

PL.I-1-1

## BRAZIL

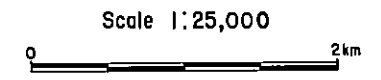
### GEOLOGICAL SURVEY OF ANTA GORDA AREA PHASE III

### Geological Map of Survey Area

LOCATION INDEX

METAL MINING AGENCY OF JAPAN  
JAPAN INTERNATIONAL COOPERATION AGENCY

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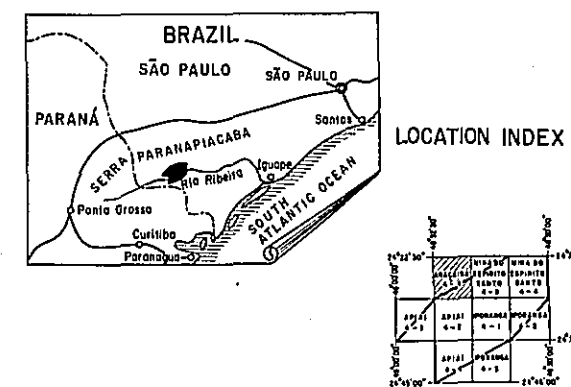


### LEGEND

Upper Precambrian	Açungui Group	Açungui Formation III	Q	mud
			AMS4b	white limestone
			AMS4	thin rhythmical alternation of meta siltstone and meta sandstone ("Gortubia")
			AMS4a	mica schist - phyllite
			AMS4	white limestone ("Passo Vista")
			AMS3	meta quartz sandstone with mica schist - phyllite ("Boa Vista")
			AMS2	mica schist and meta siltstone - meta sandstone
			AMS1	dolomite
			AMS1b	alternation of pelitic limestone and mica schist - limestone (Furnas horizon)
			AMS1a	mica schist - phyllite and meta sandstone with limestone
		Açungui Formation I	AMS1	dolomite
			AMS1a	alternation of limestone, calc-schist and mica schist - limestone with (Logado horizon)
			AMS1b	mica schist, meta siltstone - meta sandstone
			AMS1c	mica schist - phyllite
			AMS1d	meta conglomerate and meta sandstone with metasiltstone
Intrusive rocks		AMs	meta schist - phyllite	
		AMca	calc-schist - limestone and dolomite	
		AMam	amphibolite - amphibole schist	
		AMsa	meta sandstone and meta conglomerate with phyllite	
		AMps	phyllite - meta siltstone with meta conglomerate - meta sandstone	
		AMdb	meta diabase - meta basalt	
		AMb	meta basalt	
Gr	granitic rock			



### Geological Map of Survey Area



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### LEGEND

Quaternary	Q	mud	
Upper Precambrian	Acungui Group	AMSz	white limestone
		AMSa	thin rhythmical alternation of meta siltstone and meta sandstone ("Gorubira")
		AMLc	mica schist - phyllite
		AMLv	white limestone ("Passo Verde")
		AMSs	meta quartz sandstone with mica schist - phyllite ("Boa Vista")
		AMLm	mica schist and meta siltstone - meta sandstone
	Acungui Formation I	AMLd	dolomite
		AMLl	alternation of pelitic limestone and mica schist - limestone (Furnas horizon)
		AMSz	mica schist - phyllite and meta sandstone with limestone
		AMLc	dolomite
		AMLs	alternation of limestone, calc-schist and mica schist - limestone with (Lagado) mica schist, meta siltstone - meta sandstone
		AMLp	mica schist - phyllite
Acungui Formation II	AMSss	meta conglomerate and meta sandstone with metasiltstone	
	AMps	mica schist - phyllite	
	AMcs	calc-schist - limestone and dolomite	
	AMom	amphibolite - amphibole schist	
	AMSs	meta sandstone and meta conglomerate with phyllite	
	AMps	phyllite - meta siltstone with meta conglomerate - meta sandstone	
Intrusive rocks	AMb	meta basalt	
	Gr	granitic rock	
	Db	diabase	

	dip and strike of bedding
	dip and strike of schistosity
	anticlinal axis
	synclinal axis
	fault
	operating mine
	closed mine




PL. I-1-2

## BRAZIL

### GEOLOGICAL SURVEY OF ANTA GORDA AREA PHASE III

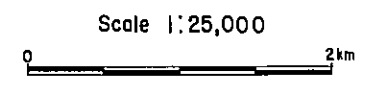
#### Geological Map of Survey Area



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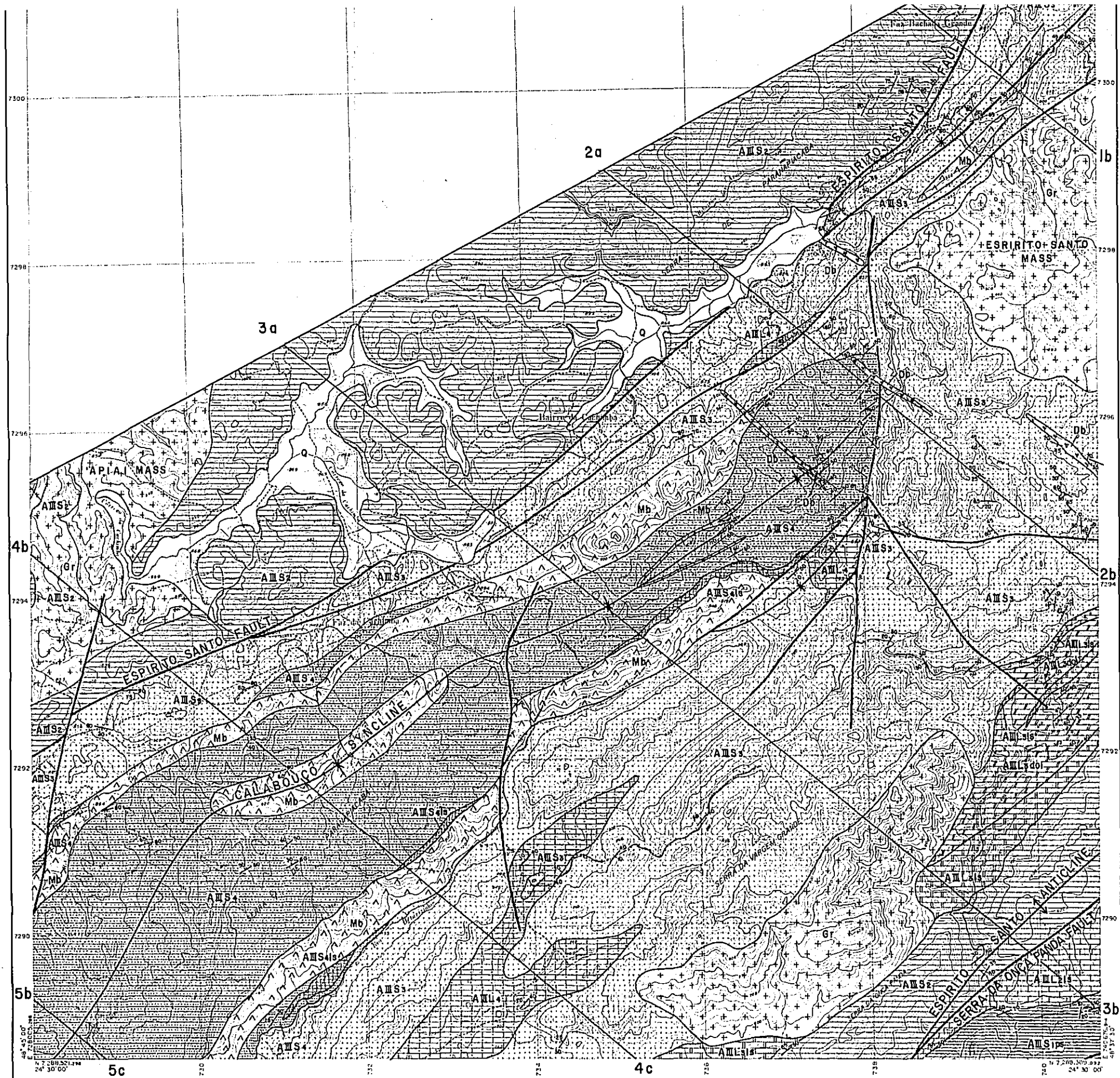
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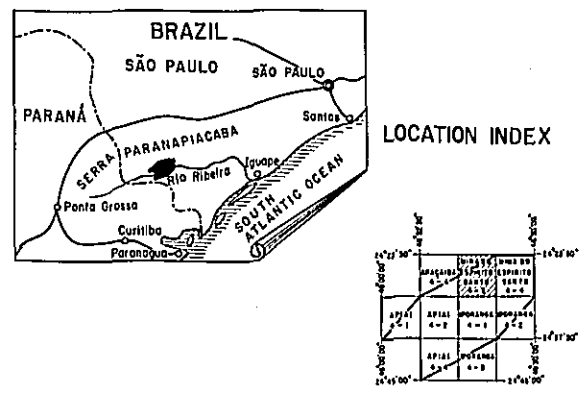


### LEGEND

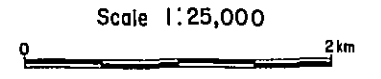
Upper Precambrian	Açungui Group	Açungui Formation II	Q	mud
			AMS <sub>4b</sub>	white limestone
			AMS <sub>4</sub>	thin rhythmic alternation of meta siltstone and meta sandstone ("Gortubira")
			AML <sub>4a</sub>	mica schist - phyllite
			AML <sub>4</sub>	white limestone ("Passo Verde")
			AMS <sub>5</sub>	meta quartz sandstone with mica schist - phyllite ("Boa Vista")
			AML <sub>5c</sub>	mica schist and meta siltstone - meta sandstone
			AML <sub>5d</sub>	dolomite
			AML <sub>5i</sub>	alteration of pelitic limestone and mica schist - limestone (Furnas horizon)
			AMS <sub>6</sub>	mica schist - phyllite and meta sandstone with limestone
	Açungui Formation I	Açungui Group	AML <sub>6d</sub>	dolomite
			AML <sub>6h</sub>	alteration of limestone, calc-schist and mica schist - limestone with (Lagado horizon)
			AMS <sub>7</sub>	mica schist, meta siltstone - meta sandstone
			AMS <sub>8</sub>	mica schist - phyllite
			AMS <sub>9</sub>	meta conglomerate and meta sandstone with meta siltstone
			AMS <sub>10</sub>	mica schist - phyllite
			AMS <sub>11</sub>	calc-schist - limestone and dolomite
			AMS <sub>12</sub>	amphibolite - amphibole schist
			AMS <sub>13</sub>	meta sandstone and meta conglomerate with phyllite
			AMS <sub>14</sub>	phyllite - meta siltstone with meta conglomerate - meta sandstone
Intrusive rocks			Mb	meta basalt
			Gr	granitic rock



Geological Map of Survey Area

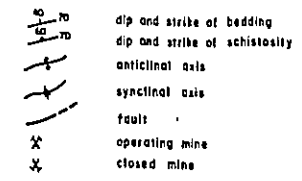


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LEGEND

Upper Precambrian	Acungui Group	Acungui Formation III	Q	mud
			AMS4b	white limestone
			AMS4	thin rhythmical alteration of meta siltstone and meta sandstone ("Gortuibe")
			AMS4a	mica schist - phyllite
			AML4	white limestone ("Passo Verde")
			AMS5	meta quartz sandstone with mica schist - phyllite ("Boa Vista")
			AMS6	meta schist and meta siltstone - meta sandstone
			AMS6a	dolomite
			AMS6b	alteration of pelitic limestone and mica schist - limestone (Furnas horizon)
			AMS6c	mica schist - phyllite and meta sandstone with limestone
Upper Precambrian	Acungui Group	Acungui Formation II	AMS7	dolomite
			AMS7a	alteration of limestone, calc-schist and mica schist - limestone with (Lagoado horizon)
			AMS7b	mica schist, meta siltstone - meta sandstone
			AMS7c	mica schist - phyllite
			AMS8	meta conglomerate and meta sandstone with metasiltstone
			AMS9	mica schist - phyllite
			AMS10	calc-schist - limestone and dolomite
			AMS11	amphibolite - amphibole schist
			AMS12	meta sandstone and meta conglomerate with phyllite
			AMS13	phyllite - meta siltstone with meta conglomerate - meta sandstone
Upper Precambrian	Acungui Group	Acungui Formation I	AMS14	meta diabase - meta basalt
			AMS15	meta diabase - meta basalt
Intrusive rocks			Mb	meta basalt
			Gr	granitic rock
			Db	diabase

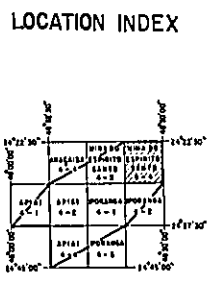




BRAZIL  
GEOLOGICAL SURVEY  
OF  
ANTA GORDA AREA  
PHASE III

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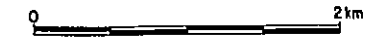
Geological Map of Survey Area



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JAPAN INTERNATIONAL COOPERATION AGENCY

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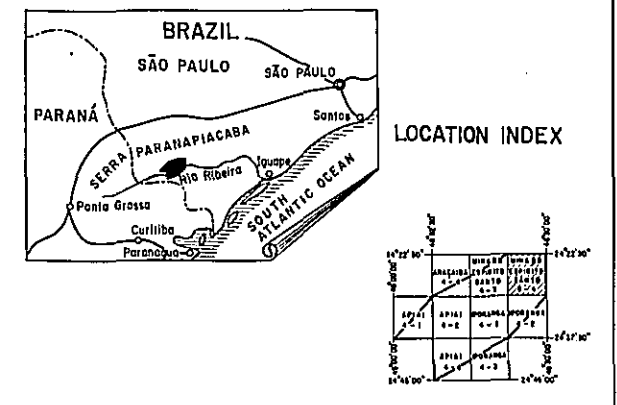


LEGEND

Quaternary	Q	mud
Upper Precambrian	AMS4b	white limestone
	AMS4	thin rhythmic alternation of meta siltstone and meta sandstone ("Oortuba")
	AML4a	mica schist - phyllite
	AML4	white limestone ("Passo Vieira")
	AMS3	meta quartz sandstone with mica schist-phyllite ("Boa Vista")
	AML3a	mica schist and meta siltstone - meta sandstone
	AML3b	dolomite
	AML3c	alteration of pelitic limestone and mica schist - limestone (Furada horizon)
	AMS2	mica schist - phyllite and meta sandstone with limestone
	AML2a	dolomite
	AML2b	alteration of limestone, calc-schist and mica schist - limestone with (Lagado horizon)
	AML2c	mica schist, meta siltstone - meta sandstone
Açungui Formation I	AMS1a	mica schist - phyllite
	AMS1b	meta conglomerate and meta sandstone with metasiltstone
	AMS1c	mica schist - phyllite
	ALCs	calc-schist - limestone and dolomite
	ALAm	amphibolite - amphibole schist
	ALSp	meta sandstone and meta conglomerate with phyllite
Açungui Formation II	ALPs	phyllite - meta siltstone with meta conglomerate - meta sandstone
	ALom	meta diabase - meta basalt
Intrusive rocks	Mb	meta basalt
	Gr	granitic rock

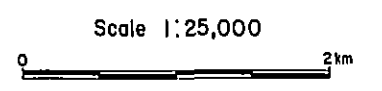


Geological Map of Survey Area



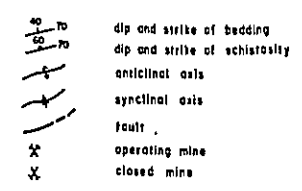
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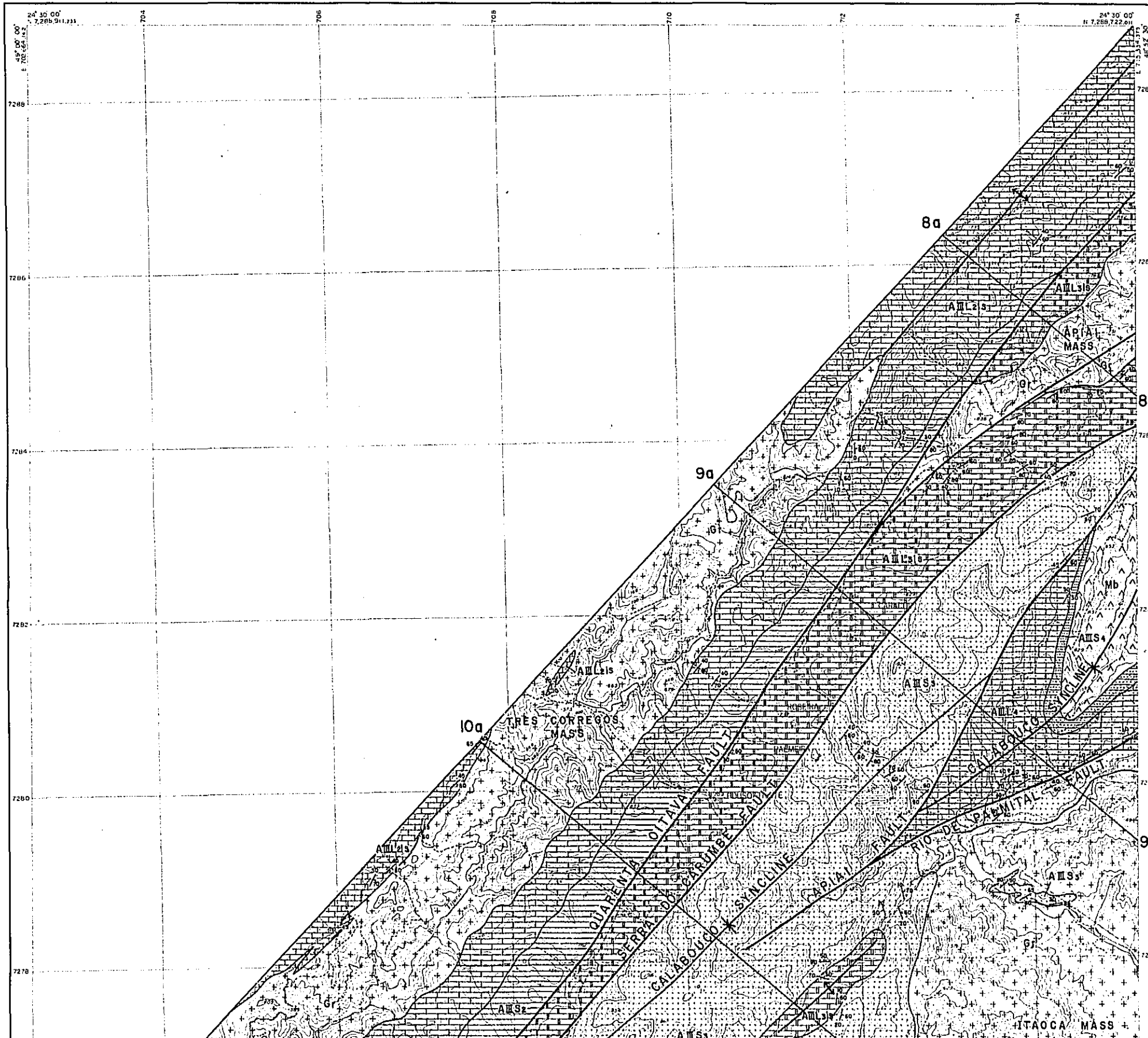
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LEGEND

Quaternary	Q	mud
Upper Precambrian	AMS4b	white limestone
	AMS4	thin rhythical alternation of meta siltstone and meta sandstone ("Gortubite")
	AML4a	mica schist - phyllite
	AML4	white limestone ("Passo Verde")
	AMS3	meta quartz sandstone with mica schist - phyllite ("Boa Vista")
	AML3a	mica schist and meta siltstone - meta sandstone
	AML3b	dolomite
	AML3c	alternation of pelitic limestone and mica schist - limestone (Furadas horizon)
	AMS2	mica schist - phyllite and meta sandstone with limestone
	AML2a	dolomite
	AML2b	alternation of limestone, calc-schist and mica schist - limestone with (Lagado horizon)
	AML2c	mica schist, meta siltstone - meta sandstone
AML2d	mica schist - phyllite	
Acungui Formation II	AMS1a	meta conglomerate and meta sandstone with metasiltstone
	AML1a	mica schist - phyllite
	AMS1b	calc-schist - limestone and dolomite
	AML1b	amphibolite - amphibole schist
	AMS1c	meta sandstone and meta conglomerate with phyllite
	AML1c	phyllite - meta siltstone with meta conglomerate - meta sandstone
Acungui Formation I	AMS1d	meta diabase - meta basalt
	AML1d	
Intrusive rocks	Mb	meta basite
	Gr	granitic rock
	Db	diabase






PL.I-1-4

## BRAZIL

### GEOLOGICAL SURVEY OF ANTA GORDA AREA PHASE III

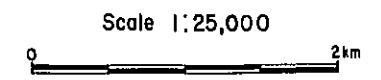
#### Geological Map of Survey Area



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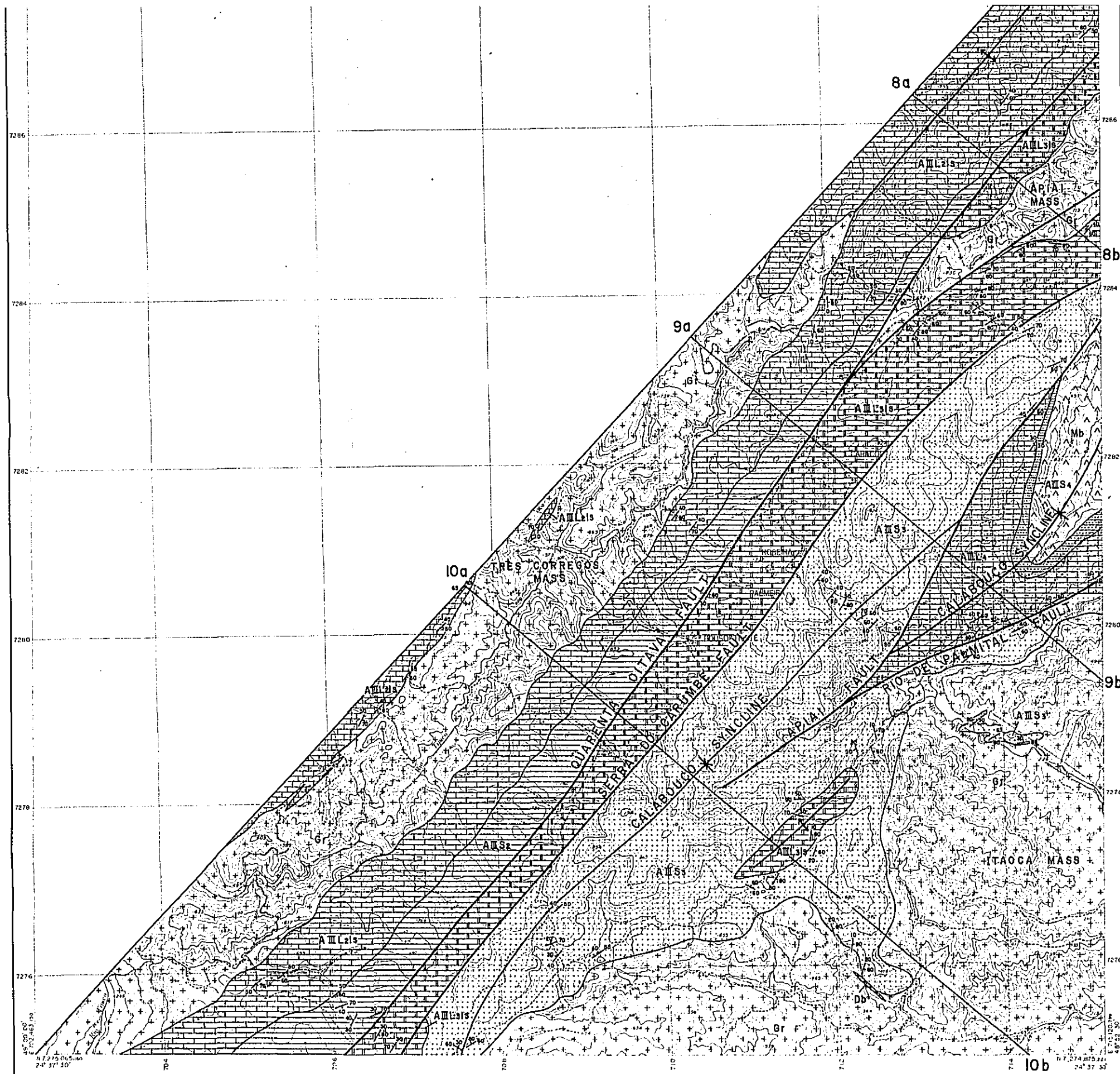
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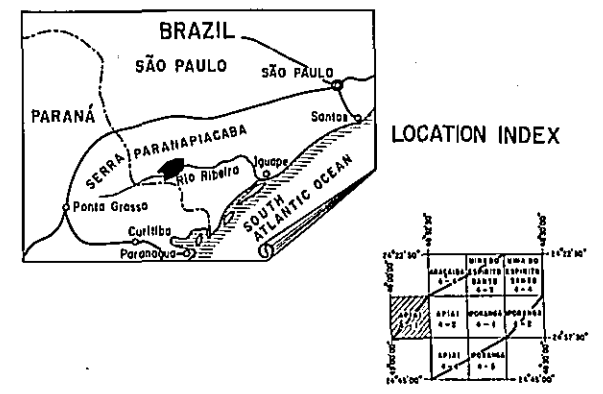


### LEGEND

Upper Precambrian	Atungul Group	Atungul Formation II	Q	mud
			ARS4b	white limestone
			ARS4	thin rhythmical alternation of meta siltstone and meta sandstone ("Gorubia")
			AML4c	mica schist - phyllite
			AML4	white limestone ("Passo Verde")
			ANS4	meta quartz sandstone with mica schist - phyllite ("Boa Vista")
			AML4a	mica schist and meta siltstone - meta sandstone
			AML4d	dolomite
			AML4e	alternation of pelitic limestone and mica schist - limestone (Furnas horizon)
			AML4f	mica schist - phyllite and meta sandstone with limestone
	AML4g	dolomite		
	AML4h	alternation of limestone, calc-schist and mica schist - limestone with (Lagado horizon)		
	AML4i	mica schist, meta siltstone - meta sandstone		
	AML4j	mica schist - phyllite		
	AML4k	meta conglomerate and meta sandstone with meta siltstone		
Atungul Formation I	ARC4	mica schist - phyllite		
	ARC4a	calc-schist - limestone and dolomite		
	ARC4b	amphibolite - amphibole schist		
	ARC4c	meta sandstone and meta conglomerate with phyllite		
	ARC4d	phyllite - meta siltstone with meta conglomerate - meta sandstone		
Intrusive rocks	Mb	meta basalt		
	Gr	granitic rock		



Geological map of survey area



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Scale 1:25,000  
0 2 km

LEGEND

Quaternary	Q	mud		
Upper Precambrian	Açungui Group	Açungui Formation III	ABS4a	white limestone
			ABS4b	thin rhythmical alternation of meta siltstone and meta sandstone ("Oortubine")
			ABL4a	mica schist - phyllite
			ABL4b	white limestone ("Passo Verde")
			AMS1	meta quartz sandstone with mica schist - phyllite ("Boa Vista")
			AMS2	mica schist and meta siltstone - meta sandstone
			AMS3	dolomite
			AMS4	alternation of pelitic limestone and mica schist - limestone (Furnas horizon)
			AMS5	mica schist - phyllite and meta sandstone with limestone
			AMS6	dolomite
			AMS7	alternation of limestone, calc-schist and mica schist - limestone with (Lagado horizon)
			AMS8	mica schist, meta siltstone - meta sandstone
			AMS9	mica schist - phyllite
			AMS10	meta conglomerate and meta sandstone with metasiltstone
			Açungui Formation II	AEPs
AECs	calc-schist - limestone and dolomite			
AEMs	amphibolite - amphibole schist			
AMSs	meta sandstone and meta conglomerate with phyllite			
Alps	phyllite - meta siltstone with meta conglomerate - meta sandstone			
Intrusive rocks	Alam	meta diabase - meta basalt		
	Mb	meta basalt		
	Gr	granitic rock		
	Db	diabase		

- dip and strike of bedding
- dip and strike of schistosity
- anticlinal axis
- synclinal axis
- fault
- operating mine
- closed mine





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## BRAZIL

### GEOLOGICAL SURVEY OF ANTA GORDA AREA PHASE III

#### Geological Map of Survey Area

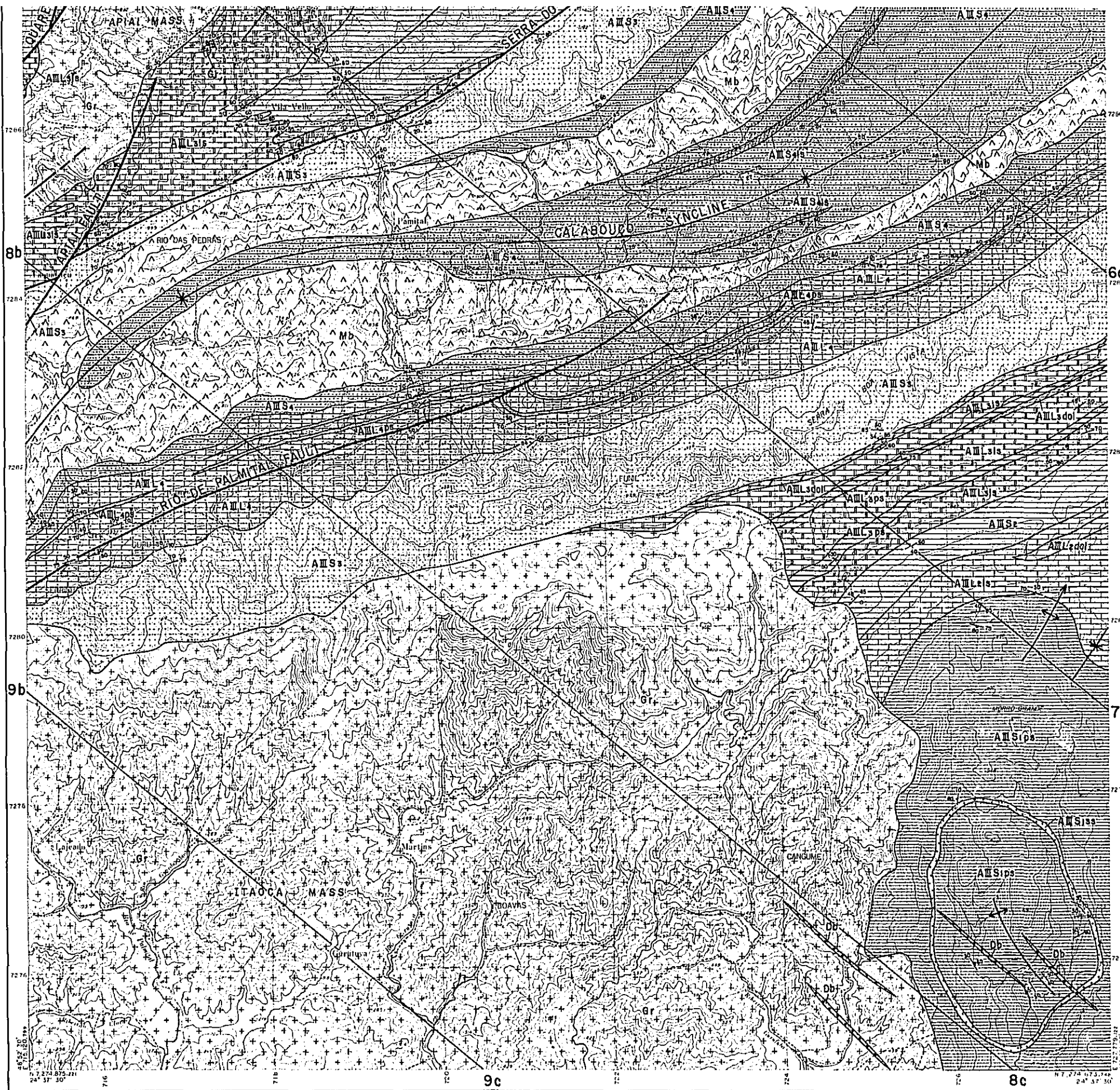
LOCATION INDEX

METAL MINING AGENCY OF JAPAN  
JAPAN INTERNATIONAL COOPERATION AGENCY

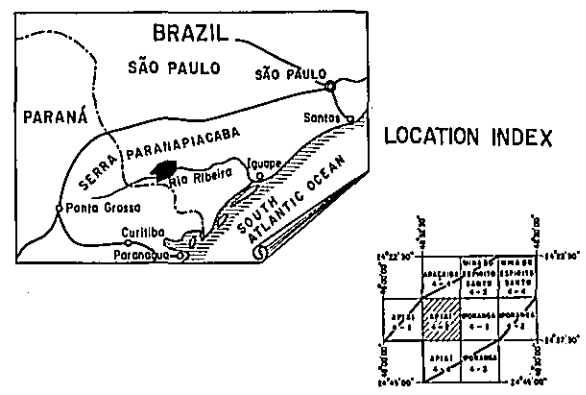
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Scale 1:25,000

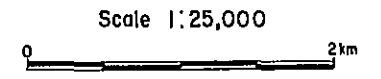
		LEGEND	
Upper Precambrian	Acungui Group Acungui Formation II	O	mud
		AMS4b	white limestone
		AMS4	thin rhythmical alternation of meta siltstone and meta sandstone ("Cortubira")
		AML4p	mica schist - phyllite
		AML4	white limestone ("Passo Verde")
		AMS5	meta quartz sandstone with mica schist - phyllite ("Boa Vista")
		AML5p	mica schist and meta siltstone - meta sandstone
		AML5d	dolomite
		AML5s	alteration of pelagic limestone and mica schist - limestone (Furadas horizon)
		AMS6	mica schist - phyllite and meta sandstone with limestone
		AML6d	dolomite
		AML6s	alteration of limestone, calc-schist and mica schist - limestone with (Logado horizon)
		AMS7	mica schist, meta siltstone - meta sandstone
		AMS8	mica schist - phyllite
Acungui Formation I	AMS9	meta conglomerate and meta sandstone with metasiltstone	
	AMS10	mica schist - phyllite	
	AMS11	calc-schist - limestone and dolomite	
	AMS12	amphibolite - amphibole schist	
	AMS13	meta sandstone and meta conglomerate with phyllite	
	AMS14	phyllite - meta siltstone with meta conglomerate - meta sandstone	
	AMS15	meta diabase - meta basalt	
Intrusive rocks	Mb	meta basalt	
	Gr	granitic rock	
	Db	diabase	



Geological Map of Survey Area



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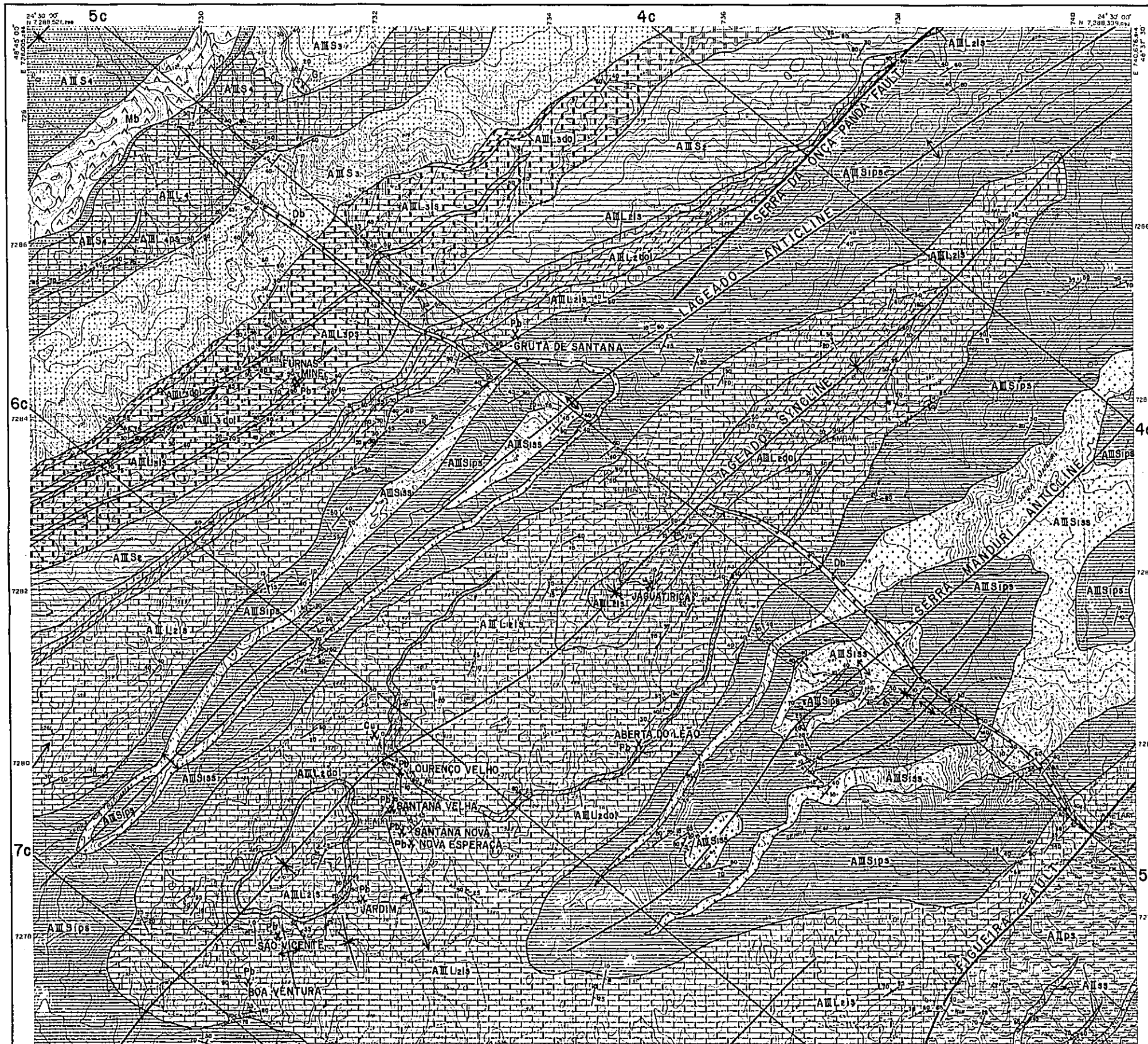


LEGEND

Upper Precambrian	Acungui Group	Q	mud
		AMS4h	white limestone
		AMS4	this rhythmical alternation of meta siltstone and meta sandstone ("Gortubia")
		AML4p	mica schist - phyllite
		AML4l	white limestone ("Passa Verde")
		AMS5	meta quartz sandstone with mica schist - phyllite ("Boa Vista")
		AML5p	mica schist and meta siltstone - meta sandstone
		AML5d	dolomite
		AML5l	alternation of pelitic limestone and mica schist - limestone (Furnas horizon)
		AMS6	mica schist - phyllite and meta sandstone with limestone
	AML6p	dolomite	
	AML6h	alternation of limestone, calc-schist and mica schist - limestone with (Lagado horizon)	
	AML6s	mica schist, meta siltstone - meta sandstone	
	AML6sp	mica schist - phyllite	
	Acungui Formation I	AMS12	meta conglomerate and meta sandstone with metasiltstone
AMS13		mica schist - phyllite	
AMS14		calc-schist - limestone and dolomite	
AMS15		amphibolite - amphibole schist	
AMS16		meta sandstone and meta conglomerate with phyllite	
Acungui Formation II	AMS17	phyllite - meta siltstone with meta conglomerate - meta sandstone	
	AMS18	meta diabase - meta basalt	
	AMS19		
Intrusive rocks	Mb	meta basalt	
	Gr	granitic rock	
	Db	diabase	

	dip and strike of bedding
	dip and strike of schistosity
	anticlinal axis
	synclinal axis
	fault
	operating mine
	closed mine



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## BRAZIL

### GEOLOGICAL SURVEY OF ANTA GORDA AREA PHASE III

#### Geological Map of Survey Area

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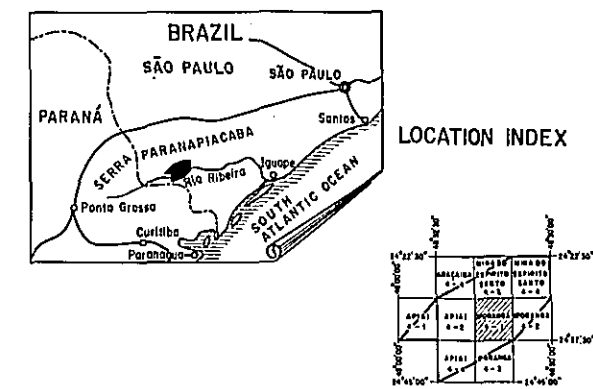
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#### LEGEND

Upper Precambrian	Acungui Group	Acungui Formation II	Q	mud
			AMS4b	white limestone
			AMS4	thin rhythmical alternation of meta siltstone and meta sandstone ("Gortubita")
			AML4c	mica schist - phyllite
			AML4	white limestone ("Passo Vista")
			AMS3	meta quartz sandstone with mica schist - phyllite ("Boa Vista")
			AML3d	mica schist and meta siltstone - meta sandstone
			AML3a	dolomite
			AML3b	alteration of pelitic limestone and mica schist - limestone (Furnas horizon)
			AMS2	mica schist - phyllite and meta sandstone with limestone
			AML2d	dolomite
			AML2b	alteration of limestone, calc-schist and mica schist - limestone with (Lajeado) siltstone - meta sandstone
			AML2c	mica schist - phyllite
			AMS1d	meta conglomerate and meta sandstone with metasiltstone
			AMS1	mica schist - phyllite
Acungui Formation I	ARps	calc-schist - limestone and dolomite		
	ALcm	amphibolite - amphibole schist		
	ALas	meta sandstone and meta conglomerate with phyllite		
	ALps	phyllite - meta siltstone with meta conglomerate - meta sandstone		
	ALam	meta diabase - meta basalt		
Intrusive rocks	Mb	meta basalt		
	Gr	granitic rock		
	Db	diabase		



### Geological Map of Survey Area



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### LEGEND

Upper Precambrian	Acungui Group	Acungui Formation II	Q	mud
			ABS4b	white limestone
			ABS4	thin rhythmical alternation of meta siltstone and meta sandstone ("Coutubite")
			ABL4a	mica schist - phyllite
			ABL4	white limestone ("Passo Vista")
			ABS1	meta quartz sandstone with mica schist - phyllite ("Boa Vista")
			ABL2c	mica schist and meta siltstone - meta sandstone
			AM2a	dolomite
			ABL2b	alteration of pelitic limestone and mica schist - limestone (Furada horizon)
			AMSz	mica schist - phyllite and meta sandstone with limestone
			AM2b	dolomite
			ABL2a	alternation of limestone, calc-schist and mica schist - limestone with (Lagoado horizon)
			AMS1	mica schist, meta siltstone - meta sandstone
			AMS2	mica schist - phyllite
			Acungui Formation I	AMS3
ALps	mica schist - phyllite			
ALca	calc-schist - limestone and dolomite			
ALam	amphibolite - amphibole schist			
ALst	meta sandstone and meta conglomerate with phyllite			
ALps	phyllite - meta siltstone with meta conglomerate - meta sandstone			
Intrusive rocks	Alam	meta diabase - meta basalt		
	Mb	meta basalt		
	Gr	granitic rock		
	Db	diabase		

	dip and strike of bedding
	dip and strike of schistosity
	anticlinal axis
	synclinal axis
	fault
	operating mine
	closed mine




PL. I-1-7

## BRAZIL

### GEOLOGICAL SURVEY OF ANTA GORDA AREA PHASE III

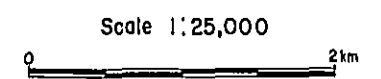
#### Geological Map of Survey Area



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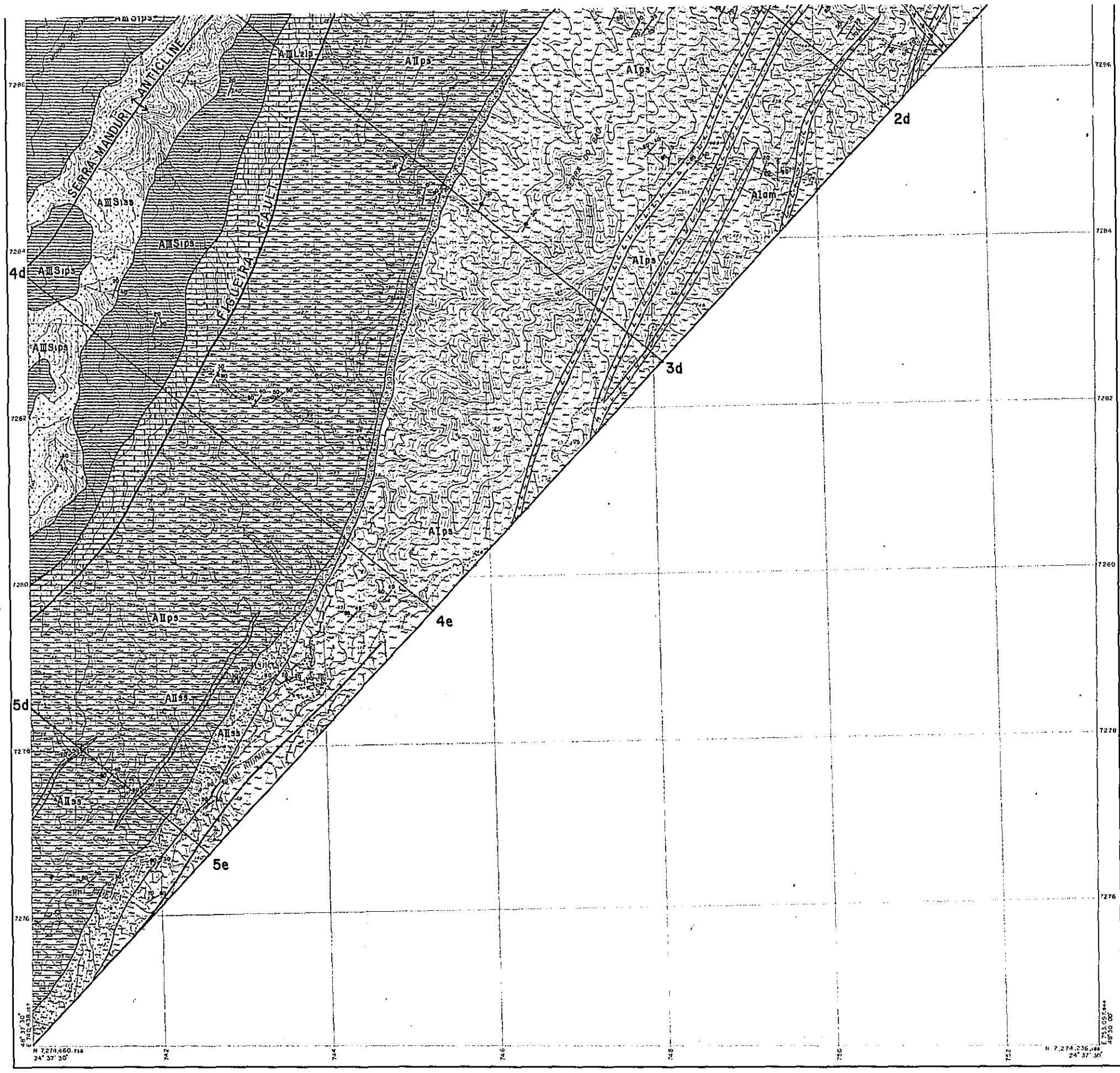
METAL MINING AGENCY OF JAPAN  
JAPAN INTERNATIONAL COOPERATION AGENCY

FEB. 1983  
Prepared by Bishimetal Exploration Co., Ltd.

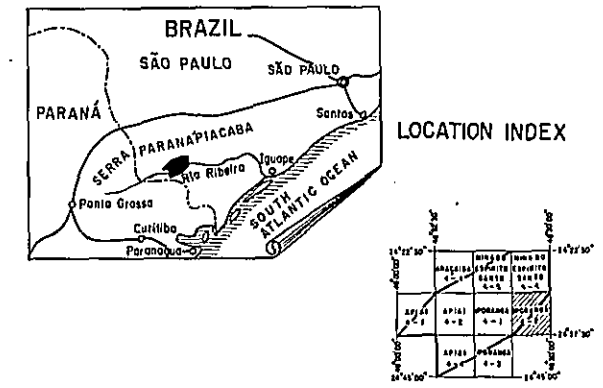


#### LEGEND

Upper Precambrian	Atungai Group	Atungai Formation II	Q	mud
			AMS4b	white limestone
			AMS4	thin rhythmic alternation of meta siltstone and meta sandstone ("Gostubire")
			AML4c	mica schist - phyllite
			AML4	white limestone ("Passo Verde")
			AMS3	meta quartz sandstone with mica schist - phyllite ("Boa Vista")
			AML3c	mica schist and meta siltstone - meta sandstone
			AML3b	dolomite
			AML3a	alternation of pelitic limestone and mica schist - limestone (Furnos horizon)
			AMS2	mica schist - phyllite and meta sandstone with limestone
			AML2b	dolomite
			AML2a	alternation of limestone, calc-schist and mica schist - limestone with Lagoado horizon
			AMS1	mica schist, meta siltstone - meta sandstone
			AML1	mica schist - phyllite
			Atungai Formation I	AMS1a
AMS1b	mica schist - phyllite			
ALCa	calc-schist - limestone and dolomite			
ALAm	amphibolite - amphibole schist			
ALAs	meta sandstone and meta conglomerate with phyllite			
Atungai Formation I	ALps	phyllite - meta siltstone with meta conglomerate - meta sandstone		
	ALom	meta diabase - meta basalt		
	ALom	meta diabase - meta basalt		
Intrusive rocks	Mb	meta basalt		
	Gr	granitic rock		
	Db	diorite		



Geological map of Survey Area



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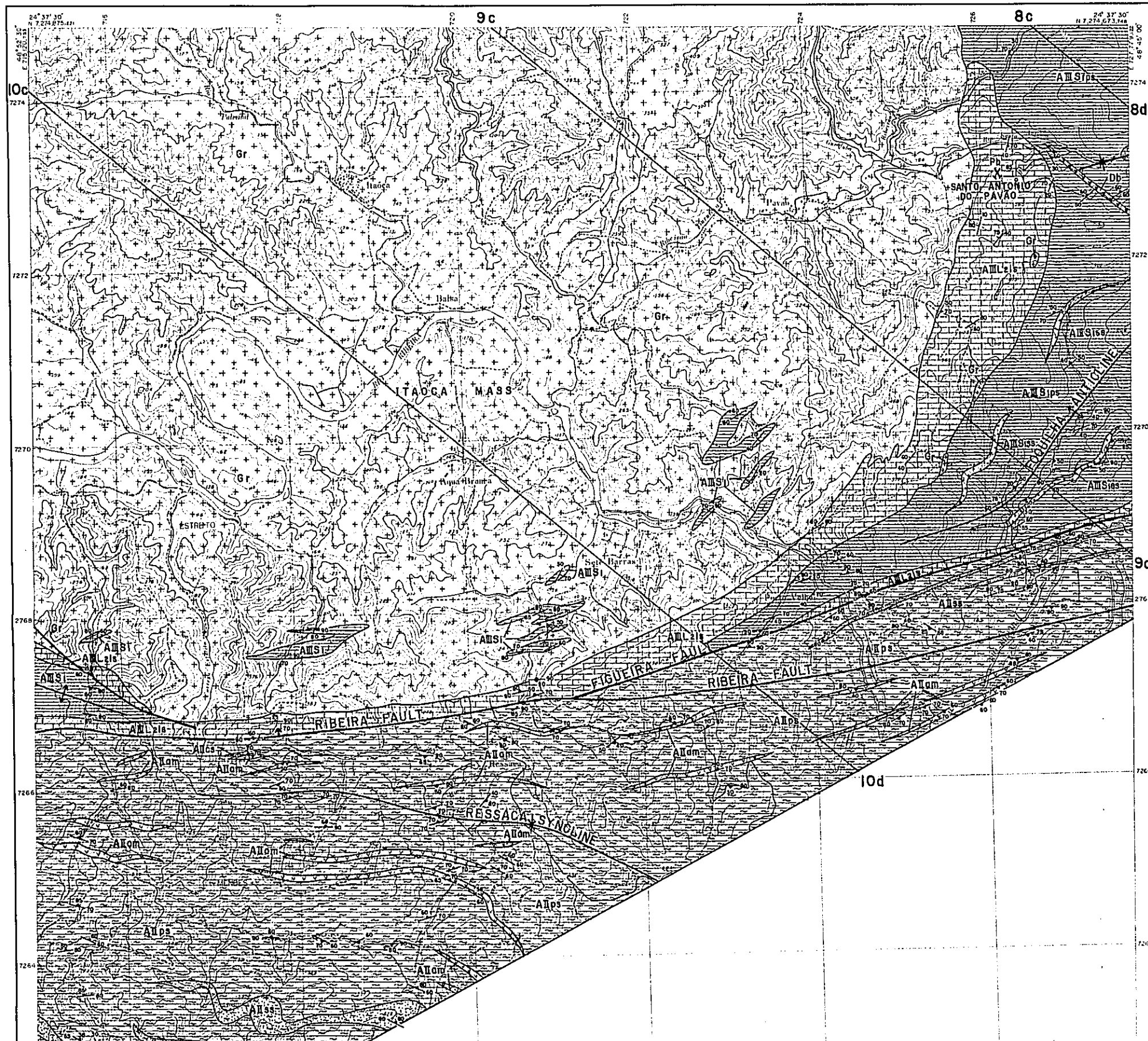
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LEGEND

Quaternary	Q	mud
Upper Precambrian	AMS4b	white limestone
	AMS4	thin rhythmical alternation of meta siltstone and meta sandstone ("Dortubir")
	AML4a	mica schist - phyllite
	AML4	white limestone ("Passo Verde")
	AMS3	meta quartz sandstone with mica schist - phyllite ("Boa Vista")
	AMS3a	mica schist and meta siltstone - meta sandstone
	AML3a	dolomite
	AML3b	alternation of paleic limestone and mica schist - limestone (Furnas horizon)
	AMS2	mica schist - phyllite and meta sandstone with limestone
	AML2	dolomite
	AML2a	alternation of limestone, calc-schist and mica schist - limestone with (Logado horizon)
	AMS1	mica schist, meta siltstone - meta sandstone
	AMS1a	mica schist - phyllite
	AMS1b	meta conglomerate and meta sandstone with metasiltstone
	AMS1c	mica schist - phyllite
Intrusive rocks	MB	meta basite
	Gc	granitic rock
	Db	diabase

- dip and strike of bedding
- dip and strike of schistosity
- anticlinal axis
- synclinal axis
- fault
- operating mine
- closed mine



PL.I-1-8

## BRAZIL

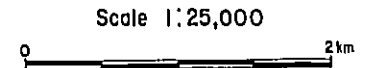
### GEOLOGICAL SURVEY OF ANTA GORDA AREA PHASE III

#### Geological Map of Survey Area

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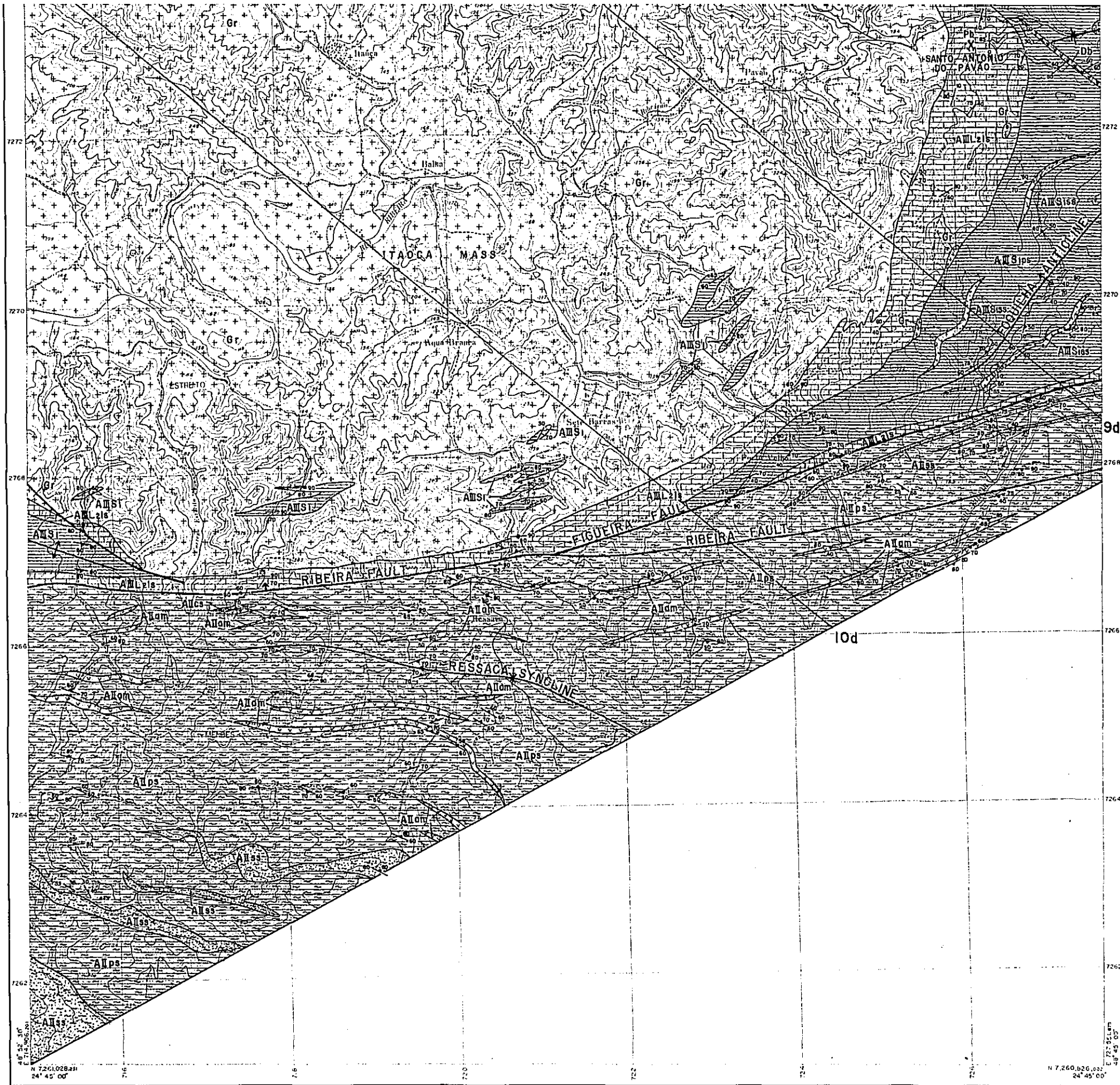
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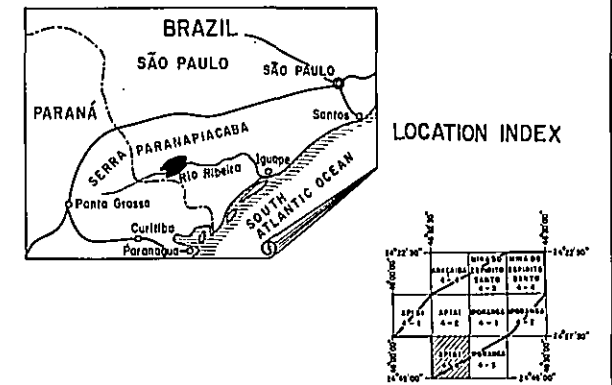


#### LEGEND

Upper Precambrian	Apungui Group	Apungui Formation III	Q	mud
			AMSb	white limestone
			AMSa	thin rhythmical alternation of meta siltstone and meta sandstone ("Gortubis")
			AMLc	mica schist - phyllite
			AMLb	white limestone ("Passo Vieira")
			AMSs	meta quartz sandstone with mica schist - phyllite ("Boa Vista")
		Apungui Formation II	AMLsp	mica schist and meta siltstone - meta sandstone
			AMLd	dolomite
			AMLlh	alternation of pelitic limestone and mica schist - limestone (Furnas horizon)
			AMSf	mica schist - phyllite and meta sandstone with limestone
			AMLst	dolomite
			AMLls	alternation of limestone, calc-schist and mica schist - limestone with (Lagado horizon)
			AMLm	mica schist, meta siltstone - meta sandstone
			AMSph	mica schist - phyllite
			AMScl	meta conglomerate and meta sandstone with metasiltstone
Apungui Formation I	AMps	mica schist - phyllite		
	AMcs	calc-schist - limestone and dolomite		
	AMam	amphibolite - amphibole schist		
	AMsa	meta sandstone and meta conglomerate with phyllite		
Intrusive rocks	AMps	phyllite - meta siltstone with meta conglomerate - meta sandstone		
	AMam	meta diabase - meta basalt		
	Mb	meta basalt		
	Gr	granitic rock		
	Db	diabase		



Geological Map of Survey Area



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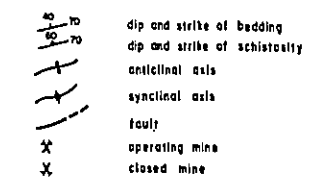
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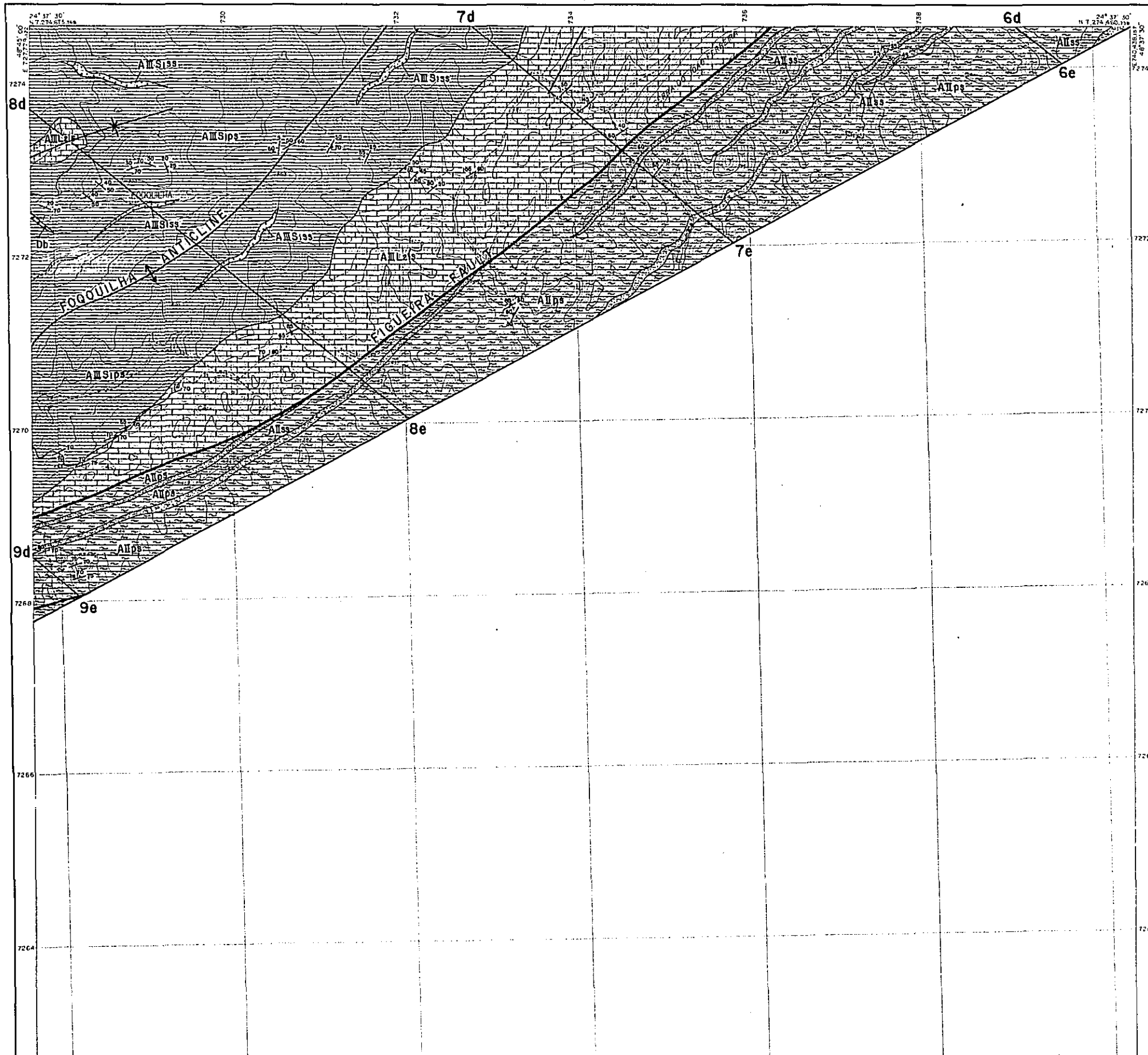


LEGEND

Quaternary	Q	mud	
Upper Precambrian	Açungui Group	AMS4b	white limestone
		AMS4a	thin rhythmical alternation of meta siltstone and meta sandstone ("Dortubite")
		AMS3	mica schist - phyllite
		AMS2	white limestone ("Passo Vista")
		AMS1	meta quartz sandstone with mica schist - phyllite ("Boa Vista")
		AMS0	mica schist and meta siltstone - meta sandstone
		AMS0	dolomite
	Açungui Formation I	AMS1h	alternation of pelitic limestone and mica schist - limestone (Furnas horizon)
		AMS1e	mica schist - phyllite and meta sandstone with limestone
		AMS1d	dolomite
		AMS1c	alternation of limestone, calc-schist and mica schist - limestone with (Logado horizon)
		AMS1b	mica schist, meta siltstone - meta sandstone
		AMS1a	mica schist - phyllite
		AMS1a	meta conglomerate and meta sandstone with metasiltstone
Intrusive rocks	MB	meta basalt	
	Gr	granitic rock	
	Db	diabase	








PL.I-1-9

## BRAZIL

### GEOLOGICAL SURVEY OF ANTA GORDA AREA PHASE III

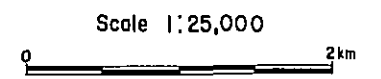
#### Geological Map of Survey Area



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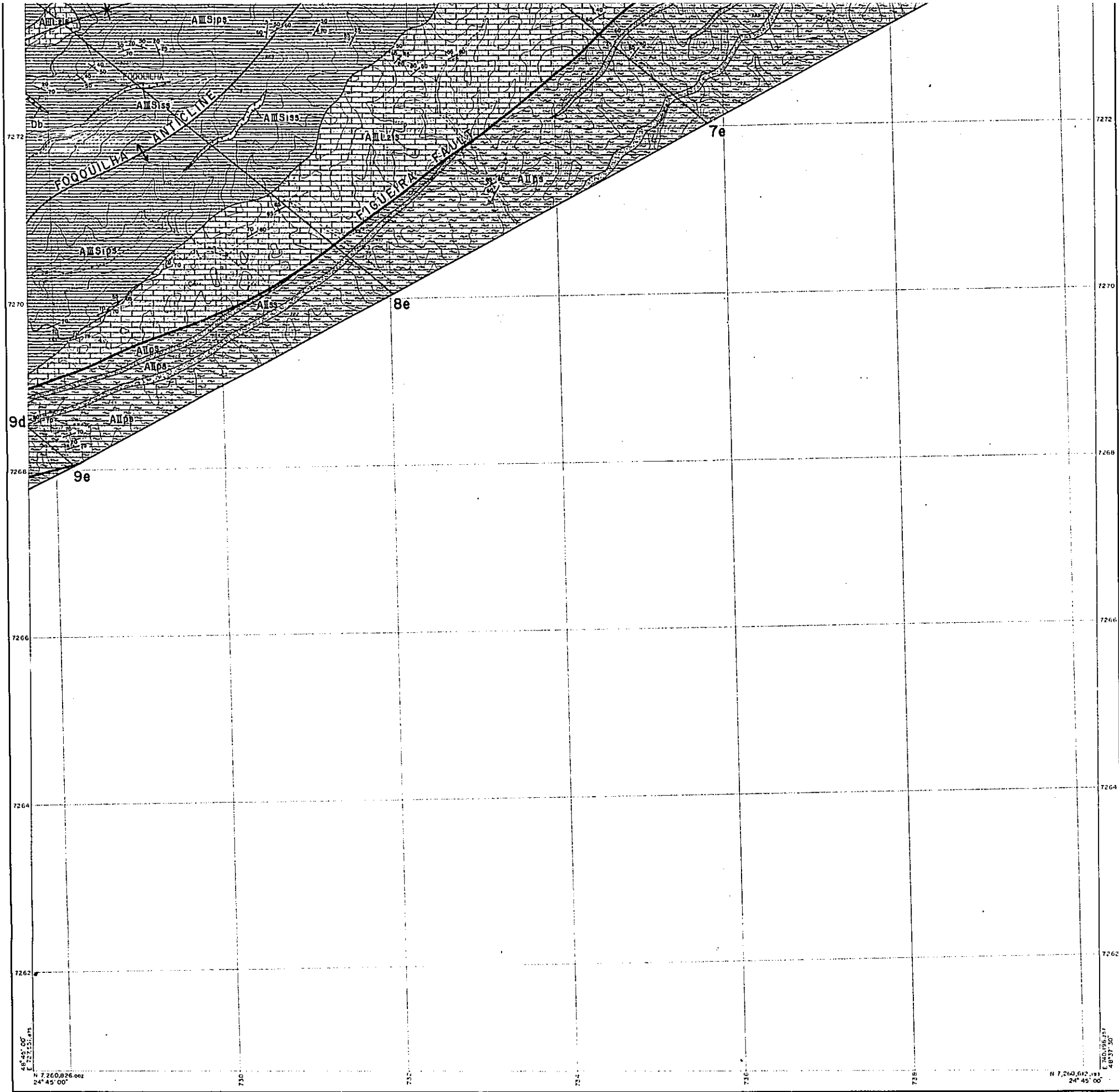
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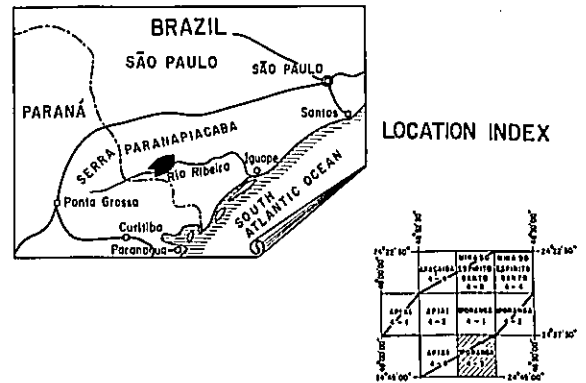


### LEGEND

Quaternary	Q	mud
Upper Precambrian Açungui Group	AMS15	white limestone
	AMS14	thin rhythmical alternation of meta siltstone and meta sandstone ("Gortubir")
	AMS13	mica schist - phyllite
	AMS12	white limestone ("Passo Vieira")
	AMS11	meta quartz sandstone with mica schist - phyllite ("Boa Vista")
	AMS10	mica schist and meta siltstone - meta sandstone
	AMS9	dolomite
	AMS8	alteration of pelitic limestone and mica schist - limestone (Furnas horizon)
	AMS7	mica schist - phyllite and meta sandstone with limestone
	AMS6	dolomite
	AMS5	alteration of limestone, calc-schist and mica schist - limestone with (Lagoado horizon)
	AMS4	mica schist, meta siltstone - meta sandstone
	AMS3	mica schist - phyllite
	AMS2	meta conglomerate and meta sandstone with metasiltstone
Açungui Formation I	AMS1	mica schist - phyllite
	AMS0	calc-schist - limestone and dolomite
	AM15	amphibolite - amphibole schist
	AM14	meta sandstone and meta conglomerate with phyllite
	AM13	phyllite - meta siltstone with meta conglomerate - meta sandstone
	AM12	meta diabase - meta basalt
Intrusive rocks	Mb	meta basalt
	Gr	granitic rock
	Db	diabase



Geological Map of Survey Area



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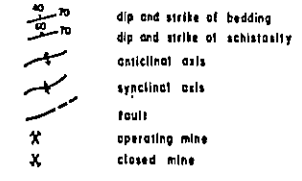
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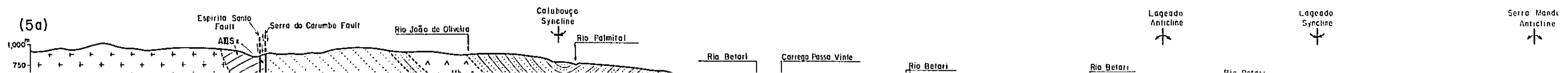
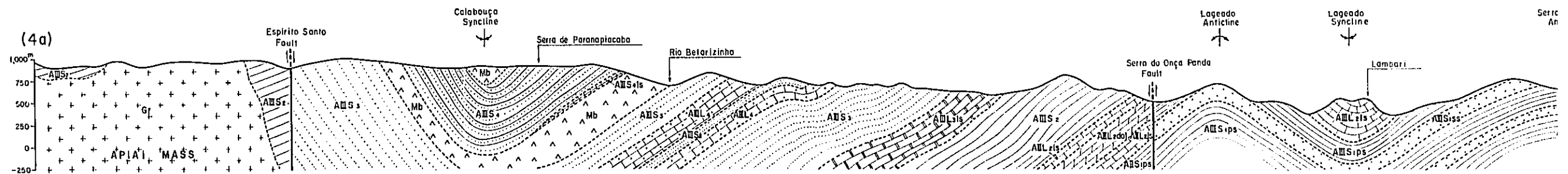
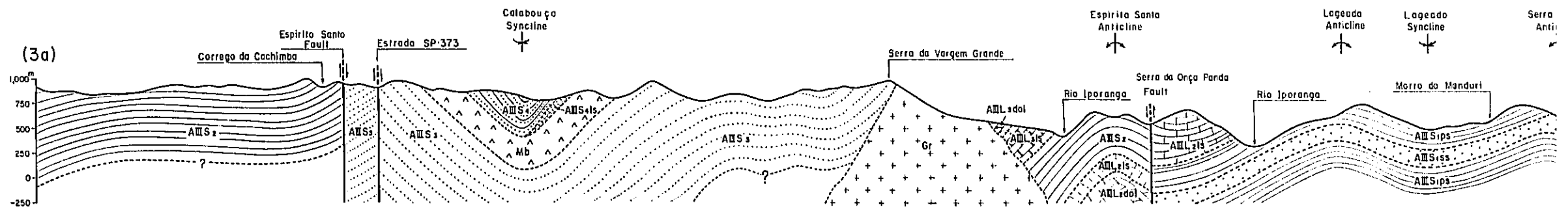
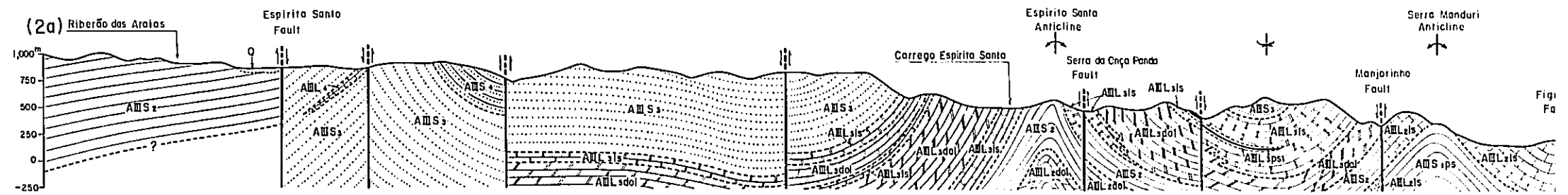
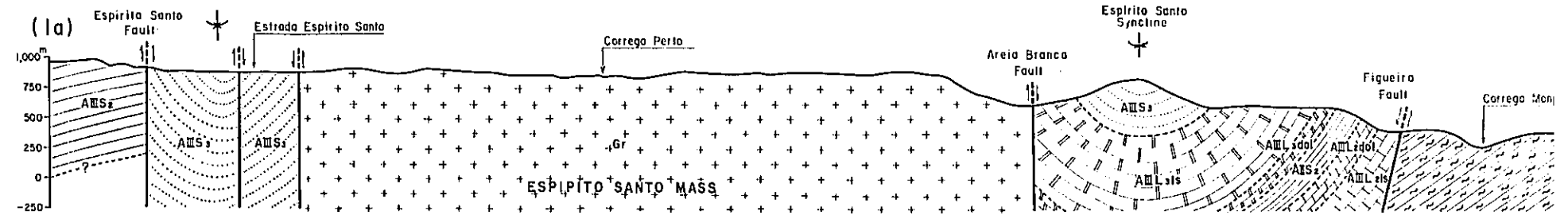
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LEGEND

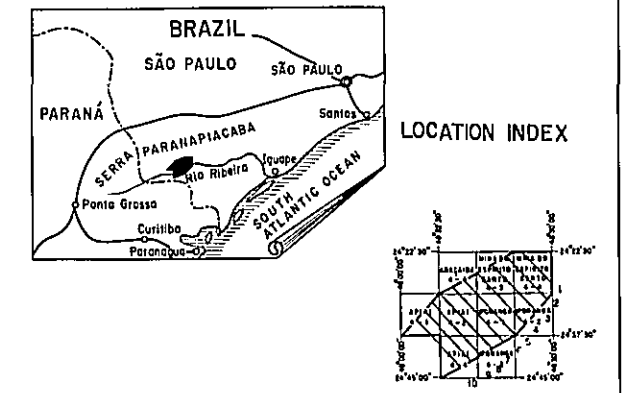
Quaternary	Q	mud
Upper Precambrian	AMS4s	white limestone
	AMS4	thin rhythmical alternation of meta siltstone and meta sandstone ("Gortubira")
	AML4s	mica schist - phyllite
	AML4	white limestone ("Passo Verde")
	AMS3s	meta quartz sandstone with mica schist - phyllite ("Boa Vista")
	AMS3	mica schist and meta siltstone - meta sandstone
	AML3s	dolomite
	AML3	alternation of pelitic limestone and mica schist - limestone (Furnas) horizon
	AMS2s	mica schist - phyllite and meta sandstone with limestone
	AMS2	dolomite
	AML2s	alternation of limestone, calc-schist and mica schist - limestone with (Logenda) horizon
	AML2	mica schist, meta siltstone - meta sandstone
	AMS1s	mica schist - phyllite
	AMS1	meta conglomerate and meta sandstone with meta siltstone
	Intrusive rocks	Mb
Gr		granitic rock
Db		diabase





BRAZIL  
GEOLOGICAL SURVEY  
OF  
ANTA GORDA AREA  
PHASE III

Geological Profile of Survey Area

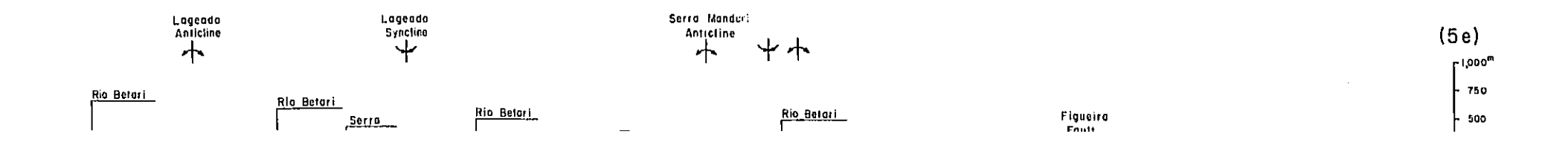
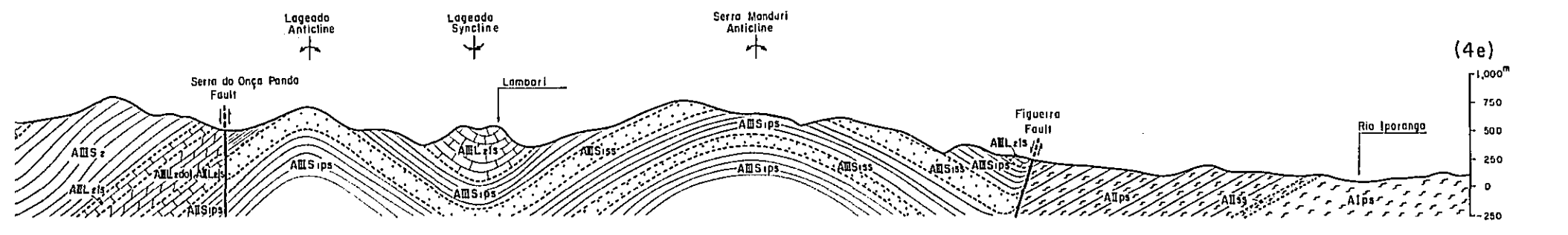
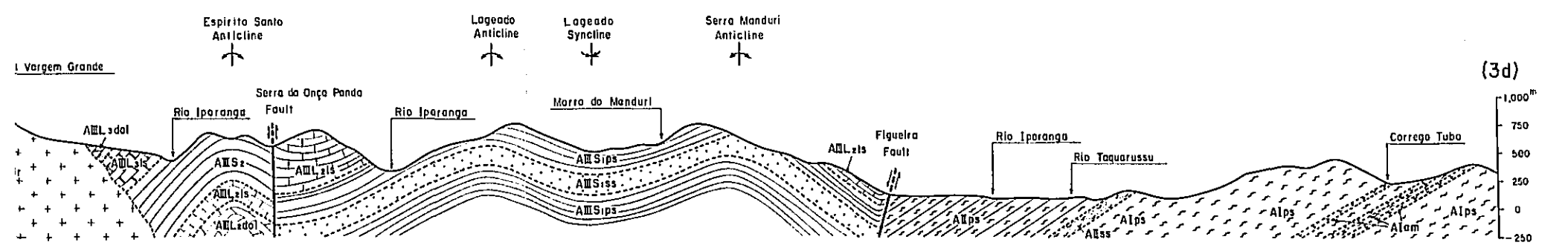
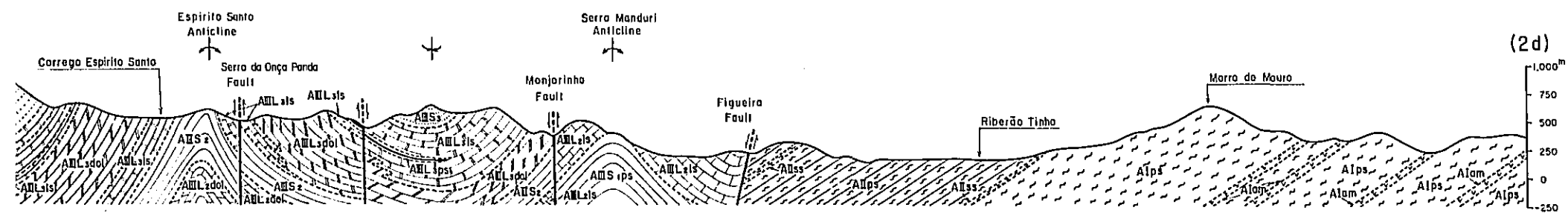
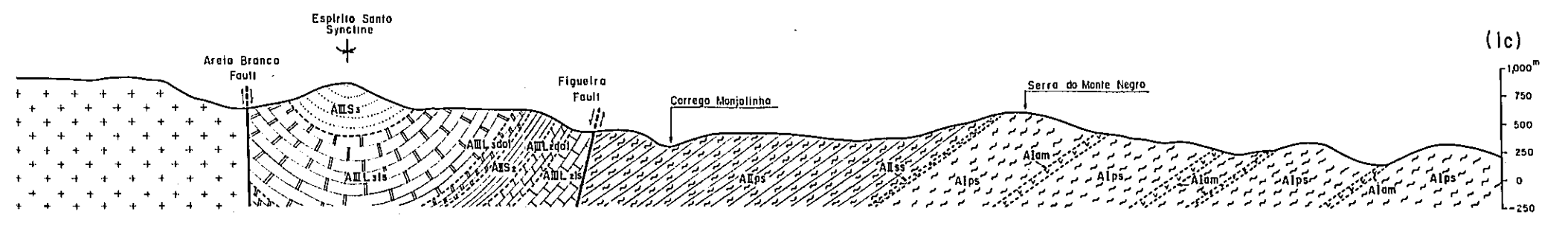


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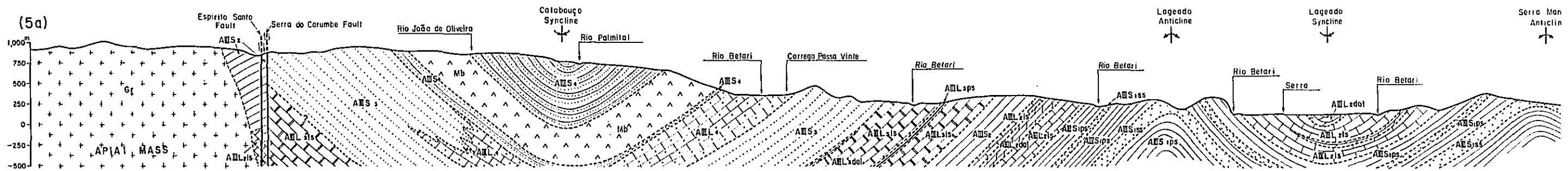
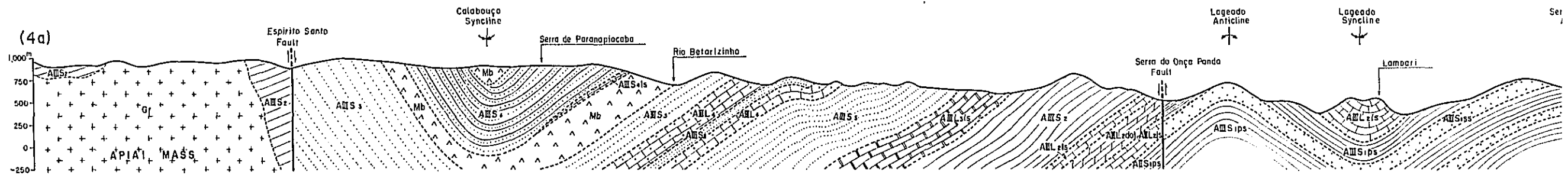
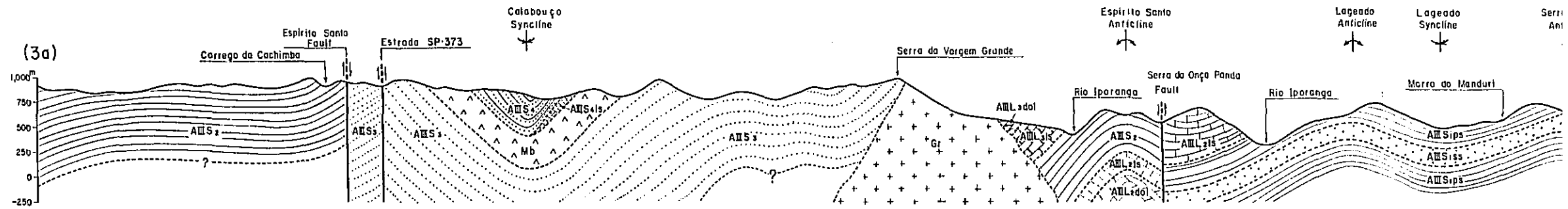
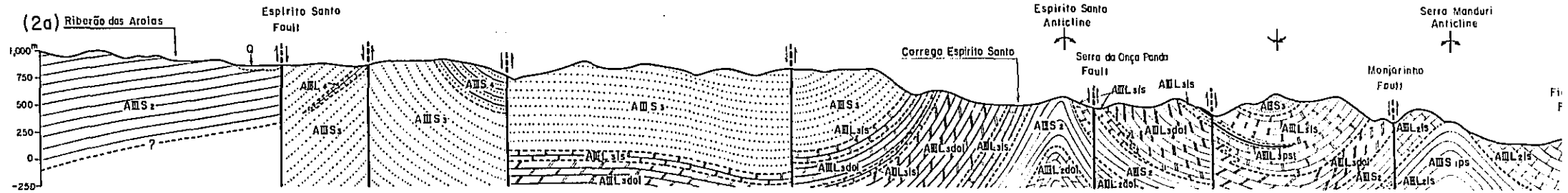
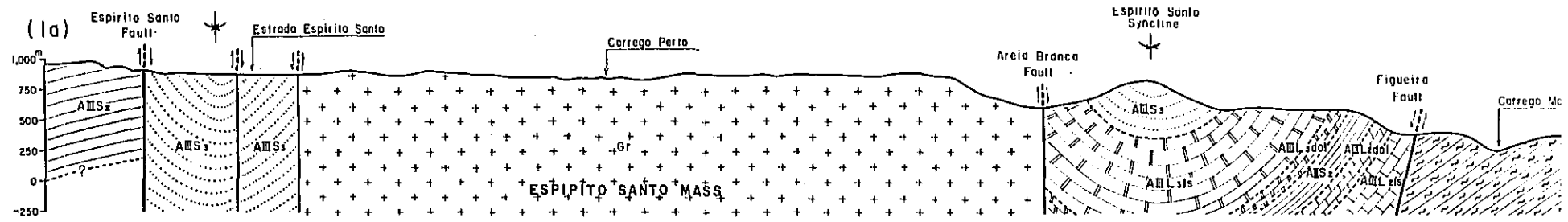
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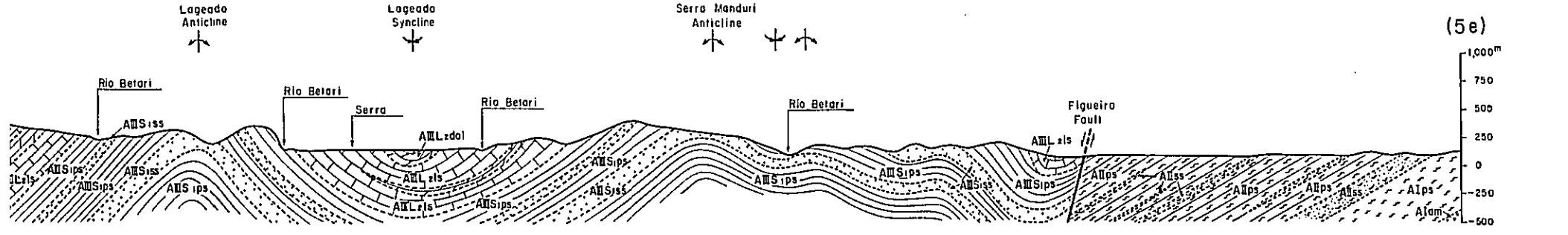
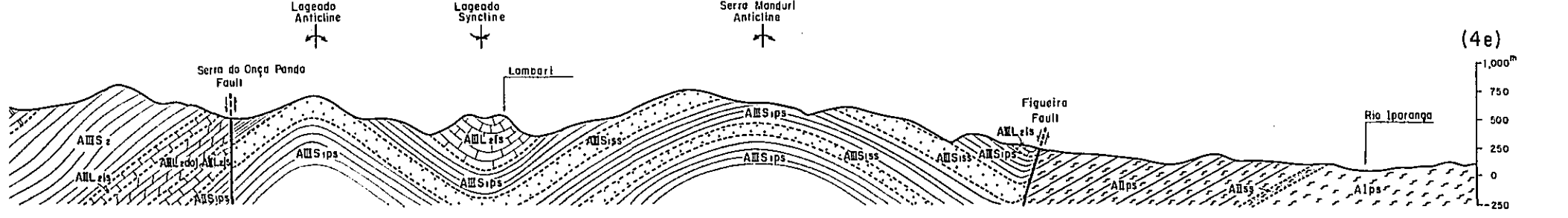
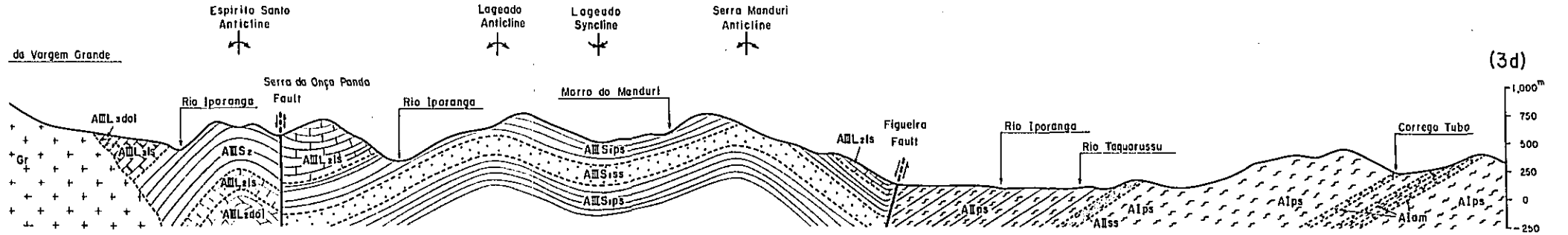
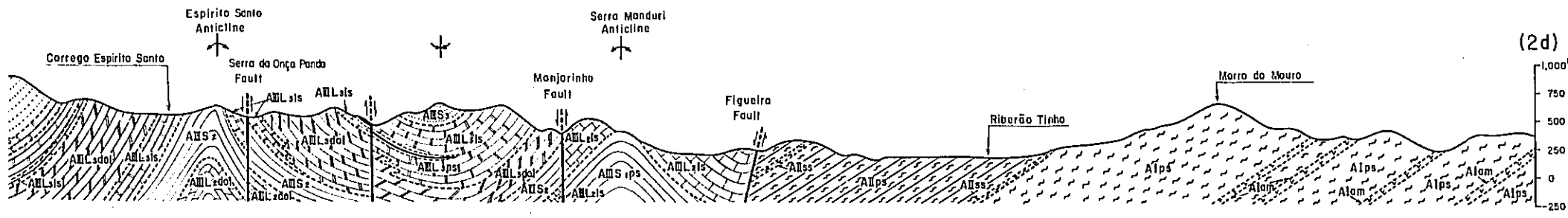
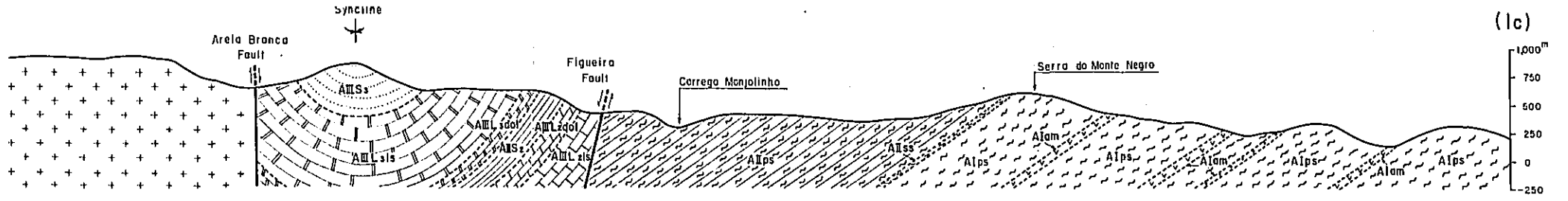
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LEGEND

Quaternary	Q	mud	
Upper Precambrian	Acungui Formation III	AMS4s	white limestone
		AMS4	thin rhythmical alternation of meta siltstone and meta sandstone ("Gortulite")
		AML4s	mica schist - phyllite
		AML4	white limestone ("Passo Vinte")
		AMS3s	meta quartz sandstone with mica schist - phyllite ("Boa Vista")
		AML3s	mica schist and meta siltstone - meta sandstone
		AML3	dolomite
	Acungui Formation II	AML2s	alteration of pelitic limestone and mica schist - limestone (Fuadas horizon)
		AMS2	mica schist - phyllite and meta sandstone with limestone
		AML2	dolomite
		AML1s	alteration of limestone, calc-schist and mica schist - limestone with (Lageado horizon)
		AMS1s	mica schist, meta siltstone - meta sandstone
		AMS1	mica schist - phyllite
		AMS1e	meta conglomerate and meta sandstone with metasiltstone
Acungui Formation I	AMS	mica schist - phyllite	
	AML	calc-schist - limestone and dolomite	
	AMC	amphibolite - amphibole schist	
	AMS	meta sandstone and meta conglomerate with phyllite	
	Alps	phyllite - meta siltstone with meta conglomerate - meta sandstone	
Intrusive rocks	Alam	meta diabase - meta basalt	
	Mb	meta basite	
	Gr	granitic rock	
	Db	diabase	





### PHASE III

## Geological Profile of Survey Area

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Scale 1:25,000

### LEGEND

Quaternary	O	mud		
Upper Precambrian	Apungui Group	Apungui Formation II	AMS4b	white limestone
			AMS4	thin rhythmical alternation of meta siltstone and meta sandstone ("Corrubir")
			AMLps	mica schist - phyllite
			ANL4	white limestone ("Passo Verde")
			AMSs	meta quartz sandstone with mica schist - phyllite ("Boa Vista")
			AMLps	mica schist and meta siltstone - meta sandstone
		Apungui Formation I	AMLdol	dolomite
			AMLps	alternation of pelitic limestone and mica schist - limestone (Fuznes horizon)
			AMSs	mica schist - phyllite and meta sandstone with limestone
			AMLps	dolomite
			AMSs	alternation of limestone, calc-schist and mica schist - limestone with (Lageado horizon)
			AMLps	mica schist, meta siltstone - meta sandstone
Intrusive rocks	AMSs	mica schist - phyllite		
	AMSs	meta conglomerate and meta sandstone with metasiltstone		
	Alps	mica schist - phyllite		
	Alca	calc-schist - limestone and dolomite		
	Alam	amphibolite - amphibole schist		
	Alps	meta sandstone and meta conglomerate with phyllite		
	Alps	phyllite - meta siltstone with meta conglomerate - meta sandstone		
	Alam	meta diabase - meta basalt		
	Mb	meta basite		
	Gr	granitic rock		
	Db	diabase		

40 70 dip and strike of bedding

40 70 dip and strike of schistosity

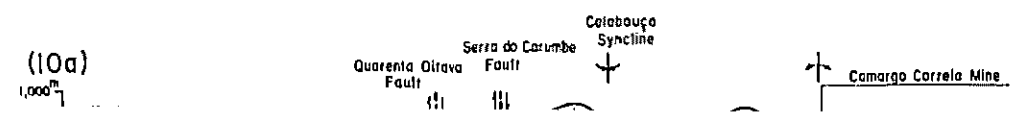
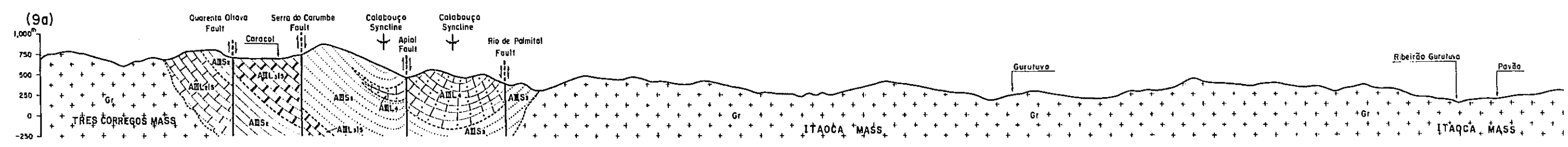
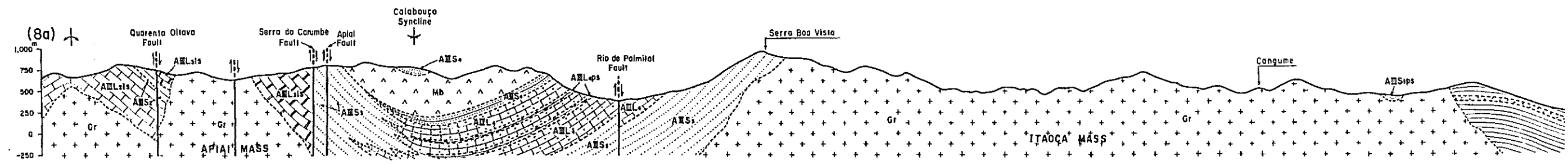
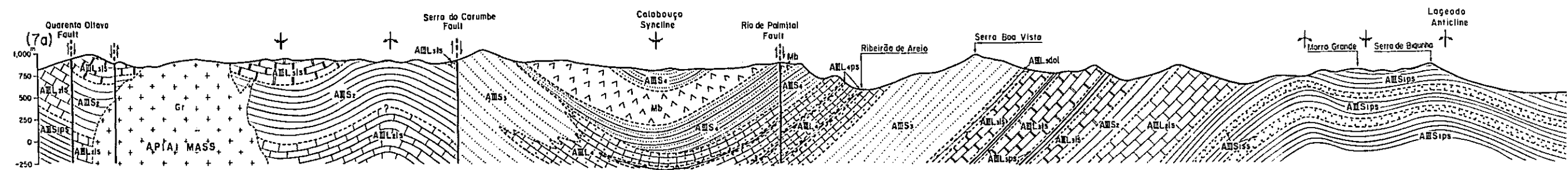
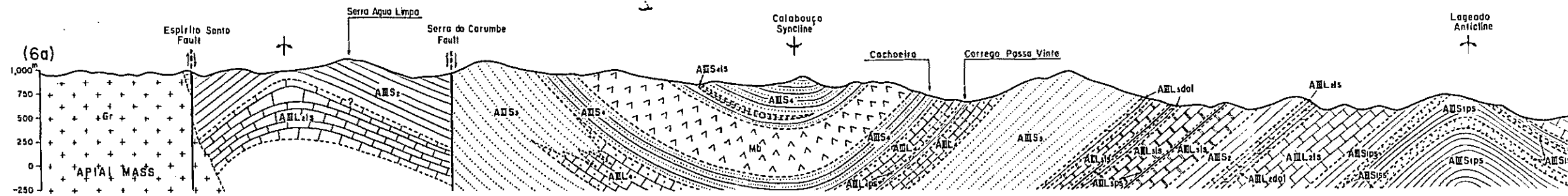
↑ antichlinal axis

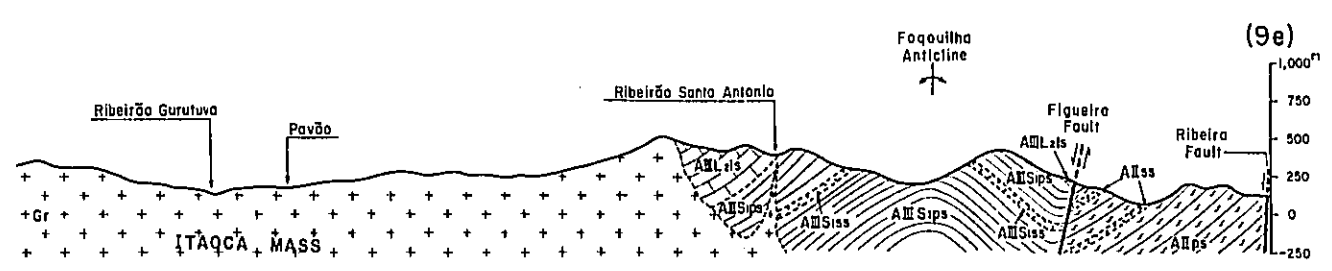
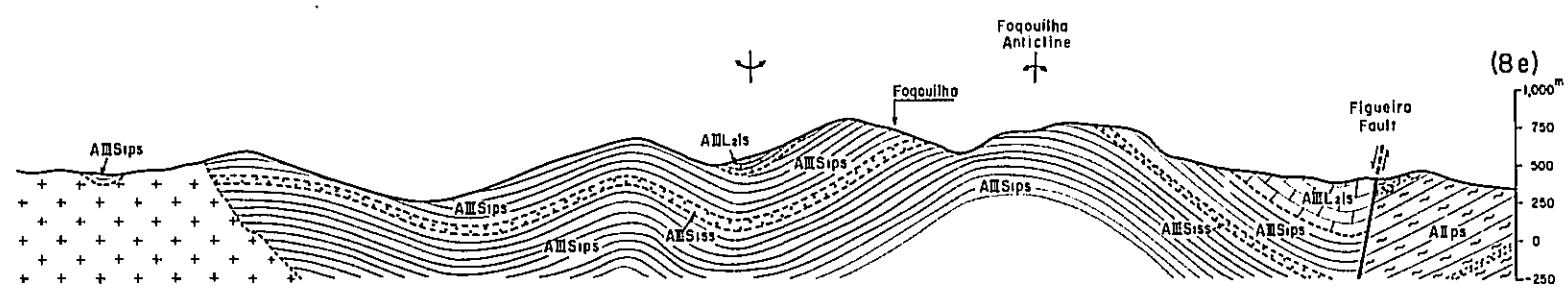
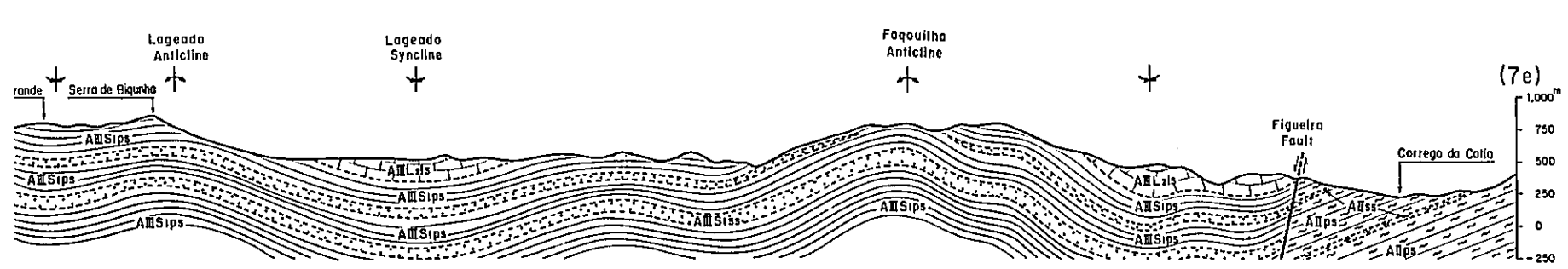
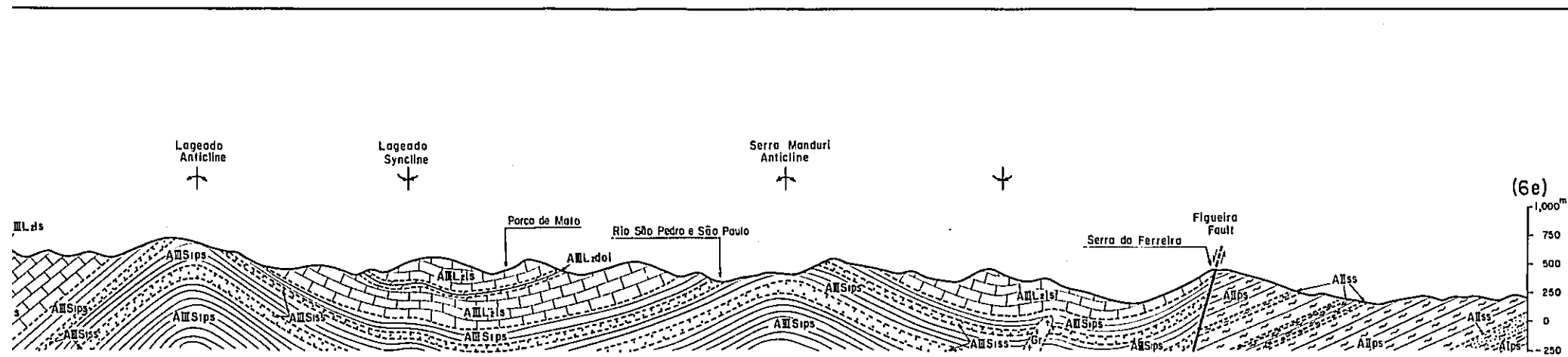
↓ synclinal axis

— fault

X operating mine

• closed mine






(10d)  
1,000m

PL. I-2-2

## BRAZIL

### GEOLOGICAL SURVEY OF ANTA GORDA AREA PHASE III

### Geological Profile of Survey Area

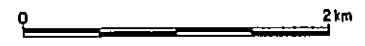


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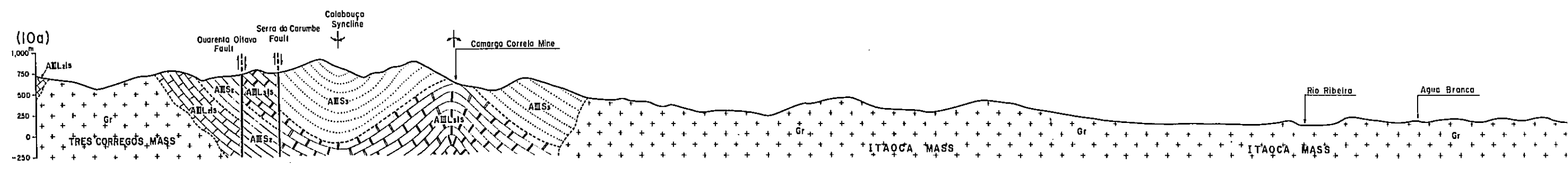
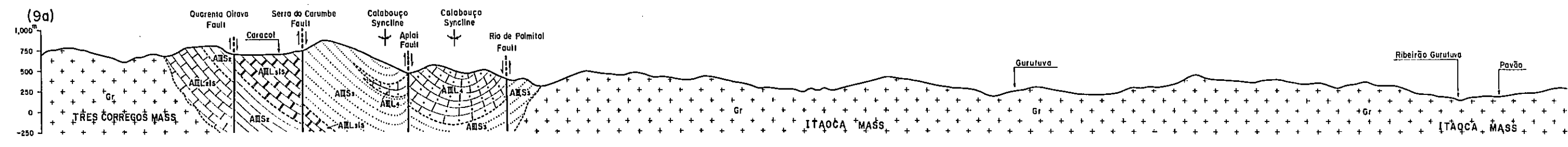
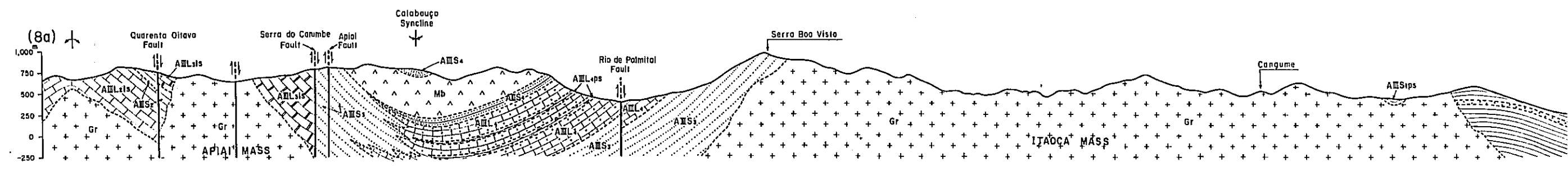
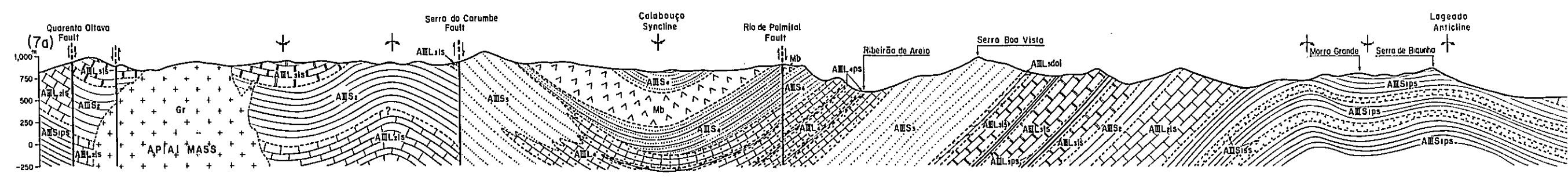
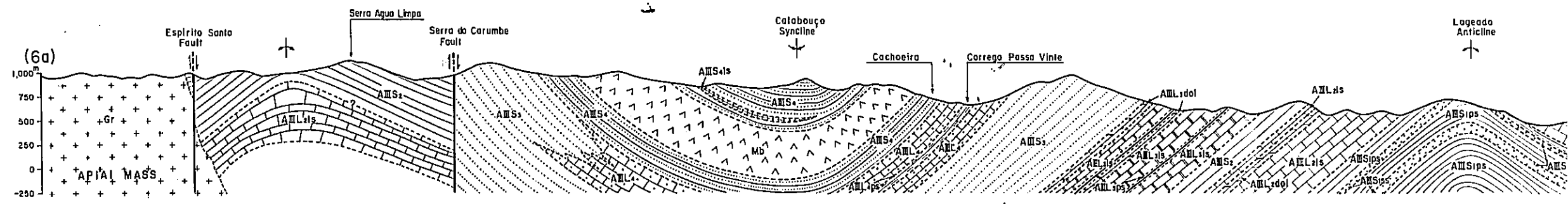
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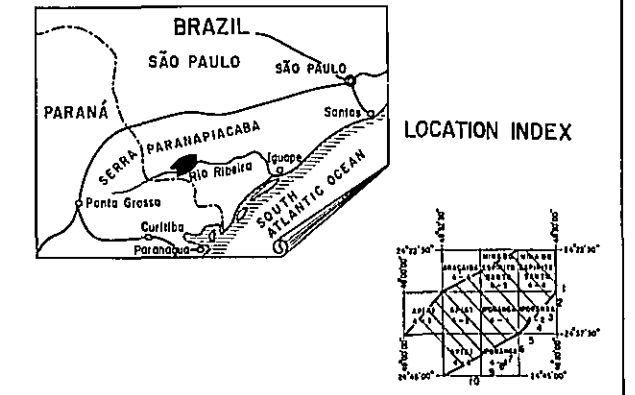
### LEGEND

Upper Precambrian	Açungui Group	Açungui Formation II	Q	mud
			AQSls	white limestone
			AMS4	thin rhythmical alternation of meta siltstone and meta sandstone ("Corubia")
			AMLps	mica schist - phyllite
			AML4	white limestone ("Passo Verde")
			AMS3	meta quartz sandstone with mica schist - phyllite ("Boa Vista")
			AMLsp	mica schist and meta siltstone - meta sandstone
			AMLsd	dolomite
			AMLlt	alternation of pelitic limestone and mica schist - limestone (Furnas horizon)
			AMS2	mica schist - phyllite and meta sandstone with limestone
			AMLs	dolomite
			AMLds	alternation of limestone, calc-schist and mica schist - limestone with (Lageado horizon)
			AMS1	mica schist - phyllite
			AMSs	meta conglomerate and meta sandstone with metasiltstone
			Açungui Formation I	AIIps
AIIcs	calc-schist - limestone and dolomite			
AIIam	amphibolite - amphibole schist			
AIIss	meta sandstone and meta conglomerate with phyllite			
AIIps	phyllite - meta siltstone with meta conglomerate - meta sandstone			
Intrusive rocks	AIIam	meta diabase - meta basalt		
	Mb	meta basalt		
	Gr	granitic rock		





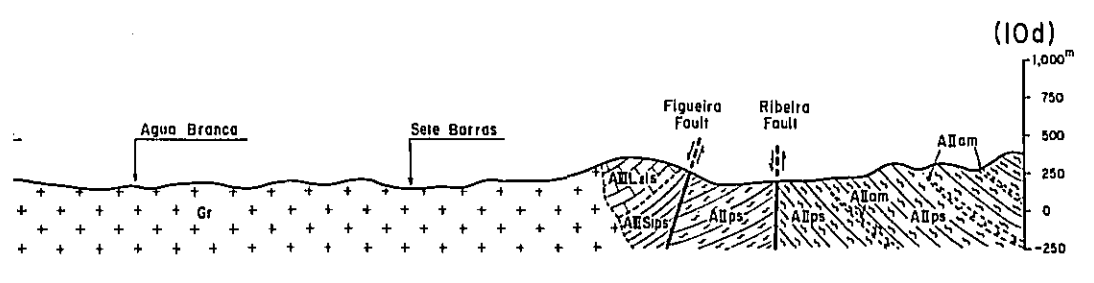
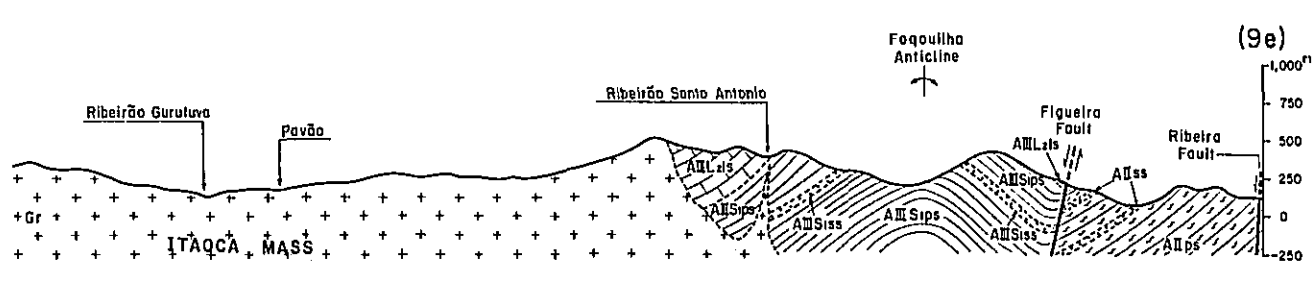
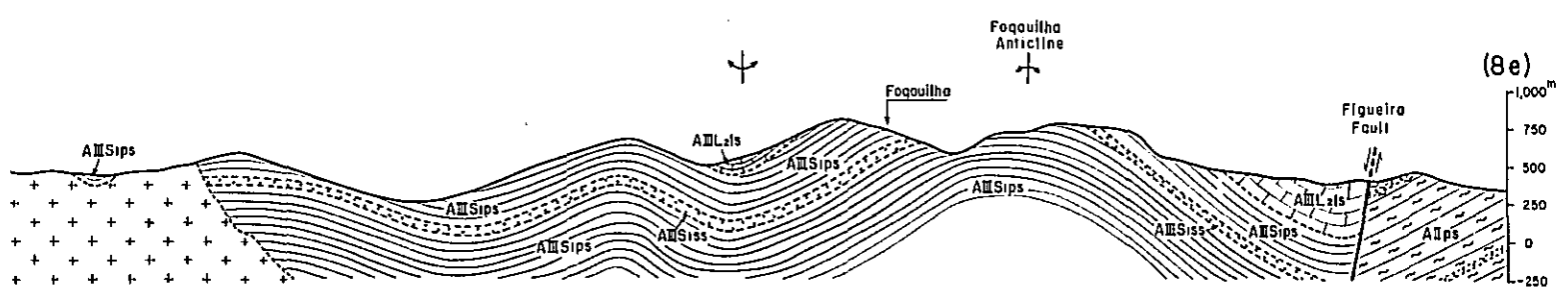
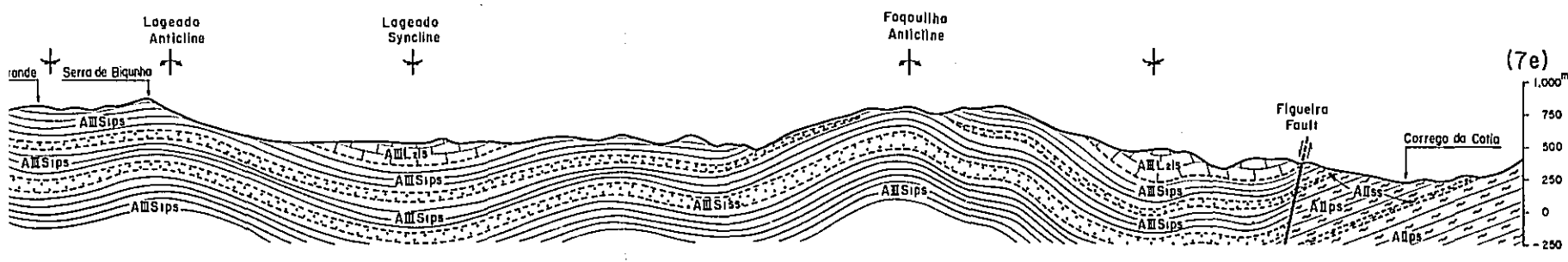
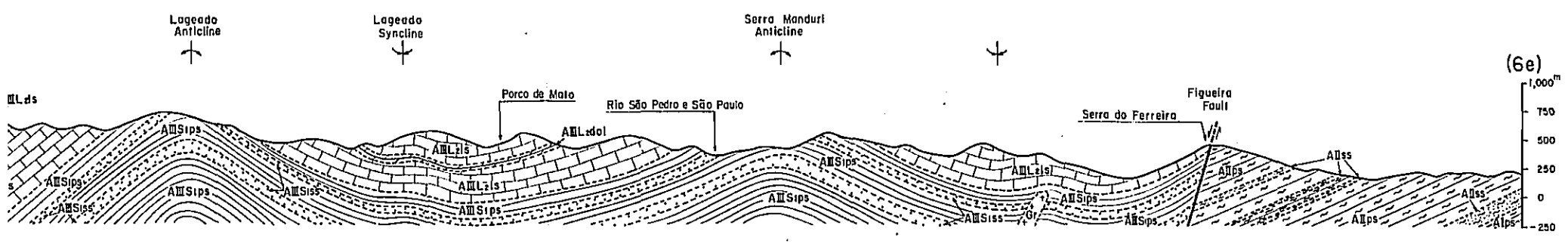
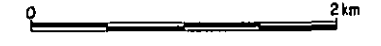
ANTA GORDA AREA  
PHASE III  
Geological Profile of Survey Area



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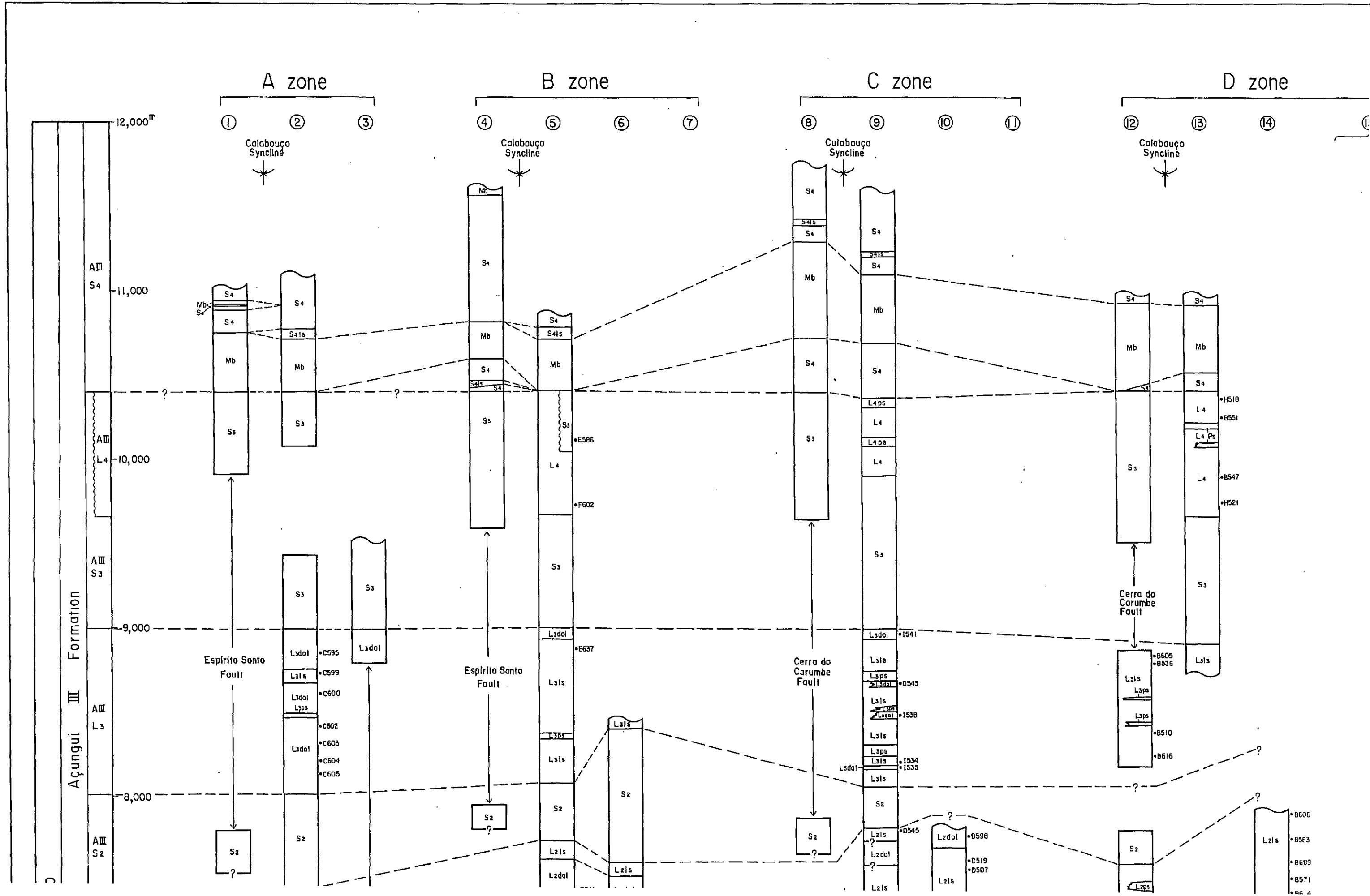


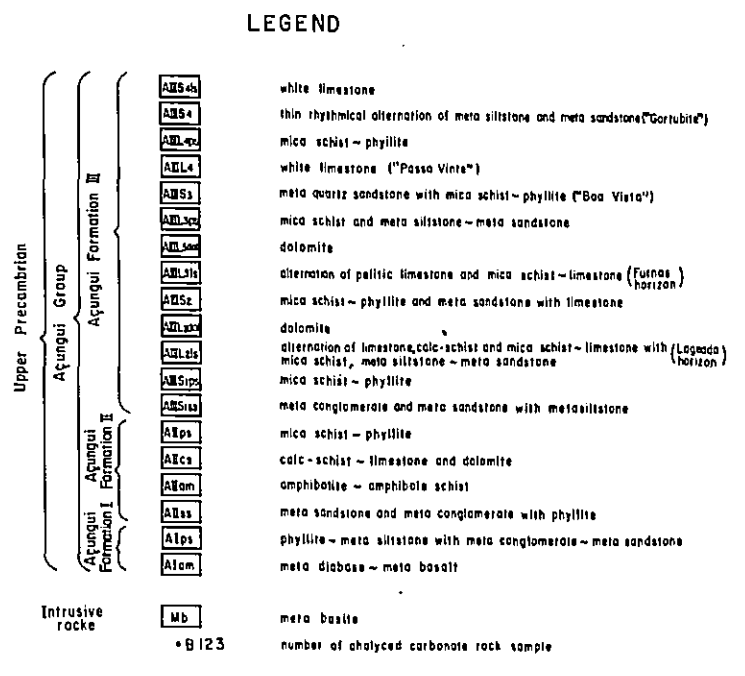
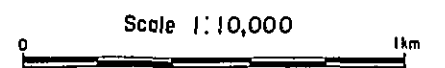
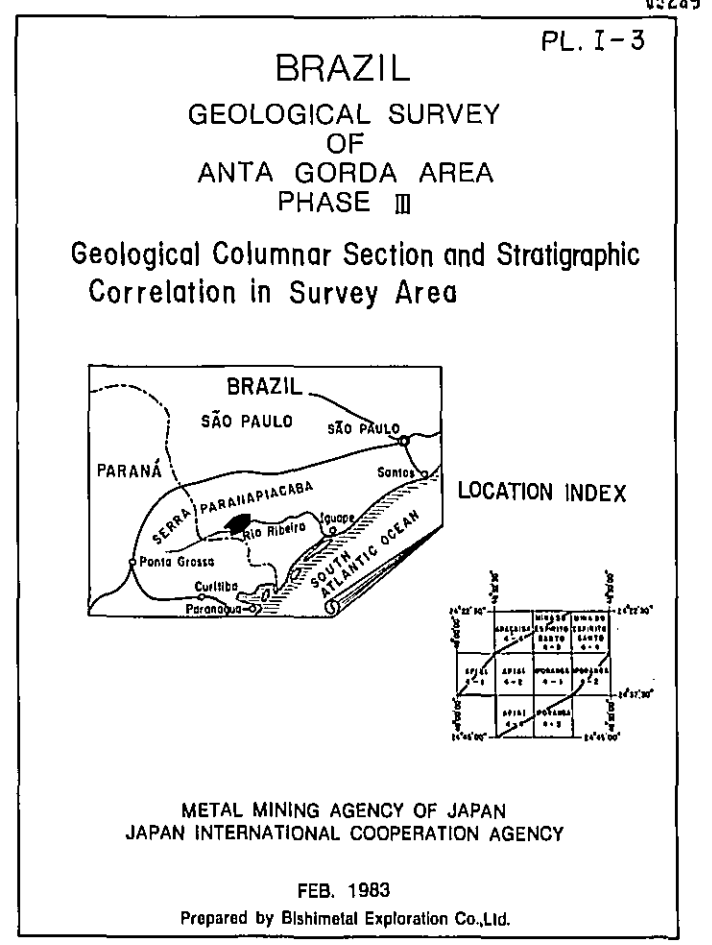
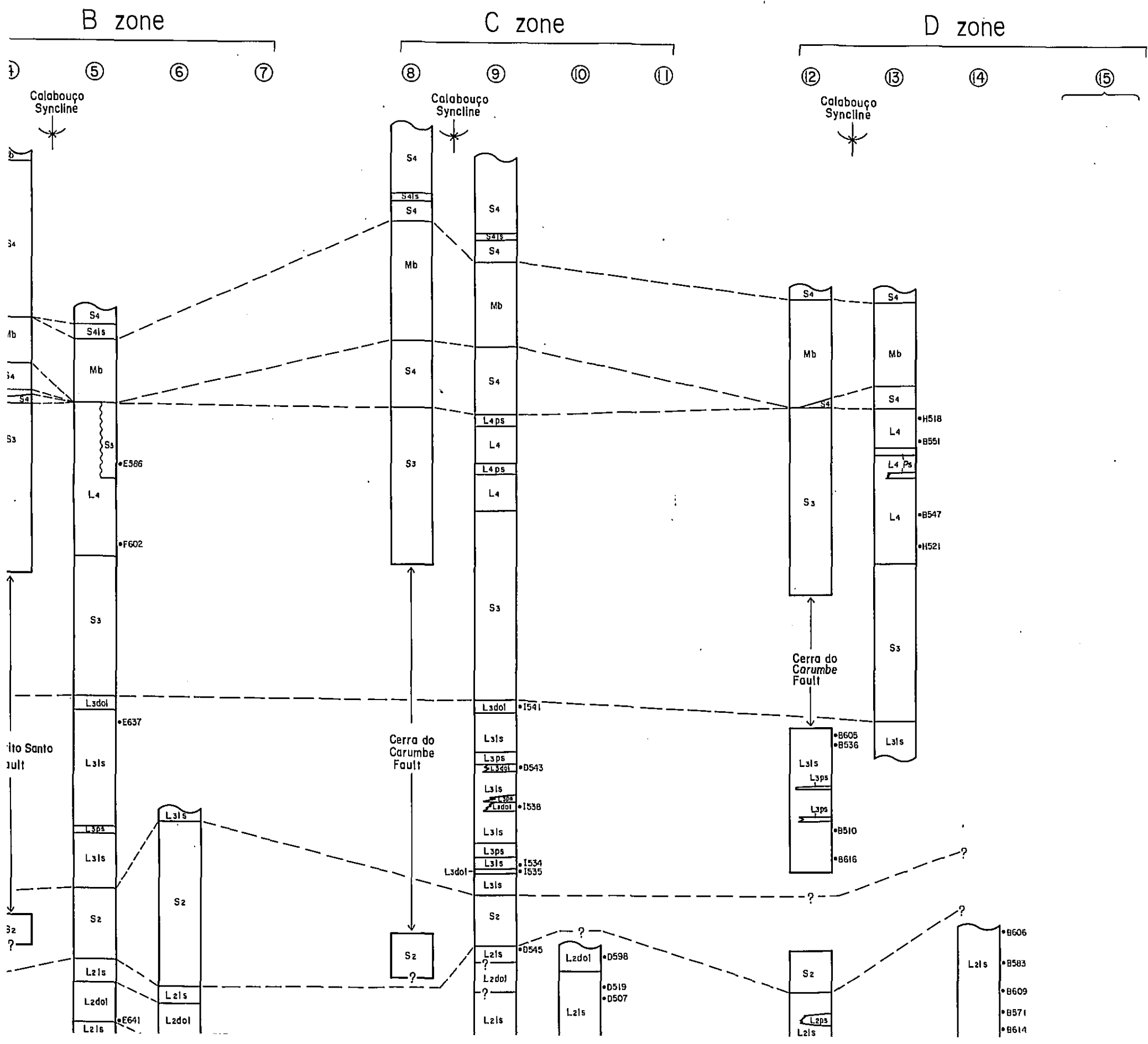
**LEGEND**

Quaternary	0	mud
Upper Precambrian	AMS4h	white limestone
	AMS4	thin rhythmical alternation of meta siltstone and meta sandstone ("Dortubite")
	AML4p	mica schist - phyllite
	AML4s	white limestone ("Passo Verde")
	AMS3	meta quartz sandstone with mica schist - phyllite ("Boa Vista")
	AML3p	mica schist and meta siltstone - meta sandstone
	AML3s	dolomite
	AML3h	alternation of pelitic limestone and mica schist - limestone (Furnas horizon)
	AMS2	mica schist - phyllite and meta sandstone with limestone
	AML2	dolomite
	AML2h	alternation of limestone, calc-schist and mica schist - limestone with Logeado horizon
	AMS1	mica schist, meta siltstone - meta sandstone
	AML1p	mica schist - phyllite
	AMS1s	meta conglomerate and meta sandstone with meta siltstone
Acungui Formation I	AMS1	mica schist - phyllite
	AMS1	meta sandstone and meta conglomerate with phyllite
	AMS1	phyllite - meta siltstone with meta conglomerate - meta sandstone
	AMS1	meta diabase - meta basalt
	Intrusive rocks	Mb
Gr		granitic rock
Db		diabase

	dip and strike of bedding
	dip and strike of schistosity
	anticlinal axis
	synclinal axis
	fault
	operating mine
	closed mine

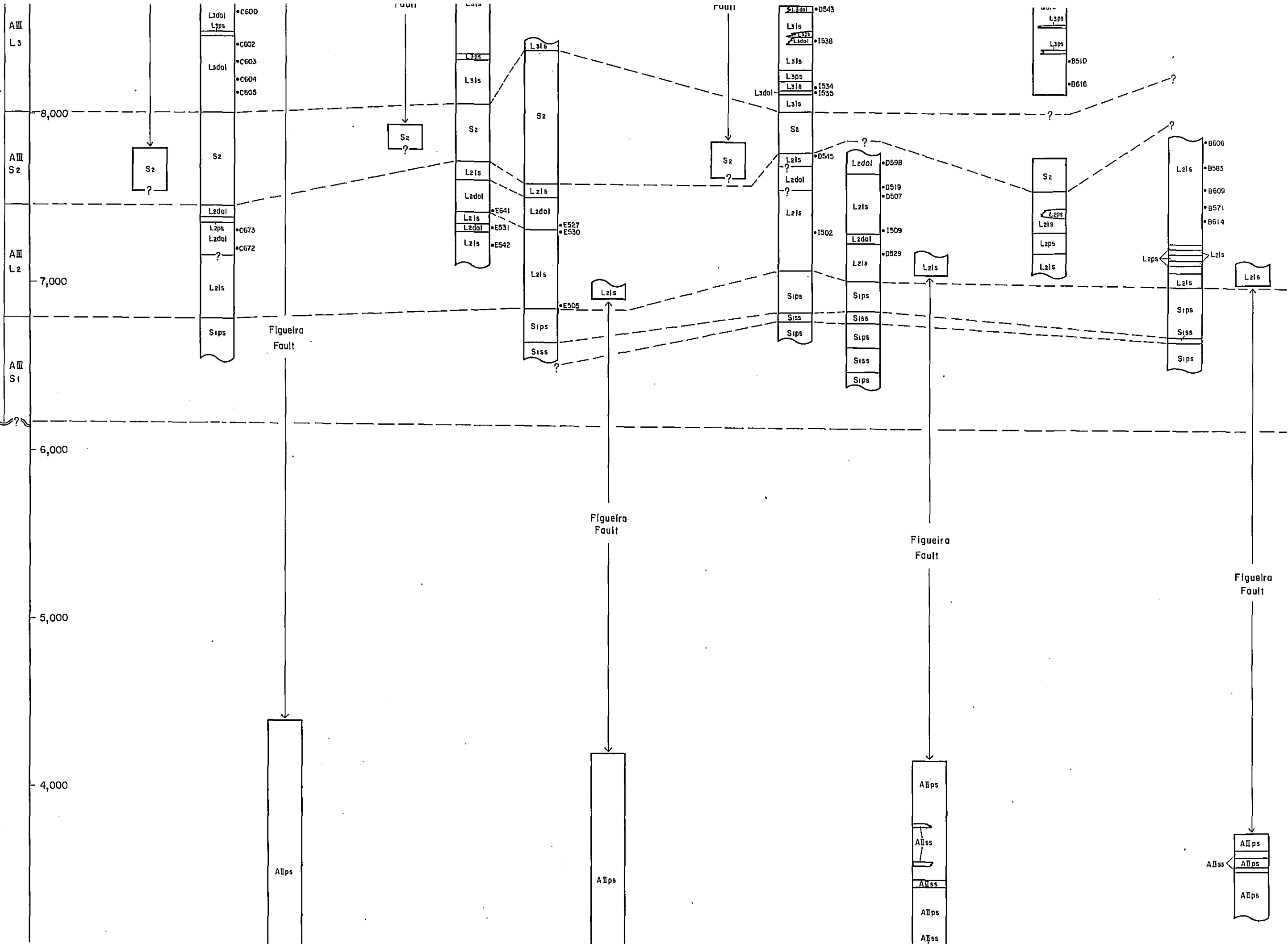


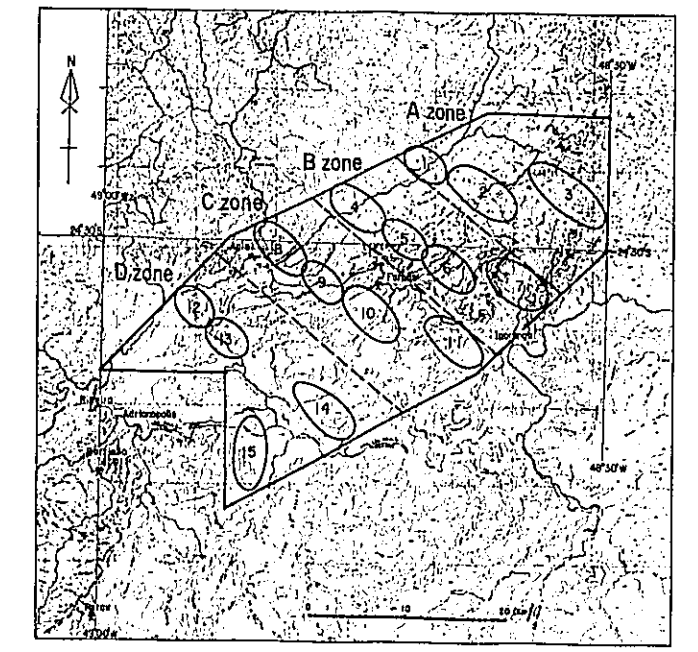
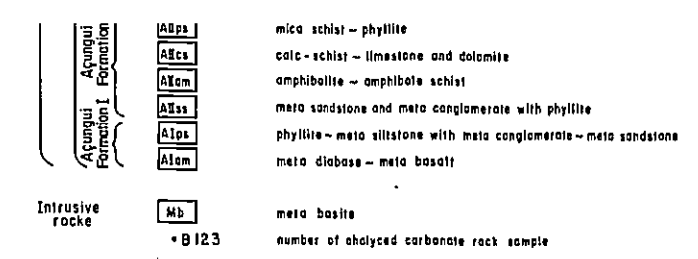
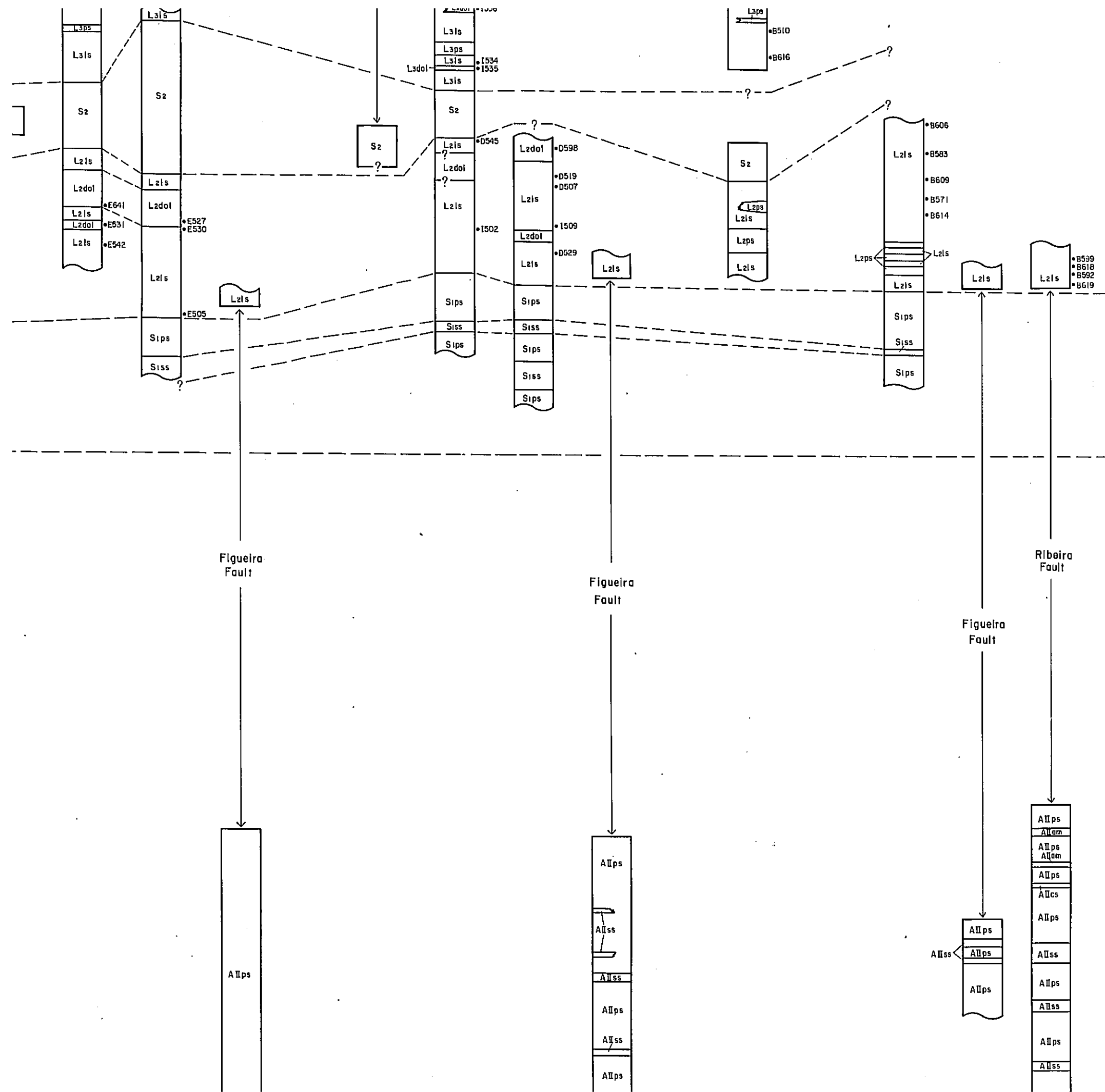


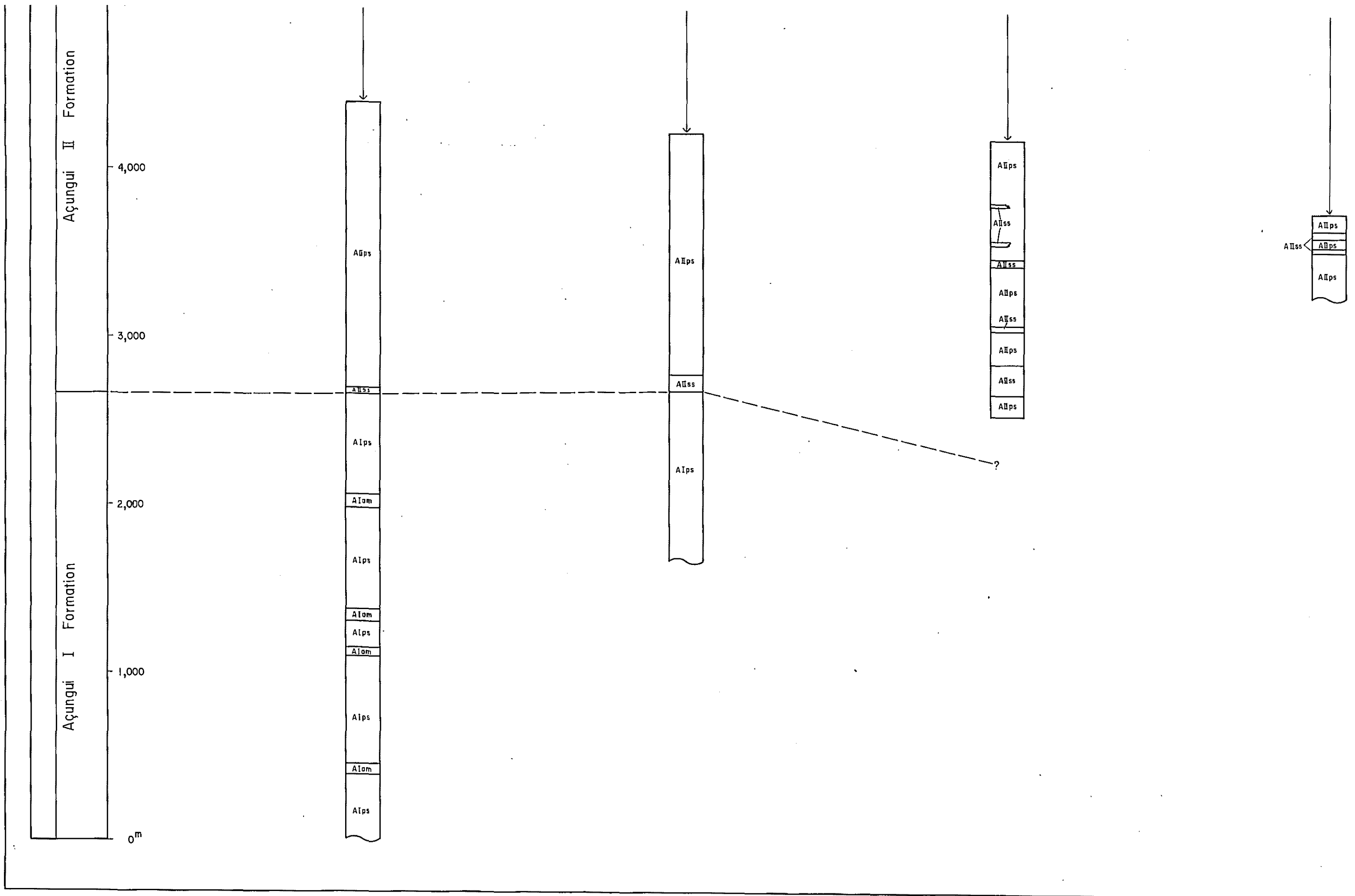
Açungui Group

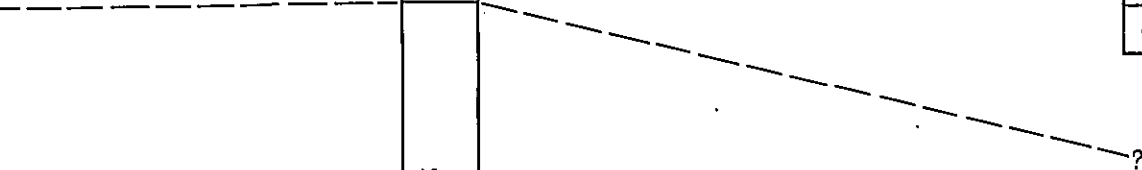
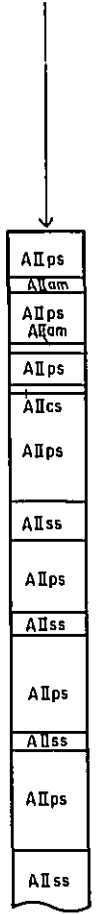
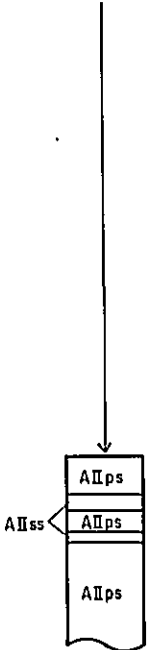
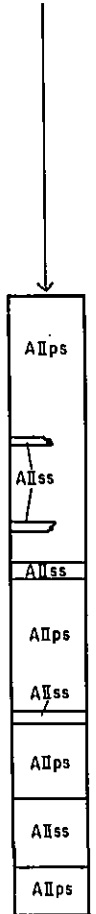
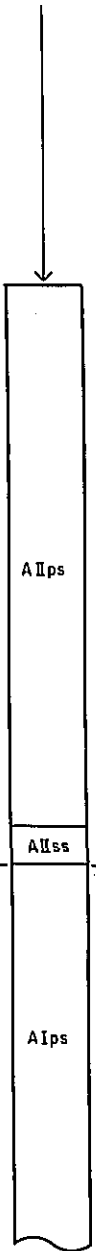
Açungui III

Açungui II Formation

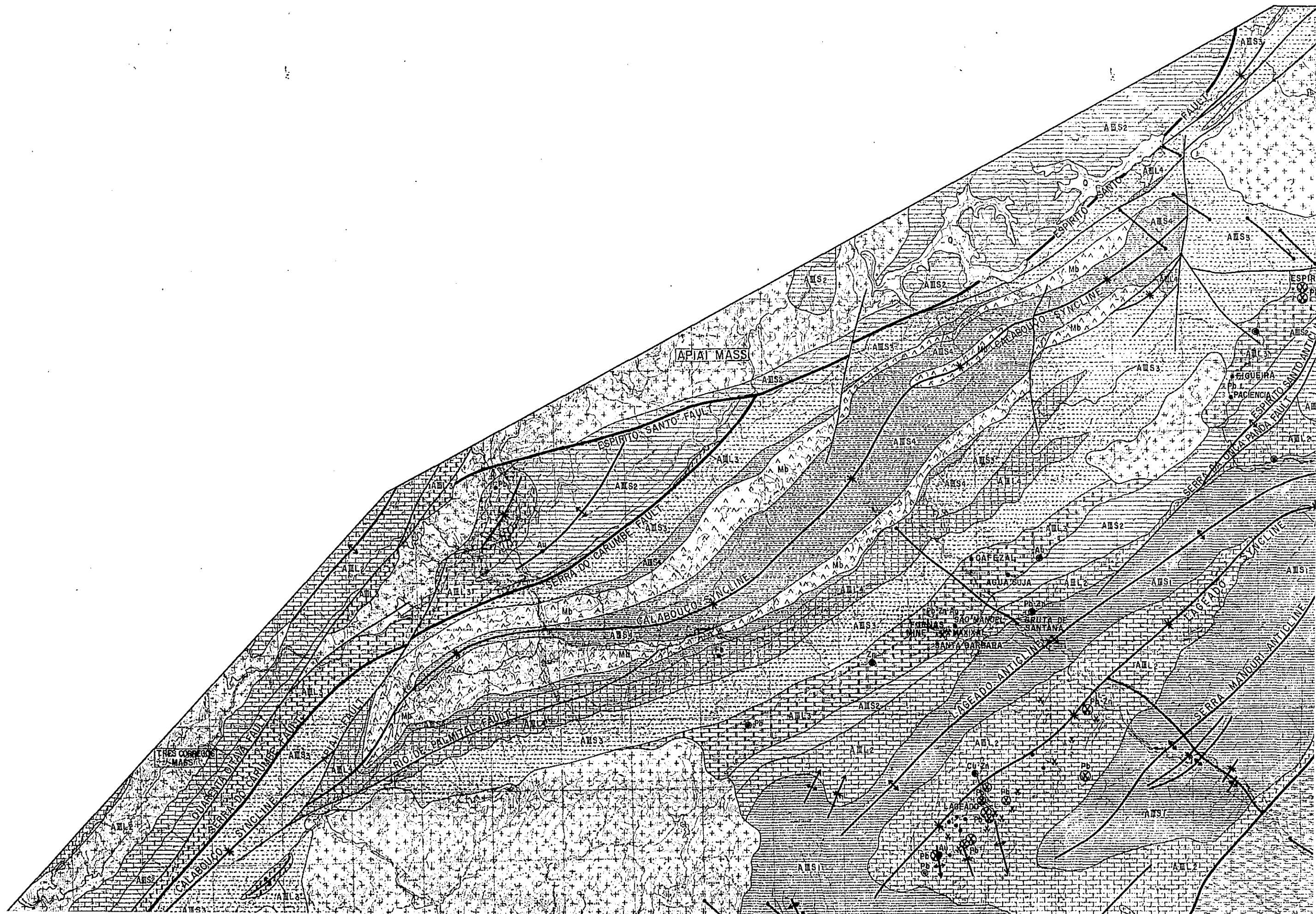






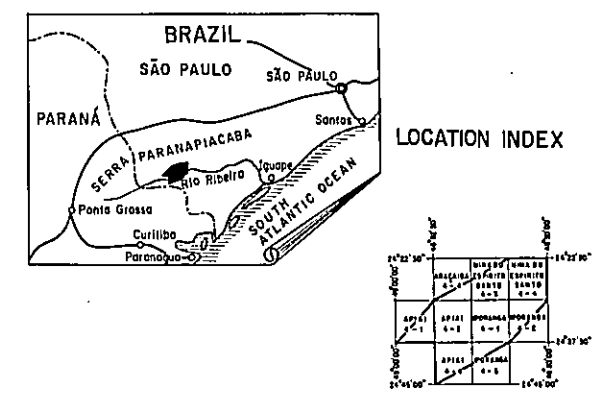






# BRAZIL GEOLOGICAL SURVEY OF ANTA GORDA AREA PHASE III

## Relation Map between Mineralization and Geological Structure in Survey Area



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Scale 1:50,000



### LEGEND

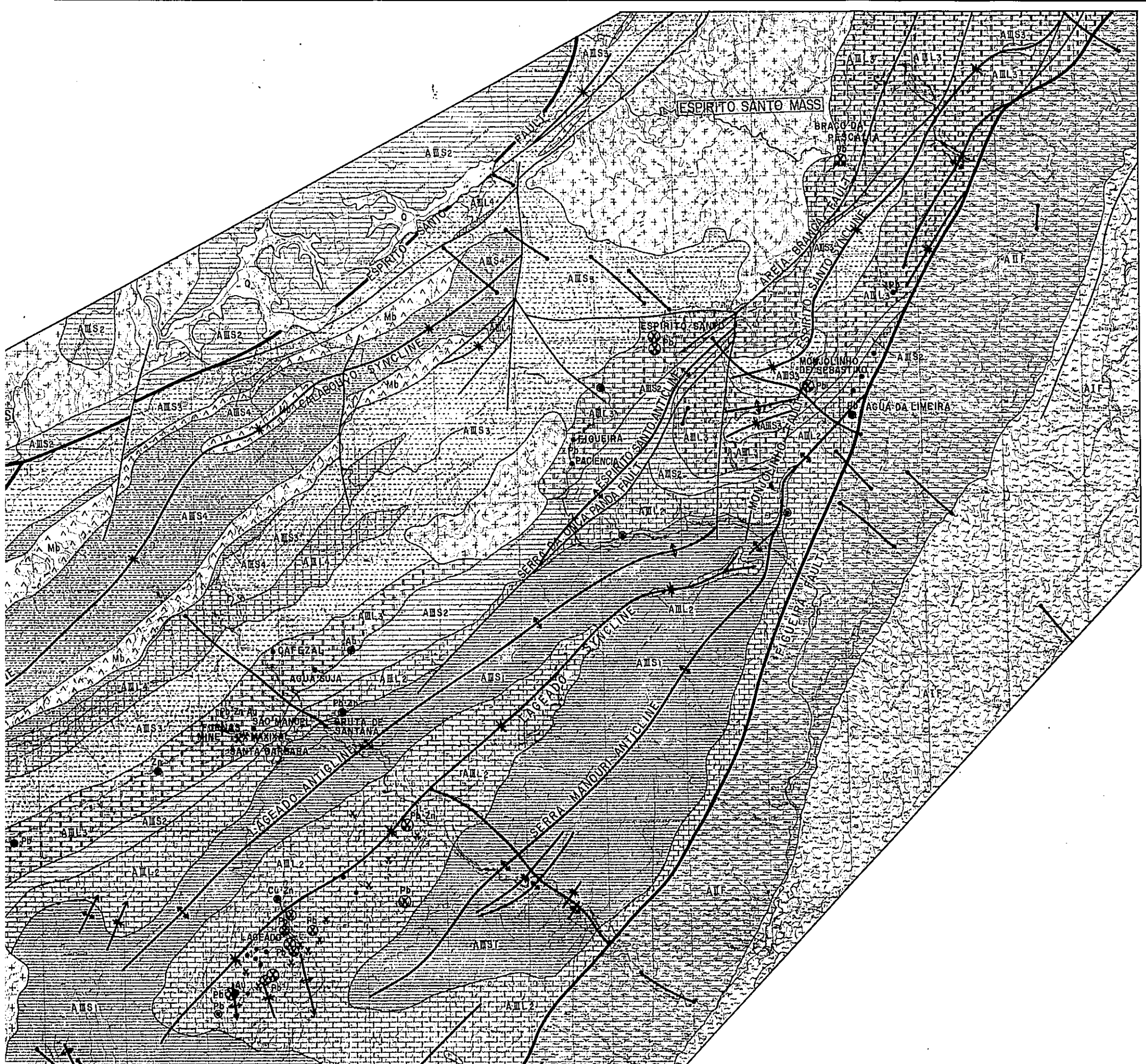
Quaternary	Q	mud	
Upper Precambrian	Açungui Formation II	AMS4	meta siltstone, meta sandstone
		AML4	limestone
		AMS3	meta quartz sandstone
		AML3	limestone with dolomite, mica schist and meta siltstone
	Açungui Formation I	AMS2	mica schist - phyllite with meta sandstone
		AML2	limestone and dolomite with mica schist and meta siltstone
		AMS1	mica schist - phyllite and meta sandstone
		AIF	mica schist - phyllite with meta sandstone, amphibole schist and calc-schist - limestone
Intrusive rocks	AIF	mica schist with meta sandstone and meta basalt	
	Mb	meta basite	
		granitic rock	
		diabase	

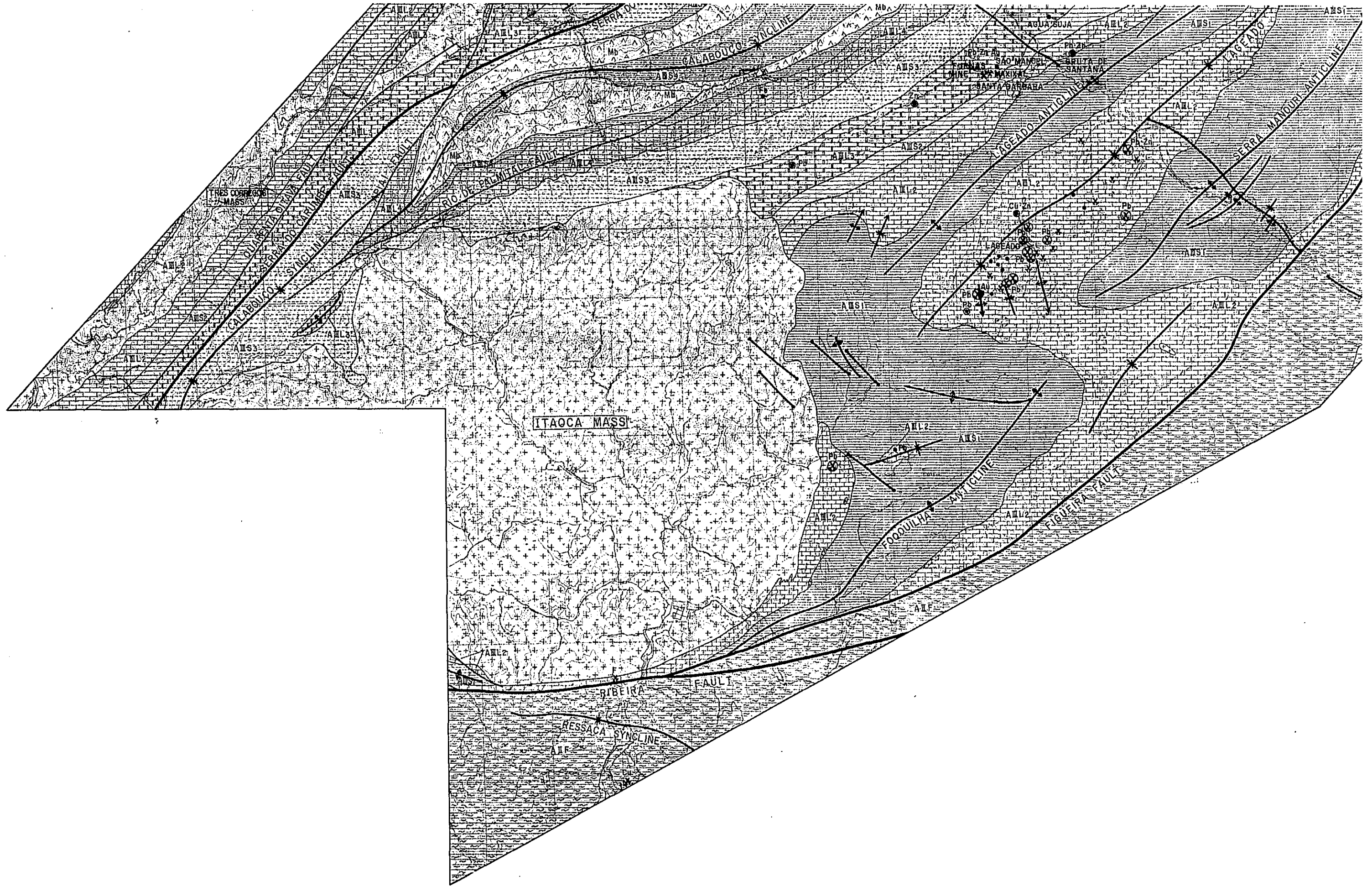
  

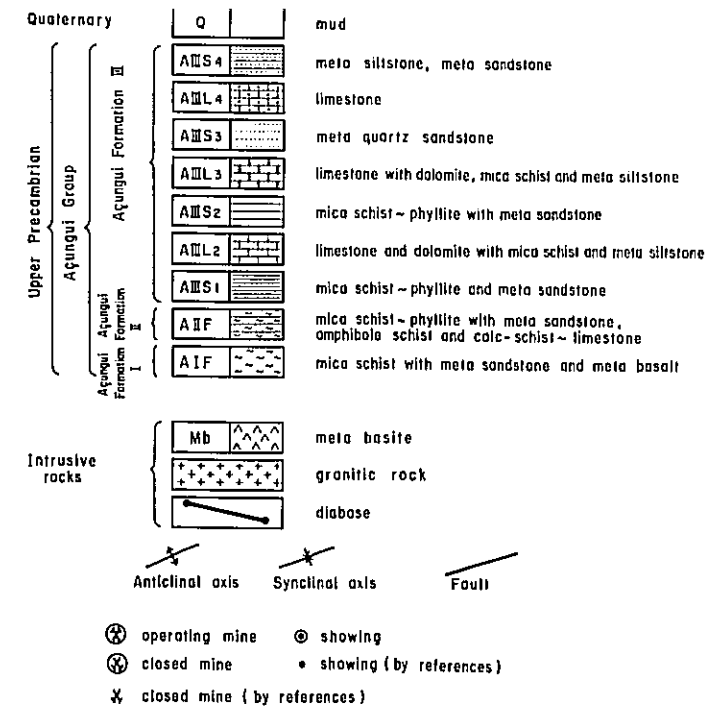
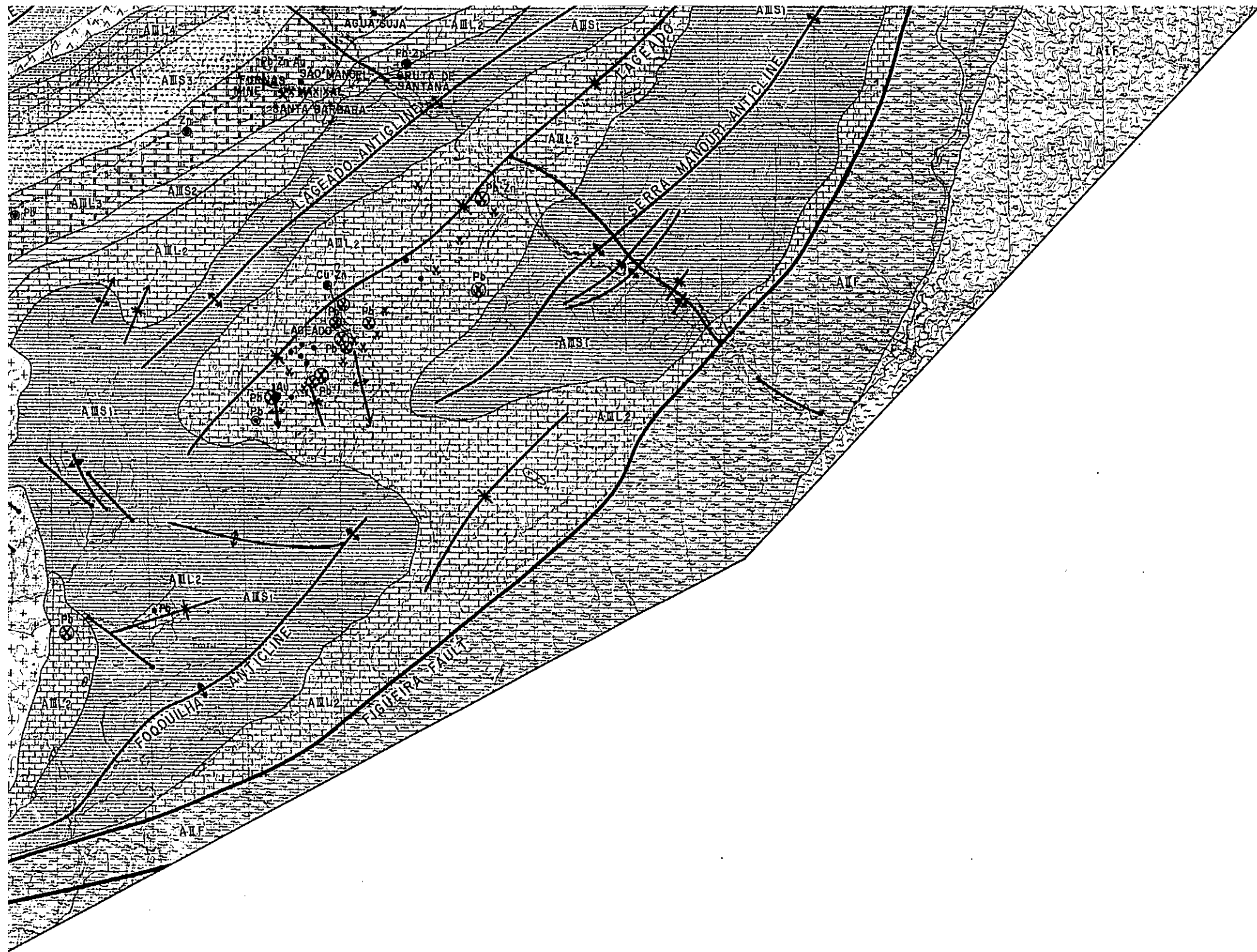
	Anticlinal axis		Synclinal axis		Fault
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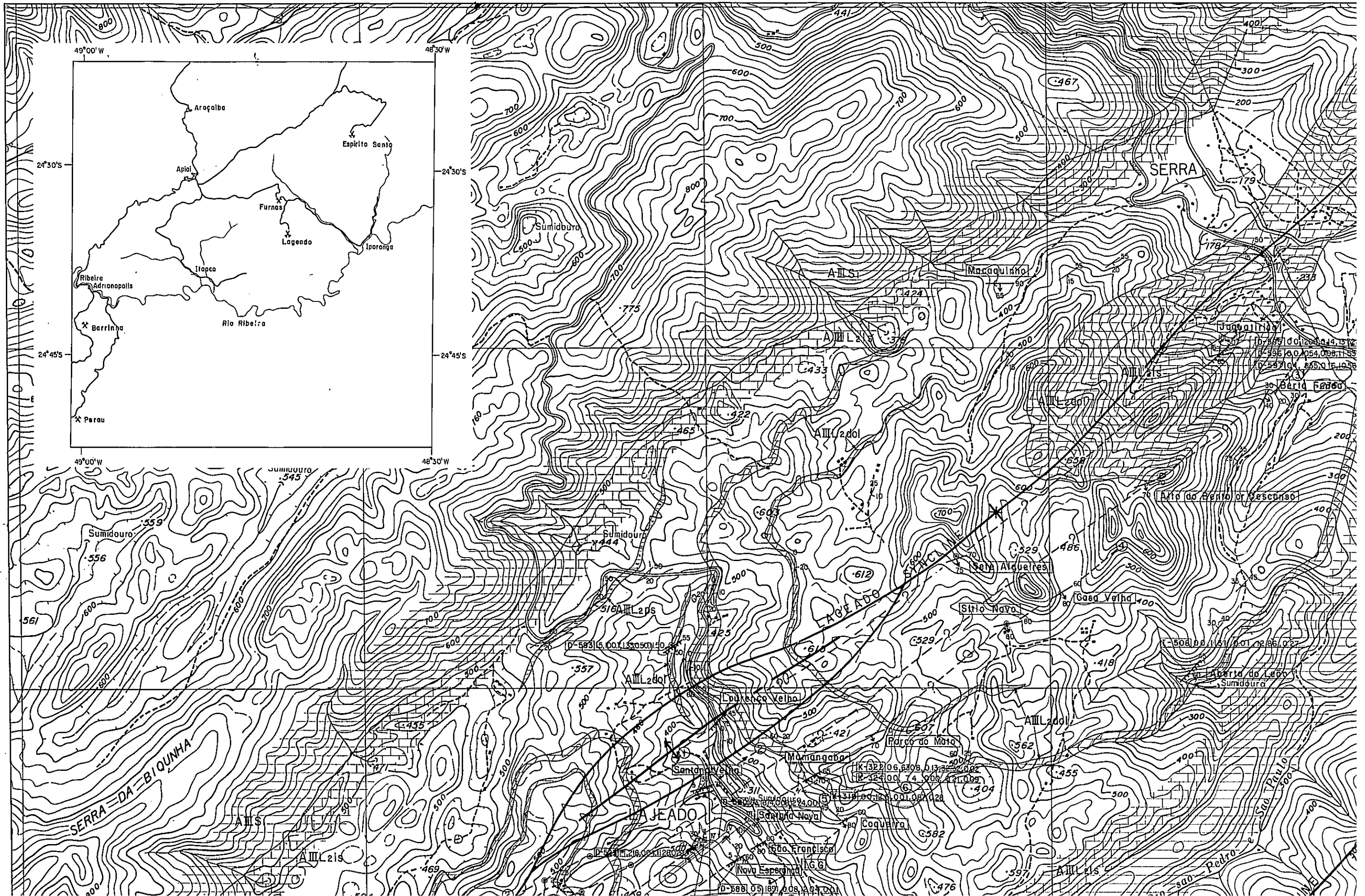
  

	operating mine		showing
	closed mine		showing (by references)
	closed mine (by references)		



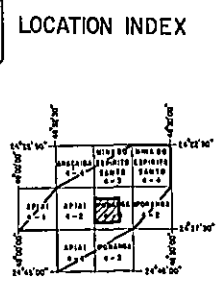
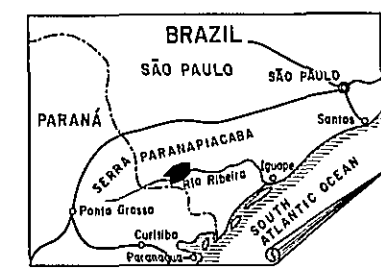






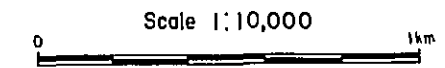
BRAZIL  
GEOLOGICAL SURVEY  
OF  
ANTA GORDA AREA  
PHASE III

Distribution Map of Mines and  
Showings in Lageado-Serra Area



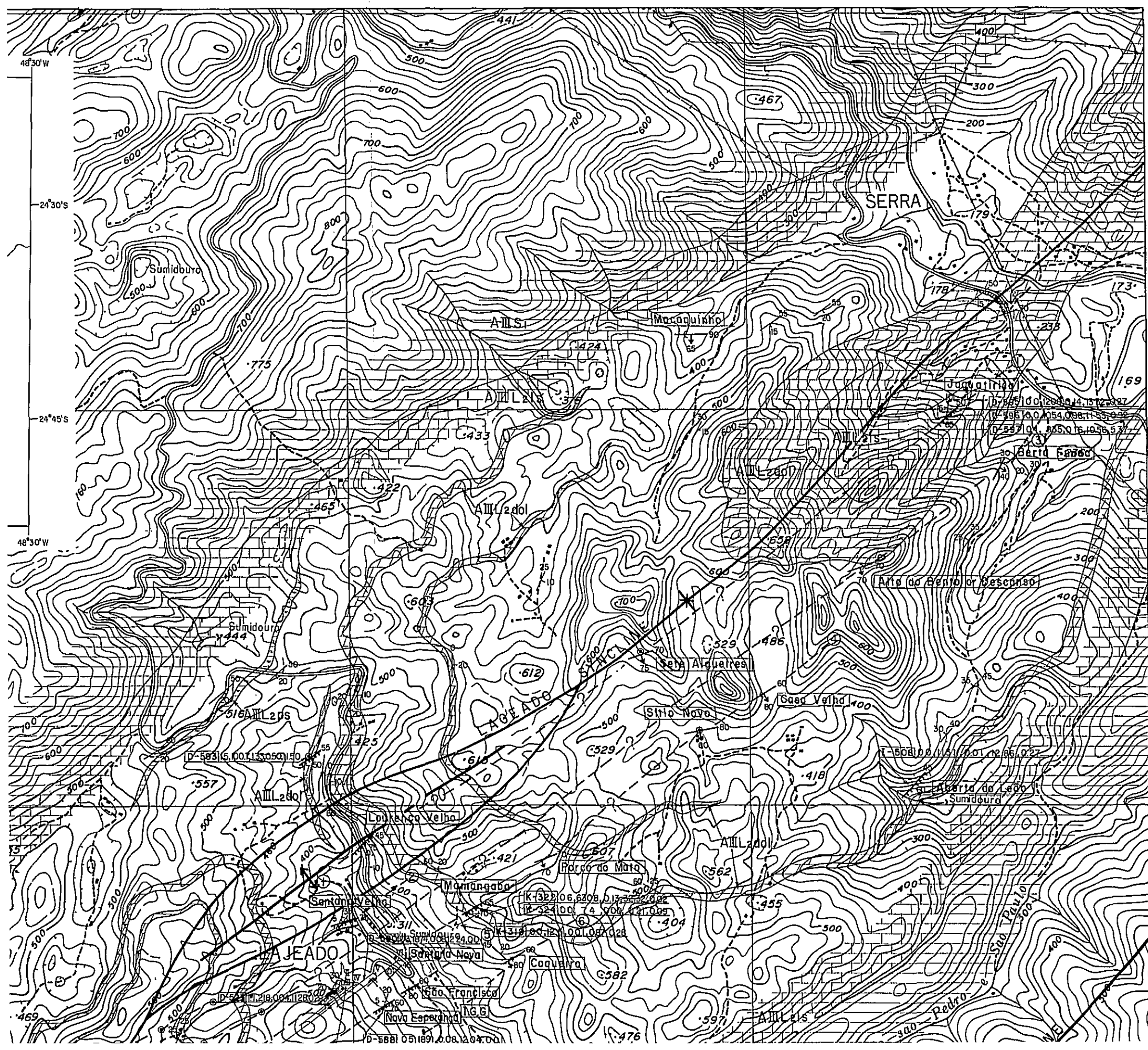
METAL MINING AGENCY OF JAPAN  
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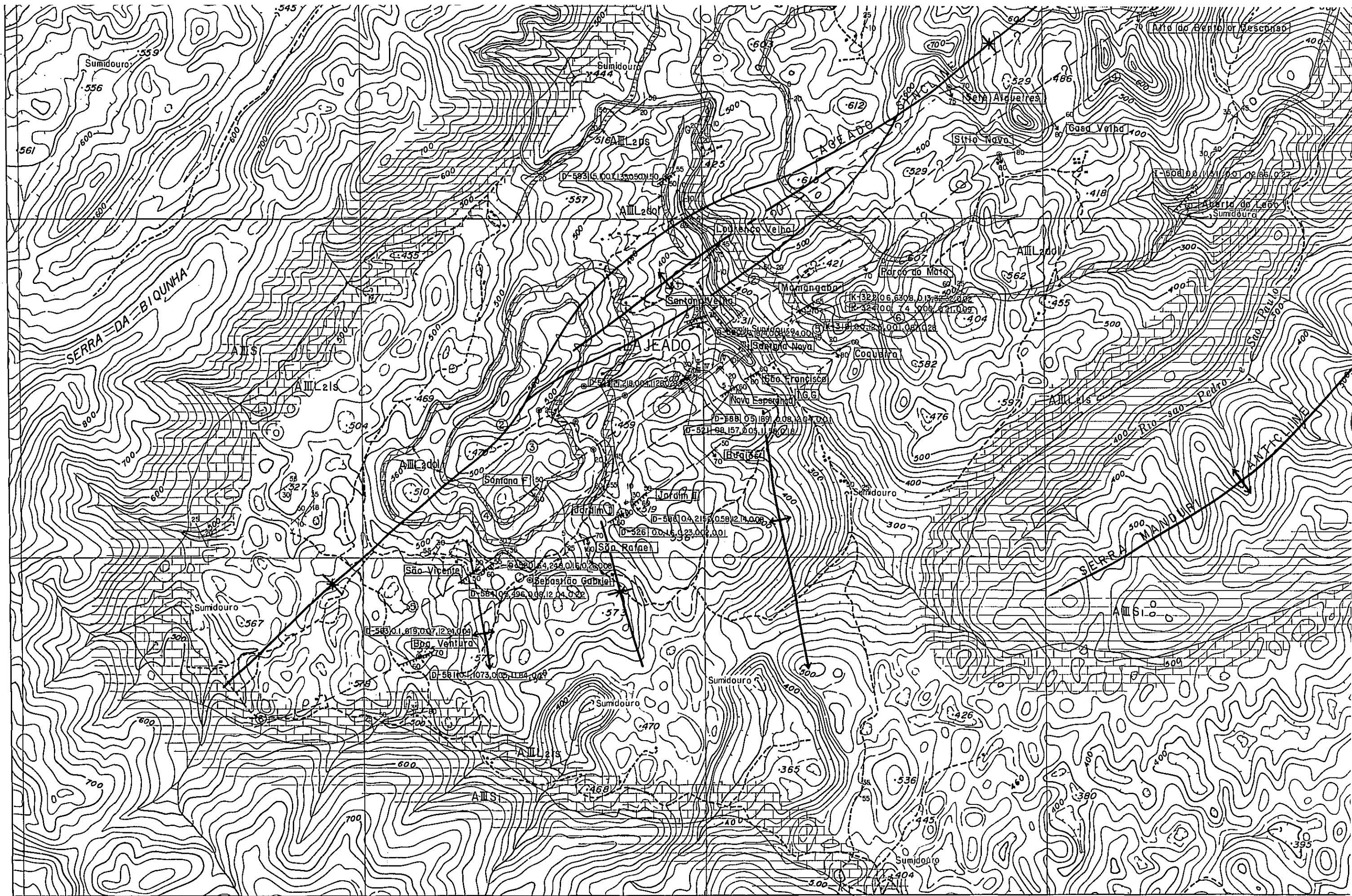
FEB. 1983  
Prepared by Bishmetal Exploration Co., Ltd.

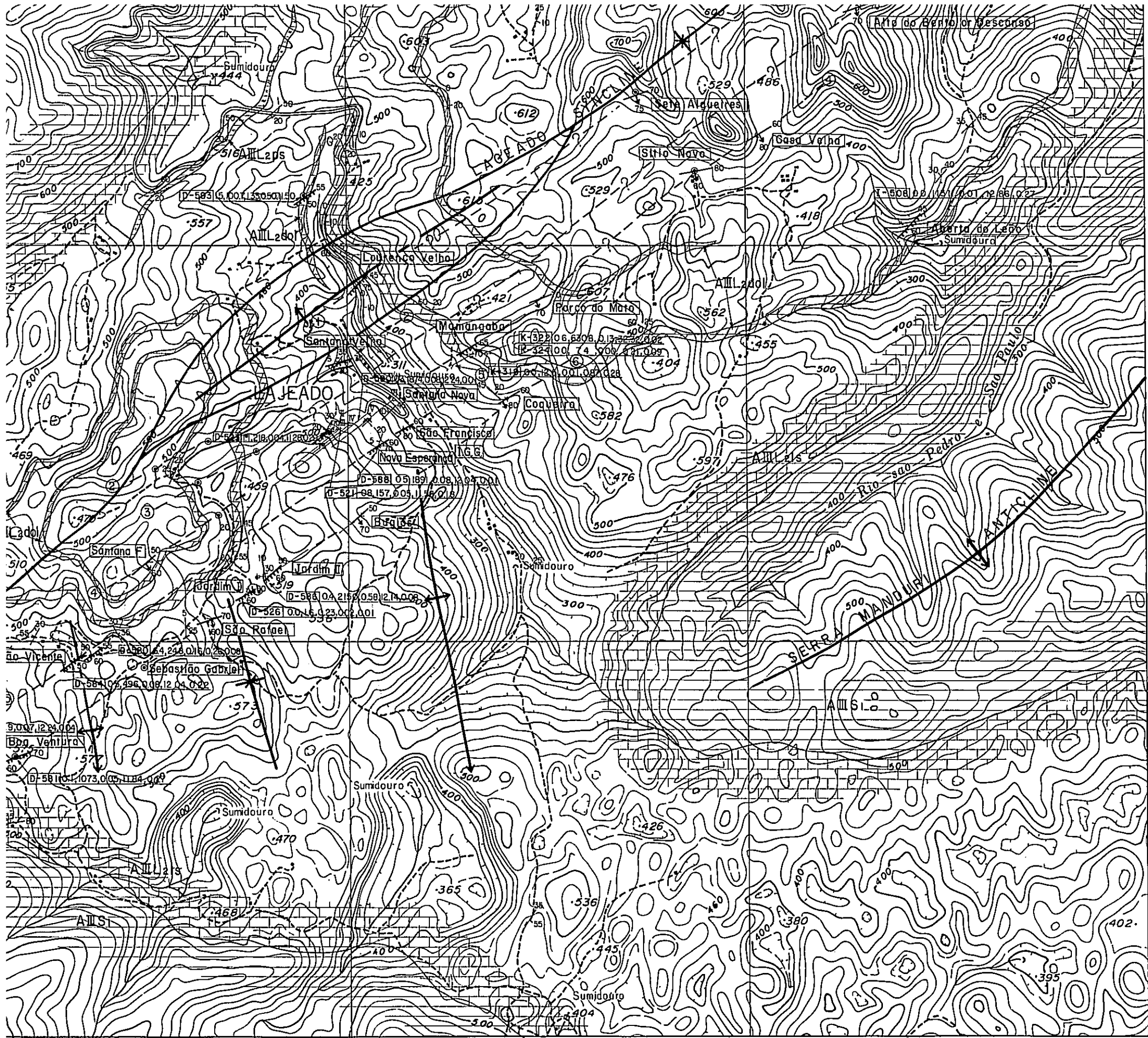


LEGEND

- phyllite
- dolomite
- limestone
- mica schist-phyllite and meta conglomerate-meta sandstone
- dip and strike of bedding
- anticlinal axis
- synclinal axis
- dip and strike of vein (surveyed)
- do. (by references)
- underground do. (uncertain)
- trench and/or outcrop of vein
- metal analysis of ore: [Sample No] Au (g/t), Ag (g/t), Cu (%), Pb (%), Zn (%)
- line number of vein



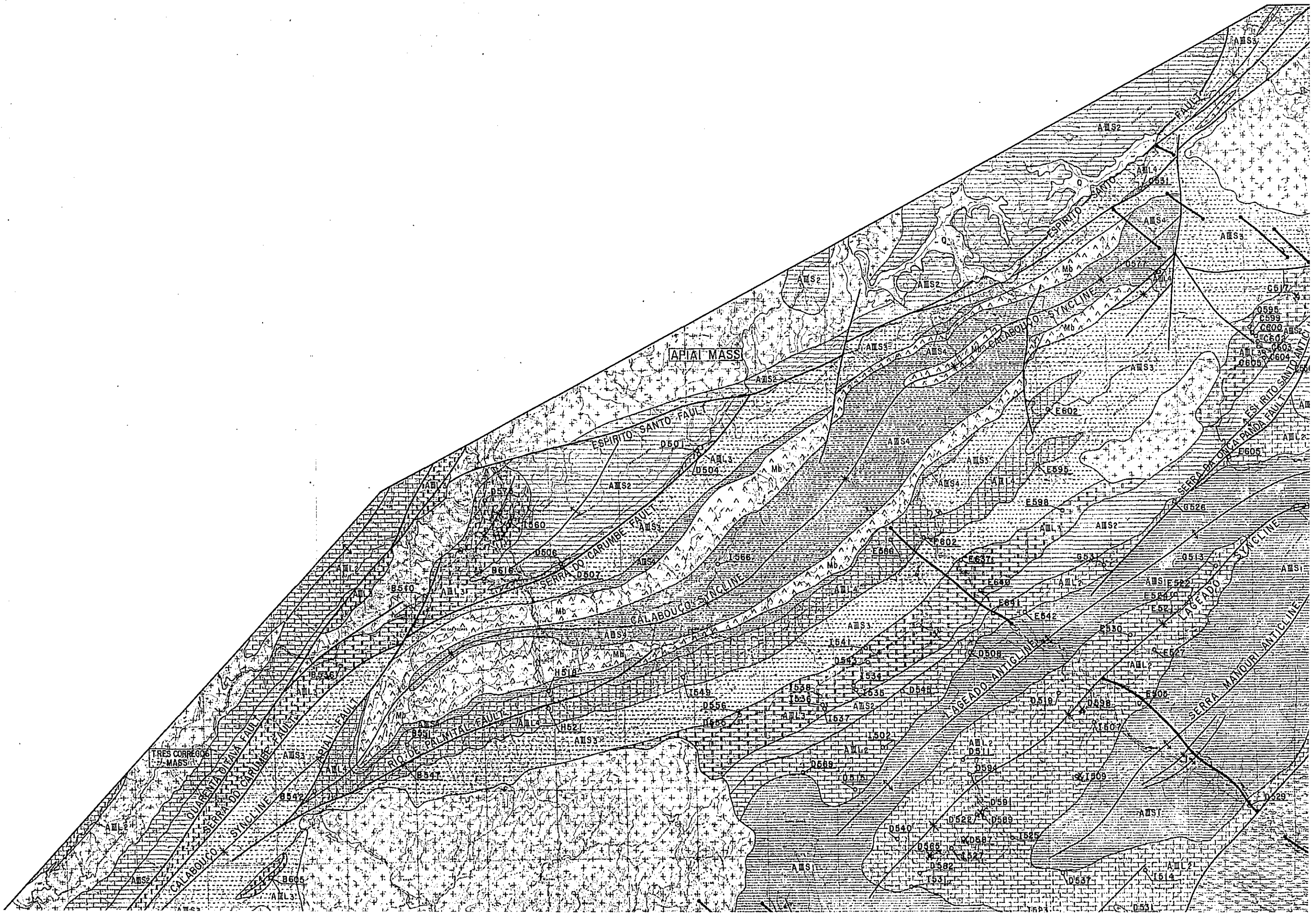




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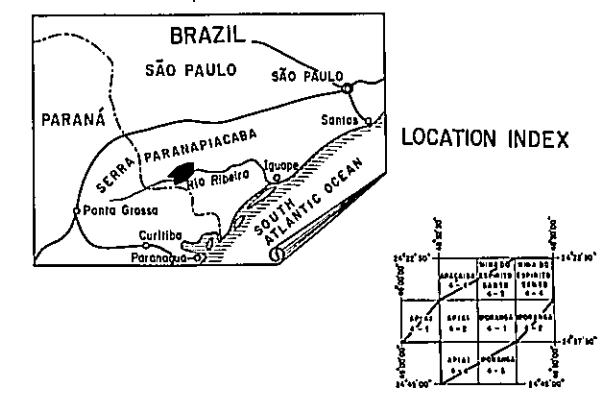
- AIII L2ps phyllite
- AIII L2dol dolomite
- AIII L2ls limestone
- AIII S1 mica schist-phyllite and meta conglomerate-meta sandstone
  
- dip and strike of bedding
- anticlinal axis
- synclinal axis
- dip and strike of vein (surveyed)
- do. (by references)
- underground do. (uncertain)
- trench and/or outcrop of vein
- metal analysis of ore: Sample No Au (g/t), Ag (g/t), Cu (%), Pb (%), Zn (%)
- line number of vein





# BRAZIL GEOLOGICAL SURVEY OF ANTA GORDA AREA PHASE III

## Location Map of Samples for Carbonate Rock Analysis in Survey Area



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Scale 1:50,000

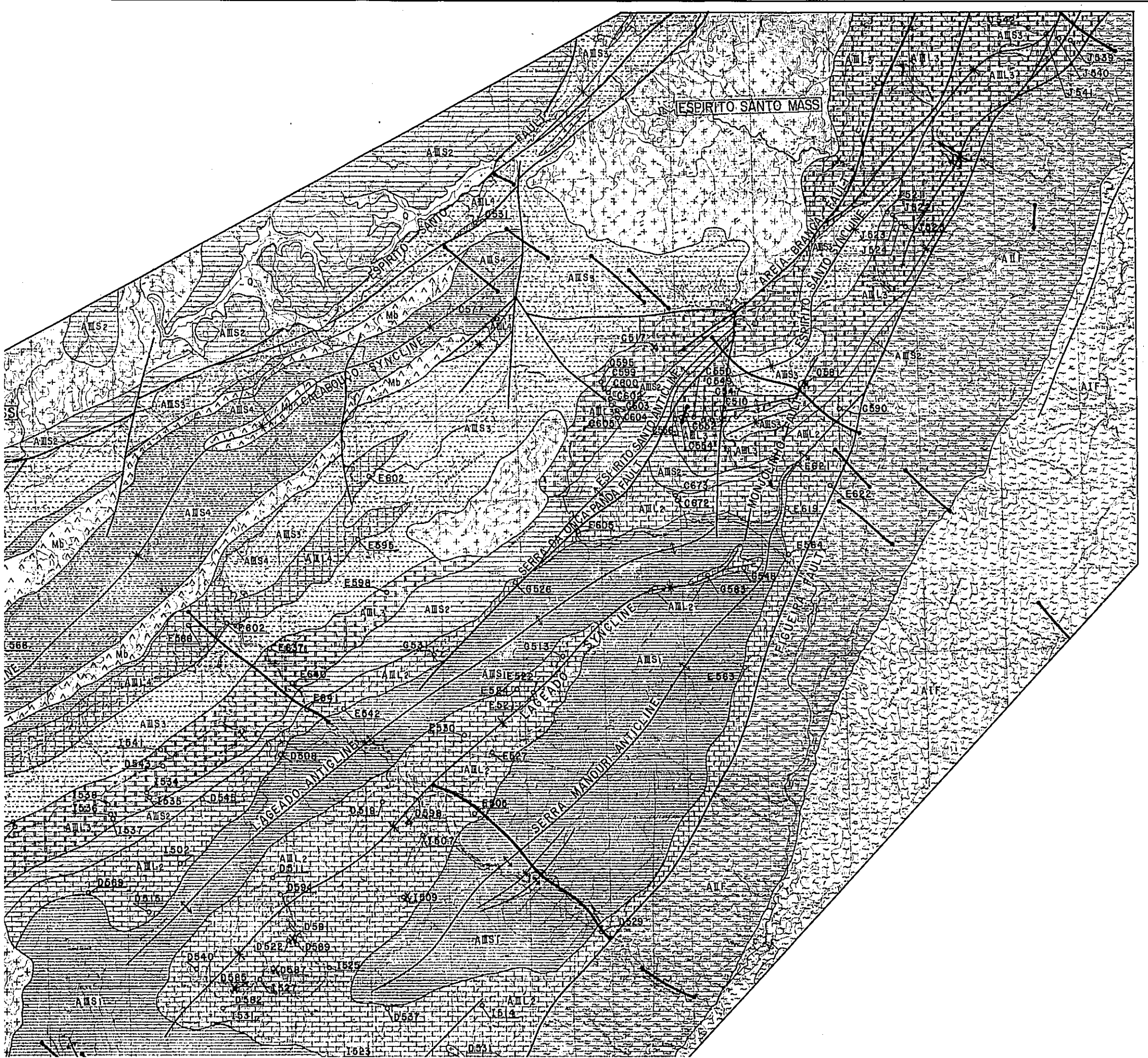


### LEGEND

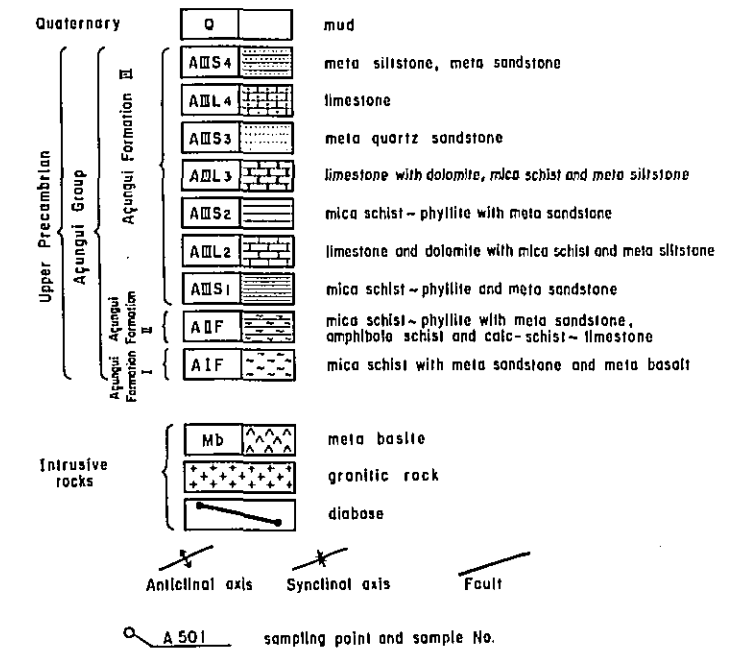
Quaternary	Q	mud
	AMS4	meta siltstone, meta sandstone
Upper Precambrian	AML4	limestone
	AMS3	meta quartz sandstone
	AML3	limestone with dolomite, mica schist and meta siltstone
	AMS2	mica schist - phyllite with meta sandstone
	AML2	limestone and dolomite with mica schist and meta siltstone
	AMS1	mica schist - phyllite and meta sandstone
	AML1	mica schist - phyllite with meta sandstone, amphibole schist and calc-schist - limestone
Intrusive rocks	Mb	meta basite
		granitic rock
		diabase

Anticlinal axis   
 Synclinal axis   
 Fault

A 501    sampling point and sample No.



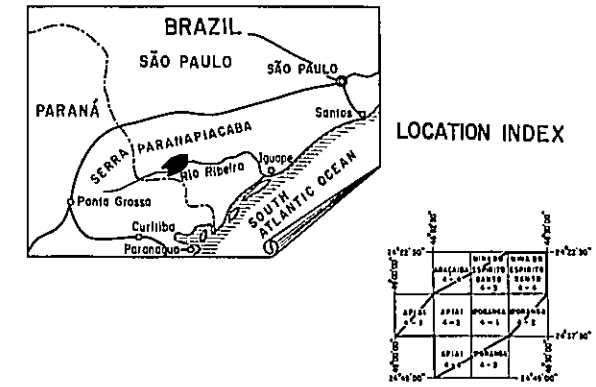






BRAZIL  
 GEOLOGICAL SURVEY  
 OF  
 ANTA GORDA AREA  
 PHASE III

Factor Map of Carbonate Rock Analysis Data  
 In Survey Area - Factor 1 and Factor 2 -



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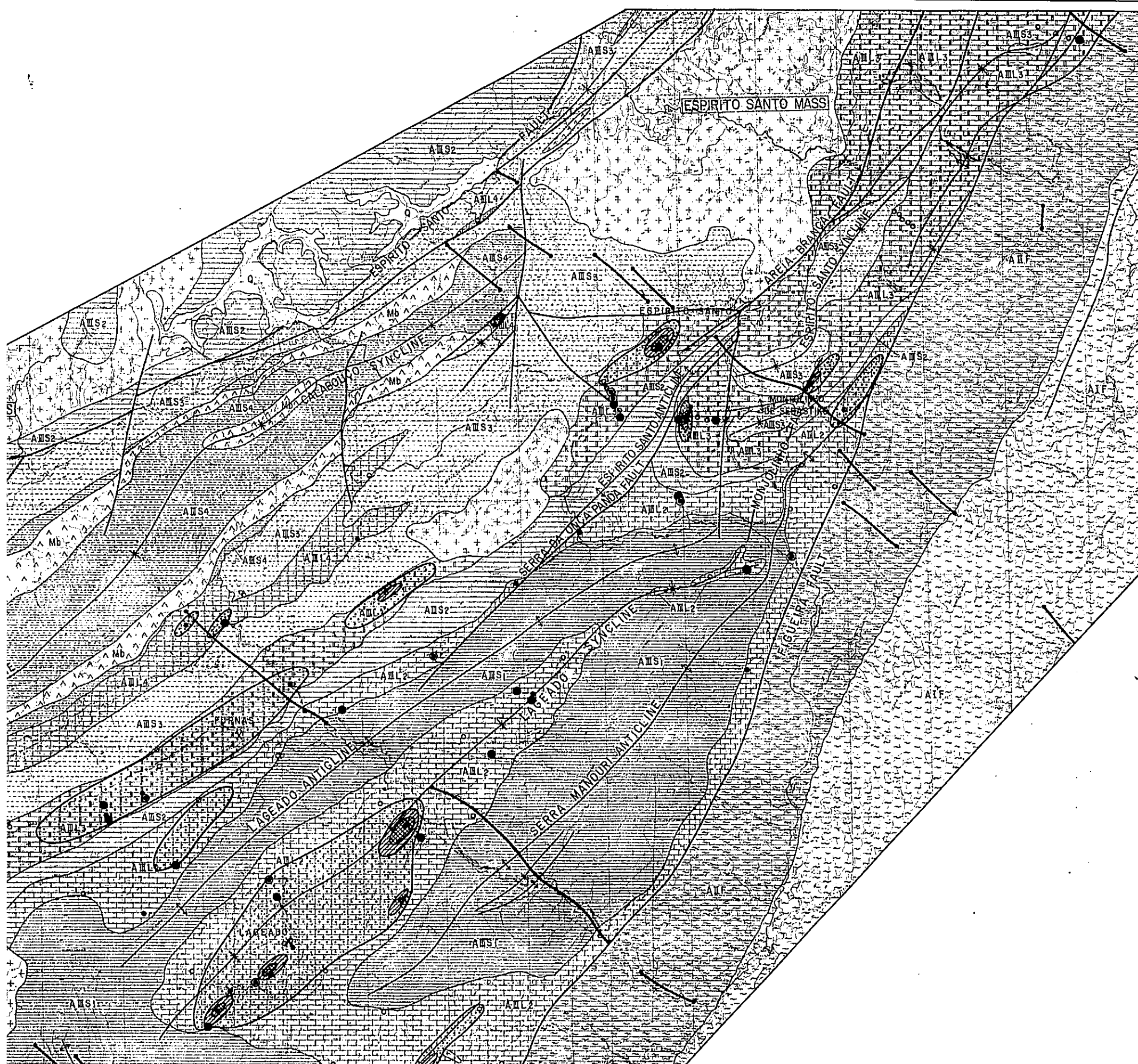
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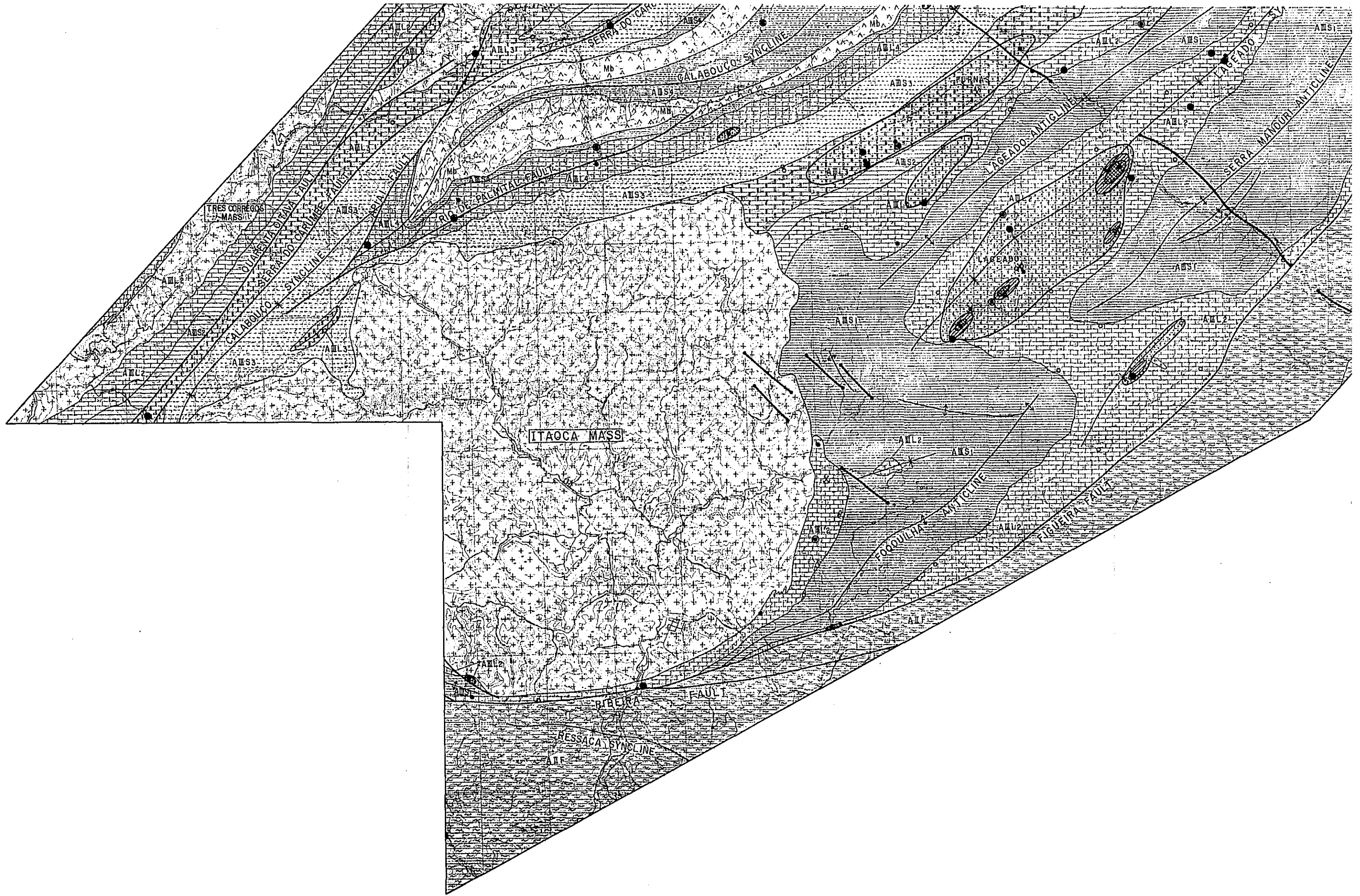
( Factor-1, IR-K-Ba-Na-Cu-Zn-Ni-F-Mn )

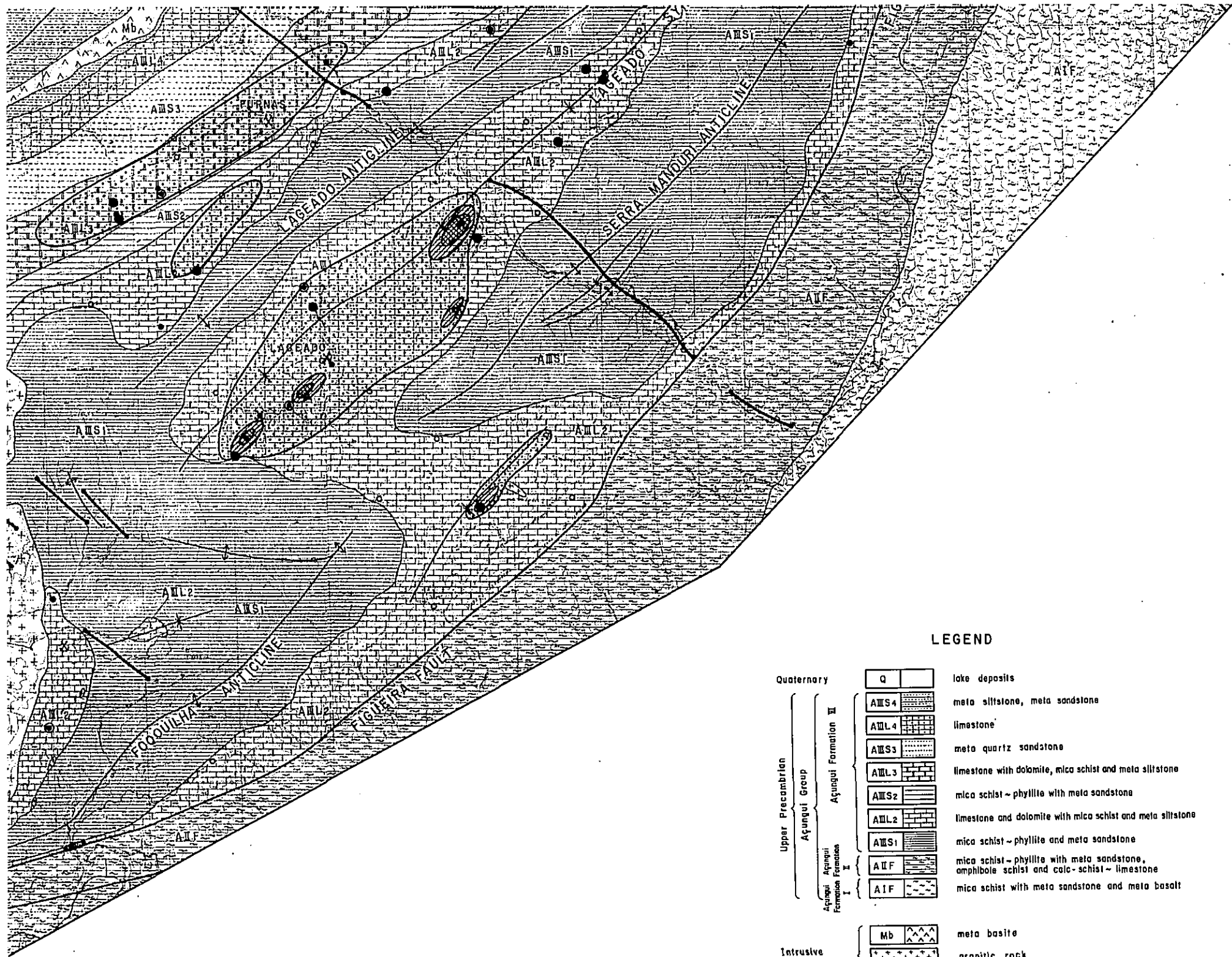
- Low factor score  
0 < F.S
- Low Anomalous Factor Score  
0 ≤ F.S < 0.5
- Medium Anomalous Factor Score  
0.5 ≤ F.S < 1.0
- High Anomalous factore score  
1.0 ≤ F.S

( Factor-2, Pb-Ag-Zn )

- Low Anomalous Factor Score zone  
0 ≤ F.S < 0.5
- Medium Anomalous Factor Score zone  
0.5 ≤ F.S < 1.0
- High Anomalous Factore Score zone  
1.0 < F.S







( Factor-1, IR-K-Ba-Na-Cu-Zn-Ni-F-Mn )

- Low factor score  
 $0 < F.S$
- Low Anomalous Factor Score  
 $0 \leq F.S < 0.5$
- Medium Anomalous Factor Score  
 $0.5 \leq F.S < 1.0$
- ⊙ High Anomalous factor score  
 $1.0 \leq F.S$

( Factor-2, Pb-Ag-Zn )

- ⊙ Low Anomalous Factor Score zone  
 $0 \leq F.S < 0.5$
- ⊙ Medium Anomalous Factor Score zone  
 $0.5 \leq F.S < 1.0$
- ⊙ High Anomalous Factor Score zone  
 $1.0 < F.S$

LEGEND

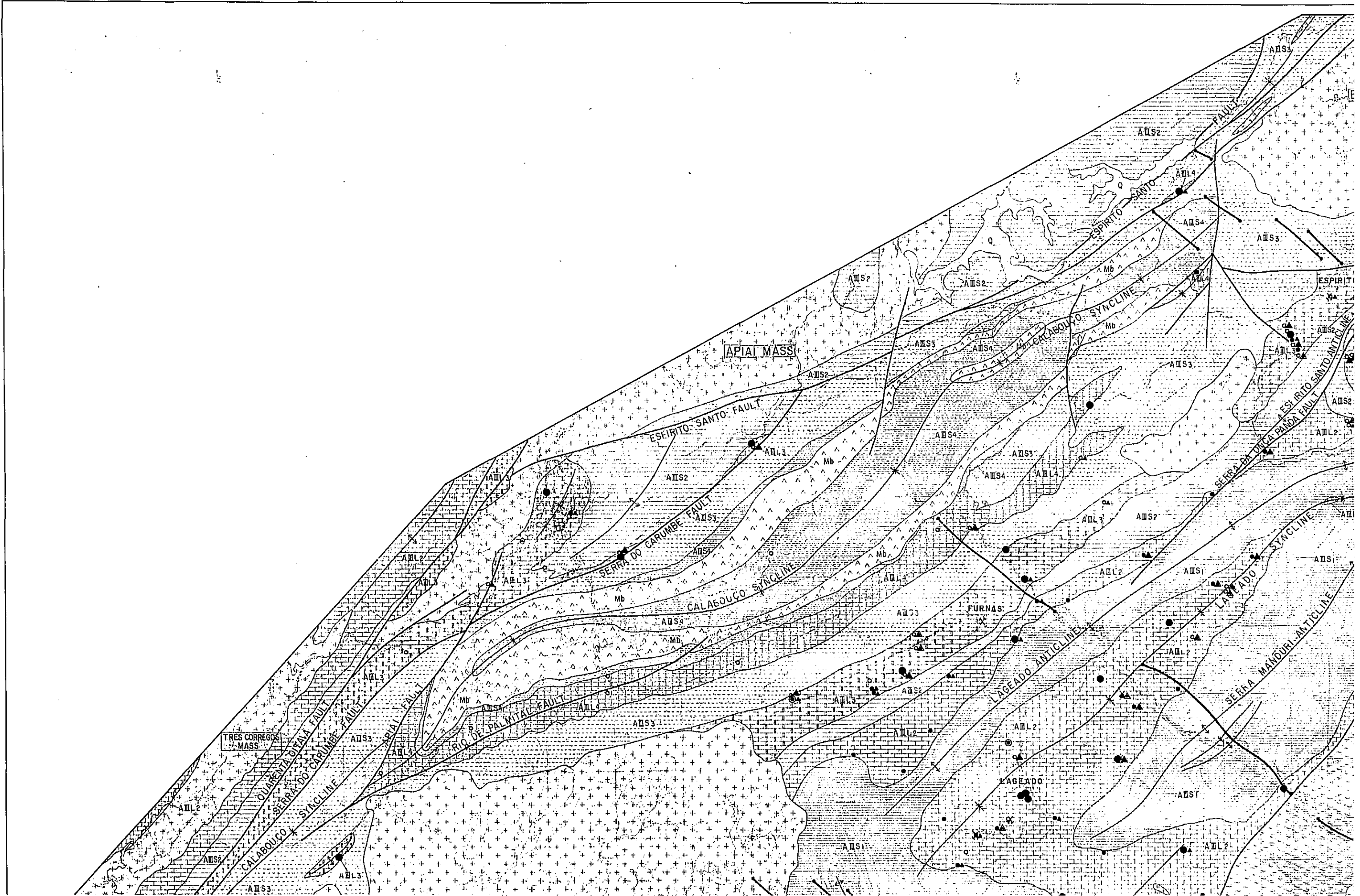
Quaternary	Q	lake deposits	
Upper Precambrian	Açuquai Formation II	AMS4	meta siltstone, meta sandstone
		AML4	limestone
		AMS3	meta quartz sandstone
		AML3	limestone with dolomite, mica schist and meta siltstone
		AMS2	mica schist - phyllite with meta sandstone
		AML2	limestone and dolomite with mica schist and meta siltstone
		AMS1	mica schist - phyllite and meta sandstone
		AIF	mica schist - phyllite with meta sandstone, amphibole schist and calc-schist - limestone
Intrusive rocks	Açuquai Formation I	AIF	mica schist with meta sandstone and meta basalt
		Mb	meta basite
			granitic rock
		diabase	

Anticlinal axis    
 Synclinal axis    
 Fault

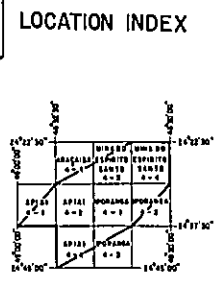
\* operating mine  
 ✖ closed mine





BRAZIL  
GEOLOGICAL SURVEY  
OF  
ANTA GORDA AREA  
PHASE III

Factor Map of Carbonate Rock Analysis Data  
in Survey Area — Factor 3 and Factor 4 —



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Scale 1:50,000

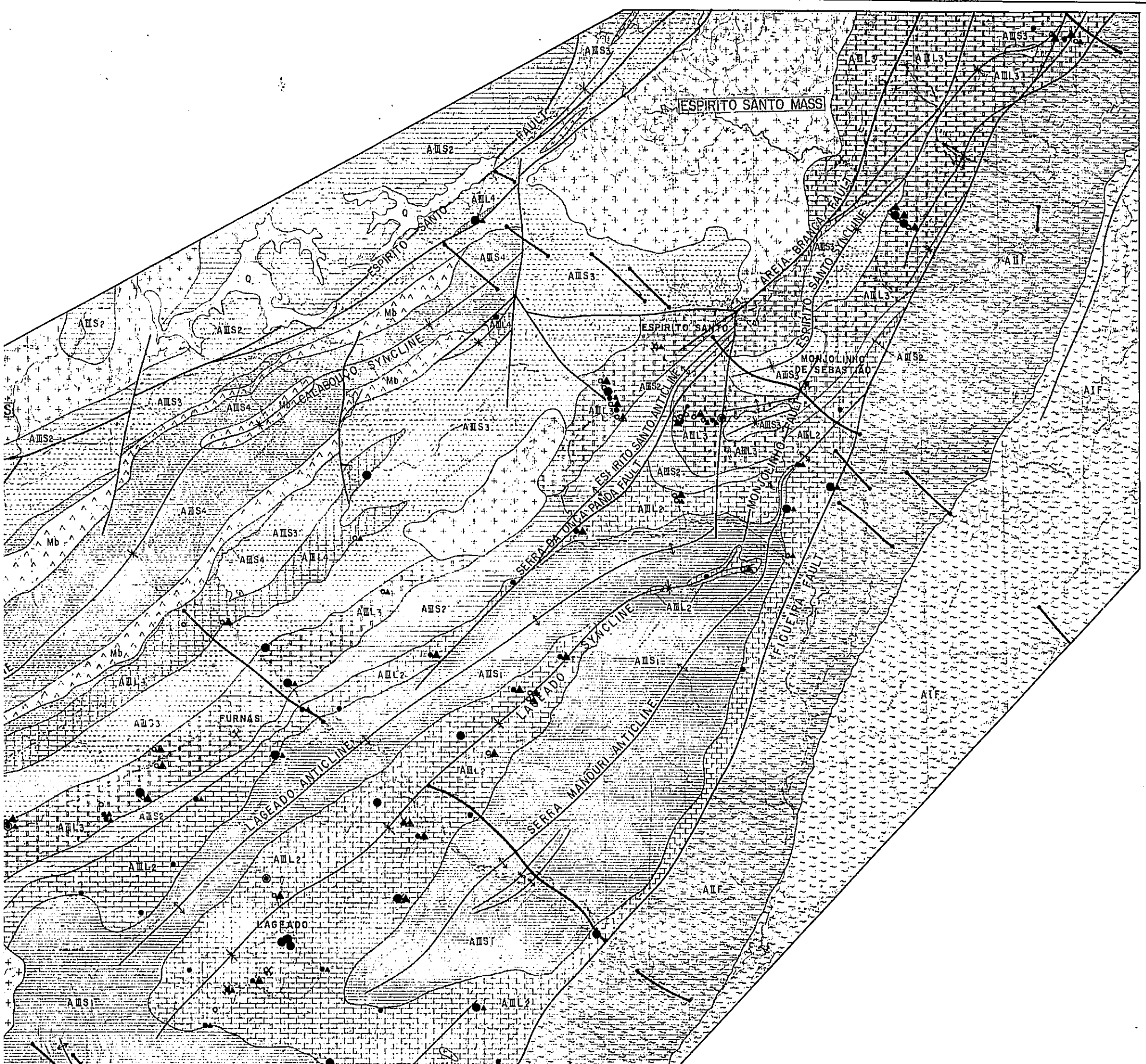


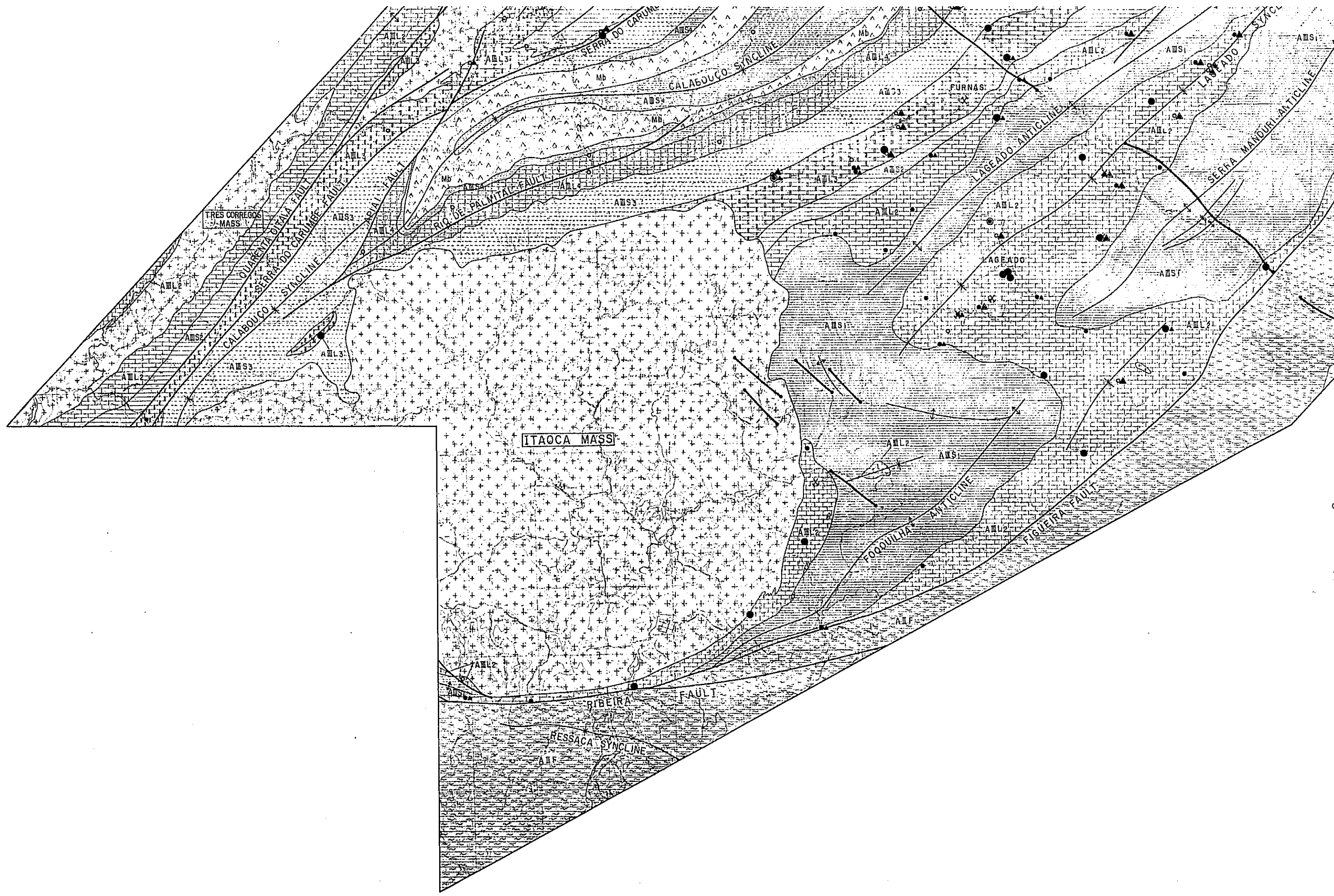
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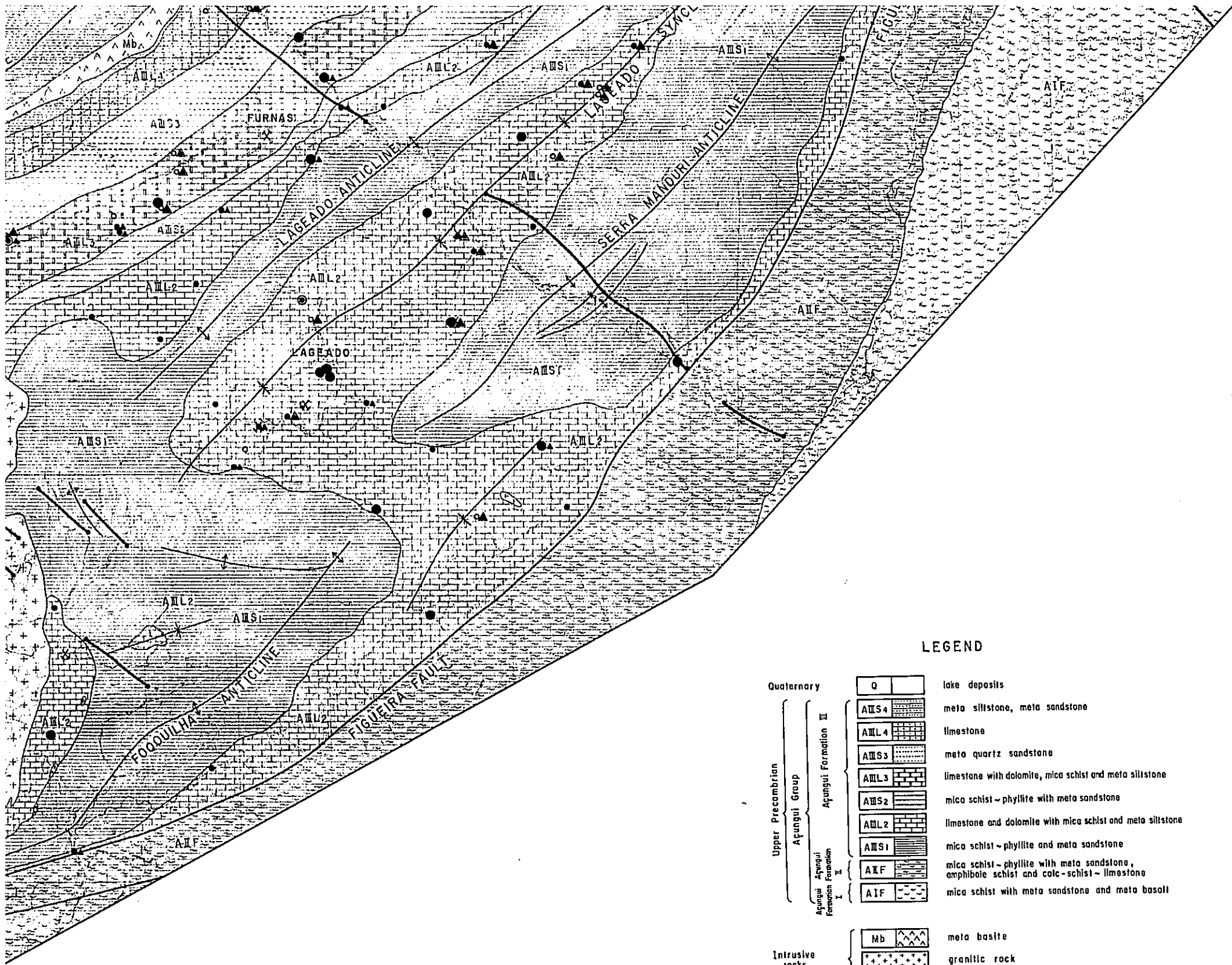
- (Factor - 3, Sr - Ca)
- Low Factor Score  
 $0 < F.S.$
  - Low Anomalous Factor Score  
 $0 \leq F.S. < 0.5$
  - Medium Anomalous Factor Score  
 $0.5 \leq F.S. < 1.0$
  - ⊙ High Anomalous Factor Score  
 $1.0 \leq F.S.$

- (Factor - 4, F - Mg)
- Low Factor Score  
 $0 < F.S.$
  - ▲ Low Anomalous Factor Score  
 $0 \leq F.S. < 0.5$
  - ▲ Medium Anomalous Factor Score  
 $0.5 \leq F.S. < 1.0$
  - ▲ High Anomalous Factor Score  
 $1.0 \leq F.S.$

— Factor - 3 (sampling point)







LEGEND

- (Factor - 3, Sr - Ca)
- Low Factor Score  
0 < F.S.
  - Low Anomalous Factor Score  
0 ≤ F.S. < 0.5
  - Medium Anomalous Factor Score  
0.5 ≤ F.S. < 1.0
  - ⊙ High Anomalous Factor Score  
1.0 ≤ F.S.
- (Factor - 4, F - Mg)
- Low Factor Score  
0 < F.S.
  - ▲ Low Anomalous Factor Score  
0 ≤ F.S. < 0.5
  - ▲ Medium Anomalous Factor Score  
0.5 ≤ F.S. < 1.0
  - ▲ High Anomalous Factor Score  
1.0 ≤ F.S.
- Factor - 3 (sampling point)  
 ▲ Factor - 4 (right side of sampling point)

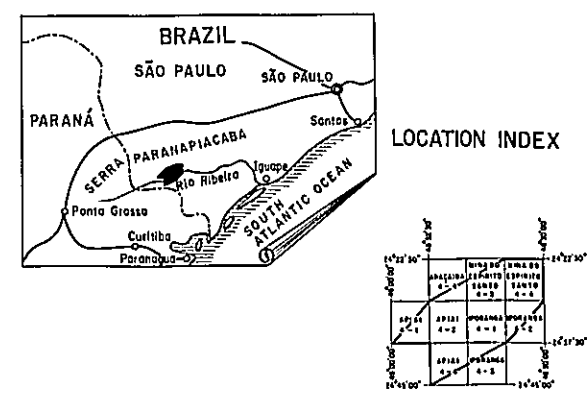
LEGEND

- |                     |                 |  |             |  |
|---------------------|-----------------|--|-------------|--|
| Quaternary          | Q               | lake deposits  |             |  |
| Upper Precambrian   | Apungui Group   | Apungui Formation II   | AMS4        | meta siltstone, meta sandstone                             |
|                     |                 |  | AML4        | limestone  |
|                     |                 |  | AMS3        | meta quartz sandstone                                      |
|                     |                 |  | AML3        | limestone with dolomite, mica schist and meta siltstone    |
|                     |                 |  | AMS2        | mica schist - phyllite with meta sandstone                 |
|                     |                 |  | AML2        | limestone and dolomite with mica schist and meta siltstone |
|                     |                 |  | AMS1        | mica schist - phyllite and meta sandstone                  |
| Apungui Formation I | AMF             | mica schist - phyllite with meta sandstone, amphibole schist and calc-schist - limestone |             |  |
|                     | AIF             | mica schist with meta sandstone and meta basalt  |             |  |
|                     | Intrusive rocks | Mb   | meta basite |  |
|                     |                 | granitic rock  |             |  |
|                     |                 | diabase  |             |  |
- Anticlinal axis    
 Synclinal axis    
 Fault
- ✕ operating mine  
 ✕ closed mine



# BRAZIL GEOLOGICAL SURVEY OF ANTA GORDA AREA PHASE III

## Pb-Zn Anomaly Map of Carbonate Rock Analysis in Survey Area



METAL MINING AGENCY OF JAPAN  
JAPAN INTERNATIONAL COOPERATION AGENCY

FEB. 1983  
Prepared by Bishimetal Exploration Co., Ltd.

Scale 1:50,000



### LEGEND

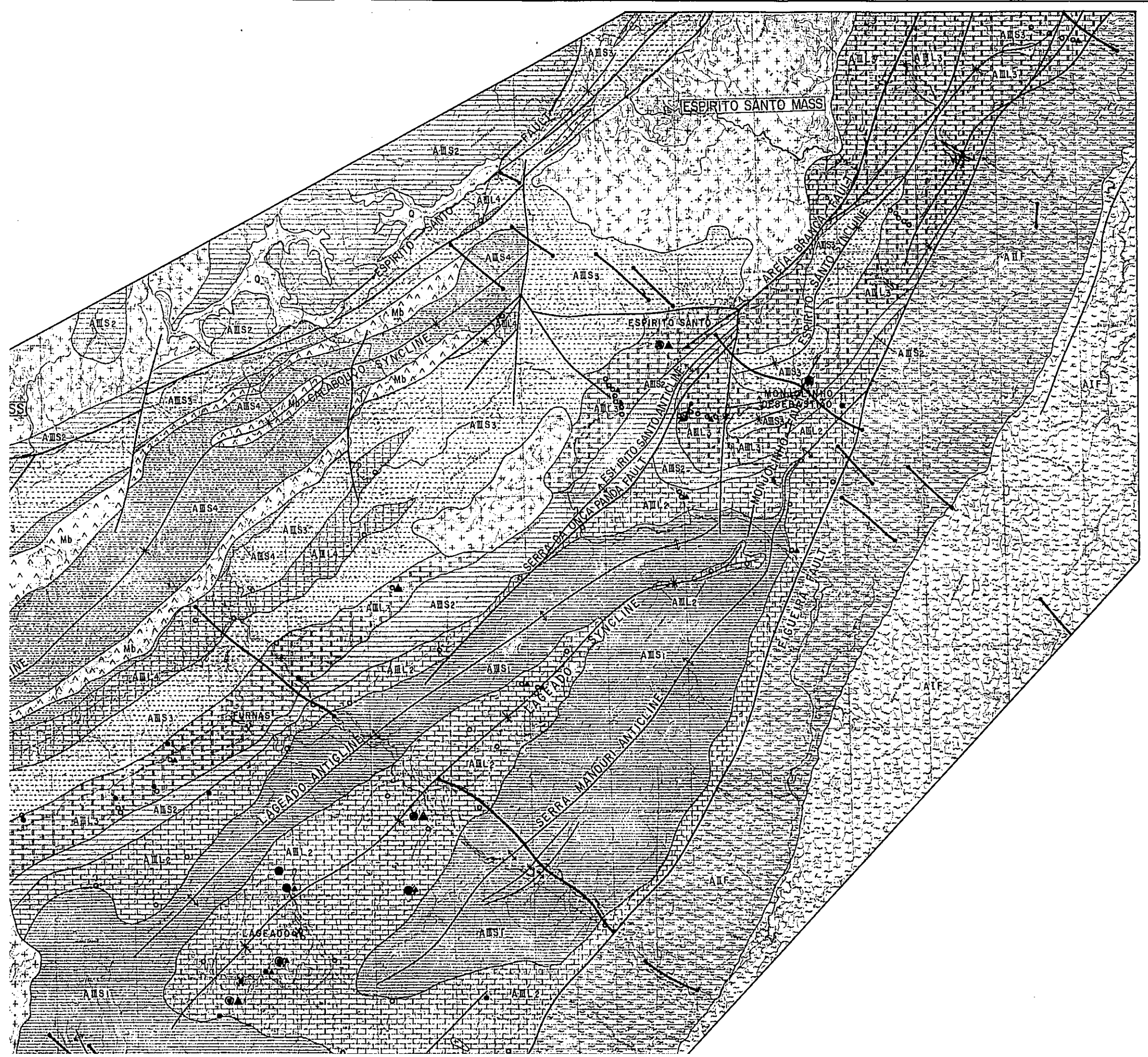
( Pb )

- Low Value  
5.0 ppm ≤ x < 27.0 ppm
- Low Anomalous Value  
27.0 ppm ≤ x < 42.6 ppm
- Medium Anomalous value  
42.6 ppm ≤ x < 105.3 ppm
- High Anomalous Value  
105.9 ppm ≤ x ≤ 540.0 ppm

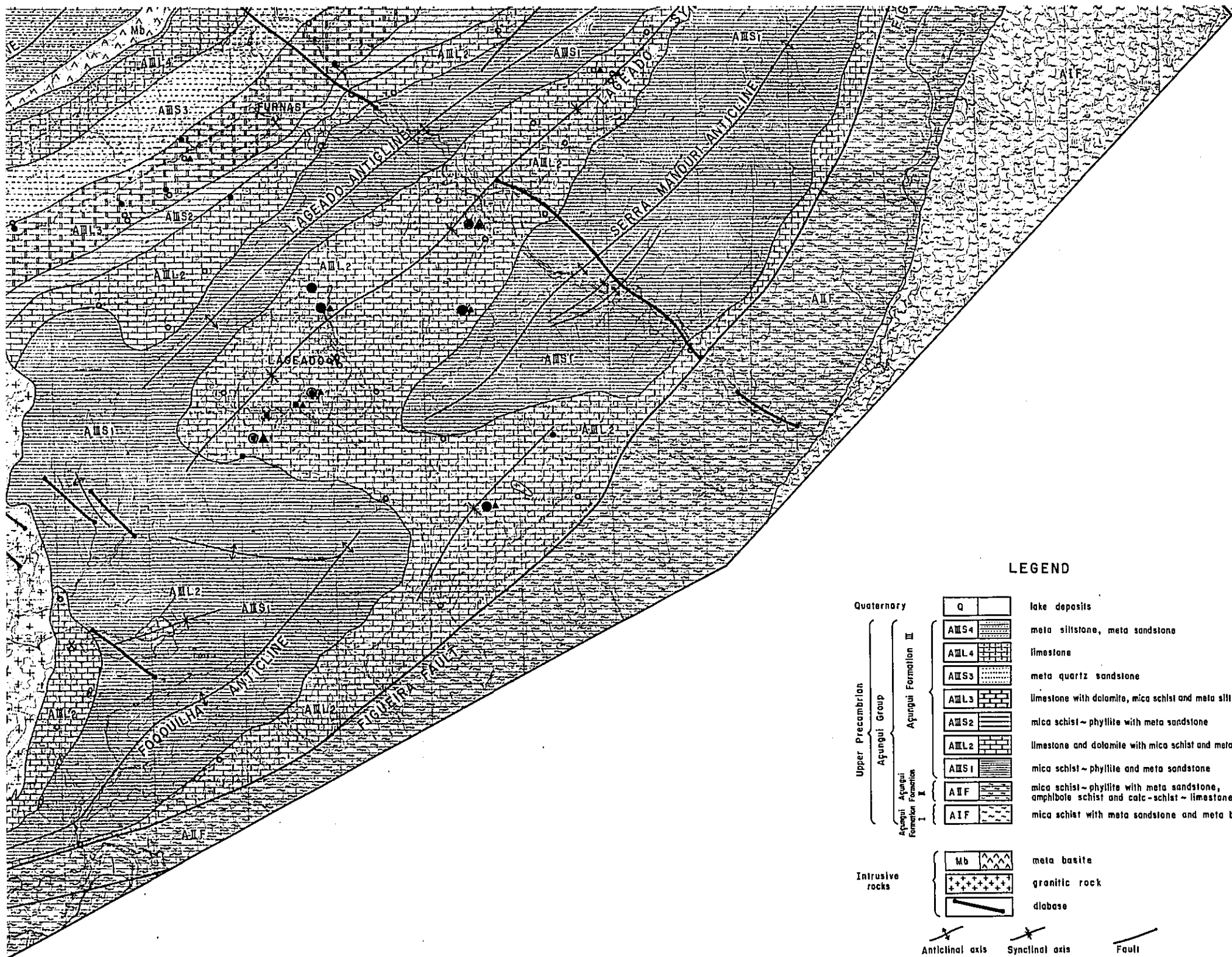
( Zn )

- Low Value  
2 ppm ≤ x < 32.1 ppm
- ▲ Low Anomalous Value  
32.1 ppm ≤ x < 98.2 ppm
- ▲ Medium Anomalous Value  
98.2 ppm ≤ x < 299.9 ppm
- ▲ High Anomalous Value  
299.9 ppm ≤ x ≤ 920.0 ppm

▲ Pb point ( sampling point )







- ( Pb )
- Low Value  
5.0 ppm ≤ X < 27.0 ppm
  - Low Anomalous Value  
27.0 ppm ≤ X < 42.6 ppm
  - Medium Anomalous value  
42.6 ppm ≤ X < 105.3 ppm
  - ⊙ High Anomalous Value  
105.9 ppm ≤ X ≤ 540.0 ppm
- ( Zn )
- Low Value  
2 ppm ≤ X < 32.1 ppm
  - ▲ Low Anomalous Value  
32.1 ppm ≤ X < 98.2 ppm
  - ▲ Medium Anomalous Value  
98.2 ppm ≤ X < 299.9 ppm
  - ▲ High Anomalous Value  
299.9 ppm ≤ X ≤ 920 ppm
- Pb point ( sampling point )  
 ▲ Zn point ( right side of sampling point )

**LEGEND**

Quaternary	Q	lake deposits	
Upper Precambrian	Apungui Group	AMS4	meta siltstone, meta sandstone
		AML4	limestone
		AMS3	meta quartz sandstone
		AML3	limestone with dolomite, mica schist and meta siltstone
	AMS2	mica schist - phyllite with meta sandstone	
	AML2	limestone and dolomite with mica schist and meta siltstone	
	AMS1	mica schist - phyllite and meta sandstone	
Apungui Formation	AIF	mica schist - phyllite with meta sandstone, amphibole schist and calc-schist - limestone	
	AIF	mica schist with meta sandstone and meta basalt	
Intrusive rocks	Mb	meta basalt	
		granitic rock	
		diorite	
		Anticlinal axis	
		Synclinal axis	
		Fault	
		* operating mine	
		✱ closed mine	