

## 5. SLOP INVESTIGATION RESULTS

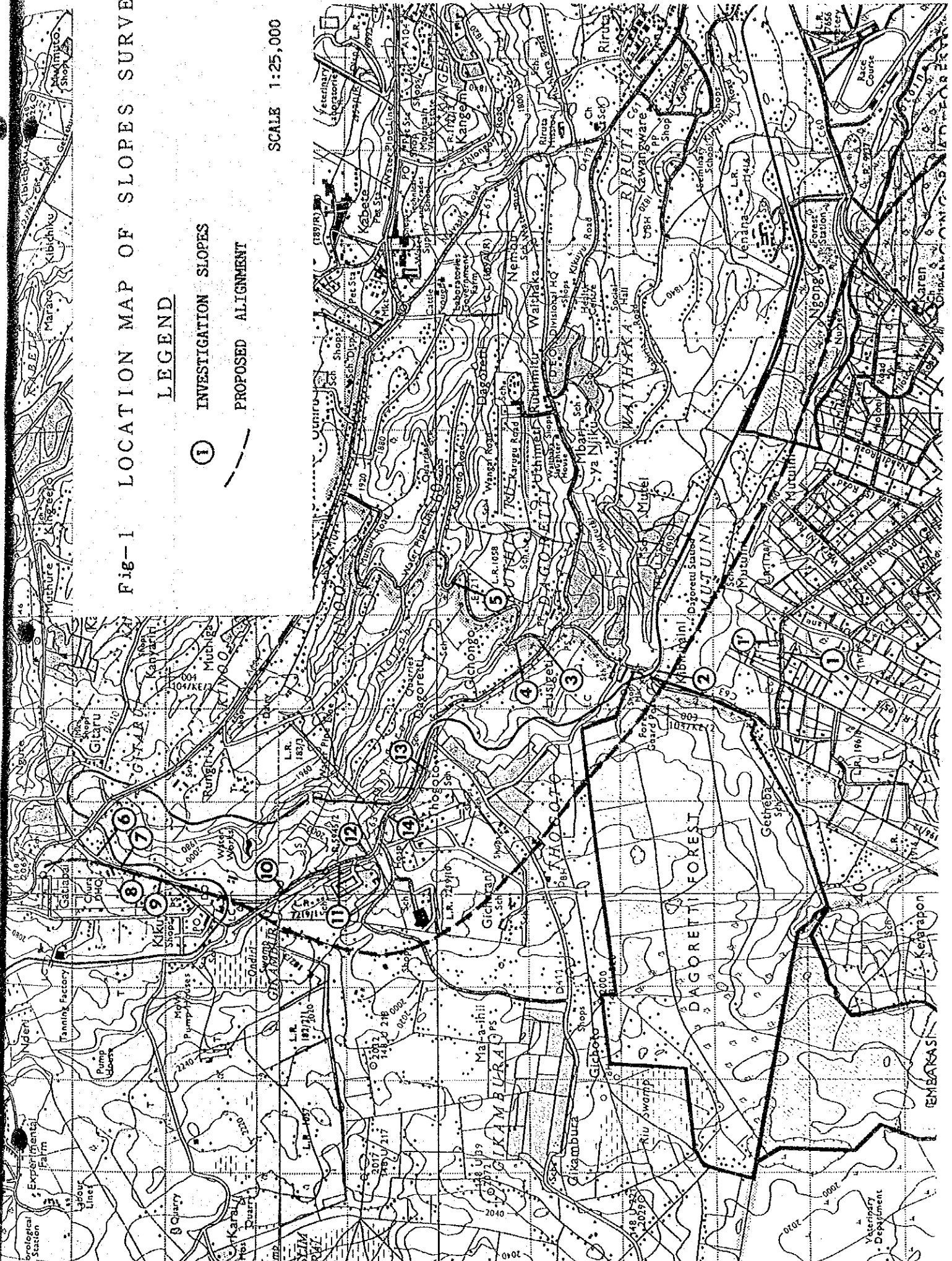


Fig-1 LOCATION MAP OF SLOPES SURVEY

LEGEND

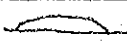
- ① INVESTIGATION SLOPES
- - - PROPOSED ALIGNMENT

SCALE 1:25,000

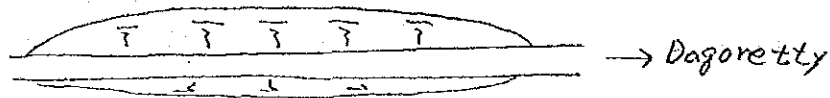




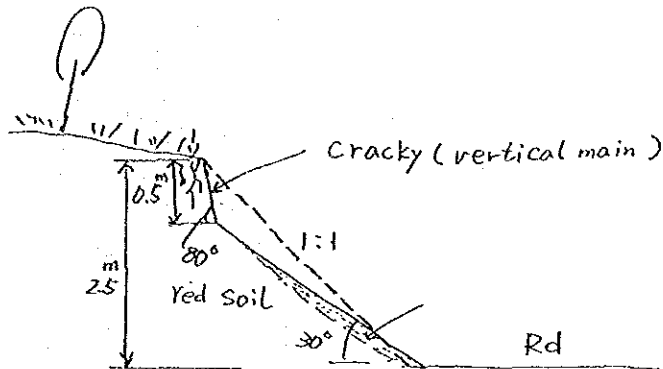
## CUTTING INVESTIGATION CARD

No	1	ROAD NAME	Dagoretti Rd		DATE	26th Jun 1990
PLACE	Mutuini		LANE	UP / <del>DOWN</del>	RECORDER	Y. Inagaki
SHAPE		DIRECTION	N		EXTENSION	50 m
LAND USE OF BACK	garden		TOPOGRAPHY OF BACK		flat	
VEGETATION OF BACK	grass and some trees					
PROTECTION	none					
DRAINAGE	none		SPRING	none		
GEOLOGY	red soil					
SLOPE FAILURE	erosion					

A PLAN

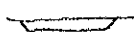
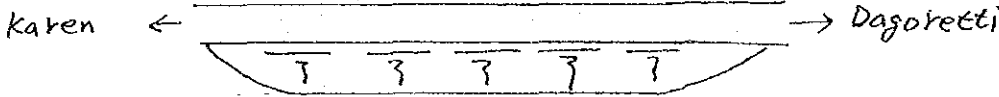
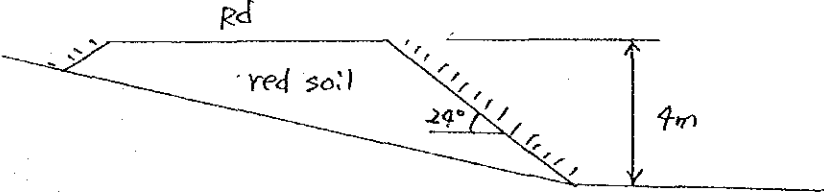


CROSS SECTION






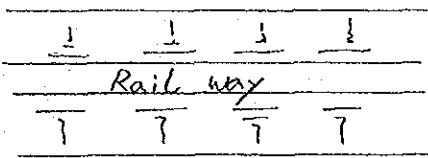
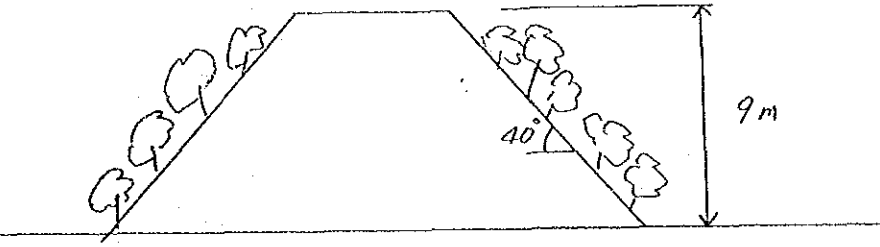
## BANK INVESTIGATION CARD

No	1*	ROAD NAME	Dagoretti Rd		DATE	26th Jun 1990
PLACE	Mutuini	LANE	UP / <del>DOWN</del>	RECORDER	Y. Inagaki	
SHAPE		DERECTION	N	EXTENSION	≈ 300 m	
LAND USE OF FOOT	Maize Farm	TOPOGRAPHY OF FOOT	Flat area			
GEOLOGY OF FOOT	red soil					
PROTECTION	soding					
DRAINAGE	none	SPRING	none			
ENBANKMENT MATERIAL	red soil					
SLOPE FAILURE	none					
A PLAN						
						
CROSS SECTION						
						





## BANK INVESTIGATION CARD

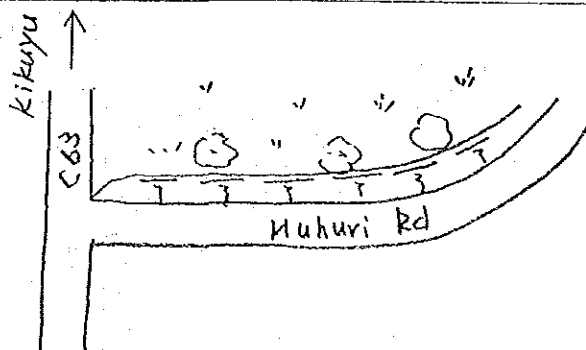
No	2	ROAD NAME	Dagoretti Rd		DATE	26th Jun 1990
PLACE	Kibiriraini Rail Way		LANE	<del>UP</del> / <del>DOWN</del>	RECORDER	Y. Inagaki
SHAPE		DERECTION	S		EXTENSION	∞ m
LAND USE OF FOOT	Farm		TOPOGRAPHY OF FOOT	Flat		
GEOLOGY OF FOOT	Black cotton soil and Alluvium clay					
PROTECTION	none (bush)					
DRAINAGE	none		SPRING	none		
EMBANKMENT MATERIAL	red soil					
SLOPE FAILURE	erosion in some places					
A PLAN						
						
CROSS SECTION						
						



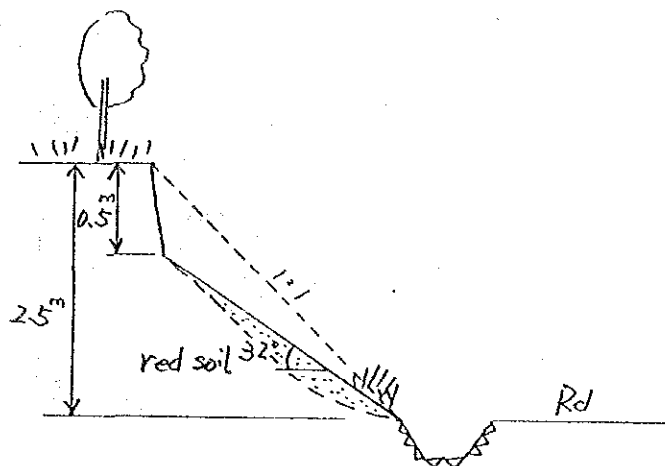
## CUTTING INVESTIGATION CARD

No	3	ROAD NAME	Muhuri Rd		DATE	26th Jun 1990	
PLACE	Dagoretti/Kikuyu		LANE	UP / DOWN	RECORDER	Y. Inagaki	
SHAPE		DIRECTION	S 40 E		EXTENSION	50 m	
LAND USE OF BACK	Agriculture		TOPOGRAPHY OF BACK		flaty hill		
VEGETATION OF BACK	grass and wattle trees						
PROTECTION	none						
DRAINAGE	none		SPRING	none			
GEOLOGY	red soil						
SLOPE FAILURE	erosion						

A PLAN

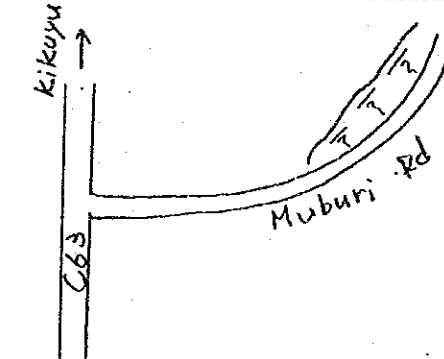
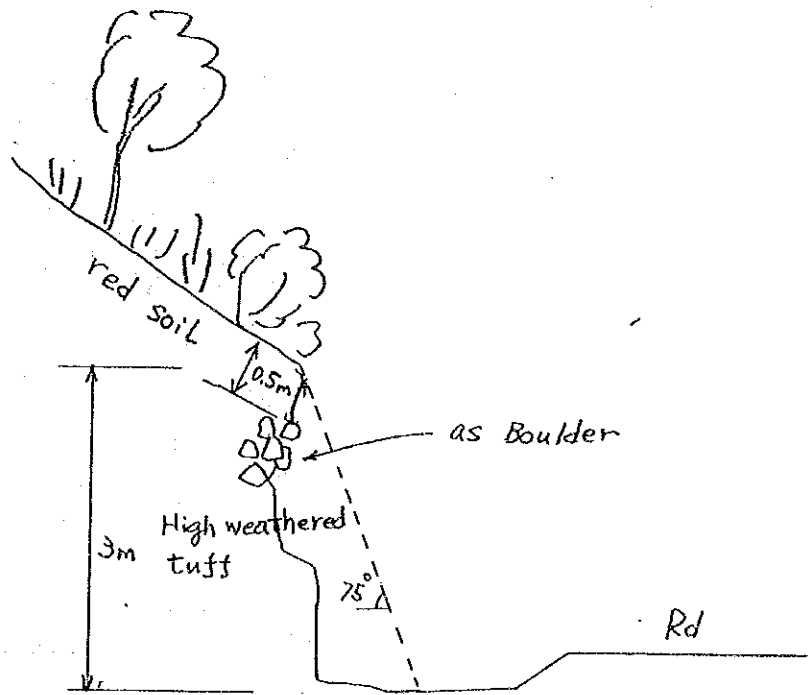


CROSS SECTION





## CUTTING INVESTIGATION CARD

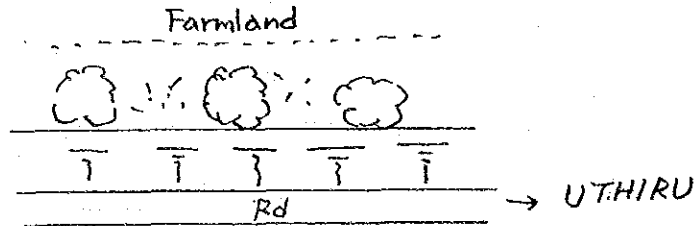
No	4	ROAD NAME	Muburi Rd		DATE	26th Jun 1990	
PLACE	Dagoretti/Kikuyu		LANE	UP / <del>DOWN</del>	RECORDER	Y. Inagaki	
SHAPE		DERECTION	S60° W		EXTENSION	50 m	
LAND USE OF BACK	Farmland		TOPOGRAPHY OF BACK	Gently Slope			
VEGETATION OF BACK	Weeds and Farming						
PROTECTION	none						
DRAINAGE	none		SPRING	none			
GEOLOGY	High weathered tuff						
SLOPE FAILURE	surface failure						
A PLAN							
							
CROSS SECTION							
							



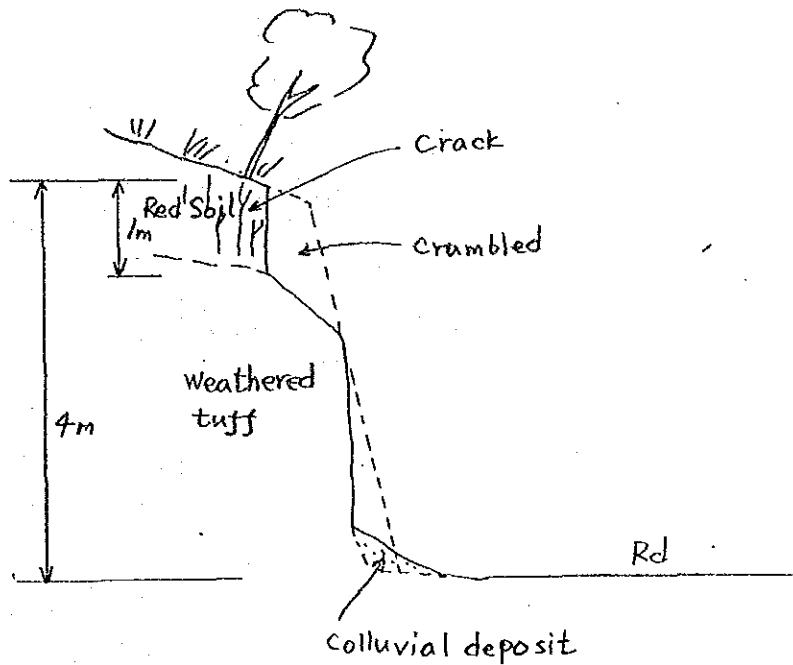
## CUTTING INVESTIGATION CARD

No	5	ROAD NAME	Muhuri Rd		DATE	26th Jun 1990
PLACE	Dagoretti		LANE	UP / <del>DOWN</del>	RECORDER	Y. Inagaki
SHAPE		DIRECTION	N10° E		EXTENSION	50 m
LAND USE OF BACK	Farmland		TOPOGRAPHY OF BACK		Gently Slope	
VEGETATION OF BACK	wattle trees and weeds					
PROTECTION	none					
DRAINAGE	none		SPRING	none		
GEOLOGY	High weathered tuff					
SLOPE FAILURE	surface failure					

### A PLAN



### CROSS SECTION



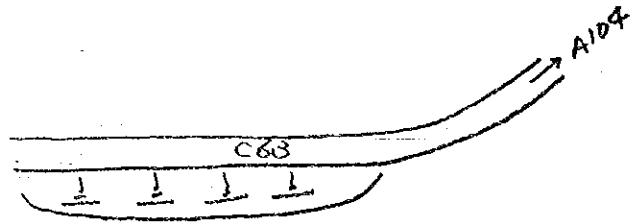




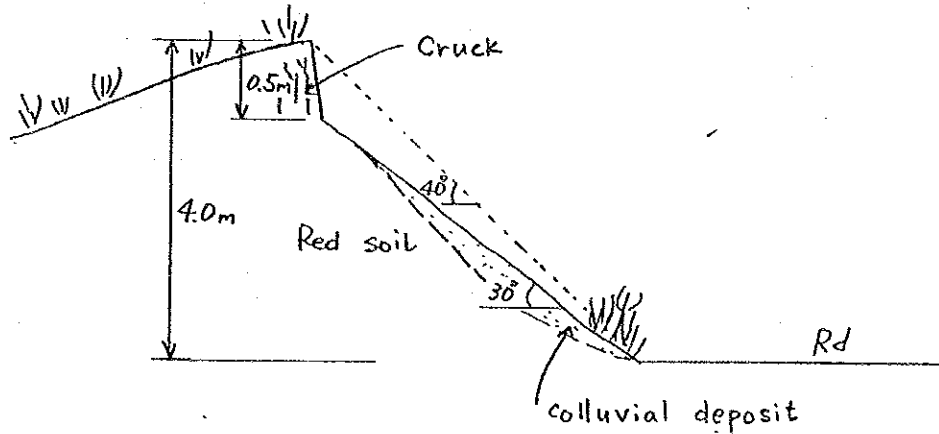
## CUTTING INVESTIGATION CARD

No	6	ROAD NAME	C63		DATE	26th Jun 1990
PLACE	Kikuyu		LANE	UP / <del>DOWN</del>	RECORDER	Y. Inagaki
SHAPE		DIRECTION	N		EXTENSION	m
LAND USE OF BACK	Farmland		TOPOGRAPHY OF BACK	Gently Slope		
VEGETATION OF BACK	nappier grass					
PROTECTION	none					
DRAINAGE	none		SPRING	none		
GEOLOGY	red soil					
SLOPE FAILURE	erosion					

### A PLAN



### CROSS SECTION

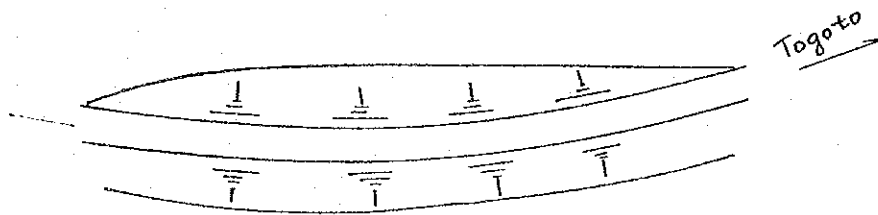




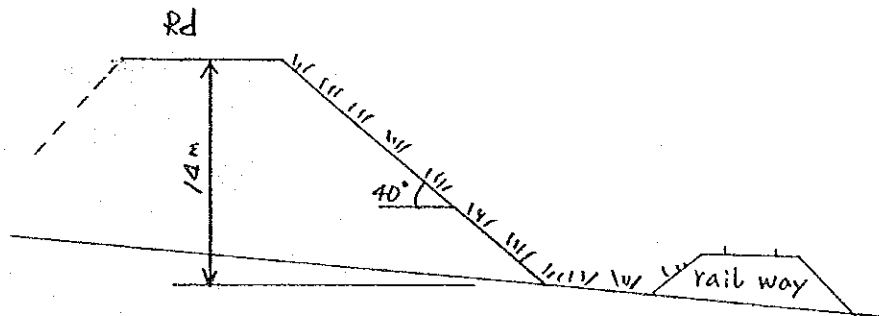
## BANK INVESTIGATION CARD

No	7	ROAD NAME	C63 Rd		DATE	26th Jun 1990
PLACE		LANE	UP / <del>DOWN</del>	RECORDER	Y. Inagaki	
SHAPE		DERECTION	N80° W	EXTENSION	100 m	
LAND USE OF FOOT	corn field		TOPOGRAPHY OF FOOT			
GEOLOGY OF FOOT	red soil					
PROTECTION	grass					
DRAINAGE	none		SPRING	none		
EMBANKMENT MATERIAL	red soil					
SLOPE FAILURE	none					

### A PLAN



### CROSS SECTION





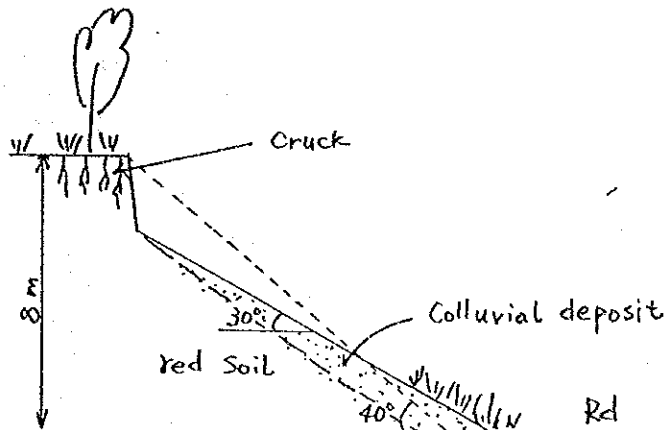
### CUTTING INVESTIGATION CARD

No	8	ROAD NAME	C63		DATE	26th Jun 1990
PLACE		LANE	# / DOWN	RECORDBR	Y. Inagaki	
SHAPE		DERECTION	S75° E	EXTENSION	m	
LAND USE OF BACK	agriculture		TOPOGRAPHY OF BACK			
VEGETATION OF BACK	nappier grass					
PROTECTION	none					
DRAINAGE	none		SPRING	none		
GEOLOGY	red soil					
SLOPE FAILURE	erosion					

**A PLAN**



**CROSS SECTION**

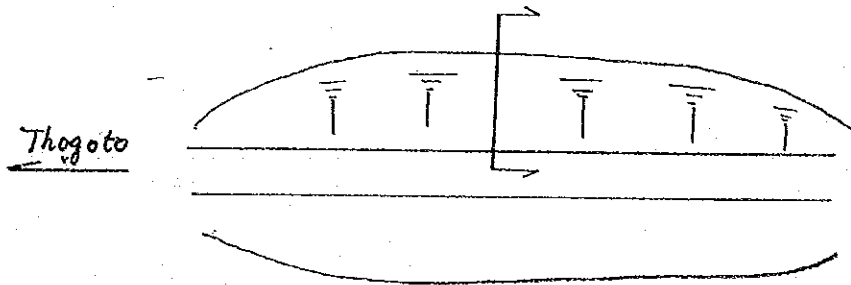




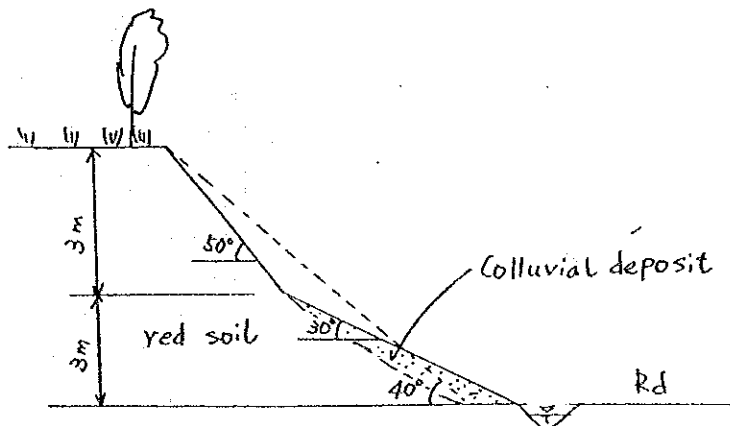
## CUTTING INVESTIGATION CARD

No	9	ROAD NAME	C63		DATE	28th Jun 1990
PLACE		LANE	UP / <del>DOWN</del>	RECORDER	Y. Inagaki	
SHAPE		DERECTION	N75° E	EXTENSION	300 m	
LAND USE OF BACK	agriculture		TOPOGRAPHY OF BACK			
VEGETATION OF BACK	maize farm					
PROTECTION	grass					
DRAINAGE	none		SPRING	none		
GEOLOGY	red soil					
SLOPE FAILURE	erosion					

### A PLAN



### CROSS SECTION



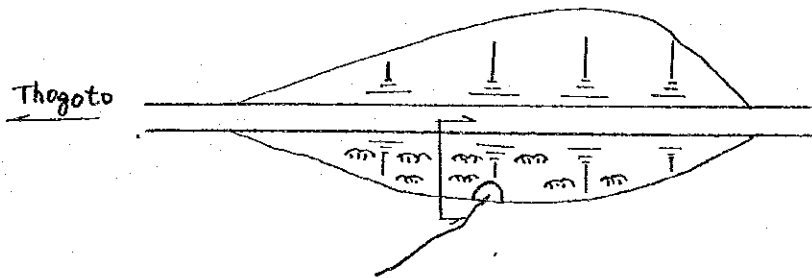




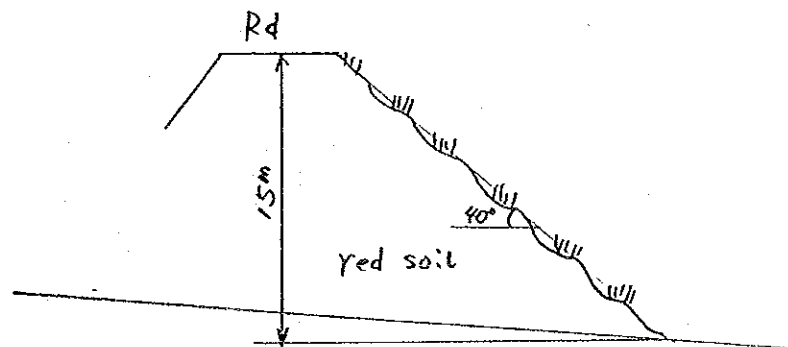
## BANK INVESTIGATION CARD

No	10	ROAD NAME	C63		DATE	28th Jun 1990
PLACE	Alliance high school		LANE	# / DOWN	RECORDER	Y. Inagaki
SHAPE		DIRECTION	N80° E		EXTENSION	m
LAND USE OF FOOT	waste land		TOPOGRAPHY OF FOOT	valley		
GEOLOGY OF FOOT	alluvium soil and trachyte					
PROTECTION	grass					
DRAINAGE	none		SPRING	none		
EMBANKMENT MATERIAL	red soil and gravel					
SLOPE FAILURE	surface small failure					

### A PLAN



### CROSS SECTION

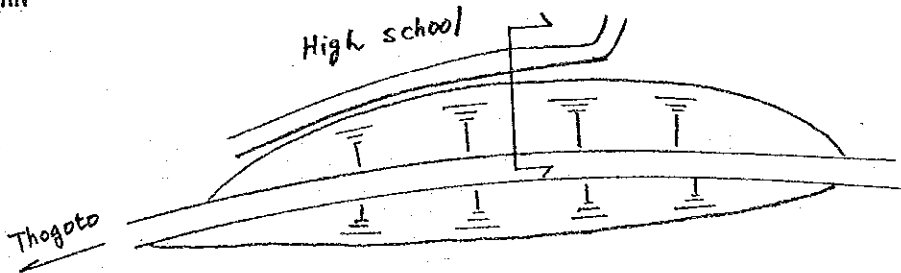




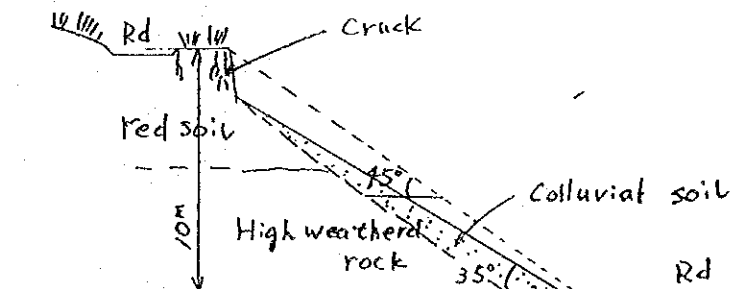
## CUTTING INVESTIGATION CARD

No	11	ROAD NAME	C63		DATE	28th Jun 1990
PLACE	Alliance high school		LANE	UP / <del>DOWN</del>	RECORDER	Y. Inagaki
SHAPE		DIRECTION	N80° E		EXTENSION	200 m
LAND USE OF BACK	road		TOPOGRAPHY OF BACK			
VEGETATION OF BACK	maize grass					
PROTECTION	grass					
DRAINAGE	none		SPRING	none		
GEOLOGY	red soil and high weathered rock					
SLOPE FAILURE	erosion					

### A PLAN



### CROSS SECTION

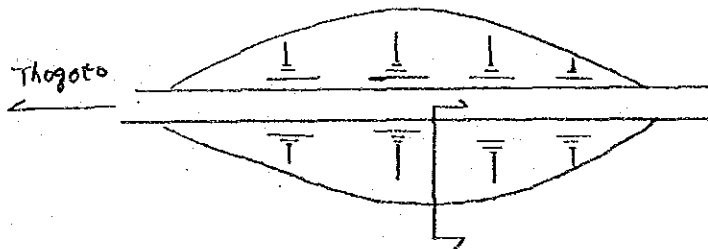




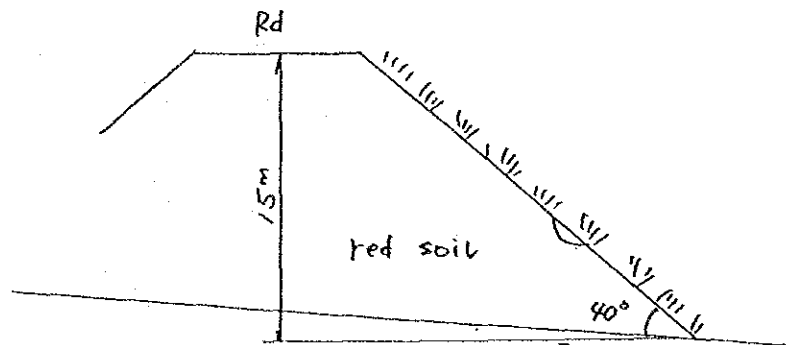
# BANK INVESTIGATION CARD

No	12	ROAD NAME	C63		DATE	28th Jun 1990
PLACE	Alliance high school	LANE	UP / DOWN	RECORDER	Y. Inagaki	
SHAPE		DERECTION	N50° E	EXTENSION	200 m	
LAND USE OF FOOT	agriculture	TOPOGRAPHY OF FOOT	valley			
GEOLOGY OF FOOT	alluvium soil					
PROTECTION	grass					
DRAINAGE	none	SPRING	none			
EMBANKMENT MATERIAL	red soil with gravels					
SLOPE FAILURE	surface small failure in some places					

**A PLAN**



**CROSS SECTION**

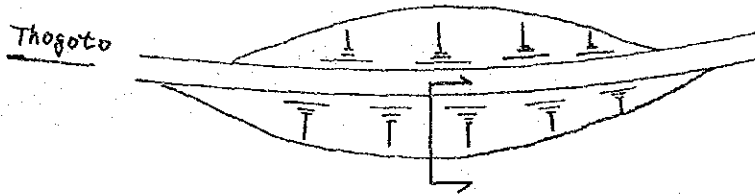




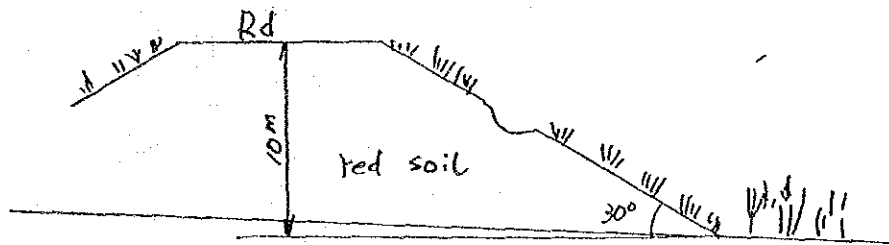
## CUTTING INVESTIGATION CARD

No	13	ROAD NAME	C63		DATE	28th Jun 1990
PLACE		LANE	UP / DOWN	RECORDER	Y. Inagaki	
SHAPE		DIRECTION	N30E	EXTENSION	200 m	
LAND USE OF BACK	agriculture		TOPOGRAPHY OF BACK	valley		
VEGETATION OF BACK	maize grass					
PROTECTION	grass					
DRAINAGE	none		SPRING	none		
GEOLOGY	red soil with gravels					
SLOPE FAILURE	surface small failure in some place					

### A PLAN



### CROSS SECTION



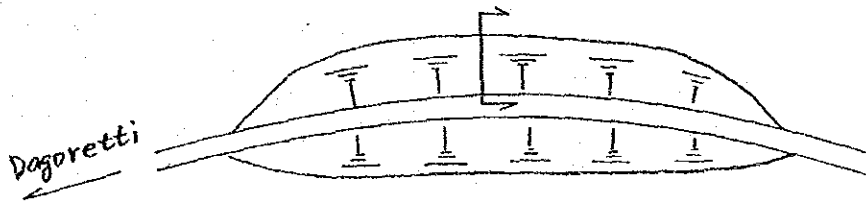




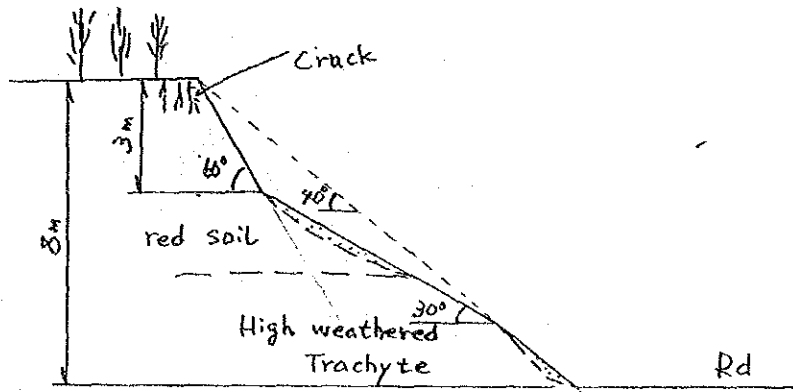
## CUTTING INVESTIGATION CARD

No	14	ROAD NAME	C63		DATE	28th Jun 1990
PLACE		LANE	# / DOWN	RECORDER	Y. Inagaki	
SHAPE		DIRECTION	N35° E	EXTENSION	200 m	
LAND USE OF BACK	agriculture		TOPOGRAPHY OF BACK			
VEGETATION OF BACK	maize farm					
PROTECTION	grass					
DRAINAGE	none		SPRING	none		
GEOLOGY	red soil and high weathered trachyte					
SLOPE FAILURE	erosion					

### A PLAN



### CROSS SECTION

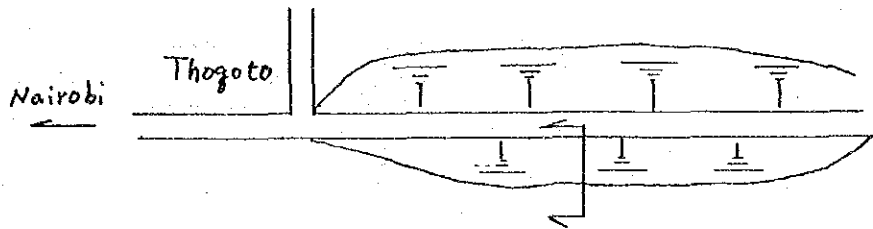




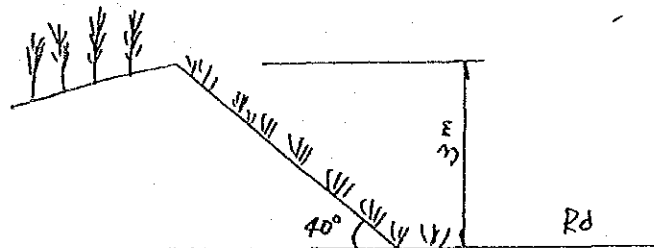
# CUTTING INVESTIGATION CARD

No	15	ROAD NAME	C63		DATE	19th July 1990
PLACE	Thogoto		LANE	UP / <del>DOWN</del>	RECORDER	Y. Inagaki
SHAPE		DERECTION	S 20° W	EXTENSION	150 m	
LAND USE OF BACK	agriculture		TOPOGRAPHY OF BACK	flaty hill		
VEGETATION OF BACK	maize					
PROTECTION	grass					
DRAINAGE	none		SPRING	none		
GEOLOGY	red soil					
SLOPE FAILURE	none					

**A PLAN**



**CROSS SECTION**

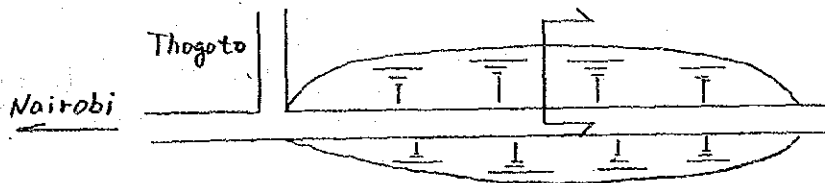




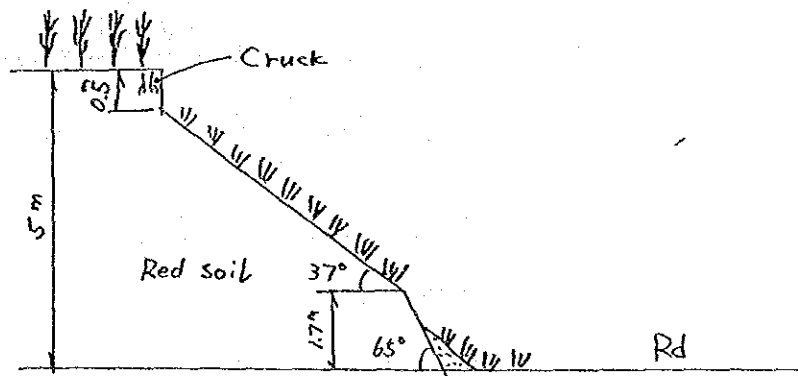
## CUTTING INVESTIGATION CARD

No	16	ROAD NAME	C63		DATE	19th July 1990
PLACE	Thogoto		LANE	UP / DOWN	RECORDER	Y. Inagaki
SHAPE		DERECTION	N30° E		EXTENSION	150 m
LAND USE OF BACK	agriculture		TOPOGRAPHY OF BACK	flaty hill		
VEGETATION OF BACK	maize					
PROTECTION	grass					
DRAINAGE	none		SPRING	none		
GEOLOGY	red soil					
SLOPE FAILURE	erosion in some place					

### A PLAN



### CROSS SECTION

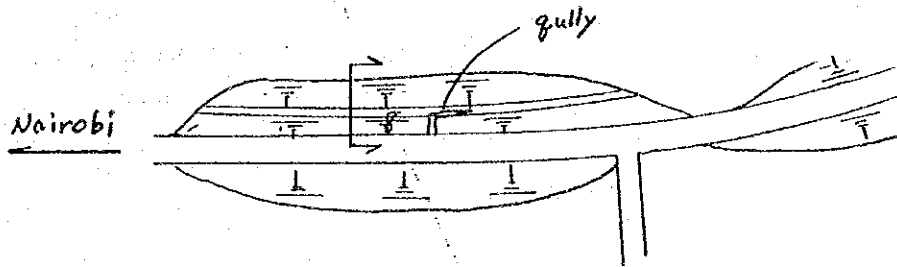




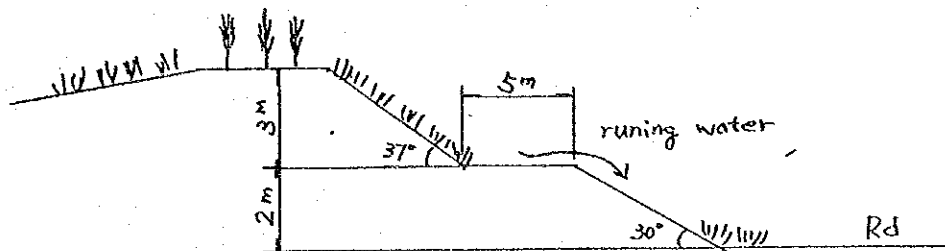
## CUTTING INVESTIGATION CARD

No	17	ROAD NAME	C63		DATE	19th July 1990
PLACE	Gchongo		LANE	# / DOWN	RECORDER	Y. Inagaki
SHAPE		DERECTION	N40° E	EXTENSION	200 m	
LAND USE OF BACK	agriculture		TOPOGRAPHY OF BACK			
VEGETATION OF BACK	maize and grass					
PROTECTION	grass					
DRAINAGE	none		SPRING	none		
GEOLOGY	red soil					
SLOPE FAILURE	gully erosion					

### A PLAN



### CROSS SECTION







## CUTTING INVESTIGATION CARD

No	18	ROAD NAME	C63		DATE	19th July 1990
PLACE	Dagoretti town	LANE	# / DOWN	RECORDER	Y. Inagaki	
SHAPE		DIRECTION	N40° E	EXTENSION	200 m	
LAND USE OF BACK	hospital	TOPOGRAPHY OF BACK	flaty hill			
VEGETATION OF BACK	grass					
PROTECTION	grass					
DRAINAGE	none	SPRING	none			
GEOLOGY	red soil					
SLOPE FAILURE	none					
A PLAN						
CROSS SECTION						



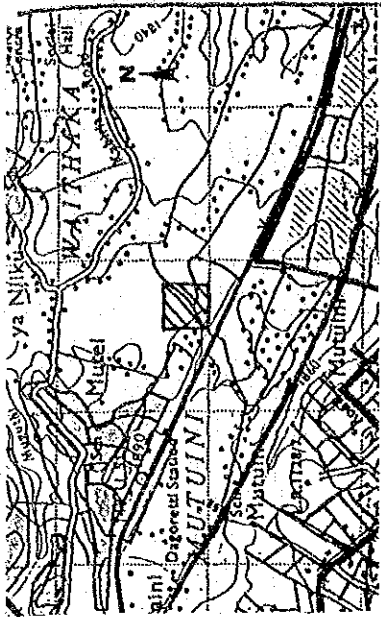




**6. GRAVEL MATERIAL SITE INVESTIGATION RESULTS**



KIRIBA SITE



Scale 1:50,000 TO DAGORETI

RAILWAY

POWER LINE  
RAILWAY

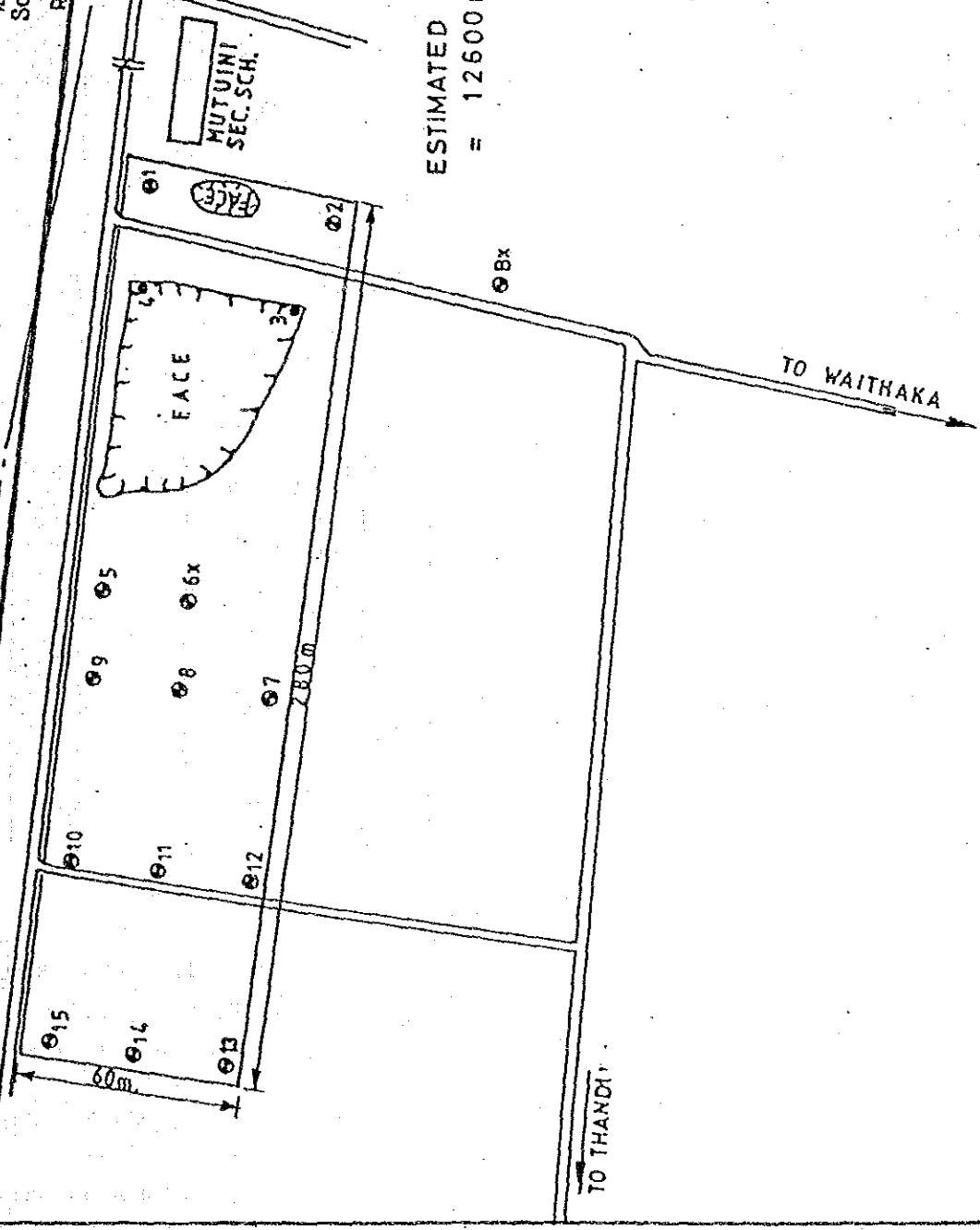
MUTUINI  
SEC. SCH.

ESTIMATED QUANTITY  
= 12600 m<sup>3</sup>



LEGEND

- ⊙ TRIAL HOLE
- RAIL LINE
- POWER LINE
- B x 6x HOLES WITHOUT MURRAM
- ⊙ 4 POINTS ON FACE

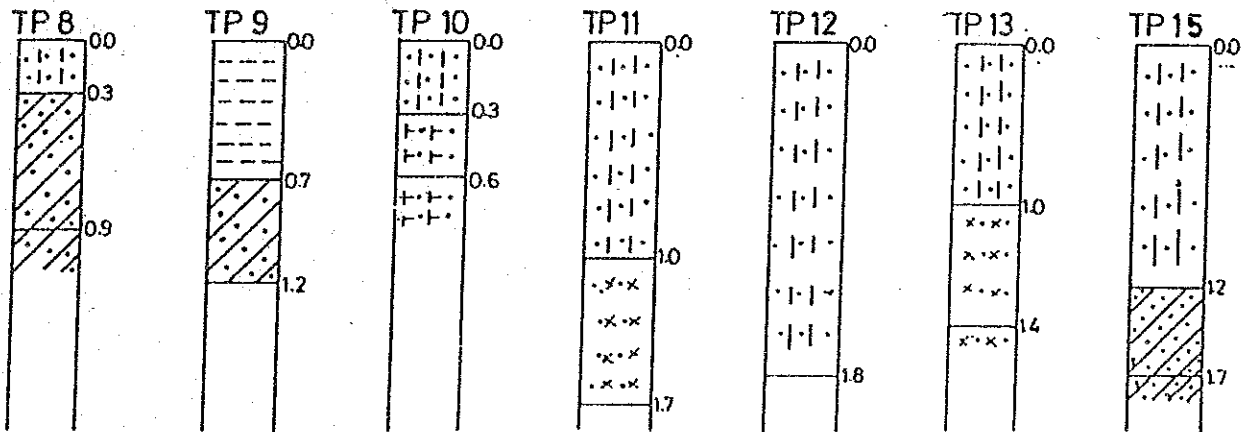
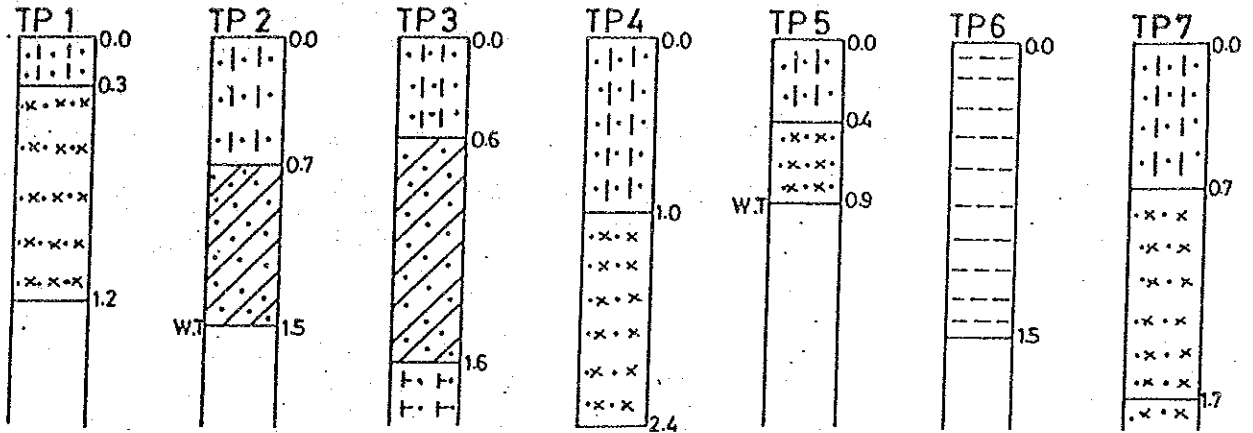







Scale = 1:2000





# GRAVEL MATERIAL SITE No.10 - KIRIBA



-  DARK BROWN SOIL
-  GREY BLACK GRAVEL
-  STIFF GRAVEL
-  BLACK COTTON SOIL
-  BLACK BROWN GRAVEL



KIRIBA GRAVEL QUARRY

<u>HOLE NO.</u>	<u>DEPTH (M)</u>	<u>DESCRIPTION</u>
1	0. - 0.3	Dark brown soil
	0.3 - 1.2 <sup>+</sup>	Black brown gravel
2	0. - 0.7	Dark brown soil
	0.7 - 1.5	Grey black gravel
	1.5 <sup>+</sup> -	Water table level
3	0 - 0.6	Dark brown soil
	0.6 - 1.6	Grey black gravel
	1.6 <sup>+</sup>	Compact murram
4	0 - 1.0	Dark brown soil
	1.0 - 2.4	Black brown gravel
5	0 - 0.4	Dark brown soil
	0.4 - 0.9	Black brown gravel
	0.9 <sup>+</sup>	Water table level
6	0 - 1.5	Black cotton soil
7	0 - 0.7	Dark brown soil
	0.7 - 1.7 <sup>+</sup>	Black brown gravel
8	0 - 0.3	Dark brown soil
	0.3 - 0.9	Grey black gravel
9	0 - 0.7	Black cotton soil
	0.7 - 1.2	Grey black gravel
10	0 - 0.3	Dark brown soil
	0.3 - 0.6 <sup>+</sup>	Stiff gravel



HOLE NO.	DEPTH (M)	DESCRIPTION
11	0 - 1.0 1.0 - 1.7 <sup>+</sup>	Dark brown soil Black brown gravel
12	0 - 0.8	Dark brown soil
13	0 - 1.0 1.0 - 1.4 <sup>+</sup>	Dark brown soil Black brown gravel
15	0 - 1.2 1.2 - 1.7 <sup>+</sup>	Dark brown soil Grey black gravel



KIRIJA MATERIAL SITE

Partly an old site with New extension.

Quantity estimate

Area = 12600m<sup>2</sup>

Average thickness of gravel = 1m

Volume = 12600m<sup>3</sup>

The old quarry was exploited by individuals for house construction. It is out of use and water lodged.

Ownership - The old quarry is Government owned. While the extension is private.

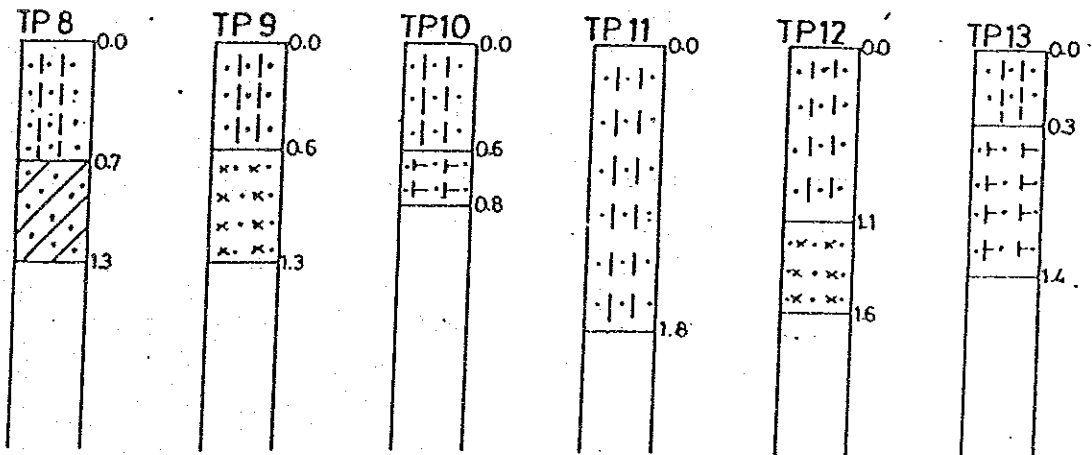
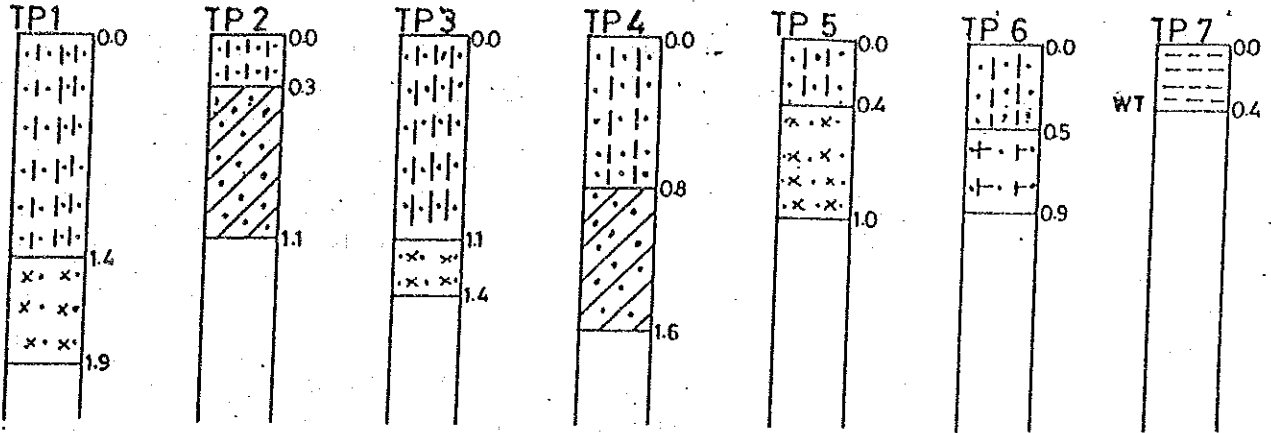











# GRAVEL MATERIAL SITE No.9 - THANDI




 DARK BROWN SOIL

 BLACK BROWN GRAVEL

 GREY BLACK GRAVEL

 STIFF GRAVEL

 BLACK COTTON SOIL



THANDI MATERIAL SITE - LOGGING DETAILS

HOLE NO.	DEPTH (M)	DESCRIPTION
1	0 - 1.4	Dark brown soil
	1.4 - 1.9	Black Brown gravel
2	0 - 0.3	Dark brown soil
	0.3 - 1.1	Grey black gravel
3	0 - 1.10	Dark brown soil
	1.1 - 1.40	Black Brown gravel
4.	0 - 0.8	Dark brown soil
	0.8 - 1.6	Grey black gravel
5	0 - 0.4	Dark brown soil
	0.4 - 1.0	Black Brown gravel
	0 - 0.5	Dark brown soil
	0.5 - 0.8	Stiff gravel
	0.8 - 0.9	Gravel with clay
7	0 - 0.4	Black cotton soil
	0.4	Water table level
8	0 - 0.7	Dark brown soil
	0.7 - 1.3	Grey black gravel
	1.3	Water table level
9	0 - 0.6	Dark brown soil
	0.6 - 1.3	Black Brown gravel



HOLE NO.	DEPTH(M)	DESCRIPTION
10	0 - 0.6	Dark brown soil
	0.6 - 0.8	Stiff gravel
11	0 - 1.8	Dark Brown soil
12	0 - 1.1	Dark brown soil
	1.1 - 1.6	Black Brown gravel
13	0 - 0.3	Dark brown soil
	0.3 - 1.4	Stiff gravel
A	0 - 2.0 <sup>+</sup>	Dark brown soil
B	0 - 2.0 <sup>+</sup>	Dark brown soil
C	0 - 1.0	Black cotton soil
	1.0	Water table level
D	0 - 0.9	Black cotton soil
E	0 - 1.5 <sup>+</sup>	Black cotton soil
F	0 - 1.5 <sup>+</sup>	Black cotton soil
G	0 - 1.5 <sup>+</sup>	Black cotton soil
H	0 - 1.5 <sup>+</sup>	Black cotton soil





### THANDI MATERIAL SITE

It is largely a new site.

#### Quantity Estimate

Area = 9220

Average thickness of gravel = 0.6m

Volume = 5530

The quarry next to the proposed new site was exploited by Kiambu County Council for a road construction.

#### Lease / sell of plots

Plot owners are willing to lease their plots provided they will be backfilled preferably with borrow materials.

#### Future Development

No immediate development plans.



# DAGORETTI SITE



TO NAIROBI

TO KIKUYU

DAGORETTI MARKET

RAIL STATION

TO MUTUINI SEC. SCH.

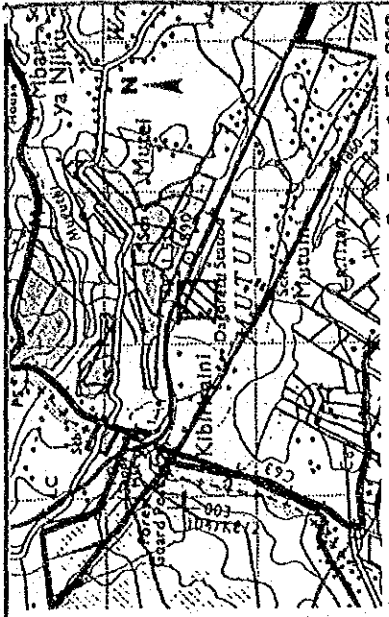
TO MUTUINI PRI. SCH.

TO KAREN

MUSA GITAU FARM EXPLOITED SITE

MUTUINI PRI. SCH.

ESTIMATED QUANTITY  
= 6480 m<sup>3</sup>



Scale 1:50,000

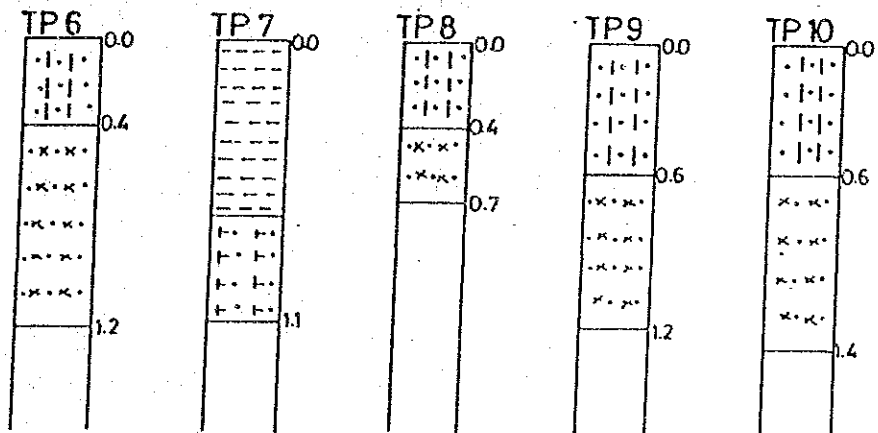
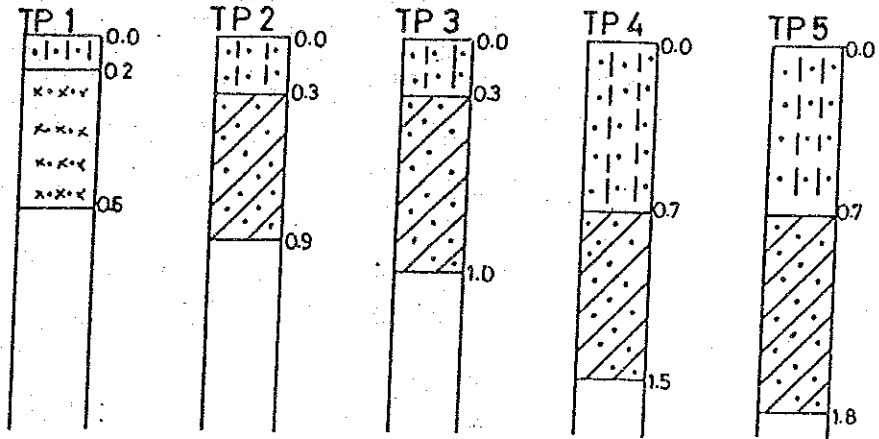
## LEGEND

- RAIL LINE
- TRIAL HOLE
- HOMESTEAD
- SITE BOUNDARY
- ROADS

Scale 1:2000



# GRAVEL MATERIAL SITE No.12 -- DAGORETTI



DARK BROWN SOIL



STIFF GRAVEL



BLACK BROWN GRAVEL



GREY BLACK GRAVEL



BLACK COTTON SOIL



DAGORETTI GRAVEL QUARRY

<u>HOLE NO.</u>	<u>DEPTH (M)</u>	<u>DESCRIPTIONS</u>
1	0 - 0.2	Dark brown soil
	0.2 - 0.6	Black brown gravel
2	0 - 0.3	Dark brown soil
	0.3 - 0.9	Grey-black gravel
3	0 - 0.3	Dark brown soil
	0.3 - 1.0	Grey black gravel
4	0 - 0.7	Dark brown soil
	0.7 - 1.5	Grey gravel
5	0 - 0.7	Dark brown soil
	0.7 - 1.8	Grey gravel
6	0 - 0.4	Dark brown soil
	0.4 - 1.2	Black brown gravel
7	0 - 0.8	Black cotton soil
	0.8 - 1.1	Stiff gravel
8	0 - 0.4	Dark Brown Soil
	0.4 - 0.7	Black brown gravel
9	0 - 0.6	Dark brown soil
	0.6 - 1.2	Black brown gravel
10	0 - 0.6	Dark brown soil
	0.6 - 1.4	





DAGORETTI MATERIAL SITE

It is a new site.

Quantity estimate

Area = 10800 m<sup>2</sup>

Average thickness of gravel = 0.6m

Volume = 6480m<sup>3</sup>

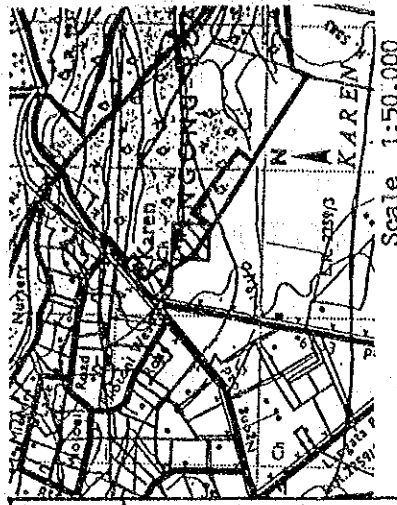
Lease/Sell of plots

Plot owner is willing to lease the plot

Future Development

No immediate development plans.



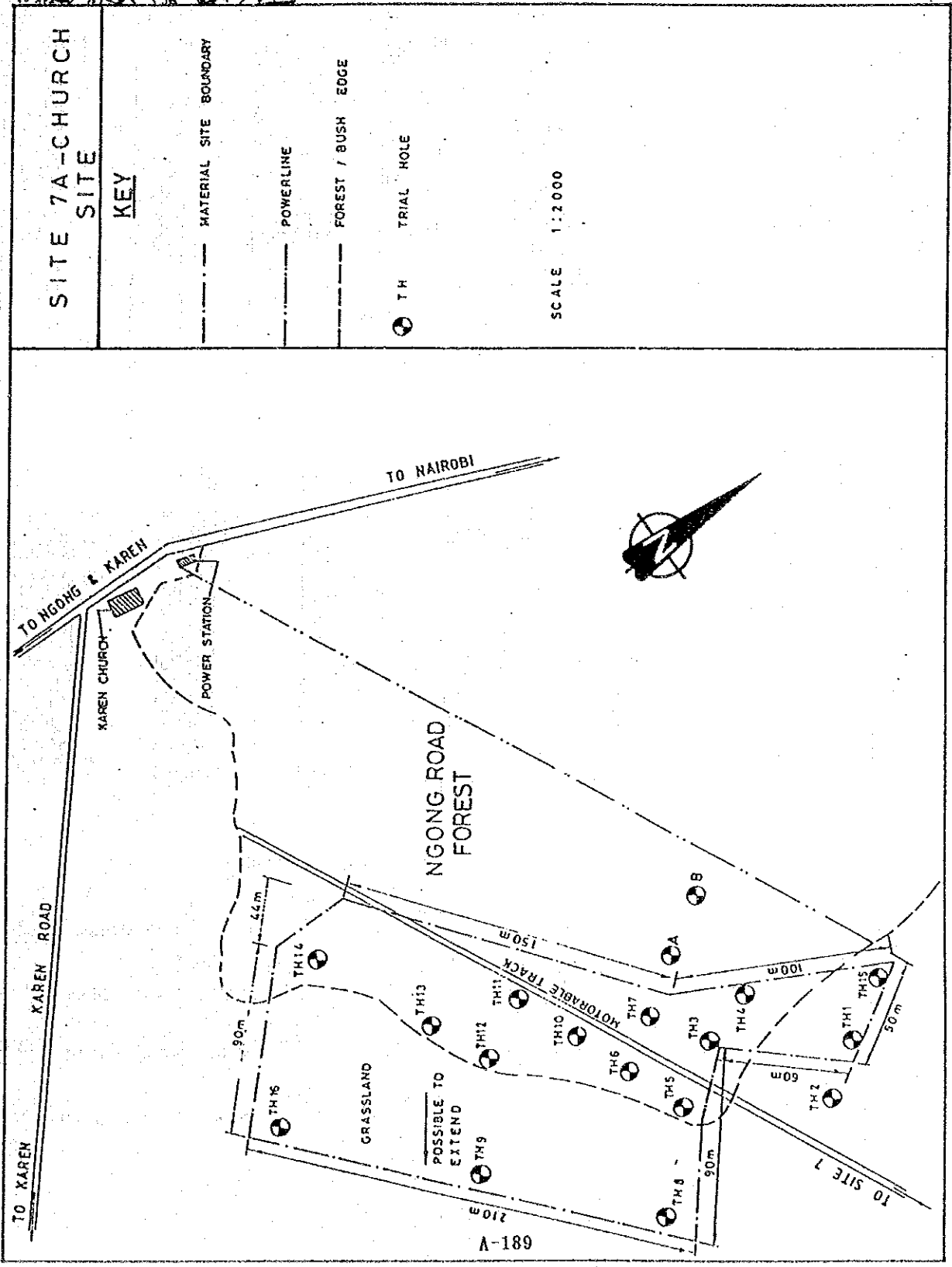


**SITE 7A-CHURCH  
SITE**

**KEY**

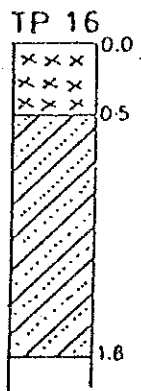
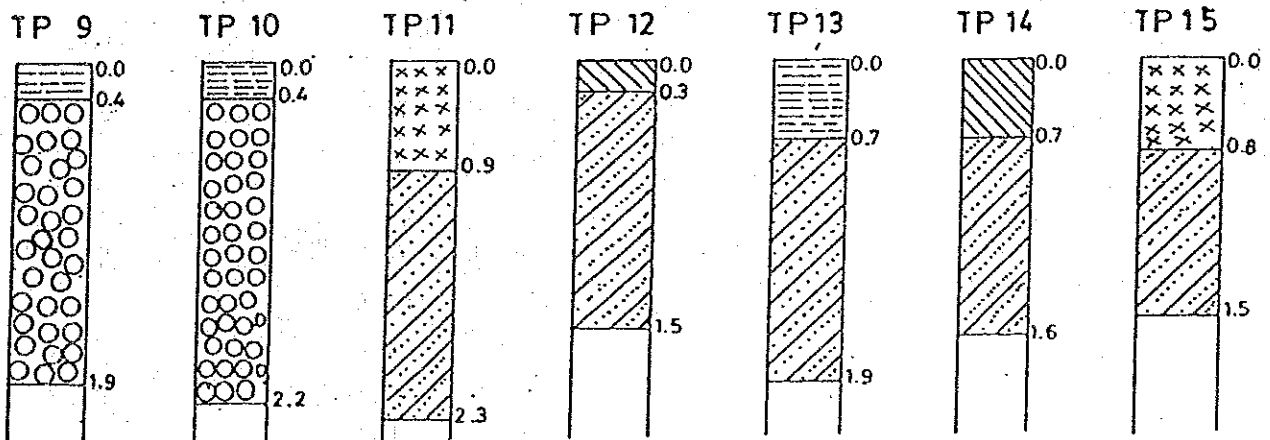
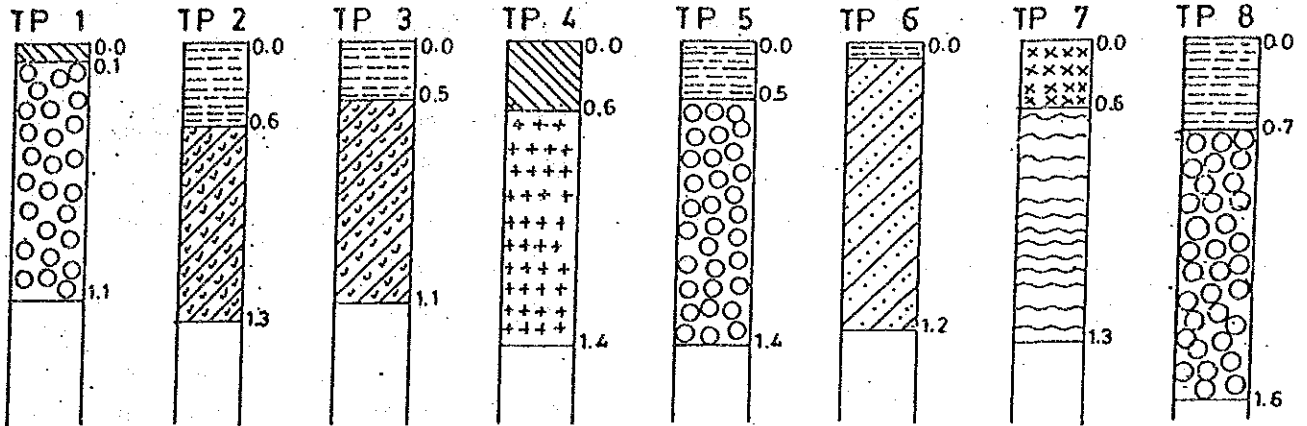
- MATERIAL SITE BOUNDARY
- POWERLINE
- FOREST / BUSH EDGE
- ⊙ TH TRIAL HOLE


SCALE 1:2,000





# GRAVEL MATERIAL SITE No. 7A - CHURCH



-  BROWN SOIL
-  HARD BLACK GRAVEL
-  BLACK BROWN GRAVEL
-  HARD BROWN GRAVEL
-  SOFT BROWN GRAVEL
-  RED SOIL
-  BLACK COTTON SOIL



SITE NO. 7A

CHURCH QUARRY

<u>TRIAL HOLE</u>	<u>DEPTH</u>	<u>DESCRIPTION</u>
1	0.0 - 0.1m 0.10 - 1.1m	Brown Soil Hard Black Murrum
2	0.0 - 0.6m 0.6 - 1.3m	Black cotton soil Yellow soft stone decomposed
3	0.0 - 0.5m 0.5 - 1.1m	Black cotton soil Yellow soft stone decomposed
4	0.0 - 0.6m 0.6 - 1.4m	Brown soil Black-Brown gravel
5	0.0 - 0.5m 0.5 - 1.4m	Black cotton soil Black gravel material
6	0.0 - 0.1m 0.1 - 1.2m	Black cotton soil Hard Brown gravel material
7	0.0 - 0.6m 0.6m - 1.3m	Red soil Hard Brown gravel materials
8	0.0 - 0.7 0.1 - 1.6	Black cotton soil Black gravel
9	0.0 - 0.4 0.4 - 1.9m	Brown soil Hard Brown gravel
10	0.0 - 0.4m 0.40m - 2.2m	Black cotton soil Black gravel
11	0.0 - 0.9m 0.9 - 2.3m	Red soil Hard Brown gravel material





TRIAL HOLE NO.	DEPTH	DESCRIPTION
12	0.0 - 0.3m	Brown soil
	0.3m - 1.5m	Hard Brown gravel material
13	0.0 - 0.7m	Black cotton soil
	0.7 - 1.9m	Hard Brown gravel material
14	0.0 - 0.7m	Brown soil
	0.7 - 1.6m	Hard Brown gravel material
15	0.0 - 0.8m	Red soil
	0.8 - 1.5m	Hard Brown gravel

#### ESTIMATION OF QUANTITY

Area = 22050m<sup>2</sup>

Average overburden = 0.6m

Average Depth of Material = 1.0

Estimated Quantity = 22050

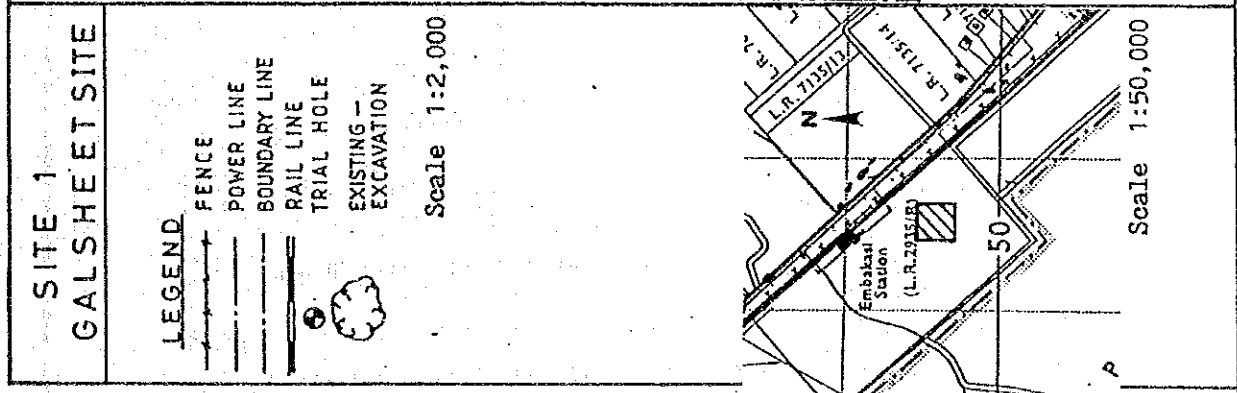
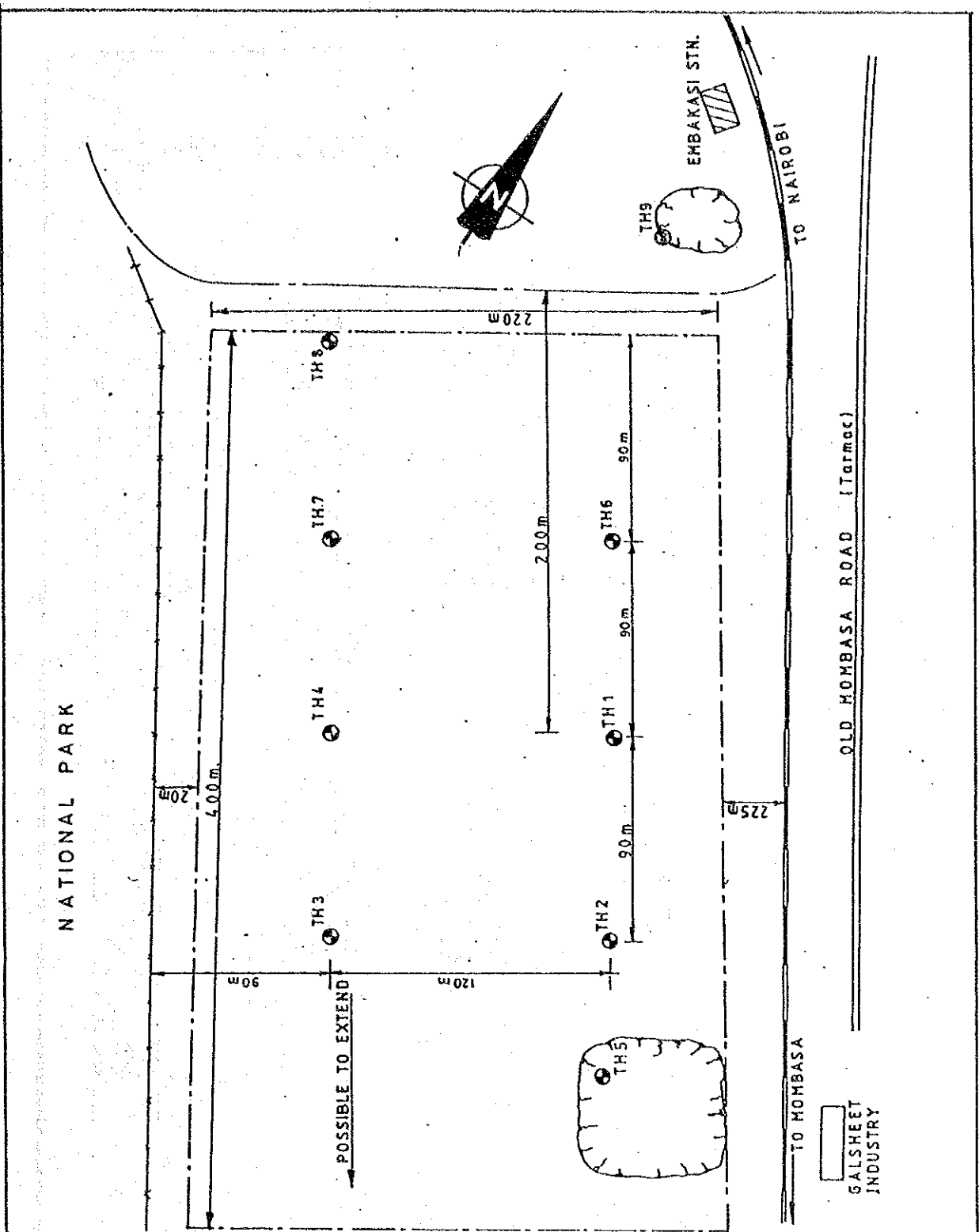
#### OWNERSHIP

This site is situated on Government land

#### FUTURE DEVELOPMENT

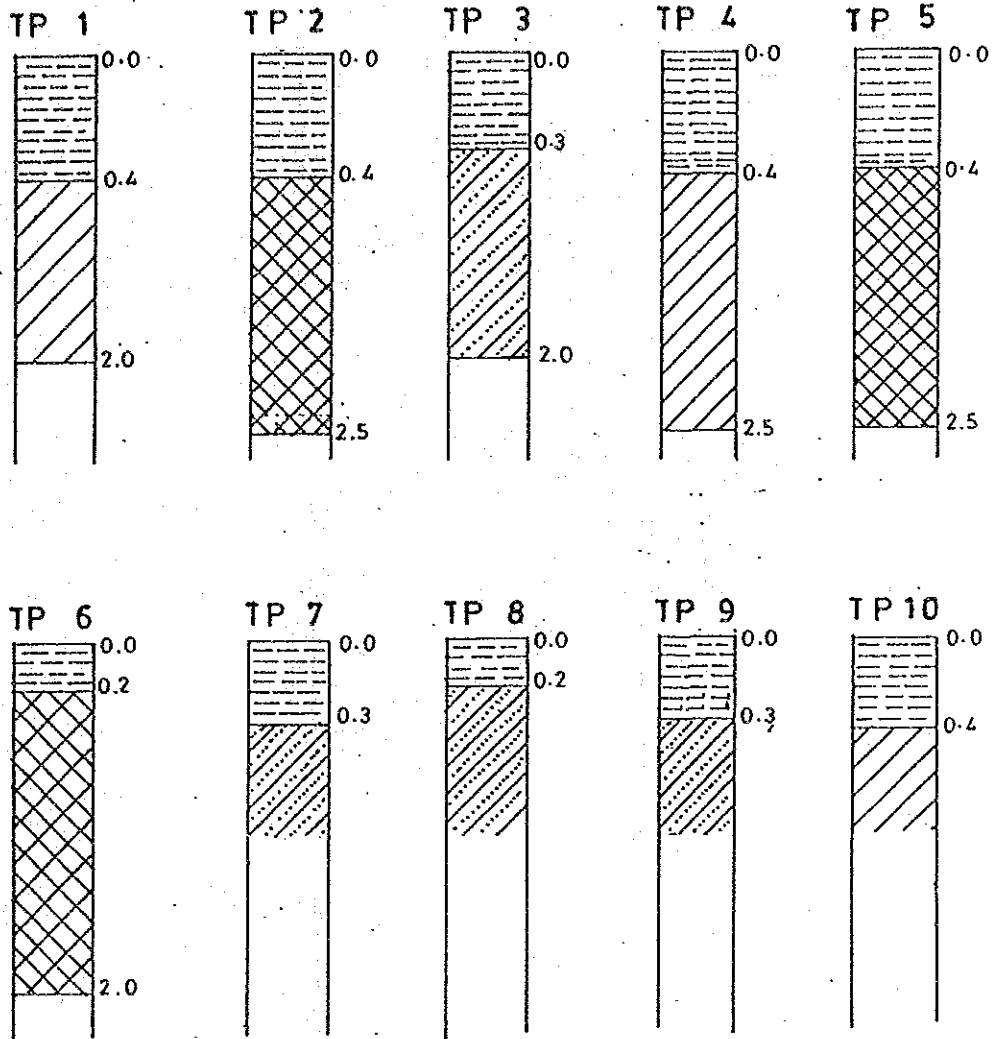
No immediate future development plans.











# GRAVEL MATERIAL SITE No. 1 GALSHEET



 BLACK COTTON SOIL

 BLACK DECOMPOSED GRAVEL

 WHITE DECOMPOSED GRAVEL

 DECOMPOSED SOFT ROCK MATERIAL

**NOTE:**

1. ALL DIMENSIONS IN ALL LOGGING SHEETS ARE IN METRES
2. WT INDICATES WATER TABLE LEVEL



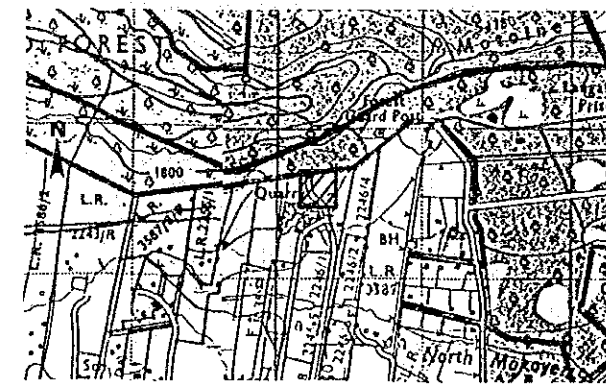
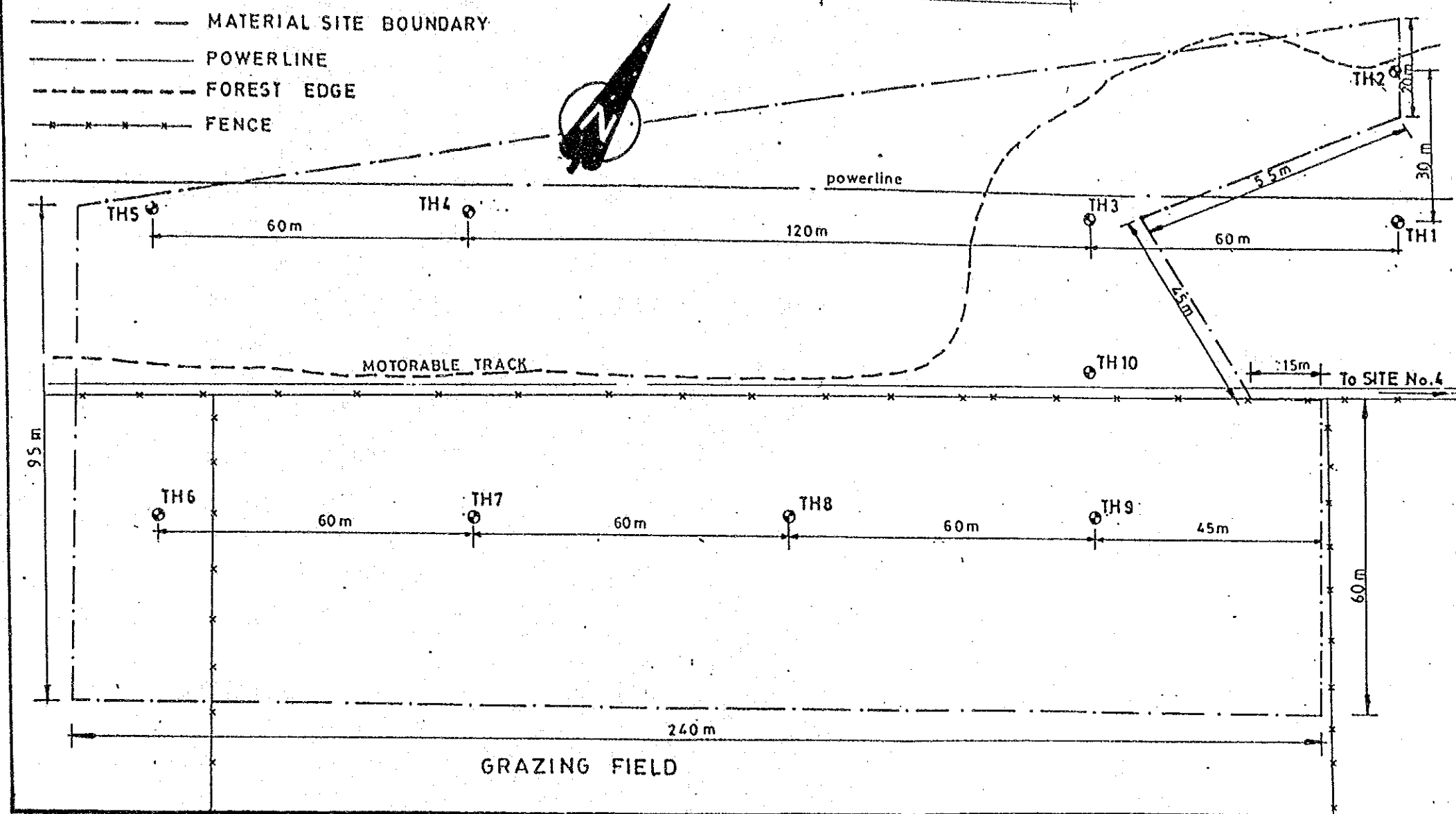
# SITE No. 5 FOREST GUARD CAMP

SCALE: 1:1000

ESTIMATED QUANTITY  
32 520 m<sup>3</sup>

**KEY**

- MATERIAL SITE BOUNDARY
- POWERLINE
- - - FOREST EDGE
- × × × FENCE



Scale 1:50,000





SITE NO. 7

KAREN

TRIAL HOLE NO.	DEPTH(M)	DESCRIPTIONS
1	0 - 0.30 0.30 - 1.30 <sup>+</sup>	Black soil on top Hard Black hard murram
2	0 - 0.80 0.80 - 1.50 <sup>+</sup>	Black cotton soil Hard Black gravel
3	0 - 0.10 0.10 - 1.40 <sup>+</sup>	Dark soil on top Hard Black gravel
4	0 - 0.30 0.30 - 1.4 <sup>+</sup>	Black cotton soil Hard Black gravel
5	0 - 0.7 0.70 - 1.70 <sup>+</sup>	Black cotton soil Black - Brown gravel
6	0 - 0.7 0.70 - 1.70 <sup>+</sup>	Black cotton soil Hard Brown gravel
7	0 - 1.10 1.10 - 1.3 <sup>+</sup>	Black wet clay soil on top White stone Decomposed Material

ESTIMATION OF QUANTITY

AREA	=	36,000m <sup>2</sup>
AVERAGE OVERBURDEN	=	0.4 m
AVERAGE DEPTH OF MATERIAL	=	1.0m
ESTIMATED QUANTITY	=	36000m <sup>3</sup>

OWNERSHIP

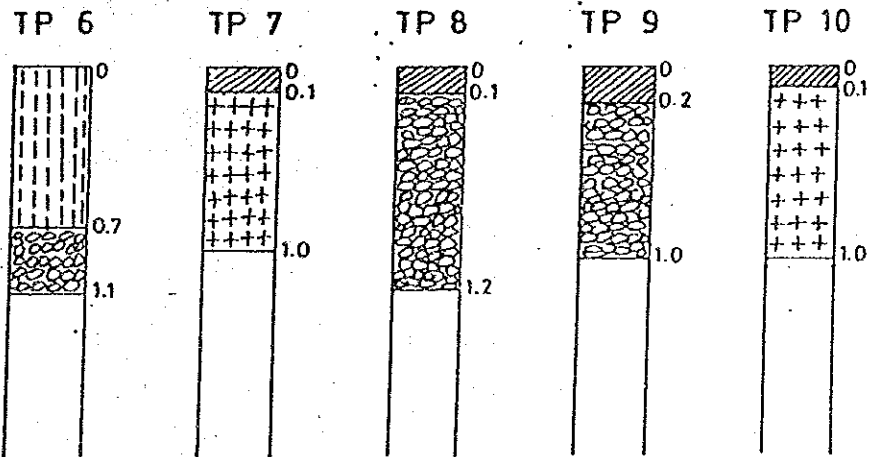
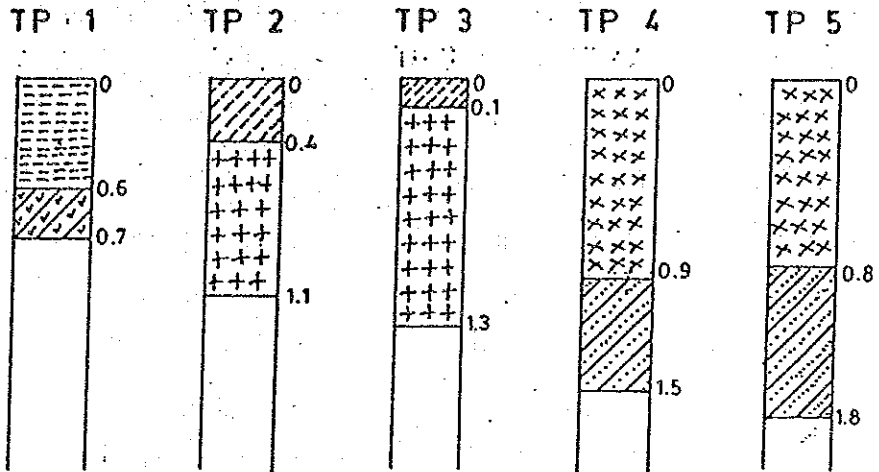
This site is situated on Government Land


FUTURE DEVELOPMENT


No immediate future development plans





# GRAVEL MATERIAL SITE No. 5 - FOREST GUARD



 BLACK COTTON SOIL


 RED SOIL


 BLACK WET CLAY


 HARD BLACK GRAVEL

 DARK SOIL

 SOFT WHITE STONE

 HARD BROWN GRAVEL

 WHITE DRY CLAY SOIL

 BLACK BROWN GRAVEL



SITE NO. 5  
FOREST GUARD

TRIAL HOLE NO.	DEPTH(M)	DESCRIPTION
1	0 - 0.60	Black Cotton Soil on top
	0.6 - 0.7 <sup>+</sup>	White Soft Stone Decomposed Mate
2	0 - 0.4	Dark Soil on top
	0.4 - 1.1	Black - Brown gravel
3	0 - 0.1	Dark soil on top
	0.1 - 1.3 <sup>+</sup>	Black - Brown gravel
4	0 - 0.90	Red soil on top
	0.90 - 1.5 <sup>+</sup>	Hard Brown gravel
5	0 - 0.80	Red soil on top
	0.80 - 1.80	Hard Brown gravel
	1.80 - 2.20 <sup>+</sup>	Yellow Soft Decomposed Material
6	0 - 0.70	Black wet clay soil on top
	0.70 - 1.10	Hard Black gravel
	1.10 - 1.4 <sup>+</sup>	Soft Stone Decomposed Material
7	0 - 0.10	White dry clay soil on top
	0.10 - 1.00 <sup>+</sup>	Black - Black gravel
8	0 - 0.10	White dry clay soil on top
	0.10 - 1.20 <sup>+</sup>	Hard Black gravel Material
9	0 - 0.20	White dry clay soil on top
	0.2 - 1.00	Hard Black gravel
10	0 - 0.10	White dry clay soil on top
	0.1 - 1.00	Black - Brown gravel



### ESTIMATION OF QUANTITY

AREA	=	23,550m <sup>2</sup>
AVERAGE OVERBURDEN	=	0.5m
AVERAGE DEPTH OF MATERIAL	=	0. g
ESTIMATED QUANTITY	=	21200

### OWNERSHIP

This site would be situated on land under three Ownerships

- The Kenya Government
- Two private persons

The two private persons could not be easily accessible for discussions on whether they would be willing to sell out or lease the land.

### FUTURE DEVELOPMENT

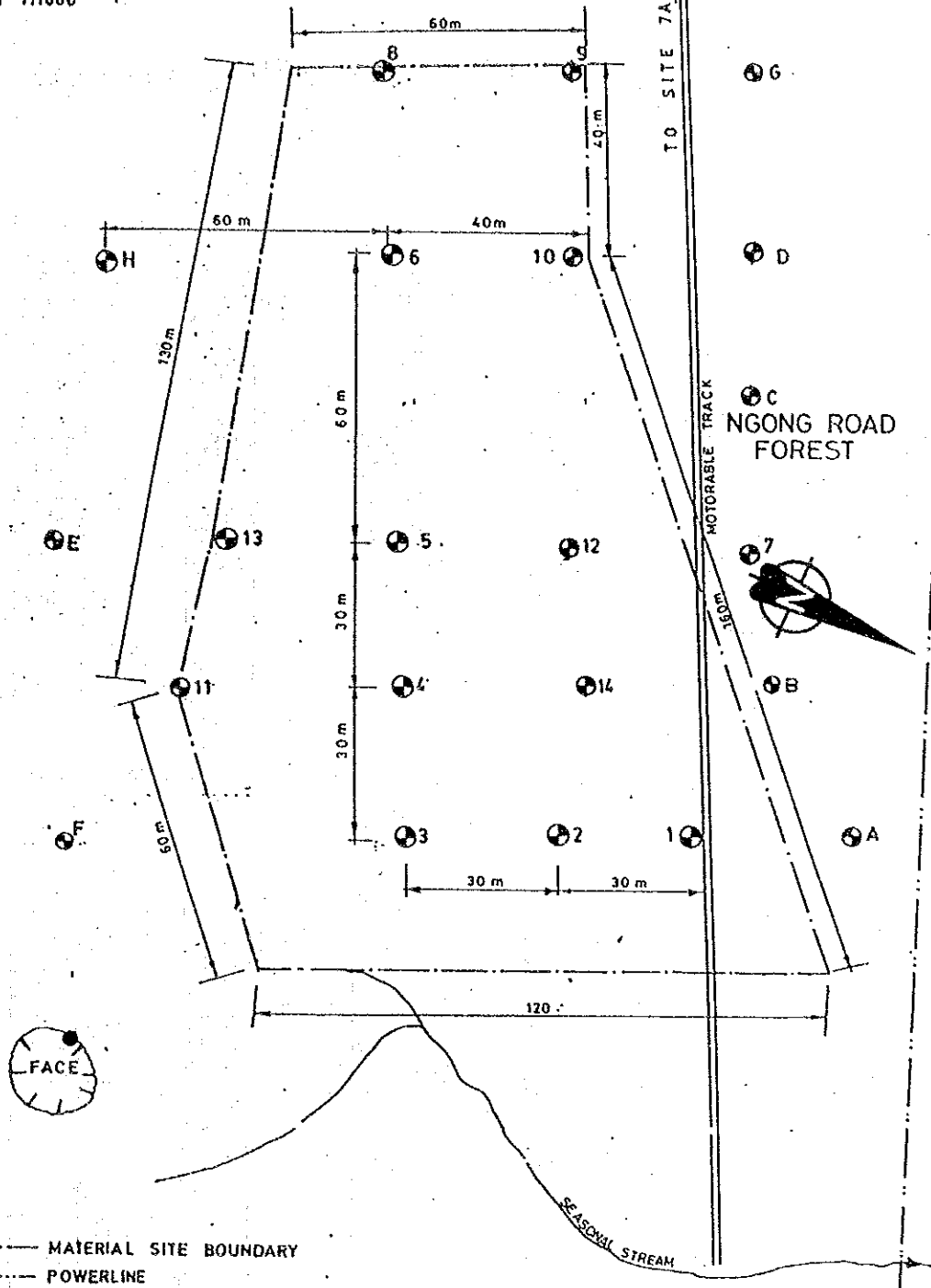
- The portion belonging to the Government is under forest
- Currently the land belonging to private persons is used as a grazing field for Grade Cattle. Future plans could not be ascertained.





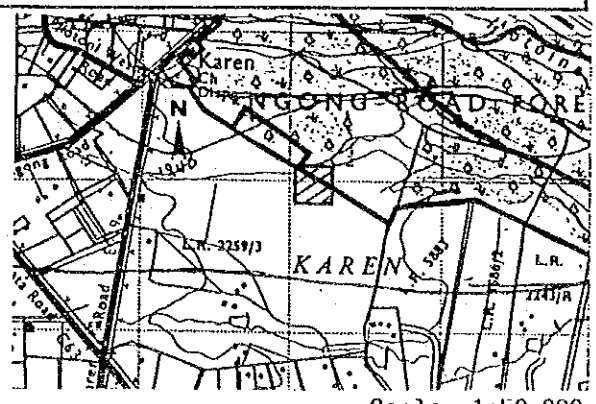
# SITE No. 7 - KAREN

SCALE: 1:1000



## KEY

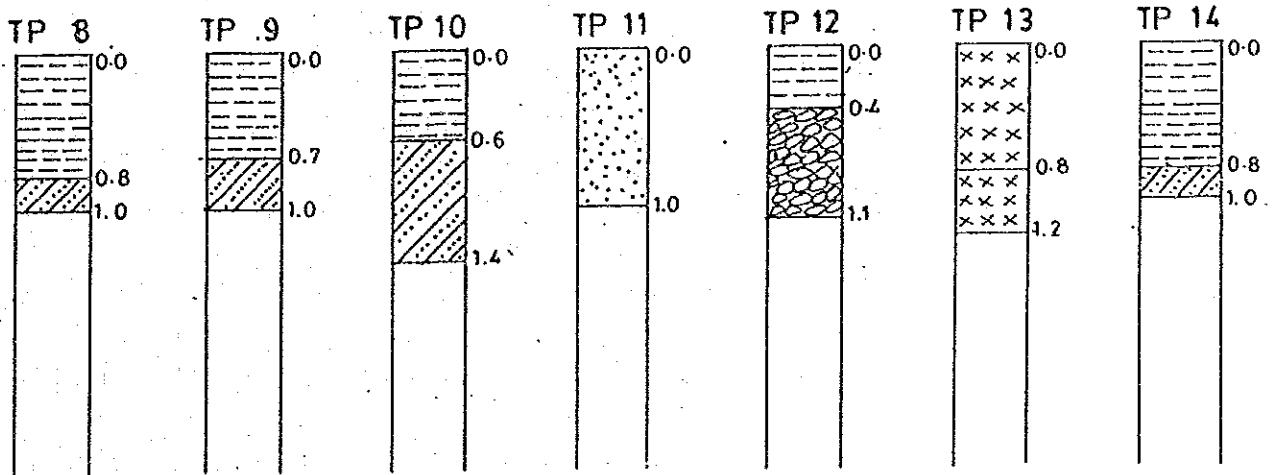
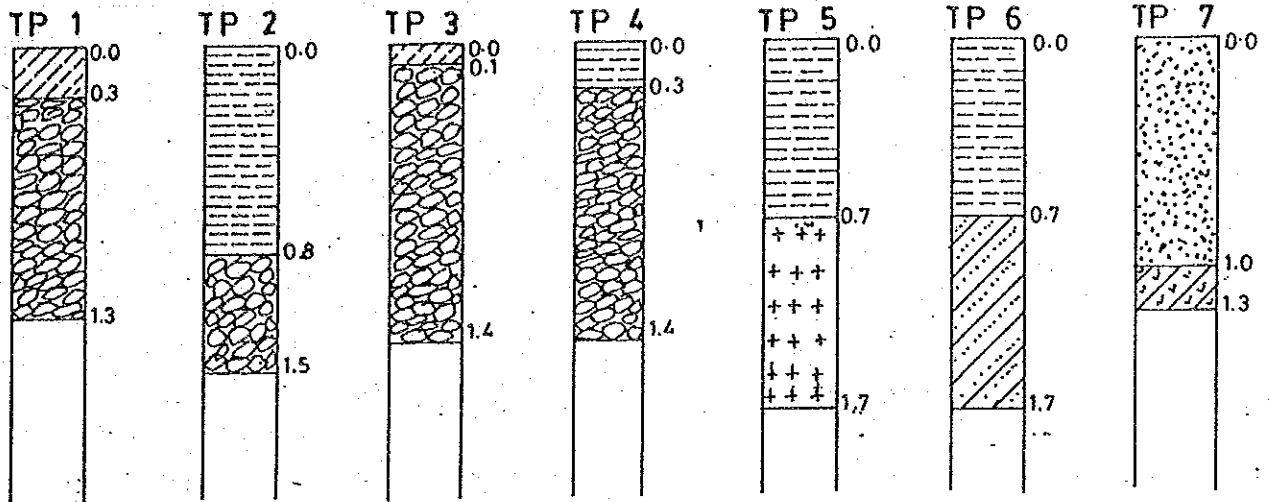
- MATERIAL SITE BOUNDARY
- ..... POWERLINE
- ⊙ TRIAL HOLES
- A, B, etc. NO GRAVEL WAS FOUND



Scale 1:50,000



# GRAVEL MATERIAL SITE No. 7 - KAREN



BLACK COTTON SOIL



HARD BLACK GRAVEL



DARK SOIL



WHITE STONE DECOMPOSED MATERIAL



BLACK BROWN GRAVEL



HARD BROWN GRAVEL



BLACK WET CLAY



GRAVEL SITE NO. 1

GALSHEET SITE

<u>TRIAL HOLE NO.</u>	<u>DEPTH (M)</u>	<u>DESCRIPTION</u>
1	0.0 - 0.4m	Black Cotton Soil
	0.40m - 2.0m	White decomposed gravel
2	0.0 - 0.4m	Overburden Black Cotton Soil
	0.4 - 2.5m <sup>+</sup>	Black decomposed gravel
3	0.0 - 0.3m	Black Cotton Soil
	0.30 - 2.0m <sup>+</sup>	decomposed soft rock material
4	0.0 - 0.40m	Black Cotton Soil
	0.40 - 2.5m <sup>+</sup>	White decomposed gravel
5 to 10	0.0 - 0.2 upto 0.4	Black Cotton soil
		White decomposed gravel

ESTIMATION OF QUANTITY

AREA	=	26000
AVERAGE OVERBURDEN	=	0.40 m
AVERAGE DEPTH OF MATERIAL	=	Over 1.5m
ESTIMATED QUANTITY	=	39000m <sup>3</sup>

OWNERSHIP

This site is situated on Government land.

FUTURE DEVELOPMENT

No immediate future development plans









7. HARD STONE MATERIAL SITE INVESTIGATION RESULTS

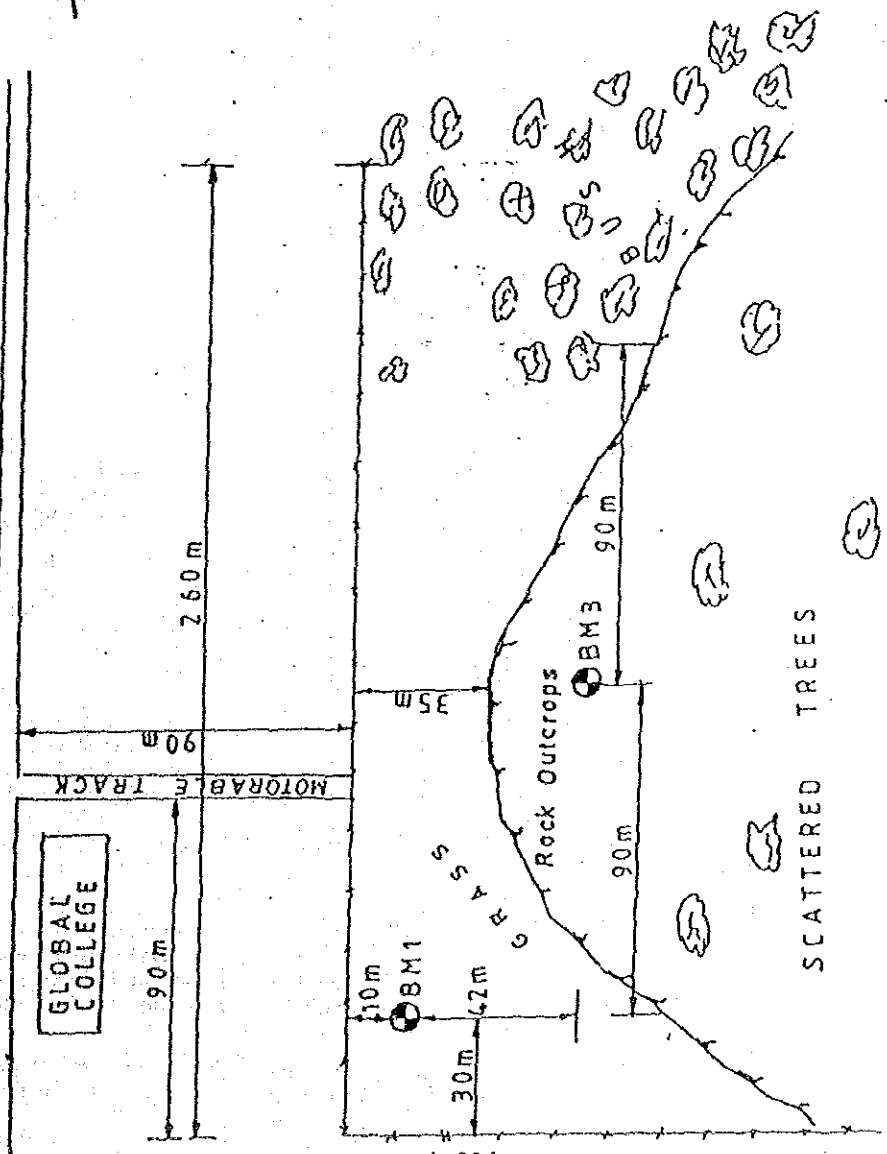
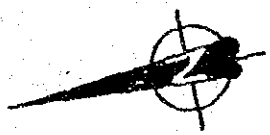
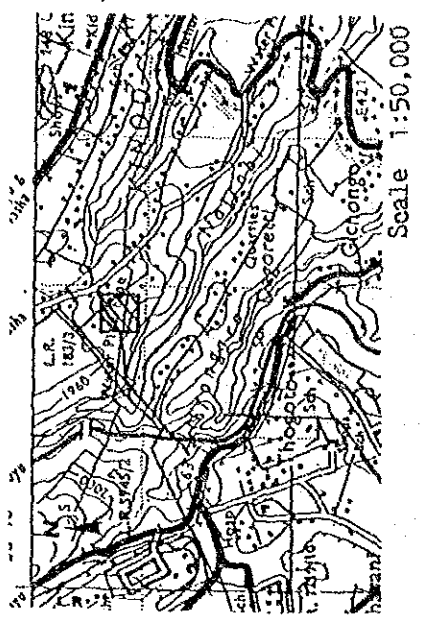


# MUTHIGA ROCK QUARRY

NOTE  
TOTAL DISTANCE FROM QUARRY TO  
MAIN ROAD IS 600m

## LEGEND

- TREES
- FENCE
- CLIFF (Not very big)
- LOCATIONS OF DRILLING



Scale 1:2000

TO KABETE  
LIMURU RD.

A-204





Equipment & Methods. Rotary auger 150mm dia.  
6.1-0.40m. Rotary coring 86mm dia. 0.60-1.40m  
7mm dia. 1.40 - 15.05m

Location.

NAIROBI BY-PASS

Carried out for: JAPAN INTERNATIONAL COOPERATION AGENCY

Ground Level

Coordinates

Date

5\_7/8/9

Description	Reduced Level	Legend	Depth & Thickness	Samples / Tests			Field Records						
				Depth	Sample Type	Sample No	Test	FI	TCR	RQD	GRADE		
Reddish brown SILTY CLAY.		x x	0.60 (0.60)	G.L. - 0.60									
Moderately weathered non intact light brownish grey fine grained porphyritic PHONOLITE.		V V V V	0.60 - 1.40 (0.80)						NI 38	0	III		
Slightly weathered with medium spaced fractures light grey fine grained porphyritic PHONOLITE. Fractures medium steep rough clay filled/ilmenite coated.	50°	V V V V	1.40 - 2.90 (1.50)						2	100	60		
	40°	V V V V	2.90 - 4.15 (1.25)						1	100	100		II
Faintly weathered grey fine grained porphyritic PHONOLITE.		V V V V	4.15 - 5.05 (0.90)						0	100	100		
		V V V V	5.05 - 6.45 (1.40)						0	100	79	I	
Moderately weathered with medium spaced fractures light grey fine grained porphyritic PHONOLITE. Fractures 40°, 70° rough ilmenite coated.	40°	V V V V	6.45 - 7.95 (1.50)						2	73	33	III	
	70°	V V V V	7.95 - 9.35 (1.40)						2	100	80	I	
Fresh with medium and widely spaced fractures grey fine grained porphyritic PHONOLITE. Fractures 90-60° rough ilmenite coated.		V V V V	9.35 - 10.65 (1.30)						2	100	78		
	30°	V V V V											

S.P.T. Where full 0.3m penetration has not been achieved the number of blows for the quoted penetration is given (Not N value)  
DEPTHS: All depths and reduced levels in metres  
Thickness given in brackets in depth column  
W.R.L.: Water level observations during boring are given on the last sheet of log.

Sample / Test Key.  
D Disturbed sample  
B Bulk sample  
W Water sample  
P Piston (P) Tube (U) or core sample length to scale  
S Standard Penetration Test  
V Vane Test  
C Core recovery  
F Rock Quality Designation (RQD - %)

Remarks  
A-205

Logged by  
J. O.  
Scale  
1:50  
Fig.





Equipment & Methods. See Sheet 1	Location. NAIROBI BY-PASS
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Carried out for: JAPAN INTERNATIONAL COOPERATION AGENCY	Ground Level	Coordinates	Date 5-7/8/90
---	--------------	-------------	------------------

Description	Reduced Level	Legend	Depth & Thickness	Samples / Tests			Field Records	
				Depth	Sample Type	Sample No	Test	
(as above)								
Fresh with widely spaced fractures grey fine grained porphyritic PHONOLITE.  Fractures 40-60° rough ilmonite coated.	60°	VVVV	(2.65)	9.35-10.65				
	40°	VVVV		10.65-12.15			2	100
Slightly weathered with widely spaced fractures light grey fine grained porphyritic PHONOLITE.	40°	VVVV	(2.60)	12.15-13.55				
	40°	VVVV		13.55-15.05			1	87
END OF BOREHOLE								

DATE	TIME	DEPTH (M)			REMARKS
		HOLE	CASING	W.R.L.	
5/8/90	10.30	NIL	NIL	DRY	
	18.00	0.60	NIL	DRY	
6/8/90	7.00	0.60	NIL	DRY	
	18.00	7.95	NIL	2.20	
7/8/90	7.00	7.95	NIL	3.00	
	18.00	15.05	NIL	2.75	

<p>S.P.T: Where full 0.3m penetration has not been achieved the number of blows for the quoted penetration is given (Not N value)</p> <p>DEPTHS: All depths and reduced levels in metres Thickness given in brackets in depth column</p> <p>W.R.L: Water level observations during boring are given on the last sheet of log.</p>	<p>Sample / Test Key.</p> <p>D Disturbed sample</p> <p>B Bulk sample</p> <p>W Water sample</p> <p>P Piston (P) Tube (U) or core sample length to scale</p> <p>S Standard Penetration Test</p> <p>V Vane Test</p> <p>C Core recovery</p> <p>r Rock Quality Designation (RQD) - %</p>	<p>Remarks</p> <p>A-206</p>	<p>Logged by</p> <p>J. O.</p>
			<p>Scale</p> <p>1:50</p>
			<p>Fig.</p>







Equipment & Methods. Rotary auger 1500mm dia.  
6.10 0.1-0.40m. Rotary coring 86mm dia. 0.40-2.60m;  
76mm dia. 2.60 - 10.25m

Location.

NAIROBI BY-PASS

Carried out for: JAPAN INTERNATIONAL  
COOPERATION AGENCY

Ground Level

Coordinates

Date

8\_10/8/90

Description	Reduced Level	Legend	Depth & Thickness	Samples / Tests			Field Records							
				Depth	Sample Type	Test No	Test	FI	TCR	ROD	GRAVE			
Reddish brown SILTY CLAY.		x	0.40	G.L. - 0.40										
High weathered brown TRACHYTE. (as sandy clay with gravel).		v	(2.20)	0.40 - 1.40						NI	40	0		
		v	(2.20)	1.40 - 2.60						NI	25	0		
Moderately weathered with closely spaced fractures zonally non intact pinkish grey fine grained porphyritic TRACHYTE.		v	2.60	2.60 - 2.90						1	100	50		
Zonally vesicular with 50° flow structure.		v	(8.00)	2.90 - 3.75						NI	100	0		
Fractures subhorizontal and steep rough reddish brown clay filled limonite coated.		v	(8.00)	3.75 - 5.25						NI	67	12	III	
		v	(8.00)	5.25 - 6.75						3				
		v	(8.00)	6.75 - 8.25						5	80	8		
Completely weathered light grey clayey TRACHYTE.		v	8.40	8.40						4	36	10		
		v	8.75	8.75										V
Completely weathered Brown TRACHYTE. (as Brown sandy CLAY).		v	(1.25)	8.25 - 10.25						NI	26	0		-

S.P.T: Where full 0.3m penetration has not been achieved the number of blows for the quoted penetration is given (Not N value)  
DEPTHS: All depths and reduced levels in metres  
Thickness given in brackets in depth column  
W.R.L: Water level observations during boring are given on the test sheet of log.

Sample / Test Key.  
D Disturbed sample  
B Bulk sample  
W Water sample  
P Platon (P) Tube (U) or core sample length to scale  
S Standard Penetration Test  
V Vane Test  
C Core recovery  
r Rock Quality Designation (RQD - %)

Remarks  
A-207

Logged by J.O.  
Scale 1:50  
Fig.





Equipment & Methods.  
See Sheet 1

Location.  
NAIROBI BY-PASS

Carried out for: JAPAN INTERNATIONAL COOPERATION AGENCY

Ground Level Coordinates Date  
8\_10/8/90

Description	Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records
				Depth	Sample		
					Type	No	
(as above)		V V V V V	10.25				
END OF BOREHOLE							

DATE	TIME	DEPTH (M)			REMARKS
		HOLE	CASING	W.R.L.	
8/5/90	7.00	NIL	NIL	DRY	
	18.00	2.90	1.50	0.20	
9/8/90	7.00	2.90	1.50	0.40	
	18.00	8.25	1.50	4.10	
10/8/90	7.00	8.25	1.50	5.00	
	18.00	10.25	NIL	4.45	

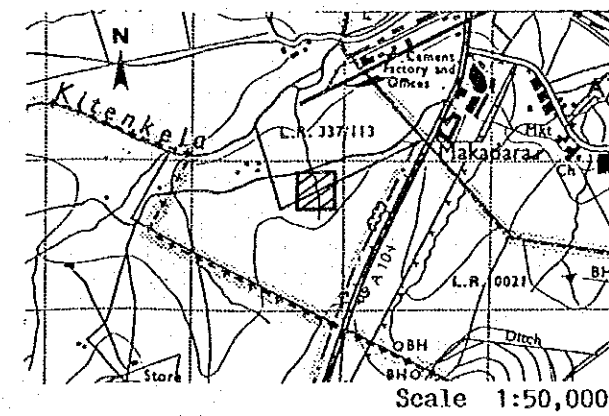
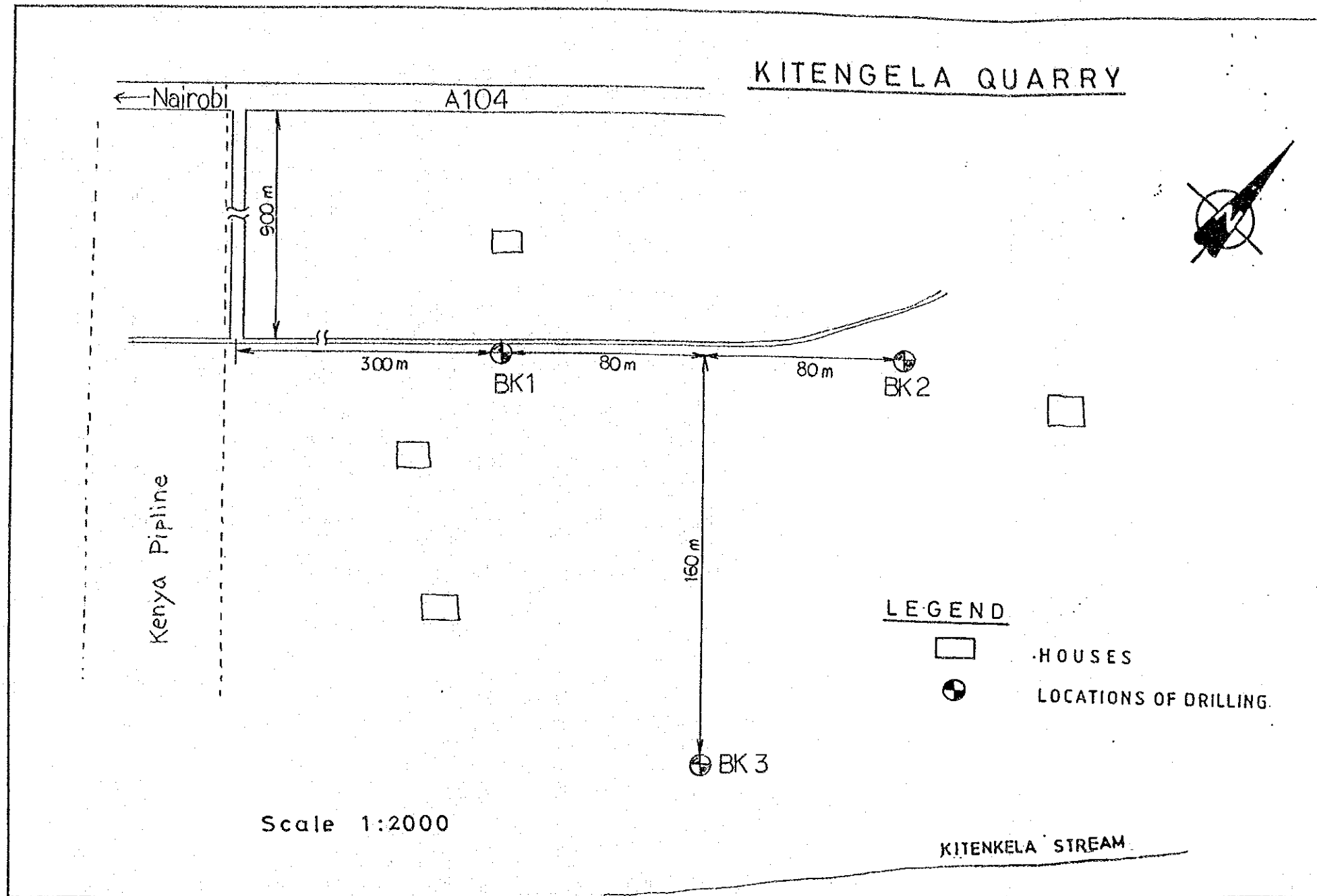
S.P.T: Where full 0.3m penetration has not been achieved the number of blows for the quoted penetration is given (Not N value)  
 DEPTHS: All depths and reduced levels in metres  
 Thickness given in brackets in depth column  
 W.R.L: Water level observations during boring are given on the test sheet of log.

Sample / Test Key.  
 D Disturbed sample  
 B Bulk sample  
 W Water sample  
 P Piston (P) Tube (U) or core sample length to scale  
 S Standard Penetration Test  
 V Vane Test  
 C Core recovery  
 r Rock Quality Designation (RQD - %)

Remarks  
 A-208

Logged by  
 J. O.  
 Scale  
 1:50  
 Fig.









Equipment & Methods. Rotary casing 101mm dia. G.L.-1.50m; 86mm dia. 1.50-15.00m	Location. NAIROBI BY-PASS
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Carried out for: JAPAN INTERNATIONAL COOPERATION AGENCY	Ground Level	Coordinates	Date 11/13/8/90
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Description	Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records												
				Depth	Sample Type	Test No	Test	FI	TCR	RQD	GRADE								
Dark grey CLAY (Black cotton soil).		X X X X	(0.45)																
Completely weathered Brown PHONOLITE. (as Sandy silty clay with phonolite boulders)		V V V V	0.70	G.L. - 1.50					5	100	74								
		V V V V		1.50 - 3.00					1	100	82								
Slightly weathered with closely and medium spaced fractures grey fine grained porphyritic PHONOLITE.	40°	V V V V		3.00 - 4.50					3	100	83								
With rare cavities upto 2cm, calcite lined; and white amygdalae of zeolites upto 1cm.	40°	V V V V		4.50 - 5.25					2	100	41								11
Fractures subhorizontal medium steep, rarely steep rough with clay veneer/illite coating.	90°	V V V V		5.25 - 6.65					7	100	51								
	40°	V V V V	(9.30)	6.65 - 7.95					4	100	51								
	90°	V V V V		7.95 - 10.95					8	100	57								
	20°	V V V V																	
	40°	V V V V																	
	40°	V V V V																	
	10°	V V V V																	
	40°	V V V V																	
	50°	V V V V																	
	50°	V V V V																	

S.P.T: Where full 0.3m penetration has not been achieved the number of blows for the quoted penetration is given (Not N value) DEPTHS: All depths and reduced levels in metres Thickness given in brackets in depth column W.R.L: Water level observations during boring are given on the last sheet of log.	<b>Sample / Test Key.</b> D Disturbed sample B Bulk sample W Water sample P Piston (P) Tube (U) or core sample length to scale S Standard Penetration Test V Vane Test C Core recovery r Rock Quality Designation (RQD)	Remarks  A-210	Logged by J.O.
			Scale 1:50
			Fig.







Equipment & Methods. See Sheet 1	Location. NAIROBI BY-PASS
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Carried out for: JAPAN INTERNATIONAL COOPERATION AGENCY	Ground Level	Coordinates	Date. 13-14/8/90
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Description	Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records				
				Depth	Sample Type No	Test					
(ss. above)	20°	VVVV	(5.00)	7.95-10.95							
Slightly weathered with closely and medium spaced fractures grey fine grained porphyritic PHONOLITE.	30°	VVVV		(5.00)							
	50°	VVVV									
	10°	VVVV									
	40°	VVVV									
	5°	VVVV									
	40°	VVVV									
	0°	VVVV									
	40°	VVVV									
	40°	VVVV									
	40°	VVVV									
Fractures subhorizontal to medium steep rough black iron oxide coated/with clay veneer.		VVVV		(5.00)	10.95-13.95			8	100	68	11
		VVVV			(5.00)						
		VVVV									
		VVVV									
		VVVV									
	VVVV										
		VVVV	(5.00)	13.95-15.00			6	100	61		
		VVVV		(5.00)							
		VVVV									
		VVVV									
		VVVV									
		VVVV									
END OF BOREHOLE											

<p>S.P.T.: Where full 0.3m penetration has not been achieved the number of blows for the quoted penetration is given (Not N value)</p> <p>DEPTHS: All depths and reduced levels in metres Thickness given in brackets in depth column</p> <p>W.R.L.: Water level observations during boring are given on the last sheet of log.</p>	<p>Sample / Test Key.</p> <p>D Disturbed sample</p> <p>B Bulk sample</p> <p>W Water sample</p> <p>P Piston (P) Tube (U) or core sample length to scale</p> <p>S Standard Penetration Test</p> <p>V Vane Test</p> <p>C Core recovery</p> <p>R Rock Quality Designation</p>	<p>Remarks</p> <p>A-211</p>	<p>Logged by</p> <p>J.O.</p> <p>Scale</p> <p>1:50</p> <p>Fig.</p>
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# Mowlem Construction Co. Ltd.

Borehole No. BK 2

Sheet 1 of 2

Equipment & Methods. Rotary coring 101mm dia.  
0.1-3.00m; 86mm dia. 3.00 - 15.25m

Location.

NAIROBI BY-PASS

Carried out for: JAPAN INTERNATIONAL COOPERATION AGENCY

Ground Level

Coordinates

Date

8\_9/8/90

Description	Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records						
				Depth	Sample Type	Sample No	Test	FI	TCR	RQD	GRADE		
Grey slightly sandy SILTY CLAY (Black cotton soil).		X X X X	0.40										
Grey silty SAND.		•••••	(1.55)	G.L. - 1.50					NA	100	NA		-
			1.95						NA	100	NA		
Highly weathered with closely spaced fractures mainly non intact grey with green tinge fine grained porphyritic PHONOLITE. Fractures subhorizontal clay filled.	90°	V V V V V	(1.75)	1.50 - 3.00					NA	100	0		IV
	80°	V V V V V		3.00 - 4.50					5	80	15		
	60°	V V V V V											
	20°	V V V V V											
	80°	V V V V V		4.50 - 5.60					2	100	0		
	60°	V V V V V											
Faintly weathered with closely and medium spaced fractures grey fine grained porphyritic PHONOLITE.	90°	V V V V V		5.60 - 6.15					1	100	0		
	30°	V V V V V											
	70°	V V V V V	(6.30)	6.15 - 7.05					7	100	17		II
	90°	V V V V V											
Zone 6.00 - 15.25m with oval cavities gradually becoming larger upto 1cm with depth, calcite/bluish earthy material lined.	70°	V V V V V		7.05 - 7.75					4	100	29		
		V V V V V											
		V V V V V		7.75 - 9.25					2	100	36		
		V V V V V											
		V V V V V		9.25 - 10.75					3	100	49		

S.P.T: Where full 0.3m penetration has not been achieved the number of blows for the quoted penetration is given (Not N value)  
 DEPT HS: All depths and reduced levels in metres  
 Thickness given in brackets in depth column  
 W.R.L: Water level observations during boring are given on the last sheet of log.

Sample / Test Key.  
 D Disturbed sample  
 B Bulk sample  
 W Water sample  
 P Pilon (P) Tube (U) or core sample length to scale  
 S Standard Penetration Test  
 V Vane Test  
 C Core recovery  
 7 Rock Quality Designation

Remarks  
 A-212

Logged by  
 J.O.  
 Scale  
 1:50  
 Fig.





Equipment & Methods: See Sheet 1	Location: NAIROBI BY-PASS
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Carried out for: JAPAN INTERNATIONAL COOPERATION AGENCY	Ground Level	Coordinates	Date 9/8/90
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Description	Reduced Level	Legend	Depth & Thickness	Samples / Tests			Field Records			
				Depth	Sample Type	Test No	Test			
(as above)		VVVVVV								
Faintly weathered with medium spaced fractures grey fine grained porphyritic PHONOLITE.  With oval cavities upto 1cm.  Fractures subhorizontal to steep rough clay lined/ limonite coated.		VVVVVV	(5.25)	10.75 - 12.25			4	100	68	11
	30° 20°	VVVVVV		12.25 - 13.75			3	100	52	
	20° 0°	VVVVVV		13.75 - 15.25			4	100	80	
END OF BOREHOLE		VVVVVV		15.25						

<p>S.P.T: Where full 0.3m penetration has not been achieved the number of blows for the quoted penetration is given (Not N value)</p> <p>DEPTHS: All depths and reduced levels in metres Thickness given in brackets in depth column</p> <p>W.R.L: Water level observations during boring are given on the last sheet of log</p>	<p>Sample / Test Key.</p> <p>D Disturbed sample</p> <p>■ Bulk sample</p> <p>W Water sample</p> <p>▬ Piston (P) Tube (U) or core sample length to scale</p> <p>S Standard Penetration Test</p> <p>V Vane Test</p> <p>C Core recovery</p> <p>R Rock Quality Designation (RQD - %)</p>	<p>Remarks</p> <p>A-213</p>	Logged by J. O.
			Scale 1:50
			Fig.













**8. LABORATORY TEST RESULTS OF EMBANKMENT MATERIAL AND SUBGRADE**



Laboratory test results of Subgrade and Fill materials

Pit No.	Station KM	Depth (m)	Soil Type	*1 Type of Material	Grading Passing 75 $\mu$ m (%)	Liquid Limit LL (%)	Plasticity index PI	Shrinkage Limit SL (%)	*2 Plasticity Modulus	*3 Group Index	CBR at 100M.D.D. 4days soak (%)	Swell at 100M.D.D. 4days soak (%)	Compaction(T99)		
													M.D.D. (kg/m <sup>3</sup> )	O.M.C. (%)	
Tb- 1	0 + 900m	0.1~0.5 0.7~1.1	B.C.S W.Rock	1 15	95 21	54 62	33 21	— —	3,267 525	41.8 -3.6	2 22	4.5 1.1	1,310 1,300	32 30	
Tb- 2	1 + 435m	0.1~1.7 1.7~1.9	B.C.S W.Rock	1 15	— 36	73 47	30 17	— —	— 731	— 1.7	— —	— —	— —	— —	— —
Tb- 3	1 + 900m	0.1~1.1 1.2~1.4	B.C.S B.C.S	1 1	93 35	80 67	42 26	— —	4,116 962	48.1 3.2	1 3	5.0 2.7	1,330 1,250	30 32	
Tb- 4	2 + 400m	0.1~0.5 0.5~0.9	B.C.S B.C.S	1 1	— 30	73 73	40 34	— —	— 1,122	— 1.7	— 2	— 4.5	— —	— 1,300	— 31
Tb- 5	2 + 900m	0.1~0.5 0.5~1.0	B.C.S W.Rock	1 15	89 18	78 54	30 18	— —	2,850 360	35.8 -4.3	1 9	4.4 1.4	1,340 1,370	31 25	
Tb- 6	3 + 400m	0.1~0.6	B.C.S	1	—	79	42	—	—	—	—	—	—	—	
Tb- 7	3 + 900m	0.1~0.6	B.C.S	1	92	74	43	20	4,171	46.5	2	5.5	1,390	29	
Tb- 8	4 + 400m	0.1~0.6	B.C.S	1	—	73	32	—	—	—	—	—	—	—	
Tb- 9	4 + 895m	0.1~0.3 0.3~0.6	Sandy Clay Sandy Clay	9 9	41 —	39~41 —	14~16 —	— —	700 —	2.2 —	— 5	— 1.3	— 1,590	— 23	

\* 1 See Table 3.6.2

\* 2 PM=No.36 $\times$ PI

No.36:Grading Passing 0.475mm(%)

\* 3  $GI=(F-35)[0.2+0.005(LL-40)]+0.01(F-15)(PI-10)$

F:Grading Passing 75 $\mu$ m(%)



Laboratory test results of Subgrade and Fill materials

Pit No	Station KM	Depth (m)	Soil Type	*1 Type of Material	Grading Passing 75 $\mu$ m (%)	Liquid Limit LL (%)	Plasticity index PI	Shrinkage Limit SL (%)	*2 Plasticity Modulus	#3 Group Index	CBR at 100M.D.D. 4days soak (%)	Swell at 100M.D.D. 4days soak (%)		Compaction(T99)		
												M.D.D. (kg/m <sup>3</sup> )	O.M.C. (%)	M.D.D. (kg/m <sup>3</sup> )	O.M.C. (%)	
Tb-10	5+400m	0.7~1.1 1.1~1.3	Grey Clay B.C.S	1 1	— 92	83 70	30 31	— —	— 2,976	— 36.1	— 1	— 5.2	— 1,320	— 33	— —	— —
Tc-1	5+920m	0.7~0.9	L.G	17	20	46	15	—	360	-3.2	70	0.2	1,720	22	—	—
T-12	6+500m	0.2	L.G	17	82	49	16	—	1,408	15.5	—	—	—	—	—	—
Tc-2	7+400m	0.5~0.8	L.G	17	27	55	24	—	720	-0.5	5	0.9	1,780	20	—	—
Tc-3	7+800m	0.2~0.6	W.Rock	15	14	NP	NP	—	—	—	65	0.3	1,340	33	—	—
T-11	8+300m	1.4	L.G	17	39	55	19	—	893	3.2	33	0.1	1,476	29	—	—
Tc-4	8+600m	0.2~1.1 1.1~1.3	R.S W.Rock	4 15	68 18	50 55	17 18	— —	1,224 396	11.9 -4.4	19 65	0.1 0.5	1,490 1,410	26 28	—	—
Tc-5	9+110m	0.25~0.55 0.55~1.10	R.S W.Rock	4 15	71 27	55 53	19 18	— —	1,406 612	14.9 -1.1	23 45	0.4 0.2	1,400 1,240	29 34	—	—
Tc-6	9+900m	0.3~1.6	R.S	4	95	52	14	—	1,386	18.8	18	0.7	1,360	33	—	—
T-15	9+940m	1.2~1.4	R.S	4	94	60	19	—	1,881	24.8	18	0.3	1,380	32	—	—
T-13	10+350m	1.3	R.S	4	93	49	16	—	1,568	21.7	#4 (21)	—	—	—	—	—

\* 1 See Table 3.6.2

\* 2 FM=N<sub>0.36</sub>×PI

No.36:Grading Passing 0.475mm.(%)

\* 3 GI=(F-35)[0.2+0.005(LL-40)]+0.01(F-15)(PI-10)

F:Grading Passing 75 $\mu$ m.(%)

\* 4 inference CBR from PI





Laboratory test results of Subgrade and Fill materials

Pit No	Station KM	Depth (m)	Soil Type	*1 Type of Material	Grading Passing 75 $\mu$ m (%)	Liquid Limit LL (%)	Plasticity index PI	Shrinkage Limit SL (%)	#2 Plasticity Modulus	#3 Group Index	CBR at 100% M.D.D. 4days soak (%)	Compaction (T99)	
												M.D.D. (kg/m <sup>3</sup> )	O.M.C. (%)
Tc-31	10+400m	1.0~1.3	R.S	4	95	55	18	9	1,728	22.9	16	1,390	35
		2.5~2.7	W.Rock	15	25	52	21	10	798	0	30	1,360	30
Tc-7	10+840m	0.3~2.0	R.S	4	96	57	18	—	1,782	23.8	11	1,320	37
T-10	11+300m	1.5	R.S	4	92	58	24	—	2,352	27.3	*4 (10)	—	—
Tc-32	11+380m	1.8~2.2	R.S	4	94	50	18	9	1,764	21.1	15	1,460	33
		3.0~3.4	R.S	4	81	53	21	10	1,827	19.5	15	1,310	32
Tc-33	11+880m	0.4~0.7	B.C.S	1	76	37	16	8	1,376	11.2	4	1,580	23
		0.8~1.0	W.Rock	15	6	NP	NP	2	—	0	48	1,420	23
Tc-8	12+100m	0.1~0.5	B.C.S	1	77	80	38	—	3,040	34.1	1	1,390	26
Tc-9	12+500m	0.4~1.0	R.S	4	97	54	13	—	1,287	19.2	26	1,360	33
Tc-37	12+575m	0.2~0.4	B.C.S	1	80	40	18	9	1,602	14.2	3	1,480	22
Tc-10	13+180m	0.1~0.5	B.C.S	1	83	64	26	—	2,340	26.2	2	1,360	28
Tc-34	13+660m	0.3~0.8	B.C.S	1	90	59	30	14	2,880	31.2	2	1,350	25

\* 1 See Table 3.6.2

\* 2 PM=No.36 $\times$ PI

No.36:Grading Passing 0.475mm(%)

\* 3  $GI=(F-35)[0.2+0.005(LL-40)]+0.01(F-15)(PI-10)$

F:Grading Passing 75 $\mu$ m(%)

\* 4 inference CBR from PI



Laboratory test results of Subgrade and Fill materials

Pit No	Station KM	Depth (m)	Soil Type	#1 Type of Material	Grading Passing 75 $\mu$ m (%)	Liquid Limit LL (%)	Plasticity index PI	Shrinkage Limit SL (%)	#2 Plasticity Modulus	#3 Group Index	CBR at 100% M.D.D. 4days soak (%)	Swell at 100% M.D.D. 4days soak (%)	Compaction (T99)	
													M.D.D. (kg/m <sup>3</sup> )	O.M.C. (%)
T-9	13+900m	1.5	R.S	4	97	58	18	—	1,782	24.5	#4 (17)	—	—	
Tc-35	14+155m	1.0~1.3	R.S	4	92	51	21	11	2,058	23.0	9	1.5	1,420	30
Tc-11	14+380m	0.5~2.0	R.S	4	95	48	18	—	1,782	20.8	6	0.7	1,370	33
Tc-36	14+650m	2.9~3.2	R.S	4	89	57	23	11	2,116	25.0	16	0.7	1,510	29
		4.0~4.2	W.Rock	15	76	53	21	10	1,743	17.6	20	0.8	1,480	30
Tc-12	15+185m	0.5~4.0	R.S	4	97	54	19	—	1,862	24.1	15	1.2	1,390	33
BF-3	15+550m	0.0~1.0	Silty Clay	9	96	62	25	—	2,500	31.0	—	—	—	—
		1.0~2.0	Silty Clay	9	98	60	32	—	3,200	37.1	—	—	—	—
		2.0~3.0	Silty Clay	9	86	46	22	—	2,134	20.2	—	—	—	—
		3.0~4.0	Silty Clay	9	80	43	19	—	1,786	15.5	—	—	—	—
		4.0~5.0	Silty Clay	9	90	54	24	—	2,328	25.3	—	—	—	—
T-8	15+840m	3.0	R.S	4	82	61	19	—	1,577	20.3	16	1.2	1,388	32
Tc-13	16+90m	0.4~4.0	R.S	4	76	55	19	—	1,539	16.7	11	0.7	1,436	31
Tc-14	16+700m	0.1~0.4	Grey Silt	9	71	50	21	—	1,680	15.1	5	0.5	1,440	25
Tc-15	17+150m	0.5~4.0	R.S	4	98	60	18	—	1,782	25.5	27	0.6	1,390	33

\* 1 See Table 3.6.2

\* 2 PM=No.36 $\times$ PI

No.36:Grading Passing 0.475mm(%)

\* 3  $GI=(F-35)[0.2+0.005(LL-40)]+0.01(F-15)(PI-10)$

F:Grading Passing 75 $\mu$ m(%)

\* 4 inference CBR from PI



Laboratory test results of Subgrade and Fill materials

Pit No	Station KM	Depth (m)	Soil Type	#1 Type of Material	Grading Passing 75 $\mu$ m (%)	Liquid Limit LL (%)	Plasticity index PI	Shrinkage Limit SL (%)	#2 Plasticity Modulus	#3 Group Index	CBR at 100% M.D.D. 4days soak (%)	Swell at 100% M.D.D. 4days soak (%)	Compaction(199)	
													M.D.D. (kg/m <sup>3</sup> )	O.M.C. (%)
T-7	17+800m	1.8	Red Soil	4	94	53	17	—	1,666	21.1	*4 (19)	—	—	—
Tc-16	18+820m	0.4~2.0	R.S	4	96	56	16	—	1,584	21.9	28	0.1	1,390	31
Tc-17	19+305m	0.7~3.5	R.S	4	92	56	22	—	2,112	25.2	13	0.2	1,330	36
		3.6~3.7	W.Rock	15	38	39	14	—	728	1.5	38	0.7	1,290	32
T-6	19+940m	1.5	R.S	4	97	63	21	—	2,058	28.5	12	1.3	1,388	31
T-5	21+200m	1.5	R.S	4	83	56	17	—	1,513	18.2	30	0.2	1,460	28
Tc-18	21+480m	0.4~2.0	R.S	4	93	55	18	—	1,764	22.1	18	0.6	1,390	33
Tc-19	21+955m	0.3~2.0	R.S	4	95	60	22	—	2,178	27.6	28	0.3	1,350	34
T-4	22+230m	1.5	R.S	4	92	60	23	—	2,254	27.1	*4 (11)	—	—	—
T-3	23+180m	1.4	R.S	4	96	65	25	—	2,475	31.9	*4 (9)	—	—	—
Tc-20	24+178m	0.3~2.0	R.S	4	95	60	17	—	1,666	23.6	23	0.1	1,340	35
Tc-21	24+705m	0.5~2.0	R.S	4	91	52	15	—	1,425	18.3	8	0.6	1,400	30
Tc-22	25+288m	0.3~3.1	R.S	4	95	61	16	—	1,568	23.1	17	0.9	1,370	33
		3.3~3.7	W.Rock	13	75	49	18	—	1,458	14.6	22	0.4	1,440	26

\* 1 See Table 3.6.2  
 \* 2 PM=No.36 $\times$ PI  
 No.36:Grading Passing 0.475mm(%)  
 \* 3  $GI=(F-35)[0.2+0.005(LL-40)]+0.01(F-15)(PI-10)$   
 F:Grading Passing 75 $\mu$ m(%)  
 \* 4 inference CBR from PI



Laboratory test results of Subgrade and Fill materials

Pit No	Station KM	Depth (m)	Soil Type	*1 Type of Material	Grading Passing 75µm (%)	Liquid Limit LL (%)	Plasticity index PI	Shrinkage Limit SL (%)	*2 Plasticity Modulus	*3 Group Index	CBR at 100% M.D.D. 4days soak (%)	Compaction(T99)		
												M.D.D. (kg/m <sup>3</sup> )	O.M.C. (%)	
Tc-23	25+775m	0.7~2.6	R.S	4	95	61	20	—	1,960	26.3	14	0.2	1,380	33
		2.6~2.8	W.Rock	13	41	39	14	—	770	2.2	21	0.7	1,620	16
Tc-24	26+158m	2.6~2.8	R.S	4	99	56	18	—	1,800	24.6	17	0.4	1,300	38
T-2	26+500m	1.5	R.S	4	95	67	22	—	2,112	29.7	*4 (12)	—	—	—
Tc-25	26+778m	0.2~1.2	R.S	4	98	63	20	—	1,980	28.1	22	0.2	1,370	35
Tc-26	27+178m	0.4~1.0	R.S	4	97	74	30	—	2,970	39.3	11	1.7	1,350	35
Tc-27	27+678m	0.6~1.0	Fill(R.S)	4	98	63	23	—	2,300	30.6	14	0.2	1,370	35
Tc-28	28+103m	0.55~1.0	Fill(R.S)	4	96	64	27	—	2,673	33.2	12	0.3	1,380	32
Tc-29		0.4~4.0	R.S	4	92	62	27	—	2,646	30.7	10	0.4	1,340	36
Tc-30		0.5~1.0	R.S	4	79	58	22	—	1,914	20.4	9	0.7	1,410	31

\* 1 See Table 3.6.2

\* 2 PM=No.36×PI

No.36:Grading Passing 0.475mm(%)

\* 3  $GI=(F-35)[0.2+0.005(LL-40)]+0.01(F-15)(PI-10)$

F:Grading Passing 75µm(%)

\* 4 inference CBR from PI























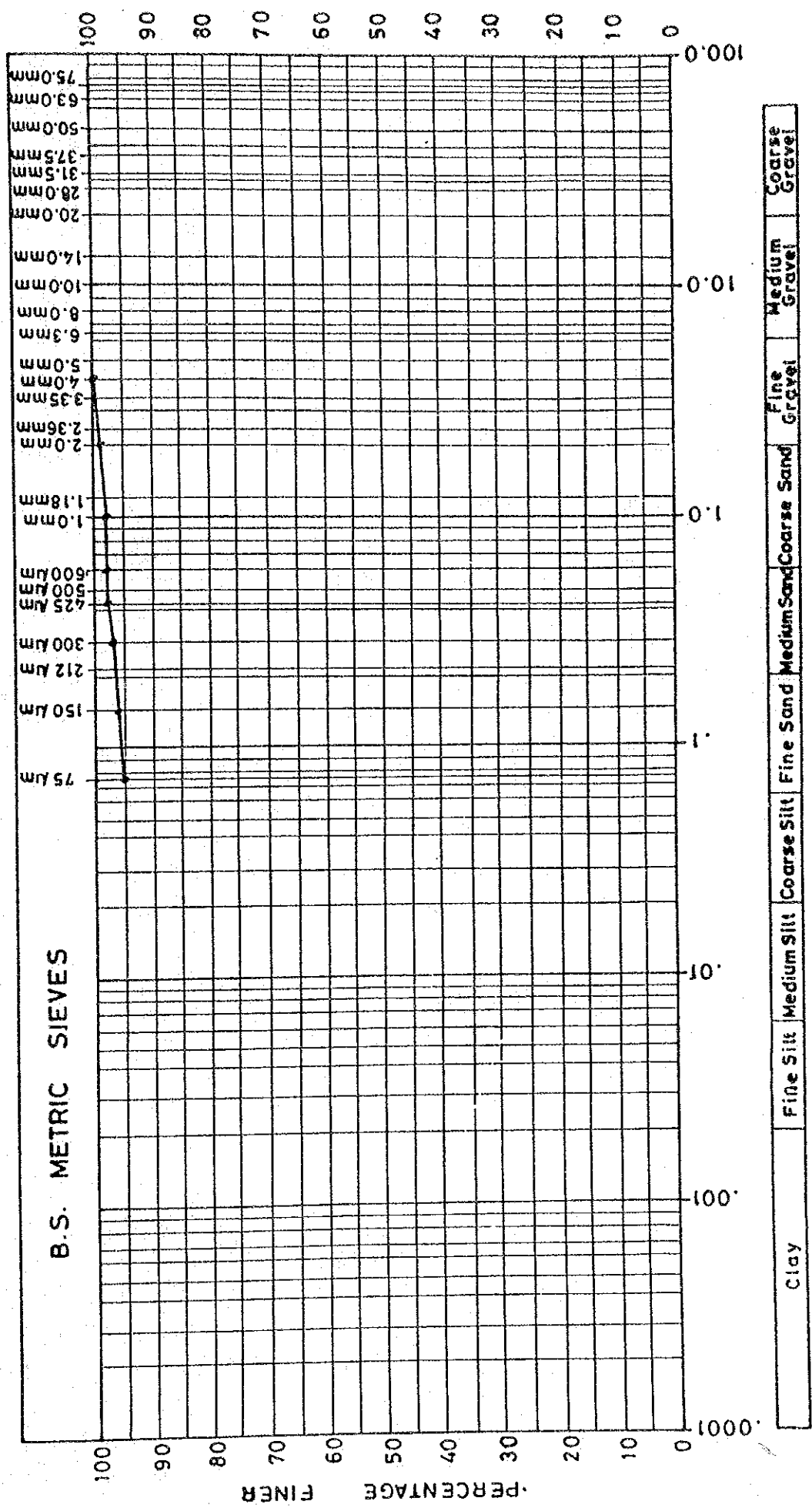
# CIL CENTRAL TESTING LABORATORIES LTD.

P.O. BOX 18507 TEL. 559422/23

NAIROBI.

## PARTICLE SIZE DISTRIBUTION

Sample No. 7724	Location TC 31 1.00-1.30m	Description of Sample Slightly gravelly, slightly sandy SILT
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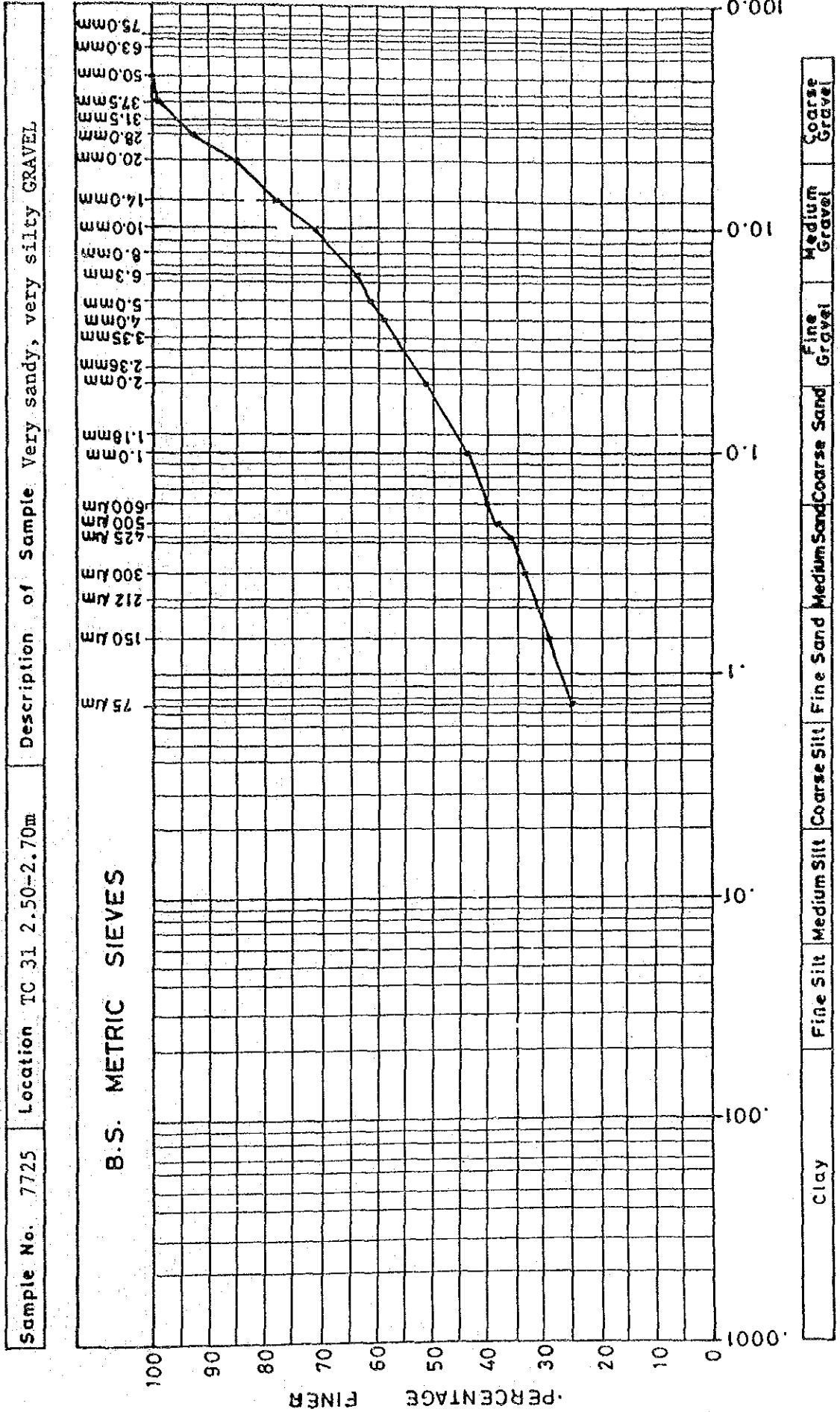


# CIL CENTRAL TESTING LABORATORIES LTD.

P.O. BOX 18507 TEL. 559422/23

NAIROBI.

## PARTICLE SIZE DISTRIBUTION



Clay
Fine Silt
Medium Silt
Coarse Silt
Fine Sand
Medium Sand
Coarse Sand
Fine Gravel
Medium Gravel
Coarse Gravel

0.001
.01
.1
1
10
100
1000

75.0mm
63.0mm
50.0mm
37.5mm
31.5mm
28.0mm
20.0mm
14.0mm
10.0mm
8.0mm
6.3mm
5.0mm
4.0mm
3.35mm
2.5mm
2.0mm
1.18mm
1.0mm
600 micrometers
500 micrometers
425 micrometers
300 micrometers
212 micrometers
150 micrometers

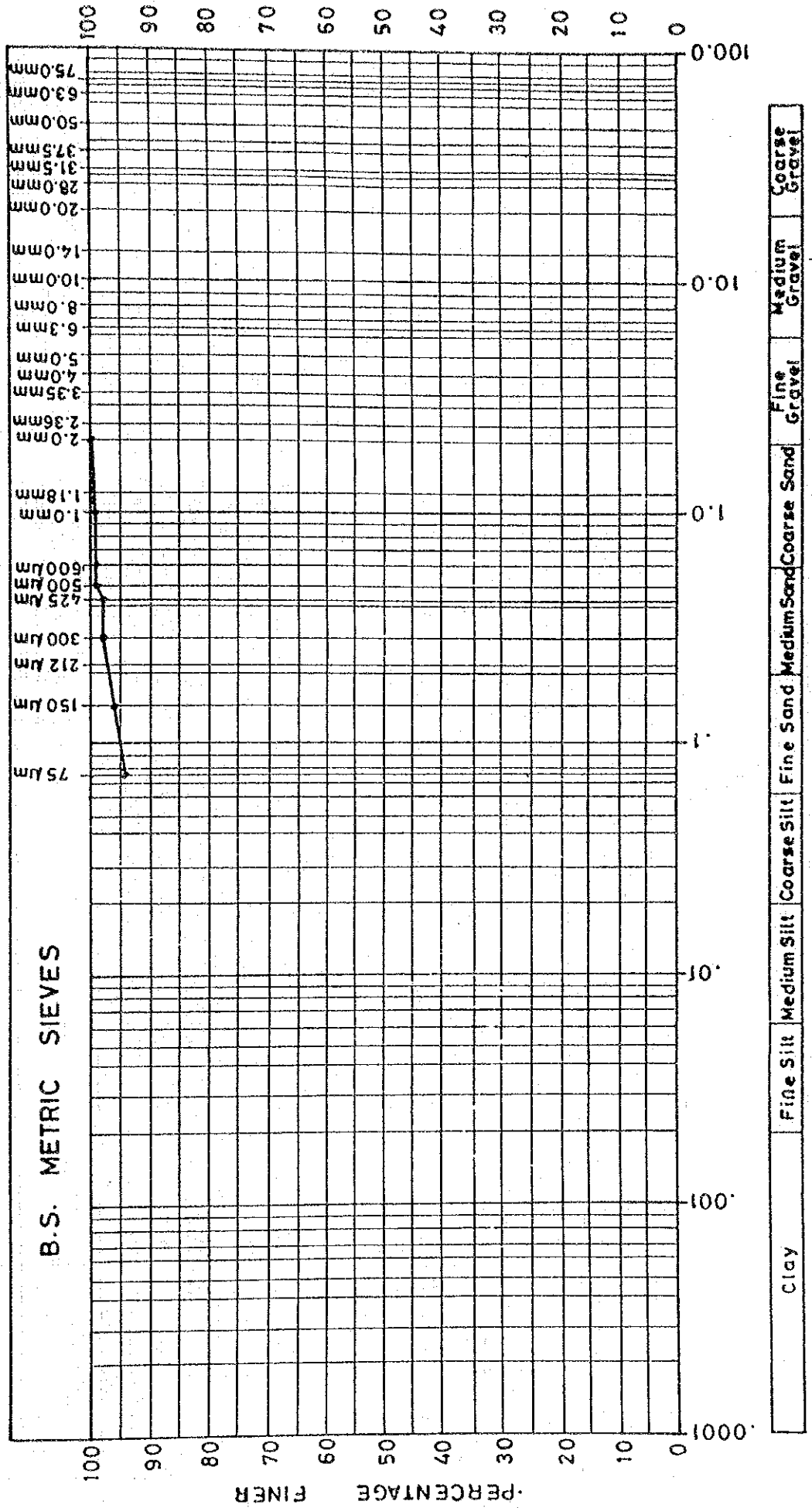


# CIL CENTRAL TESTING LABORATORIES LTD.

P.O. BOX 18507 TEL. 559422/23  
NAIROBI.

## PARTICLE SIZE DISTRIBUTION

Sample No. 7726	Location TC 32 1.80-2.20m	Description of Sample Sandy SILT
-----------------	---------------------------	----------------------------------





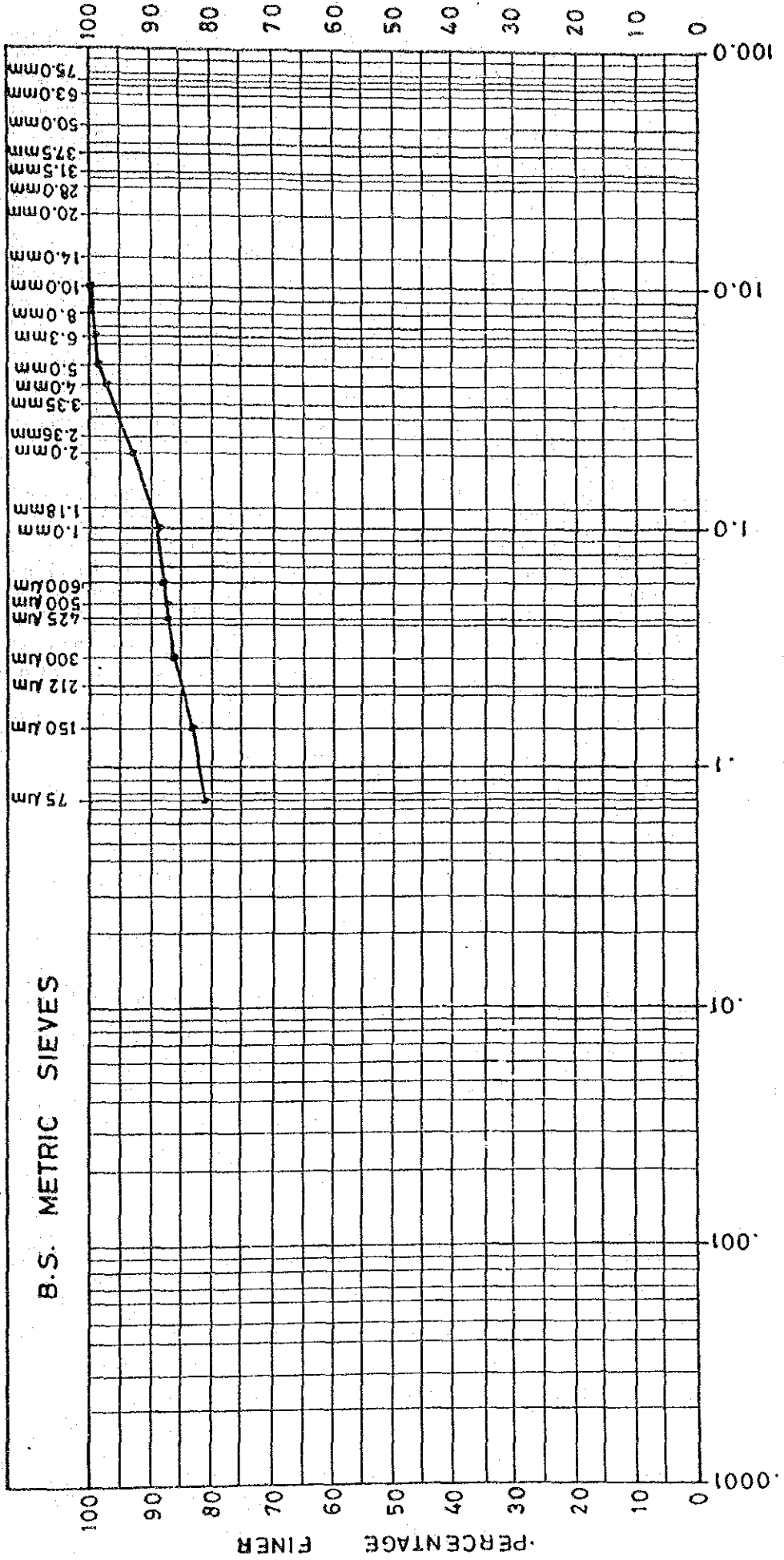
# CIL CENTRAL TESTING LABORATORIES LTD.

P.O. BOX 18507 TEL. 559422/23

NAIROBI.

## PARTICLE SIZE DISTRIBUTION

Sample No. 7727	Location TC 32 3.00-3.40m	Description of Sample Gravelly, sandy SILT
-----------------	---------------------------	--



Clay	Fine Silt	Medium Silt	Coarse Silt	Fine Sand	Medium Sand	Coarse Sand	Fine Gravel	Medium Gravel	Coarse Gravel
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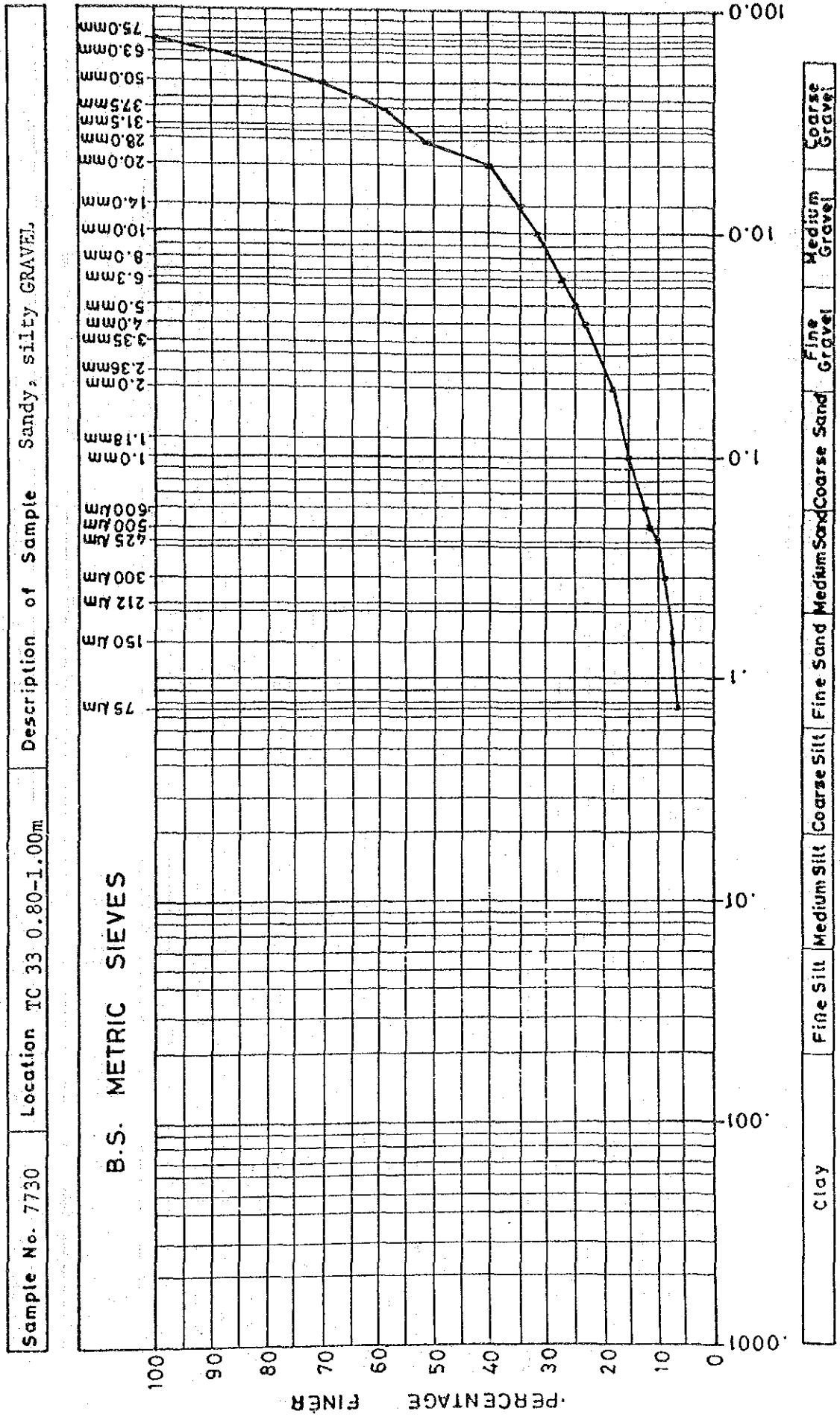




# CIL CENTRAL TESTING LABORATORIES LTD.

P.O. BOX 18507 TEL. 559422/23  
NAIROBI.

## PARTICLE SIZE DISTRIBUTION



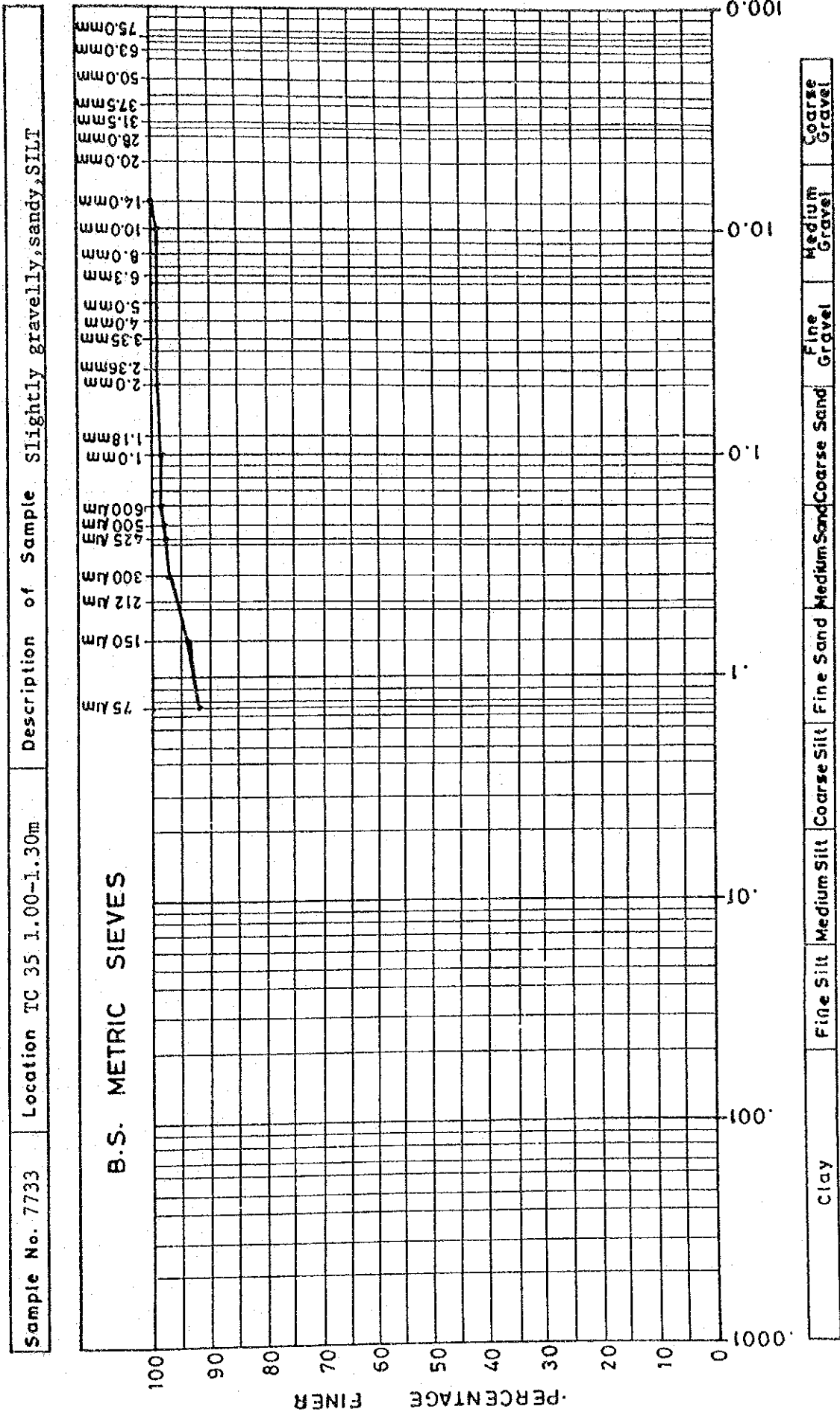


# CIL CENTRAL TESTING LABORATORIES LTD.

P. O. BOX 18507 TEL. 559422/23

NAIROBI.

## PARTICLE SIZE DISTRIBUTION





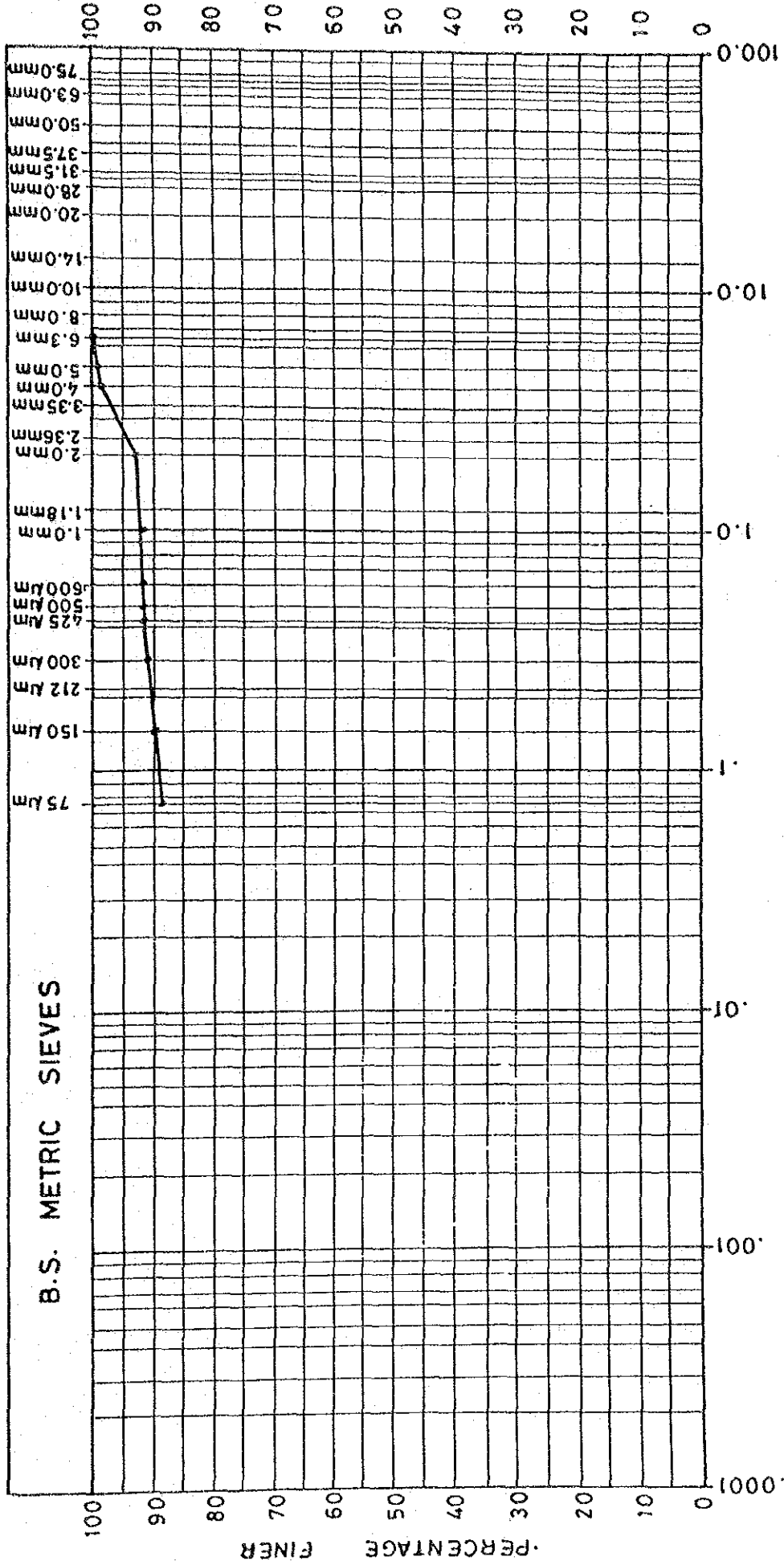
# CIL CENTRAL TESTING LABORATORIES LTD.

P.O. BOX 18507 TEL. 559422/23

NAIROBI.

## PARTICLE SIZE DISTRIBUTION

Sample No. 7734	Location IC 36 2.90-3.20m	Description of Sample Gravelly, slightly sandy SILT
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Clay	Fine Silt	Medium Silt	Coarse Silt	Fine Sand	Medium Sand	Coarse Sand	Fine Gravel	Medium Gravel	Coarse Gravel
------	-----------	-------------	-------------	-----------	-------------	-------------	-------------	---------------	---------------

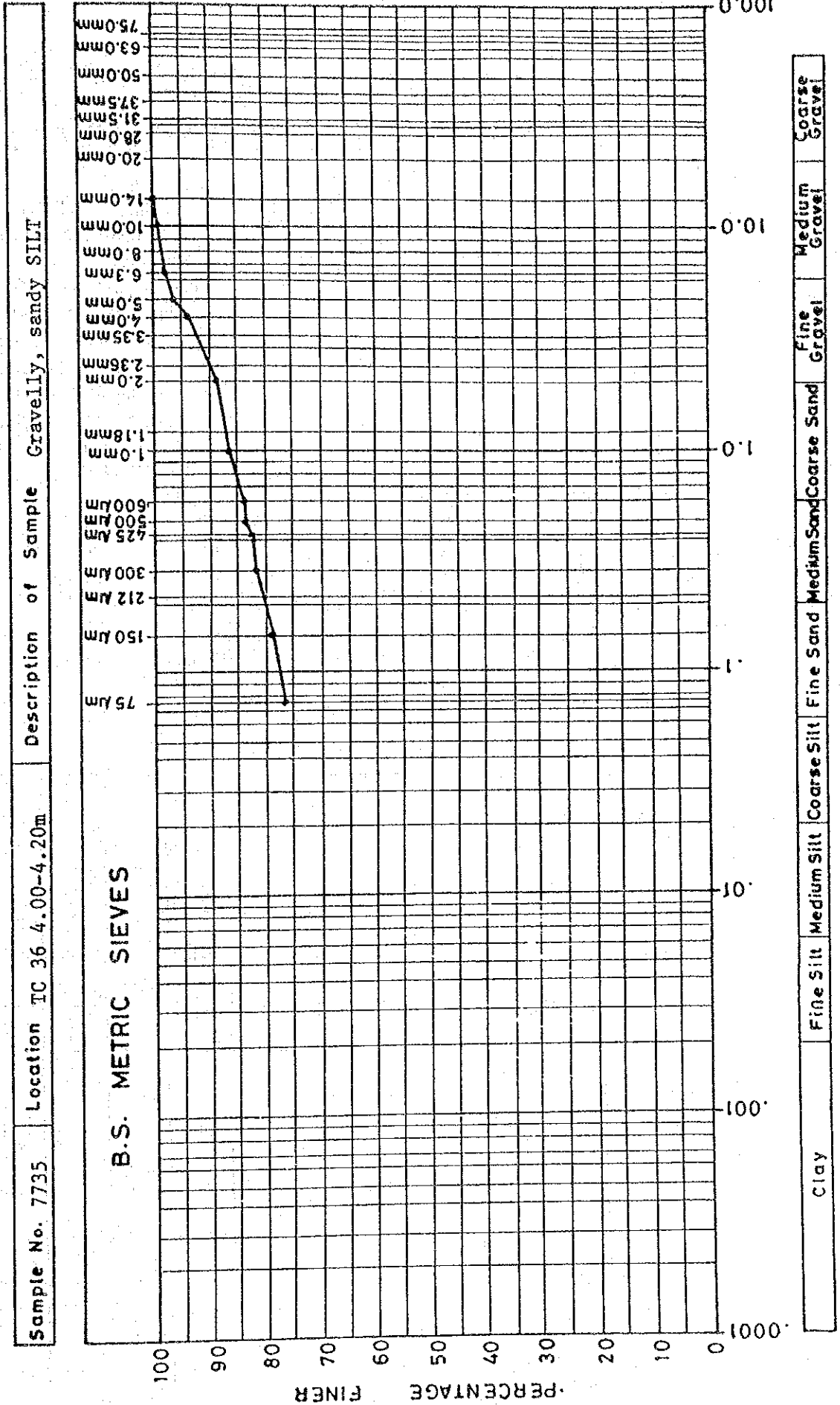


# CIL CENTRAL TESTING LABORATORIES LTD.

P.O. BOX 18507 TEL. 559422/23

NAIROBI.

## PARTICLE SIZE DISTRIBUTION







# CENTRAL TESTING LABORATORIES LTD

## P.O. Box 18507, NAIROBI, KENYA

MOWLEM CONSTRUCTION CO.(E.A.)LTD.

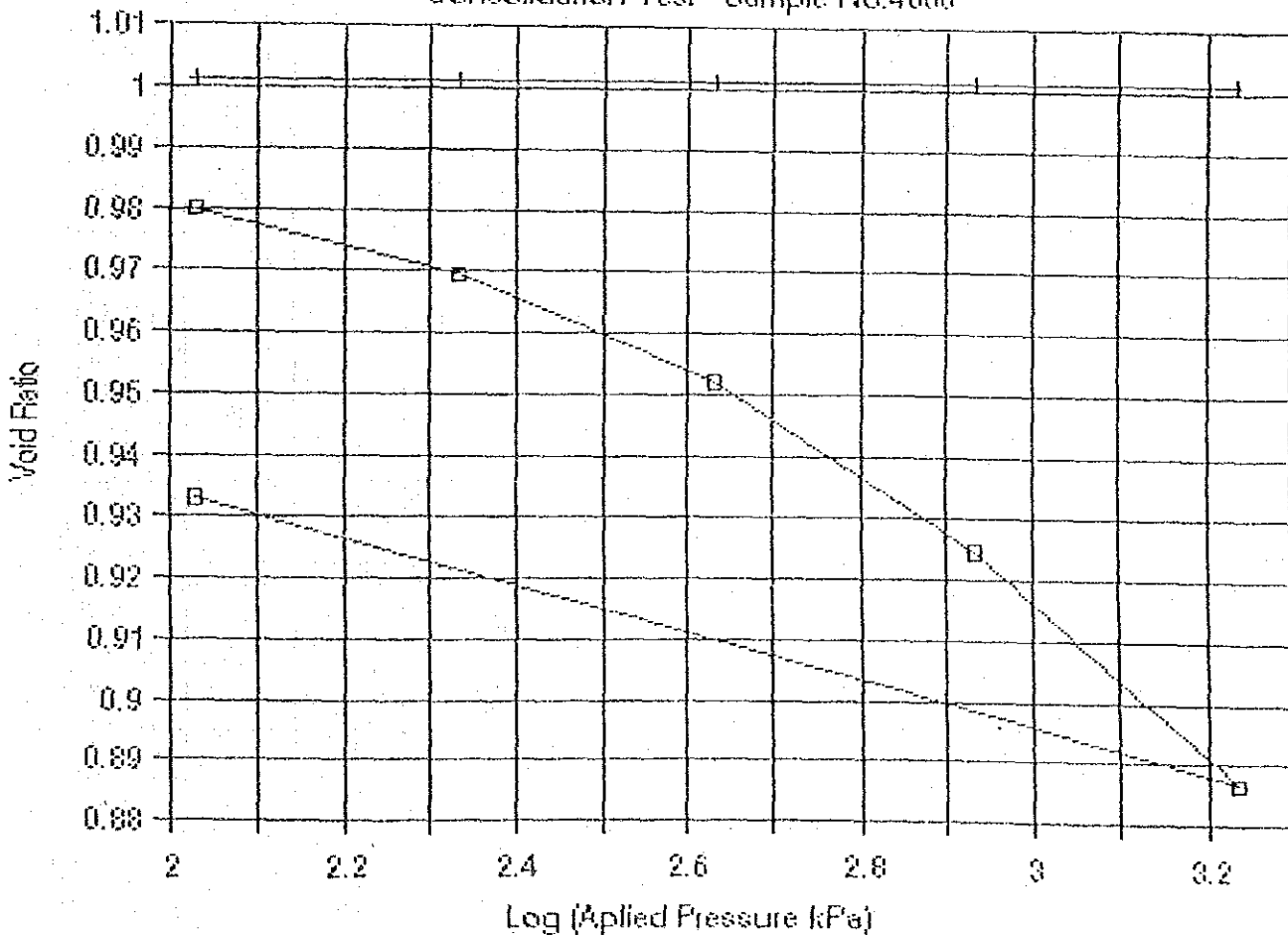
### CONSOLIDATION TEST

4680 : sample number TC25 B1 0.2m-1.2m  
 Sample Descr.: Red, slightly sandy SILT  
 2.61 : relative density of soil  
 1.30 : dry density of sample  
 21.50 : initial height of sample  
 1.00 : initial void ratio  
 0.09 : void ratio reduction factor  
 0.00 : dial gauge constant (positive if increases with settlement  
 if not then negative)

pressure	dialread	ftchange	voidchge	voidratio	sqrt90	cv m <sup>2</sup> /yr	mv m <sup>2</sup> /MN
-107.3	147	0.000	0.000	1.002	-	6.4	0.10
214.5	238	0.231	0.022	0.980	2.8	77.3	0.05
429.0	282	0.343	0.032	0.970	0.8	33.9	0.04
858.0	356	0.631	0.049	0.952	1.2	7.1	0.03
1716.0	472	0.826	0.077	0.925	2.6	32.0	0.02
107.3	633	1.234	0.115	0.887	1.2		
107.3	436	0.734	0.068	0.933			

### CENTRAL TESTING LABORATORIES LTD

Consolidation Test - Sample No.4680





# CENTRAL TESTING LABORATORIES LTD

## P.O. Box 18507, NAIROBI, KENYA

MOWLEM CONSTRUCTION CO. (E.A.) LTD.

### CONSOLIDATION TEST

4679 : sample number TC24 B2 2.6m-2.8m

Sample Descr.: - Fied, SILT

2.60 : relative density of soil

1.24 : dry density of sample

20.03 : initial height of sample

1.10 : initial void ratio

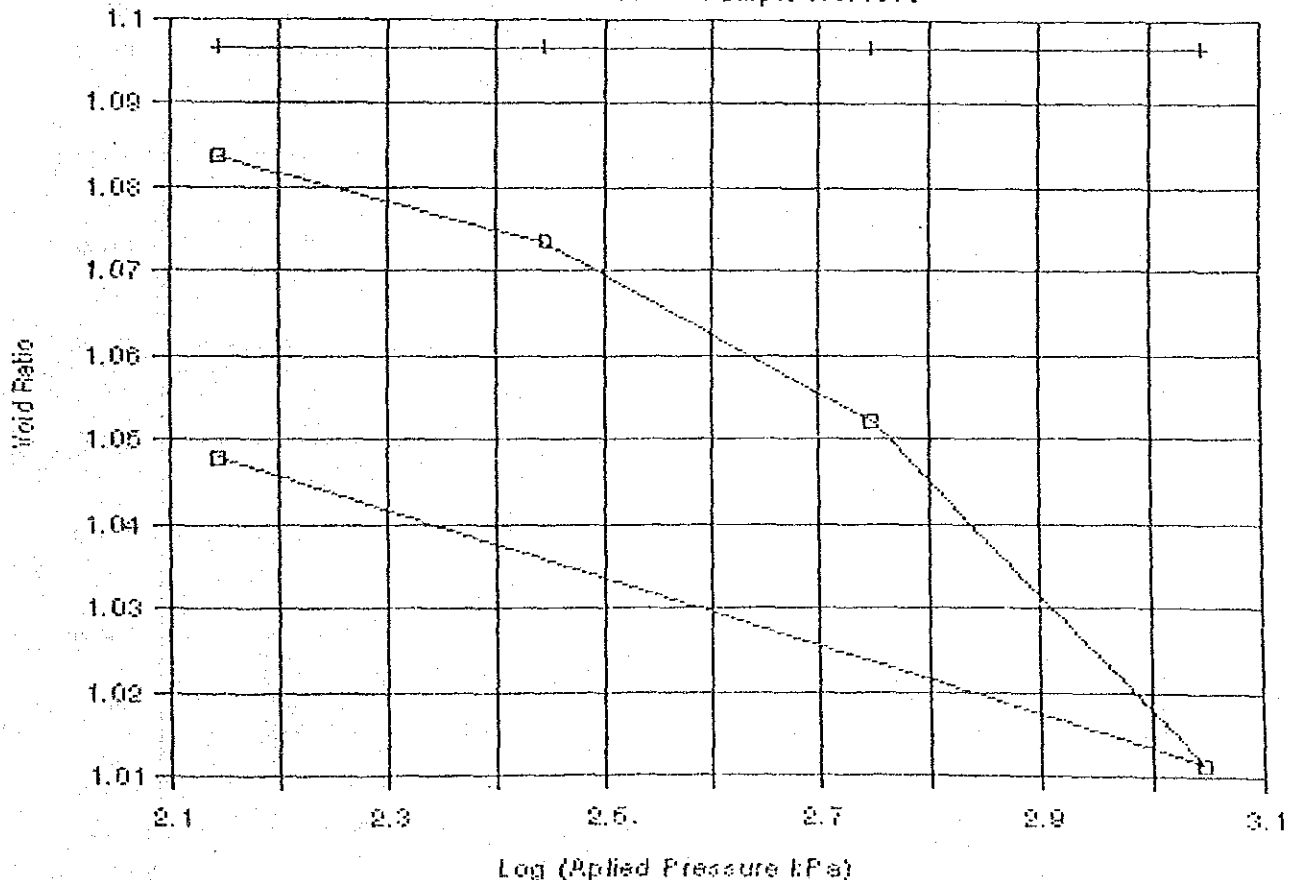
0.10 : void ratio reduction factor

-0.00 : dial gauge constant (positive if increases with settlement if not then negative)

pressure	dialread	htchange	voidchge	voidratio	sqrt90	cv m <sup>2</sup> /yr	mv m <sup>2</sup> /MN
	2739	0.000	0.000	1.097			
139.5	2690	0.124	0.013	1.084	1.7	15.2	0.04
279.0	2652	0.221	0.023	1.074	1.2	30.1	0.03
558.0	2571	0.427	0.045	1.052	1.2	29.7	0.04
1116.0	2418	0.815	0.085	1.011	1.1	34.2	0.04
139.5	2655	0.467	0.049	1.048	0.0	0.0	0.02

### CENTRAL TESTING LABORATORIES LTD

Consolidation Test - Sample No. 4679





# CENTRAL TESTING LABORATORIES LTD

## P.O. Box 18507, NAIROBI, KENYA

MOWLEM CONSTRUCTION CO. (E.A.) LTD.

### CONSOLIDATION TEST

4677 : sample number TC23 B1 0.7m-2.6m

Sample Descr.: Red, sandy, SILT

2.58 : relative density of soil

1.31 : dry density of sample

21.50 : initial height of sample

0.98 : initial void ratio

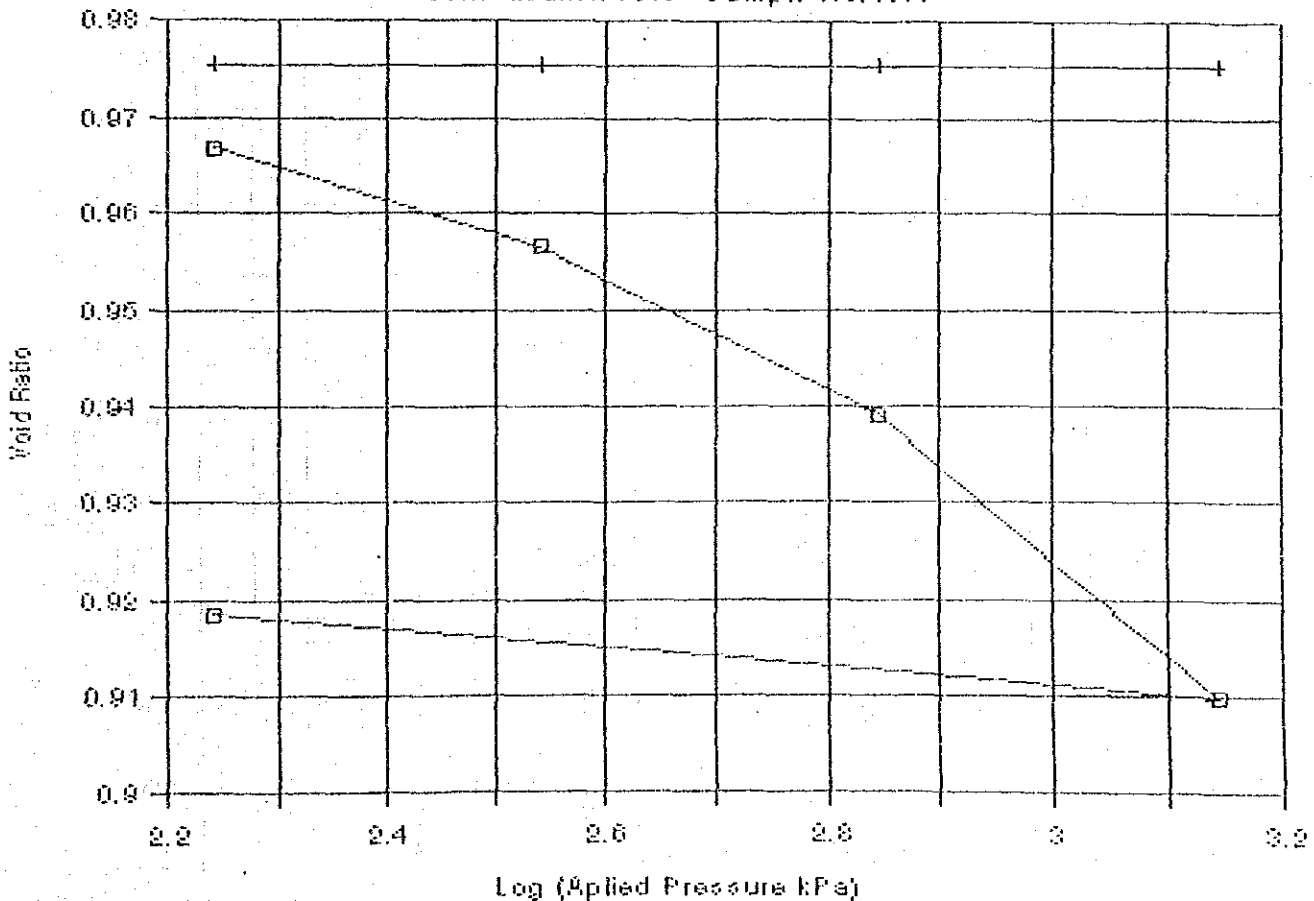
0.09 : void ratio reduction factor

0.00 : dial gauge constant (positive if increases with settlement if not then negative)

pressure	dialread	htchange	voidchge	voidratio	sqrt90	cv m <sup>2</sup> /yr	mv m <sup>2</sup> /MN
	144	0.000	0.000	0.975			
174.3	181	0.094	0.009	0.967	0.8	79.1	0.03
348.6	225	0.206	0.019	0.957	0.6	139.3	0.03
697.2	300	0.396	0.036	0.929	0.5	197.7	0.03
1394.4	425	0.714	0.066	0.910	0.8	75.4	0.02
174.3	388	0.620	0.057	0.919	0.0	0.0	0.00

### CENTRAL TESTING LABORATORIES LTD

Consolidation Test - Sample No. 4677





# CENTRAL TESTING LABORATORIES LTD

## P.O. Box 18507, NAIROBI, KENYA

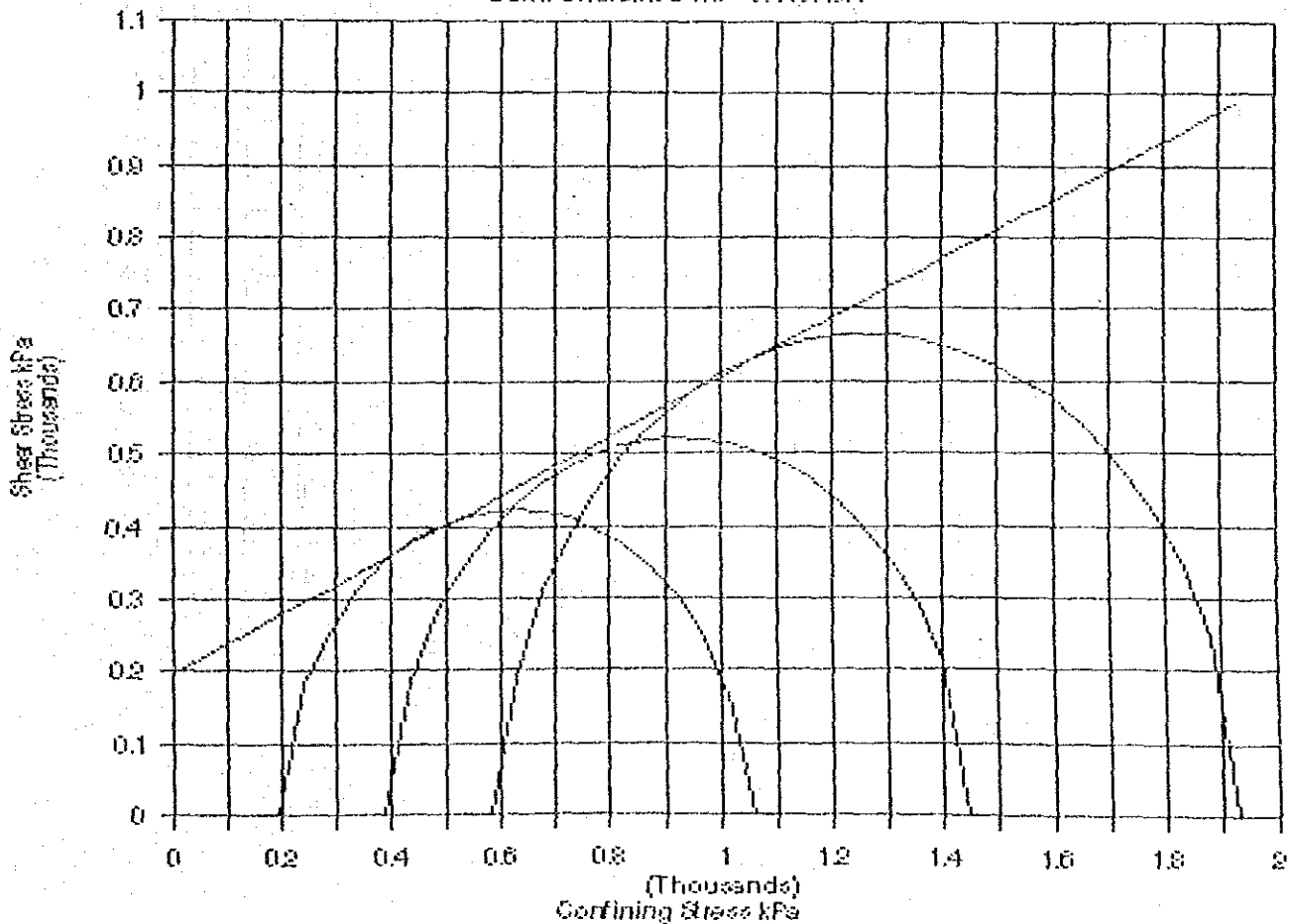
NAIROBI BY PASS  
 TC23 B1 0.7m-2.6m  
 QUICK UNDRAINED TRIAXIAL  
 4677 Sample No.

Description:-	Red, sandy, SILT			
	Remoulded at 95% MDD & OMC			
Specimen No.	Bulk Density kg/m <sup>3</sup>	Moisture Content %	Confining Pressure kN/m <sup>2</sup>	1/2 Deviator Stress kN/m <sup>2</sup>
1	1742	32.6	200	424
2	1743	32.7	400	523
3	1744	33.0	600	666

Slope                      22.2 degrees      Intercept                      198 kN/m<sup>2</sup>

### CENTRAL TESTING LABORATORIES LTD

Quick Undrained Tri - S. No. 4677







# CENTRAL TESTING LABORATORIES LTD

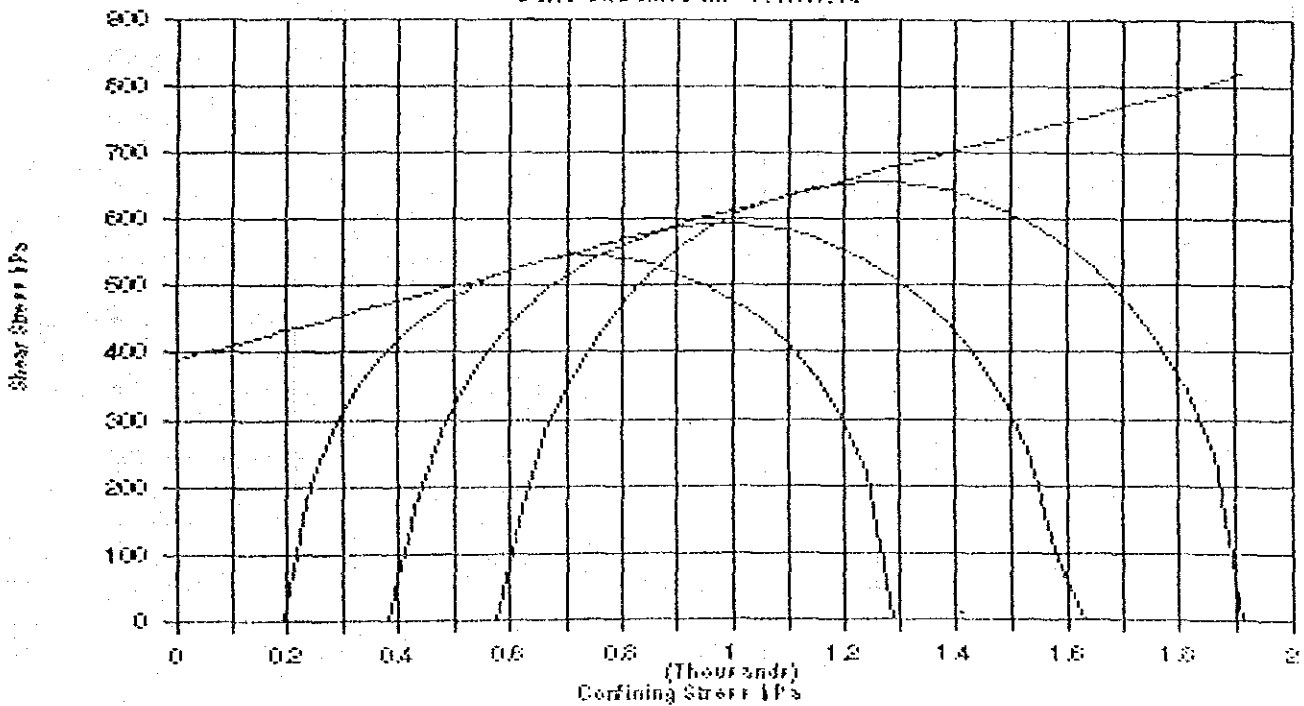
## P.O. Box 18507, NAIROBI, KENYA

NAIROBI BY PASS  
 TC24 B2 2.6m-2.8m  
 QUICK UNDRAINED TRIAXIAL  
 4679 Sample No.

Specimen No.	Bulk Density kg/m <sup>3</sup>	Moisture Content %	Remoulded at 95% MDD & OMC	Confining Pressure kN/m <sup>2</sup>	1/2 Deviator Stress kN/m <sup>2</sup>
1	1701	37.0		200	545
2	1705	37.8		400	594
3	1703	37.9		600	657

Slope 12.6 degrees Intercept 389 kN/m<sup>2</sup>

CENTRAL TESTING LABORATORIES LTD  
 Quick Undrained Tri - S. No. 4679





# CENTRAL TESTING LABORATORIES LTD

## P.O. Box 18507, NAIROBI, KENYA

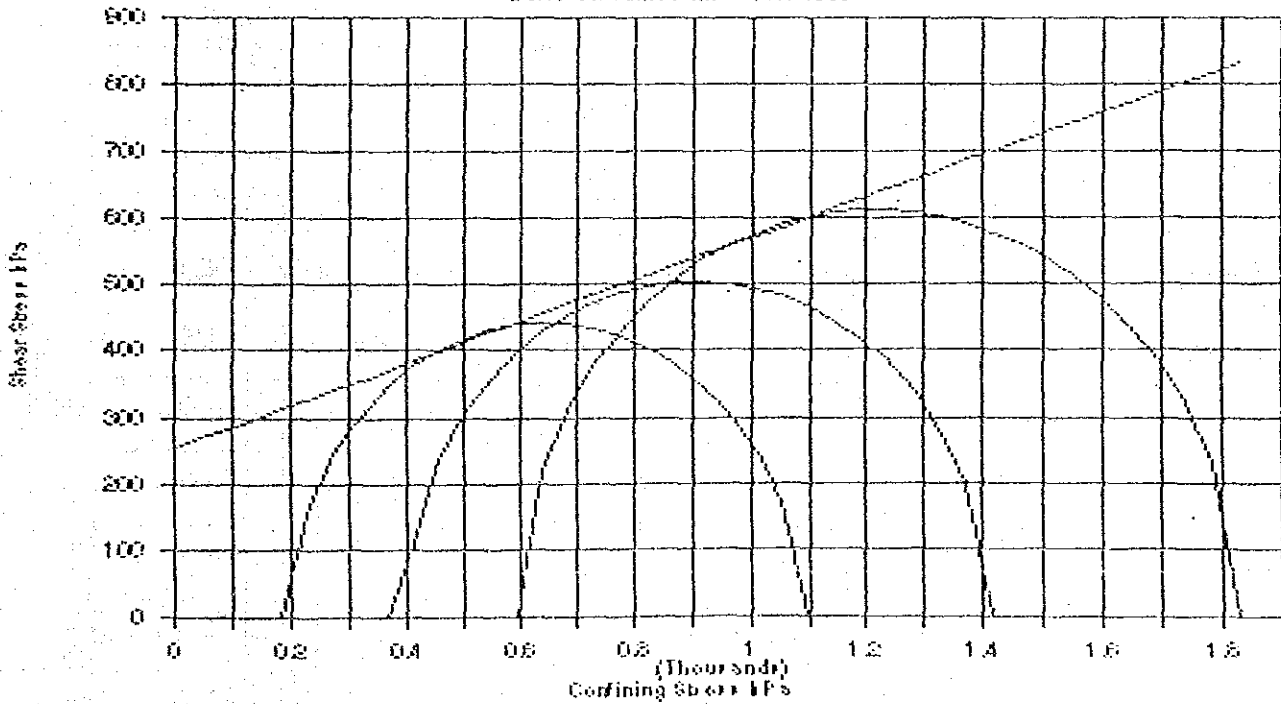
NAIROBI BY PASS  
 TC25 B1 0.2m-1.2m  
 QUICK UNDRAINED TRIAXIAL  
 4680 Sample No.

Description: - Red, slightly sandy, SILT  
 Remoulded at 95% MDD & OMC

Specimen No.	Bulk Density kg/m <sup>3</sup>	Moisture Content %	Confining Pressure kN/m <sup>2</sup>	1/2 Deviator Stress kN/m <sup>2</sup>
1	1753	34.3	200	443
2	1750	34.3	400	506
3	1752	34.3	600	614

Slope 17.5 degrees Intercept 256 kN/m<sup>2</sup>

CENTRAL TESTING LABORATORIES LTD  
 Quick Undrained Tri - S. No. 4680





CENTRAL TESTING  
LABORATORIES LTD.  
P.O. Box 18507,  
NAIROBI.

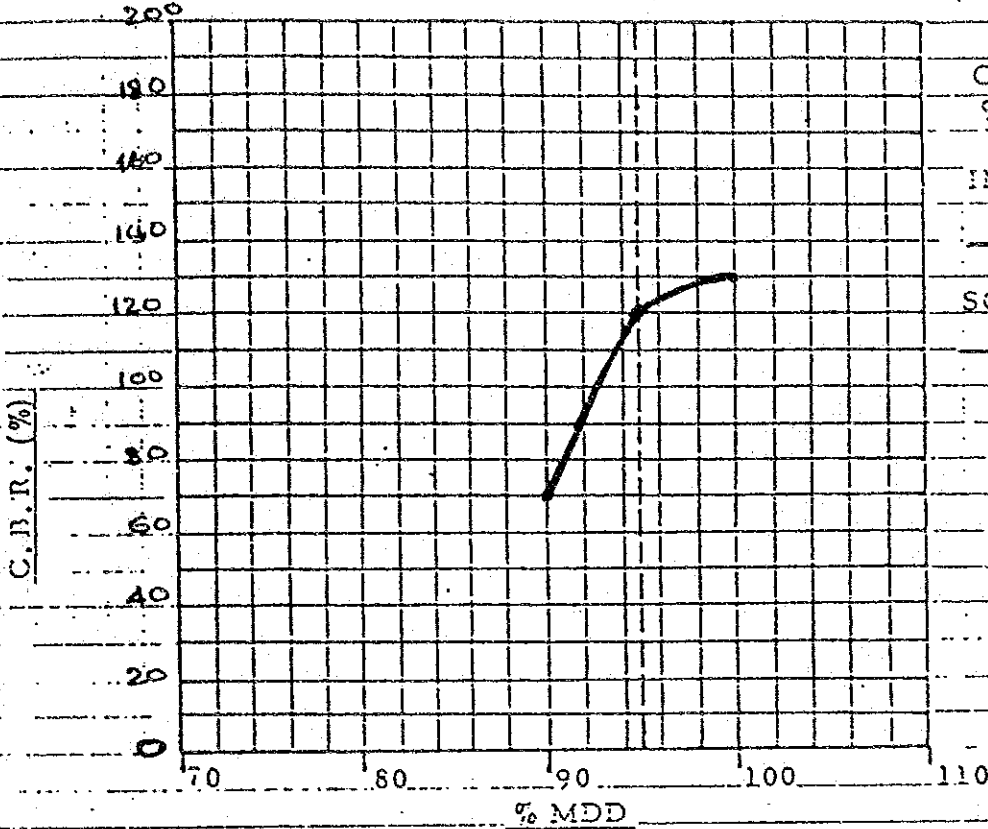
CALCULATIONS

FOR 3 POINT C.B.R.  
AND SWELL MEASUREMENT

S/No.	Date	TC	Sample
4652	27/8/90	TC 3B1	0.20-0.60mm

Client MOWLEM CONSTRUCTION CO (EA)LTD

Location NAIROBI BY PASS



C.B.R. AT

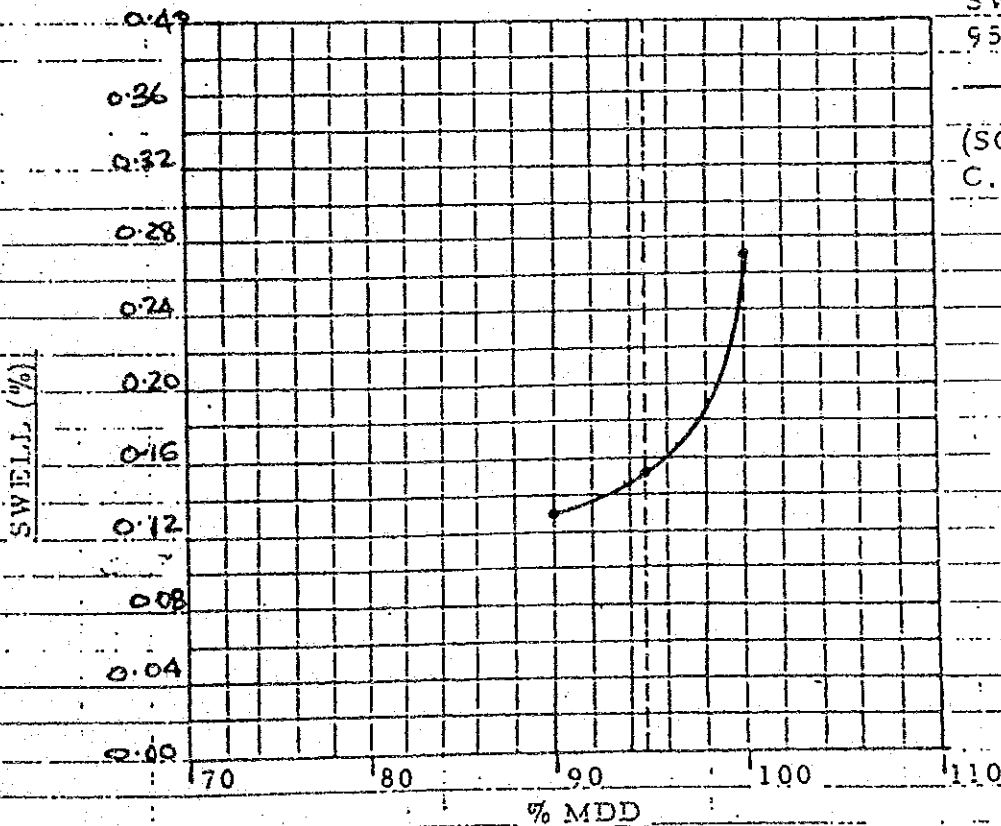
95% MDD:-

IMMEDIATE:-

N/A %

SOAKED:-

120 %



SWELL AT

95% MDD:-

0.2 %

(SOAKED  
C.B.R. ONLY)



CENTRAL TESTING  
LABORATORIES LTD.  
P. O. Box 18507,  
NAIROBI.

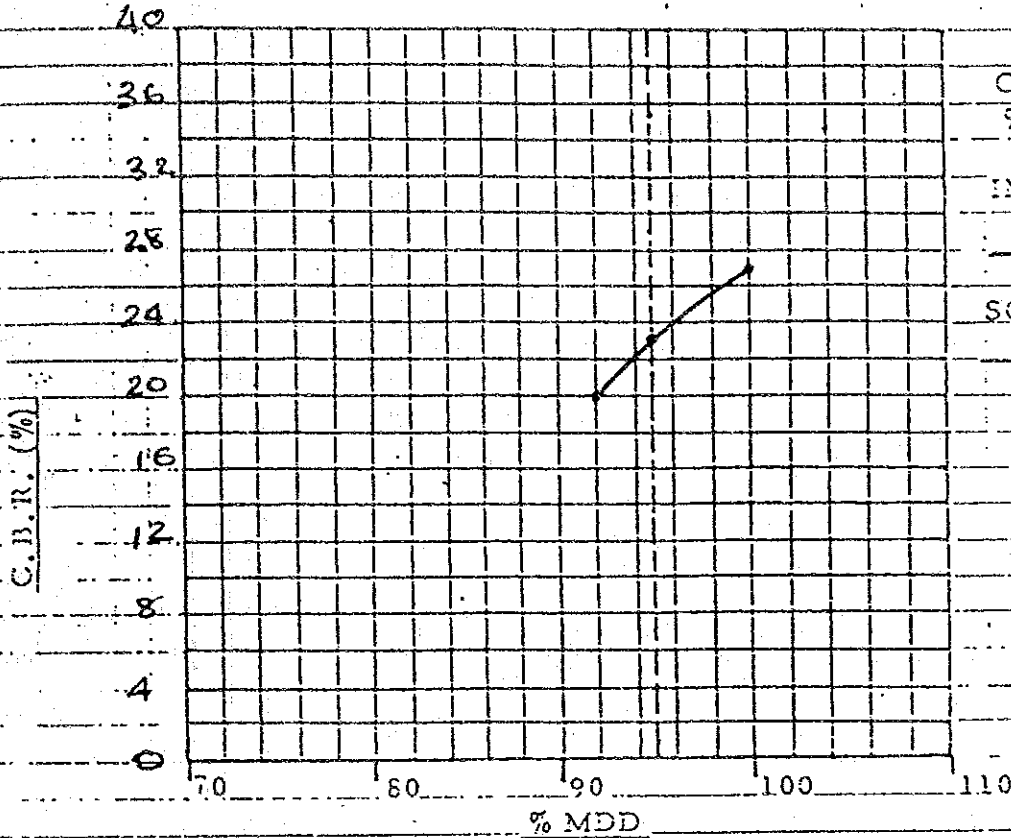
CALCULATIONS

FOR 3 POINT C. B. R.  
AND SWELL MEASUREMENT

S/No.	Date	TC6 B1	0.30-1.60m
4657	27/8/90		

Client MOWLEM CONSTRUCTION CO (EA) LTD

Location NAIROBI BY PASS



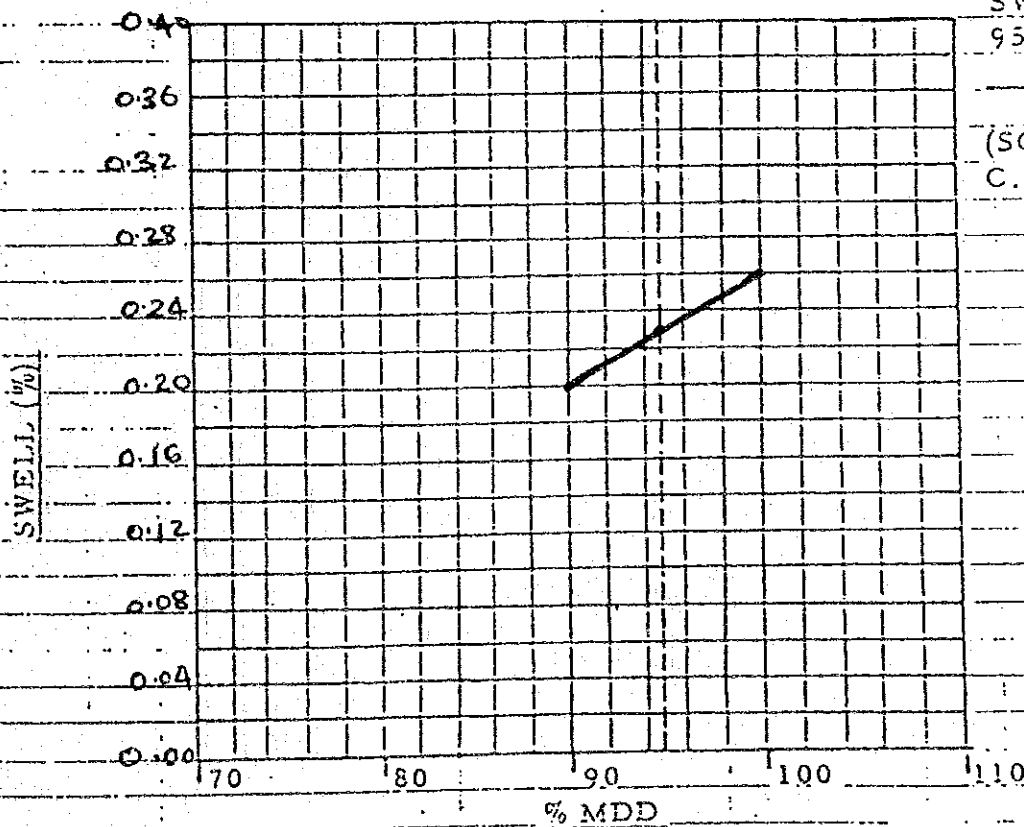
C. B. R. AT  
95% MDD:-

IMMEDIATE:-

N/A %

SOAKED:-

23 %



SWELL AT

95% MDD:-

0.2 %

(SOAKED

C. B. R. ONLY)





CENTRAL TESTING LABORATORIES LTD.  
 P. O. Box 18507,  
 NAIROBI.

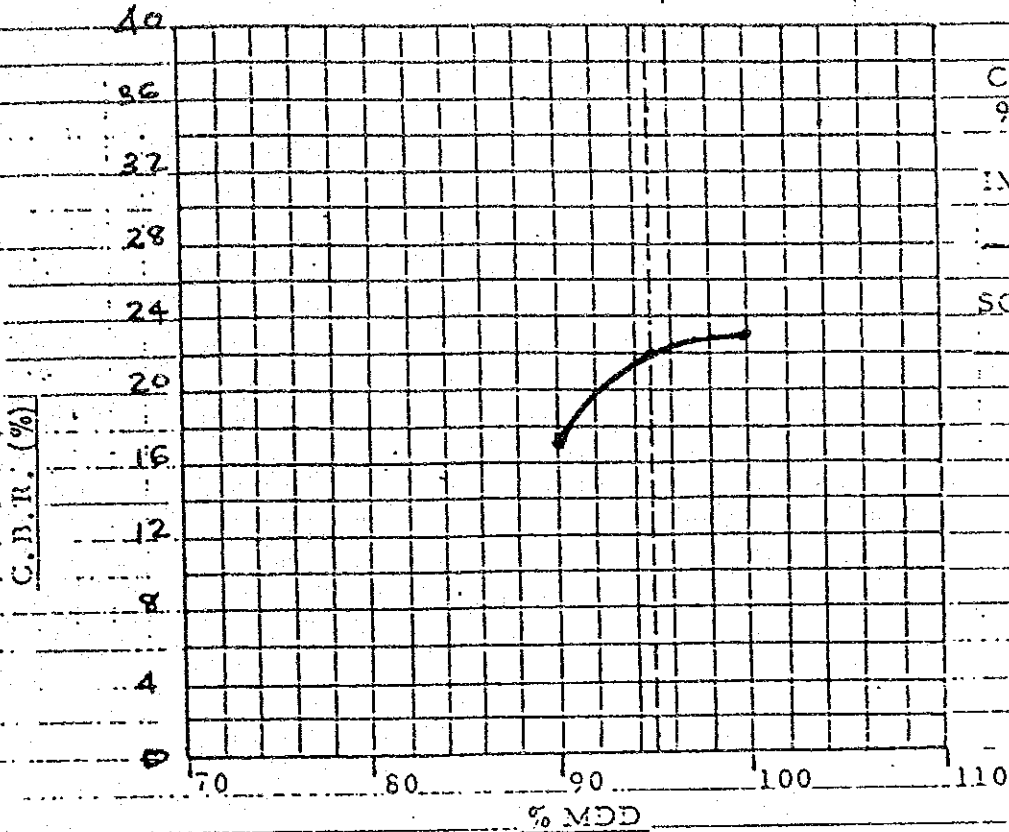
CALCULATIONS

FOR 3 POINT C.B.R.  
 AND SWELL MEASUREMENT

S/No.	Date	TC	Depth
4684	27/8/90	TC29B1	0.40-4.00m

Client MOULEM CONSTRUCTION CO (EA) LTD

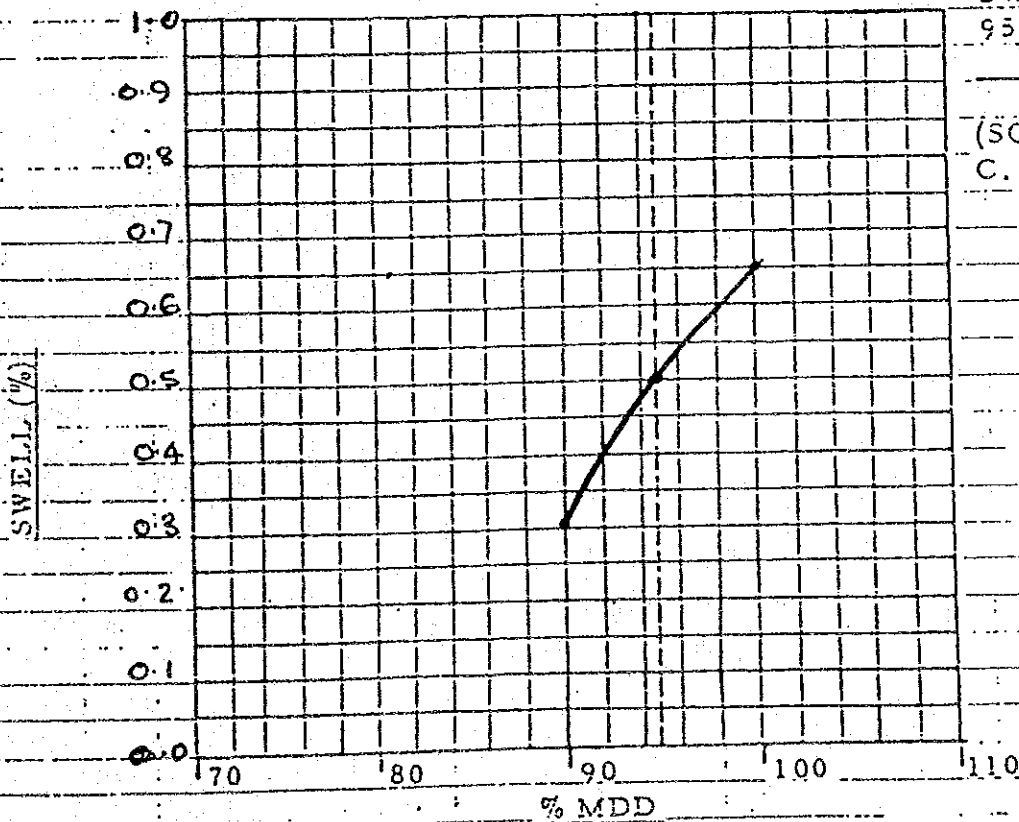
Location NAIROBI BY PASS



C.B.R. AT  
 95% MDD:-

IMMEDIATE:-  
 N/A %

SOAKED:-  
 22 %



SWELL AT  
 95% MDD:-  
 0.5%

(SOAKED  
 C.B.R. ONLY)





