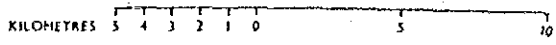


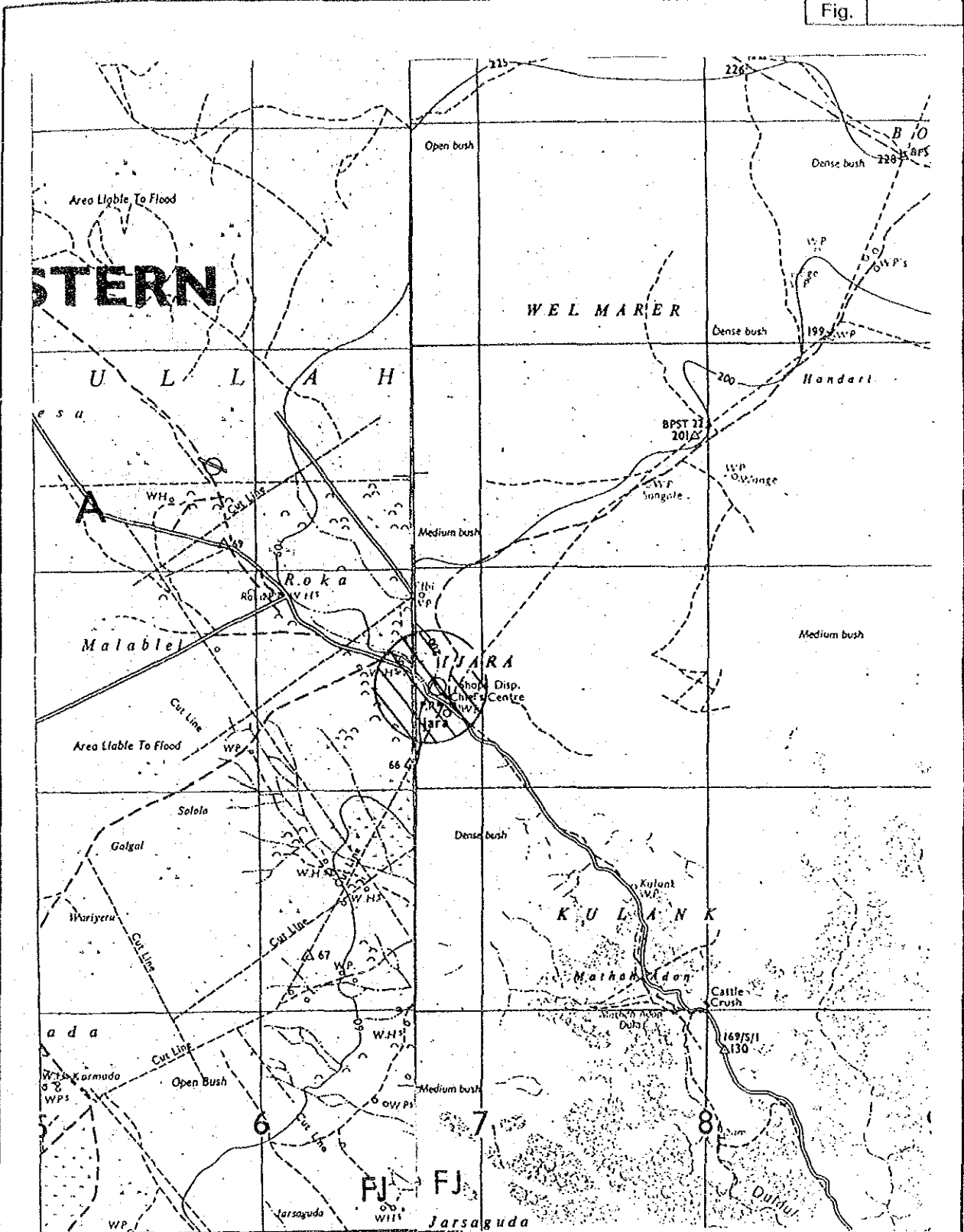
U- 63 Mudo Gashe

R 513.1 NA-37-15 5FA



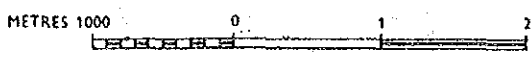
THE STUDY
ON
THE NATIONAL WATER MASTER PLAN
JAPAN INTERNATIONAL COOPERATION AGENCY

a	b	c	d	e	f	g	h	i
2	National Water Master Plan							
3	URBAN WATER SUPPLY							
4	Code No. 510	U- 64				Rate		Jul-92 25.2
5	-----							
6	Name of Urban:	Ijara	LGL Notice No:					
7	Organization:							
8	Per Capita GRDP in 1988 (guess):							
9	District:	Garissa	Locataion :	515.2	Ijara			
10	Map (1/50,000) :	SA-37-8	Coordinates X:	40°30'	Y:	S 01°37'		
11	Sub-basin Code:	4KB	Elevation (El. m):					
12	-----							
13	Existing Facilities							
14	Raw Water Source:	Boreholes	L (m)=		River No			
15	Raw Water System:	H (m)=						
16	Treatment:	Capacity (m3/d)						
17	Distribution System:							
18	-----							
19				1990	2000	2010		
20	-----							
21	Projected Population	(no)		1,400	2,500	3,200		
22	Residential Demand	(m3/d)		173	317	414		
23	Non-residential Demand	(m3/d)		0	50	66		
24	Livestock Demand	(m3/d)		0	42	65		
25	Industrial Demand	(m3/d)		0	0	0		
26	Total Demand	(m3/d)		173	409	545		
27	Area Served (estimated net)	(ha)		10	19	24		
28	-----							
29	Future Development Plan							
30	Raw Water Source:	Boreholes + Small dam		L (m)=			River No:	
31	Raw Water System:	H (m)=	0			104,000		
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost			1990	2000	2010	Total	
36	Incremental Capacity	(m3/d)		173.4	235.1	136.4	545.0	
37	Source Works	(US\$'000)		755.6	1,024.5	594.4	2,374.5	
38	Pump Cost	(US\$'000)		0.0	0.0	0.0	0.0	
39	Raw Water Main	(US\$'000)		1,125.9	1,538.9	880.8	3,545.6	
40	Treatment	(US\$'000)		153.4	184.5	132.5	470.4	
41	Storage	(US\$'000)		25.5	31.0	21.8	78.3	
42	Distribution	(US\$'000)		83.6	149.4	41.8	274.8	
43	Miscellaneous (20%)	(US\$'000)		428.8	585.7	334.3	1,348.7	
44	Admi. & Engineering	(US\$'000)		257.3	351.4	200.6	809.2	
45	Contingency	(US\$'000)		566.0	773.1	441.2	1,780.3	
46	Total Cost	(US\$'000)		3,396.2	4,638.4	2,647.5	10,682.1	
47	Cost per Capita	(US\$/c)		2,425.8	4,216.8	3,782.1		
48	Cost per ha	(US\$/ha)		324,834.5	564,647.0	506,442.2		
49	Cost per m3	(US\$/m3)		19.6	19.7	19.4	19.6	
50	-----							
51	Present Value of Water at DF=10 %			1990	2000	2010	Total	
52	Direct O & M Costs	(US\$'000)		169.8	231.9	132.4		
53	Capital Costs	(US\$'000)		349.8	477.8	272.7		
54	Total Annual Cost	(US\$'000)		519.6	709.7	405.1		
55	Unit Cost per m3	(US\$/m3)		8.2	8.3	8.1		
56	-----							
57	Remarks:	Water pan may be used for water supply in the wet period.						
58		Small dams could be alternative sources.						
59								
60								
61								
62								
63	-----							



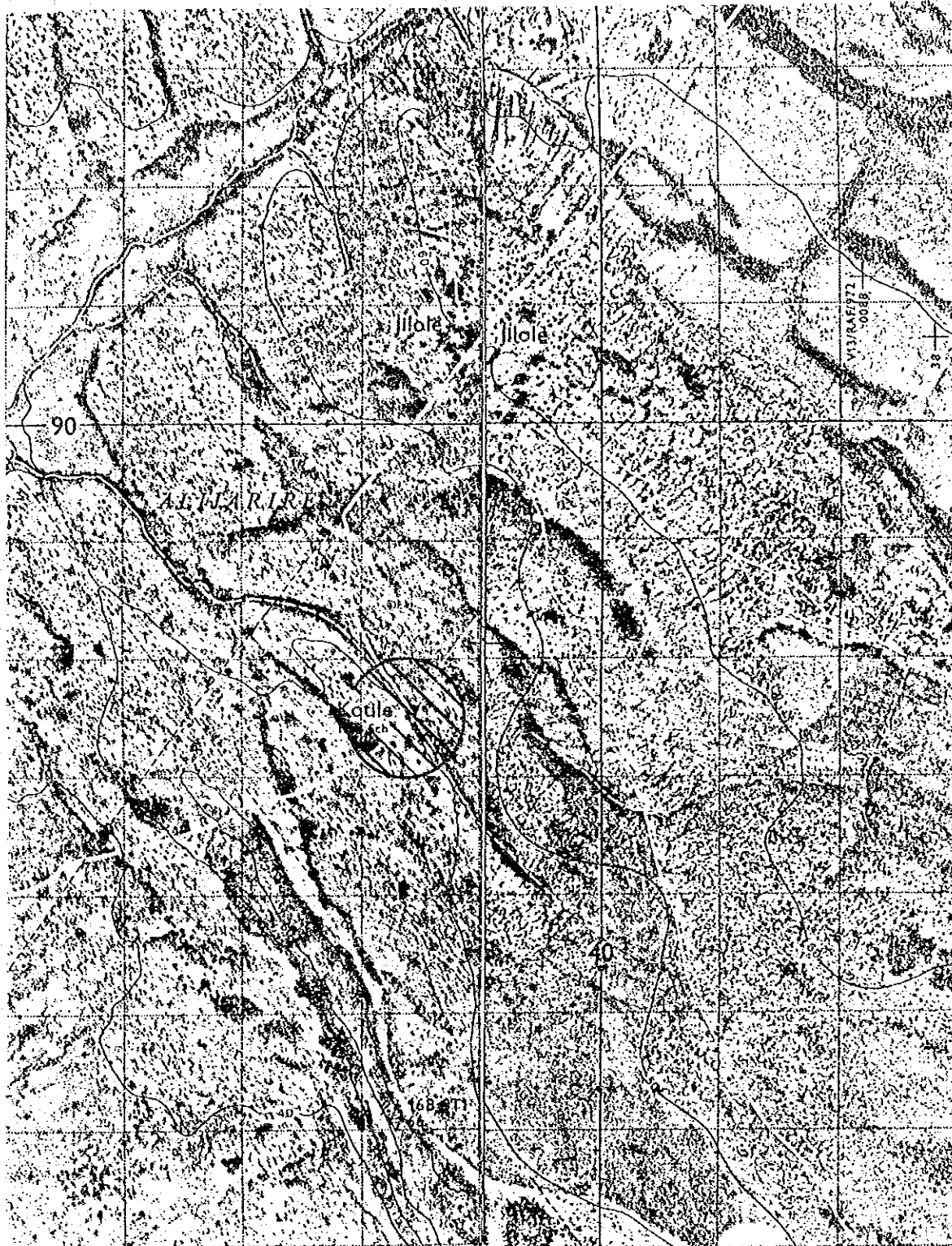
U- 64 Ijara

R 515.2 SA-37-8 4KB



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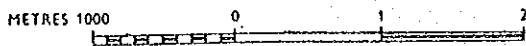
a	b	c	d	e	f	g	h	i
2	National Water Master Plan							
3	URBAN WATER SUPPLY							
4	Code No. 510		U- 65			Rate		Jul-92 25.2
5	-----							
6	Name of Urban:		Kotile		LGL Notice No:			
7	Organization:							
8	Per Capita GRDP in 1988 (guess):							
9	District:		Garissa	Locataion :	515.3	Kotile		
10	Map (1/50,000) :		168/3	Coordinates X:		40°18'	Y:	S 01°56'
11	Sub-basin Code:		4GG	Elevation (El. m):				
12	-----							
13	Existing Facilities							
14	Raw Water Source:		Boreholes			River No		
15	Raw Water System:		H (m)=	L (m)=				
16	Treatment:			Capacity (m3/d)				
17	Distribution System:							
18	-----							
19					1990	2000	2010	
20	-----							
21	Projected Population		(no)		1,400	2,500	3,200	
22	Residential Demand		(m3/d)		173	317	414	
23	Non-residential Demand		(m3/d)		0	50	66	
24	Livestock Demand		(m3/d)		0	42	65	
25	Industrial Demand		(m3/d)		0	0	0	
26	Total Demand		(m3/d)		173	409	545	
27	Area Served (estimated net)		(ha)		10	19	24	
28	-----							
29	Future Development Plan							
30	Raw Water Source:		Boreholes/Subsurface Dam/Tana			River No:		
31	Raw Water System:		H (m)=	0 L (m)=		199,000		
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost							
36	Incremental Capacity		(m3/d)		1990	2000	2010	Total
37	Source Works		(US\$'000)		173.4	235.1	136.4	545.0
38	Pump Cost		(US\$'000)		903.0	1,224.4	710.4	2,837.8
39	Raw Water Main		(US\$'000)		0.0	0.0	0.0	0.0
40	Treatment		(US\$'000)		2,154.3	2,944.7	1,685.4	6,784.4
41	Storage		(US\$'000)		0.0	0.0	0.0	0.0
42	Distribution		(US\$'000)		0.0	31.0	21.8	52.8
43	Miscellaneous (20%)		(US\$'000)		0.0	149.4	41.8	191.2
44	Admi. & Engineering		(US\$'000)		611.5	869.9	491.9	1,973.3
45	Contingency		(US\$'000)		366.9	521.9	295.1	1,184.0
46	Total Cost		(US\$'000)		807.1	1,148.2	649.3	2,604.7
47	Cost per Capita		(US\$/c)		4,842.9	6,889.5	3,895.8	15,628.2
48	Cost per ha		(US\$/ha)		3,459.2	6,263.2	5,565.5	
49	Cost per m3		(US\$/m3)		463,204.6	838,674.2	745,248.5	
50	-----							
51	Present Value of Water at DF=10 %							
52	Direct O & M Costs		(US\$'000)		1990	2000	2010	Total
53	Capital Costs		(US\$'000)		242.1	344.5	194.8	
54	Total Annual Cost		(US\$'000)		498.8	709.6	401.3	
55	Unit Cost per m3		(US\$/m3)		741.0	1,054.1	596.1	
56	-----							
57	Remarks: As an alternative, abstraction from the Tana river might be considered.							
58								
59								
60								
61								
62								
63	-----							



U- 65 Kotile

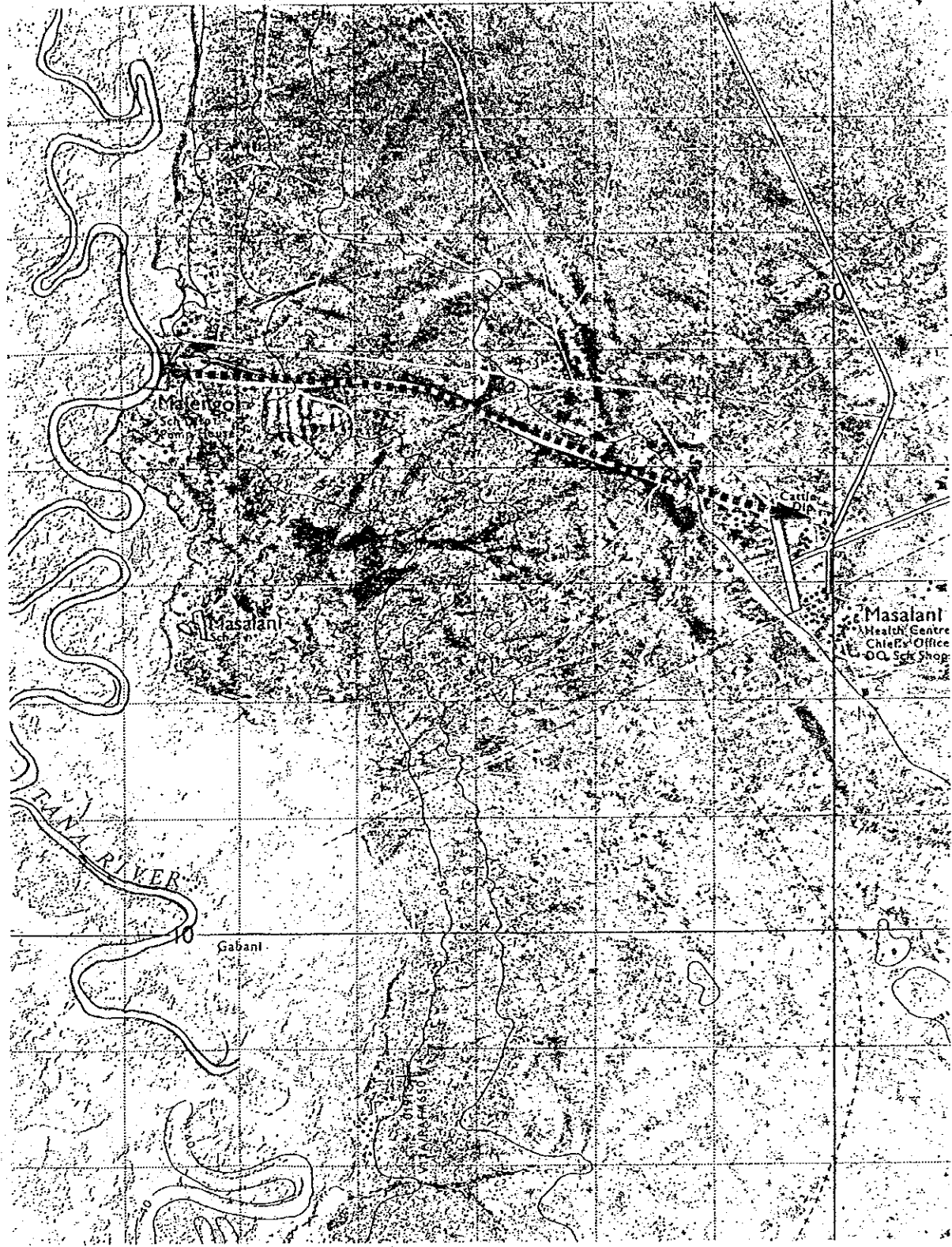
R 515.3

4GG



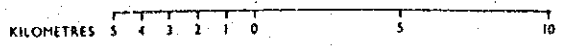
THE STUDY
ON
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a	b	c	d	e	f	g	h	i
2					National Water Master Plan			
3			URBAN WATER SUPPLY					Feb-92
4	Code No. 510		U- 66			Rate		25.2
5	-----							
6	Name of Urban:		Masalani		LGL Notice No:			
7	Organization:							
8	Per Capita GRDP in 1988 (guess):				515.4	Masalani		
9	District:		Garissa	Locataion :				
10	Map (1/50,000) :		168/1	Coordinates X:		40°10'	Y:	S 01°43'
11	Sub-basin Code:		4GF	Elevation (El. m):				
12	-----							
13	Existing Facilities							
14	Raw Water Source:		Tana river			River No		
15	Raw Water System:		H (m)=	L (m)=				
16	Treatment:			Capacity (m3/d)		60		
17	Distribution System:							
18	-----							
19					1990	2000	2010	
20	-----							
21	Projected Population		(no)		1,400	2,500	3,200	
22	Residential Demand		(m3/d)		173	317	414	
23	Non-residential Demand		(m3/d)		0	50	66	
24	Livestock Demand		(m3/d)		0	42	65	
25	Industrial Demand		(m3/d)		0	0	0	
26	Total Demand		(m3/d)		173	409	545	
27	Area Served (estimated net)		(ha)		10	19	24	
28	-----							
29	Future Development Plan							
30	Raw Water Source:		Tana River			River No:		
31	Raw Water System:		H (m)=	40 L (m)=		6,300		
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost				1990	2000	2010	Total
36	Incremental Capacity		(m3/d)		113.4	348.6	136.4	598.4
37	Source Works		(US\$'000)		2.1	4.8	2.4	9.2
38	Pump Cost		(US\$'000)		0.0	1.3	1.1	2.4
39	Raw Water Main		(US\$'000)		233.8	257.6	236.8	728.2
40	Treatment		(US\$'000)		118.2	233.4	132.5	484.1
41	Storage		(US\$'000)		19.3	39.7	21.8	80.8
42	Distribution		(US\$'000)		83.6	65.7	41.8	191.2
43	Miscellaneous (20%)		(US\$'000)		91.4	120.5	87.3	299.2
44	Admi. & Engineering		(US\$'000)		54.8	72.3	52.4	179.5
45	Contingency		(US\$'000)		120.7	159.1	115.2	394.9
46	Total Cost		(US\$'000)		723.9	954.4	691.2	2,369.6
47	Cost per Capita		(US\$/c)		517.1	867.6	987.5	
48	Cost per ha		(US\$/ha)		69,242.0	116,182.2	132,225.2	
49	Cost per m3		(US\$/m3)		6.4	2.7	5.1	4.0
50	-----							
51	Present Value of Water at DF=10 %				1990	2000	2010	Total
52	Direct O & M Costs		(US\$'000)		36.2	47.7	34.6	
53	Capital Costs		(US\$'000)		74.6	98.3	71.2	
54	Total Annual Cost		(US\$'000)		110.8	146.0	105.8	
55	Unit Cost per m3		(US\$/m3)		2.7	1.1	2.1	
56	-----							
57	Remarks:							
58								
59								
60								
61								
62								
63	-----							



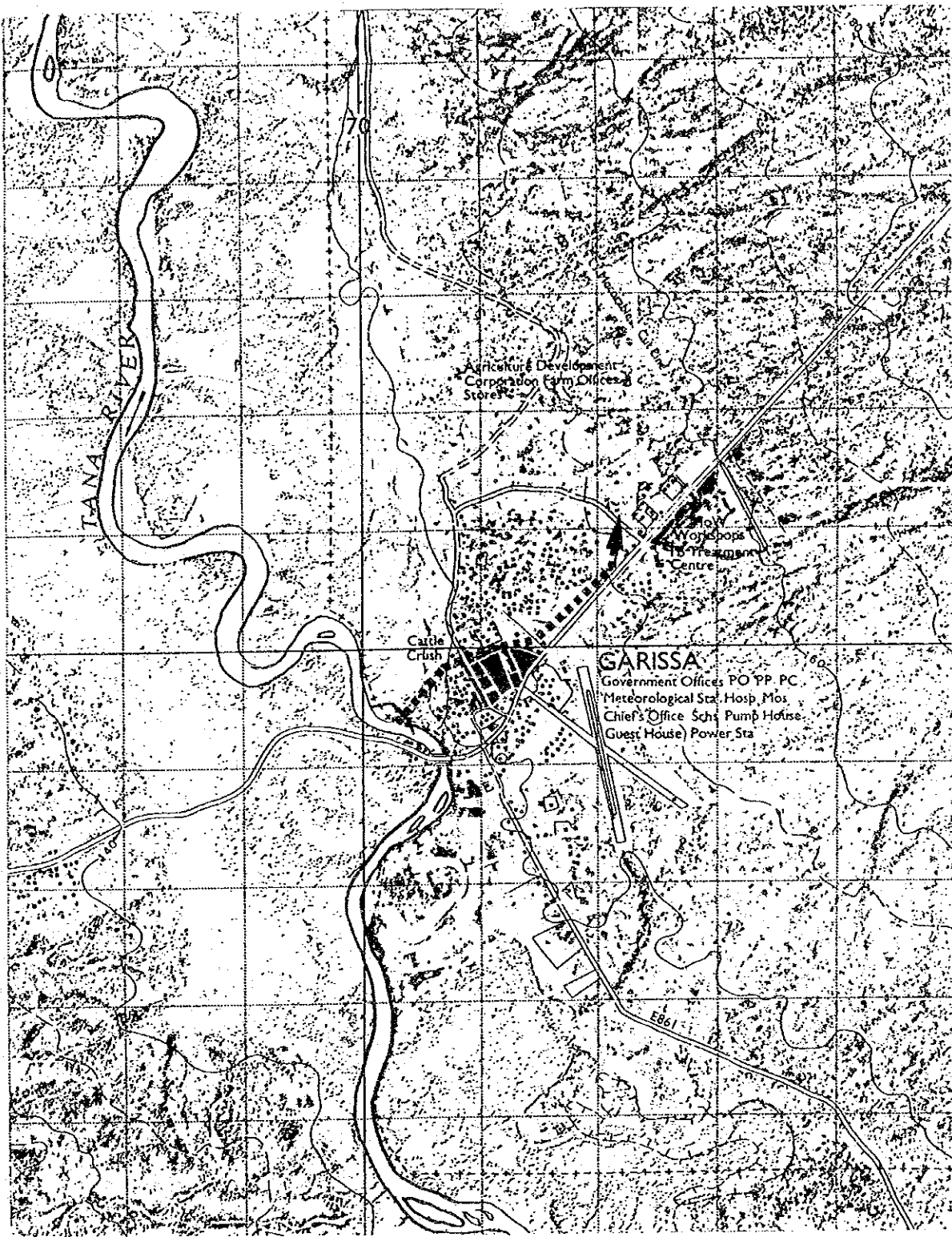
U- 66 Masalani

R 515.4 SA-37-7 4GF



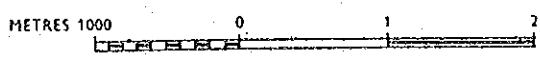
THE STUDY
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a	b	c	d	e	f	g	h	i	
2									
3			National Water Master Plan						
4	Code No. 510		URBAN WATER SUPPLY			Rate		Feb-92	
5			U- 67					25.2	
6	Name of Urban:		Garissa			LGL Notice No:			
7	Organization:								
8	Per Capita GRDP in 1988 (guess):					519.1	Sankuri		
9	District:		Garissa		Locataion :				
10	Map (1/50,000) :		126/3		Coordinates X:		39°39'	Y: S 00°26'	
11	Sub-basin Code:		4GC		Elevation (El. m):				
12									
13	Existing Facilities								
14	Raw Water Source:		Tana river				River No		
15	Raw Water System:		H (m)=		L (m)=				
16	Treatment:				Capacity (m3/d)		5641		
17	Distribution System:								
18									
19						1990	2000	2010	
20									
21	Projected Population			(no)		29,100	73,700	115,300	
22	Residential Demand			(m3/d)		3,605	9,332	14,917	
23	Non-residential Demand			(m3/d)		603	1,527	2,388	
24	Livestock Demand			(m3/d)		523	1,282	2,349	
25	Industrial Demand			(m3/d)		131	251	376	
26	Total Demand			(m3/d)		4,862	12,392	20,030	
27	Area Served (estimated net)			(ha)		217	550	861	
28									
29	Future Development Plan								
30	Raw Water Source:		Tana River				River No:		
31	Raw Water System:		H (m)=		10 L (m)=		3,000		
32	Treatment:								
33	Distribution System:								
34									
35	Incremental Capital Cost					1990	2000	2010	Total
36	Incremental Capacity			(m3/d)		0.0	6,751.3	7,637.7	14,388.9
37	Source Works			(US\$'000)		0.0	44.3	48.6	93.0
38	Pump Cost			(US\$'000)		0.0	1.9	2.1	4.0
39	Raw Water Main			(US\$'000)		0.0	230.6	240.9	471.4
40	Treatment			(US\$'000)		0.0	1,043.7	1,086.8	2,130.5
41	Storage			(US\$'000)		0.0	152.8	153.6	306.5
42	Distribution			(US\$'000)		0.0	2,664.6	2,485.3	5,149.9
43	Miscellaneous (20%)			(US\$'000)		0.0	827.6	803.5	1,631.0
44	Admi. & Engineering			(US\$'000)		0.0	496.6	482.1	978.6
45	Contingency			(US\$'000)		0.0	1,092.4	1,060.6	2,153.0
46	Total Cost			(US\$'000)		0.0	6,554.5	6,363.4	12,917.9
47	Cost per Capita			(US\$/c)		0.0	147.0	153.0	
48	Cost per ha			(US\$/ha)		0.0	19,679.0	20,483.1	
49	Cost per m3			(US\$/m3)		0.0	1.0	0.8	0.9
50									
51	Present Value of Water at DF=10 %					1990	2000	2010	Total
52	Direct O & M Costs			(US\$'000)		0.0	327.7	318.2	
53	Capital Costs			(US\$'000)		0.0	675.1	655.4	
54	Total Annual Cost			(US\$'000)		0.0	1,002.8	973.6	
55	Unit Cost per m3			(US\$/m3)		0.0	0.4	0.3	
56									
57	Remarks:								
58									
59									
60									
61									
62									
63									



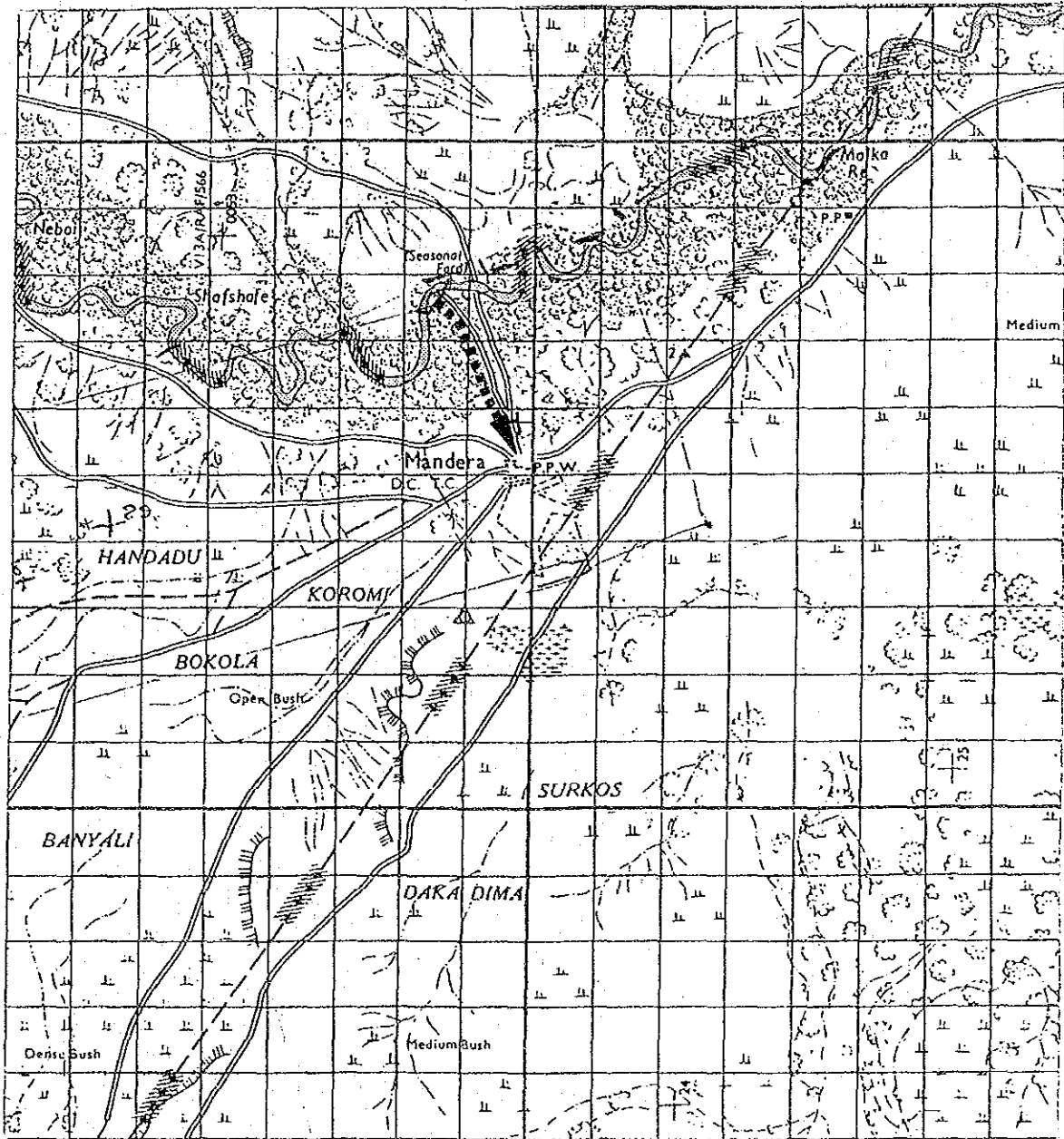
U- 67 Garissa

U 519.1 126/3 4GC



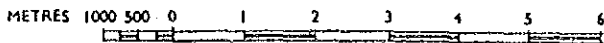
THE STUDY
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a	b	c	d	e	f	g	h	i
2	National Water Master Plan							
3	URBAN WATER SUPPLY							
4	Code No. 520		U- 68			Rate		Feb-92 25.2
5	-----							
6	Name of Urban:		Mandera		LGL Notice No:			
7	Organization:							
8	Per Capita GRDP in 1988 (guess):							
9	District:		Mandera	Locataion :	521.1	Mandera		
10	Map (1/50,000) :		NA-37-4	Coordinates X:		41°51'	Y:	N 03°56'
11	Sub-basin Code:		5GB	Elevation (El. m):				
12	-----							
13	Existing Facilities							
14	Raw Water Source:		Boreholes/Daua river			River No		
15	Raw Water System:		H (m)=	L (m)=				
16	Treatment:			Capacity (m3/d)		1400		
17	Distribution System:							
18	-----							
19					1990	2000	2010	
20	-----							
21	Projected Population		(no)		6,500	11,800	18,100	
22	Residential Demand		(m3/d)		805	1,494	2,342	
23	Non-residential Demand		(m3/d)		135	243	374	
24	Livestock Demand		(m3/d)		111	233	431	
25	Industrial Demand		(m3/d)		171	316	455	
26	Total Demand		(m3/d)		1,222	2,286	3,602	
27	Area Served (estimated net)		(ha)		49	88	135	
28	-----							
29	Future Development Plan							
30	Raw Water Source:		Daua River			River No:		
31	Raw Water System:		H (m)=	40 L (m)=		2,200		
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost				1990	2000	2010	Total
36	Incremental Capacity		(m3/d)		0.0	886.2	1,315.5	2,201.7
37	Source Works		(US\$'000)		0.0	9.7	13.0	22.7
38	Pump Cost		(US\$'000)		0.0	2.1	2.7	4.8
39	Raw Water Main		(US\$'000)		0.0	102.1	109.5	211.6
40	Treatment		(US\$'000)		0.0	399.1	494.8	893.9
41	Storage		(US\$'000)		0.0	68.8	85.0	109.0
42	Distribution		(US\$'000)		0.0	316.6	376.4	693.0
43	Miscellaneous (20%)		(US\$'000)		0.0	179.7	216.3	395.9
44	Admi. & Engincering		(US\$'000)		0.0	107.8	129.8	237.6
45	Contingency		(US\$'000)		0.0	237.2	285.5	522.6
46	Total Cost		(US\$'000)		0.0	1,422.9	1,712.9	3,135.9
47	Cost per Capita		(US\$/c)		0.0	268.5	271.9	
48	Cost per ha		(US\$/ha)		0.0	35,950.4	36,408.2	
49	Cost per m3		(US\$/m3)		0.0	1.6	1.3	1.4
50	-----							
51	Present Value of Water at DF=10 %				1990	2000	2010	Total
52	Direct O & M Costs		(US\$'000)		0.0	71.1	85.6	
53	Capital Costs		(US\$'000)		0.0	146.6	176.4	
54	Total Annual Cost		(US\$'000)		0.0	217.7	262.1	
55	Unit Cost per m3		(US\$/m3)		0.0	0.7	0.5	
56	-----							
57	Remarks:	Abstraction of surface water during high flow period and subsurface flow during day period. An appropriate						
58		water offtake work should be designed (eg. excavated pits for pumping with perforated pipes extending						
59		in the reverbed).						
60								
61								
62								
63	-----							



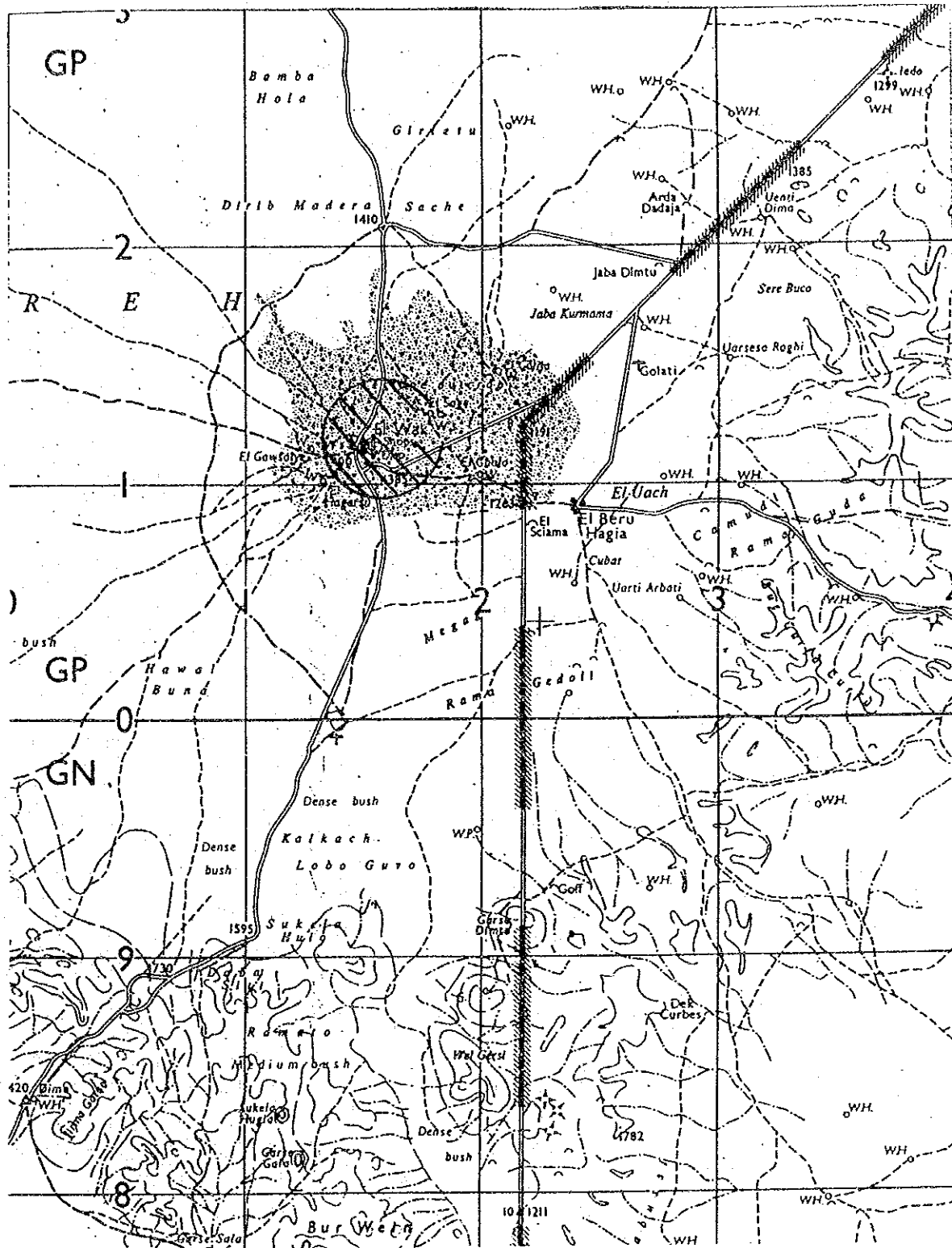
U- 68 Madera &

U 521.1 NA-37-4 5GB



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a	b	c	d	e	f	g	h	i
2					National Water Master Plan			
3			URBAN WATER SUPPLY					Jul-92
4	Code No.	520	U- 69			Rate		25.2
5	-----							
6	Name of Urban:		Elwak		LGL Notice No:			
7	Organization:							
8	Per Capita GRDP in 1988 (guess):							
9	District:		Mandera	Locataion :	523.1	Elwak		
10	Map (1/50,000):		NA-37-8	Coordinates X:		40°59'	Y:	N 02°48'
11	Sub-basin Code:		5GA	Elevation (El. m):				
12	-----							
13	Existing Facilities							
14	Raw Water Source:		Borehole			River No		
15	Raw Water System:		H (m)=	L (m)=				
16	Treatment:			Capacity (m3/d)		100		
17	Distribution System:							
18	-----							
19					1990	2000	2010	
20	-----							
21	Projected Population		(no)		10,700	17,200	24,400	
22	Residential Demand		(m3/d)		1,325	2,178	3,157	
23	Non-residential Demand		(m3/d)		222	356	504	
24	Livestock Demand		(m3/d)		183	342	581	
25	Industrial Demand		(m3/d)		0	0	0	
26	Total Demand		(m3/d)		1,730	2,876	4,242	
27	Area Served (estimated net)		(ha)		80	128	182	
28	-----							
29	Future Development Plan							
30	Raw Water Source:		Boreholes			River No:		
31	Raw Water System:		H (m)=	0 L (m)=		750,000		
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost				1990	2000	2010	Total
36	Incremental Capacity		(m3/d)		1,630.5	1,145.5	1,365.8	4,141.8
37	Source Works		(US\$'000)		7,104.2	4,991.1	5,951.0	18,046.4
38	Pump Cost		(US\$'000)		0.0	0.0	0.0	0.0
39	Raw Water Main		(US\$'000)		11,093.8	7,613.8	9,180.2	27,887.8
40	Treatment		(US\$'000)		0.0	0.0	0.0	0.0
41	Storage		(US\$'000)		94.7	79.0	86.6	260.4
42	Distribution		(US\$'000)		639.3	388.3	430.2	1,457.7
43	Miscellaneous (20%)		(US\$'000)		3,786.4	2,614.5	3,129.6	9,530.5
44	Admi. & Engineering		(US\$'000)		2,271.8	1,568.7	1,877.8	5,718.3
45	Contingency		(US\$'000)		4,998.0	3,451.1	4,131.1	12,580.2
46	Total Cost		(US\$'000)		29,988.2	20,706.5	24,786.5	75,481.2
47	Cost per Capita		(US\$/c)		2,802.6	3,185.6	3,442.6	
48	Cost per ha		(US\$/ha)		375,288.8	426,572.0	460,979.0	
49	Cost per m3		(US\$/m3)		18.4	18.1	18.1	18.2
50	-----							
51	Present Value of Water at DF=10 %				1990	2000	2010	Total
52	Direct O & M Costs		(US\$'000)		1,499.4	1,035.3	1,239.3	
53	Capital Costs		(US\$'000)		3,088.8	2,132.8	2,553.0	
54	Total Annual Cost		(US\$'000)		4,588.2	3,168.1	3,792.3	
55	Unit Cost per m3		(US\$/m3)		7.7	7.6	7.6	
56	-----							
57	Remarks:	Maximum potential of groundwater development should be surveyed. An alternative source of water						
58		may be subsurface dams on Lagh Katulo. This should also be surveyed.						
59								
60								
61								
62								
63	-----							



U- 69 El Wak

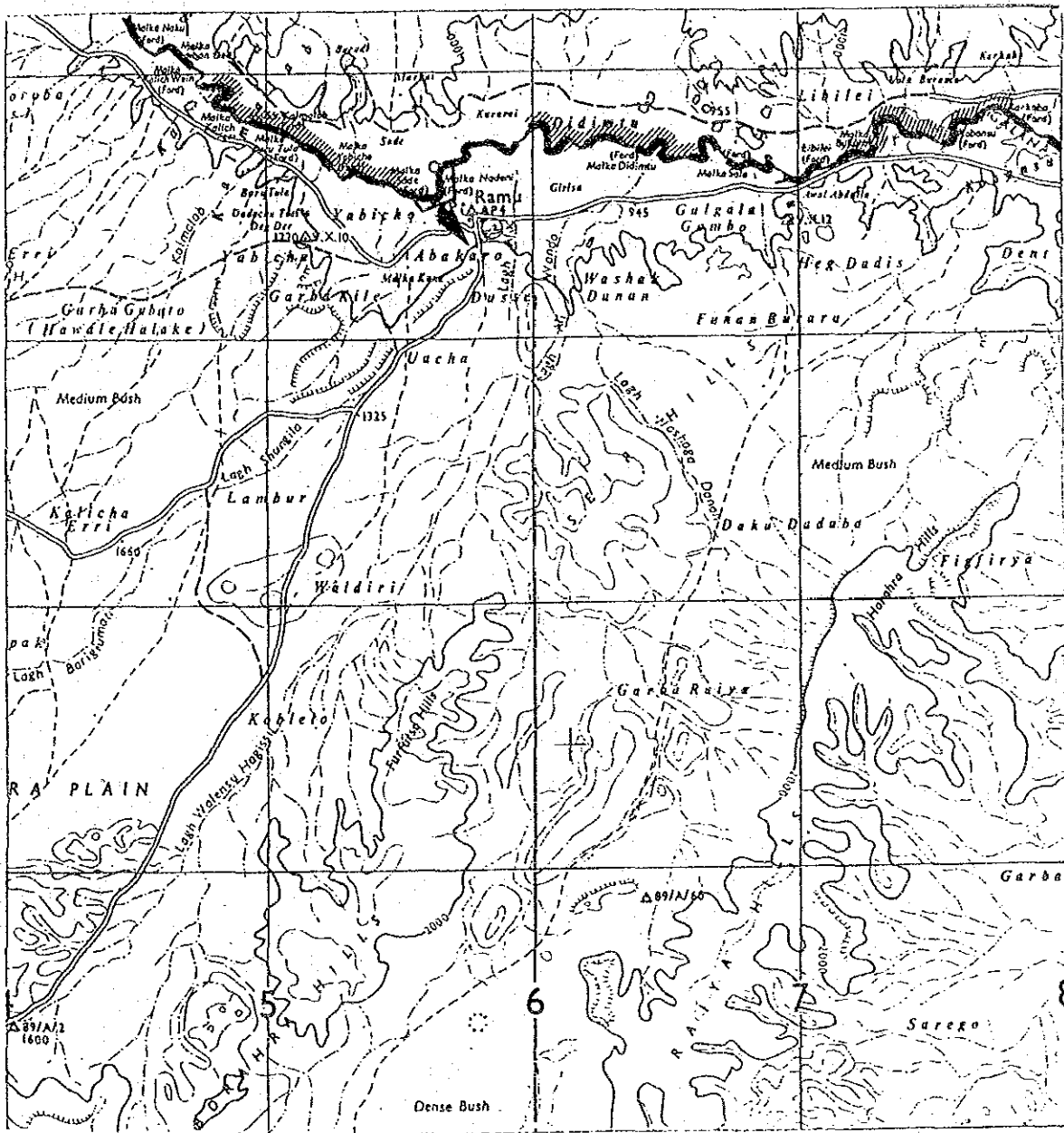
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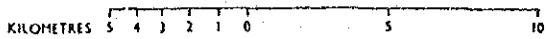
THE STUDY
ON
THE NATIONAL WATER MASTER PLAN
JAPAN INTERNATIONAL COOPERATION AGENCY

a	b	c	d	e	f	g	h	i
2					National Water Master Plan			
3			URBAN WATER SUPPLY					Feb-92
4	Code No. 520		U- 70			Rate		25.2
5	-----							
6	Name of Urban:		Rhamu		LGL Notice No:			
7	Organization:							
8	Per Capita GRDP in 1988 (guess):							
9	District:		Mandera	Locataion :	524.2	Rhamu		
10	Map (1/50,000) :		NA-37-4	Coordinates X:		41°13'	Y:	N 03°54'
11	Sub-basin Code:		5H	Elevation (El. m):				
12	-----							
13	Existing Facilities							
14	Raw Water Source:		River (Local)			River No		
15	Raw Water System:		H (m)=	L (m)=				
16	Treatment:			Capacity (m3/d)		500		
17	Distribution System:							
18	-----							
19					1990	2000	2010	
20	-----							
21	Projected Population		(no)		4,500	7,200	10,200	
22	Residential Demand		(m3/d)		557	912	1,320	
23	Non-residential Demand		(m3/d)		93	148	210	
24	Livestock Demand		(m3/d)		77	142	242	
25	Industrial Demand		(m3/d)		0	0	0	
26	Total Demand		(m3/d)		727	1,202	1,772	
27	Area Served (estimated net)		(ha)		34	54	76	
28	-----							
29	Future Development Plan							
30	Raw Water Source:		Daua River			River No:		
31	Raw Water System:		H (m)=	40 L (m)=		2,200		
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost				1990	2000	2010	Total
36	Incremental Capacity		(m3/d)		227.4	474.3	569.9	1,271.6
37	Source Works		(US\$'000)		3.5	6.0	6.9	16.5
38	Pump Cost		(US\$'000)		1.6	1.8	1.9	5.3
39	Raw Water Main		(US\$'000)		86.2	93.3	95.6	275.0
40	Treatment		(US\$'000)		180.9	279.6	311.0	771.5
41	Storage		(US\$'000)		30.4	47.9	53.4	131.6
42	Distribution		(US\$'000)		268.8	161.3	179.2	609.4
43	Miscellaneous (20%)		(US\$'000)		114.3	118.0	129.6	361.9
44	Admi. & Engineering		(US\$'000)		68.6	70.8	77.8	217.1
45	Contingency		(US\$'000)		150.8	155.7	171.1	477.6
46	Total Cost		(US\$'000)		905.0	934.5	1,026.4	2,865.9
47	Cost per Capita		(US\$/c)		201.1	346.1	342.1	
48	Cost per ha		(US\$/ha)		26,929.9	46,344.8	45,814.3	
49	Cost per m3		(US\$/m3)		4.0	2.0	1.8	2.3
50	-----							
51	Present Value of Water at DF=10 %				1990	2000	2010	Total
52	Direct O & M Costs		(US\$'000)		45.2	46.7	51.3	
53	Capital Costs		(US\$'000)		93.2	96.3	105.7	
54	Total Annual Cost		(US\$'000)		138.5	143.0	157.0	
55	Unit Cost per m3		(US\$/m3)		1.7	0.8	0.8	
56	-----							
57	Remarks:	Water abstraction similar to that for Mandera is envisaged.						
58								
59								
60								
61								
62								
63	-----							



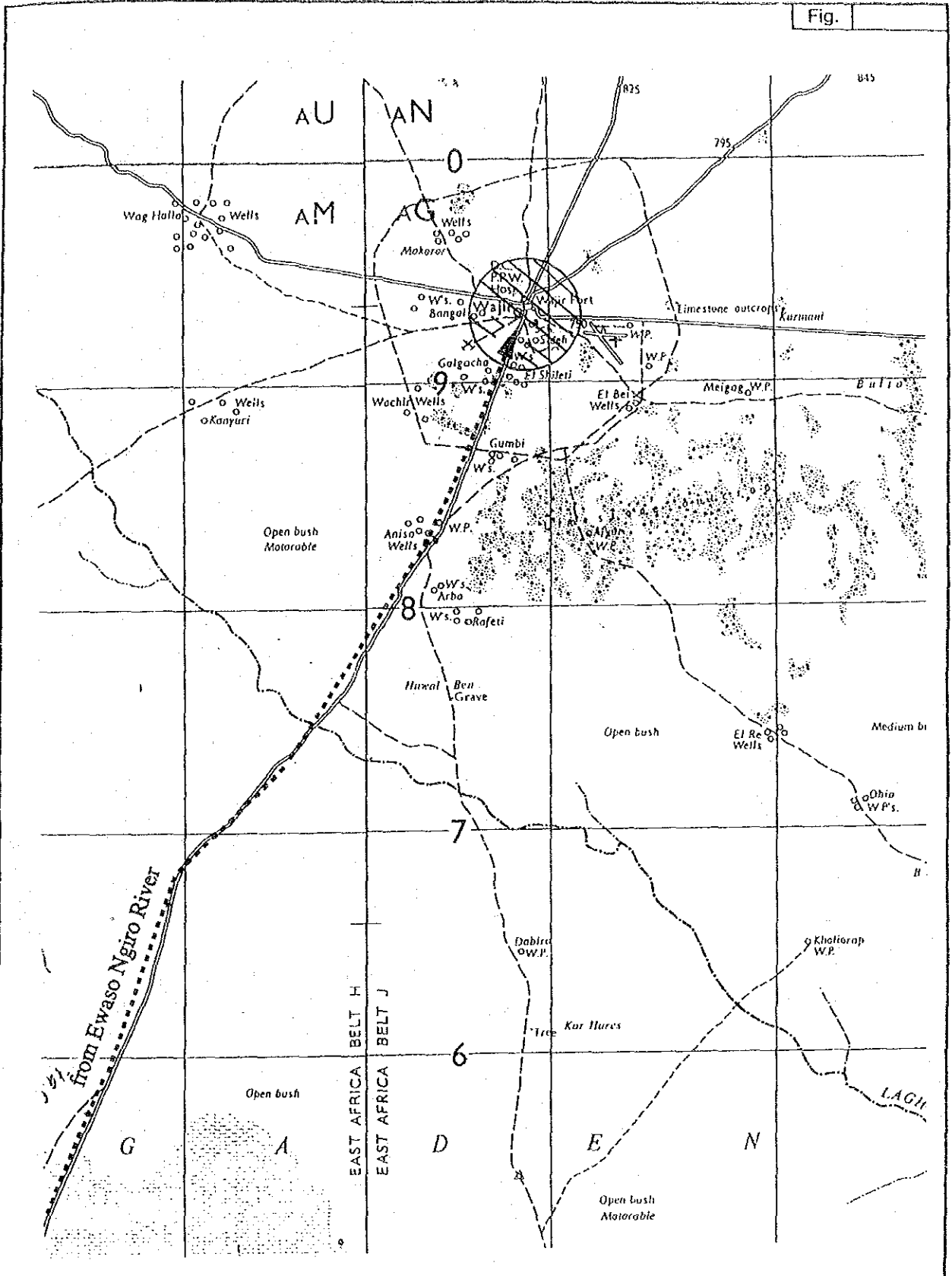
U- 70 Rhamu &

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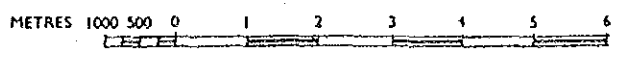
THE STUDY
ON
THE NATIONAL WATER MASTER PLAN
JAPAN INTERNATIONAL COOPERATION AGENCY

a	b	c	d	e	f	g	h	i
2					National Water Master Plan			
3			URBAN WATER SUPPLY					Jul-92
4	Code I 530		U-71			Rate		25.2
5	-----							
6	Name of Urban:		Wajir		LGL Notice No:			
7	Organization:							
8	Per Capita GRDP in 1988 (guess):							
9	District:		WAJIR	Locataion :	532.4	Wajir Township		
10	Map (1/50,000) :		NA-37-11	Coordinates X:		40°03'	Y:	N 01°44'
11	Sub-basin Code:		5EA	Elevation (El. m):				
12	-----							
13	Existing Facilities							
14	Raw Water Source:		Borehole (C5267)			River No		
15	Raw Water System:		H (m)=		L (m)=			
16	Treatment:			Capacity (m3/d)		23		
17	Distribution System:							
18	-----							
19					1990	2000	2010	
20	-----							
21	Projected Population	(no)			21,400	46,100	75,500	
22	Residential Demand	(m3/d)			2,651	5,837	9,768	
23	Non-residential Demand	(m3/d)			444	954	1,563	
24	Livestock Demand	(m3/d)			333	678	1,162	
25	Industrial Demand	(m3/d)			0	0	0	
26	Total Demand	(m3/d)			3,428	7,469	12,493	
27	Area Served (estimated net)	(ha)			160	344	564	
28	-----							
29	Future Development Plan							
30	Raw Water Source:		Boreholes + Ewaso Ngiro River			River No:		
31	Raw Water System:		H (m)=	20	L (m)=	1,456,000	145000	
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost							
36	Incremental Capacity	(m3/d)			1990	2000	2010	Total
37	Source Works	(US\$'000)			3,404.9	4,041.5	5,023.4	12,469.8
38	Pump Cost	(US\$'000)			5,898.6	7,000.6	8,700.2	21,599.4
39	Raw Water Main	(US\$'000)			2.4	2.6	3.0	8.0
40	Treatment	(US\$'000)			22,591.9	25,920.3	31,126.9	79,639.1
41	Storage	(US\$'000)			793.1	855.2	935.6	2,583.9
42	Distribution	(US\$'000)			129.9	137.5	145.7	413.1
43	Miscellaneous (20%)	(US\$'000)			1,278.5	1,475.7	1,756.5	4,510.6
44	Admi. & Engineering	(US\$'000)			6,138.9	7,078.4	8,533.6	21,750.8
45	Contingency	(US\$'000)			3,683.3	4,247.0	5,120.2	13,050.5
46	Total Cost	(US\$'000)			8,103.3	9,343.4	11,264.3	28,711.1
47	Cost per Capita	(US\$/c)			48,619.9	56,060.6	67,586.0	172,266.5
48	Cost per ha	(US\$/ha)			2,272.0	2,269.7	2,298.8	
49	Cost per m3	(US\$/m3)			304,227.6	303,920.1	307,828.0	
50	-----							
51	Present Value of Water at DF=10 %							
52	Direct O & M Costs	(US\$'000)			1990	2000	2010	Total
53	Capital Costs	(US\$'000)			2,431.0	2,803.0	3,379.3	
54	Total Annual Cost	(US\$'000)			5,007.8	5,774.2	6,961.4	
55	Unit Cost per m3	(US\$/m3)			7,438.8	8,577.3	10,340.7	
56	-----							
57	Remarks:	Cost was tentatively estimated assuming that groundwater exploitation will meet a half of the demand						
58		and the remaining water will be transferred from the Ewaso Ngiro South River.						
59		A feasibility study should be initiated to examine these aspects.						
60								
61								
62								
63	-----							



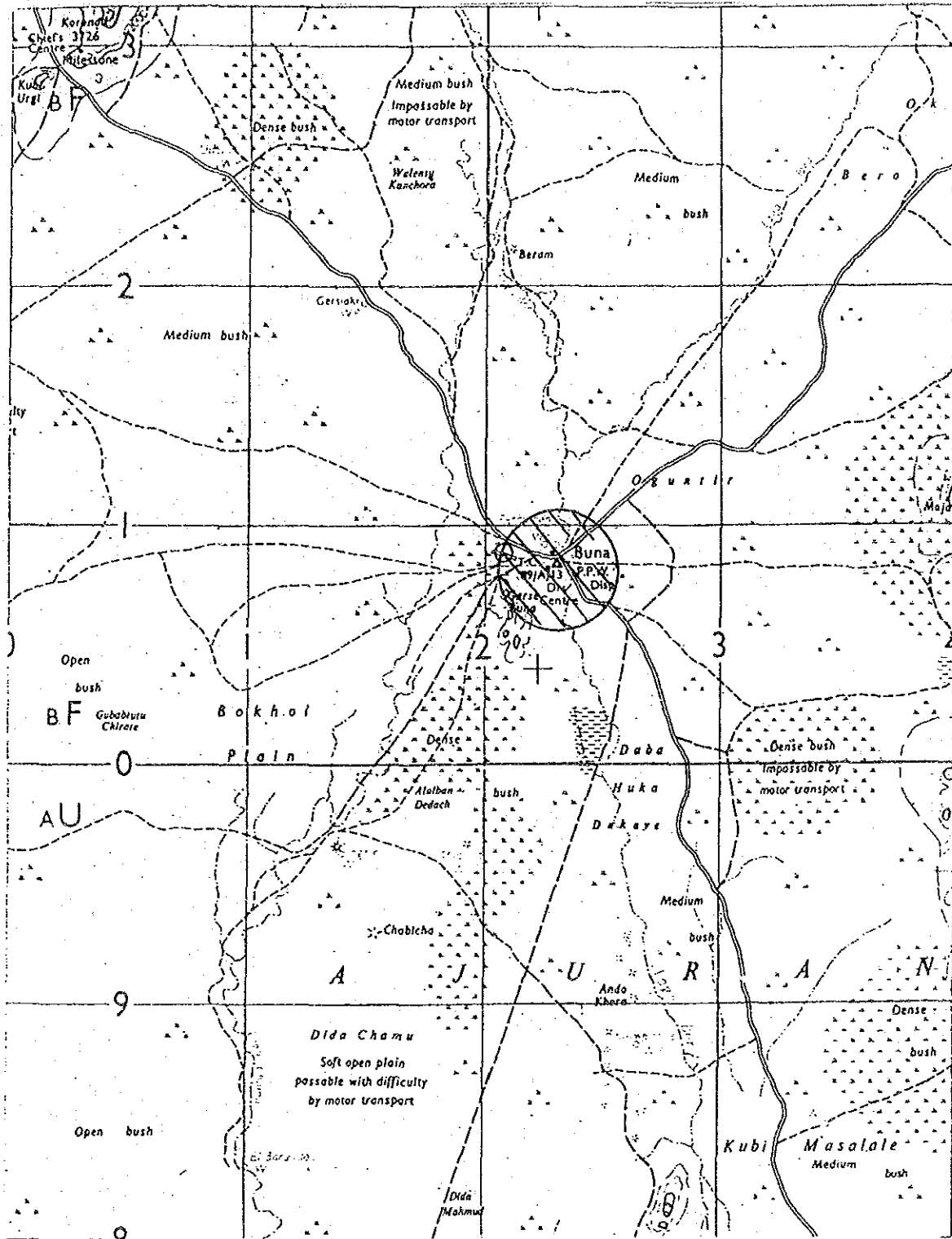
U- 71 Wajir

U 532.4 NA-37-11 SEA



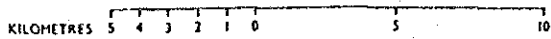
THE STUDY
ON
THE NATIONAL WATER MASTER PLAN
JAPAN INTERNATIONAL COOPERATION AGENCY

a	b	c	d	e	f	g	h	i
2						National Water Master Plan		
3			URBAN WATER SUPPLY					Jul-92
4	Code No.	530	U- 72			Rate		25.2
5	-----							
6	Name of Urban:	Buna	LGL Notice No:					
7	Organization:							
8	Per Capita GRDP in 1988 (guess):							
9	District:	Wajir	Locataion :	536.2	Buna			
10	Map (1/50,000) :	NA-37-7	Coordinates X:		39°31'		Y:	N 02°47'
11	Sub-basin Code:	5EA	Elevation (El. m):					
12	-----							
13	Existing Facilities							
14	Raw Water Source:	Boreholes	River No					
15	Raw Water System:	H (m)=	L (m)=					
16	Treatment:	Capacity (m3/d)						
17	Distribution System:							
18	-----							
19				1990	2000	2010		
20	-----							
21	Projected Population	(no)	6,800	12,600	18,700			
22	Residential Demand	(m3/d)	842	1,595	2,419			
23	Non-residential Demand	(m3/d)	140	260	387			
24	Livestock Demand	(m3/d)	105	185	288			
25	Industrial Demand	(m3/d)	0	0	0			
26	Total Demand	(m3/d)	1,087	2,040	3,094			
27	Area Served (estimated net)	(ha)	51	94	140			
28	-----							
29	Future Development Plan							
30	Raw Water Source:	Boreholes(Lago Bor river)	River No:					
31	Raw Water System:	H (m)=	0	L (m)=	1,197,000			
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost		1990	2000	2010	Total		
36	Incremental Capacity	(m3/d)	1,087.4	953.1	1,053.8	3,094.3		
37	Source Works	(US\$'000)	5,208.2	4,565.3	5,047.6	14,821.1		
38	Pump Cost	(US\$'000)	0.0	0.0	0.0	0.0		
39	Raw Water Main	(US\$'000)	15,391.2	13,389.1	14,889.3	43,669.6		
40	Treatment	(US\$'000)	0.0	0.0	0.0	0.0		
41	Storage	(US\$'000)	76.9	71.6	75.6	224.0		
42	Distribution	(US\$'000)	406.3	346.5	364.4	1,117.2		
43	Miscellaneous (20%)	(US\$'000)	4,216.5	3,674.5	4,075.4	11,966.4		
44	Admi. & Engineering	(US\$'000)	2,529.9	2,204.7	2,445.2	7,179.8		
45	Contingency	(US\$'000)	5,565.8	4,850.3	5,379.5	15,795.6		
46	Total Cost	(US\$'000)	33,394.7	29,102.0	32,277.1	94,773.8		
47	Cost per Capita	(US\$/c)	4,911.0	5,017.6	5,291.3			
48	Cost per ha	(US\$/ha)	657,607.7	671,883.0	708,538.5			
49	Cost per m3	(US\$/m3)	30.7	30.5	30.6	30.6		
50	-----							
51	Present Value of Water at DF=10 %		1990	2000	2010	Total		
52	Direct O & M Costs	(US\$'000)	1,669.7	1,455.1	1,613.9			
53	Capital Costs	(US\$'000)	3,439.7	2,997.5	3,324.5			
54	Total Annual Cost	(US\$'000)	5,109.4	4,452.6	4,938.4			
55	Unit Cost per m3	(US\$/m3)	12.9	12.8	12.8			
56	-----							
57	Remarks:							
58								
59								
60								
61								
62								
63	-----							



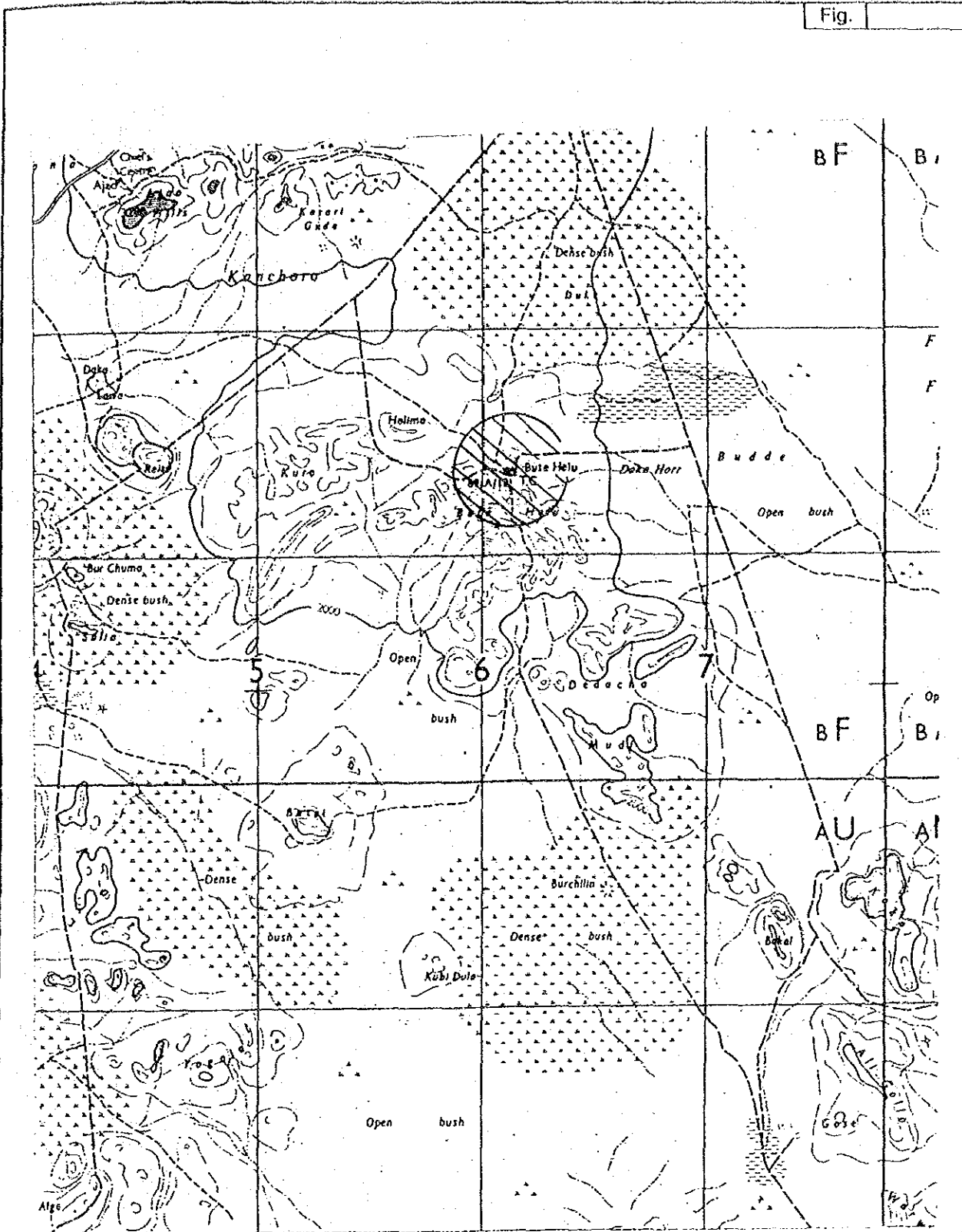
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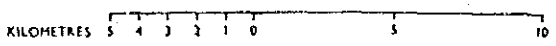
THE STUDY
ON
THE NATIONAL WATER MASTER PLAN
JAPAN INTERNATIONAL COOPERATION AGENCY

a	b	c	d	e	f	g	h	i
2	National Water Master Plan							
3	URBAN WATER SUPPLY							
4	Code No.	530	U- 73			Rate		Jul-92 25.2
5	-----							
6	Name of Urban:	Bute		LGL Notice No:				
7	Organization:							
8	Per Capita GRDP in 1988 (guess):							
9	District:	Wajir	Locataion :	537.2		Bute		
10	Map (1/50,000) :	NA-37-7	Coordinates X:		39°33'	Y:		N 03°02'
11	Sub-basin Code:	5EA	Elevation (El. m):					
12	-----							
13	Existing Facilities							
14	Raw Water Source:	Boreholes		River No				
15	Raw Water System:	H (m)=	L (m)=					
16	Treatment:	Capacity (m3/d)		12				
17	Distribution System:							
18	-----							
19				1990	2000	2010		
20	-----							
21	Projected Population	(no)		2,200	4,100	6,100		
22	Residential Demand	(m3/d)		273	519	789		
23	Non-residential Demand	(m3/d)		46	85	126		
24	Livestock Demand	(m3/d)		34	60	93		
25	Industrial Demand	(m3/d)		0	0	0		
26	Total Demand	(m3/d)		353	664	1,008		
27	Area Served (estimated net)	(ha)		16	31	46		
28	-----							
29	Future Development Plan							
30	Raw Water Source:	Borcholes + Small Dams			River No:			
31	Raw Water System:	H (m)=	0 L (m)=	176,000				
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost			1990	2000	2010	Total	
36	Incremental Capacity	(m3/d)		340.5	311.6	344.0	996.2	
37	Source Works	(US\$'000)		1,483.7	1,357.8	1,498.9	4,340.4	
38	Pump Cost	(US\$'000)		0.0	0.0	0.0	0.0	
39	Raw Water Main	(US\$'000)		2,087.5	1,904.7	2,109.7	6,101.9	
40	Treatment	(US\$'000)		230.2	218.4	231.6	680.3	
41	Storage	(US\$'000)		39.1	37.0	39.4	115.5	
42	Distribution	(US\$'000)		131.4	113.5	119.5	364.4	
43	Miscellaneous (20%)	(US\$'000)		794.4	726.3	799.8	2,320.5	
44	Admi. & Engineering	(US\$'000)		476.6	435.8	479.9	1,392.3	
45	Contingency	(US\$'000)		1,048.6	958.7	1,055.8	3,063.1	
46	Total Cost	(US\$'000)		6,291.6	5,752.3	6,334.6	18,378.4	
47	Cost per Capita	(US\$/c)		2,859.8	3,027.5	3,167.3		
48	Cost per ha	(US\$/ha)		382,943.6	405,404.1	424,116.6		
49	Cost per m3	(US\$/m3)		18.5	18.5	18.4	18.4	
50	-----							
51	Present Value of Water at DF=10 %			1990	2000	2010	Total	
52	Direct O & M Costs	(US\$'000)		314.6	287.6	316.7		
53	Capital Costs	(US\$'000)		648.0	592.5	652.5		
54	Total Annual Cost	(US\$'000)		962.6	880.1	969.2		
55	Unit Cost per m3	(US\$/m3)		7.7	7.7	7.7		
56	-----							
57	Remarks:	Primay supply source will be boreholes. On top of it, the area may have the potential of small dam						
58		development for supply duiring the wet season.						
59								
60								
61								
62								
63	-----							



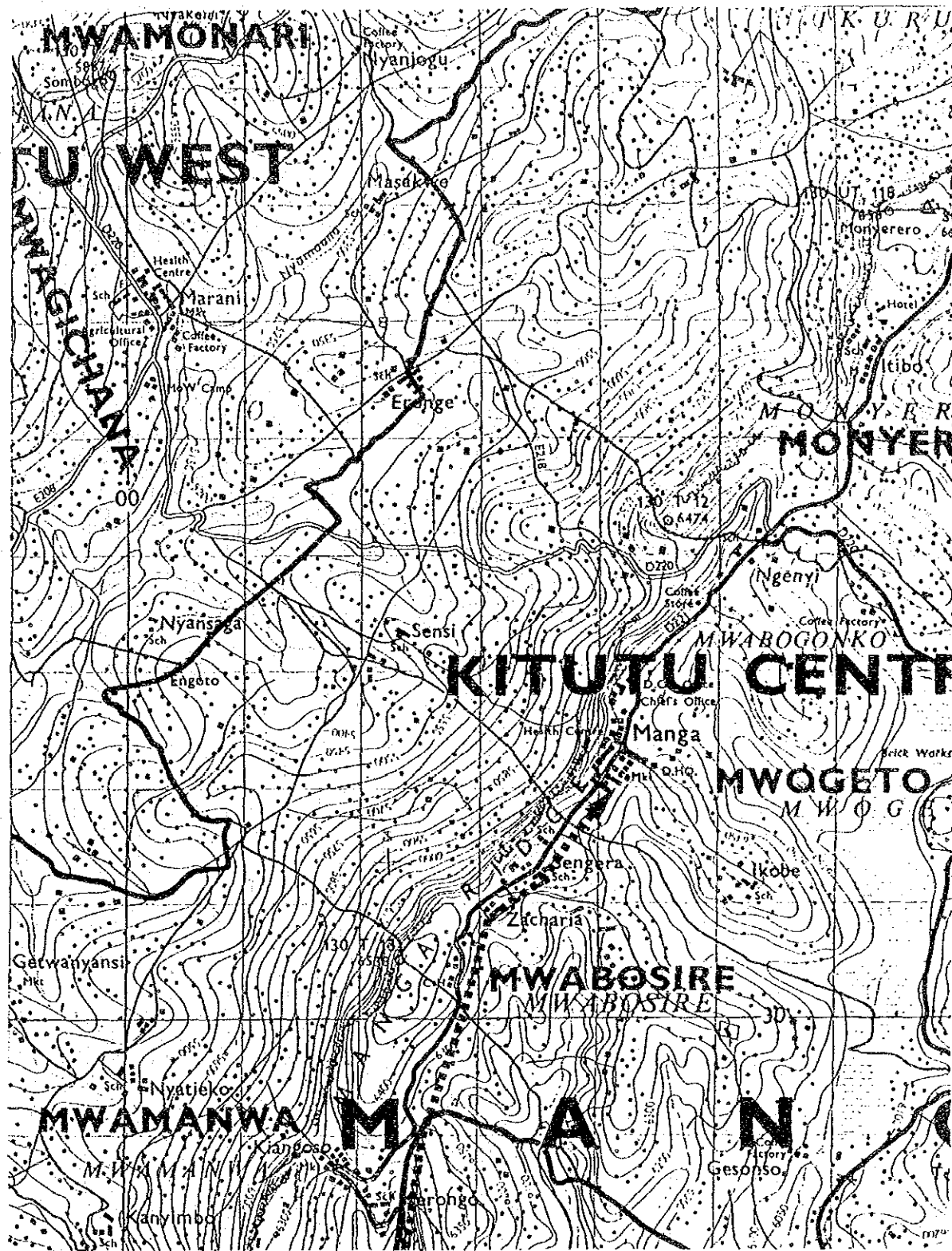
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THE STUDY
ON
THE NATIONAL WATER MASTER PLAN
JAPAN INTERNATIONAL COOPERATION AGENCY

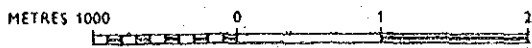
a	b	c	d	e	f	g	h	i
2					National Water Master Plan			
3			URBAN WATER SUPPLY					Feb-92
4	Code No.	610	U- 74			Rate		25.2
5	-----							
6	Name of Urban:		Manga		LGL Notice No:			
7	Organization:							
8	Per Capita GRDP in 1988 (guess):							
9	District:		Kisii	Locaation :	611		Erange	
10	Map (1/50,000) :		130/2	Coordinates X:		34°51'	Y:	S 00°36'
11	Sub-basin Code:		1HE	Elevation (El. m):				
12	-----							
13	Existing Facilities							
14	Raw Water Source:		Gucha river			River No		
15	Raw Water System:		H (m)=	L (m)=				
16	Treatment:			Capacity (m3/d)		30		
17	Distribution System:							
18	-----							
19					1990	2000	2010	
20	-----							
21	Projected Population		(no)		1,100	1,700	2,100	
22	Residential Demand		(m3/d)		136	215	272	
23	Non-residential Demand		(m3/d)		0	33	43	
24	Livestock Demand		(m3/d)		0	4	5	
25	Industrial Demand		(m3/d)		0	0	0	
26	Total Demand		(m3/d)		136	252	320	
27	Area Served (estimated net)		(ha)		8	13	16	
28	-----							
29	Future Development Plan							
30	Raw Water Source:		Bunyonyu Dam			River No:		
31	Raw Water System:		H (m)=	90 L (m)=		23,900		
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost				1990	2000	2010	Total
36	Incremental Capacity		(m3/d)		0.0	222.3	67.4	289.7
37	Source Works		(US\$'000)		0.0	3.4	1.4	4.8
38	Pump Cost		(US\$'000)		0.0	2.8	2.7	5.5
39	Raw Water Main		(US\$'000)		0.0	934.4	860.3	1,794.6
40	Treatment		(US\$'000)		0.0	178.4	85.5	263.9
41	Storage		(US\$'000)		0.0	29.9	13.6	35.4
42	Distribution		(US\$'000)		0.0	101.6	23.9	125.5
43	Miscellaneous (20%)		(US\$'000)		0.0	250.1	197.5	447.6
44	Admi. & Engineering		(US\$'000)		0.0	150.1	118.5	268.5
45	Contingency		(US\$'000)		0.0	330.1	260.7	590.8
46	Total Cost		(US\$'000)		0.0	1,980.7	1,564.0	3,544.8
47	Cost per Capita		(US\$/c)		0.0	3,301.2	3,910.0	
48	Cost per ha		(US\$/ha)		0.0	442,055.0	523,572.4	
49	Cost per m3		(US\$/m3)		0.0	8.9	23.2	12.2
50	-----							
51	Present Value of Water at DF=10 %				1990	2000	2010	Total
52	Direct O & M Costs		(US\$'000)		0.0	99.0	78.2	
53	Capital Costs		(US\$'000)		0.0	204.0	161.1	
54	Total Annual Cost		(US\$'000)		0.0	303.1	239.3	
55	Unit Cost per m3		(US\$/m3)		0.0	3.7	9.7	
56	-----							
57	Remarks:	As is present, Manga area will be supplied water from the Kuja-Kisii supply system. Source work cost						
58		does not include the cost of Bunyonyu dam, which should be added separately (see Sectoral Report M).						
59								
60								
61								
62								
63	-----							



from Bunyonyu Dam

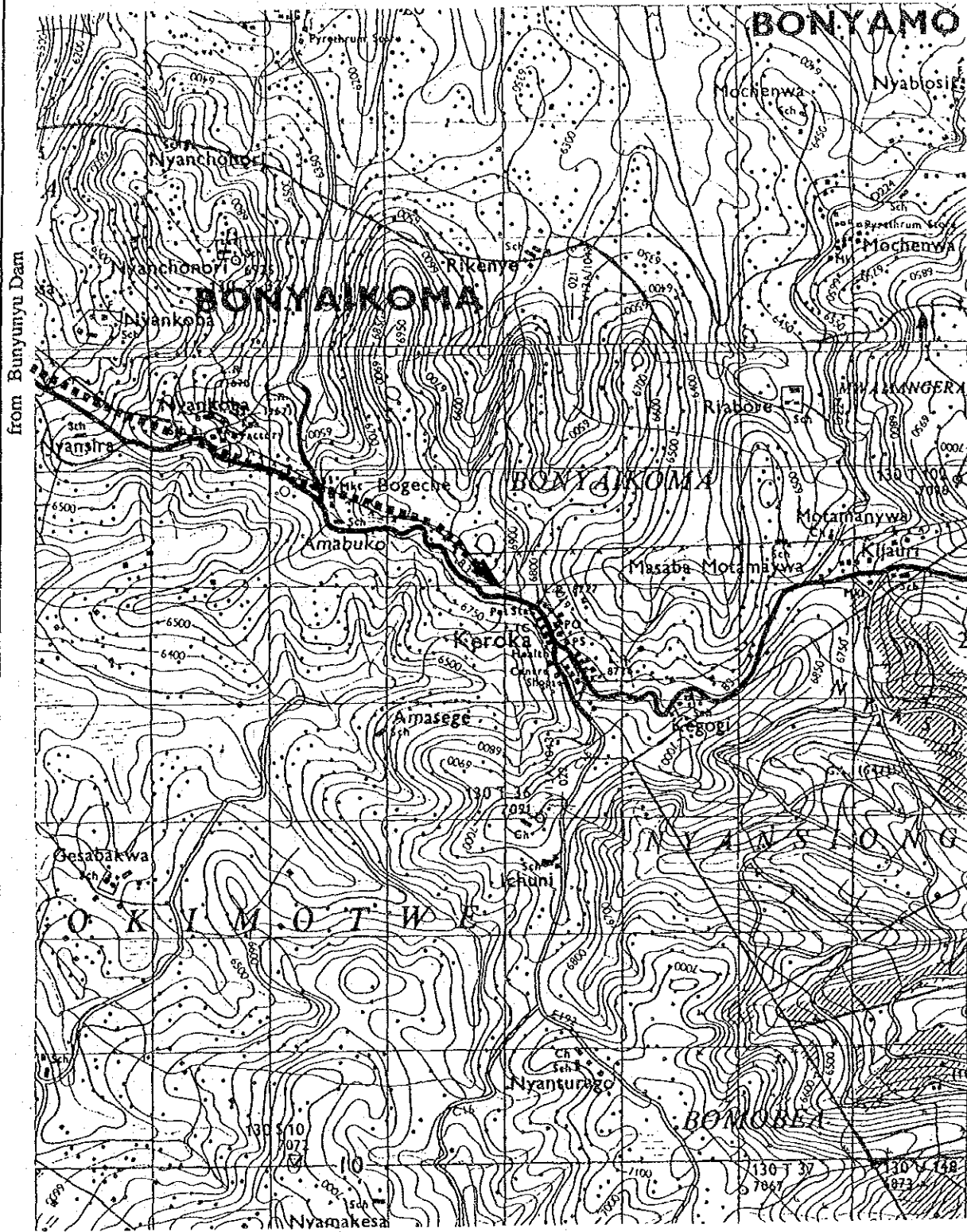
U- 74 Manga

U 611.2 130/2 1HE



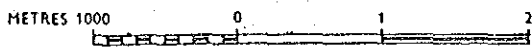
THE STUDY
ON
THE NATIONAL WATER MASTER PLAN
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a	b	c	d	e	f	g	h	i	
2									
3			National Water Master Plan						
4	Code No.	610	URBAN WATER SUPPLY					Feb-92	
5			U- 75			Rate		25.2	
6	Name of Urban:		Keroka		LGL Notice No:				
7	Organization:								
8	Per Capita GRDP in 1988 (guess):								
9	District:		Kisii	Locataion :	611.5		East Kitutu		
10	Map (1/50,000) :		130/4	Coordinates X:		34°57'	Y:	S 00°45'	
11	Sub-basin Code:		1KB	Elevation (El. m):					
12									
13	Existing Facilities								
14	Raw Water Source:		Chirichiri river			River No			
15	Raw Water System:		H (m)=	L (m)=					
16	Treatment:			Capacity (m3/d)		145			
17	Distribution System:								
18									
19					1990	2000	2010		
20									
21	Projected Population		(no)		2,500	4,400	6,100		
22	Residential Demand		(m3/d)		310	557	789		
23	Non-residential Demand		(m3/d)		52	90	126		
24	Livestock Demand		(m3/d)		6	11	15		
25	Industrial Demand		(m3/d)		228	421	607		
26	Total Demand		(m3/d)		596	1,079	1,537		
27	Area Served (estimated net)		(ha)		19	33	46		
28									
29	Future Development Plan								
30	Raw Water Source:		Bunyonyu Dam			River No:			
31	Raw Water System:		H (m)=	320 L (m)=		13,800			
32	Treatment:								
33	Distribution System:								
34									
35	Incremental Capital Cost				1990	2000	2010	Total	
36	Incremental Capacity		(m3/d)		450.7	483.5	458.0	1,392.2	
37	Source Works		(US\$'000)		5.8	6.1	5.9	17.9	
38	Pump Cost		(US\$'000)		8.9	9.1	9.1	27.1	
39	Raw Water Main		(US\$'000)		581.4	586.5	582.6	1,750.5	
40	Treatment		(US\$'000)		271.5	282.8	274.0	828.3	
41	Storage		(US\$'000)		46.4	48.4	46.9	141.7	
42	Distribution		(US\$'000)		149.4	113.5	101.6	364.4	
43	Miscellaneous (20%)		(US\$'000)		212.7	209.3	204.0	626.0	
44	Admi. & Engineering		(US\$'000)		127.6	125.6	122.4	375.6	
45	Contingency		(US\$'000)		280.7	276.3	269.3	826.3	
46	Total Cost		(US\$'000)		1,684.4	1,657.6	1,615.7	4,957.7	
47	Cost per Capita		(US\$/c)		673.8	872.4	950.4		
48	Cost per ha		(US\$/ha)		90,219.0	116,824.2	127,268.3		
49	Cost per m3		(US\$/m3)		3.7	3.4	3.5	3.6	
50									
51	Present Value of Water at DF=10 %				1990	2000	2010	Total	
52	Direct O & M Costs		(US\$'000)		84.2	82.9	80.8		
53	Capital Costs		(US\$'000)		173.5	170.7	166.4		
54	Total Annual Cost		(US\$'000)		257.7	253.6	247.2		
55	Unit Cost per m3		(US\$/m3)		1.6	1.4	1.5		
56									
57	Remarks:	Source works cost does not include the cost of Bunyonyu dam, which should be added separately							
58		(see Sectoral Report M). Alternative water source will be Chili-Chiro river.							
59									
60									
61									
62									
63									



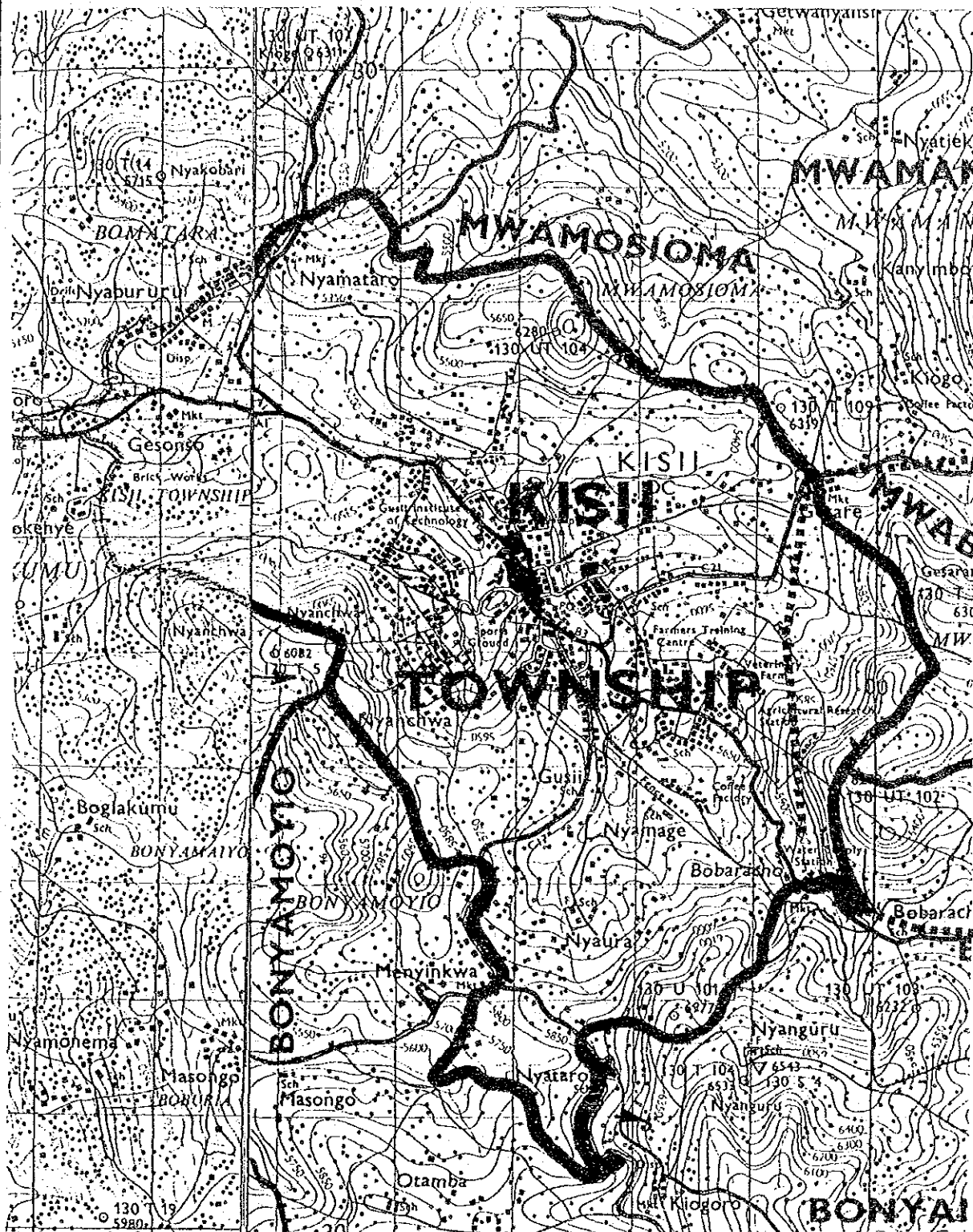
U- 75 Keroka

U 611.5 130/4 1KB



THE STUDY
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a	b	c	d	e	f	g	h	i
2								
3			National Water Master Plan					
4	Code No.	610	URBAN WATER SUPPLY					Feb-92
5			U- 76			Rate		25.2
6	Name of Urban:		Kisii			LGL Notice No:		
7	Organization:							
8	Per Capita GRDP in 1988 (guess):							
9	District:		Kisii	Locataion :	615		Kisii Municipality	
10	Map (1/50,000) :		130/2	Coordinates X:		34°48'	Y:	S 00°39'
11	Sub-basin Code:		1KA	Elevation (El. m):				
12								
13	Existing Facilities							
14	Raw Water Source:		Nyakobisaro			River No		
15	Raw Water System:		H (m)=		L (m)=			
16	Treatment:			Capacity (m3/d)		3520		
17	Distribution System:							
18								
19						1990	2000	2010
20								
21	Projected Population			(no)	45,800	91,000	138,500	
22	Residential Demand			(m3/d)	5,673	11,523	17,918	
23	Non-residential Demand			(m3/d)	949	1,884	2,870	
24	Livestock Demand			(m3/d)	114	221	343	
25	Industrial Demand			(m3/d)	1,079	2,002	2,889	
26	Total Demand			(m3/d)	7,815	15,630	24,020	
27	Arca Served (estimated net)			(ha)	342	680	1,034	
28								
29	Future Development Plan							
30	Raw Water Source:		Bunyunu Dam			River No:		
31	Raw Water System:		H (m)=		0 L (m)=	10,900		
32	Treatment:							
33	Distribution System:							
34								
35	Incremental Capital Cost							
36	Incremental Capacity			(m3/d)	4,295.5	7,814.4	8,390.6	20,500.4
37	Source Works			(US\$'000)	31.6	49.5	52.2	133.3
38	Pump Cost			(US\$'000)	0.0	0.0	0.0	0.0
39	Raw Water Main			(US\$'000)	723.8	882.4	905.8	2,512.0
40	Treatment			(US\$'000)	877.6	1,094.5	1,118.0	3,090.1
41	Storage			(US\$'000)	185.0	336.5	361.4	882.9
42	Distribution			(US\$'000)	2,736.3	2,700.4	2,837.8	8,274.5
43	Miscellaneous (20%)			(US\$'000)	910.9	1,012.7	1,055.0	2,978.5
44	Admi. & Engineering			(US\$'000)	546.5	607.6	633.0	1,787.1
45	Contingency			(US\$'000)	1,202.3	1,336.7	1,392.6	3,931.7
46	Total Cost			(US\$'000)	7,214.0	8,020.3	8,355.7	23,590.0
47	Cost per Capita			(US\$/c)	157.5	177.4	175.9	
48	Cost per ha			(US\$/ha)	21,091.6	23,760.1	23,555.3	
49	Cost per m3			(US\$/m3)	1.7	1.0	1.0	1.2
50								
51	Present Value of Water at DF=10 %							
52	Direct O & M Costs			(US\$'000)	360.7	401.0	417.8	Total
53	Capital Costs			(US\$'000)	743.0	826.1	860.6	
54	Total Annual Cost			(US\$'000)	1,103.7	1,227.1	1,278.4	
55	Unit Cost per m3			(US\$/m3)	0.7	0.4	0.4	
56								
57	Remarks:	Source works cost does not include the cost of Bunyunyu dam, which should be added separately						
58		(see Sectoral Report M).						
59								
60								
61								
62								
63								

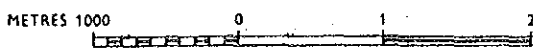


To Manga

from Bunyonyu Dam

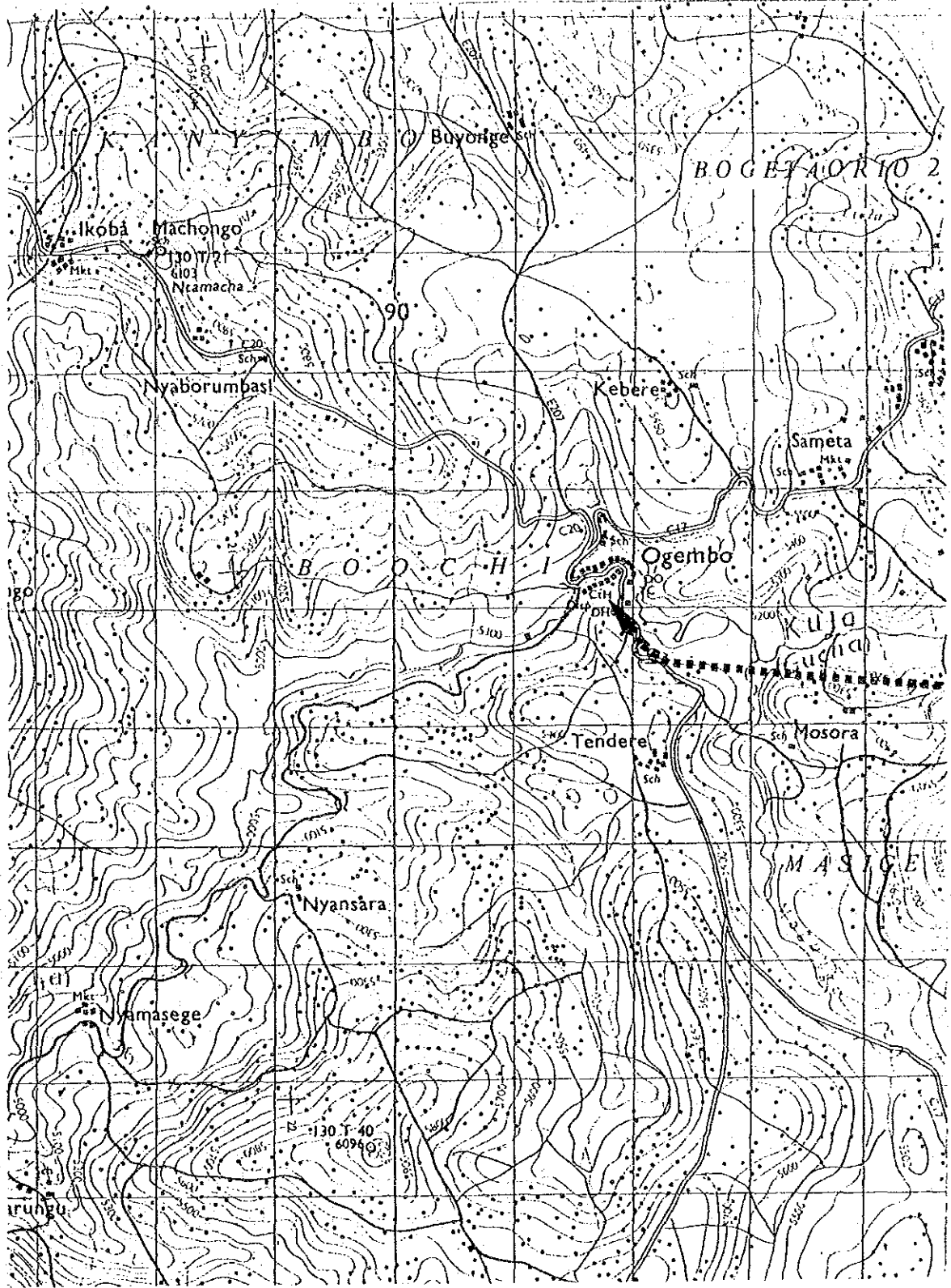
U- 76 Kisii

G 615.0 130/2 1KA



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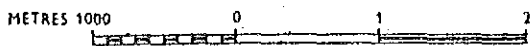
a	b	c	d	e	f	g	h	i
2	National Water Master Plan							
3	URBAN WATER SUPPLY							
4	Code No. 610		U- 77			Rate		Feb-92 25.2
5	-----							
6	Name of Urban:		Ogembo		LGL Notice No:			
7	Organization:							
8	Per Capita GRDP in 1988 (guess):							
9	District:		Kionyo	Locataion :	617.5		Majoge Chache	
10	Map (1/50,000):		130/3	Coordinates X:		34°44'	Y:	S 00°46'
11	Sub-basin Code:		1KB	Elevation (El. m):				
12	-----							
13	Existing Facilities							
14	Raw Water Source:		Spring			River No		
15	Raw Water System:		H (m)=	L (m)=				
16	Treatment:			Capacity (m3/d)				
17	Distribution System:							
18	-----							
19					1990	2000	2010	
20	-----							
21	Projected Population		(no)		1,100	2,000	2,700	
22	Residential Demand		(m3/d)		136	253	349	
23	Non-residential Demand		(m3/d)		23	40	56	
24	Livestock Demand		(m3/d)		3	5	7	
25	Industrial Demand		(m3/d)		0	0	0	
26	Total Demand		(m3/d)		162	298	412	
27	Area Served (estimated net)		(ha)		8	15	20	
28	-----							
29	Future Development Plan							
30	Raw Water Source:		Kuja river			River No:		
31	Raw Water System:		H (m)=	0 L (m)=		4,100		
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost				1990	2000	2010	Total
36	Incremental Capacity		(m3/d)		162.3	136.0	114.1	412.3
37	Source Works		(US\$'000)		2.7	2.4	2.1	7.2
38	Pump Cost		(US\$'000)		0.0	0.0	0.0	0.0
39	Raw Water Main		(US\$'000)		156.1	154.1	152.2	462.4
40	Treatment		(US\$'000)		147.3	132.2	118.6	398.1
41	Storage		(US\$'000)		24.4	21.8	19.4	65.6
42	Distribution		(US\$'000)		65.7	53.8	41.8	161.3
43	Miscellaneous (20%)		(US\$'000)		79.3	72.8	66.8	218.9
44	Admi. & Engineering		(US\$'000)		47.6	43.7	40.1	131.3
45	Contingency		(US\$'000)		104.6	96.1	88.2	289.0
46	Total Cost		(US\$'000)		627.7	576.9	529.2	1,733.8
47	Cost per Capita		(US\$/c)		570.7	640.9	756.1	
48	Cost per ha		(US\$/ha)		76,414.8	85,826.6	101,239.6	
49	Cost per m3		(US\$/m3)		3.9	4.2	4.6	4.2
50	-----							
51	Present Value of Water at DF=10 %				1990	2000	2010	Total
52	Direct O & M Costs		(US\$'000)		31.4	28.8	26.5	
53	Capital Costs		(US\$'000)		64.7	59.4	54.5	
54	Total Annual Cost		(US\$'000)		96.0	88.3	81.0	
55	Unit Cost per m3		(US\$/m3)		1.6	1.8	1.9	
56	-----							
57	Remarks:							
58								
59								
60								
61								
62								
63	-----							



from Kujua River

U- 77 Ogembo

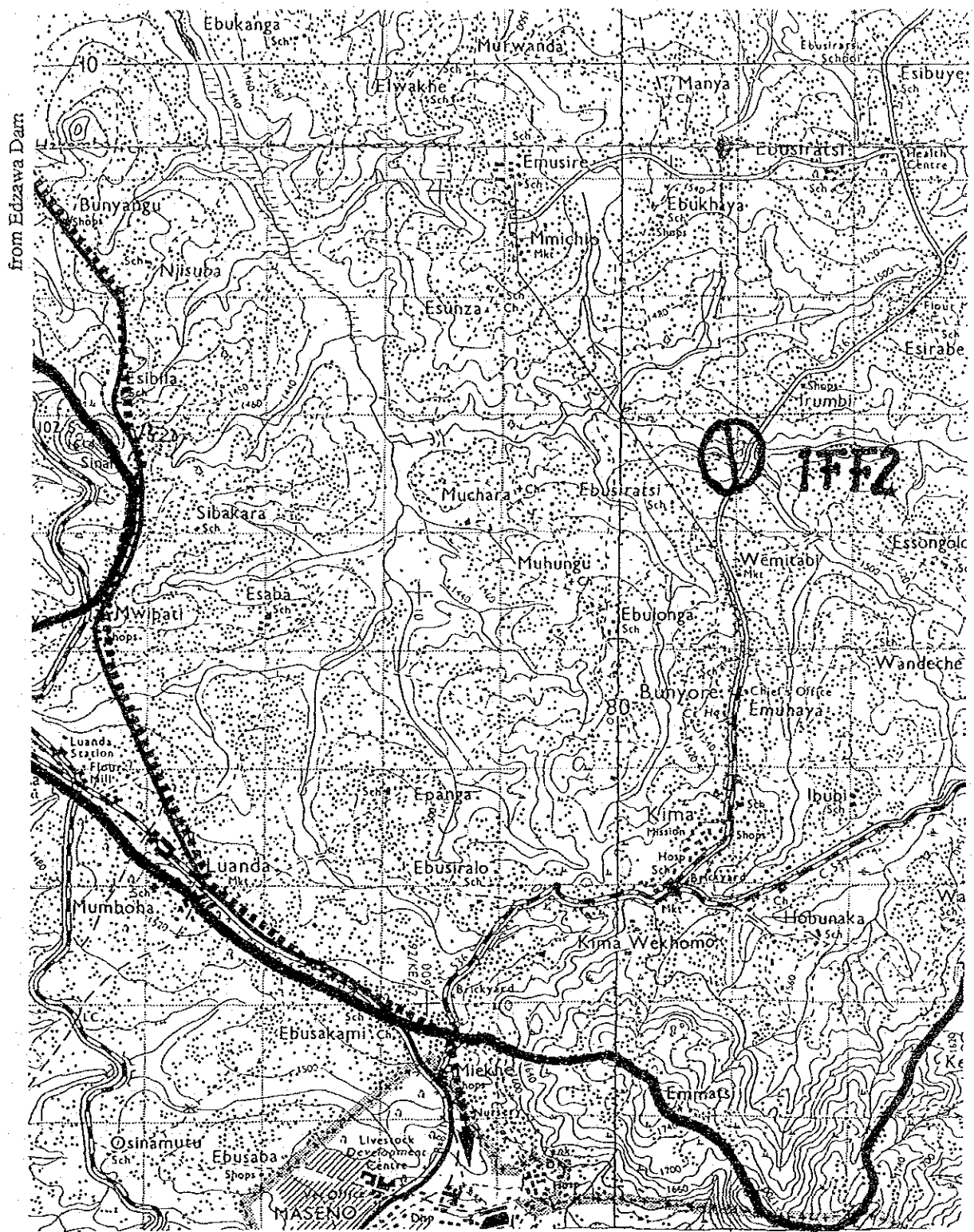
U 617.1 130/3 1KB



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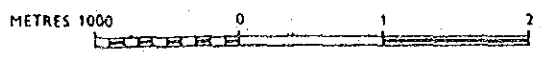
a	b	c	d	e	f	g	h	i
2	National Water Master Plan							
3	URBAN WATER SUPPLY							
4	Code No. 620		U- 78			Rate		Feb-92 25.2
5	-----							
6	Name of Urban:		Maseno		LGL Notice No:			
7	Organization:							
8	Per Capita GRDP in 1988 (guess):							
9	District:		Kisumu	Locataion :	622.1		West Kisumu	
10	Map (1/50,000):		116/1	Coordinates X:		34°38'	Y:	N 00°00'
11	Sub-basin Code:		1HB	Elevation (El. m):				
12	-----							
13	Existing Facilities							
14	Raw Water Source:		Kima river			River No		
15	Raw Water System:		H (m)=	L (m)=				
16	Treatment:			Capacity (m3/d)		2400		
17	Distribution System:							
18	-----							
19					1990	2000	2010	
20	-----							
21	Projected Population		(no)		16,000	32,200	50,600	
22	Residential Demand		(m3/d)		1,982	4,077	6,546	
23	Non-residential Demand		(m3/d)		332	666	1,049	
24	Livestock Demand		(m3/d)		46	105	203	
25	Industrial Demand		(m3/d)		5,053	8,946	12,136	
26	Total Demand		(m3/d)		7,413	13,794	19,934	
27	Area Served (estimated net)		(ha)		119	240	378	
28	-----							
29	Future Development Plan							
30	Raw Water Source:		Edzawa Dam			River No:		
31	Raw Water System:		H (m)=	160 L (m)=		13,200		
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost				1990	2000	2010	Total
36	Incremental Capacity		(m3/d)		5,013.0	6,381.3	6,140.1	17,534.4
37	Source Works		(US\$'000)		35.5	42.5	41.3	119.3
38	Pump Cost		(US\$'000)		18.2	19.3	18.7	56.2
39	Raw Water Main		(US\$'000)		919.2	994.9	982.0	2,896.1
40	Treatment		(US\$'000)		934.8	1,023.5	1,009.6	2,967.9
41	Storage		(US\$'000)		215.9	274.8	264.4	755.1
42	Distribution		(US\$'000)		955.9	967.8	1,099.3	3,023.0
43	Miscellaneous (20%)		(US\$'000)		615.9	664.6	683.1	1,963.5
44	Admi. & Engineering		(US\$'000)		369.5	398.8	409.8	1,178.1
45	Contingency		(US\$'000)		813.0	877.3	901.6	2,591.9
46	Total Cost		(US\$'000)		4,877.9	5,263.5	5,409.8	15,551.2
47	Cost per Capita		(US\$/c)		304.9	324.9	294.0	
48	Cost per ha		(US\$/ha)		40,823.3	43,507.2	39,369.7	
49	Cost per m3		(US\$/m3)		1.0	0.8	0.9	0.9
50	-----							
51	Present Value of Water at DF=10 %				1990	2000	2010	Total
52	Direct O & M Costs		(US\$'000)		243.9	263.2	270.5	
53	Capital Costs		(US\$'000)		502.4	542.1	557.2	
54	Total Annual Cost		(US\$'000)		746.3	805.3	827.7	
55	Unit Cost per m3		(US\$/m3)		0.4	0.3	0.4	
56	-----							
57	Remarks:	In view of bulk water supply requirement, water abstraction from Edzawa river was planned.						
58		The proposed system will be integrated with the Luando supply system (see U-128).						
59								
60								
61								
62								
63	-----							

Fig.



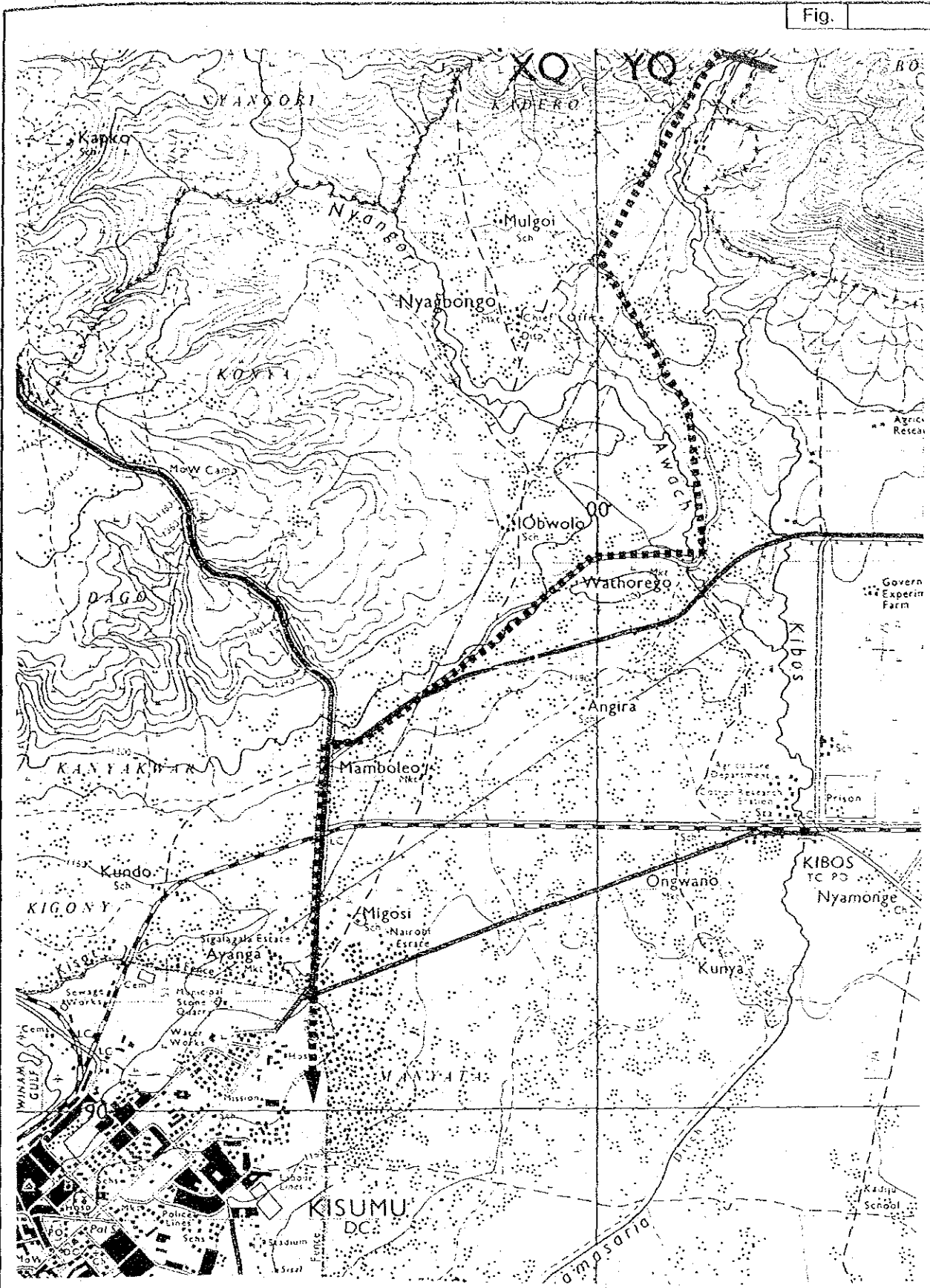
U- 78 Maseno + (Kisumu)
 U-128 Luanda

U 622.1 116/1 1HB
 U 931.3 102/3 1FF



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a	b	c	d	e	f	g	h	i
2	National Water Master Plan							
3	URBAN WATER SUPPLY							
4	Code No. 620	U-79				Rate		Feb-92 25.2
5	-----							
6	Name of Urban:	Kisumu & + Kiboswa		LGL Notice No:				
7	Organization:							
8	Per Capita GRDP in 1988 (guess):							
9	District:	Kisumu	Locataion :	622.3			East Kisumu	
10	Map (1/50,000):	116/2	Coordinates X:		34°46'		Y:	S 00°04'
11	Sub-basin Code:	1HB	Elevation (El. m):					
12	-----							
13	Existing Facilities							
14	Raw Water Source:	Lake Victoria		River No				
15	Raw Water System:	H (m)=	L (m)=					
16	Treatment:	Capacity (m3/d)		15490				
17	Distribution System:							
18	-----							
19				1990	2000	2010		
20	-----							
21	Projected Population		(no)	176,200	362,400	578,700		
22	Residential Demand		(m3/d)	21,827	45,889	74,869		
23	Non-residential Demand		(m3/d)	3,641	7,511	11,998		
24	Livestock Demand		(m3/d)	507	1,188	2,325		
25	Industrial Demand		(m3/d)	57	105	152		
26	Total Demand		(m3/d)	26,032	54,693	89,344		
27	Area Served (estimated net)		(ha)	1,316	2,706	4,322		
28	-----							
29	Future Development Plan							
30	Raw Water Source:	Kibos dam		River No:				
31	Raw Water System:	H (m)=	0 L (m)=	13,800				
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost			1990	2000	2010		Total
36	Incremental Capacity		(m3/d)	10,541.8	28,661.1	34,651.4		73,854.3
37	Source Works		(US\$'000)	61.9	131.1	151.2		344.3
38	Pump Cost		(US\$'000)	0.0	0.0	0.0		0.0
39	Raw Water Main		(US\$'000)	1,252.0	1,976.7	2,184.6		5,413.3
40	Treatment		(US\$'000)	1,185.1	2,916.3	3,525.8		7,627.1
41	Storage		(US\$'000)	454.0	1,234.3	1,492.3		3,180.7
42	Distribution		(US\$'000)	10,526.8	11,124.3	12,922.5		34,573.6
43	Miscellaneous (20%)		(US\$'000)	2,696.0	3,476.5	4,055.3		10,227.8
44	Admi. & Engineering		(US\$'000)	1,617.6	2,085.9	2,433.2		6,136.7
45	Contingency		(US\$'000)	3,558.7	4,589.0	5,353.0		13,500.7
46	Total Cost		(US\$'000)	21,352.0	27,534.2	32,117.9		81,004.1
47	Cost per Capita		(US\$/c)	121.2	147.9	148.5		
48	Cost per ha		(US\$/ha)	16,226.8	19,801.2	19,883.3		
49	Cost per m3		(US\$/m3)	2.0	1.0	0.9		1.1
50	-----							
51	Present Value of Water at DF=10 %			1990	2000	2010		Total
52	Direct O & M Costs		(US\$'000)	1,067.6	1,376.7	1,605.9		
53	Capital Costs		(US\$'000)	2,199.3	2,836.0	3,308.1		
54	Total Annual Cost		(US\$'000)	3,266.9	4,212.7	4,914.0		
55	Unit Cost per m3		(US\$/m3)	0.8	0.4	0.4		
56	-----							
57	Remarks:	Source works cost does not include the cost of Kibos dam, which should be added separately						
58		(see Sectoral Report M).						
59		Alternative water source is Lake Victoria, which should be subject to comparison with the Kibos dam plan.						
60								
61								
62								
63	-----							

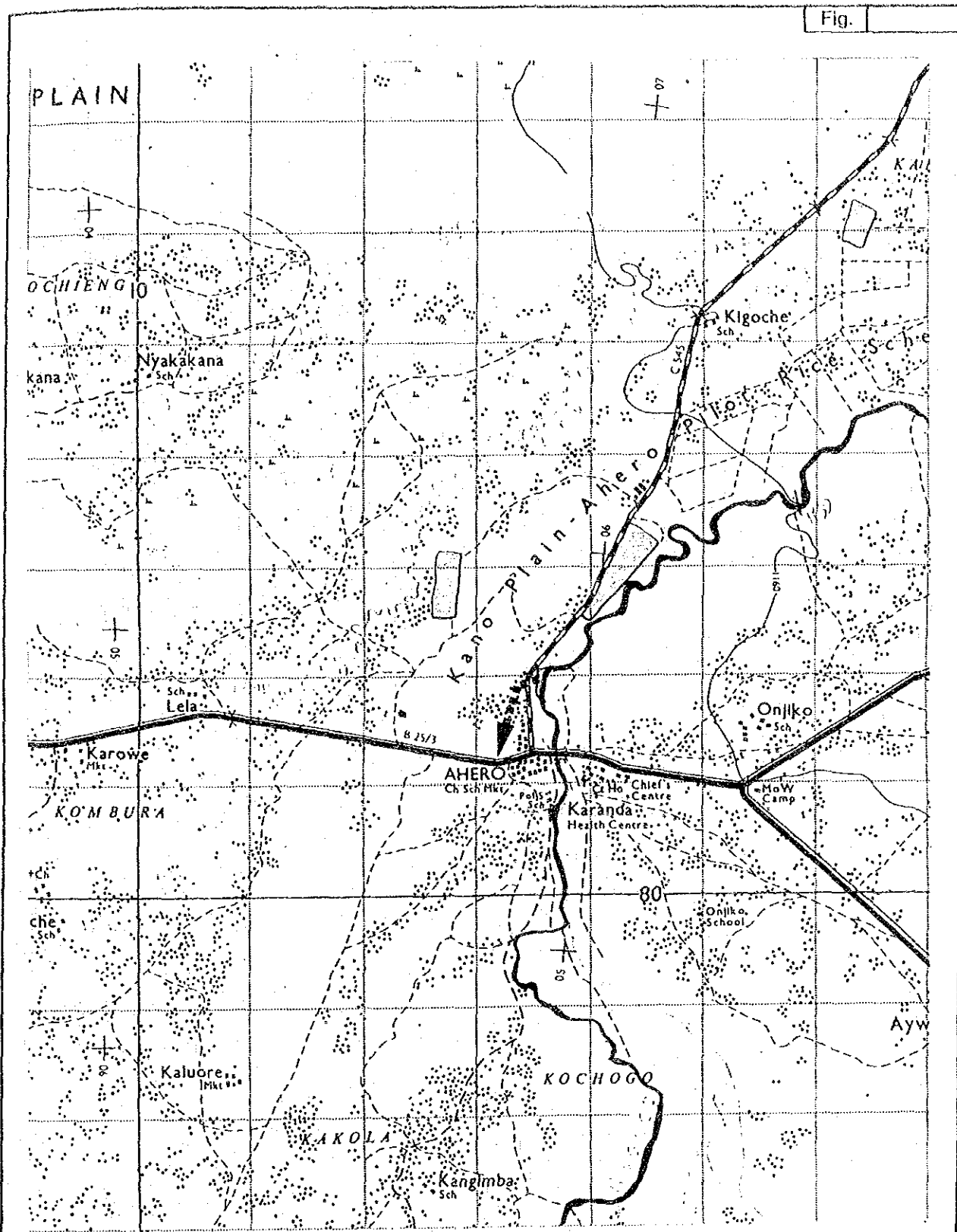


U-79 Kisumu & Kibosawa G 622.3 116/2 IHB



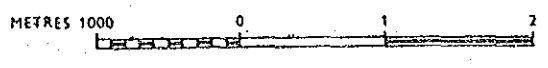
THE STUDY
ON
THE NATIONAL WATER MASTER PLAN
JAPAN INTERNATIONAL COOPERATION AGENCY

a	b	c	d	e	f	g	h	i
2	National Water Master Plan							
3	URBAN WATER SUPPLY							
4	Code No. 620	U -80				Rate		Feb-92 25.2
5	-----							
6	Name of Urban:	Ahero	LGL Notice No:					
7	Organization:							
8	Per Capita GRDP in 1988 (guess):							
9	District:	Kisumu	Locataion :	623.2	South East Kano			
10	Map (1/50,000):	116/2	Coordinates X:		34°56'	Y:		S 00°09'
11	Sub-basin Code:	1GD	Elevation (El. m):					
12	-----							
13	Existing Facilities							
14	Raw Water Source:	Boreholes	River No:					
15	Raw Water System:	H (m)=	L (m)=					
16	Treatment:	Capacity (m3/d)						
17	Distribution System:							
18	-----							
19				1990	2000	2010		
20	-----							
21	Projected Population	(no)		10,300	18,500	26,900		
22	Residential Demand	(m3/d)		1,276	2,343	3,480		
23	Non-residential Demand	(m3/d)		213	382	557		
24	Livestock Demand	(m3/d)		30	60	108		
25	Industrial Demand	(m3/d)		265	494	719		
26	Total Demand	(m3/d)		1,784	3,279	4,864		
27	Area Served (estimated net)	(ha)		77	138	201		
28	-----							
29	Future Development Plan							
30	Raw Water Source:	Nyando river	River No:					
31	Raw Water System:	H (m)=	20 L (m)=	700				
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost			1990	2000	2010	Total	
36	Incremental Capacity	(m3/d)		1,783.9	1,494.6	1,585.6	4,864.2	
37	Source Works	(US\$'000)		16.3	14.3	15.0	45.6	
38	Pump Cost	(US\$'000)		1.9	1.6	1.7	5.2	
39	Raw Water Main	(US\$'000)		37.1	35.7	36.2	109.0	
40	Treatment	(US\$'000)		580.2	529.4	546.0	1,655.5	
41	Storage	(US\$'000)		98.9	90.7	93.4	283.0	
42	Distribution	(US\$'000)		615.4	489.9	501.8	1,607.1	
43	Miscellaneous (20%)	(US\$'000)		270.0	232.3	238.8	741.1	
44	Admi. & Engineering	(US\$'000)		162.0	139.4	143.3	444.6	
45	Contingency	(US\$'000)		356.3	306.7	315.2	978.2	
46	Total Cost	(US\$'000)		2,138.0	1,840.0	1,891.3	5,869.3	
47	Cost per Capita	(US\$/c)		207.6	224.4	225.2		
48	Cost per ha	(US\$/ha)		27,795.7	30,046.3	30,150.0		
49	Cost per m3	(US\$/m3)		1.2	1.2	1.2	1.2	
50	-----							
51	Present Value of Water at DF=10 %			1990	2000	2010	Total	
52	Direct O & M Costs	(US\$'000)		106.9	92.0	94.6		
53	Capital Costs	(US\$'000)		220.2	189.5	194.8		
54	Total Annual Cost	(US\$'000)		327.1	281.5	289.4		
55	Unit Cost per m3	(US\$/m3)		0.5	0.5	0.5		
56	-----							
57	Remarks: Alternatively water can be exploited by shallow wells.							
58								
59								
60								
61								
62								
63	-----							



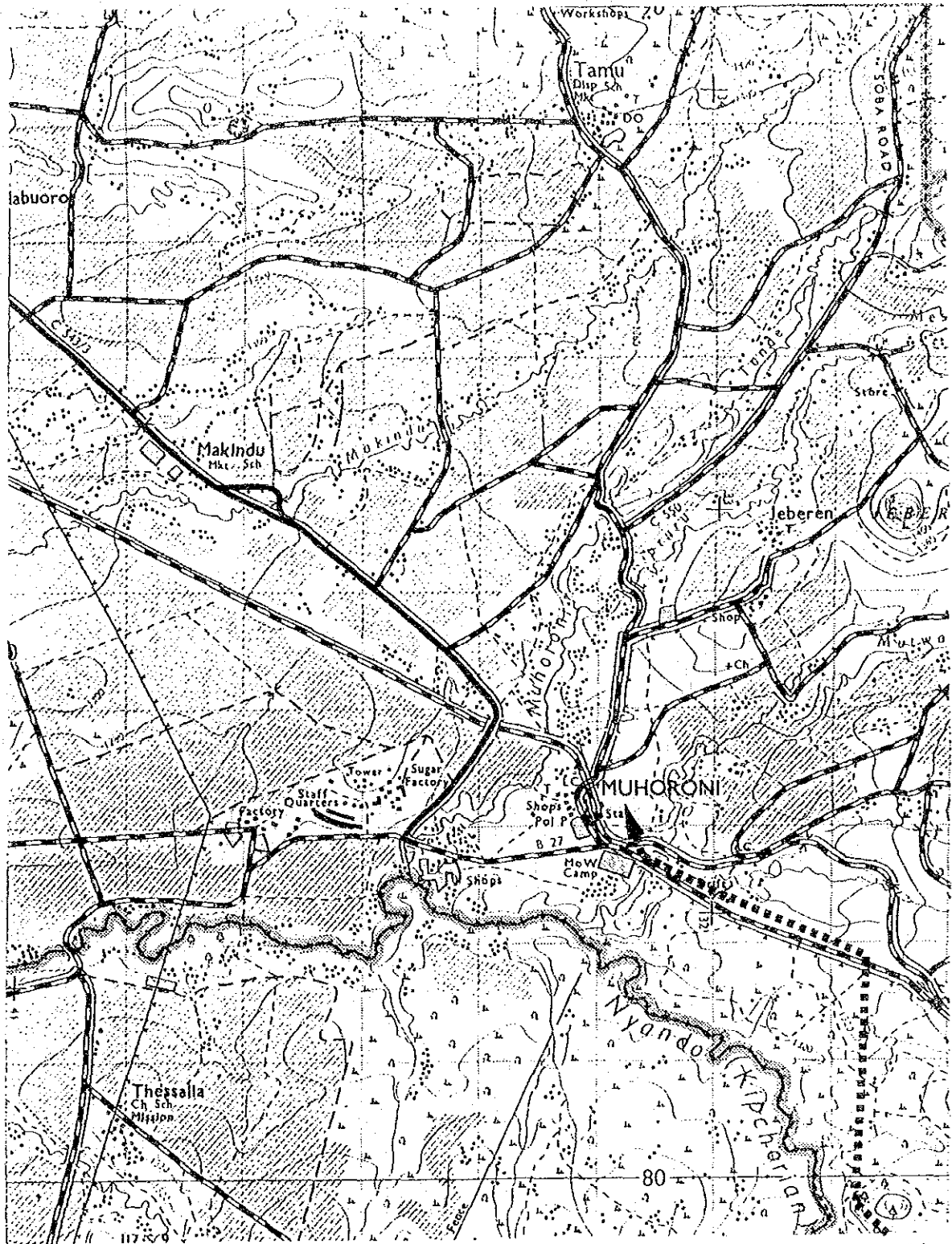
U- 80 Ahero

U 623.2 116/2 1GD



THE STUDY
ON
THE NATIONAL WATER MASTER PLAN
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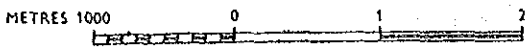
a	b	c	d	e	f	g	h	i
2	National Water Master Plan							
3	URBAN WATER SUPPLY							
4	Code No. 620		U- 81			Rate		Feb-92 25.2
5	-----							
6	Name of Urban:		Muhoroni		LGL Notice No:			
7	Organization:							
8	Per Capita GRDP in 1988 (guess):							
9	District:		Muhoroni	Locataion :	625.2		Muhoroni	
10	Map (1/50,000) :		117/1	Coordinates X:		35°12'		Y: S 00°08'
11	Sub-basin Code:		1GD	Elevation (El. m):				
12	-----							
13	Existing Facilities							
14	Raw Water Source:		Nyando river			River No		
15	Raw Water System:		H (m)=	L (m)=				
16	Treatment:			Capacity (m3/d)		96		
17	Distribution System:							
18	-----							
19					1990	2000	2010	
20	-----							
21	Projected Population		(no)		8,100	16,700	26,700	
22	Residential Demand		(m3/d)		1,003	2,115	3,454	
23	Non-residential Demand		(m3/d)		168	346	552	
24	Livestock Demand		(m3/d)		23	55	107	
25	Industrial Demand		(m3/d)		228	421	607	
26	Total Demand		(m3/d)		1,422	2,937	4,720	
27	Area Served (estimated net)		(ha)		60	125	199	
28	-----							
29	Future Development Plan							
30	Raw Water Source:		Nyando River			River No:		
31	Raw Water System:		H (m)=	0 L (m)=		8,400		
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost				1990	2000	2010	Total
36	Incremental Capacity		(m3/d)		1,326.4	1,514.3	1,783.7	4,624.3
37	Source Works		(US\$'000)		13.1	14.5	16.3	43.9
38	Pump Cost		(US\$'000)		0.0	0.0	0.0	0.0
39	Raw Water Main		(US\$'000)		418.9	430.0	445.1	1,294.0
40	Treatment		(US\$'000)		497.0	533.0	580.2	1,610.1
41	Storage		(US\$'000)		85.3	91.3	98.9	275.5
42	Distribution		(US\$'000)		483.9	513.8	597.4	1,595.2
43	Miscellaneous (20%)		(US\$'000)		299.6	316.5	347.6	963.7
44	Admi. & Engineering		(US\$'000)		179.8	189.9	208.5	578.2
45	Contingency		(US\$'000)		395.5	417.8	458.8	1,272.1
46	Total Cost		(US\$'000)		2,373.1	2,506.7	2,752.9	7,632.7
47	Cost per Capita		(US\$/c)		293.0	291.5	275.3	
48	Cost per ha		(US\$/ha)		39,231.7	39,030.9	36,862.3	
49	Cost per m3		(US\$/m3)		1.8	1.7	1.5	1.7
50	-----							
51	Present Value of Water at DF=10 %				1990	2000	2010	Total
52	Direct O & M Costs		(US\$'000)		118.7	125.3	137.6	
53	Capital Costs		(US\$'000)		244.4	258.2	283.5	
54	Total Annual Cost		(US\$'000)		363.1	383.5	421.2	
55	Unit Cost per m3		(US\$/m3)		0.7	0.7	0.6	
56	-----							
57	Remarks:							
58								
59								
60								
61								
62								
63	-----							



from Nyando River

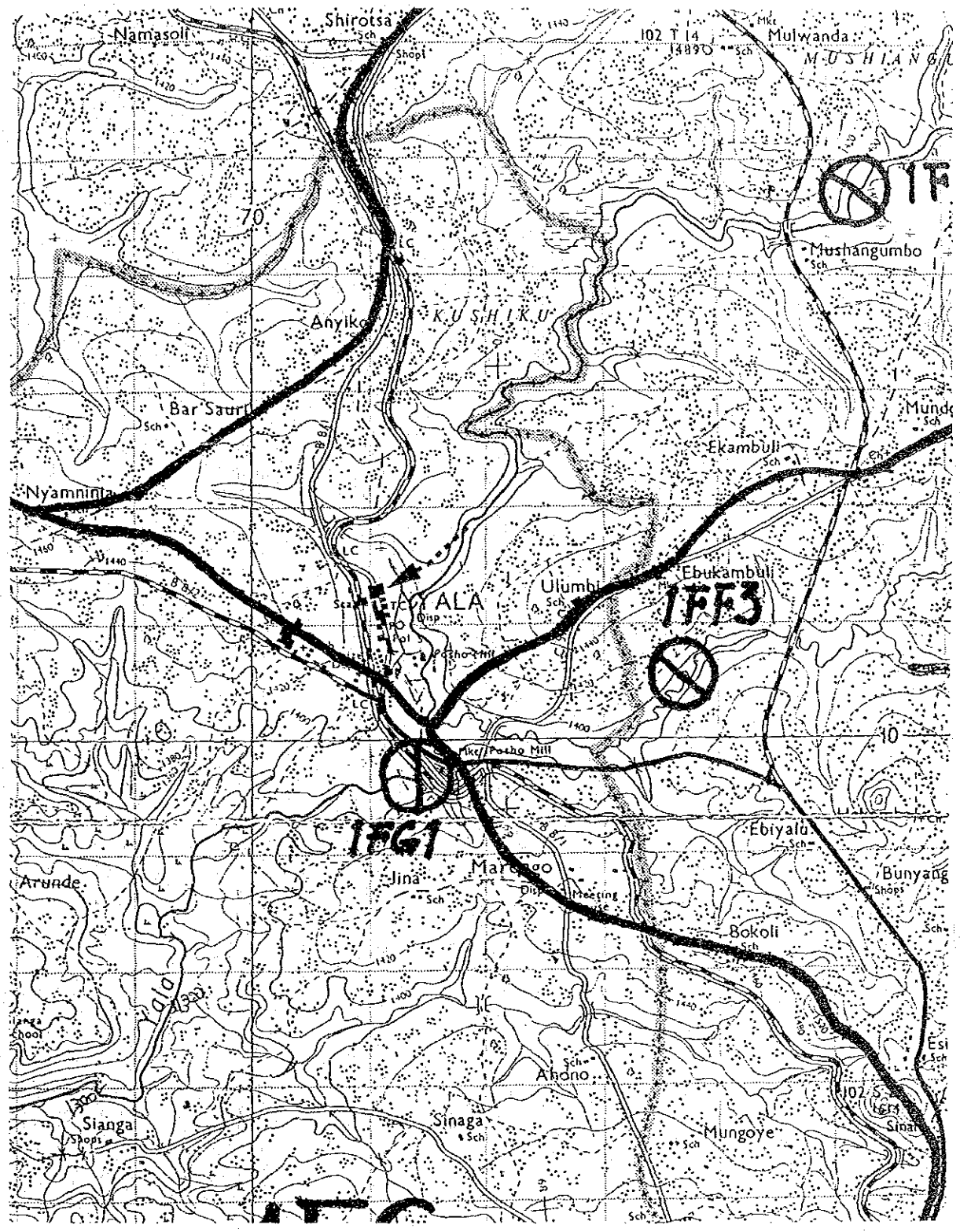
U- 81 Muhoroni

R 625.2 117/1 1GD



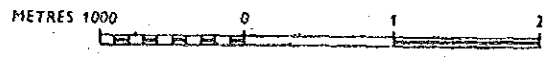
THE STUDY
ON
THE NATIONAL WATER MASTER PLAN
JAPAN INTERNATIONAL COOPERATION AGENCY

a	b	c	d	e	f	g	h	i
2						National Water Master Plan		
3			URBAN WATER SUPPLY					Jul-92
4	Code No.	630	U- 82			Rate		25.2
5	-----							
6	Name of Urban:	Yala			LGL Notice No:			
7	Organization:							
8	Per Capita GRDP in 1988 (guess):							
9	District:	Siaya	Locataion :	633.2		East Gem		
10	Map (1/50,000) :	102/3	Coordinates X:		34°34'		Y:	N 00°07'
11	Sub-basin Code:	1FE	Elevation (El. m):					
12	-----							
13	Existing Facilities							
14	Raw Water Source:	Yala River				River No		
15	Raw Water System:	H (m)=	L (m)=					
16	Treatment:		Capacity (m3/d)			210		
17	Distribution System:							
18	-----							
19				1990	2000	2010		
20	-----							
21	Projected Population		(no)	2,700	4,600	6,500		
22	Residential Demand		(m3/d)	334	582	841		
23	Non-residential Demand		(m3/d)	56	94	133		
24	Livestock Demand		(m3/d)	8	13	19		
25	Industrial Demand		(m3/d)	285	527	758		
26	Total Demand		(m3/d)	683	1,216	1,751		
27	Area Served (estimated net)		(ha)	20	34	49		
28	-----							
29	Future Development Plan							
30	Raw Water Source:	Yala river				River No:		
31	Raw Water System:	H (m)=	20 L (m)=			1,200		
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost			1990	2000	2010	Total	
36	Incremental Capacity		(m3/d)	473.5	533.0	534.5	1,540.9	
37	Source Works		(US\$'000)	6.0	6.6	6.6	19.3	
38	Pump Cost		(US\$'000)	1.4	1.3	1.3	4.0	
39	Raw Water Main		(US\$'000)	50.9	51.7	51.7	154.2	
40	Treatment		(US\$'000)	279.4	299.2	299.7	878.3	
41	Storage		(US\$'000)	47.8	51.3	51.4	150.5	
42	Distribution		(US\$'000)	161.3	113.5	113.5	388.3	
43	Miscellaneous (20%)		(US\$'000)	109.4	104.7	104.8	318.9	
44	Admi. & Engineering		(US\$'000)	65.6	62.8	62.9	191.4	
45	Contingency		(US\$'000)	144.4	138.2	138.4	421.0	
46	Total Cost		(US\$'000)	866.1	829.4	830.3	2,525.8	
47	Cost per Capita		(US\$/c)	320.8	436.5	437.0		
48	Cost per ha		(US\$/ha)	42,955.8	58,452.2	58,517.4		
49	Cost per m3		(US\$/m3)	1.8	1.6	1.6	1.6	
50	-----							
51	Present Value of Water at DF=10 %			1990	2000	2010	Total	
52	Direct O & M Costs		(US\$'000)	43.3	41.5	41.5		
53	Capital Costs		(US\$'000)	89.2	85.4	85.5		
54	Total Annual Cost		(US\$'000)	132.5	126.9	127.0		
55	Unit Cost per m3		(US\$/m3)	0.8	0.7	0.7		
56	-----							
57	Remarks:							
58								
59								
60								
61								
62								
63	-----							



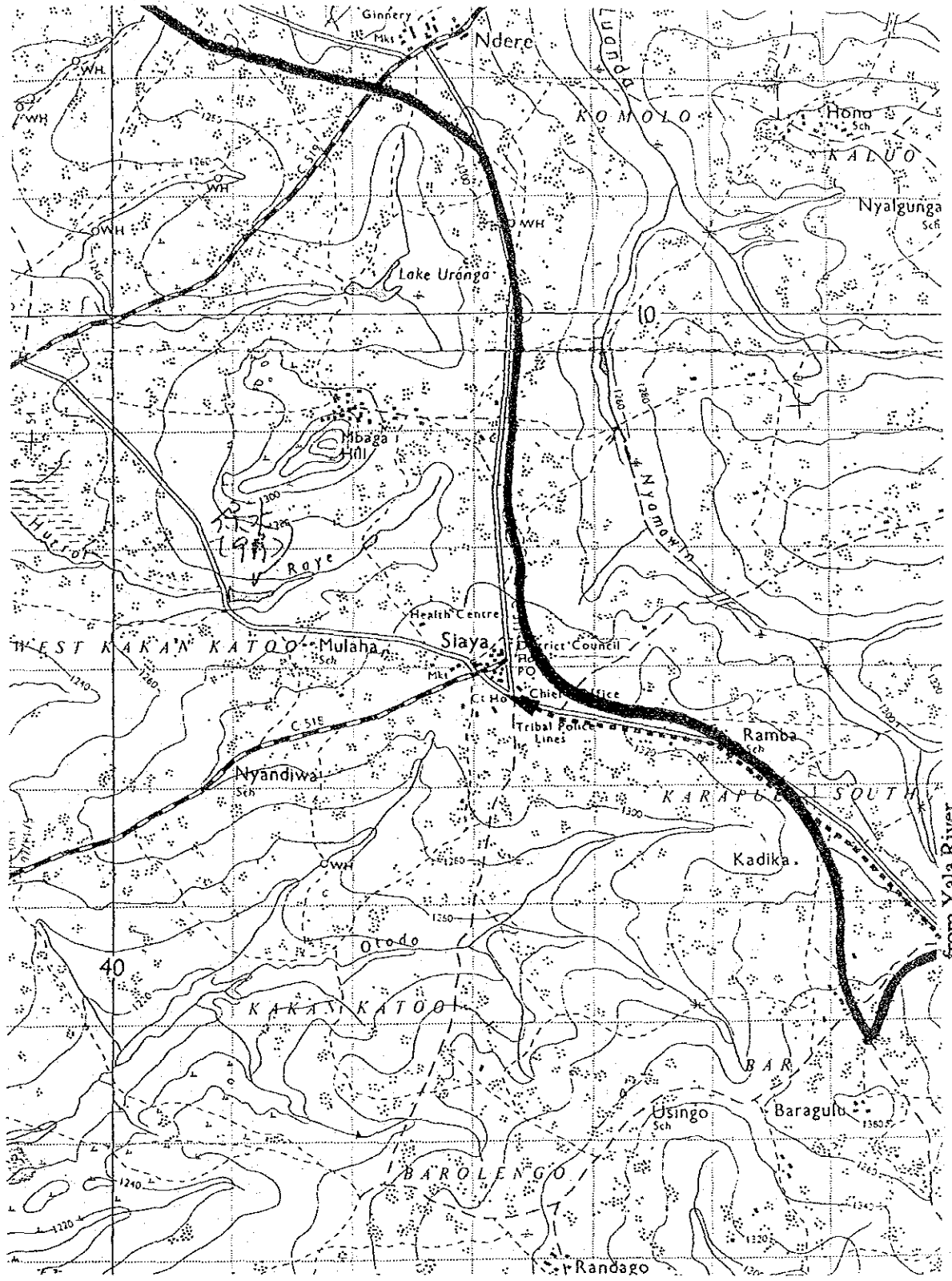
U- 82 Yala

U 633.2 102/3 1FE



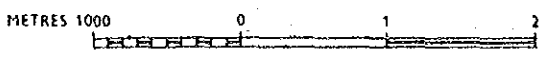
THE STUDY
ON
THE NATIONAL WATER MASTER PLAN
JAPAN INTERNATIONAL COOPERATION AGENCY

a	b	c	d	e	f	g	h	i
2	National Water Master Plan							
3	URBAN WATER SUPPLY							
4	Code No.	630	U- 83			Rate		Jul-92 25.2
5	-----							
6	Name of Urban:	Siaya		LGL Notice No:				
7	Organization:							
8	Per Capita GRDP in 1988 (guess):							
9	District:	Siaya	Locataion :	634.1		East Alego		
10	Map (1/50,000) :	101/4	Coordinates X:		34°18'	Y:	N 00°04'	
11	Sub-basin Code:	1FG	Elevation (El. m):					
12	-----							
13	Existing Facilities							
14	Raw Water Source:	Nyamawin River			River No			
15	Raw Water System:	H (m)=	L (m)=					
16	Treatment:	Capacity (m3/d)			1200			
17	Distribution System:							
18	-----							
19				1990	2000	2010		
20	-----							
21	Projected Population		(no)	19,400	37,100	57,200		
22	Residential Demand		(m3/d)	2,403	4,698	7,400		
23	Non-residential Demand		(m3/d)	402	768	1,184		
24	Livestock Demand		(m3/d)	59	107	164		
25	Industrial Demand		(m3/d)	381	710	1,030		
26	Total Demand		(m3/d)	3,245	6,283	9,778		
27	Area Served (estimated net)		(ha)	145	277	427		
28	-----							
29	Future Development Plan							
30	Raw Water Source:	Yala River			River No:			
31	Raw Water System:	H (m)=	200 L (m)=	22,000				
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost			1990	2000	2010	Total	
36	Incremental Capacity		(m3/d)	2,045.2	3,037.6	3,495.5	8,578.3	
37	Source Works		(US\$'000)	110.1	24.4	27.1	161.5	
38	Pump Cost		(US\$'000)	11.9	16.3	17.0	45.2	
39	Raw Water Main		(US\$'000)	1,201.9	1,325.0	1,376.5	3,903.4	
40	Treatment		(US\$'000)	621.8	752.8	802.5	2,177.0	
41	Storage		(US\$'000)	105.4	124.5	150.5	380.5	
42	Distribution		(US\$'000)	1,159.0	1,057.5	1,200.8	3,417.3	
43	Miscellaneous (20%)		(US\$'000)	642.0	660.1	714.9	2,017.0	
44	Admi. & Engineering		(US\$'000)	385.2	396.1	428.9	1,210.2	
45	Contingency		(US\$'000)	847.5	871.3	943.7	2,662.4	
46	Total Cost		(US\$'000)	5,084.8	5,227.9	5,661.9	15,974.6	
47	Cost per Capita		(US\$/c)	262.1	295.4	281.7		
48	Cost per ha		(US\$/ha)	35,096.9	39,550.3	37,719.7		
49	Cost per m3		(US\$/m3)	2.5	1.7	1.6	1.9	
50	-----							
51	Present Value of Water at DF=10 %			1990	2000	2010	Total	
52	Direct O & M Costs		(US\$'000)	254.2	261.4	283.1		
53	Capital Costs		(US\$'000)	523.7	538.5	583.2		
54	Total Annual Cost		(US\$'000)	778.0	799.9	866.3		
55	Unit Cost per m3		(US\$/m3)	1.0	0.7	0.7		
56	-----							
57	Remarks:	Source works include the cost of a small on the Nyamamin river. Depending on water quantity available						
58		from the Nyamamin river, an alternative source of water will be the Yala river, some 15 km away from Siaya.						
59								
60								
61								
62								
63	-----							



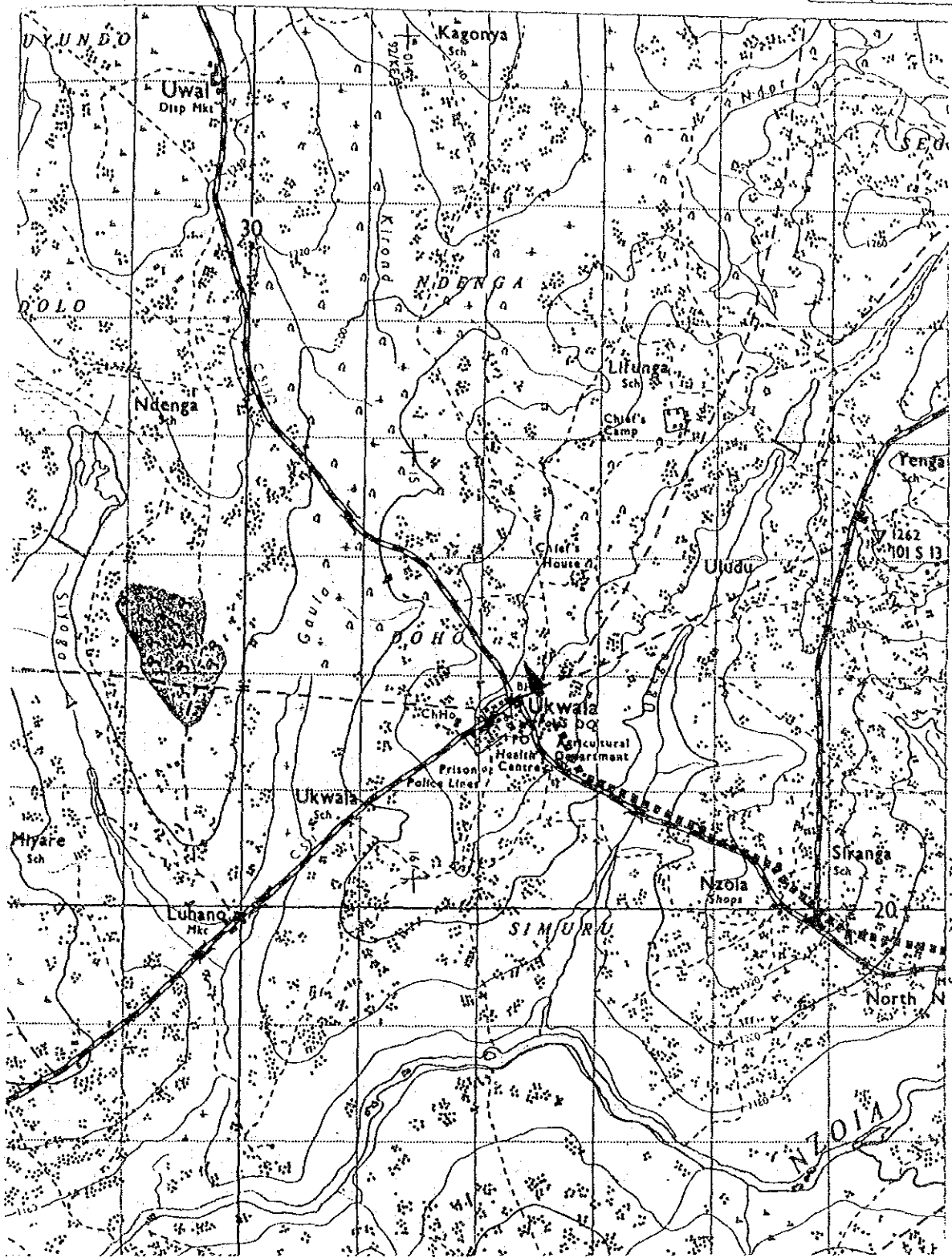
U- 83 Siaya

U 634.1 101/4 1FG



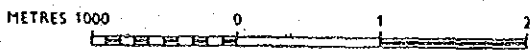
THE STUDY
ON
THE NATIONAL WATER MASTER PLAN
JAPAN INTERNATIONAL COOPERATION AGENCY

a	b	c	d	e	f	g	h	i	
2	National Water Master Plan								
3	URBAN WATER SUPPLY							Feb-92	
4	Code No. 630		U- 84			Rate		25.2	
5	-----								
6	Name of Urban:		Ukwala		LGL Notice No:				
7	Organization:								
8	Per Capita GRDP in 1988 (guess):								
9	District:		Siaya	Locataion :	635.4		North Agenya		
10	Map (1/50,000):		101/3	Coordinates X:		34°13'	Y:	N 00°13'	
11	Sub-basin Code:		1EF	Elevation (El. m):					
12	-----								
13	Existing Facilities								
14	Raw Water Source:		Boreholes			River No			
15	Raw Water System:		H (m)=	L (m)=					
16	Treatment:			Capacity (m3/d)		50			
17	Distribution System:								
18	-----								
19						1990	2000	2010	
20	-----								
21	Projected Population		(no)		1,100	1,900	2,700		
22	Residential Demand		(m3/d)		136	241	349		
23	Non-residential Demand		(m3/d)		23	38	54		
24	Livestock Demand		(m3/d)		3	5	8		
25	Industrial Demand		(m3/d)		0	0	0		
26	Total Demand		(m3/d)		162	284	411		
27	Area Served (estimated net)		(ha)		8	14	20		
28	-----								
29	Future Development Plan								
30	Raw Water Source:		Nzoia River			River No:			
31	Raw Water System:		H (m)=	100 L (m)=		5,400			
32	Treatment:								
33	Distribution System:								
34	-----								
35	Incremental Capital Cost					1990	2000	2010	Total
36	Incremental Capacity		(m3/d)			112.3	121.3	127.7	361.3
37	Source Works		(US\$'000)			2.1	2.2	2.3	6.5
38	Pump Cost		(US\$'000)			3.0	3.0	3.0	9.0
39	Raw Water Main		(US\$'000)			200.3	201.3	202.0	603.6
40	Treatment		(US\$'000)			117.5	123.2	127.2	367.9
41	Storage		(US\$'000)			19.2	20.2	20.9	60.3
42	Distribution		(US\$'000)			65.7	47.8	47.8	161.3
43	Miscellaneous (20%)		(US\$'000)			81.5	79.5	80.6	241.7
44	Admi. & Engineering		(US\$'000)			48.9	47.7	48.4	145.0
45	Contingency		(US\$'000)			107.6	105.0	106.4	319.1
46	Total Cost		(US\$'000)			645.8	630.0	638.6	1,914.3
47	Cost per Capita		(US\$/c)			587.0	787.4	798.3	
48	Cost per ha		(US\$/ha)			78,609.2	105,442.6	106,891.5	
49	Cost per m3		(US\$/m3)			5.8	5.2	5.0	5.3
50	-----								
51	Present Value of Water at DF=10 %					1990	2000	2010	Total
52	Direct O & M Costs		(US\$'000)			32.3	31.5	31.9	
53	Capital Costs		(US\$'000)			66.5	64.9	65.8	
54	Total Annual Cost		(US\$'000)			98.8	96.4	97.7	
55	Unit Cost per m3		(US\$/m3)			2.4	2.2	2.1	
56	-----								
57	Remarks: Alternatively borehole/shallow well development.								
58									
59									
60									
61									
62									
63	-----								



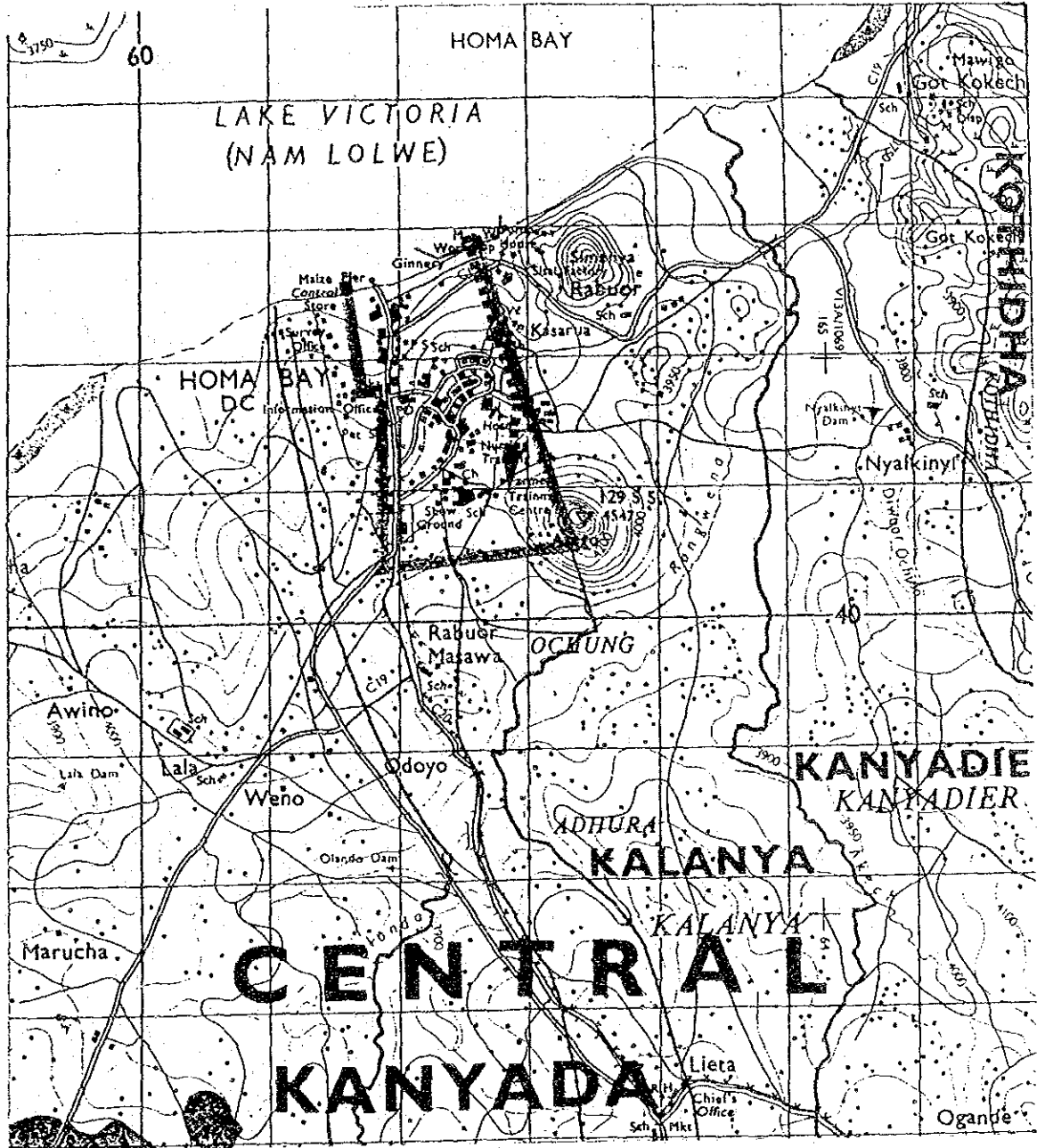
U- 84 Ukwala

U 635.4 101/3 1EF



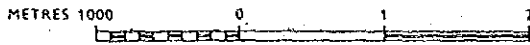
THE STUDY
ON
THE NATIONAL WATER MASTER PLAN
JAPAN INTERNATIONAL COOPERATION AGENCY

a	b	c	d	e	f	g	h	i
2	National Water Master Plan							
3	URBAN WATER SUPPLY							
4	Code No. 640		U- 85			Rate		Feb-92 25.2
5	-----							
6	Name of Urban:		Homa Bay		LGL Notice No:			
7	Organization:							
8	Per Capita GRDP in 1988 (guess):							
9	District:		South Nyan Locataion :		641.1		Kanyada West	
10	Map (1/50,000) :		129/2	Coordinates X:		34°28'	Y:	S 00°31'
11	Sub-basin Code:		1HF	Elevation (El. m):				
12	-----							
13	Existing Facilities							
14	Raw Water Source:		L. Victoria			River No		
15	Raw Water System:		H (m)=	L (m)=				
16	Treatment:			Capacity (m3/d)		1200		
17	Distribution System:							
18	-----							
19					1990	2000	2010	
20	-----							
21	Projected Population		(no)		23,000	48,600	73,900	
22	Residential Demand		(m3/d)		2,849	6,154	9,561	
23	Non-residential Demand		(m3/d)		477	1,007	1,536	
24	Livestock Demand		(m3/d)		29	58	89	
25	Industrial Demand		(m3/d)		590	1,089	1,561	
26	Total Demand		(m3/d)		3,945	8,308	12,741	
27	Area Served (estimated net)		(ha)		172	363	552	
28	-----							
29	Future Development Plan							
30	Raw Water Source:		Lake Victoria			River No:		
31	Raw Water System:		H (m)=	110 L (m)=		2,000		
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost				1990	2000	2010	Total
36	Incremental Capacity		(m3/d)		2,745.1	4,362.8	4,432.8	11,540.8
37	Source Works		(US\$'000)		22.6	32.0	32.3	86.9
38	Pump Cost		(US\$'000)		7.4	10.6	10.8	28.8
39	Raw Water Main		(US\$'000)		117.3	133.4	134.1	384.8
40	Treatment		(US\$'000)		717.9	883.4	889.2	2,490.5
41	Storage		(US\$'000)		119.7	187.9	190.9	498.5
42	Distribution		(US\$'000)		1,374.1	1,529.4	1,511.5	4,415.1
43	Miscellaneous (20%)		(US\$'000)		471.8	555.3	553.8	1,580.9
44	Admi. & Engineering		(US\$'000)		283.1	333.2	332.3	948.5
45	Contingency		(US\$'000)		622.8	733.0	731.0	2,086.8
46	Total Cost		(US\$'000)		3,736.6	4,398.3	4,385.9	12,520.7
47	Cost per Capita		(US\$/c)		162.5	171.8	173.4	
48	Cost per ha		(US\$/ha)		21,754.2	23,006.0	23,213.3	
49	Cost per m3		(US\$/m3)		1.4	1.0	1.0	1.1
50	-----							
51	Present Value of Water at DF=10 %				1990	2000	2010	Total
52	Direct O & M Costs		(US\$'000)		186.8	219.9	219.3	
53	Capital Costs		(US\$'000)		384.9	453.0	451.7	
54	Total Annual Cost		(US\$'000)		571.7	672.9	671.0	
55	Unit Cost per m3		(US\$/m3)		0.6	0.4	0.4	
56	-----							
57	Remarks:							
58								
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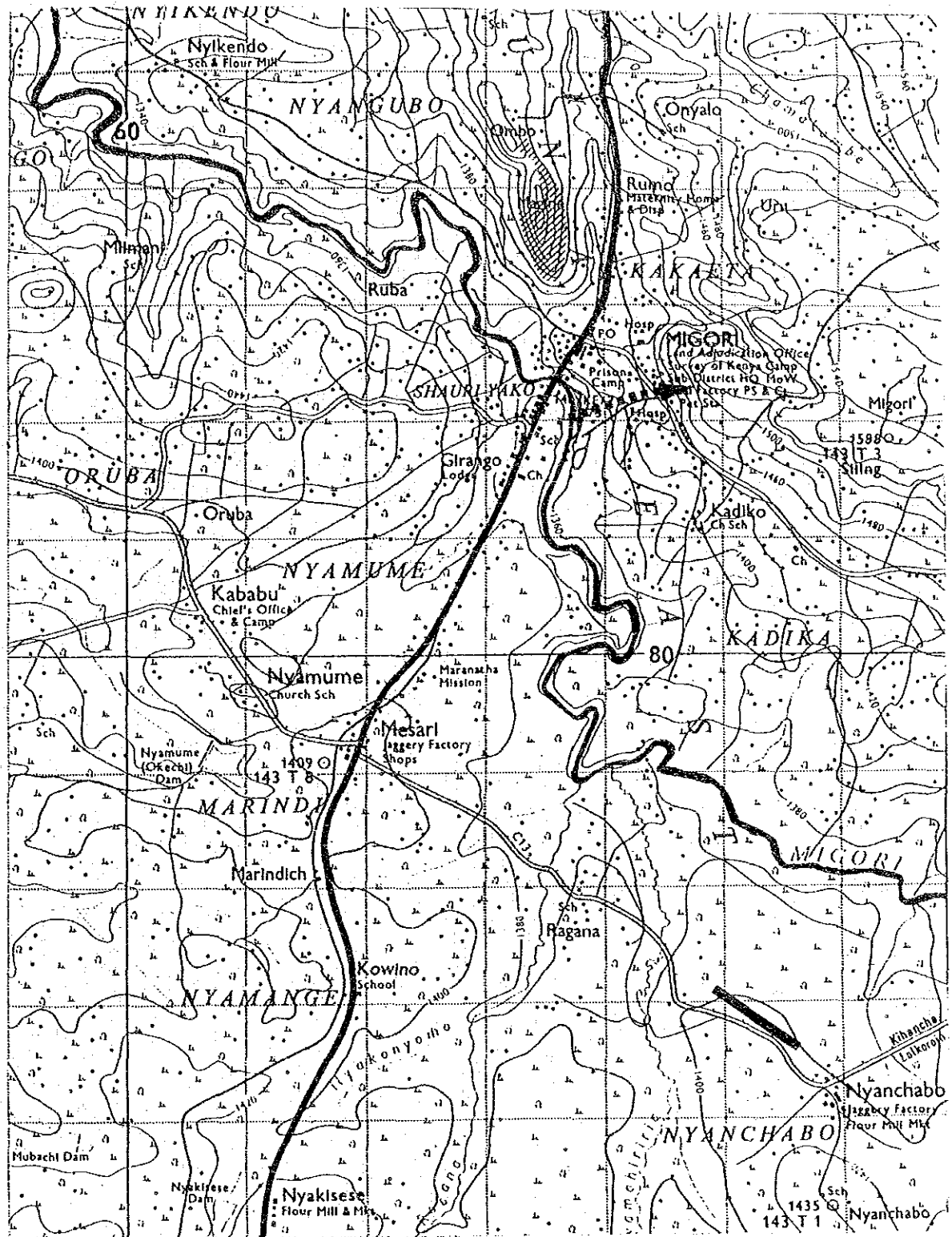
U- 85 Homa Bay

U 641.1 129/2 1HF



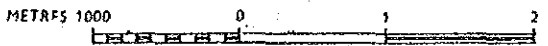
THE STUDY
ON
THE NATIONAL WATER MASTER PLAN
JAPAN INTERNATIONAL COOPERATION AGENCY

a	b	c	d	e	f	g	h	i
2					National Water Master Plan			
3			URBAN WATER SUPPLY					Feb-92
4	Code No.	640	U- 86			Rate		25.2
5	-----							
6	Name of Urban:		Migori		LGL Notice No:			
7	Organization:							
8	Per Capita GRDP in 1988 (guess):							
9	District:		South Nyan Locataion :	644.3		Suna East		
10	Map (1/50,000) :	143/2	Coordinates X:		34°29'		Y:	S 01°04'
11	Sub-basin Code:	1KC	Elevation (El. m):					
12	-----							
13	Existing Facilities							
14	Raw Water Source:		Boreholes			River No		
15	Raw Water System:		H (m)=	L (m)=				
16	Treatment:			Capacity (m3/d)		130		
17	Distribution System:							
18	-----							
19					1990	2000	2010	
20	-----							
21	Projected Population		(no)	7,500	15,900	24,100		
22	Residential Demand		(m3/d)	929	2,013	3,118		
23	Non-residential Demand		(m3/d)	155	328	499		
24	Livestock Demand		(m3/d)	9	19	29		
25	Industrial Demand		(m3/d)	228	421	607		
26	Total Demand		(m3/d)	1,321	2,781	4,253		
27	Area Served (estimated net)		(ha)	56	119	180		
28	-----							
29	Future Development Plan							
30	Raw Water Source:		Migori river			River No:		
31	Raw Water System:		H (m)=	110 L (m)=		1,100		
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost							
36	Incremental Capacity		(m3/d)	1,191.1	1,460.3	1,471.6		4,122.9
37	Source Works		(US\$'000)	12.1	14.1	14.1		40.3
38	Pump Cost		(US\$'000)	4.7	5.3	5.3		15.3
39	Raw Water Main		(US\$'000)	53.7	55.9	56.0		165.6
40	Treatment		(US\$'000)	469.1	522.9	525.0		1,517.1
41	Storage		(US\$'000)	80.7	89.6	90.0		260.3
42	Distribution		(US\$'000)	448.1	501.8	489.9		1,439.8
43	Miscellaneous (20%)		(US\$'000)	213.7	237.9	236.1		687.7
44	Admi. & Engineering		(US\$'000)	128.2	142.8	141.6		412.6
45	Contingency		(US\$'000)	282.1	314.1	311.6		907.7
46	Total Cost		(US\$'000)	1,692.4	1,884.4	1,869.7		5,446.5
47	Cost per Capita		(US\$/c)	225.7	224.3	228.0		
48	Cost per ha		(US\$/ha)	30,215.8	30,039.9	30,532.0		
49	Cost per m3		(US\$/m3)	1.4	1.3	1.3		1.3
50	-----							
51	Present Value of Water at DF=10 %							
52	Direct O & M Costs		(US\$'000)	84.6	94.2	93.5		
53	Capital Costs		(US\$'000)	174.3	194.1	192.6		
54	Total Annual Cost		(US\$'000)	258.9	288.3	286.1		
55	Unit Cost per m3		(US\$/m3)	0.6	0.5	0.5		
56	-----							
57	Remarks:							
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U- 86 Migori

U 644.3 143/2 1KC



THE STUDY
ON
THE NATIONAL WATER MASTER PLAN
JAPAN INTERNATIONAL COOPERATION AGENCY

a	b	c	d	e	f	g	h	i
2	National Water Master Plan							
3	URBAN WATER SUPPLY							
4	Code No. 640	U- 87	Rate			Jul-92 25.2		
5	-----							
6	Name of Urban:	Kendu Bay	LGL Notice No:					
7	Organization:							
8	Per Capita GRDP in 1988 (guess):							
9	District:	South Nyan Locataion :	648.1	Central Karachuonyo				
10	Map (1/50,000) :	116/3	Coordinates X:	34°39'	Y:		S 00°20'	
11	Sub-basin Code:	1HD	Elevation (El. m):					
12	-----							
13	Existing Facilities							
14	Raw Water Source:	Awachi River	River No					
15	Raw Water System:	H (m)=	L (m)=					
16	Treatment:	Capacity (m3/d)			150			
17	Distribution System:							
18	-----							
19				1990	2000	2010		
20	-----							
21	Projected Population	(no)	2,700	5,800	8,700			
22	Residential Demand	(m3/d)	334	734	1,126			
23	Non-residential Demand	(m3/d)	56	118	180			
24	Livestock Demand	(m3/d)	3	7	10			
25	Industrial Demand	(m3/d)	242	452	658			
26	Total Demand	(m3/d)	635	1,311	1,974			
27	Area Served (estimated net)	(ha)	20	43	65			
28	-----							
29	Future Development Plan							
30	Raw Water Source:	Lake Victoria	River No:					
31	Raw Water System:	H (m)=	40 L (m)=	1,500				
32	Treatment:							
33	Distribution System:							
34	-----							
35	Incremental Capital Cost		1990	2000	2010	Total		
36	Incremental Capacity	(m3/d)	485.5	676.0	662.1	1,823.6		
37	Source Works	(US\$'000)	6.2	7.9	7.8	21.8		
38	Pump Cost	(US\$'000)	1.7	2.0	2.0	5.7		
39	Raw Water Main	(US\$'000)	63.8	66.7	66.5	197.1		
40	Treatment	(US\$'000)	283.5	342.8	338.8	965.0		
41	Storage	(US\$'000)	48.5	59.0	58.3	165.8		
42	Distribution	(US\$'000)	161.3	185.2	173.3	519.8		
43	Miscellaneous (20%)	(US\$'000)	113.0	132.7	129.3	375.0		
44	Admi. & Engineering	(US\$'000)	67.8	79.6	77.6	225.0		
45	Contingency	(US\$'000)	149.1	175.2	170.7	495.1		
46	Total Cost	(US\$'000)	894.9	1,051.2	1,024.3	2,970.3		
47	Cost per Capita	(US\$/c)	331.4	339.1	353.2			
48	Cost per ha	(US\$/ha)	44,381.5	45,404.8	47,295.0			
49	Cost per m3	(US\$/m3)	1.8	1.6	1.5	1.6		
50	-----							
51	Present Value of Water at DF=10 %		1990	2000	2010	Total		
52	Direct O & M Costs	(US\$'000)	44.7	52.6	51.2			
53	Capital Costs	(US\$'000)	92.2	108.3	105.5			
54	Total Annual Cost	(US\$'000)	136.9	160.8	156.7			
55	Unit Cost per m3	(US\$/m3)	0.8	0.7	0.6			
56	-----							
57	Remarks:							
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