

## 添付資料 4 質問票及び回答



*(revised 26 Dec. 07)*

**PRELIMINARY STUDY  
ON  
THE PROJECT FOR  
IMPROVEMENT OF EMBU WATER SUPPLY AND SANITATION  
IN THE REPUBLIC OF KENYA**

**QUESTIONNAIRE**

**JANUARY 2008**

**JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)**

CONTENTS

Preface .....	1
A. General Information .....	2
B. Confirmation on the Requested Project.....	7
C. Water Supply Service Conditions in Embu by TWSB/EWASCO.....	9
D. Water Supply Service Conditions in other areas than Embu by TWSB (whose water source is Rupingazi River).....	20
E. Future Plan and Ongoing Project for Water Supply Improvement in Embu .....	21
F. Sewerage Service Conditions in Embu .....	22
G. Environmental and Social Considerations.....	23
H. Laws, Design Criteria, etc. ....	23
I. Companies Capable of Natural Conditions Survey and Construction Works .....	24
J. Construction Materials and Costs.....	24
K. Current Situation of Water Supply and Sewerage Services in Meru City .....	24

## Preface

This questionnaire aims at clarifying the background of the requested project, current situations of water supply and sewerage services in Embu City, etc. to verify the appropriateness of the requested project to meet the conditions of the Japan's Grant Aid.

It is not necessary to follow the form presented here as long as the substance is dealt with. Any material already prepared which accurately covers some of the questions may be submitted in its original form.

Attached CD includes a digital file of this questionnaire. Answers to the questionnaire can be written directly in the file and returned to the Preliminary Study Team ("the Team") with a hard copy. The Team is open to any question you may have.

In this questionnaire, "Embu" refers to Embu City, unless otherwise indicated. If this interpretation were incorrect or inappropriate, please indicate an alternative way(s).

Tana Water Services Board (TWSB), the implementing agency of the requested project, is kindly requested to help the Team with collecting the data and information from the related ministries/authorities and compile the answers to the questionnaire.

Ministries and authorities related to this questionnaire are expected as follows:

Part	Title	Expected Related Authorities
<b>A</b>	General Information	MOWI, TWSB
<b>B</b>	Confirmation on the Requested Project	TWSB, EWASCO
<b>C</b>	Water Supply Service Conditions in Embu	TWSB, EWASCO
<b>D</b>	Water Supply Service Conditions in other areas than Embu	TWSB
<b>E</b>	Future Plan and Ongoing Project for Water Supply Improvement in Embu	TWSB, EWASCO
<b>F</b>	Sewerage Service Conditions in Embu	TWSB, EWASCO
<b>G</b>	Environmental and Social Considerations	MENR, MOWI, Embu Municipality, TWSB, EWASCO, MEWASS, International aid organizations
<b>H</b>	Laws, Design Criteria, etc.	TWSB, EWASCO
<b>I</b>	Companies Capable of Natural Conditions Survey	TWSB, EWASCO
<b>J</b>	Construction Materials and Costs	TWSB, EWASCO
<b>K</b>	Current Situation of Water Supply and Sewerage Services in Meru City	TWSB, MEWASS

MOWI: Ministry of Water and Irrigation

MENR: Ministry of Environment and Natural Resources

TWSB: Tana Water Services Board

EWASCO: Embu Water and Sanitation Company

MEWASS: Meru Water and Sewerage Services Registered Trustee

## **A. General Information**

### **A-1. National Development Plan**

#### **A-1-1. The 9<sup>th</sup> National Development Plan (2002 – 2008)**

Describe targets for water sectors in the above plan.

- **Name of National Development Plan: The 9<sup>th</sup> National Development Plan 2002-2008 (Ministry of Planning, GoK)**

The 9<sup>th</sup> National Development Plan declares, to address the problems on water and sanitation sector, the government will:

- **Implement Sessional paper on water resource management;**
  - **Construct new water and sewerage schemes in small and medium towns and rural areas in order to remove water availability as a constraint to development;**
  - **Collaborate with the private sector in exploration and exploitation of groundwater as an alternative source to surface water;**
  - **Construct appropriate dams to conserve water along major river courses due to the erratic rainfall patterns and lack of adequate storage capacity;**
  - **Construct weirs and gauges along the main river courses and laboratories for water surveillance and quality control; and**
  - **Promote Capacity building in the water and sanitation sub-sector.**
- **Position of the proposed sector in the plan : High Priority**

The 9<sup>th</sup> National Development Plan (2002-2008) lists Embu Town as one of the principal towns, being the Provincial Headquarters of Eastern province. The present population of Embu Municipality is estimated at 88,000 with the town alone at 60,000. The JICA Aftercare Study (1998) gave a projected population of 92,241 by 2010. The current water supply system is very old, having started in 1949 during the colonial times. There has been efforts to improve the water supply over the years, the most notable being in 1975 when another source on the Rupingazi river was identified, bringing the water production to the current 2,500m<sup>3</sup>/day reaching the Town. Records indicate a billed volume of 2,000m<sup>3</sup>/day in 2004. The situation indicates a current water deficit of more than 4,500m<sup>3</sup>/day and is expected to grow to more than 6,000m<sup>3</sup>/day by 2010 if the same trend continues.

In line with the current National Development Plan, the National Poverty Reduction Plan (1999-2015) proposes among others the rehabilitation of 700 existing water supplies across the country to optimize production capacity by the year 2015. A major constraint in the implementation of the Plan is inadequate financial resources from the Government, hence the need to approach development partners for critically required funding to achieve the desired objectives which will cumulatively ensure improved services delivery and poverty eradication, while endeavouring to meet the millennium development goals of 2015. Embu is among the Water supplies identified under these Plan, hence the Ministry of Water and Irrigation (MW&I) has ranked it highly to benefit from Donor assistance, especially now that implementation will learn

from the experience of Meru water supply rehabilitated under Japan's Grant Aid Scheme.

The Ministry has already implemented institutional change in line with the Water Act, 2002 in the water services provision and Embu Water and Sanitation Company has been licensed to provide water supply and sewerage services for Embu Municipality.

Availability of safe water to a community has been identified by the Government of Kenya as the most important factor in the Economic Recovery Strategy (ERS). Therefore, this project is placed highly in the Government development plan: as is to be found in the After Care Study on The National Water Master Plan in The Republic of Kenya, agenda for economic recovery.

## **A-2. Sector Development Plan**

### **A-2-1. Strategic Plans of the Tana Water Services Board (TWSB)**

- Describe the relation between the requested project and the strategic plans.

TWSB Strategic Plan 2005-2015 is available. The overall goal of TWSB during the planning period is to deliver quality water and sanitation services to all the people living within board's area. The key objectives are as follows:

- i) Enhanced stakeholder awareness on water sector reforms,
- ii) Increase in access to sustainable and safe water from 20% to 100%,
- iii) Increase in demand for available safe water,
- iv) Increase in access to improved sanitation from 70% to 100%,
- v) Development of strong and well managed WSB and WSPs
- vi) Achieving operational financial sustainability in 5 years.

To achieve the key objectives, the requested project is one of the most important strategies described in the Strategic Plan.

## **A-3. Current Situation of Water Sector Reform**

### **A-3-1 Institutional structure**

Please refer to the Interim Report of JICA Water Sector Development Expert prepared on November 2007 (Note: already submitted to JICA).

### **A-3-2 Mandate and responsibility of each organization**

Please refer to the Interim Report of JICA Water Sector Development Expert prepared on November 2007 (Note: already submitted to JICA).

## **A-4. Activities of International Aid Organizations in Water Sector**

Describe the activities of the following aid organizations in the water sector:

- World Bank/AfDB

1. Water & Sanitation Service Improvement Project in Nairobi and Mombasa

2. WESTERN KENYA COMMUNITY DRIVEN DEVELOPMENT AND  
FLOOD MITIGATION PROJECT

3. Assistance for SWAP in the field of Urban Water sector with AfDB

4. Financing to WSTF with AfDB

➤ ADF

1. Water Service Boards Support Project (for AWSB, LVSWSB, NWSB, TWSB)

➤ Other aid organizations, if any

SIDA	1. Short Term Technical Support for The Restructuring of The Headquarters Of The Ministry of Water and Irrigation 2. Assistance for Swap in the Field of Rural Water Services Sector 3. Financing of WSTF
SIDA/DANIDA FNIDA	Kenya Water and Sanitation Programme Rural Water Supply and Community Empowerment Programme in cooperation with WSTF
DANIDA	1. Assistance for SWAP in the field of Water Resources Management 2. Financing to WSTF
KfW	1. Assistance for SWAP in the field of Irrigation Sector 2. Financing to WSTF
GTZ	1. Assistance for SWAP in the field of Water Sector 2. Financing to WSTF
AFD	1. Master Plan for Nairobi Water Supply for the target year 2030 2. Feasibility study on improvement for water and sanitation in Mombassa Town 3. Financing to WSTF
Saudi Arabia Fund	Garissa Water Supply
KOICA	Emergency Draught Operation
Egyptian Fund	Rural Water Supply in cooperation with CDF

**A-5. Present Land Use Maps and Future Urban Development Plans of Embu**

Local Physical Development Plan (Long Term) 2001-2030, Embu Municipality, Ministry of Lands and Housing, 30 August 2005 (Note: already submitted to JICA)

**A-6. Topographic Maps of Embu with contours**

Available with a scale of 1/50000

**A-7. Basic Statistical Data for Embu**

Please provide following basic statistical data for Embu:

A-7-1. Census of the country: 1999 population and Housing Census

A-7-2. Census of the region: 1999 population and Housing Census

A-7-3. Socio-economic data

➤ Average household income in the past three years in Embu

**This data is not available.**

➤ Annual inflation ratios or consumer price indices for the past five years of Embu



YEAR	2002	2003	2004	2005	2006
INFLATION RATE					
COUNTRY (KENYA)	2.0	9.8	11.6	10.3	14.5
EMBU (SIMILAR TO OTHER TOWNS OF ITS SIZE)	2.1	9.9	10.6	9.6	12.6

YEAR	2002	2003	2004	2005	2006
CONSUMER INDICES: YEAR 1997=100					
COUNTRY (KENYA)	133.56	146.67	163.72	180.61	206.71
EMBU (SIMILAR TO OTHER TOWNS OF ITS SIZE)	136.56	150.00	165.97	181.90	204.85

➤ Main industries in Embu

There are no major manufacturing industries in Embu and Mbeere. Agricultural processing industries include;

- Three tea processing factories located the north of the town
- Macadamia nut factory in the town
- Wood and metal products workshops in the town

A-7-4. Demographical data for the past 10 years

DIVISION	SUB-LOCATION	1999	2000	2001	2002	2,003	2,004	2005	2006	2007	2008
CENTRAL	Gattituri	5,416	5,508	5,602	5,697	5,794	5,892	5,992	6,094	6,198	6,303
	Itabua	6,283	6,390	6,498	6,609	6,721	6,836	6,952	7,070	7,190	7,312
	Kiangima	3,827	3,892	3,958	4,026	4,094	4,164	4,234	4,306	4,380	4,454
	Dallas/Stadium	16,993	17,282	17,576	17,874	18,178	18,487	18,802	19,121	19,446	19,777
	Kamiu	11,357	11,550	11,746	11,946	12,149	12,356	12,566	12,779	12,997	13,218
	Njukiri	5,092	5,179	5,267	5,356	5,447	5,540	5,634	5,730	5,827	5,926
	Nthambo	3,478	3,537	3,597	3,658	3,721	3,784	3,848	3,914	3,980	4,048
<b>SUB-TOTAL (1)</b>		<b>52,446</b>	<b>53,338</b>	<b>54,244</b>	<b>55,166</b>	<b>56,104</b>	<b>57,058</b>	<b>58,028</b>	<b>59,015</b>	<b>60,018</b>	<b>61,038</b>
PART NEMBURI	Ena East	2,969	3,019	3,071	3,123	3,176	3,230	3,285	3,341	3,398	3,455
	Gatunduri	5,330	5,421	5,513	5,606	5,702	5,799	5,897	5,998	6,100	6,203
	Ena West	1,796	1,827	1,858	1,889	1,921	1,954	1,987	2,021	2,055	2,090
	Kithegi	5,789	5,887	5,987	6,089	6,193	6,298	6,405	6,514	6,625	6,737
	Kithimu	9,666	9,830	9,997	10,167	10,340	10,516	10,695	10,877	11,062	11,250
<b>SUB-TOTAL (2)</b>		<b>25,550</b>	<b>25,984</b>	<b>26,426</b>	<b>26,875</b>	<b>27,332</b>	<b>27,797</b>	<b>28,269</b>	<b>28,750</b>	<b>29,239</b>	<b>29,736</b>
GACHOKA	Kirima	2,852	2,918	2,985	3,053	3,124	3,195	3,269	3,344	3,421	3,500
	Mbita	1,655	1,693	1,732	1,772	1,813	1,854	1,897	1,941	1,985	2,031
	Nyangwa	4,063	4,156	4,252	4,350	4,450	4,552	4,657	4,764	4,874	4,986
	Kithunthiri	2,762	2,826	2,891	2,957	3,025	3,095	3,166	3,239	3,313	3,389
	Mavuria	2,793	2,857	2,923	2,990	3,059	3,129	3,201	3,275	3,350	3,427
	Gichiche	2,602	2,662	2,723	2,786	2,850	2,915	2,982	3,051	3,121	3,193
	Gachoka	5,344	5,467	5,593	5,721	5,853	5,987	6,125	6,266	6,410	6,558
	Gachuriri	4,535	4,639	4,746	4,855	4,967	5,081	5,198	5,317	5,440	5,565
	Kiamuringa	3,815	3,903	3,993	4,084	4,178	4,274	4,373	4,473	4,576	4,681
<b>SUB-TOTAL (3)</b>		<b>30,421</b>	<b>31,121</b>	<b>31,836</b>	<b>32,569</b>	<b>33,318</b>	<b>34,084</b>	<b>34,868</b>	<b>35,670</b>	<b>36,490</b>	<b>37,330</b>
<b>TOTAL = SUB-TOTAL (1)+(2)+(3)</b>		<b>108,417</b>	<b>110,443</b>	<b>112,507</b>	<b>114,610</b>	<b>116,754</b>	<b>118,939</b>	<b>121,165</b>	<b>123,435</b>	<b>125,747</b>	<b>128,104</b>

**NOTE:**

- 1) 1999 is the Census Population. 2) Population Growth Rate for Central & Nemburi Is 1.7%
- 3) Population Growth Rate for Gachoka Is 2.3% and. Source of the data is Kenya Bureau of Statistics

A-7-5. Meteorological data (air temperature, humidity, precipitation, earthquake, wind, evaporation, etc.)

*The following weather data is as collected at Embu Meteorological Station no. 90 37/050 at an altitude of 1370 m*

PERIOD	MEAN TEMPERATURES		Mean Precipitation (mm)	Mean Monthly Evaporation (1963 – 1970)		Wind Direction
	Mean Maximum (°C)	Mean Minimum (°C)		(mm)	% mean of Annual	
January	26.4	13.6	22	192	9.7	North - Easterly to North
February	29.3	13.6	24	198	10.0	North – Easterly
March	27.9	14.9	78	191	9.7	South – Easterly
April	25.8	15.8	276	164	8.3	South – Easterly to South
May	24.0	15.7	166	139	7.1	Southerly
June	22.8	14.4	28	120	6.1	Southerly
July	21.4	13.1	23	112	5.7	Southerly to South - Westerly
August	21.7	13.0	29	135	6.8	Southerly to South - Westerly
September	24.4	13.3	26	178	9.0	Southerly to Easterly
October	25.9	14.2	114	211	10.7	Southerly to South-Easterly
November	24.2	14.6	174	153	7.8	South - Easterly
December	25.7	13.6	61	178	9.0	Easterly to North-Easterly
<b>Year</b>	<b>25.0</b>	<b>14.1</b>	<b>1021</b>	<b>1971</b>	<b>100</b>	

A-7-6 Hydrological data (annual river flow with observation station or point)

Available for 20 years flow of the Rupingazi River (Note: already submitted to JICA)

#### **A-8. Infrastructure conditions of Embu and the surrounding areas**

A-8-1. Main roads (appropriate route for transportation of equipment or materials if they are imported from Japan or third countries)

Mombasa road to Nairobi road

A-8-2. Railway transport

Mombasa to Nairobi Railway line: Nairobi to Sagana Railway Branch

A-8-3. Air transport

Nairobi International Airport

A-8-4. Maritime and inland waterways

Mombassa International Port, non inland waterway

A-8-5. Port facilities

Mombassa International Port

A-8-6. Electric power supply

Available but frequently electrical power failure occurs

A-8-7. Telecommunication and information

Effective

## B. Confirmation on the Requested Project

### B-1. Components and Costs of the Requested Project

According to the application form for the Japan's Grant Aid Scheme submitted by the Kenyan side in September 2007, components and costs of the project requested by the Kenyan side are shown in Table B1-1.

**Table B1-1 Components and Costs of the Requested Project**

No.	Item Description	KSHS	US\$
1.0	New water supply scheme		
1.1	Intake weir	2,000,000	28,571
1.2	Raw/clean water gravity main pipeline	108,000,000	1,542,857
1.3	Transmission pipelines	91,875,000	1,312,500
1.4	Allow 5% for fittings	9,993,750	142,768
	Subtotal (1.0)	201,875,000	2,883,929
2.0	Water treatment works and distribution		
2.1	Treatment works complete with buildings & accessories	150,000,000	2,142,857
2.2	Rehabilitation works	5,000,000	71,429
	Subtotal (2.0)	155,000,000	2,214,286
3.0	Sewerage system		
3.1	Construction of trunk sewer lines	70,000,000	1,000,000
3.2	Construction of primary/secondary sewers	157,800,000	2,254,286
3.3	Construction of sewage treatment works	45,000,000	642,857
3.4	Building works	4,000,000	57,143
	Subtotal (3.0)	276,800,000	3,954,286
4.0	Total Construction Works (1.0) + (2.0) + (3.0)	633,675,000	9,052,500
5.0	Subtotal (4.0), 10% for institutional capacity building, meters, vehicles, etc.	63,367,500	905,250
6.0	Cost of equipment to be procured and installed in Embu		
	Water laboratory equipment computers	5,000,000	71,429
	Chemical dozers	3,000,000	42,857
	Meters and O&M equipment (including trucks and motorbikes)	10,000,000	142,857
	Computerization	4,000,000	57,143
	Subtotal (6.0)	22,000,000	314,286
	Total Requested Grant (1.0) + (2.0) + (3.0) + (4.0) + (5.0) + (6.0)	697,042,500	9,957,750

### B-2. Confirmation on the Requested Project Components

The Team has already obtained the following data. Please confirm that those data include answers for questions B-2-1 to B-2-5 below:

- ◆ Strategic Plan for the Period 2006 - 2011
- ◆ Proposal and Working Drawings for the Extension & Augmentation of the Rupingazi Intake & Gravity Pipeline Project
- ◆ Funding Proposal for Embu Water Augmentation Project
- ◆ Embu Sewerage Project-Updating of Master Plan and Preliminary Design
- ◆ Local Physical Development Plan (Long Term)
- ◆ Final Report on Assets Inventories of Selected WSS Utilities in Embu Water Supply Cluster

B-2-1. General layout or location of the above requested water supply and sewerage facilities

The following drawings/maps are available (Note: already submitted to JICA):

- General layout: attached with the application

- Drawings of Embu Sewerage Project
- Map of Water Mains
- Location maps for Rupingazi Intake and Gravity Pipeline

B-2-2. Detailed components, quantity, specifications, cost breakdown and cost basis of the requested are as follows:

Work Item	Unit	Amount	Unit Cost	Cost (Ksh)
<b>1.0 Water Supply System</b>				
1.1 Intake Weir (W: 15m)	Place	1	2,500,000	2,500,000
1.2 Raw Water Conduit (350mm-400mm )	km	12	8,000,000	96,000,000
1.3 Water Treatment Works	m3	14,000	4,250	59,500,000
1.4 Storage Tank (Cap. 8000m3)	Place	3	24,500,000	73,500,000
Storage Tank (Cap. 2000m3)	Place	1	8,000,000	8,000,000
1.5 Transmission (uPVC, 250mm-315mm)	km	9	8,000,000	72,000,000
1.6 Distribution (uPVC, 100mm-250mm)	km	16	3,820,000	61,120,000
Sub Total				372,620,000
<b>2.0 Sewerage System</b>				
2.1 Sewerage Treatment Works	m3	20,000	3,900	78,000,000
Building Works for STW	LS	1	4,000,000	4,000,000
2.2 Trunk Sewer (uPVC, 600mm)	km	10	10,500,000	105,000,000
2.3 Primary/secondary Sewers (200mm-400mm)	km	36	3,194,444	115,000,000
Sub Total				302,000,000
<b>3.0 Procurement</b>				
3.1 Equipment for Capacity Building	LS	1	5,000,000	5,000,000
3.2 Water Laboratory Equipment	LS	1	5,000,000	5,000,000
3.3 Chemical Dozers	LS	1	3,000,000	3,000,000
3.4 Water Meters and O&M Equipment	LS	1	10,000,000	10,000,000
3.5 Computerization	LS	1	1,000,000	1,000,000
Sub Total				24,000,000
<b>Total</b>				<b>698,620,000</b>

B-2-3. Determination basis of the above requested items

The urgently requested water sector development project is in accordance to Tana WSB's strategic plan, EWASCO's strategic plan and MWI's strategic plan 2005-2009.

B-2-4. Situation of land acquisition for the candidate sites of the above requested facilities

For Water Supply System: acquired land and public land spaces

For Sewerage System: sewer line is in public space and the area of STW is planned to be obtained with compensation.

B-2-5. Budgetary arrangements for the land acquisition for the above facilities

The Government of Kenya will make the necessary budgetary provision for acquiring land for Sewage Treatment Works

**B-3. Design Data for the Requested Project in Embu City**

**Provide the following design data for the requested project:**

**Table B3-1 Design Data for the Requested Project**

No.	Item	Unit	Design Data		
			2007	2015	2024
1	Population in the jurisdiction area of Embu		123,435	156,987	199,712
2	Annual population growth rate for design population	%	1.7 /2.3	1.7 /2.3	1.7 / 2.3
3	Population in the service area	%	123,435	156,987	199,712
4	Service ratio	%	42	100	100
5	Served population		51,945	156,987	199,712
6	Daily average per capita consumption	LCD* <sup>1</sup>	150	150	150
7	Rate of loading* <sup>2</sup>	%	25	25	25
8	Leakage ratio (or UFW ratio)	%	45	35	30
9	Daily maximum production per capita water supply	LCD	80	140	120
10	Daily maximum water supply	m <sup>3</sup> /day	110	125	150

Notes: 1. LCD = Liter per capita per day

2. It is assumed that the total water production from 2010 to 2024 will be constant at 22,000cu.m per day

3. Rate of loading = Daily average distributed volume/Daily maximum distributed volume

**C. Water Supply Service Conditions in Embu by TWSB/EWASCO****C-1. Current Situation of Water Supply Service by TWSB/EWASCO****C-1-1. Institutional Situation**

- (1) Describe mandate, function and responsibility of TWSB in water supply and sewerage services of Embu.

Please refer to the Interim Report of JICA Water Sector Development Expert prepared on November 2007 (Note: already submitted to JICA).

- (2) Describe mandate, function and responsibility of EWASCO in water supply and sewerage services of Embu.

Please refer to the Interim Report of JICA Water Sector Development Expert prepared on November 2007 (Note: already submitted to JICA).

- (3) Confirm the contents and type of the contract between TWSB and EWASCO.

TWSB HAS ENTERED INTO A SIX YEAR RENEWABLE WATER SERVICE PROVIDERS AGREEMENT AS REQUIRED BY WATER ACT 2002

- (4) Provide latest organization chart of Tana Water Services Board (TWSB) and Embu Water and Sanitation Company (EWASCO).

Please refer to the Interim Report of JICA Water Sector Development Expert prepared on November 2007 (Note: already submitted to JICA).

- (5) Provide staff number with job description (manager, engineer, technician, administrator, etc.) and number in each department and section.

Please refer to the Interim Report of JICA Water Sector Development Expert prepared on November 2007 (Note: already submitted to JICA).

## C-1-2. Situation of Water Supply Service

- (1) Provide the drawing showing the water distribution districts in Embu.  
Available (Note: already submitted the partial drawings to JICA)
- (2) Make a narrative description of the current situation of drinking water supply by service district, season and customer type.

For years Embu Municipality and its environs experienced water shortages and inadequate sewage services. More over, water was rationed and water related diseases were rampant and raw sewage overflows into the environment were common. As a result there was an urgent need and pressure was brought to bear on the Company by various parties to seek redress to the problem of water supply and waste water disposal. Financial resources available to the Company were small but the consumer was in need. The Company prepared a short term water supply project proposal and using it was able to borrow materials from a Manufacturer and laid a new 315/350mm diameter water pipeline from Rupingazi River. The pipeline has a maximum production capacity of 10,000cu.m/day.

The new potable water supply provided to the consumer through this pipeline gave hope and those who are currently not receiving water in the neighbourhood are very optimistic that EWASCO will solve their water supply needs. Consequently the water supply area has organically grown to include not only Embu Municipality but also the neighbouring Gachoka Division of Mbeere District. Currently through public demand Water supply is being extended from Embu to Gachoka and the resulting water demand is currently estimated at 19,000cu.m per day. Hence, the demand exceeds available production by 9,000cu.m per day and the deficit will grow to some 14,000cu.m per day by year 2015. The Company is not able to raise the financial resources to increase production to meet the current and the projected water demand. Therefore, there is need for financial support.

- (3) Fill in Table C1-1 regarding the current situation of water supply service (2006) in Embu.

**Table C1-1 Current Situation of Water Supply Service in Embu (2006-2007)**

No.	Items	Answer
1	Total population in Embu Central Division	59,015
2	Population in Supply Area	123,435
3	Served population (by EWASCO)	51,945
4	Service population ratio	42%
5	Service area (provide a water service area map.)	54km <sup>2</sup>
6	Daily average per capita consumption (planned)	150LCD
7	Daily average per capita consumption (actual)	102LCD
8	Daily maximum supply per capita consumption (planned)	LCD
9	Daily maximum supply per capita consumption (actual)	LCD
10	UFW ratio Leakage ratio (describe the estimation method or source)	45%
11	Non-revenue water ratio	%
12	For the unserved area: - Un-served areas - Water charge in the un-served area: provided by vendors	Shown in map attached Kshs 10 – 20 /20litres

C-1-3. Fill in Table C1-2 regarding the present water supply conditions.

As shown in Table C1-2 below

C-1-4. If there are other water supply systems than TWSB/EWASCO in Embu, describe them with service areas and served population and service level.

Ngandori Water Users Association for rural water supply.

C-1-5. If there are private water supply systems for such as hotels, commercial entities, industry and water committee of community, explain them and provide the quantity of water production, if available.

None

C-1-6. Water tariff system including tariff structure, billing system and collection system

➤ Countermeasures against arrears (imposing fines, disconnecting by cut-off, etc.)

Tariff structure has been determined by MWI (Kenya Gazette Supplement No.51). In general, a monthly domestic water tariff at Embu is categorized below:

Non metered household	Ksh. 200
Basic charge (less than 10 m <sup>3</sup> ) for metered household	Ksh. 200
Excess charge per m <sup>3</sup> (10 m <sup>3</sup> to 20 m <sup>3</sup> ) for metered household	Ksh. 25/ m <sup>3</sup>
Excess charge per m <sup>3</sup> (20 m <sup>3</sup> to 50 m <sup>3</sup> ) for metered household	Ksh. 30/ m <sup>3</sup>
Excess charge per m <sup>3</sup> (50 m <sup>3</sup> to 100 m <sup>3</sup> ) for metered household	Ksh. 45/ m <sup>3</sup>
Excess charge per m <sup>3</sup> (100 m <sup>3</sup> to 300 m <sup>3</sup> ) for metered household	Ksh. 75/ m <sup>3</sup>
Excess charge per m <sup>3</sup> (more than 300 m <sup>3</sup> ) for metered household	Ksh. 100/ m <sup>3</sup>
Kiosk with meter per m <sup>3</sup>	Ksh. 15/ m <sup>3</sup>
Kiosk without meter	Ksh. 2 per 20 liters
Bulk water sales per m <sup>3</sup>	Ksh. 15/ m <sup>3</sup>
School (less than 600 m <sup>3</sup> )	Ksh. 20/ m <sup>3</sup>
School (600 m <sup>3</sup> to 1200 m <sup>3</sup> )	Ksh. 25/ m <sup>3</sup>
Other learning institution (not more than 1200 m <sup>3</sup> )	Ksh. 25/ m <sup>3</sup>
Charge per m <sup>3</sup> in excess of permissible water demand	Ksh. 45/ m <sup>3</sup>

C-1-7. Situation of customers' information management

➤ By manual or computerization: by computerization

C-1-8. Breakdown of water charge by category (domestic, commercial, industrial, governmental, etc.)

**Table C1-2 Present Water Supply Conditions in Embu**

No.	Service Area	Water supply service condition	
		Approximate water pressure at customer tap (m)	Water supply frequency and hours in a day
1	MUNICIPALITY LOCATION	Minimum 10 Maximum 60	24
2	MBETI NORTH LOCATION	Minimum 10 Maximum 90	0 TO 24
3	GACHOKA DIVISION	0	0

- ◆ Note that only a part of Mbeti North is served with potable piped water
- ◆ Please provide maps showing the service districts in the table.

- ◆ If potable water is delivered by water tankers, please mention delivered amount (daily or monthly), service population, amount delivered per person or household, selling price, etc.

## C-2. Water Distribution Volume by Source in Water Supply Service by EWASCO

### C-2-1. Annual water distribution volume by source

Fill in Table C2-1 showing annual total water distribution volume and its breakdown by source for the past three (3) years.

**Table C2-1 Annual Distribution Volume by Source**

(Unit: m<sup>3</sup>/year)

Source/system name	2004	2005	2006
1. Rupingazi source	-	-	3.2 Million
2. Kapingazi source	0.9 Million	0.9 Million	-
3. Bulk water from Ngandori WA	1.1 Million for Rural	1.1 Million for Rural	1.1 Million for Rural
4. Other source		-	-
<b>Total</b>	<b>2.0 Million</b>	<b>2.0 Million</b>	<b>4.3 Million</b>

Note: NNWA means Ngandore-Nginda Water Association

### C-2-2. Monthly and daily water production by source

Note: please refer to the Interview memo for EWASCO and the Interim Report prepared by JICA Water Sector Development Expert (Note: already submitted to JICA). Summarize below:

Rupingazi River source: 9,000 to 10,000 m<sup>3</sup>/day on average

Fill in Table C2-2 regarding monthly and daily water production by source for the year 2006 or fiscal 2006.

**Table C2-2 Monthly and Daily Water Distribution Volume by Source (Year or Fiscal 2006)**

No.	Source Name	Jan	Feb	Mar	June	July	Aug	Sep	Oct	Nov	Dec
1	Rupingazi source										
2	Kapingazi source	73880	74032	76350	80312	84971	83359	79162	73614		
3	Bulk water from NNWA	34895	22321	30006	24601	32293	30944	27663	26222		
4	Other source										
	<b>Total (monthly)</b>	<b>108775</b>	<b>96353</b>	<b>106356</b>	<b>104913</b>	<b>117264</b>	<b>114303</b>	<b>106825</b>	<b>99836</b>		
	<b>Average (daily)</b>	<b>3,509</b>	<b>3,441</b>	<b>3,431</b>	<b>3,497</b>	<b>3,783</b>	<b>3,687</b>	<b>3,561</b>	<b>3,221</b>		

### C-2-3. Bulk water supplied to Embu by Ngandore-Nginda Water Association

Provide following data and information regarding the bulk water supply to Embu by Ngandore-Nginda Water Association (NNWA).

- ◆ NGANDORI NGINDA STOPPED SUPPLYING WATER TO EWASCO IN November 2006
- (3) Future plan for the bulk water supply to Embu
  - THERE ARE NO PLANS FOR BULK WATER SUPPLY TO EMBU FROM NNWA
- (4) Cost of the bulk water supply (Ksh/m<sup>3</sup>)
  - ✧ NOT APPLICABLE ANY MORE
- (5) Contents of the contract between NNWA and EWASCO



- ❖ BULK WATER SUPPLY MEMORANDUM OF UNDERSTANDING BETWEEN NNWA AND EWASCO IS NO LONGER APPLICABLE

### **C-3. Existing Facilities for Embu Water Supply**

- C-3-1. Provide data of water quality for water sources (or raw water) of the existing water supply facilities
- Monthly data of water quality such as temperature, turbidity, color, pH, alkalinity, BOD, total coliforms, etc., for the last 3 years.

See Section C-5-5 below

- C-3-2. Provide the following data for the existing raw water intake station, water treatment plant, storage tank (or service reservoir), distribution pumping station and booster pumping station.

Note: please refer to the Interview memo for EWASCO and the Interim Report prepared by JICA Water Sector Development Expert (Note: already submitted to JICA).

Data for the present condition of existing facilities providing water to the supply area was constructed in 2006.

- (1) Major specifications of each facility (treatment capacity, treatment method, discharge quantity and head of pump, etc.)
- (2) Location map(s) showing all the existing water supply facilities
- (3) Schematic diagram of the above system
- (4) Construction year of each facility

- C-3-3. Conveyance pipeline, transmission mains, distribution mains and distribution network

Note: please refer to the Interview memo for EWASCO and the Interim Report prepared by JICA Water Sector Development Expert (Note: already submitted to JICA).

- (1) Provide location map of the pipelines and distribution network.
- (2) Fill in Table C3-1 regarding the pipelines and distribution network.
- (3) Explain countermeasures for leakage currently applied in EWASCO.

Patchworks of pipeline and water consumption meter installation, however we cannot cope with UFW due to lack of budget and technology. We, therefore, requested the technical cooperation for “Management of Un-accounted For Water (UFW) for Effective and Economical Water Supply in Kenya” to JICA.

**Table C3-1 Details of Conveyance Pipeline, Transmission Mains, Distribution Mains and Distribution Network**

	Conveyance	Transmission	Distribution
Major pipeline length by diameter	6 km D350	6 km D 315	*
Type of piping materials	uPVC		
Year of construction	2006		
Leakage ratio and major causes			
Length of distribution pipes installed in 2006 (or fiscal 2006)			
Location of pipe fittings such as valves, flow meters, air valves, hydrants, etc.			

## Notes

- \* - Sizes and lengths are as in the Inventory already submitted
- Conveyance means gravity main from Intake to Treatment Works
- Transmission is from Treatment Works to the Main Storage Tanks

## C-3-4 Service facility

Fill in Table C3-2 regarding service connections for the past three (3) years.

**Table C3-2 Number of Service Connection by Customers**

(Unit : number)

Type of connection	2004-2005		2005-2006		2006-2007	
	No.	Consumption (m <sup>3</sup> /year)	No.	Consumption (m <sup>3</sup> /year)	No.	Consumption (m <sup>3</sup> /year)
Household						
Industrial						
Commercial						
Public use						
Others ( )						
Public tap						
Total					7927	
Water tanker						

Details of categories to be submitted later

**C-4. Current Operation, Maintenance and Management**

C-4-1. Describe current operation methods of the distribution system aimed at relieving water shortages in Embu, for example, water rationing by time or district.

Currently no water rationing

C-4-2. Describe major operation and maintenance problems at the facility.

Poor control of water loss through underground leakages occasioned by supply network, poor workmanship in pipe construction and lack of monitoring equipment and expertise to detect points of leakage.

In-adequate tools/equipment and workshop facilities as well as in-adequate stores' space and stocks for maintenance purpose

C-4-3. Provide the list of equipments owned by TWSB/EWASCO for operation and maintenance work such as bulldozers, wheel loaders, vacuum cleaning vehicles, trailers, pick-up trucks, excavators, flow meters, leak detectors, etc.

- 2no. pick up trucks

2. 6no. motor-cycles
3. 1no. sewage vacuum exhauster
4. 2no. mobile water pumps
5. Ordinary hand tools: spanners, fork jembes etc.

C-4-4. Procurement of chemicals in 2006 (fill in Table C4-1)

**Table C4-1 Procurement of Chemicals in 2006**

No.	Type of chemicals	Total Quantity	Total Cost	Domestic or Imported country
1	Alum	16,290		Domestic
2	Soda Ash	10,633		Domestic
3	Chlorine	2,135	117,425	Domestic

C-4-5 Consumption of electric power and fuel in operation and maintenance by EWASCO

Kshs 25,000

C-4-6 Other information related to O&M

(1) Maintenance of customers' water meters

No meter repair workshops and tools. Meters are serviced by technicians in the field

- ◆ Method and place for water meter repair

(2) Method for water pressure check

Yet to acquire pressure testing equipment

(3) Inventory control and asset management

EWASCO possesses a small store. Procurement and stores issues control system is in place: stores procurement/issues are undertaken in accordance to the procurement act in which procurement controls are in built.

- ◆ Situations for storage warehouse
- ◆ Situations for material control

(4) Human resources development system

A Human Resource Officer is in place. Training of staff has been through seminars and occationary through self or company sponsoring to Colleges. However, the Company is in the process of procuring services of a Human Resource Consultant to evaluate the Company's Human Resource with a view to coming up with an appropriate organizational structure, staffing levels, training needs etc. by June 2008

- ◆ Training method (program, place, etc.)
- ◆ Training schedule

**C-5. Water Quality Control**

C-5-1. Provide following data for current water quality control in Embu.

**Water analysis items/Frequency/Monitoring institution**

- ◆ Water Analysis Items

- PH
- Temperature
- Turbidity
- Residual Chlorine
- Total Coliforms
- Feacal Coliforms
- Conductivity
- ◆ Frequency
  - TWSB – 4 times per year
  - EWASCO - AS detailed in C-5-2
- ◆ Monitoring by TWSB – Quarterly (4 times a year)

C-5-2. Describe methods for monitoring water quality.

- (1) Raw water at water sources
- (2) Raw water at Intake – At least once per month
- (3) Raw water at Treatment Plant – At least 6 times per day
- (4) Treated water at Treatment Works – bacteriological test – At least once per month
- (5) At storage tank – 6 times per day
- (6) Along the distribution points - Minimum 3 times a week.
- (7) Bacteriological test for treated water – At least once per month

	Description	Data
1	Sampling point (location)	
2	Sampling frequency	
3	Items for water quality analysis	
	- By EWASCO	
	- By other laboratory	

(2) Treated water at water treatment plant

	Description	Data
1	Sampling point (location)	
2	Sampling frequency	
3	Items for water quality analysis	
	- By EWASCO	
	- By other laboratory	

(3) Treated water in the distribution network

	Description	Data
1	Sampling point (location)	
2	Sampling frequency	
3	Items for water quality analysis	
	- By EWASCO	
	- By other laboratory	

(4) Treated water at water taps

	Description	Data
1	Sampling point (location)	
2	Sampling frequency	
3	Items for water quality analysis	
	- By EWASCO	
	- By other laboratory	

C-5-3. Describe in detail water quality testing building and equipment necessary for water quality control.

Small laboratory at treatment works but not adequate in terms of space and equipment. List of required equipment attached

C-5-4 Provide following data for water quality analysis staff

- ◆ Number of chemist and biochemist - 1 No.
- ◆ Experience and capability of chemist and biochemist – Graduate of biochemistry with 5 years experience

C-5-5. Provide monthly water quality data at water sources (Kapingazi River and Rupingazi River), Mukango and Kapingazi treatment plants (treated water), and service taps for the past 3 years.

<b>2005</b>				
	<b>KAPINGAZI AT SOURCE</b>		<b>KANGARU T W (TREATED)</b>	
	<b>pH</b>		<b>pH</b>	<b>RESIDUAL CL</b>
<b>Jan</b>	6.8		7	0.8
<b>Feb</b>	6.7		7.1	0.7
<b>Mar</b>	6.8		7.2	1
<b>Apr</b>	6.6		7.4	0.7
<b>May</b>	7.2		7.4	1.2
<b>Jun</b>	6.8		6.8	1
<b>Jul</b>	6.8		7.1	1.2
<b>Aug</b>	6.5		7.2	1
<b>Sep</b>	6.8		7.2	0.8
<b>Oct</b>	6.7		7.2	1
<b>Nov</b>	6.5		7.1	0.8
<b>Dec</b>	6.6		7.2	1

## YEAR 2006

KAPINGAZI AT SOURCE			RUPINGAZI AT SOURCE		KANGARU TREATMENT PLANT (TREATED)			PROVINCIAL GENERAL HOSP (TAP)		
	TUR-BIDITY	pH	TUR-BIDITY	pH	TUR-BIDITY	pH	RES-IDUAL CL	TUR-BIDITY	pH	RES-IDUAL CL
Jan						7.02	0.7		7.2	0.6
Feb	8.06	7.77			7.4	7.2	0.6	5.6	7.25	0.1
Mar	9.68	6.99			6.86	6.75	0.5	5.8	7.01	0.4
Apr	312	7.64	21.9	7	37.9	6.87	0.4	20.3	7.44	0.5
May	572	6.5	7.85	6.8	17	6.56	0.2		6.94	0.2
Jun		7				6.87	1		7.23	0.1
Jul						7.13	0.8		7.21	0.6
Aug	13.5	7.69			6.67	7.39	0.7	6.61	7.31	0.1
Sep	6.67	7.09	4.65	7.33	5.41	7.39	0.6	5.01	6.96	0.4
Oct	389	7.03			8.3	7.43	0.6		7.39	0.3
Nov	184	7.17	7.04	7.19	11.2	7.52	0.7	6.11	7.04	0.2
Dec					7.2	7.29	0.7	5.99	7.11	0.3

## 2007

## RUPINGAZI AT SOURCE

	Turbidity	pH	Conductivity	Total Coliforms	Feacal Coliforms
Jan	6.36	6.87		93	Nil
Feb	6.06	7.16			
Mar	19.3	7.28			
Apr	394	6.98			
May	25.7	6.95			
Jun	6.29	6.8	22.26	240	39
Jul	4.56	7.25	54.4	>2400	15
Aug	12.3	7.19			
Sep	3.11	6.17	43.1	75	39
Oct	6.24	6.61			
Nov	4.9	6.73	28.94	>2400	15
Dec					

## GOVERNMENT TRAINING INSTITUTE: 2007 (TAP)

	Turbidity	pH	Residual Cl	Conductivity	Total Coliforms	Feacal Coliforms
Jan	4.91	7.01	0.3		Nil	Nil
Feb	4.31	7.16	0.1			
Mar	9.67	7.5	0.1			
Apr	26.8	6.89	0.15			
May	30	7.3	0.1			
Jun	11.7	7.26	0.2	46.5	Nil	Nil
Jul	4.17	7.32				
Aug						
Sep	3.87	6.47	0.2	42.8	Nil	Nil
Oct	2.44		0.2			
Nov	7.35	7.14	1	56.5	Nil	Nil
Dec			0.4			

<b>KANGARU TREATMENT PLANT(TREATED): 2007</b>						
	<b>Turbidity</b>	<b>pH</b>	<b>Residual Cl</b>	<b>Conductivity</b>	<b>Total Coliforms</b>	<b>Feecal Coliforms</b>
<b>Jan</b>	4.85	7.2	0.7			
<b>Feb</b>	5.18	7.14	0.8			
<b>Mar</b>	11.3	7.66	0.7			
<b>Apr</b>	22.6	7.24	0.8			
<b>May</b>	18.3	7.22	0.7			
<b>Jun</b>	7.42	6.88	0.4	44.5	Nil	Nil
<b>Jul</b>	3.09	7.67	1			
<b>Aug</b>	6.97	7.64	0.8			
<b>Sep</b>	6.95	6.56	0.7	53.5	Nil	Nil
<b>Oct</b>	3.94	7.21	0.6			
<b>Nov</b>	3.58	7.14	0.4	44	Nil	Nil
<b>Dec</b>			0.8			

<b>MUKANGU TREATMENT PLANT(TREATED): 2007</b>						
	<b>Turbidity</b>	<b>pH</b>	<b>Residual Cl</b>	<b>Conductivity</b>	<b>Total Coliforms</b>	<b>Feecal Coliforms</b>
<b>Jan</b>	5.73	6.74	0.4		Nil	Nil
<b>Feb</b>			0.5			
<b>Mar</b>			0.6			
<b>Apr</b>			0.6			
<b>May</b>			0.6			
<b>Jun</b>	7.66	6.93	0.5	39.1	Nil	Nil
<b>Jul</b>			0.5			
<b>Aug</b>			0.6			
<b>Sep</b>	5.04	6.47	0.2	42.8	Nil	Nil
<b>Oct</b>			0.7			
<b>Nov</b>	4.62	6.91	0.5	33.3	Nil	Nil
<b>Dec</b>			0.8			

C-5-6. Provide the list of water quality analysis equipment owned by TWSB.

Standard Water Testing Unit

C-5-7. Describe the network system or organization for water quality control in the whole of Kenya including Embu.

Ministry of Water and Irrigation

C-5-8. Provide pollution sources and polluted places, if available.

Agrochemicals used in the farms which get eroded into the rivers. Feecal materials from poorly constructed or maintained sanitary facilities.

C-5-9. Provide quantitative data for water pollution in Embu City, such as infection rate of water borne disease, infant death rate, etc.

**Data is being compiled and will be provided later**

#### **C-6. Financial Status of TWSB and EWASCO**

The Team has already obtained following data for the financial status of EWASCO.

- ◆ Financial Statements for year ended 30 June 2007 (issued by EWASCO)

◆ Annual Report and Financial Statements 2005/2006 (issued by EWASCO)

Please provide similar financial data for TWSB.

Note: please refer to the Interim Report prepared by JICA Water Sector Development Expert (Note: already submitted to JICA).

The team will ask question(s) about the financial situations of TWSB and EWASCO after studying above documents, if any.

**D. Water Supply Service Conditions in other areas than Embu by TWSB  
(whose water source is Rupingazi River)**

**D.1 Summary of Water Supply Service**

Please provide following data and information regarding water supply service in other areas than Embu by TWSB whose water source is Rupingazi River.

Note: please refer to the Interview memo for EWASCO and the Interim Report prepared by JICA Water Sector Development Expert (Note: already submitted to JICA).

D-1-1. Service area (km<sup>2</sup>) with administrative area map or service area map

Service area: 54 km<sup>2</sup>, Map is available.

D-1-2. Served population

Population served: 52,000 in 2007

D-1-3. Number of customer by category (domestic, commercial, industrial, governmental, etc.)

Total number of subscribers: 9,000 in 2007

D-1-4. Water production volume (m<sup>3</sup>/day, m<sup>3</sup>/month, m<sup>3</sup>/year)

9,000 to 10,000 m<sup>3</sup>/day on average

D-1-5. Operation and maintenance system (or organization)

Please refer to the Interview memo for EWASCO and the Interim Report prepared by JICA Water Sector Development Expert (Note: already submitted to JICA).

D-1-6. Problems related to the above operation and maintenance

There are no major organization difficulties in operations and maintenance except for required staff skills upgrading

D-1-7. History of the existing water supply system (construction, maintenance, improvement/rehabilitation, etc.)

Please refer to the Interview memo for EWASCO and the Interim Report prepared by JICA Water Sector Development Expert (Note: already submitted to JICA).



## **E. Future Plan and Ongoing Project for Water Supply Improvement in Embu**

### **E-1. Water Supply Improvement Plan**

E-1-1. Provide improvement plan for Embu water supply other than the requested project, if any.

EWASCO is continuously rehabilitating old pipe-network.....

E-1-2. Describe the investment plan of TWSB and its cost for water supply improvement for Embu.

### **E-2. Ongoing Water Supply Project**

Provide data and information for the urgent water supply project in Embu as follows:

- ◆ Data for design and cost for Mukangu water treatment plant which is now under construction  
Please refer to the Interview memo for EWASCO and the Interim Report prepared by JICA Water Sector Development Expert (Note: already submitted to JICA).
- ◆ Data for water intake facility (capacity, structure details, construction cost, etc.)  
-Capacity of the intake is 11,000cu.m/day and can be upgraded to 24,000cu.m/day  
The Structure is built of concrete and is a side weir  
-It was constructed at cost of Kshs250,000
- ◆ Data for water conveyance pipeline (length, diameter, construction cost, etc.)  
A 12km uPVC, 350/315mm diameter pipeline was constructed from Rupingazi Water Intake at Kitharimandu to Kangaru Treatment Works. The Cost of the pipeline is estimated at Kshs .31,000,000
- ◆ Construction schedule of the ongoing project  
-The pipeline was constructed from October to November 2006. Chambers for valves were completed in April 2007.  
-Sedimentation Tanks are to be completed by February 2008 and Rapid Sand Filters by Sept.2008
- ◆ Coordination and demarcation between the requested project and the ongoing project  
The requested project will be implemented independent of the ongoing project: a separate intake, a separate conveyance pipeline running parallel to the ongoing project and a separate intake but sharing the same grounds. Any distribution lines required will run independently up to distributions tanks. The linking of the requested project distribution system to the existing have to be agreed on in order to maintain integrity of the requested project.

## **F. Sewerage Service Conditions in Embu**

Provide information and/or data for sewerage system in Embu.

Note: please refer to the Interview memo for EWASCO and the Interim Report prepared by JICA Water Sector Development Expert (Note: already submitted to JICA).

F-1. Service population and service area

Service population: 9,000 to 10,000 and service area: 4.5 km<sup>2</sup>

F-2. Current sewerage system and future plans, if any

Please refer to the Interview memo for EWASCO and the Interim Report prepared by JICA Water Sector Development Expert (Note: already submitted to JICA).

F-3. Location maps of the sewerage facility

Please refer to the Interview memo for EWASCO and the Interim Report prepared by JICA Water Sector Development Expert (Note: already submitted to JICA).

F-4. Conditions of sewer trunk line and network

The existing sewer trunk lines and network were constructed in 1972. The pipes are aging but are still in serviceable state.

F-5. Conditions of sewage treatment plant facilities and their capacity

Please refer to the Interview memo for EWASCO and the Interim Report prepared by JICA Water Sector Development Expert (Note: already submitted to JICA).

Capacity of the existing treatment plant: less than 3,000 m<sup>3</sup>/d

F-6. Discharge points of treated and untreated sewage

The treated sewage is discharged to Rupingazi River just to the down stream side of Nairobi-Embu Road Bridge

F-7. Wastewater charge

50% of water charge

## **G. Environmental and Social Considerations**

Provide data and information related to the environmental and social considerations as follows:

- G-1. Laws and legislations on environmental issues in general - EMCA
- G-2. Environmental assessment (IEE/EIA)
- G-3. Land acquisition and involuntary resettlement – Land Act
- G-4. Social and economic conditions in the project areas (Embu City and the surrounding areas)
- G-5. Natural environment
- G-6. Environmental pollution

The details of the above questions will be explained by the Team member for environment and social considerations at the beginning of this survey. There will be many authorities concerned for the environmental and social considerations. Therefore, the implementing agency (TWSB) is kindly requested to coordinate between the Team and the related authority.

The authorities related to the above questions are the following:

- ◆ Ministry of Environment and Natural Resources (MENR)
- ◆ Ministry of Water and Irrigation (MOWI)
- ◆ Embu Municipality
- ◆ Tana Water Services Board (TWSB)
- ◆ Embu Water Supply and Sanitation Company (EWASCO)
- ◆ Meru Water and Sewerage Services Registered Trustee (MEWASS)
- ◆ International aid organization (World Bank, ADB, GTZ, etc.)

## **H. Laws, Design Criteria, etc.**

- H-1. Water laws and regulations: 2002 Water Acts
- H-2. Water rights: managed by WRMA
- H-3. Design criteria for water supply and sewerage facilities  
Manual book for plan and design is available
- H-4. Standard specifications of water supply and sewerage works  
As for water supply, the manual book is available, while standard for sewerage is adopted from WHO and developed countries.
- H-5. Decentralization law  
MWI has been headed from decentralization to commercialization based on 2002 Water Acts, Sector Reform policy and SWAP.
- H-6. Urban development law  
Land Use Planning

## **I. Companies Capable of Natural Conditions Survey and Construction Works**

- I-1. Topographic survey.
- I-2. Soil investigation – Ministry of Works, Materials Branch
- I-3. Water quality survey. There are various water quality consultants who can undertake this task
- I-4. Laboratories for water quality analysis. Kenya Bureau of Standards, Ministry of Water Central Testing Laboratory, Government Chemist
- I-5. Water source survey. Water Resources Consultants
- I-6. Socio-economic survey – Socioeconomic consultants
- I-7. Construction work for civil structures and buildings. Various Registered Contractors
- I-8. Pipe laying work - Various Registered Contractors

## **J. Construction Material and Cost**

Provide following data and information regarding construction work in Kenya:

- J-1. List of flow meters (or macro meters), water meters, valves and pipe materials available in Kenya
- J-2. Manufacturers or agents for pipe materials, pumps, valves
- J-3. Unit price of the above materials – Price catalogue for pipes available and can be obtained at the various factories
- J-4. Unit price for construction materials for waterworks – Unit cost price document available
- J-5. Lease cost for construction machines, vehicles, etc., for waterworks. This can be made available
- J-6. Customs restriction on construction materials to be imported from Japan or the third countries. There are no restrictions

## **K. Current Situation of Water Supply and Sewerage Services in Meru City**

The Team will make a field survey of the current situation for the operation and maintenance by Meru Water and Sewerage Services Registered Trustee (MEWASS) in Meru City where the Japan's Grant Aid project was implemented in 2002.

Therefore, TWSB is requested to make arrangements for their field survey by the Team in Meru City.

As for this question, it is noted that the team should refer to the Interview memo for EWASCO and the Interim Report prepared by JICA Water Sector Development Expert (Note: already submitted to JICA).

## **添付資料 5 水質分析機関調査**



## 水質分析機関調査

1. Kenya bureau of standards

訪問日時：2008年8月7日

面談者：Mr.Charles wachirac

コメント

- ・ 化学分析や砒素や水銀といった重金属分析に対応できる分光光度計、AAS等のハードを備えているとのこと。(直接分析室は見えない)

2. Water testing laboratory at Kangaru, Ministry of water and irrigation

(水灌漑省カンガル浄水場内水質試験室)

写真あり

訪問日時：2008年8月19日

面談者：写真の女性 (Ministry of water and irrigation) , Mary Nungari(EWASCO)

コメント

- ・ 現在、MKEPP (Mount Kenya East Pilot Project)を IFAD(International for Agricultural Development)と実施中
- ・ プロジェクトの必要機材として以下の機材を保有  
微生物分析一式(オートクレーブ、インキュベータ、培地各種、ピペット、シャーレ他)、蒸留装置(現在は箱の中に保管。今後設置予定)、pHメータ、濁度計、冷蔵庫、分光光度計(未使用)他
- ・ EWASCOは必要時に、有償で分析を委託している。微生物分析は1サンプルKsh2,000、pHや濁度等の分析は、1サンプルKsh1,000。

3. Civil construction and environmental engineering dep., Jomo Kenyatta university of agriculture & technology

(ジョモケニヤッタ大学土木環境学部)

写真あり

訪問日時：2008年8月29日 9:00~10:00

面談者：Charles Kahumbu karugu

コメント

- ・ 1997-2000にJICAプロジェクト「Third country group training program」が実施された。現在は特にプロジェクトはない。
- ・ JICA機材供与品が多数。
- ・ Food science dep.も、多数JICAが機材供与を行っている。
- ・ 訪問時、学生はほとんどいなかった。実験器具も壊れてはいないものの、使用している感じではない。

4. Head of central water testing laboratory, Ministry of water and irrigation

(水灌漑省中央水質試験室)

写真あり

訪問日時：2008年8月29日 11:00~12:00

面談者：Mrs.Josephine M Ngari、Mr. Jackson kingori、Mrs.Celliwe A Obuya

コメント

- ・ 室長(John Muasya)は、コンタクトしていたが不在であった。
- ・ スタッフは5人以上おり、多数の分析が実施されており非常にアクティブな試験室であった。
- ・ pH、温度、濁度、色度、硬度、アルカリ度、浮遊性物質、溶解性物質、硫酸イオン、塩化物イオン、フッ素、大腸菌群、鉄、マンガン、アンモニウムイオン、硝酸イオン、重金属等を分析するための、電極、滴定装置、分光光度計、原子吸光装置等を備えており、WHO ガイドラインに明記された水質項目を測定できるハードを備えている。
- ・ 大腸菌群の測定は、Idexx.Lab 製キットを仕様。装置として、Quanti-tray/2600、紫外線装置、Quanti-tray sealer があった。1 サンプル試薬だけで約 Ksh 1,000 かかるとのこと。
- ・ 同じ省庁間の連携は特別ないようである。
- ・ 機材の供与元を尋ねたが、本省が統括しており不明であった。

5. Environment health Lab., department of civil & construction engineering, university of Nairobi  
(ナイロビ大学 土木建築学科 環境衛生研究室) 写真あり

訪問日時：2008年8月29日 11:00～12:00

面談者：Joseph Thiomgo

コメント

- ・ 学長(Dr.P.M.A Odira)は、会議のため、代わりの方にアテンドしていただいた。
- ・ 重金属分析等は、原子力学科に依頼して測定可能とのこと。その他の化学分析は当学科で対応可能とのこと。
- ・ 実験室も暫く使用されている感じがなく、学生も全く見なかった。



**Water testing laboratory at Mukangu, Ministry of water and irrigation**

		
<p>薬品庫</p>	<p>分光光度計他</p>	<p>インキュベータ</p>
		
<p>培養ビン</p>	<p>蒸留装置、BOD 測定器他</p>	

**Civil construction and environmental engineering dep., JOMO kenyatta university of agriculture and technology**

		
<p>水質分析室 1</p>	<p>遠心機、ジャーテスター</p>	<p>測定法</p>
		
<p>原子吸光装置</p>	<p>インキュベータ</p>	<p>ガスクロマトグラフ</p>
		
<p>分光光度計</p>		

Head of central water testing laboratory, Ministry of water and irrigation

		
COD 分析	アルカリ度測定	フッ素測定(イオン電極)
		
ジャーテスター	硫酸イオン測定	大腸菌群測定
		
インキュベータ	原子吸光測定装置	

Environment health Lab., department of civil & construction engineering, university of Nairobi

		
ナイロビ大学	ジャーテスター	分光光度計
		
試験室		

## 添付資料 6 原水水質データ



# REPUBLIC OF KENYA



ガンドリーギンダ取水

## MINISTRY OF WATER AND IRRIGATION Central Water Testing Laboratories

Tel. No. (020) 553834, 553957  
P.O. Box 30521-00100,  
NAIROBI

### PHYSICAL/CHEMICAL WATER ANALYSIS REPORT

Sample No. ....296..... Date of Sampling....06 -- 03 -- 08.....  
Source: Rupingari River, at Noinda-Ngaurioni Intake Date Received.....13 -- 03 -- 08.....  
Purpose of Sampling...Monitoring..... Submitted by.....MKEPP - Embu.....  
Address.....

PARAMETERS	UNIT	RESULTS	REMARKS
pH	pH Scale	7.03	
Colour	mgPt/l	20	
Turbidity	N.T.U.	9	
Permanganate Value (20 min. boiling)	mgO <sub>2</sub> /l	7.11	
Conductivity (25 <sup>o</sup> C)	μS/cm	36.3	
Iron	mg/l	0.49	
Manganese	mg/l	< 0.1	
Calcium	mg/l	2.4	
Magnesium	mg/l	0.99	
Sodium	mg/l	3.0	
Potassium	mg/l	1.2	
Total Hardness	mgCaCO <sub>3</sub> /l	10	
Total Alkalinity	mgCaCO <sub>3</sub> /l	14	
Chloride	mg/l	3	
Fluoride	mg/l	< 0.1	
Nitrate	mgN/l	0.19	
Nitrite	mgN/l	0.022	
Ammonia	mgN/l	-	
Total Nitrogen	mgN/l	-	
Sulphate	mg/l	0.3	
Orthophosphate	mgP/l	-	
Total Suspended Solids	mg/l	-	
Free Carbon Dioxide	mg/l	18	
Dissolved Oxygen	mg/l	-	
Total Dissolved Solids	mg/l	22.5	

#### COMMENTS:

Monitoring

O/c.....**J. N. MUASYA**.....  
CENTRAL WATER TESTING LABORATORIES  
WATER QUALITY LABORATORY  
P.O. BOX 30521, NAIROBI

# REPUBLIC OF KENYA



## EWASCO取水

### MINISTRY OF WATER AND IRRIGATION Central Water Testing Laboratories

Tel. No. (020) 553834, 553957  
P.O. Box 30521-00100,  
NAIROBI.

#### PHYSICAL/CHEMICAL WATER ANALYSIS REPORT

Sample No.....297..... Date of Sampling...06 - 03 - 08.....  
Source..Rupingazi River. at EWASCO intake.. Date Received.....13 - 03 - 08.....  
Purpose of Sampling...Monitoring..... Submitted by.....MKEPP - Embu.....  
Address.....

PARAMETERS	UNIT	RESULTS	REMARKS
pH	pH Scale	7.33	
Colour	mgPt/l	20	
Turbidity	N.T.U.	15	
Permanganate Value (20 min. boiling)	mgO <sub>2</sub> /l	4.74	
Conductivity (25 <sup>0</sup> C)	μS/cm	50.8	
Iron	mg/l	0.93	
Manganese	mg/l	0.04	
Calcium	mg/l	2.4	
Magnesium	mg/l	1.46	
Sodium	mg/l	5.3	
Potassium	mg/l	1.4	
Total Hardness	mgCaCO <sub>3</sub> /l	2.0	
Total Alkalinity	mgCaCO <sub>3</sub> /l	20	
Chloride	mg/l	4	
Fluoride	mg/l	< 0.1	
Nitrate	mgN/l	0.24	
Nitrite	mgN/l	0.34	
Ammonia	mgN/l	-	
Total Nitrogen	mgN/l	-	
Sulphate	mg/l	0.3	
Orthophosphate	mgP/l	-	
Total Suspended Solids	mg/l	-	
Free Carbon Dioxide	mg/l	12	
Dissolved Oxygen	mg/l	-	
Total Dissolved Solids	mg/l	31.5	

#### COMMENTS:

Monitoring

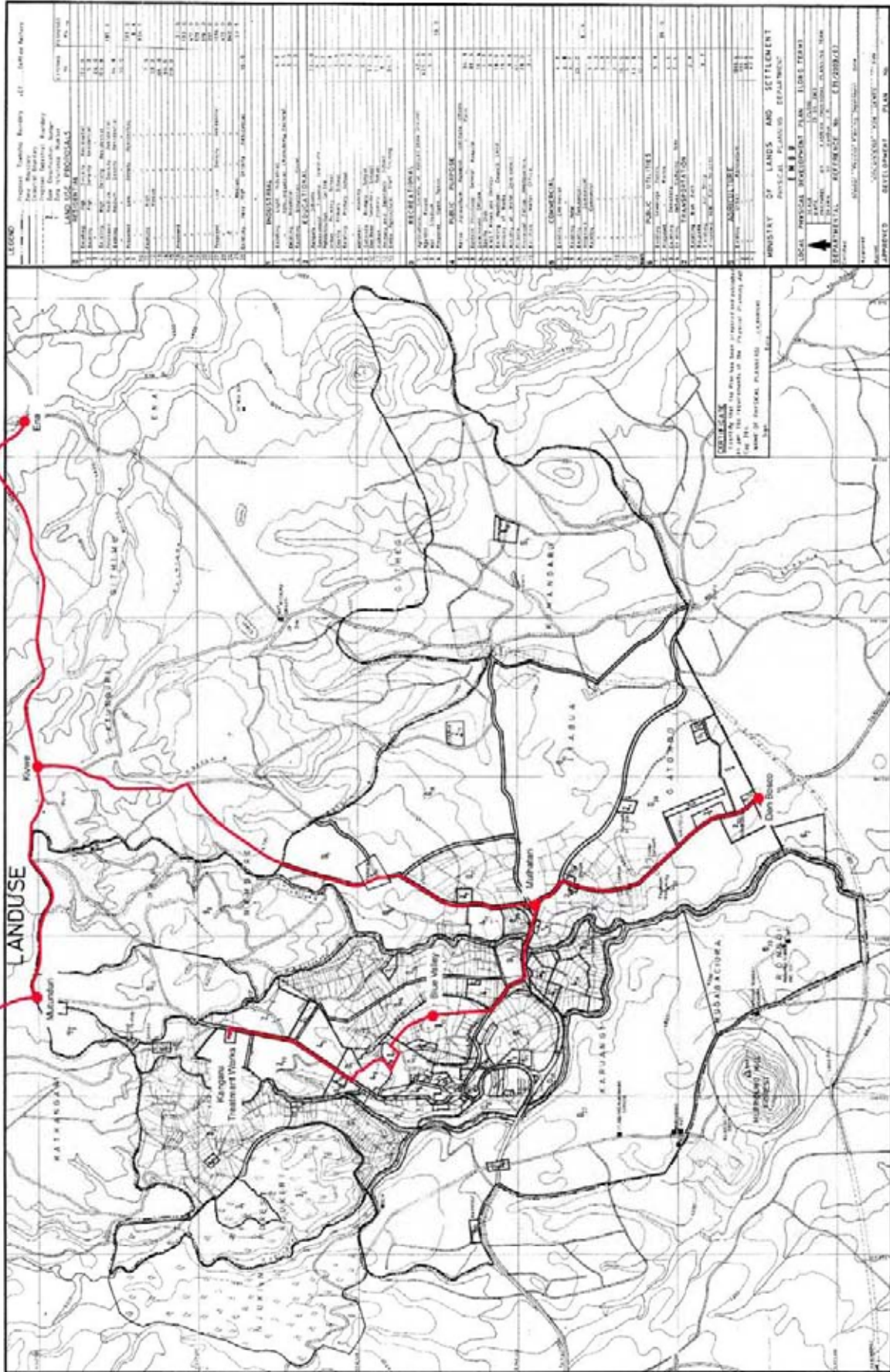
O/c.....**J. N. MUASYA**.....  
CENTRAL WATER TESTING LABORATORIES

WATER QUALITY LABORATORY  
P.O. BOX 30521, NAIROBI

## 添付資料 7 新設配水本管ルート図







**LEGEND**

Boundary: Boundary  
 Line: Boundary  
 Area: Boundary  
 Land Use: Boundary  
 Land Use: Boundary

**LAND USE**

Symbol	Description	Area (sq. m)	Percentage (%)
[Symbol]	Residential	100,000	10.0
[Symbol]	Commercial	50,000	5.0
[Symbol]	Industrial	20,000	2.0
[Symbol]	Public Use	10,000	1.0
[Symbol]	Forest	300,000	30.0
[Symbol]	Water	50,000	5.0
[Symbol]	Other	100,000	10.0

**INDUSTRIAL**

1. Industrial Zone  
 2. Industrial Zone  
 3. Industrial Zone

**RESIDENTIAL**

1. Residential Zone  
 2. Residential Zone  
 3. Residential Zone

**COMMERCIAL**

1. Commercial Zone  
 2. Commercial Zone

**LOCAL PHYSICAL DEVELOPMENT PLAN (LDP) TERMS**

1. Local Physical Development Plan (LDP) Terms  
 2. Local Physical Development Plan (LDP) Terms

**DEPARTMENTAL REFERENCE NO. (D.R.N.)**

1. Departmental Reference No. (D.R.N.)  
 2. Departmental Reference No. (D.R.N.)

**APPROVED DEVELOPMENT PLAN**

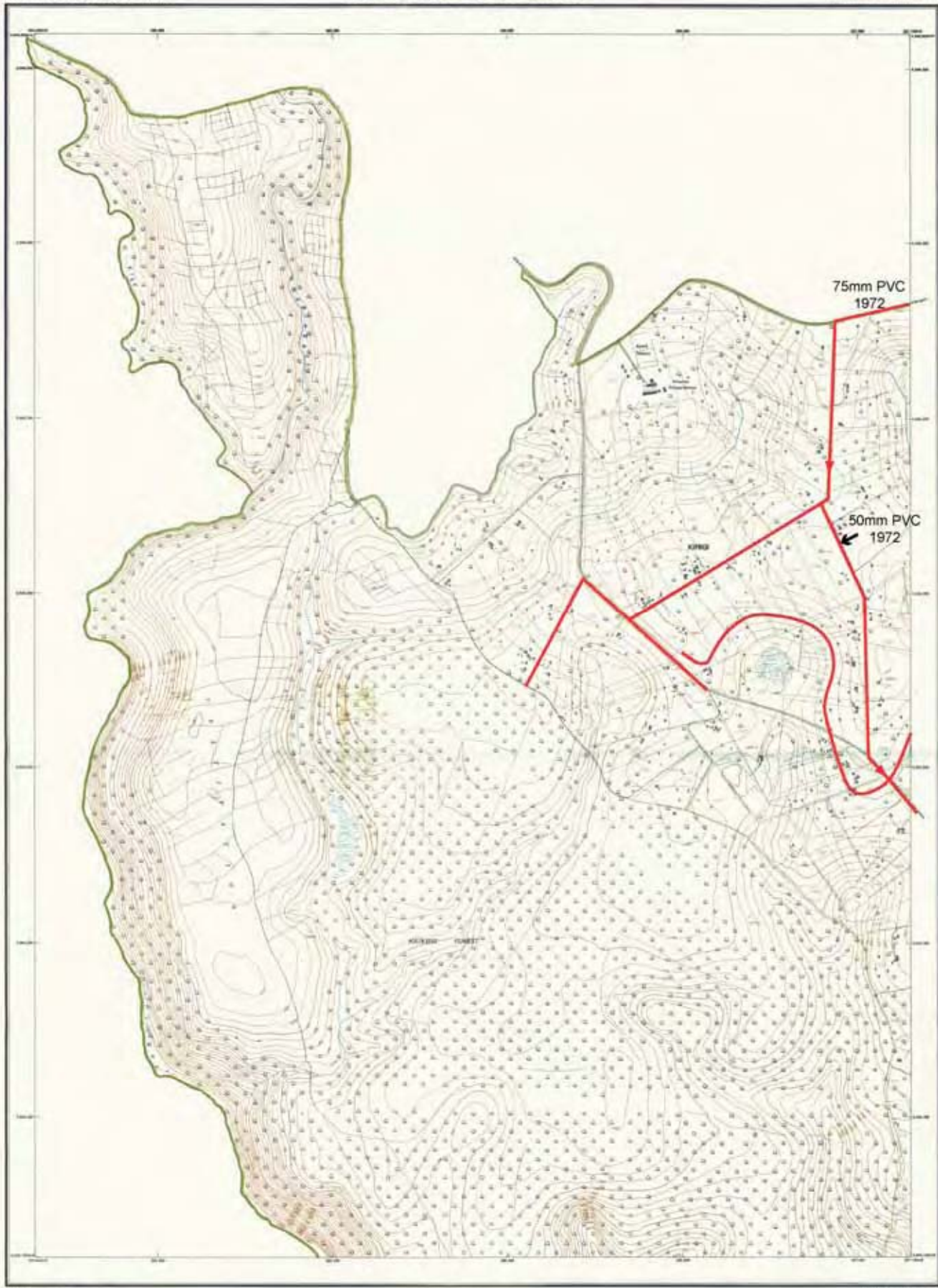
1. Approved Development Plan  
 2. Approved Development Plan

添付資料 7 新設配水本管ルート図



**添付資料 8 既設配水本管ルート図 (1:5,000)**





REFERENCE

[Symbol]	Water Pipe
[Symbol]	Other Pipe
[Symbol]	Boundary Track
[Symbol]	Boundary
[Symbol]	Settlement
[Symbol]	Lottery
[Symbol]	Red-Frame House
[Symbol]	Isolated Stone Pillar
[Symbol]	Well
[Symbol]	Water
[Symbol]	Stream
[Symbol]	Shading
[Symbol]	Open Field
[Symbol]	Contour 1:5m (20' Int.)
[Symbol]	Contour 5:5m (15' Int.)
[Symbol]	Contour 10:5m (30' Int.)
[Symbol]	Contour 20:5m (60' Int.)
[Symbol]	Contour 30:5m (90' Int.)
[Symbol]	Contour 40:5m (120' Int.)
[Symbol]	Contour 50:5m (150' Int.)
[Symbol]	Contour 60:5m (180' Int.)
[Symbol]	Contour 70:5m (210' Int.)
[Symbol]	Contour 80:5m (240' Int.)
[Symbol]	Contour 90:5m (270' Int.)
[Symbol]	Contour 100:5m (300' Int.)
[Symbol]	Contour 110:5m (330' Int.)
[Symbol]	Contour 120:5m (360' Int.)
[Symbol]	Contour 130:5m (390' Int.)
[Symbol]	Contour 140:5m (420' Int.)
[Symbol]	Contour 150:5m (450' Int.)
[Symbol]	Contour 160:5m (480' Int.)
[Symbol]	Contour 170:5m (510' Int.)
[Symbol]	Contour 180:5m (540' Int.)
[Symbol]	Contour 190:5m (570' Int.)
[Symbol]	Contour 200:5m (600' Int.)
[Symbol]	Contour 210:5m (630' Int.)
[Symbol]	Contour 220:5m (660' Int.)
[Symbol]	Contour 230:5m (690' Int.)
[Symbol]	Contour 240:5m (720' Int.)
[Symbol]	Contour 250:5m (750' Int.)
[Symbol]	Contour 260:5m (780' Int.)
[Symbol]	Contour 270:5m (810' Int.)
[Symbol]	Contour 280:5m (840' Int.)
[Symbol]	Contour 290:5m (870' Int.)
[Symbol]	Contour 300:5m (900' Int.)
[Symbol]	Contour 310:5m (930' Int.)
[Symbol]	Contour 320:5m (960' Int.)
[Symbol]	Contour 330:5m (990' Int.)
[Symbol]	Contour 340:5m (1020' Int.)
[Symbol]	Contour 350:5m (1050' Int.)
[Symbol]	Contour 360:5m (1080' Int.)
[Symbol]	Contour 370:5m (1110' Int.)
[Symbol]	Contour 380:5m (1140' Int.)
[Symbol]	Contour 390:5m (1170' Int.)
[Symbol]	Contour 400:5m (1200' Int.)
[Symbol]	Contour 410:5m (1230' Int.)
[Symbol]	Contour 420:5m (1260' Int.)
[Symbol]	Contour 430:5m (1290' Int.)
[Symbol]	Contour 440:5m (1320' Int.)
[Symbol]	Contour 450:5m (1350' Int.)
[Symbol]	Contour 460:5m (1380' Int.)
[Symbol]	Contour 470:5m (1410' Int.)
[Symbol]	Contour 480:5m (1440' Int.)
[Symbol]	Contour 490:5m (1470' Int.)
[Symbol]	Contour 500:5m (1500' Int.)
[Symbol]	Contour 510:5m (1530' Int.)
[Symbol]	Contour 520:5m (1560' Int.)
[Symbol]	Contour 530:5m (1590' Int.)
[Symbol]	Contour 540:5m (1620' Int.)
[Symbol]	Contour 550:5m (1650' Int.)
[Symbol]	Contour 560:5m (1680' Int.)
[Symbol]	Contour 570:5m (1710' Int.)
[Symbol]	Contour 580:5m (1740' Int.)
[Symbol]	Contour 590:5m (1770' Int.)
[Symbol]	Contour 600:5m (1800' Int.)
[Symbol]	Contour 610:5m (1830' Int.)
[Symbol]	Contour 620:5m (1860' Int.)
[Symbol]	Contour 630:5m (1890' Int.)
[Symbol]	Contour 640:5m (1920' Int.)
[Symbol]	Contour 650:5m (1950' Int.)
[Symbol]	Contour 660:5m (1980' Int.)
[Symbol]	Contour 670:5m (2010' Int.)
[Symbol]	Contour 680:5m (2040' Int.)
[Symbol]	Contour 690:5m (2070' Int.)
[Symbol]	Contour 700:5m (2100' Int.)
[Symbol]	Contour 710:5m (2130' Int.)
[Symbol]	Contour 720:5m (2160' Int.)
[Symbol]	Contour 730:5m (2190' Int.)
[Symbol]	Contour 740:5m (2220' Int.)
[Symbol]	Contour 750:5m (2250' Int.)
[Symbol]	Contour 760:5m (2280' Int.)
[Symbol]	Contour 770:5m (2310' Int.)
[Symbol]	Contour 780:5m (2340' Int.)
[Symbol]	Contour 790:5m (2370' Int.)
[Symbol]	Contour 800:5m (2400' Int.)
[Symbol]	Contour 810:5m (2430' Int.)
[Symbol]	Contour 820:5m (2460' Int.)
[Symbol]	Contour 830:5m (2490' Int.)
[Symbol]	Contour 840:5m (2520' Int.)
[Symbol]	Contour 850:5m (2550' Int.)
[Symbol]	Contour 860:5m (2580' Int.)
[Symbol]	Contour 870:5m (2610' Int.)
[Symbol]	Contour 880:5m (2640' Int.)
[Symbol]	Contour 890:5m (2670' Int.)
[Symbol]	Contour 900:5m (2700' Int.)
[Symbol]	Contour 910:5m (2730' Int.)
[Symbol]	Contour 920:5m (2760' Int.)
[Symbol]	Contour 930:5m (2790' Int.)
[Symbol]	Contour 940:5m (2820' Int.)
[Symbol]	Contour 950:5m (2850' Int.)
[Symbol]	Contour 960:5m (2880' Int.)
[Symbol]	Contour 970:5m (2910' Int.)
[Symbol]	Contour 980:5m (2940' Int.)
[Symbol]	Contour 990:5m (2970' Int.)
[Symbol]	Contour 1000:5m (3000' Int.)

COMPLETION DATE

Completed and Approved by Survey of Embu District 1:5,000  
 Date: November 1972  
 Prepared by: Survey of Embu District  
 Date: November 1972



UTM ZONE 48

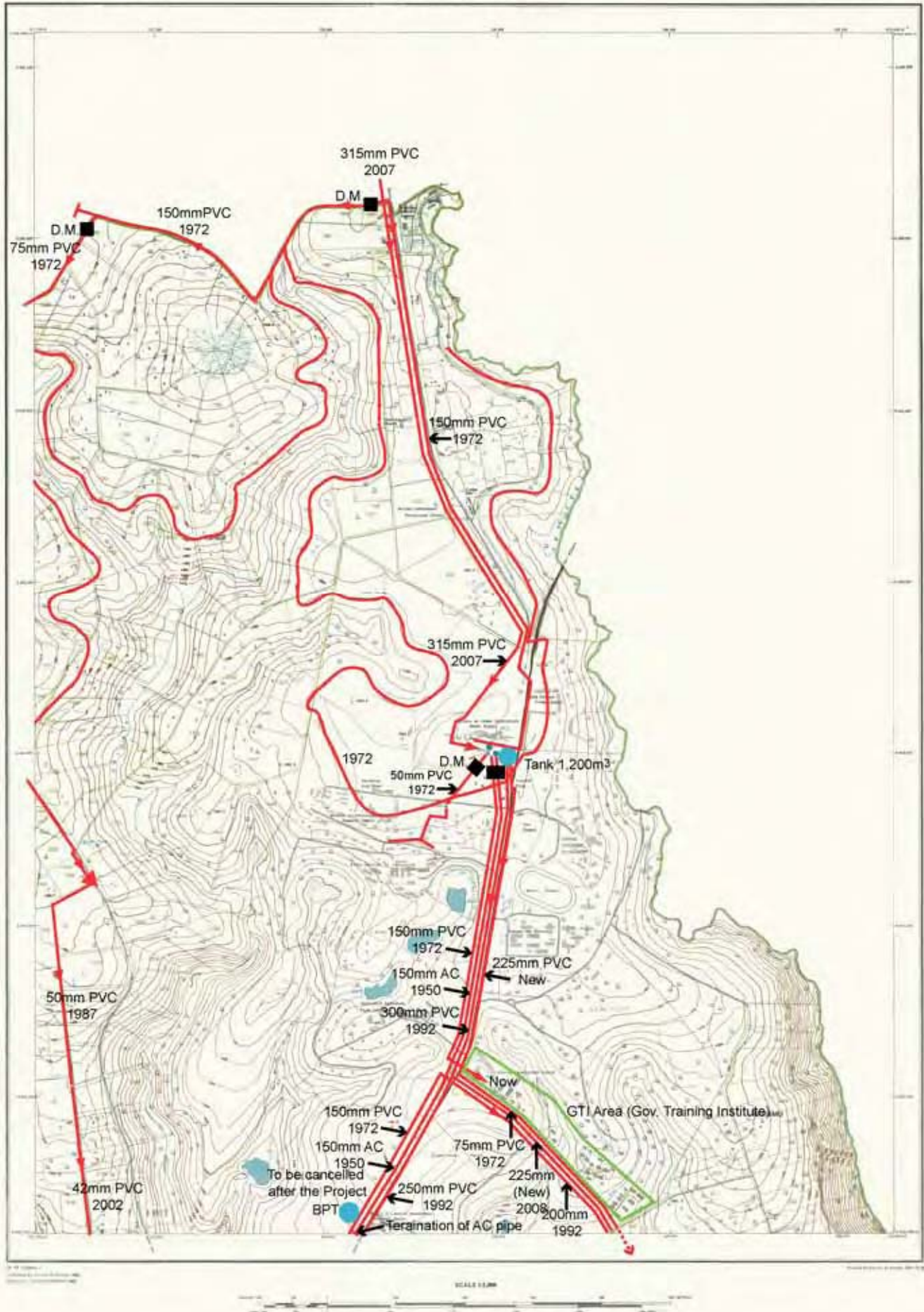
HIGHLIGHTS IN METERS

This map is not an authority on the delineation of boundaries.

SCALE 1:5,000

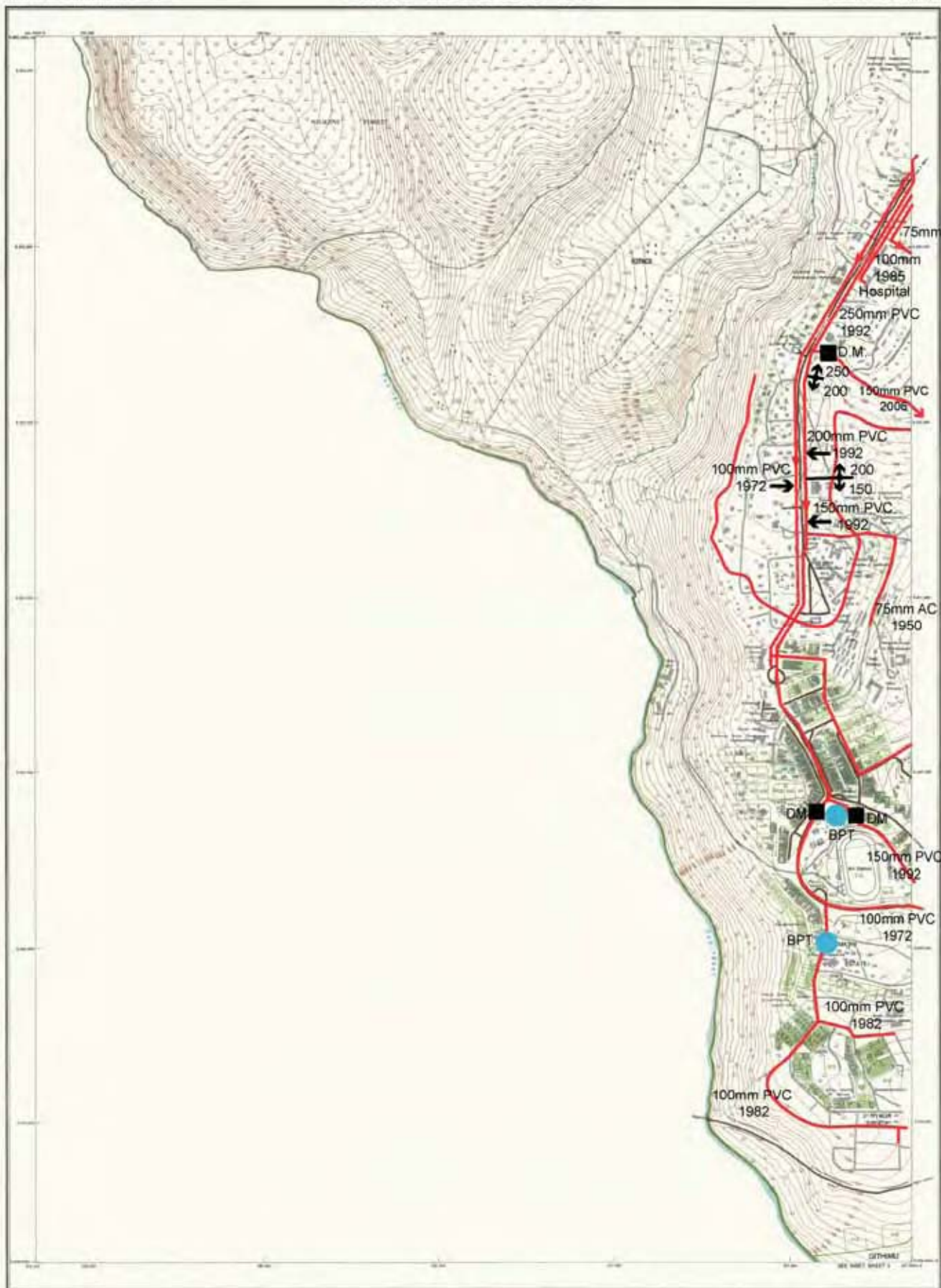
既設配水本管ルート図 (1/5)

※本ルート図は、入手資料4.14既設配管ルート図1と同じものである。



既設配水本管ルート図 (2/5)

※本ルート図は、入手資料4.15既設配管ルート図2と同じものである。

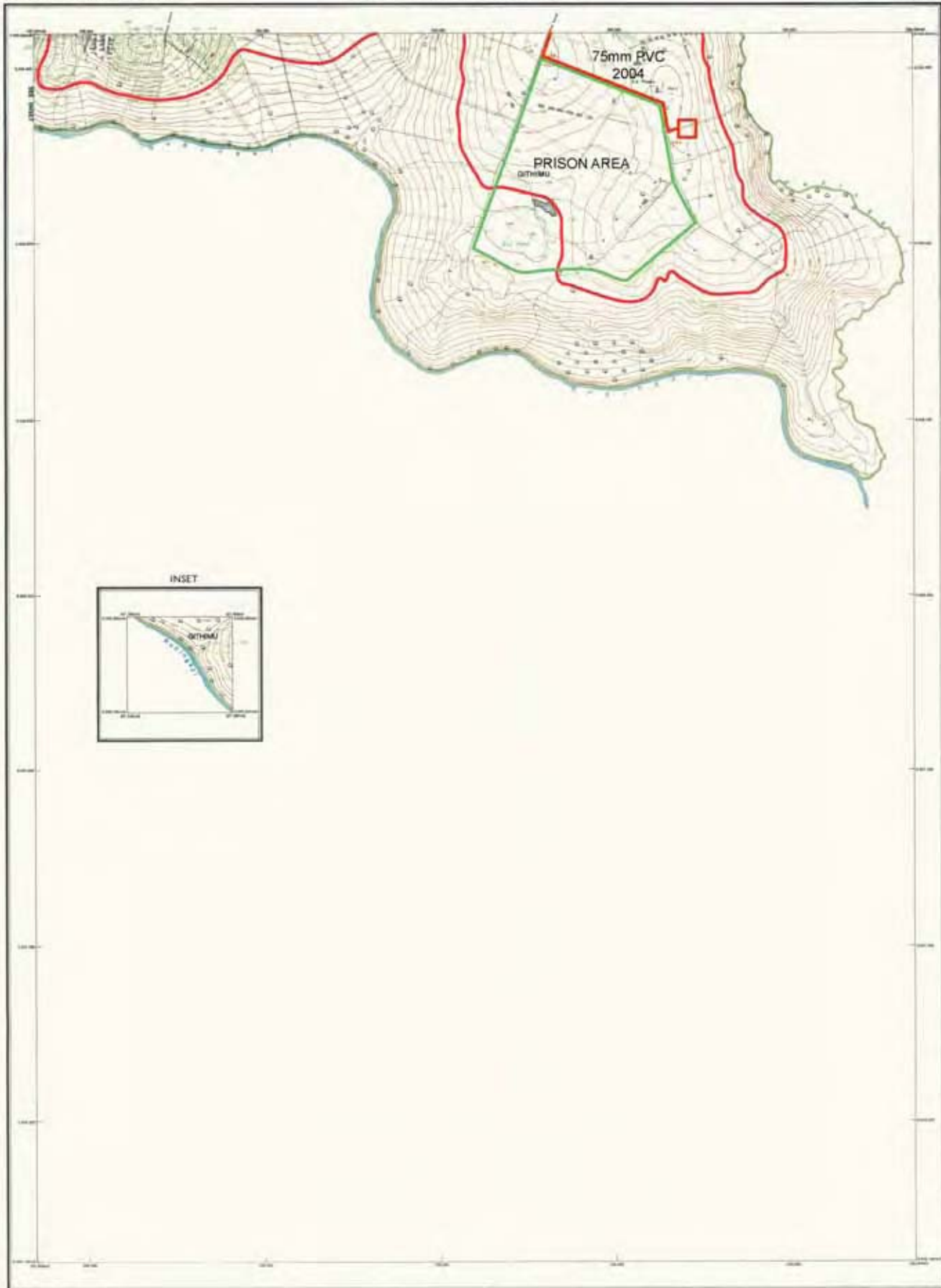


既設配水本管ルート図 (3/5)

※本ルート図は、入手資料4.16既設配管ルート図3と同じものである。







既設配水本管ルート図 (5/5)

※本ルート図は、入手資料4.18既設配管ルート図5と同じものである。

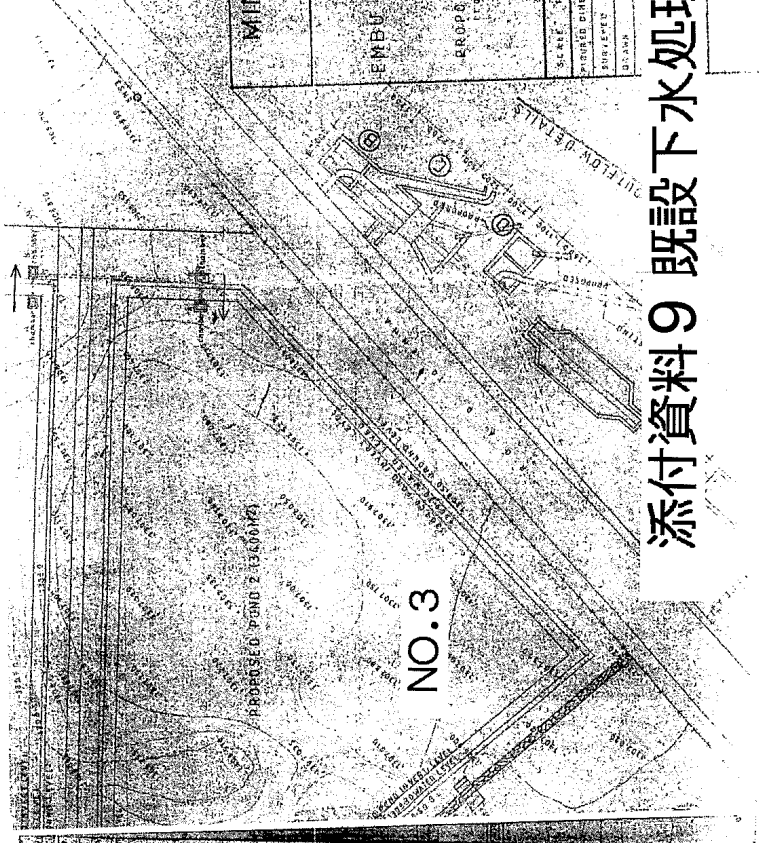
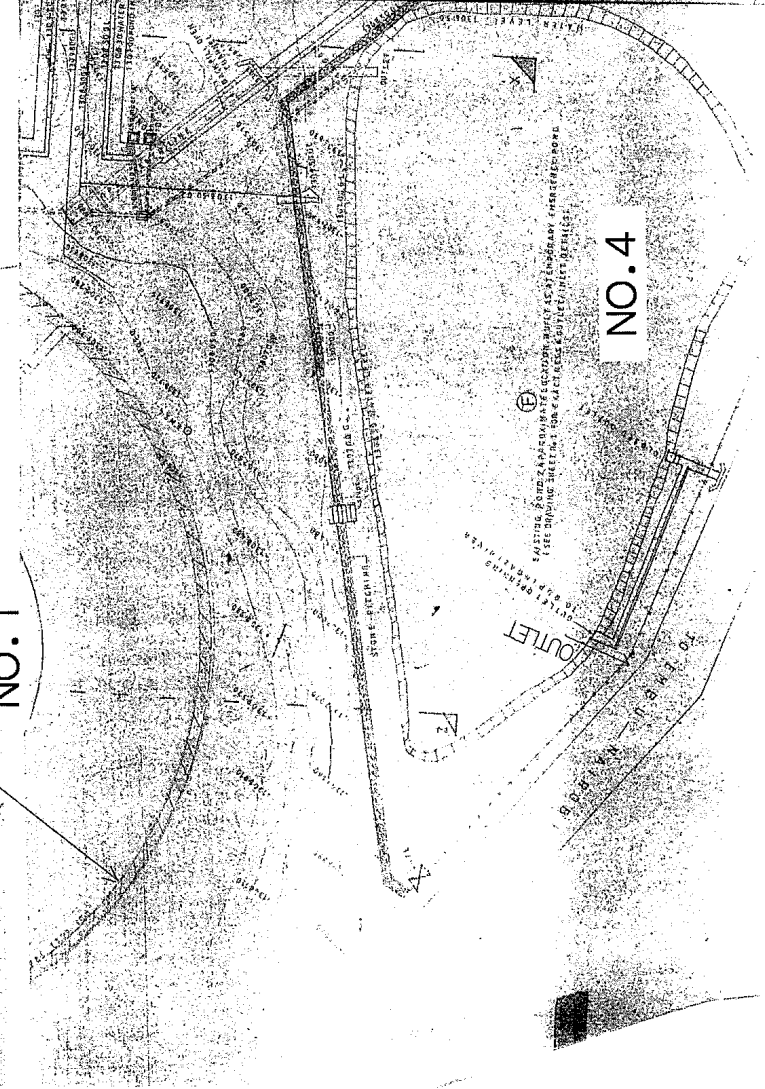
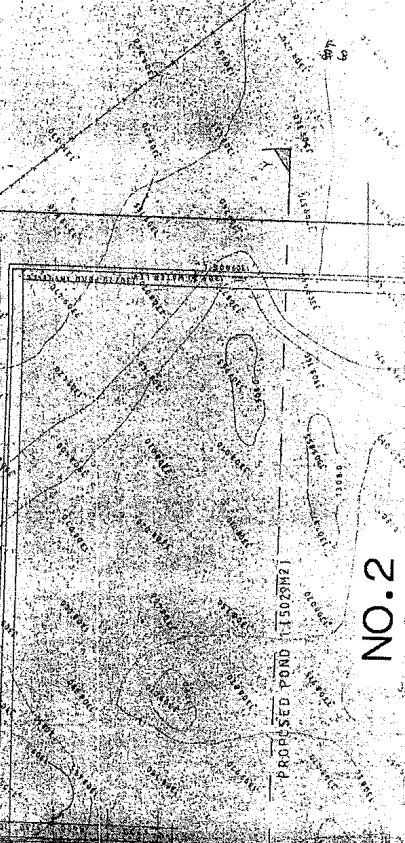
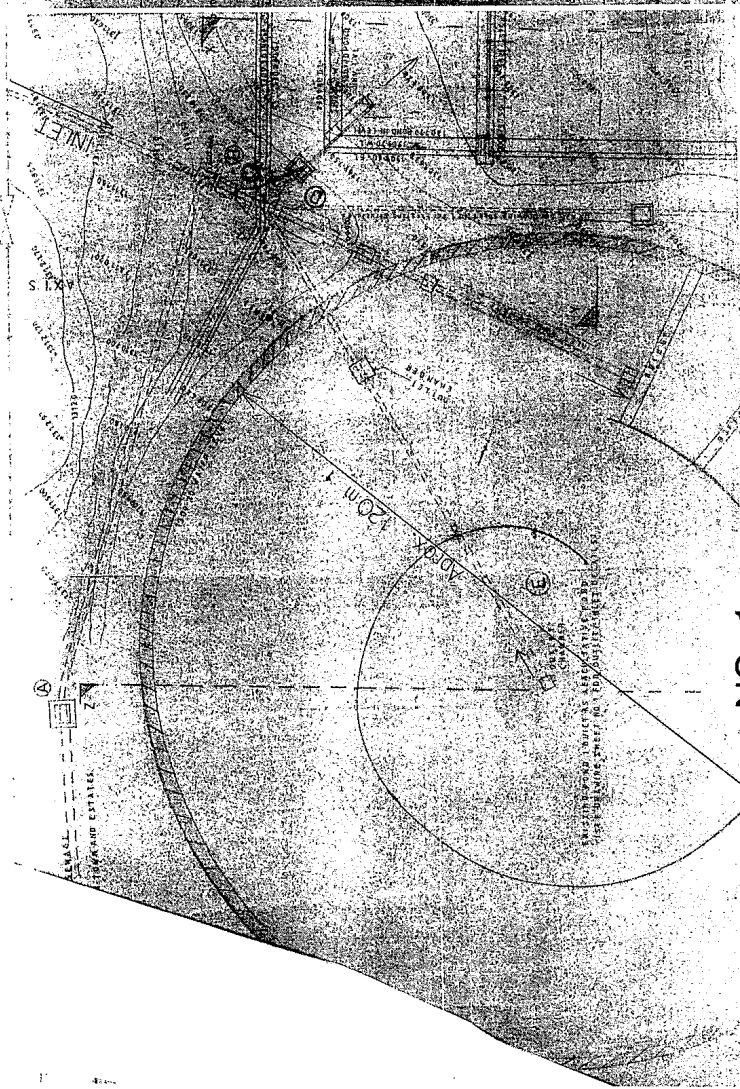


## 添付資料 9 既設下水処理場配置図



D. ...  
 E. ...  
 F. ...

**BEACONS**  
 1. ...  
 2. ...  
 3. ...  
 4. ...



MINISTRY OF WATER & IRRIGATION  
 EMBU WATER AND SANITATION COMPANY  
 PROPOSED MATURATION PONDS  
 SHEET NO. ...  
 SCALE: 1:1000  
 DRAWN BY: ...  
 CHECKED BY: ...

添付資料9 既設下水処理場配置図



**添付資料 10 新設配水池配置図 1**



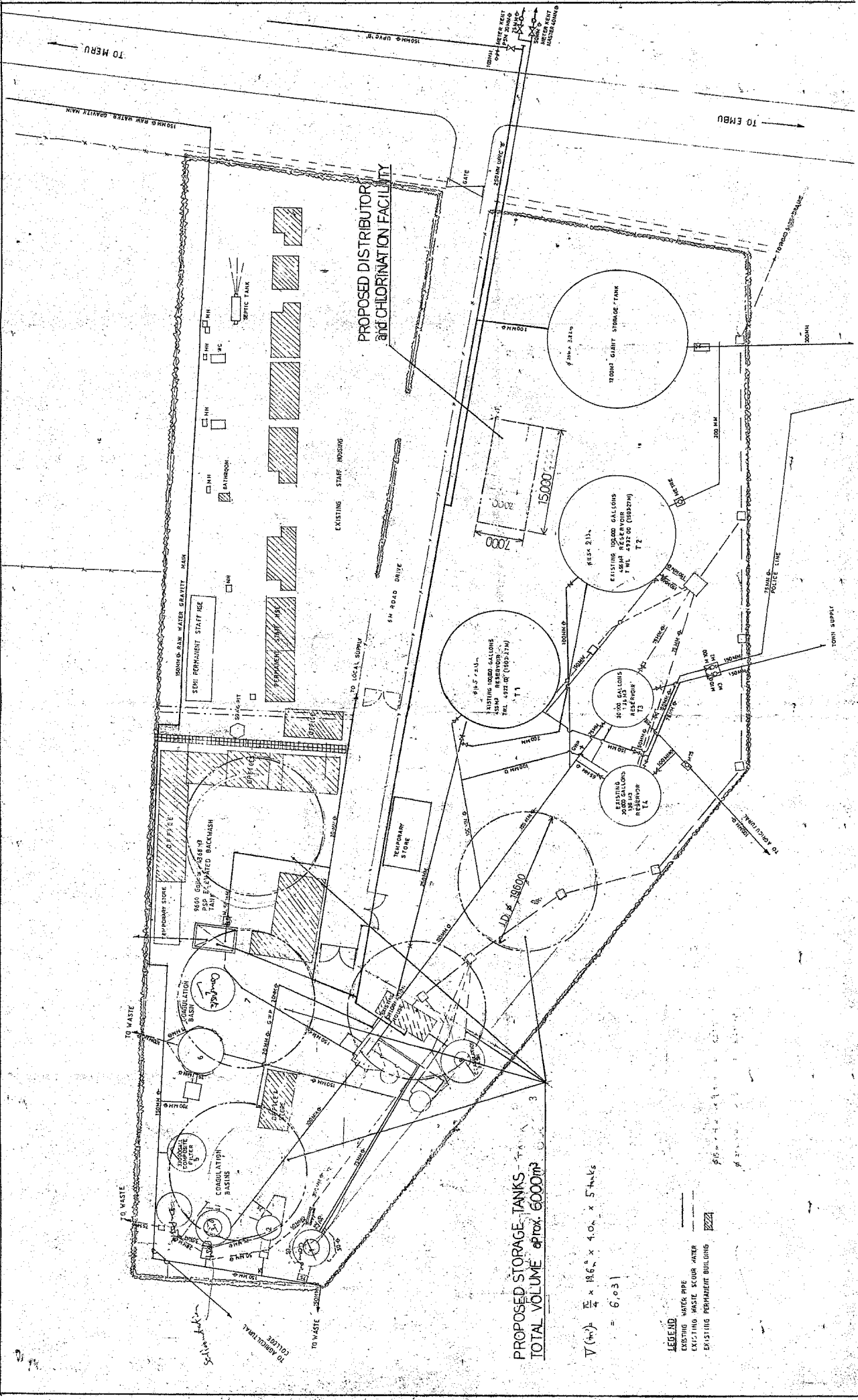






**添付資料 11 新設配水池配置図 2**





配水池容量6,000m<sup>3</sup>

添付資料11 新設配水池配置図(例2)

DATE: DEC 2005	BY:	REVISION:
DIRECTOR		
SECTION: HEAD		

DATE RECORDED:	SCALE:	SHEET:
DESIGNED:	1:250	No
DRAWN:		
CHECKED:		
APPROVED:		

DRAWING NUMBER:	WS 442/10
-----------------	-----------



## 添付資料 12 収集資料リスト





資料リスト（収集資料／専門家作成資料）

主管部長	文書管理課長	主管課長	情報管理課長	技術情報課長	図書館受入日

地域	プロジェクトID	調査団番号	調査の種類又は指導科目	調査の種別又は派遣期間	発行機関	取扱区分	図書館記入欄
ケニア国 <td>プロジェクトID</td> <td>-</td> <td>エンブ市上下水道整備計画予備調査</td> <td>予備調査</td> <td>Embu Meteorological Station</td> <td>JR・CR( )・SC</td> <td></td>	プロジェクトID	-	エンブ市上下水道整備計画予備調査	予備調査	Embu Meteorological Station	JR・CR( )・SC	
	調査団名又は専門家氏名			現地調査期間又は派遣期間	Water Resources Management Authority	JR・CR( )・SC	
	配属機関名			20年8月4日-20年8月31日	Water Resources Management Authority	JR・CR( )・SC	

番号	資料の名称	形態（図書・ビデオ・地図・写真等）	収集資料	専門家作成資料	JICA作成資料	テキスト	発行機関	取扱区分	図書館記入欄
<b>1. 統計資料</b>									
1.1	METEOROLOGICAL DATA. AIR TEMPERATURE, PRECIPITATION, WIND AND EVAPORATION.	A4 コピー					Embu Meteorological Station	JR・CR( )・SC	
1.2	RUPINGAZI DISCHARGE DATA 4DC03	A4 コピー					Water Resources Management Authority	JR・CR( )・SC	
1.3	RUPINGAZI GAUGE HEIGHT DATA 4DC03						Water Resources Management Authority	JR・CR( )・SC	
<b>2. 開発計画資料</b>									
2.1	Water Sector Reform in Kenya and the Human Right to Water	A4					Ministry of Water and Irrigation	JR・CR( )・SC	
2.2	Socially Responsible commercialization	A4					GTZ	JR・CR( )・SC	
2.3	NATIONAL DEVELOPMENT PLAN 2002-2008	A4					Ministry of Water and Irrigation	JR・CR( )・SC	
2.4	The National Water Service Strategy (2007-2015)	A4					Ministry of Water and Irrigation	JR・CR( )・SC	
2.5	Water Supply and Sanitation Sector Reforms in Kenya, Tanzania, Uganda and Zambia	A4					GTZ	JR・CR( )・SC	
2.6	PROJECT APPRISAL DOCUMENT ONA PROPOSED CREDIT IN THE AMOUNT OF SDR 96.6MILLION TO THE REPUBLIC OF	A4					World bank	JR・CR( )・SC	

番号	資料の名称	形態(図書・ビデオ・地図・写真等)	収集資料	専門家作成資料	JICA作成資料	テキスト	発行機関	取扱区分	図書館記入欄
	KENYA FOR A WATER AND SANITATION SERVICE IMPROVEMENT PROJECT								
<b>3.</b>	<b>維持管理資料</b>								
3.1	EWASCO NEWS	A4						JR・CR( )・SC	
3.2	FINANCIAL STATEMENTS FOR THE YEAR ENDED 30 <sup>TH</sup> JUNE, 2008	A4 コピー						JR・CR( )・SC	
3.3	Kenya Bureau of Standards-Customer service charter	A5					Kenya Bureau of Standards	JR・CR( )・SC	
3.4	Service Provision Agreement between Tana Water Services Board & Embu Water and Sanitation Co.,Ltd	A4					EWASCO	JR・CR( )・SC	
3.5	Taking Regulation a step further	A4					Water Services Regulatory Board	JR・CR( )・SC	
3.6	ANNUAL REPORT AND FINANCIAL STATEMENT 2006/2007	A4					EWASCO	JR・CR( )・SC	
<b>4.</b>	<b>図面資料</b>								
4.1	Catalogue of MAPS	A4						JR・CR( )・SC	
4.2	ケニア全図 1:1,000,000	A1 コピー					SURBEY OF KENYA		
4.3	NIERI SA-37-1 1:250,000	A1 コピー					SURBEY OF KENYA		
4.4	CHUKA SA-37-2 1:250000	A1 コピー					SURBEY OF KENYA		
4.5	KERUGOYA 121/4 1:50,000	A1 コピー					SURBEY OF KENYA		
4.6	CHUKA 122/3 1:50,000	A1 コピー					SURBEY OF KENYA		
4.7	EMBU 135/2 1:50,000	A1 コピー					SURBEY OF KENYA		
4.8	SIKAGO 136/1 1:50,000	A1 コピー					SURBEY OF KENYA		
4.9	KANGARU 浄水場配置図 1 1:250	A1 コピー					EWASCO		
4.10	KANGARU 浄水場配置図 2 1:250	A1 コピー					EWASCO		
4.11	本プロジェクト配水ルート図 1:25,000	A1 コピー					EWASCO		
4.12	EMBU DISTRICT 水系図 1:100,000	A1 コピー					MINISTRY OF WATER DEVELOPMENT		
4.13	TANA MANAGEMENT 水系図	A4 コピー					MINISTRY OF WATER DEVELOPMENT		
4.14	EMBU MUNICIPALITY SHEET1 1:5,000	A1 コピー					SURVEY OF KENYA		
4.15	EMBU MUNICIPALITY SHEET2 1:5,000	A1 コピー					SURVEY OF KENYA		

番号	資料の名称	形態(図書・ビデオ・地図・写真等)	収集資料	専門家作成資料	JICA作成資料	テキスト	発行機関	取扱区分	図書館記入欄
4.16	EMBU MUNICIPALITY SHEET3 1:5,000	A1 コピー					SURVEY OF KENYA		
4.17	EMBU MUNICIPALITY SHEET4 1:5,000	A1 コピー					SURVEY OF KENYA		
4.18	SEWERAGE PLAN MATAKARI/DALLAS 1:2,500	A1 コピー					RUNJI & PARTNERS		
4.19	SEWERAGE PLAN TOWN CENTER/ADMINISTRATION 1:2,500	A1 コピー					RUNJI & PARTNERS		
4.20	SEWERAGE PLAN BLUE VALLEY 1:2,500	A1 コピー					RUNJI & PARTNERS		
4.21	SEWERAGE PLAN KANGARU 1:2,500	A1 コピー					RUNJI & PARTNERS		
4.22	TREATMENT WORKS LAYOUT PLAN	A1 コピー					RUNJI & PARTNERS		
4.23	TREATMENT WORKS EMBANKMENT SECTIONS/SECTION A_A&B_B HOR:1:500 VER:1:200	A1 コピー					RUNJI & PARTNERS		
4.24	TREATMENT WORKS EMBANKMENT SECTIONS/SECTION E_E&F_F HOR:1:500 VER:1:200	A1 コピー					RUNJI & PARTNERS		
4.25	SEWERAGE TREATMENT WORKS EARTH WORKS&ACCESS ROAD 1:100	A1 コピー					RUNJI & PARTNERS		
4.26	既設下水処理場配置図	A1 コピー					MINISTRY OF WATER AND IRRIGATION		
4.27	現況配水ルート図	A1 コピー					EWASCO		
<b>5.</b>	<b>法規・規則・基準書</b>								
5.1	The environmental management and co-ordination(Water quality ) Regulations, 2006	A4 コピー					Minister for Environment and Natural Resources(NEMA)	JR・CR( )・SC	
5.2	PRACTICE MANUAL FOR WATER SUPPLY SERVICES IN KENYA	A4 コピー					KENYA- BELGIUM STUDY AND CONSULTANCY FUND	JR・CR( )・SC	
5.3	KENYA GAZETTE SUPPLEMENT ACTS,2002	A5 コピー					REPUBLIC OF KENYA	JR・CR( )・SC	

番号	資料の名称	形態(図書・ビデオ・地図・写真等)	収集資料	専門家作成資料	JICA作成資料	テキスト	発行機関	取扱区分	図書館記入欄
<b>6.</b>	<b>環境社会配慮</b>								
6.1	Economic Survey 2008	冊子、304 ページ	*				Kenya National Bureau of Statistics	JR・CR( )・SC	
6.2	Embu District Development Plan 1997-2001	ハードコピー、128 ページ	*				Office of the Vice President and Ministry of Planning and National Development	JR・CR( )・SC	
6.3	Embu District Development Plan 2002-2008	冊子、93 ページ	*				Ministry of Planning and National Development	JR・CR( )・SC	
6.4	Mbeere District Development Plan 1997-2001	ハードコピー、136 ページ	*				Office of the Vice President and Ministry of Planning and National Development	JR・CR( )・SC	
6.5	Mbeere District Development Plan 2002-2008	ハードコピー、68 ページ	*				Ministry of Planning and National Development	JR・CR( )・SC	
6.6	Document and Maps	電子ファイル	*				The Municipal Council of Embu / Ministry of Lands & Housing, provincial Physical Planning Team, Eastern Province	JR・CR( )・SC	
6.7	Environmental Impact Assessment Report on Proposed Sewage Treatment Ponds by Embu Water and Sanitation Company Ltd. (draft)	ハードコピー、54 ページ	*				Environment & development Associates Kenya (2008.8)	JR・CR( )・SC	
6.8	Government Land Act	小冊子、73 ページ	*				Government of Kenya (Government Printer, Nairobi)	JR・CR( )・SC	
6.9	The Land Titles Act	小冊子、58 ページ	*				Government of Kenya (Government Printer, Nairobi)	JR・CR( )・SC	
6.10	The Registration of Titles Act	小冊子、63 ページ	*				Government of Kenya (Government Printer, Nairobi)	JR・CR( )・SC	
6.11	The Registration of Document Act	小冊子、22 ページ	*				Government of Kenya (Government Printer, Nairobi)	JR・CR( )・SC	

番号	資料の名称	形態(図書・ビデオ・地図・写真等)	収集資料	専門家作成資料	JICA作成資料	テキスト	発行機関	取扱区分	図書館記入欄
6.12	Physical Planning Act	小冊子、38 ページ	*				Nairobi Government of Kenya (Government Printer, Nairobi)	JR・CR( )・SC	
6.13	Land Planning Act	小冊子、18 ページ						JR・CR( )・SC	
6.14	Trust Land Act	小冊子、154 ページ	*				Government of Kenya (Government Printer, Nairobi)	JR・CR( )・SC	
6.15	Land Control Act	小冊子、20 ページ	*				Government of Kenya (Government Printer, Nairobi)	JR・CR( )・SC	
6.16	Wayleaves Act	小冊子、3 ページ	*				Government of Kenya (Government Printer, Nairobi)	JR・CR( )・SC	
6.17	Land Acquisition Act	小冊子、150 ページ	*				Government of Kenya (Government Printer, Nairobi)	JR・CR( )・SC	
6.18	Survey Act	小冊子、54 ページ	*				Government of Kenya (Government Printer, Nairobi)	JR・CR( )・SC	
6.19	The Public Roads and Roads of Access Act	小冊子、23 ページ	*				Government of Kenya (Government Printer, Nairobi)	JR・CR( )・SC	
6.20	The Forest Act, 2005	小冊子、77 ページ	*				Government of Kenya (Government Printer, Nairobi)	JR・CR( )・SC	
6.21	The Wildlife (Conservation and Management) Act	小冊子、71 ページ	*				Government of Kenya (Government Printer, Nairobi)	JR・CR( )・SC	
6.22	The Environmental Management and Co-ordination Act, 1999	小冊子、133 ページ	*				Government of Kenya (Government Printer, Nairobi)	JR・CR( )・SC	
6.23	The Environmental (Impact Assessment and Audit) Regulations, 2003	小冊子、61 ページ	*				Government of Kenya (Government Printer, Nairobi)	JR・CR( )・SC	
6.24	The Environmental Management and Co-ordination (Water Quality) Regulations, 2006	小冊子、ページ	*				Government of Kenya (Government Printer, Nairobi)	JR・CR( )・SC	

番号	資料の名称	形態(図書・ビデオ・地図・写真等)	収集資料	専門家作成資料	JICA作成資料	テキスト	発行機関	取扱区分	図書館記入欄
6.25	The Environmental Management and Co-ordination (Waste Management) Regulations, 2006	小冊子、154 ページ	*				Government of Kenya (Government Printer, Nairobi)	JR・CR( )・SC	

番号	資料の名称	形態(図書・ビデオ・地図・写真等)	収集資料	専門家作成資料	JICA作成資料	テキスト	発行機関	取扱区分	図書館記入欄
	<b>ソフトコピーデータ</b>								
<b>1. 経営・財務</b>									
1.1	QUARTERLY PERFORMANCE REPORT SECOND QUARTER ENDING: 31 DEC 2008	データ					EWASCO	JR・CR( )・SC	
1.2	QUARTERLY PERFORMANCE REPORT FORTH QUARTER	データ					EWASCO	JR・CR( )・SC	
1.3	MEWASS ANNUAL REPORT	データ					MEWASS	JR・CR( )・SC	
1.4	MEWASS PI 2008	データ					MEWASS	JR・CR( )・SC	
1.5	MEWASS PROGRESS REPORT 2008	データ					MEWASS	JR・CR( )・SC	
1.6	MEWASS Performance Indicators - June 2008	データ					MEWASS	JR・CR( )・SC	
	<b>2. 上位計画・関連計画</b>								
2.1	Kenya Vision 2030 A Globally Competitive and Prosperous Kenya	データ					Armed Forces of the Republic of Kenya	JR・CR( )・SC	
2.2	Economic recovery strategy	データ					Planning and National development	JR・CR( )・SC	
2.3	EMBU MAPS DEGITIZED	データ					Department of physical planning	JR・CR( )・SC	
2.4	EMBU STRUCTURE PLAN(LONG TERM PHYSICAL DEVELOPMENT PLAN)2001-2030	データ					Department of physical planning	JR・CR( )・SC	
2.5	Kenya vision 2030	データ					Govenment of republic of Kenya	JR・CR( )・SC	
2.6	Service Provision Governance in Peri-Urban and Informal Settlements in Kenya	データ					Ministry of Water and Irrigation	JR・CR( )・SC	
	<b>3. 水セクター改編</b>								
3.1	New WSBs and New TWSB Boundaries	データ							

番号	資料の名称	形態(図書・ビデオ・地図・写真等)	収集資料	専門家作成資料	JICA作成資料	テキスト	発行機関	取扱区分	図書館記入欄
3.2	Service provision agreement between TANAWater service board and EWASCO	データ					TANA	JR-CR( )・SC	
3.3	Performance contact between the government of the republic of Kenya and TANAWater service board	データ					Ministry of Water and Irrigation	JR-CR( )・SC	
<b>4.</b>	<b>組織・制度</b>								
4.1	FINANCE AND ADMINISTRATION MANAGER – Structure	データ					TANA	JR-CR( )・SC	
4.2	TWSB organization chart	データ					TANA	JR-CR( )・SC	
4.3	TWSB organogram-CEO	データ					TANA	JR-CR( )・SC	
4.4	TWSB technical department	データ					TANA	JR-CR( )・SC	
4.5	TWSB technical service management	データ					TANA	JR-CR( )・SC	
<b>5.</b>	<b>他援助機関動向</b>								
5.1	MATRIX OF DONOR ACTIVITIES IN THE WATER AND SANITATION SECTOR	データ						JR-CR( )・SC	
<b>6.</b>	<b>水質分析</b>								
6.1	水質分析データ(EWASCO)	データ					EWASCO	JR-CR( )・SC	