Chapter 2 Drilling Survey

2-1 Survey Method

1. Outline

Figure II-2-1 shows the locations of this year's drilling survey.

MTA was in charge of drilling operation which was the main work of survey and MTA's equipments and materials except for consumption goods including bits and reaming shells were used.

Collected cores were summarized in a 1/200 scale geological columnar section. All cores were photographed and mineralization parts were macro-photographed.

While observing cores, geological survey around the drilling area was also conducted to utilize it for comparison with drill hole geology and a general analysis. The mineralization parts of the collected cores were chemically analyzed and thin and polished sections of representative parts also collected for the microscopic observation. In addition, X-ray diffraction tests were conducted to clarify alteration. Samples for measurment of IP and resistivity were collected.

2. Drilling Method and Equipment

Drilling was conducted by a wire line method. Casings were inserted according to the geological condition. The survey was proceeded to that concentration of drilling mud was adjusted to protect the hole wall.

Table II-2-1 and II-2-2 are lists of equipment and consumption goods which were mainly used for the survey. Table II-2-3 shows how a diamond bit and reaming shell used. As drilling equipment, three sets of Acker owned by MTA were used all the time. Major consumption goods except for bentonite were provided by the Japanese survey team.

3. Working Conditions

Access road construction, arrangement and removal were carried out on one shift/ day and drilling work was in three shifts of eight hours/day as a principle. Personnel for one drilling shift consisted of one to two Turkish engineers and five workers. Japanese engineers worked mainly as technical instructors. The base of survey was laid in Espiye, but the engineers for drilling and the drivers rented a part of Lahanos mine lodgings(Killik) as their base and commuted to the drilling site by car. Daily necessities including food and fuels were provided by car from Espiye every day.

4. Transportation of Equipment/Materials and Construction of Access Roads

Equipment and materials used for the drilling survey were delivered from Ankara and partly from Trabzon by several trucks to the Killik drilling camp and the drilling bases. Bulldozers for the access road construction were also delivered from Ankara. Within the survey area, there were unpaved roads which

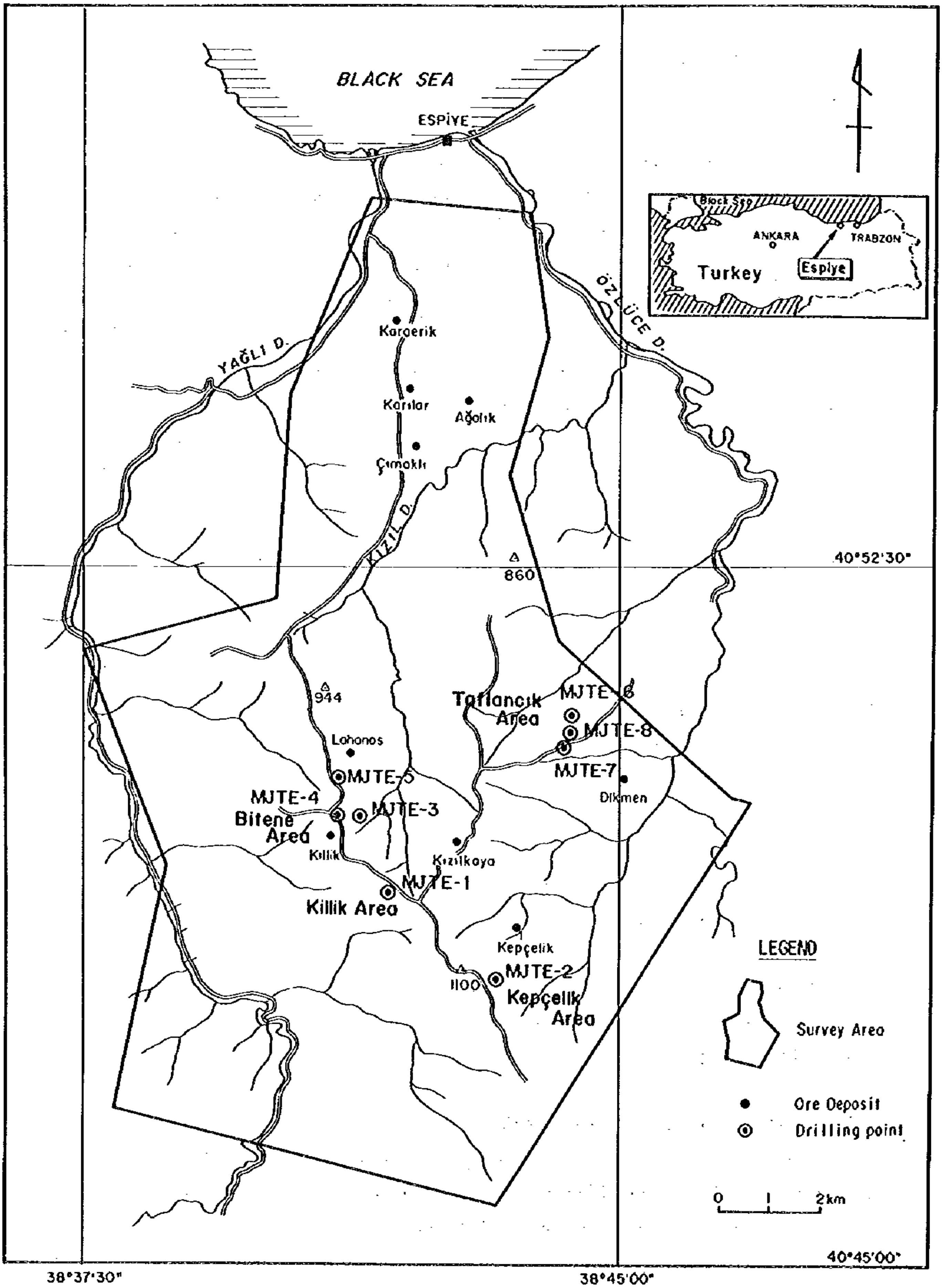

Fig. II－2－1 Location of the Drilling Survey Area connected Espiye with each village respectively, however when it rained hard, car could not pass ;consequently, the roads had to be mended frequently by bulldozer. When existing roads were far from the drilling site, new roads were constructed.

5. Demobilization

After the survey, MTA's equipment were transported to Ankara, partly to Trabzon. A part of materials was stored in a leased storage of a gas station in Espiye. Drilling cores were stored in a dome tent in the stockyard of MTA Black Sea Branch Office.

6. Drilling Process Water

Drilling sites which often located on ridges made difficult to secure process water. Usually, the water from stream was pumped up to collect in a tank pit at the drilling site. When the water from stream was difficult to obtain, water for living (natural spring water) was sent by pipes or it was transported by two tanklorries.

7. Progress of Drilling

Figure II-2-2 shows the drilling sites. The drilling summary and it itinerary are shown in Table II-2-4 through Table II-2-12.

(1) MJTE-1

The drilling period was September 9 through October 9.

From the surface to the depth of 3.05m, drilling by HW casing shoe and drilling mud with bentonite was conducted. The HW casing was set up to the depth of 3.05m and then, drilling was carried out up to the depth of 176.2m by the NQ wire line method. Since the geology was easy to break with intermediate lost circulation, drilling was conducted carefully by protecting the hole wall with reaming and casing. Although the efficiency of work was lowered because of damages of pumps and water shortage, at the end, NW casing was set up to 108m and BW casing up to 176.2m. After 176.2m, drilling was completed to the bottom of the hole by BQ wire line method.

(2) MJTE-2

Drilling period was September 15 through October 3.

From the surface to the depth of 3.05m, drilling by HW casing shoe with drilling mud with bentonite was conducted. Since high permeability of the ground and the base was unstable, the base was fixed firmly by cement grouting. Then, drilling was conducted up to the bottom of the hole by NQ wire line method. There were some troubles such as broken parts, but they were mended and the drilling was continued. Since the geology was relatively stable, NW casing was inserted only to the depth of 15.25m.

(3) MJTE-3

Drilling period was August 11 through 29.

From the surface to the depth of 3.05m, drilling by HW casing shoe with drilling mud with bentonite was conducted. HW casing was set up to the depth of 3.05m and then, drilling was carried out up to the depth of 154.5m by the NQ wire line method. NW casing was set up to the depth of 21.3m. Since some of the base rocks were unstable, concentration and amount of drilling mud were carefully adjusted but the final drilling stage was jammed at the breakable geology at the depth of 101.7m and rod was cut. Therefore, withdrawal was tried with a tap of the deformed rod for five days, but caving of the hole wall was so bad that the hole was bent and the withdrawal became impossible. Removal of the bit and rods were given up, the hole was filled and the work was closed.

(4) MJTE-4

Drilling period was August 9 through 24.

Drilling was carried out from the surface to the depth of 15.25m where ground was stable, drilling by HW casing shoe was conducted and HW casing was set up. Then, drilling was carried out up to the bottom of the hole by the NQ wire line method, but due to much swelling geology, drilling was carried out by protecting the hole wall by inserting NW casing from time to time. At the end, NW casing was set up to the depth of 88m.

(5) MJTE-5

Drilling period was August 6 through 25.

From the surface to the depth of 3.05m, drilling by HW casing shoe and drilling mud with bentonite was conducted. HW casing was set up to the depth of 3.05m and then, drilling was carried out up to the depth of 261.25m by the NQ wire line method. Since the base rocks were relatively stable, only casing of NW size was set up to the depth of 21.35m.

(6) MJTE-6

Drilling period was September 9 through 23.

From the surface to the depth of 3.05m, drilling by HW casing shoe with drilling mud of bentonite was conducted and HW casing was set up to the depth of 3.05m. Then, NW casing was set up to the depth of 12.7m where the base rock was unstable. Drilling was carried out up to the hole bottom (212.45m) by NQ wire line method. Although there were machine troubles, they were mended and drilling was completed up to the scheduled depth.

(7) MJTE-7

Drilling period was October 3 through 15.

From the surface to the depth of 6.1m, drilling by HW casing shoe was conducted and HW casing was set up to the depth of 6.1m. Then, drilling was carried out up to the bottom by NQ wire line method and at the end, NW casing was set up to the depth of 54.9m. Although the work was temporarily stopped due to water shortage and machine troubles, drilling was completed up to the bottom of hole as scheduled.

(8) MJTE-8

Drilling period was October 9 through 23.

From the surface to the depth of 3.05m, drilling by HW casing shoe was conducted and HW casing was set up to the depth of 3.05m. Then, drilling was carried out by NQ wire line. Due to unstable geology, NW casing was set up to the depth of 64.05m. Around the depth of 177m, drilling was jammed temporarily, but it recovered. BW casing pipes were set up to the depth of 177.9m and drilling was carried out up to the hole bottom by BQ wire line method as scheduled and completed.

2-2 Results of Survey

1. Geology, Mineralization and Alteration

Figure II-2-3 shows the geology of the surveyed area. It consist of, from the bottom, Çatak Formation which mainly contains andesitic volcanic rocks, Kızılkaya Formation which contains of mainly dacite lava with pyroclastic rocks, and Çağlayan Formation which contains mainly dacite volcanic rocks with abundant dacitic intrusive rocks. Survey results will be described below by each hole. Figure II-2-4 (appendix) shows the geological columnar section and Figures II-2-5 through II-2-7 show geological sections of drilling. Results of chemical analysis (of ores), X-ray diffraction test, microscopic observation of thin sections, and polished ore sections are shown in Tables II-2-13 through II-2-16 respectively.

(1) MJTE-1

0-2.0m : Soil and sand.

2.0-77.3m : Reddish brown hematite dacite.

Hematite dacite contains microphenocryst of plagioclase, mostly fractured by jointing or partly brecciated(several cm in diameter). Thin calcite veinlets are observed at 32.7m and 67m depth.

77.3-93.5m : Breccia with various kind of fragments.

It contacts with upper hematite dacite in steep angle(fault?). Top and bottom parts of several meters have brown weathered feature by circulation of under ground water. Main part shows gray to greenish gray in color, and contain fragments of altered dacite, tuff, hematized dacite. Alteration minerals such as kaolinite, calcite and pyrite are detected by XD (X-Ray diffraction).

93.5-170.0m : Reddish brown hematite dacite.(same as above)

Hematite dacite of this part is mostly fractured. Because of low core recovery, it holly brecciated at 93.5-99.6m depth. Thin calcite veinlets exist, but alteration grade seems to be low.

170-184.5m : Altered dacite of Çağlayan Formation.

This aphyric dacite shows autobrecciated texture, and is strongly argillized (sericitization). Intensely silicified and pyritized zone is observed at 178-181.5m depth. Results of the chemical analysis of samples from silicified zone and it's lasting pyritized zone are as follows (show maximum value of elements),

Au 0.02ppm, Ag 1.14ppm, Pb 0.03%, Zn 0.09%, Fe 12.77%, S 14.69%

Cu shows under detection limit(0.01%).

184.5-187.6m : Altered aphyric dacite dike.

It has undergone silicification and is accompanied by weak dissemination and vein of pyrite.

187.6-252.1m : Altered dacite of Kızılkaya Formation with thin bed of dacitic pyroclastic rock at 203.4-204.45m depth and intruded by aphyric dacite dike at 208.8-209.3m depth.

Altered dacite has mostly autobrecciated and distinct porphyritic texture of plagioclase phenocryst (2-3mm) at lower part. Alteration by quartz, sericite and pyrite is predominant. Intensely mineralized zone of networked pyrite is observed from 221m to 230m depth. Maximum value of analyzed elements of 2 samples from this zone are as follows,

Au 0.03ppm, Ag 0.15ppm, Fe 7.87%, S 9.08%,

The other elements show under detection limit(0.01%). Disseminated chalcopyrite ore (25cm width) presents at 234.5m depth, containing Ag 3.11ppm, Cu 4.88%, Fe 16.61%, S 18.61%. Moreover, pyritized clay vein and film of chalcopyrite are observed. Besides pyrite, chalcopyrite is identified microscopically from the sample at 234.5m depth.

(1) MJTE-2

0-7.8m : Surface soil and talus deposit with fragments of hematitic dacite and green glass-tuff.

7.8-43.2m : This part consists of dacitic tuff, lapilli tuff and tuff breccia with small amount of accidental fragments such as aphyric dacite, pyritized altered rocks. Fine grained matrix is dominant in upper part. Essential fragments gradually increase to the depth, it appear to be autobrecciated lava. Weak argillic alteration of chlorite and sericite presents through this part.

43.2-72.1m : Dacitic autobrecciated lava with abundant essential aphyric fragments (2-10cm) and minor fine matrix.

This part has undergone alteration of chlorite and sericite accompanied by calcite vein. Calcite and pyrite vein with very small amount of chalcopyrite, filled with steep dipping fracture(shear zone).

72.1-206.4m : Aphyric dacite (lava dome) with partial intense flow structure.

This part has undergone weak alteration of quartz, chlorite and sericite accompanied by calcite and pyrite vein in part. The boundary between this part and lower bed is sharp, showing 50° inclination.

206.4-226.5m : Dacitic autobrecciated lava with plagioclase (Kızılkaya Formation)

This part has undergone alteration of quartz, sericite and pyrite. There is no remarkable mineralization except dissemination of pyrite (3-5%) in fine matrix part. Very small amount of chalcopyrite (film) is observed in part. Maximum value of analyzed elements of 4 samples from this zone are as follows,

Au 0.14ppm, Ag 3.75ppm, Cu 0.20%, Pb 0.74%, Zn 0.94%, Fe 3.26%, S 4.14%

Besides pyrite, a little chalcopyrite, very small amount of sphalerite and galena are identified microscopically .

226.5-255.5m : Intensely altered andesitic pyroclastics of Çatak Formation.

It consists of alteration minerals such as epidote, chlorite and calcite. A chalcopyrite and sphalerite vein with pyrite and rare galena is observed at 240.5-241.4m depth. The boundary between this part and lower bed indicate solid shear zone of low angle (30°)

255.5-260.25m : Plagioclase porphyritic dacite (intrusive rock).

Weak dissemination of pyrite presents in upper part. Alteration minerals such as chlorite and sericite are common.

(3) MJTE－3

0-12.2m : Surface soil and talus deposit with fragments of weathered dacite, andesite.

12.2-22.2m : Dacitic tuff breccia of Çağlayan Formation.

It consists of accidental fragments such as andesite, dacite, pelitic rock, porphyritic rock in the matrix rich in green glass. The dominant style of alteration in this unit is weak argillization with chlorite and sericite.

22.2-23.2m : Fine grained sandy tuff.

23.2-41.3m : Dacitic lapilli tuff.

It is rich in green glass (pumice) and contains accidental fragments (0.5-3cm in size) such as andesite, dacite and altered rock. Weak argillization of chlorite and sericite with minor disseminated pyrite is observed.

41.3-42.6m : Sandy tuff, grayish green in color.

The lithology is same as mentioned above, but bedding plane dips 15° .

42.6-44.5m : Tuff, pale green in color.

It is rich in green glass and contains a little disseminated pyrite.

44.5-58.45m : Alternation of fine tuff, sandy tuff and tuff rich in green glass.

Bedding plane dips about 20° . Pyrite vein and film are rarely observed.

58.45-60.9m : Andesitic to basaltic dike, dark green in color.

60.9-65.4m : Alternation of fine tuff, sandy tuff and tuff rich in green glass.

The lithology is same as mentioned above. This unit gradually change into tuff of lower unit.

65.4-74.2m : Dacitic lapilli tuff.

It contains a lot of green glass balls.

74.2-78.9m : Fine grained sandy tuff.

It contains seams of pyrite and ferruginous chert. Bedding plane dips about 10° . Results of chemical analysis of pyritized zone , maximum value of elements areas follows, Au 0.04ppm, Fe 24%, S 23.64%. The other elements show under detection limit.

78.9-100.7m : Dacitic autobrecciated lava, dark gray in color.

Weak dissemination of pyrite has occurred in fine matrix, and pyrite network has occurred in near boundary to lower unit. Although silicification and sericitization are common in this unit, intense argillized zone has been observed at 85-88m depth.

100.7-105.0m : Quartz porphyritic dacite dike.

Intense sericitization is common in this unit.

105-146m : Dacitic autobrecciated lava with phenocryst of quartz and plagioclase.

Intense sericitization is common in this unit. Strong mineralization of networked pyrite has been observed from 108.9m to 115m depth, semi-massive yellow ore is found in top of this zone (109.2m depth). The results of chemical analysis show flowing maximum value of elements,

Au 2.06ppm, Ag 15.3ppm, Cu 12.58%, Pb 0.04%, Zn 0.02%, Fe 24.58%, S 27.67%

Besides this zone, a little pyrite networked zones of low grade are exist. Colloform pyrite and chalcopyrite, and framboidal pyrite are microscopically observed.

146-154.5m : Silicified aphyric dacite intrusive, gray in color.

Argillized dacite of Kızılkaya Formation is included in this unit from 147.7-148.8m depth.

(4) MJTE-4

0-17.2m : Surface soil with fragments of dacitic tuff.

17.2-30.2m : Dacitic tuff of Çağlayan Formation.

This unit is rich in green glass and contains accidental fragments such as dacite, pyritized rock.

30.2-36.0m : Aphyric andesite dike, deep green in color.

Intrusion boundary shows 45° .

36.0-53.4m : Dacitic tuff of Çağlayan Formation.

It shows the same lithology of above tuff, but is soft by argillic alteration.

53.4-56.7m : Chloritized Aphyric andesite dike.

56.7-53.4m : Dacitic lapilli tuff of Çağlayan Formation.

This unit contains accidental fragments such as andesite and dacite, intense argillization (sericite, chlorite) has occurred.

68.2-71.15m : Stratified fine tuff.

A pyrite seam(film) has been contained in upper part. Bedding plane shows 15° .

71.15-78.2m : Dacitic lapilli tuff of Çağlayan Formation.

It shows the same lithology of above lapilli tuff, but rich in green glass.

78.2-84.05m : Dacitic tuff of Çağlayan Formation.

It shows the same lithology of above tuff, but rich in green glass.

84.05-90.0m : Chloritized fine grain andesite dike.

Weak dissemination of pyrite filled with fracture. Fine grain tuff remains in this unit from 85.5-85.9m depth.

90.0-106.0m : Massive dacitic tuff of Çağlayan Formation.

Green glass fragments turn into small ball (a few mm) in form.

106.0-112.4m : Alternation of coarse tuff and lapilli tuff.

Bedding plane shows 10-15° . Chlorite, gypsum and very small amount of sericite have been detected by XD(X-Ray diffraction).

112.4-128.0m : Dacitic tuff with minor disseminated pyrite.

Essential lenses increase in lower boundary.

128.0-133.4m : Sandy tuff, gray in color.

Pyritized thin layers have been contained.

133.4-139.85m : Grayish green andesite dike.

It contains a little phenocrysts of chloritized mafic mineral and white altered plagioclase. Network of calcite is dominant at upper part.

139.85-142.3m : Intensely sericitized autobrecciated dacite of Kızılkaya Formation.

142.3-155.5m : Andesitic intrusive rock.

Chloritization is common in this unit, accompanied by calcite in part. Phenocrysts of mafic minerals are replaced by chlorite and calcite, but some remain pseudomorph of hornblende. Contact plane dips 30° .

155.5-212.75m : Altered autobrecciated dacite of Kızılkaya Formation.

Phenocrysts of plagioclase are observed in some part. Andesitic dike cut this unit at 165.5-169.9m depth. Strong sericitization has occurred in near contact to the dike. Stockwork zones of pyrite are observed in 197-200m depth and 211.3-211.5m depth. The results of chemical analysis of 3 samples show flowing maximum value of elements,

Au 0.08ppm, Ag 0.25 ppm, Zn 0.02%, Fe 20.93%, S 24.14%

The other elements show under detection limit.

(5) MJTE-5

0-8.3m : Surface soil and talus deposit.

8.3-39.6m : Dacitic lava of Çağlayan Formation.

This unit shows massive and aphyric feature or breccia texture filled with networked hematite . Argillization is common in this unit, and associated with sericite, kaolinite and calcite. Pyrite veinlets have been observed occasionally, minor sphalerite and chalcopyrite are accompanied in lower part.

39.6-42.35m : Andesite dike with white amygdal.

This unit has been oxidated and shows reddish brown in color. Contact plane dips 30-45 ° .

42.35-130.7m : Dacitic lava of Çağlayan Formation(same lithology as above).

This unit has been altered to light gray in color, or brecciated to reddish brown in color with hematite. The small amount of plagioclase, which have undergone sericitization, are observed microscopically in calcitized glassy groundmass. Chalcopyrite is observed at 61m depth and barite is also observed at 92m depth. The results of chemical analysis from a sample of 61.2m depth are as follows,

Au 0.09ppm, Ag 0.69ppm, Fe 13.44%, S 13.03% . The other elements show under the detection limit.

130.7-159.3m : Autobrecciated dacite lava of Kızılkaya Formation.

Essential fragments with abundant plagioclase increase to the depth. Argillization and dissemination of pyrite are common in fine dark gray matrix part. Dissemination of fine sulfide forms argillic mineralized zone in upper contact to Çağlayan Formation. There results of chemical analysis from a sample of this zone are as follows,

Au 0.35ppm, Ag 7.50ppm, Cu 2.18%, Zn 0.02%, Fe 10.46%, S 11.65%

159.3-181.95m : Hematite dacite.

It contains remarkable plagioclase as phenocryst in main part. Weak dissemination of pyrite has been observed in lower part (near boundary).

181.95-261.25m : Autobrecciated dacite lava of Kızılkaya Formation.

Although, intense silicification and sericitization with minor kaolinite are common in upper part, chloritization gradually increase to the depth. Phenocrysts of plagioclase are replaced by quartz and pyrite. Relatively intense mineralization of networked pyrite has occurred in upper part (below hematite dacite), accompanying minor chalcopyrite. The results of chemical analysis from a sample of this zone are as follows,

Au 0.07ppm, Ag 1.62ppm, Zn 0.01%, Fe 11.23%, S 12.75% .

The other elements show under the detection limit. Andesite dike cut this unit at 199.2-200.1m depth.

(6) MJTE－6

0-3.55m : Surface soil.

3.55-72.3m : Fractured(jointed) hematite dacite, reddish brown in color.

A little phenocrysts of plagioclase and minor hornblende lie in a oxidized glassy groundmass of pale brown in color. Green colored alteration with calcite veinlets has occurred at 35.7-37.7m depth. The boundary between this unit and lower unit shows 40° .

72.3-85.8m : Autobrecciated dacite lava of Kızılkaya Formation.

Although, it shows glassy lithology with minor phenocryst, plagioclase tends to increase at depth.

This unit contains thin interbedded tuff with hematite seams in 79-80m depth, and also contains yellow ore fragments (max:5cm) in uppermost part. Alteration of sericite and chlorite with minor calcite are common in this unit, and there is weak mineralization of fracture filling pyrite.

85.8-114.8m : Dacitic tuff of Kızılkaya Formation.

This unit contains fine green glassy fragments and a little accidental fragments such as dacite, pyritized rocks. Dissemination of pyrite (2-3%) and rare chalcopyrite are common in this unit. The results of chemical analysis from a sample of this zone are as follows,

Ag 0.88ppm, Zn 0.01%, Fe 4.61%, S 4.24%.

114.8-212.45m : Autobrecciated dacite lava of Kızılkaya Formation.

This unit shows porphyritic feature by plagioclase phenocrysts and intense brecciation is observed commonly. The upper part indicates gray in color by strong sericitization, but to the depth, chloritization tens to increase. Dissemination of pyrite is common in this unit. Intense mineralized part has been observed in upper part (10-15% of pyrite). Euhedral pyrite and quartz, chlorite have filled with cavities in the lower part. The results of chemical analysis of 3 samples show flowing maximum value of elements,

Au 0.04ppm, Ag 0.49ppm, Fe 12.48%, S 13.09%. The other elements show under the detection limit.

Pyrite and rare sphalerite are observed microscopically from a sample at 127m depth. Pyrites show colloform and recrystallin texture.

(7) MJTE－7

0-13.2m : Talus deposit.

It contains fragments of weathered hematite dacite.

13.2-145.5m : Aphyric dacite lava of Çağlayan Formation.

This unit contains thin interbedded lapilli tuff. Intense brecciation (1-3cm) has been observed around 45m and 105m depth. Weak mineralization of pyrite vein has occurred in upper part such as 15-17m depth. The style of alteration in this unit is weak argillization by chlorite and sericite.

145.5-200.15m : Dacite lava of Kızılkaya Formation.

It shows porphyritic feature by plagioclase phenocrysts, and autobrecciated texture is commonly observed. The dominant alteration minerals in this unit are sericite, kaolinite, magnesite and pyrite. Grayish color of this unit indicate absence of chlorite. Dissemination of pyrite has occurred in whole, especially strong network and dissemination zone (10-15% of pyrite) with chalcopyrite film is observed in 161.2-165m depth. Besides this, chalcopyrite films are observed in 177.5m and 180.6m depth. The results of chemical analysis of 6 samples show flowing maximum value of elements,

Au 0.03ppm, Ag 0.58ppm, Cu 0.01%, Zn 0.01%, Fe 30.14%, S 33.20%. Pyrite and rare sphalerite are observed microscopically from a sample at 162m depth.

(8) MJTE－8

0-6.5m : Surface soil.

6.5-104.5m : Fractured hematite dacite.

Brecciation and flow structure are observed in part. A little amount of microphenocryst of plagioclase lie in a glassy groundmass. This unit has undergone weak argillization. Very small amount of alteration minerals such as sericite, chlorite, calcite and pyrite are detected by XD (X-Ray diffraction). The results of chemical analysis from a sample of this zone are as follows,

Au 0.02ppm, Ag 3.46ppm, Cu 0.16%, Pb 0.07%, Zn 1.50%, Fe 1.73%, S 1.88%

104.5-168.75m : Dacite lava of Kızılkaya Formation.

This unit is consists of plagioclase bearing porphyritic to aphyric lava with breccia structure. It shows gray in color due to alteration (sericitization). Fine glassy part with clay and pyrite has been observed in 2m from base. Networked pyrite zone accompanying rare sphalerite and chalcopyrite, has been observed in 115-125m depth. The results of chemical analysis of 3 samples show flowing maximum value of elements,

Au 0.19ppm, Ag 4.00ppm, Cu 0.12%, Pb 0.05 %, Zn 0.03%, Fe 15.74%, S 17.89%

168.75-186.7m : Dacitic tuff of Kızılkaya Formation.

This unit shows same lithology as tuff observed in MJTE-6. Weak argillization has occurred and sericite, minor chlorite, calcite, dolomite and pyrite have been detected by XD(X-Ray diffraction). Dissemination of pyrite (3%) is dominant mineralization style of this unit.

186.7-203.55m : Brecciated dacite lava of Kızılkaya Formation.

It contains phenocrysts of plagioclase and is rich in cavities in lower part. Chlorite content increase to the depth, therefor the color of this unit turns to greenish in color. Disseminated pyrite occurred in cavities or replaced plagioclase. Clay with pyrite vein occurred occasionally. The results of chemical analysis of pyrite vein are as follows,

Fe 5.76%, S 4.41% . The other elements show under the detection limit.

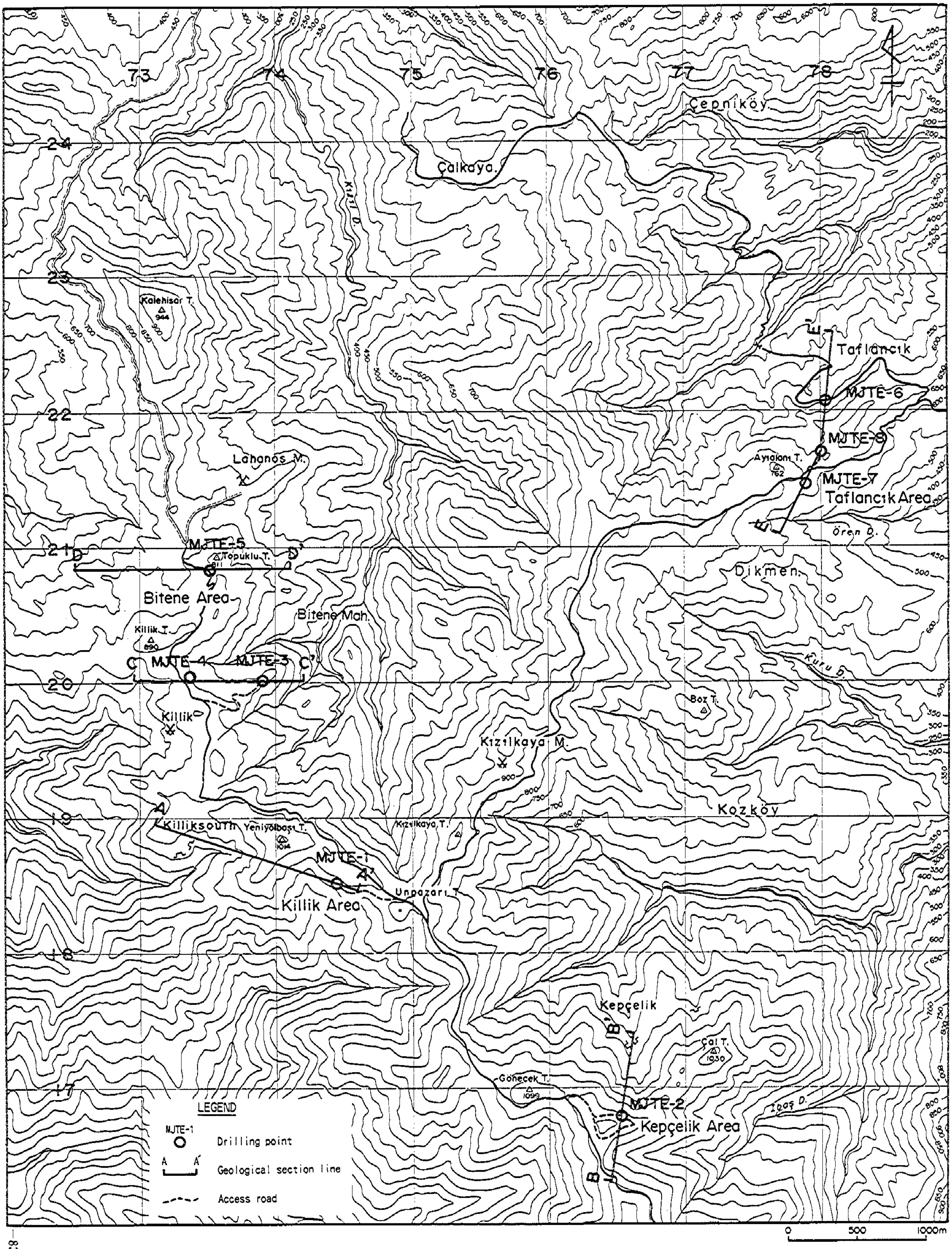

Fig. II-2-2 Location of the Drilling Sites

Table II - 2 - 1 List of Main Drilling Equipment

Drilling Machine Model " ACKER"	3 Sets
Specifications	
Capacity	640m(NQ), 762m(BQ)
Dimention L×W×H	2,310×1,070×1,850mm
Hoisting Capacity	8727Kg
Spindle Speed	Fw:234rpm, 485rpm, 887rpm, 1500rpm Rw:192rpm
Engine Model" Deutz F4L912"	58hp, 2300rpm
Drilling Pump Model" BR-535"	5 Sets
Specifications	
Piston Diameter	70mm
Stroke	70mm
Capacity	37.5liter/min, 50.7liter/min 81.4liter/min, 132.5liter/min
Engine Model" Deutz Diesel"	17.8hp, 3000rpm
Generators	4 Sets
Specifications	
Capacity	3KW, 5KW 380, 220Volt, 50Hz
Derrick for ACKER	1 Set
Specification	
Hight	6.10m

Table II-2-2 List of Drilling Equipment and Consumption Goods

Description	Specification	Unit	Quantity							
			MJTE-1	MJTE-2	MJTE-3	MJTE-4	MJTE-5	MJTE-6	MJTE-7	MJTE-8
Drilling rod NQ	3.05m	pc	58	85	50	70	85	69	65	58
Drilling rod BQ	3.05m	pc	82							66
Outer tube	NQ	pc	1	1	1	1	1	1	1	1
Outer tube	BQ	pc	1							1
Inner tube	NQ	pc	2	2	2	2	2	2	2	2
Inner tube	BQ	pc	2							2
Inner tube head	NQ	pc	2	2	2	2	2	2	2	2
Inner tube head	BQ	pc	2							2
Overshot	NQ	pc	1	1	1	1	1	1	1	1
Overshot	BQ	pc	1							1
Wireline rope	6mm	m	300	300	200	250	300	250	250	250
Casing pipe(HW)	3.05m	pc	1	1	1	3	1	1	2	1
Casing pipe(NW)	3.05m	pc	35	7	7	29	7	13	18	21
Casing pipe(BW)	3.05m	pc	58							58
Core lifter	NQ	pc	4	6	4	4	6	4	4	4
Core lifter	BQ	pc	2							2
Core lifter case	NQ	pc	4	6	4	4	6	4	4	4
Core lifter case	BQ	pc	2							2
Bentonite		kg	3750	3800	3650	3400	4150	3900	3250	4400
Cement		kg	1250	1250	1250	1250	1250	1250	1250	1250
Light oil		l	5120	3200	2800	3400	4080	3200	2640	3440
Engine oil		l	80	60	40	60	60	60	60	60
Gear oil		l	20	20	20	20	20	20	20	20
Hydraulic oil		l	40	40	40	40	40	40	40	40
Core box	5-7m	pc	40	47	26	36	47	38	40	33
Pipe for water	1"	pc	500	350	150	300	300	400	500	300

Table II-2-3 List of Used Diamond Bits and Reaming Shells

Description	Specification	Unit	Quantity							
			MJTE-1	MJTE-2	MJTE-3	MJTE-4	MJTE-5	MJTE-6	MJTE-7	MJTE-8
NQ-WL BITT	E35 30CTS	pc	5	3	4	2	4	3	2	3
BQ-WL BITT	E35 20CTS	pc	1							1
NQ-REAMING SHELL	E35 8CTS	pc	1	1	2	1	1	1	1	1
BQ-REAMING SHELL	E35 6CTS	pc	1							1
CASING SHOE BITT(NW)		pc	2	1	1	2	1	1	2	2
CASING SHOE BITT(BW)		pc	1							1

Table II - 2 - 4 Drilling Summary (MJTE-1)

WORKING PERIOD

CLASS	WORKING PERIOD PERIOD	TOTAL DAYS	DAY BREAK DOWN ACTUAL WORKING	DAY OFF	WORKERS
RIG UP	96/08/28 ~ 96/09/08	12 days	12 days	0 days	175 workers
DRILLING	96/09/09 ~ 96/10/09	31	DRILLING 28	0	448
			REPAIR etc 3	0	48
TEAR DOWN	96/10/10 ~ 96/10/12	3	3	0	48
TOTAL	96/08/28 ~ 96/10/12	46	46	0	719

DRILLING DEPTH etc.

PROPOSED DEPTH	250.00 m	OVERBURDEN	2.00 m
ADDITIONAL DEPTH	2.10 m	CORE LENGTH	232.55 m
INSPECTED DEPTH	252.10 m	RECOVERY	92.2 %

TIME ANALYSYS

CATEGORY	(hr.)	(%)	(%)
DRILLNG	247	39.6	33.6
TRIP.CORE RECOVER CASING. etc.	265	42.5	36.0
REPAIR.FISHING	72	11.5	9.8
WATER SUPPLY	40	6.4	5.4
SUB-TOTAL	624	100.0	84.8
RIG UP	88		12.0
TEAR DOWN	24		3.3
TOTAL	736		100.0

CASING

SIZE	SET DEPTH (m)	B/A×100 (%)	RECOVERY (%)
NW	108.00	42.84	100
BW	176.20	69.89	100

CORE RECOVERY PER EACH 100m

DEPTH (m)	CORE LENGTH (m)	CORE RECOVERY(%) SECTION	CUMULATIVE
0.00 ~ 102.65	92.35	90.0	90.0
102.65 ~ 200.00	88.10	90.5	90.2
200.00 ~ 252.10	52.10	100.0	92.2

TOTAL DEPTH/TOTAL WORKING DAYS	8.13 m/day
TOTAL DEPTH/ACTUL WORKING DAYS	8.13 m/day
TOTAL DEPTH/ACTUL DRILLING DAYS	9.00 m/day
ACTUAL DRLLING WORKERS/TOTAL DEPTH	1.78 worker/m

REMARKS

A : TOTAL DEPTH

B : SET DEPTH

Table II-2-5 Drilling Summary (MJTE-2)

WORKING PERIOD

CLASS	WORKING PERIOD: PERIOD	DAY BREAK DOWN: TOTAL DAYS	DAY BREAK DOWN: ACTUAL WORKING	DAY BREAK DOWN: DAY OFF	WORKERS
RIG UP	96/09/02 ~ 96/09/14	13 days	13 days	0 days	190 workers
DRILLING	96/09/15 ~ 96/10/03	19	DRILLING 18	0	288
			REPAIR etc 1	0	16
TEAR DOWN	96/10/04 ~ 96/10/05	2	2	0	32
TOTAL	96/09/02 ~ 96/10/05	34	34	0	526

DRILLING DEPTH etc.

PROPOSED DEPTH	250.00 m	OVERBURDEN	7.80 m
ADDITIONAL DEPTH	10.25 m	CORE LENGTH	255.85 m
INSPECTED DEPTH	260.25 m	RECOVERY	98.3 %

CORE RECOVERY PER EACH 100m

DEPTH (m)	CORE LENGTH (m)	CORE RECOVERY(%) SECTION	CORE RECOVERY(%) CUMULATIVE
0.00 ~ 102.65	98.25	95.7	95.7
102.65 ~ 203.30	100.65	100.0	97.8
203.30 ~ 260.25	56.95	100.0	98.3

TIME ANALYSYS

CATEGORY	(hr.)	(%)	(%)
DRILLNG	187	54.4	41.0
TRIP.CORE RECOVER CASING. etc.	133	38.7	29.2
REPAIR.FISHING	24	7.0	5.3
WATER SUPPLY	0	0.0	0.0
SUB-TOTAL	344	100.0	75.4
RIG UP	96		21.1
TEAR DOWN	16		3.5
TOTAL	456		100.0

TOTAL DEPTH/TOTAL WORKING DAYS	13.70 m/day
TOTAL DEPTH/ACTUL WORKING DAYS	13.70 m/day
TOTAL DEPTH/ACTUL DRILLING DAYS	14.46 m/day
ACTUAL DRLLING WORKERS/TOTAL DEPTH	1.11 worker/m

CASING

SIZE	SET DEPTH (m)	B/A×100 (%)	RECOVERY (%)
NW	3.05	1.21	100
BW	15.25	6.05	100

REMARKS
A : TOTAL DEPTH
B : SET DEPTH

Table Ⅱ-2-6 Drilling Summary (MJTE-3)

WORKING PERIOD

CLASS	WORKING PERIOD: PERIOD	DAY BREAK DOWN: TOTAL DAYS	DAY BREAK DOWN: ACTUAL WORKING	DAY BREAK DOWN: DAY OFF	WORKERS
RIG UP	96/08/01 ~ 96/08/10	10 days	10 days	0 days	104 workers
DRILLING	96/08/11 ~ 96/08/29	19	DRILLING 14	0	218
			REPAIR etc 5	0	80
TEAR DOWN	96/08/30 ~ 96/09/02	4	4	0	63
TOTAL	96/08/01 ~ 96/09/02	33	33	0	464

DRILLING DEPTH etc.

PROPOSED DEPTH	150.00 m	OVERBURDEN	12.20 m
ADDITIONAL DEPTH	4.50 m	CORE LENGTH	141.40 m
INSPECTED DEPTH	154.50 m	RECOVERY	91.5 %

CORE RECOVERY PER EACH 100m

DEPTH (m)	CORE LENGTH (m)	CORE RECOVERY(%): SECTION	CORE RECOVERY(%): CUMULATIVE
0.00 ~ 105.70	95.40	90.3	90.3
105.70 ~ 154.50	46.00	94.3	91.5

TIME ANALYSYS

CATEGORY	(hr.)	(%)	(%)
DRILLNG	147	44.8	33.4
TRIP.CORE RECOVER CASING. etc.	133	40.5	30.2
REPAIR.FISHING	48	14.6	10.9
WATER SUPPLY	0	0.0	0.0
SUB-TOTAL	328	100.0	74.5
RIG UP	80		18.2
TEAR DOWN	32		7.3
TOTAL	440		100.0

TOTAL DEPTH/TOTAL WORKING DAYS	8.13 m/day
TOTAL DEPTH/ACTUL WORKING DAYS	8.13 m/day
TOTAL DEPTH/ACTUL DRILLING DAYS	11.04 m/day
ACTUAL DRLLING WORKERS/TOTAL DEPTH	1.41 worker/m

CASING

SIZE	SET DEPTH (m)	B/A×100 (%)	RECOVERY (%)
NW	3.05	1.21	100
BW	21.30	8.45	100

REMARKS
A : TOTAL DEPTH
B : SET DEPTH

Table II - 2 - 7 Drilling Summary (MJTE-4)

WORKING PERIOD

CLASS	WORKING PERIOD PERIOD	TOTAL DAYS	DAY BREAK DOWN ACTUAL WORKING	DAY OFF	WORKERS
RIG UP	96/08/01 ~ 96/08/08	8 days	8 days	0 days	87 workers
DRILLING	96/08/09 ~ 96/08/24	16	DRILLING 16	0	243
			REPAIR etc 0	0	0
TEAR DOWN	96/08/25 ~ 96/08/28	4	4	0	62
TOTAL	96/08/01 ~ 96/08/28	28	28	0	392

DRILLING DEPTH etc.

PROPOSED DEPTH	200.00 m	OVERBURDEN	17.20 m
ADDITIONAL DEPTH	12.75 m	CORE LENGTH	199.30 m
INSPECTED DEPTH	212.75 m	RECOVERY	93.7 %

TIME ANALYSYS

CATEGORY	(hr.)	(%)	(%)
DRILLNG	164	47.7	37.3
TRIP, CORE RECOVER CASING, etc.	180	52.3	40.9
REPAIR, FISHING	0	0.0	0.0
WATER SUPPLY	0	0.0	0.0
SUB-TOTAL	344	100.0	78.2
RIG UP	64		14.5
TEAR DOWN	32		7.3
TOTAL	440		100.0

CASING

SIZE	SET DEPTH (m)	B/A×100 (%)	RECOVERY (%)
NW	15.25	6.05	100
BW	38.00	34.91	100

CORE RECOVERY PER EACH 100m

DEPTH (m)	CORE LENGTH (m)	CORE RECOVERY(%) SECTION	CORE RECOVERY(%) CUMULATIVE
0.00 ~ 99.60	86.15	86.5	86.5
99.60 ~ 212.75	113.15	100.0	93.7

TOTAL DEPTH/TOTAL WORKING DAYS	13.30 m/day
TOTAL DEPTH/ACTUL WORKING DAYS	13.30 m/day
TOTAL DEPTH/ACTUL DRILLING DAYS	13.30 m/day
ACTUAL DRLLING WORKERS/TOTAL DEPTH	1.14 worker/m

REMARKS
A : TOTAL DEPTH
B : SET DEPTH

Table II-2-8 Drilling Summary (MJTE-5)

WORKING PERIOD					
CLASS	WORKING PERIOD	DAY BREAK DOWN			WORKERS
	PERIOD	TOTAL DAYS	ACTUAL WORKING	DAY OFF	
RIG UP	96/08/01 ~ 96/08/05	5 days	5 days	0 days	59 workers
DRILLING	96/08/06 ~ 96/08/24	19	DRILLING 19	0	286
			REPAIR etc 0	0	0
TEAR DOWN	96/08/25 ~ 96/08/28	4	4	0	62
TOTAL	96/08/01 ~ 96/08/28	28	28	0	407

DRILLING DEPTH etc.			
PROPOSED DEPTH	250.00 m	OVERBURDEN	8.30 m
ADDITIONAL DEPTH	11.25 m	CORE LENGTH	242.35 m
INSPECTED DEPTH	261.25 m	RECOVERY	92.8 %

TIME ANALYSYS			
CATEGORY	(hr.)	(%)	(%)
DRILLNG	200	49.0	41.7
TRIP, CORE RECOVER CASING, etc.	208	51.0	43.3
REPAIR, FISHING	0	0.0	0.0
WATER SUPPLY	0	0.0	0.0
SUB-TOTAL	408	100.0	85.0
RIG UP	40		8.3
TEAR DOWN	32		6.7
TOTAL	480		100.0

CASING			
SIZE	SET DEPTH (m)	B/A×100 (%)	RECOVERY (%)
NW	3.05	1.21	100
BW	21.35	8.47	100

CORE RECOVERY PER EACH 100m			
DEPTH (m)	CORE LENGTH (m)	CORE RECOVERY(%) SECTION	CORE RECOVERY(%) CUMULATIVE
0.00 ~ 96.55	87.10	90.2	90.2
96.55 ~ 206.35	100.35	91.4	90.8
206.35 ~ 261.25	54.90	100.0	92.8

TOTAL DEPTH/TOTAL WORKING DAYS	13.75 m/day
TOTAL DEPTH/ACTUL WORKING DAYS	13.75 m/day
TOTAL DEPTH/ACTUL DRILLING DAYS	13.75 m/day
ACTUAL DRLLING WORKERS/TOTAL DEPTH	1.09 worker/m

REMARKS
A : TOTAL DEPTH
B : SET DEPTH

Table II-2-9 Drilling Summary (MJTE-6)

WORKING PERIOD

CLASS	WORKING PERIOD: PERIOD	DAY BREAK DOWN: TOTAL DAYS	ACTUAL WORKING	DAY OFF	WORKERS
RIG UP	96/08/29 ～ 96/09/08	11 days	11 days	0 days	175 workers
DRILLING	96/09/09 ～ 96/09/24	15	DRILLING 15.3	0	241
			REPAIR etc 0.7	0	15
TEAR DOWN	96/09/25 ～ 96/09/26	2	2	0	32
TOTAL	96/08/29 ～ 96/09/26	29	29	0	463

DRILLING DEPTH etc.

PROPOSED DEPTH	200.00 m	OVERBURDEN	3.65 m
ADDITIONAL DEPTH	12.45 m	CORE LENGTH	210.20 m
INSPECTED DEPTH	212.45 m	RECOVERY	98.9 %

CORE RECOVERY PER EACH 100m

DEPTH (m)	CORE LENGTH (m)	CORE RECOVERY(%) SECTION	CORE RECOVERY(%) CUMULATIVE
0.00 ～ 97.60	95.35	97.7	97.7
97.60 ～ 212.45	114.85	100.0	98.9

TIME ANALYSYS

CATEGORY	(hr.)	(%)	(%)
DRILLNG	182	63.2	46.4
TRIP, CORE RECOVER CASING, etc.	90	31.3	23.0
REPAIR, FISHING	16	5.6	4.1
WATER SUPPLY	0	0.0	0.0
SUB-TOTAL	288	100.0	73.5
RIG UP	88		22.4
TEAR DOWN	16		4.1
TOTAL	392		100.0

TOTAL DEPTH/TOTAL WORKING DAYS	13.28 m/day
TOTAL DEPTH/ACTUL WORKING DAYS	13.28 m/day
TOTAL DEPTH/ACTUL DRILLING DAYS	13.86 m/day
ACTUAL DRLLING WORKERS/TOTAL DEPTH	1.13 worker/m

CASING

SIZE	SET DEPTH (m)	B/A×100 (%)	RECOVERY (%)
NW	3.05	1.21	100
BW	12.20	4.84	100

REMARKS
A : TOTAL DEPTH
B : SET DEPTH

Table II - 2 - 10 Drilling Summary (MJTE-7)

CLASS	WORKING PERIOD: PERIOD	DAY BREAK DOWN: TOTAL DAYS	ACTUAL WORKING	DAY OFF	WORKERS
RIG UP	96/09/27 ~ 96/10/02	6 days	6 days	0 days	96 workers
DRILLING	96/10/03 ~ 96/10/15	13	DRILLING 12	0	192
			REPAIR etc 1	0	16
TEAR DOWN	96/10/16 ~ 96/10/19	4	4	0	64
TOTAL	96/09/27 ~ 96/10/19	23	23	0	368

DRILLING DEPTH etc.

PROPOSED DEPTH	200.00 m	OVERBURDEN	13.20 m
ADDITIONAL DEPTH	0.15 m	CORE LENGTH	190.95 m
INSPECTED DEPTH	200.15 m	RECOVERY	95.4 %

TIME ANALYSYS

CATEGORY	(hr.)	(%)	(%)
DRILLNG	175	64.3	49.7
TRIP, CORE RECOVER CASING, etc.	89	32.7	25.3
REPAIR, FISHING	8	2.9	2.3
WATER SUPPLY	0	0.0	0.0
SUB-TOTAL	272	100.0	77.3
RIG UP	48		13.6
TEAR DOWN	32		9.1
TOTAL	352		100.0

CASING

SIZE	SET DEPTH (m)	B/A× 100 (%)	RECOVERY (%)
NW	6.10	2.42	100
BW	54.90	21.78	100

CORE RECOVERY PER EACH 100m

DEPTH (m)	CORE LENGTH (m)	CORE RECOVERY (%) SECTION	CORE RECOVERY (%) CUMULATIVE
0.00 ~ 105.70	96.50	91.3	91.3
105.70 ~ 200.15	94.45	100.0	95.4

TOTAL DEPTH/TOTAL WORKING DAYS	15.40 m/day
TOTAL DEPTH/ACTUL WORKING DAYS	15.40 m/day
TOTAL DEPTH/ACTUL DRILLING DAYS	16.68 m/day
ACTUAL DRLLING WORKERS/TOTAL DEPTH	0.96 worker/m

REMARKS
A : TOTAL DEPTH
B : SET DEPTH

Table II - 2 - 11 Drilling Summary (MJTE-8)

WORKING PERIOD					
CLASS	WORKING PERIOD	DAY BREAK DOWN			WORKERS
	PERIOD	TOTAL DAYS	ACTUAL WORKING	DAY OFF	
RIG UP	96/10/04 ~ 96/10/08	5 days	5 days	0 days	79 workers
DRILLING	96/10/09 ~ 96/10/23	15	DRILLING 14.3	0	229
			REPAIR etc 0.7	0	11
TEAR DOWN	96/10/24 ~ 96/10/29	6	6	0	114
TOTAL	96/10/04 ~ 96/10/29	26	26	0	433

DRILLING DEPTH etc.			
PROPOSED DEPTH	200.00 m	OVERBURDEN	6.50 m
ADDITIONAL DEPTH	3.55 m	CORE LENGTH	184.80 m
INSPECTED DEPTH	203.55 m	RECOVERY	90.8 %

CORE RECOVERY PER EACH 100m			
DEPTH (m)	CORE LENGTH (m)	CORE RECOVERY(%) SECTION	CORE RECOVERY(%) CUMULATIVE
0.00 ~ 96.55	77.80	80.6	80.6
96.55 ~ 203.55	107.00	100.0	90.8

TIME ANALYSYS			
CATEGORY	(hr.)	(%)	(%)
DRILLNG	184	51.1	41.1
TRIP, CORE RECOVER CASING. etc.	160	44.4	35.7
REPAIR, FISHING	16	4.4	3.6
WATER SUPPLY	0	0.0	0.0
SUB-TOTAL	360	100.0	80.4
RIG UP	40		8.9
TEAR DOWN	48		10.7
TOTAL	448		100.0

TOTAL DEPTH/TOTAL WORKING DAYS	13.57 m/day
TOTAL DEPTH/ACTUL WORKING DAYS	13.57 m/day
TOTAL DEPTH/ACTUL DRILLING DAYS	14.20 m/day
ACTUAL DRLLING WORKERS/TOTAL DEPTH	1.13 worker/m

CASING			
SIZE	SET DEPTH (m)	B/A × 100 (%)	RECOVERY (%)
NW	64.05	25.41	100
BW	177.90	70.57	100

REMARKS

A : TOTAL DEPTH

B : SET DEPTH

Table II-2-12 Drilling Schedule

ITEM		JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER
Mobilization to Espiye		24 —	— 2			
MJTE-1	Rig up		28 —	— 8		
	Drilling			9 —	— 9	
	Tear down				10 — 12	
MJTE-2	Rig up			2 — 14		
	Drilling			15 —	— 3	
	Tear down				4 — 5	
MJTE-3	Rig up	28 —	— 10			
	Drilling		11 — 29			
	Tear down		30 —	— 2		
MJTE-4	Rig up	28 —	— 8			
	Drilling		9 — 24			
	Tear down		25 — 28			
MJTE-5	Rig up	28 —	— 5			
	Drilling		6 — 24			
	Tear down		25 — 28			
MJTE-6	Rig up		28 —	— 7		
	Drilling			8 — 23		
	Tear down			24 — 26		
MJTE-7	Rig up			26 —	— 2	
	Drilling				3 — 15	
	Tear down				16 — 29	
MJTE-8	Rig up				4 — 8	
	Drilling				— 23	
	Tear down				24 — 29	
Demobilization to Ankara					30 —	— 6

Legend

Unit	Symbol	Description
Intrusive Rocks	Db	Biotite Dacite
	Nd	Nevaditic Dacite
	Do	Dolerite
	Ad	Andesite
	Dp	Porphyritic Dacite
	Dh	Hematite Dacite
Çağlayan Formation	Ctf	Dacitic Pyroclastics
	Cdc	Aphyric Dacite Lava
	Cdp	Porphyritic Dacite Lava
	Cms	Pelitic Rocks
Kızılkaya Formation	Kt2	Dacitic Pyroclastics
	Kdc	Dacite Lava
	Kt1	Dacitic Pyroclastics
Çatok Formation	Çms	Pelitic Rocks
	Çtf	Andestic Pyroclastics
	Çad	Andesite Lava
	10	Strike and Dip
		Fault
		Active Mine
		Suspended Mine
	O	Drilling Point

Fig. II-2-3 Geological Map

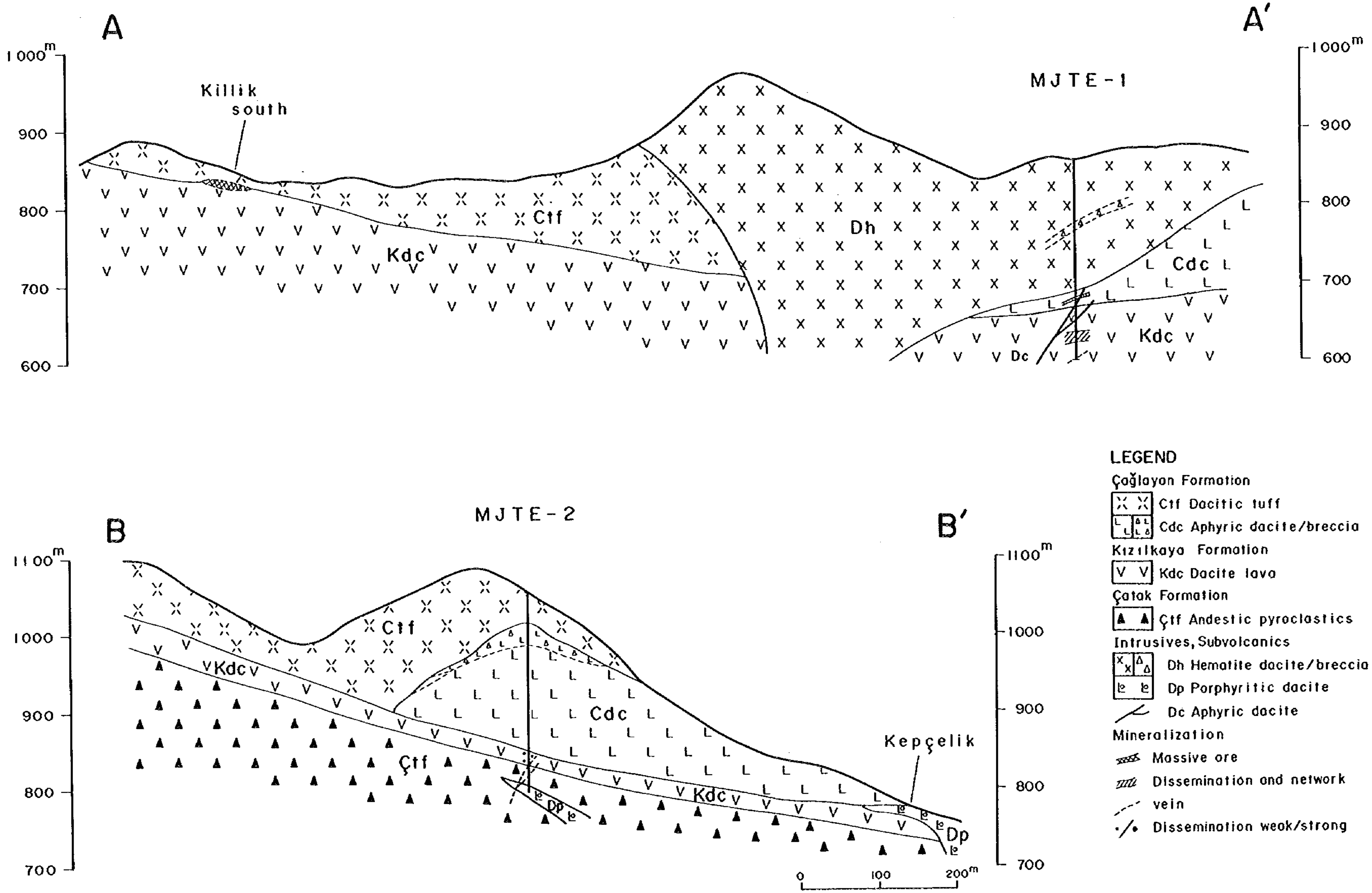

Fig. II-2-5 Geological Section (MJTE-1, MJTE-2)

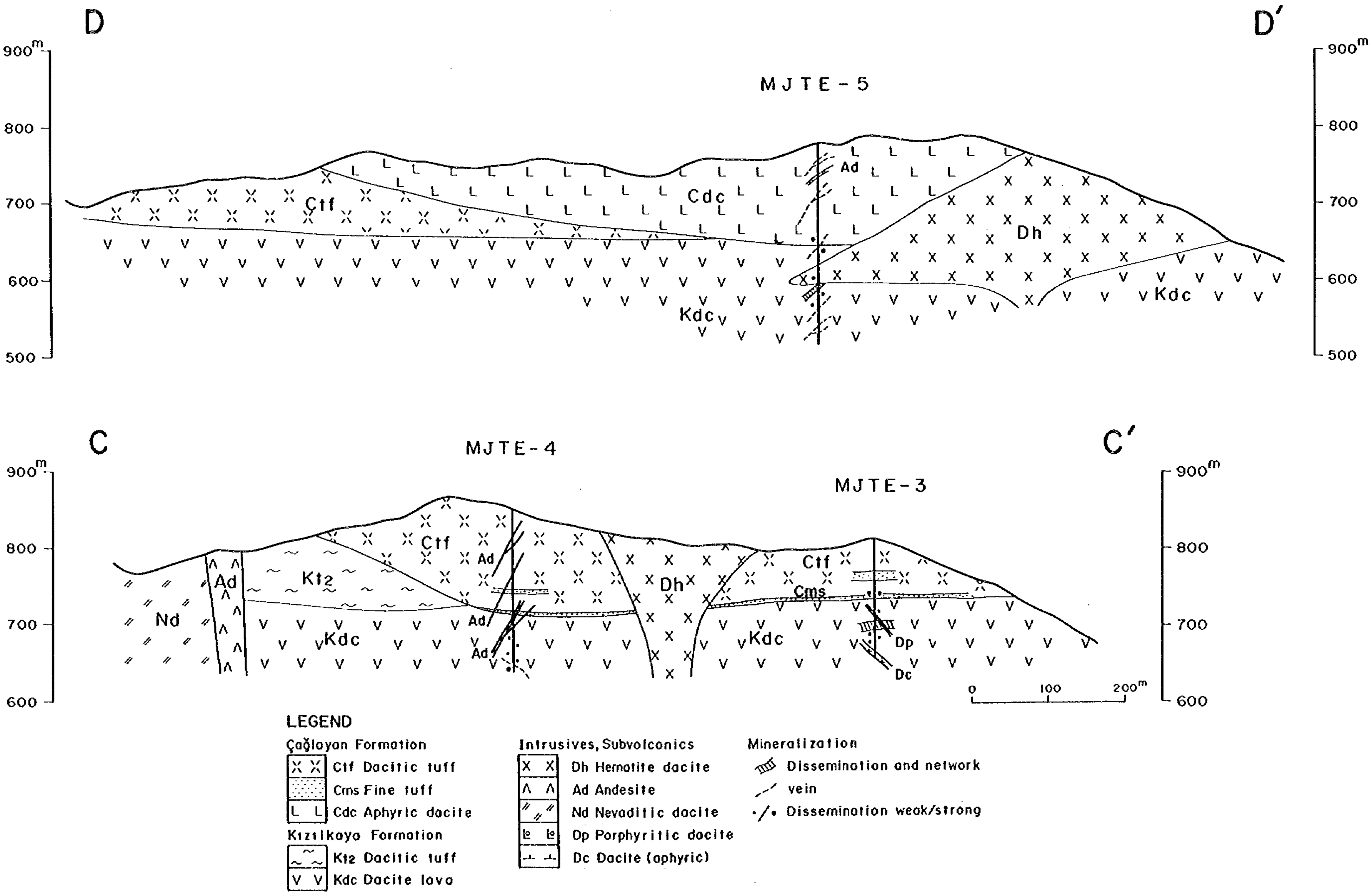

Fig. II-2-6 Geological Section (MJTE-3, MJTE-4, MJTE-5)

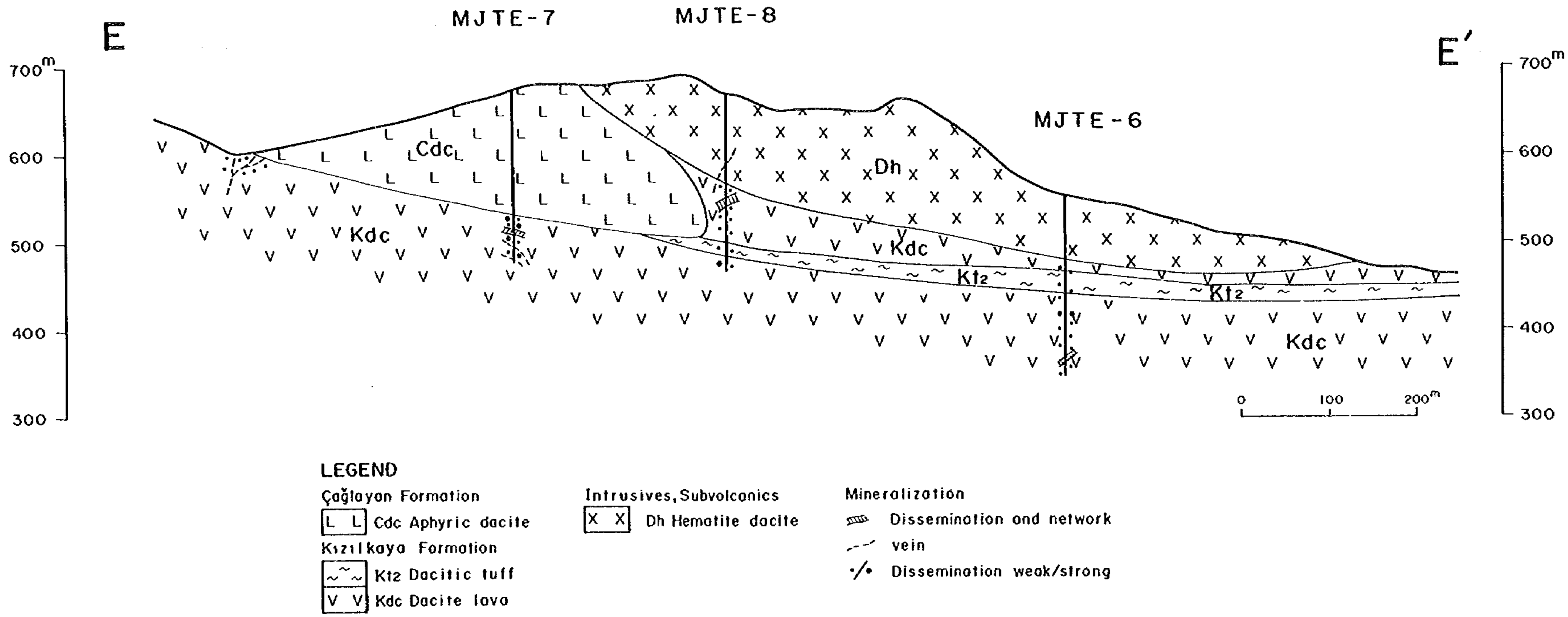

Fig. II - 2 - 7 Geological Section (MJTE-6, MJTE-7, MJTE-8)

Table II-2-13 Results of Chemical Analysis

NO.	DRILLING NO	DEPTH (m)	SAMPLE TYPE	AU (ppm)	AG (ppm)	CU (%)	PB (%)	ZN (%)	FE (%)	S (%)	REMARKS
A-1	MJTE-1	180.0-180.5	sil pyrite diss	0.02	0.74	< 0.01	< 0.01	0.03	12.67	14.49	
A-2	MJTE-1	182.0-182.2	arg pyrite diss	< 0.01	1.14	< 0.01	0.03	0.09	12.77	14.69	
A-3	MJTE-1	202.7-202.9	sil pyrite diss	< 0.01	0.15	< 0.01	< 0.01	< 0.01	9.50	10.84	
A-4	MJTE-1	221.0-221.2	sil pyrite net	0.03	0.10	< 0.01	< 0.01	< 0.01	4.42	5.12	
A-5	MJTE-1	226.7-227.2	sil pyrite net	0.02	0.15	< 0.01	< 0.01	< 0.01	7.87	9.08	
A-6	MJTE-1	234.5-234.65	chalcopyrite diss	< 0.01	3.11	4.88	< 0.01	< 0.01	16.61	18.61	
A-7	MJTE-1	250.0-250.50	pyrite diss ore	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	6.43	7.13	
A-8	MJTE-2	207.0-207.5	pyrite diss	0.14	3.75	0.20	0.74	0.94	3.26	4.14	cp. bearing
A-9	MJTE-2	210.3-210.8	pyrite diss	0.05	0.15	< 0.01	< 0.01	0.01	1.92	1.88	
A-10	MJTE-2	215.0-215.5	pyrite diss	0.08	0.35	0.05	0.08	0.52	2.30	2.72	cp. film
A-11	MJTE-2	220.0-220.5	pyrite diss	0.05	0.15	< 0.01	< 0.01	< 0.01	2.21	2.56	
A-12	MJTE-2	240.7-240.8	sph+cp+py vein	0.06	1.87	0.31	0.01	8.15	5.18	9.00	
A-13	MJTE-3	76.5-76.6	py.band tuff	0.04	< 0.01	< 0.01	< 0.01	< 0.01	24.00	23.64	
A-14	MJTE-3	109.05-109.20	yellow ore	2.06	15.30	12.58	0.04	0.02	24.58	27.67	
A-15	MJTE-3	114.8-114.9	pyrite network	0.04	0.20	0.02	< 0.01	< 0.01	37.92	42.38	
A-16	MJTE-3	116.0-116.2	pyrite diss	0.20	1.28	< 0.01	< 0.01	< 0.01	20.35	23.33	
A-17	MJTE-3	130.7-130.8	powder pyrite net	0.26	0.34	< 0.01	< 0.01	0.03	24.77	27.33	
A-18	MJTE-3	133.85-133.9	pyrite network	0.40	1.23	< 0.01	< 0.01	0.01	22.85	25.62	
A-19	MJTE-3	145.1-145.2	pyrite diss	0.06	0.05	< 0.01	< 0.01	< 0.01	15.74	5.07	
A-20	MJTE-4	177.5-177.6	pyrite diss	0.08	< 0.01	< 0.01	< 0.01	0.02	2.69	2.76	
A-21	MJTE-4	199.7-199.8	pyrite diss	< 0.01	0.25	< 0.01	< 0.01	< 0.01	5.95	7.02	
A-22	MJTE-4	211.3-211.5	powder pyrite net	< 0.01	0.10	< 0.01	< 0.01	< 0.01	20.93	24.14	
A-23	MJTE-5	61.2-61.3	hm+py+cp vein	0.09	0.69	< 0.01	< 0.01	< 0.01	13.44	13.03	
A-24	MJTE-5	129.2-129.3	pyrite network	0.02	0.15	< 0.01	< 0.01	< 0.01	9.02	10.19	
A-25	MJTE-5	131.2-131.3	pyrite diss	0.35	7.50	2.18	< 0.01	0.02	10.46	11.65	
A-26	MJTE-5	185.2-185.3	powder pyrite net	0.07	1.62	< 0.01	< 0.01	0.01	11.23	12.75	
A-27	MJTE-6	86.9-87.0	pyrite diss tuff	< 0.01	0.49	< 0.01	< 0.01	< 0.01	2.88	2.73	
A-28	MJTE-6	99.2-99.3	pyrite diss tuff	< 0.01	0.88	< 0.01	< 0.01	0.01	4.61	4.24	
A-29	MJTE-6	127.0-127.1	pyrite diss・film	0.02	0.20	< 0.01	< 0.01	< 0.01	12.48	13.09	
A-30	MJTE-6	182.9-183.0	pyrite diss Dc	0.04	0.49	< 0.01	< 0.01	< 0.01	9.41	8.57	
A-31	MJTE-6	194.8-194.9	pyrite diss Dc	< 0.01	0.49	< 0.01	< 0.01	< 0.01	5.18	2.83	qz, py druse
A-32	MJTE-7	148.0-148.4	pyrite network	< 0.01	0.19	< 0.01	< 0.01	< 0.01	10.27	8.72	
A-33	MJTE-7	161.5-161.6	diss py ore	0.03	0.34	< 0.01	< 0.01	< 0.01	21.22	21.77	
A-34	MJTE-7	162.0-162.5	pyrite network	0.01	0.24	< 0.01	< 0.01	< 0.01	11.90	10.14	
A-35	MJTE-7	177.5-177.9	hm+py network	< 0.01	0.29	0.01	< 0.01	< 0.01	6.14	3.92	cp bearing
A-36	MJTE-7	195.9-196.0	diss py ore	< 0.01	0.58	< 0.01	< 0.01	< 0.01	30.14	33.20	
A-37	MJTE-7	198.2-198.4	pyrite diss-net	< 0.01	0.54	< 0.01	< 0.01	0.01	7.87	5.49	
A-38	MJTE-8	82.0-82.1	py+clay vein	0.02	3.46	0.16	0.07	1.50	1.73	1.88	
A-39	MJTE-8	116.4-116.9	arg py net	0.05	4.00	0.12	0.05	0.03	15.74	17.89	
A-40	MJTE-8	124.8-125.0	pyrite diss-net	0.19	2.00	0.02	0.03	0.01	13.06	14.50	
A-41	MJTE-8	142.5-142.7	pyrite diss-net	0.09	0.68	< 0.01	< 0.01	< 0.01	10.94	12.20	
A-42	MJTE-8	188.0-188.2	arg py diss	0.03	< 0.01	< 0.01	< 0.01	< 0.01	8.26	7.93	
A-43	MJTE-8	201.0-201.1	pyrite diss Dc	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	5.76	4.41	

Abbreviation
py:pyrite, cp:chalcopyrite, sph:sphalerite, hm:hematite, Dc:dacite,
diss:dissemination, net:network, arg:argillization, sil:silicification

Table II-2-14 Results of X -Ray Diffraction Analysis

NO.	SAMPLE NO.	DRILLING NO.	DEPTH m	ROCK TYPE	FOR-MATION	MINERALS Qz	Pl	Ab	M	MX	Ch	Se	K	Ep	Py	Ca	Do	Gp	Mg			Remarks
1	X-1	MJTE-1	59.1	hematite dacite	Dh	△		◎		•	•											
2	X-2	MJTE-1	89.5	tuff breccia	Dh	○		◎					△		•	△						
3	X-3	MJTE-1	170.6	aphyric dacite	Cdc	○		○			•	•										
4	X-4	MJTE-1	180.0	pyritized dacite	Cdc	○						△			○							
5	X-5	MJTE-1	227.0	pyritized dacite	Kdc	◎						△			○							
6	X-6	MJTE-1	250.0	pyritized dacite	Kdc	◎					•	•			○							
7	X-7	MJTE-2	15.9	dacitic tuff	Ctf	△		○			△	△										
8	X-8	MJTE-2	63.0	dacite	Cdc	○		○			△	△										hayaloclastic
9	X-9	MJTE-2	115.5	dacite	Cdc	○		○			△	•										
10	X-10	MJTE-2	200.0	dacite	Cdc	○		◎			•	•										
11	X-11	MJTE-2	220.0	altered dacite	Kdc	◎						△			•							
12	X-12	MJTE-2	249.0	andesitic tuff	Ctf	△		•			△			△		△						
13	X-13	MJTE-3	33.0	dacitic tuff	Ctf	◎					△	△			•							
14	X-14	MJTE-3	76.5	fine tuff	Ctf	○					△				△							
15	X-15	MJTE-3	96.0	altered dacite	Kdc	◎						△			•							
16	X-16	MJTE-3	148.4	altered dacite	Kdc	◎					•	△			•		•					
17	X-17	MJTE-4	38.7	dacitic tuff	Ctf	◎					△	△										
18	X-18	MJTE-4	66.7	dacitic tuff	Ctf	◎					△	△			•							
19	X-19	MJTE-4	108.3	fine tuff	Ctf	△		△			○	•						△				
20	X-20	MJTE-4	142.7	andesite	Ad	△		◎			△					△						
21	X-21	MJTE-4	178.0	altered dacite	Kdc	◎					△	△			•							
22	X-22	MJTE-5	60.7	aphyric dacite	Cdc	○						△	△		•				△			
23	X-23	MJTE-5	131.2	altered dacite	Kdc	○						△			△	△						
24	X-24	MJTE-5	161.5	dacite	Dp	◎		○				△	•		•							porphyritic
25	X-25	MJTE-5	185.0	altered dacite	Kdc	○		○				△			△							
26	X-26	MJTE-5	221.6	altered dacite	Kdc	○		○			△	△			•		•					
27	X-27	MJTE-6	52.5	hematite dacite	Dh	○		○	•			•			•							
28	X-28	MJTE-6	73.6	dacite	Kdc	○					•	△			○	•						
29	X-29	MJTE-6	99.2	dacitic tuff	Kt2	◎		•			△	△			△	•						
30	X-30	MJTE-6	127.0	dacite	Kdc	○		◎			△	△			△	•			•			
31	X-31	MJTE-6	198.4	dacite	Kdc	△		○			○				•	•						
32	X-32	MJTE-7	50.7	aphyric dacite	Cdc	○		◎			•	•										
33	X-33	MJTE-7	100.0	aphyric dacite	Cdc	○		○			•	•							•			
34	X-34	MJTE-7	148.4	altered dacite	Kdc	○		•				△	△		◎				△			py network
35	X-35	MJTE-7	162.0	altered dacite	Kdc	•		•				△	○		△				△			py network
36	X-36	MJTE-7	177.5	altered dacite	Kdc	○		•				△	△		△				△			
37	X-37	MJTE-7	195.9	altered dacite	Kdc	•						△	•		○		•		•			
38	X-38	MJTE-8	57.5	dacite	Dh	○		△			•	•			•							
39	X-39	MJTE-8	100.0	dacite	Dh	◎		△			•	•				•						
40	X-40	MJTE-8	125.0	shear zone	Dh	◎						△			△							
41	X-41	MJTE-8	149.0	altered dacite	Kdc	◎		•			•	△			•							
42	X-42	MJTE-8	173.0	dacitic tuff	Kt2	◎					•	△			•	•	•					
43	X-43	MJTE-8	200.0	altered dacite	Kdc	△		○			◎	△			△							

Abbreviations: Qz:quartz Pl:plagioclase Ab:albite feldspar MX:sericite/montmorillonite interstratified mineral Ch:chlorite S:sericite K:kaolinite Ca:calcite Do:dolomote Gp:gypsum Ep:epidote Ah:anhydrite Mg:Magnesite Py:pyrite
◎:abundant ○:common △:rare •:very rare

Table II-2-15 Results of Microscopic Observation of Thin Section

NO.	SAMPLE NO.	DRILLING NO.	DEPTH m	ROCK TYPE	TEXTURE	PHENOCRYST Qz	Pl	Hb	Mf	FRAGMENT	GROUNDMASS・MTRIX Qz	Pl	Kf	Si	Fe	Gl	Pu	ALTERATION・METAMORPHIC Qz	Ch	Se	Ca	Ep	Cl	Op	REMARKS
1	T- 1	MJTE-1	89.50	Breccia(conglo.)	Clastic	△	○			Rhy, SS, Gr, Dc, Ad,	◎	○						△		△	△		△	△	
2	T- 2	MJTE-2	63.00	Dacite(aphyric)	Perlitic		○									○		△					○		
3	T- 3	MJTE-2	103.00	Dacite(aphyric)	Glassy											◎		○		◎				○	
4	T- 4	MJTE-2	249.00	Altered rock														◎			◎	◎		△	
5	T- 5	MJTE-2	258.50	Dacite	Porphyritic		◎	・?								◎			○		・			△	
6	T- 6	MJTE-3	33.00	Lapilli tuff	Pyroclastic					Tf, Dc, At		△				◎	◎	△	○	△				△	
7	T- 7	MJTE-3	56.25	Fine tuff	Pyroclastic						△					◎		△	○				○	△	
8	T- 8	MJTE-3	145.50	Dacite	Glassy	△	△		△							◎		◎		△	△			△	
9	T- 9	MJTE-4	142.50	Andesite	Porphyritic		△	△				○	△	◎		△		○	○	・	・			○	Fe-oxide
10	T-10	MJTE-5	115.70	Dacite(aphyric)	Felsic		△							○		◎		○		○	◎			△	
11	T-11	MJTE-6	52.50	Dacite	Porphyritic		△	△				△		○		◎		△		◎	○		◎	△	Fe-oxide
12	T-12	MJTE-6	80.70	Dacite	Porphyritic		△		△?							◎			△	◎				△	
13	T-13	MJTE-6	99.20	Lapilli tuff	Pyroclastic					Dc		△				◎		○	△	○	△			○	
14	T-14	MJTE-6	194.80	Dacite	Porphyritic		△					◎			△	◎		◎	○	○	△			○	
15	T-15	MJTE-8	59.50	Dacite	Glassy		△					△				◎		○	・	△	・			・	

Abbreviatio:Qz:quartz, Pl:plagioclase, Kf:potassium feldspar, Hb:hornblende, Mf:mafic mineral, Si:siliceous mineral, Gl:glass, Pu:pumice, Fe:Fe-mineral
Ch:chlorite, Se:sericite, Ca:calcite, Ep:epidote, Cl:clay mineral, Op:opaque mineral
Ad:andesite, Rhy:rhyiolite, SS:sandstone, Gr:granite, Dc: dacite, Tf: tuff, At: altered rock
◎:abundant, ○:common, △:few, ・:rare

Table II-2-16 Results of Microscopic Observation of Polished Section

NO.	SAMPLE NO.	DRILLING NO.	DEPTH m	ROCK TYPE	MINERALS Bn	Cp	Sp	Ga	Py		
1	P- 1	MJTE-1	180.00	siliceous ore					◎		
2	P- 2	MJTE-1	226.70	py-network ore					◎		
3	P- 3	MJTE-1	234.50	cp-diss. ore		+			◎		
4	P- 4	MJTE-2	207.00	network ore		△	+	+	◎		
5	P- 5	MJTE-2	240.70	cp+sp vein	・	◎	◎	+	○		
6	P- 6	MJTE-3	76.50	py-diss. ore					◎		
7	P- 7	MJTE-3	109.30	yellow ore		○			◎		
8	P- 8	MJTE-3	133.85	py-ore			・		◎		
9	P- 9	MJTE-3	145.10	py-ore			・		◎		
10	P-10	MJTE-5	61.20	hm-network ore			・		◎		
11	P-11	MJTE-5	185.20	py-network ore					◎		
12	P-12	MJTE-6	127.00	py-network ore			+		◎		
13	P-13	MJTE-6	182.90	py-diss. ore			+		◎		
14	P-14	MJTE-7	162.00	py-network ore			+		◎		
15	P-15	MJTE-7	177.50	py-diss. ore			+		◎		

Abbreviation:Bn:bornite, Cp:chalcopyrite, Sp:sphalerite,
Ga:galena, Py:pyrite, Hm:hematite
diss.:dissemination
◎:abundant, ○:common, △:few, ・:rare, +:very rare

2-3 Discussion

Evaluation of each area as well as K/Ar age determination of alteration zone are described below.

1. Killik Area (MJTE-1)

MJTE-1 locates between Killik South Deposit and Kızılkaya Deposit. From the facts that hanging walls are distributed on the surface, networked mineralization in footwall dacite distributed in the southern area, and IP anomaly seemingly reflecting it creepingin toward drilling points, the existence of concealed deposits was expected.

As a result of survey, it became clear that hematite dacite of hanging wall distribute unexpectedly deep; the Çağlayan Formation consisted of only aphyric dacite lava but no tuff distribution. As for the mineralization, as stockwork of footwall, dissemination of chalcopyrite (Cu ore grade 4.88%) of about 25cm in the depth of 234.5m was confirmed and also network mineralization mainly of pyrite was found at the depth of 221m to 230m.

It became clear that alteration of the footwall was significant not only in dissemination of pyrite but also in quartz and sericite; therefore, massive ore may exist nearby. There is only possibility of existence of massive sulfide ore body in the area, between MJTE-1 and Killik South Deposit where covered with hanging wall.

In the southern part of drilling site where footwalls are distributing in a wide range, judging from strong IP anomaly, it is possible that there is a low grade network type copper mineralization in large scale.

2. Kepçelik Area (MJTE-2)

MJTE-2 locates at the ridge of about 500m south-southwest of Kepçelik old exploration tunnel. Hanging wall tuff of Çağlayan Formation was distributed and a weak IP anomaly was found in the deep part of drilling point. This anomaly may possibly be continued from the end of IP survey line where networked mineralization of pyrite exists.

The results of the survey showed that the hanging wall dacite lava of Çağlayan Formation was thick while the dacite lava of Kızılkaya Formation is as thin as about 20m. Its underneath, volcanic rocks of Çatak Formation which was altered like skarn were found. The alteration was quite different from that of the upper Formation.

Mineralization in both style of dissemination and vein were found but their scales were small. The mineralization in dissemination was found in dacite lava of Kızılkaya Formation. When its analytical results were compared with those of the samples of similar mineralization in other areas, the former showed a tendency to have higher values in Pb (maximum: 0.74%) and Zn (maximum: 0.94%). Vein type mineralization was due to hydrothermal activities after Kızılkaya Formation and small veins of Cu and Zn were confirmed.

Although there is no detailed report on Kepçelik, local people said that there had been ores in lens shape. According to the results of two drilling surveys conducted later, a network type mineralization has been found during one of the surveys. Re-survey of geology near the old exploration tunnel has made clear that the old exploration tunnel was dug at the contact between aphyric dacite lava of Çağlayan Formation and porphyritic dacite intrusive rocks; alteration zone distributes in NE direction along the contact; ore showing exists at about 1.5km on this extension. In other words, old exploration tunnel, drilling sites which found ore showing and isolated ore showing seem to be on one line.

Corse-grained Kuroko type ore remaining in the waste is different from the clastic ore found in Lahanos. These facts clearly show that mineralization in Kepçelik area can be vein-network type but not Kuroko-type massive ore.

3. Bitene Area (MJTE-3, 4 and 5)

MJTE-3, 4 and 5 locate between Lahanos mine and Killik deposit and their satellite and new ore bodies in their extension were expected to exist. On the surface, Çağlayan Formation's aphyric lava, tuff, hematite dacite and andesite intrusive rocks have been distributed.

At MJTE-3 and 4, tuff of Çağlayan Formation is seen to the depth of 80-140m from the surface. At its bottom, thin layer of fine grained (sandy) tuff with ferruginous chert is seen which corresponds to those classified as Cms on the surface. Therefore, the mineral deposit horizon is 710-730m above sea level. The upper part of the horizon consists of tuff of a clear sedimentary structure and the bed dips nearly horizontal. At MJTE-4 particularly, dikes which seem to be from the same origin of andesite forming Killik Tepe are found. On the other hand at MJTE-5, aphyric dacite lava is distributed thickly from the surface but no tuffs are found. Kızılkaya Formation appears at 650m above sea level which is the same with the horizon of Lahanos deposit. Therefore, as shown in a cross section, it is considered that there is no distribution of tuff in the east of MJTE-5 but it is mainly occupied by aphyric lava and hematite dacite.

As for the alteration of Çağlayan Formation at MJTE-3 and 4, white colored argillization of their major component of sericite with chlorite is significant and silicification is also recognized at the footwall. Alteration at the hanging wall of MJTE-5 is white colored argillization mainly with sericite and kaolinite. The fact that it does not consist of chlorite differentiates it from those of MJTE-3 and 4. In addition, barite is recognized with the naked eye. Alteration of the footwall dacite mainly consists of silicification and sericitization, and chlorite appears at its lower part. MJTE-5 locates at 200 to 300m from the end of ore body of Lahanos mine. The fact that its alteration of the hanging wall is different from those of MJTE-3 and 4 may reflect the different distance from the ore body.

The mineralization is weak in MJTE-4 and only slight network type pyrite is found at the deep part of footwall dacite. At MJTE-3 in the footwall, massive ore(yellow ore) of 20cm is seen at the upper part (109m depth) of relatively dominant network type pyritized zone of about 16m. For its grade, Cu is 12.58% and Au 2.06ppm. Pb and Zn are low. Mineralization of MJTE-5 is in a network zone of footwall which lasts 7m from the depth of 182m right under the hematite dacite but its grade is low. Mineralization of chalcopyrite, sphalerite, and quartz vein with hematite, is also found in the hanging wall aphyric dacite lava.

Considering that alteration has been spread also in the hanging wall nearby Lahanos Deposit, it is certain that hydrothermal activities with mineralization continued after deposition of massive sulfide ore .

4. Taflancık Area (MJTE-6, 7 and 8)

Although there was no record of mining or exploration in this area, since IP anomaly had been found by the first year survey and its extension was found by the survey of this year, its dominant mineralization was expected.

The geology of this area ranges in the order of ages from young to old: hematite dacite, dacite lava of Çağlayan Formation, tuff of Kızılkaya Formation and footwall dacite. In the well, hematite dacite is found in MJTE-6 and 8. MJTE-6 mostly consists of red-brown rocks and only partial alteration is seen. At MJTE-8, on the other hand, most part has been argillized and decoloration has been advanced. As it is clear from a cross section, it is distributed in dip toward north.

Çağlayan Formation mainly consists of aphyric dacite with a thin layer of tuff. At MJTE-7, it is distributed most thickly (140m). By the phase I survey, the distribution of this unit on the surface in the southern part of MJTE-7 was regarded as tuff, but since it is judged by the survey of this year that most of it is the brecciated rock which has been altered by argillization, the geological map has been partly modified. Kızılkaya Formation consists of dacite tuff and dacite lava. The tuff dips moderately toward north and its thickness is increasing as it gets to the north. At MJTE-7 of Southern end, it has been pinched out. Dacite lava is autobrecciated lava consisting of a great amount of phenocryst of plagioclase and at the deep part of each borehole, the dacite lava contains porous fragments with many pores.

As for the alteration of hematite dacite of the hanging wall, it is weak with montmorillonite at MJTE-6, but it becomes intense toward the lower part with a trace amount of sericite and chlorite at MJTE-8. As for Çağlayan Formation, its alteration is mainly weak argillization. As for Kızılkaya Formation, it is mainly intense sericitization. There is a change from the south (MJTE-7) to the north (MJTE-6). In other words, MJTE-7 consists of sericite as well as kaolinite and magnesite but MJTE-8 consists of more sericite than chlorite and partly gypsum. MJTE-6 consists of chlorite and sericite as well as calcite. Thus, main role of alteration tends to change from sericite to chlorite as it gets to the north.

Mineralization of each borehole is partly characterized by dominant dissemination or network of pyrite, and a small amount of dissemination or film of chalcopyrite, but its analysis values are low. Sometimes the pyrite shows a colloform and framboidal texture. At MJTE-7, mineralization concentrates in the footwall dacite while at MJTE-8, pyrite and clay vein (fault?) can be seen also in hematite dacite of hanging wall and Cu is 0.16% and Zn 1.5%. At MJTE-6, yellow ore fragments are contained in dacite lava in upper Kızılkaya Formation and many mineralized and altered accidental fragments are in tuff. Thus, these facts indicate that the origin of these fragments was nearby.

From the results of drilling survey in Taflancık area, it is possible to say that alteration at MJTE-7 is the most dominant; mineralization of MJTE-8 is up to the shallowest among these sites; and mineralization and alteration of MJTE-6 are a little off the center.

5. Age Detemination by K/Ar Method

Kızılkaya Formation containing massive sulfide ore deposit in this area is said to be a stratum of the late Cretaceous period. Since alteration mainly consisting of kaolinite with dominant sericitization is recognized in the surroundings of massive sulfide deposit, the radioactive age determination with fresh volcanic rock sample is impossible. Since such alteration is considered to have occurred around the time of ore deposit Formation, by determining the age after separating sericite contained in the alteration zone, it is possible to assume the final period of hydrothermal activity which could have possibly influenced ore deposit formation and to know the upper limit of ore deposit formation age. Furthermore, it is also possible to compare periods of hydrothermal activities in different areas.

This survey was conducted to decide the age by collecting samples of altered rocks at two points, Kızılkaya and Karaerik. The sample from Kızılkaya (K-1), as shown in Figure II-2-8 , was taken from the outcrop along a road at southeast, 780m above sea level in Kızılkaya deposit. Its original rock is aphyric dacite of Kızılkaya Formation, but it has been completely altered by dissemination of fine grained pyrite and sericitization .

The sample from Karaerik (K-2), as shown in Figure II-2-8, was taken from the white argillized outcrop near the ridge (240m above sea level) of the southern part of Karaerik deposit. Its original rock is aphyric dacite of Çağlayan Formation.

Each sample weighed 3 to 4kg. They were crushed and 2 to 5g of sericite samples for K/Ar analysis were obtained after hydraulic elutriation. Table II-2-17 shows the results.

Both results of the samples are around 77Ma and with little difference. Reliability of the analyzed value is high because contamination of atmospheric argon is very little. The sample of Karaerik is from Çağlayan Formation. Since its ore deposit is vein-network type unlike Lahanos's massive sulfide ore deposit, it was expected that it would be younger than that of Kızılkaya. However, from the fact that both measurements are too close to discriminate their ages, it may be judged that the hydrothermal activities which formed the sericite took place after Formation of Kızılkaya ore deposit or the Formation of both Kızılkaya and Karaerik ore deposits is within period of a measurement error (1.7 Ma). In any case, it has been proved that mineralization in this area took place in the late Cretaceous period.

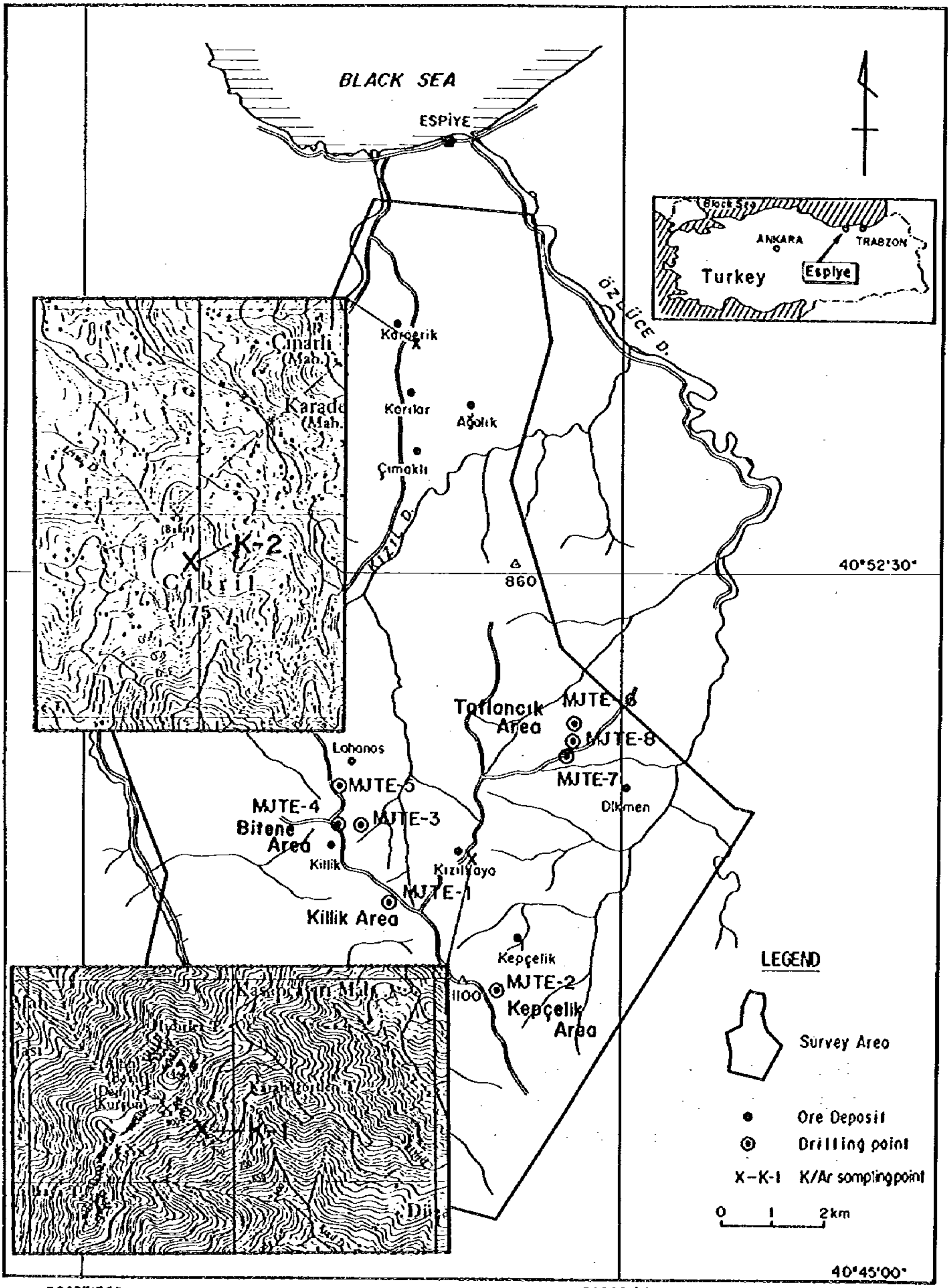

Fig. II-2-8 Locality Map of K/Ar Dating Samples

Table II - 2 - 17 Results of K/Ar Dating

Sample NO.	Formation rock name	K% (wt%)	Weight (g)	^{36}Ar ($10^{-10}cm^3STP/g$)	$^{40}Ar/^{36}Ar$	^{40}Ar rad ($10^{-8}cm^3STP/g$)	K/Ar age (Ma)	Air-fract. (%)
K-1 Kızılkaya	Kızılkaya Dacite lava pyrite+sericite	7.90	0.0405	94.20±1.19	2877.1±19.2	2430.9±24.5	77.59±1.70	10.3
			0.0532	91.54±1.07	2675.4±27.0	2404.4±24.3	76.77±1.68	10.1
			0.0450	90.48±1.12	2976.0±24.4	2421.0±24.4	77.28±1.70	10.0
K-2 Karaerik	Çağlayan Aphyric dacite, sericite >kaolinite	7.79	0.0508	96.74±1.17	2789.4±14.8	2408.3±24.6	77.96±1.70	10.6
			0.0497	97.01±1.14	2773.8±14.8	2403.4±24.2	77.80±1.70	10.7

$\lambda e = 0.518 \times 10^{-10}/y$
$\lambda \beta = 4.962 \times 10^{-10}/y$ (Steiger and Jaeger, 1977)
$^{40}K/K = 0.01167$ atm%

PART Ⅲ Conclusion and Proposal

PART Ⅲ Conclusion and Proposal

Chapter 1 Conclusion

We executed a geophysical survey (IP method, the total extension of the survey line is 30 km) and investigated eight boreholes (the total excavation length is 1749m) in a promising area selected in the first phase and this phase of the survey. The following is a summary of the survey results in each area.

1. Bitene area (Three boreholes for drilling survey)

The holes were drilled in the north-east to north north-east of the Killik ore deposit at MJTE-3 and 4. For the geological point of view, it was clarified that tuffs of the Çağlayan Formation develop relatively thickly on a gentle slope over footwall dacite. The appearance depth of the footwall is 710 to 730 m above sea level and it is higher than the altitude (about 650 m) of the Lahanos ore deposit. The ore horizon gently inclines toward the north.

As for mineralization, a predominant stockwork zone was captured in the footwall dacite at MJTE-3 and a yellow ore part (Cu = 12.58%, Au = 2.06 ppm) was observed at 20cm from the upper part.

MJTE-5 was drilled at a position 200 to 300 m south of the end of the Lahanos ore deposit. It was clarified that relatively thick aphyric dacite of the Çağlayan Formation is observed from the surface and tuffs are not distributed. The footwall dacite appears at 650 m above sea level and this is almost equal to the depth of the ore horizon in the Lahanos ore deposit. A development of a slightly predominant networked powder pyrite is observed in the footwall dacite, but the ore grade is low. However, it turned out that there are veinlets of copper and zinc and the alteration accompanied mainly by sericite and kaolinite has occurred on the hanging wall Çağlayan Formation.

The Bitene area is located between the Lahanos ore deposit and the Killik ore deposit, and an existence of a new ore deposit was expected. But, The relatively predominant mineralization of footwall was only observed. Since there is little room for exploration because an intrusive rock body is distributed in the middle, it is though that the probability of an existence of a large-scale strata-bound massive sulfide ore deposit is low.

2. Killik area (Three IP survey lines, one borehole for drilling survey)

The geophysical survey (IP method) revealed that a strong anomaly zone exists in the southern part of the area, south from the south-east slope of the Yeniyolbaşı Mountain.

However, a strata-bound ore deposit cannot be expected because the anomaly part is in the distribution area of the footwall dacite, but the possibility still remains that a network - vein type large-scale low grade ore deposit (Murgul type) exists. A further survey will clarify the details.

The drilling survey (MJTE-1) was carried out at a point between the Killik ore deposit and the Kızılkaya ore deposit where the hanging wall is distributed and the above mentioned IP anomaly continues into the depths. From top to down, thick hematite dacite, thin dacite lava of Çağlayan Formation and the footwall dacite of Kızılkaya Formation are observed but tuffs of the Çağlayan Formation were not observed.

Both alteration and mineralization were found on and below the Çağlayan Formation and a 25 cm thick dissemination zone (Cu of 4.88%) of chalcopyrite was observed in the footwall dacite. Comparing a mineralization through the drilling with the IP results, the exploration depth of the IP method in this part is about 200m.

As mentioned above, there is a possibility of an existence of a Murgul-type ore deposit in this area. Considering the IP surveys (phase I and II survey), a small-scale strata-bound type ore body may exist directly below the ridge in the southern part of the Yeniyolbaşı Mountain.

3. Kepçelik area (Two IP survey lines, one borehole for drilling survey)

In the geophysical survey (IP method) we observed a weak anomaly in the depths in the southwestern part of the survey lines, and we conducted a drilling survey (MJTE-2) for this anomaly. The survey revealed a dissemination-type and vein-type weak mineralization and clarified that the Kızılkaya Formation dacite is very thin. It was judged that the probability of an existence of a large-scale ore deposit is low.

4. Taflancık area (Four IP survey lines, three boreholes for drilling survey)

This was an unexploited area. With the help of the anomaly obtained from the results of the IP survey of the phase I, we carried out an IP survey in this year and successfully found an new anomaly area.

The plane distribution direction of the anomaly area indicates NNE - SSW and corresponds with the distribution direction of the Lahanos ore body. In the Taflancık area, distributions of two anomaly zone (northwest and southeast) in echelon form has been defined in plane map of apparent chergeability(n=3-4). MJTE-6 is located near northwest anomaly zone, MJTE-8 is located in end of southeast anomaly zone and MJTE-7 is located near center of southeast anomaly zone.

Geologically, this area is composed of hematite dacite, dacite lava of Çağlayan Formation, dacitic lava and tuff of Kızılkaya Formation and those units show a gentle north dip.

It presents the alteration mainly accompanied by sericite and kaolinite at MJTE-7 and chlorite shows a tendency to be predominant toward the north.

The mineralization of pyrite dissemination - network with a small amount of disseminated chalcopyrite are observed, which is the strongest in the footwall dacite at MJTE-7 and extends to the shallowest part at MJTE-8.

Microscopic investigation showed that the mineralization is accompanied by a trace of sphalerite and colloform and framboidal pyrite exists.

Since yellow ore fragments were obtained in MJTE-6, it was presumed that a supply source exists nearby. Although strong mineralization have been observed in MJTE-7 and MJTE-8, massive ore body could not discovered. The source area for yellow ore fragments is supposed to be in the northwest IP anomaly zone

Judging from the above-mentioned facts, the probability of an existence of a massive sulfide ore deposit is high in this area so that we hope for a drilling survey to the northwest IP anomaly zone in the future.

5. Çalkaya area (Five IP survey lines)

Only a continuous weak IP anomaly was partly observed from a weakly mineralized outcrop and a new anomaly area could not be obtained. It may be partly because the hanging wall is thick, but at the present time we cannot help judging that the probability of existence of ore deposit is low in this area.

6. Other areas

The Karaerik - Çımaklı area is one of selected promising areas in the first phase of the survey. It is clear that the previous surveys have not reached the massive ore horizon. Judging from the alteration accompanied mainly by sericite and kaolinite and the geochemical anomaly, the possibility of existence of ore deposit still remains in the further depths (200 to 350 m).

7. The age determination of sericite in the alteration zone clarified that the age of the alteration related to the Kızılkaya and Karaerik ore deposits is 77 Ma.

Chapter 2 Proposal to the Third Year's Program

Based on the results obtained from the second phase of the survey, we suggest that the third phase of the survey be conducted in the following areas. We describe those areas in order of priority.

1. Taflancık area

Since an ore deposit may exist in a new anomaly zone extending in the same direction as that of the Lahanos ore body that obtained by the geophysical survey IP method, the drilling survey should be conducted in the third phase of the survey.

2. Karaerik - Çımaklı areas

This is an area where ore showings exist on the surface and the potential of an existence of an ore deposit is high. Sufficient exploration has not been carried out so far. Therefore, it is advisable to apply the geophysical survey IP and CSAMT methods and to conduct a drilling survey in a promising area.

3. Killik area

A strata-bound type ore deposit is less expected in a strong anomaly zone which distributed from the southeastern slope of the Yeniyolbaşı Mountain to the south defined by the geophysical survey IP method, but the possibility of a large-scale network ~ vein type low grade ore deposit (Murgul type) still remains. It is recommended that an IP survey be conducted along E-W trending valley and ridge of the south end to define an extension of the mineralization and a drilling survey be carried out in a promising area.

Also, results of the IP survey revealed a possibility that an ore body may exist in the south ridge of the Yeniyolbaşı Mountain. In order to verify this, it is desirable that a drilling survey be conducted.

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Appendix(1)

Geological Columnar Section of Exploration Wells

(Fig. II-2-4)

DEPTH (m)	GEOLOGICAL COLUMN	ROCK NAME	DESCRIPTION	ALTERATION and MINERALIZATION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (cm)	Au (ppm)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)	Fe (%)	S (%)
	o o	Soil, sand													
5	X X X		2.0-77.3m												
10	X X X		purplish brown hematite dacite with small plagioclase phenocryst												
15	X X X		flow banded structure												
20	X X X		19.5-46m brecciated texture												
25	X X X														
30	X X X		32.7m calcite veinlets												
35	X X X	Dacite(Dh)													
40	X X X														
45	X X X														
50	X X X		53m brecciated texture												
55	X X X		purplish brown dacite small phenocryst of plagioclase bearing		IP-1, X-1	59.1									
60	X X X														
65	X X X		67m calcite veinlets brecciated texture												
70	X X X														
75	X X X														
80	▢ · ▢		77.3-84.6m brown weathered, mostly accidental lithic lapilli												
85	▢ · ▢	Breccia	84.6-90.3m pale greenish gray, lithic fragments white dacite, altered aphyric dacite green tuff, hematized rock etc. diam:1-3cm, max=15cm												
90	▢ · ▢		90-93.5m brown weathered, lapillistone		IP-2, X-2, T-1		89.5								
95	X X X	Dacite(Dh)	93.5-170.0m reddish brown aphyric dacite 93.5-99.6m low core recavary, only aphyric ~ hematite dacite fragments												
100															

abbreviations qz:quartz, pl:plagioclase, pyx:pyroxene, s:sericite, kao:kaolinite, ch:chlorite, cal:calcite, ep:epidote py:pyrite, cp:chalcopyrite, sph:sphalerite, hem:hematite, diss:dissemination, net:network, arg:argillization

DEPTH (m)	GEOLOGICAL COLUMN	ROCK NAME	DESCRIPTION	ALTERATION and MINERALIZATION		SAMPLE No.	FROM (m)	TO (m)	WIDTH (cm)	Au (ppm)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)	Fe (%)	S (%)
105	X X X	Dacite (Dh)	99.6-170.0m reddish brown hematite dacite plagio-phenocryst <0.5mm ~aphyric partly fractured(jointed)													
110	X X X															
115	X X X															
120	X X X		highly fractured and brecciated zone													
125	X X X															
130	X X X															
135	X X X															
140	X X X		purplish hematite dacite(brecciated) with 1mm phenocryst of plagioclase													
145	X X X															
150	X X X															
155	X X X															
160	X X X															
165	X X X		gradually change to pale green aphyric dacite breccia													
170	L L L	Dacite (Cdc)	170.0~184.5m altered aphyric dacite? 171.5~190.3m highly argillized zone with dissemination pyrite			IP-3, X-3	170.6									
175	L L L			s												
180	L L L		178-181.5m silicified and argillized zone with py-network,drusy quartz	qz	py net	IP-4, X-4, P-1	180.0									
						A-1	180.00	180.50	50.00	0.02	0.74	<0.01	<0.01	0.03	12.67	14.43
						A-2	182.00	182.20	20.00	<0.01	1.14	<0.01	0.03	0.09	12.77	14.69
185	⊥ ⊥ ⊥		184.5-187.6m light gray aphyric ,dissemination and fracture filling pyrite													
190	V V V	Dacite lava (Kdc)	187.6~252.1m altered porphyritic ?													
195	V V V															
200	V															

abbreviations qz:quartz, pl:plagioclase, px:pyroxene, s:sericite, kao:kaolinite, ch:chlorite, cal:calcite, ep:epidote
py:pyrite, cp:chalcopyrite, sph:sphalerite, hem:hematite, diss:dissemination, net:network, arg:argillization

DEPTH (m)	GEOLOGICAL COLUMN	ROCK NAME	DESCRIPTION	ALTERATION and MINERALIZATION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (cm)	Au (ppm)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)	Fe (%)	S (%)
			←py film, argillic clay 203.5-204.45m accidental tuff breccia~lapill		A-3	202.70	202.90	20.00	<0.01	0.15	<0.01	<0.01	<0.01	9.50	10.84
205															
			←py film 208.8-209.3m light gray aphyric dike												
210															
215			←py film, clay												
			←217m cp film												
220					A-4	221.00	221.20	20.00	0.03	0.10	<0.01	<0.01	<0.01	4.42	5.12
			221-230m py-network zone(30~50cm interval)												
225				py net	IP-5, P-2 226.7 A-5 X-5 227.0	226.70	227.20	50.00	0.02	0.15	<0.01	<0.01	<0.01	7.87	9.06
230		Dacite lava (K3c)	porphyritic dacite autobrecciated lava plagioclase phenocryst=max3mm												
235			234.5m cp dissemination zone 25cm width	cp	P-3 234.5 A-6	234.50	234.65	15.00	<0.01	3.11	4.88	<0.01	<0.01	16.61	18.61
240			240.7-241.2m py network zone												
245															
250			250-250.5m py dissemination(30%) zone 252.1m bottom hole		IP-6, X-6, 250.0 A-7	250.00	250.50	50.00	<0.01	<0.01	<0.01	<0.01	<0.01	6.43	7.13
255															

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py:pyrite, cp:chalcopyrite, sph:sphalerite, hem:hematite, diss:dissemination, net:network, arg:argillization

MJTE-2 (1)　　　　　　　　　　　　　　　　　　0m－100m

DEPTH (m)	GEOLOGICAL COLUMN	ROCK NAME	DESCRIPTION	ALTERATION and MINERALIZATION	SAMPLE				CHEMICAL ANALYSIS						
					No.	FROM (m)	TO (m)	WIDTH (cm)	Au (ppm)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)	Fe (%)	S (%)
5	o . o . o	Soil, sand pebble	0-7.8m mainly fragments of purplish hematite dacite, green glass tuff												
10 15 20	X X X	Dacitic tuff (Ctf)	7.8-20.2m pale greenish gray green glass tuff accidental aphyric dacite lapilli ϕ<2cm, very rare py-film gradually change		IP-7, X-7	15.9									
25 30 35 40	Δ Δ Δ	Dacitic tuff breccia (Ctf)	20.2-43.2m grayish green, amoeba form essential fragment rich lava or tuff dark gray pyritized fragment bearing green fine matrix dominant												
45 50 55 60 65 70	L L L	Dacite (Cdc)	43.2-72.1m autobrecciated hyaloclastic lava matrix < essential fragment 55-57m fracture filling calcite, pyrite, chalcopyrite 59.5m clay, pyrite bearing breccia		IP-8, X-8	63.0									
75 80 85 90 95 100	L L L	Dacite (Cdc)	72.1-206.4m light~pale greenish gray aphyric dacite, flowbanded 74.5-75.5m breccia zone with calcite druse ← calcite druse aphyric dacite very thin py-film												

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py:pyrite, cp:chalcopyrite, sph:sphalerite, hem:hematite, diss:dissemination, net network, arg:argillization

DEPTH (m)	GEOLOGICAL COLUMN	ROCK NAME	DESCRIPTION	ALTERATION and MINERALIZATION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (cm)	Au (ppm)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)	Fe (%)	S (%)
105	L L		flow banded pale greenish gray very fine dacite~rhyolite												
110	L L														
115	L L				IP-9,	X-9 115.5									
120	L L														
125	L L		brecciated or fractured												
130	L L														
135	L L														
140	L L		141.2-141.4m network breccia filled with py												
145	L L	Dacite (Cdc)	massive aphyric very fine dacite												
150	L L														
155	L L														
160	L L														
165	L L		steeply dipping flow banded dacite with small amount of pyrite(dissemination and film)												
170	L L		173.8m pyrite vein												
175	L L														
180	L L		low dipping flowband												
185	L L														
190	L L														
195	L L		massive part												
200	L L				IP-10.	X-10 200.0									

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py:pyrite, cp:chalcopyrite, sph:sphalerite, hem:hematite, diss:dissemination, net:network, arg argillization

MJTE-2 (3)

200m-300m

DEPTH (m)	GEOLOGICAL COLUMN	ROCK NAME	DESCRIPTION	ALTERATION and MINERALIZATION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (cm)	Au (ppm)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)	Fe (%)	S (%)
205	L L L L L	Dacite (Cdc)	sharp boundary 50°												
					A-8 P-4	207.00 207.5	207.50	50.00	0.14	3.75	0.20	0.74	0.94	3.26	4.14
210	V V V V V	Dacite lava (Ndc)	206.4-226.5m gray altered autobrecciated dacite pyrite dissemination in matrix(3-5%) rare chalcopyrite		A-9	210.30	210.80	50.00	0.05	0.15	<0.01	<0.01	0.01	1.92	1.86
215	V V V V		215.0m chalcopyrite film		A-10	215.00	215.50	50.00	0.08	0.35	0.05	0.08	0.52	2.30	2.72
220	V V V				IP-11, X-11, 220.0 A-11	220.00	220.50	50.00	0.05	0.15	<0.01	<0.01	<0.01	2.21	2.56
225	V V V														
230	▲ ▲ ▲ ▲ ▲ ▲	Andesitic tuff(Ctf)	226.5m py+qz vein 226.5-255.5m dark green~yellow green fine tuff? strong chlorite+epidotization 228.5m py+ep vein												
235	▲ ▲ ▲			ch ep											
240	▲ ▲ ▲		240.5-241.4m cp+py+sph vein 5mm width		A-12 P-5	240.70 240.70	240.80	10.00	0.06	1.87	0.31	0.01	8.15	5.18	9.00
245	▲ ▲ ▲		244.8-246.0m lithic lapilli tuff												
250	▲ ▲ ▲ ▲ ▲ ▲				IP-12, X-12 249.0										
255	▲ ▲		10cm fault(?) breccia 30°												
260	V V V	Dacite (Dp)	255.5-260.25m green porphyritic plagioclase 2-3mm 260.25m bottom hole												
265															

abbreviations qz:quartz, pl:plagioclase, px:pyroxene, s:sericite, kao:kaolinite, ch:chlorite, cal:calcite, ep:epidote
py:pyrite, cp:chalcopyrite, sph:sphalerite, hem:hematite, diss:dissemination, net:network, arg:argillization

DEPTH (m)	GEOLOGICAL COLUMN	ROCK NAME	DESCRIPTION	ALTERATION and MINERALIZATION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (cm)	Au (ppm)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)	Fe (%)	S (%)
5, 10		Sand・soil cobble Talus	0-12.2m brown weathered dacite andesite												
15, 20		Dacitic tuff breccia (Ctf)	12.2-22.0m green glass and accidental fragments (dacite, white altered andesite, muddy fragment brown porphyry) 20.6-21.1m reddish brown mudstone fragment 22.0-23.2m fine sandy												
25, 30, 35, 40		Dacitic lapilli tuff (Ctf)	23.2-41.3m pale greenish gray in color weak py-dissemination green glass rich accidental porphyritic dacite, andesite diam=0.5-3cm bedding boundery 15° 41.3-42.6m pale green sandy tuff		IP-13 X-13, T-6	32.80 33.0									
45		Dacitic tuff	42.6-44.5m py-disseminated, green glass tuff												
50, 55		Fine tuff and dacitic tuff alternation	44.5-58.45m fine tuff, sandy tuff, green glass tuff, bedding=20° py-fine film and spot bearing 57m-fine beded tuff		T-7	56.25									
60		Dolerite (Do)	58.45-60.9m pyroxene phenocryst 1-2mm		IP-14	60.50									
65		Fine tuff and dacitic tuff alternation	60.9-65.4m fine tuff, sandy tuff, green glass tuff bedding=20°												
70		Dacitic lapilli tuff (Ctf)	65.4-74.2m essential green fragment (ball)												
75		Fine tuff	74.2-78.9m thin py-dissemination bed and TETU-SEKIEI bed (30° diping)		X-14, IP-15 A-13	76.5 76.50	76.60	10.00	0.04	<0.01	<0.01	<0.01	<0.01	24.00	23.64
80, 85, 90, 95, 100		Dacite lava (Kdc)	78.9-154.5m (bottom) autobrecciated plagio-porphyritic lava white argillization (85-89m) quartz, pyrite, sericite altered rock 99.6-100.6m py-network	s (s) py net	X-15	96.00									

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MJTE-3 (2)

100m-200m

DEPTH (m)	GEOLOGICAL COLUMN	ROCK NAME	DESCRIPTION	ALTERATION and MINERALIZATION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (cm)	Au (ppm)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)	Fe (%)	S (%)
		Dacite dike (Dp)	100.7-105.0m quartz porphyritic	s											
105															
110			108.9-115m py-network zone 109.0-109.2m massive yellow ore	py net	A-14 P-7 IP-16	109.00 109.20 109.80	109.20	15.00	2.06	15.30	12.58	0.04	0.02	34.58	27.67
115			115-125m py-dissemination partly py-network		A-15 A-16	114.80 116.00	114.90 116.20	10.00 20.00	0.04 0.20	0.20 1.28	0.02 <0.01	<0.01 <0.01	<0.01 <0.01	37.92 20.35	42.38 23.33
120		Dacite lava (Kdc)	gray plagio-porphyritic breccia (qz+pl phenocryst)	py diss	IP-17	119.80									
125															
130			130.6m powder py.net.	py net	A-17	130.70	130.80	10.00	0.26	0.34	<0.01	<0.01	0.03	24.77	27.33
135			133.3-134.6m py network rich	py net	A-18 P-8	133.85 133.85	133.90	5.00	0.40	1.23	<0.01	<0.01	0.01	22.85	25.62
140				arg											
145				py diss	A-19 P-9 T-8 X-16	145.10 145.10 145.50 148.40	145.20	10.00	0.06	0.05	<0.01	<0.01	<0.01	15.74	5.07
150		Dacite dike (Dc)	146.0-147.7m and 148.8-152.7m pale pinkish gray aphyric dike 147.7-148.8m argillized dacite lava, light gray contact 70° 154.5m bottom hole												
155															
160															
165															
170															
175															
180															
185															
190															
195															
200															

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DEPTH (m)	ROCK NAME	DESCRIPTION	ALTERATION and MINERALIZATION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (cm)	Au (ppm)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)	Fe (%)	S (%)
0-17.2	Sand・soil Talus	0-17.2m fragments of dacitic tuff												
17.2-30.2	Dacitic tuff (Ctf)	17.2~30.2m green glass tuff accidental dacite, py-ball bearing												
30.2-36.0	Andesite (Ad)	30.2-36.0m deep green aphyric boundary=45°												
36.0-53.4	Dacitic tuff (Ctf)	36.0-53.4m dacitic coarse tuff pale green, argillized soft green grass tuff	s ch	X-17	38.7									
53.4-56.7	Andesite (Ad)	53.4-56.7m green aphyric												
56.7-68.2	Dacitic lapilli tuff (Ctf)	56.7-68.2m accidental andesite, dacite	s ch	X-18	66.7									
68.2-71.15	Fine tuff (Ctf)	68.2-71.15m thin beded, with py film in upper part, bedding=15°		IP-18	71.1									
71.15-78.2	Dacitic lapilli tuff (Ctf)	71.15-78.2m green glass rich, accidental aphyric dacite, andesite fragment												
78.2-84.05	Dacitic tuff (Ctf)	78.2-84.05m green glass dominant												
84.05-90.0	Andesite (Ad)	84.05-90.0m dark grayish green, fine												
90.0-100	Dacitic tuff (Ctf)	90.0-106.0m green glass rich, accidental fragment rare, massive												

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DEPTH (m)	GEOLOGICAL COLUMN	ROCK NAME	DESCRIPTION	ALTERATION and MINERALIZATION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (cm)	As (ppm)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)	Fe (%)	S (%)
105		Dacitic tuff (Ctf)	green glass ball with aphyiric fragment												
110		Coarse tuff / lapilli tuff alteration (Ctf)	106.0-112.4m dacitic, bedding=10-15° (10-50cm int.)		X-19	108.3									
115, 120, 125		Dacitic tuff (Ctf)	112.4-128.0m py-week dissemination green essential glass increase ↓		IP-19	126.0									
130		Sandy tuff (Cus?)	128.0-133.4m light gray, coarse py-film(129.0, 130.0m)												
135		Andesite (Ad)	133.4-139.85m dike, chloritized, pyx, pl phenocryst												
140		Dacite (Kdc)	139.65-142.3m altered, brecciated lava	s	IP-20, T-9	142.5									
					X-20	142.7									
145, 150, 155		Andesite (Ad)	142.3-155.5m dike, chloritized, pyx, pl phenocryst cal. vein boundary=30°												
160, 165		Dacite (Kdc)	155.5-165.5m gray altered (strong sericitization) with pyrite dissemination and film autobrecciated texture boundary=50°	s											
170		Andesite (Ad)	165.5-169.9m chlorite, white amygdal												
175, 180, 185, 190, 195, 200, 205, 210		Dacite lava (Kdc)	169.9-212.45m white altered dacite brecciated lava pyrite dissemination week		A-20	177.50	177.60	10.00	0.08	<0.01	<0.01	<0.01	0.02	2.69	2.76
					IP-21, X-21	178.0									
			essential pl-porphyritite lens												
			197-200m pyrite+clay zone	cly (s) py net	A-21	199.70	199.80	10.00	<0.01	0.25	<0.01	<0.01	<0.01	5.95	7.02
			pl-porphyritic		IP-22	200.7									
			211.3-211.5m powder py and clay network	(s) cly	A-22	211.30	211.50	20.00	<0.01	0.10	<0.01	<0.01	<0.01	20.93	24.14
			212.75m bottom	py net											

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MJTE-5 (1) 0m-100m

DEPTH (m)	GEOLOGICAL COLUMN	ROCK NAME	DESCRIPTION	ALTERATION and MINERALIZATION	SAMPLE No.	SAMPLE FROM (m)	SAMPLE TO (m)	SAMPLE WIDTH (cm)	CHEMICAL ANALYSIS Au (ppm)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)	Fe (%)	S (%)
0–5		Sand • soil Talus	0-8.3m gray-light gray argillic sand, pebble ϕ : 3-4cm, pyrite ore with quartz vein												
10–15		Dacite (Cdc)	8.3-39.6m light gray-gray aphyric dacite partly brecciated white kaolinite alteration												
20			19.0-22.5m calcite>quartz, pyrite veinlets-net (80°)			20.6m	X-ray								
25–35			26.1m clay-pyrite vein (50°) width=8cm 27.8m, 28.3-28.5m hematite breccia matrix 29.7-29.0m brecciated-net filled with pyrite 35.5-37.5m reddish brown hematitized 36.6m sph+py+cp+qz vein width=5cm40° 37.7m cp+py+sph+qz vein width=8cm65°												
40		Andesite (Ad)	39.6-42.35m wavy boundary (45°) reddish brown-dark gray andesite dike boundary=30°												
45–55		Dacite (Cdc)	42.35-130.7m light gray-gray aphyric dacite with qz phenocryst (0.5mm) weak argillized												
60			57.1-57.2m py vein 2-3cm 61.2m hm+py+cp vein 5-10cm		X-22	60.7									
					P-10	61.2									
					A-23	61.20	61.30	10.00	0.09	0.69	<0.01	<0.01	<0.01	13.44	13.03
65–70			67.7-68.0m hematite-py network with white mineral												
75–85															
90			87.7-90.0m hematite network rich zone 91.5-92.3m pyrite-barite vein - net												
95–100															

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DEPTH (m)	GEOLOGICAL COLUMN	ROCK NAME	DESCRIPTION	ALTERATION and MINARALIZATION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (cm)	Au (ppm)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)	Fe (%)	S (%)
	L L	dacite (Cdc)	lightgray reddish brown aphyric dacite, sericite+clay altered												
105	L L L														
110	L L L														
115	L L L		114.1m py vein 3mm		IP-23, T-10	115.7									
120	L L L		117.7-119.6m matrix brecciated brown												
125	L L L		125.7m hem-py white mineral vein 1-3mm												
	L		129.9-130.5m rich in py vein - film(5-7mm)		A-24	129.20	129.30	10.00	0.02	0.15	<0.01	<0.01	<0.01	9.02	10.19
130	L L		130.7m wavy boundary (30°)	py diss	X-23	131.2									
	V	Dacite lava (Kdc)	130.7-131.5m py-dissemination in dark clay	py diss	A-25	131.20	131.30	10.00	0.35	7.50	2.18	<0.01	0.02	10.46	11.65
135	V V V		130.7-159.3m autobrecciated plagio porphyritic essential lens=φ2-3cm black glassy groundmass with py argillized(sericite+calcite)	s	IP-24	134.6									
140	V V V														
145	V V V		145.5m powder py-vein or lens 5cm												
150	V V V		essential block increas												
155	V V V		158.4, 158.8m clay py vein or lens												
160	X X X	Dacite (Dh)	159.3-181.95m hematite brown dacite plagio porphyritic		IP-25, X-24	161.5									
165	X X X		py-small ball												
170	X X X														
175	X X X		178m py-dissemination increas hematite net												
180	X X														
	V	Dacite lava (Kdc)	181.95-261.5m(bottom)	py net	IP-26	182.9									
185	V V V		dark gray plagio-porphyritic dacite	py net	X-25	185.0									
			181.95-187.3m powder py net-vein zone with cp	py net	A-26	185.20	185.30	10.00	0.07	1.62	<0.01	<0.01	0.01	11.23	12.75
					P-11	185.2									
190	V V V		pl→py+qz, weak silicification												
195	V V V														
200	V V	Andesite (Ad)	199.2-200.1m dike altered amygdaloidal												

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DEPTH (m)	GEOLOGICAL COLUMN	ROCK NAME	DESCRIPTION	ALTERATION and MINERALIZATION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (cm)	CHEMICAL ANALYSIS Au (ppm)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)	Fe (%)	S (%)
	V V V														
205	V V V														
210	V V V	Dacite lava (Kdc)	pale greenish gray porphyritic dacite autobrecciated												
215	V V V		216.5-218.5m powder py vein - network	py net											
220	V V V				IP-27, X-26 221.6										
225	V V V		weak argillized zone	(s)											
230	V V V														
235	V V V		234.7m py film 5-7cm												
240	V V V		240.5-241.0m flow band with py-film												
245	V V V														
250	V V V		pyrite ball bearing												
255	V V V		breccia texture and essential fragment												
260	V V V		261.25m bottom hole												
265															
270															
275															
280															
285															
290															
295															
300															

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DEPTH (m)	GEOLOGICAL COLUMN	ROCK NAME	DESCRIPTION	ALTERATION and MINARALIZATION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (cm)	Au (ppm)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)	Fe (%)	S (%)
		Sand・soil cobble	0-3.55m												
5–70	X X	Hematite dacite (Dh)	3.55-72.3m reddish brown aphyric-fine fractured brecciated(partly) 35.7-37.3m pale greenish altered, with cal. vein 66-67m calcite veinlets 67.5-72.3m brecciated texture boundery=40°		IP-28, T-11, X-27 52.5										
					X-28 73.6										
75–85	V V	Dacite lava (Xdc?)	72.3-85.6m pale green aphyric auto-brecciated yellow ore(cp) fragment in 73.2m (5cm), 73.5m, 75.0m(film) 79-80m tuff part pyrite dissemination and fracture filling		IP-29, T-12 80.7										
					A-27	86.90	87.00	10.00	<0.01	0.49	<0.01	<0.01	<0.01	2.88	2.73
90–100	~ ~	Dacitic tuff (Xt2)	85.8-114.8m pale greenish gray, fine green glass with small amount of accidental dacite, pyritized fragments py-dissemination with cp(rare)		IP-30, T-13, X-29 99.2										
100					A-28	99.20	99.30	10.00	<0.01	0.88	<0.01	<0.01	0.01	4.61	4.24

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DEPTH (m)	GEOLOGICAL COLUMN	ROCK NAME	DESCRIPTION	ALTERATION and MINERALIZATION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (cm)	Au (ppm)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)	Fe (%)	S (%)
	~ ~														
105	~ ~	Dacitic tuff (Kt2)	105.5m-107m py, clay vein rich zone	ch s ; py vein											
110	~ ~		fine green glass dominant												
	~ ~		boundary=40°												
115	V V		114.8-212.45m(bottom) pale green gray green, hard auto-brecciated lava mostry plagio-porphyritic		X-30, P-12 127.0 A-29 1P-31 127.3	127.00	127.10	10.00	0.02	0.20	<0.01	<0.01	<0.01	12.48	13.09
120	V V		py-dissemination 3-5%(partly high) up to 135m with small amount of cp	py diss											
125	V V														
130	V V		partly qz+cal+py druse												
135	V V														
140	V V														
145	V V														
150	V V		149.8m qz+cal+py druse zone												
155	V V														
160	V V	Dacite lava (Kdc)	160-185m rich in dark gray essential lens (5-20cm) replased by pyrite crystal and fracture filling pyrite												
165	V V														
170	V V														
175	V V														
180	V V		179-185m porous pyrite dissemination rich	py diss	P-13 182.9 A-30	182.90	183.00	10.00	0.04	0.49	<0.01	<0.01	<0.01	9.41	8.57
185	V V														
190	V V		grayish green plagio-porphyritic pyrite-dissemination 1-2%												
195	V V				IP-32, 7-14, X-31 194.8 A-31	194.80	194.90	10.00	<0.01	0.49	<0.01	<0.01	<0.01	5.18	2.83
200	V V														
205	V V	Dacite lava (Kdc)	pl-porphyritic gray hard												
210	V V		208.7m qz+py druse 212.45m bottom												

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MJTE-7 (1) 0m−100m

DEPTH (m)	GEOLOGICAL COLUMN	ROCK NAME	DESCRIPTION	ALTERATION and MINERALIZATION	SAMPLE No.	SAMPLE FROM (m)	SAMPLE TO (m)	SAMPLE WIDTH (cm)	CHEMICAL ANALYSIS Au (ppm)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)	Fe (%)	S (%)
5 10		Talus deposit breccia	0-13.2m fragment of brown weathered aphyric dacite												
15 20 25 30		Dacite (Cdc)	13.2-33.0m light gray aphyric dacite 15.05-17m argillized zone with py vein 15.7m 5cm py vein-net 17.4m py-net 17.9m py-net												
35			33.0-37.1m light gray-pale green hyaloclastic dacite												
			37.1-38.6m dacitic lapilli tuff fragment=green tuff, altered dacite												
40 45 50			38.6-56.5m light gray-pale green dacite hyaloclastic lava	ch s	IP-33, I-32	50.7									
55 60 65 70 75 80		Dacite (Cdc)	56.5-84.35m brecciated aphyric dacite												
			81.6m green argillized, breccia												
85 90 95			84.5-87.3m aphyiric hyaloclastic part												
100			amoeba form of purplish gray hematite		IP-34, I-33	100.0									

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DEPTH (m)	GEOLOGICAL COLUMN	ROCK NAME	DESCRIPTION	ALTERATION and MINERALIZATION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (cm)	Au (ppm)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)	Fe (%)	S (%)
	L L L														
105	L L L		98-113m pale greenish-pinkish aphyric dacite hyaloclastic brecciated part												
110	L L L														
115	L L L														
120	L L L	Dacite (Cdc)	121.3m clastic dike? with py												
125	L L L														
130	L L L														
135	L L L		134.1-135.2m accidental tuff breccia fragment=altered dacite, pyritized rock 135.2-145.35m pale pinkish gray decite with hematite(originally pyrite)												
140	L L L														
145	L L		145.35-146.0m argillic zone		IP-35, X34 148.4 A-32	148.00	148.40	40.00	<0.01	0.19	<0.01	<0.01	<0.01	10.27	8.72
150	V V V	Dacite lava (Kdc)	145.5-200.15m(bottom) gray plagio-porphyritic dacite auto brecciated py-dissemination 5-10% argillization(sericite+kaolinite)	py diss											
155	V V V														
160	V V V		161.2-165m mineralized zone py dissemination and network>> cp film sph bearing	kao s; py net	A-33	161.50	161.60	10.00	0.03	0.34	<0.01	<0.01	<0.01	21.22	21.77
			161.5-161.75m py ore		IP-36, X-35, P-14 162.0 A-34	162.00	162.50	50.00	0.01	0.24	<0.01	<0.01	<0.01	11.90	10.14
165	V V V														
170	V V V		py ball replased phenocryst?												
175	V V V		176.3-177.7m hem+py netwok zone >>cp		IP-37, X-36, P-15 177.5 A-35	177.50	177.90	40.00	<0.01	0.29	0.01	<0.01	<0.01	6.14	3.92
180	V V V		183.6m cp>py vein 8mm width	py diss											
185	V V V		py dissemination=5-7%												
190	V V V		dark gray plagio porphyritic dacite with milky kaolinite vein, py												
195	V V V		195.9m powder py ore 10cm width		X-37 195.9 A-36	195.90	196.00	10.00	<0.01	0.58	<0.01	<0.01	<0.01	30.14	33.20
200	V V		200.15m bottom		A-37	198.20	198.40	20.00	<0.01	0.54	<0.01	<0.01	0.01	7.87	5.49

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MJTE-8 (1) 0m-100m

DEPTH (m)	GEOLOGICAL COLUMN	ROCK NAME	DESCRIPTION	ALTERATION and MINERALIZATION	SAMPLE No.	SAMPLE FROM (m)	SAMPLE TO (m)	SAMPLE WIDTH (cm)	Au (ppm)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)	Fe (%)	S (%)
			0-6.5m reddish brown weathered												
5		Soil, sand													
	X X		6.5-104.5m												
10	X														
	X X		light gray~yellow brown weathered aphyric-hematite dacite												
15	X														
20	X X		fractured												
25	X X	Dacite (Dh)													
30	X		pale gray altered dacite plagioclase phenocryst 1-2mm												
			33.5m breccia filled with calcite												
35	X														
40	X X														
45	X X		breccia texture												
50	X														
55	X X		pale gray fractured dacite partly pyrite film												
	X				X-38	57.5									
60	X X				IP-38, T-15	59.5									
65	X		fractured and brecciated zone												
70	X														
75	X X														
80	X X		81.3-82.2m shear zone with clay, pyrite		A-38	82.00	82.10	10.00	0.02	3.45	0.16	0.07	1.50	1.73	1.88
85	X	Dacite (Dh)	gradually change to pinkish brown in color weak pyrite(hematite) dissemination												
90	X														
95	X X														
100	X X				X-39	100.0									

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py:pyrite, cp:chalcopyrite, sph:sphalerite, hem:hematite, diss:dissemination, net:network, arg:argillization

DEPTH (m)	GEOLOGICAL COLUMN	ROCK NAME	DESCRIPTION	ALTERATION and MINERALIZATION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (cm)	Au (ppm)	Ag (ppm)	Cu (%)	Pb (%)	Zn (%)	Fe (%)	S (%)
	X X X	Dacite (Dh)	partly brecciated hematite dacite		IP-39	101.7									
105–115	V V		104.5-168.75m												
115	V V	Dacite (Kdc?)	gray altered dacitic brecciated lava pyrite dissemination weak ←sph spot	s (ch); py net	IP-40	115.5									
					A-39	116.40	116.90	50.00	0.05	4.00	0.12	0.05	0.03	15.74	17.89
120	V V		115-125m pyrite network rich												
			←chalcopyrite film		A-40	124.80	125.00	20.00	0.19	2.00	0.02	0.03	0.01	13.06	14.50
125	V V				X-40	125.0									
127	V V		127-128.5m pyrite network												
138	V V		138.5m pyrite network												
140	V V		142.5-145m py-dissemination(5-7%) and network	s ch; py net	A-41	142.50	142.70	20.00	0.09	0.68	<0.01	<0.01	<0.01	10.94	12.20
150	V V				X-41	149.9									
155	V V		grayish green matrix > brecciated fine porphyritic fragment weak pyrite dissemination												
165	V V		166-168.75m fine matrix rich with pyrite												
170	~ ~	Dacitic tuff (Kt2)	168.75-186.7m pale green glass tuff pyrite dissemination 3%	s ch	X-42	173.0									
180	~ ~				IP-41	178.0									
185	~ ~			s ch											
190	V V	Dacite lava (Kdc)	186.7-203.55m(bottom) green-grayish green autobrecciated lava		A-42	188.00	188.20	20.00	0.03	<0.01	<0.01	<0.01	<0.01	8.26	7.93
200	V V				IP-42, X-43	200.0									
			porous dacite plagio phenocryst, cavity replased by quartz and euhedral pyrite		A-43	201.00	201.10	10.00	<0.01	<0.01	<0.01	<0.01	<0.01	5.76	4.41
205															

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