2–2–2 **Copper Ore Desposits**

Copper ore deposits have been known in the area near the Mindoro Fault on the east side. In this phase, two deposits located in the upper streamof the Pula River were checked and some boulders of cupriferous sulphide ore were found at two places, viz. in the middle course of the Aglubong River and in the upper stream of the Sibakay River.

(A) Ore deposit of Mindoro Consolidated Mining Corporation (No. 4)

The ore deposit is situated in the upper stream of the Pula River, about 20 km west-south -west of Socorro. It takes two days on foot along the Pula River to reach the site from the terminal of the jeepable road.

The area is composed of alternating beds of sandstone and shale and lava flow of the Lumintao formation and ultramafic body (harzburgite, gabbro) which is intruded into the above formations (Fig. I–26). The ore deposit is of the vein-type occuring in these rocks, and mainly consists of chalcopyrite and quartz.

The ore deposit occurs in the following 3 areas.

A–1 Masnon deposit

The deposit is found on the northern bank of the mian stream of the Pula River and fills the fissure of the NE–SW system formed near the boundary between harzburgite and dunite, showing a vein-type or lenticular form. The ore is massive and mainly consists of chalcopyrite and pyrrhotite, associated with sphalerite. The outcrops are found at four places, two of which seem to be the portions of the same vein, though they are 50 m apart from each other. The width of the vein is 0.10 to 0.30 m with considerable swelling and pinching. (Fig. I–27)

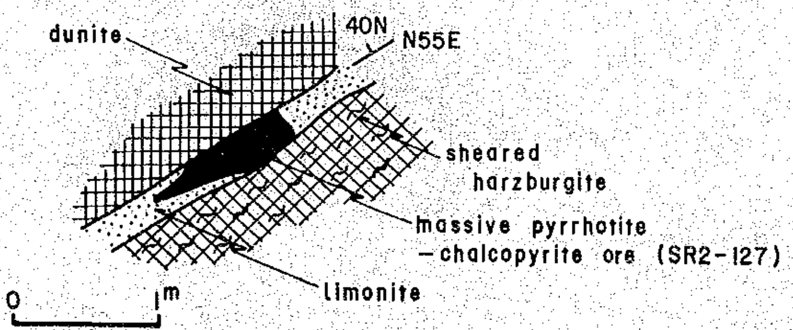

Fig. I-27 Masnon No.1 Outcrop

Ore microscopy:

SR2–127b: Pyrite and pyrrhotite are contained almost in same amount. Chalcopyrite and pyrrhotite fill the small cracks developed in pyrite. The amount of constituent minerals is pyrrhotite > pyrite > sphalerite ≫ chalcopyrite, and the sequence of crystallization is pyrite → sphalerite → pyrrhotite → chalcopyrite.

Assay result of the typical ore:

Sample No.	Width	Au g/t	Ag g/t	Cu %	Pb %	Zn %	Fe %	S %
SR2–127	0.30m	2.42	1.8	2.77	0.20	0.03	46.73	34.50

A–2 Manamburao deposit

The deposit is found in the western tributary of the Pula River, 1 km west-northwest of the Masnon deposit. The elevation is 500 m above sea level. Four outcrops were found likewise in the Masnon deposit. All of these fill the shear zone formed in basalt of the Lumintao formation The deposits are chalcopyrite-pyrite-quartz vein striking N–S, E–W and NE–SW.

(1)–vein is a limonite vein in the fault with a width of 0.20 m in which a small amount of chalcopyrite and bornite are observed.

Assy result:

Sample No.	Width	Au g/t	Ag g/t	Cu %	Pb %	Zn %	Fe %	S %
SR2–133	0.20m	0.11	4.7	2.12	0.01	0.05	19.59	20.04

(2)–vein Veinlets of chalcopyrite and pyrite (1–2 cm wide) are found in a silicified vein (1.10 m wide). Although the veinlets themselves are high in grade, the average grade of the whole vein width of 1.10 m would be 0.2 to 0.3 % Cu.

(3)–vein consists of two quartz veins with gangue rock. Two sulphide stringers of 0.10 to 0.15 m wide are contained in the quartz vein (1.10 m wide) on the hanging-wall side (northern

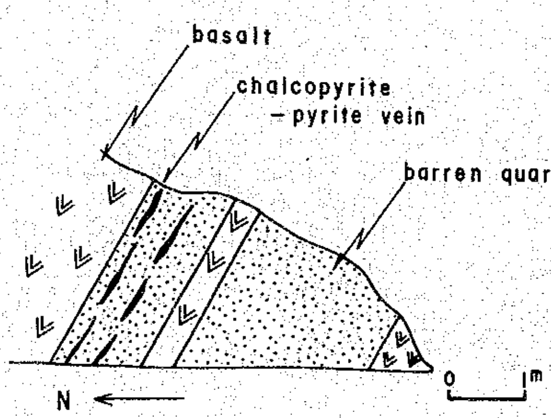

Fig. I-28 Manambulao No.3 Outcrop

side), while the footwall vein is barren although it has a width of 2.40 m.

Microscopically, the sulphide ore in the hanging-wall vein mainly consists of pyrite grains of 2 mm in size and chalcopyrite fills the interstices between them in a platy form. Sphalerite occurs enclosing pyrite grains and also as veinlets in a small amount.

The average assay values of the hanging-wall vein:

Sample No.	Width	Au g/t	Ag g/t	Cu %	Pb %	An %	Fe %	S %
SR2–136	1.10 m	0.90	1.9	2.21	0.00	0.15	14.58	9.24

(4)–vein is a quartz vein (2.20 m wide) filling the fissure formed at the bottom of basalt lava. Although a considerable amount of pyrite dissemination is observed, no copper minerals can be found.

A–3 Chialawood deposit

The deposit is found in the eastern tributary of the Pula River, 1.5 km east of the Masnon deposit. Two outcrops are found, one in basalt and the other in harzburgite.

The former has several stringers (0.10 to 0.15 m wide) consisting of pyrrhotite $\gg$ chalcopyrite $>$ sphalerite $\gg$ pyrite in two hematitized quartz veins (0.80 m wide each).

The latter consists of several chalcopyrite stringers (0.5 to 1.0 cm wide), occurring in a shear zone (0.15 m wide). Their extension is hardly expected.

Assay result of the chalcopyrite vein:

Sample No.	Width	Au g/t	Ag g/t	Cu %	Pb %	An %	Fe %	S %
SRT–149	0.15 m	5.47	30	15.33	0.00	0.12	24.17	19.55

(B) Ore Deposit of Zion Exploration Corporation (No. 5)

The deposit is found in the Banbanon River, the western tributary of the Mayu River (southern tributary of the Pula River), 4.5 km southeast of the Masnon deposit mentioned above. The outcrop occurs in basalt, consisting of quartz vein with pyrite dissemination. It is 0.40 m wide with partial concentration of pyrite, but no copper mineral was found.

A compact and massive suphide ore was found as a boulder (1.0 x 0.8 x 0.2 m in size). Microscopically it contains a small amount of chalcopyrite filling the interstices between pyrite grains (Cu: 0.5 % ?).

(C) Other Showings

Among the boulders of sulphide ore found out in several places, the following two seem important.

C–1 Boulders in Aglobang River (No. 64)

The boulders were found in the main stream of the Aglobang River, a tributary of the

Magasawangtubig River, 15 km south of Villacervesa. They are of the massive, cupriferous sulphide type and include an angular, big block of 3 m x 2 m x 1 m in size, suggesting that its source is very near. As the area is composed of phyllitic slate of the Mansalay formation, the bedded sulphide deposit can be expected.

Assay grade:

Sample No.	Size	Au g/t	Ag g/t	Cu %	Pb %	Zn %	Fe %	S %
SR2–165	3x2x1 m	0.44	20.7	0.40	0.71	8.52	28.27	27.63

C–2 Boulders in Sibakoy River (No. 17)

The boulders are found in the upper stream of the Sibakoy River, a tributary of the Rayusan River, at an altitude of 540 m. They are massive sulphide ore. Under the microscope, pyrite, chalcopyrite and pyrrhotite of the earlier stage with a colloform texture are penetrated by the coarse pyrite hairs (0.1 to 1.0 cm) of the later stage.

Assay grade:

Sample No.	Size	Au g/t	Ag g/t	Cu %	Pb %	Zn %	Fe %	S %
FR2–024	1x0.5x0.5 m	0.00	4.2	1.41	0.01	1.05	39.18	39.68

Beside these massive ore, the boulders contain those of a great size (1 x 1 x 2 m in maximum size) of silicified rock with chalcopyrite (malachite) and pyrite dissemination. As the slate of the Masalay formation is distributed in the upper stream, there are having some potential for bedded sulphide deposit like in the area of the Aglobang River.

2–2–4 Barite Deposit

(A) Mansiol Point Showing (No. 36)

In Phase I, a concentration of barite floats was found on the hill, 1.3 km west of Mansiol Point, the south of Mansalay. In order to confirm the occurrence of barite, investigation was carried out by means of checking the distribution of the float and trenching at two sites where many greater boulders are present.

As shown in Fig. I–29, blocky barite floats are scattered along the slope. Although it is difficult to get accurately the vein width, it is roughly estimated from the result of the investigation that the vein would have a maximum width of 1.60 m, striking N20°N. A small-scale parallel vein is assumed at 10 meters west of the main lode in the southern part. Good access of 1 km apart from the highway would facilitate the future exploitation.

(B) Ore Deposit of Mansalay Mining Corporation (No. 35)

The deposit is situated in the upper stream of the Walgan creek, a tributary of the Wasig

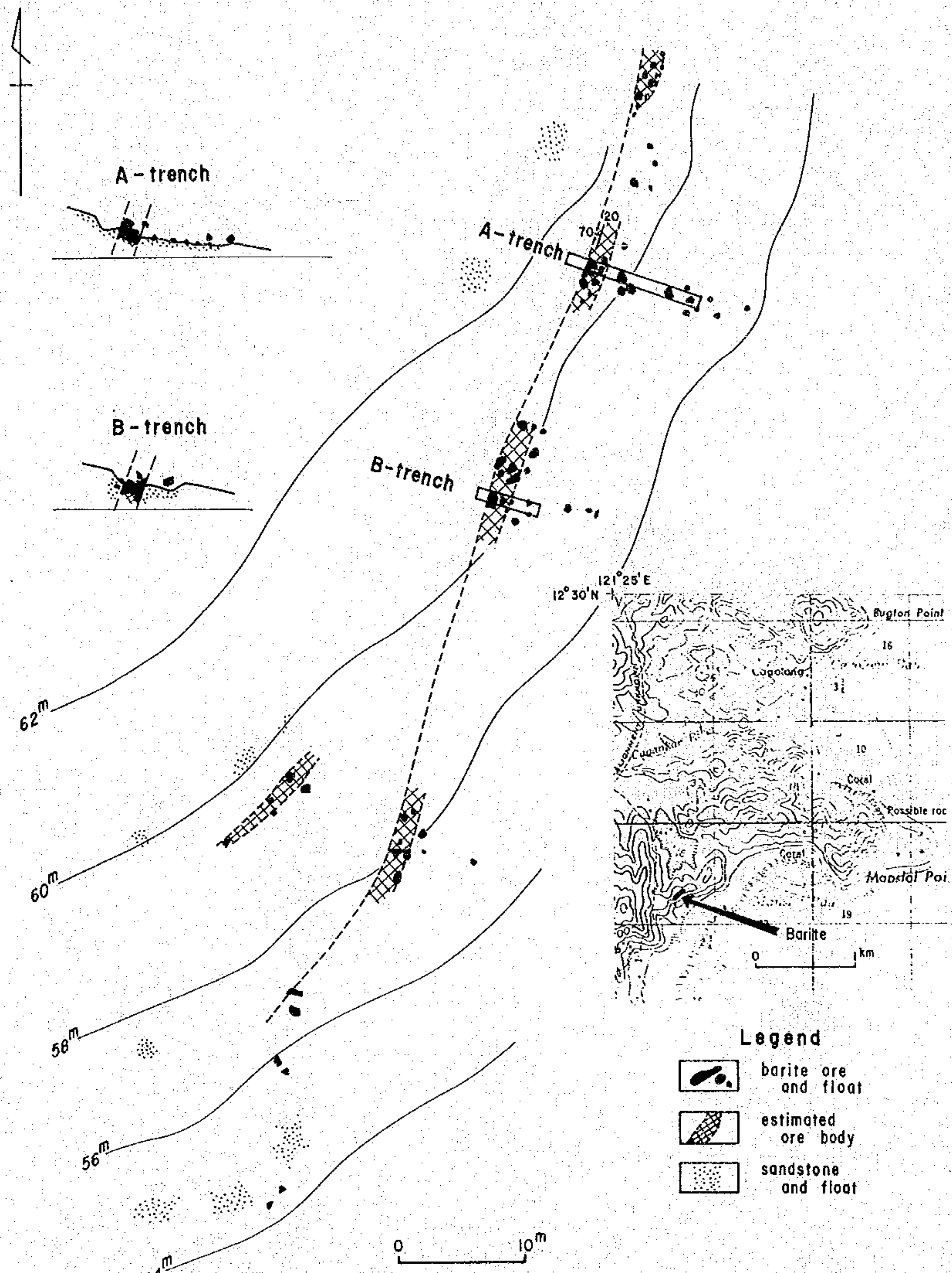

Fig. I-29 Barite Showing at Mansiol Point

River, 6.5 km west-northwest of Mansalay. Although an abandoned road of about 1 km long reaches to the ore deposit from the logging road which leads to the Taoga deposit, it is not jeepable (Fig. I–32).

The deposit is barite vein emplaced in sandstone of the Mansalay formation, forming a cliff on the mountain side as shown in the photo. It strikes N50°W and dips 70° to 85°S with stable width of 1.20 to 1.90 m, and can be traced for 17.5 m laterally. It immediately pinches out toward northwest, while the southeastern extension is not clear due to poor exposure.

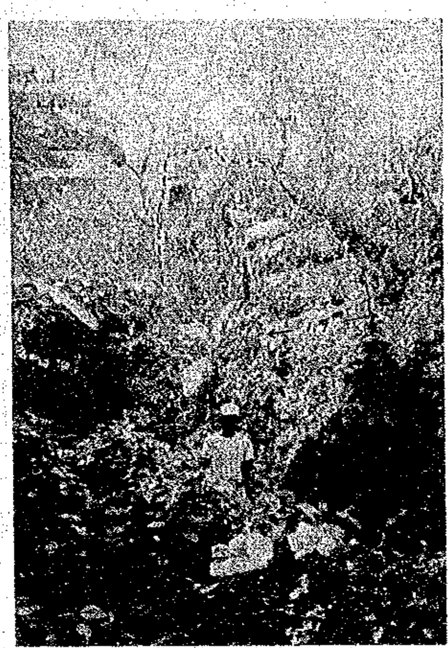

Fig. I-30 Barite Outcrop in Mansalay Mining Corp Project

Besides this outcrop, some small stringers of 0.05 m in width and some boulders were found at 0.5 km downstream and on the southern slope of the Wasig River, 0.5 km south of the outcrop, respectively, suggesting that this area is barite mineralization province.

(C) Taoga Deposit (No. 33)

The deposit is emplaced in sandstone of the Mansalay formation and consists of two principal veins of No. 1 and No. 2. The details were described in the Phase I report. During this one year, a new bench (10 m below) has been established and the mining face has advanced about 5 m. The No. 1 vein which was 5 m wide last time was diverged to several stringers and a massive vein of 0.50 m wide, and the No. 2 vein thinned to 1.20 m in width. (Fig. I–31).

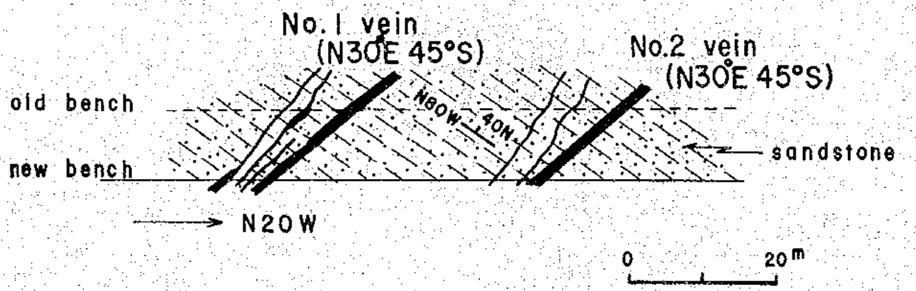

Fig. I-31 Barite Veins at Taoga Deposit

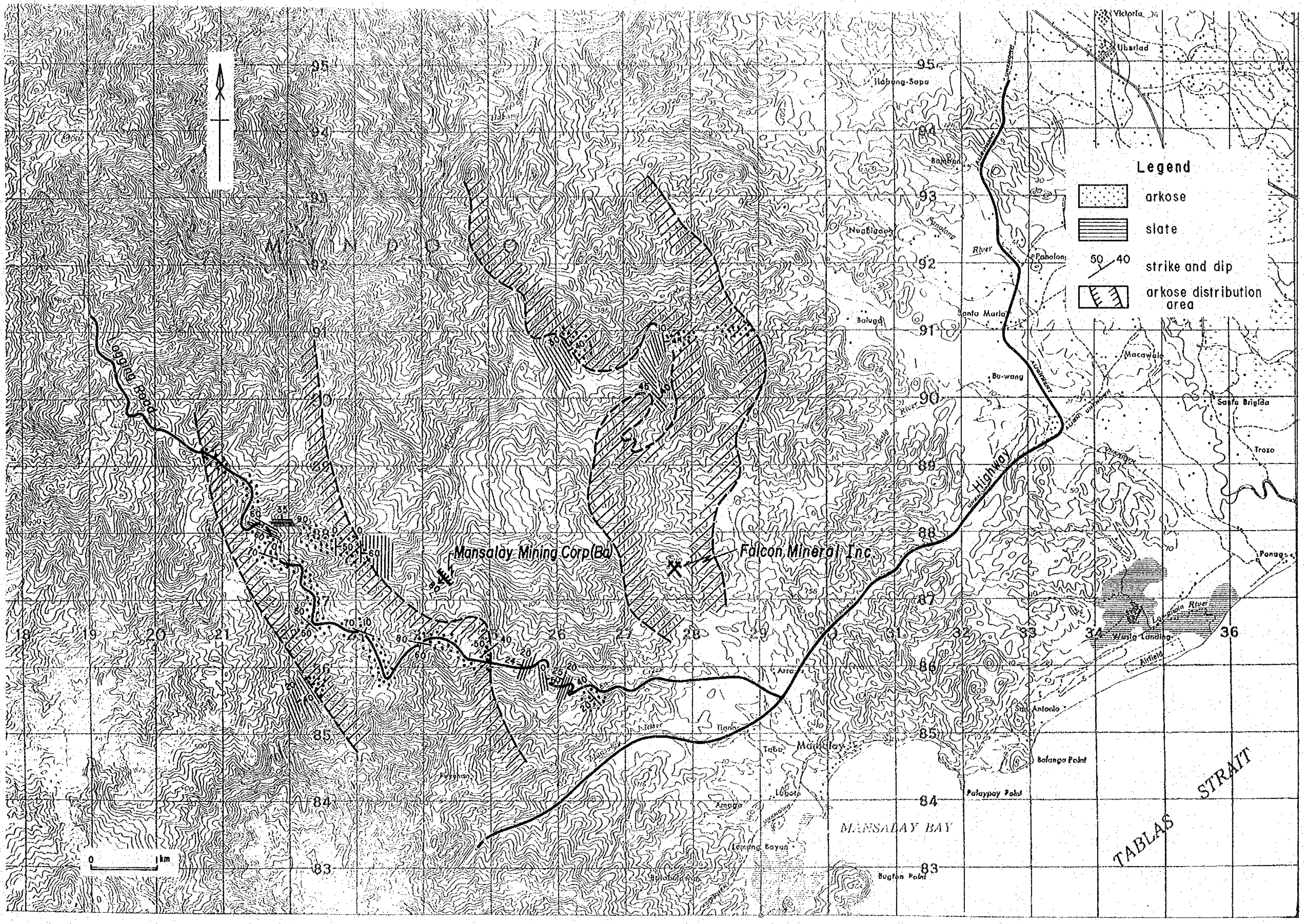

Fig. I-32 Arkose Distribution Map of Mansalay Area

2–2–5 Silica Sand Deposit

The survey in this phase made clear the distribution of arkose in the Mansalay area and the nature of beach sand distributed on the beach in the northwest of Abra de Ilog.

(A) Arkose in Mansalay Area

As described in the Phase I report, there are two arkose beds, the one on the eastern side which was once operated by Falcon Mining Inc. and the other exposed along the logging road leading to the Taoga barite mine. The thickness of beds in both areas measures 500 to 1,000 m, and they continue for more than 3 km in the NW–SE direction (Fig. I–32).

According to the unpublished data of BMG (Silvestre C. de la Rosa Jr. 1979) the assay results of 16 samples show 74.5 – 86.8 % SiO_2, 7.8 – 19.1 % Al_2O_3 and 0.2 – 9.4 % Fe_2O_3. Although no data were available for those of Falcon, it is considered to have almost the same quality. The original rocks in both areas are highly indurated, so that there might be some technical and economical problems on quartz grain separation.

(B) Deposits at Manao (No. 44) and Maria Cristina (No. 45)

In both deposits, the colorful pebbles are collecting for building materials by the name of "Gravita" from the beach sand, using screen. The pebbles consist of mica schist, amphibole schist and quartz. The quartz seems to be of segregation derived from metamorphic rocks. Although the reserve is limited to L = 1 km, W = 20 m and H = 03. m, there is no fear of mining out because a great amount of pebbles are brought by the rivers in the rainy season.

The reserve of selica of 3,600 tons (BMG 1974) was once calculated at Maria Cristina, but Gravita is now collecting there.

(C) Barahan Deposit (No. 47)

The deposit is the beach sand distributed on the beach of Barahan village, 7.5 km south-southwest of Sta. Cruz. The extent of beach sand where the claims were once established is about 7 km x 200 m. The grain size of sand tends to increase downward.

The content of compositional minerals is shown in the following, in which the ratio of quartz is about 40 %.

Quartz (40 %) ≒ slaty rocks (40 %) ≫ green rocks (including serpentinite) (10 %) ≫ basalt > mica schist > magnetite.

2–2–6 Marble Deposit

Marblecraft Deposit (No. 48)

The deposit is situated about 5.5 km southwest of Puerto Galera, at about 400 m above sea level. The marble is a member of the Halcon metamorphic rocks like Dulangan deposit (No. 49) which was described in the Phase I report (Fig. I–33).

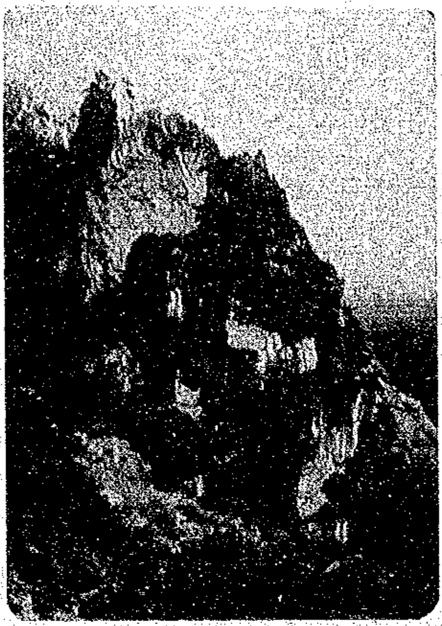

Fig. I-33 Marble Mine-site of Marblecraft

The rock is fine-grained (0.2 to 0.4 mm in size), massive and homogeneous. It is generally white, but partially red, green and orange in color.

The deposit is almost horizontal with a thickness of 200 m, extending laterally for more than 2 km. About 1,500 m^3 were mined in the past. The operation of the mine has been suspended for a while. Marblecraft Incorporation is, however, planning to reopen the operation from April 1983 using 16 workers.

2–2–7 Jade Deposit

Deposit of Monte Cristy Mining Company (No. 50)

The deposit is situated about 25 km east of Mamburao, and the mine office is located in the upper stream of the Pagbahan River, near the junction of the Alitangan River. The mining site is on the mountain slope further 200 m upward from the office.

As it is needed to go up the Pagbahan River for about 12 km from the highway, it is difficult to reach the mine site during the rainy season when the river level is high. Therefore, the mine is operating during the dry season from December to April.

The jade is a dark green soft rock and is called Mindoro Jade. This mine is the only place where they can produce such jade in Mindoro Island.

In Phase I, it was made clear that the jade is an aggregate of sericite, and in this phase the

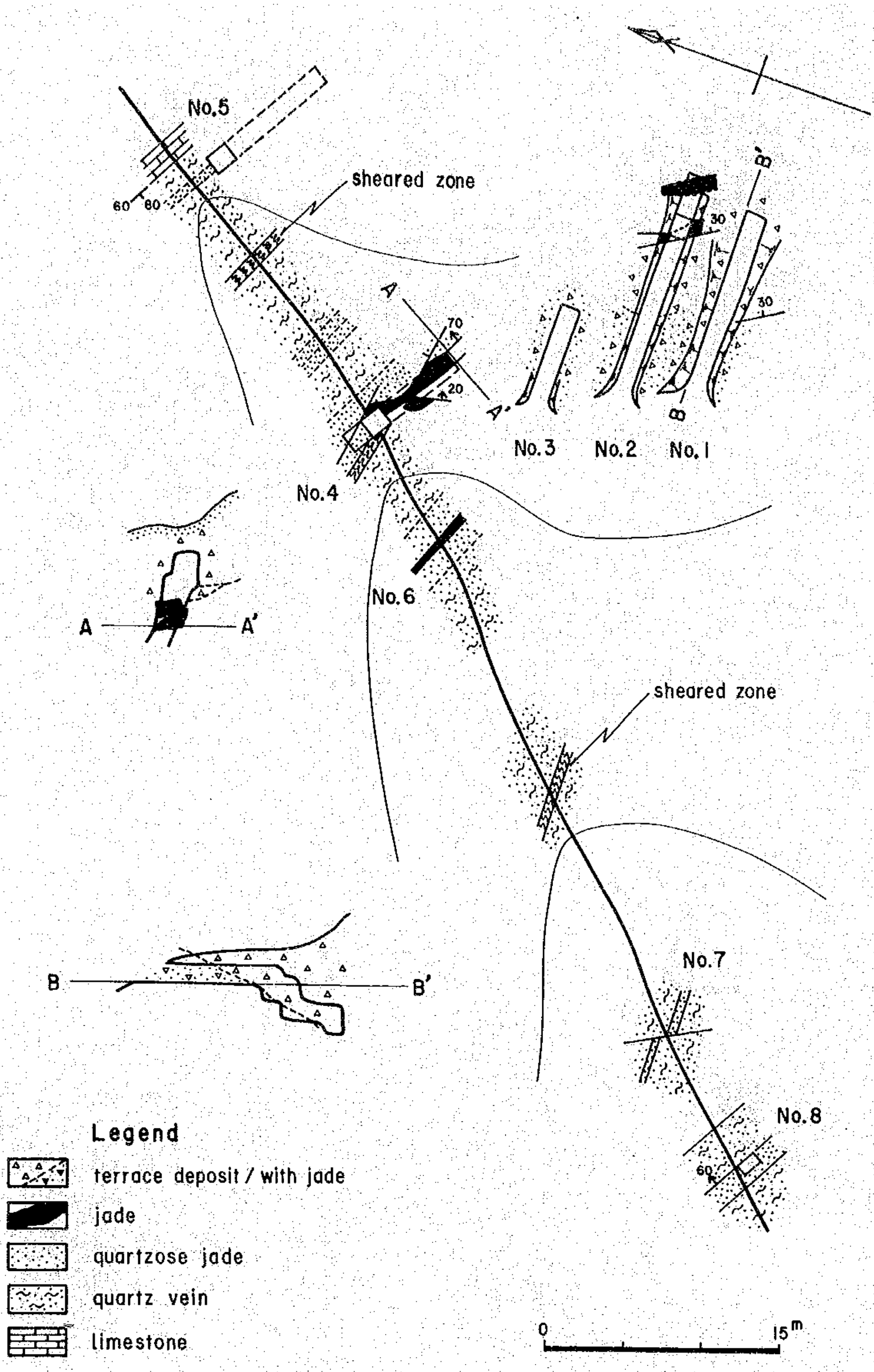

Fig. I-34 Geological Map of Jade Mine, Monte Cristy Mine occurrence has become more clear with the progress of exploration.

Jade is accompanied by quzrtz vein which occurs in the Mansalay limestone. Six veins are observed within the range of 80 m along a small creek in the mine area. Five prospecting tunnels and one pit are excavated for these veins, among which the vein in No. 4 tunnel is most dominant, with a good part of 1.00 – 1.50 m wide in the total width of about 2.5 m.

Here, the soft and dark clored jade is more valuable. It is, however, difficult to predict the occurrence of good part because the quality changes laterally and vertically (Fig. I–34).

Now, 30 laborers are working in the mine.

2–2–8 Coal Deposit

(A) Napisian Area (No. 51)

It was reported that the drilling (DDH NP3–1) conducted by Construction and Development Corporation of Philippines (CDCP) encountered six coal seams of more than 0.75 m thick. Four coal seams were confirmed during the goelogical survey of this phase, among which two seams are about 2.00 m thick. The outcrops can be traced for 3 km, though they are strongly folded by anticlinal and synclinal structures of the NE–SW system.

The analytical values of smaples from typical outcrops are as follows.

Sample No.	Thickness m	Moisture %	Volatile matter %	Fixed carbon %	Ash %	Total sulfur %	Calorific value BTU/1b
SR2–086	0.90	11.1	32.9	28.6	27.4	4.7	11,587
SR2–098	2.00	15.2	40.5	33.4	10.9	3.4	12.201
SR2–099	0.70	13.5	43.4	36.8	6.3	4.3	12.652

Each of them corresponds to High-volatile C bituminous coal, based on the American Standard of Coal Classification (ASIM 1964).

The coal reserves have been calculated to be 6,770 thousand tons from the river level to -200 m level. However, it is presumed that the following problems might arise for the development (1) the quality of coal is not so good, (2) coal seams have steep dips (35° – 40°) and (3) disturbance of strata due to folding is expected.

(B) Siay Area (No. 52)

The coal seams of the area are located 5 km northeast of Bulalacao and are exposed in the middle reaches of the Siay creek, a western tributary of the Talibong River.

As shown in Fig. I–36, 3 coal seams are found in siltstone of the Sablayan group, having thickness of 1.00 m, 0.75 m and 0.20 m from the lowest, intercalating siltstone beds of 5 m and 20 m

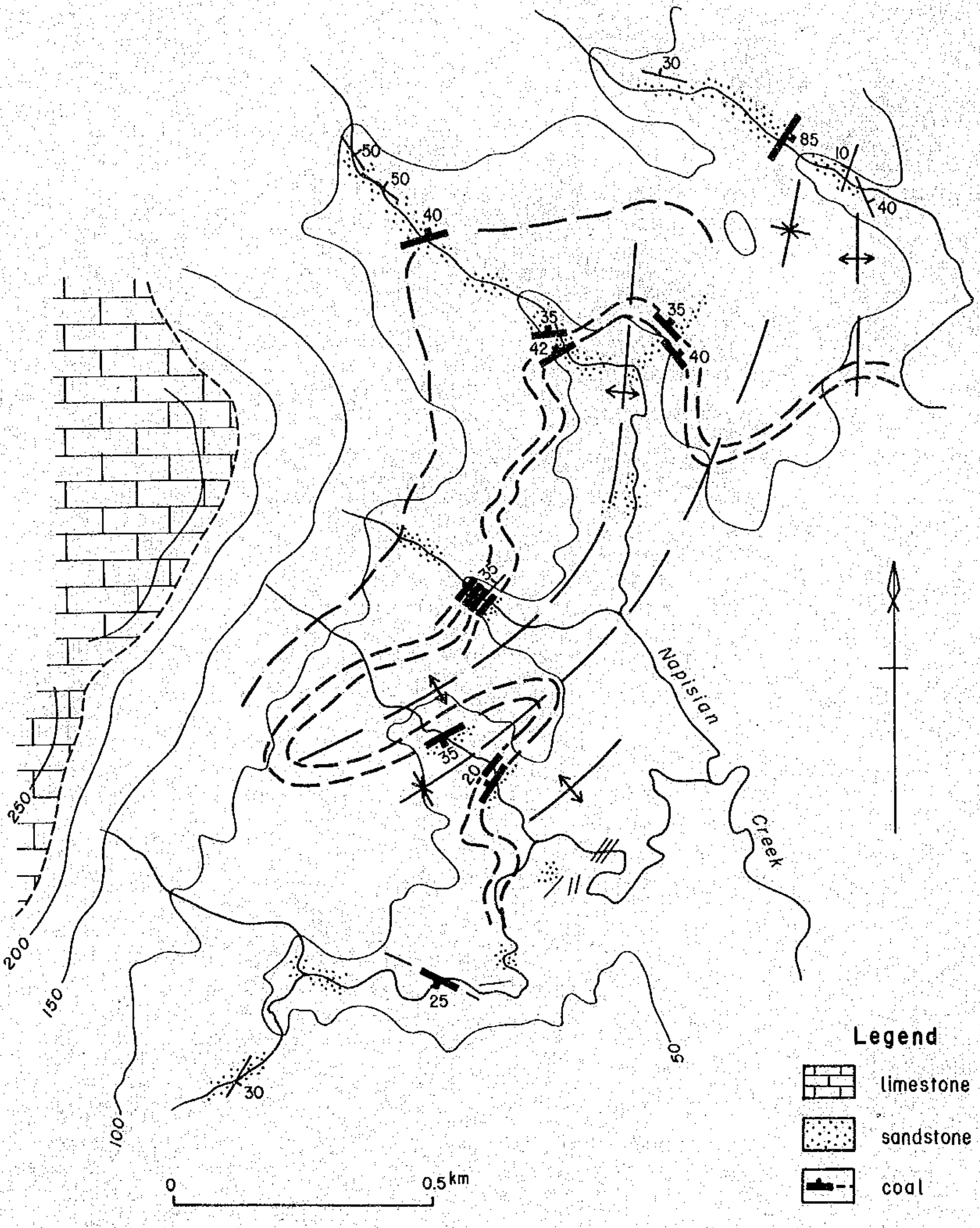

Fig. I-35 Geological Map of Napisian Coal Field

thick between the seams. It is recroded that tunneling explorations were carried out. In the upper reach of this creek thin coal seams of a thickness of 0.10 m crops out with limestone intercalation. Another outcrop of a small scale is found in siltstone in the Tambangan area (4.5 km N25°E of the Siay coal field in the upper reach of the Taliban River).

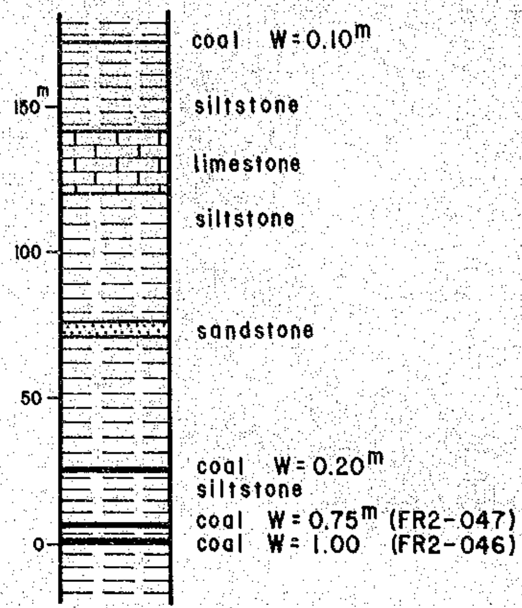

Fig. I-36 Columnar Section of Siay area

The analytical values are as follows.

Sample No.	Thickness m	Moisture %	Volatile matter %	Fixed carbon %	Ash %	Total sulfur %	Calorific value BTU/lb
FR2–045 (Tambangan	0.20	18.7	37.7	32.3	11.3	1.2	11.120
FR2–046 (Siay)	1.00	16.6	34.9	29.2	19.2	1.0	11.447
FR2–047 (do)	0.75	14.2	40.3	29.4	16.1	1.7	12.814

The quality of coal is similar to that of the Napisian area. The former two correspond to Subbituminous-B and the latest, to High-volatile C bituminous coal.

PART Ⅱ GEOCHEMICAL SURVEY

Chapter 1   General Remarks

In order to obtain the basic data on mineralization in the Mindoro Island, 425 stream sediment samples and 105 panned samples were collected last year from the main tributaries, and were analized and interpreted. The results revealed that the drainage basins with high concentration of chromite in the panned samples and high contents of nickel and chromium in the stream sediment samples well corresponded to the distribution of Ultramafic complex. And Cu-Zn and Ag anomalous zones were obtained in several places.

In Phase II, geochemical reconnaissance stream sediment survey was conducted in the uncovered area and heavy minerals were sampled by panning in the Ultramafic complex area.

From the result of the Phase I survey, the mineralized areas by ore kind was able to be outlined (they were compiled as the mineragenetic provinces map last phase). Therefore, the whole island was divided into four areas as described in the following, and chemical analyses were made for different elements which seem to be the most effective for that area.

A Area ..... The area where ultramafic bodies are distributed. There are potential for chromium or nickel deposits.

B Area ..... The area where there are potential for Au, Ag, Cu, Pb and Zn deposits. The Halcon metamorphic rocks and the Baco group are mainly distributed in this area.

C Area ..... The area where there are potential for iron ore deposits.

D Area ..... The area where there are potential for barite deposits. Gold mineralization might be overlapped with barite mineralization.

Fig. II−1 illustrates the above 4 areas, and Table II−1 shows the number of samples and analytical elements by area.

Table II−1   Number of Geochemical Samples and Analytical Elements by Area

Area	Analytical Elements	Number of Samples	Remarks
A	Cu, Pt, Ni, Cr, Fe, Co	491 pcs	491 pcs include 44 pcs in B-area
B	Au, Ag, Cu, Pb, Zn	409	409 pcs include 63 pcs in A- and C-areas
C	Au, Cu, Fe, Co, V, Ti, P	59	59 pcs include 19 pcs in B-area
D	Au, Ag, Cu, Pb, Zn Ba	213	−
Total		1,172	−

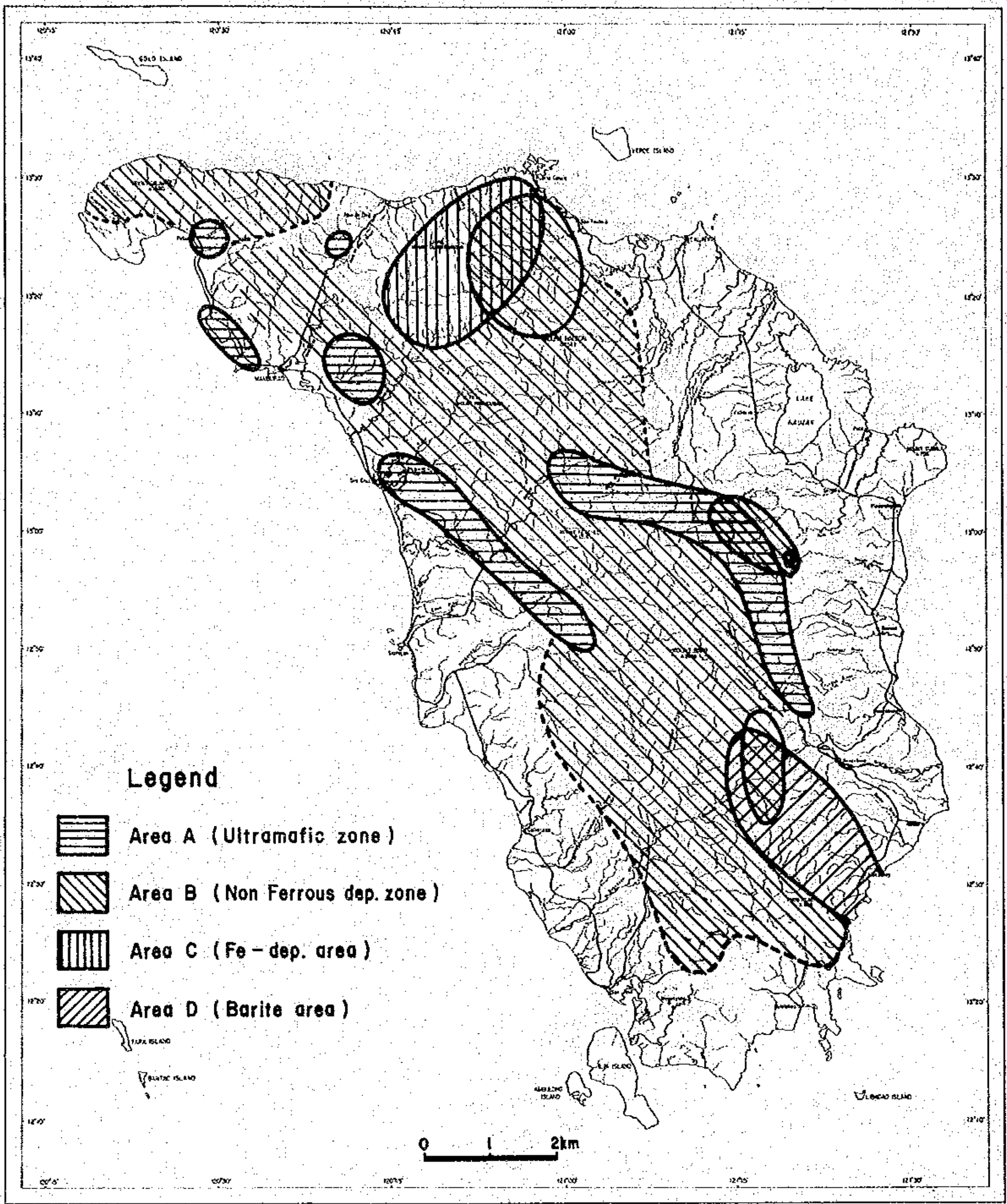

Fig. II-1 Geochemical Subdivision

As the result of analysis, two anomalous zones of Au, one zone of Cu, two zones of Cr and Ni, and one zone of Ba were extracted.

The distribution of chromite obtained by panning in ultramafic bodies well corresponds to the distribution of ore deposit.

Chapter 2 Geochemical Stream Sediment Survey

2–1 Sampling

Generally silty sediments (under 80-mesh fraction) deposited in the active channels of streams were collected for geochemical samples in the same way as last year. In order to cover the whole area as uniformly as possible, stream sediments were taken from the tributaries every about 1 km in the uncovered areas, and from almost all tributaries in the areas where there are potential for ore deposits.

2–2 Analytical Method

The samples were digested in multiacid for two hours, and the filtrates were quantitatively analyzed by atomic absorption method.

2–3 Compilation and Interpretation of the Results

A histogram for each element was made from analytical data and each threshold value was determined and finally geochemically anomalous zones were extracted.

2–3–1 Histogram

All analytical data were transformed to logarithmical figures and divided into 20 classes in which maximum and minimum values are both end values of classes to make a histogram for each element (Fig. II–2). As the contents of Au and Pt are such low that the numbers of lower values than detectable limits are 75% and 99% of the whole populations respectively, Au values lower than 5 ppb and Pt values lower than 50 ppb were read as 4 ppb and 5 ppb, corresponding to the Clarke's number of each element.

These histograms show the distribution of either single or plural populations, but seven elements such as Au, Ag, Pt, Ni, V, Ti and P have not any regulalities in their distribution.

2–3–2 Analytical Method

To determine the threshold values for extracting anomalies from the analytical data, Mean (M) and Standard deviation (S) were calculated (Table II–2), and then the cumulative frequency distribution curves were made for the elements whose data distribute somewhat regulally. (Fig. II–3).

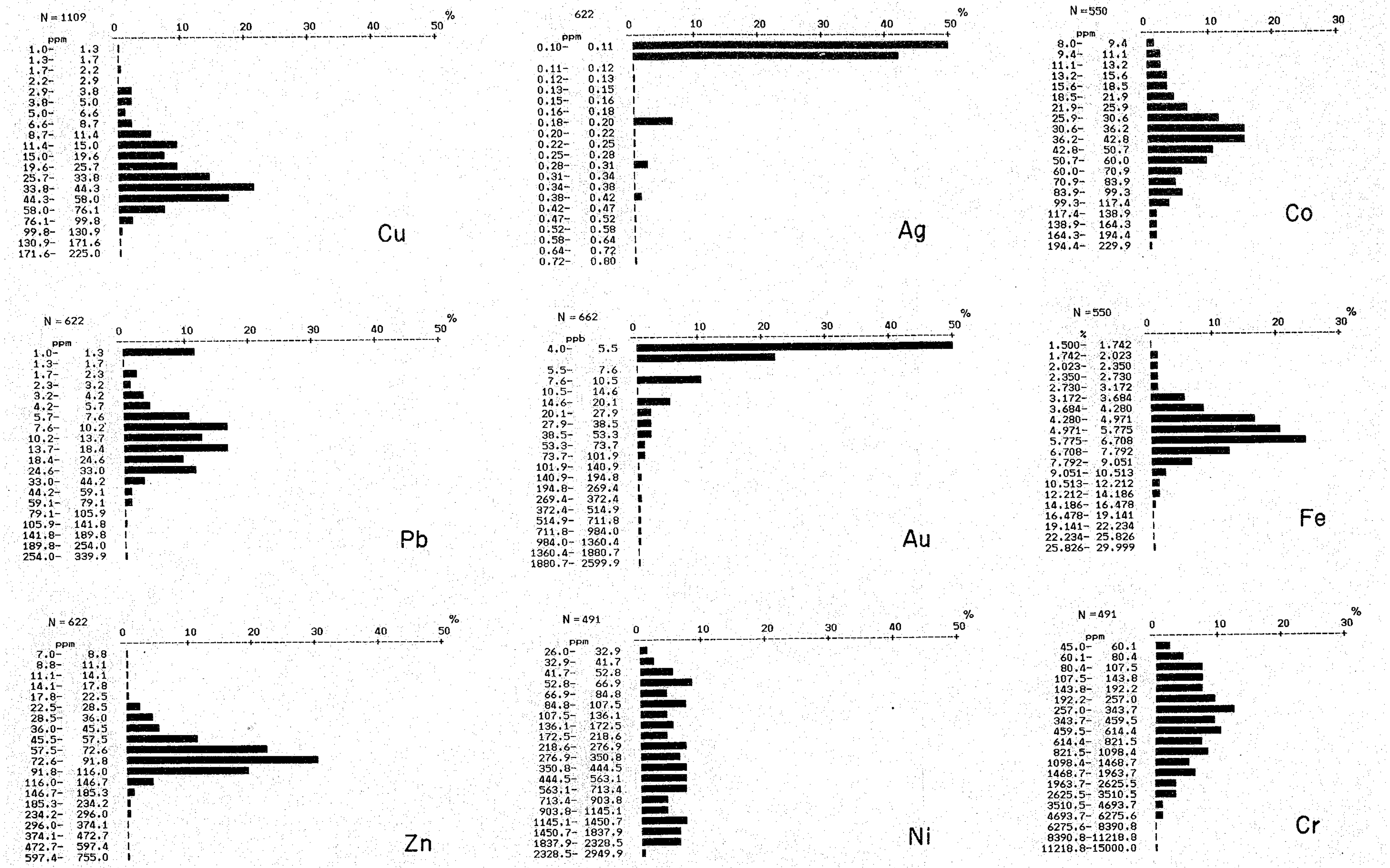

Fig. II-2 Histogram of Geochemical Data(Stream Sediment) (1)

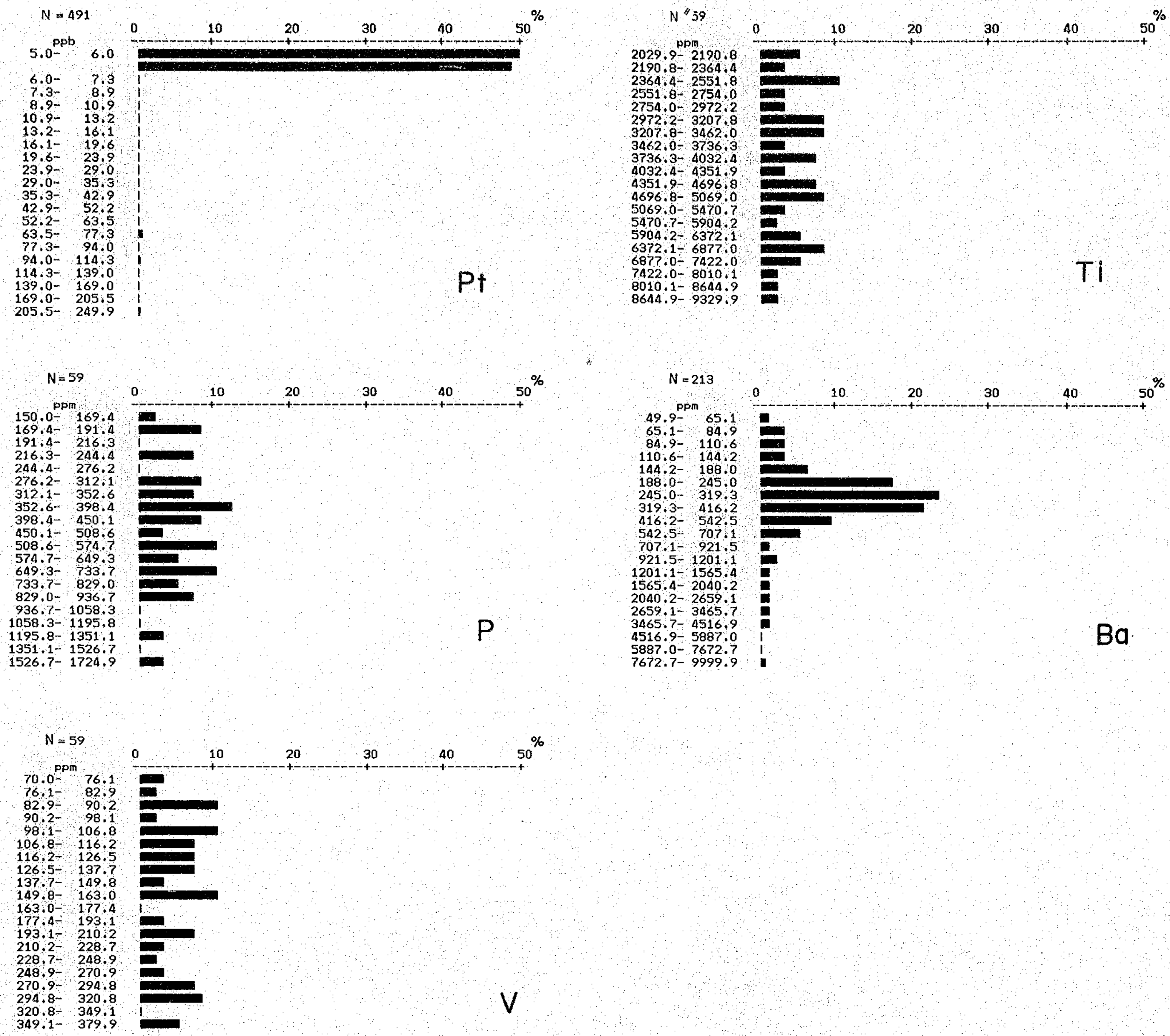

Fig. II-2 Histogram of Geochemical Data(Stream Sediment) (2)

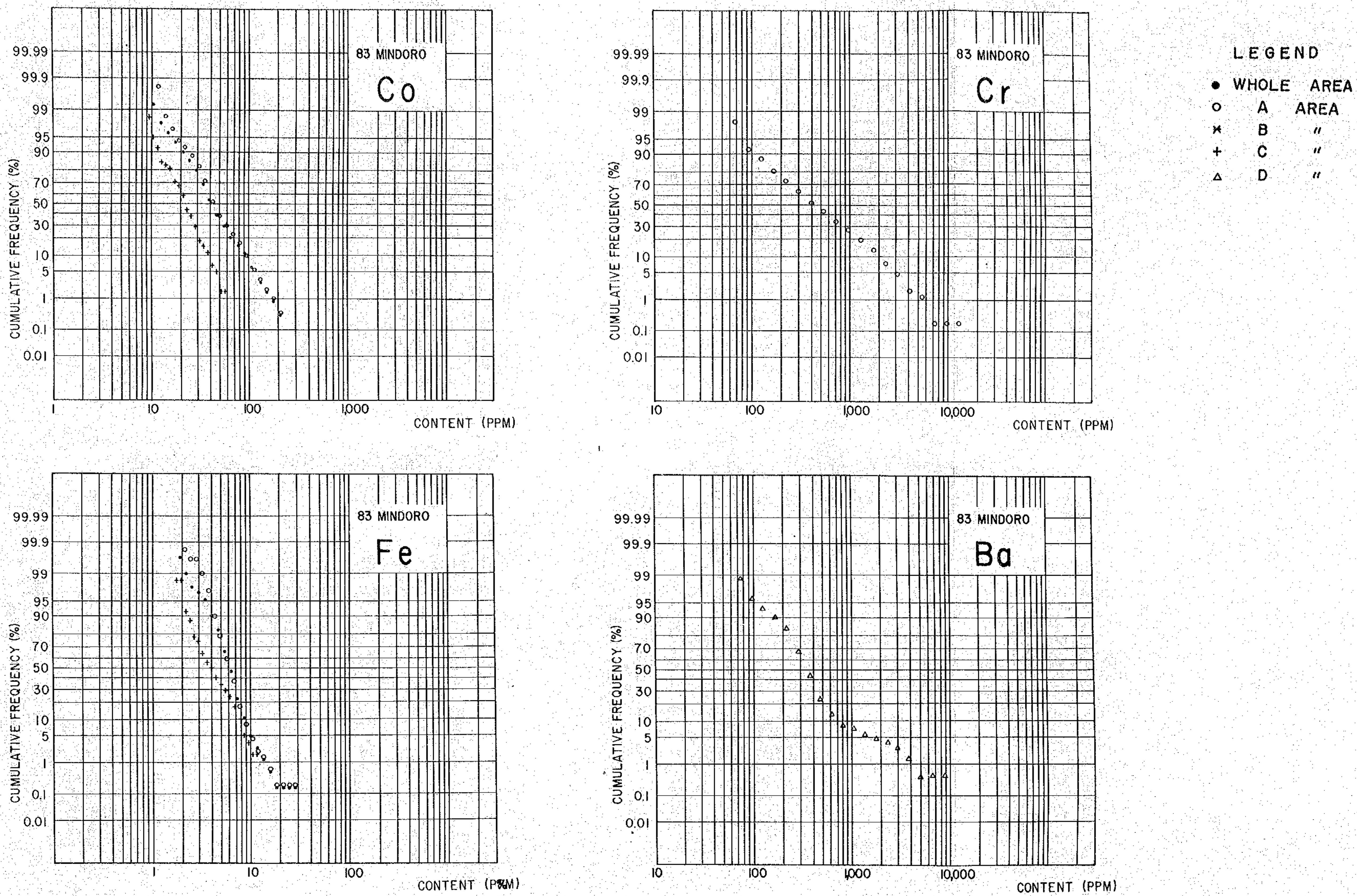

Fig. Ⅱ-3 Cumulative Frequency Distribution of Each Element (1)

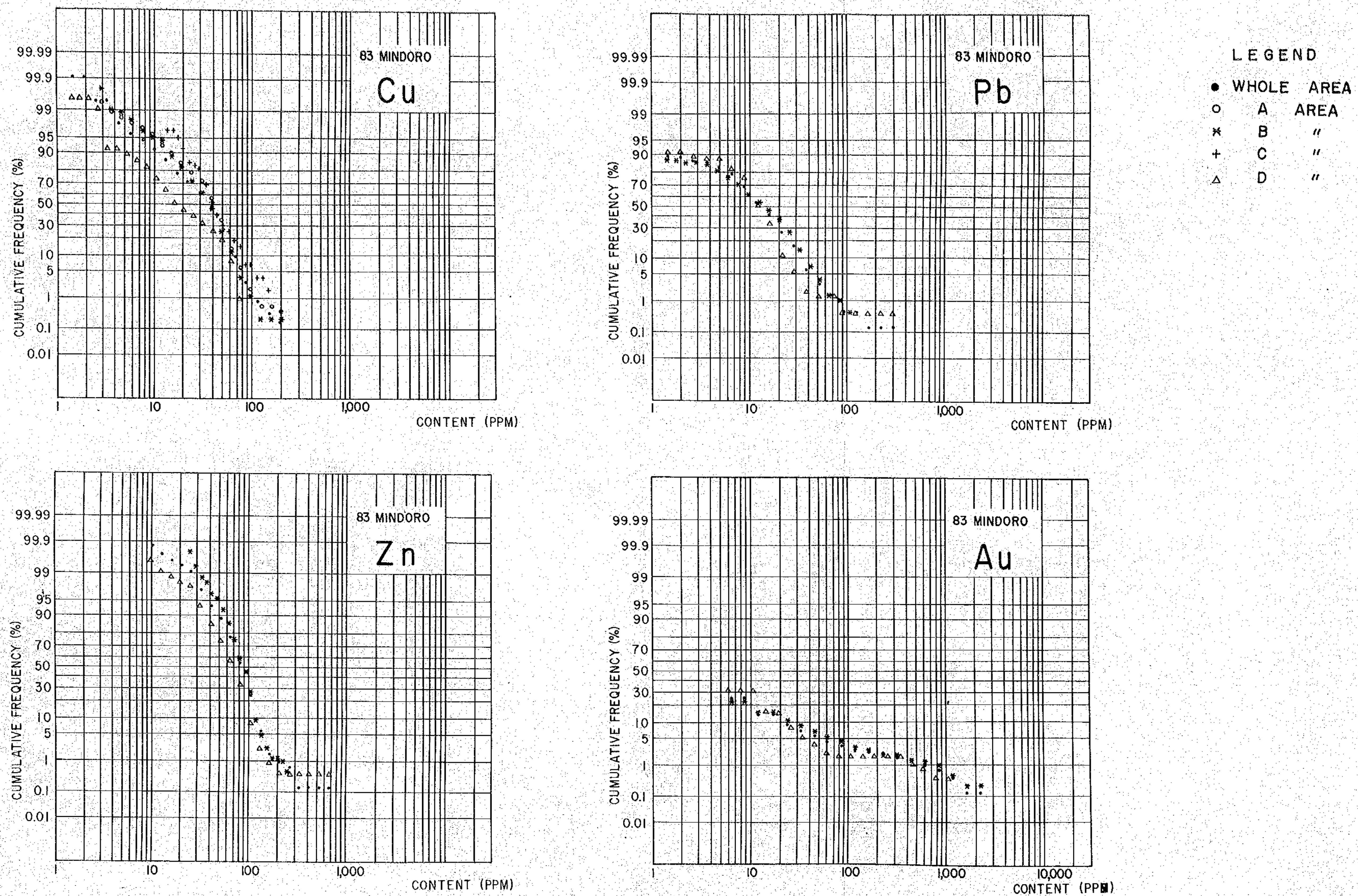

Fig. II-3 Cumulative Frequency Distribution of Each Element (2)

The threshold values were determined by the following standard with reference to the methods of C. Lepeltier (1964) and A.J. Sinclair (1974).

1. For those in which anomalous population can not be extracted by probability curve, the value of M + 2S was determined to be the threshold value (t).

2. For those in which anomalous population can be extracted, the smaller value was taken as the threshold value by comparing the value (t') of 99 percent probability level of the population and the value (t) of M + 2S.

Table II–2 and II–3 show the statistic values and the threshold values thus determined for each element.

Table II-2 Statistic Values of Geochemical data

Analyzed Element Unit	Cu ppm	Pb ppm	Zn ppm	Ag ppm	Au ppb	Ni ppm	Co ppm	Fe %	Cr ppm	Pt ppb	P ppm	V ppm	Ti ppm	Ba ppm
Number of Samples	1109	622	622	622	622	491	550	550	491	491	59	59	59	213
Minimum	1	1	7	0.1	4	26	8	1.50	45	5	150	70	2030	50
Maximum	225	340	755	0.8	2600	2950	230	30.00	15000	250	1725	380	9330	10000
Mean	26.5	9.5	70.8	0.11	6.4	300.1	39.0	5.471	397.2	5.1	455.2	155.9	4009.8	312.7
S.D.(LOG)	0.3275	0.4580	0.1783	0.1145	0.4242	0.5259	0.2505	0.1451	0.4643	0.1194	0.2441	0.2043	0.1760	0.3236
M+S.D.	56.3	27.4	106.8	0.14	17.0	1007.4	69.5	7.641	1157.0	6.7	798.5	249.6	6013.3	658.6
M+2xS.D.	119.8	78.6	160.9	0.18	45.2	3381.8	123.7	10.671	3370.0	8.9	1400.7	399.6	9017.7	1387.4

Table II-3 Threshold Values and Number of Anomalous Samples by Element

Element	Threshold Value	Number of Anomalous Samples /Total Number of Samples
Cu	120 ppm	5 / 1,109
Pb	60 ppm	8 / 622
Zn	161 ppm	6 / 622
Ag	0.3 ppm	17 / 622
Au	46 ppb	32 / 662
Ni	3,382 ppm	0 / 491
Co	124 ppm	15 / 550
Fe	10.68 %	11 / 550
Cr	3,370 ppm	10 / 491
Pt	50 ppb	4 / 491
P	1,401 ppm	2 / 59
V	400 ppm	0 / 59
Ti	9,018 ppm	1 / 59
Ba	870 ppm	16 / 213

2–3–3 Relation between the Elements

The correlation coefficients between the elements are as shown in Table II–4. Three elements such as Au, Ag and Pt were excluded, because their majority are below the detecting limit values.

Table II-4 Correlation Matrix by Area

(1) A–area (n=491)

	Cu	Ni	Co	Fe	Cr
Cu					
Ni	–0.471				
Co	–0.433	0.850			
Fe	0.079	0.188	0.478		
Cr	–0.444	0.882	0.855	0.375	

(2) B–area (n=409)

	Cu	Pb	Zn
Cu			
Pb	–0.112		
Zn	0.508	0.496	

(3) C–area (n=59)

	Cu	Co	Fe	P	V	Ti
Cu						
Co	0.816					
Fe	0.652	0.827				
P	0.447	0.552	0.641			
V	0.496	0.678	0.885	0.591		
Ti	0.316	0.583	0.730	0.361	0.810	

(4) D–area (n=213)

	Cu	Pb	Zn	Ba
Cu				
Pb	–0.248			
Zn	0.659	0.200		
Ba	–0.416	0.308	–0.043	

The tables shows the following

A area: There are very high positive correlation (correlation ratio (r) $\gtrsim$ 0.85) between Ni, Cr and Co, three elements have negative correlation with Cu. Fe has some correlation with Co, but is irrelevant to others.

B area: Zn has a positive correlation (r)=0.5±) with Cu and Pb but no correlation is shown between Cu and Pb.

C area: All elements have more or less positive correlation. Among these, Cu and Co, Fe and V, and Fe and Ti show high correlation (r > 0.8) Fe and Cu, Fe and P, and Co and V show a little higher correlation (r > 0.6).

D area: Except a little higher correlation of r = 0.66 between Cu and Zn, no particular relation is shown. Cu and Ba show a negative correlation.

Table II-5 Correlation Matrix in Whole Area

	Cu	Pb	Zn	Ni	Co	Fe	Cr	P	V	Ti	Ba
Cu											
Pb	−0.139										
Zn	0.638	0.354									
Ni	−0.472	−0.402	−0.343								
Co	−0.349	−0.652	−0.239	0.850							
Fe	0.107	−0.297	−0.011	0.188	0.579						
Cr	−0.444	−0.403	−0.318	0.882	0.855	0.375					
P	0.447	0.137	0.384	−	0.552	0.641	−				
V	0.496	−0.592	−0.043	−	0.678	0.885	−	0.591			
Ti	0.316	−0.463	0.207	−	0.583	0.730	−	0.361	0.810		
Ba	−0.416	0.308	−0.043	−	−	−	−	−	−	−	

2–3–4 Interpretation of Geochemically Anomalous Zones

The samples with higher contents than the threshold values were plotted by element on the 1 : 100,000 topographical map and their drainage basins were patterned as geochemically anomalous zones like last year. But when a drainage basin is very big, a patterned area was not whole basin but the limitted area near the sampling site.

As Cr and Ni are considered to have been deposited in the process of differentiation of the ultramafic rocks, not only t but t" = Mean (M) + Standard deviation (S) were used for these elements in order to know their geochemical trend in the whole rock body, as illustrated on the map of geochemically anomalous zones (Plate II−1~4). The values of t" calculated were 1,157 ppm in Cr and 1,007 ppm in Ni, and the number of samples with larger values than t" corresponds to about 16 percent of the whole samples.

Six geochemically anomalous zones were extracted this time, the details are as follows.

(1) Binaybay Au Anomalous Zone (drainage area : 10 km^2)

The anomalous zone includes eight small creeks located in the middle reaches of the Binaybay River and in the upper stream of the Alag River, where Au contents of 55 to 2,600 ppb were obtained. The area has been known as a panning place of placer gold and many panners are working espeically in the Binaybay River. Other two Au anomalies were obtained in the Catuiran River, 20 km southeast of this area. As Catuiran area consists of the Halcon metamorphic rocks like Binaybay area and igneous activity is hardly observed, Au seems to have been derived from the metamorphic rocks.

(2) Ogos River Cr-Ni Anomalous Zone (drainage area : 13 km^2)

The anomalous zones are distributed within the Ogos ultramafic body. High anomalous values such as Cr = 3,900 ~ 1,5000 ppm were obtained at 7 places. The drainage basins with higher Cr values than t" occupy massingly more than a half of the complex area. High Ni concentration with 1,000 ~ 2,300 ppm are also present almost overlapping Cr anomalies.

The area of drainage basin with higher values than t is 13 km^2, but the area of higher than t" value reaches up to 50 km^2.

(3) Casiligan River Cu Anomalous Zone (drainage area : 3 km^2)

The anomalies occur at two places in the Aglubang and the Casiligan Rivers, showing 160 and 225 ppm respectively. As many chalcopyrite-pyrrhotite veins (Mananbutao, Masnon and Chialawood) filling the fissures in basalt of the Lumintao formation and the ultramafic body are known in the area, these anomalies suggest that the mineralization extends toward west.

A Cu anomaly (178 ppm) detected at the place, 6 km southwest of the above Cosiligan zone, occurs in the Banbanon mineralized zone.

(4) Bansud River Cr-Ni Anomalous Zone (drainage area : 10 km^2)

Only one anomaly (Cr = 6,100 ppm) was obtained in the creek of the Banus deposit in the Bongabong complex body, the anomalous zone was determined taking into account the chromite concentration in the panned samples collected in the south adjacent the Bansud and the Sumagui Rivers.

When drainage basins with Cr values above t" (= 1,157 ppm) are picked up like in Ogos, the zone covers almost whole body, reaching up to 80 km^2. Ni contents above t" value show 1,250 to 2,200 ppm, and the drainage basins are almost same as those of Cr above t".

According to the BMG data (1974), there is a nickeliferous laterite deposit (No. 10) of the Blueridge Mining Corporation in the upper stream the Sumagui River, where nickel grades of 0.80

to 2.95% were reported. Although the deposit could not be checked this time, the nickel contents in the stream sediment taken at the immediately down-stream of the deposit showed 1,500 to 2,100 ppm.

(5) Siange River Au Anomalous Zone (drainage area : 10 km^2 +)

Au anomalies in the Siange River extends as if they covered the Cu-Zn anomalous zone of Phase I. In nine drainage basins Au contents exceed the threshold value (t = 43 ppb Au), ranging from 50 to 1,200 ppb (405 ppb in average). The possibility of Au mineralization overlapping the barite mineralization was indicated last year based on the survey of the Taoga deposit, it became clear that an Au anomalous zone extends northward from the deposit.

Any high values were not obtained this time in the Cu-Zn anomalous zone detected last year.

(6) Baroc River Ba Anomalous Zone (drainage area : 10 km^2)

The anomalous zone is widely distributed mainly on the southern bank of the upper stream of the Baroc River where the Taoga barite deposit is located. The anomalous drainage basins are found at 13 places, showing the values ranging from 1,260 to 10,000 ppm (2,973 ppm in average). As the anomalous basins mass around the Taoga deposit, the new barite deposit can be expected. In contrast to this anamalies, any remarkable anomalous zone could not be obtained in the Wigan mineralized zone of Mansalay Mining Corporation, 10 km southeast of the Taoga deposit.

The distribution of the elements which has not been described on the geochemical anomaly map is as follows.

Ag: The maximum analytical value obtained this year was 0.8 ppm, showing a very low figure as that of last year. It is questionable to consider them anomalous. As no boulders of the gossan were found out, it was erased together with the Alitayan and Mangpong Ag anomalous zones described in the Phase I report.

Co: Anomalies are scattered within the ultramafic bodies. As Co has a very high positive correlation with Cr and Ni ($r > 0.85$), and also with Cu ($r > 0.8$), the anomalous zones of Co are substituted by these elements.

Fe: No anomalous value was obtained in the iron ore deposits area like in the last phase and a little massing anomalies were detected in the drainage basin of a southern tributary of the Pula River. As the latter seems to be related to magnetite accompanied by the ultramafic rocks, it was omitted.

Pt: Most of the values were below the limit of detection, and some anomalies ranging from 65 to 250 ppb are scattered sporadically in the ultramafic bodies on the eastern side, and bear no relation to the known ore deposits.

P, V and Ti: The maximum values of these three elements were lower than three times the Clarke's number, suggested that they would not show the anomalies related to mineralization.

Among the anomalies detected last phase, the followings have not been indicated as the anomalies.

(1) Amnay River Cr-Ni Anomalous Zone

An anomalous zone was established last year for the reason that Cr contents (1,143 ~ 2,086 ppm) were obtained in the Pintin ultramafic bodies on the western side. However, t-value went up to 2,370 ppm as the result of taking many samples in the ultramafic bodies this year, consequently the anomalous zone disappeared. When the area of high Cr concentration is encircled by the values of t" (Cr-1,157 ppm, Ni-1,007 ppm), the area of 10 km^2 including the Paragpagan deposit is less massing, indicating lower Cr content compared with the eastern side.

(2) Pula River Cr Anomalous Zone

The anomalous zone (Cr = 2,426 – 10,565 ppm) extends over from the Pula River to the Balete River, but it was made clear that the Cr anomaly was derived from the ultramafic rocks contained as pebbles in conglomerate bed of the Bongabong group found in this area.

(3) Rayusan Zn Anomalous Zone

Several Zn anomalies (189 to 755 ppm) are found in the area extending from the upper stream of the Ogos River to the upper stream of the Bongabong River, which seems, macroscopically, to be the eastern extension of the Rayusan Zn anomalous zone of the last phase. It was erased, however, with the result that the anomalous drainage basins are isolated and any mineralized boulder could not be found out.

Although six Pb anomalies ranging from 65 to 118 ppm were obtained near the Zn anomalies, the anomalous zone has not been indicated for the similar reason.

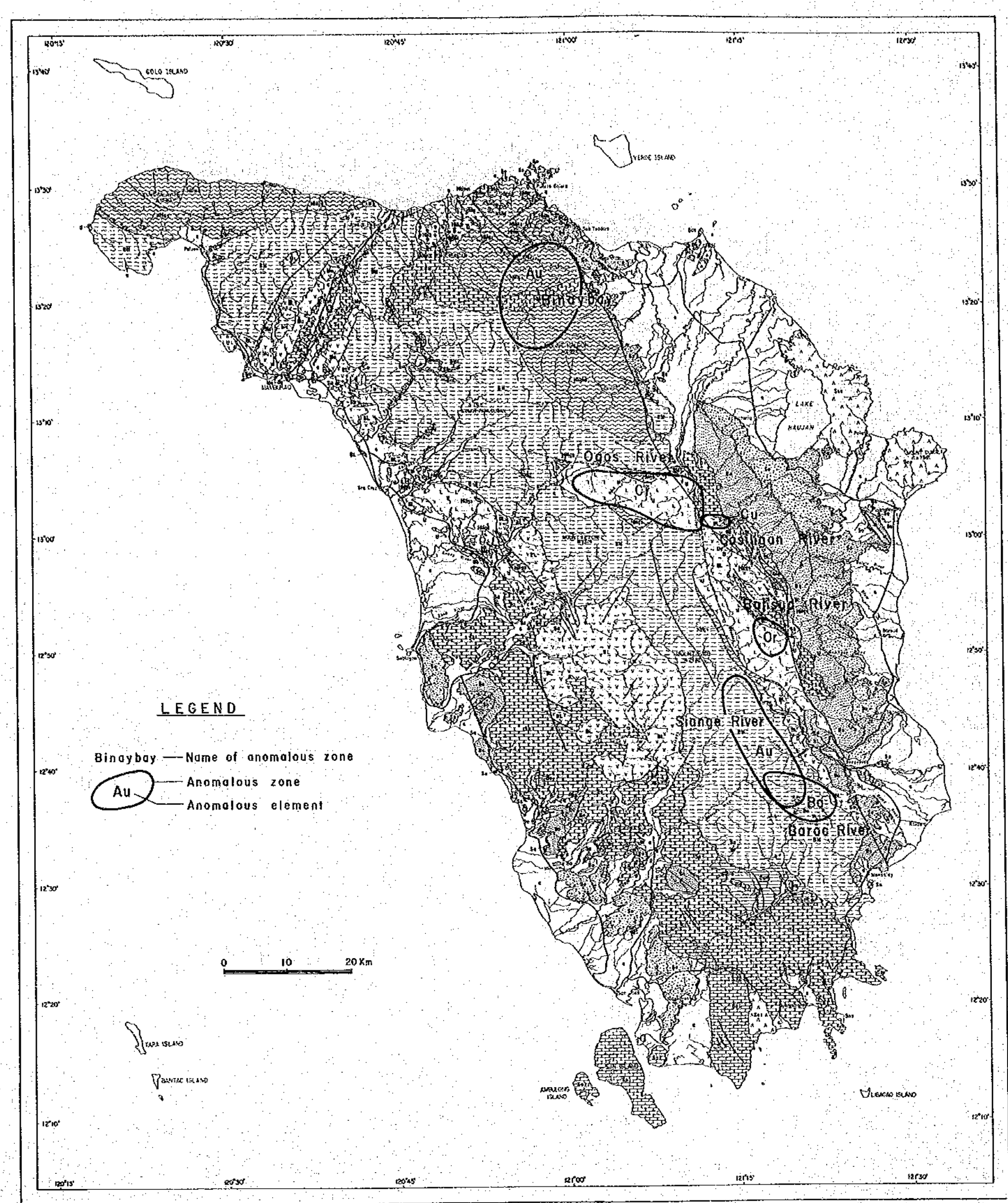

Fig. II-4 Geochemical Anomaly Map of the Survey Area