

APPENDIX - 4 FIELD SURVEY ITINERARY

1. Basic Design Study

NO	DATE	DAY	ACTIVITIES
1	Sept. 3	Fri.	Leave Tokyo for London
2	4	Sat.	Leave London for Lusaka
3	5	Sun.	Arrive Lusaka, Meeting within JICA team
4	6	Mon.	Courtesy call to EOJ and meeting
5	7	Tue.	Meeting with LWSC
6	8	Wed.	Courtesy call to LCC, Meeting with LWSC
7	9	Thu.	Meeting with LWSC and JICA
8	10	Fri.	Meeting with LWSC and signing of Minutes of discussion, Courtesy call to NCDP
9	11	Sat.	Site survey, sampling and analysis
10	12	Sun.	Data collection and analysis
11	13	Mon.	Meeting with LWSC, EOJ
12	14	Tue.	Site survey
13	15	Wed.	Data collection, meeting with LWSC
14	16	Thu.	Site survey, meeting with LWSC
15	17	Fri.	Courtesy call to MLGH, Site survey
16	18	Sat.	Questionnaire to George Complex, Site Survey
17	19	Sun.	Questionnaire to George Complex, Site Survey
18	20	Mon.	Questionnaire to George Complex, Site Survey
19	21	Tue.	Questionnaire to George Complex, Site Survey
20	22	Wed.	Site survey (Groundwater/topographic survey)
21	23	Thu.	Site survey (Groundwater/topographic survey) Meeting with Care International
22	24	Fri.	Meeting with LWSC
23	25	Sat.	Visit Depot In Kabwe
24	26	Sun.	Data collection and analysis
25	27	Mon.	Meeting with Care International
26	28	Tue.	Data collection of C S O
27	29	Wed.	Data collection of Ministry of Health
28	30	Thu.	Courtesy call to EOJ and JICA, Leave Lusaka for London
29	Oct. 1	Fri.	Leave London for Tokyo
30	2	Sat.	Arrive at Tokyo

CSO: Central Statistics Office

2.Draft Final Report Explanation Study

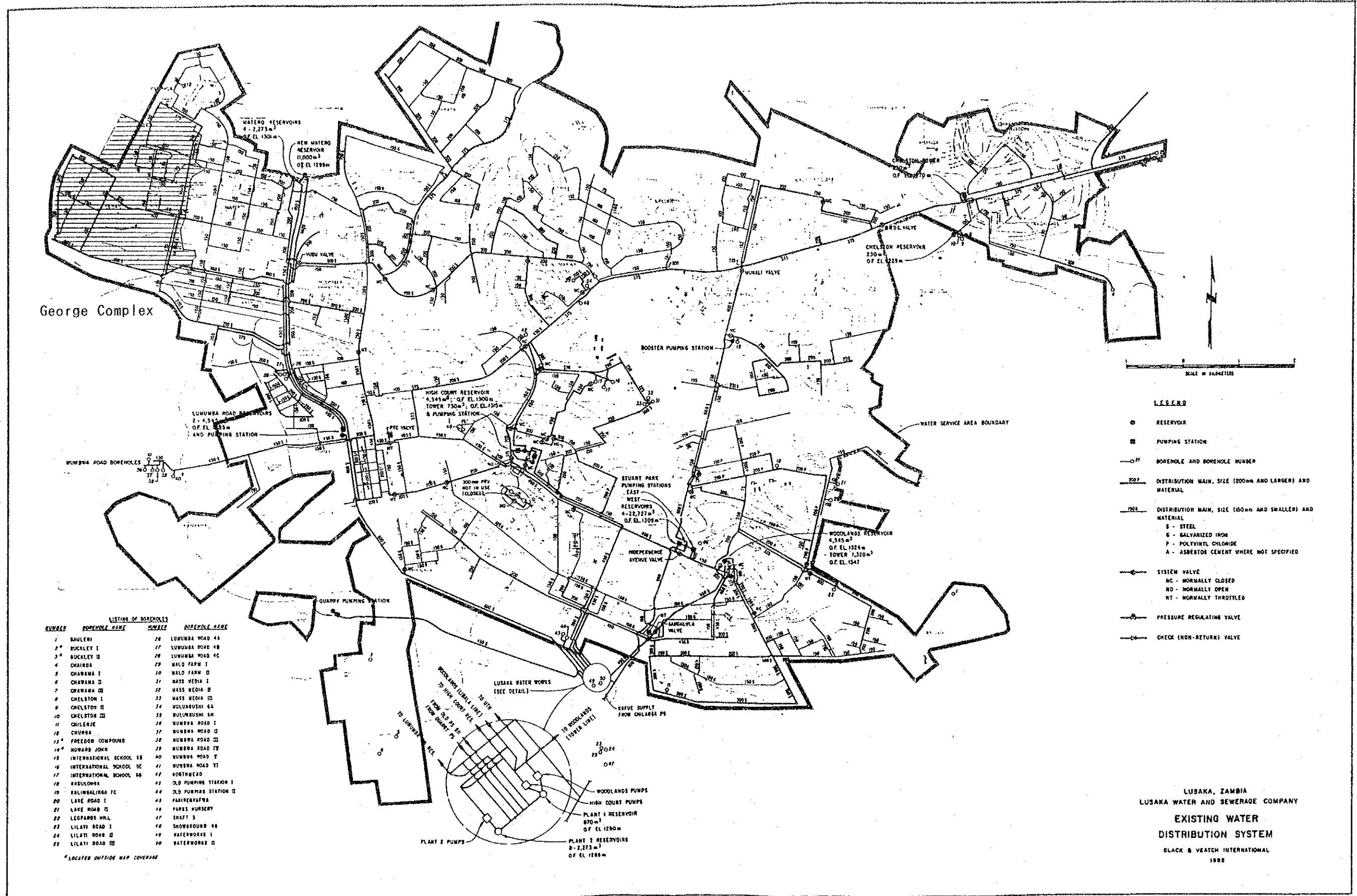
No	DATE	DAY	ACTIVITIES
1	Jan. 8	Sat.	Leave Tokyo for Lusaka(Via Hong Kong, Johannesburg)
2	9	Sun.	Arrive at Lusaka, Site survey in George Complex, Meeting within the Mission
3	10	Mon.	Meeting with EOJ, Meeting with LWSC
4	11	Tue.	Meeting with LWSC
5	12	Wed.	Meeting with LWSC, Courtesy call to JICA Zambia office
6	13	Thu.	Meeting with LWSC
7	14	Fri.	Signing of Minutes of Discussion with LWSC, NCDP, MLGH and LCC, Report to EOJ
8	15	Sat.	Site survey in George Complex
9	16	Sun.	Leave Lusaka for London
10	17	Mon.	Arrive at London
11	18	Tue.	Leave London for Tokyo
12	19	Wed.	Arrive at Tokyo

APPENDIX - 6 LIST OF COLLECTED DATA

<u>TITLE</u>	<u>DATE OF ISSUE</u>	<u>PUBLISHER</u>
1. Health		
○Minutes of Cholera task Force	1992-93	LWSC
2. Foreign Project in Lusaka		
○Care International in Zambia		Care International
○Kalingalinga Community on the Move(GTZ)	1987	GTZ
○Kamanga upgrading project(Irish Project)	1992	LCC
3. Groundwater		
○Groundwater and Management Studies for Lusaka Water Supply	1980	Bundesanstalt für Geowissenschaften und Rohstoffe
○Groundwater Supply Scheme Pre-appraisal Report	Oct.1979	Gauff Consulting Engineers
○Summary of the Groundwater Supply Situation of the City of Lusaka -High Density Area-		Rankin
○Groundwater and Management Studies for Lusaka Water Supply, Part I Groundwater Study VOLUME III	Feb.1978	Federal Institute for Geosciences and Natural Resources
○DITTO VOLUME V	Feb.1978	DITTO
4. Lusaka water and sewerage company		
○LWSC Accounts 31 DEC., 1991		KPMG PEAT MARWICK PUBLIC ACCOUNTANTS
○ DITTO 30 DEC., 1990		
○Lusaka Water Supply Rehabilitation Project of LWSC Statement of Disbursements 31 Dec., 1991		
○Status Report on Lusaka Water Supply Rehabilitation Project for LWSC Aug.,1993		LWSC
○African Development Bank Rehabilitation Project for LWSC	Mar.1988	AfDB
○Document for the Finance & Development Committee for 1993	Mar.1993	LWSC

TITLE	DATE OF ISSUE	PUBLISHER
5. Lusaka City Council		
○ Annual Council Meeting Mayoral Minute SEP,1977-SEP,1978		LUDC
○ Reports Submitted to the Committees, Jan.-Mar.,1993		LCC
○ Council meeting AGENDA Minutes of Committee and Town Clerk's Report, Feb.-Mar.,1993		LCC
○ Reports Submitted to the Committees, Jan.-Feb.,1991		LCC
○ Dept. of Housing and Social Services Annual Report 1991		
○ Social Action Programme for LUDC 1991-93	1991	ASCO CONSULTANTS

APPENDIX-7 (1) EXISTING WATER PIPE LINES IN LUSAKA CITY



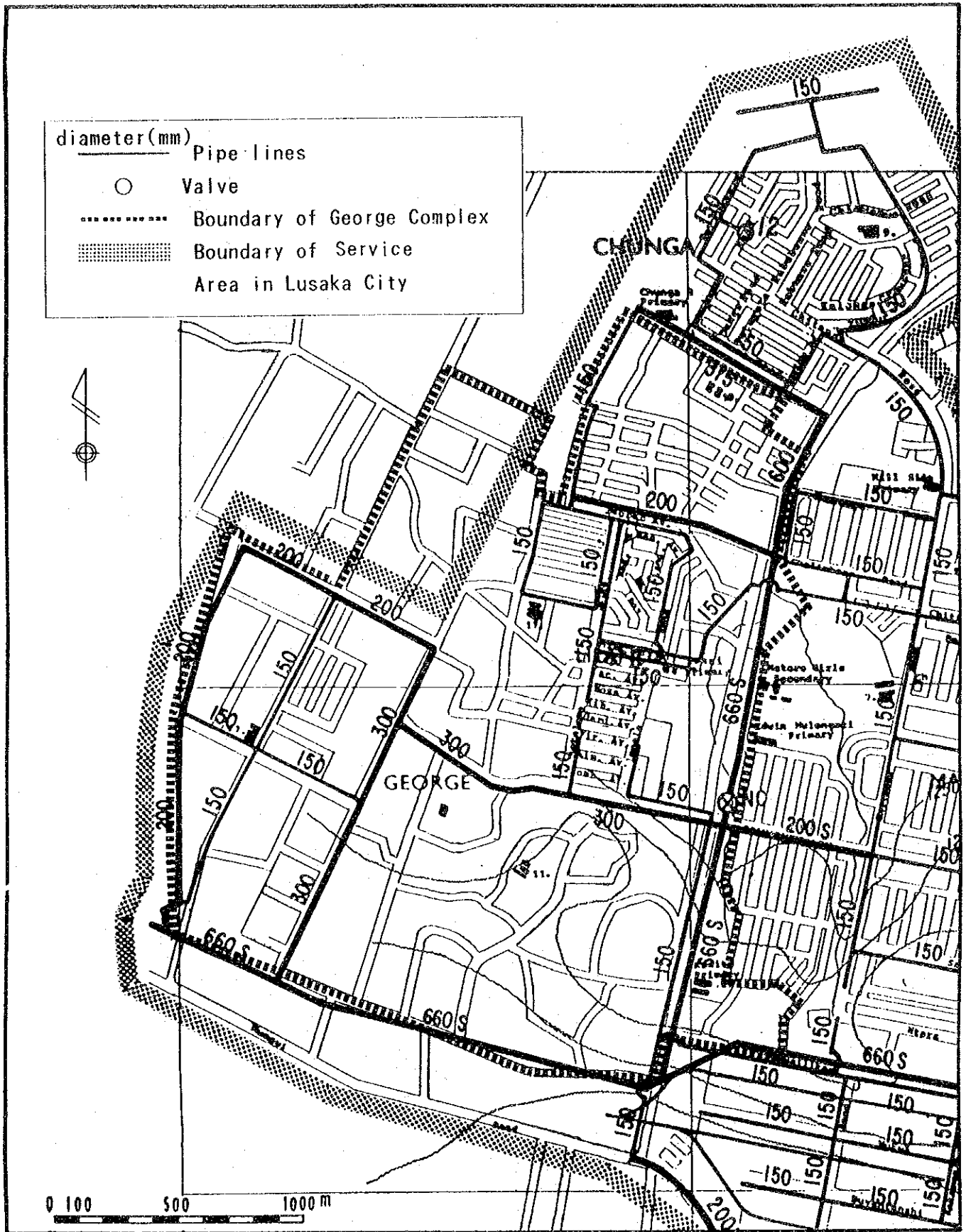
LISTING OF BOREHOLES

NUMBER	BOREHOLE NAME	DEPTH	BOREHOLE NAME
1	BAULERI	26	LUMUMBA ROAD 43
2	BOCKLEY I	17	LUMUMBA ROAD 48
3	BOCKLEY II	18	LUMUMBA ROAD 4C
4	CHAIKWA	29	WALO FARM I
5	CHAWANA I	10	WALO FARM II
6	CHAWANA II	21	WASS BEDIA I
7	CHAWANA III	22	WASS BEDIA II
8	CHELSTON I	23	WASS BEDIA III
9	CHELSTON II	24	WOLUNBUSHI 4A
10	CHELSTON III	25	WOLUNBUSHI 4B
11	CHILERJE	26	WOLUNBUSHI 4C
12	CHURWA	27	WOLUNBUSHI 4D
13	FREEDOM COMPOUND	28	WOLUNBUSHI 4E
14	HOWARD JOHN	29	WOLUNBUSHI 4F
15	INTERNATIONAL SCHOOL 18	30	WOLUNBUSHI 4G
16	INTERNATIONAL SCHOOL 19	31	WOLUNBUSHI 4H
17	INTERNATIONAL SCHOOL 20	32	WOLUNBUSHI 4I
18	ISAKOCHA	33	WOLUNBUSHI 4J
19	KALIMBALINGA 1C	34	WOLUNBUSHI 4K
20	LAKE ROAD I	35	WOLUNBUSHI 4L
21	LAKE ROAD II	36	WOLUNBUSHI 4M
22	LEOPARDS HALL	37	WOLUNBUSHI 4N
23	LILYATI ROAD I	38	WOLUNBUSHI 4O
24	LILYATI ROAD II	39	WOLUNBUSHI 4P
25	LILYATI ROAD III	40	WOLUNBUSHI 4Q
			OLD PUMPING STATION I
			OLD PUMPING STATION II
			PATRICIAVALE
			PAPER WORKS
			INLET 3
			SHOWERSHED 48
			WATERWORKS 1
			WATERWORKS 2

* LOCATED OUTSIDE MAP COVERAGE

- LEGEND
- RESERVOIR
 - PUMPING STATION
 - BOREHOLE AND BOREHOLE NUMBER
 - 200 — DISTRIBUTION MAIN, SIZE (200mm AND LARGER) AND MATERIAL
 - 100 — DISTRIBUTION MAIN, SIZE (100mm AND SMALLER) AND MATERIAL
 - S — STEEL
 - G — GALVANIZED IRON
 - P — POLYVINYL CHLORIDE
 - A — ASBESTOS CEMENT WHERE NOT SPECIFIED
 - SYSTEM VALVE
 - NC - NORMALLY CLOSED
 - NO - NORMALLY OPEN
 - NT - NORMALLY THROTTLED
 - PRESSURE REGULATING VALVE
 - CHECK (NON-RETURN) VALVE

LUSAKA, ZAMBIA
 LUSAKA WATER AND SEWERAGE COMPANY
 EXISTING WATER
 DISTRIBUTION SYSTEM
 BLACK & VEATCH INTERNATIONAL
 1992



APPENDIX - 8 GEOELECTRIC PROSPECTING

1. Outline of the survey

According to results of the hydrogeological survey and data of existing boreholes, a geoelectric prospecting was conducted for candidate points for borehole drillings using the following method. (See APPENDIX 8.1-(1))

Equipment: McOHM Specific Earth Resistance Tester

Measuring Depth: 110 m

Measuring Method: Wenner's 4-electrode configuration

Measuring Interval: 0 - 30 m 2 m interval
 30 - 70 m 4 m interval
 70 - 100 m 10 m interval

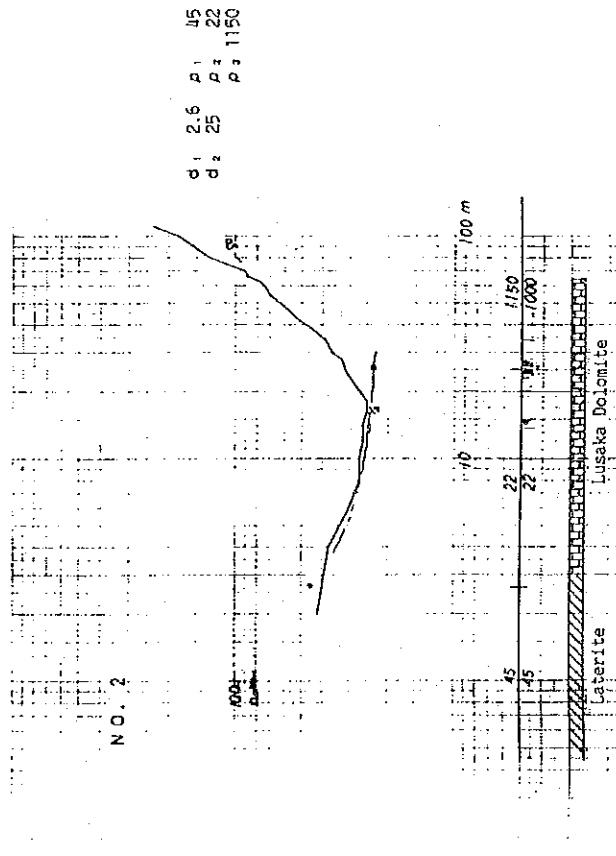
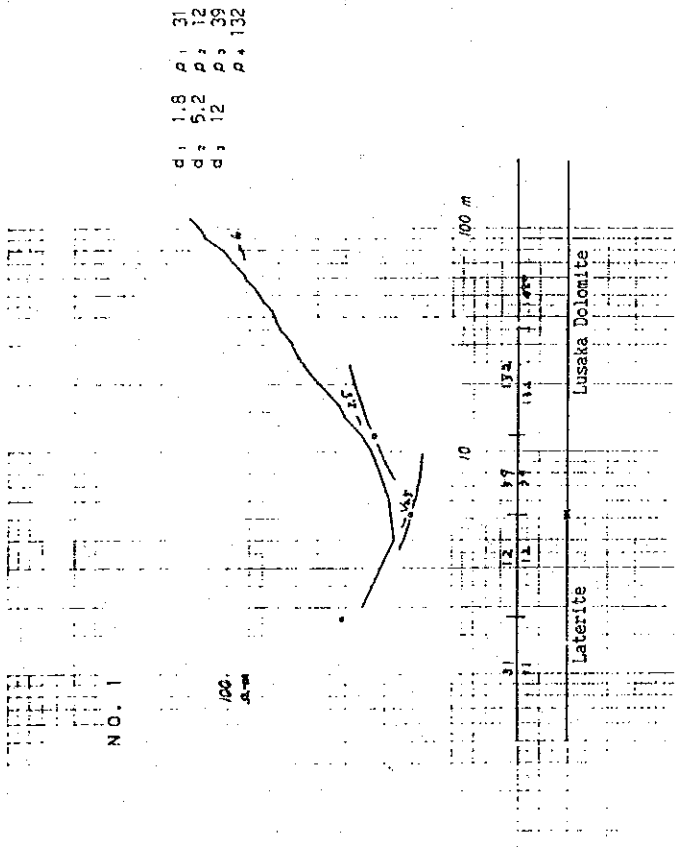
Analysis: Sundberg's standard curve method combined with direct reading method

Prospecting Point: 10 points

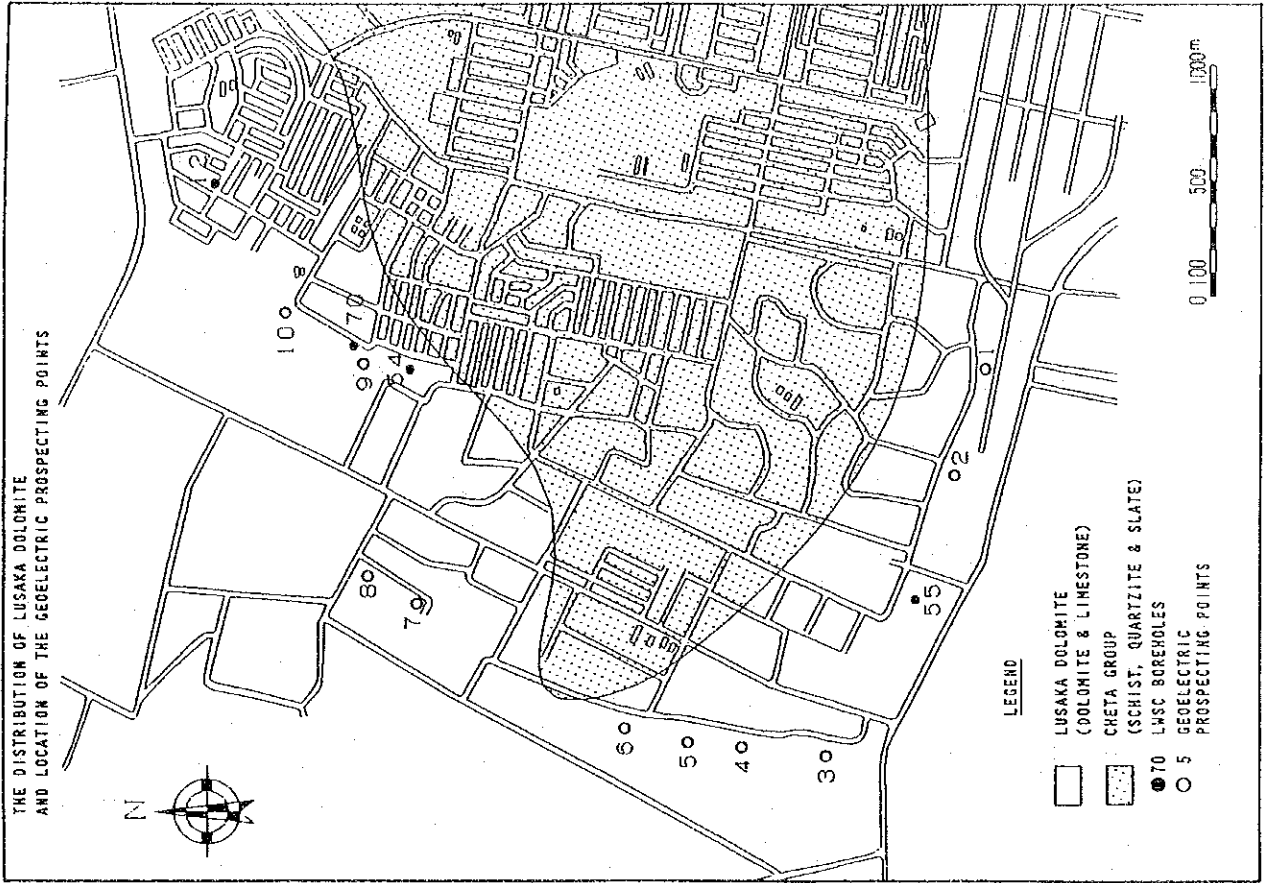
2. In the survey area, aquifer is available in the cavity zone of the dolomite formation. According to results of analysis and the data of existing boreholes, a resistivity value of 20 - 700 $\Omega \cdot m$ is judged to be the cavity zone, indicating the aquifer. And a value over 700 $\Omega \cdot m$ is judged to be the compact and hard zone of dolomite. According to the analysis, the depths and resistivity values which are used to judge the aquifer at every prospecting point were determined as shown below.

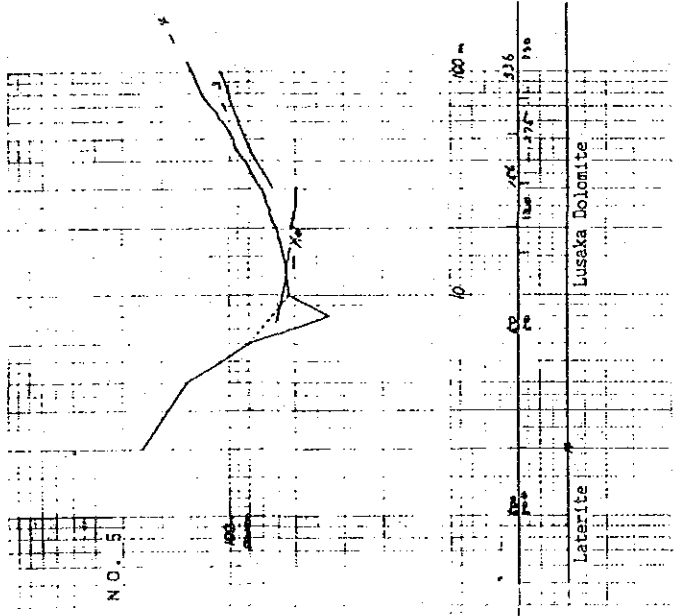
POINT NO.	DEPTH (m)	RESISTIVITY VALVE ($\Omega \cdot m$)
NO.1	12 - 35	132
NO.2	10 - 34	19 - 88
NO.3	14 - 52	55
NO.4	21 - 37	41
NO.5	20 - 75	120 - 275
NO.6	14 - 60	156 - 200
NO.7	12 - 30	52
NO.8	6.4 - 30	111
NO.9	17 - 55	240 - 360
NO.10	13 - 60	296

POINT NO.	RESISTIVITY LAYER	RESISTIVITY VALUE ($\Omega \cdot m$)	DEPTH (m)	LITHOLOGY
No. 1	1ST LAYER 2ND LAYER 3RD LAYER 4TH LAYER	3 1 1 2 3 9 1 3 2	0 ~ 1. 8 1. 8 ~ 5. 2 5. 2 ~ 1 2 1 2 ~	LATERITE DOLOMITE DOLOMITE DOLOMITE
No. 2	1ST LAYER 2ND LAYER 3RD LAYER	4 5 2 2 1 1 5 0	0 ~ 2. 6 2. 6 ~ 2. 5 2. 5 ~	LATERITE DOLOMITE DOLOMITE
No. 3	1ST LAYER 2ND LAYER	3 3 4 9. 5	0 ~ 2. 2 2. 7 ~	LATERITE DOLOMITE
No. 4	1ST LAYER 2ND LAYER 3RD LAYER 4TH LAYER 5TH LAYER	1 3 0 4 3 7 9 4 1 1 4 7 0	0 ~ 2. 9 2. 9 ~ 1 0 1 0 ~ 2 1 2 1 ~ 3 7 3 7 ~	LATERITE DOLOMITE DOLOMITE DOLOMITE DOLOMITE
No. 5	1ST LAYER 2ND LAYER 3RD LAYER 4TH LAYER	5 0 0 5 0 1 5 6 3 3 6	0 ~ 2. 0 2. 0 ~ 2. 0 2. 0 ~ 5 2 5 2 ~	LATERITE DOLOMITE DOLOMITE DOLOMITE
No. 6	1ST LAYER 2ND LAYER 3RD LAYER 4TH LAYER	7 0 0 4 6 2 0 0 7 2 0	0 ~ 2. 1 2. 1 ~ 2. 4 2. 4 ~ 4 4 4 4 ~	LATERITE DOLOMITE DOLOMITE DOLOMITE
No. 7	1ST LAYER 2ND LAYER 3RD LAYER	9 0 2 2. 5 7 2 0	0 ~ 2. 6 2. 6 ~ 2. 5 2. 5 ~	LATERITE DOLOMITE DOLOMITE
No. 8	1ST LAYER 2ND LAYER 3RD LAYER 4TH LAYER	1 7 9 3 4 1 1 1 1 0 8 0	0 ~ 1. 1 1. 1 ~ 6. 5 6. 5 ~ 1 4 1 4 ~	LATERITE DOLOMITE DOLOMITE DOLOMITE
No. 9	1ST LAYER 2ND LAYER 3RD LAYER 4TH LAYER	9 8 6 5 3 6 0 2 4 0	0 ~ 3. 2 3. 2 ~ 8. 0 8. 0 ~ 1 3 1 3 ~	LATERITE LATERITE GRAVEL DOLOMITE
No. 10	1ST LAYER 2ND LAYER 3RD LAYER	6 7 0 6 7 2 9 6	0 ~ 2. 2 2. 2 ~ 1 3 1 3 ~	LATERITE GRAVEL DOLOMITE

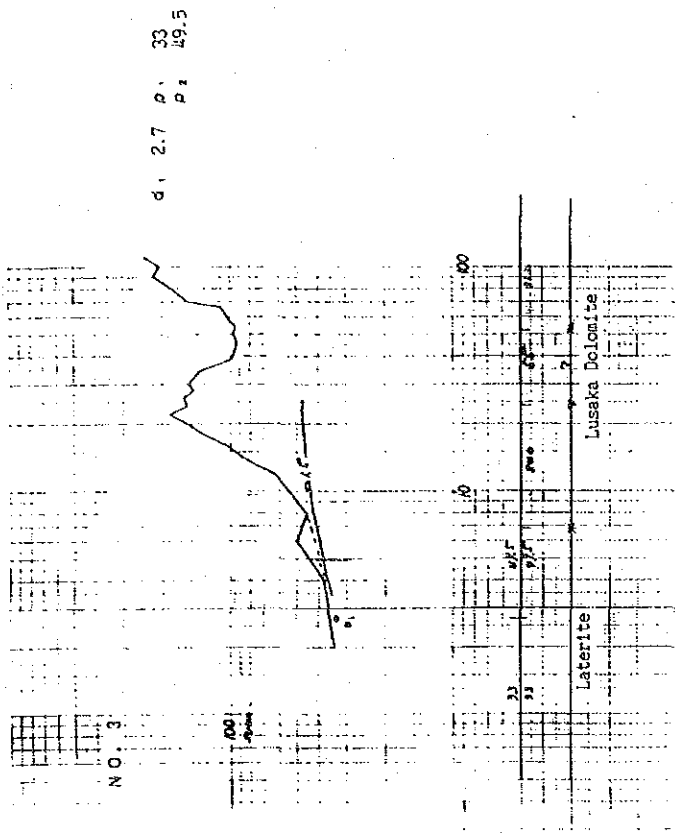


3. GEOELECTRIC PROSPECTING CURVES AND ANALYSES

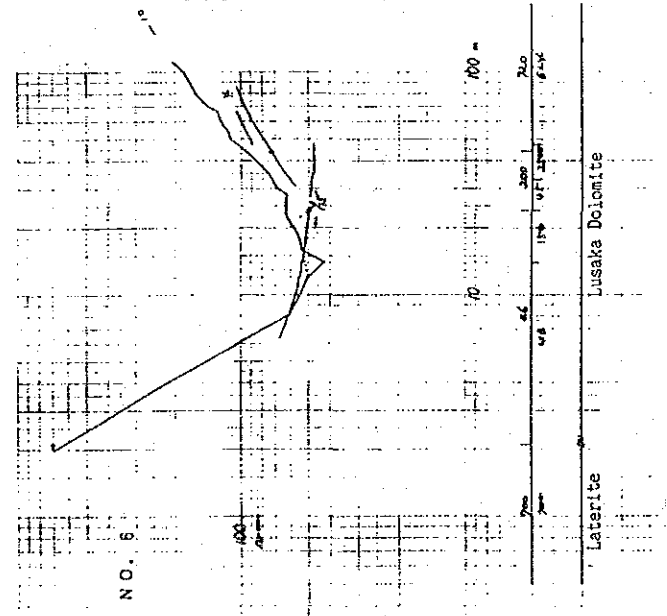




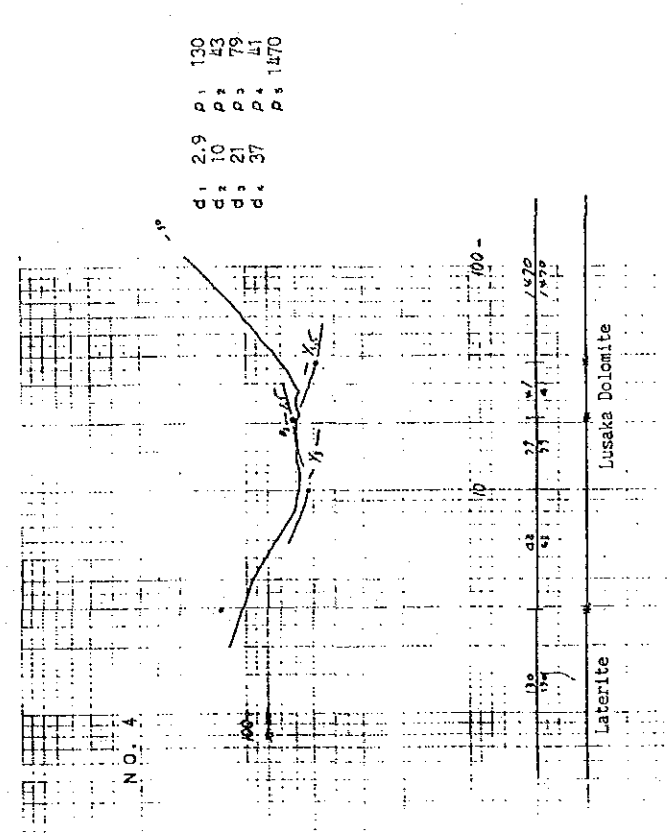
d: 2
p: 500
d: 20
p: 50
d: 52
p: 156
d: 336



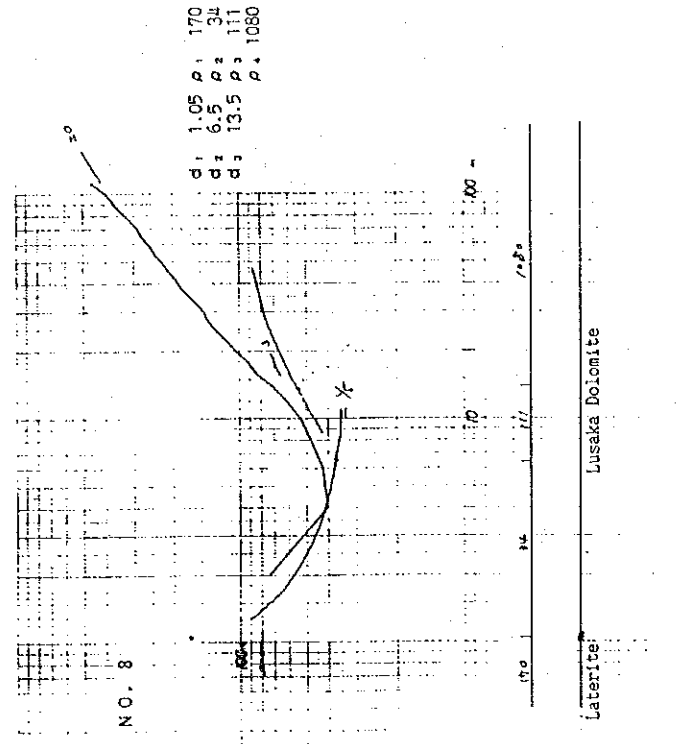
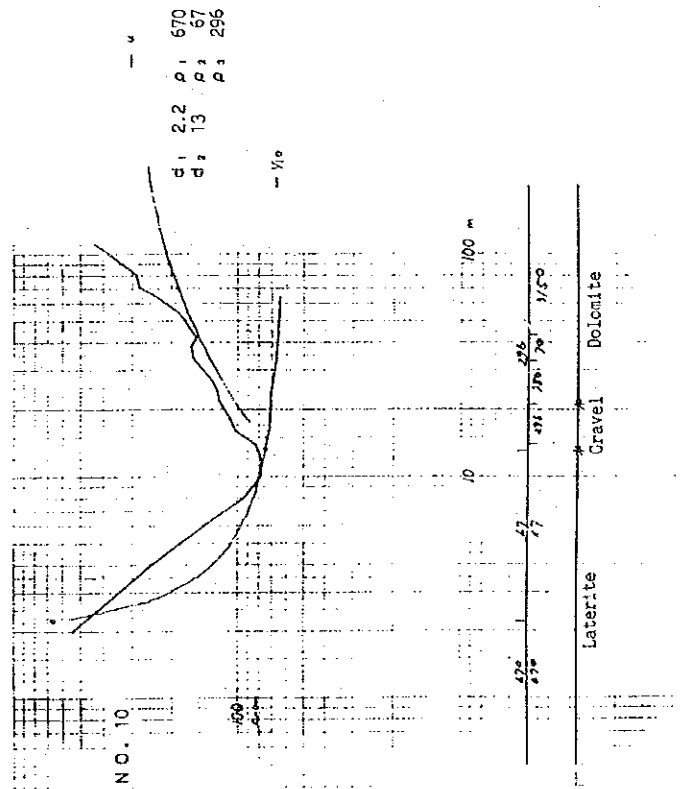
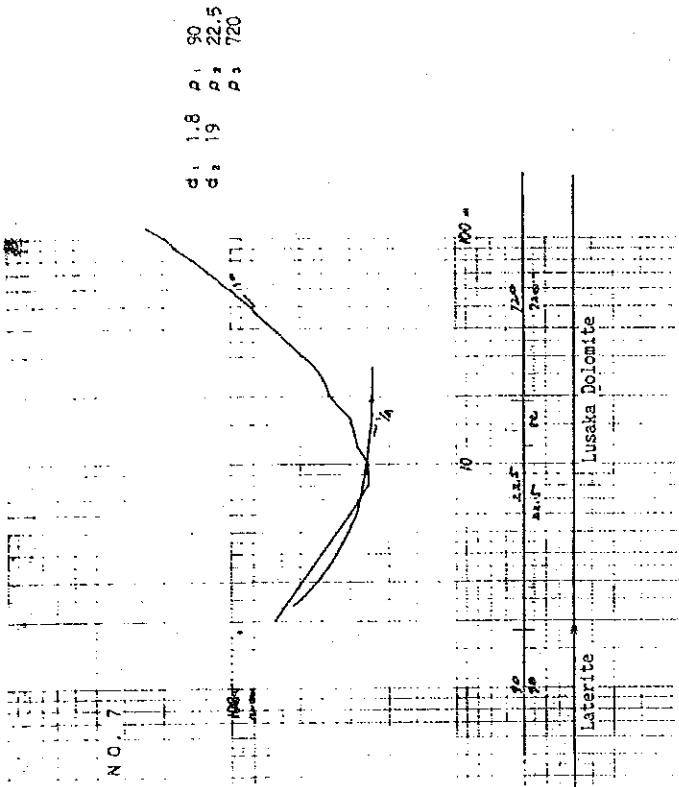
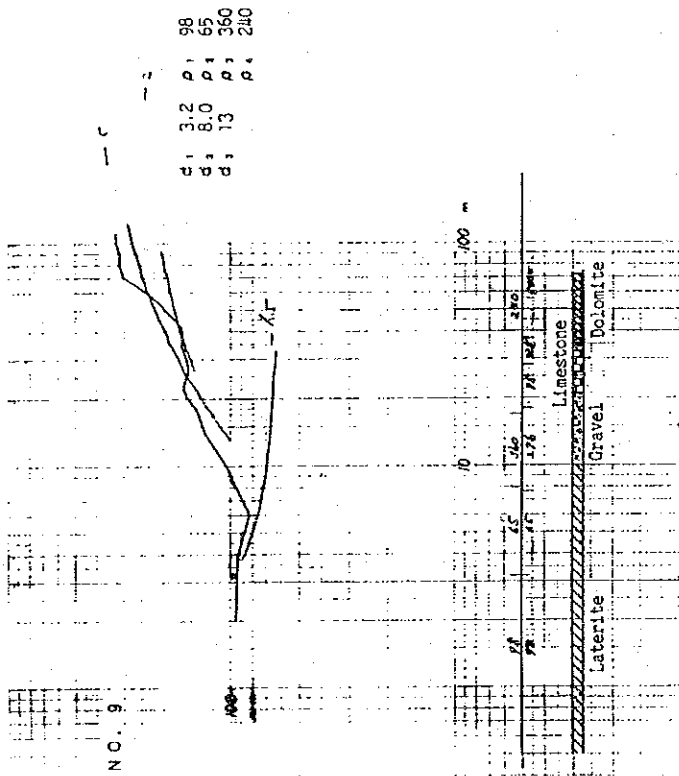
d: 2.7
p: 33
d: 49.5

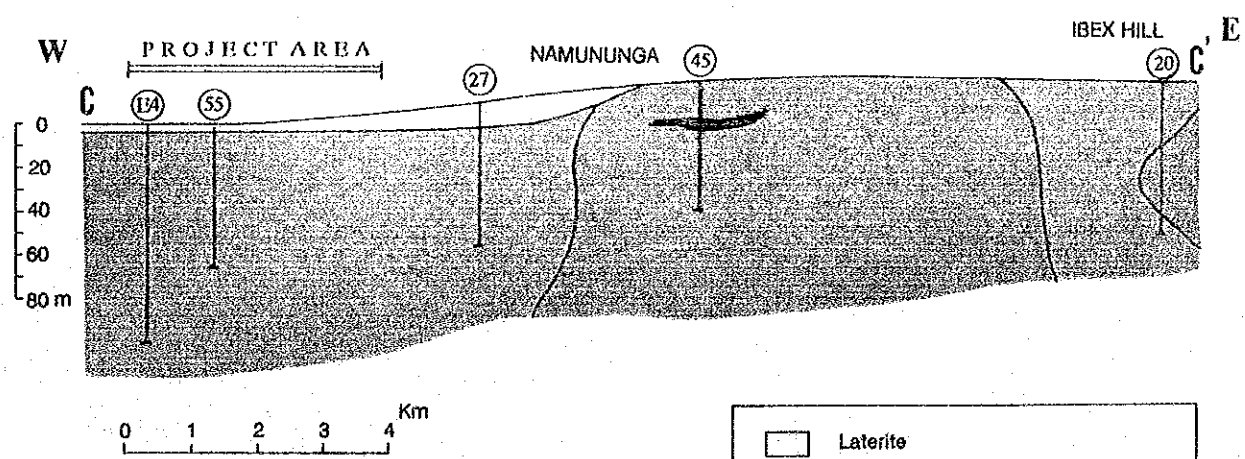
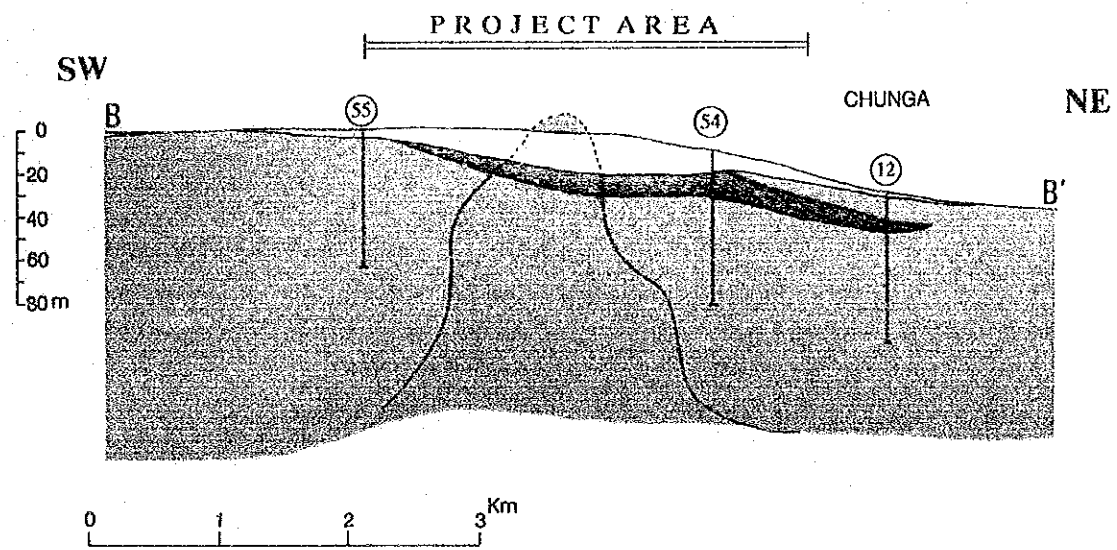
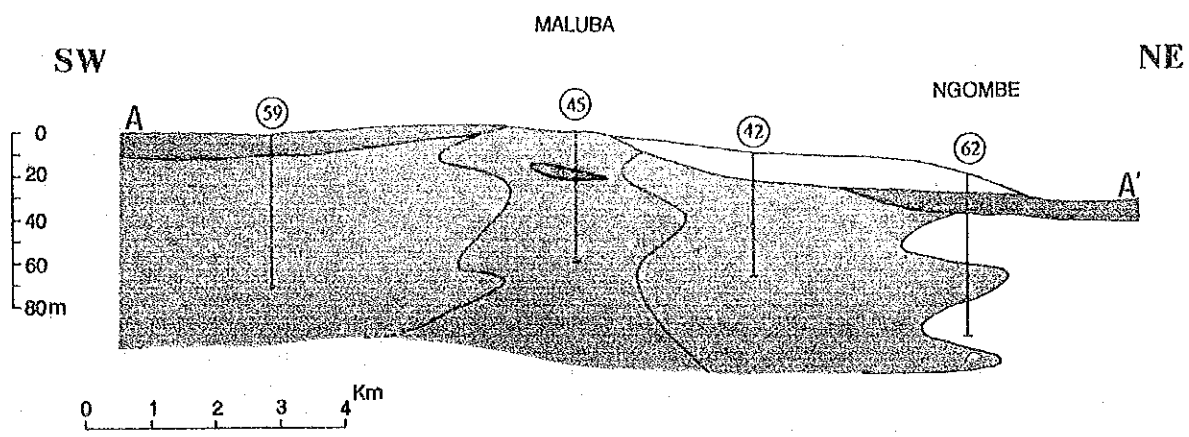


d: 2.1
p: 700
d: 24
p: 46
d: 44
p: 200
d: 720



d: 2.9
p: 130
d: 10
p: 43
d: 21
p: 79
d: 37
p: 41
d: 1470





	Laterite
	Gravel
	Limestone & Dolomite
	Schist
	LWSC Boreholes

4. HYDROGEOLOGICAL FEATURE IN PROJECT AREA:
SECTIONAL VIEW

5. LWSC BOREHOLES DATA (1)

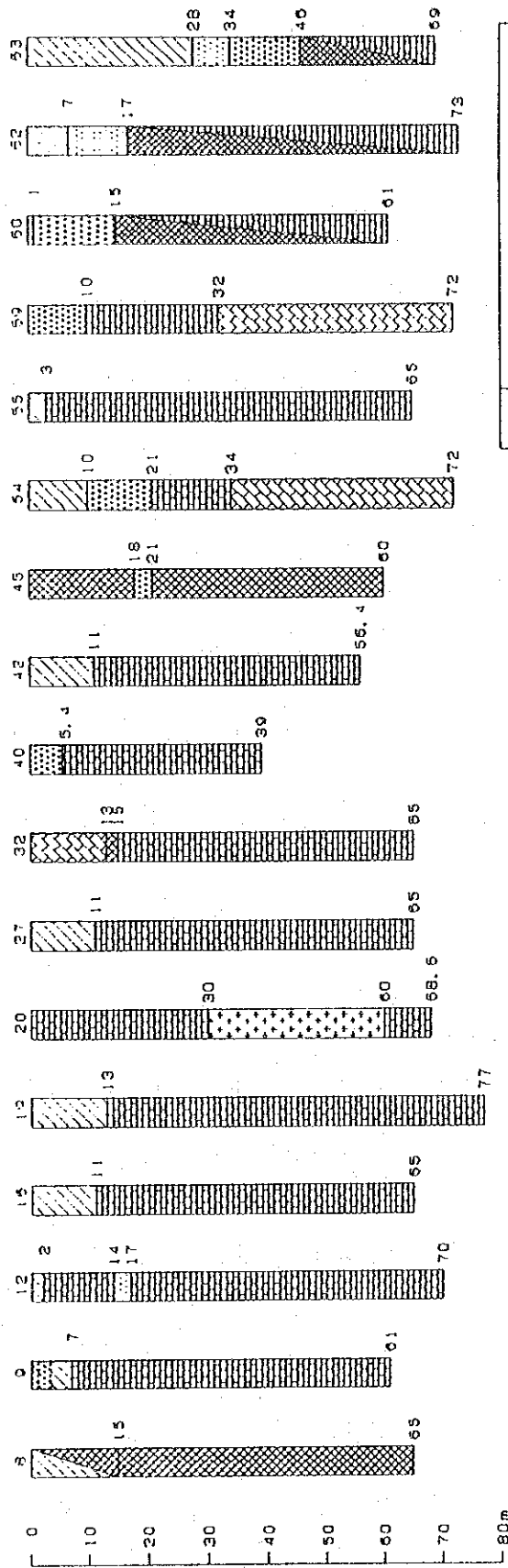
NO.	BOREHOLES	CONDITION	CONSTRUCTION YEAR	DEPTH m	WELL DIA. mm	PUMPING RATE m ³ /hr	PUMPING TEST DATA			SPECIFIC CAPACITY m ³ /hr/m
							P.R. m ³ /hr	S.W.L. m	D.W.L. m	
1	BULEN		1974	45.7	150	50	30	2.1	14.4	2.5
2	BUCKLEY-1		1976	62	150	6				
3	BUCKLEY-11					8				
4	CHANDA		1974	53	200	45	100	6	15.6	10.4
5	CHARAMA-1		1982	60	250	164	164	12.3	14	36.3
6	CHAWAMA-1	no pump	1982	64	300					
7	CHAWAMA-111	abandoned	1984	60	150					
8	CHELSTON-1		1975	55	200	50	50	19	27.6	5.2
9	CHELSTON-11		1975	61	200	48	48	18	27.6	5.0
10	CHELSTON-111	abandoned	1968	65	200					
11	CHILIFU SOUTH		1982	37.5	300	79				
12	CHUNGA		1957	70	200	40	40	4	12	5.0
13	FREEDOM COMPOUND		1972	65	150	6				
14	INTERNATIONAL SCHOOL 65		1968	81	200	150	150	12	13.6	30.8
15	INTERNATIONAL SCHOOL 6C									
16	INTERNATIONAL SCHOOL 6D		1982	65	300	220	220	11.7	14.6	24.4
17	JOHN HOWARD		1976	61	250	80	80	9	11	40.0
18	KABULONGA									
19	KALINGALINGA 7C	abandoned	1968	73	150					
20	LAKE ROAD-1		1975	68.6	200	70	36	1.8	10.65	4.1
21	LAKE ROAD-2 (BEX HILL)	abandoned	1985	68.6	200					
22	LEOPARDS HILL		1976	95	300	150	150	8	15	21.4
23	LILAYI ROAD-1		1975	67	200	45	145	13	14.6	90.6
24	LILAYI ROAD-2		1968	67	200	145	180	11.6	14.6	60.0
25	LILAYI ROAD-3	no pump	1968	67	200					
26	LUMBA ROAD 4A		1988	70	300	110	145	8	20	12.1
27	LUMBA ROAD 4B		1982	65	300	130	180	6.9	32.8	6.9
28	LUMBA ROAD 4C	abandoned	1982	75	300					
29	MALO FARM-1		1972	58	300	200	100	10	13	12.5
30	MALO FARM-2	abandoned								
31	MASS MEDIA-1		1993	70	300	220	220	12	13.2	183.3
32	MASS MEDIA-2		1980	65	350	90	180	9.1	0.6	120.0
33	MASS MEDIA-3	no pump	1982	75	300					
34	MULUNGUSHI 6A		1968	41	200					
35	MULUNGUSHI 6B		1979	68.2	200	50	60	14	13	15.0

IN OPERATION

BOREHOLES DATA (2)

NO.	BOREHOLES	CONDITION	CONSTRUCTION YEAR	DEPTH m	WELL DIA. mm	PUMPING RATE m ³ /hr	PUMPING TEST DATA		SPECIFIC CAPACITY m ³ /hr/m
							P.R. m ³ /hr	S.W.L. m	
36	MUMBWA ROAD-I (ROADSID)	no pump	1968	50	300				
37	MUMBWA ROAD-II	no pump	1970	39	150				
38	MUMBWA ROAD-III	no pump	1975	70.7	350				
39	MUMBWA ROAD-IV		1975	61	250	210	8.9	14.6	36.8
40	MUMBWA ROAD-V		1976	39	150	180	7.8	13	34.6
41	MUMBWA ROAD-VI (B. GHAT)		1980	65	300	190			
42	VERIHEAD		1982	56.4	250	70	2.2	13.6	15.3
43	OLD PUMPING STATION-1	no pump	1981						
44	OLD PUMPING STATION-2	abandoned	1981	64	300				
45	PARIRENATWA	no pump	1982	60	150	20	9.1	34.1	0.8
46	PARKS NURSERY	no pump	1965	70	150				
47	SHAFT 5 NO. I				3300	473	10	33.6	20.0
48	SHAFT 5 NO. II	abandoned							
49	SHOWERGUND 6G		1968	63	200	65	12	14.8	23.2
50	WATERWORKS-I		1953	65	500	463	11	17.8	68.2
51	WATERWORKS-II	no pump	1954	70	450				
52	QUARRY I BOOSTER					210			
53	QUARRY II BOOSTER								
54	LILANDA SITE V	no pump	1991	75	150		3.96	7	27
55	GEORGE SOUTH		1992	65	200	70	2	4.8	25.0
56	NIPA	no pump	1992	75	200				
57	OLD KANYAMA I		1986	60	200		68.4	19.45	30.9
58	OLD KANYAMA II		1986	65	200				
59	JOHN LAING	no pump	1991	72	150		19.8	5	6
60	GARDEN	no pump	1991	61	200		28.8	2	2.2
61	NGOMBE I	no pump	1992	78	200				
62	NGOMBE II	no pump	1991	73	200		6.8	10	21.5
63	KAMANGA	no pump	1991	82	150				
64	MUTENDERE	no pump	1992	75	150				
65	CHILENJE I	no pump	1992	65	150				
66	CHILENJE II	no pump	1992	66	150				
67	WOODLANDS EXT.	no pump	1992	92	150				
68	NYUMBA YANGA	no pump	1992	85	150				
69	MASS MEDIA WEST	no pump	1993	70	200				
70	TRIKATANE (Japanese)		1992	70	150				

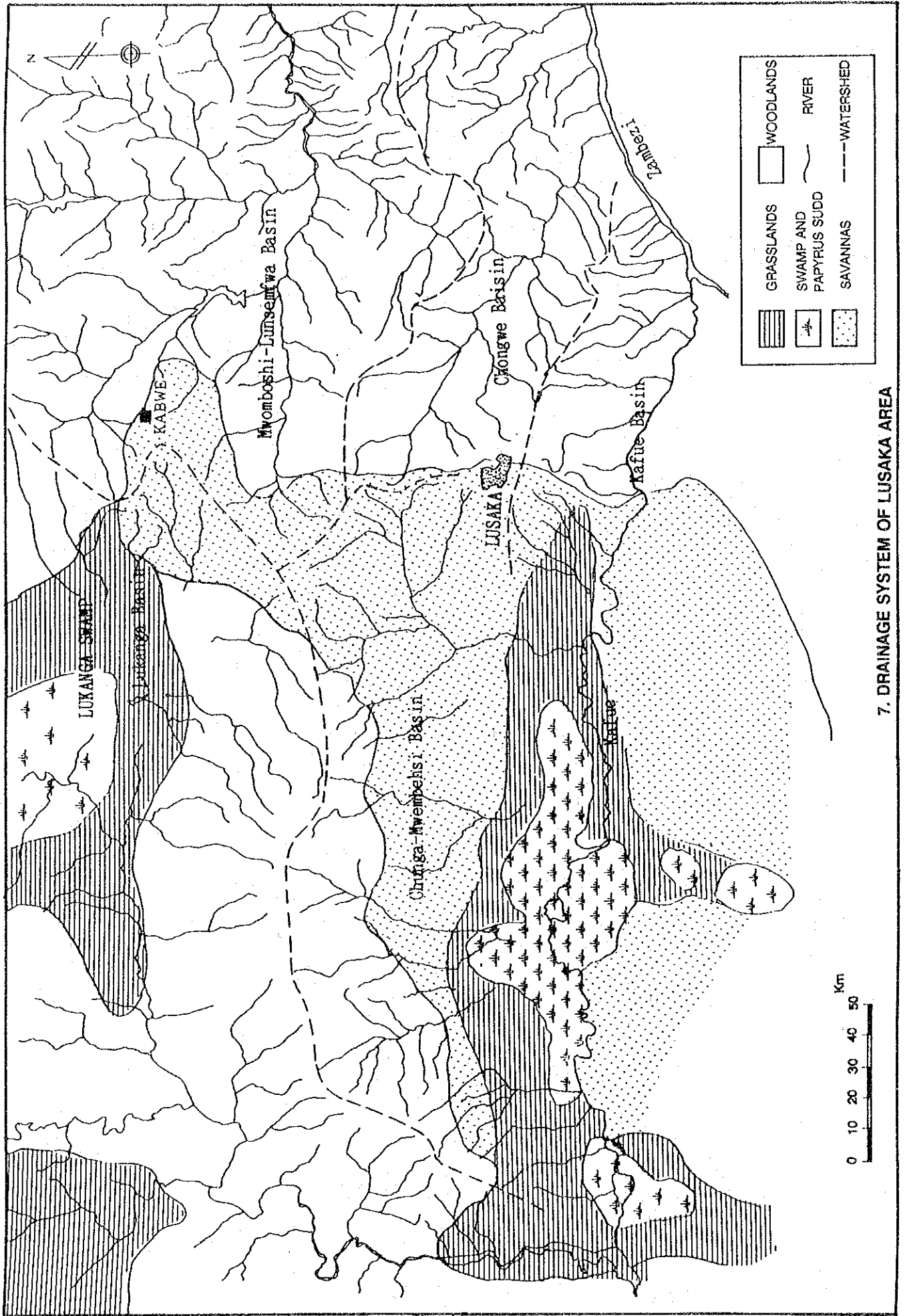
IN OPERATION



B/H No.	B/H Name
8	CHELSTON-I
9	CHELSTON-II
12	CHUNGA
16	INTERNATIONAL SCHOOL
19	KALINGALINGA 7C
20	LAKE ROAD-I
27	LUMUMBA ROAD-4B
32	MASS MEDIA-2
40	MUMBA ROAD-V
42	NORTHMEAD
45	PARIENYATWA
54	LILANDA SITE V
55	GEORGE SOUTH
59	JOHN LAING
60	GARDEN
62	NGOMBE I
63	KAMAINGA

LEGEND	
	Laterite
	Gravel
	Sand
	Limestone
	Dolomite
	Schists
	Shale

6. LITHOLOGY OF LWSC BOREHOLES



7. DRAINAGE SYSTEM OF LUSAKA AREA

APPENDIX - 9 QUESTIONNAIRE

Questionnaire

Compound[_____], Ward[_____], Branch[_____], Section[_____]

1. How many persons are there in your house? [_____]

age	0-4	5-9	10-19	20-29	30-39	40-49	50-
male							
female							

2. How many persons are working constantly in your house? [_____]

3. How many children to go to school are there in your house? [_____]

4. How much do you spend for food per month in your house? [K _____]

5. How much do you spend for (Fire wood, Charcoal, Kerosene, Gas, Electricity) per month? [K _____]

6. How much is your family's total income per month? [K _____]

7. Is there any toilet in your house area? Yes / No → (Use for Public / borrow)

7'. If you use for public one, how many families do use? [_____]families.

8. Is there any shallow well in your house area? Yes → How many? [_____]well(s) / No

8'. Is it for public use? Yes → How many families do use? [_____]families / No

9. From where do you fetch water? (Shallow well, Tapped water, Others [_____])

10. How often do you fetch water? (Morning [_____]times, Day time [_____]times, Evening [_____])

11. How many buckets of water do you fetch and use per day? [_____]buckets

12. If from tapped water / other [_____], how many minutes does it take to fetch water? [_____]

13. Who fetch water? house wife, () Daughter(s) [age _____], () Son(s) [age _____]

14. Do you pay for water? Yes → (How much? [K _____] per month or [K _____] per bucket), No

15. How many buckets of water do you use for washing clothes per time? [_____]buckets

15'. How many times do you wash clothes per week? [_____]times

16. How many buckets of water do you use for cooking and drinking? [_____]buckets

17. How many times do you take bath per week? [_____]times. (Shower, Bath in tab, Wipe body)

18. What kind of disease has your family experienced? [_____]

19. Do you know the reason why cholera epidemic happens? Yes / No

20. Does your family wash their hands before they eat? Yes / No

21. Do you want water facility which supplies clean water? Yes / No

21'. If "Yes", what kind of facility do you want? House connection, Stand pipes, Public washing basin, Public shower, Others [_____]

22. Do you understand that it costs to supply clean water? Yes / No

23. Can you pay for it? Yes / No

23'. If "Yes", how much can you pay per month or per bucket? [K _____]/month, [K _____]/bucket

23". And even if you can't afford it, how much can you pay in minimum? [K _____]/month

24. If you can use that water facility, do you protect and clean it? Yes / No

24'. If "No", why don't you do it? [_____]

Remarks: _____

Date _____ Sep :Name _____ :Signature _____ :Collector _____

APPENDIX-10 EXPECTED BALANCE

The expenditure in the financial plan for the George Division will consist of (1)Electrical cost, (2)Chlorination cost, (3)Labor cost, (4)Miscellaneous cost . The water fee collected from residents will be considered as the only revenue. As it is difficult to estimate the amount of water fee collected from the residents in the unserved area, it is not included in this financial plan.

1.Expenditure

Based on the following conditions, the expenditure per month is estimated.

Labor cost----- The salary is calculated as per the Labor cost in the following Table. The manager and accountant will perform the most important functions. Therefore they will be regular members of LWSC and the allowances such as for electrical fee in their house and school fee for their children, etc will be provided apart from salaries.

Electrical cost----- is calculated as the cost of power for borehole pump from ZESCO's electrical fee table, and add ten percent of the cost for lighting, chlorination dosing pump, etc.

Chlorination cost---- is calculated as 60% purity, 0.5mg/l dosing, at a price of K600/kg.

Miscellaneous cost---- is calculated as 30% of revenues for stationeries, communication costs, etc.

(1) Labor cost

(Kwacha/month)

Function	Salary	Allow- ance	Total Payment	After Phase 1		After Phase 2		After Phase 3		After Phase 4	
				No of Pers	Labor cost	No of Pers	Labor cost	No of Pers	Labor cost	No of Pers	Labor cost
Manager	81,000	165,000	246,000	1	246,000	1	246,000	1	246,000	1	246,000
Customer service (Supervisor)	45,000	0	45,000	1	45,000	3	135,000	5	225,000	7	315,000
(General)	18,000	0	18,000	1	36,000	9	162,000	14	252,000	19	342,000
Public Relations	45,000	0	45,000	1	45,000	1	45,000	2	90,000	2	90,000
Accountant	55,000	110,000	165,000	1	165,000	1	165,000	2	330,000	2	330,000
Revenue & Expenditure	55,000	0	55,000	1	55,000	1	55,000	1	55,000	1	55,000
Personnel Operation	40,500	0	40,500	1	40,500	1	40,500	1	40,500	1	40,500
(Supervisor)	50,132	0	50,132	1	50,132	2	100,624	3	150,936	4	201,248
(General)	20,000	0	20,000	1	20,000	6	120,000	9	180,000	12	240,000
Maintenance		0									
(Supervisor)	50,132	0	50,132	1	50,132	2	100,624	3	150,936	4	201,248
(General)	26,000	0	26,000	2	52,000	4	104,000	6	156,000	8	208,000
Engineering	62,370	0	62,370	1	62,370	1	62,370	2	124,740	2	124,740
Guards	15,000	0	15,000	6	90,000	18	270,000	26	390,000	32	480,000
Total	-----	-----	-----	20	957,134	50	1,606,118	75	2,391,112	95	2,873,736

(2)Electrical cost

Electrical cost is calculated based on Zesco's electrical fee table, which includes Fix demand, Max demand and Unit charges. Power of a borehole pump is 15KW. Electrical cost for pump per area is

FIX DEMAND CHARGE	K 5,300
MAX DEMAND CHARGE (15KW/0.8)x2,960=	K 55,500
UNIT CHARGE 15KWx13HRx30DAYx19.23=	<u>K 112,496</u>
Total K 173,296(For Pump)	

Therefore, electrical cost per area to cover for pumps and others will be,

$$173,296 \times 1.1 = \underline{K190,626}$$

(3)Chlorination cost

Chlorination cost per area is estimated based on 50m3/hr of water supply, 13hr/day of operation.

$$50 \times 13 \times 0.5 (\text{mg/l}) \times 0.001 \times 30 (\text{day}) \times K900 / 0.6 = K14,625$$

(4)Miscellaneous cost (30% of revenue {water fee K700, collection rate 55%[refer to table of expected revenue next page]})

1st phase	K950,950x0.3=	K285,285
2nd phase	K3,582,040x0.3=	K1,074,612
3rd phase	K5,410,020x0.3=	K1,623,006
4th phase	K7,129,430x0.3=	K2,138,289

Summing up each of the above expenditures, the following table shows total expenditure for each phase.

Expected Expenditure

Phase	No of served areas	Supply Rate m ³ /d	Served population (persons)	No of house-holds	Labor cost (Kwacha)	Electrical cost (Kwacha)	Chlorination cost (Kwacha)	Miscellaneous cost (Kwacha)	Expenditures (Kwacha)
1	1	650	17,293	2,470	957,134	190,626	14,625	285,285	1,447,670
2	4	2,600	65,126	9,304	1,606,118	762,504	58,500	1,074,612	3,501,734
3	6	3,900	98,361	14,052	2,391,112	1,143,756	87,750	1,623,006	5,245,624
4	8	5,200	129,629	18,518	2,873,736	1,525,008	117,000	2,138,289	6,654,033

2. Revenue

Water fees per house per month of K330, K500, K600, K700 and collection rates of 100%, 90%, 80%, 70%, 55% are used for estimating revenues. The expected revenues under these conditions are shown below.

Surplus

Collection Rate	Phase	Revenue [Water fee] Kwacha/month/household					Expenditures (Kwacha)
		[330]	[400]	[500]	[600]	[700]	
100 %	1	815,100	988,000	1,235,000	1,482,000	1,729,000	1,447,670
	2	3,070,320	3,721,600	4,652,000	5,582,400	6,512,800	3,501,734
	3	4,637,160	5,620,800	7,026,000	8,431,200	9,836,400	5,245,624
	4	6,111,940	7,407,200	9,239,000	11,110,800	12,962,600	6,654,033
90 %	1	733,590	889,200	1,111,500	1,333,800	1,556,100	1,447,670
	2	2,763,288	3,349,440	4,186,800	5,024,160	5,861,520	3,501,734
	3	4,173,444	5,058,720	6,323,400	7,588,080	8,852,760	5,245,624
	4	5,499,846	6,666,480	8,333,100	9,999,720	11,666,340	6,654,033
80 %	1	652,080	790,400	988,000	1,185,600	1,383,200	1,447,670
	2	2,456,256	2,977,280	3,721,600	4,465,920	5,210,240	3,501,734
	3	3,709,728	4,496,640	5,620,800	6,744,960	7,869,120	5,245,624
	4	4,888,752	5,925,760	7,407,200	8,888,640	10,370,080	6,654,033
70 %	1	570,570	691,600	864,500	1,037,400	1,210,300	1,447,670
	2	2,149,224	2,605,120	3,256,400	3,907,680	4,558,960	3,501,734
	3	3,246,012	3,934,560	4,918,200	5,901,840	6,885,480	5,245,624
	4	4,277,658	5,185,040	6,481,300	7,777,560	9,073,820	6,654,033
55 %	1	448,305	543,400	679,250	815,100	950,950	1,447,670
	2	1,688,676	2,046,880	2,558,600	3,070,320	3,582,000	3,501,734
	3	2,550,438	3,090,440	3,864,300	4,637,160	5,410,020	5,245,624
	4	3,361,017	4,073,960	5,092,450	6,110,940	7,129,430	6,654,033

APPENDIX 11 TABLE OF MONITORING SURVEY

Lusaka Water and Sewerage Company filled up by : _____
 George Division date : _____

Area - _____

Questionnaire : Monthly report form for monitoring survey

No.

		ITEM	UNIT			NOTES
OPERATION	Pumping Facility at Water source	(1) Running day	day			
		(2) Sleeping day	day			
		(3) Intake Quantity	m ³			
		(4) Water Quality	G/NG			
		(5) Consumption 1	m ³			
	Water tank	(6) Chemical for chlorination	Kg			
		(7) Quantity (3)-(5)	m ³			
		(8) Consumption 2	m ³			
		(9) Supply Quantity (7)-(8)	m ³			
	Water supply facilities and Consumption	(10) Running facilities	ea			
		(11) Water Quality	G/NG			
		(12) Consumption for Public Faucet	m ³			
		(13) Consumption for Washing Basin	m ³			
		(14) Total consumption (12)+(13)	m ³			
		(15) Quantity (9)-(14)	m ³			
USERS	Category 1 (K)	(16) Effective registration	No.			
		(17) Collection	No.			
		(18) Defaulter	No.			
	Category 2 (K)	(19) Effective registration	No.			
		(20) Collection	No.			
		(21) Defaulter	No.			
	Category 3 (K)	(22) Effective registration	No.			
		(23) Collection	No.			
		(24) Defaulter	No.			
	Category G. Total	(25) Effective registration	No.			
(26) Collection		No.				
(27) Defaulter		No.				
EMPLOYMENT	Personnel	(28) Regular Member	ca			
		(29) Temporary Member	ca			
		(30) Total	ca			
FINANCIAL	Cost balance	(31) Collection	K			
		(32) Arrearage	K			
		(33) Total Income	K			
		(34) Electric cost	K			
		(35) Chlorination cost	K			
		(36) Labors cost	K			
		(37) Fuel cost	K			
		(38) Stationary cost	K			
		(39) Communication cost	K			
		(40) Others	K			
		(41) Sum of expenditure	K			
		(42) Total balance	K			

Note : Consumption1:Consumption for Water Resource Facility
 Consumption2:Consumption in Elevated Tank
 Water Quality G/NG: G:Good, NG:No Good

JICA