CHAPTER 1 BACKGROUND OF THE PROJECT

In the Republic of Zambia, the population of Lusaka, the capital city, reached about 1.6 million in 2000 because of a population influx from local areas into the city. Most of the influx population resides in unplanned urban settlements (UUSs), commonly called 'Compounds', where more than one million low-income residents live. Living conditions of the UUSs are quite low where social services such as public transport, utilities, and garbage treatment are sporadically provided.

The Government of the Republic of Zambia (GRZ) made a request to the Government of Japan (GOJ) for technical cooperation to prepare the social service improvement plan for the UUSs. The implementation of this project, entitled "The Study on Environmental Improvement of Unplanned Urban Settlements in Lusaka" (hereinafter referred as to the Master Plan Study) was entrusted to the Japan International Cooperation Agency (JICA). The Master Plan Study was conducted from March 1999 to July 2001 and the action area plan was formulated.

Based on the action area plan, in August 2001 GRZ submitted a request to GOJ for a Japan's Grant Aid Scheme. The request aims to develop a water supply system of safe and healthy drinking water, and health and hygiene education in four UUSs: Ng'ombe, Freedom, Kalikiliki, and Chibolya. Those projects were selected as the priory projects/programs in the short-term plan of the action area plan.

The request covers four projects; (1) Construction of water supply systems, (2) Construction of community centers, (3) Health and hygiene education, and (4) Capacity building for community-based activities including community-managed water supply services. An outline of each project is specified in the request as mentioned below.

1) Construction of the water supply systems, of which communities carry out operation, maintenance, and levy collection in three UUSs (Ng'ombe, Freedom, and Kalikiliki). The systems are required to provide for water consumption of 30 l/person/day with access to communal water supply point within 15 minutes.
2) Construction of community centers in the four UUSs (three UUS and Chibolya). The proposed functions of the community centers are listed in the following table.

Functions Requested for the Community Centers

UUS	Water Levy Collection Room	Sub Health Center	Meeting Room	RDC Office	LCC Site Office	Others (toilet, kitchen)	Type of Community Center
Chibolya	-	○	○	-	-	○	C
Ng'ombe	○	-	○	○	-	○	B
Freedom	○	○	○	○	○	○	A
Kalikiliki	○	○	○	○	○	○	A

Note: Symbol (○) indicates functions proposed in the request.

3) Promotion of health and hygiene behaviors in the three UUSs of Ng'ombe, Freedom, and Kalikiliki.

4) Capacity building to develop community-based operation and maintenance systems for water supply services in the three UUSs of Ng'ombe, Freedom, and Kalikiliki.

CHAPTER 2 CONTENTS OF THE PROJECT

2.1 BASIC CONCEPT OF THE PROJECT

(1) Overall Goal and Project Purpose

In the Unplanned Urban Settlements (UUSs) located on the periphery of Lusaka city, more than one million people of low income households reside with poor living and environmental conditions where social services and infrastructural facilities are poorly provided. In the national plans of Zambia, it is proposed to improve the living environment in the UUSs based on community participatory methods. The plans recommend the improvement of water supply systems to create better hygiene conditions.

The Project aims to improve the hygiene conditions and provide water supply systems with sufficient water volume and good quality in three target areas of Ng'ombe, Freedom, and Kalikiliki. The project is expected to reduce water borne diseases (diarrhea, etc) by approximately 30% from the current situation and provide public taps having accessibility within 10 minutes and safe and adequate water (unit water consumption: 30 liter/person/day).

(2) Outline of the Project

The Project consists of construction works and soft components. The former includes water supply facilities and community centers, while the latter covers health and hygiene education and capacity building of communities. The Project is expected to improve the living environment, particularly hygiene conditions by provision of water supply systems and health and hygiene education, which are operated and maintained by the communities.

In the Project, the Japan's Grant Aid Scheme aims to develop initial community-managed systems by construction of the facilities and implementation of the soft components.

2.2 BASIC DESIGN OF THE REQUESTED JAPANESE ASSISTANCE

2.2.1 DESIGN POLICY

(1) Water Supply System Improvement

1) Basic Concept for Water Supply System

Objectives of the water supply system improvement project are, not only to develop the water supply system of the whole area of Ng'ombe, Freedom, and Kalikiliki by the target year of 2008, but also to establish an area-based

organization for operation and maintenance including a levy collection system and to help with the creation of a sustainable and sound living environment.

Based on the results of the basic design study, the following concepts and policies were determined for implementation of the water supply system improvement project.

- Target year of the project is 2008.
- Service area follows the existing boundaries of the UUSs.
- Daily water supply is planned to meet water demand of planned population in the year of 2008.
- Service coverage ratio of the water supply is planned to be 100% of the target area with the unit water consumption of 30 lpcd.
- Water quality is planned to comply with requirements of water quality standard in Zambia.
- Maximum walking distance to communal water supply point should be less than 200m in accordance with the LWSC standard. Walking time is assumed to be 10 minutes.
- Number of users per tap is planned to be within the range from 100 to 250 users in accordance with the LWSC standard. Queuing time is assumed to be less than 10 minutes.
- The minimum residual water pressure should be 5m or higher.
- The plan pays special attention to slope protection of the pipeline in Ng'ombe and Kalikiliki which are located in a hilly area,
- Design load for structures excludes seismic conditions. The design works follows standards issued by LCC's technical departments and LWSC and refers to the designs of existing facilities.
- Resident Development Committee (RDC) takes responsibility for community mobilization to secure a community participation approach.
- Lusaka Water and Sewerage Company (LWSC) standards are applied for facility design.
- Practical use of local materials and equipment,
- Executing agency is the Lusaka City Council (LCC).

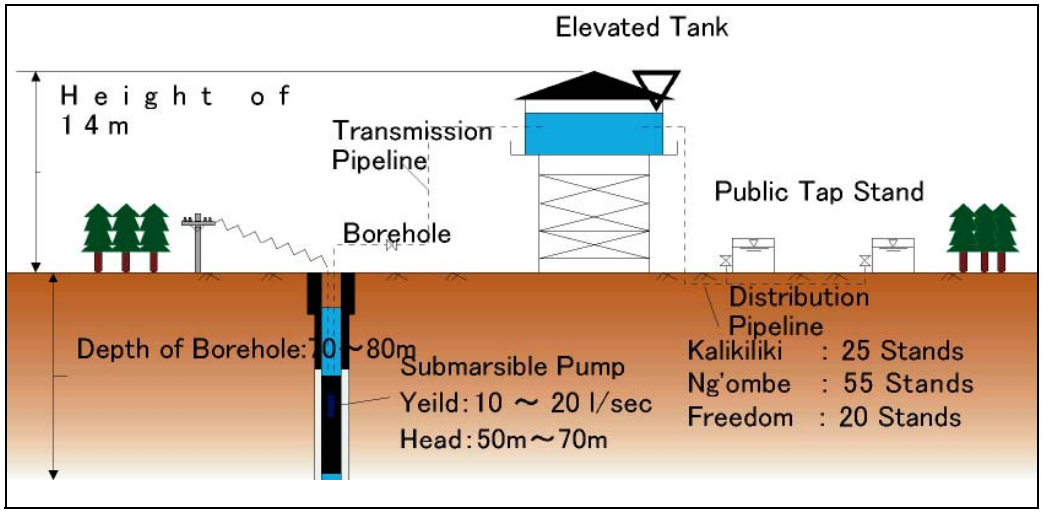
The basic design of the project is formulated according to the following framework.

Plan Framework for Water Supply System Improvement

Plan Items \ Area	Ng'ombe	Freedom	Kalikiliki
1. Served Area (ha)	91	43	61
2. Served Population (person)	61,000	11,000	14,000
3. Target Year	2008	2008	2008
4. Water Supply Level	Level 2	Level 2	Level 2
5. Unit Water Demand (lpcd)	30	30	30
6. Water Source	Deep Well	Deep Well	Deep Well
7. Design Yield per Well (l/sec)	20	10	10
8. Public Tap Stands (place)	55	20	25

The Project is planned based on the level-2[1] of water supply proposed by the Master Plan Study. Contents of the level-2 are composed of deep wells, submersible pumps, elevated tanks, distribution pipelines with gravity flow, and public tap stands. Water supply facilities are planned based on the standard of LWSC. Outline of the water supply system is proposed below.

System Diagram of Water Supply System



2) Design Policy for Water Supply System

i) Water Supply Level

The project of water supply system improvement is planned to attain level-2 consisting of deep wells, submersible pumps, elevated tanks and public tap stands, based on the following reasons.

- It is a serious problem that the phreatic water of the shallow aquifer is polluted and its water quality is deteriorating. Lusaka City Council (LCC)

[1] Level-1: Water supply systems consisting of shallow wells and hand pumps,
Level-2: Water supply systems consisting of deep wells and public taps, and
Level-3: Water supply systems consisting of deep wells and individual connections.

has been advising residents that residents should stop usage of shallow wells in settlements.

- The level-2 is a minimum requirement of LWSC for improvement of satellite water supply systems. Adoption of level-2 improves the functions of the existing urban water supply systems and facilitates the operation and maintenance of LWSC.

ii) Hydrogeological Condition

In the project, groundwater sources for Ng'ombe, Kalikiliki, and Freedom are planned in an aquifer of the Lusaka Dolomite formation.

(2) Community Center Development

1) Basic Concept of Community Center Development

In the Master Plan Study, the community centers are proposed to be multi-purpose facilities for community-based activities. The center is designed to have functions for the sub-health center, water tariff collection, and meetings. Since the community center of Chibolya has been developed by CARE PUSH, it is excluded from the Project.

In this project, the function of the community center is focused on supporting the community-based activities of O&M on the water supply projects. The necessary facilities of the centers are planned to cover the following functions.

- Levy collection facilities required for water supply services,
- Training facilities necessary for health and hygiene education,
- Assembly facilities necessary for community-based activities, such as meetings held by the Residential Development Committee (RDC) and permanent stations for the RDC.

Based on the functions mentioned above, the necessary spaces of the community center are determined as listed below.

Functions and Necessary Spaces of Community Centers

Function	Necessary Spaces
1) Water Tariff Collection	• Levy Collection Room with a Vault
2) Training Facilities for Health and Hygiene Education	• Assembly Room
3) Assembly for Community-based Activities (RDC meeting, etc.)	• Assembly Room • RDC Office • LCC Site Office

2) Design Policy for Community Center Development

i) Scale Setup

Scale of facilities are set up by the number of users for training of health and hygiene education as well as periodic meetings of RDC. In addition, scale of a community center developed by CARE PUSH in Chibolya is taken into consideration.

ii) Applied Regulations

In Zambia, legal systems for construction have been developed as the Public Health Act and Town and Country Planning Act. On the other hand, the regulations and standards for planning of buildings are not sufficiently prepared, therefore the community center is designed to take plan and structure of existing similar facilities into consideration.

iii) Structure and Specifications

The structure shall be made of concrete blocks. Building materials are selected from ones ordinarily used for low-rise buildings in Zambia.

iv) Water Supply and Sanitation Systems

Drinking water in the community centers is provided by water supply systems of the Project. Since there is no sewage collection system in the UUSs, wasted water shall be treated by septic tanks in accordance with standard drawings in Zambia.

Power supply is covered by the distribution lines of ZESCO through exclusive lines to secure a stable power supply. Wiring of service lines will be provided by the Zambian side. The accurate location of the services will be discussed in the implementation stage.

ZAMTEL has a telecommunication network located 1 – 2 km from UUSs. Similar to the power supply, service lines will be wired by the Zambian side after the discussion of the accurate location for the services.

(3) Health and Hygiene Education

1) Basic Concept of Health and Hygiene Education

The health and hygiene education in the Project aims at improving the environmental health through better knowledge, attitude, and practice of health and hygiene of the community people. The basic concept of health and hygiene education is defined as: 1) strengthening the implementation system of health and hygiene education, 2) developing human resources for health and hygiene education.

The health and hygiene education should be implemented so that education activities can be conducted in a sustainable way by the Zambian organizations and community people after the completion of the Project. It is often the case that women treat and utilize water, including drawing water, therefore, special consideration should be taken to the empowerment of women and the enhancement of the awareness of the community to support it.

2) Design Policy for Health and Hygiene Education

i) Basic Policy

The following are the basic policies for the health and hygiene education.

- To establish a supporting system for the project among the Public Health Department (PHD) of Lusaka City Council (LCC), Central Board of Health (CBH), Lusaka District Health Management Board (LDHMB) and Kafue District Health Management Board (KDHMB)
- To strengthen implementation system among key stakeholders in the UUSs, including Resident Development Committees (RDC), Health Centers, Neighborhood Health Committees (NHC), and Community Health Workers (CHW)
- To train members of community-based organizations (CBO) such as RDC, NHC, CHW as trainers (TOT) for community people
- To give education to improve the knowledge on health and hygiene and to improve the awareness to implement the adequate health and hygiene practice including the proper use of different water resources of shallow wells and deep wells
- To give education on the methods necessary for trainers including those of teaching, awareness promotion, problem finding, problem solving and project planning
- To establish and maintain coordination with on-going JICA Lusaka Primary Health Care Project Phase II (PHC Project)

ii) Collaboration with PHC Project

As the Grant Aid Scheme and the PHC Project have the same target area (Ng'ombe and Kalikiliki) and the same training topics (water and sanitation) in common, it is highly recommended that the both Projects implement its activities in coordination where possible.

(4) Capacity Building of Community

1) Basic Concept of Capacity Building

Capacity building of communities focuses on three programs having purposes as listed below.

i) Capacity Building of the Community-based Organization

- To recommend amendments of articles and rules for the Resident Development Committee, Water Supply Management Board, and organization for health and hygiene education,
- To promote awareness of necessity for community participation in this Project,
- To strengthen capability for community-based activities, and
- To strengthen capability for financial management of RDC.

ii) Capacity Building for Operation and Maintenance of Water Supplies

- To develop human resources for operation and management of water supplies,
- To develop human resource for financial management and levy collection systems,
- To develop organizations to improve water tariff collection rates, and
- To develop supporting systems by related organizations, such as LCC and LWSC.

iii) Capacity Building for Operation and Maintenance of Community Centers

- To develop human resources for maintenance of community centers,
- To strengthen capability for operation including financial management, and
- To develop supporting systems by related organizations, such as the LCC.

2) Planning Policy for Capacity Building of Communities

The basic plans for capacity building of communities are formulated to comply with the following policies.

i) Capacity Building of Community-based Organizations

- To Capacity building is planned after recognition and evaluation of current capacity of RDCs, water supply management boards, and organizations for health and hygiene education.
- To recommend amendments of constitution for RDC to support

community-based activities based on the evaluation of the constitution which is currently under the preparation by LCC, and

- To prepare human resource development plans including financial management to secure sustainable community-based activities, such as health and hygiene education conducted by RDC.

ii) Capacity Building for Operation and Maintenance of Water Supplies

- To develop supporting systems for community-based organizations including the supervision by LCC and the technical assistance by the LWSC,
- To formulate training programs to develop capacities for sustainable operation and management by RDC and Water Management Committee,
- To implement promotion necessary for community participation, aiming to create ownership by the communities, and
- To implement promotion to secure collection of water tariffs and community participation.

iii) Capacity Building for Operation and Maintenance of Community Centers

- To provide supervision by LCC.
- To formulate training programs for sustainable operation and maintenance by RDC.

2.2.2 Basic Plan

(1) Water Supply System Improvement

1) Basic Plan

As the three targeted settlements are categorized as a sub urban residential area around the Lusaka city, the water supply systems in the settlements are designed to be isolated from the existing water supply network of LWSC'. Living environmental aspects and integration with existing infrastructure are essential requirements for the plan. The basic plan is formulated according to the following process.

i) Policy of basic plan

To formulate the improvement plan for the water supply system in three UUSs, the following items were considered carefully.

- Needs and requirements for the water supply systems of the residents,
- Capacity of community organizations for implementation and sustainability

of the project,

- Willingness and ability of the residents to pay water levies,
- Urgency of the short-term project to be achieved by 2008,
- Necessity of water supply systems to cover the whole area of each settlement by 2008,
- Safety and stable water supply at settlements by 2008 as a final goal,
- Introduction of a levy system into Kalikiliki to eliminate water supply services without water charges,
- Physical characteristics of target settlements such as topographic and hydro-geological conditions,
- Integration of community-managed water supply systems with the existing water supply systems operated by LWSC,
- Scale merit of the projects and ease of O&M, and
- Standards of LWSC.

ii) Water Demand Projection

Unit water consumption per capita is proposed as 30 lpcd for the year 2008. Based on the population forecast and unit water consumption, water demand projection of three UUSs is determined as tabulated below.

Water Demand and Served Population

Description	Ng'ombe	Freedom	Kalikiliki
Served Population in 2008 (persons)	61,000	11,000	14,000
Number of Served Households in 2008 (households)	12,000	1,800	2,300
Daily Water Demand (m^3/d)	1,830	330	420

iii) Water Source

The water source will come from the deep wells to be newly developed at each settlement. Kalikiliki and Freedom are underlain by the Lusaka Dolomite that is the major aquifer in Lusaka. Since the Cheta and Chunga Formations that form minor aquifers underlie Ng'ombe, a borehole for Ng'ombe is to be situated near to the Great East Road where the capacity of aquifer is expected to be high. In Freedom, a borehole is to be constructed at a reserved area in the southeastern part of the settlement. A new borehole is to be constructed near the stream in Kalikiliki.

Well depth is estimated to be from 70 m to 80 m judging from the previous data of boreholes in the City. Diameter of the wells is to be 250 mm or 300 mm. Suction level ranges from 50 m to 70 m. Pumping rate of a submersible motor pump is estimated at 36 m^3/h for Freedom and Kalikiliki and 48 m^3/h for Ng'ombe. A submersible motor pump is to be set in the boreholes.

iv) Water Quality

It is confirmed that the existing wells adjoining the targeted areas are not polluted. When the project is implemented, the plan is made in consideration of well construction management and chlorination control.

v) Water Supply Facilities

(a) Borehole development and submersible pumps

The proposed main source of drinking water is boreholes (deep wells) to be newly developed at each settlement. The number of boreholes to be constructed in Ng'ombe is 2 wells and one each in Freedom and Kalikiliki.

Borehole depth is estimated to be from 70m to 80m (suction level: 50m to 70m) judging from hydrological data. Diameter of the wells is planned to be 300 mm for Ng'ombe and 250 mm for Freedom and Kalikiliki. Pumping rate of a submersible motor pump is estimated at 10 l/s to 20 l/s.

Although there are three sources of power: electricity from the grid, engine generator, and solar battery, it is recommended that the borehole pumps be operated by electricity from the grid since ZESCO supplies stable power. As borehole development will be conducted in the initial stage of construction works, potential of groundwater and type of submersible pump will be reexamined in the detail design stage. The type of submersible pump will be finally determined based on optimum pumping yield to be reached from the pumping test at construction stage.

(b) Elevated tank

The elevated tanks are to be hot-dip Galvanized Steel Plate (GSP) with a steel frame tower. The shape of the tanks is square with an effective water depth of 3m for simplification and workability of construction. The tank has a level meter connecting with the borehole pump for automatic control of the pump.

(c) Transmission pipeline and distribution pipeline

Transmission and distribution pipelines are formed with Ductile Iron Pipe (DIP), Galvanized Steel Pipe (GSP) and Polyethylene Pipe (PEP).

The target areas are located on a hilly area that has hard soil including rocks and debris. For preventing damage to the pipes when backfilling the dug soil, the pipes are covered with sand to a depth of 20 cm over the pipes. As thrust forces in pipeline are created when the pipeline changes direction at bends or tees, concrete thrust blocks will be constructed. Minimum thickness of earth cover is designed to be 0.6 m, while the earth cover of 1.0 m is applied for places of intense excavation by steep slopes and heavy rainfall discharge.

(d) Public-faucet (public tap stand)

The gravity water distribution is adopted for the water supply system with public-faucet (public tap stand). One stand has four taps with a diameter of 3/4 inches. A drain with a length of 5m is provided at each stand.

(e) Pump operation and control system

Borehole pumps are operated by an automatic control system in correspondence with the dynamic water level in the elevated tank. A level meter of the electrode type is recommended. The pump turns on and off automatically according to the specified high water level and low water level in the tank. The level meter and pump are linked by a cable of which instrumentation works are conducted at the same time as pipe installation works.

vi) Design standard

Water supply facilities are designed basically in compliance with the following standards of LWSC.

(a) Design water supply

Unit design water consumption for water supply systems with public taps is recommended by LWSC as tabulated below.

Unit Design Water Consumption by LWSC Standard

Target Year	Minimum Requirement at Present	5-10 years	10-15 years	15 years
Unit Water Supply (lpcd)	20	30	40	50

In case of the individual connection system, unit design water consumption ranges from 100 lpcd to 200 lpcd. In the project, unit consumption of 30 lpcd is adopted and water supply amount is estimated assuming the ratio of system losses to be 10% of water consumption.

(b) Design distribution flow

Average daily supply is consumed usually during the daytime in settlements. Since actual use of water shows a concentration in the three separate periods of four hours in the morning, noon, and evening, peak hourly flow factor is calculated by the following formula for the flow calculation of distribution pipelines.

Hourly Factor = {Qd / (3×4 hr)}÷(Qd / 24 hr) = 2.0

Qd : Design average daily supply (m^3/d)

Peak hourly flow factor is taken as 2.0.

(c) Capacity of elevated tank

Capacity of an elevated tank is generally designed to be about 2 hours of the design average daily supply (Qd). Public tap stand system is served with restriction of water supply to certain hours. Operation time for the water supply is presumed to be about 12 hours a day. Capacity of the elevated tank is determined by the following formula.

Capacity of Elevated Tank = (Qd/12)×2}÷(Qd/24) = 4 hrs

The capacity of elevated tank should be four hours of the design average daily supply.

(d) Chlorine treatment

Groundwater is pumped up to an elevated tank and chlorinated before distribute to residents through a pipeline. Water quality standards prepared by the World Health Organization (WHO) are applied for development of water supply systems. Chlorine dosage is 5 ppm and residual chlorine is more than 0.3 ppm.

(e) Pipeline and hydraulic design

Diameters for transmission pipelines vary from 100mm to 200mm and between 25mm to 300mm for distribution pipelines. DIP is used for water mains with a diameter of 200mm or more, while GSP is adopted for water mains with diameters less than 200mm and PEP is used for distribution and service pipes with diameters less than 65mm. The Hazen-Williams equation and Continuity equation are applied for the hydraulic calculations. Roughness coefficient of the pipe is assumed to be 110.

(f) Maximum hydrostatic pressure and minimum hydrodynamic pressure

The pipelines of project are designed in compliance with the standards of LWSC which specify the maximum hydrostatic pressure and minimum hydrodynamic pressure for pipelines as listed below.

- Maximum hydrostatic pressure :60m
- Minimum hydrodynamic pressure :15m at Water Mains
- Minimum hydrodynamic pressure :5m at Public Tap Stands

(g) Public-faucet (public tap stand) system

The layout of the public tap stands and number of taps are determined by the following criteria:

- Maximum walking distance to public tap stand: 200 m
- Number of users per tap: 100 to 250

The recommended number of taps is determined based on the following WHO formula:

$$Nt = \frac{P * Qp * Pf * Wf}{24 * Qt * Te}$$

Where,

Nt: Number of Taps

P : Served Population

Qp: Unit Design Water Consumption (30 lpcd)

Pf: Hourly Peak Factor (2.0)

Wf: Wastage Factor (1.1)

Qt: Standard Discharge Rate per 3/4" Tap (0.28 l/s under 5 m of minimum water head)

Te: Tap Efficiency Factor (0.9)

vii) Related Facilities (Power Supply and Communication)

(a) Power supply

Ng'ombe, Freedom and Kalikiliki are well supplied with electricity by ZESCO. There are distribution lines along the Great East Road where the area of the borehole is to be developed for Ng'ombe water supply. As the cost for distributing power line to the pumping station is shouldered by the Zambian side, it is necessary that required electric power and distributed sites be reported correctly during detail design stage.

(b) Communication

The distance between boreholes and elevated tanks in Freedom and Kalikiliki is not far, while it is approximately 2.5 km in Ng'ombe. As pump operation is fully managed by the automatic control system, communication equipment is not required.

viii) Basic Design Criteria

The basic plan with target year of 2008 is formulated according the following design criteria.

Basic Design Criteria

Description	Ng'ombe	Freedom	Kalikiliki
Served Area (ha)	91	43	61
Target Zones	Zones 1 to 6	Whole area	Zones 1 to 5
Served Population in 2008 (persons)	61,000	11,000	14,000
Daily Water Demand (m^3/d)	1,830	330	420
Water Source	2 boreholes	1 borehole	1 borehole
Design Water Yield at a Borehole (l/sec.)	20 or more	10 or more	10 or more
Number of Individual Connections	none	none	none
Type of Water Supply System	Public-faucet system		
Distance to water source (m)	Less than 200		
Water Quality	WHO standard		
Water Supply Operation Time (hours)	Less than 12		
Capacity of Elevated Tank	More than 4 hours of Daily Water Demand		
Hydrodynamic Pressure of Main (m)	15 to 60		
Peak Factor	2.0		
System loss (%)	10		
Wastage Factor at Water Point (%)	10		
Queuing Time (minutes)	Less than 10		
Minimum Residual Water Head (m)	More than 5		
Number of Served Population per Pubic Tap Stand(persons)	Less than 400		
Number of Served Population per Tap (persons)	Less than 100		

ix) Facility Plan

Water is delivered to residents through a pipeline by gravity flow system. The pipeline consists of ductile iron pipe (DIP), galvanized steel pipe (GSP) and polyethylene pipe (PEP). The minimum hydrodynamic water pressure in

the distribution main system under peak hourly flow condition is 15 m. The maximum hydrostatic pressure under zero flow condition is to be 60 m. At the public tap stand, the minimum residual water head is 5 m. From a result of water flow calculation, the height of elevated tank is required to be 10m and the capacity of tank is estimated at an amount proportionate to four hours of the design average daily supply. The chlorinator is provided at each area of the elevated tank.

Public-faucet (public tap stand) system is to be adopted for water supply in three UUSs. Operation time for water supply is 12 hours per day. The layout of the public tap stands and number of taps are determined based on the standard of LWSC (maximum walking distance: 200 m and number of user per tap: 100 to 250).

In order to secure the minimum requirement of accessibility from houses to public tap stands, number of tap stands are recommended to be 11 points for Freedom, 16 points for Kalikiliki and 25 points for Ng'ombe. The accessibility from houses to public tap stands is improved to be less than 10 minutes for all the residents.

The recommended number of taps is determined by the WHO formula and estimated at 80 in Freedom, 100 in Kalikiliki and 220 in Ng'ombe. The number of taps per a tap stand is recommended to be four taps. A water meter is to be equipped at each public tap stand for O&M.

Basic plan of water supply facilities are proposed in the following tables.

Basic Plan of Water Supply Facilities

Parameter	Ng'ombe	Freedom	Kalikiliki
Design Population (persons)	61,000	11,000	14,000
Design Unit Water Consumption (lpcd)	30	30	30
Daily Water Demand (m^3/d)	1,830	330	420
Average Daily Water Supply (m^3/d)	2,013	363	462
Maximum Daily Water Supply (m^3/d)	2,215	400	509
Number of Boreholes (borehole)	2	1	1
Design Water Yield per Borehole (l/sec)	21	7	10
Number of Submersible Pumps (unit)	2	1	1
Number of Chlorinators (unit)	2	2	2
Capacity of Elevated Tank (m^3)	300	100	100
Height of Elevated Tank (m)	10	10	10
Length of Transmission Pipeline (km)	2.4	0.1	1.0
Length of Distribution Pipeline (km)	9.8	3.6	4.6
Number of Public Tap Stands (place)	55	20	25

Basic Plan of Public Tap Stands

Description	Ng'ombe	Freedom	Kalikiliki
Number of Public Tap Stands (location)	55	20	25
Number of Water Meters (unit)	55	20	25
Number of Taps per Point (tap)	4	4	4
Total Number of Taps (tap)	220	80	100
Served Population per Public Tap Stand (person/location)	1,109	550	560
Served Households per Public Tap Stand (person/location)	87	71	60
Number of Population per Tap (person/tap)	278	138	140
Maximum Walking Time to a Public Tap Stand (minutes)	Less than 10	Less than 10	Less than 10
Queuing Time (120 l/household/day, minute)	Less than 7	Less than 7	Less than 7
Operation Hours*[1]	10	6	6

*1: Minimum time for operation based on the required number of taps.

x) Operation and Maintenance System

A new organization, that is provisionally called "Water Supply Management Board", is to be established for the operation and maintenance (O&M) of the planned facilities at each settlement. The organization consists

of LCC, LWSC and the area-based organization (ABO). The new organization operates and maintains the facilities instead of LWSC.

xi) Levy Collection System

It is proposed that a water levy collection room be built in order to handle and store the collected money safely. Monthly or weekly basis contract tickets/cards are to be sold at the room of the community center to be constructed by the Project. Tap attendants, who are selected from the community, work for operating and maintaining the public tap stands and collect the water charge daily

2) Main Works of Water Supply Project

Main works of the project are summarized below:

Main Works of Water Supply Improvement Project

Item \ Area	Ng'0mbe	Freedom	Kalikiliki
1. Development of Borehole			
Electric/Physical Resistance Survey	4	2	2
Diameter of Borehole	300 mm	250 mm	250 mm
Depth of Borehole (±10%)	70m-80m	70m-80m	70m-80m
Number of Boreholes	2	1	1
Pumping Test	2 places	1 place	1 place
2. Pump Installation with Operation Room			
Pump Model	Submersible	Submersible	Submersible
Diameter of Lifting Pipe	100 mm	80 mm	80 mm
Voltage	380 V	380 V	380 V
Frequency	50 Hz	50 Hz	50 Hz
Power Output	30 kW	15 kW	18 kW
Lifting Rate	1.20 m3/min.	0.60 m3/min.	0.60 m3/min.
Number of Pumps	2	1	1
Total head	94 m	62 m	87 m
3. Chlorinator			
Flow Rate	25-120 ml/min.	25-120 ml/min.	25-120 ml/min.
Diameter of Pipe	15 mm	15 mm	15 mm
Injection Pressure	10 kg/cm^2	10 kg/cm^2	10 kg/cm^2
Voltage	220 V	220 V	220 V
Number of Pumps	2	2	2
Capacity of Chemical Tank	100 l	100 l	100 l
Number of Chemical Tanks	2	2	2
4. Pipeline	12,228m	3,671m	5,663m
Transmission Pipeline			
- GSP Dia.200mm	2,434m		
150mm			1,016m
100mm		100m	
Distribution Pipeline			
- DIP Dia.300mm	383m		
- GSP Dia.200mm	927m		
150mm	1,618m	125m	245m
100mm	2,813m	220m	618m
75mm	1,663m	987m	1,846m
50mm		1,599m	758m
- PEP Dia.50mm	2,390m		
40mm		640m	1,180m
5. Elevated Tank (GSP)			
Capacity: 300m^3 Height: 10m	1		
Capacity: 100m^3 Height: 10m		1	1
6. Public Tap Stand	55 places	20 places	25 places
7. Incidental Facilities including power (Power Receiving and Distribution Equipment)	1 L.S.	1 L.S.	1 L.S.

(2) Community Center Development

1) Plan and Scale of Facilities

Based on the required functions, the community centers are to consist of a meeting room, levy collection room (including a vault), LCC site office, and RDC office. In addition to these rooms, the community center includes kitchen, storage room, toilet with septic tank, and security office as surrounding facilities.

Necessary capacity of the meeting room is estimated to be 30 users in maximum based on the number of attendants for health and hygiene education and meetings by RDC. The floor area is designed to be around 40m^2 according to occupant density (schools: 0.7 person/m^2) and scale of meeting room of the existing community center in Chibolya.

Assumed Number of Building Users

UUS	RDC Meeting	Water Management Meeting	Health and Hygiene Education
Ng'ombe	• Maximum: 13 persons (RDC 12 + LCC 1) • Frequency: Periodically 2 times/month + Extraordinary 6 times/year	• Maximum: 26 persons (WSMB 6 + TA 18 + RDC 2) • Frequency: 4 times/year	• Maximum: 26 person • Target: 26 persons (2 person from each zone + Facilitators 2) • Frequency: 2 times/month
Kalikiliki	• Maximum: 21 persons (RDC 20 + LCC 1) • Frequency: Periodically 2 times/month + Extraordinary 6 times/year	• Maximum: 15 persons (WSMB 6 + TA 7 + RDC 2) • Frequency: 4 times/year	• Maximum: 30 person • Target: 42 persons (2 persons from each zone + Facilitators 2) • Frequency: 2 times/month
Freedom	• Maximum: 29 persons (RDC 28 + LCC 1) • Frequency: Periodically 2 times/month + Extraordinary 6 times/year	• Maximum: 17 persons (WSMB 6 + TA 9 + RDC 2) • Frequency: 4 times/year	• Maximum: 30 person • Target: 38 persons (2 persons from each zone + Facilitators 2) • Frequency: 2 times/month

Note: The maximum number of attendants for health and hygiene education is limited to 30 persons/time in order to secure effectiveness of the training.

The floor area of each room is presented in the following table.

Floor Area of Community Centers

Room	Scale (Floor Area: m2)	Notes
1. Center Building		• 1 person (permanent)
LCC Site Office	2.5m x 3m =7.5m^2	• 2 persons (Chairperson and secretary)
RDC Office	2.5m x 3m =7.5m^2	• 2 persons (Cashier and Accountant), incl. safety room
Levy Collection Room	3m x 3m =9.0m^2	• 30 persons (maximum number of attendants for health and hygiene education)
Meeting Room	5m x 7.5m =37.5m^2	
Kitchen	2m x 3m =6.0m^2	• Corridor, etc.
Others	22.5m^2	
Sub-total	90.0m^2	
2. Surrouding Facilities		
Security Office	1.5m x 2.0m =3.0m^2	
Flush Toilet	5m x 1.5m =7.5m^2	• Water closet for male: urinal 1/ pot 1 • Water closet for female: pot 1 • Incl. septic tank
Total	100.5m^2	

2) Section and Structure

Design criteria for section and structure is chosen as listed below.

- Floor level is elevated by 30 cm or more from the ground level to prevent flooding
- Building is consisted of a single floor structure made with concrete blocks. Since there is no earthquake in Zambia, loading by earthquake is excluded. Floors and foundation are made with reinforced concrete.
- Roof is formed by corrugated cement sheets with beams of steel bars (spider trusses).

3) Building Materials

- Openings: Out-swinging window with steel frame and burglar bars.
- Exterior Finishing: Cement mortar with paint on the concrete block structure
- Interior Finishing: Cement mortar with paint on the concrete block structure for floors and walls

4) Equipment

The community centers shall be equipped with necessary office equipment for financial management of water supply services and health and hygiene education. The equipment includes office desk, chair, book shelves, personal computer, and its peripherals. The planned equipment for each room is listed in the following table.

Office Equipment of Community Centers

Room	Equipment and Furniture	Quantity (set)	
		Each Community Center	Total
1. LCC Site Office	1) Office Desk and Chair	1	3
2. RDC Office	1) Office Desk and Chair	1	3
3. Levy Collection Room	1) Personal Computer (with Monitor)	1	3
	2) Printer (A4 size)	1	3
	3) Computer Rack	1	3
	4) UPS	1	3
	5) Office Desk and Chair	2	6
	6) Book Shelves	1	3
	7) Safety Box	1	3
4. Meeting Room	1) Teacher's Desk and Long Chairs	1	3
	2) Book Shelf	1	3
	3) Blackboard	1	3

Note: Zambian side shall provide kitchen equipment, facsimile, telephone, and copy machine.

5) Supply and Treatment System

Supply and treatment system is designed to comply with the following conditions.

- Drinking water is supplied from the water supply systems of the Project.
- Wastewater from kitchen and toilets is treated by on-site septic tank.
- Power supply is provided from existing distribution line of ZESCO.
- Telecommunication is connected to existing line of ZAMTEL.

6) Land for Community Center

It is confirmed that the land for community centers is vacant space and provided by LCC and RDC in each UUS. The current situation of the land is summarized in the following table.

Current Situation of Land for Community Center

UUS	Current Situation
Ng'ombe	• Available land is in the form of 28-30m by 28.5m. • It is located in the area newly incorporated with Ng'ombe and at the north of the Old Ng'ombe area. • The land is located along a passageway which goes to a health center. • Around the land, houses have been constructing.
Freedom	• Available land is in the form of 22-24m by 21-30m. • It is located along the southern boundary of the UUS. • It is a part of a large vacant parcel.
Kalikiliki	• Available land is in the form of 95-63m by 73m including the land for a borehole and elevated tank to be constructed in the Project. • It is located at the north-eastern boundary of the UUS. • It is a part of a large empty parcel.

(3) Health and Hygiene Education

1) Framework of Health and Hygiene Education

The framework of health and hygiene education plan is defined as below.

i) Objective of Health and Hygiene Education

The objective of health and hygiene education is to improve environmental health through nurturing, improving, and expanding the knowledge, attitude, and practice on health and hygiene of the community people.

ii) Target Group of Health and Hygiene Education

The direct target group of health and hygiene education by this project are members of CBOs, i.e., RDC, Neighborhood Health Committee (NHC), Community Health Workers (CHW), and Environmental Health Committee (EHC). The trained members of these CBOs will give education to

community people as trainers. The project will implement monitoring and give guidance for the health and hygiene education conducted by trainers for community people during the project period.

The number of targeted CBO members is as follows. Two members of each RDC will be picked up as health and hygiene education trainers. In Kalikiliki, there are two Neighborhood Health Committees (NHC), each of which is supposed to consist of ten members, that is, 20 members in total. However, many of the members have been "dropped out" and have not been active, and there are only four active members now. The PHC Project is planning to select additional members of CHW in the beginning of the year 2004 or later in Mtendere Health Centre, which oversees Kalikiliki, consequently the number of people to be trained in Kalikiliki is expected to increase.

Number of CBO Members to be trained in each UUSs

	RDC	NHC	CHW	EHC	Total
Ng'ombe	12	50	7	3	72
Kalikiliki	20	4	3	Not existing	27
Freedom	28	30	Not existing	Not existing	58

Source: Interview with health centers and attendants of workshops during the Basic Design Study.
The number of members in each organization is indicated in the table although some members belong to more than two organizations and there may be some duplication.

iii) Administrators of health and hygiene education

Health and hygiene education will be administered by the Public Health Department (PHD) of LCC (LCC-PHD), LDHMB, and Kafue District Health Management Team and assisted by Environmental Health Technicians (EHT) at each Health Centre. The Project will hire a local health education consultant as instructor of training.

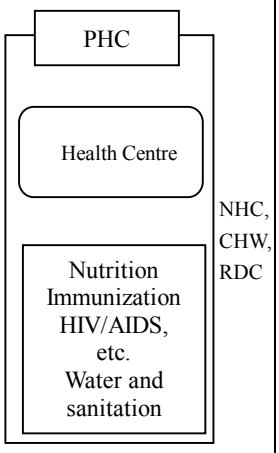
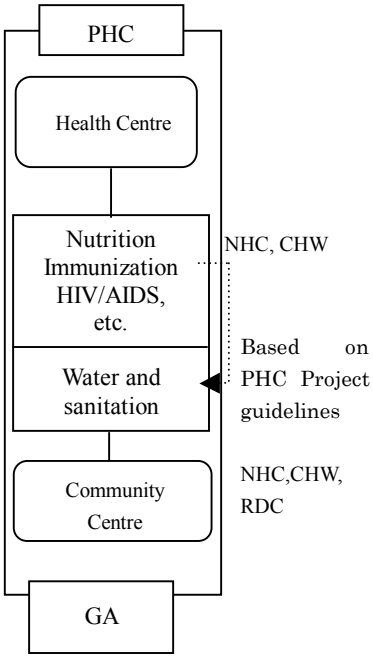
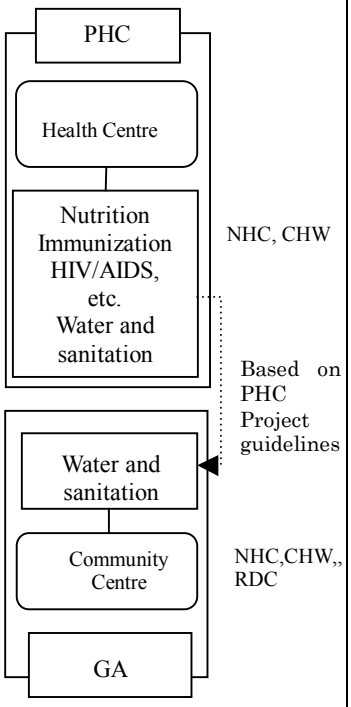
iv) Methodology of Health and Hygiene Education

The Project will utilize the guideline and the manual developed in cooperation between the PHC Project and CBH. In the training, it is important to introduce a participatory education method, such as group discussion, drama performance, and role-play, rather than a didactic one. The importance will be placed on communication between the instructor and participants and among participants.

v) Methodology for Collaboration with PHC Project

The proposed coordination scheme with PHC project is shown in the following figure.

Proposed Coordination Scheme between Grant Aid Scheme and PHC Project on Health and Hygiene Education

	〔A〕	〔B〕	〔C〕
Proposed scheme of coordination	Health and hygiene education to be implemented by the PHC Project only. 	The planned training on water and sanitation in the PHC Project to be implemented in coordination with the Grant Aid Project 	Health and hygiene education to be implemented by the PHC Project and the Grant Aid Project separately 
Remarks		• Follow-up training courses will be provided in coordination between the PHC Project and the Grant Aid Scheme in Ng'ombe and Kalikiliki. (In the initial training provided by the Grant Aid Scheme in Ng'ombe and Kalikiliki, the topics of the training will be selected and structured in coordination with PHC Project.)	• Training will be provided by the Grant Aid Scheme in Freedom.

PHC: Primary Health Care Project, NHC: Neighborhood Health Committee, CHW: Community Health Worker
GA:Grant Aid Project

In the proposed coordination scheme A, education on water and sanitation will be given entirely in the training courses given by the PHC Project. The Grant Aid Scheme will not implement health and hygiene education if scheme A is adopted. In the coordination scheme B, the training on water and sanitation will be conducted in coordination with the Grant Aid Scheme and the PHC Project. The proposed coordination scheme C shows that the education on water and sanitation will be implemented by the Grant Aid Scheme independently of the PHC Project.

After discussion and consultation between the PHC Project and the Basic Design Study Team, both sides agreed to propose having training courses in coordination scheme B for Ng'ombe and Kalikiliki and in scheme C for Freedom.

In Ng'ombe and Kalikiliki, it is expected that the initial training courses for community-based health workers by the PHC Project will have finished before the start of the Grant Aid Scheme. Consequently, the Grant Aid Scheme will conduct its initial training courses independently of the PHC Project for the target group and on the topics necessary for the Grant Aid Scheme. The topics in the training are those that are not covered in the PHC Project or those that need to be discussed in more detail. The training course will be tailored so that the concepts necessary for the Grant Aid Scheme will be incorporated, including the operation and maintenance of water facilities and the improvement of environmental health. The scheme B will be also applied to follow-up training ("refresher" training as called in the PHC Project) of the Grant Aid Scheme in Ng'ombe and Kalikiliki when the PHC Project has water and sanitation as training topic in refresher courses.

As Freedom is not included in the PHC Project target area, health and hygiene education in Freedom will be conducted entirely by the Grant Aid Scheme as shown in scheme C.

The guidelines and manuals developed by the PHC Project in cooperation with the Central Board of Health will be used in each of the above schemes. The Community Centres to be constructed in the Grant Aid Scheme can be used for the training courses by the PHC Project as well when necessary. The Grant Aid Scheme and the PHC Project will discuss how to share the training costs for the courses in coordination.

As the PHC Project is expected to be going on when the Grant Aid Scheme is completed, PHC Project will give support to follow-up monitoring after the Grant Aid Scheme in Ng'ombe and Kalikiliki.

vi) Schedule of Health and Hygiene Education

Upon the start of the Grant Aid Project, an additional site survey will be conducted and a meeting will be held with key stakeholders to discuss planning and implementation of health and hygiene education. After educational materials are developed and produced, the initial training on water and sanitation will be launched in each UUS. Then follow-up trainings will be conducted in each UUS once a month. In the latter part of the Project period, the members of RDC, NHC, CHW and other CBO who participate in the training will start educating community people as trainers.

In Ng'ombe and Kalikiliki, the schedule and contents of training courses will be decided through discussion and agreement with the PHC Project. The following is the tentative schedule of training courses in coordination with the PHC Project. In the actual implementation, however, the schedule and topics of the training will be re-adjusted after discussion with the PHC Project.

Proposed Schedule in Coordination with PHC Project

	Month	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
Ng'ombe	PHC Project	A*	B*	B*	B*	A*	B*	B*	B*	A*	B*	B*	B*	A*	B*	B*
	Grant Aid Project						○	A*	A*	A*	△	A*	A*	A*	A*	A*
Freedom	PHC Project	B*	B*	B*	A*	B*	B*	B*	A*	B*	B*	B*	A*	B*	B*	B*
	Grant Aid Project					○		A*	A*	A*	△	A*	A*	A*	A*	A*
Kalikiliki	PHC Project															
	Grant Aid Project			○	○		A*	A*	A*	△	A*	A*	A*	A*	A*	

○: Initial Training Course for RDC, CHW, and other CBO members.

*: Follow-up training. The PHC Project conducts follow-up training (refresher training as called in the PHC Project) once in a month on selected topic such as nutrition, immunization, and HIV/AIDS. When water and sanitation is selected as the training topic once in four or five months, the course will be conducted in coordination with the PHC Project.

A: Water and Sanitation

B: Other topics such as nutrition and immunization

△: PHAST Workshop

2) Plan of Heath and Hygiene Education

The plan of the health and hygiene education is as follows.

Proposed Plan of Health and Hygiene Education

Item	Analysis of problems	Health and hygiene education plan
(1) Strengthening of the implementation system for health and hygiene education	(1) Analysis of coordinating relations and depth of attitude of key stakeholders (2) Study on how each stakeholder understands the knowledge, attitude, and practice of health and hygiene of community people (3) Study on planning and output of human resource development on health and hygiene education (4) Analysis of monitoring and evaluation methods of health and hygiene education	(1) Establishment of coordination system of key stakeholders (2) Preparation and compilation of statistics on knowledge, attitude, and practice of health and hygiene by community people (3) Planning of human resource development of key stakeholders (4) Establishment of methodology and indicators of monitoring & evaluation of human resource development
(2) Human resource development for health and hygiene education	(1) Study of activities of community-based health workers	(1) Improvement of knowledge, attitude, and practice of health and hygiene (a) Relation between environment and diseases (b) Adequate use of water (c) Adequate method of washing hands (d) Adequate use of sanitary facility (toilet) (e) Method of cleaning and maintenance of living environment, including water sources and sanitary facilities (f) Establishment of desirable living practices with consideration to environmental health and hygiene
	(2) Study on knowledge of health and hygiene, communication skills, problem analysis and project planning skills, and need for training of community-based health workers	(2) Improvement of extension skills of knowledge, attitude, and practice on health and hygiene (a) Communication skills (b) Education method (c) Evaluation skills of outputs of education
	(3) Study on knowledge, attitude, and practice on health and hygiene by community people	(3) Improvement of ability of problem finding and analysis and project planning (a) Method of investigation and analysis of present situation in the communities (b) Method for planning of project activities and presentation of planning
	(4) Analysis on the practice of community visits and reporting system of responsible institutions	(4) Establishment of the system of community visits by trainers and reporting to responsible institutions (a) Establishment of a system of consultation and home visits by trainers (b) Establishment of a communication and reporting system between trainers and responsible institutions

3) Outputs of Health and Hygiene Education

The following outputs are expected as the result of health and hygiene education.

Expected Outputs of Health and Hygiene Education

Item	Health and Hygiene Education Plan
(1) Strengthening of implementation system of health and hygiene education	(1) Health and hygiene education plan (Documents on health and hygiene education plan, Document of education schedule, Document of budget assignment, Organization chart of implementation) (2) Manuals for trainers (Manuals, Other supplemental didactic materials) (3) Documentation of monitoring and evaluation methodology of health and hygiene education (Guideline of monitoring and evaluation, Indicators of monitoring and evaluation) (4) Results of monitoring and evaluation (Record of monitoring and evaluation) (5) Results of training courses by EHTs (Record of training courses, including number of courses, topics of courses, and comments and recommendations)
(2) Human resource development of health and hygiene education	(1) Increase in knowledge on health and hygiene of training participants before and after the training (Evaluation test, Observation record during training courses and workshops) (2) Increase in education skills of training participants before and after the training (Evaluation test, Observation record during training courses and workshops, Training plan and training report prepared by the trained participants) (3) Record of training and home visits by the trained participants for community people (Report of training, Report of home visit) (4) Increase in knowledge, and change in attitude, and practices of community people on health and hygiene (Questionnaire to community people, Report of trainers and EHTs)

(4) Capacity Building of Community

1) Planning Framework for Capacity Building of Community

Based on the basic concept, the basic plan for capacity building is formulated to comply with the following frameworks.

i) Objective of the Capacity Building

The capacity building aims to develop capacity for effective and certain implementation of the Project and community-based operation and maintenance.

ii) Target Group for the Capacity Building

Target groups are strictly limited to RDC members (Ng'ombe: 12 persons, Kalikiliki: 20 persons, and Freedom: 28 persons) and the Water Supply Management Board's members (including Tap Attendants), which will be newly established. In other words, the target indirectly covers residents who

participate in the Project. RDC will be planned to conduct instruction of community participation, training for O&M, and promotion for registration and payment of water tariff by the residents.

iii) Supervisor for the Capacity Building

LCC site officers, as daily supervisors, are required to attend capacity building for RDC members (Ng'ombe: 12 persons, Kalikiliki: 20 persons, and Freedom: 28 persons) and the Water Supply Management Committee's members (including Tap Attendants). When the crucial themes is picked up for the training and supervision by LCC officials is necessary, LCC officials will be appointed to attend the training from the Peri-urban section and the department of public health.

iv) Method of the Capacity Building

The evaluation of current problems utilizes hearings with RDCs and reconnaissance of target areas. Training will be conducted by participatory education methods such as workshops. The on-the job training will be also adopted, if necessary.

2) Plan of the Capacity Building

Based on the planning frameworks, the plan for capacity building is tabulated below.

Plan of Capacity Building for Community (1/2)
(Strengthening of Community-Based Organization)

Item	Analysis of Present Situation and Problematical Issue	Plan
(1) Capacity Building of RDC, Water Supply Management Board (WSMB) and Organization for Health and Hygiene Education	Analysis is conducted based on the following indicators (scoring). (a) Level of leadership (b) Decision-making system (c) Frequency of meetings and custody of records (d) Maturity level of financial management (e) Monitoring and evaluation (f) Maturity and contents of training	(1) Establishment of RDC, WSMB, and organization for health and hygiene education (2) Strengthening of RDC, WSMB, and organization for health and hygiene education (a) Evaluation of capacity of the organizations and preparation and implementation of plan for capacity building (b) Training for partnership with related organizations
(2) Recommendation of Rules for RDC, WSMB and Organization for Health and Hygiene Education	Review of Constitution for RDC prepared by LCC and other related laws and legal systems	(1) Recommendation on rules for RDC, WSMB, and organization for health and hygiene education (2) Clarification of related organization structures (3) Clarification of responsibility and roles of related organizations and positions
(3) Human Resource Development for Community-based Activities incl. Health and Hygiene Education	Analysis of current situation and problem issues for community-based activities including health and hygiene education	(1) Manuals for human resource development for community-based activities (2) Implementation of human resource development for community-based activities (a) Training on significance of community participation and the project cycle (b) Training on planning, monitoring, and evaluation methods for community participated projects (c) Training on preparation of appraisal documents to donors
(4) Financial Management of RDC	Analysis of current situation and problem issues for financial management of water suppliers	(1) Manual of financial management for water suppliers (2) Training of financial management for water suppliers (a) Method of water tariff collection (b) Custody and management of cash in small amounts (c) Record and management of account books (d) Opening and maintenance of bank accounts (e) Management of expenditure for operation and maintenance (3) Training of financial management for other community-based activities (including management of community centers and health and hygiene education) (a) Diversion of profit from water suppliers (b) Other methods of fund raising

Plan of Capacity Building for Community (2/2)
(Training for O&M of Water Supplies and Community Centers)

Item	Analysis of Present Situation and Problematical Issue	Plan
(1) Training for Operation and Management of Water Supplies	(1) Analysis of current situation and problem issues of operation and management for water suppliers (2) Analysis of current situation and problem issues of community-based activities (meetings, training, etc.)	(1) Preparation of manual for O&M of water supply facilities (2) Training of O&M for water supplies (a) Mechanism of water intake (b) Mechanism of water distribution (c) Precautions and inspection of water quality (d) Method of pipe layout (e) Method of maintenance and checks (f) Safety and security (g) Visit to similar water supply projects (2) Recommendation for consensus formation of community for O&M (a) Roles and fees for WSMB members (b) Preparation of member rules including water tariff and registration fees
(2) Training for Operation and Management of Community Centers	(1) Analysis of current situation and evaluation of community-based activities (meeting, training, etc.)	(1) Manual for operation and management of community centers (2) Training for O&M and consensus formation (a) Operation method (b) Maintenance including cleaning (c) Safety and security

3) Output of Capacity Building

Expected outputs of the capacity building are listed in the following table.

Expected Outputs of Capacity Building
(Strengthening of Community-based Organization)

Item	Output
(1) Capacity Building of RDC, WSMB and Organization for Health and Hygiene Education	(1) Pre- and post level of capacity (Score Sheet, and Radar Chart) (2) Organization chart of RDC, WSMB, and Organization for Health and Hygiene Education (3) Capacity building strategy for RDC, WSMB, and Organization for Health and Hygiene Education
(2) Recommendation of Rules for RDC, WSMB and Organization for Health and Hygiene Education	(1) Document of recommendation for Rules for RDC, WSMB, and Organization for Health and Hygiene Education (2) Draft Document of Roles and Responsibilities of each Organization or Position
(3) Human Resource Development for Community-based Activities incl. Health and Hygiene Education	(1) Manual on Human Resource Development of Community-based Activities (2) Manual on Human Resource Development of Community-based Activities incl. Health and Hygiene Education
(4) Financial Management of RDC	(1) Financial Management Manual for Water Supply Services (2) Record of Training for Financial Management of Water Supply Services (3) Account book (4) Bankbook (5) Record of Training for Financial Management of other community-based activities

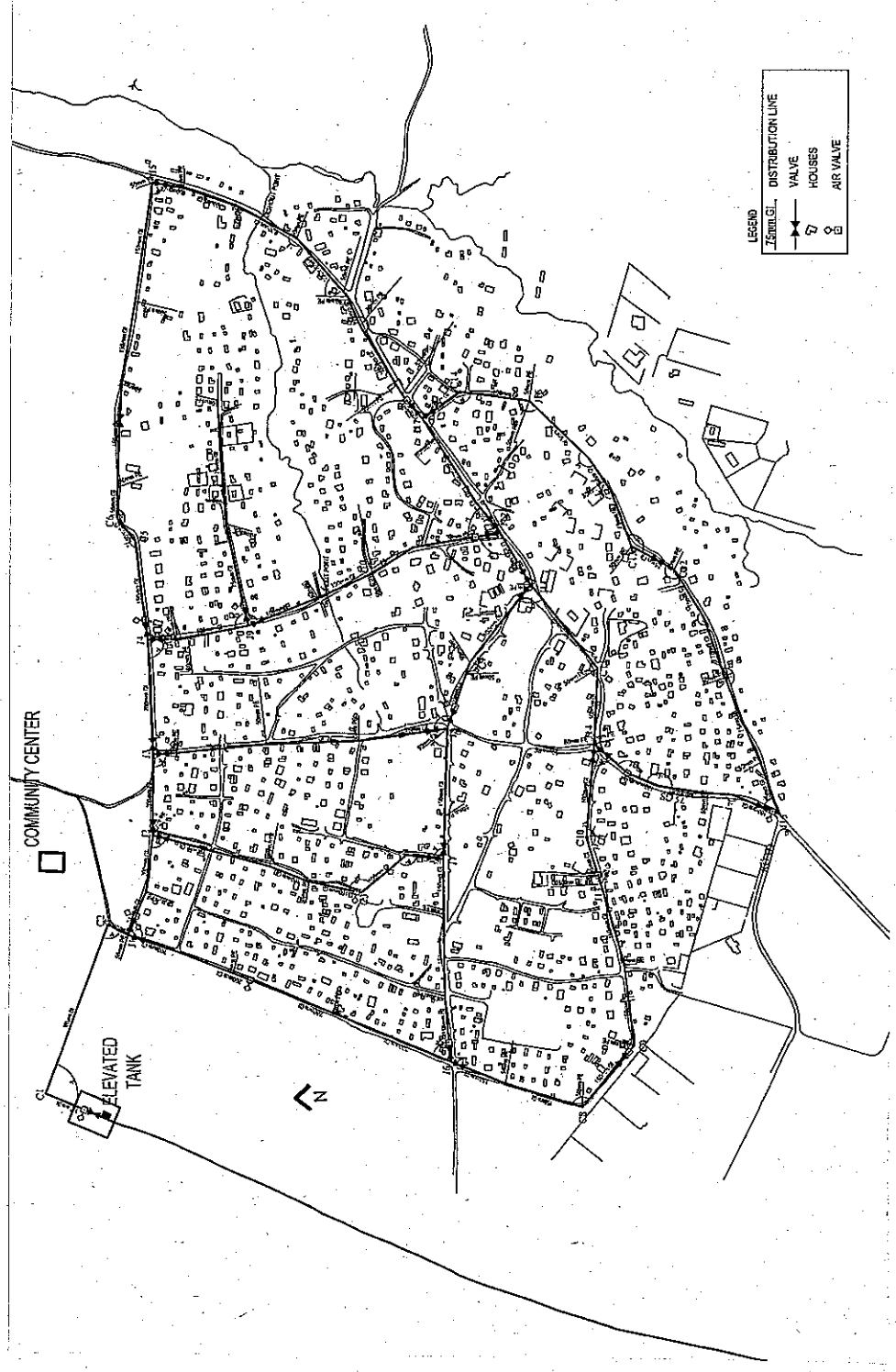
Expected Outputs of Capacity Building
(Training for O&M of Water Supplies and Community Centers)

Item	Output
(1) Training for Operation and Management of Water Supplies	(1) O&M Manual for Water Supply Services (2) Record of Training for Operation and Management of Water Supply Services (3) Document of recommendation on consensus formation for O&M of Water Supply Services (Salary and role of WSMB members and member rules including water tariff and registration fee)
(2) Training for Operation and Management of Community Centers	(1) Manual of O&M for Community Center (2) Record of Training for O&M for Community Center

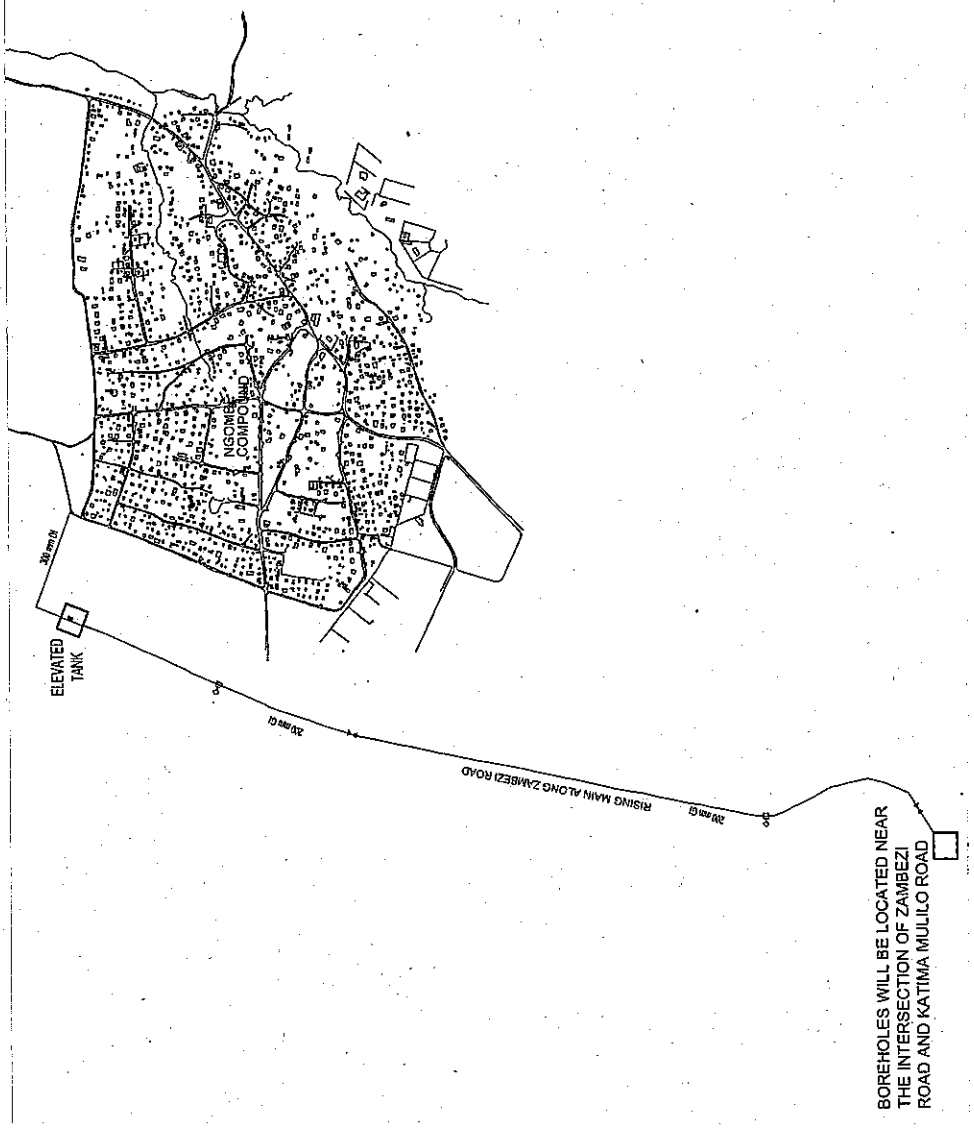
2.2.3 Basic Design Drawings

(1) Water Supply Facilities

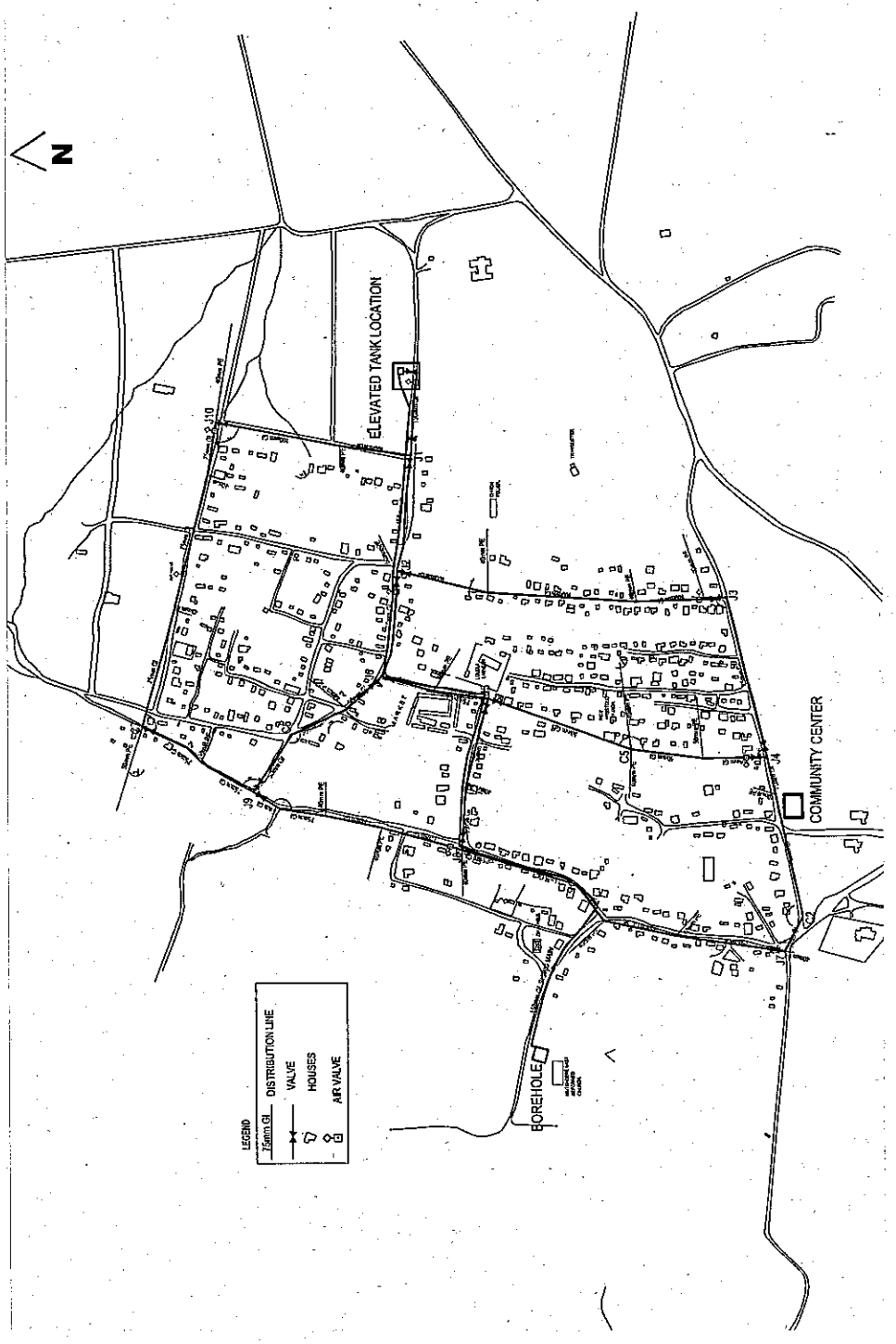
The basic design drawings of the water supply facilities are shown in Figure 1 to Figure 9.



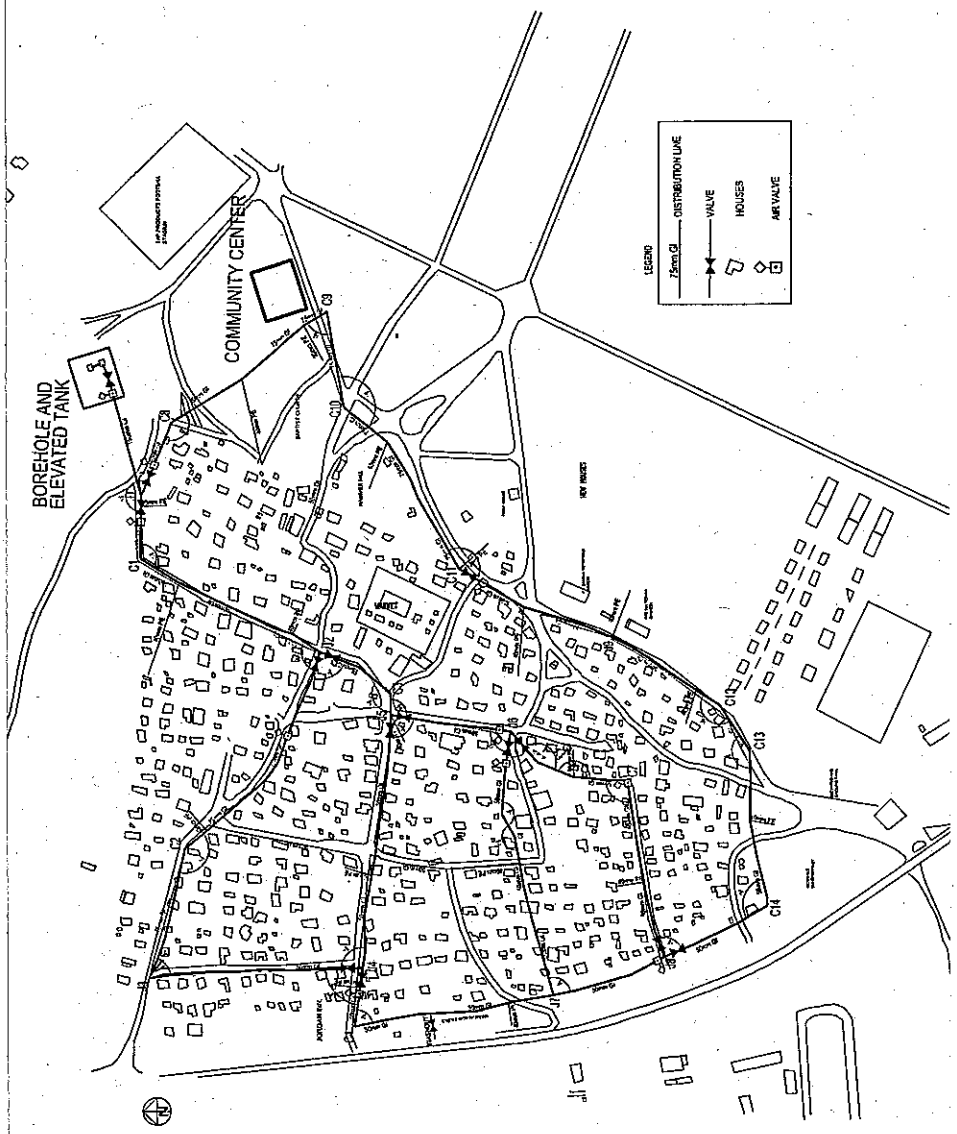
Living Environmental Improvement Project for Unplanned Urban Settlements in Lusaka in the Republic of Zambia	Figure-1: General Plan of Water Supply Facilities (Distribution) – Ng'ombe



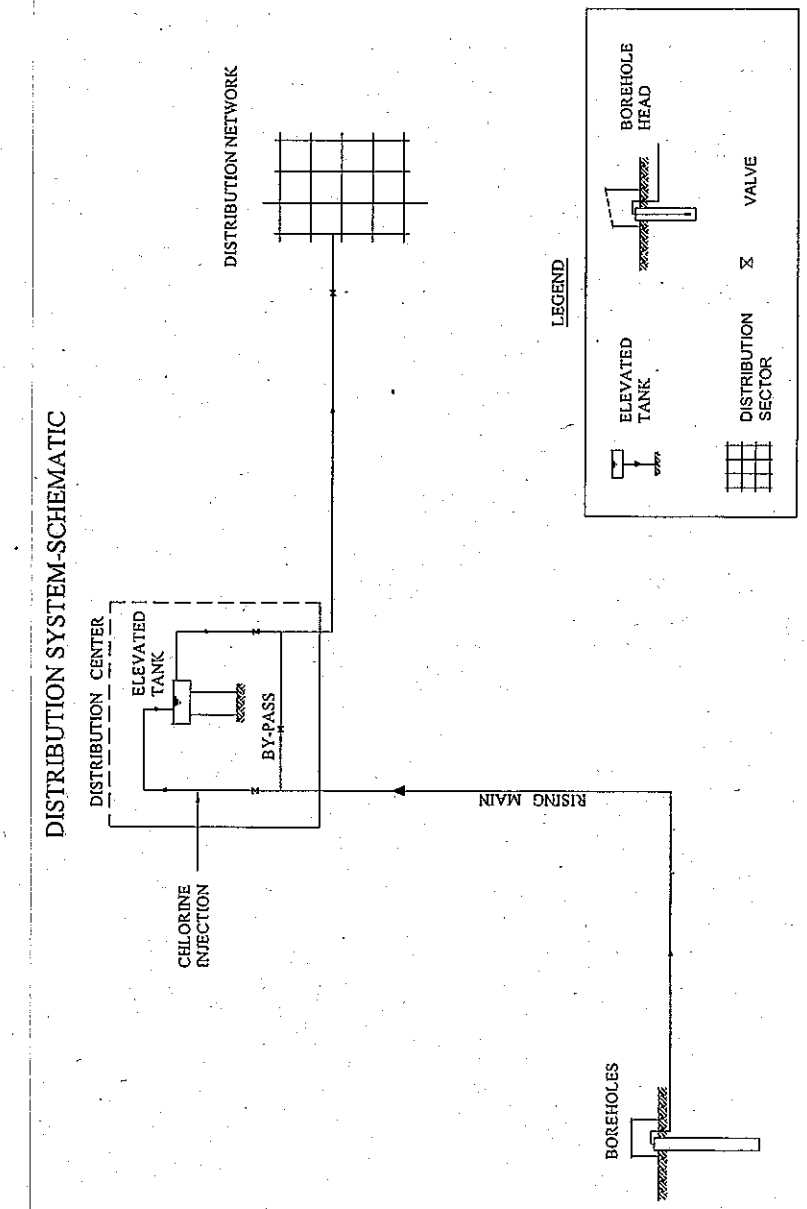
Living Environmental Improvement Project for Unplanned Urban Settlements in Lusaka in the Republic of Zambia	Figure-2: General Plan of Water Supply Facilities (Borehole, Transmission Pipe) – Ng'ombe



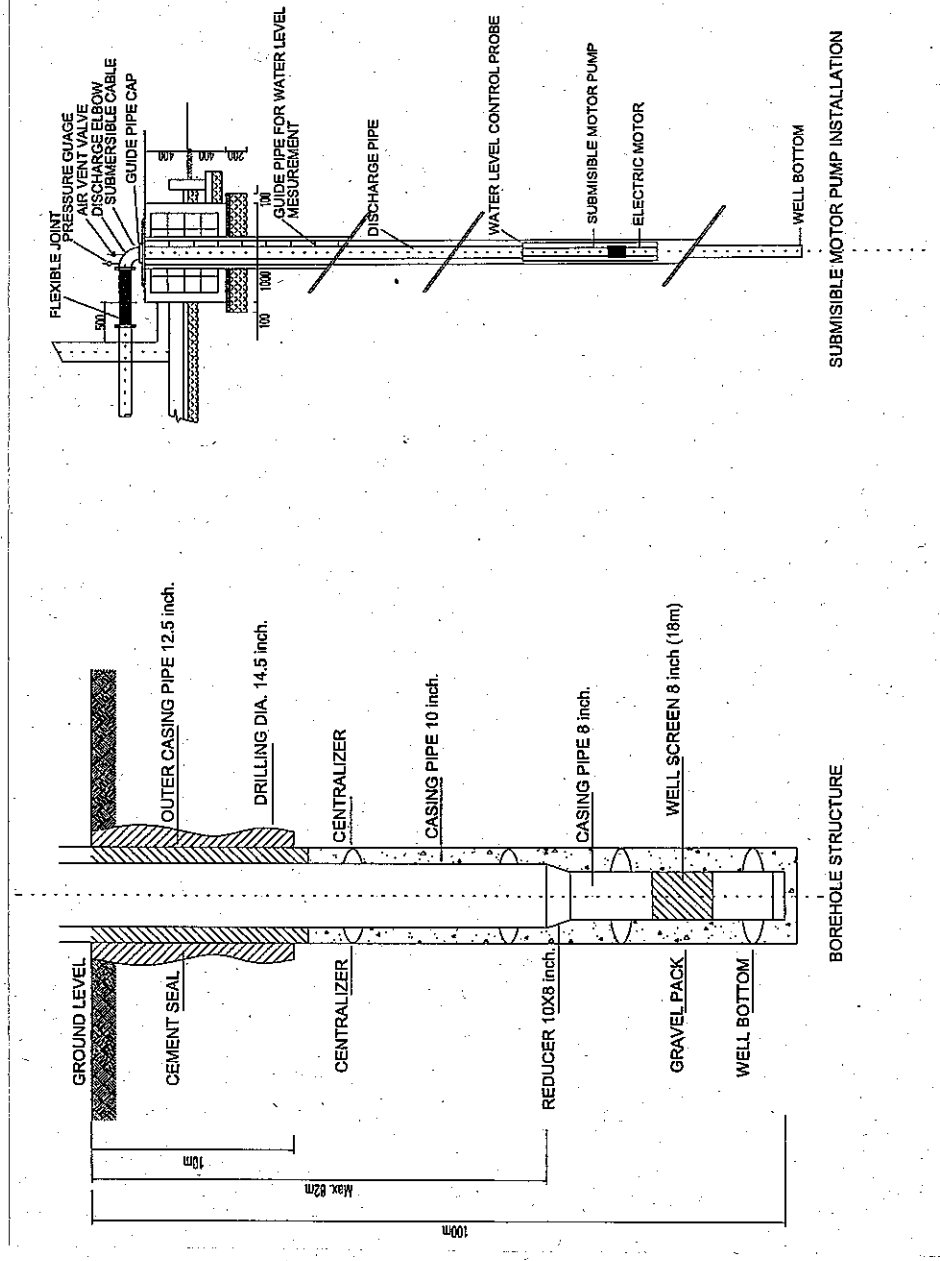
Living Environmental Improvement Project for Unplanned Urban Settlements in Lusaka in the Republic of Zambia	Figure-3: General Plan of Water Supply Facilities – Kalikiliki



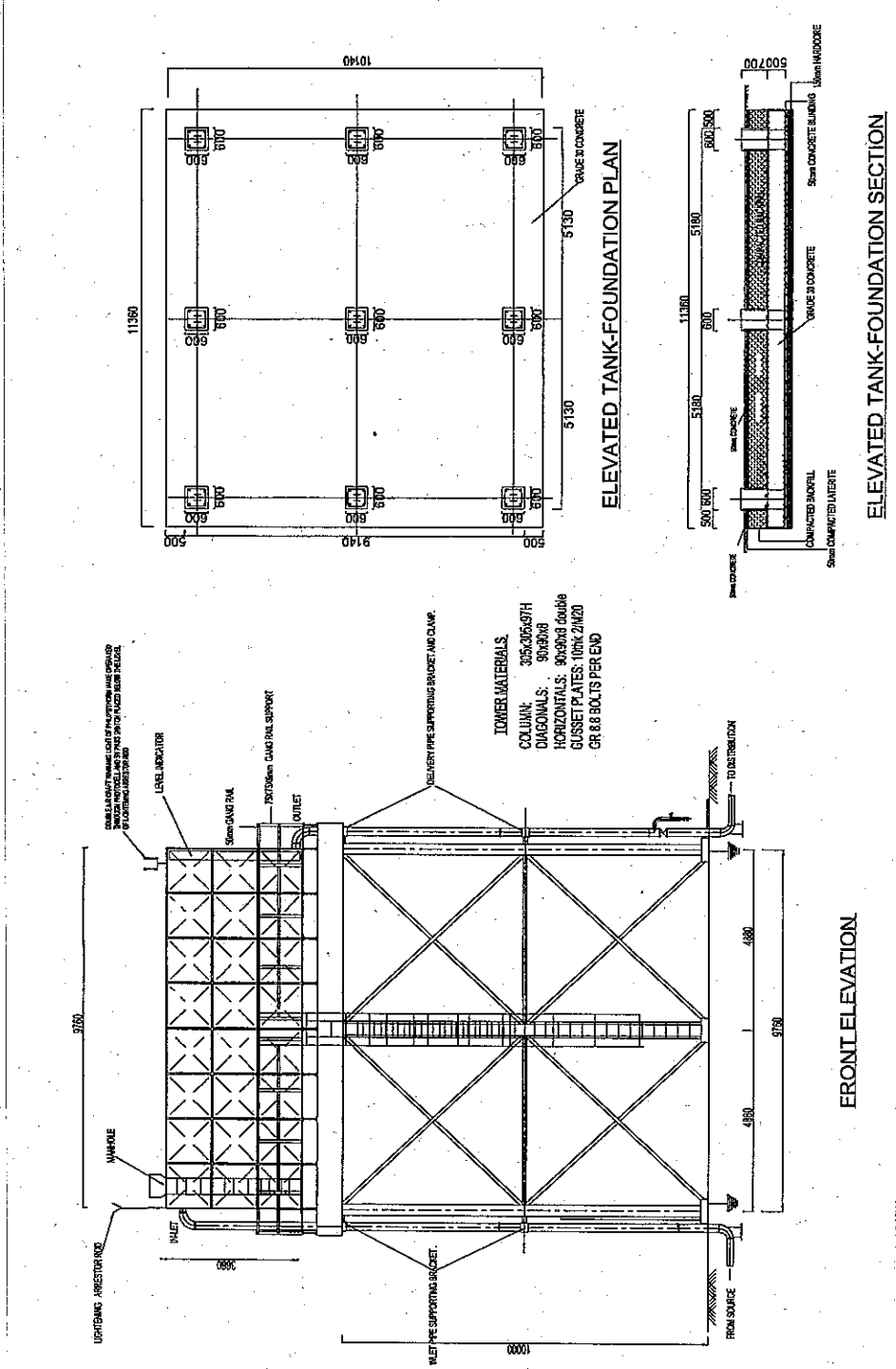
Living Environmental Improvement Project for Unplanned Urban Settlements in Lusaka in the Republic of Zambia	Figure-4: General Plan of Water Supply Facilities – Freedom



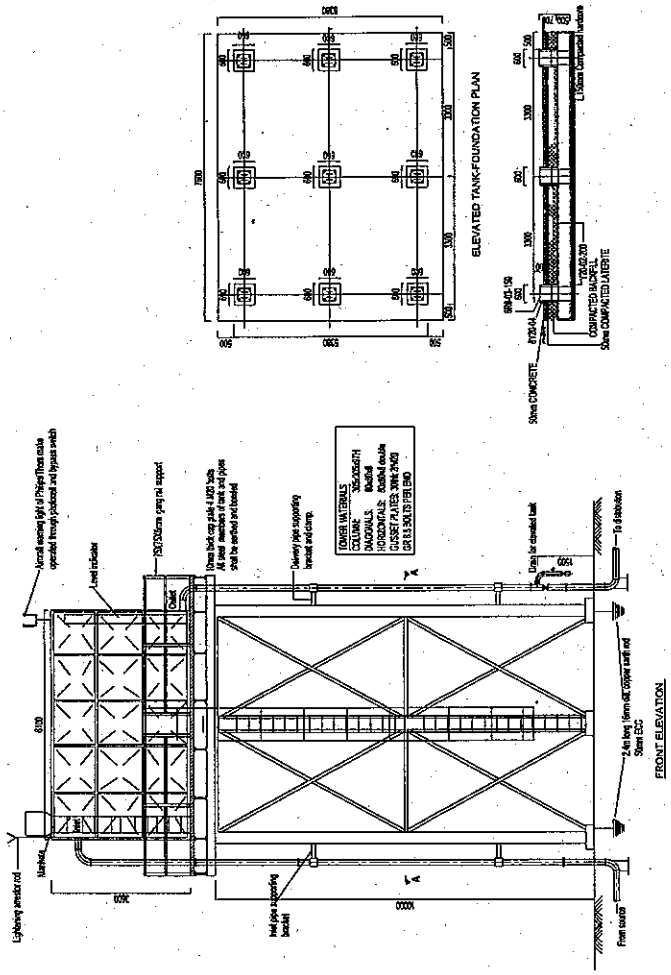
Living Environmental Improvement Project for Unplanned Urban Settlements in Lusaka in the Republic of Zambia	Figure-5: System Diagram of Water Supply



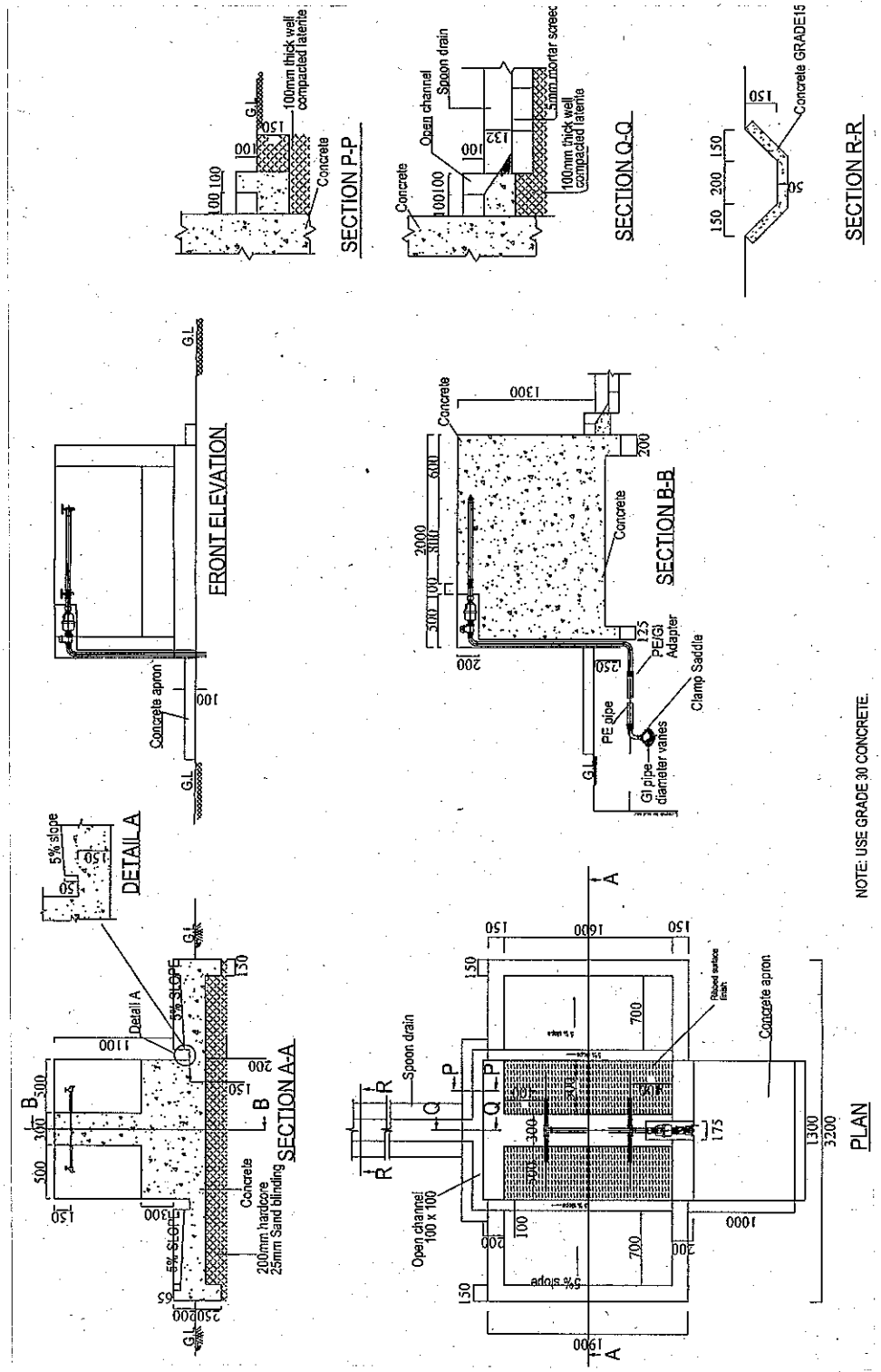
Living Environmental Improvement Project for Unplanned Urban Settlements in Lusaka in the Republic of Zambia	Figure-6: Borehole Structure and Installation of Submersible Pump



Living Environmental Improvement Project for Unplanned Urban Settlements in Lusaka in the Republic of Zambia	Figure-7: Steel Elevated Tank (Ng'ombe: 300m^3)



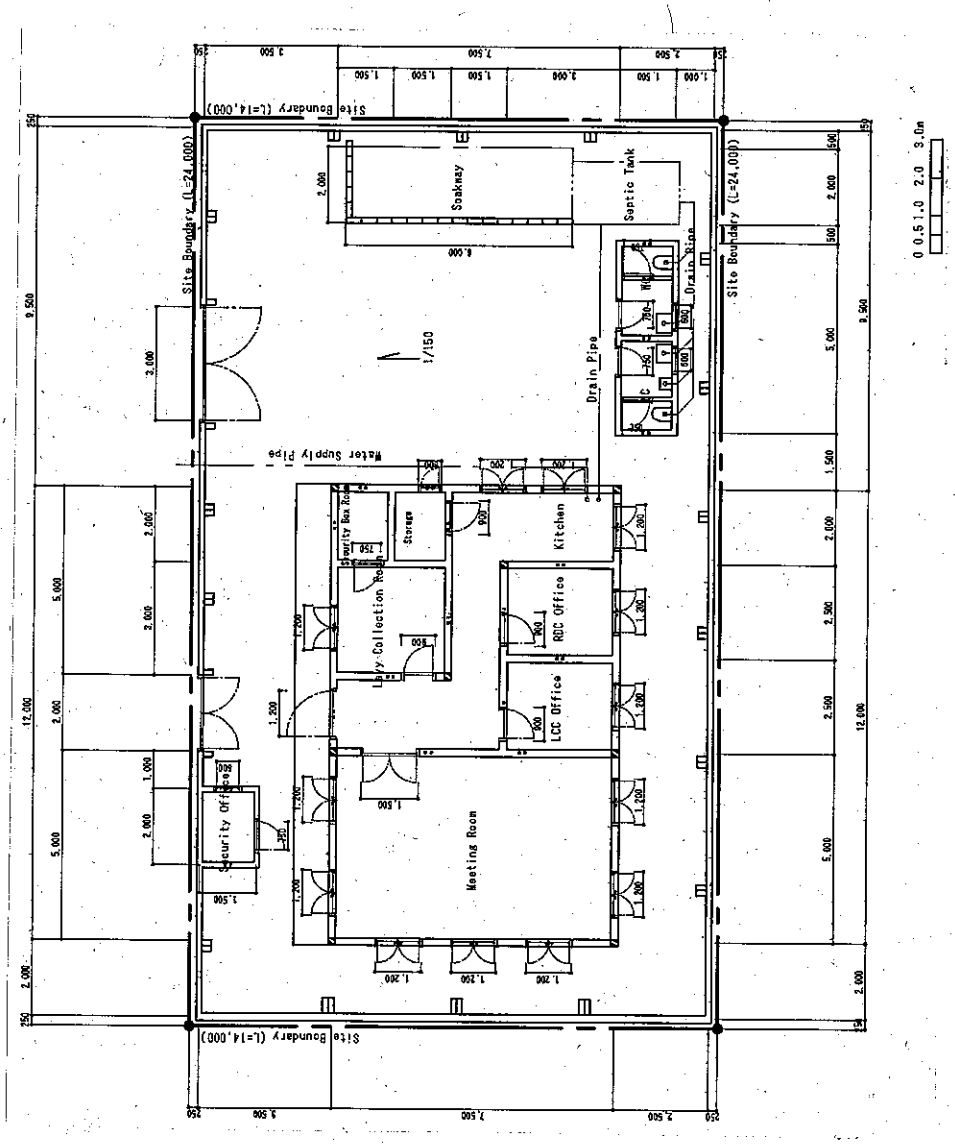
Living Environmental Improvement Project for Unplanned Urban Settlements in Lusaka in the Republic of Zambia	Figure-8: Steel Elevated Tank (Kalikiliki, Freedom: 100m^3)



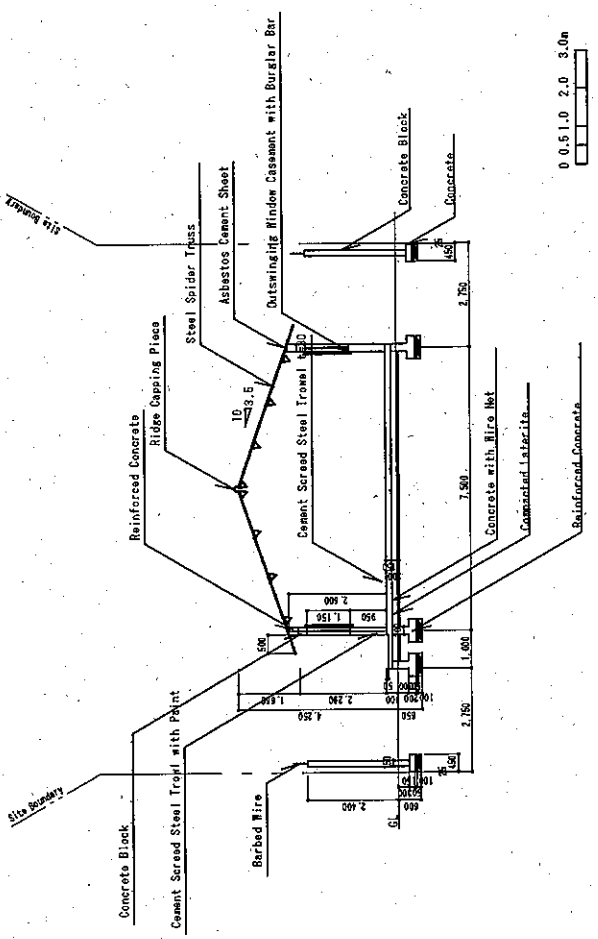
Living Environmental Improvement Project for Unplanned Urban Settlements in Lusaka in the Republic of Zambia	Figure-9: Public Tap

(2) Community Center

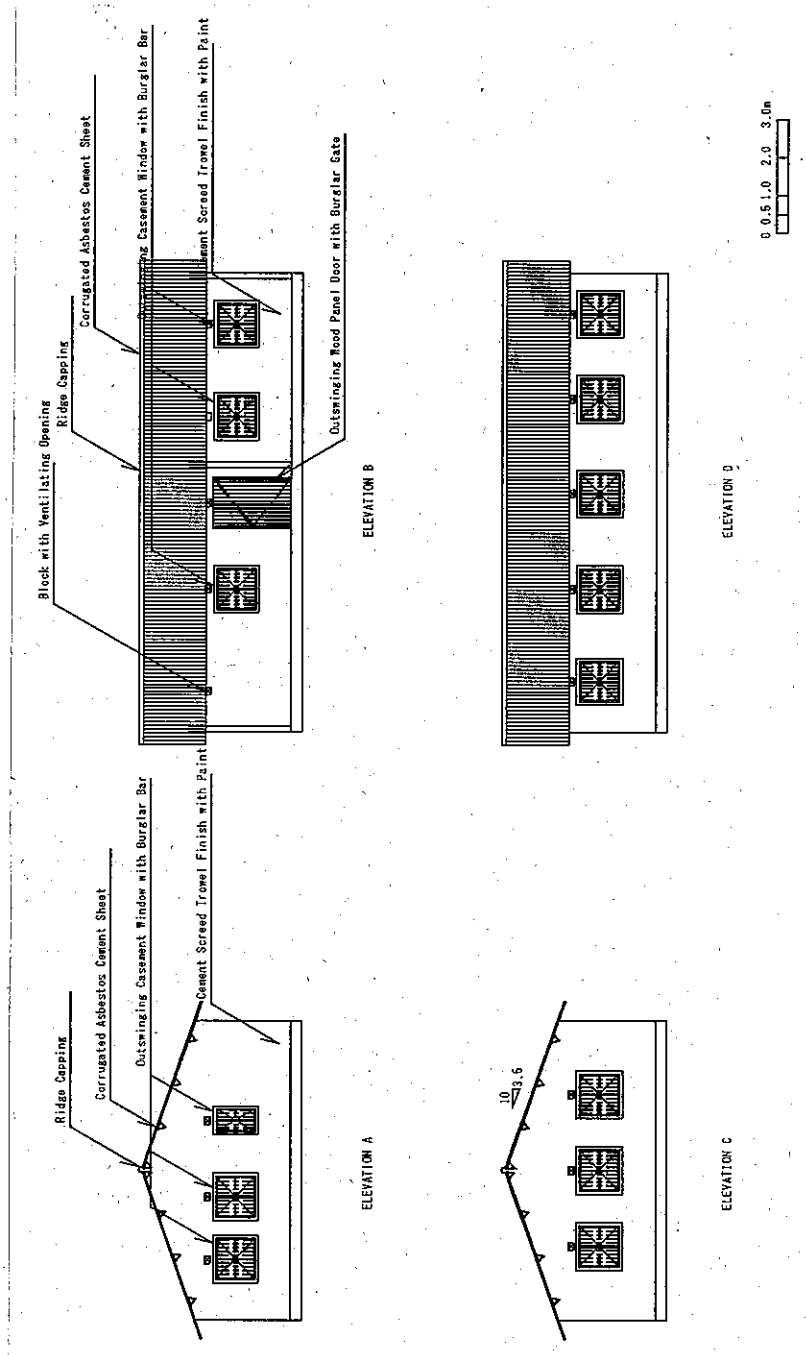
The basic design drawings of the community centers are shown in Figure 10 to Figure 12.



Living Environmental Improvement Project for Unplanned Urban Settlements in Lusaka in the Republic of Zambia	Figure-10: Plan of Community Center



Living Environmental Improvement Project for Unplanned Urban Settlements in Lusaka in the Republic of Zambia	Figure-11: Section of Community Center



Living Environmental Improvement Project for Unplanned Urban Settlements in Lusaka in the Republic of Zambia	Figure-12: Elevation of Community Center

2.2.4 Implementation Plan

(1) Implementation Policy

The Project will be implemented on the basis of the following principles, under the Japan's Grant Aid Scheme:

- Local labor force and material will be utilized to the maximum extent, in order to contribute to the generation of employment opportunity, promotion of technology transfer, and revitalization of the regional economy.
- Close liaison system will be established among MLGH, LCC, the Consultant, and Contractor for the smooth implementation of the project.
- The climate condition and the necessary time for procurement of goods will be considered in the construction time schedule.
- The Japanese general contractor will make a contract for construction and procurement of the goods with GRZ, and the Japanese consultant will supervise the construction works.
- LCC will undertake the resettlement/removal of the things that would hinder the work, prior to the construction works.
- LCC will undertake the coordination among the community and the concerned agencies/offices with the assistance of the contractor and the consultant.
- The contractor will maintain the constructed facilities until the handover to GRZ. The community center will be handed over earlier to enable it to be used for the soft component program of the project.

The Japanese general contractor will undertake the construction works of the facilities. The Zambian contractors will be employed by the Japanese contractor as a sub-contractor for labor supply.

(2) Implementation Conditions

1) Weather Conditions

In the rainy season, there sometimes occur intensive heavy rainfalls and it is necessary to take measures for drainage during the construction works. The construction schedule should be coordinated to avoid conducting pipe and concrete works in the rainy seasons. Particularly, protection and backfilling works should be conducted with precaution after the installation of pipelines.

Since construction works by machinery is not applicable at many locations in the target areas, due to constraint by roads, topographic conditions, and building possession, the construction schedule should be arranged with selection of construction methods and construction period.

2) Social Conditions

In Zambia, the majority (70%) of the people are Christian and there is no particular religious restriction on implementation of the project.

In the Labor Act, Sunday and the national holidays are provided as public holidays and the weekly working hours are set to be 48 hours. Furthermore, there exists an agreement between the contractor's association and the union of the construction workers that prescribe the weekly working hours to be 45 hours. 1.5 times of normal wage is paid for the overtime. (2.0 times wages for work on Sunday or the national holidays.)

The national holidays in Zambia are shown below:

National Holiday in Zambia (2003)

Jan 1	New Year's Day
Mar 12	Youth Day
Apr 18	Good Friday
Apr 19	Holy Saturday
Apr 21	Easter Monday
May 1	Labor Day
May 25	Africa Freedom Day
May 26	Public Day (Day following Africa Freedom Day which falls on Sunday)
Jul 7	Heroes Day
Jul 8	Unity Day
Aug 4	Farmers' Day
Oct 24	Independence Day
Dec 25	Christmas Day

3) Infrastructure

The distance of the Project area from the center of Lusaka city is about 6 km for N'gombe and Kalikiliki, and about 13 km for Freedom. Although the main roads in the city are paved, the access road to each Project area and the roads within the Project area are not paved. The widths of the roads in the Project area are mostly narrow and most of the roads do not have a side drain. Although the topography of the Project area is relatively flat, there exist roads with about a 5% slope. At the time of rainfall, the rainwater runs on the roads and it causes deterioration of the road surface. It is necessary to take measures for maintenance of the roads especially in rainy season.

With regard to the construction water, it can be obtained from the existing water supply system operated by LWSC.

Electric power for the submersible pump that is to be installed by the Project can be supplied from the existing electric power line network that covers all Lusaka city including the Project area. The power supply situation is mostly good, although power cuts occur about once a month in the rainy season. As exclusive power lines for the Project can not be obtained, it is necessary to take measures against voltage fluctuation in order to protect the pump system.

The telecommunication cable network covers all Lusaka city. Cellular phones have also become wide spread and there is no difficulty in communication for implementation of the Project.

4) Construction Situation

In Zambia, a large number of construction projects have been implemented over many years with assistance of various donors including Japan.

The amount of construction equipment is insufficient and works by manpower is likely to be applied rather than by equipment. The level of construction technology is not high and work productivity of the technician or laborer is low.

5) Tax Exemption

Import tax will be exempted for import of construction material and equipment with a document issued by the Japanese embassy or JICA. When the application documents are submitted to a national tax office, VAT will also be exempted for the goods procured directly by the Japanese contractor. But the labor supply and goods procured by the local contractors are not subject for tax exemption.

6) Land

In Zambia, all land is owned by the government and private companies/citizens have leaseholds called "Titles" with a 99 year validity. The site of the pump facilities, elevated tanks, and community centers are located within the jurisdiction of LCC. Accordingly, no land acquisition procedure is necessary for the Project.

Land acquisition is usually conducted by compensation of cash and/or alternative land after discussion with land owners.

7) Authorization/Permission

An authorization for exploitation of groundwater from the Ministry of Energy and Water Resource Development should be obtained. Permission for construction works on the road should be obtained from the engineering

department of LCC. For establishment of water supply facilities, the following authorization/permission is necessary:

- Authorization from LWSC for selling drinking water (LWSC has an authority to sell drinking water.)
- Permission from LCC for construction of water supply facilities. Design drawings are required for the application.
- Permission from Zambian Environmental Council. Planning documents are required for the application.

(3) Scope of Works

The demarcation for the scope of works between the Japanese and Zambian sides is defined as shown below.

1) Japanese Side

- Detail design, preparation of tender documents, and construction supervision, and
- Construction works for the proposed water supply facilities and community centers.

2) Zambian Side

- Land acquisition for the facilities and removal/transfer of obstacles,
- Site clearance when needed,
- Provision of electrical distribution lines and telecommunication lines for the facilities,
- Construction of gates and fences of the community center, and
- Provision of access roads to the sites of boreholes, elevated tanks, and community centers.

(4) Consultant Supervision

1) Detail Design and Tender

i) Detail Design

In accordance with the basic design study, detail design and tender documents will be prepared.

- Detail design of the water supply facilities and community centers,
- Preparation of design report and drawings,
- Quantity calculations and cost estimates, and

- Preparation of construction plans and tender documents.

ii) Tender

Prior to the tender, a pre-qualification of applicants will be done. This announcement will appear in the name of MLGH in the major Japanese construction related newspaper. The pre-qualification documents will be prepared and distributed by the consultant. Then, the tender documents will be distributed to the qualified contractors (with Japanese nationality). The proposals of the contractors will be received by the consultant and opened by the consultant with the representative of MLGH. The proposals will be evaluated by the consultant and the representative of MLGH immediately after opening of the proposal. The contract document will be drafted and finalized by discussion with the selected contractor. The consultant will assist MLGH in the following works:

- Tender announcement,
- Preparation, distribution, and evaluation of the pre-qualification documents, and
- Distribution and evaluation of the tender documents and contract negotiation.

2) Construction Supervision

After certification of the contract by the Government of Japan, the consultant will publish the notification of the commencement of the works. After commencement of the works, a resident engineer will reside at the site. The resident engineer will supervise the construction works and report the work progress to JICA office in Zambia, MLGH, and LCC. The resident engineer will take a role to facilitate the communication among the concerned agencies including the contractor.

The following are the major items of the supervision works:

i)	Approval of construction drawings	:	Evaluation and approval of construction and shop drawings, permission for construction works, material, specification of equipment and machinery and so on,
ii)	Supervision of construction works	:	Instruction for construction schedule, determining the progress of works, shop inspection for material, and other required works,
iii)	Approval for payment	:	Issuance of certificate for payment and completion of works, and
iv)	Inspection at the end of	:	Inspection of the constructed facilities.

defect liability period

(5) Quality Control Plan

The quality control of the main construction items is planned as follows.

Quality Control Plan

Construction Item	Control Item	Test	Remarks
Pipeline	Water Leakage	Pressure Test Leakage Test	
Concrete Structure	Concrete Strength	Compressive Strength Test	Cylinder
	Workability	Slump Test	
Elevated Tank, Public Tap	Water Quality		

(6) Procurement Plan

1) Construction Material

i) General

Most of the material required for the Project such as submersible pumps, galvanized iron pipe, ductile iron pipe, PVC pipe, polyethylene pipe, steel plate, structural steel, reinforcement bar, cement, timber, fuel, oil, and paint can be procured in Zambia as shown in the following table. The required quantity will not be so much that it affects the procurement situation.

Procurement Source of the Material

Item	Zambia	Japan	Third Country	Reason
Submersible pump set	X			Reliability of quality and supply
Galvanized iron pipe	X			Reliability of quality and supply
Ductile iron pipe	X			Reliability of quality and supply
PVC, PE pipe	X			Reliability of quality and supply
Measuring device	X			Reliability of quality and supply
Structural steel	X			Reliability of quality and supply
Reinforcement bar	X			Reliability of quality and supply
Stone, sand	Y			Available from domestic product
Cement	Y			Available from domestic product
Concrete admixture	Y			Available from domestic product
Wood materials	Y			Available from domestic product
Formwork material	Y			Available from domestic product
Fuel	X			Reliability of quality and supply
Oil	X			Reliability of quality and supply
Paint	X			Reliability of quality and supply

Note: X: Procurement of imported material from the Agent in Lusaka
Y: Procurement of the domestic product

ii) Submersible Pump Set for Deep Well

The submersible pump set for the Project can be procured through the Zambian agents of the European or South African suppliers. Spare parts for the pump set can also be procured through the Zambian agents.

iii) Pipe Material (galvanized iron pipe, ductile iron pipe, PVC pipe, and PE pipe)

All type of pipes and fittings can also be procured through the Zambian agents.

iv) Steel Tank and Structural Steel

The steel tank and structural steel are imported from South Africa and they can be procured through the Zambian agents.

v) Valves

The valves are imported from South Africa and they can be procured through the Zambian agents.

vi) Reinforcement Bar, Material for Formwork

The reinforcement bars are imported from South Africa and they can be procured through the Zambian agents. The domestic products can be procured for formwork material.

vii) Concrete Block

Concrete blocks for the buildings or walls are manufactured by the small or medium scale manufacturers in Lusaka.

viii) Sand, Aggregate

Sand for pipe bedding can be procured from the suburbs of Lusaka city. The aggregate for mortar can be obtained from the Kafue River and its tributaries located about 65 km south from Lusaka City.

There are small quarries for fine and coarse aggregate and stones in and around the City. These materials can be obtained in the country.

ix) Cement

Domestic products can be procured for the cement.

x) Fuel

Fuel can be procured through the Zambian agents of a major international oil company.

xi) Fittings for Doors, etc.

Fittings for windows and doors can be procured at the market in Lusaka city.

xii) Paints

Paints are imported from South Africa and they can be procured at the market in Lusaka city.

xiii) Office Equipment

Office equipment for community centers can be procured from domestic products. Electric products, such as personal computers can be obtained by imported products from South Africa though the Zambian agents.

Procurement Source of the Office Equipment for Community Centers

Item	Zambia	Japan	Third Country	Reason
Office desk and office chair	Y			Available from domestic product
Personal computer (with monitor)	X			Reliability of quality and supply
Printer (A4 size)	X			Reliability of quality and supply
Computer rack	Y			Reliability of quality and supply
Uninterruptible power system (UPS)	X			Reliability of quality and supply
Platform and bench	Y			Available from domestic product
Book Shelf	Y			Available from domestic product
Blackboard	Y			Available from domestic product

Note: X: Procurement of imported material from the Agent in Lusaka
Y: Procurement of the domestic product

2) Construction Equipment

Most of the construction equipment excluding large-scale equipment can be procured from Zambian companies by a lease contract.

3) Construction Company

In Zambia, construction companies are registered in each category of their main works by the ministry of construction and public works. LWSC has a registration system for suppliers of materials and equipment, though there is no registration system for construction companies.

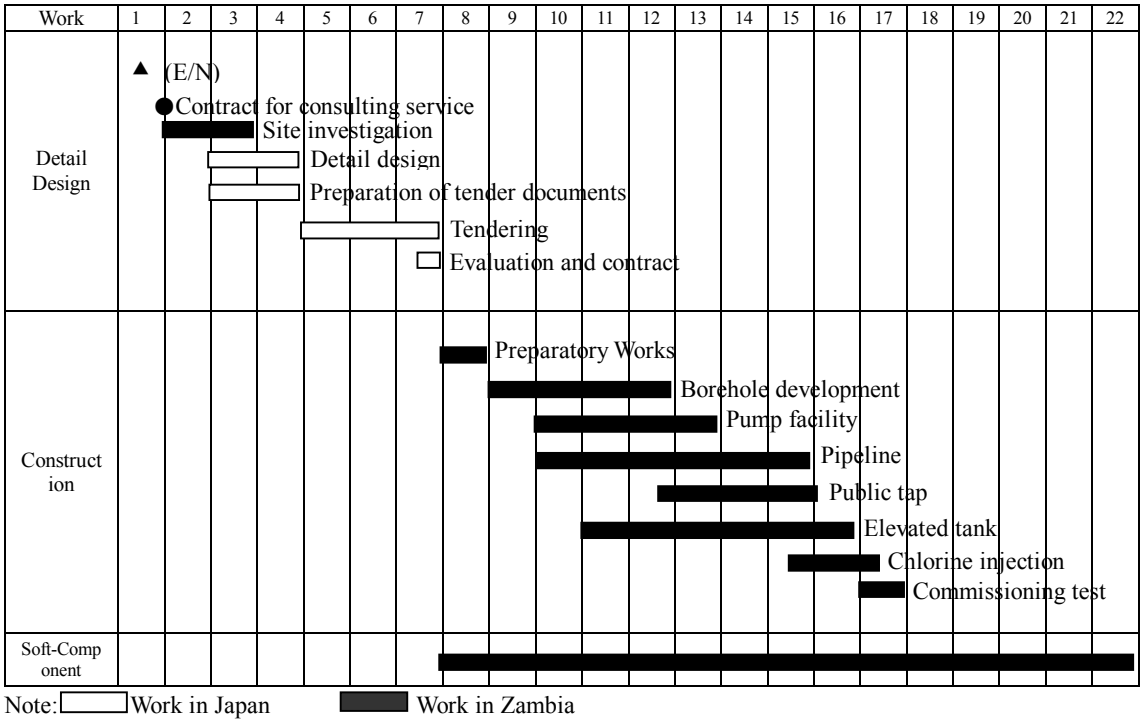
Construction companies in the country consist of local firms and local subsidiaries of foreign firms. The former have accumulated experience and technology through the domestic projects conducted by joint venture with foreign firms, mainly from European countries, for many years. On the other hand, the latter companies also have sufficient experience through large-scale projects executed by governments and various donors. The local subsidiaries procure necessary engineers and construction machinery from abroad. These firms have experience with Japan's Grant Aid Scheme as subcontractors under Japanese firms.

Sub-contractors for the Project will be selected from the Zambian construction companies with experience with similar projects of LWSC or under Japan's Grant Aid Scheme.

(7) Implementation Schedule

After signing of the Exchange of Notes (E/N), the Project will be executed for 20 months including detail design works as shown in the following figure.

Implementation Schedule



2.3 OBLIGATION OF RECIPIENT COUNTRY

Undertakings of the Government of the Republic of Zambia (GRZ) are drafted as follows:

1) Ministry of Local Government and Housing (MLGH)

- Ensuring all the expenses and prompt execution for customs clearance of the products purchased under the Grant Aid Scheme,
- Opening of an account in the name of GRZ in an authorized foreign exchange bank in Japan,
- Issuance of authorization of payment, execution of bank arrangement for the payment, and burden of commission fees for the bank arrangement,
- Ensuring necessary supports and conveniences for Japanese experts who stay in Zambia for the implementation of the Project, and
- Burden of the expenses necessary for the Project other than those of the Government of Japan.

2) Lusaka City Council (LCC)

- Securing of land for execution of construction works of the Project,
- Assignment of the counterpart personnel ,
- Provision of data and information required for implementation of the Project, and
- Permission required for implementation of the Project.

3) Lusaka Water and Sewerage Company (LWSC)

- Assignment of staff necessary for operation and maintenance of water supply facilities, and
- Participation in the training for operation and maintenance of water supply facilities.

4) Resident Development Committee (RDC)

- Consensus formation in the community, and
- Formulation of the community-based organization for the Project.

2.4 PROJECT COST

Under the Japan's Grant Aid Scheme, the project cost is estimated as mentioned in the following table, according to the above-mentioned demarcation between Japanese and Zambian sides and based on the conditions mentioned below.

1) Japanese Side

Item				Project Cost (million JPY)			
				Ng'ombe	Freedom	Kalikiliki	Total
Construction	Direct Construction Cost	Water Supply	Well, Intake	14	7	6	27
			Pipeline, Public Tap Stand	91	30	17	138
			Water Tank, Sterilization Equipment	20	12	12	44
		Community Center		6	6	6	18
		Sub-total		131	55	41	227
	Common Temporary Construction Cost						22
	On-site Expense						82
	General Management Cost						22
	Sub-total						353
Detail Design, Construction Supervision							76
Soft Component Program							44
Total							473

This cost estimate is provisional and would be further examined by the Government of Japan for the approval of the Grant.

2) Zambian Side

	Project Cost	
	Million Kwacha	Equivalent Amount in Thousand JPY
1 Site Clearance	3	75
2 Electric distribution lines to the sites	28	706
3 Fences for the community centers	78	1,966
Total	109	2,747

3) Conditions for cost estimate

i) Time of Estimation April 2003

ii) Exchange Rate 1US$ = 121 yen

1 kwacha = 0.0252 yen

iii) Schedule As shown in the implementation schedule (in the previous section)

iv) Others The Project shall be implemented in accordance with the regulation and system of the Japan's Grant Aid Scheme.

2.5 PROJECT OPERATION PLAN

(1) Operation Plan

1) Water Supply Improvement Project

i) Basic Plan for Operation and Maintenance Organization

A new community-based organization will be established for the operation and maintenance (O&M) of the planned water supply facilities. The new organization conducts the operation and maintenance under the supervision by LWSC and LCC. LWSC supports the board in the financial and technical aspects. As the board requires active support from LWSC after completion of construction to commence the O&M, LWSC takes special measures for supporting the board. As a part of soft component programs, the Japanese side will provide technical assistance for community-based organizations of O&M.

ii) Existing Condition of Operation and Maintenance System

There are two water supply systems in the City: i) the network system supplying water to the urban areas of the City, and ii) the satellite system

supplying water independently at UUSs. LWSC has been directly conducting the O&M of facilities including water charge collection for the network system. As for the satellite system, the O&M and water charge collection have been carried out by the area-based organizations in cooperation with LWSC in order to make up the shortage of manpower.

The O&M of the satellite systems in the settlements has been conducting by various types of organizations, for instance, water committees organized by residents, tap attendants contracted directly by LWSC and new organizations consisting of LCC, LWSC and the area-based organizations. Furthermore an are-based organization independently carries O&M in Bauleni without the support by LWSC. In all cases of the satellite system, the area-based organization commonly conducts repairing of taps, water charge collection, management of registration and preparation of an account book.

The present water charge is presented below. There are not many differences between water tariffs at the various settlements.

Existing Water Tariff in UUSs

Annual membership fee	2,000 kwacha to 5,000 kwacha
Monthly water charge	3,000 kwacha/month to 3,500 kwacha/month (Daily water supply: 120 l/day to 200 l/day)
Buckets sale (20 l/bucket)	50 kwcha/bucket to 150 kwacha/bucket

Monthly allowance of a tap attendant is usually 40,000 kwacha. In case of George and Chibolya, tap attendants get a fixed amount of allowance and additionally a bonus corresponding to 10% of the collected water fee in order to encourage tap attendants to collect fees and sell water.

iii) Proposed Organization of Operation and Maintenance

New organizations of operation and maintenance (O&M) are to be established for water supply projects at Ng'ombe, Freedom and Kalikiliki. The organization, that is provisionally called the "Water Supply Management Board", conducts operation and maintenance of water supply facilities after the completion of the Project. Personnel organization for the Water Supply Management Board is as planned below.

Proposed Operation and Maintenance Organization for Water Supply

Staff	Present Body	Task	Monthly Allowance
1. Chairman	Water Committee of ABO	General management of the board	K.150,000
2. Facility Manager	LCC	Control and management for the facility and community development	K.150,000
3. Treasury	LWSC	Management of bank accounts, registration, water tariff collection, accounts and financial reports (daily/monthly/annually)	K.150,000
4. Assistant Treasury	Water Committee of ABO	Assistance for treasury	K.70,000
5. Technician for O&M	LWSC	Operation and maintenance of pump, control of chlorination and operation records (daily/monthly/annually)	K.150,000
6. Assistant Technician	Water Committee of ABO	Assistance for a technician	K.70,000
7. Security Guard	Water Committee of ABO	Guard for a pumping station and elevated tank	K.70,000
8. Tap Attendant	Water Committee of ABO	Collection of water tariffs and operation and maintenance for public tap stand	K.40,000

(K: kwacha)

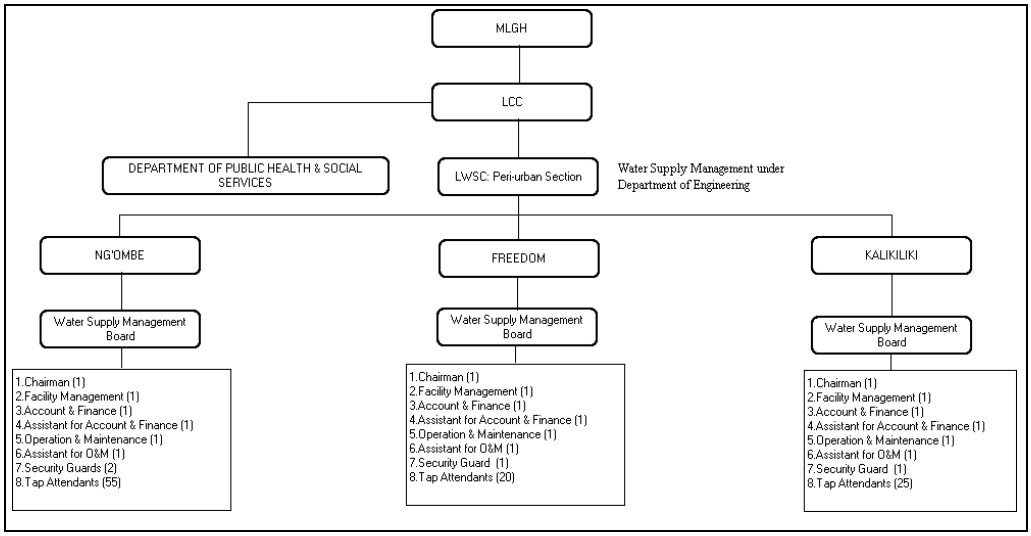
Total number of permanent staff, excepting security guards and tap attendants, is six. The number of tap attendants is equivalent to the number of public tap stands in each UUS. Allowance will be paid to all staff members. The life period of the planned water supply facilities is expected to be about 30 years. Submersible pumps will be renovated after 10 years. These renovation works are planned to be conducted by LWSC instead of the Water Supply Management Board. Therefore, 15% of revenue from the water charge will be appropriate for the future renovation cost and this amount will be reserved by the head office of LWSC.

Roles and responsibilities of each organization are planned as mentioned below.

- Ministry of Local Government and Housing (MLGH): As the highest responsible government body, to coordinate and instruct related organizations on their obligations and the execution.
- Lusaka City Council (LCC): To support administrative procedures related to operation and maintenance, such as the opening and management of a bank account. LCC also takes responsibility for the maintenance of water supply facilities as the owner of the facilities.
- Lusaka Water & Sewage Company (LWSC): To provide technical supports for maintenance of water supply facilities and financial management. LWSC shall conduct the periodical water quality inspection and provide technical advices for the rehabilitation and renewal of the facilities.

- Resident Development Committee (RDC): To conduct promotion for community participation. RDC shall assist the water supply management boards to solve troubles which the water boards will encounter.
- Water Supply Management Board: To conduct operation, maintenance, and inspection of the water supply facilities. The board shall take charge of water tariff collection and the financial management.

Organization of Operation and Maintenance



Note: The figures in parentheses indicates the number of staffs.

2) Community Center Development

The Community Centers are operated daily and mainly maintained by RDC. LCC will support RDC in terms of the management of O&M and a large scale of repair of the facilities, if necessary. The personnel organization for the O&M of the community center is shown below.

Personnel Organization for the O&M of Community Center

Staff	Position	Task
Facility Manager	LCC site officer	• Supervision of O&M for Community Center • Arrangement with LCC
Assistant Facility Manager	RDC member (1 person)	• Control and management for the facility • Administration for utilization of the facility
Treasury	RDC member	• Collection of rental fee • Payment for maintenance cost • Record of account books and management of cash
Technician for O&M	RDC member (1person)	• Procurement for materials and personnel necessary of maintenance, repairs, and cleaning • Request to contractors and LCC in case of large scale rehabilitation
Security Guard	Resident	• Guard for the facility
Office boy	(if necessary)	• Cleaning for the facility（once a week）

Allowance will be paid to a security guard and an office boy. The O&M cost for the community center shall be allocated from profits to be generated by the water supply project. The roles and responsibilities of organizations concerned are shown below.

i) MLGH: Coordination and supervision of organizations concerned,

ii) LCC: Supporting administrative procedure for O&M of the community center, such as opening and management of bank accounts. LCC also takes responsibility for the maintenance of community centers as the owner of the facilities.

iii) RDC: Daily O&M for the community center.

3) Health and Hygiene Education Plan

In the project, training will be given to CBO members such as RDC, NHC and CHW, who are going to be trainers to educate community people. The trainers are expected to start providing education to community people after initial trainings and workshops. Therefore, in the second half of the project period, health and hygiene education should incorporate the results of monitoring of the activities of trainers so that the trainers can receive necessary additional training.

It is important to arouse the awareness of their role as community leaders among the training participants as well as to improve their knowledge on health and hygiene so that the training participants can continue education activities as trainers.

In addition, as support by the government organizations is indispensable to sustainable community activities, it is necessary to fully establish the implementation system among LCC-PHD, CBOH, and DHMT during the Project period to maintain the implementation system after the Project.

The role of each stakeholder in health and hygiene education is as follows.

i) MLGH and CBH: MLGH and CBOH will provide coordination and guidance on responsibility and implementation status of each stakeholder.

ii) LCC and LDHMT: LCC will support administrative procedures for RDC and LDHMT for Health Centre and trainers. Both agencies will cooperate to provide coordination to community activities.

iii) Health Centre: Health Centre will give technical assistance on health and hygiene education by the community.

iv) RDC: RDC will give support on health and hygiene education by CHW, EHC, and NHC, including financial aspect.

v) CHW, EHC, NHC: CHW, NHC, EHC will conduct health and hygiene education in each UUS.

(2) Operation and Maintenance (O&M) Cost

1) Basic Concept

The surplus from the water supply projects can be used for O&M of community centers, and health and hygiene education. Especially, it is likely that health and hygiene education will not be sustainable once the donor stops financial aid at the end of the project. As health and hygiene education is not a profit producing activity, it is necessary to raise a budget for rental cost of seminar rooms and educational materials. Therefore some part of the surplus from water supply projects should be used for public sanitary education.

2) Water Supply Projects

i) Operation and Maintenance Cost and Revenue of Water Charge at Ng'ombe

Monthly O&M cost is estimated as follows.

Operation and Maintenance Cost for Ng'ombe Water Supply System

Expenses	Unit Cost	Quantity	Total
Board Operating Fee	K.740,000	L.S.	K.740,000
Allowance for Security Guards	K.70,000	2	K.140,000
Allowance for Tap Attendants	K.40,000	55	K.2,220,000
Electricity Charge	K.250,000	L.S.	K.250,000
Sundry Expenses	10% of above	L.S.	K.333,000
Monthly Total			K.3,663,000

Annual O&M cost is estimated at 44 million Kwacha. Annual revenue from water charge is calculated for different registration ratios.

Financial Plan of Ng'ombe Water Supply System

Revenue	Unit Cost	Quantity	Annual Total
In case of 100% Registration Ratio			
Annual membership Fee	K.2,000	12,000	K.24,000,000
Water Fee（K3,500/month）	K.42,000	12,000	K.504,000,000
Buckets Sale (20 l/bucket): assumed that monthly Number is 20% of total number of households	K.100	28,800	K.2,880,000
Annual Total			K.530,880,000
Renovation cost of facilities to LWSC	15% of annual total		-K.79,632,000
Total of Annual Revenue			K.451,248,000
In case of 75% Registration Ratio			
Annual membership Fee	K.2,000	9,000	K.18,000,000
Water Fee（K3,500/month）	K.42,000	9,000	K.378,000,000
Buckets Sale (20 l/bucket): assumed that monthly Number is 20% of total number of households	K.100	21,600	K.12,160,000
Annual Total			K.398,160,000
Renovation cost of facilities to LWSC	15% of annual total		-K.59,724,000
Total of Annual Revenue			K.338,436,000

Registration Ratio of 75% to the Water Supply Management Board is the minimum requirement in order to sustain the water supply project. According to the Social Survey in the Study, peoples' willingness to pay shows 84% in Ng'ombe. Even in case of 75% Registration Ratio, the O&M cost is maintained by the revenue from the water charge. It is obvious from the above trial calculation that the Water Supply Management Board can properly conduct the operation and maintenance of water supply facilities on a self-paying basis if a registration ratio of more than 75% is secured.

ii) Operation and Maintenance Cost and Revenue of Water Charge at Freedom

Monthly O&M cost is estimated as follows.

Operation and Maintenance Cost for Freedom Water Supply System

Expenses	Unit Cost	Quantity	Total
Board Operating Fee	K.740,000	L.S.	K.740,000
Allowance for Security Guards	K.70,000	1	K.70,000
Allowance for Tap Attendants	K.40,000	20	K.800,000
Electricity Charge	K.250,000	L.S.	K.250,000
Sundry Expenses	10% of above	L.S.	K.186,000
Monthly Total			K.2,046 ,000

Annual O&M cost is estimated at 25 million Kwacha. Annual revenue from water charge is calculated for different registration ratios.

Financial Plan for Freedom Water Supply System

Revenue	Unit Cost	Quantity	Annual Total
In case of 100% Registration Ratio			
Annual membership Fee	K.2,000	1,800	K.3,600,000
Water Fee（K3,500/month）	K.42,000	1,800	K.75,600,000
Buckets Sale (20 l/bucket): assumed that monthly Number is 20% of total number of households	K.100	4,320	K.432,000
Annual Total			K.79,632,000
Renovation cost of facilities to LWSC	15% of annual total		-K.11,944,800
Total of Annual Revenue			K.67,687,200
In case of 75% Registration Ratio			
Annual membership Fee	K.2,000	1,350	K.2,700,000
Water Fee（K3,500/month）	K.42,000	1,350	K.56,700,000
Buckets Sale (20 l/bucket): assumed that monthly Number is 20% of total number of households	K.100	3,240	K.324,000
Annual Total			K.59,724,000
Renovation cost of facilities to LWSC	15% of annual total		-K.8,958,600
Total of Annual Revenue			K.50,765,400

Judging from the above trial estimations, it is possible for the Water Supply Management Board to suitably conduct the operation and maintenance of water supply facilities on a self-paying basis if a minimum registration ratio of 75% is secured in Freedom. The result of the Social Survey indicates that peoples' willingness to pay is 87% in Freedom.

iii) Operation and Maintenance Cost and Revenue of Water Charge at Kalikiliki

Monthly O&M cost is estimated as follows.

Operation and Maintenance Cost for Kalikiliki Water Supply System

Expenses	Unit Cost	Quantity	Total
Board Operating Fee	K.740,000	L.S.	K.740,000
Allowance for Security Guards	K.70,000	1	K.70,000
Allowance for Tap Attendants	K.40,000	25	K.1,000,000
Electricity Charge	K.250,000	L.S.	K.250,000
Sundry Expenses	10% of above	L.S.	K.186,000
Monthly Total			K.2,266,000

Annual O&M cost is estimated at 27 million Kwacha. Annual revenue from water charge is calculated for different registration ratios.

Financial Plan of Kalikiliki Water Supply System

Revenue	Unit Cost	Quantity	Annual Total
In case of 100% Registration Ratio			
Annual membership Fee	K.2,000	2,300	K.4,600,000
Water Fee（K3,500/month）	K.42,000	2,300	K.96,600,000
Buckets Sale (20 l/bucket): assumed that monthly Number is 20% of total number of households	K.100	5,520	K.552,000
Annual Total			K.101,752,000
Renovation cost of facilities to LWSC	15% of annual total		-K.15,262,800
Total of Annual Revenue			K.86,489,200
In case of 75% Registration Ratio			
Annual membership Fee	K.2,000	1,725	K.3,450,000
Water Fee（K3,500/month）	K.42,000	1,725	K.72,450,000
Buckets Sale (20 l/bucket): assumed that monthly Number is 20% of total number of households	K.100	4,140	K.414,000
Annual Total			K.76,314,000
Renovation cost of facilities to LWSC	15% of annual total		-K.11,447,100
Total of Annual Revenue			K.64,866,900

Judging from the above trial estimations in Kalikiliki, it is possible for the Water Supply Management Board to suitably conduct the operation and maintenance of water supply facilities on a self-paying basis if a minimum registration ratio of 75% is secured. The result of social survey in Kalikiliki shows that peoples' willingness to pay is 78%.

3) Community Center

i) N'gombe

The O&M cost of the community center is estimated 7.6 million Kwacha/year.

O&M Cost of Community Center

Expenditure	Unit（Kwacha）	Quantity	Total（Kwacha）
1)Maintenance cost	80,000	1 set	80,000
2)Stationary, etc.	247,000	1 set	247,000
3)Remuneration fee	90,000	1 person	90,000
4)Electric charge（fixed rate）	25,000	1 set	25,000
5)Telecommunication	160,000	1 set	160,000
6)Others	5% of (1) to 5))	-	30,100
Total (Month)			632,100
Annual O&M Cost			7,585,200

The O&M cost shall be allocated from profit to be generated by the water supply project. The profit from the water supply project in N'gombe is estimated to be 294 million Kwacha/year shown as below.

Profit to be generated by Water Supply Project in N'gombe

	Amount（Kwacha）
Annual Revenue from the Water Supply Project*	338,436,000
Annual Expenditure by the Water Supply Project	43,956,000
Profit	294,480,000

*: The registration rate of the water committee members is assumed at 75%.

Therefore, the O&M cost for the community center can be covered by profit from the water supply project.

ii) Freedom

The profit by the water supply project in Freedom is estimated 26 million Kwacha/year shown as below.

Profit to be generated by Water Supply Project in Freedom

	Amount（Kwacha）
Annual Revenue from the Water Supply Project *	50,765,400
Annual Expenditure by the Water Supply Project	24,552,000
Profit	26,213,400

*: The registration rate of the water committee members is assumed at 75%.

Because the O&M cost of the community center in Freedom is estimated to be the same as N'gombe (7.6 million Kwacha/year), it can be covered by profit from the water supply project.

iii) Kalikiliki

The profit from the water supply project in Kalikiliki is estimated to be 38 million Kwacha/year shown as below.

Profit to be generated by Water Supply Project in Kalikiliki

	Amount（Kwacha）
Annual Revenue from the Water Supply Project *	64,866,900
Annual Expenditure by the Water Supply Project	27,192,000
Profit	37,674,900

*: The registration rate of the water committee members is assumed at 75%.

Because the O&M cost of the community center in Kalikiliki is estimated to be the same as N'gombe (7.6 million Kwacha/year), it can be covered by the profit from the water supply project.

iv) Health and Hygiene Education Plan

During the project implementation period the project will cover the necessary costs. However, once the project is over, it will be the counterpart that should be responsible for the cost. To smooth the process, LCC-PHD will be advised to try to raise the budget for health and hygiene education at the

earliest possible time in the course of the project period. It would be preferable to include rental fees for seminar rooms and educational materials costs as well as some incentive for trainers (luncheon etc).

2.6 OTHER RELEVANT ISSUES (SOFT COMPONENT)

(1) Objectives

The soft component of the Project aims at establishing an institutional framework for proper and sustainable community-based activities. The following four programs will be supported under this component.

1) Establishment and strengthening of community-based organizations,
2) Establishment of an operation and maintenance system for the water supply system,
3) Establishment of an operation and maintenance system for the community center, and
4) Establishment of an implementation system for health and hygiene education.

(2) Contents and Outputs of Soft Component

Contents and outputs of soft component are summarized in the following tables.

Contents and Outputs of the Soft Component
(Strengthening of Community-based Organizations)

Item	Related Organization	Objective	Output	Input
1) Preparation of regulations and rules	• LCC	• Legal status of WSMB and RDC will be clarified.	• Draft regulations and rules	• Japanese expert for community development
2) Workshop with the organizations concerned	• LCC • LWSC • RDC	• Legal status of WSMB and RDC will be agreed by related organizations in accordance with the draft regulations and rules.	• Draft regulations and rules • Agreement documents	• Japanese expert for community development • Zambian expert for capacity building

Contents and Outputs of the Soft Component (O&M of Water Supply Systems) (1/2)

Item	Related Organization	Objective	Output	Input
1)Establishment of WSMB				
a) Training for the concerned organization	• RDC • WSMB	• Necessity and methodology of community participation will be understood.	• Manual for community participation	• Japanese expert for community development • Zambian expert for capacity building
b) Clarification of responsibility and role of the concerned organization and persons in charge	• LCC • LWSC • RDC • WSMB	• Role of concerned organizations and persons in charge will be clarified. • Correspondence to normal condition and malfunction will be clarified.	• Organization chart • Demarcation of roles and responsibilities	• Japanese expert for community development • Zambian expert for capacity building
c) Preparation of role and allowance for WSMB	• RDC • WSMB	• Responsibility among WSMB members will be clarified. • Allowance for WSMB members will be set up.	• Internal rules of WSMB • Allowance for WSMB members	• Zambian expert for capacity building
d) Preparation of membership rules	• RDC • WSMB	• Requisites and obligations for membership will be clarified. • Promotion system will be established to increase registration ratio.	• Members rules • Brochure for promotion	• Zambian expert for capacity building
d) Setting up water charges and registration fee	• RDC • WSMB	• Water fees will be properly set up.	• Water charges • Water charge collection method	• Zambian expert for capacity building

Contents and Outputs of the Soft Component (O&M of Water Supply Systems) (2/2)

Item	Related Organization	Objective	Output	Input
2) Training on Financial Management				
a) Preparation of financial management manual	• LCC • LWSC	• WSMB will prepare and implement financial plan. • WSMB will obtain adequate knowledge for financial management.	• Account book • Manual for bank account • Long-term financial plan	• Japanese expert for community development • Zambian expert for capacity building
b) Training for financial management	• RDC • WSMB • LWSC • LCC	• WSMB will prepare and implement financial plan. • WSMB will obtain adequate knowledge for financial management, as listed below. - Management of account book - Management of bank account - Preparation of long-term financial management plan	• Monitoring record • Evaluation report of training	• Japanese expert for community development • Zambian expert for capacity building
3) Training on Operation and Maintenance				
a) Preparation of operation and maintenance manual	• LWSC	• WSMB will prepare and implement financial plan. • WSMB will obtain adequate knowledge for financial management.	• O&M manual • O&M plan • O&M report • Inventory document of equipment	• Japanese expert for O&M • Zambian expert for O&M
b) Training for operation and maintenance	• RDC • WSMB • LWSC	• WSMB will prepare and implement O&M plan. • WSMB will obtain adequate knowledge for O&M, as listed below. - Mechanism of intake and water distribution - Water quality tests and necessary precaution - Method of piping - Inspection and maintenance - Safety and security	• Monitoring report • Evaluation report of training	• Japanese expert for O&M • Zambian expert for O&M
4) Registration of users and employment of security guard	• RDC • WSMB	• User list will be prepared. • Initial operation system will be formulated.	• List of users • List of staffs	• Zambian expert for O&M
5) Review of training plan	• RDC • WSMB • LCC • LWSC	• Manuals and other relevant documents will be improved to be more practical.	• Revised manual • Revised rules/ regulations • Revised relevant documents	• Japanese expert for O&M • Zambian expert for O&M

Contents and Output of the Soft Component (O&M of Community Centers)

Item	Related Organization	Objective	Output	Input
1) Establishment of Operation and Maintenance system				
a) Preparation of management system and operation program	• RDC • LCC	• Utilization of the center will be clarified	• Schedule of utilization • Definition of activities	• Japanese expert for community development • Zambian expert for capacity building
b) Workshop with concerned organizations	• LCC • LWSC • RDC	• Role of related organizations and persons in charge will be clarified.	• Organization chart • Task demarcation	• Japanese expert for community development • Zambian expert for capacity building
c) Clarification of organizational structure and role demarcation	• RDC	• Responsibility of RDC members will be clarified.	• Internal rules of RDC	• Zambian expert for capacity building
2) Training on Operation and Maintenance				
a) Training for financial management	• RDC • LCC	• WSMB will prepare and implement financial plan. • WSMB will obtain adequate knowledge for financial management.	• Manual of financial management • Financial management plan • Account book • Manual for bank account	• Japanese expert for community development • Zambian expert for capacity building
b) Training on operation and maintenance	• RDC • WSMB • LWSC	• RDC will prepare and implement O&M plan. • RDC will obtain adequate knowledge for O&M.	• O&M manual • O&M plan • Monitoring record • Evaluation report of training	• Japanese expert on community development • Zambian expert for capacity building
3) Employment of staff	• RDC	• Initial operation system will be formulated.	• List of staffs	• Zambian expert for capacity building
4) Review of training plan	• RDC • LCC • LWSC	• Manuals and other relevant documents will be improved to be more practical.	• Revised manual • Revised rules/ regulation • Revised relevant documents	• Japanese expert for community development • Zambian expert for capacity building

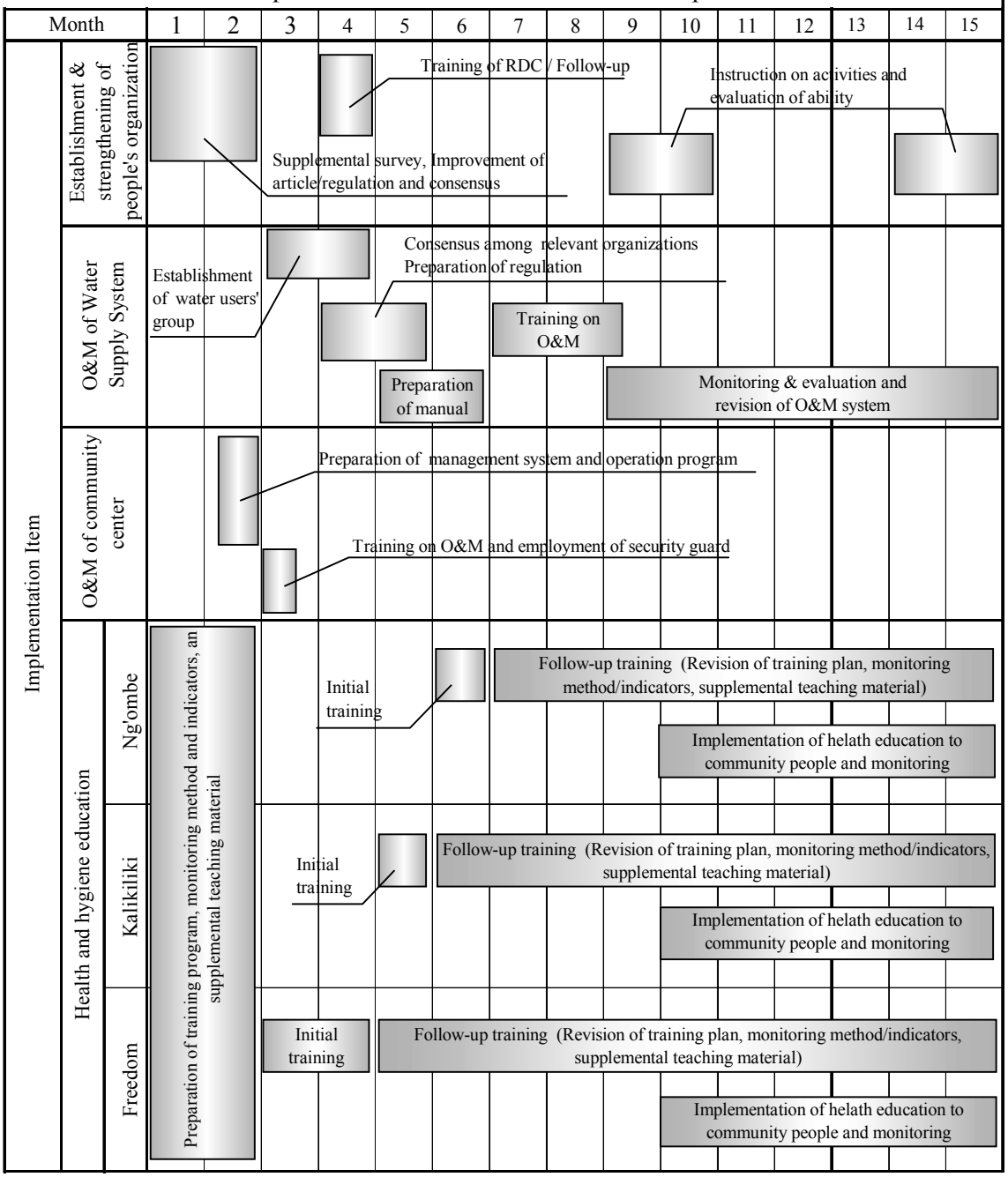
Contents and Output of the Soft Component (Health and Hygiene Education)

Item	Related Organization	Objective	Output	Input
1) Activities for Overall Implementation Framework				
a) Preparation and revision of detail training plan	• DHMB • LCC	• Training method for trainers will be established. • Supporting system for health and hygiene education will be established.	• Detail training plan	• Japanese expert for health and hygiene education
b) Establishment of Monitoring method and indicators	• DHMB • LCC	• Methods for measurement and review of training will be established.	• Monitoring plan	• Japanese expert for health and hygiene education
c) Preparation of supplemental teaching material	• CBH • DHMB	• Training method for trainers will be established.	• Manual for training of trainers • Supplemental education material	• Japanese expert for health and hygiene • Zambian expert for health and hygiene
d) Workshop of the person in charge from relevant organizations	• CBH • DHMB • Health Center • LCC • RDC	• Role and responsibility of the related organization will be clarified. • Supporting system for health and hygiene education will be agreed between related organizations.	• Organization chart • Task demarcation	• Japanese expert for health and hygiene • Zambian expert for health and hygiene
2) Initial training	• RDC • Health Center	• Trainers will obtain knowledge on health and hygiene. • Trainers will understand how to educate community people.	• Training report • Monitoring record	• Japanese expert for community development • Zambian expert for health and hygiene
3) Follow-up training	• RDC • Health Center	• Trainers will understand how to educate community people.	• Evaluation report of training • Monitoring record	• Japanese expert for community development • Zambian expert for health and hygiene
4) PHAST workshop	• RDC • Health Center	• Knowledge on health and hygiene will be improved.	• Training report	• Japanese expert for community development • Zambian expert for health and hygiene

(3) Plan of Operation

The soft component shall start at the same time as the commencement of construction works. Implementation period is planned to be 15 months as shown in the following figure.

Implementation Schedule for the Soft Component



CHAPTER 3 PROJECT EVALUATION AND RECOMMENDATIONS

3.1 PROJECT EFFECT

(1) Water Supply Improvement

The Project will have direct and indirect effects as mentioned below.

1) Direct effects

Direct effects after the implementation of the Project are expected as below.

- Increase in water supplied population, extension of served area, and improvement of water served provision,
- Reduction of walking time to public tap stand and queuing time,
- Increase in stable water supply, and
- Securing the minimum water pressure to be required.

Comparison between present condition and expected effects after implementation of the Project is presented below.

Present Conditions and Expected Effects

Impacts	Present Conditions (2003)	Expected Effects
(a) Served Population	54,300 persons	86,000 persons
Ng'ombe	34,000 persons	61,000 persons
Freedom	7,800 persons	11,000 persons
Kalikiliki	12,500 persons	14,000 persons
(b) Served Area Ratio	20% - 30%	100%
(c) Water Supply Provision (Number of Households)	0% - 40%	More than 75 %
(d) Walking time to public tap stand*1	Within 15 minutes (83.1%)	Within 10 minutes (100%)
(e) Queuing time	5 – 30 minutes or more	Less than 10 minutes
(f) Unit water supply volume	Less than 10 lpcd	30 lpcd
(g) Minimum residual pressure	0 – 5 m or more	More than 5m

*1: Walking time of the present condition includes the time to unsafe water resources, such as shallow wells.

2) Indirect effects

The following indirect effects are expected after implementation of the Project.

- Establishment of community-based operation and maintenance organizations,
- Saving labor of women and children for drawing water,
- Improved health and hygiene conditions at the settlements,
- Decrease in water born diseases,

- Promoting community-based businesses and creating employment, and
- Promoting community development and securing stable civil administration in UUSs.

(2) Health and Hygiene Education

World Bank, UNICEF, and WHO suggest the importance and effectiveness of integrated improvement of water supplies and health education.

In the Project, the criteria for judging the effectiveness of hygiene improvement are based on the planned targets of LCC Public Health Department and the results of similar projects as listed below.

- Reduction of water borne diseases (especially diarrhea) by more than 30%,
- Reduction of infection ratio to 197 persons per 1,000 people for children less than 5 years old, and
- Reduction of death rate by cholera to one person per 10,000 people.

The background of targeted effects is explained in Annex 3.

(3) Verifiable Indicators

In the basic design study, the social conditions survey was conducted in three target areas. Through interviews with questionnaires, the survey confirms the prevalence of problems related to "Walking time to public tap stands", "Morbidity of diarrhea", and "Unit water supply volume" as of the study stage.

Verifiable indicators for the Project consist of the following three items. It is desirable to conduct the baseline survey two years after completion of the Project.

1) Walking time to public tap stand

2) Morbidity of diarrhea

3) Unit water supply volume

The following table presents the current situation as confirmed by the social conditions survey in the target areas together with expected effects after implementation of the Project.

Baseline Survey before and after Implementation of the Project

	Ng'ombe		Kalikiliki		Freedom	
	Before	After	Before	After	Before	After
Walking Time to Public Taps *[1]	Within 15 minutes 83.1%	Within 10 minutes 100.0%	Within 15 minutes 83.1%	Within 10 minutes 100.0%	Within 15 minutes 83.1%	Within 10 minutes 100.0%
Unit Water Supply Volume (lpcd)	5.5	30.0	0.6	30.0	9.3	30.0
Morbidity of Diarrhea (%)*[2]	23.0	17.0	28.5	20.0	22.5	16.0

*1: Since the walking time before the Project includes the time to shallow wells, the result of the Social Survey is not defined as the exact access time. In Kalikiliki, residents receive water from beneficiaries of individual connections, as the sole public tap in the project area is currently out of use.
*2: Reduction for morbidity by approximately 30% is assumed in each project area

3.2 RECOMMENDATIONS

(1) Issues to be solved by the Zambian Side

1) Unpredictable Population Influx

Since the population growth ratio is extremely high in the Unplanned Urban Settlements (UUSs), the water supply system is designed to have sufficient capacity to reflect the population growth to date. However it is not able to deny the possibility of unpredictable population influx into the UUSs, due to economic and political changes in Zambia and neighboring countries in the future. In such case, administrative measures are desirable to avoid population influx concentrated on the target areas.

2) Vandalism

Disparity of income and political equality in the same community may cause acts of vandalism on relevant facilities. The vandalistic acts obstruct sustainability of the Project. Therefore it is desirable to promote security and participation of the communities to prevent the facilities from being demolished.

3) Continuous Support by GRZ

Since the country faces remarkable financial troubles and personnel reduction for structural reform, the government has difficulty to adequately support living environmental improvement in the UUSs. It is important to set up organizations for continuous support with plans including sufficient budget and personnel in the future.

4) Water Resource Management

In order to prevent pollution of water resources, it is desirable to dispatch patrols at water resources and implement promotion to residents around the resources. In the Project the capacity building of community is planned to provide education for water resource management to community-based organizations. The trained organizations are expected to manage water resources after the Project.

(2) Cooperation with Technical Assistance and Other Donors

Newly established water supply management boards will operate and maintain water facilities with technical and financial support from LWSC and LCC. The management boards will be new organizations for the communities. Therefore close instruction and supervision is necessary until the activities of the management boards become stable. On the other hand, the peri-urban section of LCC, the department responsible for the UUSs, is not well-organized to support the community, and LWSC sometimes does not provide prompt action because the communities stand in a position inferior to LCC and LWSC and government, furthermore, has organizational problems. Therefore a mediatory office is required to supervise the water supply management board with coordination between LCC and LWSC after the implementation of the Project. In this works, NGOs will be appropriate for the aftercare of the Project. The following issues should be taken into consideration for cooperation with NGOs.

i) NGOs, who have no activity or plan in the target areas, may not have an interest in the Project.

ii) NGOs require financial support with contract basis to remove current restrictions, due to inadequate finance and personnel.

Following those situations, the following methods are taken into consideration.

i) Subcontract to NOGs for follow-up of the Project

ii) Request that the NGOs, which have activities in wide areas including the three target areas, will support the coordination works that do not include technical and financial supports.

The second method mentioned above has uncertain conditions, because the water supply management board needs close supervision to maintain sustainability of the Project. Therefore, the first proposed method might be the most applicable. It aims to obtain the support from NGOs within a certain period based on a contract. Although AMDA, CARE, and Africare can be offered to follow-up, it is desirable to involve staffs of NGOs in the

implementation stage of the Project to transfer the works for aftercare with good understanding of the contents of the Project and tendencies of the communities. The following items present tentative TOR for aftercare by NGO.

- Coordination between communities, LWSC, and LCC for water supply,
- Supervision of financial management for water supply,
- Support for monitoring of operation conditions and users for water supply,
- Coordination with LCC for operation of community centers,
- Supervision of operation costs for community centers,
- Support for monitoring of operation conditions and users for community centers
- Support for monitoring of capacity building of RDC and water supply management boards,
- Support for health and hygiene education and coordination with the Ministry of Health, and
- Monitoring on changes of life style by the health and hygiene education.