

## 現地再委託

### - 漏水状況調査 -

**WATER LEAKAGE SURVEY**  
**FOR**  
**PREPARATORY STUDY**  
**FOR**  
**THE PROJECT**  
**FOR**  
**ZANZIBAR URBAN SUPPLY DEVELOPMENT**  
**IN**  
**THE REVOLUTIONARY GOVERNMENT OF ZANZIBAR**

**December, 2002**

**Department of Water Development (DWD)**

## **WATER LEAKAGE SURVEY**

### **1. PRESSURE READINGS**

Pressure Reading in the existing pipelines at the following points and time.

1) Points: Total 15 points

Mnazi Mmoja, Shangani, Michenzani, Chumbuni-1, Chunbuni-2, Muungano, Sebleni, Sogea(Mosq), Kwa Mtipura, Magogoni(S), Magogoni(N), Bububu South, Bububu North, Mombasa(S), Mombasa(N).

2) Time: Total 4 interval

at 00:00, 06:00, 12:00 and 18:00

3) Day: Total 3 days

on 6 Dec, 7 Dec and 8 Dec, 2002.

### **2. QUANTITY READINGS**

Quantity Reading in the existing pipelines at the following points and time.

1) Points: Total 15 points

Mnazi Mmoja, Shangani, Michenzani, Chumbuni-1, Chunbuni-2, Muungano, Sebleni, Sogea(Mosq), Kwa Mtipura, Magogoni(S), Magogoni(N), Bububu South, Bububu North, Mombasa(S), Mombasa(N)

2) Time and Day: at 06:00 on 9 Dec, 2002.

SUMMARY OF PIPE REPAIR)  
HARIFA ZA MAJI SAFI

ANNEX B

(YEAR 2000)

MWALA 2000  
 MONTH  
 MWEZI

(PIPE REPAIRED)

BOMBA LILILOFANYWA VAZI

	8"ac	8"pvc	6"ac	6"pvc	4"ac	4"pvc	3"ac	3"pvc		
JANUARI	5	-	12	-	6	-	6	-		
FEBRUARI	8	-	9	2	3	-	2	-		
MACHI	12	2	16	-	7	-	4	-		
APRILI	4	-	12	-	4	-	6	-		
MEI	2	2	14	2	5	3	-	-		
JUNI	25	-	14	4	10	2	-	-		
JULAI	22	1	20	12	2	-	1	-		
AGOSI	9	-	14	8	8	9	3	3		
SEPTEMBER	20	3	12	-	4	4	4	-		
OKTOBA	21	-	6	-	-	-	1	1		
NOVEMBER	8	-	6	-	7	-	1	1		
DISEMBA	6	-	17	-	11	8	2	1		
NOVEMBER										

(SUMMARY OF PIPE REPAIR)  
TAAKIFA ZA MAJI SAFI

(YEAR - 2001)

MWAKA 2001

(PIPE REPAIRED)

BOMBA LILILOFANYWA UAZI

(MONTH) MWEZI	8"ac	8"pvc	6"ac	6"pvc	4"ac	4"pvc	3"ac	3"pvc
JANUARI	12	1	15	5	5	7	8	-
FEBRUARI	20	-	8	1	6	3	6	-
MACHI	7	5	19	3	14	2	-	-
APRILI	6	-	16	-	15	3	2	-
MEI	2	-	15	-	36	9	1	1
JUNI	-	-	16	-	22	6	7	1
JULAI	7	-	12	-	21	5	10	-
AGOSTI	7	2	10	-	12	6	4	-
SEPTEMBA	12	-	3	4	8	4	2	-
OKTOBA	7	-	24	-	11	5	3	-
NOVEMBA	17	-	16	1	7	6	-	1
DISEMBA	7	-	6	-	4	7	4	1

(SUMMARY OF PIPE REPAIRS)  
 TAARIFA ZA MASI SAFI

(YEAR - 2002)

WAWA 2002

(PIPE REPAIRED)

MONTH)  
 WERU

BOMBA LILILOFANYWA WAZI

	8"ac	8"pre	6"ac	6"pre	4"ac	4"pre	3"ac	3"pre	
JANUARI	12	1	14	3	8	7	8	-	
FEBRUARI	4	7	13	3	8	-	1	1	
MARCH	13	1	18	-	4	5	4	-	
APRILI	3	-	9	3	-	1	-	-	
MAY	12	-	18	-	8	1	-	-	
JUNI	4	-	18	-	10	1	2	1	
JULAI	12	-	5	-	7	2	3	-	
AGOSTI	12	-	19	-	6	-	4	-	
SEPTEMBER	4	1	6	-		3	10	16	
OKTOBA	6	-	14	-	4	1	8	8	
NOVEMBER	13	4	1	2	4	-	1	-	
DISEMBER	9	-	11	-	6	1	7	-	4

## WATER LEAKAGE SURVEY RESULTS

### 1. PRESSURE READINGS

Table 1 PRESSURE READINGS

S/N	Date	Station	Reading (Bars)				Remarks
			00 : 00	06 : 00	12 : 00	18 : 00	
1.	06/12/02	Mnazi Mmoja	0.6	0.4	0.5	0.3	
2.	06/12/02	Shangani	0.3	0.2	0.4	0.2	
3.	06/12/02	Michenzani	0.5	0.4	0.3	0.3	
4.	07/12/02	Chumbuni - 1	R	R	0.4	R	R = No supply due rationing.
5.	07/12/02	Chumbuni - 2	R	R	0.3	0.2	R = No supply due rationing.
6.	07/12/02	Muungano	-	-	-	-	Reading too small, appr. = 0
7.	07/12/02	Sebleni	-	-	-	-	Reading too small, appr. = 0
8.	07/12/02	Sogea (Mosq)	0.3	0.2	-	0.1	- = Reading small, appr. = 0
9.	07/12/	Kwa Mtipura	0.5	0.5	0.4	0.4	
10.	08/12/02	Magogoni (S)	-	-	-	-	Low pressure - 0 Reading ap.
11.	08/12/02	Magogoni (N)	0.2	0.1	0.1	0.1	(S) = South and (N) = North
12.	08/12/02	Bububu South	0.5	0.2	0.2	R	R = No supply due rationing.
13.	08/12/02	Bububu North	x	X	x	x	x = No supply due low press.
14.	08/12/02	Mombasa (S)	-	-	-	0.05	Reading too small, appr. = 0
15.	08/12/02	Mombasa (N)	0.3	0.2	0.1	0.1	

## 2. VOLUME/QUANTITY READINGS

**Table 2.2.2. QUANTITY READINGS**

S/N	Date	Station	Reading (ltrs/min.)	Remarks
1.	09/12/2002	Mnazi Mmoja	7.5	
2.	09/12/2002	Shangani	3.2	
3	09/12/2002	Michenzani	4.5	
4.	09/12/2002	Chumbuni - 1	-	No supply due to rationing.
5.	09/12/2002	Chumbuni - 2	-	No supply due to rationing
6.	09/12/2002	Muungano	-	No supply due to rationing
7.	09/12/2002	Sebleni	-	No supply due to rationing
8.	09/12/2002	Sogea (Mosqu)	2.5	
9.	09/12/2002	Kwa Mtipura	8.0	
10.	09/12/2002	Magogoni (S)	-	No supply due to rationing.
11.	09/12/2002	Magogoni (N)	7.5	
12.	09/12/2002	Bububu South	-	
13.	09/12/2002	Bububu North	-	No supply.
14.	09/12/2002	Mombasa (S)	-	No supply due to rationing
15.	09/12/2002	Mombasa (N)	-	No supply due to rationing



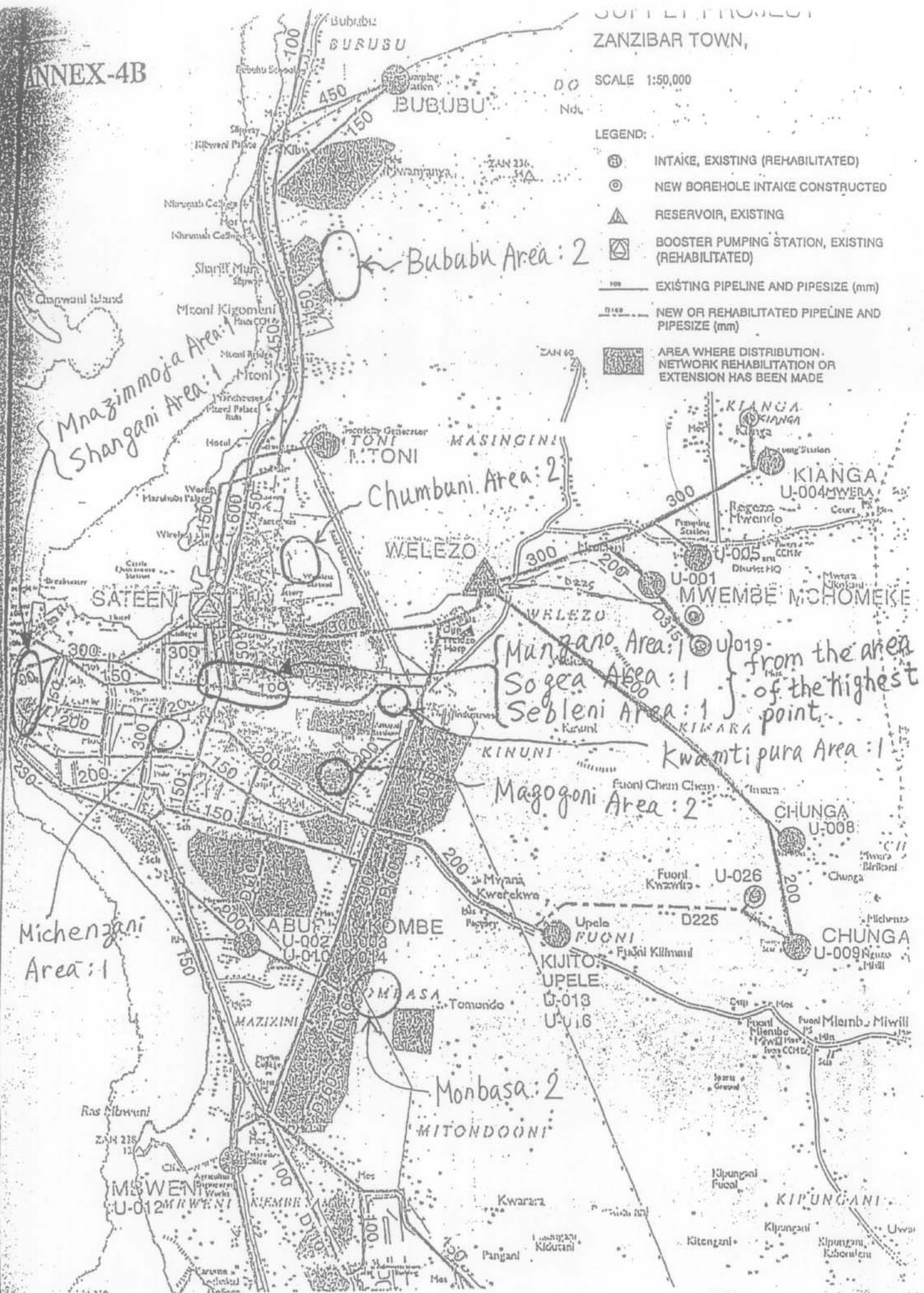
ANNEX-4B

SUPPLY PROJECT  
ZANZIBAR TOWN,

SCALE 1:50,000

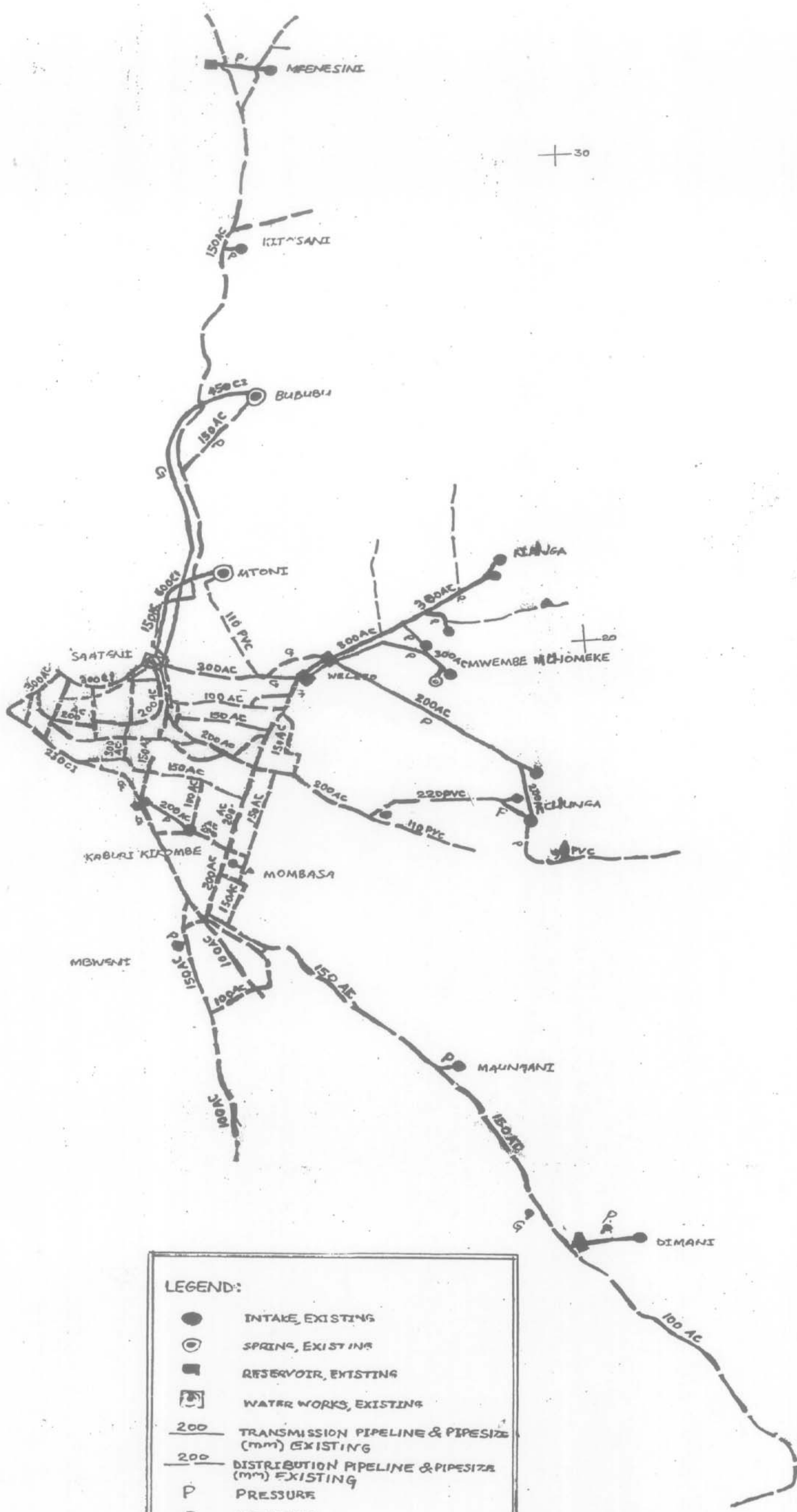
LEGEND:

- ⊕ INTAKE, EXISTING (REHABILITATED)
- ⊙ NEW BOREHOLE INTAKE CONSTRUCTED
- △ RESERVOIR, EXISTING
- ⊞ BOOSTER PUMPING STATION, EXISTING (REHABILITATED)
- EXISTING PIPELINE AND PIPESIZE (mm)
- - - NEW OR REHABILITATED PIPELINE AND PIPESIZE (mm)
- ▨ AREA WHERE DISTRIBUTION NETWORK REHABILITATION OR EXTENSION HAS BEEN MADE



M.S  
M.I.M

Layout Plans of Existing Water Supply Network in Zanzibar Town Municipality

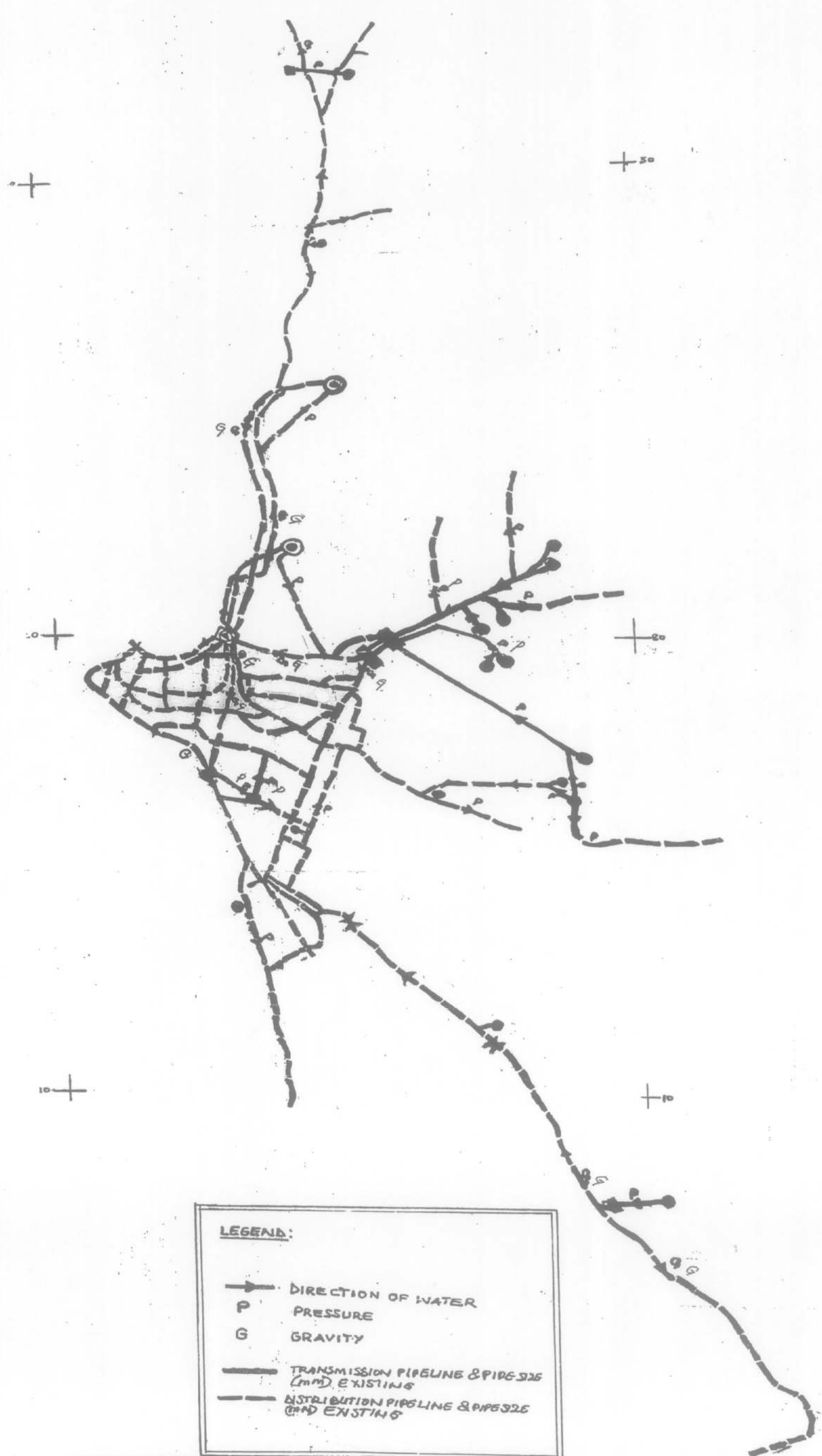


**LEGEND:**

- INTAKE, EXISTING
- ⊙ SPRINGS, EXISTING
- RESERVOIR, EXISTING
- ⊠ WATER WORKS, EXISTING
- 200 — TRANSMISSION PIPELINE & PIPESIZE (mm) EXISTING
- 100 — DISTRIBUTION PIPELINE & PIPESIZE (mm) EXISTING
- P PRESSURE
- G GRAVITY

SCALE 1:50,000

Layout Plans of Existing Water Supply Network in Zanzibar Town Municipality



**LEGEND:**

- ➔ DIRECTION OF WATER
- P PRESSURE
- G GRAVITY
- TRANSMISSION PIPELINE & PIPE SIZE (mm) EXISTING
- - - DISTRIBUTION PIPELINE & PIPE SIZE (mm) EXISTING

## Photograph of Water Leakage Survey



Quantity Reading in the Existing Pipelines



Pressure Reading in the Existing Pipelines



Pressure Reading in the Existing Pipelines



Pressure Reading in the Existing Pipelines

電気施設メンテナンス記録 (2002年)

S/N	Month	Period	Intake	Type of fault
1.	February	01/02/2002	Mwembe Mchomeke-U019	Motor Problem
2.		02/02/2002	Kianga-U032	Motor Problem
3.		03/02/2002	Mbweni-U012	Motor Problem
4.			Dimani	Motor Problem
1.	March	01-31/03/2002	Mwembe Mchomeke-U019	Motor Problem
2.			Kianga-U004	Motor Problem
3.			Kianga-U032	Motor Problem
4.			Mbweni	Control panel problem
5.			Dimani	Motor Problem
6.			Bububu booster	Control panel problem
1.	April	01-03/04/2002	Semuso	Control panel problem
2.			Mnara wa Mbao	Control panel problem
3.			Maungani	High tension problem-SFPC
4.			Mtoni spring	Low tension problem-SFPC
5.			Bububu booster station	Low tension problem-SFPC
6.			Saateni 2 (Booster)	Control panel problem
1.	May	01-31/05/2002	Maungani-U034	Motor Problem
2.			Mbweni TRW-U012	Control panel problem
3.			Mwembe Mchomeke-U019	Control panel problem
4.			Samuso (Booster)	Motor problem
1.	June	01-30/06/2002	Maungani-U034	Motor problem
2.			Chunga-U009	Control panel problem
3.			Mwembe Mchomeke-U019	Motor problem
1.	July	01-31/07/2002	Mwembe Mchomeke-U019	Motor problem
	August	01-31/08/2002	No fault report	
1.	Sept.	01-30/09/2002	Bububu booster	High tension problem-SFPC
2.			Kaburi Kikiombe-U027	Control panel problem
1.	October	01-31/10/2002	Saateni 3 (Booster)	Control panel problem

補修内容の記述

S/N	Type of faults	Description	Remarks
1.	Motor Problem	Faults associated with motor bearing, motor winding, bushes, winding, motor cables, etc.	
2.	Control panel problem	Faults associated with relay components; such as voltage relay, water level relay, overload relay, timer relay, contactor, control switch, push button switch, etc.	
3.	High tension problem	These faults correspond to high-tension power lines (33 kV or 11 kV). Most of these faults are associated to power conductors, HT fuses, HT switches etc, SFPC is responsible to rectify these problems.	SFPC = State Fuel and Power Corporation
4.	High tension problem	These faults correspond to low-tension power lines (3 Phase, 415 Volts, 50 Hz). Most of these faults are associated to power line conductors, loose connections, MV switch gears, fuses (burned), etc. Either SFPC or DWD is responsible to rectify these problems, depending upon the extent and location of the problem itself.	

機材施設メンテナンス記録 (2000年～2002年)

S/N	Date	Location	Type/Description of repair	Remarks
<b>A.</b>	<b>YEAR 2000:</b>			
1.	31/01/2000	Chunga U-009	- Replacement of 47 by 53kW motor pumps.	Mo53 kW, 102 A, 400V, 50Hz.
2.	23/02/2000	Kaburi Kikombe U035	- Removal, Cleaning and Flushing of motor pump and borehole.	Motor pump: 43.5kW
3.	24/02/2002		- Re installation of motor pump	Riser: 4" GS, 13 pcs-3m each.
4.	27/03/2000	Saateni 1 Booster	- Replacement of bush to pump No.1	
5.	25/04/2000	Saateni 1 Booster	- Tightening of coupling unt	
6.	24/07/2000	Chunga U-008	- Removal of 75 kW pump from the borehole.	Motor pump: 75kW, 110A
7.	28/07/2000		- Installation of another 75kW pump following repair of the motor by changing rotor, clutch and bush.	Riser pipes: 5" Stainless steel, 9 pcs-3m each.
8.	11/08/2000	Chunga U-008	- Removal of pump following its coupling bush being worn out due to misalignment and installation of a temporary one.	
9.	15/08/2002		- Re-installation of the same following repair.	
10.	19/09/2000	Kianga U-032	- Installation of a pump and commissioning of the new borehole.	UPA 150 S-65/18, UMA 150 B33/21, 33kW,
11.	10/10/2000	Kaburi Kikombe U-035	- Removal, Cleaning and Flushing of motor pump and borehole after being jammed by mud.	Incrustation is the main problem of Kaburi Kikombe boreholes.
12.	11/10/2000		- Re-installation of the same after cleaning	Routine cleaning is necessary.
13.	12/10/2000	Maungani U-034	- Installation of a pump and commissioning of the new borehole.	UPA 150 S-48/15, 29kW, 50Hz, 400V, 67.6A
14.	17/10/2000	Chunga U-008	- Removal of pump for repair of bush of the motor	
15.	22/10/2000		- Re-installation of the same after repair of bush and clutch.	
16.	23/10/2000	Mwembe Mchomeke U-019	- Removal of pump following motor shorts circuiting with body and clutch worn out.	
17.	24/10/2000		- Re-installation of the same after making repair on motor by changing rotor and bush of 75kW.	
18.	03/11/2000	SEMUSO U-039	- Removal of pump following motor shorts circuiting with body and clutch worn out. - Re-installation of the same after replacement of motor.	Riser pipes: 3" Stainless steel, 11 pcs-3m each.
19.	13/12/2002	Chunga U-008	- Removal of a pump for clutch repair and re-installation of the same after repair.	
20.	29/12/2000	Mwembe Mchomeke U019	- Installation of 30kW motor pump.	30kW, 50m <sup>3</sup> /hr, H=97m, 5" pipe

機材施設メンテナンス記録 (2000年～2002年)

S/N	Date	Location	Type/Description of repair	Remarks
<b>B.</b>	<b>YEAR 2001:</b>			
1.	03/01/2001	Mwembe Mchomeke U-001	- Removal of motor pump due to problems of motor clutch and bearing.	Motor pump: 55kW
2.	06/01/2001		- Re-installation of the same after sending the clutch to Dar-Es Salaam for repair.	Riser pipes: 5" Stainless steel, 16 pcs-3m each.
3.	20/01/2001	Kaburi Kikombe U-027	- Installation of a pump and commissioning of the new borehole.	UPA 150 S-48/10, 18.5kW, 385A, 400V
4.	26/01/2001	Chunga U-009	- Repair of non-return valve by putting glance packing to stop leakage.	
5.	07/02/2001	SEMUSO U-039	- Sending of 2.5" riser pipes to the intake station.	
6.	14/02/2001	Chunga U-008	- Replacement of 75 kW motor pump.	75 kW, 160 m <sup>3</sup> /hr H=110m.
7.	16/02/2001	Mwembe Mchomeke U-019 Chunga-U008.	- Removal of 30 kW motor pump. - Installation of 100 m <sup>3</sup> /hr motor pump	30 kW, 50 m <sup>3</sup> /hr Q= 100m <sup>3</sup> /hr, 5"SS-15 pcs.
8.	19/02/2002	Kianga U-004	- Removal of motor pump - Installation of motor pump of/from Mwembe Mchomeke.	50 kW m <sup>3</sup> /hr
9.	20/02/2001		- Tightening bolts of 90° bend so as to stop leakage of the same.	
10.	27/03/2001	SEMUSO U-039	- Installation of the relevant motor pump to the well.	9.2 kW, 18 m <sup>3</sup> /hr H=100 m, Pipe=2.5" SS-11pcs
11.	08/05/2001	Mwembe Mchomeke U-019 Mbweni U-041	- Removal of motor pump from the well. - Constructions of well head fittings.	
12.	09/05/2001	Kianga U-032 Mbweni U-041	- Installation of a motor pump. - Constructions of well head fittings.	
13.	12/05/2001	SEMUSO U-039	- Removal, Cleaning and Flushing of borehole and motor pump.	
14.	06/06/2001	Mbweni U-041	- Installation of a pump and commissioning of the new borehole.	UPA 150 S 48/10, 18.5 kW, 50 Hz, 400V, 38.5A
15.	03/12/2001	SEMUSO Mwembe Mchomeke U019	- Electrical breakdown. - Pump breakdown.	
16.	05/12/2001	Mwembe Mchomeke U-019	- Removal of motor pump.	95 m <sup>3</sup> /hr, H=85m Pipes=15 pcs
17.	07/12/2001	Kaburi Kikombe U027	- Installation of pump after cleaning.	
	12/12/2001	Kianga U-032	- Installation of a pump which was previously at Kitosani borehole.	Pleuger, Damm 10SP-22047

機材施設メンテナンス記録 (2000年～2002年)

S/N	Date	Location	Type/Description of repair	Remarks
<b>C. YEAR 2002:</b>				
1.	02/01/2002	Kianga U-0	- Removal of motor pump due to increase in electrical current.	33kW, 85m <sup>3</sup> /hr. Pipe=12pcs-each 2.5m.
2.	08/01/2002	Mtoni Booster	- Removal of motor pump due to coupling and shaft being broken.	Motor pump: 8kW
3.	09/01/2002	Mwembe Mchomeke U-019	- Installation of a motor pump following repair of cut cable.	
4.	11/01/2002	Bububu Booster	- Tightening of the unit which was loose hence causing leakage.	
5.	24/01/2002	Mwembe Mchomeku U-033	- Constructions of well head fittings.	
6.	01/02/2002	Mwembe Mchomeke U-019	- Removal of motor pump due to motor and pump were running separate.	
7.	13/02/2002	Mtoni Booster	- Removal of motor pump due to shaft cut off.	
8.	14/02/2002	Mwembe Mchomeke U-033	- Installation of motor pump following repair of motor.	
9.	26/02/2002	Mwembe Mchomeke U-033	- Removal of motor pump following motor shorts circuiting with body.	
10.	03/03/2002	Mwembe Mchomeke U-033	- Installation of new 30kW Grund Force motor pump.	
11.	06/03/2002	Kianga U-004	- Installation of new 30 kW Grund Force motor pump.	
12.	23/03/2002	Kianga U-032	- Installation of new 22 kW motor pump.	22 kW, Q=60m <sup>3</sup> /hr, H=95m.
13.	02/04/2002	Saateni 2Booster	- Dismantling of motor pump due to bearing and bush breakdowns.	
14.	03/04/2002		- Dismantling ended by identifying shaft worn out.	
15.	08/04/2002	Mbweni (TRW) U-012	- Removal of motor pump	
16.	14/04/2002	Saateni 2 Booster	- Assembling of motor pump.	Assembling failed, part sent to machine workshop.
17.	17/04/2002		- Re-assembling of motor pump.	
18.	24/04/2002		- Tightening of glance packing.	
19.		Mwembe Mchomeke	- Tightening of glance packing	
20.	09/05/2002	Maungani U-034	- Removal of motor pump	4" GS-pcs
21.	22/05/2002	Mbweni (TRW) U-012	- Installation followed by removal of motor pump due to motor short-circuiting with body. - Re-installation of the same after repair.	
22.	20/06/2002	Mwembe Mchomeke	- Removal of motor pump due to breakdown.	
23.	21/06/2002		- Installation of the same after repair.	
24.	01/08/2002	Mbweni (TRW) U-012	- Motor pump repair.	
25.	09/08/2002	SEMUSO Booster	- Installation of motor pump in the reservoir.	
26.	13/08/2002	Maungani U-034	- Installation of new 30 kW motor pump.	Motor pump: 30 kW, 40m <sup>3</sup> /hr.
27.	24/09/2002	Saateni 2 Booster	- Start assembling of motor pump.	



機材施設メンテナンス記録 (2000年～2002年)

S/N	Date	Location	Type/Description of repair	Remarks
<b>C.</b>	<b>YEAR 2002:</b>			
28.	15/10/2002	Saateni 2 Booster	- Finalize assembling of the same.	Riser pipe: PE 11/2", 36m
29.	18/10/2002	Migombani U-047	- Installation of motor pump and commissioning of the new borehole.	
30.	23/10/2002	Kaburi Kikombe	- Installations of motor pump following repair of worn out coupling.	
31.	26/10/2003	Saateni 3 Booster	- Motor pump repair.	
32.	30/10/2002		- Installation of motor pump. - Replacement of Kianga by Mwembe Mchomeke pumps.	
	20/02/2001		- Tightening bolts of 90° bend so as to stop leakage of the same.	
	27/03/2001	SEMUSO-U039	- Installation of the relevant motor pump to the well.	
	08/05/2001	Mwembe Mchomeke New B/H	- Removal of motor pump from the well.	
		Mbweni-U041	- Construction of well head fittings.	
	09/05/2001	Kianga	- Installation of a motor pump.	
		Mbweni-U041	- Constructions of well head fittings.	
	12/05/2001	SEMUSO-U039	- Removal, Cleaning and Flushing of borehole and motor pump.	
	06/06/2001	Mbweni President B/H	- Installation of a pump and commissioning of new borehole.	

### 水質試験用機器・要望リスト

1. Atomic Absorption Spectrophotometer with reagents for water analysis (Full analysis).  
( 炎光分光光度計及び水質試験試薬 )
2. pH meter.  
( PH メーター )
3. Turbidity meter.  
( 濁度計 )
4. Distiller-Automatic Water Stills (for distilled water) – Double distiller more better.  
( 蒸留器 )
5. Titration Cartridge with full reagents for Hardness, Calcium, Alkalinity, Carbon dioxide, Chloride.  
( 滴定濃度測定器 ( 硬度、カルシウム、アルカリ度、炭素、二酸化炭素、塩素 ) )
6. Media for Fecal Coliform (M-FC Agar) and for total Coliform (M-ENDO Agarless)  
( 大腸菌群、細菌培養地、測定器 )
7. Microscope Binocular  
( 顕微鏡 )
8. Reagent and sample cell for papua Lab-Photo meter  
( 携帯式水質試験キット ( 試薬及びサンプルセル付き ) )

## 工作機器要望リスト

1. Hack saw machine (切断マシーン)
  2. Presser machine (プレスマシーン)
  3. Milling machine (フライス盤(粉碎機))
  4. Surface grinder machine (表面研削機)
  5. Block re boring machine (ブロックさく孔機)
  6. Tools for shaping (Turning tools) (型削り盤)
  7. Workshop based mobile crane (2 $\frac{1}{2}$  tons)
  8. Taps of dies (All sizes) (ダイス(雄ネジを切る工具の Taps (栓)))
  9. Forging accessories (鍛錬付属品)
  10. Reamer 1 set (リーマー式(金属に開けた穴を拡大したり仕上げたりする))
  11. Drill bit 1" up to 40 mm (ドリルビット(25mm~40mm))
  12. Tool box (工具箱)
  13. Pipe wrenches (工具(レンチ))
  14. Welding machines (溶接機材)
  15. Welding equipment (溶接部品)
  16. Bench vices (作業台)
  17. Bending machine (曲げ機械)
  18. Hydraulic bending machine for pipes (油圧式管用曲げ機械)
  19. Bench shears (剪断台)
  20. Heat treatment equipment
  21. Blow lamps
  22. Hydraulic hammer (油圧ハンマー)
  23. Turning lathe (掛け金)
  24. Horizontal grinding machine (水平研削機械)
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