Table 3.3.4 SUMMARY OF LABORATORY TEST FOR EARTH MATERIAL IN KEDUNGWARAK BORROW AREA IV

		KTP. 1	KTP. 2	KTP. 3	KTP. 4	KTP. 5
Sampling Depth	(m)					
Natural Moisture Content W	(%)	10.36	11.03	24.72	8.12	20.14
Specific Gravity Gs		2.85	2.79	2.68	2.75	2.64
Grain Size						
Maximum Particle Size (mm)		20.0	40.0	2.0	2.0	2.0
Gravel (2 - 76.2 mm)	(%)	12	59	-	-	-
Sand (0.074 - 2 mm)	(%)	80	33	65	86	39
Silt (0.005 - 0.074 mm)	(%)	4	5	24	7	45
Clay (< 0.005 mm)	(%)	4	3	11	7	16
Unified Soil Classification System		SP~SM	GW-GM	SC	SM	CH
Consistency						
Liquid Limit W_L	(%)	NP	NP	34.70	NP	55.40
Plastic Limit Wp	(%)	-	-	23.13	-	24.71
Plasticity Index I_P	(%)	-	-	11.57	-	30.69
Optimum Moisture Content	(%)	19.50	17.30	22.00	16.85	26.85
Maximum Dry Density γd	(g/cm^3)	1.657	1.794	1.549	1.659	1.398
Cohesion Intercept c'	(kg/cm^2)	0.5	0.25	0.3	0.3	0.4
Angle of Internal Friction Φ'		37^o	37^o	27^o	36^o	15^o
Initial Void Ratio e_0		0.82	0.64	0.77		1.03
Compression Index c_c		0.11	0.10	0.13		0.29
Coefficient of Permeability K	(cm/s)	5.8×10^{-5}	2.5×10^{-4}	1.7×10^{-6}	1.1×10^{-4}	1.3×10^{-6}

Table 3.3.5 SUMMARY OF LABORATORY TEST FOR EARTH MATERIAL
(WIDAS RIVER IMPROVEMENT SCHEME) (1/2)

			TW.1	TW.2	TW.3	TW.4	TW.5	TW.6
Sampling Depth		(m)	0.25 - 1.60	0.30 - 3.00	0.30 - 3.00	0.30 - 3.00	0.30 - 3.00	0.30 - 3.00
Natural Moisture Content	W	(%)	46.51	47.81	41.06	36.78	40.53	41.36
Specific Gravity	Gs		2.71	2.66	2.69	2.65	2.77	2.65
Grain Size								
Maximum Particle Size		(mm)	2.0	2.0	2.0	2.0	2.0	2.0
Gravel (2 - 76.2 mm)		(%)	-	-	-	-	-	-
Sand (0.074 - 2 mm)		(%)	6	4	4	7	14	4
Silt (0.005 - 0.074 mm)		(%)	60	59	56	57	46	60
Clay (0.005 mm)		(%)	34	37	40	36	38	36
Unified Soil Classification System								
Consistency								
Liquid Limit	W_L	(%)	69.90	79.90	72.20	64.80	84.20	68.05
Plastic Limit	Wp	(%)	28.94	33.85	34.94	29.27	35.45	28.79
Plasticity Index	I_p	(%)	40.96	45.05	42.92	35.53	48.75	29.26
Optimum Moisture Content		(%)	32.70	36.43	35.60	33.20	35.00	34.20
Maximum Dry Density	γ_d	(g/cm^3)	1.334	1.267	1.282	1.312	1.129	1.308
Cohesion Intercept	C'	(kg/cm^2)	0.25			0.25	0.4	0.5
Angle of Internal Friction	Φ'		20°			16°	5°	14°
Initial Void Ratio	e_0		1.15			1.12	1.12	1.14
Compression Index	c_c		0.31			0.37	0.41	0.36
Coefficient of Permeability	K	(cm/s)	1.9×10^{-8}	4.2×10^{-8}	9.0×10^{-9}	3.6×10^{-9}	1.9×10^{-9}	7.5×10^{-9}

Table 3.3.5 SUMMARY OF LABORATORY TEST FOR EARTH MATERIAL (WIDAS RIVER IMPROVEMENT SCHEME) (2/2)

			TW.7	TW.8	TW.9	TW.10	TW.11	TW.12
Sampling Depth		(m)	0.30 - 3.00	0.30 - 3.00	0.30 - 3.00	0.30 - 1.90	0.30 - 3.00	0.35 - 2.75
Natural Moisture Content	W	(%)	33.32	46.32	42.15	43.22	42.45	47.33
Specific Gravity	Gs		2.78	2.69	2.78	2.72	2.74	2.64
Grain Size								
Maximum Particle Size		(mm)	2.0	2.0	2.0	2.0	2.0	2.0
Gravel (2 - 76.2 mm)		(%)	-	-	-	-	-	-
Sand (0.074 - 2 mm)		(%)	70	2	13	4	7	10
Silt (0.005 - 0.074 mm)		(%)	10	43	43	35	32	43
Clay (< 0.005 mm)		(%)	20	55	44	61	61	47
Unified Soil Classification System			SC	CH	CH	CH	CH	CH
Consistency								
Liquid Limit	W_L	(%)	30.40	97.55	84.05	97.80	96.65	79.90
Plastic Limit	W_P	(%)	17.74	39.61	33.99	37.64	33.65	33.90
Plasticity Index	Ip	(%)	12.66	57.94	50.51	60.16	63.00	46.00
Optimum Moisture Content		(%)	20.00	37.80	34.80	37.10	36.90	40.05
Maximum Dry Density	γ_d	(g/cm^3)	1.681	1.233	1.318	1.220	1.244	1.206
Cohesion Intercept	C'	(kg/cm^2)	0.2		0.35			
Angle of Internal Friction		ϕ'	30°		9°			
Initial Void Ratio		e_0	0.74		1.35			
Compression Index		C_c	0.23		0.26			
Coefficient of Permeability	K	(cm/s)	1.1×10^{-5}	9.2×10^{-9}	2.2×10^{-9}	1.0×10^{-8}	5.7×10^{-9}	7.6×10^{-9}

Table 3.3.6 GEOLOGICAL INVESTIGATION AND CONSTRUCTION MATERIAL SURVEY COMPONENTS FOR KETANDAN DAM

Test Item		Quantity(sample) Thin Wall (Bridge)	Test Pit (Borrow Area)
(I) Soil Test			
(I-1) Physical Properties			
(i)	Specific gravity test	2	6
(ii)	Particle size analysis		
(iii)	Moisture content test	2	6
(iv)	Unit weight test	2	-
(v)	Consistency test	2	6
(I-2) Mechanical Properties			
(i)	Compaction test	-	6
(ii)	Permeability test	-	6
(iii)	Consolidation test		
	(Disturbed sample)	-	3
	(Undisturbed sample)	2	-
(iv)	Triaxial compression test		
	(UU : Undisturbed sample)	2	-
	($\overline{CU}$: Disturbed sample)	-	3

(II) Rock Test (from boring core)		Dam site	Transbasin Tunnel
(i)	Specific gravity and absorbtion test	12	4
(ii)	Compression strength test	2	2

CONSTRUCTION MATERIAL SURVEY TEST PITTING AND SAMPLING

Loaction	No of Test Pitting and Sampling
Earth Borrow Area	6

Table 3.3.7 SUMMARY OF LABORATORY TEST FOR EARTH MATERIAL IN KETANDAN BORROW AREA

			KT.1	KT.2	KT.3	KT.4	KT.5	KT.6
Sampling Depth		(m)	2.0-3.0	2.0-3.0	2.0-3.0	2.0-3.0	-	-
Natural Moisture Content	W	(%)	46.32	29.32	52.13	44.75		
Specific Gravity	Gs	2.78	2.78	2.78	2.71	2.77		
Grain Size								
Maximum Particle Size		(mm)	100	100	100	100	100	38.1
Gravel (2 - 76.2 mm)		(%)	81	44	86	69	30	24
Sand (0.074 - 2 mm)		(%)	9	22	4	7	30	32
Silt (0.005 - 0.074 mm)		(%)	5	28	6	15	26	27
Clay (< 0.005 mm)		(%)	5	6	4	9	14	17
Unified Soil Classification System			GC	GC	GC	GC	GC-SC	SM
COnsistency								
Liquid Limit	W_L	(%)	65.00	57.45	79.80	70.60	62.15	67.75
Plastic Limit	W_P	(%)	47.46	33.67	45.91	40.87	31.00	35.90
Plasticity Index	I_P	(%)	15.54	23.78	33.89	29.73	31.15	31.85
Optimum Moisture Content		(%)	42.00	34.50	49.90	48.70	33.60	39.20
Maximum Dry Density		(g/cm^3)	1.192	1.292	1.068	1.124	1.275	1.227
Cohesion Intercept	c'	(kg/cm^2)	0.6	0.9	0.4	0.4	0.1	0.3
Angle of Internal Friction	ϕ'		30°	20°	30°	30°	23°	20°
Initial Void Ratio	e_0							
Compression Index	c_c							
Coefficient of Permeability	K	(cm/s)						

Table 3.3.8 REQUIREMENT OF CONSTRUCTION MATERIAL FOR KEDUNGWARAK WEIR (PROVISIONAL)

Material	Quantity (m^3)
1. Earth Material	6,300
2. Rock riprap	250
3. Masonry	600
4. Coarse aggregate	9,000

Table 3.3.9 PROPOSED DESIGN VALUES OF EMBANKMENT MATERIALS FOR KEDUNGWARAK WEIR

		Earth Material	Filter and Drain Material	Rock Material
Specific gravity		2.75	2.85	2.60
Dry density	(t/m^3)	1.55	1.70	1.80
Wet density	(t/m^3)	1.85	1.80	1.84
Saturated density	(t/m^3)	1.95	2.00	2.00
Cohesion	(t/m^2)	2.0	0	0
Angle of internal friction	(°)	32	38	
Coefficient of Permeability	(cm/s)	5×10^{-5}	1×10^{-3}	1×10^{0}

Table 3.3.10 REQUIREMENT OF CONSTRUCTION MATERIALS FOR KETANDAN DAM (PROVISIONAL)

Material	Quantity (m^3)
1. Earth Material	423,000
2. Filter and Drain Material	27,000
3. Rock riprap	58,400
4. Coarse aggregate	10,700
5. Fine aggregate	1,000

Table 3.3.11 PROPOSED DESIGN VALUES OF EMBANKMENT MATERIALS FOR KETANDAN DAM

		Earth Material	Filter and Drain	Rock Material
Specific gravity			2.75	2.60
Dry density	(t/m^3)			1.75
Wet density	(t/m^3)	1.60	1.80	1.80
Saturated density	(t/m^3)	1.75	2.10	2.15
Cohesion	(t/m^2)	4.0	0	0
Angle of internal Friction	(°)	25	38	40
Coefficient of permeability	(cm/s)	5×10^{-5}	1×10^{-3}	1×10^{0}

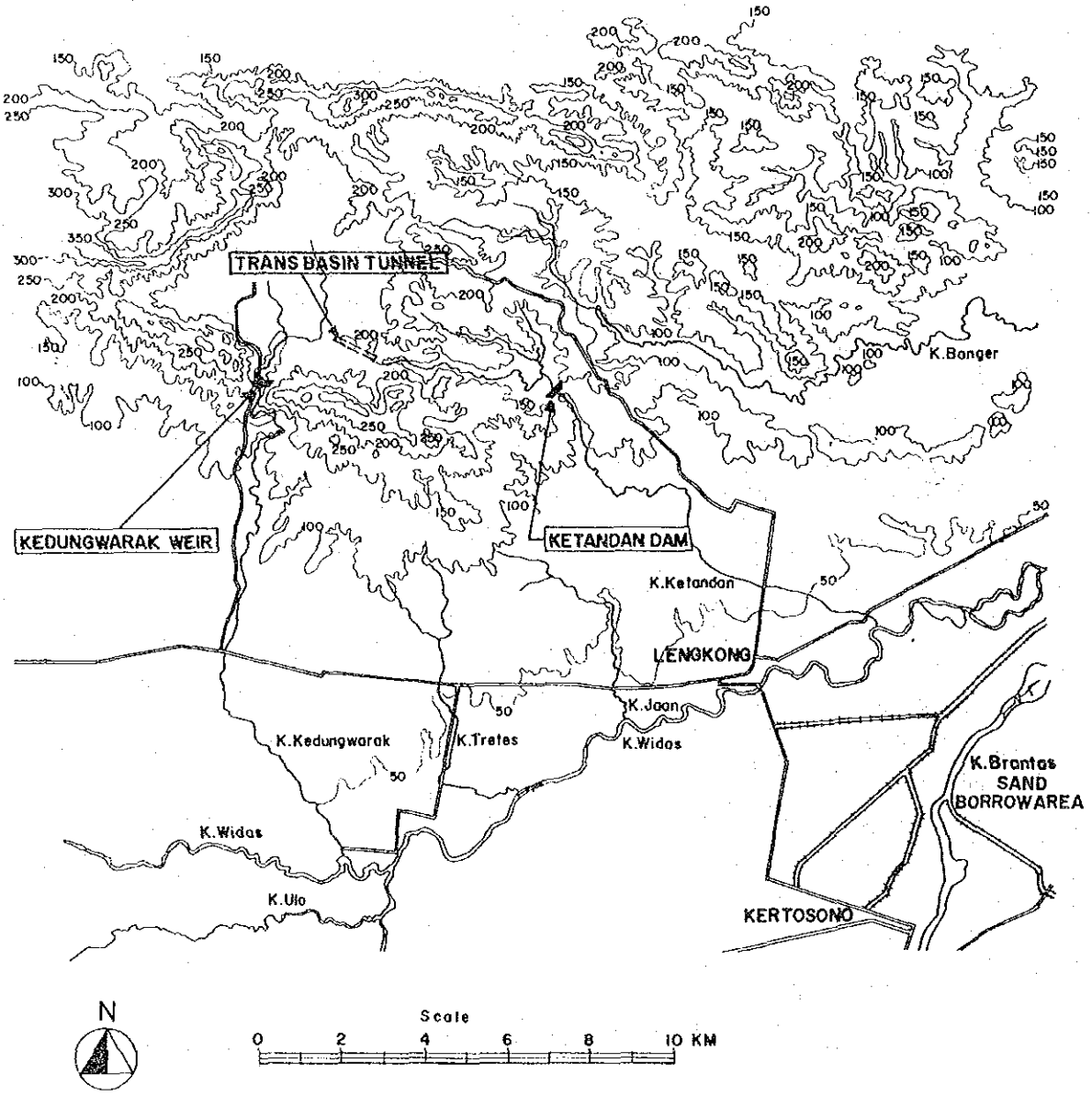


Fig. 3. 3. 1 LOCATION MAP OF KEDUNGWARAK WEIR SITE AND KETANDAN DAM SITE

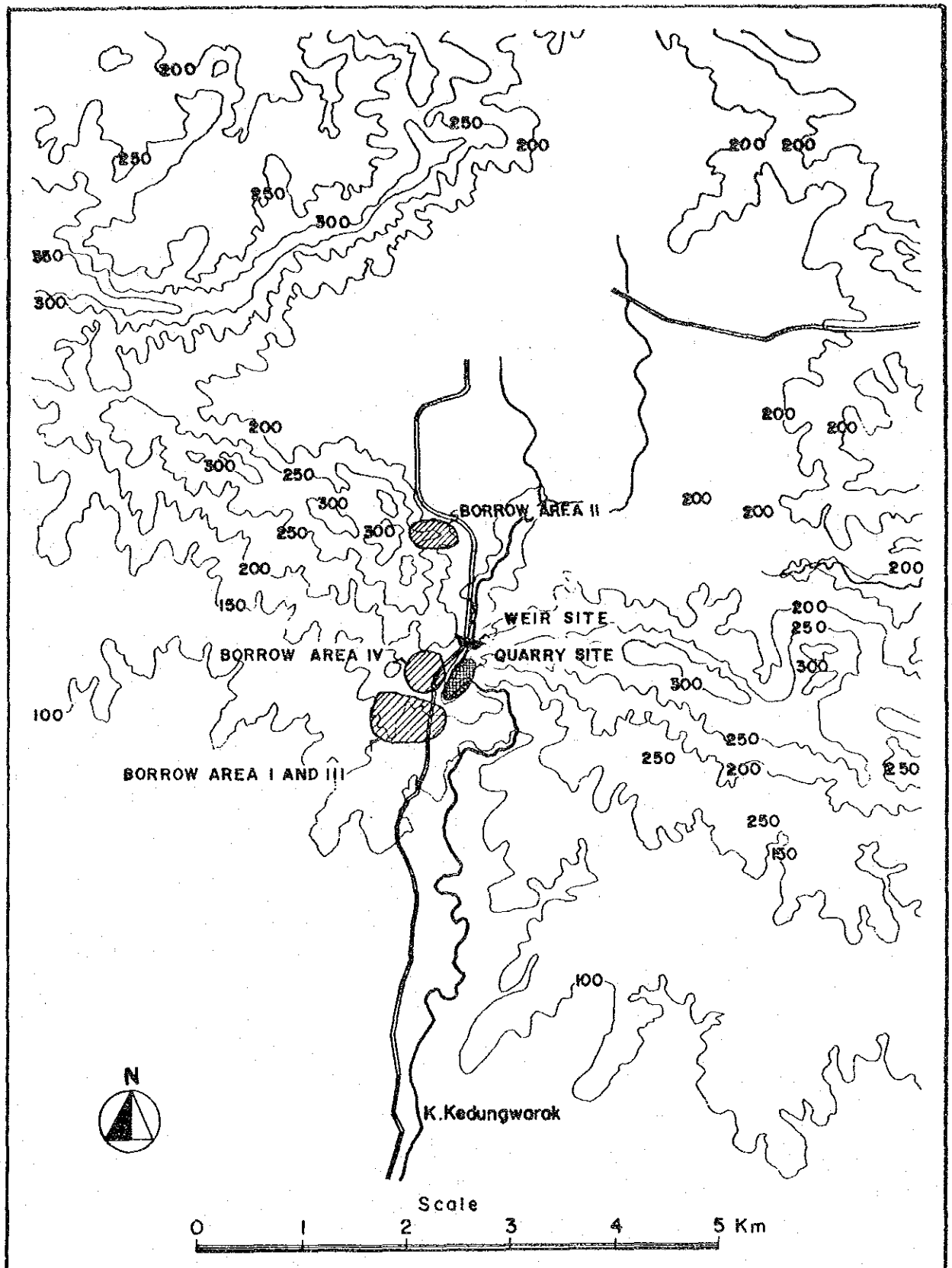


Fig. 3.3.2 LOCATION MAP OF KEDUNGWARAK WEIR SITE, BORROW AREA AND QUARRY SITE

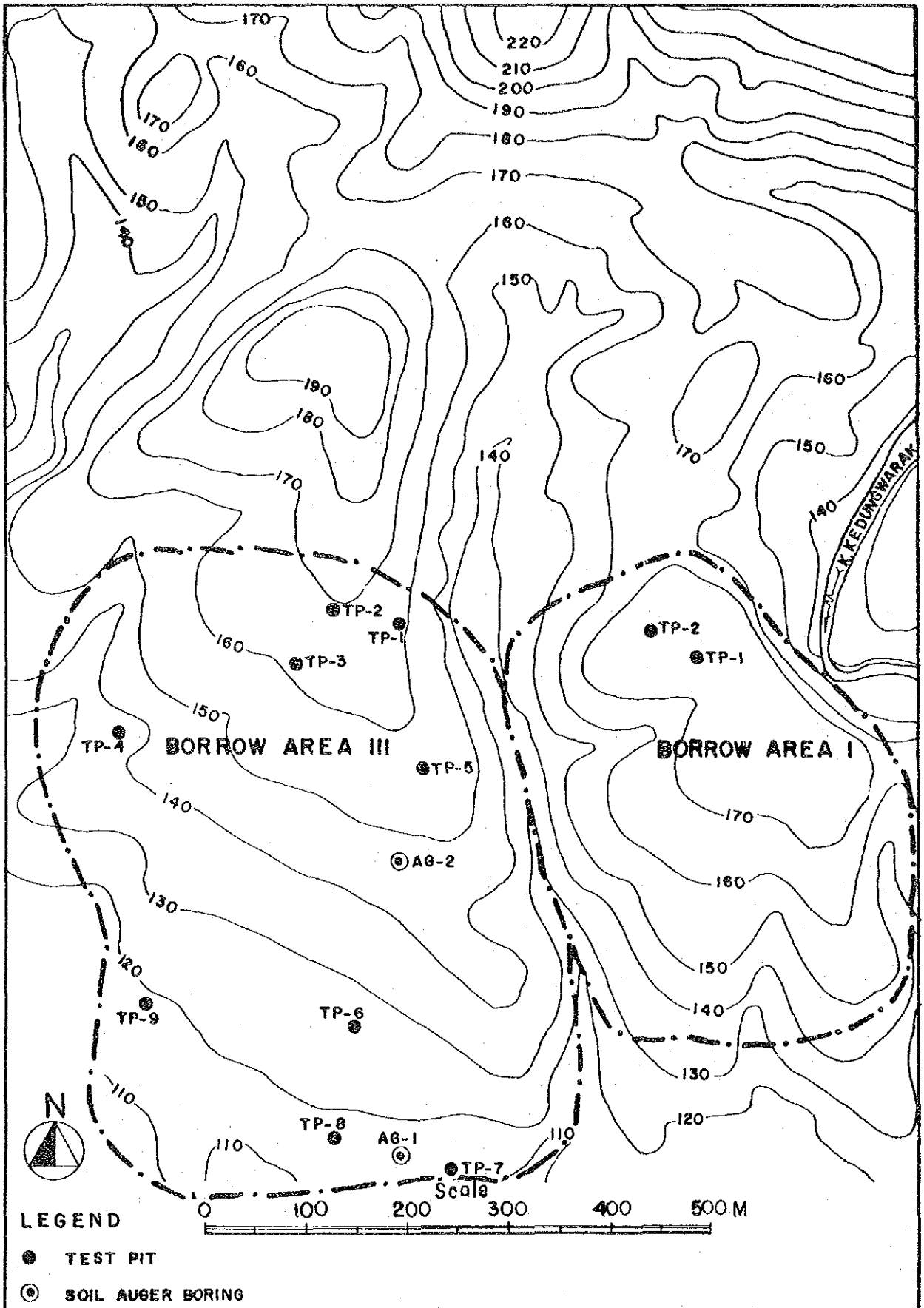


Fig. 3.3.3 LOCATION MAP OF KEDUNGWARAK EARTH BORROW AREA I AND III

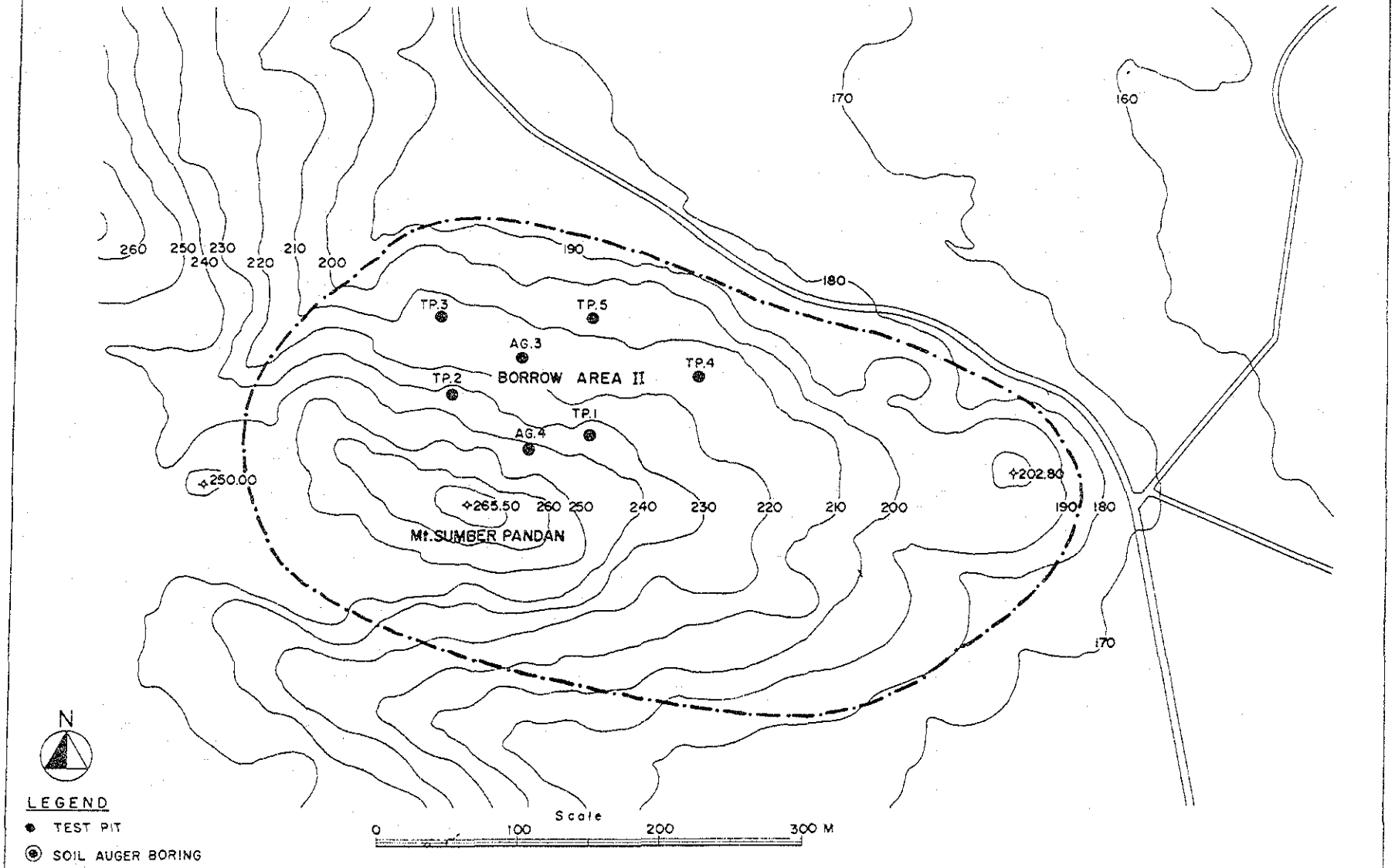


Fig. 3.3.4 LOCATION MAP OF KEDUNGWARAK BORROW AREA II

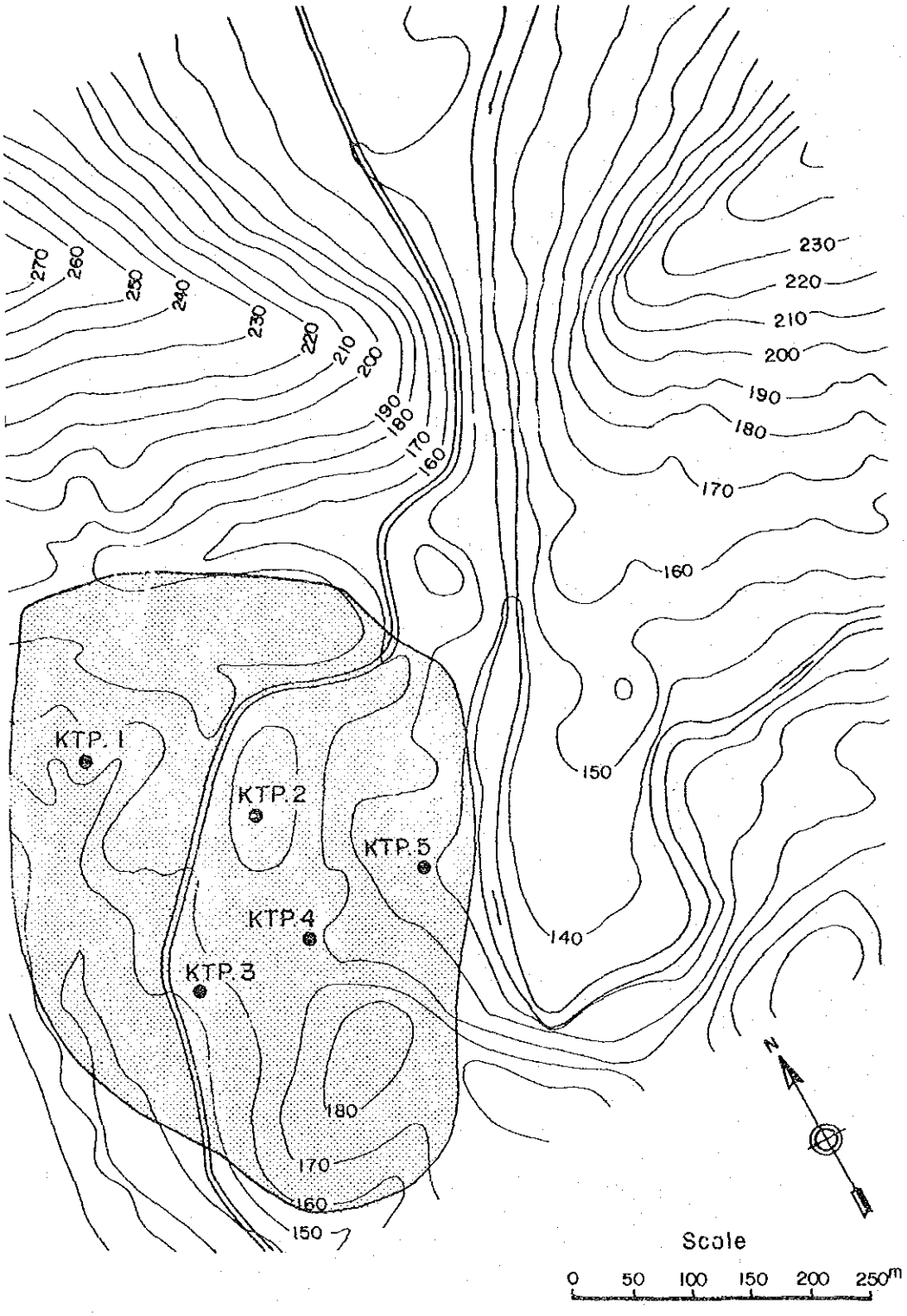


Fig. 3.3.5 LOCATION MAP OF TEST PITTING IN KEDUNGWARAK BORROW AREA IV

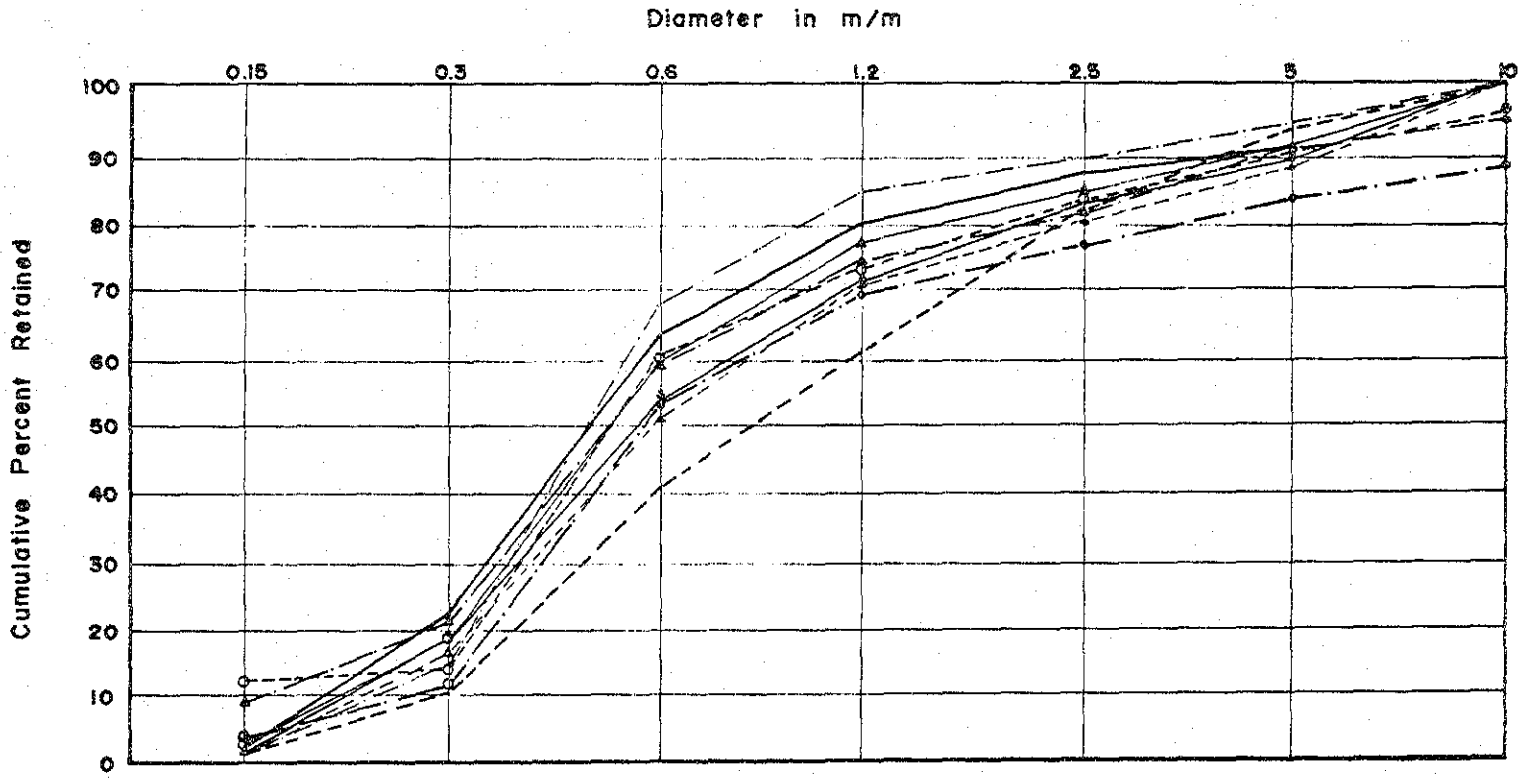


Fig. 3.3.6 SIEVING ANALYSIS TEST RESULT OF FILTER, DRAIN AND FINE AGGREGATE FOR BENING DAM CONSTRUCTION

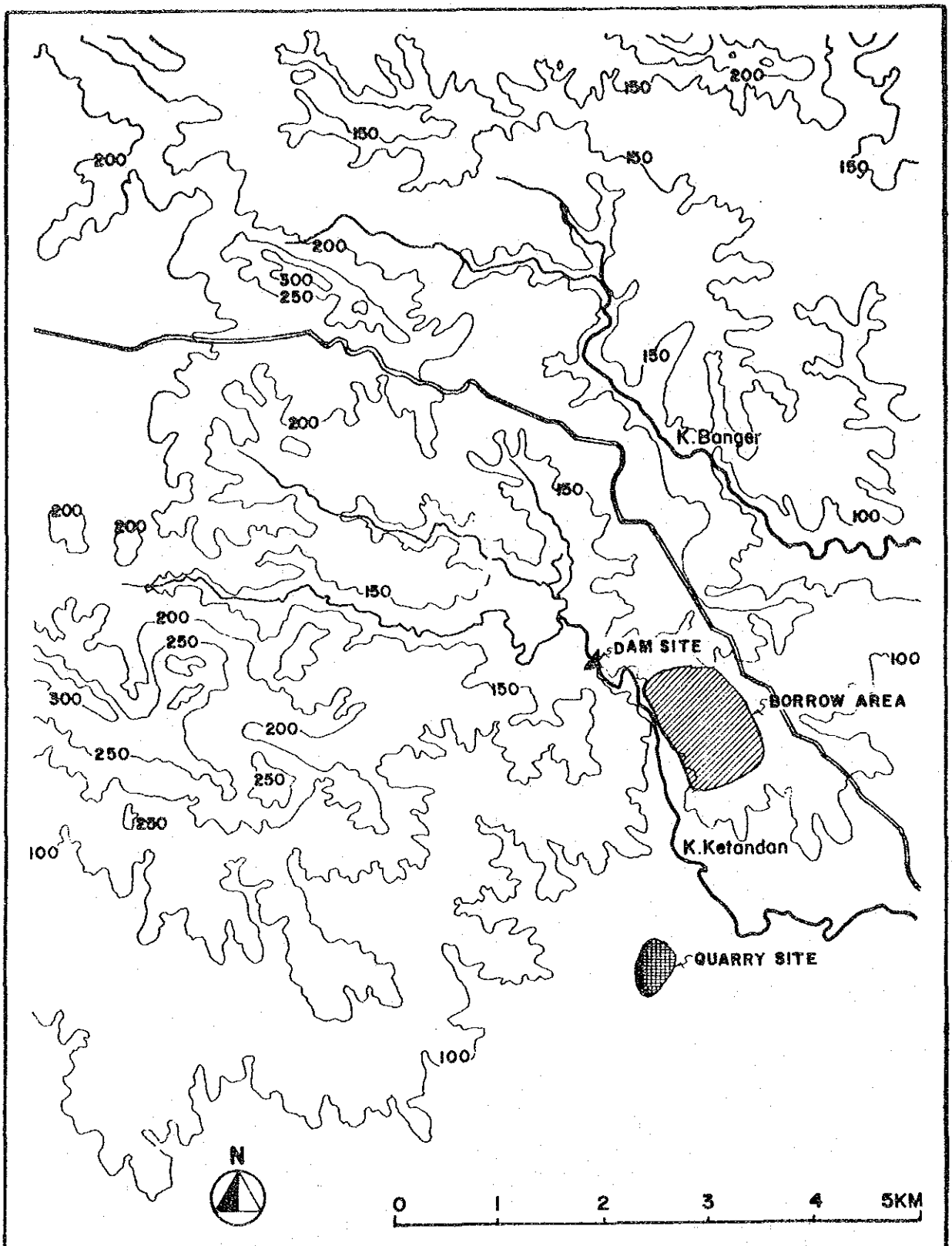


Fig. 3.3.7 LOCATION MAP OF KETANDAN DAM SITE, BORROW AREA AND QUARRY SITE

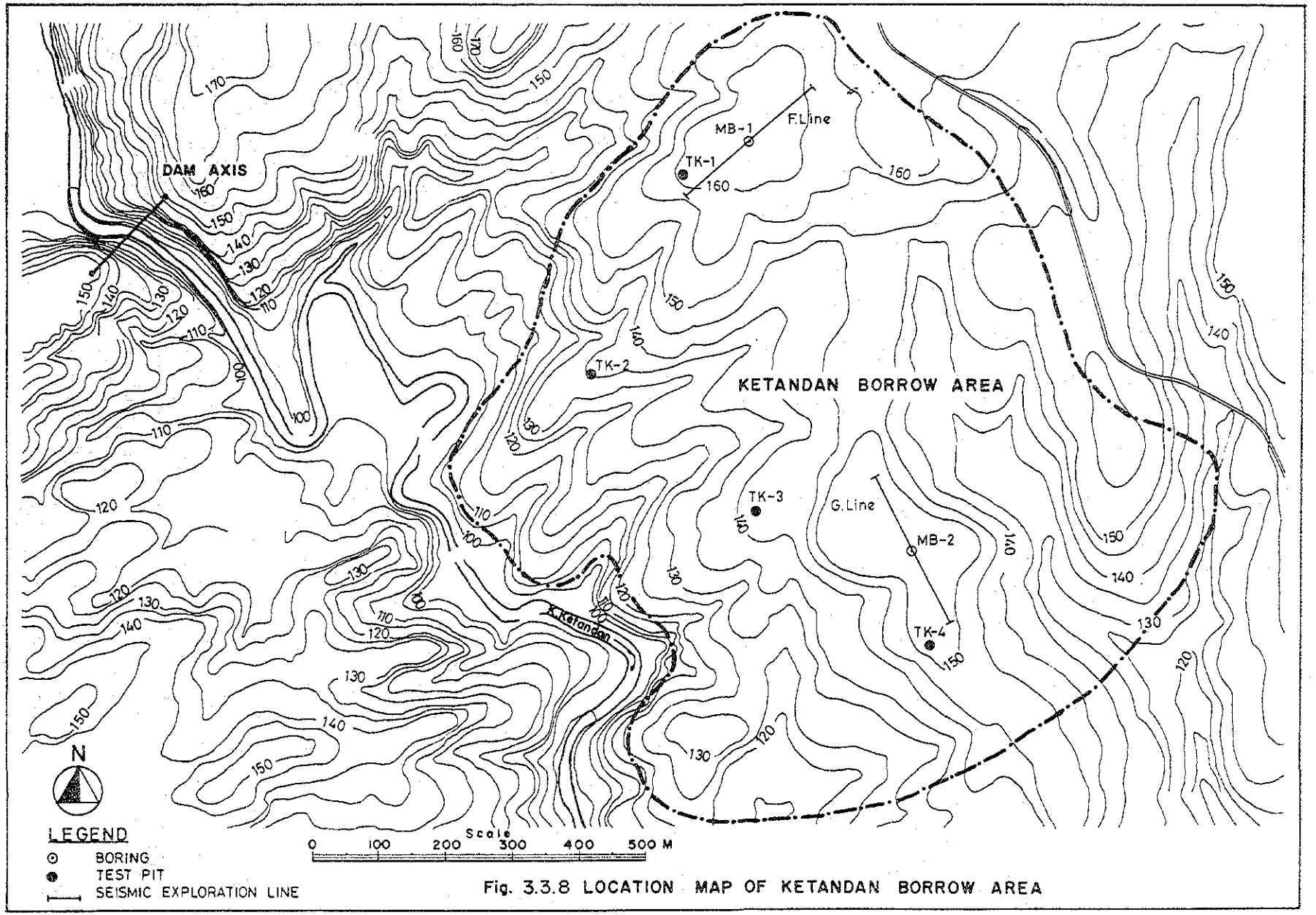


Fig. 3.3.8 LOCATION MAP OF KETANDAN BORROW AREA

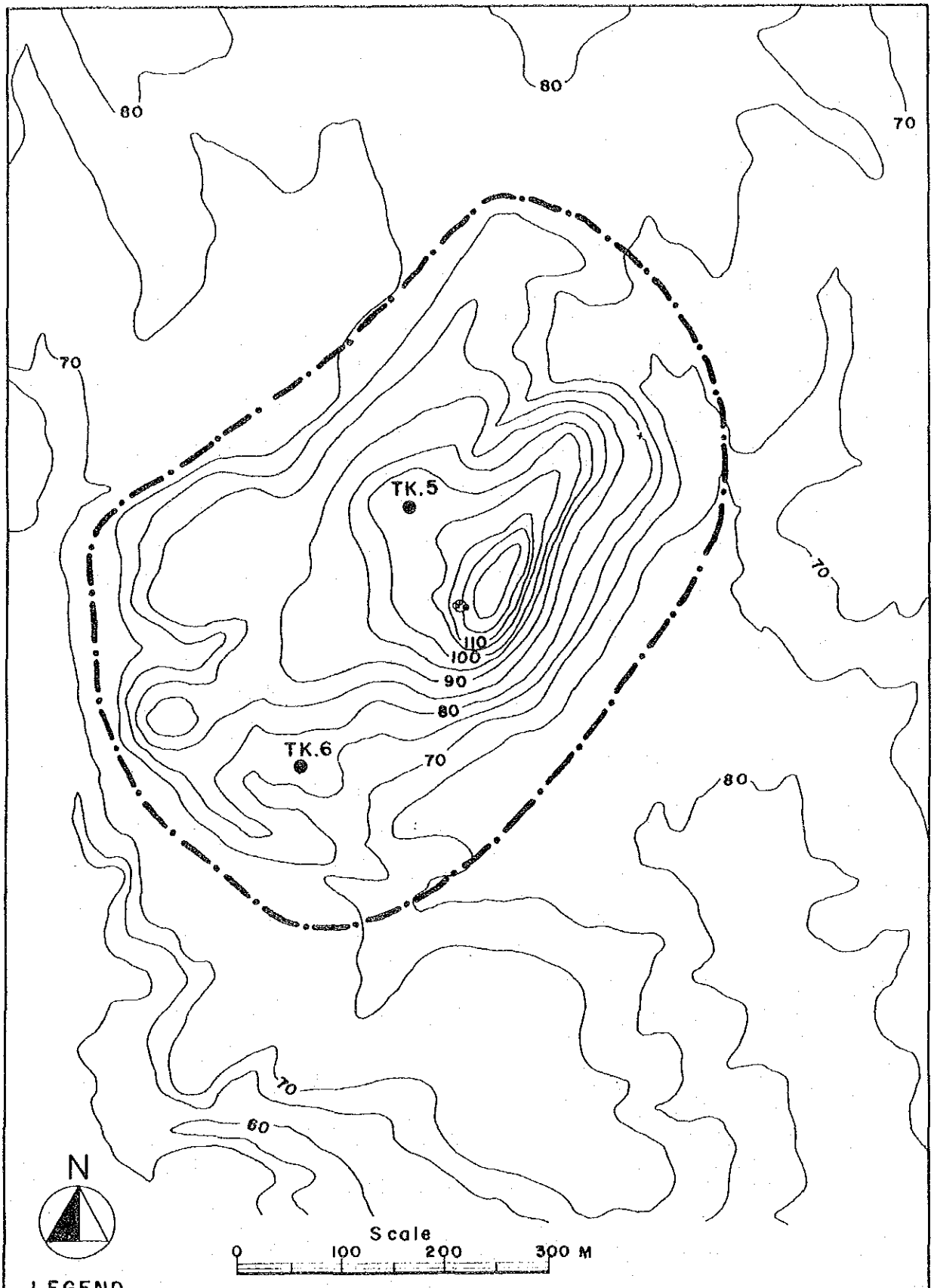


Fig. 3.3.9 LOCATION MAP OF KETANDAN QUARRY SITE

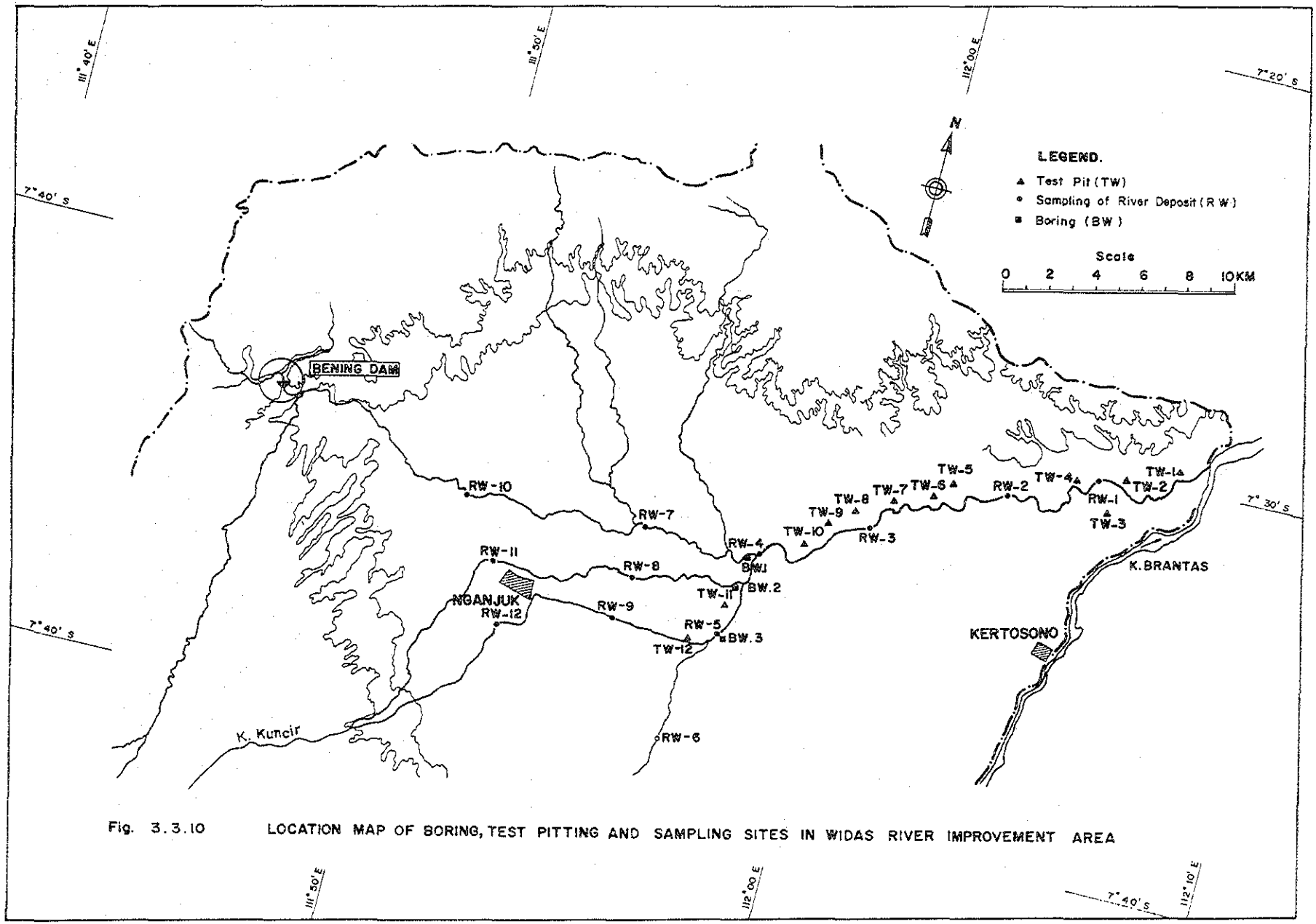


Fig. 3.3.10 LOCATION MAP OF BORING, TEST PITTING AND SAMPLING SITES IN WIDAS RIVER IMPROVEMENT AREA

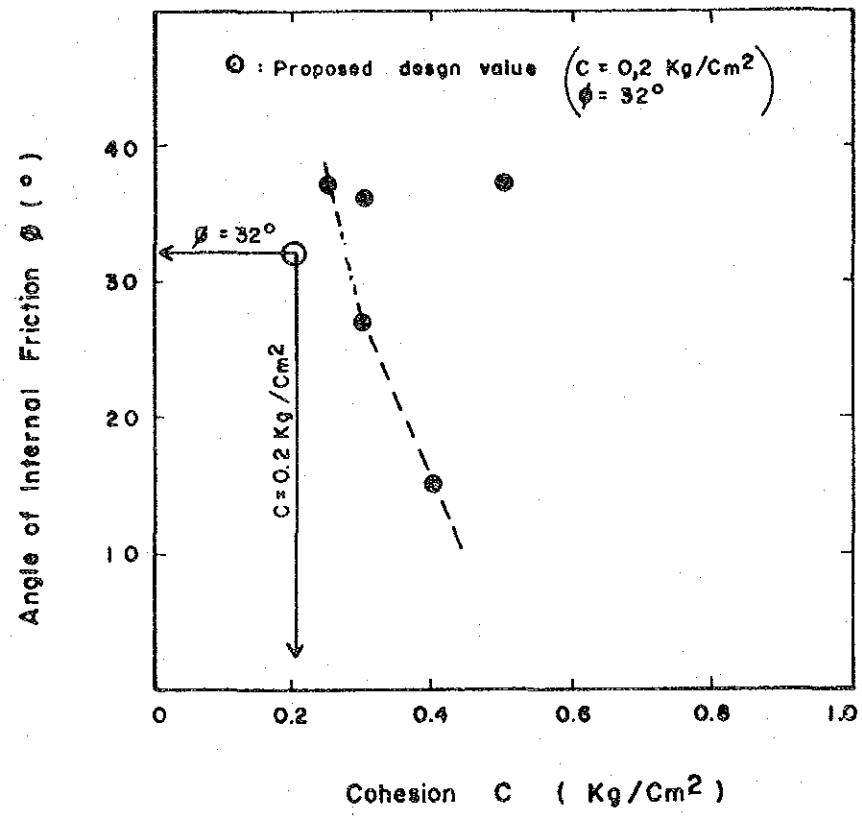


Fig. 3.3.11 RELATIONSHIP BETWEEN COHESION AND ANGLE OF INTERNAL FRICTION FOR EARTH MATERIAL IN KEDUNGWARAK EARTH BORROW AREA IV

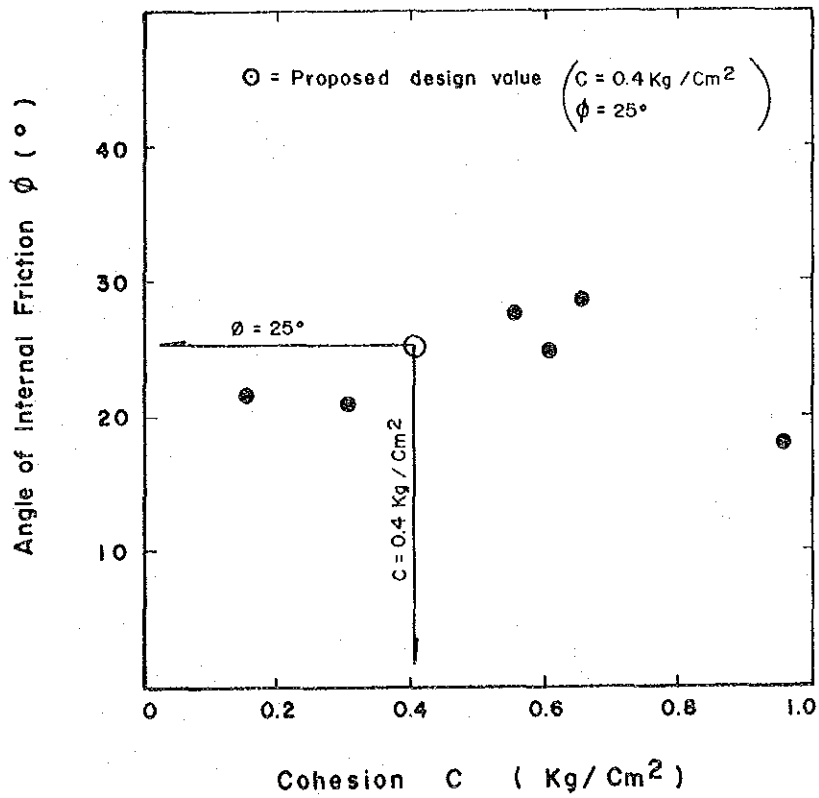
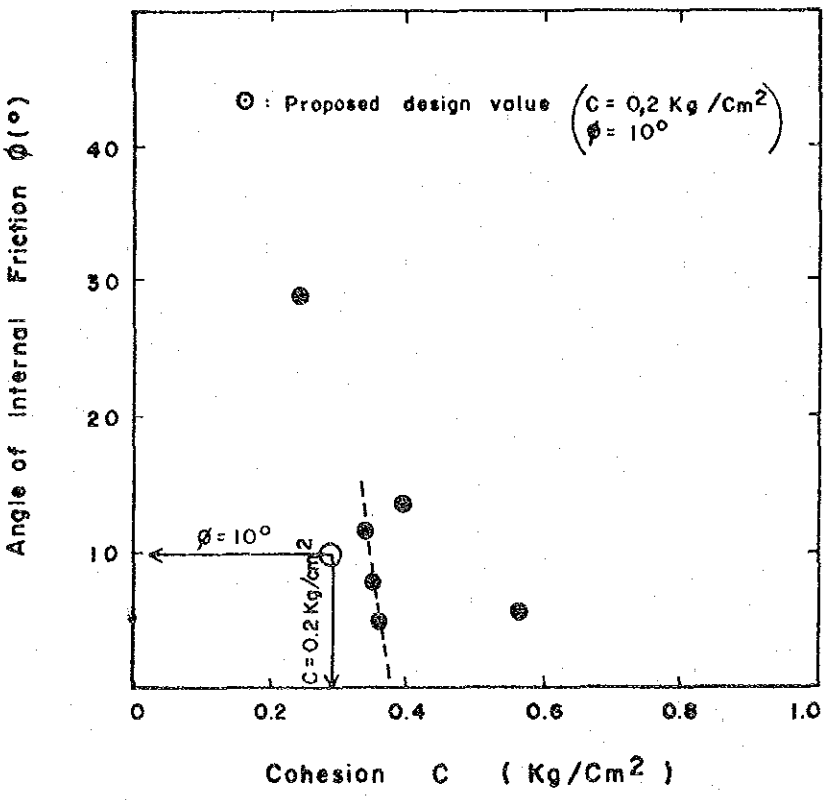


Fig. 3.3.12 RELATIONSHIP BETWEEN COHESION AND ANGLE OF INTERNAL FRICTION FOR EARTH MATERIAL IN KETANDAN EARTH BORROW AREA



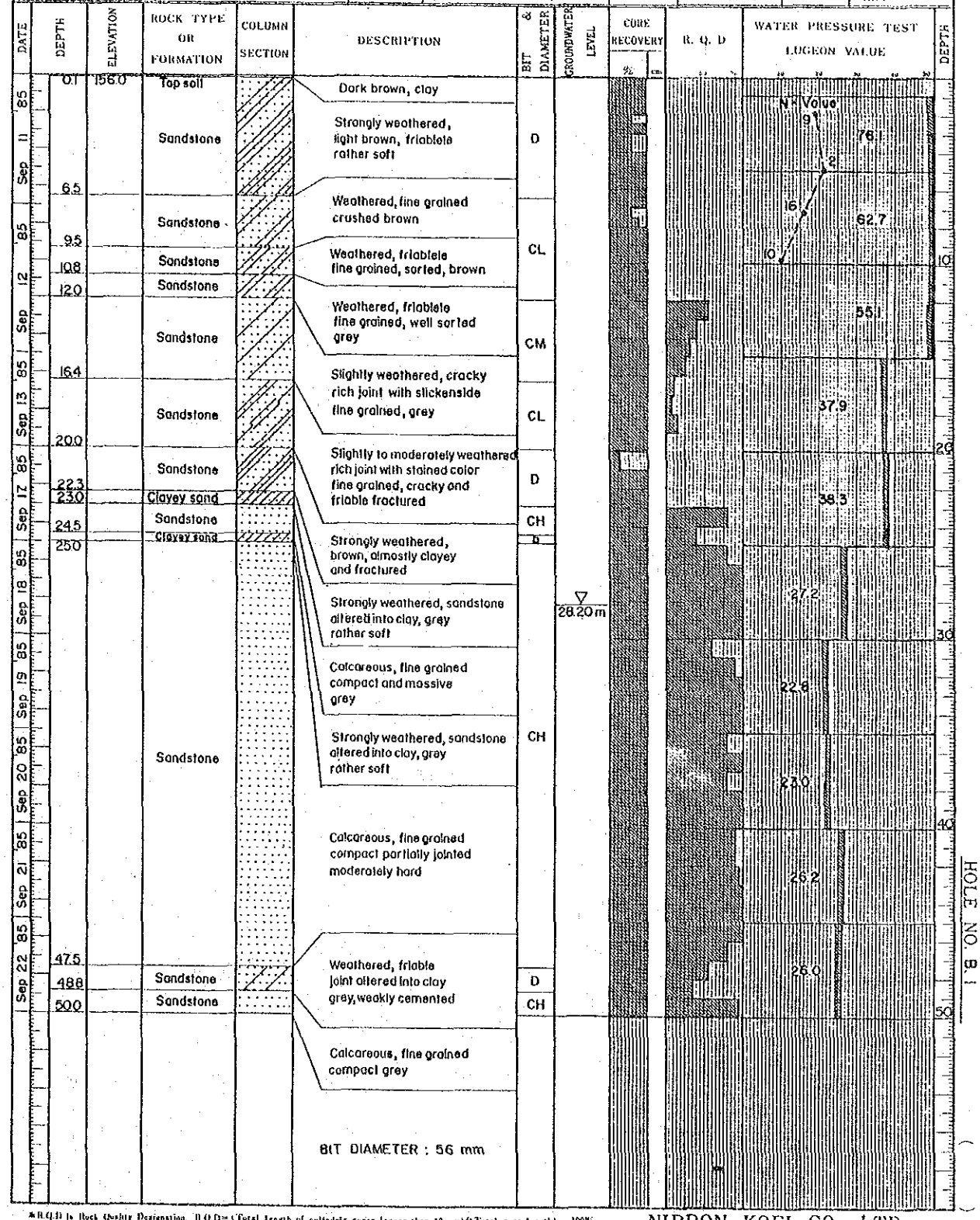
Note : Borrow area is assumed to be along the river channel

Fig. 3.3.13 RELATION BETWEEN COHESION AND ANGLE OF INTERNAL FRICTION FOR EARTH MATERIAL IN WIDAS LOWER FOR LEVEE EMBANKMENT

DRILL LOG

HOLE NO. B.1 SHEET NO. OF

PROJECT	WIDAS FLOOD CONTROL AND DRAINAGE PROJECT			DEPTH	50 m	ELEVATION	156.10 m
SITE	KETANDAN DAM SITE	COORDINATE	: :	INCLINATION	90°	DRILL RIG	UD - 5
AVERAGE CORE RECOVERY		DATE	FROM Sep. 10 TO Sep. 24'85	DRILLED	MUJIB. S.	LOGGED	M. F



HOLE NO. B.1

LOG FORM—B

*R.Q.D is Rock Quality Designation, R.Q.D= (Total length of cylindric cores longer than 10 cm)/(Total core length) × 100%
*LUGEON VALUE is l/min/m under injection water pressure of 10kg/cm²
*DEPTH and ELEVATION are in meter

NIPPON KOEI CO., LTD.
CONSULTING ENGINEERS, TOKYO.

DRILL LOG

HOLE NO. B2 SHEET NO. OF

PROJECT	WIDAS FLOOD CONTROL AND DRAINAGE PROJECT			DEPTH	50 m	ELEVATION	138.82 m
SITE	KETANDAN DAM SITE	COORDINATE		INCLINATION	90 m	DRILL RIG	UD - 5
AVERAGE CORE RECOVERY		DATE	FROM TO	DRILLED	SIYADI	LOGGED	M.F

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	BIT DIAMETER	GROUNDWATER LEVEL	CORE RECOVERY %	R Q D	WATER PRESSURE TEST LUGEON VALUE	DEPTH
Sep.11'85	0.5		Top soil		Clay to silt, dark brown					N-Value	
	5.5		Sand stone		Strongly weathered light brown friable, partly altered into clay, rather soft	D				11	
Sep.12'85										260.6	
			Sand stone		Strongly to moderately weathered, brown, cracky friable, weakly cemented fine to medium grained, rich joint well stained in color, rather soft	CL				67.2	
Sep.13'85										51.0	
	17.0				Strongly weathered sand stone altered into clay, grey rather soft					41.0	
			Clayey sand			D					
Sep.14'85	19.5				Calcareous slightly weathered rich joint, cracky, partially fractured, grey	CM ~ CL				41.8	
			Sand stone								
	24.0				Calcareous slightly weathered, compact, grey, partially weakly fractured joint altered into clayey at 28.2 - 28.4 m, 28.8 - 29.0 m					28.0	
Sep.17'85			Sand stone			CM					
Sep.18'85	32.0				Moderately weathered, calcareous, rough surface, contain mass clay, medium weight rather hard, whitish grey with calcite rein					35.7	
			Tuffaceous sand stone								
Sep.19'85										27.2	
Sep.20'85			Sand stone		Calcareous, fine to medium grained partially strongly weathered jointed with calcite rein at 41.3 - 41.6 m, 440 - 450 m, 450 - 453 m, 490 - 492 m,	CH ~ CM	47 45.00m			23.2	
Sep.21'85											
Sep.22'85	50.0									19.9	
	51							100	6		
	52							90	12		
	53							90	10	K = 2.71 x 10⁻⁴ cm/sec	
	54				Greyish white colour fine sand size, medium compaction, contained carbonate, medium hard.			100	20	LU = 19.7	
	55		Sandstone.					80			
	56							100	11		
	57							100	49		
	58						On 35.77m depth.	90	41	K = 2.04 x 10⁻⁴ cm/sec	
	59	79.52						100	40	LU = 14.8	
	60		Sandstone.		Greyish white colour, med sand size, med compaction, contained carbonate, medium hard.			100	58		
	61	77.78						100	62		
	62		Sandstone.		Greyish white, colour fine sand size med compaction contained carbonate med hard.			100	63	K = 3.13 x 10⁻⁵ cm/sec	
	63	76.12						100	48	LU = 2.12	
	64							80	10		
	65							82			
	66		Marl.		Greyish white colour silt clay size compact med hard.			100	61		
	67							100	25		
	68							100	79		
	69							105	58	K = 1.615 x 10⁻⁵ cm/sec	
	70							100	51	LU = 1.153	
	71	67.82						100	72		

BIT DIAMETER : 56 mm

HOLE NO. B2

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DRILL LOG

HOLE NO. B. 3 SHEET NO. OF

PROJECT	WIDAS FLOOD CONTROL AND DRAINAGE PROJECT			DEPTH	60 m	ELEVATION	99.65 m
SITE	KETANDAN DAM SITE	COORDINATE	: :	INCLINATION	90°	DRILL RIG	UD - 5
AVERAGE CORE RECOVERY		DATE	FROM Aug 11 TO Aug 30 '85	DRILLED	MISENI	LOGGED	M. I

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	BIT & DIAMETER	GROUNDWATER LEVEL ▽	CORE RECOVERY %	CORE RECOVERY cm	R. Q. D %	WATER PRESSURE TEST LUGEON VALUE	DEPTH
Aug 11 '85	0.6		Sandstone		Strongly weathered, crushed grey	D	0 m					
Aug 12 '85			Sandstone		Tuffaceous and calcareous, fine grained compact, light weight, rich joint, party fractured, grey	CM					20m ~ 8.00m 12.7 4.20m ~ 0.00m 86.2	
Aug 13 '85											8.4	10
Aug 14 '85					Calcareous, weathered rather soft, friable weackly joint with slicken side, grey						9.7	
Aug 16 '85	20.5		Sandstone			CM CL						20
Aug 20 '85	22.3		Marl		Clayey to sandy, friable, partially compact, grey	CL					2.6	
Aug 21 '85	27.0		Sandstone		Calcareous, slightly weathered, mainly compacted, grey	CM					1.0	30
Aug 22 '85	29.3		Marl		Sandy, friable partially clayey, grey	CL					0.3	
Aug 23 '85	36.0		Marly Clay		Strongly weathered marl, altered into clay, soft, fractured grey	D					0.3	
Aug 27 '85	39.0		Marl		Sandy, fractured grey	CL ~ D					0.3	40
Aug 28 '85	52.0		Marly Clay		Strongly weathered marl, altered into clay soft, grey	D					0.2	50
Aug 30 '85	56.0		Marl		Sandy, fractured grey	CL ~ D					0.2	
	60.0										0.2	60

HOLE NO. B.3

LOG FORM-B

*R.Q.D is Rock Quality Designation. R.Q.D= (Total length of cylindric cores longer than 10 cm)/(Total core length) x 100%
*LUGEON VALUE is l/min/m under injection water pressure of 10kg/cm²
*DEPTH and ELEVATION are in meter

NIPPON KOEI CO., LTD.
CONSULTING ENGINEERS, TOKYO.

BIT DIAMETER : 56 mm

DRILL LOG

HOLE NO. B 4 SHEET NO. OF

PROJECT	WIDAS FLOOD CONTROL AND DRAINAGE PROJECT			DEPTH	50 m	ELEVATION	123.14 m
SITE	KETANDAN DAM SITE	COORDINATE	: :	INCLINATION	90°	DRILL RIG	UD-5
AVERAGE CORE RECOVERY		DATE	FROM Aug.15 TO Aug. 30 '85	DRILLED	SIYADI	LOGGED	M.F

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	BIT & DIAMETER	GROUNDWATER LEVEL	CORE RECOVERY %	R.Q.D %	WATER PRESSURE TEST LUGEON VALUE	DEPTH
Aug.15	0.6		TOP SOIL		Clay, dark brown						
	3.0		Redival soil		Strongly weathered sandstone brown	D					
Aug.16	5.0		Sandstone		Strongly to moderately weathered fractured, brown					137.1	
Aug.19 '85	9.4		Sandstone		Strongly to moderately weathered fractured, rich jointed with stained color fine grained	CL				81.4	
	10.4		Sandstone			CM					10
Aug.20			Tuffaceous Sandstone		Slightly weathered, compact, calcareous, contain calcite vein, white grey, rather hard	CL					
Aug.23	14.2									38.5	
Aug.24 '85			Sandstone		Weathered, hardly fractured, calcareous, contain some fossil frogments rather hard, grey	CM ≀ CL				33.8	20
	22.0						▽21.55m			41.0	
Aug.25 '85					Slightly weathered, fine to medium grained partially contain clayey sandstone						
Aug.26 '85										30.0	30
Aug.27 '85			Sandstone		Calcareous, fine to medium and coarse grained, not sorted, light weight, rather soft, easy broken to sand by hammering at lower portion. Partially exposed slicken side joint, grey	CH ≀ CM				25.3	
Aug.28 '85										35.0	40
Aug.29 '85										37.1	
	45.0										
Aug.30 '85			Sandstone		Calcareous, fine grained, rather clayey partially bedding, rather soft dark grey	CM ≀ CL				44.9	50
	50.0										
	51							12		46.40	
	52				Greyish white colour, fine sand size, medium hard, contained carbonate. exposed joint, tight, interval more than 50cm.		On 15.32cm depth.	54		K=3.03x10⁻⁶cm/sec	
	53							60	0	LU = 21.96	
	54		Sandstone.					30		54.30	
	55							90	0	55.00	
	56							100	71	K=1.06x10⁻⁵cm/sec	
	57	81.29						90	81	LU = 0.87	
	58							150	51	57.80	
	59				Greyish white colour, silt clay size, compact, med hard.			95	63		
	60		Marl.					110	81	K=1.178x10⁻⁶cm/sec	
	61							100	19	LU = 0.827	
	62							80	21		
	63							100	64		
	64	74.82						100	0	64.00	
					BIT DIAMETER : 56mm						

HOLE NO. B 4

LOG FORM B

*R.Q.D = Rock Quality Designation. R.Q.D = Total length of cylindric cores longer than 10 cm / Total core length × 100%
*LUGEON VALUE is Lose in water injection water pressure of 10kg/cm²
*DEPTH and ELEVATION are in meter

NIPPON KOEI CO., LTD.
CONSULTING ENGINEERS, TOKYO.

DRILL LOG

HOLE NO. B 5 SHEET NO. OF

PROJECT	WIDAS FLOOD CONTROL AND DRAINAGE PROJECT			DEPTH	50m	ELEVATION	139.06m
SITE	KETANDAN DAM SITE	COORDINATE	: :	INCLINATION	90°	DRILL RIG	UD - 5
AVERAGE CORE RECOVERY		DATE	FROM Aug. 15 TO Aug. 30'85	DRILLED	MUDJIB	LOGGED	M. F

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	BIT & DIAMETER	GROUNDWATER LEVEL	CORE RECOVERY %	CORE RECOVERY cm	R. Q. D	WATER PRESSURE TEST LUGEON VALUE	DEPTH
Aug. 15'85	0.2		Top soil		Sandy silt, brown							
	3.0		Sand stone		Strongly weathered, light brown to whitish grey fractured	D					N-Value 23	
	4.0		Sand stone								47.6	
Aug. 9'85	5.0		Sand stone		Strongly to moderately weathered, fractured whitish grey	CM						
Aug. 20'85					Weathered, cracky, rather soft, grey, frioble	CL					56.9	
Aug. 21'85			Sand stone		Fresh to slightly weathered calcareous, rich jointed partially fractured with calcite rein at 8.2m - 11.0m, 18.2m - 19.8m, 20.5m - 21.6m, 23.9m - 24.7m, 27.0m - 27.4m. fine to medium grained	CM					31.4	
Aug. 24'85						CL					35.8	
						CM						
						CL					20.6	
						CM						
Aug. 25'85						CL					5.0	
	30.0											
Aug. 27'85			Sand stone		Calcareous, slightly weathered, fine to medium whitish grey, rather soft	CM ~ CL	▽ 30.80m				30.6	
	33.5		Tuffaceous Sand stone		Weathered, calcareous rough surface, medium weight rather hard whitish grey with calcite vein							
Aug. 28'85	36.3										35.2	
Aug. 29'85			Sand stone		Calcareous, fresh to slightly weathered rich joint at upper part rather soft, fine grained grey	CH ~ CM					21.3	
Aug. 30'85	48.0											
	50.0		Sand stone		Calcareous, slightly weathered, bedding dip about 30°, rather sofe friable, fine grained grey partially stained color						28.7	
					BIT DIAMETER: 56mm							

HOLE NO. B 5

LOG FORM-B

*R.Q.D is Rock Quality Designation. R.Q.D = (Total length of cylindric cores longer than 10 cm)/(Total core length) x 100%
*LUGEON VALUE is l/min/m under injection water pressure of 10kg/cm²
*DEPTH and ELEVATION are in meter

NIPPON KOEI CO., LTD.
CONSULTING ENGINEERS, TOKYO.

DRILL LOG

HOLE NO. B.6 SHEET NO. OF

PROJECT	WIDAS FLOOD CONTROL AND DRAINAGE PROJECT			DEPTH	50 m	ELEVATION	100.95 m
SITE	KETANDAN DAM SITE	COORDINATE	: :	INCLINATION	90°	DRILL RIG	UD - 5
AVERAGE CORE RECOVERY		DATE	FROM Sep 4 TO Sep 23'85	DRILLED	MISENI	LOGGED	M. F

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	DESCRIPTION	BIT & DIAMETER	GROUNDWATER LEVEL	LUGEON VALUE
Sep 4 '85	2.0		Marl	Strongly weathered decomposed, soft, grey	D	0 m	
	3.0		Marly clay				N - Value
Sep 5 '85			Marl	Weathered marl altered into clay, soft, brownish grey			12.4 / 39 / 50
Sep 10 '85	13.5			Rather soft, fractured Whitish grey	CL		89.8 / 5.4
Sep 11 '85	19.3		Marl	Compact, light weight, partly fractured, rather soft, whitish grey	CM ~ CL		4.9
Sep 12 '85	25.0		Marl	Fractured, soft, partly altered into clay grey to brownish grey	CL ~ D		4.6
Sep 13, Sep 17, Sep 18 '85			Marl	Compact, light weight, friable, rather soft, partly fractured, rich joint with slicken side at 26.5m - 27.5m, 34.5m - 35.0m 35.0m - 35.4m, whitish grey	CM ~ CL		No Test / 0.3
Sep 19 '85	38.0			Fractured, clayey marl, soft, grey			0.3
	39.0		Marl		D		
Sep 20 '85, Sep 23 '85	50.0		Marl	Compact, light weight, friable, rather soft partially fractured, rich joint, whitish grey	CM ~ CL		0.2 / 0

BIT DIAMETER : 56 mm

*R.Q.D is Rock Quality Designation, R.Q.D= (Total length of cylindric cores longer than 10 cm)/(Total core length) x 100%
*LUGEON VALUE is l/min/m under injection water pressure of 10kg/cm²
*DEPTH and ELEVATION are in meter

LOG FORM-B

HOLE NO. B.6

NIPPON KOEI CO., LTD.
CONSULTING ENGINEERS, TOKYO.

DRILL LOG

HOLE NO. B. 7 SHEET NO. OF

PROJECT	WIDAS FLOOD CONTROL AND DRAINAGE PROJECT			DEPTH	50 m	ELEVATION	102.86 m
SITE	KETANDAN DAM SITE	COORDINATE	: :	INCLINATION	90°	DRILL RIG	UD - 5
AVERAGE CORE RECOVERY		DATE	FROM Sep 3 TO Sep 24'85	DRILLED	MASTUR	LOGGED	M. F

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	BIT & DIAMETER	GROUNDWATER LEVEL	CORE RECOVERY %	CORE RECOVERY cm	R. Q. D %	WATER PRESSURE TEST LUGEON VALUE	DEPTH
Sep 3 '85	1.0		Top soil		Brown silt soft	D						
	3.0		Sandstone		Weathered calcareous fine grained fractured brown	CL ~ CM						
	4.3		Sandy marl									
	5.0		Marl									
Sep 4 '85			Marl		Compact, light weight friable, rather soft grey	CM	▽ 5.70m				5.2	
	7.2											
Sep 5 '85					Fractured, grey	CL ~ D						
Sep 6			Marl		Compact, light weight friable rich joint with slicken side rather soft grey						9.9	10
	17.0											
Sep 7 '85	18.0		Marl		Fractured, rather soft light weight, grey	D					3.8	
Sep 9					Fractured, clayey marl, soft, grey to brown	CL ~ D					5.4	20
Sep 10			Marl									
Sep 11 '85					Mainly fractured, partly compact, light weight friable, rather soft, grey						4.3	
Sep 13 '85	32.0											30
Sep 14	35.0		Marl		Fractured, altered into clay, soft, grey to brown	D					2.6	
Sep 17			Marl		Cracky and rich joint with slicken side, grey	CL					2.2	
Sep 18	40.0											40
Sep 19			Marl		Fractured, altered into clay, strongly weathered, soft grey to brown	D					2.7	
Sep 20	45.0											
Sep 23			Marl		Cracky and rich joint with slicken side, grey	CL					1.9	
Sep 24	50.0											50
					BIT DIAMETER							

LOG FORM-B

HOLE NO. B.7

*R.Q.D is Rock Quality Designation, R.Q.D = (Total length of cylindric cores longer than 10 cm)/(Total core length) × 100%
*LUGEON VALUE is l/min/m under injection water pressure of 10kg/cm²
*DEPTH and ELEVATION are in meter

NIPPON KOEI CO., LTD.
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DRILL LOG

HOLE NO. B 8 SHEET NO. OF

PROJECT	WIDAS FLOOD CONTROL AND DRAINAGE PROJECT			DEPTH	50 m	ELEVATION	99.202 m
SITE	KETANDAN DAM SITE	COORDINATE	: :	INCLINATION	90°	DRILL RIG	UD - 5
AVERAGE CORE RECOVERY		DATE	FROM Aug.16 TO Aug.30'85	DRILLED	MASTUR	LOGGED	M.F

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	BIT & DIAMETER	GROUNDWATER LEVEL ▽	CORE RECOVERY %	R. Q. D %	WATER PRESSURE TEST LUGEON VALUE	DEPTH
Aug.16'	0.5		Top soil		Brown, silty sand	D	▽1.00				
	2.0		Sand stone		Strongly weathered, grey						
Aug.18'85			Sand stone		Calcareous, weathered cracky, compact, rather soft grey	CL					
Aug.19'	5.0		Sand stone		Calcareous, slightly weathered, compact partly included dayly sand stone of 11.7m - 12.0m, 16.8m - 17.3m, 17.7m - 18.3m, fine grained, laminated, well sorted, grey.	CM ∫ CL				27.2 / 3.2 / 1.2	
Aug.20'85											
Aug.21'85											
Aug.22'85	20.8		Sand stone		Fractured with calcite rein, frioble, grey.	CL ∫ D				NO DATA	
Aug.23'85	23.6		Sand stone		Weathered, calcareous, rather soft grey.						
	25.0		Tuff Sand stone		Tuffaceous, rough surface, contain grey clay bowl, rather heavey weight, whiteish grey.					4.9	
Aug.24'85	27.3		Sand stone								
Aug.25'85	30.0		Sand stone		Slightly weathered, fine grained, cracky grey, rather soft.	CM ∫ CL				6.2	
Aug.27'					Slightly weathered, calcareous, rather hard and compact, fine to medium grained, not well sorted, grey.					4.5	
Aug.28'85	42.0		Sand stone		Weathered, calcareous, coarse grained, weakly cemented, rather soft grey	CL				5.3	
Aug.30'85	43.0		Sand stone		Slightly to moderately weathered, rich joint with stiken side rather hard and compact partly fractured.	CM ∫ CL				5.6	
	50.0				BIT DIAMETER: 56mm						

HOLE NO. B 8

LOG FORM-B

- R.Q.D is Rock Quality Designation, R.Q.D= (Total length of cylindric cores longer than 10 cm)/(Total core length) × 100%
- LUGEON VALUE is l/min/m under injection water pressure of 10kg/cm²
- DEPTH and ELEVATION are in meter

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DRILL LOG

HOLE NO. B. 9 SHEET NO. OF

PROJECT	WIDAS FLOOD CONTROL AND DRAINAGE PROJECT			DEPTH	50 m	ELEVATION	99.49 m
SITE	KETANDAN DAM SITE	COORDINATE	: :	INCLINATION	90°	DRILL RIG	UD - 5
AVERAGE CORE RECOVERY		DATE	FROM Aug 16 TO Sep 3 '85	DRILLED	MURKANI	LOGGED	M. I

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	BIT & DIAMETER	GROUNDWATER LEVEL	CORE RECOVERY %	CORE RECOVERY cm	R. Q. D	WATER PRESSURE TEST LUGEON VALUE	DEPTH
Aug 16 '85	0.9		Sandstone		Strongly weathered brown	D	▽ 0.65 m					
			Sandstone		Fine grained, bedded well sorted, consolidated soft, friable, grey						7.4	
	5.0											
Aug 20 '85	6.7		Sandstone		Medium grained, bedded compact, grey, soft							
	7.8		Sandstone								218.2	10
Aug 21 '85			Sandstone		Tuffaceous, coarse grained, mixed volcanic minerals, partly soft and silty, grey						40.6	
	15.0				Calcareous, silty to fine grained, consolidated, rather soft	CM ~ CL						
	16.0		Sandstone								9.5	
Aug 22 '85					Calcareous, rich calcite vein tight joint thickness 2~3 mm, grey							20
Aug 23 '85			Sandstone		Calcareous, fine grained, consolidated, rather light weight, partially fractured and friable						9.7	
Aug 28 '85											10.3	
	30.0											30
Aug 29 '85			Sandstone		Calcareous, fine grained, bedded contain calcite vein, grey							
	33.0										8.2	
	35.0		Sandstone		Weathered, tuffaceous porous, rough surface contain volcanic minerals	CL ~ D						
Aug 30												
Aug 31			Sandstone								8.6	
	40.0				Strongly to moderately weathered, calcareous soft, friable, grey contain calcite vein and volcanic minerals	CM ~ CL						40
Sep 1 '85			Sandstone								9	
Sep 2					Slightly weathered, calcareous, partially clayey, calcite vein at 42.5 m							
	46.6										7	
Sep 3 '85			Sandstone			CL ~ D						
	50.0				Weathered, calcareous fine to medium grained soft and friable							50
					BIT DIAMETER : 56 mm							

HOLE NO. B. 9

LOG FORM-B

- R.Q.D is Rock Quality Designation, R.Q.D = (Total length of cylindric cores longer than 10 cm)/(Total core length) × 100%
- LUGEON VALUE is l/min/m under injection water pressure of 10kg/cm²
- DEPTH and ELEVATION are in meter

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DRILL LOG

HOLE NO. B 10 SHEET NO. OF

PROJECT	WIDAS FLOOD CONTROL AND DRAINAGE PROJECT		DEPTH		ELEVATION
SITE	KETANDAN DAM SITE	COORDINATE : :	INCLINATION		DRILL BIG
AVERAGE CORE RECOVERY		DATE FROM TO	DRILLED		LOGGED

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	BIT & DIAMETER	GROUNDWATER LEVEL	CORE RECOVERY %	CORE RECOVERY cm	R. Q. D %	WATER PRESSURE TEST LUGEON VALUE	DEPTH
	1.8		Marl		Strongly to moderately weathered, stiff, white	D						
	6.0		Marl		Strongly weathered fractured, brown						36.8	
							▽ 7.80m				9.2	
			Marl		Consolidated but friable partially included slicken side joint at 8.5m, 16.3m-16.4m, 17.3m - 17.4m, 20.5m - 20.6m, grey.	CM ∫ CL					5.6	
											3.8	
											2.2	
	30.0										2.1	
					BIT DIAMETER: 56mm							

HOLE NO. B 10

LOG FORM-B

* R.Q.D is Rock Quality Designation, R.Q.D=(Total length of cylindric cores longer than 10 cm)/(Total core length) × 100%
* LUGEON VALUE is l/min/m under injection water pressure of 10kg/cm²
* DEPTH and ELEVATION are in meter

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DRILL LOG

HOLE NO. B 11 SHEET NO. 1 OF 2

PROJECT	WIDAS FLOOD CONTROL AND DRAINAGE PROJECT			DEPTH	70 m	ELEVATION	160.26 m
SITE	KETANDAN DAM SITE	COORDINATE	: :	INCLINATION	90°	DRILL RIG	UD - 5
AVERAGE CORE RECOVERY		DATE	FROM TO	DRILLED		LOGGED	M. F

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	BIT & DIAMETER	GROUNDWATER LEVEL	CORE RECOVERY %	CORE RECOVERY cm	R. Q. D %	WATER PRESSURE TEST LUGEON VALUE	DEPTH
	0.8		Top soil		Brown, sandy silt	D						
	2.0		Sand stone									
			Sand stone		Strongly weathered light brown, friable fractured	CL ∫ D					82.0	
	5.0										8.00m - 11.20m 38.7	
	6.1		Sand stone		Strongly to moderately weathered, friable and fracture, stained joint, brown							
	7.0		Sand stone								0.00m - 15.00m 39.0	
					Weathered, fractured weakly cemented, soft grey, stained, joint							
			Sand stone		Weathered, clayey, rather soft, grey.	CM					33.7	
					Calcareous, fine grained, consolidated, partially fractured with stained joint and calcite vein, from 19 to 20 m, bedded medium grained		▽ 21.00m				35.7	
	24.6											
			Sand stone		Slightly to moderately weathered, weakly cemented, soft, friable soft, almostly fractured, grey calcareous	CL					9.2	
	35.0										20.0	
					Calcareous, fine grained laminated friable partially fractured but almostly consolidated compact core fractured portion (at 43.8 - 45.3 m, 47.0 - 47.7 m, 48.7 - 49.0 m, 51.8 - 62.0 m, 53.3 - 55.0 m, 55.0 - 57.0 m) from 55 to 60 m, water lost during drilling.						9.9	
			Sand stone			CM ∫ CL					20.2	
											5.9	
											32.9	
	60.0										6.3	

HOLE NO. B 11

LOG FORM-B

- R.Q.D is Rock Quality Designation. R.Q.D = (Total length of cylindric cores longer than 10 cm)/(Total core length) x 100%
- LUGEON VALUE is l/min/m under injection water pressure of 10kg/cm²
- DEPTH and ELEVATION are in meter

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DRILL LOG

HOLE NO. B. 11 SHEET NO. 2 OF 2

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	ROCK GRADE	GROUNDWATER LEVEL	CORE RECOVERY %	R. Q. D %	WATER PRESSURE TEST LUGEON VALUE	DEPTH
			Sandstone		Calcareous, fine grained, consolidated, partially fractured (at 64 - 65 m.) with rich calcite vein (60 - 61 m, 65 - 65.5 m, 68 - 70 m)	CM / CL				NO DATA	
					BIT DIAMETER: 56 mm						

HOLE NO. B. 11

LOG FORM-C

NIPPON KOEI CO., LTD.
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DRILL LOG

HOLE NO. B. 12 SHEET NO. OF

PROJECT	WIDAS FLOOD CONTROL AND DRAINAGE PROJECT		DEPTH	30 m	ELEVATION	
SITE	KETANDAN DAM SITE	COORDINATE	INCLINATION	90°	DRILL RIG	UD - 5
AVERAGE CORE RECOVERY		DATE FROM Sep 9 TO Sep 9 '85	DRILLED		LOGGED	M. F

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	BIT & DIAMETER	GROUNDWATER LEVEL	CORE RECOVERY %	CORE RECOVERY cm	R. Q. D %	WATER PRESSURE TEST LUGEON VALUE	DEPTH
	1.0		Top soil		Sandy silt, brown	D						
	2.7		Sandstone		Strongly weathered light brown						6.3	
											5.8	10
					Calcareous, slightly weathered, fine grained to silty, light weight compact but friable 21.6 - 25.0 m, not laminated and stiff compact grey	CM ~ CL	▽ 14.30 m				2.8	
			Sandstone								7.7	20
						CH ~ CM					3.1	
						CM ~ CL					4.8	
	30.0											30

HOLE NO. B. 12

LOG FORM-B

*R.Q.D is Rock Quality Designation. R.Q.D=(Total length of cylindric cores longer than 10 cm)/(Total core length) × 100%
*LUGEON VALUE is l/min/m under injection water pressure of 10kg/cm²
*DEPTH and ELEVATION are in meter

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DRILL LOG

HOLE NO. 1B1 SHEET NO. OF

PROJECT	WIDAS FLOOD CONTROL AND DRAINAGE PROJECT			DEPTH	20	ELEVATION	
SITE	BANGLE HEAD WORKS	COORDINATE	: :	INCLINATION	90°	DRILL RIG	UD-5
AVERAGE CORE RECOVERY		DATE	FROM TO	DRILLED		LOGGED	M.F

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	BIT & DIAMETER	GROUNDWATER LEVEL ▽	CORE RECOVERY % / cm	R.Q.D %	WATER PRESSURE TEST LUGEON VALUE	DEPTH
	1.2		Coarse sand		Tuff, silty br		+0m				
	2.0		Sand stone		Weathered, clayey, br						
	5.0		Sand stone		Weathered, medium grained contain some fossil					27.3	
	10.0		Clay stone		Weathered, tuffaceous, interlocated fine red SS at 6.4 - 6.5	CL ~ D				24	
	18.0		Sand stone		Weathered, tuffaceous, contain some fossil fine to medium grained partially some gravel, weakly cemented grey					38.4	
	19.0		Silt stone							39.4	
	20.0		Sand stone		Weathered, tuffaceous, weakly cemented, grey						
					Weathered tuffaceous contain some grovel weakly cemented						
					BIT DIAMETER: 56mm						

HOLE NO. 1B1

LOG FORM-B

*R.Q.D is Rock Quality Designation. R.Q.D = (Total length of cylindric cores longer than 10 cm)/(Total core length) × 100%
*LUGEON VALUE is l/min/m under injection water pressure of 10kg/cm²
*DEPTH and ELEVATION are in meter

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DRILL LOG

HOLE NO. IB. 2 SHEET NO. OF

PROJECT	WIDAS FLOOD CONTROL AND DRAINAGE PROJECT		DEPTH	20 m	ELEVATION	
SITE	BANGL HEAD WORKE	COORDINATE : :	INCLINATION	90°	DRILL RIG	UD - 5
AVERAGE CORE RECOVERY		DATE FROM TO	DRILLED		LOGGED	M. F

DEPTH	ROCK TYPE OR FORMATION	DESCRIPTION
0.4	Gravel	
	Tuff	River bed deposits grey
3.5		
	Sandy tuff	Weathered, rather soft partially contain gravel at 2.5 - 3.0 m
8.0		Weathered, mixed gravel
	Sandstone	Weathered, weak ly cemented grey color but reddish color at 8.0 - 8.3 m, fine grained
10.5		
12.0	Tuff	
	Claystone	Weathered contain gravel weakly cemented
14.0		
	Sandstone	Compact dark grey
19.0		Tuffaceous, fine grained, fractured
20.0	Clay	Grey, rather soft
		BIT DIAMETER : 56 mm

BIT & DIAMETER: CL ~ D

GROUNDWATER LEVEL: ▽ 5.50 m

CORE RECORD: %

R. Q. D: 50 %

WATER PRESSURE TEST LUGEON VALUE: 10 20 30 40 50

82

38

26.5

28

DEPTH: 10, 20

HOLE NO. IB. 2

LOG FORM—B

*R.Q.D is Rock Quality Designation. R.Q.D=(Total length of cylindric cores longer than 10 cm)/(Total core length) × 100%
*LUGEON VALUE is l/min/m under injection water pressure of 10kg/cm²
*DEPTH and ELEVATION are in meter

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DRILL LOG

HOLE NO. IB. 5 SHEET NO. OF

PROJECT	WIDAS FLOOD CONTROL AND DRAINAGE PROJECT			DEPTH	4 m	ELEVATION	.
SITE	BANGLE HEAD WORKS	COORDINATE	: :	INCLINATION	90°	DRILL RIG	UD - 5
AVERAGE CORE RECOVERY		DATE	FROM TO	DRILLED		LOGGED	M. F

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	BIT & DIAMETER	GROUNDWATER LEVEL	CORE RECOVERY %	CORE RECOVERY cm	R. Q. D	WATER PRESSURE TEST LUGEON VALUE	DEPTH
	2.0		Tuff		Semi compact, white weathered	CL ~ D						
	4.0		Sandstone		Tuffaceous, bedding bluish grey, weathered							

HOLE NO. IB. 5

LOG FORM-B

* R.Q.D is Rock Quality Designation. R.Q.D = (Total length of cylindric cores longer than 10 cm)/(Total core length) x 100%
* LUGEON VALUE is l/min/m under injection water pressure of 10kg/cm²
* DEPTH and ELEVATION are in meter

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DRILL LOG

HOLE NO. IB 6 SHEET NO. OF

PROJECT	WIDAS FLOOD CONTROL AND DRAINAGE PROJECT			DEPTH	4 m	ELEVATION	
SITE	BANGLE HEAD WORKS	COORDINATE	: :	INCLINATION	90°	DRILL RIG	UD-5
AVERAGE CORE RECOVERY		DATE	FROM TO	DRILLED		LOGGED	M.F

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	BIT & DIAMETER	GROUNDWATER LEVEL	CORE RECOVERY %	CORE RECOVERY cm	R. Q. D %	WATER PRESSURE TEST LUGEON VALUE	DEPTH
	0.2		Top soil		Grey, semi compact	D						
	1.5		Sandstone		Weathered, reddish color	CM ~ CL						
			Sandstone		Tuffaceous, fine to medium grained well bedded, with calcite vein, grey partly stained							
	4.0											5

HOLE NO. IB 6

LOG FORM-B

*R.Q.D is Rock Quality Designation, R.Q.D=(Total length of cylindric cores longer than 10 cm)/(Total core length) x 100%
*LUGEON VALUE is l/min/m under injection water pressure of 10kg/cm²
*DEPTH and ELEVATION are in meter

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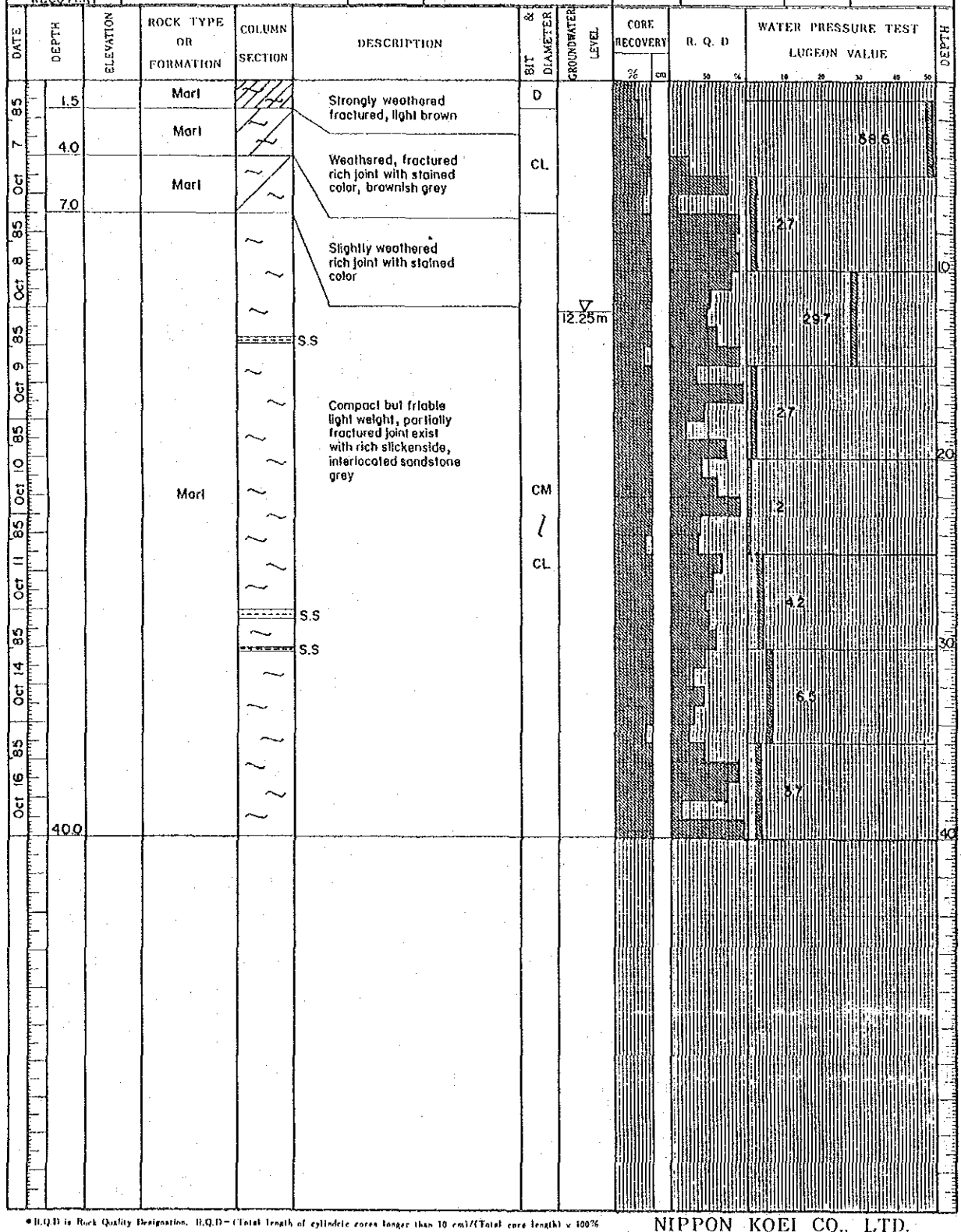
DRILL LOG

HOLE NO. TB. 1 SHEET NO. OF

PROJECT	WIDAS FLOOD CONTROL AND DRAINAGE PROJECT		DEPTH	40 m	ELEVATION	
SITE	TRANS BASIN TUNNEL	COORDINATE : :	INCLINATION	90°	DRILL RIG	UD.-5
AVERAGE CORE RECOVERY		DATE FROM Oct 7 TO Oct 16 '85	DRILLED		LOGGED	M. I



HOLE NO. TB. 1

LOG FORM-B

* R.Q.D is Rock Quality Designation. R.Q.D = (Total length of cylindric cores longer than 10 cm)/(Total core length) × 100%
* LUGEON VALUE is l/min/m under injection water pressure of 10kg/cm²
* DEPTH and ELEVATION are in meter

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DRILL LOG

HOLE NO. TB 2 SHEET NO. OF

PROJECT	WIDAS FLOOD CONTROL AND DRAINAGE PROJECT			DEPTH	60 m	ELEVATION	
SITE	TRANS BASIN TUNNEL	COORDINATE	: :	INCLINATION	90°	DRILL RIG	UD-5
AVERAGE CORE RECOVERY		DATE	FROM Oct. 9 TO Oct. 24 '85	DRILLED	NASIKIN	LOGGED	M.F

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	BIT & DIAMETER	GROUNDWATER LEVEL	CORE RECOVERY %	CORE RECOVERY cm	R. Q. D	WATER PRESSURE TEST LUGEON VALUE	DEPTH
Oct. 9 '85	1.5		Marl		Strongly weathered, fractured, brown	D						
	4.7		Marl		Weathered, rich joint with stained color light weight, brown	CL					6.9	
Oct. 10 '85	7.0		Marl		Weathered and fractured, brown	D					55.9	
							9.30 m					10
Oct. 11 '85											1.1	
Oct. 12					S.S Dip 40°	CM					7.8	
Oct. 14 '85			Marl		S.S S.S S.S Compact, light weight, friable, partially jointed with slikenside and fractured with sandy seam joint, interlocated sandstone, grey	CL					1.9	20
Oct. 15 '85											2.0	
Oct. 16 '85					S.S Dip 35°						2.9	30
Oct. 17 '85											25.6	
Oct. 18 '85											18.5	40
Oct. 20 '85	47.2		Sandstone		Slightly weathered, Calcareous, medium grained, rather weakly cemented, rather soft grey Dip. 40°						20.8	50
Oct. 22 '85	50.0		Marl		S.S Consolidated but friable, partly fractured joint with slikenside, grey interlocated calcareous sandstone						32.8	
Oct. 24 '85	60.0										28.3	60

HOLE NO. TB 2

LOG FORM-B

*R.Q.D is Rock Quality Designation. R.Q.D=(Total length of cylindric cores longer than 10 cm)/(Total core length) × 100%
*LUGEON VALUE is l/min/m under injection water pressure of 10kg/cm²
*DEPTH and ELEVATION are in meter

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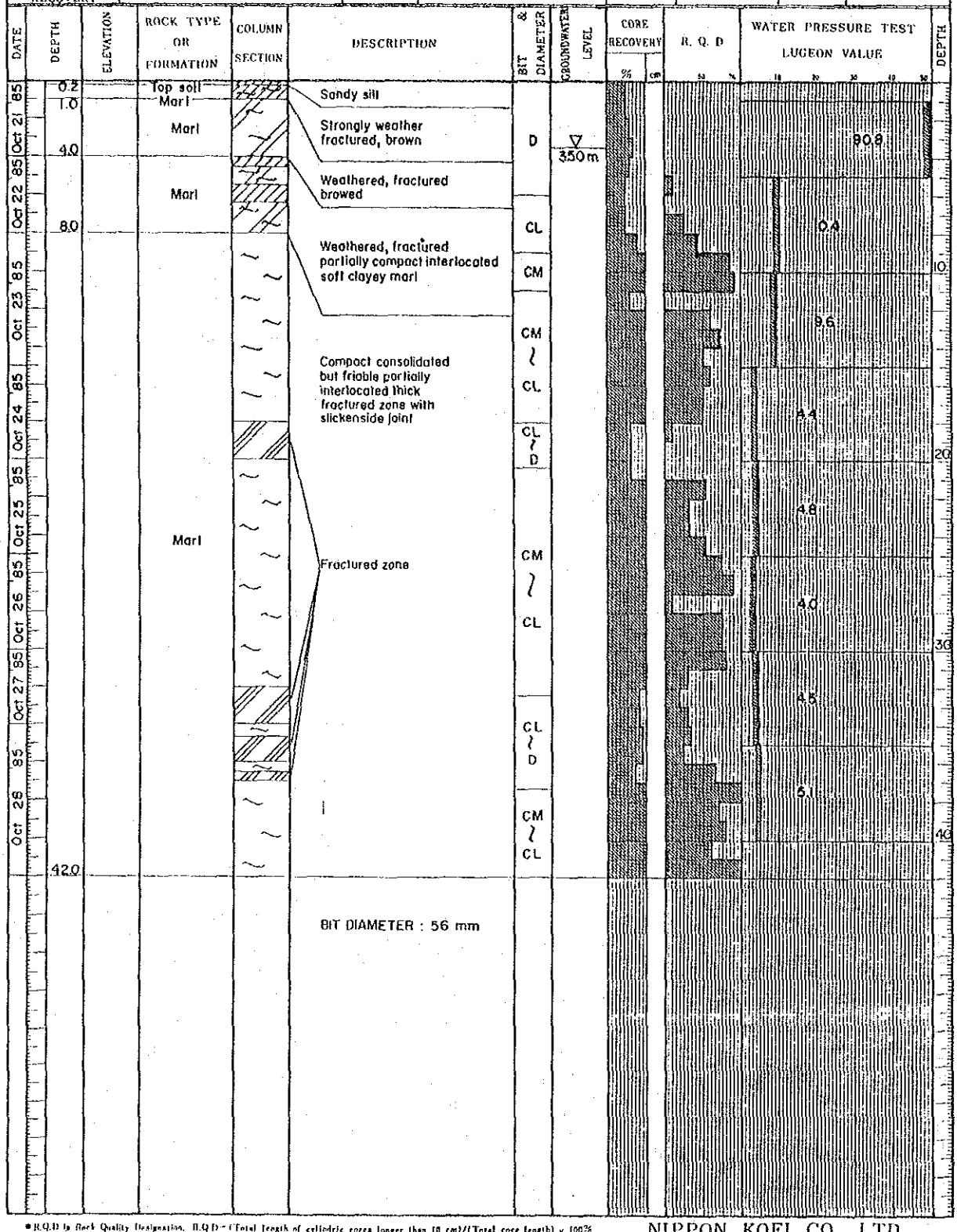
BIT DIAMETER : 86 mm

DRILL LOG

HOLE NO. TB. 3 SHEET NO. OF

PROJECT	WIDAS FLOOD CONTROL AND DRAINAGE PROJECT			DEPTH	42 m	ELEVATION	
SITE	TRANS BASIN TUNNEL	COORDINATE	: :	INCLINATION	90°	DRILL RIG	UD - 5
AVERAGE CORE RECOVERY		DATE	FROM Oct 21 TO Oct 28'85	DRILLED	KOMARUDIN	LOGGED	M. F



HOLE NO. TB. 3

LOG FORM-B

*R.Q.D is Rock Quality Designation. R.Q.D = (Total length of cylindric cores longer than 10 cm)/(Total core length) × 100%
*LUGEON VALUE is l/min/m under injection water pressure of 10kg/cm²
*DEPTH and ELEVATION are in meter

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DRILL LOG

HOLE NO. BM. 1 SHEET NO. OF

PROJECT	WIDAS FLOOD CONTROL AND DRAINAGE PROJECT			DEPTH	20 m	ELEVATION	
SITE	BORROW AREA	COORDINATE	: :	INCLINATION	90°	DRILL RIG	UD - 5
AVERAGE CORE RECOVERY		DATE	FROM TO	DRILLED		LOGGED	M. F

DATE	DEPTH	ELEVATION	ROCK TYPE OR FORMATION	COLUMN SECTION	DESCRIPTION	BIT & DIAMETER	GROUNDWATER LEVEL	CORE RECOVERY %	CORE RECOVERY cm	R. Q. D	WATER PRESSURE TEST LUGEON VALUE	DEPTH
			Sandstone		Strongly weathered partially altered into clay friable and soft, light brown fine grained	D					NO TEST	10
	15.2		Sandstone		Strongly to moderately weathered friable grey fine grained							
	20.0											20

LOG FORM-B

HOLE NO. BM. 1

*R.Q.D is Rock Quality Designation. R.Q.D = (Total length of cylindric cores longer than 10 cm)/(Total core length) × 100%
*LUGEON VALUE is l/min/m under injection water pressure of 10kg/cm²
*DEPTH and ELEVATION are in meter

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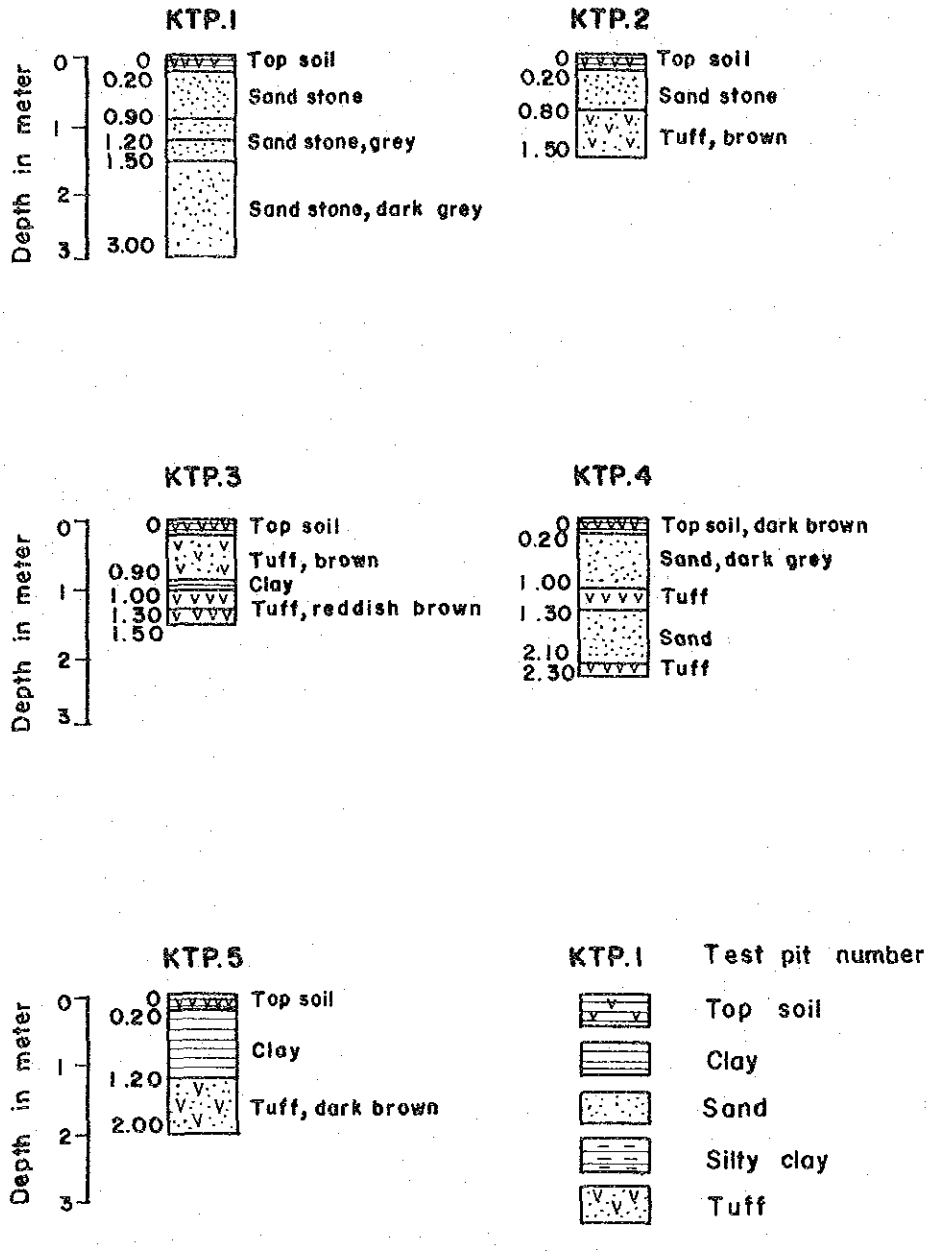


Fig. A 2.1 LOG OF TEST PITS IN KEDUNGWARAK BORROW AREA

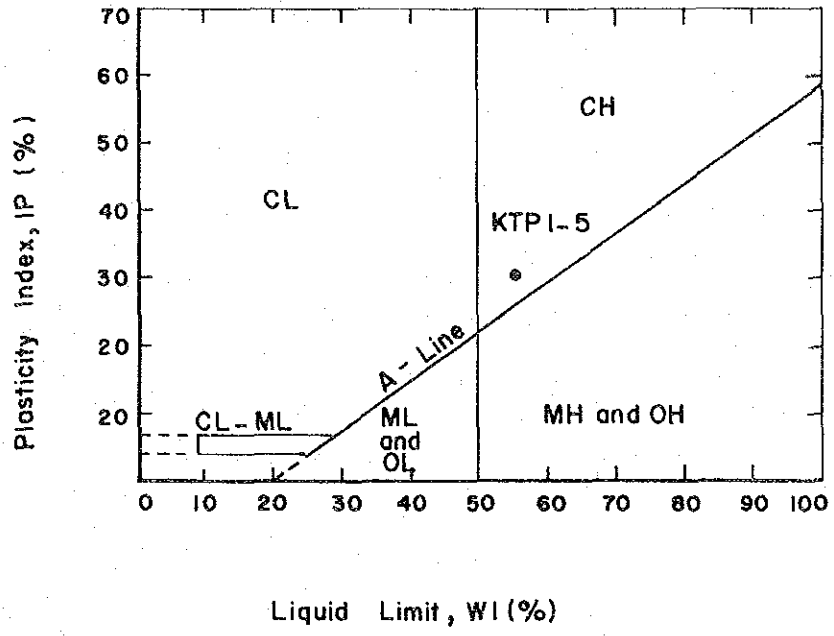
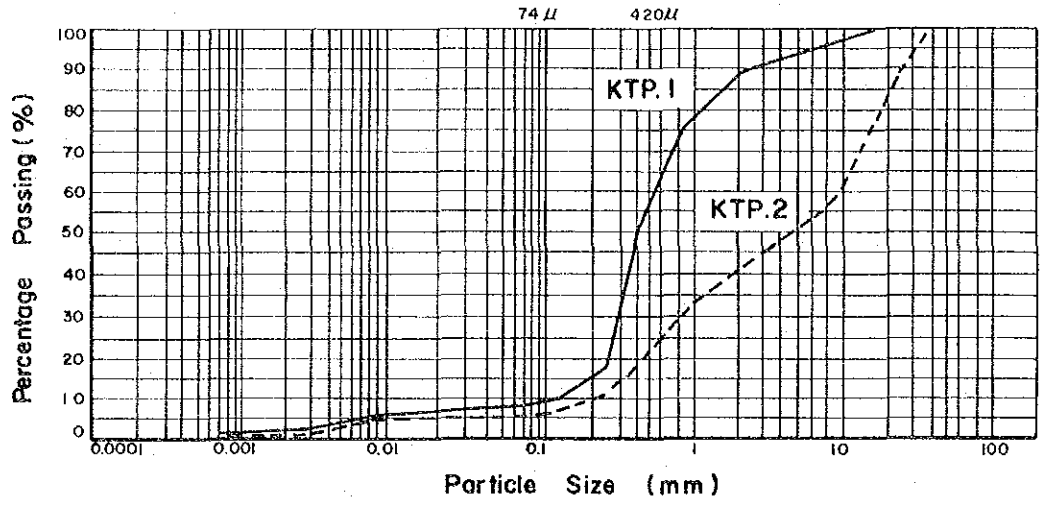
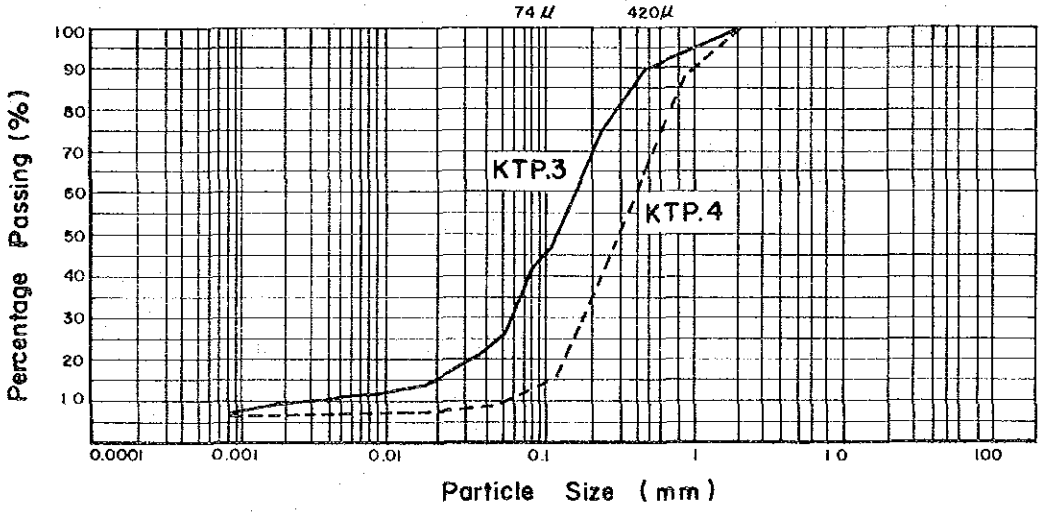


Fig. A2.2 PLASTICITY CHART FOR UNIFIED SOIL CLASSIFICATION SYSTEM OF EARTH MATERIALS SAMPLED FROM KEDUNGWARAK BORROW AREA





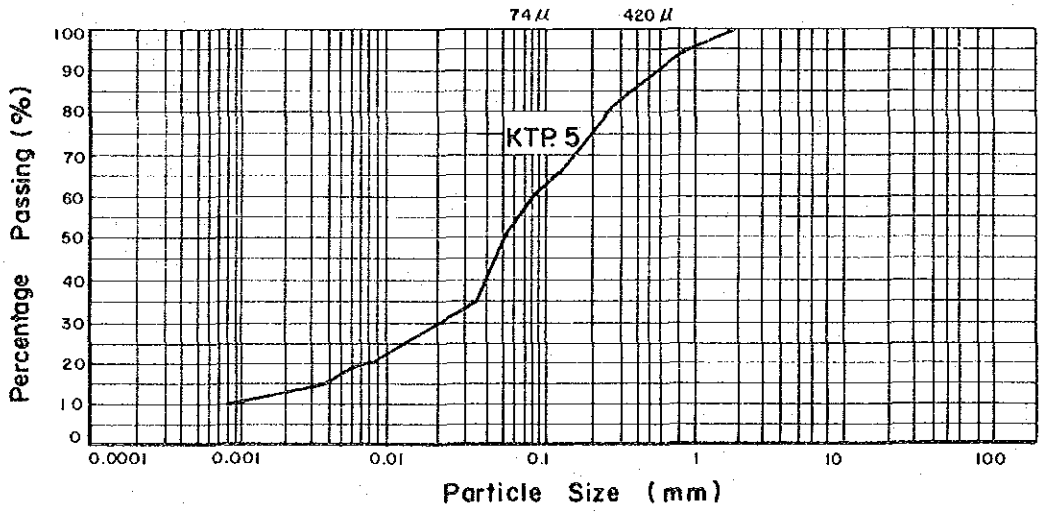


Fig. A2.3 PARTICLE SIZE DISTRIBUTION OF EARTH MATERIAL IN KEDUNGWARAK BORROW AREA

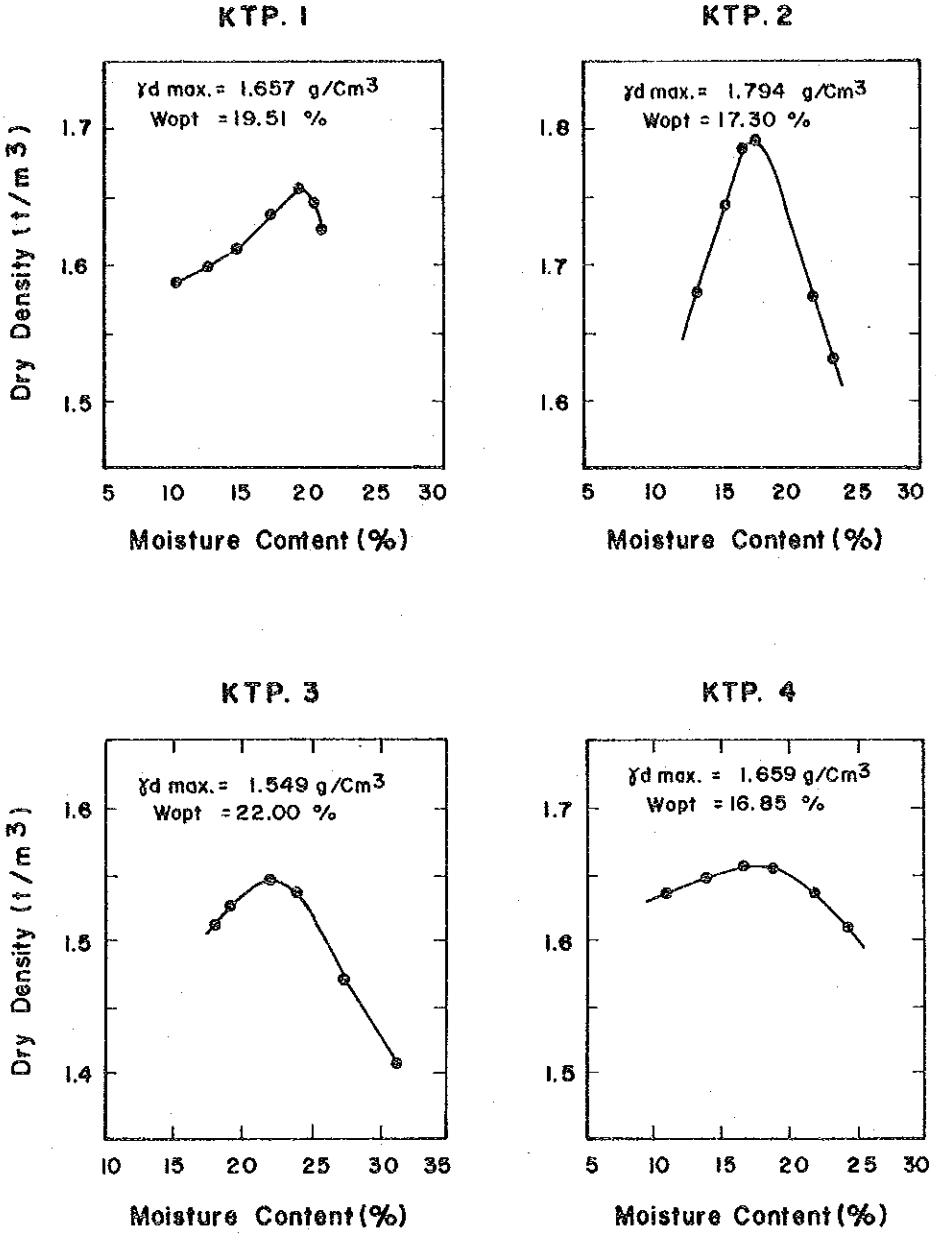


Fig. A2.4 MOISTURE - DRY DENSITY RELATIONSHIP OF EARTH MATERIAL FROM KEDUNG-WARAK BORROW AREA IV (1/2)

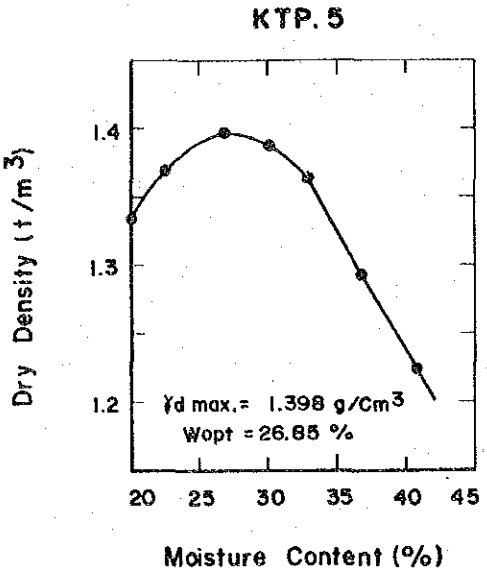


Fig. A2.4 MOISTURE - DRY DENSITY RELATIONSHIP OF EARTH MATERIAL FROM KEDUNGWARAK BORROW AREA IV (2/2)

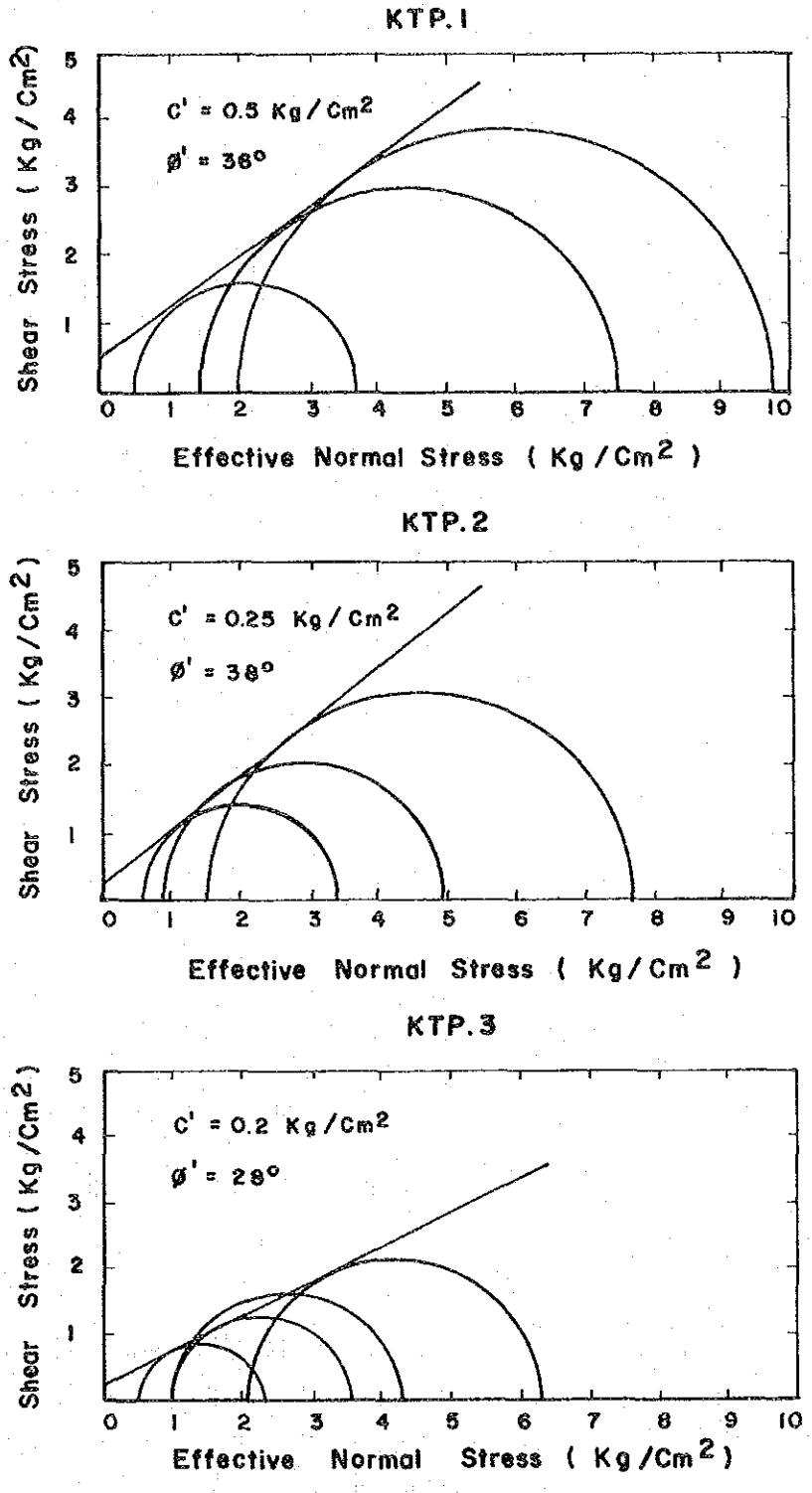
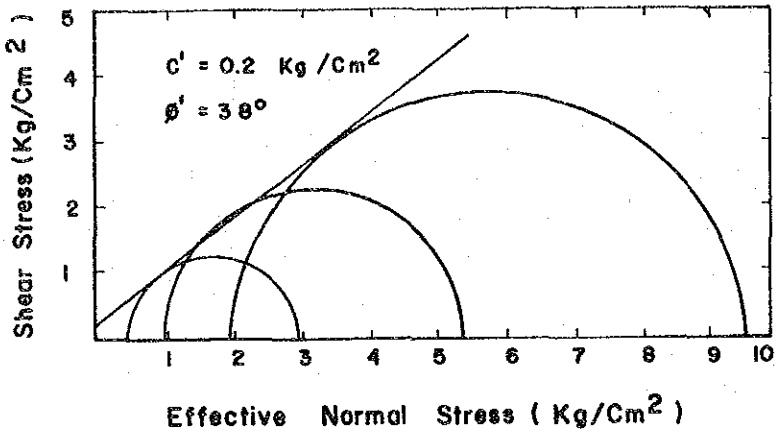


Fig. A2.5 TRIAXIAL COMPRESSION TEST RESULTS SAMPLED FROM KEDUNGWARAK BORROW AREA (1/2)

KPT. 4



KPT. 5

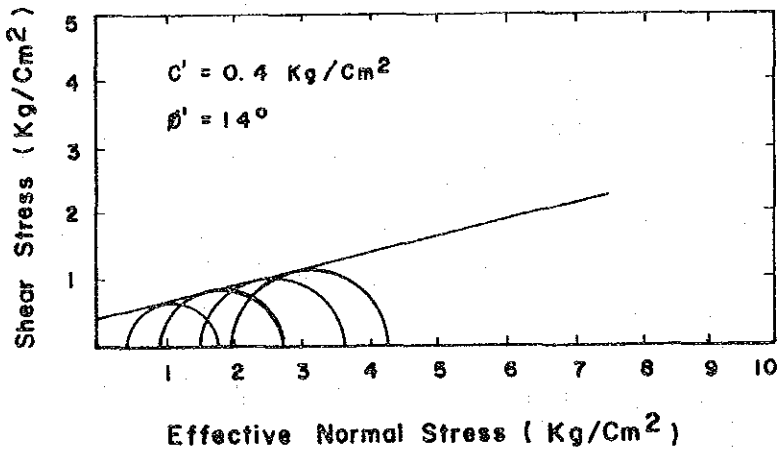
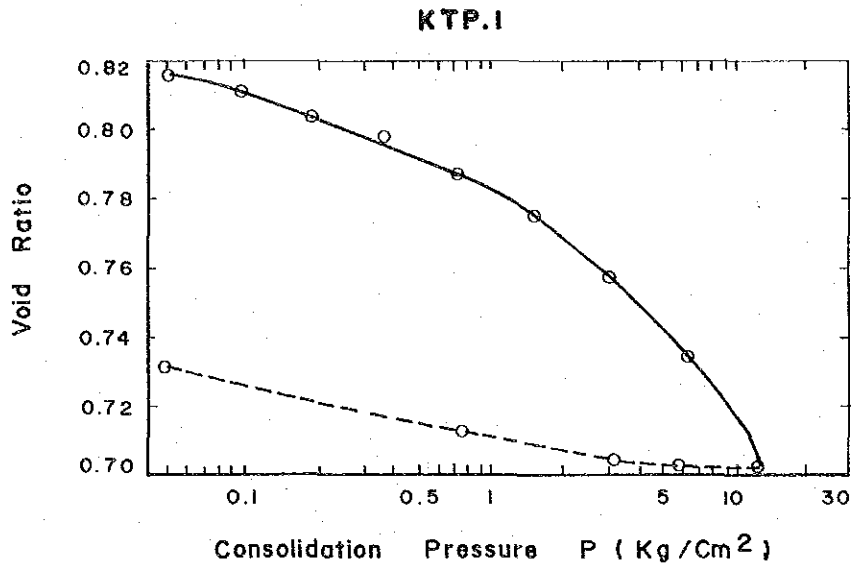


Fig. A2.5 TRIAXIAL COMPRESSION TEST RESULTS ($\overline{C}\,\overline{U}$) SAMPLED FROM KEDUNGWARAK BORROW AREA (2/2)



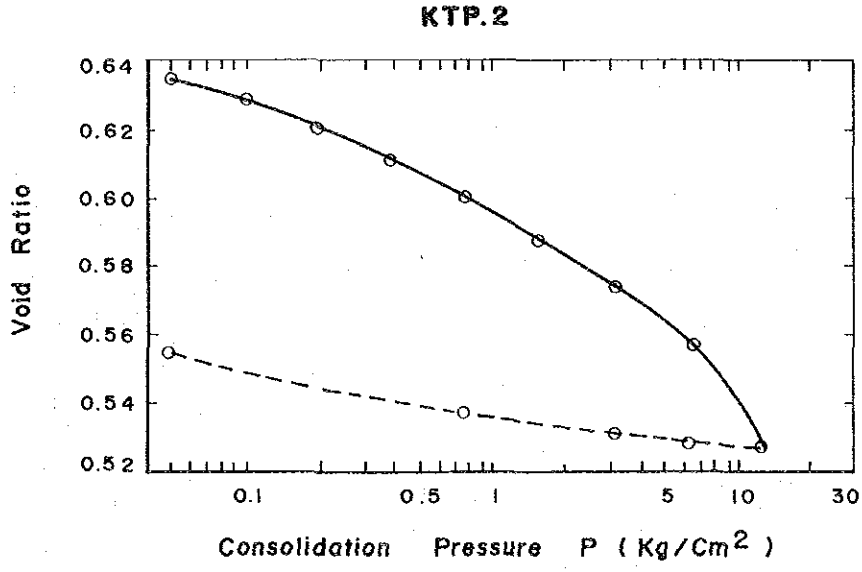
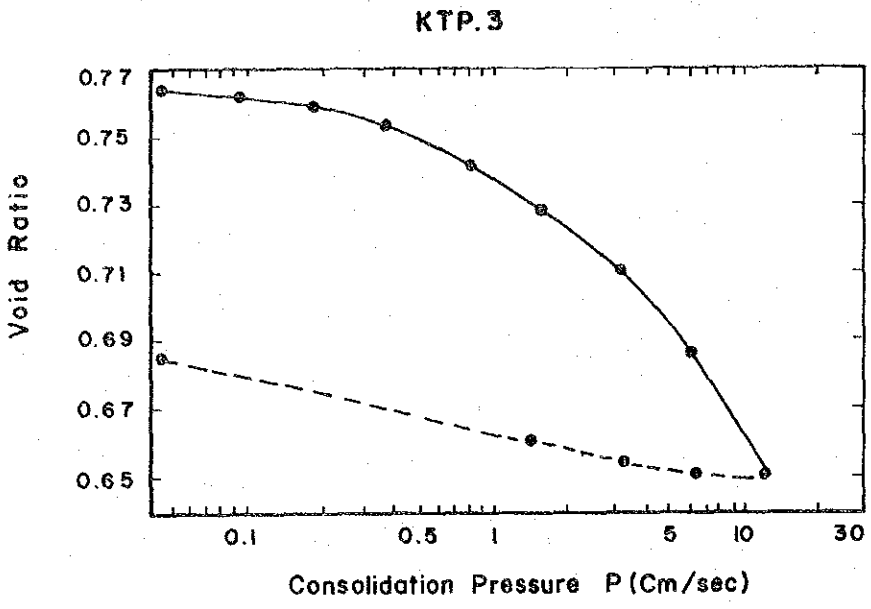


Fig. A2.6 **VOID RATIO - CONSOLIDATION PRESSURE RELATIONSHIP OF EARTH MATERIAL SAMPLED FROM KEDUNGWARAK BORROW AREA (1/3)**



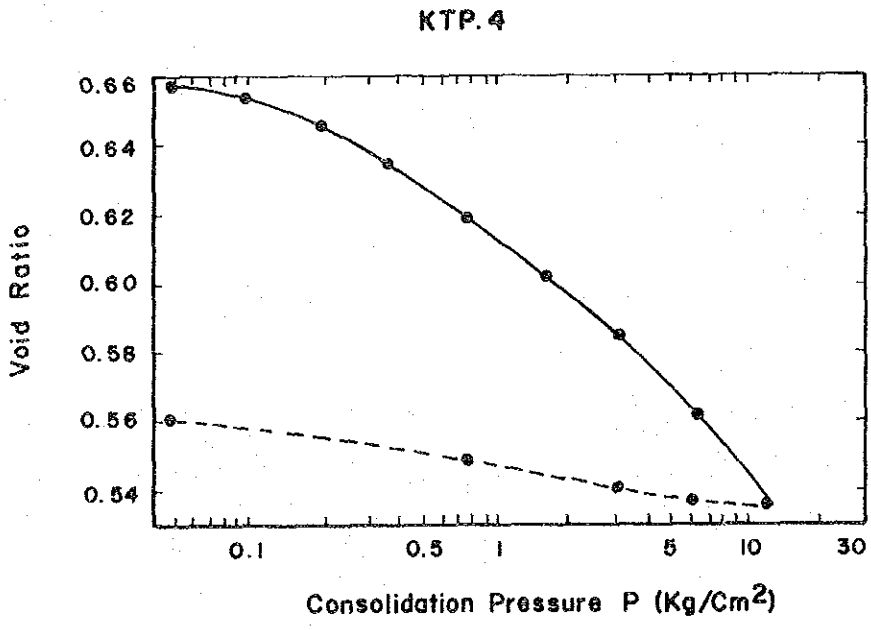


Fig. A2.6 VOID RATIO - CONSOLIDATION PRESSURE RELATIONSHIP OF EARTH MATERIAL SAMPLED FROM KEDUNGWARAK BORROW AREA (2/3)

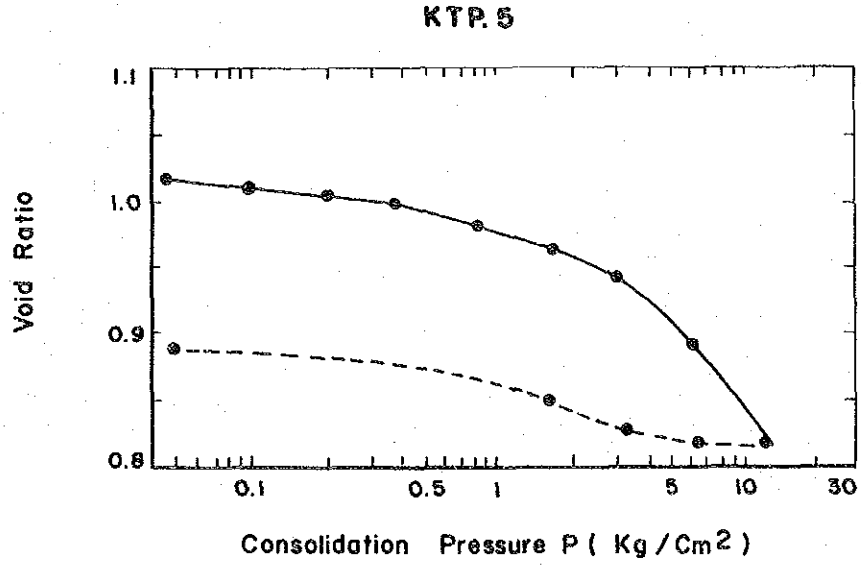


Fig. A2.6 VOID RATIO - CONSOLIDATION PRESSURE RELATIONSHIP OF EARTH MATERIAL SAMPLED FROM KEDUNGWARAK BORROW AREA (3/3)

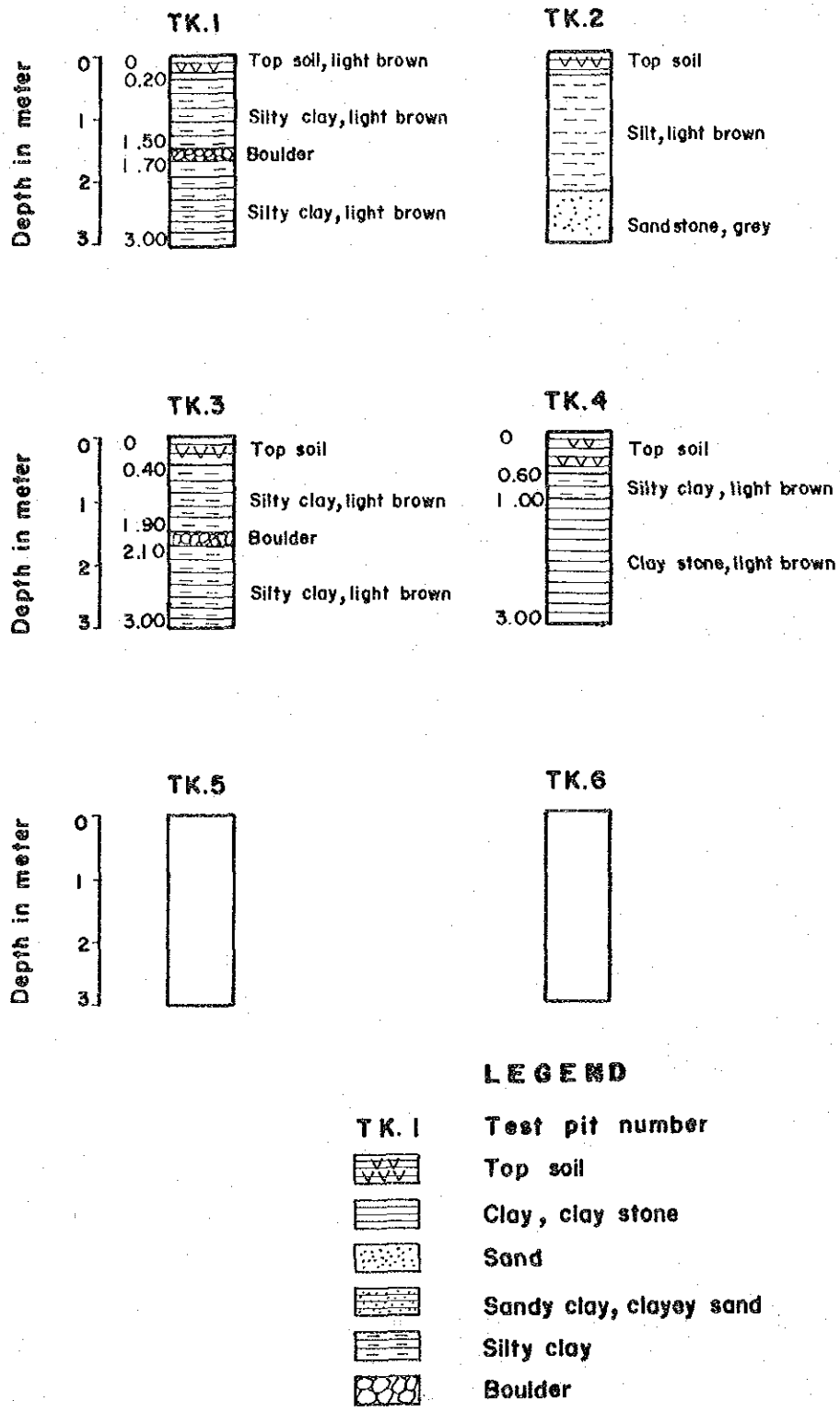


Fig.A3.1 LOG OF TEST PITS IN KETANDAN BORROW AREA

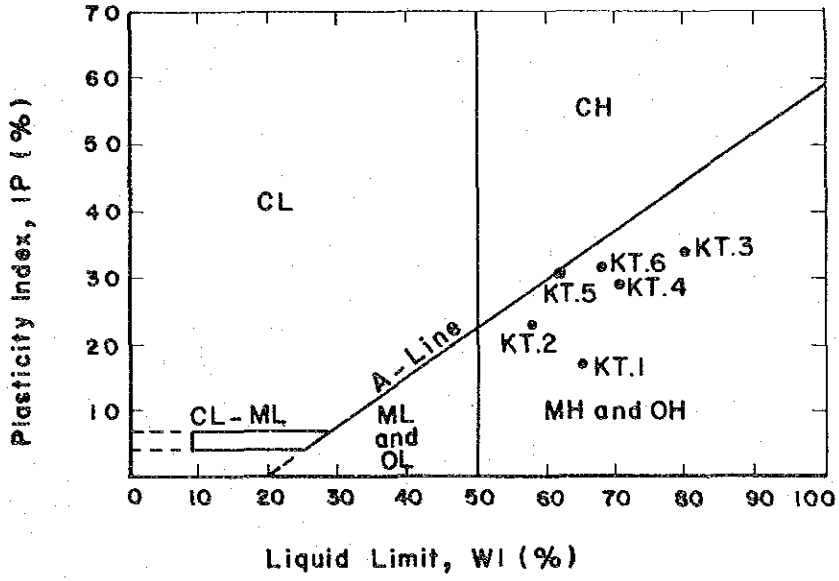
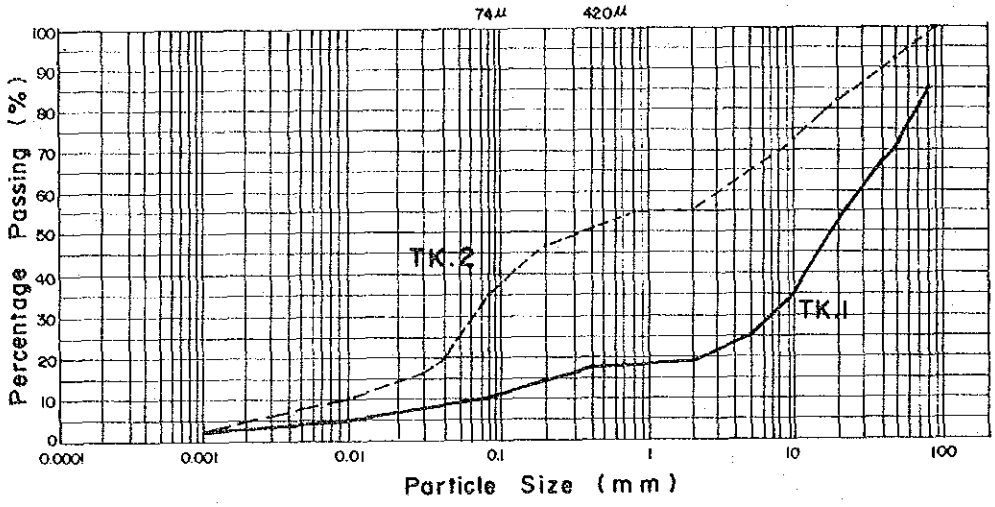
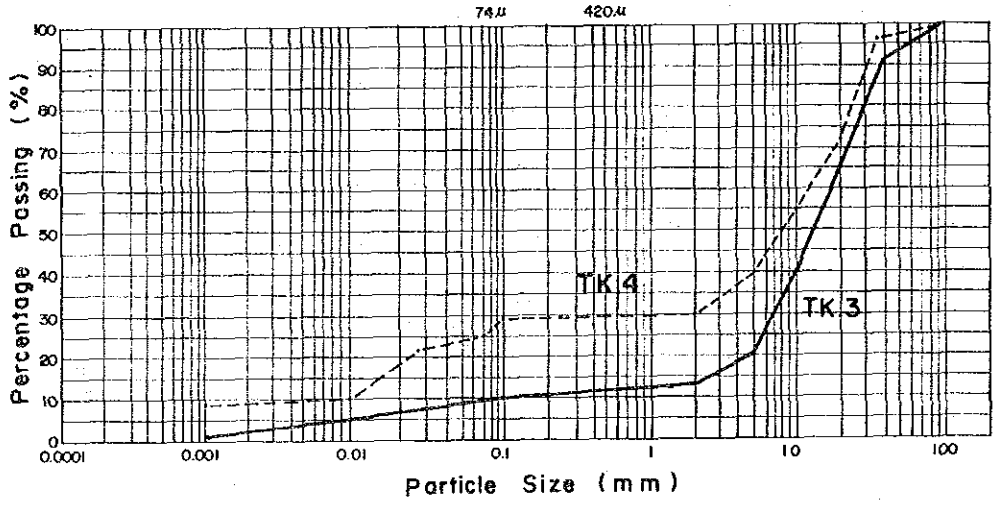


Fig.A 3.2 PLASTICITY CHART FOR UNIFIED SOIL CLASSIFICATION SYSTEM OF EARTH MATERIALS IN KETANDAN BORROW AREA





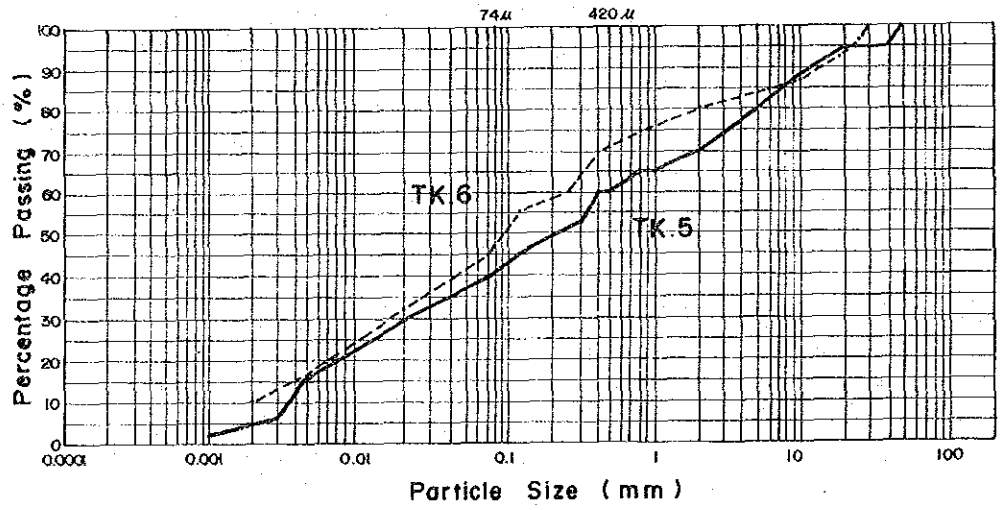


Fig.A3.3 PARTICLE SIZE DISTRIBUTION OF EARTH MATERIAL IN KETANDAN BORROW AREA

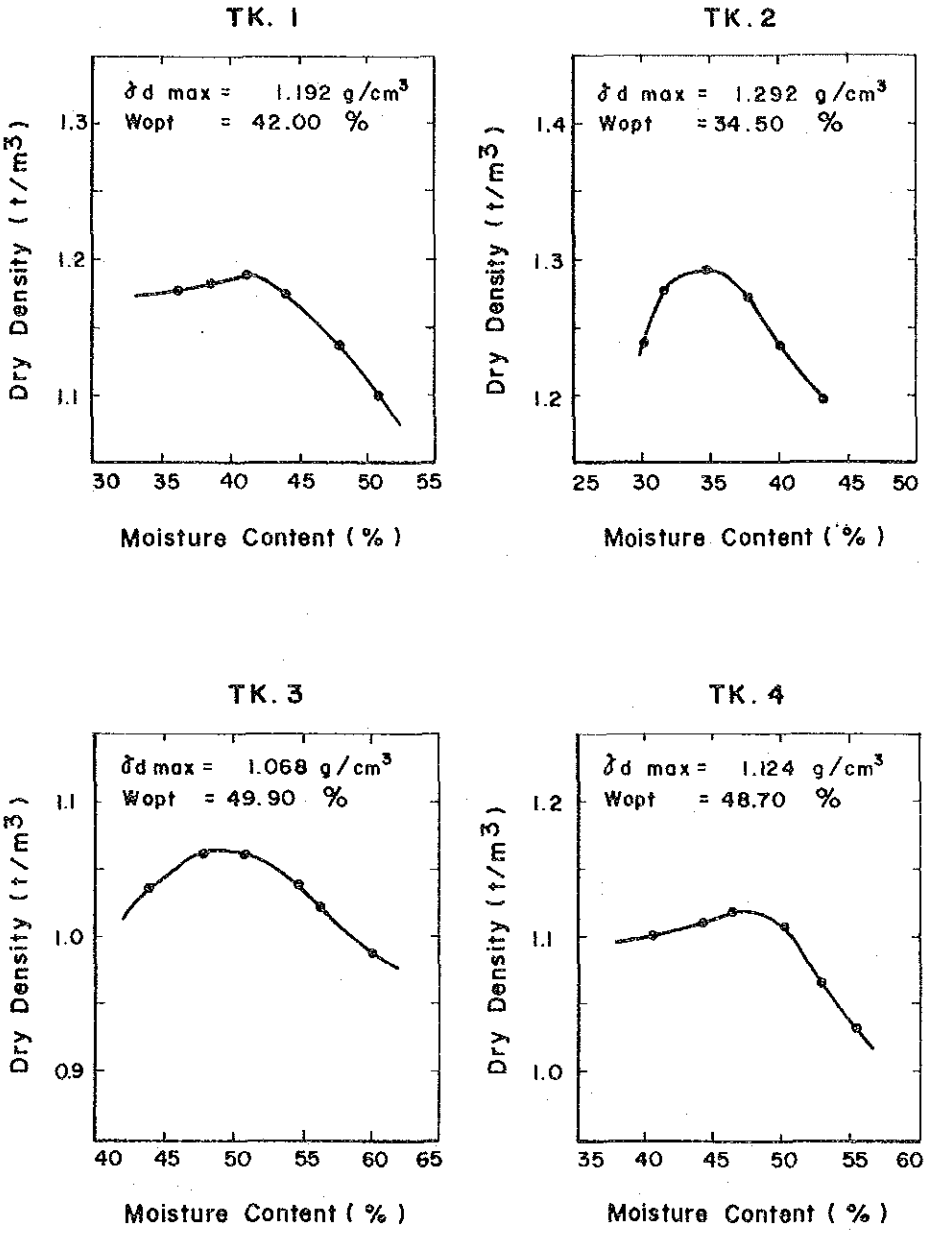


Fig.A3.4 **MOISTURE - DRY DENSITY RELATIONSHIP OF EARTH MATERIAL SAMPLED FROM KETANDAN BORROW AREA (1/2)**

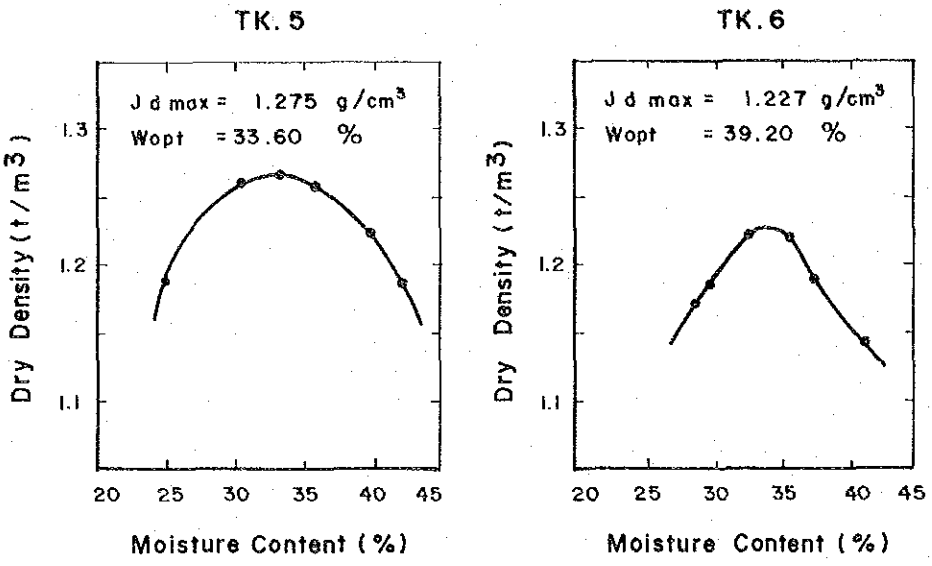
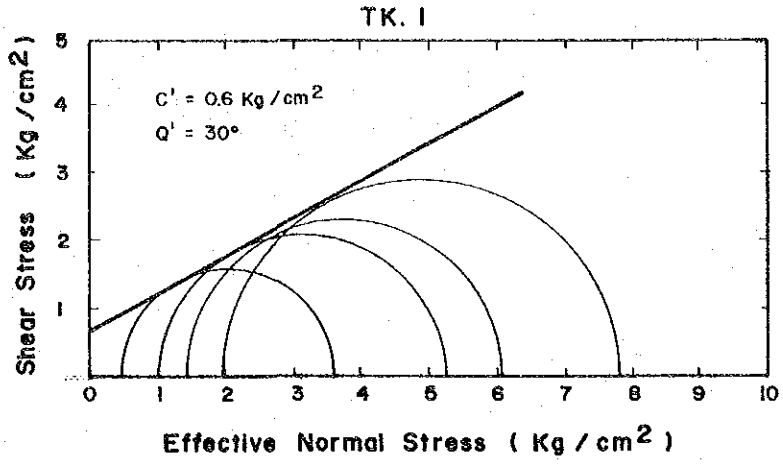
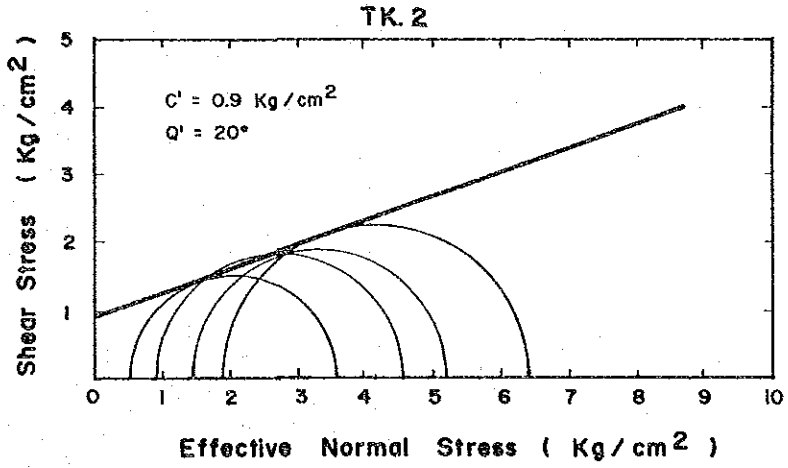


Fig.A3.4 MOISTURE - DRY DENSITY RELATIONSHIP OF EARTH MATERIAL SAMPLED FROM KETANDAN BORROW AREA (2/2)





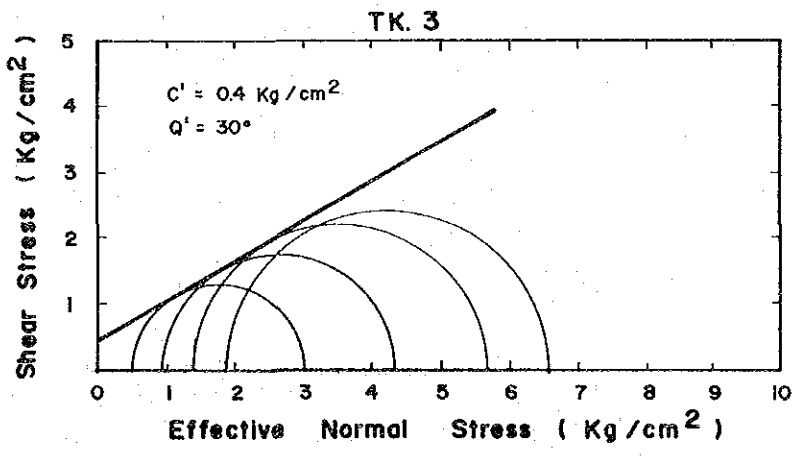
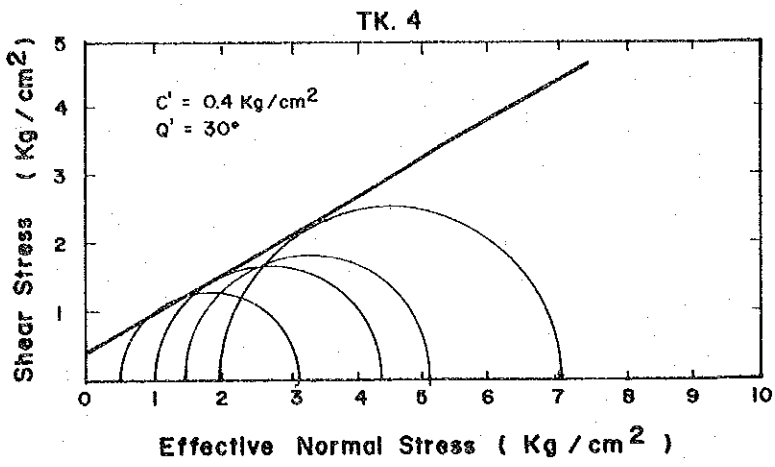
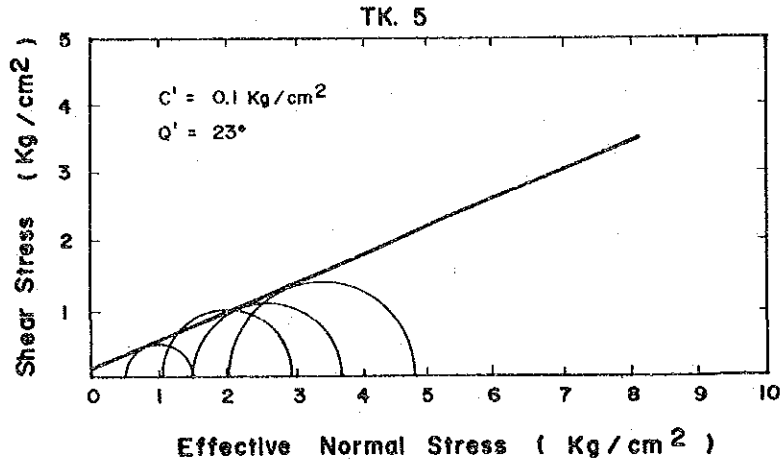


Fig. A 3.5 TRIAXIAL COMPRESSION TEST RESULTS SAMPLED FROM KETANDAN BORROW AREA (1/2)





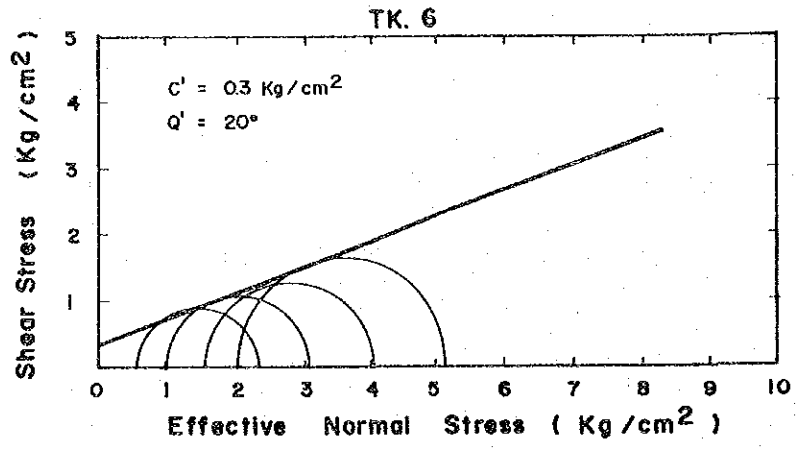
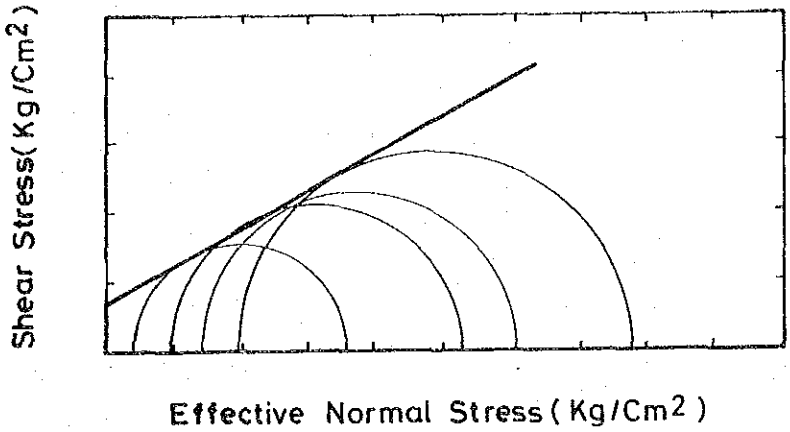
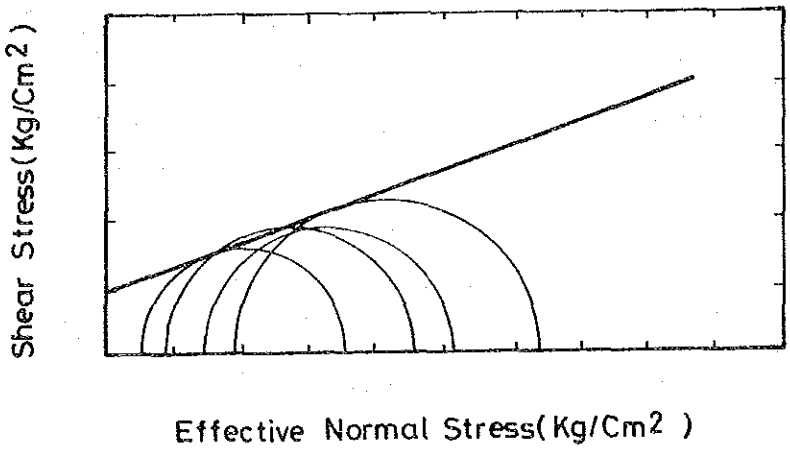


Fig. A3.5 TRIAXIAL COMPRESSION TEST RESULTS SAMPLED FROM KETANDAN BORROW AREA (2/2)





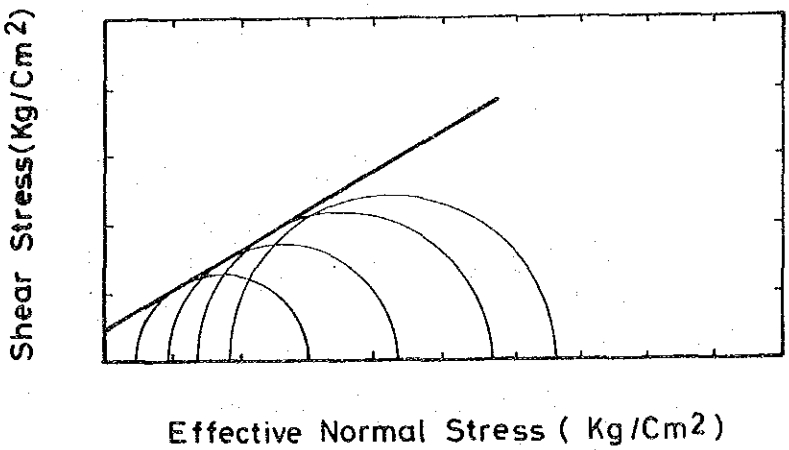


Fig. TRIAXIAL COMPRESSION TEST RESULTS(CU) SAMPLED FROM KETANDAN BORROW AREA

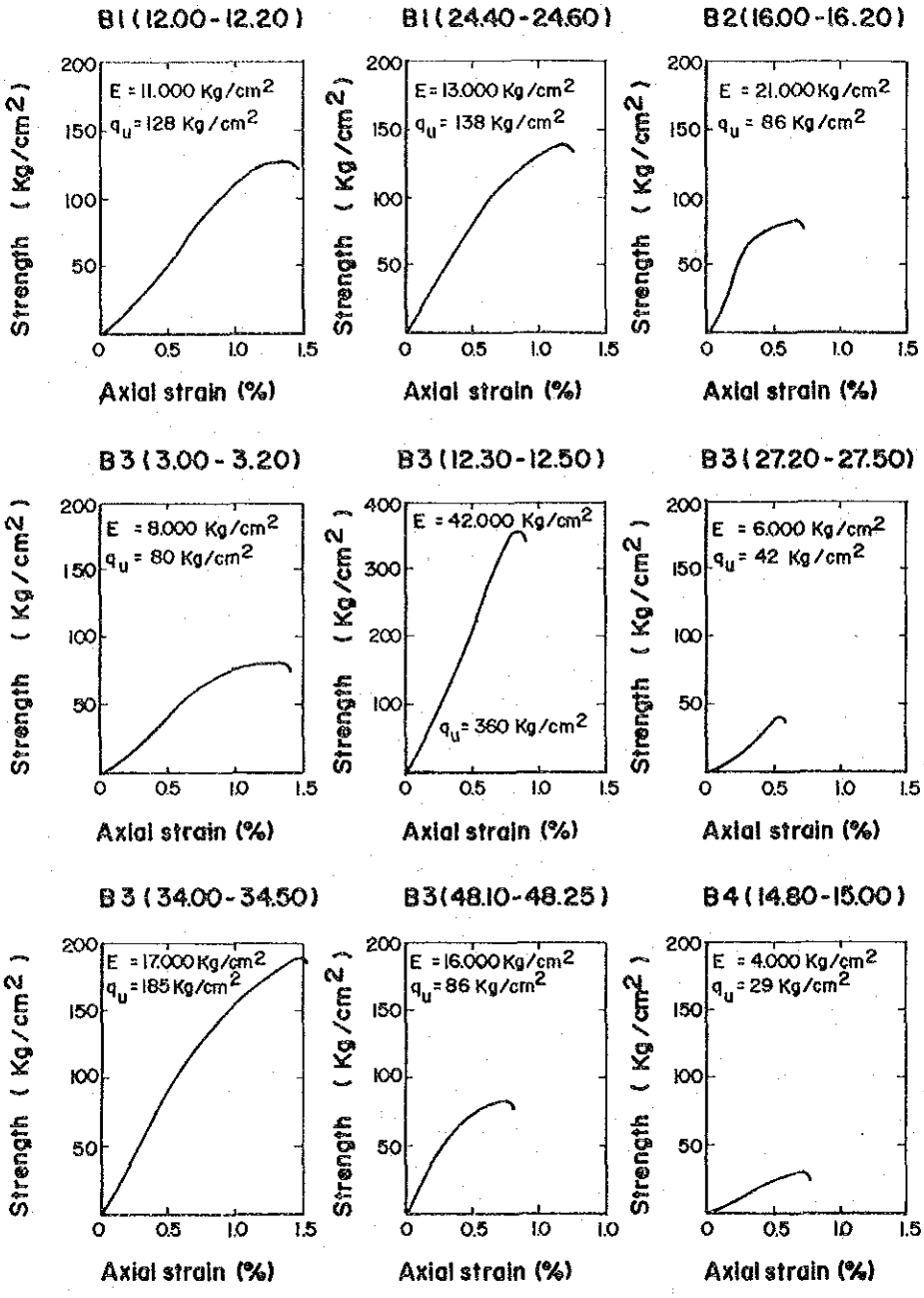


Fig. A3.6 UNCONFINED COMPRESSION TEST RESULTS ON BORING CORE AT THE KETANDAN DAM SITE (1/3)

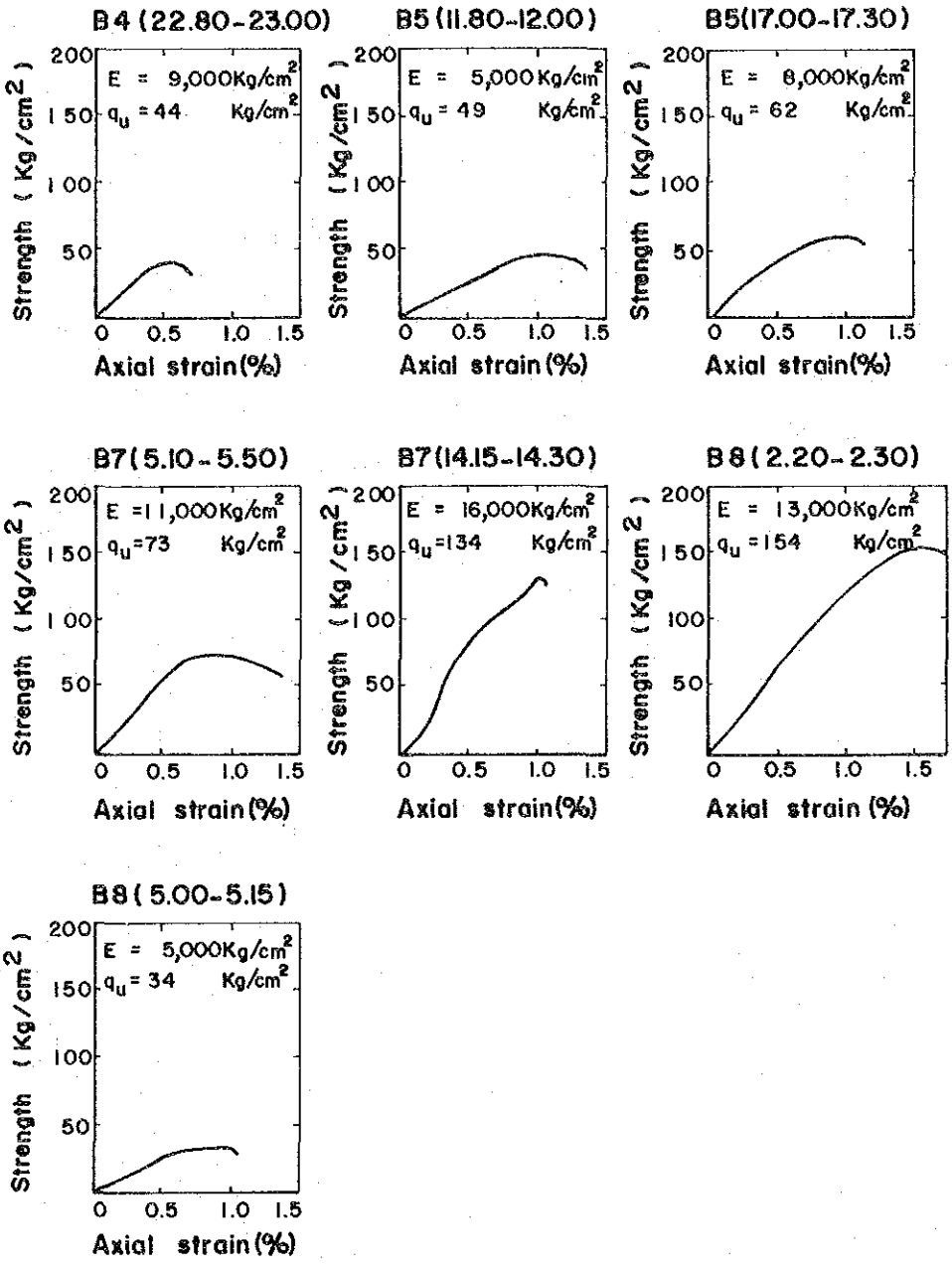


Fig. A3.6 UNCONFINED COMPRESSION TEST RESULTS ON BORING CORE AT THE KETANDAN DAM SITE (2/3)

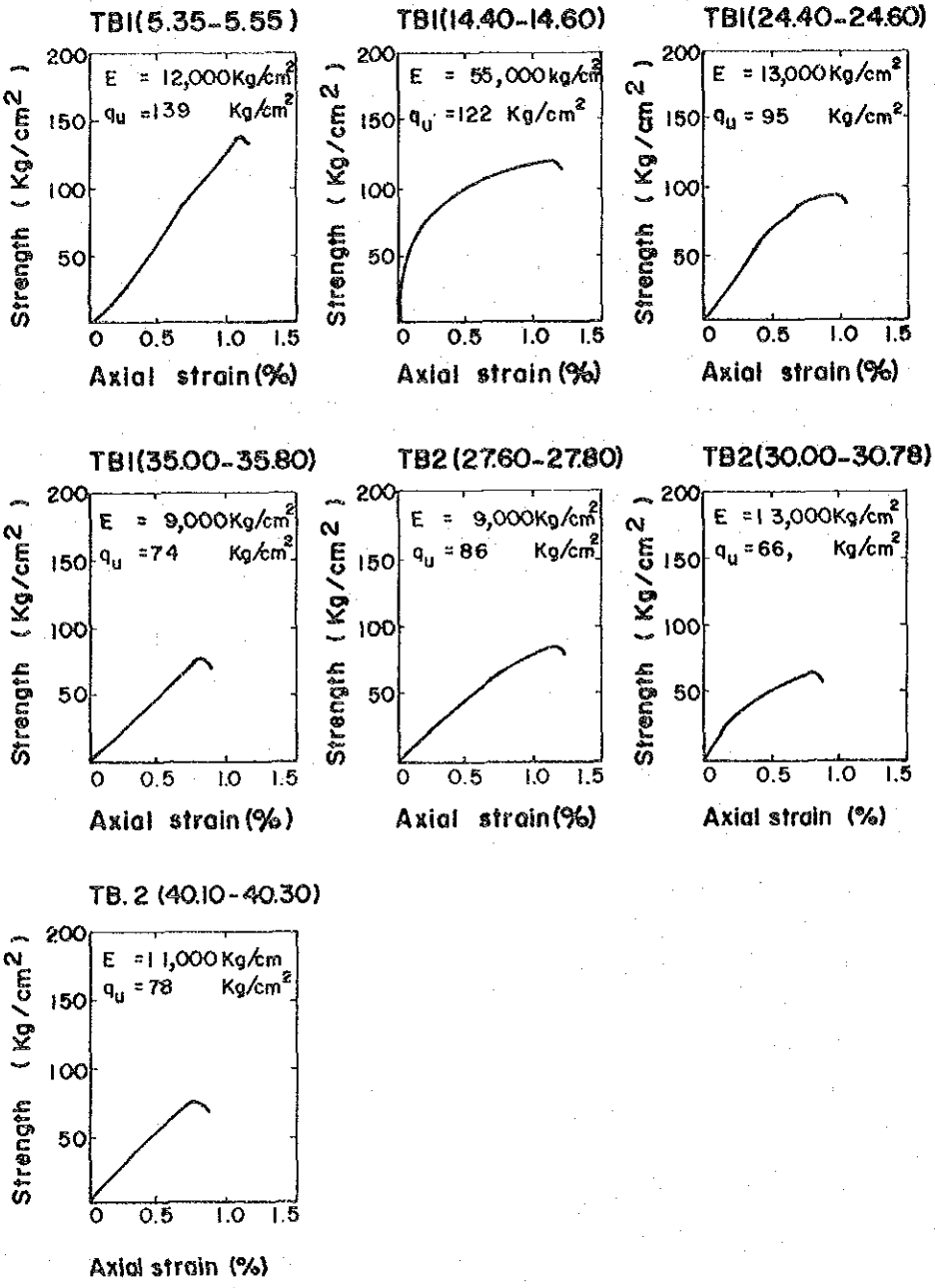


Fig. A 3.6 UNCONFINED COMPRESSION TEST RESULTS ON BORING CORE AT TRANS BASIN TUNNEL (3/3)

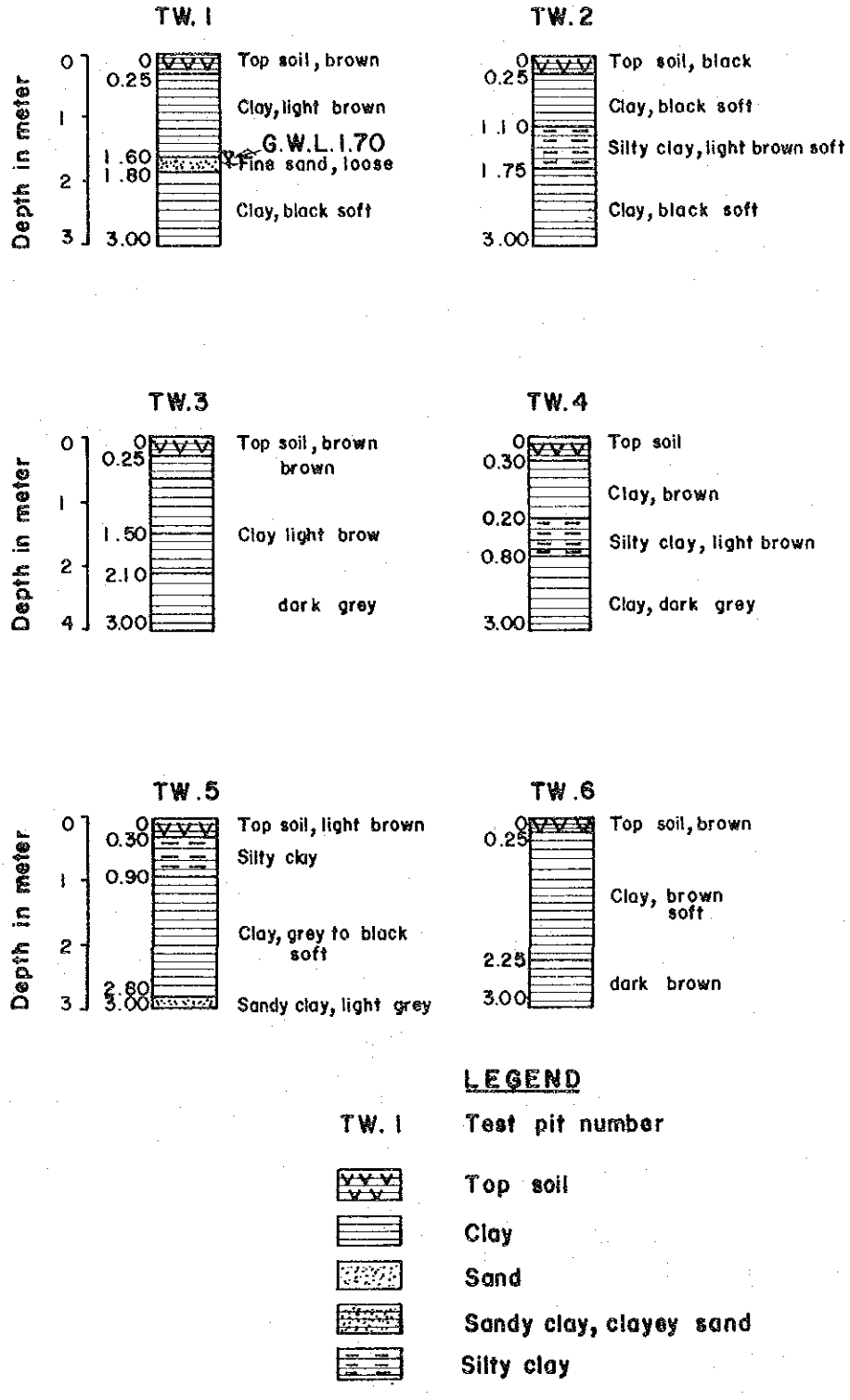


Fig. A 4.1 LOG OF TEST PITS IN WIDAS LOWER REACH (1/2)

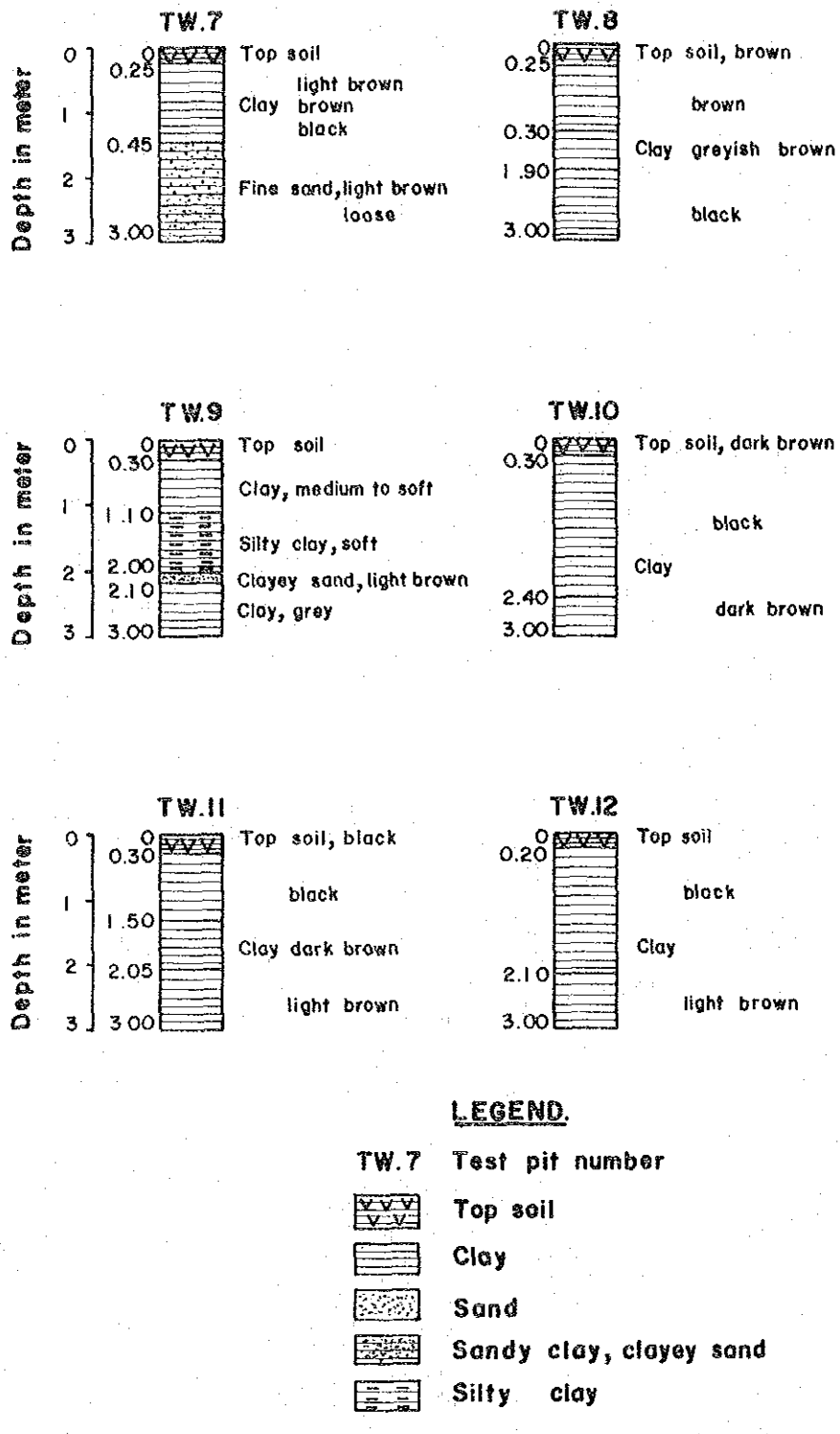


Fig. A4.1 LOG OF TEST PITS IN WIDAS LOWER REACH (2/2)

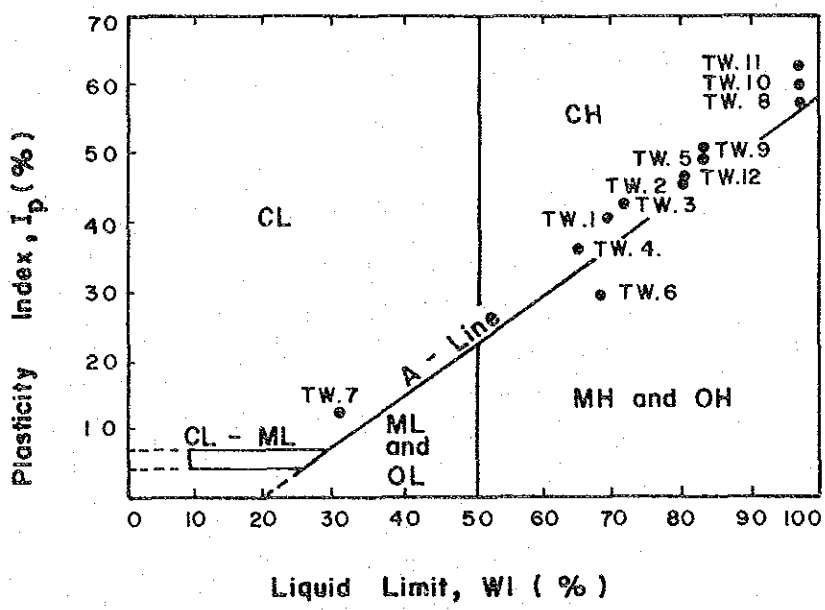
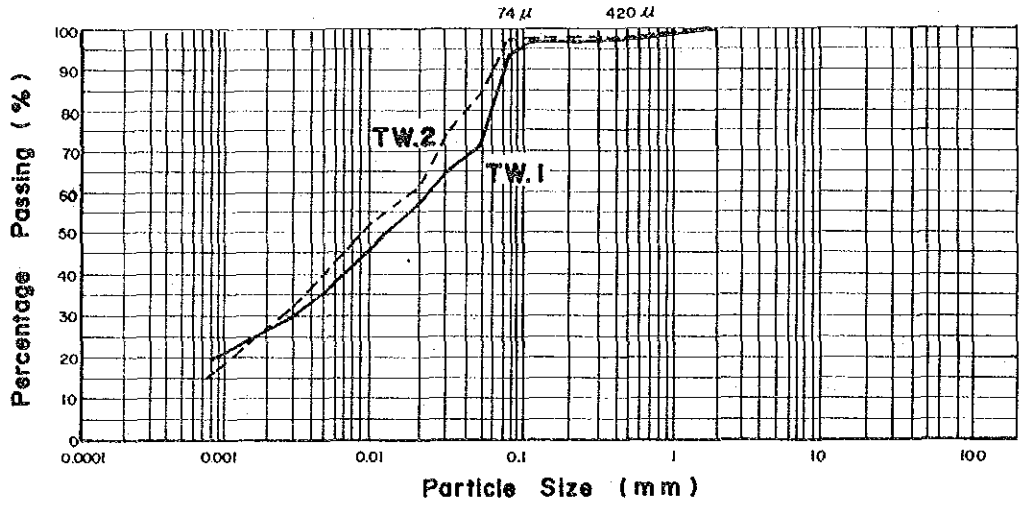
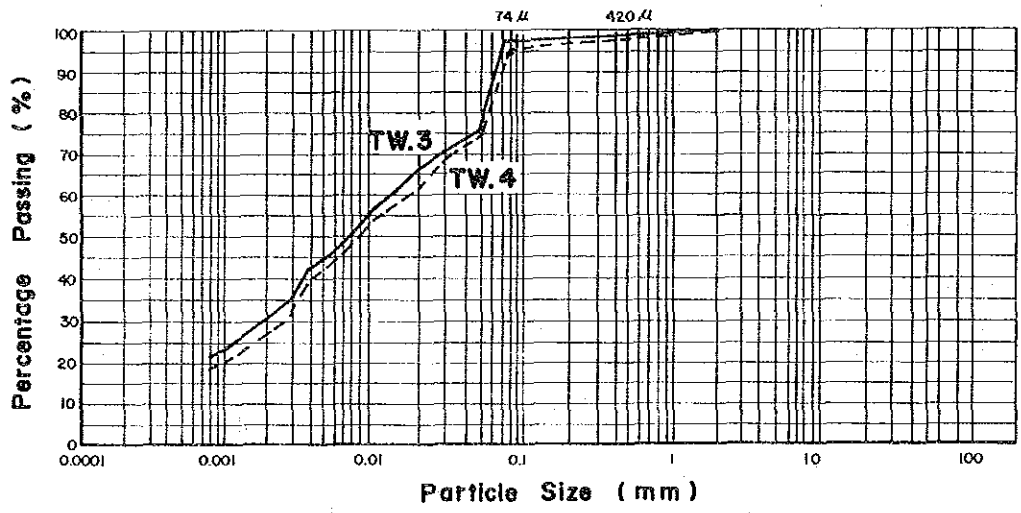


Fig. A4.2 PLASTICITY CHART FOR UNINFIED SOIL CLASSIFICATION SYSTEM OF EARTH MATERIALS ON WIDAS RIVER IMPROVEMENT PLAN





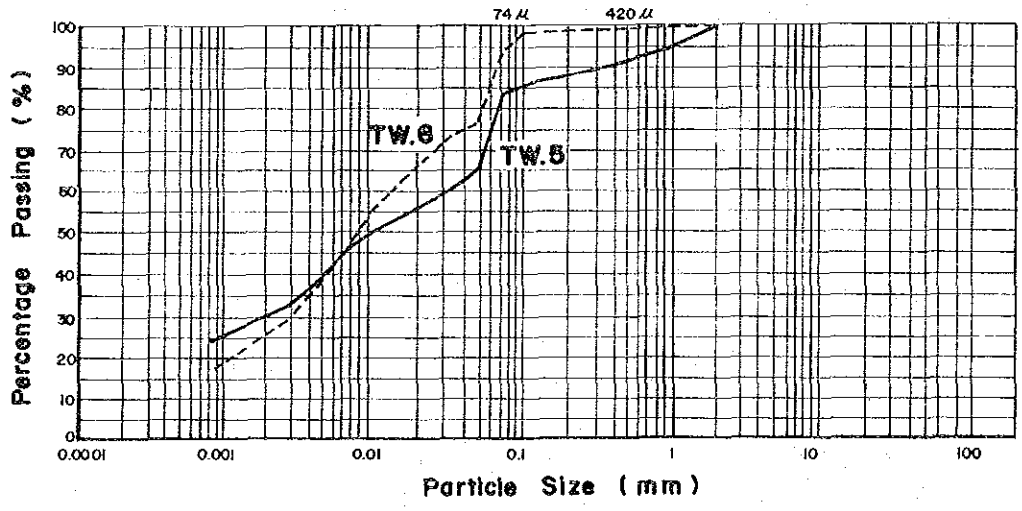
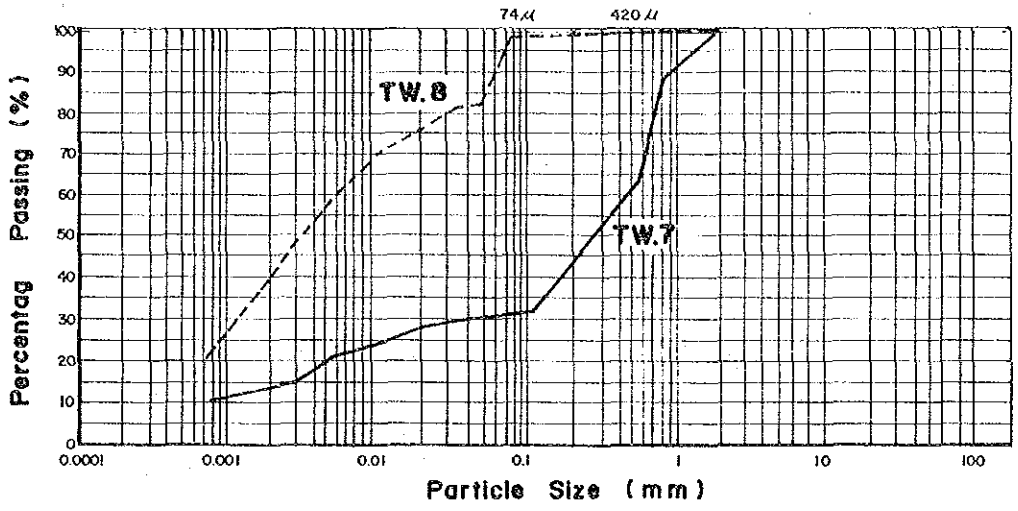
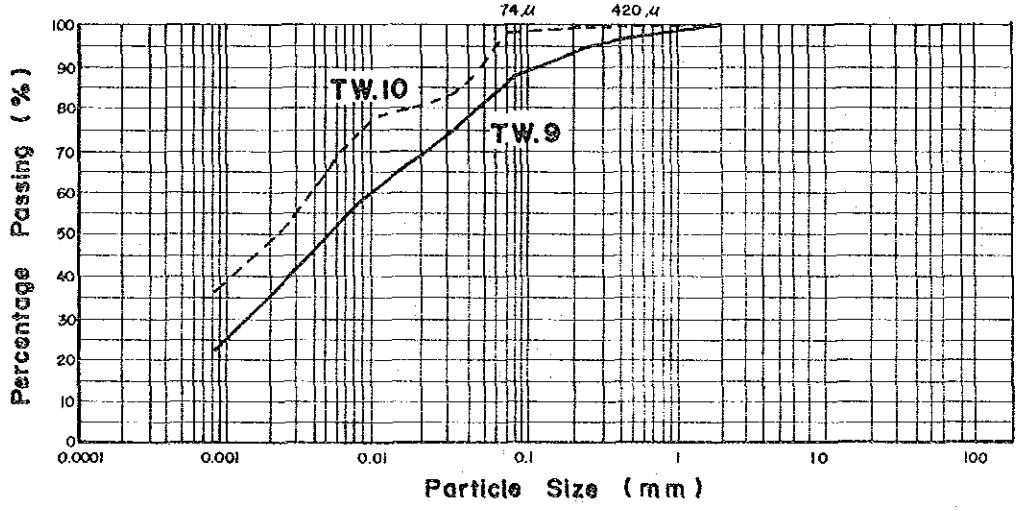


Fig. A4.3 PARTICLE SIZE DISTRIBUTION OF EARTH MATERIAL IN WIDAS LOWER REACH BORROW AREA (1/2)





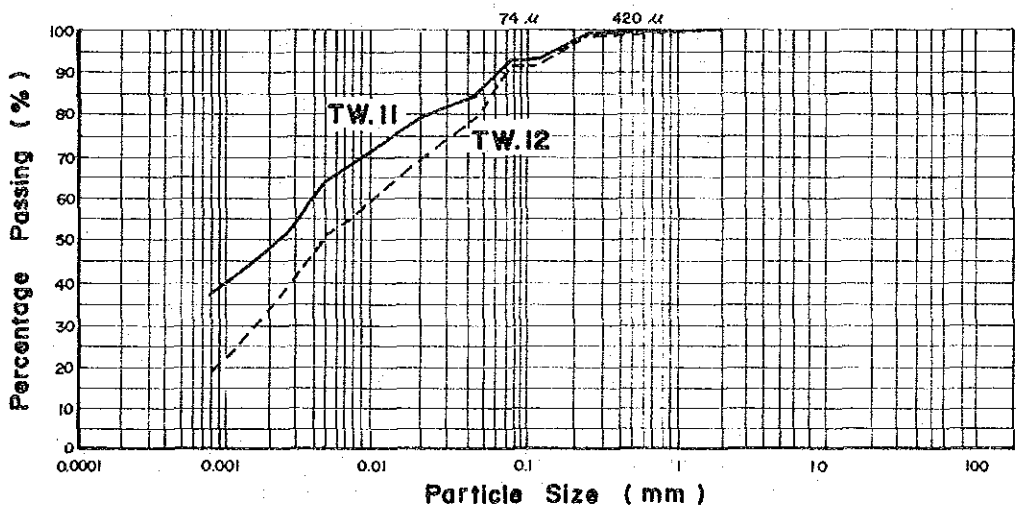


Fig. A4.3 PARTICLE SIZE DISTRIBUTION ON EARTH MATERIAL IN WIDAS LOWER REACH BORROW AREA (2/2)