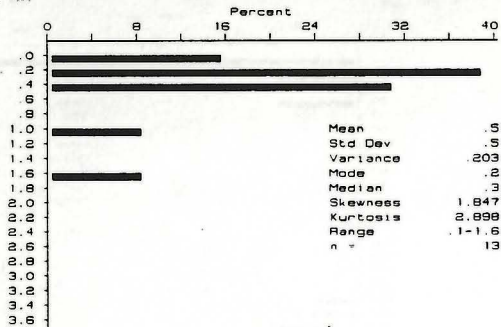
Group 1 - Main Zone Picrite
Na2O (%)



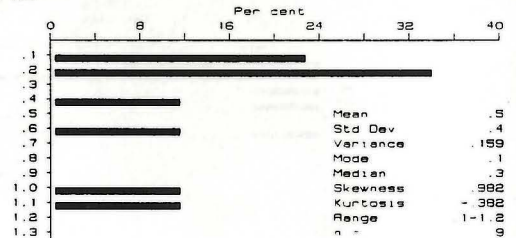
Group 10 - Background Picrite East
Na2O (%)



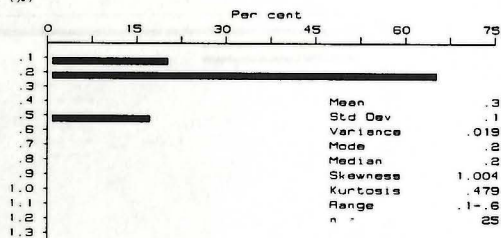
Group 13 - Background Picrite West
Na2O (%)



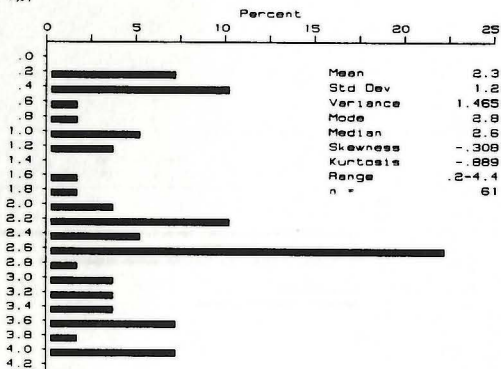
Group 4 - East Zone (Nisku) Picrite
Na2O (%)



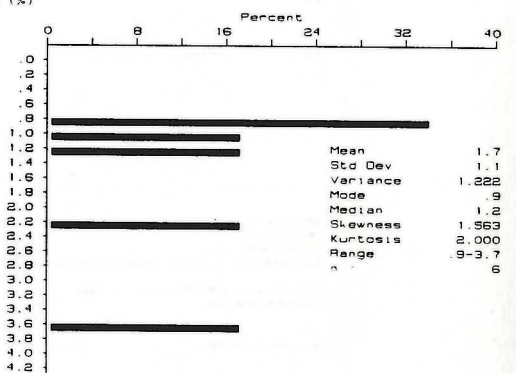
Group 7 - West Zone (Rainbow) Picrite
Na2O (%)



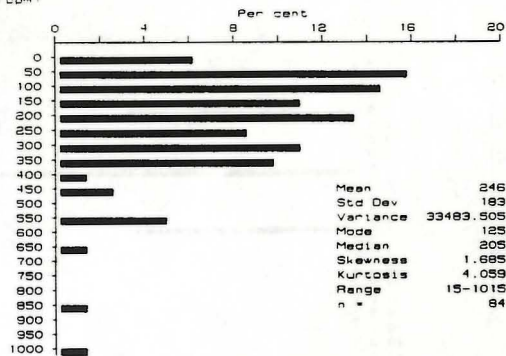
Group 3 - Main Zone Basalt
Na2O (%)



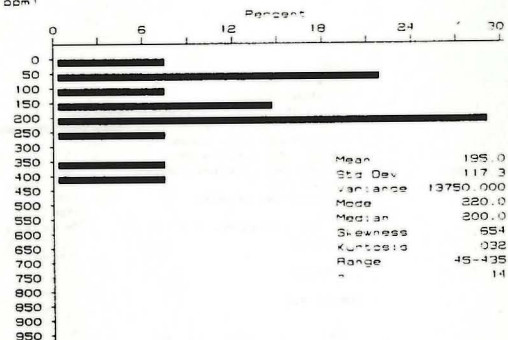
Group 11 - Background Basalt East
Na2O (%)



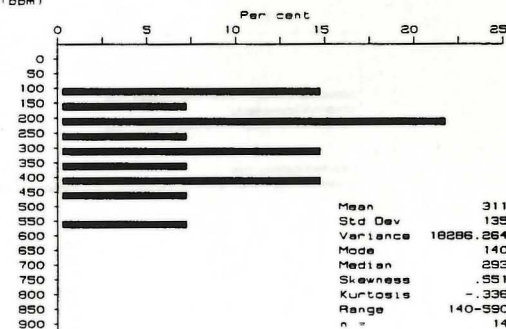
Group 2 - Main Zone Sedimentary Rocks
Ba (ppm)



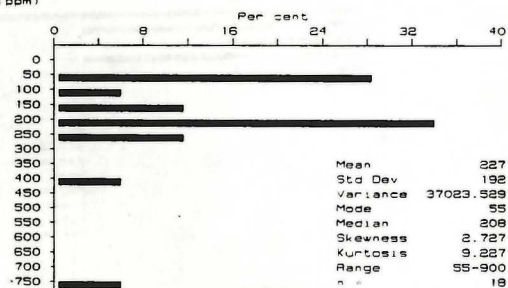
Group 12 - Background Sedimentary East
Ba (ppm)



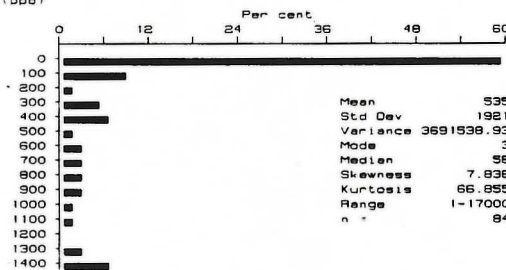
Group 5 - East Zone (Nisku) Sedimentary Rocks
Ba (ppm)



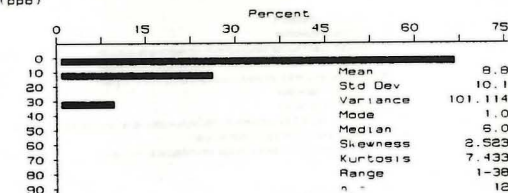
Group 8 - West Zone (Rainbow) Sedimentary Rocks
Ba (ppm)



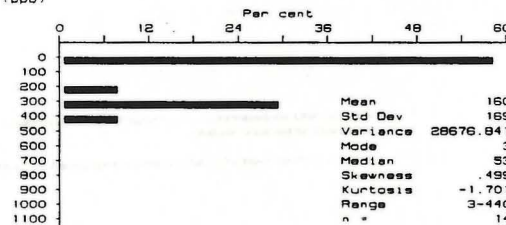
Group 2 - Main Zone Sedimentary Rocks
Au (ppb)



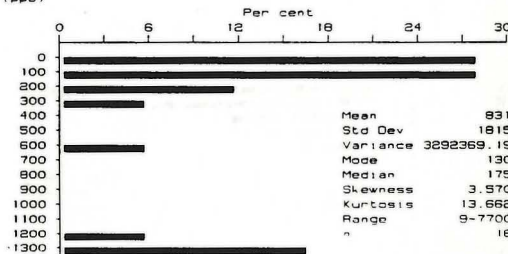
Group 12 - Background Sedimentary East
Au (ppb)



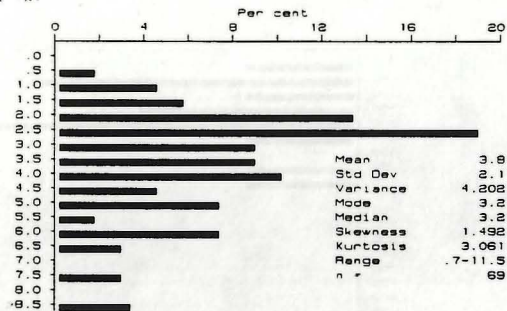
Group 5 - East Zone (Nisku) Sedimentary Rocks
Au (ppb)



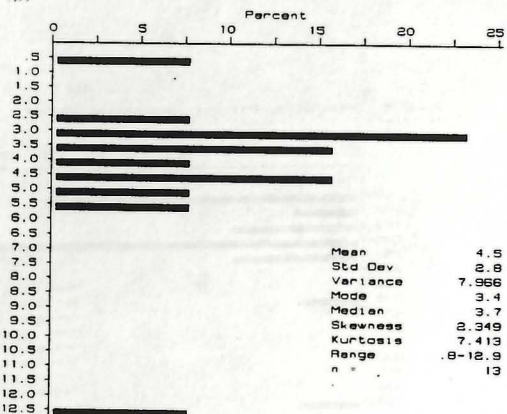
Group 8 - West Zone (Rainbow) Sedimentary Rocks
Au (ppb)



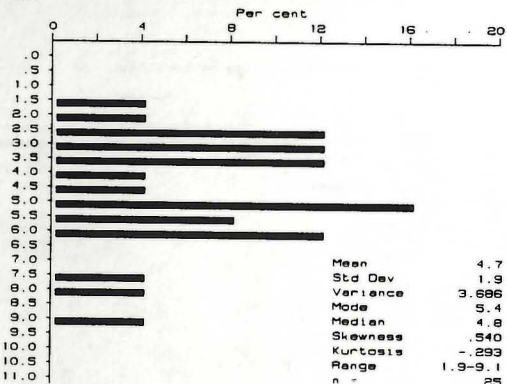
Group 1 - Main Zone Picrite
LOI (%)



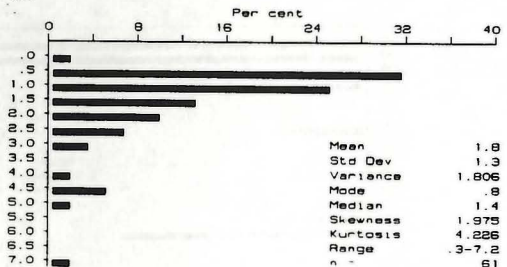
Group 13 - Background Picrite West
LOI (%)



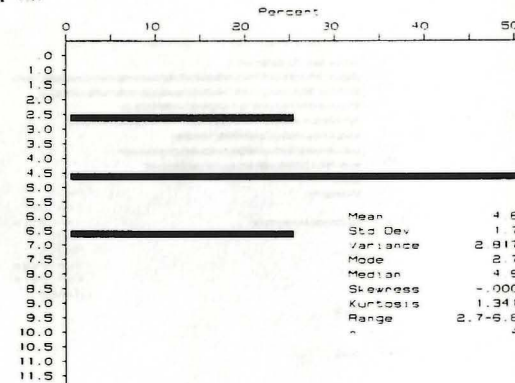
Group 7 - West Zone (Rainbow) Picrite
LOI (%)



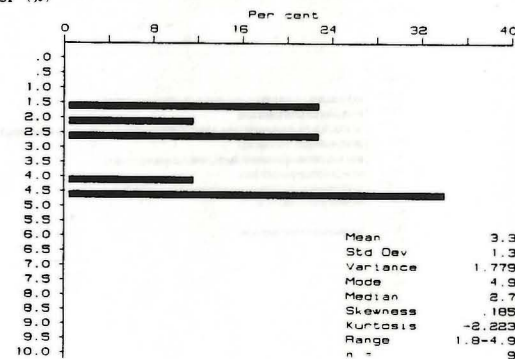
Group 3 - Main Zone Basalt
LOI (%)



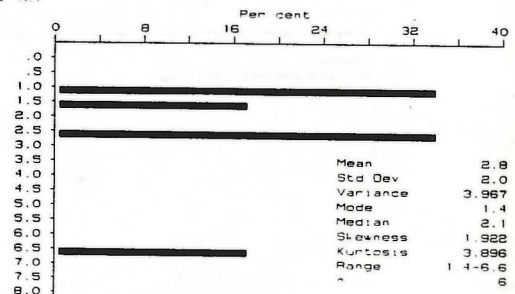
Group 10 - Background Picrite East
LOI (%)



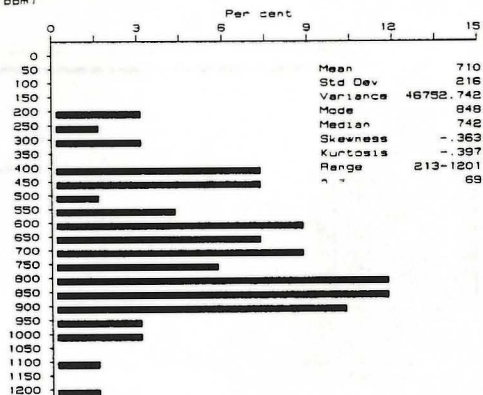
Group 4 - East Zone (Nisku) Picrite
LOI (%)



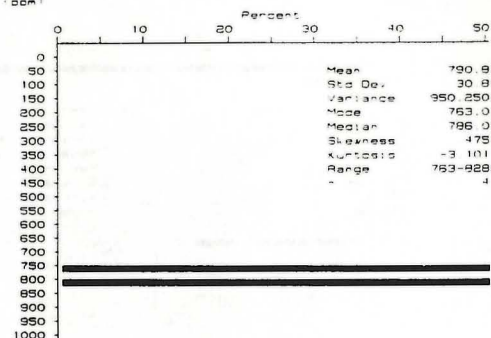
Group 11 - Background Basalt East
LOI (%)



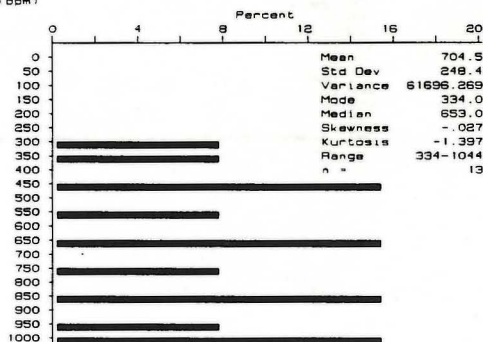
Group 1 - Main Zone Picrite
Ni (ppm)



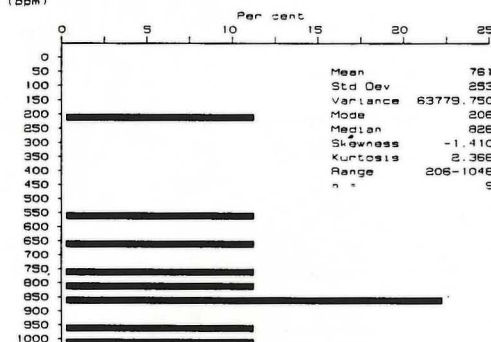
Group 10 - Background Picrite East
Ni (ppm)



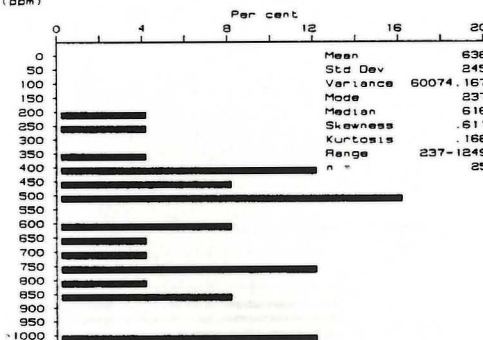
Group 13 - Background Picrite West
Ni (ppm)



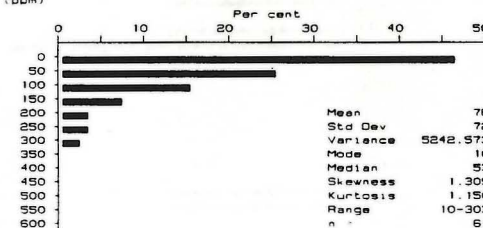
Group 4 - East Zone (Nisku) Picrite
Ni (ppm)



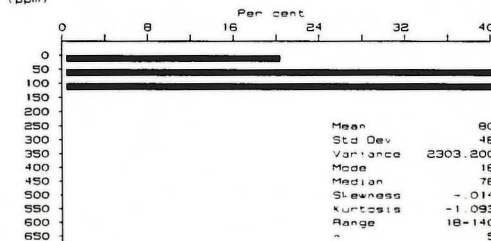
Group 7 - West Zone (Rainbow) Picrite
Ni (ppm)



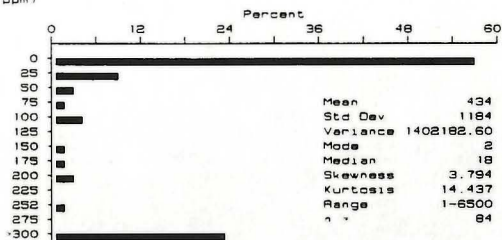
Group 3 - Main Zone Basalt
Ni (ppm)



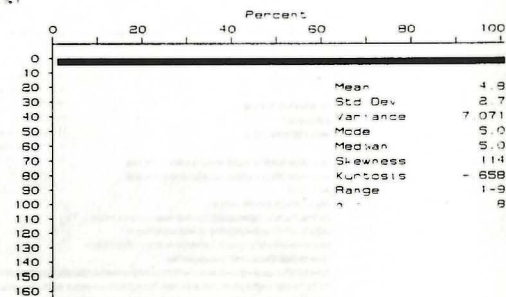
Group 11 - Background Basalt East
Ni (ppm)



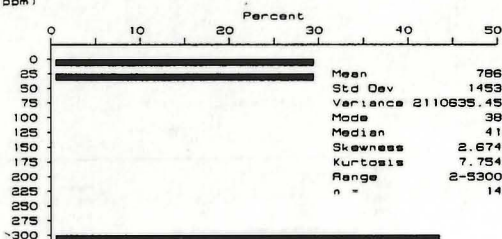
Group 2 - Main Zone Sedimentary Rocks
As (ppm)



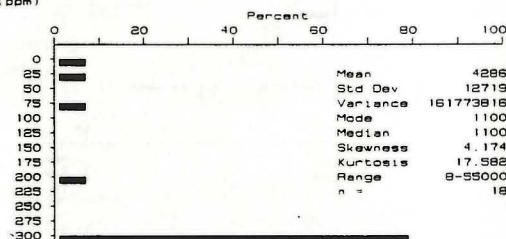
Group 12 - Background Sedimentary East
As (%)



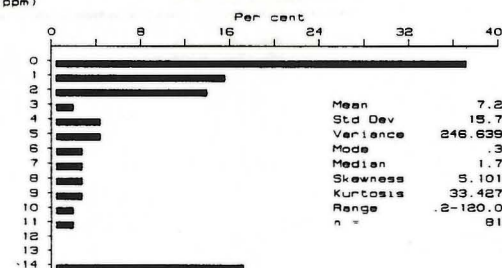
Group 5 - East Zone Sedimentary Rocks
As (ppm)



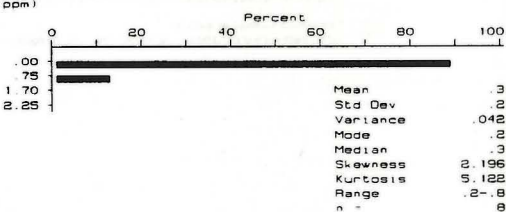
Group 8 - West Zone Sedimentary Rocks
As (ppm)



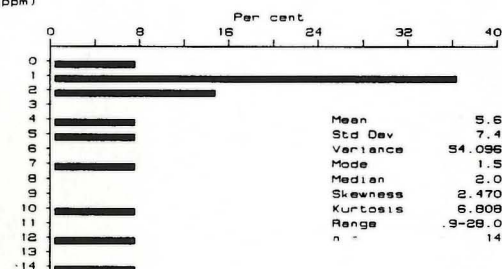
Group 2 - Main Zone Sedimentary Rocks
Sb (ppm)



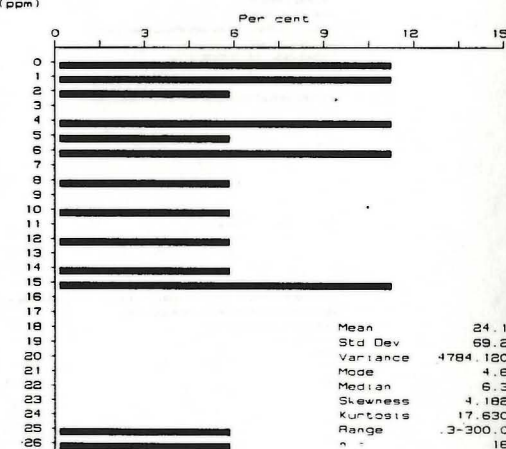
Group 12 - Background Sedimentary East
Sb (ppm)



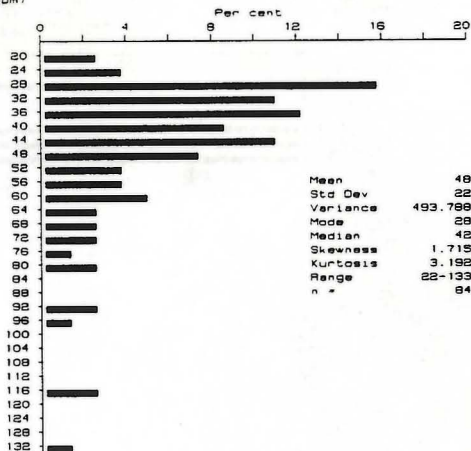
Group 5 - East Zone (Nisku) Sedimentary Rocks
Sb (ppm)



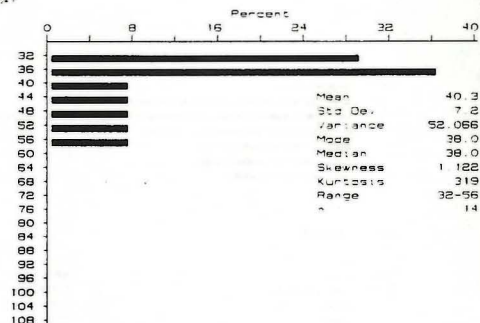
Group 8 - West Zone (Rainbow) Sedimentary Rocks
Sb (ppm)



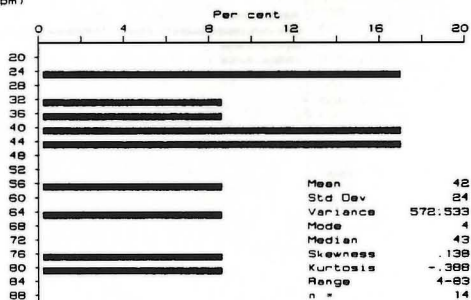
Group 2 - Main Zone Sedimentary Rocks
Co (ppm)



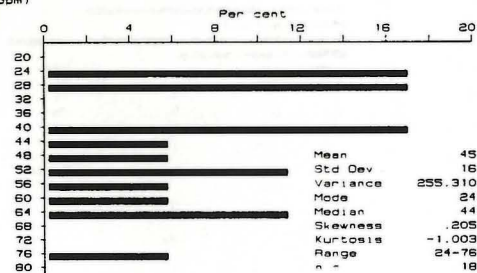
Group 12 - Background Sedimentary East
Co (ppm)



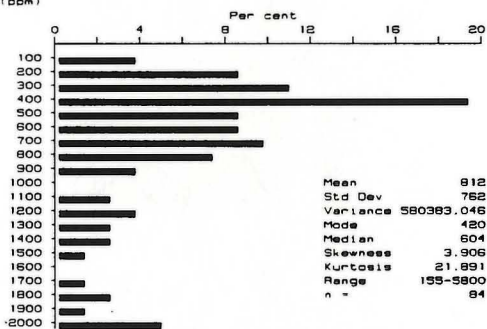
Group 5 - East Zone (Nisku) Sedimentary Rocks
Co (ppm)



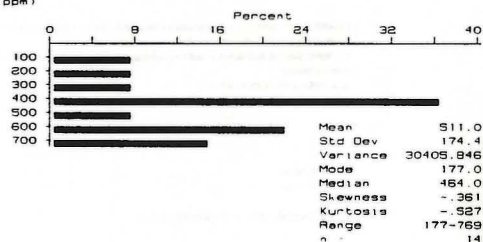
Group 8 - West Zone (Rainbow) Sedimentary Rocks
Co (ppm)



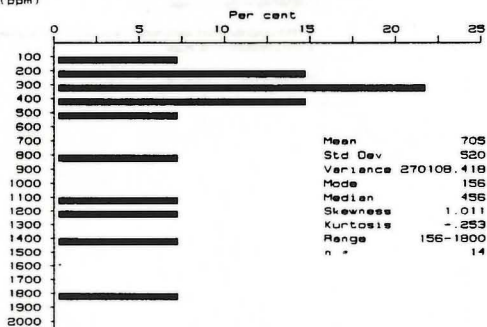
Group 2 - Main Zone Sedimentary Rocks
Mn (ppm)



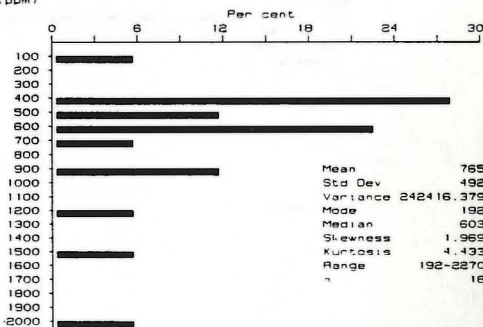
Group 12 - Background Sedimentary East
Mn (ppm)



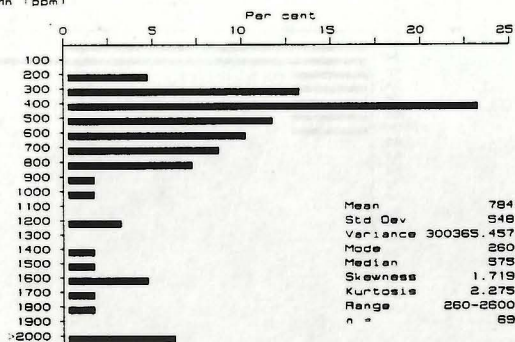
Group 5 - East Zone (Nisku) Sedimentary Rocks
Mn (ppm)



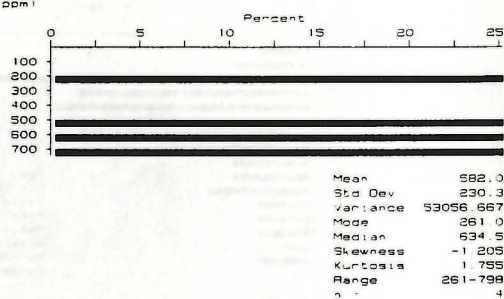
Group 8 - West Zone (Rainbow) Sedimentary Rocks
Mn (ppm)



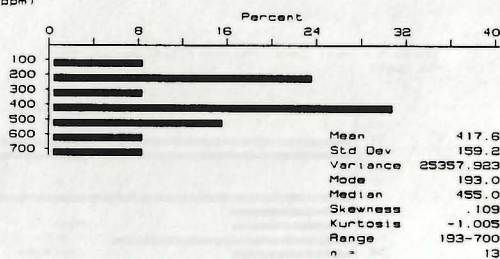
Group 1 - Main Zone Picrite
Mn (ppm)



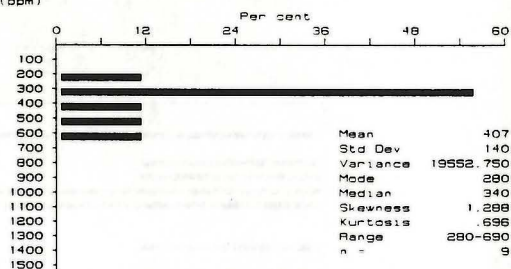
Group 10 - Background Picrite East
Mn (ppm)



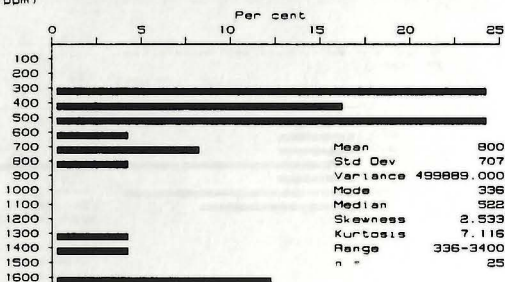
Group 13 - Background Picrite West
Mn (ppm)



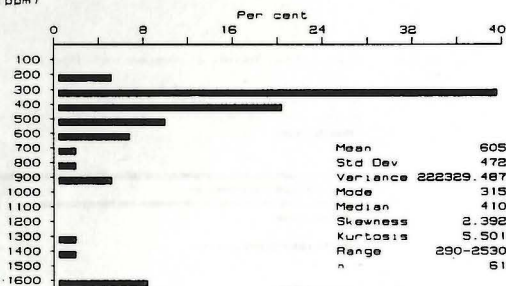
Group 4 - East Zone (Nisku) Picrite
Mn (ppm)



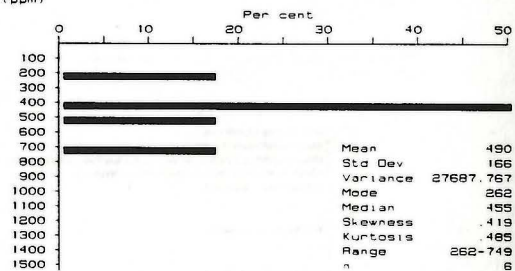
Group 7 - West Zone (Rainbow) Picrite
Mn (ppm)



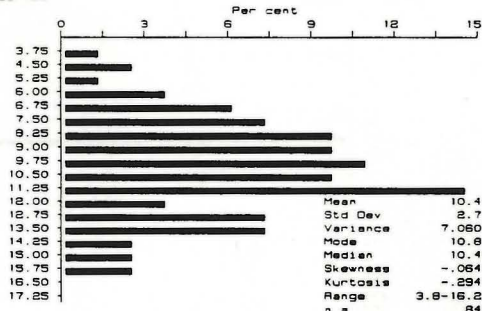
Group 3 - Main Zone Basalt
Mn (ppm)



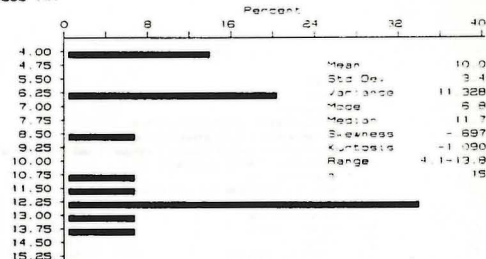
Group 11 - Background Basalt East
Mn (ppm)



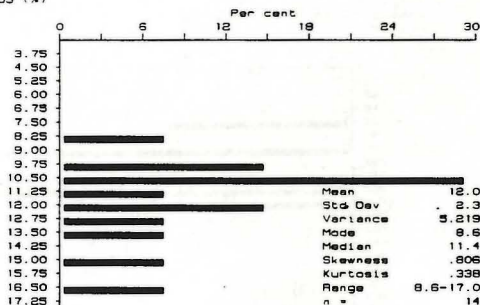
Group 2 - Main Zone Sedimentary Rocks
Fe2O3 (%)



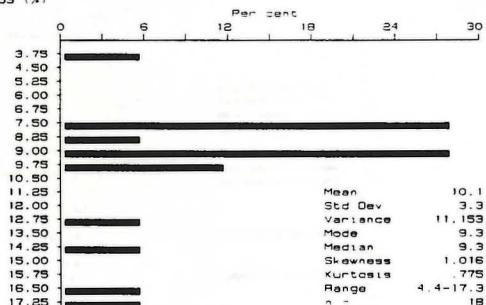
Group 12 - Background Sedimentary East
Fe2O3 (%)



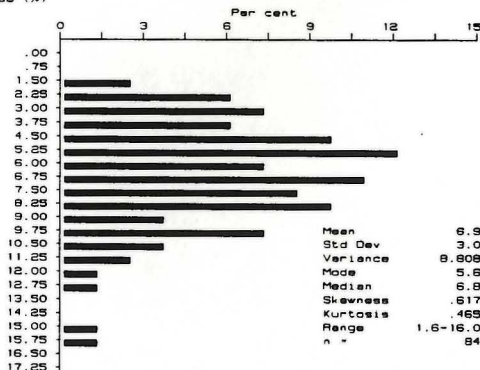
Group 5 - East Zone (Nisku) Sedimentary Rocks
Fe2O3 (%)



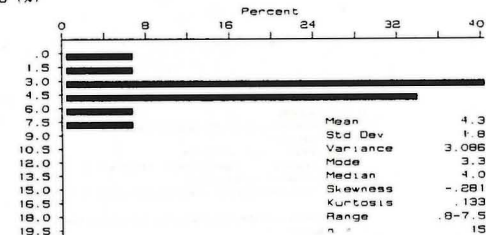
Group 8 - West Zone (Rainbow) Sedimentary Rocks
Fe2O3 (%)



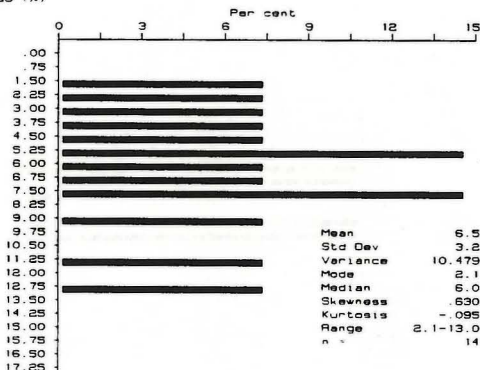
Group 2 - Main Zone Sedimentary Rocks
CaO (%)



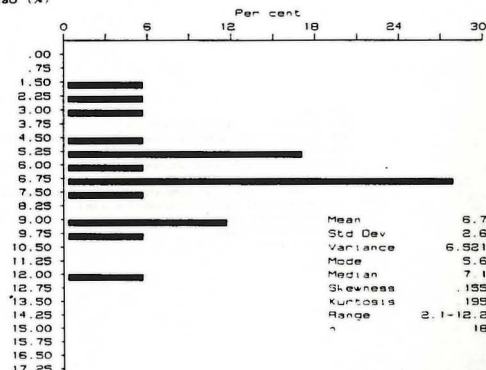
Group 12 - Background Sedimentary East
CaO (%)



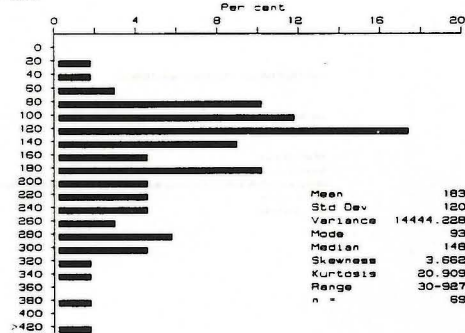
Group 5 - East Zone (Nisku) Sedimentary Rocks
CaO (%)



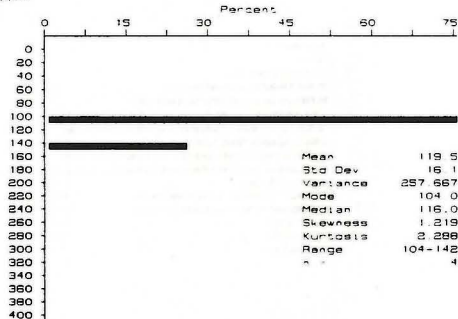
Group 8 - West Zone (Rainbow) Sedimentary Rocks
CaO (%)



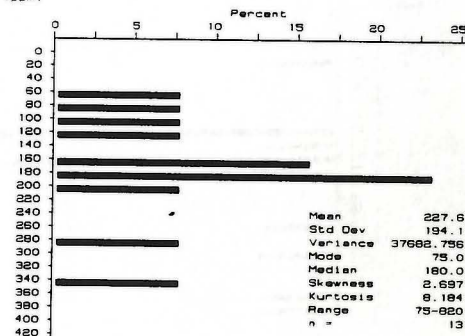
Group 1 - Main Zone Picrite
Cu (ppm)



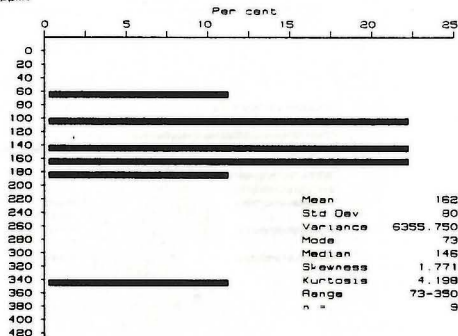
Group 10 - Background Picrite East
Cu (ppm)



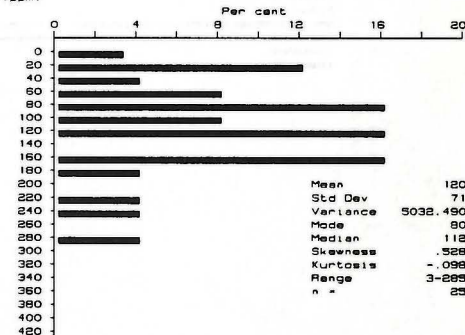
Group 13 - Background Picrite West
Cu (ppm)



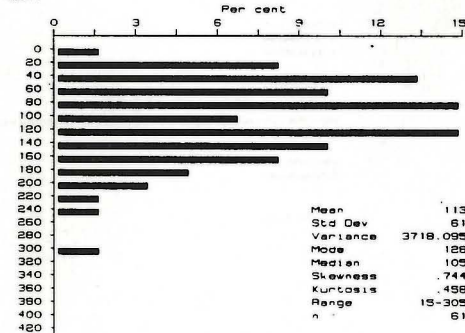
Group 4 - East Zone (Nisku) Picrite
Cu (ppm)



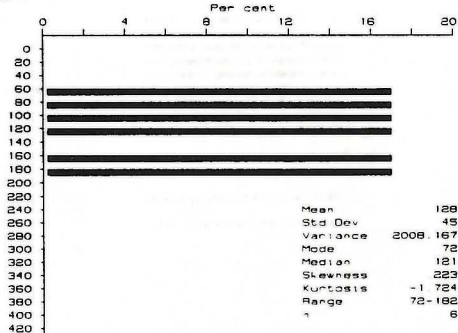
Group 7 - West Zone (Rainbow) Picrite
Cu (ppm)



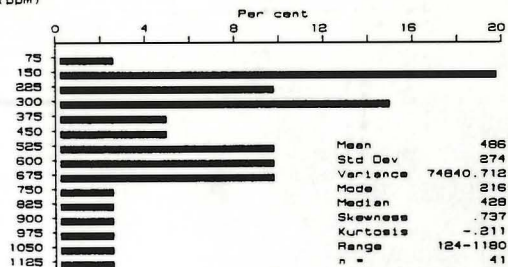
Group 3 - Main Zone Basalt
Cu (ppm)



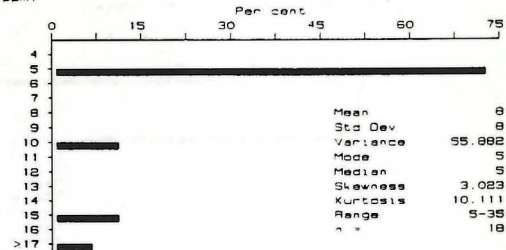
Group 11 - Background Basalt East
Cu (ppm)



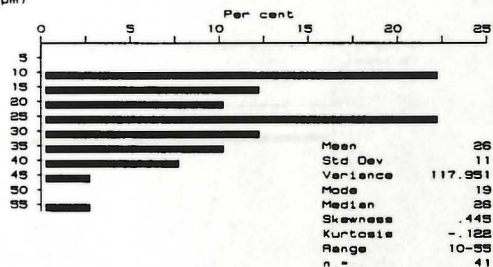
Group 2 - Main Zone Sedimentary Rocks
F (ppm)



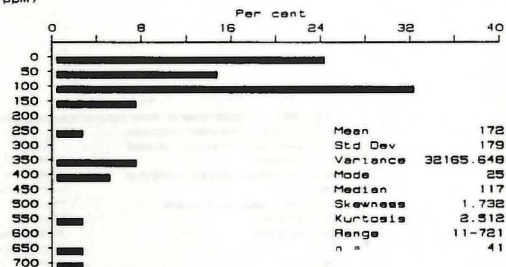
Group 2 - Main Zone Sedimentary Rocks
Hg (ppm)



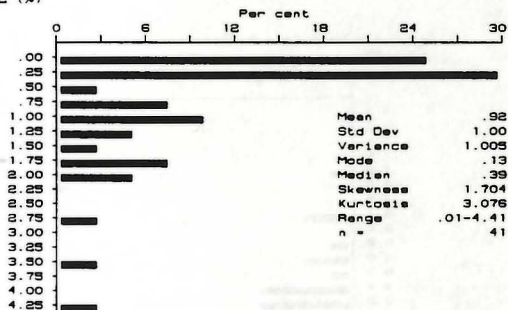
Group 2 - Main Zone Sedimentary Rocks
Li (ppm)



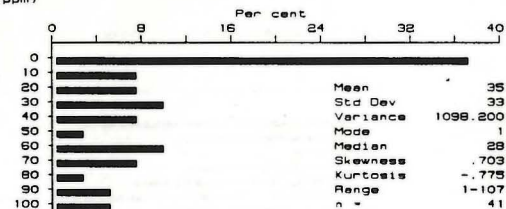
Group 2 - Main Zone Sedimentary Rocks
Zr (ppm)



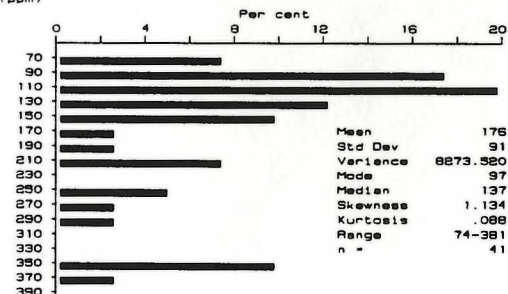
Group 2 - Main Zone Sedimentary Rocks
CO2 (%)



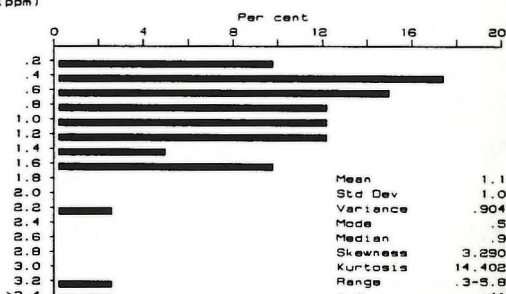
Group 2 - Main Zone Sedimentary Rocks
Rb (ppm)



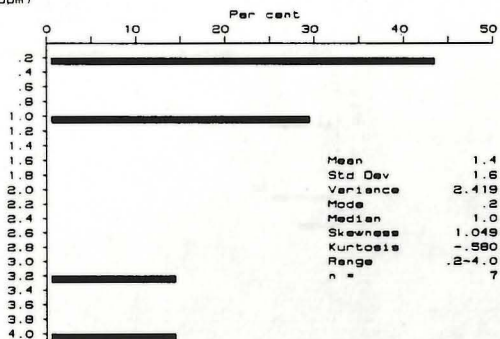
Group 2 - Main Zone Sedimentary Rocks
Sr (ppm)



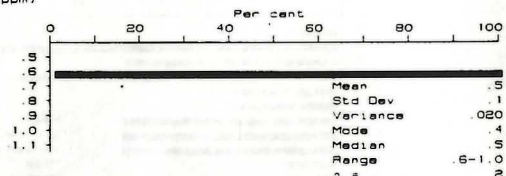
Group 2 - Main Zone Sedimentary Rocks
Se (ppm)



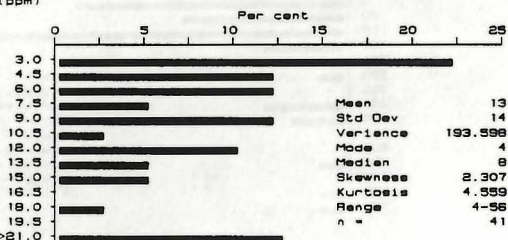
Group 2 - Main Zone Sedimentary Rocks
Bl (ppm)



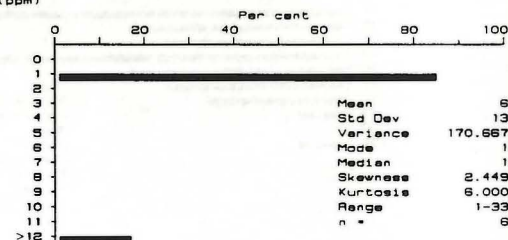
Group 2 - Main Zone Sedimentary Rocks
Te (ppm)



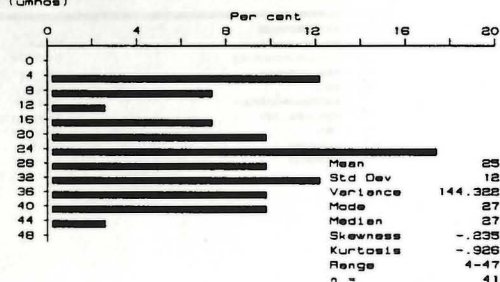
Group 2 - Main Zone Sedimentary Rocks
B (ppm)



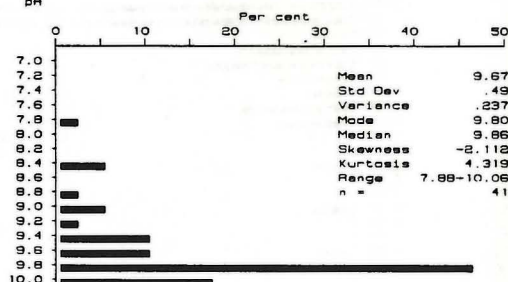
Group 2 - Main Zone Sedimentary Rocks
Cd (ppm)



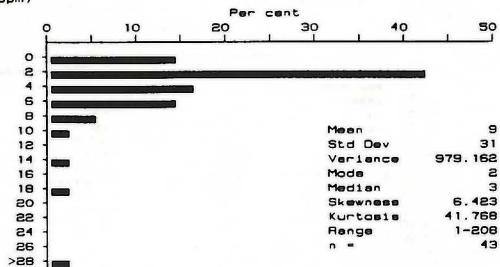
Group 2 - Main Zone Sedimentary Rocks
Cond (umhos)



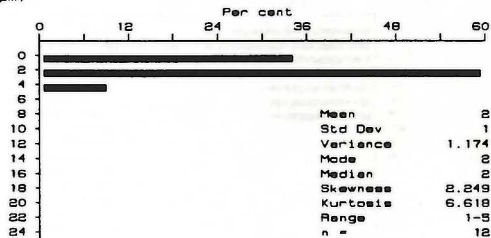
Group 2 - Main Zone Sedimentary Rocks
pH



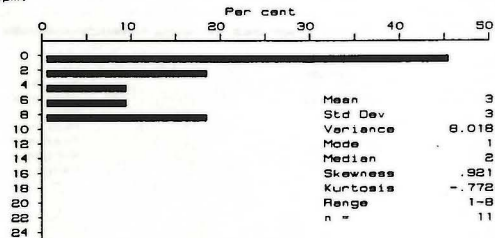
Group 2 - Main Zone Sedimentary Rocks
Ag (ppm)



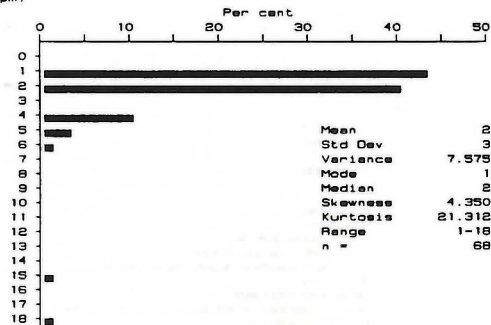
Group 5 - East Zone (Nisku) Sedimentary Rocks
Ag (ppm)



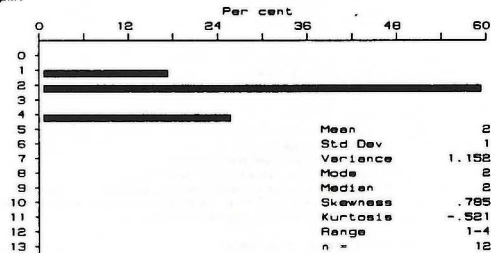
Group 8 - West Zone (Rainbow) Sedimentary Rocks
Ag (ppm)



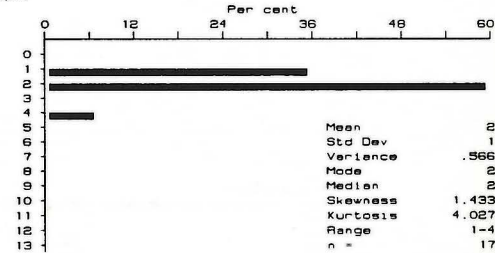
Group 2 - Main Zone Sedimentary Rocks
Mo (ppm)



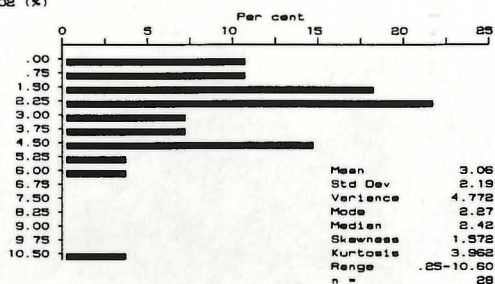
Group 5 - East Zone (Nisku) Sedimentary Rocks
Mo (ppm)



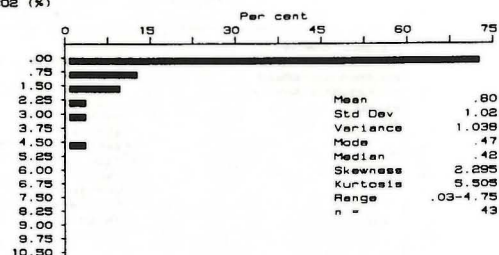
Group 8 - West Zone (Rainbow) Sedimentary Rocks
Mo (ppm)



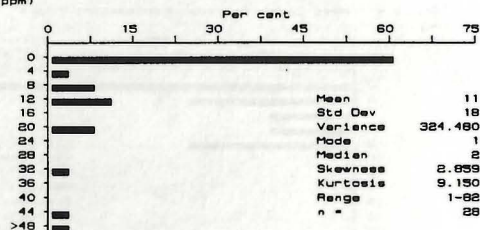
Group 1 - Main Zone Picrite
CO₂ (%)



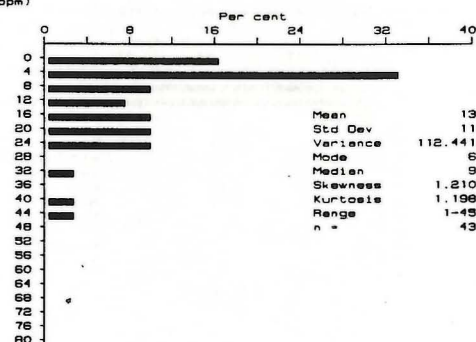
Group 3 - Main Zone Basalt
CO₂ (%)



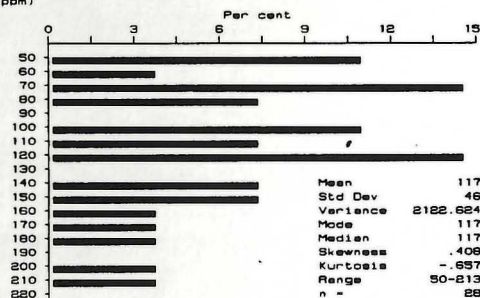
Group 1 - Main Zone Picrite
Rb (ppm)



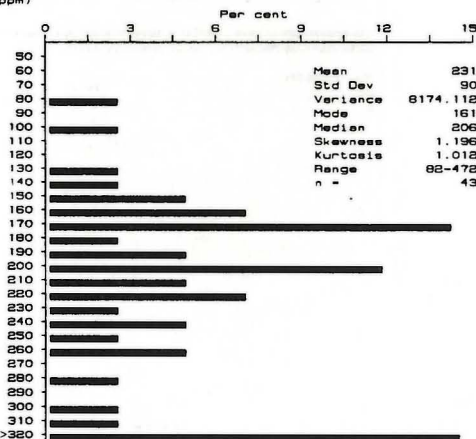
Group 3 - Main Zone Basalt
Rb (ppm)



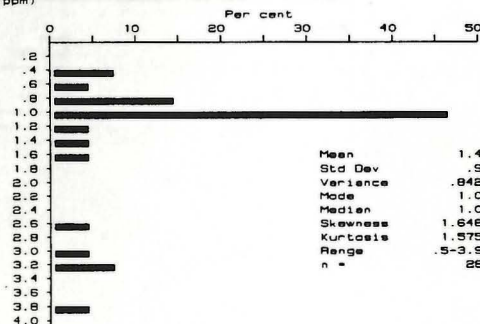
Group 1 - Main Zone Picrite
Sr (ppm)



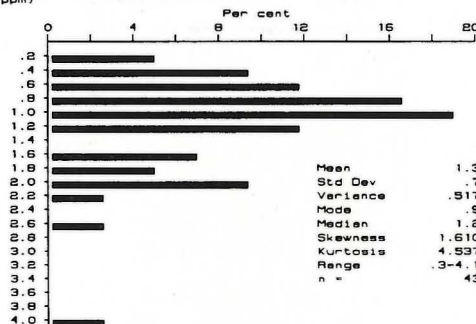
Group 3 - Main Zone Basalt
Sr (ppm)



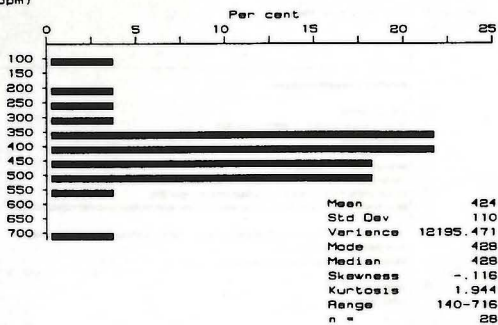
Group 1 - Main Zone Picrite
Se (ppm)



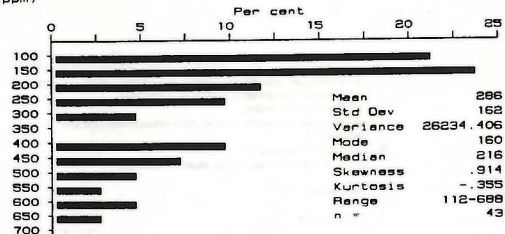
Group 3 - Main Zone Basalt
Se (ppm)



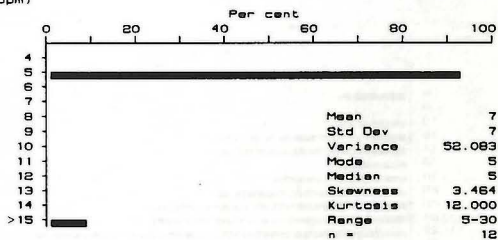
Group 1 - Main Zone Picrite
F (ppm)



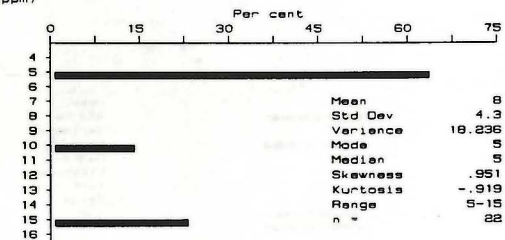
Group 3 - Main Zone Basalt
F (ppm)



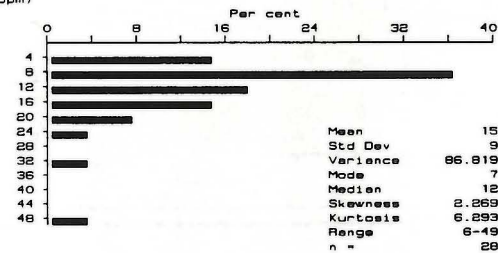
Group 1 - Main Zone Picrite
Hg (ppm)



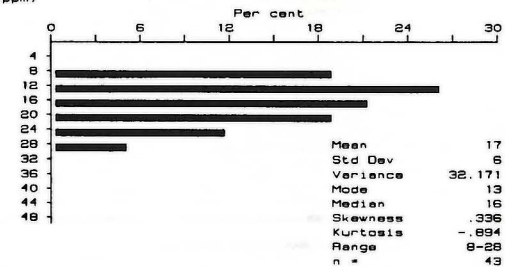
Group 3 - Main Zone Basalt
Hg (ppm)



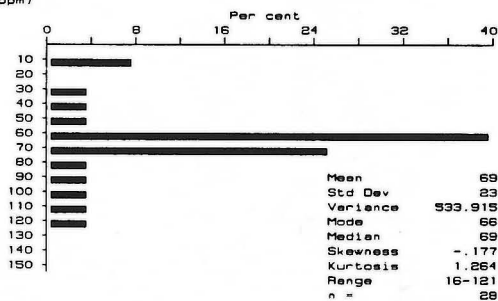
Group 1 - Main Zone Picrite
Li (ppm)



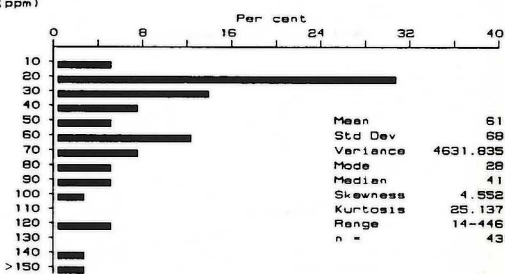
Group 3 - Main Zone Basalt
Li (ppm)



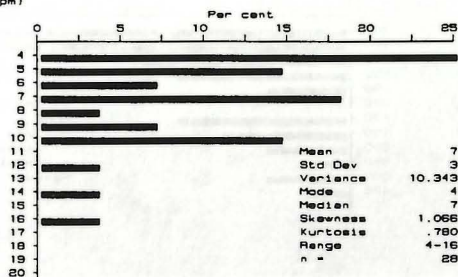
Group 1 - Main Zone Picrite
Zr (ppm)



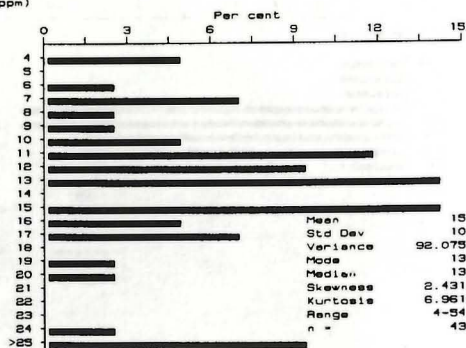
Group 3 - Main Zone Basalt
Zr (ppm)



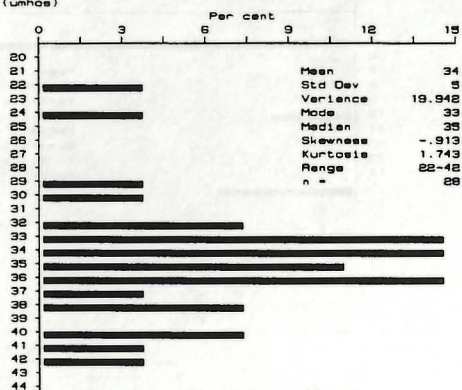
Group 1 - Main Zone Picrite
B (ppm)



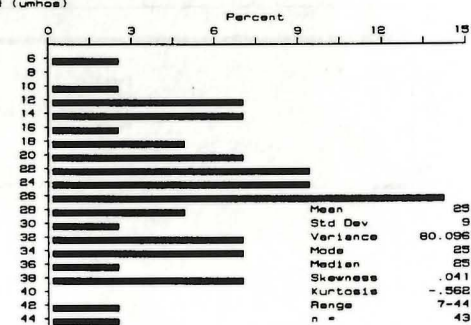
Group 3 - Main Zone Basalt
B (ppm)



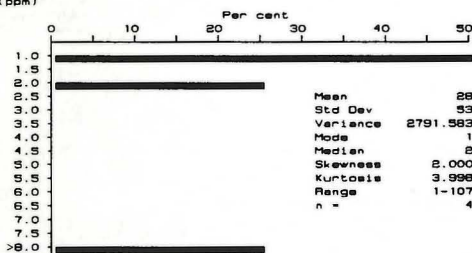
Group 1 - Main Zone Picrite
Cond (umhos)



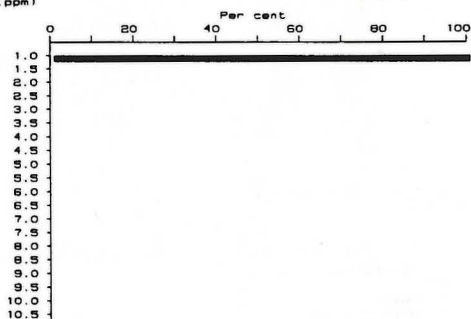
Group 3 - Main Zone Basalt
Cond (umhos)



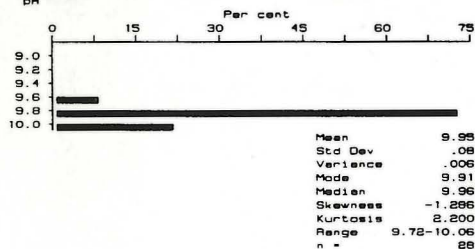
Group 1 - Main Zone Picrite
Cd (ppm)



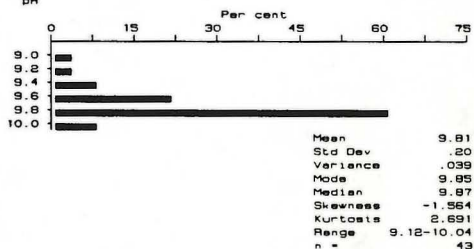
Group 3 - Main Zone Basalt
Cd (ppm)



Group 1 - Main Zone Picrite
pH



Group 3 - Main Zone Basalt
pH



APPENDIX IV

PART 2: Summary of Descriptive Statistics

Data Set	Range %	Variable	Arithmetic Mean %	Standard Deviation	Skewness	Kurtosis	No. of Samples
Main Zone Picrite	34.4-50.2	SiO ₂	43.3	3.0	-.417	0.484	69
Nisku Picrite	42.9-47.9	SiO ₂	44.8	1.7	.783	-.468	9
Rainbow Picrite	35.3-50.9	SiO ₂	45.5	3.7	-.802	0.842	25
Background Picrite (east)	41.8-45.2	SiO ₂	43.5	1.8	-.221	-1.497	4
Background Picrite (west)	36.7-49.8	SiO ₂	44.5	3.4	-.451	1.395	13
Main Zone Picrite	6.2-13.8	Al ₂ O ₃	8.6	1.8	1.282	1.414	69
Nisku Picrite	7.6-14.3	Al ₂ O ₃	9.6	2.2	1.448	1.684	9
Rainbow Picrite	4.3-15.9	Al ₂ O ₃	9.6	2.3	0.453	1.549	25
Background Picrite (east)	6.0-9.6	Al ₂ O ₃	7.5	1.5	1.031	1.933	4
Background Picrite (west)	6.4-13.7	Al ₂ O ₃	8.8	2.0	1.213	1.777	13
Main Zone Picrite	0.1-2.1	K ₂ O	0.3	0.4	2.911	10.377	63
Nisku Picrite	0.1-0.9	K ₂ O	0.4	0.3	0.494	-1.793	9
Rainbow Picrite	0.1-4.4	K ₂ O	0.6	1.0	3.568	14.088	21
Background Picrite (east)	0.1-0.3	K ₂ O	0.2	0.1	-.000	1.500	4
Background Picrite (west)	0.1-4.4	K ₂ O	0.9	1.0	1.731	3.158	21
Main Zone Picrite	10.1-20.0	MgO	14.6	1.8	0.279	1.299	69
Nisku Picrite	10.2-19.2	MgO	14.7	3.1	0.259	-1.089	9
Rainbow Picrite	10.2-18.7	MgO	15.3	2.2	-0.534	-.084	25
Background Picrite (east)	14.2-16.8	MgO	15.1	1.2	1.527	2.057	4
Background Picrite (west)	7.3-19.2	MgO	13.9	3.8	-0.445	-.949	13
Main Zone Picrite	0.18-0.83	MnO	0.41	0.15	0.759	0.048	69
Nisku Picrite	0.18-.043	MnO	0.27	0.08	0.882	-.030	9
Rainbow Picrite	0.13-0.82	MnO	0.35	0.15	1.208	2.615	25
Background Picrite (east)	0.20-0.32	MnO	0.27	0.05	-.862	1.738	4
Background Picrite (west)	0.15-0.34	MnO	0.22	0.05	1.090	1.114	13

Data Set	Range %	Variable	Arithmetic Mean %	Standard Deviation	Skewness	Kurtosis	No. of Samples
Main Zone Picrite	5.1-16.3	CaO	11.8	1.9	-0.254	1.446	69
Nisku Picrite	6.8-12.5	CaO	10.3	1.8	-0.665	-0.061	9
Rainbow Picrite	3.4-15.4	CaO	10.5	2.4	-0.861	2.030	25
Background Picrite (east)	9.2-20.7	CaO	15.3	4.7	-0.219	1.305	4
Background Picrite (west)	8.4-19.9	CaO	11.0	2.9	2.773	8.793	13
Main Zone Picrite	5.8-18.0	Fe ₂ O ₃ ^T	13.5	1.8	-0.387	3.963	69
Nisku Picrite	11.4-15.9	Fe ₂ O ₃ ^T	13.0	1.4	1.006	0.730	9
Rainbow Picrite	11.0-15.1	Fe ₂ O ₃ ^T	12.6	1.0	1.031	1.370	25
Background Picrite (east)	11.3-12.8	Fe ₂ O ₃ ^T	12.1	0.6	-0.205	-0.321	4
Background Picrite (west)	10.9-15.6	Fe ₂ O ₃ ^T	13.2	1.5	-0.014	-0.573	13
Main Zone Picrite	0.01-1.13	P ₂ O ₅	0.16	0.16	3.976	20.303	69
Nisku Picrite	0.10-0.21	P ₂ O ₅	0.14	0.03	1.502	2.773	9
Rainbow Picrite	0.01-0.25	P ₂ O ₅	0.09	0.07	0.614	-0.374	25
Background Picrite (east)	0.08-0.12	P ₂ O ₅	0.10	0.02	-0.753	0.343	4
Background Picrite (west)	0.10-0.23	P ₂ O ₅	0.15	0.05	0.836	-0.638	13
Main Zone Picrite	0.4-2.8	TiO ₂	1.3	0.4	0.521	1.960	69
Nisku Picrite	0.8-2.5	TiO ₂	1.4	0.5	1.661	3.707	9
Rainbow Picrite	0.3-1.8	TiO ₂	1.0	0.4	0.057	-0.382	25
Background Picrite (east)	1.0-1.5	TiO ₂	1.2	0.2	1.190	1.500	4
Background (Picrite) (west)	0.9-2.0	TiO ₂	1.3	0.4	1.030	0.070	13
Main Zone Picrite	0.1-1.0	Na ₂ O	0.3	0.2	1.496	2.603	69
Nisku Picrite	0.1-1.2	Na ₂ O	0.5	0.4	0.982	-0.382	9
Rainbow Picrite	0.1-0.6	Na ₂ O	0.3	0.1	1.004	0.479	25
Background Picrite (east)	0.3	Na ₂ O	0.3	-	-	-	4
Background Picrite (west)	0.1-1.6	Na ₂ O	0.5	0.5	1.847	2.898	13
Main Zone Picrite	0.7-11.5	LOI	3.8	2.1	1.492	3.061	69
Nisku Picrite	1.8-4.9	LOI	3.3	1.3	0.185	-2.223	9
Rainbow Picrite	1.9-9.1	LOI	4.7	1.9	0.540	-0.293	25
Background Picrite (east)	2.7-6.8	LOI	4.8	1.7	-0.000	1.341	4
Background Picrite (west)	0.8-12.9	LOI	4.5	2.8	2.349	7.413	13

Data Set	Range %	Variable	Arithmetic Mean %	Standard Deviation	Skewness	Kurtosis	No. of Samples
Main Zone Picrite	5-260	Ba	49	53	2.169	4.840	69
Nisku Picrite	5-255	Ba	99	93	0.596	-1.175	9
Rainbow Picrite	5-850	Ba	70	168	4.513	21.528	25
Background Picrite (east)	10-55	Ba	33	23	0.000	-5.546	4
Background (Picrite (west)	5-935	Ba	187	286	1.988	3.515	13
Main Zone Picrite	2-988	Pb	48	164	5.011	26.540	45
Nisku Picrite	4-77	Pb	27	27	1.323	0.779	7
Rainbow Picrite	3-313	Pb	39	75	3.513	13.172	17
Background Picrite (east)		Pb					
Background Picrite (west)	2-48	Pb	20	18	0.860	-01.249	10
Main Zone Picrite	3-250	As	33	38	3.116	14.483	69
Nisku Picrite	3-56	As	25	20	0.652	-01.015	9
Rainbow Picrite	9-2200	As	345	503	2.576	7.618	24
Background Picrite (east)	5-65	As	26	27	1.744	3.316	4
Background Picrite (west)	3-360	As	65	106	2.338	5.644	12
Main Zone Picrite	4-4200	Au	226	563	5.960	37.985	68
Nisku Picrite	3-210	Au	83	89	0.660	-1.704	9
Rainbow Picrite	2-500	Au	126	155	1.211	0.193	24
Background Picrite (east)	1-58	Au	16	28	1.998	3.994	4
Background Picrite (west)	4-95	Au	29	31	1.512	1.081	12
Main Zone Picrite	463-2513	Cr	1300	406	-0.097	0.336	69
Nisku Picrite	578-1915	Cr	1348	410	-0.692	0.446	9
Rainbow Picrite	431-1739	Cr	1290	339	-0.700	0.026	25
Background Picrite (east)	1241-1329	Cr	1285	50	0.003	-5.980	4
Background Picrite (west)	410-2195	Cr	1307	481	0.019	-0.102	13
Main Zone Picrite	213-1201	Ni	710	216	-0.363	-0.397	69
Nisku Picrite	206-1048	Ni	761	253	-1.410	2.366	9
Rainbow Picrite	237-1249	Ni	638	245	0.611	0.168	25
Background Picrite (east)	763-828	Ni	791	31	0.475	-3.101	4
Background Picrite (west)	334-1044	Ni	705	248	-0.027	-1.397	13

Data Set	Range %	Variable	Arithmetic Mean %	Standard Deviation	Skewness	Kurtosis	No. of Samples
Main Zone Picrite	27-119	Co	65	15	0.817	2.131	69
Nisku Picrite	14-70	Co	52	17	-1.508	2.503	9
Rainbow Picrite	28-133	Co	66	22	1.128	2.316	25
Background Picrite (east)	34-51	Co	44	8	-0.289	-04.225	4
Background Picrite (west)	37-111	Co	72	26	0.305	-1.515	13
Main Zone Picrite	35-22000	Zn	574	2824	6.995	51.269	69
Nisku Picrite	56-635	Zn	203	198	1.559	1.901	9
Rainbow Picrite	44-1610	Zn	218	305	4.247	19.759	25
Background Picrite (east)	53-99	Zn	74	24	0.092	-5.452	4
Background Picrite (west)	54-4330	Zn	460	1164	3.593	12.933	13
Main Zone Picrite	1-4	Mo	1	0.6	2.416	7.690	39
Nisku Picrite	1-4	Mo	1	1.3	1.714	2.664	5
Rainbow Picrite	1-2	Mo	2	0.5	-0.812	-1.650	12
Background Picrite (west)	1-2	Mo	0.5	0.3	0.661	-1.964	11
Main Zone Picrite	1-9	Ag	3	1.7	1.794	3.712	48
Nisku Picrite	1-15	Ag	4	5	2.371	5.837	7
Rainbow Picrite	1-4	Ag	2	1	1.458	2.007	15
Background (Picrite (west)		Ag	3				1
Main Zone Picrite	0.6-28	Sb	3.1	3.6	5.201	33.532	69
Nisku Picrite	0.9-12	Sb	3.8	4.1	1.355	0.604	9
Rainbow Picrite	1-11	Sb	3	2	2.012	4.466	24
Background Picrite (east)	0.8-2.2	Sb	1.3	0.6	1.762	3.299	4
Background Picrite (west)	0.2-2.3	Sb	0.8	0.7	1.520	1.248	12
Main Zone Picrite	260-2600	Mn	784	548	1.719	2.275	69
Nisku Picrite	280-690	Mn	407	140	1.288	0.696	9
Rainbow Picrite	336-3400	Mn	800	707	2.533	7.116	25
Background Picrite (east)	261-798	Mn	582	230	-1.205	1.755	4
Background Picrite (west)	193-700	Mn	418	159	0.109	-1.005	13

Data Set	Range %	Variable	Arithmetic Mean %	Standard Deviation	Skewness	Kurtosis	No. of Samples
Main Zone Picrite	30-927	Cu	183	120	3.662	20.909	69
Nisku Picrite	73-350	Cu	162	80	1.771	4.198	9
Rainbow Picrite	3-285	Cu	120	71	0.528	-.098	25
Background Picrite (east)	104-142	Cu	120	16	1.219	2.288	4
Background Picrite (west)	75-820	Cu	228	194	2.697	8.184	13
Main Zone Picrite	140-716	F	424	110	-0.116	1.944	28
Main Zone Basalt	112-688	F	286	162	0.914	-0.355	43
Main Zone Picrite	5-30	Hg	7	7	3.464	12.00	12
Main Zone Basalt	5-15	Hg	8	4	0.951	-0.919	22
Main Zone Picrite	6-49	Li	15	9	2.269	6.293	28
Main Zone Basalt	8-28	Li	17	6	0.336	-0.894	43
Main Zone Picrite	16-121	Zr	69	23	-0.177	1.264	28
Main Zone Basalt	14-446	Zr	61	68	4.552	25.137	43
Main Zone Picrite	0.25-10.60	CO ₂	3.06	2.19	1.572	3.962	28
Main Zone Basalt	0.03-4.75	CO ₂	0.80	1.02	2.295	5.505	43
Main Zone Picrite	1-82	Rb	11	18	2.859	9.150	28
Main Zone Basalt	1-45	Rb	13	11	1.210	1.198	43
Main Zone Picrite	50-213	Sr	117	46	0.408	-0.657	28
Main Zone Basalt	82-472	Sr	231	90	1.196	1.012	43
Main Zone Picrite	0.5-3.9	Se	1.4	0.9	1.648	1.575	28
Main Zone Basalt	0.3-4.1	Se	1.3	0.7	1.610	4.537	43
Main Zone Picrite	4-16	B	7	3	1.066	0.780	28
Main Zone Basalt	4-54	B	15	10	2.431	6.961	43
Main Zone Picrite	22-42	Cond.	34	5	-0.913	1.743	28
Main Zone Basalt	7-44	Cond.	25	9	0.041	-0.562	43

Data Set	Range %	Variable	Arithmetic Mean %	Standard Deviation	Skewness	Kurtosis	No. of Samples
Main Zone Picrite	1-107	Cd	28	53	2.000	3.998	4
Main Zone Basalt	1	Cd	-	-	-	-	43
Main Zone Picrite	9.72-10.06	pH	9.95	0.08	-1.286	2.200	28
Main Zone Basalt	9.12-10.04	pH	9.81	0.20	-1.564	2.691	43
Main Zone Sedimentary Rocks	35.2-78.0	SiO ₂	53.0	8.2	0.796	0.903	84
Nisku Sedimentary Rocks	43.1-63.4	SiO ₂	51.1	6.4	0.704	-0.424	14
Rainbow Sedimentary Rocks	40.2-61.1	SiO ₂	51.5	6.0	0.261	-0.380	18
Background (east) Sedimentary Rocks	48.7-74.8	SiO ₂	58.1	8.0	0.896	0.319	15
Main Zone Sedimentary Rocks	8.3-23.0	Al ₂ O ₃	16.2	3.2	-0.100	-0.362	84
Nisku Sedimentary Rocks	12.7-18.8	Al ₂ O ₃	15.1	2.2	0.547	-1.218	14
Rainbow Sedimentary Rocks	4.1-26.0	Al ₂ O ₃	17.8	6.5	-0.979	0.157	18
Background (east) Sedimentary Rocks	11.7-21.1	Al ₂ O ₃	16.8	3.1	-0.111	-1.014	15
Main Zone Sedimentary Rocks	3.8-16.2	Fe ₂ O ₃ ^T	10.4	2.7	-0.064	-0.294	84
Nisku Sedimentary Rocks	8.6-17.0	Fe ₂ O ₃ ^T	12.0	2.3	0.806	0.338	14
Rainbow Sedimentary Rocks	4.4-17.3	Fe ₂ O ₃ ^T	10.1	3.3	1.016	0.775	18
Background (east) Sedimentary Rocks	4.1-13.8	Fe ₂ O ₃ ^T	10.0	3.4	-0.697	-1.090	15
Main Zone Sedimentary Rocks	1.6-16.0	CaO	6.9	3.0	0.617	0.465	84
Nisku Sedimentary Rocks	2.1-13.0	CaO	6.5	3.2	0.630	-0.095	14

Data Set	Range %	Variable	Arithmetic Mean %	Standard Deviation	Skewness	Kurtosis	No. of Samples
Rainbow Sedimentary Rocks	2.1-12.2	CaO	6.7	2.6	0.155	0.195	18
Background (east) Sedimentary Rocks	0.8-7.5	CaO	4.3	1.8	-0.281	0.133	15
Main Zone Sedimentary Rocks	0.8-11.1	MgO	5.6	2.3	0.028	-0.648	84
Nisku Sedimentary Rocks	2.4-9.2	MgO	5.6	2.0	0.209	-0.720	14
Rainbow Sedimentary Rocks	2.4-10.0	MgO	6.0	1.8	0.314	0.443	18
Background (east) Sedimentary Rocks	0.6-4.7	MgO	3.0	1.3	-0.299	-0.813	15
Main Zone Sedimentary Rocks	0.2-5.1	Na ₂ O	1.6	1.4	0.908	-0.336	84
Nisku Sedimentary Rocks	0.2-3.9	Na ₂ O	1.4	1.1	1.004	0.122	14
Rainbow Sedimentary Rocks	0.1-2.7	Na ₂ O	1.1	0.8	0.315	-0.520	18
Background (east) Sedimentary Rocks	0.6-5.5	Na ₂ O	2.0	1.2	1.625	4.083	15
Main Zone Sedimentary Rocks	0.1-5.2	K ₂ O	2.2	1.2	-0.027	-0.707	84
Nisku Sedimentary Rocks	0.7-4.2	K ₂ O	2.4	1.0	0.121	-0.395	14
Rainbow Sedimentary Rocks	0.3-5.6	K ₂ O	3.0	1.8	0.261	-1.047	18
Background (east) Sedimentary Rocks	0.5-3.6	K ₂ O	2.1	0.9	-0.190	-0.257	15

Data Set	Range %	Variable	Arithmetic Mean %	Standard Deviation	Skewness	Kurtosis	No. of Samples
Main Zone Sedimentary Rocks	0.2-3.0	TiO ₂	1.4	0.7	0.417	-0.900	84
Nisku Sedimentary Rocks	1.2-3.3	TiO ₂	2.0	0.7	0.558	-0.677	14
Rainbow Sedimentary Rocks	0.3-1.9	TiO ₂	0.8	0.4	1.011	2.932	18
Background (east) Sedimentary Rocks	0.5-1.7	TiO ₂	1.0	0.4	0.080	-0.676	15
Main Zone Sedimentary Rocks	0.01-0.70	P ₂ O ₅	0.19	0.14	1.386	3.074	84
Nisku Sedimentary Rocks	0.14-0.44	P ₂ O ₅	0.26	0.09	0.589	-0.318	14
Rainbow Sedimentary Rocks	0.02-0.24	P ₂ O ₅	0.11	0.06	0.644	0.833	18
Background (east) Sedimentary Rocks	0.04-0.68	P ₂ O ₅	0.18	0.18	2.249	4.460	15
Main Zone Sedimentary Rocks	0.04-1.22	MnO	0.23	0.16	3.432	18.925	84
Nisku Sedimentary Rocks	0.08-0.64	MnO	0.22	0.15	1.943	4.670	14
Rainbow Sedimentary Rocks	0.05-0.38	MnO	0.19	0.09	0.874	0.046	18
Background (east) Sedimentary Rocks	0.04-0.24	MnO	0.14	0.06	0.081	-0.709	15
Main Zone Sedimentary Rocks	0.2-8.3	LOI	2.0	1.4	2.064	5.644	84
Nisku Sedimentary Rocks	0.5-5.7	LOI	2.2	1.4	1.561	1.886	14
Rainbow Sedimentary Rocks	0.8-8.7	LOI	2.9	2.3	1.863	3.015	18
Background (east) Sedimentary Rocks	0.8-2.7	LOI	1.6	0.5	0.593	0.074	15
Main Zone Sedimentary Rocks	14-880	Cu	157	152	2.709	8.538	84

Data Set	Range %	Variable	Arithmetic Mean %	Standard Deviation	Skewness	Kurtosis	No. of Samples
Nisku Sedimentary Rocks	48-330	Cu	140	94	0.927	-0.359	14
Rainbow Sedimentary Rocks	17-628	Cu	127	142	2.939	9.826	18
Background (east) Sedimentary Rocks	18-165	Cu	92	49	0.214	-1.282	14
Main Zone Sedimentary Rocks	10-340	Ni	86	72	1.326	2.396	84
Nisku Sedimentary Rocks	14-233	Ni	92	64	0.831	0.128	14
Rainbow Sedimentary Rocks	10-504	Ni	107	133	2.066	4.020	18
Background (east) Sedimentary Rocks	14-125	Ni	52	34	1.386	2.951	8
Main Zone Sedimentary Rocks	25-770	Cr	136	140	2.229	6.381	84
Nisku Sedimentary Rocks	24-415	Cr	139	123	0.992	0.221	14
Rainbow Sedimentary Rocks	25-838	Cr	143	228	2.501	5.691	18
Background (east) Sedimentary Rocks	26-47	Cr	34	11	1.485	---	3
Main Zone Sedimentary Rocks	1-1940	Pb	127	285	4.889	27.142	67
Nisku Sedimentary Rocks	4-1150	Pb	122	310	3.546	12.681	13
Rainbow Sedimentary Rocks	5-1380	Pb	159	337	3.143	10.868	18
Background (east) Sedimentary Rocks	2-5	Pb	3	1	0.405	-0.178	5

Data Set	Range %	Variable	Arithmetic Mean %	Standard Deviation	Skewness	Kurtosis	No. of Samples
Main Zone Sedimentary Rocks	30-4100	Zn	364	628	3.928	17.695	84
Nisku Sedimentary Rocks	74-5560	Zn	662	1458	3.375	11.795	14
Rainbow Sedimentary Rocks	85-5600	Zn	560	1335	3.619	13.577	18
Background (east) Sedimentary Rocks	82-281	Zn	159	70	0.556	-0.586	14
Main Zone Sedimentary Rocks	15-1015	Ba	246	183	1.685	4.059	84
Nisku Sedimentary Rocks	140-590	Ba	311	135	0.551	-0.336	14
Rainbow Sedimentary Rocks	55-900	Ba	227	192	2.727	9.227	18
Background (east) Sedimentary Rocks	45-435	Ba	195	117	0.654	0.032	14
Main Zone Sedimentary Rocks	1-17000	Au	535	1921	7.838	66.855	84
Nisku Sedimentary Rocks	3-440	Au	160	169	0.499	-1.701	14
Rainbow Sedimentary Rocks	9-7700	Au	831	1815	3.570	13.662	18
Background (east) Sedimentary Rocks	1-38	Au	8.8	10.1	2.523	7.433	12
Main Zone Sedimentary Rocks	22-133	Co	48	22	1.715	3.192	84
Nisku Sedimentary Rocks	4-83	Co	42	24	0.138	-0.388	14
Rainbow Sedimentary Rocks	24-76	Co	45	16	0.205	-1.003	18
Background (east) Sedimentary Rocks	32-56	Co	40	7	1.122	0.319	14

Data Set	Range %	Variable	Arithmetic Mean %	Standard Deviation	Skewness	Kurtosis	No. of Samples
Main Zone Sedimentary Rocks	155-5800	Mn	812	762	3.906	21.891	84
Nisku Sedimentary Rocks	156-1800	Mn	705	520	1.011	-0.253	14
Rainbow Sedimentary Rocks	192-2270	Mn	765	492	1.969	4.433	18
Background (east) Sedimentary Rocks	177-769	Mn	511	174	-0.361	-0.527	14
Main Zone Sedimentary Rocks	1-6500	As	434	1134	3.794	14.437	84
Nisku Sedimentary Rocks	2-5300	As	786	1453	2.674	7.754	14
Rainbow Sedimentary Rocks	8-55000	As	4286	12719	4.174	17.582	18
Background (east) Sedimentary Rocks	1-9	As	5	3	0.114	-0.658	8
Main Zone Sedimentary Rocks	0.2-120	Sb	7.2	15.7	5.101	33.427	81
Nisku Sedimentary Rocks	0.9-28.0	Sb	5.6	7.4	2.470	6.808	14
Rainbow Sedimentary Rocks	0.3-300	Sb	24.1	69.2	4.182	17.630	18
Background (east) Sedimentary Rocks	0.2-0.8	Sb	0.3	0.2	2.196	5.122	8
Main Zone Sedimentary Rocks	1-208	Ag	9	31	6.423	41.768	43
Nisku Sedimentary Rocks	1-5	Ag	2	1	2.249	6.618	12
Background (east) Sedimentary Rocks	1-8	Ag	3	3	0.921	-0.772	11

Data Set	Range %	Variable	Arithmetic Mean %	Standard Deviation	Skewness	Kurtosis	No. of Samples
Main Zone Sedimentary Rocks	1-18	Mo	2	3	4.350	21.312	68
Nisku Sedimentary Rocks	1-4	Mo	2	1	0.785	-0.521	12
Rainbow Sedimentary Rocks	1-4	Mo	2	1	1.433	4.027	17
Main Zone Sedimentary Rocks	124-1180	F	486	274	0.737	-0.211	41
Main Zone Sedimentary Rocks	5-35	Hg	8	8	3.023	10.111	18
Main Zone Sedimentary Rocks	10-55	Li	26	11	0.445	-0.122	41
Main Zone Sedimentary Rocks	11-721	Zr	172	179	1.732	2.512	41
Main Zone Sedimentary Rocks	0.01-4.41	CO ₂	0.92	1.00	1.704	3.076	41
Main Zone Sedimentary Rocks	1-107	Rb	35	33	0.703	-0.775	41
Main Zone Sedimentary Rocks	74-381	Sr	176	91	1.134	0.088	41
Main Zone Sedimentary Rocks	0.3-5.8	Se	1.1	1.0	3.290	14.402	41
Main Zone Sedimentary Rocks	0.2-4.0	Bi	1.4	1.6	1.049	-0.580	7
Main Zone Sedimentary Rocks	0.6-1.0	Te					2
Main Zone Sedimentary Rocks	4-56	B	13	14	2.307	4.559	41
Main Zone Sedimentary Rocks	1-33	Cd	6	13	2.449	6.000	6

Data Set	Range %	Variable	Arithmetic Mean %	Standard Deviation	Skewness	Kurtosis	No. of Samples
Main Zone Sedimentary Rocks	4-47	Cond	25	12	-0.235	-0.926	41
Main Zone Sedimentary Rocks	7.88-10.06	pH	9.67	0.49	-2.112	4.319	41

Note: Cond refers to Conductivity

**APPENDIX V
LOG OF DDH RO 75-4 WITH SAMPLE LOCATIONS
ARBOUR LAKE**

0 - 14' (0 - 4.3 m)	Missing
14' - 25' (4.3 - 7.6 m)	greywacke-type sedimentary rocks; wisps and blebs of fine grained amphibole-chlorite; specks sulphide
25' - 31' (7.6 - 9.4 m)	granodiorite intrusion; lower contact with sedimentary rocks marked by Fe-stained quartz veins
31' - 42' (9.4 - 12.8 m)	greywacke-type sedimentary rocks with acicular amphibole crystals
42' - 63' (12.8 - 19.2 m)	granodiorite intrusion with short interlaminated sections of greywacke-type sedimentary rocks
63' - 90' (19.2-27.4 m)	greywacke-type sedimentary rocks with (19.2 - 27.4 m) interlaminated sections
90' - 100' (27.4 - 30.5 m)	mafic sedimentary rocks; amphibole-rich layers interbedded with biotite-rich layers 0.6 cm thick); biotite layers contain disseminated Py-Po; rock appears to have been partly silicified and epidotized
100' - 129' (30.5 - 39.3 m)	greywacke-type sedimentary rocks with 0.3 m sections of granodiorite
129' - 143' (39.3 - 43.6 m)	greywacke-type sedimentary rocks with increasing amounts of mafic layers (wisps, blebs); coarse grained intervals are either intrusions or re-textured sedimentary rocks of greywacke type; flecks of Py-Po throughout; coarse grained actinolite crystals in mafic "picritic" patches
143' - 159' (43.6 - 48.5 m)	apparent transition from greywacke to picrite sedimentary rocks; increase in abundance of coarse grained actinolite; occasional biotite-rich patches, flecks Py-Po; 0.6 cm blebs of siliceous material
159' - 170.6' (48.5 - 52 m)	even textured, fine grained - medium grained greywacke-type sedimentary rocks; passive/planar contact with picritic sedimentary rocks at 52 m
170.6' - 258' (52 - 78.6 m)	variable picritic sedimentary rocks with disseminated magnetite; 1 - 5 mm layers of biotite; 1 - 5 mm layers of brown carbonate; sections of fine grained talcose (?) ("sericite-chlorite"); AL-8 to AL-11
258' - 376' (78.6 - 114.6m)	variable picritic sedimentary rocks; 91.7-92.7 m granitic intrusion 2.5-7.6 cm biotite-rich layers; layers of 1.5 cm maximum thickness of greywacke-type sedimentary rocks with carbonate filling fractures; AL-12 to AL-16
376' - 492' (114.6 - 150 m)	variable picritic sedimentary rocks; split core from 134-138.6 m; flecks Py-Po, flecks and blebs of magnetite; white carbonate filled fractures and foliation; AL-17, AL-18, AL-19, AL-20
492' - 507' (150 - 154.5 m)	picritic sedimentary rocks
507' - 551' (154.5 - 167.9 m)	variable picritic rocks

551' - 597' (167.9 - 182 m)	coarse grained granodiorite intrusion; split core from 169.1-170.7 m; fractures parallel to LCA with Po-Py-Cp fractures marked by concentration of amphiboles; variable textures throughout intrusion - short intervals could be retextured greywacke-type sedimentary rocks
597' - 613' (182 - 186.8 m)	picritic sedimentary rocks with numerous thin granodiorite dikes
613' - 638' (186.8 - 194.5 m)	granodiorite intrusion
638' - 661' (194.5 - 201.5 m)	granodiorite intrusion; split core from 199.8-204.5 m; core split where intrusion contains fragments of biotite-sulphide-rich rock
661' - 666' (201.5 - 203 m)	fine laminated biotite-picrite layers with 0.6-1.2 cm Py-Po laminae; grades into more evenly textured greywacke-type sedimentary rock; AL-21
666' - 711' (203 - 216.7 m)	variable greywacke-type sedimentary rocks with thin (15-20 cm) sections of interlayered biotite-picrite
711' - 754' (216.7 - 229.8 m)	216.7-220 m - biotite-hornblende feldspar dyke; 220-229.8 m - granodiorite intrusion
754' - 762' (229.8 - 232.3 m)	granodiorite intrusion
762' - 814' (232.3 - 248.1 m)	intermediate to mafic, salt and pepper textured sedimentary rock or intrusion; unmineralized, massive to weakly foliated; no visible bedding
814' - 843' (248.1 - 257 m)	granodiorite intrusion with mineralized zone from 249.9-256 m consisting of quartz veins and quartzose zones, bleached silicified zone with Po-Py, Py-Cp and Po-Cp
843' - 887' (257 - 270.4 m)	granodiorite intrusion with an 20 cm section of biotite-rich sedimentary rock at 268 m
887' - 901' (270.4 - 274.6 m)	biotite-hornblende picritic rock
901' - 921' (274.6 - 280.7 m)	granodiorite dyke
921' - 927' (280.7 - 282.6 m)	strongly foliated biotite-amphibole-rich picritic sedimentary rocks
927' - 1334' (282.6 - 406.6 m)	granodiorite intrusion; split core with disseminated Py + Po $\pm$ Cp at: 371.9-373.4m; 376.4-378 m; 378-381 m; 386.8-391.4 m; 395.3-406.6 m
1334' - 1340' (406.6 - 498.4 m)	variable greywacke-type sedimentary rocks with blebs and layers of biotite-amphibole rich material; disseminated and wisps Fe sulphide at contact with granodiorite intrusion; disseminated Py-Po and silicification; Py-Po coating along shears (mobilizate)
1340' - 1346' (408.4 - 410.3 m)	siliceous greywacke with increased abundance of biotite-amphibole-rich material towards bottom of interval

1346' - 1349' (410.3 - 411.2 m)	medium grained granitic intrusion
1349' - 1359' (411.2 - 414.2 m)	mafic/altered greywacke with amphibole and biotite-rich sections
1359' - 1363' (414.2 - 415.4 m)	medium grained granitic intrusion
1363' - 1378' (415.4 - 420 m)	amphibole-rich greywacke, unmineralized
1378' - 1380' (420 - 420.6 m)	medium grained granitic intrusion
1380' - 1416' (420.6 - 431.6 m)	mafic greywacke with siliceous greywacke interbands; biotite-rich sections; minor disseminated Py-Po; core split from 420.9-422.8 m
1416' - 1427' (431.6 - 435 m)	picritic sedimentary rocks; AL-24
1427' - 1436' (435 - 437.7 m)	medium grained granitic intrusion
1436' - 1470' (437.7 - 448.1 m)	mixed greywacke-type sedimentary rocks with amphibole and biotite-rich sections

Abbreviations: Cp.- chalcopyrite; Py - pyrite; Po - pyrrhotite; LCA - long core axis;
 Al-17 - rock sample 17 from Arbour Lake core.

APPENDIX VI
Normative Analyses of MacLellan Picritic Basalts

Sample No.	N SiO ₂	N Al ₂ O ₃	N Fe ₂ O ₃	N FeO	N MgO	N CaO	N Na ₂ O	N K ₂ O	N TiO ₂	N P ₂ O ₅	N MnO
AGC-47	47.5099	8.5991	2.9637	10.6801	16.7682	10.7488	.43	.1075	1.8273	.1182	.2472
AGC-49	48.335	9.2579	2.8606	10.3086	14.4251	11.8415	.7536	.1077	1.6148	.1184	.3768
AGC-50P	49.3083	9.1079	2.761	9.9496	15.1799	10.5736	.6281	.2094	1.7797	.1256	.3769
AGC-51D	45.8454	7.8194	2.8892	10.4116	15.5317	14.6748	.5356	.1071	1.7138	.15	.3213
AGC-53	44.8417	10.3157	3.1968	11.5199	14.7367	11.9999	.5263	.5263	1.8947	.1368	.3053
AGC-55	46.0719	10.9991	2.944	10.609	13.4895	12.3481	.6226	.1038	2.1791	.2387	.3943
AGC-56	45.9381	11.9885	2.8616	10.3122	13.3677	10.9275	.6366	1.3792	2.0158	.3077	.2652
AGC-58	48.3024	7.7704	2.6854	9.6773	14.5957	14.3857	.42	.42	1.2601	.1155	.3675
AGC-59	47.21979	9.0242	2.8513	10.275	14.4807	13.5363	.4197	.3148	1.2592	.1574	.4617
AGC-62	45.3279	13.9631	2.7065	9.7533	15.1093	10.6286	.4168	.8336	.8336	.0104	.4168
AGC-68P	48.9828	9.408	2.5744	9.2771	14.8278	12.2713	.409	.2045	1.3294	.1738	.542
AGC-207	46.5162	12.4043	2.4357	8.7771	13.2598	13.3667	1.0693	.8555	.8555	.1176	.3422
AGC-209	46.4426	8.7951	2.7431	9.8849	17.054	12.6564	.2145	.1073	1.7161	.1502	.236
AGC-212	47.9405	10.9668	2.5668	9.2498	13.9957	11.9068	.7311	.94	1.3578	.1253	.2193
AGC-213	47.0414	9.0669	2.9838	10.7523	17.8139	9.707	.32	.2133	1.6	.128	.3733
AGC-214	46.3446	8.2102	2.806	10.1116	20.7416	9.7226	.108	.2161	1.4044	.1404	.1945
AGC-225	47.6324	8.9311	2.5067	9.0331	20.0949	10.1006	.1063	.1063	1.1695	.1063	.2126
AGC-273	49.9393	10.2816	2.4945	8.9891	16.1568	9.9669	.5246	.6295	.7344	.0944	.1888
AGC-292	48.683	7.3699	2.5924	9.3422	19.5147	10.5878	.2076	-	1.2456	.1246	.3322
AGC-293	47.8415	7.4586	2.5973	9.3595	17.6875	12.7861	.2131	.3197	1.2786	.1172	.341
AGC-300	46.5405	7.7747	2.6969	9.7184	16.1974	15.0096	.216	-	1.2958	.1296	.4211
AGC-311	47.7879	7.7044	2.725	9.8199	14.3676	15.2005	.4165	.1041	1.4576	.1874	.229
AGC-317	46.5332	7.5259	2.9014	10.4557	18.0197	11.9778	.212	-	1.59	.424	.3604
AGC-328	46.3358	9.7435	2.9418	10.6009	13.2079	13.3161	.3248	.6496	1.9487	.3464	.5846
AGC-333	43.2777	7.6818	3.8911	14.022	17.852	10.0621	.1082	-	1.8393	.7574	.5085
AGC-338	47.2093	10.8699	2.6615	9.591	17.1573	9.591	.5328	.4263	1.5985	.1279	.2344
AGC-342	50.2613	7.4615	2.464	8.8792	16.0629	12.8503	.2073	-	1.1399	.2591	.4145
AGC-347	49.7172	11.9404	2.6942	9.7088	11.7345	7.5142	.5147	4.5291	1.3381	.175	.1338
AGC-349	50.0641	9.6156	2.7147	9.7829	12.2286	13.0647	.5226	.209	1.2542	.1359	.4076
AGC-350	50.8827	9.9082	2.4952	8.9917	13.4173	12.4884	.3096	.4128	.6193	.031	.4438
AGC-351	49.7855	11.143	2.4715	8.9062	16.97	9.5073	.2045	.1022	.6134	.0204	.276
AGC-352	50.7281	8.946	2.5389	9.1494	14.1307	12.3008	.305	.2033	1.2199	.0813	.3965

Sample No.	N SiO ₂	N Al ₂ O ₃	N Fe ₂ O ₃	N FeO	N MgO	N CaO	N Na ₂ O	N K ₂ O	N TiO ₂	N P ₂ O ₅	N MnO
AGC-374	48.4822	8.5744	2.538	9.146	16.937	12.3852	.1059	.1059	1.1644	.1376	.4234
AGC-392	47.5636	8.1933	2.7851	10.0362	18.3019	10.9599	.2128	.3192	1.2769	.117	.2341
AGC-393	45.9057	8.2478	2.9055	10.4704	20.8367	9.9842	.1085	-	1.1938	.1085	.2388
AGC-544	48.6848	7.676	2.6682	9.615	19.9787	9.6739	.1052	-	1.2618	.1157	.2208
AGC-548	46.4972	10.1449	2.8715	10.3477	14.7946	12.6811	.5284	.1057	1.6908	.1268	.2114
AGC-552	48.4975	6.9282	2.5649	9.243	18.9507	12.0225	.2038	-	1.3245	.0917	.1732
AGC-553	45.6606	9.8443	2.9294	10.5564	19.5838	9.2159	.2095	-	1.6756	.1152	.2095
AGC-554	46.1789	9.5902	2.7492	9.9071	20.4313	8.9647	.1042	-	1.7721	.1042	.1981
AGC-557	47.0305	8.6083	2.8316	10.2039	18.6862	10.2879	.21	.105	1.6797	.105	.2519
AGC-558	46.2774	10.5034	2.8258	10.1831	17.367	10.2954	.312	.104	1.7679	.1248	.2392
AGC-560	47.6803	8.5659	2.7631	9.9571	19.4024	9.4948	.2064	-	1.6513	.1032	.1754
AGC-561	43.4734	9.6832	2.8617	10.3126	20.5767	10.8936	.1009	-	1.8156	.121	.1614
AGC-562	44.4135	10.4996	2.7691	9.9789	18.6894	11.1296	.105	.105	1.9949	.1365	.1785
AGC-563	46.2183	8.8881	2.9876	10.7661	19.2402	9.6201	.2091	-	1.7776	.1046	.1882
AGC-564	44.9423	8.9037	3.0285	10.9134	20.7752	9.2217	.212	-	1.6959	.1272	.1802
AGC-567	45.7179	10.9807	2.7846	10.0347	17.1046	11.0863	.2112	.1056	1.5838	.1478	.2428
AGC-568	43.698	10.9506	2.7922	10.062	18.7724	11.1592	.2086	.1043	1.773	.146	.3337
AGC-569	48.0418	8.9356	2.7095	9.764	16.7148	11.7739	.1051	-	1.4717	.1682	.3154
1002-3	48.3951	9.1271	2.4032	8.6602	19.8462	9.9762	.4245	.1061	.7429	.1167	.2016
1019-4	49.4651	8.7539	2.3882	8.6063	18.879	10.4415	.5273	.1055	.5273	.0844	.2215

N - Normalized Data (100%) Anhydrous

Sample No.	Quartz	Corundum	Orthoclase	Albite	Anorthite	Leucite	Nepheline	Kallopillite	Acmite	Sodium Metasilicate
AGC-47			.6352	3.6381	21.2159					
AGC-49			.6361	6.3764	21.5606					
AGC-50P	.1886		1.2373	5.3151	21.4138					
AGC-51D			.633	4.5319	18.6156					
AGC-53			3.1101	4.4535	24.2304					
AGC-55			.6132	5.2682	26.911					
AGC-56			8.1501	5.3864	25.781					
AGC-58			2.482	3.5541	18.0763					
AGC-59			1.8602	3.5516	21.8096					
AGC-62			4.9261	3.5269	33.7666					
AGC-68P			1.2086	3.4612	23.2304					
AGC-207			5.0552	9.0484	26.5198					
AGC-209			.6338	1.8152	22.7186					
AGC-212			5.5548	6.1865	23.8659					
AGC-213			1.2607	2.7078	22.6734					
AGC-214			1.2767	.9141	21.2793					
AGC-225			.6283	.8997	23.578					
AGC-273			3.7198	4.4388	23.8406					
AGC-292				1.7567	19.1776					
AGC-293			1.8889	1.8032	18.4508					
AGC-300				1.8274	20.2447					
AGC-311			.6152	3.5239	18.8452					
AGC-317				1.7939	19.5834					
GC-328			3.8385	2.7482	23.2098					
AGC-333				.9155	20.4748					
AGC-338			2.5189	4.5087	26.0087					
AGC-342	1.5227			1.7538	19.4289					
AGC-347			26.7637	4.355	16.8943					
AGC-349	2.6028		1.2352	4.422	23.274					
AGC-350	2.3999		2.4396	2.62	24.4263					
AGC-351	.1596		.6041	1.7301	29.1849					
AGC-352	3.0883		1.2015	2.5806	22.4406					

Sample No.	Quartz	Corundum	Orthoclase	Albite	Anorthite	Leucite	Nepheline	Kallopillite	Acmite	Sodium Metasilicate
AGC-374			.6255	.8957	22.6081					
AGC-392			1.8864	1.8008	20.4581					
AGC-393				.9183	22.0178					
AGC-544				.8898	20.4727					
AGC-548			.6245	4.471	24.9973					
AGC-552				1.7243	17.9895					
AGC-553				1.7723	25.9207					
AGC-554				.8821	25.6998					
AGC-557			.6203	1.7766	22.2359					
AGC-558			.6145	2.6399	26.9519					
AGC-560				1.7466	22.4464					
AGC-561				.8535	25.9686					
AGC-562			.6205	.8885	27.8678					
AGC-563				1.7696	23.3133					
AGC-564				1.7938	23.3429					
AGC-567			.6239	1.7868	28.7022					
AGC-568			.6163	1.765	28.6354					
AGC-569				.8895	23.9096					
1002-3			.6271	3.5922	22.6852					
1019-4			.6232	4.4623	21.2073					

Sample No.	Ilmenite	Sphene	Perovskite	Rutile	Fluorapatite	Wollastonite (Diopside)	Enstatite (Diopside)
AGC-47	3.4704				.2801	13.0843	8.9313
AGC-49	3.0668				.2805	15.2034	10.0359
AGC-50P	3.3801				.2976	12.6184	8.5414
AGC-51D	3.255				.3552	22.2159	14.9391
AGC-53	3.5985				.3241	14.3663	9.3303
AGC-55	4.1385				.5653	13.6906	8.9551
AGC-56	3.8284				.7287	11.0316	7.2559
AGC-58	2.3931				.2736	21.9362	14.625
AGC-59	2.3915				.3728	18.5037	12.0908
AGC-62	1.5832				.0247	7.889	5.2254
AGC-68P	2.5248				.4118	15.2451	10.2715
AGC-207	1.6247				.2786	16.2942	10.7734
AGC-209	3.2593				.3557	16.3212	11.36
AGC-212	2.5787				.2969	14.3571	9.6602
AGC-213	3.0388				.3032	10.2909	7.0422
AGC-214	2.6672				.3326	10.8716	7.7617
AGC-225	2.2212				.2518	10.7876	7.7864
AGC-273	1.3948				.2236	10.4336	7.1743
AGC-292	2.3657				.295	13.5845	9.6827
AGC-293	2.4284				.2776	18.4618	12.9269
AGC-300	2.461				.3069	22.2847	15.1768
AGC-311	2.7683				.4439	23.1068	15.4392
AGC-317	3.0197				1.0043	15.4776	10.6863
AGC-328	3.701				.8206	16.9472	10.8913
AGC-333	3.4932				1.7939	10.2277	6.5483
AGC-338	3.0359				.3029	8.6586	6.0581
AGC-342	2.165				.6137	17.7993	12.3038
AGC-347	2.5414				.4145	8.0337	5.1233
AGC-349	2.382				.3218	16.9741	10.7867
AGC-350	1.1761				.0733	15.5854	10.1692
AGC-351	1.1649				.0484	7.452	5.1577
AGC-352	2.3169				.1926	15.8884	10.6421
AGC-374	2.2115				.3259	15.8398	10.9986
AGC-392	2.4251				.2772	13.8411	9.6367

Sample No.	Ilmenite	Sphene	Perovskite	Rutile	Fluorapatite	Wollastonite (Diopside)	Enstatite (Diopside)
AGC-393	2.2672				.257	11.1922	7.9005
AGC-544	2.3965				.274	11.175	7.9771
AGC-548	3.2112				.3004	15.4845	10.3429
AGC-552	2.5155				.2172	17.1421	12.2498
AGC-553	3.1824				.2729	7.9528	5.599
AGC-554	3.3656				.2469	7.5547	5.4417
AGC-557	3.19				.2487	11.7399	8.246
AGC-558	3.3576				.2956	9.7322	6.7593
AGC-560	3.1361				.2444	10.0139	7.1279
AGC-561	3.4482				.2867	11.392	8.1637
AGC-562	3.7888				.3233	11.0459	7.8653
AGC-563	3.3761				.2477	9.9078	6.9408
AGC-564	3.221				.3013	9.0084	6.3728
AGC-567	3.0079				.3501	10.5769	7.3163
AGC-568	3.3672				.3458	10.7606	7.5878
AGC-569	2.7952				.3984	13.9467	9.6188
1002-3	1.4109				.2765	10.8744	7.8244
1019-4	1.0015				.1999	12.5436	8.9122

Sample No.	Potassium Metasilicate	Wollastonite	Diopside	Hypersthene	Olivine	Calcium Orthosilicate	Magnetite	Hematite
AGC-47			25.1393	33.6992	7.6339		4.2971	
AGC-49			29.318	29.9966	4.6284		4.1477	
AGC-50P			24.2667	39.909			4.0032	
AGC-51D			42.7547	7.7434	17.934		4.1891	
AGC-53			27.7519	12.749	19.1584		4.635	
AGC-55			26.4266	23.4686	8.3574		4.2685	
AGC-56			21.2814	14.9891	15.7251		4.1491	
AGC-58			42.256	19.0687	8.0132		3.8936	
AGC-59			35.721	19.8708	10.3023		4.1341	
AGC-62			15.2074	15.4777	21.5691		3.9242	
AGC-68P			29.3331	34.9588	1.1547		3.7326	
AGC-207			31.416	.0301	22.5061		3.5315	
AGC-209			31.2894	23.1449	12.8168		3.9772	
AGC-212			27.6286	18.7478	11.4285		3.7216	
AGC-213			19.7667	34.9579	10.9766		4.3262	
AGC-214			20.7808	30.1362	18.5543		4.0684	
AGC-225			20.5936	35.5751	12.6259		3.6345	
AGC-273			20.0299	38.9495	3.7935		3.6167	
AGC-292			25.9715	38.8463	7.839		3.7588	
AGC-293			35.3691	24.1319	11.8947		3.7658	
AGC-300			42.8271	14.0124	14.4224		3.9102	
AGC-311			44.5004	18.0769	7.2878		3.951	
AGC-317			29.6993	28.5036	12.2156		4.2068	
AGC-328			32.7737	20.0388	8.6295		4.2653	
AGC-333			19.7868	28.5854	19.3544		5.6417	
AGC-338			16.5895	30.9264	12.2596		3.8589	
AGC-342			34.1499	36.8121			3.5725	
AGC-347			15.5485	14.5009	15.0861		3.9063	
AGC-349			32.8639	28.9742			3.9361	
AGC-350			30.0921	33.1623			3.6178	
AGC-351			14.2954	49.2338			3.5834	
AGC-352			30.5907	33.9168			3.6812	
AGC-374			30.3748	34.4022	4.8889		3.6799	
AGC-392			26.5339	30.4855	12.1041		4.0381	
AGC-393			21.4219	28.5139	20.3997		4.2128	

Sample No.	Potassium Metasilicate	Wollastonite	Diopside	Hypersthene	Olivine	Calcium Orthosilicate	Magnetite	Hematite
AGC-544			21.3611	44.1734	6.5728		3.8686	
AGC-548			29.822	21.2742	11.1453		4.1634	
AGC-552			32.7632	32.2796	8.7987		3.7189	
AGC-553			15.2264	32.3908	16.9959		4.2474	
AGC-554			14.4255	36.3652	15.0368		3.9861	
AGC-557			22.4831	33.8244	11.5241		4.1055	
AGC-558			18.6622	31.1029	12.2876		4.0972	
AGC-560			19.148	40.412	8.8677		4.0062	
AGC-561			21.766	15.2703	28.2657		4.1492	
AGC-562			21.1204	20.7656	20.6195		4.015	
AGC-563			18.9802	33.8306	14.1586		4.3317	
AGC-564			17.2377	27.2768	22.4445		4.391	
AGC-567			20.2913	26.8304	14.3807		4.0374	
AGC-568			20.5984	14.9219	25.7134		4.0484	
AGC-569			26.7651	37.9272	3.3992		3.9285	
1002-3			20.7671	33.4816	13.6835		3.4844	
1019-4			23.9903	35.2402	9.8197		3.4627	

Sample No.	Ferrosillite (Diopside)	Enstatite (Hypersthene)	Ferrosillite (Hypersthene)	Forsterite (Olivine)
AGC-47	3.1236	24.9671	8.732	5.4979
AGC-49	4.0787	21.3285	8.6681	3.1896
AGC-50P	3.1069	29.2643	10.6447	
AGC-51D	5.5997	5.6322	2.1112	12.6632
AGC-53	4.0553	8.8866	3.8624	12.925
AGC-55	3.7809	16.5016	6.967	5.691
AGC-56	2.9939	10.6109	4.3782	10.7857
AGC-58	5.6948	13.7245	5.3442	5.5946
AGC-59	5.1266	13.9541	5.9167	7.0058
AGC-62	2.093	11.0511	4.4265	14.9305
AGC-68P	3.8165	25.4882	9.4705	.8174
AGC-207	4.3484	.0214	.0087	15.5427
AGC-209	3.6082	17.5656	5.5793	9.4726
AGC-212	3.6113	13.6463	5.1015	8.0759
AGC-213	2.4336	25.9799	8.978	7.9316
AGC-214	2.1475	23.6052	6.531	14.1873
AGC-225	2.0196	28.2482	7.3269	9.7974
AGC-273	2.422	29.1191	9.8304	2.7587
AGC-292	2.7043	30.3654	8.4809	5.9808
AGC-293	3.9803	18.4507	5.6812	8.8614
AGC-300	5.3655	10.3525	3.6599	10.3557
AGC-311	5.9544	13.0456	5.0313	5.1028
AGC-317	3.5354	21.4178	7.0858	8.9319
AGC-328	4.9352	13.7901	6.2488	5.7426
AGC-333	3.0108	19.5819	9.0035	12.817
AGC-338	1.8728	23.6235	7.3029	9.124
AGC-342	4.0468	27.7011	9.111	
AGC-347	2.3915	9.8862	4.6147	9.9396
AGC-349	5.1032	19.6688	9.3054	
AGC-350	4.3374	23.2469	9.9154	
AGC-351	1.6857	37.1064	12.1274	
AGC-352	4.0601	24.5505	9.3663	
AGC-374	3.5364	26.0321	8.3701	3.6018
AGC-392	3.0562	23.1452	7.3403	8.9494

Sample No.	Ferrosillite (Diopside)	Enstatite (Hypersthene)	Ferrosillite (Hypersthene)	Forsterite (Olivine)
AGC-393	2.3292	22.0216	6.4923	15.363
AGC-544	2.209	34.5937	9.5797	5.0248
AGC-548	3.9946	15.347	5.9272	7.8005
AGC-552	3.3712	25.3132	6.9664	6.7362
AGC-553	1.6745	24.9336	7.4571	12.7543
AGC-554	1.4291	28.8014	7.5638	11.6358
AGC-557	2.4971	25.9623	7.8621	8.6213
AGC-558	2.1707	23.5425	7.5604	9.0555
AGC-560	2.0063	31.5357	8.8763	6.7532
AGC-561	2.2103	12.0168	3.2535	21.7218
AGC-562	2.2093	16.2119	4.5537	15.7105
AGC-563	2.1316	25.8818	7.9487	10.5548
AGC-564	1.8565	21.1233	6.1535	16.9523
AGC-567	2.398	20.2071	6.6232	10.5412
AGC-568	2.2499	11.5092	3.4127	19.3374
AGC-569	3.1996	28.4602	9.4671	2.4818
1002-3	2.0683	26.4815	7.0001	10.5731
1019-4	2.5346	27.4372	7.803	7.4599

Sample No.	Fayallite (Olivine)
AGC-47	2.1238
AGC-49	1.4318
AGC-50P	
AGC-51D	5.2427
AGC-53	6.2048
AGC-55	2.6539
AGC-56	4.9155
AGC-58	2.4062
AGC-59	3.281
AGC-62	6.6054
AGC-68P	.3355
AGC-207	6.929
AGC-209	3.3232
AGC-212	3.3346
AGC-213	3.0274
AGC-214	4.3355
AGC-225	2.8068
AGC-273	1.0287
AGC-292	1.845
AGC-293	3.0137
AGC-300	4.0437
AGC-311	2.1736
AGC-317	3.2639
AGC-328	2.8742
AGC-333	6.509
AGC-338	3.1154
AGC-342	
AGC-347	5.1245
AGC-349	
AGC-350	
AGC-351	
AGC-352	
AGC-374	1.2791
AGC-392	3.1348

Sample No.	Fayalite (Olivine)
AGC-393	5.0026
AGC-544	1.5369
AGC-548	3.3275
AGC-552	2.0476
AGC-553	4.2132
AGC-554	3.3752
AGC-557	2.8836
AGC-558	3.212
AGC-560	2.0995
AGC-561	6.4957
AGC-562	4.8741
AGC-563	3.5803
AGC-564	5.4546
AGC-567	3.8161
AGC-568	6.3332
AGC-569	.9118
1002-3	3.087
1019-4	2.3433

APPENDIX VII

Summary of Significant Spearman Correlation Coefficients at the 95% and 99% Confidence Levels for Main Zone, Nisku and Rainbow Picritic Basalt and Sedimentary Rocks and Background Picritic Basalt and Sedimentary Rocks

Summary of significant positive Spearman correlation coefficients for the Main Zone Picrite at 95% (*) and 99% (**) confidence levels

SiO ₂	:	Al ₂ O ₃ (.2851*), Na ₂ O (.3847**)
Al ₂ O ₃	:	Na ₂ O (.5036**), K ₂ O (.5785**), Ba (.4329**), Li (.6560**)
Fe ₂ O ₃	:	TiO ₂ (.2874*), Co (.2888*), Ag (.3605*), Sb (.3861**), Li (.5852**)
CaO	:	MnO (.3150*), LOI (.3949**), Mn (.5092**), Ni (.3733**), Cr (.3216*), CO ₂ (.6665**), Cond (.5429*)
MgO	:	LOI (.4773**), Ni (.4678**), Cr (.3031*)
Na ₂ O	:	Ba (.3919**), Li (.8424**)
K ₂ O	:	Ba (.6046**), Li (.5299*), Rb (.5526*)
TiO ₂	:	P ₂ O ₅ (.3192*), F (.5049*), Zr (.8464**), Sr (.4857*)
P ₂ O ₅	:	F (.5968**), Zr (.8086**), Sr (.5643**)
MnO	:	Cd (.9938*)
LOI	:	Mn (.6412**), CO ₂ (.9577**), Se (.5917**), Cond (.4555*)
Cu	:	Co (.3512*), Ag (.5872**), Se (.4581*)
Pb	:	Ag (.5298**), Cd (.9973*)
Zn	:	Co (.2802*), Cd (.9999**)
Co	:	Sb (.3798**)
Mn	:	CO ₂ (.9094**), Se (.4898*), Cond (.5485*)
Ni	:	Cr (.7912**)
Cr	:	F (.4805*), Zr (.5908**)
Ba	:	Li (.6461**), Rb (.6102**)
F	:	Zr (.5534*)
Ag	:	Sb (.3935*), Cd (1.000*)
Sb	:	Zr (.4835*)
Zr	:	Sr (.5407*)
CO ₂	:	Se (.4742*), Cond (.5590**)
Cond	:	pH (.8181**)
Mo-Au-Ag-Hg	:	No significant correlations

Note: Cond - conductivity

Summary of significant positive Spearman correlation coefficients for the Nisku deposit (East Zone) picrite at 95% (*) and 99% () confidence levels**

SiO ₂ -CaO-LOI-Pb-Ag-Mo	:	No significant correlations
Al ₂ O ₃	:	Na ₂ O (.9645**), K ₂ O (.8635*), Ba (.7722*)
Fe ₂ O ₃	:	TiO ₂ (.8677*)
MgO	:	Ni (.8362*), Cr (.7585*)
Na ₂ O	:	K ₂ O (.9210**), Ba (.7665*)
K ₂ O	:	Ba (.8468*)
TiO ₂	:	P ₂ O ₅ (.7704*)
MnO	:	Cu (.7554*), As (.9103**)
Zn	:	Mn (.7895*)
Co	:	Cr (.7769*)
Cr	:	Ni (.9521**)
Au	:	As (.9198**), Sb (.9090**)
As	:	Sb (.8423*)

Summary of significant positive Spearman correlation coefficients for the Rainbow (West Zone) picrite at 95% (*) and 99% () confidence levels**

SiO ₂ -Al ₂ O ₃ -Fe ₂ O ₃ -Co-Mo	:	No significant correlations
CaO	:	MnO (.6655**), MnO (.5540*)
MgO	:	Ni (.5278*), Cr (.5277*)
Na ₂ O	:	Cu (.6149**), Pb (.5853*), Zn (.5090*), Ba (.4688*)
K ₂ O	:	Cu (.5354*), Ba (.9629**)
TiO ₂	:	P ₂ O ₅ (.7878**), Cu (.4672*)
P ₂ O ₅	:	Cu (.4979*)
MnO	:	Au (.5066*)
LOI	:	Mn (.6036**)
Cu	:	Ba (.5175*), Ag (.6531*)
Pb	:	Zn (.9327**), Ag (.7437*)
Zn	:	Ag (.6425*)
Ni	:	Cr (.6407**)
Au	:	As (.5631*), Sb (.5838*)
As	:	Sb (.9616**)

Summary of significant positive Spearman correlation coefficients for Background picrite east data at 95% (*) and 99% () confidence levels**

TiO ₂ -P ₂ O ₅ -Pb-Mo-Au	:	No significant correlations
SiO ₂	:	Al ₂ O ₃ (.7611**), Na ₂ O (.7228**)
Al ₂ O ₃	:	Na ₂ O (.9216**)
Fe ₂ O ₃	:	MgO (.5387**), Cu (.5220*), Co(.5842*), Ni (.6198*), Cr (.5970*)
CaO	:	MnO (.5811*), LOI (.7466**), Mn (.6710**)
MgO	:	MnO (.6931**), Ni (.9272**), Cr (.8701**)
K ₂ O	:	Ba (.9513**)
MnO	:	Ni (.7213**), Cr (.6859**)
LOI	:	Mn (.7141**)
Cu	:	Zn (.9029**), Co (.5508*)
Co	:	Ni (.6145*), Cr (.6231**)
Ni	:	Cr (.9612**)
As	:	Sb (.6671**)

Summary of significant positive Spearman correlation coefficients for the Rainbow deposit sedimentary rocks at 95% (*) and 99% () confidence levels**

MgO-Co	:	No significant correlations
SiO ₂	:	Fe ₂ O ₃ (.5536*)
Al ₂ O ₃	:	Na ₂ O (.5889*), K ₂ O (.6601*)
Fe ₂ O ₃	:	P ₂ O ₅ (.5461*)
CaO	:	Mo (.6202*)
TiO ₂	:	P ₂ O ₅ (.5771*), Ba (.7411**)
MnO	:	LOI (.7391**), Ni (.7163**), Cr (.7156**)
LOI	:	Au (.6100*), As (.6129*), Sb (.6189*)
Cu	:	Zn (.8288**), Ni (.6545*), Cr (.6016*)
Pb	:	Ag (.8041*)
Zn	:	Ni (.6923**), Cr (.7262**), Ag (.7221*)
Ni	:	Cr (.9448**)
Cr	:	Au (.6170*)
Au	:	As (.9352**), Sb (.9480**)
As	:	Sb (.9991**)

Summary of significant positive Spearman correlation coefficients for the Nisku deposit sedimentary rocks at 95% (*) and 99% () confidence levels**

SiO ₂ -MgO-Na ₂ O-K ₂ O	:	No significant correlations
-P ₂ O ₅ -Cu-Mo-Au	:	
Al ₂ O ₃	:	Co (.7045*)
Fe ₂ O ₃	:	TiO ₂ (.7029*)
CaO	:	LOI (.7944**), Cr (.6845*)
TiO ₂	:	MnO (.6203*)
Pb	:	Zn (.9716**), Ag (.9015**)
Zn	:	Ba (.6335*), Ag (.8932(**)
Ni	:	Cr (.7896**)
Ba	:	Ag (.6801*)
As	:	Sb (.9711**)

Summary of significant positive Spearman correlation coefficients for Background sedimentary rocks at 95% (*) and 99% () confidence levels**

SiO ₂ -Na ₂ O-LOI-Pb-Co-	:	No significant correlations
Ni-Cr-Ba-Au-As	:	
Al ₂ O ₃	:	MgO (.5317*), K ₂ O (.4735*)
Fe ₂ O ₃	:	CaO (.7203**), MgO (.6828**), TiO ₂ (.7327**), MnO (.7842**), Cu (.5580*)
CaO	:	MgO (.7107**), TiO ₂ (.5970**), MnO (.7478**)
MgO	:	TiO ₂ (.4803*), MnO (.6177**)
TiO ₂	:	P ₂ O ₅ (.5156*), MnO (.5481*), Zn (.6977**)
P ₂ O ₅	:	Zn (.5822*), Sb (.8350**)

Summary of significant positive Spearman correlation coefficients for Main Zone sedimentary rocks at 95% (*) and 99% () confidence levels**

Sr-B	:	No significant correlations
SiO ₂	:	Na ₂ O (.2730*), Zr (.8127**)
Al ₂ O ₃	:	MgO (.2634*), K ₂ O (.4338**), Li (.4421**)
Fe ₂ O ₃	:	CaO (.2703*), MgO (.3985**), TiO ₂ (.5348**), MnO (.2675*), Cu (.4086**), Co (.4401**), Cr (.2535*)
CaO	:	MgO (.3985**), MnO (.4981**), LOI (.5199**), Ni (.2536*), Cr (.3862**), Cond (.7000**), pH (.6523**)
MgO	:	K ₂ O (.4407**), MnO (.4816**), LOI (.2595*), Co (.2731*), Ni (.6333**), Cr (.6012**), Li (.5133**), Rb (.4390*)
Na ₂ O	:	P ₂ O ₅ (.2595*)
K ₂ O	:	MnO (.2653*), LOI (.3106*), Ni (.2962*), F (.3941*), As (.2949*), Sb (.3401**), Li (.6651**), Rb (.8335**)
TiO ₂	:	P ₂ O ₅ (.5153**), MnO (.2768*), Co (.5294**), F (.4202*)
P ₂ O ₅	:	F (.5444**), Zr (.4233*)
MnO	:	LOI (.4718**), Pb (.4228**), Zn (.3373**), Co (.3374**), Ni (.3740**), Cr (.3947**), Mo (.5518**), CO ₂ (.3766*), Cond (.5270**), pH (.4645*)
LOI	:	Pb (.3249*), Mn (.5465**), Ni (.3011*), Cr (.3328**), Ag (.3554*), Mo (.3750**), Au (.2699*), Sb (.2647*), CO ₂ (.7552**), Rb (.5045**), Cond (.4043*)
Cu	:	Co (.4243**), Ni (.3231*), Mo (.3741**), Li (.4257*)
Pb	:	Zn (.4530**), Mn (.4299**), Au (.2986*)
Zn	:	Mn (.3617**), Ni (.2713*), Cd (.9938**)
Co	:	Ni (.4523**), Cr (.3045*), As (.4639**)
Mn	:	Ni (.2648*), Cr (.3031*), Mo (.5912**), CO ₂ (.5552**), Rb (.6610**), Cond (.4761**)
Ni	:	Cr (.8019**), Rb (.3902*)
Ba	:	F (.7340**), Li (.3727*), Rb (.3630*)
Ag	:	Au (.9693**), Sb (.8416**)
Au	:	Sb (.8522**)
As	:	Sb (.4736**)
Sb	:	Bi (.8888*)
Hg	:	Bi (.9481*)
Li	:	Rb (.4813**)
CO ₂	:	Rb (.3783*), Cond (.8139**), pH (.5071**)
Se	:	Cd (.9892**)
Cond	:	pH (.8213**)

Note: Cond = conductivity