The locations of the test pitting and the core drillings are shown in Fig. 3.1 "Location Map of Construction Material Survey". The logs of the test pit and core drilling are compiled in the part of Data Book for Geological Study.

1.2.2 Laboratory Testing

The laboratory tests performed for the present investigations are listed in Table 3.1 "Sampling Location and Laboratory Test Items". The results of the laboratory tests are summarized in Table 3.2.

1.2.3 Alkali Aggregate Reaction Test

The granite gneiss occupying the project site is planned to be used for the concrete aggregates. Although the granite gneiss is deemed to be sufficiently hard for concrete aggregates, it has silica which may react upon alkali in cement.

Cause of alkali aggregate reaction has not been made clear because of many factors involved in the reaction on a long-term basis. Besides, currently standardized testing methods are not always fully reliable to evaluate the reactivity of aggregates.

The alkali aggregate reaction test for this project was conducted by means of chemical method designated in ASTM C289., so as to get data to judge fitness of the granite gneiss for the concrete aggregates on the basis of the said current conditions on evaluation of the reactivity.

Each rock sample of the granite gneiss was obtained from the boring cone BD-3, 4 and 5.

The chemical method was applied to evaluate potential reactivity of silica in the granite gneiss upon alkali in cement. Samples were kept in solution of 1 normal NaOH for 24 hours under the condition of 80 ± 1.0_C. Quantity of reduction in alkalinity and quantity of dissolved silica in the solution were detected for the evaluation of potential reactivity of silica.

Test results of the chemical method are presented in Fig. 3.6. Although the Figure 3.6 shows that the granite gneiss has potentiality to act upon alkali in cement, the plotted points are very close to the border of allowable range.

In the future detailed design stage, it is recommended that the following test be carried out.

1. Physical test (X-ray analysis, etc.)
2. Chemical test
3. Mortar bar test

The mortar bar test designated in ASTM C227 is most suitable method to judge fitness of the granite gneiss for the concrete aggregates.

2. SOURCES OF CONSTRUCTION MATERIALS

2.1 Earth Fill Materials

The impervious materials for the homogeneous type of the dam embankment will come from the area of the both banks top forming gentle or flat hill. All the potential borrow sites have thick laterite soil reaching 10 m (maximum 35 m at BD 16). Considering an effective depth above ground water level, exploitable depth might be 5 to 6 m in all the potential borrow sites. The facts that the stratum for the earth fill material in all the sites is composed of laterite soil with minor proportion of gravels originated in the weathered granitic gneiss, with the in-situ moisture content (mostly 22 - 30 % reported by the foreign laboratory), a several percent higher than the optimum (16 - 24 % reported by Labogeni), are deemed to be not so disadvantageous for the operation of borrow development (refer Table 3.2).

2.2 River Sand and Gravel

The present river sand bank in the upstream area of the Ntem river shall be one of promising source for the filter and concrete mixing materials, because the sand deposits of the investigated downstream area along the river course is very fine grain distribution with organic clayey material or very poorly sorted (Fig. 3.2), in addition the quantity is quite limited. Further detail survey for confirmation of available quantity in the upstream area, hauling distance, access and cost should be examined in D/D study stage.

2.3 Quarry Rock

In this stage total 5 potential sites were reconnoitered, whose 3 sites were checked by core drilling. As a result, the right bank upstream quarry site (BQ 17) shall be abandoned due to very small area limited in quantity. The 2 sites checked by core drilling (BW 11, BQ 13 and BQ 14), shown in Fig. 3.2, are the most promising source for aggregate, quarry sand for concrete and filter zone of dam, and for rip rap material. However, in case of large scale dam construction such as the alternative dam axes of 1, 2, 3, and 5, huge amount of rock quantity shall be required. Since it is clear that the exploitable quantity of the above 2 promising quarry sites is very limited, the pondage bottom can be utilized as a rock quarry and the unstudied potential rock quarry sites of RQ 3 and Mt. Ebungu (R 4) shall be investigated in future stage. The R4 is located about 5 km west of the alternative dam site 5 as shown in Fig. 1.2 "Interpretation of Lineament" of former chapter II Geological Study.

3. QUANTITIES AVAILABLE

The quantities of the available materials are summarized as follows:

Materials		Estimated Volume (M3)	Location
Earth fill	E1	>450,000	600 m upstream of Village boat station. Right bank top of alternative dam axis 1. Checked by TP 9 to TP 12, BD 16 and BQ 17.
	E2	>300,000	Right bank top of alternative dam axis 3. Checked by TP 14.
	E3	>750,000	Right bank top of alternative dam axis 4. Checked by TP 3, SD4(2) and BD 1.
	E4	>360,000	Right bank top of the Ntem river between Ndjo'o and Biwome rivers. Checked by TP 2.
	E5	>682,500	Left bank of alternative dam axes. Checked by SW 2.
	E6	>900,000	Left bank of alternative dam axes. Checked by TP 7.
	E7	>562,500	Left bank of alternative dam axis 1 and 2. Checked by TP 5 and 6.
	E8	>300,000	Left bank of alternative dam axis 1. 400 m NW of Aloum 1 village.
River sand	S1	200,000	600 m upstream of Village boat station. Immediately downstream of alternative dam axis 1. Submerging at rainy season. Poorly sorted coarse grain size.
	S2	some10,000 (Unknown)	Along the river course of Ntem river (upstream). Not available in rainy season (submerging).
Quarry Rock	R1	1,440,000	Steep ridge along the waterway route between Pondage site and Reservoir area. Top soil is within a few meters. Checked by BW 11.
	R2	720,000	Terrace along Gorge Du Ntem. Rock will come from the excavation of P/H and tail race waterway. Checked by BQ 13 and BQ 14.
	R3	3,000,000 (Assumed)	4 km ESE of waterway and 4 km SSE of dam sites. Future survey is needed (no data is available).
	R4	Unknown	8 to 10 km WNW of alternative dam axis 5. Downstream right bank of Ntem river, Mt. Ebungu. Rock exposed.

4. PROPERTIES OF CONSTRUCTION MATERIALS

4.1 Earth fill Materials

The soil for earthfill material is mostly of fine grained soil (F: clay) or sandy soil (SF) of high plasticity (Fig. 3.2 to 3.4), which will be a suitable impervious material. The natural moisture content is slightly or a few percent lower than the value of the plastic limit (PL), and a few percent higher than that of the optimum (Table 3.2). Therefore, the soil shall be dried for moisture control and the embankment work will be restricted only in dry season. A high compaction effect is expectable when the earth work at dry season is properly done under a moisture control.

Judging from the physical property test of the soil such as specific gravity (Gs), wet density (rt), gradation test, and Utterberg limits (LL, PL) etc., shown in Table 3.2, the soil properties of all the borrow sites may be uniformly same condition. The design parameters for earthfill materials for preliminary design is shown on Table 3.4.

The slope stability analysis of embankment structure shall be done by taking into both of boundary and foundation against the loads such as dead weight, hydrostatic pressure, pore pressure and seismic force.

At the beginning of the embanking work from the bottom of foundation basement, care of objectionable water should be done carefully.

4.2 Sand and Gravels

There found out no gravel deposit. The sand deposit is very limited at the present river course. The test pit result of TP 4 and TP 17 for check of sand at the terrace shows also that all the sand deposits are containing an organic matters, very fine grains, very poorly sorted, and minor reserves. Therefore, the sand for fine concrete aggregate and a part of filter material shall be collected mostly from the upstream river course of the Ntem river, which is expected more coarse sand deposit developing.

As to the fine concrete aggregate, this river sand shall be passed through a rod mill in an aggregate production plant. Filter material will be mixed the river sand with aggregate passing through a secondary jaw crusher.

4.3 Quarry Rock

The R1 and R2 sites were checked by the drilling of BW11, BQ 13 and BQ 14 respectively. All the sites are very thinly covered by residual soil with 1 to 5 m thickness, or exposed without soil. The rock test for the drilled core samples in foreign laboratory for unit weight, unconfined compression test, Vp-Vs seismic velocities measurement, density and porosity tests etc., proves the rock is excellent (refer to Table 3.2). The abrasion test result (Los Angels test) shows that losses of samples are around 20%, while general practice dictates that coarse aggregate should lose not more than 40% after 500 revolutions.

5. TYPE OF DAM EMBANKMENT

The most conceivable dam type for the alternative dam site is a homogeneous type with drains. Fig. 3.5 shows a typical dam section of homogeneous type of dam for the alternative 1 to 5 dam sites.

The area of the alternative dam sites 1 to 5 is thickly covered by laterite and residual soil. The thickness of laterite and residual soil is more than 5 m in many places and maximum 35 m at the right bank of the alternative 1 dam site. Such abundant soil shall be utilized for the core zone and random zone of the dam. According to the test pit results, soil sequence is generally of silty clay without gravel (laterite) of 3 to 6 m thick, hard clay of some 1 m thick with pebbles of 1 to 2 cm in diameter, and silty clay of kaoline (residual soil of several meters thick to the boundary of basement rock (gneiss) in descending order. Such soil sequence is also concordant with the facts that the grain size distribution of the samples taken from deeper portion is high compared to the samples taken from shallower portion (Fig. 3.2).

Based on the availability of construction material and the dam scale, homogeneous type dam will be able to consist of impervious material from borrow areas of 1 to 8, filter material for drains by mixture of river sand and aggregate production, and riprap from quarry rock.

The design parameters for the embankment materials for the preliminary design for the feasibility study are proposed as given in Table 3.4.

6. CONCLUSION

From the analysis result of the construction material survey, the followings are recommended.

1) due to very limited quantity of sand and rock materials, the **Dam site 4** is the most recommendable,

2) in order to obtain more reliable laboratory test results from the local laboratory in future, especially for mechanical tests such as triaxial test and consolidation test, it is recommended to improve laboratory to meet the design requirement,

3) in case of the selection of dam sites of 1, 2, 3 and 5, and/or high dam planning, detail survey for sand and rock quarry sites is needed.

Table 3.1 Sampling Location and Laboratory Test Items (1/2)

1) Sampling nos. and Location for the test

1-1 Earthfill Material

Location Test Pit nos. and Depth taken the Samples for test
(Borrow Area)

E1TP13 (4m), TP9 (5.3m), Camp Well (16m)
E2TP14 (9.7m),
E3TP3 (7.7m),
E4TP1 (4.7m), TP2 (8.5m),
E6TP7 (7.7m),
E7TP5 (10m), TP6 (10m),

1-2 Sand and Rock Materials

Sand Sample (1D,2U)

Test Pit	:	TP4 (2.5m)
Present river bed 1D	:	Upstream of the Ntem river
2U	:	Downstream of the Ntem river

Rock Sample

R1,R2,R3,R4,R5	:	Outcrop of Gorge Du Ntem
Boring core sample	:	BD1(18.7-18.83m),BD1(19.43-19.6m), BQ13(30-30.29m),BQ14(14.61-14.91m), BQ14(36.0-36.28m)

2) Test Items and nos. for Earthfill Materials

2-1 Mixed sample (BL and BH) for Triaxial Test
BL(Liquid Limit is less than 80 %): TP5(10m),TP7(5m),TP7(10m)
BH(Liquid Limit is more than 80 %): TP5(3m),TP6(3m),TP6(10m)

Test Item	Sample nos. BLBH
Specific Gravity (Gs)	22
Water Content (w %)	22
Wet Density (rt %)	22
UU test, CU test	11

2-2 Physical and Mechanical Property Test by each sample

Sample nos. (Depth)	Gradation, (sieve test)	Consistency, (WL, WP)	w,	Gs,	Compaction*	UU*
TP1 (1m)	1	1, 1	1	1	1#	-
TP1 (3m)	1	1, 1	1	1	-	-
TP2 (4m)	1	1, 1	1	1	-	-
TP2 (8m)	1	1, 1	1	1	-	-
TP3 (3m)	1	1, 1	1	1	1#	-

(to be continued)

Table 3.1 Sampling Location and Laboratory Test Items (2/2)

Sample nos. (Depth)	Gradation, (sieve test)	Consistency, (WL, WP)	w,	Gs,	Compaction*	UU*
TP3 (7.7m)	1	1, 1	1	1	-	-
TP5 (3m)	1	1, 1	1	1	-	-
TP5 (5m)	1	1, 1	1	1	-	-
TP5 (10m)	1	1, 1	1	1	2#	-
TP6 (3m)	1	1, 1	1	1	-	-
TP6 (5m)	1	1, 1	1	1	-	-
TP6 (10m)	1	1, 1	1	1	2#	-
TP7 (3m)	1	1, 1	1	1	-	-
TP7 (5m)	1	1, 1	1	1	-	-
TP7 (10m)	1	1, 1	1	1	-	-
Camp Well (5m)	1	1, 1	1	1	-	-
Camp Well (8m)	1	1, 1	1	1	-	-
Camp Well (11m)	1	1, 1	1	1	-	-
Camp Well (16m)	-	-, -	-	-	1#	-
TP9 (2m)	1	1, 1	1	1	1	-
TP13 (2m)	1	1, 1	1	1	1	1
TP14 (3m)	1	1, 1	1	1	1	1
TP14 (7m)	1	1, 1	1	1	1	1

3)Test Items and nos. for Rock samples

Sample nos. (depth)	R1	R2	R3	R4	R5	BD1	BD1	BQ13	BQ13	BQ14	BQ14
	(outcrop of Gorge Du Ntem)										
from						18.7	19.4	19.7	30.0	14.6	36.0
to						18.8	19.6	20.0	30.2	14.9	36.2
Unit weight	-	-	-	-	-	1	1	1	1	1	1
Water content	-	-	-	-	-	1	1	1	1	1	1
Absorption	-	-	-	-	-	1	1	1	1	1	1
Porosity	-	-	-	-	-	1	1	1	1	1	1
Vp velocity	-	-	-	-	-	1	1	1	1	1	1
Vs velocity	-	-	-	-	-	1	1	1	1	1	1
Unconfined Compression Test	-	-	-	-	-	1	1	1	1	1	1
Brazilian Test	-	-	-	-	-	-	1	1	1	1	1
Los Angels* Test	1	1	1	1	1	-	-	-	-	-	-

3) Sieve test for Sand samples from the Ntem river bed
River sand (1D) River Sand (2U)

Note * : Test was done by LBTP (Laboratoire du Batiment et des Travaux Publics

: Test was done by Labogeni

Table 3.2 Summary of Laboratory Test Results (1/3)

1) Test Results of Earthfill Materials

1-1 Mixed samples (BL and BH)

BL : Liquid Limit less than 80 %
BH : Liquid Limit more than 80 %

Test Item / Sample nos.	BL	BH
Specific Gravity (Gs)	2.638,2.638	2.689,2.689
Water Content (w %)	16.7 ,16.7	20.4 ,20.4
Wet Density (rt %)	2.017,2.027	2.012,2.012
Void Ratio (e %)	0.526,0.519	0.609,0.593
Sr (%)	83.8 ,84.9	90.1 ,92.5
Cohesion (kg/cm2)	2.26(UU),1.0(CU)	3.29(UU),1.3(CU)
Internal Friction Angle (degree)	23.8(UU),21.7(CU)	20.8(UU),36.0(CU)

2-2 Physical and Mechanical Property test by each sample

Sample nos. (Depth)	Gradation, (sieve test)	Consistency, (LL, PL, PI)		w	Gs
TP1(1m)	F	CH:	72.0,26.7,45.3	22.43	2.658
TP1(4.7m)	F	CH:	104.0,37.1,66.9	38.81	2.715
TP2(4m)	F	CH:	98.0,36.0,62.0	31.69	2.726
TP2(8m)	SF	CL:	41.8,23.8,18.4	18.58	2.632
TP3(3m)	F	CH:	95.5,33.2,62.3	28.74	2.710
TP3(7.7m)	SF	OL:	45.5,30.6,14.9	33.56	2.797
TP5(3m)	F	CH:	102.0,30.5,71.5	25.93	2.669
TP5(5m)	F	CH:	86.0,31.3,54.7	28.91	2.665
TP5(10m)	F	VH1:	50.5,29.1,21.4	33.23	2.622
TP6(3m)	F	CH:	90.0,29.2,60.8	25.29	2.687
TP6(5m)	F	CH:	96.0,32.7,63.3	25.15	2.691
TP6(10m)	F	VH2:	90.5,39.6,50.9	44.68	2.683
TP7(3m)	F	CH:	86.5,30.7,55.8	25.30	2.737
TP7(5m)	F	CH:	57.5,28.7,28.8	23.68	2.649
TP7(10m)	F	VH1:	58.7,33.1,25.6	38.68	2.642
Camp Well(5m)	F	CH:	98.0,34.2,63.8	36.00	2.712
Camp Well(8m)	F	CH:	75.0,32.7,42.3	22.90	2.679
Camp Well(11m)	F	VH1:	58.5,33.5,25.0	30.00	2.642
Camp Well(16m)	-	- :	- - -	-	-

2-3 Test Results by Local Laboratory

Sample nos. (Depth)	Gradation, (sieve test)	LL,PL,PI	w	Gs	OMC (density)	C' (CU)	phi' (CU)
TP3	-	- - -	-	-	23(1.66)	-	-
TP9 (2m)	F	61,32,29	30	2.56	22(1.65)	0.01*	22
TP13(2m)	F	53,26,27	25	2.64	18(1.78)	0.05*	32
TP14(3m)	F	66,33,33	29	2.69	21(1.68)	0.18*	19

Note * : unit is (bar) tested by Labogeni

(to be continued)

Table 3.2 Summary of Laboratory Test Results (2/3)

Sample nos. (Depth)	Gradation, (sieve test)	LL,PL,PI	w	Gs	OMC (density)	C (CU)	phi (CU)
*TP14(7m)	F	52,29,27	25	2.58	20(1.72)	-	-
#TP1(4.7m)	-	- - -	-	-	21(1.70)	-	-
#TP3(7.7m)	-	- - -	-	-	23(1.66)	-	-
#TP5(5m)	-	- - -	-	-	21(1.69)	-	-
#TP5(10m)	-	- - -	-	-	16(1.76)	-	-
#TP6(5m)	-	- - -	-	-	19(1.72)	-	-
#TP6(10m)	-	- - -	-	-	20(1.70)	-	-
#Camp Well(16m)		- - -	-	-	24(1.60)	-	-

Note *: Tested by Labogeni
#: Tested by LBTP (Laboratorie du Batiment et des Travaux Publics)

3-1 Rock Test

3-1-1 For drilled core samples (tested by foreign laboratory).

Sample nos.
(depth of the samples taken in meter)

Test Items	BD 1	BD 1	BQ 13	BQ 13	BQ 14	BQ 14
(Depth from	18.70	19.43	19.73	30.00	14.61	36.00)
(to	18.83	19.60	20.00	30.29	14.91	36.28)
Unit weight (g/cm3)	2.664	2.619	2.696	2.727	2.727	2.758
Water content (W %)	0.11	0.13	0	0	0	0
Absorption (Wsat %)	1.10	0.55	0.28	0.26	0.26	0.28
Porosity (n %)	2.90	1.47	0.75	0.72	0.72	0.79
Vp velocity (km/sec)	5.79	6.2	6.4	6.6	6.6	6.4
Vs velocity (km/sec)	3.21	3.5	3.6	3.7	3.7	3.5
Unconfined compressive (kgf/cm2)	592	1530	1361	2379	1596	1568
Brazilian test (kgf/cm2)		94	157	129	222	184

(to be continued)

Table 3.2 Summary of Laboratory Test Results (3/3)

3-1-2 Test results for rock and sand samples

(tested in local laboratory)

Sample nos.	Los Angels Test (%)	Sample nos.	Sieve test
R1(Gorge Du Ntem)	13.7	River sand 1D	SF
R2(Gorge Du Ntem)	20.4	River sand 2U	SF
R3(Gorge Du Ntem)	20		
R4(Gorge Du Ntem)	24		
R5(Gorge Du Ntem)	22		
R6(Gorge Du Ntem)	15		

Table 3.3 Summaries the sources of construction materials for earth fill dam or another type dam

1) Alternative Dam Site and Dam Type

Alternative Dam Site 1, 2, 3, 4, 5: Zoned Earthfill Dam
(Earthfill, Filter, Drain, Rock and Random zone)
Alternative Dam Site 6 : Concrete Gravity Dam

2) Dam Type and Source of Construction Material

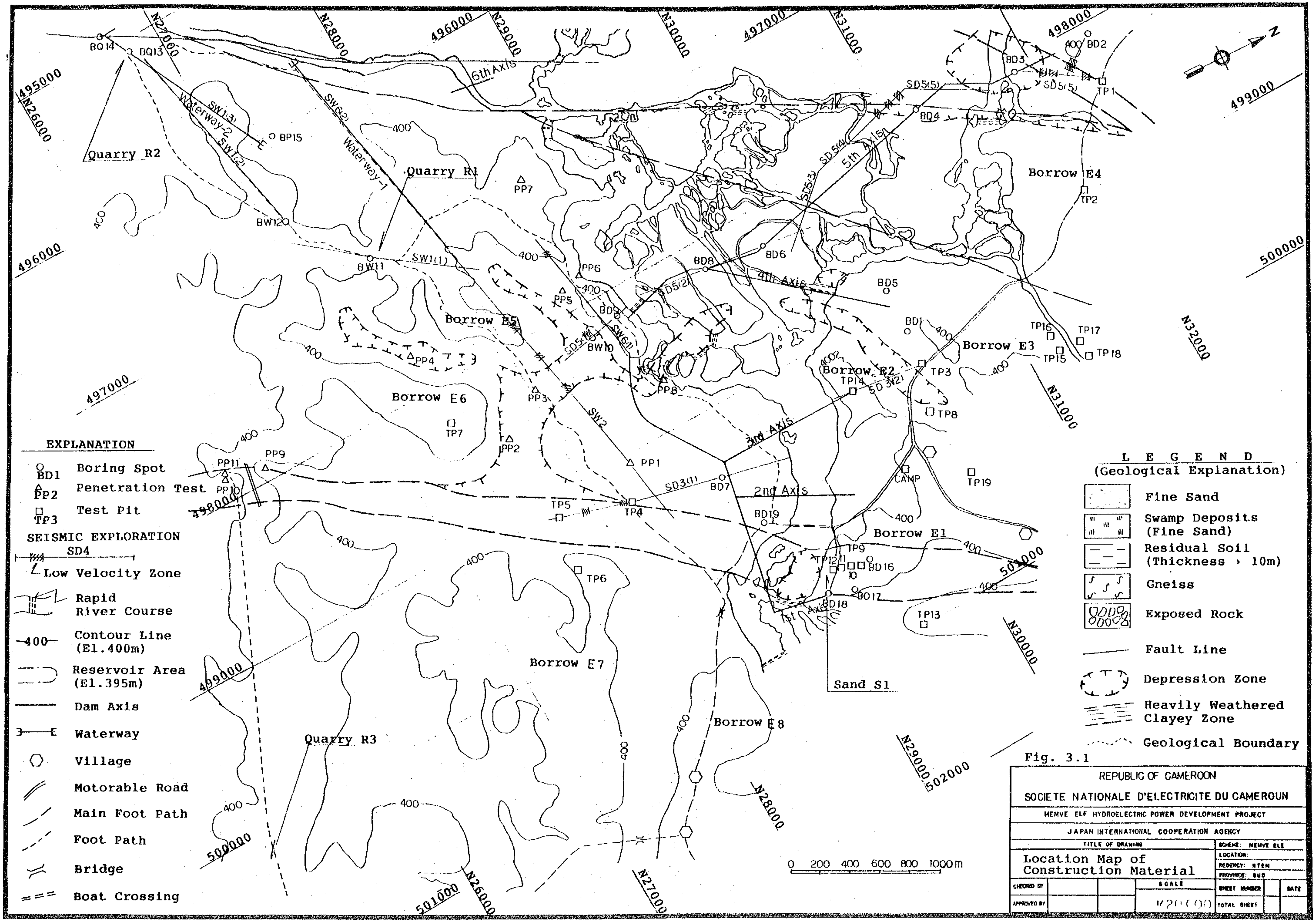
Dam Site,	Borrow nos. of Impervious core	Filter Sand/Rock fill
1	E1,E7,E8	S1,S2/R1,R3
2	E2,E3,E6,E7	S1,S2/R1,R3
3	E2,E3,E6,E7	S1,S2/R1,R3
4	E2,E3,E6,E7	S1,S2/R1,R3
5	E4,E5,E6	S1,S2/R1,R4
6	--------	S1,S2/R1,R2

Table 3.4 Design Parameters for Embankment Materials (for Preliminary Design)

Item	Earthfill Zone	Filter Zone	Rockfill Zone (Riprap)
Specific Gravity (Gs)	2.68	2.7	2.7
Dry Density (rd t/m3)	1.7	2.2*	2.7*
Void Ratio (e)	0.56	0.5*	0.01
Wet Density (rt t/m3)	2.02	2.3*	2.7
Water Content (W %)	20.8#	10*	5*
Effective Cohesion (C' t/m3)	0.5*	0*	0*
Effective phi (p)	21	26*	40*
Coefficient of Permeability (K cm/sec)*	1 x 10-6	1 x 10-2	free-draining
Seismic coefficient (G)	k = 0.01 (for 100years)		

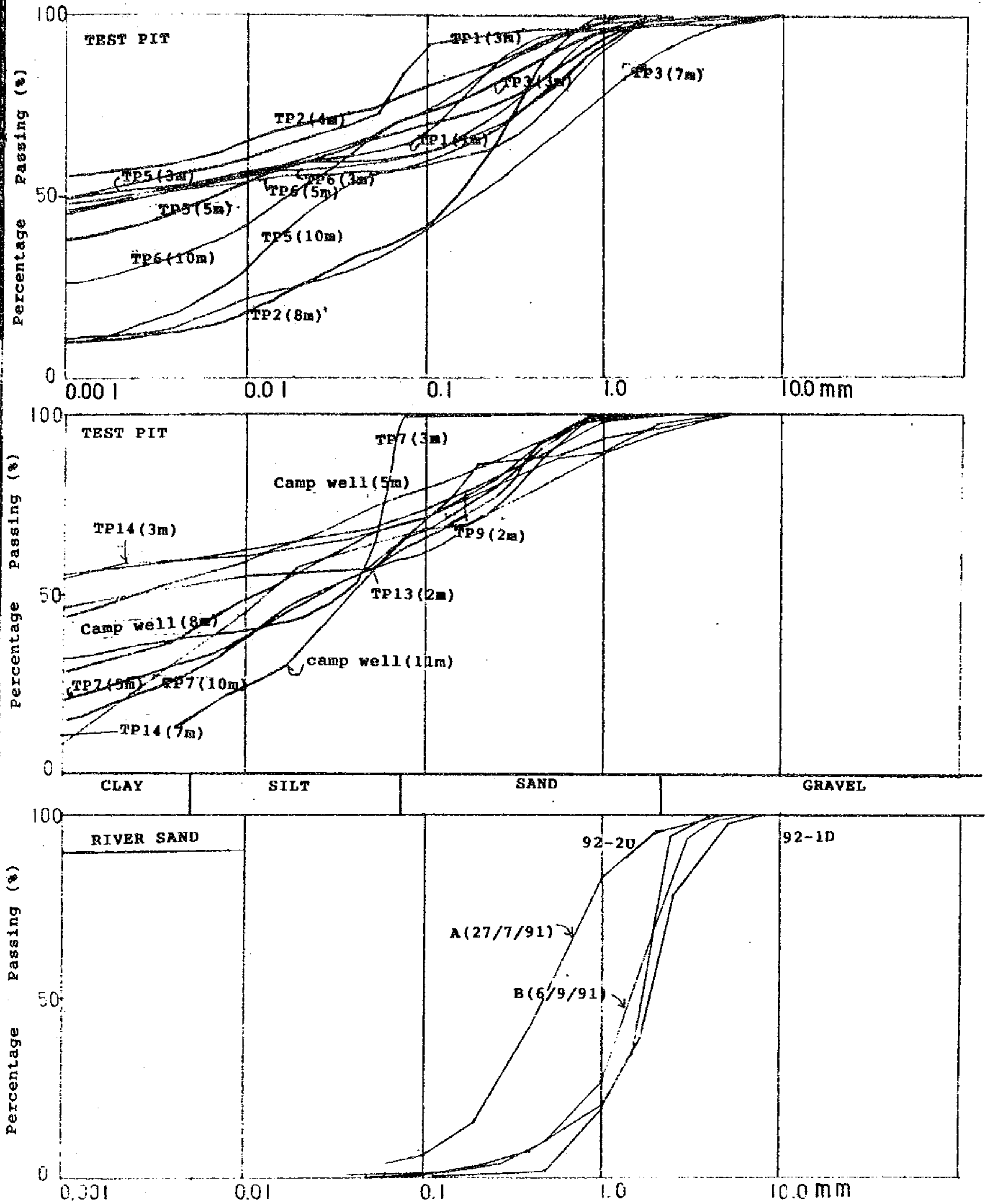
Note * : the figures are inferred from the relationship between the other available data, or derived from empirical way.

\# : the figure is the same as the optimum moisture content obtained by compaction test.



EXPLANATION
BD1 Boring Spot
PP2 Penetration Test
TP3 Test Pit
SEISMIC EXPLORATION
SD4
Low Velocity Zone
Rapid River Course
-400- Contour Line (El.400m)
Reservoir Area (El.395m)
Dam Axis
Waterway
Village
Motorable Road
Main Foot Path
Foot Path
Bridge
Boat Crossing
L E G E N D
(Geological Explanation)
Fine Sand
Swamp Deposits (Fine Sand)
Residual Soil (Thickness › 10m)
Gneiss
Exposed Rock
Fault Line
Depression Zone
Heavily Weathered Clayey Zone
Geological Boundary
Quarry R1
Quarry R2
Quarry R3
Borrow E1
Borrow E3
Borrow E4
Borrow E5
Borrow E6
Borrow E7
Borrow E8
Borrow R2
Sand S1
2nd Axis
3rd Axis
4th Axis
5th Axis
6th Axis
Waterway-1
Waterway-2
CAMP
0 200 400 600 800 1000m
REPUBLIC OF CAMEROON
SOCIETE NATIONALE D'ELECTRICITE DU CAMEROUN
MEMVE ELE HYDROELECTRIC POWER DEVELOPMENT PROJECT
JAPAN INTERNATIONAL COOPERATION AGENCY
TITLE OF DRAWING
Location Map of Construction Material

Fig. 3.1



REPUBLIC OF CAMEROON

SOCIETE NATIONALE D'ELECTRICITE DU CAMEROUN

MEMVE ELE HYDROELECTRIC POWER DEVELOPMENT PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

TITLE OF DRAWING	SCHEME: MEMVE ELE
Gradation Analysis	LOCATION
	REGENCY: NTEM
	PROVINCE: SUD

CHECKED BY			SCALE	SHEET NUMBER		DATE
APPROVED BY			000	TOTAL SHEET		

Fig. 3.2

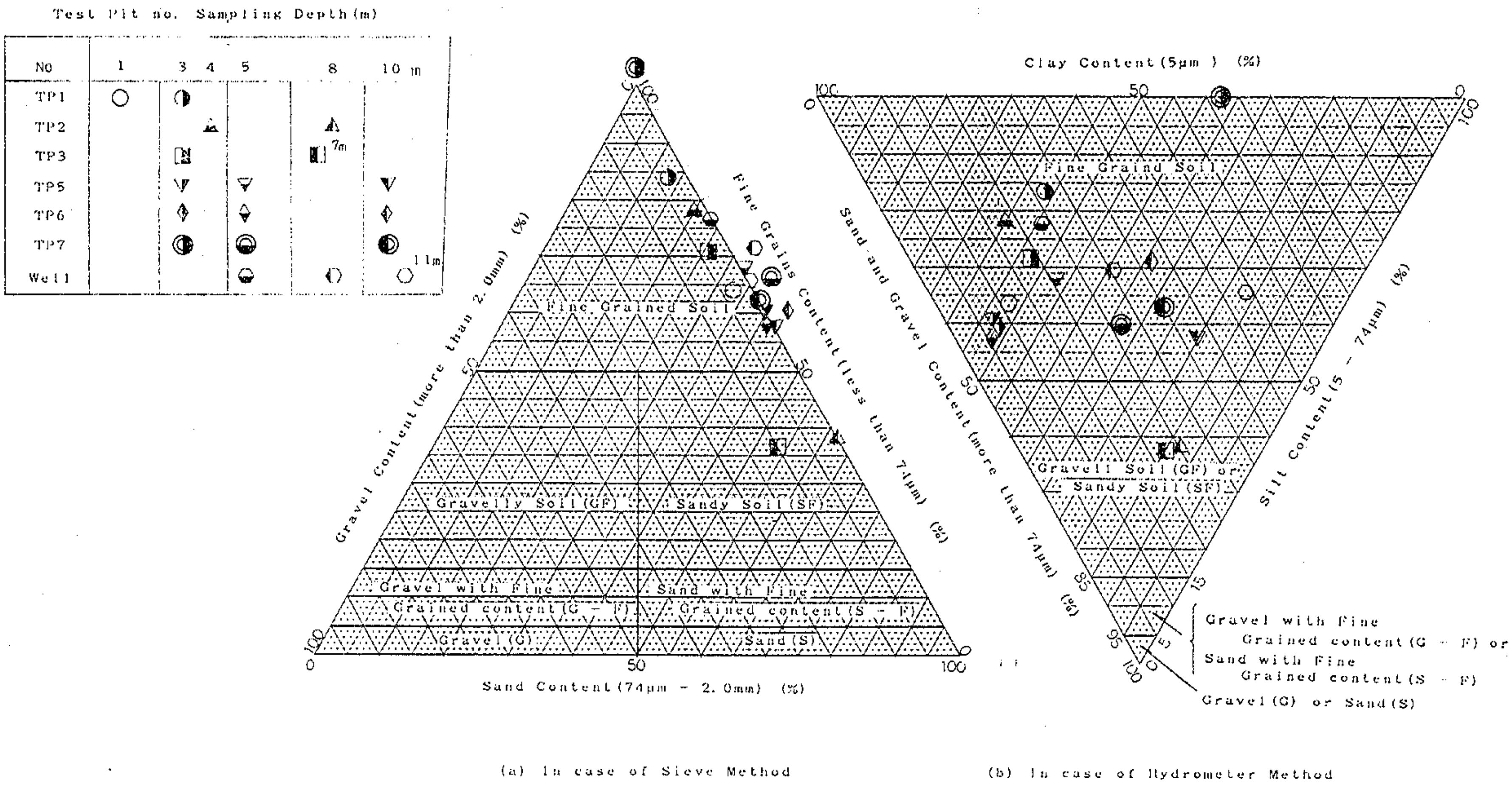


Fig. 3.3

Fig Gradation Characteristics by Triangulation Chart

REPUBLIC OF CAMEROON
SOCIETE NATIONALE D'ELECTRICITE DU CAMEROUN
MEMVE ELE HYDROELECTRIC POWER DEVELOPMENT PROJECT
JAPAN INTERNATIONAL COOPERATION AGENCY

TITLE OF DRAWING		SCHEME	MEMVE ELE
Gradation Characteristics by Triangulation Chart		LOCATION	
		REGENCY	KYEN
		PROVINCE	SUD
CHECKED BY		SCALE	SHEET NUMBER	DATE
APPROVED BY		1/ 000	TOTAL SHEET	

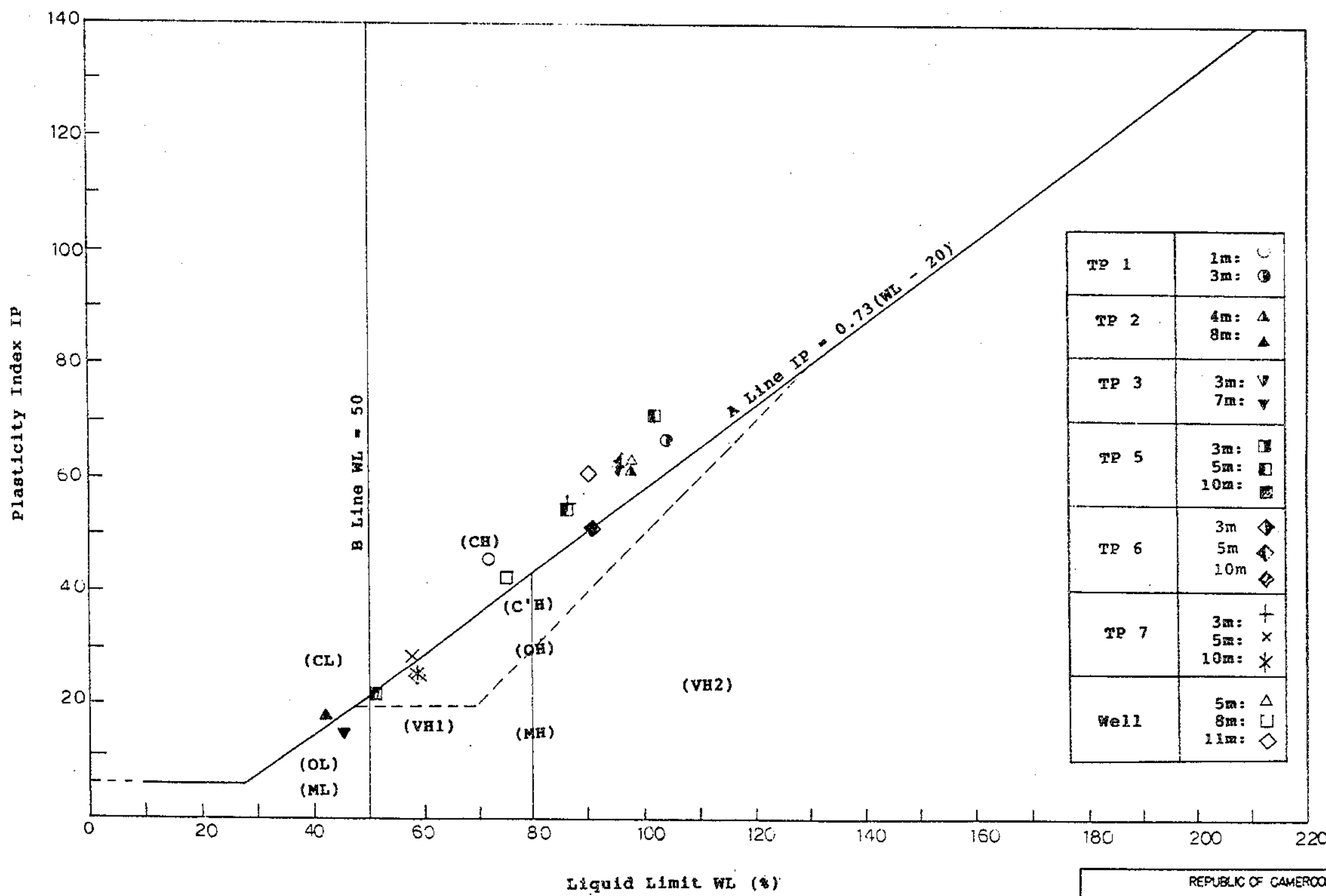
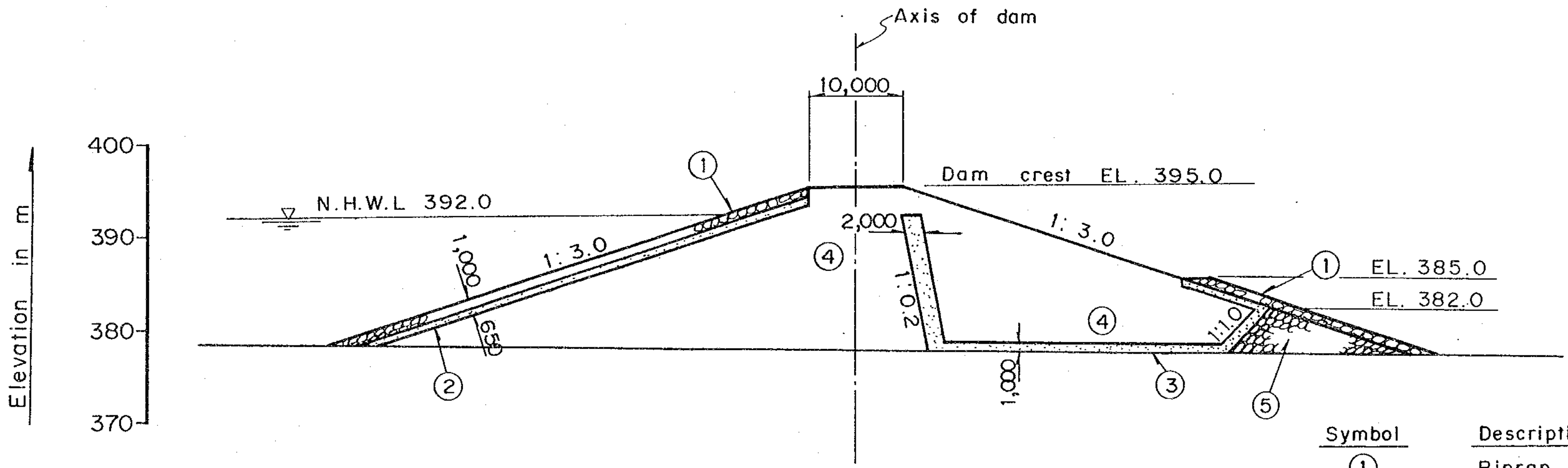


Fig. 3.4

REPUBLIC OF CAMEROON	
SOCIETE NATIONALE D'ELECTRICITE DU CAMEROUN	
MENVE ELE HYDROELECTRIC POWER DEVELOPMENT PROJECT	
JAPAN INTERNATIONAL COOPERATION AGENCY	
TITLE OF DRAWING	
Plasticity Chart	
SCALE	1/ 000



TYPICAL CROSS SECTION

Symbol	Description
①	Riprap
②	Transition
③	Filter
④	Impervious material
⑤	Rockfill

THE REPUBLIC OF CAMEROON SOCIETE NATIONALE D'ELECTRICITE DU CAMEROUN	**Fig. 3.5 Typical Dam Section**	
MEMVE ELE HYDROELECTRIC POWER DEVELOPMENT PROJECT	DWG. NO.	JAPAN INTERNATIONAL COOPERATION AGENCY

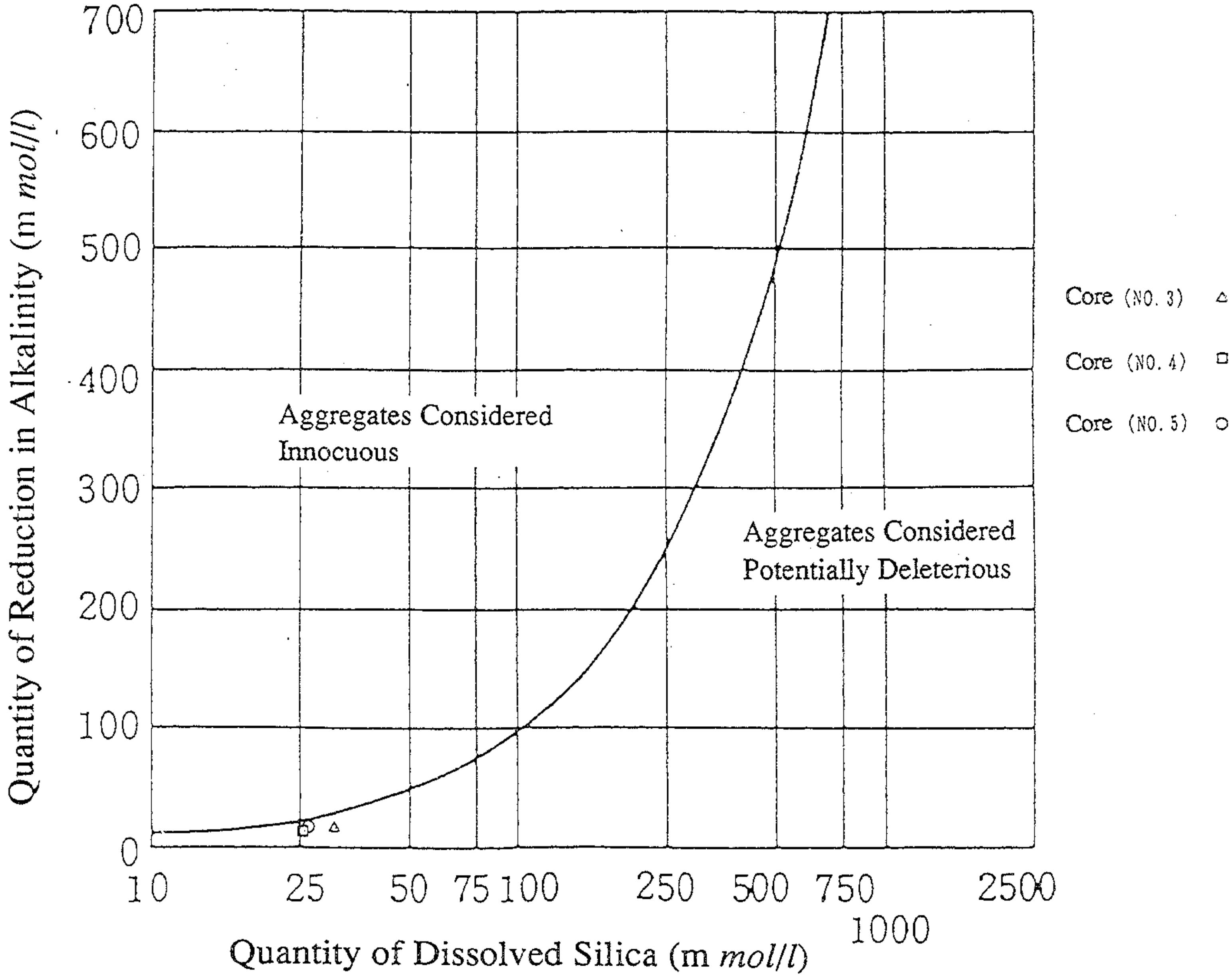


Fig. 3.6 Potential Reactivity of Granite Gneiss