6. Plan of rural water supply

6.1 Existing plan for water supply development

In the Study Area, two of water supply development plans were elaborated in last 20 years. They are of:

- Central Baringo Water Development Plan (PENCOL plan, 1984) and
- District Water Development Plan for Baringo and Koibatek (DWDP, WRAP study in 1992-1996).

Their outlines are:

- **PENCOL Plan:** It was prepared in 1994 as the water master plan in the period of 1983-2003, ranging Rift Valley Area: including Tugen Hills, Kerio Valley and northern part of Baringo District. The plan includes proposal for development of some large piped water supply schemes using dam reservoirs built on five rivers which were considered to perennial. Long piped transmission system were proposed to overcome seasonal and geographical limitation of Central Baringo. Total supply capacity is 15,447 m^3/day and to serve 282,100 and 42,200 livestock by the year 2003. Total capital of scheme is was Ksh 1,108,569 at 19847s price. Within the range of Study Area, Cemenron Dam and Kimao dam were planned as the water source, and will be used to supply water in both domectic and irrigation puposes to the rural areas.

  This plan was not implemented, with exemptions of two main components, which construction of Chemeron and Kimao dam were still funded.

  The reasons why they were not implemented are:

  - plan will be very costly;
  - not effective investigate per capita;
  - high operation cost per capita;
  - not supported by District Water Offices;
  - discard of local source for supplying water, and
  - environmental influenced to he Lake Baringo.

  Up to now, the plan are still suspended even main sources had been built like as Cemenron dam and Kimao dam.

- **DWDP for Baringo and Koibatek District:** This plan was formulated as a part of WRAP IV (water Resources Assessment and Planning Project –Phase IV), involving Districts offices. The objectives of DWDP were:

  - to supply clean and portable water to all households within a reasonable distance;
  - to care for water requirements in the different sectors of a economy;
  - propose the most appropriate water supply technologies in different regions of districts and
  - to conserve and preserve the water source.
  - to provide all domestic users and livestock with sufficient clean water by the year 2015.

  and the plan represented strategies for water development and gives an out line of necessary works and project proposals up to 2015 with 20 years planning horizon. With various elements of water resources management, technical, institutional and financial framework following strategy were concluded as below:

1.Priority should be give to water supply development works in areas with a high water shortage
2.The DWO office should be strengthen in order to play a far more important role in water resources management in the District
3.Surface water abstractions for irrigation purpose should be reduced
4.Improved surface water resource availability in the Perikerra catchment
5.Erosion control measures should be integrated part of water supply development activity.
6.Waste water treatment should been an integrated part of water supply development in case of supplying large quantity of water or the presence of vulnerable environmental condition
7.The quality of (yet not) accepted water supply technologies, should be improved and the results should be demonstrated.
8.There is need for long term commitments of all actors, active in Districts water sector, reallocation of task as well as strengthening of the coordination of the activity of the different actors at Districts level
9.Use pilot projects to demonstrate new water supply concepts to decision makers such as local politicians.
10.The DWO should be strengthen to better perform in the fields of survey, planning and design of water supply facilities.
11.The ongoing trend of handing over Governments water supply schemes to communities and institutions should be strengthen.
12.Communities should be supported in operating their own water supplies
13.Public water supply systems should become financially self sustainable.
14.The reliability of water supply systems should be improved.
15.In planning and design of water supply system, gender differentiated baseline data should be used.
16.Women should sufficiently be represented, consulted and involved in the decision making and management of water supplies
17.Cooperation of different type of actors in the sector should be stimulated to change the stereo type thinking.

As physical plan in the Study Area, three adequate components of water facilities to meet above water strategy. were encouraged for utilizing local water source. They are essentially of

- Piped Water Supplies using river and lake source
- Boreholes with hand pumps" and "Improved Pans", and
- District Water Development Plan,

was formulated with combination of each component as to meet water demand for respective Locations (or Sub-Laceration).

6.2 Provisional plan of water facility for verification project

Type of water facility prepared for verification project was prudently selected among needs risen in the water resources surveys. In a course of factual activity in field, various facility plans were represented by communities, as well as found out in the reconnaissance survey. At beginning of the Survey, these however include lots of huge and unrealistic facility plans, such as new construction of gouge-dam, renovation of large dam, diversion works and so forth. Accordingly, these had been screened by giving technical concerns with concrete conditions to be realized. Likewise, they were again selected in view of whether they are acceptable to verification project, which is intended to promote community participation and management with self-help activity.
They were all small scale schemes, but have a function to meet both chronic short of water supply, poor water quality and requirement of livestock-watering. These plans are of two types of "Construction of new water facilities" and "Expansion of existing facilities", as follows.

Construction of new water facilities
(a) Boreholes[BH]: Medium potential of middle to deep groundwater to be developed for domestic water supply and cattle watering at Arabal and Mukutani Location.
(b) Shallow wells[W]: A potential can be developed along river courses. Hand dug well with a fix bucket /rope abstraction can provide some amount of domestic water.
(c)Spring improvements[S]: Non-protected natural spring. is needed to be meet the requirement of domestic supply by improvement.
(d) Piped water supplies with sources of springs, boreholes[Ps]: Spring and borehole bearing enough yield are required to be developed as piped water supply system.
(e) Roof catchment[R]: School, health center and dispensary wherever have extensive roof cover can be utilized as supplemental water source by roof catchment. This was already applied as verification project at Rugus Primary School..
Expansion of existing water facility
(f) Fencing pan with public tap and cattle trough[Pf]: Fencing of pan are required in preventing pollution for cattle entering and trapping silt, but these pans are still not suitable for domestic purpose because they still remain as the high potential risk of contamination.
(g) Extending pan with out-let facility[Po]: This type of improved pan is equipped with the out-let facility functioning as a filtering muddy water. This was already applied as verification project at Rugus village.
(h) Rehabilitation of shallow well[Wr]: Half of shallow wells have breakdown, They once functioned in good performance of both yield and quality for water supply. These must be rehabilitated.
(i) Rehabilitation of improved spring[Sr]: Existing improve-springs are contaminated. Further improvements on them are required by capping spring-eye and widening their collectors and protection areas.
(j) Extending the local treatment facility for piped water system[Pt]: Water distributed from these systems are not treated, so that they are being contaminated with high content of Fluoride. Local treatment system is proposed as extended facility on existing piped water system.
(k) Checking the piped water supply[Pc]: piped supplies based on springs or other groundwater source must be checked as to whether the existing water supply capacity excess water can be supplied to neighboring Location.
(l) Restoration of abandoned borehole[BHr]: Boreholes are abandoned due to high contents of Fluoride and saline water. If low-cost and easy maintained treatment facility is available to remove them, such boreholes are to be restored.
(m) Metering consumption of supplied water[Pm]: Water tariff on piped water system is charged per respective water stand, hence the water consumption is not controled, and resulting in far less revenue than the expenses on its maintenance work. The water flow meter is required for appropriate management on existing water supply system.

Apart from water facility plan selected above, sub-surface dam and piped distribution from surface sources are recommended in existing water supply development plan (DWDP,1995). And they were supported by its workshop which was held during WRAP study, as below:

- **subsurface dam:** is now construction at Arabal river as a part of in-take facility of Arabal water supply. It will give us practical experiment on verification whether sub-surface dam is really effective in the Study Area, and further to ASAL area.
- **piped distribution form surface sources:** Phase II program of Kimao dam is comprising of construction of treatment facility and water distribution system

However, these are judged to be too large to promote participatory project with community with self-help activity, therefore these two were excluded from the Plans.

For respective Sub-Location, several types of facility plan are technically selected for verification project as shown in Table 4.3, and as below:

Sub-Location	Type of water facilities and Nos. of proposed sites for *4													
	Pop. *1	BH] *2	[W]	[S]	[Ps]	[R]*3	[Paf]	[Pao]	[Wr]	[Sr]	[Pt]	[Pc]	BHr]	Pm]
Endao	893				1	2	6							
Perkerra	4921					7+(2)								
Yatoi	2623						3					1		1
Eldume	2174	1				2			1				2	
Ilng'arua	1279													
N'gambo	2636					3+(1)	2		2					
Sintaan	1424													
Salabani	1316					3+(2)								
Meisori	2521						2				1			1
Chelaba	775	1		2			2							
Maji Ndege	476			1		3+(1)								
Mbechot	926													
Sandai	855					2								
Kapkuikui	444						1							
Kaptombes	438						2							
Kimalel	624						3						1	
Sabor	1194			4		3+(1)	2			1	1			
Koriema	1466			5	1	5+(2)			1	1	1			
Mukutani	1036	3		1	2	4+(1)	3		1					
Rugus	881													
Arabal	2024	7		6	1		5							
Ngelecha	717													
Kiserian	2000													
Logumgum	790													

Note *1: Information from "Provisional Population Figures" based on 1999 census (Source: District Statistical Office)".
Note *2: Nos. of facility is determined by "Groundwater Potential Survey" completed in this Study.
Note *3: No. of facility is determined by 1993 data of schools and hospital (Source: MOH, Baringo and District Education Office), hence the administrative division of sub-Locations and including Nos. are different from the present. No parenthesis: schools, ():hospital.
Note *4: items [ ] refer to above "box"

As other important issues on the project plan, such that have close relation to the water supply plan: the institutional, financial, social frameworks, and health and hygiene education were not described in this sub-section.

6.2 Technology choice and physical plan prepared by Location

In selecting the most appropriate technology to apply each type of plan, experiences in WRAP study, DWO offices and "Groundwater Development Project in Rural Districts (JICA, 2000)" are adaptable especially for following technical principals:

- In areas where live stock numbers reach livestock carrying capacities, and in areas where no other alternatives, improvement of pan with cattle trough are opted for in addition to boreholes to prevent settling cattle close to boreholes in village center.
- In borehole sites in Arabal and Mukutani, there are supposed to be as Low- Medium potential of groundwater, hence the handpump are to be applicable.

- Construction of borehole is most common requests from villagers, and 12 sites were selected as proposed sites for verification project. Required number of user per borehole indicated in "Design Manual in Kenya (1986)" is being in the ranges of 200 to 500, which should be achieved by adjusting the walking distance. In the WRAP study, number of user per water point were assumed to be 100 as minimum number while 500 as maximum number depending on the cost of the facility. In the Plan for verification project, the required yield per borehole is estimated with taking a figure of 500 users/hole, which can be converted to a demand of $10m^3$/day. The structure of borehole is applied same type of JICA well which is used in Rural Water development in Baringo and Koibatek Districts, as shown in Figure 5-1.
- Handpump type are must be chosen by groundwater levels: Afridev or Indian Mark II is for deeper than 40 m, while Indian Mark II Extra Deep Well or Duba type pump is for 40-70 m.
- At the remote area and having enough yield as much as 30 m^3/day, solar pump may be one of the alternatives. In this case, solar system can employs other functions: for example lighting and desalination and even water treatment.
- In cases of selecting pump type as above, it must be checked whether there are sufficient opportunities for O/M back-up support.
- High concentration of Fluoride in water source can causes skeletal flourosis, Although it will be selected safe water source, Fluoride contamination still remain in number of existing water sources as serious and widespread problem in the Study area. As others, Iron and manganese also affect health indirectly. To mitigate these affection by contaminants, the new treatment technology and method would be applied as long as possible.

Table 3-1 Proposed Villages for Water Resource Survey (1/4)

No.	Name	Location (Sub-Location)	Population	Demand (m3/day)	Distance to present water source (km)	Hrs. required for water-fetching (to/from)	Period forced to be water-fetching	Priority determined by community	Groundwater resource survey ○: done	Esteemed groundwater potential (medium-deep aquifer)		
										Aquifer yield *1	Water quality	Depth (m)
										*1 ○fair, △medium, ▲low, -not detected		
1	Ramacha	Arabal	800	16	10	6.0	Dec-Mar	1	○	▲		40-60
2	Karma		700	38	4	2.5	Aug-Apr	2	○	△		30-50
3	Katilomwo		340	19	3	2.0	year	3	○	△		30-60
4	Kipkoibetu		300	32	6	3.0	Jul-Mar	4	○	▲		30-40
5	Partalo		674	23	7	4.0	Jul-Apr	5	○	▲		40-50
6	Losokoni		250	40	6	4.0	Dec-Apr	6	○	○	saline	80-120
7	Ngelecha primary sc.		350	23	8	8.0	Aug-Apr	7	○	-		
8	Arabal primary school		85	2	0.5	0.5	year	8	○	○		40-70
9	Kapindasum primary school		210	4	0.5	0.5	year	9	○	▲		10-20
10	Chepngerichi		373	20	2	1.5	dry season	10				
11	Kiplelabei		326	17	2.5	2.0	dry season	11				
12	Chepnguwanian		20	1	3	2.0	dry season	12				
13	Kapindasum dispensary		50	2	1	1.0	dry season	13				
14	Loromoru(Likwonte)		238	15	5	4.0	dry season	14				
15	Tapartap-ange		60	8	6	4.0	dry season	15				
16	Sitewe		180	8	5	3.0	dry season	16				
17	Tartarye(Tikoluk)		40	10	10	6.0	dry season	17				
18	Kures		250	10	9	5.0	dry season	18				
19	Joke		200	10	8	5.0	dry season	19				
20	Lamargweny (Eldume primary school)	Eldume	180	7	1	0.5	year	1	○	▲	saline	90-100
21	Lororo centre		180	8	1.5	1.0	year	2	○	▲		60-90
22	Kailer		160	7	3.5	2.0	dry season	3	○	-		
23	Ntepes		200	8	1	0.5	year	4				
24	Ntepes	Ilngarua	276	13	-	4.0	-	1	○	-		
25	Ilngarua primary school		376	8	-	4.0	-	2	○	-		
26	Longewan		300	14	-	2.0	-	3				
27	Ilngarua		284	10	-	2.0	-	4				

Table 3-1 Proposed Villages for Water Resource Survey (2/4)

No.	Name	Location (Sub-Location)	Population	Demand (m3/day)	Distance to present water source (km)	Hrs. required for water-fetching (to/from)	Period forced to be water-fetching	Priority determined by community	Groundwater resource survey ○: done	Esteemed groundwater potential (medium-deep aquifer)		
										Aquifer yield *1	Water quality	Depth (m)
										*1 ○fair, △medium, ▲low, -not detected		
28	Toborweche	kapkuikui	90	5	4.5	3.0	-	1	○	—		
29	Ngarie		160	8	2	1.3	-	2				
30	Poi		105	8	3.5	2.3	-	3				
31	Nyalilbuch		45	6	1.5	1.0	-	4				
32	Loitip	Kiserian	640	16	6	4.0	Aug-Apr	1	○	—		
33	Losaburbur		500	13	4	3.0	Aug-Apr	2	○	▲	saline	30-60
34	Sokotei		1500	36	3	2.0	Jul-Mar	3	○	—		
35	Mosuro		300	50	5	4.0	Jun-Mar	4	○	—		
36	Kieserian center		2000	49	1.5	1.0	year	5				
37	Kapkun	Kimalel (kimalel & Sobor)	620	35	5.6	3.7	4 months	1	○	—		
38	Kimorok		120	10	5	3.3	4 months	2				
39	Kimorok primary school		140	3	5	3.3	4 months	2	○	—		
40	Kapbowen		300	19	5	3.3	3 months	3				
41	Bartulgel		112	9	16	8.0	3 months	4	○	—		
42	Keniayach		130	13	6	4.0	3 months	5	○	—		
43	Tabatkorok-kamungei		150	8	4	2.7	year	6				
44	Kapchumo		400	18	4	2.7	3 months	7				
45	kapngetuny		500	23	5	3.3	3 months	8				
46	Sabor primary school		600	26	1	0.7	year	9				
47	Remus	Kimalel (koriema)	300	34	-	4.0	year	1	○	—		
48	Kapcheptogei		250	27	-	2.5	year	2				
49	Kabirsang		150	10	-	2.5	year	4				
50	Kirambach		130	19	-	1.5	Jul-Mar	5				
51	Chebatakwa		110	22	-	4.0	year	3				
52	Kapronguno	Loboi	300	13	3	2.0	-	1	○	▲		60-80
53	Chepkoinet		100	7	5	3.3	-	2				
54	Chelaba		300	14	3.5	2.3	-	3				
55	Siracho		100	8	5	3.3	-	4				

Table 3-1 Proposed Villages for Water Resource Survey (3/4)

No.	Name	Location (Sub-Location)	Population	Demand (m3/day)	Distance to present water source (km)	Hrs. required for water-fetching (to/from)	Period forced to be water-fetching	Priority determined by community	Groundwater resource survey ○: done	Esteemed groundwater potential (medium-deep aquifer)		
										Aquifer yield *1	Water quality	Depth (m)
										*1 ○fair, △medium, ▲low, -not detected		
56	Barkibi	Marigat (Endao)	500	19	4	2.7	-	1	○	—		
57	Poim		600	24	8	5.3	-	2				
58	Seretyon		400	15	3	2.0	-	3				
59	Ndambul	Marigat (Perikerra)	3000	70	1.5	1.0	-	1	○	▲	saline	40-80
60	Labos Primary School		1500	35	2	1.3	-	2				
61	Perikarra primary school		2000	48	1	0.7	-	3				
62	Nhoswe		1600	39	0.7	0.5	-	4				
63	Kaptich		2000	45	1	0.7	-	5				
64	Sirinyo	Marigat (Yatoi)	700	24	5	3.3	-	1	○	—		
65	Marilat primary school		2500	58	2	1.3	-	2				
66	Kapsoricho		1500	40	5	3.3	-	3				
67	Ndobet		1000	30	2	1.3	-	4				
68	Rabai primary school		1500	37	3.5	2.3	-	5				
69	Parkarin		800	21	1.5	1.0	-	6				
70	Chelaba		180	8	3	2.0	-	7				
71	Akule	Mukutani	300	14	8	6.0	Nov-Feb	1	○	△		
72	Ilmuet		200	25	4	2.0	Nov-Feb	2	○	▲		
73	Karau		375	19	3.5	4.0	Dec-Apr	3	○	—		
74	Lorukon		300	12	2.5	1.7		4				
75	Mukutani center		700	50	1	0.5	year	5	○	—		
76	Iberesati		1000	50	1	0.5	year	6	○	—		
77	Lekerati		400	54	2.5	4.0	Feb-Apr	7	○	○		90-100
78	Morat		150	7	1	0.5	Jan-Apr	8	○	—		
79	Kalingobe (kabigoki)		350	13	3	2.0	Jan-Apr	9				
80	Soision		500	21	1	0.5	year	10				
81	Rugus			0				11	○	—		
82	Loropil	Ngambo (Nagambo)	600	24	-	6.0	-	1	○	—		
83	Masai		397	15	-	4.0	-	3	○	—		

Table 3-1 Proposed Villages for Water Resource Survey (4/4)

No.	Name	Location (Sub-Location)	Population	Demand (m3/day)	Distance to present water source (km)	Hrs. required for water-fetching (to/from)	Period forced to be water-fetching	Priority determined by community	Groundwater resource survey ○: done	Esteemed groundwater potential (medium-deep aquifer)		
										Aquifer yield *1	Water quality	Depth (m)
										*1 ○fair, △medium, ▲low, -not detected		
84	Ilkateyo	Ngambo (Sintan)	50	13	-	3.0	-	1	○	—		
85	Marti(Londiani)	Salabani	350	10	3	2.0	-	1	○	○	saline	
86	Loongion		305	24	2	1.3	-	2				
87	Lontiani		406	10	1	0.7	-	3				
88	Salabani		350	12	2	1.3	-	4				
89	Lorecho		362	15	1.5	1.0	-	5				
90	Lekiricha		200	10	2	1.3	-	6				
91	Ntau		463	14	2	1.3	-	7				
92	Ledeki		192	13	2	1.3	-	8				
93	Idepe		250	10	2	1.3	-	9				
94	Sandai primary school	Sandai	300	11	1	0.7	-	1	○	○	saline	30-50
95	Chepkotoiyan primary school		300	10	1	0.7	-	2	○	○	saline	40-60

Table 4-1 Summary of Field Reconnaissance Survey on Water Points (1/9)

No.	Name	Co-ordinates				Location	Type of Water Point	Established by	Construction year	Present condition	Water taken by	Field Memo
		Zone	Easting	Northing	El.(m)							
1	TEM site (rugus)	37N	181715	70803	990	Mukutani	pan	Maintained by JICA	2000	used	bucket/ container	TEM site (Rugus). Project monitoring site for "Rehabilitation of Pan". Water is not full, its remain about 1/3 of full level and with muddy water.
2	Arabal river (L/S)	37N	179855	57022	990	kiserian	river					Flow rate is considerably low (less than 1m3/sec) and are caused in undercurrent condition. The stream water is used as all purposes, including human drinking, cattle holding, washing and so on.
3	Rugus pan sites	37N	181667	70967	1041	Mukutani	pan					Monitoring site for Rehabilitation of Pan. Water quality test is examined with a sample taken from the U/S pond of rehabilitated pan, which is exclusively used for human drinking for neighboring villagers
4	Molo river	37N	174487	50262	990	Eldume	river					Flow rate is low. Width of steams are about 5m, flowing muddy water, commonly used as all domestic purposes in daily
5	Perikerra irrigation	37N	169605	52284	999	Eldume	channel					Flow rate is not high due to divert water into irrigation canal at the U/S barrage. Water is used in all domestic purpose.
6	Perikerra irrigation channel	37N	166276	52431	1014	Eldume	channel					Irrigation canal. Water is flowing much and is used for not only irrigation but other domestic purposes, including drinking water.
7	TEM site (eldume pr.. sc..)	37N	167697	49838	1014	Eldume	river					TEM (Eldume1). Villagers are fetching water to Molo river.
8	Eldume primary school	37N	168230	50768	996	Eldume	dug well	Inter AID	1993	break down	hand pump	9 classes with 425 pupils. Hand dug-well is constructed at 1993, but it breaks down due to the lowering of groundwater level. Water source of school is now from Molo river even for drinking purpose.
9	Molo river	37N	166336	49271	996	Eldume	river					Flow rate is estimated as 1.5 m3/sec. Water used for domestic purpose, including drinking washing, and even bathe.
10	Eldume borehole(1)	36N	833939	48397	996	Eldume	boreholes	private	1987	not used		Borehole was constructed for uses of Bogoria hotel, but not used with reason of high Fluorine content. Location is 50 m far from river.
11	Eldume borehole(2)	36N	833822	48278	996	Eldume	boreholes	private	1987	not used		Borehole was constructed for usage of Bogoria hotel, but not used. Location is near river where abundant gauging station is stetted.
12	Head works	36N	833299	47882	1011	Eldume	river					Diversion works, amount of water diverted is 3.0 m3/sec in visual.
13	TEM site (eldume)	37N	833299	47882	1011	Eldume	river					TEM(Eldume1), near river(Molo river) which is used to domestic water.
14	Perikerra river (at RGS:2EE7)	36N	830477	51132	1008	Marigat	river					River, source of marigat drinking water system, gauging station(RGS:2EE7) is located.
15	Kimalel pr. school	36N	822013	51424	1350	Kimalel	tap					8classes with 400 pupils, water sours is tapped water and rain collector About 20 ton water-tank is installed for storing water during dry season (10-4) in the dry season, water is commonly short..
16	Kimalel school borehole					Kimalel	boreholes	MENR		dry		Two wells were drilled by MENR, but dry.
17	River	36N	823964	48502	1344	Kimalel	–					–
18	Kiniyach pan	36N	822861	49810	1356	Kimalel	pan	MENR		used		300 m X 300 m in size, constructed in 1982 by MENR, used for all purpose including human drinking
19	TEM site (kiniyach)	36N	822861	49810	1356	Kimalel	pan	MENR		used		Water sources are pan and Perikerra river(6km far from village). Pan is not available in dry season of Jan.-Mar (3 months). Village is consisting of 130 people, 400 caws and 2000 gouts and 20 sheep.
20	Kimorok pri. school	36N	826718	52276	1356	Kimalel	no source/pan					132 pupils and 8 teachers holding 8 classes, but no water source. Roof catchment is under construction and drinking water is taken by pupils by hand form their home.
21	Kimorok pan	36N	827082	51567	1356	Kimalel	pan			used		100 m X 100 m pond, used by domestic and cattle for neighboring villagers, kimorok primary school, for all purpose including human drinking
22	TEM site (kimorock)	37N	827082	51567	1356	Kimalel	pan/river					Water sources are pan and Perikerra river(5km far from village). Pan is not available in dry season from Dec. - Mar. Village is consisting of 120 people, 400 caws and 1000 gouts.
23	Saboul primary school	36N	818379	45512		Kimalel	W/S	MENR	1999	used	tap	Water system comprising 3 taps is operated. The system is constructed by MENR at 1999, (survey commenced 1991). But it is not sufficient amount for villagers especially in dry season. Alternative water sources are water holes in Sabor river adjacent to the center of village. Village is of 600 people, 400 caws, 3000 gouts,400 sheep and 20 donkeys.
24	Chepkubei pan	36N	819358	42703		kimalel	Pan	MENR	1984	used		100x100 pan, located near the river, water is diverged from river flow. Sedimentation of pan is progressed and filled much, storage capacity decreases, used for cattle and domestic used for villagers.

Table 4-1 Summary of Field Reconnaissance Survey on Water Points (2/9)

No.	Name	Co-ordinates				Location	Type of Water Point	Established by	Construction year	Present condition	Water taken by	Field Memo
		Zone	Easting	Northing	El.(m)							
25	TEM site (kimorock primary school)	36N				Kimalel	no source/pan					132 pupils and 8 teachers holding 8 classes. Roof catchment is under construction and drinking water is taken by pupils by hand form their home.
26	Egerton University, Chemeron Field	36N	825099	54604		Marigat	Borehole			used	submersible pump 2"	Domestic use for cattle and 36 workers, 6hr/day pumping is required for maintaining demand of farm.
27	TEM site (sandai primary school)	36N	175442	43518	1041	Sandai	river/spring					400 pupils and 12 teachers holding 9 classes, water source is spring/river water. Pipe line from the spring source.
28	Wasegres river	37N	175951	43523	1041	Sandai	river/spring			used		Flow rate is about 2m3/sec (measuring 15 hr after rainfall), irrigation water is diverted to canal(JICA renovated project).
29	Bogoria hotel borehole	37N	171741	39711	1041	Sandai	borehole	MENR	1999	used	solar pump	Borehole depth is about 20 m, installed solar pump(50WX6=300W), used for irrigation purpose.
30	TEM site (kairel village)	37N	174727	46059	1011	Sandai	irrigation channel			used	bucket/container	Villagers use irrigation water (from Sandai) for domestic and cattle feeding. But is suffered drought ever years. In dry season, villages take 2 hrs for fetching water to sandai, and even to Loboi.
31	kairel village (CC borehole)	37N	174204	46999	1032	Sandai	irrigation c	CC	1985(drilling fail)	abundant		Christain Chach was drilled borehole in1985, but was failed due to breaking hammer resulting in hard rock.
32	TEM site (Chepkotoiyan primary school)	37N	173904	42078	1038	Sandai	irrigation channel			used	bucket/container	Available water is only form irrigation canal, 300 pupils and 8 teachers hold 8claases.
33	Arabal W/S pipeline	37N	173961	42134	1038	Sandai	W/S			not used	tap	Tap, but no water is supplied for Arabal W/S, for which was broken the water source.
34	Local Irrigation, Molo river	37N	166931	47463	1002	Eldume	irrigation canal			used	bucket/container	Water is not used irrigation. Vegetable and water melon are producing and selling
35	Kapkuikui village	37N	170134	42192	1011	kapkuikui	irrigation canal/spring			used	bucket/container	Irrigation canal flowing (ca. 0.5m3/sec) form Loboi swamp, water is used in all purposes, which includes drinking, cattle, washing bath, an so on.
36	Lorwai hot spring	37N	171655	39900	1011	Roboi	spring			used	bucket/container	Hot spring water, flowing (2-3 m3/sec) form Bogoria hotel.
37	Loboi river	37N	172375	39859	1011	Roboi	river			used	bucket/container	River flow, villagers and school students (bogoria secondary school) are taken water from water-hole on the river bed for using in all purposes.
38	TEM site (kapindasun primary School)	37N	186386	53549	1290	Arabal	river					River flow, school students (200 primary-school students and 30 nursery-schools pupils comprise 8 classes, which is organized by 8 teachers) are taken water from water-hole on the river bed for the use of drinking, cattle feeding and other
39	Arabal river (arabal center,U/S:1)	37N	185978	53526	1290	Arabal	river			used	bucket/container	River flow, flowing rate, ca. 0.5m 3/sec, is little in comparison with normal year due to continuos drought for last year. Villagers are taken water from water-hole on the river bed for the use of drinking, cattle feeding and other domestic use.
40	Chemerongwon pan	37N	187689	50891	1254	Arabal	pan	MENR		used	bucket/container	Constructed 1987 by MENR. Villagers living in the surroundings which is including 4 km far, is gathering the pan for taking water. Water are used for all purposes
41	Arabal river (U/S:2)	37N	188409	50706	1338	Arabal	river			used	bucket/container	Flowing amount is lager than the D/S, it is over 1.0m 3/sec. River water is used as irrigation and other domestic use.
42	TEM site (Arabal primary school)	37N	189390	47719	1338	Arabal	river			used	bucket/container	River flow, school students (76 primary-school students with 8 classes and by 7 teachers) are taken water from river water. Water is used for school farming.
43	TEN site (londiani village)	37N	166931	64196	1029	Salabani	pan/river/lake			used	bucket/container	Villagers use marti pan (distance is 2km from center of village) in rainy season or if water remain in pan. If pan is dried up, villagers dig water hole in neighboring river bed and far fetching water up to 6km; to the lake side. Village population is about 2000. Another water source, Londaini pan, is locating 7km far from the center of village, but it is not functioning due to its

Table 4-1 Summary of Field Reconnaissance Survey on Water Points (3/9)

No.	Name	Co-ordinates				Location	Type of Water Point	Established by	Construction year	Present condition	Water taken by	Field Memo
		Zone	Easting	Northing	El.(m)							
44	Baringo lake (fisheries office)	37N	168888	68428	1026	Salabani				used	bucket/container	Villagers use lake-water as all domestic purposes, but it treated with Alum ($KAl(SO_4)_2.12H_2O$) for drinking purpose.
45												Water quality is made after treatment with Alum
46	Marti pan	36N	833783	64201	1029	Salabani		along with road constructio	1982	used	bucket/container	Pan is used for villagers and cattle, it constructed along with new road construction in 1982
47	EnDow Borehole(CCF well no.2)	36N	832435	59631	1028	Marigat	borehole	CCF	2000		pump not installed	CCF is drilled boreholes on August 2000. Yield is high, so the W/S(level 2; consisting of submersible pump, water tank and pipe line with gravity system) is now constructing.
48	Endow Borehole(CCF well no.1)	36N	831803	61407	1047	Marigat	borehole	CCF	2000		pump not installed	CCF is drilled boreholes on September 2000. Yield is as high as 300 l/min.
49	Ramacha pan	37N	188463	61354	1236	Arabal	pan	village community	1975	used	bucket/container	Pan was constructed in 1970th by villagers contribution. Villagers living in the surroundings which is ranging within 4-5 km far form pan. Water are used for all purposes, but little water remain, 1meter depth, at this present.
50	TEM site (Ramacha village)	37N	188385	61408	1221	Arabal	river/pan					Village population is 800 and 100 hoses, which is located in to 4 different areas. It was spring pouring out, but was dried-up since 20 years ago. Present water source is water-hole digging on the neighboring river-bed in rainy season. If river is dried-up, pan is alternative water source. At drought year, pan is even going to be dried-up, in such case, villagers are fetching water to Arabal river or Mukotani area, where are 10 km far and spending 2 hrs and more by one way.
51	Karma village	37N	189934	56604	1413	Arabal	mountain channel/river			used	bucket/container	From may to July, water flowing is in mountain channel at center of village, villagers are able to use the channel water. For other months, villagers are have to fetch the water to Arabal river, 4 km far form the center of village. Path to river is in slope, so the 1 hr for going to river, and 1.5 hr for way back is needed to take water. Village population is 700 peoples with 74 households, and holds 1200 caws,3000 gouts, 80 donkey and 100 sheep
52	TEM site (karma)	37N	189858	56127	1428	Arabal	river			used	bucket/container	The site is located confluence point of two mountain channels form the north and the south. Until 1980th, the spring was pouring out at northern flank of mountain, The road form Arabal center to the site was constructed by villagers contribution.
53	TEM site (katilommo)	37N	186787	56057	1311	Arabal	river			used	bucket/container	Water source is Arabal river, 3 km far form the center of village. Path to river is in slope, so the 1 hr is needed to reach the river. Village population is 3400 peoples with 42 households, and holds 625 caws,1200 gouts, 70 donkey and 120 sheep. It was planned to make pan, but has not still constructed. The site is located at down reach of village, and concourse of streams flowing form village farming area.
54	Tangolbei	37N	197903	88885	1302	Tangolbei	pan/boreh	CCF(?)	1997	used	hand pump	Water source is and borehole located beside Tangible town. Yield of borehole is about 10 l/min. A lots of people are gathering borehole, hence water amount to be supplied to people is not sufficient for town people and surrounding villagers.
55	TEM site (borehole: JICA WELL 78)	37N	196531	82793	1302	Keohil Chemoigut	river/pan/borehole		2000/July	not used	pump not installed	Water source is in rainy season(March-May) is river near by village. In May - October, water source is changed to pan. Further in dry season, villagers have to fetching water to tangulbei town by taking 3hr. 60 household, ca.1000 people, 1200 caw and 1800 gouts. JICA well is located along road side and near river.
56	Borehole(JICA WELL 79)	37N	202424	88838	1236	Keohil Chemoigut	river/spring/borehole		2001/July	not used	pump not installed	Water source is river-bed in the rainy season. When river is dried-up, little spring is used as alternative source, located far from village and 2 hrs on a lap for conveying water. If drought year, villagers must be going to Tangulbei town and back in mid-dry season by taking 5 hrs. 55 household, ca.500 people, 550 caws and 2500 gouts. JICA well is located near river.

Table 4-1 Summary of Field Reconnaissance Survey on Water Points (4/9)

No.	Name	Co-ordinates				Location	Type of Water Point	Established by	Construction year	Present condition	Water taken by	Field Memo
		Zone	Easting	Northing	El.(m)							
57	TEM site (Ilmuet village)	37N	190912	63852	1206	Mukutani	river/pan			used		Water source is Akule river, 4 km far form the center of village, with taking 1hr + 1hr on foot there and back.. When pan is dried, villagers have to go Mukutani river. Village is consist of 20 households, and are farming 12 acres and have 1000 caws,
58	Akule river (U/S:3)					Mukutani						Water-hole digging in river bed, with depth of 0.5m, water remain little.
59	Akule river (L/S:1)	37N	192233	61861	1272	Mukutani	river			used		Water-hole digging in river bed, with depth of 1.0m. Toward dry season, the hole is to be deepen up to the water table.
60	TEM site (Akule)	37N	192379	61845	1293	Mukutani	river/pan			used		Water sources are both pan and river. In wet season form May.- Oct., villagers can use both sources within 1km distance. At dry season of Nov.-Feb., pan is dried-up annually, villagers have to fetch water to Mukutani river 8km far from village with 6 hrs(3hrs+3hrs). Village community consists of 30 households, and they have 500 caws, 500 gouts. Particularly, in drought year, many caws(ca.4000 caws) are gathering this area to be pastured.
61	Akule pan	37N	191936	62506	1269	Mukutani	pan	village community	1974	used	bucket/container	Pan is using for all domestic purposes including drinking water and for feeding cattle, as well. It was constructed 1974 by village community. At time of observation, the water in pan is almost filled due to last rainfalls and river flow, which is in-taken trough the connection canal from Akule river. But, It will be dried-up on Nov., two months later from last rainfall, and resume storage at the begin of next rainy season on March.
62	TEM site (partalo nursery schools)	37N	182336	59036	1131	Arabal	depression/river			used	bucket/container	Water source is shallow depression in the rainy season (May-June). When depression is dried-up, Arabal river is used as alternative source, located 7km far from village and 4 hrs on a lap for conveying water. 84 household, 674 people, 427 caws and 1424 gouts, 95 sheep, 26 donkey. Nursery school is of 64 pupils and 1 teacher.
63	TEM site (mukutani center)	37N	193871	70262	1254	Mukutani	river/spring			used	bucket/container	Water source is Mukutani river and spring where is located 3km far from the center. Both are perennial stream and flow, so villagers are used all the year around. There are Mukutani primary school and dispensary. School has 8 classes held with 200 students and 7 teachers. Dispensary has about 10 rooms. In the surroundings of the center 700 people, 2000 caws and 3000 gouts, and sheep. 100-300 donkeys.
64	TEM site (karau)	37N	187451	66752	1194	Mukutani	pan/river			used	bucket/container	Water source is pan in the rainy season (May-Nov.). When pan is dried-up, Losukueta river and Mukutani river are alternative water source, located 7km far from village and 4 hrs on a lap for fetching water. 75 household, 375 people, 200 caws and 3000 gouts, 150 sheep. 2 donkey.
65	Losukueta river	37N	190715	69906	1131	Mukutani	river			used	bucket/container	River flow is interrupted into small muddy ponds on river bed, due to very little water. Villagers dig water-hole on river bed for collecting clean water by small cup/bucket.
66	Mukutani river	37N	193655	70179	1260	Mukutani	river			used	bucket/container	Flow rate is about 0.5 m3/sec. Almost clear-water, however containing some suspended material, is flowing down along the southern boundary of Mukutani center. Villagers use the water as all the domestic purposes and irrigation, as well.
67	Karau pan	37N	187481	65721	1185	Mukutani	river	MENR/village community	1987/1985	used	bucket/container	There are three pans, consisting of Large;100x70, Middle;100x50 and Small;50x20m. If runoff takes place in the rainy season, such rain-water is initially caught by Large pan. If Large pan is once fill-up, its storage-water is spilled over to the Middle pan. Next to Middle pan, Small pan is filled by water from Middle pan. However, all the pans are dried up annually at the end of Nov. in average weather condition. Villagers use Small pans for domestic purpose. Large pan was constructed MENR in 1987. Middle pan is through of natural depression (or very old pan), and small pan was constructed in 1985 by village community with man-
68	Bogoria Lake (hot spring)	37N	175292	28336	990	Loboi	lake			used	bucket/container	Bogoria hot spring located southern end of lake
69	Bogoria Lake (north)	37N	174354	36963	1020	Loboi	lake			used	bucket/container	Water sample is taken at northern end of Bogoria lake. Contents of NO_3 can not be obtained by pack-test due to very intense chemical reaction.
70	TEM site (kipkoibetu)	37N	186617	35816	1383	Arabal	river			used	bucket/container	Water source is small streams near village in the rainy season (Apr-June.). When steam is dried-up, Arabal river are alternative water source, located 2km from village center 1 hrs on a lap for fetching water. House located farthermost from water source is 6 km with 3 hrs. 60 household, 300 people, 1200 caws and 3000 gouts, 600 sheep.

Table 4-1 Summary of Field Reconnaissance Survey on Water Points (5/9)

No.	Name	Co-ordinates				Location	Type of Water Point	Established by	Construction year	Present condition	Water taken by	Field Memo
		Zone	Easting	Northing	El.(m)							
71	TEM site (neglecha pry. sc..)	37N	196044	56557	2094	Arabal	river/pan			used	bucket/container	Water source is streams near site only in the rainy season (May-July.) within 3 km distance. When steam is dried-up, pan locating neighboring private ranch 3 km far from village and river (8km with 8hs) are alternative water source. 52 household, 350 people, 500 caws and 1500 gouts, 2000 sheep and 28 donkey. 150 pupils and 7 teachers holding 8 classes.
72	Loskeita river (U/S:1)	37N	194367	67661	2094	Mukutani	river			used	bucket/container	Pond on river bed caused by recent rainfall, used for cattle watering
73	TEM site (murat)	37N	193660	66480	1227	Mukutani	river/spring			used	bucket/container	Water source is Murat river located east of village. In the rainy season (May-Dec.), villagers uses for domestic water. When river is dried-up, Ilpirisati spring is alternative water source, located 1km from village center 0.5 hrs on a lap for taking water. 28 household, 150 people, 200 caws and 300 gouts, 50 sheep.
74	Murat river	37N	193797	66486	1260	Mukutani	river			used	bucket/container	Pond on river bed caused by recent rainfall, used for domestic and cattle watering
75	ilpirisati hot spring	37N	194225	67647	1269	Mukutani	spring			used	bucket/container	Spring, its flow rate can not be measured due to broad area (300 m x 150m) of spring pouring, but is not much. At the down-stream, spring water is merging into the ground. Water used for cattle watering and bath.
76	ilpirisati spring (cool)	37N	193498	67690	1269	Mukutani	spring			used	bucket/container	Spring site with 5X5m. its flow rate is about 150 l/min. Streams pouring out from spring are to flowing to both Murat river and neighboring depression for cattle watering. Flow rate is not changed through a year.
77	TEM site (iberesati)	37N	193493	67730	1248	Mukutani	spring			used	bucket/container	Water source is Ilpirisati spring in the village. User of spring is 100 households, 1000 people, and providing water to 1000 caws and 4000 gouts, 100 sheep and 60 donkeys.
78	Akule river (D/S)	37N	189845	67240	1185	Mukutani	river			used	-	Puddles rest on river-bed caused by recent rainfall, used for cattle watering
79	Losokoni pan	37N	191932	59162	1197	Arabal	pan	MOA/village	2000/June	used	bucket/container	Pan is 100x70 m in size, but water is not full and is with muddy water. It is usually dried up until end of November. It was renovated by both community and MOA in june/2000.
80	TEM site (losokoni)	37N	191593	58600	1150	Arabal	river/pan			used	bucket/container	Water source during the rainy season (May-Aug.) is Akule river flowing near village. Flowing water is commonly taken form river-bed for domestic use. When stream is dried up, the pan is to be alternative water source, but until end of Nov.(June-Nov). After dried up of pan, villagers have to fetch water even to Losukueta river, which is locating 6km far from village (or 4 hrs on a lap) for taking water. Village is of 25 households, 250 people, 2000 caws and 3000 gouts, 200 sheep and 25 donkeys.
81	Lekerati river	37N	195888	64517	1290	Mukutani	river			used		Seepage water flowing from river-bed, discharge is about 200 l/min. During Feb.-Mar, stream is dried up.
82	Well (lekerati)	37N	195900	64520	1290	Mukutani	well	Gospel church	1991	not used		Well was build with the assistance of Gospel Church in 1991. But, hand pump, which had been installed, was stolen in 1998. Up to now, well is still abandoned, and is also plugging by woods, stones and soils. No of well curved on basement is "KA-97".
83	Lekerati village	37N	196103	64773	1305	Mukutani	river			used	bucket/container	Water source is Loskeita river flowing in the village center. When the river is dried up during Feb-May, villagers seek water source toward the upper steam of Loskeita river far beyond 5 km far, or 4 hrs on lap, from center of village. At the surroundings of the village, there is 45 households, 400 people, 3000 caws and 2000 gouts, and 100 sheep and 50 donkeys.
84	Soision					Mukutani	river				bucket/container	Water source is Sosion river flowing in village through all the year, and stream is persistently used as domestic purpose. But, microbe such as Amoeba is living in steam, so that water must be boiled before used. Village have 50 households, 500 people, 500 caws and 1600 gouts, 80 sheep and 20 donkeys.
85	Kalingobe					Mukutani	river				bucket/container	Water sources in rainy season (May.-Dec.) is Loskieta river 2km from village (1.5hr on lap) . Villager is taking water from water-hole dug in the river bed. In he dry season (Jan.-Apr.), Mukutani river 3km from village (3 hrs on lap). Village is of 36 households, 350 people, 230 caws and 800 gouts, 50 sheep and 100 donkeys.

Table 4-1 Summary of Field Reconnaissance Survey on Water Points (6/9)

No.	Name	Co-ordinates				Location	Type of Water Point	Established by	Construction year	Present condition	Water taken by	Field Memo
		Zone	Easting	Northing	El.(m)							
86	TEM site (kapkun)		821702	43893	1290	Kimalel	river				bucket/container	Seasonal river. Stream water is used as nearest water point from the center of village.
87	Kapkun village		822171	43677	1290	Kimalel	river/pan			used	bucket/container	Water sources are pan, Kapkun river(3 km from village), Emwon river and Mangar river. Pan and Emwon river is seasonal water source (May to Nov.). Mangar river is solely perennial river, locating 5.6km far from village (2hrs on lap) . Villager is using this stream water as drinking purpose. Village is of 90 households, 620 people, 800 caws and 4000 gouts, 500 sheep and 100
88	Kapkun pan		822544	44429	1290	Kimalel	pan			used	bucket/container	Pan is locating near the village center and providing seasonal water source. Villager uses this as domestic purpose without drinking water.
89	TEM site (bartulgel)	36N	826717	55125	1170	Kimalel	dam/river/well			used	bucket/container	Water source during the rainy season (May-Nov.) is Chemeron dam and natural depression on the river bed (8km or 4hrs on lap). When dry season, villager goes to Perikerra river locating 16 km far from village and taking 8hrs on lap for fetching the water. In last drought, borehole owned by Egerton Univ. Chmeron Field Station, locating 3km far from village, was provided as emergency water source. Village is of 30 households, 112 people, 200 caws and 1500 gouts.
90	TEM site (loitip)	37N	177952	51572	1185	Kiserian	river/lake					Water sources are stream, lake, Molo river and Perikerra river. In the rainy season (Mar-May), stream flowing along village is used as domestic use. When stream is died, the lake; called as "lake 94" by local people which is locating north of Baringo lake(3km far, 2hrs on lap.), Molo river (6km far, 4hrs on lap), and Perikerra river(8km far,6hrs on lap) are alternative water sources. Village is of 80 households, 640 people, 50 caws(before last year's drought,800 caws were grazing) and 800 gouts.
91	lake 94	37N	177059	52018	1000	Kiserian	lake					Wide and shallow pond spreading south of lake Baringo. It was initially formed by wet year caused 1994, thus called as "lake 94" as local name. However, it had been died again in the drought like as that of 1999. The water gathered in pond is often used in dry season as all the domestic use, including cattle watering, bathing, washing and even drinking purpose.
92	TEM site (losaburuburu)	37N	176442	49429	1008	Kiserian	river/lake					Water sources are stream, lake, Molo river and Perikerra river. In the rainy season (Mar-May), stream flowing along village is used as domestic use. When stream is died, the lake; called as "lake 94" by local people which is locating north of Baringo lake(3km far, 2hrs on lap.), Molo river (6km far, 4hrs on lap), and Perikerra river(8km far,6hrs on lap) are alternative water sources. Village is of 80 households, 640 people, 50 caws(before last year's drought,800 caws were grazing) and 800 gouts.
93	Molo river (D/S, water hole)	37N	174453	50379	1008	Kiserian	river					Villager is taking from water hole dug in the dried river-bed until November.
94	Sokotei					Kiserian	river/ Arabal W/S					Water sources are lake (3km far, 2hrs on lap), Arabal W/S, Molo river and Perikerra river. Arabal W/S is not used now by under re-construction. Village is consisting of 150 households, 1500 people, 200 caws, and 1000 gouts, 300 sheep.
95	kieserian					Kiserian	river/ arabal W/S/lake					Water sources are of Baringo lake (1.5km far, 1hrs on lap), Arabal W/S. Village is consisting of 200 households, 2000 people, 250 caws, 1500 gouts, 600 sheep and 30 donkeys.
96	Kapbowen					Kimalel	pan/river					Water sources are of Keniach Pan (8km far) and Perikerra river (5km far). Pan is not available in dry season of Jan.-Mar (3 months). Village is consisting of 300 people, 500 caws and 2000 gouts ,200 sheep and 20 donkeys.
97	Tasankorok					Kimalel	river					Water source is Endao river (4km far). River is perennial. Village is consisting of 150 people, 200 caws and 1000 gouts and 50
98	Kapchumo					Kimalel	pan/river					Water sources are of Keniach Pan (4km far) and Temo stream (3km far). Pan is not available in dry season of Jan.-Mar (3 months) and stream is dried form Dec to Mar.(4months). Village is consisting of 400 people, 400 caws and 1500 gouts and 200

Table 4-1 Summary of Field Reconnaissance Survey on Water Points (7/9)

No.	Name	Co-ordinates				Location	Type of Water Point	Established by	Construction year	Present condition	Water taken by	Field Memo
		Zone	Easting	Northing	El.(m)							
99	kapngetuny					Kimalel	pan/river					Water sources are of Keniach Pan (2km far) and Sabor river (5km far). Pan is not available in dry season of Jan.-Mar (3 months) and river is dried form Dec to Mar.(4months). Village is of 500 people, 500 caws and 2000 gouts, 300 sheep and 30
100	TEM site (borehole: JICA Well 86,Kabairwok)	37N	185614	53100	1278	Arabal	-	JICA	2000	not used	pump not installed	Drilled at the middle of September by JICA not installed pump
101	TEM site (borehole: JICA Well 85,Chemerongwon)	37N	184157	50650	1287	Arabal	-	JICA	2000	not used	pump not installed	Drilled at the August by JICA not installed pump
102	TEM site (borehole: JICA Well 84,Sienori pr.. sc.)	37N	189004	41881	1326	Mochongoi		JICA	2000	not used	pump not installed	Drilled at the September by JICA not installed pump
103	TEM site (borehole: JICA Well 83,seretion)	37N	190074	44503	1326	Mochongoi		JICA	2000	not used	pump not installed	Drilled at the September by JICA not installed pump
104	TEM site (borehole: JICA Well 82,seretion)	37N	189307	45340	1461	Kaseila		JICA	2000	not used	pump not installed	Drilled at the September by JICA not installed pump
105	TEM site (borehole: JICA Well 83A,kaseila)	37N	188585	46525	1455	Kaseila		JICA	2000	not used	pump not installed	Drilled at the September by JICA not installed pump
106	Hemitian river	37N	188533	46503	1455	Kaseila						Pond in river-bed caused by recent rainfall.
107	Kasie spring	37N	190152	47543	1455	Kasie						Hot spring locating at the foot of Kapkosom ridge, and is yielding over 80 l/min. Range of spring source is 40m x 30m, and it is providing water to glassy land down stream. From the spring source, three outlets are setting for bathing, cattle watering and drinking, respectively by community.
108	Ngusero river	37N	185554	48979	1455	Chebinyiny						Pond in river-bed caused by recent rainfall.
109	TEM site (borehole: JICA Well 81,chebinyiny)	37N	184791	46414	1524	Chebinyiny		JICA	2000	not used	pump not installed	Drilled at the October by JICA not installed pump
110	Water sample1(kipramoi spring)	36N	813793	54101	1510		Spring	MENR/village		used	taps	Water source of Koriema W/S, in-take is with small barrage and 2" pipe. Flow rate is about 200-300 l/min.
111	Water sample2(kimao dam)	36N	815820	50016	1524	kimalel	Dam	Kerio valley water development authority		not used		Kimao dam is gravity type dam, and total capacity of reservoir is 288,000 m3. Effective storage is 142,000, height 25m, length 35m and catchment area is 7.8 km2. This dam was planed for domestic and irrigation purpose for Koriema, Kimalel and Kimorock. But, reservoir have been only constructed in 1998 as phase I. The phase II, comprising of treatment system and distribution system, is not commenced up to the present.
112	Water sample3(keben spring)	36N	815563	46134	1530	kimalel	Spring	MENR/village	2000	used	taps	Water source of Sabour W/S, in-take is with small barrage and 2" pipe. Flow rate is 30 l/min. water system provides water by 22 taps.
113	Water sample4(egerton Univ. well)	36N	816724	46576	1578	kimarel	borehole	personal		used		Borehole build in Egerton University, Chemeron Field station. Water is warm and saline. Domestic use for cattle and 36 workers and neighboring villagers. Yield is little and 6hr/day pumping is required for maintaining demand of farm.
114	Water sample5(arabal W/S, treatment water)	37N	180210	56861	894	Kiserian	river	national water supply co-operation		not used		Arabal W/S was destroyed by heavy flood took place in 1994 and 1997by world -wide effect of El-nino. W/S system including dam and pipelines are under re-constructed by Nation Water Supply and Cooperation. The construction is commenced at summer 2000, and will be terminated with 1 year. Finance is made with assistance of world bank.

Table 4-1 Summary of Field Reconnaissance Survey on Water Points (8/9)

No.	Name	Co-ordinates				Location	Type of Water Point	Established by	Construction year	Present condition	Water taken by	Field Memo
		Zone	Easting	Northing	El.(m)							
115	Arabal Dam D/S (water source of arabal W/S)	37N	181869	57273	894	Kiserian	river	national water supply co-operation		not used		D/S of constructing dam site.
116	Water sample6(kasie spring)	37N	190158	47543	1416	Kasie	spring	Christian Church		used		Hot spring locating at the foot of Kapkosom ridge, and is yielding over 80 l/min. Range of spring source is 40m x 30m, and it is providing water to glassy land down stream. From the spring source, three outlets are setting for bathing, cattle watering and drinking, respectively by community. The construction, fencing around spring and taps, was made with assistance of Christian church. Villagers have further plan to extend the survive area to the D/S.
117	Water sample7(arabal river at arabal center)	37N	186014	53619	1416	Arabal	river			used		Flow rate expecting about 1.0m 3/sec is higher than that of normal flow due to recent rainfall (22/Oct.). Villagers living in surroundings are taken water from water-hole on the river bed or directly from river stream for the use of drinking, cattle feeding and other domestic use.
118	Water sample8(Perikerra river at RGS:2EE7)	36N	830435	51332	1416	Marigat	river			used		River, source of Marigat drinking water system, gauging station(RGS:2EE7) is located.
119	Sokoteiwo pan	37N	167947	45480	1416	loboi	pan	World vision		used	bucket/container	This pan was constructed by World Vision, and is used for all the domestic purpose. Villagers want to use the reservoir as irrigation as well in their future plan.
120	Water sample9(chelaba spring)	37N	171480	39951	1416					used	bucket/container	Measure water source of Loboi village, villagers use this source as mainly drinking water. The yield is high as about 0.7m3/sec. Village has new plan to provide water to upper part of village by W/S.
121	Water sample10(wasegres river)	37N	175951	43523	1041	Sandai	river/spring			used	bucket/container	Flow rate is about 4-5m3/sec (measuring after heavy last rainfall), irrigation water is diverted to canal(JICA renovated project).
122	Water sample11(perkier river D/S)	37N	172069	51400	1002					used	bucket/container	Main water sources for village. Villagers taken water from water hole dug in the river bed.
123	Perikerra irrigation channel(R6)	37N	169930	52385	1002					used	bucket/container	Main water sources for village. Villagers taken water from directly from irrigation canal.
124	Lorwai hot spring	37N	171655	39900	1011	Loboi	spring			used	bucket/container	Hot spring water, flowing (2-3 m3/sec) form Bogoria hotel. Water is used for cattle watering, and car wash.
125	Water sample12(losukueta river)	37N	190653	69971	1100	Mukutani	river			used	bucket/container	Villagers dig water-hole on river bed for collecting clean water by small cup/bucket.
126	Water sample13(mukutani river)	37N	193766	70177	1100	Mukutani	spring			used	bucket/container	Flow rate is about 0.5 m3/sec. Whitish water, containing some algae and organic material, is flowing down along the southern boundary of Mukutani center. Villagers take the water for water hole on river-bed for all domestic purposes and irrigation, as
127	Water sample14(lelerai spring)	37N	197748	71575	1370	Mukutani	spring			used	bucket/container	Clean water, discharge is about 10 l/min, villagers constructed barrage to trap water, and use in all domestic purpose. EL.1370m which can be obtained 250 m head form mukutani center.
128	Water sample15(ilpirisati hot spring)	37N	194225	67647	1269	Mukutani	spring			used	bucket/container	Spring, its flow rate can not be measured due to spreading broad area (300 m x 150m) of spring pouring, but is not much. At the down-stream, spring water is merging into the ground. Water used for cattle watering and bath.
129	Water sample16(ilpirisati cool spring)	37N	193498	67690	1269	Mukutani	spring			used	bucket/container	Spring site with 5X5m. its flow rate is about 150 l/min. Streams pouring out from spring are to flowing to both Murat river and neighboring depression for cattle watering. Flow rate is not changed through a year.
130	Iiboiloi pan	37N	172840	54627	1014	Ngambo	pan	community	1984	used	bucket/container	Pan is mainly used for cattle watering. Water is not much stored due to filled up most of reservoir by silty deposits.
131	Water sample17(sesiai UNICEF well)	37N	173831	54363	1008	Ngambo	well	UNICEF	1994	used	hand pump	Hand dug well, installed by UNICEF in 1994. At same times, UNICEF made 4 wells in Ngambo, but 2 have been broke out without any repairing up to now. Water community is not organized.
132	Water sample18(katanin canal)	37N	170827	41782	1047	Kapkuiki	canal	community		used	bucket/container	Irrigation canal flowing over 1.0m3/sec form Loboi swamp, water is used in all purposes, which includes drinking, cattle, washing bath, an so on.

Table 4-1 Summary of Field Reconnaissance Survey on Water Points (9/9)

No.	Name	Co-ordinates				Location	Type of Water Point	Established by	Construction year	Present condition	Water taken by	Field Memo
		Zone	Easting	Northing	El.(m)							
133	Water sample19(molo river)	37N	166329	49269	1017	Eldume	river			used	bucket/container	Flow rate is high. Width of steams are about 15m, flowing muddy water, commonly used as all domestic purposes in dally villagers' life.
134	Water sample20(marigat W/S)	36N	832676	51906	1038	Marigat	W/S			used	taps	W/S marigat, row water is in-taking from Perikerra irrigation canal, treated with Alum ($AlSO_4$), and chorine before distribution. Service area is Marigat township.
135	Water sample21(kampi ya samaki W/S)	36N	169231	69000	1038	Salabani	W/S	MENR	1989	used	taps/bucket/container	W/S was constructed by MENR in 1989, but water tank have been not completed yet. Accordingly, treated water is pumping directly to the distribution lines and taps every morning. About 3000 villagers are provided by the W/S. Operation cost without personnel cost of treatment plant is spent by uses.
136	Water sample22(Chemeron irrigation canal)	36N	832454	57076	1137	Marigat	canal	Kerio valley water development authority	1983	used	bucket/container	Villagers use canal water, which is conveyed from Chemeron dam reservoir locating 2.5km east. About 4500 villagers utilize water for all the domestic purposes and irrigation water, as well.
137	Chemron dam	36N	830076	56748	1137	Marigat	dam	Kerio valley water development authority	1983	used	bucket/container	Earth dam, 380 m long with 31m high, was constructed by Kerio Valley Water Development Authority with contract by H.Z. co.ltd in 1983. Dam storage is of 4600,000 m3, but has been suffered by siltation in reservoir and crack of embankment.

Table 4-2 Field Water Quality Test (Outline of test results) (1/2)

No.	Name	Date (day-m)	UTM co-ordinates			Location	Water point	Present condition	Water quality parameters in field test							
			Zone	Easting	Northing				Fe	Mn	NO_3	F	NH_4	EC	pH	Tem
1	Chemerongwon pan	2-Oct	37N	187689	50891	Arabal	pan	used	2.0	–	0.0	> 5	0.0	344	8.1	31.4
2	Ramacha pan	4-Oct	37N	188463	61354	Arabal	pan	used	5.0	5.0	0.0	> 5	2.0	624	7.8	29.3
3	Losokoni pan	13-Oct	37N	191932	59162	Arabal	pan	used	5.0	5.0	0.0	2.0	5.0	340	8.4	30.5
4	Arabal river (arabal center,U/S:1)	2-Oct	37N	185978	53526	Arabal	river	used	0.5	–	0.0	1.0	0.0	666	8.8	30.4
5	Arabal river (U/S:2)	2-Oct	37N	188409	50706	Arabal	river	used	1.0	–	1.0	1.0	0.0	634	8.5	29.7
6	Ngusero river	19-Oct	37N	185554	48979	Chebinyiny	river	not used	–	–	–	–	–	94	8.1	33.2
7	Perikerra irrigation channel	24-Sep	37N	166276	52431	Eldume	canal	used	0.3	<0.5	<1.0	1.0	0.1	141	–	30.8
8	Eldume primary school	25-Sep	37N	168230	50768	Eldume	dug well	break down	1.0	0.0	1.0	>5.0	0.1	459	8.1	33.9
9	Local Irrigation, Molo river	30-Sep	37N	166931	47463	Eldume	canal	used	0.1	0.0	0.0	2.0	0.1	185	7.9	33.7
10	Molo river	24-Sep	37N	174487	50262	Eldume	river	used	1.5	<0.5	1.0	1.0	0.1	215	–	25.6
11	Molo river	25-Sep	37N	166336	49271	Eldume	river	used	0.2	0.0	0.0	0.5	0.0	324	7.4	27.1
12	Molo river	27-Oct	37N	166329	49269	Eldume	river	used	–	–	–	–	–	215	7.8	28.5
13	Katanin canal	27-Oct	37N	170827	41782	Kapkuikui	canal	used	1.0	0.0	0.0	0.2	>5	719	7.5	26.4
14	Kapkuikui village	30-Sep	37N	170134	42192	kapkuikui	canal	used	0.2	0.0	0.0	> 5	0.1	672	7.7	30.3
15	Kasie spring	19-Oct	37N	190152	47543	Kasie	spring	used	0.2	0.0	1.0	1.0	0.1	522	9.0	32.3
16	Kimao dam	23-Oct	36N	815820	50016	kimalel	dam	not used	1.0	1.0	0.0	0.5	0.5	–	–	–
17	Kiniyach pan	27-Sep	36N	822861	49810	Kimalel	pan	used	2.0	1.0	1.0	1.0	0.2	143	7.3	29.0
18	Kimorok pan	27-Sep	36N	827082	51567	Kimalel	pan	used	0.5	0.0	0.0	1.0	0.1	242	8.6	31.9
19	Chepkubei pan	28-Sep	36N	819358	42703	kimalel	Pan	used	2.0	1.0	0.0	2.0	0.0	166	7.4	29.7
20	Kapkun pan	16-Oct	36N	822544	44429	Kimalel	pan	used	0.5	0.0	0.0	2.0	0.2	284	9.6	34.0
21	Keben spring	23-Oct	36N	815563	46134	kimalel	spring	used	0.2	0.0	0.0	>5	0.2	763	8.0	22.9
22	Saboul primary school	28-Sep	36N	818379	45512	Kimalel	W/S	used	0.2	0.0	1.0	> 5	0.1	765	7.7	28.3
23	Hemitian river	19-Oct	37N	188533	46503	Kiseilan	river	used	0.5	0.0	0.0	1.0	0.1	253	8.5	32.8
24	lake 94	17-Oct	37N	177059	52018	Kiserian	lake	used	2.0	0.0	0.0	>5	0.0	618	8.7	38.1
25	Arabal river (L/S)	24-Sep	37N	179855	57022	Kiserian	river	used	2.0	0.0	0.0	>5.0	0.1	621	6.3	26.4
26	Molo river (D/S, water hole)	17-Oct	37N	174453	50379	Kiserian	river	used	0.5	0.0	5.0	2.0	0.1	443	7.2	28.7
27	Bogoria Lake (hot spring)	10-Oct	37N	175292	28336	Loboi	lake	used	0.5	0.0	0.0	> 5	0.5	####	8.7	–
28	Bogoria Lake (north)	10-Oct	37N	174354	36963	Loboi	lake	used	>10	0.0	–	> 5	0.3	>2000	10	35.2
29	Sokoteiwo pan	25-Oct	37N	167947	45480	Loboi	pan	used	–	–	–	–	–	81	8.1	30.5
30	Loboi river	30-Sep	37N	172375	39859	Loboi	river	used	0.1	0.0	2.0	> 5	0.1	695	8.6	35.1
31	Lorwai hot spring	30-Sep	37N	171655	39900	Loboi	spring	used	0.0	0.0	5.0	> 5	0.1	642	7.3	34.6
32	Lorwai hot spring	25-Oct	37N	171655	39900	Loboi	spring	used	–	–	–	–	–	743	7.1	35.3
33	Chelaba spring	25-Oct	37N	171480	39951	Loboi	spring	used	0.2	0.0	5.0	2.0	0.1	751	6.9	36.6

Table 4-2 Field Water Quality Test (Outline of test results) (2/2)

No.	Name	Date (day-m)	UTM co-ordinates			Location	Water point	Present condition	Water quality parameters in field test							
			Zone	Easting	Northing				Fe	Mn	NO_3	F	NH_4	EC	pH	Tem
34	Egerton University, Chemeron Field	28-Sep	36N	825099	54604	Marigat	borehole	used	0.1	0.0	2.0	> 5	0.1	886	7.2	–
35	Chemeron irrigation canal	28-Oct	36N	832454	57076	Marigat	canal	used	0.5	0.0	1.5	1.0	0.1	199	8.6	27.3
36	Perikerra river (at RGS:2EE7)	26-Sep	36N	830477	51132	Marigat	river	used	0.3	0.0	0.0	0.5	0.0	230	7.7	28.9
37	Perikerra river at RGS:2EE7	25-Oct	36N	830435	51332	Marigat	river	used	1.0	0.5	1.0	1.0	0.1	87	7.5	22.9
38	Marigat W/S	27-Oct	36N	832676	51906	Marigat	W/S	used	0.5	0.0	1.0	0.0	0.5	202	4.9	32.2
39	TEM site (rugus)	23-Sep	37N	181715	70803	Mukutani	pan	used	–	–	–	2.0	–	–	–	–
40	Rugus pan sites	24-Sep	37N	181667	70967	Mukutani	pan	used	–	–	–	2.0	–	151	–	32.0
41	Akule pan	7-Oct	37N	191936	62506	Mukutani	pan	used	0.5	1.0	0.0	1.0	0.2	179	8.3	31.9
42	Akule river (L/S:1)	7-Oct	37N	192233	61861	Mukutani	river	used	0.5	0.0	0.0	> 5	0.1	240	7.0	31.7
43	Losukueta river	9-Oct	37N	190715	69906	Mukutani	river	used	0.5	0.0	0.0	> 5	0.1	356	8.0	32.4
44	Mukutani river	9-Oct	37N	193655	70179	Mukutani	river	used	0.5	0.0	1.0	> 5	0.0	####	8.8	28.8
45	Karau pan	9-Oct	37N	187481	65721	Mukutani	river	used	1.0	1.0	0.5	> 5	0.5	186	8.1	31.5
46	Loskeita river (U/S:1)	12-Oct	37N	194367	67661	Mukutani	river	used	1.0	0.5	<1	0.7	0.1	70	6.7	31.5
47	Murat river	12-Oct	37N	193797	66486	Mukutani	river	used	0.5	1.0	0.0	1.5	0.0	750	7.3	30.3
48	Akule river (D/S)	13-Oct	37N	189845	67240	Mukutani	river	used	2.0	0.5	–	2.0	0.1	237	8.4	31.3
49	Lekerati river	14-Oct	37N	195888	64517	Mukutani	river	used	0.2	0.0	2.0	1.5	0.2	629	7.1	32.9
50	ilpirisati hot spring	12-Oct	37N	194225	67647	Mukutani	spring	used	1.0	0.0	<1	1.5	0.1	945	9.1	35.8
51	ilpirisati spring (cool)	12-Oct	37N	193498	67690	Mukutani	spring	used	0.5	0.0	1.0	0.7	0.0	615	6.8	29.9
52	Lelerai spring	26-Oct	37N	197748	71575	Mukutani	spring	used	0.2	0.0	0.0	0.5	0.1	783	8.1	26.7
53	Akule river (U/S:3)	–	–	–	–	Mukutani	river	used	1.0	0.0	2.0	1.0	0.2	264	7.9	32.4
54	Ilboiloi pan	27-Oct	37N	172840	54627	Ngambo	pan	used	2.0	0.0	0.0	0.2	1.5	225	9.3	36.5
55	Perkier river D/S	25-Oct	37N	172069	51400	Ngambo	river	used	0.0	0.0	0.0	0.5	0.1	228	8.2	21.7
56	Sesiai UNICEF well	27-Oct	37N	173831	54363	Ngambo	well	used	0.5	0.5	0.0	0.2	2.0	564	7	27.1
57	Baringo lake (fisheries office)	3-Oct	37N	168888	68428	Salabani	lake	used	2.0	0.5	0.0	> 5	0.0	####	8.9	33.7
58	Marti pan	3-Oct	36N	833783	64201	Salabani	pan	used	0.2	0.0	0.5	0.3	0.1	217	7.9	34.2
59	Kampi ya samaki W/S	28-Oct	36N	169231	69000	Salabani	W/S	used	0.5	0.0	1.0	3.0	0.1	####	6.2	33.3
60	Baringo lake (fisheries office)	3-Oct	37N	168888	68428	Salabani	lake	used	0.5	0.0	0.0	1.0	0.0	–	–	–
61	Bogoria hotel borehole	29-Sep	37N	171741	39711	Sandai	borehole	used	2.0	0.0	5.0	2.0	0.1	990	7.3	33.1
62	Wasegres river	29-Sep	37N	175951	43523	Sandai	river/spring	used	2.0	0.0	1.0	1.0	0.1	233	778	31.5
63	Tangolbei	6-Oct	37N	197903	88885	Tangolbei	pan/borehol	used	0.1	0.0	2.0	3.0	0.1	951	7.7	33.0
64	Kipramoi spring	23-Oct	36N	813793	54101	–	spring	used	0.5	0.0	3.0	0.5	0.0	336	8.1	21.7

Table 4-3 Field Water Quality Test (condition of sampling points) (1/4)

No.	Name	Water quality parametres tested in field								Memorandum on sampling point
		Fe	Mn	NO_3	F	NH_4	EC	pH	Tem	
1	Chemerongwon pan	2.0	–	0.0	> 5	0.0	344	8.1	31.4	Constructed 1987 by MENR. Villagers living in the surroundings which is including 4 km far, is gathering the pan for taking water. Water are used for all purposes.
2	Ramacha pan	5.0	5.0	0.0	> 5	2.0	624	7.8	29.3	Pan was constructed in 1970th by villagers contribution. Villagers living in the surroundings which is ranging within 4–5 km far form pan. Water are used for all purposes, but little water remain, 1meter depth, at this present.
3	Losokoni pan	5.0	5.0	0.0	2.0	5.0	340	8.4	30.5	Pan is 100x70 m in size, but water is not full and is with muddy water. It is usually dried up until end of November. It was renovated by both community and MOA in june/2000.
4	Arabal river (arabal center,U/S:1)	0.5	–	0.0	1.0	0.0	666	8.8	30.4	River flow, flowing rate, ca. 0.5m^3/sec, is little in comparison with normal year due to continuos drought for last year. Villagers are taken water from water–hole on the river bed for the use of drinking, cattle feeding and other domestic use.
5	Arabal river (U/S:2)	1.0	–	1.0	1.0	0.0	634	8.5	29.7	Flowing amount is lager than the D/S, it is over 1.0m 3/sec. River water is used as irrigation and other domestic use.
6	Ngusero river	–	–	–	–	–	94	8.1	33.2	Pond in river–bed caused by recent rainfall.
7	Perikerra irrigation channel	0.3	<0.5	<1.0	1.0	0.1	141	–	30.8	Irrigation canal. Water is flowing much and is used for not only irrigation but other domestic purposes, including drinking water.
8	Eldume primary school	1.0	0.0	1.0	>5.0	0.1	459	8.1	33.9	9 classes with 425 pupils. Hand dug–well is constructed at 1993, but it breaks down due to the lowering of groundwater level. Water source of school is now from Molo river even for drinking.
9	Local Irrigation, Molo river	0.1	0.0	0.0	2.0	0.1	185	7.9	33.7	Water is not used for irrigation. Vegetable and water melon are producing and selling
10	Molo river	1.5	<0.5	1.0	1.0	0.1	215	–	25.6	Flow rate is low. Width of steams are about 5m, flowing muddy water, commonly used as all domestic purposes in daily villagers' life.
11	Molo river	0.2	0.0	0.0	0.5	0.0	324	7.4	27.1	Flow rate is estimated as 1.5 m^3/sec. Water used for domestic purpose, including drinking washing, and even bathe.
12	Molo river	–	–	–	–	–	215	7.8	28.5	Flow rate is high. Width of steams are about 15m, flowing muddy water, commonly used as all domestic purposes in daily villagers' life.
13	Katanin canal	1.0	0.0	0.0	0.2	>5	719	7.5	26.4	Irrigation canal flowing over 1.0m^3/sec form Roboi swamp, water is used in all purposes, which includes drinking, cattle, washing bath, an so on.
14	Kapkuikui village	0.2	0.0	0.0	> 5	0.1	672	7.7	30.3	Irrigation canal flowing (ca. 0.5m3/sec) form Roboi swamp, water is used in all purposes, which includes drinking, cattle, washing bath, an so on.
15	Kasie spring	0.2	0.0	1.0	1.0	0.1	522	9.0	32.3	Hot spring locating at the foot of Kapkosom ridge, and is yielding over 80 l/min. Range of spring source is 40m x 30m, and it is providing water to glassy land down stream. From the spring source, three outlets are setting for bathing, cattle watering and drinking, respectively by community.
16	Kimao dam	1.0	1.0	0.0	0.5	0.5	–	–	–	Kimao dam is gravity type dam, and total capacity of reservoir is 288,000 m^3. Effective storage is 142,000, height 25m, length 35m and catchment area is 7.8 km^2. This dam was planed for domestic and irrigation purpose for Koriema, Kimalel and Kimorock. But, reservoir have been only constructed in 1998 as phase I. The phase II, comprising of treatment system and distribution system, is not
17	Kiniyach pan	2.0	1.0	1.0	1.0	0.2	143	7.3	29.0	300 m X 300 m in size, constructed in 1982 by MENR, used for all purpose including human drinking

Table 4-3 Field Water Quality Test (condition of sampling points) (2/4)

No.	Name	Water quality parametres tested in field								Memorandum on sampling point
		Fe	Mn	NO_3	F	NH_4	EC	pH	Tem	
18	Kimorok pan	0.5	0.0	0.0	1.0	0.1	242	8.6	31.9	100 m X 100 m pond, used by domestic and cattle for neighboring villagers, kimorok primary school, for all purpose including human drinking
19	Chepkubei pan	2.0	1.0	0.0	2.0	0.0	166	7.4	29.7	100x100 m pan, located near the river, water is diverged from river flow. Sedimentation of pan is progressed and filled much, storage capacity decreases, used for cattle and domestic used for
20	Kapkun pan	0.5	0.0	0.0	2.0	0.2	284	9.6	34.0	Pan is locating near the village center and providing seasonal water source. Villager uses this as domestic purpose without drinking water.
21	Keben spring	0.2	0.0	0.0	>5	0.2	763	8.0	22.9	Water source of Sabour W/S, in-take is with small barrage and 2" pipe. Flow rate is 30 l/min. water system provides water by 22 taps.
22	Saboul primary school	0.2	0.0	1.0	> 5	0.1	765	7.7	28.3	Water system comprising 3 taps is operated. The system is constructed by MENR at 1999, (survey commenced 1991). But it is not sufficient amount for villagers especially in dry season. Alternative
23	Hemitian river	0.5	0.0	0.0	1.0	0.1	253	8.5	32.8	Pond in river-bed caused by recent rainfall.
24	lake 94	2.0	0.0	0.0	>5	0.0	618	8.7	38.1	Wide and shallow pond spreading south of lake Baringo. It was initially formed by wet year caused 1994, thus called as "lake 94" as local name. However, it had been died again in the drought like as that of 1999. The water gathered in pond is often used in dry season as all the domestic use, including cattle watering, bathing, washing and even drinking purpose.
25	Arabal river (L/S)	2.0	0.0	0.0	>5.0	0.1	621	6.3	26.4	Flow rate is considerably low (less than 1m3/sec) and are caused in undercurrent condition. The stream water is used as all purposes, including human drinking, cattle holding, washing and so on.
26	Molo river (D/S, water hole)	0.5	0.0	5.0	2.0	0.1	443	7.2	28.7	Villager is taking from water hole dug in the dried river-bed until November.
27	Bogoria Lake (hot spring)	0.5	0.0	0.0	> 5	0.5	####	8.7	–	Bogoria hot spring located southern end of lake
28	Bogoria Lake (north)	>10	0.0	–	> 5	0.3	>2000	10	35.2	Water sample is taken at northern end of Bogoria lake. Contents of NO_3 can not be obtained by pack-test due to very intense chemical reaction.
29	Sokoteiwo pan	–	–	–	–	–	81	8.1	30.5	This pan was constructed by World Vision, and is used for all the domestic purpose. Villagers want to use the reservoir as irrigation as well in their future plan.
30	Loboi river	0.1	0.0	2.0	> 5	0.1	695	8.6	35.1	River flow, villagers and school students (bogoria secondary school) are taken water from water-hole on the river bed for using in all purposes.
31	Lorwai hot spring	0.0	0.0	5.0	> 5	0.1	642	7.3	34.6	Hot spring water, flowing (2-3 m3/sec) form Bogoria hotel.
32	Lorwai hot spring	–	–	–	–	–	743	7.1	35.3	Hot spring water, flowing (2-3 m3/sec) form Bogoria hotel. Water is used for cattle watering, and car
33	Chelaba spring	0.2	0.0	5.0	2.0	0.1	751	6.9	36.6	Measure water source of Loboi village, villagers use this source as mainly drinking water. The yield is high as about 0.7m3/sec. Village has new plan to provide water to upper part of village by W/S.
34	Egerton Univesity, Chemeron Field	0.1	0.0	2.0	> 5	0.1	886	7.2	–	Domestic use for cattle and 36 workers, 6hr/day pumping is required for maintaining demand of farm.
35	Chemeron irrigation canal	0.5	0.0	1.5	1.0	0.1	199	8.6	27.3	Villagers use canal water, which is conveyed from Chemeron dam reservoir locating 2.5km east. About 4500 villagers utilize water for all the domestic purposes and irrigation water, as well.
36	Perikerra river (at RGS:2EE7)	0.3	0.0	0.0	0.5	0.0	230	7.7	28.9	River, source of marigat drinking water system, gauging station(RGS:2EE7) is located.

Table 4-3 Field Water Quality Test (condition of sampling points) (3/4)

No.	Name	Water quality parametres tested in field								Memorandum on sampling point
		Fe	Mn	NO_3	F	NH_4	EC	pH	Tem	
37	Perikerra river (at RGS:2EE7)	1.0	0.5	1.0	1.0	0.1	87	7.5	22.9	River, source of Marigat drinking water system, gauging station(RGS:2EE7) is located.
38	Marigat W/S	0.5	0.0	1.0	0.0	0.5	202	4.9	32.2	W/S marigat, row water is in-taking from Perikerra irrigation canal, treated with Alum ($AlSO_4$), and chorine before distribution. Service area is Marigat township.
39	TEM site (rugus)	–	–	–	2.0	–	–	–	–	TEM site (Rugus). Project monitoring site for "Rehabilitation of Pan". Water is not full, its remain about 1/3 of full level and with muddy water.
40	Rugus pan sites	–	–	–	2.0	–	151	–	32.0	Monitoring site for Rehabilitation of Pan. Water quality test is examined with a sample taken from the U/S pond of rehabilitated pan, which is exclusively used for human drinking for neighboring villagers
41	Akule pan	0.5	1.0	0.0	1.0	0.2	179	8.3	31.9	Pan is using for all domestic purposes including drinking water and for feeding cattle, as well. It was constructed 1974 by village community. At time of observation, the water in pan is almost filled due to last rainfalls and river flow, which is in-taken trough the connection canal from Akule river. But, It will be dried-up on Nov., two months later from last rainfall, and resume storage at the begin of next rainy season on March.
42	Akule river (L/S:1)	0.5	0.0	0.0	> 5	0.1	240	7.0	31.7	Water-hole digging in river bed, with depth of 1.0m. Toward dry season, the hole is to be deepen up to the water table.
43	Losukueta river	0.5	0.0	0.0	> 5	0.1	356	8.0	32.4	River flow is interrupted into small muddy ponds on river bed, due to very little water. Villagers dig water-hole on river bed for collecting clean water by small cup/bucket.
44	Mukutani river	0.5	0.0	1.0	> 5	0.0	####	8.8	28.8	Flow rate is about 0.5 m3/sec. Almost clear-water, however containing some suspended material, is flowing down along the southern boundary of Mukutani center. Villagers use the water as all the
45	Karau pan	1.0	1.0	0.5	> 5	0.5	186	8.1	31.5	There are three pans, consisting of Large;100x70, Middle;100x50 and Small;50x20m. If runoff takes place in the rainy season, such rain-water is initially caught by Large pan. If Large pan is once fill-up, its storage-water is spilled over to the Middle pan. Next to Middle pan, Small pan is filled by water from Middle pan. However, all the pans are dried up annually at the end of Nov. in average weather condition. Villagers use Small pans for domestic purpose. Large pan was constructed MENR in 1987. Middle pan is through of natural depression (or very old pan), and small pan was constructed in 1985.
46	Loskeita river (U/S:1)	1.0	0.5	<1	0.7	0.1	70	6.7	31.5	Pond on river bed caused by recent rainfall, used for cattle watering
47	Murat river	0.5	1.0	0.0	1.5	0.0	750	7.3	30.3	Pond on river bed caused by recent rainfall, used for domestic and cattle watering
48	Akule river (D/S)	2.0	0.5	–	2.0	0.1	237	8.4	31.3	Puddles rest on river-bed caused by recent rainfall, used for cattle watering
49	Lekerati river	0.2	0.0	2.0	1.5	0.2	629	7.1	32.9	Seepage water flowing from river-bed, discharge is about 200 l/min. During Feb.-Mar, stream is dried
50	ilpirisati hot spring	1.0	0.0	<1	1.5	0.1	945	9.1	35.8	Spring, its flow rate can not be measured due to broad area (300 m x 150m) of spring pouring, but is not much. At the down-stream, spring water is merging into the ground. Water used for cattle
51	ilpirisati spring (cool)	0.5	0.0	1.0	0.7	0.0	615	6.8	29.9	Spring site with 5X5m. its flow rate is about 150 l/min. Streams pouring out from spring are to flowing to both Murat river and neighboring depression for cattle watering. Flow rate is not changed
52	Lelerai spring	0.2	0.0	0.0	0.5	0.1	783	8.1	26.7	Clean water, discharge is about 10 l/min, villagers constructed barrage to trap water, and use in all domestic purpose. EL.1370m which can be obtained 250 m head form mukutani center.
53	Akule river (U/S:3)	1.0	0.0	2.0	1.0	0.2	264	7.9	32.4	Water-hole digging in river bed, with depth of 0.5m, water remain little.

Table 4-3 Field Water Quality Test (condition of sampling points) (4/4)

No.	Name	Water quality parametres tested in field								Memorandum on sampling point
		Fe	Mn	NO_3	F	NH_4	EC	pH	Tem	
54	Ilboiloi pan	2.0	0.0	0.0	0.2	1.5	225	9.3	36.5	Pan is mainly used for cattle watering. Water is not much stored due to filled up most of reservoir by silty deposits.
55	Perkier river D/S	0.0	0.0	0.0	0.5	0.1	228	8.2	21.7	Main water sources for village. Villagers taken water from water hole dug in the river bed.
56	Sesiai UNICEF well	0.5	0.5	0.0	0.2	2.0	564	7	27.1	Hand dug well, installed by UNICEF in 1994. At same times, UNICEF made 4 wells in Ngambo, but 2 have been broke out without any repairing up to now. Water community is not organized.
57	Baringo lake (fisheries office)	2.0	0.5	0.0	> 5	0.0	####	8.9	33.7	Villagers use lake-water as all domestic purposes, but it treated with Alum ($KAl(SO_4)_2.12H_2O$) for drinking purpose.
58	Marti pan	0.2	0.0	0.5	0.3	0.1	217	7.9	34.2	Pan is used for villagers and cattle, it constructed along with new road construction in 1982
59	Kampi ya samaki W/S	0.5	0.0	1.0	3.0	0.1	####	6.2	33.3	W/S was constructed by MENR in 1989, but water tank have been not completed yet. Accordingly, treated water is pumping directly to the distribution lines and taps every morning. About 3000 villagers are provided by the W/S. Operation cost without personnel cost of treatment plant is spent.
60	Baringo lake (fisheries office)	0.5	0.0	0.0	1.0	0.0	–	–	–	Water quality is made after treatment with Alum
61	Bogoria hotel borehole	2.0	0.0	5.0	2.0	0.1	990	7.3	33.1	Borehole depth is about 20 m, installed solar pump(50WX6=300W), used for irrigation purpose.
62	Wasegres river	2.0	0.0	1.0	1.0	0.1	233	778	31.5	Flow rate is about $2m^3$/sec (measuring 15 hr after rainfall), irrigation water is diverted to canal(JICA renovated project).
63	Tangolbei	0.1	0.0	2.0	3.0	0.1	951	7.7	33.0	Water source is and borehole located beside Tangible town. Yield of borehole is about 10 l/min. A lots of people are gathering borehole, hence water amount to be supplied to people is not sufficient for town people and surrounding villagers.
64	Kipramoi spring	0.5	0.0	3.0	0.5	0.0	336	8.1	21.7	Water source of Koriema W/S, in-take is with small barrage and 2" pipe. Flow rate is about 200-300

Table 4-4 Result of Water Quality Test (laboratory test) (1/2)

Items of Water Quality Analysis		Unit	Water Quality Guideline			Kimalel				Salabani		Marigat		Eludme	Ilng'arua	Ngambo
(A) Physical/Chemical Water Analysis			Kenya < >desirable aesthetic quality	Kenya ( ) permissible aesthetic quality	WHO	Kipramoi Spring	Kimao Dam	Keben spring	Egerton Univ.B/H	Kampi Ya Samiki W/S	Chemeron Irrigation Canal	Perikerra river	Marigat W/S	Molo River	Sesiai UNCEF well	Perkerra River
1	pH	pH scale	<6.5-8.5>	(6.5-9.2)	–	7.7	7.5	8	7.5	6.9	8	7	4.3	7.8	7.5	7.7
2	Colour	mg pt/l				70	5	<5	<5	30	30	425	5	1000	< 5	70
3	Turbidity	N.T.U	5		5	28	13	2	2	22	24	166	5	270	nil	32
4	EC	μS/cm				372	403	768	869	1524	191	93	185	196	495	239
5	Iron(Fe)	mg/l	<0.3>	(0.5)	0.3	1.1	1.9	0.5	0.4	0.9	0.6	10.3	0.4	3.1	0.4	1.2
6	Manganese(Mn)	mg/l	<0.1>	(1.0)	1	0.2	2.2	0.0	0.0	0.1	0.1	0.6	0.1	0.3	1.0	0.1
7	Calcium(Ca)	mg/l			–	16.8	27.2	19.2	24.8	10.4	19.2	7.2	20.0	8.0	2.4	23.2
8	Magnesium(Mg)	mg/l			–	8.8	18.0	12.6	13.6	22.8	4.8	2.4	5.8	12.6	47.7	5.3
9	Sodium(Na)	mg/l	<200>		200	51	30	165	150	300	13	8.5	10	18	24	19
10	Potassium(K)	mg/l			–	8.4	6.1	2.7	5.8	21.0	3.8	4.9	5.1	10.0	5.4	6.5
11	Total Hardness (Ca+Mg)	mg/l	<500>		–	78	142	100	118	120	68	28	74	72	202	80
12	Total Alkalinity	mg/l			–	160	194	372	268	192	88	40	nil	78	238	104
13	Chloride(Cl)	mg/l	<250>	(600)	250	11	8	15	82	80	1	1	4	10	5	1
14	Fluoride(F)	mg/l	<1.5>/3.0>		1.5	0.8	0.7	5.0	12.0	1.8	1.0	0.6	0.4		1.1	0.9
15	Nitrate(NO3)	mg/l	10		50	1.0	0.8	0.2	0.4	0.4	0.2	0.9	0.6	1.3	0.4	0.3
16	Hardness (Ca)	mg/l			–	42.0	68.0	48.0	62.0	26.0	48.0	18.0	50.0	20.0	6.0	58.0
17	Sulfate(SO4)	mg/l	<400>		400	28.0	6.3	58.0	50.0	469.0	8.0	6.7	90.0	28.0	16.0	8.0
18	TSS(Total Suspended Solids	mg/l				35	58	3	3	37	12	342	8	240	nil	54
19	TDS(Total Dissolve Solid)	mg/l	<1000>	(1500)	1000	231	250	477	539	945	118	58	115	122	306	148
20	Silica(Si)	mg/l			–	29.4	22.9	21.8	22.4	22.9	28.8	60.0	24.1	122.6	22.9	28.8
(B) Bacteriological Water Analysis																
21	Total Colonies, spc	CFU/ml	–	–	–	Spreaders	Aprox.350	Aprox.290	Aprox.300,few Spr	nil	>6500	Aprox.700	nil	>6500	nil	Aprox.3000
22	Coliform group (24hrs)	/100 ml	not detected	not detected	not detected	>2400	>2400	>2400	>2400	nil	>2400	>2400	nil	>2400	nil	>2400
23	Coliform group (72hrs)	/100 ml				>2400	>2400	>2400	>2400	nil	>2400	>2400	nil	>2400	nil	>2400
24	Faecal Coliform	–	not detected	not detected	not detected	>2400	>2400	>2400	>2400	nil	>2400	460	nil	1100	nil	1100
(C) Heavy Minerals Analysis–																
25	Arsenic(As)	mg/l	0.050	–	0.01 ( )	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
26	Cadmium(Cd)	mg/l	0.005	–	0.003 ( )	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
27	Mercury(Hg)	mg/l	<0.001>	–	0.001 ( )	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

Note: box shaded shows do not meet the Kenya permissible(or desirable quality standard

Table 4-4 Result of Water Quality Test (laboratory test) (2/2)

Items of Water Quality Analysis		Unit	Water Quality Guideline			Sandai	Loboi	Kapkuikui	Kiserian	Arabal		Mukutani				
(A) Physical/Chemical Water Analysis			Kenya < >desirable aesthetic quality	Kenya ( ) permissible aesthetic quality	WHO	Waseges River	Chelaba Spring	Katanin canal	Arabal W/S	Kaseila Spring	Arabal River	Nosukeita River	Mukutani River	Lelerai spring	Ilpirisati hot spring	Ilpirisati cool spring
1	pH	pH scale	<6.5-8.5>	(6.5-9.2)	–	7	7.1	8	7.6	8.3	7	7.9	8.4	8	8.7	7
2	Colour	mg pt/l					5	70	5	<5	--	–	150	5	5	5
3	Turbidity	N.T.U	5		5	910	2	7	3	2	1900	83	73	3	8	6
4	EC	μS/cm				187	608	730	707	500	245	847	1388	762	755	575
5	Iron(Fe)	mg/l	<0.3>	(0.5)	0.3	17.8	0.5	1.0	0.5	0.5	22.0	3.3	3.1	0.5	0.8	0.5
6	Manganese(Mn)	mg/l	<0.1>	(1.0)	1	1.2	0.0	0.4	0.1	0.0	2.0	0.5	1.4	0.0	0.1	0.0
7	Calcium(Ca)	mg/l			–	12.0	8.8	2.4	16.0	0.8	12.0	18.4	12.8	10.4	0.8	0.8
8	Magnesium(Mg)	mg/l			–	7.3	5.8	8.3	12.1	8.3	4.9	8.7	3.9	6.8	6.3	9.0
9	Sodium(Na)	mg/l	<200>		200	25	113	158	123	100	48	50	335	172	182	118
10	Potassium(K)	mg/l			–	7.8	13.0	14.0	8.4	2.0	9.6	3.9	8.8	3.8	1.8	5.8
11	Total Hardness (Ca+Mg)	mg/l	<500>		–	60	46	50	90	36	50	82	54	48	28	39
12	Total Alkalinity	mg/l			–	58	260	340	90	228	106	164	662	322	332	254
13	Chloride(Cl)	mg/l	<250>	(600)	250	10	9	9	20	8	10	3	3	37	26	22
14	Fluoride(F)	mg/l	<1.5> 3.0*		1.5	0.7	4.2	5.3	0.6	0.8	0.7	1.9	5.3	0.9	1.3	0.9
15	Nitrate(NO3)	mg/l	10		50	1.4	2.0	0.1	0.6	0.7	1.1	0.2	0.7	0.2	0.3	0.3
16	Hardness (Ca)	mg/l			–	30.0	22.0	6.0	40.0	2.0	30.0	46.0	32.0	26.0	2.0	2.0
17	Sulfate(SO4)	mg/l	<400>		400	44.0	23.0	33.0	226.0	21.0	40.0	21.0	109.0	54.0	52.0	15.0
18	TSS(Total Suspended Solids	mg/l				935	1	21	3	4	1855	246	215	5	26	12
19	TDS(Total Dissolve Solid)	mg/l	<1000>	(1500)	1000	116	377	453	438	309	152	215	861	472	468	357
20	Silica(Si)	mg/l			–	305.0	24.1	19.4	21.8	21.2	397.0	28.2	48.8	24.1		25.3
(B) Bacteriological Water Analysis																
21	Total Colonies, spc	CFU/ml	–	–	–	Spreaders, Spr	Spr	>6500	>6500	Aprox.3000	>650, Many Spr	Aprox.2500	>6500	>6500	>6500,many Spr.	>6500
22	Coliform group (24hrs)	/100 ml	not detected	not detected	not detected	>2400	>2400	>2400	>2400	>2400	>2400	>2400	>2400	>2400	>2400	>2400
23	Coliform group (72hrs)	/100 ml				>2400	>2400	>2400	>2400	>2400	>2400	>2400	>2400	>2400	>2400	>2400
24	Faecal Coliform	–	not detected	not detected	not detected	460	1100	>2400	>2400	1100	>2400	nil	>2400	>2400	nil	4
(C) Heavy Minerals Analysis–																
25	Arsenic(As)	mg/l	0.050	–	0.01 ( )	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
26	Cadmium(Cd)	mg/l	0.005	–	0.003 ( )	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
27	Mercury(Hg)	mg/l	<0.001>	–	0.001 ( )	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

Table 4-5 Existing Water Points and Water Facilities of Study Area (1/5)

Sub Location	Type of Water points.										Total
	River	Pan	Spring	Water Hole	Borehole	Well	Dam	Canal	W/S	Lake	
Arabal	Kiplelabei (Arabal Katilomwo (Arabal river) Partalo (Arabal river) Kipkoibetu (Arabal river) Arabal Pri. Sch. (Arabal river) Kapindasum (Arabal river) Tikoluk (Arabal river) Kiptorugon (Arabal river) Kachikorkor (Arabal river)	Ramacha Karma Losokoni Chemorongion Chepngerechi	Kamur Lomoiwe Loromuru Tandar Chepngania n Kasiela		Kabirwok Chemorongi on						
	9	5	6	0	2	0	0	0	0	0	22
Eldume	Mpirich Kailer				Eldume			Lororo	Kailer		
	2	0	0	0	1		0	1	1	0	5
Endao		Barkibi `A` Barkibi `B` Loberer `A` Loberer `B` Kipkututya Chebisasai			Endao (Nturi) Loberer		Chemeron	Losekem (Intake) Chemeron Upper (Dip Kipsorem Area Nursery tree Area Chepsom Area Isaac Lemondo Area			
	0	6	0	0	2	0	1	6	0	0	15
Ilngarua	Ilngarua (Perkerra)										
	1	0	0	0	0	0	0	0	0	0	1
Kaptombes		Kaptombes Kipchebii						Nyalilibuch Chepngerichi Tirion Sitewe			
	0	2	0	0	0	0	0	4	0	0	6
Kapkuikui		Cheule						Katanin Kapzero			
	0	1	0	0	0	0	0	2	0	0	3

Table 4-5 Existing Water Points and Water Facilities of Study Area (2/5)

Sub Location	Type of Water points.										Total
	River	Pan	Spring	Water Hole	Borehole	Well	Dam	Canal	W/S	Lake	
Sabor		Kapkun Kapngetuny	Mangar Maoi Yemo Kapkole	Cheptirei					Sabor SHW Project Sabor SHW Proj. (Keben)		
	0	2	4	1	0	0	0	0	2	0	9
Kimalel	Kimorok	Kimalel Kimorok Kinyach		Kisokanin Emchuck			Chemeron				
	1	3	0	2	0	0	1	0	0	0	7
Logumgum	Logumgum (Molo										
	1	0	0	0	0	0	0	0	0	0	1
Kiserian	Sokotei (Molo river) Lelesepei (Molo river) Lorok (Molo river) Mnada (Arabal river) Nkolragai (Arabal) Daraja (Arabal river)								Ol Arabal	Lokojokon (L. Baringo) Kiserian (L. Baringo) Ngasotok (L. Baringo)	
	6	0	0	0	0	0	0	0	1	3	10
Koriema			Sosurwo Ketiny Rotinwo Bebbomet	Kirambach Ngoror	Egerton Univ.	Kamnyore	Kimao		Koriema Rotubei Patkawanin/ Kamungei W. Proj.		
	0	0	4	2	1	1	1	0	2	0	11

Table 4-5 Existing Water Points and Water Facilities of Study Area (3/5)

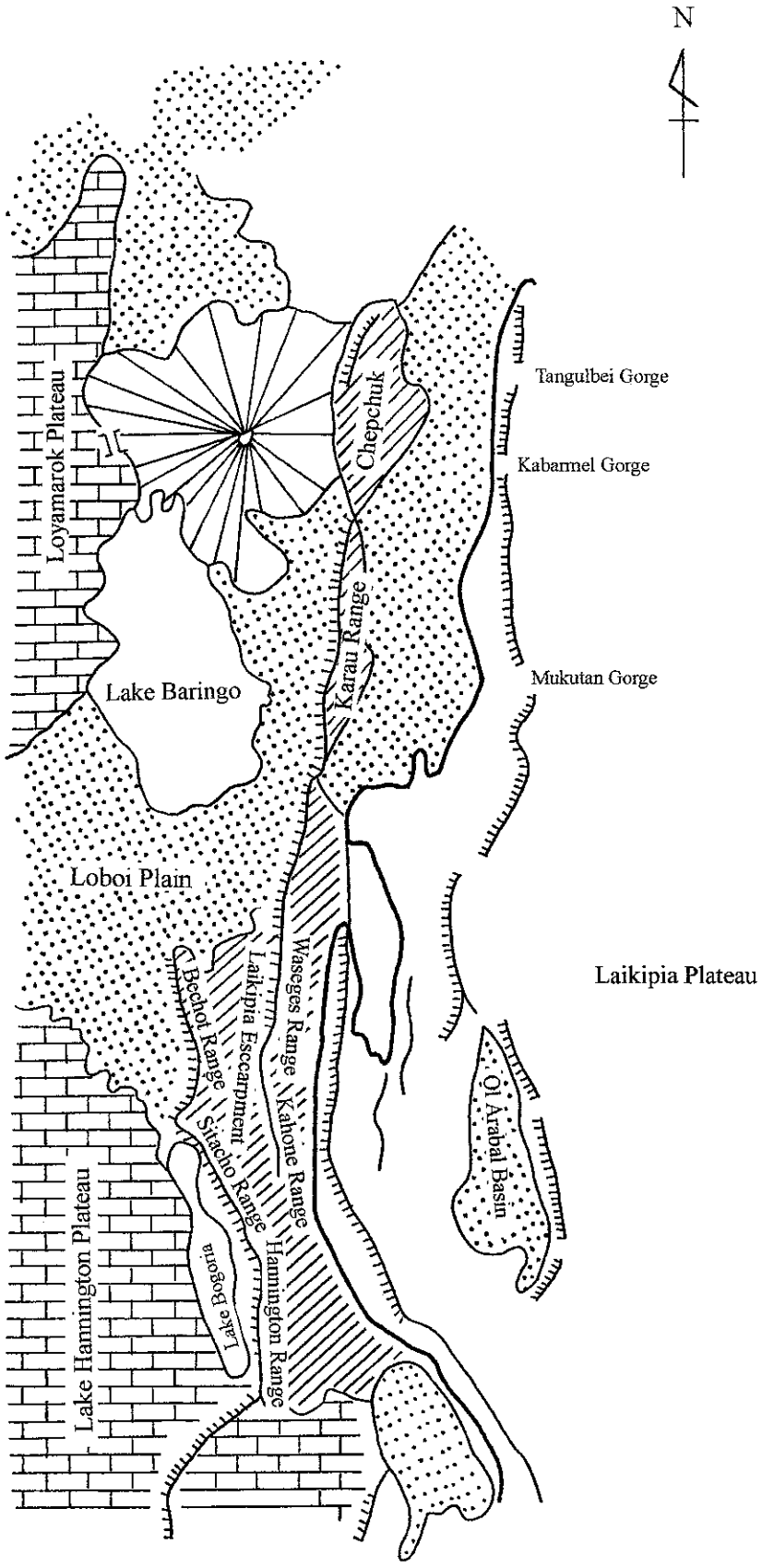
Sub Location	Type of Water points										Total
	River	Pan	Spring	Water Hole	Borehole	Well	Dam	Canal	W/S	Lake	
Chelaba		Chepkoimet Chelaba	Lorwai Njorro								
	0	2	2	0	0	0	0	0	0	0	4
Maji Ndege	Loboi		Tuiyo-bei								
	1		1	0	0	0	0	0	0	0	2
Meisori		Loturo (Marti) Loturo (Leseki)		Lontiani					Loruk WS Kampi ya Samaki	Salabani (L. Baringo) Loongiron (L. Baringo) Loruk centre (L. Baringo)	
	0	2		1	0	0	0	0	2	3	8
Mukutani	Lelerai Lontiani Loitapak Kabikoki `A` Kabikoki `B` Lekirati	Akule Karau Lekiricha	Ilpirisati	Itwa Nosingeta							
	6	3	1	2	0	0	0	0	0	0	12
Ngambo	Keper (Perkerra river) Masai (Perkerra river)	Ilboilei Langata Eloonoo				Sesiai Ewaso Oongishu	Chemeron			Ildepe (L. Baringo)	
	2	2	0	0	0	2	1	0		1	8

Table 4-5 Existing Water Points and Water Facilities of Study Area (4/5)

Sub Location	Type of Water points.										Total
	River	Pan	Spring	Water Hole	Borehole	Well	Dam	Canal	W/S	Lake	
Perkerra	Water Camp (Perkerra)							Kari (Perkerra Canal) Zero grazing (Perkerra Canal) Richard (Perkerra Canal) Kaptich (Perkerra Canal) Ngoswe (Perkerra Canal) R5 (Perkerra Canal) R6 (Perkerra Canal) R14 (Perkerra Canal) R7 (Perkerra Canal) R2 (Perkerra Canal) L2 (Perkerra Canal) Kampi Wakulima (Perkerra Canal) L3 (Perkerra Canal) L3F (Perkerra Canal) L4 (Perkerra Canal) L5 (Perkerra Canal)			
	1	0	0	0	0	0	0	16	0	0	17
Salabani				Noolmorijo river						Ildepe (L. Baringo) Lekiricha (L. Baringo) Ntau (L. Baringo)	
	0	0	0	1	0	0	0	0	0	3	4

Table 4-5 Existing Water Points and Water Facilities of Study Area (5/5)

Sub Location	Type of Water points										Total
	River	Pan	Spring	Water Hole	Borehole	Well	Dam	Canal	W/S	Lake	
Sandai	Waseges Mokokwo (Waseges river) Mbechot (Waseges river) Kapmaech (Waseges)							Kipangawe Sokoteiwo Kipangawe (seasonal) Sandai (Sesya) Sandai (Kokyande) Sandai (Chepkotoyon) Sandai (Cheplooch)			
	4	0	0	0	0	0	0	7	0	0	11
Yatoi	Chebaran Kwendo Kasururein (Perkerra river) Loskecha (Perkerra) Darajani (Perkerra river) Ainabmotony Marigat Sec. Sch. (Perkerra R.) Intake - NIB (Perkerra R.) Rabai (Perkerra river) Lokoiwe (Perkerra river) Ainabusia (Perkerra river) Kamoingon (Molo river) Aronaik (Molo river) Chebaran Lower Oinobwarkach (Molo river)	Kaptim Sirinyo Peberenoi			Maoi Marigat DRICO		Chemeron	Chemeron Irrigation	Marigat Sirinyo (Marigat W/S)		
	15	3	0	0	2	0	1	1	2	0	24
Total	*49*	*31*	*18*	*9*	*8*	*5*	*5*	*37*	*10*	*10*	**180**



The Integrated Rural Development Project
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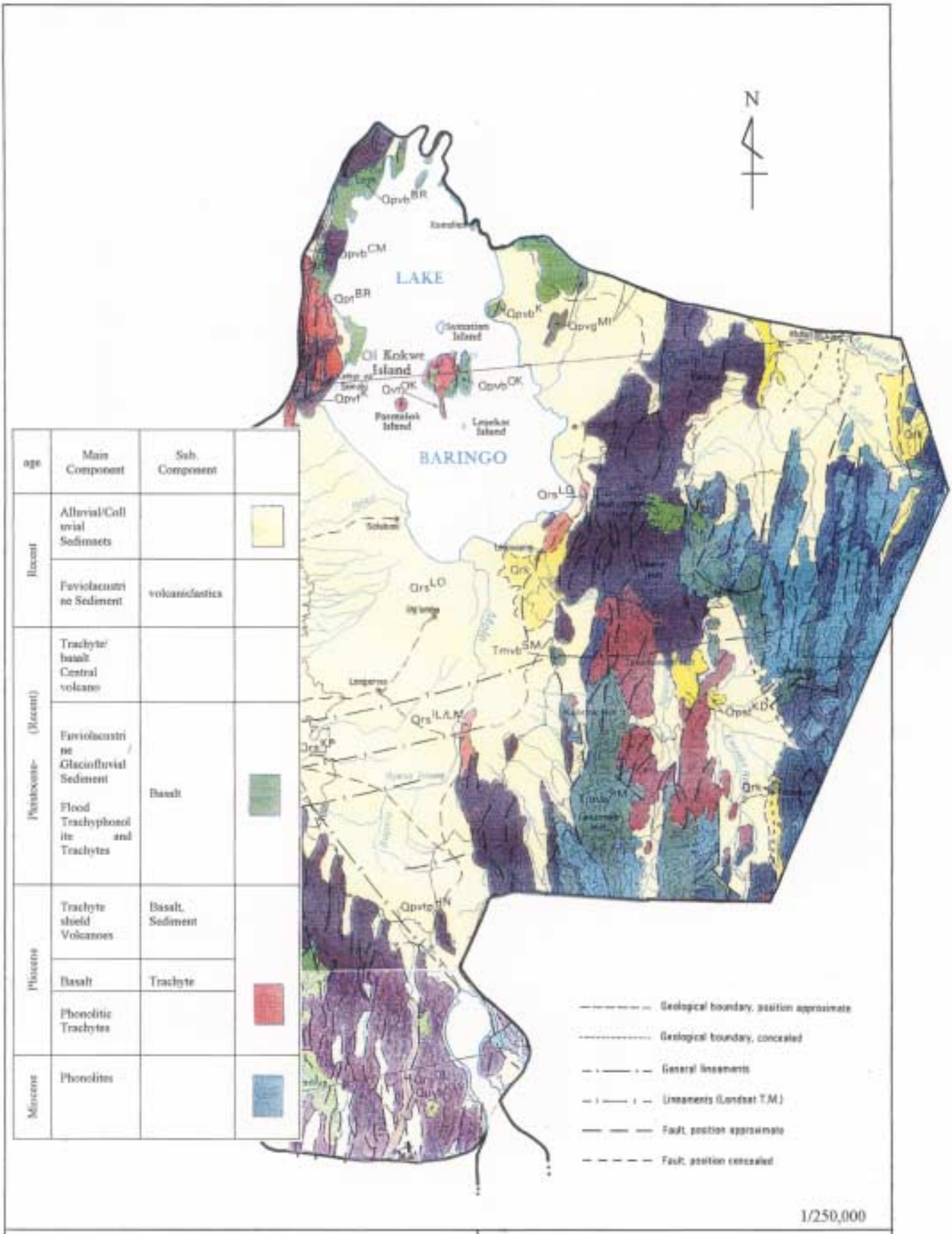
Figure 2-1
Physiographic Zones of Study Area



age	Main Component	Sub. Component
Recent	Alluvial/Collu vial Sediments	
	Faviolacustrin e Sediment	volcaniclastics
Pleistocene- (Recent)	Trachyte/ basalt Central volcano	
	Faviolacustrin e / Glaciofluvial Sediment Flood Trachyphonoli te and Trachytes	Basalt
Pliocene	Trachyte shield Volcanoes	Basalt, Sediment
	Basalt	Trachyte
	Phonolitic Trachytes	
Miocene	Phonolites	

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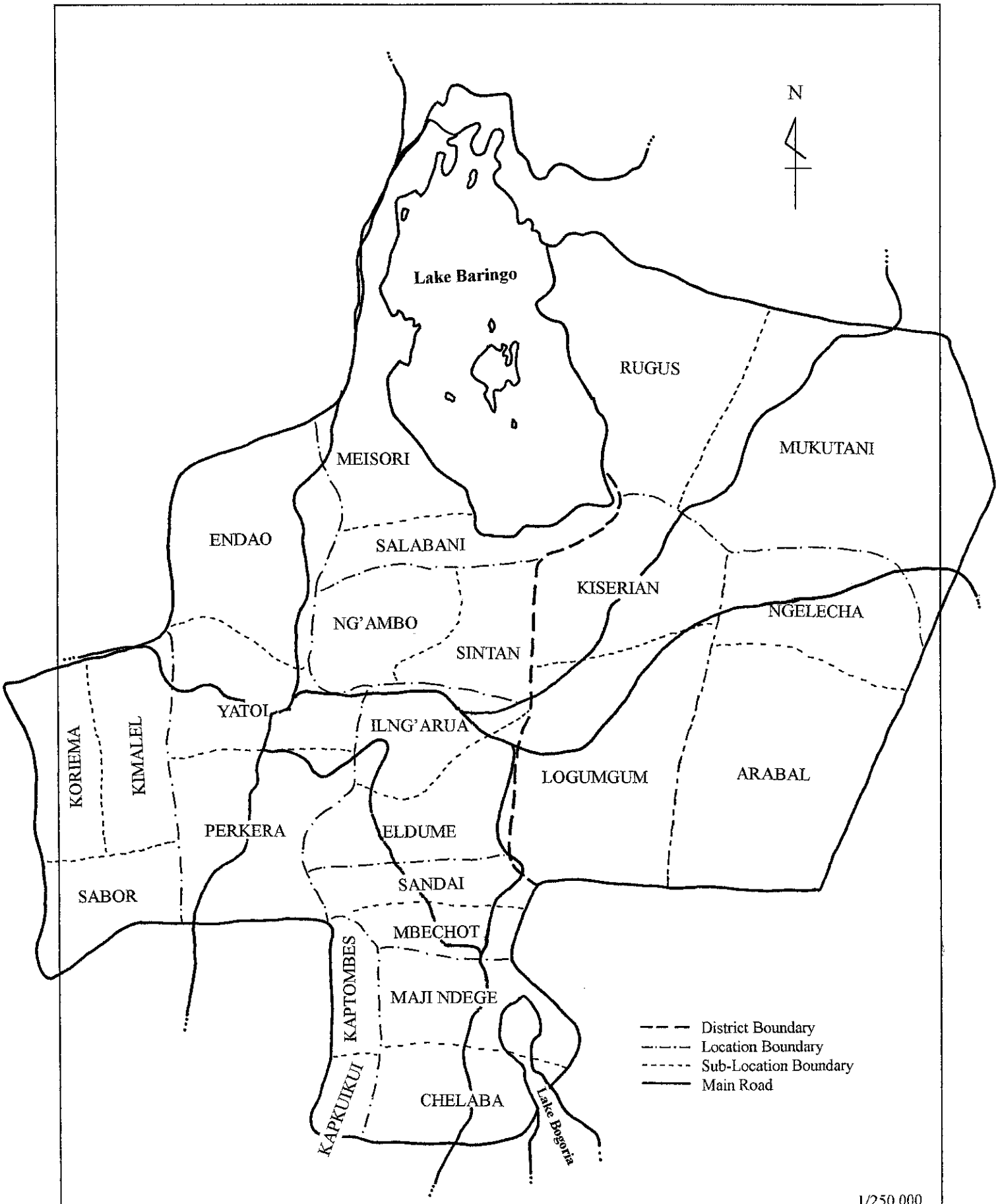
Figure 2-2
Geological Mapof Study Area



The Integrated Rural Development Project in The Baringo Semi Arid Land Area (Marigat and Mukutani Divisions)	**Figure 3-1 Sub-Location Boundary in Study Area**
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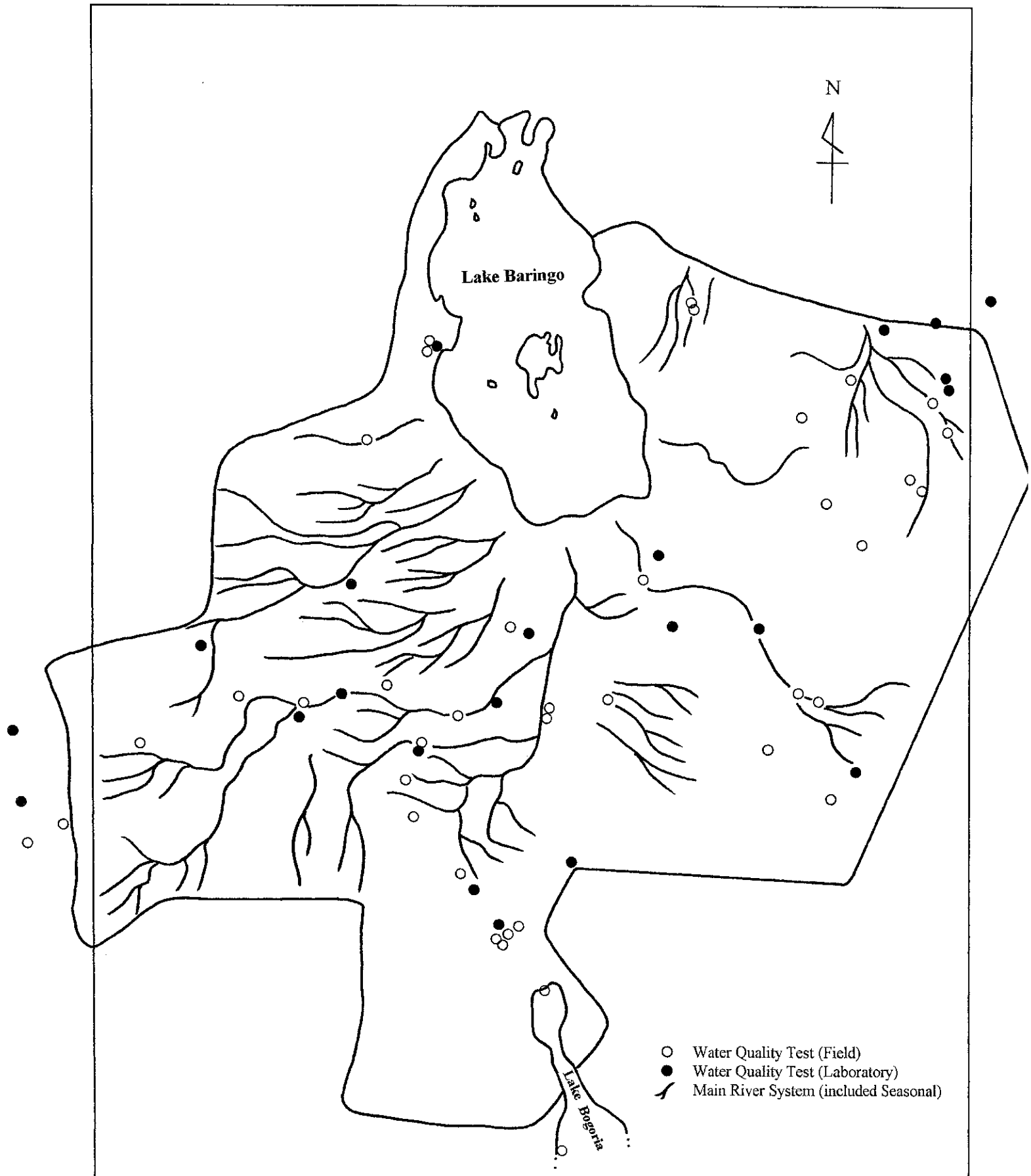

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Figure 4-1
Location Map of Water Quality Test

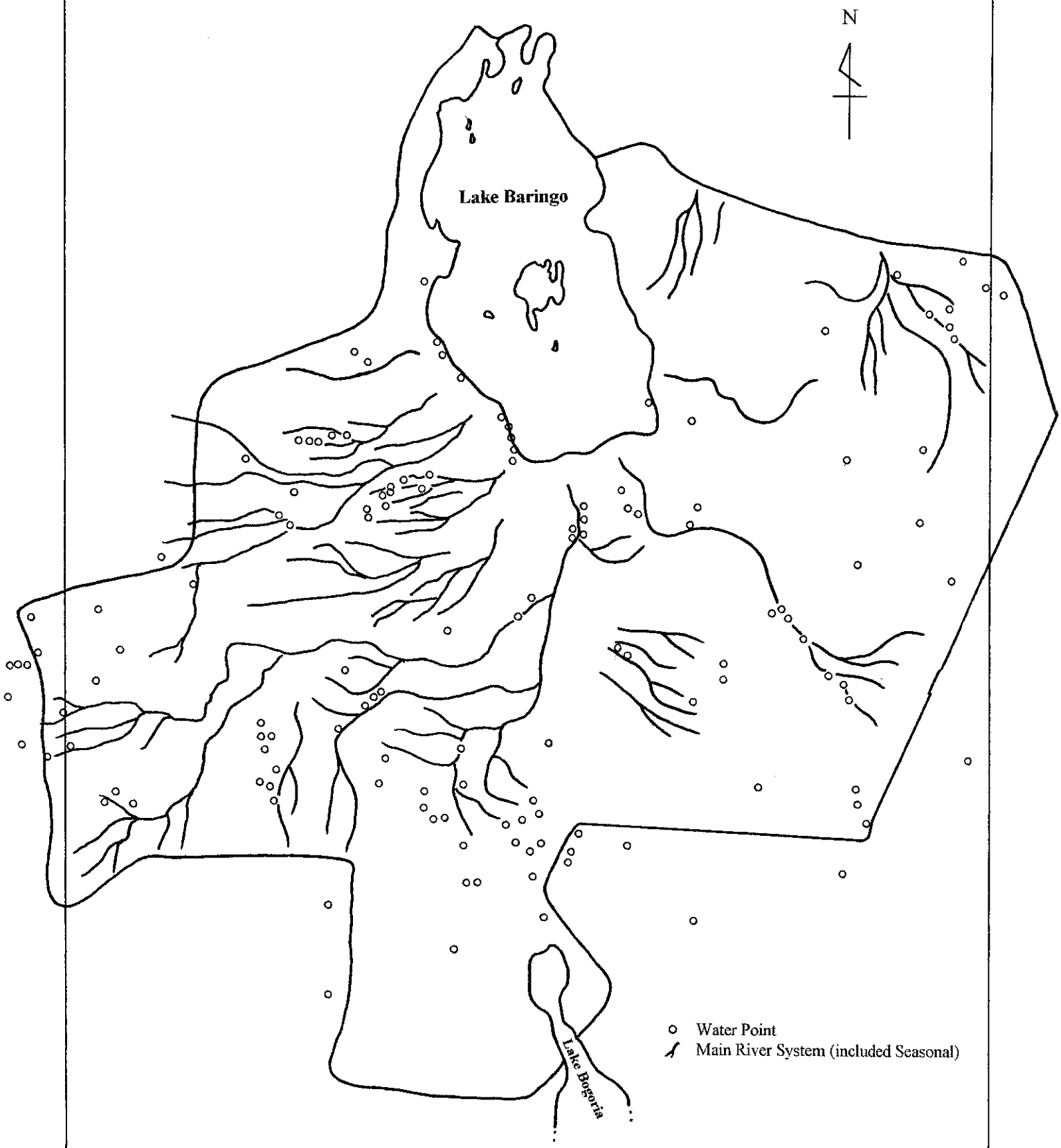

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Figure 4-2
Location Map of Water Point

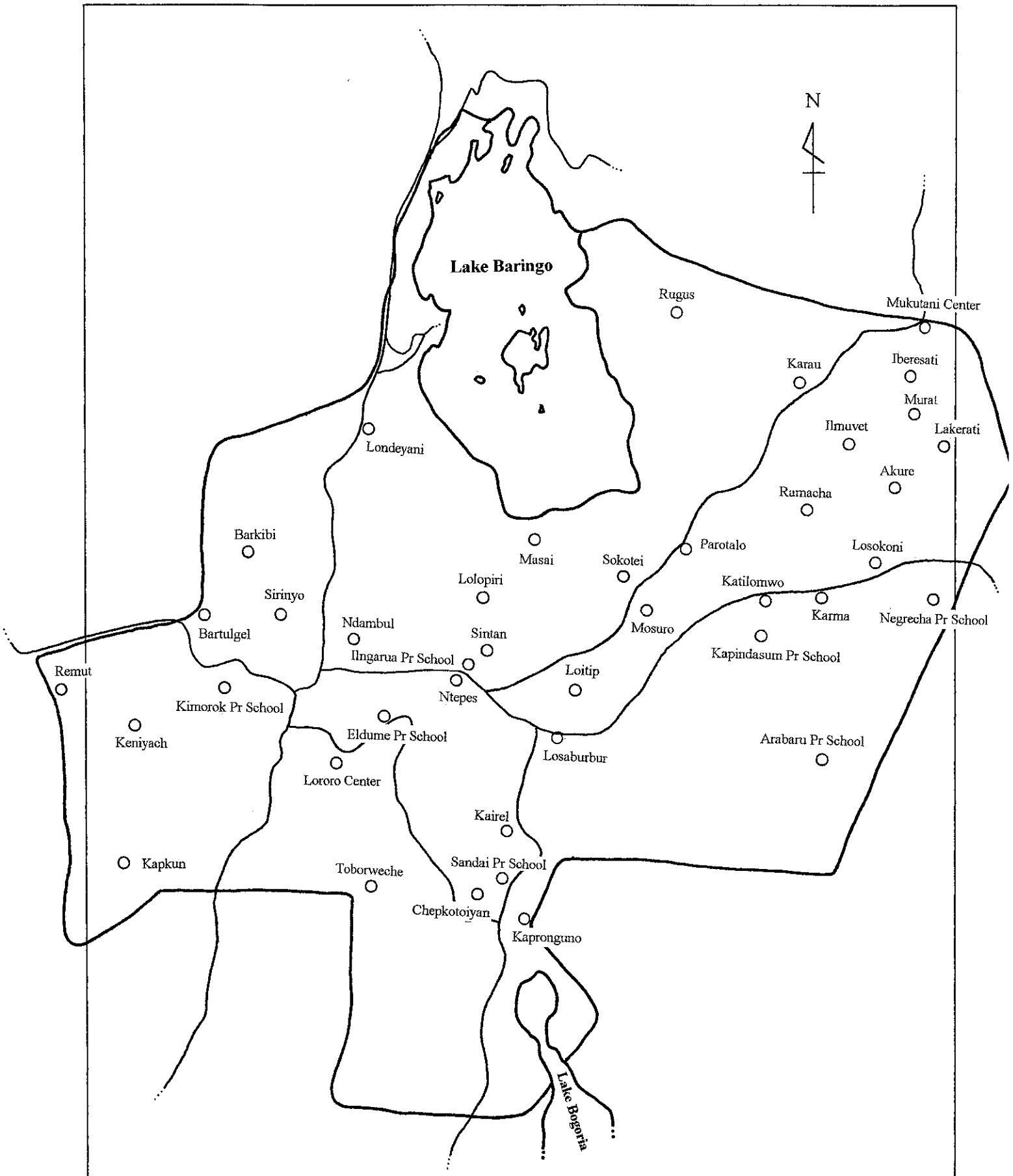

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Figure 4-3
Location Map of Geophysical Survey

Figure 5-1
Standard Borehole Design