The native structure of rock including bedded plane, joint plane and schistsity appears different characteristic between granite area and Paleozoic area. As mentioned above, the granite is generally recognized as a uniform rock mass with a few discontinuous plane. The zone of dense joint plane however develops sparsely at the margin of intrusive.

On the other hand, Paleozoic member is marked by distinct bedded plane with secondary schistcity. The bed commonly shows the ENE to WSW strike with high angle dip, and is noted by thin bed repeating in several centimeters. These directions are also refrected to the topography, depressions or cols on ridge arranging in similar direction to strike, and the structure also forms a linear weathering zone along softer facies example for slaty horizon. The schistcity of them commonly does not develop fully due to the low metamorphic grade.

The proposed dam axis situate on the hard sandstone horizon of Paleozoic member. The dam axis is in the same direction to the strike of them so that the most part of dam foundation are occupied by a similar rock facies as well as hard sandstone drilled by boring survey.

(4) Permeability and Bearing Capacity

Permeability and N value of site are summarized at Figures 5-4-8 and 5- 4-9. The permeability test reveals low permeability condition less than 5 Lugeon in bedrock without near the saddle dam.

The CT-4 borehole was drilled in the slope stretching from the abutment of saddle dam. The permeability data of CT-4 shows a changeable value ranging 1 to 35 Lugeon with high permeable peak at 28 to 33 m depth. These permeable layer is also correlative with the upper horizon of bedrock which is observed as a slight sign of weathering such as an oxidation along cracks. The general tendency of permeability however is decreasing toward lower horizon below 2 Lugeon while the upper horizon of 15 m depth is in over 10 Lugeon.

Bearing capacity is obviously different between overburden and bedrock. The overburden usually shows very small bearing capacity which is indicated smaller than 20 blows as N value. The minimum value of 0 to 1 blow were observed at the center of dam axis, and is in the clayey layer where intercalates above the weathered bedrock. However, the N value abruptly increases toward the lower horizon made up of weathered bedrock to over 50 blows which is sufficient for the bearing capacity for dam foundation.

5.5 Khlong Katha

(1) Topography

The topography is characterized by two significant lineations which are expressed by two major valleys running through NW to SE and NE to SW. Furthermore, they are both noticeable for that converage at the dam axis. The bird's eye views of Figures 5-5-1 and 5-5-2 distinctly shows these characteristics and that the proposed dam site is situated on a position at the intersected two valleys. Accordingly, the low hill extended from mountain remains at the center of dam site.

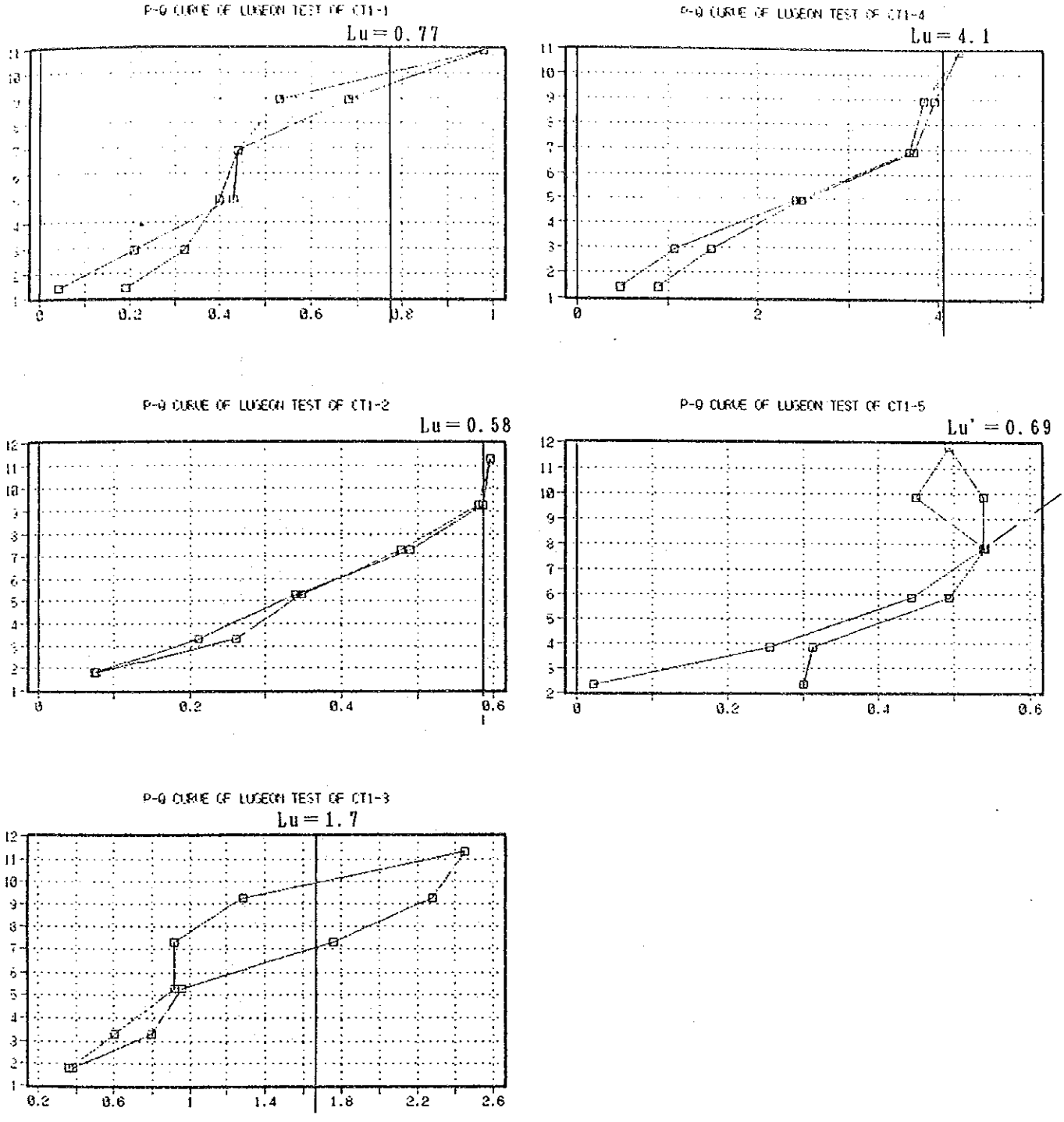
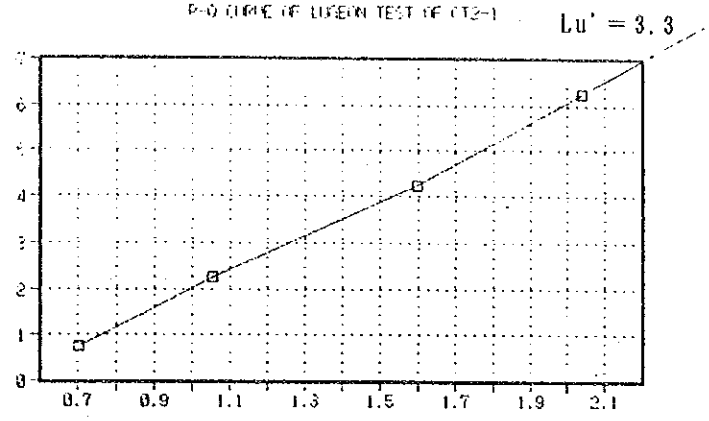
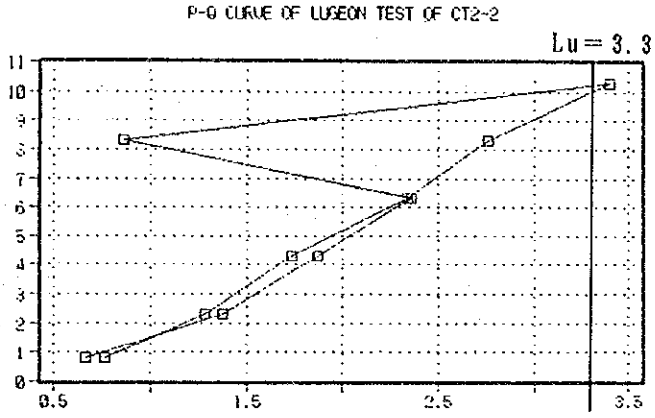


Fig. 5－4－9－1 Result of Lugion Test of CT－1





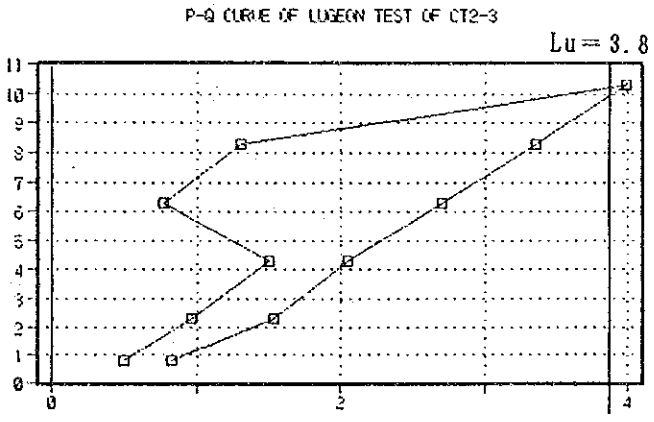


Fig. 5－4－9－2 Result of Lugion Test of CT--2

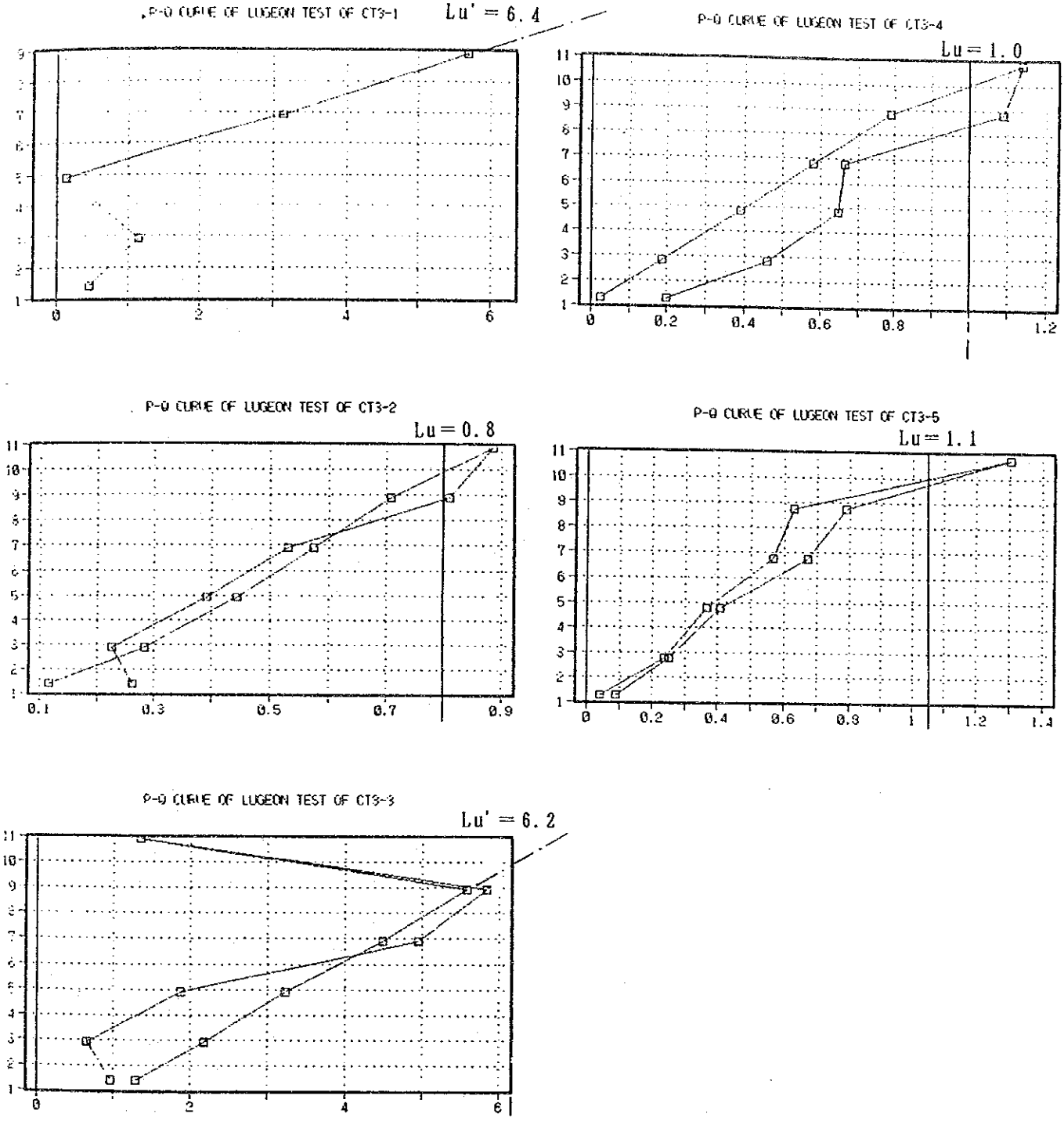


Fig. 5－4－9－3 Result of Lugion Test of CT－3

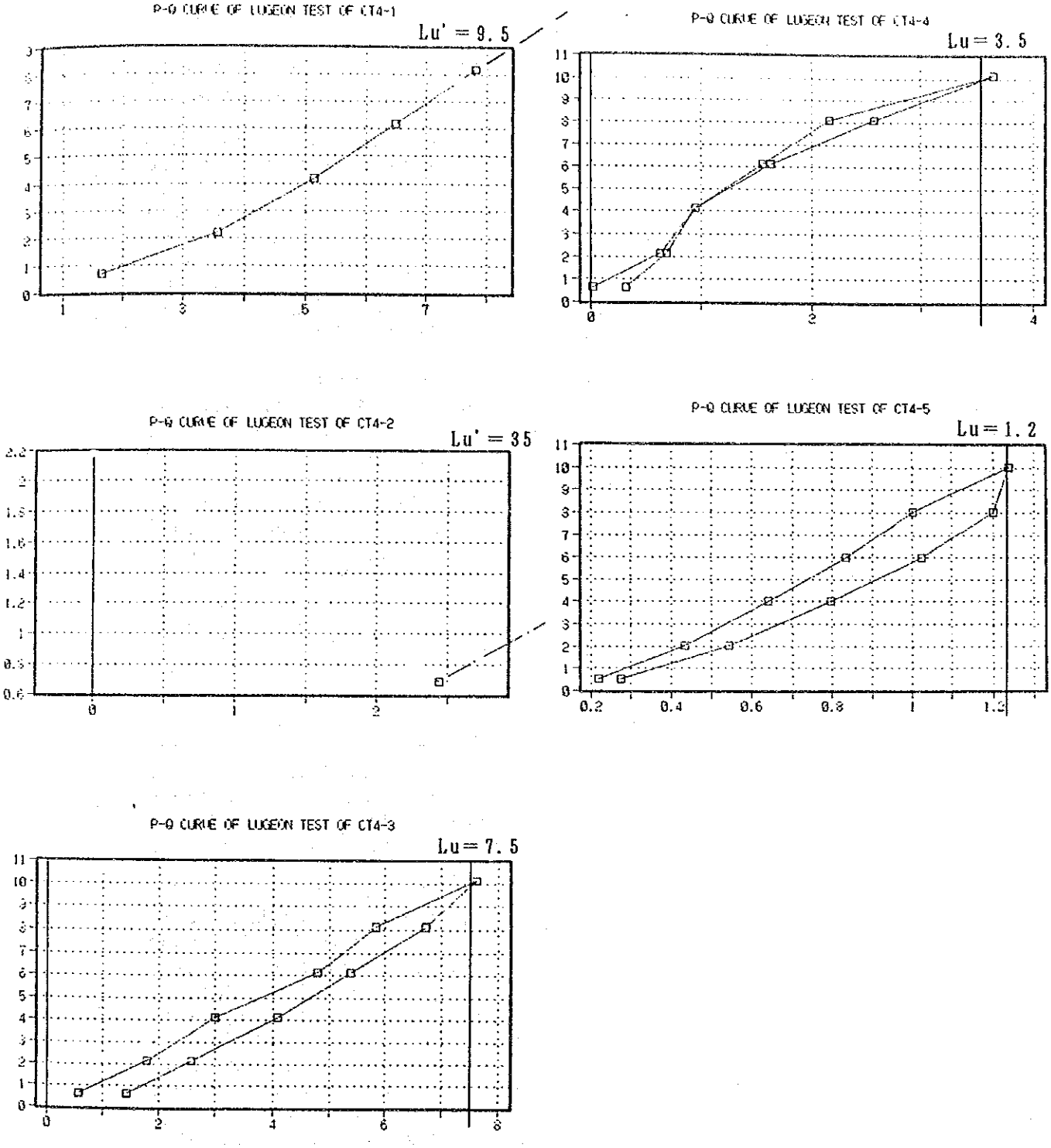


Fig. 5－4－9－4 Result of Lugion Test of CT－4

In accordance with above topographical feature, the lowest elevation at dam axis at about 24 m was seen at the both sides of river floor. The intermediate area of river floor is occupied by the low hilly mound with the relative height of about 5 m. As shown in Figure 5-5-5, the profile along dam axis also indicats the sharp boundary to sloping area from the river floor, so that the shape along dam axis is classified as a flat-floored to kastental valley.

The highest point in the watershed is shown at the northern summit of divide with the elevation of 400 m. On the other hand, the distance from dam axis to this summit is only 2.5 km. Therefore, the average gradient of slope is calculated to be 16/100. As shown in the longitudinal section of Figure 5-5-6, the detail profile along stream reveals the steeper slope than average gradient on the mountain area locally. The steepest slope is seen on the higher part above 100 m. The gradient is over 30/100 in contrast to lower part consisting of the flat river floor and terrace plane.

The terrace plane formed at several elevations are also observed in the watershed. The lowest terrace is situated beside the river bed and have a uniform plane flattened by sandy deposit at the elevation of 30 to 35 m. The higher terrace is on the side slope ranging the elevation of 50 to 75 m. Though the height of terrace position is variable individually, their topographical feature seems to be similar that the terrace deposit is not resting on plane and the eroded flat plane is only reserved on steep slopes. These terrace plane may be referred to as that the lower terrace and sandy deposit is corresponded to last transgression and that higher terrace is identical with an event of pleistocene eustatic changes.

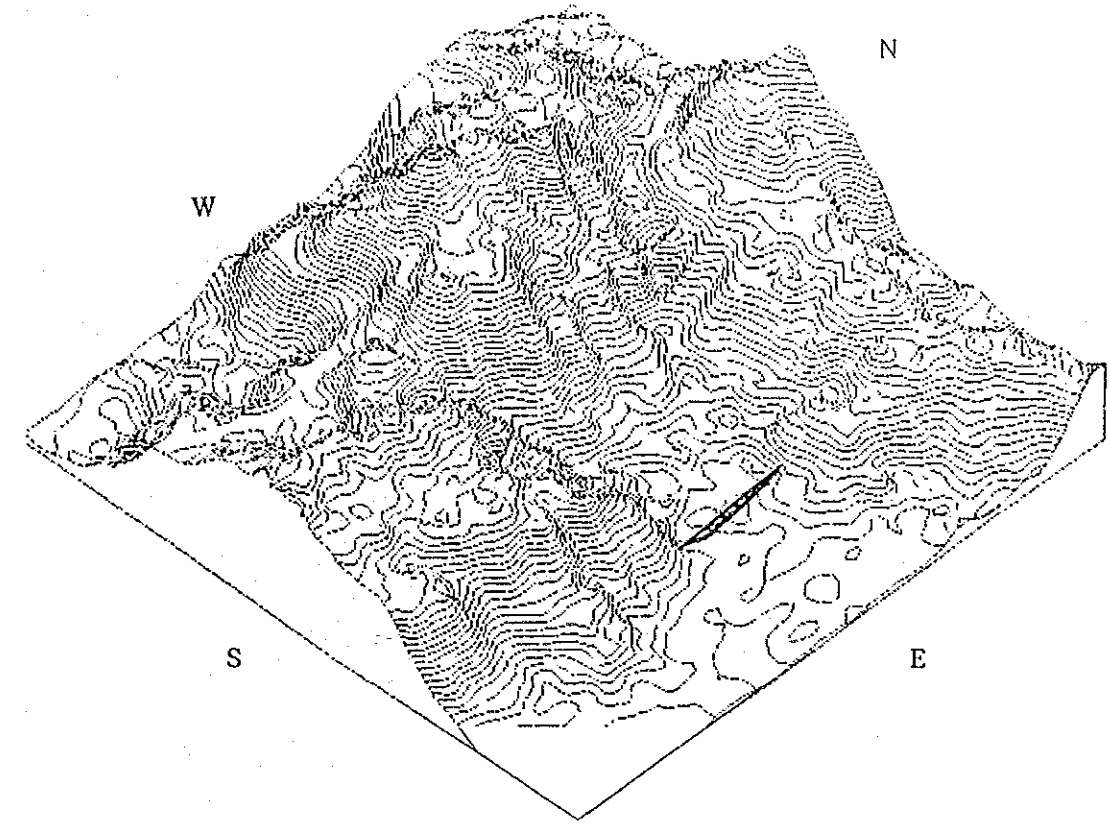
(2) Overburden

The thickness of overburden is relatively thin in comparison with the other site as shown in Fig 5-5-8. The boring survey clarifies that its maximum depth is 13 m at the KK-2. The member of over burden however is same to the other site which is composed by top soil, sandy river deposit, sand and gravel terrace deposit and clayey deposit in order from the surface.

Top soil is marked by facies which is of the loose sand and gravel. It is underlain by a remarkable reddish layer. The layer mainly consist of lateritic clay ,furthermore, the under horizon of this layer is made up of the sandy terrace deposit. Terrace deposit correlating with lowest terrace is marked by the coarse sand with granule gravel and contains the tin minerals which has been dug for mining by several decades. The clayey facies was locally observed just on the bedrock. Its distribution shows an aspect as the filling up the relief of bedrock up to the 23 m in elevation. The facies are mainly of very soft greyish clay with high plasticity, but the thickness is less than 5 m resulting from KK-3 located at the center of its distribution.

(3) Bedrock

The geological members exposed on the site are shown in the Geological map of Khlong Katha Dam Site of Figure 5-5-7. The members without above mentioned overburden are grouped into two lithological types of granite which are of the coarse grained biotite porphyry or granite and the fine grained biotite-muscovite granite.



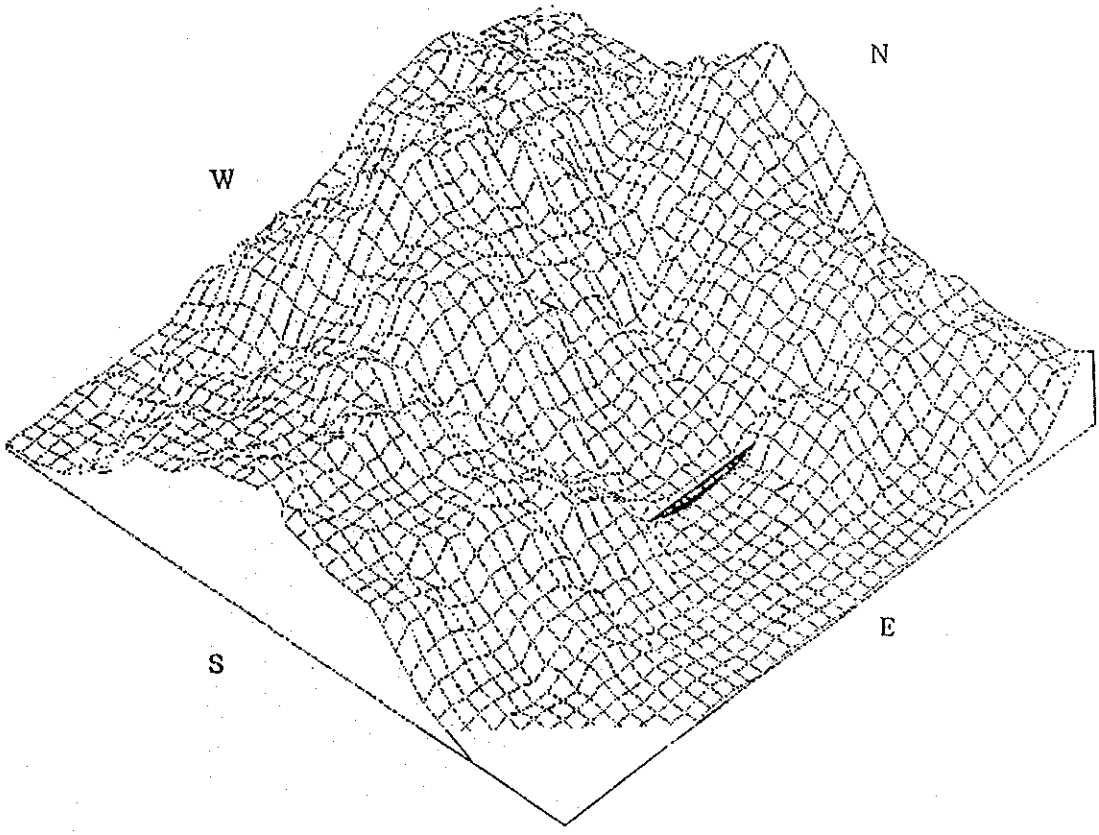
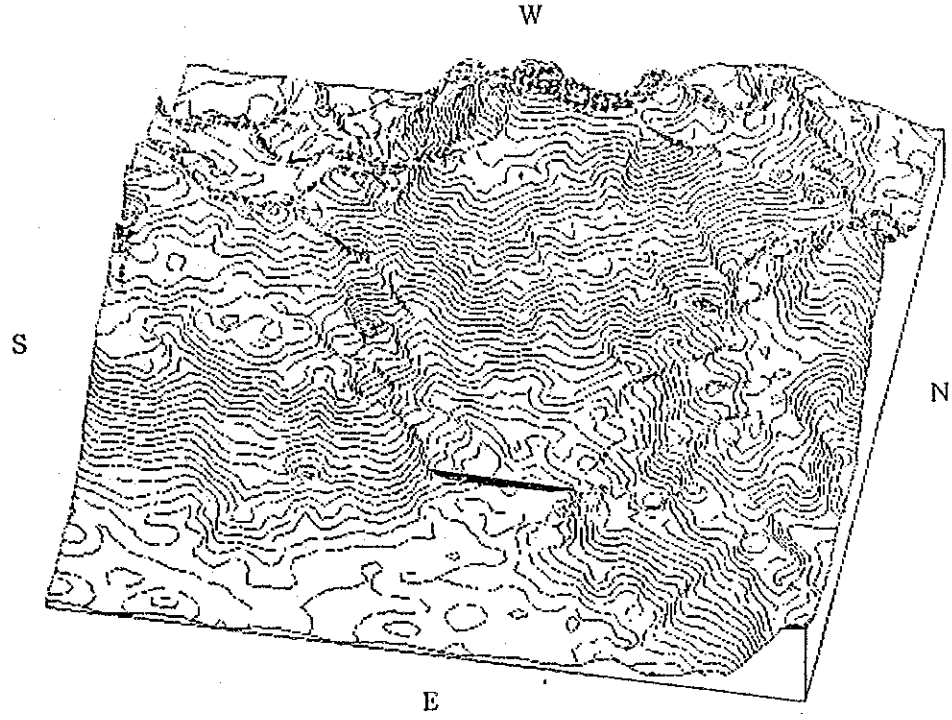


Fig. 5-5-1 Bird's Eye View of Khlong Katha Dam Site(1)



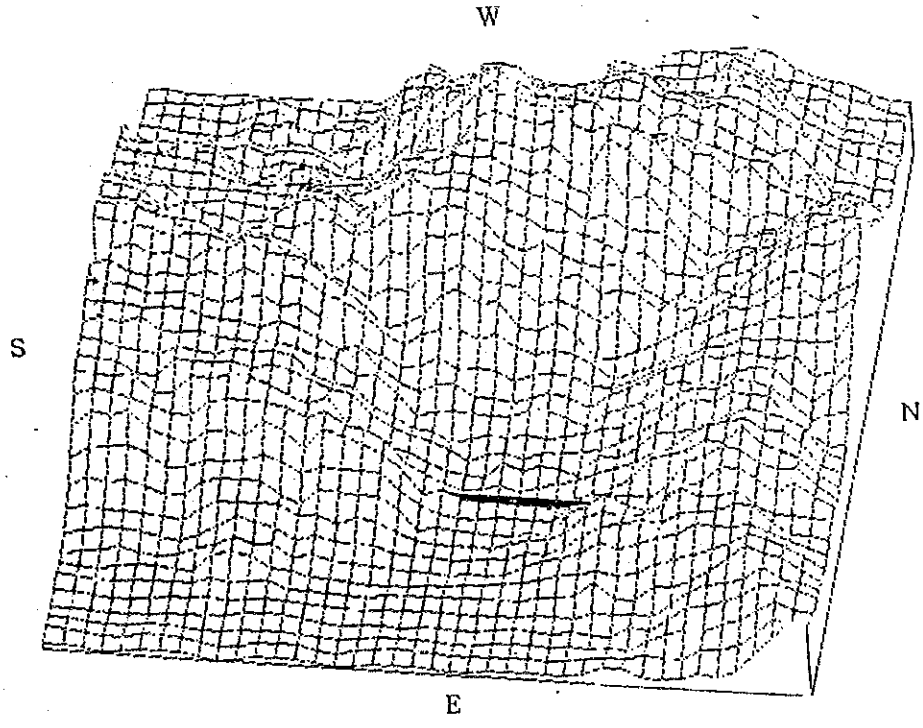


Fig. 5-5-2 Bird's Eye View of Khlong Katha Dam Site(2)

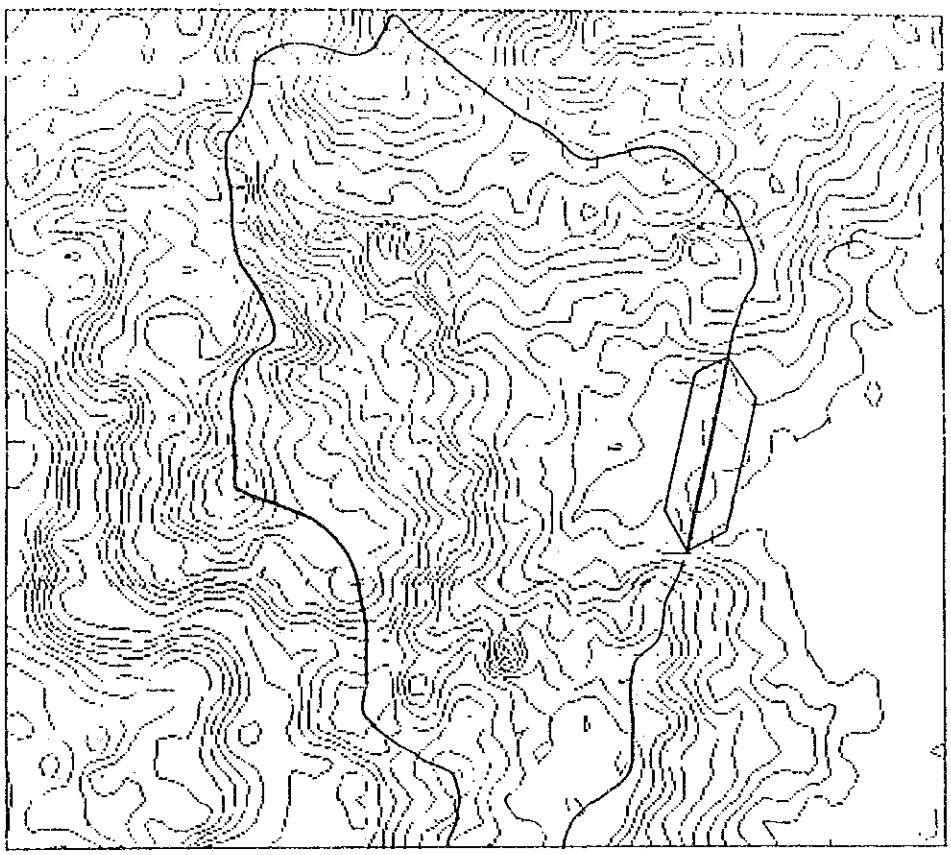


Fig. 5-5-3 Catchment Area of Khlong Katha Dam Site

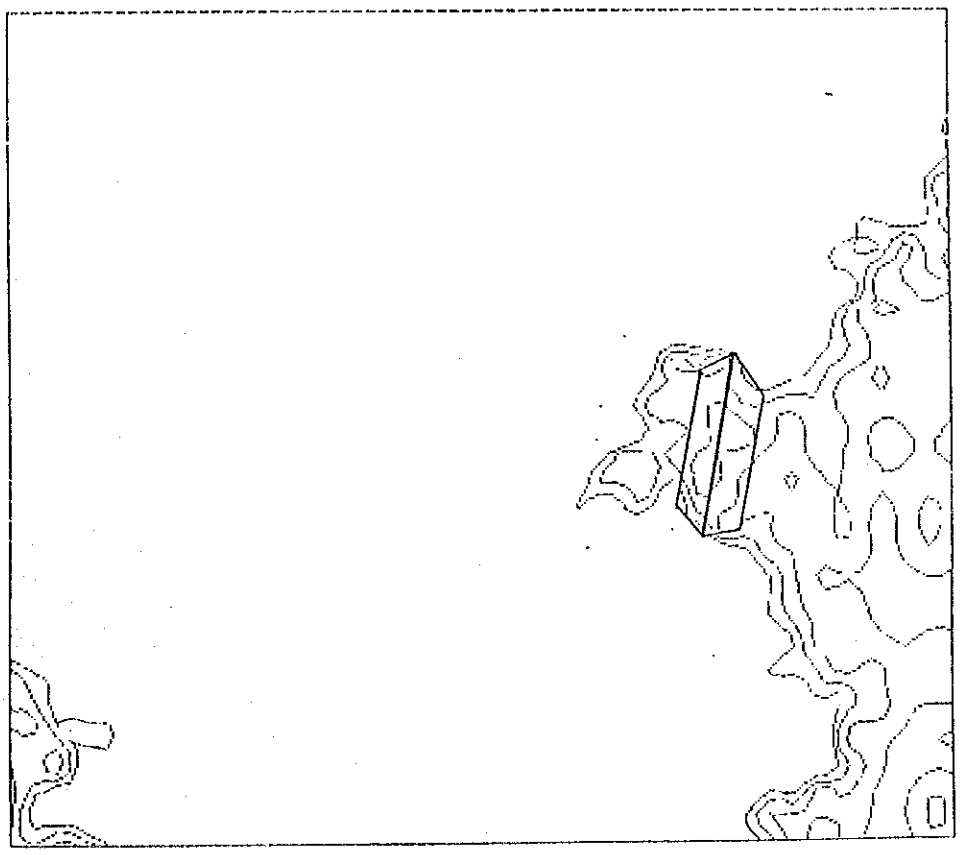


Fig. 5-5-4 Reservoir Area of Khlong Katha Dam Site

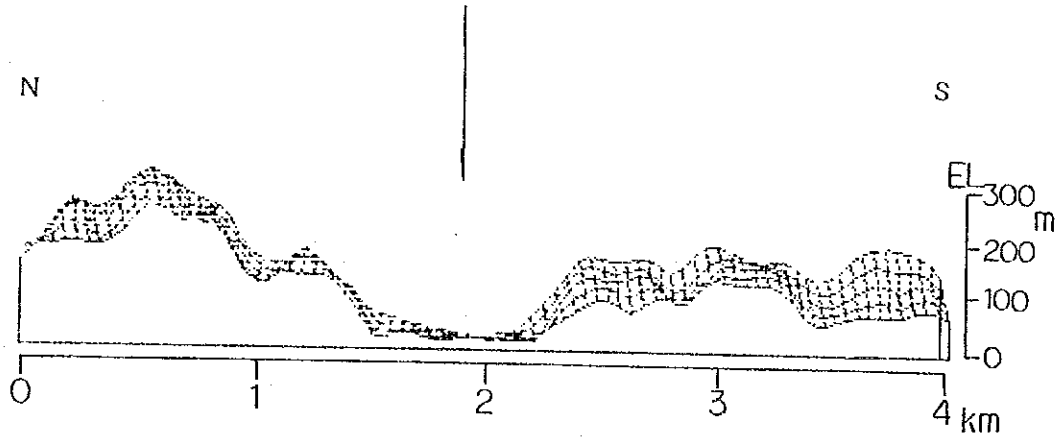


Fig. 5-5-5 Cross Section along Dam Axis of Khlong Katha Dam Site

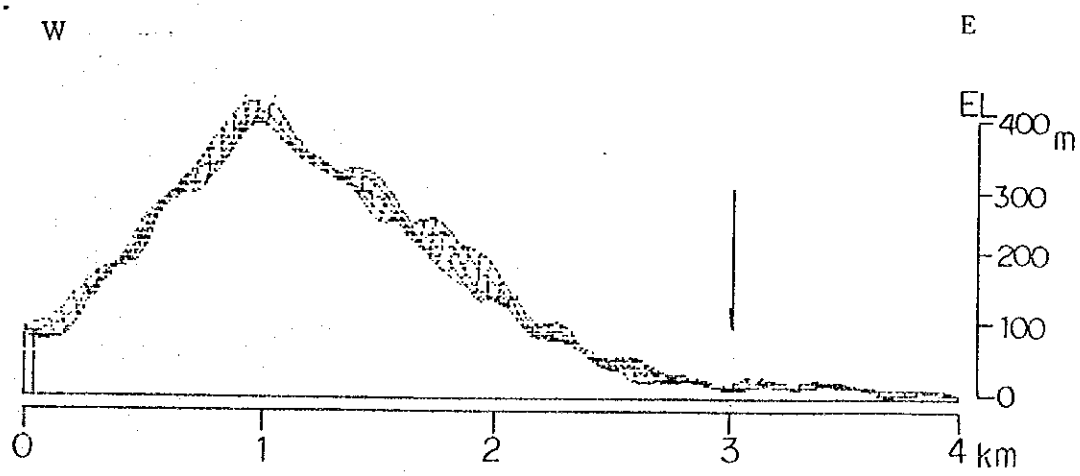


Fig. 5-5-6 Longidudinal Section along River Stream of Khlong Katha Dam Site

LEGEND

Rd	Alluvium	: Recent river deposite consisting of sand, gravel and silt, Swamp sediment of sand to clay
Tre	Erosional Terrace	: Recent river terrace made up of gravel, sand and silt
Trl	Lower Terrace	: Terrace deposit mainly composed of sand and gravel with thin clay layer
Trm	Middle Terrace	: Flat plain covering thin weathering material and sandy Layer locally
Trh	Higher Terrace I	: Erosional plain on the sideslope at the elevation of 100-150 m
Trp	Higher Terrace II	: Highest erosional plain at the elevation of 200 m
Ta	Talus	: Talus and colluvial deposite consisting of various size materials
Ss	Sandstone	: Palaeozonic sandstone, beded metamorphosed sandstone with chert and slate layer
Sl	Slate	: Slate with metamorphosed sand and chert layer
Gr	Coarse Granite	: Coarse grained biotite-porphyritic granite
Grf	Pine Granite	: Pine grained biotite-muscovite granite

Fig. 5－5－7　Geological Map of Khlong Katha Damsite

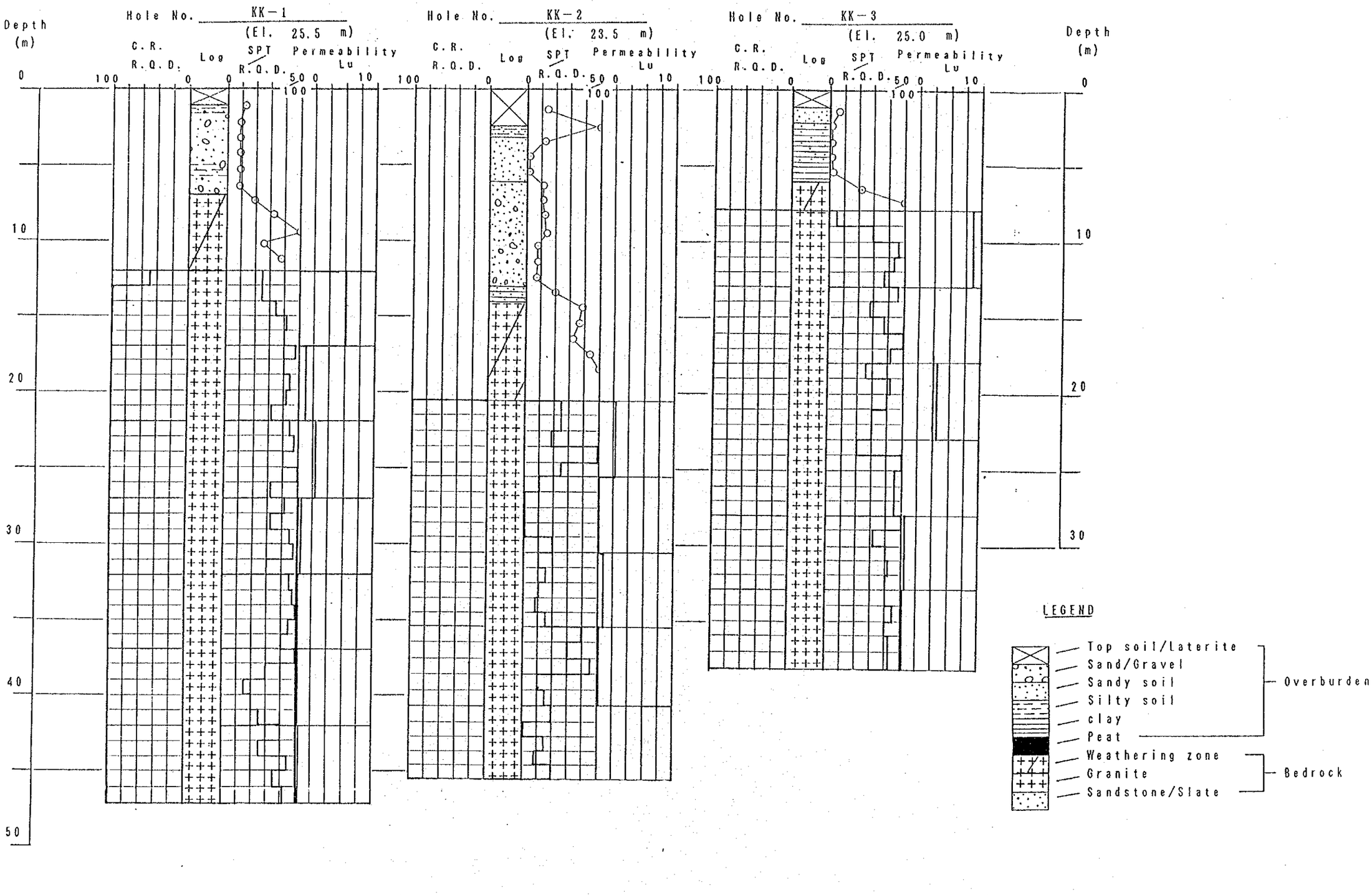


Fig. 5－5－8 Result of Boring Survey

The coarse granite forms the most part of the reservoir and south-eastern area of watershed. The rock mass is pronounced by the massive facies with minor intrusion of the granite-phophyry and quartz vein. According to the progress of boring survey, quartz vein is enable to readily distinguished from others since these facies are fairly harder for drilling than other layers. The facies' change occurs at the several meters in boreholes repeatedly.

The fine granite is marked by not only fine grained phonocryst but also high frequency of intrusive vein and remaining the bedded plane and joint plane. At the many outcrop these discontinuous planes well develop; consequently, the scarp or free face is formed in direction of these planes.

The weathering zone is also observed at both of boring core and outcrop. The weathering zone is less than 10 m and is of the light brown gravely facies with much content of clay. From the result of KK-2 which is located on the center of dam axis and have the thickest weathering zone, the sign of weathering was found out up to 24 m depth.

(4) Geological Structure

Two zones of faults are recognized in the field reconnaissance, one of which is running through the upstream of reservoir area and another is along the dam axis. Both roughly show the same trend of NE-SW to NNE- SSW and can be trace out in the watershed from the right slope to the left slope which does not across to the dam axis. Along these fault zone, the scarp or differential weathering is observed, Slight alterative layer is also interbedded along the contacted plane.

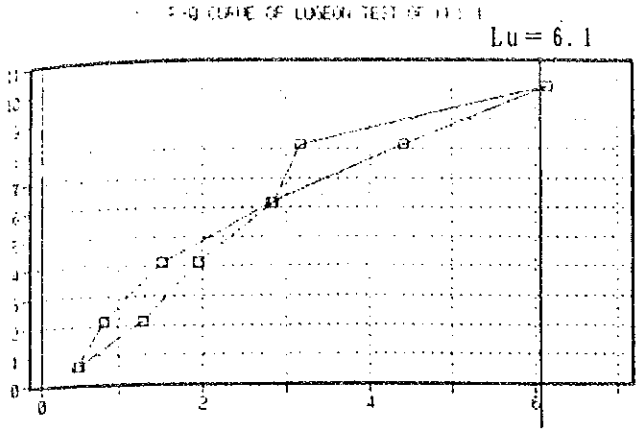
From the view point of general topographical property, two large lineations across the dam axis and may be inferred as a structural valley as previously stated. However, neither boring investigation nor field reconnaissance survey revealed any evidence of a fracture zone. The quantity of investigation however has not been enough until the present for leading a conclusion that these lineations are not derived from a fault structure.

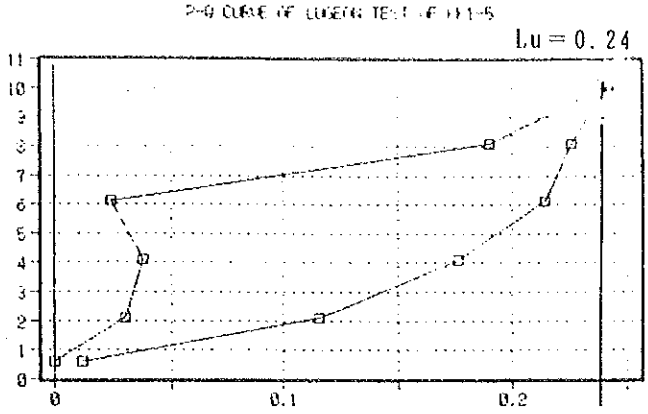
The primary structure such as the bedding or joint plane is not so many in the boring core while the watershed area locally presents a high frequency of discontinuous plane as already stated. Accordingly, it may be concluded that the bedrock making up of dam foundation does not involve any fracture and is built up of the massive rock facies.

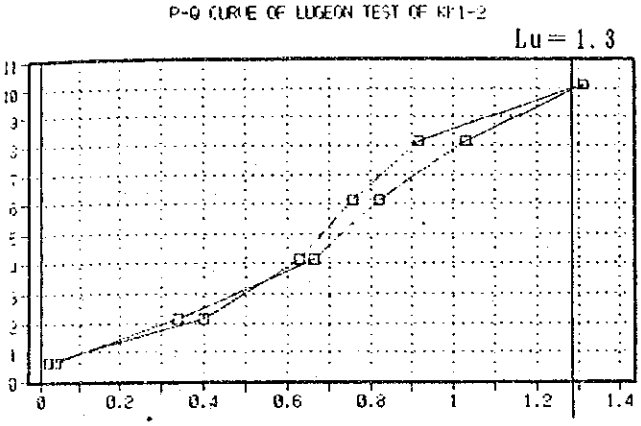
(5) Permeability and Bearing Capacity

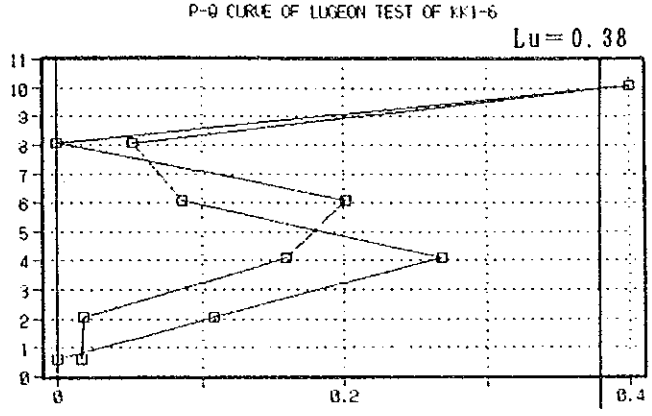
Permeability observed in borehole was very low and less than 9 Lugeon. Especially below the 18 m depth, the permeability was further lower around 1 Lugeon. The bearing capacity in overburden deposit normally indicates small value which is less than 1 converting into N value.

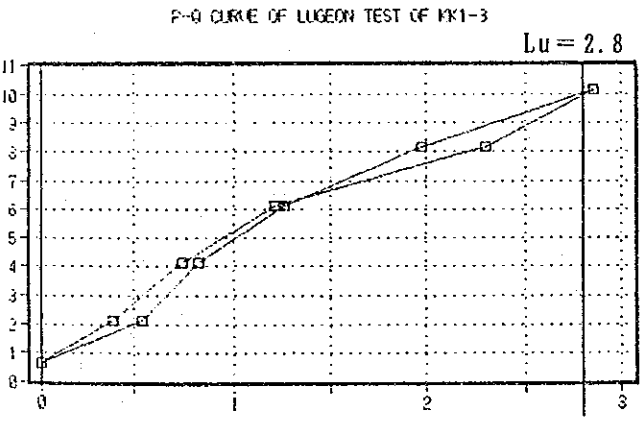
The result of permeability test is shown in Figure 5-5-9, the permeability of bedrock varies from 10 to 0.1 Lugeon which is differed in degree between the upper horizon and the lower one. The upper horizon, generally above 20 m depth, finding out a sign of weathering is

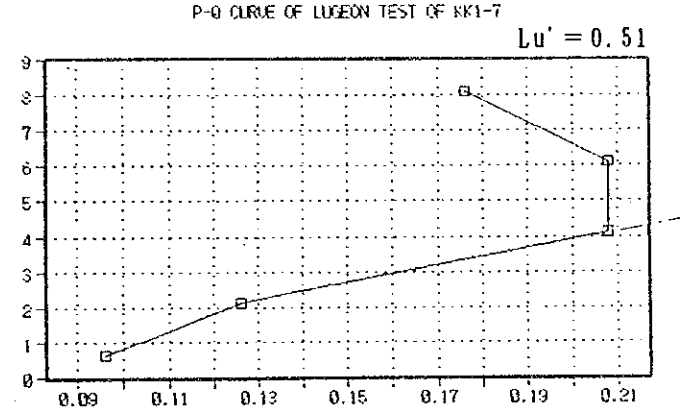












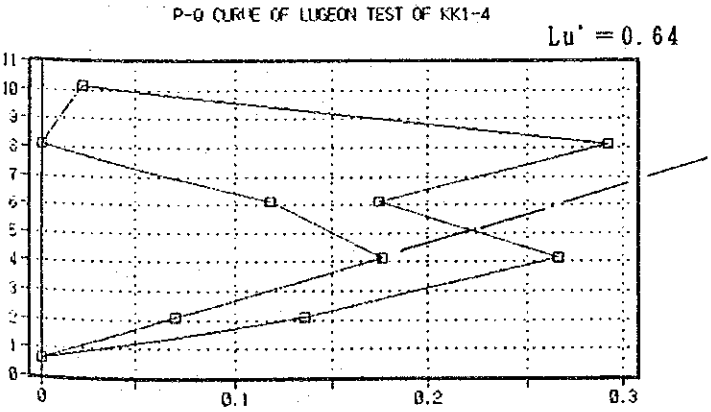
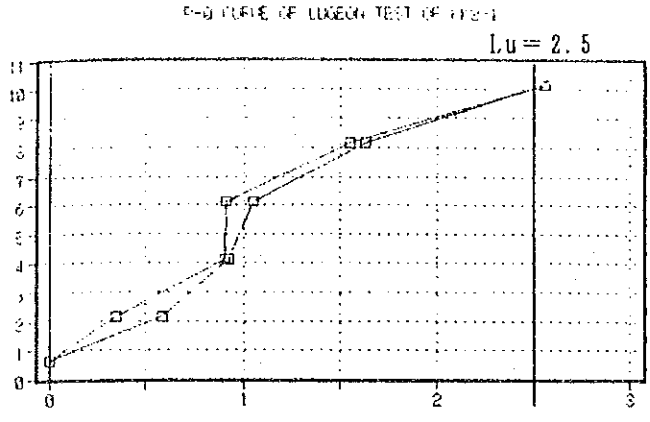
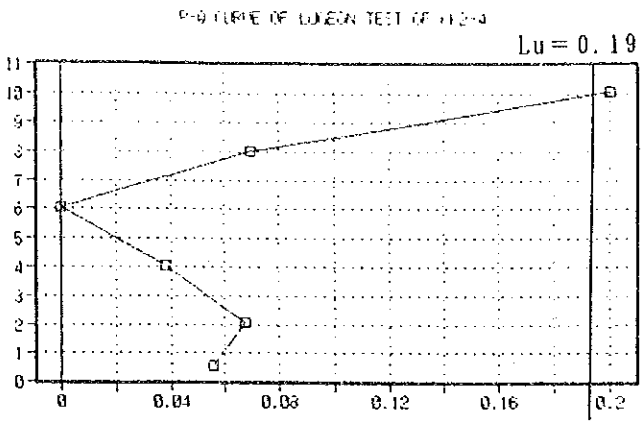
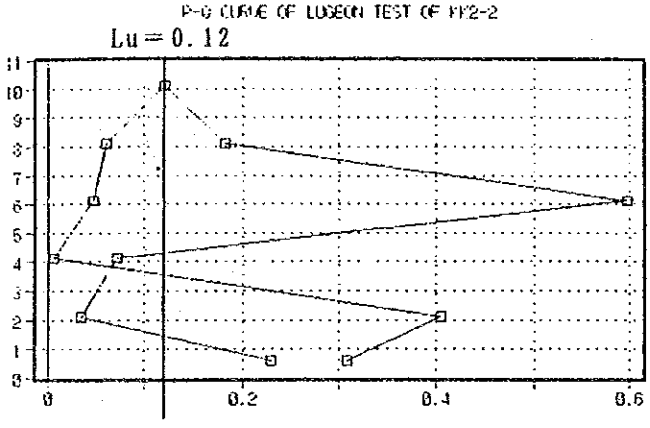


Fig. 5－5－9－1 Result of Lugion Test of KK－1







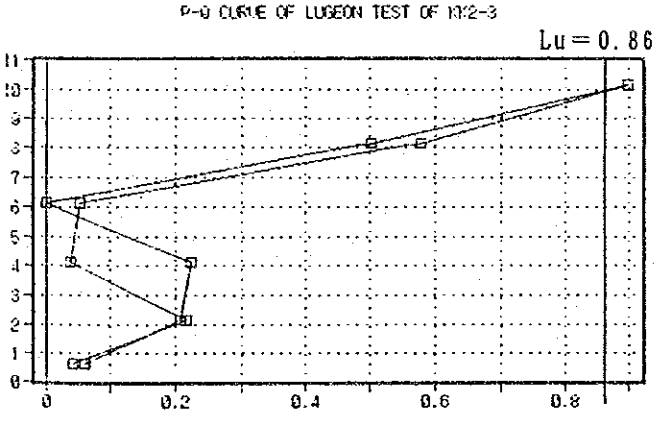
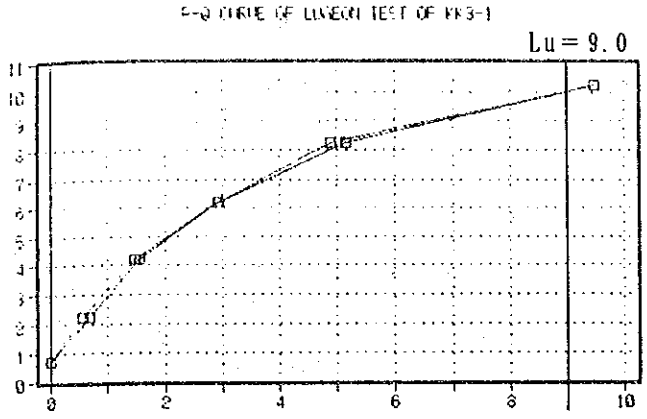
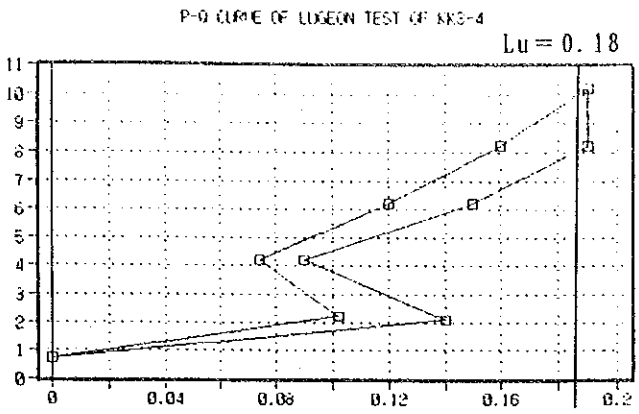
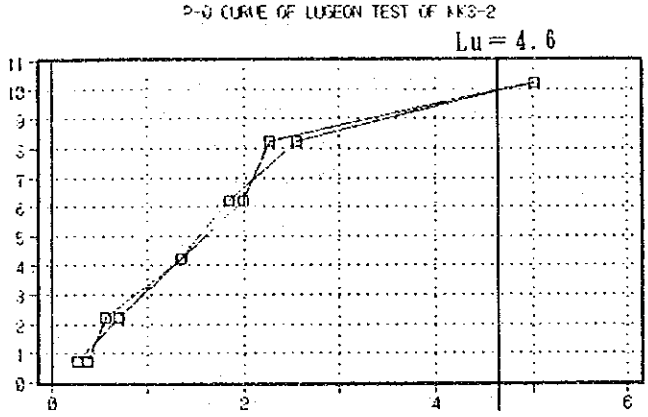


Fig. 5－5－9－2 Result of Lugion Test of KK－2







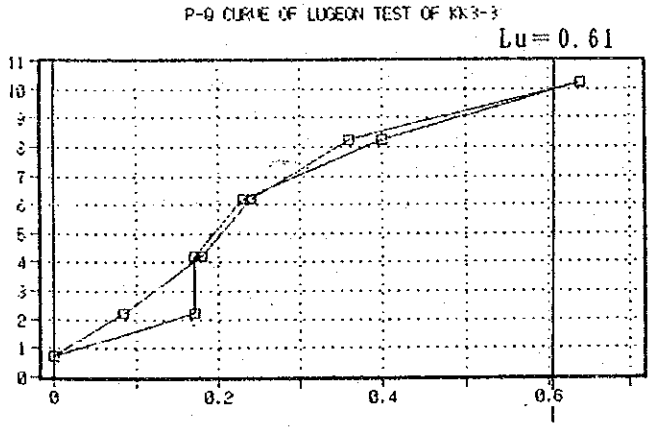


Fig. 5－5－9－3 Result of Lugion Test of KK－3

correlative with high permeability zone over the 5 Lugeon. In contrast to these, the lower horizon shows very low value indicating smaller than 1 Lugeon. Especially below the 25 m depth where any oxidative pollution by weathering was not found out in the boring core, the layer looks like a impervious rock mass.

Although the bearing capacity in overburden is very low, the layer showing low N value is so thin as usually presenting about 10 to 15 m. The minimum value observed in the site is obtained from the clayey horizon situated between weathering granite and sandy terrace deposit. Only 0 to 1 blow was observed there. It is increasing to both directions of the upper and lower horizon. Toward the lower facies of weathering granite, the bearing capacity becomes increasingly a large value more than 50 blows while it only increases up to 15 blows even in maximum value toward the upper facies of the terrace deposit and top soil.

5-6 Bang Tho Sung

(1) Topography

The Bang Tho Sung site is situated beside the Bangwad Reservoir. Its topographical aspect pronounced by the narrower river bed than the other proposed sites. As visualized from the bird's eye view of Figure 5-6-1, the site represents a trough shaped valley which involves the flat riverbed having longer axis along the stream and contrastively narrow width of riverbed. The planned dam length is less than 600 m which is the shortest among all sites in this study. However the short dam length, the reservoir occupies an area stretching out over 800 m to the upstream.

The lowest elevation is seen near the center of dam axis and is represented with the elevation about 30 m. The wide flat spreads out with similar elevation of dam axis to the down area and also the flat extends to 500 m to the upstream. The abutment slope have considerably steep gradient in contrast with these of low flat and continues to the the ridges forming the divide of watershed. The highest summit making the divide is presented with the elevation over the 450 m. As illustrated longitudinal and cross profile in Figures 5-6-5 and 5-6-6, the slope forming the ridge to low flat shows a peculiar form of the convex in the upper and contrastively concave in the lower slope ,and is marked by a modification of the several terrace plane resting on it. The average gradient of slope is estimated about 30/100. The terrace planes can be classified into three groups depending on their elevation respectively.

The lower terrace is at the elevation below 45 m and is located at the surroundings of the river bed. The middle terrace is at the elevation of about 50 m; the higher terrace is at 75 m. The deposit making the terrace surface is only shown on the lower one. The others are formed with an erosional plane as well as that of other dam site. Their origin is same to other site. Therefore, they are resulted from the Pleistocene sea level changes.

(2) Overburden

Since the boring survey was not conducted until the present, the overburden in the site only observed at the surface by the field

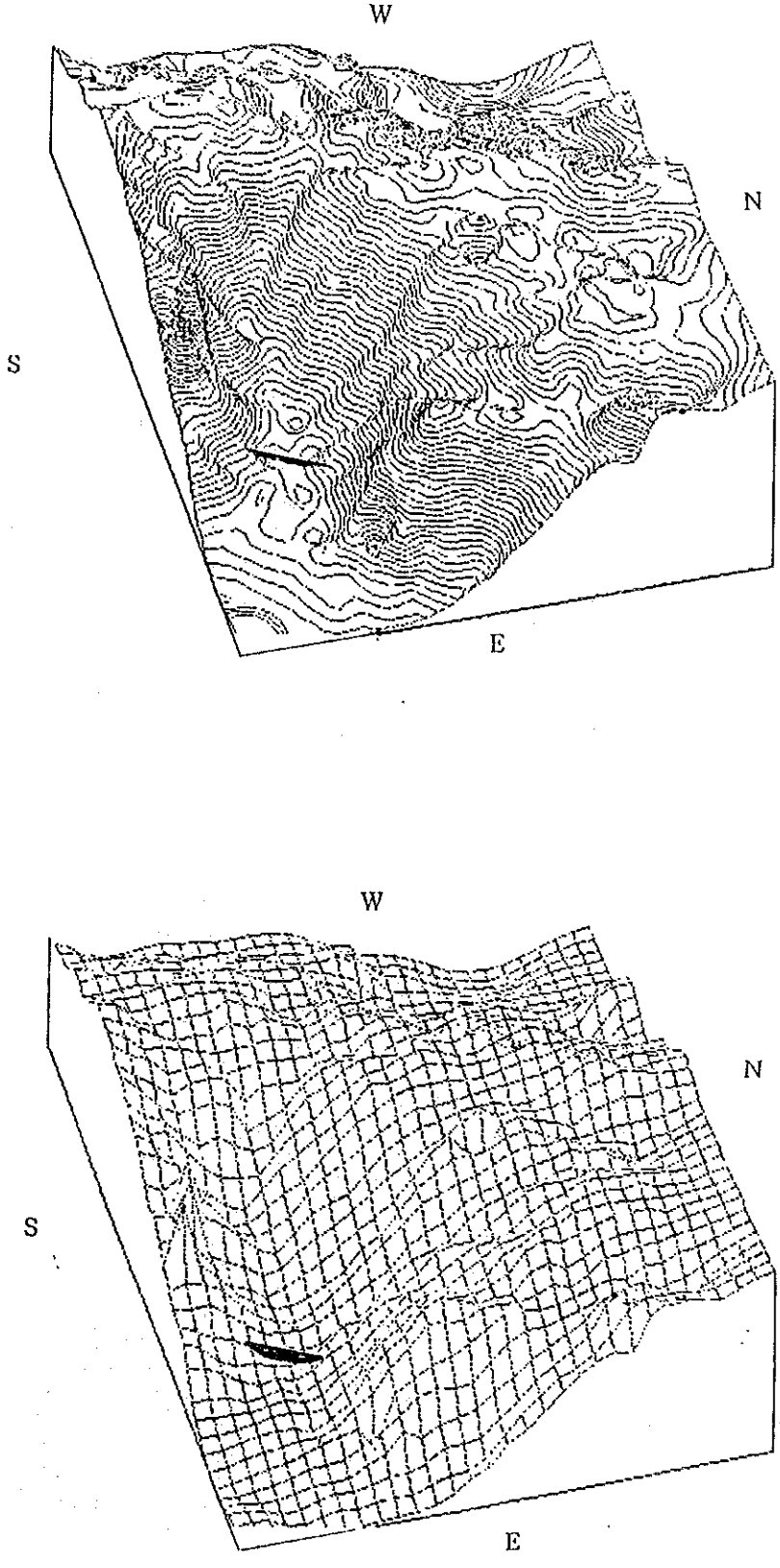
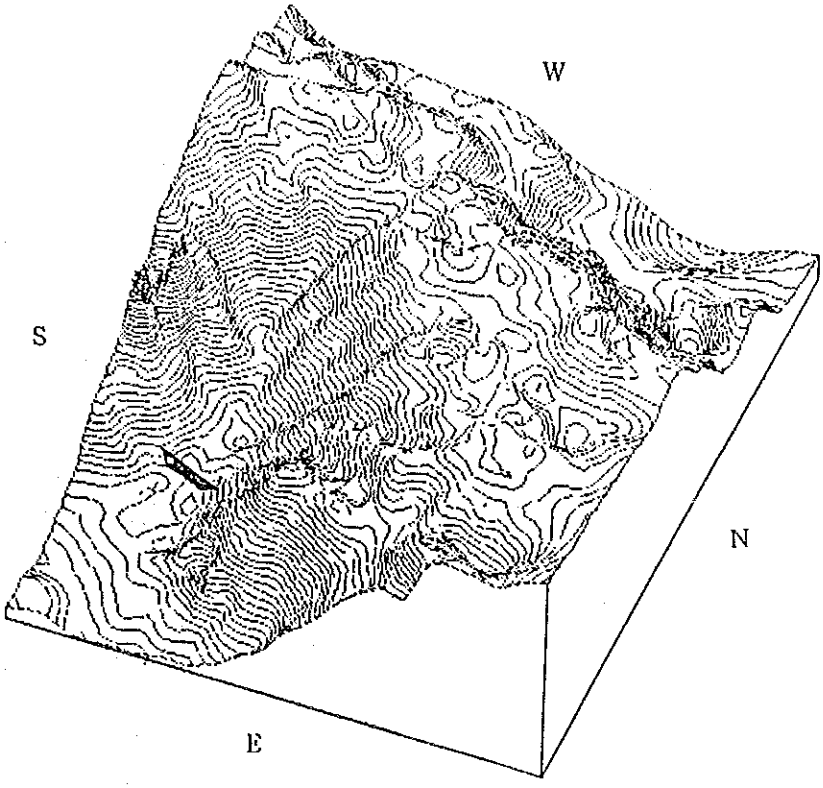


Fig. 5-6-1 Bird's Eye View of Bang The Sung Dam Site(1)



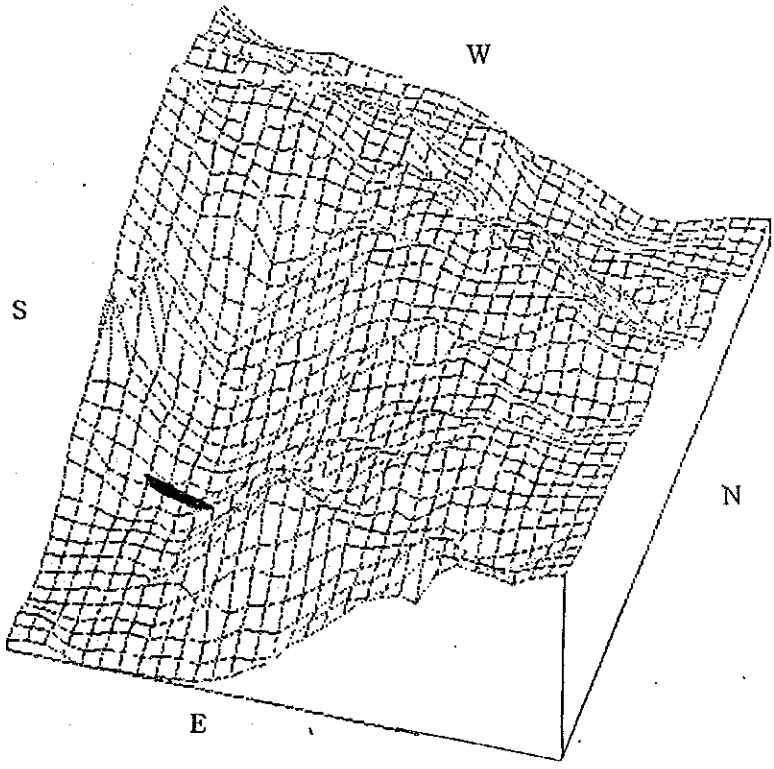


Fig. 5-6-2 Bird's Eye View of Bang The Sung Dam Site(2)

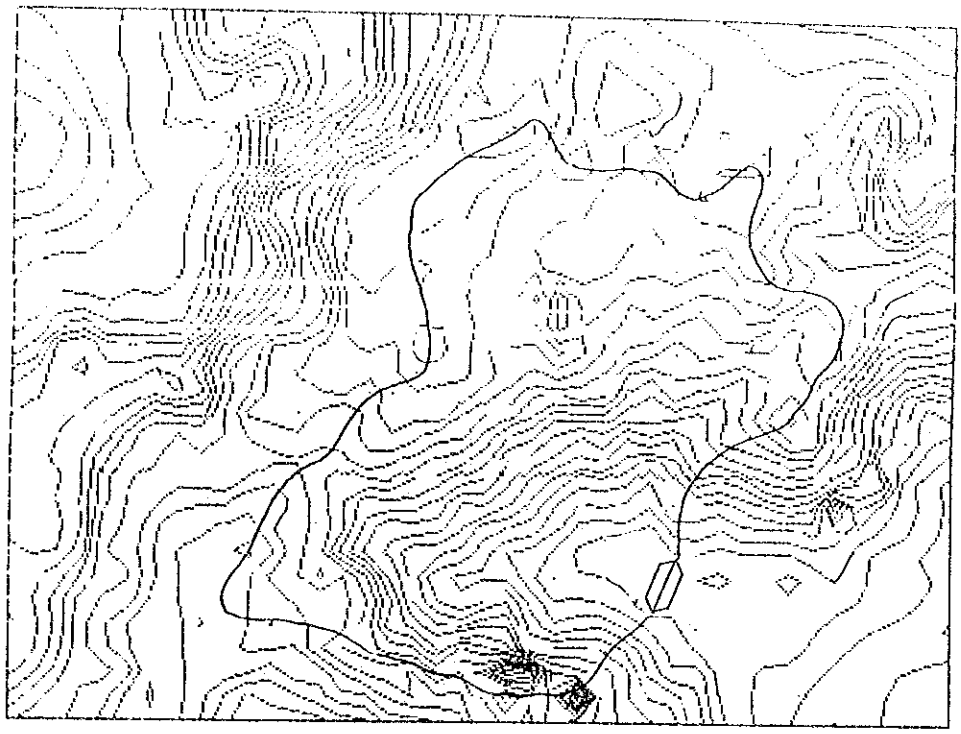


Fig. 5-6-3 Catchment Area of Bang The Sung Dam Site

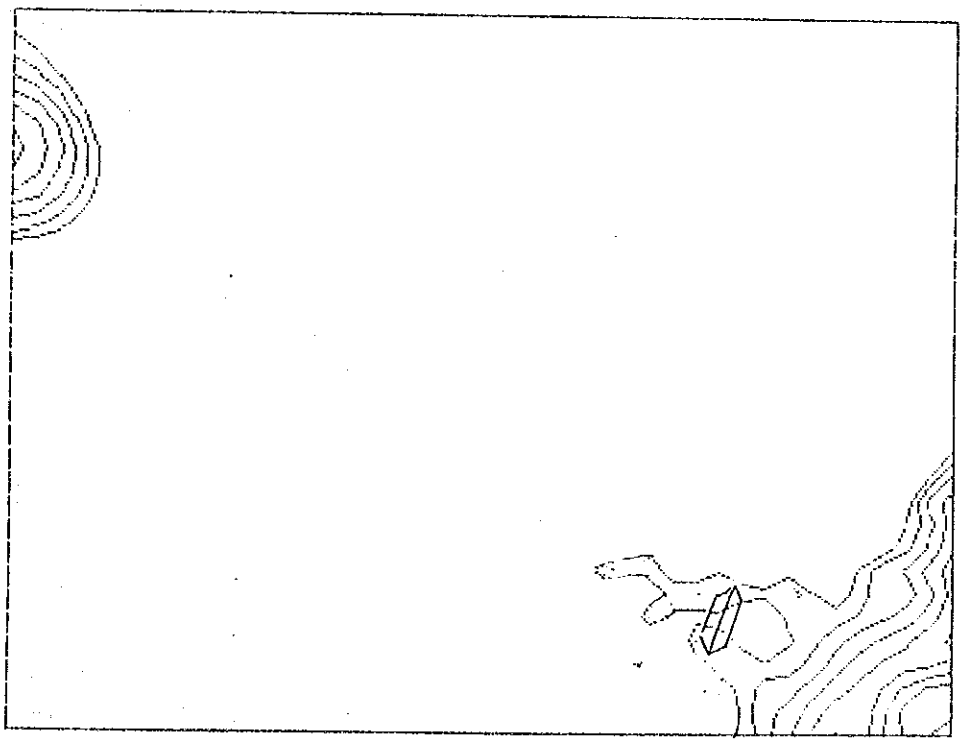


Fig. 5-6-4 Reservoir Area of Bang The Sung Dam Site

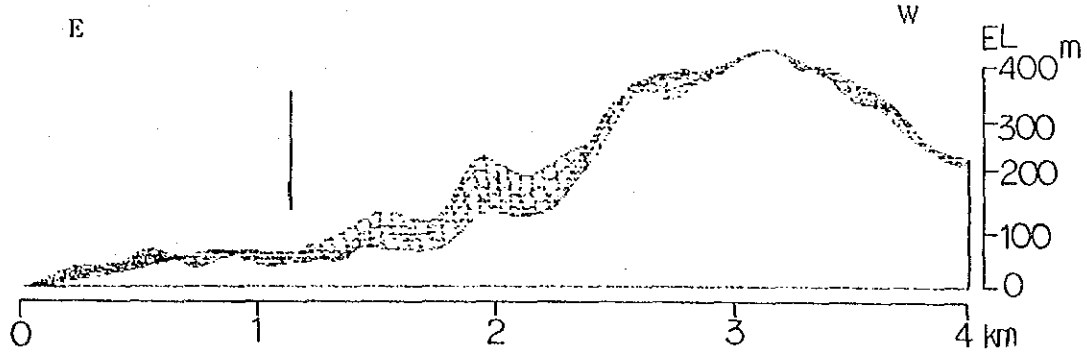


Fig. 5-6-5 Longitudinal Section along River Stream of Bang The Sung Dam Site

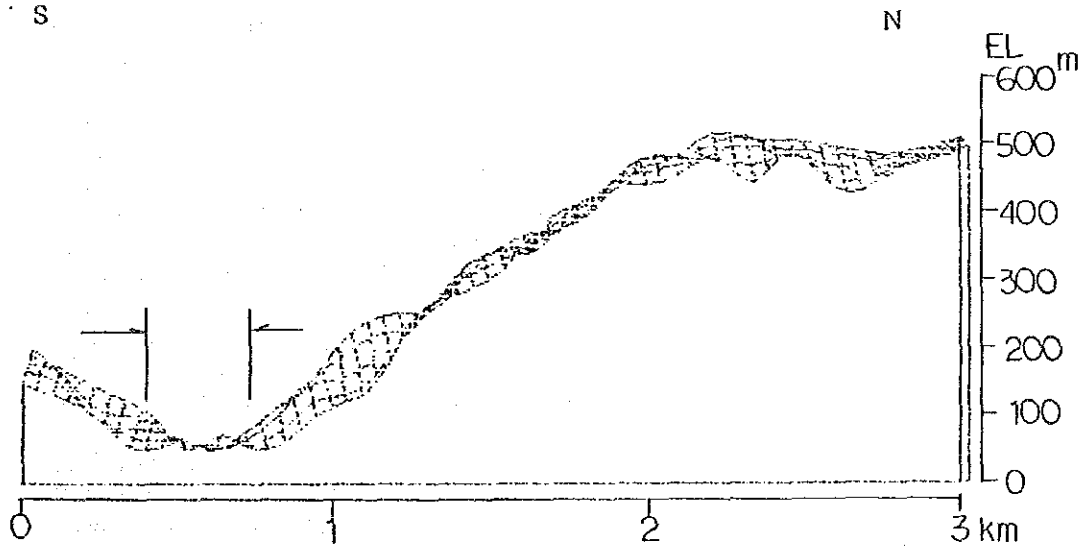


Fig. 5-6-6 Cross Section along Dam Axis of Bang The Sung Dam Site

reconnaissance. The member recognized in the surface is describable as three layers inclusive of Recent river deposit, lower terrace deposit and talus deposit in the order from the upper horizon.

Recent river deposit and lower deposit mainly consist of the loose sand and gravel facies, and spreads widely out the down of dam axis. The talus deposit is tractable to the foot slopes, especially between the constant slope and waning slope. It covers thickly on the surface. And the component of tulus deposit is mostly formed of the lateritic clay with gravel. Although the stratigraphical order for the overburden is still unknown, the layer of tulus facies plunges beneath the overlaying terrace deposit at the center of valley.

When the whole geological condition is supposed to be similar to Bangwad reservoir or Bang Nieo Dam site, the facies of overburden can be classified into above stated three members a total thickness of which may be inferred to be reached up to 20 m locally ranging from top soil to weathering granite.

(3) Bedrock

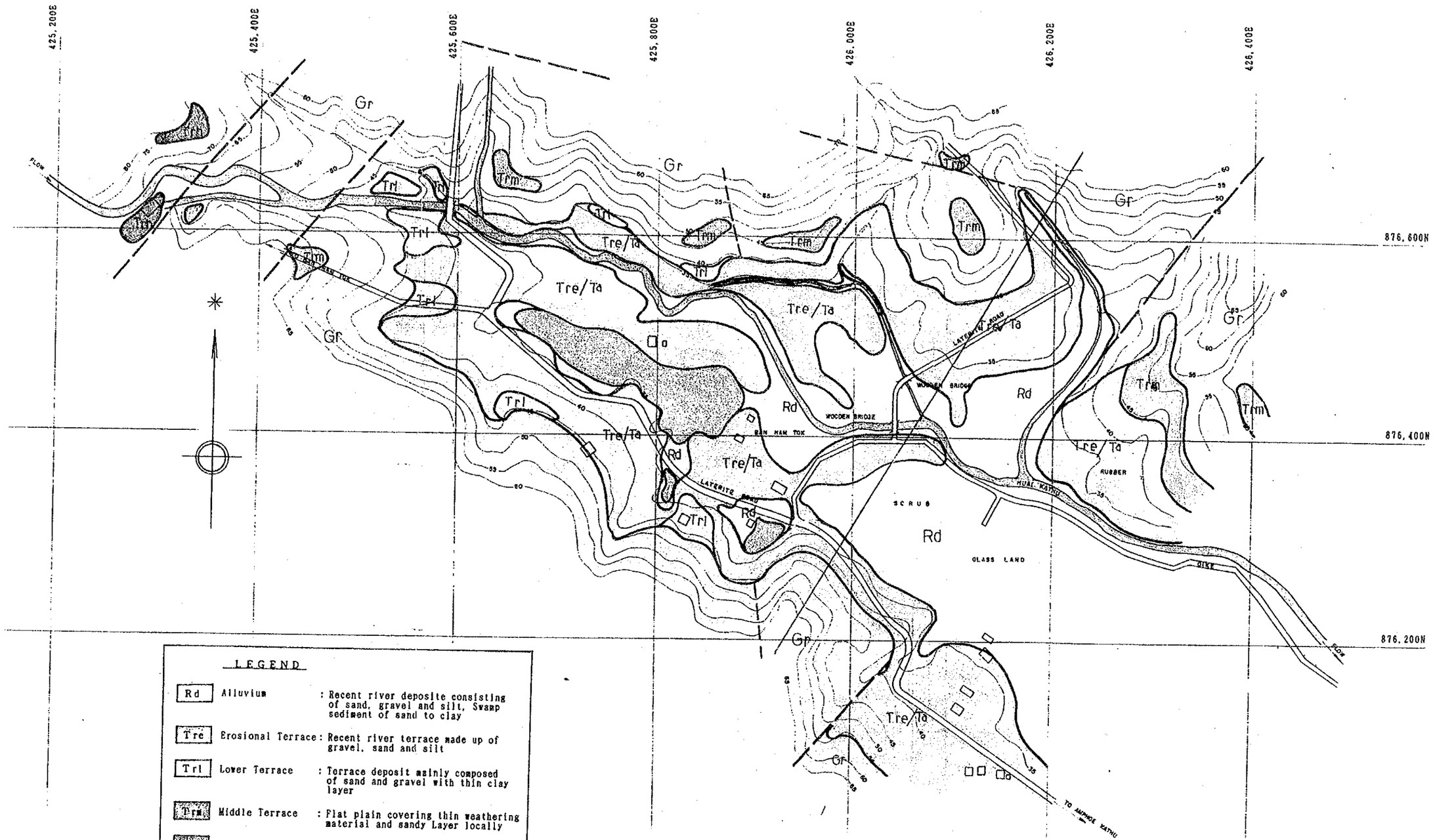
The bedrock of site is of granite which is classified as coarse grained biotite-phophyritic granite. Whole watershed area is formed of same type of granite; the rock is noted by uniformed mass with a few joint plane. The joint well develops locally for example, along a distributary at north of watershed. The distinct joints arranging in direction of ENE with 0.5 to 1 m interval is observed along a stream. The huge exposures are scattered on slope and fresh rock was observed there. The frequent quartz veins run through these outcrops on the southern slope of the reservoir.

However, the weathered zone in which the rock completely alter to sapolite is also found out at many places. Its thickness can hardly be grasped obviously since there is no boring survey. In case that the weathering condition seems to be equivalent to the Bang Nieo Dam site, the weathering zone is inferred to be at least 5 m on fresh granite facies.

(4) Geological Structure

The fault trending to the NE-SW is expressed as the main structure in the site which is the same faulting system as the regional lineation. In consequence of practical survey within the watershed, two faults in accordance with NE-SW trend are traceable downstream and the upstream respectively. Both faults are also supported by topographical characteristics such as cols on ridge, linear valley and fault scarp, They are correlative with next lineations recognized in the surrounding area at the site.

The secondary structure is shown along the direction of WNW-ESE and N-S which are interrupted by the main structure above. From the result of field reconnaissance, the lineations along them are dominant on the northern slope of reservoir and are topographically marked by a continuous fault scarp in many places, while most of these lineations are intercepted by the main structure. In view of geological structure, it may be assumed that a part of them passes the dam foundation, nevertheless the secondary faults are not continuously crossing by a main fault.



LEGEND

Rd	Alluvium	: Recent river deposite consisting of sand, gravel and silt, Swamp sediment of sand to clay
Tre	Erosional Terrace	: Recent river terrace made up of gravel, sand and silt
Trl	Lower Terrace	: Terrace deposit mainly composed of sand and gravel with thin clay layer
Trm	Middle Terrace	: Flat plain covering thin weathering material and sandy Layer locally
Trh	Higher Terrace I	: Erosional plain on the sideslope at the elevation of 100-150 m
Trp	Higher Terrace II	: Highest erosional plain at the elevation of 200 m
Ta	Talus	: Talus and colluvial deposite consisting of various size materials
Ss	Sandstone	: Palaeozonic sandstone, beded metamorphosed sandstone with chert and slate layer
Sl	Slate	: Slate with metamorphosed sand and chert layer
Gr	Coarse Granite	: Coarse grained biotite-porphyritic granite
Grf	Fine Granite	: Fine grained biotite-muscovite granite

Fig. 5-6-7 Geological Map of Bang The Sung Damsite

(5) Permeability and Bearing Capacity

Neither permeability nor bearing capacity was grasped through the in-situ data not for carrying out the boring survey in this site. In order to be in these circumstance, the permeability and bearing capacity for this site have to be presumed on the basis of the data in other site. From the view point of surface condition of geology, the Ban Nieo Dam site appears to be similar to this site, so that it is expected that the permeability is probably low in the bed rock and that the bearing capacity is also low in the overburden.

6. GEOLOGICAL ASSESSMENT

The engineering geological assessment for dam construction is described in the following chapter with respect to the geological members of overburden and bedrock respectively.

6.1 Overburden

At the thought of dam construction, the most severe problem in all dam sites are very deep Recent river bed and terrace deposit.

The overburden, in general, can be classified into three facies as shown in the following Table 6-1-1 from the engineering properties inclusive of typographical situation, lithological change, permeability and bearing capacity.

Table 6-1-1 Classification of Overburden

Practical Classification	Generalized Lithology	Average of N-value	Maximum Thickness (m) BN	CT	KK
Top soil/River bed	Lateritic soil, Sand and gravel with clay	10	2	2	2
Terrace Deposit	Sand and gravel	15	10	7	10
Clay/Peat	Clayey deposit with sandy inter-calations.	1	7	7	3
Weathering zone of Bedrock	Lateritization, sapolite	50	17	15	6

BN : Bang Nieo Dam CT : Khao Che Tra KK : Khlong Katha

Based on the engineering geological characteristics, at least overburden including the lowest member of clayey deposit shall be excavated off throughout the dam foundation, because it is too loose to be used for dam foundation. Even if the dam scale is smaller than 30 m high, the bearing capacity of clayey deposit is so weak that all of overburden members have to be taken away. When the higher dam is planned, the excavation line shall be put on the deeper horizon which is correlative with the weathering zone of bedrock. For both abutment of all site and the low terrace hill seeing at Che tra site, the overburden are so thin that the stripping off can be reduced to only for top soil.

While at an impervious core trench, the overburden should be excavated completely, because it has high permeability in contrast to the bedrock especially at sandy and gravel layer. Moreover there is a doubt for a toughness as a foundation of dam, even small scale dam, in a part of loose clayey deposit.

6.2 Bedrock

The bed rock in the site consists of granite and sandstone. Among five proposed dam site, four sites of Khlong Lo Young, The Bang Nieo Dam, Khlong

Katha and Bang Tho Sung are observed granite. Only Che Tra site is formed of sandstone. Although they are lithologically quite different, the engineering characteristic is similar in parts; for example, the bearing capacity and permeability is indicated as severally strong and low for both rock facies. Consequently, there is no problem with a bearing capacity as a foundation of fill type dam if the overburden and highly weathered rock have been excavated. In the case of a large scaled dam more than 50 m in height such as Khlong Katha, Bang Tho Sung and Khlong Lo Young, the main part of foundation should be based on the fresh bedrock.

Permeability of foundation is generally low; however, the value shows the slightly higher than 2 Lugeon which is a target value for grouting work. Accordingly, the grouting work shall be required up to impervious zone of bedrock. The depth reaching out the impervious horizon is supposed to be 10 to 15 m from the surface of foundation so that the grouting curtain shall be provided to this level. The high permeability of grouting zone is mainly due to the crack and/or joints opened under the influence of weathering. A cement grouting is recommened for an impervious curtain treatment.

At any rate, grouting work is required to all of proposed sites even though the quantity of work is not so much.

6.3 Embankment Materials

There is no information for embankment materials except for that of field reconnaissance and existing study at Khlong Katha.

All of sites are composed of hard rock which is locally crop out on the side slope in the vicinity of dam site. In view of these geological condition, the riprap and rock zone materials are available to be readily obtained from the surrounding area.

The weathering zone is thick especially in the Paleozoic layer which is spread out in the Che Tra site, the down stream of Khlong Lo Young, Bang Nieo Dam and Bang Tho Sung sites. These weathering facies show favorable properties for core zone or random materials. The quantities of materials are also enough for embankment volume of proposed dam at above mentioned four sites but Khlong Katha. Since the bedrock of site is formed of granite at all, furthermore, the adjacent area of site is not also underlain by Paleozoic facies, the Khlong Katha site may be pointed out a difficulty in procurement of the core zone materials. However, it would be expected that a coming study for a wider area than this time or a careful consideration for dam types will solve the problem in the detailed design.

APPENDIX A-1

Boring Log

BOREHOLE LOG

Bang Nie

PROJECT	PROVINCIAL WATER SUPPLY				SITE	BANG NIEO DAM, A.THA LANG, PHU KET	
HOLE NO.	BN-1	ELEVATION	32.0 MSL	ANGLE	0°	MACHINE	ROTARY ACKER
		DEPTH	50.0 m	BIT	NMLC BIT	PUMP	TP 1800
		DIAMETER	74 mm.	GW LEVEL	-8.0 m	ENGINE	GOLD FIELDS

BEGUN	10/10/89	SITE ENGINEER	TEERAYUT
COMPLETED	24/10/89	FOREMAN	—
DAYS REQUIRED	15	DRILLER	NIYOM

DATE	ELEVAT'N	DEPTH	THICK'S	LOG	TERMINO'Y	COLOR	RQD / NO. OF CORE	SPT-N / RECOVERY(%)	DRILL SPEED (h/m)	ROCK CLASS	METHOD	PERMEABILITY, K, CM/SEC	DESCRIPTIONS
10/10/89	32.0	1	1.5					12					0.00 STIFF CLAY WITH GRAVEL, DARK BROWN AND REDDISH BROWN 1.50
	30.5	2						33					
		3						41					
		4			(SC)			24					MEDIUM DENSE TO DENSE CLAYEY FINE TO COARSE SAND, DARK BROWN
	26.5	5	4.0					18					5.50
		6						12					
		7			(SM)			41					MEDIUM DENSE TO DENSE SILTY FINE TO COARSE SAND, DARK BROWN
	23.8	8	2.7					26					6.20
	22.5	9	4.3		(CH)			26					VERY STIFF CLAY, BROWN 9.50
11/10/89		10						27					
		11						40					
		12						18					
		13						25					
		14						50					
12/10/89		15						35					
		16			(SE)			19					
		17						31					
		18						50/9"					
13/10/89		19						50/7"					
	12.0	20	10.5										20.00
		21					15	100		SW			
		22						100		CL			
		23					65	100					
14/10/89		24			GRANITE		50	100					LIGHT COLOR, PHANERITIC TEXTURE, MODERATELY HARD TO HARD FRESH ROCK, JOINT PLANE 30° 60° (20°-70°) FILL WITH CLAY, COMPOSED OF QUARTZ, NA-FELDSPAR, BIOTITE AND HORNBLENDE
		25					40	100		CH			
		26					30	100		I			
		27					50	100		CM			
15/10/89		28					80	100					
		29					90	100					
		30					70	100					

BOREHOLE LOG

Bang Nie

PROJECT	PROVINCIAL WATER SUPPLY					SITE	BANG NIEO DAM, A.THA LANG, PHU KET		
HOLE NO.	BN-1	ELEVATION	32.0 MSL	ANGLE	0°	MACHINE	ROTARY ACKER	BEGUN	10/10/89	SITE ENGINEER	TEERAYUT
		DEPTH	50.0 m	BIT	NMLC BIT	PUMP	TP 1800	COMPLETED	24/10/89	FOREMAN	—
		DIAMETER	74 mm.	GW LEVEL	-8.0 m	ENGINE	GOLD FIELDS	DAYS REQUIRED	15	DRILLER	NIYOM

DATE	ELEVAT'N	DEPTH	THICK'S	LOG	TERMINO'Y	COLOR	RQD / NO. OF CORE (10 20 30 40)	SPT-N / RECOVERY(%) (10 20 30 40 / 20 40 60 80)	DRILL SPEED (h/m)	ROCK CLASS	PERMEABILITY, K, CM/SEC (10^{-3} 10^{-2}) / PERMEABILTY, K, LUGEON (0.10 1.00)	DESCRIPTIONS
20/10/89	32.0											
		31										
		32										
		33										
		34										
		35										
21/10/89		36										
		37										
		38										
		39			GRANITE					CM	0.49	LIGHT COLOR, PHANERITIC TEXTURE, MODERATELY HARD TO HARD, FRESH ROCK, JOINT PLANE 40°-70° MAY BE CLEAN AND/OR CALCITE FILL, COMPOSED OF QUARTZ, NA-FELDSPAR LICTITE AND HORNBLENDE
22/10/89		40								I		
		41									0.485	
23/10/89		42								CH		
		43										
		44										
		45										
24/10/89		46								CL	0.52	
		47										
		48								CM		
		49								I		
	-18.0	50	30.0							CH		50.00
												END OF CORING

BOREHOLE LOG

Bang Nie

PROJECT	PROVINCIAL WATER SUPPLY				SITE	BANG NIEO DAM, A.THA-LANG, PHU KET	
HOLE NO.	BN-2	ELEVATION	23.0 MSL	ANGLE	0°	MACHINE	ROTARY ACKER
		DEPTH	52.5 m	BIT	IMPREGNATED	PUMP	TP 1800
		DIAMETER	74 mm.	GW LEVEL	0.0	ENGINE	GOLD FIELDS

BEGUN	25/10/89	SITE ENGINEER	TEERAYUT
COMPLETED	8/11/89	FOREMAN	—
DAYS REQUIRED	19	DRILLER	PYSAN

DATE	ELEVATION	DEPTH	THICKNESS	LOG	TERMINOLOGY	COLOR	RQD / NO. OF CORE (10 20 30 40)	SPT-N / RECOVERY(%) (10 20 30 40 / 20 40 60 80)	DRILL SPEED (h/m)	ROCK CLASS / METHOD	PERMEABILITY, K, CM/SEC (10^{-4} 10^{-3})	PERMEABILITY, K, LUGEON (1.00 0.00)	DESCRIPTIONS
	23.0												0.00
25/11/89	22.5	1	0.5										SAND, LI-BROWN 0.50
	21.5	2	1.0										LOOSE SILTY FINE SAND 1.50
		3											
		4											
		5			(SP-SM)								VERY LOOSE SILTY FINE TO MEDIUM SAND, LI-BROWN
		6											
		7											
		8											
27/11/89	13.5	9	8.0										9.50
		10											
	12.5		1.0		(SC)								VERY LOOSE CLAYEY SAND, LI-GREY 10.50
		11											
		12			(CL-SC)								VERY SOFT TO MEDIUM CLAY, BLACK (INTERMEDIATE SOIL) 12.50
		13											
		14			(SC)								
	8.5	15	4.0										VERY LOOSE CLAYEY SAND, BLACK 14.50
		16											
		17			(SC)								MEDIUM DENSE TO DENSE CLAYEY SAND, BROWN AND REDDISH BROWN 17.50
	5.5	18	3.0										
28/11/89		19											
		20											
		21			(SC)								DENSE TO VERY DENSE CLAYEY SAND, REDDISH BROWN AND BROWN 22.50
29/11/89	0.5	22	5.0										
		23								CL - CM			LIGHT COLOR, PHANERITIC TEXTURE MODERATELY HARD TO HARD FRESH ROCK TO SLIGHTLY WEATHERED, COMPOSED OF QUARTZ, NA-FELDSPAR, BIOTITE AND HORNBLENDE
30/11/89		24											
		25								CM			
		26			GRANITE	GREYISH WHITE SCATTERED OF BLACK							
		27								CL			
31/11/89		28								CM			QUARTZ VEIN AT 23.5-23.6 M.
		29								CL			
		30								CM			

BOREHOLE LOG — Bang Nie

PROJECT	PROVINCIAL WATER SUPPLY					SITE	BANG NIEO DAM, A-THA-LANG, PHU KET		
HOLE NO.	BN-2	ELEVATION	23.0 MSL	ANGLE	0°	MACHINE	ROTARY ACKER	BEGUN	25/10/89	SITE ENGINEER	TEERAYUT
		DEPTH	52.5 m	BIT	IMPREGNATED	PUMP	TP 1800	COMPLETED	8/11/89	FOREMAN	—
		DIAMETER	74 mm.	GW LEVEL	0.0	ENGINE	GOLD FIELDS	DAYS REQUIRED	19	DRILLER	PYSAN

DATE | ELEVATION | DEPTH | THICKNESS | LOG | TERMINOLOGY | COLOR | ROD (10 20 30 40) / NO. OF CORE (10 20 30 40) | SPT-N (10 20 30 40) / RECOVERY(%) (20 40 60 80) | DRILL SPEED (h/m) | METHOD / ROCK CLASS | PERMEABILITY, K, CM/SEC (10^{-4} – 10^{-3}) / PERMEABILITY, K, LUGEON (0.10 – 1.00) | DESCRIPTIONS

DATE	ELEVATION	DEPTH	THICKNESS	TERMINOLOGY	COLOR	METHOD / ROCK CLASS	PERMEABILITY	DESCRIPTIONS
31/10/89		31				CL		
		32				I	0.9	
		33				CM		
3/11/89		34				CM		
		35				CL I CM	0.17	
		36						
		37				CH		
		38						
		39						
5/11/89		40		GRANITE	GRAYISH WHITE	CL		LIGHT COLOR, PHANERITIC TEXTURE, MODERATELY HARD TO HARD, FRESH, JOINT PLANE 30°-70° DIP, COMPOSED OF QUARTZ, NA-FELDSPAR, BIOTITE AND HORNBLENDE
		41					1.0	
		42				D CL		
		43						
		44						
		45						
6/11/89		46					5.6	
		47				CM		
		48						
		49						
7/11/89		50					2.0	
		51						
8/11/89	-29.5	52	30.0			CL		52.5 END OF CORING

BOREHOLE LOG

Bang Nie

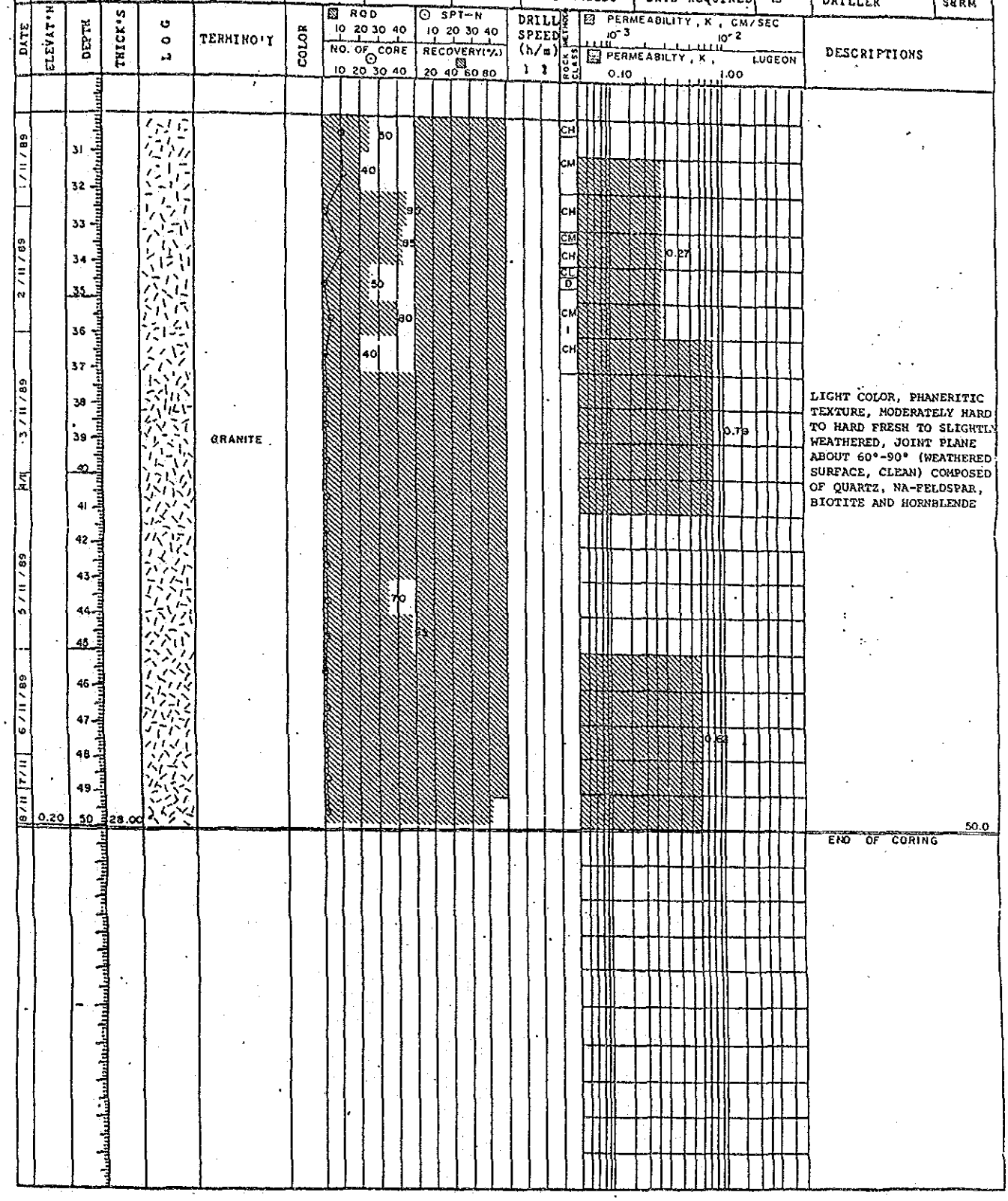
PROJECT	PROVINCIAL WATER SUPPLY					SITE	BANG NIEO DAM, A.THA LANG, PHU KET		
HOLE NO. BN-3	ELEVATION	50.0 MSL	ANGLE	0°	MACHINE	ROTARY ACKER	BEGUN	25/10/89	SITE ENGINEER	TEERAYUT
	DEPTH	50.0 m	BIT	IMPREGNATED	PUMP	TP 1800	COMPLETED	9/11/89	FOREMAN	—
	DIAMETER	74 mm.	GW LEVEL	-9.10 m	ENGINE	GOLD FIELDS	DAYS REQUIRED	15	DRILLER	SERM

DATE	ELEVATION	DEPTH	THICKNESS	LOG	TERMINOLOGY	COLOR	RQD / NO. OF CORE	SPT-N / RECOVERY(%)	DRILL SPEED (h/m)	ROCK CLASS	PERMEABILITY, K, CM/SEC	DESCRIPTIONS
	50.0											0.00
		1										MEDIUM TO STIFF CLAYEY SAND, REDDISH BROWN
	47.0	3	3.0		(SC)			11, 7, 5, 16, 15, 19, 24, 37				3.00
25/10/89		5										COMPLETELY WEATHERED GRANITE, LI-GREY REDDISH BROWN AND YELLOWISH BROWN
		6			(SM)							
		8										
	41.1	9	5.9									8.90
		10										GRANITE BOULDER
27/10/89	39.5		1.6									10.50
		11										COMPLETELY WEATHERED GRANITE
		12			(SM)						1.94×10^{-3}	
		13										
	36.5		3.0									13.50
28/10	35.5	14	1.0		(SP-SM)			21, 50/8", 50/8", 58, 50/2", 50, 50/10"				MEDIUM DENSE, SILTY FINE TO MEDIUM SAND, YELLOWISH BROWN 14.50
		15										
		16										
29/10/89		17										COMPLETELY WEATHERED GRANITE, LI-GREY AND BROWN
		18									1.81×10^{-2}	
		19										
		20			(SC, SM)							
		21										
	28.20		6.3									21.80
30/10/89		22				GREYISH WHITE WITH SCATTERED OF BLACK	81, 80, 70, 90			CM	15.7	LIGHT COLOR, PHANERITIC TEXTURE, MODERATELY HARD TO HARD FRESH ROCK TO SLIGHTLY WEATHERED, SLIGHTLY JOINTING JOINT PLANE ABOUT 30°-40° DIP COMPOSED OF QUARTZ, NA-FELDSPAR, BIOTITE AND HORNBLENDE
		23										
		24								CL		
		25			GRANITE						036	
		26										
31/10/89		27								CH		
		28										
		29										
1/11/89		30										

BOREHOLE LOG

Bang Nie

PROJECT	PROVINCIAL WATER SUPPLY					SITE	BANG NIEO DAM, A.THA LANG, PHU KET		
HOLE NO.	BN-3	ELEVATION	50.0 MSL	ANGLE	0	MACHINE	ROTARY ACKER	BEGUN	25/10/89	SITE ENGINEER	TEERAYUT
		DEPTH	50.0 m	BIT	BIT	PUMP	TP 1800	COMPLETED	9/11/89	FOREMAN	—
		DIAMETER	74 mm.	GW LEVEL	- 9.10	ENGINE	GOLD FIELDS	DAYS REQUIRED	15	DRILLER	SERM



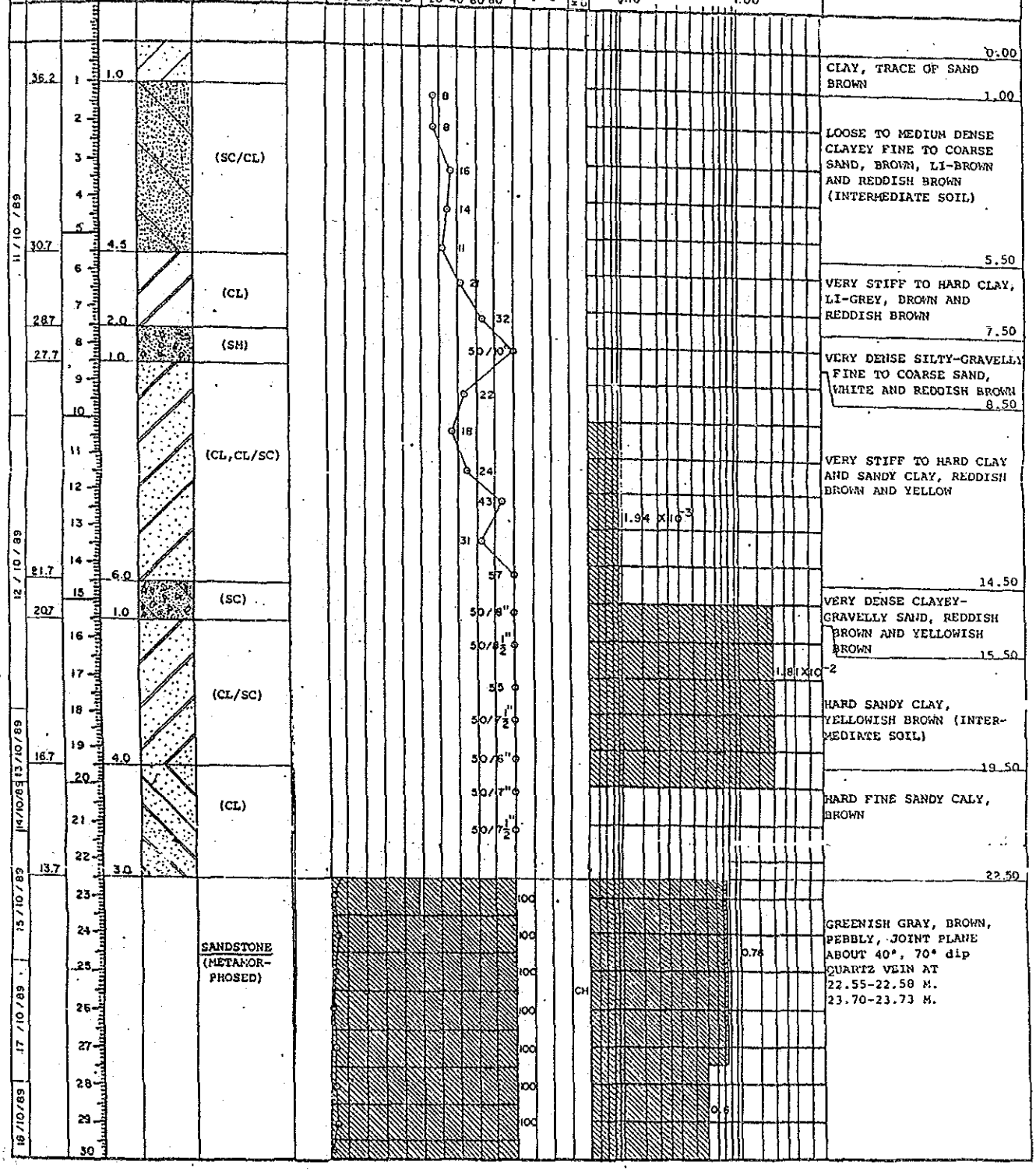
BOREHOLE LOG — Khao Che Tra

PROJECT	PROVINCIAL WATER SUPPLY				SITE	KHAO CLIETRA, A. THA-LANG, PHU KET	
BOREHOLE NO.	CT-1	ELEVATION	36.2	ANGLE	0°	MACHINE	ROTARY ACKER
		DEPTH	50.00	BIT	NQ DIAMOND BIT	PUMP	TP 1800
		DIAMETER	74 mm.	GW LEVEL	-10.20	ENGINE	GOLD FIELDS

BEGUN	11/10/89	SITE ENGINEER	TEERAYUT
COMPLETED	22/10/89	FOREMAN	-
DAYS REQUIRED	12	DRILLER	PYSAN

DATE: 11/10/89 — 12/10/89 — 13/10/89 — 14/10/89 — 15/10/89 — 17/10/89 — 18/10/89

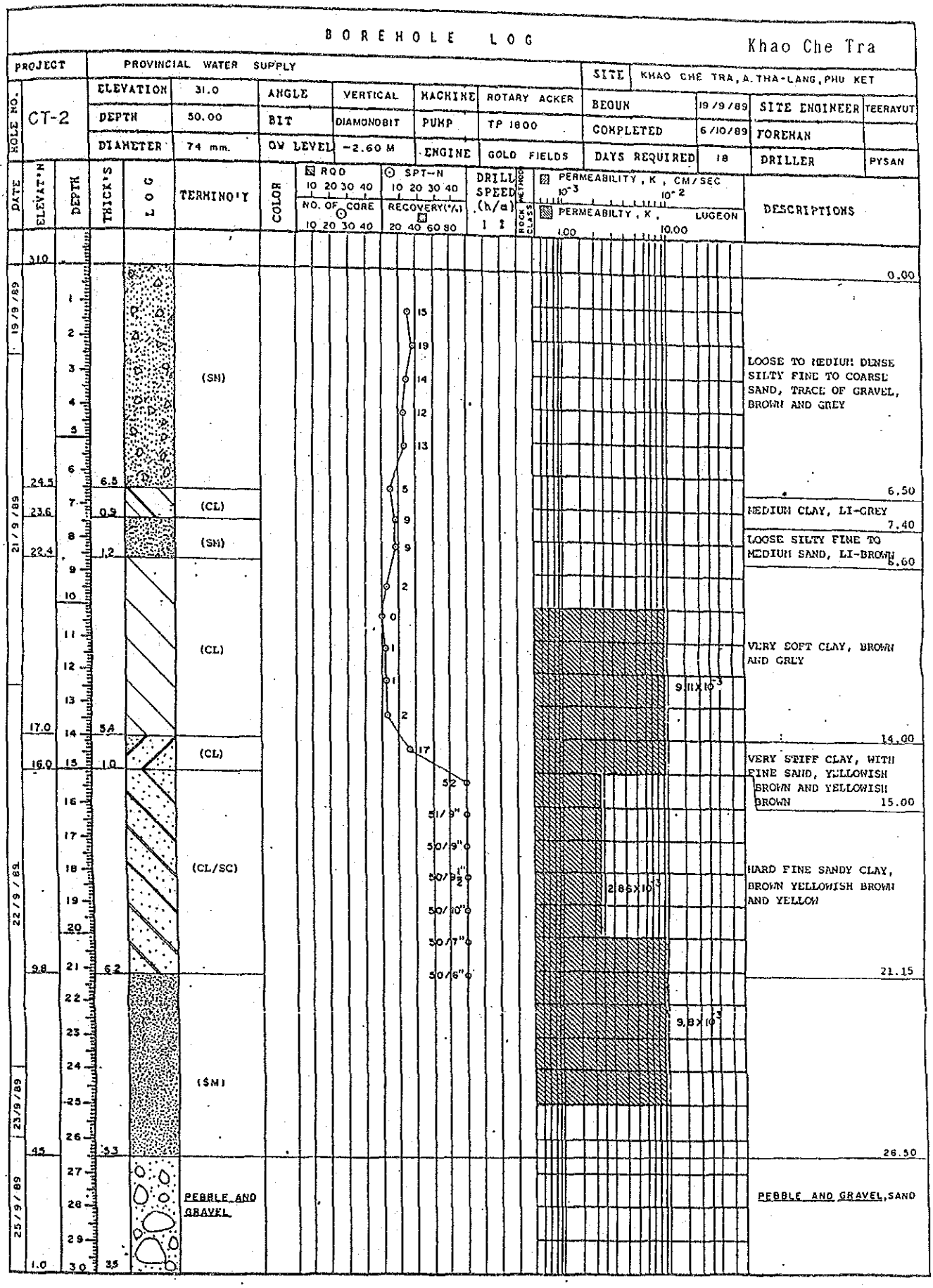
ELEVATION	DEPTH	THICKNESS	TERMINOLOGY	DESCRIPTIONS
				0.00
36.2	1	1.0		CLAY, TRACE OF SAND BROWN
				1.00
	2–5		(SC/CL)	LOOSE TO MEDIUM DENSE CLAYEY FINE TO COARSE SAND, BROWN, LI-BROWN AND REDDISH BROWN (INTERMEDIATE SOIL)
30.7	5	4.5		
				5.50
	6–7		(CL)	VERY STIFF TO HARD CLAY, LI-GREY, BROWN AND REDDISH BROWN
28.7	7	2.0		
				7.50
27.7	8	1.0	(SM)	VERY DENSE SILTY-GRAVELLY FINE TO COARSE SAND, WHITE AND REDDISH BROWN
				8.50
	9–14		(CL,CL/SC)	VERY STIFF TO HARD CLAY AND SANDY CLAY, REDDISH BROWN AND YELLOW
21.7	14	6.0		
				14.50
20.7	15	1.0	(SC)	VERY DENSE CLAYEY-GRAVELLY SAND, REDDISH BROWN AND YELLOWISH BROWN
				15.50
	16–19		(CL/SC)	HARD SANDY CLAY, YELLOWISH BROWN (INTERMEDIATE SOIL)
16.7	19	4.0		
				19.50
	20–22		(CL)	HARD FINE SANDY CALY, BROWN
13.7	22	3.0		
				22.50
	23–30		SANDSTONE (METAMORPHOSED)	GREENISH GRAY, BROWN, PEBBLY, JOINT PLANE ABOUT 40°, 70° dip QUARTZ VEIN AT 22.55-22.58 M. 23.70-23.73 M.



BOREHOLE LOG — Khao Che Tra

PROJECT	PROVINCIAL WATER SUPPLY					SITE	KHAO CLIETRA, A. THA-LANG, PHU KET		
HOLE NO. CT-1	ELEVATION 36.2	ANGLE 0°	MACHINE ROTARY ACKER	BEGUN 11/10/89	SITE ENGINEER TEERAYUT
	DEPTH 50.00	BIT NQ DIAMOND BIT	PUMP TP 1800	COMPLETED 22/10/89	FOREMAN -
	DIAMETER 74 mm.	GW LEVEL -10.20	ENGINE GOLD FIELDS	DAYS REQUIRED 12	DRILLER PYSAN

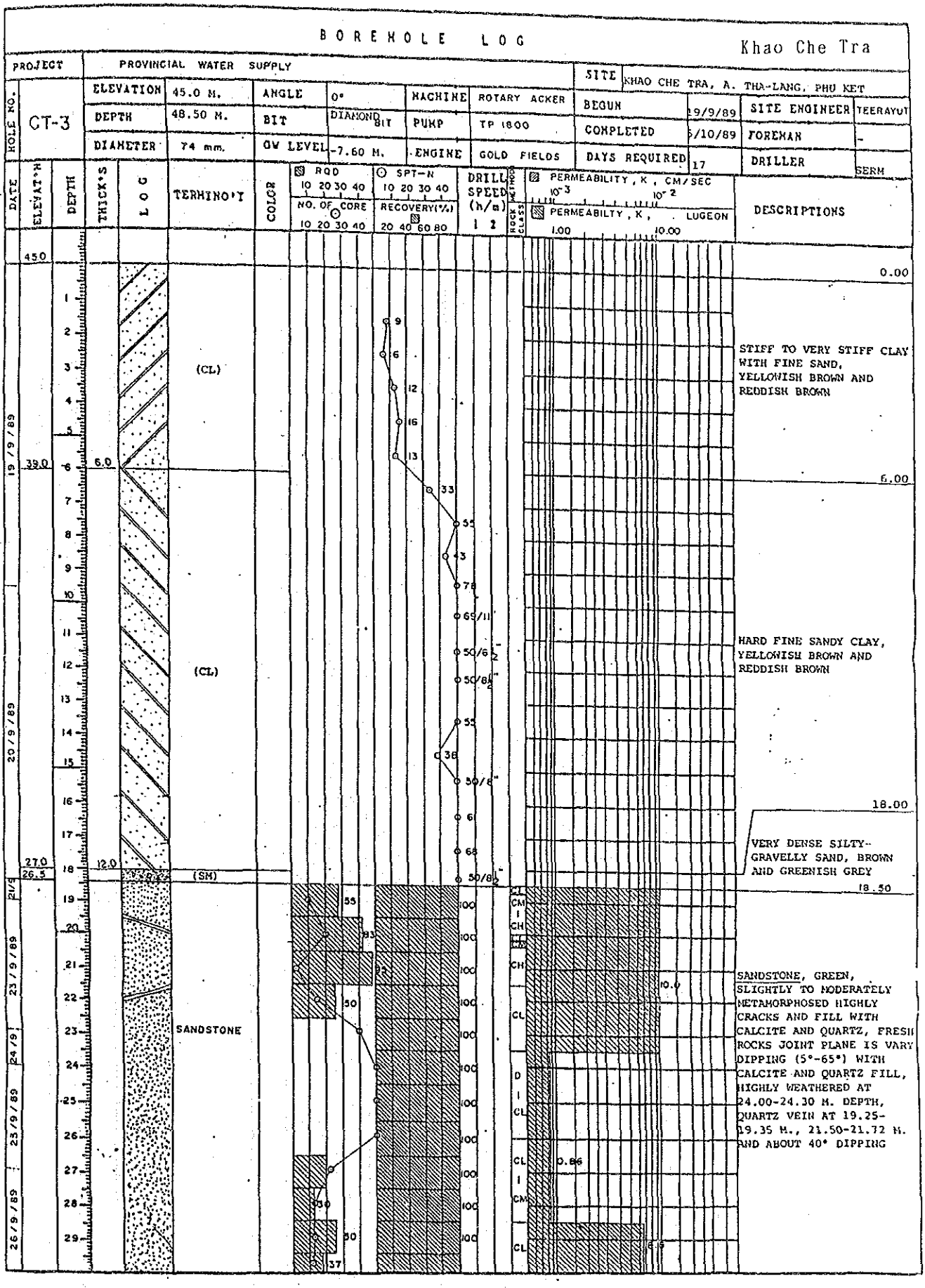
DATE	ELEVAT'N	DEPTH	THICK'S	LOG	TERMINO'Y	COLOR	RQD / NO. OF CORE	SPT-N / RECOVERY(%)	DRILL SPEED (h/m)	ROCK CLASS	PERMEABILITY, K, CM/SEC (LUGEON)	DESCRIPTIONS
19/10/89		31										
		32										
		33										
		34										
		35										
20/10/89		36								CH		
		37			SANDSTONE (METAMORPHOSED)							
		38										
		39										GREEN, FRESH ROCK JOINT PLANE 40° 70°, (30°-70° DIP), CRACK FILL WITH CALCITE/QUARTZ, THE ROCK SHOWING PEBBLY SANDSTONE
		40										
21/10/89		41					45					
		42					75			CM		
		43										
		44					50					
22/10/89		45					60			CH		
		46					50			CL		
	-11.3	47	25.0				60			CL-O		QUARTZ VEIN AT 32.85-32.90 M.
												47.50 END OF CORING


BOREHOLE LOG
Khao Che Tra
PROJECT
PROVINCIAL WATER SUPPLY
SITE
KHAO CHE TRA, A.THA-LANG, PHU KET
HOLE NO.
CT-2
ELEVATION 31.0
DEPTH 50.00
DIAMETER 74 mm.
ANGLE
VERTICAL
BIT
DIAMONDBIT
GW LEVEL -2.60 M
MACHINE
ROTARY ACKER
PUMP
TP 1800
ENGINE
GOLD FIELDS
BEGUN 19/9/89
COMPLETED 6/10/89
DAYS REQUIRED 18
SITE ENGINEER TEERAYUT
FOREMAN
DRILLER PYSAN
DATE
ELEVATION
DEPTH
THICKNESS
LOG
TERMINOLOGY
COLOR
RQD
SPT-N
NO. OF CORE
RECOVERY(%)
DRILL SPEED (h/a)
ROCK CLASS METHOD
PERMEABILITY, K, CM/SEC
PERMEABILITY, K, LUGEON
DESCRIPTIONS
19/9/89
21/9/89
22/9/89
23/9/89
25/9/89
(SM)
(CL)
(SM)
(CL)
(CL)
(CL/SC)
(SM)
PEBBLE AND GRAVEL
LOOSE TO MEDIUM DENSE SILTY FINE TO COARSE SAND, TRACE OF GRAVEL, BROWN AND GREY
0.00
6.50
MEDIUM CLAY, LI-GREY
7.40
LOOSE SILTY FINE TO MEDIUM SAND, LI-BROWN
8.60
VERY SOFT CLAY, BROWN AND GRLY
9.11X10-3
14.00
VERY STIFF CLAY, WITH FINE SAND, YELLOWISH BROWN AND YELLOWISH BROWN
15.00
HARD FINE SANDY CLAY, BROWN YELLOWISH BROWN AND YELLOW
2.85X10-3
21.15
9.8X10-3
26.50
PEBBLE AND GRAVEL, SAND

BOREHOLE LOG — Khao Che Tra

PROJECT	PROVINCIAL WATER SUPPLY					SITE	KHAO CHE TRA, A.THA-LANG, PHU KET		
HOLE NO.	CT-2	ELEVATION	31.0	ANGLE	VERTICAL	MACHINE	ROTARY ACKER	BEGUN	19/9/89	SITE ENGINEER	TEERAYUT
		DEPTH	50.00	BIT	DIAMOND BIT	PUMP	TP 1800	COMPLETED	6/10/89	FOREMAN	
		DIAMETER	74 mm.	GW LEVEL	-26.0M	ENGINE	GOLD FIELDS	DAYS REQUIRED	18	DRILLER	PYSAN

DATE	ELEVATION	DEPTH	THICKNESS	LOG	TERMINOLOGY	COLOR	RQD / NO. OF CORE	SPT-N / RECOVERY(%)	DRILL SPEED (h/m)	ROCK CLASS METHOD	PERMEABILITY, K, CM/SEC	DESCRIPTIONS
27/9/89												
28/9/89	31	31					10	75	3.75	CL D		
	32	32						88		CL D		
	33	33						15				
	34	34										
	35	35										
29/9/89	36	36					71	100		CL I		
	37	37			SANDSTONE		70	100				
	38	38					60	100		CM	2.75	SANDSTONE, GRELN, FRESH ROCK, SLIGHTLY TO MODERATELY METAMORPHOSED, WIDE TO CLOSE JOINTING AND JOINT PLANE IS VARY DIPPING (30°-70°), HIGHLY CRACKS MAY BE FILL WITH CALCITE AND QUARTZ, TWO JOINT MAY BE 50° AND 40° DIP (PERPENDICULAR)
	39	39						100				
	40	40						100				
4/10/89	41	41					80	100		CL I		
	42	42					70	100		CM		
	43	43					9	100			3.2	
	44	44					80	100		CH		
	45	45					80	100		CM I CH		
	46	46					85	100		CL I		
	47	47					90	100		CM		
5/10/89	48	48					80	100		CL I	3.6	
	49	49					20	100		CM		
	-18.0	50	20.0					100				50.00
												END OF CORING


BOREHOLE LOG
Khao Che Tra
PROJECT
PROVINCIAL WATER SUPPLY
SITE
KHAO CHE TRA, A. THA-LANG, PHU KET
HOLE NO.
CT-3
ELEVATION 45.0 M.
DEPTH 48.50 M.
DIAMETER 74 mm.
ANGLE 0°
BIT DIAMOND BIT
GW LEVEL -7.60 M.
MACHINE ROTARY ACKER
PUMP TP 1800
ENGINE GOLD FIELDS
BEGUN 19/9/89
COMPLETED 6/10/89
DAYS REQUIRED 17
SITE ENGINEER TEERAYUT
FOREMAN -
DRILLER SERM
DATE
ELEVATION
DEPTH
THICKNESS
LOG
TERMINOLOGY
COLOR
RQD
NO. OF CORE
SPT-N
RECOVERY(%)
DRILL SPEED (h/m)
ROCK WEATHERING
ROCK CLASS
PERMEABILITY, K, CM/SEC
PERMEABILITY, K, LUGEON
DESCRIPTIONS
45.0
39.0
27.0
26.5
6.0
12.0
(CL)
(CL)
(SM)
SANDSTONE
0.00
STIFF TO VERY STIFF CLAY WITH FINE SAND, YELLOWISH BROWN AND REDDISH BROWN
6.00
HARD FINE SANDY CLAY, YELLOWISH BROWN AND REDDISH BROWN
18.00
VERY DENSE SILTY-GRAVELLY SAND, BROWN AND GREENISH GREY
18.50
SANDSTONE, GREEN, SLIGHTLY TO MODERATELY METAMORPHOSED HIGHLY CRACKS AND FILL WITH CALCITE AND QUARTZ, FRESH ROCKS JOINT PLANE IS VARY DIPPING (5°-65°) WITH CALCITE AND QUARTZ FILL, HIGHLY WEATHERED AT 24.00-24.30 M. DEPTH, QUARTZ VEIN AT 19.25-19.35 M., 21.50-21.72 M. AND ABOUT 40° DIPPING
19/9/89
20/9/89
23/9/89
24/9
23/9/89
26/9/89

BOREHOLE LOG — Khao Che Tra

PROJECT	PROVINCIAL WATER SUPPLY					SITE	KHAO CHE TRA, A. THA-LANG, PHU KET		
HOLE NO.	CT-3	ELEVATION	45.0 M.	ANGLE	0°	MACHINE	ROTARY ACKER	BEGUN	19/9/89	SITE ENGINEER	TEERAYUT
		DEPTH	48.50 M.	BIT	DIAMOND BIT	PUMP	TP 1800	COMPLETED	5/10/89	FOREMAN	-
		DIAMETER	74 mm.	GW LEVEL	-7.60 M.	ENGINE	GOLD FIELDS	DAYS REQUIRED	17	DRILLER	SERM

DATE	ELEVATION	DEPTH	THICKNESS	LOG	TERMINOLOGY	COLOR	RQD 10 20 30 40 / NO. OF CORE 10 20 30 40	SPT-N 10 20 30 40 / RECOVERY(%) 20 40 60 80	DRILL SPEED (h/m) 1 2	ROCK CLASS METHOD	PERMEABILITY, K, CM/SEC 10^{-3} 10^{-2} / PERMEABILITY, K, LUGEON 1.00 10.00	DESCRIPTIONS
27/9/89		31					51		100	CL		
28/9		32					70		100			
2/10/89		33					65		100	CM	6.8	
		34					30		100			
3/10		35					0		100	CL		
		36					55		100		1.0	
		37					0		100			
4/10/89		38			SANDSTONE		70		100	CM		SANDSTONE, GREEN, SLIGHTLY TO MODERATELY METAMORPHOSED, HIGHLY CRACKS AND FILL WITH CALCITE AND QUARTZ, WIDE TO CLOSE SPACING JOINTING, JOINT PLANE 40°-70° DIP QUARTZ VEIN AT 38.50-38.74 M. 39.32-39.50 M.
		39					75		100			
		40					70		100			
		41					70		100	CL		
		42					60		100	CM		
		43					0		100	CH		
		44					80		100	CM		
		45					0		100			
5/10/89		46					90		100			
		47					96		100	CM		
		48					0		100	I	1.05	
	-3.0		30.0				0		100	CM		
												48.50
												END OF CORING

BOREHOLE LOG

Khao Che Tra

PROJECT	PROVINCIAL WATER SUPPLY					SITE	KHAO CHE TRA, A. THALANG, PHU KET		
HOLE NO.	CT-4	ELEVATION	39.0 M.	ANGLE	0°	MACHINE	ROTARY ACKER	BEGUN	7/10/89	SITE ENGINEER	TEERAYUT
		DEPTH	48.00M.	BIT	NMLL BIT	PUMP	TP 1800	COMPLETED	21/10/89	FOREMAN	
		DIAMETER	74 mm.	GW LEVEL	- 0.70	ENGINE	GOLD FIELDS	DAYS REQUIRED	15	DRILLER	SERM

DATE	ELEVATION	DEPTH	THICKNESS	LOG	TERMINOLOGY	COLOR	ROD 10 20 30 40 / NO. OF CORE ○ 10 20 30 40	SPT-N 10 20 30 40 / RECOVERY(%) 20 40 60 80	DRILL SPEED (h/m) 1 2	ROCK CLASS METHOD	PERMEABILITY, K, CM/SEC 10^{-3} 10^{-2} / PERMEABILITY, K, LUGEON 1.00 10.00	DESCRIPTIONS
	39.0											0.00
7/10/89		1			(CL,CH)			11				STIFF TO VERY STIFF AND HARD FINE SANDY CLAY AND CLAY WITH FINE SAND, YELLOWISH BROWN AND REDDISH BROWN
		2						32				
		3						11				
		4						15				
		5						25				
		6						25				
	32.0	7	7.0					50/5"				7.00
		8						73				
		9						50/8"				
		10						66/7"				
		11						50/8"				HARD FINE SANDY CLAY, YELLOWISH BROWN AND LI-BROWN
		12			(CL,CL/SC)			50/7"				
		13						50/9"				
		14						50/8"				
		15						51/5"				
		16						50/2"				
		17						50/3"				
	21.0	18	11.0									18.00
8/10/89		19	0.50		QUARTZ	WHITE				D		HIGHLY WEATHERED, WHITE 18.50
		20				BROWN TO DARK BROWN		20		I CL		MODERATELY TO COMPLETELY WEATHERED
10/10/89		21								D		
		22			SANDSTONE (SLIGHTLY METAMORPHOSED)		20			I CL		SLIGHTLY TO HIGHLY WEATHERED, JOINT PLANE ABOUT 50 TO DIPPING AND OPEN STAINED
		23								CL		
		24								D I CL		QUARTZ VEIN AT24.85-24.95 M. 25.40-25.60 M.
11/10/89		25				GREENISH GREY					6.8	
		26					10			CL		
12/10		27					15					
13/10/89		28					35			CL I CM		
		29					10			D		
		30						50				

BOREHOLE LOG — Khao Che Tra

PROJECT	PROVINCIAL WATER SUPPLY					SITE	KHAO CHE TRA, A. THALANG, PHU KET		
HOLE NO. CT-4	ELEVATION	39.0 M	ANGLE	0°	MACHINE	ROTARY ACKER	BEGUN	7/10/89	SITE ENGINEER	TEERAYUT
	DEPTH	48.00 M	BIT	NMLL BIT	PUMP	TP 1800	COMPLETED	21/10/89	FOREMAN	
	DIAMETER	74 mm.	GW LEVEL	- 0.70	ENGINE	GOLD FIELDS	DAYS REQUIRED	15	DRILLER	SERM

DATE | ELEVAT'N | DEPTH | THICK'S | LOG | TERMINO'Y | COLOR | RQD (10 20 30 40) / NO. OF CORE (10 20 30 40) | SPT-N (10 20 30 40) / RECOVERY(%) (20 40 60 80) | DRILL SPEED (h/m) (1 2) | ROCK CLASS METHOD | PERMEABILITY, K, CM/SEC (10^{-3} 10^{-2}) / PERMEABILITY, K, LUGEON (1.00 10.00) | DESCRIPTIONS

14/10/89 — 13/10/89 — 18/10/89 — 19/10/89 — 20/10/89 — 21/10/89

31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48

-11.0

29.5

SANDSTONE (SLIGHTLY METAMORPHOSED)

RQD: 100 15 30 20 50 50 85 85

SPT-N: 50 15 50 15

D CL CL I CM D CL D-I-CL CH CM CL I CM

8.0 2.9 1.9

FRESH ROCK, JOINT PLANE 30°-70° DIP MAY BE FILL WITH CLAY

QTZ VEIN AT 34.80 m(DIP40°)

41.00-41.10 m.

46.50-46.60m.

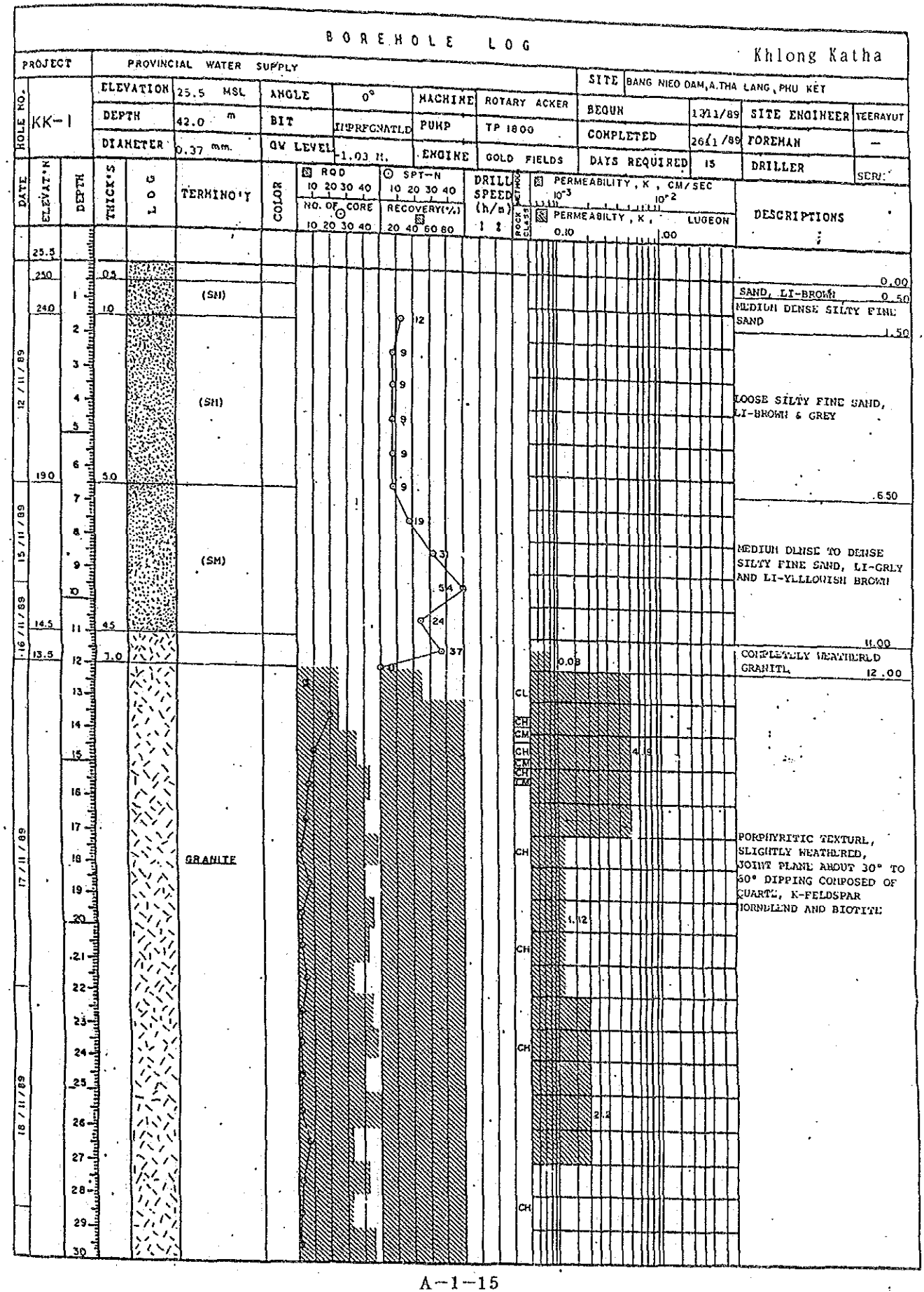
CORE NOT RECOVERY AT

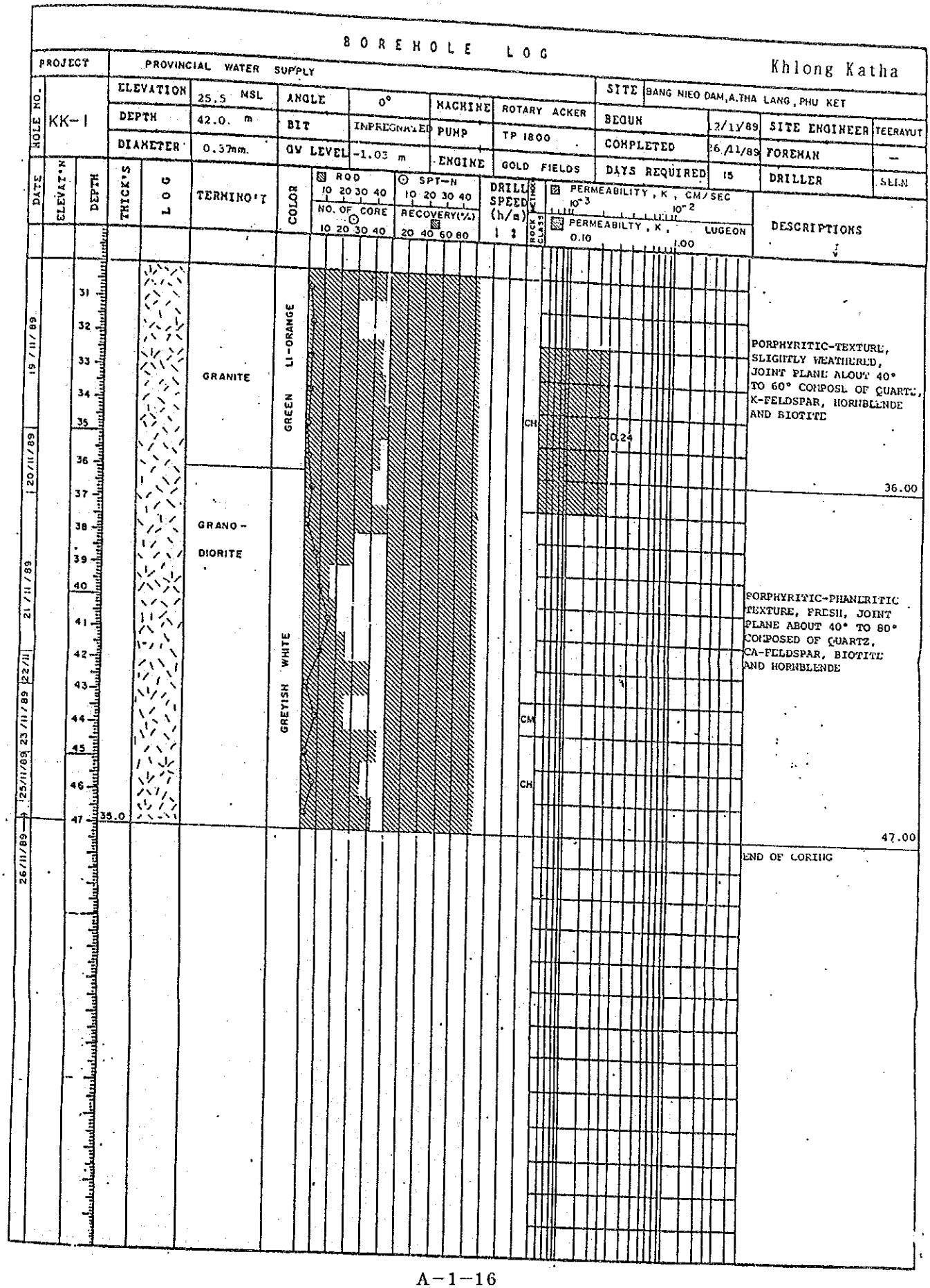
30.00-30.50 m

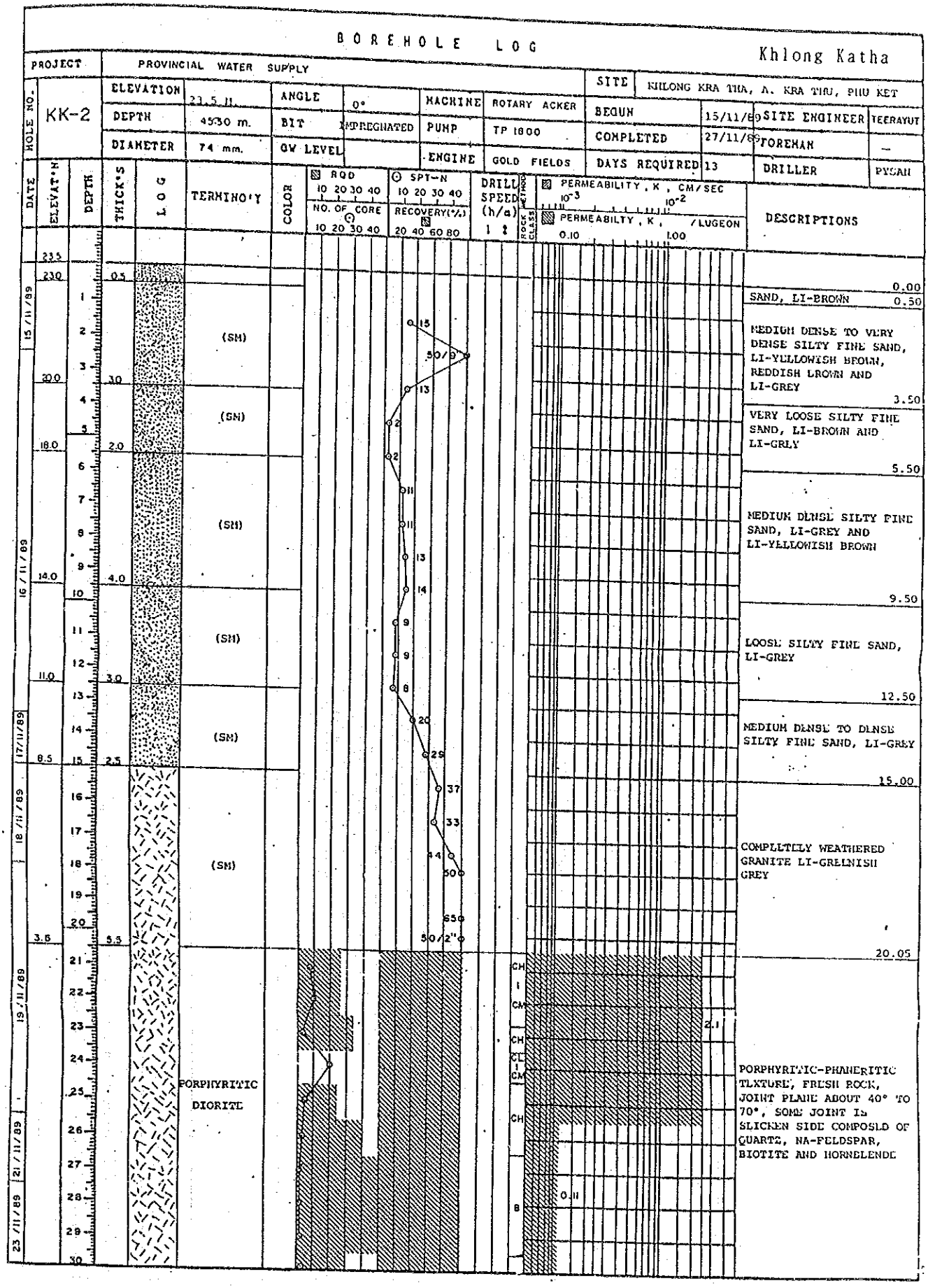
39.15-40.00 m

48.00

END OF CORING


BOREHOLE LOG
Khlong Katha
PROJECT
PROVINCIAL WATER SUPPLY
SITE
BANG NIEO DAM, A.THA LANG, PHU KET
HOLE NO.
KK-1
ELEVATION 25.5 MSL
ANGLE 0°
MACHINE ROTARY ACKER
BEGUN 13/11/89
SITE ENGINEER TEERAYUT
DEPTH 42.0 m
BIT IMPREGNATED
PUMP TP 1800
COMPLETED 26/1/89
FOREMAN —
DIAMETER 0.37 mm.
GW LEVEL -1.03 M.
ENGINE GOLD FIELDS
DAYS REQUIRED 15
DRILLER SURI
DATE
ELEVATION
DEPTH
THICKNESS
LOG
TERMINOLOGY
COLOR
RQD
NO. OF CORE
SPT-N
RECOVERY(%)
DRILL SPEED (h/m)
ROCK CLASS
ROCK METHOD
PERMEABILITY, K, CM/SEC
PERMEABILITY, K, LUGEON
DESCRIPTIONS
25.5
24.0
19.0
14.5
13.5
0.5
1.0
5.0
7.0
(SM)
(SM)
(SM)
GRANITE
SAND, LI-BROWN
MEDIUM DENSE SILTY FINE SAND
1.50
LOOSE SILTY FINE SAND, LI-BROWN & GREY
6.50
MEDIUM DENSE TO DENSE SILTY FINE SAND, LI-GRLY AND LI-YLLLOWISH BROWN
11.00
COMPLETELY WEATHERED GRANITE
12.00
PORPHYRITIC TEXTURE, SLIGHTLY WEATHERED, JOINT PLANE ABOUT 30° TO 60° DIPPING COMPOSED OF QUARTZ, K-FELDSPAR HORNBLEND AND BIOTITE
12/11/89
15/11/89
16/11/89
17/11/89
18/11/89


BOREHOLE LOG
PROJECT
PROVINCIAL WATER SUPPLY
Khlong Katha
HOLE NO.
KK-1
ELEVATION 25.5 MSL
DEPTH 42.0 m
DIAMETER 0.37mm.
ANGLE 0°
BIT IMPREGNATED
GW LEVEL -1.03 m
MACHINE ROTARY ACKER
PUMP TP 1800
ENGINE GOLD FIELDS
SITE BANG NIEO DAM, A.THA LANG, PHU KET
BEGUN 2/11/89
COMPLETED 26/11/89
DAYS REQUIRED 15
SITE ENGINEER TEERAYUT
FOREMAN —
DRILLER SEIN
DATE
ELEVATION
DEPTH
THICKNESS
LOG
TERMINOLOGY
COLOR
ROD
SPT-N
NO. OF CORE
RECOVERY(%)
DRILLING SPEED (h/m)
ROCK CLASS
METHOD
PERMEABILITY, K, CM/SEC
PERMEABILITY, K, LUGEON
DESCRIPTIONS
19/11/89
20/11/89
21/11/89
22/11
23/11/89
25/11/89
26/11/89
GRANITE
GREEN LI-ORANGE
PORPHYRITIC-TEXTURE, SLIGHTLY WEATHERED, JOINT PLANE ALOUT 40° TO 60° COMPOSL OF QUARTZ, K-FELDSPAR, HORNBLENDE AND BIOTITE
CH
0.24
36.00
GRANO-DIORITE
GREYISH WHITE
PORPHYRITIC-PHANERITIC TEXTURE, FRESH, JOINT PLANE ABOUT 40° TO 80° COMPOSED OF QUARTZ, CA-FELDSPAR, BIOTITE AND HORNBLENDE
CM
CH
35.0
47.00
END OF CORING


BOREHOLE LOG
Khlong Katha
PROJECT
PROVINCIAL WATER SUPPLY
SITE
KHLONG KRA THA, A. KRA THU, PHU KET
HOLE NO.
KK-2
ELEVATION
23.5 M.
ANGLE
0°
MACHINE
ROTARY ACKER
BEGUN
15/11/89
SITE ENGINEER
TEERAYUT
DEPTH
45.30 m.
BIT
IMPREGNATED
PUMP
TP 1800
COMPLETED
27/11/89
FOREMAN
—
DIAMETER
74 mm.
GW LEVEL
ENGINE
GOLD FIELDS
DAYS REQUIRED
13
DRILLER
PYCAH
DATE
ELEVATION
DEPTH
THICKNESS
LOG
TERMINOLOGY
COLOR
RQD
NO. OF CORE
SPT-N
RECOVERY(%)
DRILL SPEED (h/a)
ROCK CLASS
METHOD
PERMEABILITY, K, CM/SEC
PERMEABILITY, K, /LUGEON
DESCRIPTIONS
0.00
SAND, LI-BROWN
0.50
MEDIUM DENSE TO VERY DENSE SILTY FINE SAND, LI-YELLOWISH BROWN, REDDISH BROWN AND LI-GREY
3.50
VERY LOOSE SILTY FINE SAND, LI-BROWN AND LI-GRLY
5.50
MEDIUM DENSE SILTY FINE SAND, LI-GREY AND LI-YELLOWISH BROWN
9.50
LOOSE SILTY FINE SAND, LI-GREY
12.50
MEDIUM DENSE TO DENSE SILTY FINE SAND, LI-GREY
15.00
COMPLETELY WEATHERED GRANITE LI-GRELNISH GREY
20.05
PORPHYRITIC-PHANERITIC TEXTURE, FRESH ROCK, JOINT PLANE ABOUT 40° TO 70°, SOME JOINT IS SLICKEN SIDE COMPOSED OF QUARTZ, NA-FELDSPAR, BIOTITE AND HORNELENDE
(SM)
PORPHYRITIC DIORITE
15/11/89
16/11/89
17/11/89
18/11/89
19/11/89
21/11/89
23/11/89

BOREHOLE LOG — Khlong Katha

PROJECT	PROVINCIAL WATER SUPPLY				SITE	KHLONG KRA THA, A. KRA THU, PHU KET	
HOLE NO.	KK-2	ELEVATION	23.5 M.	ANGLE	0°	MACHINE	ROTARY ACKER
		DEPTH		BIT	IMPREGNATED	PUMP	TP 1800
		DIAMETER	74 mm.	GW LEVEL		ENGINE	GOLD FIELDS

BEGUN	15/11/89	SITE ENGINEER	TEERAYUT
COMPLETED	27/11/89	FOREMAN	—
DAYS REQUIRED	13	DRILLER	PYSAN

DATE	ELEVATION	DEPTH	THICKNESS	LOG	TERMINOLOGY	COLOR	RQD (10 20 30 40) / NO. OF CORE (10 20 30 40)	SPT-N (10 20 30 40) / RECOVERY(%) (20 40 60 80)	DRILL SPEED (h/m)	ROCK CLASS METHOD	PERMEABILITY, K, CM/SEC (10^{-3} – 10^{-2}) / PERMEABILITY, K, LUGEON (0.10 – 1.00)	DESCRIPTIONS
25/11/89		31										
		32										
		33										
		34								CM	0.11	
		35			GRANITE					CH	0.88	PORPHYRITIC-PHANERITIC TEXTURE, FRESH ROCK, JOINT PLANE ABOUT 40° TO 80° DIPPING (SLICKEN SIDE) COMPOSE OF QUARTZ, NA-FELDSPAR, BIOTITE AND HORNBLENDE
		36								CM		
		37								CH		
		38				GREYISH WHITE				CM		
26/11/89		39								CL	0.12	
		40								CH		
		41										
		42										
		43								CH		
		44										
27/11/89		45										
	-22.0		23.0							CH		45.50
												END OF CORING

BOREHOLE LOG — Khlong Katha

PROJECT	PROVINCIAL WATER SUPPLY				SITE	KHLONG KATHA, A KRA THU, PHU KET	
HOLE NO.	KK-3	ELEVATION	25.0 M.	ANGLE	0°	MACHINE	ROTARY ACKER
		DEPTH	38.0 M.	BIT	IMPREGNATED	PUMP	BEAN
		DIAMETER	74 mm.	GW LEVEL	-2.00 M.	ENGINE	VK

BEGUN	20/10/89	SITE ENGINEER	TEERAYUT
COMPLETED	12/11/89	FOREMAN	-
DAYS REQUIRED	16	DRILLER	SIYOM

DATE	ELEVATION	DEPTH	THICKNESS	LOG	TERMINOLOGY	COLOR	RQD / NO. OF CORE	SPT-N / RECOVERY(%)	DRILL SPEED (h/s)	ROCK METHOD / CLASS	PERMEABILITY, K, CM/SEC / LUGEON	DESCRIPTIONS
28/10/89	25.0	0										0.00
		1			(SM)			6				VERY LOOSE TO LOOSE SILTY FINE SAND, LI-BROWN
	22.5	2	2.5					2				2.50
		3						2				VERY LOOSE CLAYEY FINE SAND LI-BROWN
		4			(SC)			2				
	19.5	5	3.0					3				5.50
29/10/89		6										COMPLETELY WEATHERED GRANITE LI-BROWN AND YELLOWISH BROWN
		7			(SM)			22				
	17.0	8	2.5					50/4				7.02
30		9				GREYISH PINK				CM		PORPHYSITIC TEXTURE, COMPOSED OF QUARTZ, K-FELDSPAR, HORNBLENDE
		10										9.00
31/10/89		11								CH		
		12										
		13										
4/11/89		14										
		15								CM		
6/11/89		16			GRANITE							PORPHYSITIC PHANESITIC TEXTURE, FRESH ROCK, JOINT PLANE ABOUT 30°-70° DIPPING, COMPOSED OF QUARTZ, CA-FELDSPAR, BIOTITE AND HORNBLENDE
		17								CH		
10/11/89		18										
		19								CM		
		20										
		21								CH		
		22										
		23								CM		
		24								CH		
		25								CM		
11/11/89		26										
		27								CH		
		28										
		29								CL		
		30				GREY				CH		

BOREHOLE LOG

Khlong Katha

PROJECT	PROVINCIAL WATER SUPPLY					SITE	KHLONG KATHA, A. KRA THU, PHU KET		
HOLE NO.	KK-3	ELEVATION	25.0 M.	ANGLE	0°	MACHINE	ROTARY ACKER	BEGUN	28/10/89
		DEPTH	38.0 M.	BIT	IMPREGNATED	PUMP	BEAN	COMPLETED	12/11/89
		DIAMETER	74 mm.	GW LEVEL	-2.00 M.	ENGINE	VM	DAYS REQUIRED	16

SITE ENGINEER: TEERAYUT
FOREMAN: -
DRILLER: NIYOM

DATE	ELEVAT'N	DEPTH	THICK'S	LOG	TERMINOLY	COLOR	ROD (10 20 30 40) / NO. OF CORE (10 20 30 40)	SPT-N (10 20 30 40) / RECOVERY(%) (20 40 60 80)	DRILL SPEED (h/m) 1 2	ROCK METHOD / ROCK CLASS	PERMEABILITY, K, CM/SEC (10^{-3} 10^{-2}) / PERMEABILITY, K, LUGEON (0.10 1.00)	DESCRIPTIONS
11/11/89		31								CH		
		32									0.8	
		33			GRANITE							PORPHYSITIC-PHANESITIC TEXTURE FRESH ROCK, JOINT PLANE ABOUT 40°-70° COMPOSED OF QUARTZ, CA-FELDSPAR, BIOTITE AND HORNBLENDE
		34										
12/11/89		35				GREY				CM		
		36								CH	0.19	
		37								CM		
	-13.0	38	30.0							CH		38.00
												END OF CORING