Table II-2-4 Factor analyses for stream sediment analytical data

	Elements	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	Communality
Phase I	Au	0.038	-0.031	-0.425	0.007	0.088	0.035	0.1919
	Ag	0.108	0.017	0.003	0.058	-0.165	-0.037	0.0439
	Fe	0.131	0.324	0.013	0.655	-0.290	0.257	0.7009
	Mn	0.083	0.159	-0.094	0.783	-0.016	0.048	0.6589
	Mo	-0.008	-0.274	-0.025	0.444	-0.481	0.289	0.5581
	W	0.357	0.004	-0.048	0.017	-0.016	0.096	0.1397
	Sn	0.483	-0.199	0.100	0.151	-0.545	0.096	0.6118
	Nb	0.353	-0.313	0.088	0.475	-0.430	0.227	0.6928
	Ta	0.651	-0.177	0.020	0.144	-0.359	-0.006	0.6025
	Be	0.102	0.032	0.048	0.116	-0.045	0.460	0.2409
	Li	-0.100	0.566	-0.100	0.176	0.036	0.041	0.3741
	As	-0.013	0.129	-0.422	0.035	-0.020	-0.095	0.2057
	Sb	0.037	0.015	0.055	0.009	-0.408	0.049	0.174
	Contributions	18.6%	13.6%	7.7%	29.8%	21.7%	8.6%	
Phase II	Au	-0.005	0.098	-0.126	-0.008			0.0256
	Ag							
	Fe	0.096	0.741	-0.072	0.096			0.5731
	Mn	0.076	0.687	0.148	0.256			0.5652
	Mo	0.373	0.425	-0.514	0.187			0.6184
	W							
	Sn	0.527	-0.112	0.130	0.066			0.3112
	Nb	0.386	0.281	-0.339	0.500			0.5928
	Ta	0.049	0.076	-0.043	0.572			0.3370
	Be	0.519	0.138	-0.021	0.047			0.2916
	Li	0.112	0.098	0.487	-0.098			0.2686
	As	0.016	-0.144	0.087	0.004			0.0284
	Sb							
	Contributions	24.0%	37.6%	19.0%	19.5%			
PhaseIII	Au	-0.023	0.377	0.098	-0.522			0.4252
	Ag							
	Fe	0.823	0.173	0.210	0.113			0.7648
	Mn	0.763	0.355	-0.057	0.192			0.7342
	Mo	-0.226	0.050	0.027	0.133			0.0722
	W							
	Sn	-0.033	0.242	0.464	0.239			0.3318
	Nb	0.226	0.729	0.129	0.310			0.6959
	Ta	0.103	0.809	0.135	-0.167			0.7109
	Be	-0.055	0.126	0.541	0.067			0.3157
	Li	0.230	-0.089	0.486	-0.170			0.3263
	As	-0.006	-0.027	-0.026	-0.142			0.0215
	Sb							
	Contributions	32.5%	35.4%	19.0%	13.1%			

the points with higher scores corresponds with the distribution of the pegmatites, trending north south.

(d) Other factors

Factor related to Li, related to the lithology of the Serido Formation, and factor related to Au were also extracted. These factors have lower loading and communality.

2-4-3 Pan concentrate survey

(1) Sampling

Pan concentrates were sampled in the area where gold geochemical anomalies were formerly obtained and information on gold was brought during the survey. Samples total 319.

The samples were examined for gold fragments, then they were chemically analyzed for Au, Ag, Mo, W, Sn, Ta and Nb on 314 samples.

(2) Observation of the samples

Gold particles were observed in some samples (Figure II-2-3). Those gold particles were in general very small up to 0.5mm.

The other minerals identified were magnetite, columbite-tantalite, scheelite and beryl.

(3) Chemical analysis

(a) Gold

Higher analytical values, more than 1,000ppb, were obtained at the locations shown in Figure II-2-3. Gold was highly included in the some samples even though the samples do not include gold particles. Especially, around the San Francisco deposit, and around the auriferous quartz vein 7km south of the Frei Martinho, gold was highly included in many samples.

(b) Molybdenum

Molybdenum has in general very low analytical values. However, higher values more than 100ppm are detected at the point 8km west of the San Francisco deposit.

(c) Tungsten

High tungsten values were obtained in the entire area where pan concentrates were sampled.

(d) Tin

High tin values were obtained on the Caico Complex in the northern most part of the survey area, on the area surrounding the San Francisco deposit and on the Serido Formation 10km west northwest of the deposit.

(e) Tantalum

Tantalum occurs with niobium in pegmatites as columbite-tantalite. High tantalum values were obtained in the entire area where pan concentrates were sampled.

(f) Niobium

High niobium values were also obtained in the entire area where pan concentrates were sampled. The value itself is in general lower than the one of tantalum.

(g) Silver

Silver was not detected due to the detection limit.

2-4-4 Summary of the Stream Sediment Geochemical Survey

Strong gold anomalies were detected in the south to west of the Sao Francisco deposit. Minor gold anomalies were detected in the north and east of Frei Martinho and in the west of picui. Gold anomalies in the south of the Sao Francisco deposit are only thought to correspond to gold mineralization. In the north of Frei Martinho, minor gold mineralization has been found in skarn rocks. In the other areas, no gold mineralization has been found by the geologic traversing. Therefore, if there is any gold mineralization in the area except the area near Sao Francisco deposit, they should be too small to be developed.

From the result of the stream sediment geochemical survey, gold mineralization is in general inferior in the project area except the area neighboring the Sao Francisco deposit.

Chapter 3 Detail Survey of the Area A

3-1 GEOLOGY and MINERALIZATION

3-1-1 Geology

The area A is predominated by schist of the Serido Formation. The Serido Formation is divided into five subunits, pCssx1 which is composed mainly of mica schist accompanied by garnet-biotite schist and cordierite-biotite schist, pCssx2, is siliceous biotite schist, pCssx4 which is alternation beds of biotite schist, garnet-biotite schist and cordierite-garnet-biotite schist, pCsscs, calc-silicate rock, and pCssaf of amphibolite.

Geology of the area A-I, A-II, A-III and A-IV are shown in Figure II-3-1.

Area A-I is lain by pCssx1 and pCssx4. pCssx2 is intercalated in the pCssx1. pCsscs beds extend in the direction of NNE-SSW. There are two beds of pCsscs 350 to 400m wide and several beds 25 to 100m wide. In the pCssx4, thin beds of pCssx2 and pCsscs are included. Many pegmatite dikes trending NNE and basalt dike trending WNW intruded in the rocks described above.

Area A-II is occupied by pCssx4, intercalated with thin beds of pCssx2 and pCsscs.

Area A-III is dominated by pCssx4 in the center and pCssx1 in the west. In this area, many lenticular pCsscs beds are intercalated in the pCssx4. A large number of pegmatite dikes intrude in those units.

Area A-IV is occupied by pCssx4, intercalating pCssx2 300m wide, trending NNE.

Foliations in the area A generally strike NNE and dip slightly to the east except in the east of the area A-I, where they strike NNe and dip steeply to the east.

3-1-2 Mineralization

In regarding to the mineralization in the bed rock, quartz veins occur, accompanying copper sulfides, in the central western portion of the area A-I. Six garimpos of placer gold are recognized in the area A-II (Figure II-3-3).

The quartz veins with copper minerals extend laterally along foliation of biotite schist up to 400m. They strike NNE-SSW and dip 80 N. Some tens of quartz veins 1 to 5 cm thick form one zone 5m wide. In the zone three sub-zones accompanying ore minerals such as bornite and malachite are discriminated. Those sub-zones are 2 to 10 cm wide. In the quartz veins epidote and biotite are also observed.

3-2 BIOGEOCHEMICAL SURVEY

3-2-1 Method

Biogeochemical survey was carried out in the areas A-I and A-II, where were recommended for further survey as the result of the phase I survey. Following three species of plant leaves were sam-

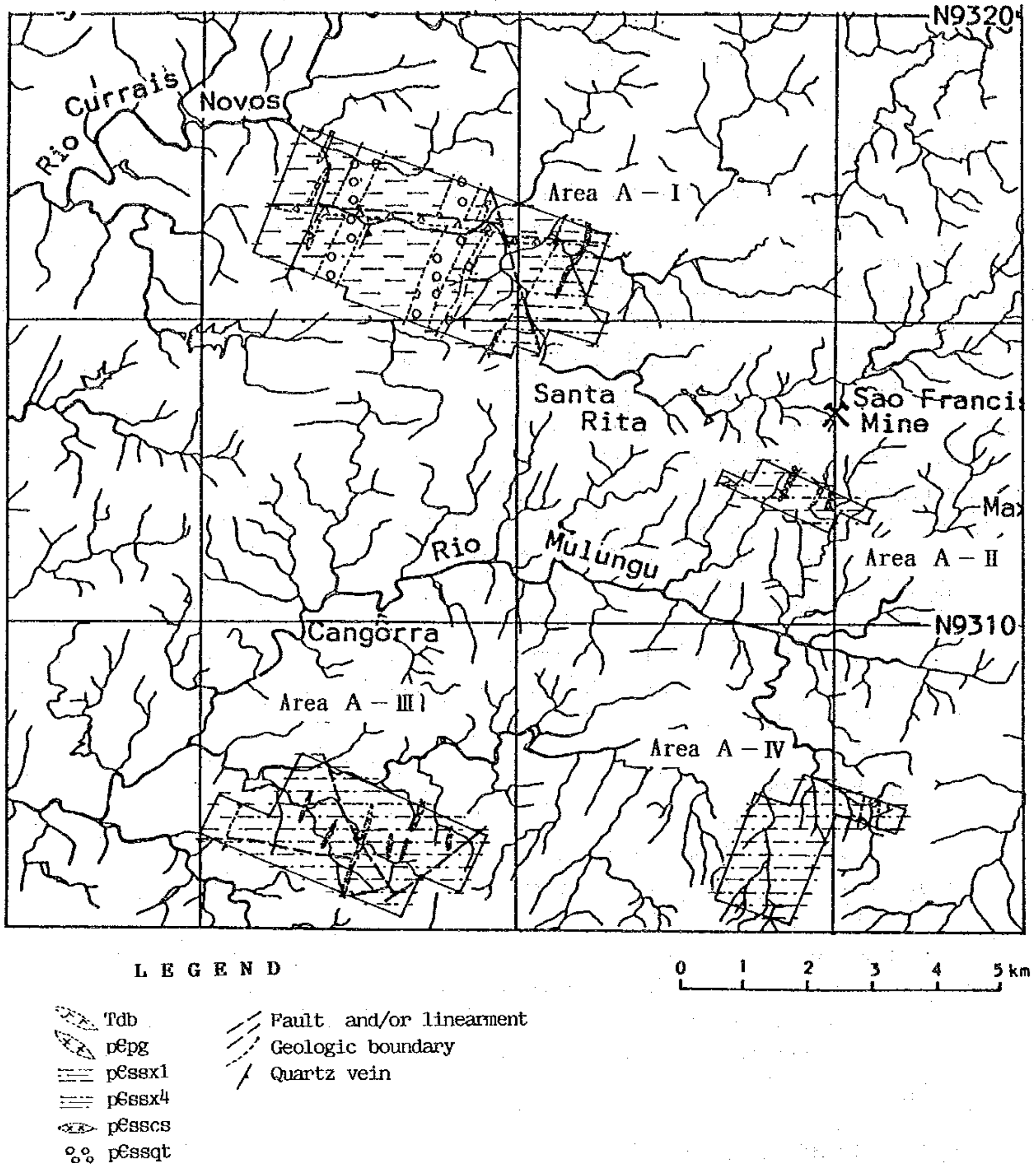

Figure II-3-1 Geology of areas A-I, A-II, A-III and A-IV

pled for chemical analysis. Those plants are broad leaf trees (Appendix 2).

a)Jurema Preta
Family and subfamily; Leguminosae, Mimosoideae
Scientific name; Leguminosae Mimosa acutistipula Benth
b)Catingueira
Family and subfamily; Leguminosae, Caesalpinioideae
Scientific name; Leguminosae Caesapinia piramidalis Tul
c)Malva
Family and subfamily; Malvaceae
Scientific name; Malva Sida rhombifalia

510 samples were collected in total. Three species of plant samples were collected together within a radius of 20m, at the center of the area soil samples were taken. Those samples were taken at a grid point 400m by 400m in area A-I and 200m by 100m in area A-II.

Elements for analyses are Au, As, Sb, Fe and Al. Fe and Al were applied to examine whether any contamination with the dust is recognized or not. The analysis were carried out in Chemex Labs Ltd. in Canada.

To examine geochemical anomalies, EDA method was applied for the analytical values (Table II-3-1, Table II-3-2).

3-2-2 Results

(1) Area A-I (Figure II-3-2)

Jurema Preta

Gold anomalies were detected in the following four areas; southeast to central part, northwest part, southwest part and northeast part. In the southeast to central part gold values are 1.8 to 5.2ppb, in the northwest part they are 1.0 to 11.2ppb, in the southwest part they are 4.0ppb and in the northeast part they are 2.2 to 6.4ppb.

Arsenic anomalies were found in the southeast and central parts and northeast and northwest parts of the area. The anomalies do not always correspond to those of gold. They are located rather outside of the gold anomalies. In the southeast part gold anomalous value was highest, 0.45ppm. In the central part the anomalous value was 0.37ppm.

Antimony anomalies were detected in the north, northwest, northeast, east and southeast part of the area. Antimony values in the southeast part is highest, 0.06 to 0.175ppm. Other anomalous values are 0.05ppm and less than that. Those anomalies do not always correspond to the gold anomalies.

Caatingueira

Gold anomalies were detected at four areas in the central to northeast part of the area. They

Table II-3-1 Statistical studies of plant analytical data

	Elements	Mean	Variance	Standard deviation	Minimum	Maximum	Below detectio limit(%)
J	Au(ppb)	0.562	0.290	0.538	0.100	11.200	23.1
	As(ppm)	0.015	0.489	0.699	0.005	2.410	60.7
	Sb(ppm)	0.004	0.187	0.432	0.002	0.175	61.8
	Fe(ppm)	101.930	0.118	0.343	25.000	1,550.000	15.6
	Al(ppm)	76.577	0.140	0.374	25.000	2,000.000	21.3
C	Au(ppb)	0.213	0.298	0.546	0.100	907.000	64.0
	As(ppm)	0.010	0.248	0.498	0.005	1.250	62.8
	Sb(ppm)	0.003	0.100	0.316	0.002	0.045	80.8
	Fe(ppm)	50.793	0.025	0.159	25.000	250.000	10.5,89.5*
	Al(ppm)	33.002	0.041	0.204	25.000	300.000	68.0
M	Au(ppb)	0.874	0.258	0.508	0.100	46.000	9.1
	As(ppm)	0.014	0.360	0.600	0.005	5.110	47.3
	Sb(ppm)	0.004	0.202	0.449	0.002	0.055	55.8
	Fe(ppm)	223.712	0.047	0.217	100.000	1,000.000	none
	Al(ppm)	184.971	0.085	0.292	50.000	1,250.000	none

J:Jurema Preta C:Catingueira M:Malva * detection limit or less

Table II-3-2 EDA analyses for plant analytical data

	Elements	Median	Lower fence	Lower whisker	Lower hinge	Upper hinge	Upper whisker	Upper fence	Upper fence or more(%)
J	Au(ppb)	0.600	- 1.900	0.100	0.200	1.600	1.800	3.700	3.5,22.5**
	As(ppm)	0.000	- 0.060	0.000	0.000	0.040	0.070	0.100	16.8
	Sb(ppm)	0.002	- 0.002	0.002	0.002	0.005	0.010	0.009	21.4
	Fe(ppm)	100.000	25.000	50.000	100.000	150.000	200.000	225.000	12.1
	Al(ppm)	100.000	- 25.000	25.000	50.000	100.000	150.000	175.000	14.5
C	Au(ppb)	0.100	- 0.350	0.100	0.100	0.400	0.600	0.850	16.3
	As(ppm)	0.000	- 0.015	0.000	0.000	0.010	0.020	0.025	13.4
	Sb(ppm)	0.002	0.002	0.002	0.002	0.002	0.002	0.002	19.2 *
	Fe(ppm)	50.000	50.000	50.000	50.000	50.000	50.000	50.000	10.5 ***
	Al(ppm)	25.000	- 12.500	25.000	25.000	50.000	50.000	87.500	5.8
M	Au(ppb)	1.000	- 1.100	0.400	0.400	1.400	2.000	2.900	12.7
	As(ppm)	0.010	- 0.045	0.000	0.000	0.030	0.040	0.075	11.5
	Sb(ppm)	0.002	- 0.010	0.002	0.002	0.010	0.015	0.022	11.5
	Fe(ppm)	200.000	- 75.000	150.000	150.000	300.000	350.000	525.000	4.8
	Al(ppm)	200.000	-125.000	100.000	100.000	250.000	300.000	475.000	9.1

J: Jurema Preta
C: Catingueira
M: Malva

* Detection limit or more
** Upper whisker or more (1.8 ppb<)
*** 100 ppm<

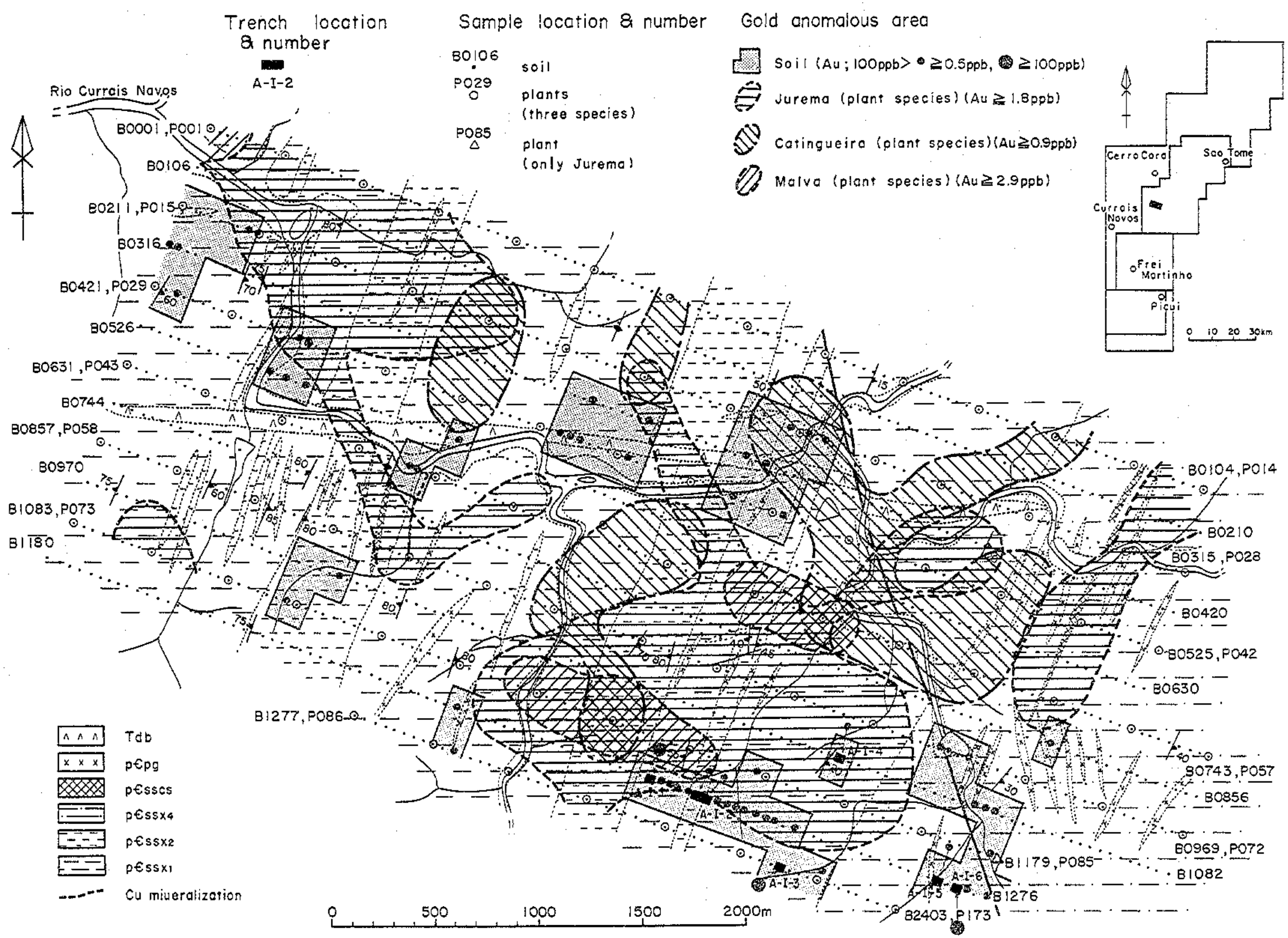

Figure II-3-2 Soil and biogeochemical anomalies in area A-I

do not always correspond to soil anomalies. Maximum value 907ppb is in the northwest edge of the northeastern anomalous area. The rests in the same area are 2.2ppb and less than that. In the central anomalous area, gold values are 1.2ppb to 3.0ppb. The other anomalies are 2.6ppb and less than that.

Arsenic anomalies were detected at six points in the central to northeastern part of the area. Those in the northeastern part are included in a gold anomalous area and correspond to the anomalies of iron and aluminum. The arsenic values are 0.03 to 0.85ppm. The points with highest arsenic anomalies is the same point as the one with highest gold anomalies. The rest of the anomalies lies scattered with the values of 0.03 to 0.06ppm.

Antimony anomalies are distributed in the northeast, central and northwestern parts of the area. These anomalies are somewhat correspond to gold and arsenic anomalies. In the northeastern part, antimony values are 0.002 to 0.045ppm, and the point with the maximum value is on the same point as the one with gold maximum value. The rest of the anomalous points are sparsely distributed. The anomalous values are mainly distributed in the northern side of basaltic dike trending WNW as the anomalies of soil.

Malva

Gold anomalies were detected in the southeastern and northwestern parts of the area. These anomalous areas are included in the gold anomalous area of Jurema Preta. The gold values are 3.0 to 4.0ppb.

Arsenic anomalies are sparsely distributed in the northwestern to eastern part of the area. None of these anomalous points do not correspond to either soil anomalies or the other plant anomalies in respect to three elements. Higher values, 1.70 to 5.11ppm, are located in the central western part of the area.

Antimony anomalies are distributed in the northwestern to eastern part of the area. They do not generally correspond to the gold and arsenic anomalies. However, they correspond to gold and arsenic anomalies in the northern side of basaltic dike. Their arsenic values are 0.025 to 0.045ppm.

(2) Area A-II (Figure II-3-3)

Jurema Preta

Gold anomalies are detected in the north, central and southern parts of the area. These anomalies do not correspond to soil anomalies. Gold values in the northeastern part are 1.8ppb to 4.8ppb. Gold values in the other areas are 2.2ppb and less than that.

Arsenic anomalies are clustered in the north to south, central and northwestern parts of the area. The anomalies in the north to southern part is located on the southern extension of the Sao Francisco deposit. The anomalies in northern, central and southern anomalies include gold anomalies mentioned above. The arsenic values right on the extension of the Sao Francisco deposit is highest, 0.14ppm to 2.41ppm. The arsenic values in the central part and in the western part are 0.20ppm to 1.30ppm and 0.1ppm to 0.41ppm respectively.

Antimony anomalies are sparsely distributed in the north to southeastern part and southwestern to southern part of the areas. The anomalies, the values of which are 0.02ppm and less than that,

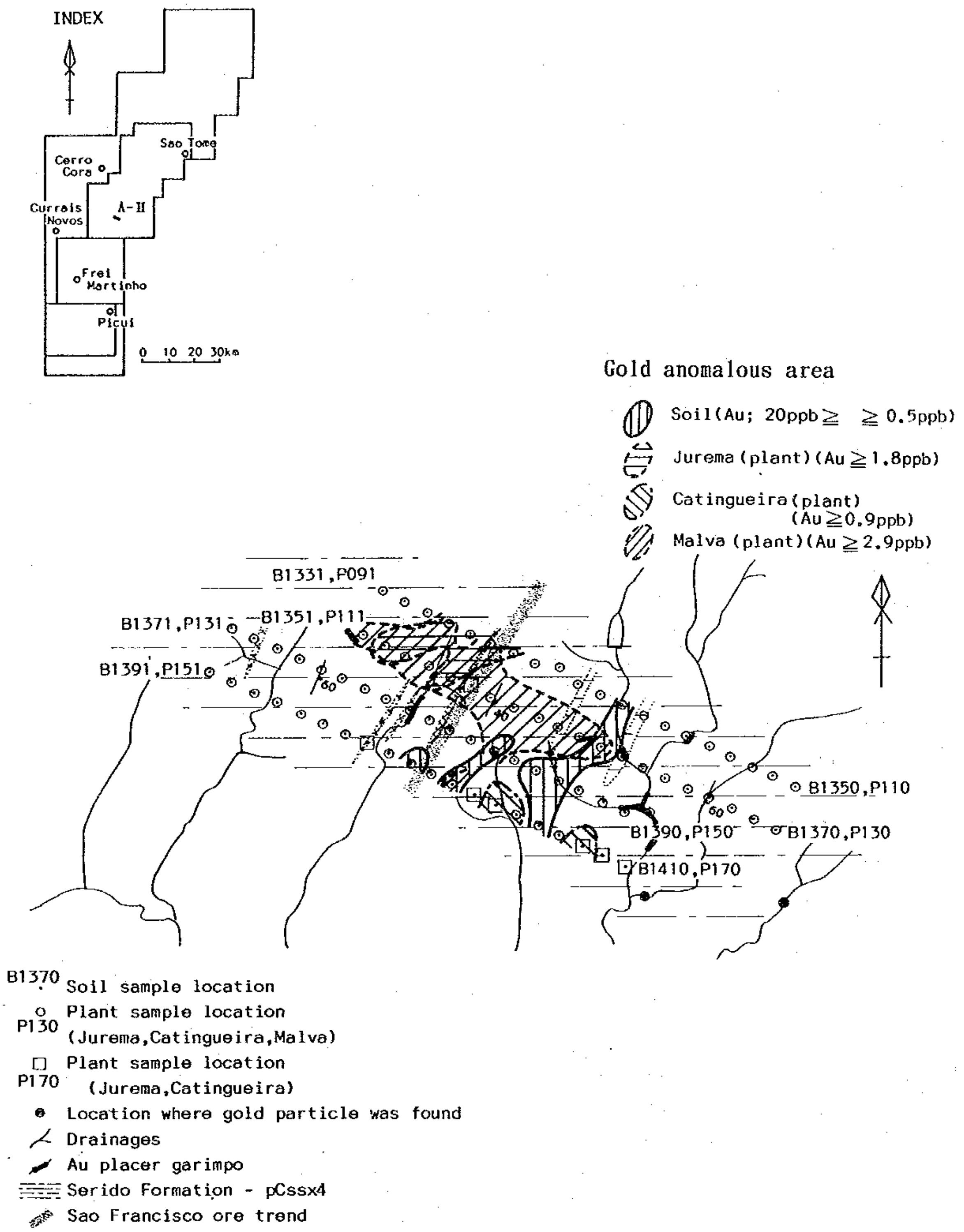

Figure II-3-3 Soil and biogeochemical anomalies in area A-II

do not always correspond to the gold and silver anomalies.

Caatingueira

Gold anomalies are sparsely distributed. In the southeastern part, higher values, 2.0 to 11.4ppb, were detected. On the extension of the Sao Francisco deposit, higher value was not detected. It was 1.2ppb Au.

Arsenic anomalous values are clustered in the northern part of the area with the values of 0.05 to 1.25ppm. The anomalous area includes a part of anomalous areas of gold and antimony. On the extension of the Sao Francisco deposit, highest value, 1.25ppm, was obtained. The other anomalous values are 0.03 to 0.1ppm.

Antimony anomalies, 0.005 to 0.02ppm, are scattered, not corresponding to anomalies of gold and arsenic.

Malva

Gold anomalies are very much clustered in a direction of WNW-ESE in the northwest to central part of the area. The gold analytical values are 4.0 to 46.0ppb. The anomalous area includes some parts of the gold anomalous areas of soil and the plants.
The highest value, 46.0ppb, was taken right on the extension of the Sao Francisco deposit.

Arsenic anomalies are sparsely distributed. Highest value was obtained on the extension of the Sao Francisco deposit. Other analytical values are 0.13 to 0.67ppm.

Antimony anomalies, 0.025ppm to 0.055ppm, are also sparsely distributed. The anomalous area do not always correspond to the anomalies of gold and arsenic.

As described above, gold was effectively detected in the species of malva. Gold anomalies of three species of plants are overlapped each other in the central southern part and in the central eastern part of the area A-I. Gold and arsenic anomalies of three species of plants also overlap each other on the extension of the Sao Francisco deposit.

(3) Iron and aluminum in three species of plants

Iron and aluminum are strongly correlated in all of the plants.

These elements are considered to be removed by ground water along the topographical slope and absorbed by plants, according to the analysis of the relation of the anomalies of iron and aluminum to the geology and topography.

(4) Effectiveness of the biogeochemical survey

In this biogeochemical survey, soil samples were simultaneously collected at the same points. Average ratio of plant gold contents to soil gold contents are 2.37, 0.90 and 3.69 for jurema preta, catingueira and malva respectively. Average ratio of plant arsenic contents to soil arsenic contents are 0.0048, 0.0032 and 0.0045 for jurema preta, catingueira and malva respectively. And average ratio of

Table II-3-3 Summary of plant geochemical anomalies

Area	Plant species	Gold anomalies	As & Sb anomalies
A－I	Jurema Preta	anomalous value ≧1.8ppb ① Central to southeast part:max5.2ppb ② Northwest part : max 11.2ppb ③ Southwest part : max 4.0ppb ④ Northeast part : max 6.4ppb	As:anomalies lies outside the Au amomalies;max 0.45ppm Sb:anomalies are sparsed & do not correspond to Au & As
	Catingueira	anomalous value ≧0.9ppb ① North east part : max 907ppb ② Central part : 1.2 ～3.0ppb	As:anomalies in northeast is inside Au anomalies;0.03 ～ 0.85ppm Sb:northeast,central,northwest;0.002～0.045ppm, some correspond to Au a amomalies
	Malva	anomalous value ≧2.9ppb ① South east part : max 4.0ppb	As:sparsed,1.70 ～5.11ppm,not correspond to Au,Sb Sb:northwest～east;sparsed;0.025～0.045ppm
A－II	Jurema Preta	anomalous value ≧1.8ppb ① North part:max 4.8ppb ② Central part:max 2.2ppb	As:north～south,central ～northwest;correspond to S.F.ore trend;0.14 ～2.41ppm Sb:sparsed
	Catingueira	anomalous value ≧0.9ppb Anomalous points are sparsed with max. 11.4ppb On the S.F.ore trend:1.2ppb	As:sparsed anomalies ;1.25ppm on the S.F.ore trend Sb:sparsed;not correspond to Au,As
	Malva	anomalous value ≧2.9ppb Northwest to central part,trending WNW. max.46.0ppb on the S.F.ore trend	As:Sparsed;max.3.00ppm lies on S.F.ore trend Sb:sparsed;not correspond to Au,As

plant antimony contents to soil antimony contents are 0.002, 0.0015 and 0.002 for jurema preta, catingueira and malva respevctively. Therefore, jurema preta and malva can easely absorb above three elements in soil. Anomalous areas for those three elements in plants do not correspond each other. Gold anomalous areas of three plants correspond with each other in the central and eastern portion of area A-I and in the central portion of the area A-II (Figure II-3-2, Figure II-3-3). In the central portion of the area A-II, arsenic anomalous area covers the gold anomalous area. Gold content in jurema preta is thought to effectively represent soil gold content in area A-I, judging from the relationship of gold anomalous area of jurema preta to soil gold content in regard to topography.

From the above mentioned, it is understood that jurema preta and malva easely absorb gold in soil and jurema preta effectively represents the gold mineralization in the ground. Therefore, biogeochemical survey is understood to be effective.

3-3 SOIL GEOCHEMICAL SURVEY

3-3-1 Method

Soil geochemical survey was carried out to decrease the survey area for further detail survey in the area A, which was defined from the primary survey area. The area A was subdivided into four, A-I, A-II, A-III and A-IV.

Soil sampling lines were established in a direction of N70W and N65W and distance among those sampling lines are 200m in the areas A-I, A-III and A-IV. Soil samples were collected at every 50m on those sampling lines. In the area A-II, soil sampling lines are established in a direction of N65W and distances among those sampling lines are 100m. Samples were collected every 100m on those sampling lines. 2,400 soil samples were collected in total, 1,380 in the area A-I, 80 in the area A-II, 664 in the area A-III and 338 in the area A-IV.

Soil is not well developed in this area. A zone of soil section do not exist, therefore, soil samples were taken from B or C zone of the soil section.

Soil samples taken were dried, sieved and shipped to GEOSOL Ltda. for chemical analyses for the elements, Au, As and Sb. EDA method was applied to define anomalies of those three elements (Table II-3-4, Table II-3-5, Table II-3-6).

3-3-2 Results

(1) Area A-I (Figure II-3-2)

(a) Gold

Gold anomalous areas with more than 0.5ppb of gold area mainly distributed in the southeast, central, west and southwestern parts of the area. The anomalous area in the southeast is widespread with the highest gold value of 208ppb.

Table II-3-4 Statistical studies of soil analytical data in areas A and B

	Elements	Mean	Variance	Standard deviation	Minimum	Maximum	Below detection limit(%)
Phase II	Au(ppb)	0.237	0.095	0.308	0.200	208.000	93.1
	As(ppm)	1.252	0.391	0.625	0.500	560.000	64.8
	Sb(ppm)	0.512	0.003	0.058	0.500	2.000	96.7
Phase III	Au(ppb)	0.749	26.373	5.135	0.200	116.000	93.9
	As(ppm)	1.526	7.729	2.780	0.500	37.000	62.4
	Sb(ppm)	0.500	0.000	0.000	0.500	0.500	100.0

Table II-3-5 EDA analyses for soil analytical data in areas A and B

	Elements	Median	Lower fence	Lower whisker	Lower hinge	Upper hinge	Upper whisker	Upper fence	Upper fence or more(%)
PhaseII	Au(ppb)	0.200	0.200	0.200	0.200	0.200	0.200	0.200	6.9 *
	As(ppm)	0.500	-3.250	0.500	0.500	3.000	7.000	6.750	19.3
	Sb(ppm)	0.500	0.500	0.500	0.500	0.500	0.500	0.500	3.3*
PhaseIII	Au(ppb)	0.200	0.200	0.200	0.200	0.200	0.200	0.200	6.1
	As(ppm)	0.500	-0.250	0.500	0.500	1.000	1.000	1.750	18.0
	Sb(ppm)	0.500	0.500	0.500	0.500	0.500	0.500	0.500	100.0

Table II-3-6 Soil geochemical anomalies in area A

Area	Gold anomalies (≧0.5ppb)	As & Sb anomalies
A－I	① Southeast:max 208ppb ② Central:sparse ③ West southweat:sparse	As:eastend;1500m wide,NNN-SSW direction max 92ppm;no correlation to Au,Sb Sb:north～northwest;low no correlation to Au,Sb
A－II	① 500m east of S.F.southern extention; max 20.0ppb ② 200m east of S.F.southern extention	As:two zones somewhat corresponding Au anomalies ① lies on the S.F.extention;54 ～89ppm ② 500m east of S.F.extention;max 93ppm Sb:not detected
A－III	Anomalies are sparsed;low value	As:two zones trending NNW-SSW;max 242ppm no correlation to Au Sb.not detected
A－IV	Anomalies are spotty;low value	As:spotty;≦50ppm;no correlation to Au Sb.not detected

(b) Arsenic

Anomalous areas are concentrated in the eastern zone trending NNE. The zone is about 1,500m wide, lying mostly on the pCssx4. Small anomalous zone trending NNE is also present in the eastern margin of the pCssx1, which is western neighbor of the pCssx4. The highest value, 92ppm of arsenic, exist in this anomalous zone. The arsenic anomalous zones mentioned formerly except locally in the southeastern part.

(c) Antimony

Though anomalous values are lower, the anomalous zones are scattered mainly in the central north to northwestern part of the area. The anomalous zones are small and aligned in the direction of WNW-ESE in the pCssx1 and pCssx4 to the north of basalt dike trending WNW. These anomalous zones do not correspond to those of Au and As.

(2) Area A-II (Figure II-3-3)

(a) Gold

Two anomalous areas were found in the central part of the area. One is 500m east of the southern extension of the Sao Francisco ore trend. The other is about 200m east of the Sao Francisco ore trend. THose anomalies extend in a direction of NNE-SSW. On the extension of the Sao Francisco ore trend, anomalies are sparsely distributed.

(b) Arsenic

Two zones of anomalies, 50 200m wide, extend in a direction of NNE-SSW. The zone located on the west, having 54ppm to 89ppm of arsenic, lies on the southern extension of the Sao Francisco ore trend. The eastern zone is located 500m east of the Sao Francisco ore trend. The eastern zone somewhat corresponds to the gold anomalies described above, having more than 10ppm of arsenic with maximum value of 93ppm.

(c) Antimony

No anomalies was detected.

(3) Area A-III (Figure II-3-4)

(a) Gold

Anomalies were sparsely distributed with lower values.

(b) Arsenic

Anomalous area occupy wide area, forming two zones trending NNE. The western zone is 1 to 2km wide, including more than 100ppm of arsenic value. The eastern zone, 150m to 500m wide, is 500m apart from the western zone, including 242ppm, 66ppm and 55ppm of arsenic values. These anomalies are especially located in the area rich in pCsscs beds.

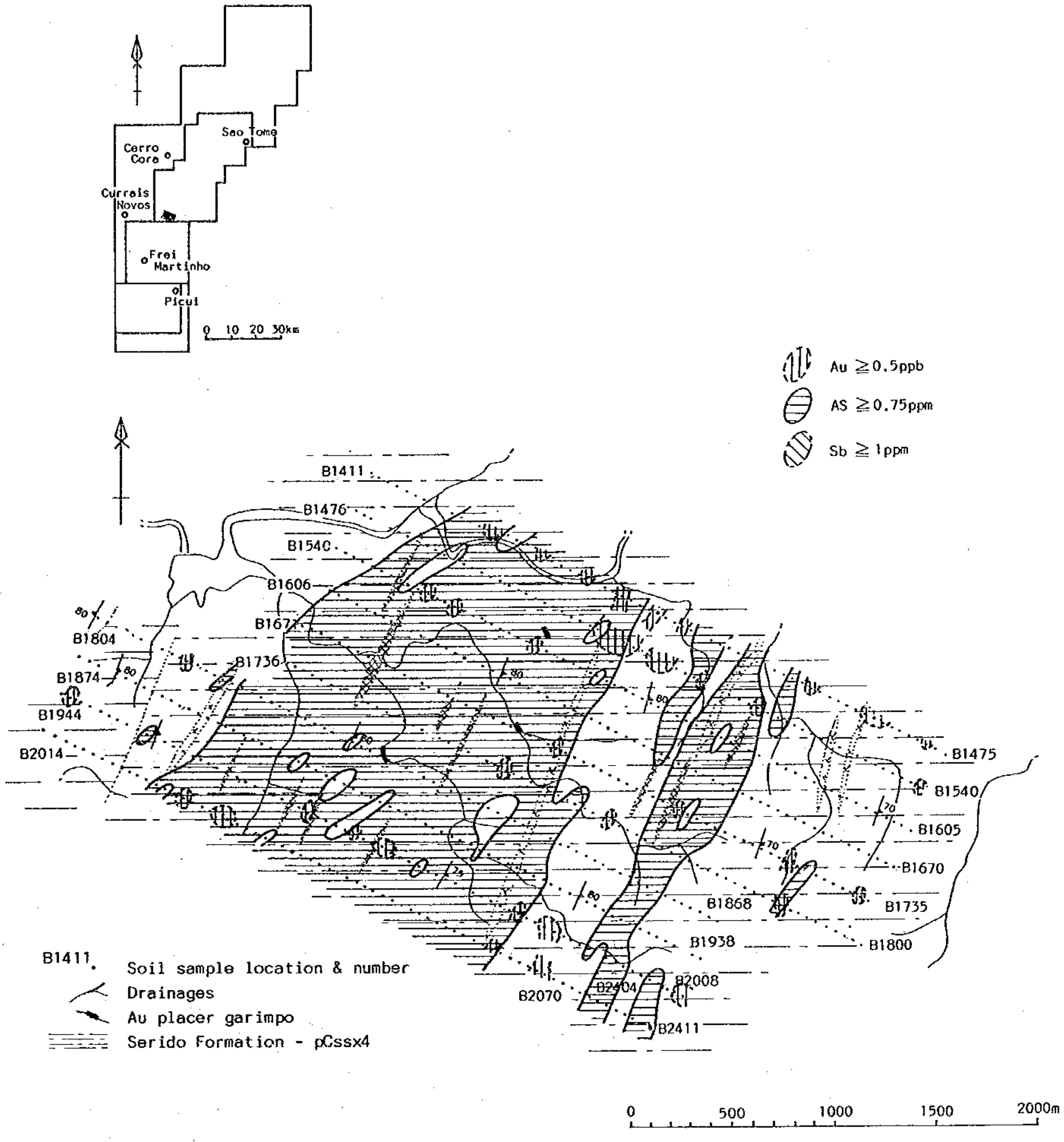

Figure II-3-4 Soil geochemical anomalies in area A-III

(c) Antimony

No anomalies were detected.

(4) Area A-IV (Figure II-3-5)

(a) Gold

Anomalies with lower values, are scattered in the area. Only one point is above 10ppb of gold, others are less than that.

(b) Arsenic

Anomalous areas 50 to 100m wide extend intermittently in a direction of NNE-SSW in the central part of the area. Analytical values are 50ppm and less than that. The anomalous areas do not correspond to either any lithology or other elements.

(c) Antimony

No anomalies were detected.

3-4 GEOPHYSICAL SURVEY

3-4-1 Method

IP survey was executed for the determination of trench location in the area A-II.

Five survey lines 2km long each were established in the direction of WNW-ESE same as the one of geochemical survey carried out in the phase II survey. Distance among the survey lines is 200m. Measurement was executed by dipole-dipole method. Measuring points were planned at every 50m on the survey lines. N factors (separation factors) applied are 1, 2 and 3.

3-4-2 Results

(a) Apparent Resistivity Sections (Figure II-3-6)

1) Line A

Prominent low apparent resistivity (called AR herein after) values are distributed in the cen tral part. These low AR values possibly reflect low resistivity zone of the shallower part of the ground. Higher AR values of 500 m and more than that are locally distributed in the deep.

2) Line B

Lower AR values less than 50 m are scattered in the west. Zones of higher values incline to the east in the west and central eastern portion. On the other hand, the zones incline to the west in the central part and eastern portion. This tendency is similar to the one of line A.

3) Line C

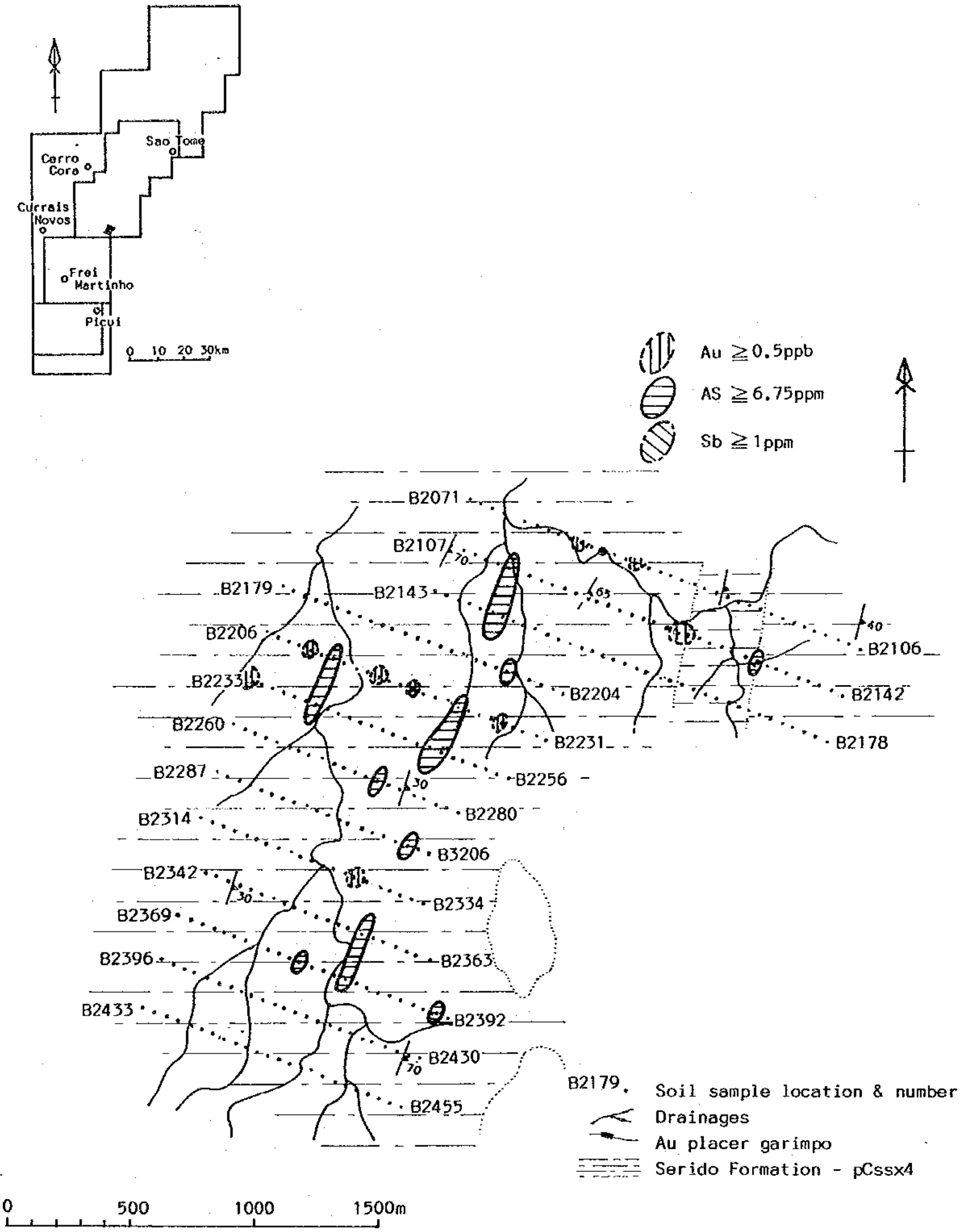

Figure II-3-5 Soil geochemical anomalies in area A-IV

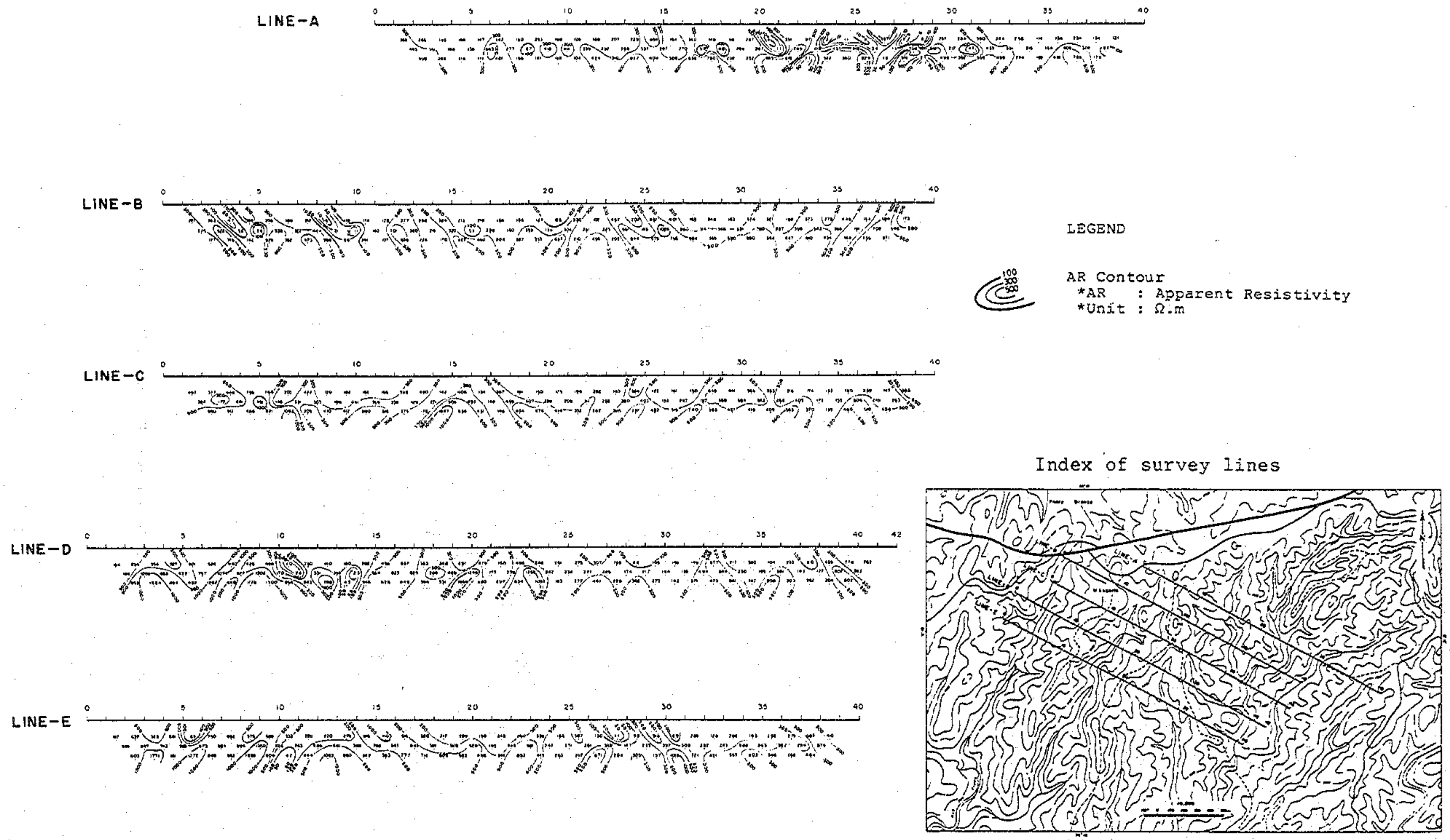

Figure II-3-6 Apparent resistivity in cross section in area A-II

Intermediate AR values are intermittently distributed from the shallower part to the middle depth (n = 1 to 2). Two high AR values of 1,000 m are distributed in the west. This means that the values are getting higher to the south.

4) Line D

Lower AR values are distributed in the west, central east and east. In the west, the zone of low AR values inclines to the east and to the west. They are localized close to the surface in the central east and eastern end. Higher values more than 500 m are scattered in the deep.

5) Line E

Lower AR values are widely scattered. They locally reflect lower resistivity zone near the sur face. Higher AR values with 500 m and more than that are also locally present.

(b) Percent Frequency Effect Sections (Figure II-3-7)

1) Line A

Zones of intermediate PFE values are distributed in the west. Those zones are thought to be formed by the origin inclining to the east and to the west. West dipping lower PFE zone about 100m wide is to the west of east dipping lower PFE zone.

2) Line B

Intermediate PFE zone is located in the west. The intermediate zone inclines east in the west, forming a chevron shape in the central portion.

3) Line C

Zone of higher to intermediate PFE is distributed in the central to western portion. The zone is widest in the area. In the east, the center of the higher zones are supposed to be in two portions and incline west.

4) Line D

Lower PFE zone is in the eastern end of the line. No prominent higher PFE zone are present. That is, PFE values decreases abruptly from line C to line D toward south. However, in cen tral to western portion, lower PFE zone tending N-S continues from the northern line C to the line D, this zone corresponding to the Sao Francisco ore trend.

5) Line E

Small lower PFE zone is in the west end. However, further lower values are in the western portion, being supposed to continue further south and corresponded to the Sao Francisco ore trend.

(c) Apparent Resistivity Plan Maps

1) n = 1 (Figure II-3-8)

This plane indicates AR distribution at the depth of about 50m from the surface. In the plane intermediate AR values, 100 to 300 m, are widely distributed. Lower values with less than 100 m are locally distributed. Higher AR values more than 300 m extend in the direction of NNE-SSW to N-S inside the zone of intermediate AR values.

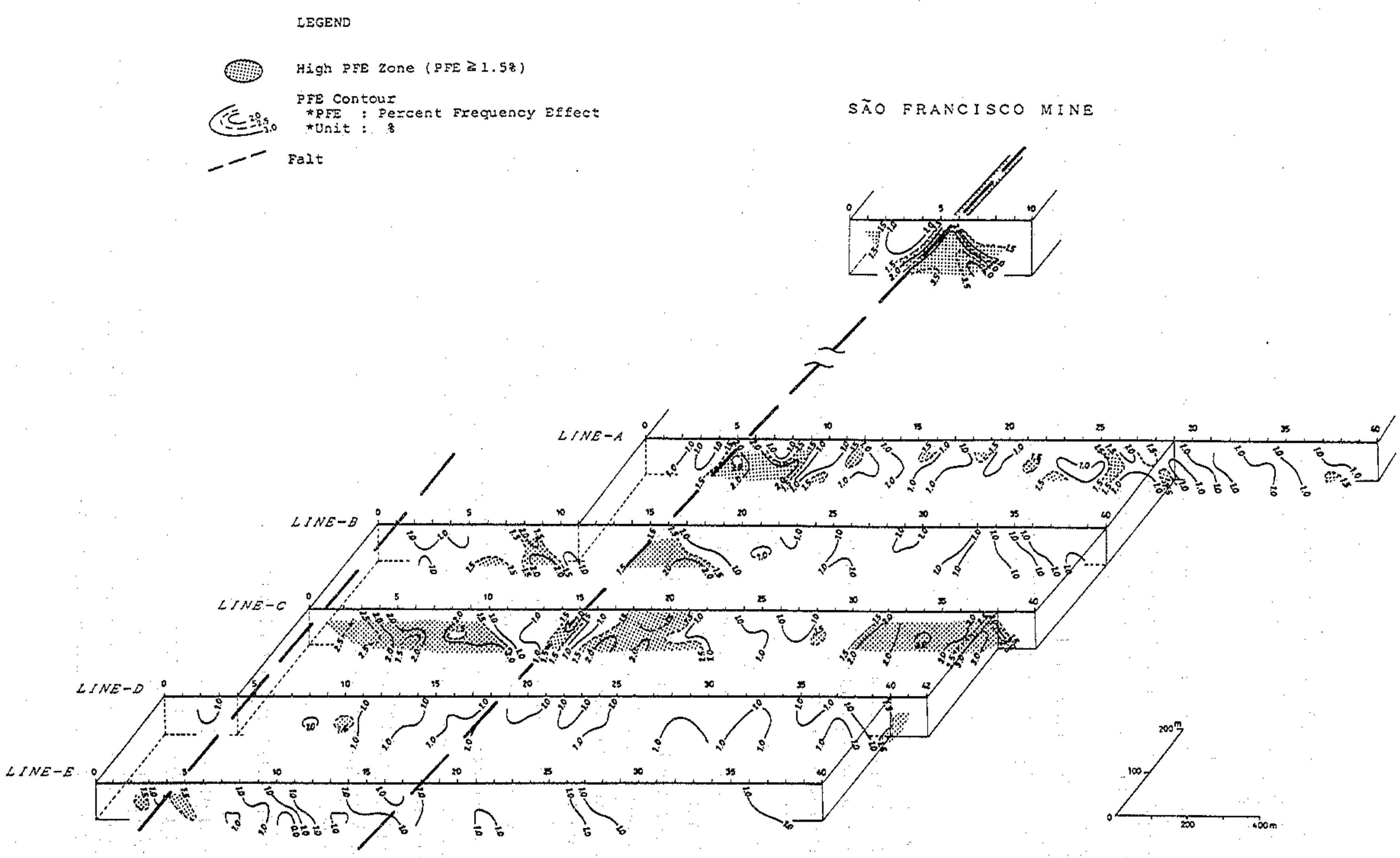

Figure II-3-7 Percent Frequency Effect block diagram in area A-ii

2) n = 2 (Figure II-3-9)

This plane indicates AR distribution at the depth of about 75m from the surface. In this plane, area of intermediate AR values decreased and area of higher AR values increased, compared to the n = 1 plane. The higher AR values form zones trending NNE in the west, central and east of the plane. Lower AR values are scattered.

3) n = 3 (Figure II-3-10)

This plane indicates AR distribution at the depth of about 100m from the surface. Higher AR values are widely distributed compared to on the planes of n = 1 and n = 2. Intermediate to high AR values form zones trending NNE, those trends correspond to the trend of geologic structure. In the west, AR values change prominently from the shallower part to the deeper part. That is, Lower AR values on the n = 2 plane mostly disappear in n = 3 plane.

(d) Percent Frequency Effect Plan Maps

1) n = 1 (Figure II-3-11)

PFE anomalous values with more than 1.5% are distributed in the west, central and eastern part to the north of line C. The western anomalous part extends to the west and to the north, the eastern anomalous part extends to the southeast and the central anomalous part extends to the north. In the three areas, two intermediate PFE zone, which are thought to be the center of the area, are included in those three areas.

2) n = 2 (Figure II-3-12)

PFE anomalous values with more than 1.5% are concentrated in the west, central and eastern parts of the plane. These anomalous zones are distributed in about same areas as those in n = 1 plane. However, the western anomalous zone is subdivided into two parts. The central anomalous zone bends NE-SW direction in the north to NW-SE direction in the south. The eastern anomalous zone has higher PFE values than those of n = 1 plane and the zone increases its area.

3) n = 3 (Figure II-3-13)

PFE anomalous values with more than 1.5% are also concentrated in the west, central and eastern parts of the plane. The distribution is about same as that of n = 1 plane. However, the PFE values are higher than those of n-1 plane. The anomalous values in the central portion is more widely distributed than those in n = 1 and n = 2 planes.

From the above mentioned, there are three potential zones, eastern zone, central zone and western zone, for the mineralization (Figure II-3-14).

The eastern zone extends in a direction of NW-SE, western zone and central zones extend in a direction of E-W and NNE-SSW respectively. The central zone is along estimated fault, indicating the correlation of the mineralization with the fault. The fault is presumed to extend further south, while the PFE anomalous zone do not extend to the south of line D. From this evidence, the possible mineralization is not thought to continue to the south of line D.

The PFE value in the anomalous zone in the eastern end of the line C is equal to the value at

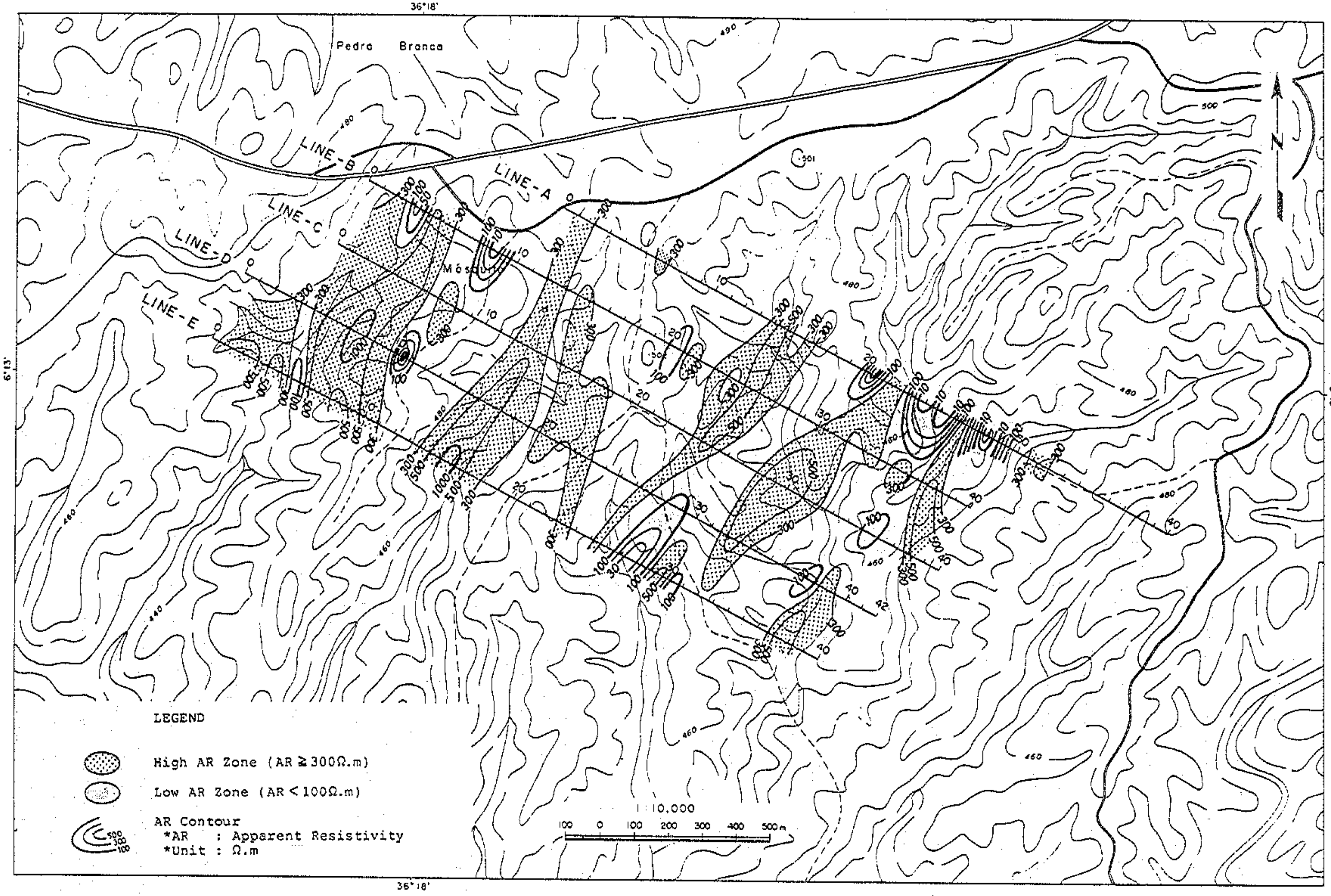

Figure II-3-8 Apparent resistivity in a n = 1 plan

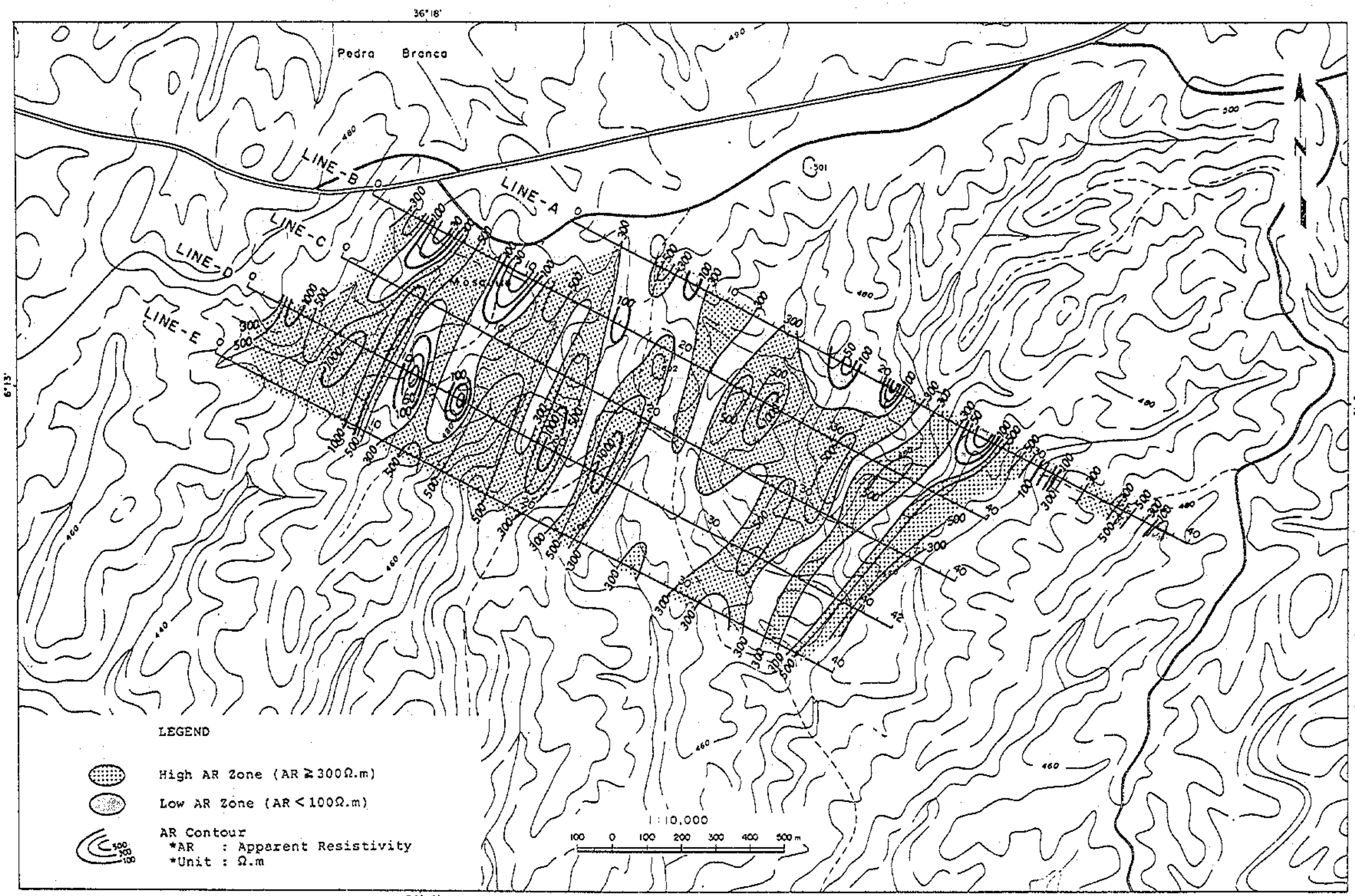

Figure II-3-9 Apparent resistivity in a n = 2 plan

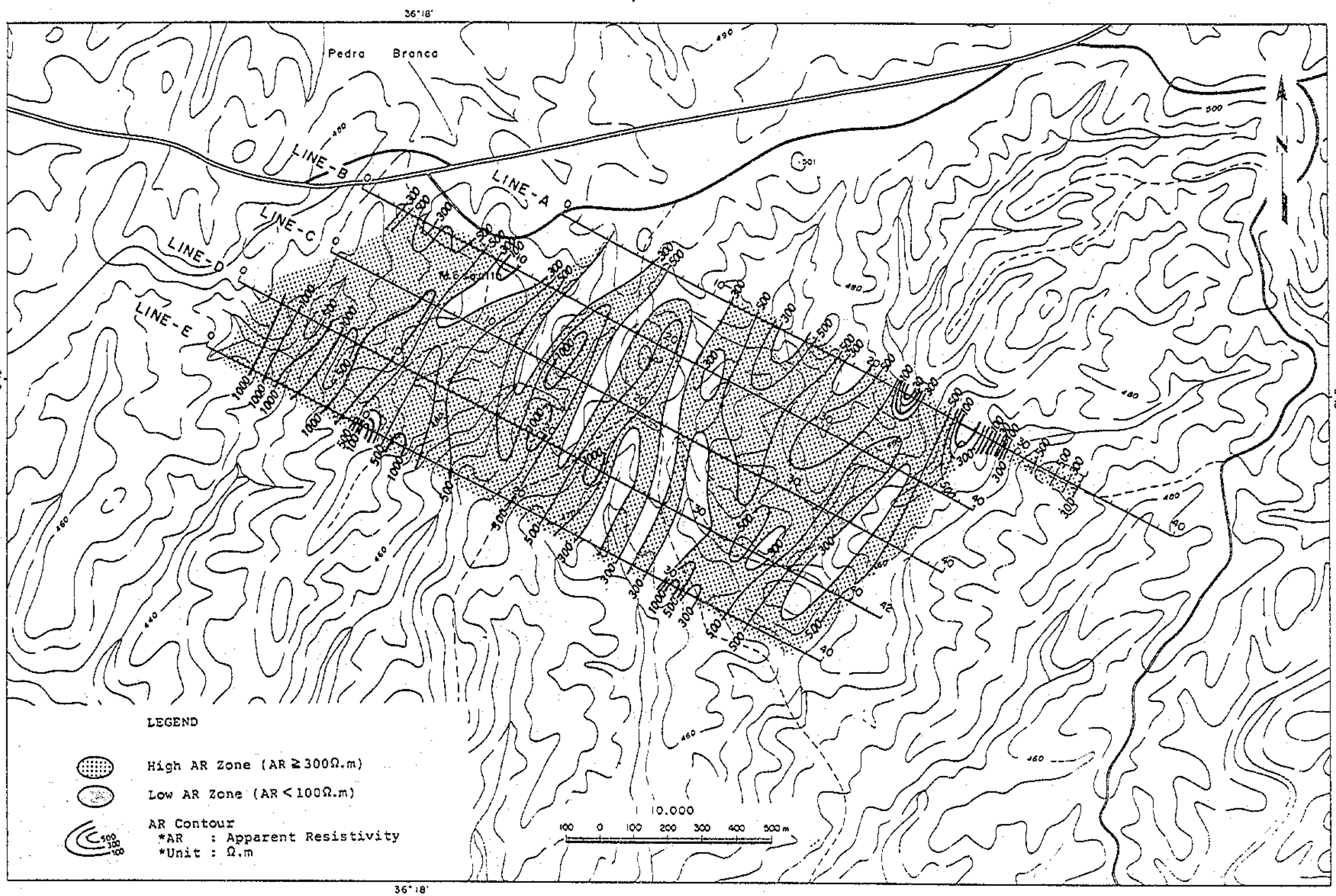

Figure II-3-10 Apparent resistivity in a n=3 plan

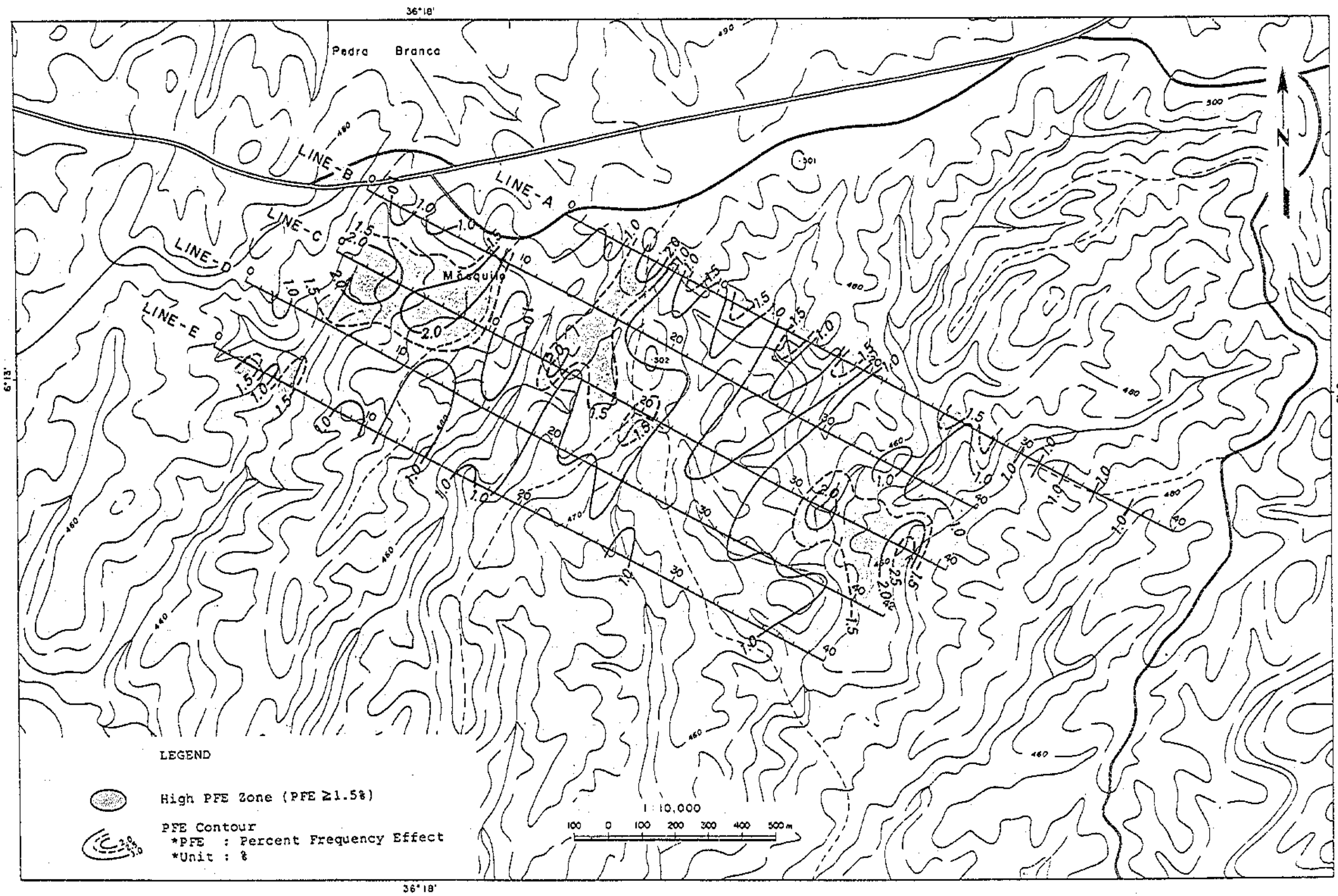

Figure II-3-11 Percent frequency effect in a n = 1 plan

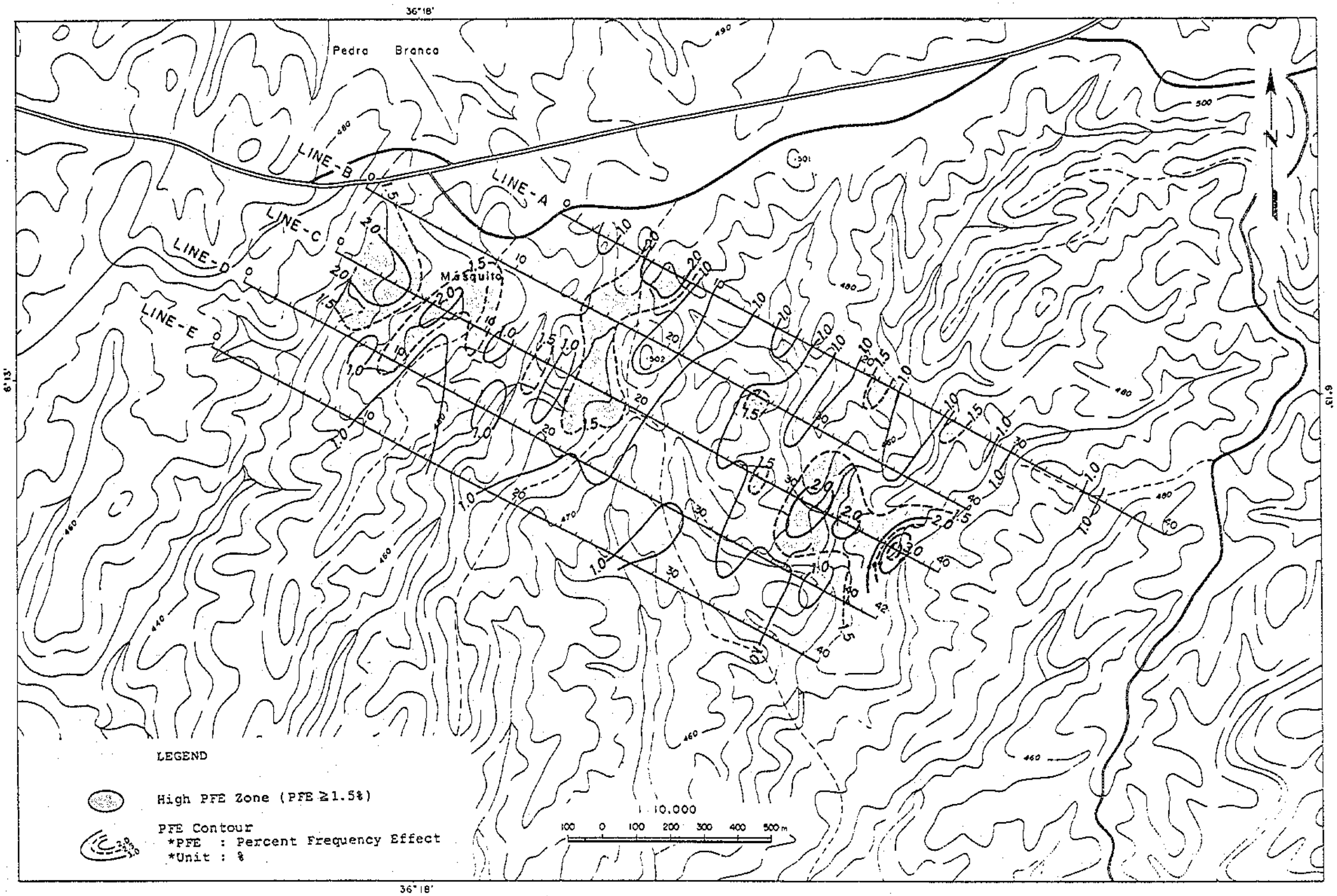

Figure II-3-12 Percent frequency effect in a n=2 plan

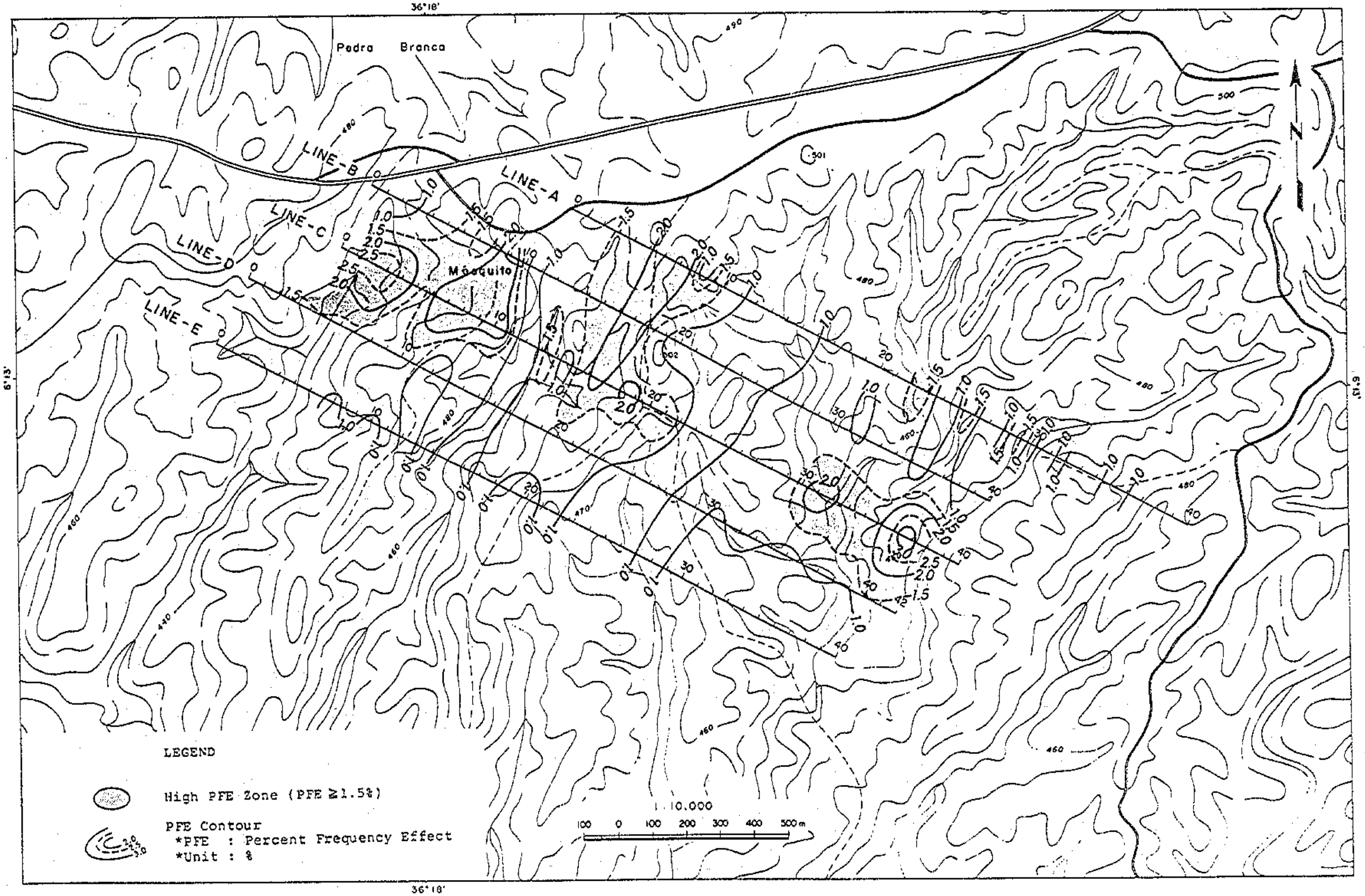

Figure II-3-13 Percent frequency effect in a n=3 plan the Sao Francisco ore deposit. Therefore, the anomalous zone is thought to have higher potential.

In case of location of trenches in the area A-II, IP and geochemical anomalies are considered together (Figure II-3-14). The Sao Francisco ore trend was avoided for opening trenches.

1) Trench A-II-1

The trench is located in between 6 and 7 of measuring point on the line C. There apparent resistivity is less than 500 m, PFE value is 2 to 3%. Furthermore, the part is covered by gold anomalous area of malva.

2) Trench A-II-2

The trench was opened in between 20 and 22 of measuring point on the line C. Apparent re sistivity is less than 300 m, PFE value is 1.5% there. The location is covered by gold anomalies of malva and catingueira.

3) Trench A-II-3

The trench was excavated in between 37 and 38 of measuring point on the line C. There ap parent resistivity is less than 300 m and PFE values are 2 to 4%. No geochemical anomalies were detected there. The shape of the PFE anomalous zone and the apparent resistivity values are similar to those of Sao Francisco deposit.

4) Trench A-II-4

The trench was excavated in between 7 and 8 of measuring point on the survey line B. Apparent resistivity is less than 300 m and PFE values are 1.1 to 2.4 % there. Soil geochemical anomaly of gold is also detected at the same point.

3-5 TRENCH SURVEY

3-5-1 Method

The purpose of the trench survey is to verify the mineralization in the ground where was recommended for further survey in the phase 1 and 2 surveys.

In area A-I, trench locations were decided according to the results of the soil geochemical survey carried out in phase II survey. On the other hand, in area A-II trench locations were decided based on the results of soil geochemical, biogeochemical and geophysical surveys. From the trench bottom, one meter channel samples were taken for chemical analyses of Au, Ag and W.

The reasons for trench location are as follows;

No.	Au in soil	As in soil	Geology
A-I-1	142ppb		pCssx1
A-I-2	48, 11ppb		pCssx2
A-I-3	190ppb		pCssx1
A-I-4	20ppb		pCssx1
A-I-5	13ppb		pCssx4

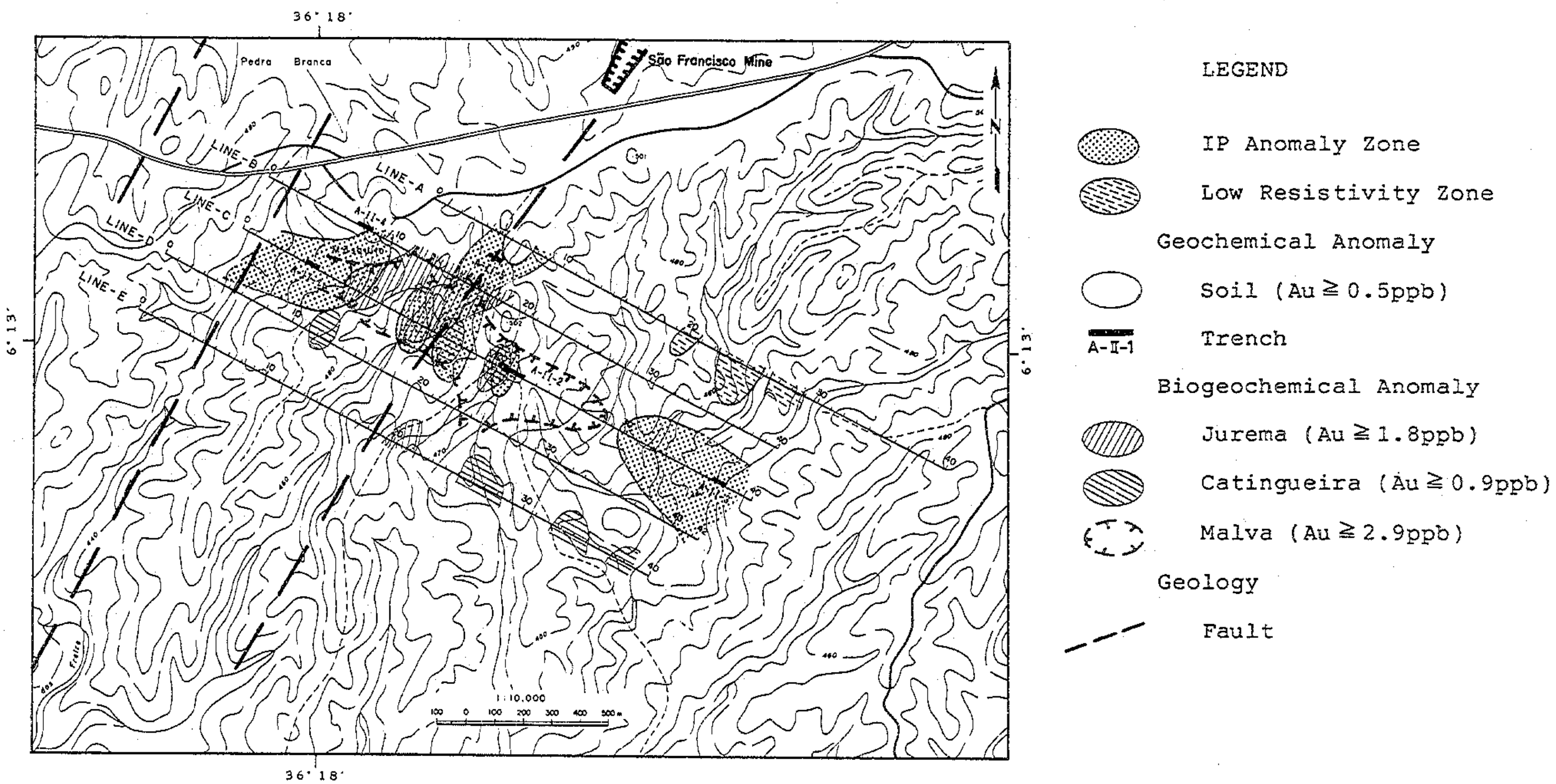

Figure II-3-14 Geophysical and geochemical anomalies in area A-II

A-I-6	208ppb	13ppm	pCssx4

No.	AR	PFE	Geochemistry	Geology
A-II-1	-500 m	2-3%	Plant Au anomaly	pCssx4
A-II-2	-300 m	1.5-2%	Plant Au anomaly	pCssx4
A-II-3	-300 m	2-4%		pCssx4
A-II-4	-300 m	1.1-2.4%	Soil Au anomaly	pCssx4
A-II-5				pCssx4

A-II-5 is a trench excavated by Sao Francisco mine. The trench was only sampled and analyzed for comparison to analytical data of other trenches.

The trench locations in the area A-I and area A-II are illustrated in Figure II-3-2 and Figure II-3-14 respectively. The results of the trench survey are compiled in Table II-3-7.

3-5-2 Results

(1) Trench A-I-1

The trench is occupied by fine grained biotite schist, accompanying quartz veinlets with white to pale brown clayish minerals.

8 ppb of gold was detected at only one point west end of the trench. Silver was not detected, its value is below detection limit. On the other hand, tungsten was high, 70 to 388ppm, along the entire trench. Mineralization was possibly occurred.

(2) Trench A-I-2

The trench was occupied by muscovite-biotite schist and biotite schist with pegmatite intrusions. White quartz veinlets are also present.

12ppb and 53ppb of gold were detected at the point of 29m from the west end of the trench and at the point of 53m from the west end of the trench respectively. There are some points with 1 to 9ppb of gold as well. These gold contents are as same as those of rock itself, therefore gold mineralization may not be verified. Tungsten values are 10ppm and more than that in the western half of the trench and 2 to 9ppm in the eastern half of the trench, those contents are still higher than those of rock itself. Tungsten may also have been mineralized.

(3) Trench A-I-3

The trench was occupied by biotite schist with quartz veilets parallel to foliation. The quartz veinlets are accompanied with white to pale brown clayish minerals.

6ppb and 2ppb of gold were detected at the points of 20m and 21m from the west end of the trench respectively. These points correspond to the lithology with quartz veinlets and boudins. However, these contents are within the contents of rock itself.

37 to 135ppm of tungsten were detected at the points 6 to 10m from the west end of the trench, at the other points 3 to 21 ppm of tungsten were detected. These contents are higher than

those of rock itself. Therefore, tungsten may have been added by mineralization.

(4) Trench A-I-4

The lithology of the trench is garnet-biotite schist.

Neither gold nor silver were detected. Tungsten contents are 3 to 32ppm, which are lower than those of trenches A-I-1 and A-I-2. However, at some points more than 10ppm of tungsten were detected. Those higher tungsten contents may have been added by mineralization.

(5) Trench A-I-5

Alternated beds of biotite schist and muscovite-biotite schist are identified in the trench.

Neither gold nor silver were detected. Higher tungsten contents, 8 to 86 ppm, were detected on the western half of the trench and lower contents, 4 to 9ppm, were detected on the eastern half of the trench. Those higher contents may also have been added by mineralization.

(6) Trench A-I-6

Garnet-biotite schist predominates in the trench. Some pegmatites intruded in the schist.

Neither gold nor silver were detected. Tungsten contents are lower than those of trenches formerly mentioned. They are 2 to 8ppm. Tungsten mineralization may not be verified.

(7) Trench A-II-1

Biotite schist and garnet-biotite schist occupy in the western end of the trench and in the rest of the trench respectively. Gray silicified zone occur in the fracture parallel to foliation in the east of the trench.

Gold was detected at only one point in the east end of the trench. The content is 4ppb.

(8) Trench A-II-2

Garnet-biotite schist occupies the trench. Pegmatite dikes intrude into the schist.

Gold was not detected in the western part of the trench. However, in the eastern part of the trench, 0.6 to 19ppb of gold were detected continuously through about 60 in the trench except only local part. These contents themselves are not so high. However, the continuous detection of gold is so abnormal that those gold may be added by mineralization. Furthermore, intervals with gold correspond to the lithological zone with a number of quartz veinlets.

(9) Trench A-II-3

Alternated beds of muscovite-biotite schist, garnet-muscovite-biotite schist and garnet-cordierite-biotite shcist are distributed in the trench.

Gray silicified zone 30 to 40cm wide along fault is present at the point 23m from the west end of the trench.

2 to 4 ppb of gold were detected in 4m interval at the west end of the trench and 2 to 9ppb of gold were also detected through 4m interval at about the middle of the trench. The latter corresponds to the interval where gray silicified zone are present along a fault. Though the gold contents are low,

the gold might be thought to be added by a mineralization because of a silicification.

(10) Trench A-II-4

Biotite schist occupies the trench.

Gold was detected at the only one point with the value of 10ppb.

(11) Trench A-II-5

This trench, being on the southern extension of the Sao Francisco ore trend, was excavated by the Sao Francisco mine when is was developed.

Garnet-biotite schist predominates in the trench. Three sheared zones, with numerous quartz veinlets less than 1cm to 10cm wide, were identified. Quartz veinlets parallel to the foliation of the schist are also sparsely distributed through the entire trench. Those sheared zones correspond to faults inferred during the regional geologic mapping and geophysical survey. Foliations strike N30 E to N35 E and dip eastward by 45 to 70 except inside the sheared zones.

Gold was detected from the entire trench. Gold contents are generally higher with the maximum of 500ppb. From some intervals more than 100ppb of gold was consecutively analyzed, most of those intervals are inside the sheared zones. The contents of gold are distinctively higher than those of normal host rocks and corresponded to the analytical value, 635ppb, of samples taken from the wall rock of the mineralized quartz vein in the mine pit. Therefore, the gold detected continuously through long intervals are unquestionably thought to be added by mineralization. The intervals with higher gold contents are about 50m.

Silver was also detected inside the sheared zones with the maximum value of 1.9ppm. The evidence that silver is accompanied with gold in the sheared zone as described above, and is included in the Sao Francisco ore by about eightfold of gold indicates that the silver was also added by the same mineralization as the one of gold.

Tungsten contents are lower, maximum being 5ppm and minimum is below detection limit. No mineralization is presumed.

Table II-3-7 Summary of trench survey

Area	Trench no.	Ddirection, length	Au anomalies	Ag & W anpmalies
A-I	A-I-1	N70° W, 25m	only 1 point; 8ppb	Ag<0.2ppm W: west half, 70 ~388ppm
	A-I-2	N70° W, 75m	few sparsed points; 1 ~17ppb	Ag<0.2ppm W: west half ≧10ppm;east helf,2 ~ 9ppm
	A-I-3	N70° W, 25m	2 points ; 2,6 ppb	Ag<0.2ppm W: west side, 37 ~135ppm;other, 3 ~21ppm
	A-I-4	N70° W, 25m	not detected	Ag<0.2ppm W: 3 ~32ppm
	A-I-5	N70° W, 25m	not detected	Ag<0.2ppm W: west half,8 ~86ppm;east falf, 4~9ppm
	A-I-6	N70° W, 25m	not detected	Ag<0.2ppm W: lower than above
A-II	A-II-1	N65° W, 50m	only one point; 4ppb	ditto
	A-II-2	N65° W, 100m	east side;60m; 0.6 ~19ppb	〃
	A-II-3	N65° W, 50m	several sparsed points; 4 ~9ppb	〃
	A-II-4	N65° W, 50m	only one point; 10ppb	〃
	A-II-5 (S.F.trend)	(N65° W)	higher values with max 500ppb in sheared zones;60m	Ag:max 1.9ppm W: lower with max 5ppm

Chapter 4 Detailed Survey in Area B

4-1 GEOLOGY and MINERALIZATION

4-1-1 Geology

Area B-I is located in the southwest end of the area B (Figure 2). In the center of the area, Serra da Umburana extends in a direction of NNE-SSW, forming a mountainous topography with a peak 563m high. Schist of Serido Formation predominates in the area. The schist comprises principally garnet-biotite schist, accompanying with local cordierite-garnet-biotite schist (Figure II-4-1). A large number of pegmatite dikes intrude into those schist, trending NNE, NNW and east. Those pegmatite dikes are in general 10m wide with maximum of more than 100m.

Foliations of schist strike N-S to NNE-SSW same as those of schist in the surrounding the area, dipping east or west by less than 10 degrees. Those dips of foliation are distinctly different from those in the surrounding area. In the surrounding area, they generally dip eastward by 30 degrees. Furthermore, pegmatite dikes characteristically strike E-W in this area.

4-1-2 Mineralization

Auriferous quartz vein accompanied with sulfide such as pyrite and secondary minerals, such as malachite, hematite and limonite, is in the central east of the area. The quartz vein is 0.3 to 2m wide and more than 200m long, strikes N5 E and dips east by 70 degrees. It contents 0.2ppm Au, 103ppm Ag, 3.76% Cu and 5ppm As. The vein was surveyed by some pits. One of them is 7m deep.

Two more quartz veins with sulfide were found. One is located in the central northern part and the other is located in the southwestern end of the area. These quartz veins crop out like collapsed floats so that their strike and dip were not measured. However, the floats of veins were spread in a direction of N20 E. Gold contents of those quartz veins are less than 0.1ppm.

Columbite-tantalite minerals also occur in pegmatites in this area. These are mined by local people at a small scale. Therefore, their reserves and/or size of mineralization are not known.

4-2 SOIL GEOCHEMICAL SURVEY

4-2-1 Method

Soil geochemical survey was carried out in the area B-I where was recommended for detail survey by geologic mapping and stream sediment geochemical survey in phase II. The survey method is as follows.

660 soil samples were collected from the area B-I, 2km east west by 3km north south. Soil is about 20 to 30 cm thick, not well developed in this area as well.

Au, As and Sb were analyzed. The analytical data were statistically treated. No correlation was recognized among three elements. Anomalous values of each element were decided by EDA method.

4-2-2 Results

Anomalous values and their distribution in the area are as follows.

(1) Gold

Maximum gold content is 116ppb and minimum is below detection limit, 0.5ppb. Samples with gold content below detection limit occupies 93.9% of total sample. Therefore, values higher than 0.5ppb are treated as anomalous ones.

Anomalous points are sparsely distributed in the entire area. Points with values higher than 10ppb are concentrated in the northeast and southern part of the area. The maximum content 116ppb was detected at the central east of the area (Figure II-4-1).

(2) Arsenic

Arsenic contents range from below detection limit, 1ppm, up to 37ppm. Anomalous points are concentrated in the northern half of the area. Those anomalous values are not related to any lithology.

(3) Antimony

No antimony was detected due to its detection limit.

Gold anomalies detecetd by soil survey are in general lower compared to those in area A and moreover they are scattered in the area. No gold anomalies were detected in the neighboring area of auriferous quartz vein in the central west of the area B-I.

There is a quartz vein with sulfide 300m to the northwest of the auriferous quartz vein. It trends NNE. To the NNE extension of the sulfide quartz vein, there are soil gold anomalies. From the evidence that the auriferous quartz vein in the central west of the area, the quartz vein with sulfide 300m northwest of it may include gold. Therefore, the area with soil gold anomalies should be surveyed in detail.

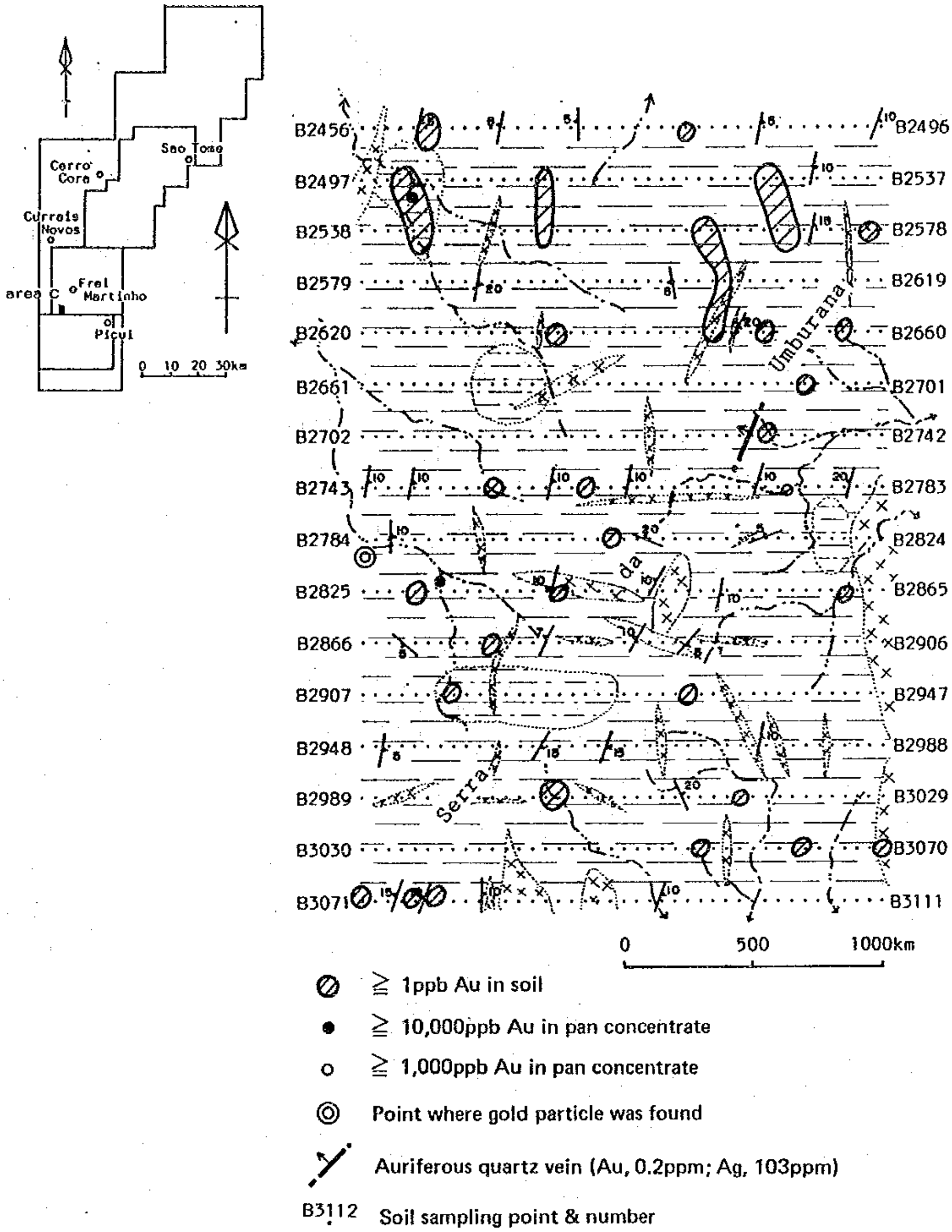

Figure II-4-1 Summary of soil survey in area B-I

Chapter 5 Integrated Discussion

5-1 ENTIRE AREA

Three occurrences of auriferous quartz veins were investigated over the three years of the project. These are the occurrence in the area west of Sao Tome (a), those of the Sao Francisco deposit (b), and that in the area southwest of Frei Martinho (c). Their characteristics were compiled as follow.

1) HOST ROCKS

(a) Caico Complex
(b) Serido Formation
(c) Serido Formation

2) STRUCTURAL CONTROL

All three occurrences comprise fissure-filling veins.
(a) strikes N30 E, dip 50 E,
(b) strikes NNE-SSW, dip 45 E,
(c) strikes N5 E, dip 70 W.

3) ORE FORMING MINERALS

(a) pyrite, chalcopyrite, chalcocite and covelline,
(b) natural gold, pyrite, chalcopyrite, pyrrhotite, chalcocite, covelline, cuprite, limonite, marcasite, arsenopyrite, sphalerite, hematite, manganese oxide, melnicovite, angelellite, scorodite, sulfur, anglesite and cerussite
(c) pyrite, malachite, hematite and limonite

4) Au/Ag RATIO

(a) about 2
(b) below 1/8
(c) about 1/500

5) FLUID INCLUSION IN VEIN QUARTZ

(a) not studied
(b) Sizes range from 0.001mm to 0.01mm. Primary inclusions are rich in CO_2. Homogenized temperature was not measured.
(c) Sizes range from 0.005mm to 0.015mm. Only few primary inclusions. Homogenized temperature ranges between 130°C to 140°C. These temperature are too low compared with commonly known gold mineralization. It seems, therefore, that the measured temperature corresponds to the that of secondary quartz vein formation.

6) ALTERATION MINERALS

The following minerals were found in and/or close to the veins.
(a) Sericite and chlorite,
(b) Sericite and kaolinite,
(c) Sericite, kaolinite and montmorillonite.

7) METAMORPHISM

Microscopic observations revealed nothing that could indicate metamorphic overprint on ore minerals of Sao Francisco deposit.

8) RELATION TO IGNEOUS ROCKS

No igneous rocks which could have brought gold into the ore deposits or triggered convection of ore forming fluids were found nearby the deposits. The nearest igneous rock in the area is granite 5 km far from the Sao Francisco deposit, except the Tertiary basalt dikes.

From the above mentioned, the genesis of those three auriferous quartz veins can be pictured as follow.

1) Gold was probably leached from the host Serido Formation, because these rocks contain more gold than any other rocks occurring in the area, even the granite and gneiss.
2) Ore forming fluids are thought to be generated locally, because Au/Ag ratios are quite different in each of those auriferous quartz veins occurrences.
3) These deposits are thought to be formed after the Braziliano metamorphic event, because of the presence of alteration minerals such as sericite and of the absence of the evidences of metamorphism.
4) The deposits are considered as being epithermal due to the presence of ore forming minerals and alteration minerals similar to those of epithermal deposit.
5) Convection of ore-forming fluids is thought to have been driven by the remaining heat of the latest metamorphism, because of the lack of contemporary igneous rocks near the deposits.

It should be emphasized that the ore genesis picturing above described relies only on the few available data. More reliable insights could probably be obtained by investigating the sulfur and oxygen isotopic composition of fluid inclusions.

Stream sediment geochemical surveys carried out during the three phases revealed numerous anomalous areas surrounding the Sao Francisco deposit down to areas B and C. However, no auriferous quartz veins were found except those comprising the Sao Francisco deposit. Considering these and other facts like the relatively low values taken as anomalous (0.5 ppb to 160 ppb), it is concluded that there is no potentiality for finding an economic mineralization in this area.

5-2 AREA A

Surface geologic survey, stream sediment geochemical survey, soil geochemical and biogeochemical surveys, detailed surface mapping, geophysical survey and trench survey were carried out in the area A (Table II-5-1). Survey results indicate that the surroundings of the Sao Francisco deposit has still potential for mineralization. Considering the anomalous area nearby the Sao Francisco mine defined by geochemical results and ratified by geophysical and trench surveys, it seems possible that there exist some satellite mineralization in the surrounding of the Sao Francisco deposit. This can, for

Table II-5-1 Summary of surveys in area A

Area	Soil anomalies	Plant anomalies	I P anomalies	Trench
A − I	Au:southeastern part As:eastern end zone,without correlation to Au	Au: JUREHA;wide anomalise:north west,northeast, sotheast parts, some correspondto S.F.trend CATINGOEIRA;central, northeast parts, HALVA;Spotty As: JUREHA,east part; CATINSOEIRA;no anomalies HALVA;Spotty		no prominent Au mineralization
A − II	Au: ① 200m east of S.F.ore trend ② 500m east of S.F.pre trend As:same as above	Au: JUREHA;western half, correspond to S.F.trend CATINGOERA;Sparsely,HALVA, north central part,WNW trend As: JUREHA;corresponds to S.F.tred,other in Central north. CATINGUEIRA,central north HALVA;on S.F.trend,200m east of S.F.trend	3 Zones ① West zone:trending EW ② central zone:trending ENE corresponds to S.F. trend ③ east tone;trending WNW	Au anomalies in central zone 200m east of S.F. trend; on Jurema, Catingueira, IP anomalies 0.6 ~19ppn Au.,in an interval of 60m

instance, explain the occurrence of placer gold being mined in an area distant from the mine site (Figure II-3-2).

5-3 AREA B

No mineralization such as auriferous quartz veins has been found in the north east part of the area B-I, where gold anomalies have been detected by soil geochemical survey. However, in the western foothills of the Umburana Range, sulfide-bearing quartz veins have been observed in an ares 300 meters apart from the auriferous quartz veins formerly mentioned. It is worth noting that the strikes of both quartz veins are coincident. These two quartz veins are thought to have formed by the same event. It is possible, therefore, that some other sulfide-bearing auriferous quartz veins can be found in the neighborhoods.

No gold anomalies were detected by the soil geochemical survey nearby the auriferous quartz veins in the mid-eastern portion of the area B-I, which has been investigated during Phase II. This results indicate that the quartz veins do not contain much gold and/or the veins are small in size. The obtained gold anomalies in soils are rather scattered, and yielded a maximum value of 116 ppb, which is by no means a content that can be considered high. These results are quite similar to those obtained in areas A-III and A-IV, indicating that the potentiality for gold of area B-I is relatively low.

From the above mentioned, it seems evident that there is no potential for economic gold deposit in area B-I. However, it should be emphasized that this area has not been investigated in detail at all, remaining therefore some possibilities of finding occurrences of auriferous quartz veins in the neighborhoods, by further detailed geologic mapping and geophysical prospecting.

PART III

CONCLUSIONS

and

RECOMMENDATIONS

Chapter 1 Conclusions

Whole Project Area

Results of the surveys carried out over the last three years have shown that, apart from some evidences for existence of a satellite mineralization of the Sao Francisco deposit, and a small occurrence of auriferous quartz veins observed in area B, no other evidence of new mineralizations are present within the survey area. It seems, therefore, that there exist only few possibilities to a new, economic gold deposit be found within the limits of the project area, except for some potential left in the neighborhoods of the auriferous veins above mentioned.

Area A

The geophysical (IP) survey carried out around the Sao Francisco deposit proved to be able to clearly delineate the ore body, providing important insights as for interpretation of similar data obtained in other areas of this project. Results of geophysical surveys indicated the existence of a satellite mineralization in the surroundings of the Sao Francisco deposit, suggesting that there remains some possibilities of lateral expansions of the presently known reserves. Moreover, geophysical results indicated that the mineralization at the Sao Francisco deposit is continuous even to levels deeper than presently prospected.

Area B

Sulfide-bearing quartz veins, some of them auriferous, were observed in the areas east and west of the Umburana Range. These veins have not been detailed explored, and there are some evidences suggesting the existence of hidden veins in the neighboring. A detailed investigation of this area could therefore lead important findings and obtention of valuable information concerning to the mineralization processes that have occurred in the region. It should be emphasized, however, that the sizes of the observed veins are rather small, indicating that even if they are associted to a gold mineralization, it will be hardly economic.

Exploration Methods

Geologic traversing and stream sediment geochemical survey proved themselves to be very effective tools for prospecting and delineating gold anomalous zones in the project area.

On the other hand, soil geochemical survey yielded results that could not be confirmed by underground prospecting methods like trenching. This absent of correlation can be related to the poor development of soils in the area, and to the pluvial regime, which tends to wash over the soils during the rainy season by torrential rains. Soil geochemical survey seems, therefore, to be an inadequate geochemical prospecting method of areas with similar hydrologic and climatic conditions.

Biogeochemical prospecting yielde some interesting results, reflecting quite well the subsurface anomalies.

Geophysical survey by the IP method proved itself to be effective in delineating large mineralization as that of the Sao Francisco deposit, but yielded dubious results in detecting small vein-type occurrences.

Chapter 2 Recommendations

(1) It is recommended that a known mineralization such as the Sao Francisco deposit and auriferous quartz veins occurrences like that to the south~southwest of Frei Martinho are investigated from a genetic point of view. The results will, without doubts, be helpful for selecting more effective methods and for providing valuable interpretation clues to explore for gold in similar areas.

(2) The area around the Umburana range is recommend to be investigated by geophysical (IP) survey and detailed geological mapping, in order to understand the actual distribution of the occurrence as well as the mineralizing process that lead to the formation of sulfide-bearing (sometimes auriferous) quartz veins observed in the foothills of this mountain range.

(3) Based on results accumulated over the three years of this project, the following steps are recommended for the exploration of epithermal gold mineralization similar to the Sao Francisco deposit. At first, regional geological and stream sediment geochemical surveys, followed by detailed geological mapping aimed at localization of mineralizing evidences and by geophysical (IP) survey to delineate the underground mineralization. The mineralization should be finally confirmed by trenching and/or drilling surveys.

TABLES

and

FIGURES

FIGURES

TABLES

APPENDICES

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REFERENCES

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APPENDICES

Appendix 1

Analytical data of rock samples

Sample No.	B010	B011	C029	C039	C041	D068	E048	E052	E064	E065	E068	E066	D047	D022	A062
Coordinates	E815.70	E815.70	E806.95	E806.20	E809.75	E809.80	E813.95	E810.70	E816.05	E812.90	E811.85	E815.70	E808.85	E807.55	E819.70
of location	N9338.15	N9338.15	N9330.40	N9339.20	N9342.90	N9346.55	N9347.25	N9345.80	N9341.80	N9342.65	N9344.80	N9341.95	N9306.50	N9318.85	N9346.25
Lithology	ms-bi Gn (CC)	ms-bi Gn (CC)	bi Gn (CC)	bi Gn (CC)	Amph (CC)	hb-bi Gn (CC)	am Sch (CC)	hb-bi Gn (CC)	ms-bi Gr (CC)	bi Gn (CC)	bi Gn (CC)	bi Gn (SJ)	bi Gr (CC)	bi Gr (GZ)	sa-hb Sch (INT)
SiO2 %	71.00	78.10	69.20	70.00	51.00	70.50	52.90	65.40	70.10	70.30	70.30	77.40	71.80	70.40	60.00
TiO2 %	1.00	0.85	0.50	0.46	1.40	0.43	0.85	0.58	0.17	0.95	0.40	0.51	0.31	0.22	0.60
Al2O3 %	12.20	9.60	14.00	13.00	15.40	12.50	12.80	14.20	15.40	10.80	13.60	9.00	14.00	14.90	10.30
Fe2O3 %	1.10	1.30	0.93	1.20	3.80	1.00	2.30	1.60	L 0.10	1.90	1.20	1.10	0.76	0.97	0.82
FeO %	2.30	1.50	2.40	3.10	7.20	3.20	8.60	2.60	1.50	4.10	1.70	1.70	1.30	1.20	3.40
MnO %	0.03	0.02	0.07	0.08	0.19	0.08	0.23	0.07	0.02	0.06	0.03	0.09	0.05	0.10	0.19
MgO %	3.90	2.30	1.90	1.90	5.30	1.70	7.50	3.80	0.83	3.90	2.70	1.40	0.78	0.73	5.90
CaO %	0.73	0.30	2.50	1.50	10.10	1.80	12.00	4.50	1.10	1.00	3.00	2.30	2.40	2.80	13.60
Na2O %	1.70	0.39	3.80	5.20	3.30	4.50	1.30	4.60	5.80	2.50	5.00	2.60	4.40	5.30	1.40
K2O %	4.40	3.90	3.90	2.90	1.20	3.60	0.54	1.80	4.60	3.30	1.30	2.60	3.60	2.60	1.80
P2O5 %	0.34	0.29	0.21	0.12	0.29	0.14	0.27	0.17	0.10	0.38	0.14	0.11	0.16	0.33	1.30
LOI %	1.26	1.40	0.53	0.51	0.79	0.45	0.68	0.58	0.34	0.73	0.59	1.12	0.40	0.39	0.67
total %	99.96	99.95	99.94	99.97	99.97	99.90	99.97	99.90	99.96	99.92	99.96	99.93	99.96	99.94	99.98
Au ppb	2	2	2	4	1	3	1	L 1	L 1	1	1	1	L 1	L 1	L 1
Ag ppm	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2	0.2	L 0.2	L 0.2	L 0.2
Fe %	2.6	2.1	2.5	3.2	8.3	3.2	8.3	3.1	1.2	4.5	2.2	2.1	1.5	1.6	3.2
Mn ppm	216	151	530	648	1483	648	1758	519	130	464	259	702	356	800	1450
Mo ppm	1	L 1	1	2	5	1	4	L 1	L 1	1	L 1	L 1	L 1	L 1	2
W ppm	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10
Sn ppm	14	8	2	L 2	L 2	L 2	L 2	L 2	L 2	19	L 2	L 2	L 2	L 2	L 2
Nb ppm	100	60	15	10	L 10	L 10	L 10	L 10	L 10	81	L 10	L 10	L 10	L 10	L 10
Ta ppm	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10
Be ppm	3	2	0.6	1	L 0.5	1	L 0.5	0.6	0.5	1	0.5	0.7	L 0.5	L 0.5	0.5
Li ppm	44	35	29	28	16	21	6	21	11	27	12	22	14	16	4
As ppm	1	L 1	L 1	1	3	L 1	1	1	L 1	1	1	1	L 1	2	1
Sb ppm	1	2	L 1	1	1	1	1	2	L 1	1	1	1	L 1	1	1

Sample No.	C019	C028	C032	C060	E013	E018	E020	E022A	E022B	E040	E041	E042	E067	A023	A031
Coordinates of location	E796.70 N9317.55	E800.45 N9326.80	E805.05 N9331.00	E800.20 N9313.65	E801.90 N9312.15	E798.50 N9319.60	E797.45 N9322.10	E803.35 N9321.00	E803.35 N9321.00	E796.25 N9329.45	E795.70 N9329.70	E795.70 N9329.70	E817.85 N9346.90	E805.00 N9328.15	E811.10 N9332.65
Lithology	hb-ep-gt-sa Rock (SS)	bi Sch (SS)	bi Sch (SS)	bi Sch (SS)	gt-ct-bi Sch (SS)	gt-ms-bi Sch (SS)	am Sch (SS)	gt-ct-bi Sch (SS)	gt-ct-bi Sch (SS)	gt-bi Sch (SS)	hb Sch (SS)	gt-bi Sch (SS)	ms-bi Sch (SS)	ms-bi Sch (CC)	Amph (CC)
SiO2 %	58.60	72.50	56.60	63.80	67.70	68.60	65.70	51.80	58.10	65.80	67.00	65.00	63.60	71.80	56.30
TiO2 %	0.81	0.68	1.10	0.95	0.90	0.72	0.78	1.30	1.20	0.96	0.95	0.92	0.55	0.51	0.33
Al2O3 %	17.00	11.40	17.50	15.30	15.50	13.60	14.80	22.40	20.20	14.20	13.60	13.60	15.00	13.30	3.30
Fe2O3 %	1.00	1.60	2.20	L 0.10	0.43	L 0.10	1.10	0.95	1.10	1.00	0.78	0.48	3.40	1.70	2.80
FeO %	4.20	2.50	4.70	6.50	5.10	4.80	3.40	8.50	6.50	5.10	5.10	5.60	2.40	2.20	6.60
MnO %	0.65	0.12	0.17	0.39	0.19	0.18	0.25	0.21	0.22	0.13	0.17	0.15	0.15	0.10	0.27
MgO %	3.40	3.00	4.50	3.70	4.30	2.50	2.20	6.90	4.30	4.00	2.60	4.80	4.90	0.74	15.90
CaO %	12.50	2.00	2.80	2.30	1.10	2.40	9.50	1.40	1.60	2.20	5.90	2.80	2.70	1.50	12.50
Na2O %	0.56	3.30	3.60	3.10	1.80	4.00	0.95	2.20	3.10	2.90	0.90	3.10	2.50	4.40	0.79
K2O %	0.30	2.00	4.30	2.90	1.20	2.20	0.20	2.30	2.00	2.40	1.60	2.60	3.30	3.10	0.11
P2O5 %	0.28	0.18	0.24	0.19	0.28	0.22	0.39	0.30	0.19	0.22	0.28	0.22	0.12	0.14	0.08
LOI %	0.62	0.70	2.25	0.85	1.46	0.69	0.71	1.69	1.39	0.99	1.08	0.71	1.34	0.48	0.96
total %	99.92	99.98	99.96	99.98	99.96	99.91	99.98	99.95	99.90	99.90	99.96	99.98	99.96	99.97	99.94
Au ppb	2	1	3	635	3	9	1	4	3	5	2	L 1	2	2	L 1
Ag ppm	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2	0.2	L 0.2	0.2	L 0.2	0.2	L 0.2	L 0.2	L 0.2	L 0.2
Fe %	4.0	3.1	5.2	5.1	4.3	3.7	3.4	7.3	5.8	4.7	4.5	4.7	4.2	2.9	7.1
Mn ppm	5033	908	1363	3020	1505	1406	1978	1670	1714	994	1319	1135	1135	789	2110
Mo ppm	3	2	3	3	1	3	2	4	3	3	3	3	2	L 1	4
W ppm	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10
Sn ppm	3	L 2	3	L 2	L 2	L 2	L 2	2	2	2	L 2	2	L 2	L 2	L 2
Nb ppm	12	13	15	L 10	L 10	L 10	L 10	L 10	L 10	L 10	10	L 10	L 10	L 10	L 10
Ta ppm	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10
Be ppm	3	1	1	L 0.5	9	0.5	0.8	4	10	4	L 0.5	0.5	1	0.5	0.5
Li ppm	9	52	69	24	169	38	9	240	127	66	20	41	47	28	4
As ppm	60	L 1	1	1	1	2	1	3	1	L 1	4	1	1	1	L 1
Sb ppm	1	1	1	1	1	2	1	0.0	1	1	1	1	1	1	L 1

CC: Caico Complex SJ: Jucurutu Fm. SS: Serido Fm. L: Lower than

Sample No.	A101	C112	D101	A105	D102	A127	C117	C137	D111A	D111B	D115	D119	D120	D121	D122
Coordinates of location	E793.87 N9316.88	E792.55 N9316.29	E794.02 N9317.05	E792.03 N9306.37	E791.72 N9306.98	E787.75 N9300.55	E777.75 N9285.25	E786.25 N9299.25	E793.65 N9293.35	E793.65 N9293.35	E785.65 N9295.65	E781.75 N9300.45	E791.10 N9298.65	E791.10 N9298.65	E791.10 N9298.65
Lithology	bi-ms-Sch	bi-ms-Sch	hb brg bi-Sch	ep-gt-st Rock	Cataclastic Rock	bi-ms-Sch	gt-bi-Sch	bi-ms-Sch	gt-bi-Sch	ct-bi-Sch	bi-ms-Sch	gt-bi-Sch	bi-ms-Sch	gt-bi-ms-Sch	gt-bi-Sch
SiO2 %	73.60	74.00	72.50	58.50	68.10	71.10	50.40	72.40	68.70	66.40	72.60	67.60	69.30	69.00	69.30
TiO2 %	0.72	0.67	1.00	0.62	0.78	0.85	1.10	0.94	0.77	0.92	0.83	0.81	0.81	0.77	0.79
Al2O3 %	11.20	11.50	10.30	15.60	14.10	12.20	22.80	11.40	14.10	16.70	11.90	14.40	14.50	14.40	14.30
Fe2O3 %	2.80	3.00	2.50	2.90	1.40	2.70	3.40	3.70	1.10	2.60	3.10	1.40	1.10	2.70	1.90
FeO %	1.60	1.10	2.90	2.90	3.50	2.40	6.10	1.80	4.20	4.20	1.80	4.20	4.50	2.70	3.50
MnO %	0.08	0.10	0.12	0.90	0.21	0.10	0.21	0.10	0.11	0.19	0.11	0.09	0.09	0.11	0.21
MgO %	2.50	2.20	2.80	2.90	2.70	3.00	4.70	2.30	2.80	3.90	2.30	3.10	2.60	2.40	2.20
CaO %	2.10	2.70	3.40	14.00	1.10	2.50	2.90	2.80	1.90	1.10	2.80	2.50	1.60	1.80	2.50
Na2O %	2.60	2.60	2.10	0.74	2.10	2.30	3.90	1.90	3.60	1.60	2.00	3.10	2.70	3.40	2.60
K2O %	2.20	1.40	1.70	0.10	3.10	2.20	4.00	1.90	2.00	1.70	1.90	2.20	2.20	2.10	1.70
P2O5 %	0.18	0.12	0.19	0.32	0.23	0.15	0.15	0.17	0.14	0.20	0.14	0.21	0.18	0.05	0.40
LOI %	0.00	0.01	0.00	0.00	2.14	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
total %	99.58	99.40	99.51	99.48	99.46	99.50	99.67	99.41	99.43	99.52	99.49	99.62	99.59	99.44	99.41
Au ppb	5.0	33.0	L 0.5	13.0	L 0.5	L 0.5	L 0.5	L 0.5	1.0	L 0.5	L 0.5	L 0.5	L 0.5	L 0.5	L 0.5
Ag ppm	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2
Fe %	3.2	2.9	4.0	4.3	3.7	3.8	7.1	4.0	4.1	5.1	3.6	4.3	4.3	4.0	4.1
Mn ppm	620	770	930	6970	1630	770	1630	770	850	1470	850	700	700	850	1630
Mo ppm	5	2	3	4	L 1.0	1	L 1.0	11	3	3	2	3	2	2	2
W ppm	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10
Sn ppm	5	L 2	L 2	4	L 2	L 2	L 2	2	L 2	L 2	2	2	2	L 2	2
Nb ppm	24	14	L 10	34	L 10	14	L 10	30	L 10	13	24	24	19	15	20
Ta ppm	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10
Be ppm	2	1	L 0.5	L 0.5	1	2	2	1	L 0.5	2	2	L 0.5	L 0.5	2	0.5
Li ppm	29	23	11	L 5.0	29	34	46	23	29	97	29	17	11	23	11
As ppm	L 1	L 1	L 1	82	36	L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1	5	15
Sb ppm	L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1

Sample No.	D124	D131	A124	C122	C125	C141	D116	D118	D130	A111	C123	C133	A119	A117	D127
Coordinates of location	E787.20 N9303.40	E788.05 N9285.10	E789.10 N9298.90	E794.85 N9284.50	E794.30 N9287.30	E783.65 N9304.85	E783.00 N9295.50	E781.45 N9300.60	E776.75 N9304.20	E797.50 N9289.90	E795.55 N9284.40	E795.60 N9284.75	E798.40 N9289.80	E798.85 N9290.45	E797.15 N9296.70
Lithology	bi-ms-Sch	ct-bi-ms-Sch	gt brg am-Sch	gt brg am-Sch	gt-ep-st Sch	ep-st-Sch	gt brg am Sch	hb-ep-st Rock	hb-bi-Gt	hb-bi Gd	hb-bi Gt	hb-bi Gt	bi Gt	bi-Gt	Basalt
SiO2 %	72.80	61.70	58.20	62.60	60.20	49.10	69.30	51.00	74.60	62.60	66.90	64.70	69.50	69.60	47.30
TiO2 %	0.66	0.92	0.89	0.82	0.72	1.10	0.66	1.60	0.63	0.69	0.32	0.47	0.27	0.23	1.90
Al2O3 %	12.50	17.70	16.80	14.00	13.10	21.60	11.40	7.60	10.70	16.60	16.20	16.30	14.80	15.00	11.00
Fe2O3 %	2.60	2.40	2.50	2.90	1.20	1.20	1.40	1.60	2.50	3.50	1.30	2.60	1.40	1.30	6.60
FeO %	1.60	5.30	4.80	4.20	5.10	1.90	3.80	5.00	1.10	2.40	2.00	2.00	1.40	1.40	4.20
MnO %	0.10	0.14	0.66	1.10	1.10	0.10	0.33	0.22	0.12	0.11	0.12	0.09	0.08	0.08	0.20
MgO %	1.70	3.40	3.20	3.30	2.40	3.80	2.70	9.20	1.20	2.70	0.84	1.40	0.71	0.38	13.10
CaO %	2.20	2.20	11.40	9.20	14.70	19.20	7.30	22.60	3.00	5.60	2.70	3.40	2.20	1.40	10.00
Na2O %	2.60	2.90	0.77	0.91	0.61	1.20	0.71	0.59	3.00	2.80	4.00	4.10	4.10	4.10	3.40
K2O %	2.70	2.70	0.07	0.21	0.10	0.15	1.80	0.08	2.50	2.40	5.10	4.30	4.80	6.00	1.20
P2O5 %	0.13	0.12	0.16	0.29	0.30	0.15	0.19	0.16	0.14	0.21	0.14	0.15	0.16	0.07	0.55
LOI %	0.01	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01
total %	99.60	99.49	99.45	99.54	99.54	99.51	99.60	99.66	99.50	99.61	99.62	99.51	99.42	99.56	99.46
Au ppb	L 0.5	L 0.5	7.0	35.0	6.0	9.0	L 0.5	L 0.5	L 0.5	L 0.5	L 0.5	L 0.5	L 0.5	L 0.5	2.0
Ag ppm	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2	L 0.2
Fe %	3.1	5.8	5.5	5.3	4.8	2.3	3.9	5.0	2.6	4.3	2.4	3.4	2.1	2.0	7.9
Mn ppm	770	1080	5110	8520	8500	770	2560	1700	930	850	930	700	620	620	1550
Mo ppm	2	2	2	4	5	5	1	5	1	6	4	2	1	1	5
W ppm	L 10	L 10	L 10	700.0	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10
Sn ppm	2	2	6	23	73	6	2	L 2	L 2	L 2	6.0	6.0	2.0	2.0	8.0
Nb ppm	23	14	11	24	28	17	15	28	12	14	20	20	10	10	21
Ta ppm	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10
Be ppm	1	L 0.5	L 0.5	10	18	4	1	3	0.5	0.5	2	1	1	1	0.5
Li ppm	23	40	L 5	L 5	L 5	L 5	L 5	L 5	11	L 5	116	60	40	48	8
As ppm	L 1	L 1	L 1	L 1	L 1	L 1	L 1	5	L 1	L 1	L 1	L 1	L 1	L 1	8
Sb ppm	L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1

Sample No.	A202	A209	A210	A212	A216	A218	A220	A222	A225	B213	C201	C203	C208	C209	C215
Coordinates of location	E793.35 N9270.27	E785.70 N9273.00	E784.70 N9281.75	E780.55 N9281.34	E781.22 N9274.44	E769.96 N9264.68	E769.53 N9264.35	E770.40 N9267.83	E772.67 N9275.71	E771.28 N9274.22	E793.26 N9265.32	E793.58 N9265.41	E795.14 N9276.32	E794.45 N9276.50	E786.23 N9274.98
Lithology	bi-Gneiss	2-px Granulite	mu-bi Gneiss	bi Schist	mu-bi Schist	bi Sch	bi Sch	2-px Granulite	Dolerite	mu Quartz	bi Gneiss	Amphibolite	bi-hb Granite	Hornblen-dite	mu-bi-Sch
SiO2 %	73.00	54.97	70.27	70.73	69.30	69.21	67.99	46.62	42.41	80.02	68.24	57.56	65.22	57.99	64.10
TiO2 %	0.26	0.32	0.68	0.71	0.72	0.73	0.76	0.46	2.31	0.08	0.28	0.68	0.40	0.46	0.77
Al2O3 %	13.26	17.45	13.45	13.92	14.04	13.93	13.89	12.29	9.40	10.23	15.12	15.34	15.34	12.10	15.68
Fe2O3 %	1.03	2.23	0.61	0.73	0.71	1.23	1.44	3.09	3.97	0.71	0.92	2.44	1.56	1.63	2.92
FeO %	1.79	1.53	4.46	4.79	4.40	4.27	4.34	3.51	9.06	0.89	3.06	6.12	4.08	5.22	4.01
MnO %	0.04	0.09	0.08	0.11	0.08	0.12	0.12	0.25	0.21	0.02	0.07	0.14	0.11	0.15	0.20
MgO %	0.60	1.64	1.86	2.13	1.79	2.21	2.55	8.21	15.22	0.46	1.00	4.43	1.80	8.01	2.12
CaO %	1.36	7.44	1.75	1.63	1.81	1.44	1.98	17.82	9.50	0.50	3.20	7.25	4.00	7.72	2.54
Na2O %	2.69	6.53	3.52	2.97	3.37	2.91	3.11	0.49	2.94	1.36	3.43	3.19	3.14	4.08	3.85
K2O %	5.15	1.41	2.05	1.13	1.80	1.47	2.18	0.26	1.61	4.82	4.17	1.96	3.72	1.65	2.48
P2O5 %	0.10	0.06	0.21	0.23	0.33	0.17	0.24	0.18	0.78	0.04	0.21	0.22	0.20	0.12	0.31
LOI %	0.40	1.72	0.64	0.77	1.05	1.71	0.81	3.34	1.21	0.73	0.25	0.39	0.34	0.78	0.76
total %	99.68	95.39	99.58	99.85	99.40	99.40	99.41	96.52	98.62	99.86	99.95	99.72	99.91	99.91	99.74
Au ppb	L 0.5	L 0.5	L 0.5	L 0.5	L 0.5	L 0.5	L 0.5	5	L 0.5	L 0.5	L 0.5	L 0.5	L 0.5	L 0.5	L 0.5
Ag ppm	0.2	1.6	0.2	0.1	0.2	0.1	L 0.1	33.7	0.3	L 0.1	L 0.1	0.2	0.3	0.2	0.1
Fe %	2.11	2.75	3.90	4.23	3.92	4.18	4.38	4.89	9.82	1.19	3.02	6.47	4.26	5.20	5.16
Mn ppm	327.0	730	652	854	650	936	1941	1961	1619	166	545	1067	829	1152	1577
Mo ppm	2	20	1	1	L 1	1	L 1	432	12	3	1	L 1	1	L 1	1
W ppm	76	573	23	54	14	50	12	2030	1037	36	27	11	50	39	19
Sn ppm	6	5	6	3	6	4	3	4	6	2	L 2	7	4	5	9
Nb ppm	11	13	16	L 10	14	10	15	10	67	L 10	13	18	L 10	11	12
Ta ppm	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10
Be ppm	17.6	22.8	16.2	16.6	12.5	12.4	7.0	268.6	16.8	16.6	21.3	22.0	18.3	20.2	37.9
Li ppm	45	10	36	100	64	58	16	24	12	23	31	35	26	8	74
As ppm	L 1	1	2	L 1	1	L 1	L 1	L 1	2	L 1	1	1	1	L 1	1
Sb ppm	L 1	1	L 1	L 1	L 1	L 1	L 1	4	L 1	1	2	1	2	2	L 1

Sample No.	C216	C217	C220	C221	C223	C224	C229	C232	C235	C236	C240	C243	C244	C245	C249
Coordinates	E788.40	E786.43	E783.03	E783.40	E782.67	E781.51	E772.99	E776.23	E771.20	E771.55	E796.00	E794.73	E792.74	E793.13	E772.43
of location	N9282.74	N9282.97	N9281.65	N9280.79	N9272.06	N9272.08	N9264.60	N9278.18	N9282.70	N9282.71	N9265.25	N9265.14	N9264.97	N9265.07	N9263.52
Lithology	ms-bi-Sch	mu-bi Sch	mu-bi Sch	mu-bi Sch	mu-bi Sch	mu-bi Sch	Cortlandite	bi Sch	mu Quartz	Pegmatite	bi Granite	bi Granite	bi Gneiss	bi Gnanite	Skarn
SiO2 %	58.14	67.64	66.86	70.48	70.26	73.92	48.70	67.60	76.24	74.23	70.06	73.24	64.09	73.98	48.72
TiO2 %	0.73	0.54	0.86	0.47	0.60	0.42	0.29	0.82	0.15	0.02	0.37	0.14	0.43	0.12	0.86
Al2O3 %	20.46	15.54	13.92	13.86	13.93	12.66	7.81	14.28	12.04	13.95	13.95	13.23	16.41	13.37	18.37
Fe2O3 %	1.04	0.86	3.17	1.52	0.84	1.10	3.33	0.86	0.90	0.06	0.96	0.34	1.53	0.70	4.58
FeO %	7.27	4.34	3.51	2.61	3.25	2.87	3.45	4.91	1.21	1.40	2.74	1.92	3.13	1.40	3.45
MnO %	0.20	0.08	0.10	0.10	0.09	0.10	0.40	0.12	0.03	0.18	0.05	0.04	0.09	0.03	0.22
MgO %	4.05	2.13	2.26	0.65	1.57	0.71	10.72	2.10	0.61	0.09	0.66	0.24	1.91	0.15	4.75
CaO %	1.05	1.37	3.42	1.38	2.23	1.05	20.90	2.18	0.36	0.40	1.80	0.96	3.60	0.87	16.55
Na2O %	1.48	2.38	2.96	3.62	3.70	3.45	0.13	3.70	1.54	4.24	3.38	3.19	4.24	3.83	0.46
K2O %	2.04	2.17	1.86	4.32	1.96	2.69	0.06	2.04	5.49	4.74	5.28	5.95	3.23	5.21	0.31
P2O5 %	0.20	0.20	0.24	0.16	0.28	0.14	0.18	0.25	0.11	0.30	0.17	0.11	0.33	0.07	0.10
LOI %	1.89	1.63	0.51	0.35	0.36	0.56	2.74	0.72	0.78	0.20	0.47	0.35	0.34	0.26	1.37
total %	98.55	98.88	99.67	99.52	99.07	99.67	98.71	99.58	99.46	99.81	99.89	99.71	99.33	99.99	99.74
Au ppb	3	L 0.5	L 0.5	L 0.5	L 0.5	L 0.5	L 0.5	0.9	0.6	L 0.5	L 0.5	6	L 0.5	L 0.5	15
Ag ppm	0.2	0.1	0.1	0.1	L 0.1	L 0.1	0.4	L 0.1	L 0.1	0.1	L 0.1	L 0.1	0.1	0.2	1.0
Fe %	6.38	3.97	4.95	3.09	3.12	3.00	5.01	4.42	1.57	1.13	2.8	1.73	3.50	1.58	5.88
Mn ppm	1511	596	810	764	659	775	3067	908	1381	233	375	282	674	230	1676
Mo ppm	2	1	L 1	1	L 1	L 1	4	1	3	2	3	12	2	4	22
W ppm	48	21	32	42	8	24	183	17	64	64	152	504	74	47	1150
Sn ppm	3	2	5	L 2	3	5	8	2	2	8	7	9	L 2	6	4
Nb ppm	11	L 10	11	18	16	42	L 10	L 10	L 10	30	32	21	18	L 10	16
Ta ppm	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10	L 10
Be ppm	35.9	17.7	28.0	17.1	22.3	22.2	272.4	13.3	24.1	9.8	30.8	19.9	29.6	20.3	42.3
Li ppm	109	30	31	41	33	34	11	22	50	15	24	24	64	25	22
As ppm	1	1	1	1	L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1	L 1
Sb ppm	L 1	L 1	L 1	L 1	L 1	1	2	L 1	2	2	3	L 1	L 1	2	L 1

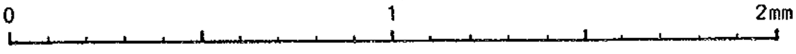
Appendix 2

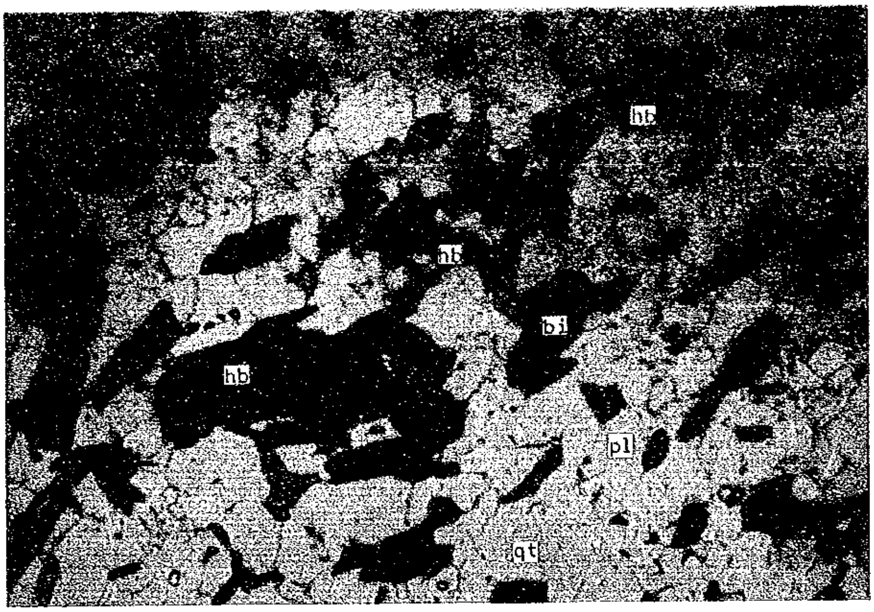
Photographs of rock thin sections

ABBREVIATION

bi; biotite	hb; hornblende	qt; quartz
sph; sphene	kf; potash feldspar	mu; muscovite
ct; cordierite	cz; clinozoisite	pl; plagioclase
gt; garnet	chl; chlorite	

Scale of photographs



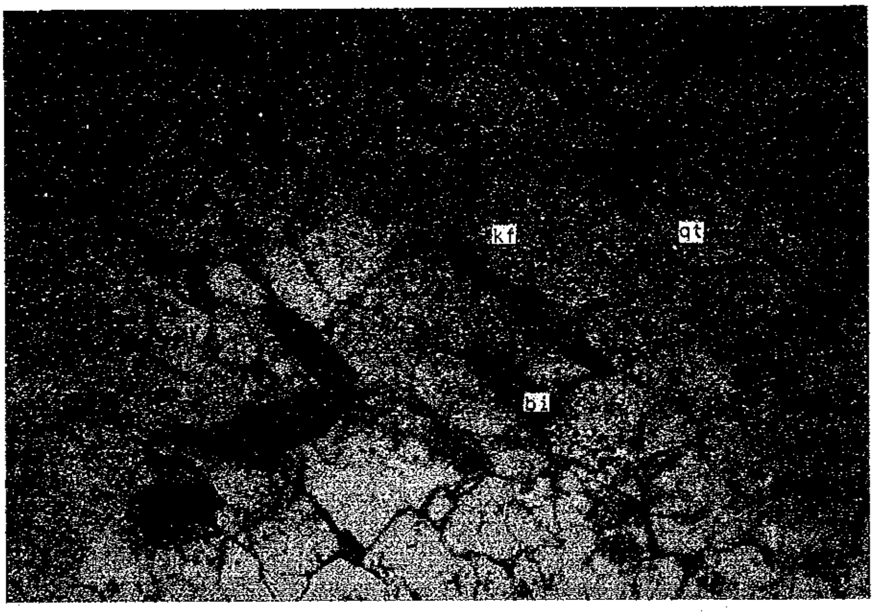


hb-bi Granodiorite;
sample A111, pCgr,
north of Picui

one polar

hb-bi Granodiorite;
sample A111, pCgr,
north of Picui

crossed polars

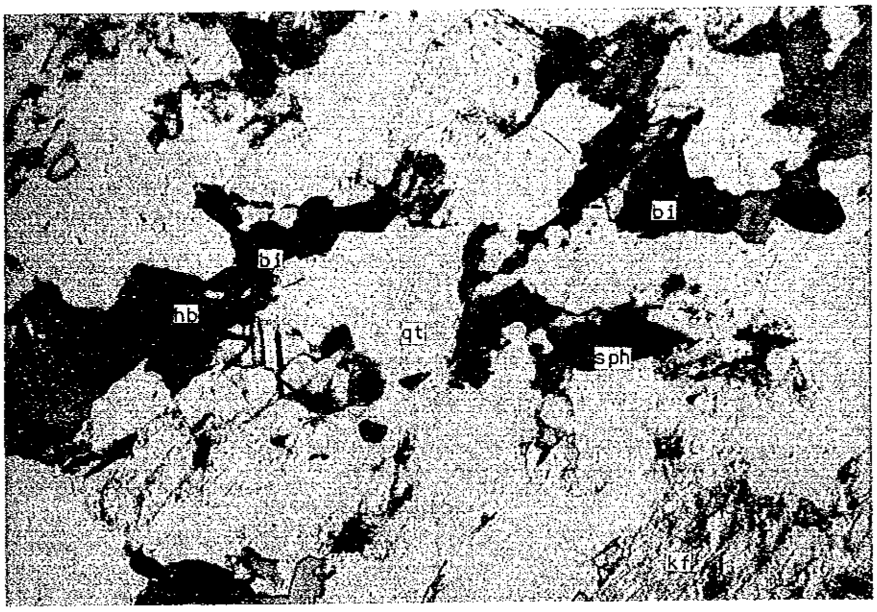


bi Granite;
sample A117, pCgr,
north of Picui

one polar

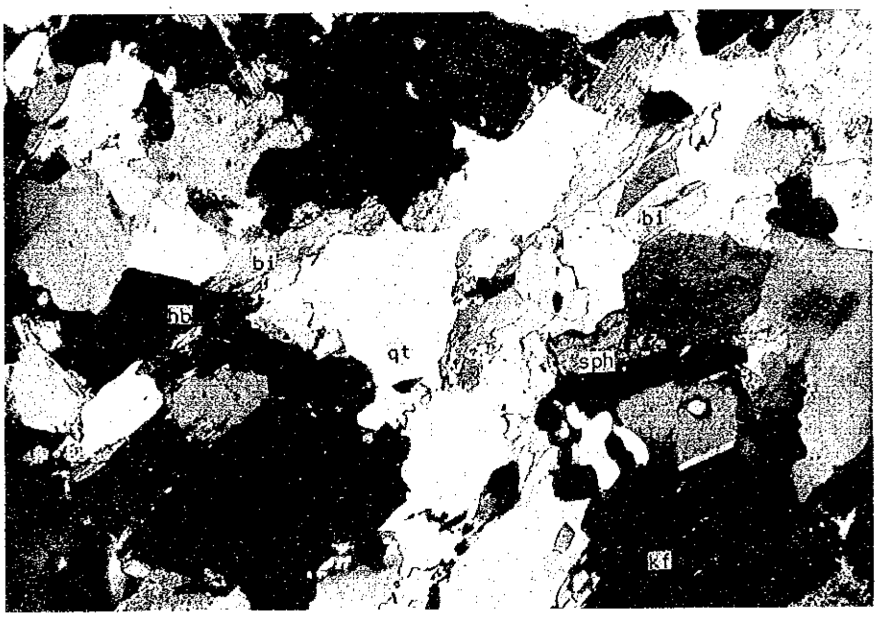
bi Granite;
sample A117, pCgr,
north of Picui

crossed polars



hb-bi Gneiss;
sample D130, pCsjgn,
north of Rio Picui

one polar



hb-bi Gneiss;
sample D130, pCsjgn,
north of Rio Picui

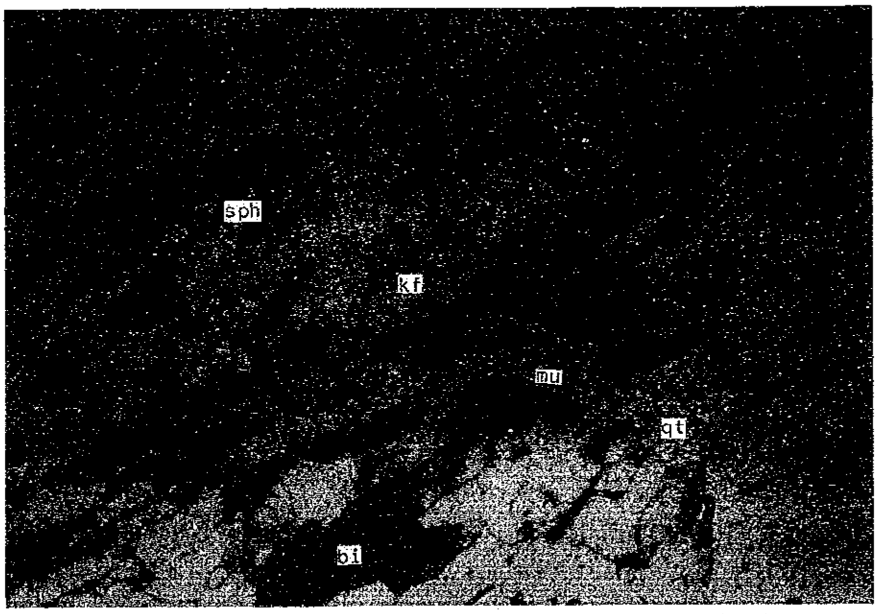
crossed polars

gt-bi Schist;
sample C117, pCssx1,
Sitio Timbauba

one polar

gt-bi SChist;
sample C117, pCssx1,
Sitio Timbauba

crossed polars

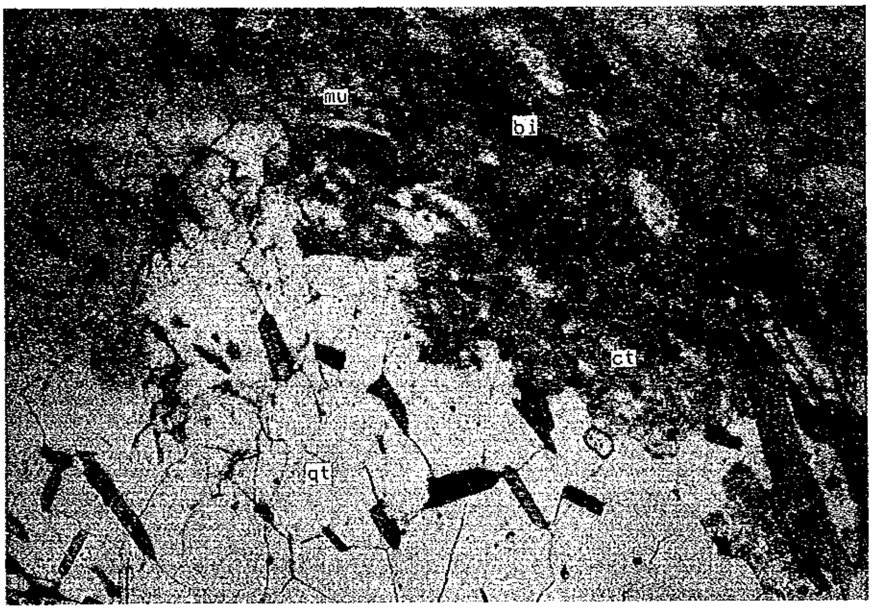


mu-bi Schist;
sample A127, pCssx2,
northwest of Quixaba

one polar

mu-bi Schist;
sample A127, pCssx2,
northwest of Quixaba

crossed polars

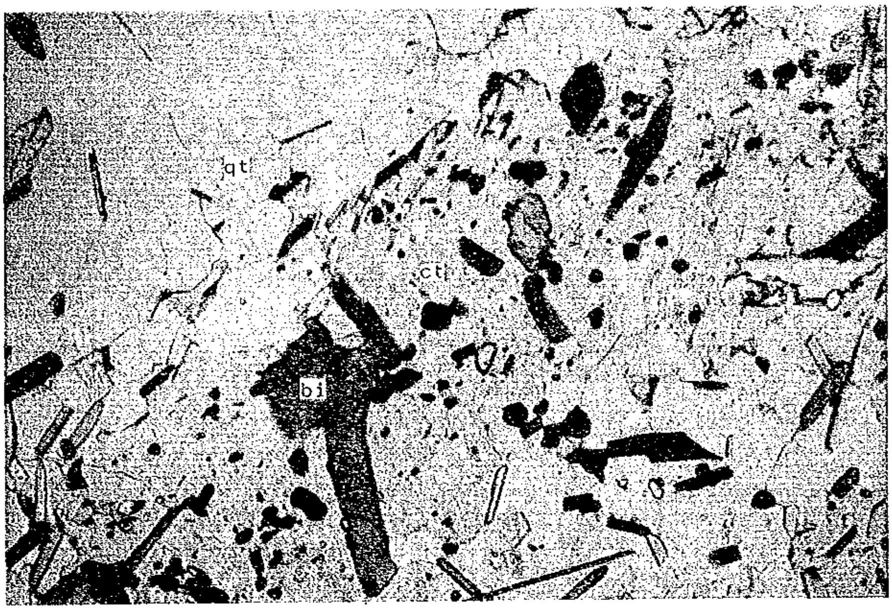


mu-ct-bi Schist;
sample D131, pCssx4,
west of Boa Sorte

one polar

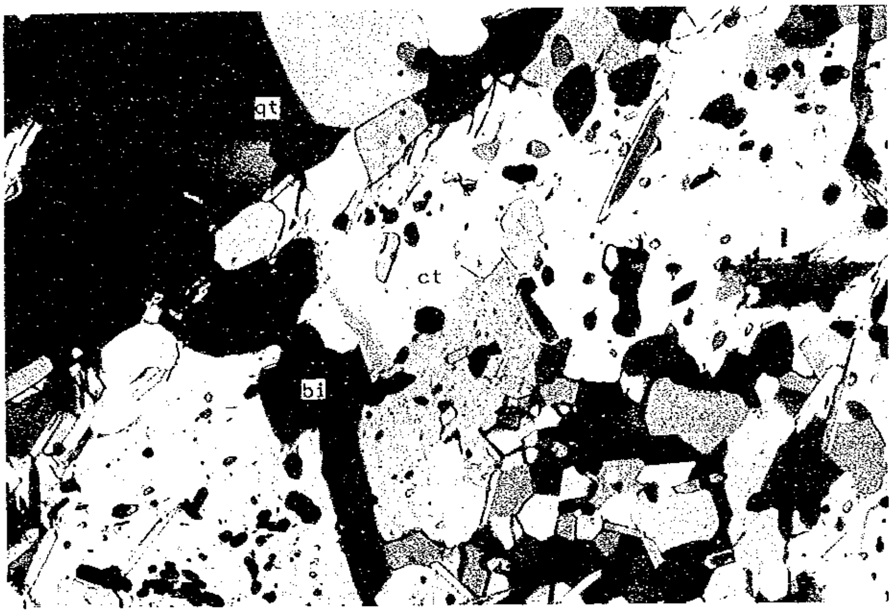
mu-ct-bi Schist;
sample D131, pCssx4
west of Boa Sorte

crossed polars



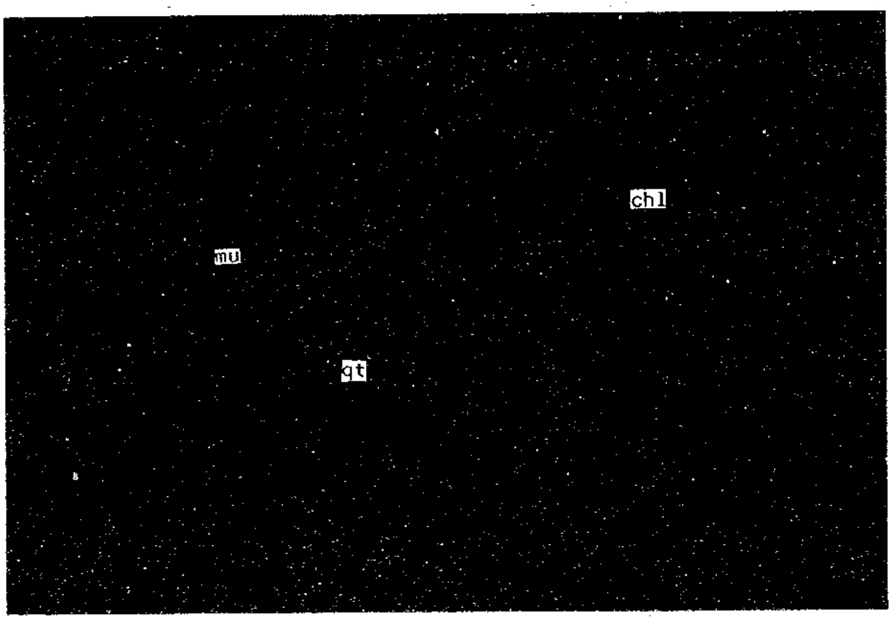
ct-bi Schist;
sample D111, pCssx4,
Riacho Pimenta

one polar



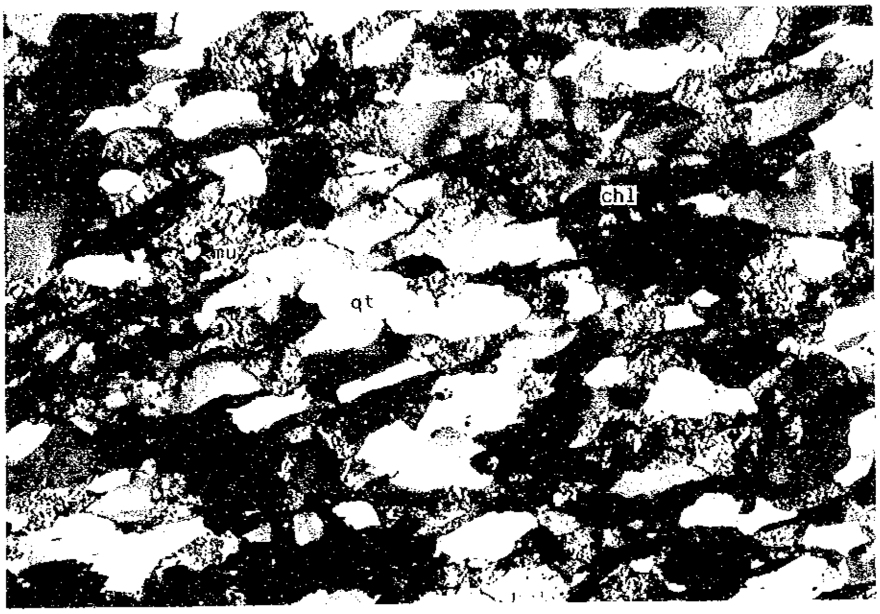
ct-bi Schist
sample D111, pCssx4
Riacho Pimenta

crossed polars



Cataclasite;
sample D102, pCssx4,
north of Quixaba

one polar

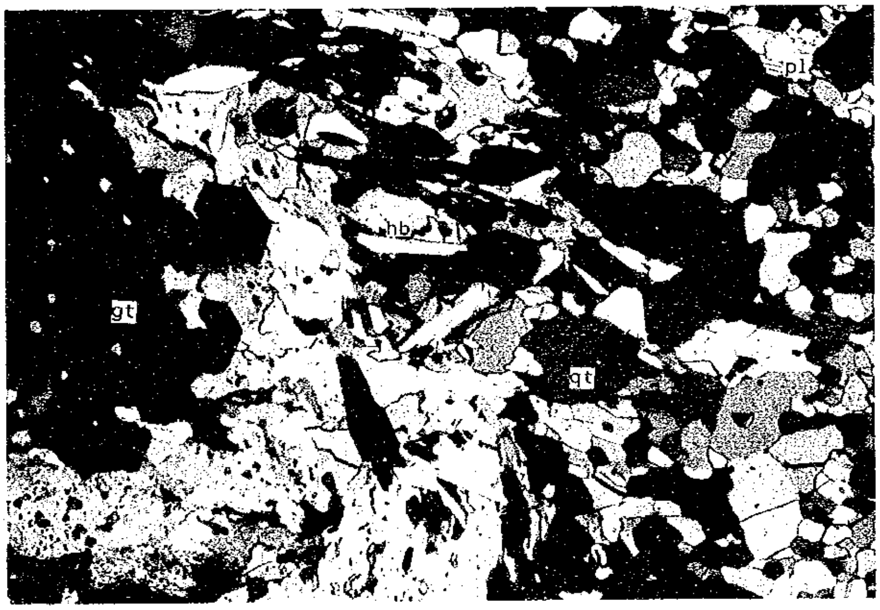


Cataclasite;
sample D102, pCssx4
north of Quixaba

crossed polars

gt bearing amph Schist;
sample A124, pCsscs,
Quixaba

one polar



gt bearing amph Schist;
sample A124, pCsscs,
Quixaba

crossed polars