

添付資料

- 資料 1. 署名ミニッツ
- 資料 2. ザンビア国水道水質基準
- 資料 3. ザンビア国排水水質基準
- 資料 4. 現地写真集

MINUTES OF DISCUSSIONS
ON
THE FIRST PREPARATORY SURVEY
ON
THE PROJECT FOR THE IMPROVEMENT OF
WATER SUPPLY AND SANITATION CONDITION IN NDOLA CITY
IN
THE GOVERNMENT OF THE REPUBLIC OF ZAMBIA

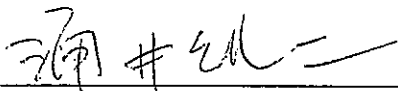
In response to a request from the Government of the Republic of Zambia (hereinafter referred to as "Zambia"), the Government of Japan decided to conduct the First Preparatory Survey on the Project for the Improvement of Water Supply and Sanitation Condition in Ndola City (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to Zambia the First Preparatory Survey Team (hereinafter referred to as "the Team"), which is headed by Mr. Junji Wakui, Director of Water Resources Management II, Global Environment Department, JICA, and is scheduled to stay in the country from April 13, 2010 to May 8, 2010.

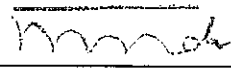
The Team held discussions with the officials concerned from Zambia and conducted a field survey in the study area.

As a result of discussions and field survey, the Team and Zambian side confirmed the main items described in the attached sheets.

Lusaka, April 23, 2010



Mr. Junji Wakui
Leader
First Preparatory Survey Team
Japan International Cooperation Agency



Mr. Timothy Hakuyu
Acting Permanent Secretary
Ministry of Local Government and Housing
Government of the Republic of Zambia

ATTACHMENT

1. Title of the Project

As the requested items of the Project are included not only in water supply sector but also in sewerage and sanitation sector, the title of the Project has been changed to read as follows;

- Initial Title in the Original Proposal:

The Project for the Improvement of Water Supply Condition in Ndola City

- New Title:

The Project for the Improvement of Water Supply and Sanitation Condition in Ndola City

2. Objective of the Project

The objective of the Project is to improve the water supply and sanitation conditions in Ndola City, by rehabilitating and expanding the facilities related to water supply and sewerage services.

3. Project Sites

The project site, according to the current request, is Ndola City, as shown in Annex-1A.

4. Responsible and Implementing Organization

4-1 The Responsible Organization is the Ministry of Local Government and Housing, the Government of the Republic of Zambia.

4-2 The Implementing Organization is the Kafubu Water Supply and Sewerage Company Limited (hereinafter referred to as "KWSC"), Zambia. KWSC is in charge of operation and maintenance of the facilities to be rehabilitated and constructed under the Project.

4-3 The organization charts of the responsible and implementing organizations are shown in Annex-2A and 2B.

5. Items requested by the Zambian side

As the result of discussions, both sides agreed that the requested items of the Project and the priorities of the Zambian side are as shown in Annex-3.

6. Japan's Grant Aid Scheme

6-1 The Zambian side understood the Japan's Grant Aid Scheme explained by the Team, as described in Annexures-4 and 5.

6-2 The Zambian side will take the necessary measures, as described in Annex-6 for smooth implementation of the Project, as the condition of the Japan's Grant Aid to be implemented.

6-3 JICA will report to the Zambian side if there are any other specific undertakings based on the result of this study.

7. Schedule of the Study

7-1 Consultant members of the Team will undertake additional in-depth studies related to the Project in Zambia until May 8th, 2010.

7-2 If the Project is found feasible by the First Preparatory Survey, the Team will convey the results of the Study to enable further discussions concerning the Second Preparatory Survey

for outline design as a next step.

- 7-3 The Team explained that implementation of Preparatory Surveys is not necessarily a commitment of the Project to be implemented.

8. Other Relevant Issues

8-1 Scope of the Project

The scope of the Project is to recover the original capacity of safe water supply and to increase supply hours and the number of people to be served.

8-2 Unit Amount of Water Supply (liter/day/person)

Both sides agreed that the unit amount of house connection water supply applied for the design of the facilities in the Project will be set as 280L/day/person for high cost residential, 160L/day/person for medium cost residential and 100L/day/person for low cost residential.

Both sides also agreed that the unit amount of public tap stand type water supply (hereinafter referred to as "water kiosk") will be 60L/day/person for urban poor residential areas.

8-3 Some of the Specific Undertakings by the Zambian Side

The Team requested the Zambian side to timely allocate necessary budgeted resources required for the smooth implementation of the Project, to assign counterpart personnel during the period of the Preparatory Surveys and implementation of the Project, and to abide by the following undertakings in addition to major understandings described in Annex-5.

- (1) Proper land preparation for new water supply and sewerage facilities, including clearing and leveling

Both sides confirmed that the Zambian side will take necessary measures to prepare the land for new facilities to be constructed in the Project, such as water kiosk, water transfer lines and sewer lines, etc.

- (2) Improvement of existing facilities before the implementation of the Project

The Team requested the Zambian side to take necessary measures in advance to improve and fix the roof, wall and windows of existing facilities which are included in the request. The Zambian side agreed with the request.

- (3) Selection of suitable sites for the water kiosks:

The location of the water kiosks to be constructed in the Project has not been decided yet. The Team requested the Zambian side to decide the candidate locations, considering the following points, and submit the site list and the locations map to the JICA Zambia Office;

- 1) The water kiosks should be constructed along the distribution main to be constructed in the Project so that water can be efficiently and surely delivered to the kiosks.
- 2) The water kiosks are to be constructed in the areas which are inhabited by the low income residents, in order to maximize the benefit of the Project.

3) The locations of the water kiosks are to be decided upon with the consent of the beneficiary communities.

The proposed sites of the water kiosks may be changed based on the result of the technical evaluation by both sides, and in that case, alternative sites shall be proposed.

(4) Tax exemption and Custom Clearance

Both sides confirmed that the Zambian side shall take necessary measures to exempt Japanese nationals who will be engaged in the Project from all duties and related fiscal charges which may be imposed in Zambia with respect to the import and local procurement of project specific equipment and services supplied under the verified contract.

Both sides also confirmed that the Zambian side shall take necessary measures to implement smooth custom clearance for the materials and equipment for the Project to be imported from Japan or third countries.

8-4 Water Source

(1) The Zambian side confirmed that KWSC has the water right for the Kafubu Dam as source, and adequate amount of water of the Kafubu Dam can be used for proper operation of the rehabilitated water treatment plant.

(2) KWSC shall monitor and control the water quality of water sources through the Environmental Council of Zambia (ECZ) so that supplied water will meet the national standards.

8-5 Coordination with the other interventions

KWSC has submitted proposals to DANIDA and the Devolution Trust Fund (DTF) for the improvement of water supply and sanitation infrastructure for Ndola City. It is therefore important that KWSC ensures that proposed activities are not duplicated but instead compliment each other. The Zambian Government appreciates this position and will assist KWSC to coordinate the various partners and ensure that any necessary modifications are effected.

8-6 Safety and Security

The Zambian side promised to take any measures deemed necessary to secure the safety of the Second Preparatory Survey Team members, and personnel engaged in the Project.

8-7 Operation and Maintenance of the Facilities

The Zambian side explained that the proposed water supply and sewerage facilities will belong to KWSC and it will be in charge of operation and maintenance (hereinafter referred to as "O&M"). The Zambian side also promised to timely implement any necessary measures such as proper tariff application and collection, sufficient budget allocation, and appropriate personnel assignment necessary for the proper O&M of the facilities to be constructed and rehabilitated by the Project.

The Team explained that soft component and technical assistance program may be considered for appropriate O&M system in Ndola City.

8-8 Environmental and Social Considerations

The Team explained to the Zambian side about the JICA Guidelines for Environmental and Social Considerations (hereinafter referred to as "JICA Guidelines"). The Zambian side understood the contents of JICA Guidelines, and that the Project should comply with JICA Guidelines, as well as Zambia's laws and regulations related to environmental and social considerations. In addition, the Zambian side assured the Team that necessary measures will be taken for environmental impact assessment (EIA) and that the relevant approvals are to be obtained in a timely manner.

(END)

Annex:

Annex-1 Proposed Project Site

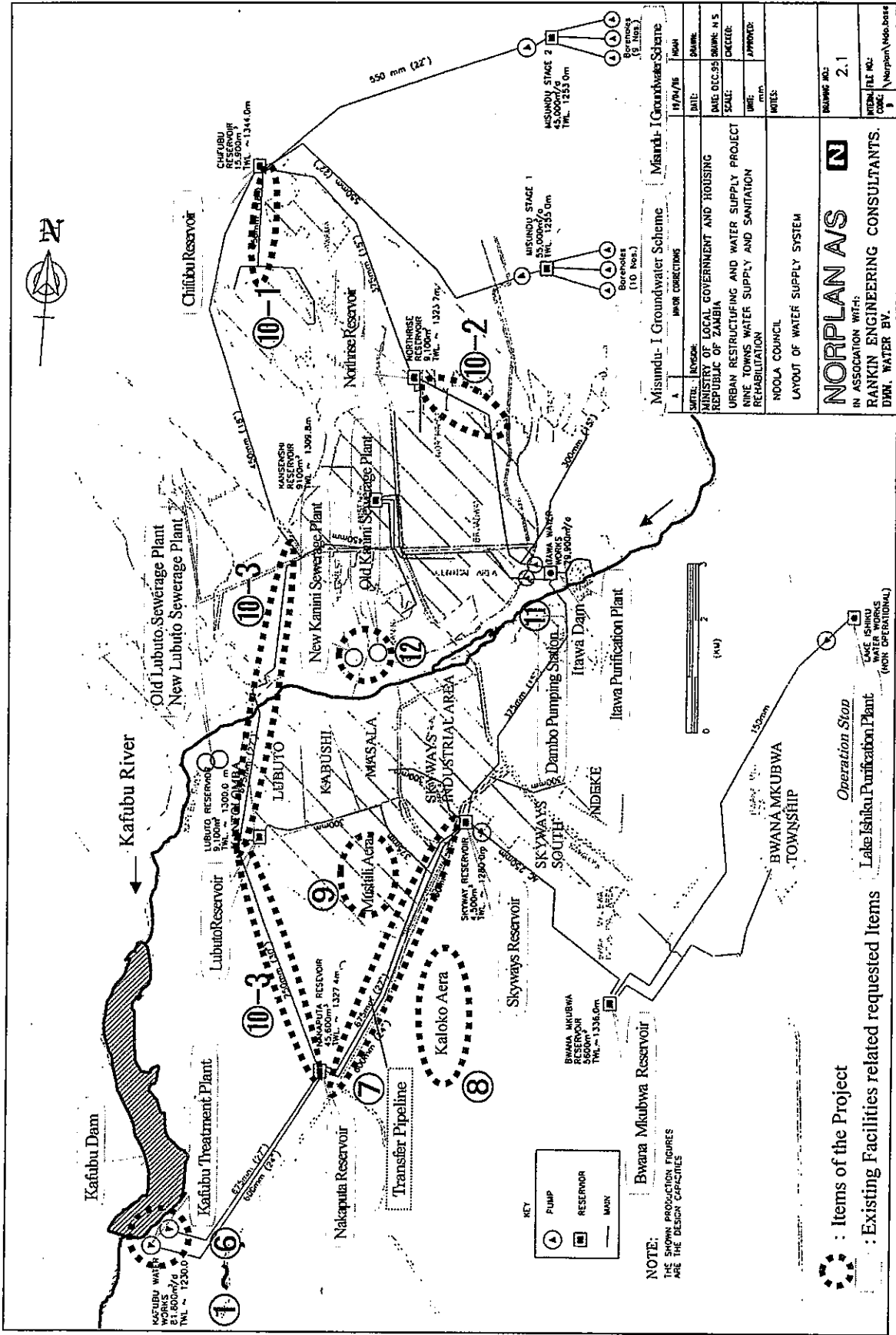
Annex-2 Organization Chart of the Implementing Organizations

Annex-3 Items requested by the Zambian side

Annex-4 Japan's Grant Aid Scheme

Annex-5 Flow Chart of Japan's Grant Aid Procedures

Annex-6 Undertakings by the Government of the Recipient Country



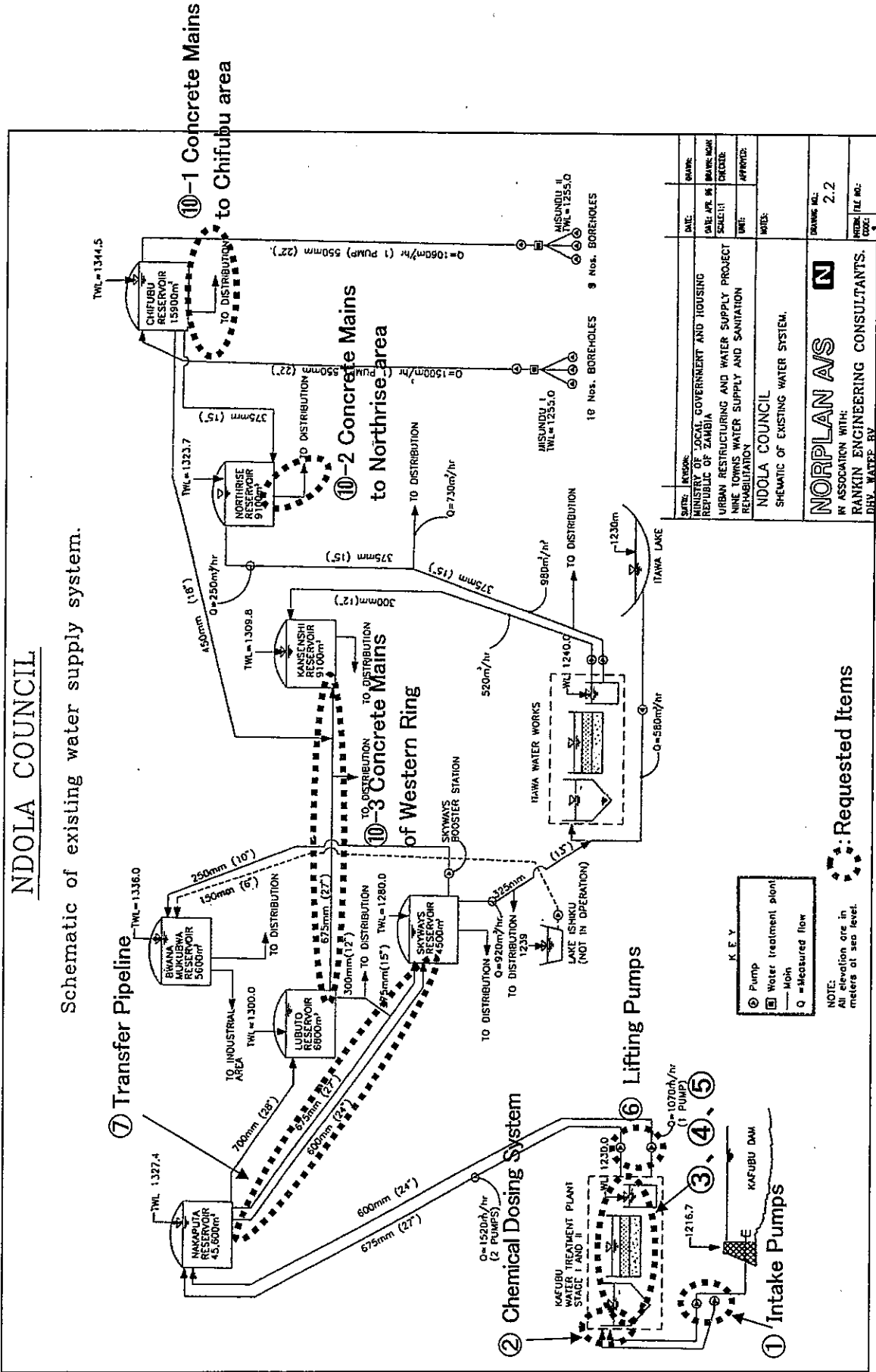
Proposed Project Sites in Ndola city

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NDOLA COUNCIL

Schematic of existing water supply system.



DATE:	18 Nov. 2010	DATE:	18 Nov. 2010
BY:	DR. M. M. M. M. M.	BY:	DR. M. M. M. M. M.
CHECKED:	DR. M. M. M. M. M.	CHECKED:	DR. M. M. M. M. M.
APPROVED:	DR. M. M. M. M. M.	APPROVED:	DR. M. M. M. M. M.
CLIENT: MINISTRY OF LOCAL GOVERNMENT AND HOUSING REPUBLIC OF ZAMBIA		PROJECT: URBAN RESTRUCTURING AND WATER SUPPLY PROJECT NINE TOWNS WATER SUPPLY AND SANITATION REHABILITATION	
DRAWING NO.: 2.2		PROJECT FILE NO.:	
CONSULTANT: NORPLAN AS IN ASSOCIATION WITH: RANKIN ENGINEERING CONSULTANTS. DIV. WATER BY		TITLE: SCHEMATIC OF EXISTING WATER SYSTEM.	

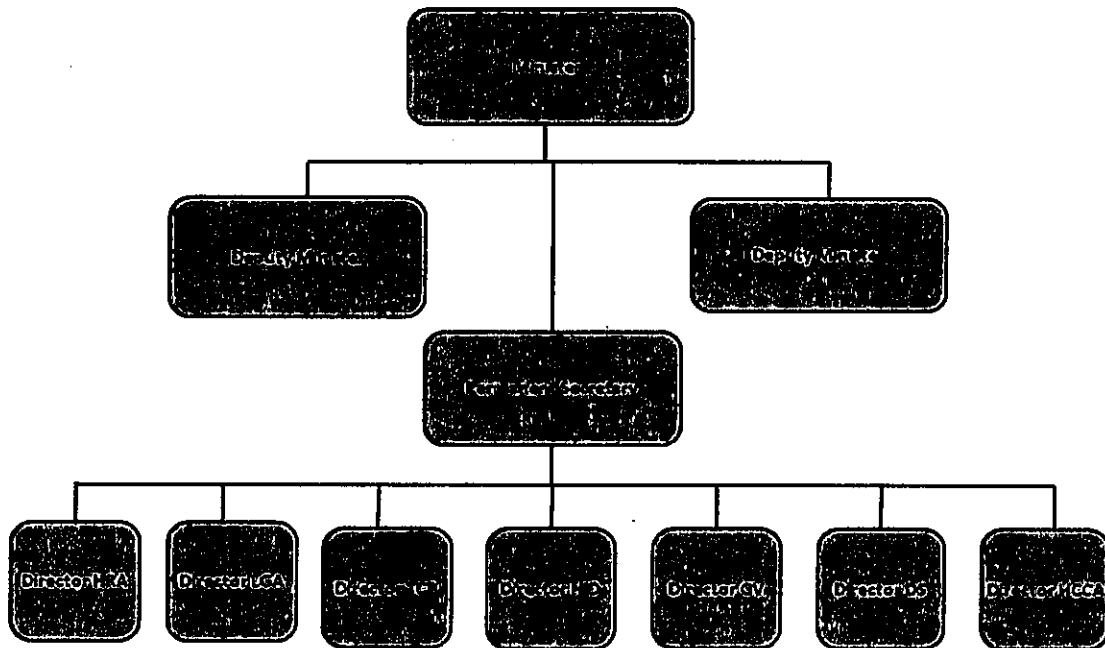
Schematic of existing water supply system in Ndola city

Requested Items

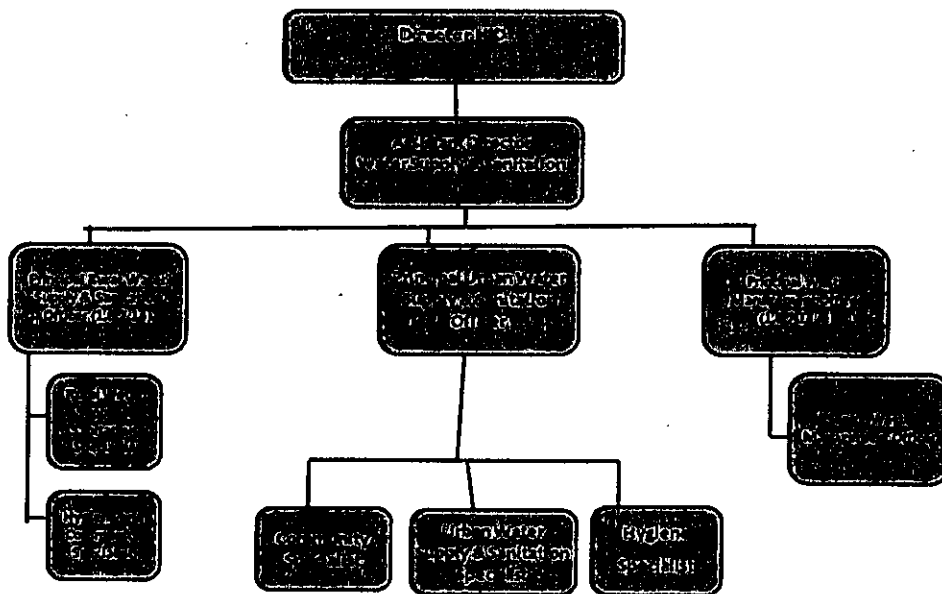
NOTE: All elevation are in meters at sea level.

**Organization Chart of the Responsible Organization
(Ministry of Local Government and Housing)**

MINISTRY OF LOCAL GOVERNMENT AND HOUSING HIGHER LEVEL STRUCTURE



DEPARTMENT OF HOUSING AND INFRASTRUCTURE DEVELOPMENT (DHID)

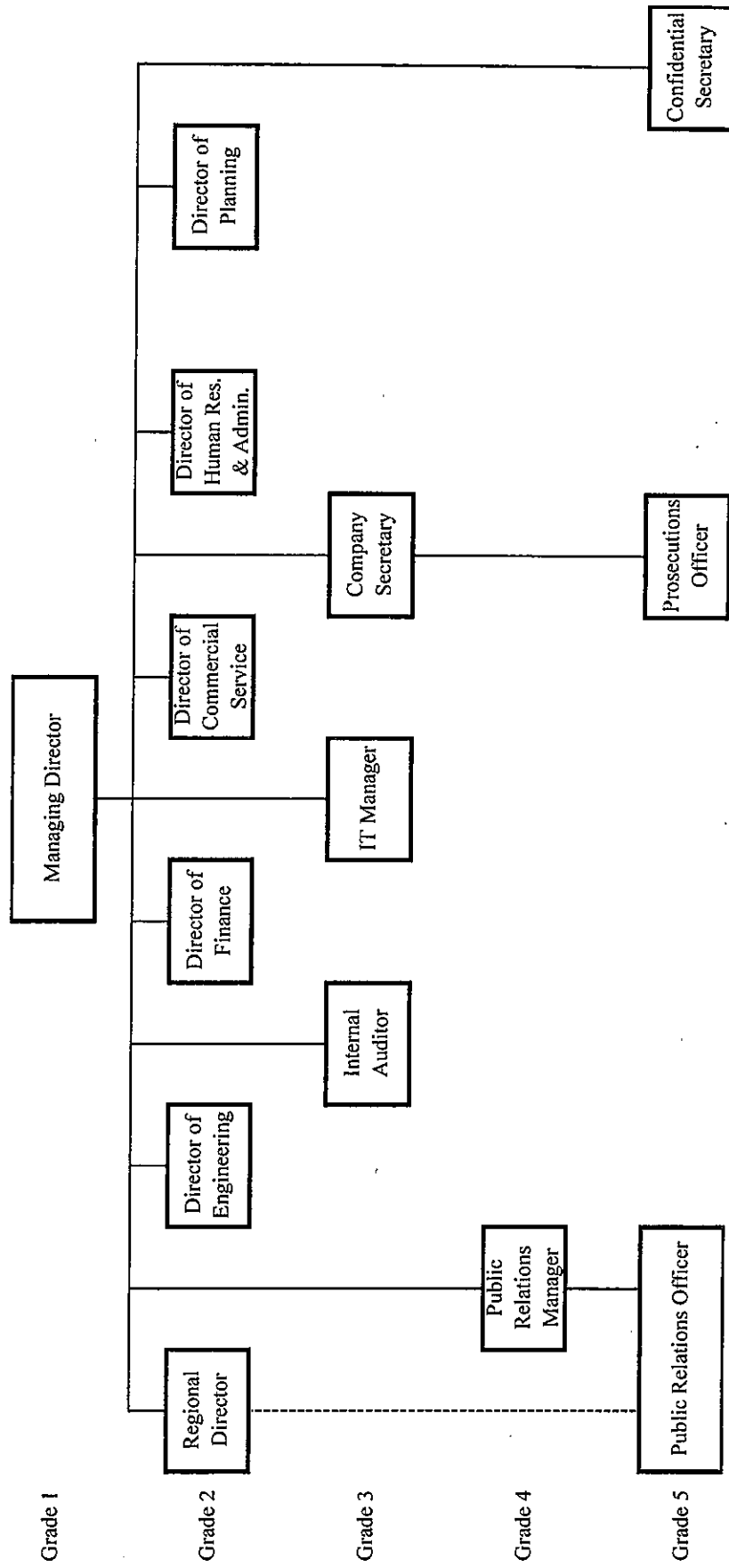


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**Organization Chart of the Implementing Organization
(Kafubu Water Supply and Sewerage Company: KWSC)**



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Items requested by the Zambian side

No.	Priority by Zambian Side	Description
①	1	Replacement of 7 nos of intake pumps
②	1	Replacement of 1 set of chemical dosing system
③	1	Replacement of 180 nos sedimentation tank channels at Kafubu WTP
④	1	Replacement of 600 m ³ filter sand
⑤	2	Replacement of filter nozzles
⑥	1	Replacement of 7 nos of lifting pumps
⑦	1	Installation of 900 mm×8 km transfer pipeline and accessories from Nakaputa reservoirs
⑧	1	Construction of 6 no. extra water kiosks in the Kaloko area
⑨	1	Installation of main water supply line and accessories for upper Mushili
⑩-1	2	Replacement of 600 mm× 2 km Chifubu concrete type water mains and accessories
⑩-2	2	Replacement of 375 mm× 1.7 km Northrise concrete type water mains and accessories
⑩-3	2	Replacement of 700 mm× 12.8 km Western ring concrete type water mains and accessories
⑪	1	Installation of 6 no. ×lift pumps at Dambo sewage pumping station
⑫	1	Installation of analysis machinery and equipment for the Kanini laboratory
⑬	1	Necessary bulk water meters concerning above request

JAPAN'S GRANT AID

The Government of Japan (hereinafter referred to as "the GOJ") is implementing the organizational reforms to improve the quality of Official Development Assistance (ODA) operations, and as a part of this realignment, a new JICA law was entered into effect on October 1, 2008. Based on this law and the decision of the GOJ, JICA has become the executing agency of the Grant Aid for General Projects, for Fisheries and for Cultural Cooperation, etc.

The Grant Aid is non-reimbursable fund provided to a recipient country to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures

The Japanese Grant Aid is supplied through following procedures:

- Preparatory Survey
 - The Survey conducted by JICA
- Appraisal & Approval
 - Appraisal by the GOJ and JICA, and Approval by the Japanese Cabinet
- Authority for Determining Implementation
 - The Notes exchanged between the GOJ and a recipient country
- Grant Agreement (hereinafter referred to as "the G/A")
 - Agreement concluded between JICA and a recipient country
- Implementation
 - Implementation of the Project on the basis of the G/A

2. Preparatory Survey

(1) Contents of the Survey

The aim of the preparatory Survey is to provide a basic document necessary for the appraisal of the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the recipient country necessary for the implementation of the Project.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of an outline design of the Project.
- Estimation of costs of the Project

The contents of the original request by the recipient country are not necessarily approved in their initial form as the contents of the Grant Aid project. The Outline Design of the Project is confirmed based on the guidelines of the Japan's Grant Aid scheme.

JICA requests the Government of the recipient country to take whatever measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization of the recipient country which actually implements the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country based on the

Minutes of Discussions.

(2) Selection of Consultants

JICA reviews the Report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the appropriateness of the Project.

(3) Result of the Survey

JICA reviews the Report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the appropriateness of the Project.

3. Japan's Grant Aid Scheme

(1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes (hereinafter referred to as "the E/N") will be signed between the GOJ and the Government of the recipient country to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Government of the recipient country to define the necessary articles to implement the Project, such as payment conditions, responsibilities of the Government of the recipient country, and procurement conditions

(2) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the recipient country to continue to work on the Project's implementation after the E/N and G/A.

(3) Eligible source country

Under the Japanese Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased. When JICA and the Government of the recipient country or its designated authority deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm are limited to "Japanese nationals".

(4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by JICA. This "Verification" is deemed necessary to fulfill accountability to Japanese taxpayers.

(5) Major undertakings to be taken by the Government of the Recipient Country

In the implementation of the Grant Aid Project, the recipient country is required to undertake such necessary measures as Annex.

(6) "Proper Use"

The Government of the recipient country is required to maintain and use properly and effectively the facilities constructed and the equipment purchased under the Grant Aid, to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Grant Aid.

(7) "Export and Re-export"

The products purchased under the Grant Aid should not be exported or re-exported from the recipient country.

(8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account under the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). JICA will execute the Grant Aid by making

payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

- b) The payments will be made when payment requests are presented by the Bank to JICA under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions paid to the Bank.

(10) Social and Environmental Considerations

A recipient country must carefully consider social and environmental impacts by the Project and must comply with the environmental regulations of the recipient country and JICA socio-environmental guidelines.

Flow Chart of JAPAN'S Grant Aid Procedures

Stage	Flow & Works	Recipient Government	Japanese Government	JICA	Consultant	Contractor	Others
Application	<p>(T/R : Terms of Reference)</p> <p>Request (Oval) → Screening of Project (Oval) → Evaluation of T/R (Rect) → Project Identification Survey* (Oval)</p>						
Project Formulation & Preparation	<p>Preparatory Survey</p> <p>Preliminary Survey* (Oval) → Field Survey Home Office Work Reporting (Rect) → *if necessary</p> <p>Outline Design Study (Oval) → Selection & Contracting of Consultant by Proposal (Rect) → Field Survey Home Office Work Reporting (Rect)</p> <p>Explanation of Draft Final Report (Oval) ↔ Final Report Final Report (Rect)</p>						
Appraisal & Approval	<p>Appraisal of Project (Oval) → Inter Ministerial Consultation (Oval) → Presentation of Draft Notes (Oval) → Approval by the Cabinet (Oval)</p>						
Implementation	<p>(E/N : Exchange of Notes) (G/A : Grant Agreement) (A/P : Authorization to Pay)</p> <p>E/N and G/A (Oval) → Banking Arrangement (Oval) → Consultant Contract (Oval) → Verification (Rect) → Issuance of A/P (Rect)</p> <p>Detailed Design & Tender Documents (Oval) → Approval by Recipient Government (Rect) → Preparation for Tendering (Rect)</p> <p>Tendering & Evaluation (Oval) → Procurement /Construction Contract (Oval) → Verification (Rect) → Issuance of A/P (Rect)</p> <p>Construction (Oval) → Completion Certificate Recipient Government (Rect) → Certificate of Completion of the Work (Rect)</p> <p>Operation (Oval) → Post Evaluation Study (Oval)</p>						
Evaluation & Follow up	<p>Ex-post Evaluation (Oval) → Follow up (Oval)</p>						

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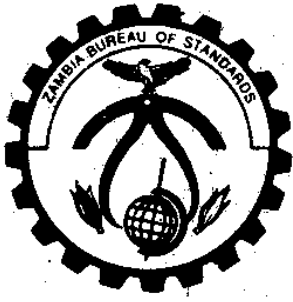


## Major Undertakings to be taken by Each Government (Construction)

| No. | Items                                                                                                                                                                                                                                                        | To be covered by Grant Aid | To be covered by Recipient Side |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|---------------------------------|
| 1   | To secure lots of land necessary for the implementation of the Project and to clear the sites;                                                                                                                                                               |                            | •                               |
| 2   | To ensure prompt customs clearance of the products and to assist internal transportation of the products in the recipient country                                                                                                                            |                            |                                 |
|     | 1) Marine (Air) transportation of the Products from Japan to the recipient country                                                                                                                                                                           | •                          |                                 |
|     | 2) Tax exemption and custom clearance of the Products at the port of disembarkation                                                                                                                                                                          |                            | •                               |
|     | 3) Internal transportation from the port of disembarkation to the project site                                                                                                                                                                               | (•)                        | (•)                             |
| 3   | To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and the services be exempted                                                                |                            | •                               |
| 4   | To accord Japanese nationals whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work |                            | •                               |
| 5   | To ensure that the Facilities be maintained and used properly and effectively for the implementation of the Project                                                                                                                                          |                            | •                               |
| 6   | To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project                                                                                                                                             |                            | •                               |
| 7   | To bear the following commissions paid to the Japanese bank for banking services based upon the B/A                                                                                                                                                          |                            |                                 |
|     | 1) Advising commission of A/P                                                                                                                                                                                                                                |                            | •                               |
|     | 2) Payment commission                                                                                                                                                                                                                                        |                            | •                               |
| 8   | To give due environmental and social consideration in the implementation of the Project.                                                                                                                                                                     |                            | •                               |

(B/A: Banking Arrangement, A/P: Authorization to pay)





**DZS 190:2007**  
**ICS 13.060.20**

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**Draft Zambian Standard (*First Revision*)**

**DRINKING WATER QUALITY - Specification**

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UNDER REVISION

**ZAMBIA BUREAU OF STANDARDS**

## **DATE OF PUBLICATION**

This Zambian Standard has been published under the authority of the Bureau on.....

## **ZAMBIA BUREAU OF STANDARDS**

The Zambia Bureau of Standards is a statutory organization established by the Standards Act, Cap 416 of 1994, for the preparation and promulgation of Zambian Standards

## **REVISION OF ZAMBIAN STANDARDS**

Zambia Standards are revised, when necessary, by the issue either of amendments or of revised editions. It is important that users of Zambian Standard should ascertain that they are in possession of the latest amendments or edition.

## **CONTRACT REQUIREMENTS**

A Zambian Standard does not purport to include all the necessary provisions of a contract. Users of Zambian Standards are responsible for their correct application.

## **TECHNICAL COMMITTEE RESPONSIBLE**

The Water and Environmental Pollution Technical Committee (CHD/7) upon which the following organizations were represented undertook the preparation of this Zambian Standard:

Geological Survey Department  
Lusaka Water and Sewerage Company Limited  
Ministry of Health, Food and Drugs Control Laboratories  
Ministry of Health, Public Health Department  
Ministry of Lands and Natural Resources, Water Affairs Department  
Ministry of Lands and Natural Resources, Dept. of Natural Resources  
National Council for Scientific Research  
Ndola Urban District Council  
Nitrogen Chemicals of Zambia Limited  
Premium Oil Industries Limited  
University of Zambia, School of Engineering, Dept. of Civil Eng.  
University of Zambia, School of Natural Sciences, Dept. of Biology  
University of Zambia, School of Natural Sciences, Dept. of Chemistry  
Zambia Consolidated Copper Mines Limited

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**ZAMBIA BUREAU OF STANDARD, P.O. BOX 50259, ZA 15101 RIDGEWAY, LUSAKA, ZAMBIA.**

## FOREWORD

The Technical Committee, CHD/7, prepared this *Zambian Standard* in accordance with the procedures of the Bureau.

In Zambia the sources of water used for consumption are widely varied ranging from surface waters, i.e. streams, rivers, and lakes, to underground water. Some of this water is consumed untreated by quite a large portion of the population while the treated water sometimes comes from source like lakes and rivers which are recipients of various industrial and domestic effluent which are either pre-treated or not at all.

It was felt that, as drinking water is a commodity which no one can do without, a *Zambian Standard* should be prepared to set limits and permissible levels of substances likely to be encountered in water to safeguard people's health and to control the aesthetic quality. The standard will be acting as the measuring stick to assess the portability of water.

In the preparation of this standard assistance was derived from the following publications:-

*WHO Guidelines for drinking water quality*, 2nd Edition, published by the World Health Organisation.

*SSA 409:1984 Bottled and un-bottled drinking water*, published by the Saudi Arabian Standards Organization.

*Circulation No. 3 of 1989, Guidelines for drinking water*, published by the Department of Water Affairs, Ministry of Lands, Water and Natural Resource.

**COMPLIANCE WITH A ZAMBIAN STANDARD DOES NOT OF ITSELF CONFER IMMUNITY FROM LEGAL OBLIGATIONS**

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## ZAMBIA BUREAU OF STANDARDS

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### ZAMBIAN STANDARD

**DZS 190:2007**

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## DRINKING WATER QUALITY - Specification

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### 0. INTRODUCTION

**0.1** The Local Administration and Public Health Acts of the Laws of Zambia specify that water for public consumption must be potable. However, generally potable water should not necessarily be pure as the presence of certain minerals in suitable concentrations is actually desirable to health.

**0.2** Some of the numerous substances that are found in natural water supplies include the following:

*Suspended matter:* bacteria, viruses, protozoans, algae, clay, colloids, silt and various other inorganic and organic matter.

*Dissolved matter:* dissolved gases, inorganic and organic substances.

Some of these substances listed above may be desirable and some may not depending on the use for which the water is going to be put and the quantities of such substances in the water.

**0.3** To render such natural waters safe and satisfactory for use by the public, purification or treatment is done to them. Hygienic and aesthetic considerations necessitate the limiting of undesirable substances in water being considered for public supply.

### 1. SCOPE

This draft Zambian Standard prescribes requirements for potable (drinking) water suitable for human consumption.

### 2. NORMATIVE REFERENCES

The following publications have been referred to in this standard:

ZS 191 *Vocabulary for water quality.*

ZS 276 *Methods of sampling for water quality.*

ZS 312 *Methods of testing for water quality.*

### 3. DEFINITIONS

For the purpose of this Zambian Standard the definitions given in ZS 191 shall apply.

### 4. NON-INJURIOUS CONSTITUENTS OF POTABLE WATER

#### 4.1 General

This clause deals with parameters that do not pose a risk to human health.

## 4.2 Requirements

The following requirements shall be met in drinking water.

**4.2.1 General physical and chemical characteristics.** Drinking water shall meet the following general physical and chemical requirements as given in table 1.

**TABLE 1 GENERAL PHYSICAL AND CHEMICAL CHARACTERISTICS OF DRINKING WATER**

| Parameters                                                            | Maximum permissible limit         | Method of test<br>ZS 312 Part |
|-----------------------------------------------------------------------|-----------------------------------|-------------------------------|
| Cobalt (Co) (mg/litre)                                                | 0.5                               | 7                             |
| Colour (Hazen units or TCU)                                           | 15                                | 5                             |
| Conductivity (umho/cm)                                                | 2 300                             | 4                             |
| Dissolved solids (total)                                              | 1 500                             | 2                             |
| Hardness (total) as Calcium carbonate (CaCO <sub>3</sub> ) (mg/litre) | 500                               |                               |
| pH                                                                    | 6.5 - 8.0                         | 27                            |
| Turbidity (NTU Scale)                                                 | 10                                | 3                             |
| Taste                                                                 | Unobjectionable to most consumers |                               |
| Odour                                                                 | Unobjectionable to most consumers | 1                             |

**4.2.2 Non-toxic chemical substances.** Drinking water shall have the following limits of non-toxic chemical substances as given in table 2.

**TABLE 2 NON-TOXIC CHEMICAL SUBSTANCES IN DRINKING WATER**

| Substance                                 | Maximum permissible limit (mg/litre) | Method of test<br>ZS 312 Part |
|-------------------------------------------|--------------------------------------|-------------------------------|
| Calcium (Ca)                              | 200                                  | 6                             |
| Chloride (Cl)                             | 250                                  | 17                            |
| Chlorine residue                          | 0.5                                  | 17                            |
| Copper (Cu)                               | 1.0                                  | 7                             |
| Iron (Fe)                                 | 0.3                                  | 28                            |
| Magnesium (Mg)                            | 150                                  | 25                            |
| Sulphate (SO <sub>4</sub> <sup>2-</sup> ) | 400                                  | 16                            |
| Zinc (Zn)                                 | 3                                    | 7                             |
| Phenolic compounds (as phenol)            | 0.002                                | 20                            |
| Detergents (alkyl benzene sulphonate)     | 1.0                                  | 29                            |



## 5. INJURIOUS CONSTITUENTS OF WATER

### 5.1 General

This clause deals with parameters that represent a risk to human health.

### 5.2 Requirements

The following given in 5.2.1 to 5.2.6 requirements shall be met in drinking water.

**5.2.1 Specific toxic chemical substances.** Drinking water shall meet the limits of toxic chemicals as given in table 3.

**5.2.2 Pesticides.** The contamination of drinking water with pesticides listed in table 4 shall not exceed the limits given in the same table.

#### 5.2.3 Total residual chlorine

**5.2.3.1** The total residual chlorine in treated drinking water shall be sufficient for complete destruction of all micro-organisms, and the concentration of the residual chlorine in water shall range from 0.2 to 0.5 mg/litre when arriving to the consumer.

**5.2.3.2** The amount of chlorine shall be increased during epidemic cases or special cases according to instructions from the Ministry of Health.

**TABLE 3 TOXIC CHEMICAL SUBSTANCES IN DRINKING WATER**

| Substance                                  | Maximum permissible limit (mg/litre) | Method of test<br>ZS 312 Part |
|--------------------------------------------|--------------------------------------|-------------------------------|
| Arsenic (As)                               | 0.01                                 | 10                            |
| Cadmium (Cd)                               | 0.003                                | 7                             |
| Chromium (Cr)                              | 0.05                                 | 12                            |
| Cyanide (CN <sup>-</sup> )                 | 0.05                                 | 24                            |
| Fluoride (F <sup>-</sup> )                 | 1.5                                  | 11                            |
| Lead (Pb)                                  | 0.05                                 | 7                             |
| Mercury (Hg)                               | 0.001                                | 22                            |
| Manganese (Mn)                             | 0.1                                  |                               |
| Nitrates (NO <sub>3</sub> <sup>-</sup> -N) | 10                                   | 14                            |
| Nitrite (NO <sub>2</sub> <sup>-</sup> -N)  | 1.0                                  | 36                            |
| Selenium (Se)                              | 0.01                                 | 15                            |
| Aluminium (Al)                             | 0.2                                  | 30                            |
| Silver (Ag)                                | 0.05                                 | 31                            |

**TABLE 4 PESTICIDE LIMITS IN DRINKING WATER**

| Pesticide                         | Maximum permissible limit (ug/litre) | Method of test<br>ZS 312 Part |
|-----------------------------------|--------------------------------------|-------------------------------|
| Aldrin/dieldrin                   | 0.01                                 | 32                            |
| Chlordane                         | 0.3                                  | 32                            |
| 2,4-D                             | 30                                   | 32                            |
| DDT                               | 1.0                                  | 32                            |
| Endosulfan                        | 2                                    | 32                            |
| Endrin                            | 0.2                                  | 32                            |
| Heptachlor and heptachlor epoxide | 0.1                                  | 32                            |
| Hexachlorobenzene                 | 0.01                                 | 32                            |
| Lindane (Gamma BHC)               | 3.0                                  | 32                            |
| Methoxychlor                      | 30                                   | 32                            |
| Toxaphene                         | 5                                    | 32                            |

**NOTE.**

Corresponding chemical names of the pesticides in table 4 are given in annex A.

**5.2.3.3** The concentration of the trihalomethanes (chloroform, bromodichloromethane, dibromochloromethane and tribromomethane) shall not exceed 30 ug/litre when tested in accordance with methods of test given in ZS 312 Part 45.

**5.2.3.4** In case of water treatment with ozone, saturated iodine solution, ultraviolet rays or by any other treatment, this treatment shall be sufficient to kill all the micro-organisms. Treated water shall comply with the specific microbiological properties of treated water mentioned in **5.2.5**

**5.2.4** *Chemical substances which indicate pollution.* Considerable variations in the amount of the following matter in drinking water from the prevailing rates in the source area shall indicate presence of pollution: organic matter, albuminoid nitrogen, nitrates, hydrogen sulphide, dissolved oxygen, free carbon dioxide, phosphate, ammonia and nitrite.

The nitrate content shall not exceed 45 mg/litre (10 mg/litre nitrogen) and the content of nitrate, nitrite and ammonia shall not exceed 10 mg/litre taking into consideration what is mentioned above.

**5.2.4** *Bacteriological characteristics.* The number of coliforms in piped supply and un-piped supplies of drinking water shall not be more than the limits given in table 5.

**5.2.5** *Biological characteristics.* Drinking water shall be completely free from insects and their ova or cyst, their vesicles or parts, and free from amoeba, algae, mould and parasites.

**5.2.6** *Radioactive characteristics.* The levels of radioactive constituents of drinking water shall not be more than the limits given in table 6.

## 6 SAMPLING

Representative samples shall be drawn according to sampling schemes designed in accordance with ZS 276.

**TABLE 5. BACTERIOLOGICAL QUALITY OF PIPED AND UN-PIPED DRINKING WATER**

| Characteristic                                   | Maximum permissible limit in 100 ml <sup>1)</sup> |                    | Remarks                                                |
|--------------------------------------------------|---------------------------------------------------|--------------------|--------------------------------------------------------|
|                                                  | Faecal Coliforms                                  | Coliform organisms |                                                        |
| <b>1. PIPED WATER SUPPLIES</b>                   |                                                   |                    |                                                        |
| Treated water entering the distribution system   | 0                                                 | 0                  |                                                        |
| Untreated water entering the distribution system | 0                                                 | 10                 | In any two consecutive samples                         |
| Water in the distribution system                 |                                                   | 20                 | In an occasional sample but not in consecutive samples |
|                                                  | 0                                                 | 10                 | In any two consecutive samples                         |
| <b>2. UN-PIPED WATER SUPPLIES</b>                |                                                   |                    |                                                        |
|                                                  | 0                                                 | 20                 | In an occasional sample but not in consecutive samples |
|                                                  | 0                                                 | 20                 | In any two consecutive samples                         |
|                                                  |                                                   | 50                 | In an occasional sample but not in consecutive samples |

**TABLE 6 RADIOACTIVE CHARACTERISTICS OF DRINKING WATER**

| Substance            | Maximum permissible limit (Bg/litre) | Remarks                                                                                   |
|----------------------|--------------------------------------|-------------------------------------------------------------------------------------------|
| Gross alpha activity | 0.1                                  | If the levels are exceeded more detailed radionuclide analysis may be necessary           |
| Gross beta activity  | 1                                    | Higher levels do not necessarily imply that the water is unsuitable for human consumption |

## 7. TESTING AND CONFORMITY TO THE STANDARD

The drinking water shall be said to conform to the requirements of the relevant clauses of this standard if it passes all the tests and requirements as prescribed in this standard and tested according to the methods given in this standard.

UNDER REVISION

**ANNEX A: CHEMICAL NAMES FOR PESTICIDES MENTIONED IN THIS STANDARD**

| <b>Common name</b>                   | <b>Chemical name</b>                                                                                                        |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| Aldrin                               | 1,2,3,4,10,10-hexachloro-1,4,4a-5,8,8a-hexahydro- <u>endo</u> -1,4- <u>exo</u> -5,8-dimethanonaphthalene                    |
| Chlordane                            | 1,2,4,5,6,7,8,8-Octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methanoindene                                                        |
| 2,4-D                                | (2,4-dichlorophenoxy) acetic acid                                                                                           |
| o,p'-DDT                             | 1,1,1-trichloro-2-(o-chlorophenyl)-2-(p-chlorophenyl)-ethane                                                                |
| p,p'-DDT <sup>1</sup>                | 1,1,1-trichloro-2,2-bis(p-chlorophenyl) ethane                                                                              |
| Dieldrin                             | 1,2,3,4,10-10-hexachloro- <u>exo</u> -6,7-epoxy-,4a,5,6,-7,8,8a-occtahydro-1,4- <u>endo,exo</u> -5,8-dimethano- naphthalene |
| Endosulfan (Alpha and beta)          | 6,7,8,9,10,10-hexachloro- <u>exo</u> -6,7-epoxy-4a,5,6,-7,8,8a-Octahydro-1,4- <u>endo,exo</u> -5,8-dimethano naphthalene    |
| Endrin                               | 1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro- <u>endo</u> -5,8-dimethanonaphthalene                       |
| Heptachlor                           | 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-4,7-methanoindene                                                            |
| Heptachlor epoxide                   | 1,4,5,6,7,8,8a-heptachloro-2,3-epoxy-3a,4,7,7a-tetrahydro-4,7-methanoindene                                                 |
| Hexachlorobenzene                    | Same name                                                                                                                   |
| Lindane (gamma BHC)                  | 1,2,3,4,5,6-a,a,e,e,e-hexachloro-cyclohexane                                                                                |
| Methoxychlor                         | 2,2,-bis(p-methoxyphenyl)-1,1,1-trichloroethane                                                                             |
| Toxaphene (camphechlor) <sup>2</sup> | Approximately C <sub>10</sub> H <sub>10</sub> Cl <sub>8</sub>                                                               |

**NOTES:**

1. This is the pure technical form of DDT which is transformed into a family of closely related partial degradation and re-arrangement compounds (o,p'-DDT, DDD, DDE and others) in the environment.
2. A mixture of chlorinated camphenes



資料 3. ザンビア国 排水基準

**STATUTORY INSTRUMENT No.72 OF 1993**  
**The Environmental Protection and Pollution Control Act, 1990 (No. 12 of 1990)**  
**The Water Pollution Control (Effluent and Waste Water) Regulations, 1993**

**THIRD SCHEDULE**  
*(Regulation 5 (2) )*

**TABLE OF STANDARDS (LIMITS) FOR EFFLUENTS AND WASTE WATER**

| <b>Column 1</b><br><b>PARAMETER</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Column 2</b><br><b>EFFLUENT AND WASTE WATER INTO AQUATIC ENVIRONMENT</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>A. Physical</b><br>1. Temperature (Thermometer)<br>2. Colour (Hazen Units)<br>3. Odour and Taste (Threshold odour number)<br><br>4. Turbidity (NTU scale)<br>5. Total suspended solids(Gravimetric method)<br><br>6. Settleable matter sedimentation in 2 hours (Imhoff funnel)<br><br>7. Total Dissolved Solids (Evaporation @ 105 C and Gravimetric method)<br>8. Conductivity (Electrometric method)                                                                                                                                                                                                                                                                                                                       | 40 °C at point of entry<br>20 Hazen units<br>Must not cause any deterioration in taste or odor as compared with natural state<br>15 Nephelometer turbidity units<br>100 mg/L must not cause formation of sludge or scum in receiving water<br>0.5 mg/L in two hours. Must not cause formation of sludge in receiving water<br>3000 mg/L The TDS of waste water must not adversely affect surface water<br>4300 µS/cm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>B. Bacteriological</b><br>9. Total Coliform/100 ml (Membrane Filtration method)<br>10. Faecal Coliform/100ml (Membrane Filtration method)<br>11. Algae /100 ml (Colony counter)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 2500°<br>5000°<br>1000 cells                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>C. Chemical</b><br>12. pH (0-14 scale) (Electro-metric method)<br>13. Dissolved oxygen mg Oxygen / Litre (Modified Winkler method and membrane electrode method)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 6.0 - 9.0<br>5 mg/L after complete mixing extreme temperature may result in lower values                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>A. Physical</b><br>14. Chemical Oxygen Demand (COD) (Dichromat method)<br><br>15. Biochemical Oxygen Demand (BOD) (Modified Winkler method and Membrane Electrode method)<br><br>16. Nitrates (NO <sub>3</sub> as nitrogen) (Spectrophotometric method and electrometric method)<br><br>17. Nitrite (NO <sub>2</sub> as nitrogen/L Spectrophotometric sulphanilamide)<br>18. Organic Nitrogen (Spectro-photometric method NKjeldal)<br><br>19. Ammonia and Ammonium (Total) (NH <sub>3</sub> as N/L) (Nesslerization method and Electrometric method)<br><br>20. Cyanides (Spectrophoto-metric method)<br>21. Phosphorous (Total) (PO <sub>4</sub> as P/L) (Colori-metric method)<br><br>22. Sulphates (Turbidimetric method) | COD based on the limiting values for organic carbon 90 mg O <sub>2</sub> /L average for 24 hours<br>50 mg O <sub>2</sub> /L (mean value over 24 hours period ) According to circumstances in relation to the self cleaning capacity of waters<br>The nitrates burden must be reduced as far as possible according to circumstances: water course 50 mg/L; Lakes 20 mg/L<br>2.0 mg NO <sub>2</sub> as N/L<br><br>5.0 mg/L Mean* (* the % of nutrient elements for degradation of BOD should be 0,4 - 1 % for phosphorous ( different for processes using algae )<br>The burden of ammonium salts must be reduced to 10 mg/L (depending upon temperature, pH and salinity)<br>0.2 mg/L<br>Treatment installation located in the catchment area of lakes: 1.0 mg/L; located outside the catchment area: reduce the load of P as low as possible (PO <sub>4</sub> = 6 mg/L<br>The Sulphate burden must be reduced to 1500 mg/L |

|                                                                                     |                                                                           |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------|
| 23. Sulfite (Iodometric method)                                                     | 0.1 mg/L (presence of Oxygen changes SO <sub>3</sub> to SO <sub>4</sub> ) |
| 24. Sulphide (Iodometric and electrometric method)                                  | 0.1 mg/L (depending on temperature, pH and dissolved O <sub>2</sub> )     |
| 25. Chlorides Cl/L (Silver nitrate and Mercuric nitrate)                            | Chloride levels must be 800 mg/L                                          |
| 26. Active chloride Cl <sub>2</sub> /L (Iodometric method)                          | 0.5 mg/L                                                                  |
| 27. Active Bromine (Br <sub>2</sub> /L)                                             | 0.1 mg/L                                                                  |
| 28. Fluorides F/L (Electro-metric method and Colorimetric method with distillation) | 2.0 mg/L                                                                  |
| <b>C. Metals</b>                                                                    |                                                                           |
| 29. Aluminium compounds (Atomic Absorption method)                                  | 2.5 mg/L                                                                  |
| 30. Antimony (Atomic absorption method)                                             | 0.5 mg/L                                                                  |
| 31. Arsenic compounds (Atomic Absorption method)                                    | 0.05 mg/L                                                                 |
| 32. Barium compounds (water soluble concentration) (Atomic Absorption method)       | 0.5 mg/L                                                                  |
| 33. Beryllium salts and compounds (Atomic Absorption method)                        | 0.5 mg/L                                                                  |
| <b>A. Physical</b>                                                                  |                                                                           |
| 34. Boron compounds (Spectro photometric method curcumin method)                    | 0.5 mg/L                                                                  |
| 35. Cadmium compounds (Atomic Absorption method)                                    | 0.5 mg/L                                                                  |
| 36. Chromium Hexavalent, Trivalent (Atomic absorption method)                       | 0.1 mg/L                                                                  |
| 37. Cobalt compounds (Atomic Absorption method)                                     | 1.0 mg/L                                                                  |
| 38. Copper compounds (Atomic Absorption method)                                     | 1.5 mg/L                                                                  |
| 39. Iron Compounds (Atomic Absorption method)                                       | 2.0 mg/L                                                                  |
| 40. Lead compounds (Atomic Absorption method)                                       | 0.5 mg/L                                                                  |
| 41. Magnesium (Atomic Absorption method and flame photometric method)               | 500 mg/L                                                                  |
| 42. Manganese (Atomic Absorption method)                                            | 1.0 mg/L                                                                  |
| 43. Mercury (Atomic Absorption method)                                              | 0.002 mg/L                                                                |
| 44. Molybdenum (Atomic Absorption method)                                           | 5.0 mg/L                                                                  |
| 45. Nickel (Atomic Absorption method)                                               | 0.5 mg/L                                                                  |
| 46. Selenium (Atomic Absorption method)                                             | 0.02 mg/L                                                                 |
| 47. Silver (Atomic Absorption method)                                               | 0.1 mg/L                                                                  |
| 48. Thallium (Atomic Absorption method)                                             | 0.5 mg/L                                                                  |
| 49. Tin compounds (Atomic Absorption method)                                        | 2.0 mg/L                                                                  |
| 50. Vanadium compounds (Atomic Absorption method)                                   | 1.0 mg/L                                                                  |
| 51. Zinc compounds (Atomic Absorption method)                                       | 10 mg/L                                                                   |
| <b>D. Organics</b>                                                                  |                                                                           |
| 52. Total hydrocarbons (Chromatographic method)                                     | 10.0 mg/L                                                                 |
| 53. Oils (Mineral and Crude) (Chromatographic method and Gravimetric method)        | 5.0 mg/L                                                                  |
| 54. Phenols (steam distillable) (Colorimetric method) (Non-steam distilled)         | 0.2 mg/L<br>0.05 mg/L                                                     |
| 55. Fats and saponifiable oils (Gravimetric method and chromatographic method)      | 20 mg/L                                                                   |
| 56. Detergents (Atomic) (Atomic Absorption Spectrophometric)                        | 2.0 mg/L (Detergents should contain at least biodegradable compounds)     |
| 57. Pesticides and PCB's (Total) (Chromatographic method)                           | 0.5 mg/L                                                                  |
| 58. Trihaloforms (Chromatographic)                                                  | 0.5 mg/L                                                                  |
| <b>E. Radioactive Materials</b>                                                     |                                                                           |
| 59. Radioactive materials specified by International accepted Atomic Energy Agency  | No discharge accepted                                                     |



資料 4. 現地写真集 2010 年 4 月



カフブダム (取水池)



取水塔



取水箇所の水質



殺藻剤 (硫酸銅) 溶解液を取水塔で投入



①取水ポンプ場 2 棟



①取水ポンプ 全 7 台のうち 4 台



①補修のため分解されたままのポンプ



①KSB 社製ポンプ 軸封部の漏水が激しい



②カフブ浄水場 薬品室



②1階：攪拌槽、地下：薬品注入・搬送ポンプ室



②攪拌機が故障し、凝集剤が使用されていない



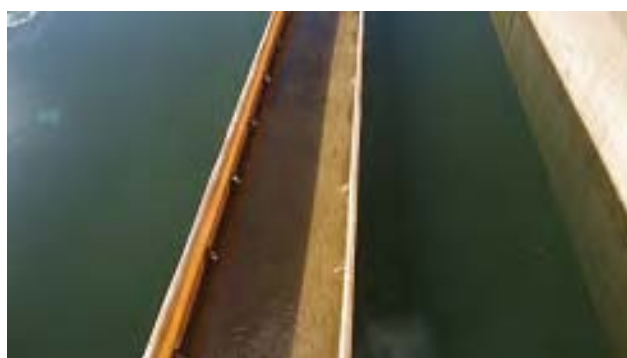
②薬品注入ポンプは取り外されている



凝集剤滴下配管と迂流式の薬品混和槽



原水の状況



③上向流式沈殿池の集水トラフ



③折れたグラスファイバー製トラフ（中央）



④⑤急速濾過池 濁っていて濾過砂が見えない



濾過後の浄水



水質検査スペース



塩素ガス貯蔵設備



⑥送水ポンプ7台のうち4台



⑥KSB社製ポンプ 振動と軸封部の漏水が激しい



⑥送水ポンプ7台のうち3台



⑥取り外された電動機



⑥取り外されたインペラ



濾過池逆流洗浄ポンプ



送水管の水撃防止用圧力調整タンク



高圧受電設備



ナカプタ配水池



⑦送水管（コンクリート管）の漏水箇所



⑧カロコ地区（郊外地区）のキオスク型公共水栓



⑧キオスク内に設置された量水器



スカイウエイズ配水池



配水池の流出側に水量計が2系統あるが動作不能



ブワナムクブワ配水池への増圧ポンプ



増圧ポンプ吐き出し側の水量計も動作不能



撤去された石綿セメント管 (AC管)



コンクリート管の差込継手



⑨ムシリ地区の民家の水栓



⑨給水中には残留塩素が含まれている



⑨戸外にホースを伸ばして給水所となっている



⑨排水側溝は整備されている



ルプト配水池



配水池内の水は緑色



ルプト地区内の町並



DTF 資金により水道公社が設置した大口径水量計



カブシ地区の民家の手桶式便所



マサラ地区の民家の水洗便所（配管は壊れている）



マサラ地区の各戸給水 (水栓がない)



給水中に残留塩素は含まれている



固形廃棄物は道路際に集積されている



ブワナムクブワ配水池



増水ポンプの隔日運転により貯水されていない



工業地区遠景



工業地区内の状況



イタワダムと取水箇所



取水槽の水面



イタワ浄水場の薬品攪拌槽と注入ポンプ



凝集剤攪拌機 使われていない



原水の状況



沈殿池の集水トラフ



急速濾過池 濾過砂表面に亀裂が生じている



使用されていない濾過池 集水装置が見える





濾過後の浄水



濾過池の逆流洗浄設備



塩素ガスタンクと注入配管



使われていない送水ポンプ



カンセンシ配水池への送水ポンプ



カンセンシ配水池への送水ポンプ



チフブ配水池への送水ポンプ



受電盤内 断路器の焼損後、直結配線してある



ミスンドゥ I 系統の送水ポンプ場内にある取水井



集水井への配管に設置された水量計（動作不能）



取水井 10 箇所をまとめた集水井



次亜塩素酸カルシウムを人力で溶解・攪拌して注入



送水ポンプ場と圧力タンク



チフブ配水池への送水ポンプ



⑩-2 ノースライズ配水池からの配水管理設箇所



⑩-2 コンクリート配水管からの漏水



チフブ配水池



⑩-1 配水池からの配管の水量計（動作不能）



カワマ地区（カロコ地区と同じく郊外地区）



カンセンシ配水池と使われていない増圧ポンプ場



⑭ニューカニニ下水処理場内にある水質検査室



⑭各浄水場・下水処理場から集められた標本



⑭原子吸光光度計



⑭試薬類



⑩-1 ルプト下水処理場の沈砂池



⑩-1 自動除塵機から掻き出されたし渣



⑩-1 最初沈殿池



⑩-1 上澄水越流部の状況



⑩-1 散水濾床槽



⑩-1 散水ノズルと礫層表面



⑩-1 使われていない散水濾床槽と内部の礫層



⑩-1 カフブ川への放流口



⑪-1 汚泥搬送ポンプ



⑪-1 汚泥消化槽



⑪-1 熟成池建設予定地 既に家屋が建っている



⑪-1 汚泥天日乾燥床



⑪-2 オールドカニニ下水処理場の流入路



⑪-2 流入水の水面



⑪-2 自動除塵機



⑪-2 バースクリーンの状況



⑪-2 ルフト下水処理場へのバイパス送水管



⑪-2 流入部の凝集剤攪拌槽 (利用状況不明)



⑪-2 流入量計測水路 計測されていない



⑪-2 最初沈殿池



⑪-2 スカムと上澄水越流部の状況



⑪-2 使われていない最初沈殿池 底部に汚泥掻寄機



⑪-2 散水濾床槽



⑪-2 使われていない散水濾床槽の内部



⑪-2 最終沈殿池



⑪-2 最終沈殿池 水面に藻類が繁茂している



⑪-2 ホテイアオイの群生による植生浄化の試み



⑪-2 使われていない砂濾過槽 (高度処理用)



⑪-2 放流水の状況



⑪-2 最初沈殿池からの汚泥引き抜きパイプと消化槽



⑪-2 好気性消化槽



⑪-2 攪拌装置



⑪-2 ニューカニニ下水処理場の流入水



⑪-2 沈砂池



⑪-2 各系統への流入部とスクリーン



⑪-2 流入量計測水路 計測されていない



⑪-2 最初沈殿池



⑪-2 上澄水越流部の状況



⑪-2 散水濾床槽



⑪-2 生物膜が張り付いた礫層の表面

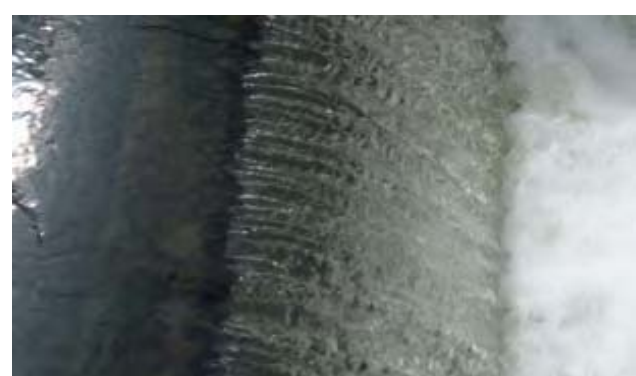




⑪-2 最終沈殿池



⑪-2 上澄水越流部の状況



⑪-2 放流水の状況



⑪-2 汚泥搬送ポンプ



⑪-2 汚泥消化槽



⑪-2 拡張予定地



⑪-2 汚泥天日乾燥床



⑪-1 コンクリート製下水流入管水管橋



⑫工業地区の中の下水管路漏水箇所



⑫下水管閉塞による人孔溢水箇所



⑫漏水のある下水管理設路線



⑫下水管漏水箇所



⑬ダンボポンプ場の流入部



⑬地階に配置された立軸ポンプの電動機3台



⑬ベルト駆動の横軸ポンプが2台稼動中



⑬故障している配電盤