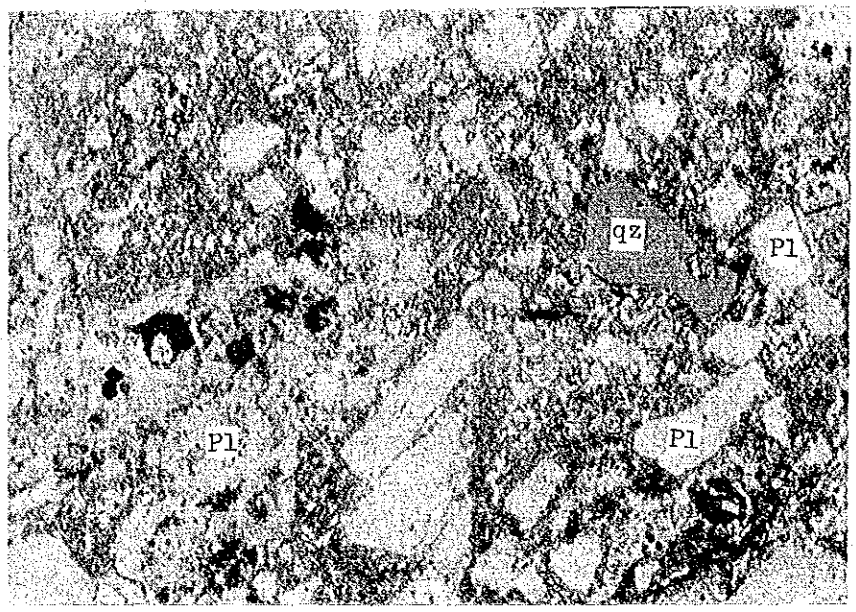
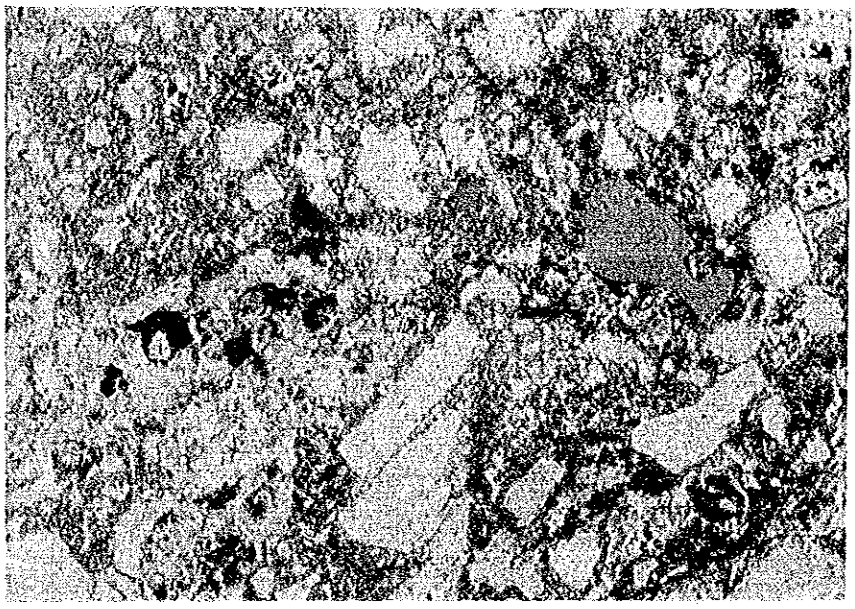



open nicol



crossed nicols

0 1mm

(10) Sample No. : MJP－12－3T

Location : E＝680.023 N＝8331.110

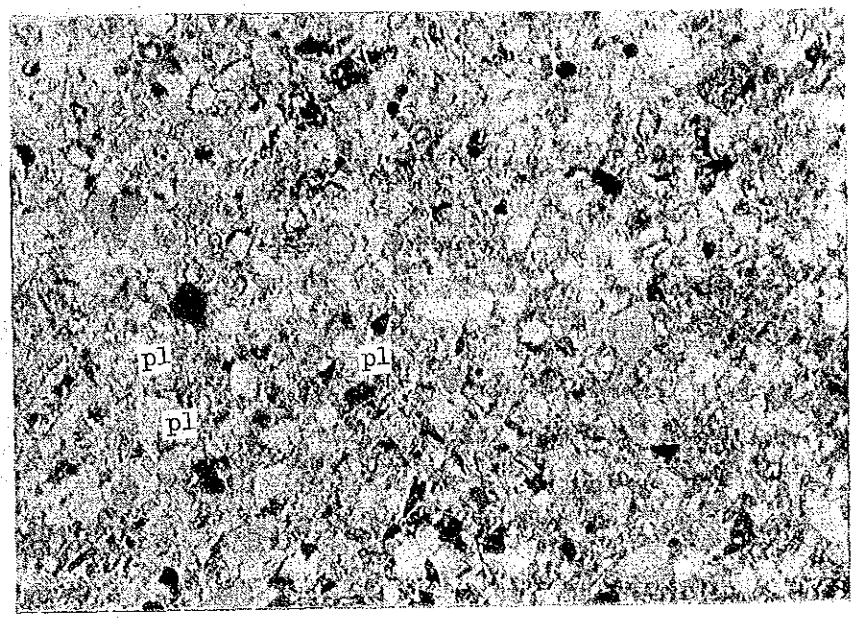
Rock name : andesitic tuff with green pumice

Texture : matrix…hyalopilitic～felsitic

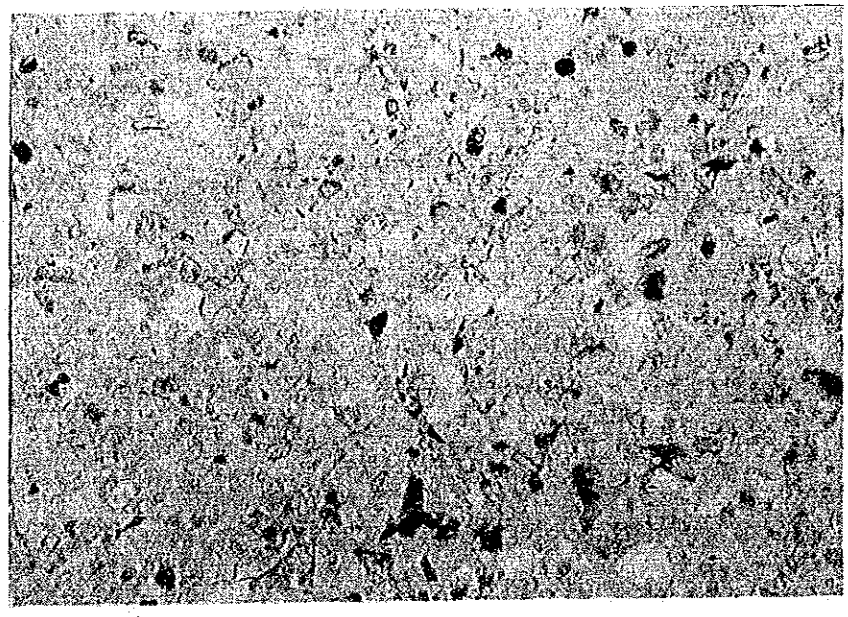
Remarks : crystal fragments : pl＞qz＞mafic mineral, oq

rock fragments : dc

matrix…gl→pl＋qz (devitrification)




open nicol



crossed nicols

0 1mm

(11) Sample No. : MJP－13－2T

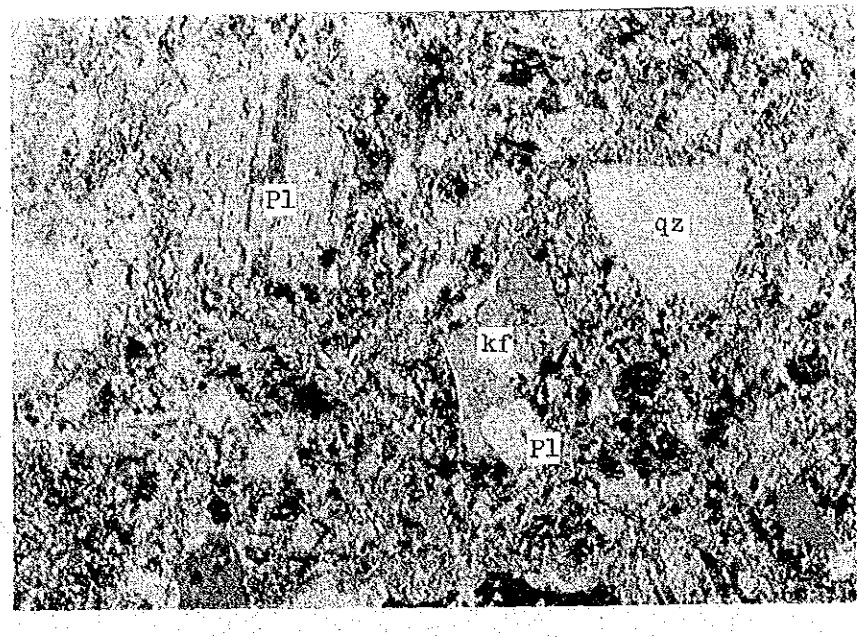
Location : E＝680.455 N＝8330.305

Rock name : calcareous fine sandstone

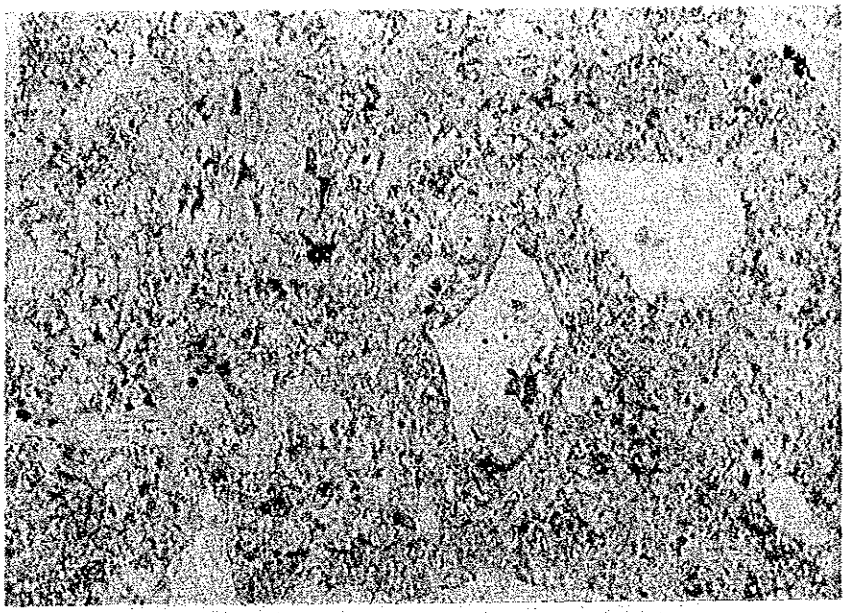
Remarks : crystal fragments…qz, ca, pl, se, oq

rock fragment…dc

matrix…se＋ch＋ (ca)




open nicol



crossed nicols

0 1mm

(12) Sample №. : MJP－13－3T

Location : E＝680.455 N＝8330.305

Rock name : dacitic tuff～lapilli tuff

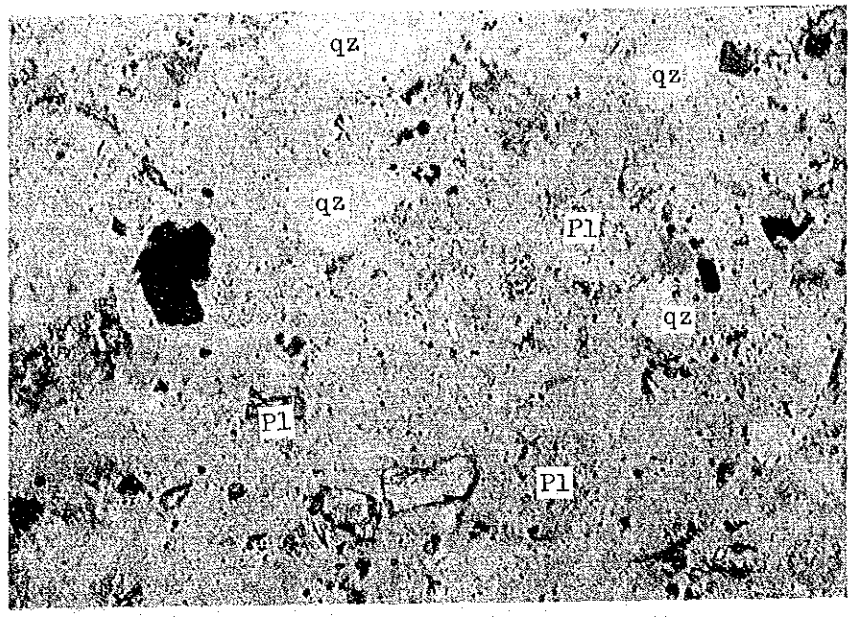
Texture : matrix…felsitic

Remarks : crystal fragment…qz＞pl＞kf, mafic mineral

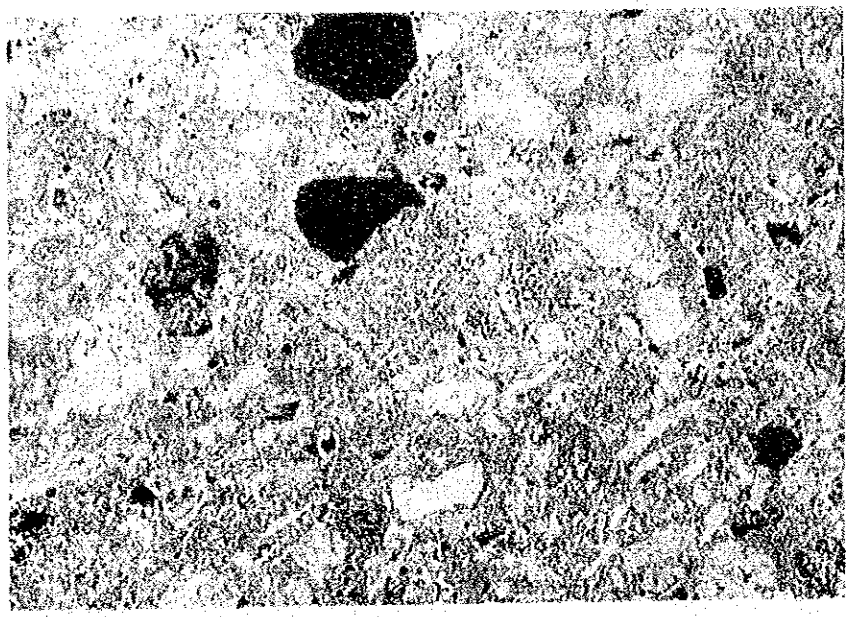
mafic mineral→se, ch

rock fragment…an→ca＋se＋ch

matrix…qz, pl, gl




open nicol



crossed nicols

0 1mm

(13) Sample No. : MJP－13－4T

Location : E＝680.455 N＝8330.305

Rock name : dacitic lapilli tuff～tuff breccia

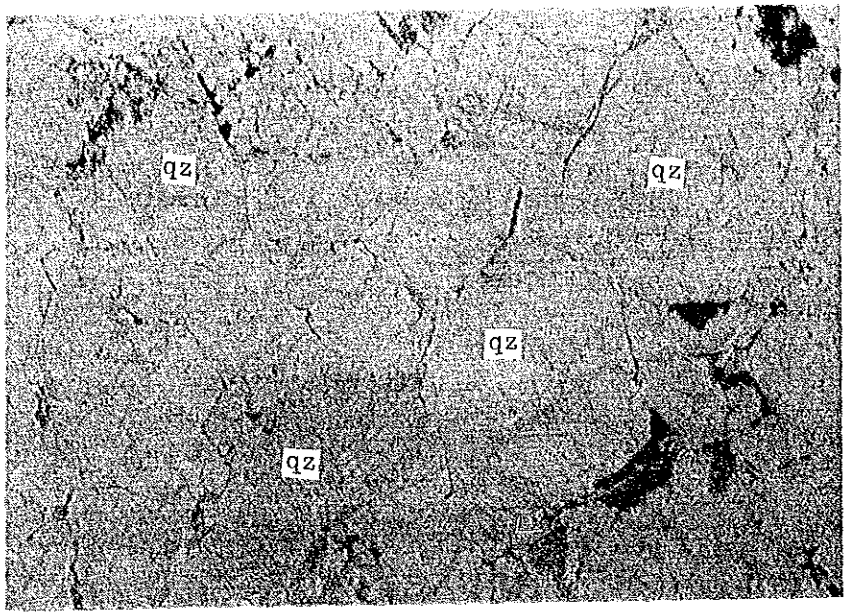
Texture : matrix…cryptocrystalline

Remarks : crystal fragment…qz＞pl＞mafic mineral

rock fragment…an, dc

mafic…very fine→se

※chloritization, sericitization




open nicol

crossed nicols

0 1mm

(14) Sample №: MJP－14－1T

Location : E＝683.210 N＝8321.835

Rock name : quartz arenite

Texture : mosaic

Remarks : qz (subround grains)

# Apx. 3 Microscopic Observations of Polished Sections

## Abbreviations

Mineral

El : electrum
Ar : argentite
Po : polybasite
Pc : pearceite
Cp : chalcopyrite
Ga : galena
Sp : sphalerite
Py : pyrite
Cv : covellite
Mn : Mn－Fe mineral
Th : tetrahedrite
Tn : tennantite
Hm : hematite
Lm : limonite
Fe : Fe mineral (oxide or hydrocxide)
Fe (Mn) : Fe－Mn mineral (oxide ? )
KFe : K－Fe－S mineral
Zr : Zircon
Ti : Ti mineral
Ru : rutile

◎ : abundant
○ : common
・ : minor

## Apx. 3 Microscopic Observations of Polished Sections

| No. | Sample No. | Co ordinates | | Type of Ore | Ore mineral | | | | | | | | | | | | | | | | | | | Remarks | Location |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | E (km) | N (km) | | El | Ar | Po | Pc | Cp | Ga | Sp | Py | Cv | Mn | Th | Tn | Hm | Lm | Fe | Fe (Mn) | KFe | Zr | Ti | Ru | | |
| 1 | N3−2P | 680.260 | 8330.865 | silicified rock with dissemination of Sp | | • | • | | • | ○ | ◎ | ○ | | | | | | | ○ | | | | | | | Northern part of Colpar (Tunnel) |
| 2 | S5−5P | 680.580 | 8330.285 | altered rock with blackish brown clay | | | | | | | | • | | ○ | | | | | ◎ | ○ | | | | | Adularia | Southern part of Colpar (Tunnel) |
| 3 | S6−1P | 680.585 | 8330.250 | altered rock with brown and black clay | | | | | | | | • | | ◎ | | | | | ◎ | ○ | | | | | | |
| 4 | SN9−1P | 680.615 | 8330.210 | Sp−Ga−quartz vein | • | • | | ○ | • | ○ | ◎ | ◎ | • | | | • | • | | | | | | | | | |
| 5 | MT3−3P | 683.330 | 8321.715 | quartz vein net−work | | | | | ○ | • | • | ○ | | | | | | | | | | | | | | Marcamalata (Trench) |

| No. | Sample No. | Depth (m) | Type of Ore | Ore mineral | | | | | | | | | | | | | | | | | | | | Location |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | El | Ar | Po | Pc | Cp | Ga | Sp | Py | Cv | Mn | Th | Tn | Hm | Lm | Fe | Fe (Mn) | KFe | Zr | Ti | Ru | |
| 6 | MJP−11−1P | 119.35 | grey quartz vein and altered rock with Cp and Ga | | | | | ○ | ◎ | • | ○ | | | | | | • | • | | | | • | • | Northern part of Colpar (Drilling) |
| 7 | MJP−12−1P | 75.47 | grey quartz vein with Sp, Ga and Cp | • | • | • | | ○ | ◎ | ◎ | ○ | | | | | | | | | | | | | |
| 8 | MJP−12−2P | 113.62 | dark grey quartz vein with black mineral and Py | | | | | | | • | ◎ | | | | | | | | | | • | | • (?) | |
| 9 | MJP−12−3P | 213.70 | grey quartz vein with Py | | | | | ○ | • | • | ◎ | | | | | | | ○ | • | | | | | |
| 10 | MJP−13−1P | 203.65 | altered rock with Sp, Cp, Ga and Py | | | | | • | • | ◎ | ○ | | | | | | | | | | | | | Southern part of Colpar (Drilling) |
| 11 | MJP−14−1P | 166.50 | white and dark grey quartz vein with Py | | | | | | | | ◎ | | | • (?) | | | | | | | | | | Marcamalata (Drilling) |
| 12 | MJP−14−2P | 167.70 | silicified sandstone with iron oxides | | | | | | | | | | | | | | ◎ | • | | • | | | | |
| 13 | MJP−15−1P | 93.60 | yellowish brown iron oxides veinlet in arkose sandstone | | | | | | | • | • | | | | | | | | | | | | | |

## Apx. 4 Quantitative Analyses of Ore Mineral by Electron Probe Microanalyzer

| | Element | Mineralized Zone of Northern Part | | | | | Mineralized Zone of Southern Part | | |
|---|---|---|---|---|---|---|---|---|---|
| | | MJP−12−1P | | | | N3−2P | SN−9−1P | | |
| | | El (1) | El (2) | Ar (1) | Ar (2) | Ar | Pc (1) | Pc (2) | Pc (3) |
| Weight % | Au | 51.54 | 51.54 | − | − | − | − | − | − |
| | Ag | 48.35 | 46.74 | 87.50 | 83.79 | 85.52 | 74.02 | 71.12 | 73.36 |
| | Cu | − | − | 1.47 | 2.23 | 0.29 | 7.19 | 7.38 | 6.64 |
| | Zn | − | − | 0.20 | 0.19 | 0.20 | 0.17 | 0.19 | 0.49 |
| | As | − | − | 0.68 | 0.17 | 0.36 | 6.21 | 6.74 | 6.77 |
| | Sb | − | − | 0.05 | 0.01 | 0.02 | 0.06 | 0.20 | 0.88 |
| | S | − | − | 12.99 | 13.81 | 13.15 | 13.07 | 14.08 | 14.10 |
| | Total | 99.89 | 98.29 | 102.89 | 100.21 | 99.55 | 100.73 | 99.70 | 102.24 |
| Atomic % | Au | 36.86 | 37.65 | − | − | − | − | − | − |
| | Ag | 63.14 | 62.35 | 64.79 | 62.24 | 65.22 | 53.06 | 50.37 | 51.16 |
| | Cu | − | − | 1.85 | 2.81 | 0.38 | 8.75 | 8.87 | 7.86 |
| | Zn | − | − | 0.25 | 0.24 | 0.26 | 0.21 | 0.22 | 0.56 |
| | As | − | − | 0.72 | 0.18 | 0.40 | 6.41 | 6.87 | 6.79 |
| | Sb | − | − | 0.03 | 0.01 | 0.01 | 0.04 | 0.13 | 0.54 |
| | S | − | − | 32.36 | 34.51 | 33.73 | 31.53 | 33.54 | 33.08 |
| | Total | 100 | 100 | 100 | 99.99 | 100 | 100 | 100 | 99.99 |

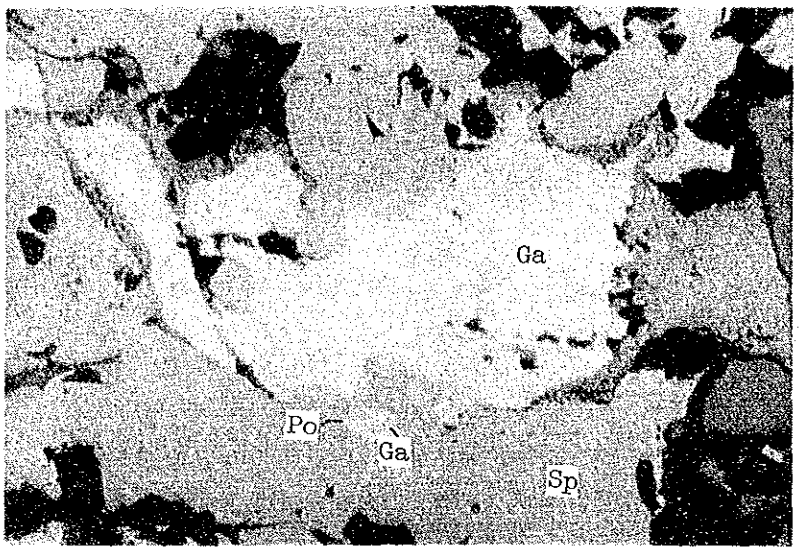
El : electrum, Ar : argentite, Pc : pearceite

# Apx. 5 Photomicrographs of Polished Sections

## Abbreviations

Mineral

El : electrum
Ar : argentite
Po : polybasite
Pc : pearceite
Cp : chalcopyrite
Ga : galena
Sp : sphalerite
Py : pyrite
Cv : covellite
Mn : Mn－Fe mineral
Th : tetrahedrite
Tn : tennantite
Hm : hematite ,
Lm : limonite
Fe : Fe mineral (oxide or hydrocxide)
Fe (Mn) : Fe－Mn mineral (oxide ? )
KFe : K－Fe－S mineral
Zr : Zircon
Ru : rutile



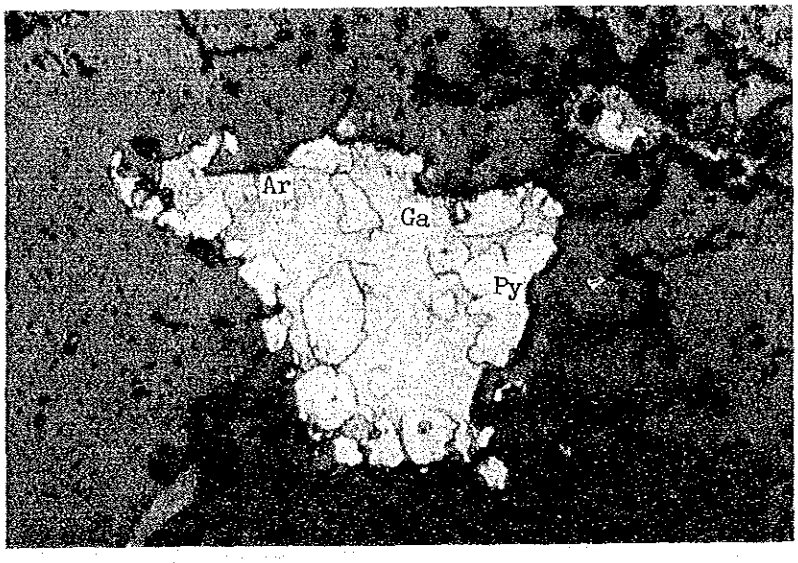

crossed nicols

(1) Sample No. : N3-2P@

Location : E=680.260
N=8330.865

Type of Ore : Silicified rock with dissemination of Sp>Py>Ga≫Cp

Remarks : Po ; Ag- (Cu) - (Zn) -Sb -S




crossed nicols

0 0.01mm

(2) Sample No. : N3-2P⑥

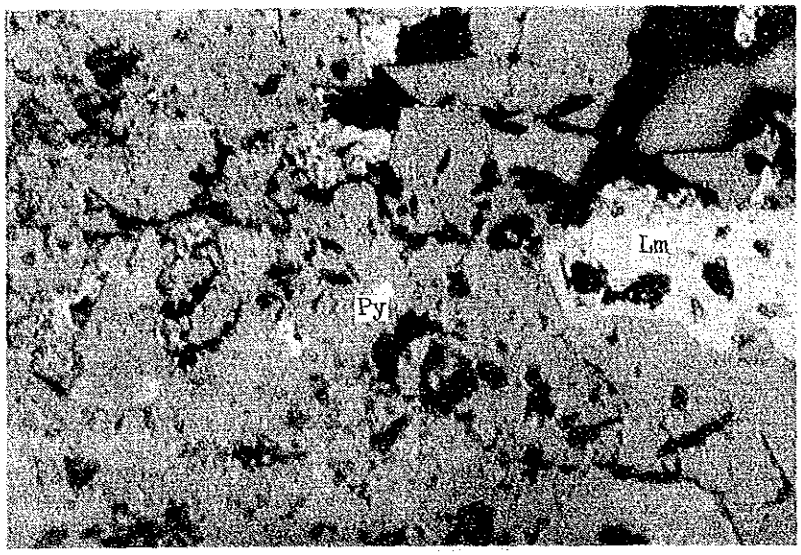
Location : E=680.260
N=8330.865

Type of Ore : Silicified rock with dissemination of Sp>Py>Ga≫Cp

Remarks :

Ar ; Ag 85.52, Cu 0.29, Zn 0.20, As 0.36, Sb 0.02, S 13.15, Total 99.55wt%

Ag 65.22, Cu 0.38, Zn 0.26, As 0.40, Sb 0.01, S 33.73at%



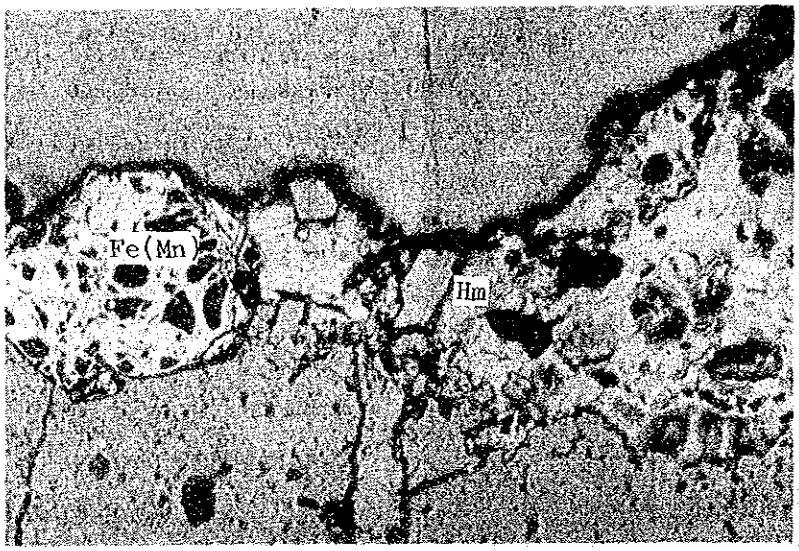

open nicol

(3) Sample No. : S5-5P@

Location : E=680.580
N=8330.285

Type of Ore : altered rock with blackish brown clay

Remarks : Py, Lm




open nicol

0 0.01mm

(4) Sample No. : S5-5P⑥

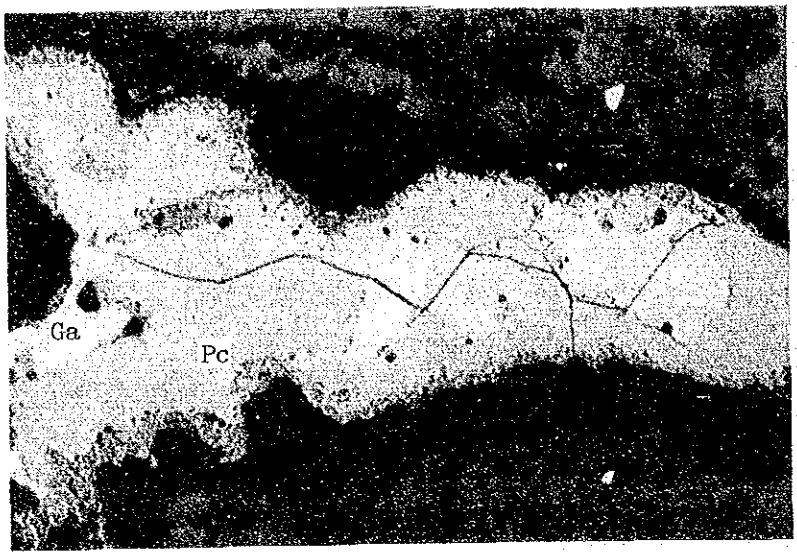
Location : E=680.580
N=8330.285

Type of Ore : altered rock with blackish brown clay

Remarks :

Fe (Mn) ; Fe- ((Si)) - ((Mn)) -S

Mn ; Mn-Fe- ((Ti)) - ((Ca?)) - ((Zn)) - ((S)) - (K)




open nicol

(5) Sample №. : SN9-1P@

Location : E=680.615
N=8330.210

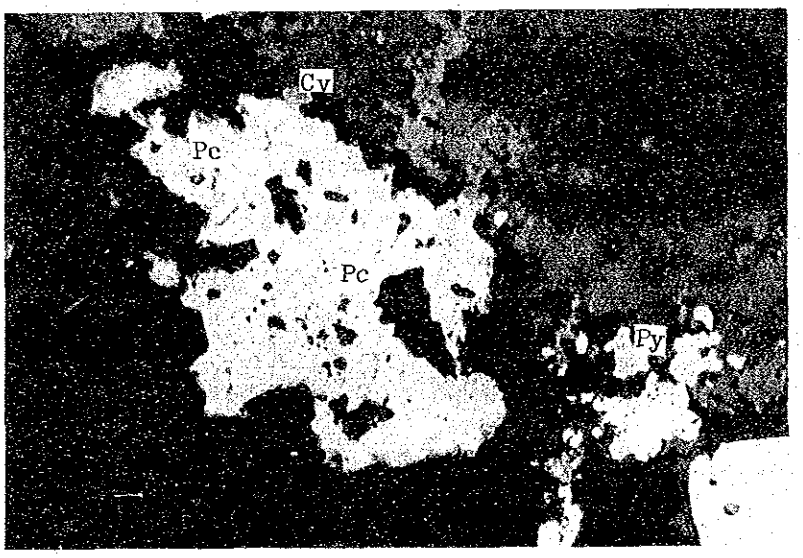
Type of Ore : Sp-Ga-quartz vein

Remarks : Ga, Pc

Pc : fine vein let (1mm×0.3mm)

Pc : Ag 73.36, Cu 6.64, Zn 0.49, As 6.77, Sb 0.88, S 14.10 Total 102.24wt%

Ag 51.16, Cu 7.86, Zn 0.56, As 6.79, Sb 0.54, S 33.08 at%




open nicol

(6) Sample №. : SN9-1P⑥

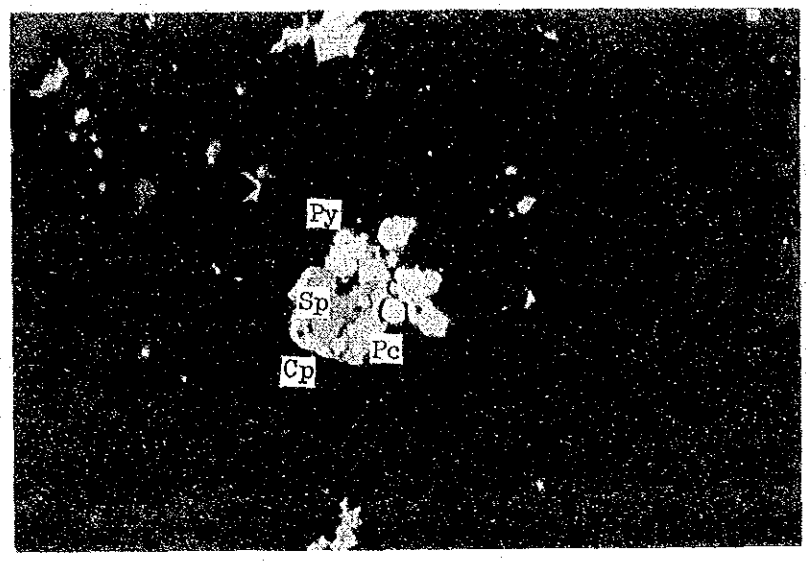
Location : E=680.615
N=8330.210

Type of ore : Sp-Ga-quartz vein

Remarks : Pc>Py, Cv

Pc : Ag 74.02, Cu 7.19, Zn 0.17, As 6.21, Sb 0.06, S 13.07, Total 100.73wt%

Ag 53.06, Cu 8.75, Zn 0.21, As 6.41, Sb 0.04, S 31.53 at%




(7) Sample No. : SN9-1P◎

Location : E=680.615

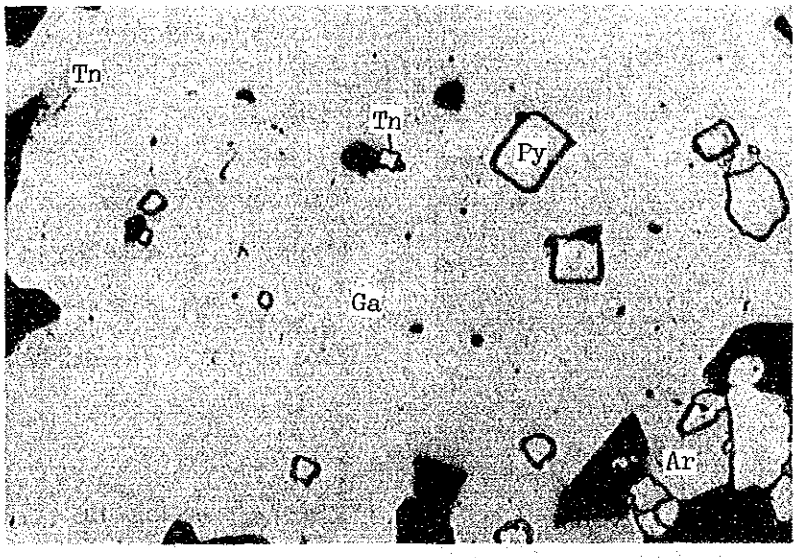
N=8330.210

Type of Ore : Sp-Ga-quartz vein

Remarks : Sp, Py, Pc, Cp

Pc ; Ag-Cu-((Fe))-Sb-As-S

open nicol




(8) Sample No. : SN9-1P◎

Location : E=680.615

N=8330.210

Type of Ore : Sp-Ga-quartz vein

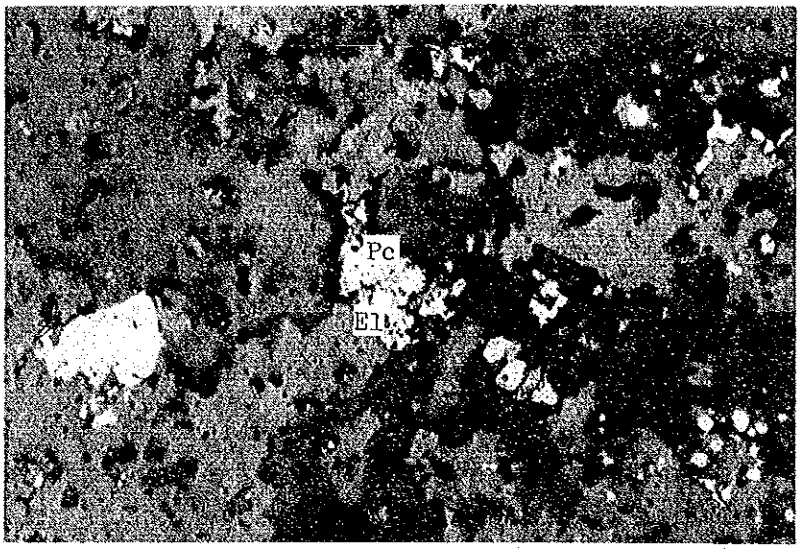
Remarks : Ga, Py, Tn, Ar

Ar ; Ag-(Cu)-((As))-S

Tn ; Ag-Cu-As-((Sb))-S

0 0.01mm

open nicol




(9) Sample No. : SN9-1P©

Location : E=680.615
N=8330.210

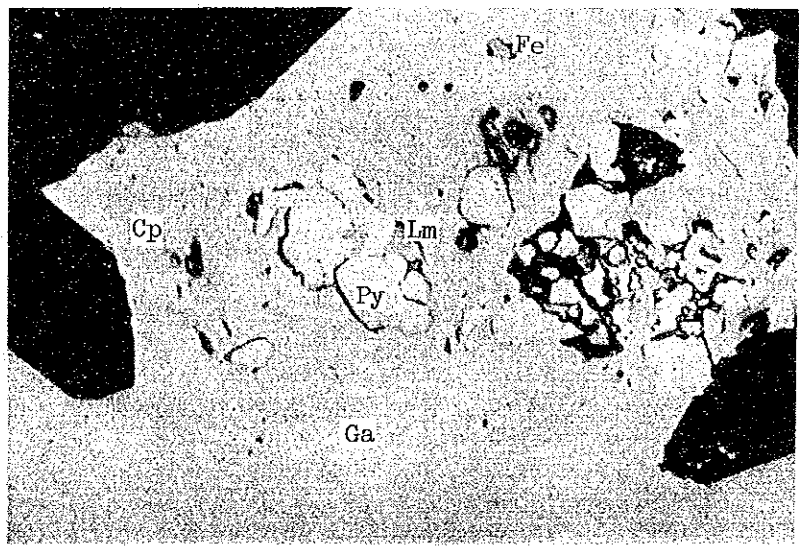
Type of Ore : Sp-Ga-quartz vein

Remarks : Pc, El

El ; Au-Ag

Pc ; Ag-Cu-As- (Sb) -S

open nicol




(10) Sample No. : MJP-11-1P@

Location : E=680.315
N=8331.305

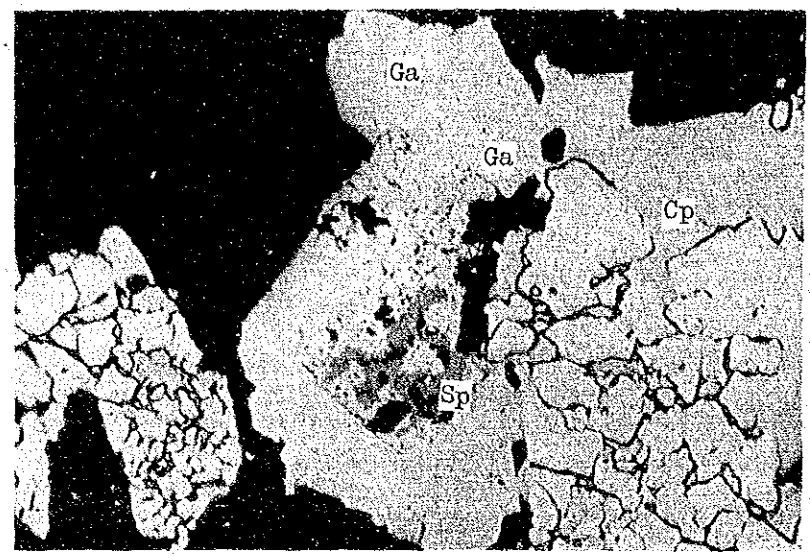
Type of ore : grey quartz vein and altered rock with Cp and Ga

Remarks : Ca, Py, Cp, Fe

Lm : Fe- ((S))
Fe : Fe ((S))
} oxides of Fe

0 0.01mm

open nicol




(11) Sample No. : MJP-11-1P⑥

Location : E=680.315
N=8331.305

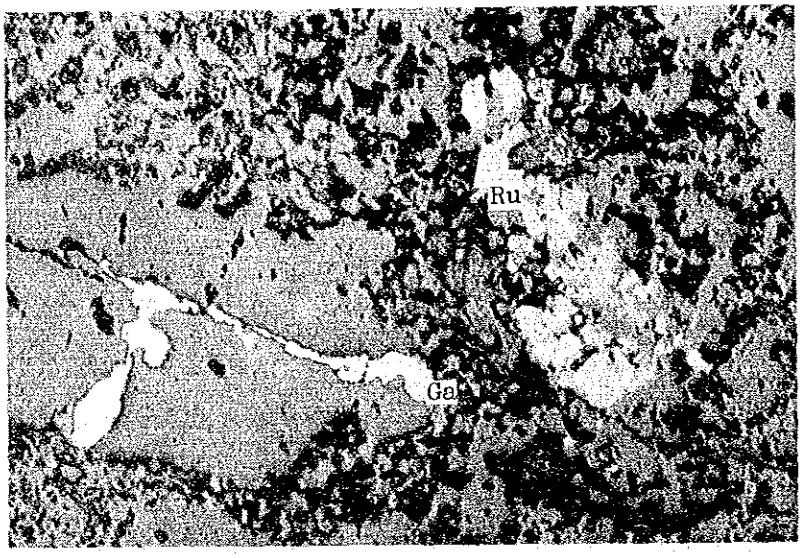
Type of Ore : grey quartz vein and altered rock with Cp and Ga

Remarks : Ga, Sp, Cp

Sp : Zn- (Cd) - ((Fe)) -S

Ga : Pb- ((Fe)) -S

open nicol




(12) Sample No. : MJP-11-1P©

Location : E=680.315
N=8331.305

Type of Ore : grey quartz vein and altered rock with Cp and Ga

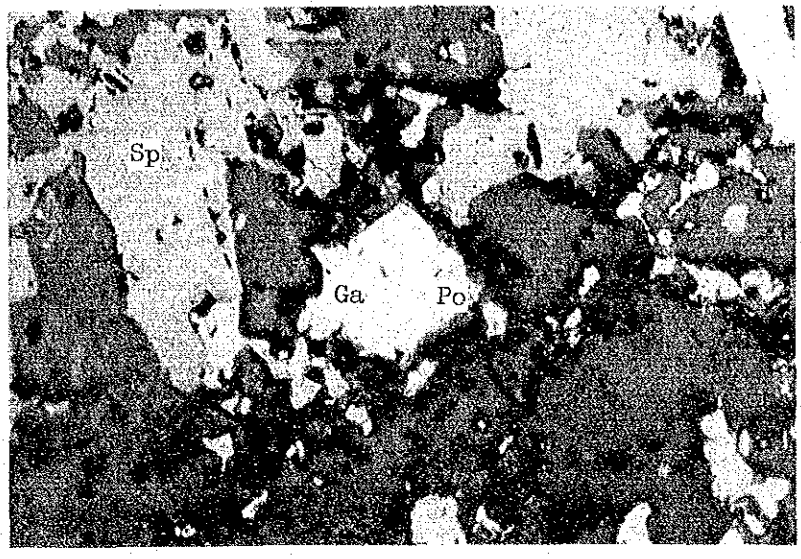
Remarks : Ga, Ru

Ga : Pb-S

Ru : Ti- ((Si)) - ((K?))

0 0.01mm

Open nicol

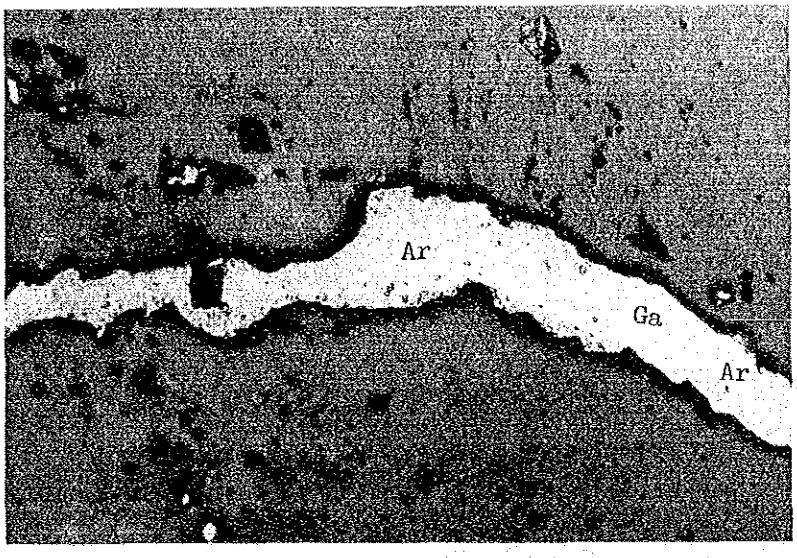



(13) Sample No. : MJP-12-1P@

Location : E=680.023
N=8331.110

Type of Ore : grey quartz vein with Sp, and Ga and Cp

open nicol



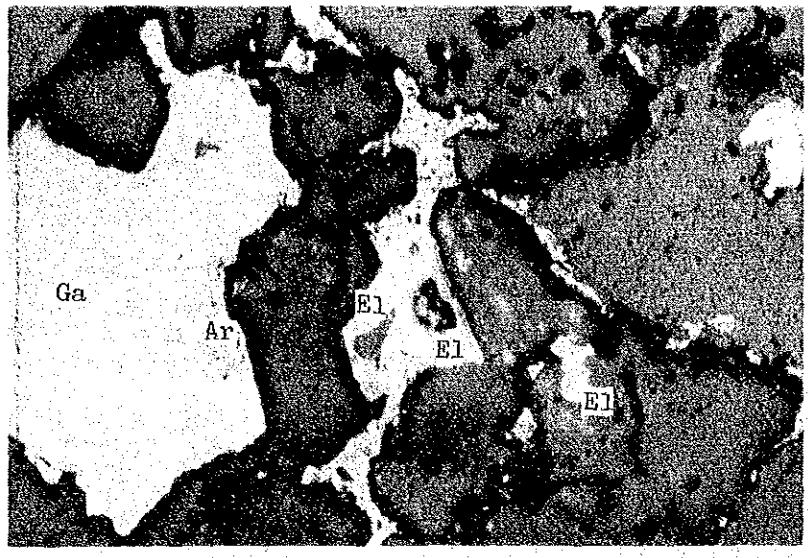

(14) Sample No. : MJP-12-1P⑥

Location : E=680.023
N=8331.110

Type of Ore : grey quartz vein with Sp, Ga and Cp

0 0.01mm

open nicol




open nicol

(15) Sample №. : MJP-12-1P©

Location : E=680.023
N=8331.110

Type of Ore : grey quartz vein with Sp, Ga and Cp

Remarks : Ga, Ar, El

$El_1$ : Au 51.54, Ag 48.35
Total 99.89wt%
Au 36.86, Ag 63.14
Total 100at%

$El_2$ : Au 51.54, Ag 46.74
Total 98.29%
Au 37.65, Ag 62.35
Total 100at%

Ar : Ag 87.50, Cu 1.47,
Zn 0.20, As 0.68, Sb 0.05,
S 12.99, Total 102.89wt%
Ag 64.79, Cu 1.85, Zn 0.25,
As 0.68, Sb 0.03, S 32.36,
Total 100at%


0 0.01mm

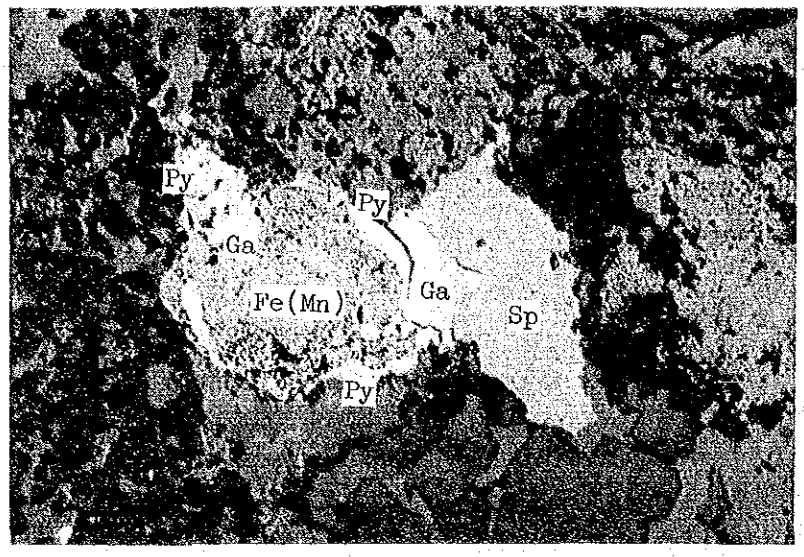
open nicol

(16) Sample №. : MJP-12-2P

Location : E=680.023
N=8331.110

Type of ore : dark grey quartz vein with black mineral and Py

Remarks : Py, Ru, Zr
Ru : Ti- ((Fe))
Zr : Zr-Si



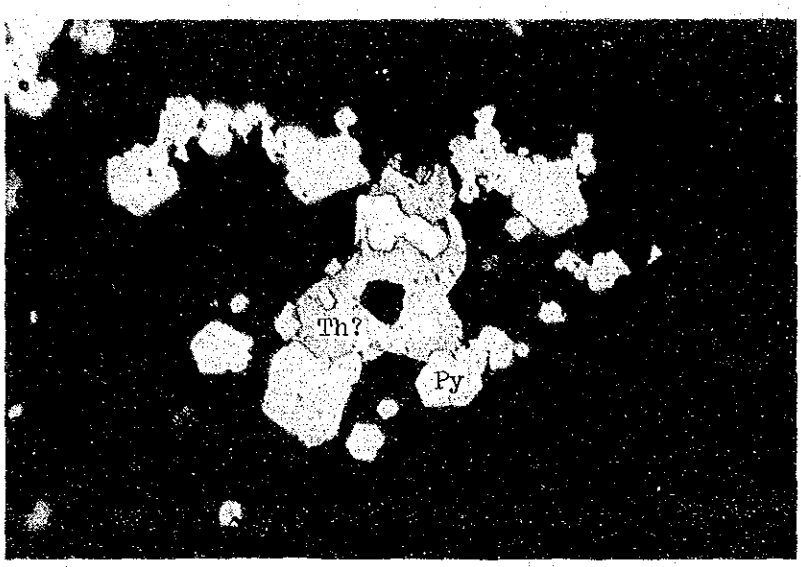

(17) Sample No. : MJP-12-3P
Location : E=680.023
N=8331.110
Type of Ore. : grey quartz vein with Py
Remarks : Sp, Ga, Py, Fe (Mn)
Fe (Mn) ; Fe- (Mn) - ((Cu)) - (S)

open nicol


(18) Sample No. : MJP-13-1P
Location : E=680.455
N=8330.305
Type of Ore : altered rock with Sp, Cp, Ga and Py
Remarks : Py, Cp

0 0.01mm

open nicol




(19) Sample No. : MJP-14-1P

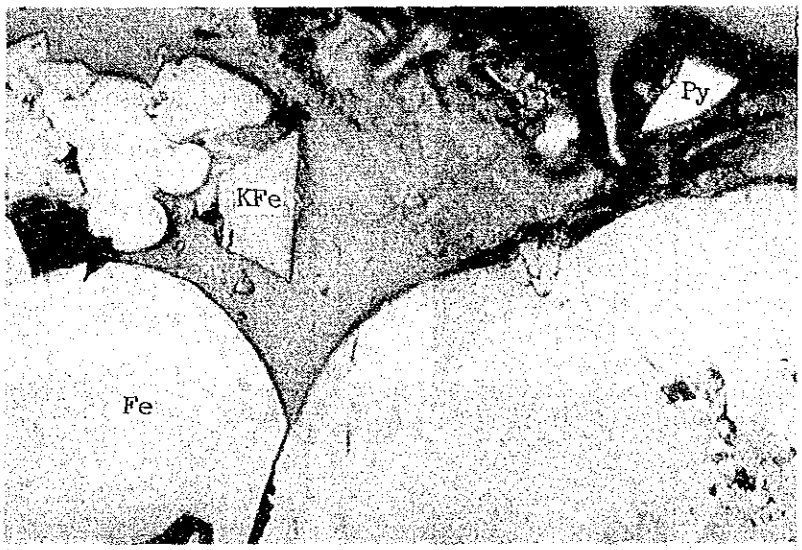
Location : E=683,210
N=8321,835

Type of Ore : white and dark grey quartz vein with Py

Remarks : Py, Th?

Th (?) ; Ag-Cu- (Zn) - (Fe) -Sb-S

open nicol




(20) Sample No. : MJP-14-2P

Location : E=683,210
N=8321,835

Type of Ore : silicified sandstone with iron oxides

Remarks : Fe, KFe, Py

Fe ; Fe- (S)

KFe ; K-Fe-S

0 0.01mm

open nicol

## Apx. 6 X-ray Diffractive Analyses of the Survey Area

| No. | Sample No. | Co ordinates | | Occurrence | Alteration mineral | | | | | | | | | | Metalic mineral | | | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | E (km) | N (km) | | Qz | Se | Ch | Am | Kf | Ca | Do | An | Gy | Ja | Py | Go | Gal | Sph | Ag | |
| 1 | N3-2X | 680.260 | 8330.865 | silicified rock and quartz veinlet with Sp. Ga. and black mineral | ◎ | * | | | ○ | | | | △ | | △ | | △ | ◎ | | |
| 2 | Mz-38X | 680.070 | 8330.870 | altered rock with iron oxides | ◎ | * | △ | | ◎ | | | | * | | * | | | * | | |
| 3 | Mz-15X | 680.570 | 8330.318 | brown altered rock with iron oxides | ◎ | △ | | | ◎ | | | | | | | | | | | |
| 4 | S5-5X | 680.580 | 8330.285 | altered rock with blackish brown clay | ◎ | * | | △ | ○ | | | | | | | * | | | | |
| 5 | S6-1X | 680.585 | 8330.250 | altered rock with brown and black clay | ◎ | * | | | △ | | ? | | * | | | * | | ? | | |
| 6 | SN-9-1X | 680.615 | 8330.210 | Sp-Ga-quartz veinlet | ◎ | | | | ○ | | | | ○ | | △ | | ○ | ◎ | ○ | |
| 7 | MT3-3X | 683.330 | 8321.715 | network of quartz vein | ◎ | | | | | * | | * | | | * | | * | * | | |

| No. | Dorill Hole No. | Co ordinates | | Sample No. | Depth (m) | Alteration mineral | | | | | | | | | | Metalic mineral | | | | | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | E (km) | N (km) | | | Qz | Se | Ch | Am | Kf | Ca | Do | An | Gy | Ja | Py | Go | Gal | Sph | Ag | |
| 8 | MJP-11 | 680.315 | 8331.305 | MJP-11X | 119.35m | ◎ | △ | | | ◎ | △ | | | | | △ | | ○ | | | quartz vein and silicified rock |
| 9 | MJP-12 | 680.023 | 8331.110 | MJP-12X | 113.62m | ◎ | △ | * | | ○ | | | | | | △ | | | | | dark grey quartz vein |
| 10 | MJP-13 | 680.455 | 8330.305 | MJP-13X | 203.70m | ◎ | △ | * | | ○ | ? | ○ | | | | ○ | | | | | strongly altered rock with Sp, Cp, Ga, Py veinlet |
| 11 | MJP-14 | 683.210 | 8321.835 | MJP-14X | 167.60m | ◎ | | | | | | | | | ◎ | | △ | | | | silicified sandstone with iron oxides |
| 12 | MJP-15 | 683.290 | 8321.845 | MJP-15X | 93.60m | | | | | | | | | | ◎ | | △ | | | | network of brown iron oxides |

Abbreviations

Qz : Quartz　Se : Sericite　Ch : Chlorite　Am : Amesite
Kf : Potassiu feldspar　Ca : Calcite　Do : Dolomite　An : Anhydrite
Gy : Gypsum　Ja : Jarosite　Py : Pyrite　Go : Goethite
Gal : Galena　Sph : Sphalerite　Ag : Ag mineral

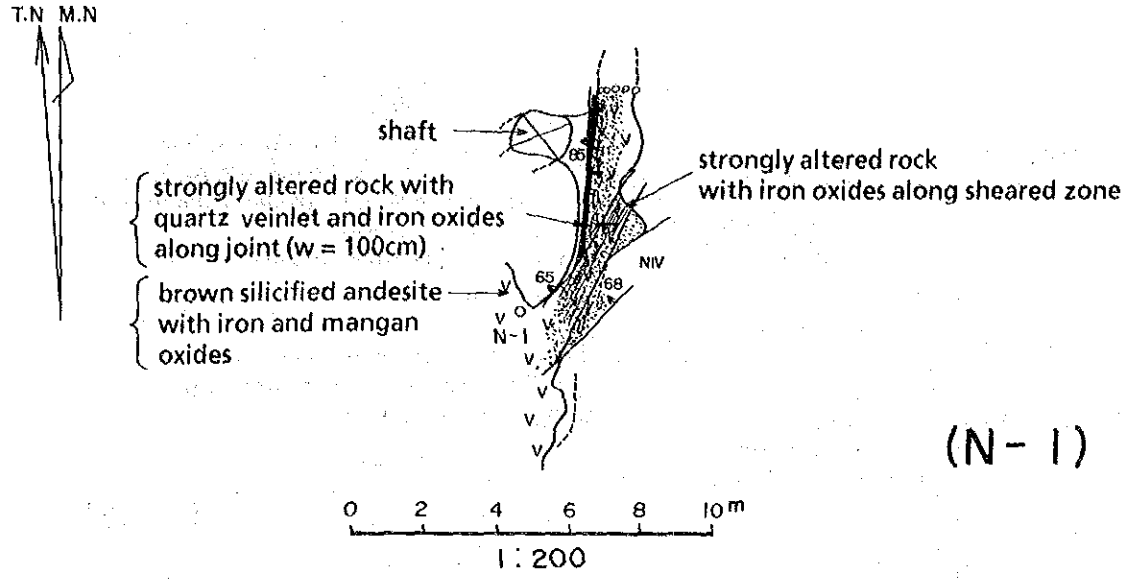
◎ : abundant　○ : common　△ : minor　* : minim　? : uncertainty

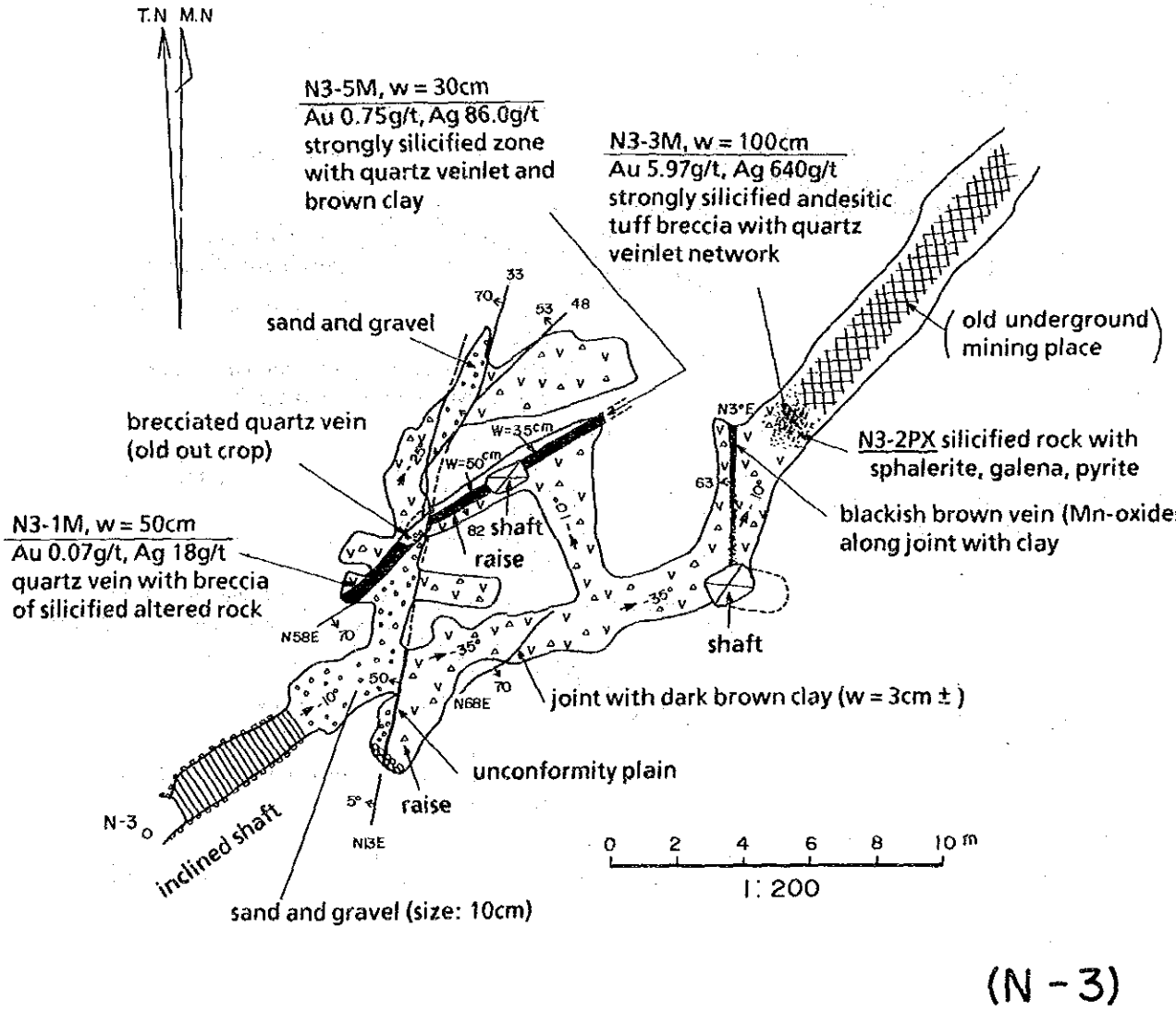
## Apx. 7 Results of Chemical Analyses of Altered Rock and Ore Samples

| Area | No. | Sample No. | Co-ordinates E (km) | Co-ordinates N (km) | Type of Samples | Width of Sample (m) | Au g/t | Ag g/t |
|---|---|---|---|---|---|---|---|---|
| Mineralization Zone of Northern Part | 1 | N-3-1M | 680.260 | 8330.865 | quarty vein with breccia of silicified rock | 0.50 | 0.07 | 18.0 |
| | 2 | 3M | 680.260 | 8330.865 | silicified andesitic tuff breccia with quartz veinlet network | 1.00 | 5.97 | 640 |
| | 3 | 5M | 680.260 | 8330.865 | strongly silicified zone with quartz veinlet and brown clay | 0.30 | 0.75 | 86.0 |
| | 4 | N-6-4M | 680.060 | 8330.865 | brown to dark brown sheared zone with quartz veinlet | 0.50 | 0.89 | 390 |
| | 5 | N-7-MZ-37M | 680.070 | 8330.870 | sheared zone with iron and mangan oxides | 0.30 | 0.82 | 205 |
| | 6 | N-8-N8-2M | 680.080 | 8330.875 | sheared zone with brown to reddish brown iron oxides | 0.50 | 0.89 | 178 |
| Mineralization Zone of Southern Part | 7 | SN-1-MZ-17M | 680.625 | 8330.373 | strongly altered rock with argillization | 0.50 | 0.41 | 33.0 |
| | 8 | SN-3-MZ-24M | 680.560 | 8330.328 | sheared zone with quartz veinlet and limonite stain | 0.25 | 1.17 | 55.0 |
| | 9 | SN-4-MZ-16M | 680.570 | 8330.318 | brown altered rock with iron oxides | 0.30 | 3.36 | 142 |
| | 10 | S-5-5M | 680.580 | 8330.285 | dark brown to brown clay along sheared zone | 0.15 | 21.50 | 410 |
| | 11 | 6M | 680.580 | 8330.285 | brown clay (w=3cm) and sheared part (w=17cm) | 0.20 | 11.10 | 890 |
| | 12 | S-6-1M | 680.585 | 8330.250 | brown and black clay along sheared zone | 0.10 | 10.10 | 540 |
| | 13 | SN-7-MZ-12M | 680.605 | 8330.225 | strongly altered rock with iron oxides | 0.45 | 0.14 | 10.5 |
| | 14 | SN-8-MZ-10M | 680.615 | 8330.210 | ditto | 0.45 | 0.55 | 31.5 |
| | 15 | SN-9-MZ-11M | 680.615 | 8330.210 | silicified zone with Sp, Ga, Py and iron oxides | 0.30 | 20.10 | 1200 |
| | 16 | S-12-1M | 680.660 | 8330.180 | sheared zone with quartz veinlet | 0.60 | 1.85 | 108 |
| | 17 | SN-15-MZ-22M | 680.645 | 8330.375 | altered andesite with quartz veinlet | 1.00 | 0.14 | 29.0 |
| | 18 | S-16-1M | 680.560 | 8330.210 | brown clay along joint | 0.40 | 14.50 | 90.0 |
| | 19 | 2M | 680.560 | 8330.210 | sheared zone, argillization and silicification | 0.80 | 0.82 | 43.0 |
| | 20 | SN-18-MZ-34M | 680.575 | 8330.240 | silicified altered rock with iron oxides | 1.20 | 0.48 | 22.5 |
| | 21 | MZ-35M | 680.575 | 8330.240 | sheared zone with iron oxides | 0.30 | 1.23 | 18.5 |
| Trenches | 22 | TC-1-2M | 680.570 | 8330.270 | silicified altered rock with quartz vein network | 0.20 | 0.69 | 71.0 |
| | 23 | 6M | 680.570 | 8330.270 | silicified dacite with mangan oxides and quartz veinlet | | 0.07 | 5.0 |
| | 24 | TC-2-2M | 680.580 | 8330.230 | quartz vein with mangan oxides | 0.20 | 0.07 | 8.0 |
| | 25 | TC-3-1M | 680.540 | 8330.215 | altered andesite with brown iron oxides | | <0.07 | 1.0 |
| | 26 | TC-5-4M | 680.185 | 8330.913 | brown silicified andesite with quartz veinlet | 2.00 | 0.07 | 43.5 |
| | 27 | 7M | 680.185 | 8330.913 | grey to brownish grey quartz vein | 0.15 | <0.07 | 2.8 |
| Outcrops of Q.Querumahuaico | 28 | 50-1M | 680.040 | 8329.958 | strongly silicified rock with white clay | 1.50 | 0.27 | 7.0 |
| | 29 | 50-2M | 680.040 | 8329.958 | ditto | 0.70 | 0.27 | 3.9 |
| | 30 | 50-3M | 680.040 | 8329.958 | strongly silicified rock | 0.40 | 2.30 | 2.0 |
| | 31 | 51M | 680.040 | 8329.950 | altered zone with quartz veinlet network | spot | 0.14 | 2.3 |
| | 32 | 52M | 680.045 | 8329.940 | lenticular quartz vein | 0.20 | 0.07 | 9.0 |
| | 33 | 53M | 680.065 | 8329.935 | lenticular strongly silicified rock | 0.50 | <0.07 | 1.9 |
| | 34 | 54M | 680.065 | 8329.925 | ditto | spot | 0.82 | 1.3 |
| | 35 | 55M | 680.098 | 8329.920 | ditto | 1.00 | 0.07 | 1.9 |
| | 36 | 56M | 680.125 | 8329.933 | silicified zone and white clay zone | 1.10 | <0.07 | 1.0 |
| | 37 | 57M | 680.160 | 8329.918 | lenticular silicified zone | 0.50 | 0.21 | 0.3 |
| | 38 | 58M | 680.170 | 8329.915 | silicified rock with black band | 1.20 | 0.55 | 0.5 |
| | 39 | 59M | 680.213 | 8329.900 | strongly silicified zone | 6.80 | 3.70 | 2.0 |
| | 40 | 60M | 680.205 | 8329.900 | yellowish brown clay and breccia | 0.20 | 0.34 | 9.5 |
| | 41 | 61M | 680.270 | 8329.885 | argillized zone with lenticular silicified zone | 1.60 | <0.07 | 0.3 |
| | 42 | 62M | 680.310 | 8329.905 | yellowish green clay with mangane oxides | 3.00 | <0.27 | 0.3 |
| | 43 | 63M | 680.310 | 8329.910 | strongly silicified zone with quartz crystal in druse | 2.20 | Tr | 1.0 |
| | 44 | 64M | 680.315 | 8329.915 | brecciated zone with lenticular silicified rock | 2.00 | <0.07 | 0.3 |
| Marcamalate Area | 45 | SM-2-1M | 683.220 | 8321.775 | brown clay along joint | 0.05 | 1.99 | 440 |
| | 46 | MZ-30M | 683.220 | 8321.775 | sheared zone along joint with brown iron oxides | 0.20 | 0.41 | 90.0 |
| | 47 | SM-4-MZ-31M | 683.238 | 8321.763 | sheared zone with iron oxides | spot | 0.14 | 47.5 |
| | 48 | SM-8-MZ-32M | 683.318 | 8321.735 | argillized altered rock with dissemination of pyrite | spot | 0.69 | 14.5 |
| | 49 | SM-9-MZ-33M | 683.335 | 8321.730 | argillized altered rock | spot | 0.21 | 54.0 |

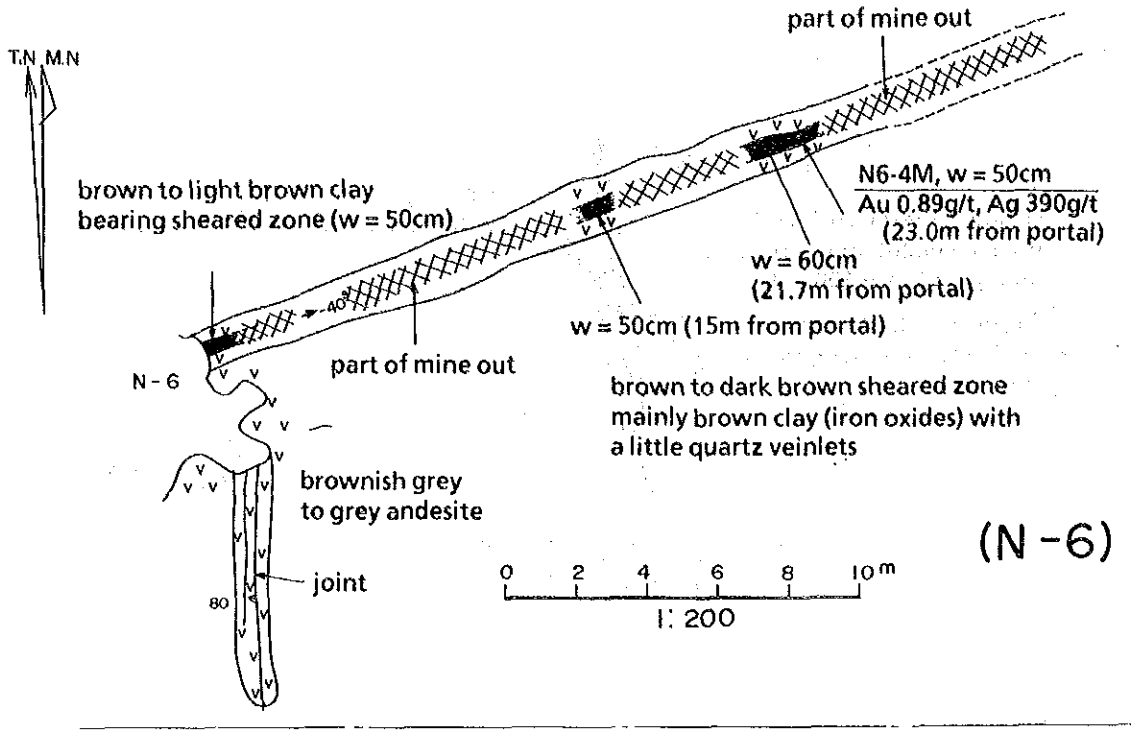
## Apx. 8 Results of Chemical Analyses of Altered Drilling Core and Ore Samples

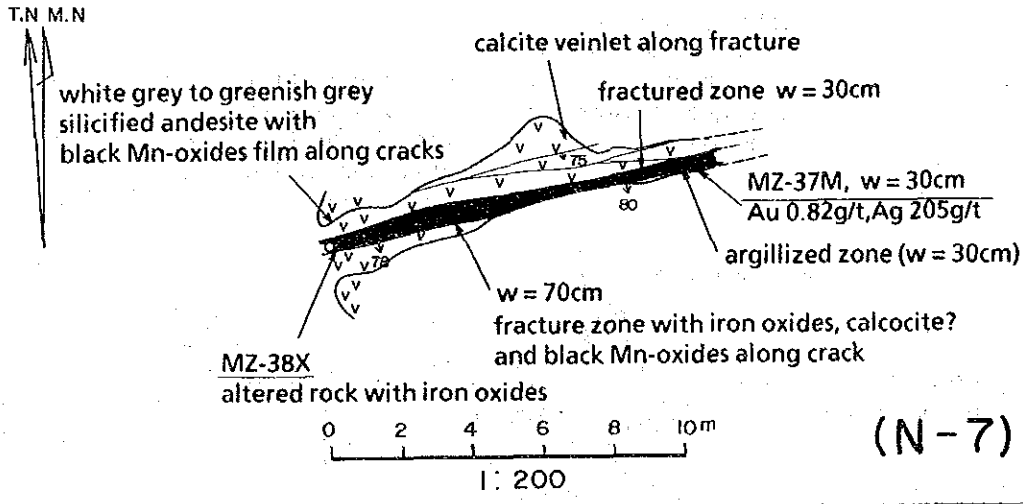
| Drilling No. | Sample No. | Depth (m) ~ (m) | Type of Sample | width (m) | Au g/t | Ag g/t | Cu % | Pb % | Zn % |
|---|---|---|---|---|---|---|---|---|---|
| MJP-11 | 1 | 119.35 - 119.70 | quartz vein | 0.35 | 0.41 | 104.0 | 0.34 | 2.96 | 0.01 |
| | 2 | 119.70 - 120.10 | strongly silicified rock | 0.40 | 0.14 | 32.3 | 0.08 | 0.29 | <0.01 |
| | 3 | 120.10 - 120.95 | strongly bleached rock | 0.85 | 0.14 | 28.3 | 0.03 | 0.17 | 0.02 |
| MJP-12 | 1 | 65.35 - 65.50 | quartz vein | 0.15 | 0.27 | 14.0 | - | - | - |
| | 2 | 75.40 - 75.60 | silicified rock | 0.20 | 3.54 | 705 | - | - | - |
| | 3 | 84.05 - 84.15 | quartz vein | 0.10 | 0.14 | 13.3 | - | - | - |
| | 4 | 111.92 - 112.52 | silicified rock | 0.60 | 0.07 | 56.5 | <0.01 | 0.01 | 0.10 |
| | 5 | 112.52 - 112.95 | ditto | 0.43 | 0.14 | 3.6 | <0.01 | <0.01 | <0.01 |
| | 6 | 112.95 - 114.50 | quartz vein and silicified rock | 1.55 | 0.21 | 22.3 | <0.01 | <0.01 | 0.06 |
| | 7 | 121.00 - 122.00 | silicified rock | 1.00 | 0.27 | 15.3 | - | - | - |
| | 8 | 186.30 - 186.50 | ditto | 0.20 | 0.07 | 3.0 | - | - | - |
| | 9 | 189.00 - 189.30 | black lenticular vein | 0.30 | 13.10 | 360 | - | - | - |
| | 10 | 193.70 - 193.80 | quartz vein | 0.10 | 0.14 | 3.6 | - | - | - |
| | 11 | 212.30 - 212.55 | ditto | 0.25 | 0.27 | 5.3 | - | - | - |
| | 12 | 212.55 - 212.75 | black vein | 0.20 | 0.48 | 7.3 | - | - | - |
| | 13 | 212.75 - 213.10 | grey quartz vein | 0.35 | 0.21 | 5.8 | - | - | - |
| | 14 | 213.30 - 214.00 | ditto | 0.70 | 0.21 | 6.3 | - | - | - |
| | 15 | 247.70 - 248.40 | quartz vein | 0.70 | <0.07 | 1.3 | - | - | - |
| MJP-13 | 1 | 156.90 - 157.55 | quartz vein network | 0.65 | <0.07 | 3.6 | - | - | - |
| | 2 | 199.45 - 199.60 | silicified rock with Cp, Sp | 0.15 | 2.33 | 8.0 | 0.03 | 0.33 | 0.48 |
| | 3 | 199.60 - 200.60 | silicified rock | 1.00 | 0.27 | 1.9 | <0.01 | 0.06 | 0.03 |
| | 4 | 200.60 - 201.14 | ditto | 0.54 | 0.48 | 6.3 | 0.06 | 0.14 | 0.29 |
| | 5 | 201.14 - 201.30 | quartz vein network with Cp, Sp, Ga | 0.16 | 5.04 | 45.0 | 0.79 | 1.37 | 1.30 |
| | 6 | 201.30 - 202.05 | silicified rock | 0.75 | <0.07 | 2.3 | <0.01 | 0.03 | 0.07 |
| | 7 | 202.05 - 202.75 | ditto | 0.70 | 0.07 | 4.1 | 0.03 | 0.04 | 0.13 |
| | 8 | 202.75 - 203.50 | silicified rock with Cp, Sp | 0.75 | <0.07 | 5.0 | 0.06 | 0.12 | 0.14 |
| | 9 | 203.50 - 204.20 | quartz vein network with Cp, Sp, Ga | 0.70 | 0.21 | 18.0 | 0.18 | 0.86 | 1.62 |
| | 10 | 204.20 - 205.05 | silicified rock | 0.85 | <0.07 | 1.3 | <0.01 | 0.01 | 0.02 |
| MJP-14 | 1 | 8.90 - 10.15 | quartz vein network | 1.25 | <0.07 | 2.3 | - | - | - |
| | 2 | 10.15 - 11.60 | ditto | 1.45 | <0.07 | 1.9 | - | - | - |
| | 3 | 11.60 - 12.75 | ditto | 1.15 | <0.07 | 0.3 | - | - | - |
| | 4 | 14.15 - 14.25 | white quartz vein | 0.10 | <0.07 | <0.3 | - | - | - |
| | 5 | 17.40 - 17.50 | ditto | 0.10 | <0.07 | 0.3 | - | - | - |
| | 6 | 18.40 - 18.47 | grey quartz vein | 0.07 | <0.07 | 0.3 | - | - | - |
| | 7 | 23.15 - 23.25 | ditto | 0.10 | <0.07 | 0.5 | - | - | - |
| | 8 | 28.50 - 29.65 | reddish brown quartz vein | 1.15 | <0.07 | 0.5 | - | - | - |
| | 9 | 29.65 - 30.70 | ditto | 1.05 | <0.07 | 3.3 | - | - | - |
| | 10 | 115.40 - 115.60 | grey shale with pyrite | 0.20 | <0.07 | 2.5 | - | - | - |
| | 11 | 165.30 - 165.70 | quartz vein | 0.40 | <0.07 | 2.3 | - | - | - |
| | 12 | 165.70 - 166.55 | quartz vein network | 0.85 | <0.07 | 2.5 | - | - | - |
| | 13 | 167.30 - 167.85 | ditto | 0.55 | <0.07 | 0.5 | - | - | - |
| | 14 | 167.85 - 168.55 | ditto | 0.70 | <0.07 | 0.5 | - | - | - |
| | 15 | 179.22 - 179.40 | white and grey quartz vein | 0.18 | 0.07 | 2.5 | - | - | - |
| MJP-15 | 1 | 32.70 - 33.45 | quartz vein network | 0.75 | <0.07 | 1.9 | - | - | - |
| | 2 | 33.45 - 34.20 | ditto | 0.75 | <0.07 | 1.0 | - | - | - |
| | 3 | 35.00 - 36.00 | brown iron oxides network | 1.00 | <0.07 | 0.3 | - | - | - |
| | 4 | 63.70 - 64.00 | iron oxides with pyrite | 0.30 | 0.07 | 0.3 | - | - | - |
| | 5 | 68.35 - 69.55 | disseminated of pyrite | 1.20 | <0.07 | 1.3 | - | - | - |
| | 6 | 82.75 - 83.80 | quartz vein network | 1.05 | <0.07 | 0.5 | - | - | - |
| | 7 | 84.50 - 85.00 | quartz vein | 0.50 | <0.07 | 0.8 | - | - | - |
| | 8 | 92.20 - 93.10 | silicified rock with pyrite | 0.90 | <0.07 | 0.3 | - | - | - |
| | 9 | 93.10 - 93.80 | veinlet of iron oxides | 0.70 | <0.07 | 2.8 | - | - | - |
| | 10 | 197.45 - 197.80 | pyrite veinlet network | 0.35 | <0.07 | 1.9 | - | - | - |

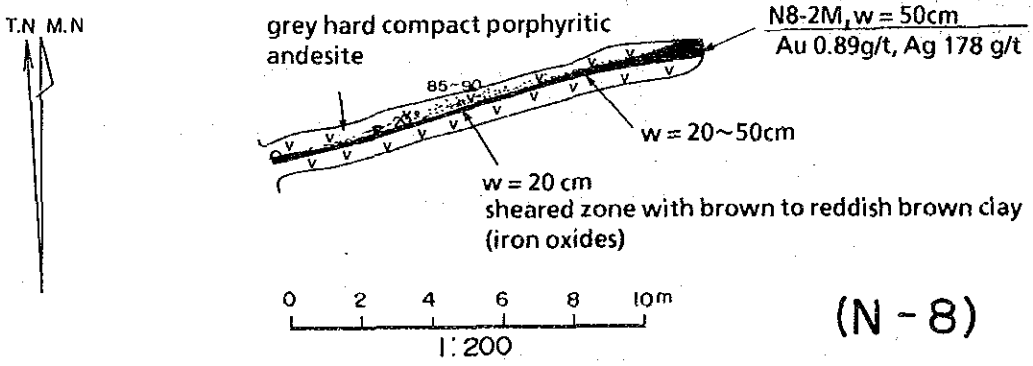


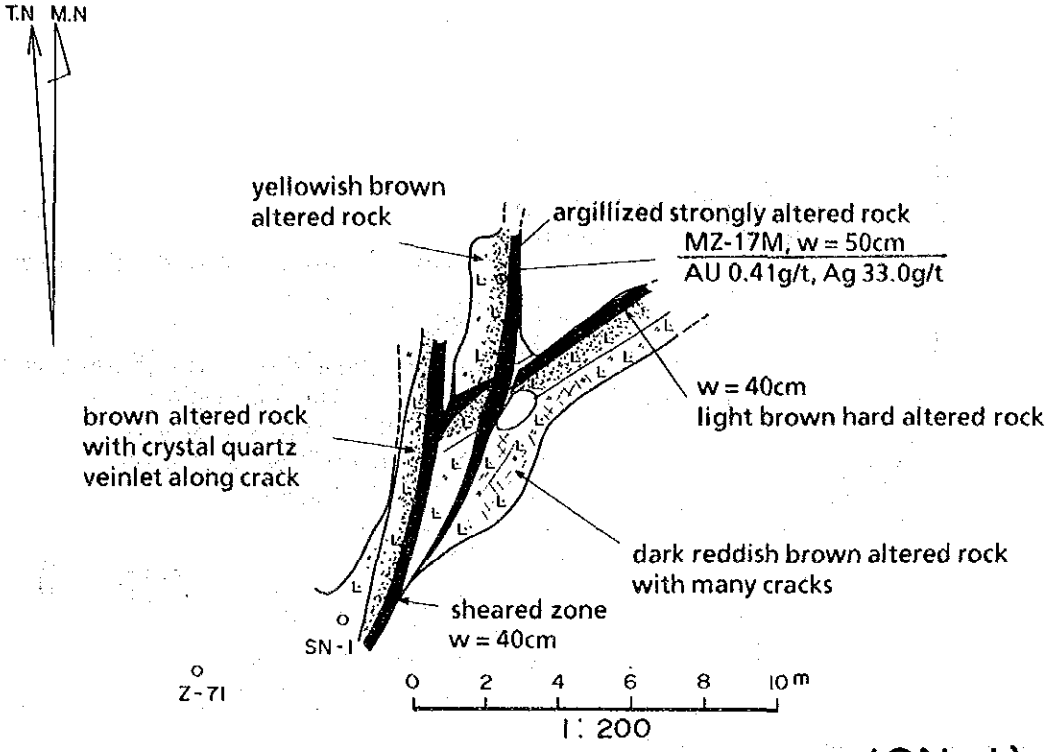

Apx. 9 Geological Sketch Map of Tunnel N-1, N-3 in North of the Colpar Area



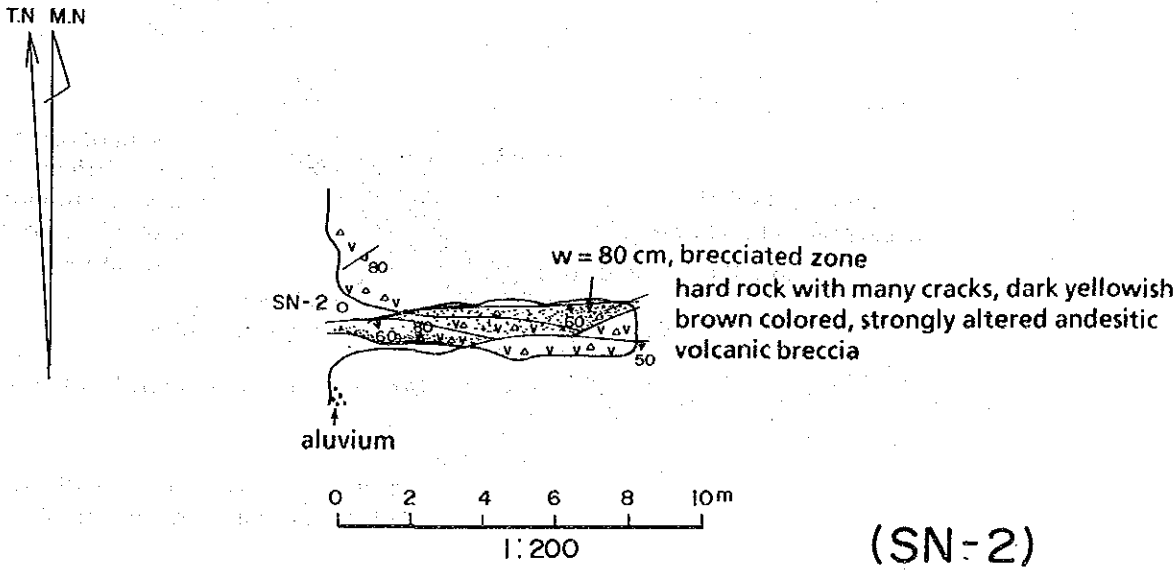




Apx. 10 Geological Sketch Map of Tunnel N-6, N-7, N-8 in North of the Colpar Area

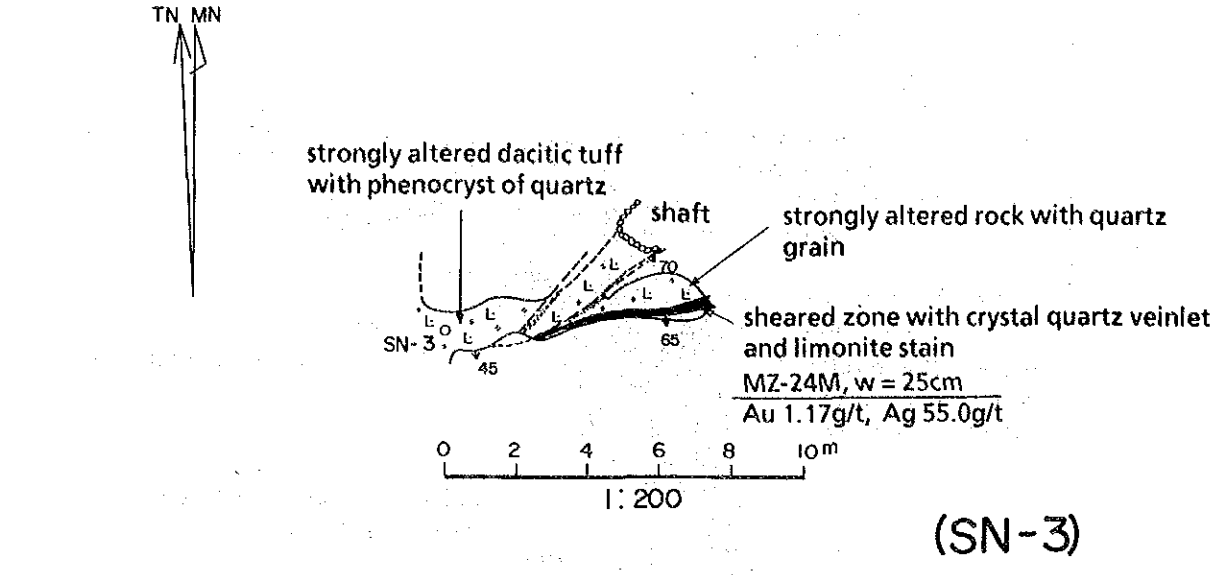


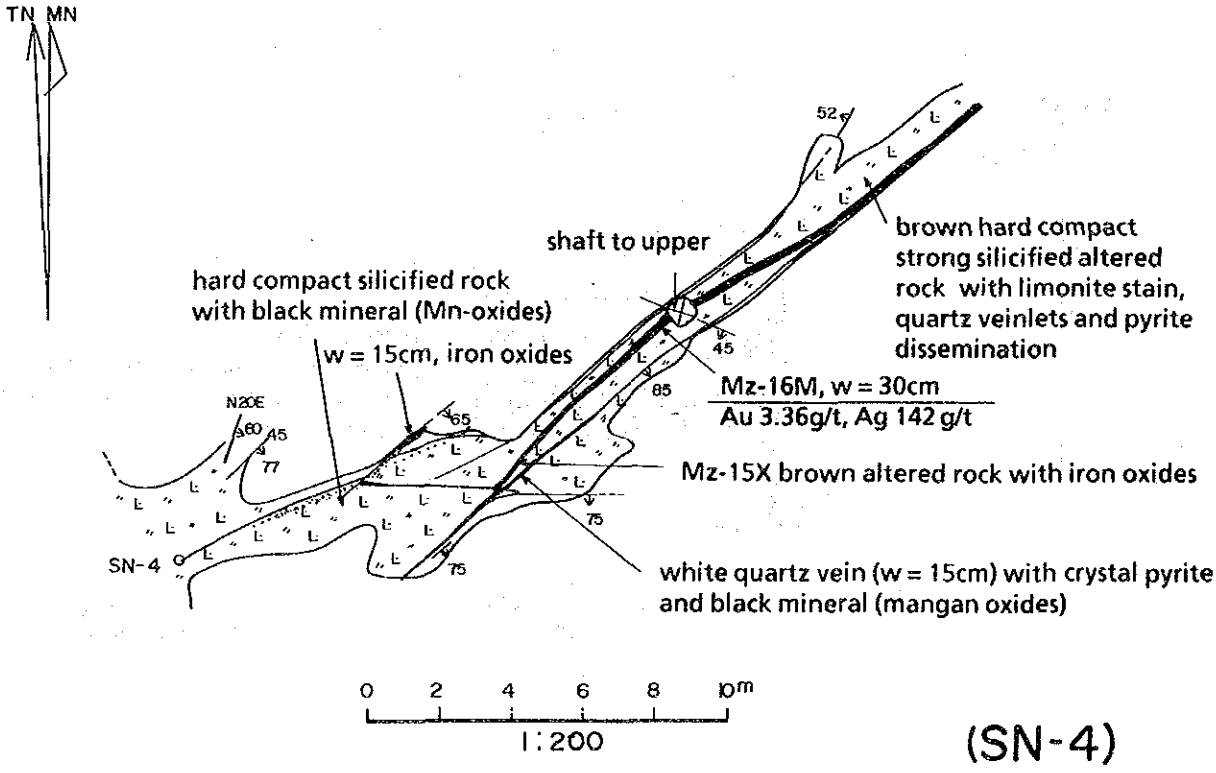

(SN-1)



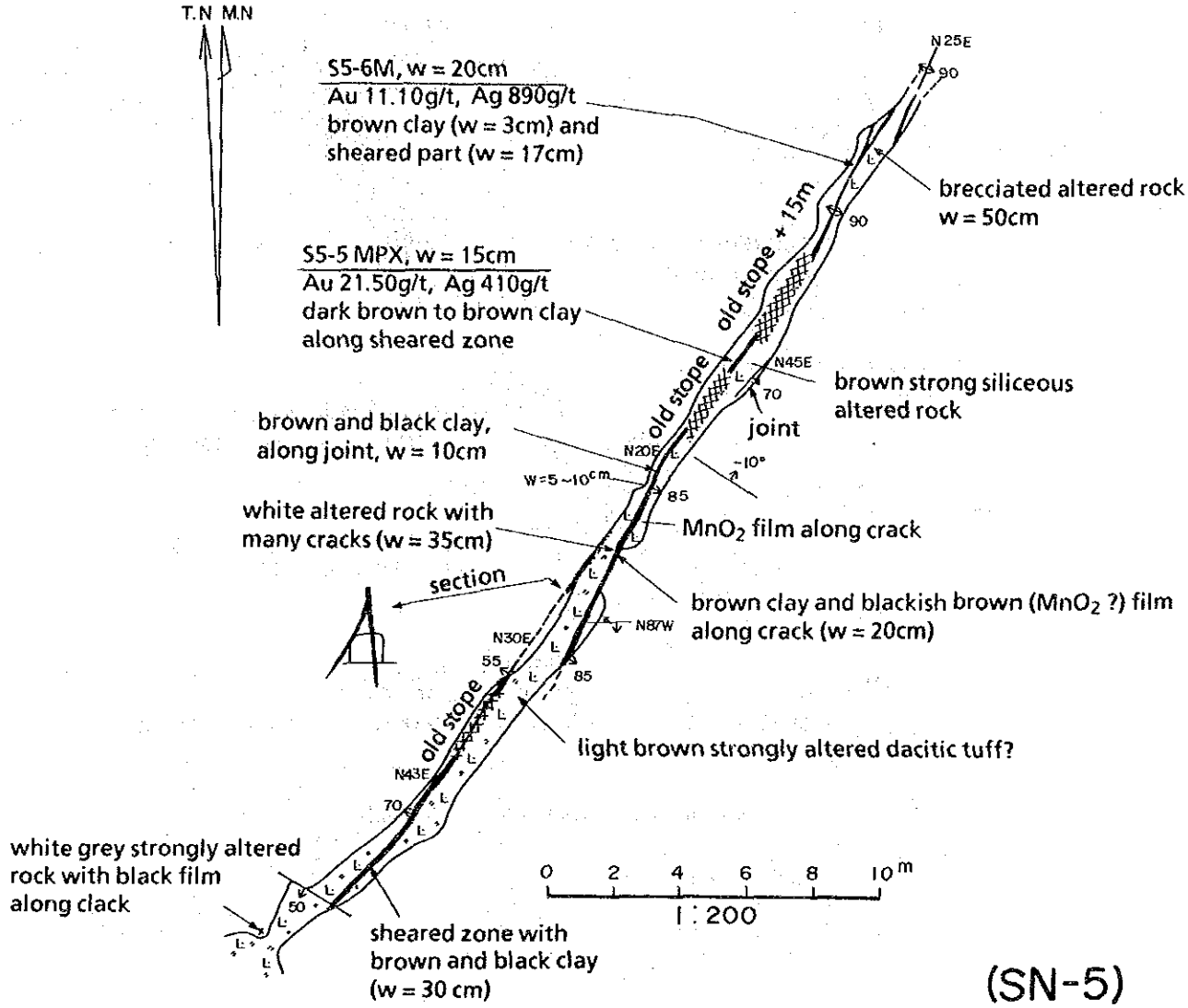

(SN-2)

Apx. I I Geological Sketch Map of Tunnel SN-1, SN-2 in South of the Colpar Area

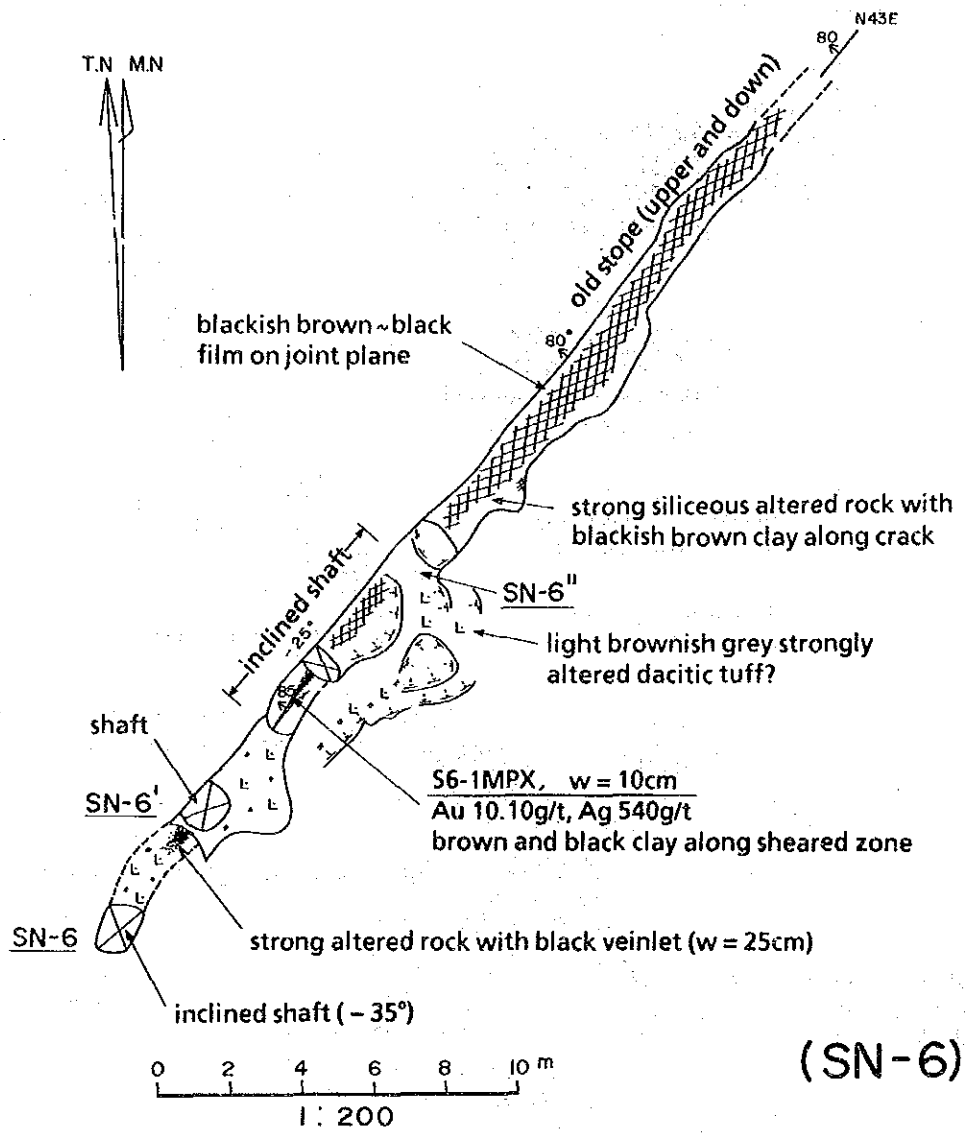


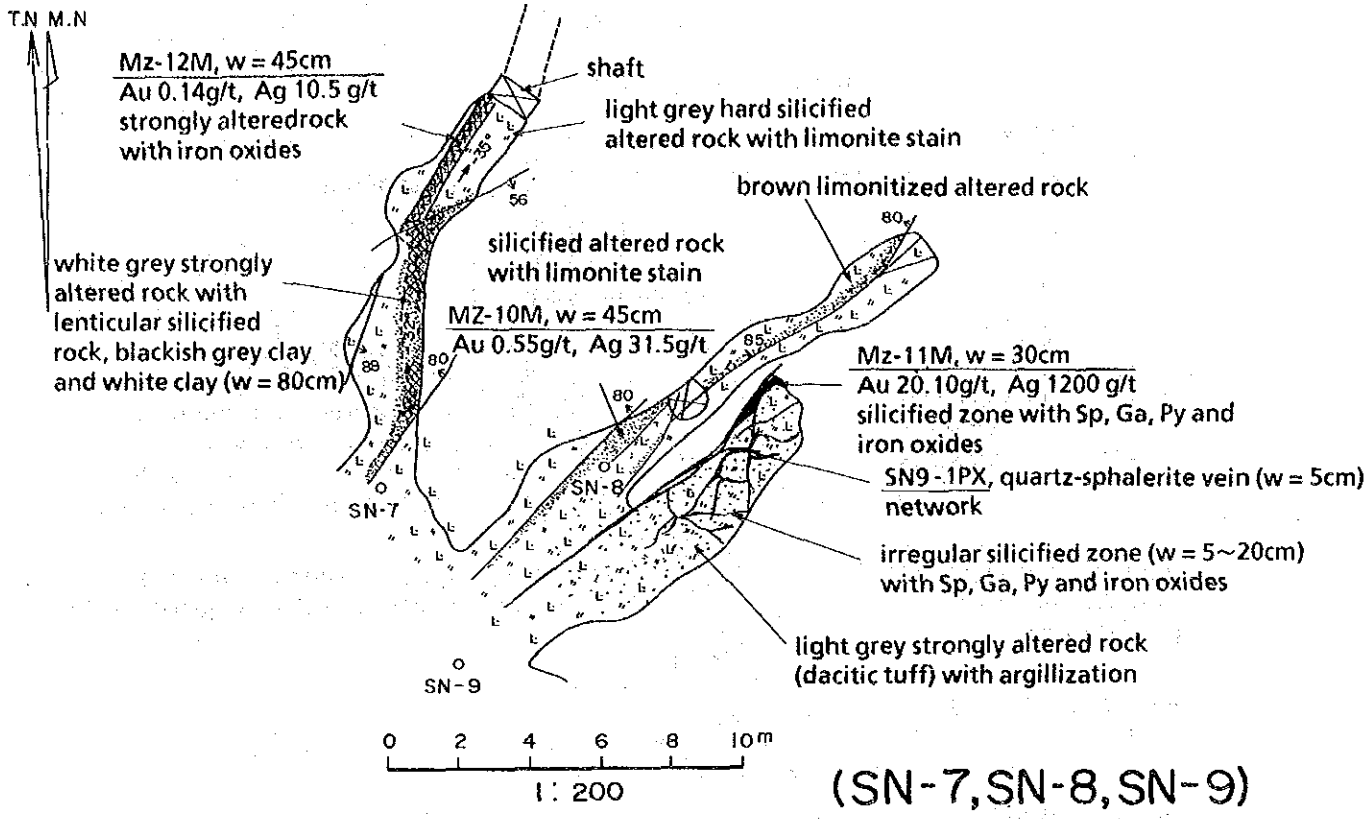

Apx. I2 Geological Sketch Map of Tunnel SN-3, SN-4 in South of the Colpar Area

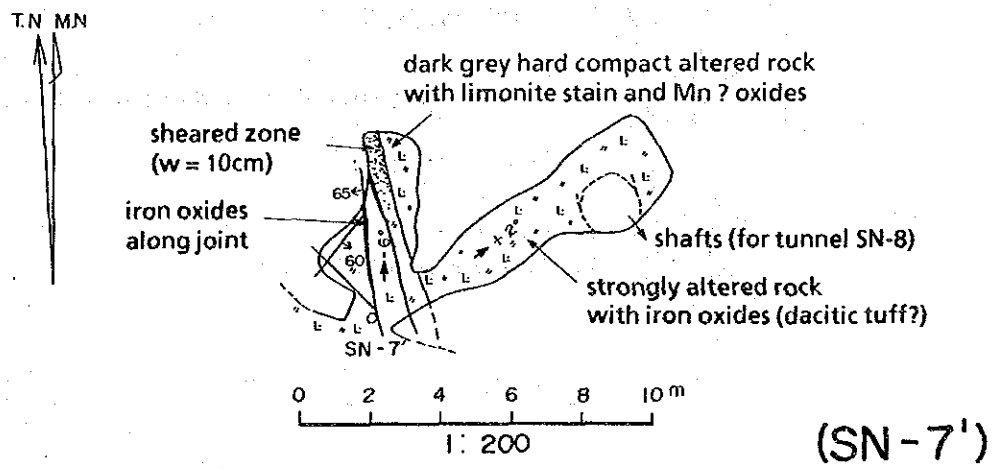



Apx.13 Geological Sketch Map of Tunnel SN-5 in South of the Colpar Area

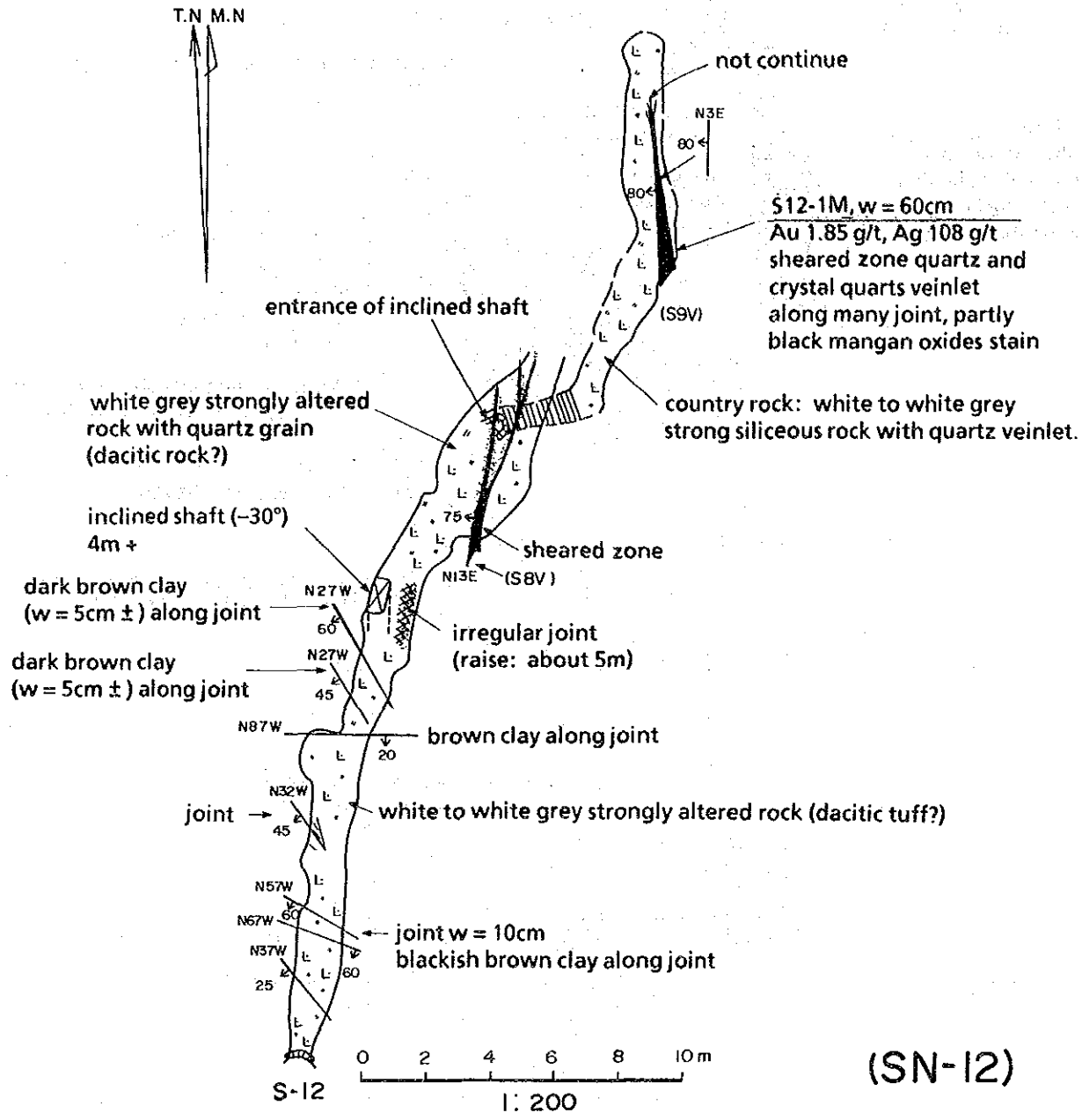



Apx.14 Geological Sketch Map of Tunnel SN-6 in South of the Colpar Area

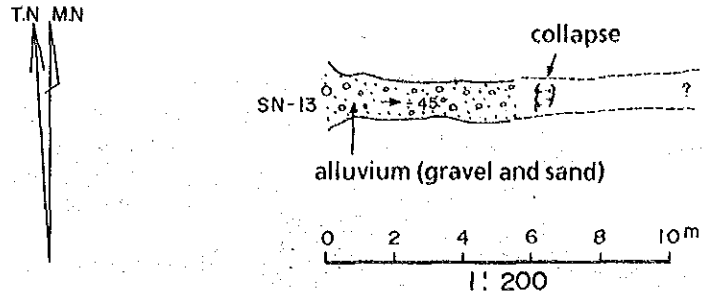


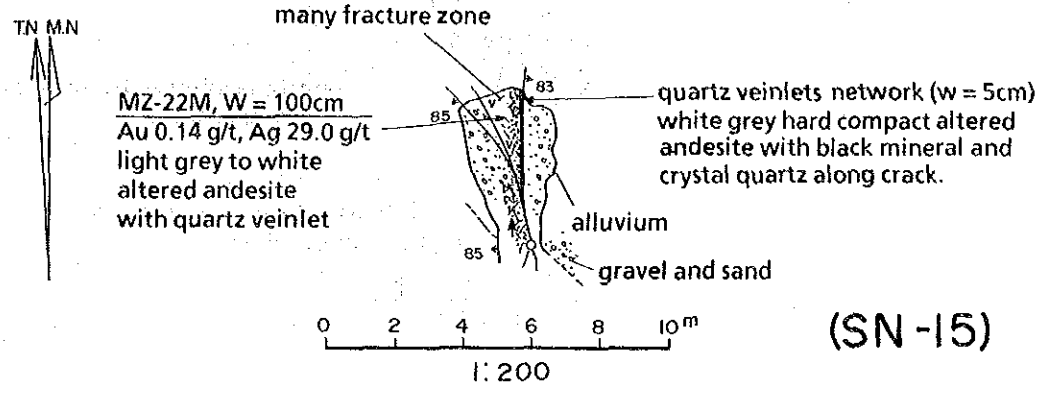

Apx.15 Geological Sketch Map of Tunnel SN-7, SN-7', SN-8, SN-9 in South of the Colpar Area



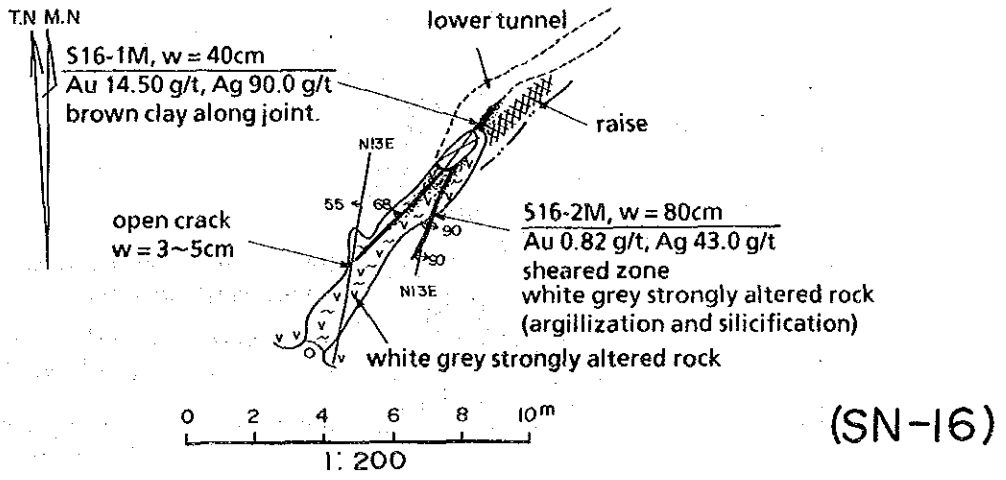

Apx. 16 Geological Sketch Map of Tunnel SN-12 in South of the Colpar Area



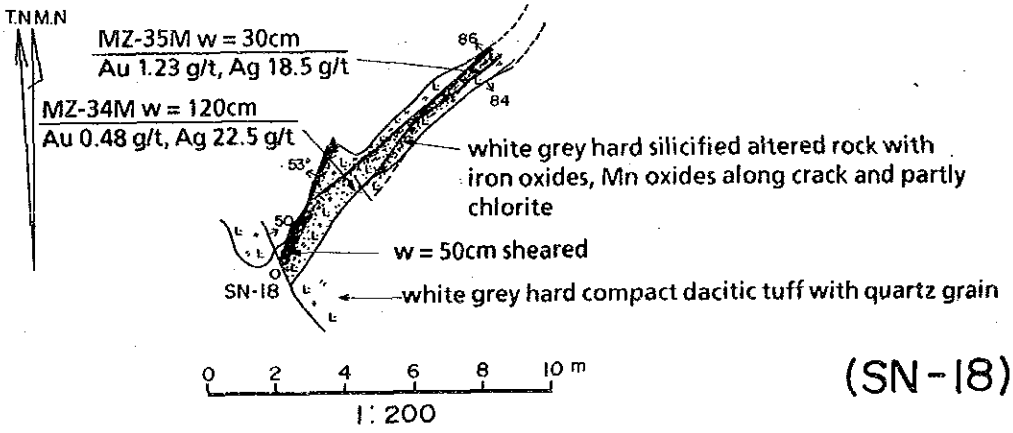

(SN-13)




(SN-15)

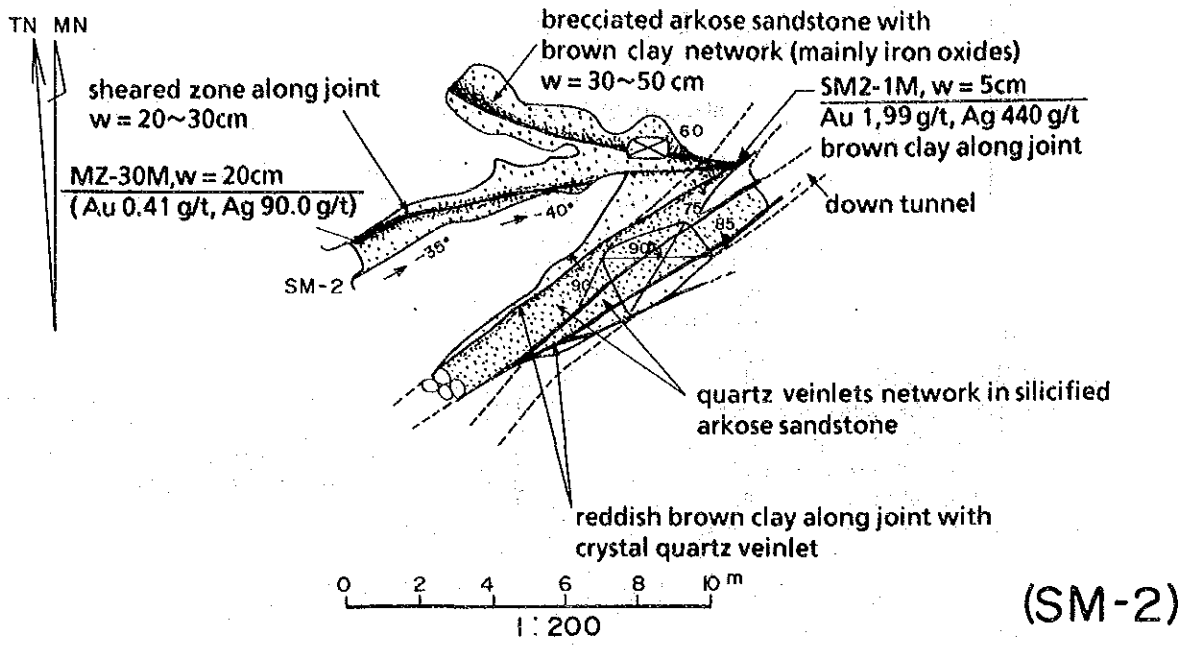



(SN-16)

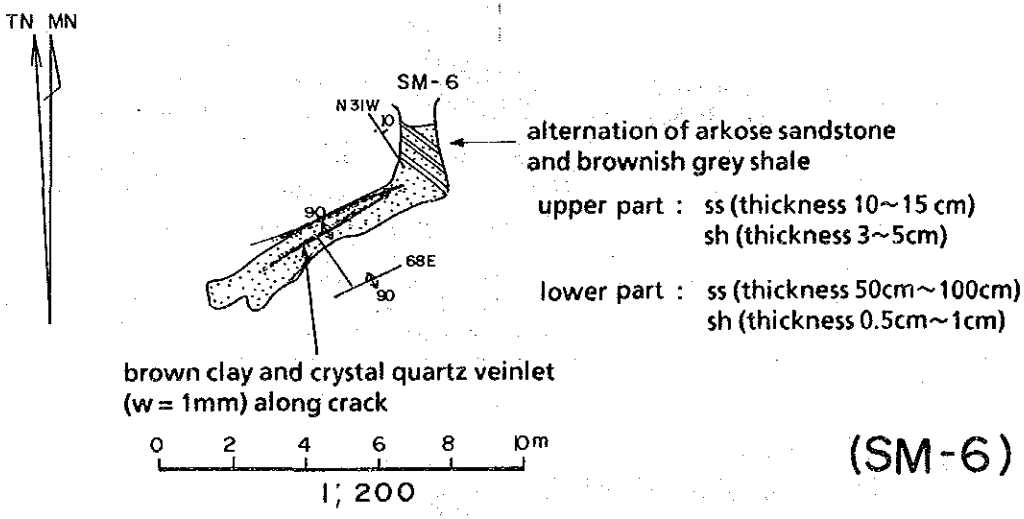



(SN-18)

Apx. I7 Geological Sketch Map of Tunnel SN-13, SN-15, SN-16, SN-18 in South of the Colpar Area

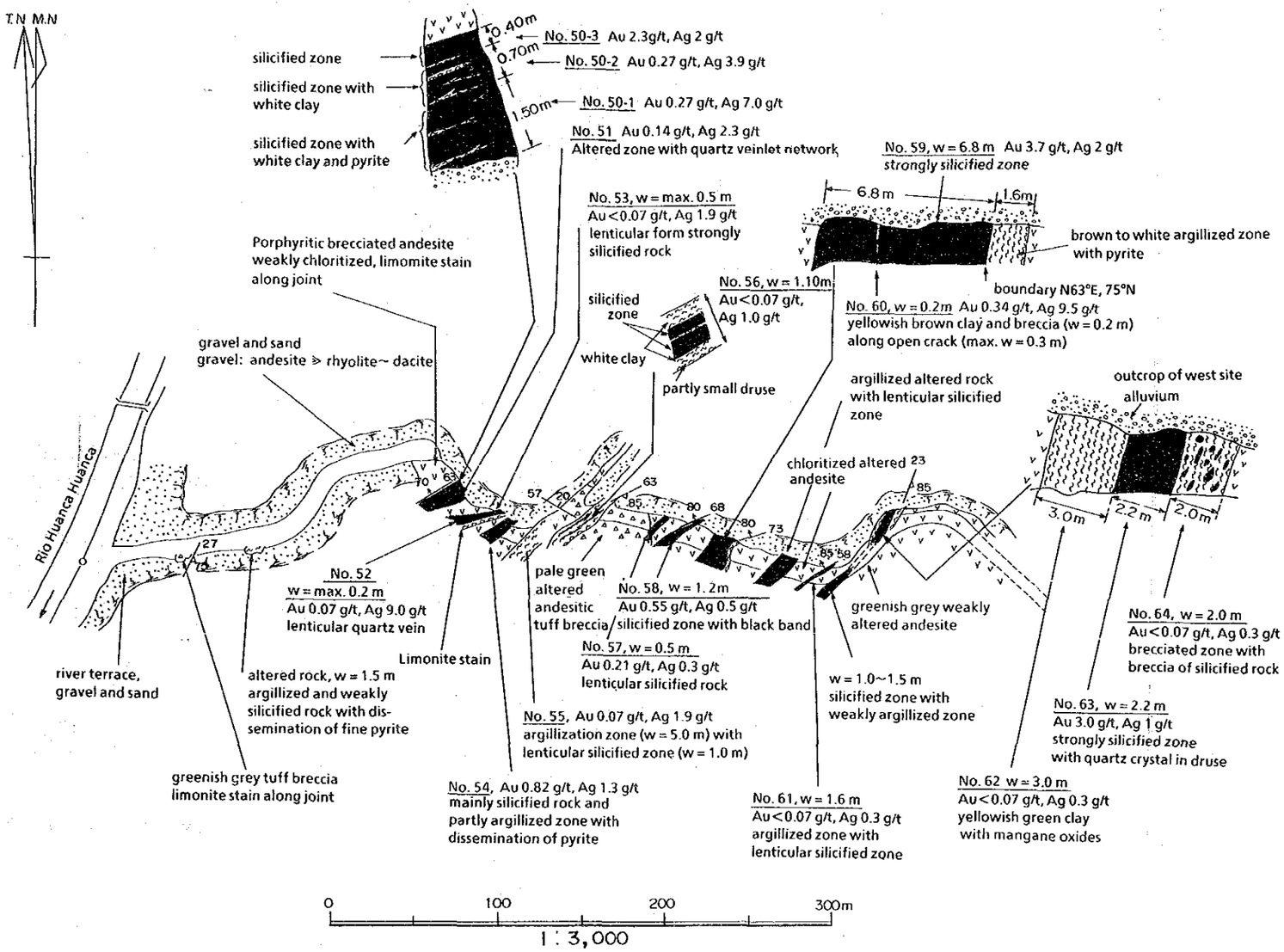



(SM-2)

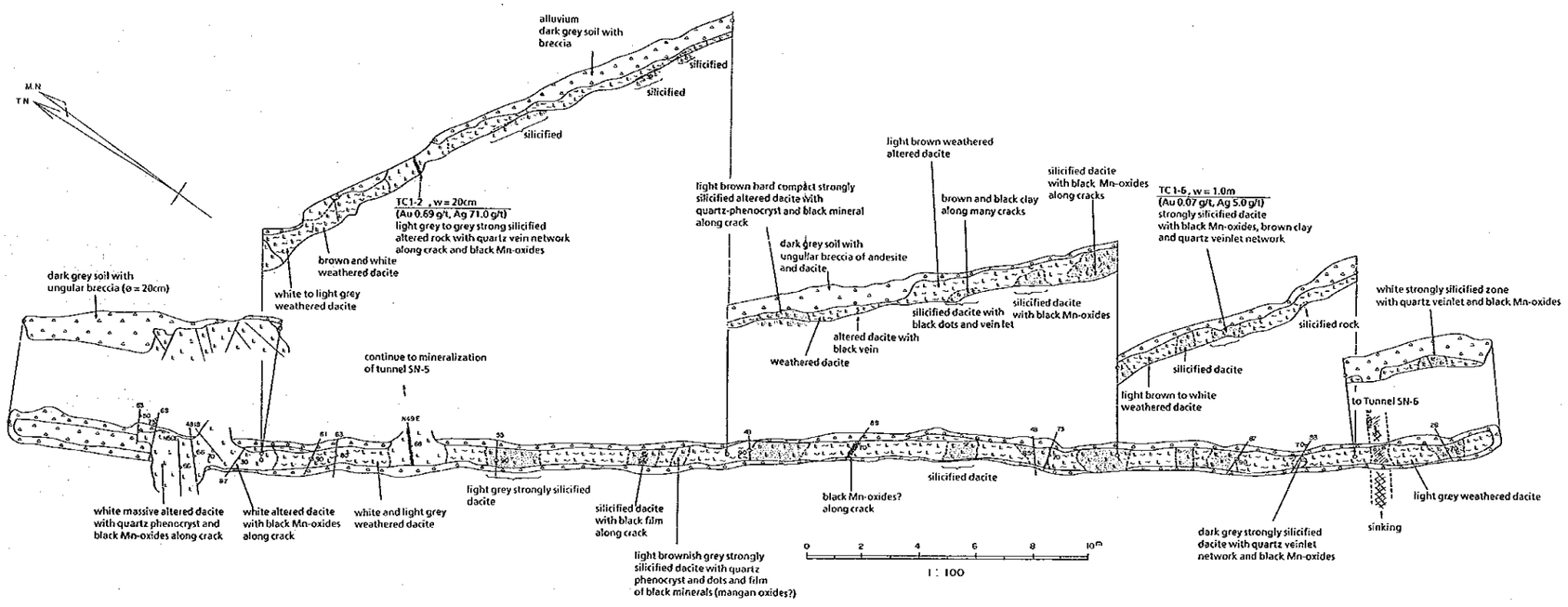



(SM-6)

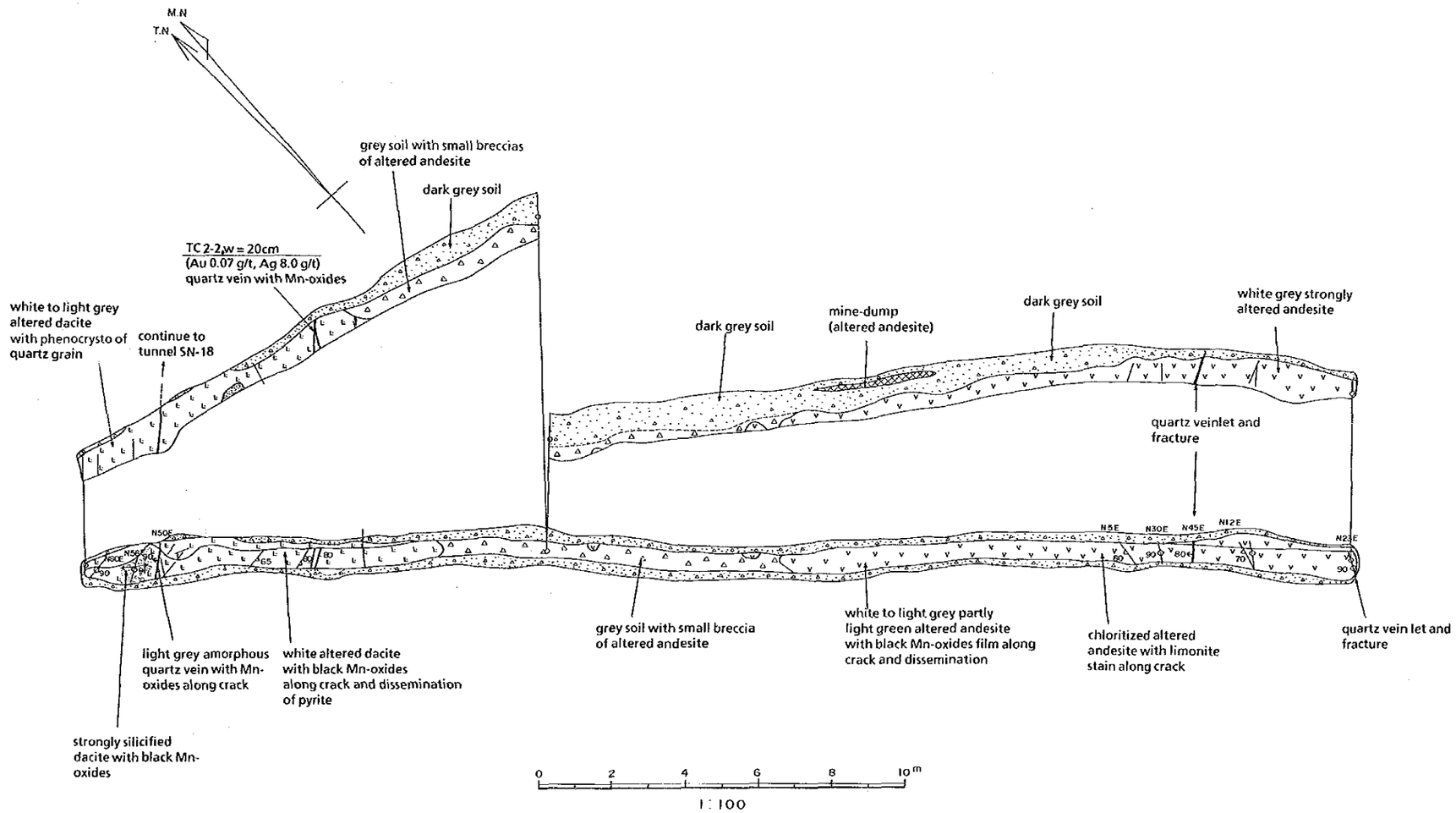
Apx. 18 Geological Sketch Map of Tunnel SM-2, SM-6 in the Marcamalata Area



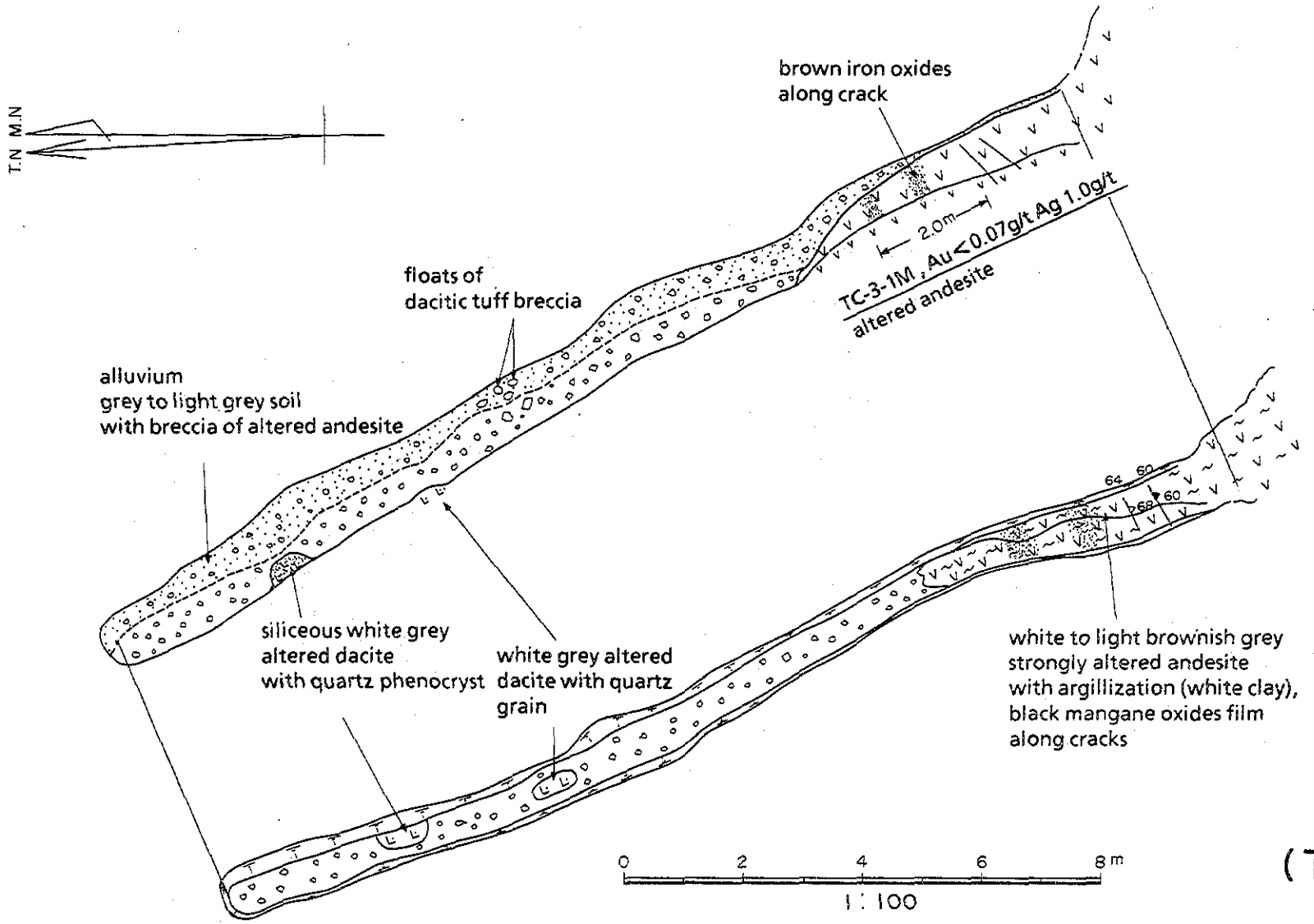

Apx. 19 Geological Route Map of Q. Querumahuaico Valley in the Colpar Area



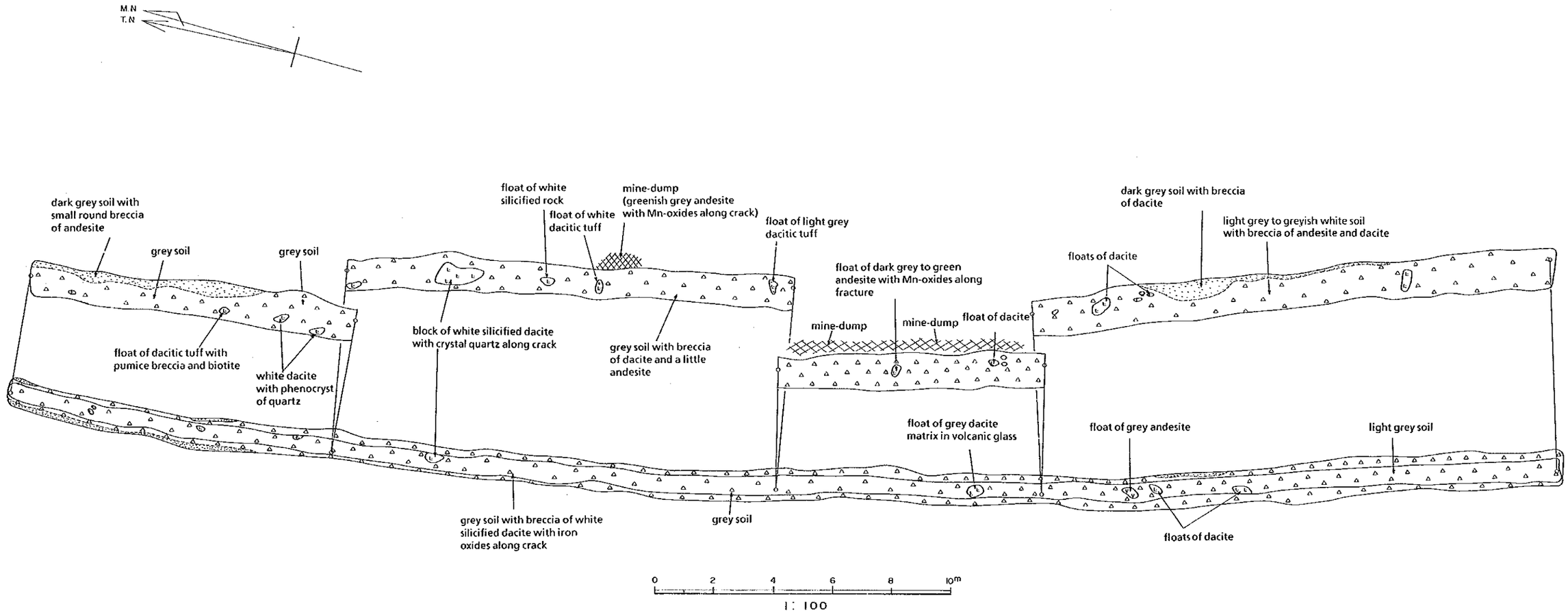

Apx.20 Geological Sketch Map of Trench TC-1 in South of the Colpar Area



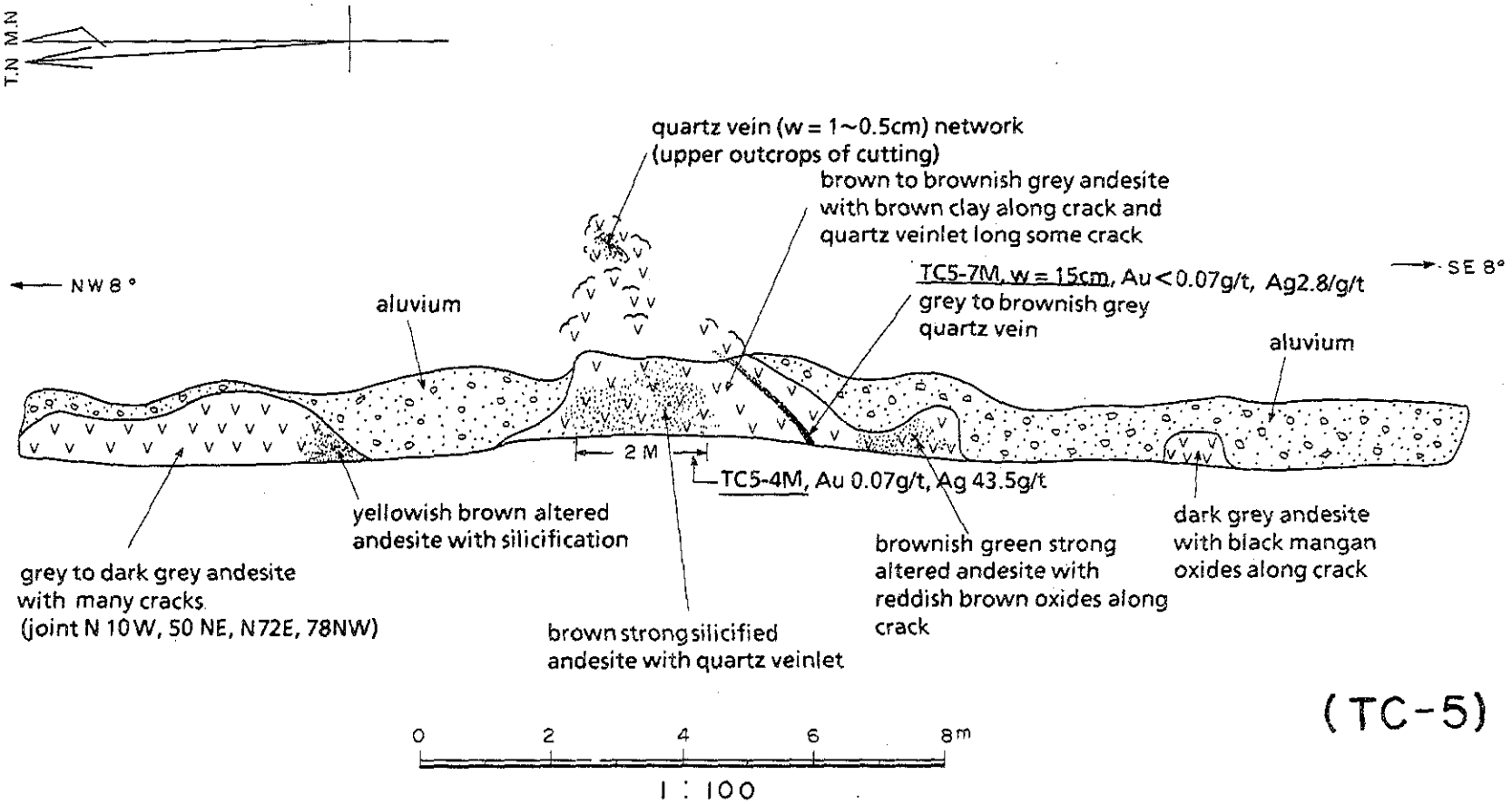

Apx. 2 1 Geological Sketch Map of Trench TC-2 in South of the Colpar Area



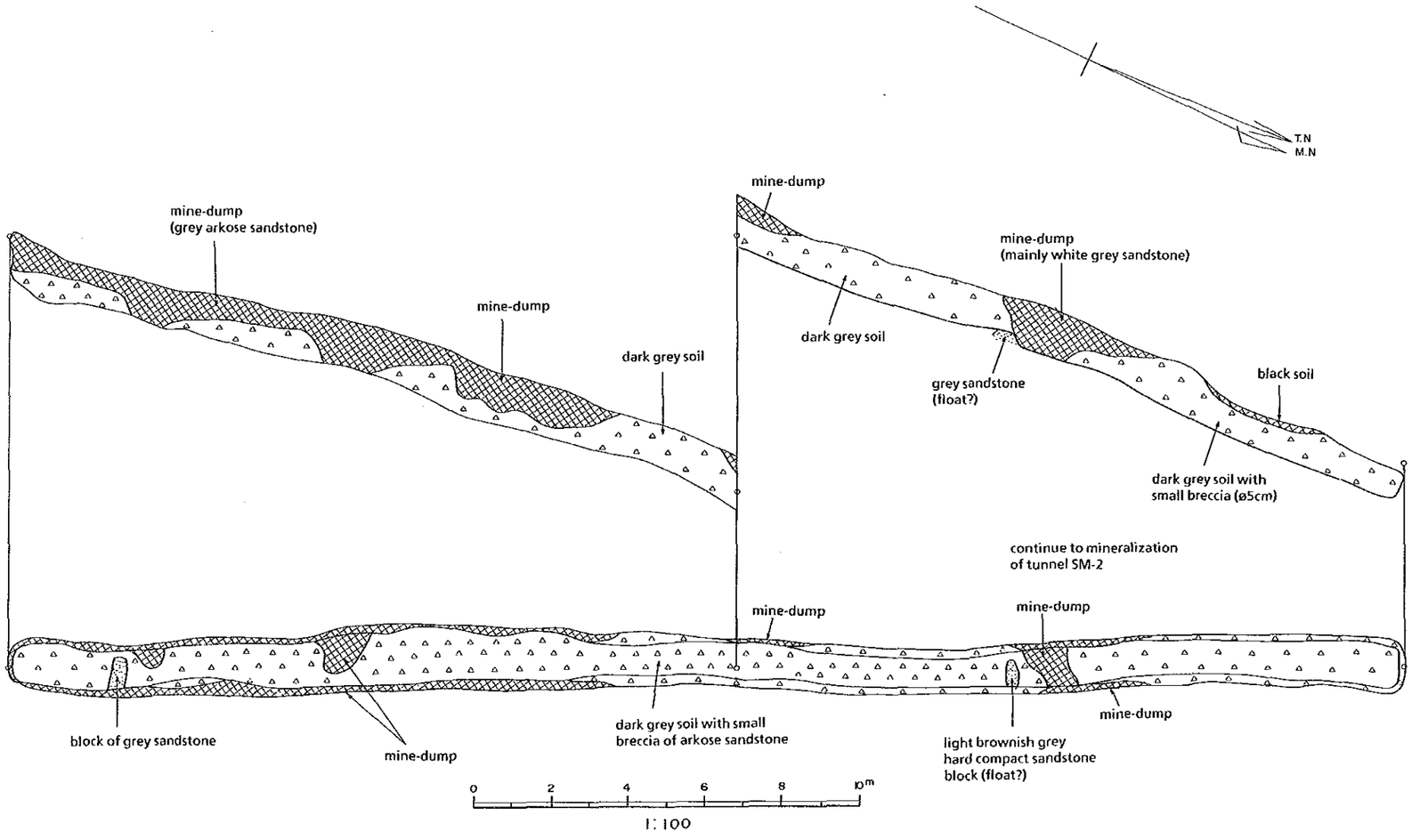

Apx.22 Geological Sketch Map of Trench TC-3 in South of the Colpar Area



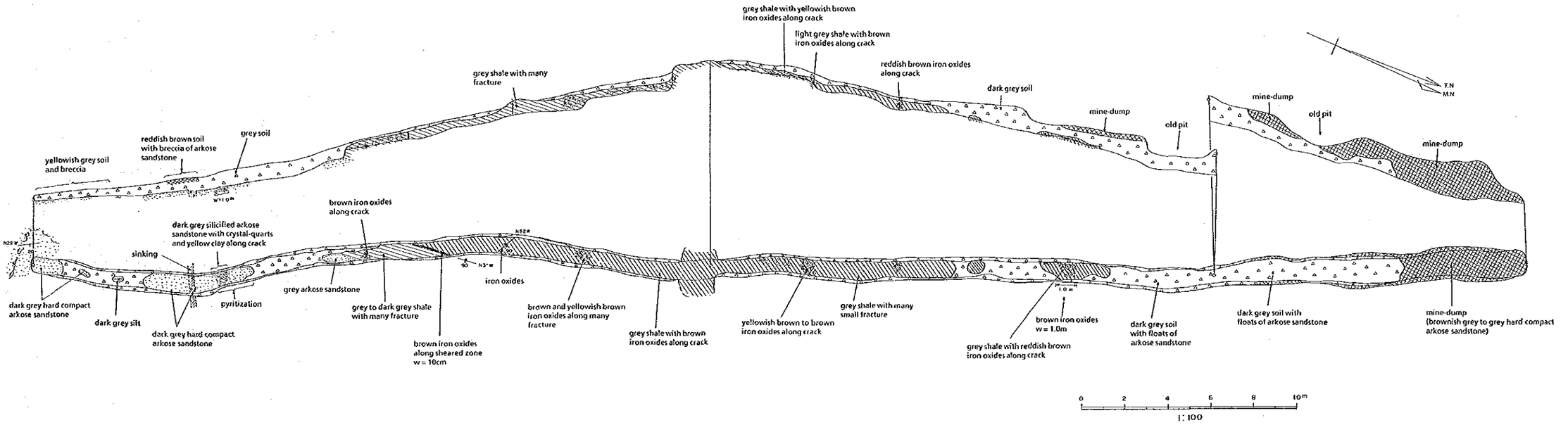

Apx. 23 Geological Sketch Map of Trench TC-4in North of the Colpar Area



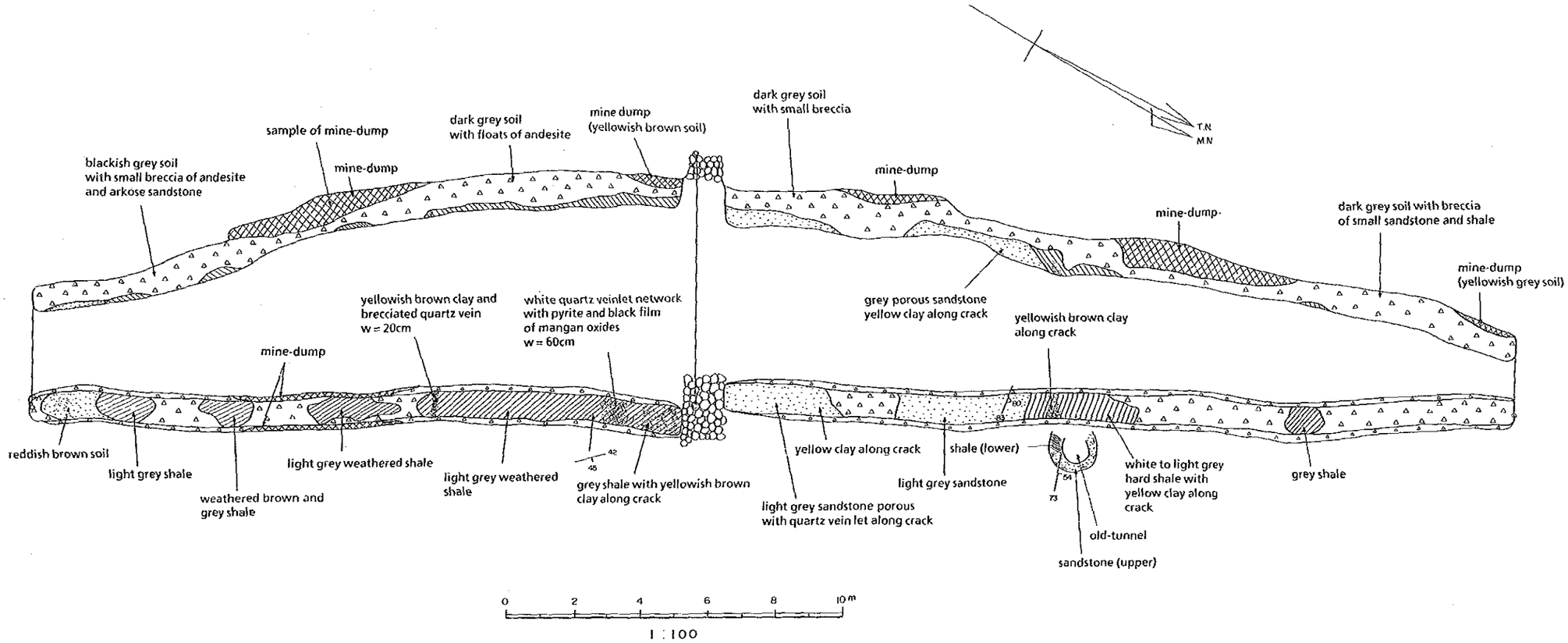

Apx. 24 Geological Sketch Map of Trench TC-5 in North of the Colpar Area




Apx. 25 Geological Sketch Map of Trench MT-1 in the Marcamalata Area




Apx.26 Geological Sketch Map of Trench MT-2 in the Marcamalata Area




Apx.27 Geological Sketch Map of Trench MT-3 in the Marcamalata Area

# Apx. 28 (1) Summary of Drilling Results (MJP-11)

| | Item | Working Period | Item of Working Period | | | Total Number of Workers |
|---|---|---|---|---|---|---|
| | | Period | Number of Days | Actual Working Days | No Working Days | |
| Working period | Preparation | 14th Sep. '87-4th Oct. '87 | 21days | 21days | 0days | 546mans |
| | Drilling | 5th Oct. '87-21th Oct. '87 | 17 | Drilling 17 | 0 | 351 |
| | | | | Trouble 0 | 0 | 0 |
| | Dismounting | | | | | |
| | Total | 14th Sep. '87-21th Oct. '87 | 38 | 38 | 0 | 897 |

| Drilling length, etc. | | | | Core recovery for each 100m section | | |
|---|---|---|---|---|---|---|
| Planned length | 250.00m | Over burden | 9.60m | Depth of hole | Section | Total |
| Increase or decrease in length | 1.05m | Core length | 246.95m | 0 ~ 100m | 96.0 | 96.0 |
| Length drilled | 251.05m | Core recovery | 98.4% | 100 ~ 200m | 100.0 | 98.0 |

| Working time | | | | | | |
|---|---|---|---|---|---|---|
| | Drilling | 178° 15′ | 48.0% | 28.8% | 200 ~ 251.05m | 99.8 | 98.4 |
| | Hoisting & lowering rod casing | 144° 45′ | 39.0 | 23.3 | Drilling efficiency | |
| | Repairing | 48° 00′ | 13.0 | 7.7 | Total drilling length / Working period | 14.8m/day |
| | Sub total | 371° 00′ | 100.0 | 59.8 | Total drilling length / Net working days | 14.8m/day |
| | Preparations | 249° 00′ | | 40.2 | Total drilling length / Net drilling days | 14.8m/day |
| | Dismounting | | | | Total drilling workers / Total drillig length | 1.40man/m |
| | Others | | | | Remarks | |
| | Total | 620° 00′ | | 100.0 | Preparation includes transfer of machines and setting up derrick. | |

| Inserting casing pipe | Pipe size & inserted length (m) | Inserted length / Drilling length ×100 (%) | Recovery of casing pipe (%) | Core recovery includes overburden. |
|---|---|---|---|---|
| | 4½"× 11.86 | 4.7 | 100 | |
| | NC × 32.80 | 13.1 | 100 | |
| | NX × 149.45 | 59.5 | 100 | |

## Apx. 28 (2) Summary of Drilling Results (MJP-12)

| | Item | Working Period | Item of Working Period | | | Total Number of Workers |
|---|---|---|---|---|---|---|
| | | Period | Number of Days | Actual Working Days | No Working Days | |
| Working period | Preparation | 16th July '87-7th Aug. '87 | 23days | 23days | 0days | 566mans |
| | Drilling | 8th Aug. '87-12th Sep. '87 | 36 | Drilling 31 | 0 | 720 |
| | | | | Trouble 5 | 0 | 95 |
| | Dismounting | 13th Sep. '87 | 1 | 1 | 0 | 18 |
| | Total | 16th July '87-13th Sep. '87 | 60 | 60 | 0 | 1,399 |

| Drilling length, etc. | | | | Core recovery for each 100m section | | |
|---|---|---|---|---|---|---|
| Planned length | 250.00m | Over burden | 0m | Depth of hole | Section | Total |
| Increase or decrease in length | 0.46m | Core length | 243.65m | 0 ~ 100m | 93.4% | 93.4% |
| Length drilled | 250.46m | Core recovery | 97.3% | 100 ~ 200m | 99.8 | 96.6 |

| Working time | | | | | | |
|---|---|---|---|---|---|---|
| | Drilling | 250° 30′ | 35.5% | 26.0% | 200 ~ 250.46m | 100 | 97.3 |
| | Hoisting & lowering rod casing | 268° 30′ | 38.1 | 27.9 | Drilling efficiency | |
| | Repairing | 186° 00′ | 26.4 | 19.3 | Total drilling length / Working period | 6.96m/day |
| | Sub total | 705° 00′ | 100.0 | 73.1 | Total drilling length / Net working days | 6.96m/day |
| | Preparations | 254° 00′ | | 26.3 | Total drilling length / Net drilling days | 8.08m/day |
| | Dismounting | 5° 00′ | | 0.6 | Total drilling workers / Total drillig length | 2.87man/m |
| | Others | | | | Remarks | |
| | Total | 964° 00′ | | 100.0 | Preparation includes transportation transfer of machines and setting up derrick. | |

| Inserting casing pipe | Pipe size & inserted length (m) | Inserted length / Drilling length ×100 (%) | Recovery of casing pipe (%) | Core recovery includes overburden. |
|---|---|---|---|---|
| | 4½"× 5.65 | 2.3 | 100 | |
| | NC × 15.14 | 6.0 | 60.4 | |
| | NX × 218.72 | 87.3 | 100 | |

## Apx. 28 (3) Summary of Drilling Results (MJP−13)

| | Item | Working Period | Item of Working Period | | | Total Number of Workers |
|---|---|---|---|---|---|---|
| | | Period | Number of Days | Actual Working Days | No Working Days | |
| Working period | Preparation | 8th Sep. '87−28th Sep. '87 | 21days | 21days | 0days | 301mans |
| | Drilling | 29th Sep. '87−29th Oct. '87 | 31 | Drilling 29 | 0 | 300 |
| | | | | Trouble 2 | 0 | 13 |
| | Dismounting | | | | | |
| | Total | 8th Sep. '87−29th Oct. '87 | 52 | 52 | 0 | 614 |

| Drilling length, etc. | | | | Core recovery for each 100m section | | |
|---|---|---|---|---|---|---|
| Planned length | 250.00m | Over burden | 45.55m | Depth of hole | Section | Total |
| Increase or decrease in length | 0.20m | Core length | 228.45m | 0 ~ 100m | 81.5 | 81.5 |
| Length drilled | 250.20m | Core recovery | 91.3% | 100 ~ 200m | 96.8 | 89.1 |

| Working time | | | | | | |
|---|---|---|---|---|---|---|
| | Drilling | 219° 30′ | 32.0% | 23.8% | 200 ~ 250.20m | 100 | 91.3 |
| | Hoisting & lowering rod casing | 323° 30′ | 47.0 | 35.0 | Drilling efficiency | | |
| | Repairing | 144° 00′ | 21.0 | 15.6 | Total drilling length / Working Period | | 8.1m/day |
| | Sub total | 687° 00′ | 100.0 | 74.4 | Total drilling length / Net working days | | 8.1m/day |
| | Preparations | 237° 00′ | | 25.6 | Total drilling length / Net drilling days | | 8.6m/day |
| | Dismounting | | | | Total drilling workers / Total drillig length | | 2.5man/m |
| | Others | | | | Remarks | | |
| | Total | 924° 00′ | | 100.0 | Preparation includes transportation, transfer of machines and setting up derrick. | | |

| Inserting casing pipe | Pipe size & inserted length (m) | Inserted length / Drilling length ×100 (%) | Recovery of casing pipe (%) |
|---|---|---|---|
| | 4½"× 12.90 | 5.2 | 100 |
| | NC × 41.15 | 16.4 | 100 |
| | NX × 126.25 | 50.5 | 100 |

Core recovery includes overburden.

# Apx. 28 (4) Summary of Drilling Results (MJP-14)

| | Item | Working Period | Item of Working Period | | | Total Number of Workers |
|---|---|---|---|---|---|---|
| | | Period | Number of Days | Actual Working Days | No Working Days | |
| Working period | Preparation | 3th Oct. '87-4th Oct. '87 | 2days | 2days | 0days | 35.5man |
| | Drilling | 5th Oct. '87-20th Oct. '87 | 16 | Drilling 16 | 0 | 301.5 |
| | | | | Trouble 0 | 0 | 0 |
| | Dismounting | | | | | |
| | Total | 3th Oct. '87-20th Oct. '87 | 18 | 18 | 0 | 337 |

| Drilling length, etc. | | | | Core recovery for each 100m section | | |
|---|---|---|---|---|---|---|
| Planned length | 200.00m | Over burden | 8.90m | Depth of hole | Section | Total |
| Increase or decrease in length | 0.65m | Core length | 192.95m | 0 ~ 100m | 96.7 | 96.7 |
| Length drilled | 200.65m | Core recovery | 96.2% | 100 ~ 200.65m | 95.6 | 96.2 |

| Working time | | | | |
|---|---|---|---|---|
| | Drilling | 158° 50′ | 46.0% | 43.8% |
| | Hoisting & lowering rod casing | 154° 10′ | 44.7 | 42.5 |
| | Repairing | 32° 00′ | 9.3 | 8.7 |
| | Sub total | 345° 00′ | 100.0 | 95.0 |
| | Preparations | 18° 00′ | | 5.0 |
| | Dismounting | | | |
| | Others | | | |
| | Total | 363° 00′ | | 100.0 |

| Drilling efficiency | |
|---|---|
| Total drilling length / Working period | 12.54m/day |
| Total drilling length / Net working days | 12.54m/day |
| Total drilling length / Net drilling days | 12.54m/day |
| Total drilling Workers / Total drillig length | 0.67man/m |

| Inserting casing pipe | Pipe size & inserted length (m) | Inserted length / Drilling length ×100 (%) | Recovery of casing pipe (%) |
|---|---|---|---|
| | NC × 9.25 | 4.6 | 100 |
| | NX × 121.65 | 60.6 | 100 |
| | | | |

Remarks

Preparation includes transfer of machines and setting up derrick.

Core recovery includes overburden.