Part II The Result of the 1st Year Campaign

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Chapter 1 Geological Survey

1-1 Methodology

The geological survey was carried out in conjunction with the environmental baseline study. Geological base maps were produced in the course of the geological survey using topographic maps at a scale of 1 to 5,000. Mineralized outcrops were sketched, photographed and sampled. The topographic maps used in the geological survey were based on a local grid system that was uncorrelated to the UTM grid system. Therefore, locations on the topographic maps were correlated to the WGS grid system based on the identification of specific points using GPS. The geological map of the project area is shown in Figure II-1-1.

1-2 General Geology

The geology of the Project Area comprises Triassic limestone, shale and siltstone of Bang Tang formation, and shale and sandstone of Nam Mu formation, intruded by Palaeogene syenite (Dong Pao Syenite). These formations and intrusions are partly overlain by Palaeogene volcanic rocks and tuff. A number of narrow dikes of an alkaline rock, minette, are observed in the syenite intrusions.

The Project Area belongs to the Song Da zone in the structural division. The Song Da zone is a depression that trends in the NW-SE directions and continues from the international border between Vietnam and China to Van Yen of Nghia Lo Province. This zone, being 250 km long with the maximum width of 40-50 km, is bounded by the Fanxipan up-rift zone on the northeast and by the Son La zone (Palaeozoic-Tertiary) on the southwest with two major faults. The geology of the Song Da zone consists of late Palaeozoic to Triassic sedimentary rocks. However, the Triassic formations, such as Nam Sap, Ban Tang, Ta Khoa and Nam Mu, are predominated.

The syenite in the Project Area constitutes a part of the Pusamcap complex that is located in a limited area centering the Mount Pusamcap and comprises tuffaceous agglomerate, trachytic tuff, leucitophyre, syenite and alkaline quartz syenite. The alkaline quartz syenite occupies an area of 13 km^2 of the Dong Pao area. The rocks present gray to light purple colors. In addition, there are a number of minette dikes associated with the alkaline quartz syenite.

The geology in this area underwent intensive deformation by the collision of the South China and Indochina plates mainly in the Palaeogene period. I the initial stage, the Palaeogene sedimentary formations subsided and were intensively folded, which formed the major anticlinal structure in the song Da zone. The collision of the two major plates caused intensive igneous activity, forming various igneous rocks. Mineralization

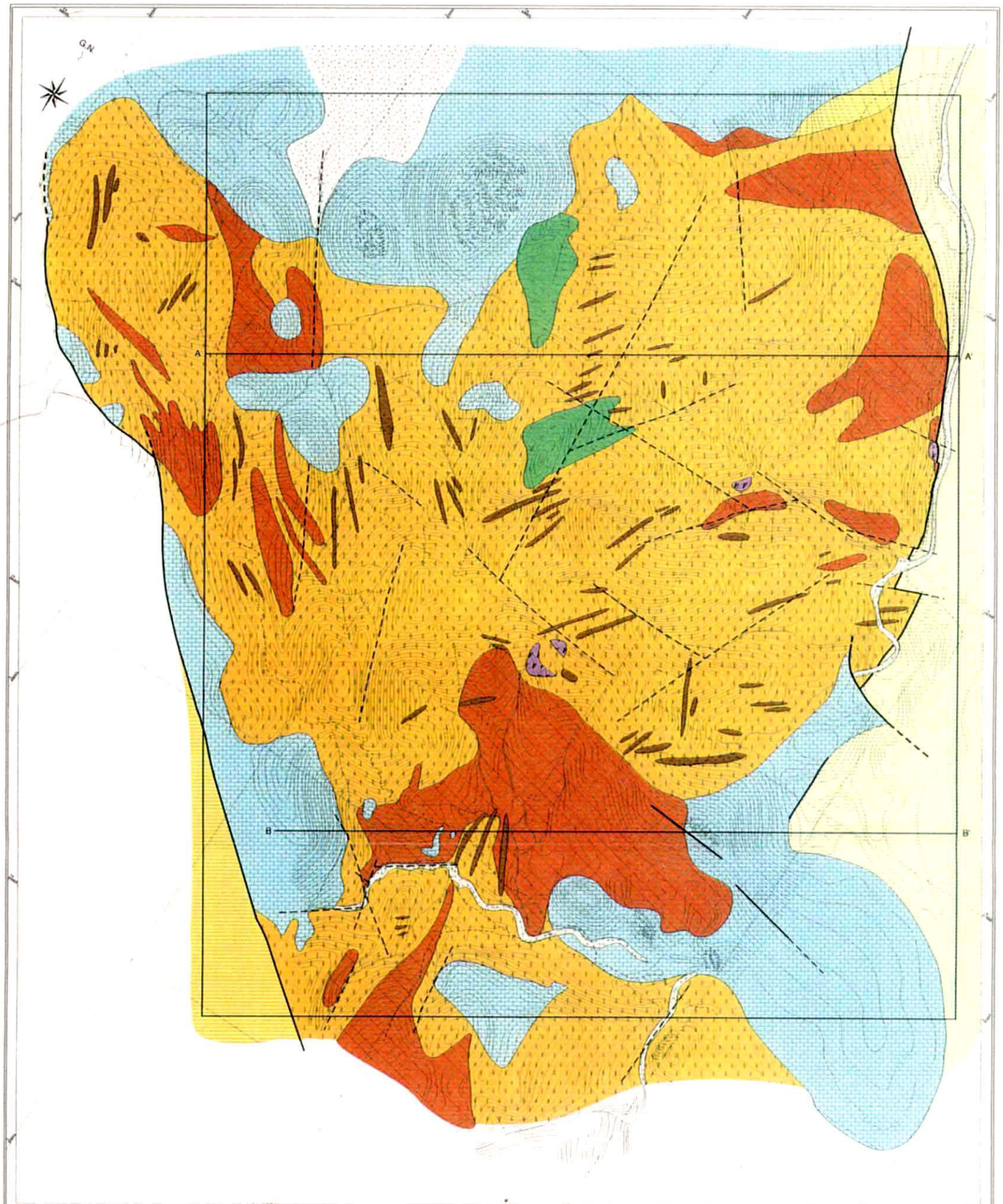


Figure II-1-1 Geological map of Dong Pao area

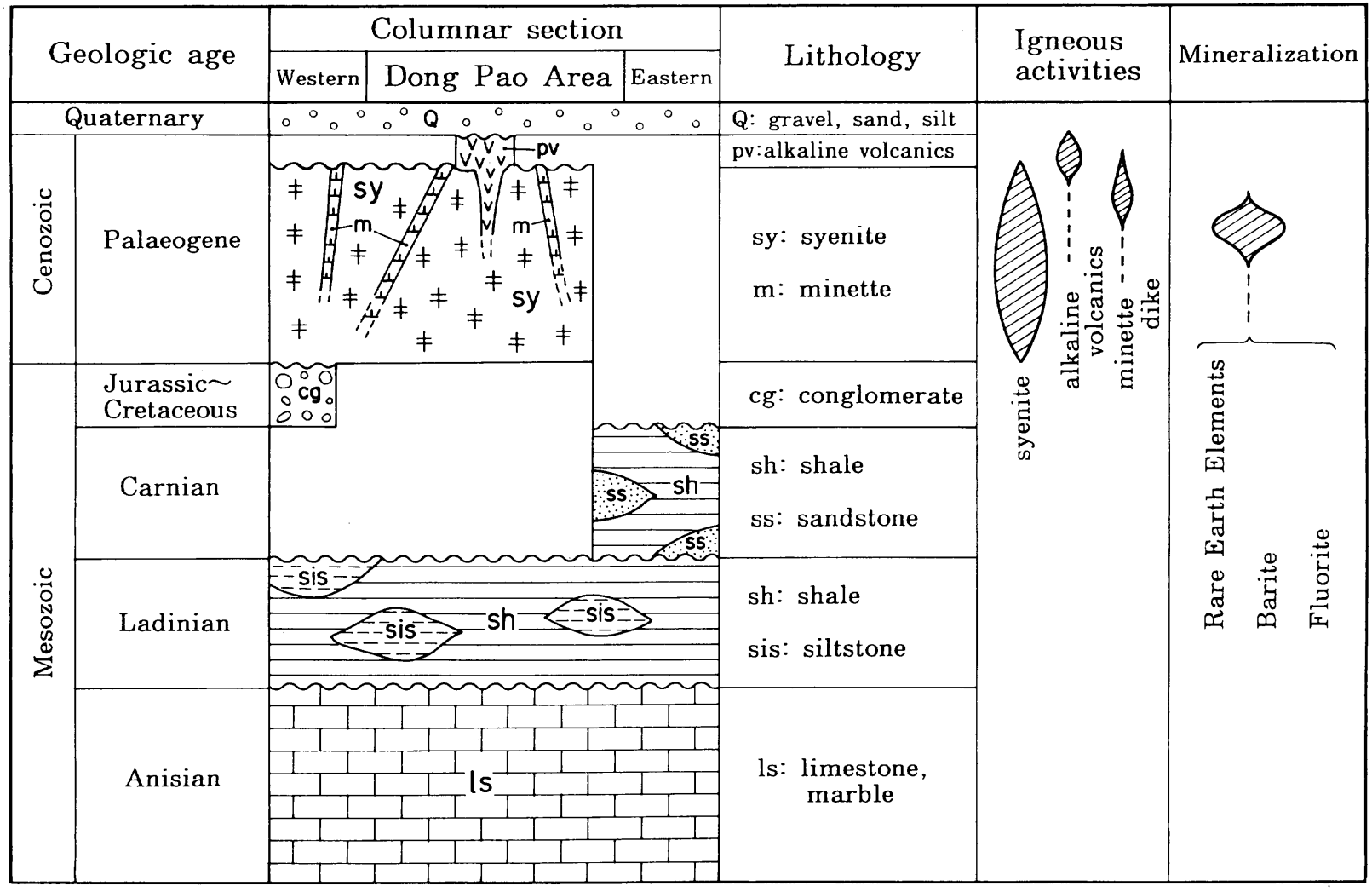


Figure II-1-2 Schematatic columnar section of Dong Pao area

of rare earths, fluorite and barite were introduced in association with the igneous activity in this area.

1-3 Stratigraphy

The schematic columnar section is shown in Figure II-1-2. The rock facies of each stratigraphic unit is described below.

Limestone (Anisian) :

The limestone, distributing in the north and northwestern parts of this area, strikes in the NW-SE direction and displays white-gray to dark gray colors. It forms a dome by intrusion of a syenite body and are crushed and metamorphosed to dolomitic marble due to the regional tectonic movement and the igneous activity. Veins, blebs and disseminations of rare earths, barite and fluorite are observed in association with the limestone and marble at a number of localities. The major rock forming minerals are calcite (50-90 %) and quartz, accompanied by subordinate barite, rare earth minerals and forsterite. The rocks are fine-grained and exhibit cataclastic, blasto-granular and partly poikilitic textures. Its geologic age is considered of Anisian.

Shale and Siltstone (Ladinian) :

Ban Tang formation, distributing in the southwestern part, consists mainly of green to gray-yellow shale and of green-gray to reddish brown siltstone. The shale contacts to the syenite at a locality to the south of Ban Na Cua village, where it is intensely sericitized and folded. Its geologic age is considered of Ladinian.

Shale and Sandstone (Carnian) :

The shale and sandstone of Nam Mu formation, distributing in the northeastern, eastern and southeastern parts, generally strike in the NW-SE direction and are subjected to folding, granulation and alteration due to intrusion of syenite and alkaline granite. The geologic ages of Nam Mu formation and the intrusions are considered of Carnian.

Conglomerate and Sandstone (Jurassic to Cretaceous) :

These rocks distribute mainly in the vicinity of Mount Pu Sam Cap, about 5 km to the southwest outside the Project Area. Their distribution in the Project Area is limited along the west-bank of Na Cua river in the northwestern part. This formation consists essentially of conglomerate and sandstone unconformably overlying the Anisian limestone and the Ladinian shale and siltstone. Their geologic age is considered of Jurassic to Cretaceous.

Syenite Intrusion (Palaeogene) :

The intrusions in this area consist essentially of syenite and minette dikes. The syenite intrusive body occupies an area of 13 km^2, forming two notable peaks in the northwestern and southwestern parts of this area. The rocks are leucocratic, displaying

light yellow, light gray or light purple color, and contain kaolinized or albitized potash feldspar. They are generally subjected to carbonatization and biotitization. The syenite contacts to limestone or shale with obscure boundary. The syenite body in Dong Pao area is massive and shows fine-grained, euhedral to subhedral textures.

Although two samples of relatively fresh looking syenite were submitted for K-Ar age determination, scarce contents of potash feldspar due to alteration and mineralization impeded obtaining reliable results.

Rare earth, fluorite and barite mineralization occurs principally in syenite or sheared syenite as disseminations. The three types of mineralization superimpose each other or occur in close proximity to each other in space.

Alkaline Volcanics and Tuffs (Palaeogene)

These rocks distribute in a limited area on the top of peak in the northern part and comprise trachyte and trachytic tuff. The sample H-02, collected in the course of the geological traverse, was a quartz-trachytic volcanic breccia.

1-4 Geological Structure

This area is located near the northwestern end of the West Bacbo geologic province that is a major structural zone trending in the NW-SE direction. The regional structures trending in the NW-SE are predominated in the northern Vietnam including The West Bacbo geologic province. The major fault in this area also trends in the NW-SE direction, dividing the geology in two distinct parts. In addition to NW-SE lineaments, those trending N-S and E-W are also observed in the topographic map of this region.

1-5 Mineral Occurrence Prospecting

1-5-1 Major Mineral Occurrences (excluding F3 ore body)

More than 60 rare earth-fluorite-barite ore bodies have been located in this area by the past exploration works. The localities of major rare earth occurrences are indicated in Figure II-1-3. The result of the prospecting is described below. Meanwhile, F3 ore body will be mentioned in detail in Chapter 4.

1. F 1 Ore Body

Figure II-1-4(1) indicates the location of F 1 ore body and also incorporates a sketch and photographs of its mineralized outcrops as well as the assay results of collected samples. The ore body is composed mainly of fluorite ores and is currently being mined for fluorite. It is located on hillside close to the peak and is exposed on an outcrop with a width of more than 50 m. Fluorite occurs as purple crystals with grain sizes ranging from 1 to 5 mm. The ore body forms a irregular belt or lenticular shape with its outer boundary being obscured. The host syenite is extremely loose on outcrops subjected to intense mineralization, alteration and weathering. Barite and rare earth minerals are accompanied with fluorite concentrations. According to the assay result, the fluorite ores contained some 70 % of CaF_2 as well as a minor amount of rare earths ranging from 0.42 to 3.76 % T-RE_2O_3. Ore samples that were collected in the periphery of the fluorite ore body and contained some 50 % of $BaSO_4$ indicated rare earth content of 1.01 to 2.22 % T-RE_2O_3.

2. F 4 Ore Body

Figure II-1-4(2) indicates the location of F 4 ore body and also incorporates sketches and photographs of its mineralized outcrops as well as the assay results of collected samples. This ore body is, the same as F 1, composed mainly of fluorite ores and was mined for fluorite until 1995. The mining operation is currently ceased because its operating cost is high due to a large proportion of ores being fine-grained compared to the F 1 ores. The ore body forms a knob jutting out from the main ridge composed of syenite. Fluorite displays purplish color in general, though mega-crystals with sizes of 5 to 8 cm are green in their peripheries and grade into purplish color towards their centers (sample F4-U04). The ore body forms a irregular aggregation of vein networks or lenticular shape with its outer boundary being obscured. According to the assay result, a fluorite ore sample that contained 57.7 % of CaF_2 indicated a rare earth content of 4.87 % T-RE_2O_3. The samples, F4-U05 and -U06, which were collected in the vicinity of the contact between the fluorite ore body and the host syenite, were composed primarily of weathered barite according to the assay result. Black colored lamellae are observed in the sample F4-U06 and are high in manganese and lead contents at 6,740 ppm Mn and

3,480 ppm Pb according to the assay result. These lamellae also contain 4.07 % T-RE_2O_3.

The fluorite sample F4-U04 was submitted for fluid inclusion analysis that yielded homogenization temperatures with the frequency peak at 125℃. Therefore, it can be interpreted that F 4 ore body was formed at the temperature condition of around 125℃.

3. Barite-Fluorite Concentration Zone-1 of F7 Ore Body (UTM:0350820E, 2466675N)

Figure II-1-4(3) indicates the location of the barite-fluorite concentration zone-1 of F7 ore body and also incorporates a sketch and a photograph of the mineralized outcrop as well as the assay results of collected samples. F7 ore body is the largest in the Project Area and includes rare earths, barite and fluorite mineralization. The outcrop is located along the trail leading to F 1 ore body from New Dong Pao village. The ores in the outcrop consist of extremely weathered fluorite and barite. The assay result indicates that the ores contain 37.09 to 50.34 % CaF_2, 29.83 to 39.60 % $BaSO_4$ and 2.58 to 8.00 % T-RE_2O_3. According to the assay result of the samples of three locations, the total rare earth content is the highest in the sample collected in the lower part where barite is relatively enriched.

4. Barite-Fluorite Concentration Zone-2 of F7 Ore Body (UTM:0350753E, 2466650N)

Figure II-1-4(4) indicates the location of the barite-fluorite concentration zone-2 of F7 ore body and also incorporates a sketch and a photograph of the mineralized outcrop as well as the assay results of collected samples. This outcrop is located along the stream to the southwest of the barite-fluorite concentration zone-1 of F7. The ores consist of extremely weathered barite aggregates and fine-grained fluorite in matrix of microcrystalline barite. The sample collected in a channel for 1 m length indicated assay result of 24.35 % CaF_2, 47.76 % $BaSO_4$ and 11.09 % T-RE_2O_3.

5. F 16 Ore Body (UTM:0348817E, 2467694N)

Figure II-1-4(5) indicates the location of the barite concentration zone of F 16 ore body and also incorporates a sketch and a photograph of the mineralized outcrop as well as the assay results of collected samples. This outcrop is located along the ridge trail southeasterly extending from Na Cua village at the northwestern end of the prospecting area. The geochemical sample, U-136, was collected at the same location. The ores contain barite pebbles (less than 1 cm) in dark gray, brown or light yellow matrices. The assay result indicated that the ores contained 0.06 to 0.21 % CaF_2, 80.22 % $BaSO_4$ and 4.39 to 16.79 % T-RE_2O_3. The dark gray part of the outcrop is enriched in manganese, indicating manganese content of 6510 to more than 10,000 ppm.

6. Fluorite Veins in Limestone to the Southwest of F3 Ore Body (UTM:0350340E,

2465604N)

Figure II-1-4(6) indicates the location of the fluorite-rare earth veins in limestone to the southwest of F3 ore body and also incorporates a sketch of the mineralized outcrop and polished section microphotographs of an ore sample. This outcrop is located along the trail southwesterly extending from F3 ore body. The veins (5 to 35 mm wide) occur in white to light gray limestone and present dark purplish gray color. Fluorite is very fine-grained though it can be identified by a hand lens. The microscopic observation of an ore sample have indicated that extremely fine-grained rare earth minerals fill spaces between fluorite crystals. This is the occurrence in the prospected area that rare earth mineralization is associated with limestone.

1-5-2 Other Mineral Occurrences

Most of the rare earth-fluorite-barite mineralization occurs within the syenite intrusive body. The mineral occurrences tend to be located in the peripheries of the intrusive body, particularly in the vicinity of the contact to limestone. A number of mineral occurrences have been identified in the prospected area in addition to those described in the previous section. Some of them are described below.

- F 5 Ore Body : This ore body is small in its size, comprising mainly fluorite. Fluorite of F 5 ore body is green colored and coarse-grained, while that of F1 and F 4 ore bodies is purple colored and fine-grained. Fluorite ores were mined from this ore body in the past. However, the mining operation is currently ceased, because the resource has been exhausted. Fluorite is hardly observed on outcrops at he present time.

- F 9 Ore Body : This is a rare earth ore body located in the northeastern part of the prospected area. Outcrops of intensely weathered syenite containing rare earth minerals are exposed along a trail connecting Tam Duong and Dong Pao. Barite and fluorite also occur in association occasionally. The assay result of the collected sample 0104-U03 indicates 4.44 % T-RE_2O_3, 25.92 % $BaSO_4$ and 40.79 % CaF_2.

- F 10 Ore Body : This is a rare earth ore body located to the northwest of F 9 ore body in the northeastern part of the prospected area. The ore body is hosted by intensely weathered syenite, as F 9 ore body. The sample 0112-U04 that was collected near the contact to limestone consists of orange colored syenite carrying thin black layers and limestone pebbles. The assay result of the sample indicates 4.54 % T-RE_2O_3, 23.45 % $BaSO_4$ and 15.82 % CaF_2. The sample contains manganese exceeding 10,000 ppm, which implies the thin black layers of manganese concentrations. A sample (0012-U03) of a quartz float was collected beside a pit excavated during the 1964-1968 exploration. The sample was submitted for fluid inclusion analysis, the

result of which indicated a unimodal frequency distribution in homogenization temperatures with the average at 205℃. The homogenization temperature is high, compared to the average of 138℃ for the quartz sample (P1b-02) collected from F3 ore body.

- F 14 Ore Body : This ore body is located on the ridge to the southeast of F3 ore body. No outcrop mineralized with rare earths has been identified in the course of the current prospecting. However, significant geochemical anomalies in rare earths and barite have been located. The ore body appears to extend southwards.

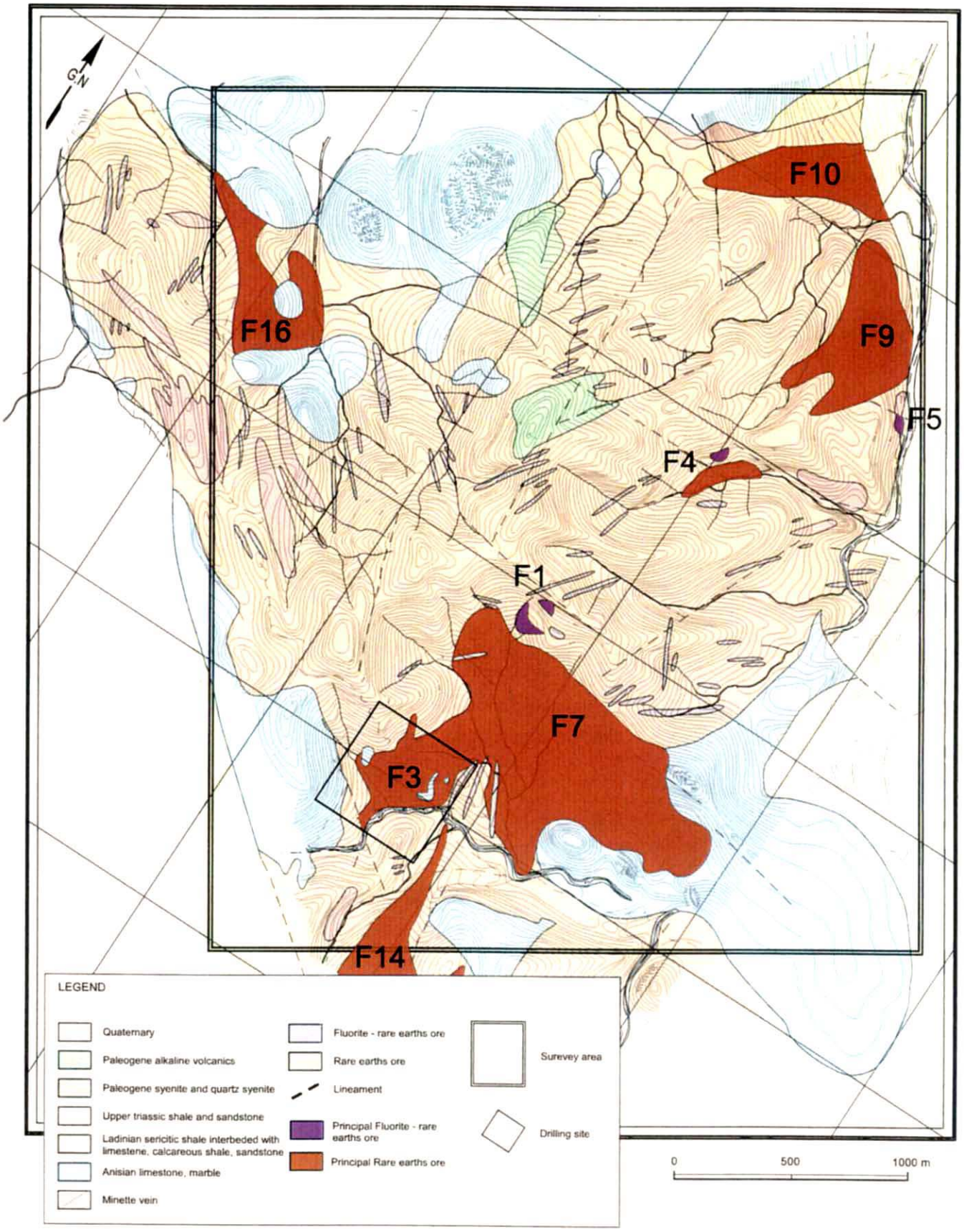
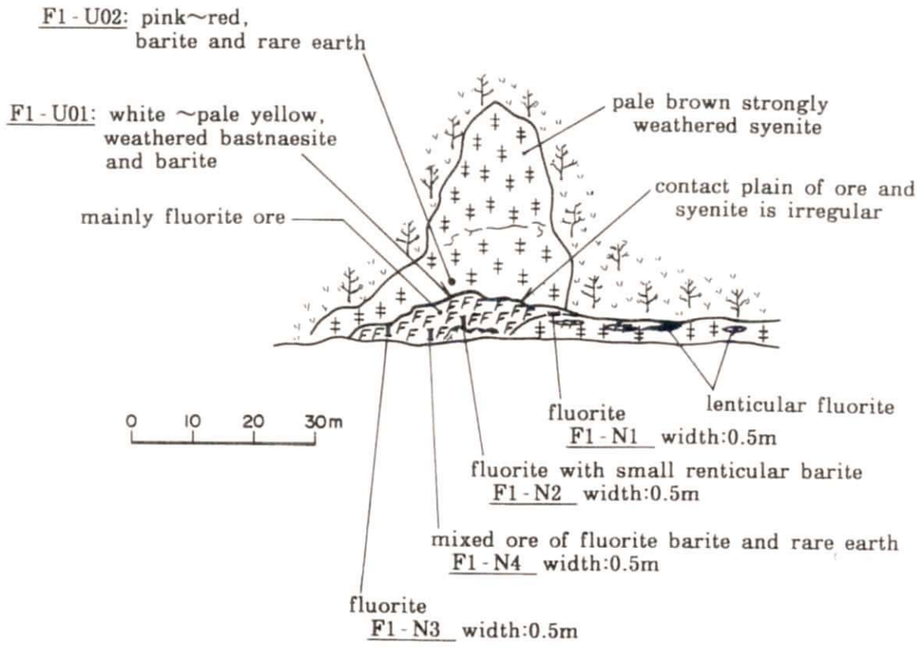
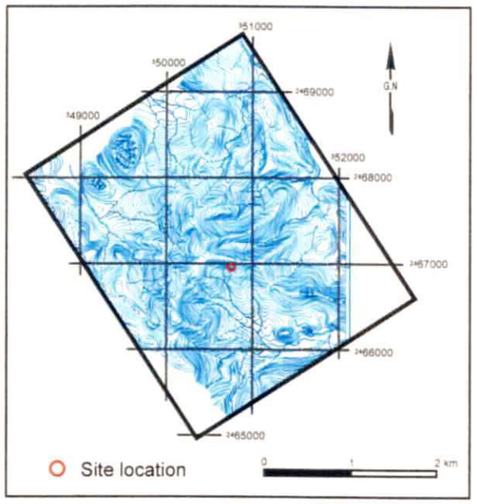


Figure II-1-3 Principal Mineralization site in Dong Pao area



The whole view of F1 orebody



SAMPLE	$T-RE_2O_3$	CaF_2	$BaSO_4$
	%	%	%
F1-N01	1.12	69.04	9.57
F1-N02	3.76	70.27	4.35
F1-N03	0.42	71.10	8.87
F1-N04	1.53	25.07	51.33
F1-U01	2.22	1.09	51.84
F1-U02	1.01	0.29	40.45

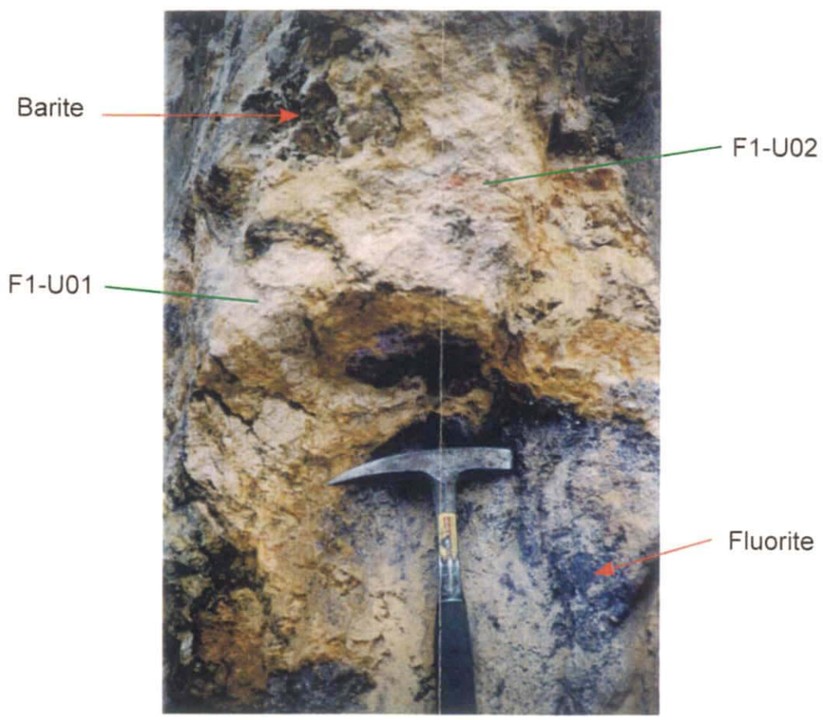
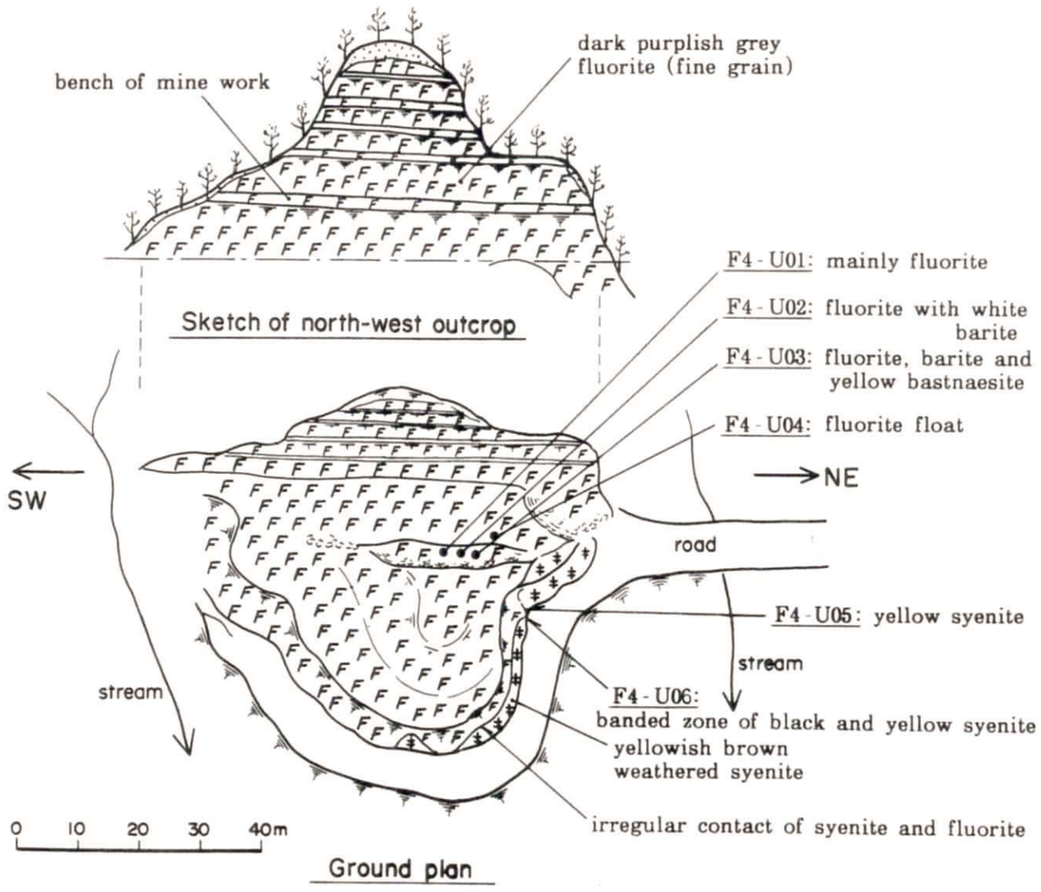
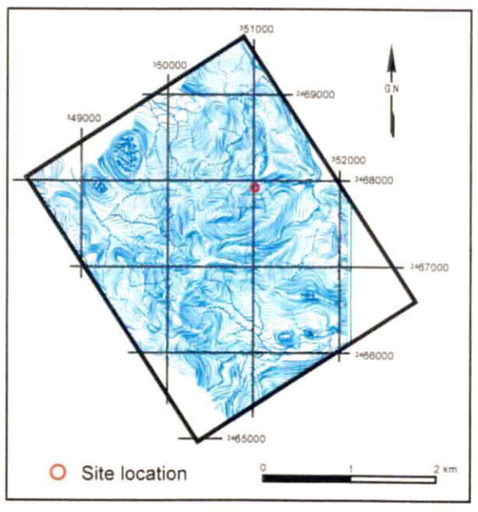


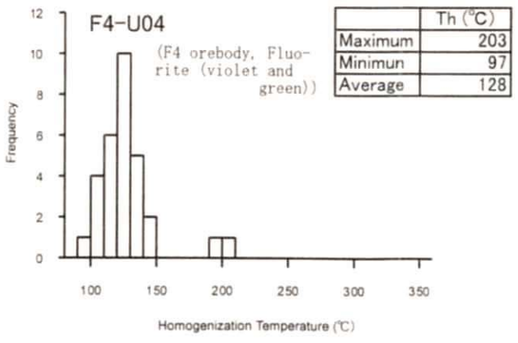
Figure II-1-4 (1) Geologic Sketch of F1 orebody



The whole view of F4 orebody



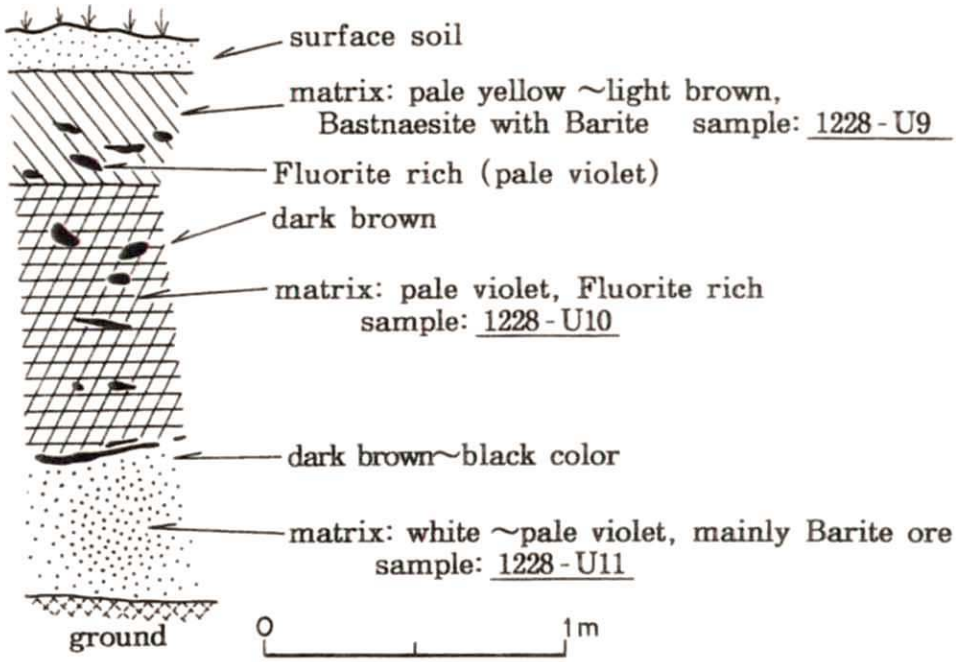
SAMPLE	$T\text{-}RE_2O_3$	CaF_2	$BaSO_4$
	%	%	%
F4-U01	4.87	57.74	15.45
F4-U02	1.33	44.38	42.83
F4-U03	0.78	43.36	40.79
F4-U05	1.58	0.27	83.28
F4-U06	4.07	0.53	75.80



	Th (℃)
Maximum	203
Minimun	97
Average	128

Figure II-1-4 (2) Geologic Sketch of F4 orebody

UTM: 0350820E, 2466675N



SAMPLE	T-RE_2O_3	CaF_2	$BaSO_4$
	%	%	%
1228-U09	2.58	37.09	37.73
1228-U10	6.40	50.34	29.83
1228-U11	8.00	37.91	39.60

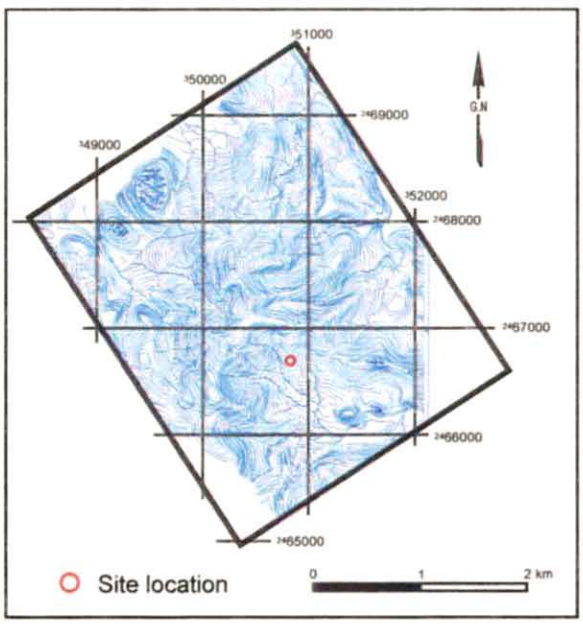
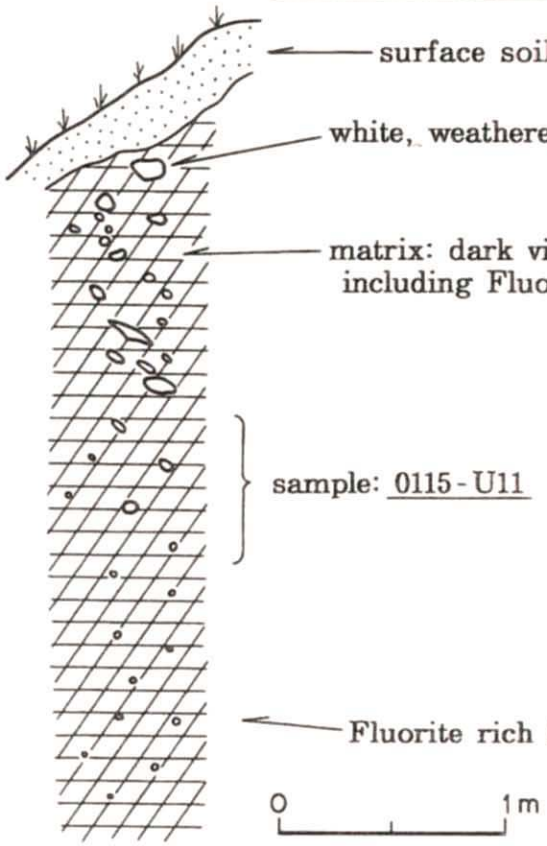


Figure II-1-4 (3) Geologic Sketch of F7 orebody (1/2)

UTM: 0350753E, 2466650N



SAMPLE	$T-RE_2O_3$	CaF_2	$BaSO_4$
	%	%	%
0115-U11	11.09	24.35	47.76

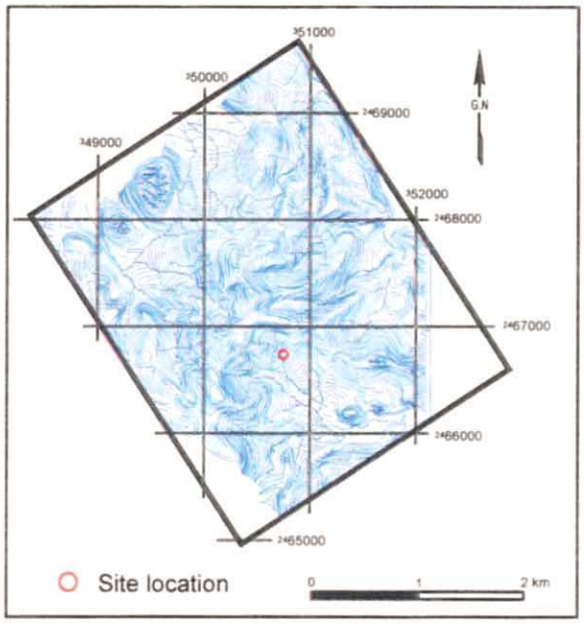
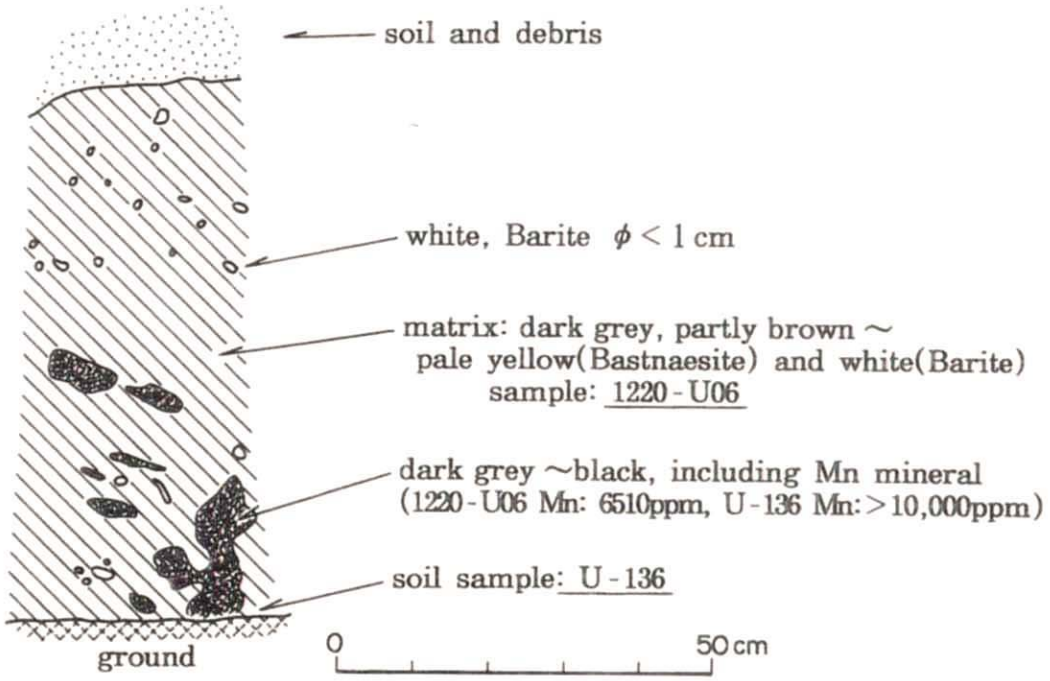


Figure II-1-4 (4) Geologic Sketch of F7 orebody (2/2)

UTM: 0348817E, 2467694N



SAMPLE	$T\text{-}RE_2O_3$ %	CaF_2 %	$BaSO_4$ %
1220-U06	4.39	0.06	80.22
U-136	16.79	0.21	>1.70

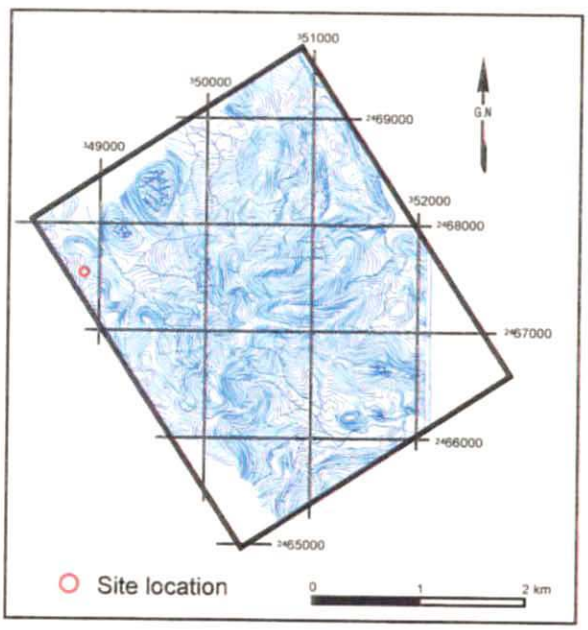
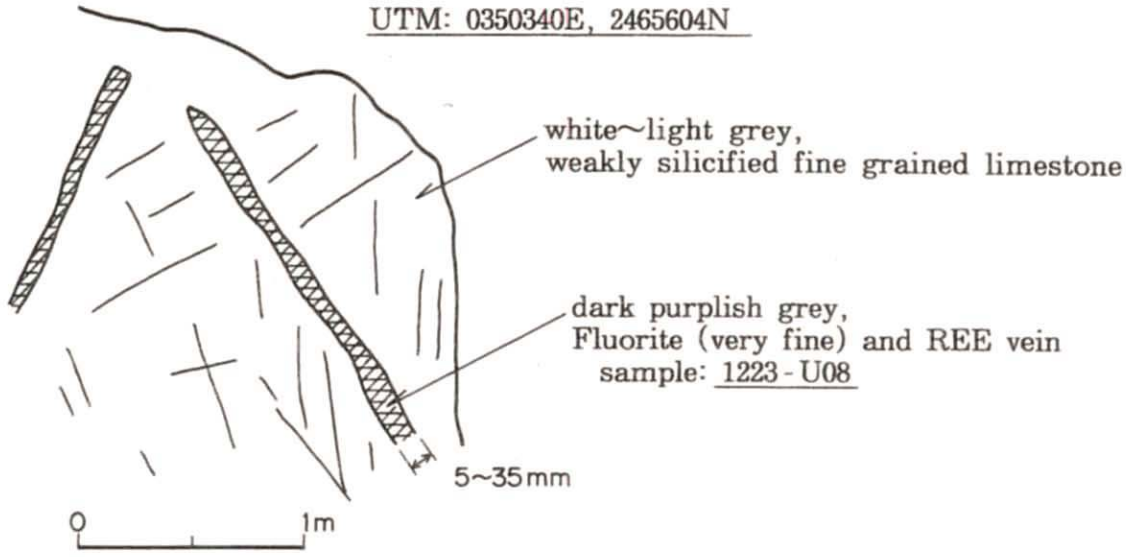
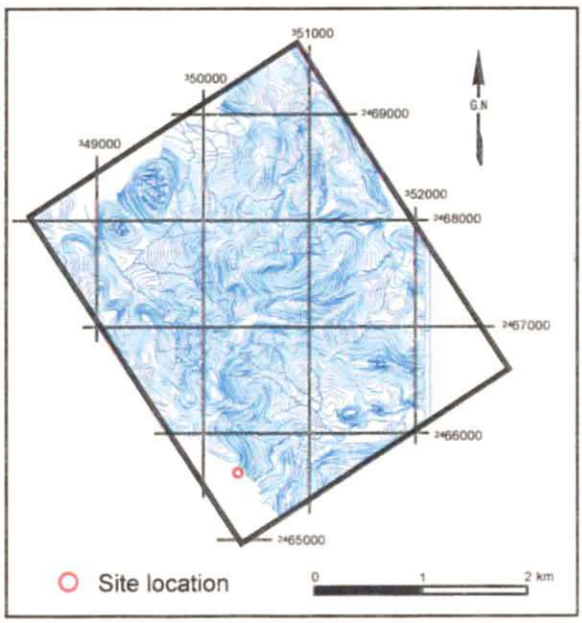


Figure II-1-4 (5) Geologic Sketch of F16 orebody





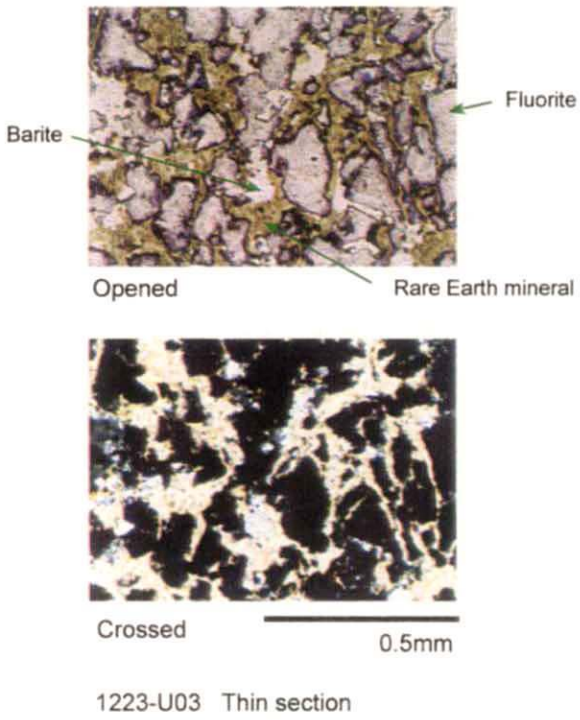


Figure II-1-4 (6) Geologic Sketch of the Southwestern area of F3 orebody

Chapter 2 Environmental Base-line Study

The environmental base-line study was carried out to collect fundamental data on the present states of the environment in the Project Area. The study items include soil, hydrology, meteorology and vegetation.

2-1 Soil Survey

2-1-1 Methodology

Geochemical soil sampling was carried out in the entire Project Area in order to establish the regional backgrounds of trace elements contained in heavy and rare earth metals and to outline their distributions. The samples were collected on grid-basis with an interval of 50m as much as possible on and in the vicinity of F3 ore body and at intervals of 25 to 50 m along the prospecting traverses in other part of the Project Area. The total number of samples collected was 1,606. The samples were principally collected from the B horizon or the transition zone between the B to C horizons of soil profiles. The sampling locations, shown in Figure II-2-1, were identified using GPS.

The -80 mesh fractions of sieved samples were submitted for chemical analysis and analyzed for 56 elements including 19 rare earth elements. The analytical elements and its detection limits are shown in Table II-2-1. The analytical methods employed were the specific ion electrode for fluorine, the atomic absorption spectroscopy for selenium and induced coupling plasma emission (ICP) for the rest of the elements. The chemical analysis was conducted at the laboratory of Chemex Labs Ltd., Vancouver, Canada.

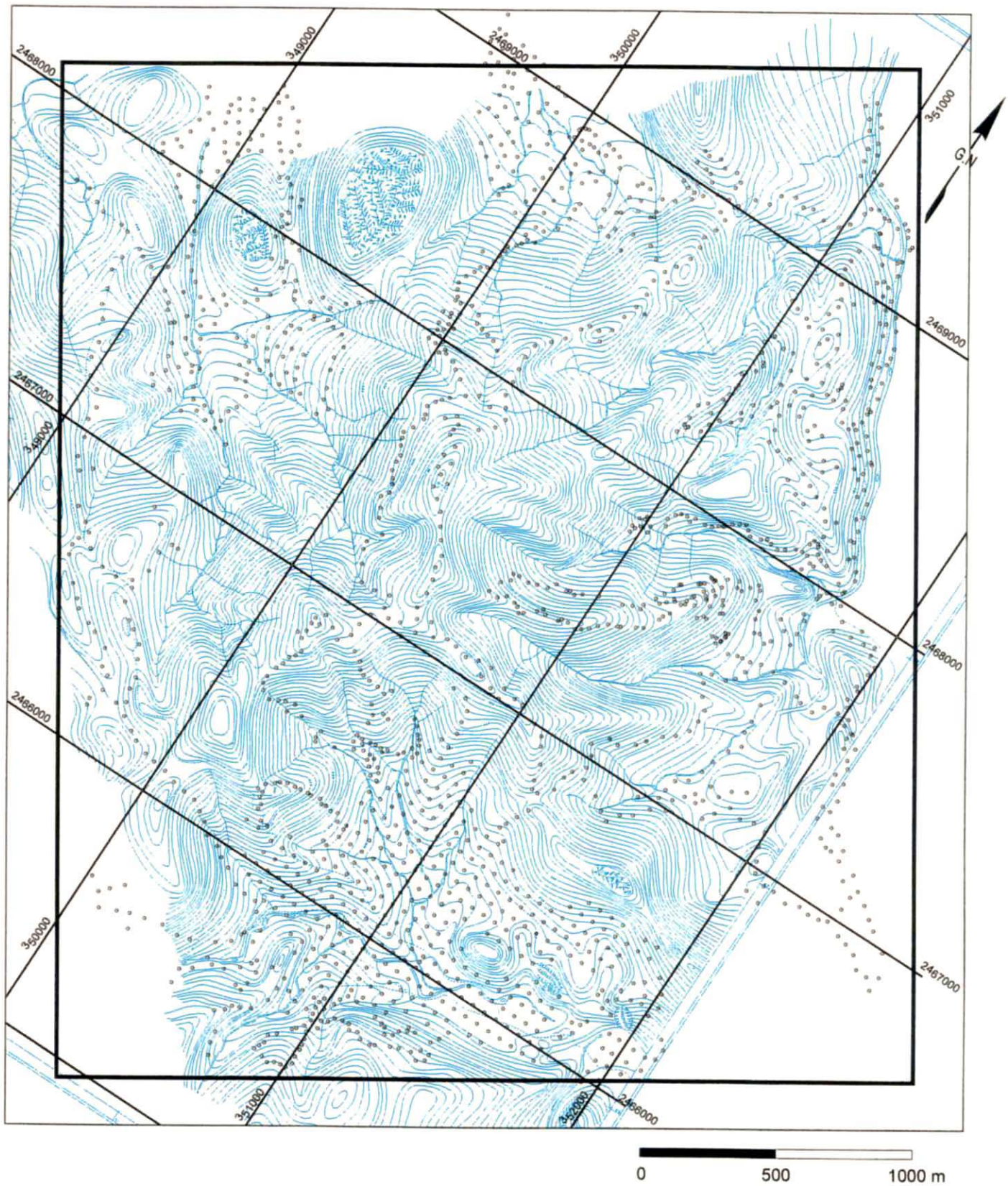
Table II-2-1 Analytical elements and detection limit

1	F	0.01	%	20	Be	0.5	ppm	39	Ti	10	%
2	Ba	0.5	ppm	21	Bi	2	ppm	40	V	5	ppm
3	Cs	0.1	ppm	22	Ca	0.01	%	41	Zn	5	ppm
4	Co	0.5	ppm	23	Cd	0.5	ppm	42	Sc	1	ppm
5	Hf	1	ppm	24	Cr	1	ppm	43	Y	0.5	ppm
6	Nb	1	ppm	25	Cu	1	ppm	44	La	0.5	ppm
7	Rb	0.2	ppm	26	Fe	0.01	%	45	Ce	0.5	ppm
8	Sr	0.1	ppm	27	Ga	10	ppm	46	Pr	0.1	ppm
9	Ta	0.5	ppm	28	Hg	0.01	ppm	47	Nd	0.5	ppm
10	Tl	0.5	ppm	29	K	0.01	%	48	Sm	0.1	ppm
11	Th	1	ppm	30	Mg	0.01	%	49	Eu	0.1	ppm
12	Sn	1	ppm	31	Mn	5	ppm	50	Gd	0.1	ppm
13	W	1	ppm	32	Mo	1	ppm	51	Tb	0.1	ppm
14	U	0.5	ppm	33	Na	0.01	%	52	Dy	0.1	ppm
15	Zr	0.5	ppm	34	Ni	1	ppm	53	Ho	0.1	ppm
16	Se	0.2	ppm	35	P	10	ppm	54	Er	0.1	ppm
17	Ag	1	ppm	36	Pb	5	ppm	55	Tm	0.1	ppm
18	As	2	ppm	37	S	0.01	%	56	Yb	0.1	ppm
19	B	10	ppm	38	Sb	2	ppm	57	Lu	0.1	ppm

2-1-2 The Result of the Soil Geochemical Survey

Geochemical concentrations of T-RE_2O_3, $BaSO_4$ and CaF_2 in soil are plotted on plans as shown in Figures II-2-2 through II-2-4. The complete analytical results are presented in the laboratory reports attached in Annex.

Major soil geochemical anomalies for T-RE_2O_3 are associated with the ore bodies of F1, F3, F 4, F7, F 9, F 10, F 14 and F 16 as seen in Figure II-2-2. Those for $BaSO_4$ and CaF_2 indicate excellent agreement with the T-RE_2O_3 anomalies in their distributions. Therefore, the minerals, barite and fluorite, are significant indicators for rare earth mineralization that is often very difficult to be visually recognized in the field. Correlation coefficients between T-RE_2O_3, $BaSO_4$, CaF_2 and other elements are presented in Table II-2-2. T-RE_2O_3 is better correlated with light rare earth elements than heavy rare earths, which implies that the rare earth mineralization in this area is principally of light rare earth mineralization. In addition, T-RE_2O_3 is well correlated to Th, Sr, As, Pb, U, F and Ba. Celestite ($SrSO_4$) and finnemanite ($Pb_5(AsO_3)_3Cl$) are also identified in ore samples submitted for the metallurgical testing by X-ray diffraction analysis. Therefore, it is implied that the rare earth mineralization have accompanied concentrations of Sr, Pb and As to some extent.



LEGEND

○ Sampling point

Figure II-2-1 Soil sampling point in Dong Pao area

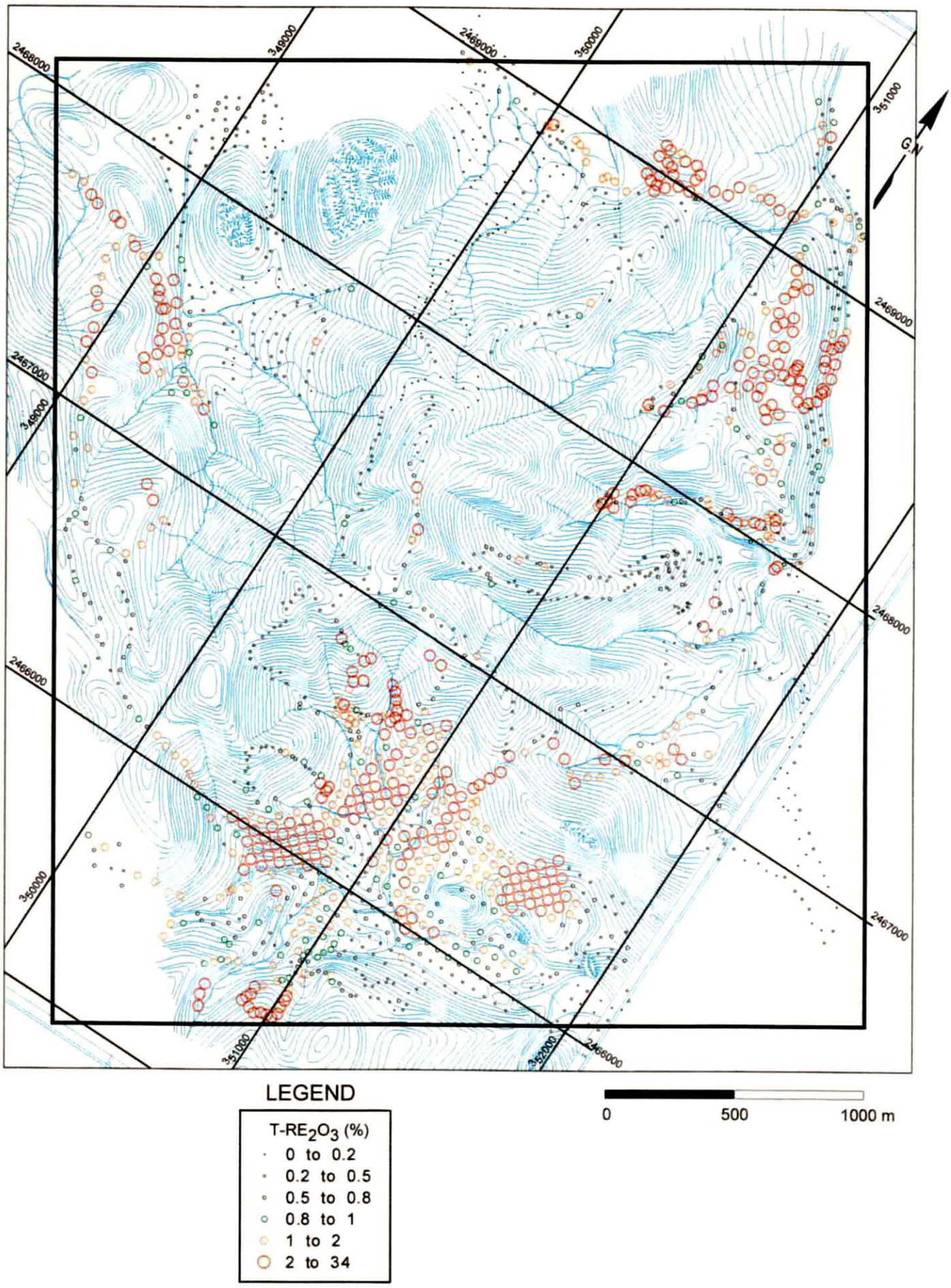


Figure II-2-2 Total rare earth elements distribution map in Dong Pao area

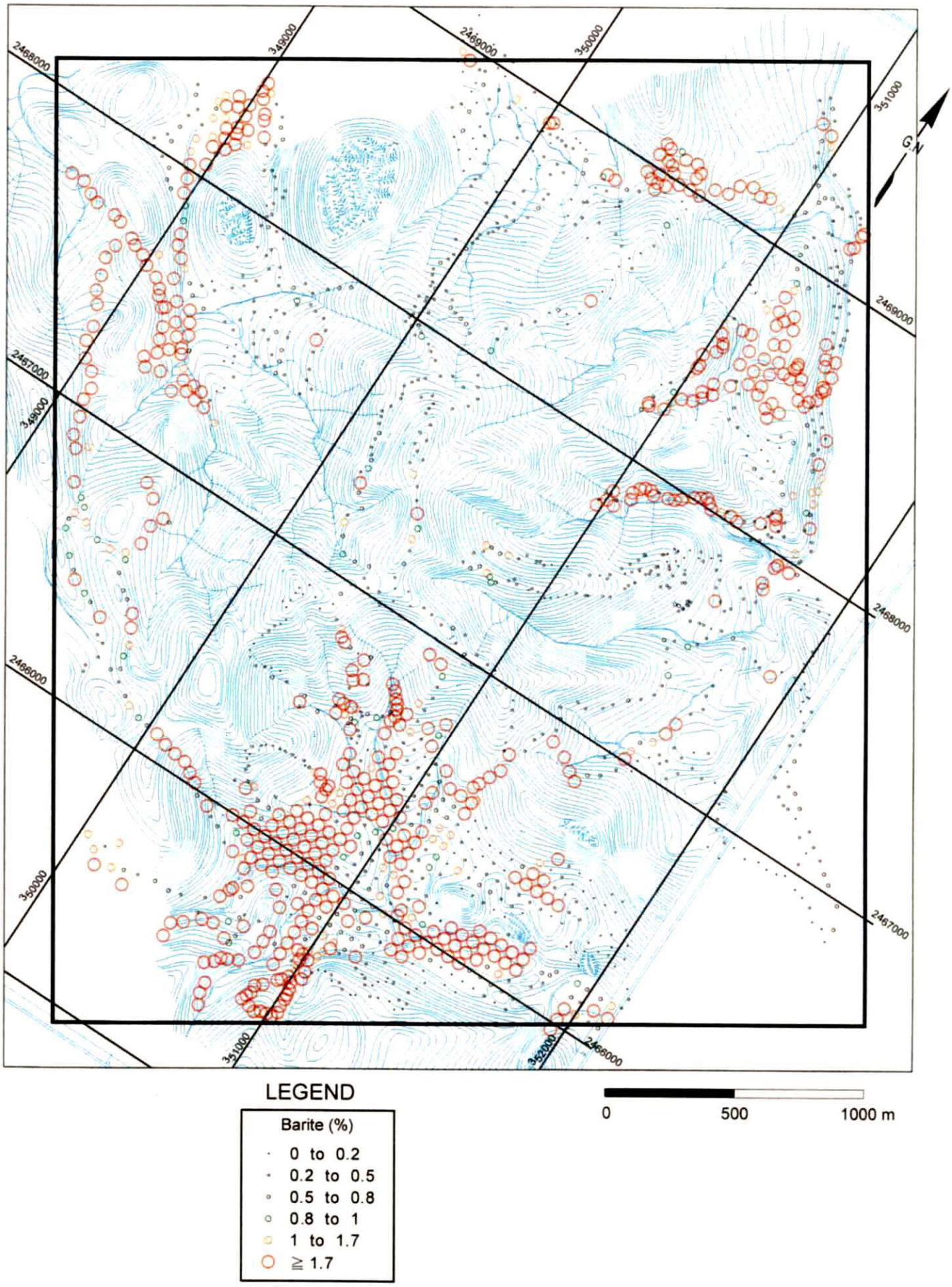


Figure II-2-3 Barite ($BaSO_4$) distribution map in Dong Pao area

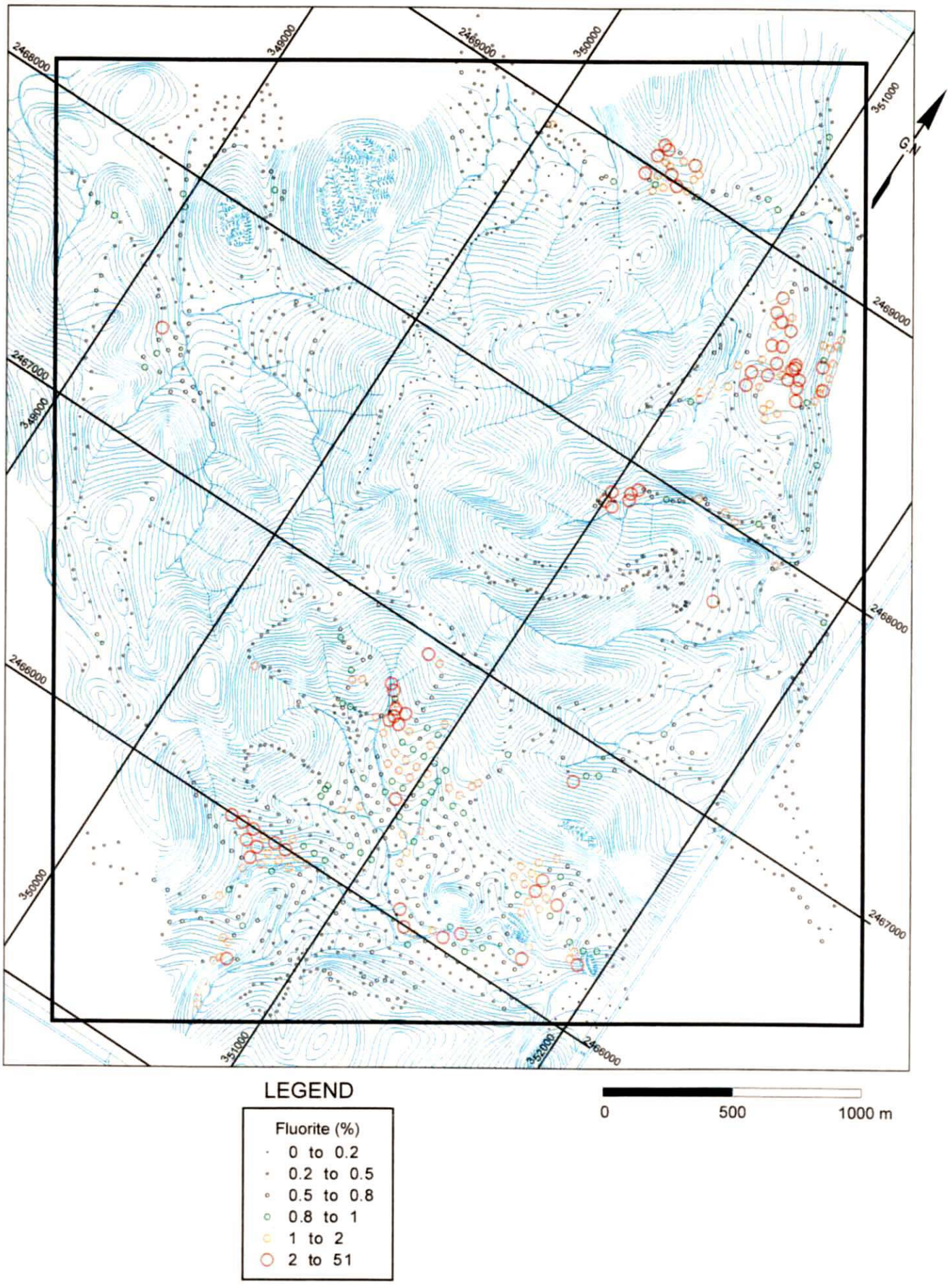


Figure II-2-4 Fluorite (CaF_2) distribution map in Dong Pao area

Table II-2-2 Correlation matrix

	T-REO	CaF2	BaSO4	F	Ba	Cs	Co	Hf	Nb	Rb	Sr	Ta	Tl	Th	Sn	W	U	Zr	Se	Al	As	Ca	Cr	Cu	Fe	K	Mg	Mn	Mo	Ni	P	Pb	S	Sb	Ti	V	Zn	Y	La	Ce	Pr	Nd	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
T-REO	1.000																																																			
CaF2	0.419	1.000																																																			
BaSO4	0.465	0.220	1.000																																																	
F	0.419	1.000	0.220	1.000																																															
Ba	0.465	0.220	1.000	0.220	1.000																																														
Cs	-0.258	-0.196	-0.180	-0.196	-0.180	1.000																																														
Co	-0.112	-0.085	-0.099	-0.085	-0.099	0.233	1.000																																													
Hf	-0.101	-0.118	-0.146	-0.118	-0.146	-0.100	-0.321	1.000																																												
Nb	0.243	0.003	0.504	0.003	0.504	-0.088	-0.054	-0.213	1.000																																											
Rb	-0.300	-0.209	-0.021	-0.209	-0.021	0.307	0.015	-0.052	-0.271	1.000																																										
Sr	0.681	0.381	0.527	0.381	0.527	-0.222	-0.107	-0.171	0.369	-0.266	1.000																																									
Ta	0.022	-0.026	0.224	-0.026	0.224	-0.132	0.079	-0.067	0.389	-0.216	0.107	1.000																																								
Tl	0.102	-0.022	-0.108	-0.022	-0.108	0.048	0.313	-0.216	-0.046	-0.128	0.162	-0.034	1.000																																							
Th	0.721	0.258	0.426	0.258	0.426	-0.180	-0.210	0.077	0.334	-0.250	0.616	0.047	0.042	1.000																																							
Sn	0.007	-0.005	-0.002	-0.005	-0.002	-0.039	-0.002	0.035	0.013	-0.004	-0.017	0.016	-0.024	0.020	1.000																																						
W	0.195	0.007	0.111	0.007	0.111	0.032	0.015	-0.084	0.213	-0.177	0.279	0.129	0.261	0.266	0.026	1.000																																						
U	0.614	0.305	0.545	0.305	0.545	-0.173	-0.002	-0.201	0.737	-0.313	0.604	0.305	0.094	0.490	0.020	0.219	1.000																																						
Zr	-0.139	-0.199	-0.113	-0.199	-0.113	-0.080	-0.343	0.904	-0.153	-0.018	-0.156	0.057	-0.200	0.072	0.027	-0.065	-0.185	1.000																																					
Se	0.009	-0.031	-0.119	-0.031	-0.119	-0.014	0.030	0.016	-0.045	-0.100	-0.058	-0.023	0.024	-0.001	0.101	0.090	-0.026	-0.051	1.000																																					
Al	-0.086	-0.180	-0.013	-0.180	-0.013	-0.010	0.065	0.329	0.055	-0.208	-0.137	0.100	-0.132	0.035	0.003	0.052	-0.003	0.328	0.035	1.000																																					
As	0.677	0.155	0.357	0.155	0.357	-0.147	0.098	-0.267	0.326	-0.306	0.614	0.108	0.489	0.505	-0.013	0.375	0.565	-0.231	0.031	-0.106	1.000																																					
Ca	0.427	0.886	0.232	0.886	0.232	-0.237	-0.072	-0.176	-0.002	-0.204	0.401	-0.027	-0.025	0.222	0.002	-0.026	0.306	-0.255	-0.039	-0.244	0.141	1.000																																					
Cr	-0.113	-0.079	-0.050	-0.079	-0.050	0.213	0.602	-0.153	-0.094	-0.073	-0.111	0.055	0.017	-0.187	-0.015	-0.133	-0.076	-0.165	-0.038	0.282	-0.068	-0.067	1.000																																					
Cu	0.246	0.008	0.242	0.008	0.242	0.003	0.420	-0.265	0.272	-0.074	0.246	0.288	0.159	0.091	0.037	0.170	0.435	-0.275	0.048	0.061	0.373	0.041	0.241	1.000																																					
Fe	0.014	-0.144	-0.051	-0.144	-0.051	0.140	0.623	-0.247	0.301	-0.276	0.030	0.109	0.373	0.075	0.026	0.253	0.233	-0.286	0.084	0.250	0.322	-0.191	0.347	0.387	1.000																																				
K	0.254	0.397	0.238	0.397	0.238	0.095	0.117	-0.137	-0.048	0.080	0.283	-0.055	-0.046	0.146	-0.032	-0.052	0.136	-0.152	-0.094	-0.031	0.097	0.571	0.303	0.098	-0.094	1.000																																				
Mg	-0.128	-0.045	0.089	-0.045	0.089	0.174	0.354	-0.159	-0.068	0.131	-0.055	0.044	-0.051	-0.185	-0.049	-0.171	-0.106	-0.126	-0.155	0.007	-0.131	0.089	0.640	0.083	-0.002	0.419	1.000																																			
Mn	0.373	0.181	0.342	0.181	0.342	-0.087	0.320	-0.240	0.379	-0.227	0.406	0.161	0.346	0.338	-0.022	0.228	0.558	-0.229	0.023	0.051	0.547	0.190	0.027	0.426	0.413	0.071	-0.052	1.000																																			
Mo	0.361	0.188	0.243	0.188	0.243	-0.195	-0.021	0.053	0.004	-0.079	0.253	-0.108	0.089	0.340	0.054	0.095	0.214	0.023	-0.009	0.091	0.280	0.208	-0.060	0.126	0.076	0.182	-0.111	0.180	1.000																																		
Ni	-0.061	-0.050	0.021	-0.050	0.021	0.231	0.800	-0.359	-0.042	0.045	-0.026	0.101	0.270	-0.164	-0.009	-0.046	0.043	-0.368	-0.034	0.011	0.116	-0.003	0.706	0.384	0.448	0.232	0.581	0.217	-0.028	1.000																																	
P	0.238	-0.015	0.436	-0.015	0.436	-0.010	0.199	-0.362	0.757	-0.185	0.343	0.323	0.048	0.247	0.002	0.231	0.683	-0.309	-0.023	0.004	0.394	0.004	0.081	0.395	0.475	0.024	0.048	0.451	0.003	0.206	1.000																															
Pb	0.623	0.374	0.574	0.374	0.574	-0.241	-0.010	-0.222	0.516	-0.257	0.635	0.248	0.112	0.532	0.031	0.248	0.770	-0.233	0.019	-0.052	0.577	0.390	-0.091	0.531	0.143	0.230	-0.100	0.591	0.378	0.041	0.503	1.000																													
S	0.140	0.107	0.471	0.107	0.471	-0.220	0.028	-0.025	0.162	-0.124	0.189	0.100	0.106	0.194	-0.025	0.039	0.173	-0.004	-0.036	0.168	0.150	0.124	-0.038	0.067	0.067	0.033	0.041	0.325	0.205	0.032	0.074	0.181	1.000																											
Sb	0.396	0.079	0.143	0.079	0.143	-0.107	0.139	-0.185	0.109	-0.234	0.335	0.121	0.579	0.263	0.037	0.365	0.332	-0.176	0.055	-0.100	0.698	0.096	-0.008	0.474	0.306	0.091	-0.085	0.427	0.241	0.155	0.230	0.479	-0.037	1.000																										
Ti	-0.068	-0.070	-0.056	-0.070	-0.056	0.153	0.384	-0.028	-0.067	0.044	-0.123	-0.042	-0.203	-0.077	-0.032	-0.232	-0.103	-0.047	-0.077	0.268	-0.187	-0.076	0.801	0.043	0.133	0.329	0.678	-0.167	-0.070	0.465	-0.021	-0.143	-0.160	-0.095	1.000																									
V	0.185	-0.025	0.181	-0.025	0.181	-0.005	0.366	-0.273	0.471	-0.382	0.241	0.371	0.408	0.292	0.044	0.365	0.415	-0.238	0.037	0.123	0.457	-0.037	0.158	0.381	0.663	-0.036	-0.016	0.466	0.099	0.294	0.522	0.409	0.172	0.406	-0.026	1.000																								
Zn	0.394	0.073	0.346	0.073	0.346	-0.077	0.266	-0.341	0.481	-0.222	0.482	0.280	0.371	0.340	0.050	0.246	0.642	-0.314	0.055	-0.044	0.653	0.136	0.047	0.605	0.428	0.085	-0.019	0.714	0.169	0.331	0.591	0.669	0.110	0.642	-0.138	0.556	1.000																							
Y	0.559	0.168	0.265	0.168	0.265	-0.141	0.125	-0.088	0.067	-0.171	0.372	-0.017	0.297	0.435	0.082	0.220	0.373	-0.116	0.101	0.000	0.604	0.183	0.003	0.411	0.239	0.148	-0.086	0.598	0.335	0.142	0.220	0.578	0.040	0.697	-0.074	0.355	0.615	1.000																						
La	0.979	0.444	0.443	0.444	0.443	-0.252	-0.122	-0.099	0.197	-0.258	0.660	-0.010	0.082	0.705	-0.002	0.163	0.547	-0.137	-0.012	-0.133	0.634	0.447	-0.109	0.193	-0.029	0.277	-0.108	0.294	0.354	-0.059	0.169	0.568	0.131	0.340	-0.053	0.131	0.326	0.490	1.000																				
Ce	0.987	0.392	0.459	0.392	0.459	-0.258	-0.118	-0.079	0.256	-0.328	0.668	0.040	0.104	0.717	0.006	0.207	0.627	-0.116	0.020	-0.035	0.672	0.398	-0.120	0.247	0.032	0.224	-0.147	0.412	0.360	-0.084	0.255	0.613	0.160	0.395	-0.080	0.204	0.388	0.548	0.939	1.000																			
Pr	0.984	0.422	0.479	0.422	0.479	-0.243	-0.098	-0.151	0.274	-0.268	0.690	0.026	0.087	0.694	0.011	0.183	0.635	-0.185	0.001	-0.139	0.674	0.444	-0.102	0.273	0.006	0.272	-0.102	0.359	0.325	-0.025	0.279	0.652	0.096	0.391	-0.057	0.177	0.432	0.559	0.974	0.952	1.000																	
Nd	0.971	0.407	0.484	0.407	0.484	-0.235	-0.086	-0.169	0.299	-0.269	0.694	0.041	0.084	0.680	0.017	0.186	0.657	-0.199	0.005	-0.143	0.679	0.438	-0.095	0.303	0.018	0.268	-0.096	0.379	0.310	-0.009	0.315	0.675	0.079	0.404	-0.056	0.190	0.469	0.577	0.951	0.940	0.996	1.000													
Sm	0.907	0.361	0.500	0.361	0.500	-0.220	-0.033	-0.197	0.334	-0.260	0.683	0.076	0.110	0.649	0.041	0.201	0.691	-0.227	0.031	-0.128	0.695	0.401	-0.071	0.401	0.080	0.254	-0.089	0.462	0.313	0.050	0.390	0.746	0.059	0.489	-0.061	0.257	0.591	0.695	0.858	0.883	0.944	0.965	1.000											
Eu	0.896	0.345	0.494	0.345	0.494	-0.179	0.014	-0.128	0.240	-0.202	0.672	-0.009	0.149	0.631	0.052	0.194	0.727	-0.148	0.060	-0.069	0.657	0.399	-0.034	0.421	0.073	0.267	-0.068	0.402	0.452	0.083	0.313	0.735	0.071	0.530	-0.039	0.276	0.593	0.771	0.851	0.877	0.926	0.945	0.991	1.000									
Gd	0.892	0.345	0.476	0.345	0.476	-0.209	-0.002	-0.196	0.295	-0.246	0.660	0.056	0.146	0.647	0.049	0.210	0.653	-0.223	0.038	-0.120	0.702	0.386	-0.058	0.405	0.108	0.253	-0.085	0.473	0.330	0.077	0.370	0.735	0.053	0.534	-0.060	0.278	0.611	0.762	0.848	0.862	0.929	0.950	0.991	0.995	1.000							
Tb	0.847	0.306	0.457	0.306	0.457	-0.203	0.021	-0.175	0.278	-0.243	0.625	0.042	0.177	0.637	0.065	0.227	0.624	-0.210	0.061	-0.084	0.706	0.340	-0.051	0.422	0.161	0.232	-0.096	0.522	0.361	0.089	0.373	0.735	0.060	0.589	-0.068	0.316	0.647	0.850	0.791	0.825	0.875	0.896	0.962	0.976	0.982	1.000					
Dy	0.647	0.196	0.354	0.196	0.354	-0.160	0.107	-0.143	0.182	-0.199	0.473	0.060	0.267	0.501	0.075	0.230	0.499	-0.168	0.092	-0.030	0.659	0.223	-0.010	0.464	0.229	0.168	-0.085	0.644	0.348	0.146	0.319	0.669	0.046	0.686	-0.077	0.375	0.680	0.971	0.574	0.634	0.665	0.691	0.813	0.854	0.863	0.929	1.000				
Ho	0.589	0.170	0.294	0.170	0.294	-0.149	0.121	-0.107	0.121	-0.190	0.415	0.027	0.300	0.466	0.077	0.226	0.433	-0.132	0.101	-0.011	0.634	0.187	0.000	0.430	0.248	0.148	-0.086	0.634	0.332	0.145	0.270	0.614	0.044	0.702	-0.074	0.373	0.649	0.991	0.515	0.579	0.595	0.617	0.738	0.796	0.798	0.879	0.987	1.000			
Er	0.665	0.208	0.308	0.208	0.308	-0.168	0.088	-0.095	0.122	-0.213	0.458	0.009	0.298	0.516	0.061	0.233	0.449	-0.118	0.086	-0.031	0.673	0.216	-0.015	0.389	0.222	0.161	-0.092	0.579	0.342	0.112	0.252	0.614	0.054	0.702	-0.070	0.356	0.613	0.976	0.601	0.653	0.663	0.677	0.768	0.818	0.823	0.893	0.974	0.987	1.000		
Tm	0.499	0.127	0.220	0.127	0.220	-0.135	0.136	-0.052	0.055	-0.183	0.335	-0.010	0.339	0.405	0.067	0.228	0.348	-0.070	0.109	0.030	0.597	0.131	0.009	0.377	0.272	0.111	-0.090	0.595	0.324	0.134	0.210	0.531	0.055	0.704	-0.076	0.370	0.591	0.977	0.425	0.499	0.488	0.504	0.620	0.698	0.688	0.785	0.941	0.978	0.971	1.000	
Yb	0.518	0.132	0.224	0.132	0.224	-0.146	0.144	-0.050	0.054	-0.193	0.354	-0.044	0.344	0.421	0.076	0.241	0.355	-0.076	0.119	0.041	0.605	0.139	0.005	0.385	0.294	0.108	-0.101	0.601	0.338	0.135	0.215	0.541	0.065	0.701	-0.085	0.376	0.602	0.975	0.442	0.518	0.506	0.523	0.637	0.717	0.704	0.801	0.941	0.976	0.964	0.992	1.000
Lu	0.511	0.129	0.212	0.129	0.212	-0.133	0.146	-0.049	0.042	-0.188	0.344	-0.052	0.346	0.417	0.076	0.237	0.341	-0.073	0.121	0.038	0.603	0.138	0.012	0.376	0.297	0.114	-0.097	0.582	0.332	0.138	0.208	0.525	0.057	0.704	-0.076	0.375	0.596	0.973	0.437	0.511	0.498	0.514	0.625	0.710	0.694	0.791	0.933	0.970	0.960	0.989	0.993	1.000

2-2 Hydrology

2-2-1 Methodology

The hydrological study was carried out to identify background quality of river and stream water and to interpret relationship of surface and ground water with the topography and the geological structures. Initially, the study was made to characterize rivers and streams for their distributions and drainage basins. According to the result of this drainage study, five observation points were selected for on-site water quality measurements (water temperature, atmospheric temperature, conductivity, pH and flow rate) and for water sampling. These observation points were set at the headwater and the outlet of Dong Pao river, two locations along the main and a branch stream of Nam Hon river and the hot spring in the vicinity of Ban Tam village as shown in Figure II-2-5.

Apparatuses used for the on-site measurements were a pH meter, model HM-21P and a conductivity meter, model CM-21P, both of which were products of Toua Denpa Industry Ltd., Japan. Current velocity was measured taking an average for 30 seconds, using a current meter, model FP 101, a product of Global Water Ltd. In measuring flow rate, the river cross-section at each observation point were divided into blocks according to its shape and the river width. The flow rates of individual blocks were separately measured and summed up for the total flow rate at the observation point.

Water samples, 2,000 cc each, were collected at the observation points and submitted for analyses. The items analyzed were pH, electric conductivity, suspended solids, COD and such cations and anions as Na, Ca, K, Mg, Cl, HCO_3, CO_3, SO_4, As, Cd, Pb, Cu, Zn, Mn, Fe, Hg, F and sulfer. The analysis was conducted by 'Laboratory of Environmental Project of Mining and Metallurgical Institute'.

2-2-2 Result of the Hydrological Study

・ Drainage System

The drainage systems of the Project Ares are shown in Figure II-2-5, together with the locations of water samples. Since the study was carried out during the dry season from December 2000 to January 2001, there were a number of streams that had no running water. Therefore, the drainage map (Figure II-2-5) was prepared according to the topographic maps and the on-site obsevation. The intervals where running water was observed in the current study are distinguished by color in the drainage map.

The geomorphology of this area presents characteristics of karst because of the extensive distribution of limestone. There are a number of dolines and sink-holes, though small in their sizes, where surface water drains to underground. Where limestone distributes, it is observed that river water drains to underground or spring water comes out on surface. The water sampling points, DW-1 and -2, are locations

where river water drains to underground and spring water comes out. A hot spring is located at the point DW-4.

・ Water Quality Testing

The results of the on-site water quality testing and of the laboratory analysis of water samples are presented in Table II-2-3. The water samples collected at the five sampling points indicated pH ranging from 7.33 to 8.55, which was neutral to weakly alkaline. The water temperature at the sampling point, DW-4, was 28.9℃, which would be regarded as a hot spring according to the Japanese Law for Hot Spring. The water temperature at the other four sampling points ranged from 16.7 to 21.2℃. The conductivity was generally high at all the sampling points, ranging from 214 to 625 μ mS. Arsenic and fluorine contents, among other trace elements, were significantly higher than in ordinary river water in other areas. The arsenic content, ranging from 0.25 to 0.32 mg/l, is extremely high, compared to the minimum threshold of 0.01 mg/l prescribed in the 'Environmental Standards for Protecting Human Health' of the 'General Environmental Regulations on Water Pollution' in Japan. The fluorine content is also high, ranging from 0.79 to 2.42 mg/l. The four of five samples indicated fluorine contents exceeding the minimum threshold of 0.8 mg/l prescribed in the items required for monitoring of the same 'Environmental Standards'. The high fluorine content in surface water may be attributed to dissolved fluorine from outcrops mineralized with fluorite within the drainage basins. With respect to the high arsenic content in surface water, no direct source of arsenic has been identified in the general area without any significant arsenic mineralization. There may be unknown sources of arsenic in ground water recharge areas elsewhere outside the Project Area.

A Stiff diagram (Figure II-2-6) and a Piper diagram (Figure II-2-7) are prepared to characterize the water quality of the collected samples. The Stiff diagram indicates that Ca among the cations is most enriched in all samples. This may be attributed to the extensive distribution of limestone in the general area. Among anions, HCO_3 and CO_3 are high in the four samples except DW-4, which may be also caused by the extensive limestone. The sample, DW-4, is high in SO_4 besides HCO_3 and CO_3, suggesting its hydrothermal origin.

The four samples, except DW-4, are plotted in the calcium carbonate domain of the Piper diagram and are typical of groundwater in limestone terrains. The sample, DW-4, indicates transitional nature between the calcium carbonate and the non-calcium carbonate types or is closer to the calcium sulfate type. Since ground water of the calcium sulfate type is regarded as hydrothermal water in its origin, the DW-4 water has been influenced by hydrothermal solutions at depth.

Table II-2-3 Result of water analysis

Element	Unit	DW-01 Dong Pao upstream	DW-02 Dong Pao downstream	DW-03 Nam Hon River	DW-04 Nam Hon Hot spring	DW-05 Tributary of Nam Hon River
Sampling Date		2001/1/8	2001/1/8	2001/1/8	2001/1/8	2001/1/8
Water Temp.	℃	19.4	16.7	21.2	28.9	20.9
Air Temp.	℃	17.3	20.3	23.6	24.0	24.9
Flow Rate	m^3/min	23.6	1.1	25.2	11.6	0.5
pH (in situ)		7.43	8.25	8.55	7.33	8.33
E. Cond. (in situ)	μ S/m	227	214	303	625	226
pH		7.78	7.73	7.95	7.47	7.79
E. Cond.	μ S/m	268	263	330	636	273
Solid suspension	mg/l	5	2	3	1	8
COD	mg/l	3	<2	<2	<2	<2
K	mg/l	1.75	1.76	2.92	5.30	2.12
Na	mg/l	0.54	0.53	0.79	4.29	0.74
Ca	mg/l	39.05	37.92	41.02	33.31	30.51
Mg	mg/l	1.70	2.22	6.78	10.55	6.52
Cl	mg/l	0.24	0.01	0.04	0.02	0.09
HCO_3	mg/l	71.0	76.2	131.0	181.0	186.0
CO_3	mg/l	87	84	15	3	9
SO_4	mg/l	3.28	2.66	34.13	158.23	6.35
Sulfide	mg/l	0.003	0.003	0.003	0.002	0.008
Fe	mg/l	0.92	0.35	0.15	0.13	0.25
Cu	mg/l	0.01	0.02	0.03	0.39	0.06
Pb	mg/l	0.015	0.008	0.005	0.004	0.006
Zn	mg/l	0.01	0.00	0.30	0.03	0.05
Mn	mg/l	0.2	0.1	0.2	0.1	0.4
F	mg/l	1.00	0.79	1.06	2.40	2.42
Cd	mg/l	0.005	0.003	0.003	0.004	0.006
Hg	mg/l	0.001	0.001	0.001	0.002	0.001
As	mg/l	0.25	0.34	0.26	0.31	0.32

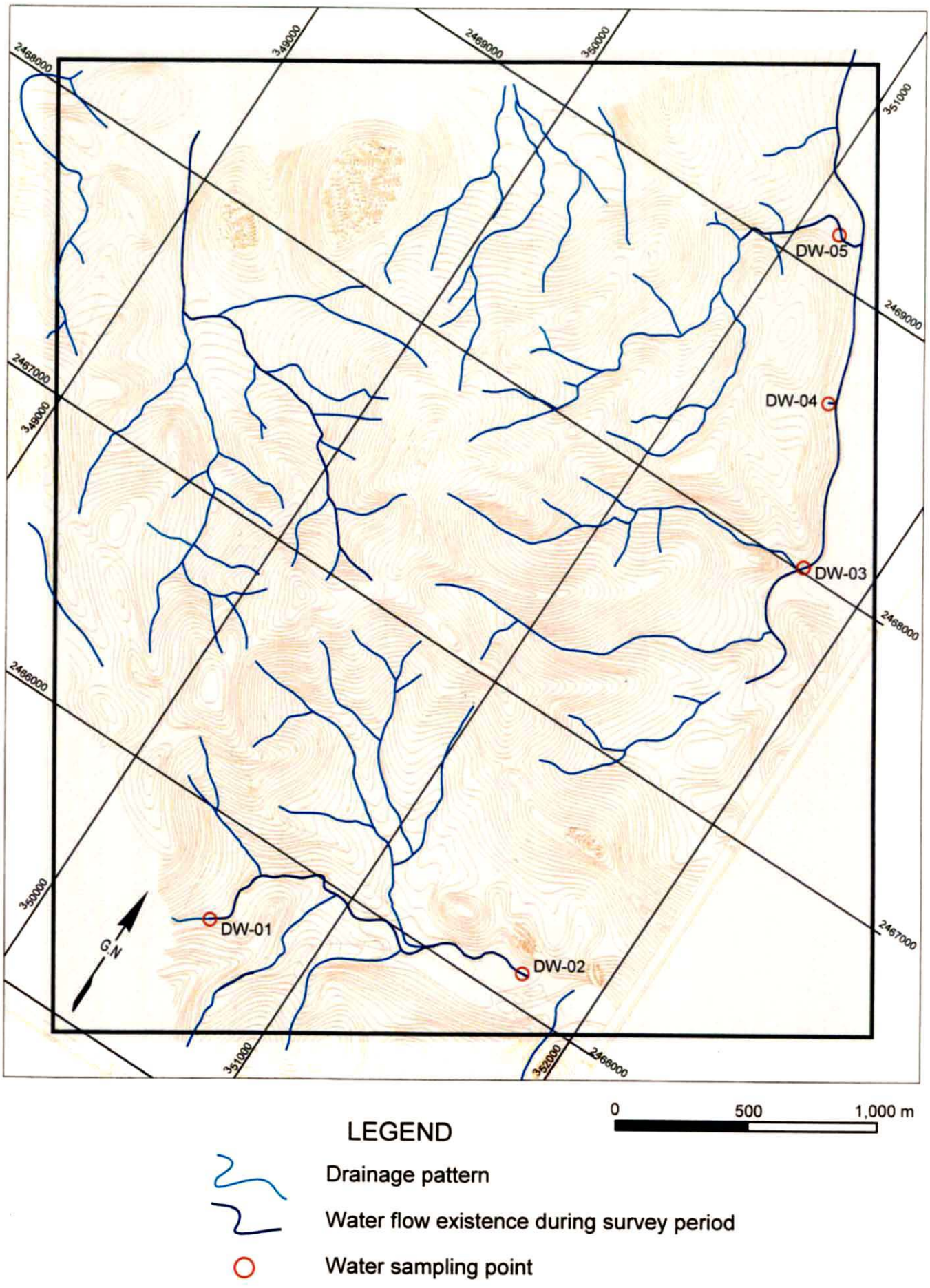


Figure II-2-5 Map of drainage system and water sampling points in Dong Pao area

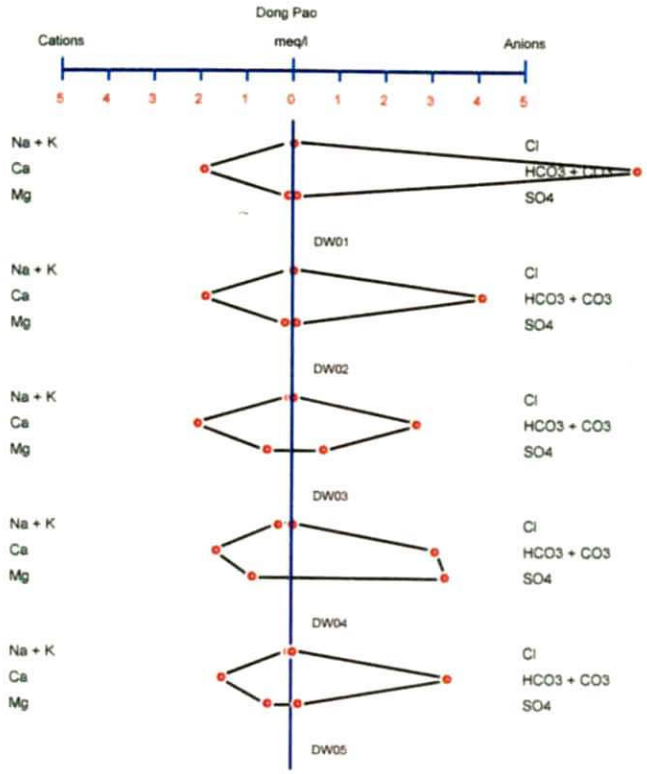
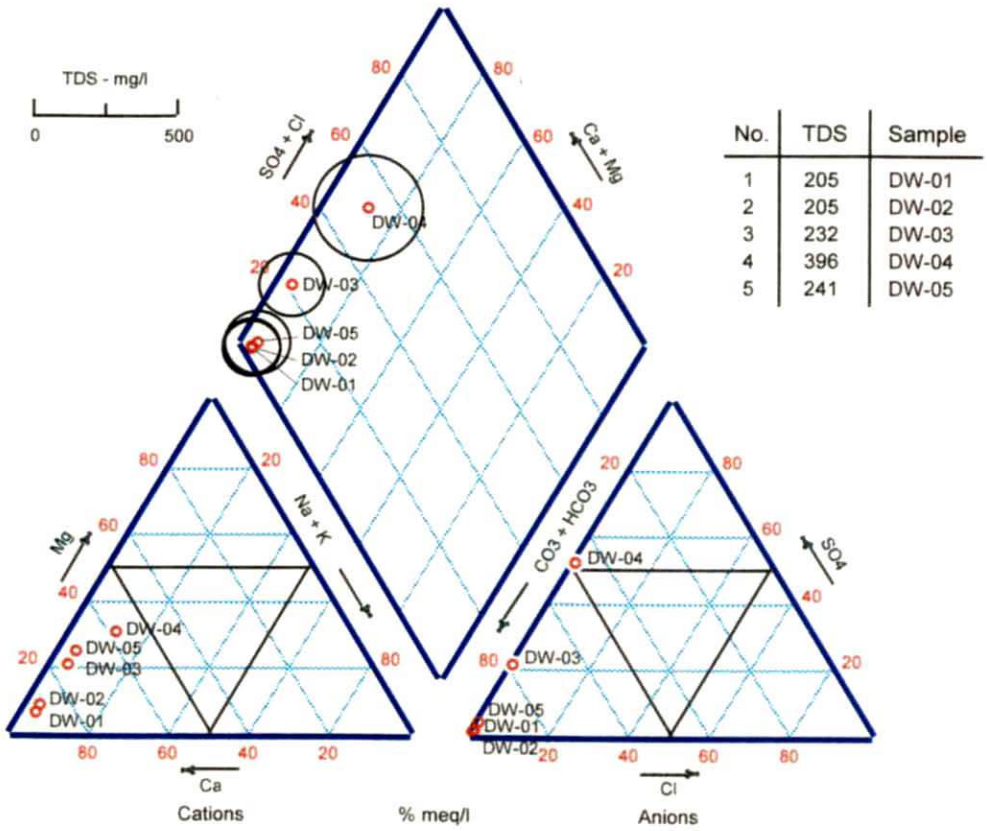


Figure II-2-6 Stiff diagram



No.	TDS	Sample
1	205	DW-01
2	205	DW-02
3	232	DW-03
4	396	DW-04
5	241	DW-05

Figure II-2-7 Piper diagram

2-3 Meteorological Study

2-3-1 Methodology

A meteorologic observation system has been installed to observe the meteorologic conditions in the Project Area and its vicinity. The system, comprising a set of instruments, is to automatically record such meteorologic parameters as temperature, humidity, precipitation, and wind direction and velocity continuously. The location for the system was selected on the roof of the Guest House of the Phong Tho County People's Commissary at Tam Duong situated 20 km northwest of the Project Area, taking account of convenience for the operation and maintenance of the instruments. The authorization of the People's Commissary has been obtained for the installation of the instruments and the access to the Guest House.

2-3-2 The Meteorologic Observation System

The roof of the Guest House is situated approximately 8 m above the ground and has no obstacles, such as high trees or buildings, in its environ for observation of wind direction and velocity. The rain gauge is set on the concrete foundation with the height of 15 cm. The thermo-hygrometer and the anemoscope/anemometer are placed on the supports at the heights of 1.0 and 1.25 m respectively. The conditions for the observation of the wind direction and velocity are excellent with the instrument being situated at the height of approximately 10 m above the ground. It is ideal to set the thermo-hygrometer at the height of approximately 1.5 m above the ground. However, the instrument has been installed together with other instruments taking account of convenience for the operation and maintenance (see attached photo).

The system consists of five sensors as above mentioned, two data-loggers and two battery boxes. Lithium batteries are used as the power sources necessary for recording observed data because it is difficult to secure stable power supply on site. The observation of each meteorologic parameter is recorded every one hour. The recorded data of each sensor are stored in the memory built in the data-loggers that are capable of retaining the entire data recorded for one-year period by all of the five sensors. The observation using this system commenced on 18th of January 2001, and will continue until the period of the field operation in the 2nd Year Campaign of the current project. The recorded data are read by a card-type flash memory and transmitted to a computer for data-processing. The details of the observation and the recording procedures are sited in the attached data file.

2-3-3 Existing Data

The past meteorologic data that have been recorded at the Meteorologic Observatory at Tam Duong are obtained for the 5-year period from 1996 to 2000 (Table

II-2-4). The Observatory is located close to the Guest House where the meteorologic observation system is installed as above mentioned. The data include monthly means of temperature and humidity, monthly total precipitation, and the most frequent wind direction and velocity in a month. Fluctuations in the monthly mean temperature and the monthly total precipitation for the 5-year period are indicated in Figure II-2-8.

The Project Area belongs to a humid-subtropical climatic zone of the Asian Monsoon region and is relatively clear in its four-seasonal climatic change, regularly repeating a yearly weather cycle. The temperature fluctuation is small, while the precipitation considerably varies from month to month, compared to those of Tokyo.

Table II-2-4 Weather data in Tam Duong for 5 years

Year/Month	Temp.(℃)	Humidity (%)	Rain fall (mm)	Wind direction-1 (%)		Wind direction-2 (%)		Wind velocity (m/s)
1996/1	14.1	77	2.7	SE	43.3	NW	33.3	5
1996/2	12	81	44.4	SE	53.3			6
1996/3	20.2	65	124.2	WSW	26.7			4
1996/4	20.4	77	107.9	W	56.7			8
1996/5	22.4	84	453.8	SW	40.0			6
1996/6	22.7	90	529.5	WSW	30.0			5
1996/7	22.3	93	593.1	SSW	36.7			7
1996/8	22.5	90	412.1	SSW	23.3			4
1996/9	22.2	84	78.9	NNW	50.0			3
1996/10	19.9	85	169.2	NW	40.0			4
1996/11	17.6	86	58	NW	66.7			5
1996/12	13.2	85	34.5	NW	46.7	SE	53.3	6
1997/1	13.7	81	35.9	SE	60.0	NW	50.0	4
1997/2	14.5	79	24.1	E	26.7	SE	45.4	5
1997/3	18.6	80	127.2	SW	30.0			6
1997/4	19.4	81	261.5	W	50.0			8
1997/5	23.5	75	164.3	SW	23.3	S	20.0	7
1997/6	23.4	85	390.3	WSW	36.7			8
1997/7	22.4	94	620.1	SW	33.3			5
1997/8	23.8	87	204.7	SSW	20.0			4
1997/9	20.6	89	229.4	NW	30.0			5
1997/10	20.1	88	244.1	NW	33.3			4
1997/11	17.1	82	16.3	NW	26.7	SE	26.7	5
1997/12	15.3	88	49.2	NW	36.7			4
1998/1	15.7	75	0.3	NW	50.0			3
1998/2	16.4	71	54.6	E	16.7	SE	25.0	5
1998/3	20.7	62	119.5	WSW	18.3	W	12.5	3
1998/4	21.5	77	111.5	W	19.2			7
1998/5	22.6	85	347.1	SW	21.7	WSW	15.0	3
1998/6	23.5	90	758.4	WSW	29.3			6
1998/7	22.6	94	676.8	SW	23.3	WSW	25.8	4
1998/8	23.2	90	458.3	NW	35.0			2
1998/9	22.5	82	51.5	NNW	21.7			3
1998/10	20.7	80	45.3	NW	25.0			4
1998/11	17.8	80	41.9	NW	30.8			3
1998/12	15.3	79	31.3	NW	30.0	SE	24.2	4
1999/1	13.9	82	62.5	SE	25.8	NW	29.2	3
1999/2	16.7	76	0.6	SE	20.8	E	14.2	3
1999/3	20.5	70	65.1	WSW	18.3	W	15.0	5
1999/4	21.8	81	201	W	30.8			6
1999/5	21.2	87	380.6	W	17.5	SW	15.8	6
1999/6	23.2	90	392	WSW	30.0			4
1999/7	23	92	760.5	SSW	24.2			5
1999/8	22.7	91	410.7	SSW	15.0			3
1999/9	22.4	86	58.3	NNW	20.0			3
1999/10	20.5	86	243.2	NW	31.7			4
1999/11	17	84	59.9	NW	41.7			5
1999/12	11.8	79	25.4	NW	59.2			5
2000/1	14	75	39.6	NW	32.3	SE	25.8	4
2000/2	14.6	80	63.8	SE	31.0	E	27.6	3
2000/3	18.8	75	36.5	WSW	38.1			4
2000/4	21.2	80	263.2	W	50.0			6
2000/5	21.4	86	307.8	SW	41.9			5
2000/6	22.1	91	468.9	WSW	46.7			4
2000/7	23.3	89	385.9	SSW	29.0			3
2000/8	23.2	89	301	SSW	35.5			3
2000/9	21.7	84	113.5	NNW	43.3			4
2000/10	20.7	86	140.4	NW	60.0			5
2000/11	16.6	80	8.8	NW	50.0			6
2000/12	15	85	75.4	NW	84.3			9

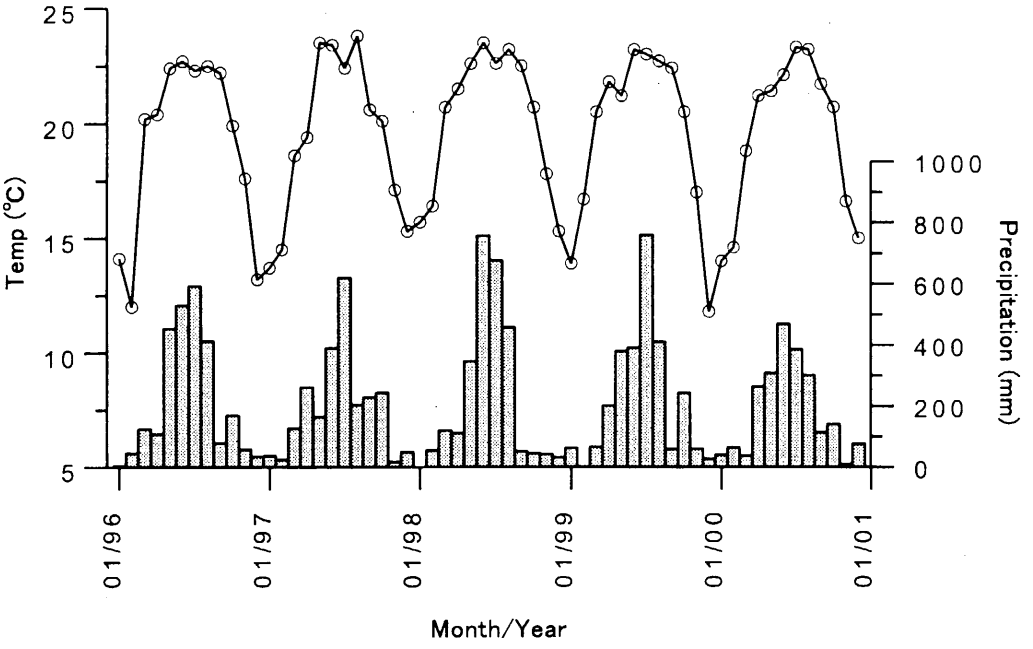


Figure II-2-8 Mean monthly temperature and precipitation in Tam Duong

2-4 Vegetation Study

2-4-1 Methodology

The vegetation in the Project Area is studied for its distribution and species. The land use situation is observed in the course of the soil survey. The study on the major and rare plant species in the area has been commissioned to Dr. Tran Ninh, Professor of Vietnam National University in Hanoi.

2-4-2 The Study Result

(1) Overview

The vegetation in Dong Pao area has been considerably influenced by human activity. Natural or virgin forest lands have diminished in areas due to the development of agricultural lands for the last century, and have been replaced by farm lands, paddy fields, residential areas and so forth. Most of the low and flat lands along rivers are developed for paddy fields by removing trees and plants. Small patches of forested lands still remain but is subject to continued land development by local residents. The vegetation study was carried out in four districts, Ban Hon, Na Kua, Ban Tam and Dong Pao. Plants were collected for identification of their species.

(2) Result

A total of 165 species that belong to 110 genera of 71 classes in 4 phyla have been identified in the course of this study. Among these species, those listed in Table II-2-5, II-2-6 are 53 common species that have been commonly identified in the general area , and 9 rare species that are relatively limited in their distributions in the Project Area and its vicinity. The detailed study result is incorporated in the attached data file.

Although 9 rare species have been identified, they distribute beyond the premises of the Project Area. Their distribution is by far broader than the extent of an area for possible mining development. Therefore, the future mining development in New Dong Pao area would have least risks to endanger these species.

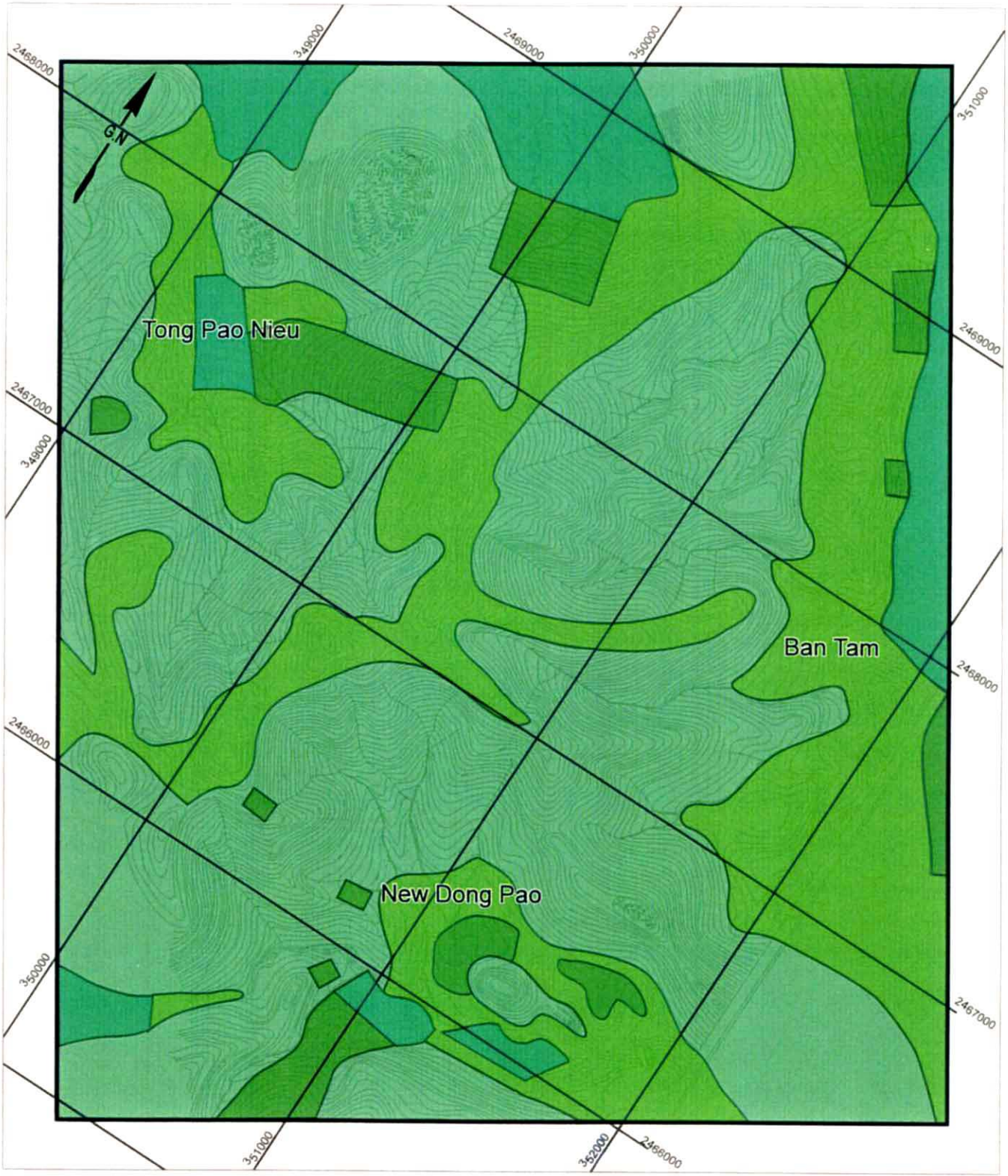
The present state of land uses is classed into 4 categories, namely the forest land, the shrub and grass land, the paddy and rice field, and the land for other uses, as shown in the Vegetation Map (Figure II-2-9).

Table II-2-5 List of common plants in Dong Pao area

Order	Family	Species
1. LYCOPODIOPHYTA	1 Lycopodiaceae	1 *Lycopodium cernua*
2 EQULSOPHYTA	2 Equisetaceae	2 *Equisetum diffusum*
3 POLYPODIOPHYTA	3 Aspleniaceae	3 *Asplenium nidus*
	4 Blechnaceae	4 *Blechnum orientale*
	5 Dennstaedtiaceae	5 *Pteridium aquilianum*
	6 Gleicheniaceae	6 *Dicranopteris linearis*
4 ANGIOPSPERMAE	a Dicotyledones	
	7 Amaranthaceae	7 *Alternathera sessilis*
		8 *Amaranthus spinosus*
		9 *Celosia argentea*
	8 Araliaceae	10 *Trevesia palmata*
	9 Bignoniaceae	10 *Stereospermum colais*
	10 Bombacaceae	11 *Bombax ceiba*
	11 Asteraceae	12 *Ageratum conyzoides*
		13 *Blumea balsamifera*
		14 *Eupatorium odoratum*
		15 *Gynura crepidoides*
	12 Euphorbiaceae	16 *Phyllanthus reticulatus*
	13 Lauraceae	16 *Litsea cubeba*
	14 Fabaceae	17 *Cassia hirsuta*
	15 Loganiaceae	18 *Gelsemium elegans*
	16 Malvaceae	19 *Sida rhombifolia*
		20 *Urena lobata*
	17 Melastomataceae	21 *Melastoma candidum*
	18 Moraceae	22 *Ficus racemosa*
		23 *Streblus ilicifolius*
		24 *Streblus macrophyllus*
	19 Rosaceae	25 *Rubus alceaefolius*
	20 Rubiaceae	26 *Mussaenda cambodiana*
		27 *Wendlandia glabrata*
	21 Rutaceae	28 *Euodia lepta*
	22 Solanaceae	29 *Solanum torvum*
		30 *Solanum annuum*
	23 Theaceae	31 *Camellia sinensis*
		32 *Schima wallichii*
	24 Urticaceae	33 *Laportea violacea*
	25 Verbenaceae	34 *Clerodendrum philippinum*
	b Monocotyledones	
	26 Alismataceae	35 *Alisma plantago – aquatica*
		36 *Sagittaria sagittaefolia*
	27 Araceae	37 *Alocasia macrorrhizos*
		38 *Raphidophora decursiva*
	28 Eriocaulaceae	39 *Eriocaulon nigrum*
	29 Musaceae	40 *Musa acuminata*
	30 Poaceae	41 *Bambusa bambos*
		42 *Dendrocalamus brandisii*
		43 *Dendrocalamus patellaris*
		44 *Gingantochloa leavis*
		45 *Imperata cylindrica*
		46 *Centotheca lappacea*
		47 *Setaria viridis*
		48 *Saccharum spontneum*
		49 *Thysanolaena maxima*
	31 Palmae	50 *Arenga pinnata*
		51 *Garyota urens*
	32 Zingiberaceae	52 *Alpinia globosa*
		53 *Zingiber officinale*

Table II-2-6 List of precious plants in Dong Pao area

Family	Species
1 Fagaceae	1 *Castanopsis indica*
2 Magnoliaceae	2 *Michelia balanse*
	3 *Paramichelia ballonii*
3 Meliaceae	4 *Chukrasia tabularis*
4 Rosaceae	5 *Prunus fordiana*
5 Polygonaceae	6 *Polygonum multiflorum*
6 Sapindaceae	7 *Pometia pinnata*
7 Sapotaceae	8 *Madhuca pasquieri*
8 Tiliaceae	9 *Burretiodendron hsienmu*



LEGEND

- Trees
- Bushes and Grasses
- Rice field
- Field (Cassava, Corn, Tea, etc.)

Figure II-2-9 Vegetation map of Dong Pao area

Chapter 3 Drilling Investigation

3-1 General

3-1-1 Objective

The drilling investigation was carried out to verify the geological and mineralogical characteristics of the known ore body, F3, at depth. According to the past exploration record, the reserves of F3 South ore body among others in Dong Pao area has been estimated for the weathered zone to the depth of 30 m from the surface based on the assay results of the samples collected from the trenches and pits. The estimation result indicates the category C1+C2 reserves of Class 1 ores at 422,359 tons with the average grades of 13.89 % T-RE_2O_3, 22.81 % CaF_2 and 47.29 % $BaSO_4$. However, no effective data with respect to the geology and the mineralization is recorded in the past exploration report in order to estimate the resources below the weathered zone. The drilling program in the current project that consisted of 16 holes aimed at exploring and characterizing the geology and mineralization of F3 South ore body at depth.

3-1-2 Drilling Operation

The drilling operation was carried out for F3 ore body to the west of New Dong Pao village as shown in the location map (Figure II-3-1). For the drilling operation, the trail connecting Ban Hong and New dong Pao villages was widened and upgraded for the distance of 7.5 km. In addition, a road leading to F3 ore body from New Dong Pao and access roads to drilling sites, with the total length of 2.16 km, were newly constructed (Figure II-3-1).

A total of 16 holes, MJVD-1 through-16, totaling 1,480 m in length, were drilled during the 1st Year Campaign. The hole locations are indicated in Figure II-3-2. The performance of each hole is shown in Table II-3-1

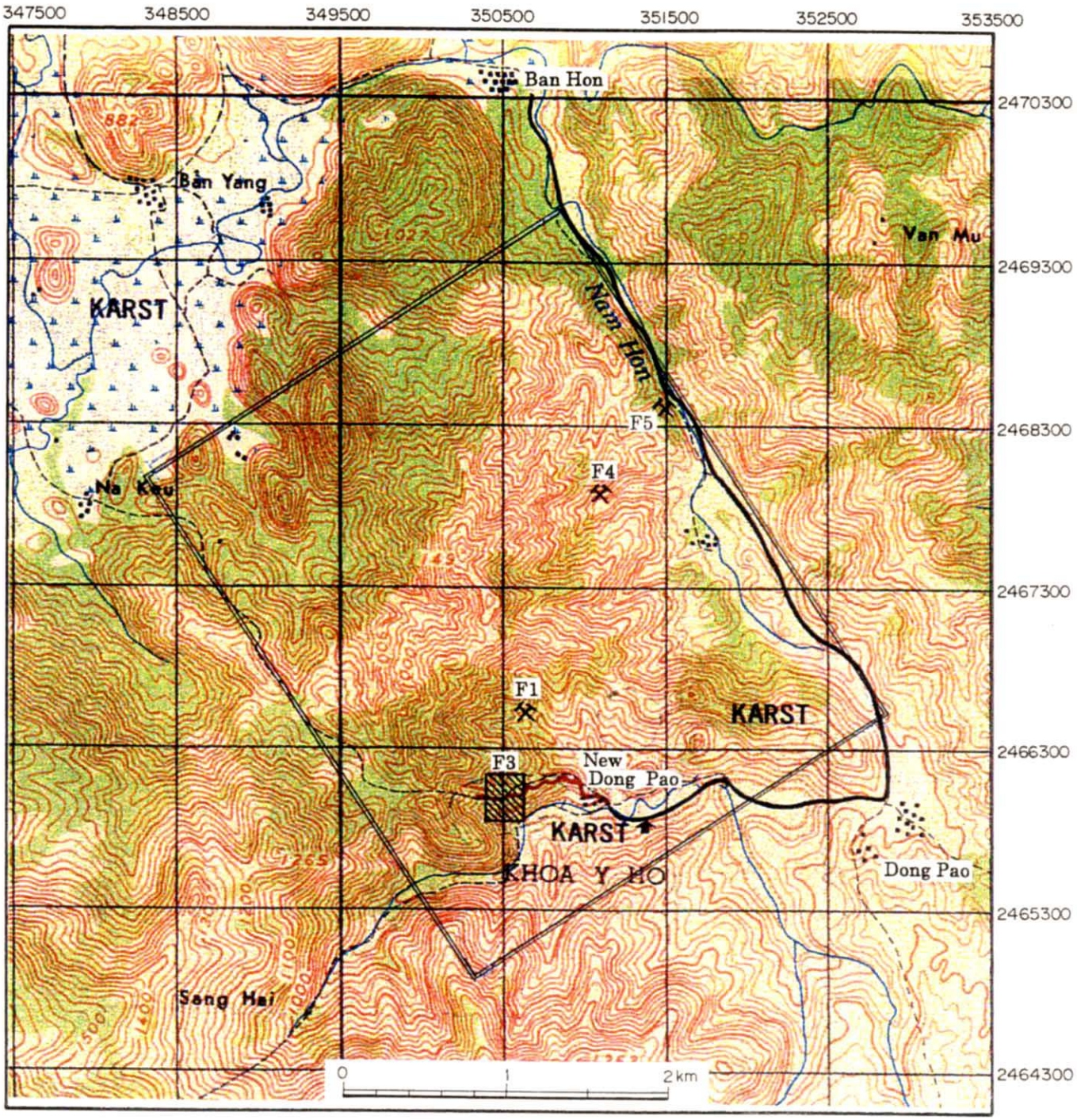
Table II-3-1 Drilling Performance

Drill Hole	Sea Level (m)	Depth (m)	Angle
MJVD-1	844.2	80	90°
MJVD-2	835.3	80	90°
MJVD-3	845.9	80	90°
MJVD-4	843.2	100	90°
MJVD-5	841.4	100	90°
MJVD-6	858.5	100	90°
MJVD-7	851.8	100	90°
MJVD-8	858.8	100	90°
MJVD-9	864.5	100	90°
MJVD-10	874.6	100	90°
MJVD-11	848.5	100	90°
MJVD-12	852.0	100	90°
MJVD-13	825.7	80	90°
MJVD-14	833.0	80	90°
MJVD-15	833.2	80	90°
MJVD-16	853.4	100	90°
Total		1,480	

The drilling operation was performed according to the work progress of each drill machine as shown in Table II-3-2. The drill crew was mobilized on December 1st, 2000 and remobilized on January 10th, 2001, with the actual operation period from December 7th, 2000 to January 8th, 2001 (Table II-3-2). Three truck-mounted drill machines were employed for the operation. The usage of drill bits, the consumption of consumables and the work progress are presented in Appendices 8, 9 and 10 respectively.

The holes were drilled principally with the hole diameter of HQ and partly with that of PQ. The core recovery of 93.35 to 97.80 % were generally achieved except for the holes MJVD-3 and -7 that indicated the respective core recoveries of 82.00 and 89.00 % due to caves encountered for lengths of 6.60 and 5.60m respectively. The operation was performed satisfactorily as a whole except the holes MJDV-3 and-4 that encountered the cave and major water losses.

The recovered drill cores were placed in tin core boxes with the inner length of 1 m (mostly 5 rows in a box, partly 3 rows) labeled with the hole numbers and the respective depth. The drill cores were photographed and observed on site to prepare the columnar sections of holes at a scale of 1 to 200. It is virtually impossible to visually determine ore grades due to difficulty in identifying rare earth minerals by a hand lens. Therefore, one quarter of each 1-m section of drill cores was continuously sampled and submitted for chemical analysis. The collected samples were dried, crushed, pulverized and quartered before shipping to Chemex Labs Ltd. via air for chemical analysis. Core samples were also collected and submitted for microscopic observation of thin sections,



LEGEND

- Dong Pao Area
- Drilling Survey Area
- Preparation of old road
- Making new road
- Core house

Figure II-3-1 Location map of drilling site

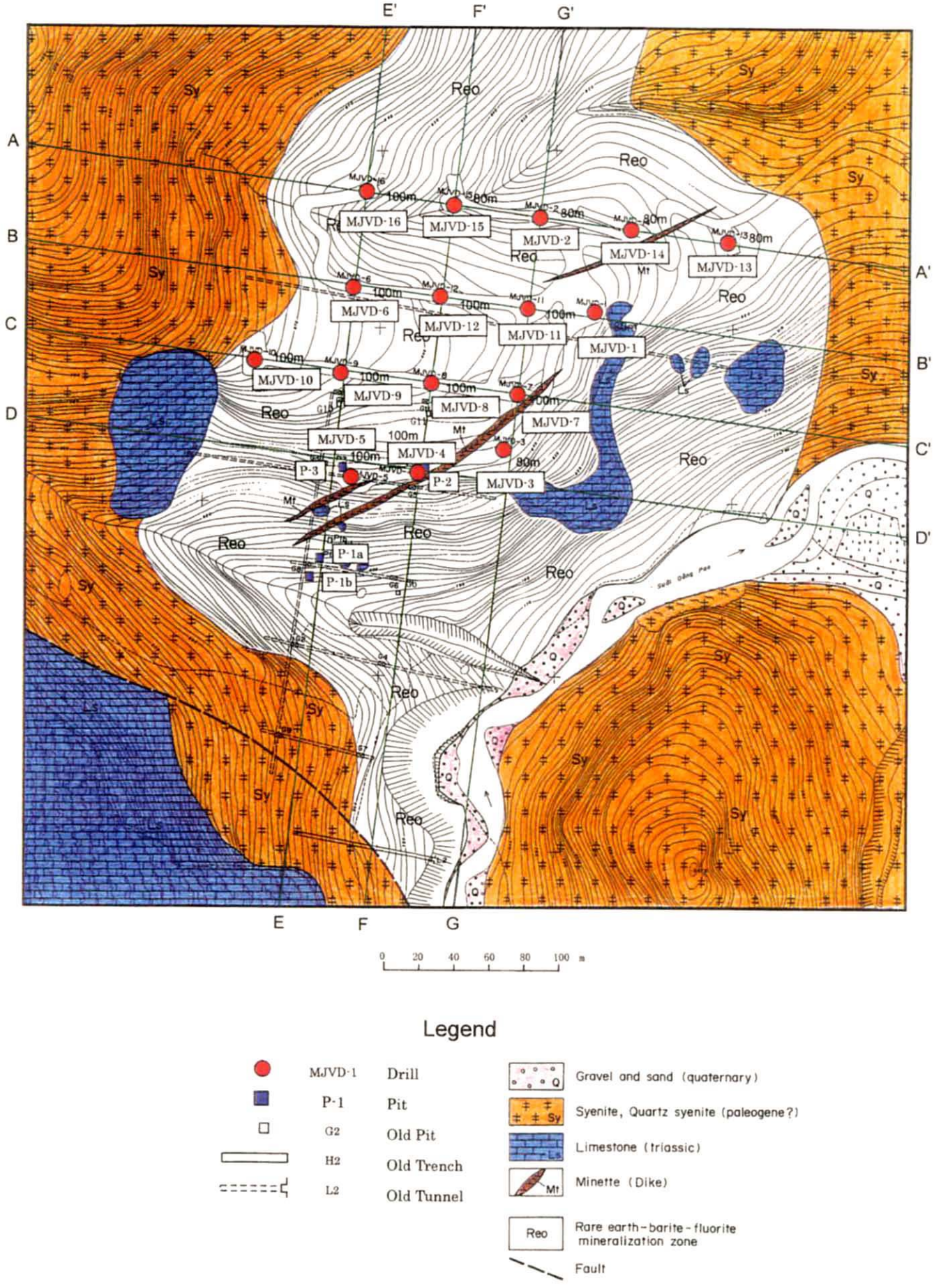
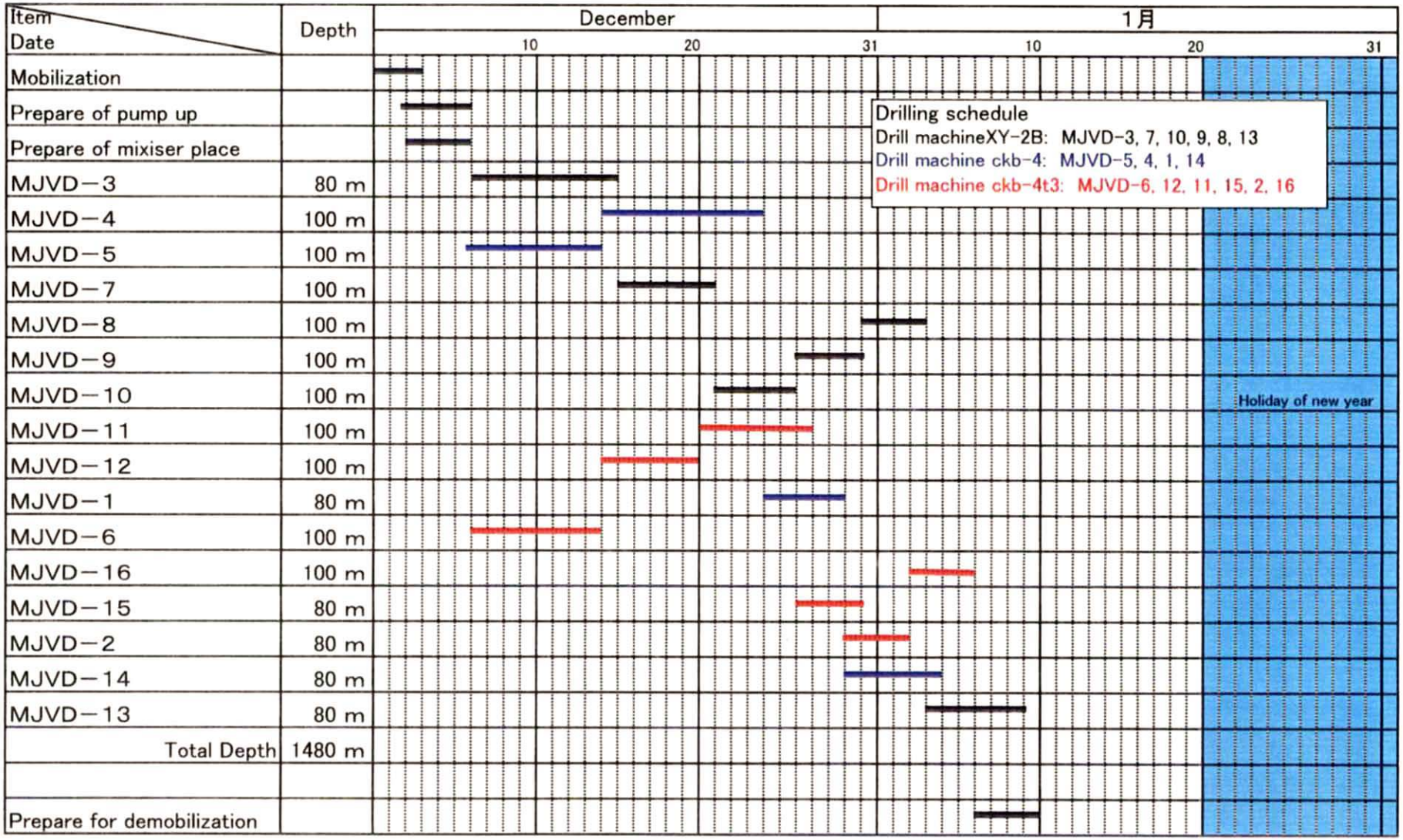


Figure II-3-2 Location map of drilling hole

Table II-3-2 Work progress of each drill machine



X-ray diffraction analysis, fluid inclusion analysis for determination of homogenization temperatures and salinity, and other laboratory testing. The cores, after the sampling as above mentioned, were stored in the core storage constructed beside the road about 400 m to the southwest of New Dong Pao village.

3-2 Description of Drill Cores

The drill core samples were analyzed by ICP spectrometry for 57 elements (Al, Sb, As, Ba, Be, Bi, B, Cd, Ca, Ce, Cs, Cr, Co, Cu, Dy, Er, Eu, F, Gd, Ga, Hf, Ho, Fe, La, Pb, Lu, Mg, Mn, Hg, Mo, Nd, Ni, Nb, P, K, Pr, Rb, Sm, Sc, Ag, Na, Sr, S, Ta, Tb, Tl, Th, Tm, Sn, Ti, W, U, V, Yb, Y, Zn and Zr). T-RE_2O_3, $BaSO_4$ and CaF_2 contents are calculated based on the analytical results of the relevant elements and are recorded in the hole columnar sections of 1 to 200 scale as per the data file attached in Appendix-11. The T-RE_2O_3, $BaSO_4$ and CaF_2 contents of the continuous core samples are compared with the analytical results for rare earth elements and are presented in the data-file attached in Appendix-12. The analytical results for all elements are filed in Appendix-13. The hole columnar sections are summarized into those at a scale of 1 to 500 and are presented in Figure II-3-3 (1/16-16/16), together with graphical displays of T-RE_2O_3, grades. Appendix-1 includes the results of microscopic observation for thin sections of ore samples collected from the drill cores.

The drill core observation of each hole is described below.

(1) MJDV-1 (Total Depth : 80 m, Vertical, Collar Elevation : 844.2 m)

- Geology : comprising surface soil, syenite, limestone and minette dikes.

0.00-0.60 m : surface soil, brown.

0.60-3.00 m : minette dike, brown, intensely weathered, carrying light green mica.

3.00-9.00 m : syenite, brownish gray, dark brown to brown, intensely weathered.

9.00-16.30 m : syenite, dark brown, containing abundant angular fragments of limestone

16.30-25.90 m : limestone, light gray, brecciated.

25.90-31.80 m : minette dike, weakly weathered, containing limestone fragments, carrying light green mica.

31.80-35.25 m : limestone, light gray, brecciated.

35.25-41.15 m : syenite, dark gray, porous, weakly weathered, containing abundant angular fragments of limestone.

41.15-41.75 m : no core (cave).

41.75-44.00 m : limestone, light gray, brecciated.

44.00-46.40 m : syenite, black-gray, intensely weathered.

46.40-51.70 m : syenite, black-brown, weakly weathered, containing abundant

angular fragments of limestone.

51.70-52.80 m: no core (cave).

52.80-58.00 m : syenite, dark gray, intensely weathered.

58.00-61.80 m : brown sands, possibly secondary deposit of weathered syenite.

61.80-80.00 m (bottom of hole) : syenite, brown to gray-brown, weakly weathered as a whole, intensely weathered in part.

· Mineralization

The hole is weakly mineralized with rare earths, barite and fluorite as a whole.

The rare earth mineralization is weak with the best assay-run between 45.00 and 46.00 m indicating 3.17 % T-RE2O3 that is included in the 40.00 to 47.00 (7 m) section indicating the average grade of 2.54 % T-RE_2O_3. Otherwise, assay values are no better than 1.00 % T-RE_2O_3.

The fluorite mineralization is visually identified, as disseminations, in brecciated limestone between 18.00 and 20.00 m and in syenite containing limestone fragments at 37.20 and 38.20 m. The best assay value is obtained in the assay run between 18.00 and 19.00 m indicating 6.04 % CaF_2, which is not particularly high.

The barite grade is low indicating the average of 8.87 % $BaSO_4$ in the 9.00 to 35.00 m (26 m) section where brecciated limestone and minette dikes occur. The section from hole collar to 9.00 m (9.0 m) indicates an average of 18.05 % $BaSO_4$, while the average grade of the 35.00 to 80.00m (45 m) section, below the major limestone sections, is 30.14 % $BaSO_4$. The best assay value is obtained in the assay-run between 73.00 and 74.00 m indicating 70.19 % $BaSO_4$.

Table Summary of Assay Result, Hole MJVD-1

	Depth (m)	Width (m)	Content (Average %)
T-RE_2O_3	40.00~47.00	7.00	2.54
CaF_2	18.00~19.00	1.00	6.04
$BaSO_4$	0.00~ 9.00	9.00	18.05
	9.00~35.00	24.00	8.87
	35.00~80.00	45.00	30.14

(2) MJDV-2 (Total Depth : 80 m, Vertical, Collar Elevation : 835.3m)

· Geology : comprising surface soil, syenite, limestone and minette dikes.

0.00-0.75 m : surface soil, brown.

0.75-10.00 m : syenite, black-gray, yellow or pink, intensely weathered.

10.00-18.10 m : syenite, black, gray, yellow or white, intensely weathered.

18.10-35.55 m : syenite, black gray to gray.

35.55-38.80 m : minette dike, dark brown, intensely weathered.

38.80-44.00 m : syenite, black gray to gray.

44.00-45.50 m : limestone, light gray, crystalline.

45.50-53.10 m : syenite, black gray to gray.

53.10-56.00 m : syenite, dark gray to brown, intensely weathered.

56.00-57.00 m : minette dike, dark brown, intensely weathered.

57.00-66.60 m : syenite, black gray to gray, brown, intensely weathered.

66.60- 68.35 m : clay, white to pink, partly dark gray.

68.35-80.00 m (bottom of hole) : syenite, gray to dark gray, weakly weathered.

Narrow minette dikes, dark brown and intensely weathered, are also observed in the sections from 30.60 to 31.20 m and from 32.30 to 33.60 m.

・ Mineralization

The hole is mineralized with rare earths, barite and fluorite as a whole. The sections rich in bastnaesite display yellow to light yellow color.

The rare earth mineralization in the section from 11.00 to 18.00 m is averaged at 8.87 % T-RE_2O_3 including the best assay-run between 17.00 and 18.00 m with 16.41 % T-RE_2O_3.

The fluorite mineralization in the section from 13.00 to 18.00 m is averaged at 16.50 % CaF_2, approximately corresponding to the section of rare earth mineralization as above mentioned.

The barite mineralization is associated with white to brown clay, the product of intense weathering. The section from 9.00 to 36.00 m (25.0 m) indicates an average grade of 70.31 % $BaSO_4$, which is very high. The barite grade tends to be lowered in the section where the rare earth and fluorite grades are elevated.

Table Summary of Assay Result, Hole MJVD-2

	Depth (m)	Width (m)	Content (Average %)
T-RE_2O_3	11.00~18.00	7.00	8.87
CaF_2	13.00~18.00	5.00	16.50
	43.00~44.00	1.00	7.71
	50.00~67.00	17.00	3.57
$BaSO_4$	0.00~ 5.00	5.00	52.62
	9.00~36.00	25.00	70.31
	51.00~67.00	16.00	37.06

(2) MJDV-3 (Total Depth : 80 m, Vertical, Collar Elevation : 845.9m)

- Geology : comprising syenite, limestone and a number of caves.

  0.00-21.70 m : syenite, black, brown or yellow, intensely weathered.

  21.70-28.30 m : no core, a major cave.

  28.30-32.80 m : limestone, gray.

  32.80-34.80 m : no core, a major cave.

  34.80-41.90 m : syenite, brown gray to dark gray, containing abundant fragments of white limestone.

  41.90-42.90 m : sandy syenite, possibly secondary deposit of weathered syenite in a cave.

  42.90-80.00 (bottom of hole) m : principally syenite with a major cave between 72.20 and 73.80 m, gray to dark gray, partly dark brown, relatively weak in weathering in the section from 57.10 to 72.20 m.

  In addition to the caves as above described, a number of minor caves are observed particularly in the section between 15.20 and 21.70 m.

- Mineralization

  The hole is mineralized with rare earths from the collar to the depth of 19.00 m, below which no significant mineralization is observed. Fluorite mineralization is generally weak. Significant barite mineralization continues from the collar to 22.00m.

  The best assay-run of the rare earth mineralization is the 1.00-2.00 m section indicating 22.39 % T-RE2O3, included in the section from 0.00 to 16.00 m (16.00 m) with the average grade of 6.89 % T-RE2O3. The average barite grade for the section from 0.00 m to 22.00 m (22.00 m) is 54.13 % BaSO4.

Table Summary of Assay Result, Hole MJVD-3

	Depth (m)	Width (m)	Content (Average %)
T-RE_2O_3	0.00~16.00	16.00	6.89
	0.00~ 4.00	4.00	13.09
	12.00~16.00	4.00	7.23
CaF_2	14.00~19.00	5.00	4.17
	48.00~51.00	3.00	5.25
$BaSO_4$	0.00~22.00	22.00	54.13

(4) MJDV-4 (Total Depth : 100 m, Vertical, Collar Elevation : 843.2 m)

- Geology : comprising syenite, limestone and minette dikes.

  0.00-10.30 m : syenite, black, partly yellow, intensely weathered, a cave between 7.50 and 8.20 m.

10.30 to 13.00 m: minette dike, brown, intensely weathered to clay containing green biotite.

13.00-29.60 m : syenite, dark gray, partly containing white to brown barite and purple fluorite, moderately to weakly weathered.

29.60-40.10 m : limestone, gray to light gray, micro-crystalline.

40.10-43.70 m : syenite, black, dark gray to gray, weakly weathered.

43.70-47.70 m : limestone, gray to light gray, micro-crystalline.

47.70-64.70 m : syenite, black, dark gray to gray, weakly weathered.

64.70-65.70 m : limestone, gray to light gray, micro-crystalline..

65.70-85.40 m : syenite, black, dark gray to gray, weakly weathered.

85.40-92.00 m : limestone, gray to light gray, micro-crystalline..

92.00-98.00 m : syenite, black, dark gray to gray, weakly weathered.

98.00-100.00 (bottom of hole) m : limestone, gray to light gray, micro-crystalline.

A thin black clay layer is interbedded between 57.00 and 57.60 m.

- Mineralization

Significant rare earth mineralization is observed to the depth of 7 m, below which the mineralization is weak to the bottom of hole. The highest assay is recorded at 11.34 % T-RE_2O_3 in the assay-run between 6.00 and 7.00 m included in the section from 0.00 to 7.00 m with the average of 7.51 % T-RE_2O_3.

Fluorite mineralization is significant in two 2 m-sections, from 13.00 to 15.00 m and from 94.00 to 96.00 m. The former indicates an average of 21.31% CaF_2 and the latter, of 22.26 % CaF_2. Otherwise, the mineralization is weak, with the grade less than 10 % CaF_2.

Barite mineralization is significant from the collar to the depth of 8 m averaging at 60.52 % $BaSO_4$ but weak in other part of the hole showing assay values less than 30 % $BaSO_4$ except for a few narrow sections.

The mode of rare earth occurrences is obscured due to intense weathering. Fluorite and barite occur in limestone as veins or disseminations.

Table Summary of Assay Result, Hole MJVD-4

	Depth (m)	Width (m)	Content (Average %)
T-RE_2O_3	0.00~18.00	18.00	4.66
	0.00~ 7.00	7.00	7.51
CaF_2	13.00~15.00	2.00	21.31
	94.00~96.00	2.00	15.25
$BaSO_4$	0.00~ 8.00	8.00	60.52

(5) MJDV-5 (Total Depth : 100 m, Vertical, Collar Elevation : 841.4m)

· Geology : comprising syenite, limestone and minette dikes.

0.00-14.30 m : syenite, black, black-gray, light yellow, partly pink, intensely weathered.

14.30-15.00 m: dark gray to gray sand, possibly secondary deposit of weathered syenite in a cave.

15.00-18.45 m : minette dike, dark brown to greenish dark brown, weakly weathered.

18.45-42.60 m : syenite, gray to white, partly dark brown, weakly weathered.

42.60-46.45 m : minette dike, dark brown to greenish dark brown, weakly weathered.

46.50-50.90 m : syenite, gray, white, brown, dark purple, weakly weathered, carrying barite and fluorite.

50.90-53.00 m : dark gray to gray sand, possibly secondary deposit of weathered syenite in a cave.

53.00-71.90 m : syenite, gray, white, brown, dark purple, weakly weathered, carrying barite and fluorite.

71.90-72.50 m : limestone, light gray, carrying fluorite veinlets.

72.50-76.50 m : syenite, gray, white, brown, dark purple, weakly weathered, carrying barite and fluorite.

76.50-77.00 m : limestone, light gray, carrying fluorite veinlets.

77.00-80.00 m : syenite, gray, white, brown, dark purple, weakly weathered, carrying barite and fluorite.

80.00-80.45 m: limestone, light gray, carrying fluorite veinlets.

80.45-88.00 m : syenite, gray, white, brown, dark purple, weakly weathered, carrying barite and fluorite.

88.00-90.80 m : limestone, light gray, carrying fluorite veinlets.

90.80-100.00 (bottom of hole)m : syenite, dark gray, dark brown, gray, pink, weakly weathered, carrying fluorite and barite mineralization.

· Mineralization

Significant rare earth mineralization is observed from the collar to the depth of 25 m and near to the bottom of hole. Elsewhere, the mineralization is weak. The highest assay is recorded at 35.26 % T-RE_2O_3 in the assay-run between 1.00 and 2.00 m included in the section from 0.00 to 14.00 m with the average of 15.39 % T-RE_2O_3. The average grade for the section from 0.00 to 25.00 m is 11.00 % T-RE_2O_3.

Fluorite mineralization is ubiquitous in the entire hole with five sections indicating upgraded averages. They are the sections from 10.00 to 15.00 m, from 18.00

to 32.00 m, from 55.00 to 78.00 m, from 82.00 to 87.00 m and from 98.00 to 100.00 (bottom of hole), with the average grades ranging between 10.25 and 12.94 % CaF_2. The barite mineralization is generally weak except for the two sections from 0.00 to 15.00 m and from 40.00 to 42.00 m, with the average grades of 50.95 % and 59.14 % $BaSO_4$.

Table Summary of Assay Result, Hole MJVD-5

	Depth (m)	Width (m)	Content (Average %)
T-RE_2O_3	0.00~25.00	25.00	11.00
	0.00~14.00	14.00	15.39
	19.00~25.00	6.00	8.54
	97.00~100.00	3.00	7.29
CaF_2	10.00~15.00	5.00	11.74
	18.00~32.00	14.00	11.37
	55.00~78.00	23.00	12.94
	82.00~87.00	5.00	10.25
	98.00~100.00	2.00	10.82
$BaSO_4$	0.00~15.00	15.00	58.98
	26.00~28.00	2.00	34.33
	40.00~42.00	2.00	59.14
	82.00~84.00	2.00	35.94

(6) MJDV-6 (Total Depth : 100 m, Vertical, Collar Elevation : 858.5m)

- Geology : comprising surface soil, syenite, and minette dikes.

0.00-2.15 m : surface soil, brown, clayey.

2.15-6.20 m : syenite, yellowish brown.

6.20-19.40 m : syenite, black gray, yellow, yellowish brown, intensely weathered.

19.40-21.75 m : minette dike, yellowish brown, clayey, intensely weathered.

21.75-25.00 m : syenite, black gray, yellow, yellowish brown, intensely weathered.

25.00-42.00 m : syenite, black gray, intensely weathered.

42.00-51.00 m : syenite, black gray, yellow, yellowish brown, brown, white, intensely weathered.

51.00-60.00 m : syenite, black gray, intensely weathered.

60.00-61.00 m : reddish brown clay, possible fault clay.

61.00-65.00 m : syenite, light yellow, pink, black gray, yellow, intensely weathered, appreciably mineralized and altered.

65.00-68.00 m : syenite, black gray, intensely weathered.

68.00-82.00m: syenite, light yellow, pink, black gray, yellow, intensely weathered, appreciably mineralized and altered.

82.00-86.10 m : syenite, mainly black gray, partly dark brown, intensely weathered.

86.10-88.90 m : no core, major cave.

88.90-100.00 (bottom of hole)m : syenite, mainly black gray, partly dark brown, intensely weathered.

· Mineralization

Significant rare earth mineralization is observed in the section from 63.00 to 86.10 m. Elsewhere, the mineralization is weak. The highest assay is recorded at 42.75 % T-RE_2O_3 in the assay-run between 81.00 and 82.00 m included in the section from 63.00 to 87.00 m (24 m) with the average of 14.20 % T-RE_2O_3. The particularly high grade section is located between 69.00 and 82.00 m (13m) with the average grade of 21.43 % T-RE_2O_3, which is very high.

The section from the depth of 65.00 m to the bottom of hole is appreciably mineralized with fluorite. The average grade is estimated at 27.42 % CaF_2 for the section between 69.00 and 100.00 (bottom of hole) m, of which the section from 93.00 to 100.00 m indicates the average grade as high as 54.14 % CaF_2.

The average grades of barite are elevated in the two sections from 0.00 to 76.00 m (76 m) and from 82.00 to 93.00 m (11 m) with 50.95 % and 39.68 % $BaSO_4$ respectively. The barite content is low in the section from 93.00 to 100.00 m where fluorite is upgraded.

Table Summary of Assay Result, Hole MJVD-6

	Depth (m)	Width (m)	Content (Average %)
T-RE_2O_3	63.00~87.00	24.00	14.20
	69.00~82.00	13.00	21.43
CaF_2	65.00~67.00	2.00	16.64
	69.00~100.00	31.00	27.42
	93.00~100.00	7.00	54.14
$BaSO_4$	0.00~76.00	76.00	50.95
	76.00~82.00	6.00	27.15
	82.00~93.00	11.00	39.68

(7) MJDV-7 (Total Depth : 100 m, Vertical, Collar Elevation : 851.8 m)

· Geology : comprising surface soil, syenite, limestone and minette dikes.

0.00-1.15 m : surface soil, dark brown.

1.15-4.40 m : syenite, black gray, weathered.

4.40-8.20 m : minette dike, soft, brown, intensely weathered, carrying green biotite.

8.20-47.15 m : syenite, black gray, weathered.

47.15-55.80 m : syenite, gray, yellow, brown, black-brown, intensely weathered.

55.80-61.40 m : no core, major cave.

61.40-62.90 m : syenite, dark gray, dark brown, weathered.

62.90-64.70 m : clay, dark gray, brown.

64.70-72.50 m :. syenite, dark gray, dark brown, weathered.

72.50-73.20 m : limestone, light gray, carrying barite veinlets.

73.20-77.60 m : syenite, black gray, weathered.

77.60-82.20 m: limestone, light gray, carrying barite veinlets.

82.20-100.00 (bottom of hole) m: syenite, black, dark gray, white, pink, weathered.

· Mineralization

This hole is ubiquitously mineralized with rare earths, which is particularly significant in the section between 39.00 and 47.00 m. A number of sections indicate mineralization with rare earth contents ranging from 3 to 10 % T-RE_2O_3. The highest assay is recorded at 24.37 % T-RE_2O_3 in the assay-run between 44.00 and 45.00 m. The average grade of the section from 8.00 to 55.00 m (47 m) is estimated at 7.60 % T-RE_2O_3, including the section from 39.00 to 55.00 m (16 m) with the average grade of 11.76 %. The particularly high grade section is located between 39.00 and 47.00 m (8 m) with the average grade of 16.76 % T-RE_2O_3. The section between 92.00 and 99.00 m, near the bottom of hole, indicates the average of 5.66 % T-RE_2O_3.

Fluorite mineralization is locally significant. The average grades in the sections from 26.00 to 34.00 m (8 m) and from 48.00 to 55.00 m (7 m) are 13.40 and 18.18 % CaF_2. Elsewhere, high grade assay runs occur sporadically and are discontinuous. Significant barite mineralization is observed to the depth of 56.00 m and weakens with depth. The 3-m section between 2.00 and 5.00 returns the best average grade of 54.84 % $BaSO_4$. The average grades of the sections from 8.00 to 22.00 m (14 m), from 26.00 to 36.00 m and from 39.00 to 56.00 m (17 m) range between 41.09 and 45.91 % $BaSO_4$.

The average grades of barite are elevated in the two sections from 0.00 to 76.00 m (76 m) and from 82.00 to 93.00 m (11 m) with 50.95 % and 39.68 % $BaSO_4$ respectively. The barite content is low in the section from 93.00 to 100.00 m where fluorite is upgraded.

Table Summary of Assay Result, Hole MJVD-7

	Depth (m)	Width (m)	Content (Average %)
T-RE_2O_3	8.00~55.00	47.00	7.60
	8.00~35.00	27.00	6.11
	39.00~47.00	7.00	16.76
	39.00~55.00	16.00	11.72
	92.00~99.00	7.00	5.66
CaF_2	18.00~21.00	3.00	12.34
	26.00~34.00	8.00	13.40
	39.00~41.00	2.00	14.73
	48.00~55.00	7.00	18.18
	91.00~93.00	2.00	11.37
$BaSO_4$	2.00~ 5.00	3.00	54.84
	8.00~22.00	14.00	45.91
	26.00~36.00	10.00	44.99
	39.00~56.00	17.00	41.09

(8) MJDV-8 (Total Depth : 100 m, Vertical, Collar Elevation : 858.8m)

- Geology : comprising surface soil, syenite, and minette dikes.

0.00-1.30 m : surface soil, brown.

1.30-23.15 m : syenite, dark gray to black gray, weathered.

23.15-29.20 m : syenite, dark gray, yellow, carrying bastnaesite.

29.20-34.80 m : syenite, dark gray to black gray, weathered.

34.80-35.40 m : syenite, light yellow to yellow, intensely weathered.

35.40-38.15 m : syenite, dark gray to black gray, weathered

38.15-39.30 m : syenite, light yellow to yellow, intensely weathered.

39.30-58.20 m : syenite, dark gray to black gray, weathered.

58.20-65.00 m : minette dike, dark brown, soft, intensely weathered.

65.00-65.60 m : syenite, dark gray to black gray, weathered.

65.60-65.70 m : minette dike, dark brown, soft, intensely weathered.

65.70-88.00m: syenite, dark gray to black gray, weathered.

88.00-89.60 m : no core, major cave.

89.60-100.00 (bottom of hole) m : syenite, dark gray to black gray, weathered.

The syenite displays yellowish color where bastnaesite is present and whitish color where barite is enriched.

- Mineralization

Rare earth mineralization continuously occurs in the section from 23.00 to 58.00 m. Elsewhere, the mineralization is weak. The highest assay is recorded at 11.93 % T-RE_2O_3 in the assay-run between 55.00 and 56.00 m included in the section from 27.00 to

59.00 m (32 m) with the average of 6.70 % T-RE_2O_3. The high grade section is located between 41.00 and 42.00 m (6m) with the average grade of 11.11 % T-RE_2O_3.

Fluorite mineralization is generally weak through the entire hole. The assay results are recorded at 13.81 % and 14.16 % CaF_2 respectively for the two assay-runs from 20.00 to 21.00 m and from 46.00 to 47.00 m.

Appreciable barite mineralization is observed to the depth of 58.00 m, beyond which the mineralization is weakened. The average grade of barite is 60.20 % $BaSO_4$ for the section from 1.00 to 59.00 m. The 2-m section between 85.00 and 87.00 m is high in barite, indicating 62.29 % $BaSO_4$. The barite mineralization is otherwise weak, staying below 30.00 % $BaSO_4$ except for a few sporadic assay-runs.

Table Summary of Assay Result, Hole MJVD-8

	Depth (m)	Width (m)	Content (Average %)
T-RE_2O_3	27.00~59.00	32.00	6.70
	27.00~40.00	13.00	5.53
	41.00~42.00	1.00	11.11
	46.00~59.00	13.00	6.95
	55.00~56.00	1.00	11.93
CaF_2	20.00~21.00	1.00	13.81
	46.00~47.00	1.00	14.16
$BaSO_4$	1.00~59.00	58.00	60.20
	85.00~87.00	2.00	62.29

(9) MJDV-9 (Total Depth : 100 m, Vertical, Collar Elevation : 864.5 m)

- Geology : comprising surface soil, syenite.

0.00-3.00 m : surface soil, light brown.

3.00-6.20 m : syenite, dark brown, intensely weathered, containing barite pebbles.

6.20-27.70 m : syenite, black gray, intensely weathered, containing weathered white barite in part.

27.70-38.85 m : syenite, yellow, light gray, purple gray, intensely weathered, mineralized and altered.

38.85-64.00 m : syenite, black gray, light gray, intensely weathered, carrying fluorite.

64.00-76.10 m : syenite, gray, dark brown, white, purple, intensely weathered, altered, mineralized.

76.10-78.90 m : no core, major cave.

78.90-89.00 m : syenite, dark brown, dark gray, carrying bastnaesite, fluorite, barite.

89.00-90.70 m :. No core, cave.

90.70-100.00 (bottom of hole) m : syenite, black gray, intensively weathered, carrying fluorite and barite.

· Mineralization

Rare earth mineralization is weak but widespread in the entire hole with the two sections, from 28.00 to 38.00 m and from 64.00 to 88.00 m, where the mineralization is relatively upgraded. The average grade of the former section (10 m) is 8.33 % T-RE_2O_3, including the section from 33.00 to 38.00 m (5 m) with the average grade of 10.47 % T-RE_2O_3. The total rare earth content of the latter section is averaged at 10.59 % T-RE_2O_3. with the average grade of 11.76 %.

Significant fluorite mineralization is observed in the section deeper than 29 m. The average grade in the section from 0.00 to 29.00 m is lower than 1.5 % CaF_2. However, the sections from 29.00 to 51.00 m, from 53.00 to 65.00 m, from 68.00 to 80.00 m and from 96.00 m indicate the average grades ranging between 20.83 and 28.01 % CaF_2.

Barite mineralization is appreciable to the depth of 51.00 m and then weaken with the depth. The section from 5.00 to 10.00 m (5 m) is high in barite content averaging at 62.41 % $BaSO_4$. The average grade of barite in the section from 13.00 to 51.00 m (38 m) is 46.77 % $BaSO_4$. The bottom 5-m section from 95.00 to 100.00 m indicates the average grade of 50.99 % $BaSO_4$.

Table Summary of Assay Result, Hole MJVD-9

	Depth (m)	Width (m)	Content (Average %)
T-RE_2O_3	13.00~17.00	4.00	5.60
	28.00~38.00	10.00	8.33
	33.00~38.00	5.00	10.47
	64.00~88.00	24.00	10.59
CaF_2	29.00~51.00	22.00	23.38
	53.00~65.00	12.00	22.32
	68.00~80.00	12.00	20.83
	83.00~85.00	2.00	19.85
	87.00~96.00	9.00	28.01
	98.00~100.00	2.00	17.19
$BaSO_4$	5.00~10.00	5.00	62.41
	13.00~51.00	38.00	46.77
	70.00~76.00	6.00	34.54
	95.00~100.00	5.00	50.99

(10) MJDV-10 (Total Depth : 100 m, Vertical, Collar Elevation : 874.6 m)

· Geology : comprising surface soil, syenite, and limestone.

0.00-0.75 m : surface soil, light brown.

0.75-11.60 m : syenite, black gray to dark brown, intensely weathered.

11.60-25.85 m : syenite, white, brown, dark brown, purple, intensely weathered.
25.85-26.80 m : no core, cave.

26.80-37.00 m : syenite, purple gray to light gray, intensely (weakly in part) weathered.

37.00-45.90 m : syenite, brown to dark brown, weathered.

45.90-52.65 m : syenite, white, light yellow, dark purple, mineralized and altered.

52.65-53.50 m : no core, cave.

53.50-56.40 m : syenite, black to dark brown, intensely weathered.

56.40-57.20 m: no core, cave.

57.20-70.40 m : syenite, black to dark brown, intensely weathered.

70.40-80.30 m : syenite, white, yellow, black, intensely weathered, mineralized and altered.

80.30-87.90 m :syenite, brown to gray, weakly weathered.

87.90-89.30 m: limestone, white, carrying fluorite veinlets.

89.30-100.00 (bottom of hole)m : syenite, dark brown, weathered, appreciably mineralized with bastnaesite, fluorite and barite.

A thin limestone layer is observed in the section between 25.85 and 26.80 m.

· Mineralization

Rare earth mineralization is weak from the collar to the depth of 44.00m, indicating less than 1 % T-RE_2O_3. The section deeper than 44.00 m to 96.00 m is appreciably mineralized with rare earths. The highest assay is recorded at 40.14 % T-RE_2O_3 in the assay-run between 61.00 and 62.00 m included in the section from 44.00 to 96.00 m (52 m) with the average of 10.44 % T-RE_2O_3. The particularly high grade section is located between 49.00 and 64.00 m (15m) with the average grade of 20.71 % T-RE_2O_3, which is very high.

Significant fluorite mineralization is observed in several sections deeper than 47 m. The sections from 47.00 to 65.00 m (18 m) and from 90.00 to 100.00 (10 m) indicate the average grades of 18.85 and 34.64 % CaF_2 respectively.

Barite mineralization is generally weak in this hole. The average grade of the section between 3.00 and 8.00 m (5 m) is relatively high at 56.56 % $BaSO_4$.

Table Summary of Assay Result, Hole MJVD-10

	Depth (m)	Width (m)	Content (Average %)
T-RE_2O_3	44.00~96.00	52.00	10.44
	44.00~49.00	5.00	6.45
	49.00~64.00	15.00	20.71
	64.00~96.00	32.00	6.26
CaF_2	47.00~65.00	18.00	18.85
	73.00~75.00	2.00	13.09
	78.00~80.00	2.00	19.15
	90.00~100.00	10.00	34.63
$BaSO_4$	3.00~ 8.00	5.00	56.56
	44.00~46.00	2.00	31.95
	62.00~66.00	4.00	38.11
	83.00~86.00	3.00	37.25

(11) MJDV-11 (Total Depth : 100 m, Vertical, Collar Elevation : 848.5 m)

- Geology : comprising surface soil and syenite.

0.00-3.00 m : surface soil, light brown.

3.00-19.05 m : syenite, black gray to gray, intensely weathered.

19.05-22.15 m : syenite, white to dark yellow, weathered.

22.15-38.00 m : syenite, black gray to gray, intensely weathered.

38.00-38.70 m : brown clay.

38.70-41.80 m : syenite, dark brown to brown, weakly weathered.

41.80-87.30 m : syenite, black gray to gray, intensely weathered.

87.30-97.40 m : syenite, dark brown to brown, weakly weathered.

97.40-100.00 (bottom of hole) m :. syenite, black gray to gray, intensely weathered.

- Mineralization

Rare earth and fluorite mineralization is weak in this hole. Barite mineralization is significant to the depth of 29 m, below which it weakens.

The highest assay for total rare earth is recorded at 9.64 % T-RE_2O_3 in the assay-run between 30.00 and 31.00 m included in the section from 24.00 to 31.00 (7 m) with the average grade of 5.00 % T-RE_2O_3. Another assay-run from 79.00 to 80.00 m indicates 8.07 % T-RE_2O_3.

The highest assay for fluorite is recorded at 10.19 % CaF_2 in the assay-run between 49.00 and 50.00 m.

The section between 0.00 and 31.00 m is relatively well mineralized with barite and returns the average grade of 58.19 % $BaSO_4$. The mineralization below this depth is

weak.

Table Summary of Assay Result, Hole MJVD-11

	Depth (m)	Width (m)	Content (Average %)
T-RE_2O_3	8.00~32.00	24.00	3.41
	24.00~31.00	7.00	5.00
	79.00~80.00	1.00	8.07
CaF_2	49.00~50.00	1.00	10.19
$BaSO_4$	0.00~31.00	31.00	58.19

(12) MJDV-12 (Total Depth : 100 m, Vertical, Collar Elevation : 852.0 m)

- Geology : comprising surface soil, syenite, and minette dikes.

0.00-1.00 m : surface soil, brown.

1.00-3.30 m : syenite, dark brown, intensely weathered.

3.30-55.60 m : syenite, black gray, partly pink, yellow, brown, dark brown, intensely weathered.

55.60-90.40 m : syenite, black gray, yellow to light yellow, intensely weathered, altered and mineralized.

90.40-93.40 m : minette dike, brown, intensely weathered.

93.40-96.50 m : syenite, black gray, weathered

96.50-98.50 m : minette dike, brown, intensely weathered.

98.50-100.00 (bottom of hole) m : syenite, gray to dark brown, weathered.

The section from 36.00 to 37.10 m consists of dark brown clay, suggesting a fault. Reddish brown clay occurs in the section between 43.60 and 44.00 m.

- Mineralization

Rare earth mineralization continuously occurs in the section from 11.00 to 91.00 m and is particularly significant in the section between 67.00 and 88.00 m. The highest assay is recorded at 26.84 % T-RE_2O_3 in the assay-run between 80.00 and 81.00 m. The average grade is estimated at 10.82 % T-RE_2O_3 for the section from 46.00 to 91.00 m (45 m) that includes the 21-m section between 67.00 and 88.00 m indicating an average grade of 15.76 % T-RE_2O_3.

Fluorite mineralization is generally weak except for a few sections. The three sections from 63.00 to 67.00 m, from 87.00 to 90.00 m and from 94.00 to 96.00 m indicate the average grades of 19.15 %, 16.89 % and 13.23 % CaF_2 respectively. Barite mineralization is significant throughout the hole. The average grade of barite is high at 60.20 % $BaSO_4$ for the section from 1.00 to 90.00 m (89 m).

Table Summary of Assay Result, Hole MJVD-12

	Depth (m)	Width (m)	Content (Average %)
T-RE_2O_3	11.00~46.00	35.00	3.21
	46.00~91.00	45.00	10.82
	67.00~88.00	21.00	15.76
CaF_2	63.00~67.00	4.00	19.15
	87.00~90.00	3.00	16.89
	94.00~96.00	2.00	13.23
$BaSO_4$	1.00~90.00	89.00	58.93
	93.00~96.00	3.00	39.71

(13) MJDV-13 (Total Depth : 80 m, Vertical, Collar Elevation : 825.7 m)

· Geology : comprising surface soil, syenite.

0.00-0.70 m : surface soil, brown.

0.70-3.50 m : syenite, brown to light brown, intensely weathered

3.50-23.00 m : syenite, black gray to gray, partly yellow to brown, intensely weathered.

23.00-35.00 m : syenite, dark brown to brown, intensely weathered.

35.00-43.80 m : syenite, dark brown, weathered.

43.80-45.00 m : syenite, yellow, pink, weakly weathered.

45.00-80.00 (bottom of hole) m : syenite, dark brown, weathered.

The section from 12.15 to 13.00 m consists of yellow to brown clay. No core is recovered in the section between 24.50 and 25.35 m due to a cave.

· Mineralization

Weak rare earth mineralization is observed to the depth of 44.00 m, below which the mineralization is minimal. The best assay-run is the 13.00-14.00 m section indicating 4.63 % T-RE_2O_3. Otherwise, the assay values are low and range from 1.00 to 4.46 % T-RE_2O_3.

Significant fluorite mineralization is observed in the sections from 34.00 to 36.00 m and from 40.00 to 42.00 m, indicating the average grades of 16.74 and 10.49 % CaF_2 respectively.

Significant barite mineralization is observed in the sections from 13.00 to 16.00 m and from 40.00 to 44.00 m, indicating 55.52 and 43.30 % $BaSO_4$ respectively.

Table Summary of Assay Result, Hole MJVD-13

	Depth (m)	Width (m)	Content (Average %)
T-RE_2O_3	10.00~14.00	4.00	3.31
	33.00~44.00	11.00	2.46
CaF_2	34.00~36.00	2.00	16.74
	40.00~42.00	3.00	10.49
$BaSO_4$	13.00~16.00	3.00	55.52
	40.00~44.00	4.00	43.30

(10) MJDV-14 (Total Depth : 80 m, Vertical, Collar Elevation : 833.0 m)

· Geology : comprising surface soil, syenite, limestone and minette dikes.

0.00-1.50 m : surface soil, brown.

1.50-25.80 m : syenite, black gray to dark gray, partly yellow or brown, intensely weathered.

25.80-28.40 m : limestone, light gray, micro-crystalline.

28.40-42.80 m : syenite, dark brown, partly dark gray, intensely weathered.

42.80-51.20 m : syenite, gray to light gray, weathered, carrying white barite in part.

51.20-59.50 m : syenite, to dark brown, weathered, containing light gray limestone pebbles in part.

59.50-64.10 m : limestone, light gray, micro-crystalline, carrying barite, fluorite, pyrite in part.

64.10-80.00 (bottom of hole) m : syenite, black gray to dark gray, dark brown, weathered.

Two thin layers of limestone are intersected from 74.30 to 74.80 m and from 76.30 to 76.70 m.

Minette dikes, occurring in the sections from 9.00 to 11.70 m and from 22.30 to 24.70 m, are brown to reddish brown and contain minor biotite.

· Mineralization

Weak rare earth mineralization is observed from the collar to the depth of 21.00 m, below which the mineralization is minimal. The highest assay is recorded at 6.81 % T-RE_2O_3 in the assay-run between 6.00 and 7.00 m. Otherwise, the total rare earth content ranges from 2.00 to 5.37 % T-RE_2O_3.

Barite and fluorite mineralization is generally weak except for a few narrow sections. Fluorite is contained in appreciable amounts in the two assay-runs from 18.00 to 19.00 m and from 39.00 to 40.00 m with the grades of 15.23 and 10.27 % CaF_2 respectively. The sections of appreciable barite mineralization are from 1.00 to 9.00 m,

from 11.00 to 21.00 m and from 63.00 to 74.00 m with the average grades of 47.06, 47.59 and 42.57 % $BaSO_4$ respectively.

Table Summary of Assay Result, Hole MJVD-14

	Depth (m)	Width (m)	Content (Average %)
T-RE_2O_3	0.00~21.00	21.00	3.09
CaF_2	18.00~19.00	1.00	15.23
	39.00~40.00	1.00	10.27
$BaSO_4$	1.00~9.00	8.00	47.06
	11.00~21.00	10.00	47.59
	28.00~33.00	5.00	45.68
	52.00~55.00	3.00	33.45
	57.00~59.00	2.00	35.26
	63.00~74.00	11.00	42.57

(15) MJDV-15 (Total Depth : 80 m, Vertical, Collar Elevation : 833.2 m)

- Geology : comprising surface soil, syenite and minor limestone.

0.00-0.80 m : surface soil, brown.

0.80-27.00 m : syenite, black gray to gray, partly yellow to light yellow, reddish brown to brown or white, intensely weathered, mineralized and altered.

27.00- 34.40 m : syenite, reddish brown to light brown, partly dark gray, weathered.

34.40-58.90 m : syenite, black gray, partly yellow, brown or pink, intensely weathered, mineralized and altered in part.

58.90-72.60 m : syenite, black gray, intensely weathered, carrying fluorite and barite.

72.60-76.00 m : syenite, gray, weathered, containing abundant yellow spots of bastnaesite, also carrying fluorite and barite.

76.00-80.00 (bottom of hole) m :. syenite, black gray, intensely weathered, containing white barite and purple fluorite.

Limestone occurs in the narrow section between 43.00 and 43.25 m.

Caves are observed from 47.70 to 48.55 m and from 51.40 to 52.30 m.

- Mineralization

Rare earth mineralization, regardless of the degree of its concentration, is observed throughout this hole with a significant concentration between 72.00 and 76.00 m.

The highest assay for total rare earth is recorded at 31.70 % T-RE_2O_3 in the assay-run between 73.00 and 74.00 m included in the section from 63.00 to 77.00 (14 m) with the average grade of 10.90 % T-RE_2O_3. The 4-m section between 72.00 and 76.00 m is particularly well mineralized, indicating the average grade of 25.25 % T-RE_2O_3. The

sections that indicate the average grade lower than 10 % T-RE_2O_3 are those from 16.00 to 20.00 m (4 m) with 6.33 % T-RE_2O_3, from 25.00 to 39.00 m (14 m) with 5.17% T-RE_2O_3 and from 52.00 to 59.00 m (7 m) with 8.26 % T-RE_2O_3.

Fluorite mineralization is significant in the deeper section than 58.00 m. The average grade of the section from 58.00 to 80.00 m (22 m) is estimated at 14.99 % CaF_2.

The entire hole is well mineralized with barite. The high grade sections are from 3.00 to 21.00 m (18 m) and from 25.00 to 39.00 m (14 m) indicating the average grades of 68.74 % and 68.75 % $BaSO_4$ respectively. The two sections from 41.00 to 43.00 m and from 52.00 to 80.00 m (28 m) indicates 44.95 % and 46.36 % $BaSO_4$ respectively.

Table Summary of Assay Result, Hole MJVD-15

	Depth (m)	Width (m)	Content (Average %)
T-RE_2O_3	16.00~20.00	4.00	6.33
	25.00~39.00	14.00	5.17
	52.00~59.00	7.00	8.26
	63.00~77.00	14.00	10.90
	72.00~76.00	4.00	25.52
CaF_2	58.00~80.00	22.00	14.99
$BaSO_4$	3.00~21.00	18.00	68.74
	25.00~39.00	14.00	68.75
	41.00~43.00	2.00	44.95
	52.00~80.00	28.00	46.36

(16) MJDV-16 (Total Depth : 100 m, Vertical, Collar Elevation : 853.4 m)

- Geology : comprising surface soil, syenite and limestone.

0.00-0.50 m : surface soil, brown, containing barite pebbles.

0.50-17.00 m : syenite, brown, reddish brown, dark brown, partly dark gray, intensely weathered.

17.00-78.50 m : syenite, black gray, partly yellow or brown, intensely weathered.

78.50-81.90 m : limestone, light gray, brown stains along fractures, weakly weathered, containing pyrite and fluorite as disseminations and/or veinlets.

81.90-90.90 m : syenite, dark brown, intensely weathered, containing yellow bastnaesite and purple fluorite.

90.90-100.00 (bottom of hole) m : limestone, light gray, brown stains along fractures, weakly weathered, containing pyrite and fluorite as disseminations and/or veinlets.

A major cave is intersected between 32.60 and 36.60 m (4 m).

· Mineralization

Weak rare earth mineralization continues to the bottom of hole below the depth of 10 m. The highest assay is recorded at 9.32 % T-RE_2O_3 in the assay-run between 10.00 and 11.00 m. The average grade is estimated at 5.50 % T-RE_2O_3 for the section from 83.00 to 90.00 m (7 m). Otherwise, the total rare earth grade generally ranges between 2.00 and 5.00 % T-RE_2O_3.

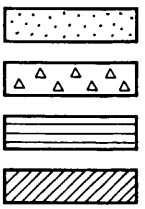
Fluorite mineralization is generally associated with the limestone or the syenite in the vicinity to the contact. The section from 83.00 to 89.00 m (6 m) indicates the average grade of 20.60 % CaF_2. The highest assay-run is the 78.00-79-00 m section that indicates 20.60 % CaF_2.

Barite mineralization is significant in the three sections from 10.00 to 33.00 m and from 36.00 to 75.00 m, the average grades of which are estimated at 62.03 % and 68.01 % $BaSO_4$ respectively. The 83.00-90.00 m section bounded by the two limestone layers indicate the average of 43.70 % $BaSO_4$.

Table Summary of Assay Result, Hole MJVD-16

	Depth (m)	Width (m)	Content (Average %)
T-RE_2O_3	10.00~11.00	1.00	9.32
	83.00~90.00	7.00	5.50
CaF_2	75.00~76.00	1.00	36.58
	78.00~79.00	1.00	21.58
	83.00~89.00	6.00	20.60
$BaSO_4$	10.00~33.00	23.00	62.03
	36.00~75.00	39.00	68.01
	83.00~90.00	7.00	43.70

Leagend of weathered zone



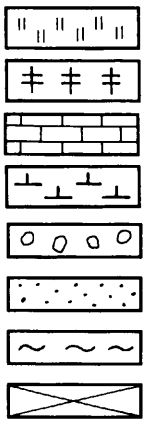
Core of likely sand and clay

Core of likely breccia

Weakly weathered short core

Weakly weathered long core

Leaged of column



Overburden

Syenite

Limestone

Minette

Containing Breccia

Core of Sandlike

Clay

Cave and no-core

Samary of Drill hole

Drill hole	Depth (m)	Sea level (m)	Direction
MJVD-1	80	844.23	90°
MJVD-2	80	835.32	90°
MJVD-3	80	845.89	90°
MJVD-4	100	843.15	90°
MJVD-5	100	841.42	90°
MJVD-6	100	858.52	90°
MJVD-7	100	851.79	90°
MJVD-8	100	858.78	90°
MJVD-9	100	864.48	90°
MJVD-10	100	874.63	90°
MJVD-11	100	848.45	90°
MJVD-12	100	851.95	90°
MJVD-13	80	825.69	90°
MJVD-14	80	833.02	90°
MJVD-15	80	833.17	90°
MJVD-16	100	853.43	90°

Figure II-3-3 Legend of the hole columnar section

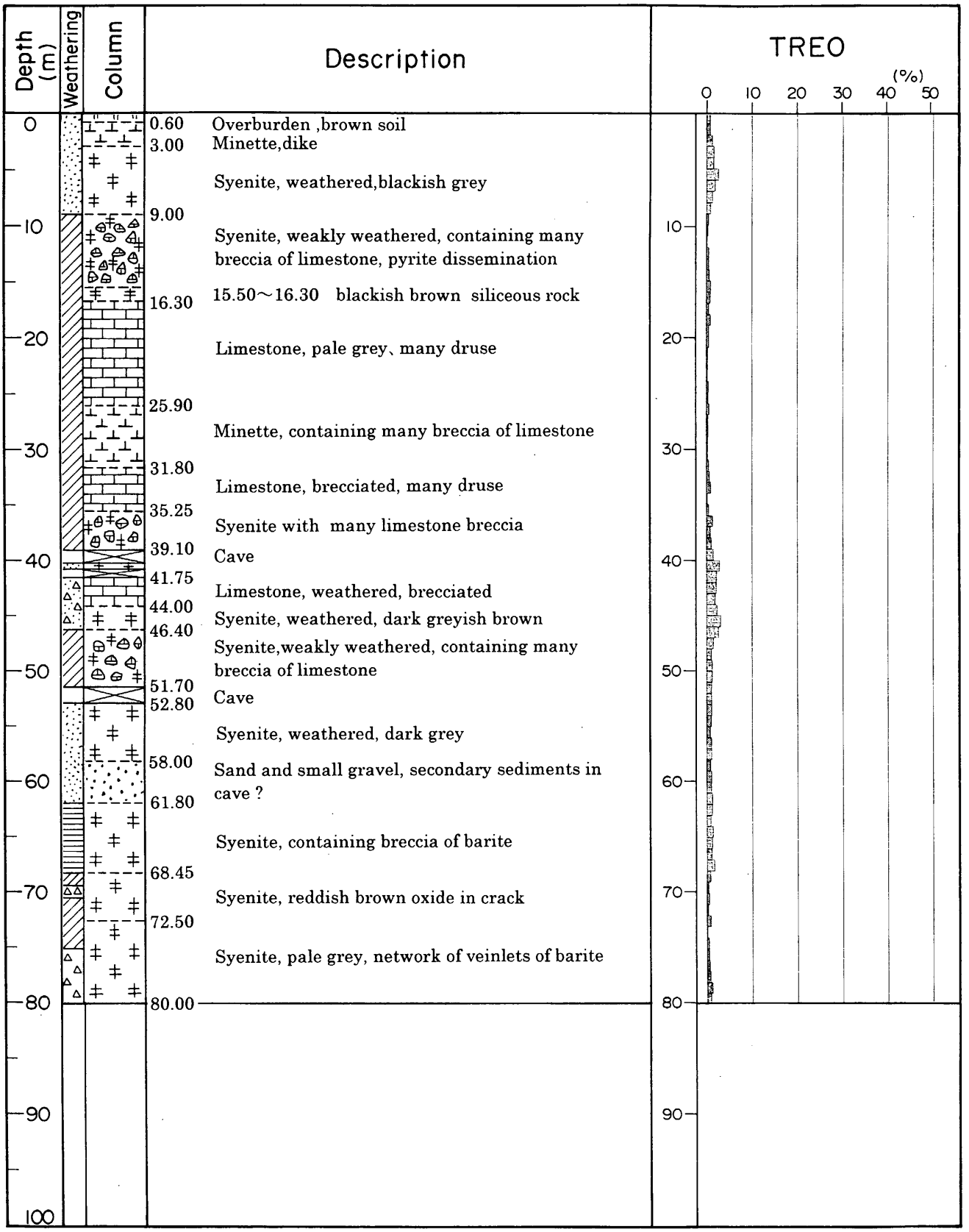


Figure II-3-3 (1/16) The hole columnar section (MJVD-1)

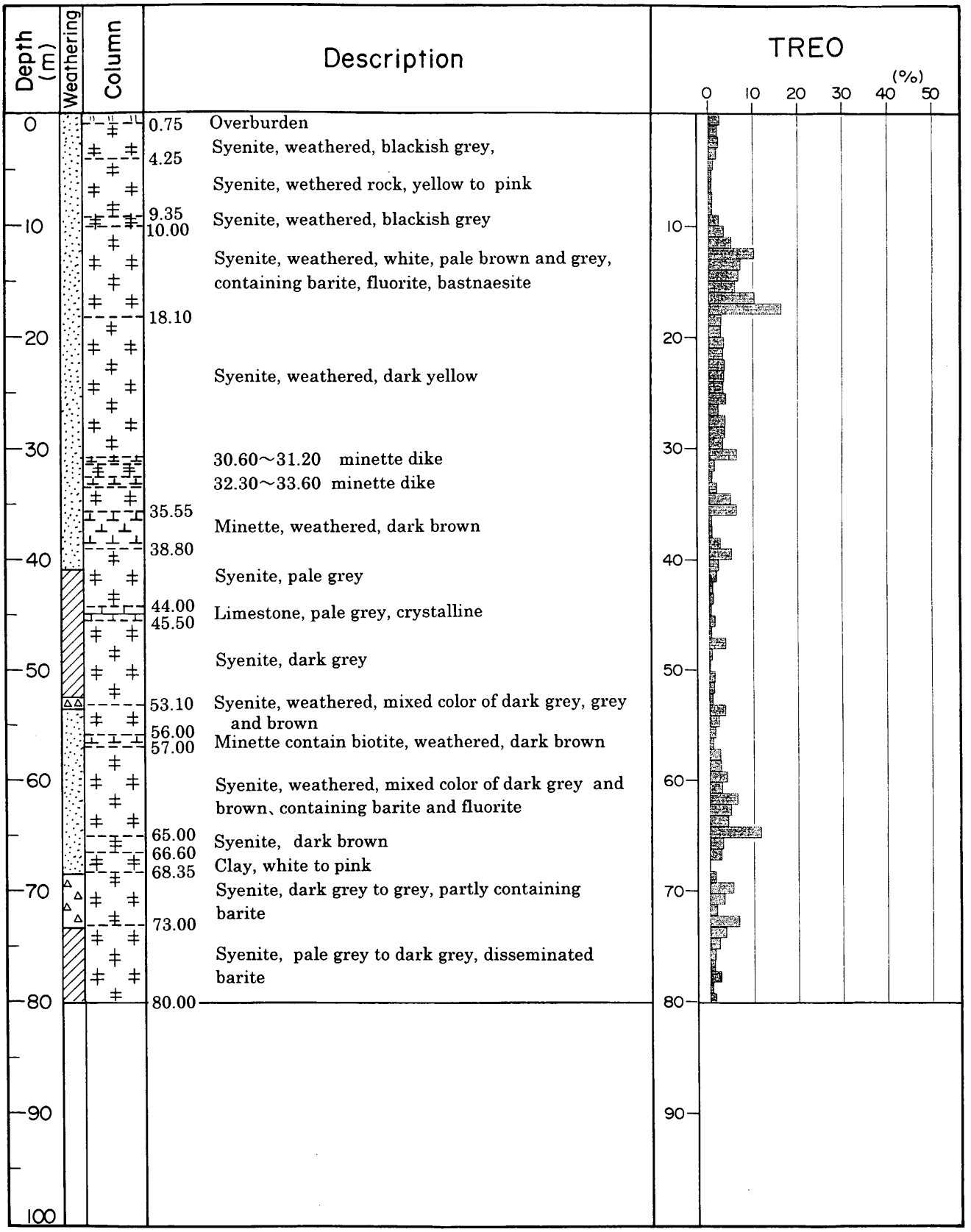


Figure II-3-3 (2/16) The hole columnar section (MJVD-2)

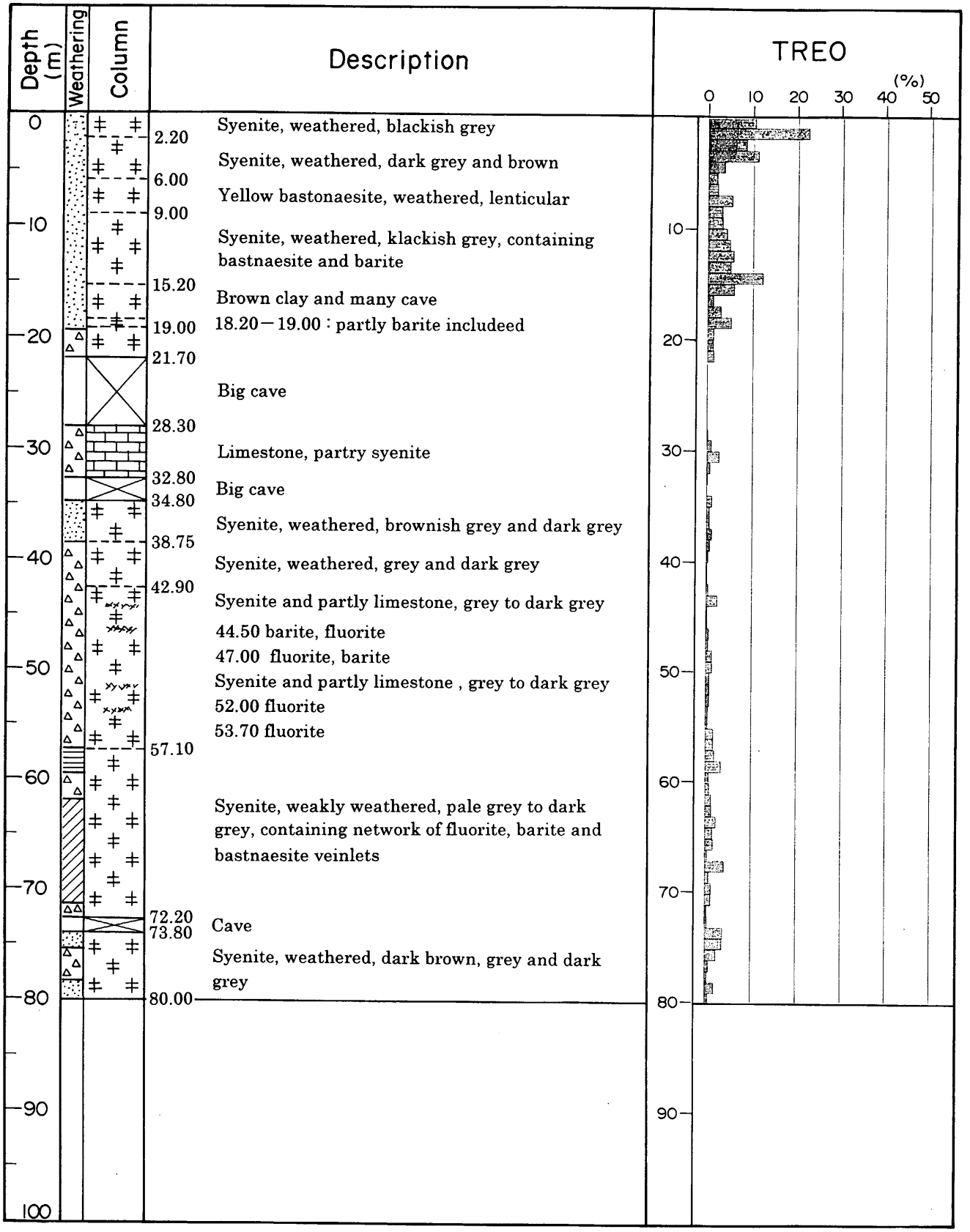


Figure II-3-3 (3/16) The hole columnar section (MJVD-3)

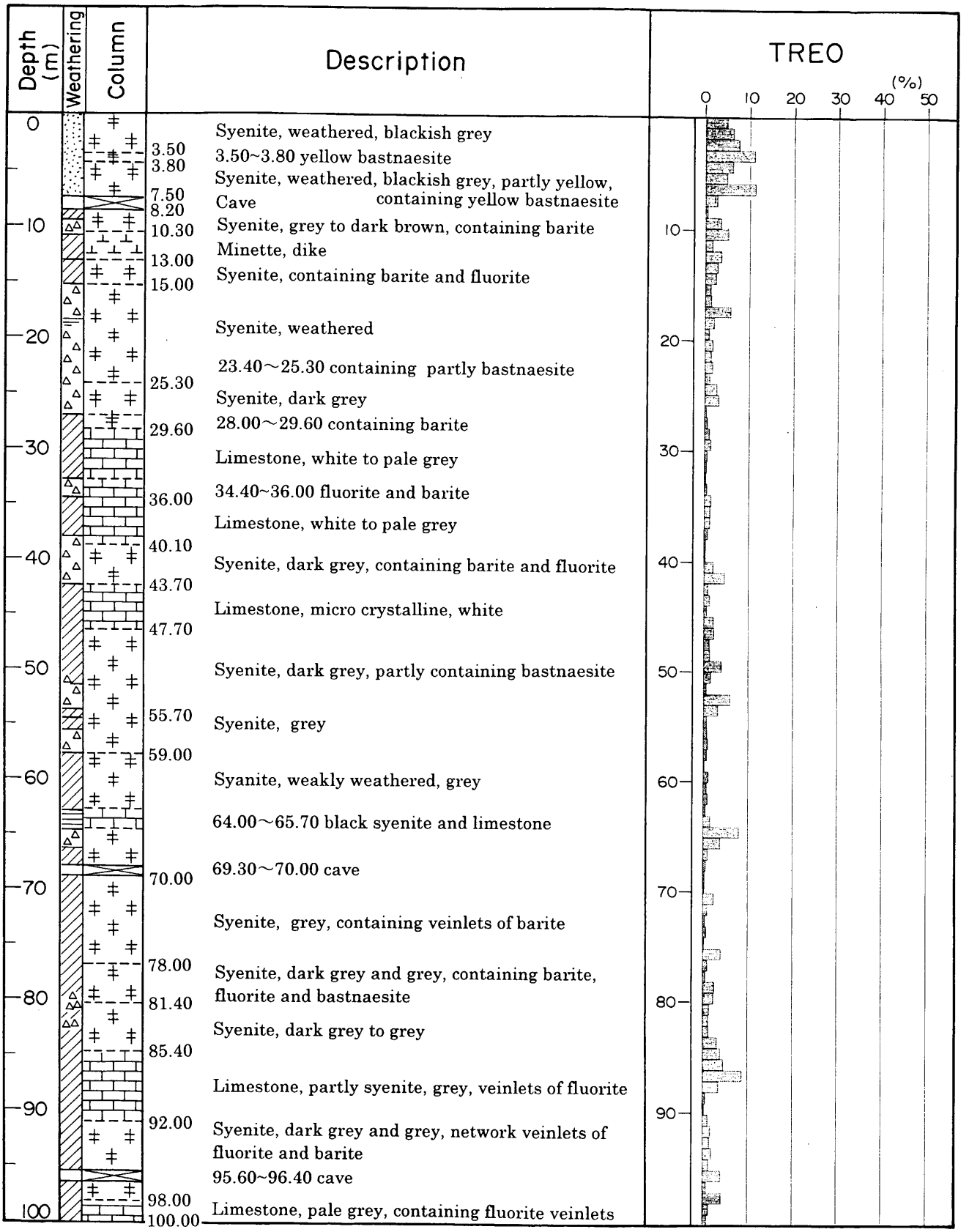


Figure II-3-3 (4/16) The hole columnar section (MJVD-4)

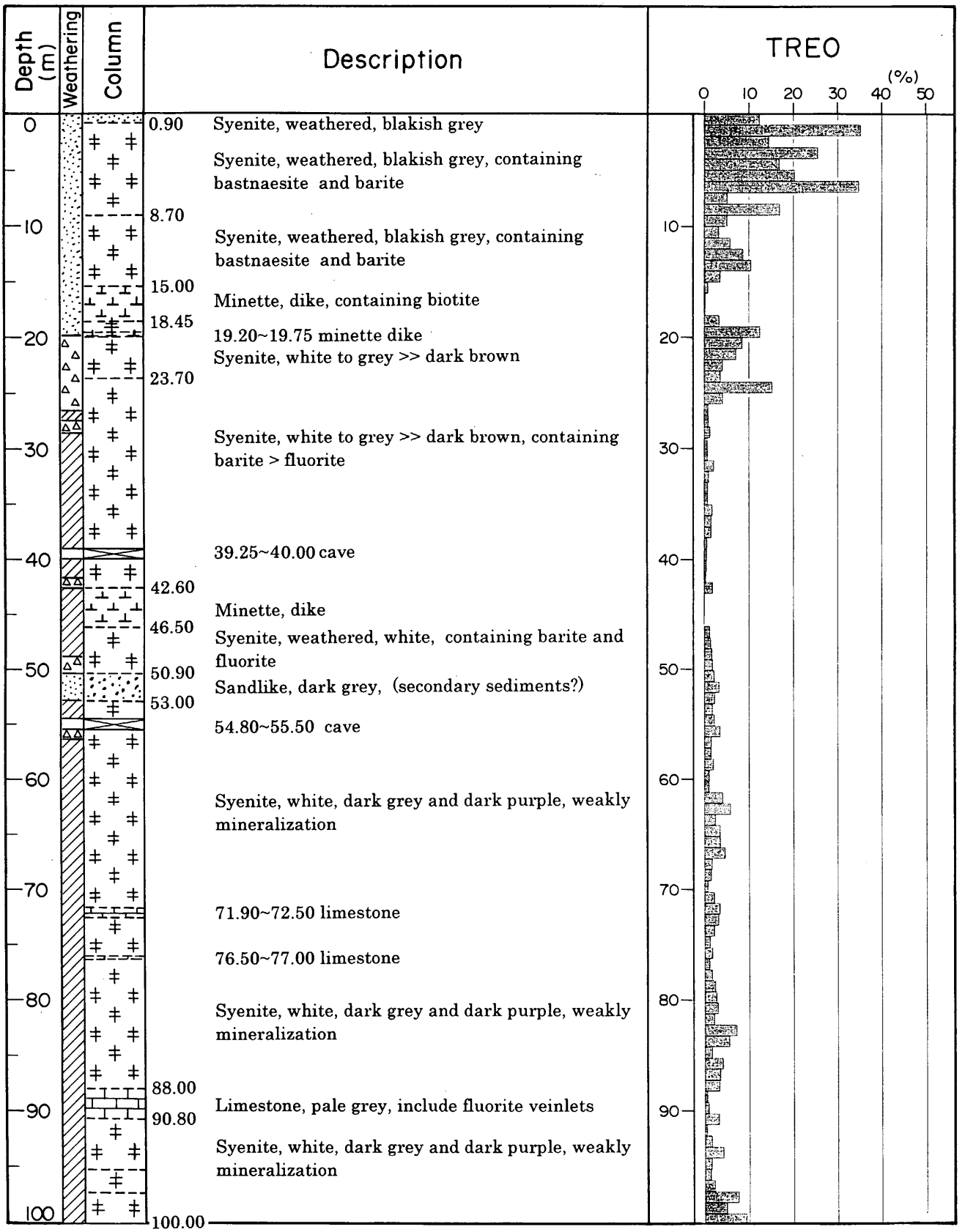


Figure II-3-3 (5/16) The hole columnar section (MJVD-5)

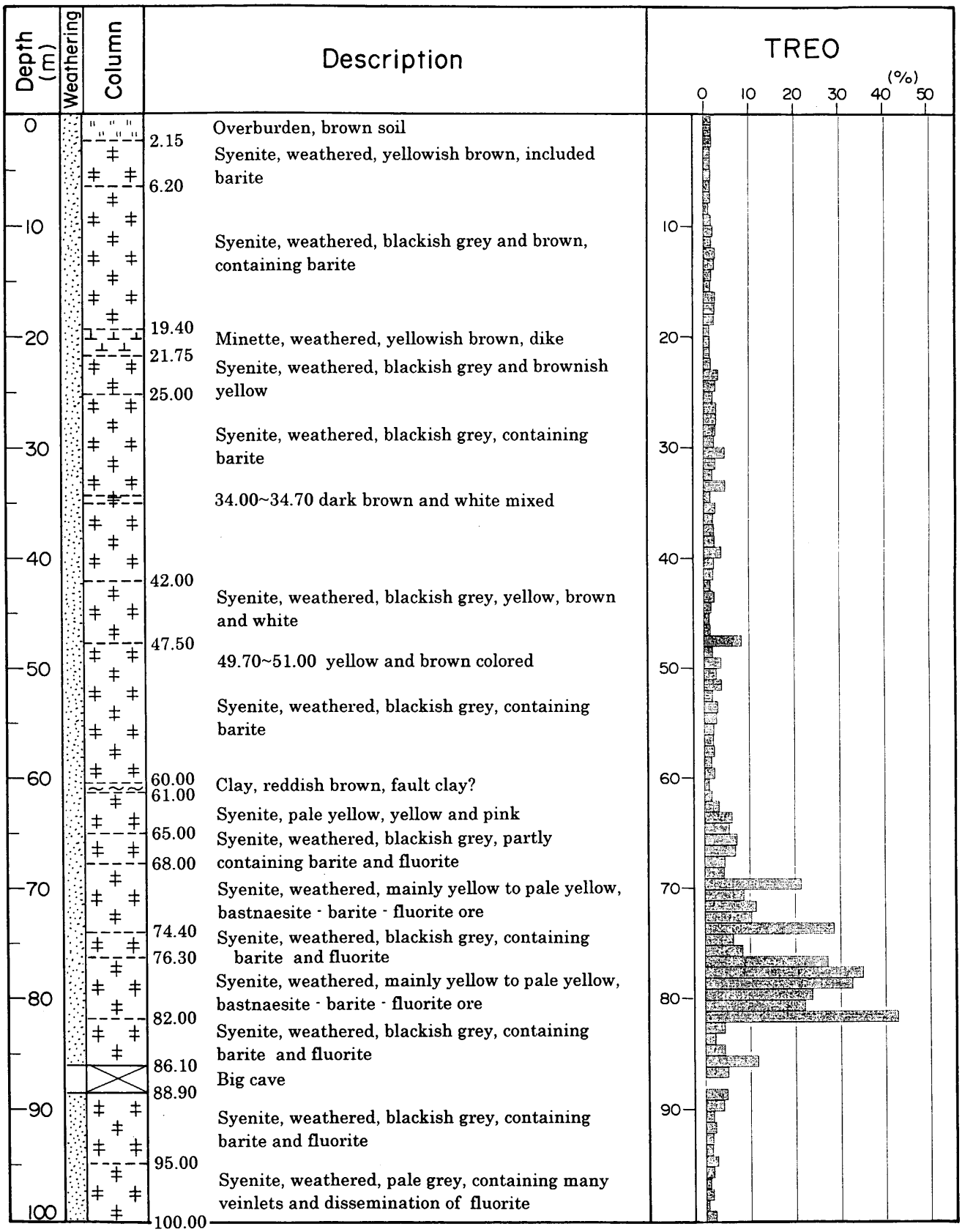


Figure II-3-3 (6/16) The hole columnar section (MJVD-6)

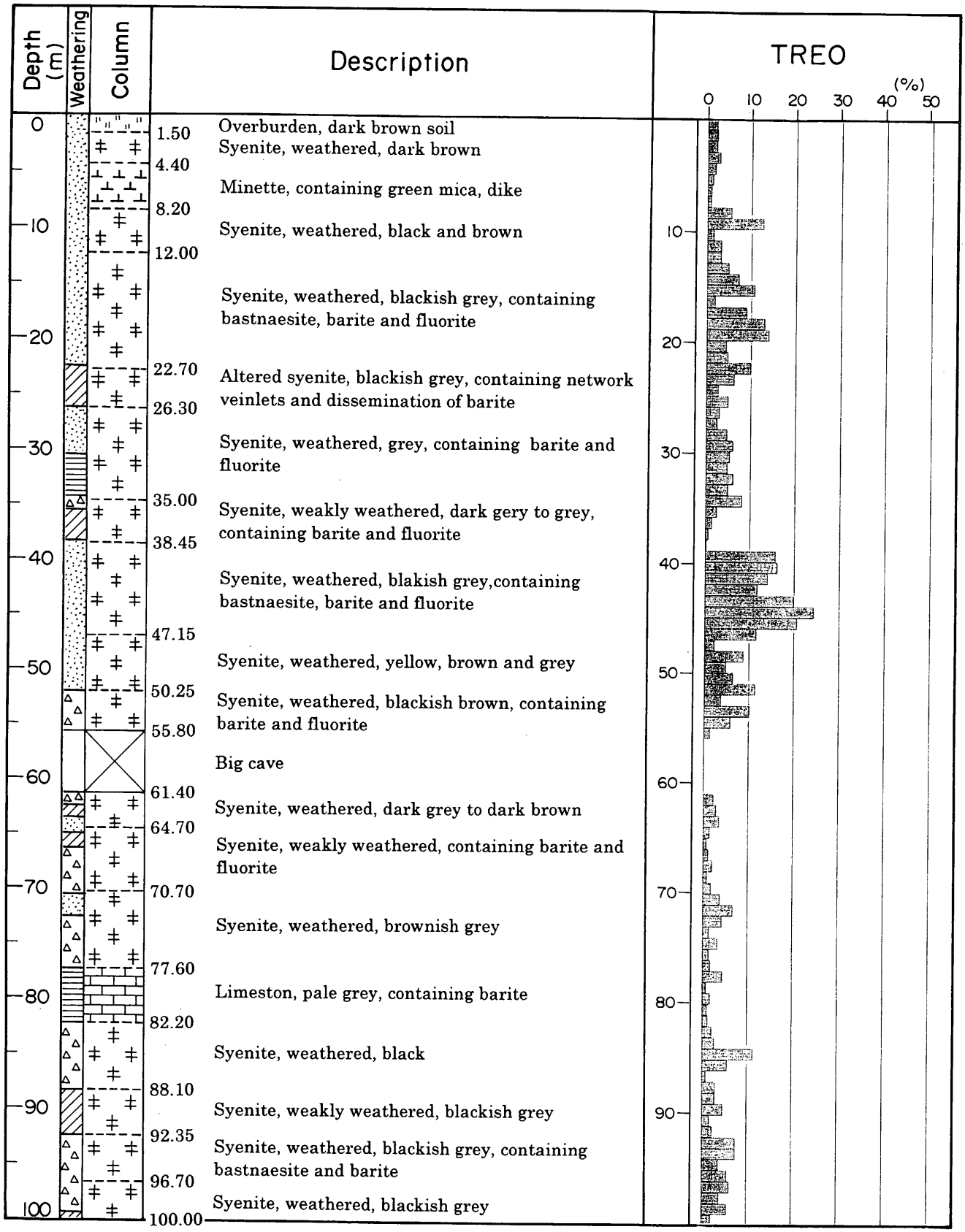


Figure II-3-3 (7/16) The hole columnar section (MJVD-7)

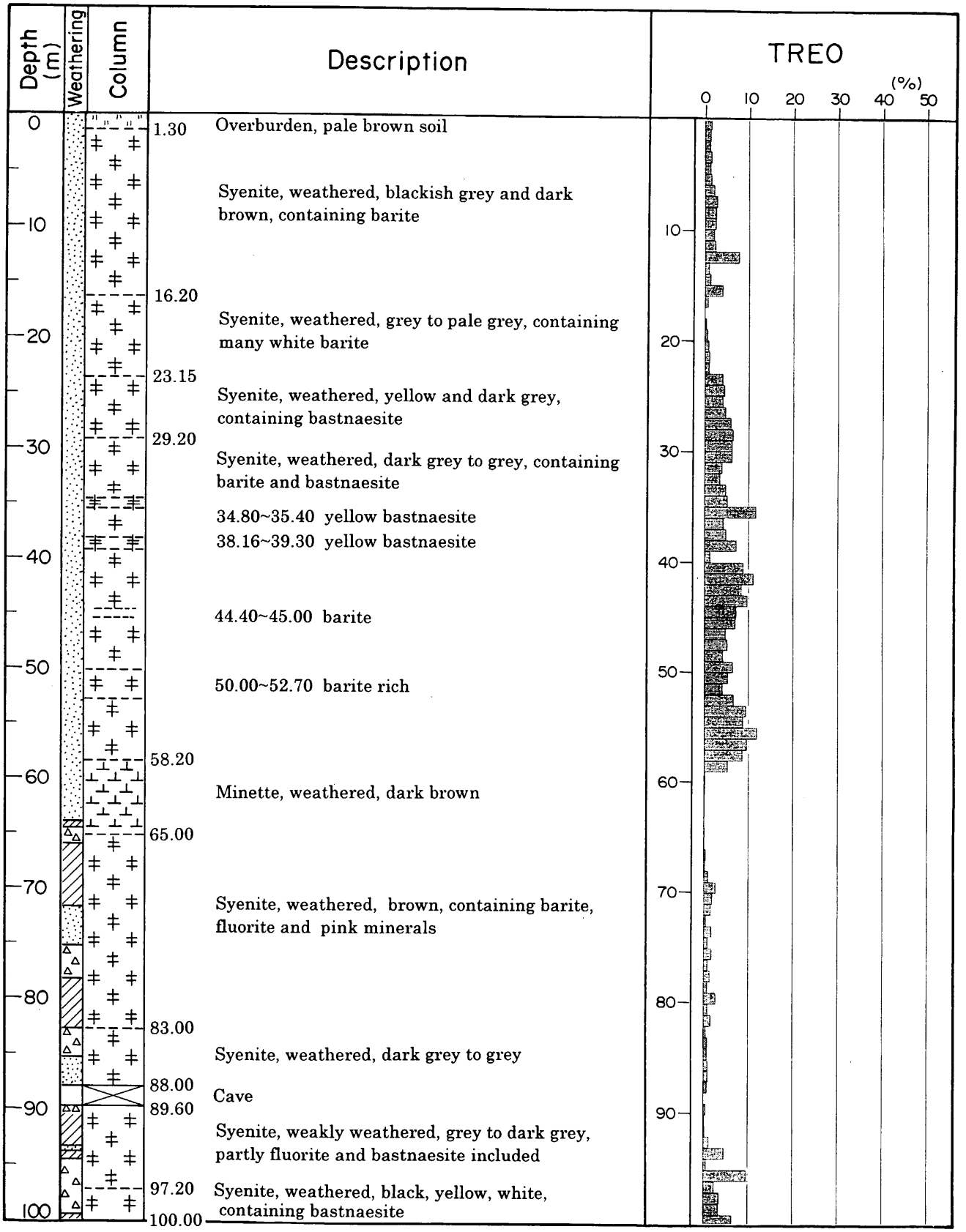


Figure II-3-3 (8/16) The hole columnar section (MJVD-8)

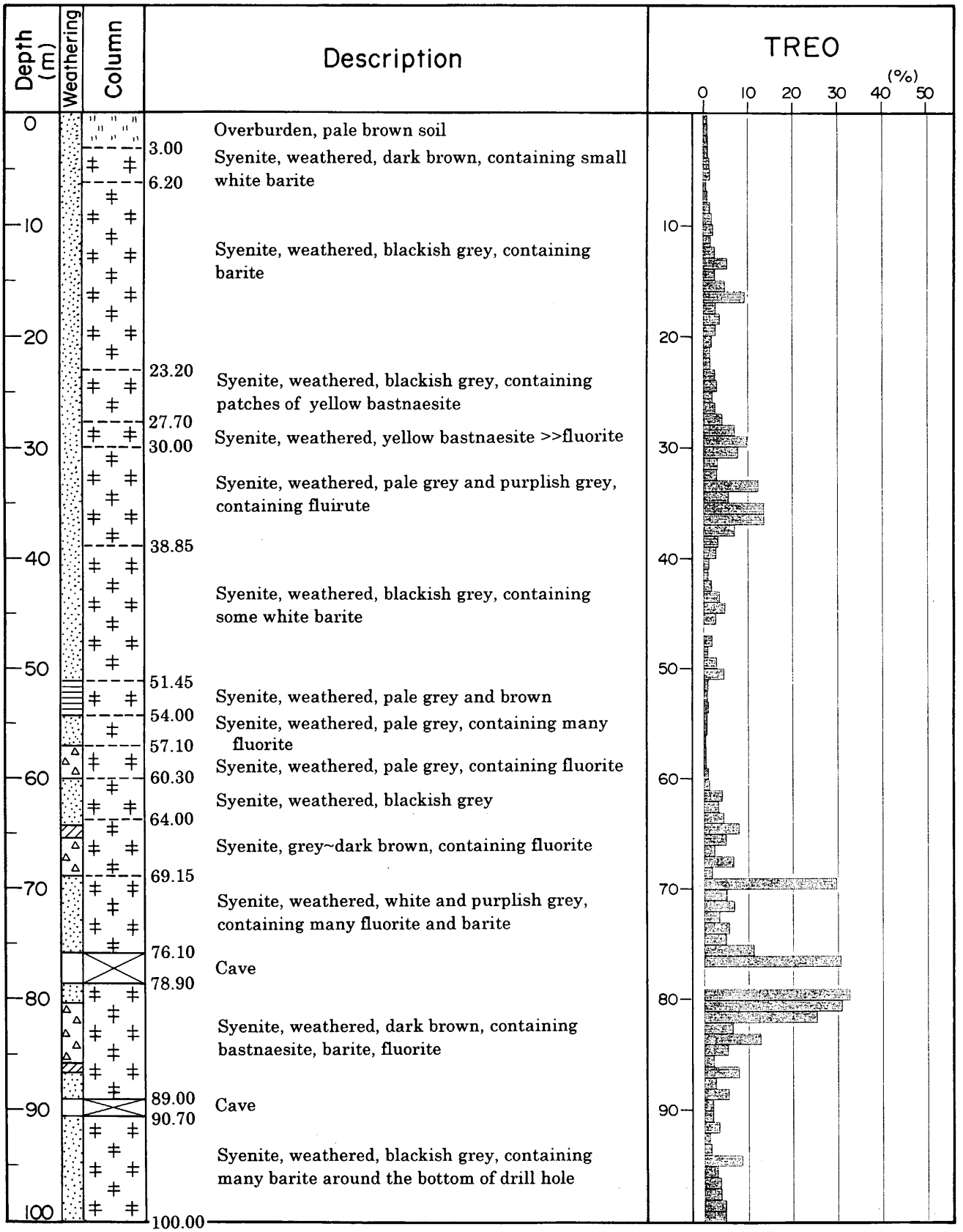


Figure II-3-3 (9/16) The hole columnar section (MJVD-9)

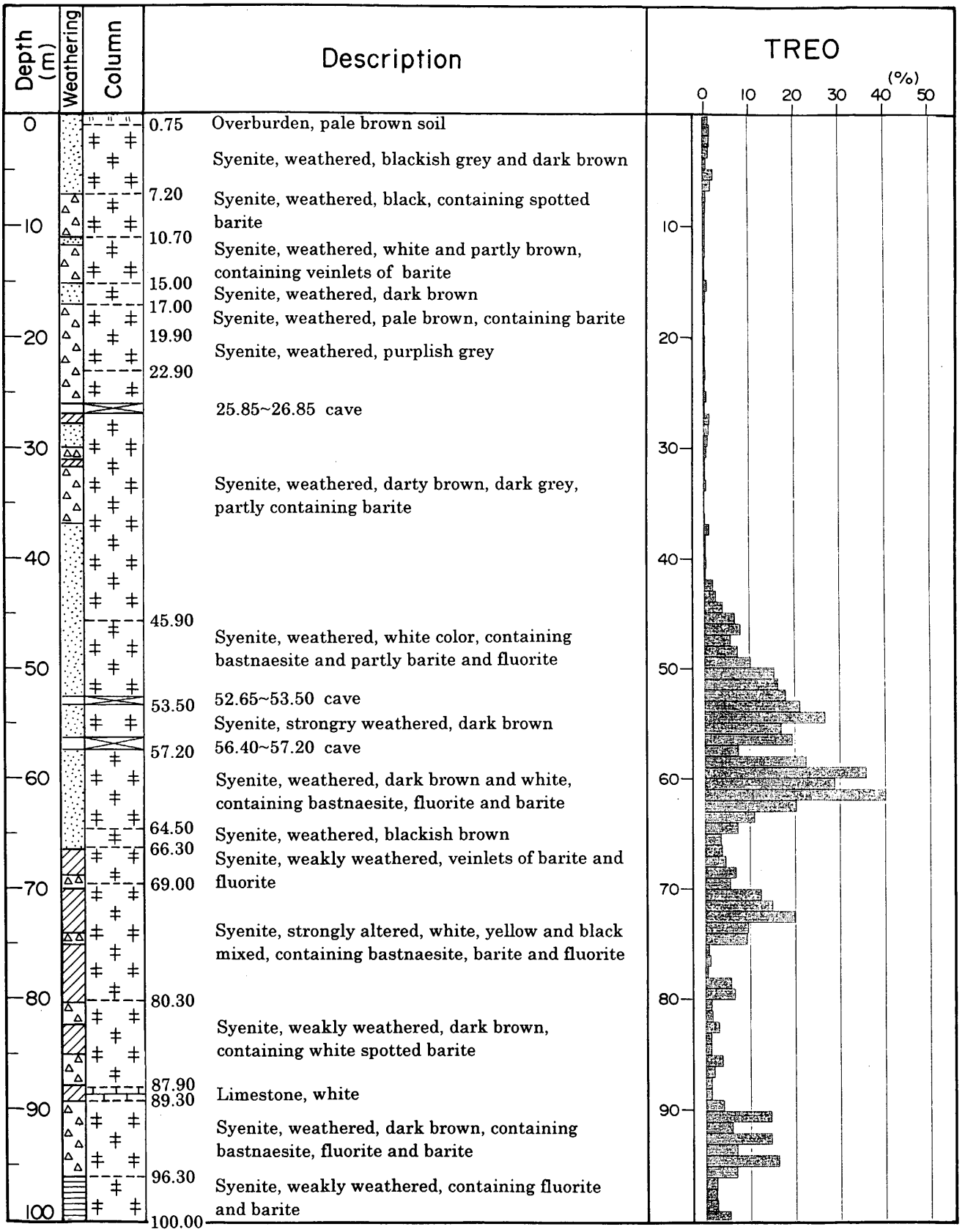


Figure II-3-3 (10/16) The hole columnar section (MJVD-10)

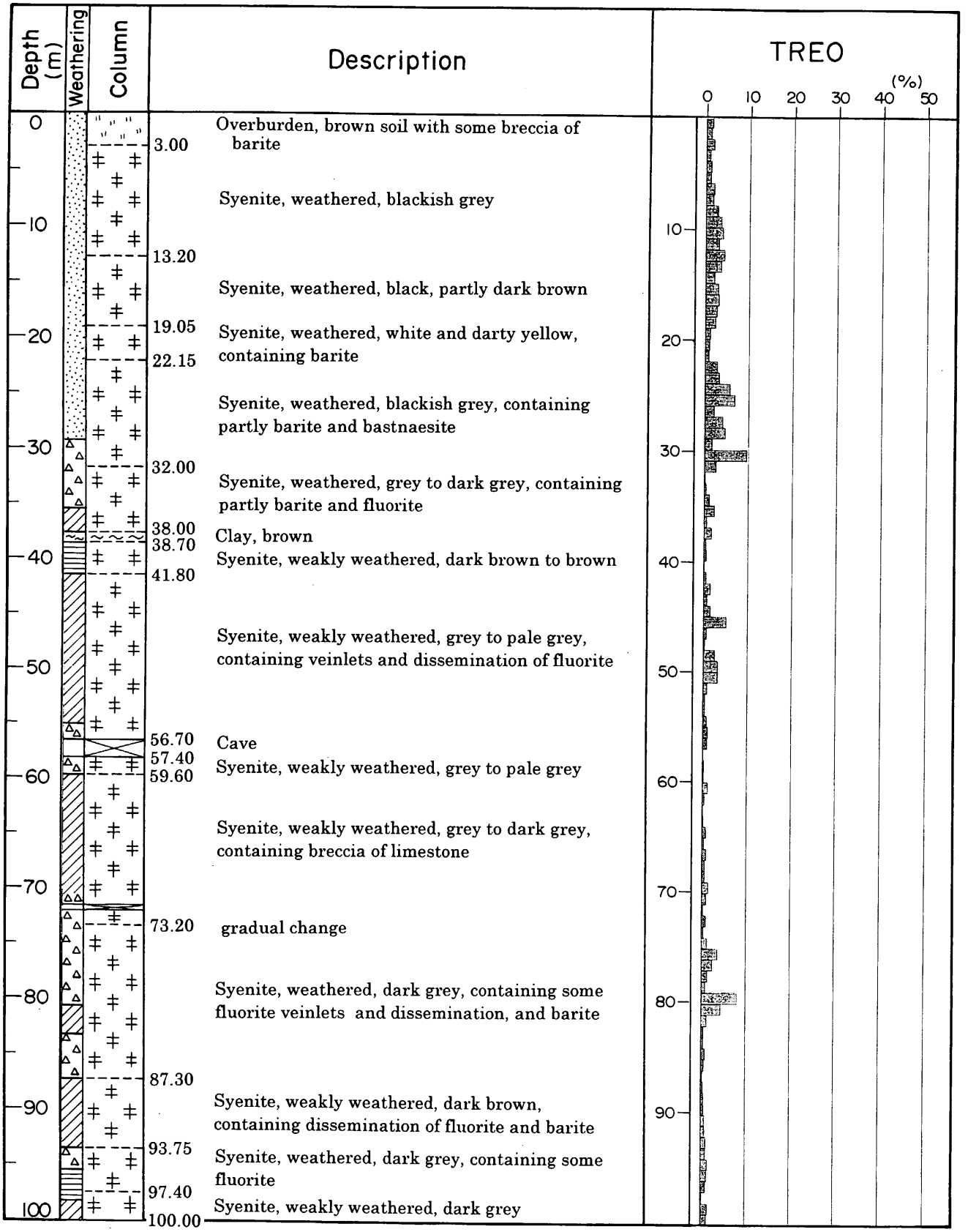


Figure II-3-3 (11/16) The hole columnar section (MJVD-11)

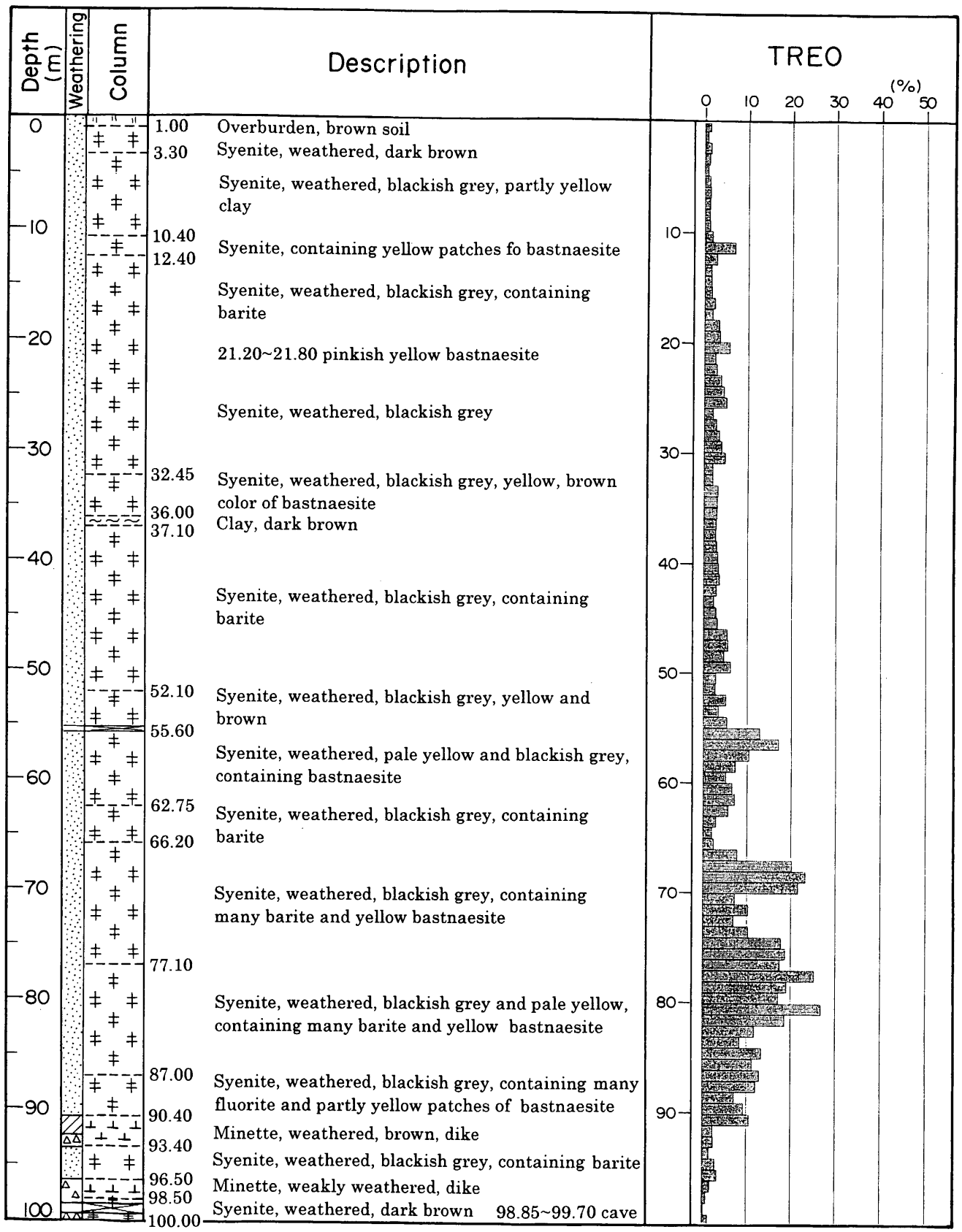


Figure II-3-3 (12/16) The hole columnar section (MJVD-12)

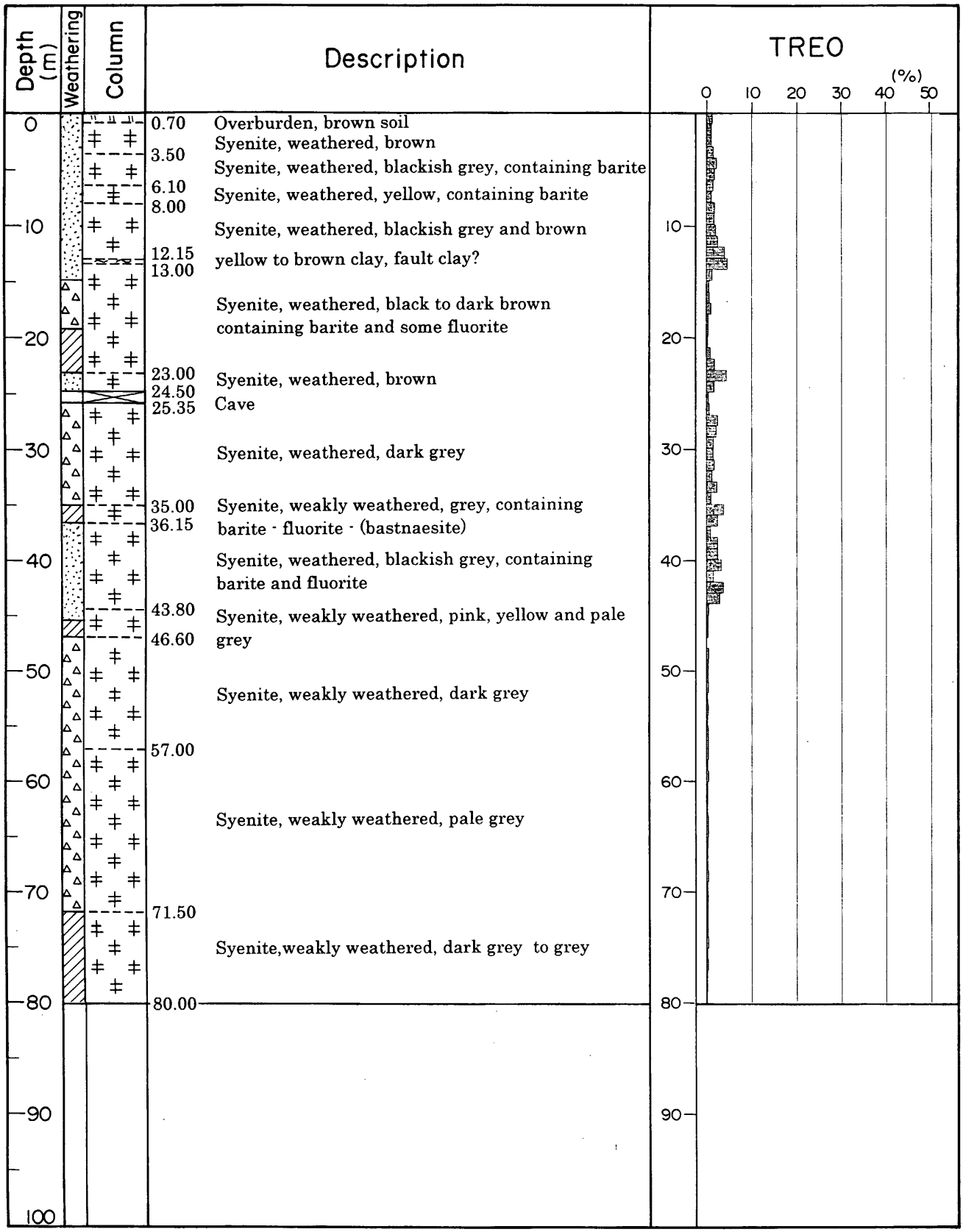


Figure II-3-3 (13/16) The hole columnar section (MJVD-13)

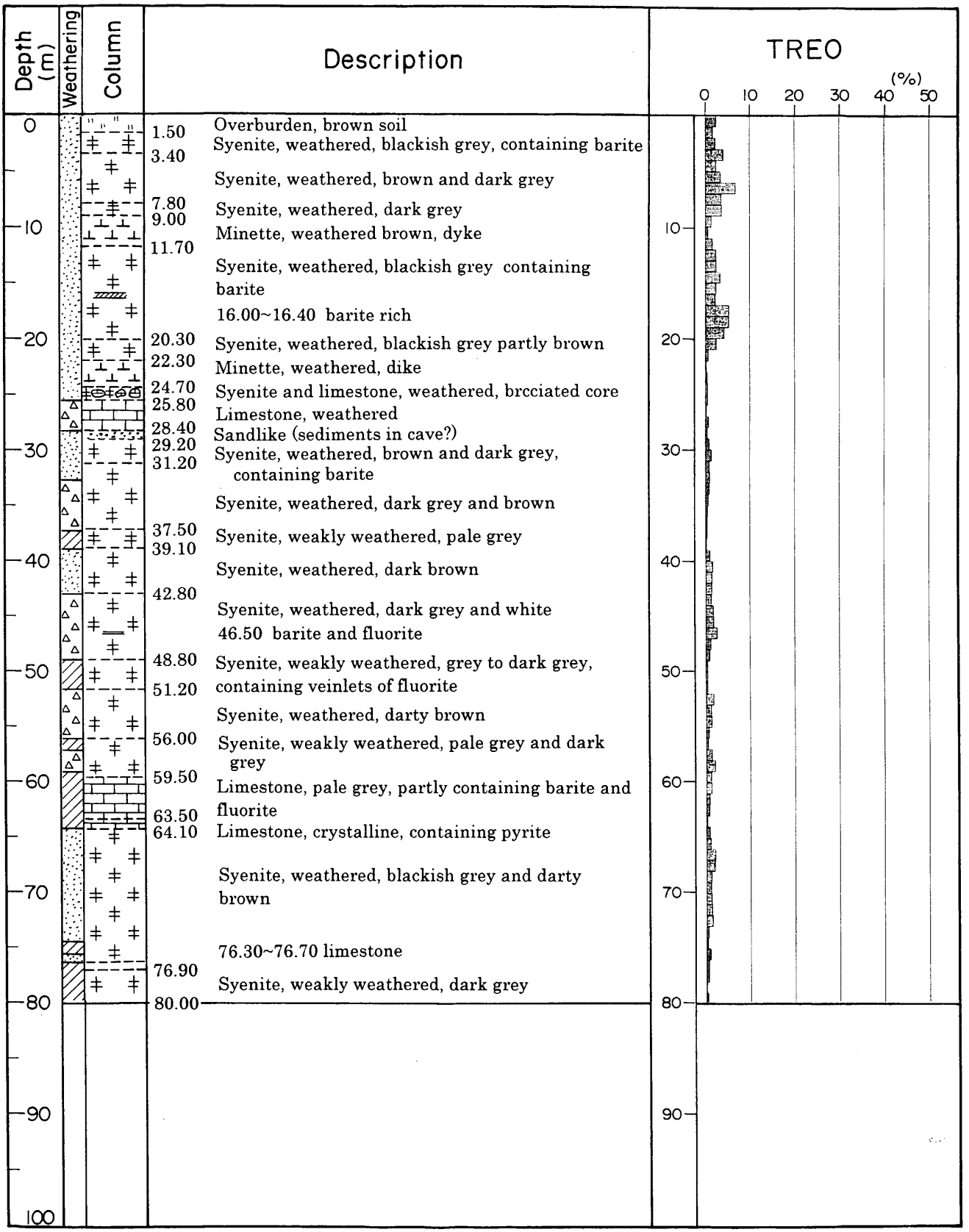


Figure II-3-3 (14/16) The hole columnar section (MJVD-14)

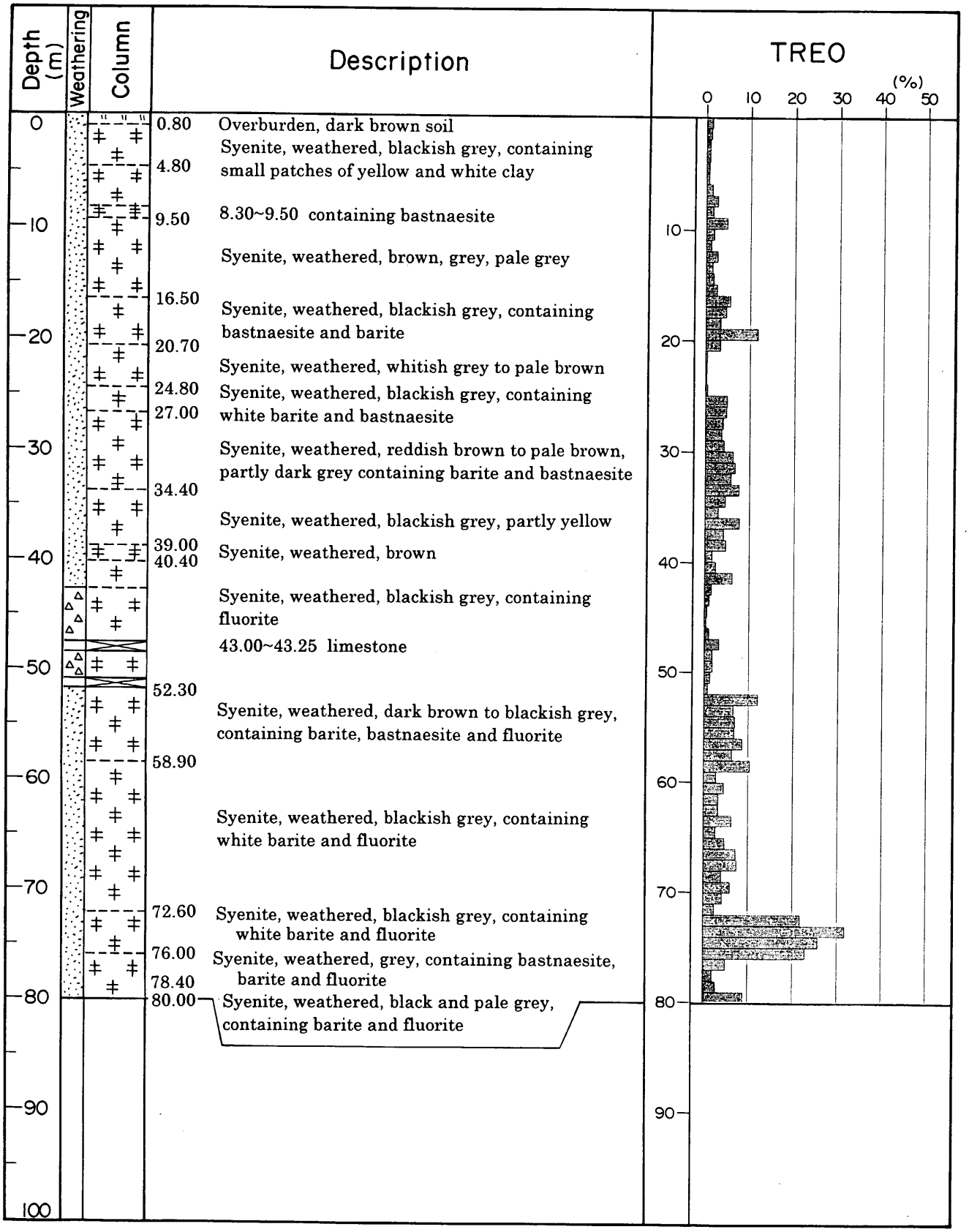


Figure II-3-3 (15/16) The hole columnar section (MJVD-15)

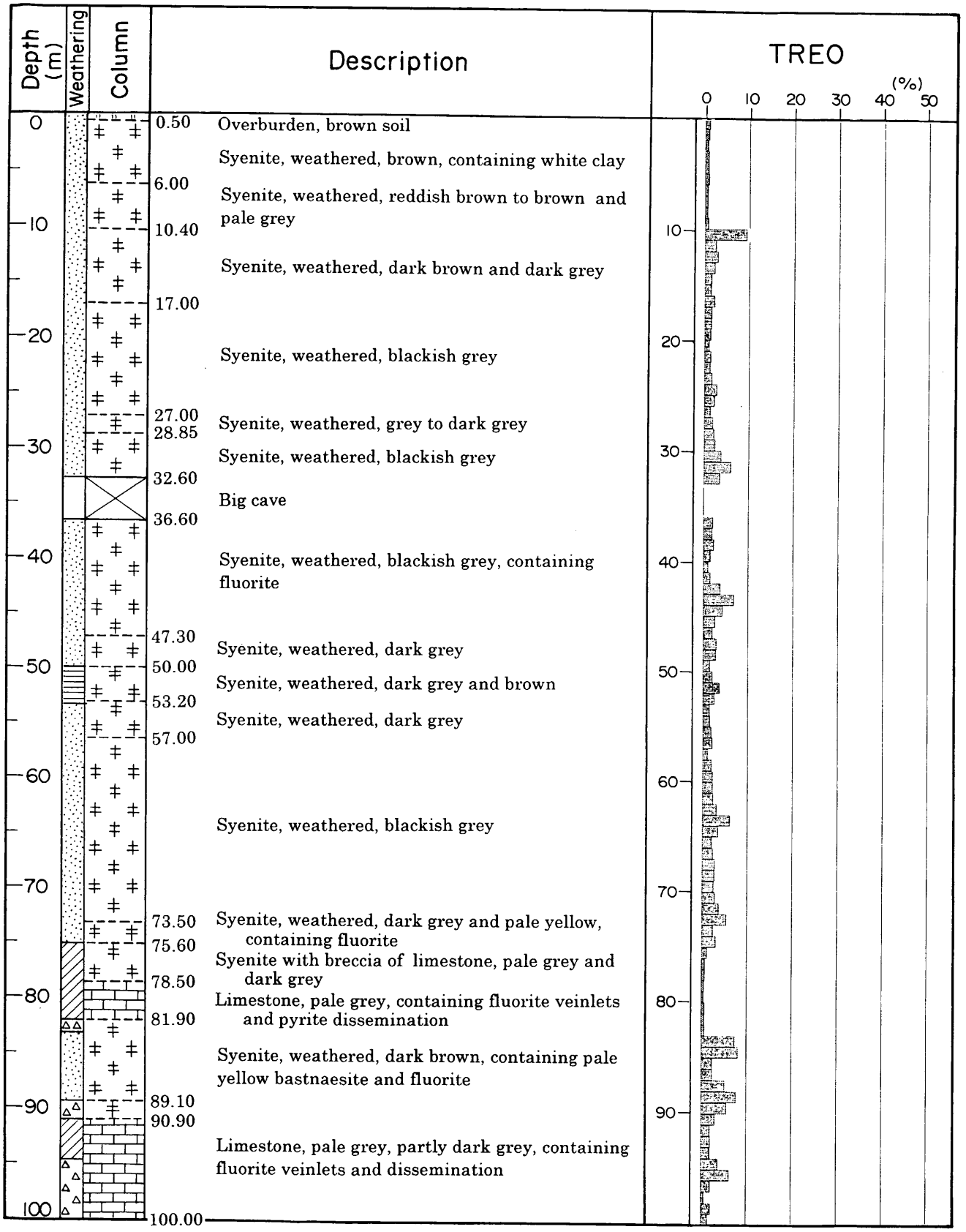


Figure II-3-3 (16/16) The hole columnar section (MJVD-16)