

Fig. 4.11.46 Geological Log of Borehole

Project Name			Tabel Hydro-electric Power Development Project			Site Name		Upper Tekol Dam Site									
Hole No		UD-15()	Elevation of Ground Level		93.27 m	Ground Water Level		-5.2 m	Bit Size		76 (NX)X						
Date		Beginning		September 15th, 1982	Operator		Mosomi NARITA		Casing		0.0m to 4.0m						
		Ending		September 16th, 1982	Supervisor		Tokuji SUGIMOTO Shiro OGANO		Dry Drilling		0.0m to 2.7m						
Scale	Elevation(m)	Depth(m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)		R Q D (%)		Logan Value (Ln) Permeability K (m ² /m)				Result of Rock Tests	Rock Classification
								20 (0) 80	20 (0) 80	(Ln) 10 ¹	10 ¹	10 ²	10 ³				
	92.97	0.30	1-15	Brown	Clayey soil		Organic material										
	91.77	1.50	00	Yellowish brown	Talus deposits		Including weathered breccio, clayey sand										
		2.00		Y. brown													
		2.70		Reddish brown	Medium quartzose sandstone												
		3.30		Brown													
	89.52	3.75		Y. brown	Coarse quartzose sandstone	Completely weathered	Very soft Mainly clayey sand with breccio										O
	88.77	4.50		Yellowish brown Brownish white													
		5.00			Conglomerate		Fractionated zone. Mainly breccio, with clay										
	87.67	5.60		Brown													
		6.00		Whitish grey			Soft, Cracky										CL
		6.40		grey		Moderately weathered	Medium hard Crack of 60°, 30° with brownish clay										CL
		7.30		Light grey													CM
		8.00															CM
		8.60		Grey	Shale	Slightly weathered	Hard Crack at 40°, 50° 60° with iron oxide										CM
		10.00															CM
		11.00															CM
		12.00		Dark grey													CM
		14.00				Slightly weathered to fresh	Hard 12.95m Crack of 30° with iron oxide 13.50m Clean crack of 50°										B
	79.27	14.00															CM
		14.80		Light grey	Sandy shale		Clean crack of 80° 14.80m Joint of 60° with iron oxide										CM
		15.00															CM
		19.50															CM
		19.70															CM
	73.27	20.00		Light grey	Shaly sandstone	Slightly weathered	16.20m Iron oxide stained crack of 20° 16.50m Crack of 70° with calcite 18.10m Joint of 60° with iron oxide 19.20m Iron oxide stained crack										CM
																	CM

A. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Depth

D : Density, Specimen In Air. (grt/cm³)

σ_c : Unconfined Compression Strength. (Kgt/cm²)

Checked

Fig. 4.11.47

Geological Log. of Borehole

Project Name		Taket Hydro-electric Power Development Project			Site Name		Upper Tekoi Dam Site							
Hole No	UD-16(1)	Elevation of Ground Level	172.42 m	Ground Water Level	-600m	Bit Size	76(NX)%							
Date	Beginning	September 22nd, 1982	Operator	Masahito NARITA			Casing	00m to 3.5 m						
	Ending	October 13th, 1982	Supervisor	Tokuji SUGIMOTO Shiro OGANO			Dry Drilling	00m to 1.1 m						
Scale	Elevation(m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R. Q. D (%)	Logan Value. (L _v) Permeability. K (cm ² /sec)			Result of Rock Tests	Rock Classification
										(L _v) 10 ⁻¹	10 ⁻²	10 ⁻³		
	179.97	0.45	-1	Brown	Sandy soil		Containing organic material Clayey sand	20 40 60 80	20 40 60 80					
		1.00		Yellowish white	Fine quartzose sandstone	Completely weathered	Very soft Mainly clayey sand with breccia							
		3.00		Whitish yellow										
		3.50		Light brown										
	168.37	4.05		Light brown	Siltstone		Soft Iron oxide stained crack at 10', 40', 50' With brownish clay							
	167.97	4.45		Whitish brown										
		5.00		Greyish white	Fine quartzose sandstone	Highly weathered	Soft Iron oxide stained crack at 20', 30', 50', 80' With brownish and whitish clay							
		5.30		Whitish brown										
		7.00		Light brown										
	162.97	9.45			Fine quartzose sandstone	Highly weathered	Very soft Crocky zone With iron oxide and brownish clay							
		10.35		Brown										
	159.72	12.70			Clayey shale		Fractured zone Mainly whitish clay with breccia (15mm to 30mm)							
		14.00		Whitish brown										
		14.90		Reddish brown	Dark grey Shale	Moderately weathered	Very soft Fractured zone Mainly breccia (15mm to 30mm) with clay							
		16.95		Whitish brown										
		20.00												

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Depth
 D: Density, Specimen in Air. (g/cm³)
 UC: Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 4.11.48

Geological Log of Borehole

Project Name		Takai Hydro-electric Power Development Project			Site Name		Upper Takai Dam Site					
Hole No	UD-16(2)	Elevation of Ground Level	17242m	Ground Water Level	-600m	Bit Size	76(NX)%					
Date	Beginning	September 22nd, 1982	Operator	Masakatsu NARITA		Coatag	00m to 35 m					
	Ending	October 13th, 1982	Supervisor	Tokuji SUGIMOTO Shiro OGANO		Dry Drilling	00m to 1.1 m					
Seate	Elevation(m)	Depth(m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Logon Value (L _u) Permeability K (cm/sec)	Results of Rock Tests	Rock Classification
								20 10 80	20 10 80	(L _u) 10 ⁻¹ 10 ⁻² 10 ⁻³		
	152.22	20.20			Clayey shale		Fault clay					
	149.82	22.60		Dark grey	Shale		Medium hard Cracky zone with clay.					D near Cl
	149.42	23.00			Clayey shale		Fault, moisty breccia					
		23.60			Shale							
		24.75		Dark grey	Silty shale	Moderately weathered	Medium hard Cracky zone with clay					D
		26.00		Dark grey	Shale		Soft Cracky zone					
	145.62	26.00			Silty shale		Mainly breccia (#5m/m to 50m/m with clay)					
	145.42	27.00		Light grey	Clay		Fault clay					
				Dark grey	Silty shale	Moderately weathered	Medium hard Cracky zone with clay					D 20 Cl
	143.42	29.00			Clay		Fault clay including breccia					D
	142.94	29.48		Grey	Clay							D
		30.00		Dark grey	Silty shale		Joint at 65° to 90°					Cl
	141.97	30.45		Grey	Shaly sandstone		Hard, crack at 37.5°				30.0-30.7 D = 2.653 σ _c = 661	Cl
				Dark grey	Silty shale		Medium hard Cracky zone with clay					D near Cl
	140.42	32.00										
		32.86		Dark grey	Sandy shale	Slightly weathered						
		35.00					Fractured zone Very soft Moisty clay with breccia					D
	134.72	37.70		Light grey	Shale							
				Grey	Fine sandstone		Cracky, hard Clean crack at 50° Joint at 75° with shale					Cl near Cl Cl
	132.92	39.50										
		40.00					Cracky with clay					

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Depth

D : Density, Specimen in Air. (g/cm³)

σ_c : Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 4.11.49

Geological Log. of Borehole

Project Name				Site Name						
Takai Hydro-Electric Power Development Project				Upper Tekoi Dam Site						
Hole No.	Elevation of Ground Level	172.42 m	Ground Water Level	-600m	Bit Size	76 (NX) %				
Date	Beginning	September 22nd, 1982	Operator	Masakazu NARITA	Casing	00m to 35m				
	Ending	October 13th, 1982	Supervisor	Tetsuji SUGIMOTO Shiro OGANO	Dry Drilling	00m to 1.1m				
Scale	Depth (m)	Color	Name of Sample	Weathering	Visual Description	Recovery (%)	R. Q. D. (%)	Logea Vals. (Lo) Permeability. K (cm/s)	Result of Rock Tests	Rock Classification
						20 40 60 80	20 40 60 80	(L) 10 ⁻¹ 1 10 10 ² (K) 10 ⁻¹ 10 ⁻² 10 ⁻³		
	129.42-130.00	Grey	Fine sandstone		Cracky zone or fractured zone					O
	45.00			Slightly weathered	Cracky, hard clean crack at 20° 30°, 80°					CL
	126.42-146.00	Brown or Grey	Fine sandstone		Cracky, hard Crack, with whitish clay					O CL
	48.00 48.20 48.35 49.00	Black	Shale		Cracky zone, Medium hard Crack with clay or quartz					CL CL
	122.42-150.00	Grey	Fine sandstone		Cracky zone, hard with clay					CL

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Depth
 ρ : Density, Specimen in Air. (g/cm³)
 σ_c : Unconfined Compression Strength. (Kg/cm²)

checked

Fig.4.11.50

Geological Log of Borehole

Project Name		Tekol Hydro-electric Power Development Project			Site Name		Upper Tekol Dam Site						
Hole No.	UD-17 (1)	Elevation of Ground Level		102.32 m		Ground Water Level	-6.7 m	Bit Size	76 (NX)%				
Date	Beginning	September 7th, 1982		Operator	Tokosh TOYA		Casing	00m to 1.5 m					
	Ending	September 12th, 1982		Supervisor	Tokuji SUGIMOTO Shiro OGANO		Dry Drilling	00m to 1.4 m					
Scale	Elevation(m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Lugeon Value (Lu)	Permeability (K)	Result of Rock Tests	Rock Classification
								(%)	(%)	(Lu) 10 ²	(K) 10 ²		
	100.92	1.40	○ ○ ○ ○ ○	Brown	Talus deposits		Containing organic material. Mainly weathered breccia with sand and clay						
		2.00		Greyish white									
		3.00		Brownish grey	Medium quartzose sandstone	Highly weathered	Soft Crack of 20°, 50° With brownish or whitish clay						C ₁
		4.05		Brown									
		4.25		Yellow brown	Clayey sand		Fractured zone						
		5.00		Brownish white		Moderately weathered	Medium hard Crack of 40°, 60° 80° with clay						C ₁ near C ₁
		5.40		Brownish grey									C ₁
		7.00			Medium quartzose sandstone	Slightly weathered	Very hard Iron oxide stained crack of 40°, 60°, 30°						C ₁
		9.00		Light grey			79m Crack of 50° with clay						C ₁
		9.60					Very hard Iron oxide stained crack of 30°, 60°						C ₁
	92.32	10.00					Cracky zone Iron oxide stained crack						C ₁ near C ₁
		10.80											C ₁
	91.27	11.05		Dark grey	Shale		Hard Joint of 35°						C ₁
		12.30		Dark grey	Sandy shale	Fresh	12.3m Crack of 20° with quartz vein						C ₁
	68.42	13.90					13.6m Crack of 70° with quartz vein						C ₁
	87.67	14.65		Brownish grey			Cracky, Iron oxide stained crack						C ₁
	86.92	15.40		Light grey	Shaly sandstone	Slightly weathered to fresh	Hard Iron oxide stained crack of 60°						C ₁
		15.80		Dark grey	Sandy shale								C ₁
		16.00		Light grey	S. sandstone								C ₁
		16.40		Dark grey	Sandy shale		16.4m Joint of 35°						C ₁
	65.42	16.90		Dark grey	F. sandstone Sandy shale								C ₁
				Dark grey	Shaly sandstone	Very fresh	Very hard						B
	19.65												
	19.80				Sandy shale		19.8m Joint of 30°						
	20.00			Grey	Shaly sandstone								

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Depth
D : Density, Specimen In Air. (gri/cm³)
σc : Unconfined Compression Strength. (Kgf/cm²)

Checked

Fig. 4.11.51

Geological Log. of Borehole

Project Name		Tekoi Hydro-electric Power Development Project			Site Name		Upper Tekoi Dam Site								
Hole No	UD-17 (2)	Elevation of Ground Level	102.32 m	Ground Water Level	-6.7 m	Bit Size	16 (NX)%								
Date	Beginning	September 7th, 1982	Operator	Tokoshi TOYA		Casing	00m to 15 m								
	Ending	September 12th, 1982	Supervisor	Tetsuji SUZUKI Shiro OGANO		Dry Drilling	0.0m to 1.4 m								
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Logon Value (Lg) Permeability K (cm/sec)			Result of Rock Tests	Rock Classification	
								20 40 60 80	20 40 60 80	(Lg) 10 ⁻¹ 10 ⁻² 10 ⁻³					
	79.85	22.45		Grey	Shaly sandstone	Fresh	Hard Crack of 65° with calcite Joint of 25° 22.25m Iron oxide stained crack of 70°								
	79.37	22.95		Dark grey	Shale										
	77.22	25.10		Grey	Shaly sandstone	Fresh	Hard Crack of 65° with calcite								
	75.07	27.25		Dark grey	Sandy shale		Hard 25.75m Clean crack of 50° 26.6m Clean crack of 60°								
		27.45		Grey	S sandstone		27.5m Clean crack of 60°								
		28.00		Dark grey	Silty shale										
	73.22	29.10				Very fresh	Very hard								
		30.00		Dark grey	Sandy shale										
	71.32	31.00					Hard Crocky Crack with calcite								
		32.00				Fresh	Hard 32.9m Crack of 60° with calcite 33.7m Crack of 60° with calcite 34.6m Crack of 80° with calcite								
		35.00		Dark grey	Silty shale										
		35.80					35.7m With quartz vein 36.8m With quartz vein								
						Very fresh	Very hard								
	63.17	39.15													
	62.32	40.00		Dark grey	Shale		Very hard With quartz vein								
R. Q. D. : Rock Quality Designation															
Legend Result of Rock Tests															
											Depth				
											D : Density, Specimen in Air. (g/cm ³)				
											σ _c : Unconfined Compression Strength. (Kg/cm ²)				
											3900-396				
											0.2711				
											0.574				
											checked				

Fig. 4.11.52

Geological Log. of Borehole

Project Name		Tekai Hydro-electric Power Development Project			Site Name		Upper Tekai Dam Site					
Hole No	UD-18 ()	Elevation of Ground Level	74.67 m	Ground Water Level	-1.0 m	Bit Size	76 (NX)%					
Date	Beginning	September 16th, 1982	Operator	Akio SASAKI			Casing	00m to 05 m				
	Ending	September 19th, 1982	Supervisor	Tetsuji SUJIMOTO Shiro O'BANO			Dry Drilling	00m to 05 m				
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Logon Value (Lg) Permeability, K (cm/m)	Result of Rock Tests	Rock Classification
								20 (0.80)	20 (0.80)	(Lg) 10 ¹ 10 ² 10 ³ (K) 10 ¹ 10 ² 10 ³		
	73.69	0.50	0	Brown	River Deposits		Mainly boulder with sand					
		1.00	0	Brownish white								
		2.00		Greyish white	Medium quartzose sandstone	Moderately weathered	Very hard Iron oxide stained crack at 10°, 20°, 40°, 80° 4.50m Crack at 70° with clay					
		3.00		Brownish grey								
		4.00		Light grey								
		5.65		Brownish white								
	69.02	5.65					With shale, joint at 60°					
		10.00		Light grey	Medium quartzose sandstone	Slightly weathered	Very hard Iron oxide stained crack at 10°, 20°, 30°, 40°, 50°, 60° 10.95m Crack at 70° with clay					
		11.00										
	61.52	13.15										
	60.17	14.50		Light grey	Coarse quartzose sandstone	Slightly weathered	Very hard Iron oxide stained crack at 20°, 40°, 70°					
	59.67	15.00		Dark grey	Shale		Medium hard Joint at 75°					
		15.95			15.90m to 15.95m Shale		Very hard Joint at 70°					
		17.30		Light grey	17.30m Shale	Slightly weathered to fresh	Very hard Joint at 70° Iron oxide stained crack at 10°, 30°, 50°					
		18.50			Coarse quartzose sandstone							
	54.67	20.00					Very hard Clean crack at 5°, 20°, 40°					

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Depth
 D : Density, Specimen in Air. (g/cm³)
 σ_c : Unconfined Compression Strength. (Kg/cm²)

215-225
 D = 2609
 σ_c = 2462

360-395
 D = 2563
 σ_c = 1641

checked

Fig. 4.11.53

Geological Log. of Borehole

Project Name				Site Name		Upper Tekai Proposed Borrow Area								
Hole No	UB-1 ()	Elevation of Ground Level	164.61 m	Ground Water Level	- m	Bit Size	75 (NX) %							
Date	Beginning	September 12th, 1982	Operator	Tetsuharu IZUMI	Coring	0.0m to 11.0m								
	Ending	September 15th, 1982	Supervisor	Tokuji SUGIMOTO Shige OGANO	Dry Drilling	0.0m to 3.0m								
Seate	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Logan Value. (Ln) Permeability. K (cm/m)			Result of Rock Tests	Rock Classification
								20 (9) (80)	20 (10) (80)	(K) 10 ⁻¹	10 ⁻¹	10 ⁻²		
	164.31	0.30		Dark brown	Top soil		Containing organic material							
				Brown	Soil	Completely weathered	Clayey							
	161.61	3.00												
	160.81	3.80		Light brown			Very soft							
	160.11	4.50					Clayey shale							
	159.61	5.00		Light grey	Shale									
		6.10		Brownish grey			Soft Cracky, with clay							
		6.65					Fractured zone clay including breccia							
		7.10		Brown	Shaly Sandstone		Joint at 55°							
	157.06	7.55					Fractured zone							
		7.90					Woody, clay with breccia							
	156.41	8.20		Brownish grey	Shale									
	156.61	9.00					Soft							
	155.41	9.20		Whish grey	Shale		Iron oxide stained crack of 10°, 20°							
	155.01	9.60		Brown	S. Sandstone		Joint at 55°							
	153.86	10.75		Whish grey	Shale		Soft							
	153.61	11.00		Light brown			Iron oxide stained crack of 10°, 30°							
	153.41	11.20		Brownish grey			Joint at 55°							
	152.96	11.65												
	152.61	12.00		Brown	Sandy Shale	Highly weathered	Soft							
							Cracky zone							
		12.60		Brownish grey			Iron oxide stained crack							
	151.61	13.00					Fractured zone clayey							
				Light grey	Shale									
	151.06	13.55					Cracky zone							
	150.61	14.00		Brownish grey			Crack with clay							
							Fractured zone clay including breccia							
	150.06	14.55												
	149.66	14.95		Brown	F. Sandstone		Cracky zone with clay							
	149.01	15.00												
	148.10	16.00					Soft to medium hard							
							Iron oxide stained crack of 20°, 30°							
	147.21	17.40		Brownish grey	Shale		Joint at 55° with clay							
	146.71	17.90					Medium hard Iron oxide stained crack of 70°							
				Brown	Fine Sandstone		at 30° Joint 55°							
	146.06	18.55												
	145.11	19.50		Brownish grey	Shale	Moderately to slightly weathered	Medium hard to hard							
	144.86	19.76					Iron oxide stained crack of 70°							
	144.61	20.00		Grey	Sandy Shale		Joint at 55° to 60°							

A. Q. D | Rock Quality Designation

Legend Result of Rock Tests

Q_u D_u

D_u Density, Sp. Gr. (g/cm³)

Q_u Unconfined Compression Strength. (Kg/cm²)

checked

900-2913
D=2320
Q=165
C_u

Fig 4.11.54

Geological Log. of Borehole

Project Name		Taket Hydro-electric Power Development Project			Site Name		Upper Takoi Proposed Borrow Area					
Hole No	UB-2 (1)	Elevation of Ground Level	150.06 m	Ground Water Level	-8.0 m	Bit Size	75 (NX)%					
Date	Beginning	September 18th, 1982	Operator	Tetsuharu IZUMI		Casing	0.0m to 1.5m					
	Ending	September 21st, 1982	Supervisor	Tetsuji SUJIMOTO Shiro OGANO		Dry Drilled	0.0m to 1.0m					
Scale	Direction (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Lugeon Value (Lu) Permeability K	Result of Rock Tests	Rock Classification
								20 40 60 80	20 40 60 80	(Lu) 10 ¹ 10 ² 10 ³ 10 ⁴ 10 ⁵ 10 ⁶		
		149.06	0.40	Brown	Clayey soil							
		149.06	1.00	Reddish brown	Soil	Completely weathered	Containing organic material including breccia					
		148.52	1.60			Highly weathered	Crocky with white clay					
		147.36	2.70	Purplish grey	Medium sandstone	Moderately weathered	Soft to medium hard crack of 20°, 30°, 60° with clay					
		147.06	3.00									
			3.35				Crocky, with clay					
				Greyish purple	Silty shale	Slightly weathered	Hard Crack of 20°, 40°, 60° with brownish clay. Joint of 35° with clay					
		143.86	6.20				Hard					
			6.40				Iron oxide stained crack of 10°, 20°, 30° Crack of 30° with clay					
			8.00				Crocky					
			8.50									
				Purplish grey								
					Medium sandstone		Hard iron oxide stained crack of 20°, 30°, 40° Joint at 55°					
			12.35									
			13.00			Moderately weathered	Crocky with iron oxide					
				Grey								
							Hard iron oxide stained crack of 20°, 30°, 40°, 50°, 60° - 16.15m Iron oxide stained Joint at 65°				145-155 D: 2599 σ _c : 1373	
		132.76	17.30									
		131.66	18.20	Bluish grey	Fine sandstone		Crocky, with whitish clay					
			19.00				Hard, iron oxide stained crack of 30°, 40°					
			19.50	Whitish grey	Medium Sandstone		Crocky with iron oxide iron oxide stained crack of 40°, 70°, 20°					
			20.00									

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests

Depth

D : Density, Specimen in Air. (g/cm³)

σ_c : Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 4.11.55

Geological Log of Borehole

Project Name		Takai Hydro-electric Power Development Project			Site Name		Upper Takai Proposed Borrow Area							
Hole No	UB - 2 (2)	Elevation of Ground Level	150.06 m	Ground Water Level	-8.0 m	Bit Size	16 (NX) %							
Date	Beginning	September 18th, 1982	Operator	Tetsuharu IZUMI		Casing	00m to 1.5 m							
	Ending	September 21st, 1982	Supervisor	Takuji SUGIMOTO Shiro OGANO		Dry Drilling	00m to 1.0 m							
Seals	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R. Q. D (%)	Logan Value. (Lv) Permeability. K (cm/m)			Result of Rock Tests	Rock Classification
								20 40 60 80	20 40 60 80	(Ln) 10 ⁻¹ 10 ⁻² 10 ⁻³	(K) 10 ⁻¹ 10 ⁻² 10 ⁻³			
	229.11	2050		Light brown	Medium Sandstone	Moderately weathered	Hard Iron oxide stained crack of 40°, 70°, 20°		33				C _u	
		2065					Hard Iron oxide stained crack of 10°, 20°		82					
		2300					2235m Crack of 20° with powder quartz		29				C _u	
							Cracky with greyish clay		78				C _u near	
				Light grey	Medium sandstone		Hard Iron oxide stained crack of 30°, 20°		70				C _u	
	224.06	2600					Clean crack of 30° at 2490m Joint of 65° with shale		66					
							Hard Clean crack of 20°		62					
		2720					Cracky with quartz		0					
		2786					Hard. Iron oxide stained crack of 20°		0				C _u	
							Clean crack of 20°		0					
	220.71	2936					Fractured zone							
	220.06	3000					Muddy clay with breccia						D	

R. Q. D.: Rock Quality Designation

Legend Result of Rock Tests

Depth

D: Density, Specimen in Air. (g/cm³)

σ_c: Unconfined Compression Strength. (kgf/cm²)

checked

Fig. 4.11.56

Geological Log. of Borehole

Project Name		Tekol Hydro-electric Power Development Project			Site Name		Upper Tekol Proposed		Borrow Area				
Hole No	UB -3 ()	Elevation of Ground Level		12779 m	Ground Water Level	-1.2 m	Bore Size	76 (NX) %					
Date	Beginning	September 24 th, 1982		Operator	Tetsuharu IZUMI		Casing	00m to 15 m					
	Ending	September 25 th, 1982		Supervisor	Tetsuji SUBIMOTO Shiro OGANO		Dry Drilling	00m to 080m					
Seate	Elevation(m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Logan Value (L _v) Permeability, K (cm ² /m)		Result of Rock Tests	Rock Classification
								20408080	20408080	(L _v) 10 ⁻¹ 10 ⁻²	10 ⁻¹ 10 ⁻²		
0	12759	0.20	11	R. brown	Top soil		Clayey						
	12699	0.80		Reddish purple		Completely weathered	Soft						
	12619	1.00				Highly weathered	Mainly breccia Crack with clay						
		1.60											
		3.00		Greyish purple	Shale	Moderately weathered	Hard Crack of 10', 50', 60' with clay						
		3.80											
5	12279	5.00				Fresh	345m Clean crack of 40' 4.5m Crack of 50' with whitish clay Very hard						
						Very fresh	Very hard Clean crack of 70'						
	11979	8.00		Purple	Sandy shale		720m Clean crack 770m at 10°						
						Fresh	8.10m Clean crack of 80'						
							9.50m Iron oxide stained crack of 20'						
	11624	11.55					1090m to 1100m Crack of 30', 40' with whitish clay & brownish clay						
	11569	12.10			Shaly sandstone		Crack of 40' with brown clay						
	11479	13.00				Very fresh	1245m Clean crack of 40'						
		14.00					13.20m Clean crack 13.50m at 40', 60'						
		15.00		Purple			Clean crack of 30', 40'						
		16.00			Shale	Fresh	Clean crack of 20', 50'					556-570 D = 2362 σ _c = 519	C _u
		17.00					16.45m Crack of 50' with brownish clay 16.50m Clean crack of 20'						
	0979	18.00		Greyish purple			Cracky Crack of 30', 60'						C _u
							Mainly breccia including brownish clay.						
20	0779	20.00					Fractured zone						

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Depth

σ : Density, Specimen in Air. (g/cm³)

σ_c : Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 4.11.57

Geological Log. of Borehole

Project Name				Tokai Hydro-electric Power Development Project		Site Name		Upper Tokai Proposed Borrow Area							
Hole No	UB-4 (1)		Elevation of Ground Level	135.47 m		Ground Water Level	-30.0 m		Bit Size	76(NX)%					
Date	Beginning	September 11th, 1982		Operator	Tokayoshi FUJII		Casing	00m to 1.5 m							
	Ending	September 23rd, 1982		Supervisor	Tokuji SUGIMOTO Shiro OGANO		Dry Drilling	00m to 1.2 m							
Scale	Stratigraphic	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Logon Value. (Lw) Permeability. K (cm/sec)				Result of Rock Tests	Rock Classification
	Vertical									(Lw) 10 ¹	10 ²	10 ³	10 ⁴		
		0.30		Dark grey			Containing organic material								
		0.90		Yellowish brown	Sandy soil		Including gravels								
		1.30		Yellowish brown		Completely weathered									
		3.00		Brownish white		Highly weathered	Soft Crack with clay								
		5.10		Brownish white		Highly weathered	Medium hard Crack at 40° with clay Crack at 60° with reddish clay								
		6.00			Fine quartzose sandstone		Hard Iron oxide stained crack at 30°, 40° with reddish clay								
		7.60		Greyish white		Moderately weathered	Hard Iron oxide stained crack at 20°, 40° Crack at 40° with reddish clay								
		9.00													
		10.00													
		11.70		Brownish white			Hard Iron oxide stained crack at 70°								
		12.10		Greyish white	Purplish shale	Highly weathered	Medium hard Iron oxide stained crack at 35°, 60°, 30°, 60°								
		13.00		Light grey	Shale		Fractured zone Mainly breccia with clay								
		13.35					Soft, Cracky zone								
		14.00		Greyish white	Fine quartzose sandstone		Hard. Crack at 40° with iron oxide								
		14.40		Grey	14.40-14.45m Medium sandstone		Cracky. Soft Iron oxide stained crack								
		15.05													
		15.30		Purple	Shale		Cracky zone Iron oxide stained crack								
		16.40		Brownish white			Fractured zone								
		17.50			Fine quartzose sandstone	Moderately weathered	Hard Iron oxide stained crack at 40°, 70°, 60° 30°, 60°								
		19.50		Greyish white											
		19.70													
		20.00					Cracky zone								

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Depth
 ρ : Density, Specimen In Air. (g/cm³)
 σ_c : Unconfined Compression Strength. (kgf/cm²)

checked

Fig. 4.11.58

Geological Log. of Borehole

Project Name		Tekol Hydro-electric Power Development Project			Site Name		Upper Tekol Proposed Borrow Area							
Hole No	UB-4 (2)		Elevation of Ground Level	135.47 m		Ground Water Level	-30.0 m		Bit Size	76(NX)%				
Date	Beginning		September 11th, 1982		Operator		Tokoyoshi FUJII		Cooling		0.0m to 1.5 m			
	Ending		September 23rd, 1982		Supervisor		Tokuji SUGIMOTO Shiro OGANO		Dry Drilling		0.0m to 1.2 m			
Scale	Elevation(m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Loges Value (Lp) Permeability K (cm/sec)			Result of Rock Tests	Rock Classification
										(K) 10 ⁻¹	10 ⁻²	10 ⁻³		
0	114.42	21.05		Greyish white	Fine quartzose sandstone	Highly weathered	Very hard Iron oxide stained crack at 20°, 50°, 70°	20	20					Cu
	114.07	21.40		G. brown	Shale	Moderately weathered	Soft							Cu
	113.47	22.00		Greyish brown										
	112.92	22.55			22.55-22.65m Shale									
	111.72	23.75		Grey	Medium sandstone		Hard Iron oxide stained crack at 20°, 60° Joint at 70° & 65°							Cu
5		25.30		Dark grey	Shale	Slightly weathered	Hard Cracky							Cu
	109.07	26.40												
	108.07	27.40		Light grey	Fine quartzose sandstone		Very hard Iron oxide stained crack at 30°, 40°							Cu
							28.35m with quartz vein							Cu
							Very hard							Cu
10				Light grey	299m Shale	Slightly weathered	Iron oxide stained crack at 10°, 20°, 60°, 40° Joint at 65° to 70°							Cu
	103.47	32.00			Medium quartzose sandstone									Cu
		33.00												
	101.77	33.70				Fresh	Very hard Clean crack at 45°, 30°, 65° Joint at 25°							Cu
	101.17	34.30		Brownish grey										
15	100.27	35.20		Light grey	Shale									
	99.87	35.60												
	99.62	35.85		Dark grey	Shale		Very hard Iron oxide stained crack at 20°, 60°, 30° Joint at 70°							Cu
	96.07	37.40		Light grey	Medium quartzose sandstone	Slightly weathered to fresh								
	97.62	37.85			37.85m Shale		Cracky zone Minor crack at 30° Iron oxide stained crack Joint at 70°							
		38.50												
	96.62	38.85												
	96.22	39.25		Dark grey	Shale									
20				Light grey	Fine quartzose sandstone		Iron oxide stained crack at 50°, 20°							

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests
 D: Density, Specimen in Air. (g/cm³)
 σ_c: Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 4.11.59

Geological Log. of Borehole

Project Name		Tekel Hydro-electric Power Development Project			Site Name		Upper Tekel Proposed Borrow Area							
Hole No	UB-4 (3)	Elevation of Ground Level	135.47 m <th>Ground Water Level</th> <td>-30.0 m <th>Bit Size</th> <td colspan="4">16 (NX)%</td> </td>	Ground Water Level	-30.0 m <th>Bit Size</th> <td colspan="4">16 (NX)%</td>	Bit Size	16 (NX)%							
Date	Beginning	September 11th, 1982	Operator	Tokoyoshi FUJII		Casing	00m to 1.5 m							
	Ending	September 23rd, 1982	Supervisor	Tetsuji SUBIMOTO Shiro OGANO		Dry Drilling	00m to 1.7 m							
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Logan Value. (Lw) Permeability. K (cm/sec)			Result of Rock Tests	Rock Classification
								20 0 0 80	20 0 0 80	(K) 10 ⁻¹ 10 ⁻⁵ 10 ⁻³				
	9307	4240		Light grey	Fine quartzose sandstone		Very hard iron oxide stained crack at 30°, 50°, 60°							
	9142	4405		Light grey	Medium quartzose sandstone		Very hard iron oxide stained crack at 20° crack at 70° with quartz							
	9107	4440		Dark grey	Shale									
	8982	4565		Light grey	44.75m Shale Medium quartzose sandstone	Slightly weathered to fresh	Very hard iron oxide stained crack at 20°, 40° Joint at 60°							
	8722	4822		Whish grey	46.65m shale Coarse quartzose sandstone		Very hard with shale patch iron oxide stained crack at 20°, 40°, 60° Clean crack at 60° Joint at 60° with shale							
	8672	4875		Light grey	Mq sandstone									
	8622	4925		Dark grey	Shaly sandstone									
	8547	5000		Grey	Medium sandstone		59.80m Clean crack at 90°							

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests

Depth
 ρ : Density, Specimen in Air. (g/cm³)
 σ_c : Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 4.11.60

Geological Log. of Borehole

Project Name		Takes Hydro-electric Power Development Project			Site Name		Upper Takes Proposed Barron Area								
Hole No	UB-5 ()	Elevation of Ground Level	77.25 m	Ground Water Level	-0.5 m	Bit Size	76 (NX)%								
Date	Beginning	September 28th, 1982	Operator	Shigemitsu HAGATA		Casing	00m to 7.8m								
	Ending	October 4th, 1982	Supervisor	Tetsuji SUGIMOTO Shiro OGANO		Dry Drilling	00m to 3.8m								
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Logan Value (L _v) Permeability (K) (L _v) 10 ¹ 10 ² 10 ³ (K) 10 ¹ 10 ² 10 ³			Result of Rock Tests	Rock Classification	
	7465	260		Brown	River bed deposits		Mony fine sand including clay containing organic material.								
	7345	380		Greyish brown			Clayey sand containing organic material								
	7325	405		Grey			Gravel with clay								
	7260	470			470 to 475m Fine sandstone		Soft Iron oxide stained crack								
	7135	500			Shale	Highly weathered	Crack with brownish clay								
	7055	670		Brown	Sandy shale		Iron oxide stained crack of 40°, 50°								
	7015	710					Fractured zone, clay								
	6965	760			Fine sandstone		Soft								
	6925	800			Sandy shale	Moderately weathered	Iron oxide stained crack of 10°, 70°, 40°								
	6835	830			Fine sandstone										
	6825	900		Brownish blue			Hard Iron oxide stained crack of 30°, 40°, 60°, 80°								
	6725	1000		Greyish blue		Slightly weathered	Jard of 80°								
	6625	1100				Moderately weathered	Hard Iron oxide stained crack of 20°, 60°, 40°								
	6425	1300			Sandy shale	Fresh	Hard Iron oxide stained crack of 20°, 70°								
	6010	1715		Bluish grey			13.45m Iron oxide stained crack of 20°								
	5965	1760			Shaly sandstone		16.65m Crack of 0° with quartz								
				Bluish grey	Sandy shale	Very fresh	27.90m Crack of 55°								

R. Q. D. ; Rock Quality Designation

Legend Result of Rock Tests

Depth
 D : Density, Specimen in Air. (g/cm³)
 σ_c : Unconfined Compression Strength. (Kgf/cm²)

checked

Fig. 4.11.61

Geological Log of Borehole

Project Name		Tskai Hydro-electric Power Development Project			Site Name	Upper Tskai Proposed Borrow Area								
Hole No	UB-5 (2)	Elevation of Ground Level	77.25 m <th>Ground Water Level</th> <td>-0.5 m</td> <th>Bit Size</th> <td>76 (NX) %</td>	Ground Water Level	-0.5 m	Bit Size	76 (NX) %							
Date	Beginning	September 28 th, 1982	Operator	Shigemitsu NAGATA		Casing	00m to 7.8 m							
	Ending	October 4 th, 1982	Supervisor	Tskaji SUBIMOTO Shigeo OGANO		Dry Drilling	00m to 3.8 m							
Sample	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Ingeon Value. (L _v) Permeability. K (cm ² /m)			Result of Rock Tests	Rock Classification
								20 40 60 80	20 40 60 80	(L _v) 10 ¹ 10 ² 10 ³	(K) 10 ¹ 10 ² 10 ³			
	57.15	20.10		Dark grey	Shaly sandstone	Fresh	Hard Crack at 70° with calcite							
	56.30	20.96			Sandy shale		2170m							
	55.25	22.00			Fine sandstone		Clean crack of 50°							
	54.75	22.50			Sandy shale		2200m Crack of 50° with calcite vein					0.828		
	53.65	23.60				Very fresh	237m 239m Quartz vein							
				Bluish grey										
	51.25	26.00			Shaly sandstone									
	49.80	27.45					2700 Crack of 70° with quartz 275 Clean crack of 50°					0.30		
		28.40			Silty shale									
	48.25	29.00		Dark grey		Fresh								
	47.25	30.00					Crack of 40°, 50° with quartz 3020m 3040m Crack of 50°							
				Dark grey	Sandy shale		3110m Clean crack of 60°							
	45.25	32.00			Shaly sandstone		325m Clean crack of 20°							
	44.00	33.25			Shale									
	43.35	33.90			Shaly sandstone									
	43.05	34.20		Grey	F. sandstone	Very fresh	Joint of 75°							
	42.55	34.70		Dark grey	Shaly sandstone									
				Grey	Fine sandstone		3575m Clean crack of 40°							
	41.65	35.80												
	41.25	36.00												
				Dark grey	Sandy shale	Fresh	Clean joint of 75°							
	38.75	38.50												
	38.25	39.00		Grey	Fine sandstone		388m With quartz vein							
				Dark grey	Sandy shale	Very fresh	Hard							

R. Q. D ; Rock Quality Designation

checked

Legend Result of Rock Tests

Depth

D: Density, Specimen in Air. (g/cm³)

σ_c: Unconfined Compression Strength. (Kg/cm²)

Project Name		Tekel Hydro-electric Power Development Project			Site Name		Upper Tekel Proposed Boron Area							
Hole No	UB-5(3)	Elevation of Ground Level		77.25 m	Ground Water Level	-05 m	Bit Size	76 (NX) %						
Date	Beginning	September 28th, 1982		Operator	Shigemitsu NAGATA		Casing	00 m to 7.8 m						
	Ending	October 4th, 1982		Supervisor	Tokuji SUJIMOTO Shiro OGANO		Dry Drilling	00 m to 3.8 m						
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Logon Value. (L _u)		Permeability. K (cm ² /m)	Result of Rock Tests	Rock Classification
	20 40 60 80									20 40 60 80	(L _u) 10 ¹ 10 ²			
	3575	4150				Very fresh	Hard							
					Sandy shale									
	3425	4300				Fresh	Crack of 80° 70° with greyish clay							
	3380	4345												
	3325	4400		Dark grey		Very fresh	Hard							
	3225	4500			Shaly sandstone		Fresh	Crack of 50° 60° with quartz						
		4656												
	3056	4670			Shale		Very fresh	Hard						
	2935	4790			Shaly sandstone									
	2825	4900		Grey	Fine sandstone									
	2770	4935												
	2725	4955		Dark grey	Sandy shale	Fresh	Crack of 30° with quartz							
		5000		Grey	F. sandstone		Clean joint at 70°							

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Depth

D : Density, Specimen in Air. (g/cm³)

σ_c : Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 4.11.63

Geological Log. of Borehole

Project Name		Tekai Hydro-electric Power Development Project			Site Name		Upper Tekai Proposed Bottom Area								
Hole No		UB-6 (1)		Elevation of Ground Level		107.10 m		Ground Water Level		-5.0 m		Bit Size		76 (NX)%	
Date		Beginning		October 6th, 1982		Operator		Shigemitsu NAGATA		Casing		00m to 100m			
		Ending		October 13th, 1982		Supervisor		Tokuji SUGIMOTO Shiro O'BANO		Dry Drilling		00m to 100.0m			
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	In-situ Value. (L _v) Permeability. K (cm/s)			Result of Rock Tests	Rock Classification	
								20 40 60 80	20 40 60 80	(L _v) 10 ⁻¹ 10 ⁻² 10 ⁻³	(K) 10 ⁻⁴ 10 ⁻⁵ 10 ⁻⁶				
	106.10	1.00		Brown	Soil		Clayey Containing organic material								
	106.60	1.30													
		4.00			Sandy shale		Clayey Very soft								
		4.65			Clay										
	101.70	5.40		Reddish brown	Sandy shale	Completely weathered	Very soft Iron oxide stained crack at 70°/50°								
		9.30			Shale		Very soft Iron oxide stained crack at 70°/40°/50°/20°/60° 8.10m to 8.90m Crack at 60° with brownish clay								
	97.10	10.00		Yellowish brown											
		12.00													
		12.35		Reddish brown		Highly weathered	Soft Iron oxide stained crack at 30°/50°/60° Crack at 30°/50° with clay Cracky Iron stained crack								
		14.50			Shale		Soft Iron oxide stained crack at 30°/40°/60°								
	92.50	15.00				Moderately weathered									
		17.00		Brown			Soft Iron oxide stained crack at 20°/30°/60° 15.60-17.00m; cracky								
		17.60				Highly weathered	Cracky zone Cracky crack with clay								
	74.20	18.40					Medium hard Iron oxide stained crack at 20°/40°/60° Joint at 75°								
	67.50	19.60		Greyish brown	Sandy shale										
				Brown	fine sandstone										

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Depth
 O : Density, Specimen in Air. (g/cm³)
 σ_c : Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 4.11.64

Geological Log. of Borehole

Project Name		Takai Hydro-electric Power Development Project			Site Name		Upper Takai Proposed Bottom Area								
Hole No	UB - 6 (2)	Elevation of Ground Level	107.10 m	Ground Water Level	-5.0 m	Bit Size	75(NX)X								
Date	Beginning	October 6 th , 1982	Operator	Shigemitsu NAGATA			Casing	0.0 m to 100 m							
	Ending	October 13 m , 1982	Supervisor	Takuji SUBIMOTO Sairei OGANO			Dry Drilling	0.0 m to 100 m							
Scale	Elevation(m)	Depth(m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Logos Value. (L _v) Permeability, K (cm/m)			Result of Rock Tests	Rock Classification	
								20 40 60 80	20 40 60 80	(L _v) 10 ² 10 ³ 10 ⁴	(K) 10 ² 10 ³ 10 ⁴				
0	86.30	2080		Brown	Fine sandstone	Highly weathered	Medium hard Iron oxide stained crack of 40°, 60°	[Hatched pattern]	[Hatched pattern]	[Hatched pattern]	[Hatched pattern]	[Hatched pattern]	[Hatched pattern]	[Hatched pattern]	[Hatched pattern]
	85.75	2135		Light brown			Joint of 75° with brownish clay								
		2300		Light grey	Shaly sandstone	Moderately weathered	Hard Iron oxide stained crack of 20°, 70°								
	83.80	2330													
	83.45	2365			F. sandstone										
		2400													
		2520		Grey		Slightly weathered	Hard Iron oxide stained crack of 20°, 50°, 60°								
	80.66	2615		Brown			Joint of 70°, 80°, 85°								
		2870		Greyish brown	Shaly sandstone	Slightly weathered to fresh	Hard Iron oxide stained crack of 10°, 40°								
	78.40	2870													
5		2910													
		3200		Grey		Very fresh	Very hard								
	74.50	3260					31.55 m Iron oxide stained crack of 35°								
	71.60	3350		Grey	Shale										
	73.10	3400		Grey	Fine sandstone	Slightly weathered	Very hard Iron oxide stained crack of 20°, 70°								
	72.10	3500		Grey	Medium sandstone		Iron oxide stained Joint of 80° (3280m)								
		3710					Hard Crack of 60°, 40°, 50° with clay								
				Grey	Shaly sandstone	Fresh									
							Hard Clean crack of 40°, 50° 39.20-39.50m, Coaly								
	20	6710	4000												

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Depth

0 : Density, Specimen in Air. (g/cm³)

σ_t : Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 4.11.65 Geological Log of Borehole

Project Name		Tetoi Hydro-electric Power Development Project			Site Name		Upper Tetoi Proposed Barrage Area							
Hole No	UB-6(3)	Elevation of Ground Level	107.10 m	Ground Water Level	-5.0 m	Bit Size	76(NX)%							
Date	Beginning	October 6th, 1982	Operator	Shigemitsu NAGATA		Coating	0.0 m to 10.0 m							
	Ending	October 13th, 1982	Supervisor	Tokuji SUZUMOTO Shiro OGANO		Dry Drilling	0.0 m to 10.0 m							
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Vitral Description	Recovery (%)	R. Q. D (%)	Logon Value (Lp) Permeability K (cm/s)			Result of Rock Tests	Rock Classification
								20 40 60 80	20 40 60 80	(K) 10 ⁻¹ 10 ⁻² 10 ⁻³				
	6295	446		Grey	Silty sandstone	Very fresh	41.30m Clean crack of 35° 42.20m Clean crack of 40° 42.50m Clean crack of 50° 43.50m Crack of 30° with quartz		100					C ₂
	6185	4525			Fine sandstone				100					B
	6170	4540				fresh	Very hard Iron oxide stained crack		73					C ₁
	6145	4565							100					B
	5710	5000		Brownish grey	Silty shale	Very fresh	47.75m Iron oxide stained crack of 20°		95					B

R. Q. D.: Rock Quality Designation

Legend Result of Rock Tests

0.01h

ρ: Density, Specimen in Air (g/cm³)

σ_c: Unconfined Compression Strength (Kgf/cm²)

checked

Fig. 4.1166

Geological Log. of Borehole

Project Name		Tetel Hydro-electric Power Development Project			Site Name		Upper Tetel Quarry Area								
Hole No		UO-1(1)		Elevation of Ground Level		132.56 m		Ground Water Level		-		Bill Size		76(NX)%	
Date		Beginning		October 7th, 1982		Operator		Akio SASAKI		Costing		00m to 6.5m			
		Ending		October 12th, 1982		Supervisor		Tetsuji SUGIMOTO Shiro OGANO		Dry Drilling		00m to 23m			
Scale	Elevation(m)	Depth(m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R. Q. D (%)	Logon Value, (L _v) Permeability, K (cm ² /m)				Result of Rock Tests	Rock Classification
								20 40 60 80	20 40 60 80	(L _v) 10 ¹ 10 ² 10 ³ 10 ⁴					
	13191	0.95	1	Brown	Soil		Containing organic material, sandy								
		200		Reddish brown		Completely weathered	Very soft Moistly sand including breccia								D
	13026	230		Y. brown											
		400		Greyish brown	Medium quartzose sandstone										
				Light brown	Coarse quartzose sandstone	Highly weathered	Soft Crack of 20°, 30°, 60° 70° with iron oxide and clay								C ₁
	12731	525		Greyish brown	Medium quartzose sandstone	Moderately weathered	Medium hard Iron oxide stained crack of 50°, 60°								
	12616	640		Light brown	Coarse quartzose sandstone	Highly weathered	Soft, joint of 50° with brownish clay								C ₂
		665		Light brown	Coarse quartzose sandstone	Highly weathered									C ₂
	12511	745		Brownish white											C ₂ near C ₁
		800		Greyish white											C ₂
		900		Whiteish brown	Medium quartzose sandstone		Medium hard Cracky								C ₂
		10.00		Light brown			Iron oxide stained crack								C ₂
		10.50		Light brown											
		11.00		Brown		Highly weathered									
		12.00		Light brown	Coarse quartzose sandstone		Medium hard Iron oxide stained crack of 40°, 50°								
	12086	12.00													
	11991	1385			Conglomerate		Cracky, with iron oxide and clay								
				Brown	Medium quartzose sandstone		Medium hard Iron oxide stained crack of 30°								
	11856	1400													
	11816	14.40			C ₂ sandstone		Joint of 60° with clay								C ₂
		15.30		Light brown											
		16.00		Brownish white	Medium quartzose sandstone		Hard Iron oxide stained crack of 20°, 40°, 50°, 60°, 80° with clay								
	11601	16.56		Light brown											
		17.00		Whiteish brown	Coarse quartzose sandstone										
	11491	17.65		Light brown		Moderately weathered	Cracky zone Iron oxide stained crack								
	11461	17.95		Light brown	M.g. sandstone										
				Brownish white	Coarse quartzose sandstone		Hard Iron oxide stained crack of 40°, 50°, 60°, 70°								
	11526	19.30		Light brown	Medium quartzose sandstone		Crack of 40° with clay								
		20.00													

R. Q. D.: Rock Quality Designation

Legend Result of Rock Tests

Depth

D: Density, Specimen in Air. (g/cm³)

σ_c: Unconfined Compression Strength. (Kg/cm²)

checked

Project Name		Tateki Hydro-electric Power Development Project			Site Name		Upper Tateki Quarry Area						
Hole No	UQ - 1 (2)	Elevation of Ground Level	132.56 m	Ground Water Level	- m	Bit Size	76 (NX)X						
Date	Beginning	October 7th, 1982	Operator	AKIO SASAKI		Casing	00m to 65m						
	Ending	October 12th, 1982	Supervisor	TATEKI SUBIMOTO SHIRO OGANO		Dry Drilling	00m to 23m						
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R. Q. D (%)	Logon Value (Lu)	Permeability, K (cm/sec)	Result of Rock Tests	Rock Classification
								20 (0) 80	20 (0) 80	(L _u) 10 ¹ 10 ² 10 ³			
	2025	2025		White	C, q, sandstone								
	2075	2075	III 81	W. brown	M, q, sandstone	Moderately weathered							
	2100	2100	III 56	Whitish brown	Coarse quartzose sandstone								
	2180	2180	III 076	Light brown	Medium quartzose sandstone	Highly weathered	Medium hard Iron oxide stained crack of 30°, 50°						
	2240	2240		Whitish brown	C, quartzose sandstone		Cracky zone						
	2320	2320	10936	Whitish brown	C, quartzose sandstone							2305-2320 D=2568 C _u 1283	
	2380	2380		Brownish white	Medium quartzose sandstone		Medium hard Cracky Iron oxide stained crack						
	2450	2450		White	C, q, sandstone		Clean joint of 50°						
	2515	2515		Brownish white	Medium quartzose sandstone								
	2800	2800		Light brown	Medium quartzose sandstone								
	2900	2900		Brownish grey	Medium quartzose sandstone	Moderately weathered	Hard Iron oxide stained crack of 30°, 50°						
	3030	3030		Light brown	Medium quartzose sandstone		Cracky Iron oxide stained crack						
	3100	3100	10456	Whitish grey	Medium quartzose sandstone		Hard Iron oxide stained crack of 20°, 40°, 70°						
	3270	3270		Light grey	Medium quartzose sandstone		3065m with quartz vein						
	3400	3400		Brownish grey	Medium quartzose sandstone								
	3455	3455	9801	Whitish brown	Medium quartzose sandstone	Slightly weathered	Very hard Iron oxide stained crack of 40°, 60°						
	3500	3500	9756	Brown	Medium quartzose sandstone		Cracky, iron oxide stained crack.						
	3665	3665		Brownish white	Coarse quartzose sandstone								
	3800	3800		Brownish white	Coarse quartzose sandstone	Moderately weathered	Very hard Iron oxide stained crack of 30°, 60°						
	3925	3925	9331	Brownish grey	Medium quartzose sandstone								
	4000	4000		Brown	Fine sandstone		Hard Iron oxide stained crack of 70°						

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests

Depth
D : Density, Specimen in Air (g/cm³)
σ_c : Unconfined Compression Strength (Kg/cm²)

checked

Fig 4.11.68

Geological Log. of Borehole

Project Name		Tekki Hydro-electric Power Development Project			Site Name		Upper Tekol Quarry Area							
Hole No	UO-1 (3)	Elevation of Ground Level		132.56 m	Ground Water Level	- m	Bit Size	76 (NX) %						
Date	Beginning	October 7 th , 1982		Operator	Ako SASAKI		Casing	00m to 65 m						
	Ending	October 12 th , 1982		Supervisor	Tokuji SUGIMOTO Shiro OGANO		Dry Drilling	00m to 2.3 m						
Seals	Elevation (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Ingeco Value. (L ₉)			Result of Rock Tests	Rock Classification	
	Depth (m)						20 (100%)	20 (100%)	Permeability, K (cm/m)	(L ₉) 10 ²	10 ³			10 ⁴
	918.1	407	Brownish grey	Fine sandstone	Moderately weathered	Hard, Iron oxide stained crack of 70° Joint of 50°								
	914.1	416	B. grey			Cracky								C ₂₄
		4350	Light grey	Medium - quartzose sandstone		Very hard Iron oxide stained crack of 40°, 70° Clean joint of 50°								C ₂₄
	895.6	4600	Light brown	C. quartzose sandstone		Very hard Iron oxide stained crack of 20°, 30°								C ₂₄
		4470	Grey	Medium sandstone		Clean joint of 50°								C ₂₄
		4520	Light grey	M. quartzose sandstone	Slightly weathered	Hard, Iron oxide stained crack of 60°								
		4588	Grey	Medium sandstone		Joint of 50°								
		4607	Dark grey	S. sandstone		Very hard Iron oxide stained crack of 5°, 40°, 80°								
		4735	Dark grey	Medium sandstone		Joint of 50°								
		4755	Dark grey	S. sandstone		Very hard Iron oxide stained crack of 20° 40° 50° Joint of 55°								
		4820	Dark grey	M. sandstone										
	839.6	4860	B. white	M. q. sandstone										
		5000	Light grey	Medium sandstone	Slightly weathered to fresh									
	825.6													

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Depth

○ : Density, Specimen in Air. (gri/cm³)

σ_c : Unconfined Compression Strength. (Kgf/cm²)

Checked

Fig. 4.11.69

Geological Log of Borehole

Project Name		Tekoi Hydro-electric Power Development Project			Site Name		Upper Tekoi Quarry Area							
Hole No	UQ-2 (1)		Elevation of Ground Level	164.31 m		Ground Water Level	-4.0 m		Bit Size	75(NX)%				
Date	Beginning	October 7th, 1982		Operator	Masami NARITA			Casing	00 m to 30 m					
	Ending	October 15th, 1982		Supervisor	Takuji SUBIMOTO Shiro OGANO			Dry Drilling	0.0 m to 2.0m					
Scale	Direction (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R. Q. D (%)	Logon Value. (Ln) Permeability. K (m/m)			Result of Rock Tests	Rock Classification
								20 40 60 80	20 40 60 80	(K) 10 ⁻⁸ 10 ⁻⁵ 10 ⁻²				
0	15391	0.40		Dark brown			Containing organic material							
	15286	1.45		Brown	Sandy soil									
		3.00		Brownish yellow		Completely weathered								D
		3.00		Yellowish brown	Medium quartzose sandstone		Very soft Mainly sand with sandstone gravel							
	15991	4.40		Yellowish brown										
5		5.00		Ashish grey			Medium hard. Crocky Iron oxide stained crack with clay							
		5.00		Brownish white	Coarse quartzose sandstone									
	15771	6.60		Light brown	M. quartzose sandstone		Medium hard Iron oxide stained crack at 30°/40° with clay							Cl
	15711	7.20		Light brown	M. quartzose sandstone									
	15681	7.40		Brown	Shale		Joint at 30° with clay							
	15656	7.75		Brown	C.G. sandstone									
		8.00		Brownish yellow	Shale		Crocky zone Joint at 20°-30° with limonite							
	15496	9.35		Brownish yellow	Shale									
10		10.25		Brown	Clayey shale	Highly weathered	Fractured zone Very soft							D
	15406	10.25		Brown	Clayey shale									
	15281	11.50		Brown	Medium quartzose sandstone		Crocky zone							Cl
	15226	12.10		Brownish grey	Fine sandstone		Medium hard Iron oxide stained crack with clay							
	15171	12.60		Yellowish brown										
		13.25		Brown	Medium quartzose sandstone		Fractured zone Very soft							D
	15086	13.45		G. brown	Clay (Shale)		Crocky zone Iron oxide stained crack with clay							Cl
		14.20		Brownish grey										
		14.20		Brown			Hard Iron oxide stained crack at 20°, 40°, 80°							
15	14921	15.10		Brown										
		15.10		Brownish grey	Medium quartzose sandstone		Hard Iron oxide stained crack at 20°, 40°, 80° 30°, 70°							
		18.25		Brownish grey		Moderately weathered								
		18.25		Light brown	Coarse quartzose sandstone		Hard Iron oxide stained crack at 20°, 30°, 70° 1900-2000m, Crocky							
20	14471	19.60		Light brown										
		19.60		Brown										

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Depth

0 : Density, Specimen in Air. (gr / cm³)

: Unconfined Compression Strength. (Kgf / cm²)

checked

527-1545
D = 2 602
Q = 1986

Fig 4.11.70

Geological Log. of Borehole

Project Name				Tetel Hydro-electric Power Development Project		Site Name		Upper Tetel Quarry Area								
Hole No		UO-2 (2)		Elevation of Ground Level		164.31 m		Ground Water Level		-4.0 m		Bit Size		74 (HX)X		
Date		Beginning		October 7th, 1982		Operator		Masami NARITA		Casing		00m to 30m				
		Ending		October 15th, 1982		Supervisor		Tokuji SUBIMOTO		Dry Drilling		00m to 20m				
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R. Q. D (%)	Logan Values (L _v)			Result of Rock Tests	Rock Classification		
										Permeability (C _v K)						
										(L _v) 10 ²	10 ¹⁰	10 ⁵				
	143.71	20.60		Brown	C. quartzose sandstone	Moderately weathered	Hard Iron oxide stained crack of 30° 70°								C _u	
	143.31	21.00			Conglomerate		200-210° crack								C _u	
	142.06	22.25		Light grey	Medium sandstone	Slightly weathered	Hard Iron oxide stained joint of 25°								C _u	
		22.70		Dark grey	Sandy shale		Crocky zone								D	
		22.90		Black	Shale											
		23.30		Dark grey	Sandy shale			Hard Lamination of 25° Joint of 20° to 30°								
	140.01	24.30		Dark grey	Shaly sandstone	Slightly weathered to fresh										
	138.56	25.75		Grey	Very coarse quartzose sandstone		Very hard Clean crack of 75° Joint of 20°								C _u	
		27.25		Dark grey	Conglomerate		Hard Mainly shale breccia									
	136.56	27.75														
	136.21	28.10		Grey	M. sandstone			Hard Clean crack of 85° clean joint of 20°								C _u
	135.91	28.40		Dark grey	Shale											
	135.51	28.60		Grey	Mq sandstone											
		30.00		Dark grey	Fine sandstone			Hard Clean joint of 20° clean crack of 65°								C _u
	134.11	30.20			Shale											
		31.30		Grey	Fine sandstone			Hard Clean crack of 30° Joint of 20°								C _u
	133.01	31.30														
	132.61	31.70		Dark grey	Fine sandstone		Crocky, with clay								C _u	
	131.91	32.50														
		34.45		Light grey	Medium quartzose sandstone	Fresh	Very hard 32.7m Crack of 30° with iron oxide								C _u	
	129.86	34.45						34.05m Crack of 50° with iron oxide								
	129.41	34.90		Grey	Cq sandstone											
	128.86	35.78		Black	Shale											
	128.86	35.45		Dark grey	F. sandstone											
	127.86	36.45		Grey	Shale											
		36.45		Grey	Quartzose sandstone		Very hard Clean crack of 70, 65° Clean joint of 25°									
	126.71	37.60		Grey	Conglomerate											
				Light grey	Medium quartzose sandstone		Very hard Clean crack of 65° This rock with shale patch.								C _u	

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Depth

D : Density, Specimen in Air. (g/cm³)

σ_c : Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 4.11.71

Geological Log of Borehole

Project Name		Takai Hydro-electric Power Development Project			Site Name	Upper Takoi Quarry Area																						
Hole No	UQ-2 (3)	Elevation of Ground Level	164.31 m	Ground Water Level	-40 m	Bit Size	76(NX)%																					
Date	Beginning	October 7th, 1982	Operator	Masumi HARITA		Casing	0.0m to 30 m																					
	Ending	October 15th, 1982	Supervisor	Takeshi SUBIMOTO Shiro OGANO		Dry Drilling	0.0m to 20 m																					
Strata	Direction	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R. Q. D (%)	Logan Value (Ln)			Result of Rock Tests	Rock Classification														
	Permeability K (cm ² /s)																											
										(L ₁) 10 ⁻¹	10 ¹⁰																	
										(K) 10 ⁻¹	10 ⁻⁵																	
0		23.31	41.00	Light grey	Medium quartzose sandstone	Fresh	Very hard Clean crack of 20, 30° 65°, 50°	20.43 (0.8)	20.43 (0.8)	58	30	69	70	75	80	85	90	95	100	C ₁₁ near C ₁₂								
		42.11	42.20	Light grey	Coarse quartzose sandstone																							
		43.45	43.45	Light grey	Medium quartzose sandstone																42.6m, 42.7m Iron oxide stained crack of 30° clean joint of 50°							
		44.60	44.60	Light grey	Coarse quartzose sandstone																							
		47.15	47.15	Light grey	Medium quartzose sandstone																Slightly weathered to fresh	Very hard Iron oxide stained crack of 75, 20, 60, 30° Joint of 30° to 25°						
		47.90	47.90	Whitish grey	Coarse quartzose sandstone	Very fresh	Hard			22	25	28	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	C ₁₁
		49.00	49.00	Light grey	Conglomerate																							

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests

$\frac{D \rho_{sp}}{\rho_t}$

D : Density, Specimen in Air (g/cm³)

ρ_t : Unconfined Compression Strength (Kgf/cm²)

checked

Fig. 4.11.72

Geological Log. of Borehole

Project Name		Tekol Hydro-electric Power Development Project			Site Name		Upper Tekol Quarry Area							
Hole No	UO-3 (1)	Elevation of Ground Level	234.87 m	Ground Water Level	-5.5 m	Bit Size	76 (NX) %							
Date	Beginning	October 7th, 1982	Operator	Tetsuharu IZUMI			Coring	0.0m to 60m						
	Ending	October 15th, 1982	Supervisor	Tetsuji SUBIMOTO Shiro OGANO			Dry Drilling	0.0m to 50m						
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Logan Value, (Lp) Permeability, K (cm/s)			Result of Rock Tests	Rock Classification
								2040 (0.8)	2040 (0.8)	(Ln) 10 ¹ 10 ² 10 ³	(K) 10 ¹ 10 ² 10 ³			
	23277	2.10		Brownish yellow	Soil		Containing organic material							
	22977	5.10		Light reddish brown	Fine sandstone	Completely weathered	Very soft Moist sand with breccia							O
	22957	5.30		Greyish brown	Shale									
	22917	5.70			Fine sandstone									
	22887	6.30		Light brown	Medium sandstone									
	22592	9.15		Whitish brown	Fine sandstone	Highly weathered	Medium hard Cracky Iron oxide stained crack with clay							Cu
	22487	10.00		Brown	Fine sandstone		Medium hard Iron oxide stained crack at 70°, 50° Joint at 20°							Cu
	22032	14.55		Brown	Medium quartzose sandstone	Highly weathered	Medium hard to soft Fractured zone Moist breccia with clay Iron oxide stained crack							Cu
	21827	16.60		Yellowish grey	Medium quartzose sandstone	Highly weathered	Hard Joint at 25° Iron oxide stained crack at 10°, 50°, 20°							Cu
	21737	17.50		Dark grey	Shale	Highly weathered to moderately weathered	Cracky zone to fractured zone Joint at 10°							CL
	21652	18.35					Fractured zone with clay							O
	21487	20.00		Brownish grey	Medium quartzose sandstone	Highly weathered to moderately weathered	Hard Iron oxide stained crack at 20°, 40°, 60°, 30°, 50°							Cu

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Depth

D : Density, Specimen in Air. (g/cm³)

σ_c : Unconfined Compression Strength. (Kgf/cm²)

checked

Fig. 4.11.73

Geological Log of Borehole

Project Name		Total Hydro-electric Power Development Project			Site Name		Upper Tekoi Quarry Area					
Hole No	UO-3 (2)	Elevation of Ground Level	234.87 m	Ground Water Level	-5.5 m	Bit Size	76 (NX) %					
Date	Beginning	October 7th, 1982	Operator	Tetsuharu IZUMI		Casing	00m to 60m					
	Ending	October 15th, 1982	Supervisor	Tokuji SUGIMOTO Saifu OGANO		Dry Drilling	00m to 50m					
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R. Q. D (%)	Logon Value. (L ₀) Permeability. K (cm ² /s)	Result of Rock Tests	Rock Classification
								2010080	2010080	(L ₀) 10 ¹ 10 ² 10 ³		
	213.47	21.40		Greyish white	Medium quartzose sandstone	Highly to moderately weathered	Hard Iron oxide stained crack of 20°, 40°, 60°, 30°, 50° Joint of 15° with limonite	26				
		23.40		Brownish white		Moderately weathered	Hard Iron oxide stained crack of 70°, 80° 21.40m-22.00m clean joint of 30° Joint of 25° to 30° with clay	29				
	209.67	25.20						35				
	207.87	27.00		Dark grey	Clayey shale		Very hard Iron oxide stained crack of 60° Joint of 25°	36				
		28.05						42				
		28.40										
		28.60			Medium sandstone	Slightly weathered	Very hard Iron oxide stained crack of 80°, 70° clean joint of 25° to 30°	43				
	208.22	31.65					32.15m Iron oxide stained crack of 10°	47				
		33.60		Light grey	33.60-33.65m Shale		Very hard Iron oxide stained crack of 20°, 70°, 40°, 50° 34.00-35.15m with shale patch	52				
		35.15						53				
		35.55		Black	Shale	Slightly weathered		58				
		35.75		Grey	Fq sandstone			59				
	198.77	36.10		Black	Shale		Hard to very hard craky and many joint	65				
	198.62	36.25		Dark grey or grey	Fq sandstone		joint of 60°	69				
	198.02	36.65			Shale			73				
	197.77	37.10			Fq sandstone		Elongated shale patch and sandy shale layer	75				
		37.70		Grey	Conglomerate			77				
	196.87	38.00						78				
	196.17	38.70		Light grey	38.70-38.76m Shale	Slightly weathered to fresh	Very hard Iron oxide stained crack of 60°, 50°, 70°, 40° clean crack of 50°, 20°, 30° clean joint of 25°, 30°	80				

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests

Depth
 ρ : Density, Specimen in Air (g/cm³)
 σ_c : Unconfined Compression Strength (Kg/cm²)

checked

Project Name		Tekol Hydro-electric Power Development Project			Site Name		Upper Tekol Quarry Area									
Hole No	UO-3 (3)	Elevation of Ground Level	234.87 m	Ground Water Level	-5.5 m	Bit Size	76 (NX)%									
Date	Beginning	October 7th, 1982	Operator	Yetsuhoru IZUMI		Casing	0.0m to 6.0m									
	Ending	October 15th, 1982	Supervisor	Tokuji SUGIMOTO Sairei OGANO		Dry Drilling	0.0m to 5.0m									
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)		R Q D (%)		Logon Value. (Ln) Permeability, K (cm/m)			Results of Rock Tests	Rock Classification
	0							20 40 60 80	20 40 60 80	(K) 10 ⁻¹ 10 ⁻² 10 ⁻³						
	1921242.75			Light grey	Medium quartzose sandstone		Very hard Iron oxide stained crack of 60°, 55°, 70°, 40° Clean crack of 50°, 20°, 30° Clean joint of 25°, 30°									
	1908744.00			Grey	Fine sandstone		Hard Crocky Iron oxide stained crack									Cu
		46.00		Light grey	Fine quartzose sandstone	Slightly weathered to fresh	Very hard Iron oxide stained crack of 60°, 30°, 70°									
	1873747.50						Clean crack of 20°, 40° crack of 60° with whitish clay									
	1858749.00			Light grey	Medium quartzose sandstone		Very hard Iron oxide stained crack of 20°, 50° Clean crack of 80°, 20°								4600-4812 D = 2592 σc = 672	Cu
	1851249.75			Brownish grey			Iron oxide stained crack of 50°, 75°									
	1848750.00			Light grey	Cq sandstone	Slightly weathered										

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests

Depth

D : Density, Specimen in Air. (gr/cm³)

σc : Unconfined Compression Strength. (Kgf/cm²)

checked

Fig. 4.11.75

Geological Log of Borehole

Project Name		Tatol Hydro-electric Power Development Project			Site Name		Upper Tekol Quarry Area							
Hole No	UO-4 (1)	Elevation of Ground Level	121.32 m	Ground Water Level	0.0 m	Bit Size	76 (NX) %							
Date	Beginning	October 6th 1982	Operator	Tokashi TOYA		Casing	00m to 45 m							
	Ending	October 17th, 1982	Supervisor	Tetsuji SUBIMOTO Shiro OGANO		Dry Drilling	00m to 03 m							
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R. Q. D (%)	Logeo Value (Ln) Permeability K (cm ² /s)			Result of Rock Tests	Rock Classification
								20 40 60 80	20 40 60 80	(Ln) 10 ⁻¹ 10 ⁻² 10 ⁻³	10 ⁻¹ 10 ⁻² 10 ⁻³	10 ⁻¹ 10 ⁻² 10 ⁻³		
	121.02	0.30	1.Y		Top soil		Sand with clay							
		1.50		Brownish Yellow	Coarse quartzose sandstone	Highly weathered	Soft crack of 10°, 30° with clay							C ₁
	119.32	2.00												D
		2.50												
	118.32	3.00		Grey	Shale	Completely weathered	Soft, cracky crack with clay							
	117.42	3.90					Soft to medium hard crack of 20° with clay joint of 45°							C ₁
	116.92	4.40		Brown	Silty shale									
				Light brownish yellow	Coarse quartzose sandstone	Highly weathered	Medium hard crack of 30°, 40°, 50°, 70° with clay joint of 40° with clay						255 ± 6.00 D = 2458 C _c = 754	
	113.87	7.40												
	113.52	7.80		Purplish grey	Shale									
	113.12	8.40			F. quartzose sandstone									
				Brownish grey	Medium quartzose sandstone		Hard Iron oxide stained crack of 70°, 50°, 20° joint of 50° with limonite							
	111.72	9.80												
	111.47	10.05		Brown	F. sandstone									
				Light grey	Medium quartzose sandstone	Moderately weathered	Hard Iron oxide stained crack of 70°, 50°, 30° crack of 70° with clay joint of 50° with clay							C ₂
	107.42	13.90												
	107.12	14.20		Whitish grey	Conglomerate									
				Purplish Grey	Coarse quartzose sandstone									
	06.32	15.00												
	05.67	15.65		Light brown	Conglomerate		Hard Iron oxide stained crack of 70°, 30°, 60°, 50°, 40°, 20°							
	04.87	16.45			Mq sandstone									
	04.52	16.80												
	04.27	17.05		B. grey	Shale		Medium hard Many joint of 50° with iron oxide							
		17.50		W. grey	Shaly sandstone									
	03.42	17.90		Grey	Sandstone									
	03.27	18.05		Dark grey	Shale									
				Light brown	Medium quartzose sandstone?	Moderately weathered	Hard Iron oxide stained crack of 30°, 80°							
	02.22	19.10												
				Light brown	Coarse quartzose sandstone									

R. Q. D. : Rock Quality Designation
 Leged Result of Rock Tests

D_{sp} : Density, Specimen in Air. (g/cm³)
 C_c : Unconfined Compression Strength. (Kg/cm²)

checked

Fig. 4.11.76

Geological Log of Borehole

Project Name		Takai Hydro-electric Power Development Project			Site Name		Upper Takai Quarry Area								
Hole No	UQ-4 (2)	Elevation of Ground Level	12132 m	Ground Water Level	0.0 m	Bit Size	76(NX)%								
Date	Beginning	October 6th, 1982	Operator	Tokoshi TOYA		Casing	0.0m to 4.5m								
	Ending	October 17th, 1982	Supervisor	Tokuji SUGIMOTO Shiro O'BANO		Dry Drilling	0.0m to 0.3m								
Scale	Elevation(m)	Depth(m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Ingeos Value (Lu)			Result of Rock Tests	Rock Classification	
										Permeability, K (cm ² /m)	(Lu) 10 ⁻¹	10 ⁻²			10 ⁻³
0	104.27	20.05			Conglomerate		Hard Clean joint of 50°								
	100.12	21.20		Light brown		Moderately weathered	Hard clean crack of 40,30°								C _u
		21.50			Coarse quartzose sandstone		Hard Iron oxide stained crack of 70,80,40°								C ₁
		21.90					crack of 40° with clay								
	98.62	22.70													
				Light grey	Medium quartzose sandstone	Slightly weathered	Hard Iron oxide stained crack of 80,50,40,60°								C _u
							Joint of 50°,55°								
							Joint of 50° with clay								
5	96.07	25.25		Block	Shale										
		25.40													
		25.70		Grey	Shale										
	95.17	26.15			F. sandstone										
				Block	Shale										
	94.47	26.85													
				Grey	Fine sandstone										
	93.82	27.50					Hard to very hard clean joint of 50,40°								
	93.57	27.75		Block	Shale										
	93.42	27.80			F sandstone										
	93.12	28.20		Block	Shale										
		29.35													
		29.60		Grey	Shale										
					Medium sandstone	Fresh	Very hard clean crack of 70° clean joint of 50° to 60°								
10	90.32	31.00		Block	Shale										
	89.77	31.55					Hard								
	89.32	32.00		Grey	M sandstone		With dark grey shale patch								
							Very hard clean crack of 40° clean joint of 50° 346-3500m crack of 50° with iron oxide								C _u
15	66.32	35.00													
				Light grey	Medium quartzose sandstone	Slightly weathered	Very hard Iron oxide stained crack of 30,60,40° joint of 80° with shale								
	83.32	38.00				Slightly weathered to fresh	Very hard Iron oxide stained crack of 30,50,40° clean crack of 70,20°								B

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Depth

D : Density, Specimen in Air. (g/cm³)

σ_c : Unconfined Compression Strength. (Kg/cm²)

Checked

Fig.4.11.77

Geological Log. of Borehole

Project Name				Takai Hydro-electric Power Development Project			Site Name		Upper Takai Quarry Area										
Hole No		UO-4 (3)		Elevation of Ground Level		121.32 m		Ground Water Level		0.0 m									
Date		Beginning		October 6th, 1982		Operator		Tokoshi TOYA		Casing		0.0m to 4.5 m							
		Ending		October 17th, 1982		Supervisor		Takai SUGIMOTO Shira OGANO		Dry Drilling		0.0m to 0.3 m							
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)		R. Q. D (%)		Logcon Value (Ln) Permeability K (cm/s)			Result of Rock Tests	Rock Classification			
								20	10	20	10	(K) 10 ⁻⁸	10 ⁻⁹	10 ⁻¹⁰					
	81.22	40.10			Coarse quartzose sandstone	Slightly weathered to fresh	Very hard Iron oxide stained crack of 30°, 60°, 40° Joint of 50° with shale												
	79.87	41.45		Grey	Medium sandstone	Fresh	Very hard Joint of 50°, 45° with shale Very hard Clean crack of 40°, 50° 44m Crack of 20° with iron oxide												
	76.32	45.00																	
	74.37	46.50																	
	74.07	47.25						Dark grey	Sandy shale		Very hard Iron oxide stained crack of 40°, 50°, 70° Joint at 50°								
	73.57	47.75			Mq sandstone		Crocky Iron oxide stained crack												
	72.32	49.00		Light grey	Coarse quartzose sandstone	Slightly weathered													
		50.00				Medium quartzose sandstone		Very hard Iron oxide stained crack of 30°, 50°, 70°, 20°											
	70.52	50.80				Cq sandstone		Clean joint of 50°											
	70.32	51.00																	

R. Q. D : Rock Quality Designation

Legend Result of Rock Tests

Depth

ρ : Density, Specimen in Air. (g/cm³)

σ_c : Unconfined Compression Strength (Kg/cm²)

checked

Fig. 4.11.78

Geological Log. of Borehole

Project Name		Tetel Hydro-electric Power Development Project			Site Name		Upper Tetel Quarry Area					
Hole No	UO-5 (1)	Elevation of Ground Level	195.05 m	Ground Water Level	-90 m	Bit Size	76 (NX) %					
Date	Beginning	October 13th, 1982	Operator	Takahumi KOBAYASHI		Coalag	00m to 220m					
	Ending	October 18th, 1982	Supervisor	Tokuji SUBIMOTO Shiro OGANO		Dry Drilling	00m to 205m					
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R Q D (%)	Logon Value (L _n) Permeability (K) (cm ² /m)	Result of Rock Tests	200 Change position
								20 10 0 50	20 0 50 50	(L _n) 10 ⁻¹ 10 ⁻² 10 ⁻³		
	194.65	0.40	1-1	Y. brown	Clayey soil		With organic material	[Hatched]	[Hatched]	[Hatched]	[Hatched]	[Hatched]
		2.15		Brownish red		Very soft clayey soil						
	192.65	2.40				Clay						
	192.05	3.00			Tetel deposits		Very soft, clay	[Hatched]	[Hatched]	[Hatched]	[Hatched]	[Hatched]
				Brownish grey		Very soft Mainly greyish shale breccia with clay						
	189.00	6.05						[Hatched]	[Hatched]	[Hatched]	[Hatched]	[Hatched]
				Light grey	Shale		Very soft Cracky Iron oxide stained crack with clay					
		8.90		Brown	F. sandstone							
	185.35	9.75		Light grey	Shale		Very soft					
		9.90		Brown	F. sandstone		Cracky					
		11.00		Brownish grey	Shale							
		11.10		Brown	F. sandstone		Crack with brownish clay					
		11.80		Reddish brown	Shale							
		11.95			F. sandstone							
				Brownish grey	Shale	Highly weathered	Soft Cracky Crack with brownish clay					
		14.00						[Hatched]	[Hatched]	[Hatched]	[Hatched]	
		14.50		Light grey								
	180.05	15.00		Greyish brown	Clayey shale							
	179.05	16.00		Brown	Medium sandstone							
		16.65		Light grey	Clayey shale							
		17.50					Fractured zone Very cracky					
		18.00			M sandstone							
		18.50			Clay (shale)							
		19.25		Purplish red	Medium sandstone		Very soft Crack with clay					
		19.55			Clay (shale)							
				Brown	Medium sandstone			[Hatched]	[Hatched]	[Hatched]	[Hatched]	

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Depth

D : Density, Specimen In Air. (g/cm³)

σ_c : Unconfined Compression Strength. (kg/cm²)

checked

Fig. 4.11.79

Geological Log of Borehole

Project Name		Tekai Hydro-electric Power Development Project			Site Name		Upper Tekai Quarry Area									
Hole No		U0-5 (2)		Elevation of Ground Level		195.05 m		Ground Water Level		-9.0 m		Bit Size		16 (NX) %		
Date		Beginning		October 13th, 1982		Operator		Takafumi KOBAYASHI		Catalog		00m to 220m				
		Ending		October 18th, 1982		Supervisor		Tetsuji SUGIMOTO Shiro OSAHO		Dry Drilling		00m to 205m				
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)		R Q D (%)		Logan Value (Ln) Permeability K (cm ² /sec)			Result of Rock Tests	Rock Classification
								20-100%	20-100%	(Ln) 10 ⁻²	10 ⁻¹	10 ⁻¹	10 ⁻²			
		20.50		Brown	M. sandstone	Highly weathered to Moderately weathered	Fractured zone very cracky very soft crack with clay									O C ₁
		21.00			Clay (shale)											
	17375	21.35		Brownish grey	Medium sandstone	Highly weathered to Moderately weathered	Hard Joint of 60° with clay									C ₁
		22.40		Light grey	Coarse sandstone											
		24.60			Coarse sandstone	Highly weathered to Moderately weathered	Hard Clean joint of 50° clean crack of 30°, 40°									C ₁
		25.35		Grey	Medium sandstone											
		26.20			Coarse sandstone	Highly weathered to Moderately weathered	Hard Joint of 50°, 40° Joint of 50° with quartz									C ₁
		26.65		Dark grey	S sandstone											
		27.00			Coarse sandstone	Highly weathered to Moderately weathered	With organic material & quartz vein									C ₁
		28.25		Light grey	S sandstone											
		30.00			Coarse sandstone	Slightly weathered	Hard Iron oxide stained crack of 20°, 30°, 60° crack at 60° with clay									C ₁
		31.00		Dark grey	Medium sandstone											
		32.00			Coarse sandstone	Slightly weathered	Fractured zone Mottly breccia with clay									C ₁
		33.00		Grey	Medium sandstone											
		36.05			Coarse sandstone	Slightly weathered	Hard cracky Iron oxide stained crack Joint of 60° with clay									C ₁
		38.00		Dark grey	Medium sandstone											
		39.05			Coarse sandstone	Slightly weathered	Hard Iron oxide stained crack of 20° Joint of 60°, 50° with clay									C ₁
		43.50		Grey	Medium sandstone											
		45.55			S sandstone	Slightly weathered to fresh	Very hard clean crack of 40°, 60° with quartz vein Joint of 30°									C ₁
		46.50		Light grey	Medium quartzose sandstone											
		48.00			Coarse sandstone	Slightly weathered to fresh	Very hard Iron oxide stained crack of 40°, 10°, 30° Joint of 60°, 50° with shale									C ₁
		55.20		Grey	Compensable											

2520 - 2535
D = 2612
Qc = 488

370 - 375
D = 2628
Qc = 2688

checked

Legend Result of Rock Tests

Depth
O: Density, Specimen in Air (g/cm³)
Qc: Unconfined Compression Strength (Kg/cm²)

Project Name		Takai Hydro-electric Power Development Project			Site Name	Upper Tetsu Quarry Area						
Hole No	UO-8 (3)	Elevation of Ground Level	195.05 m	Ground Water Level	-9.0 m	Bit Size	76 (NX) %					
Date	Beginning	October 19th, 1982	Operator	Tetsuji KOBAYASHI		Casing	0.0 m 1922.0 m					
	Ending	October 18th, 1982	Supervisor	Tetsuji SUMIMOTO Sairei OGANO		Dry Drilling	0.6 m 1920.6 m					
Scale	Elevation (m)	Depth (m)	Mark of Sample	Colour	Name of Sample	Weathering	Visual Description	Recovery (%)	R. Q. D. (%)	Logice Value (L _v) Permeability, K (cm ² /m)	Result of Rock Tests	Rock Classification
	154.70	40.35	0000	Gray	Conglomerate		With high content of organic materials	20 (0) 0.8	20 (0) 0.8	(K) 10 ⁻¹ 10 ⁻¹ 10 ⁻¹		
		43.50		Light gray			Very hard Iron oxide stained Crack at 40° Joint at 50° with clay Green joint at 60° Crack at 75 with clay					
		44.30		Brownish gray	Medium quartzite sandstone	Slightly weathered						
		45.90		Light gray			Very hard Iron oxide stained Crack at 30°, 40°, 60° Joint at 50°					
	149.15	45.90		Gray	Medium sandstone							
	147.75	47.30		Light gray	Medium quartzite sandstone	Slightly weathered						
	146.70	48.25			M. sandstone		Very hard Iron oxide stained Crack at 40°, 60°, 70° Clean crack at 50°, 40° Clean joint at 40°, 60°					
	146.45	48.65			F. sandstone	fresh						
	145.95	49.10		Gray	Medium sandstone							
	145.05	50.00										

R. Q. D. : Rock Quality Designation

Legend Result of Rock Tests

Depth

D : Density, Specimen in Air. (g/cm³)

σ_c : Unconfined Compression Strength. (Kg/cm²)

Checked

Table. 4.11.1

SUMMARY OF PERMEABILITY FOR BOREHOLE NO. U-1

DATE	TESTING SECTION (M)	DEPTH (M)		PERMEABILITY (K) (LUGÉON VALUE)
		FROM	TO	
2 Sep. '81	4.45	5.50	9.95	7.5×10^{-4} (61.7)
10 Sep. '81	5.00	21.80	26.80	2.3×10^{-4} (18.1)
11 Sep. '81	5.00	26.80	31.80	2.6×10^{-4} (20.4)
12 Sep. '81	5.00	31.80	36.80	2.5×10^{-4} (19.8)
13 Sep. '81	5.00	36.80	41.80	2.1×10^{-4} (14.9)

Table 4. 11.2

SUMMARY OF PERMEABILITY FOR BOREHOLE NO. U-2

DATE	TESTING SECTION (M)	DEPTH (M)		PERMEABILITY (K) (LUGEON VALUE)
		FROM	TO	
24 Sep. '81	5.00	1.50	6.50	1.4×10^{-3} (106.1)
25 Sep. '81	4.50	7.00	11.50	7.5×10^{-4} (60.8)
26 Sep. '81	5.00	11.50	16.50	2.7×10^{-4} (20.8)
28 Sep. '81	5.00	16.50	21.50	4.6×10^{-4} (36.9)
28 Sep. '81	5.00	21.50	26.50	2.3×10^{-4} (18.2)
29 Sep. '81	5.00	26.50	31.50	2.3×10^{-5} (1.8)
29 Sep. '81	5.00	31.50	36.50	1.6×10^{-5} (1.2)
1 Oct. '81	5.00	36.50	41.50	2.2×10^{-5} (1.7)

Table 4.11.3

SUMMARY OF PERMEABILITY FOR BOREHOLE NO. U-3

DATE	TESTING SECTION (M)	DEPTH (M)		PERMEABILITY (K) (LUGEON VALUE)
		FROM	TO	
30 Aug. '81	3.64	3.77	7.41	1.4×10^{-3} (119.8)
1 Sep. '81	5.00	7.41	12.41	3.0×10^{-4} (24.8)
5 Sep. '81	6.21	12.41	18.62	3.5×10^{-4} (27)
8 Sep. '81	5.50	18.70	24.20	3.5×10^{-5} (2.7)
10 Sep. '81	5.00	24.20	29.20	6.0×10^{-5} (4.8)
11 Sep. '81	5.00	29.20	34.20	2.2×10^{-5} (1.7)
11 Sep. '81	5.00	35.00	40.00	2.3×10^{-5} (1.9)

Table 4.11.4

SUMMARY OF PERMEABILITY FOR BOREHOLE NO. U-4

DATE	TESTING SECTION (M)	DEPTH (M)		PERMEABILITY (K) (LUGEON VALUE)
		FROM	TO	
20 Sep. '81	5.00	10.00	15.00	9.5×10^{-4} (74)
22 Sep. '81	5.00	15.00	20.00	8.1×10^{-4} (62)
23 Sep. '81	5.00	20.00	25.00	4.0×10^{-4} (31)
24 Sep. '81	5.00	25.00	30.00	3.7×10^{-4} (29)
25 Sep. '81	5.00	30.00	35.00	4.9×10^{-5} (3.9)
26 Sep. '81	5.00	35.00	40.00	6.7×10^{-4} (52)
28 Sep. '81	5.00	40.00	45.00	1.8×10^{-5} (1.4)
29 Sep. '81	5.00	45.00	50.00	4.7×10^{-4} (37)

Table. 4.11.5

SUMMARY OF PERMEABILITY FOR BOREHOLE NO. U-5

DATE	TESTING SECTION (M)	DEPTH (M)		PERMEABILITY (K) (LUGEON VALUE)
		FROM	TO	
4 Oct. '81	5.00	10.00	15.00	1.4×10^{-5} (11)
7 Oct. '81	5.00	24.70	29.70	1.6×10^{-5} (7.25)
8 Oct. '81	4.35	29.70	34.05	2.4×10^{-5} (1.9)
9 Oct. '81	5.00	34.05	39.05	1.5×10^{-5} (1.2)
10 Oct. '81	5.45	39.05	44.50	2.2×10^{-5} (1.7)
11 Oct. '81	5.00	45.00	50.00	1.5×10^{-5} (1.2)

Table .4.11.6

SUMMARY OF PERMEABILITY FOR BOREHOLE NO. UB-5

DATE	TESTING SECTION (M)	DEPTH (M)		PERMEABILITY (K) (LUGEON VALUE)
		FROM	TO	
29 Sep. '82	4.00	6.60	10.40	3.6×10^{-4} (29.6)
29 Sep. '82	5.00	10.00	15.00	2.1×10^{-4} (16.6)
30 Sep. '82	5.00	15.00	20.00	3.2×10^{-4} (2.51)
1 Oct. '82	5.00	20.00	25.00	1.1×10^{-4} (0.83)
2 Oct. '82	5.00	25.00	30.00	3.9×10^{-5} (0.30)

Table 4.11.7

SUMMARY OF PERMEABILITY FOR BOREHOLE NO. UD-2

DATE	TESTING SECTION (M)	DEPTH (M)		PERMEABILITY (K) (LUGEON VALUE)
		FROM	TO	
16 Sep. '82	5.00	5.00	10.00	1.8×10^{-4} (14.2)
17 Sep. '82	5.00	10.00	15.00	1.4×10^{-4} (11.1)
18 Sep. '82	5.00	15.00	20.00	5.0×10^{-4} (3.90)

Table 4.11.8

SUMMARY OF PERMEABILITY FOR BOREHOLE NO. UD-3

DATE	TESTING SECTION (M)	DEPTH (M)		PERMEABILITY (K) (LUGEON VALUE)
		FROM	TO	
8 Sep. '82	4.00	1.20	5.20	5.7×10^{-4} (44.3)
9 Sep. '82	5.00	5.00	10.00	1.1×10^{-4} (8.28)
9 Sep. '82	5.00	10.00	15.00	1.7×10^{-4} (13.1)
9 Sep. '82	5.00	15.00	20.00	2.3×10^{-4} (17.7)

Table 4.11.9

SUMMARY OF PERMEABILITY FOR BOREHOLE NO. UD-4

DATE	TESTING SECTION (M)	DEPTH (M)		PERMEABILITY (K) (LUGEON VALUE)
		FROM	TO	
17 Aug. '82	5.00	7.70	12.70	1.81×10^{-3} (141)
18 Aug. '82	5.00	12.70	17.70	6.6×10^{-4} (51.3)
19 Aug. '82	5.00	21.00	26.00	5.6×10^{-4} (43.7)
20 Aug. '82	5.00	26.00	31.00	3.5×10^{-4} (27.6)
23 Aug. '82	5.00	35.00	40.00	2.9×10^{-4} (22.6)
24 Aug. '82	5.00	40.00	45.00	1.9×10^{-4} (14.5)
29 Aug. '82	5.00	45.00	50.00	1.5×10^{-4} (11.4)

Table 4.11.10

SUMMARY OF PERMEABILITY FOR BOREHOLE NO. UD-5

DATE	TESTING SECTION (M)	DEPTH (M)		PERMEABILITY (K) (LUGEON VALUE)
		FROM	TO	
7 Sep. '82	5.00	5.00	10.00	3.0×10^{-4} (23.2)
7 Sep. '82	5.00	10.00	15.00	2.3×10^{-4} (17.6)
8 Sep. '82	5.00	15.00	20.00	2.1×10^{-4} (16.2)
9 Sep. '82	5.00	20.00	25.00	1.7×10^{-4} (13.4)
9 Sep. '82	5.00	25.00	30.00	1.2×10^{-4} (9.53)
10 Sep. '82	5.00	30.00	35.00	7.3×10^{-5} (5.73)
11 Sep. '82	5.00	35.00	40.00	3.4×10^{-5} (2.67)
12 Sep. '82	5.00	40.00	45.00	1.2×10^{-5} (0.97)
13 Sep. '82	5.00	45.00	50.00	2.8×10^{-5} (2.17)

Table 4.11.11

SUMMARY OF PERMEABILITY FOR BOREHOLE NO. UD-6 (1)

DATE	TESTING SECTION (M)	DEPTH (M)		PERMEABILITY (K) (LUGEON VALUE)
		FROM	TO	
16 Aug. '82	5.00	10.00	15.00	1.0×10^{-5} (0.81)
18 Aug. '82	5.00	15.00	20.00	5.0×10^{-5} (3.93)
19 Aug. '82	5.00	20.00	25.00	5.6×10^{-5} (4.38)
19 Aug. '82	5.00	25.00	30.00	1.9×10^{-5} (1.45)
20 Aug. '82	5.00	30.00	35.00	1.3×10^{-5} (0.99)
20 Aug. '82	5.00	35.00	40.00	2.7×10^{-6} (0.21)
21 Aug. '82	5.00	40.00	45.00	7.8×10^{-7} (0.06)
23 Aug. '82	5.00	45.00	50.00	6.0×10^{-7} (0.05)
23 Aug. '82	5.00	50.00	55.00	1.8×10^{-6} (0.14)
24 Aug. '82	5.00	55.00	60.00	2.1×10^{-6} (0.16)

Table.4.11.12

SUMMARY OF PERMEABILITY FOR BOREHOLE NO. UD-6 (2)

DATE	TESTING SECTION (M)	DEPTH (M)		PERMEABILITY (K) (LUGEON VALUE)
		FROM	TO	
30 Aug. '82	5.00	60.00	65.00	5.7×10^{-7} (0.04)
30 Aug. '82	5.00	65.00	70.00	1.9×10^{-6} (0.15)
31 Aug. '82	5.00	70.00	75.00	8.4×10^{-6} (0.65)
31 Aug. '82	5.00	75.00	80.00	2.1×10^{-5} (1.63)
1 Sep. '82	5.00	80.00	85.00	3.6×10^{-5} (2.79)
2 Sep. '82	5.00	85.00	90.00	3.9×10^{-5} (3.08)
3 Sep. '82	5.00	90.00	95.00	3.2×10^{-7} (0.03)

Table. 4.11.13

SUMMARY OF PERMEABILITY FOR BOREHOLE NO. UD-7 (I)

DATE	TESTING SECTION (M)	DEPTH (M)		PERMEABILITY (K) (LUGEON VALUE)
		FROM	TO	
14 Aug. '82	5.00	5.00	10.00	1.7×10^{-4} (13.5)
15 Aug. '82	5.00	10.00	15.00	8.0×10^{-5} (6.27)
18 Aug. '82	5.00	15.00	20.00	3.6×10^{-4} (28.1)
19 Aug. '82	5.00	20.00	25.00	4.0×10^{-5} (3.12)
20 Aug. '82	5.00	25.00	30.00	1.2×10^{-5} (0.97)
21 Aug. '82	5.00	30.00	35.00	1.2×10^{-5} (0.93)
21 Aug. '82	5.00	35.00	40.00	2.4×10^{-5} (1.84)
23 Aug. '82	5.00	40.00	45.00	5.1×10^{-6} (0.40)
24 Aug. '82	5.00	45.00	50.00	4.2×10^{-6} (0.33)
31 Aug. '82	5.00	50.00	55.00	1.7×10^{-5} (1.34)

Table.4.11.14

SUMMARY OF PERMEABILITY FOR BOREHOLE NO. UD-7 (2)

DATE	TESTING SECTION (M)	DEPTH (M)		PERMEABILITY (K) (LUGEON VALUE)
		FROM	TO	
1 Sep. '82	5.00	55.00	60.00	2.3×10^{-5} (1.79)
2 Sep. '82	5.00	60.00	65.00	3.2×10^{-5} (2.52)
3 Sep. '82	5.00	65.00	70.00	1.3×10^{-5} (1.02)
4 Sep. '82	5.00	70.00	75.00	2.0×10^{-5} (1.55)
6 Sep. '82	5.00	75.00	80.00	4.1×10^{-6} (0.32)
7 Sep. '82	5.00	80.00	85.00	2.3×10^{-6} (0.18)
7 Sep. '82	5.00	85.00	90.00	2.5×10^{-6} (0.19)
8 Sep. '82	5.00	90.00	95.00	1.2×10^{-5} (0.91)
10 Sep. '82	5.00	95.00	100.00	7.4×10^{-6} (0.58)

Table. 4.11.15

SUMMARY OF PERMEABILITY FOR BOREHOLE NO. UD-8

DATE	TESTING SECTION (M)	DEPTH (M)		PERMEABILITY (K) (LUGEON VALUE)
		FROM	TO	
13 Sep. '82	5.00	5.00	10.00	4.1×10^{-5} (3.19)
14 Sep. '82	5.00	10.00	15.00	4.6×10^{-5} (3.57)
15 Sep. '82	5.00	15.00	20.00	5.4×10^{-5} (4.21)
16 Sep. '82	5.00	20.00	25.00	2.2×10^{-5} (1.69)
16 Sep. '82	5.00	25.00	30.00	3.7×10^{-5} (2.91)
18 Sep. '82	5.00	30.00	35.00	2.8×10^{-5} (2.15)
18 Sep. '82	5.00	35.00	40.00	1.9×10^{-5} (1.45)
19 Sep. '82	5.00	40.00	45.00	1.2×10^{-5} (0.91)
20 Sep. '82	5.00	45.00	50.00	2.4×10^{-5} (1.85)

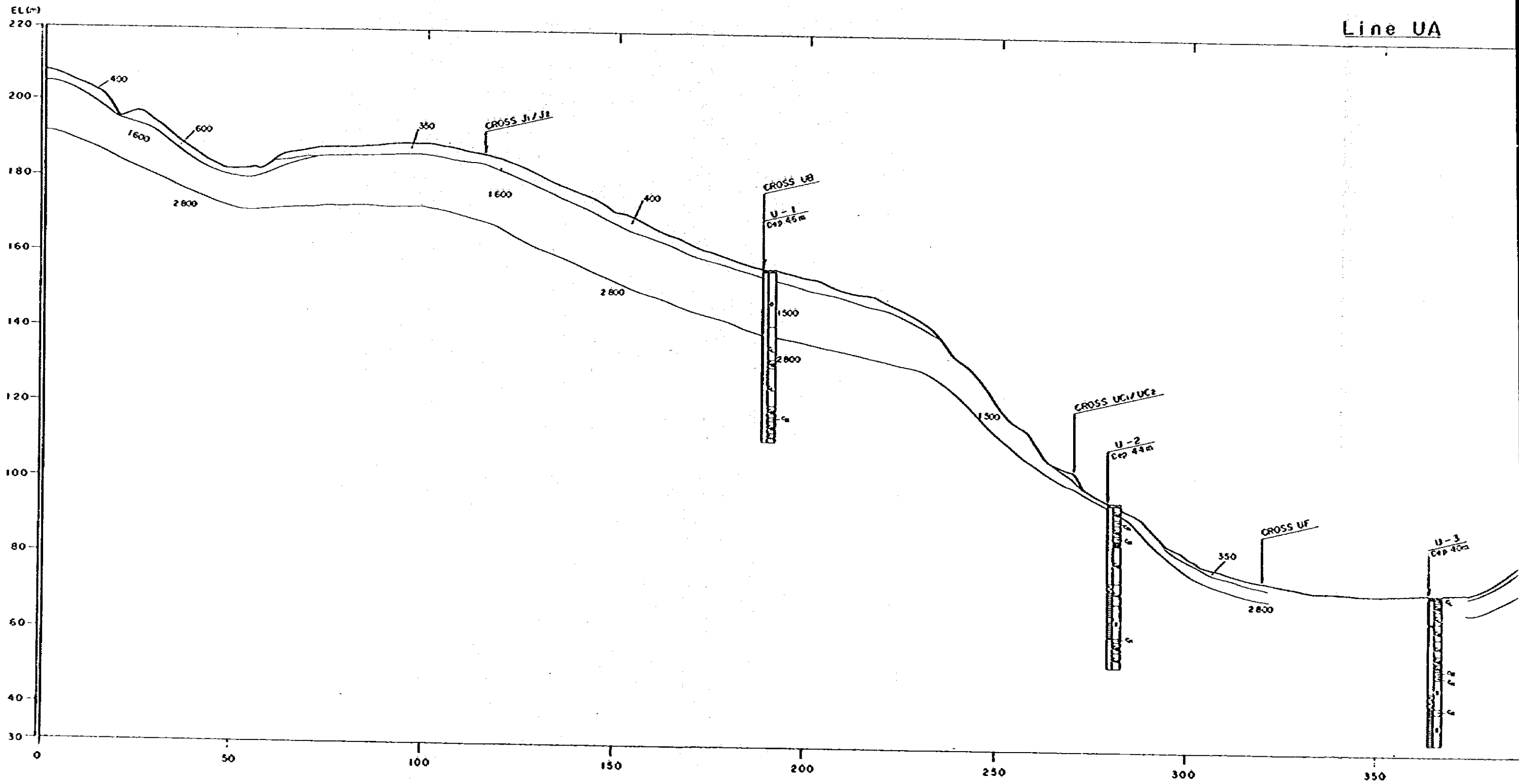
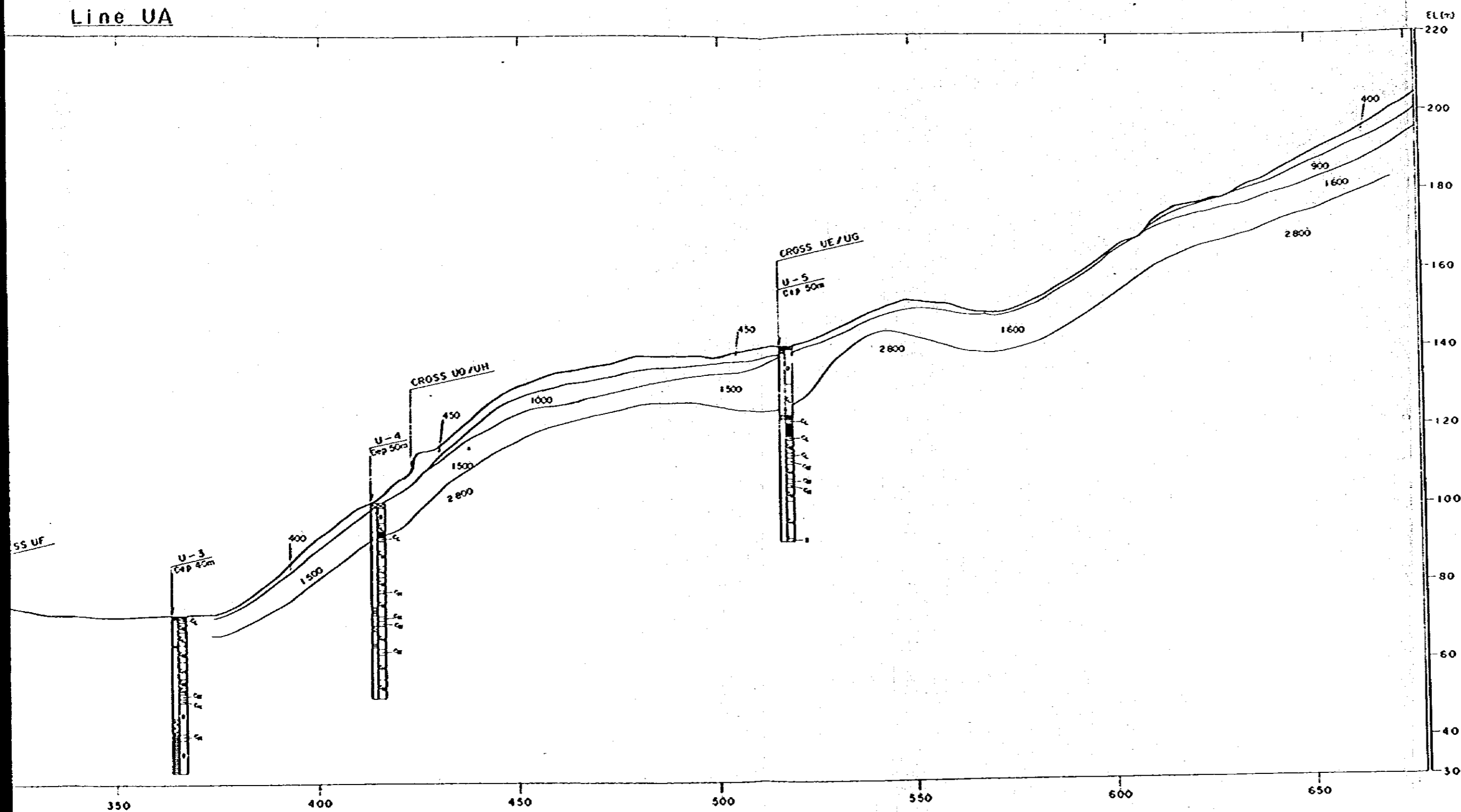
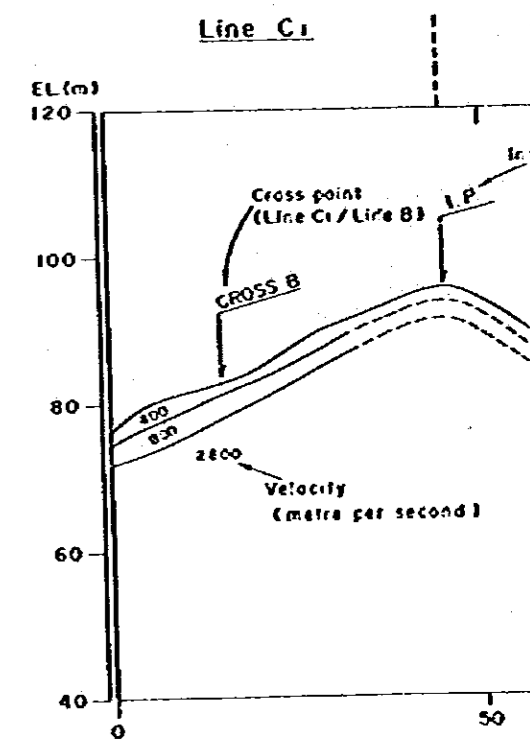


Fig. 4.12.1
SEISMIC PROSP



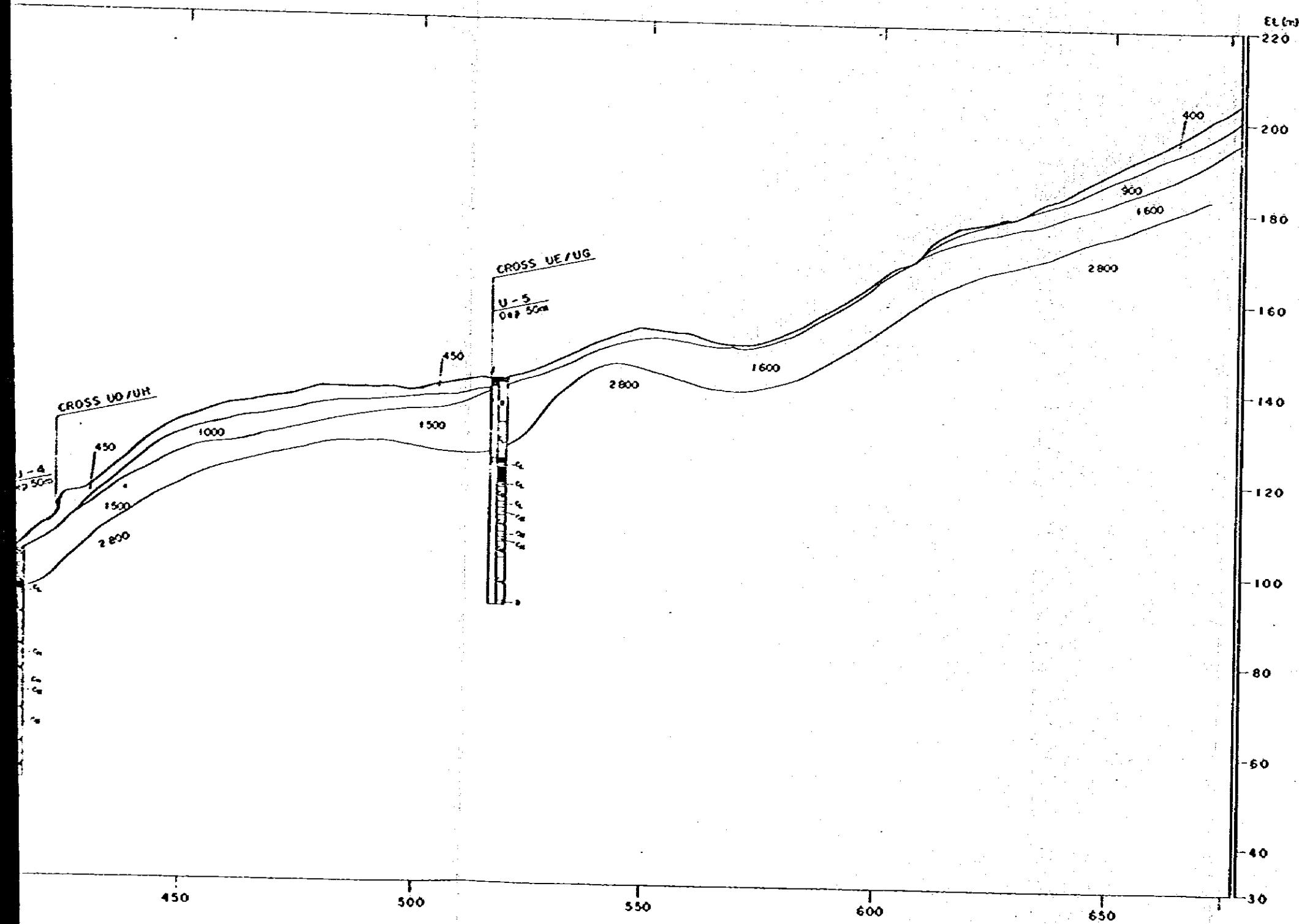
LEGEND



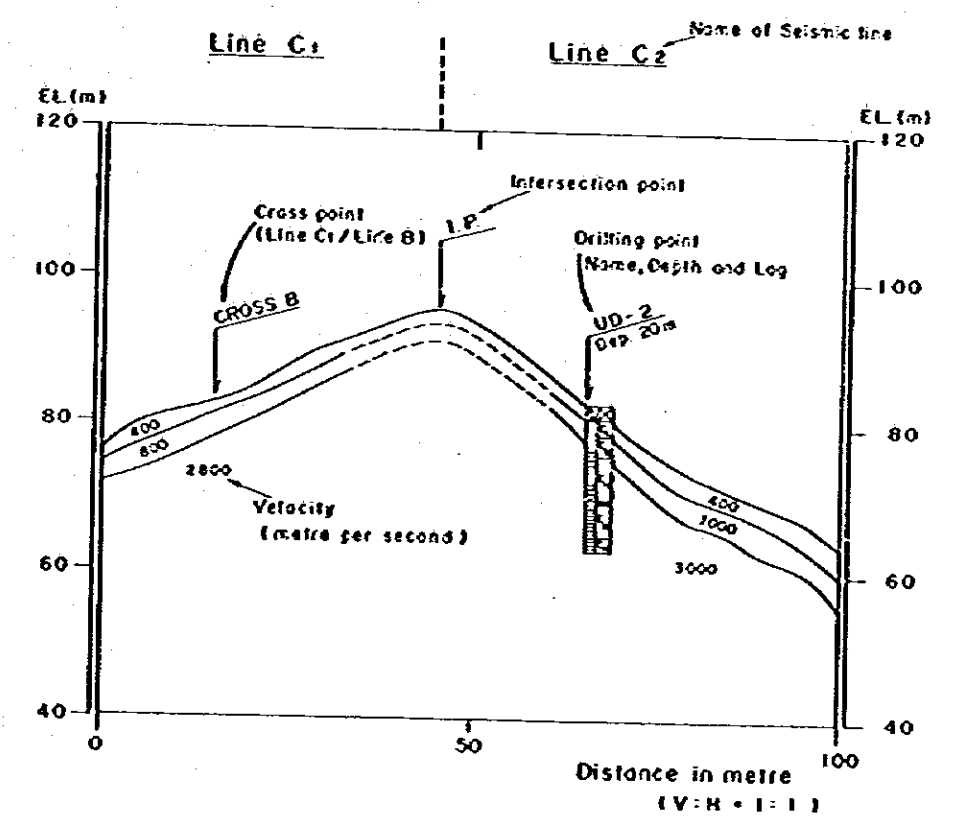
- Mark of Sample
- Tolu Deposits
 - Stratum of Predominantly Sandstone
 - Stratum of Predominantly Shale
 - Conglomerate
 - Alternation of Sandstone and Shale

Line UA
(Upper Dam)

Fig. 4.12.1
SEISMIC PROSPECTING



LEGEND



Mark of Sample		Rock Classification	
	Talus Deposits		Excellent
	Stratum of Predominantly Sandstone		C _M
	Stratum of Predominantly Shale		C _W
	Conglomerate		C _L
	Alternation of Sandstone and Shale		Worst
			Fractured Zone

Line UA
(Upper Dam Site)

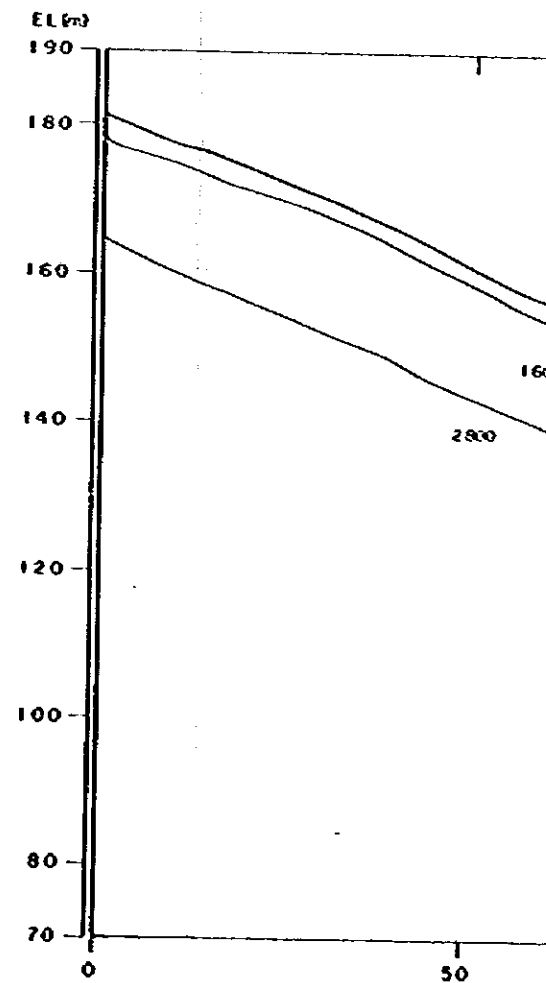
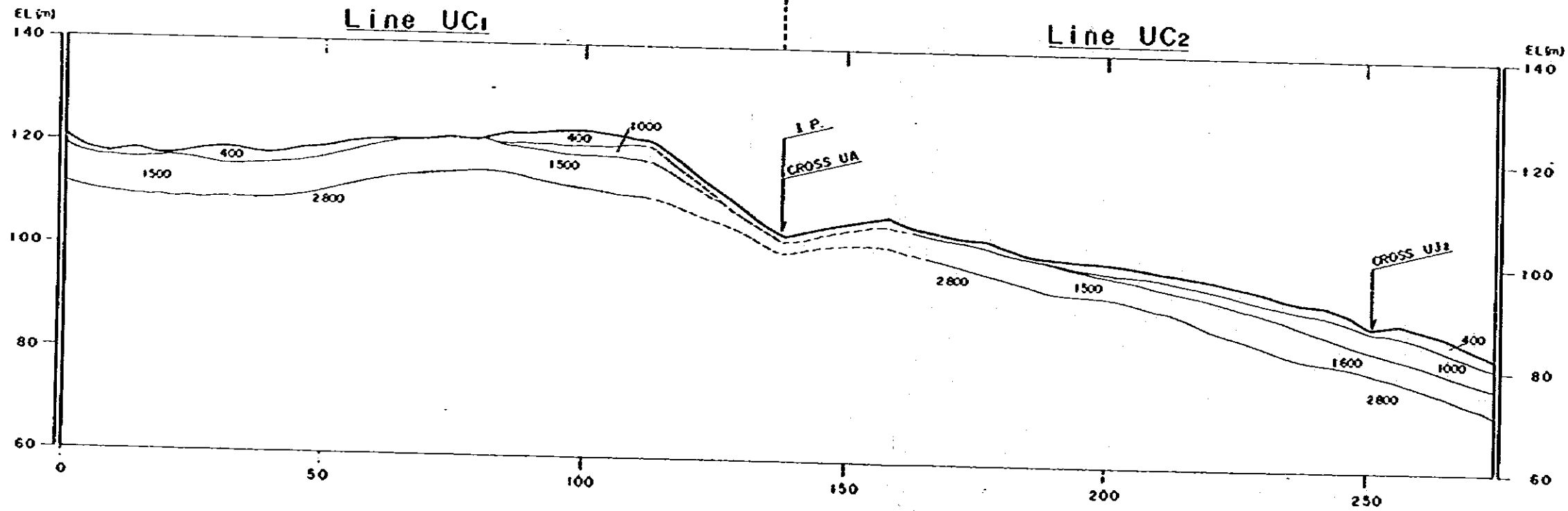
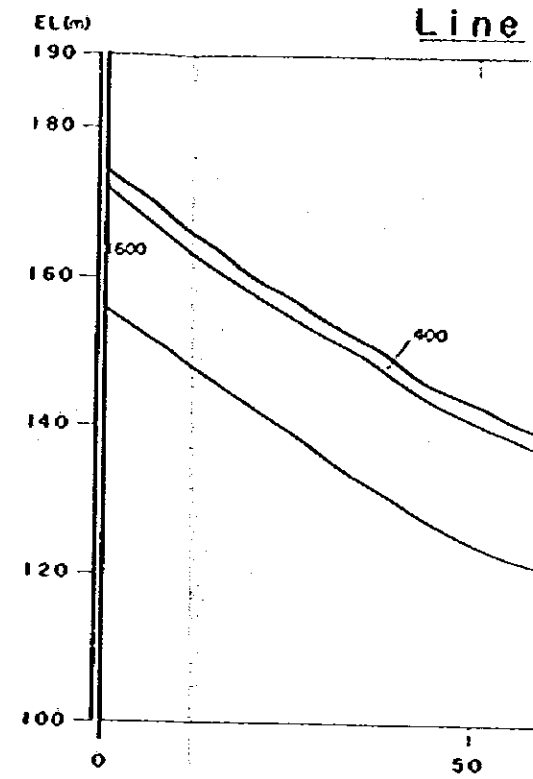
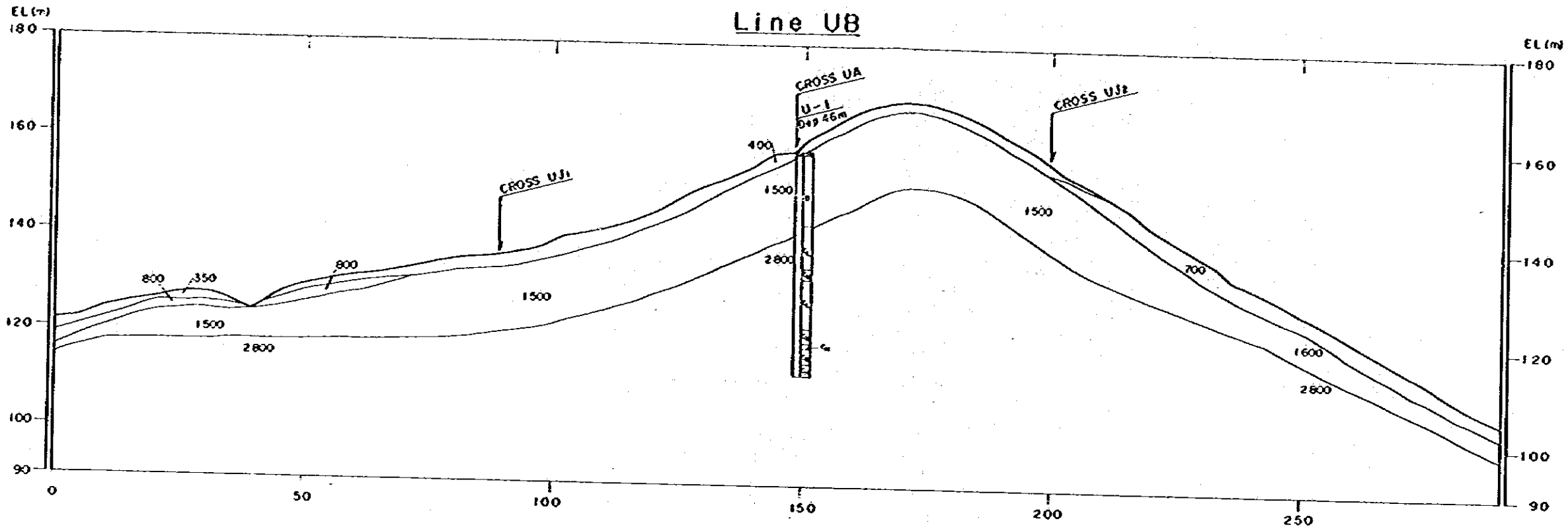
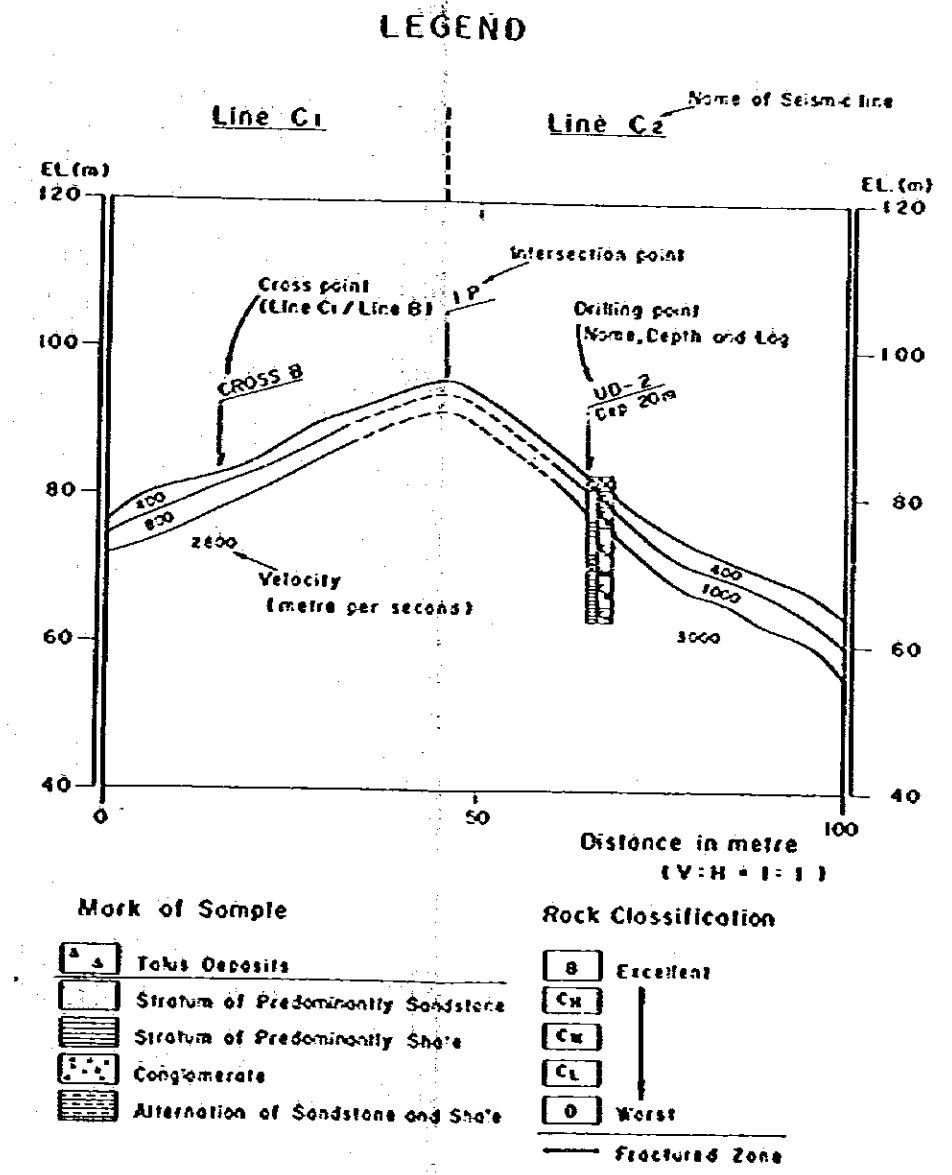
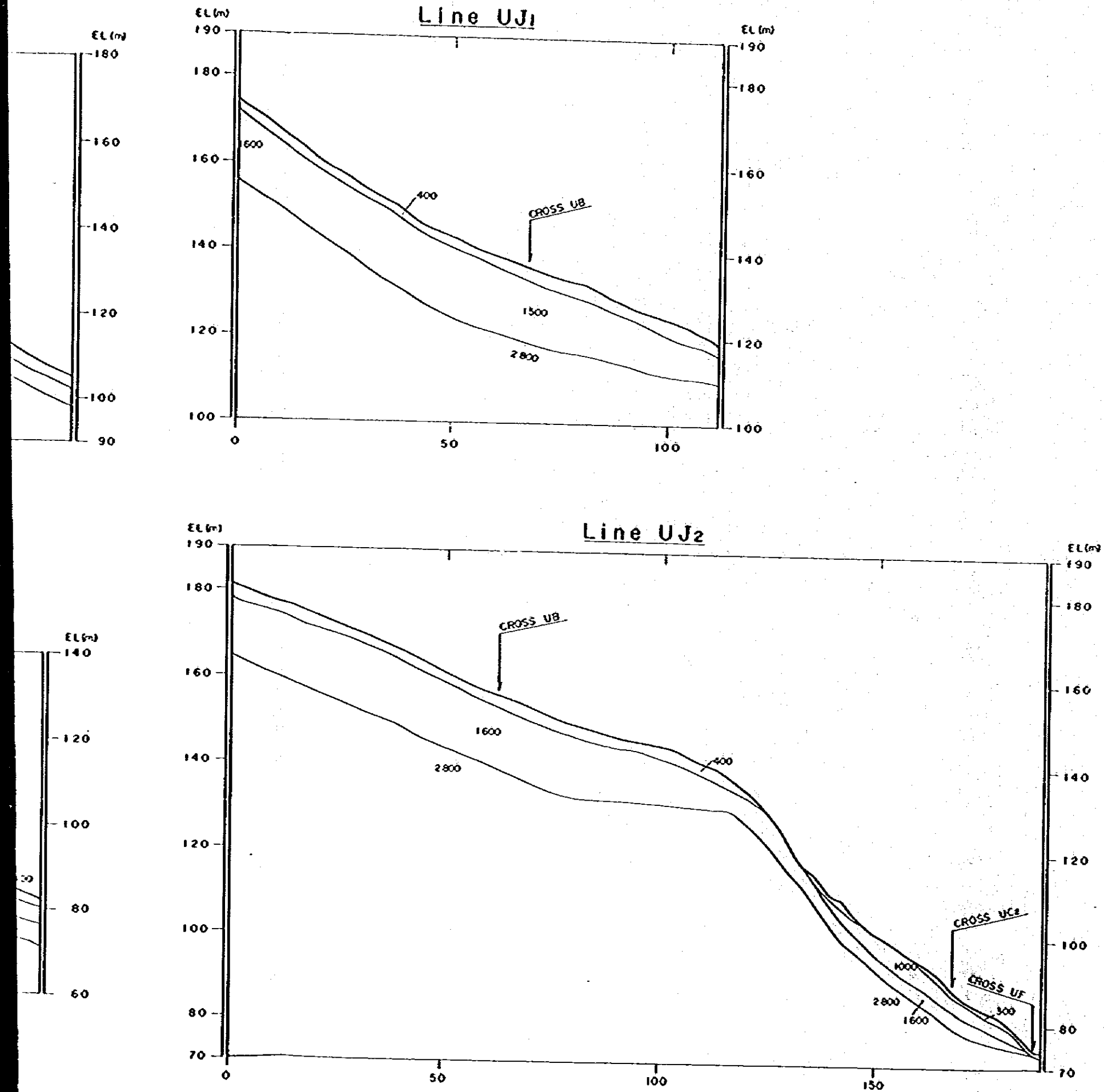
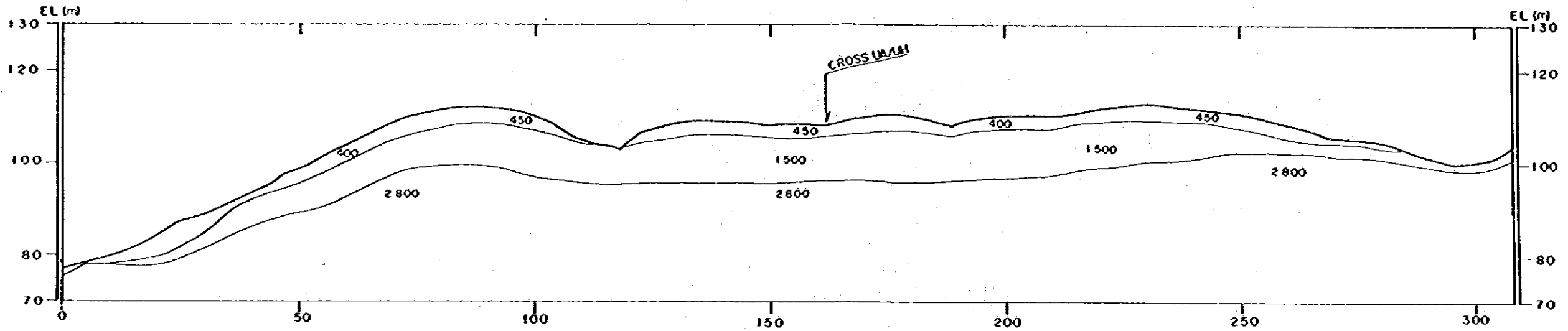


Fig. 4.12.2
SEISMIC PROSPECTING

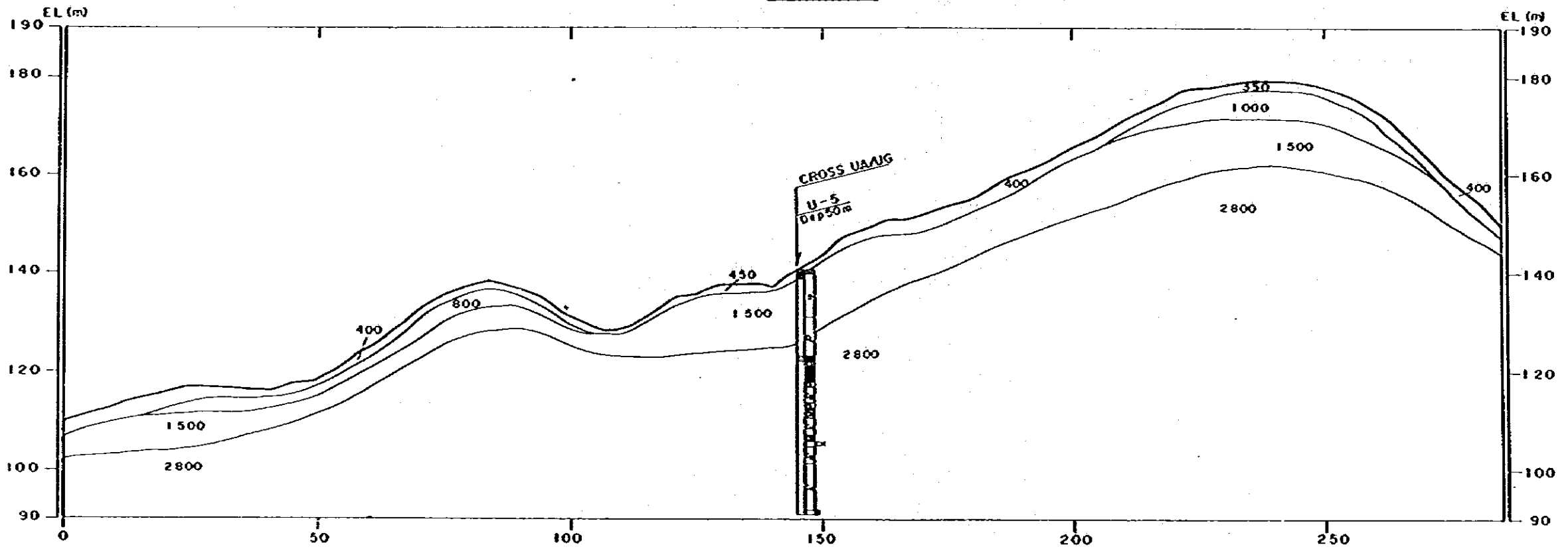


Line UB1, UC1/UC2, UJ1, UJ2
(Upper Dam Site)

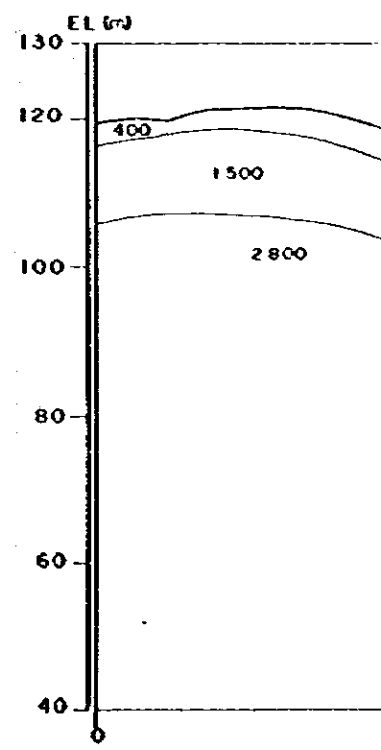
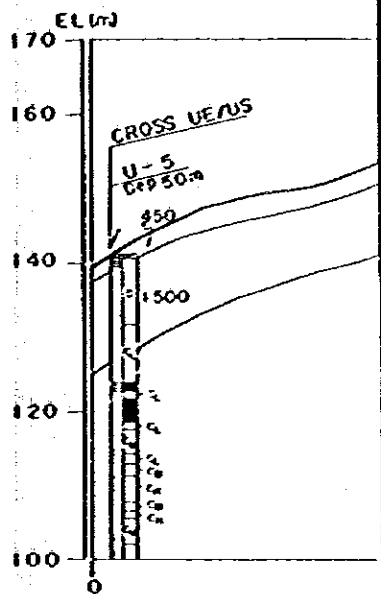
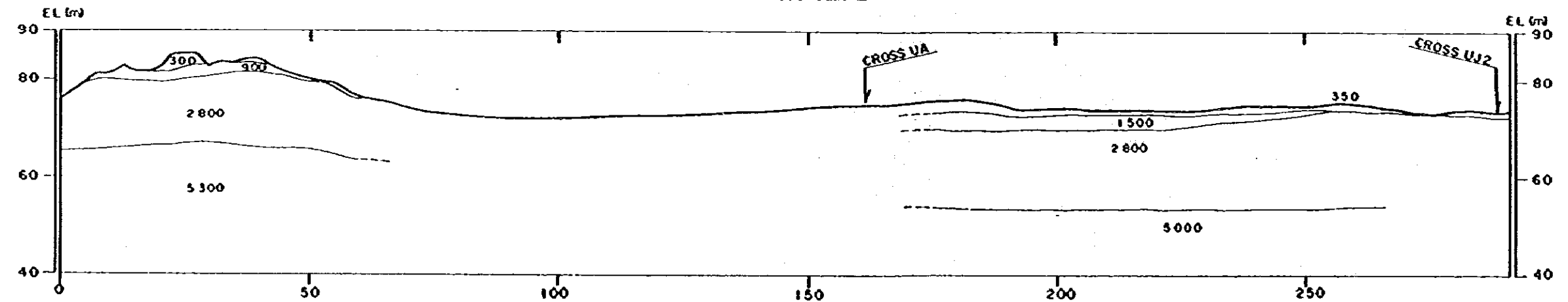
Line UD



Line UE



Line UF



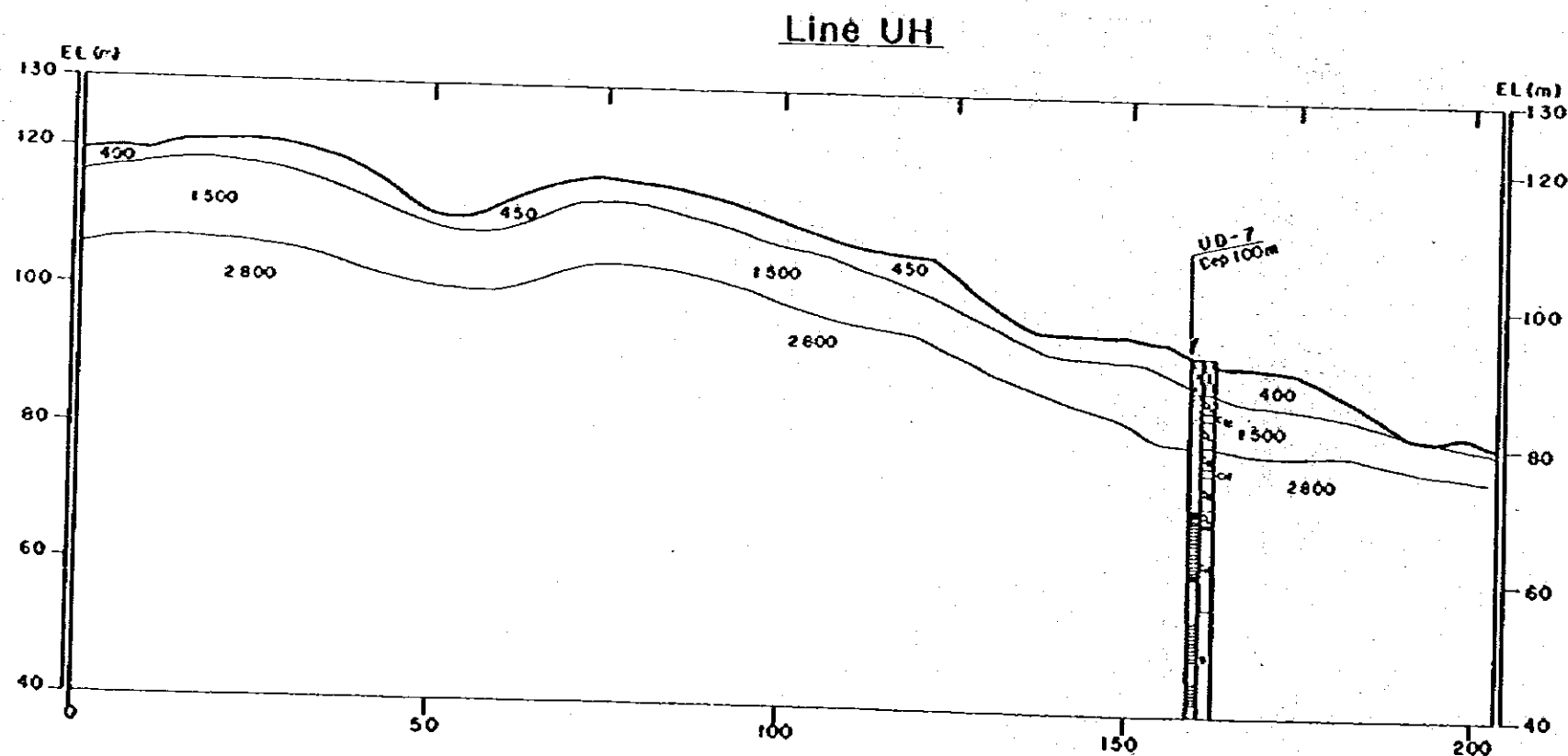
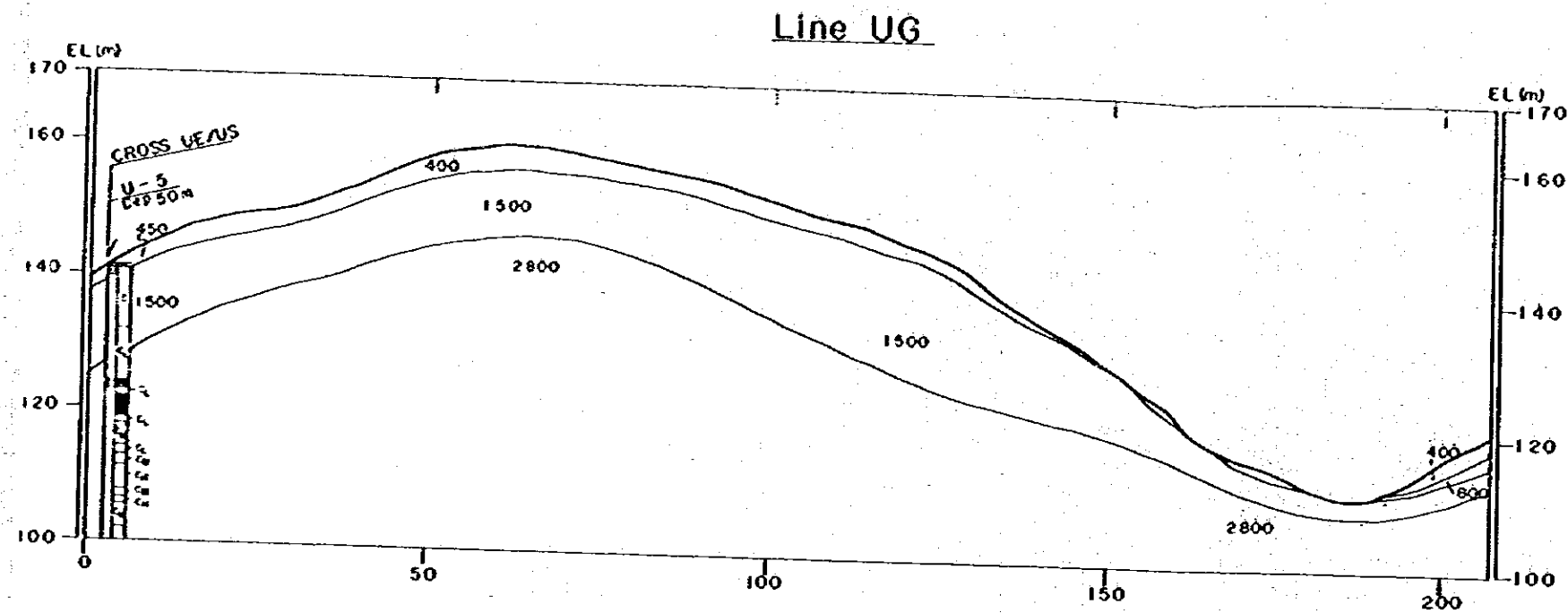
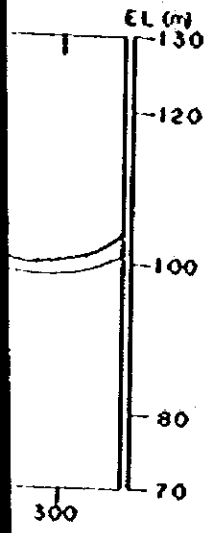
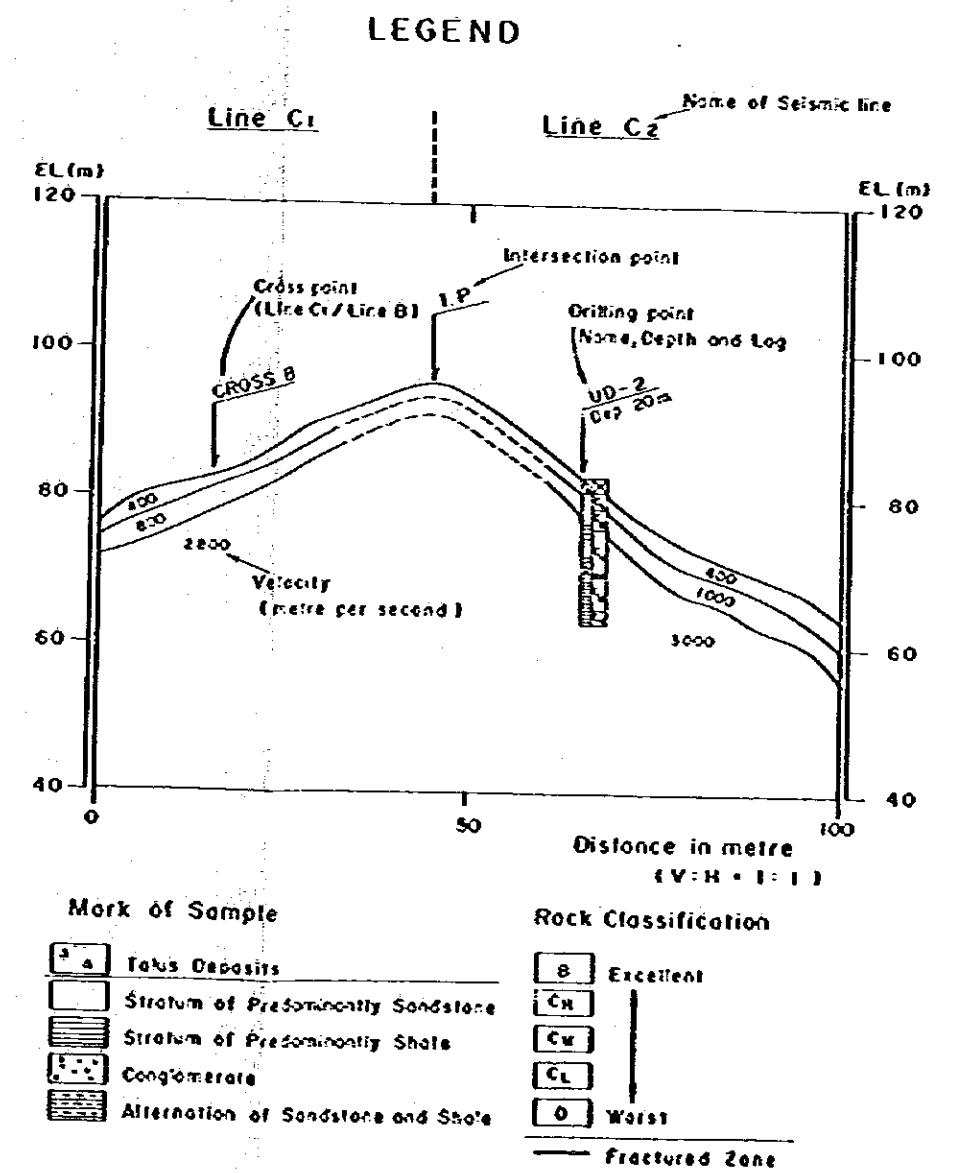
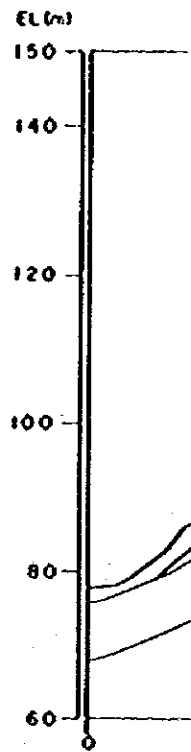
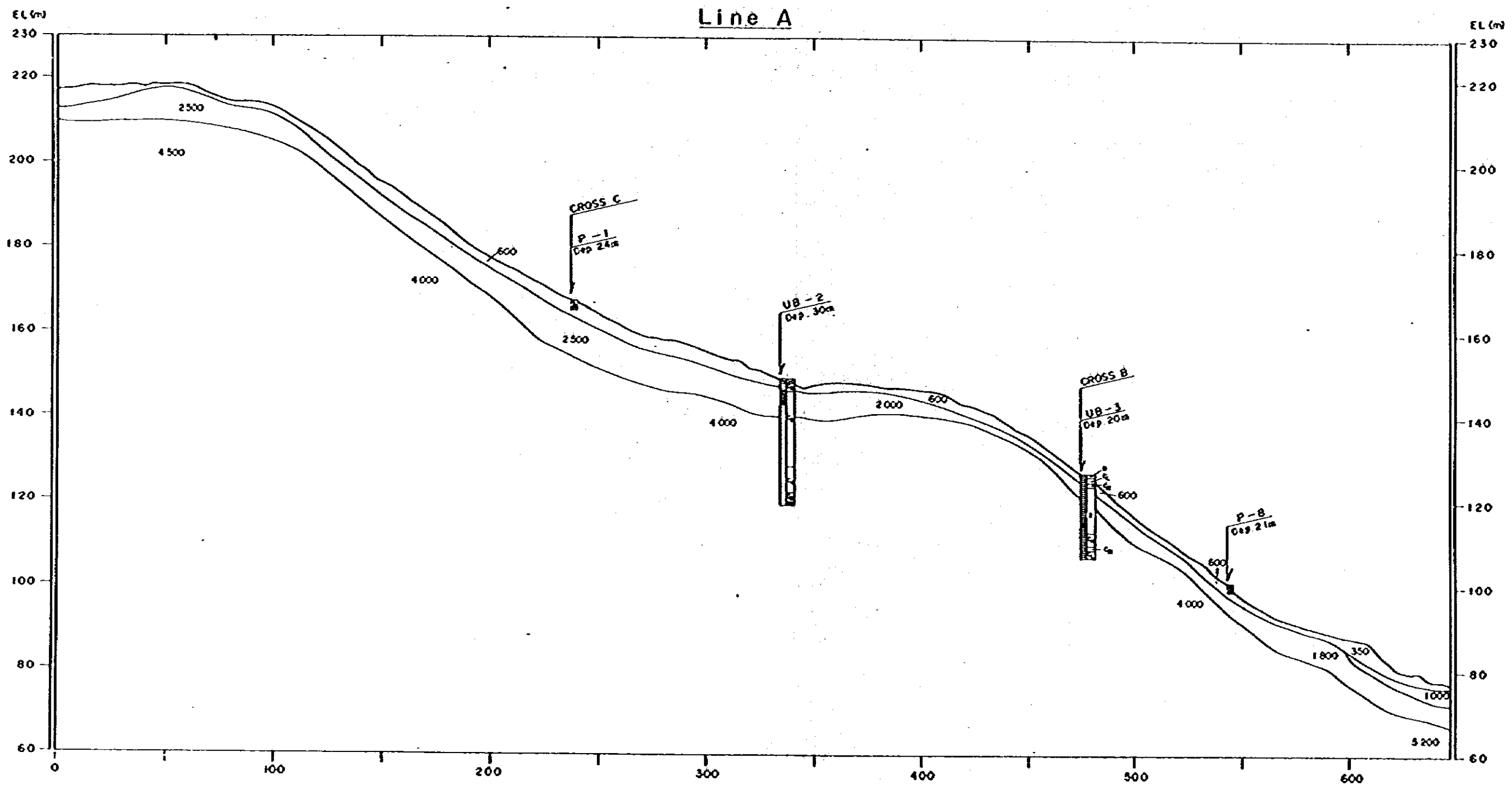


Fig. 4.12.3
SEISMIC PROSPECTING



Line UD, UE, UF, UG, UH
(Upper Dam Site)



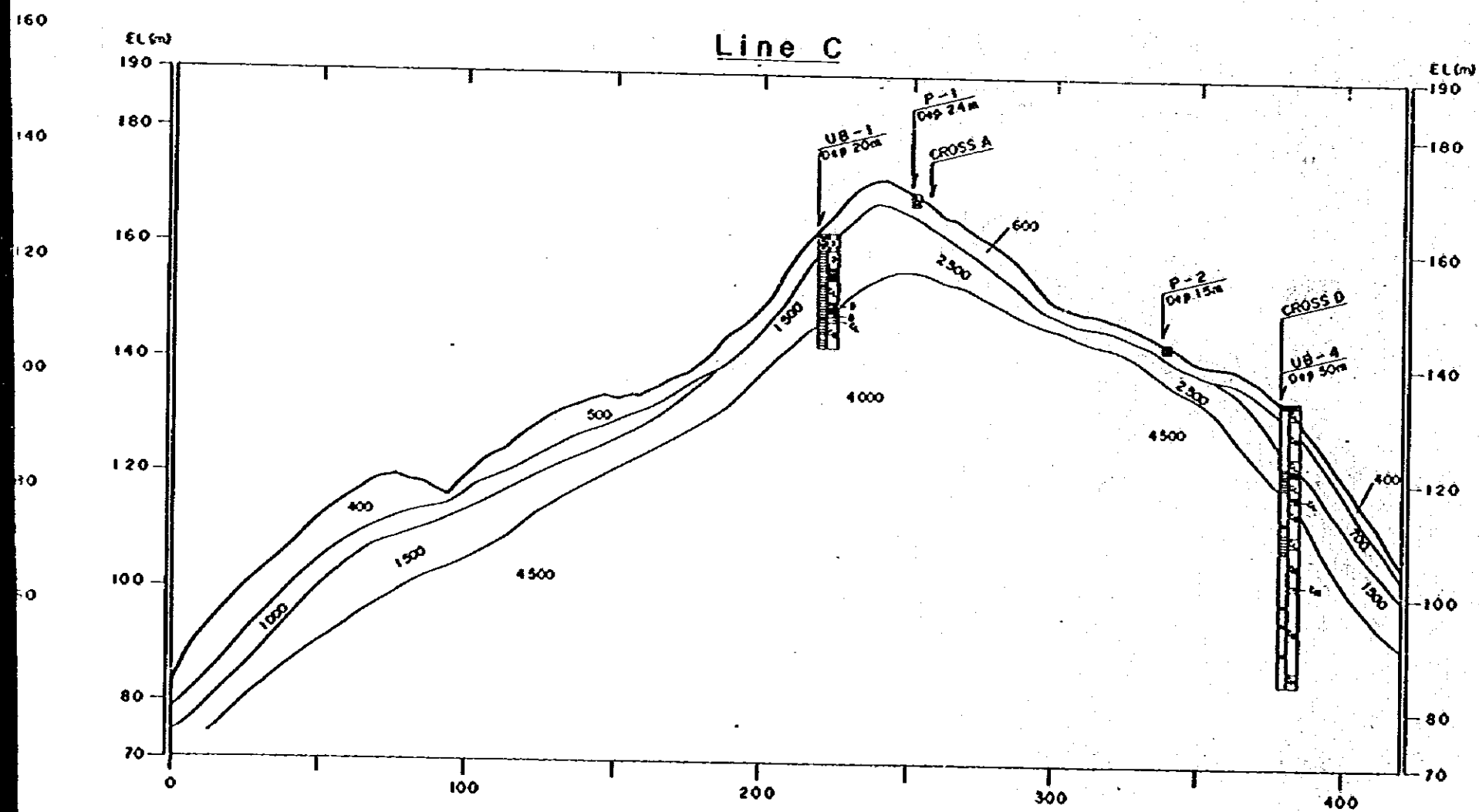
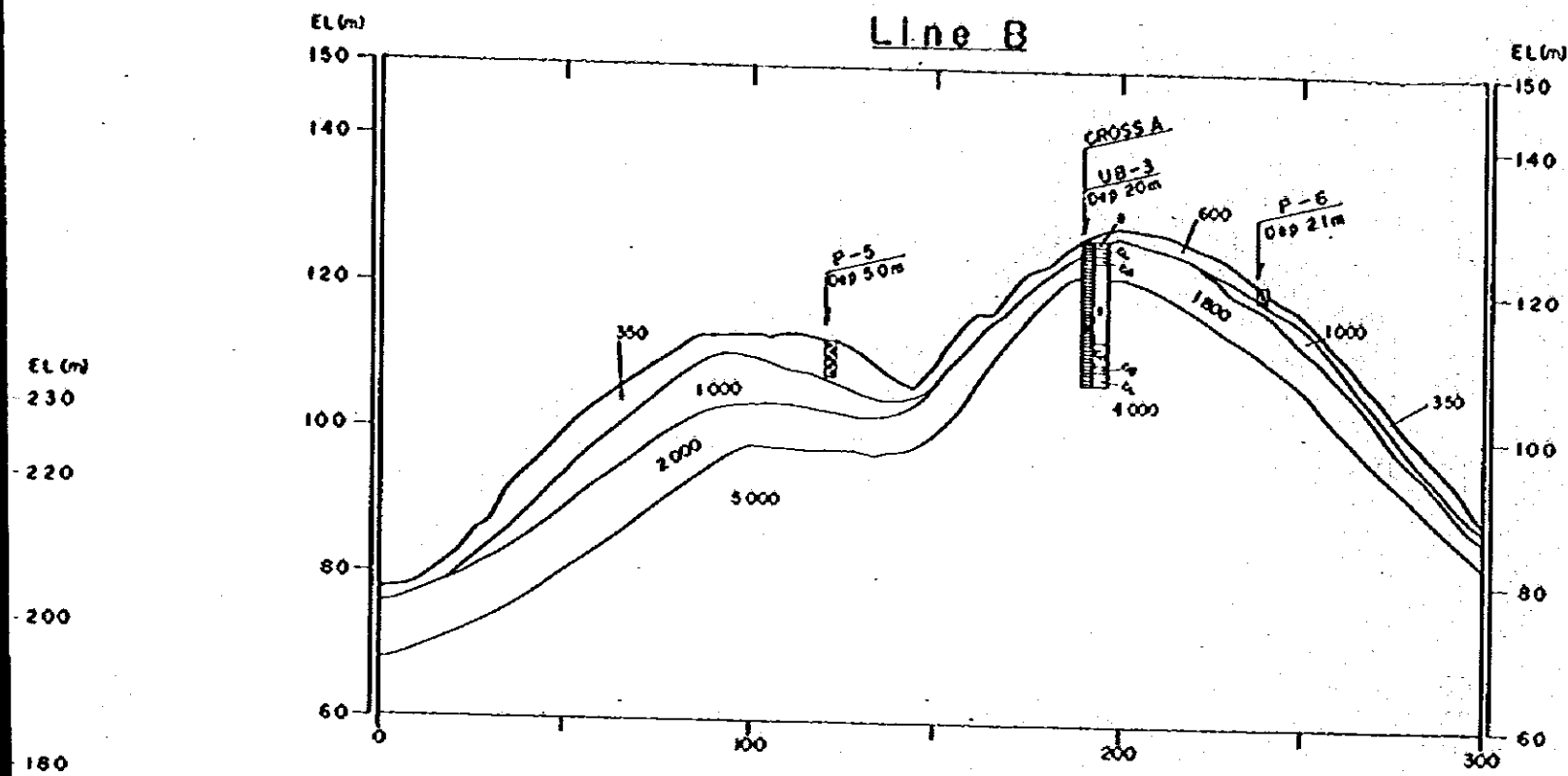
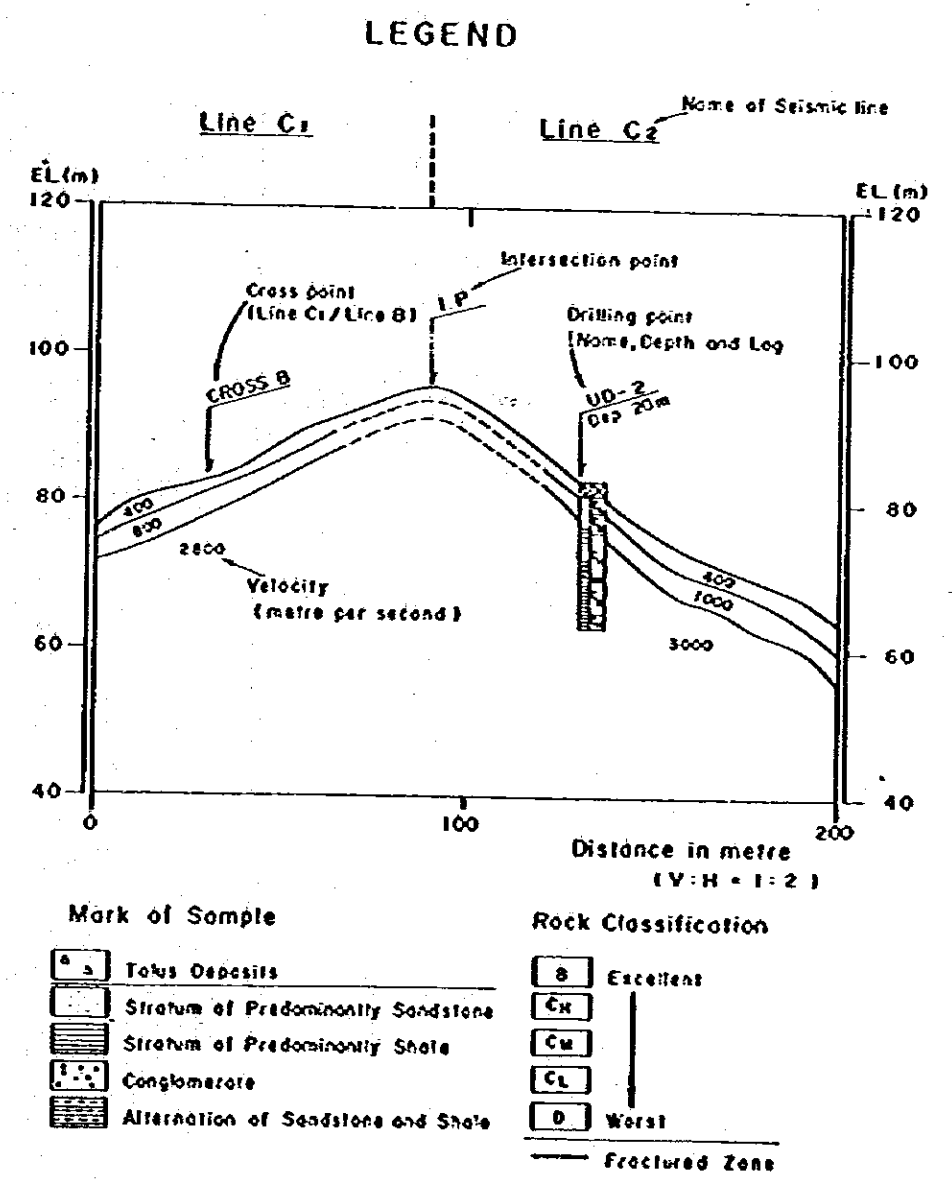
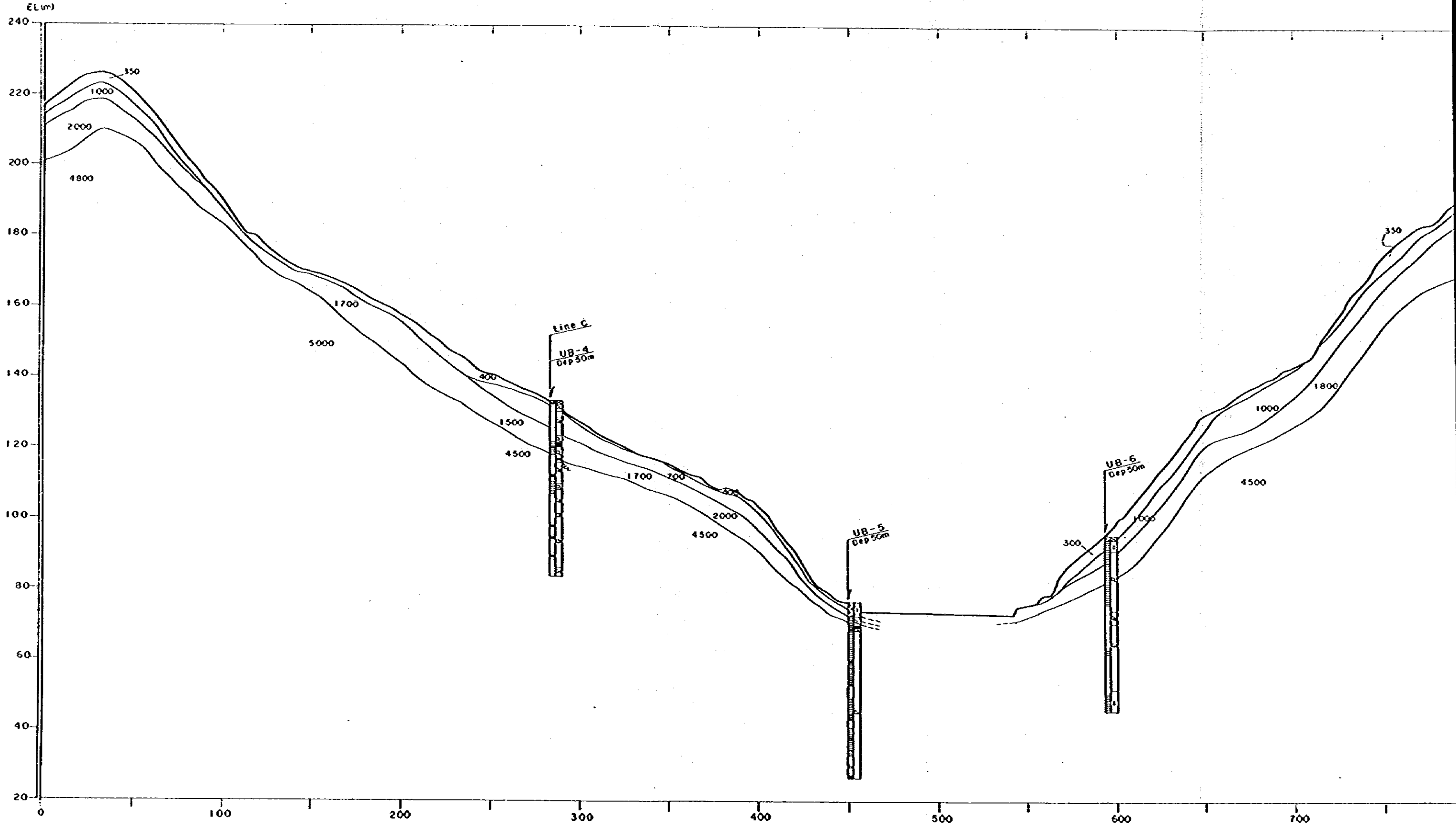


Fig. 4.13.1
SEISMIC PROSPECTING



Line A, B, C
(Upper Borrow Area)

Line D₁



Line D₁

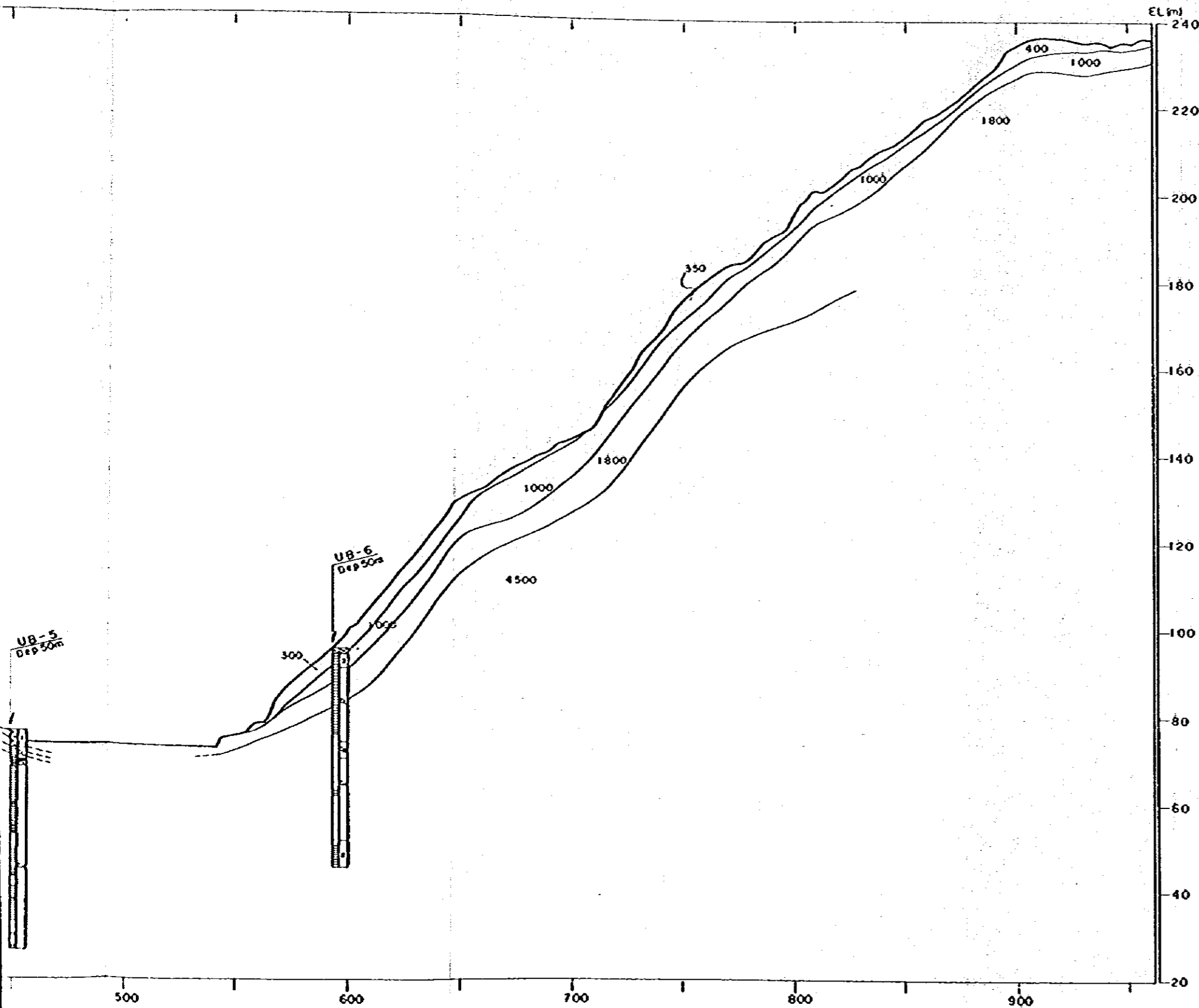
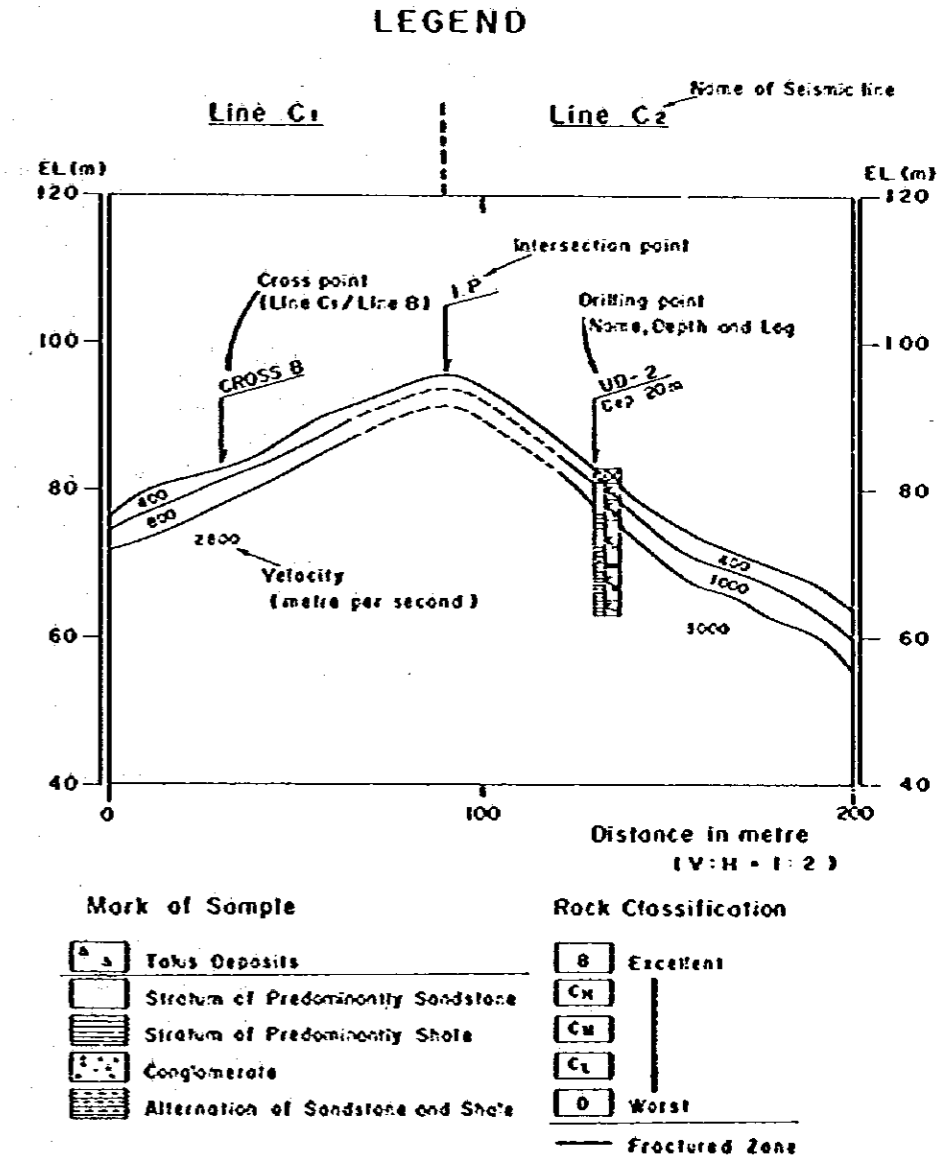


Fig. 4.13.2
SEISMIC PROSPECTING



Line D₁
(Upper Borrow Area)