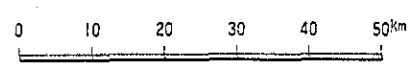


R A N G E

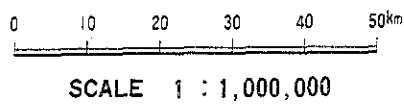
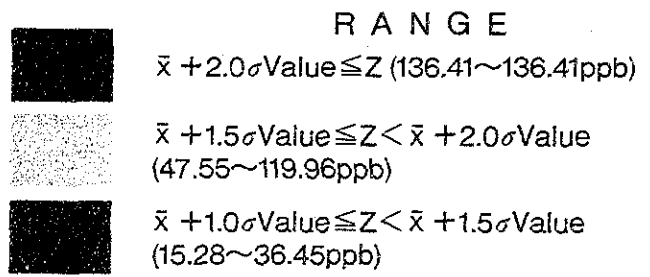
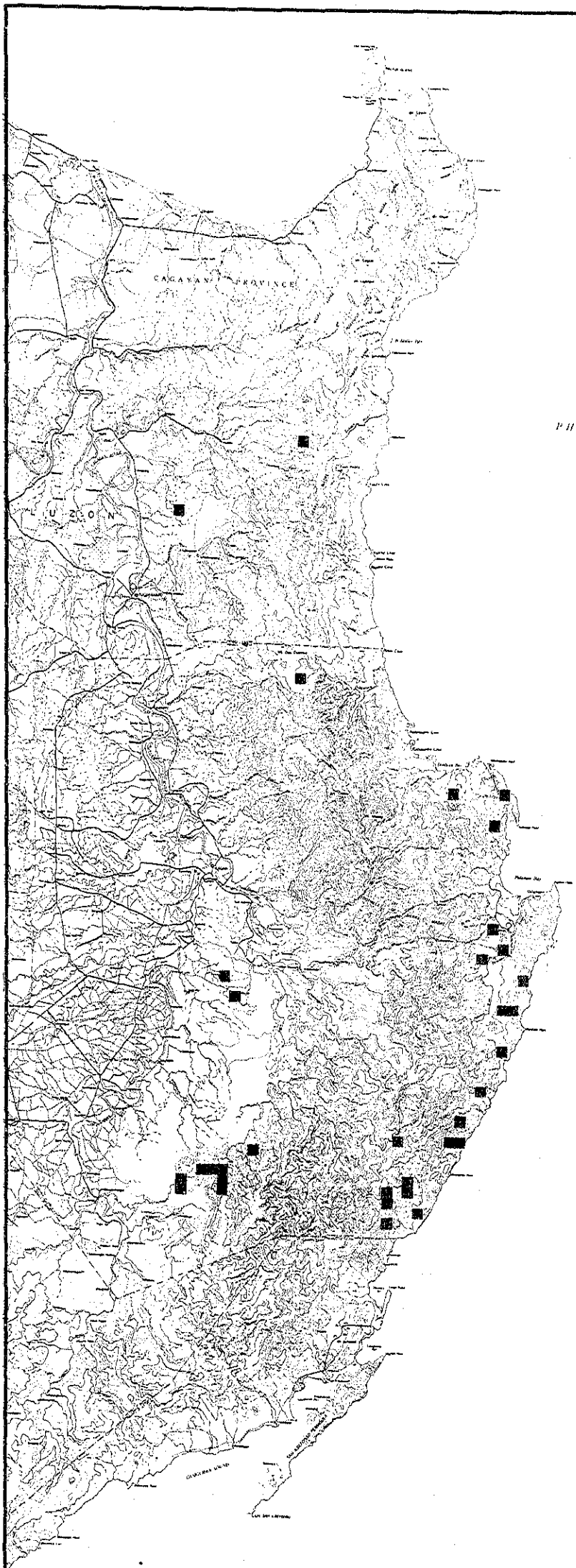
	$\bar{x} + 2.0\sigma \text{Value} \leq Z$ (10.76~12.42ppm)
	$\bar{x} + 1.5\sigma \text{Value} \leq Z < \bar{x} + 2.0\sigma \text{Value}$ (3.69~4.06ppm)
	$\bar{x} + 1.0\sigma \text{Value} \leq Z < \bar{x} + 1.5\sigma \text{Value}$ (1.17~3.11ppm)



SCALE 1 : 1,000,000

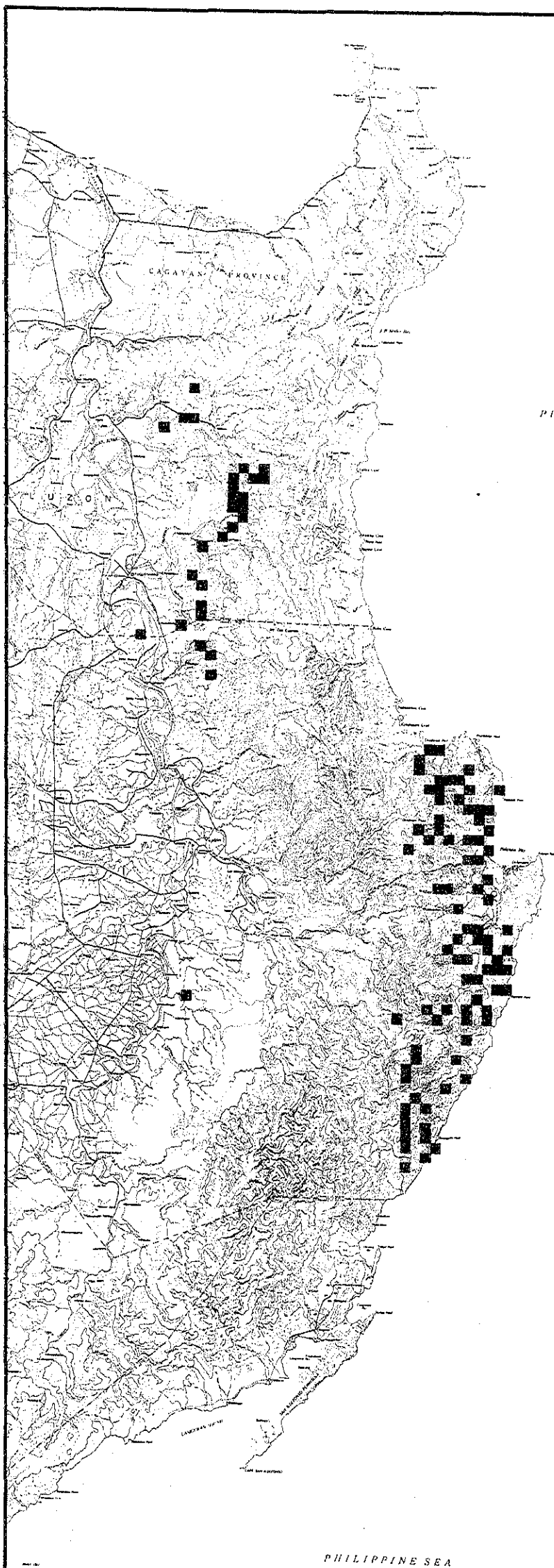
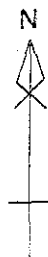
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 GEOCHEMICAL ANALYSIS
 HIGH-PASS FILTER VALUES
 DISTRIBUTION MAP




No.8 Mo

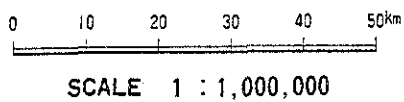


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GEOCHEMICAL ANALYSIS HIGH-PASS FILTER VALUES DISTRIBUTION MAP

No.9 Hg



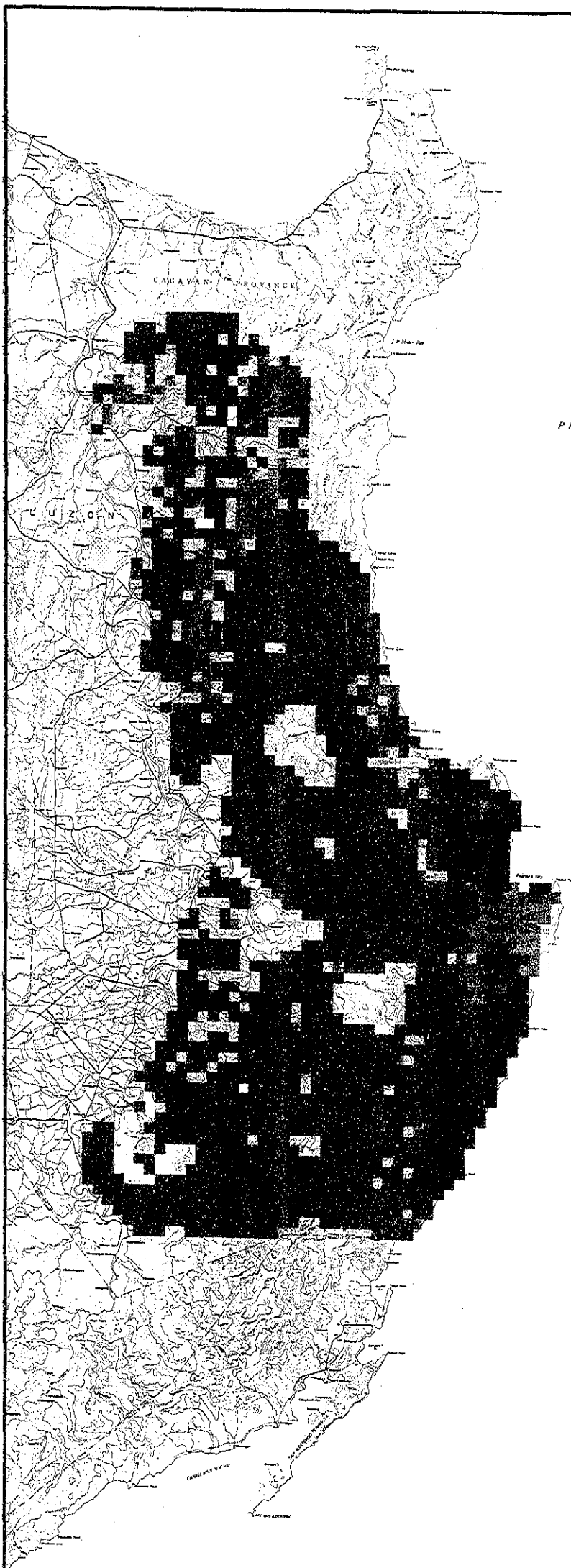
RANGE	
	$\bar{x} + 2.0\sigma \text{ Value} \leq Z$ (27,358.05~99,698.08ppm)
	$\bar{x} + 1.5\sigma \text{ Value} \leq Z < \bar{x} + 2.0\sigma \text{ Value}$ (6,546.65~24,155.11ppm)
	$\bar{x} + 1.0\sigma \text{ Value} \leq Z < \bar{x} + 1.5\sigma \text{ Value}$ (1,618.80~6,381.48ppm)



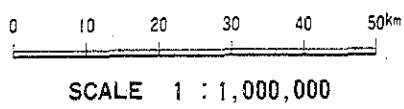
THE MINERAL EXPLORATION MINERAL DEPOSITS AND TECTONICS OF TWO CONTRASTING GEOLOGIC ENVIRONMENTS IN THE REPUBLIC OF THE PHILIPPINES
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GEOCHEMICAL ANALYSIS HIGH-PASS FILTER VALUES DISTRIBUTION MAP

No.10 Cr

PL-2-4 (No. 1 to No. 5) Geochemical Analysis Factor Analytical Values
Distribution Map (1:1,000,000)



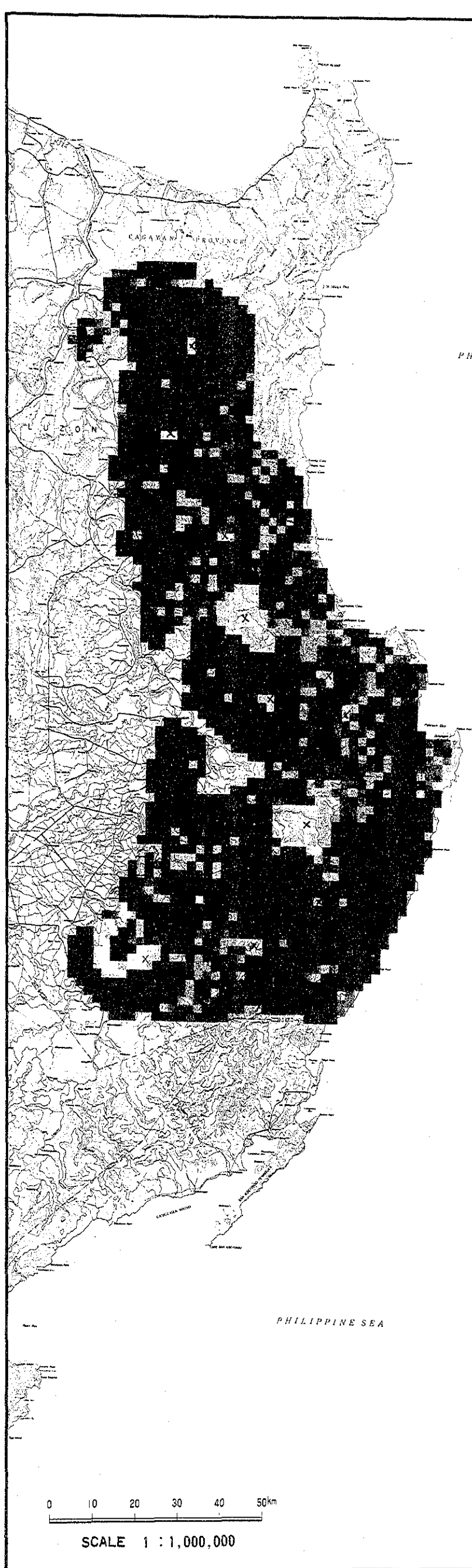
CODE	RANGE
A	$90\% \leq Z < 100\%$ (1.50~4.10)
B	$80\% \leq Z < 90\%$ (0.35~1.50)
C	$70\% \leq Z < 80\%$ (0.08~0.35)
D	$50\% \leq Z < 70\%$ (-0.27~0.08)
E	$0\% \leq Z < 50\%$ (-2.25~-0.27)



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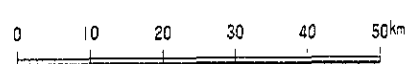
GEOCHEMICAL ANALYSIS
FACTOR ANALYTICAL VALUES
DISTRIBUTION MAP No.1 FACTOR 1



PHILIPPINE SEA

PHILIPPINE SEA

CODE	RANGE
A	$0\% \leq Z < 10\%$ (-5.91 ~ -1.24)
B	$10\% \leq Z < 20\%$ (-1.23 ~ -0.78)
C	$20\% \leq Z < 30\%$ (-0.78 ~ -0.47)
D	$30\% \leq Z < 50\%$ (-0.47 ~ 0.03)
E	$50\% \leq Z < 100\%$ (0.03 ~ 3.65)

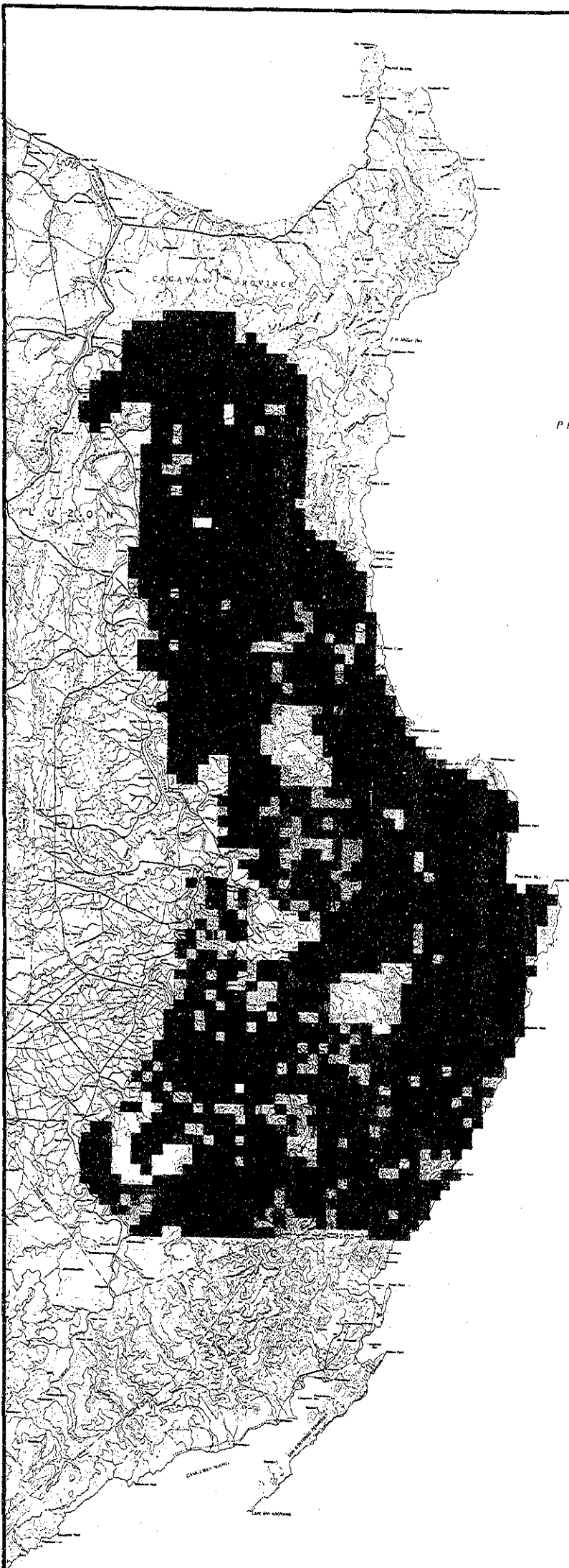


SCALE 1 : 1,000,000

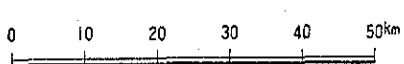
THE MINERAL EXPLORATION
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GEOCHEMICAL ANALYSIS
FACTOR ANALYTICAL VALUES
DISTRIBUTION MAP No.2 FACTOR 2



CODE	RANGE
A	$90\% \leq Z < 100\%$ (0.44~16.57)
B	$80\% \leq Z < 90\%$ (0.07~0.44)
C	$70\% \leq Z < 80\%$ (-0.08~0.07)
D	$50\% \leq Z < 70\%$ (-0.22~-0.08)
E	$0\% \leq Z < 50\%$ (-1.31~-0.22)

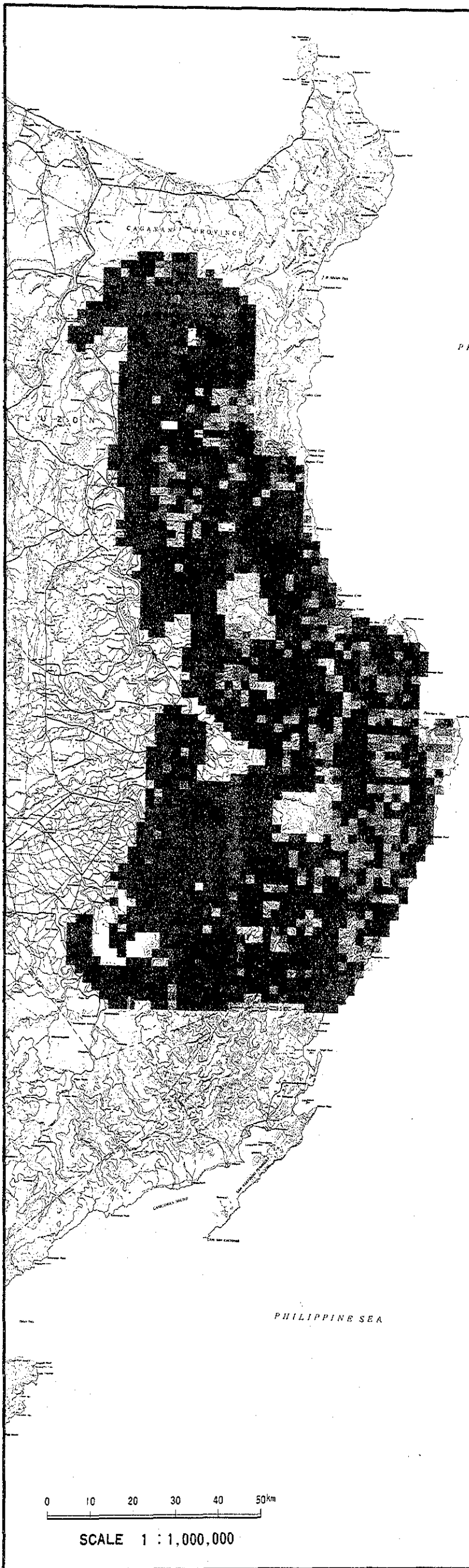


SCALE 1 : 1,000,000

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GEOCHEMICAL ANALYSIS
FACTOR ANALYTICAL VALUES
DISTRIBUTION MAP No.3 FACTOR 3



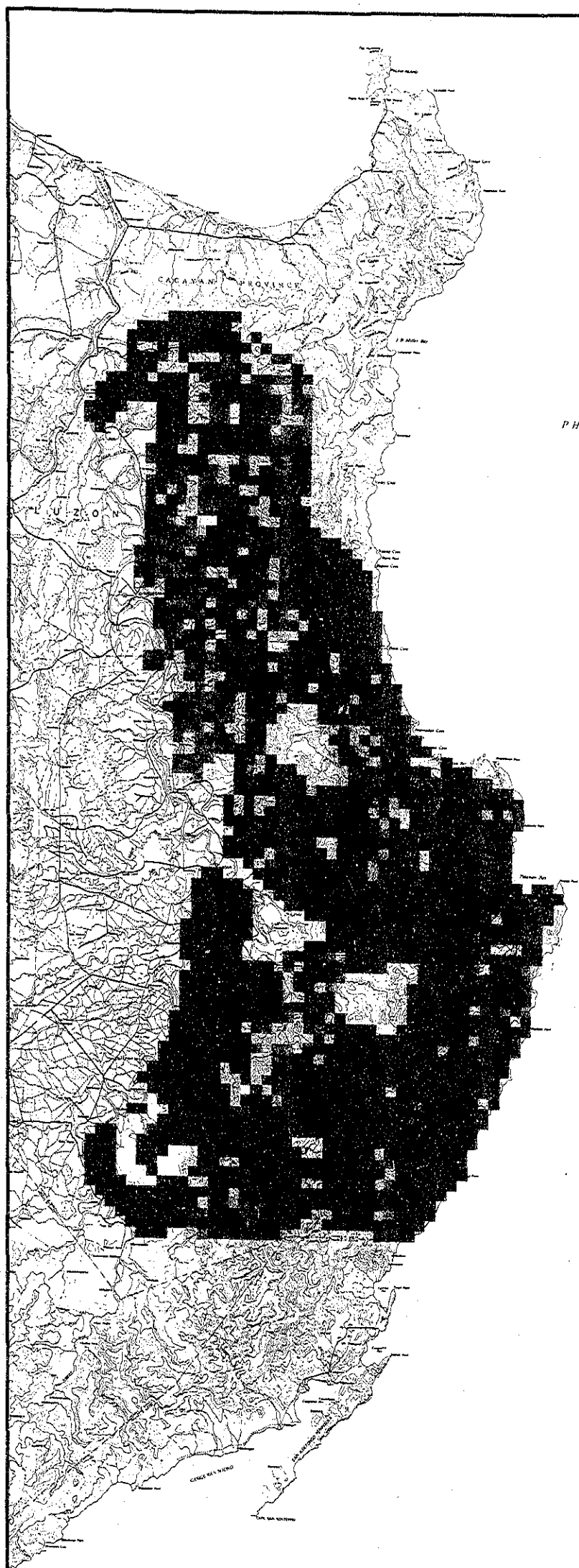
CODE	RANGE
A	$0\% \leq Z < 10\%$ (-17.51 ~ -0.15)
B	$10\% \leq Z < 20\%$ (-0.15 ~ -0.05)
C	$20\% \leq Z < 30\%$ (-0.05 ~ 0.02)
D	$30\% \leq Z < 50\%$ (0.02 ~ 0.13)
E	$50\% \leq Z < 100\%$ (0.13 ~ 1.35)

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GEOCHEMICAL ANALYSIS
FACTOR ANALYTICAL VALUES
DISTRIBUTION MAP

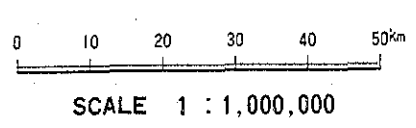
No.4 FACTOR 4



PHILIPPINE SEA

PHILIPPINE SEA

CODE	RANGE
A	$90\% \leq Z < 100\%$ (1.30~2.89)
B	$80\% \leq Z < 90\%$ (0.94~1.30)
C	$70\% \leq Z < 80\%$ (0.64~0.94)
D	$50\% \leq Z < 70\%$ (-0.01~0.64)
E	$0\% \leq Z < 50\%$ (-2.65~-0.01)

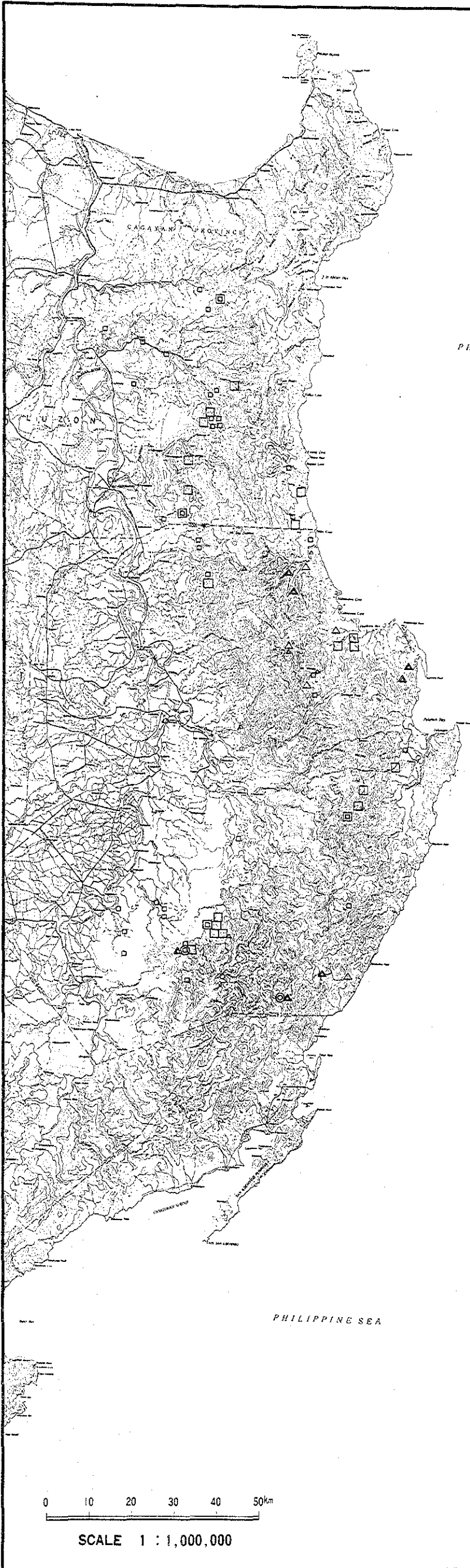


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GEOCHEMICAL ANALYSIS
FACTOR ANALYTICAL VALUES
DISTRIBUTION MAP No.5 FACTOR 5

- PL-3 Distribution Map of Anomalous Values in Panned Samples (1:1,000,000)
- PL-4 Distribution Map of the Major Heavy Minerals Wt % in Panned Samples (1:1,000,000)
- PL-5 Compiled Gravimetric Map (Bouguer Anomalies) (1:1,000,000)
- PL-6 Lineaments Map (LANDSAT Images) (1:1,000,000)
- PL-7 Locality Map of Mineral Showings (1:1,000,000)
Attached Index Table of Mineral Showings
- PL-8 Index Map of Existing Data regarding Survey Works of the Area (1:1,000,000)
- PL-9 Relation Map between Promising Area and Mineral Showings Localities (1:1,000,000)



Au (ppb)	
⊙	$2603.6 \leq Au$
○	$856.9 \leq Au < 2603.6$
◦	$282 \leq Au < 856.9$

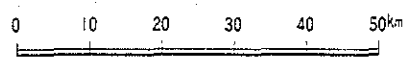
Ag (ppb)	
▲	$447.8 \leq Ag$
△	$286.8 \leq Ag < 447.8$
△	$183.6 \leq Ag < 286.8$

Ga (ppm)	
⊠	$27.2 \leq Ga$
□	$22.3 \leq Ga < 27.2$
◻	$18.2 \leq Ga < 22.3$

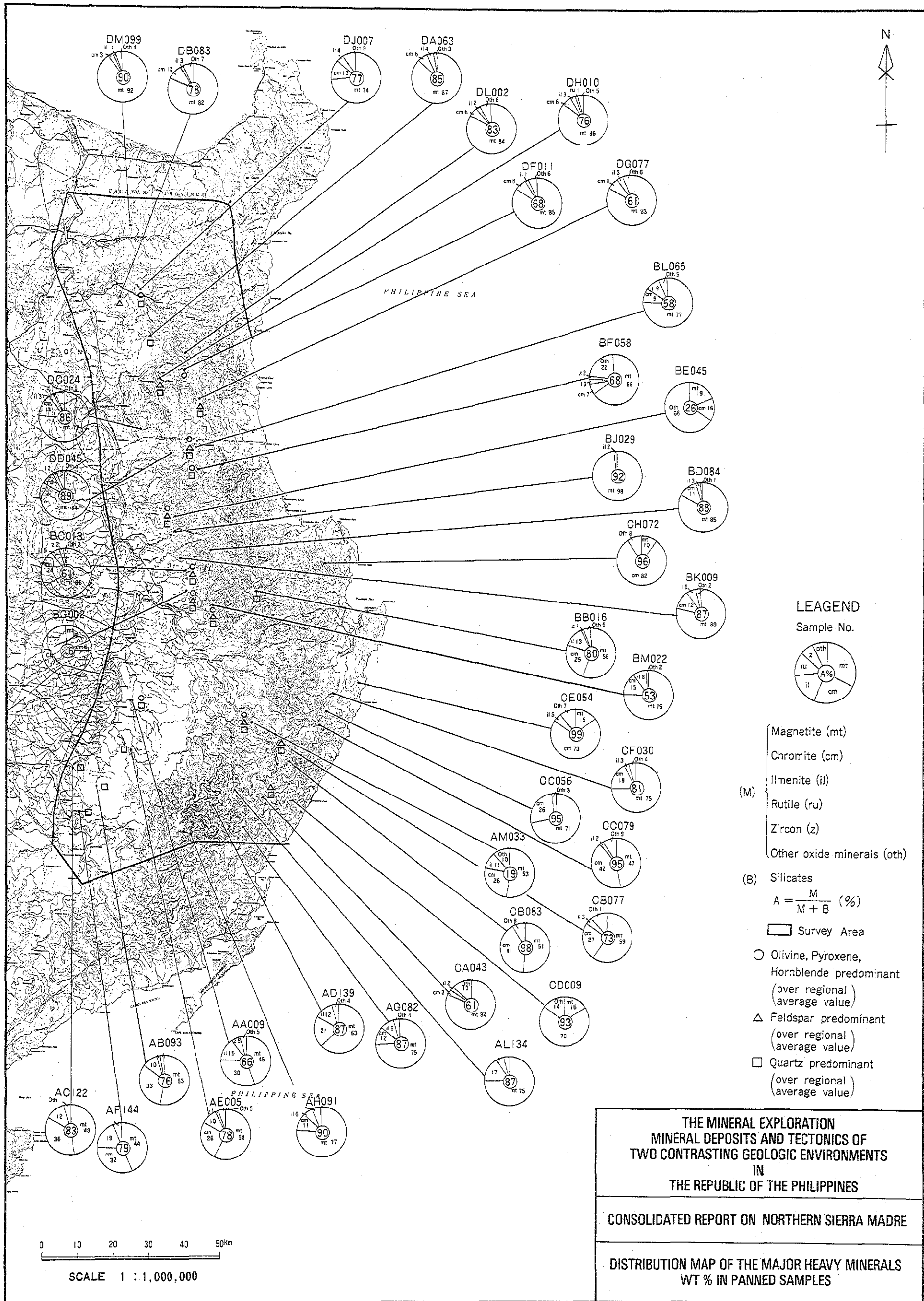
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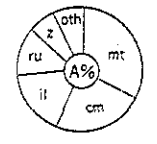
DISTRIBUTION MAP OF ANOMALOUS
VALUES IN PANNED SAMPLES



SCALE 1 : 1,000,000

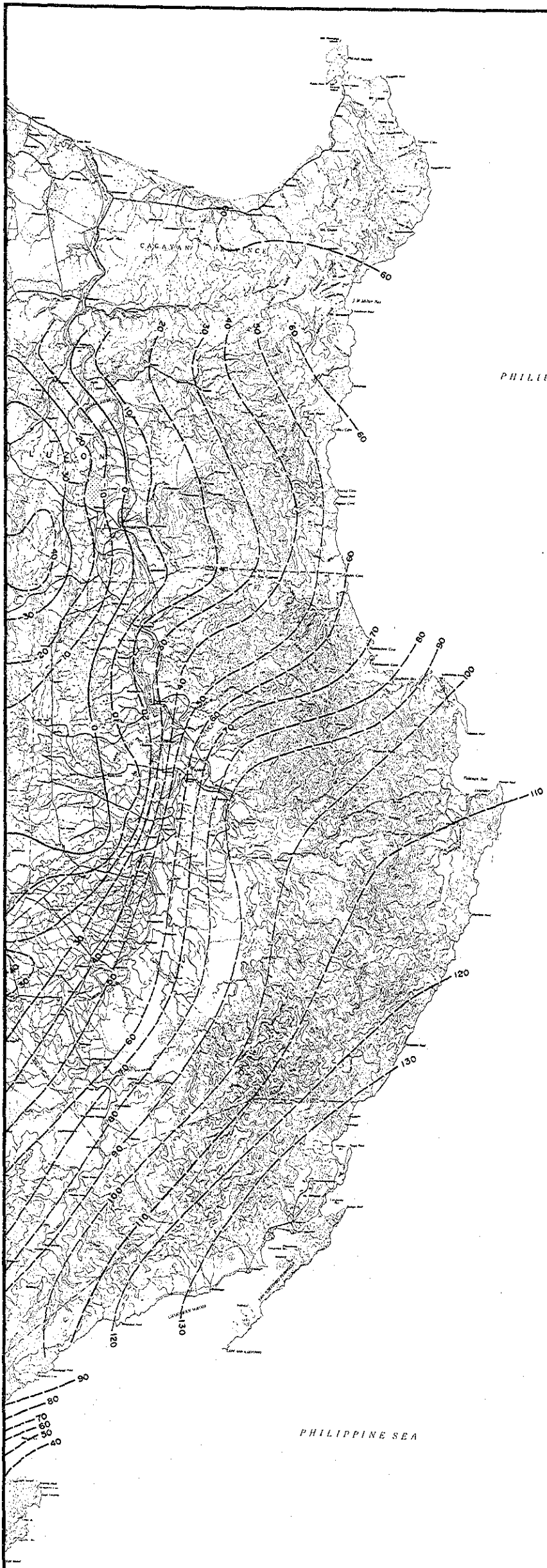


LEAGEND
Sample No.



- (M) Magnetite (mt)
- Chromite (cm)
- Ilmenite (il)
- Rutile (ru)
- Zircon (z)
- Other oxide minerals (oth)
- (B) Silicates
- $A = \frac{M}{M+B} (\%)$
- Survey Area
- Olivine, Pyroxene, Hornblende predominant (over regional) (average value)
- △ Feldspar predominant (over regional) (average value)
- Quartz predominant (over regional) (average value)

0 10 20 30 40 50km
SCALE 1 : 1,000,000



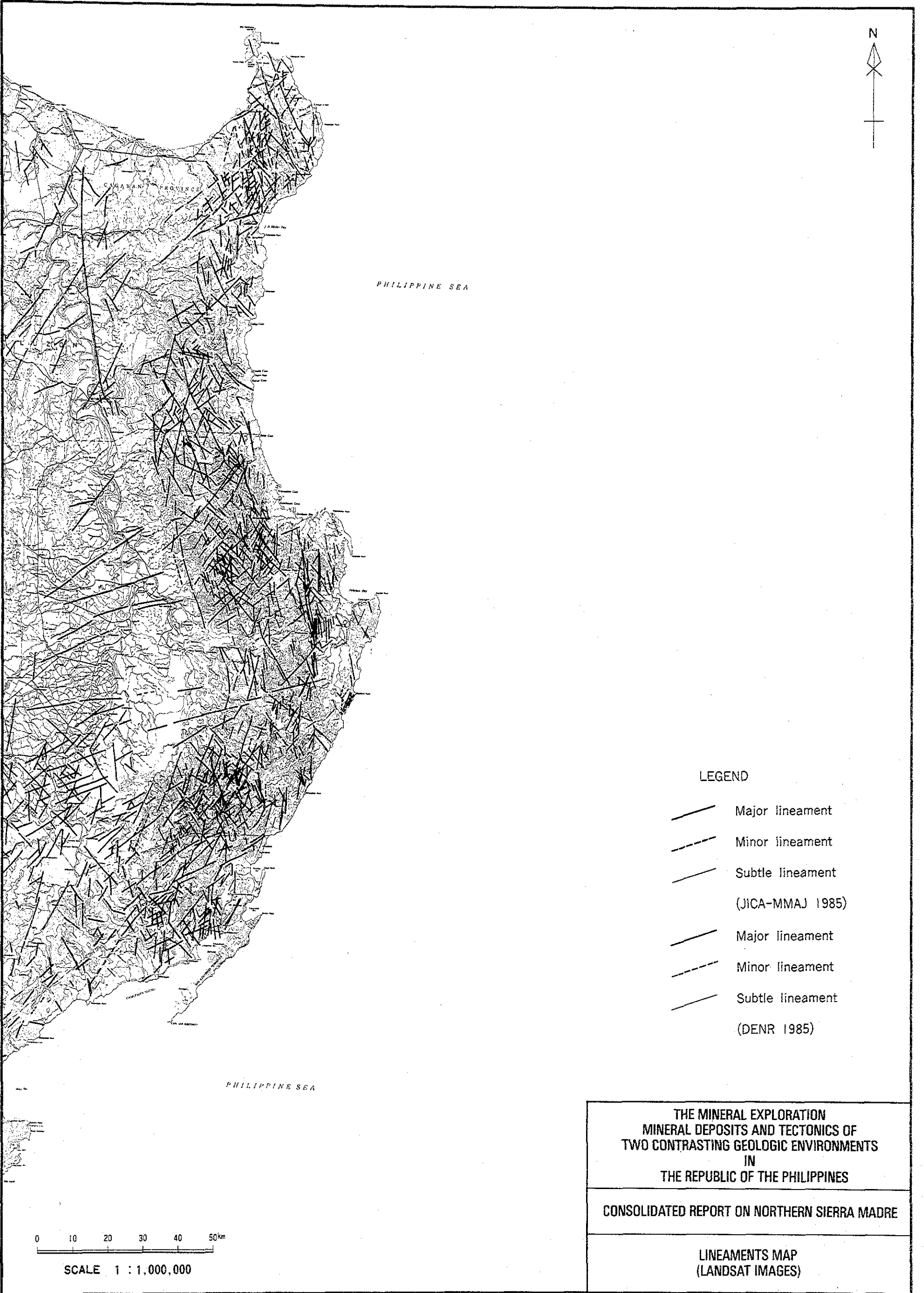
LEGEND
—— } Bouguer Gravity
- - - } Contour
 (milligal)

0 10 20 30 40 50km
SCALE 1 : 1,000,000

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COMPILED GRAVIMETRIC MAP
(BOUGUER ANOMALIES)



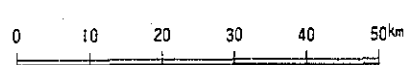
PHILIPPINE SEA

CAGAYAN PROVINCE

LEGEND

- Major lineament
- Minor lineament
- Subtle lineament
- (JICA-MMAJ 1985)
- Major lineament
- Minor lineament
- Subtle lineament
- (DENR 1985)

PHILIPPINE SEA



SCALE 1 : 1,000,000

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**LINEAMENTS MAP
 (LANDSAT IMAGES)**

Index Table of Mineral Showings

Northern Sierra Madre

1) Cagayuan

<u>Metallics</u>		<u>Nonmetallics</u>	
② Broderth & Magdengal	Fe	① San Vicente, Santa Ana	Ls
③ Lal-lo	Mn	⑧ Angang	Cly
④ APEX	Fe	⑨ Liwan	Cly
⑤ Marina Mines	Fe	⑫ Makatay	Gyp
⑥ Mayonga Mining Co., Ltd.	Fe		
⑦ Camalaniugan	Fe		
⑩ Sanchez Mira	Fe		
⑪ Calaveria	Fe		
⑬ FE VA Mining Co,	Fe		
⑭ Casablangan	Cu		
⑮ Dinaccadan	Cu		
⑯ Capisayan West	Fe		
⑰ Capisayan east	Fe		

LEGEND

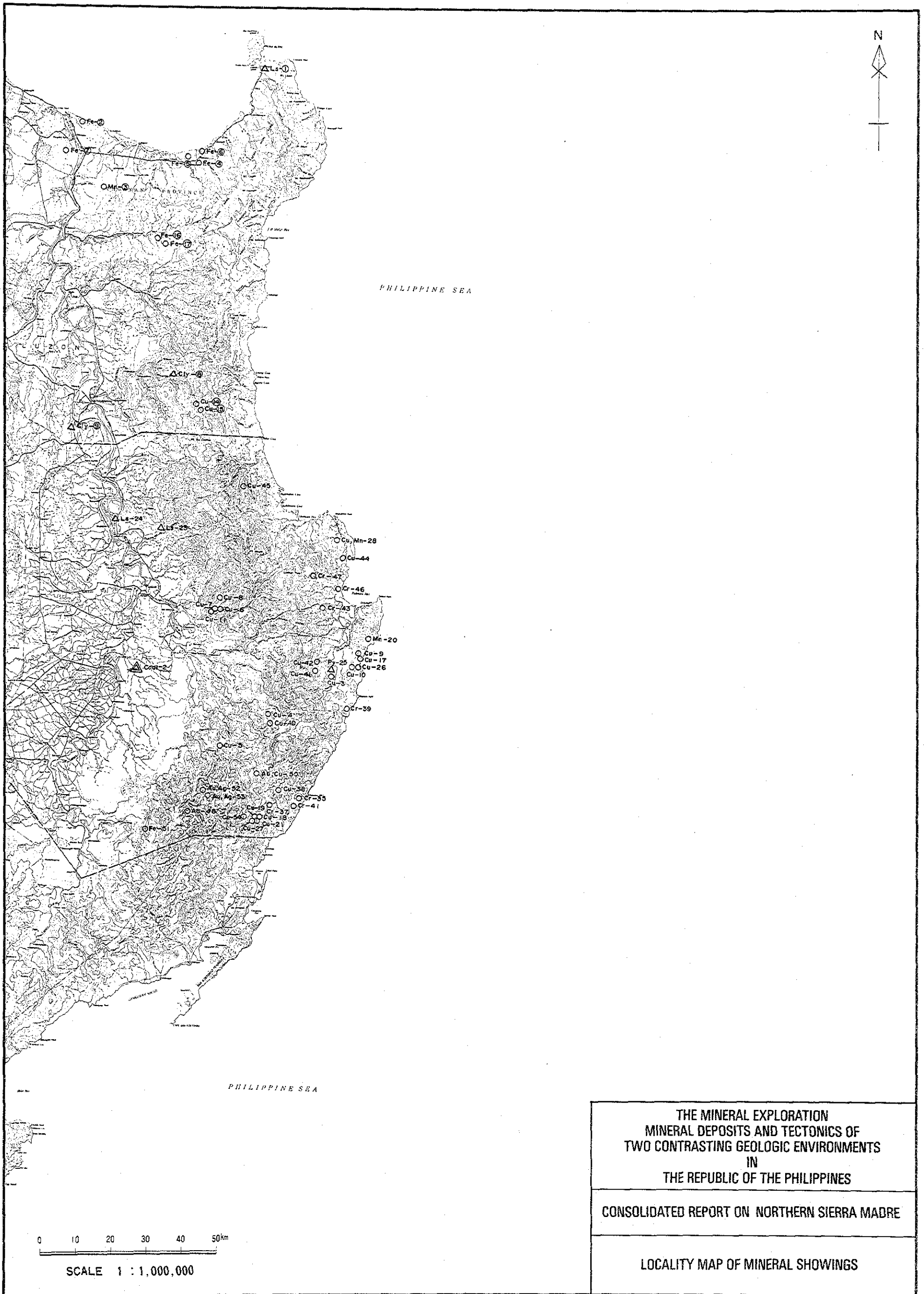
metallic	nonmetallic	
⊙	△	: Operating mine
○	△	: Explored, Developed, Prospect or Indication

nonmetallics

Ls : Limestone	Py : Pyrite
Cly : Clay	Coal : Coal
Gyp : Gypsum	

2) Isabela

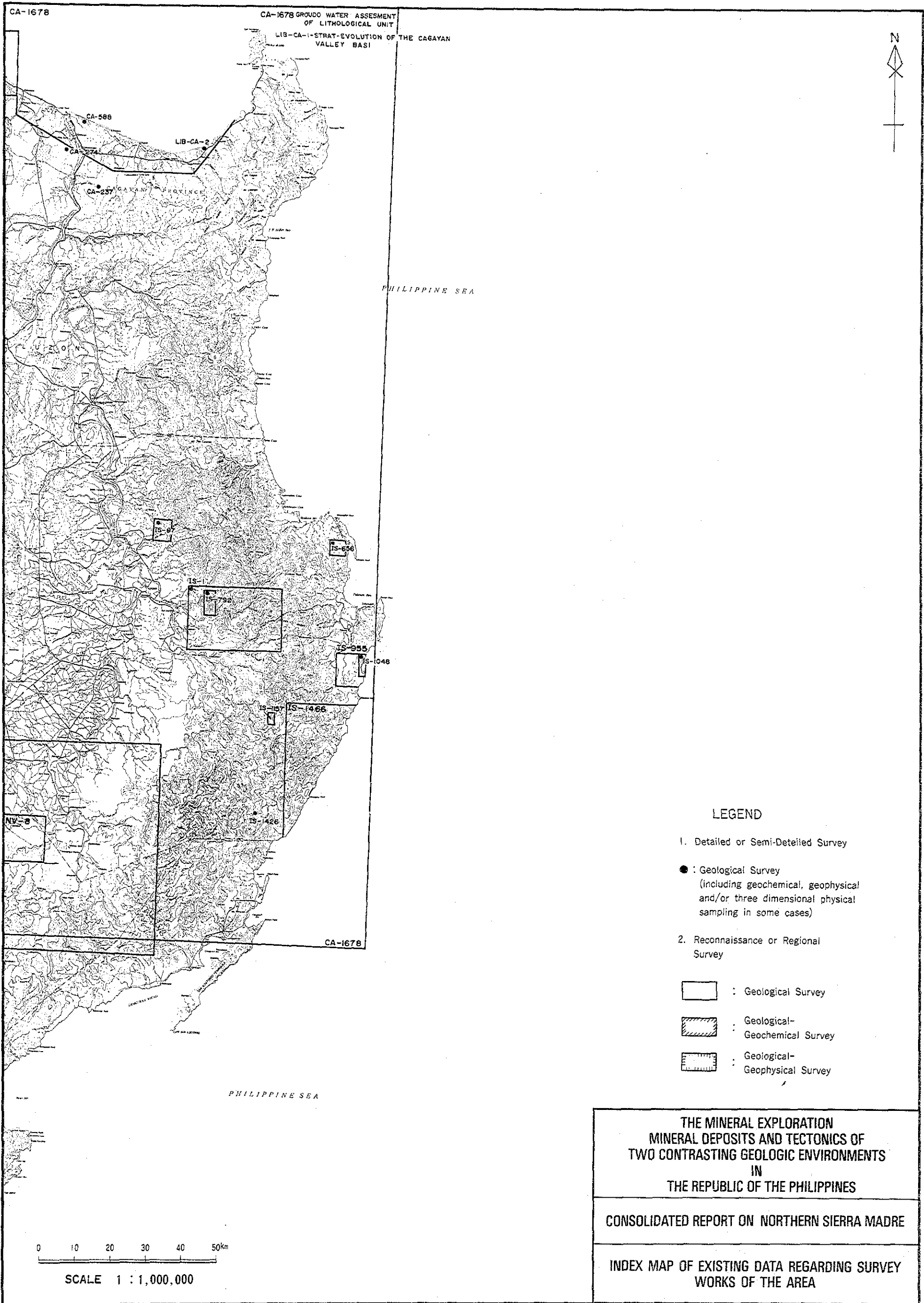
<u>Metallics</u>		<u>Nonmetallics</u>	
1. Cordon, Marian Copper Deposits	Cu	34. Cas chrome Wasayan I	Cr
2. Diwed	Cu	35. Cas chroma Wasayan II	Cr
4. Agar	Cu	36. _____	
5. Calabasa	Cu	37. Dinapiqui	Cu
6. Menuma	Cu	38. Dimatatno	Cu
7. Saigot	Cu	39. Dikapisan	Cr
8. Ilagan	Cu	40. _____	
9. Dikadiaoan	Cu	41. Giwed	Cu
10. Disawat No. 2	Cu	42. Diudenan	Cu
11. Isabela	Cu	43. Debenelang	Cr
12. J-Group of Claims	Cu	44. Lacson	Cu
13. Marian Group of Claims	Cu	45. Bolos River	Cu
14. Ilut	Cu	46. Diskad	Cr
15. Kimmaldero	Cu	47. Dilacnadinom	Cr
16. Diadi	Cu	48. Disudo Creek	Au, Cu
17. Disawit	Cu	49. Dina Creek	Cu
18. Black Rock Mining Corp.	Cu	50. Diwagao	Au, Cu
19. Diwakawal	Cu	51. Dicamay River	Fe
20. Dicavatuel	Mn	52. Ilagan River	Au, Ag
21. Black Rock Mining Corp.	Mn	53. Diden River	Au, Ag
22. San Luis	Cu	54. Palig Creek	Cu, Ag
26. Kanaipang Hill	Cu		
27. Black Rock Ming Corp.	Cu		
28. Bicobian	Cu, Mn		
29. Cordon	Cu		
30. Marian	Cu		
31. Caguilingan	Cu		
32. Olympus Mineral & Exploration Co.	Cu		
33. Emmy & M Claim of Vulcan Ind'l & Mining Corp.	Cu		



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LOCALITY MAP OF MINERAL SHOWINGS



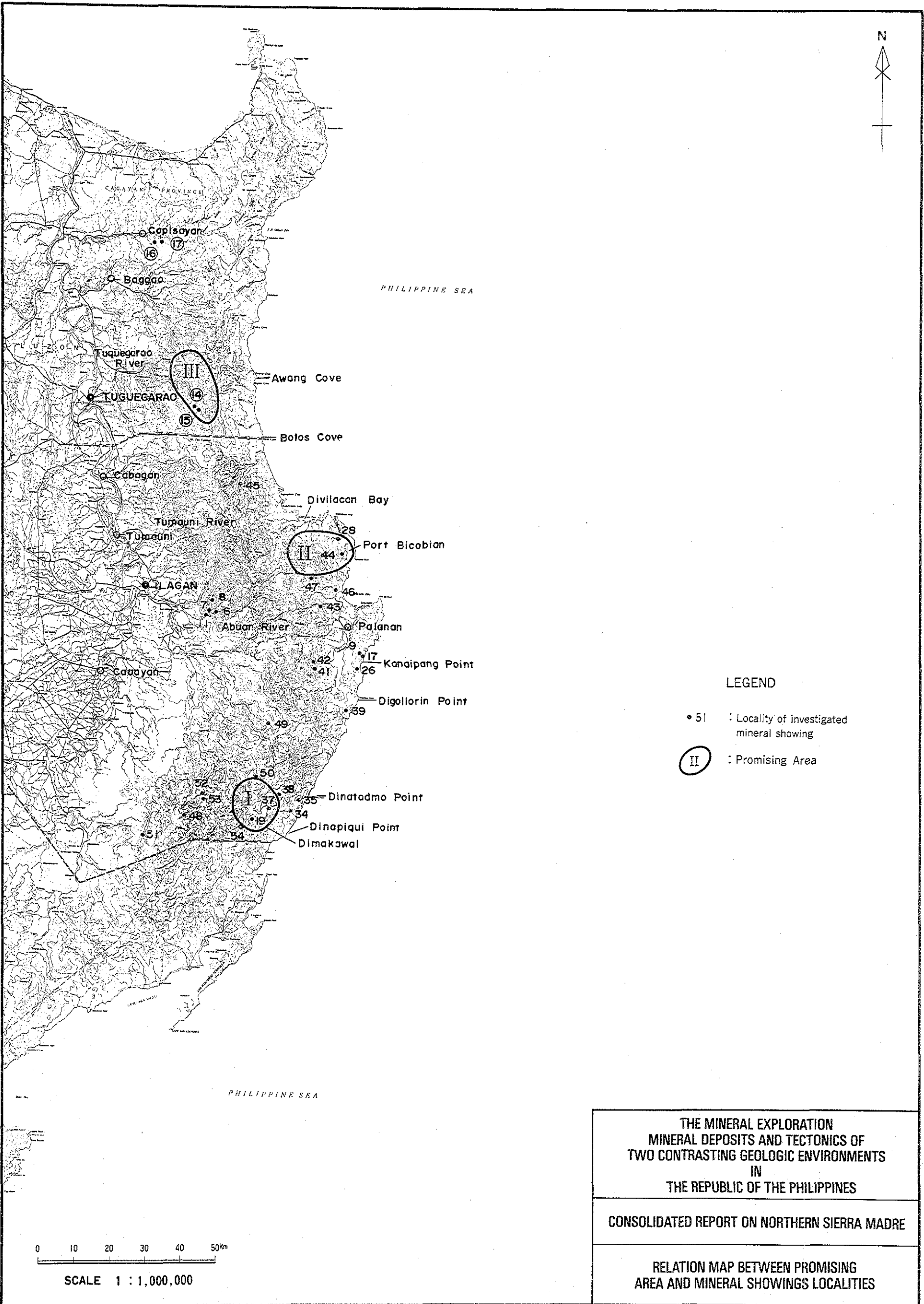
LEGEND

- 1. Detailed or Semi-Detailed Survey
 - : Geological Survey
(including geochemical, geophysical and/or three dimensional physical sampling in some cases)
- 2. Reconnaissance or Regional Survey
 - : Geological Survey
 - ▨ : Geological-Geochemical Survey
 - ▤ : Geological-Geophysical Survey

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**INDEX MAP OF EXISTING DATA REGARDING SURVEY
 WORKS OF THE AREA**



LEGEND

- 51 : Locality of investigated mineral showing
- Ⓜ : Promising Area

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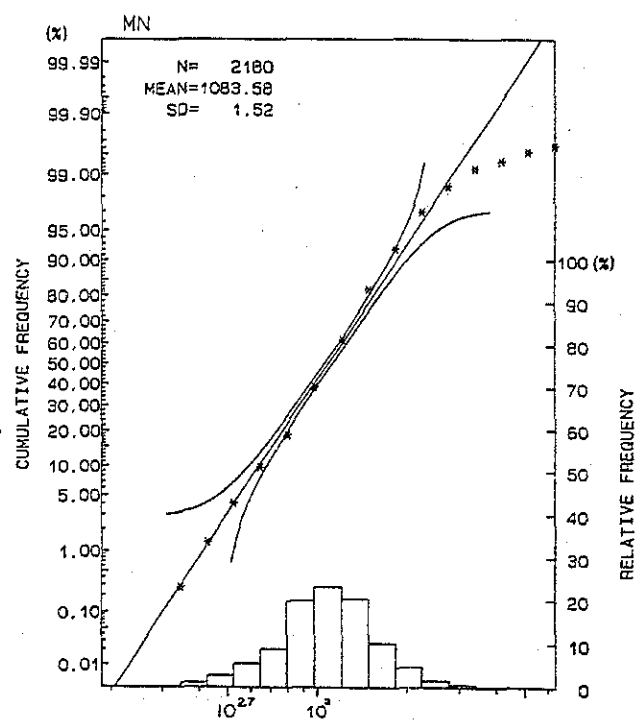
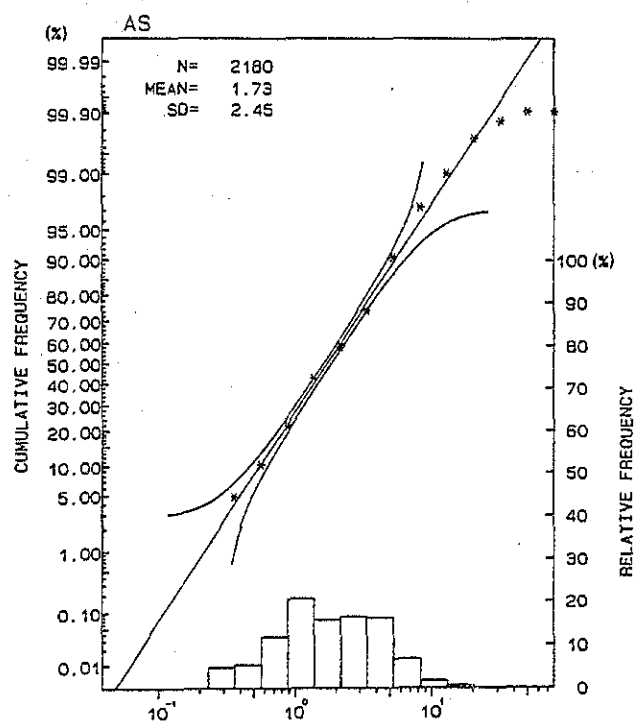
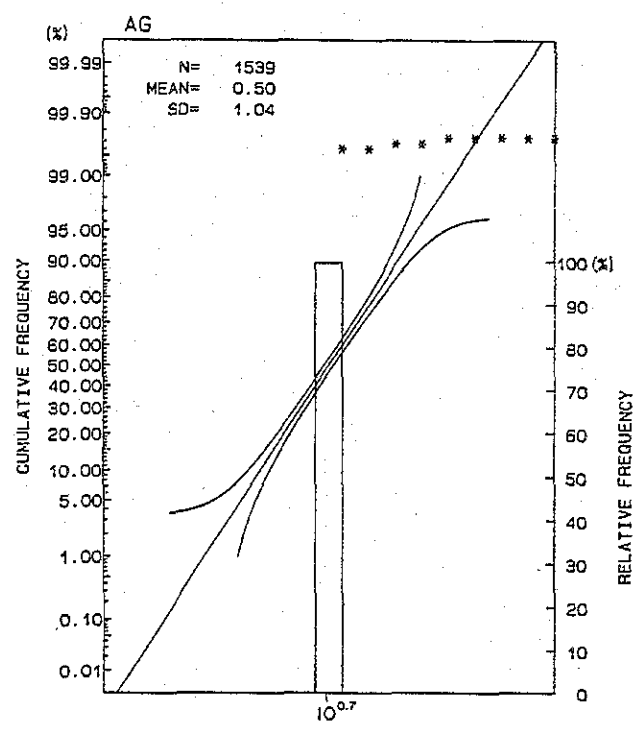
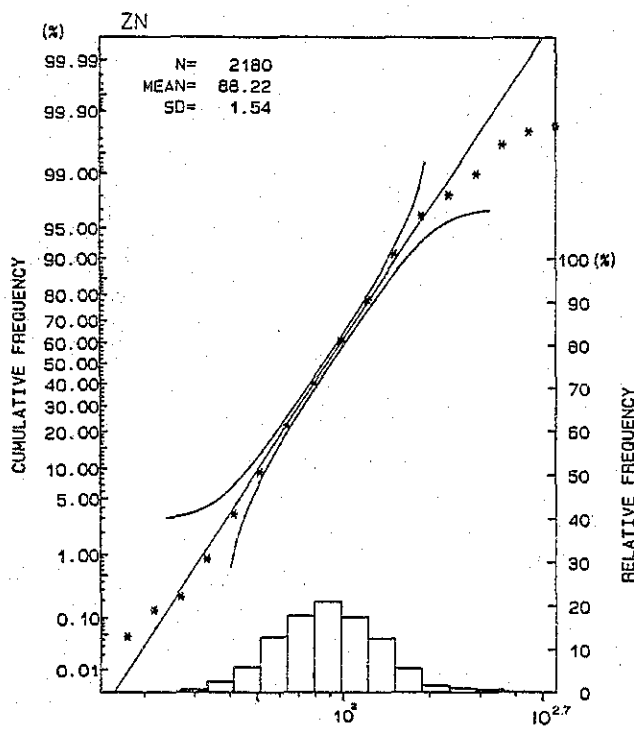
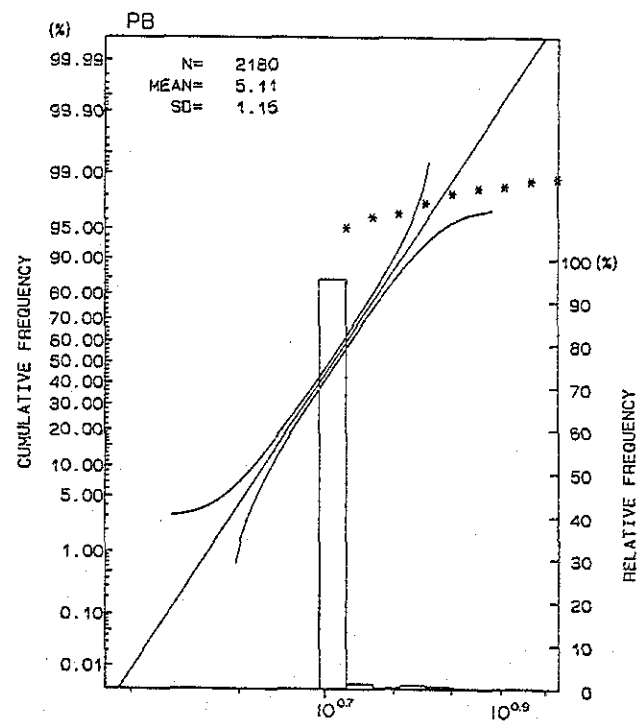
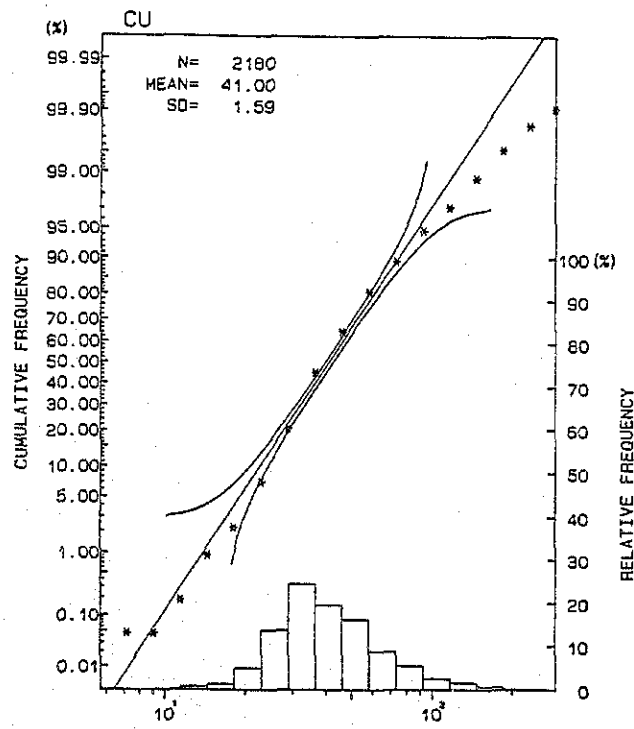
**RELATION MAP BETWEEN PROMISING
 AREA AND MINERAL SHOWINGS LOCALITIES**

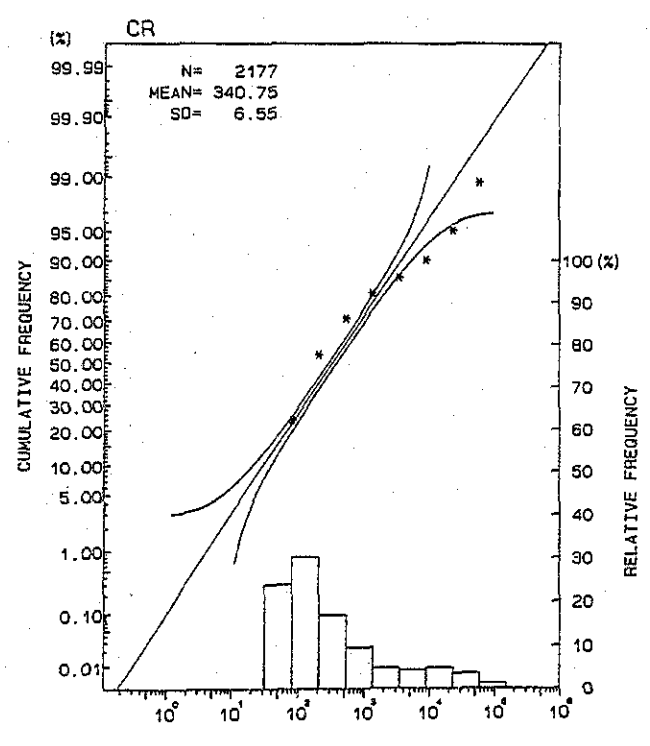
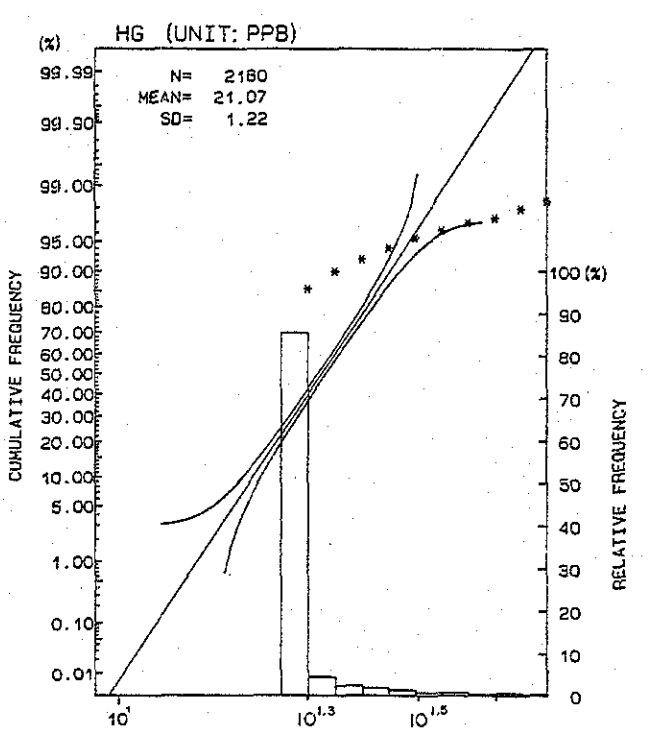
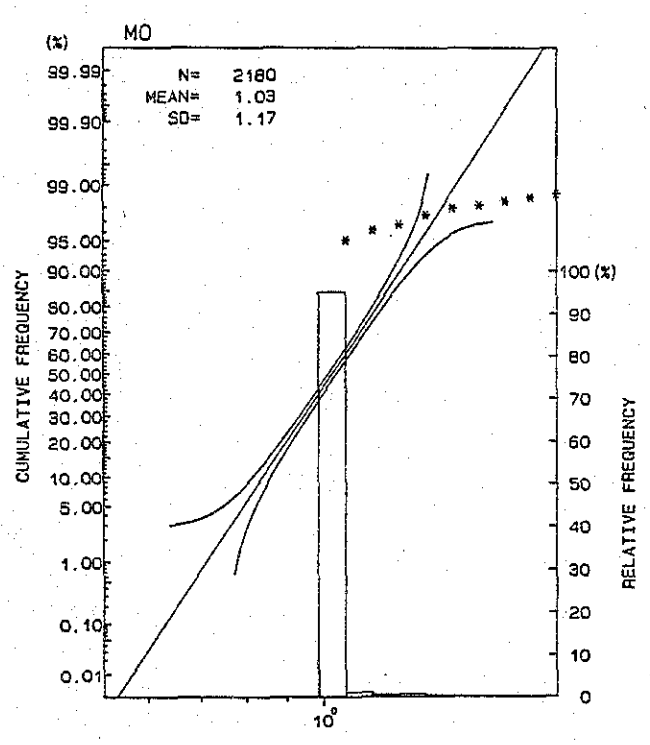
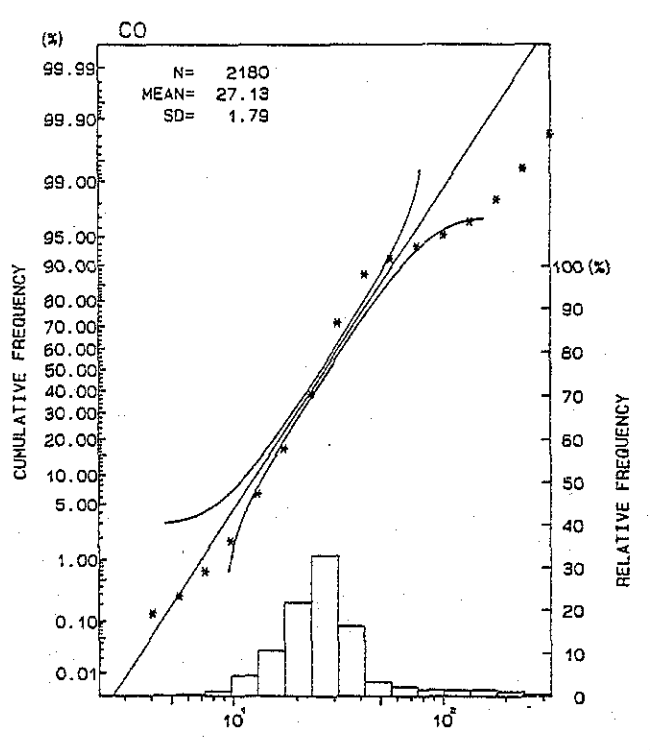
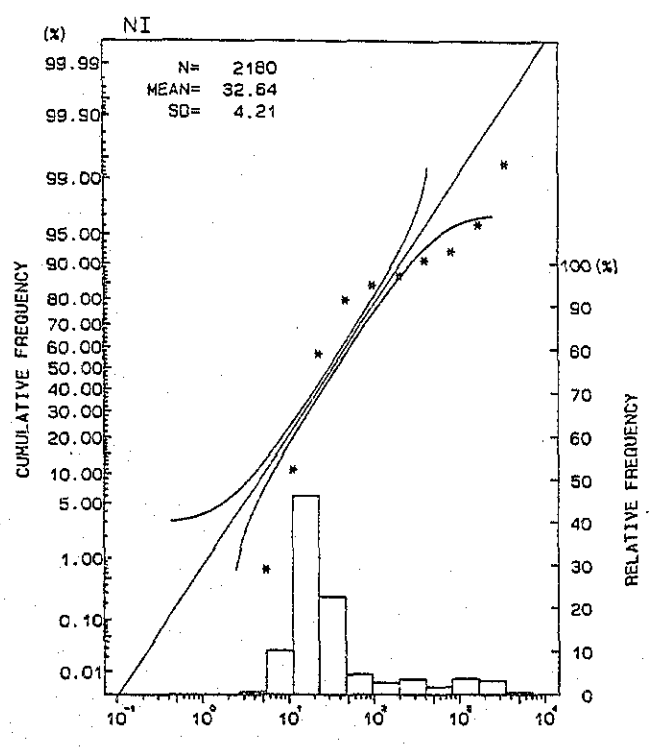
Appendix 1 Histograms and Cumulative Frequency Curves
of Cell Average Values

Appendix 2 Flow Charts of Chemical Analysis

Appendix 3 List of the Existing Data

Appendix 1 Histogram and Cumulative Frequency Curves of Cell Average Values



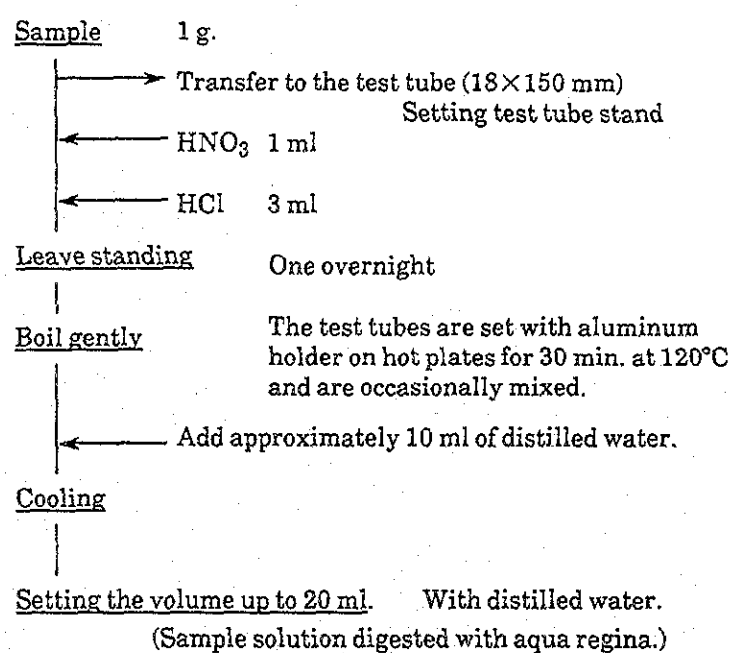


Appendix 2 Flow Charts of Chemical Analysis

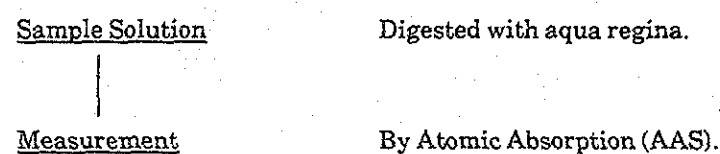
Appendix 2-1

Analytical flow chart for Cu, Pb, Zn, Co, Ni and Mn

(A) Digestion Procedure with aqua regia



(B) Measurement of contents of Cu, Pb, Zn, Co, Ni and Mn

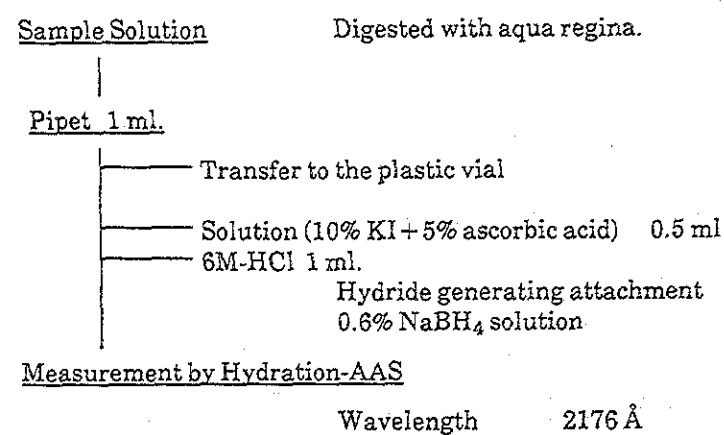


Element	Flame	Wave Length (Å)
Cu	Air-C ₂ H ₂	3247
Pb	id	2170
Zn	id	2137
Co	id	2407
Ni	id	2320
Mn	id	4033

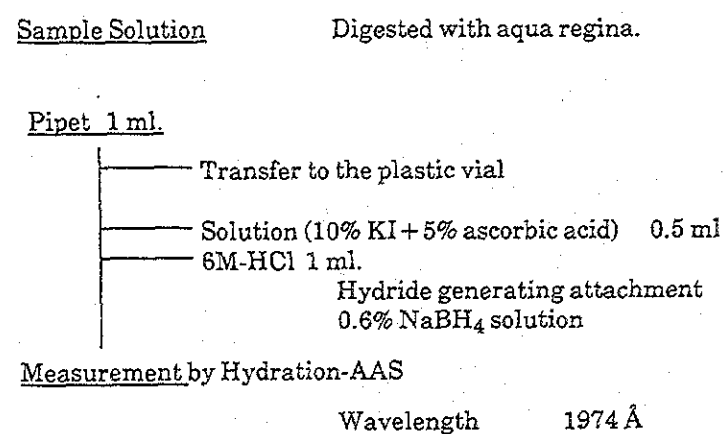
Appendix 2-2

Analytical flow chart of As, Sb and Hg

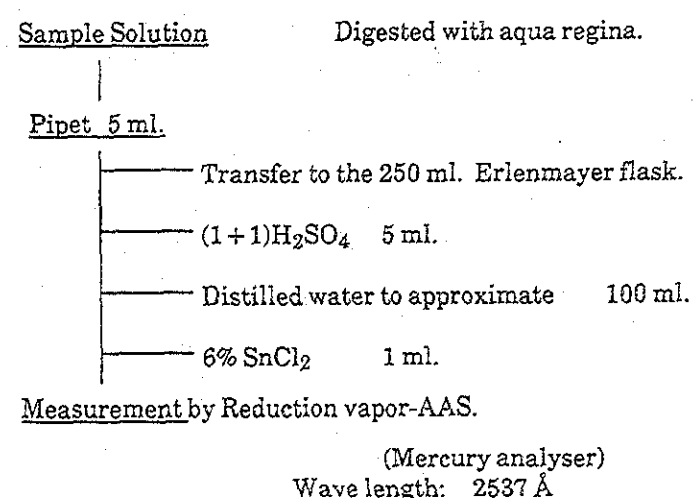
(A) Measurement of Sb content



(B) Measurement of As content.



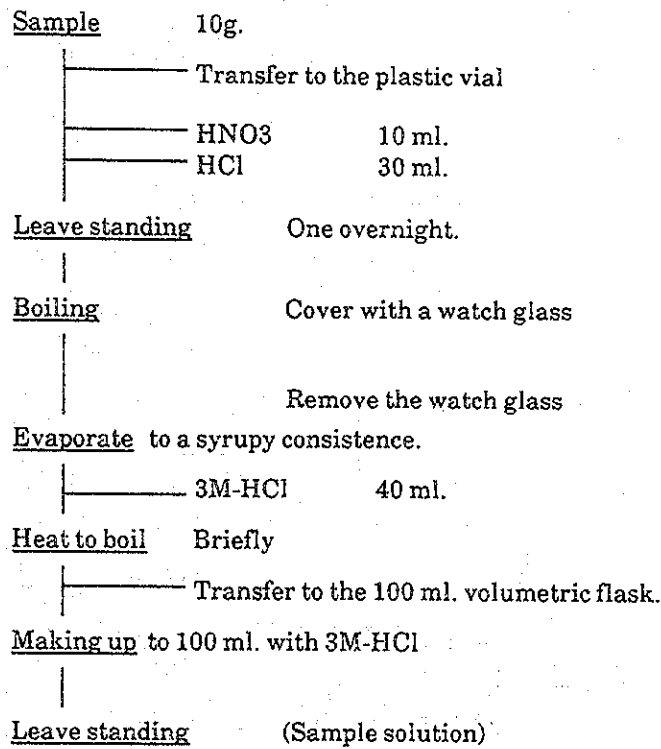
(C) Measurement of Hg content.



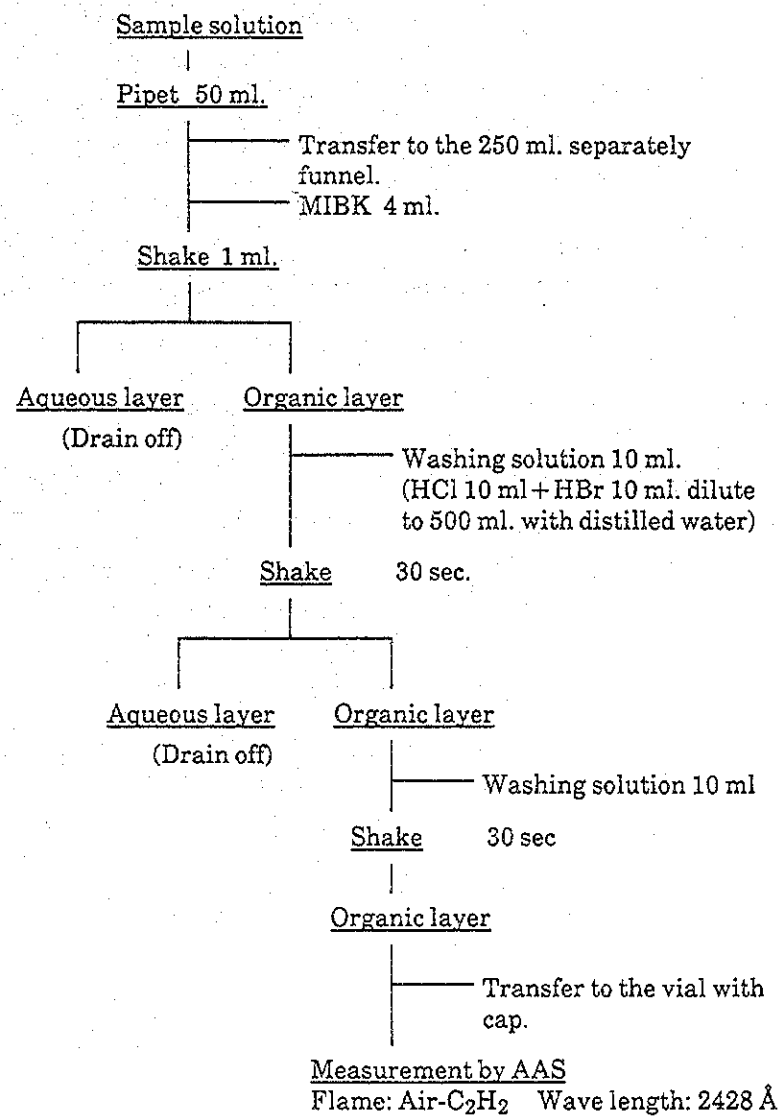
Appendix 2-3

Analytical flow chart of Au, Ag and Ga.

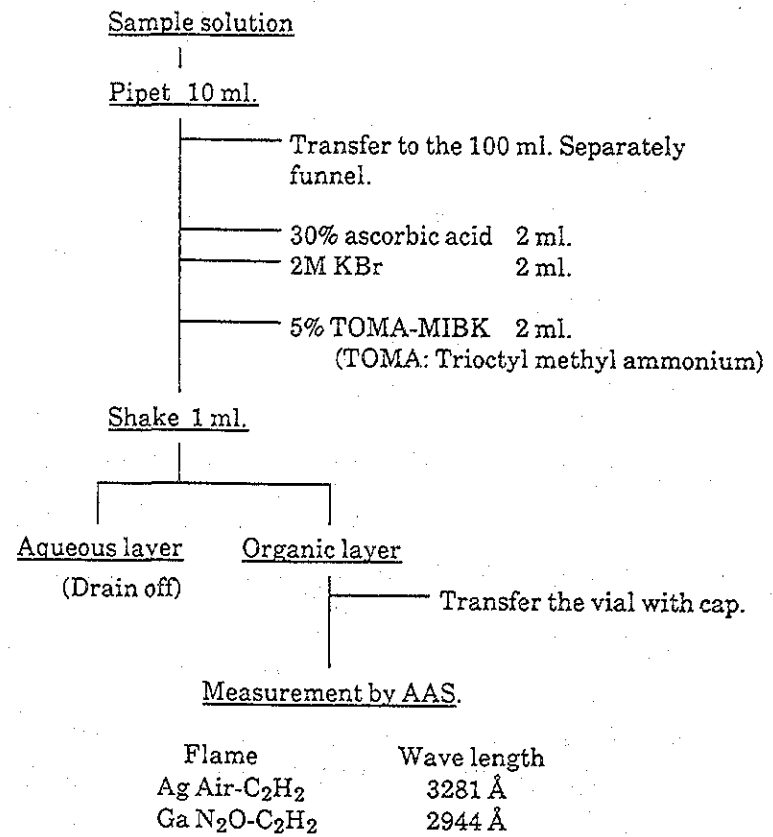
(A) Decomposition of sample.



(B) Measurement of Au content.



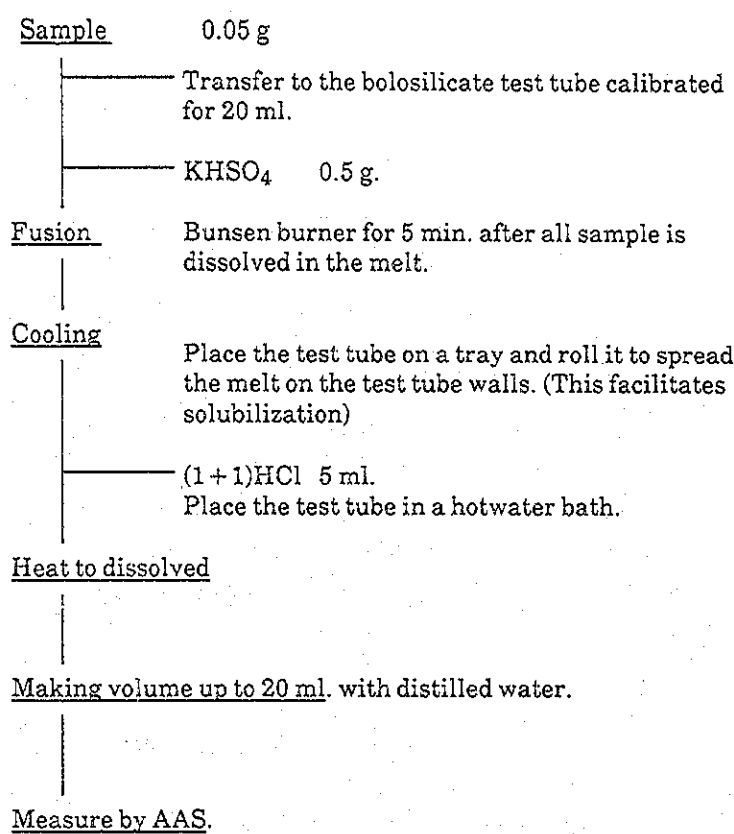
(C) Measurement of Ag and Ga content.



Appendix 2-4

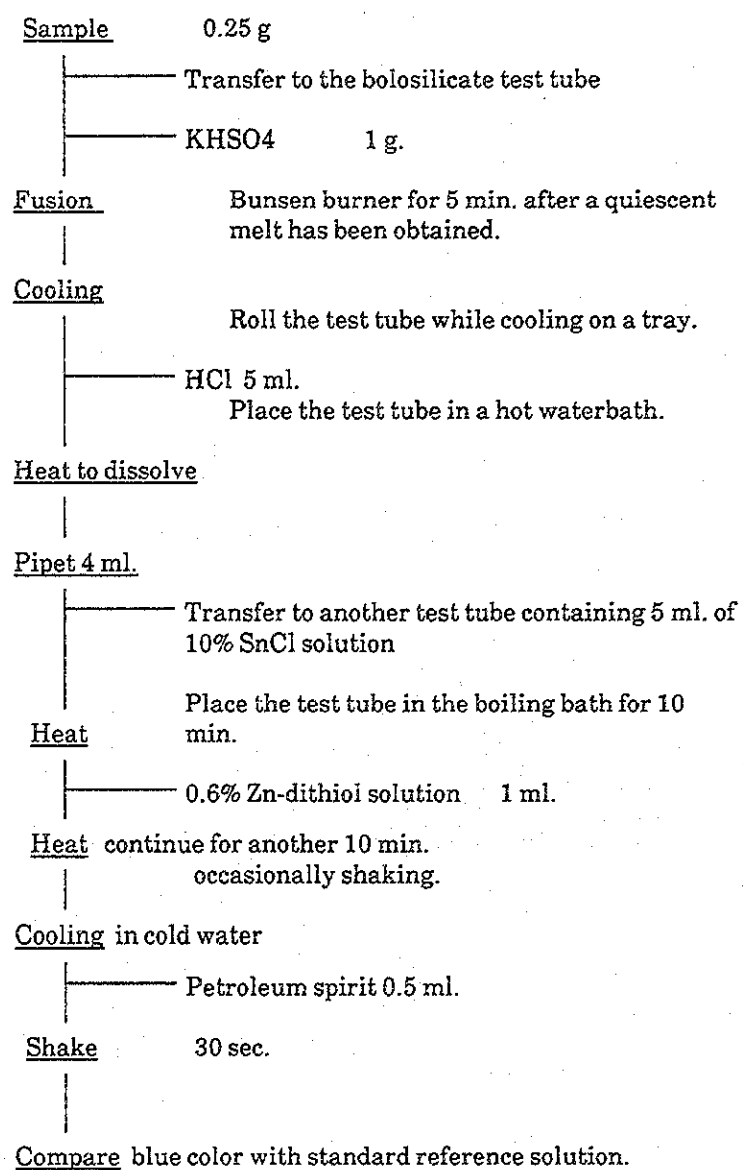
Analytical flow chart of Cr and W.

(A) Measurement of Cr content.



Flame: Air-C₂H₂ Wave length: 3579 Å
(Using a strongly oxidizing flame)

(B) Measurement of W content.



Appendix 3 List of the Existing Data

<u>REPORT NO.</u>	<u>AUTHOR/S</u>	<u>TITLE OF REPORTS</u>
CAGAYAN: 15		
*233	J. de la Cruz	Preliminary report on the white Clay Deposit and Regional Geology of Calayan Island, Cagayan
237	O. Crispin, E.M. Puzon	Report on the Preliminary geological Investigation Manganese deposit at Lal-lo, cagayan
247	B.C. Burgess	Perlite, Calayan Island, Cagayan
*274	P.M. Capistrano	Preliminary Report on the Geology and Ore Possibilities of the Camalaniugan Iron Prosepect in cagayan Province
*405	L.R. Antonio	Preliminary Report on the Geology of Claveria Iron Prospects Claveria, cagayan
558	E. Durkee, S. Pederson	Geology of Northern Luzon
*588	M. Liggayu	Geological Investigation of the Broaderth & Magdangal Black Sand Claims in Northern Cagayan
*530	A. Cruz	Geologic Investigation of Gypsum Prospect in Sitio Makatay, San Jose, Sanchez Mira, Cagayan
*844	J. de la Cruz	Preliminary Report on the Survey of Clay and Perlite Deposits of Calayan Island, Prov. of Cagayan
*1077 (1529)	C. Ramos	Report on the Mineral Verification of Magnetite Sand Claims of FE VA Mining Corpo. in Northern Cagayan Province
*1333 (1989)	C. Llave	Mineral and Lease Survey Verification of Teresita Mining Claims Sitios Cabatoan Ensenada, Paguitpit, Barrio Naguilian Camaguin Island, Calayan, Cagayan
*1450	M.V. Garcia	Report on the Mineral verification of the Magnetite Sand Deposits at Sanchez Mira, Cagayan
*1678 (1976)	E.A. de Luna	Groundwater in Cagayan Basin Northeastern Luzon
LIB-CA-1	N.L. Caagusan	Stratigraphy and evolution of the Cagayan Valley Basin, Luzon, Phil.
LIB-CA-2	E.T. Avila, Jr.	Mineral verification of the magnetite sand claims of Mayorga Mng. Co., Cagayan Province
ISABELA: 20		
*503	J. Santiago	Memo report on the tektite occurrence in Isabela
*656	R. Peña	Memo report on geological investigation of some claims applied for lease in Bicobian, Palana, Isaabela
*792 (1163)	P. Contreras	Geological investigation of four groups of copper claims in Ilagan, Isabela
*871 (1244)	Z. Zepeda	Memo report on the geological verification of the mining claims of the Cagayan Valley Cement Corp. in Tumauni, Isabela
*955 (1415)	R. Peña	Memo report on the geological investigation of copper and manganese prospects in Palanan, Isabela
*1042 (1485)	C. Samonte	Mineral verification of thirty-lode claims applied for lease in Cordon, Isabela
*1048 (1494)	D.H. Almogela	Geology and verification of eleven (11) lode claims of San Pablo Mining Corp. in barrio Didadongon, Palaya, Isabela
*1157 (1669)	P. Manlansing	Geological investigation of the Agar copper prospect in Kasala, San Mariano, Isabela
*1227 (1781)	D. Almogela	Geological investigation and mineral verification on the group of lode claims of Olympus mineral exploration company, Inc. situated in Cordon, Isabela
*1426	A. Cabantog	Geological Field verification of copper, manganese etc. deposits of black rock Mng Corporation in Bo. Dimakawal, San Mariano, Isabela
*1466	M.G. Pacis	Geological investigation and mineral verification of 79 placer claims applied for lease by New Frontier Mines Incorporated in the Municipalities of Dimapiqui, San Mariano and Palanan, Isabela
*1475	D.G. Custodio	Giological verification of two (2) lode claims applied for lease in San Luis, Cordon, Isabela
*1523	E.M. Manalang	Mineral verification of three lode claims applied for lease in Bo. Caguilingan, Cordon, Isabela
*1604 (1976)	O.M. Pineda	Evaluation of the copper-gold property of Vulcan Industrial and mineral exploration in Kakillingan, municipality of cordon, Province of Isabela
LIB-IS-1	D.G. Custodio	Progress report on the reconnaissance geological survey of part of Lapigne Quad, Isabela Prov.
LIB-IS-2 (same as 656)	R. Peña	A report on the geological investigation of some claims applied for lease in Bicobian, Ilagan, Isabela
PG-IS-1	R.A. de Guzman	Geology & remobilized aspects of the massive sulphide deposits of port Bicobian, Ilagan, Isabela, & other similar Phil. deposits J. of Gsp, V.22, N3, Sept. 1908
PG-IS-2	G.B. Baguiran	Notes on the geology & exploration of the marian copper deposit, Cordon, Isabela J of GSP V.29 N.1, Mar. 1975
IS-3	R.B. de Los santos	Report on the geological investigation of 23 "Emmy" & "M" claims of Vulcan Ind'l & Mining Corp., Cordon, Isabela
IS-4	E.A. Rillon, N.G. Santiago	Report on the geology of Jones, Santiago, Cabatuan, Roxes & Corpon Wuadangles

Consolidated Report on Palawan Area

SUMMARY

A total area of 10,520 km² in the Palawan area was covered by geochemical prospecting in 1986 and 1987 as a part of the "Mineral Exploration-Mineral Deposits and Tectonics of Two Contrasting Geologic Environments in the Republic of the Philippines" project. The results of the above were processed statistically with a regional perspective and also an integrated evaluation was carried out incorporating the results of the geological survey, the investigation of mineral showings and the study of existing data regarding the area.

The Palawan dred is located in the western part of the Philippine Archipelago and is the center of a unique stable or aseismic zone in the Philippine Islands.

The Palawan is composed of two lithologically different zones, they are the Northern Part and the Southern Part. The Northern Part is composed mainly of Paleozoic to Mesozoic sedimentary and metamorphic units associated with the Cretaceous and the Eocene sedimentary formation which occurs in relatively lesser extent. The Southern Part which is composed of Eocene sedimentary formation and of Cretaceous basalt at its lowermost horizon has been overthrust by an ophiolite suite. Neogene sedimentary formations unconformably overlie in part both the basal formations and the ophiolitic units. The Sabang Thrust marks the northernmost limit of ophiolite distribution and for the purpose of this report, this thrust has been designated as the bounding structure between the Northern Part and the Southern Part. The thrust runs through the eastern side of Ulugan Bay in the central main Palawan Island.

In the Northern Palawan, the geology of the northeastern part is composed mainly of chert units which has been interpreted to have deposited in the southern margin of the continental mainland China. The rifting and consequent drifting of the southeastern fragment of mainland China during the latter part of the Mesozoic have led into its collision with the proto-Philippine arc sometime during the Oligocene to Miocene. The major geologic unit of the southwestern part of the Northern Palawan is phyllite and mica schist which are believed to have been derived from Paleozoic or older turbidites. Metamorphosed fractions of Cretaceous and Paleogene turbidites could be in part composed these phyllite and mica schist formations.

In Southern Palawan, the geology is composed of Eocene Oligocene sedimentary formations and of Cretaceous basalt over which the Eocene ophiolite suite was emplaced through thrusting. Neogene sedimentary rocks flank and cover in part the ophiolite suite and its basal lithologies. The Eocene ophiolite suite is believed to have formed in the proto-Sulu Sea. Its emplacement upon turbiditic sediments and metasediments could be attributed to its relative movement towards the northwest.

The mineralizations in the Northern Palawan are bedded manganese, antimony associated with the quartz veins and disseminated chromite associated with the ultramafic rocks. In the Southern Palawan, the major metal concentrations are the orthomagmatic chromite mineralization in the ultramafic complex which associates the lateritic nickel concentration nickel concentration in laterite

and the Cyprus type massive sulfide copper mineralization within the Cretaceous basalt. Lead and zinc mineralizations are also known in the area.

Regional analyses and interpretation of the geochemical anomalies were carried out on the approximately 8,400 stream sediments samples (grain size is less than 0.175 mm) collected for chemical analysis (JICA-MMAJ, 1987, 1988).

Fourteen elements were determined (Cu, Pb, Zn, Ag, As, Mn, Ni, Co, Mo, Hg, Cr, Sb, Sn and W) for the samples from the Northern Palawan and ten elements were determined (Cu, Pb, Zn, Ag, As, Mn, Ni, Co, Hg and Cr) for the Southern Palawan samples. The whole area was divided into 2 km X 2 km cells and the geometric mean values of each cell (cell average) were calculated. Four types of statistical analyses were carried out and they are as follows:

- (1) Univariate analysis of the cell average values
- (2) Univariate analysis of the moving average values in which the value of a cell is based on the average values of nine surrounding cells.
- (3) Univariate analysis of high-pass filter values which is the positive difference between each cell average and moving average values.
- (4) Multivariate analysis (factor analysis) for the cell average values

These results are shown in 1: 1,000,000 scale maps (Attached Plates P1-2-1-1 to P1-2-4-2).

As a result of integrated and comprehensive evaluation of the igneous rock distribution, geological structure, mineralization and alteration, together with geochemical characteristics of the area, the following six localities were delineated as promising and further detailed prospecting of the area have been proposed (Attached Plates P1-10-1 and P1-10-2).

- (I) Overlapping anomalous zones of Ni and Cr at the Pulute Range in the central part of the Southern Palawan:

Cretaceous formations and overthrust ultramafic rocks are distributed in this area. Assumed type of major mineralization and the associated commodities are nickel-laterite Ni and Cr.

- (II) The vicinity of Barong-Barong mineral showings in the central southern part of the Southern Palawan:

The Cretaceous Espina Basalt is distributed in this zone. Assumed major mineralization and commodities are Cyprus type massive sulfide copper mineralization, Cu and Zn.

- (III) The eastern part of Berong at the northwestern coast in the central part of the Southern Palawan:

The ultramafic rocks are distributed in this zone. Assumed type of major mineralization and the associated commodities are residual and orthomagmatic Ni and Cr.

- (IV) The North side of Puerto Princesa in the northern part of the Southern Palawan:

Ultramafic rocks and Cretaceous formations which are exposed as inliers under the ultramafics are present in this zone. Assumed major mineralization and commodities are hydrothermal vein type, Hg, Cu and Mn.

(V) The northwestern part of Tinitian at the southeastern coast of the Northern Palawan:

The Caramay Schist is distributed in this zone. Assumed major mineralization and commodities are hydrothermal vein type and Sb.

(VI) This area extends from El Nido to Kapoas Peninsula at western coast of the Northern Palawan:

Several stocks of diorite are observed with a NNE-SSW distribution in the Mesozoic sedimentary formations. Assumed major mineralization and commodities are hydrothermal vein type which associate with diorite stocks, Cu, Zn and Sn.

