

No. IV-3-1








Name of Dam Gondongwe

Location	District Gutu		Communal Land Serima	
	Map Ref. 1930B4		Coordinates TP836453	
Geology	Granite, it seems to be soft and well jointed, the surface soil is very deep from the airphoto-reading.			
Hydrology	River Popoteke		Hydrological Zone E-UT4	
	Catchment Area	16.4 sq.km	M.A. Rainfall	780 mm
	M.A. Runoff	95 mm	Sediment	60 tonnes km ² /yr.
Reservoir	Effective Capacity	1.160 MCM	1/10 Yr. Yield	0.436 MCM
	Dead Capacity	0.020 MCM	D.W.S.	1 411 m
	Total Capacity	1.180 MCM	N.W.S.	1 422 m
Dam	Height	18 m	Length	280 m
	Embankment Volume	105 000 cu.m	Spillway	91 m
Agriculture	Natural Region III		Soil -	
	Potential Irrigable Area - ha			
	Proposed Cropping Pattern -			
Irrigation	Net Irrigable Area - ha		Dist. - km by -	
	Topography	Area	-	
		Conveyance	-	
Rural Water Supply	Population 3 543 person		71 cu.m/day	
	Livestock 1 535 unit		69 cu.m/day	
Cost and Benefit	Dam		Irrigation Facilities	Total Cost
	Z\$ 1 387 000		-	Z\$1 387 000
	Annual Increment Benefit		Net Present Value	Economic Internal Rate of Return
	Z\$ 14 297 /year		Z\$ 166 000	-
Visit	Dam Engineer	Geologist	Irrigation Engineer	Agronomist
	Y	N	Y	N
Remarks	Water Control Area			

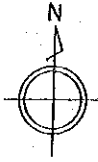
Present Condition on the Ward

Ward Name	21		Area	8 005 ha
Demography	Population Density		118.1	persons/sq.km
	Family Size		9.4	Persons/household
Agriculture	Arable Area		2 616 ha	Grazing Area 5 389 ha
	Maize	2.1 ha/household	18	bags/ha
	Sorghum	0 ha/household	5	bags/ha
	Livestock	2.5 LSUs/household	30.7	LSUs/sq.km
Rural Water Supply	Borehole	0.05 units/sq.km	2 363	persons/unit
	Well	0.12 units/sq.km	945	persons/unit

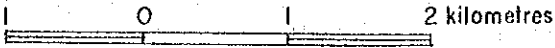
LEGEND

-  Catchment Area
-  Reservoir
-  Dam
-  Pump
-  Conveyance Canal or Pipe
-  Night Storage Reservoir
-  Irrigable Area

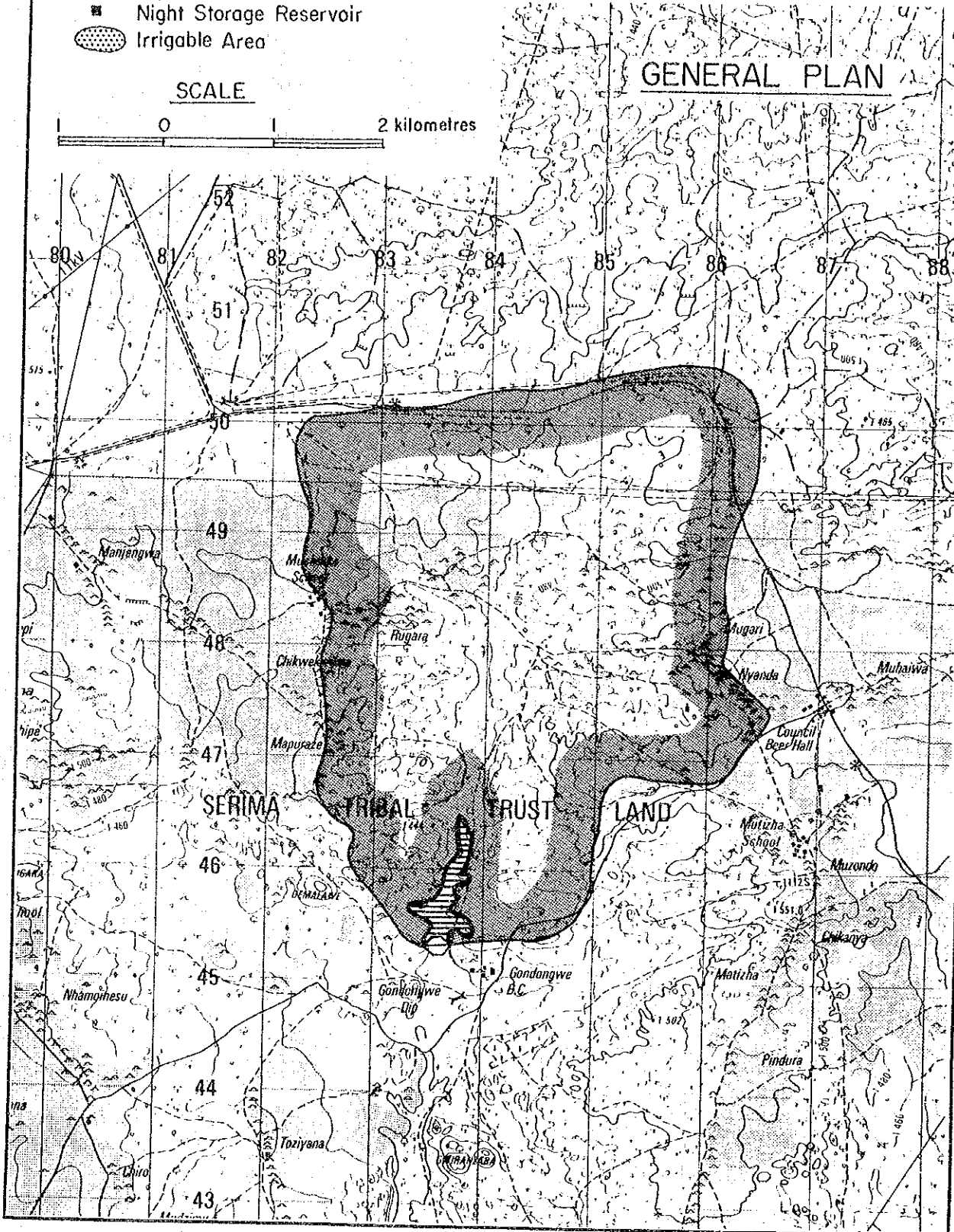
Dam No. IV-3-1
 Dam Name GONDONGWE
 Catchment Area 16.4 sq.km
 1/10 yr. Yield 436 Th.cu.m
 Water Conveyance none
 Water for livestock and domestic use



SCALE



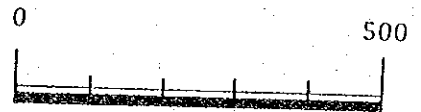
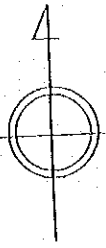
GENERAL PLAN



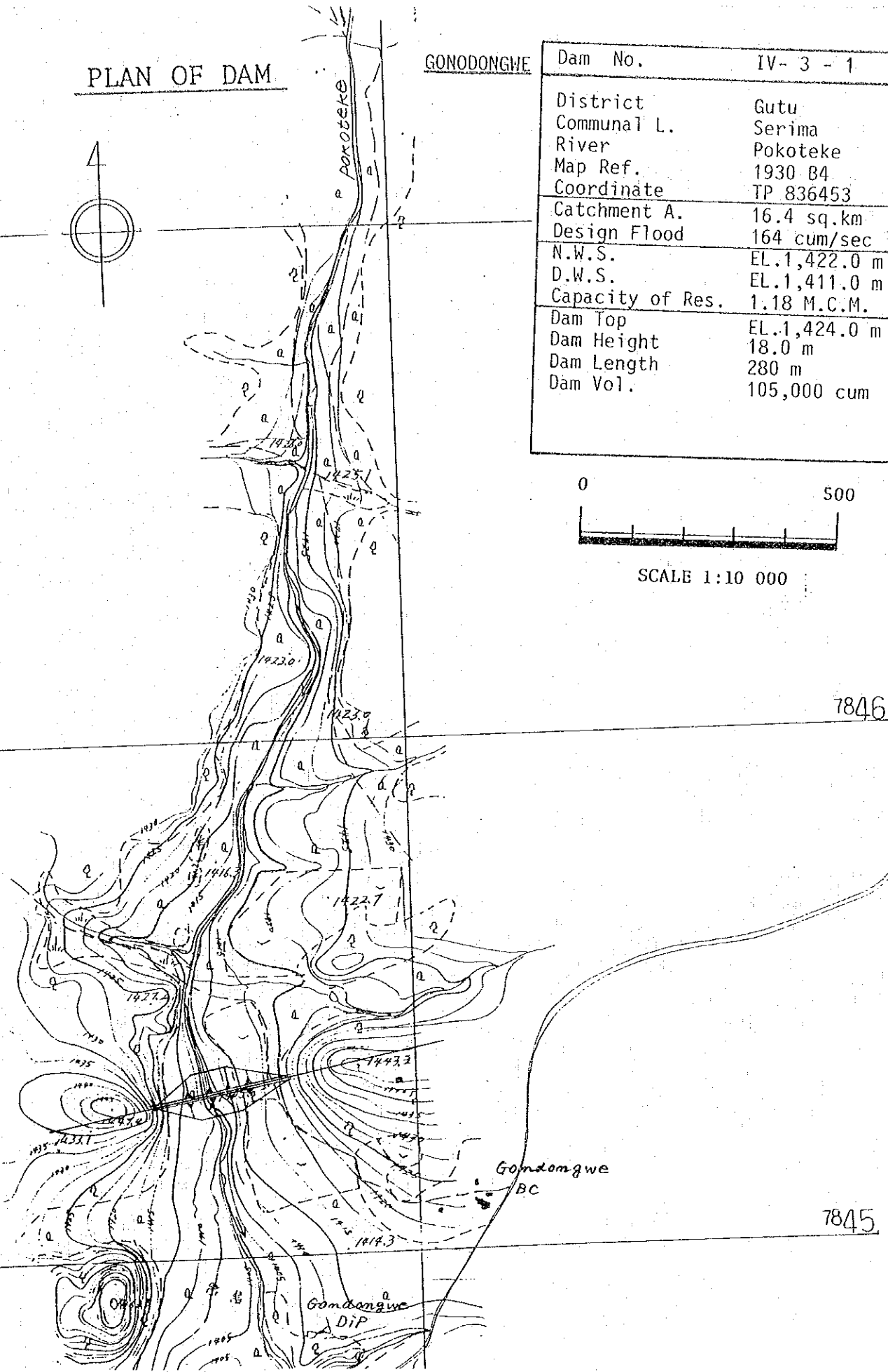
PLAN OF DAM

GONODONGWE

Dam No.	IV- 3 - 1
District	Gutu
Communal L.	Serima
River	Pokoteke
Map Ref.	1930 B4
Coordinate	TP 836453
Catchment A.	16.4 sq.km
Design Flood	164 cum/sec
N.W.S.	EL.1,422.0 m
D.W.S.	EL.1,411.0 m
Capacity of Res.	1.18 M.C.M.
Dam Top	EL.1,424.0 m
Dam Height	18.0 m
Dam Length	280 m
Dam Vol.	105,000 cum



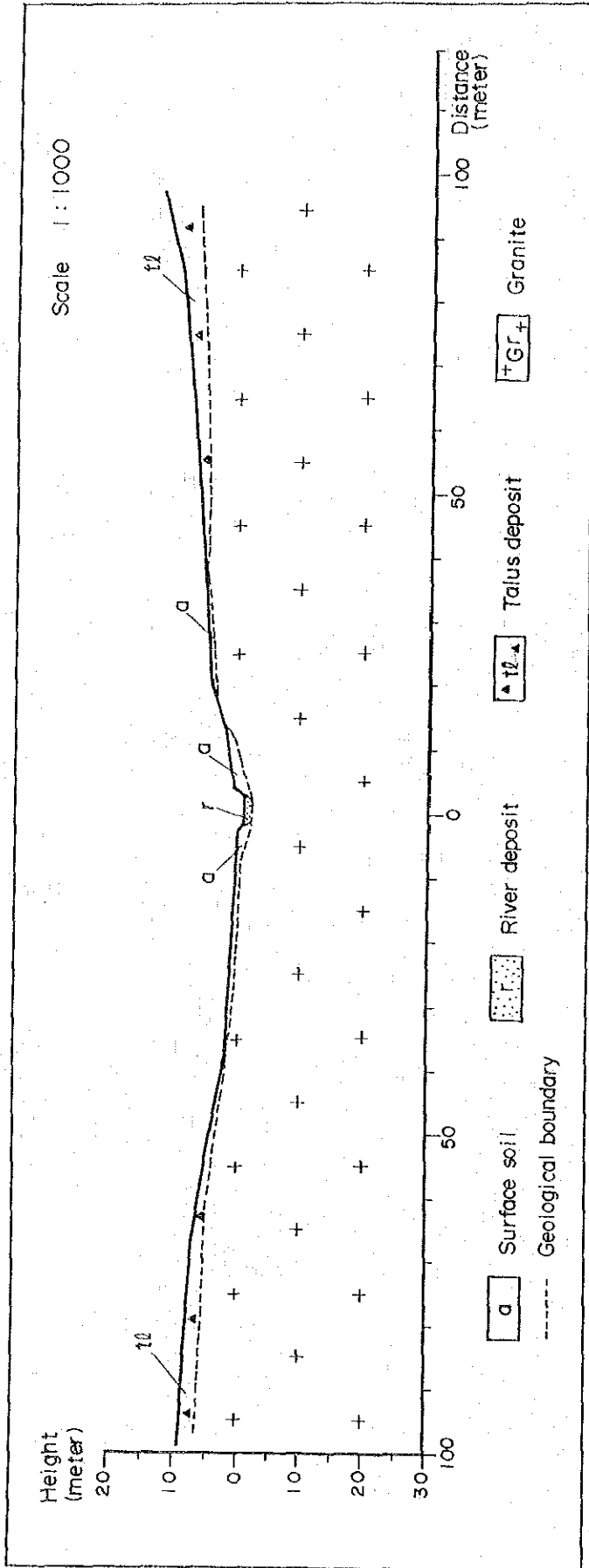
SCALE 1:10 000



7846

7845

IV-3-1 Gondongwe



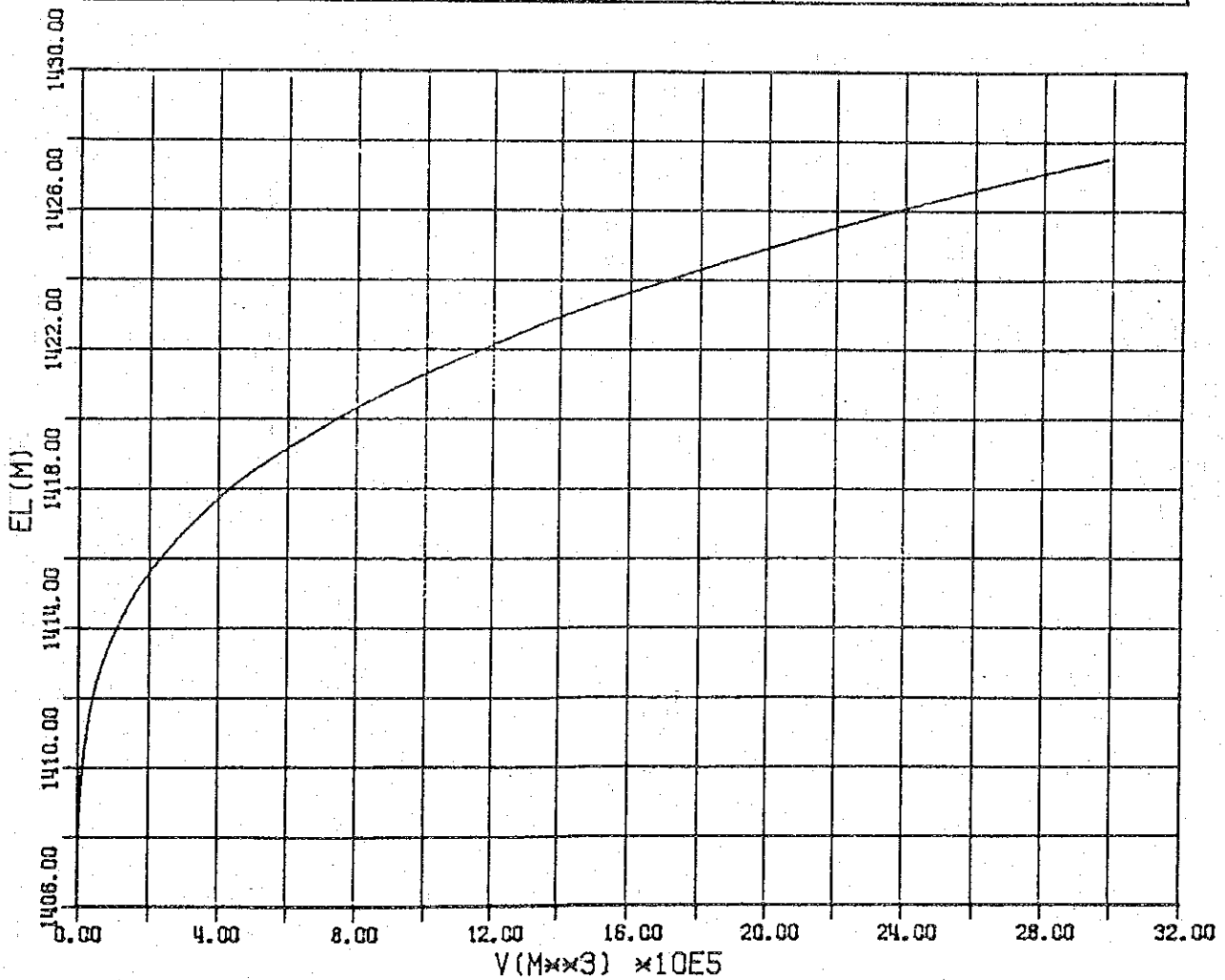
The ground survey was not carried out in this area, therefore the geophysical and the geological conditions were studied from existing data.

The area is hilly, and around the damsite many "dwalas" are distributed. The Pokoteke River forms relatively deep and wide flood plane, and it has been greatly affected by the geological structures and flows straight. The bedrock consists of granite and surface soil is thick. The Pokoteke River flows along a great lineament, therefore the bedrock seems to be soft and well jointed. It seems that leakage through the bedrock is large and bearing strength in foundation strata is weak.

TABLE STORAGE VOLUME OF RESERVOIR

NO	MAP	GRID	VER	HCR
IV-3-1	1930B4	TP	836	453

EL (M)	ΔH (M)	AREA (M ²)	AVE (M ²)	VOL (M ³)	ΣV (1000M ³)	NOTE
1406.0	0.0	0	0	0	0.00	
1407.5	1.5	2000	1000	1500	1.50	
1410.0	2.5	8000	5000	12500	14.00	
1412.5	2.5	23500	15750	39375	53.37	
1415.0	2.5	61000	42250	105625	159.00	
1417.5	2.5	111000	86000	215000	374.00	
1420.0	2.5	181000	146000	365000	739.00	
1422.5	2.5	255500	218250	545625	1284.62	
1425.0	2.5	334000	294750	736875	2021.50	
1427.5	2.5	434000	384000	960000	2981.50	



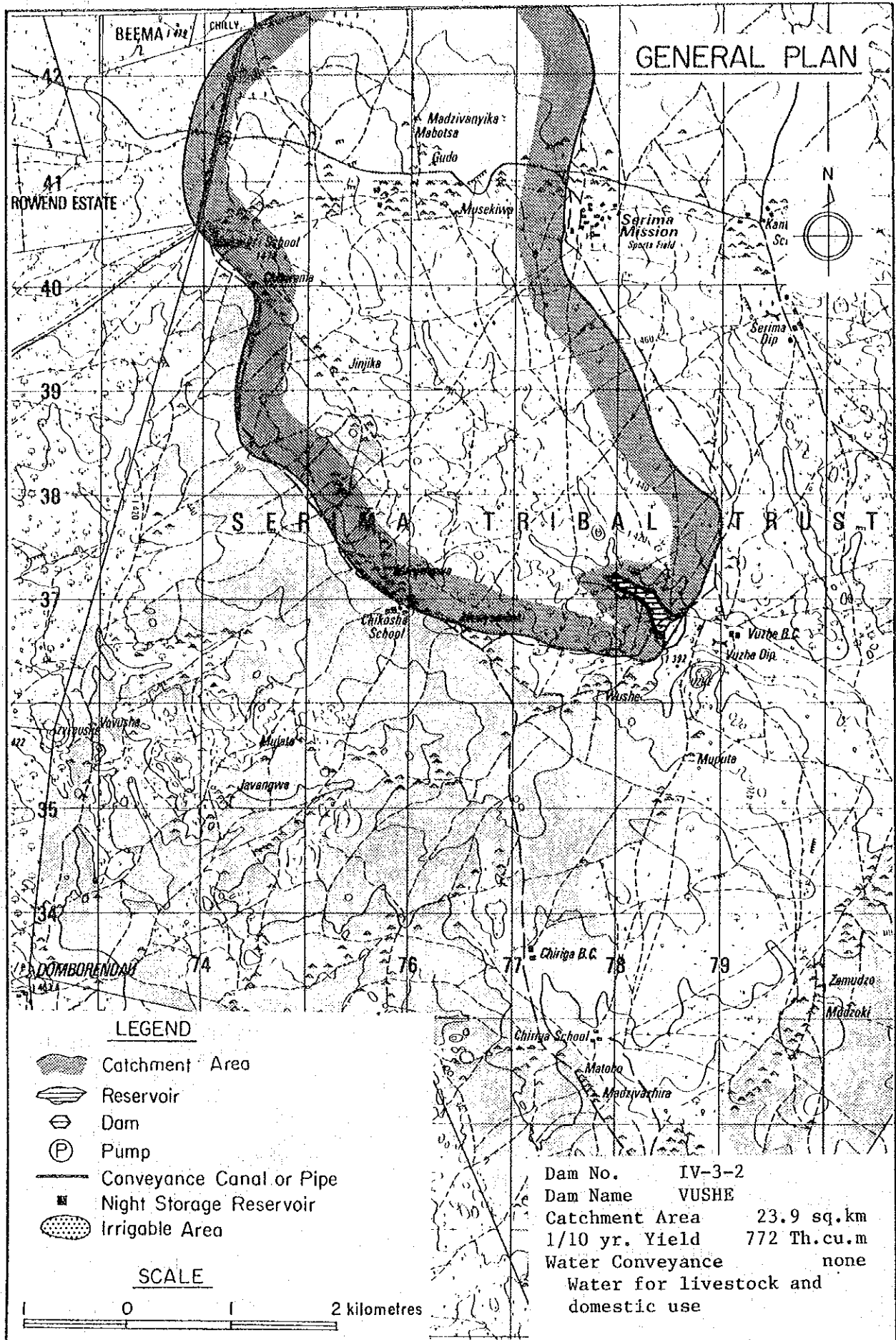
No. IV-3-2

Name of Dam Vushe

Location	District Gutu		Communal Land Serima	
	Map Ref. 1930D2		Coordinates TP785355	
Geology	Granite, it seems to be very soft and well jointed from the airphoto-reading.			
Hydrology	River Chinyika		Hydrological Zone E-UT4	
	Catchment Area	23.9 sq.km	M.A. Rainfall	780 mm
	M.A. Runoff	95 mm	Sediment	60 tonnes km ² /yr.
Reservoir	Effective Capacity	2.640 MCM	1/10 Yr. Yield	0.772 MCM
	Dead Capacity	0.020 MCM	D.W.S.	1 387 m
	Total Capacity	2.660 MCM	N.W.S.	1 400 m
Dam	Height	18 m	Length	900 m
	Embankment Volume	155 000 cu.m	Spillway	118 m
Agriculture	Natural Region III		Soil -	
	Potential Irrigable Area			- ha
	Proposed Cropping Pattern -			
Irrigation	Net Irrigable Area - ha		Dist. - km by -	
	Topography	Area	-	
		Conveyance	-	
Rural Water Supply	Population 3 621 person		72 cu.m/day	
	Livestock 1 875 unit		84 cu.m/day	
Cost and Benefit	Dam		Irrigation Facilities	Total Cost
	Z\$1 605 000		-	Z\$1 605 000
	Annual Increment Benefit		Net Present Value	Economic Internal Rate of Return
	Z\$ 25 695 /year		Z\$ 299 000	1.6 per cent
Visit	Dam Engineer	Geologist	Irrigation Engineer	Agronomist
	Y	N	Y	Y
Remarks	Water Control Area			

Present Condition on the Ward

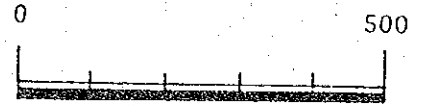
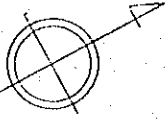
Ward Name	22, 23		Area (3 659 + 7 826) ha	
Demography	Population Density		120.7 persons/sq.km	
	Family Size		6.7 Persons/household	
Agriculture	Arable Area (2 759 + 5 113) ha		Grazing Area (900 + 2 713) ha	
	Maize	2.5 ha/household	15	bags/ha
	Sorghum	0 ha/household	5	bags/ha
	Livestock	2.1 LSUs/household	37.5	LSUs/sq.km
Rural Water Supply	Borehole	0.07 units/sq.km	1 908	persons/unit
	Well	0.50 units/sq.km	272	persons/unit



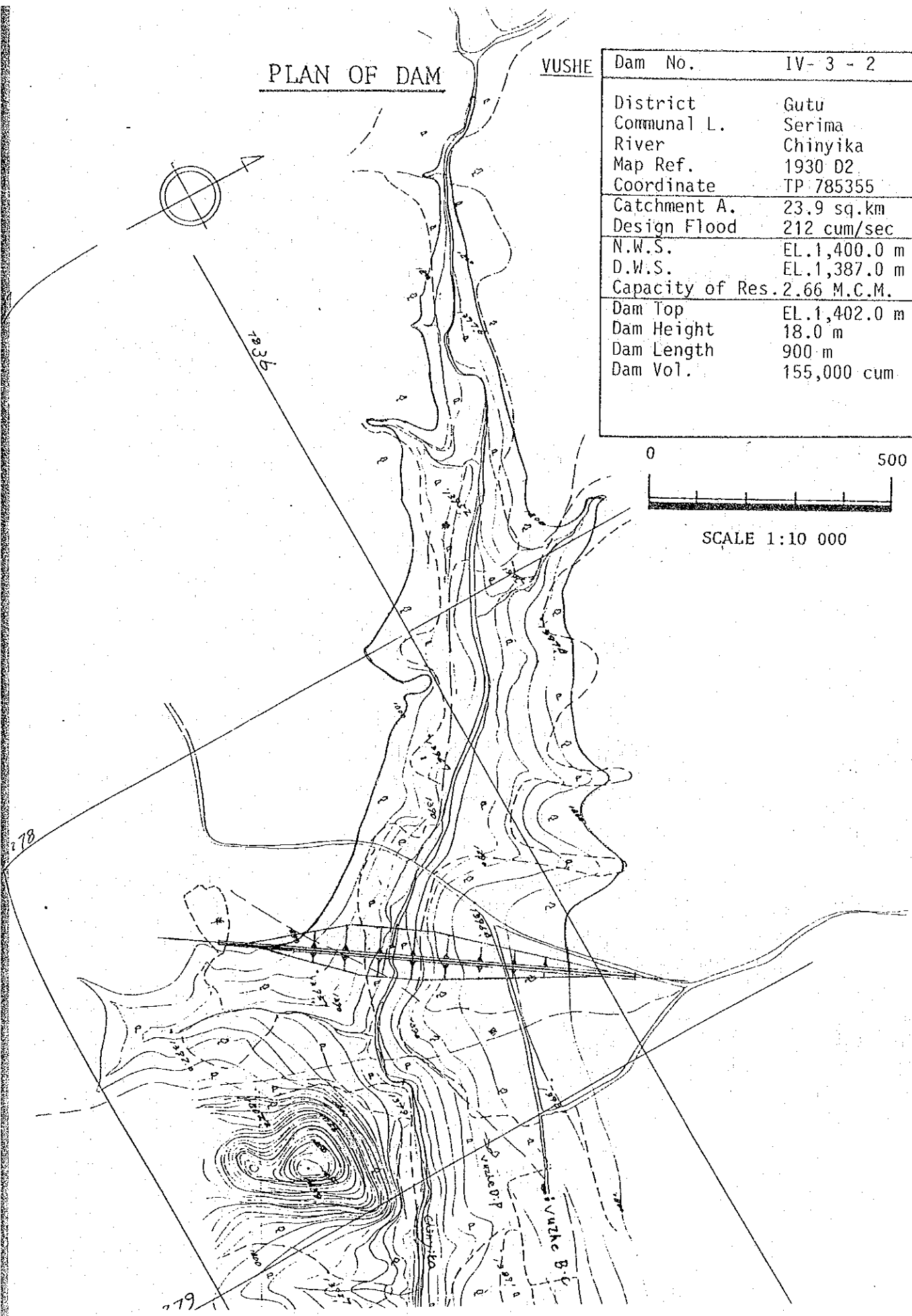
PLAN OF DAM

VUSHE

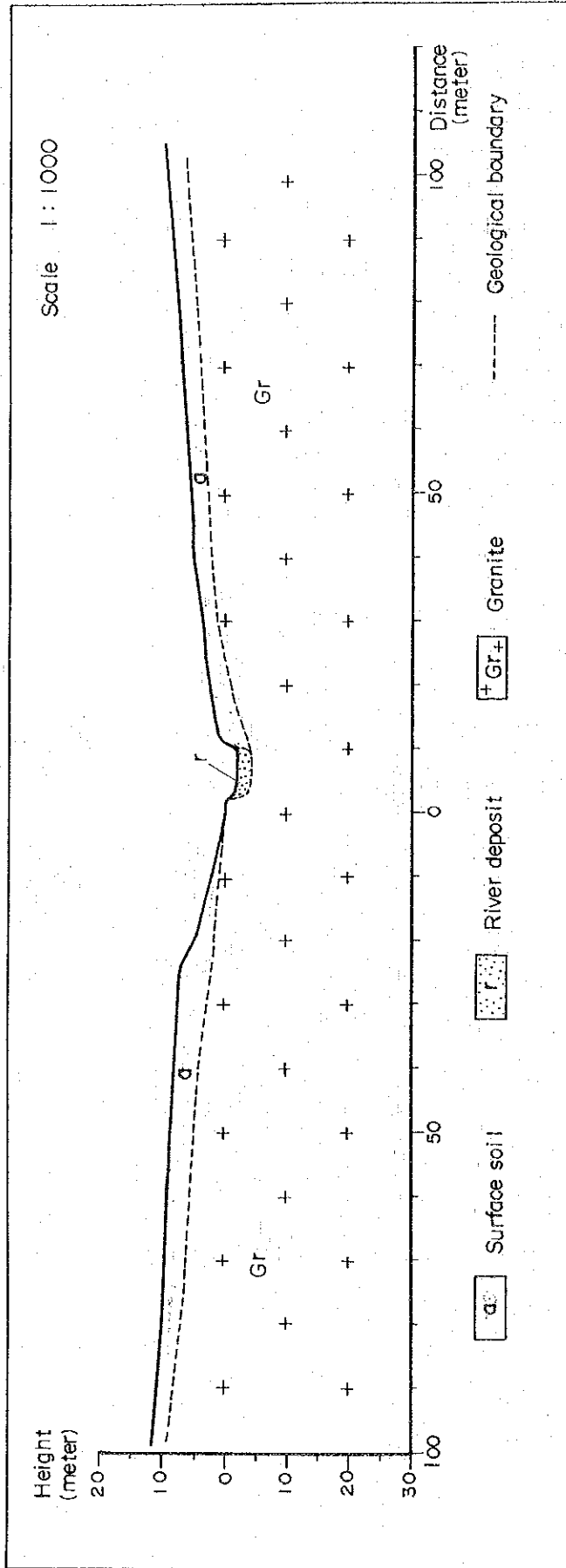
Dam No.	IV-3-2
District	Gutu
Communal L.	Serima
River	Chinyika
Map Ref.	1930 D2
Coordinate	TP 785355
Catchment A.	23.9 sq.km
Design Flood	212 cum/sec
N.W.S.	EL.1,400.0 m
D.W.S.	EL.1,387.0 m
Capacity of Res.	2.66 M.C.M.
Dam Top	EL.1,402.0 m
Dam Height	18.0 m
Dam Length	900 m
Dam Vol.	155,000 cum



SCALE 1:10 000



IV-3-2 Vushe

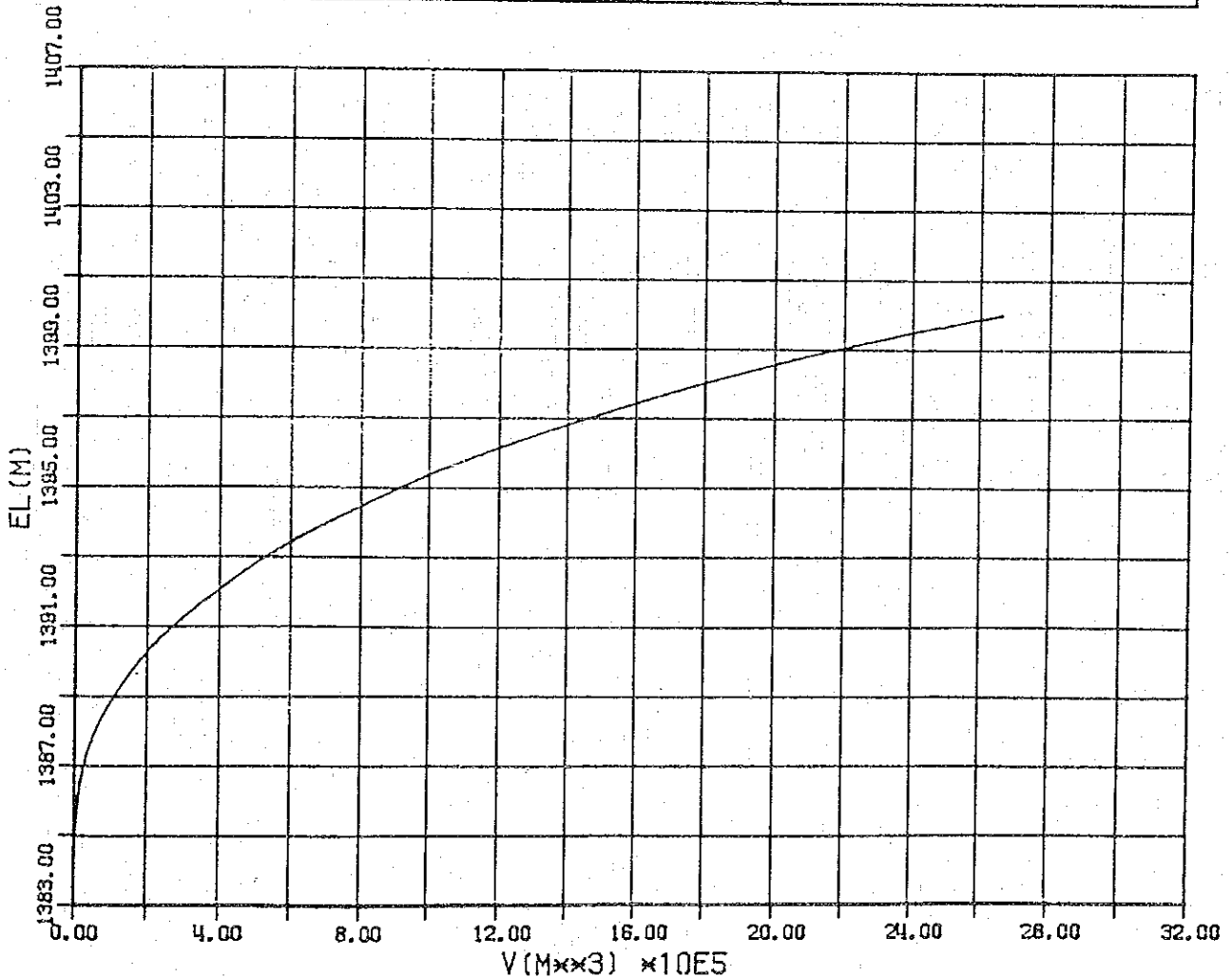


The ground survey was not carried out in this area, therefore the geophysical and the geological conditions were studied from existing data. The area is undulated land and few "dwalas" are distributed. The Chinyka River forms wide and shallow valley, and flows straight. The bedrock consists of granite. The air-photograph indicates that many lineaments and low ridges of dykes are distributed, and one of them is great and along the Chinyka River including the damsite. It seems that the bedrock is soft and well jointed, and leakage is great.

TABLE STORAGE VOLUME OF RESERVOIR

NØ	MAP	GRID	VER	HØR
IV-3-2	193002	TP	785	355

EL (M)	ΔH (M)	AREA (M ²)	AVE (M ²)	VOL (M ³)	ΣV (1000M ³)	NØTE
1383.5	0.0	0	0	0	0.00	
1385.0	1.5	4000	2000	3000	3.00	
1387.5	2.5	25000	14500	36250	39.25	
1390.0	2.5	85000	55000	137500	176.75	
1392.5	2.5	139000	112000	280000	456.75	
1395.0	2.5	225000	182000	455000	911.75	
1397.5	2.5	340000	282500	706250	1618.00	
1400.0	2.5	495000	417500	1043750	2661.75	



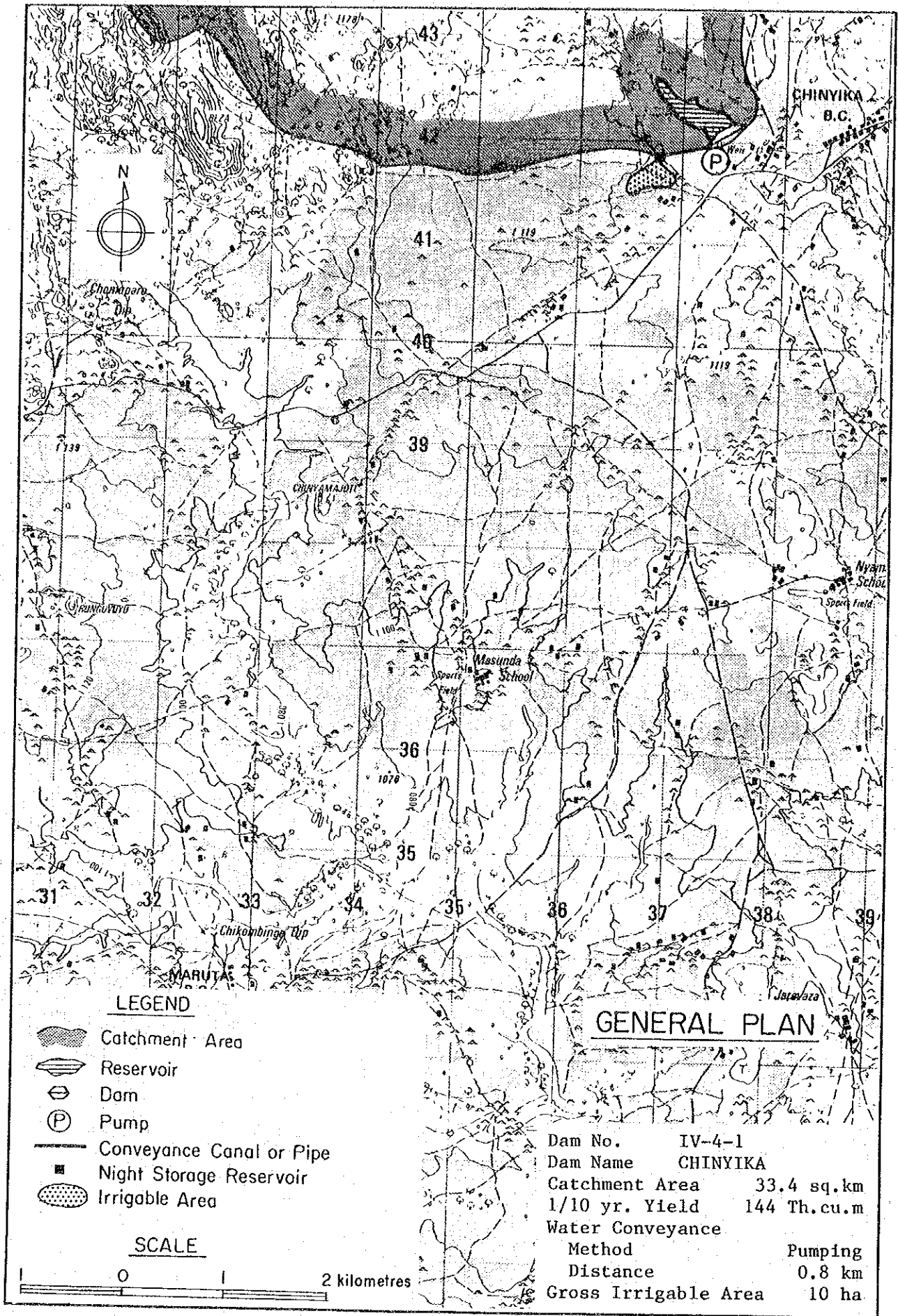
No. IV-4-1

Name of Dam Chinyika








Location	District Gutu		Communal Land Gutu	
	Map Ref. 1931C2		Coordinates UP374420	
Geology	Granite and the dyke of dolerite, dolerite and surrounding rocks changed into boulders.			
Hydrology	River Chinyika		Hydrological Zone E-S4	
	Catchment Area 33.4 sq.km		M.A. Rainfall 720 mm	
	M.A. Runoff 72 mm		Sediment 320 tonnes km ² /yr.	
Reservoir	Effective Capacity 0.240 MCM		1/10 Yr. Yield 0.144 MCM	
	Dead Capacity 0.160 MCM		D.W.S. 1 109 m	
	Total Capacity 0.400 MCM		N.W.S. 1 110 m	
Dam	Height 9 m		Length 630 m	
	Embankment Volume 39 000 cu.m		Spillway 144 m	
Agriculture	Natural Region IV		Soil SL	
	Potential Irrigable Area			50 ha
	Proposed Cropping Pattern B			
Irrigation	Net Irrigable Area 8.5 ha		Dist. 0.8 km by Pump, H=11.0 m	
	Topography	Area	Flat	
		Conveyance	Slightly sloping	
Rural Water Supply	Population 823 person		17 cu.m/day	
	Livestock 2 550 unit		115 cu.m/day	
Cost and Benefit	Dam		Irrigation Facilities	Total Cost
	Z\$ 856 000		Z\$539 000	Z\$1 395 000
	Annual Increment Benefit		Net Present Value	Economic Internal Rate of Return
	Z\$ 19 037 /year		Z\$ 221 000	-
Visit	Dam Engineer	Geologist	Irrigation Engineer	Agronomist
	Y	Y	Y	N
Remarks				

Present Condition on the Ward

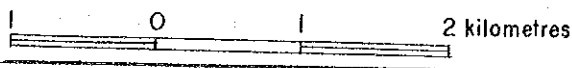
Ward Name	5, 15		Area (4 000 + 5 900) ha	
Demography	Population Density		82.3 persons/sq.km	
	Family Size		5.1 Persons/household	
Agriculture	Arable Area (2 500 + 3 400) ha		Grazing Area (1 500 + 2 500) ha	
	Maize	N.A ha/household	16	bags/ha
	Sorghum	N.A ha/household	13	bags/ha
	Livestock	3.1 LSUs/household	51.0	LSUs/sq.km
Rural Water Supply	Borehole	0.15 units/sq.km	585	persons/unit
	Well	0.49 units/sq.km	169	persons/unit



LEGEND

-  Catchment Area
-  Reservoir
-  Dam
-  Pump
-  Conveyance Canal or Pipe
-  Night Storage Reservoir
-  Irrigable Area

SCALE



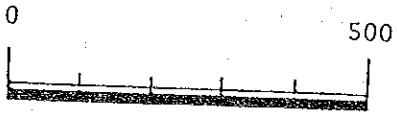
GENERAL PLAN

Dam No.	IV-4-1
Dam Name	CHINYIKA
Catchment Area	33.4 sq.km
1/10 yr. Yield	144 Th.cu.m
Water Conveyance	
Method	Pumping
Distance	0.8 km
Gross Irrigable Area	10 ha

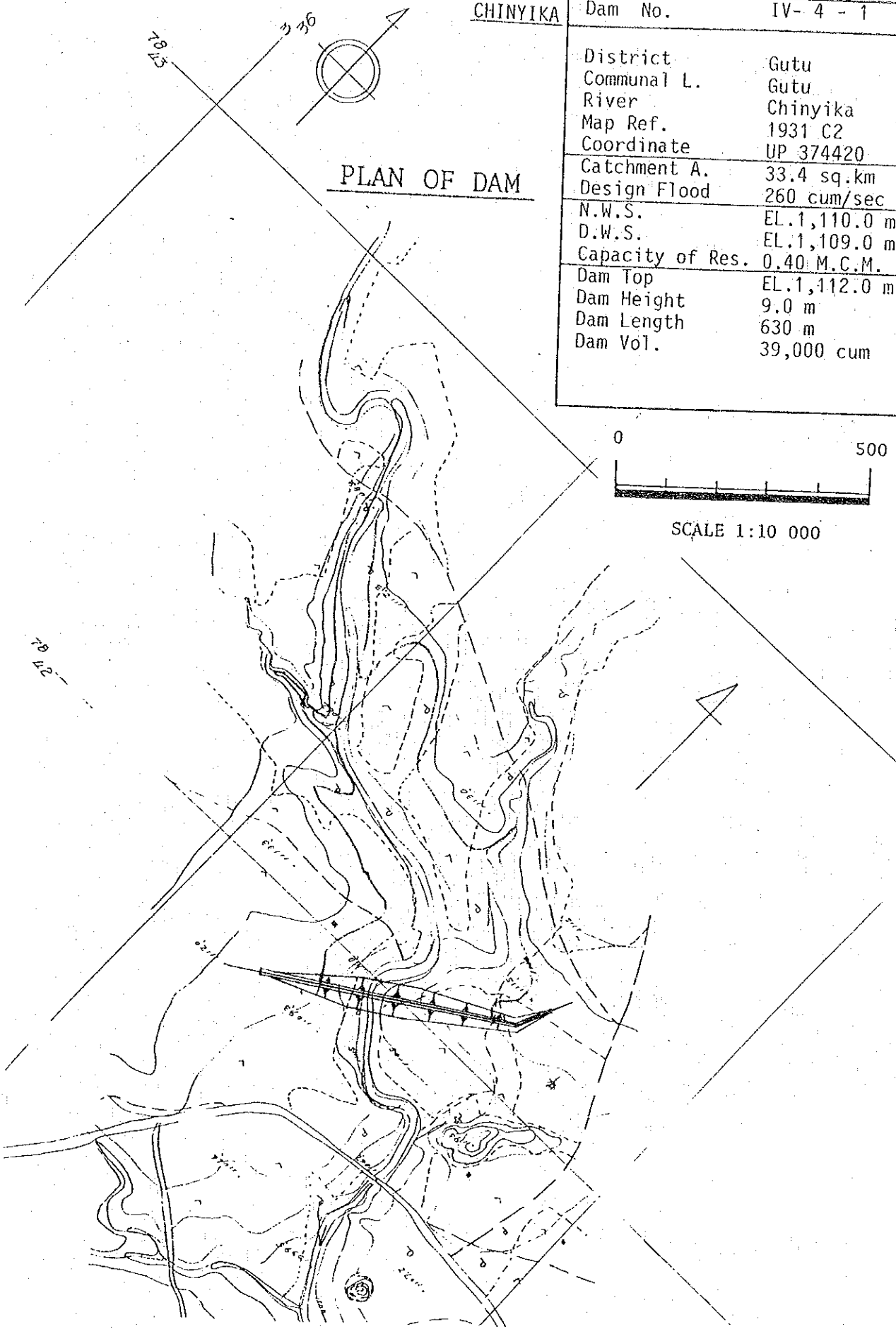
CHINYIKA

Dam No.	IV- 4 - 1
District	Gutu
Communal L.	Gutu
River	Chinyika
Map Ref.	1931 C2
Coordinate	UP 374420
Catchment A.	33.4 sq.km
Design Flood	260 cum/sec
N.W.S.	EL.1,110.0 m
D.W.S.	EL.1,109.0 m
Capacity of Res.	0.40 M.C.M.
Dam Top	EL.1,112.0 m
Dam Height	9.0 m
Dam Length	630 m
Dam Vol.	39,000 cum

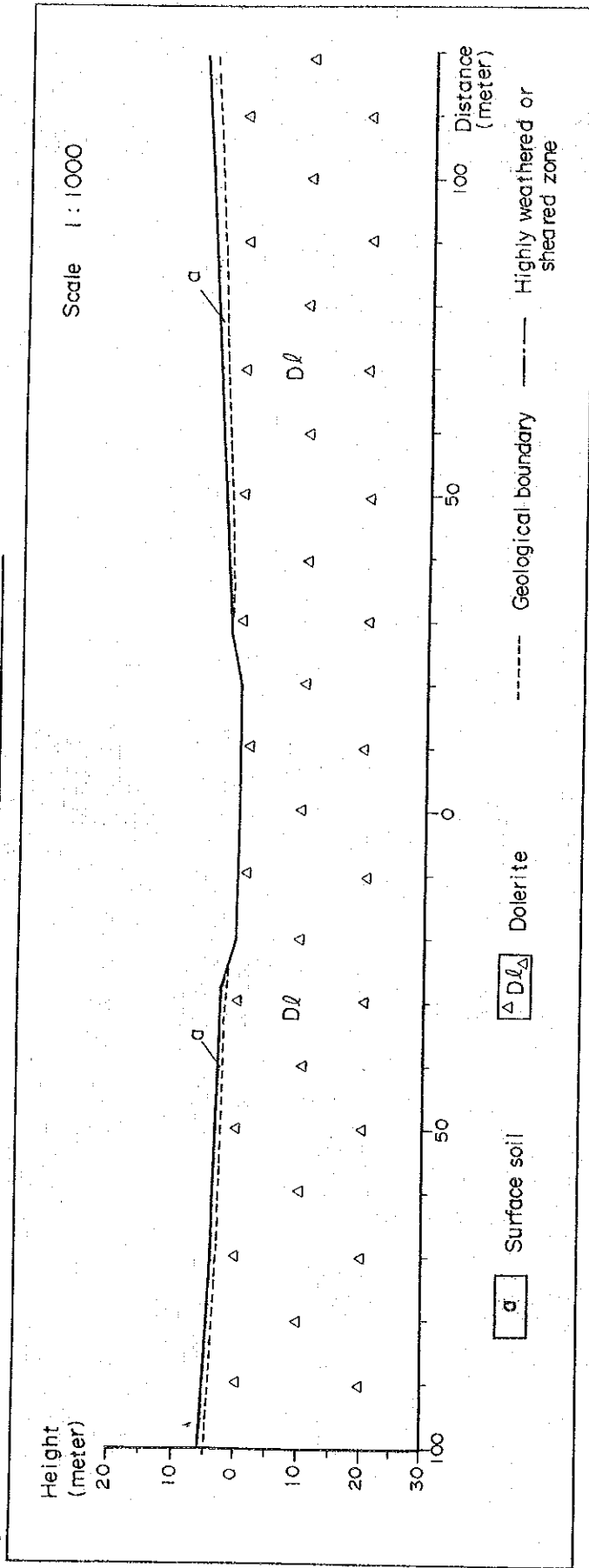
PLAN OF DAM



SCALE 1:10 000



IV-4-1 Chinyika



The area is very flat land, and the Chinyika River meanders shortly by the effect of the geological structure.

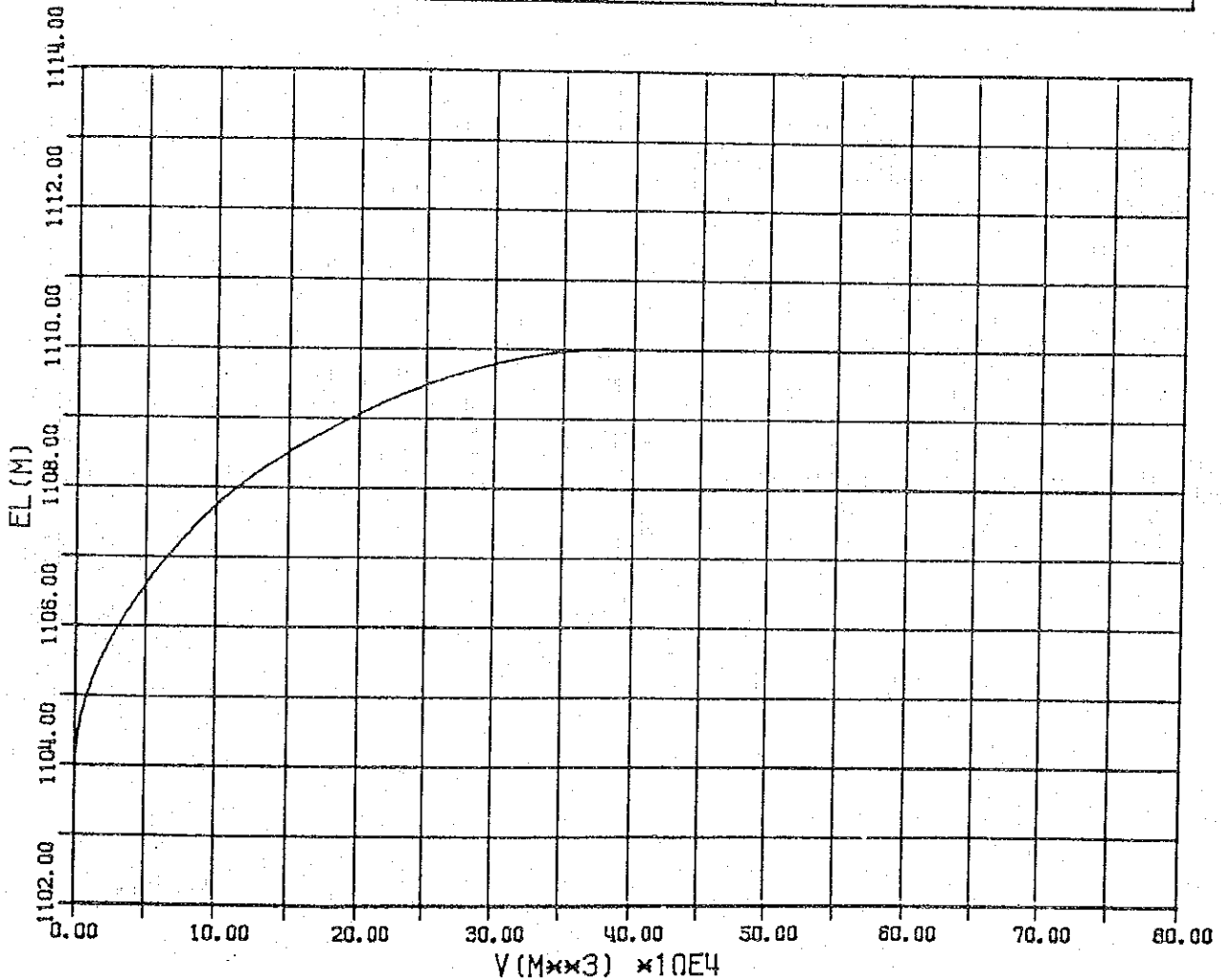
The bedrock consists of granite and dolerite dyke. The former is generally massive and hard, however surrounding rocks of the dyke has been changed into boulders, and they are very soft. The latter is very hard, however all rock at the surface has been changed into boulders.

It seems that leakage through the bedrock is considerably large and the cost of foundation treatments is great. The bedrock is less suitable for the dam foundation from the geological point of view.

TABLE STORAGE VOLUME OF RESERVOIR

NO	MAP	GRID	VER	HCR
IV-4-1	1931C2	UP	374	420

EL (M)	ΔH (M)	AREA (M ²)	AVE (M ²)	VOL (M ³)	ΣV (1000M ³)	NOTE
1102.5	0.0	0	0	0	0.00	
1105.0	2.5	6088	3044	7610	7.61	
1107.5	2.5	57840	31964	79910	87.52	
1110.0	2.5	188902	123371	308428	395.95	



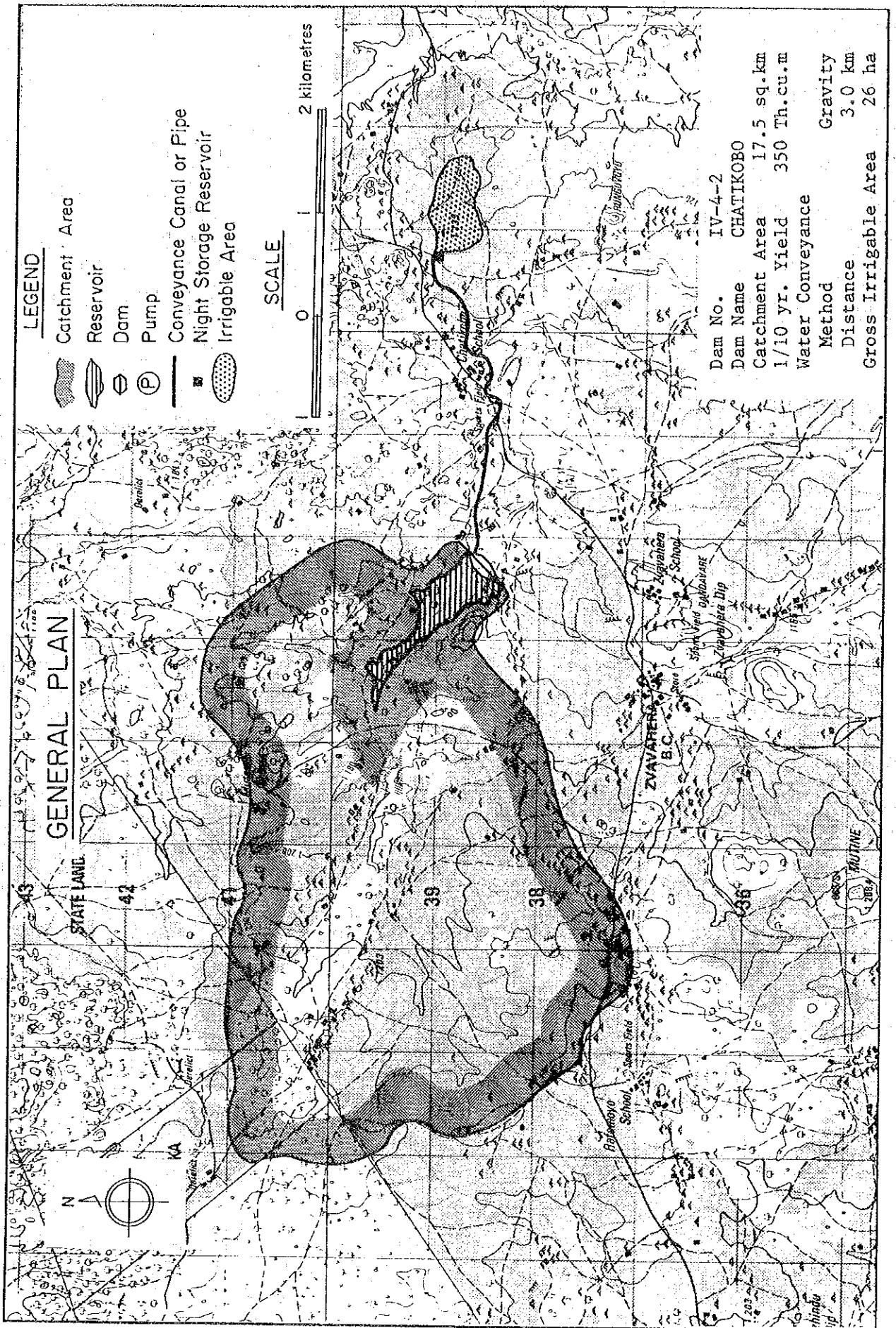
No. IV-4-2

Name of Dam Chatikobo

Location	District Gutu		Communal Land Gutu		
	Map Ref. 1931C2		Coordinates UP277385		
Geology	Granite, massive and very hard. Few connecting joints, very flat terrain.				
Hydrology	River Vazizi		Hydrological Zone E-S4		
	Catchment Area 17.5 sq.km		M.A. Rainfall 720 mm		
	M.A. Runoff 91 mm		Sediment 320 tonnes km ² /yr.		
Reservoir	Effective Capacity 1.310 MCM		1/10 Yr. Yield 0.350 MCM		
	Dead Capacity 0.080 MCM		D.W.S. 1 154 m		
	Total Capacity 1.390 MCM		N.W.S. 1 160 m		
Dam	Height 13 m		Length 650 m		
	Embankment Volume 82 000 cu.m		Spillway 98 m		
Agriculture	Natural Region IV		Soil CL		
	Potential Irrigable Area		150 ha		
	Proposed Cropping Pattern A				
Irrigation	Net Irrigable Area 20.6 ha		Dist. 3.0 km by Gravity		
	Topography	Area	Slightly sloping		
		Conveyance	Complicated, one river crossing		
Rural Water Supply	Population 2 601 person		52 cu.m/day		
	Livestock 632 unit		28 cu.m/day		
Cost and Benefit	Dam		Irrigation Facilities	Total Cost	
	Z\$ 895 000		Z\$714 000	Z\$1 609 000	
	Annual Increment Benefit		Net Present Value	Economic Internal Rate of Return	
	Z\$77 088 /year		Z\$ 896 000	9.2 per cent	
Visit	Dam Engineer	Geologist	Irrigation Engineer	Agronomist	Economist
	Y	Y	Y	Y	Y
Remarks					

Present Condition on the Ward

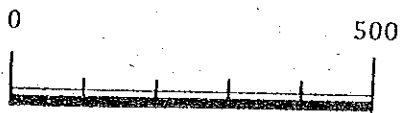
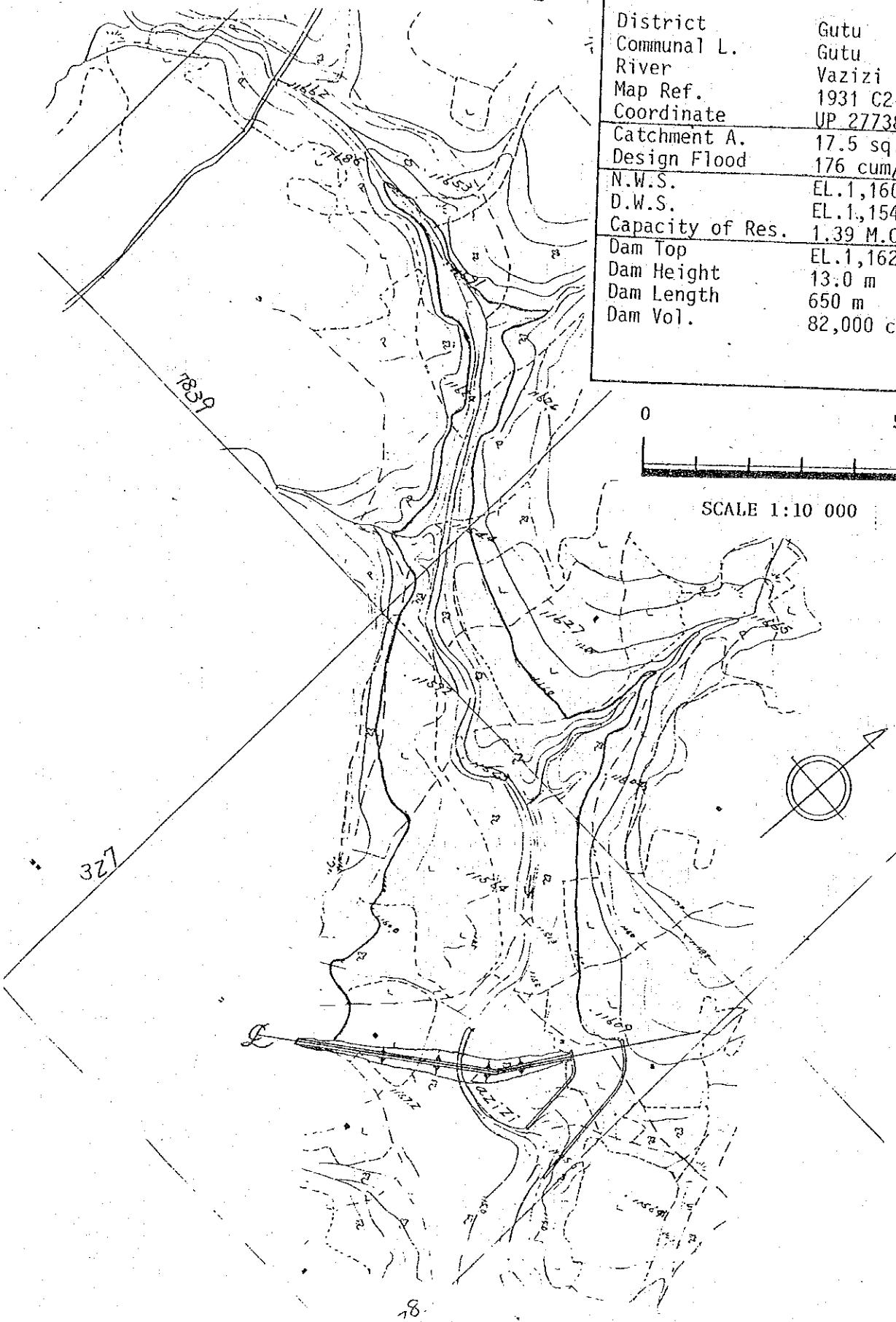
Ward Name	16		Area 7 163 ha	
Demography	Population Density		86.7 persons/sq.km	
	Family Size		10.3 Persons/household	
Agriculture	Arable Area 6 281 ha		Grazing Area 882 ha	
	Maize 8.3 ha/household		10 bags/ha	
	Sorghum 0.1 ha/household		4 bags/ha	
	Livestock 3.8 LSUs/household		31.6 LSUs/sq.km	
Rural Water Supply	Borehole 0.01 units/sq.km		6 208 persons/unit	
	Well 0.84 units/sq.km		103 persons/unit	



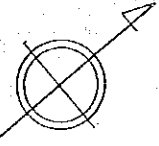
CHATIKOBO

PLAN OF DAM

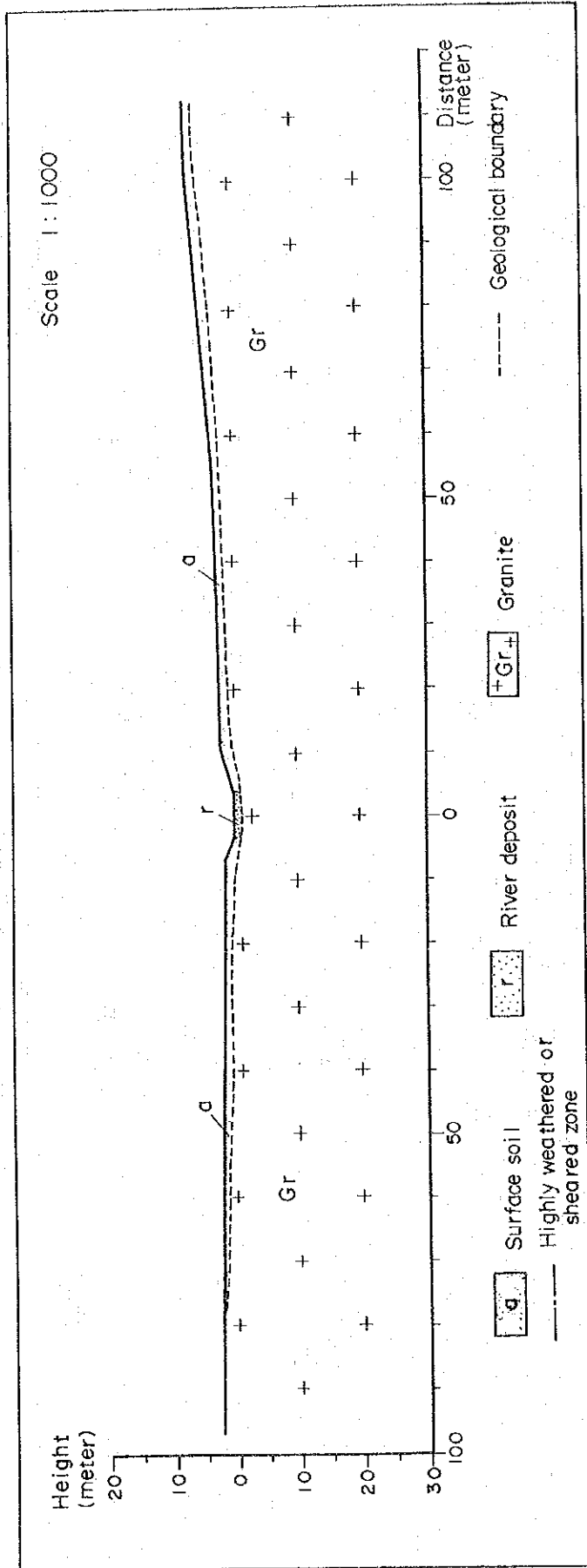
Dam No.	IV-4-2
District	Gutu
Communal L.	Gutu
River	Vazizi
Map Ref.	1931 C2
Coordinate	UP 277385
Catchment A.	17.5 sq.km
Design Flood	176 cum/sec
N.W.S.	EL.1,160.0 m
D.W.S.	EL.1,154.0 m
Capacity of Res.	1.39 M.C.M.
Dam Top	EL.1,162.0 m
Dam Height	13.0 m
Dam Length	650 m
Dam Vol.	82,000 cum



SCALE 1:10 000



IV-4-2 Chatikobo



The area is very flat land, and the Vazizi River forms a shallow valley.

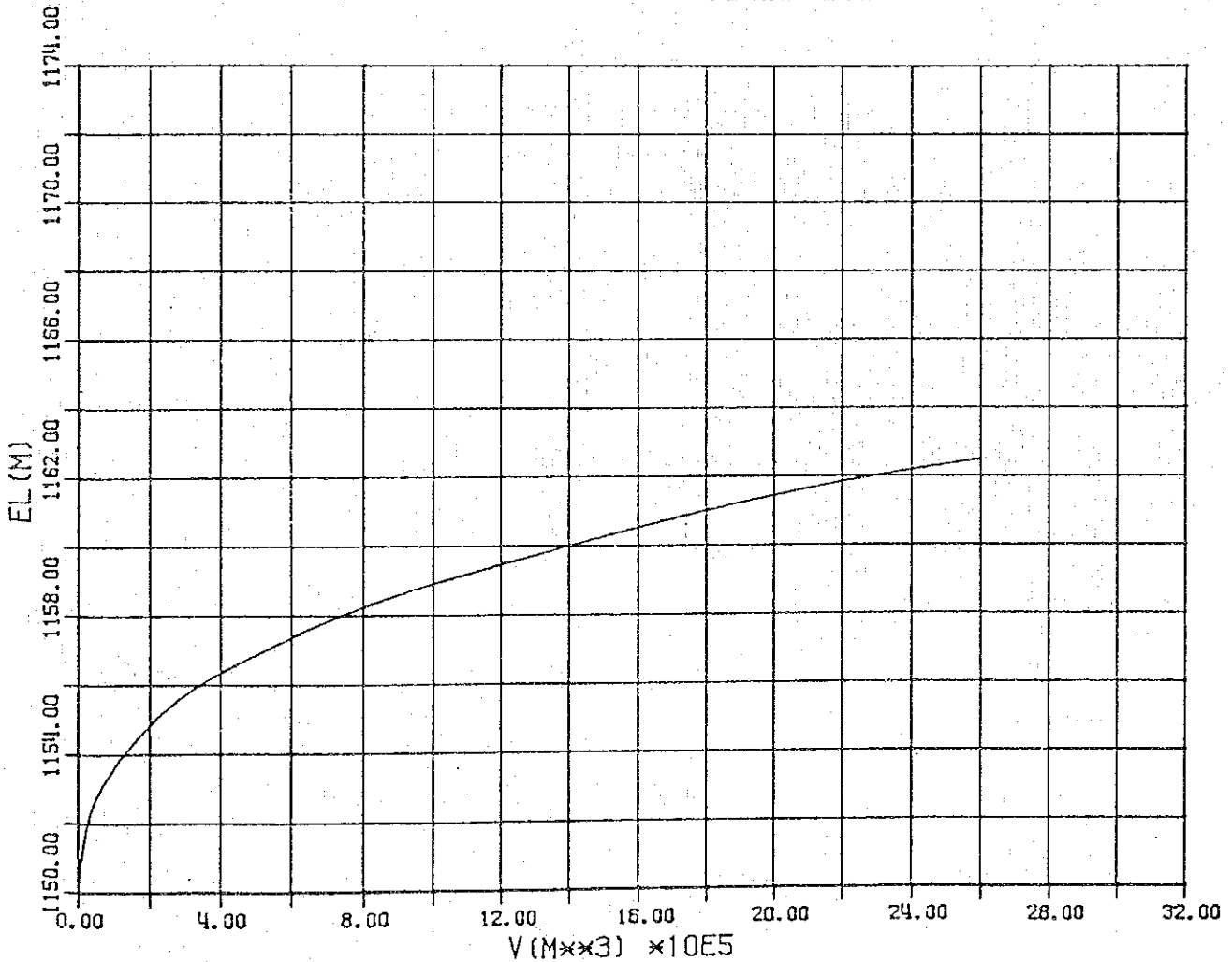
The bedrock consists of granite, and it is generally massive, very hard and poorly jointed. The estimated thickness of unconsolidated deposits is less than 2 meters.

The bedrock is suitable for the dam foundation from the geological point of view, however less suitable from the geophysical point of view.

TABLE STORAGE VOLUME OF RESERVOIR

NO	MAP	GRID	VER	HOR
IV-4-2	1931C2	UP	277	385

EL (M)	ΔH (M)	AREA (M ²)	AVE (M ²)	VOL (M ³)	ΣV (1000M ³)	NOTE
1150.0	0.0	0	0	0	0.00	
1150.0	0.0	700	350	0	0.00	
1152.5	2.5	31700	16200	40500	40.50	
1155.0	2.5	106400	69050	172625	213.12	
1157.5	2.5	220900	163650	409125	622.25	
1160.0	2.5	397000	308950	772375	1394.62	
1162.5	2.5	558000	477500	119374	2588.37	



V (M³) × 10⁵

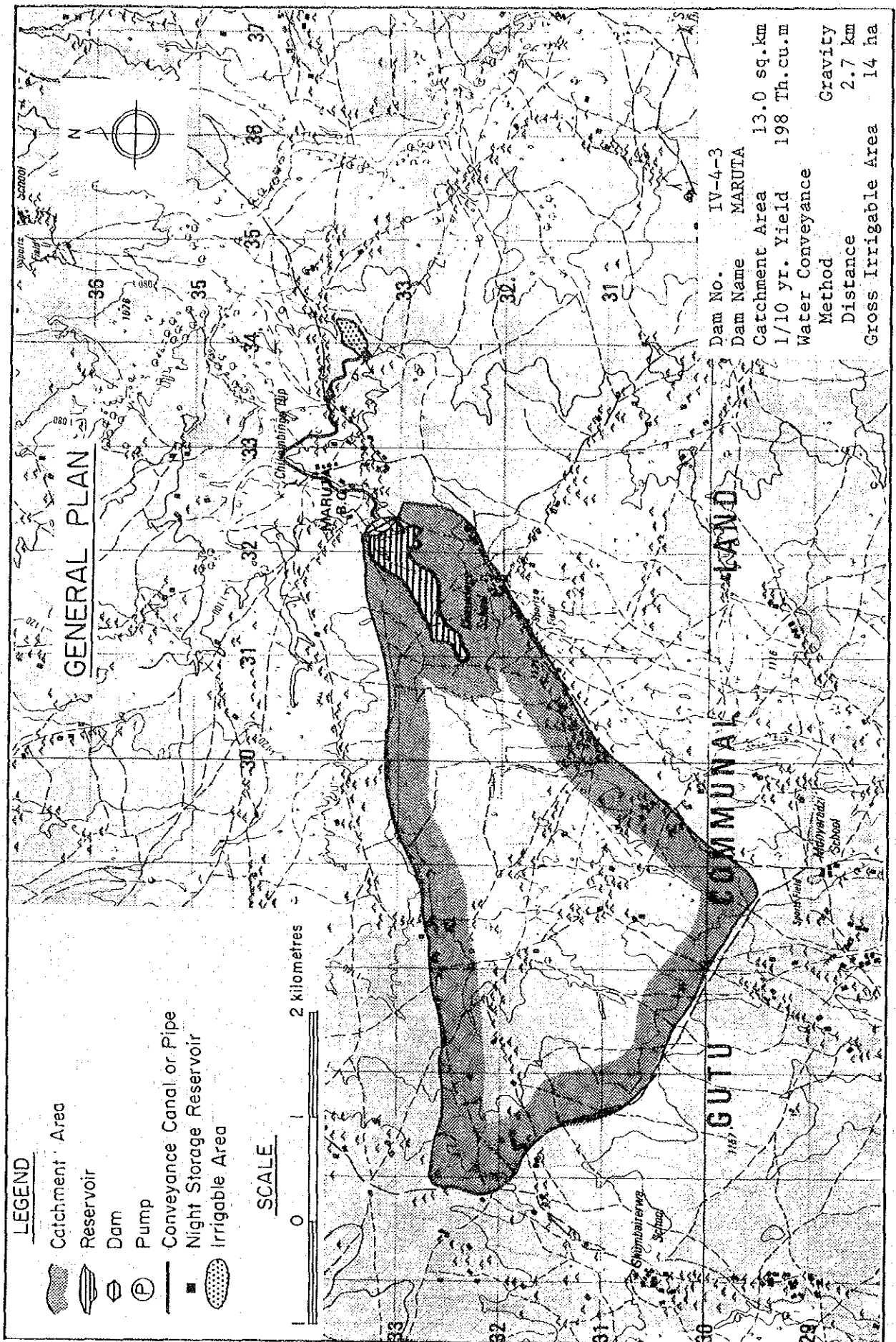
No. IV-4-3

Name of Dam Maruta

Location	District Gutu		Communal Land Gutu		
	Map Ref. 1931C2		Coordinates UP322333		
Geology	Granite, generally massive and very hard. Partly weathering and very soft to soft.				
Hydrology	River Aumborimwe		Hydrological Zone E-S4		
	Catchment Area	13.0 sq.km	M.A. Rainfall	730 mm	
	M.A. Runoff	76 mm	Sediment	320 tonnes km ² /yr.	
Reservoir	Effective Capacity	1.630 MCM	1/10 Yr. Yield	0.198 MCM	
	Dead Capacity	0.060 MCM	D.W.S.	1 099 m	
	Total Capacity	1.690 MCM	N.W.S.	1 107 m	
Dam	Height	16 m	Length	1 000 m	
	Embankment Volume	237 000 cu.m	Spillway	79 m	
Agriculture	Natural Region IV		Soil SL		
	Potential Irrigable Area		100 ha		
	Proposed Cropping Pattern		B		
Irrigation	Net Irrigable Area 11.6 ha		Dist. 2.7 km by Gravity		
	Topography	Area	Slightly undulated		
		Conveyance	Slightly sloping		
Rural Water Supply	Population	4 431 person	87 cu.m/day		
	Livestock	692 unit	31 cu.m/day		
Cost and Benefit	Dam	Irrigation Facilities	Total Cost	Class	
	Z\$ 2 437 000	Z\$537 000	Z\$2 974 000	C	
	Annual Increment Benefit	Net Present Value	Economic Internal Rate of Return		
	Z\$ 27 390 /year	Z\$ 318 000	-		
Visit	Dam Engineer	Geologist	Irrigation Engineer	Agronomist	Economist
	Y	Y	Y	Y	Y
Remarks					

Present Condition on the Ward

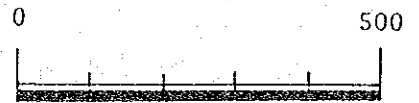
Ward Name	34		Area	5 580 ha
Demography	Population Density		147.7	persons/sq.km
	Family Size		4.0	Persons/household
Agriculture	Arable Area	5 078 ha	Grazing Area	502 ha
	Maize	N.A ha/household	15	bags/ha
	Sorghum	N.A ha/household	12	bags/ha
	Livestock	0.9 LSUs/household	34.6	LSUs/sq.km
Rural Water Supply	Borehole	0.07 units/sq.km	2 060	persons/unit
	Well	5.38 units/sq.km	27	persons/unit



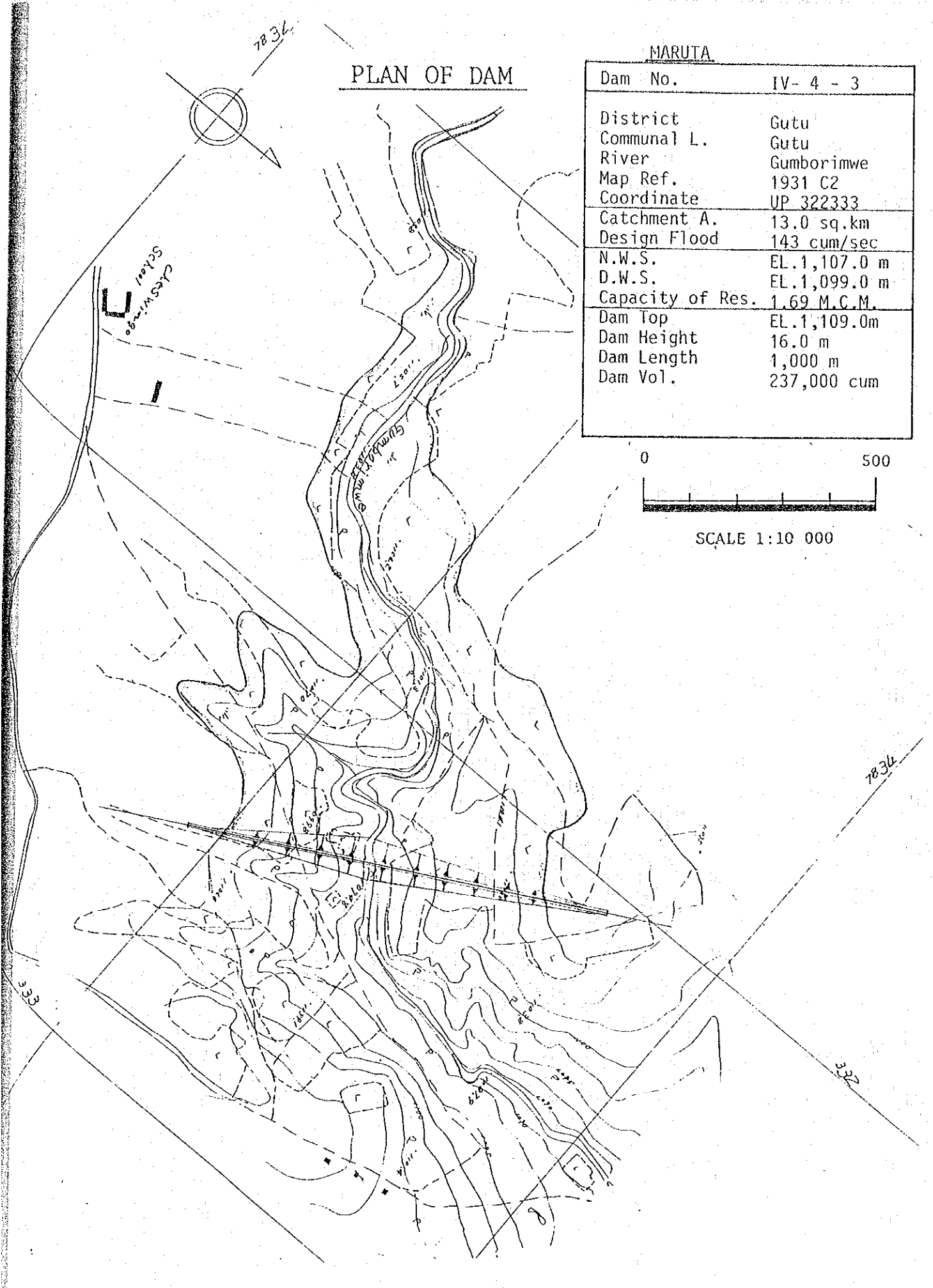
MARUTA

PLAN OF DAM

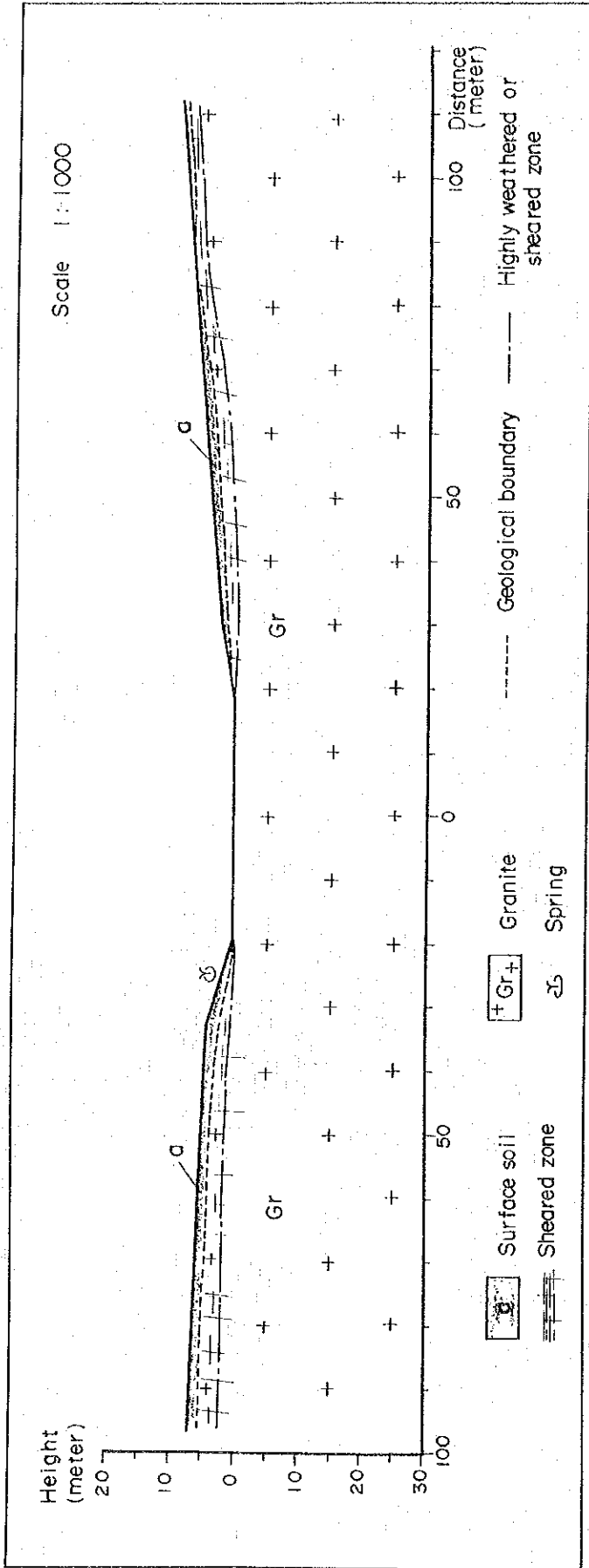
Dam No.	IV- 4 - 3
District	Gutu
Communal L.	Gutu
River	Gumborimwe
Map Ref.	1931 C2
Coordinate	UP 322333
Catchment A.	13.0 sq.km
Design Flood	143 cum/sec
N.W.S.	EL.1,107.0 m
D.W.S.	EL.1,099.0 m
Capacity of Res.	1.69 M.C.M.
Dam Top	EL.1,109.0m
Dam Height	16.0 m
Dam Length	1,000 m
Dam Vol.	237,000 cum



SCALE 1:10 000



IV-4-3 Maruta



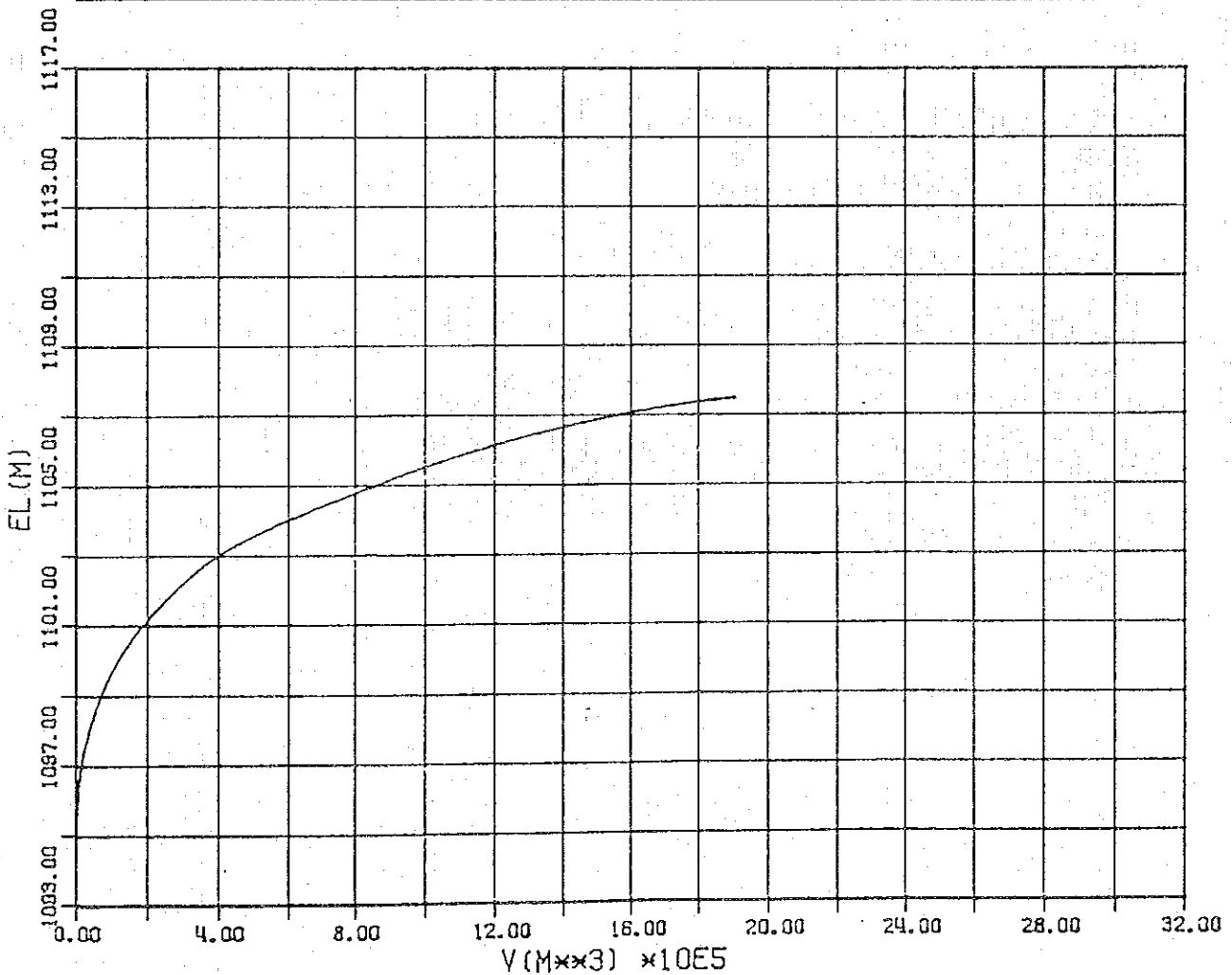
The bedrock consists of granite and it is generally massive and very hard. It is generally poorly jointed, however all rock at the both banks is very soft by highly weathering and well jointed. The weathering layer is estimated to be 5 to 3 meters thick. Because it seems that leakage through the bedrock is great and bearing strength in the foundation strata is small, it is necessary to cut off the weathering layer for the dam safety.

The estimated thickness of unconsolidated deposits is maximum 3 meters at the left bank. There is a small spring at the left bank and the land around the spring is marsh. It is necessary to avoid the spring and marsh to set the damsite.

TABLE STORAGE VOLUME OF RESERVOIR

NO	MAP	GRID	VER	HOR
IV-4-3	1931C2	UP 3	322	333

EL (M)	ΔH(M)	AREA(M ²)	AVE (M ²)	VOL (M ³)	ΣV (1000M ³)	NOTE
1093.0	0.0	0	0	0	0.00	
1095.0	2.0	200	100	200	0.20	
1097.5	2.5	20600	10400	26000	26.20	
1100.0	2.5	53100	36850	92125	118.32	
1102.5	2.5	116500	84800	212000	330.32	
1105.0	2.5	301600	209050	522625	852.95	
1107.5	2.5	536800	419200	1048000	1900.95	



No. IV-4-4

Name of Dam Mutero

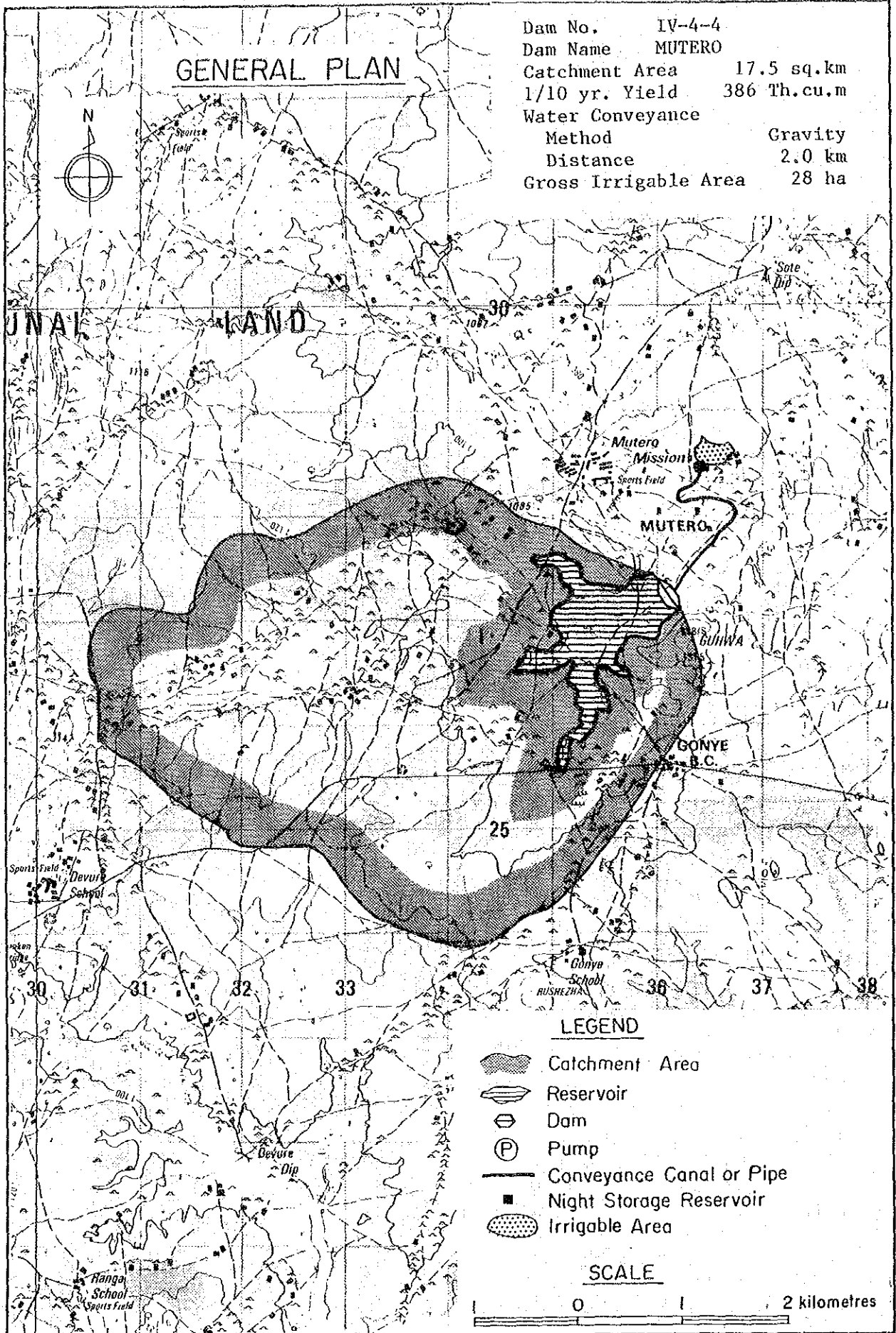
Location	District Gutu		Communal Land Gutu		
	Map Ref. 1931C2		Coordinates UP362272		
Geology	Granite, generally massive and hard. Partly weathered and very soft to soft.				
Hydrology	River (T) Sote		Hydrological Zone E-S4		
	Catchment Area	17.5 sq.km	M.A. Rainfall	710 mm	
	M.A. Runoff	69 mm	Sediment	320 tonnes km ² /yr.	
Reservoir	Effective Capacity	2.340 MCM	1/10 Yr. Yield	0.386 MCM	
	Dead Capacity	0.080 MCM	D.W.S.	1 071 m	
	Total Capacity	2.420 MCM	N.W.S.	1 080 m	
Dam	Height	14 m	Length	580 m	
	Embankment Volume	121 000 cu.m	Spillway	98 m	
Agriculture	Natural Region IV		Soil LS		
	Potential Irrigable Area			100 ha	
	Proposed Cropping Pattern B				
Irrigation	Net Irrigable Area 22.7 ha		Dist. 2.0 km by Gravity		
	Topography	Area	Flat		
		Conveyance	Slightly sloping, one river crossing		
Rural Water Supply	Population	2 292 person	46 cu.m/day		
	Livestock	1 820 unit	82 cu.m/day		
Cost and Benefit	Dam	Irrigation Facilities	Total Cost	Class	
	Z\$ 1 272 000	Z\$ 527 000	Z\$ 1 799 000	B	
	Annual Increment Benefit	Net Present Value	Economic Internal Rate of Return		
	Z\$ 39 981 /year	Z\$ 465 000	3.1 per cent		
Visit	Dam Engineer	Geologist	Irrigation Engineer	Agronomist	Economist
	Y	Y	Y	Y	Y
Remarks					

Present Condition on the Ward








Ward Name	35		Area	8 581 ha
Demography	Population Density		76.4	persons/sq.km
	Family Size		5.1	Persons/household
Agriculture	Arable Area		4 691 ha	Grazing Area 3 890 ha
	Maize	N.A	ha/household	12 bags/ha
	Sorghum	N.A	ha/household	6 bags/ha
	Livestock	2.4	LSUs/household	36.4 LSUs/sq.km
Rural Water Supply	Borehole	0.09	units/sq.km	820 persons/unit
	Well	0.78	units/sq.km	98 persons/unit

GENERAL PLAN

Dam No. IV-4-4
 Dam Name MUTERO
 Catchment Area 17.5 sq.km
 1/10 yr. Yield 386 Th.cu.m
 Water Conveyance Method Gravity
 Distance 2.0 km
 Gross Irrigable Area 28 ha



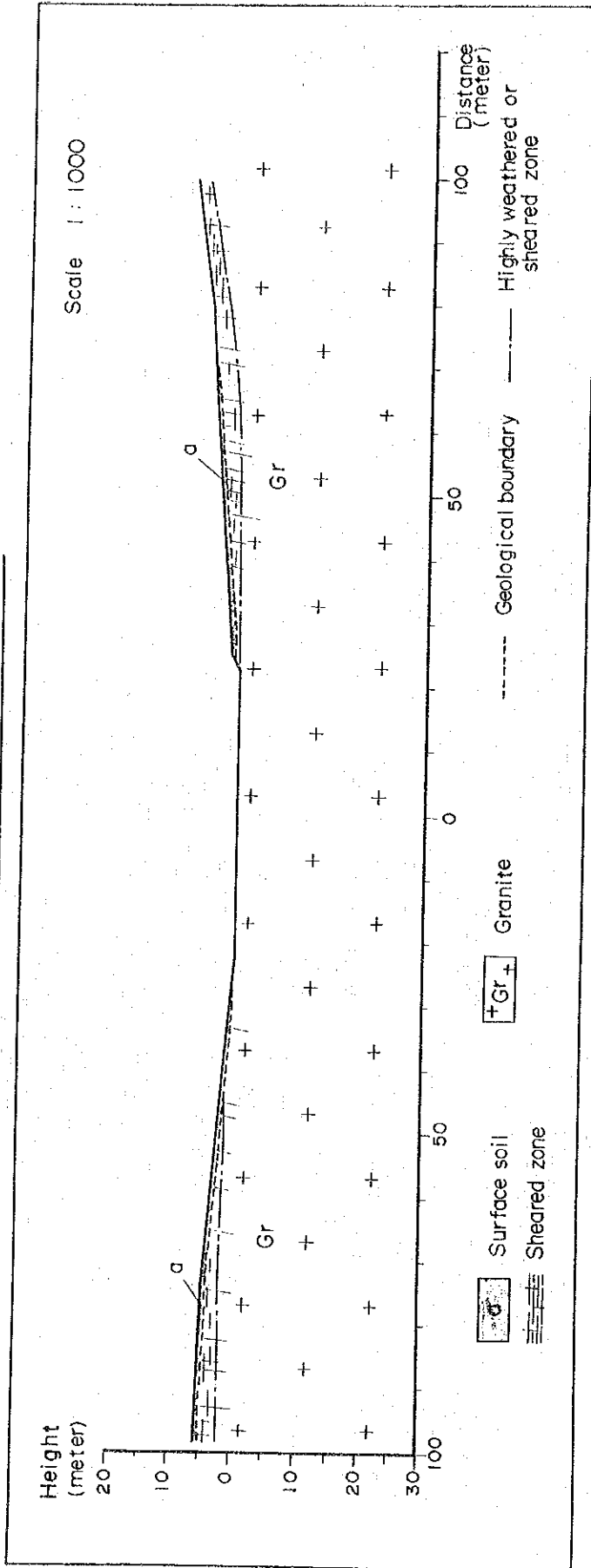
LEGEND

-  Catchment Area
-  Reservoir
-  Dam
-  Pump
-  Conveyance Canal or Pipe
-  Night Storage Reservoir
-  Irrigable Area

SCALE

0 1 2 kilometres

IV-4-4 Mutero

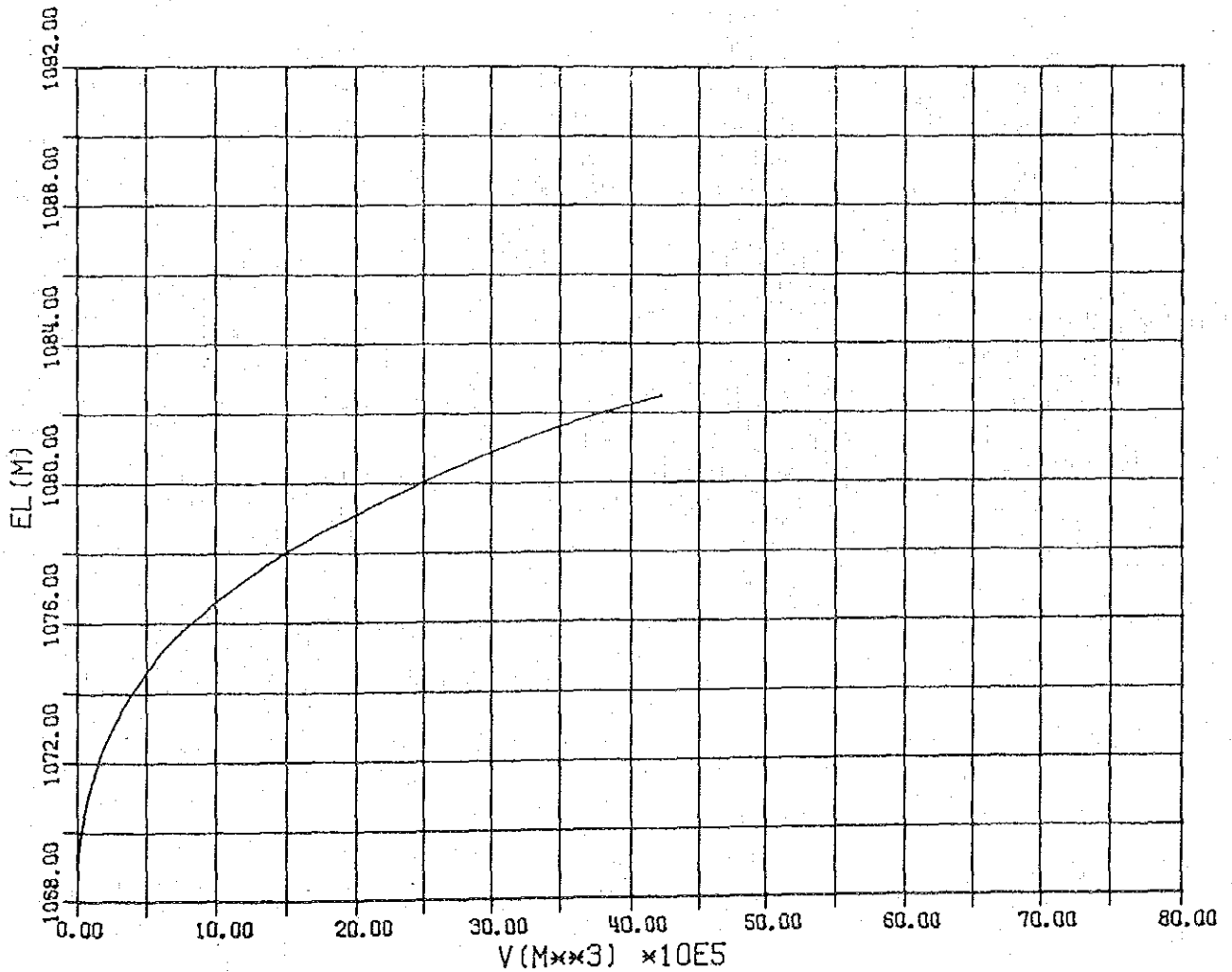


The River flows straight around the damsite and forms a rapid closely down the damsite. The bedrock consists of granite, and it is massive, very hard and poorly jointed. However about 3 meters thick at the surface is very soft by highly weathering and it is well jointed. It is necessary to cut off the highly weathering layer to construct the dam, because it seems that leakage through the bedrock is large and the bearing strength in the foundation strata is small. The estimated thickness of unconsolidated deposits is less than 1 meter.

TABLE STORAGE VOLUME OF RESERVOIR

NO	MAP	GRID	VER	HOR
IV-4-4	1931C2	UP	362	272

EL (M)	ΔH (M)	AREA (M ²)	AVE (M ²)	VOL (M ³)	ΣV (1000M ³)	NOTE
1068.2	0.0	0	0	0	0.00	
1070.0	1.8	30831	15416	27749	27.75	
1072.5	2.5	102306	66569	166421	194.17	
1075.0	2.5	200942	151624	379060	573.23	
1077.5	2.5	378085	289514	723784	1297.01	
1080.0	2.5	560079	469082	1172705	2469.72	
1082.5	2.5	844707	702393	1755982	4225.70	



No. IV-4-5








Name of Dam Sinbanegavi

Location	District Gutu		Communal Land Gutu		
	Map Ref. 1931C2		Coordinates UP208185		
Geology	Granite, generally massive and very hard. In part soft by weathering.				
Hydrology	River Shuku		Hydrological Zone E-S4		
	Catchment Area	32.8 sq.km	M.A. Rainfall	770 mm	
	M.A. Runoff	91 mm	Sediment	320 tonnes km ² /yr.	
Reservoir	Effective Capacity	1.090 MCM	1/10 Yr. Yield	0.477 MCM	
	Dead Capacity	0.160 MCM	D.W.S.	1 206 m	
	Total Capacity	1.250 MCM	N.W.S.	1 211 m	
Dam	Height	13 m	Length	1 000 m	
	Embankment Volume	132 000 cu.m	Spillway	144 m	
Agriculture	Natural Region IV		Soil SL		
	Potential Irrigable Area		40 ha		
	Proposed Cropping Pattern B				
Irrigation	Net Irrigable Area 28.1 ha		Dist. 1.4 km by Gravity		
	Topography	Area	Undulated		
		Conveyance	Complicated		
Rural Water Supply	Population 1 509 person		30 cu.m/day		
	Livestock 450 unit		20 cu.m/day		
Cost and Benefit	Dam	Irrigation Facilities	Total Cost	Class	
	Z\$ 1 438 000	Z\$ 482 000	Z\$ 1 920 000	B	
	Annual Increment Benefit	Net Present Value	Economic Internal Rate of Return		
	Z\$ 62 379 /year	Z\$ 725 000	4.8 per cent		
Visit	Dam Engineer	Geologist	Irrigation Engineer	Agronomist	Economist
	Y	Y	Y	Y	Y
Remarks					

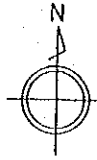
Present Condition on the Ward

Ward Name	26		Area	11 940 ha	
Demography	Population Density		50.3 persons/sq.km		
	Family Size		5.5 Persons/household		
Agriculture	Arable Area		8 239 ha	Grazing Area 3 701 ha	
	Maize	N.A	ha/household	10	bags/ha
	Sorghum	N.A	ha/household	N.A	bags/ha
	Livestock	2.4	LSUs/household	22.5	LSUs/sq.km
Rural Water Supply	Borehole	0.02	units/sq.km	3 000	persons/unit
	Well	N.A	units/sq.km	N.A	persons/unit

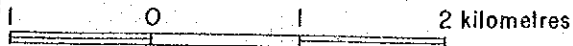
LEGEND

-  Catchment Area
-  Reservoir
-  Dam
-  Pump
-  Conveyance Canal or Pipe
-  Night Storage Reservoir
-  Irrigable Area

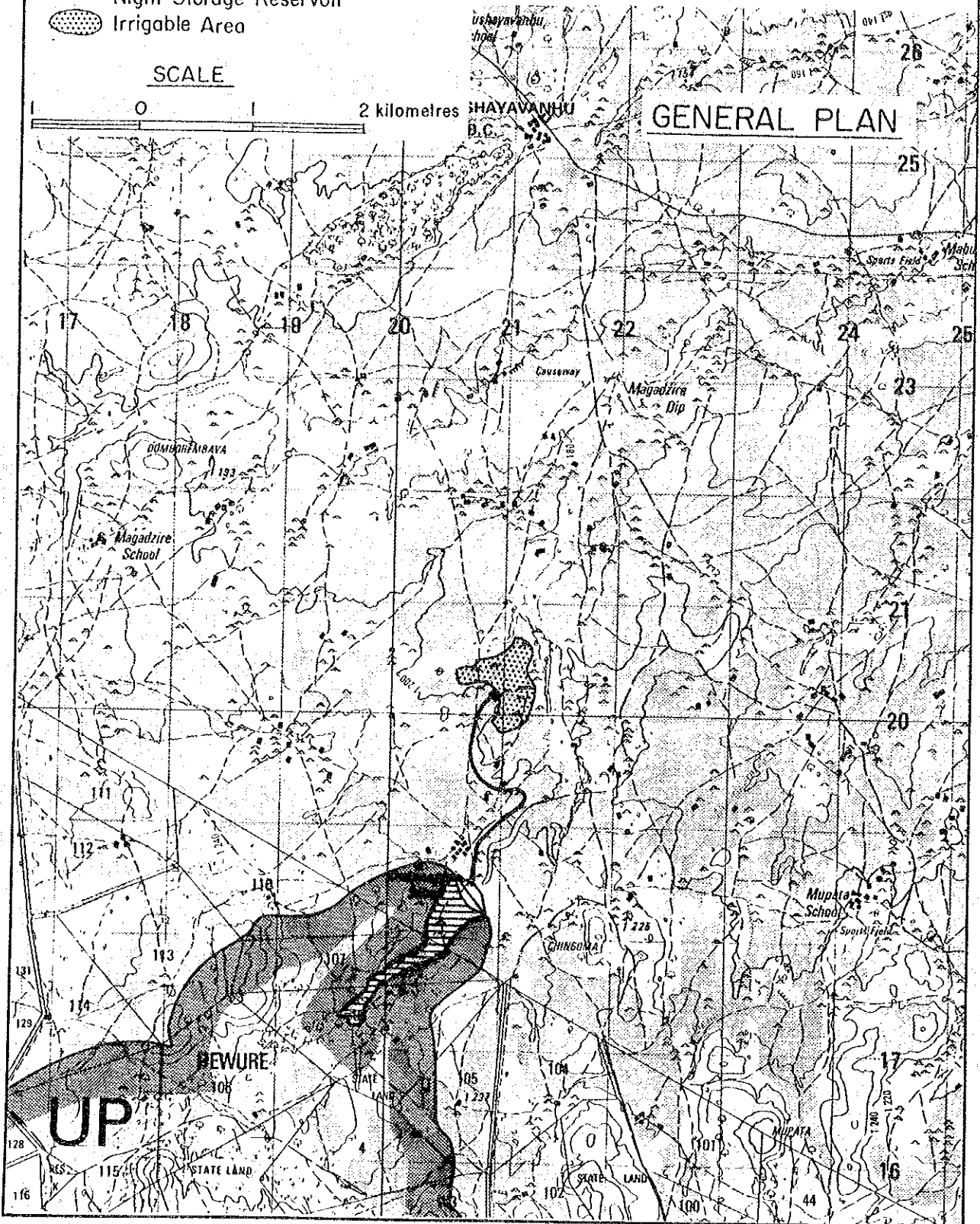
Dam No. IV-4-5
 Dam Name SINBANEGAVI
 Catchment Area 32.8 sq.km
 1/10 yr. Yield 477 Th.cu.m
 Water Conveyance Method Gravity
 Distance 1.4 km
 Gross Irrigable Area 35 ha



SCALE



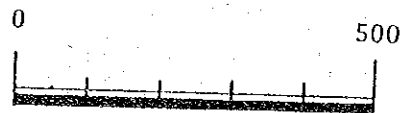
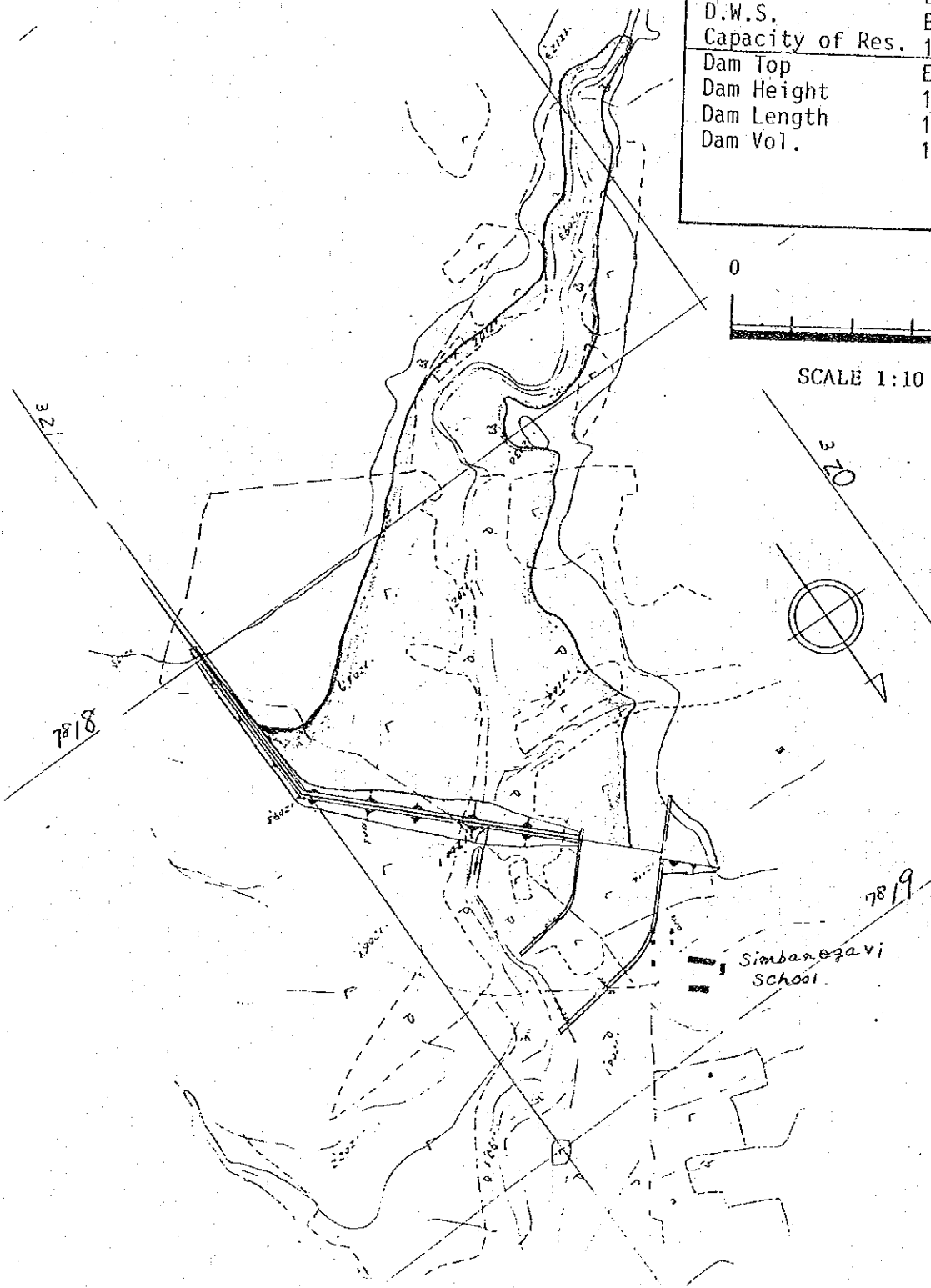
GENERAL PLAN



SINBANEGAVI

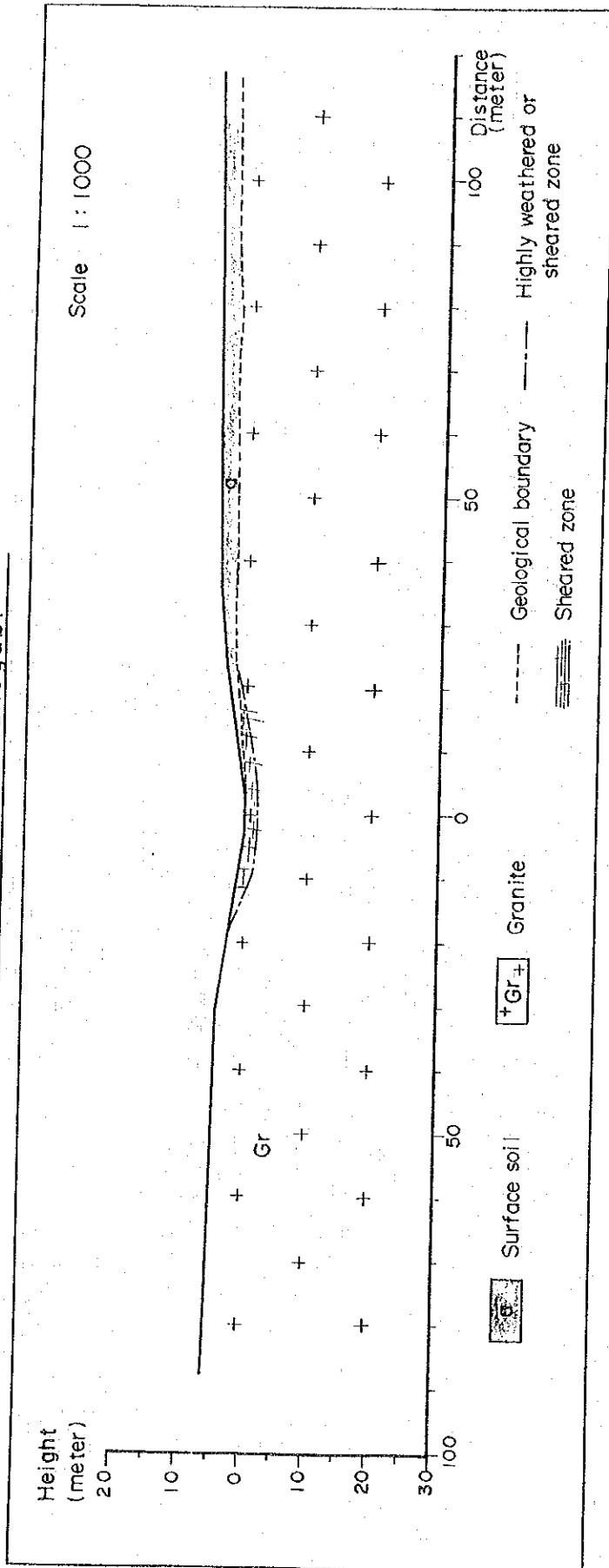
PLAN OF DAM

Dam No.	IV- 4 - 5
District	Gutu
Communal L.	Gutu
River	Shuku
Map Ref.	1931 C2
Coordinate	UP 208185
Catchment A.	32.8 sq.km
Design Flood	260 cum/sec
N.W.S.	EL.1,211.0 m
D.W.S.	EL.1,206.0 m
Capacity of Res.	1.25 M.C.M.
Dam Top	EL.1,213.0 m
Dam Height	13.0 m
Dam Length	1,000 m
Dam Vol.	132,000 cum



SCALE 1:10 000

IV-4-5 Sinbanegabi

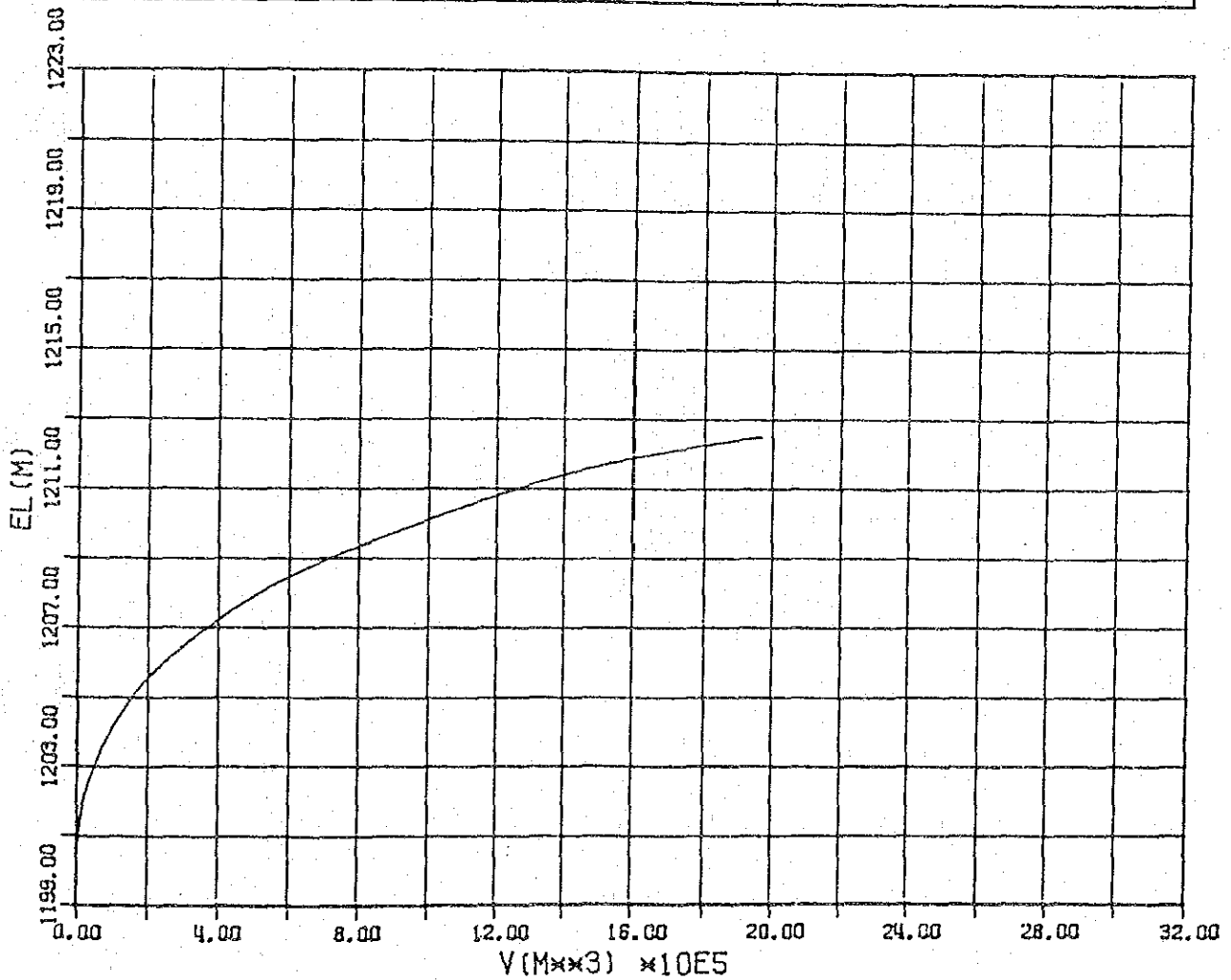


The Shuku River in the area flows straight, and forms relatively wide and deep valley. The bedrock consists of granite. It is generally massive and very hard, however partly soft by weathering. The weathering layer is estimated to be 3 to 2 meters. It is not necessary to cut off the bedrock of the foundation. The estimated thickness of unconsolidated deposits seems to be maximum 3 meters.

TABLE STORAGE VOLUME OF RESERVOIR

NO	MAP	GRID	VER	HCR
IV-4-5	1931C2	UP	208	185

EL (M)	ΔH (M)	AREA (M ²)	AVE (M ²)	VOL (M ³)	ΣV (1000M ³)	NOTE
1199.8	0.0	0	0	0	0.00	
1200.0	0.2	300	150	30	0.03	
1202.5	2.5	24500	12400	31000	31.03	
1205.0	2.5	74500	49500	123750	154.78	
1207.5	2.5	151000	112750	281875	436.65	
1210.0	2.5	274000	212500	531250	967.90	
1212.5	2.5	523000	398500	996250	1964.15	



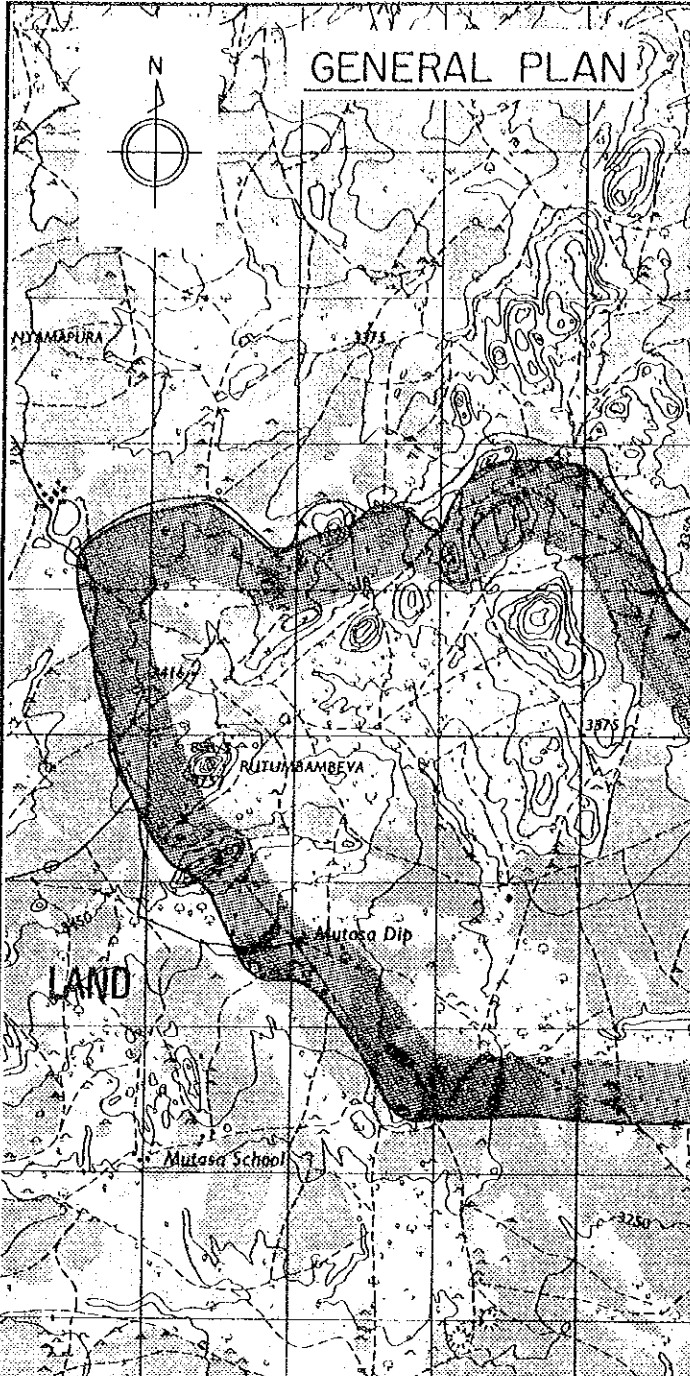
No. IV-4-6

Name of Dam Mushangwe








Location	District Gutu		Communal Land Gutu		
	Map Ref. 1931D1		Coordinates UP624271		
Geology	Granitic gneiss, weathering and fracturing, very soft, and joints well developed.				
Hydrology	River Chindshovinya		Hydrological Zone E-S5		
	Catchment Area	18.5 sq.km	M.A. Rainfall	600 mm	
	M.A. Runoff	38 mm	Sediment	320 tonnes km ² /yr.	
Reservoir	Effective Capacity	0.260 MCM	1/10 Yr. Yield	0.070 MCM	
	Dead Capacity	0.090 MCM	D.W.S.	975 m	
	Total Capacity	0.350 MCM	N.W.S.	977 m	
Dam	Height	9 m	Length	600 m	
	Embankment Volume	37 000 cu.m	Spillway	101 m	
Agriculture	Natural Region IV		Soil SL		
	Potential Irrigable Area			30 ha	
	Proposed Cropping Pattern B				
Irrigation	Net Irrigable Area 4.1 ha		Dist. 3.5 km by Gravity		
	Topography	Area	Flat		
		Conveyance	Slightly sloping		
Rural Water Supply	Population	1 725 person	35 cu.m/day		
	Livestock	800 unit	36 cu.m/day		
Cost and Benefit	Dam	Irrigation Facilities	Total Cost	Class	
	Z\$ 842 000	Z\$ 613 000	Z\$ 1 455 000	C	
	Annual Increment Benefit	Net Present Value	Economic Internal Rate of Return		
	Z\$ 9 274 /year	Z\$ 108 000	—		
Visit	Dam Engineer	Geologist	Irrigation Engineer	Agronomist	Economist
	Y	Y	Y	N	N
Remarks					

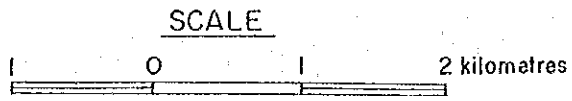
Present Condition on the Ward

Ward Name	18, 36	Area(21 309+8 600) ha
Demography	Population Density	57.5 persons/sq.km
	Family Size	5.0 Persons/household
Agriculture	Arable Area (11 590+6 000) ha	Grazing Area (5 914+2 600)ha
	Maize	0.8 ha/household 16 bags/ha
	Sorghum	0.3 ha/household 18 bags/ha
	Livestock	1.5 LSUs/household 16.0 LSUs/sq.km
Rural Water Supply	Borehole	0.06 units/sq.km 1 229 persons/unit
	Well	0.20 units/sq.km 250 persons/unit



Dam No.	IV-4-6
Dam Name	MUSHANGWE
Catchment Area	18.5 sq.km
1/10 yr. Yield	70 Th.cu.m
Water Conveyance	
Method	Gravity
Distance	3.5 km
Gross Irrigable Area	5 ha

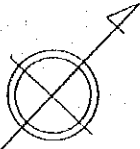
- LEGEND**
-  Catchment Area
 -  Reservoir
 -  Dam
 -  Pump
 -  Conveyance Canal or Pipe
 -  Night Storage Reservoir
 -  Irrigable Area



PLAN OF DAM

MUSHANGWE

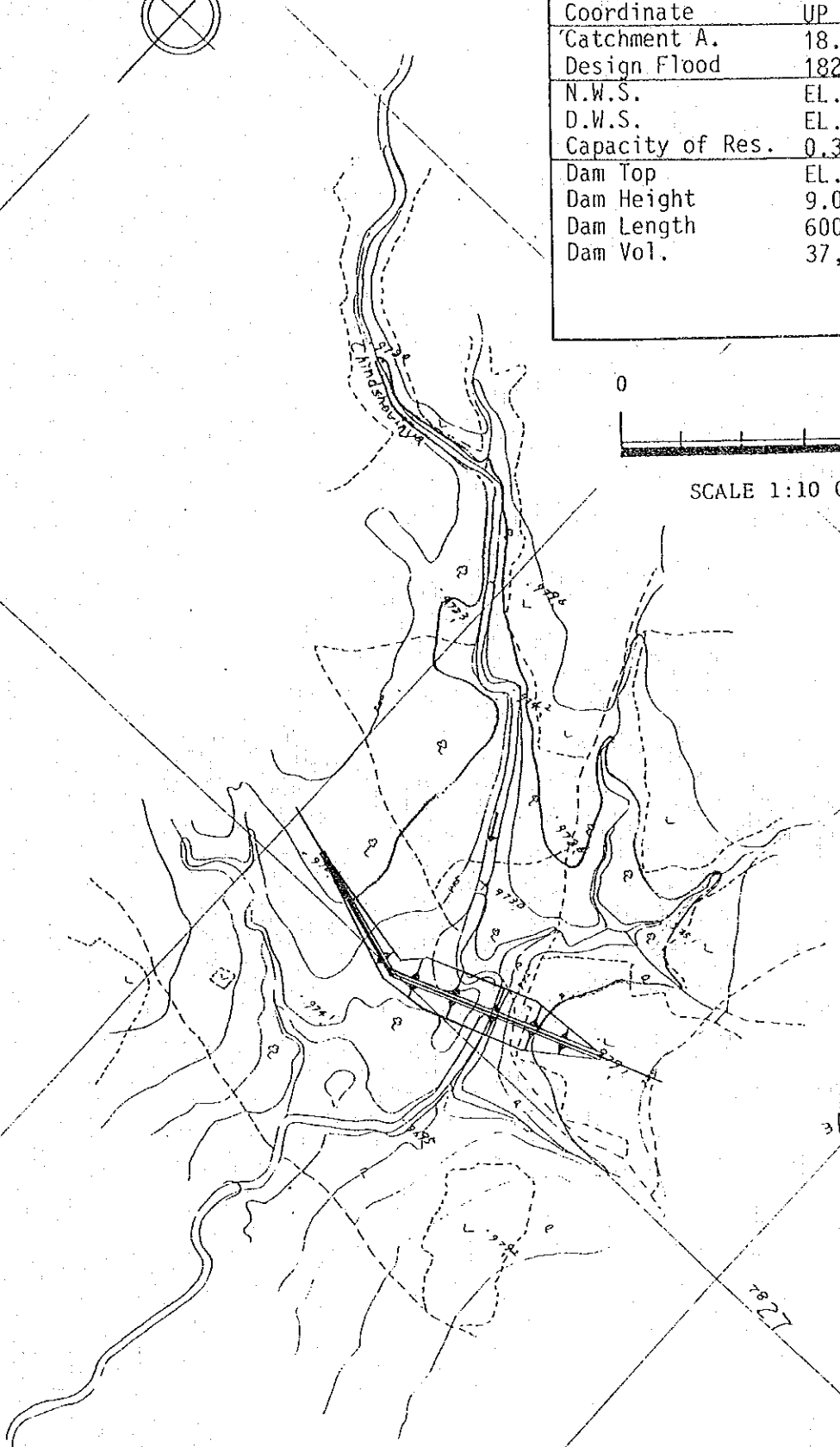
Dam No.	IV- 4 - 6
District	Gutu
Communal L.	Gutu
River	Chindshovinya
Map Ref.	1931 D1
Coordinate	UP 624271
Catchment A.	18.5 sq.km
Design Flood	182 cum/sec
N.W.S.	EL.977.0 m
D.W.S.	EL.975.0 m
Capacity of Res.	0.35 M.C.M.
Dam Top	EL.979.0 m
Dam Height	9.0 m
Dam Length	600 m
Dam Vol.	37,000 cum



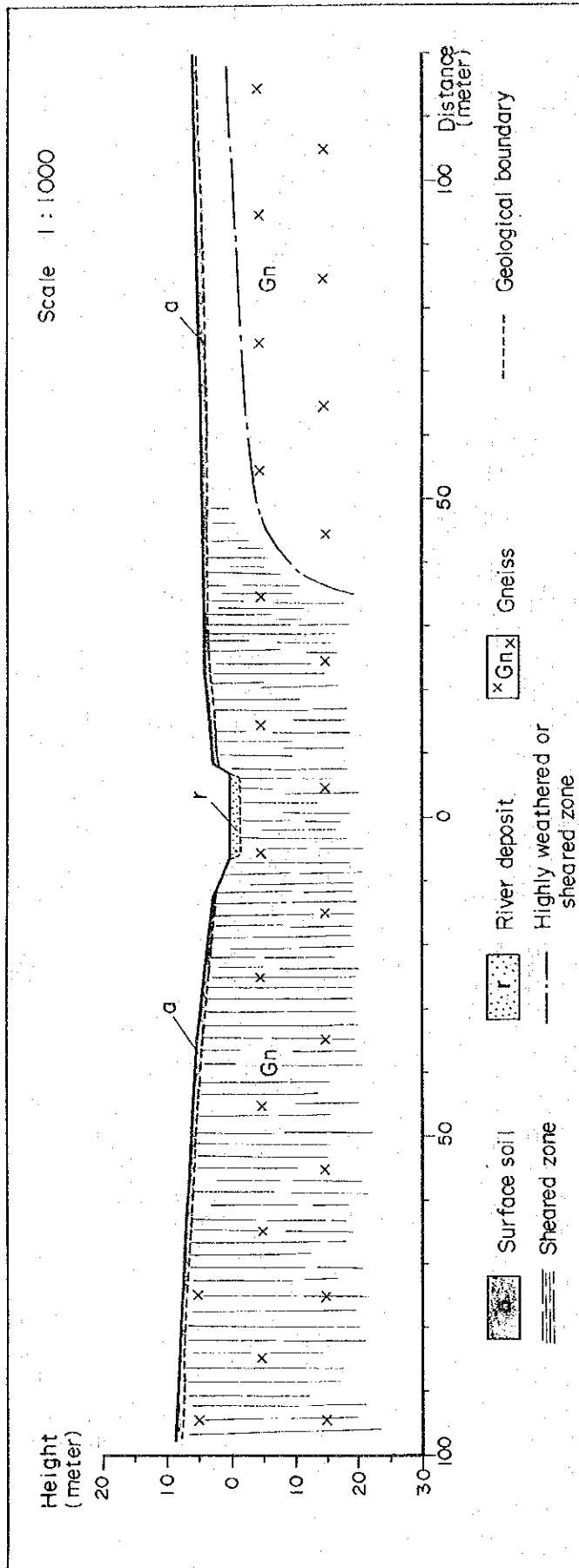
0 500



SCALE 1:10 000



IV-4-6 Mushangwe



The Chindoshovinya River has been affected by geological structures, therefore it forms a straight, wide and shallow valley around the damsite.

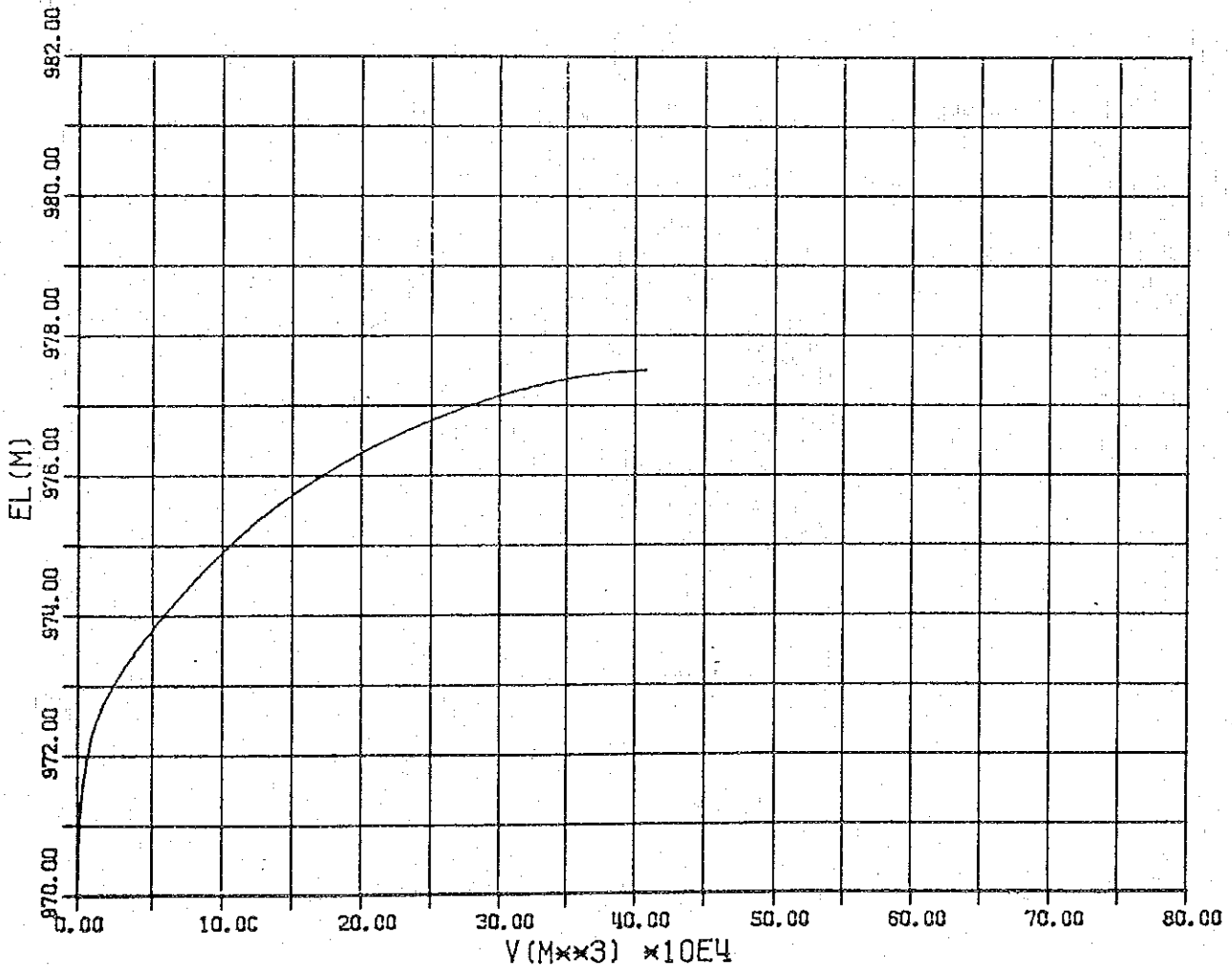
The bedrock consists of granite gneiss. Around the damsite it has been sheared widely by faults and is very soft, and partly it has been changed into patches and soils. It is well jointed at intervals of 100 to 50 centimeters, and abundant intersected quartz veins are distributed.

It seems that leakage through the bedrock is large and bearing strength in the foundation strata is small. The estimated thickness of unconsolidated deposits is about 3 meters in the riverbed and less than 1 meter at both banks.

TABLE STORAGE VOLUME OF RESERVOIR

NØ	MAP	GRID	VER	HØR
IV-4-6	193101	UP	624	271

EL (M)	ΔH (M)	AREA (M ²)	AVE (M ²)	VØL (M ³)	ΣV (1000M ³)	NOTE
970.0	0.0	0	0	0	0.00	
972.5	2.5	10000	5000	12500	12.50	
975.0	2.5	64000	37000	92500	105.00	
977.5	2.5	178000	121000	302500	407.50	



No. IV-4-7








Name of Dam Chingai

Location	District Gutu		Communal Land Gutu		
	Map Ref. 1931D2		Coordinates UP735184		
Geology	Granite, shearing, has been changed into boulders or clays.				
Hydrology	River (T) Nyazvidzi		Hydrological Zone E-S5		
	Catchment Area	9.9 sq.km	M.A. Rainfall	600 mm	
	M.A. Runoff	38 mm	Sediment	320 tonnes km ² /yr.	
Reservoir	Effective Capacity	0.530 MCM	1/10 Yr. Yield	0.056 MCM	
	Dead Capacity	0.050 MCM	D.W.S.	901 m	
	Total Capacity	0.580 MCM	N.W.S.	905 m	
Dam	Height	8 m	Length	1 000 m	
	Embankment Volume	92 000 cu.m	Spillway	67 m	
Agriculture	Natural Region V		Soil SL		
	Potential Irrigable Area		50 ha		
	Proposed Cropping Pattern B				
Irrigation	Net Irrigable Area 3.3 ha		Dist. 3.0 km by Gravity		
	Topography	Area	Gentle slope		
		Conveyance	Slightly sloping, one river crossing		
Rural Water Supply	Population	2 067 person	41 cu.m/day		
	Livestock	1 040 unit	47 cu.m/day		
Cost and Benefit	Dam	Irrigation Facilities	Total Cost	Class	
	Z\$ 2 373 000	Z\$ 699 000	Z\$ 3 072 000	C	
	Annual Increment Benefit	Net Present Value	Economic Internal Rate of Return		
	Z\$ 7 764 /year	Z\$ 90 000	-		
Visit	Dam Engineer	Geologist	Irrigation Engineer	Agronomist	Economist
	Y	Y	Y	N	N
Remarks					

Present Condition on the Ward

Ward Name	17, 18		Area (26 636+21 309) ha	
Demography	Population Density		68.9 persons/sq.km	
	Family Size		7.5 Persons/household	
Agriculture	Arable Area (15 983+11 590) ha		Grazing Area (9 855+5 914) ha	
	Maize	0.6 ha/household	15	bags/ha
	Sorghum	0.3 ha/household	17	bags/ha
	Livestock	2.3 LSUs/household	20.8	LSUs/sq.km
Rural Water Supply	Borehole	0.03 units/sq.km	2 264	persons/unit
	Well	0.13 units/sq.km	625	persons/unit

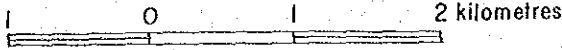
LEGEND

-  Catchment Area
-  Reservoir
-  Dam
-  Pump
-  Conveyance Canal or Pipe
-  Night Storage Reservoir
-  Irrigable Area

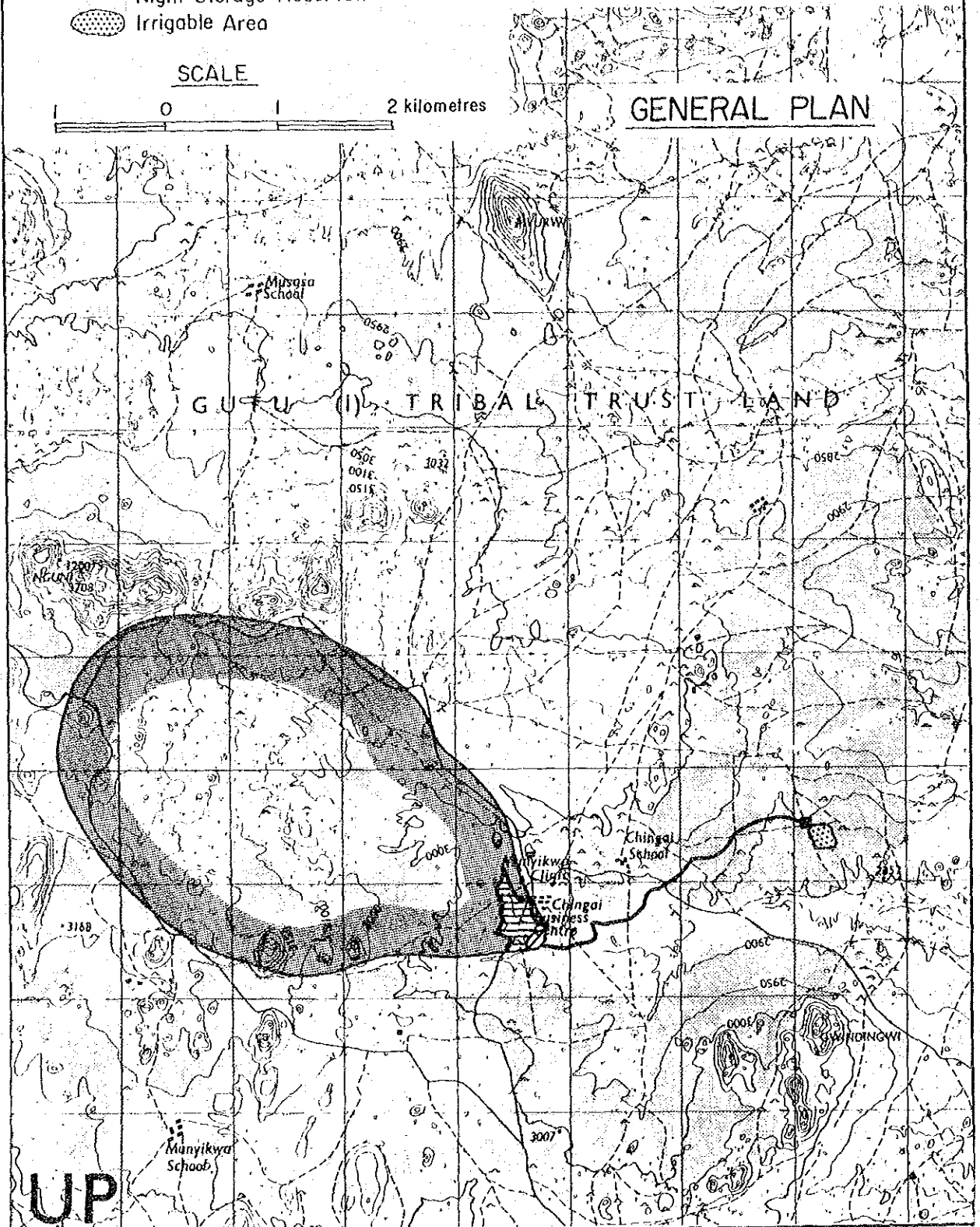


Dam No.	IV-4-7
Dam Name	CHINGAI
Catchment Area	9.9 sq. km
1/10 yr. Yield	56 Th. cu. m
Water Conveyance	
Method	Gravity
Distance	3.0 km
Gross Irrigable Area	4 ha

SCALE



GENERAL PLAN

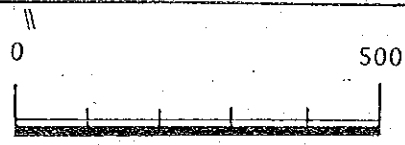


UP

CHINGAI

Dam No.	IV- 4 - 7
District	Gutu
Communal L.	Gutu
River	(T)Nyazvidzi
Map Ref.	1931 D2
Coordinate	UP 735184
Catchment A.	9.9 sq.km
Design Flood	120 cum/sec
N.W.S.	EL.905.0 m
D.W.S.	EL.901.0 m
Capacity of Res.	0.58 M.C.M.
Dam Top	EL.907.0 m
Dam Height	8.0 m
Dam Length	1,000 m
Dam Vol.	92,000 cum

PLAN OF DAM



SCALE 1:10 000

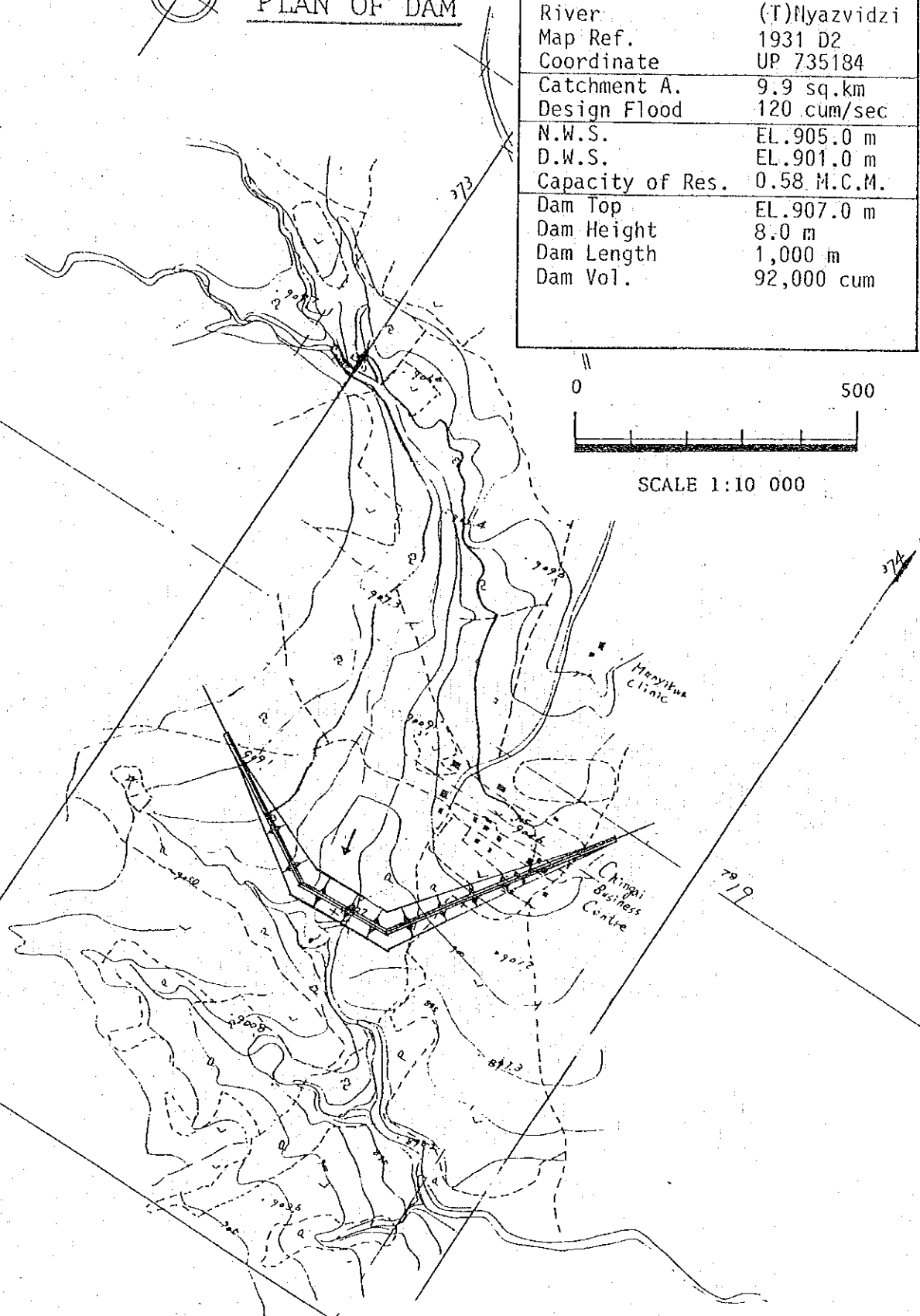
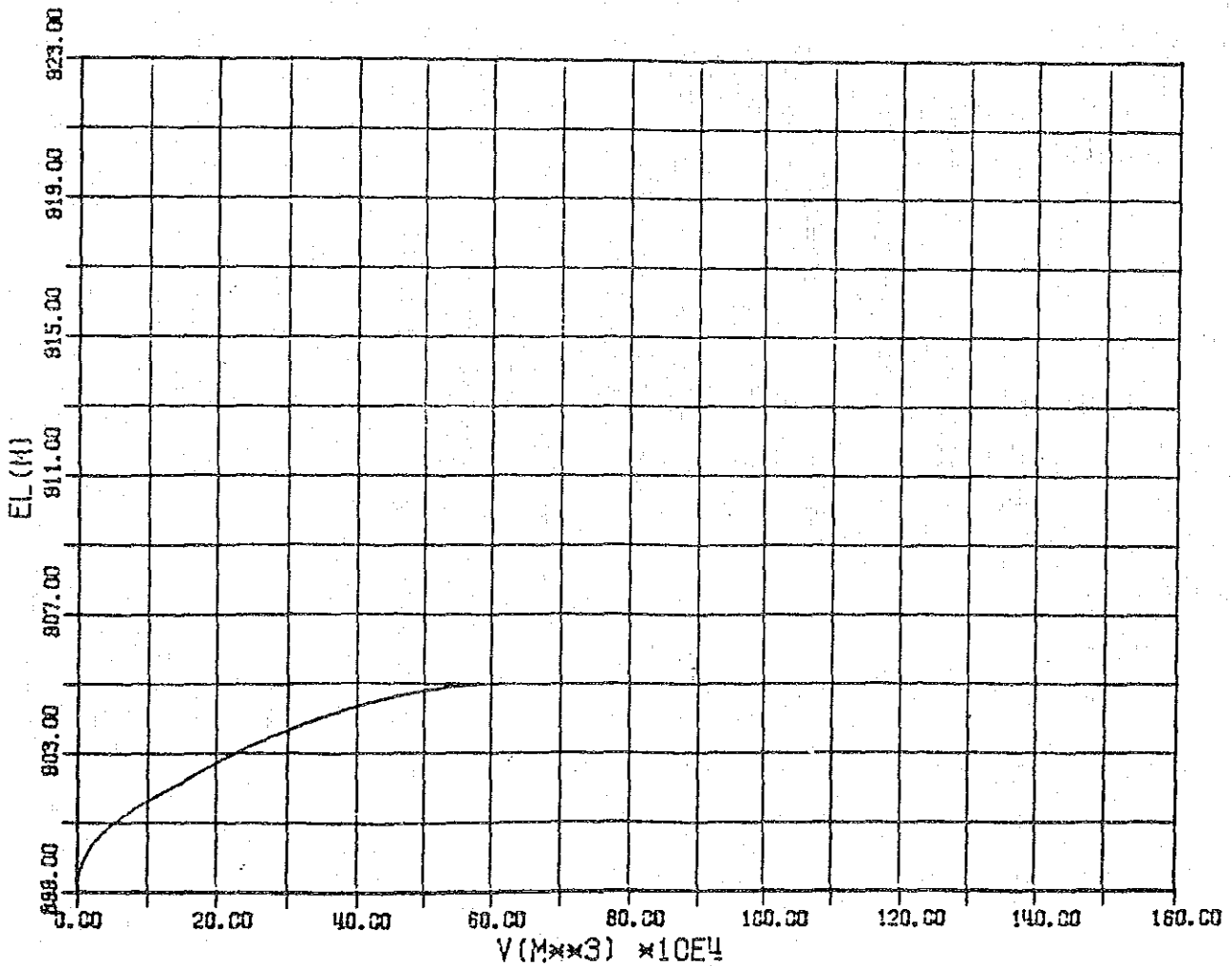


TABLE STORAGE VOLUME OF RESERVOIR

NO	MAP	GRID	VER	HCR
IV-4-7	193102	UP	735	186

EL (M)	ΔH (M)	AREA (M ²)	AVE (M ²)	VOL (M ³)	ΣV (1000M ³)	NOTE
899.2	0.0	0	0	0	0.00	
900.0	0.8	27500	13750	11001	11.00	
902.5	2.5	105900	66700	166750	177.75	
905.0	2.5	217000	161450	403625	581.38	



No. IV-4-8

Name of Dam Mutanda

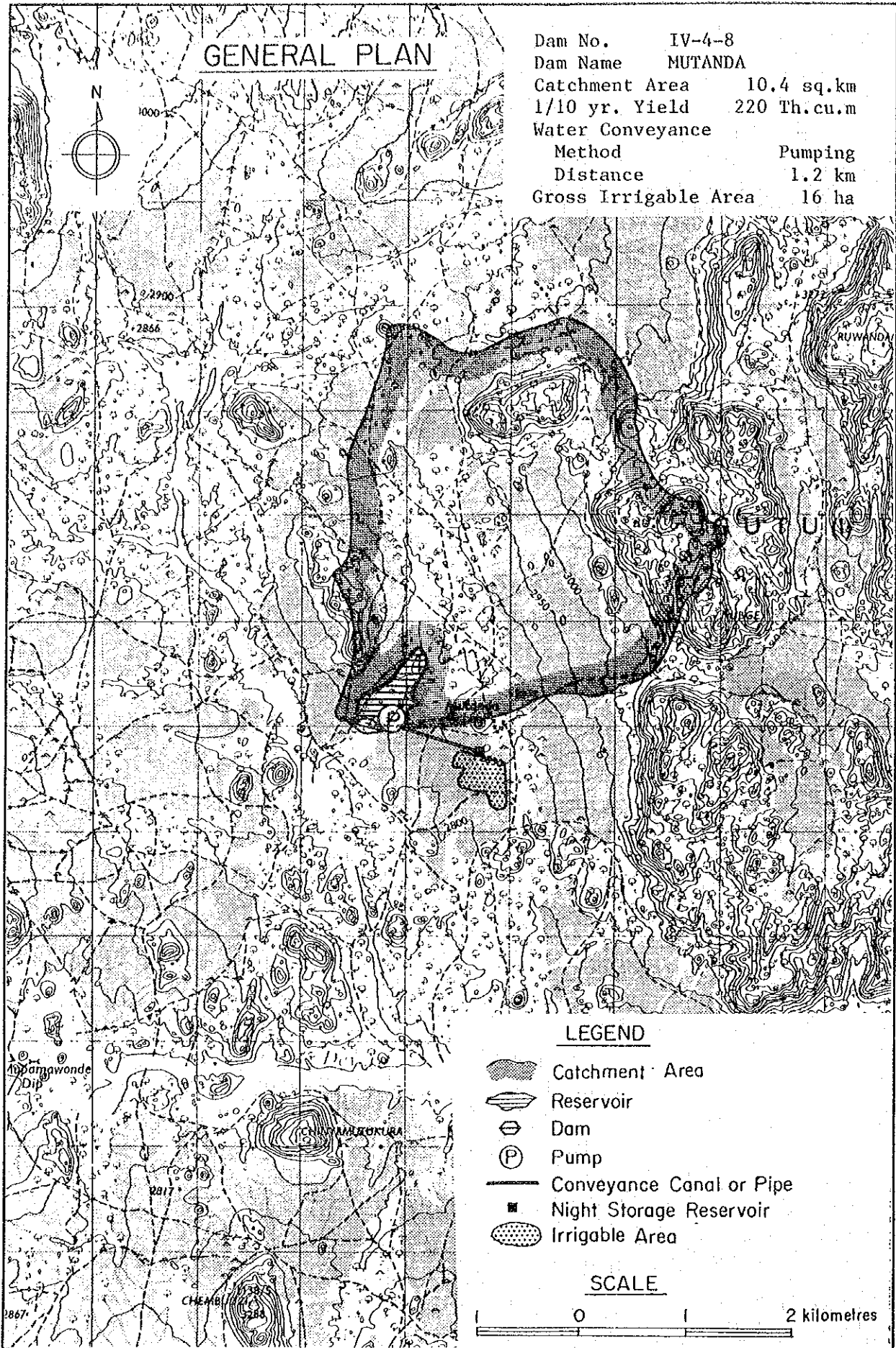
Location	District Gutu		Communal Land Gutu		
	Map Ref. 1931D4		Coordinates UP726091		
Geology	Granite, highly weathering, soft, however, joints and cracks are very few and connecting.				
Hydrology	River (T) Pembe		Hydrological Zone E-S4		
	Catchment Area	10.4 sq.km	M.A. Rainfall	700 mm	
	M.A. Runoff	66 mm	Sediment	320 tonnes km ² /yr.	
Reservoir	Effective Capacity	1.320 MCM	1/10 Yr. Yield	0.220 MCM	
	Dead Capacity	0.050 MCM	D.W.S.	847 m	
	Total Capacity	1.370 MCM	N.W.S.	885.5 m	
Dam	Height	15.5 m	Length	800 m	
	Embankment Volume	177 000 cu.m	Spillway	67 m	
Agriculture	Natural Region V		Soil SL		
	Potential Irrigable Area			50 ha	
	Proposed Cropping Pattern B				
Irrigation	Net Irrigable Area 12.9ha		Dist. 1.2 km by Pump, H=23.0 m		
	Topography	Area	Slightly sloping		
		Conveyance	Gentle slope		
Rural Water Supply	Population	2 781 person	56 cu.m/day		
	Livestock	1 205 unit	54 cu.m/day		
Cost and Benefit	Dam	Irrigation Facilities	Total Cost	Class	
	Z\$ 3 872 000	Z\$ 808 000	Z\$ 4 680 000	C	
	Annual Increment Benefit	Net Present Value	Economic Internal Rate of Return		
	Z\$ 27 143 /year	Z\$ 316 000	-		
Visit	Dam Engineer	Geologist	Irrigation Engineer	Agronomist	Economist
	Y	Y	Y	N	N
Remarks					

Present Condition on the Ward








Ward Name	17		Area	26 636 ha
Demography	Population Density		92.7	persons/sq.km
	Family Size		10.0	Persons/household
Agriculture	Arable Area	15 983 ha	Grazing Area	9 855 ha
	Maize	0.4 ha/household	18	bags/ha
	Sorghum	0.2 ha/household	15	bags/ha
	Livestock	2.5 LSUs/household	241	LSUs/sq.km
Rural Water Supply	Borehole	0.03 units/sq.km	3 527	persons/unit
	Well	0.10 units/sq.km	950	persons/unit

GENERAL PLAN

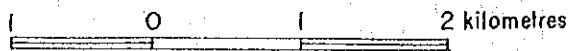
Dam No. IV-4-8
 Dam Name MUTANDA
 Catchment Area 10.4 sq.km
 1/10 yr. Yield 220 Th.cu.m
 Water Conveyance
 Method Pumping
 Distance 1.2 km
 Gross Irrigable Area 16 ha



LEGEND

-  Catchment Area
-  Reservoir
-  Dam
-  Pump
-  Conveyance Canal or Pipe
-  Night Storage Reservoir
-  Irrigable Area

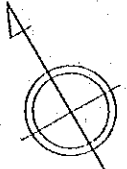
SCALE



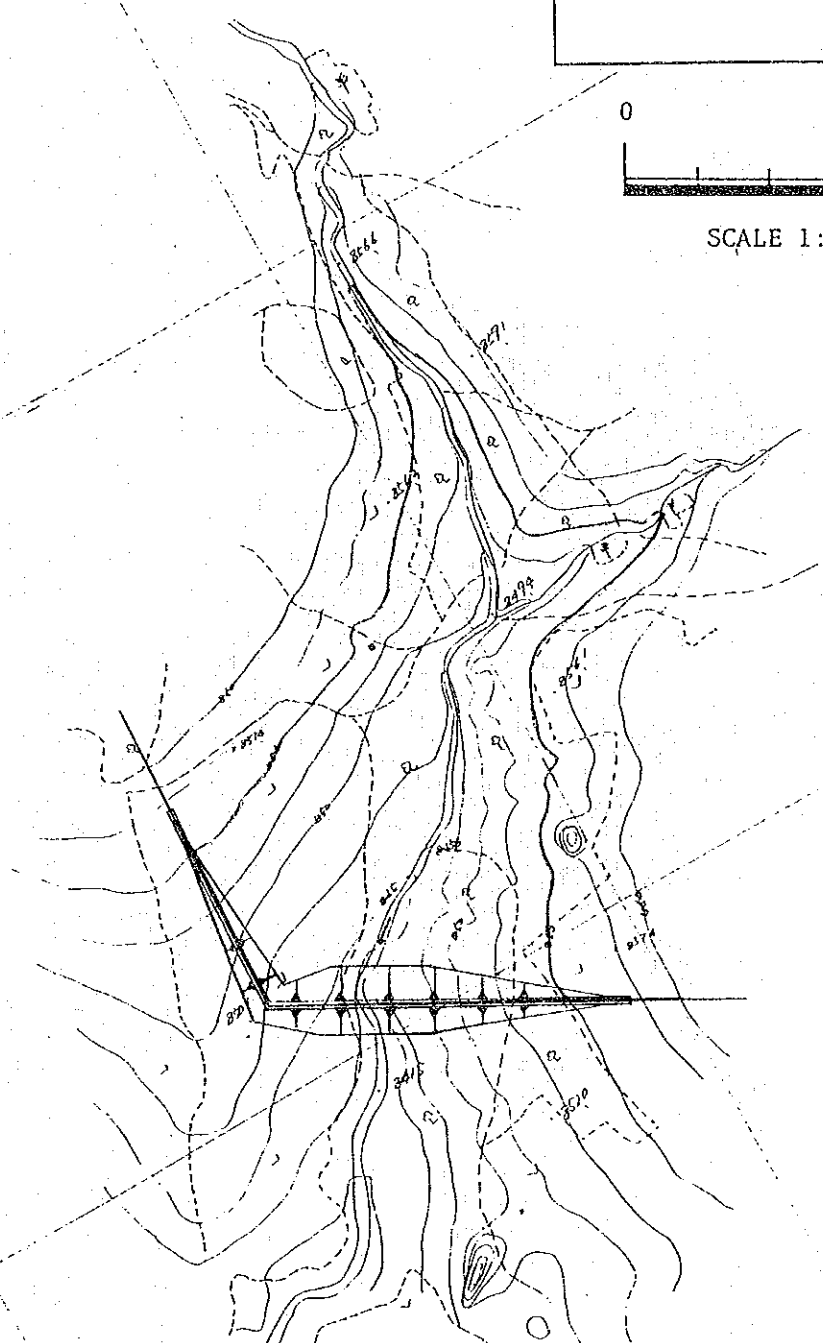
MUTANDA

Dam No.	IV-4-8
District	Gutu
Communal L.	Gutu
River	(T)Pembe
Map Ref.	1931 D4
Coordinate	UP 726091
Catchment A.	10.4 sq.km
Design Flood	120 cum/sec
N.W.S.	EL.955.5 m
D.W.S.	EL.847.0 m
Capacity of Res.	1.37 M.C.M.
Dam Top	EL.857.5 m
Dam Height	15.5 m
Dam Length	800 m
Dam Vol.	177,000 cum

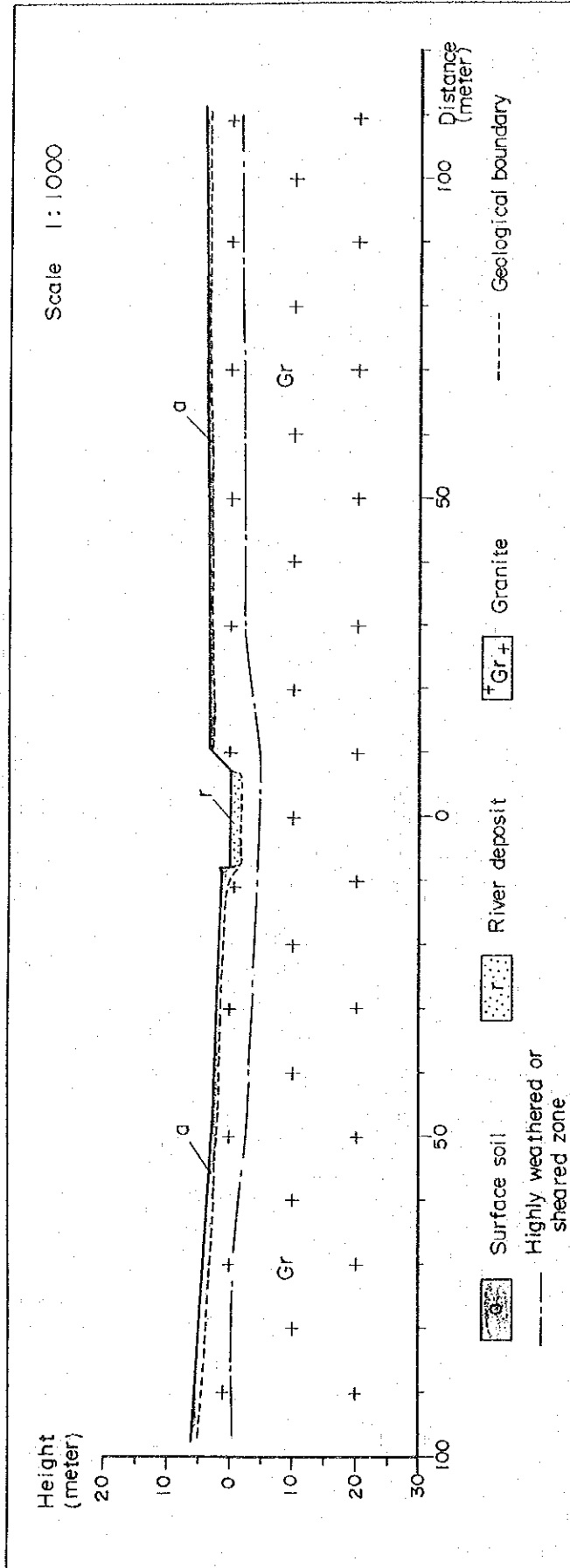
PLAN OF DAM



SCALE 1:10 000



IV-4-8 Mutanda



The area is very flat land, and the Pembe River forms shallow and narrow valley. The bedrock consists of granite and it is massive and soft. It has been affected by highly weathering and partly has been changed into soils. The highly weathering layer seems to be less than 5 meters. It seems that leakage through the bedrock is few and bearing strength in the foundation strata is small. The highly weathering layer will be eroded easily by flashing water, therefore it is necessary to cut off it for the dam safety. The estimated thickness of unconsolidated deposits is less than 3 meters in the riverbed and less than 1 meter at both banks.

TABLE STORAGE VOLUME OF RESERVOIR

NØ	MAP	GRID	VER	HØR
IV-4-8	193104	UP	726	091

EL (M)	ΔH (M)	AREA (M ²)	AVE (M ²)	VØL (M ³)	ΣV (1000M ³)	NØTE
842.0	0.0	0	0	0	0.00	
842.5	0.5	1000	500	250	0.25	
845.0	2.5	8000	4500	11250	11.50	
847.5	2.5	52000	30000	75000	86.50	
850.0	2.5	112000	82000	205000	291.50	
852.5	2.5	175000	143500	358750	650.25	
855.0	2.5	271000	223000	557500	1207.75	
857.5	2.5	380000	325500	813750	2021.50	
860.0	2.5	501000	440500	110124	3122.75	

