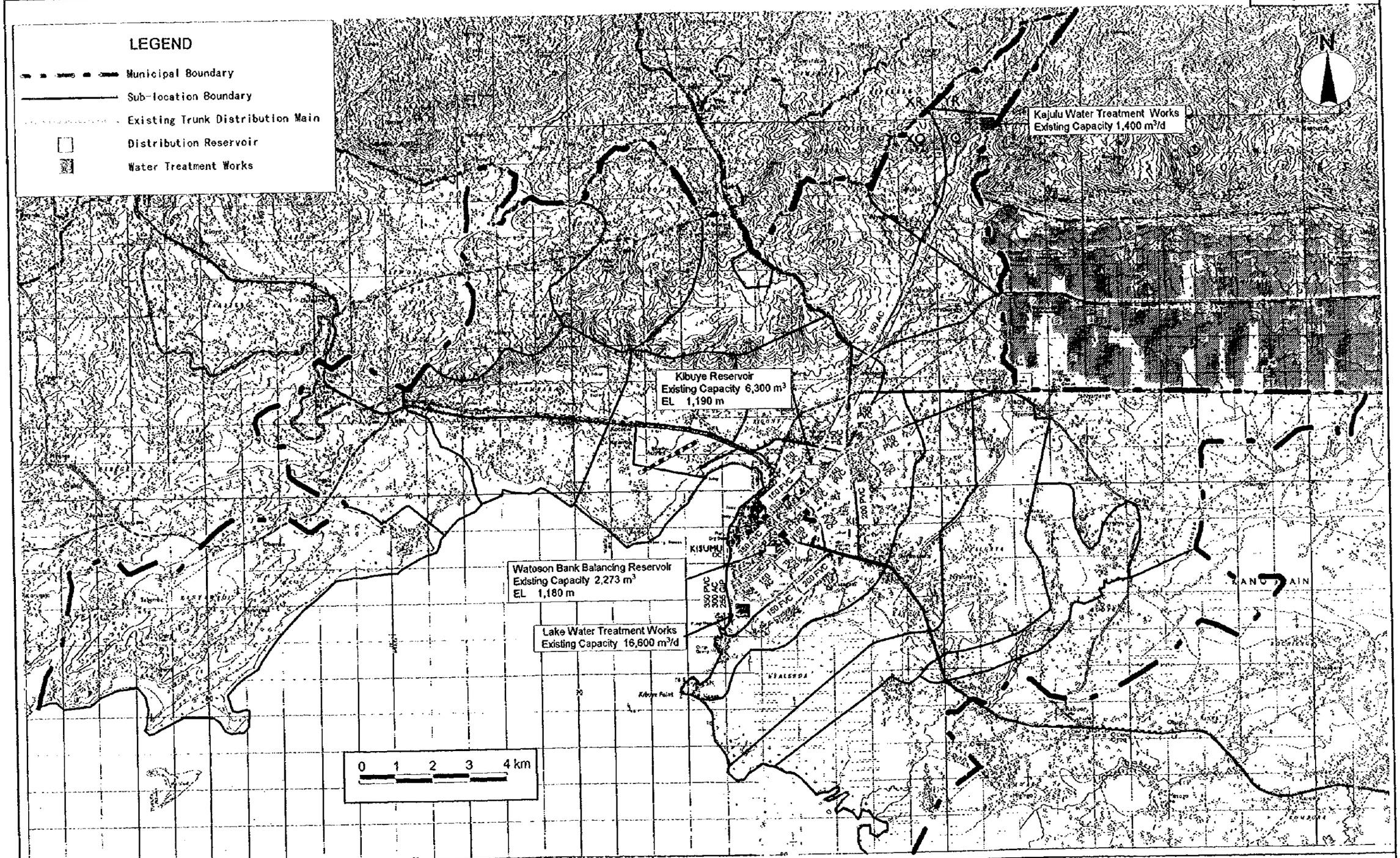
Figure 4-7



THE REPUBLIC OF KENYA THE MINISTRY OF LOCAL AUTHORITIES KISUMU MUNICIPAL COUNCIL	THE STUDY ON KISUMU WATER SUPPLY AND SEWERAGE SYSTEM JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Exisiting Trunk Distribution Mains

e. Consumer Meters

A project sponsored by GTZ collected information with respect to the customer connections from the existing meter recording books for the period January to October 1995. Such information is summarised below.

Table 4-4 Working Condition of Domestic Consumer Meters (1995)

Condition of Customer Connection	No. of Unit	Proportion to Total (%)
With a functioning meter	3,546	32
With a malfunctioning meter	2,943	26
Without a meter	4,081	36
Others (Condition Unknown)	670	6
Total	11,240	100

Source: Kisumu Municipality/GTZ

The results of field surveys conducted by the JICA Study Team are summarised below.

Table 4-5 Working Condition of Consumer Meters (September 1997)

Survey Items		Number of Meters	Component, %
Number of households visited		309	
Condition of Meter	Working	192	62.1
	Malfunctioning and not working	117	37.9
	Total		100.0

Source : Study Team

The figures in Table 4-5 were obtained from the households located in the central part of Kisumu, which are currently being supplied daily on a twenty four hours basis from the municipal water supply system. The figures in Table 4-4 were collected from households in different parts of the existing service area, and thus can be assumed to be representing the overall situation in the service area.

Despite the difference in the location, number of samples and water supply condition, the results obtained from these field surveys provide a similar indication that approximately one third of the customer meters installed in Kisumu are not working properly.

Water meters which, at the time of survey, appeared to be working were also subjected to an accuracy test by installing a calibrated test meter immediately adjacent to them. This was conducted during 3 continuous days from October 5 to 8, 1997 and the results are presented in Table 4-6. As can be seen in the table, most of the existing water meters tested show the tendency of under-registration, on average about 85% of the volume registered by the calibrated test meter. This indicates that remedial actions are needed not only for malfunctioning meters but also for those appear to be functioning normally.

Table 4-6 Accuracy of Consumer Meters

Location	Meter Reading, m^3		Difference in Meter Readings, m^3		
	Test Meter	Existing Meter	m^3	%	%
	A	B	A - B	B x 100 / A	Simple Average
Industrial Area Sabuni Road B1/3 - Afro Meat Factory	6.109	5.169	0.940	84.61	
B 1/1 - Grada Agencies	0.289	0.270	0.019	93.43	
Ndunga Estate B 5/3 - Building under construction	2.776	2.460	0.316	88.62	
Ondieki Estate B 3/1 - Butchery	0.506	0.392	0.114	77.47	
	9.680	8.291	1.389	85.65	86.03

Note : Survey was conducted between 5-8 October 1997

Source : Study Team

In summary, existing condition of meters is summarised as follows:

Ratio of failed meters (malfunctioning or not working)	-38%
Accuracy of working meters	-85% (under registration)

A team of only a few people is currently assigned for the repair/replacement of water meters. Given the total number of currently malfunctioning meters which is more than 3,000, more resources apparently need to be allocated for this task team to accomplish the job in a more effective and proper way. At the same time, every effort should be exercised to arrest the number of malfunctioning meters at the current level and prevent the number from further increasing in the future.

(5) Tap Water Quality

In September 1997, the JICA Study Team examined tap water quality at 10 different locations within the areas served by Kajulu and Lake WTWs. The results indicated that tap water quality varies from one place to another, particularly in respect of residual chlorine and turbidity. Residual chlorine was in the range of between 0.04 and 3.70 mg/l and was generally higher in the area served by Kajulu WTW than in the area served by Lake WTW. Turbidity was between 2 and 17 NTU. Improvement of tap water quality is necessary throughout the service area to meet the Drinking Water Quality Standards in Kenya.

4.2.2 Water Supply in Sub-urban Areas

Population in sub-urban areas as of 1997 is estimated at 89,229 while that in urban and peri-urban is estimated at 273,928. Several sub-urban water supply schemes are found in the Study Area operated by government institutions and communities. Locations of these water schemes are shown on Figure 4-8. A survey of these schemes was conducted and the results are presented in Appendix B. Most of them depend on small streams, shallow wells and lake. Summary of the major community facilities are shown in Table 4-7.

Table 4-7 Major Community Water Supply Facilities in Kisumu Municipality

Location	Facility Outline	Remarks
Mkendwa/Kanyakwar Water Supply	- Underground reservoir receiving water through subsurface filters from a spring - Water is pumped for 12 hours a day to a distribution reservoir (approximately 90 m^3)	- Facility was originally owned by municipality but was later abandoned due to vandalism. - In 1994, community elder (Mzee) organised a committee which obtained the technical and financial help from MLRRWD and restored the supply. - Committee has planned for expansion including renovation of existing reservoirs and expansion of intake capacity - 54 house connections, each charged Ksh. 150/month - Electricity for pumping is provided by the government without cost
Dago Water Supply	- Same source as above	- Facility operated by MLRRWD
Chiga Mission Supply	- Borehole operated using wind pump	- Presence of flouride
Soko Kogweno (Bandani)	- Protected spring	- Presence of turbidity - Managed by Youth Group - Used by a few thousand people

Mkendwa/Kanyakwar supply is one of the few piped schemes operated by communities. It supplies to households as well as a technical college.

In Bandani which is located north of the airport, a protected spring called 'Soko Kogweno', is used by several thousand residents and is managed by youth group in that area.

Number of shallow wells are low, but almost all of their water quality is not suitable for drinking because of turbidity in the range of 40-80 units and the presence of ammonia indicating contamination.

People living along the downstream of Kibos River use river water but the water is not suitable for drinking due to high turbidity.

In the western part away from Lake Victoria, springs and small streams are used as water sources. These also dry-up during dry season except for small springs (e.g. Ojolla) resulting in harsh water environmental conditions.

Water quality of deep-wells was pH being high in the range of 8.0 to 8.5, and electrical conductivity was at 450 μS/cm due to inorganic salts. Further, average fluoride concentration was 3 mg/L and prevalence of mild fluorosis was also observed in the nearby areas.

Maseno/Kombewa Water Supply which supplies part of Ojolla (sub-location No. 24) in the Study Area. Treatment works is located outside the Study Area and the supply is operated by National Water Conservation and Pipeline Corporation (NWCPC). Treatment facilities are not maintained and chlorination is not practised.

4.2.3 System Operation and Maintenance

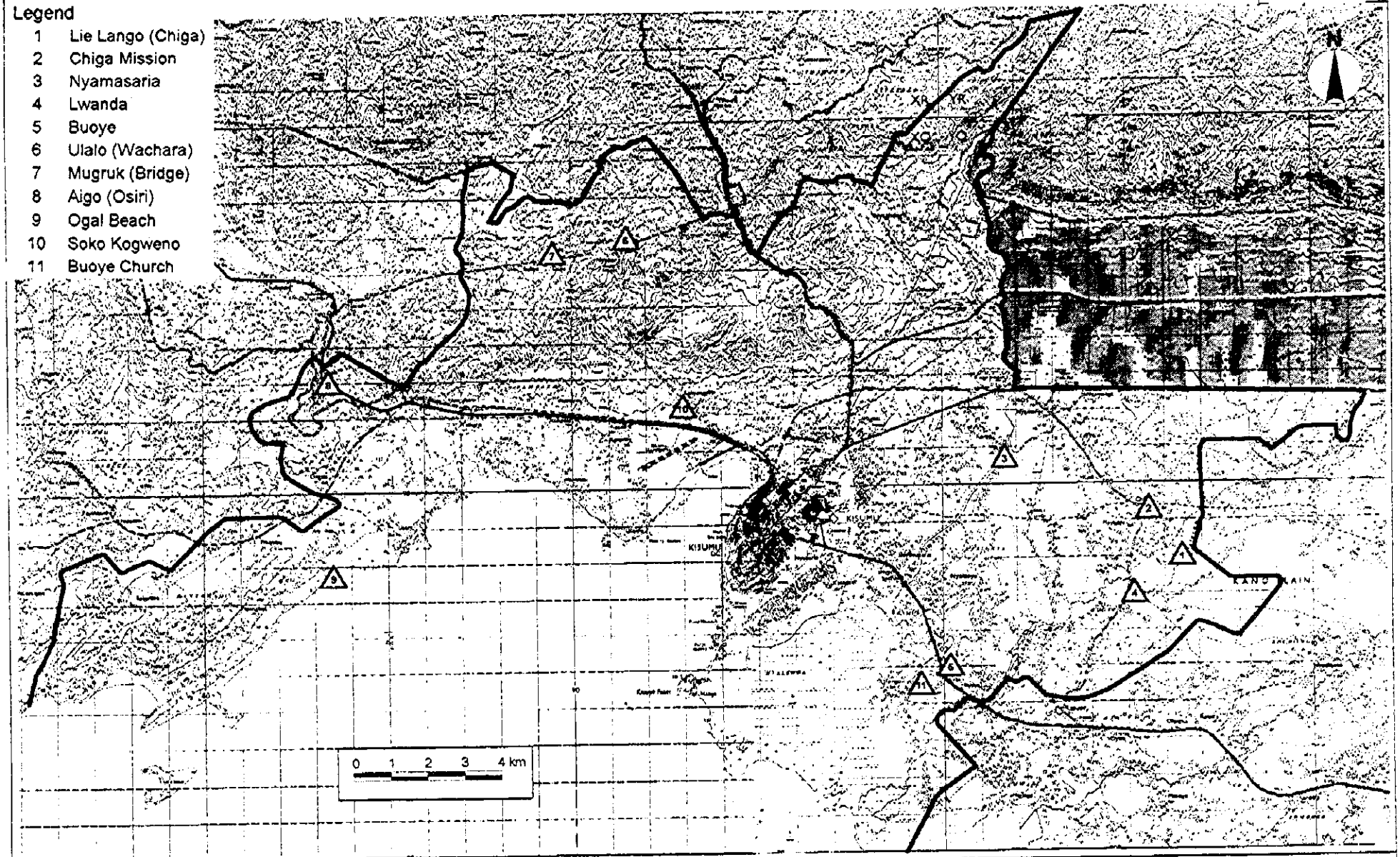
Equipment necessary for operation and maintenance is inadequate. For example, for water quality testing, equipment for only a few parameters like pH, alum dose (jar tester) are available. Equipment is insufficient for basic operation of not only treatment works but also for monitoring raw, treated, and distributed water.

Elevated Steel tanks at Kibuye Distribution Reservoir are leaking through the bottom of the tank, due to loosened bolt used to join steel plates. Even after one month it was left as it was, despite being reported for repair. Reason for not attending to it include inadequate storage of repair equipment, delays in administrative procedure after reporting etc.

In the treatment works and pumping stations, some of the pumps are broken down and has not been repaired.

In Kajulu Treatment Works, accumulation of silt in the intake weir is left without cleaning resulting in the reduction of retention time of water upstream of the weir. Although this is not a major problem, dissolving of iron and manganese from the deposits is suspected. This example shows that the importance of routine maintenance is lacking.

Figure 4-8



THE REPUBLIC OF KENYA THE MINISTRY OF LOCAL AUTHORITIES KISUMU MUNICIPAL COUNCIL	THE STUDY ON KISUMU WATER SUPPLY AND SEWERAGE SYSTEM JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Location of Rural Water Supplies

4.3 SEWERAGE SYSTEM

4.3.1 General Conditions

Existing municipal sewerage system covers very limited area of central part of Kisumu Municipality and rest of municipal area is on-site sanitation area as shown on Figure 4-9.

The existing municipal sewerage system in Kisumu comprises two wastewater treatment districts, namely Central Wastewater Treatment District (Central WTD) and Eastern Wastewater Treatment District (Eastern WTD). Figure 4-9 shows the locations of major sewerage infrastructure and the area currently managed by the municipal sewerage system.

4.3.2 Municipal Sewerage System

(1) Central WTD

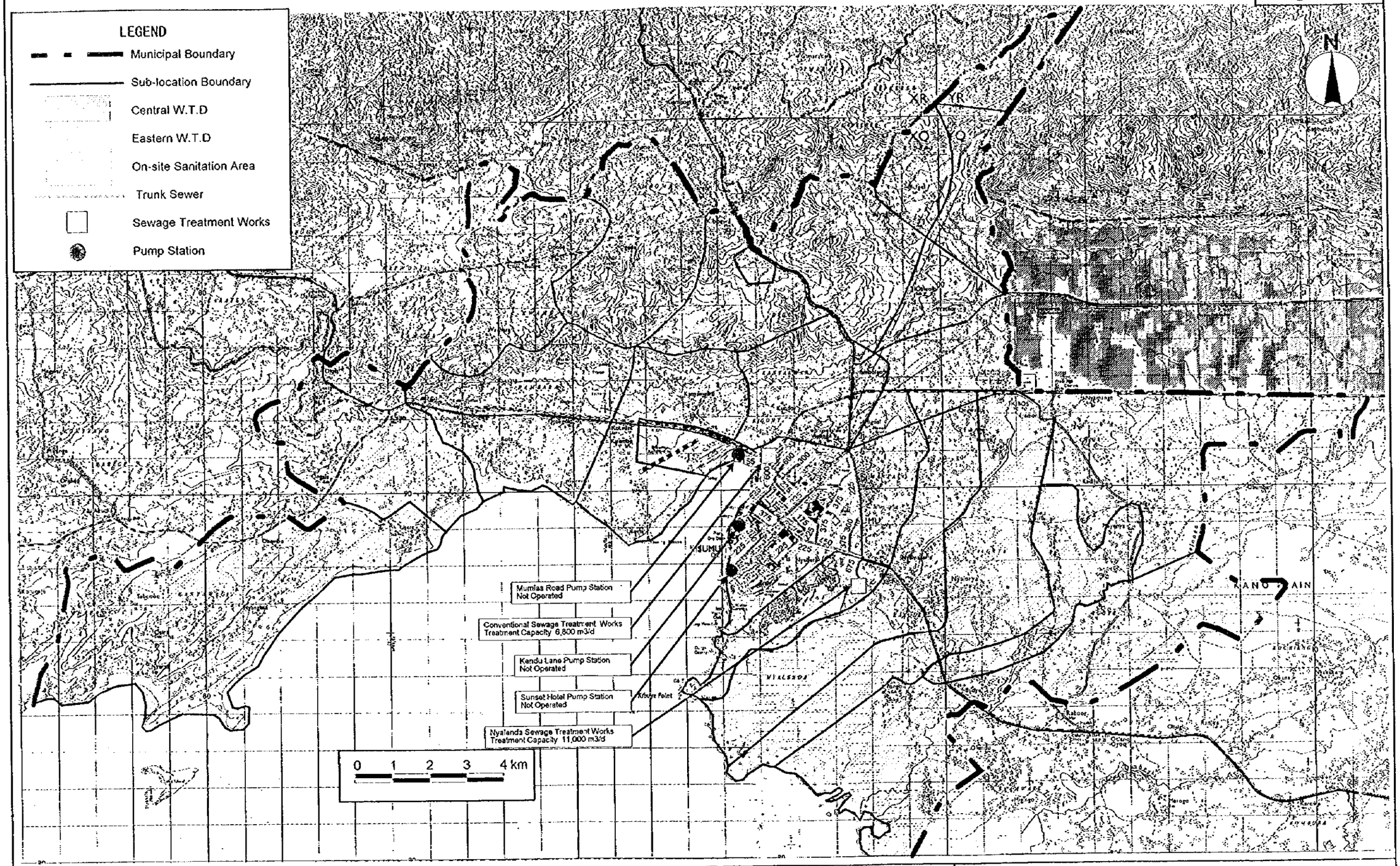
a. Wastewater Collection Facilities

Central WTD collects wastewater generated in the area north-west of the old town by gravity and that generated in low-lying coastal areas along the shore of Lake Victoria through three pump stations, namely Mumias Road, Kendu Lane and Sunset Hotel pump stations. Wastewater collected in this district comprises domestic, commercial, institutional and industrial origins and is conveyed to the Conventional Sewage Treatment Works (Conventional STW) for treatment. The district covers a total area of 390 ha with main sewers 175 to 600 mm in diameter and 8.5 km in total length.

All the sewer mains within the existing sewer networks are concrete pipes with ogee joints except for rising mains which are either uPVC or asbestos cement pipes. The oldest sewers were laid in 1958 and are now almost forty years old. Despite their age, these old sewer pipes are generally in a good condition except for blockage which occurs frequently in certain sections.

All of the three existing pump stations, namely Sunset Hotel PS, Kendu Lane PS, and Mumias Road PS, are currently not being operated. At these stations, broken or worn-out pumps have been left without repair or replacement for many years due primarily to lack of funds. This has resulted in the overflow of sewage at manholes upstream of the respective stations as well as in the direct discharge of sewage to Lake Victoria.

Figure 4-9



THE REPUBLIC OF KENYA THE MINISTRY OF LOCAL AUTHORITIES KISUMU MUNICIPAL COUNCIL	THE STUDY ON KISUMU WATER SUPPLY AND SEWERAGE SYSTEM JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Exisiting Sewerage System

Records at Conventional STW indicate that the amount of inflow to the STW increases to between 10,000 to 15,000 m^3/d during rainy season, which is more than double the amount of what is supposed to be received (6,000 to 7,000 m3/d) by the STW for treatment. The cause for this seasonal increase is estimated to be the intrusion of storm-water through manholes, broken sewers and faulty connections, and the infiltration of groundwater through pipe fittings and manholes.

Major problems identified for the existing wastewater collection system in Central WTD are summarised as follows:

- Wastewater overflow from manholes or direct discharge to Lake Victoria resulting from the existing three pump stations which are currently not being operated
- Increase of wastewater inflow to the Conventional STW during rainy season

b. Conventional Sewage Treatment Works

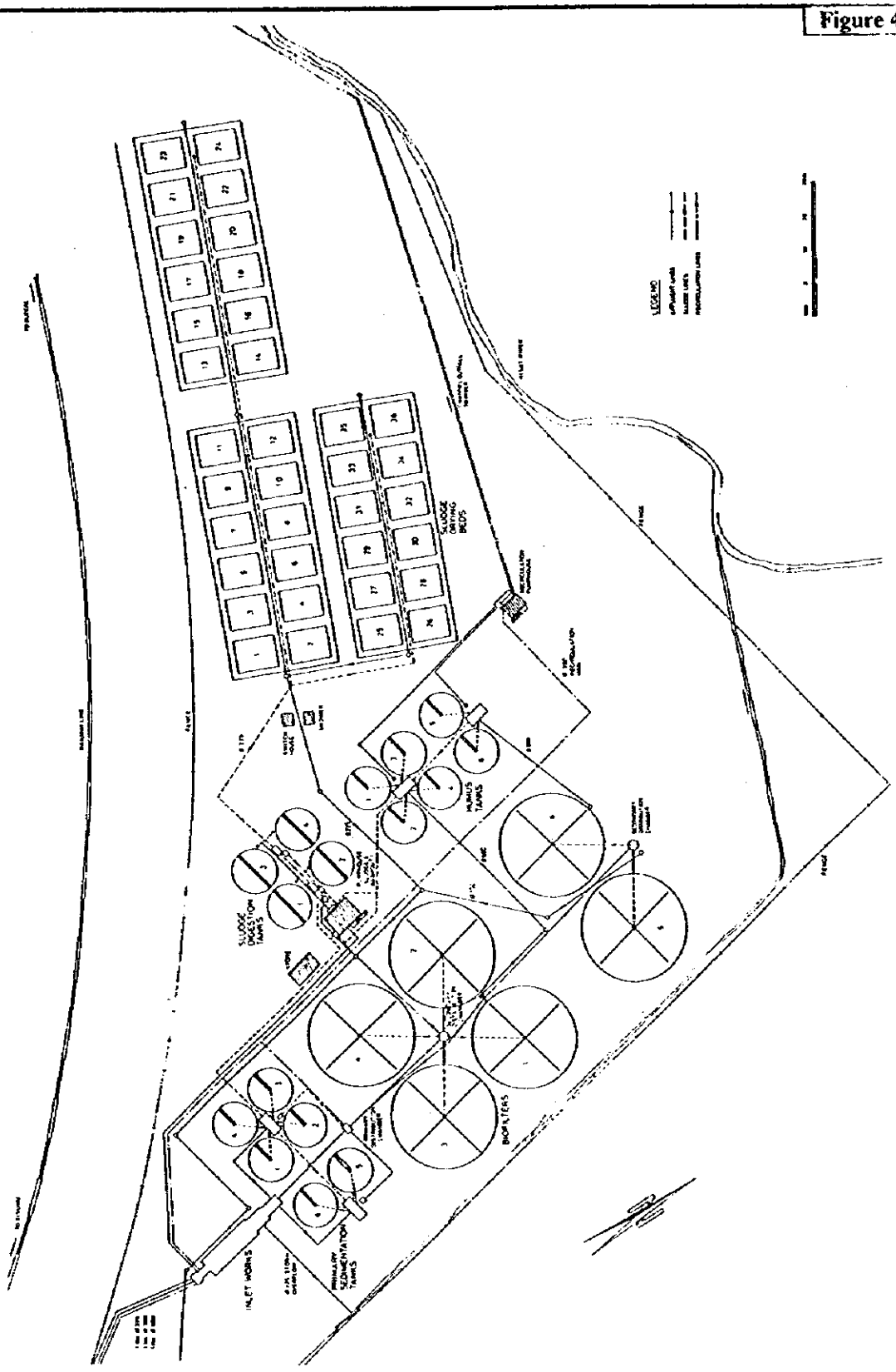
This sewage treatment works is sited to the north-west of the town adjacent to the Kasat River. Originally the works was designed to treat 2,270 m^3 per day but was extended to treat a dry weather flow (D.W.F.) of 6,800 m^3 per day (1.5 mgd). Flowchart and layout of the works are as shown in Figures 4-10 and 4-11. Outline of the Conventional STW is shown in Table 4-8.

Table 4-8 Outline of the Conventional Sewage Treatment Works

Wastewater Treatment Method	Trickling Filter
Sludge Treatment and Disposal Method	Anaerobic Digester + Sludge Drying Bed
Present Treatment Capacity	6,800 m^3/d
Actual Wastewater Inflow	9,000 m^3/d
Design Treated Wastewater Quality	BOD_5 Conc.: less than 50 mg/L
Treated Wastewater Quality	BOD_5 Conc.: 143 – 254 mg/L
Receiving Water Body	via the Kisat Stream to Lake Victoria
Problems in Operation and Maintenance	Due to the worn-out of sludge pumps, the final sedimentation tanks do not function. Floating oil and grease separator in the inlet works is not functioning High influent loads due to receiving industrial wastewater and inflow of rain water during wet weather conditions

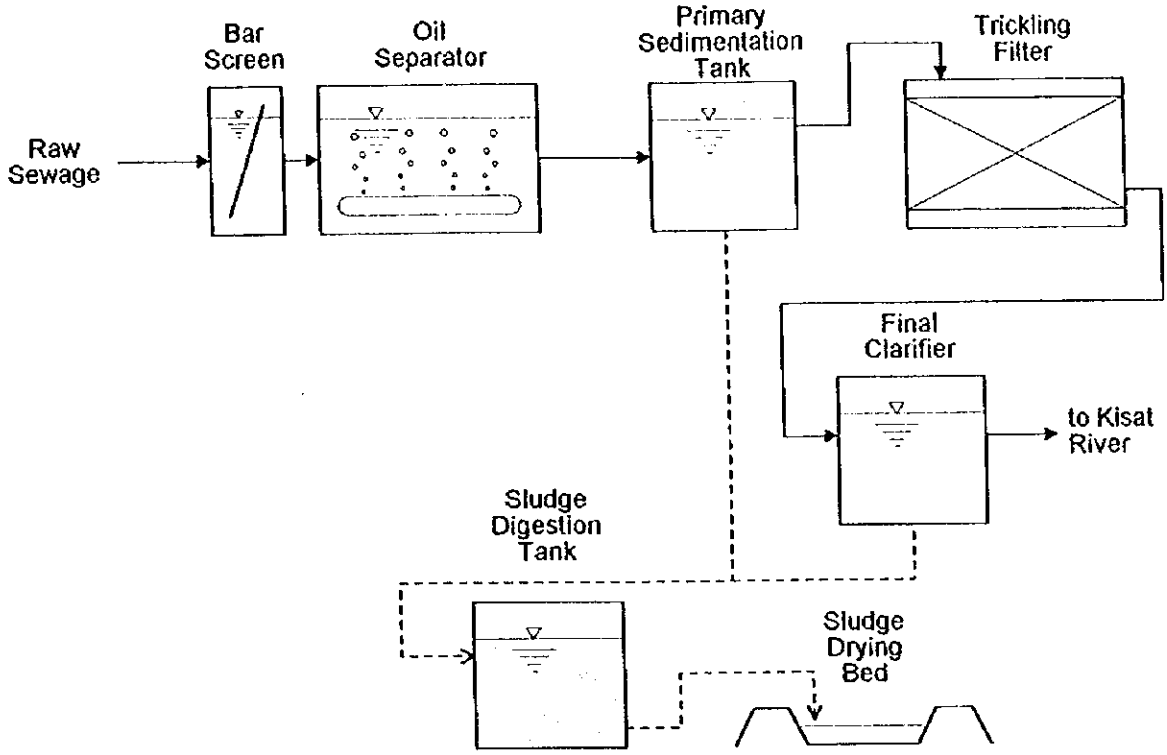
Source: JICA Study Team

Figure 4-10

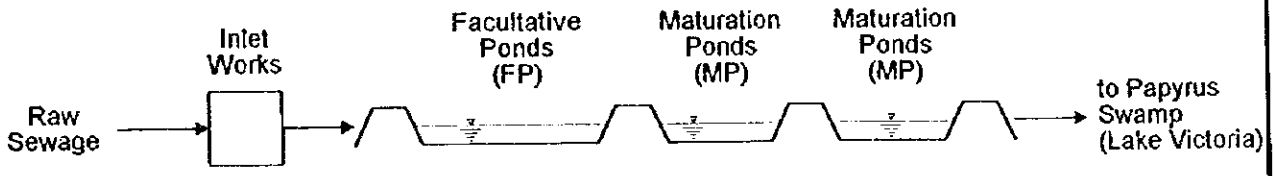


THE REPUBLIC OF KENYA THE MINISTRY OF LOCAL AUTHORITIES KISUMU MUNICIPAL COUNCIL	THE STUDY ON KISUMU WATER SUPPLY AND SEWERAGE SYSTEM JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Layout of Existing Conventional Sewage Treatment Works

Figure 4-11



Schematic of Conventional Sewage Treatment Works



Schematic of Nyatenda Waste Stabilisation Ponds

THE REPUBLIC OF KENYA THE MINISTRY OF LOCAL AUTHORITIES KISUMU MUNICIPAL COUNCIL	THE STUDY ON KISUMU WATER SUPPLY AND SEWERAGE SYSTEM JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE : Process Schematic of Existing Sewage Treatment Works

Treatment process comprises screening, grit removal, primary settlement, biological filtration and final settlement of filter humus. The sludge produced is conditioned in cold digestion tanks and dried in sludge drying beds before disposal to the land. It is possible to recirculate filter effluent. Final effluent is discharged into the Kasat River which then flows through the golf course and into Lake Victoria. The mechanical/electrical equipment underwent rehabilitation/replacement under a KFW financed project in 1986. On completion of the project the plant was restored to its design capacity.

However at present the plant is overloaded, hydraulically and in terms of BOD, influent concentrations being in the order of 800 mg/l. This is due to industrial wastewaters which are not pretreated at source.

The works as designed should be capable of producing an effluent up to British Commission Standards of 20mg/l Biochemical Oxygen Demand and 30mg/l Settleable Solids. However analysis of the final effluent show that it rarely falls below 100 mg/l.

Performance of the Conventional STW is shown below.

Table 4-9 Performance of Conventional Sewage Treatment Works

Parameter	Influent	Effluent
BOD_5, mg/L	822 - 914	143 - 254
SS, mg/L	620 - 1,257	250 - 916
Total Coliform, CFU/100 mL	5.2×10^5 - 8.1×10^7	4.8×10^5 - 4.5×10^6
T-N, mg/L	238 - 378	161 - 251
T-P, mg/L	12.5 - 15.2	12.5 - 15.2
COD, mg/L	1,550 - 3,650	507 - 826

Note: Ranges given above are based on analysis of three samples taken at 8:00 h, 14:00 h and 20:00 h.

Source: JICA Study Team

Influent BOD concentration is very high in the range of 822 - 914 mg/L, characterising the effect of industrial wastewater. Inflow is estimated at more than 9,000 m^3/d. Effluent BOD concentration around 143 - 254 mg/L exceeding the design value of 50 mg/L. High concentration of SS in the effluent (250-916 mg/L) shows the poor performance of settling tanks and overloading. Overloading is mainly attributed to expansion of industrial production in brewery, fish processing, textile, soft drink bottling and edible oil industries.

Effluent is discharged to the Kisat Stream which flows into Lake Victoria north of Lake Water Intake Works.

At present mechanical/electrical facilities are in need of rehabilitation/replacement and the Conventional Treatment Works has experienced frequent stoppages due to failure of mechanical and electrical facilities.

The Works is not operated properly during the night time due to the absence of operating staff. The site is not secure as watchmen are often not on duty and the works has suffered a major robbery in the past which involved electric panels and switch gear. These items were not replaced which seriously reduced the efficiency of the works.

A screenings macerator should be installed to overcome the task of collection and disposal of screenings which will increase as the inflow increases. This unit is designed to chop screenings into fine particles and return them to the flow upstream.

At present there are six number of stone media filters in operation. The units are grouped as follows; filters 1 to 4 fed individually from a secondary distribution chamber which in turn is fed from the primary distribution chamber and the filters 5 and 6 fed from their own secondary distribution chamber connected to the primary distribution chamber. Flow diversion to the unit is not uniform and filters 5 and 6 always tend to receive a higher individual loading than filters 1 to 4. The limiting component in the treatment works is at present trickling filters, it is recommended that the construction of a separate 7th trickling filter using high rate media be done to overcome this problem.

At present the peripheral collector channels are undersized thus tending to drown the floor tiles thereby blocking the air flow to the filter media. It is proposed that the width of the channels be increased leaving the depths and the invert levels as existing.

Covers for sludge drying are recommended to aid sludge drying in periods of prolonged rainfall. A pair of covers is recommended for each drying bed, each cover being individually moveable. Single covers over an entire bed have been found too heavy to be moved manually.

(2) Eastern WTD

a. Wastewater Collection Facilities

Eastern WTD collects wastewater generated in the south-east of the old Kisumu town. Wastewater which is mainly of domestic origin except for that received from the new Nyanza Hospital, is collected and conveyed to the Nyalenda Sewage Treatment Works (Nyalenda STW) by gravity. The district covers a total area of 214 ha with trunk sewer mains 175 to 675 mm in

diameter and 8.0 km in total length.

Some of the existing sewers in this district are not properly functioning. The trunk sewer from the Shauri Moyo Estate to Ondiek Highway through Akech Street is collapsed and raw sewage overflows from manholes. Kibos Trunk Sewer is clogged at several locations with stones, rags and plastic bags, and sewage overflows at manholes. Branch sewers in Migosi are not functioning due probably to the blockage resulted from low flow of sewage.

The present average wastewater inflow to the Nyalenda STW is estimated to be 2,000 m^3/d, which is smaller than 20% of its design capacity, 11,000 m^3/d. It is assessed that the lack of an adequate water supply in the Eastern WTD is the main reason for this. The situation has resulted in a low flow with a higher solid concentration in sewer mains. The heavier solids tend to settle down and help forming scum and sludge within sewer mains and manholes, causing blockages. Silting, too, has occurred in large diameter sewers having minimum gradients which reduces velocities. Silting reduces the normal capacity of sewer mains and hinders the smooth passage of larger solids.

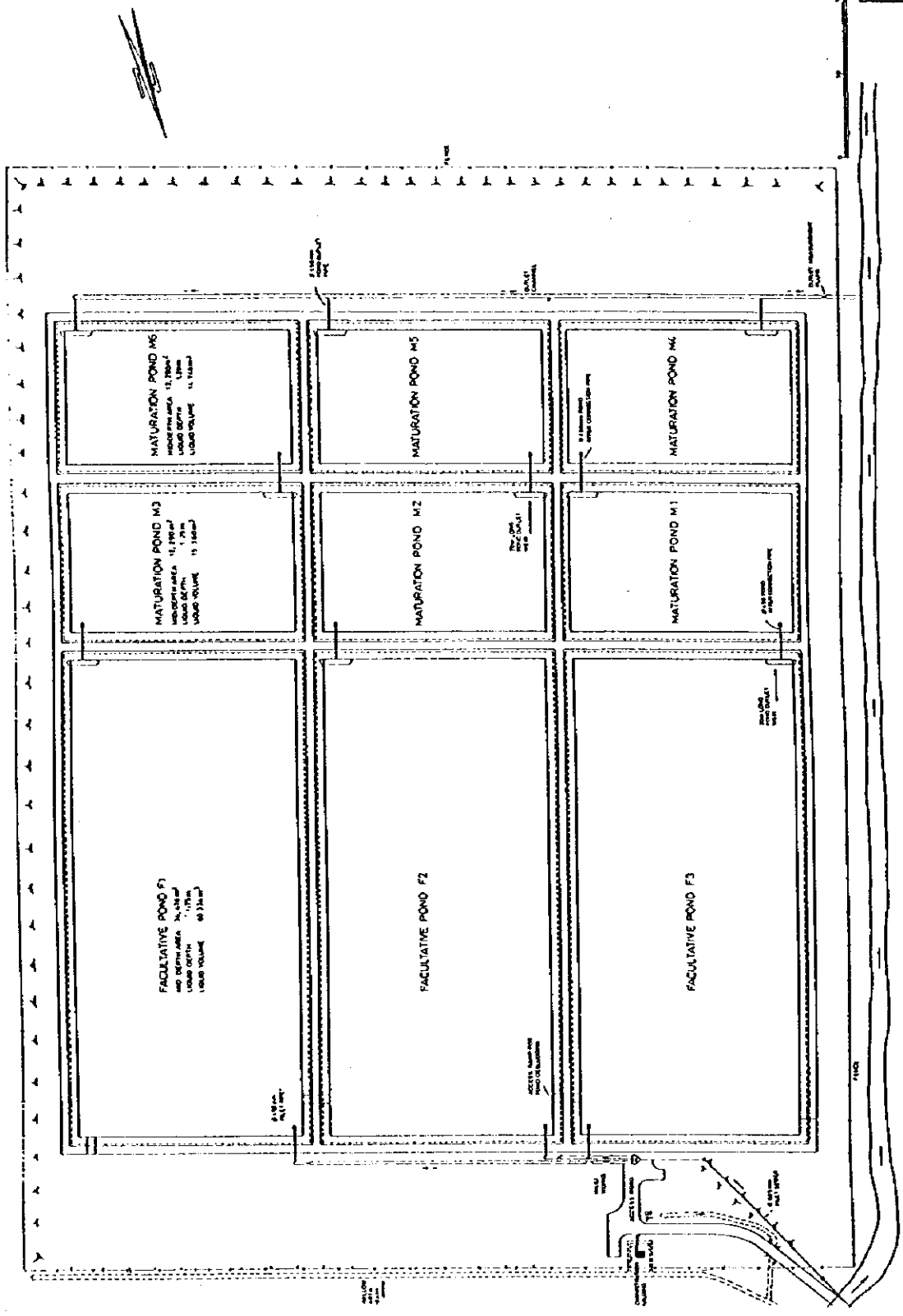
Major problems identified for the existing wastewater collection system in Eastern WTD are summarised as follows:

- Wastewater overflows due to collapsed or clogged sewer mains
- Low wastewater flow resulted from inadequate water supply

b. Nyalenda Sewage Treatment Works

The existing plant provides preliminary, secondary and tertiary treatment to an inflow predominantly domestic in origin but including that from the new Nyanza Hospital. The works consists of an inlet works with screening and grit removal, 3 No facultative ponds in parallel and 6 No maturation ponds arranged as parallel pairs. Flowchart and layout of the works are as shown in Figures 4-11 and 4-12 and outline of the works is summarised in Table 4-10.

Figure 4-12



THE REPUBLIC OF KENYA THE MINISTRY OF LOCAL AUTHORITIES KISUMU MUNICIPAL COUNCIL	THE STUDY ON KISUMU WATER SUPPLY AND SEWERAGE SYSTEM JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Layout of Nyalenda Sewage Treatment Works

Table 4-10 Outline of the Nyalenda Sewage Treatment Works

Wastewater Treatment Method	Stabilisation Ponds composed of three facultative ponds and six maturation ponds
Design Treatment Capacity	11,000 m^3/d
Actual Wastewater Inflow	Inflow rate is far less than the design flow, it may be about 2,000 m^3/d
Treated Wastewater Quality	BOD_5 conc.: 75 - 86 mg/L
Receiving Water Body	via the Nyalenda papyrus swamp to the Lake Victoria
Operational Mode	Two out of three trains of ponds are operated alternately
Problems in Operation and Maintenance	Facultative ponds are malfunction due accumulation of sludge, to the growth of water hyacinth and other weeds

Source: JICA Study Team

The treated final effluent is discharged to an adjacent watercourse, from whence it percolates to the lake via the Nyalenda papyrus swamp. The present estimated inflow of 2000 m^3/d is very low compared to the design capacity of 11,000m^3/d. This low flow combined with high evaporation rates due to the geographical location of Kisumu results in very low effluent flows. The present flows are so low that it is not necessary to operate all three parallel streams at once. Two streams could be closed and all the present influent treated in one stream.

As shown in Table 4-11, influent BOD concentration was between 314-472 mg/L which is lower than that of the influent to Conventional STW, and can be characterised as high strength domestic wastewater. Despite reduced retention time due to accumulation of sludge and proliferation of weeds in the facultative ponds, effluent quality was in the range of 74-86 mg/L due to low wastewater inflows. This also signifies the effectiveness of stabilisation pond systems for wastewater treatment where problems in operation and maintenance is envisaged.

Table 4-11 Performance of Nyalenda Sewage Treatment Works

Parameter	Influent	Effluent
BOD_5, mg/L	314 - 472	75 - 86
SS, mg/L	714 - 1,000	66 - 400
Total Coliform, CFU/100 mL	3.0×10^6 - 3.2×10^7	2.2×10^5 - 4.2×10^5
T-N, mg/L	181 - 248	18 - 31
T-P, mg/L	6.7 - 11.2	2.2 - 3.8
COD, mg/L	735 - 1,150	340 - 380

Note: Ranges given above are based on analysis of three samples taken at 8:00 h, 14:00 h and 20:00 h.

Source: JICA Study Team

The present condition of the works illustrates the result of lack of maintenance with overgrown embankments, inoperable flow measurement equipment, malfunctioning facultative ponds overgrown with water hyacinth, dislodged anti-erosion slabs and minor collapses to embankments. Whilst some of the problems are attributable, at least in part, to design shortcomings and possibly to poor construction, a lack of maintenance tools and absence of suitably trained maintenance staff is paramount.

The present inflow is less than half that designed for, at least one of the three parallel streams could be closed. Mode of operation used in the past of using one stream for seven days followed by two streams for two weeks was totally inappropriate and resulted in poor quality effluent. At the time this was drawn to the plant operators attention but resulted in no change. The inlet works contain a profusion of flow measurement devices that currently fail to either achieve accurate measurement or accurate flow splitting with critical flow occurring before rather than in the Parshall flume throats. Although this does not in itself cause a major deleterious effect on treatment operations, the inlet works are in need of considerable modification.

The facultative ponds require desludging and the access ramps are not only inaccessible but far too steep at 1:2 to be used by any form of laden mechanical plant. Ramps will need to be built at a much shallower slope and made accessible by bridges placed across the inlet channels.

A major exercise will be needed at the time of desludging as the volume of sludge is likely to be of the order of 58,000 m^3 with a dried out volume of 20,000 m^3 to be removed and disposed of.

4.3.3 On-site Community Treatment Facilities

In the Municipality, following on-site sewage treatment system has been used; Septic Tanks, Pit Latrines, and Bucket Latrines.

Septic tanks are used in the low density residential areas in Milimani area and at certain institutions. Septic tanks operate satisfactorily in the area. Emptying sludge service for septic tanks are provided by the municipality.

Pit latrines are commonly used in the peri-urban and rural area in the municipality. Pit latrines of various designs are used as follows:

- Pit with a slab at ground level and a superstructure of timber poles and iron sheets without a roof or ventilation to the pit;
- Pit raised above ground level and a superstructure of timber/iron sheets with a roof. The raised slab prevents surface water from entering the pit and provides extra pit volume; and
- Ventilated improved pit with a raised slab and sound superstructure. Pits were seen with a manhole for emptying by a vacuum tanker or manually.

In areas prone to flooding, a common problem is collapse of pit latrines. This is probably due to their poor construction in unstable soils and the problem can be overcome with lining of the pit and raising the floor slab to prevent surface waters entering the pit.

Another common problem is that of high ground water level that reduces the available pit volume and increases the frequency of emptying the pits or digging new pits. Contamination of the groundwater is a serious consequence especially in areas where shallow wells and boreholes are used for local water supply. Emptying of pits in many areas is not possible by vacuum tanker due to the limited or no access to the sites.

Bucket latrines are used in a very limited area. A daily collection service are still operated by the Municipality, and the waste is disposed to Nyalenda STW. But daily collection service becomes difficult to operate without any proper vehicle or manpower.

In rural area where population density is low, the on-site facilities function well. However, in high population density area, especially in informal settlements, combination of poor state of pit latrines, poor drainage and lack of proper solid waste disposal leads to a deteriorate the sanitary environment and significant increase in water borne diseases such as malaria and diarrhoea. In those areas, wastewater from washing, cooking, bathing is usually discharged into the nearest drainage channels. In case that drainage channels are not well defined, this leaves stagnant pools of wastewater. The close proximity of pit latrines can cause the contamination of shallow wells which constitutes the main water supply.

4.3.4 Industrial Wastewater Management

The discharge of industrial wastewaters to municipal treatment works and sewers must be regulated to ensure that no material which could have an adverse effect on the biological processes enter the works. To achieve this objective it will be necessary to set down allowable

levels of such properties as pH, heavy metals, sulphates, temperature etc. Each industrial effluent must be separately scrutinised and regulated for and where necessary on-site treatment, to approved standards, must be undertaken before discharge licenses are granted. This situation exists at present but slackness in enforcement is allowing discharge of inadequately treated effluents.

Overloading in the Conventional STW is attributed to increase in industrial wastewater. Normal water supply is available in only in Milimani area and part of its surroundings for domestic, commercial and institutional uses resulting in wastewater and in other areas water supply is restricted to few hours a day. Excluding the water supplied through common taps, a total volume of about 7,000 m^3/d is used and even if about 60% the wastewater reaches sewer system, wastewater volume cannot exceed 5,000 m^3/d. Rest of the wastewater reaching treatment works is from the industries. Due to inadequate water supply, other water sources namely Lake Victoria, groundwater etc. are used in the industries resulting in additional wastewater.

Almost all of the industries discharging to public sewers do not have pretreatment facilities and does not comply with water quality standards for discharging to public sewers, for example BOD concentration below 500 mg/L. There is neither any monitoring system nor any enforcement of the standards, which result in overloading of public wastewater treatment works.

Some of the individual industries are provided with simple wastewater treatment facilities. They are not functioning resulting in discharge of settled oil/fat and extreme temperatures and pH into public sewers. The industrial wastewater is the major source of pollutant loads and hampers the treatment process. The heavy metals and toxic materials are seen to be the problem influents which inhibit biological breakdown.

The only pretreatment of industrial effluent to public sewers appears to be aerated ponds at Kenya Breweries and at Kisumu Paper Mills. Kicomi Textile Factory has a settlement tank, this does not however remove toxic substances such as sodium sulphide, copper and chromium which are used in the drying process. These substances cause poor bio-filter performance in the conventional treatment works. The effluent from the paper mill is discharged directly to the lake.

4.4 ORGANISATION AND INSTITUTION

4.4.1 Legal and Institutional Framework

In the general framework of Laws related to water, The Water act (Cap 372) is the most important. The Water Act was established in 1951, revised in 1972, and is currently being revised. The Act enables the Minister of Water Development to exercise control over every body of water. There are no less than 28 other laws related to water, operated through 13 Ministries, and details may be found in The Study on the National Water Master Plan, Sectoral Report (P), "Laws and Institutions", of July 1992 by JICA.

Whilst the Water Act covers Municipal water, and some aspects of pollution, The Public Health Act (Cap 242) includes many provisions relating to water and sewerage which enables Local Authorities to take action regarding any pollution which may be dangerous to health.

The National Water Conservation and Pipeline Corporation (NWCPC) Order, 1988 assigns the Corporation as the implementing body for relatively large scale water development projects. Accordingly the NWCPC may, or may not become involved with the bulk supply of water to Kisumu.

Under the Local Government Act (Cap 265) the Ministry of Local Authorities (MOLA) controls Local Authorities, with sections 178 to 180 specifically relating to the supply of water by Municipalities, and providing for the making of By-laws. Water By-laws may be issued under the Municipalities Ordinance (CAP 136), and whilst water and sewerage tariffs may be developed by the Municipality they must be approved by the Minister.

From an Institutional standpoint the MOLA is the lead player for overseeing the whole system of Local Government. For the Municipal Council of Kisumu the link is provided through the Urban Development Department (UDD) which either deals directly, or where necessary, channels matters to other Government Ministries and Departments.

An ongoing project of major importance is the Kenya Local Government Reform Programme (KLGRP) which has particular significance for Kisumu (KMC) it being a phase 1 partner town for the establishment of the basis for major investment in upgrading basic services. KMC has many institutional weaknesses to the extent that it has been unable to form an effective Water and Sewerage Department (WSD) since its breakaway from the Town Engineers Dept in 1993.

The relationship with the Ministry of Water Development (MOWD) is basically through the

MOLA. The MOWD itself has recently instituted a Water Sector Actors Survey in the wake of the formulation of a new National Water Policy, and it is likely that when this new policy is adopted, the role of Ministries could well change to that of an advisory and regulatory role. This Survey will look into the administrative and institutional changes that will be needed within a variety of Government bodies to ensure efficiency and accountability in the sector.

Strong links are also maintained with central government through the District Commissioner for Kisumu (who is also a nominated member of the Kisumu Council), and the Provincial Commissioner for Nyanza Province.

Whilst Legal and Institutional matters are covered adequately, both are spread through a multitude of Laws and Government Ministries, and often overlap causing delays and administrative problems.

4.4.2 Organisation and Management

Organisation and Management for KMC at National level is effected through the Urban Development Department of the MOLA. The ongoing Kenya Local Government Reform Programme (KLGRP) is looking into the broad issues of improving Municipal Management. With specific reference to the WSD the Urban Development Department (UDD) of the MOLA together with the German Technical Co-operation Agency (GTZ) are now in the fourth phase of the Urban Water and Sanitation Management Project (UWASAM) aimed at strengthening the management of W&S Departments. and the creation of autonomous Commercialised Water and Sanitation Companies.

Figure 4-13 shows the existing structure of the Kisumu WSD as proposed prior to the study. As can be seen, key management posts remain vacant. The WSD still does not operate as a separate department due to totally inadequate staffing. Hence most of its functions are integrated into the traditional Municipal system. The Council of KMC consists of 17 elected and 5 nominated Councillors and operates through Standing Committees formed of Councillors with voting powers, with the Chief Officers of the Council acting as advisers. The WSD reports to the Water and Sewerage Committee and also to the Finance, Staff and General Purpose Committee.

The activities of the Council in general and the WSD in particular are constrained by lack of finance and senior staff. The WSD has a recently appointed General Manager (GM) but none of the senior management and engineering posts below the GM have been filled. Without the

necessary Commercial Division the WSD is unable to handle its own finances and this function is combined with the Town Treasurers Dept. As with most Municipal Councils who are also water undertakers, revenue from water and sewerage charges is used as ready cash on a daily basis, and to top up the General Fund. Whilst it is reasonable for WSD money to be used for the General Fund as this is required by the budget, both the operation and maintenance of the WSD simply can not be managed, with development work impossible.

Operations are interrupted due to financial constraints, maintenance is at a minimum to merely keep operating, and the whole system is fast deteriorating to a point where it may not be able to provide the much needed finance to the Council for much longer.

The WSD does not have adequate accommodation both within and outside of the Town Hall, and it lacks any reasonable manner of transport, equipment and tools.

There is no planning policy as a result of the foregoing constraints, and management/labour relations can be strained.

Customer services exist only at the most rudimentary level, and despite the national policy to increase individual metered connections, Kisumu moves in reverse as more and more of the distribution system dries, up and more and more disconnection's take place. The WSD has a huge problem with management of its metering unit, with about 30% of its 11,240 meters working and almost 40% disconnected. The meter repair section hardly exists, and the meter reading section requires a major overhaul. It is said that the few remaining meters in working condition are not read accurately or regularly despite a large labour force.

There is no effective Non-revenue Water Management with only major or obvious leaks and bursts being attended to, and there is confusion in the billing section with no readily available information on water demand, and the split of consumption into user categories. Despite the critical supply situation there was no evidence of any moves to deal with illegal connections and illegal use of water.

Supplies from water kiosks are unsatisfactory, with one bulk supply facility mainly for industry and a few kiosks for domestic consumers. There are a number of private "kiosks" from which water is onward sold by vendors at a price at least ten times that charged by the Municipality. There is little or no effective management of such kiosk sales and clearly kiosks will have a major role to play in the development of the water system.

Due to staff shortages there is no effective management and administration, and no

management system to monitor and reconcile production, consumption, revenue billed and collected, chemical usage etc.

Operation of the distribution system appears to accept that as demand grows more and more areas will dry up and no effort appears to have been made to see if careful management of the system could provide water to a larger area and population even for short but regular periods.

Similarly the operation of the sewerage system is below standard with spillage of raw sewerage in densely populated areas of the town, pumping stations not operational, and both the conventional works and lagoons not functioning correctly.

Clearly maintenance is a function of the financial and manpower resources available, but careful organisation of these meagre resources may go some way to alleviating a potential health problem, which may occur through lack of water lowering basic hygiene standards, and pollution from the sewerage system.

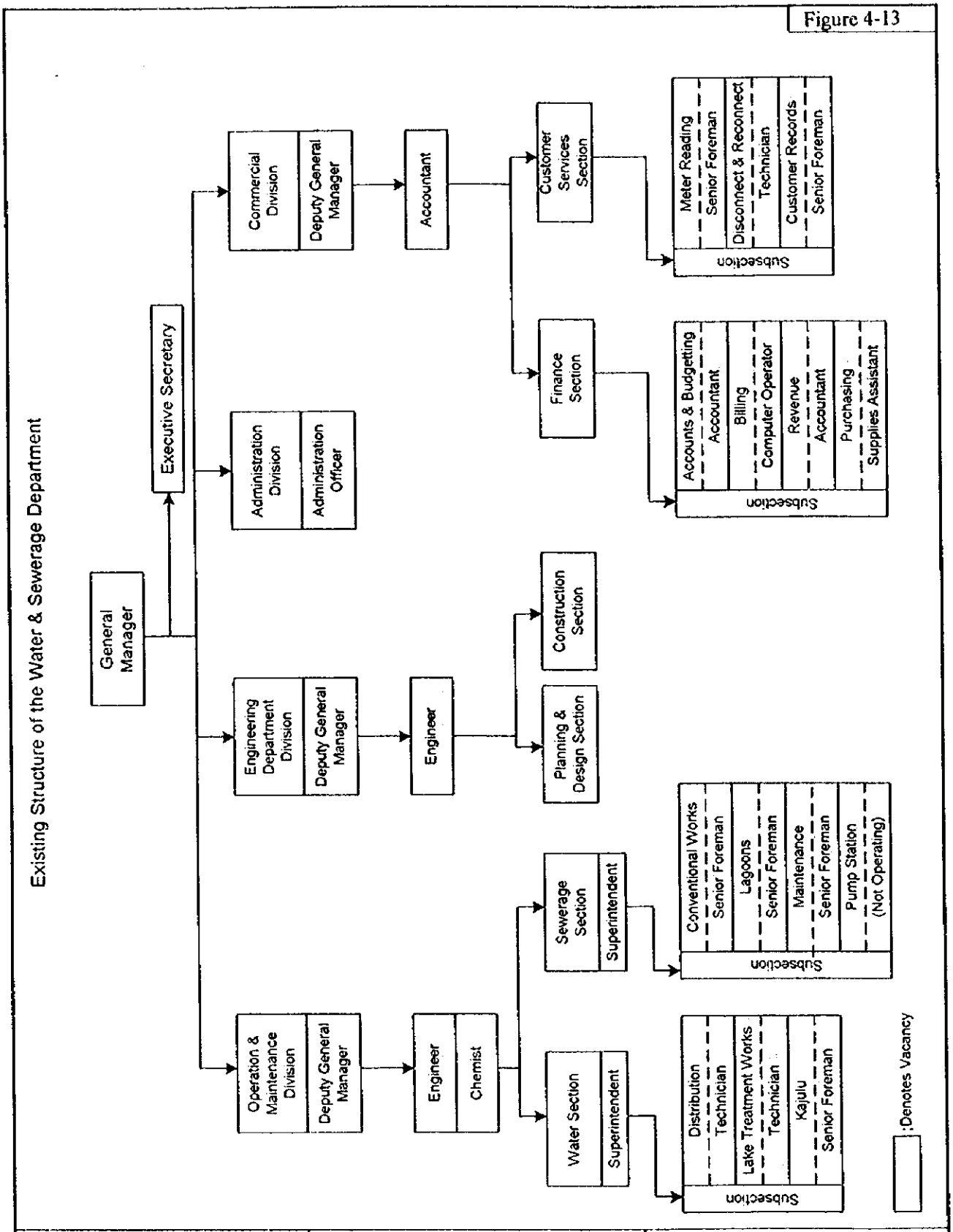
The poor situation regarding solid waste disposal is an additional hazard, and this will not form part of this project which is limited to water and sewerage, as opposed to water and sanitation in the GTZ programme. Responsibility for solid waste will still rest with the Health Department, which is also responsible for the septic and conservancy tank exhauster service.

Whilst KMC itself has established some links with the community, the WSD appears not to have involved itself with the management of water supplies outside the municipal system, yet many exist within the Municipal limits. Similarly there has been little or no involvement with the vast sanitation system outside of the sewered areas.

The current study on Partnership Approaches to Meeting the Needs of the Urban Poor (PAMNUP), a project to be financed by British Aid through the Department for International Development (DFID), will involve, amongst other things, the development of water and sanitation facilities where these are most needed. This study also involves the provision of facilities over as much of the area of Kisumu as possible serving the majority of the population. There is therefore an obvious need for integration with the PAMNUP project.

In these times environmental issues are well to the fore and whereas an Environmental Committee has been formed by KMC there is no specific department to deal with the issues raised. An Environmental management system will have to be set up, particularly to cope with the newly proposed environmental bill, and clearly the WSD will have to organise itself to take a leading role in environmental issues.

Figure 4-13



THE REPUBLIC OF KENYA THE MINISTRY OF LOCAL AUTHORITIES KISUMU MUNICIPAL COUNCIL	THE STUDY ON KISUMU WATER SUPPLY AND SEWERAGE SYSTEM JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE : Existing Structure of the Water & Sewerage Department

4.4.3 Human Resources

Personnel matters are handled under the umbrella of the Directorate of Personnel Management (DPM) which has responsibility for Public Service Regulations, training, scheme of service and the supervision of Government Training Institutes.

The Public Service Commission (PSC) is responsible for recruitment, dismissals, promotions, transfers and disciplinary action for Local Authority staff. The PSC exercises direct control of staff on salary scales 1-9, whilst delegating responsibilities for staff on salary scales 10-19 to the Local Authorities who channel personnel matters through the MOLA.

KMC's personnel matters are handled by the Principal Administration Officer for scales 10-19 whilst the Town Clerk has responsibility for scales 1-9, reporting through the MOLA.

Staffing levels in KMC are unsatisfactory at the senior level, with the WSD having a serious problem in this area. The 1996/97 staff list indicates a WSD establishment of 344 with 89 vacancies, with 60% of vacancies at the senior management and supervisory level. None of the Deputy General Managers are in post for the three divisions, despite efforts to recruit through the Government system. These serious shortages prevent any form of manpower development or succession planning policy to be put in place

The situation regarding the Scheme of Service is more positive as these were updated in 1995 and are in operation at KMC. The Scheme of Service document provides broad job descriptions and specifications, delineation of duties and responsibilities, standards of recruitment, training and career advice. This last publication revised the salaries and salary scales and made changes to job titles where necessary.

The Scheme of Service provides a concise framework for all Local Government employees from the most senior official down to a newly recruited labourer. From this framework it is possible to develop more detailed job descriptions to ensure that personnel are aware of the tasks required of them.

Whilst salaries were increased for local Government employees and are competitive with Government, they are two to three times lower than the private sector at senior level and up to two times lower at the junior grades.

With reference to training, the Directorate of Personnel Management has the major responsibility for training in Local Government, as well as the supervision and funding of the

Kenya Institute of Administration (KIA) and the Government training Institute. MOLA also plays a significant role in identifying training needs, planning new courses, and dealing with overseas scholarships.

Of particular relevance to the WSD is the Kenya Water Institute (KEWI), and older employees have had the benefit of these highly relevant specific courses. KEWI has recently been involved with GTZ funded training projects, and also with the Kenya/France Development Co-operation Task Force. This has resulted in the publication of a Draft Action Plan on Human Resources Development, which includes a draft training plan with some courses available now and others being developed. Whilst training still takes place, there is no coherent plan or budget within KMC. However, a wide range of staff have benefited considerably from the GTZ programme of seminars and workshops on Financial Management designed to assist Local Authorities in preparing for Commercialisation of their water and sanitation departments.

4.5 FINANCIAL SITUATION

4.5.1 Income and Expenditures of Municipal Council

Under the new budget guidelines, the municipal council is required to maintain separate accounts for the recurrent costs and capital outlays. The council records show no expenditures in the capital account, though there were some investments over the last four years. These are included in the current account.

The main expenditure items in the recurrent account are general administration and health. Each of these accounted for 30% of the General Fund expenditures in 1995/96 (Table 4-12). These are followed by the civil works and town planning (15%); education (11%); and social services (10%). Some of these departments generate revenue. Excluding these internally generated funds and basing the analysis on net outlays only, health and general administration dominate the expenditures with 44.5% and 28% respectively. There has been no debate either in Kenya or in Kisumu to transfer the responsibility for health services to the central government or provide for local funding of these services.

Part of the internally generated funds are genuine. Others are simply charges levied on the other departments. It is not clear if these actually correspond to services provided or they represent transfers to other departments. Excluding the funds internally generated, the departments under the general fund incurred net expenditures of 98 million Shillings in 1996/97. The major source of income was the "Rates" (Table 4-13). This is the real estate tax. This tax is levied on the

central government for the land owned and used by the government departments within the municipal boundaries. The tax is levied on individuals for private land held on the basis of a lease or free hold. Other major sources of revenue were fees collected from the market transactions and the bus garage, license fees, tax on the employees, and service charges.

The whole issue of the role of municipal councils in local service delivery and their financing is being studied under the World Bank funded Local Government Reform program. The findings of this program will effect the choice of appropriate levels for providing health and education services and the manner in which these are financed. The extent of local autonomy and control is also being studied. The recommendations of the ongoing work will have a significant effect on the local government reforms.

(1) The Budget Process and Controls

The government is implementing a comprehensive budget system for selected local authorities since the early 1980's. Technical assistance is provided to the local governments to train their staff in the implementation of the new system. Kisumu is one of the six pilot projects included in this scheme.

The new system is very comprehensive for monitoring municipal revenues and for control of expenditures. The accounting system being implemented is considered to be excessively detailed for the present requirements of the local governments. Nonetheless, the local governments are encouraged to implement it to improve the capacity to meet the future requirements for a comprehensive budgeting and reporting system.

The budget process is commendable in a formalistic sense. The budgets, however, do not play the role of expressing priorities and controlling resource allocation. The budget generally sets very high expenditure ceilings. The limits set by the budget never become binding. Cash availability and access to this cash rather than the budget perform the resource allocation function.

The budgeting process is initiated by the guidelines issued by the Ministry of Local Government in early August- about 10 months prior to the beginning of the new fiscal year, which starts on July 1. Budget proposals are prepared in the light of these guidelines by each department of the municipal council. There are seven such departments in Kisumu. The department heads and the treasurer form the budget committee. This committee and the relevant committees of the municipal council discuss the budgets submitted by each department. The Treasurer then consolidates these proposals into a master budget.

Table 4-12 Income and Expenditure of Kisumu Municipal Council (Actual in K. Ponds)

	1993/94			1994/95			1995/96		
	Expenditure (K.Pounds)	Revenue (K.Pounds)	Net Expenditure (K.Pounds)	Expenditure (K.Pounds)	Revenue (K.Pounds)	Net Expenditure (K.Pounds)	Expenditure (K.Pounds)	Revenue (K.Pounds)	Net Expenditure (K.Pounds)
Education	368,097	2,010	366,087	439,066	7,519	431,547	455,264	7,516	447,748
Health Department	1,159,402	146,252	1,013,150	1,939,120	114,996	1,824,124	2,215,546	429,219	1,786,327
Social Services	360,408	29,751	330,657	363,267	36,436	326,831	684,027	139,036	544,991
Town Engineer	340,700	177,695	163,005	391,579	107,715	283,864	650,181	575,939	74,242
Central Administration	1,295,732	337,997	957,735	1,683,812	691,417	992,395	1,188,891	680,150	508,741
Housing Development	291,762	160,347	131,415	233,787	185,872	47,915	148,300	59,840	88,460
	3,816,101	854,052	2,962,049	5,050,631	1,143,955	3,906,676	5,342,209	1,891,700	3,450,509
Deficit Brought Down			(2,962,049)			(3,906,676)			(3,450,509)
Contribution									
Rates Income			11,105,318			1,286,687			1,361,405
Water Account			1,362,476			1,627,549			1,426,591
Market			84,573			465,375			322,654
Service Charge			390,838			419,992			200,000
Rent Account									
			(18,844)			(107,073)			(139,859)

Source : Municipal Council Budget Books.

Table 4-13 Revenue of the Kisumu Municipal Council (Ksh.)

		1993/4	1994/5	1995/6	1996/7
	Details	Total (Ksh.)	Total (Ksh.)	Total (Ksh.)	Total (Ksh.)
1	Miscellaneous	7,531,922.00	11,801,734.00	5,060,751.00	5,491,874.00
2	Water and Sewage	52,781,095.00	73,117,867.00	71,812,306.00	94,791,994.00
3	Water Deposit	559,940.00	432,130.00	528,830.00	547,700.00
4	General Rates	22,106,358.00	25,733,742.00	35,228,120.00	37,251,996.00
5	Estate Rent Income	1,090,985.00	1,266,204.00	1,243,398.00	1,210,231.00
6	Housing Dev. Dept. (H.D.D)	12,765.00	267,900.00	1,192,816.00	411,795.00
7	Housing Loan Repl. (H.L.R)	288,887.00	614,136.00	4,000.00	260,846.00
8	Bus Park Fees	1,921,159.00	3,339,586.00	3,693,175.00	3,618,641.00
9	Market Shop Rent (MSR)	136,409.00	379,160.00	334,695.00	303,620.00
10	Market Fees	11,883,232.00	17,428,247.00	19,352,984.00	16,573,664.00
11	Institutional Rent Collec.	266,100.00	533,032.00	422,850.00	485,000.00
12	License Charge	10,892,490.00	13,460,506.00	16,114,606.00	15,102,375.00
13	Service Charge	12,218,596.00	15,359,571.00	16,220,410.00	17,446,895.00
14	Slaughter House			628,891.00	654,665.00
15	Contribution in Lieu of Rates			13,740,391.00	5,100,000.00
16	Sundry Debtors	77,062.00	47,240.00	163,843.00	101,500.00
	Total	121,767,000.00	163,781,035.00	185,742,266.00	199,352,796.00

Source:- Municipal Council, office of Treasurer. Date from Daily records of actual collections (C&D). Date then aggregated to monthly and annual totals.

The master budget is submitted to the finance committee of the municipal council for approval. The final step at the local level is the approval by the full council. The budget approved at the local level is submitted to the provincial council, which then forwards it to the Ministry of Local Government for final approval. The consistency between the budget proposals and district and provincial development plans and projects is insured by the review at the provincial level.

After the approval, various controls are exercised to insure that expenditures remain within the budget limits. This is needed because the amounts budgeted far exceed available resources. The key instrument for expenditure control is the vote books. Each department keeps these. They show the amount allocated by expenditure categories, the amount actually spent and the outstanding balances. These vote books record actual expenditures, not costs. This allows expenditure commitments even when there is no corresponding item in the budget.

This pattern of excessive budget provision is true of all recent years. In all years, the amount of expenditure budgeted exceeds the actual by a factor of 1.5 times. The high ceilings provided in the budget allow each department to spend as much money as it can get hold of. This makes it even more urgent that the revenue of water department is allocated for the system maintenance before the other departments can make claims on it.

Establishing unrealistically high expenditure ceilings removes the control function of a budget. Similarly, resource allocation is not done by the budget. These two functions are performed through a parallel exercise. Even for items budgeted, a separate system of expenditure control is instituted. A standing committee consisting of the town treasurer, the chief accountant and the town clerk have to approve expenditures even for the items included in the budget.

This practice of establishing non-binding budgetary ceilings is a result of dependence of local governments on the transfers from the central government. These transfers may take the form of loans or grants. Without objective criteria for these transfers and lack of information on their possible magnitude, the councils behave rationally by setting very high expenditure ceilings. These high ceilings accommodate the highest level of central government transfers possible in case these transfers somehow materialise.

Another impetus for setting high expenditure ceilings originates from lack of budget discipline. In countries where contractual obligations are not enforced, the public agencies spend more than their income by running arrears to suppliers; they default on loans; and do not pay their taxes. The unrealistic budget ceilings accommodate these practices.

(2) The Municipal Revenue Base

As in other local governments in Kenya, the municipal revenue base in Kisumu is very weak. Though no expenditure is recorded in the capital account, there were some fixed capital investments over the last four years. Some water mains were renewed. The municipality is also included in a major road program with World Bank financing and there are ongoing investments under that project.

The Municipal Council is expected to resist establishment of the water department as a separate entity while it remains dependent on it for financing other council operations. Efforts are made to provide other sources of income to reduce the council dependence on the water department. Options being explored include revenue generation by the other departments; transfers from the central government; and increasing revenue from the existing sources.

The major source of municipal government revenue is rate income or transfers in lieu of rates. These rates are real estate taxes. The government owns all land in urban areas in Kenya. This is the legacy of the British system and is responsible for many problems presently faced in Kenya. For land owned and used by the government, the treasury is supposed to pay the real estate taxes. The government owns the other land but inheritable leases are granted for up to 99 years. The tenants pay the rates for this land.

The local government law allows municipalities to impose real estate taxes. Under the low, these taxes may be set at a limit of up to 5% of the value of land- excluding improvements. The tax rate on the improvements may be as high as 25%. The actual tax levied in Kisumu is 7.5% of the unimproved land value. The law provides alternative systems of land valuation. The councils may hire their own valuers; they may rely on government valuation staff; or they may contract out this work to private companies.

The real estate taxes (rates) payable to local authorities is rarely paid by the central government. The general tendency is to count these receivables against dues to the central government. One practical result of this is that every entity is in arrears: central government to councils, councils to central government and by extension to government owned corporations. Many government departments in Kisumu owe money for water, which they have not paid in many months.

Under the local government reform program, the government has started to include the amount of rates due to local governments in the budget. This allocation is included in the budget of Ministry of Public Works, but its actual disbursement is entrusted to a committee chaired by the Ministry of Local Government.

The real estate taxes, the single most important source of local tax revenue, are calculated in a totally irrational manner in Kenya. The rates are actually calculated as a residual to cover the revenue shortfall in the budget. In Kisumu, the rates on all property were 7.5% in 1976/77. It is not clear if it is legal to charge such high rates as these are above the rate (5%) established under the Local Government Act.

The real estate tax rate is extremely high by international standards. In most developed countries this rate is around 1% of the market value. The low levels of valuation relative to market prices somehow mitigate the adverse impact of the high rate in Kenya. The difference between the two reduces the effective tax rate to reasonable levels. There are periodic calls to increase the assessed value to market levels, but this would not be reasonable with the prevailing rates.

The manner of calculating the rates is also irrational. The normal practice is to set a reasonable rate of tax on the real estate. The rate determines the amount of revenue generated. In Kenya, the rate is determined by the revenue shortfall. The municipality calculates all income and expenditures for the following year. The projected revenue gap is divided by the value of property to arrive at what is called "rate struck".

The other major source of municipal revenue is fees. They cover a wide range of charges. The most important ones are business license fees, employee taxes and taxes on the market sales. Some fees are also collected for the use of municipally owned facilities such as the slaughterhouse and the bus terminal.

Central government transfers to local governments take two major forms. Historically, the main source of transfers was loans from the central government. The magnitude of grants was small by comparison. The major channel was Local Government Loan Agency (LGLA). Kisumu municipality was one of the major beneficiaries of this facility. Theoretically, the funds made available through this agency were loans. These loans were seldom repaid. The LGLA is at present defunct. It has made no new loans in recent years and has received no repayments on its outstanding loans.

The government policy at present is to improve the local revenue base rather than augment this through loans. There are three such major programs initiated by the government. The first is the transfer of part of fuel consumption tax. As of January 1998, the local governments will receive 20% of the tax on fuel consumption. This is expected to increase by 10 percentage points every year to a limit of 50% of the fuel consumption tax. The funds from this source will be tied and

will be used only for road improvement. Another scheme transfers 5% of the payroll tax to local authorities. Finally, the government is committed to including all rates owed to local governments in the budget as a separate item.

(3) The Size of Municipal Financial Operations

Local governments in Kenya are much weaker than those in most other developing countries. Local governments in Kenya spend less than 10% of the actual public investments for fixed capital formation. Kisumu seems to be typical of other cities in Kenya. The most recent comparative data on incomes of municipalities in Kenya is available for 1994/95. The per capita expenditure of Municipal Council of Kisumu was Ksh. 644. The national average for the same year was Ksh. 320.

The revenue generated per capita in Kisumu was also found to be consistent with its revenue base. This included value of real estate, per capita income levels, and the volume of business activity. This suggests that there will not be major improvements in municipal revenues in Kisumu under the present system.

This size of financial operations will thus continue to remain small relative to that of the water department. Excluding the water department, the total expenditure of Kisumu Municipal council was Ksh. 104.6 million in 1996/97. This is not substantially larger than that of the water department alone. The size of water department will become far larger than that of the rest of the municipal council if the water department provided sufficient water, and actually collected the revenue for this.

4.5.2 Income and Expenditures of the Water Department

Water departments in cities in Kenya generate substantial revenues. This consists of both actual income and cash generated by running large arrears. The water revenue is used for general council operations. Water department bills for water treatment chemicals, electricity, and staff do not necessarily have priority over other items.

(1) Policy on Tariffs

The central government encourages the local authorities to operate the water departments as

viable commercial entities. Its policy on water pricing is stated in the Sessional Paper No. 2 of 1997. " The pricing of water will be such that the rates take into account the ability to pay by the water users in different parts of the country. Rates in rural areas will cover the costs of operation and maintenance where feasible. On the other hand, prices in industrial locations will cover both the maintenance and capital investment costs on a long-term recovery basis".

While emphasising the commercial aspects of water operations, the government policy is also concerned with protecting the low-income domestic users. Two instruments are used to achieve this: a) industrial and institutional users are charged a higher rate than the domestic consumers are; b) the block tariff system employs a graduating tariff structure. This charges higher rates per cubic meter for households that use a large volume of water. These two sources of cross subsidy allow the municipality to charge lower rates for families with low levels of consumption.

In reality, the lowest income households do not have access to tap water. Poor families who rely on vendors pay up to 10 times the regular fees. Concern with equity would suggest that the top priority is not to keep the price low, but to increase access to safe water.

It is not only the poorest households that have suffered. In Kisumu, the population has been increasing at an estimated rate of 4.5% per annum since the early 1980's. There was no expansion in water supply capacity since 1988. This has reduced the per capita availability by a third. The resulting severe shortage of water is also cited to be the most important cause of lack of new employment generation in Kisumu.

(2) Revenue Collection and Financial Assets

Records of water produced, billed, and actual collections are not produced. Actual collections are monitored on daily basis due to the revenue requirements. These collections are not measured against the potential due to poor software in the computer department. The records produced by that department were not very useful and needed immediate improvements.

Some data is generated for various ad hoc reports. This data indicate very impressive performance by the water department on water losses, billing, and revenue collection. These reports confuse targets with actual achievements. The actual situation is not that satisfactory and is in need of desperate immediate improvement.

Despite its extremely poor performance, the water department has always been able to generate

surplus revenue. The surplus is used to finance operating expenses of other departments. The budget only partially reflects these financial transfers. Actual transfers seem to be much higher than the amounts budgeted, and reported in the financial statements. The 1996/97 budget includes a transfer of 14 million Shillings to the general revenue account from the Water Account. The actual transfers were over three times the amount budgeted. These transfers take priority over payment of the bills of the water department.

Available information on the balance sheets of the council and the water department is incomplete. Additional data is being collected. Initial indications are that the financial status of the water department is not any better than that of the council. It reportedly owes Ksh. 40 million to the power company. Our estimates indicate that this is the equivalent of two years power consumption of the water department. It also owes back-pay to the employees, there are outstanding debts to suppliers of chemicals, and the water account has received large advances from the main water consumers. These advances appear to have been used for partial payments to avoid power cut off.

The municipal council accounts do not differentiate between actual payments and accruals. While the guidelines adhere to the principle of basing the accounts on accruals, in practice the information given is derived from actual payments. The attempts to build a balance sheet for the General and the Water account were unsuccessful, because there is no systematic information on outstanding debts and receivables.

The available budget information shows cash flows rather than actual expenditures and as such is not useful for analysis costs of producing water. The reported actual expenditures for the water department are inaccurate. Over 70% of the expenditure for general administration is transfers to the rest of municipal council. The jump in the expenditure for meter reading section in the 1996/97 budget is due to a large item budgeted for meters but not actually spent.

There is no accounting and budgeting unit in the water department, but there is a large expense item. These and other charges inflate the general expenditures recorded for water production.

The reverse is true in the official figures for power and consumption of treatment chemicals. The reported total expenditure for the "lake water works" (Ksh. 19 million) is about the same as that of power consumed in that unit. This unit incurs additional costs for chemicals, labour and other operating costs. Clearly, the data supplied records payments made and not actual costs incurred. Similarly, there is no reporting for the treatment chemicals which were donated to the municipality. The analysis of production costs of water in this study are based on prices and technical parameters rather than actual costs.

(3) Urgent measures

Two critical further steps that are needed to improve the financial performance of the Kisumu water supply department. It should be granted operational autonomy immediately and should operate on commercial principals. Further steps towards privatisation can be taken in the medium to long term.

One of the major issues involved in financial autonomy is a separate system of accounts. The revenues and expenditures of the water department are carried out from an account shared by the different departments of the municipality. A separate account was established for the water department in 1997. Even the smallest bills incurred by the other departments continue to be paid out of this account. The use of the account is supposed to be cleared with the General Manager of the water department. This again is not followed in practice. No improvement can be expected without a clear policy commitment and a clear statement of operational guidelines.

Similarly, the revenue collection effort is impaired as the funds generated by different departments are pooled. With no control over the revenues it raises, the staff is not particularly keen to improve collection efficiency. The issue becomes more sensitive when politically undesirable measures need to be implemented.

Experience in other municipalities in Kenya shows that there is a marked improvement in collection efficiency when a separate accounting system is established for the water department and the department is somehow insulated from the rest of the Council.

4.5.3 Water Production and Sales

Water production over the last five years was 18,200 m^3/d. Around 1,400 m^3/d of this is produced in Kajulu on the Kibos river and the rest (an average of 17,000 m^3/d) is extracted from Lake Victoria. The amount of water produced seems to be fairly stable. It has varied from 6.2 to 6.9 million cubic meters per annum.

There is no information on the quantity of water billed. Without an actual measure of the amount billed or metered, there is no way to estimate the unaccounted for water. This latter includes the physical losses, unauthorised uses, and tampering with meters. All three of these components are known to be very significant.

The municipal council records of water billed to the consumers for the corresponding periods

vary enormously. Some months the municipal council records show that the consumers were billed for three times the amount of water actually produced. During other months, the amount billed can be a small fraction of water produced. One possible cause of billing unrealistically high volumes of water is probably charges for the minimum consumption levels even when the consumers have received no water for years. The controls on meter reading and billing also do not work and lead to arbitrary amounts being billed.

It is not possible to analyse consumption by end use without actual information on users. Original records of individual consumers are available in the new computers for the period since January 1997. The staff of the computer department has made an effort to calculate the volume of water billed and its breakdown by the type of end users- households, industry/commerce and institutions. This information is also of limited use, because the data base is very poor: studies of sample blocks show that less than 20% of the meters were actually read. Half of the existing meters are out of order and those that are working are not read.

Data based on meters read and what is called an "average" give some indication of actual consumption. The "average" refers to the amount actually billed for a particular meter at the last reading. In some cases this last reading goes back to four years.

The data for July and August 1997 appear to be somehow sensible. This data was produced on the new computers currently in use. Data entry was also done on time. The amount of water billed in August is 290,000 m^3 and is reasonably close to the expected amount of 350,000 m^3 based on production (500,000 m^3 per month) and loss of 30%.

The distribution of the amount billed by the end users also seems to be reasonable. Households consumed 60% of water, industry and commercial enterprises 36%, and institutions 4%. This distribution is consistent with detailed data directly collected from the major industrial and institutional users. Interviews with the major users indicate that the actual consumption by industries in 1997 was around 100,000 m^3 per month. Close to half of this was consumed by Kenya Breweries, and a further 20% by the Coca Cola bottling plant

Recorded institutional consumption is low due to definition. All private service enterprises are recorded under the commercial enterprises. This category only contains governmental institutions.

The amount billed is the critical variable for estimating losses. Funds collected do not necessarily reflect sales as some of collections may represent payments against outstanding debts. The municipality makes a special effort for revenue collection when it needs cash.

During other months it reverts to a normal collection path. Therefore, information on the amount actually billed can not be derived from revenue collection.

There are reasonable records of money actually collected; though these are not always complete. The income from bulk sales, for example, is included in miscellaneous income, but charges for solid waste are included on the water bills. This is a minor distortion and may be ignored.

The monthly collections are fairly stable. Over the last 12 months, monthly average collections were around Ksh. eight million per month. The expected revenue is more than double this amount after adjustments for water losses. The same pattern is true of the last four years. Over long periods of time, actual billing and collections would tend to be close. In Kisumu, the two continue to diverge. Some consumers are over billed through the charge for the minimum amount. Others find ways of avoiding payment.

The calculation of expected revenue requires additional information A rough estimate of the expected revenue is derived from the available data. The calculations are based on the amount of water billed, its distribution among the end-users and the tariff being applied. The water tariffs applied up to August 1997. Surprisingly, the actual tariff applied to the domestic users is much higher than expected. The median tariff applied to domestic users was Ksh. 23/ m^3. The highest tariff was Ksh. 32/m^3 and applies to households who consume more than 60 m^3 per month. This is the equivalent of consuming almost 400 L/(capita • day). This is far from the actual consumption levels.

Estimates of expected revenue, given below, are based on a more reasonable tariff structure. The expected revenue consists of water charge and payment for sewerage. Customers who have a sewerage connection are charged a separate tariff for sewerage. In practice, this tariff is not used but an additional charge of 75% of the water charge is levied for sewerage. This is levied only if there is a house connection for both water and sewerage. Users, who have disconnected the water meters but continue to use the sewer system, by getting water from other sources, do not pay the sewerage charge.

The expected water revenue calculations assume that half of water used by domestic users have a sewerage charge. All industrial and institutional users are assumed to have sewerage connections.

End Users (water consumption in m^3 per month)			
Tariff Block	Domestic	Industry and Commerce	Institutional
1	--	--	--
2	100,000	--	--
3	100,000	--	50,000
4	(100,000)	--	(50,000)
5	--	100,000	--
Total consumption	200,000	100,000	50,000

Case I - Moderate actual effective tariff (unit: Ksh.)			
	Domestic	Industry and Commerce	Institutional
Water revenue	4,200,000	3,900,000	1,150,000
Sewerage revenue	2,100,000	2,925,000	862,000
Total revenue			15,137,000

Case II - Relatively High actual effective tariff (unit: Ksh.)			
	Domestic	Industry and Commerce	Institutional
Water revenue	4,900,000	3,900,000	1,850,000
Sewerage revenue	2,450,000	2,925,000	1,387,000
Total revenue			17,412,000

The composition of the expected revenue is very instructive. Nearly half of the revenue is generated from industrial/commercial consumers. The expected revenue from these users is similar to the total revenue actually collected by the municipal council. It seems possible to collect the present level of revenue from less than 50 major consumers.

This striking conclusion is confirmed by the actual data. Kenya Breweries consumes 45,000 m^3 of water a month and pays municipal council Ksh. 3.1 million a month. The brewery consumes half of the industrial water. Collecting the actual bills from other industries would increase the monthly revenue to over six million Shillings a month. This is only two million shillings less than the total revenue collected by the municipal government.

The other major conclusion of this analysis is the relatively minor role that the low income consumers have in total water revenues. Even at present levels of distribution and tariffs, considerable revenue can be generated from large water users and non-domestic consumers

while leaving the low income groups unaffected by likely tariff changes.

There are three cost components of similar magnitude in supplying water. These are electricity for pumping, water treatment chemicals, and labour. For the present system there are no capital recovery charges and very little maintenance.

The lake water works consume around 3.4 million kWh of electricity for abstracting water from the lake, pumping it to the treatment plant, and pumping from the treatment plant to Kibuye for distribution. Two-third of the total power consumption is spent for pumping treated water to Kibuye.

The power charges vary with the fuel costs and the efficiency with which the system is operated. The actual charge in August 1997 was Ksh. 5.55/kWh. This is the equivalent of US 9 cents and is quite reasonable by international standards. The impression that there is excessive electricity consumption is not based on the high cost of electricity but its excessive utilisation. This situation of reasonable power costs may change significantly following the government decision to withdraw the present subsidy to power production estimated at 25% of the cost. The costs may also go up depending on measures for deregulation and the structure of the sector.

The municipal government engineers estimate that the power consumption can be reduced to less than half of the present levels by installing more efficient pumps and good maintenance. The design lay out is also regarded to be inappropriate, requiring three successive pumping before the water reaches the final consumer. The estimates by the study team show that there is limited room for saving power by changing pumps only. The newest pumps of a very efficient scale would reduce power consumption by less than 30%.

The cost of chemicals is effected by the dosage practices, the unit price of chemicals and appropriate dosage adjustments as the quality of water changes. All three can be improved with considerable savings in costs. In Kajulu, the Alum. use in 1996 was almost three times the recommended level. The use of chemicals in Lake Water Works was erratic: there was excessive use of soda ash, though none is recommended ; and there is no apparent use of Chlorine over extended periods.

As expected, there is excessive employment. For example, there were reported to be over 60 meter readers. On average, they appear to read around 1000 meters per month. Each meter reader is required to read less than one meter a day.

The municipal council and the water department are viewed as providers of employment to

reduce unemployment rather than hiring people for specific jobs. This is rational behaviour on the part of local politicians and administrators as long as the central government bails the local government out of bankruptcy.

4.5.4 Water Tariffs

(1) Kisumu Municipality as a Water Undertaker

Only licensed water undertakers may provide water in cities in Kenya. Kisumu Municipality is one of few authorised entities. The tariffs charged are proposed by the municipal government, but they become effective only after approval by the MOLG.

The tariffs in effect in Kisumu were not changed between 1994 - 1995 due to lack of initiative from the municipality. The new tariffs proposed by the municipality in 1996 were approved in totality. They covered not only those to be applied in 1996 but also the proposals for the new year. The MOLG approval thus seems to be quite prompt as long as the municipal government shows some initiative.

The water tariffs charged up to July 1997 and those that will be charged thereafter are presented in Table 4-14. Different tariffs are charged for households (sometimes referred to as ordinary consumers) and commercial and industrial users. An intermediate tariff is charged to institutions.

Both the national government and the municipal council emphasise the need to protect the low income consumers from high tariffs. This is achieved through cross subsidisation from industry and institutions, and domestic users who consume large amounts. In practice the consumer subsidy is not directly targeted to the low income groups. Water consumption is used as a proxy for income levels. Any other direct targeting for the poor households is considered impractical.

Households consuming less than 10 m^3/d were charged a fixed amount of Ksh.160 per month. The highest charge was Ksh. 32/m^3. The median tariff for the five blocks was Ksh. 23/m^3. Data provided to the study team indicates that the actual charge for domestic consumers was between 30 and 31 Kenya shillings per cubic meter in the period June to August 1997. This is a higher than expected charge based on the tariff structure.

Higher than expected tariffs could occur if meters were not actually read at fixed intervals. It is claimed that the meters are actually read every month. Less frequent reading of meters would

lead to "bracket creep" and result in higher per unit charges than those indicated by the tariff blocks.

The actual tariff charged depends on the consumption level specified for each block. The levels of consumption specified for the domestic users seem to be reasonable. The lowest tariff is for monthly consumption level of up to 10 m^3 per month. This implies per capita consumption of around 55 L/d if we assume an average family size of 6. The implied total gross consumption is 131 L/d if we assume losses of 30%, and domestic uses accounting for 60% of the total consumption.

The consumption blocks identified in the tariff are the same for different type of users. This would tend to put most commercial enterprises on the lowest tariff block. In the case of industry, it is not clear as to what the intent is. It would be much simpler to charge all non-domestic users at the same rate. The level at which this uniform rate is set depends on the amount of cross subsidisation targeted. In any case, this level should not be less than the median tariff applied to the domestic users.

Table 4-14 Water and Sewerage Tariffs in Kisumu (Ksh./m³)

	Domestic		Governmental & Gov. Institutions		Industrial and Commercial	
	1996/97	1997/98	1996/97	1997/98	1996/97	1997/98
Minimum	160	180	340	400	380	400
11 - 20 m³	19	20	21	22	23	24
21 - 40 m³	23	23	23	25	27	28
41 - 60 m³	26	26	28	30	31	32
Over 60 m³	32	33	35	37	39	40
Raw Water					14	15

Sewer charges in Ksh./m³

	Domestic		Government & Gov. Institutions		Industrial and Commercial	
	1996/97	1997/98	1996/97	1997/98	1996/97	1997/98
Minimum	120	140	11	13	12	14
11 - 20 m³	12	14	14	15	15	17
21 - 40 m³	14	16	15	18	17	19
41 - 60 m³	16	18	18	20	20	22
Over 60 m³	20	23	22	25	24	28

Source : Kenya Gazette, August 16,1996

The effective tariff should be consistent with macro aggregates. The highest tariff was charged to households who consumed more than 60 m³ per month. This would imply daily water consumption per capita of over 330 L if we assume an average household size of six persons. The high water consumption level should thus be defined at a lower level than it is presently done. Further work is required to achieve consistency between the parameters on tariff, actual effective tariff, and the actual per unit consumption.

The price of water is a small fraction of what the poor households are paying for water even at the relatively high actual effective tariff. The combined tariff for water and sewerage is Ksh. 41/m³ based on an actual effective tariff of Ksh. 31/m³ and sewerage coverage ratio of one-third.

The price of tap water charged by vendors varied from Ksh. 60 to 240 depending on quality and location. The price was 1.5 Shillings for a 25 litre can of water from shallow wells with very poor quality. Tap water delivered to homes is 6 Shillings for 25 L. This price went up to 10 Shillings for a can of 25 L in hot/dry season. The poor households who rely on vendors thus pay 3 to 10 times the tariff charged for tap water.

The water bill records domestic users who have sewerage connections. There is a separate sewerage tariff. In practice, this sewerage tariff is not applied. An additional amount of 75% of the water bill is charged for sewerage. The total revenue for sewerage would be 75% of the water bill if all water users had sewerage connections. The actual ratio was around 30%, indicating that households who had sewerage connections consumed only one-third of the water. In other words, the sewerage system discharged only 30% of the domestic water consumption.

It is highly likely that the actual situation is quite different. People in outlying urban areas who lack sewerage connections hardly get any water. The data base for sewerage service thus seems to be particularly weak.

Some households who are not water users have sewerage connections but they are not charged for sewerage. These primarily consist of households who requested to be disconnected after not receiving any water for many years. There were 4000 such units who were disconnected out of a total of 11,000 meters. These hoses have developed their own supply arrangements and some continue to utilise water as if they were under normal conditions.

The "sewerage" for billing purposes is defined in a narrow sense. It includes only those who have access to the central discharge system. Those who have septic tanks and use the exhauster service are charged separately and their water bill does not include the sewer charge. These separate charges are negligible: the Health Department's expenditures for exhauster service was Ksh. 409,800 in 1996/97. The revenue for this service was Ksh. 236,000. There was no recorded income from night soil drains. The expenses of that service were similar to those of the exhauster service.

Industrial and commercial consumers pay around 20% more than the corresponding tariffs for the domestic users. They are charged in the same manner for sewerage as for domestic users.

According to the data provided to the study team the sewerage charge was 55% of that of water in the case of industry and commercial users. Most water consumed in that group (73%) seem to have a central sewerage connection. This ratio is less than what is expected, because almost all water in that category is consumed by few enterprises that actually have sewerage connections.

Industry and institutions pay a higher water charges than the domestic users. Some industrial users were granted permission to abstract water from Lake Victoria. They have analysed the cost of providing water on their own and have concluded that it costs much less if water is

procured from the municipality. The tariff for the largest block of industrial users was Ksh. 39/m^3.

Half of the total industrial water consumption in Kisumu is that of Kenya Breweries. The brewery has commissioned feasibility studies for developing their own water sources. In the case of abstraction from Lake Victoria, the cost of water at the facility was over Ksh.100 per cubic meter. The price of water from the Municipal Council was less than one-third of that. This large differential is indicative of the extent to which the water department may increase its tariff.

The low price of water supplied to industry has other implications as well. Kenya Breweries consumes 20% of the water produced. Only 10% of the water it consumes is used directly for production. An additional 40 % is used for cleaning bottles and containers and needs to be clean. Half of the water is used for general purposes and needs not to be treated at all. Because of the low price of water supplied by the municipality, the brewery uses treated water for all purposes.

Part of the low price of water supplied by the municipality may be due to economies of scale in producing and distributing water. Economic efficiency requires that these savings should be passed on to the consumers in the form of low prices. The low price may also be due subsidies provided by the local government. These are transfers from the residents of Kisumu to industrial users.

There appear to be possibilities for substantial increases in the price of water both to residential users and industries. The municipal water revenue can be substantially increased through tariff adjustments.

The higher tariffs will not particularly effect the lowest income groups. As expected, the lowest income households in Kisumu are those that have no access to tap water. These households pay much higher rates than the highest tariff block charged to the domestic users. From an equity point of view the priority is to provide access to tap water for the poorest households rather than try to maintain low prices price.

Additional protection can be provided to all domestic users if this is deemed desirable. The tariff difference is much sharper for the levels of consumption rather than type of user. The tariff for the lowest block household users is half (51.5%) of the that of the highest tariff. The tariff difference is not as large between different type of users: for the largest consumption block the domestic tariff was 82% of the industrial tariff. The emphasis is thus more on the

level of consumption rather than type of user.

(2) Water Supplies in Sub-urban Areas

A different tariff applies to sub-urban water schemes and urban schemes operated by the Ministry of Land Reclamation, Regional and Water Development. The sub-urban water tariffs currently in force are significantly lower than both the urban tariffs applied by the same ministry and are only half of those currently charged by the Kisumu Municipal Council.

The schemes operated by this Ministry have a completely different funding structure as well. Unlike water undertakers, full cost recovery is not expected. The bulk of funds are supplied through the budgetary allocations where there is no repayment. The enacting legislation empowers the Ministry to set water tariffs for the municipal councils as well. The municipal councils are required to establish their tariffs in relation to those established by the ministry, but this is not enforced.

(3) Wholesale Water Tariffs

The present tendency in Kenya is for the Municipal Councils to develop their own water sources rather than buy the water from the regional or national water providers. National Water Corporation is one such provider.

One cause of the reluctance of Municipalities in dealing with the water corporation seem to the latter's tendency to get into water retailing. This may be prompted by the need to insure repayment.

At present the National Corporation charges Ksh. 10/m^3 for treated water. This is considerably less than the cost of own production even when low cost resources are available. The possible forms of cooperation between local governments and the Corporation need to be explored to benefit from economies of scale in water supply.

4.5.5 Billing and Revenue Collection

The estimated number of water connections in March 1996 was 11,240. More than half of the meters were either out of order or were disconnected as shown below.

	Number of connections
Meter working	3,546
Meter not working	2,943
Incomplete records	670
Meters disconnected	4,082
Total	11,240

This data is consistent with other information. There were 6,339 water users being billed and 4,273 disconnections in August 1977. There were 3,522 connections billed for sewerage for Ksh. 3,319,278. This was 38.7 % of the water bill. At the same time, the number of sewerage connections was 55.5 % of the number of water connections being billed. That means that the proportion of connections billed for sewerage was higher than the proportion of sewerage income. This is the opposite of what one would expect.

In cases when the meters are out of order, the water department charges on the basis of past consumption. This is termed "average" consumption. In some cases, consumers continue to be charged on this base for up to four years. This practice not only deprives the Council of revenue, but it will also encourage water waste. The level of consumption will become progressively higher when the consumer receives a bill for a fixed amount with no monthly variations.

The number of consumers disconnected is also very high. There has been no water in some areas for years. Consumers who remain with a connection continue to pay the minimum charge even in this case. They apply to be disconnected to avoid the minimum charge. The sewerage charges are based on water consumption. Those who do not pay for water also do not pay for sewerage services, though they may be using the service.

In some cases there is collusion between the consumer and the meter readers to understate consumption. Two steps are taken to reduce faulty meter reading. First, meter readers are rotated on a monthly basis to reduce collusion. Recently, the water department has also hired inspectors for meter reading. Additional inspectors are to be hired for effective inspection in the near future.

There are also large outstanding debts that are not paid. Contrary to the general claim these can not be owed by the large institutional users given their small share of the total consumption. In any case, the central government has expressed the position that the water should be disconnected in case the institutions do not pay their bills. Still there is some reluctance on the part of the local authority to discontinue service to the institutional consumers.

Meters are read at specified dates in each block. A senior officer verifies the books returned to the office. The verified books are sent to the computer centre for preparation of bills. These are checked against outstanding balances. These bills are left with the consumers for payment during the next visit for meter reading. These are payable within one week of the receipt. A warning is sent to consumers if payment is not received within the specified time and disconnection effected within one month of this warning.

The bills paid are recorded in triplicate. The original is given to the customer. One is kept in the master file while the last is sent to the computer centre for processing. Daily collection summaries are prepared from the computer centre copy before it is sent to the computer centre for processing. The information is processed in the computer centre at present through eight data entry terminals. This should be ample capacity for maintaining up to date records.

A major problem in revenue generation is unaccounted for water. This covers physical losses, unregistered connections, and tampering with meters. The first is actual loss while the latter two categories represent use but revenue loss. Information is not available on the share of each component of unaccounted for water. No systematic effort seems to be made to control illegal connections. The Municipal Council has the legal power to control unauthorised water use. This includes fines as well as criminal proceedings.

4.6 PUBLIC ATTITUDE

A sample survey by direct interview method was conducted and a total number of 200 samples were distributed over four categories of areas as follows:

Water and sewer	-	water supplied and sewer served areas	- 75 samples
Water only	-	water supplied and unsewered areas	- 50 samples
Sewer only	-	water not supplied and sewered areas	- 25 samples
No water and sewer	-	water not supplied and unsewered	- 50 samples

Details of the survey is described in Appendix P. Following are the summary of the results.

Table 4-15 Satisfaction with water supply (% satisfied)

Area	way of collection	quantity	quality	price
Water and sewer	35	25	23	17
Water only	36	32	24	32
Sewer only	8	24	4	16
No water and sewer	34	40	34	46

Most of the population is not satisfied with the water supply both municipal and others

Table 4-16 Satisfaction with Night Soil / Greywater Disposal

Area	% satisfied
Water and sewer	53
Water only	24
Sewer only	24
No water and sewer	40

Night soil/grey water disposal is not satisfactory in water only and sewer only areas.

Table 4-17 Average (median) Payment for Water

Area	Ksh. /month
Water and sewer	225
Water only	302
Sewer only	331
No water and sewer	148

Expenditure for water in water-scarce areas (i. e. water only, and sewer only) is higher than the expenditure in relatively well supplied area (water and sewer)

Table 4-18 Average (median) Household Expenditure

Area	Ksh. /month	average water payment as household expenditure, %
Water and sewer	8,400	2.68
Water only	4,050	7.46
Sewer only	8,000	4.14
No water and sewer	3,750	3.95

Low-income people spend higher portion of their expenditure for water than money for water than the high-income people

Table 4-19 Willingness to pay (WTP) and Affordability to Pay (ATP) for water

Area	WTP Ksh. /month	Calculated ATP Ksh. /month (3% - 5% of expenditure)
Water and sewer	130	252 - 420
Water only	115	122 - 203
Sewer only	120	240 - 400
No water and sewer	75	113 - 188

Willingness to pay is less than what the people are paying at present and is also less than the affordability to pay as well.

Table 4-20 Common Diseases (except malaria which was for all samples)

Area	Diarrhoea (%)	Typhoid (%)	Cholera (%)
Water and sewer	40	69	8
Water only	62	82	16
Sewer only	44	44	0
No water and sewer	68	84	22

Expenditure for water in water-scarce areas (i. e. water only, and sewer only) is higher than the expenditure in relatively well supplied area (water and sewer)

Sanitary habits and Knowledge of Diseases

Even though 70 to 97 % of the respondents said that they know the causes of diseases and a similar percentage said they boil water for drinking and wash hands with soap before meal or after the use of toilet, the prevalence of diseases is also high which means that the respondents do not practice what they were saying due to inadequate water, unavailability of safe water and other commodities such as fuel for boiling water.

4.7 KEY ISSUES

Discussion in the preceding sections are summarised here as key issues which will form the basis for planning. In summary, there is an acute shortage of water supply capacity in Kisumu and the existing water distribution network and sewers are dry. Population has resorted to use of any water available close to them which are often polluted. Shortage of water supply capacity and poor management has resulted in dissatisfaction of consumers. Wastewater management is also poor resulting in deterioration of living environment and pollution of water environment including Lake Victoria. Waterborne diseases are rampant and especially cholera outbreaks are common. Following are the key issues:

4.7.1 Increased Water Supply Capacity

Estimated deficit between demand and supply is 25,000 m^3/d for 1997. Existing treatment works which are aged and not maintained properly are functioning below their design capacity. Existing water production is 18,000 m^3/d. It is imperative that water production is increased at the earliest as much as possible by rehabilitation/augmentation of existing facilities.

4.7.2 Metering and Leakage Prevention

Most of the water meters are not working and those which are working are not read regularly. Consumers are charged a flat rate up to 10 m^3/month but those consumers who never received water for the last few years are also charged for the minimum charge. Non-revenue water ratio is reported to be low because of the payment of these customers who have never consumed any water. This has resulted in widespread dissatisfaction. Illegal connections are not controlled. Aged distribution system, older than 30 years, is in need of replacement together with water supply improvement.

4.7.3 Water Supply in Sub-urban Areas

Except for the municipal water supply system in the central part of the town, Kisumu municipality does not provide water supply service to its population in sub-urban areas. Alternative sources of water are scarce especially in sub-urban areas during dry season. However, communities in these areas have taken positive steps to operate small-scale water supplies. Provision of potable drinking water in these areas through assistance to the

community based organisations (CBO's) is essential.

4.7.4 Wastewater Management

Wastewater management including wastewater collection and treatment is unsatisfactory. Blocked sewers overflowing to streets and malfunctioning treatment works (especially conventional sewage treatment works) have been polluting the environment and are health hazards. Industrial wastewaters, which are of high concentration, undegradable and toxic, discharged without treatment are overloading the sewage treatment works and hinder the treatment efficiency.

4.7.5 Autonomous Department

The key to the success of the development of the Kisumu water supply and sewerage system is the setting up of a truly autonomous department in both financial and operational aspects. These services have deteriorated over a number of years for a variety of reasons. It is clear that operation and financial control by the municipal council is not a viable option for provision of sustainable water and sewerage services.

A successful move to autonomy can only be achieved with the support of the council and the chief officers of the municipality. This support will only be given when it can be seen that the WSD has the management capacity to meet its obligations, and that it has the financial capacity to effect meaningful transfers to the council's General fund, as well as operate and maintain its facilities.

These criteria can initially be met by the successful recruitment of a number of senior staff, and the increased revenue that will result from the Block Mapping exercise and extended service coverage from direct pumping to Kibuye, with sound management of the distribution system. This should occur over a number of months during late 1998 and early 1999, and a fully autonomous WSD should be formed by the middle of 1999 at the latest.

Only when this has been achieved will it be possible for the Unaccounted for water programme and the management and institutional improvements, provided for under Phase 1,to make a meaningful contribution to the further development of the department.

The autonomous department may then move forward and become a fully commercialised

private company, wholly owned by the council but operated on commercial principles to the benefit of the council and the residents of Kisumu.

4.7.6 Revenue Collection

No business can survive unless it receives prompt payment for goods and services provided. As an essential service provider, the WSD must ensure that it is able to collect the revenue due in an efficient manner. Sustainability will not be achieved unless all revenue due is collected with honesty and integrity from all consumers, be they government establishments or water kiosk operators. Phase I provides for capacity building in this area, with the management consultancy services provided through the Management and Institutional improvements.

4.7.7 Organisation

A matter of great concern has been the large number of vacancies in key areas of the WSD. This problem should be remedied in the short term by the council mounting its own recruitment programme. Adequately qualified and experienced staff must be brought in to ensure that the department can gain autonomy and manage the system until the commencement of the management and institutional improvements. This programme will ensure that the staff are further strengthened and able to meet the performance criteria required of a commercially run private company.