

# APPENDICES



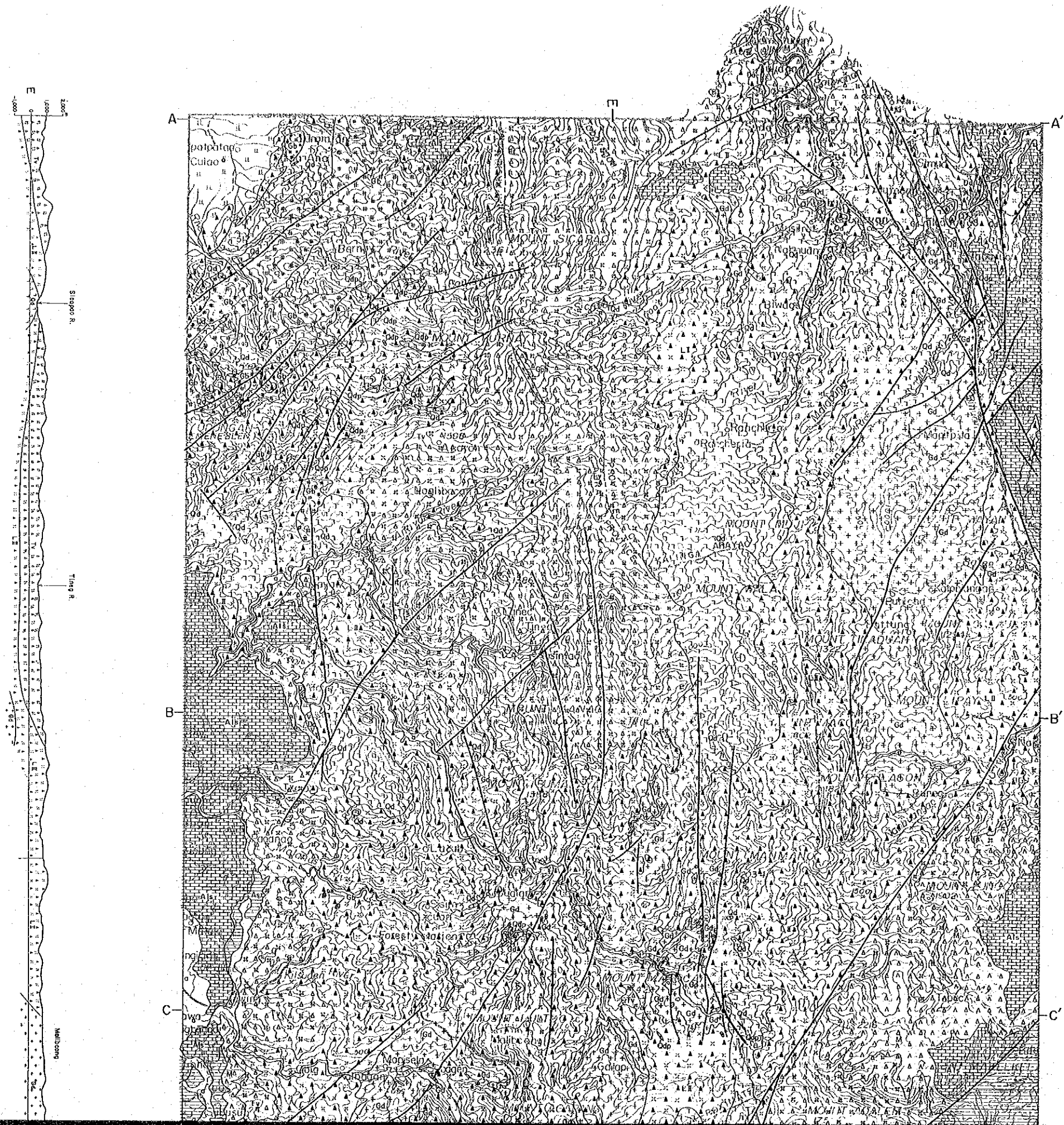
(2) Smaller Foraminifera

Species of Foraminifera	Phase		Phase I							Phase II
	Name of Formation	Tineg F.	Alava F.							Alava F.
	Sample No.	b-129	b-527	f-302	f-561a	f-592	g-523	g-524	b-2165	
Location	Maitep Cr.	Malanas R.	Mabaca R.	Bayy R.	Manikbei R.	San Juan	San Juan	San Juan	Malanas R.	
Co-ordinate	E. Longi. 120° 54' 25" N. Lat. 17° 02' 37"	120° 47' 16" 17° 40' 42"	121° 14' 57" 17° 34' 45"	120° 46' 45" 17° 34' 40"	120° 45' 23" 17° 27' 08"	120° 44' 55" 17° 42' 43"	120° 44' 20" 17° 42' 33"	120° 47' 12" 17° 40' 18"		
<i>Anomalina glabrata</i> Cushman				15						
<i>Anomalina</i> sp.									6	
<i>Astrorion italicum</i> Cushman and Edwards									6	
A. sp.									9	
<i>Cibicides akenerianus</i> (d'Orbigny)	10	2		15	7				6	
C. lobatulus (Walker and Jacob)									6	
C. mallowi Matsuura									9	
C. sp.									15	
<i>Criboepithidium</i> sp.		2							15	
<i>Discorbis</i> sp.									18	
<i>Epididium craticulatum</i> (Fichtel and Moll)		2							24	
<i>Epididium</i> <i>hughesi</i> Cushman and Grant		32		12		6			36	
E. rugosum (d'Orbigny)		4		3		2				
E. sp.						4				
<i>Gyroldina orbicularis</i> d'Orbigny										
G. sp.										
<i>Lagenodosaria</i> sp.		1								
<i>Lenticulina</i> cf. <i>nikobarensis</i> (Schwager)										
L. cf. <i>pseudoreticulatus</i> Asano										
L. sp.										
<i>Lagena</i> sp.										
<i>Nonion grateloupi</i> (d'Orbigny)										
N. labradoricum (Dawson)		15							36	
N. incisum (Cushman)		3							18	
N. micrum Cole		4							6	
N. pacificum (Cushman)										
N. sp.		25							42	
<i>Nomionella</i> sp.										
<i>Planulina</i> sp.										
<i>Pseudonion</i> sp.	2	2								
<i>Quinqueloculina</i> sp.		2								
<i>Saracenaria</i> <i>Schencki</i> Cushman and Holson		4								
<i>Uvigerina nitidula</i> Schwager										
U. sp.										
<i>Virgulina</i> sp.										
Cal. Foram. gen. and sp. indet.	30	15	7	10		4			30	
<i>Globigerinoides triloba</i> (Reuss)			30		20					
G. immaturus LeRoy			27		16					
G. ruber subquadratus Bronniman			35							
G. obliquus Bolli			5							
<i>Globigerina falconensis</i> Blow			25		14					
G. bulloides d'Orbigny			40		8			10		
G. praebulloides Blow			25		18					
G. foliata Bolli			15	1						
G. inflata d'Orbigny			14		7					
G. sp.			10		15		2		3	
<i>Globorotalia tumida</i> (Brady)					13					
G. cf. <i>tumida</i> (Brady)			1		3					
G. sp.			4		7					
<i>Orbulina universa</i> d'Orbigny			11							
O. suturalis Bronniman			2							
O. bilobata (d'Orbigny)			3		2					
O. sp.			5		5					
Pla. Foram. gen. and sp. indet.										

Table A-2 Results of Chemical Analysis and K-Ar Dating

No.	Sample No.	Rock Name	Location	Co-ordinate		Chemical Composition (%)														Age (m.y.) by K-Ar dating	
				E Longi.	N Lat.	SiO <sub>2</sub>	TiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	FeO	MnO	MgO	CaO	Na <sub>2</sub> O	K <sub>2</sub> O	P <sub>2</sub> O <sub>5</sub>	CO <sub>2</sub>	H <sub>2</sub> O(+)	H <sub>2</sub> O(-)		Total
		<b>Phase I</b>																			
1	a-502	Granophyre	Middle stream of Ikmin R., 1Km E of Boriney	120° 49' 35"	17° 22' 49"	76.36	0.13	12.07	0.48	0.93	0.02	0.09	0.70	3.22	4.82	0.05	-	0.25	0.10	99.22	12.6
2	a-512	Granodiorite	2.5Km West of Boriney	120° 47' 38"	17° 22' 52"	59.01	0.49	17.55	2.83	3.56	0.10	2.31	5.64	3.77	2.94	0.24	-	0.93	0.08	99.45	18.4
3	b-522	Granodiorite	National Road No.6, 3.5Km SW of Licuan	120° 53' 33"	17° 35' 19"	57.39	0.73	17.10	2.83	4.92	0.13	2.73	6.52	3.09	3.04	0.35	0.18	0.80	0.08	99.87	18.3
4	e-308	Quartz monzonite	Upper stream of Nabuangan River	121° 09' 39"	17° 43' 45"	62.73	0.53	17.03	0.32	4.24	0.10	1.39	3.62	3.96	4.65	0.23	-	0.39	0.22	99.41	16.2
5	f-515	Quartz diorite	Middle stream of Utep River	120° 49' 09"	17° 15' 37"	61.22	0.51	16.74	2.08	3.95	0.14	2.77	6.12	3.33	1.90	0.16	-	0.50	0.12	99.54	9.8
6	g-106	Diorite porphyry	Lower stream of Layacan River	120° 49' 18"	17° 08' 45"	56.67	0.48	18.17	4.19	2.84	0.14	3.31	6.81	4.07	0.88	0.26	0.40	1.41	0.22	99.85	* -
7	g-307	Granodiorite	Lower stream of Baren R., 5Km W of Tawini	121° 12' 02"	17° 50' 06"	65.43	0.51	15.74	1.52	2.87	0.10	1.39	3.77	3.70	3.77	0.21	-	0.08	0.14	99.23	13.7
8	g-512	Gabbro	Middle stream of Madongan River	120° 51' 39"	18° 00' 32"	48.01	0.81	20.21	3.94	7.19	0.17	4.46	12.07	2.43	0.24	0.07	-	0.10	0.16	99.86	* -
9	g-533	Quartz diorite	Lower stream of Tineg R., 3Km W of Agsimao	120° 55' 08"	17° 47' 43"	56.08	0.71	17.22	3.59	5.07	0.17	3.61	7.19	3.68	1.53	0.23	-	0.52	0.12	99.72	18.5
10	m-317	Quartz diorite	Middle stream of Dagara R., 1Km NW of Dagara	121° 05' 30"	17° 55' 36"	62.95	0.51	15.60	2.28	4.20	0.14	2.92	5.55	3.10	1.80	0.13	-	0.38	0.06	99.62	19.9
		<b>Phase II</b>																			
11	a-2306	Gabbro	Middle stream of Burnay River	120° 46' 53"	17° 58' 52"	41.62	1.21	18.78	6.38	8.70	0.18	5.41	12.02	1.62	0.16	0.02	-	3.54	0.24	99.88	* -
12	b-2338	Quartz diorite	Middle stream of Burnay River	120° 48' 56"	17° 59' 04"	67.23	0.39	15.65	1.16	3.81	0.11	1.48	3.59	3.99	0.92	0.08	-	1.08	0.32	99.81	23.0 ± 1.1
13	c-2161	Quartz diorite porphyry	Upper stream of Manikbel R., Near Ud-Udiao	120° 52' 05"	17° 28' 35"	58.38	0.45	17.50	3.08	2.59	0.13	2.56	7.29	2.51	0.48	0.15	-	4.42	0.24	99.78	15.4 ± 1.5
14	c-2162	Granodiorite	2Km West of Ud-Udiao	120° 50' 53"	17° 28' 24"	52.95	0.70	18.67	3.34	6.11	0.18	3.79	8.12	2.92	1.65	0.27	-	0.81	0.04	99.55	20.0 ± 1.0
15	e-2203	Quartz diorite	Upper stream of Binongan R., 8Km E of Malibcong	121° 05' 00"	17° 35' 19"	69.66	0.42	14.65	1.28	3.02	0.07	1.00	2.47	4.70	0.72	0.13	-	1.10	0.04	99.26	26.3 ± 1.8
16	e-2207	Dacite dyke	6Km Northwest of Malibcong	121° 02' 27"	17° 36' 10"	52.20	0.53	20.65	3.79	3.81	0.16	2.96	9.42	2.41	0.41	0.16	-	2.91	0.36	99.77	18.3 ± 2.0
17	e-2704	Granodiorite	3.5Km South of Kabugao	121° 11' 13"	17° 59' 36"	59.54	0.68	17.72	2.35	4.35	0.12	2.76	5.77	3.12	2.12	0.19	-	0.88	0.18	99.78	19.4 ± 1.0
18	g-2250	Quartz diorite porphyry	Middle stream of Bucloc R., 3Km SE of Bucloc	120° 52' 26"	17° 25' 21"	63.50	0.39	17.21	1.95	3.56	0.10	2.07	5.66	3.35	1.23	0.12	-	0.24	0.20	99.58	12.6 ± 0.6
19	h-2121	Quartz diorite	Upper stream of Bucloc R., 0.3Km NE of Ableg	120° 56' 00"	17° 27' 56"	63.03	0.42	17.19	2.20	3.23	0.13	2.31	6.05	3.22	0.73	0.13	-	0.86	0.16	99.66	12.0 ± 0.8
20	r-2120	Quartz diorite	Middle stream of Bucloc R., 1.5Km E of Bucloc	120° 52' 14"	17° 26' 30"	52.92	0.87	20.67	2.07	5.39	0.13	4.27	9.17	2.56	0.65	0.17	-	0.88	0.12	99.87	16.1 ± 1.1
		<b>Phase III</b>																			
21	b-3143	Quartz diorite	1.1Km North of Ud-Udiao	120° 29' 50"	17° 29' 15"	57.77	0.71	17.55	2.64	4.81	0.18	3.35	6.53	2.54	2.33	0.25	-	0.95	0.08	99.69	15.9 ± 0.8
22	b-3144	Dacite dyke	0.8Km North of Ud-Udiao	120° 29' 50"	17° 29' 09"	62.52	0.37	16.24	1.64	4.28	0.16	2.13	5.56	2.15	1.30	0.12	-	2.65	0.36	99.48	10.5 ± 1.1
23	b-3350	Dacite dyke	Lower stream of Balasian R., 1.2Km E of Babasig	120° 45' 57"	17° 07' 01"	60.08	0.50	17.64	2.76	3.81	0.17	2.75	7.02	3.35	0.58	0.21	-	0.71	0.36	99.94	9.8 ± 2.0

\* K-content was not sufficient to date



GEO  
NORT  
Geo  
Geo

18°05'  
17°35'  
17°05'

Laoag  
Vigan  
Bangue

120°45'

SCA

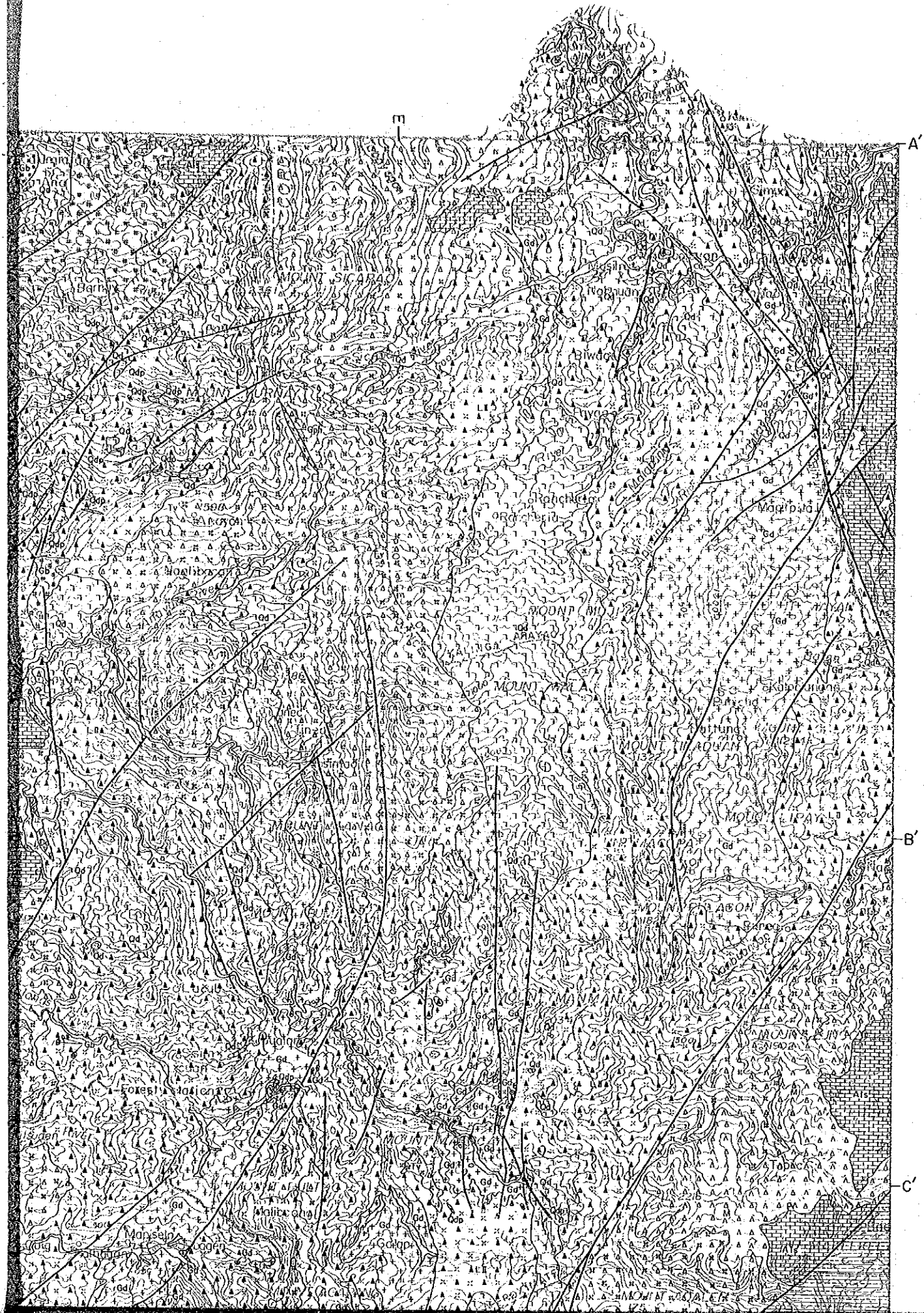
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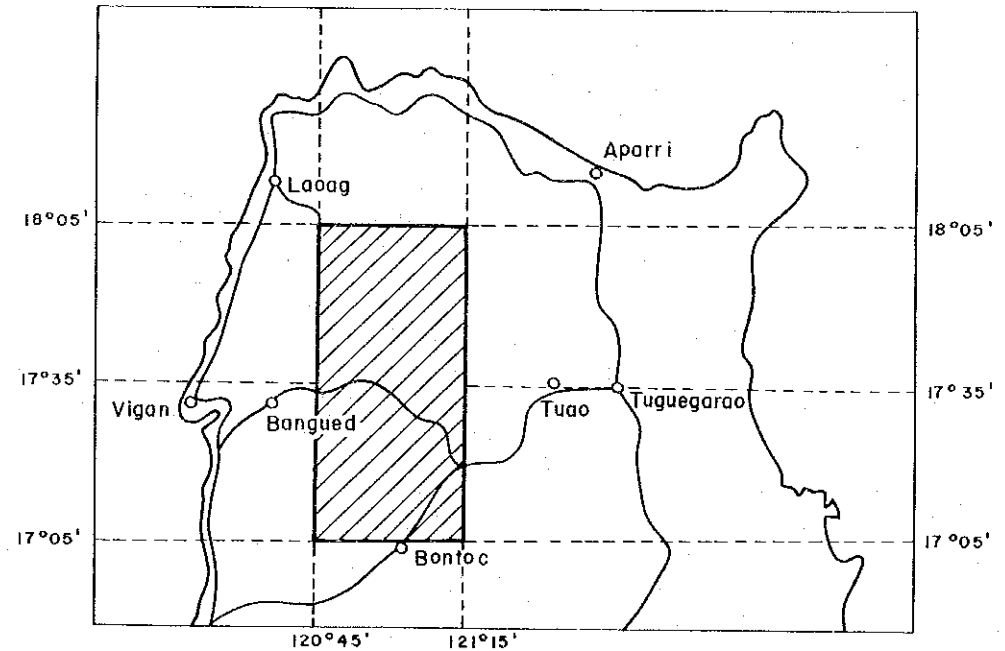
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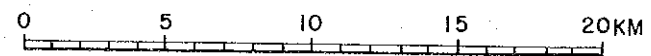
Geological Map  
and  
Geological Profile



LOCATION INDEX



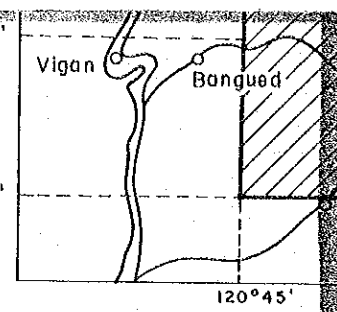
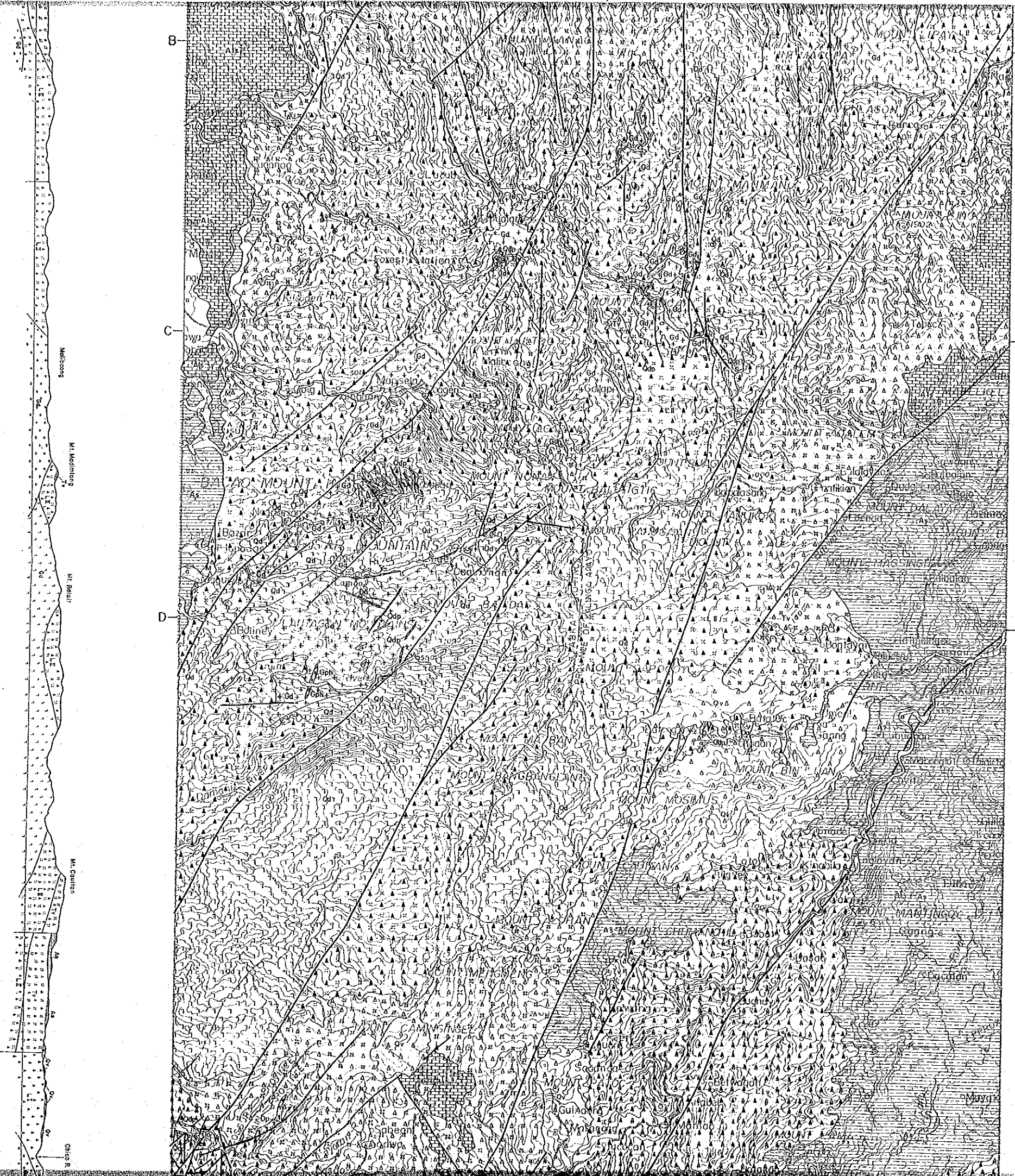
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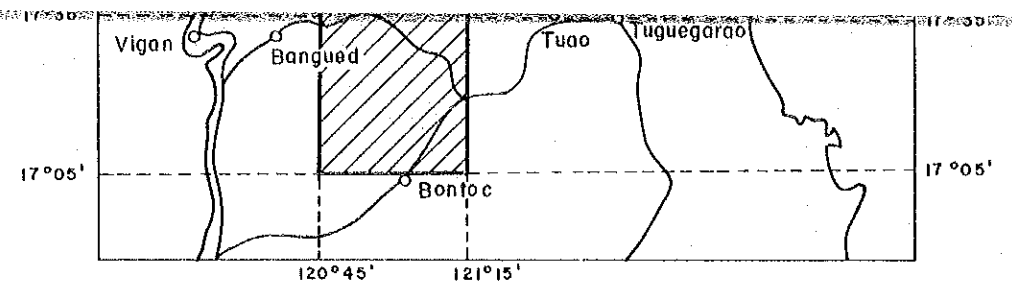
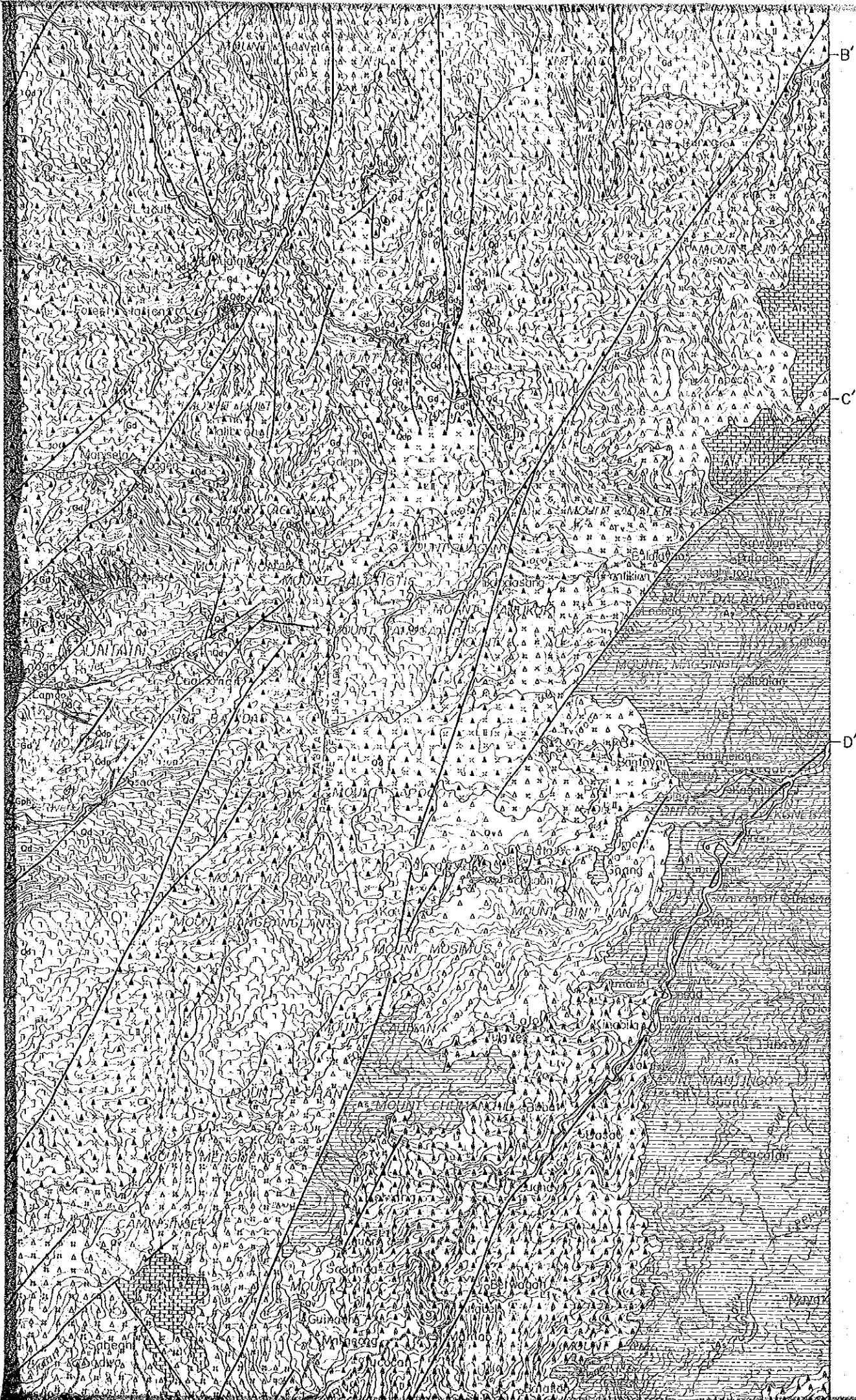
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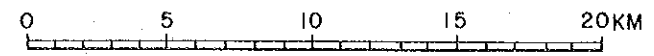
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Quaternary	Alluvium	Q
	Quaternary volcanics	Qv
Tertiary	Alava Formation	As
	Nagage	Ats
	Mobaca Formation	M
	Ting Formation	Tv
Palaeozoic	Ting Formation	Tts
	Formation	LE
	Luzon Group	LIV
Dikes	Formation	Lts
Plutonic rocks		Da
		Gph
		Qdp
		Op
		Gd
		Od
		Gb



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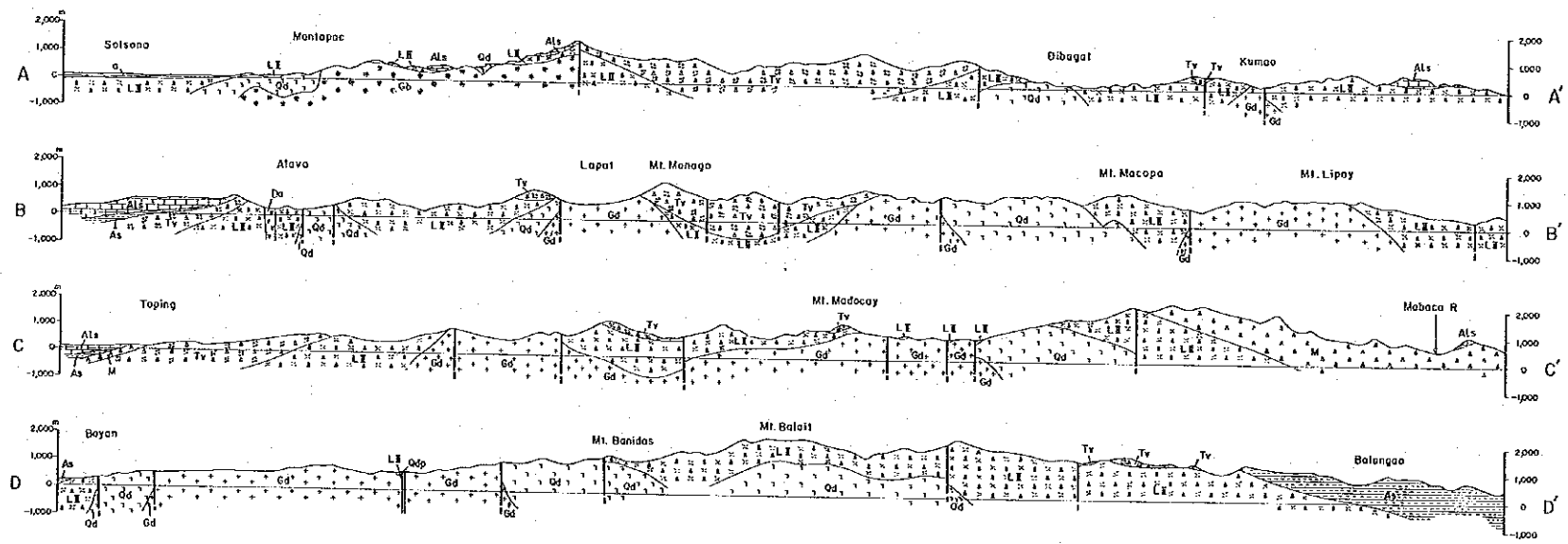
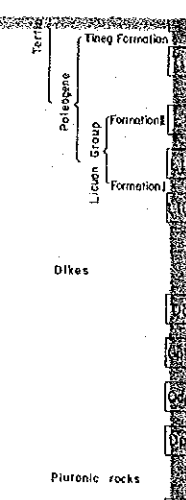
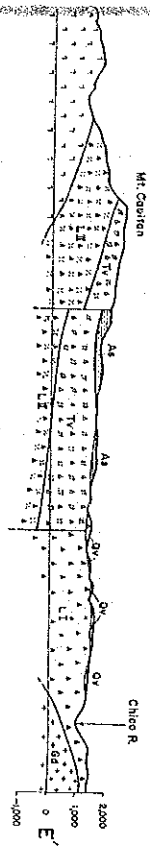
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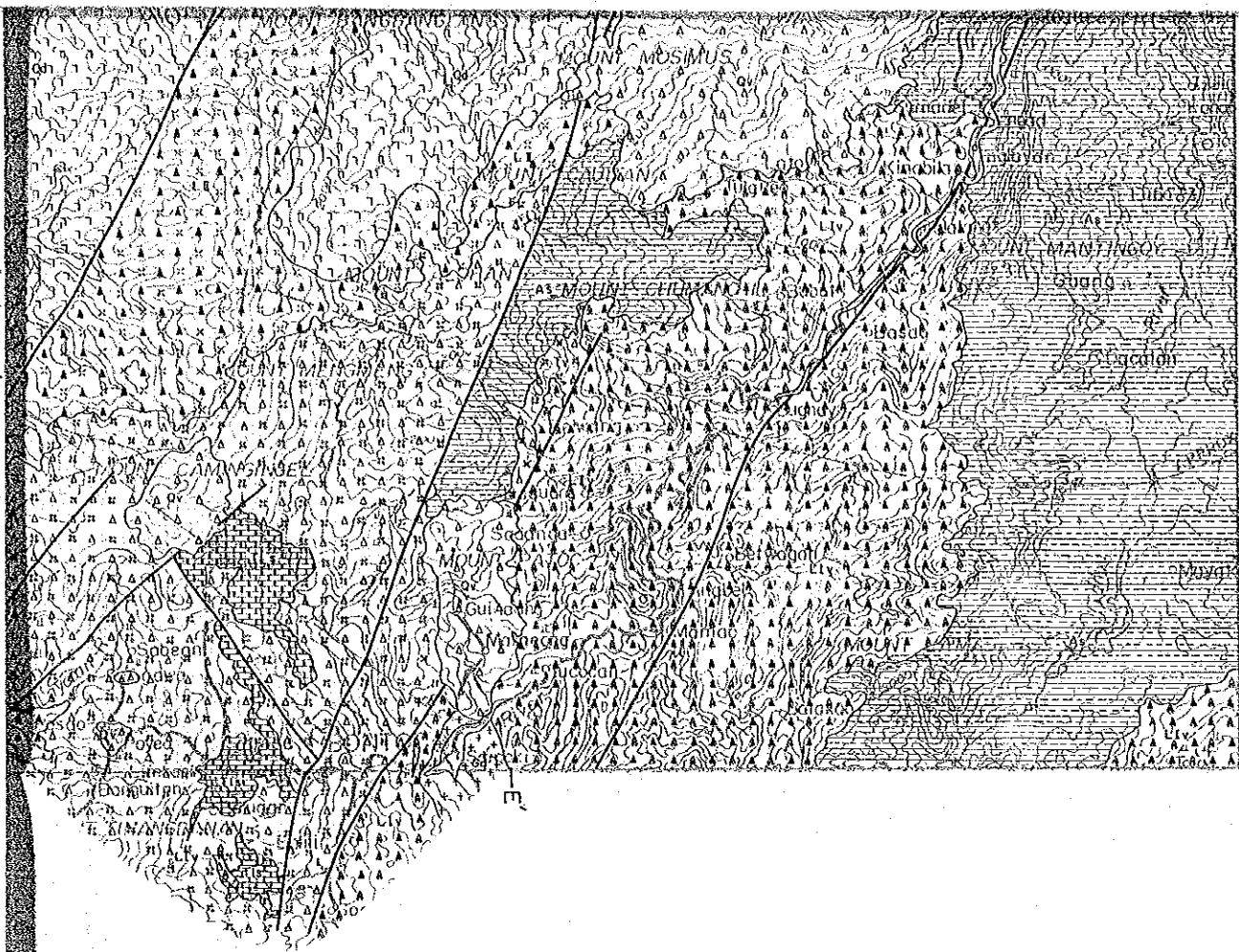
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LEGEND

Quaternary	Alluvium	a	gravel & sand
	Quaternary volcanics	Qv	dacitic to andesitic pyroclastics & lava
Neogene	Alava Formation	As	sandstone & mudstone with conglomerate
		Als	limestone
	Mabaca Formation	M	andesitic pyroclastics with andesite lava, volcanic congo & tuffaceous sand
		Tv	dacitic pyroclastics & dacite lava
Tertiary	Tineg Formation	Tls	limestone
		Lli	andesite lava & its pyroclastics
Paleogene		Llv	basalt lava and pyroclastics
	Luzon Formation	Lls	thin bedded limestone
Dikes		Da	dacite
		Gph	granophyre
		Qdp	quartz diorite porphyry
		Dp	diorite porphyry
Plutonic rocks		Gd	granodiorite
		Qd	quartz diorite
		Gb	gabbro



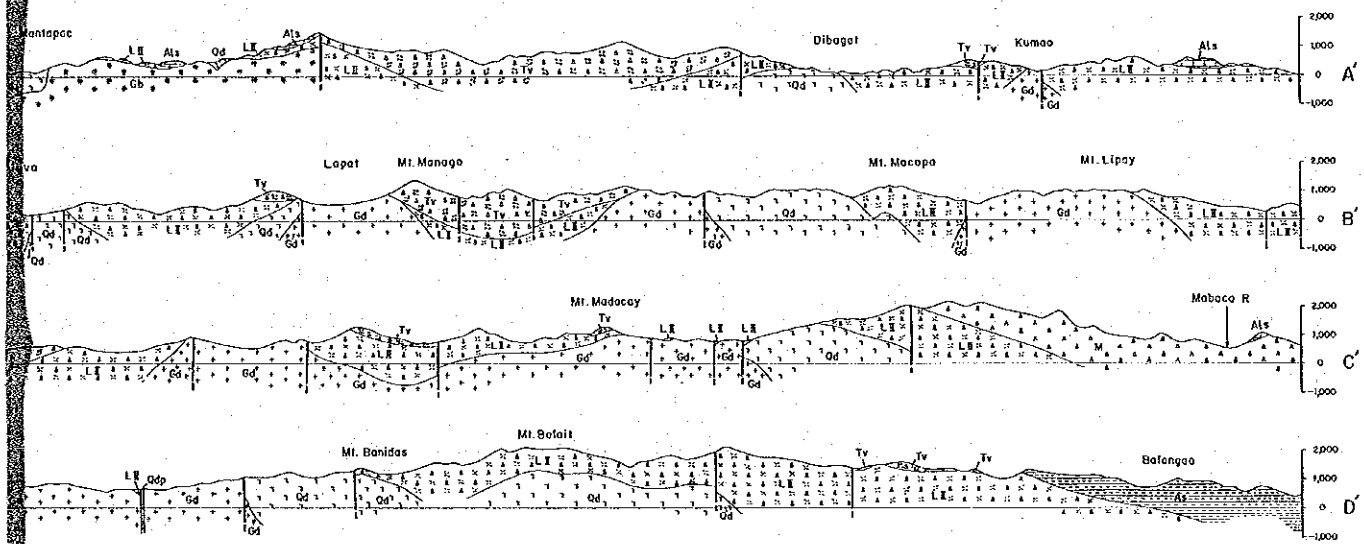




- Paleogene  
 L. C. Group  
 Formation: LL ▲▲ andesite lava & its pyroclastics  
 Formation: Llv ▲▲▲▲ basalt lava and pyroclastics  
 Formation: Lls ■■■■ thin bedded limestone

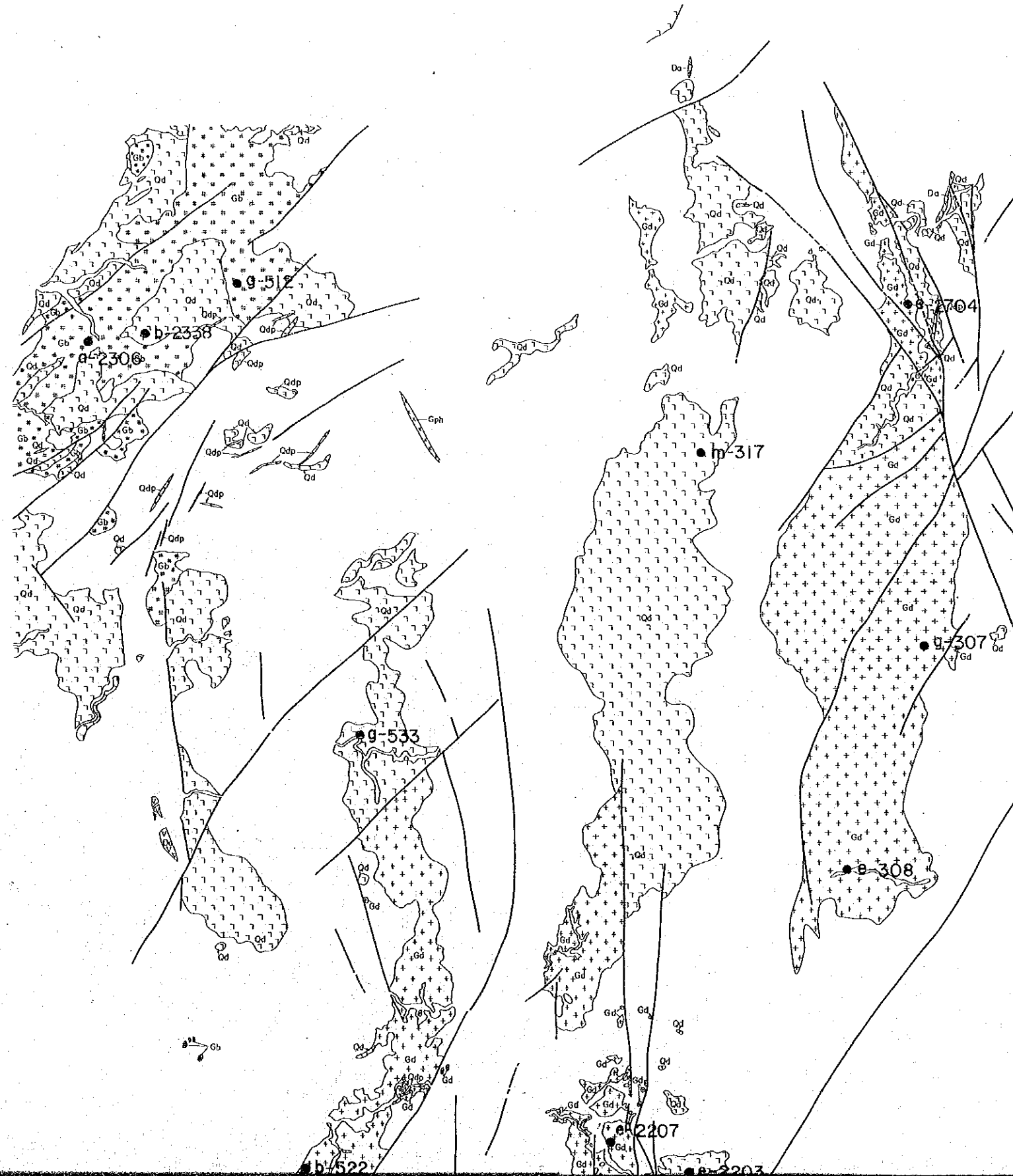
- Dikes  
 Dd / / / dacite  
 Sph / / / granophyre  
 Qdp / / / quartz diorite porphyry  
 Dp / / / diorite porphyry

- Plutonic rocks  
 Gd ■■■■ granodiorite  
 Qd ■■■■ quartz diorite  
 Gb ■■■■ gabbro

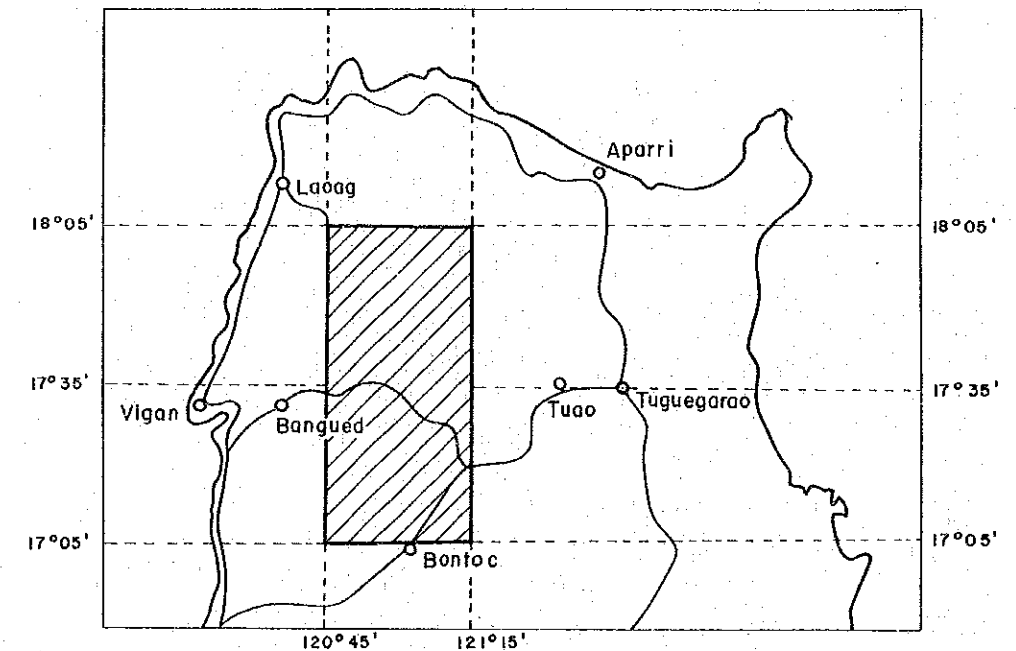


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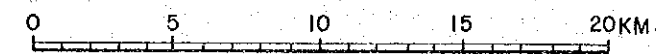
Location Map of Rock  
Samples for Chemical Analysis,  
K-Ar Dating

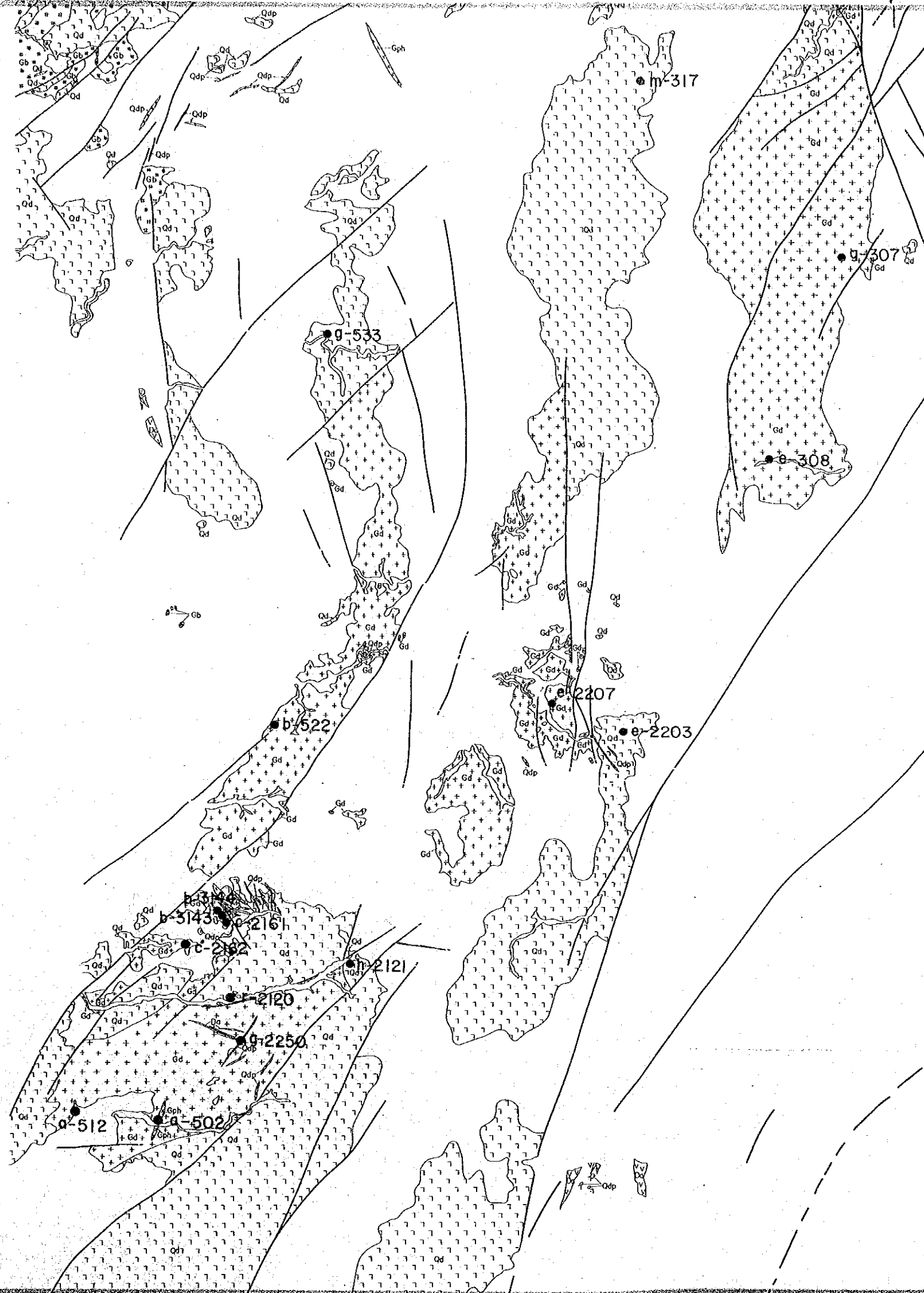


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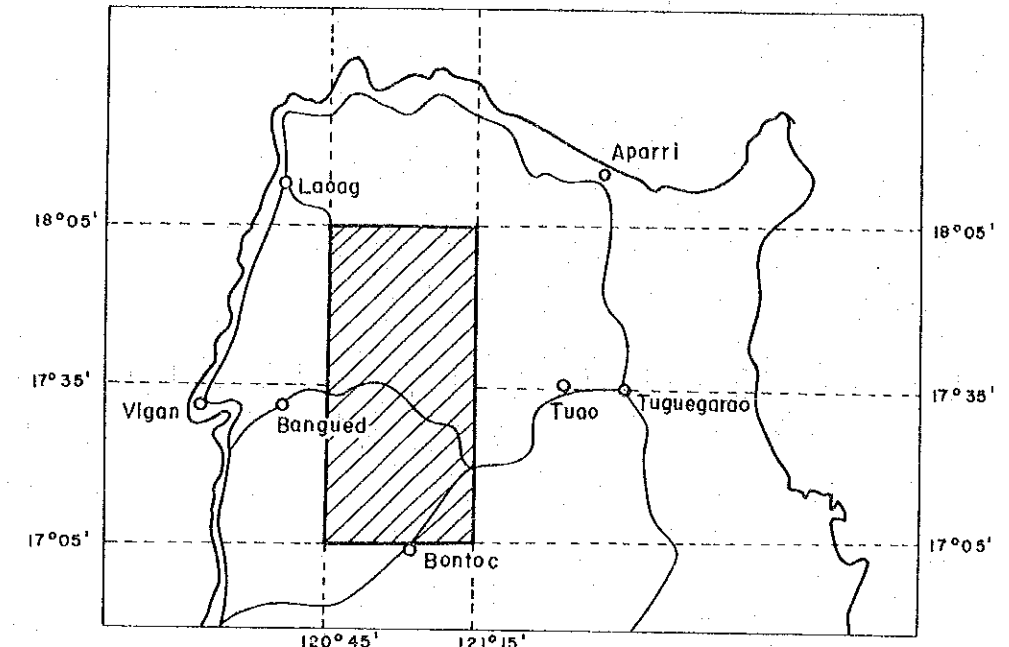
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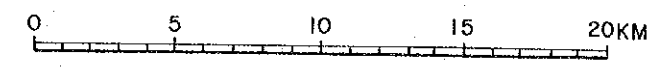


# K-Ar Dating

## LOCATION INDEX



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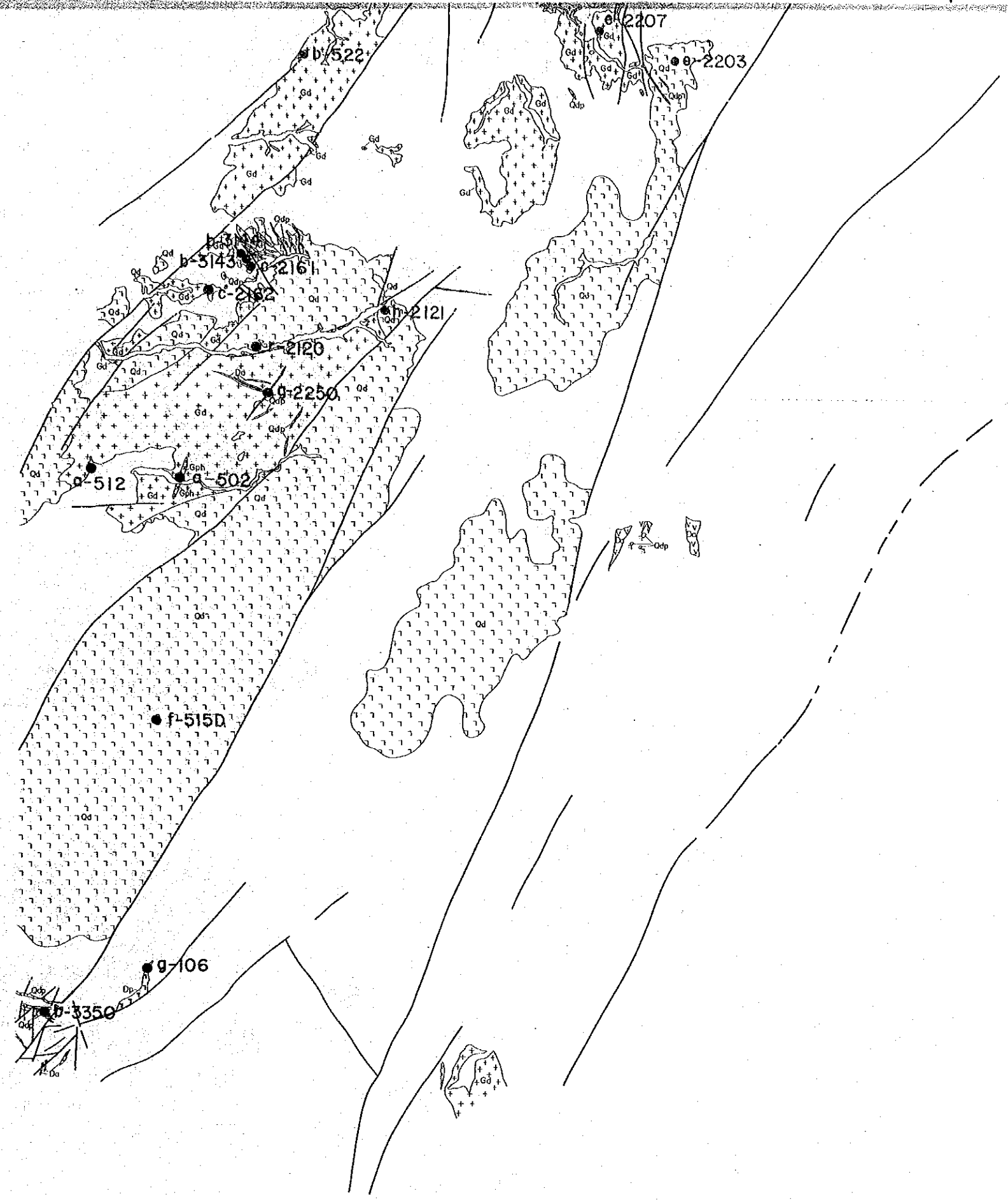
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## LEGEND

● Rock Samples for K-Ar Dating and Chemical Analysis

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LEGEND

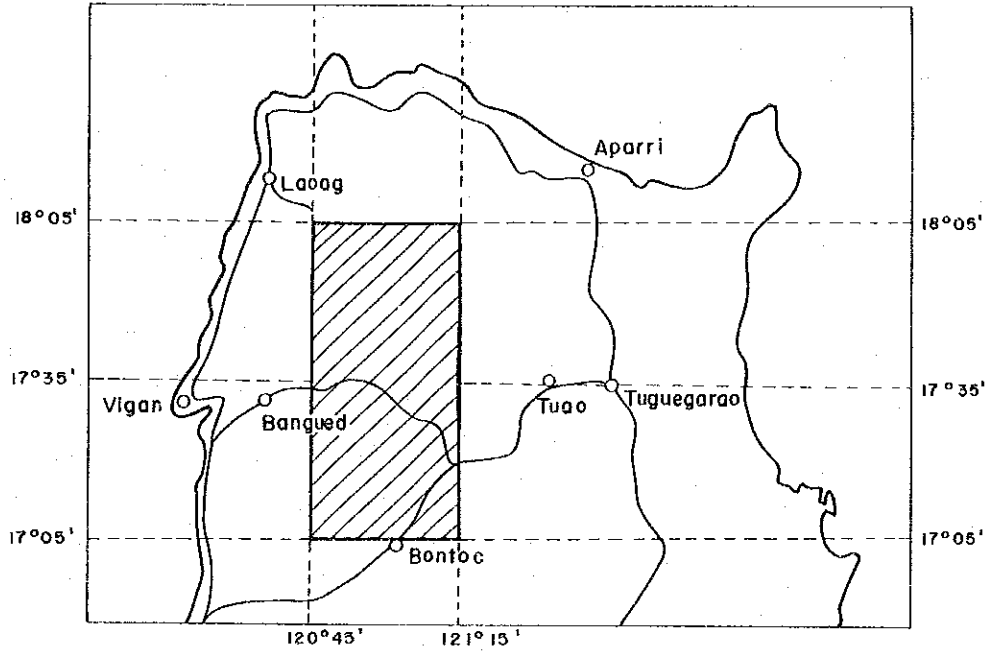
● Rock Samples for K-Ar Dating and Chemical Analysis

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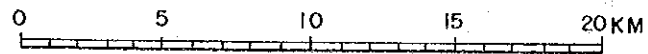
Geochemical Anomaly Map  
in Phase I (Stream Sediments)



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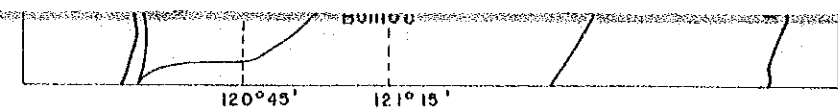


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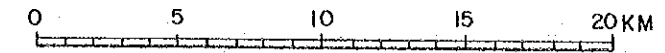


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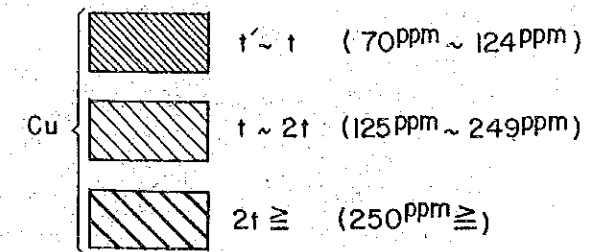
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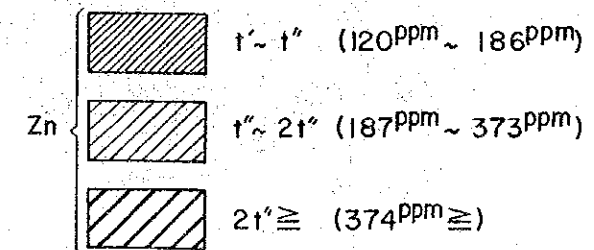
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### LEGEND

Cu content in stream sediment sample



Zn content in stream sediment sample



• sample location

anomalous zone

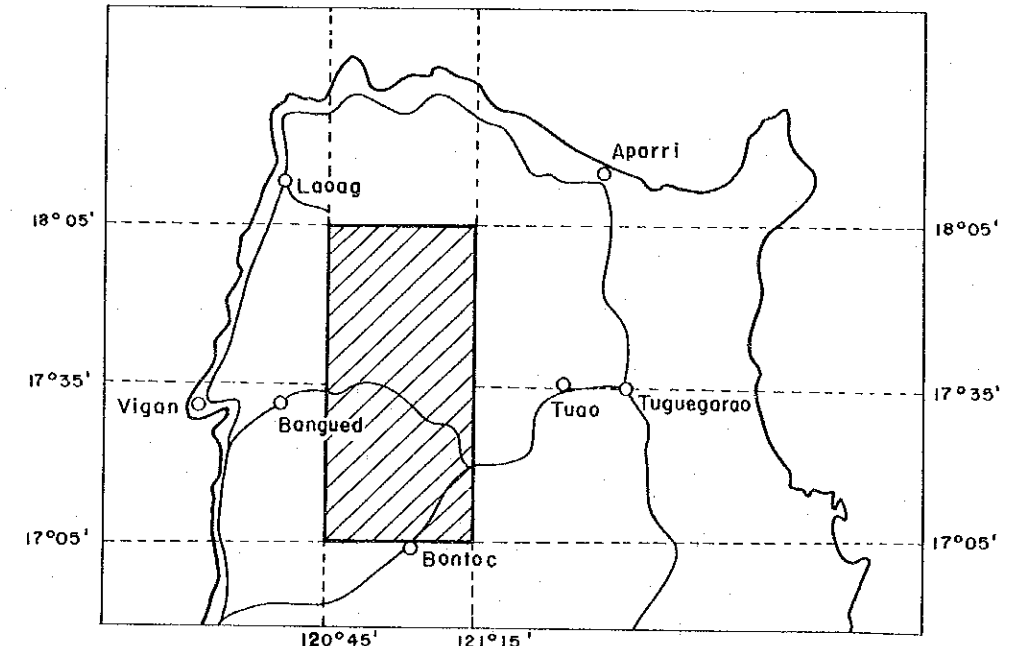
boundary of unfeasible area for field survey

GEOLOGICAL SURVEY  
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NORTHWESTERN LUZON  
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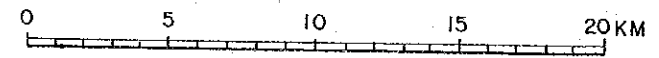
Geochemical Anomaly Map  
in Phase II (Stream Sediments)



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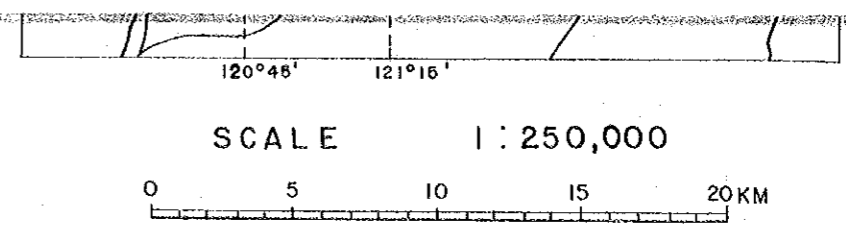
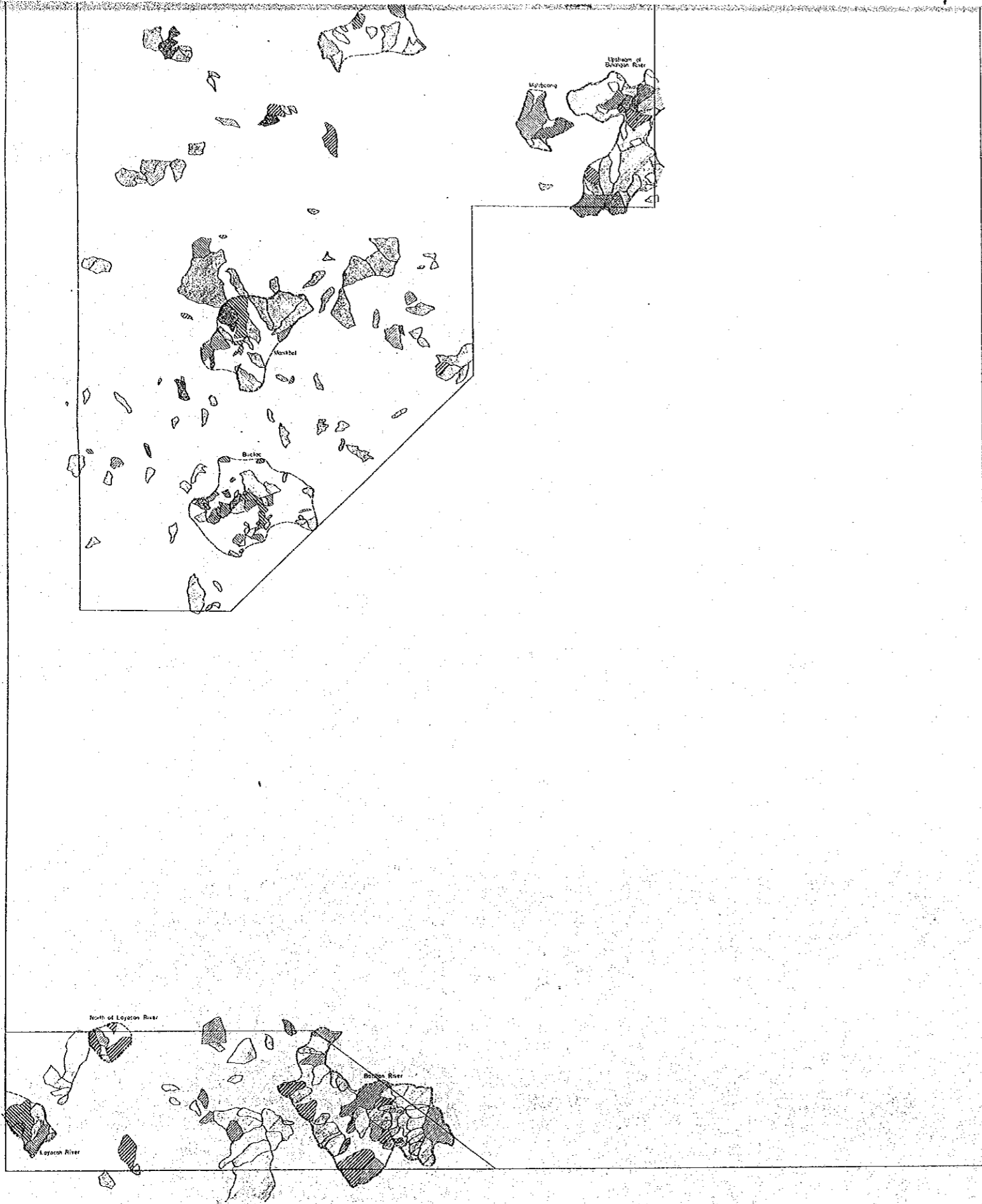


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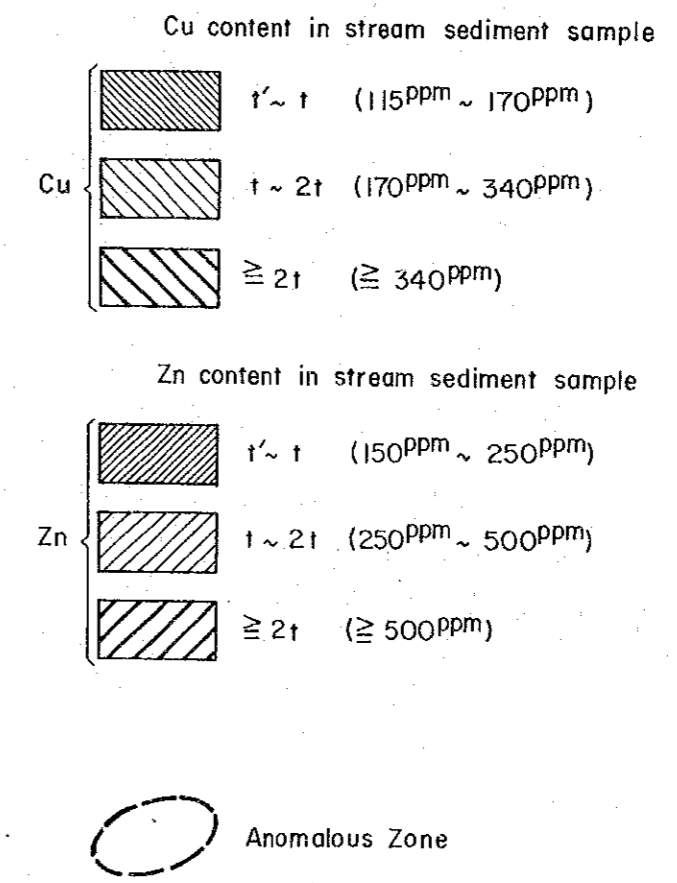




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**LEGEND**







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