56.20 - 100.00 m: Andesite, rhyolite

The digging was done using BX-WL diamond bits in 60 lit./minute of water supply, 250 to 300 rpm of bit revolution and 500 to 600 kg of bit load.

This section is composed of medium hard andesite and rhyolite, and in the sections of 56.20 to 59.70 m and 81.10 to 86.85 m clayey alteration zone exist.

In drilling, lost circulation occurred in the depth of 71.30 m but it was recovered up to 50% by a gushing-out preventive. The bore was digged to 100.00 m under this condition and the digging work was finished.

The core recovery in this section was 96.5%.

4-4 Geology of Drill Holes

The ten vertical holes drilled in the Pirca Area were aimed to make clear the mineralization of the area through clarifying mainly of the geology and the geological structure in the six borings of MJP-1 to MJP-6 and the states of the geochemically anomalous zones and the alteration zones in the four borings of MJP-7 to MJP-10.

Location of each drill hole and cross sections between each drill hole are shown in the Geological Map of the Pirca Southeastern Area (PL.31) and Geological Profiles of the Pirca Southeastern Area (scale 1:5,000, PL.32) respectively. The geological columnar sections of each drilling hole were prepared in scale, 1:200 and are shown in PL.33. The geological cross sections drawing in the proximities of each drill hole are shown in Fig. 4-3 (1) to (10) (scale 1:1,000). The geology of each drill hole are described below:

MJP-1 [PL-33 (1), Fig. 4-3 (1)]

0.00 m - 24.00 m: Upper part of the Barroso Upper Formation (Vbu-bt). This section is composed of white to light gray welded dacitic lapilli tuff. This rock contains angular andesitic lapilli and elongated dacitic pumices in lens shape (ϕ = 2 cm) with a matrix of white tuff containing brown biotite. The section from surface to 2.0 m is composed of yellowish white pumice and tuffaceous sand of weathered products.

24.00 m - 43.55 m: Lower part of the Barroso Upper Formation (Vbu-wt). This section is composed of gray compact dacitic welded tuff containing a small amount of andesite breccia, with a matrix of welded tuff containing biotite. The sections of 41.10 m to 42.55 m and 42.55 m to 43.55 m are composed of obsidian and fine particle tuff, respectively and the later is regarded as a unwelded facies formed in and near the contact zone with the lower stratum.

43.55 m - 100.80 m (bore bottom): Pirca Sediments (Ps). This section is composed of gravel, sand and silt layers. The section of 43.55 m to 57.70 m is composed of gravel containing predominantly cobbles of about 10 cm in diameter, 69.90 m to 75.95 m is composed of a light brown silt and sand layers and the other section is mainly composed of sand containing gravels. Gravels contained in this formation is composed of andesite, altered rock and silicified rock originated from the Tacaza Formation of the Tertiary and not at all include gravel of the Quaternary.

MJP-2 [PL-33 (2), Fig. 4-3 (2)]

0.00 m - 3.90 m: Alluvium (al). This section is composed of gravel, sand and silt, and the gravel includes those of angular to subangular andesite and altered rock.

3.90 m - 18.40 m: Pirca Sediments (Ps). This section is composed of sand, silt and clay containing minor amount of andesite and altered rock breccias ranging from 2 cm to 5 cm in diameter. The upper section of 3.90 m to 7.45 m is composed of mainly clay layers of various tints.

18.40 m - 100.00 m (bore bottom): Rhyolitic tuff of the Tacaza Formation (Tc-rho). This section is composed of white or gray rhyolitic tuff containing fragments of quartz 0.5 mm to 1.0 mm in diameter. It is discolored throughout the section by weak argillization and has dissemination of pyrite.

The results of X-ray diffraction test for five samples taken from this section show predominantly a combination of quartz and sericite as alteration minerals and existance of a small amount of alunite, halloysite and kaolinite in some samples. In addition the sample taken from the crushed part in the depth of 99.70 m to 99.80 m contains potassium feldspar.

The results of chemical analysis of two samples taken from the altered parts are shown in Table 4-7, indicating any mineralization.

Table 4-7 Chemical Analyses of Altered Rock Samples in MJP-2 Drilling Cores

Sample No.	Depth (m)	Type of Sample	Au g/t	Ag g/t	Cu %	Pb %	Zn %	As %
P2M-1	31.45∿31.50	White altered rhyolitic tuff	<0.07	<0.3	<0.01	<0.01	<0.01	0.019
P2M-2	70.00∿70.20	White altered rhyolitic tuff (brecciated)	<0.07	<0.3	<0.01	<0.01	<0.01	0.001

MJP-3 [PL-33 (3), Fig. 4-3 (3)]

0.00 m - 3.90 m: Barroso Upper Formation (Vbu-pt). This section is composed of sandy volcanic ash containing light gray or white pumices.

3.90 m - 16.40 m: Pirca Sediments (Ps). This section is composed of light brown to white, medium to coarse-grained sand containing gravel of silicified rock and altered rock of about 5 to 10 cm in diameter. The section of 13.80 m to 16.40 m contains boulders of silicified rock.

16.40 m - 92.10 m: Andesite lava of the Tacaza Formation (Tc-an). This section is composed of light brownish green, grayish green and dark grayish green massive andesite. The greenish color of the section is due to chloritization of the formation, and it's colour is also due to epidote in part. In joints with core angle of 30° to 70°, precipitation of brown iron oxide and black manganese dioxide are observed. The section of 53.70 to 66.00 m is composed of dark gray massive five-grained andesite. These andesites corresponds to the andesite lava (Tc-an) in the Tacaza Formation.

92.10 m - 100.00 m (bore bottom): Tuff of the Tacaza Formation (Tc-an). This section is composed of a white or grayish white strongly altered tuff with dissemination of pyrite. This rock corresponds to a tuff layer intercalated in the andesite lavas (Tc-an) of the Tacaza Formation.

The strongly altered sections of the bore are seen in 33.50 m to 42.45 m, 67.50 m to 68.00 m, 81.80 m to 85.65 m and 94.95 m to 100.00 m, and are mainly characterized brown, light brown or white argillic alteration. Of these, the section of 96.30 m to 96.60 m is composed of porous white quartz vein and 98.80 m to 99.20 m silicified rock. On the other hand, marked dissemination of pyrite is seen in the sections of 84.50 m to 84.70 m and 92.10 m to 100.00'm.

In the X-ray diffraction test of the six samples taken from the altered zones, alteration minerals are characterized mainly by a combination of quartz and sericite, with subordinate montmorillonite, halloysite and pyrite. The sample taken from the bore bottom contains abundant alunite in addition to these.

Weak mineralization of silver, copper and arsenic is recognized in the sample of the altered andesite with dissemination of pyrite.

The results of chemical analysis of the samples taken from the strongly altered andesite, quartz vein and strongly silicified part of the bore are shown in the Table 4-8.

Table 4-8 Chemical Analyses of Altered Rock and Quartz Vein Samples in MJP-3 Drilling Cores

Sample No.	Depth (m)	Type of Sample	Au g/t	Ag g/t	Cu %	Pb %	Zn %	As %
P3M-1	84.50∿85.65	Argillized andesite with pyrite dissemination	<0.07	0.5	0.04	<0.01	<0.01	0.025
P3M-2	96.30∿96.60	Porous white quartz vein	<0.07	<0.3	<0.01	<0.01	<0.01	0.001
P3M-3	98.80∿100.00	Strongly silicified rock	<0.07	<0.3	<0.01	<0.01	<0.01	0.001

MJP-4 [PL-33 (4), Fig. 4-3 (4)]

0.00 m - 34.55 m: Pirca Sediments (Ps). This section is composed of mainly light brown gravel with intercalating beds of sand, silt and clay. The gravel containes predominantly breccias of green andesite and brown or white altered rock with a matrix of light yellowish brown sand and silt. In this section, intercalating beds are seen at the depth of 15.85 m to 16.85 m, 27.65 m to 29.00 m and 29.70 m to 30.10 m (reddish clay).

34.55 m - 45.00 m: Andesite of the Tacaza Formation (Tc-an). This section is composed of light gray, partly reddish brown altered brecciated andesite with dissemination of pyrite.

45.00 m - 100.00 m (bore bottom): Andesite of the Tacaza Formation (Tc-an). This section is composed of gray to dark gray hard compact andesite undergone weak silicification and chloritization. In the section of more deeper than 90.00 m, epidote appears in a spotted state.

Alteration zones are observed in three places in the drill hole. The section of 34.55 m to 45.00 m is strongly argillized clayey alteration zone with white clay, 50.30 m to 51.15 m is alteration zone being accompanied by shearing with clay and 76.60 m to 83.00 m an alteration zone composed of silicification and argillization. In all of those sections, dissemination of pyrite is remarkable. Veinlets seen in this drill hole are as followings; goethite veinlets with quartz in 55.00 m to 55.30 m and 55.80 m to 56.10 m, stockwork quartz veins containing pyrite in 79.50 m to 79.70 m and quartz veinlets with dissemination of pyrite in 85.70 m to 86.85 m.

In the results of X-ray diffraction test of the five samples taken from the alteration zones, alteration minerals are shown as a combination of quartz, sericite and pyrite with a small amount of chlorite, kaolinite, prophyllite and montmorillonite.

The results of chemical analysis of the samples taken from the alteration zones and the quartz veins are as shown in the Table 4-9. In this bore, weak mineralization of silver, copper and arsenic is recognizable in the samples of a goethite-quartz vein.

Table 4-9 Chemical Analyses of Altered Rock and Quartz Vein Samples in MJP-4 Drilling Cores

Sample No.	Depth (m)	Type of Sample	Au g/t	Ag g/t	Cu %	Pb %	Zn %	As %
P4M-1	40.45∿42.05	White argillized rock with pyrite	<0.07	<0.3	0.02	0.01	<0.01	0.004
P4M-2	55.80∿56.10	Quartz-goethite vein	<0.07	1.9	0.05	<0.01	0.02	0.028
P4M-3	79.50∿79.70	Network of quartz veinlets	<0.07	<0.3	<0.01	<0.01	0.01	0.002
P4M-4	79.70∿81.65	Altered andesite with pyrite	<0.07	0.5	<0.01	<0.01	<0.01	0.002
P4M-5	85.70∿86.85	Silicified andesite with quartz veinlets	<0.07	0.5	<0.01	<0.01	<0.01	0.001

MJP-5 [PL-33 (5), Fig. 4-3 (5)]

0.00 m - 1.90 m: Talus. This section is composed of light brown sand and mud containing gravels of altered andesite.

1.90 m - 100.10 m (bore bottom): Andesite of the Tacaza Formation (Tc-an). The rock of this section varies from weakly altered dark gray hard compact andesite to strongly altered pale gray, pale brown and white argillic andesite according to the degree of alteration and the original texture becomes gradually indistinct.

Stongly altered zones in this section, though the alteration extends throughout it, are seen in the sections of 1.90 m to 13.30 m, 22.70 m to 27.00 m, 49.80 m to 54.40 m, 61.90 m to 63.70 m and 83.30 m to 100.00 m (bore bottom). The majority of these altered zones is characterized by argillic alteration, but the sections of 83.30 m to 95.35 m and 95.35 m to 97.80 m are composed of strongly silicified zone and gray porous quartz vein respectively. In the bore, the shallower section than 44.85 m is contaminated by brown iron oxide after pyrite and in the deeper section than it dissemination of pyrite is seen unchanged.

The results of X-ray diffraction test of the seven samples take from the altered zones, shows alteration minerals as an assemblage of quartz, alunite, kaolinite and pyrite. In addition to these, a small amount of prophyllite, sericite and montmorillonite is detected locally.

The results of chemical analysis of the samples taken from the silicified part and quartz veins of this bore are as shown in Table 4-10. No mineralization is recognized in the silicified zone and quartz veins of the bore.

Table 4-10 Chemical Analyses of Altered Rock and Quartz Vein Samples in MJP-5 Drilling Cores

Sample No.	Depth (m)	Type of Sample	Au g/t	Ag g/t	Cu %	Pb %	Zn %	As %
P5M-1	89.10 ~ 89.60	Strongly silicified rock	<0.07	<0.03	<0.01	<0.01	<0.01	0.010
P5M-2	95.35 ~ 96.60	Gray porous quartz vein	<0.07	<0.03	<0.01	<0.01	<0.01	0.003
P5M-3	96.60 ~ 97.80	Gray porous quartz vein	<0.07	<0.03	<0.01	<0.01	<0.01	0.003

0.00 m - 7.05 m: Talus (al). This section is composed of gravels of porphyritic andesite and tuffaceous sand.

7.05 m - 23.60 m: Porphyritic andesite of the lower formation of the Barroso Group (Vbl-po). This section is composed of gray porphyritic andesite lava containing phenocrysts of plagioclase (0.5 to 0.2 cm in diameter) and amphibole (1 m to 2 mm in diameter) characteristically.

23.60 m - 96.35 m: Andesitic volcanic breccia of the lower formation of the Barroso Group (Vbl-tf). This section is composed of light purplish gray andesitic volcanic breccia containing breccias of porphylitic andesite lava similar to that of overlying unit, with a matrix of light purplish gray or gray unconsolidated or semi-consolidated andesitic volcanic ash. The section of 95.85 m to 96.35 m is composed of andesitic volcanic conglomerate forming the contact part with the underlying unit.

96.35 m - 100.80 m (bore bottom): Altered andesite of the Tacaza Formation (Tc-an). This section is composed of brown or purplish brown altered andesite.

No distinct alteration is seen in this drill hole except of weak argillic alteration in altered andesite of the lowest part. The altered andesite in 96.35 m to 97.65 m has network veinlets of iron oxide and manganese dioxide.

The results of X-ray diffraction test of the samples taken from the volcanic breccia (Vbl-tf) in the Barroso Lower Formation and the andesite (Tc-an) in the Tacaza Formation, show no alteration minerals in the former but an assemblage of quartz, sericite and montmorillonite in the later.

MJP-7 [PL-33 (7), Fig. 4-3 (7)]

The bore is located in the place where the outcropping silicified and argillic alteration zones overlap with the geochemical anomaly (PE-Q) of Au and Ag.

0.00 m - 57.90 m: Andesite of the Tacaza Formation (Tc-an). The upper section of 0.00 m to 22.4 m, is composed of strongly altered andesite, so the original texture of the rock is not clear. The great part of 22.40 m to 57.90 m is composed of dark gray to grayish black hard compact andesite. In the section of 49.50 to 56.55 m weak chloritization is observable, and in some part weak argillization and contamination of brown or light brown iron oxide are also observable.

57.90 m - 100.00 m (bore bottom): Andesitic lapilli tuff of the Tacaza Formation (Tc-tf). This section is composed of greenish gray andesitic lapilli tuff that is predominantly lapilli of green to brown angular to subangular andesite or dacite, with a matrix of gray tuff containing epidote partly. The lapilli tuff has an intercalated bed of altered andesitic tuff in the section of 73.30 m to 76.40 m. In this section of the specimen taken from the depth of 99.35 m, the rock is seen to be altered andesitic lapilli tuff suffered from strong epidotization.

The remarkable argillic alteration zones are recognized in the sections of 0.00 m to 22.40 m and 57.90 m to 60.10 m, and slightly weak alteration zones occur in the sections of 22.40 m to 34.70 m, 45.00 m to 49.50 m, 56.55 m to 67.25 m and 73.30 m to 76.40 m. The alteration zone of 0.00 m to 22.40 m is a strong alteration zone with white, yellowish brown or brown clay. In the outcrop of this alteration zone, a silicified zone is exposed, but it does not continue within the bore. The section of 57.90 m to 60.10 m is also a purpulish brown strongly argillized alteration zone. In the alteration zones of the other sections, the original texture is still remained, though the colours of the rocks have changed because of argillization.

The results of X-ray diffraction test of the six samples taken from the alteration zone of this bore show the alteration mineral's assemblage of quartz, montmorillonite and (halloysite), and show sericite and mixed layer mineral of sericite and montmorillonite are existing locally.

The results of chemical analysis of the samples taken from the argillic alteration zones are as shown in the Table 4-11. In this bore, although the size of alteration zones are big, mineralization is hardly recognized.

Table 4-11 Chemical Analyses of Altered Rock Samples in MJP-7 Drilling Cores

Sample No.	Depth (m)	Type of Sample	Au g/t	Ag g/t	Cu %	Pb %	Zn %	As %
P7M-1	18.80∿20.35	Brown and white strongly argillized rock	0.07	0.3	<0.01	<0.01	<0.01	0.001
P7M-2	45.20∿46.15	Altered andesite	<0.07	0.3	0.01	<0.01	0.01	0.001
P7M-3	57.90∿60.10	Strongly argillized rock	<0.07	0.3	<0.01	<0.01	<0.01	0.001

MJP-8 [PL-33 (8), Fig. 4-3 (8)]

The bore is located in the place where an exposing silicified and argillic alteration zone and a geochemically anomaly zone of Au and As overlap. The geology in this drilling hole is composed of an andesite (Tc-an) and andesitic tuff (Tc-tf), both of the Tacaza Formation, and forms alterating beds. The former is distributed in the sections of 0.00 m to 22.20 m, 36.20 m to 55.20 m and 89.70 m to 100.20 m and the latter is distributed in the remaining sections.

The andesites (Tc-an) are dark gray to gray somewhat porphyritic rocks containing phenocrysts of plagioclase 0.5 to 1.0 mm in diameter. This rocks have undergone epidotization and chloritization. The tuff breccias are gray to greenish gray rocks containing andesite breccias 5 cm or less in diameter with a matrix of greenish gray andesitic tuff partly being accompanied by epidote spots.

Alteration of the bore is remarkable most nearby the surface. In the section in the depth of 0.00 m to 15.80 m, the section of 1.90 m to 3.65 m is composed of gray heavy silicified rock, 7.55 m to 8.75 m reddish brown massive iron oxide ore, 9.90 m to 10.45 m dark reddish brown semi-massive iron oxide ore and other sections white to brown strongly argillized alteration zone. In this bore, quartz veinlets occur in the section of 46.85 m to 46.95 m and brown to white strongly argillized alteration zones occur in the sections of 69.95 m to 79.55 m and 94.85 m to 100.20b m (bore bottom).

The results of the X-ray diffraction test of the seven samples taken from the alteration zones shows an assemblage of alteration minerals of quartz, alunite and kaolinite and an existence of remarkable amount of hematite.

The results of chemical analysis of the samples taken from the strongly silicified zones, the massive iron oxide ore, the quartz vein and the strongly argillized alteration zone is as shown in the Table 4-12. From the results, weak mineralization of gold and silver is recognized in a heavy silicified rock, a massive reddish brown iron oxide ore and a quartz vein.

Table 4-12 Chemical Analyses of Altered Rock and Quartz Vein Samples in MJP-8 Drilling Cores

Sample No.	Depth (m)	Type of Sample	Au g/t	Ag g/t	Cu %	Pb %	Zn %	As %
P8M-1	1.90 ∿ 2.55	Gray strongly silicified rock	0.17	<0.3	<0.01	0.01	<0.01	0.008
P8M-2	2.55 ∿ 3.65	Gray strongly silicified rock	0.07	0.3	<0.01	<0.01	<0.01	0.016
P8M-3	7.55 ∿ 8.75	Reddish brown massive iron oxide ore	<0.07	1.7	0.01	<0.01	<0.01	0.021
P8M-4	9.10 ∿ 9.90	Gray strongly silicified rock	<0.07	<0.3	<0.01	<0.01	<0.01	0.015
P8M-5	46.85∿46.95	Quartz vein	0.07	1.0	<0.01	<0.01	0.01	0.012
P8M-6	69.95∿73.35	Strongly argillized rock with pyrite	<0.07	0.5	0.01	<0.01	<0.01	0.001

MJP-9 [PL-33 (9), Fig. 4-3 (9)]

The drilling hole is located in the area where the rhyolitic tuff of the Tacaza Formation is widely distributed and a strongly silicified zone and quartz veins occur in it striking almost in east-west direction (Fig. 2-9). And a geochemically anomaly zone (PE-T) of Au, As and Cu is located in and around it. The quartz vein and the silicified zone is estimated to be nearly vertical or steeply dips north and the drilling hole is located somewhat north side of those.

0.00 m - 3.80 m: Alluvium (al). The upper section from 0.00 m to 1.50 m is composed of a dark gray sand and the lower section from 1.50 m to 3.80 m is composed of gravels of strongly silicified rhyolite and rhyolitic tuff.

3.80 m - 100.00 m (bore bottom): Rhyolitic tuff to lapilli tuff of the Tacaza Formation (Tc-rho). This section is composed of light gray to white rhyolitic tuff to lapilli tuff containing characteristically quartz particles. In thin section a very light gray rhyolitic lapilli tuff taken from the depth of 78.40 m is seen to be composed of fragments of rhyolite and corroded quartz (maximum size: 7 mm), with a matrix of altered rhyolitic tuff.

All rocks in the bore have undergone weak argillic alteration resulting in white colour. Dissemination of pyrite, silicification and veining of quartz are also recognized in the rocks. Strongly silicified zone is seen in the section of 3.80 m to 14.90 m and other is recognized in the sections of 74.65 m to 76.00 m and 90.75 m to 91.55 m. The section where argillization is strong is from 14.90 m to 21.25 m and is accompanied with contamination of brown iron oxide. The section with remarkable pyritization is of 38.60 m to 39.80 m and 61.65 m to 64.70 m, where pyrite occurs in a form of veinlets along cracks and disseminating zone. Quartz veins are seen in the altered part around the depth of 49.00 m, as a veinlet 4 cm or less in width in 76.70 m to 77.00 m as a gray quartz vein and in 88.80 m as a dark gray quartz veinlet 1.5 cm in width. In polished section of the sample taken from the quartz veinlet in 88.80 m, minor amount of pyrite, sphalerite and galona is observable.

The results of X-ray diffraction test of the eight samples taken from the alteration zones show an assemblage of alteration minerals of quartz and kaolinite with a subordinate sericite in the argillized zones. In addition to those, mixed layer mineral of sericite and montmorillonite and potassium feldspar are detected locally.

The results of chemical analysis of the samples taken from strongly silicified zones and quartz veins are as shown in the Table 4-13. In this drilling hole, weak mineralization of silver, copper, lead and zinc is recognized in the strongly silicified parts and the quartz veins.

Table 4-13 Chemical Analyses of Altered Rock and Quartz Vein Samples in MJP-9 Drilling Cores

Sample No.	Depth (m)	Type of Sample	Au g/t	Ag g/t	Cu %	Pb %	Zn %	As %
P9M-1	3.80 ∿ 5.30	Strongly silicified rock	<0.07	<0.3	<0.01	<0.01	<0.01	0.003
P9M-2	49.00 ∿ 49.45	Quartz vein	<0.07	0.8	0.01	<0.01	<0.01	0.004
P9M-3	61.65 ∿ 62.15	Rhyolitic tuff with strong pyritization	<0.07	<0.3	<0.01	<0.01	<0.01	0.004
P9M-4	74.65 ∿ 76.00	Strongly silicified rock	<0.07	1.0	0.01	0.01	0.06	0.006
P9M-5	76.70 ∿ 77.00	Gray quartz vein	<0.07	2.8	0.02	0.01	0.07	0.006
P9M-6	88.80 ∿ 89.00	Rhyolitic tuff with quartz vein	<0.07	1.0	<0.01	0.01	0.08	0.008
P9M-7	90.75 ∿ 91.00	Silicified rhyolitic tuff	<0.07	0.5	<0.01	0.02	0.08	0.005

MJP-10 [PL-33 (10), Fig. 4-3 (10)]

In and around the drill site, a light gray to yellowish brown argillic alteration zone is exposed in a direction of east and west, and a geochemical anormaly zone of As (PE-S) extending in the same direction overlaps on this. This drilling hole is located in the north side of this altered zone.

0.00 m -26.70 m: Andesite of the Tacaza Formation (Tc-an). This section is composed of greenish brown or greenish gray altered andesite and a white, yellowish gray and brown strongly argillized altered andesite. The section of 25.95 m to 26.70 m forms a sheared zone with breccia and clay.

26.70 m -53.15 m: Andesitic tuff breccia of the Tacaza Formation (Tc-tf). This section is composed of greenish gray andesitic tuff breccia containing breccia (2 to 5 cm in diameter) of various coloured andesites with a matrix of chloritized and epidotized andesitic tuff. The section of 52.80 m to 53.15 m which is the contact part with the lower section forms a strongly argillized alteration zone.

53.15 m - 81.10 m: Andesite of the Tacaza Formation (Tc-an). This section is gray massive andesite containing characteristically phenocrysts of plagioclase (0.5 to 1.0 mm in diameter). In thin section the specimen taken from the depth of 67.35 m, is seen to have porphyritic texture and to contain phenocrysts of plagioclase, augite and hypersthene with a ground-mass composed of plagioclase and volcanic glass which have undergone chloritization and calcitization.

81.10 m - 100.00 m (bore bottom): Rhyolitic lapilli tuff of the Tacaza Formation (Tc-rho). This section is composed of light greenish gray rhyolitic lapilli tuff containing light green pumice (0.5 cm to 1.0 cm in diameter) and brown, gray and green breccias of andesite (1 cm to 3 cm in diameter) with a matrix of rhyolitic tuff. Of these, the section of 81.10 to 86.85 m is a strongly argillized alteration zone with remarkable disseminated of pyrite.

Among those remarkable alteration zones, strong argillic alteration zones contaminated with iron oxide are in the sections of 0.00 m to 13.00 m, 18.20 m to 21.75 m, 24.55 m to 25.35 m and 58.40 m to 59.70 m and a white or grayish white argillic zone with remarkable pyritization is seen in the section of 81.10 m to 86.85 m. In the results of X-ray diffraction test of the six samples taken from these alteration zones, the combination of alteration minerals is seen to be quartz and montmorillonite with a very minor amount of kaolinite, chlorite, sericite, alunite and potassium feldspar.

The results of chemical analysis of the samples taken from the argillic alteration zones are as shown in the Table 4-14. In this drilling hole, the size of alteration zone is big but mineralization is not recognized.

Table 4-14 Chemical Analyses of Altered Rock Samples in MJP-10 Drilling Cores

Sample No.	Depth (m)	Type of Sample	Au g/t	Ag g/t	Cu %	Pb %	Zn %	As %
P10M-1	20.45 ∿ 21.05	Strongly argillized rock	<0.07	0.3	<0.01	<0.01	<0.01	0.002
P10M-2	83.25 ∿ 84.40	White strongly argillized rock with pyrite dissemination	<0.07	<0.3	0.01	<0.01	<0.01	0.004

4-5 Mineralization and Alteration

From the boring survey of the ten drilling holes of MJP-1 to MJP-10, the classification of geology and alteration with the depth in drilling hole, the alteration mineral assemblage and the results of chemical analysis of samples taken from main alteration zones are summarized in Table 4-16.

In all the drilling holes except MJP-1 and MJP-6 many alteration zones are recognized. All alteration zones are observed in the rhyolitic tuff (Tc-rho) and the andesitic volcanic rocks (Tc-an and Tc-tf) both of the Tacaza Formation and can be roughly divide in an argillic alteration zone, silicified zone, quartz vein and pyritization zone.

Argillic alteration zone: This zone appears in the most frequency of the altered zones, is an altered zone with brown, yellowish brown and white clay and can be observed in all drilling holes except MJP-1 and MJP-6. The most thick argillic alteration zone is the white and brown argillic alteration zone spread from the drilling hole mouth to the depth of 22.40 m of MJP-7 (0.00 m). The similar argillic alteration zones over 10 m in the core length are observed in the holes of MJP-4, 5, 8 and 9.

Silicified zone: Dominant silicified zones are observed in the boring holes of MJP-5 and MJP-9. The former has a gray to purplish gray strongly silicified zone in the depth between 83.30 m and 95.35 m (core length: 12.05 m). In the latter, a white or grayish white strongly silicified zone can be observed in the section of 3.80 m to 14.90 m (core length: 11.0 m). In addition to those, in the MJP-8, gray to grayish white strongly silicified zones lie in the sections of 1.90 m to 3.65 m and 9.10 m to 9.90 m being intercalated in the altered zone of 0.00 m to 15.80 m. The silicified zones of MJP-3 and MJP-4 are small in scale.

Quartz vein: Quartz veins are observed in each drilling hole of MJP-3, 4, 5, 8 and 9 but the majority of them are veinlets. The particular wide quartz vein occurs in the section of the depth of 95.35 m to 97.80 m (core length: 2.45 m) of MJP-5 and it is gray porous one. The section of 96.30 m to 96.60 m (core length:

0.3 m) of MJP-3 is a porous white quartz vein and 76.70 m to 77.00 m (core length: 0.3 m) of MJP-9 is a gray to dark gray quartz vein. The vein width other than these is a quartz thin vein of 10 cm or less.

Pyritization: Pyritization can be observed in all boring holes except MJP-1, 6 and 7 and is divided to dissemination type and concentration type in a form of veinlets along cracks. In general, shallower places than 30 m to 40 m under the surface are of oxidized contamination by brown iron oxide and pyrite is not recognized. But in the deeper places than that, euhedral pyrite is observed. In the sections of 7.55 m to 8.75 m and 9.90 m to 10.45 m of MJP-8, reddish brown iron oxide is observed, which is estimated to be due to oxidation of the concentrated pyrite.

Table 4-15 shows assemblages of alteration minerals detected by X-ray diffraction tests of samples taken from the altered zones. From these alteration minerals, the altered zones in the area are judged to be formed by hydrothermal alteration. The major assemblages of alteration minerals in each boring holes are as follows:

Quartz + Sericite	MJP-2, MJP-3 and MJP-4
Quartz + Alunite + Kaolinite	MJP-5 and MJP-8
Quartz + Kaolinite	MJP-9
Quartz + Montmorillonite	MJP-10
Quartz + Montmorillonite + (Halloysite)	MJP-7

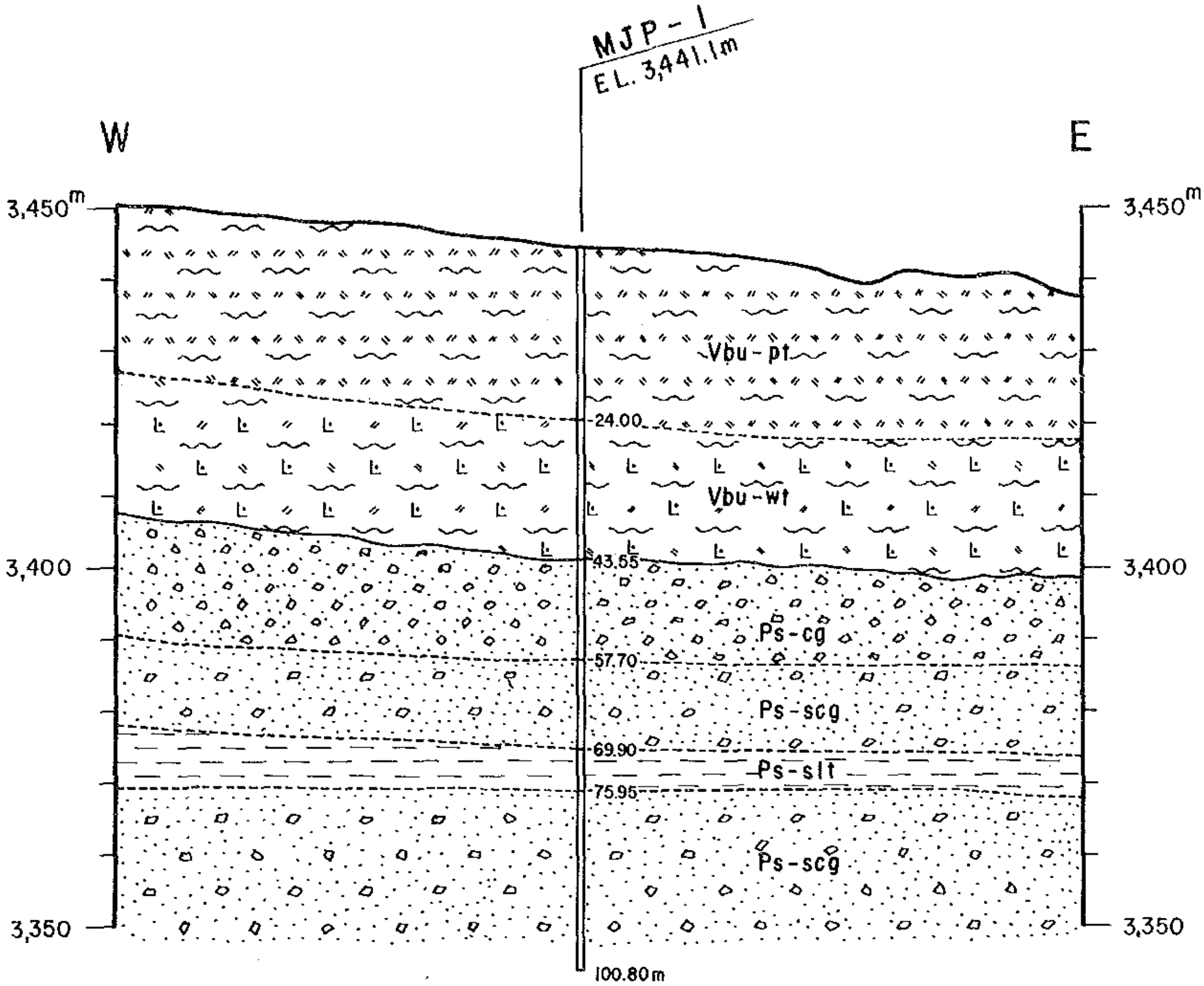
The results of chemical analysis for the six components of Au, Ag, As, Cu, Pb and Zn of the thirty one samples taken from the argillized zones, silicified zones, quartz veins and pyritic zones of each boring holes show mostly values below detecting limits.

The alteration zones in this area are very large in size but mineralization is very weak in spite of strong alteration. Mineral indications found in those alteration zones, though they are very weak, are mostly include in alteration zones with quartz veinlets and partly in pyritized zones. Samples having mineralization, though they are very weak, are shown in Table 4-15. Of the chemical analysis of the thirty one samples (Apx.-9), the highest values of each component are Au: 0.17 g/t, Ag: 2.8 g/t, As: 0.28%, Cu: 0.05%, Pb: 0.01% and Zn: 0.08%, and either case is low grade.

Table 4-15 List of Alteration and Mineralization of Drilling Cores in Pirca Eastern Area

Drilling No.	Geological Unit: Depth (m) ~ (m)	Geological Unit: Formation	Argillization (m) ~ (m)	Silicification (m) ~ (m)	Quartz Vein (m) ~ (m)	Pyritization (m) ~ (m)	Mineral Assemblage of Altered Zone	Main Results of Chemical Analysis of Altered Rock: Depth (m)	Au g/t	Ag g/t	As%	Cu%	Pb%	Zn%
MJP-1	0.00~ 24.00 24.00~ 43.55 43.55~100.80	Barroso Upper (Vbu-pt) Barroso Upper (Vbu-wt) Pirca Sediments (Ps)	-	-	-	-	no examination		no-assey					
MJP-2	0.00~ 3.90 3.90~ 18.40 18.40~100.00	Alluvium (al) Pirca Sediments (Ps) Tacaza F. (Tc-rho)	weak argillization	weak silicification	-	18.40-100.00 (dissemination)	Main [Qz+Ser] Others (Al),(Hal), (Kao),(Kf)		-					
MJP-3	0.00~ 3.90 3.90~ 16.40 16.40~ 92.10 92.10~100.00	Barroso Upper (Vbu-pt) Pirca Sedimens (Ps) Tacaza F. (Tc-an) Tacaza F. (Tc-tf)	33.50~ 42.45 67.60~ 68.00 81.80~ 85.65 94.95~ 96.30 96.60~100.00	(98.80~99.20)	96.30~96.60	92.10~100.0	Main [Qz+Ser] Others (Mn),(Hal)(Py)	[P3M-1] 84.50~ 85.64	<0.07	0.5	0.025	0.04	<0.01	<0.01
MJP-4	0.00~ 34.55 34.55~100.00	Pirca Sediments (Ps) Tacaza F.(Tc-an)	34.55~ 45.00 50.30~ 51.15 76.60~ 83.00	85.70~ 86.85	55.00~55.30 55.80~56.10 79.50~79.70 85.70~86.85 (network)	30.70~43.75 76.60~83.00 (dissemination vein let)	Main [Qz+Ser+Py] Others (Chl),(Kao) (Pyp),(Mm)	[P4M-2] 55.80~ 56.10	<0.07	1.9	0.028	0.05	<0.01	<0.01
MJP-5	0.00~ 1.90 1.90~100.10	Talus (al) Tacaza F.(Tc-an)	1.90~ 13.30 22.70~ 27.0 49.80~ 54.40 61.90~ 63.70	83.30~95.35	95.35~97.80 (2.45 m)	44.85~49.80 61.90~63.70 97.80~100.10	Main [Qz+Al+Kao+ Py] Others (Pyp),(Ser), (Mm)		-					
MJP-6	0.00~ 7.05 7.05~ 23.60 49.80~ 54.40 23.60~ 96.35 96.35~100.80	Talus (al) Borroso Lower (Vbl-po) " Tacaza F. (Tc-an)	-	-	-	-	Tacaza F. [Qz+Ser+Mm]		no-assey					
MJP-7	0.00~ 57.90 57.90~100.00	Tacaza F. (Tc-an) " (Tc-tf)	0.00~22.40 57.90~60.10 22.40~34.70 45.00~49.50 56.55~67.25 73.30~76.40	-	-	-	Main [Qz+Mm+(Hal)] Others (Ser)(Ser/Mm)		-					
MJP-8	0.00~ 22.20 22.20~ 36.20 36.20~ 55.20 55.20~ 89.70 89.70~100.20	Tacaza F. (Te-an) " (Tc-tf) " (Tc-an) " (Tc-tf) " (Tc-an)	0.00~ 1.90 3.65~ 7.55 8.75~ 9.10 10.45~ 15.80 66.95~ 79.55 94.85~100.20	1.90~ 3.65 9.10~ 9.90	46.85~46.95 quartz vein let	7.55~ 8.75 (iron oxides) 9.90~10.45 (iron oxides) 69.95~79.55 86.60~89.70	Main [Qz+Alu+Kao] Others (Mm), (hem) (Hal)	[P8M-1] 1.90~ 2.55 [P8M-3] 7.55~ 8.75 [P8M-5] 46.85~ 46.95	0.17 <0.07 0.07	<0.3 1.7 1.0	0.08 0.021 0.012	<0.01 0.01 <0.01	0.01 <0.01 <0.01	<0.01 <0.01 <0.01
MJP-9	0.00~ 3.80 3.80~100.00	Alluvium (al) Tacaza F.(Tc-rho)	14.90~ 21.25	3.80~14.90 74.65~76.00 90.75~91.55	49.00~49.80 (w=4 cm) 76.70~77.00 (w=30 cm)	38.60~39.80 61.65~64.70	Main [Qz+Kao] Others (Ser),(Py) (Ser/Mm), (Kf)	[P9M-4] 74.65~ 76.00 [P9M-5] 76.70~ 77.00 [P9M-6] 88.80~ 89.00	<0.07 <0.07 <0.07	1.0 2.8 1.0	0.006 0.006 0.08	0.01 0.02 <0.01	0.01 0.01 0.01	0.06 0.07 0.08
MJP-10	0.00~ 26.70 26.70~ 53.15 53.15~ 81.10 81.10~100.00	Tacaza F. (Tc-an) " (Tc-tf) " (Tc-an) " (Tc-rho)	0.00~ 13.00 18.20~ 21.75 24.55~ 25.35 58.40~ 59.70 81.00~ 86.85	-	-	81.10~86.85	Main [Qz+Mm] Others (Kao), (Chl), (Ser), (Alu), (Kf)		-					

Abbreviation Qz: Quartz, Ser: Sericite, Kao: Kaolinite, Hal: Halloysite, Al: Alunite, Mm: Montmorillonite,
Chl: Chlorite, Pyp: Pyrophyllite, Py: Pyrite, Kf: Potasium feldspar, Ser/Mm: Sericite-Montmorillonite mixed layer



Abbriviation

al : alluvium, Vbu : Barroso Group Upper, Vbl : Barroso Group Lower ,

Ps : Pirca Sediments , Tc : Tacaza Formation , pt : pumice tuff ,

wt : welded tuff , po : porphyritic andesite , cl : clay , slt : silt ,

cg : gravel and sand , scg : sand with gravel , tf : tuff , an : andesite , rho : rhyolite

Symbol

—— : quartz vein , ▩ : strongly silicified zone , ░ : argillized zone

Fig. 4-3 (1) Geological Profile of the Drilling Site (MJP-1)

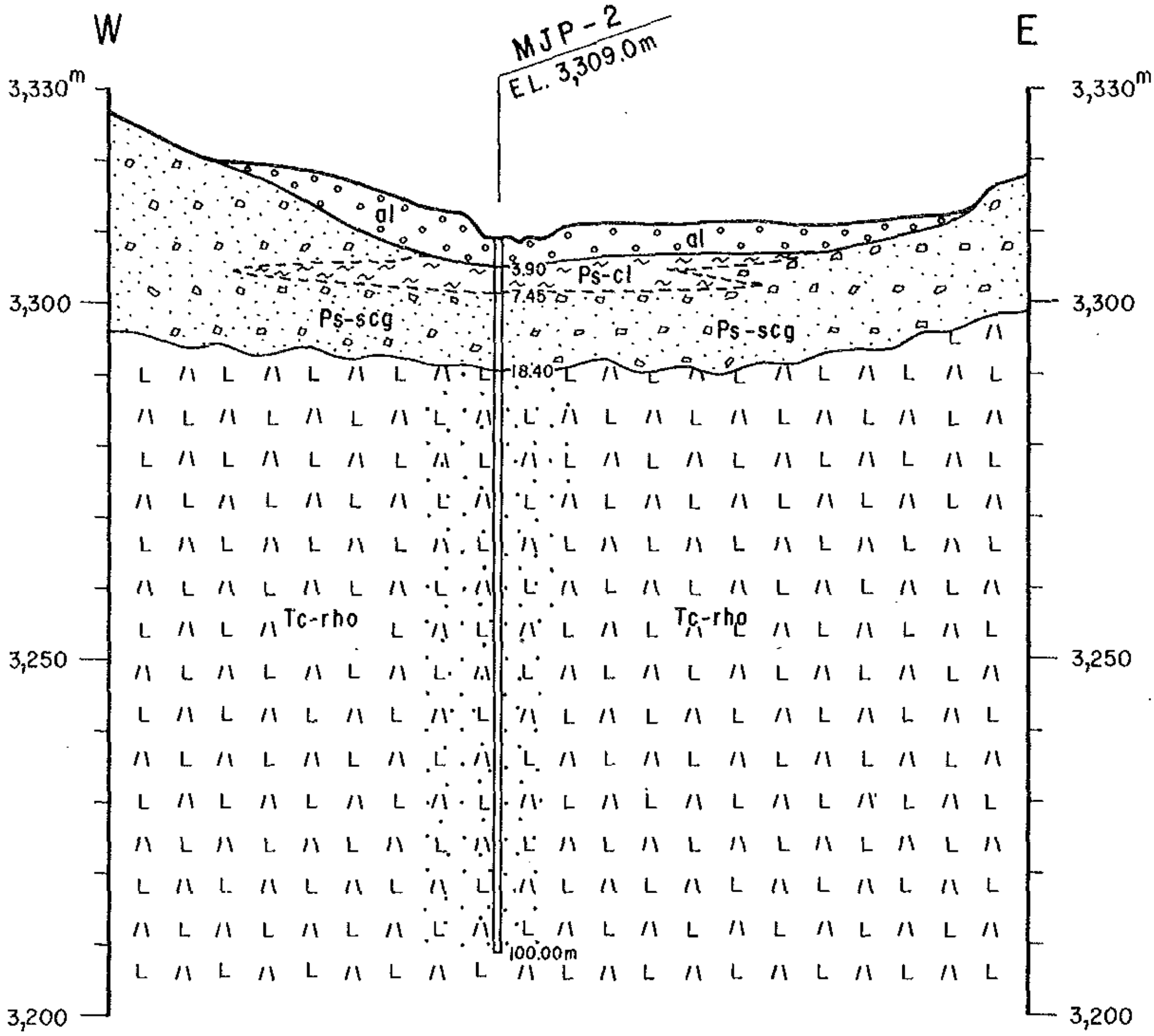


Fig. 4-3 (2) Geological Profile of the Drilling Site (MJP-2)

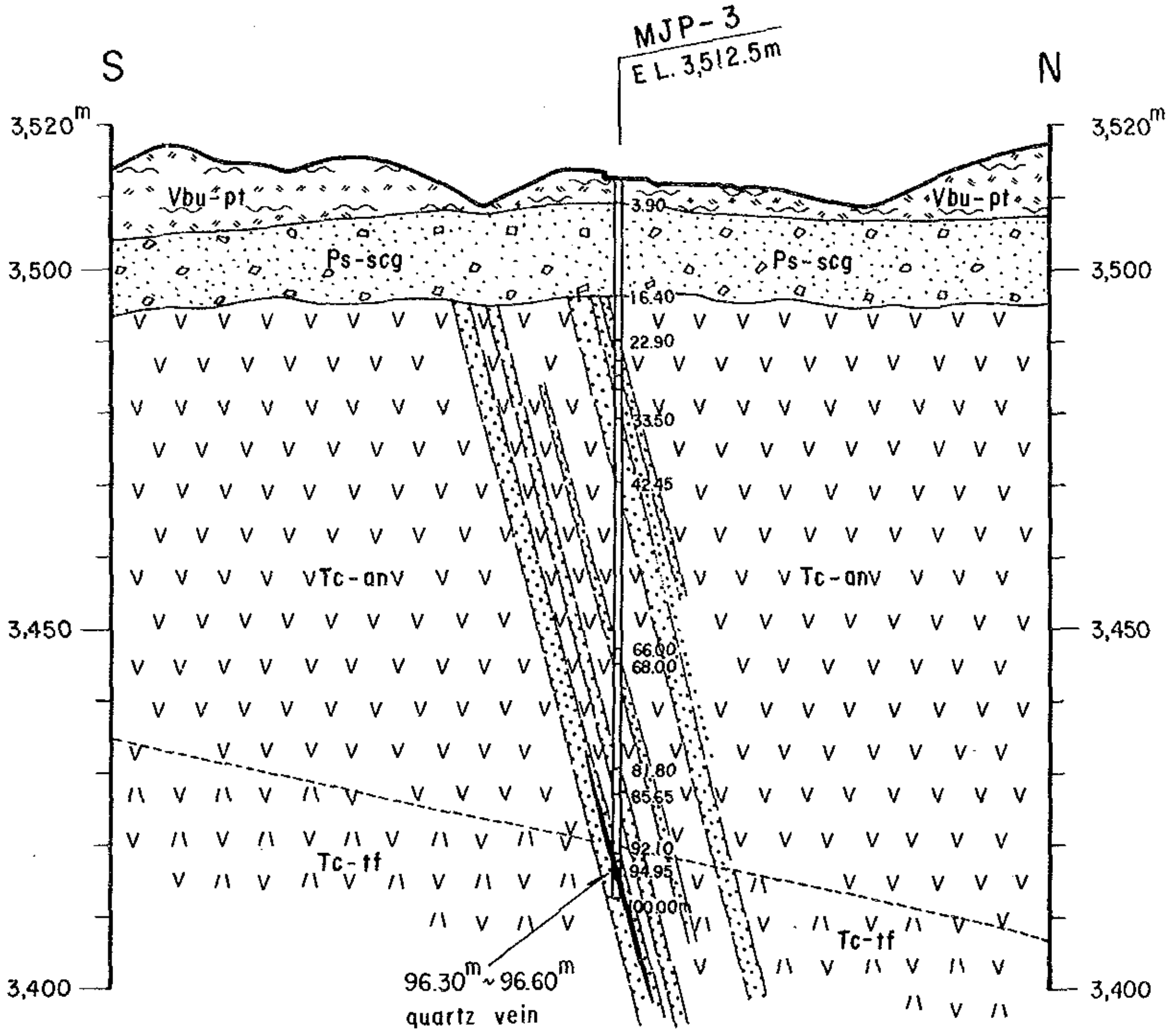


Fig. 4-3 (3) Geological Profile of the Drilling Site (MJP-3)

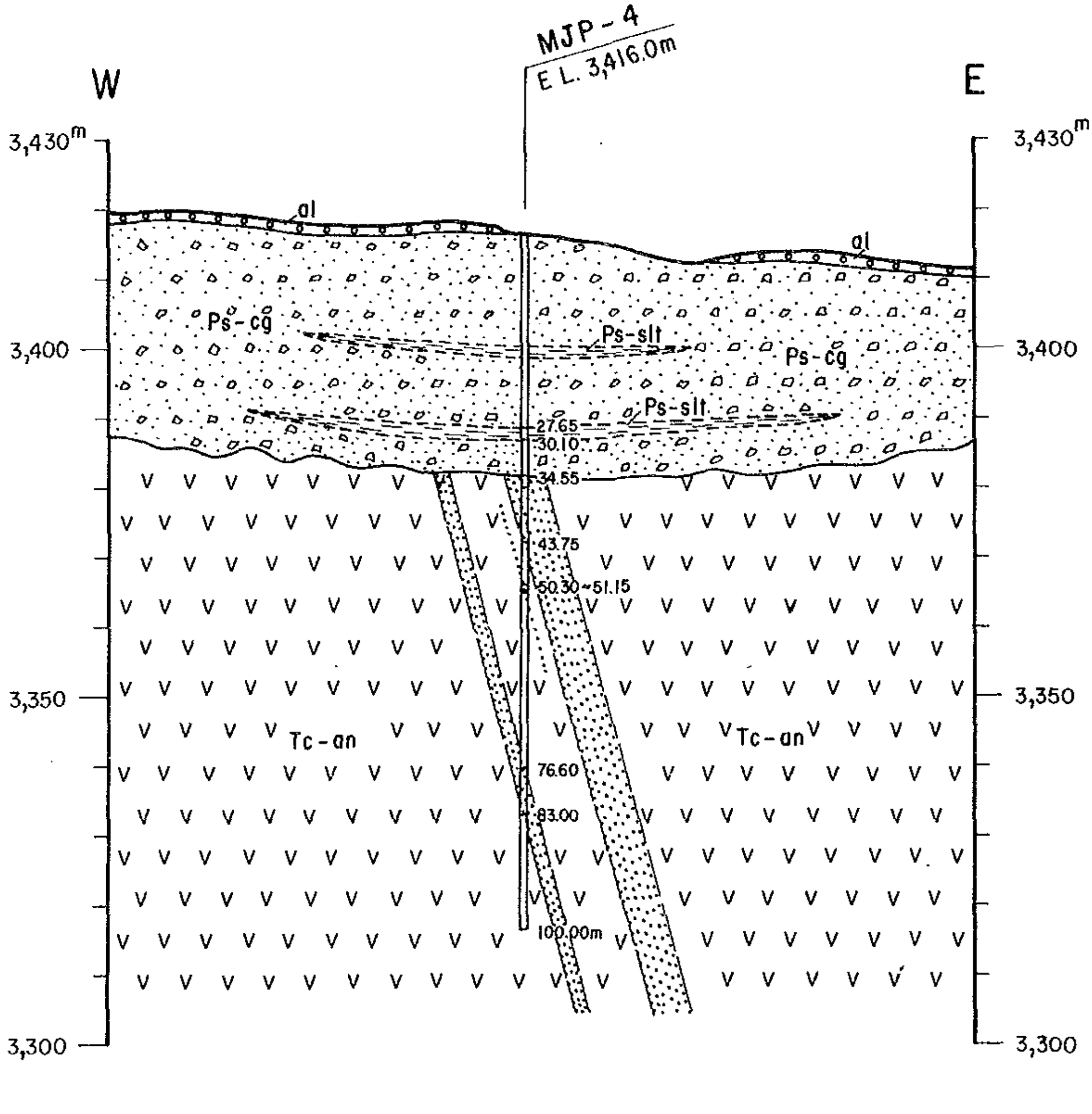


Fig. 4-3 (4) Geological Profile of the Drilling Site (MJP-4)

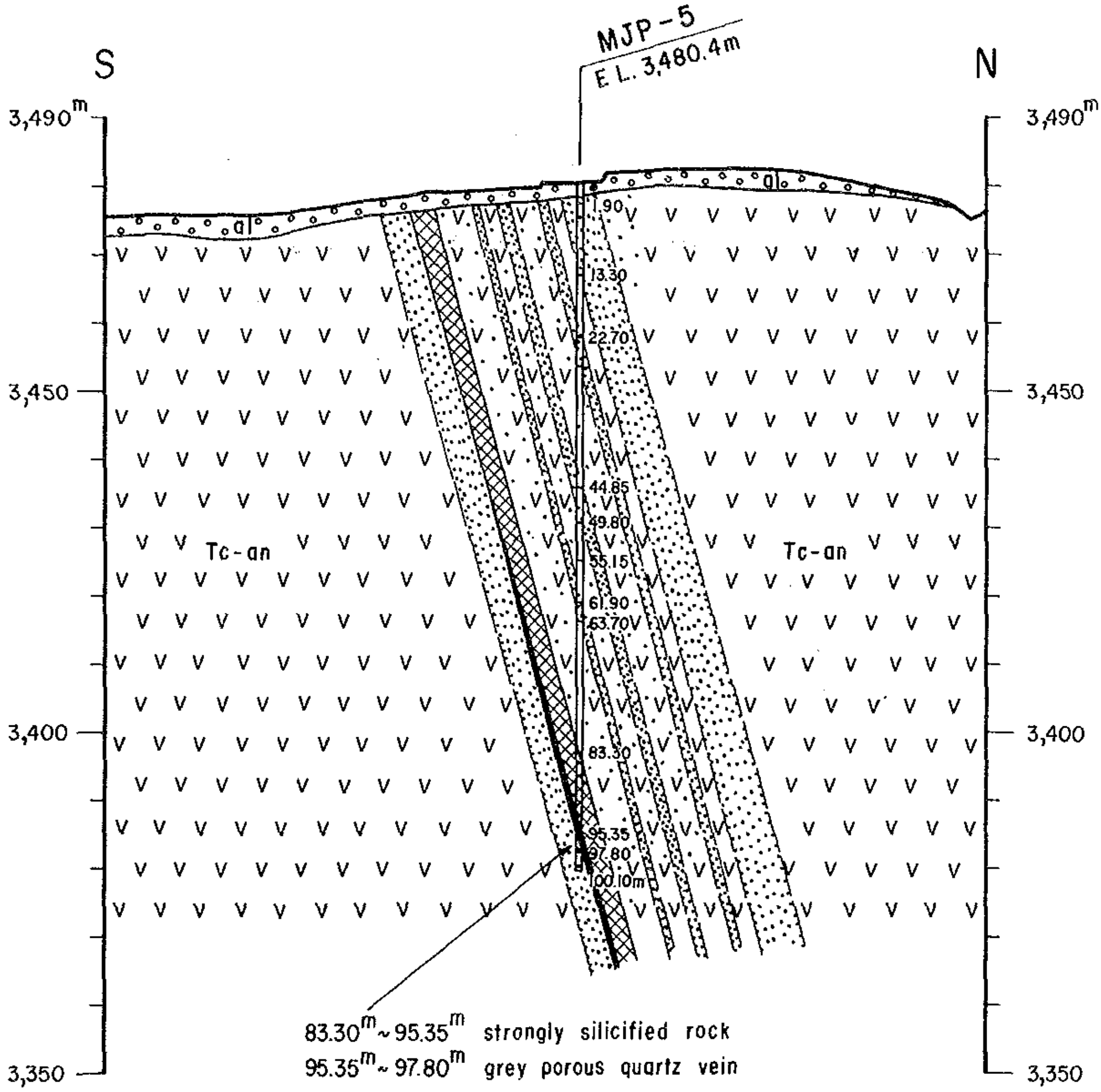


Fig. 4-3 (5) Geological Profile of the Drilling Site (MJP-5)

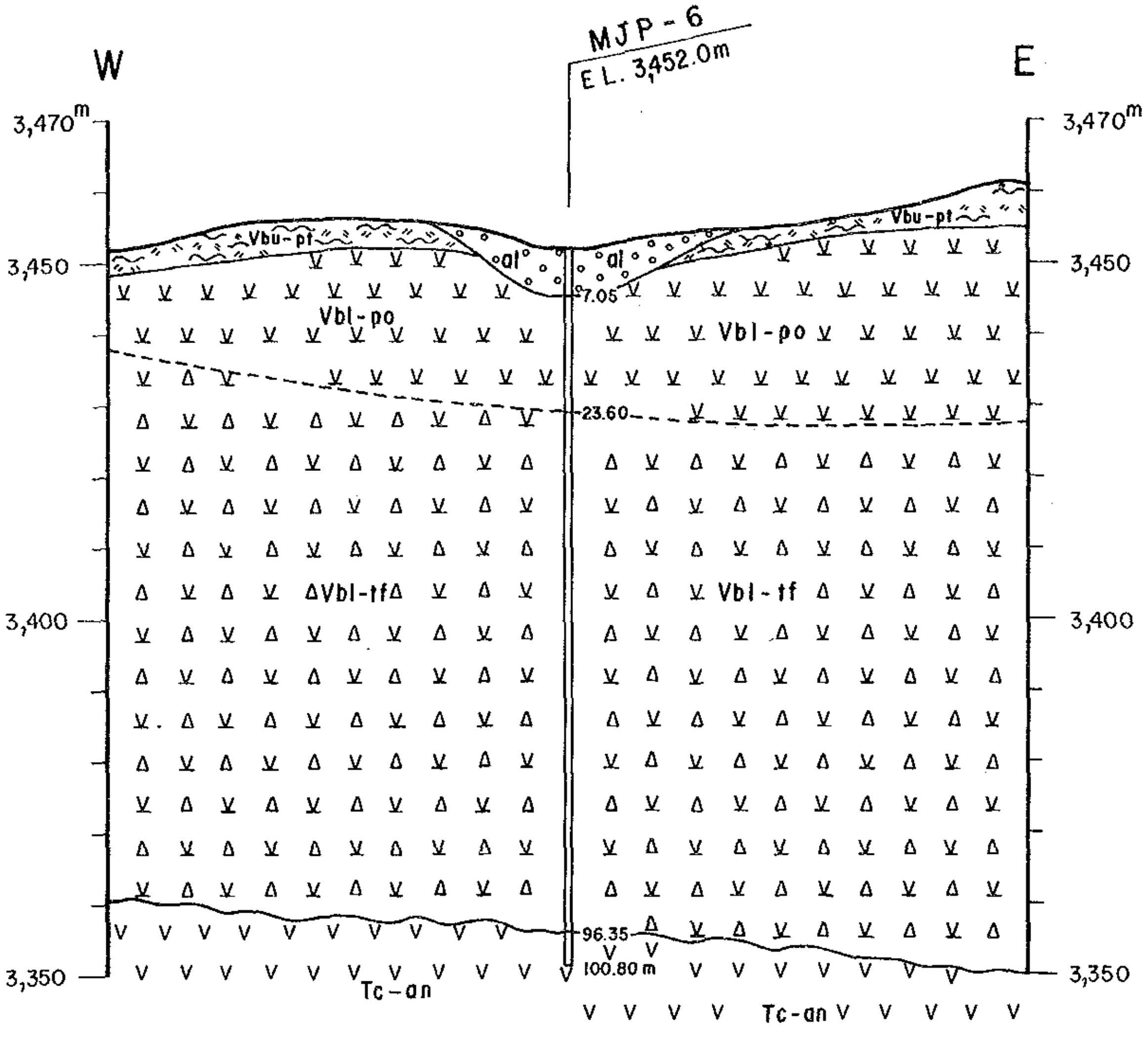


Fig. 4-3 (6) Geological Profile of the Drilling Site (MJP-6)

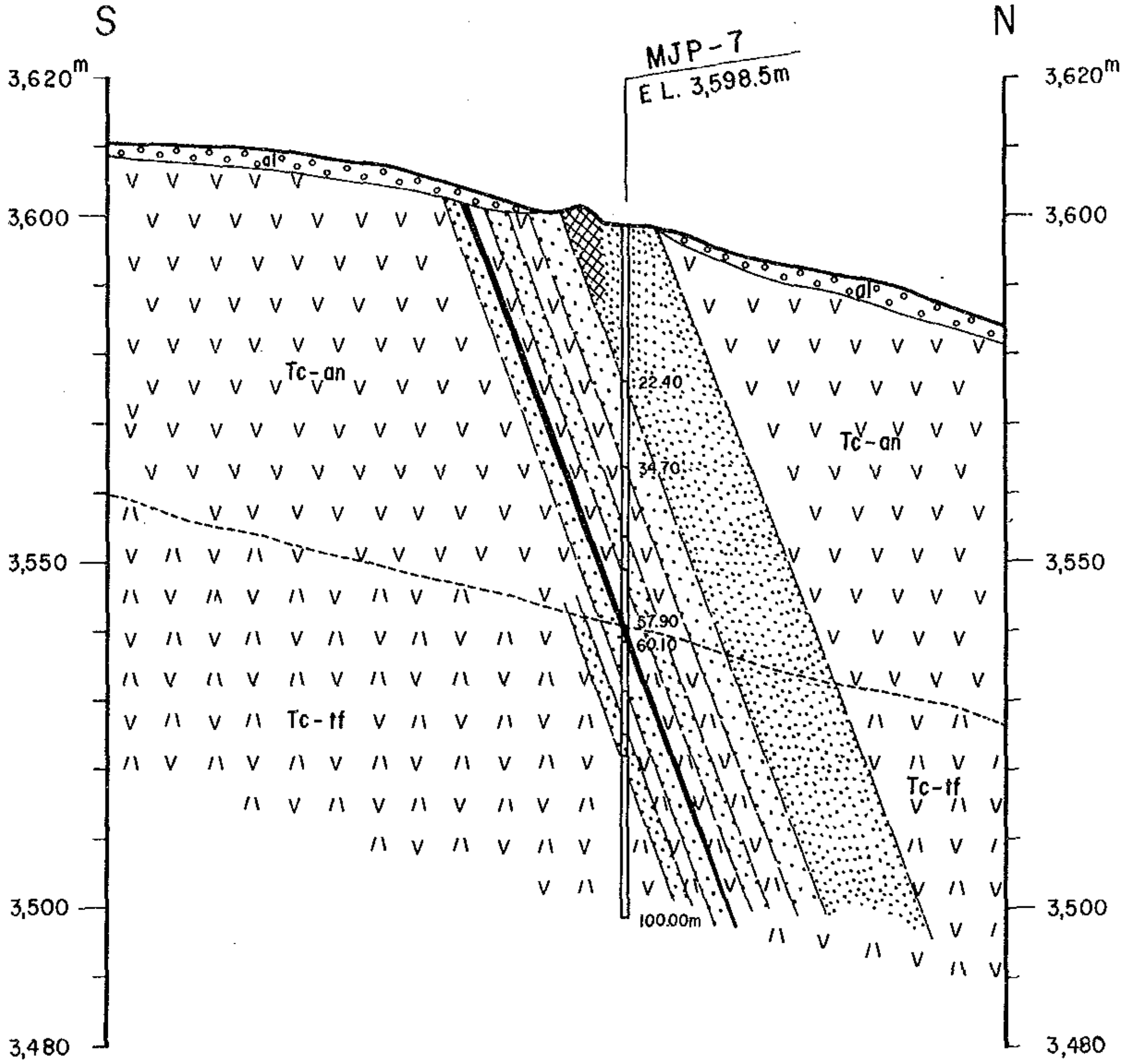


Fig. 4-3 (7) Geological Profile of the Drilling Site (MJP-7)

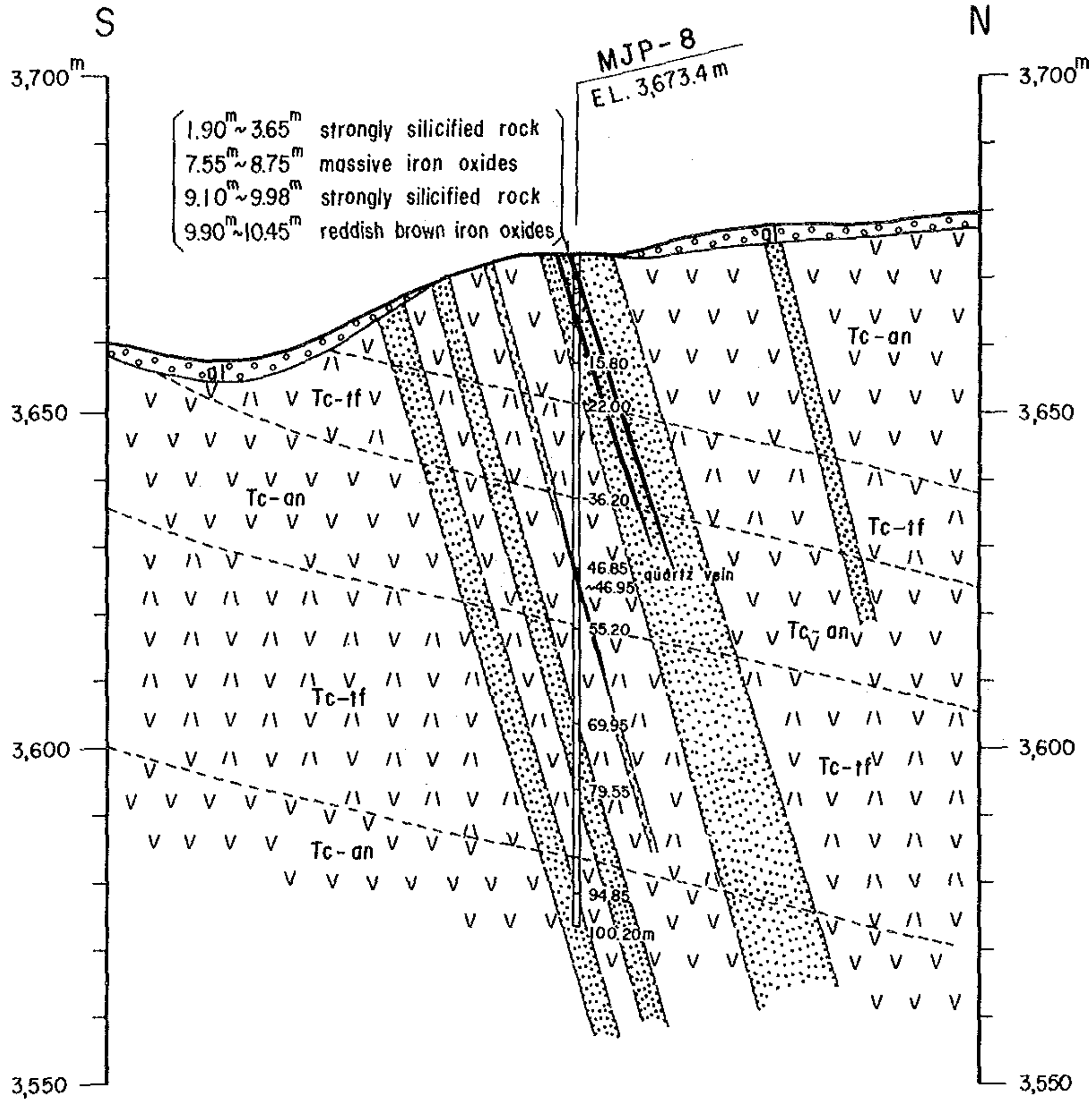


Fig. 4-3 (8) Geological Profile of the Drilling Site (MJP-8)

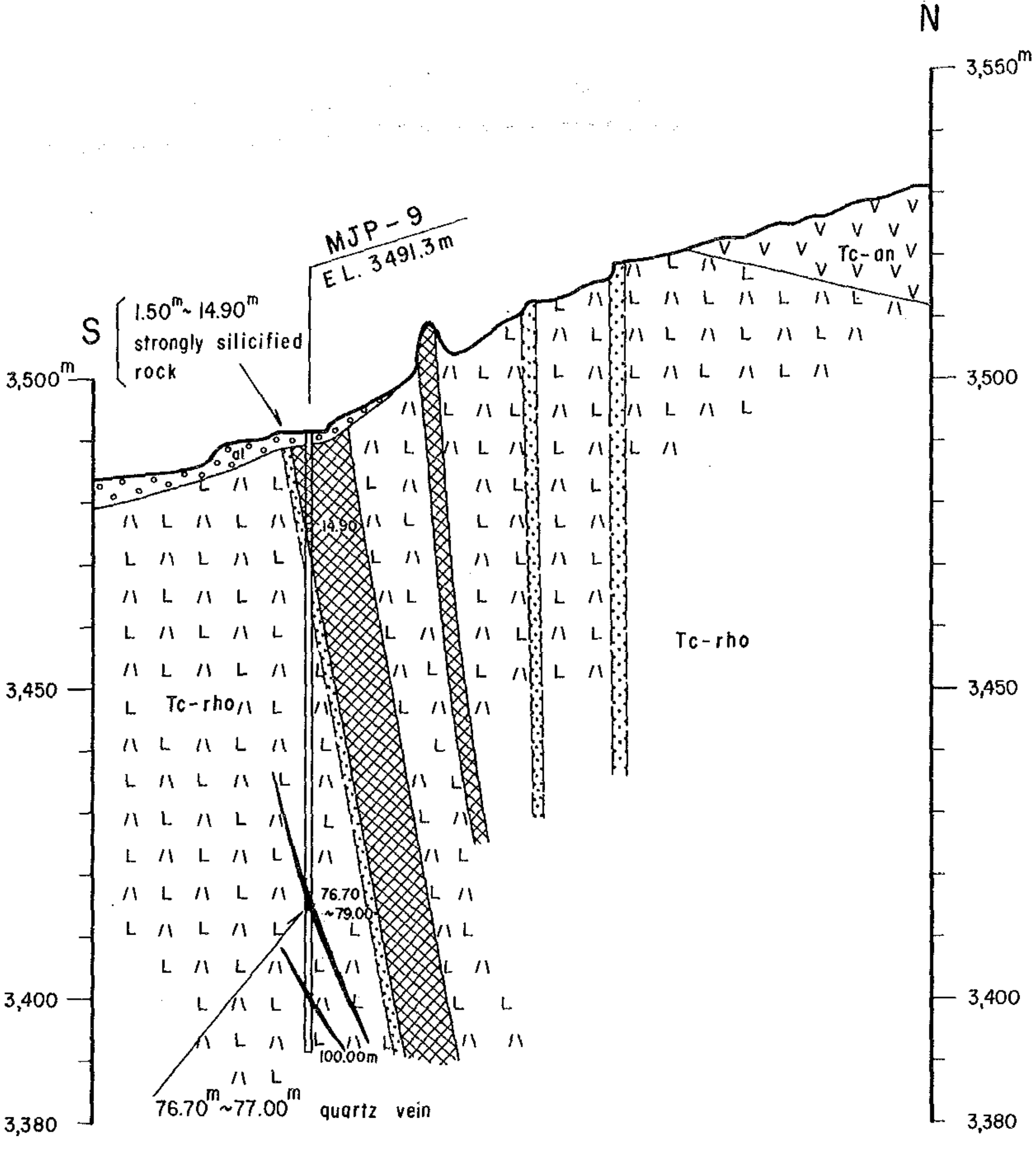


Fig. 4-3 (9) Geological Profile of the Drilling Site (MJP-9)

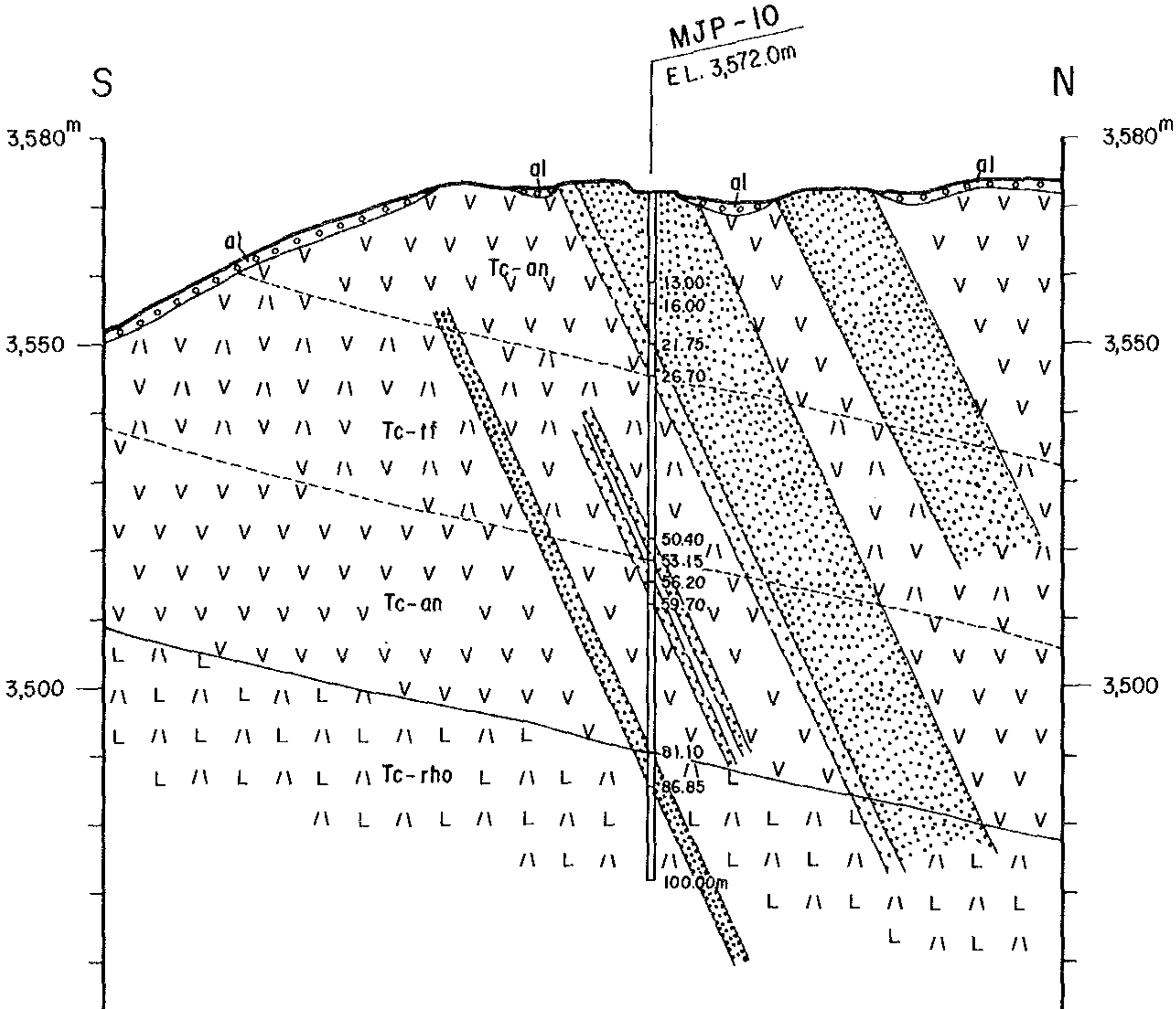


Fig. 4-3(10) Geological Profile of the Drilling Site (MJP-10)

CHAPTER 5 CONCLUSION AND PROPOSAL

CHAPTER 5 CONCLUSION AND PROPOSAL

5-1 Conclusion

In the survey of this year, which is the second year, survey areas were set to the Marcabamba area (80 km^2) and the Pirca area (90 km^2) based on the survey results of the first year, and geological and geochemical surveys were conducted in the both areas and in addition a drilling survey was also conducted in the second area

The survey results for each area are summarized as follows:

(1) Marcabamba Area

Alteration and mineralization zones are observed in the Tacaza Formation of the Tertiary and the underlying formations. Alteration zones can be classified into three types; an alteration zone mainly consisting of silicification, of silicification and argillization and of argillization, and mineralization is somewhat dominant in the first two alteration zones.

Mineralization in the area is mainly classified into several types; mineralization of gold and silver associated with intensive silicification or quartz veinlets in silicified zones, mineralization of gold and silver in fracture zones and joints stained by iron oxide, and disseminated pyrite mineralization in alteration zones of silicification and argillization. The major alteration and mineralization zones in the area are summarized in the table below. The former two types are of major interest in the survey area.

No.	Name	Scale (km)	Wall Rock	Alteration	Mineralization
(1)	Colpar	0.18 × 1.0	Andesitic volcanic rocks (Tc)	Brown to light brown alteration zone stained by iron oxide, Hydrothermal alteration of mainly silicification [Qz + Kf + (Ser), Qz + (Ser) + (Jar)]	Mineralization of gold and silver in the silicified zone of N45°E-70°NW accompanying quartz veinlets. Assay results indicate max. Au: 0.41 g/t, Ag: 39.3 g/t
(2)	Soncota	0.35 × 1.0	Andesitic volcanic breccia (Tc)	Hydrothermal alteration being composed of silicification and argillization [Qz + Kf + (Gyp) + (Mm)]	Mineralization of gold and silver in a silicified zone of pyrite dissemination. Assay results indicate Au 0.07 g/t, Ag 2.8 g/t
(3)	Pomacocha	0.4 × 0.5	Andesitic volcanic breccia (Tc)	Brown alteration zone stained by iron oxide. Hydrothermal alteration being composed of silicification and argillization [Qz + Kao + Mm + (Alu), Qz + Kao + Pyp + (Jar), Qz + Kao + Ser + Mm]	Mineralization of silver in a silicified zone. Assay results indicate Au < 0.07 g/t, Ag 1.9 g/t
(4)	Marcamalata	0.15 × 0.3	Sandstone (Yu)	Brown alteration zone stained by iron oxide. Hydrothermal alteration of mainly silicification [Qz + (Jar)]	Mineralization of silver in silicified rocks. Assay results indicate Au < 0.07 g/t, Ag 86.5 g/t
(5)	Sequello	0.8 × 2.0	Andesite lava (Tc)	Brown alteration zone being accompanied with dissemination of pyrite and contamination of iron oxide. [Qz + (Ser), Qz + (Ser) + (Chl)]	No prominent mineralization is observed

Abbreviation:
Qz: quartz, Kf: patasium feldspar, Ser: sericite, Jar: jarosite, Gyp: gypsum, Mm: montmorillonite,
Alu: alunite, Kao: Kaolinite, Pyp: pyrophyllite, Chl: chlorite, Cri: α-cristobalite, Hal: Halloysite

Among these alteration and mineralization zones, the Colpar mineralization zone is prominent in gold and silver and the Marcamalata zone prominent in silver.

Based on the results of geochemical survey, the major geochemically anomalous areas are summarized in the table below.

No.	Name of geochemically anomalous area	Scale of anomalous area (km)	Anomaly by univariate statistical analysis Au	Ag	As	Cu	Pb	Zn	Anomaly by principle component analysis 1st principle component + Anomaly	1st principle component − Anomaly	2nd principle component + Anomaly	2nd principle component − Anomaly	Relation with alteration zone
1	Colpar A	0.6×0.7	AA	AA	AA	AA	AA	AA	Yes	No	No	No	Colpar alteration zone
2	Colpar B	0.4×0.9	A	A	A	A	A	A	Yes	No	No	(Yes)	Alteration zone is unclear
3	Machancha	0.2×0.8	A	A	A				Yes	No	Yes	No	Contact part between porphyritic andesite stocks and andesitic volcanic breccia Alteration zone is unclear
4	Soncota	0.4×0.9	AA	A					Yes	No	Yes	(Yes)	Soncota alteration zone
5	Marcamalata	0.5×1.1	A	AA	A	A	AA		Yes	No	No	Yes	Marcamalata alteration zone

AA : Anomaly in which three or more samples have a value that is equal to or greater than "M + 3δ"
A : Anomaly in which one or two samples have a value that is equal to or greater than "M + 3δ"

Among these geochemically anomalous zones, the Colpar-A, the Colpar-B and the Marcamalata anomalous zones are prominent. The Colpar-A and the Marcamalata anomalous zones overlap the Colpar and the Marcamalata alteration zones respectively. On the other hand, the Colpar B anomalous zone located to the south of the Colpar alteration zone has no surface expression of mineralization-alteration, but assay results of one soil sample shows Au > 10 g/t and Ag: 72 g/t, indicating a possibility of existance of a concealed mineralization zone.

Considering these results, the Colpar area including Colpar-A and Colpar-B geochemically anomalous zones and the Marcamalata area including the Marcamalata anomalous zones are considered to have potential mineralization.

(2) Pirca Area

Most of alteration zones of the area are distributed in andesitic volcanic rocks of the Tacaza Formation and some exist in the area underlain by rhyolitic tuff.

Alteration zones can be classified into those of mainly composed of silicification, those of composed of silicification and argillization and those of composed of mainly argillization. Among many alteration zones, those having a comparatively large scale are summarized in the following table.

Area	No.	Name	Scale (km)	Wall Rock	Alteration	Mineralization
Eastern Area	1	PE-1	0.3×0.5	Rhyolite type tuff (Tc-rho)	Brown alteration zone composed of dissemination of pyrite and contamination of iron oxide. Hydrothermal alteration composed of silicification and argillization with quartz veinlets (width 0.1 m - 1.0 m) [Qz + Ser + (Kao) + (Alu)]	No prominent mineralization is observed.
	2	PE-2	0.1×0.3	Andesite lava (Tc-an)	Brown alteration zone contaminated by iron oxide. Hydrothermal alteration composed of silicification and argillization [Qz + Alu+ (Mn) + (Ser)]	No prominent mineralization is recognized. Massive iron oxide is observed in MJP-8. Assay results of a sample taken from silicified outcrop indicate Au<0.07 g/t and Ag 4.7 g/t.
	3 { 5	PE-3 PE-4 PE-5	0.6×1.4 0.4×1.4 0.5×1.5	Andesite lava (Tc-an) and andesitic volcanic breccia (Tc-tf)	Brown to yellow-brown alteration zone contaminated by iron oxide, partially accompanying white argillization zone and strongly silicified zone. Hydrothermal alteration composed of silicification and argillization. Silicified part: [Qz, Qz + Kao, Qz + Cri + Kao] Argillization part: [Qz + Alu, Qz + Alu + Jar]	No prominent mineralization is recognized. PE-4; silicified rock --- Au<0.07 g/t, Ag 6.8 g/t PE-5; argillizated rock --- Au<0.07 g/t, Ag 12.0 g/t PE-5; silicified rock --- Au<0.07 g/t, Ag 4.7 g/t
	6 } 7	PE-6 PE-7	0.1×0.6 0.1×0.8	Andesite lava (Tc-an)	Brown to yellow-brown alteration zone contaminated by iron oxide. Hydrothermal alteration composed of mainly argillization. Silicified part: [Qz + Mn + (Kao), Qz + (Mn) + (Ser)] Argillization part: [Qz + Kao + Pyp]	No prominent mineralization is observed. PE-6; argillizated rock --- Au<0.07 g/t, Ag 2.5 g/t PE-7; silicified rock --- Au<0.07 g/t, Ag 8.0 g/t

continued

Area	No.	Name	Scale (km)	Wall Rock	Alteration	Mineralization
Western Area	8	PW-1	0.3×1.5	Andesite lava (Tc-an)	Grey to light grey alteration zone with strong silicification being accompanied with quartz veinlets and dissemination of pyrite. Hydrothermal alteration composed of mainly silicification. [Qz, partly Qz + (Cri) + (Alu)]	Mineralization of gold and silver occurs locally. Veinlets in silicified rocks --- Au 6.65 g/t, Ag 10.0 g/t Other silicified parts are in low grade.
	9	PW-2	0.3×2.5	Andesite lava (Tc-an), partly including andesitic volcanic breccia (Tc-tf)	Brown to light brown alteration zone contaminated by iron oxide. Hydrothermal alteration composed of silicification and argillization. [Qz + Cri + Alu, Kf + (Hal) + (Mn) + (Alu)]	No prominent mineralization is observed.
	10	PW-3	0.15×0.5	Andesite lava (Tc-an)	Light brown to greyish white alteration zone accompanying strongly silicified part. Hydrothermal alteration composed of silicification and argillization. [Qz, Qz + (Hal)]	No prominent mineralization is recognized. A local sample taken from silicified zone --- Au 0.89 g/t, Ag 7.0 g/t

Abbreviation: See table in clause 5-1 (1)

Among these alteration zones, a sample of a quartz-vein network in strongly silicified part in the PW-1 alteration zone in the Pirca Western Area has the highest analytical values of Au 6.65 g/t and Ag 10.0 g/t. However, all other samples taken from silicified outcrops of the same zone are in low grade, and for this reason, mineralization in the whole of the PW-1 alteration zone may be insignificant. Mineralization observed in other alteration zones is poor in all cases.

Results of the geochemical survey show that the geochemical anomalies in this area are small in scale and low in intensity compared with those in the Marcabamba area. Comparatively large-scaled geochemical anomalies in this area are summarized in the following table.

Area	No.	Name of geochemically anomalous area	Scale of anomalous area (km)	Anomaly by univariate statistical analysis						Anomaly by principle component analysis				Relation with alteration zone
				Au	Ag	As	Cu	Pb	Zn	1st principle component + Anomaly	1st principle component - Anomaly	2nd principle component + Anomaly	2nd principle component - Anomaly	
Eastern Area	1	PE-F	0.2 × 0.5	BB	A		B	B		Yes	No	No	No	Partly PE-3 alteration zone
	2	PE-G	0.25×0.3	A	A		A			Yes	No	Yes	No	None
	3	PE-H	0.5 × 0.7	B		AA				Yes	No	No	No	Weakly argillized alteration zone
	4	PE-J	0.2 × 0.75	A						Yes	No	No	No	Partly PE-3 alteration zone
	5	PE-O	0.3 × 0.4	A	A					Yes	No	Yes	No	None
	6	PE-Q	0.1 × 0.3	BB	A					No	No	No	No	None
	7	PE-R	0.25 0.8	A		AA				Yes	No	No	No	PE-2 alteration zone
	8	PE-S	0.1 × 0.75			BB				No	No	No	(Yes)	PE-1 alteration zone
	9	PE-T	0.15×0.3	B		A	BB			Yes	No	No	No	PE-1 alteration zone
	10	PE-V	0.15 0.3			B		A		Yes	No	No	No	PE-4 alteration zone
	11	PE-W	0.2 × 0.55			BB		A	A	No	No	No	(Yes)	PE-5 alteration zone
	12	PE-X	0.3 × 0.7			BB				Yes	No	No	(Yes)	PE-5 alteration zone
Western Area	13	PW-B	0.2 × 0.25	A			B			Yes	No	No	No	Small scale argillized alteration zone
	14	PW-D	0.25×0.25	B			B	A		Yes	No	No	No	None
	15	PW-F	0.25×0.6		A		B			Yes	No	Yes	No	Small scale argillized alteration zone
	16	PW-H	0.2 × 0.2	A			A			Yes	No	Yes	No	None

* AA: Anomaly in which three or more samples have a value that is equal to or greater than "M + 3δ"
A: Anomaly in which one or two samples have a value that is equal to or greater than "M + 3δ"
BB: Anomaly in which two or more samples have a value that is smaller than "M + 3δ" and that is equal to or greater than "M + 2δ"
B: Anomaly in which one or more samples have a value that is smaller than "M + 3δ" and that is equal to or greater than "M + 2δ"
( ): One sample only

In the Pirca Eastern Area, the places where an alteration zone and geochemically anomalous zone overlap prominently are the PE-1 alteration zone overlapping PE-S and PE-T anomalous zones, and PE-2 alteration zone overlapping PE-R anomalous zone. Also, PE-W and PE-X anomalous zones overlap with the PE-5 alteration zone in its southeastern part.

In the Pirca Western Area, sizes of geochemical anomalies are limited in comparison with those of alteration zones, besides, there is no geochemical anomaly which overlap alteration zones prominently.

As the result of drilling survey in the Pirca Eastern Area, the Pirca Sediment (Ps), which had not been recognized in the past, and its stratigraphy were confirmed in MJP-1 to MJP-4 holes. In these four holes, alteration zones and quartz veins in the lower part of the Pirca Sediment (Ps) were confirmed in MJP-3 and MJP-4. In MJP-5, a quartz vein having a core length of 2.45 m was interseeted in the lower part of the hole. In MJP-6, rock facies and thickness of the Lower Barroso Formation were confirmed. In four holes of MJP-7 to MJP-10, prominent alteration of mainly argillization was recognized in each of them, and in addition, alteration zones having strong silicification zones and quartz veins were recognized in MJP-8 and MJP-9.

The results of chemical analysis on the drill core samples of the alteration zones seen indicate that they are low in grade, for the sizes of these alteration zones. The parts where mineralization are recognized, though very weak, are mainly alteration zones of quartz veinlets, of strongly silicified rocks, of concentrated zones by iron oxide and of disseminated zone of pyrite. These are summarized in the following table.

Drilling No.	Sample No.	Depth (m) ~ (m)	Alteration	Au g/t	Ag g/t	As %	Cu %	Pb %	Zn %
MJP-3	P3M-1	84.50 ~ 85.65	Argillized andesite accompanying dissemination of pyrite	<0.07	0.5	0.025	0.04	<0.01	<0.01
MJP-4	P4M-2	55.80 ~ 56.10	Quartz-goethite veins	<0.07	1.9	0.028	0.05	<0.01	<0.01
MJP-8	P8M-1	1.90 ~ 2.55	Strongly silicified rocks	0.17	<0.3	0.008	<0.01	<0.01	<0.01
	P8M-3	7.55 ~ 8.75	Massive reddish brown iron oxide	<0.07	1.7	0.021	0.01	<0.01	<0.01
	P8M-5	46.85 ~ 46.95	Quartz veins	<0.07	1.0	0.012	<0.01	<0.01	<0.01
MJP-9	P9M-4	74.65 ~ 76.00	Strongly silicified rocks	<0.07	1.0	0.006	0.01	0.01	0.06
	P9M-5	76.70 ~ 77.00	Greyish quartz veins	<0.07	2.8	0.006	0.02	0.01	0.07
	P9M-6	88.80 ~ 89.00	Rhyolitic tuff accompanying quartz veinlets	<0.07	1.0	0.008	<0.01	0.01	0.08

Taking all these survey results into consideration, possibility of existence of high potential mineralization are considered to be low in the Pirca Area.

5-2 Proposal

Based on the survey results of the second year, the Corpar area and the Marcamalata area which are in the northeastern part and in the southeastern part of the Marcabamba Area respectively are selected as potentially mineralized areas. In the Pirca Area, no prominent mineralization was recognized and it is considered that there is a little chance of having a potentially mineralized area.

The survey methods to be adopted in the third and later years in the Colpar and Marcamalata areas are as follows.

Survey Methods	Contents
Geological survey	Clarification of the situation of mineralization/ alteration zones by detailed geological survey
Trench survey	Clarification of the sizes and modes of occurrences of mineralized zones by very detailed geological mapping and judgement of characteristics of mineralization by tracing mineralized outcrops
Drilling survey	Clarification of mineralization in the depth

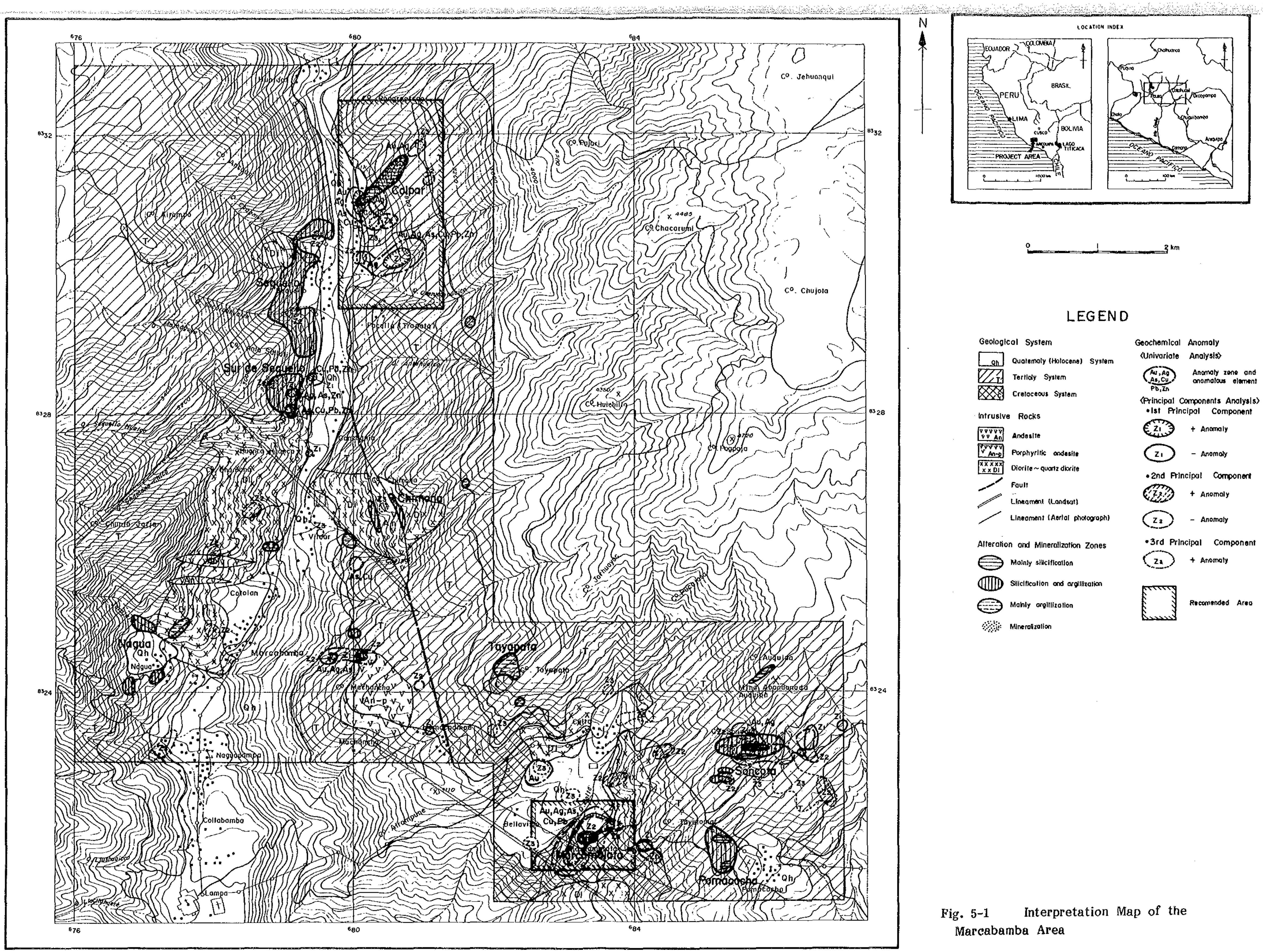
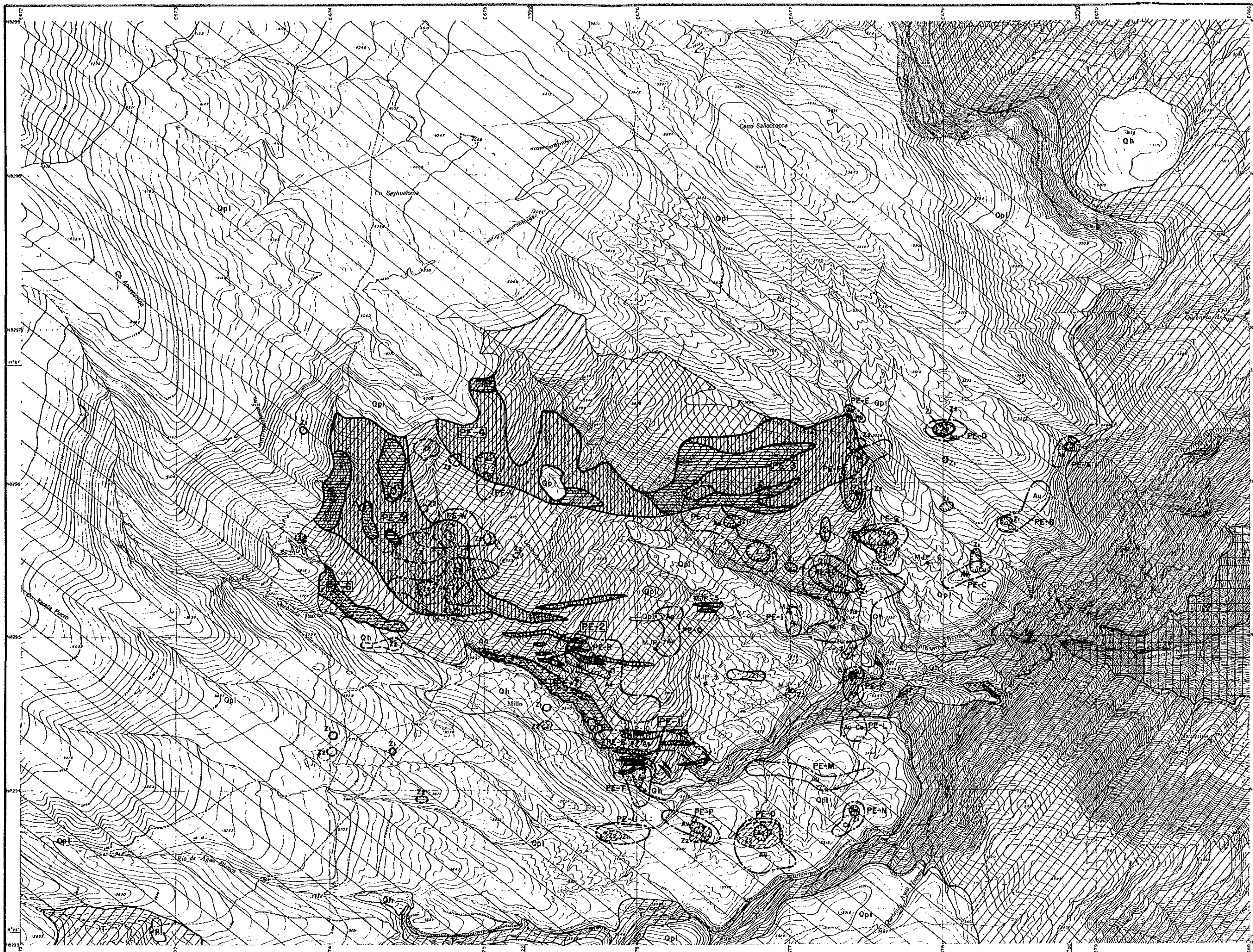
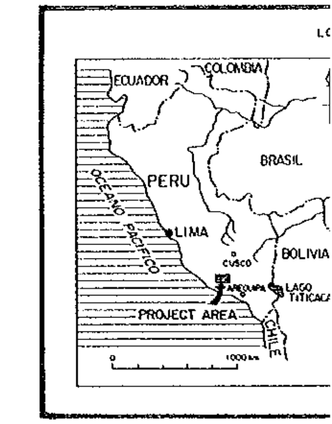


Fig. 5-1 Interpretation Map of the Marcabamba Area





N

LE

Geological System

Qh Quaternary (Holocene)

Qpl Quaternary (Pleistocen

T Tertiary System

J Jurassic System

Intrusive Rock

An Hornblende andesite

Fault

Alteration and Mineralization

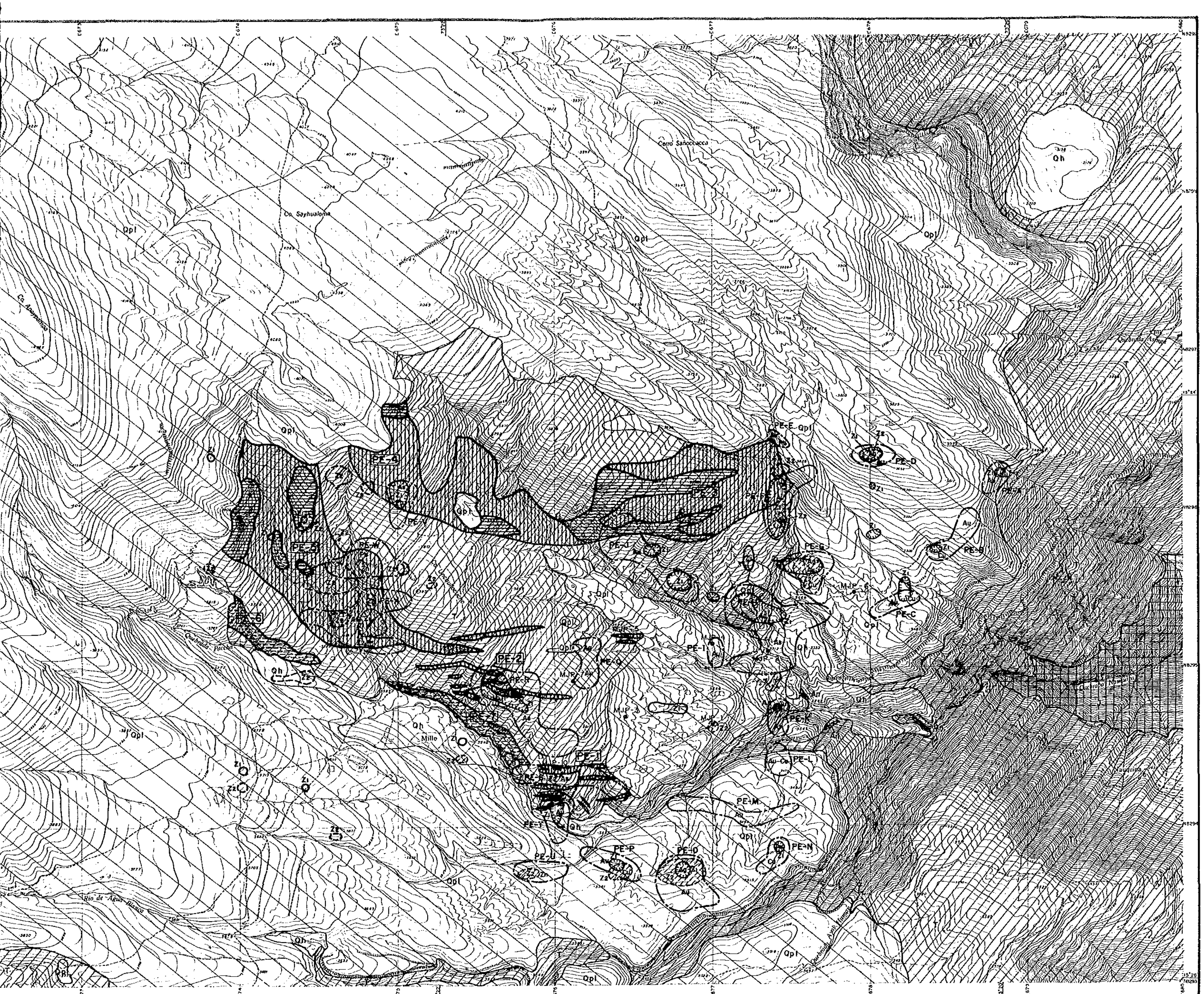
Mainly silicification

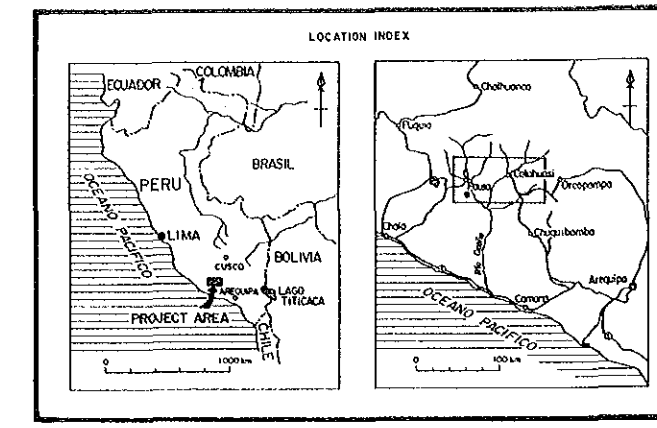
Silicification and argi

Mainly argillization

Mineralization

Fig. 5-2 Interpre
Eastern Area





N

0 0.5 1 km

LEGEND

Geological System

- Qh — Quaternary (Holocene) System
- Qpl — Quaternary (Pleistocene) System
- Tertiary System
- J — Jurassic System

Intrusive Rock

- An — Hornblende andesite

Fault

Alteration and Mineralization Zones

- Mainly silicification
- Silicification and argillization
- Mainly argillization
- Mineralization

Geochemical Anomaly

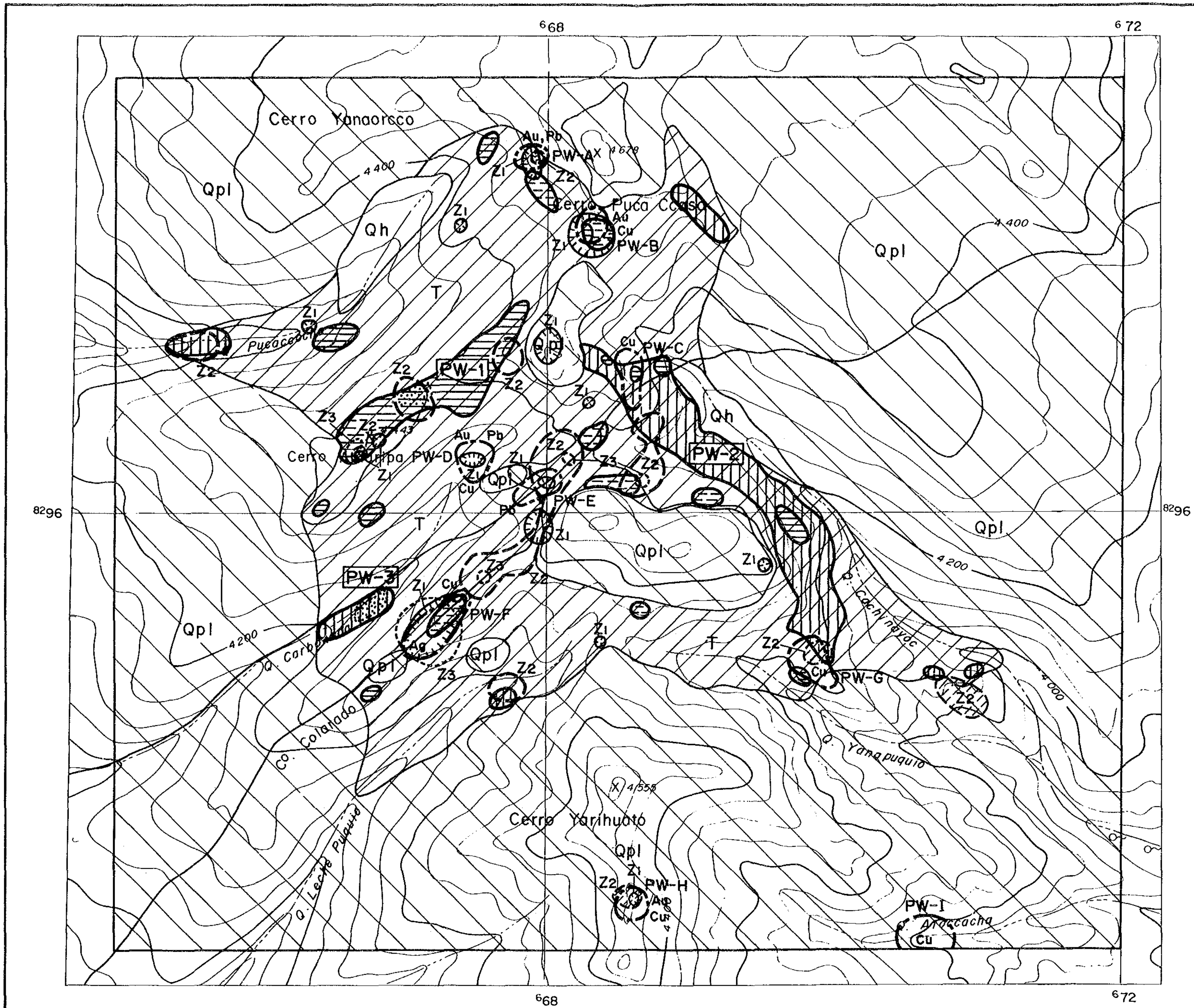
<Univariate Analysis>

- Au, Ag, As / Cu, Pb, Zn — Anomaly zone and anomalous elements

<Principal Components Analysis>

- 1st Principal Component
  - Z1 + Anomaly
  - Z1 − Anomaly
- 2nd Principal Component
  - Z2 + Anomaly
  - Z2 − Anomaly

Fig. 5-2 Interpretation Map of the Pirca Eastern Area



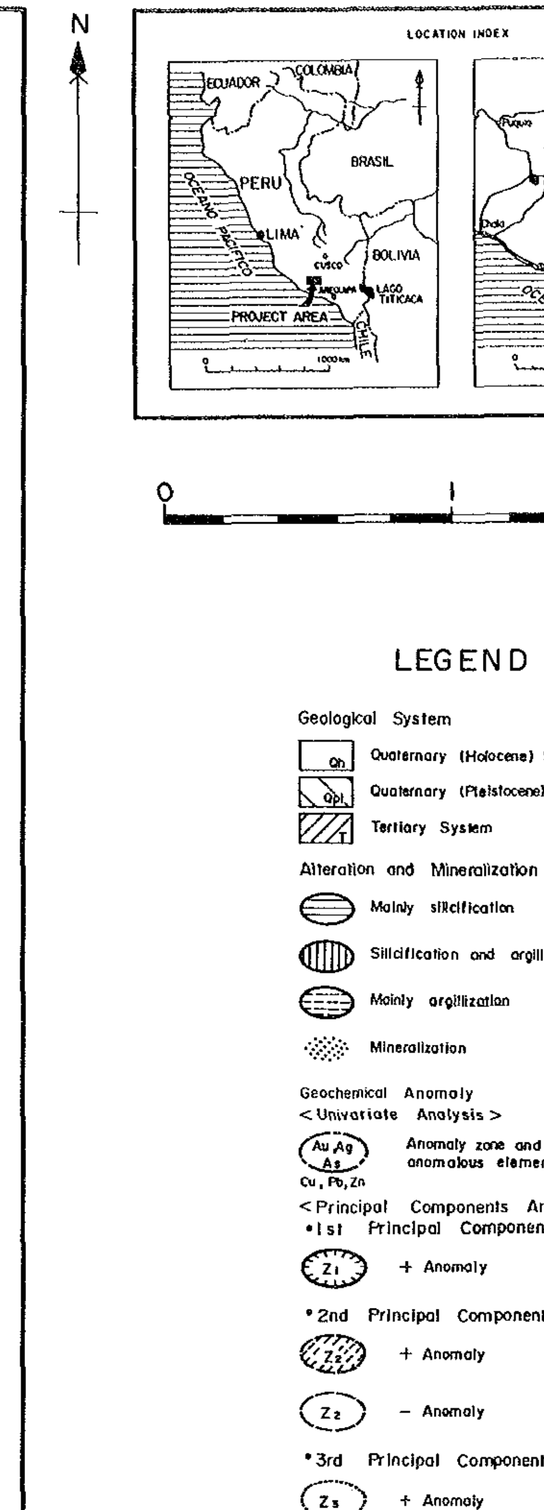
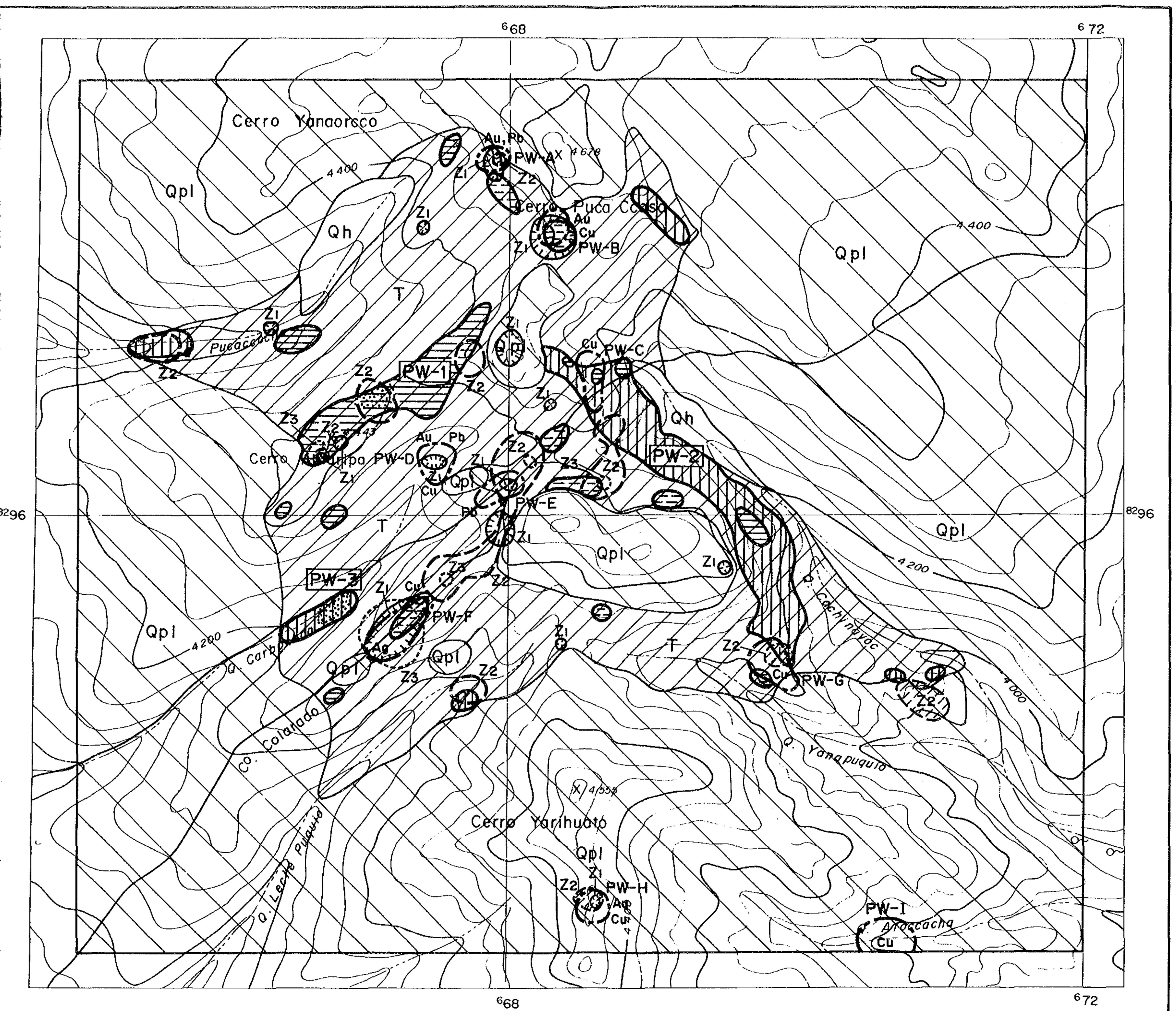


Fig. 5-3 Interpretation Map
Western Area



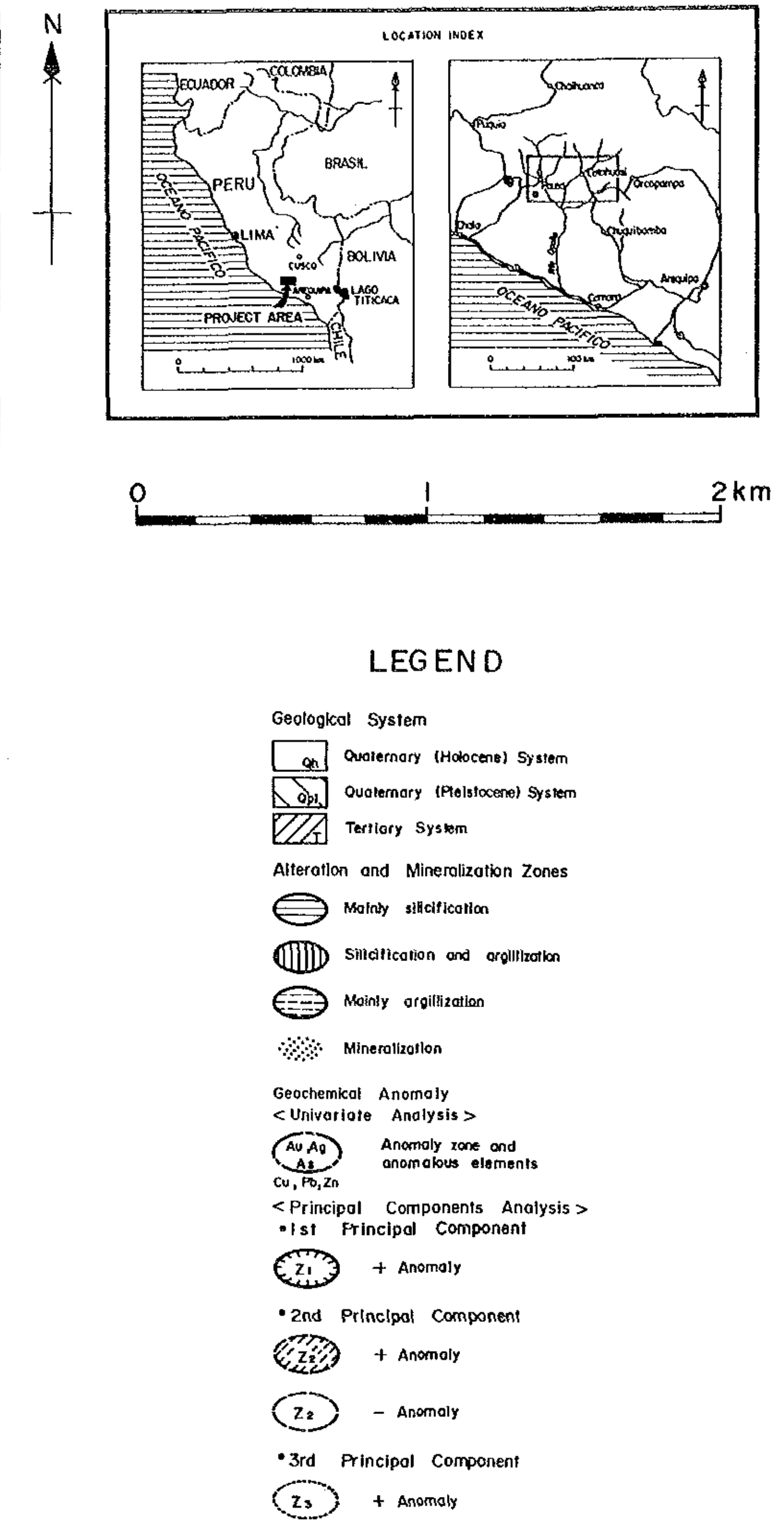


Fig. 5-3 Interpretation Map of the Pirca Western Area

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APPENDICES

Apx. 1 Microscopic Observations of Rock Thin Sections

Abbreviations

Mineral

pl	:	plagioclase
ol	:	olivine
hy	:	hyperthene
ag	:	augite
hb	:	hornblende
qz	:	quartz
or	:	orthoclase
bi	:	biotite
oq	:	opaque
gl	:	glass
ch	:	chlorite
se	:	sericite
ze	:	zeolite
ca	:	calcite
ep	:	epidote
ab	:	albite
hm	:	hematite
lim	:	limonite
mon	:	montmorillonite

Others

dc	:	dacite
tf	:	tuff
rho	:	rhyolite
f·fr	:	fine fragment

Apx. 1 Microscopic Observations of Rock Thin Sections

(Igneous rocks)

No.	Sample No.	Co-ordinates E (km)	Co-ordinates N (km)	Rock name	Geol. unit	Texture	Phenocryst pl	ol	hy	ag	hb	qz	or	bi	oq	Groundmass pl	hy	ag	bi	ol	qz	gl	hb	oq	Secondary mineral ch	se	ze	ca	ep	ab	qz	hm	lim	Remarks	Area
1	Mn-1	667.9	8324.7	qz-diorite	Di	holocrystalline	◎				○					◎					○				○	○									Marcabamba
2	Mn-4	679.9	8323.9	qz-hb-andesite	An-p	porphyritic hyalopilitic	◎		●		○	○				○						◎		●	○			○							Marcabamba
3	Mn-15	681.8	8328.0	rhyolite	Al	porphyritic	◎					○		○	●	○			●			◎									●			weak silicification	Marcabamba
4	MN-2	679.2	8328.2	altered andesite	Tc	porphyritic	◎									○						◎			◎									propylitization	Marcabamba
5	PK-13	676.0	8295.7	altered andesite	Tc-an	porphyritic	◎									○						◎			◎				○	○				propylitization	Pirca (East)
6	Pm-1	673.8	8293.9	ol-basalt	Vbl-an	porphyritic	◎	●	○	○			○		●	◎	○	○		●		○		●											Pirca (East)
7	Pm-22	675.4	8294.9	altered andesite	Tc-an	porphyritic	◎									○						◎			○				○	○				propylitization	Pirca (East)
8	PN-1	677.4	8294.5	hb-ol-bsalt	Vbl-an	porphyritic hyalopilitic	◎	●	●	○	●				●	◎	●	●		●		○													Pirca (East)
9	PN-12	677.8	8296.4	hb-andesite	Vbl-po	porphyritic	◎			●	○					○		●				◎	●	●											Pirca (East)
10	PV-10	674.6	8295.7	silicified-he-rock	Tc-an	porphyritic	○																			○					○	○		silicification	Pirca (East)
11	PN-25	667.6	8295.1	hb-px-andesite	Vbl-an	glomeroporphyritic	◎			○	●				●	○		○				◎	●												Pirca (West)
12	PN-33	668.5	8294.1	basaltic andesite	Vbl-tf	porphyritic hyalopilitic	◎		●	○						○	●	●				◎			○								●		Pirca (West)
13	PIOT-1	676.01	8294.35	altered andesite	Tc-an	porphyritic hyalopilitic	◎		○	○						○						◎			○			○						MJP-10 depth 67.35m～67.40m	Drilling

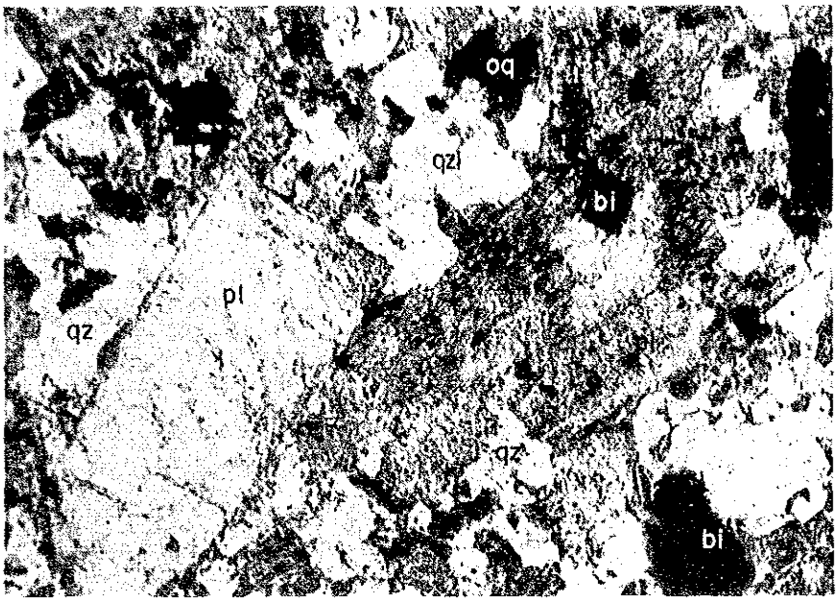
(Pyroclastic rocks)

No.	Sample No.	Co-ordinates E (km)	Co-ordinates N (km)	Rock name	Geol. unit	Texture	Crystal fragment pl	qz	ag	bi	Matrix qz	pl	hb	gl	bi	f·fr	Rock fragment dc	tf	rho	gl	Secondary mineral ch	mon	ze	ca	ep	ab	se	qz	hm	lim	Remarks	Area
14	MR-16	684.0	8323.8	rhyolitic lapilli-tuff	Al						○	○	○	○		○	○		○												weak silicification	Marcabamba
15	PK-1	676.0	8293.9	dacitic tuff	Vbu-wt	poryhyritic flow structure	◎	○		●	●	●		◎	●																	Pirca (East)
16	PK-31	675.0	8296.7	sandy tuff	Vbu-pt	volcanic sediment								○				○	○	○								○	○		weak silicification	Pirca (East)
17	PV-12	674.6	8296.4	altered sandy tuff	Tc-tf																	○		○					○		strong argillization	Pirca (East)
18	PV-15	675.2	8295.5	rhyolitic tuff	Tc-rho						○	○		○		○		○	○										○		weak silicification	Pirca (East)
19	Pm-32	669.8	8295.3	rhyolitic tuff	Tc-tf		●		●			○		◎								○	●						○	○		Pirca (West)
20	P7T-1	676.15	8294.90	altered andesitic lapilli tuff	Tc-tf		●					●		◎								○			◎	●		●	○	○	MJP-7 depth 99.35m～99.45m	Drilling
21	P9T-1	675.99	8294.13	rhyolitic tuff	Tc-rho	mortar	●	○			●	●		●					○							●	○	◎			MJP-9 depth 78.40m～78.50m	Drilling

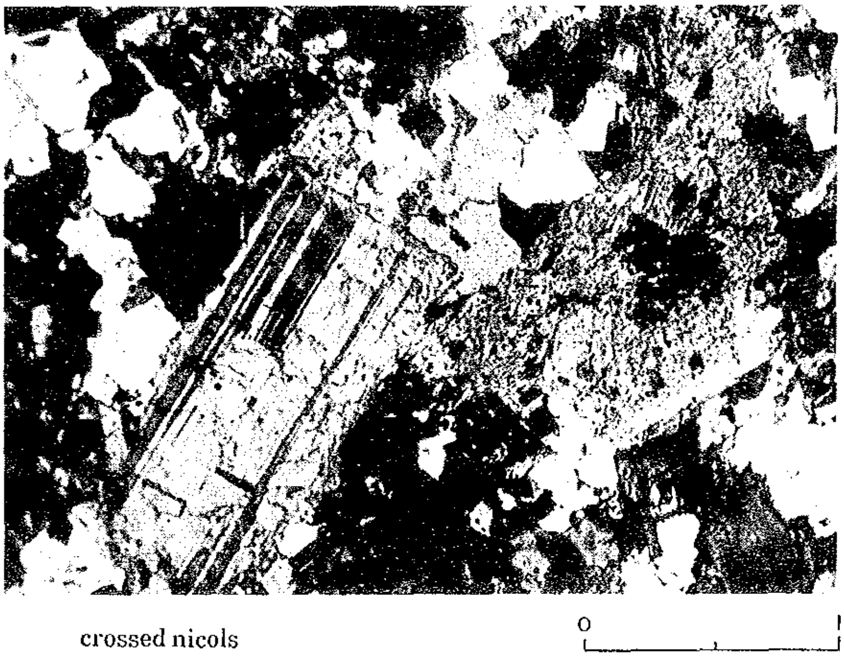
Apx. 2 Photomicrographs of rock thin Sections

Abbreviations

pl	:	plagioclase	gl	:	glass
ol	:	olivine	ch	:	chlorite
ag	:	augite	ep	:	epidote
hb	:	hornblende	ab	:	albite
qz	:	quartz	hm	:	hematite
bi	:	biotite	lim	:	limonite

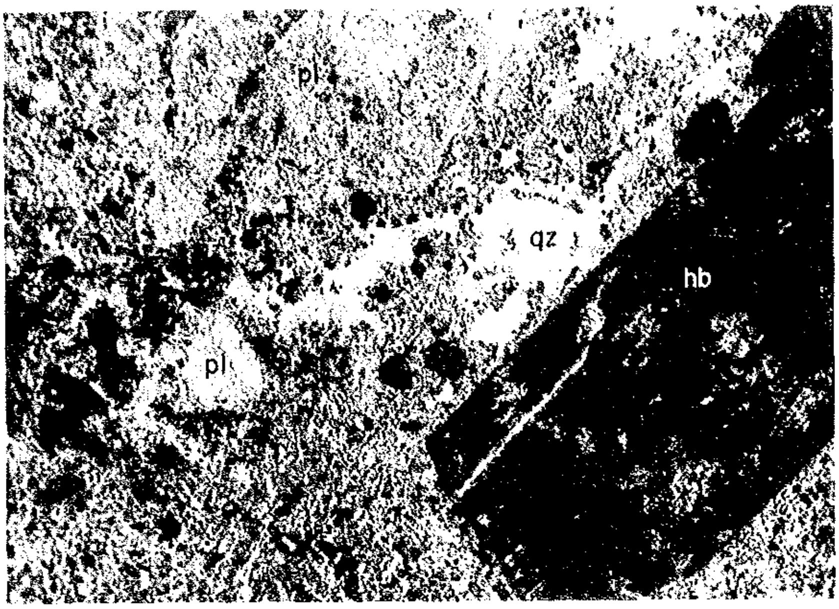


open nicol



crossed nicols

(1) Sample No.: Mm-1 (Di)
Location: X=667.9 Y=8324.7
Rock name: Quartz diorite
Texture: Holocrystalline
Remarks: pl>qz>hb≫bi≧oq



open nicol

crossed nicols

0 1 mm

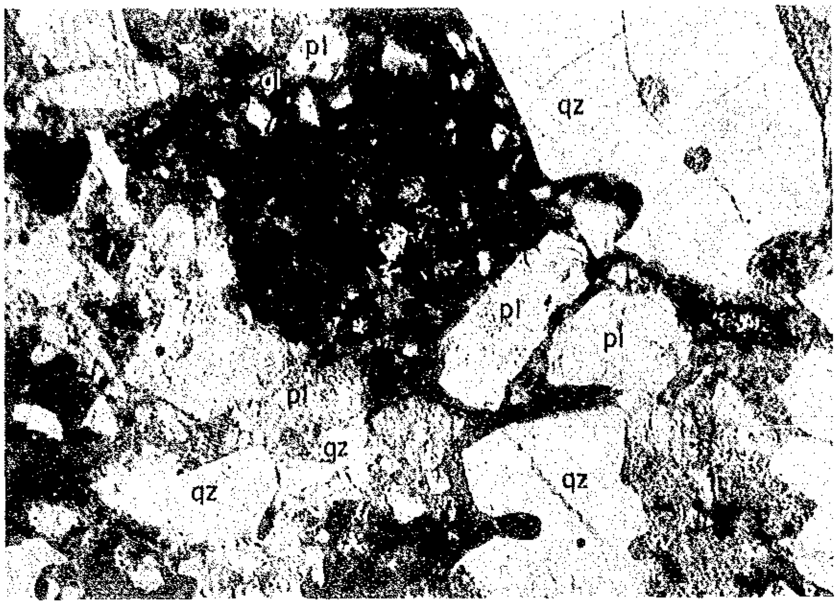
(2) Sample No.: Mm-4 (An-p)

Location: X = 679.9 Y = 8323.9

Rock name: Hornblende andesite

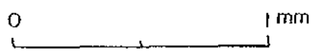
Texture: Porphyritic, hyalopilitic
phenocryst ... pl > hb > qz > oq ≫ hy
groundmass ... gl > pl > oq

Remarks: hb → opacite



open nicol

crossed nicols



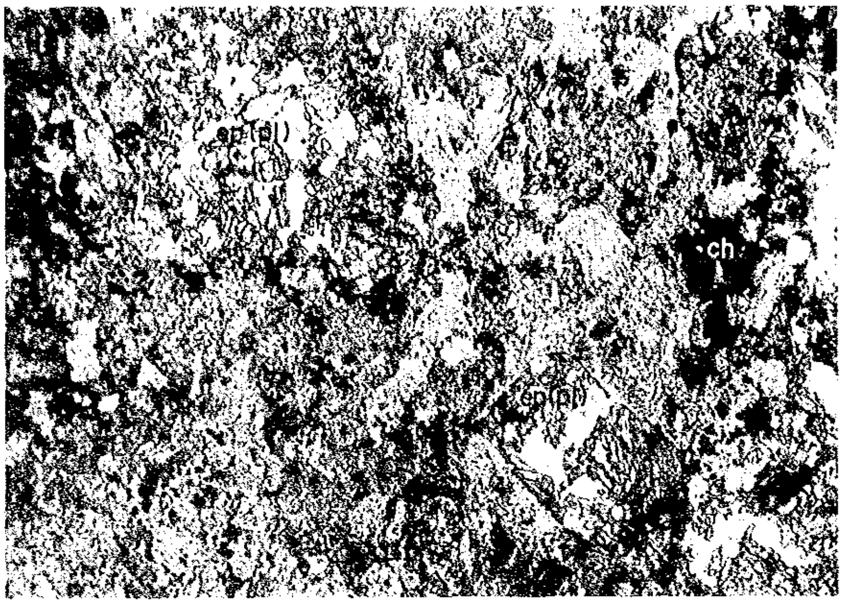
(3) Sample No.: Mm-15 (Al)

Location: X=681.8 Y=8328.0

Rock name: Rhyolite

Texture: Porphyritic
phenocryst ... pl>qz>bi>oq
(fragmental)
groundmass ... gl≫pl>qx>bi

Remarks: gl → ch, weak silicification



open nicol

crossed nicols

0 1 mm

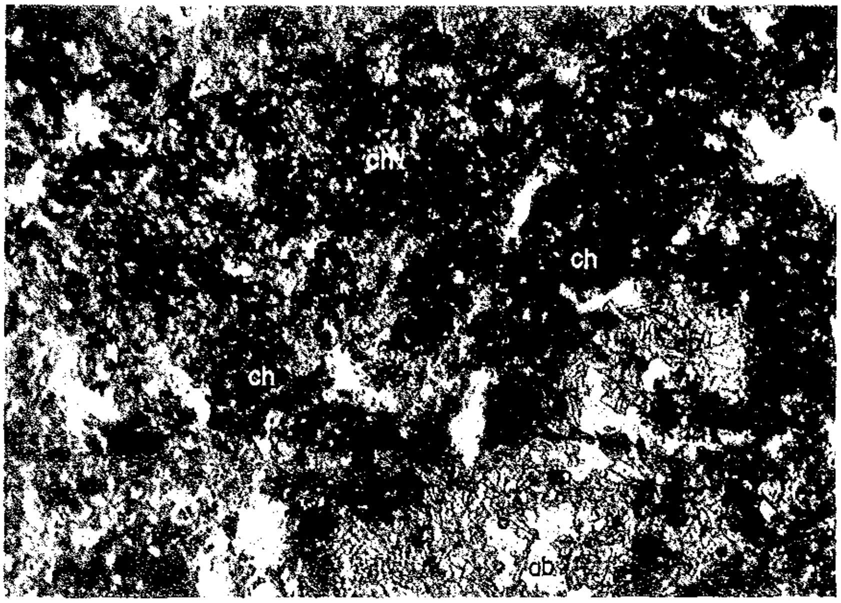
(4) Sample No.: M_N-2 (Tc)

Location: X = 679.2 Y = 8328.2

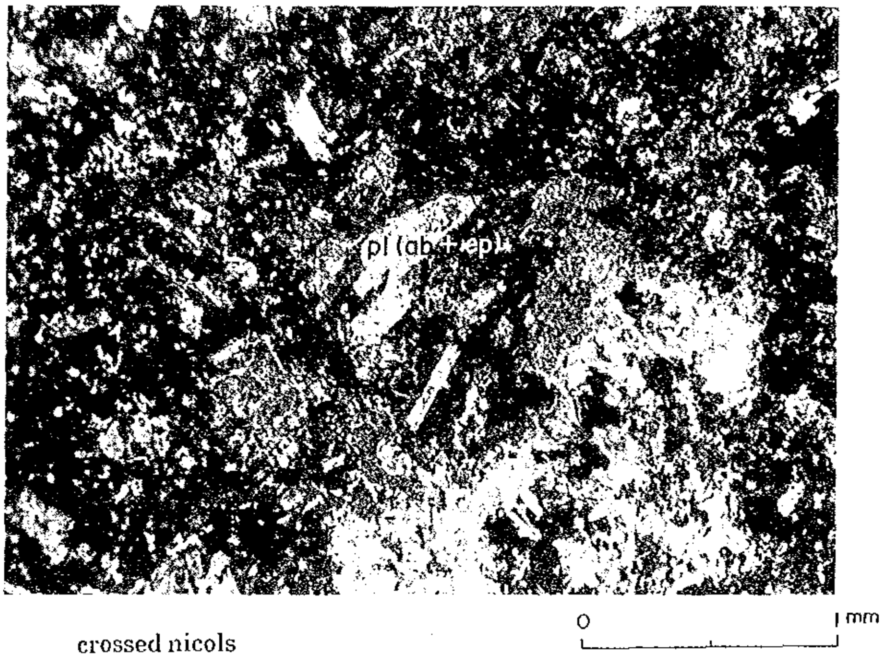
Rock name: Altered andesite (propylite)

Texture: Porphyritic, hyalopilitic~cryptocrystalline
phenocryst ... pl > mafic mineral
groundmass ... gl ≫ pl > mafic mineral

Remarks: Propylitization



open nicol



crossed nicols

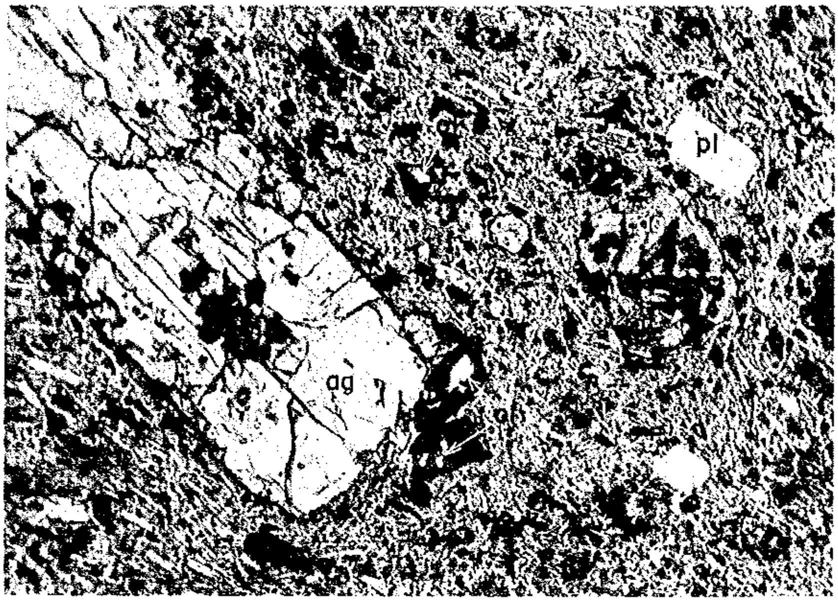
(5) Sample No.: Pm-22 (Tc-an)

Location: X = 675.4 Y = 8294.9

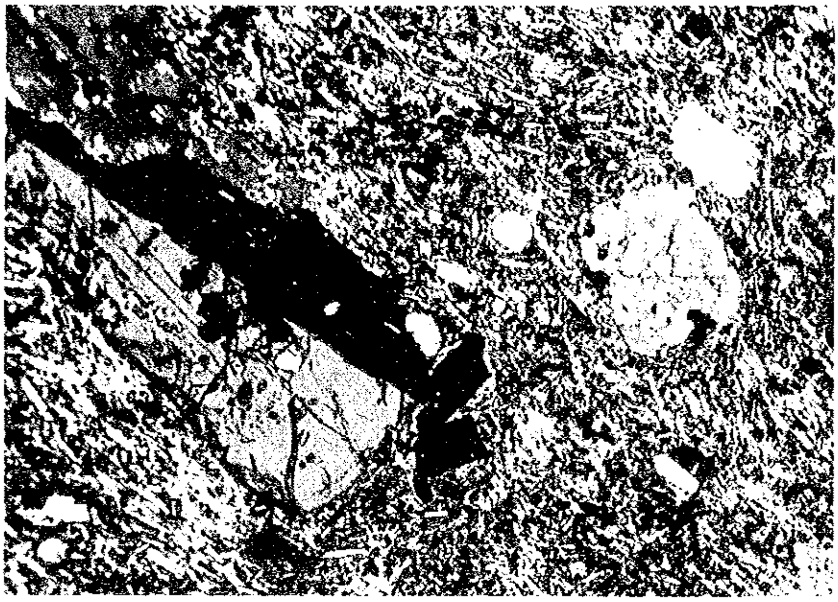
Rock name: Altered andesite (propylite)

Texture: Porphyritic
phenocryst ... pl > px?
groundmass ... gl ≫ pl

Remarks: Propylitization
pl → ep + albite
px → ch
gl → ch + albite



open nicol



crossed nicols

0 1 mm

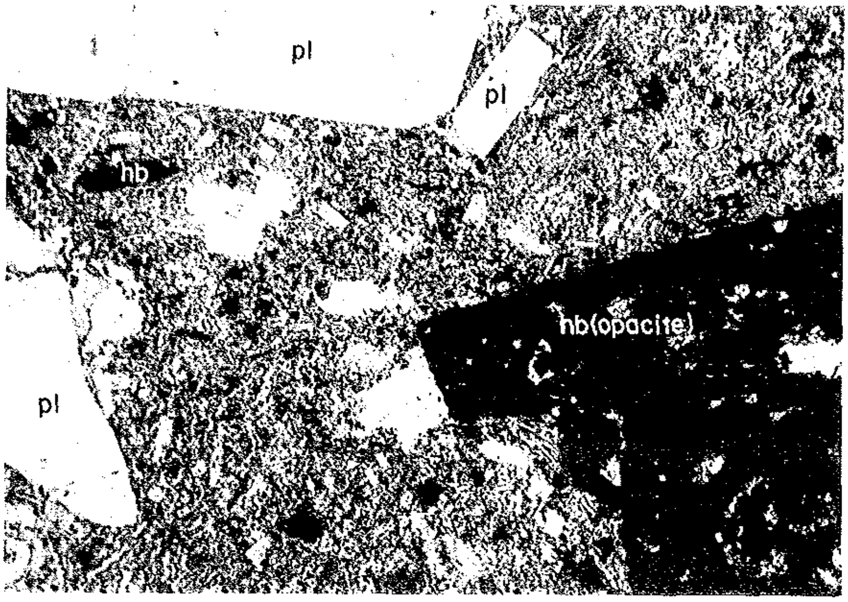
(6) Sample No.: P_N-1 (Vbl-an)

Location: X = 677.4 Y = 8294.5

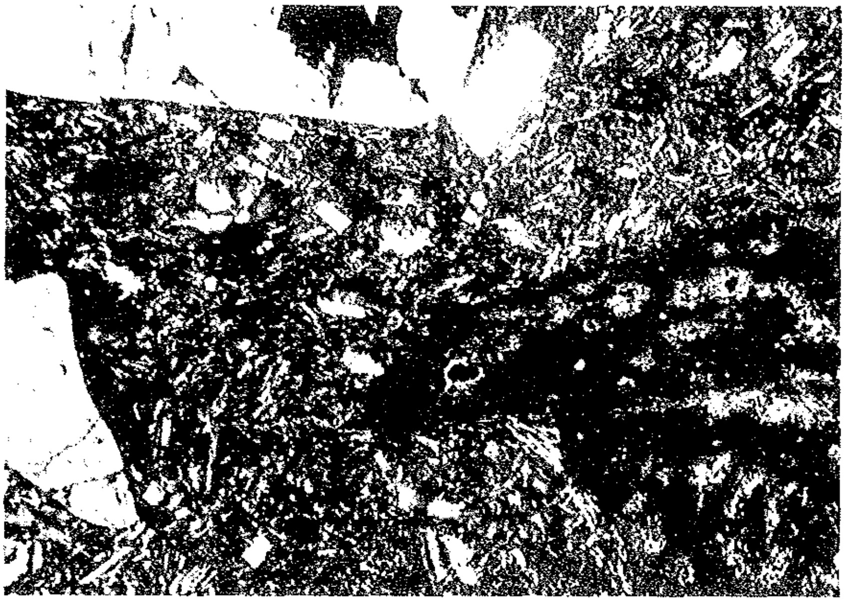
Rock name: Hornblende olivine basalt

Texture: Porphyritic, hyalopilitic
phenocryst ... pl > ag > hy > hb, ol > oq
groundmass ... pl ≧ gl > ag ≧ hy > ol

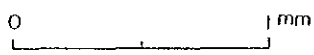
Remarks: hy → opacite



open nicol



crossed nicols



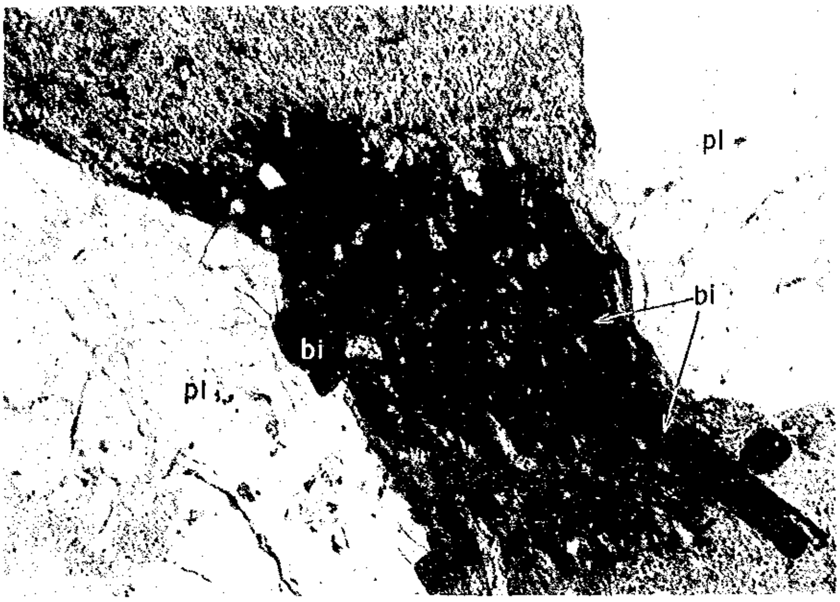
(7) Sample No.: P_N-12 (Vbl-po)

Location: X = 677.8 Y = 8296.4

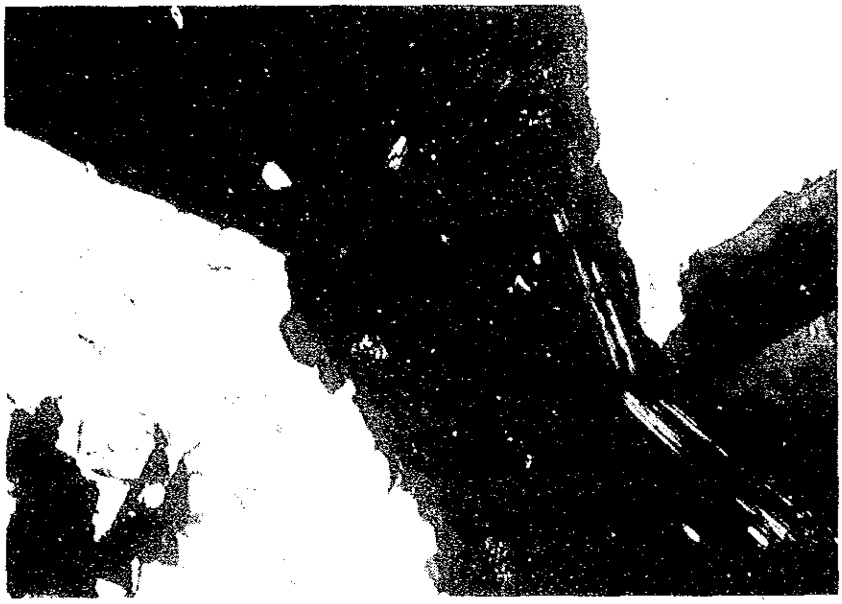
Rock name: Hornblende andesite

Texture: Porphyritic, hyalopilitic
phenocryst ... pl > hb ≫ ag
groundmass ... gl ≫ pl > ag ≧ hb > oq

Remarks: hb → opacite



open nicol



crossed nicols

0 1 mm

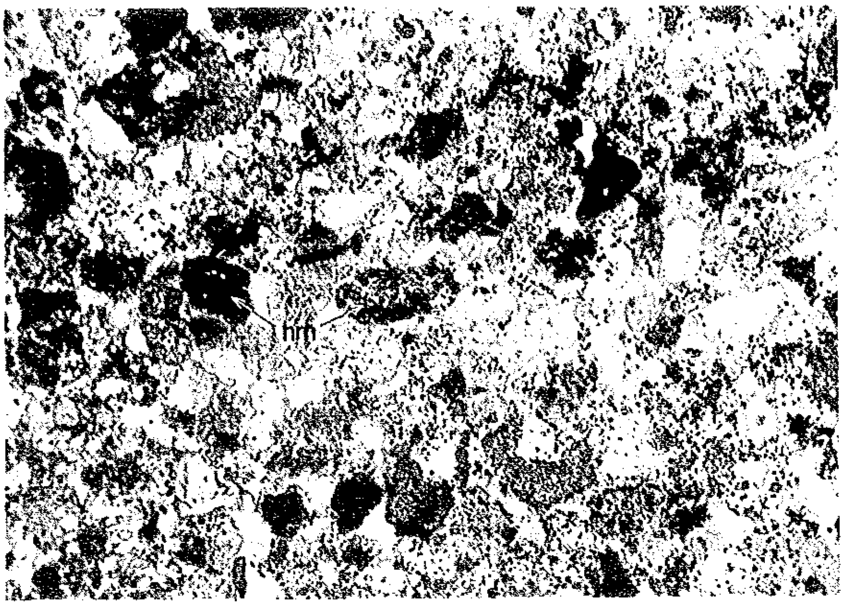
(8) Sample No.: Pk-1 (Vbu-wt)

Location: X = 676.0 Y = 8293.9

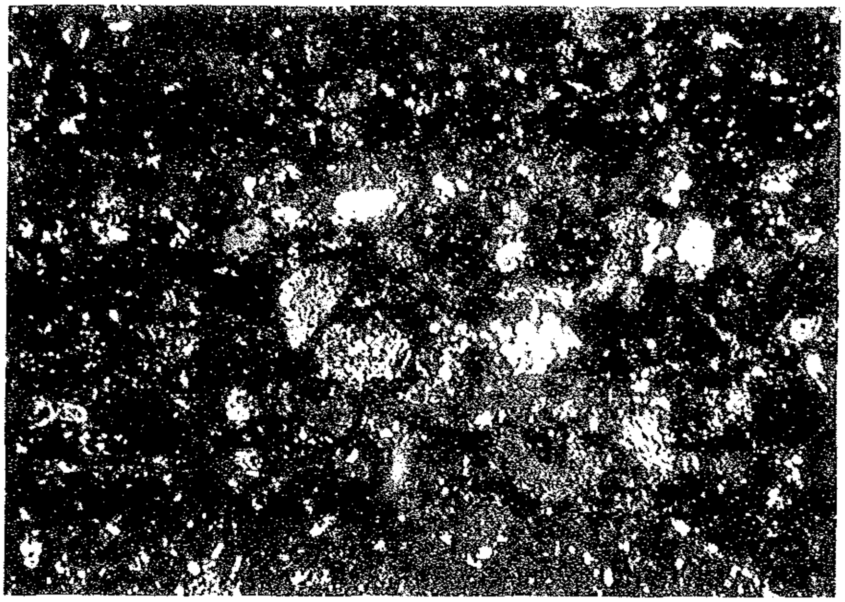
Rock name: Dactic tuff

Texture: Flow structure, Porphyritic
mineral fragment ... pl > qz ≧ bi
matrix ... gl ≫ pl > qz > bi

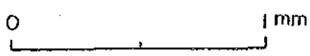
Remarks: Devitrification



open nicol



crossed nicols



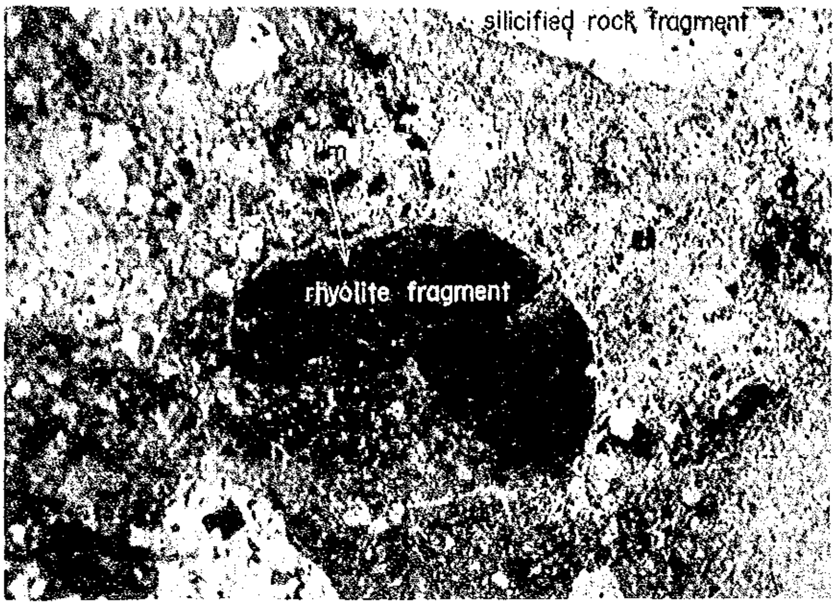
(9) Sample No.: Pv-12 (Tc-tf)

Location: X=674.6 Y=8296.4

Rock name: Altered sandy tuff

Texture: Medium grained

Remarks: Strong argillizaiton, hematite stained



open nicol

crossed nicols

0 1 mm

(9) Sample No.: Pv-15 (Tc-rho)

Location: X = 675.2 Y = 8295.5

Rock name: Rhyolitic tuff

Texture: Clastic
rock fragment (tuff, rhyolite),
gl, pl, qz fragment

Remarks: Weak silicification, limonite stained

Abbreviations for X-ray Diffractive Analyses (Apx.-3, -4, -5)

Mineral

Hal	:	Halloysite	Tri	:	Tridymite
Hha	:	Hydrated halloysite	Qz	:	Quartz
Kao	:	Kaolinite	Kf	:	Potassium feldspar
Dic	:	Dickite	Al	:	Alunite
Pyp	:	Pyrophyllite	Jar	:	Jarosite
Mm	:	Montmorillonite	Gyp	:	Gypsum
Ser	:	Sericite	Cal	:	Calcite
Chl	:	Chlorite	Sid	:	Siderite
Kao/Mm	:	Kaolinite-Montmorllonite	Py	:	Pyrite
		mixed layer	Hm	:	Hematite
Ser/Mm	:	Sericite-Montmorillonite	Geo	:	Goethite
		mixed layer	Dia	:	Diaspore
Clp	:	Clinoptilolite	Rutil	:	Rutile
Sti	:	Stilbite	Pl	:	Plagioclase
Cri	:	α-Cristobalite	Bio	:	Biotite
			Hb	:	Hornblende

Apx. 3 X-ray Diffractive Analyses of the Marcabamba Area

No.	Sample No.	Co-ordinates		Occurrence	Silicate mineral																Sulfate mineral			Carbonate mineral		Others					Rock forming mineral			Remarks
					Clay mineral										Zeolite mineral		Silica mineral																	
		E (km)	N (km)		Hal	Hha	Kao	Dic	Pyp	Mm	Ser	Chl	Kao/Mm	Ser/Mm	Clp	Sti	Cri	Tri	Qz	Kf	Alu	Jar	Gyp	Cal	Sid	Py	Hem	Goe	Dia	Rutil	Pl	Bi	Hb	
1	MK - 6	678.8	8328.3	Siliceous rock							●								◎												◎			
2	MK - 7	679.8	8330.3	Strong argillaceous rock							●	●							◎												○			
3	MK - 10	686.4	8323.1	White argillaceous rock							●						◎		◎	◎														
4	Mm - 3	679.9	8329.8	Siliceous rock								●		●					◎				◎			●					◎			
5	Mm - 6	685.3	8321.9	"			◎			◎*									◎		●													* 18Å
6	Mm - 7	685.2	8321.9	White argillaceous rock			○		◎										◎			●				●				●				
7	Mm - 8	685.2	8321.5	" "			○			●	○								◎											●				
8	MN - 6	679.2	8329.3	Weak argillaceous rock with pyrite dissemination							●	●							◎					?		●					◎			
9	MN - 7	679.3	8329.5	Siliceous rock with banded structure							●								◎												◎			
10	MN - 10	680.2	8331.1	Siliceous rock							●			●					◎	◎		●												
11	MN - 11	680.1	8331.0	"										●					◎	●		●												
12	MN - 16	680.7	8331.6	"							●								◎	◎														
13	MN - 17	680.6	8331.6	"							●								◎	◎						●								
14	MN - 18	679.9	8326.2	White argillaceous rock	●					●	●			●					◎				●								◎			
15	MN - 23	685.6	8323.3	Siliceous rock										●					◎	○			●			●								
16	MN - 24	685.7	8323.3	"						●					●				◎	○			●			●					◎			
17	MN - 26	685.8	8323.7	White argillaceous rock							●				◎				◎															
18	MN - 28	685.9	8324.3	White argillaceous rock with quartz phenocrysts													◎		◎	◎											◎			
19	MN - 32	682.3	8324.2	White argillaceous rock with banded structure															◎	◎											◎	?		
20	MN - 34	682.2	8324.5	White argillaceous rock			●							●					◎												◎			
21	MN - 37	681.5	8329.7	Pale green argillaceous rock										●					◎	◎											◎			
22	MZ - 2	677.2	8323.9	Argillaceous rock							●								◎	◎		●	?											
23	MZ - 4	678.2	8324.3	White argillaceous rock	●						○								◎												◎			
24	MZ - 12	677.2	8324.9	Siliceous and argillaceous rock			◎		●		◎								◎		◎									●				
25	MZ - 14	677.4	8324.9	White argillaceous rock							◎								◎			○												
26	MV - 6	678.8	8260.1	White argillaceous rock with iron oxides							●					●			●									●			◎			
27	MMV - 6	683.3	8321.9	Siliceous rock															◎			●												

Apx. 4　X-ray Diffractive Analyses of the Pirca Area

No.	Sample No.	Co-ordinates		Occurrence	Silicate mineral																Sulfate mineral			Carbonate mineral		Others					Rock forming mineral			Remarks
		E (km)	N (km)		Clay mineral										Zeolite mineral		Silica mineral																	
					Hal	Hha	Kao	Dic	Pyp	Mn	Ser	Chl	Kao/Mn	Ser/Mn	Clp	Sti	Cri	Tri	Qz	Kf	Alu	Jar	Gyp	Cal	Sid	Py	Hem	Goe	Dia	Rutil	Pl	Bi	Hb	
1	PK - 4	676.0	8294.1	Siliceous and argillaceous rock			•				•								◎															
2	PK - 5	676.0	8294.1	White argillaceous rock			•				○								◎		•													
3	PK - 9	676.0	8294.8	Siliceous rock															◎		◎													
4	PK - 11	676.0	8295.1	Weak argillaceous rock							•								◎												◎			
5	PK - 12	676.0	8295.6	"	•									○					◎												○			
6	PK - 14	676.0	8296.3	Siliceous rock				◎											◎		○													
7	PK - 24	675.1	8294.8	White clay with pyrite				◎	◎										◎			•				○								
8	PK - 25	675.1	8294.8	Siliceous rock (vein?)			○		○										◎							•								
9	PK - 26	675.1	8294.8	Strong argillaceous rock			•		◎					•					◎			•				•								
10	PK - 29	675.0	8295.5	Siliceous rock with iron															◎		○				•		•			•				
11	PK - 28	675.0	8296.1	White argillaceous rock									○				•																	
12	PK - 30	675.0	8296.6	Siliceous rock										•					◎								•	•						Anatase
13	Pm - 9	674.1	8295.2	White argillaceous rock			•			◎									◎															Anatase
14	Pm - 10	674.0	8295.4	"			•			◎									◎			○				•								Anatase
15	Pm - 11	674.0	8295.5	Siliceous rock			•										◎				•													
16	Pm - 12	674.0	8295.7	Weak siliceous rock			◎										◎				○													
17	Pm - 13	674.0	8295.9	Argillaceous rock with pyrite			○										◎		◎	◎														
18	Pm - 15	674.4	8295.4	Weak siliceous andesite															◎		◎													
19	Pm - 16	674.4	8295.6	"				○											◎		◎													
20	Pm - 18	674.4	8295.9	Chalcedonic rock			•										◎				○					•								
21	Pm - 20	675.4	8294.7	Argillaceous rock with pyrite						•	•	•							◎							◎								
22	Pm - 21	675.4	8294.9	Weak argillaceous rock of andesite							•	•							◎															
23	Pm - 23	675.4	8295.1	White argillaceous rock			•			•				○					◎		•						•							
24	Pm - 24	675.4	8295.2	Argillaceous rock with pyrite			•												◎		•									•				Anatase
25	Pm - 25	675.4	8295.8	Siliceous rock			•												◎															
26	PN - 4	677.4	8295.6	Argillaceous andesite							◎								◎	◎								•						
27	PN - 5	677.4	8295.5	Argillaceous rock with iron oxides							○								◎									•						
28	PN - 6	677.4	8295.9	Siliceous rock				◎											◎		•													
29	PN - 7	677.4	8296.2	Siliceous rock with iron oxides			•			•		•							◎								•			•				
30	PN - 8	677.4	8296.3	Weak argillaceous rock															◎		◎									•				
31	PN - 14	676.4	8294.2	Greenish grey andesite						•		•							◎								•				◎			
32	PN - 15	676.4	8293.2	White altered rock			•				•								◎				•											
33	PN - 16	676.4	8295.1	Argillaceous rock			•		◎	•									◎		◎	•			•									
34	PN - 17	676.4	8295.3	Siliceous rock with iron oxides					◎										◎		•				•									

Apx.4 continued

No.	Sample No.	Co-ordinates E (km)	Co-ordinates N (km)	Occurrence	Silicate mineral: Clay mineral										Zeolite mineral		Silica mineral				Sulfate mineral			Carbonate mineral		Others					Rock forming mineral			Remarks
					Hal	Hha	Kao	Dic	Pyp	Mn	Ser	Chl	Kao/Mn	Ser/Mn	Clp	Sti	Cri	Tri	Qz	Kf	Alu	Jar	Gyp	Cal	Sid	Py	Hem	Goe	Dia	Rutil	Pl	Bi	Hb	
35	PN - 18	676.4	8295.6	White altered rock + quartz veinlets															◎		◎		•							•				
36	PN - 19	676.4	8295.9	Siliceous rock															◎											•				
37	PN - 20	676.4	8296.1	"															◎											•				
38	PN - 21	676.4	8296.7	Weak argillaceous rock				◎											◎		◎													
39	PN - 22	677.0	8294.4	White argillaceous rock							•								◎															
40	PN - 23	676.9	8294.3	White siliceous rock				◎	•					•					◎			•												
41	PZ - 5	675.8	8296.5	Argillaceous rock			•							•					◎								•			•				
42	PZ - 8	675.6	8294.6	White argillaceous rock						•				•					◎			•									◎			
43	PZ - 10	675.6	8295.0	"				◎											◎		◎						•							
44	PZ - 12	674.8	8295.0	Chalcedony															◎		•													
45	PZ - 16	674.8	8296.5	"													◎		•															
46	PZ - 18	676.6	8294.9	White argillaceous rock			○				○						◎			○								•						
47	PZ - 19	676.6	8295.8	Siliceous rock with iron oxide veinlets				◎	•?										◎		•						•	•						
48	RI - 16	677.0	8295.4	Argillaceous rock with iron oxides				•											◎		○				•		•	•						
49	RI - 18	677.0	8295.6	"			•												◎		•						•	•						
50	RI - 22	677.0	8295.9	"					?										◎		◎	○						•		•				
51	RJ - 22	676.8	8295.9	White argillaceous rock				◎											◎		•					•								
52	Pm - 26	668.2	8296.2	Siliceous rock														◎	◎															
53	Pm - 29	668.6	8296.4	Weak siliceous and argillaceous rock													◎				◎													
54	Pm - 30	667.3	8295.3	Argillaceous rock			•										◎				•													
55	Pm - 31	667.1	8294.6	Siliceous and argillaceous rock																	◎													
56	Pm - 32	669.8	8295.3	White argillaceous rock	•					•										◎	•							•						
57	PN - 24	667.7	8295.7	Siliceous rock													◎				○					•								
58	PN - 26	667.6	8295.3	Siliceous rock															◎											•				
59	PN - 27	667.6	8295.4	Weak argillaceous rock													◎		◎		◎													
60	PN - 29	667.4	8296.8	Siliceous rock brecciated															◎											•				
61	PN - 30	667.5	8296.8	Siliceous rock															◎															
62	PN - 31	667.5	8297.1	"													•		◎		•													
63	PN - 32	667.6	8298.6	"													•				◎													
64	PV - 21	666.6	8296.6	"															◎															
65	WG - 1	666.8	8295.4	"	•														◎								•			•				
66	WPR - 1	668.8	8297.0	White argillaceous rock													◎		○		◎													
67	WPR - 6	668.4	8295.2	White argillaceous rock			•			•								◎			◎	•						•			○			
68	WPZ - 10	666.5	8295.3	Strong siliceous rock															◎											•				
69	WPZ - 11	668.1	8296.2	White argillaceous rock															◎											•				
70	WPZ - 12	668.3	8296.6	Argillaceous rock with iron oxides													◎				◎				?									