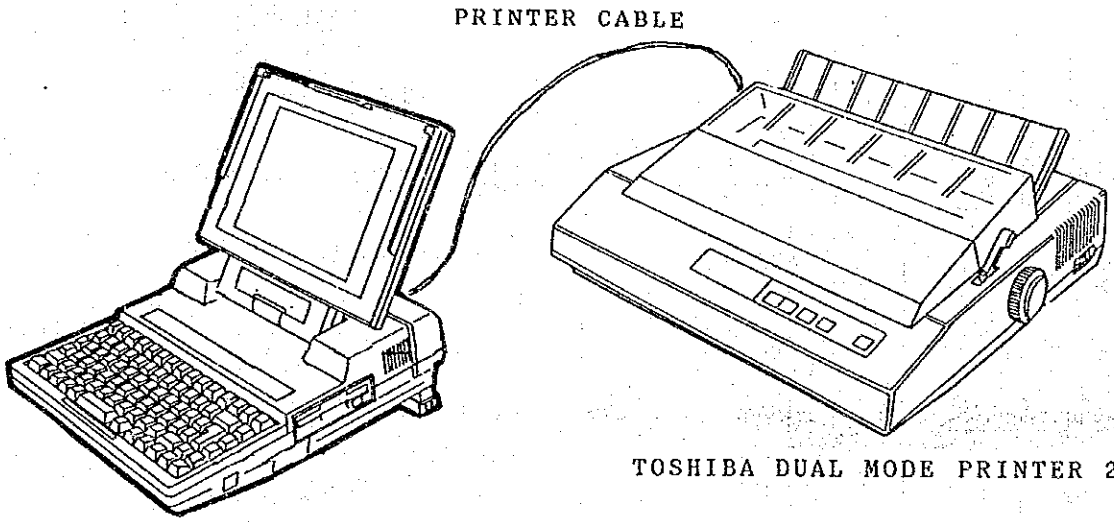
SUPPLEMENT - 4.1

MANUAL OF DATABASE SYSTEM

<<< BEFORE START >>>

All the hydrologic observation data dealt in this Study will be filed and analyzed by using the following instruments.

- P/C (TOSHIBA, J-3100 series, IBM compatible)
- Printer (TOSHIBA DUAL MODE PRINTER 2/3)
- MS-DOS (Ver.3.3)
- LOTUS 1-2-3 (Rel.2.0)



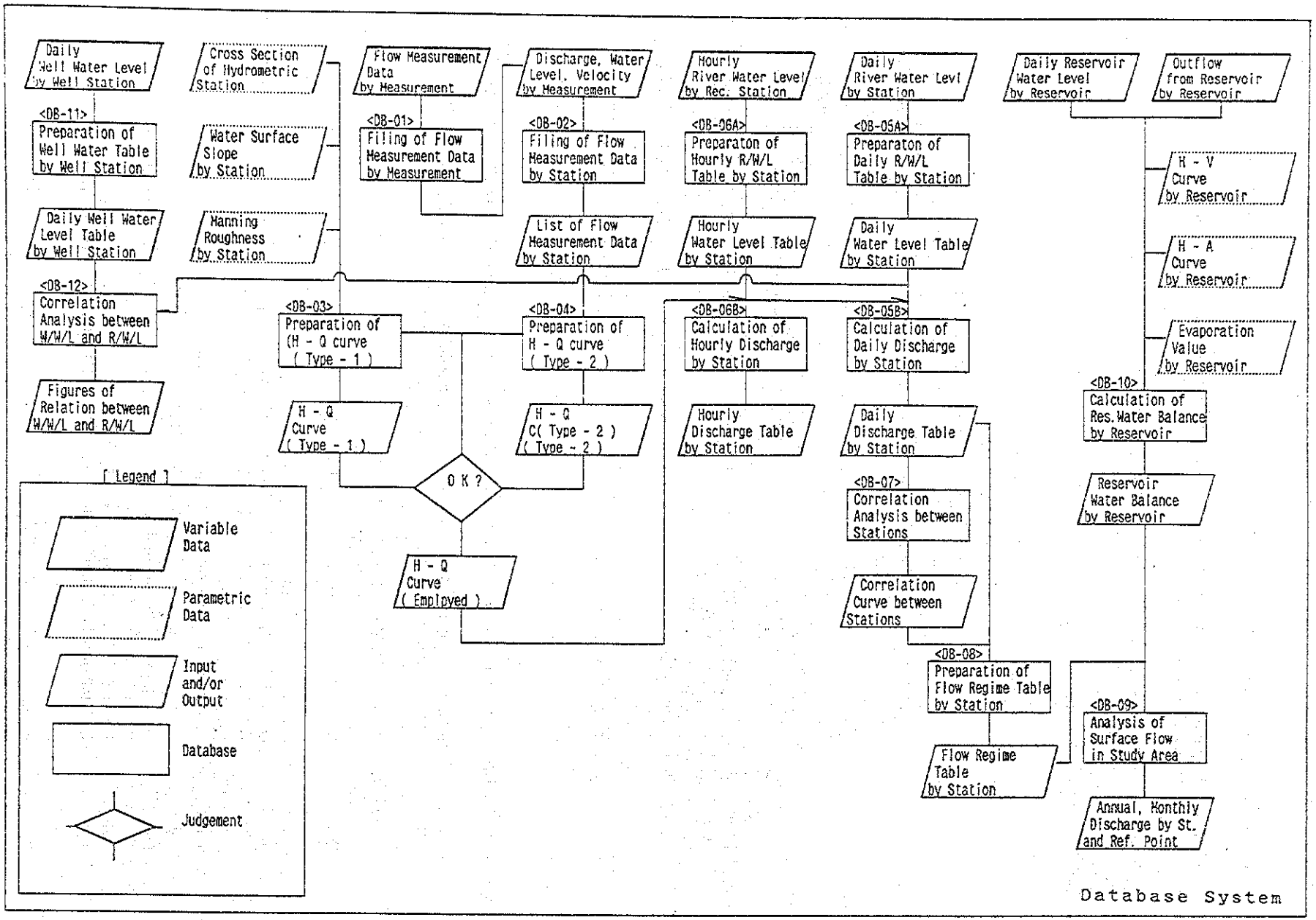
TOSHIBA LAP-TOP COMPUTER

TOSHIBA DUAL MODE PRINTER 2/3

This database systems developed in Study are composed of;

1) Filing System : consisting of 5 systems
   - DB-01 FLOW MEASUREMENT DATA BY MEASUREMENT
   - DB-02 FLOW MEASUREMENT DATA BY STATION
   - DB-05A DAILY RIVER WATER LEVEL
   - DB-06A HOURLY RIVER WATER LEVEL
   - DB-11 DAILY WELL WATER LEVEL

2) Analyzing System : consisting of 9 systems
   - DB-03 DISCHARGE RATING CURVE METHOD (Type-1)
   - DB-04 DISCHARGE RATING CURVE METHOD (Type-2)
   - DB-05B DAILY DISCHARGE
   - DB-06B HOURLY DISCHARGE
   - DB-07 DISCHARGE CORRELATION ANALYSIS
   - DB-08 FLOW REGIME TABLE
   - DB-09 RIVER WATER BALANCE
   - DB-10 RESERVOIR WATER BALANCE
   - DB-12 CORRELATION BETWEEN RIVER AND WELL WATER LEVEL


Daily Well Water Level by Well Station
Cross Section of Hydrometric Station
Flow Measurement Data by Measurement
Discharge, Water Level, Velocity by Measurement
Hourly River Water Level by Rec. Station
Daily River Water Levl by Station
Daily Reservoir Water Level by Reservoir
Outflow from Reservoir by Reservoir
<DB-11>
Preparation of Well Water Table by Well Station
Water Surface Slope by Station
<DB-01>
Filing of Flow Measurement Data by Measurement
<DB-02>
Filing of Flow Measurement Data by Station
<DB-06A>
Preparaton of Hourly R/W/L Table by Station
<DB-05A>
Preparaton of Daily R/W/L Table by Station
H - V Curve by Reservoir
Daily Well Water Level Table by Well Station
Manning Roughness by Station
List of Flow Measurement Data by Station
Hourly Water Level Table by Station
Daily Water Level Table by Station
H - A Curve by Reservoir
<DB-12>
Correlation Analysis between W/W/L and R/W/L
<DB-03>
Preparation of (H - Q curve (Type - 1)
<DB-04>
Preparation of H - Q curve (Type - 2)
<DB-06B>
Calculation of Hourly Discharge by Station
<DB-05B>
Calculation of Daily Discharge by Station
Evaporation Value by Reservoir
Figures of Relation between W/W/L and R/W/L
H - Q Curve (Type - 1)
H - Q C(Type - 2) (Type - 2)
Hourly Discharge Table by Station
Daily Discharge Table by Station
<DB-10>
Calculation of Res.Water Balance by Reservoir
O K ?
<DB-07>
Correlation Analysis between Stations
Reservoir Water Balance by Reservoir
[Legend]
H - Q Curve (Emplyed)
Correlation Curve between Stations
Variable Data
Parametric Data
Input and/or Output
Database
Judgement
<DB-08>
Preparation of Flow Regime Table by Station
<DB-09>
Analysis of Surface Flow in Study Area
Flow Regime Table by Station
Annual, Monthly Discharge by St. and Ref. Point
Database System

<<< DB-01 >>> FLOW MEASUREMENT DATA BY MEASUREMENT

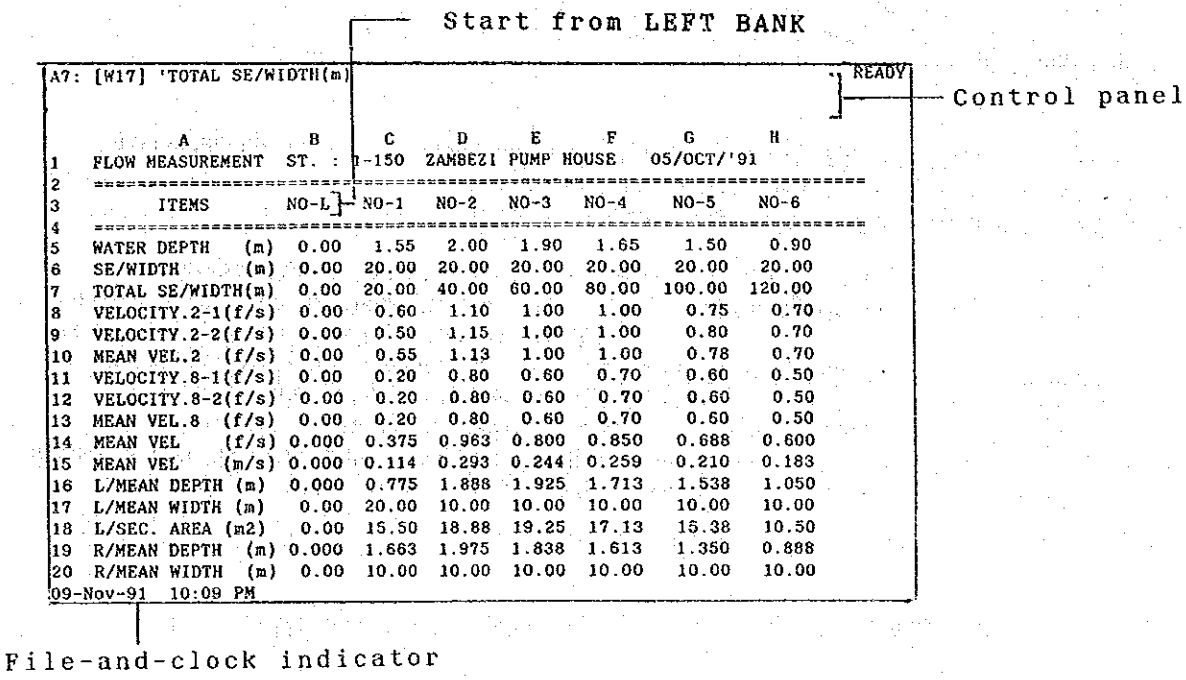
This filing system is to check a result of flow measurement data by use of computer and draw mean velocity & discharge graph.

To begin this filing, use the following steps to retrieve each station number file.

*** for example ***

Diskette No.	**DB-01**
Select	**/File**
Select	**/Retrieve**
Highlight	**\FM\1-150\1-150.WK1.....Zambezi Pump House**
Press	**ENTER** to retrieve 1-150.WK1

The following worksheet appears on your screen. This worksheet contains the labels you entered in the previous flow measurement data. You will also notice that the worksheet contains some values. In this system, you will modify to enter new flow measurement data values.



A7: [W17] 'TOTAL SE/WIDTH(m) READY

	A	B	C	D	E	F	G	H
1	FLOW MEASUREMENT	ST. :	1-150	ZAMBEZI	PUMP HOUSE		05/OCT/'91	
2								
3	ITEMS	NO-L	NO-1	NO-2	NO-3	NO-4	NO-5	NO-6
4								
5	WATER DEPTH (m)	0.00	1.55	2.00	1.90	1.65	1.50	0.90
6	SE/WIDTH (m)	0.00	20.00	20.00	20.00	20.00	20.00	20.00
7	TOTAL SE/WIDTH(m)	0.00	20.00	40.00	60.00	80.00	100.00	120.00
8	VELOCITY.2-1(f/s)	0.00	0.60	1.10	1.00	1.00	0.75	0.70
9	VELOCITY.2-2(f/s)	0.00	0.50	1.15	1.00	1.00	0.80	0.70
10	MEAN VEL.2 (f/s)	0.00	0.55	1.13	1.00	1.00	0.78	0.70
11	VELOCITY.8-1(f/s)	0.00	0.20	0.80	0.60	0.70	0.60	0.50
12	VELOCITY.8-2(f/s)	0.00	0.20	0.80	0.60	0.70	0.60	0.50
13	MEAN VEL.8 (f/s)	0.00	0.20	0.80	0.60	0.70	0.60	0.50
14	MEAN VEL (f/s)	0.000	0.375	0.963	0.800	0.850	0.688	0.600
15	MEAN VEL (m/s)	0.000	0.114	0.293	0.244	0.259	0.210	0.183
16	L/MEAN DEPTH (m)	0.000	0.775	1.888	1.925	1.713	1.538	1.050
17	L/MEAN WIDTH (m)	0.00	20.00	10.00	10.00	10.00	10.00	10.00
18	L/SEC. AREA (m2)	0.00	15.50	18.88	19.25	17.13	15.38	10.50
19	R/MEAN DEPTH (m)	0.000	1.663	1.975	1.838	1.613	1.350	0.888
20	R/MEAN WIDTH (m)	0.00	10.00	10.00	10.00	10.00	10.00	10.00

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[Entering Value]

To know which section you are entering, select window menu to split the screen horizontally at the row.

Move	the cell pointer to **A5**
Select	**/Worksheet**
Select	**/Window**
Select	**/Horizontal**
Press	**ENTER**

Your worksheet should look like the following screen.
Now, you will enter only water depth (m), sectional width (m) and velocity values in the worksheet.

C11: (F2) [W7] 0.2 READY

	A	B	C	D	E	F	G	H
1	FLOW MEASUREMENT	ST. : 1-150	ZAMBEZI PUMP HOUSE				05/OCT/'91	
2	==========	==========	==========	==========	==========	==========	==========	==========
3	ITEMS	NO-L	NO-1	NO-2	NO-3	NO-4	NO-5	NO-6
4	==========	==========	==========	==========	==========	==========	==========	==========
	A	B	C	D	E	F	G	H
7	TOTAL SE/WIDTH(m)	0.00	20.00	40.00	60.00	80.00	100.00	120.00
8	VELOCITY.2-1(f/s)	0.00	0.60	1.10	1.00	1.00	0.75	0.70
9	VELOCITY.2-2(f/s)	0.00	0.50	1.15	1.00	1.00	0.80	0.70
10	MEAN VEL.2 (f/s)	0.00	0.55	1.13	1.00	1.00	0.78	0.70
11	VELOCITY.8-1(f/s)	0.00	0.20	0.80	0.60	0.70	0.60	0.50
12	VELOCITY.8-2(f/s)	0.00	0.20	0.80	0.60	0.70	0.60	0.50
13	MEAN VEL.8 (f/s)	0.00	0.20	0.80	0.60	0.70	0.60	0.50
14	MEAN VEL (f/s)	0.000	0.375	0.963	0.800	0.850	0.688	0.600
15	MEAN VEL (m/s)	0.000	0.114	0.293	0.244	0.259	0.210	0.183
16	L/MEAN DEPTH (m)	0.000	0.775	1.888	1.925	1.713	1.538	1.050
17	L/MEAN WIDTH (m)	0.00	20.00	10.00	10.00	10.00	10.00	10.00
18	L/SEC. AREA (m2)	0.00	15.50	18.88	19.25	17.13	15.38	10.50
19	R/MEAN DEPTH (m)	0.000	1.663	1.975	1.838	1.613	1.350	0.888
20	R/MEAN WIDTH (m)	0.00	10.00	10.00	10.00	10.00	10.00	10.00
21	R/SEC. AREA (m2)	0.00	16.63	19.75	18.38	16.13	13.50	8.88

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Data entering range

Of course, number of sections by measurement are different, in this case modify the number of section by using **COPY**, **DELETE** commands, and enter a formula as follows:

Move	the cell pointer to **L19**.....R/mean depth
Type	**+(L5+M5)/2**.....L5 is water depth at last section M5 is water depth at right bank
Press	**ENTER** to enter the formula in the worksheet
Move	the cell pointer to **L20**.....R/mean width
Type	**+M6**.....sectional width between last section and right bank edge
Press	**ENTER** to enter the formula in the worksheet

K22: (F2) [W14] +K18+K21 *READY

	A	J	K	L	M	N
3	ITEMS 3	NO-8	NO-9	NO-10	NO-R	
4	========== 4	==========	==========	==========	==========	
5	WATER DEPTH (m)5	1.50	1.50	0.80	0.00	
6	SE/WIDTH (m)6	20.00	20.00	20.00	17.50	
7	TOTAL SE/WIDTH(m)7	160.00	180.00	200.00	217.50	
8	VELOCITY.2-1(f/s)8	0.40	0.10	0.00	0.00	
9	VELOCITY.2-2(f/s)9	0.40	0.10	0.00	0.00	
10	MEAN VEL.2 (f/s)10	0.40	0.10	0.00	0.00	
11	VELOCITY.8-1(f/s)11	0.05	0.10	0.10	0.00	
12	VELOCITY.8-2(f/s)12	0.05	0.10	0.05	0.00	
13	MEAN VEL.8 (f/s)13	0.05	0.10	0.08	0.00	
14	MEAN VEL (f/s)14	0.225	0.100	0.038	0.000	
15	MEAN VEL (m/s)15	0.069	0.030	0.011	0.000	
16	L/MEAN DEPTH (m) 16	1.338	1.500	0.975	0.000	
17	L/MEAN WIDTH (m) 17	10.00	10.00	10.00	-	
18	L/SEC. AREA (m2) 18	13.38	15.00	9.75	-	
19	R/MEAN DEPTH (m)19	1.500	((K5+L5)/2+K5+L6/2	(L5+M5)/2+M6	-	
20	R/MEAN WIDTH (m)20	10.00			-	
21	R/SEC. AREA (m2) 21	15.00	13.25	7.00	-	
22	S/AREA (m2)22	28.38	28.25	16.75	-	

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hidden formula

[Printing the Worksheet]
Print your worksheet as follows:

Select	/Print
Select	Printer

After selecting /Print Printer, you must specify a print range:

Select	Range
Press	HOME to move to A1
Press	.(period) to anchor the cell pointer
Move	the cell pointer to anchor
Press	ENTER to accept above printer range

Then do the following:

Select	Align
select	Go to begin printing

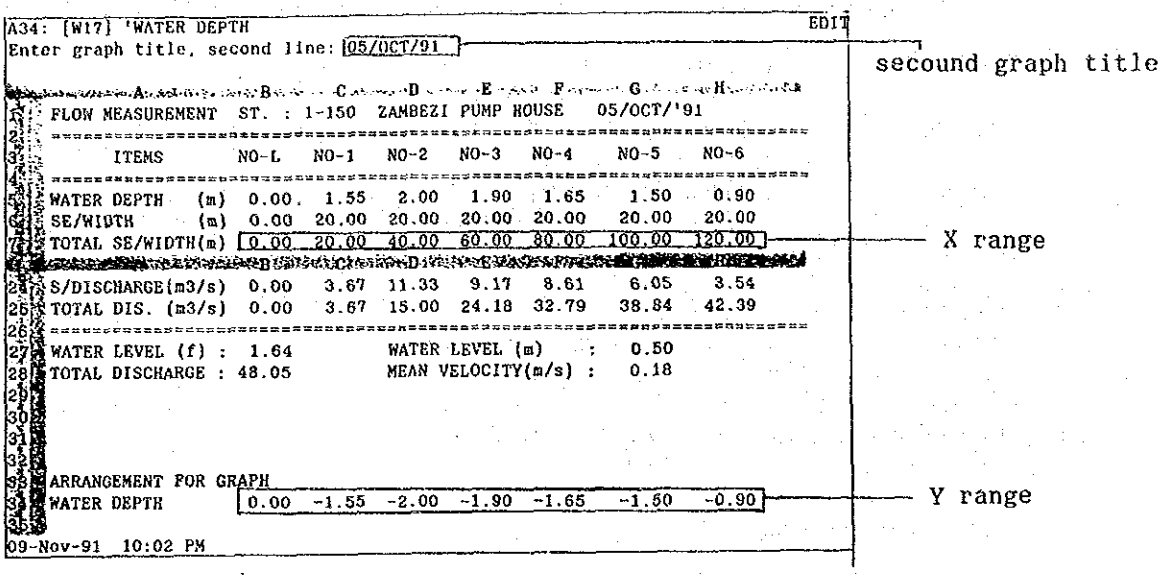
1-2-3 begins printing the range. The printed flow measurement data worksheet should look as follows.

FLOW MEASUREMENT ST. : 1 150 ZAMBEZI PUMP HOUSE 05/OCT/'91

ITEMS	NO-L	NO-1	NO-2	NO-3	NO-4	NO-5	NO-6	NO-7	NO-8	NO-9	NO-10	NO-R
WATER DEPTH (m)	0.00	1.55	2.00	1.90	1.65	1.50	0.90	0.85	1.50	1.50	0.80	0.00
SE/WIDTH (m)	0.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	17.50
TOTAL SE/WIDTH(m)	0.00	20.00	40.00	60.00	80.00	100.00	120.00	140.00	160.00	180.00	200.00	217.50
VELOCITY.2-1(f/s)	0.00	0.60	1.10	1.00	1.00	0.75	0.70	0.60	0.40	0.10	0.00	0.00
VELOCITY.2-2(f/s)	0.00	0.50	1.15	1.00	1.00	0.80	0.70	0.60	0.40	0.10	0.00	0.00
MEAN VEL.2 (f/s)	0.00	0.55	1.13	1.00	1.00	0.78	0.70	0.60	0.40	0.10	0.00	0.00
VELOCITY.8-1(f/s)	0.00	0.20	0.80	0.60	0.70	0.60	0.50	0.40	0.05	0.10	0.10	0.00
VELOCITY.8-2(f/s)	0.00	0.20	0.80	0.60	0.70	0.60	0.50	0.40	0.05	0.10	0.05	0.00
MEAN VEL.8 (f/s)	0.00	0.20	0.80	0.60	0.70	0.60	0.50	0.40	0.05	0.10	0.08	0.00
MEAN VEL (f/s)	0.000	0.375	0.963	0.800	0.850	0.688	0.600	0.500	0.225	0.100	0.038	0.000
MEAN VEL (m/s)	0.000	0.114	0.293	0.244	0.259	0.210	0.183	0.152	0.069	0.030	0.011	0.000
L/MEAN DEPTH (m)	0.000	0.775	1.888	1.925	1.713	1.538	1.050	0.863	1.338	1.500	0.975	0.000
L/MEAN WIDTH (m)	0.00	20.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	-
L/SEC. AREA (m2)	0.00	15.50	18.88	19.25	17.13	15.38	10.50	8.63	13.38	15.00	9.75	-
R/MEAN DEPTH (m)	0.000	1.663	1.975	1.838	1.613	1.350	0.888	1.013	1.500	1.325	0.400	-
R/MEAN WIDTH (m)	0.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	17.50	-
R/SEC. AREA (m2)	0.00	16.63	19.75	18.38	16.13	13.50	8.88	10.13	15.00	13.25	7.00	-
S/AREA (m2)	0.00	32.13	38.63	37.63	33.25	28.88	19.38	18.75	28.38	28.25	16.75	-
TOTAL AREA (m2)	0.0	32.1	70.8	108.4	141.6	170.5	189.9	208.6	237.0	265.3	282.0	-
S/DISCHARGE(m3/s)	0.00	3.67	11.33	9.17	8.61	6.05	3.54	2.86	1.95	0.86	0.19	-
TOTAL DIS. (m3/s)	0.00	3.67	15.00	24.18	32.79	38.84	42.39	45.24	47.19	48.05	48.24	-

WATER LEVEL (f) : 1.64 WATER LEVEL (m) : 0.50
TOTAL DISCHARGE : 48.05 MEAN VELOCITY(m/s) : 0.18

[Creating Graph]
The following illustrations show the relation ship between the data in the flow measurement worksheet and the graph.



A34: [W17] 'WATER DEPTH EDIT
Enter graph title, second line: 05/OCT/91

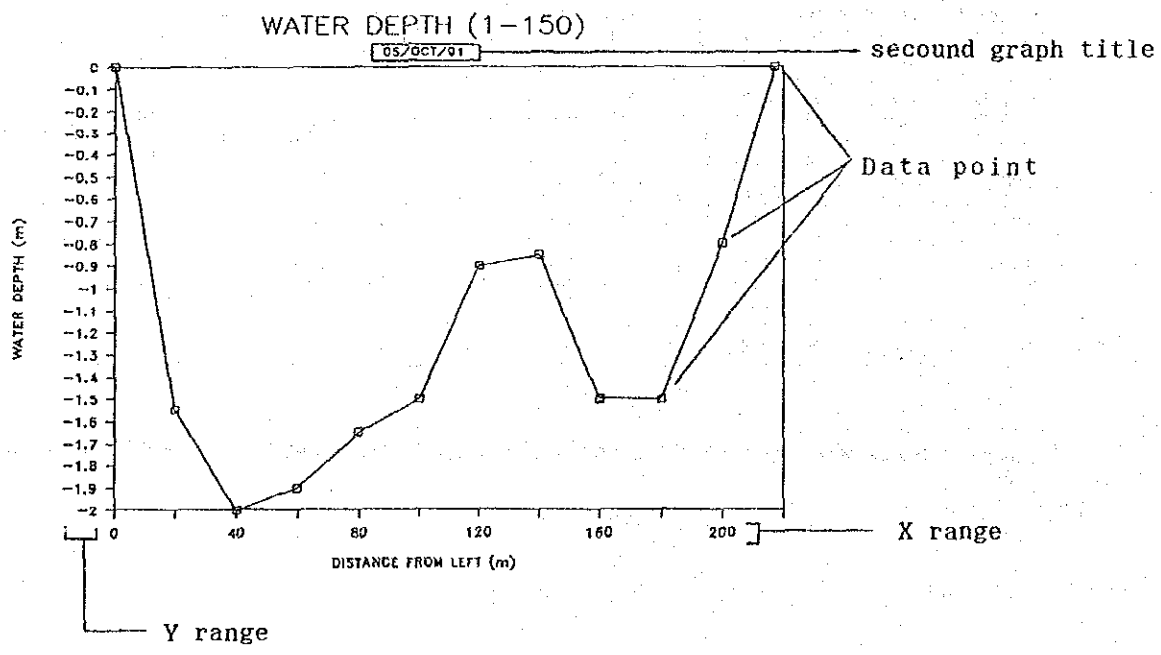
	A	B	C	D	E	F	G	H
1	FLOW MEASUREMENT ST. : 1-150 ZAMBEZI PUMP HOUSE 05/OCT/'91							
2								
3	ITEMS	NO-L	NO-1	NO-2	NO-3	NO-4	NO-5	NO-6
4								
5	WATER DEPTH (m)	0.00	1.55	2.00	1.90	1.65	1.50	0.90
6	SE/WIDTH (m)	0.00	20.00	20.00	20.00	20.00	20.00	20.00
7	TOTAL SE/WIDTH(m)	0.00	20.00	40.00	60.00	80.00	100.00	120.00
8								
24	S/DISCHARGE(m3/s)	0.00	3.67	11.33	9.17	8.61	6.05	3.54
25	TOTAL DIS. (m3/s)	0.00	3.67	15.00	24.18	32.79	38.84	42.39
26								
27	WATER LEVEL (f) : 1.64			WATER LEVEL (m) : 0.50				
28	TOTAL DISCHARGE : 48.05			MEAN VELOCITY(m/s) : 0.18				
29								
30								
31								
32								
33	ARRANGEMENT FOR GRAPH							
34	WATER DEPTH	0.00	-1.55	-2.00	-1.90	-1.65	-1.50	-0.90
35								

09-Nov-91 10:02 PM

secound graph title

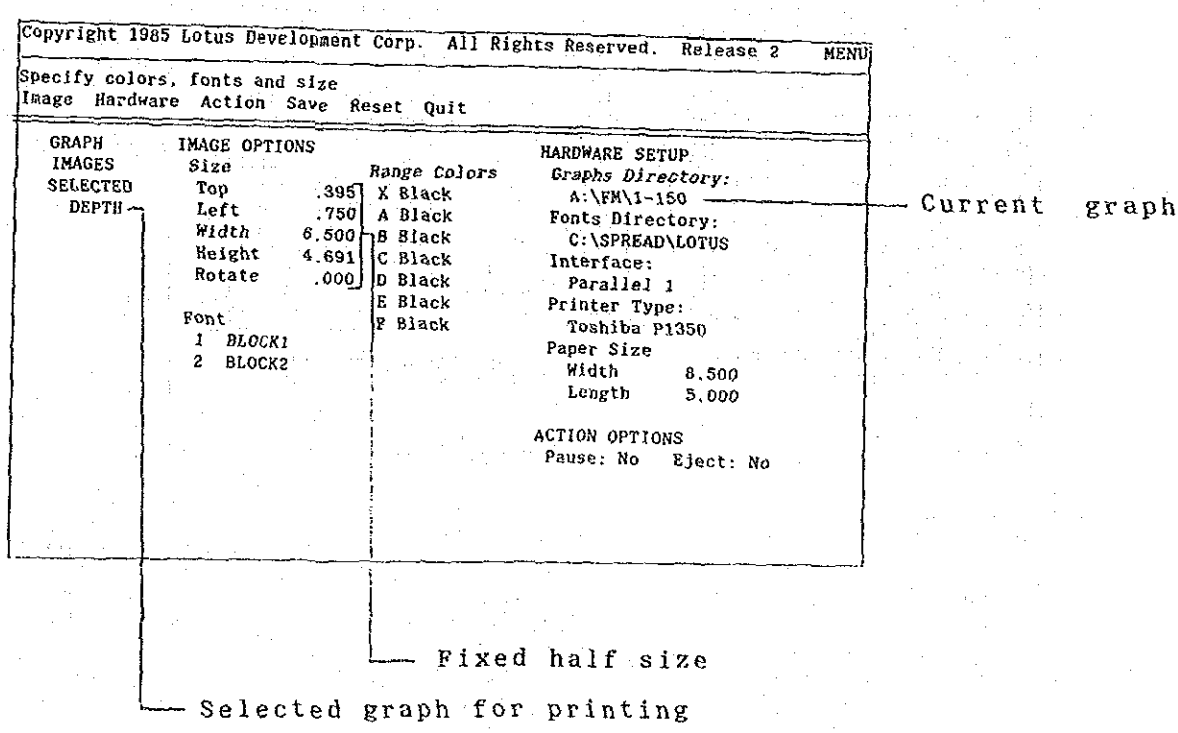
X range

Y range



[Printing the Graph]
After creating both water depth and velocity graph, now you ready to print them. Be sure that you have saved both graph into a diskette.

Select	Quit the worksheet
Select	Printgraph menu
Select	Setting to define hardware and graph setting
Select	Hardware to specify hardware setup
Select	Graph-Directory
Type	A:\FM\1-150.....where graphs contained
Press	Enter to select a directory for graphs
Select	Quit to returned to previous menu
Select	Image to specify size
Select	Size to set size of graph
Select	Half to print on A4 paper
Select	Quit to return to previous menu
Select	Quit - " -
Select	Quit - " -
Select	Image-Select to select graphs for printing
Highlight	Depth.....(next to be velocity)
Press	ENTER to set a graph
Press	Align to print at the top of page
Press	Go to begin printing



<<< DB-02 >>> FLOW MEASUREMENT DATA BY STATION

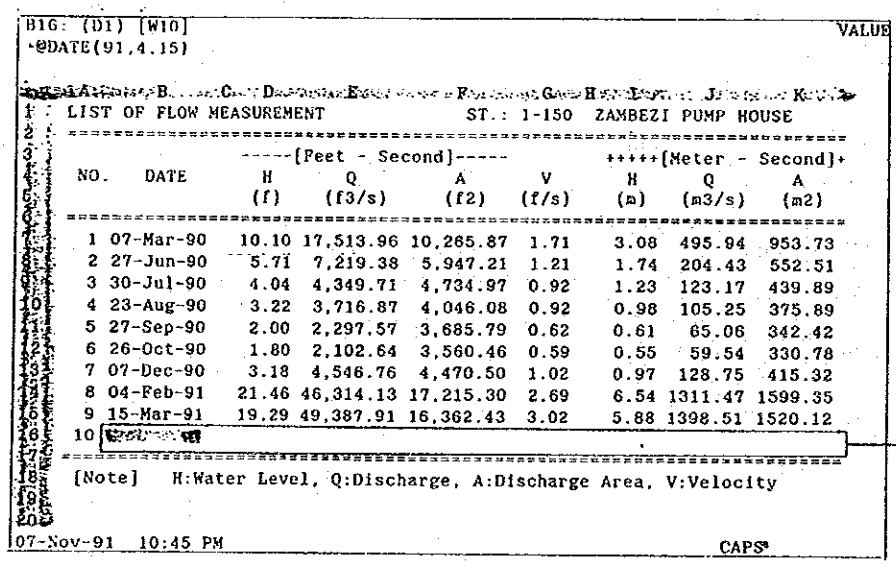
This filing system is to file flow measurement data of each station and output tables by station.

To begin this filing, use the following steps to retrieve each station number file.

*** for example ***

Diskette No.	**DB-02**
Select	**/File**
Select	**/Retrieve**
Highlight	**\1-150.WK1.....Zambezi Pump House**
Press	**ENTER** to retrieve 1-150.WK1

The following worksheet appears on your screen. This worksheet contains the labels you entered in the previous flow measurement data by station. In this system, you will enter the result obtained from DB-01 filling system such as date, water depth, discharge, cross sectional area and velocity in both feet and meter.



B16: (D1) [W10] VALUE
+@DATE(91,4,15)

LIST OF FLOW MEASUREMENT ST.: 1-150 ZAMBEZI PUMP HOUSE

NO.	DATE	-----[Feet - Second]----- H (f)	Q (f3/s)	A (f2)	V (f/s)	+++++[Meter - Second]+ H (m)	Q (m3/s)	A (m2)
1	07-Mar-90	10.10	17,513.96	10,265.87	1.71	3.08	495.94	953.73
2	27-Jun-90	5.71	7,219.38	5,947.21	1.21	1.74	204.43	552.51
3	30-Jul-90	4.04	4,349.71	4,734.97	0.92	1.23	123.17	439.89
4	23-Aug-90	3.22	3,716.87	4,046.08	0.92	0.98	105.25	375.89
5	27-Sep-90	2.00	2,297.57	3,685.79	0.62	0.61	65.06	342.42
6	26-Oct-90	1.80	2,102.64	3,560.46	0.59	0.55	59.54	330.78
7	07-Dec-90	3.18	4,546.76	4,470.50	1.02	0.97	128.75	415.32
8	04-Feb-91	21.46	46,314.13	17,215.30	2.69	6.54	1311.47	1599.35
9	15-Mar-91	19.29	49,387.91	16,362.43	3.02	5.88	1398.51	1520.12
10								

[Note] H:Water Level, Q:Discharge, A:Discharge Area, V:Velocity

07-Nov-91 10:45 PM CAPS

Data entering range

<<< DB-05A >>> DAILY RIVER WATER LEVEL

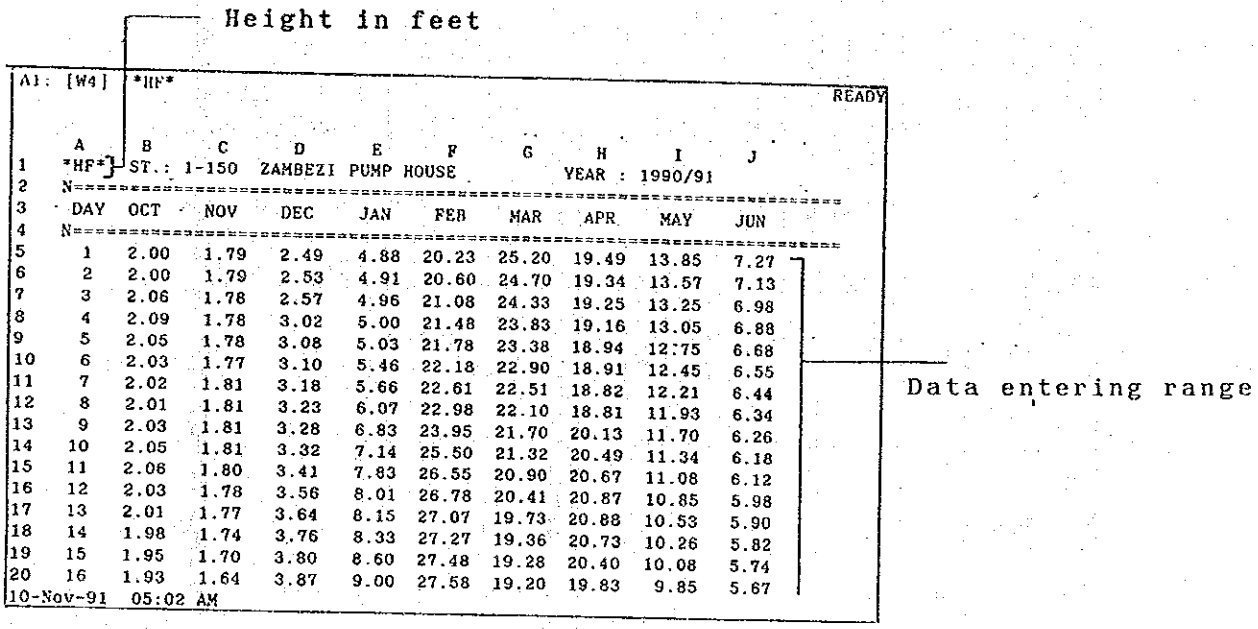
To file the daily river water level observed at the hydrometric stations and output tables showing water level in feet and meter by station.

To begin this filing, use the following steps to retrieve each station number file.

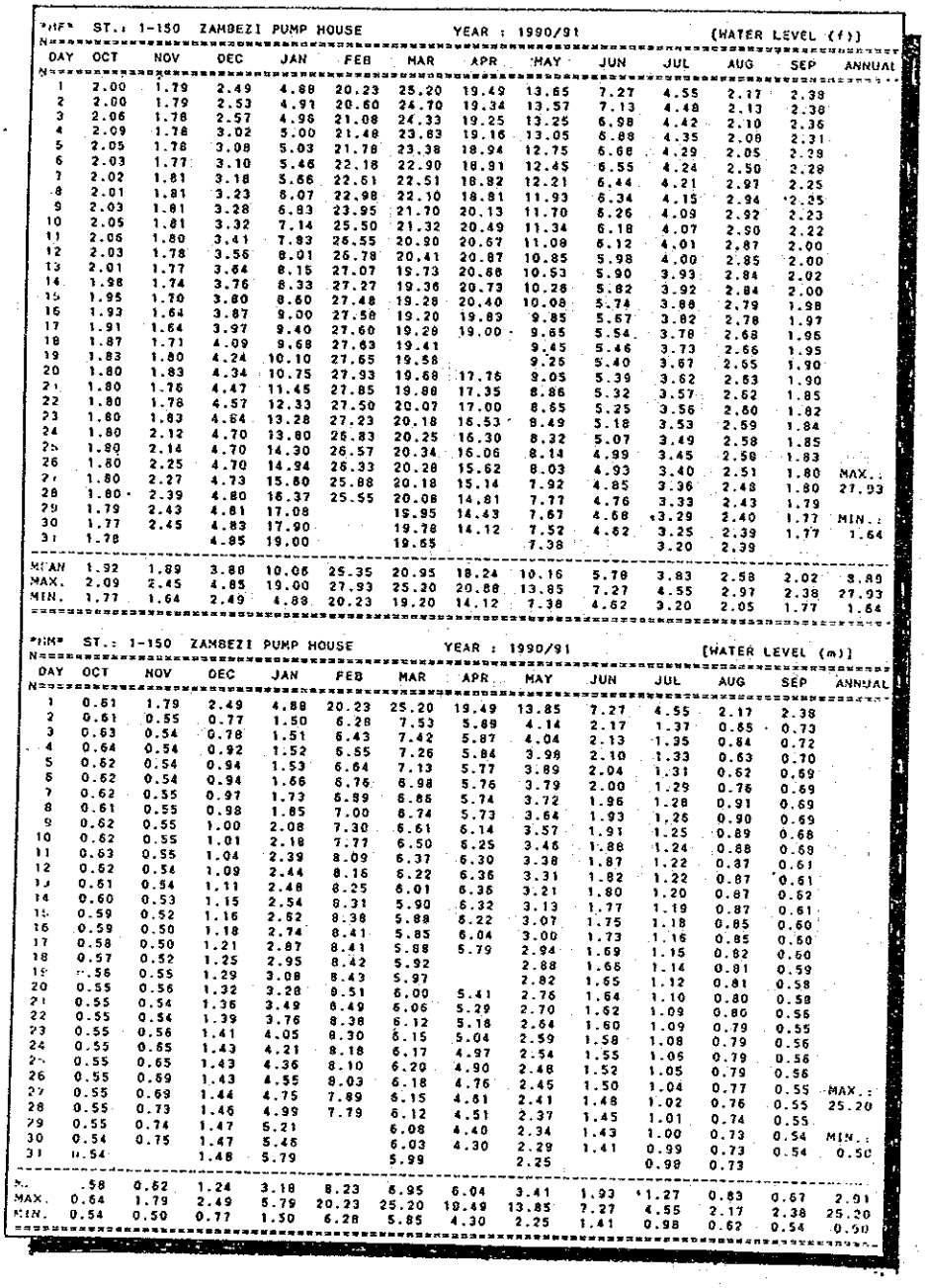
*** for example ***

Diskette No.	**DB-05A 1-150 ZAMBEZI PUMP HOUSE**
Select	**/File**
Select	**/Retrieve**
Highlight	**\11509091.WK1.....Zambezi Pump House 1990/91**
Press	**ENTER** to retrieve 11509091.WK1

The following worksheet appears on your screen. In this system, you will enter the monthly gauge readings in feet unit into first table. The metric results are automatically appeared in next table as below.



[Printing the Worksheet]
Print your worksheet as same as previous filing system. The printed worksheet should look like the followings.



HP ST.: 1-150 ZAMBEZI PUMP HOUSE YEAR : 1990/91 (WATER LEVEL (f))

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
1	2.00	1.79	2.49	4.88	20.23	25.20	19.49	13.85	7.27	4.55	2.17	2.38	
2	2.00	1.79	2.53	4.91	20.60	24.70	19.34	13.57	7.13	4.48	2.13	2.38	
3	2.06	1.78	2.57	4.96	21.08	24.33	19.25	13.25	6.98	4.42	2.10	2.36	
4	2.09	1.78	3.02	5.00	21.48	23.83	19.16	13.05	6.88	4.35	2.08	2.31	
5	2.05	1.78	3.08	5.03	21.78	23.38	18.94	12.75	6.68	4.29	2.05	2.28	
6	2.03	1.77	3.10	5.46	22.18	22.90	18.91	12.45	6.55	4.24	2.50	2.28	
7	2.02	1.81	3.18	5.66	22.61	22.51	18.82	12.21	6.44	4.21	2.97	2.25	
8	2.01	1.81	3.23	6.07	22.98	22.10	18.81	11.93	6.34	4.15	2.94	2.25	
9	2.03	1.81	3.28	6.83	23.95	21.70	20.13	11.70	6.26	4.09	2.92	2.23	
10	2.05	1.81	3.32	7.14	25.50	21.32	20.49	11.34	6.18	4.07	2.90	2.22	
11	2.06	1.80	3.41	7.83	26.55	20.90	20.67	11.08	6.12	4.01	2.87	2.00	
12	2.03	1.78	3.56	8.01	26.78	20.41	20.87	10.85	5.98	4.00	2.85	2.00	
13	2.01	1.77	3.64	8.15	27.07	19.73	20.68	10.53	5.90	3.93	2.84	2.02	
14	1.98	1.74	3.76	8.33	27.27	19.36	20.73	10.26	5.82	3.92	2.84	2.00	
15	1.95	1.70	3.80	8.60	27.48	19.28	20.40	10.08	5.74	3.88	2.79	1.98	
16	1.93	1.64	3.87	9.00	27.58	19.20	19.89	9.85	5.67	3.82	2.78	1.97	
17	1.91	1.64	3.97	9.40	27.60	19.29	19.00	9.65	5.54	3.78	2.68	1.96	
18	1.87	1.71	4.09	9.68	27.63	19.41		9.45	5.46	3.73	2.66	1.95	
19	1.83	1.80	4.24	10.10	27.65	19.58		9.26	5.40	3.67	2.65	1.90	
20	1.80	1.83	4.34	10.75	27.93	19.68	17.76	9.05	5.39	3.62	2.63	1.90	
21	1.80	1.76	4.47	11.45	27.85	19.80	17.35	8.86	5.32	3.57	2.62	1.85	
22	1.80	1.78	4.57	12.33	27.50	20.07	17.00	8.65	5.25	3.56	2.60	1.82	
23	1.80	1.83	4.64	13.28	27.23	20.18	16.53	8.49	5.18	3.53	2.59	1.84	
24	1.80	2.12	4.70	13.80	26.83	20.25	16.30	8.32	5.07	3.49	2.58	1.85	
25	1.90	2.14	4.70	14.30	26.57	20.34	16.06	8.14	4.99	3.45	2.58	1.83	
26	1.80	2.25	4.70	14.94	26.33	20.28	15.62	8.03	4.93	3.40	2.51	1.80	MAX.:
27	1.80	2.27	4.73	15.80	25.88	20.18	15.14	7.92	4.85	3.36	2.48	1.80	27.93
28	1.80	2.39	4.80	16.37	25.55	20.08	14.81	7.77	4.76	3.33	2.43	1.79	
29	1.79	2.43	4.81	17.08		19.95	14.43	7.67	4.68	3.29	2.40	1.77	MIN.:
30	1.77	2.45	4.83	17.90		19.78	14.12	7.52	4.62	3.25	2.39	1.77	1.64
31	1.78		4.85	19.00		19.65		7.38		3.20	2.39		
MEAN	1.92	1.89	3.88	10.06	25.35	20.95	18.24	10.16	5.78	3.83	2.58	2.02	8.89
MAX.	2.09	2.45	4.85	19.00	27.93	25.20	20.88	13.85	7.27	4.55	2.97	2.38	27.93
MIN.	1.77	1.64	2.49	4.88	20.23	19.20	14.12	7.38	4.62	3.20	2.05	1.77	1.64

HP ST.: 1-150 ZAMBEZI PUMP HOUSE YEAR : 1990/91 [WATER LEVEL (m)]

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
1	0.61	1.79	2.49	4.88	20.23	25.20	19.49	13.85	7.27	4.55	2.17	2.38	
2	0.61	0.55	0.77	1.50	6.28	7.53	5.89	4.14	2.17	1.37	0.65	0.73	
3	0.63	0.54	0.78	1.51	6.43	7.42	5.87	4.04	2.13	1.35	0.64	0.72	
4	0.64	0.54	0.92	1.52	6.55	7.26	5.84	3.98	2.10	1.33	0.63	0.70	
5	0.62	0.54	0.94	1.53	6.64	7.13	5.77	3.89	2.04	1.31	0.62	0.69	
6	0.62	0.54	0.94	1.66	6.76	6.98	5.76	3.79	2.00	1.29	0.76	0.69	
7	0.62	0.55	0.97	1.73	6.89	6.86	5.74	3.72	1.96	1.28	0.91	0.69	
8	0.61	0.55	0.98	1.85	7.00	6.74	5.73	3.64	1.93	1.26	0.90	0.69	
9	0.62	0.55	1.00	2.08	7.30	6.61	6.14	3.57	1.91	1.25	0.89	0.68	
10	0.62	0.55	1.01	2.18	7.77	6.50	6.25	3.46	1.88	1.24	0.88	0.69	
11	0.63	0.55	1.04	2.39	8.09	6.37	6.30	3.38	1.87	1.22	0.87	0.61	
12	0.62	0.54	1.09	2.44	8.16	6.22	6.36	3.31	1.82	1.22	0.87	0.61	
13	0.61	0.54	1.11	2.48	8.25	6.01	6.36	3.21	1.80	1.20	0.87	0.62	
14	0.60	0.53	1.15	2.54	8.31	5.90	6.32	3.13	1.77	1.19	0.87	0.61	
15	0.59	0.52	1.16	2.62	8.38	5.88	6.22	3.07	1.75	1.18	0.85	0.60	
16	0.59	0.50	1.18	2.74	8.41	5.85	6.04	3.00	1.73	1.16	0.85	0.60	
17	0.58	0.50	1.21	2.87	8.41	5.88	5.79	2.94	1.69	1.15	0.82	0.60	
18	0.57	0.52	1.25	2.95	8.42	5.92		2.88	1.66	1.14	0.81	0.59	
19	0.56	0.55	1.29	3.08	8.43	5.97		2.82	1.65	1.12	0.81	0.58	
20	0.55	0.56	1.32	3.28	8.51	6.00	5.41	2.76	1.64	1.10	0.80	0.58	
21	0.55	0.54	1.36	3.49	8.49	6.06	5.29	2.70	1.62	1.09	0.80	0.56	
22	0.55	0.54	1.39	3.76	8.38	6.12	5.16	2.64	1.60	1.09	0.79	0.55	
23	0.55	0.56	1.41	4.05	8.30	6.15	5.04	2.59	1.58	1.08	0.79	0.56	
24	0.55	0.65	1.43	4.21	8.18	6.17	4.97	2.54	1.55	1.06	0.79	0.56	
25	0.55	0.65	1.43	4.36	8.10	6.20	4.90	2.48	1.52	1.05	0.79	0.56	
26	0.55	0.69	1.43	4.55	8.03	6.18	4.76	2.45	1.50	1.04	0.77	0.55	MAX.:
27	0.55	0.68	1.44	4.75	7.89	6.15	4.61	2.41	1.48	1.02	0.76	0.55	25.20
28	0.55	0.73	1.46	4.99	7.79	6.12	4.51	2.37	1.45	1.01	0.74	0.55	
29	0.55	0.74	1.47	5.21		6.08	4.40	2.34	1.43	1.00	0.73	0.54	MIN.:
30	0.54	0.75	1.47	5.46		6.03	4.30	2.29	1.41	0.99	0.73	0.54	0.50
31	0.54		1.48	5.79		5.99		2.25		0.98	0.73		
MEAN	0.58	0.62	1.24	3.18	8.23	6.95	6.04	3.41	1.93	1.27	0.83	0.67	2.91
MAX.	0.64	1.79	2.49	5.79	20.23	25.20	19.49	13.85	7.27	4.55	2.17	2.38	25.20
MIN.	0.54	0.50	0.77	1.50	6.28	5.85	4.30	2.25	1.41	0.98	0.62	0.54	0.50

<<< DB-06A >>> HOURLY RIVER WATER LEVEL

To file the hourly water level recorded at the hydrometric stations and output tables in feet and meter by station.

To begin this filing, use the following steps to retrieve each station number file.

*** for example ***

Diskette No.	**DB-06A 5-030 EXCHANGE FARM**
Select	**/File**
Select	**/Retrieve**
Highlight	**\1991\APR.WK1**.....Exchange Farm Apr.1991
Press	**ENTER** to retrieve APR.WK1

The following worksheet appears on your screen. Before enter the hourly water level, a technician should convert from chart line into values by use of a special scale.

A2: [W9] '=HF====== READY

	A	B	C	D	E	F	G	H	I	J	K	L
1	HOURLY RIVER WATER LEVEL					ST.NO.5-030			EXCHANGE FARM			APR./199
2	=HF==========											
3	HOUR\DATE	1	2	3	4	5	6	7	8	9	10	
4	==========											
5	1	0.62	0.58	0.54	0.50	0.47	0.45	0.44	0.50	0.54	0.51	
6	2	0.61	0.58	0.54	0.50	0.47	0.45	0.44	0.49	0.54	0.50	
7	3	0.61	0.58	0.54	0.50	0.47	0.45	0.44	0.49	0.54	0.50	
8	4	0.60	0.58	0.54	0.49	0.47	0.45	0.44	0.49	0.54	0.50	
9	5	0.60	0.58	0.54	0.49	0.47	0.45	0.44	0.49	0.54	0.50	
10	6	0.60	0.58	0.54	0.49	0.47	0.45	0.44	0.49	0.54	0.50	
11	7	0.60	0.58	0.54	0.49	0.47	0.45	0.44	0.50	0.54	0.50	
12	8	0.60	0.58	0.53	0.49	0.47	0.45	0.44	0.50	0.54	0.50	
13	9	0.59	0.58	0.53	0.49	0.47	0.45	0.44	0.50	0.54	0.50	
14	10	0.59	0.58	0.53	0.49	0.47	0.45	0.44	0.51	0.54	0.50	
15	11	0.59	0.58	0.53	0.49	0.47	0.45	0.44	0.51	0.54	0.49	
16	12	0.59	0.58	0.52	0.49	0.47	0.45	0.44	0.51	0.53	0.49	
17	13	0.59	0.57	0.52	0.49	0.47	0.45	0.44	0.52	0.53	0.49	
18	14	0.59	0.57	0.52	0.48	0.47	0.44	0.44	0.52	0.53	0.49	
19	15	0.59	0.57	0.51	0.48	0.46	0.44	0.44	0.52	0.53	0.49	
20	16	0.58	0.56	0.50	0.48	0.46	0.44	0.45	0.52	0.52	0.48	

[illegible]-Nov-91 03:08 AM

C43: [F2] [W6] +C5*0.3048 READY

formula

	A	B	C	D	E	F	G	H	I	J	K	L
39	HOURLY RIVER WATER LEVEL					ST.NO.5-030			EXCHANGE FARM			APR./199
40	=HM==========											
41	HOUR\DATE	1	2	3	4	5	6	7	8	9	10	
42	==========											
43	1	0.19	0.18	0.16	0.15	0.14	0.14	0.13	0.15	0.16	0.16	
44	2	0.19	0.18	0.16	0.15	0.14	0.14	0.13	0.15	0.16	0.15	
45	3	0.19	0.18	0.16	0.15	0.14	0.14	0.13	0.15	0.16	0.15	
46	4	0.18	0.18	0.16	0.15	0.14	0.14	0.13	0.15	0.16	0.15	
47	5	0.18	0.18	0.16	0.15	0.14	0.14	0.13	0.15	0.16	0.15	
48	6	0.18	0.18	0.16	0.15	0.14	0.14	0.13	0.15	0.16	0.15	
49	7	0.18	0.18	0.16	0.15	0.14	0.14	0.13	0.15	0.16	0.15	
50	8	0.18	0.18	0.16	0.15	0.14	0.14	0.13	0.15	0.16	0.15	
51	9	0.18	0.18	0.16	0.15	0.14	0.14	0.13	0.15	0.16	0.15	
52	10	0.18	0.18	0.16	0.15	0.14	0.14	0.13	0.16	0.16	0.15	
53	11	0.18	0.18	0.16	0.15	0.14	0.14	0.13	0.16	0.16	0.15	
54	12	0.18	0.18	0.16	0.15	0.14	0.14	0.13	0.16	0.16	0.15	
55	13	0.18	0.17	0.16	0.15	0.14	0.14	0.13	0.16	0.16	0.15	
56	14	0.18	0.17	0.16	0.15	0.14	0.13	0.13	0.16	0.16	0.15	
57	15	0.18	0.17	0.16	0.15	0.14	0.13	0.13	0.16	0.16	0.15	
58	16	0.18	0.17	0.15	0.15	0.14	0.13	0.14	0.16	0.16	0.15	

[illegible]-Nov-91 03:28 AM

Data entering range

<<< DB-11 >>> DAILY WELL WATER LEVEL

To file daily well water level observed at the observation well, calculate water level elevation in meter and output tables by station.

To begin this system, use the following steps to retrieve each station number file.

*** for example ***

Diskette No.	**DB-11 Well No.1 Kanyilaba**
Select	**/File**
Select	**/Retrieve**
Highlight	**\9091.WK1.....Year of 1990/1991**
Press	**ENTER to retrieve 9091.WK1**

This filing system contains 5 (five) difference tables in a worksheet to prevent human error. The first table defines the characters of a well station, now appears on your screen as follows;

```
** WELL RECORD ***1990/91*****************************************

  (01)  Well No ------------------------->    1
  (02)  Well Name ----------------------->    Kanyilaba
  (03)  Height of Observation Point ----->     0.43 m
  (04)  Elevation of Ground Level (m)---->    1068.55
  (05)  Diameter of Well ---------------->     1.30 m
  (06)  Depth of Well ------------------->    11.77 m
  (07)  Zero Reading of Tape ------------>    20.00 m
  (08)  Distance from Hydrometric St. --->     8.5 km
  (09)  Hydrometric St. No. ------------->    1-150
  (10)  Hydrometric St. Name ------------>    Zambezi
  (11)  R/B/H of Hydrometric St. (m)----->    1040.55
  (12)  Zero Height of Staff Gauge (m)--->    1026.65

*****************************************************************
```

B23: (,2) [W7] 29.04 READY

	A	B	C	D	E	F	G	H	I	J
19	*MWLm*		Well No1		Kanyilaba				1990/91	Morning
20	N==N									
21	DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
22										
23	1	29.04	29.48	29.80	30.13	27.57	25.40	25.19	25.69	26.25
24	2	29.05	29.49	29.82	30.07	27.51	25.37	25.22	25.68	26.29
25	3	29.05	29.52	29.82	30.10	27.48	25.37	25.22	25.66	26.31
26	4	29.08	29.53	29.84	30.13	27.49	25.38	25.24	25.72	26.29
27	5	29.07	29.52	29.86	30.10	27.45	25.38	25.25	25.75	26.32
28	6	29.07	29.51	29.84	30.15	27.28	25.38	25.24	25.79	26.36
29	7	29.10	29.52	29.88	30.11	26.98	25.39	25.26	25.75	26.38
30	8	29.09	29.54	29.89	30.09	26.76	25.40	25.22	25.80	26.37
31	9	29.18	29.56	29.90	30.02	26.51	25.42	25.24	25.81	26.39
32	10	29.15	29.55	29.90	29.91	26.43	25.41	25.25	25.84	26.41
33	11	29.16	29.62	29.90	29.91	26.28	25.41	25.30	25.84	26.39
34	12	29.18	29.64	29.94	29.94	26.21	25.44	25.30	25.87	26.37
35	13	29.18	29.64	29.93	29.92	26.10	25.43	25.35	25.88	26.43
36	14	29.21	29.63	29.95	29.95	25.99	25.45	25.36	25.91	26.50
37	15	29.21	29.60	29.96	29.92	25.74	25.47	25.37	25.93	26.52
38	16	29.23	29.65	29.99	29.97	25.60	25.45	25.39	25.93	26.55

10-Nov-91 05:07 AM

Data entering range

The third table is for entering well water level data in the evening. Be sure that unit should be metric.

B65: (,2) [W7] 29.42 READY

	A	B	C	D	E	F	G	H	I	J
61	*MWLe*		Well No1		Kanyilaba				1990/91	Evening
62	N==N									
63	DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
64										
65	1	29.42	29.93	30.26	30.29	27.93	25.51	25.36	25.88	26.51
66	2	29.39	30.00	30.30	30.23	27.72	25.42	25.38	25.82	26.58
67	3	29.66	29.91	30.28	30.30	27.74	25.55	25.39	25.95	26.55
68	4	29.49	29.97	30.29	30.25	27.64	25.50	25.42	25.94	26.56
69	5	29.09	30.08		30.19	27.56	25.48	25.31	25.92	26.60
70	6	29.52	30.01		30.29	27.42	25.47	25.44	26.01	26.58
71	7	29.56	30.02		30.26	27.03	25.52	25.46	26.00	26.64
72	8	29.30	29.99		30.23	26.80	25.49	25.47	25.98	26.62
73	9	29.43	29.98		30.21	26.68	25.53	25.46	26.02	26.75
74	10	29.40	30.07		30.16	26.46	25.50	25.44	26.00	26.78
75	11	29.45	30.08		30.19	26.44	25.61	25.44	26.04	26.76
76	12	29.61	30.12		30.30	26.28	25.55	25.45	26.08	26.78
77	13	29.59	30.08		30.21	26.16	25.61	25.50	26.04	26.81
78	14	29.68	30.10		30.16	26.00	25.57	25.49	26.02	26.80
79	15	29.67	30.07		30.18	25.74	25.63	25.55	26.09	26.75
80	16	29.68	30.05		30.25	25.56	25.62	25.54	26.13	26.82

10-Nov-91 05:08 AM

Data entering range

The Forth table describes the actual well water level in the morning by hidden formula as follows;

B107: (,2) [W7] +B23-H5-H9 READY

formula

	A	B	C	D	E	F	G	H	I	J
103	*WWLm*		Well No1		Kanyilaba				1990/91	Morning
104	N==N									
105	DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
106										
107	1	8.61	9.05	9.37	9.70	7.14	4.97	4.76	5.26	5.82
108	2	8.62	9.06	9.39	9.64	7.08	4.94	4.79	5.25	5.86
109	3	8.62	9.09	9.39	9.67	7.05	4.94	4.79	5.23	5.88
110	4	8.65	9.10	9.41	9.70	7.06	4.95	4.81	5.29	5.86
111	5	8.64	9.09	9.43	9.67	7.02	4.95	4.82	5.32	5.89
112	6	8.64	9.08	9.41	9.72	6.85	4.95	4.81	5.36	5.93
113	7	8.67	9.09	9.45	9.68	6.55	4.96	4.83	5.32	5.95
114	8	8.66	9.11	9.46	9.66	6.33	4.97	4.79	5.37	5.94
115	9	8.75	9.13	9.47	9.59	6.08	4.99	4.81	5.38	5.96
116	10	8.72	9.12	9.47	9.48	6.00	4.98	4.82	5.41	5.98
117	11	8.73	9.19	9.47	9.48	5.85	4.98	4.87	5.41	5.96
118	12	8.75	9.21	9.51	9.51	5.78	5.01	4.87	5.44	5.94
119	13	8.75	9.21	9.50	9.49	5.67	5.00	4.92	5.45	6.00
120	14	8.78	9.20	9.52	9.52	5.56	5.02	4.93	5.48	6.07
121	15	8.78	9.17	9.53	9.49	5.31	5.04	4.94	5.50	6.09
122	16	8.80	9.22	9.56	9.54	5.17	5.02	4.96	5.50	6.12

10-Nov-91 05:09 AM

Result of formula

The Fifth table describes the actual well water level in the evening by hidden formula as follows;

B149: (,2) [W7] +B65-$HS5-$HS9 READY

formula

	A	B	C	D	E	F	G	H	I	J
145	*WWLe*		Well No1		Kanyilaba				1990/91	Evening
146	N==N									
147	DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
148										
149	1	8.99	9.50	9.83	9.86	7.50	5.08	4.93	5.45	6.08
150	2	8.96	9.57	9.87	9.80	7.29	4.99	4.95	5.39	6.15
151	3	9.23	9.48	9.85	9.87	7.31	5.12	4.96	5.52	6.12
152	4	9.06	9.54	9.86	9.82	7.21	5.07	4.99	5.51	6.13
153	5	8.66	9.65		9.76	7.13	5.05	4.88	5.49	6.17
154	6	9.09	9.58		9.86	6.99	5.04	5.01	5.58	6.15
155	7	9.13	9.59		9.83	6.60	5.09	5.03	5.57	6.21
156	8	8.87	9.56		9.80	6.37	5.06	5.04	5.55	6.19
157	9	9.00	9.55		9.78	6.25	5.10	5.03	5.59	6.32
158	10	8.97	9.64		9.73	6.03	5.07	5.01	5.57	6.35
159	11	9.02	9.65		9.76	6.01	5.18	5.01	5.61	6.33
160	12	9.18	9.69		9.87	5.85	5.12	5.02	5.65	6.35
161	13	9.16	9.65		9.78	5.73	5.18	5.07	5.61	6.38
162	14	9.25	9.67		9.73	5.57	5.14	5.06	5.59	6.37
163	15	9.24	9.64		9.75	5.31	5.20	5.12	5.66	6.32
164	16	9.25	9.62		9.82	5.13	5.19	5.11	5.70	6.39

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The sixth table summarizes the monthly well water level by hidden formula as follows;

B192: (F2) [W7] @VALUE($HS6)-@VALUE($HS14)-B181 READY

formula

	A	B	C	D	E	F	G	H	I	J
180										
181	MEAN	9.18	9.67	9.85	9.26	5.86	5.12	5.13	5.71	6.43
182	MAX.	9.41	9.87	9.87	9.87	7.50	5.31	5.45	6.09	6.88
183	MIN.	8.66	9.48	9.83	7.49	4.99	4.87	4.88	5.39	6.08
184										
185										
186										
187	*H*		Well No1		Kanyilaba				1990/91	<Well Wate
188	N==N									
189	DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
190										
191	Hm	33.10	32.69	32.38	32.87	36.17	36.91	36.94	36.39	35.80
192	He	32.72	32.23	32.05	32.64	36.04	36.78	36.77	36.19	35.47
193										
194		33.10	32.69	32.38	32.87	36.17	36.91	36.94	36.39	35.80
195		32.72	32.23	32.05	32.64	36.04	36.78	36.77	36.19	35.47
196										
197										
198										
199										

10-Nov-91 05:12 AM

Monthly well water table

<<< DB-03 >>> DISCHARGE RATING CURVE METHOD

In case that flow measurement data is few, this system prepares discharge rating curve using Manning's Formula. (parametric data : cross section, water surface slope and roughness)

St.4-941 Kaleya Dam Site is a good sample to explain this analyzing system. To begin this system, be sure that cross sectional survey results is required. In DB-03 diskette of each stations contains as the following files;

*** for example ***
Diskette No. **DB-03 4-941 KALEYA DAM SITE**

- **CS.WK1** .....Cross sectional survey result
- **RC1.WK1** .....Calculation of Manning's Formula
- **FM-LIST.WK1**.....F/M file brought from DB-02 Sys.
- **RC.WK1** .....Discharge Rating Curve (Type-1)
- **HQTABLE** .....Discharge Table

Now, retrieve RC1.WK1 file on your computer. The following worksheet appears in the screen. This file is for calculating cross sectional area (=A), velocity (=V) and discharge (=Q) substituting water surface slope (=i) and roughness coefficient (=n) into the data entering range as shown below;

CS.WK1

4-941 KALEYA DAM SITE
CROSS SECTIONAL SURVEY DATA

GAUGE PLATE ZERO (0) ELEVATION 1242.73

X	Y	H
(120.00)	1251.79	9.056
(100.00)	1250.75	8.016
(72.00)	1249.30	6.566
(40.00)	1248.45	5.716
(26.50)	1248.02	5.286
(24.50)	1246.84	4.106
(19.50)	1246.89	4.156
(18.00)	1246.28	3.526
(17.80)	1245.60	2.866
(17.00)	1244.97	2.236
(17.00)	1242.85	0.116
(16.00)	1242.76	0.026
(15.00)	1242.62	(0.114)
(14.00)	1242.57	(0.164)
(13.00)	1243.12	0.386
(11.50)	1244.16	1.426
(10.00)	1244.57	1.836
(9.00)	1245.95	3.216
(8.00)	1246.33	3.596
(3.50)	1247.10	4.366
0.00	1247.22	4.486
18.00	1247.32	4.586
40.00	1246.89	4.156
80.00	1246.76	4.026
93.00	1247.48	4.746
112.00	1249.42	6.686
129.00	1251.19	8.456
150.00	1252.25	9.516

Copy

RC1.WK1

Data entering range

4-941 KALEYA DAM SITE <<< H - A - V - Q CALCULATION >>>

h = 1249.72 n = 0.04000 i = 0.00040
Area = 430.46 C = 0.50000
S = 199.81 h MIN= 1,242.57 h MAX= 1,252.25
R = 2.15
V =(1/n)*R^(2/3)*I(1/2)=C*R^(2/3) = 0.83 (m/sec) : Velocity
Q = A*V = 359.0 (m3/s) : Discharge

h(m)	H(m)	A(m2)	S(m)	R(m)	V(m/s)	Q(m3/s)
1,249.72	7.00	430.46	199.81	2.15	0.83	359.01

Result of Formula

X	Y	h	[b]	A1	A21	A22	AREA
(120.00)	1,251.79	0.00	20.00	0.00	0.00	0.00	0.00
(100.00)	1,250.75	0.00	0.00	0.00	1.70	0.00	1.70
(72.00)	1,249.30	0.42	32.00	13.44	0.00	0.00	13.44
(40.00)	1,248.45	1.27	13.50	17.14	0.00	0.00	17.14
(26.50)	1,248.02	1.70	2.00	3.40	0.00	0.00	3.40
(24.50)	1,246.84	2.88	5.00	14.40	0.00	0.00	14.40
(19.50)	1,246.89	2.83	1.50	4.24	0.00	0.00	4.24
(18.00)	1,246.26	3.46	0.20	0.69	0.00	0.00	0.69
(17.80)	1,245.60	4.12	0.80	3.30	0.00	0.00	3.30
(17.00)	1,244.97	4.75	0.00	0.00	0.00	0.00	0.00
(17.00)	1,242.85	6.87	1.00	6.87	0.00	0.00	6.87
(16.00)	1,242.76	6.96	1.00	6.96	0.00	0.00	6.96
(15.00)	1,242.62	7.10	1.00	7.10	0.00	0.00	7.10
(14.00)	1,242.57	7.15	1.00	7.15	0.00	0.00	7.15
(13.00)	1,243.12	6.60	1.50	9.90	0.00	0.00	9.90
(11.50)	1,244.16	5.56	1.50	8.34	0.00	0.00	8.34
(10.00)	1,244.57	5.15	1.00	5.15	0.00	0.00	5.15
(9.00)	1,245.95	3.77	1.00	3.77	0.00	0.00	3.77
(8.00)	1,246.33	3.39	4.50	15.26	0.00	0.00	15.26
(3.50)	1,247.10	2.62	3.50	9.17	0.00	0.00	9.17
0.00	1,247.22	2.50	18.00	45.00	0.00	0.00	45.00
18.00	1,247.32	2.40	22.00	52.80	0.00	0.00	52.80
40.00	1,246.89	2.83	40.00	113.20	0.00	0.00	113.20
80.00	1,246.76	2.96	13.00	38.48	0.00	0.00	38.48
93.00	1,247.48	2.24	19.00	42.56	0.00	0.00	42.56
112.00	1,249.42	0.30	0.00	0.00	0.00	0.43	0.43
129.00	1,251.19	0.00	21.00	0.00	0.00	0.00	0.00
150.00	1,252.25	0.00	0.00	0.00	0.00	0.00	0.00
150.00	1,252.25						

Survey Result

Calculation range

After entering data in the first table, the following table should summarize in the same file.

A1: '4-941 KALEYA DAM SITE READY

	A	B	C	D	E	F	G	H
1	4-941 KALEYA DAM SITE		<<< H - A - V - Q CALCULATION >>>					
2								
3		h =	1249.72	n =	0.04000	i =	0.00040	
4		Area =	430.46	C =	0.50000			
5		S =	199.81	h MIN=	1,242.57	h MAX=	1,252.25	
6		R =	2.15					
7	V =(1/n)*R^(2/3)*i(1/2)=C*R^(2/3) =				0.83	(m/sec)	: Velocity	
8		Q = A*V		=	359.0	(m3/s)	: Discharge	
9								
10	h(m)	H(m)	A(m2)	S(m)	R(m)	V(m/s)	Q(m3/s)	
11	1,249.72	7.00	430.46	199.81	2.15	0.83	359.01	
12								

4-941 KALEYA DAM SITE <<< H - A - V - Q CALCULATION >>>

n = 0.03500 i = 1/2500

h(m)	H(m)	A(m2)	S(m)	R(m)	V(m/s)	Q(m3/s)	REMARKS
1,243.00	0.28	0.94	4.06	0.23	0.22	0.20	0.45
1,244.00	1.28	5.76	6.85	0.84	0.51	2.93	1.71
1,245.00	2.28	13.35	10.24	1.30	0.68	9.10	3.02
1,246.00	3.28	22.06	12.94	1.70	0.82	17.99	4.24
1,247.50	4.78	91.30	123.35	0.74	0.47	42.69	6.53
1,248.00	5.28	152.14	129.26	1.18	0.64	96.92	9.84
1,248.50	5.78	215.20	149.61	1.44	0.73	156.70	12.52
1,249.00	6.28	293.57	173.36	1.69	0.81	238.33	15.44
1,249.72	7.00	430.46	199.81	2.15	0.95	410.29	20.26

n = 0.03000 i = 1/2500

h(m)	H(m)	A(m2)	S(m)	R(m)	V(m/s)	Q(m3/s)	REMARKS
1,243.00	0.28	0.94	4.06	0.23	0.25	0.24	0.49
1,244.00	1.28	5.76	6.85	0.84	0.59	3.42	1.85
1,245.00	2.28	13.35	10.24	1.30	0.80	10.62	3.26
1,246.00	3.28	22.06	12.94	1.70	0.95	20.99	4.58
1,247.50	4.78	91.30	123.35	0.74	0.55	49.80	7.06
1,248.00	5.28	152.14	129.26	1.18	0.74	113.07	10.63
1,248.50	5.78	215.20	149.61	1.44	0.85	182.82	13.52
1,249.00	6.28	293.57	173.36	1.69	0.95	278.05	16.67
1,249.72	7.00	430.46	199.81	2.15	1.11	478.68	21.88

n = 0.04000 i = 1/2500

h(m)	H(m)	A(m2)	S(m)	R(m)	V(m/s)	Q(m3/s)	REMARKS
1,243.00	0.28	0.94	4.06	0.23	0.19	0.18	0.42
1,244.00	1.28	5.76	6.85	0.84	0.45	2.56	1.60
1,245.00	2.28	13.35	10.24	1.30	0.60	7.97	2.82
1,246.00	3.28	22.06	12.94	1.70	0.71	15.74	3.97
1,247.50	4.78	91.30	123.35	0.74	0.41	37.35	6.11
1,248.00	5.28	152.14	129.26	1.18	0.56	84.80	9.21
1,248.50	5.78	215.20	149.61	1.44	0.64	137.11	11.71
1,249.00	6.28	293.57	173.36	1.69	0.71	208.54	14.44
1,249.72	7.00	430.46	199.81	2.15	0.83	359.01	18.95

Copy result of formula

In order to select the most appropriate curve among three alternative results, water level (H) - square root discharge (Q^0.5) graph should be prepared as follows. In this case, n=0.035 curve is the most appropriate curve.

roughness coefficient

water surface slope

4-941 KALEYA DAM SITE <<< H - A - V - Q CALCULATION >>>

n = 0.03500 I = 1/2500

h(m)	H(m)	A(m2)	S(m)	R(m)	V(m/s)	Q(m3/s)	REMARKS
1,243.00	0.28	0.94	4.06	0.23	0.22	0.20	0.45
1,244.00	1.28	5.76	6.85	0.84	0.51	2.93	1.71
1,245.00	2.28	13.35	10.24	1.30	0.68	9.10	3.02
1,246.00	3.28	22.06	12.94	1.70	0.82	17.99	4.24
1,247.50	4.78	91.30	123.35	0.74	0.47	42.69	6.53
1,248.00	5.28	152.14	129.26	1.18	0.64	96.92	9.84
1,248.50	5.78	215.20	149.61	1.44	0.73	156.70	12.52
1,249.00	6.28	293.57	173.36	1.69	0.81	238.33	15.44
1,249.72	7.00	430.46	199.81	2.15	0.95	410.29	20.26

Y data range for (1)

n = 0.03000 I = 1/2500

h(m)	H(m)	A(m2)	S(m)	R(m)	V(m/s)	Q(m3/s)	REMARKS
1,243.00	0.28	0.94	4.06	0.23	0.25	0.24	0.49
1,244.00	1.28	5.76	6.85	0.84	0.59	3.42	1.85
1,245.00	2.28	13.35	10.24	1.30	0.80	10.62	3.26
1,246.00	3.28	22.06	12.94	1.70	0.95	20.99	4.58
1,247.50	4.78	91.30	123.35	0.74	0.55	49.80	7.06
1,248.00	5.28	152.14	129.26	1.18	0.74	113.07	10.63
1,248.50	5.78	215.20	149.61	1.44	0.85	182.82	13.52
1,249.00	6.28	293.57	173.36	1.69	0.95	278.05	16.67
1,249.72	7.00	430.46	199.81	2.15	1.11	478.88	21.88

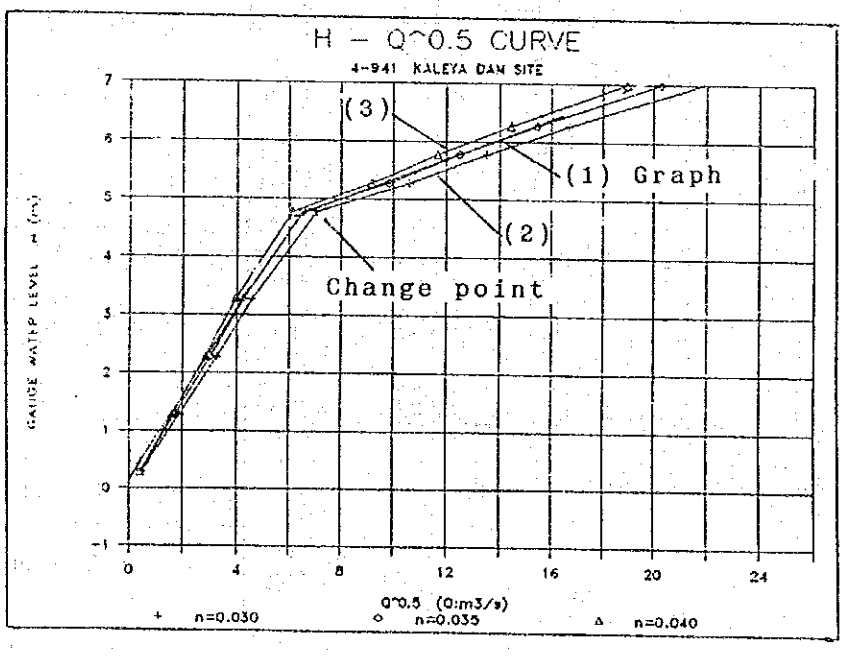
for (2)

n = 0.04000 I = 1/2500

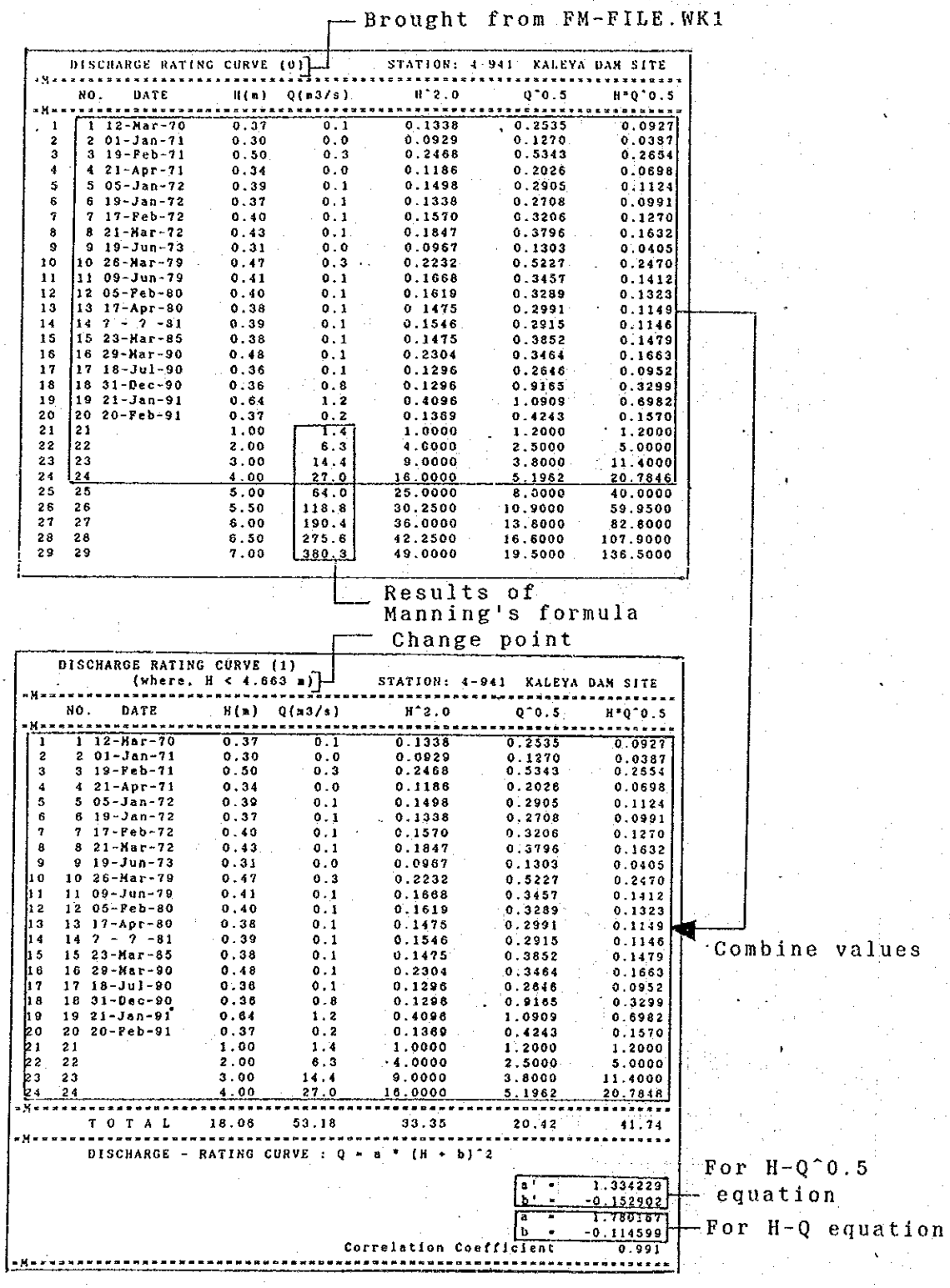
h(m)	H(m)	A(m2)	S(m)	R(m)	V(m/s)	Q(m3/s)	REMARKS
1,243.00	0.28	0.94	4.06	0.23	0.19	0.18	0.42
1,244.00	1.28	5.76	6.85	0.84	0.45	2.59	1.60
1,245.00	2.28	13.35	10.24	1.30	0.60	7.97	2.82
1,246.00	3.28	22.06	12.94	1.70	0.71	15.74	3.97
1,247.50	4.78	91.30	123.35	0.74	0.41	37.35	6.11
1,248.00	5.28	152.14	129.26	1.18	0.56	84.80	9.21
1,248.50	5.78	215.20	149.61	1.44	0.64	137.11	11.71
1,249.00	6.28	293.57	173.36	1.69	0.71	208.54	14.44
1,249.72	7.00	430.46	199.81	2.15	0.83	359.01	18.95

for (3)

X data range



Next, retrieve RC.WK1 file. This file is for preparing the H-Q curve, there are two type of H-Q curves in this station according to result of H-Q^0.5 curve. From FM-FILE.WK1 (DB-02), actual measured data is only available at the range of between water level zero and water level 0.70 m. Therefore, substitute these measured data into the discharge rating curve (1) table and substitute result of Manning's formula into the discharge rating curve (2).



DISCHARGE RATING CURVE (1) STATION: 4-941 KALEYA DAM SITE

	NO.	DATE	H(m)	Q(m3/s)	H^2.0	Q^0.5	H*Q^0.5
1	1	12-Mar-70	0.37	0.1	0.1338	0.2535	0.0927
2	2	01-Jan-71	0.30	0.0	0.0929	0.1270	0.0387
3	3	19-Feb-71	0.50	0.3	0.2468	0.5343	0.2654
4	4	21-Apr-71	0.34	0.0	0.1186	0.2026	0.0698
5	5	05-Jan-72	0.39	0.1	0.1498	0.2905	0.1124
6	6	19-Jan-72	0.37	0.1	0.1338	0.2708	0.0991
7	7	17-Feb-72	0.40	0.1	0.1570	0.3206	0.1270
8	8	21-Mar-72	0.43	0.1	0.1847	0.3796	0.1632
9	9	19-Jun-73	0.31	0.0	0.0967	0.1303	0.0405
10	10	26-Mar-79	0.47	0.3	0.2232	0.5227	0.2470
11	11	09-Jun-79	0.41	0.1	0.1668	0.3457	0.1412
12	12	05-Feb-80	0.40	0.1	0.1619	0.3289	0.1323
13	13	17-Apr-80	0.38	0.1	0.1475	0.2991	0.1149
14	14	? - ? -81	0.39	0.1	0.1546	0.2915	0.1146
15	15	23-Mar-85	0.38	0.1	0.1475	0.3852	0.1479
16	16	29-Mar-90	0.48	0.1	0.2304	0.3464	0.1663
17	17	18-Jul-90	0.36	0.1	0.1296	0.2646	0.0952
18	18	31-Dec-90	0.36	0.8	0.1296	0.9165	0.3299
19	19	21-Jan-91	0.64	1.2	0.4096	1.0909	0.6982
20	20	20-Feb-91	0.37	0.2	0.1369	0.4243	0.1570
21	21		1.00	1.4	1.0000	1.2000	1.2000
22	22		2.00	6.3	4.0000	2.5000	5.0000
23	23		3.00	14.4	9.0000	3.8000	11.4000
24	24		4.00	27.0	16.0000	5.1962	20.7846
25	25		5.00	64.0	25.0000	8.0000	40.0000
26	26		5.50	118.8	30.2500	10.9000	59.9500
27	27		6.00	190.4	36.0000	13.8000	82.8000
28	28		6.50	275.6	42.2500	16.6000	107.9000
29	29		7.00	380.3	49.0000	19.5000	136.5000

DISCHARGE RATING CURVE (1) (where, H < 4.663 m) STATION: 4-941 KALEYA DAM SITE

	NO.	DATE	H(m)	Q(m3/s)	H^2.0	Q^0.5	H*Q^0.5
1	1	12-Mar-70	0.37	0.1	0.1338	0.2535	0.0927
2	2	01-Jan-71	0.30	0.0	0.0929	0.1270	0.0387
3	3	19-Feb-71	0.50	0.3	0.2468	0.5343	0.2654
4	4	21-Apr-71	0.34	0.0	0.1186	0.2026	0.0698
5	5	05-Jan-72	0.39	0.1	0.1498	0.2905	0.1124
6	6	19-Jan-72	0.37	0.1	0.1338	0.2708	0.0991
7	7	17-Feb-72	0.40	0.1	0.1570	0.3206	0.1270
8	8	21-Mar-72	0.43	0.1	0.1847	0.3796	0.1632
9	9	19-Jun-73	0.31	0.0	0.0967	0.1303	0.0405
10	10	26-Mar-79	0.47	0.3	0.2232	0.5227	0.2470
11	11	09-Jun-79	0.41	0.1	0.1668	0.3457	0.1412
12	12	05-Feb-80	0.40	0.1	0.1619	0.3289	0.1323
13	13	17-Apr-80	0.38	0.1	0.1475	0.2991	0.1149
14	14	? - ? -81	0.39	0.1	0.1546	0.2915	0.1146
15	15	23-Mar-85	0.38	0.1	0.1475	0.3852	0.1479
16	16	29-Mar-90	0.48	0.1	0.2304	0.3464	0.1663
17	17	18-Jul-90	0.36	0.1	0.1296	0.2646	0.0952
18	18	31-Dec-90	0.36	0.8	0.1296	0.9165	0.3299
19	19	21-Jan-91	0.64	1.2	0.4096	1.0909	0.6982
20	20	20-Feb-91	0.37	0.2	0.1369	0.4243	0.1570
21	21		1.00	1.4	1.0000	1.2000	1.2000
22	22		2.00	6.3	4.0000	2.5000	5.0000
23	23		3.00	14.4	9.0000	3.8000	11.4000
24	24		4.00	27.0	16.0000	5.1962	20.7848
		T O T A L	18.06	53.18	33.35	20.42	41.74

DISCHARGE - RATING CURVE : Q = a * (H + b)^2

a' =	1.334223
b' =	-0.152902
a =	1.780187
b =	-0.114599
Correlation Coefficient	0.991

DISCHARGE RATING CURVE (0) STATION: 4-941 KALEYA DAM SITE

	NO.	DATE	H(m)	Q(m3/s)	H^2.0	Q^0.5	H*Q^0.5
1	1	12-Mar-70	0.37	0.1	0.1338	0.2535	0.0927
2	2	01-Jan-71	0.30	0.0	0.0929	0.1270	0.0387
3	3	19-Feb-71	0.50	0.3	0.2468	0.5343	0.2654
4	4	21-Apr-71	0.34	0.0	0.1186	0.2026	0.0698
5	5	05-Jan-72	0.39	0.1	0.1498	0.2905	0.1124
6	6	19-Jan-72	0.37	0.1	0.1338	0.2708	0.0991
7	7	17-Feb-72	0.40	0.1	0.1570	0.3206	0.1270
8	8	21-Mar-72	0.43	0.1	0.1847	0.3796	0.1632
9	9	19-Jun-73	0.31	0.0	0.0967	0.1303	0.0405
10	10	26-Mar-79	0.47	0.3	0.2232	0.5227	0.2470
11	11	09-Jun-79	0.41	0.1	0.1868	0.3457	0.1412
12	12	05-Feb-80	0.40	0.1	0.1619	0.3289	0.1323
13	13	17-Apr-80	0.38	0.1	0.1475	0.2991	0.1149
14	14	? - ? -81	0.39	0.1	0.1546	0.2915	0.1146
15	15	23-Mar-85	0.38	0.1	0.1475	0.3852	0.1479
16	16	29-Mar-90	0.48	0.1	0.2304	0.3464	0.1663
17	17	18-Jul-90	0.36	0.1	0.1296	0.2646	0.0952
18	18	31-Dec-90	0.36	0.8	0.1296	0.9165	0.3299
19	19	21-Jan-91	0.64	1.2	0.4096	1.0909	0.6982
20	20	20-Feb-91	0.37	0.2	0.1369	0.4243	0.1570
21	21		1.00	1.4	1.0000	1.2000	1.2000
22	22		2.00	6.3	4.0000	2.5000	5.0000
23	23		3.00	14.4	9.0000	3.8000	11.4000
24	24		4.00	27.0	16.0000	5.1962	20.7846
25	25		5.00	64.0	25.0000	8.0000	40.0000
26	26		5.50	118.8	30.2500	10.9000	59.9500
27	27		6.00	190.4	36.0000	13.8000	82.8000
28	28		6.50	275.6	42.2500	16.6000	107.9000
29	29		7.00	380.3	49.0000	19.5000	136.5000

Results of Manning's formula

DISCHARGE RATING CURVE (2)
(where, H >= 4.863 m) STATION: 4-941 KALEYA DAM SITE

	NO.	DATE	H(m)	Q(m3/s)	H^2.0	Q^0.5	H*Q^0.5
1	1		5.00	64.0	25.0000	8.0000	40.0000
2	2		5.50	118.8	30.2500	10.9000	59.9500
3	3		6.00	190.4	36.0000	13.8000	82.8000
4	4		6.50	275.6	42.2500	16.6000	107.9000
5	5		7.00	380.3	49.0000	19.5000	136.5000
	T O T A L		30.00	1029.06	182.50	68.80	427.15

DISCHARGE - RATING CURVE : Q = a * (H + b)^2

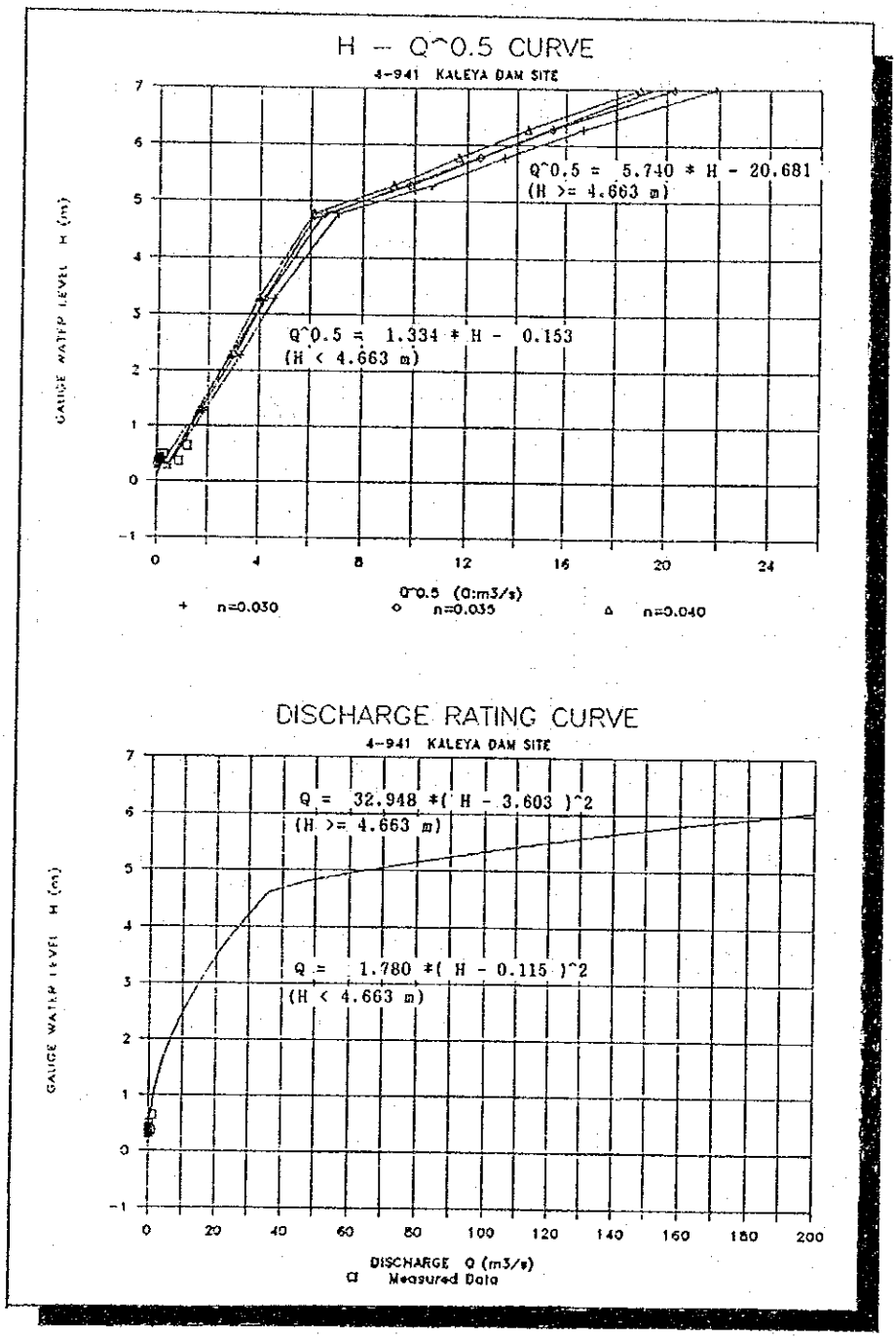
a' =	5.740000
b' =	-20.680000
a =	32.947600
b =	-3.602787
Correlation Coefficient	1.000

Combine values

For H-Q^0.5 equation

For H-Q equation

By using these calculation results, both H-Q^0.5 curve and H-Q curve can appear as follows;



<<< DB-04 >>> DISCHARGE RATING CURVE METHOD

In case that many flow measurement data is available, this system prepares discharge rating curve using the data filed in DB-02.

In DB-04 diskette (same diskette as DB-03) of each stations contains as the following files;

*** for example ***

Diskette No. DB-04 WATOPA PONTOON

- **CS.WK1** .....Cross sectional survey result
- **FM-LIST.WK1** .....F/m file brought from DB-02 Sys.
- **RC.WK1** .....Discharge Rating Curve (Type-2)
- **HQTABLE** .....Discharge Table

At first, retrieve RC.WK1 file on your computer. The following worksheet appears in the screen. This file is for calculating discharge rating curve. From second column to fifth column should be copied from FM-LIST.WK1 file.

FM-FILE.WK1

Omitted data (out of range)

DISCHARGE RATING CURVE STATION: 1-950 WATOPA PONTOON

	NO.	DATE	H(m)	Q(m3/s)	H^2.0	Q^0.5	H*Q^0.5
1	1	58/ 5/26	1.98	84.1	3.9252	9.1707	18.1689
2	2	8/ 8	1.80	66.8	3.2340	8.1714	14.6947
3	3	9/13	1.68	58.0	2.8308	7.6134	12.8096
4	4	11/ 8	1.83	73.7	3.3445	8.5870	15.7040
5	5	11/22	2.00	79.3	4.0102	8.9059	17.8344
6	6	59/ 1/ 3	2.88	227.5	8.2965	15.0830	43.4445
7	7	1/ 8	3.16	295.5	10.0098	17.1889	54.3826
8	8	2/11	3.66	394.4	13.4227	19.8601	72.7615
9	9	2/19	3.96	448.5	15.6523	21.1787	83.7895
10	10	2/27	4.31	515.1	18.5750	22.6961	97.8172
11	11	3/24	4.34	525.1	18.8651	22.9152	99.5300
12	12	3/26	4.15	479.2	17.2592	21.8908	90.9436
13	13	3/27	4.07	464.8	16.5574	21.5584	87.7228
14	14	4/11	3.27	293.8	10.6962	17.1394	56.0545
15	15	4/16	3.11	263.4	9.6467	16.2306	50.4107
16	16	4/18	3.02	246.8	9.1054	15.7102	47.4058
17	17	5/14	2.33	133.7	5.4085	11.5609	26.8864
18	18	5/30	2.09	95.4	4.3592	9.7658	20.3898
19	19	6/19	1.94	82.7	3.7816	9.0931	17.6827
170	174	89/10/ 6	0.51	1.3	0.2622	1.1396	0.5835
171	175	90/ 2/ 9	3.03	257.3	9.1809	16.0406	48.6029
172	176	3/ 8	3.26	251.3	10.6276	15.8531	51.6810
173	177	5/ 8	3.03	257.3	9.1809	16.0406	48.6029
174	178	6/26	2.13	87.0	4.5369	9.3247	19.8616
175	179	7/29	2.01	65.6	4.0401	8.1019	16.2847
176	180	8/22	1.92	55.3	3.6864	7.4351	14.2753
177	181	9/26	1.71	46.0	2.9241	6.7853	11.6028
178	182	10/25	1.70	49.9	2.8900	7.0626	12.0064
179	183	12/ 6	1.88	66.9	3.5344	8.1786	15.3758
180	184	91/ 1/12	3.08	211.7	9.4864	14.5509	44.8169
181	185	2/ 4	4.29	514.1	18.4041	22.6740	97.2714
OMIT	157	79/11/12	2.27	37.9	5.1564	6.1553	13.9773
OMIT	158	80/ 5/23	3.18	50.0	10.1064	7.0696	22.4747
OMIT	169	6/ 7	2.59	46.4	6.7122	6.8084	17.6393
OMIT	166	4/ 9	1.73	145.0	2.9973	12.0420	20.8479
		T O T A L	548.97	46401	1895.2297	2666.2666	9343.3469

DISCHARGE - RATING CURVE : Q = a * (H + b)^2

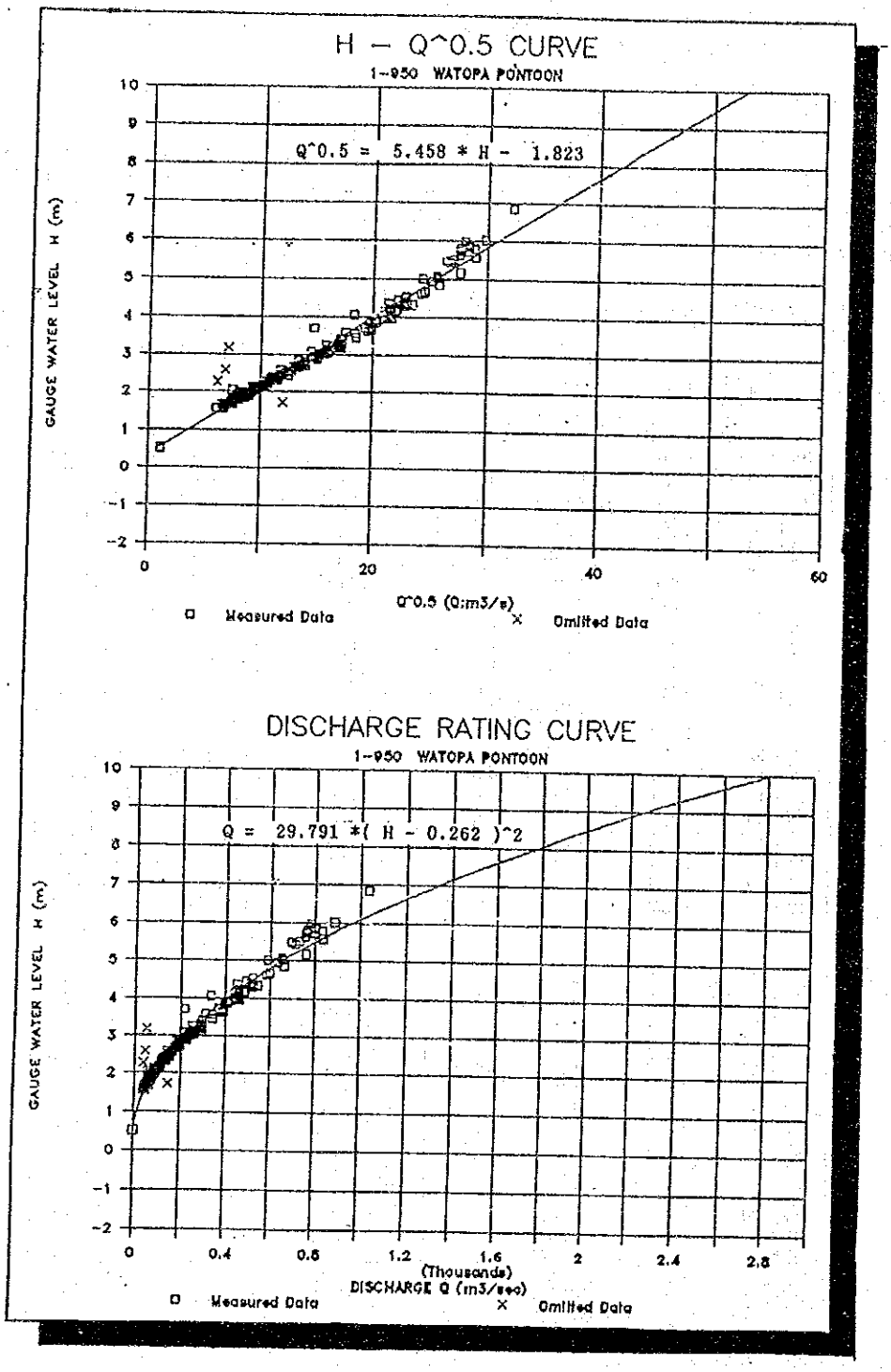
(where, OMIT : Omitted data)

a' =	5.458147
b' =	-1.823601
a =	29.791368
b =	-0.261824
Correlation Coefficient	0.981

Equation for H-Q^0.5

for H-Q

[Printing the Graph]
By using these calculation results, both H-Q^0.5 curve and H-Q curve can appear as follows;



<<< DB-05B >>> DAILY DISCHARGE

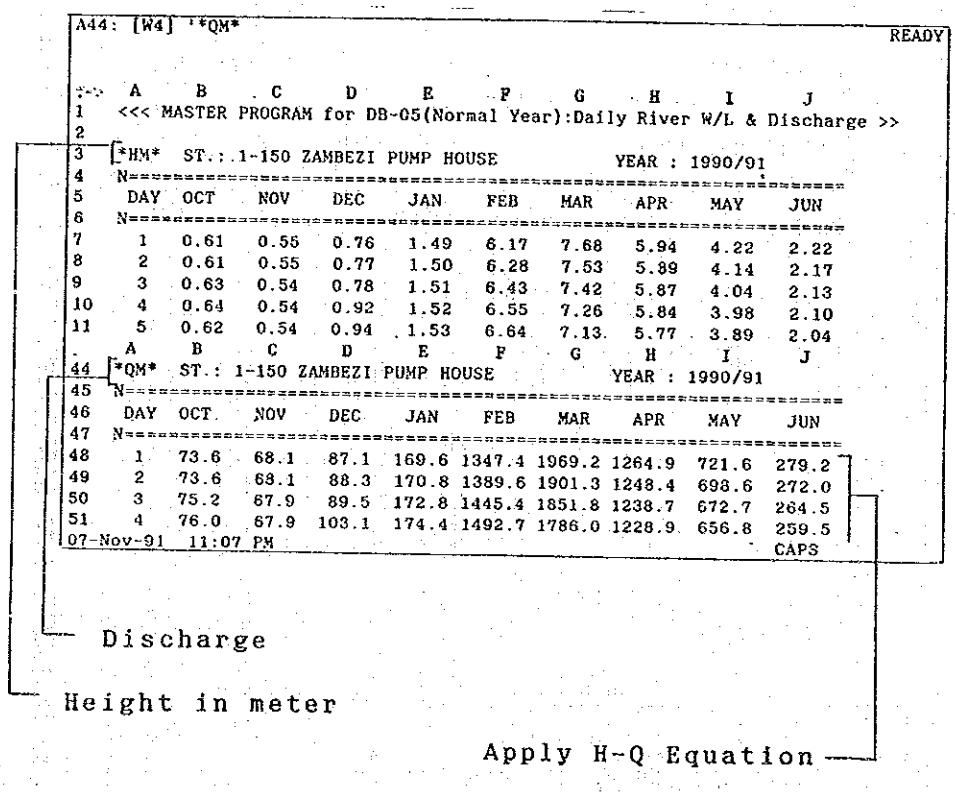
Using the discharge rating curve prepared by DB-03 or DB-04, this system convert the daily river water level filed in DB-05A to daily discharge, and output daily discharge tables.

To begin this filing, use the following steps to retrieve each station number file.

*** for example ***

Diskette No.	**DB-05B 1-150 ZAMBEZI PUMP HOUSE**
Select	**/File**
Select	**/Retrieve**
Highlight	**\9091\9091.WK1**.....Zambezi Pump House 1990/91
Press	**ENTER** to retrieve 9091.WK1

The following worksheet appears on your screen. In this system, you will copy the daily water level from DB-05A diskette in meter unit (second table in DB-05A diskette) into first table. The daily discharge results are automatically appeared in next table as below. Be sure that each cell in discharge table has a discharge rating equation prepared by either DB-03 or DB-04.



[Printing the Worksheet]
Print your worksheet as same as previous filing system. The printed worksheet should look like the followings.

HM ST.: 1-150 ZAMBEZI PUMP HOUSE YEAR : 1990/91 (WATER LEVEL (m))

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
1	0.61	0.55	0.76	1.49	6.17	7.68	5.94	4.22	2.22	1.39	0.66	0.73	
2	0.61	0.55	0.77	1.50	6.28	7.53	5.89	4.14	2.17	1.37	0.65	0.73	
3	0.63	0.54	0.78	1.51	6.43	7.42	5.87	4.04	2.13	1.35	0.64	0.72	
4	0.64	0.54	0.92	1.52	6.55	7.25	5.84	3.98	2.10	1.33	0.63	0.70	
5	0.62	0.54	0.94	1.53	6.64	7.13	5.77	3.89	2.04	1.31	0.62	0.69	
6	0.62	0.54	0.94	1.56	6.76	6.98	5.76	3.79	2.00	1.29	0.76	0.69	
7	0.62	0.55	0.97	1.73	6.89	6.86	5.74	3.72	1.96	1.28	0.91	0.69	
8	0.61	0.55	0.98	1.85	7.00	6.74	5.73	3.64	1.93	1.26	0.90	0.69	
9	0.62	0.55	1.00	2.08	7.30	6.61	6.14	3.57	1.91	1.25	0.89	0.68	
10	0.62	0.55	1.01	2.18	7.77	6.50	6.25	3.46	1.88	1.24	0.88	0.68	
11	0.63	0.55	1.04	2.39	8.09	6.37	6.30	3.38	1.87	1.22	0.87	0.61	
12	0.62	0.54	1.09	2.44	8.16	6.22	6.36	3.31	1.82	1.22	0.87	0.61	
13	0.61	0.54	1.11	2.48	8.25	6.01	6.36	3.21	1.80	1.20	0.87	0.62	
14	0.60	0.53	1.15	2.54	8.31	5.90	6.32	3.13	1.77	1.19	0.87	0.61	
15	0.59	0.52	1.15	2.62	8.38	5.88	6.22	3.07	1.75	1.18	0.85	0.60	
16	0.59	0.50	1.18	2.74	8.41	5.85	6.04	3.00	1.73	1.16	0.85	0.60	
17	0.58	0.50	1.21	2.87	8.41	5.88	5.79	2.94	1.69	1.15	0.82	0.60	
18	0.57	0.52	1.25	2.95	8.42	5.92	5.66	2.88	1.66	1.14	0.81	0.59	
19	0.56	0.55	1.29	3.08	8.43	5.97	5.54	2.82	1.65	1.12	0.81	0.58	
20	0.55	0.56	1.32	3.20	8.51	6.00	5.41	2.76	1.64	1.10	0.80	0.56	
21	0.55	0.54	1.36	3.49	8.49	6.06	5.29	2.70	1.62	1.09	0.80	0.56	
22	0.55	0.54	1.39	3.76	8.38	6.12	5.18	2.64	1.60	1.09	0.79	0.55	
23	0.55	0.56	1.41	4.05	8.30	6.15	5.04	2.59	1.58	1.08	0.79	0.56	
24	0.55	0.65	1.43	4.21	8.18	6.17	4.97	2.54	1.55	1.06	0.79	0.56	
25	0.55	0.65	1.43	4.36	8.10	6.20	4.90	2.48	1.52	1.05	0.79	0.56	
26	0.55	0.69	1.43	4.55	8.03	6.16	4.76	2.45	1.50	1.04	0.77	0.55	
27	0.55	0.69	1.44	4.75	7.89	6.15	4.61	2.41	1.48	1.02	0.76	0.55	
28	0.55	0.73	1.46	4.99	7.79	6.12	4.51	2.37	1.45	1.01	0.74	0.55	
29	0.55	0.74	1.47	5.21		6.08	4.40	2.34	1.43	1.00	0.73	0.54	
30	0.54	0.75	1.47	5.46		6.03	4.30	2.29	1.41	0.99	0.73	0.54	
31	0.54		1.48	5.79		5.99		2.25		0.98	0.73		
MEAN	0.58	0.58	1.18	3.07	7.73	6.39	5.56	3.10	1.76	1.17	0.79	0.62	2.67
MAX.	0.64	0.75	1.48	5.79	8.51	7.68	6.36	4.22	2.22	1.39	0.91	0.73	8.51
MIN.	0.54	0.50	0.76	1.49	6.17	5.85	4.30	2.25	1.41	0.98	0.62	0.54	0.50

QM ST.: 1-150 ZAMBEZI PUMP HOUSE YEAR : 1990/91 (DISCHARGE (m3/sec))

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANNUAL
1	73.6	68.1	87.1	169.6	1347.4	1969.2	1254.9	721.6	279.2	156.6	78.2	84.0	
2	73.6	68.1	88.3	170.8	1389.6	1901.3	1248.4	698.6	272.0	153.9	77.1	84.0	
3	75.2	67.9	89.5	172.8	1445.4	1851.8	1238.7	672.7	264.5	151.6	76.3	83.4	
4	76.0	67.9	103.1	174.4	1492.7	1786.0	1228.9	656.8	259.5	148.9	75.7	82.0	
5	74.9	67.9	105.0	175.7	1528.7	1727.8	1205.2	633.3	249.6	146.7	74.9	81.2	
6	74.4	67.6	105.6	193.7	1577.3	1666.8	1202.0	610.2	243.3	144.8	87.4	81.2	
7	74.1	68.6	108.1	202.4	1630.5	1618.0	1192.4	592.0	238.1	143.7	101.5	80.4	
8	73.9	68.6	109.8	220.8	1676.9	1567.5	1191.3	571.2	233.3	141.5	100.6	80.4	
9	74.4	68.6	111.4	257.0	1801.7	1519.0	1336.1	554.4	229.6	139.3	100.0	79.8	
10	74.9	68.6	112.7	272.6	2010.5	1473.7	1377.0	528.5	225.8	138.6	99.3	79.5	
11	75.2	68.4	115.6	308.8	2158.4	1424.3	1397.7	510.2	223.1	136.4	98.4	73.6	
12	74.4	67.9	120.7	318.7	2191.5	1367.8	1420.8	494.3	216.7	135.1	97.8	73.6	
13	73.9	67.6	123.4	326.4	2233.8	1291.3	1422.0	472.6	213.0	133.5	97.5	74.1	
14	73.1	66.9	127.5	336.6	2262.8	1250.6	1404.6	454.7	209.5	133.2	97.5	73.6	
15	72.3	65.9	129.0	352.0	2293.8	1241.9	1366.7	442.9	205.9	131.8	96.0	73.1	
16	71.7	64.4	131.4	375.5	2308.6	1233.2	1302.4	428.1	202.8	129.7	95.7	72.8	
17	71.2	64.4	135.0	399.9	2311.5	1241.9	1211.7	415.4	197.1	128.3	92.7	72.5	
18	70.2	66.1	139.3	417.3	2316.0	1256.1	1211.7	402.9	193.7	126.5	92.1	72.3	
19	69.2	68.4	144.8	444.2	2318.9	1274.8	1165.9	391.3	191.1	124.4	91.8	71.8	
20	68.4	69.2	148.8	487.5	2360.7	1285.8	1082.1	378.5	190.7	122.7	91.2	71.0	
21	68.4	67.4	153.5	536.4	2348.8	1308.0	1040.9	367.2	187.7	121.0	90.9	69.7	
22	68.4	67.9	157.3	601.1	2296.7	1329.3	1006.3	354.9	184.8	120.7	90.3	68.9	
23	68.4	69.2	160.1	675.1	2257.0	1341.7	960.9	345.7	181.8	119.7	90.0	69.4	
24	68.4	76.8	162.4	717.5	2198.7	1349.6	939.0	336.0	177.3	118.3	89.7	69.7	
25	68.4	77.3	162.4	759.4	2161.2	1359.9	916.4	325.9	174.0	117.0	89.7	69.2	
26	68.4	80.4	162.4	814.8	2126.9	1353.0	875.8	319.8	171.6	115.3	87.7	68.4	
27	68.4	80.9	163.6	874.0	2063.4	1341.7	832.5	313.7	168.4	114.0	86.8	68.4	
28	68.4	84.3	166.4	945.6	2017.4	1330.4	803.4	305.6	164.8	113.0	85.4	68.1	
29	68.1	85.4	166.8	1014.2		1315.8	770.5	300.2	161.6	111.7	84.6	67.6	
30	67.6	86.0	167.6	1096.4		1296.9	744.2	292.3	159.3	110.4	84.3	67.6	
31	67.9		168.4	1211.7		1282.5		284.9		108.8	84.3		
MEAN	71.5	70.9	133.1	484.6	2004.5	1437.4	1145.3	457.3	209.0	130.3	89.9	74.3	515.2
MAX.	76.0	86.0	168.4	1211.7	2360.7	1959.2	1422.0	721.6	279.2	156.6	101.5	84.0	2360.7
MIN.	67.6	64.4	87.1	169.6	1347.4	1233.2	744.2	284.9	159.3	108.8	74.9	67.6	64.4

/Discharge Rating Curve]:Q=25.626*(H+1.085)^2
' Flow Regime (m3/s)]:
Q(95day): 759.4 Q(185day): 162.4 Q(275day): 83.4 Q(355day): 67.6

<<< DB-06B >>> HOURLY DISCHARGE

Using the discharge rating curve prepared by DB-03 or DB-04, this system convert the hourly river water level filed in DB-06A to hourly discharge, an output hourly discharge tables.

To begin this filing, use the same diskette as DB-06A, in each file contains hourly river water level in feet, hourly river water level in meter and hourly river water discharge table.

*** for example ***

Diskette No.	**DB-06B** (DB-06A) **5-030 EXCHANGE FARM**
Select	**/File**
Select	**/Retrieve**
Highlight	**\1991\APR.WK1**.....Exchange Farm Apr.1991
Press	**ENTER** to retrieve APR.WK1

The following worksheet appears on your screen. Be sure that in third table (discharge table) contains a discharge rating formula prepared by either DB-03 or DB-04.

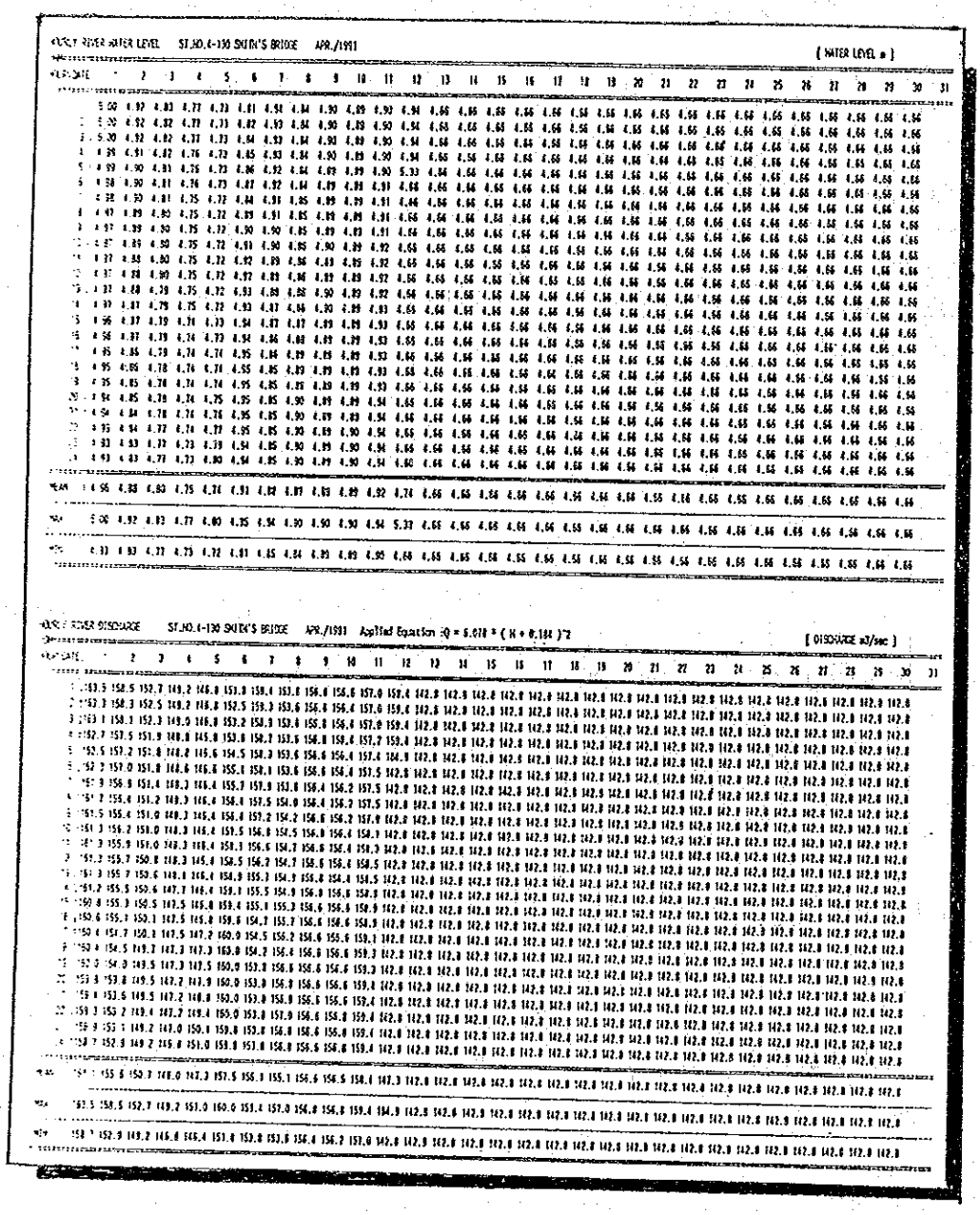
C81: (F1) [W6] 6.078*(C43+0.184)^2 READY

	A	B	C	D	E	F	G	H	I	J	K	L
39	HOURLY RIVER WATER LEVEL					ST.NO.4-130 SMITH'S BRIDGE					APR./1991	
40	=:M=											
41	HOUR\DATE		1	2	3	4	5	6	7	8	9	10
42												
43		1	5.00	4.92	4.83	4.77	4.73	4.81	4.94	4.84	4.90	4.89
44		2	5.00	4.92	4.82	4.77	4.73	4.82	4.93	4.84	4.90	4.89
45		3	5.00	4.92	4.82	4.77	4.73	4.84	4.93	4.84	4.90	4.89
46		4	4.99	4.91	4.82	4.76	4.73	4.85	4.93	4.84	4.90	4.89
47		5	4.99	4.90	4.81	4.76	4.73	4.86	4.92	4.84	4.89	4.89
	A	B	C	D	E	F	G	H	I	J	K	L
76												
77	HOURLY RIVER DISCHARGE					ST.NO.4-130 SMITH'S BRIDGE					APR./1991	
78	=QM=											
79	HOUR\DATE		1	2	3	4	5	6	7	8	9	10
80												
81		1	163.5	158.5	152.7	149.2	146.8	151.8	159.4	153.6	156.8	156.6
82		2	163.3	158.3	152.5	149.2	146.8	152.5	159.3	153.6	156.8	156.4
83		3	163.1	158.1	152.3	149.0	146.8	153.2	158.9	153.6	156.8	156.4
84		4	162.7	157.5	151.9	148.8	146.8	153.8	158.7	153.6	156.8	156.4
85		5	162.5	157.2	151.8	148.8	146.6	154.5	158.3	153.6	156.6	156.4

21-Nov-91 03:02 AM

[Printing the Worksheet]

Print your worksheet as same as previous filing system. The printed worksheet should look like the followings.



<<< DB-07 >>> DISCHARGE CORRELATION ANALYSIS

This system prepares the correlation curve(s) between two stations' discharge. The curve(s) will be used to fill the missing or not-available discharge data in the table output from DB-05B. The equation of the lines are;

$$Y = aX + b$$

where, a is the regression coefficient of y versus x, b is the regression constant of x versus y.

The correlation coefficient (:f) is used statistical parameters for measuring the degree of association of two linearly dependent variables. It is determined as;

$$f = \frac{\sum Xi \cdot Yi - (\sum Xi)(\sum Yi)/N}{\sqrt{\{\sum X^2 i - (\sum Xi)^2/N\} \cdot \{\sum Y^2 i - (\sum Yi)^2/N\}}}$$

To begin this filing, use the following steps;

*** for example ***

Diskette No.	**DB-07**
Select	**/File**
Select	**/Retrieve**
Highlight	**\0401.WK1.....St.No.2-030-St.No.1-150**
Press	**ENTER** to retrieve 0401.WK1

Mean Monthly Discharge

<< MASTER PROGRAM FOR DB-7:REGRESSION CURVE >>>

MONTHLY DISCHARGE CORELATION BETWEEN STATIONS X and Y
X: NO.04 2-030 LUKULU
Y: NO.01 1-150 ZAMBEZI PUMP HOUSE (DISCHARGE UNIT : m3/s)

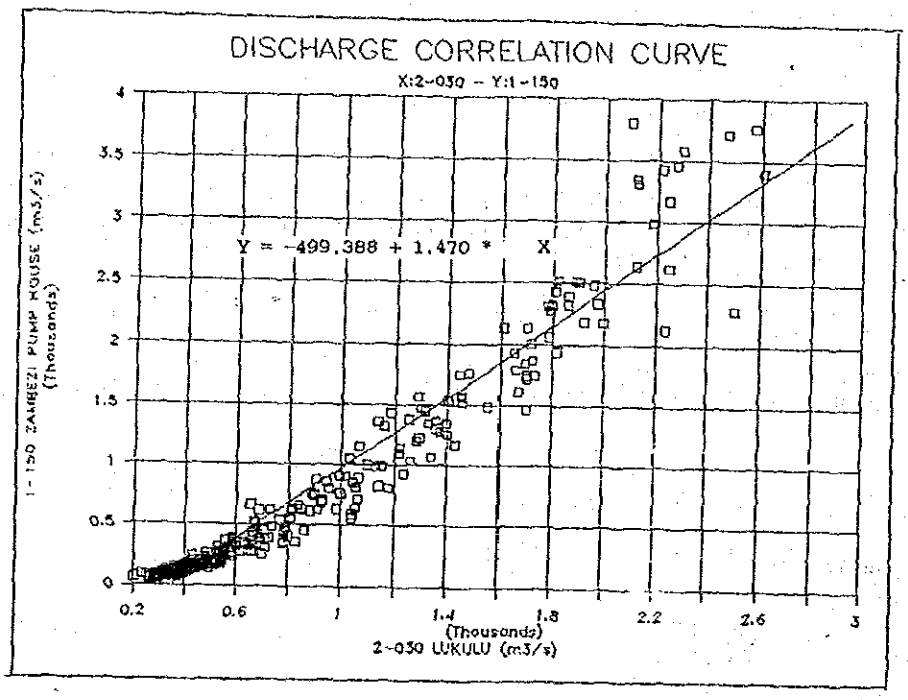
NO	YEAR-MONTH	ST:X	ST:Y	X*Y	X^2	Y^2
1	(59/60-10)	260.1	61.0	15865.25	67644.73	3721.00
2	11	280.9	72.1	20251.81	78896.42	5198.41
3	12	349.4	120.8	42210.26	122096.21	14592.64
4	1	587.2	330.0	193774.43	344798.27	108900.00
5	2	1,097.0	996.0	1092582.24	1203343.44	992016.00
				⟆		
308	(88/89-10)	278.6	70.4	19611.58	77603.26	4956.16
309	11	331.1	104.3	34536.66	109645.81	10878.49
310	12	421.9	183.9	77591.11	178016.61	33819.21
311	1	689.8	614.7	423993.65	475764.76	377856.09
312	2	1,135.3	1,354.5	1537739.77	1288865.72	1834670.25
313	8	403.9	168.1	67887.20	163094.90	28257.61
314	9	345.1	115.1	39715.97	119063.79	13248.01
	T O T A L	250293	211126	315849944	299890930	372021945

Y = a + b*X
X = a' + b'*Y (a'=-a/b, b'=1/b)

a=	-499.38835
b=	1.47001
a'=	339.71716
b'=	0.68027
Corelation Coefficient c=	0.97100

Equation

According to result of correlation, Zambezi Pump House can be correlated by using equation Y = -499.388 + 1.470 * X .
And the correlation curve will draw as follows;



<<< DB-08 >>> FLOW REGIME TABLE

This system prepares the flow regime of each year by stations under the following condition,

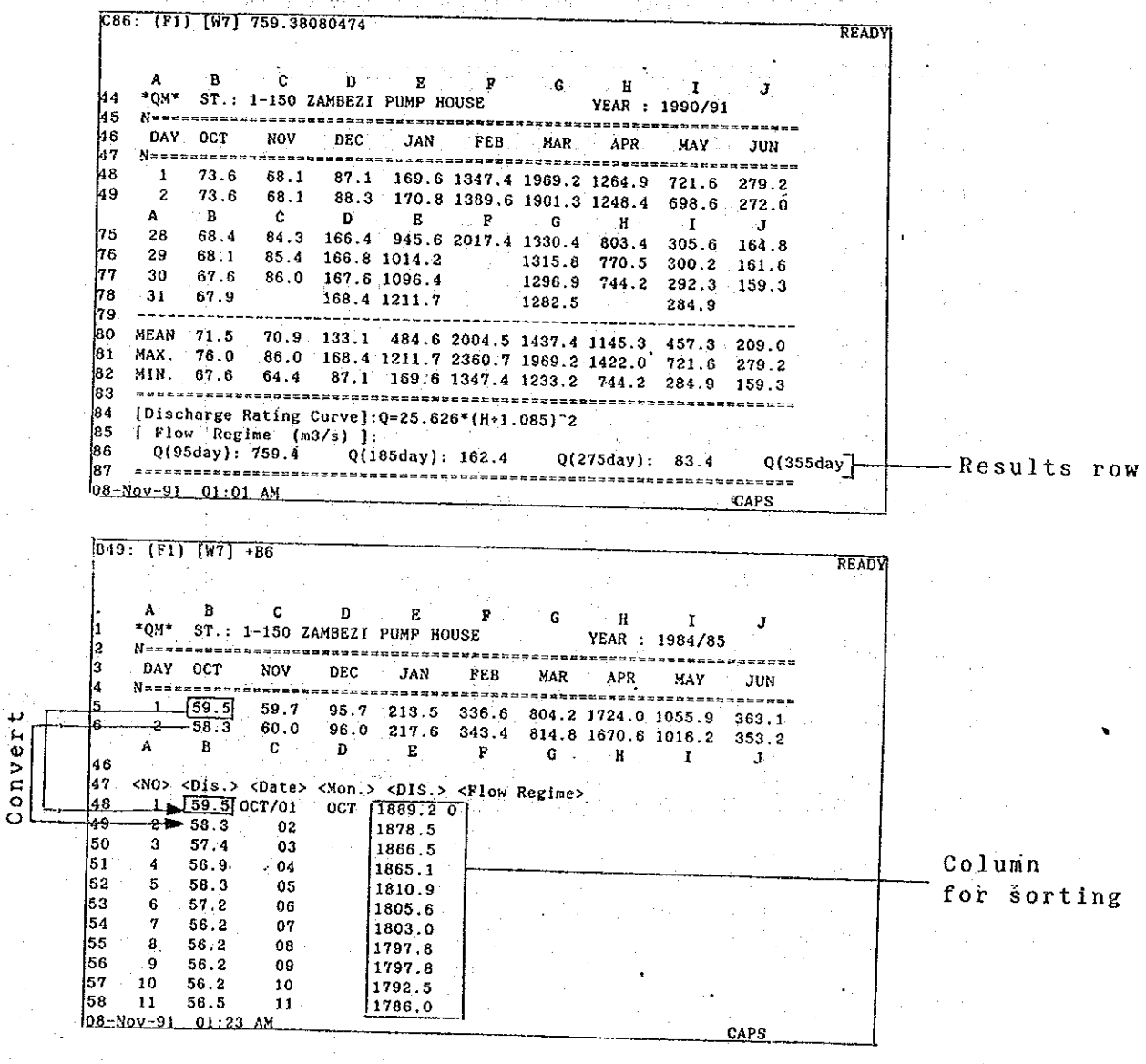
The risk level of design flow is set as 1/10 year probability. Therefore, the year which has the 3rd-small drought discharge (Q355day : discharge exceeding 355day in a year) among 30 years, is decided as design year in this Study.

To begin this filing, use the following diskette same as DB-05B.

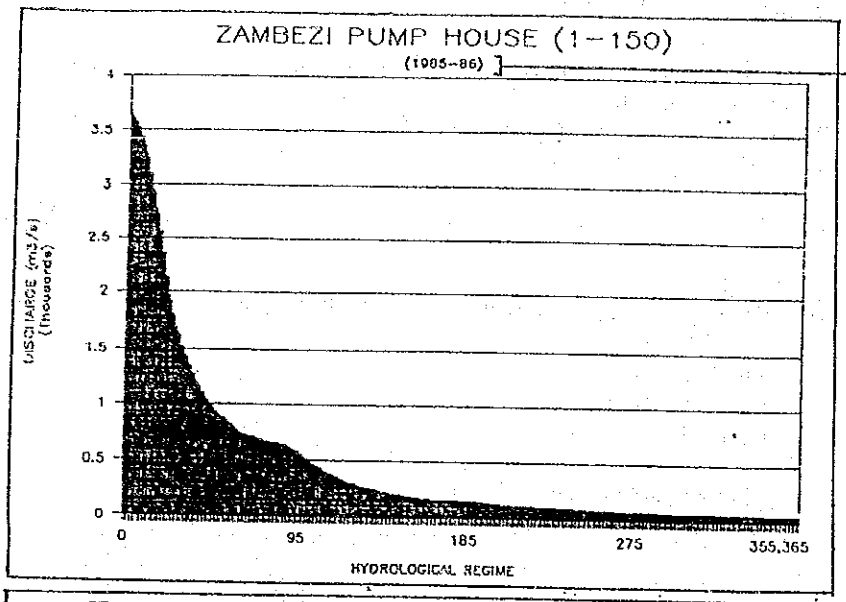
*** for example ***

Diskette No.	**DB-05B 1-150 ZAMBEZI PUMP HOUSE**
Select	**/File**
Select	**/Retrieve**
Highlight	**\9091\9091.WK1.....Zambezi Pump House 1990/91**
Press	**ENTER to retrieve 9091.WK1**

The following worksheet appears on your screen.



After calculating the flow regime of each year, summarize those results into the following table.



ST.: 1-150 ZAMBEZI PUMP HOUSE FLOW REGIME (m3/s)

NO	YEAR	Q(95days)	Q(185day)	Q(275day)	Q(355day)	REMARKS
1	1959/60	828.9	222.1	102.4	56.2	
2	1960/61	901.5	265.5	125.5	65.9	
3	1961/62	1604.4	363.7	158.5	87.4	
4	1962/63	2010.5	363.7	139.7	96.3	
5	1963/64	828.9	270.5	132.5	93.3	
6	1964/65	864.9	217.6	108.8	73.6	
7	1965/66	684.8	245.7	112.0	71.0	
8	1966/67	977.2	204.1	99.3	79.0	
9	1967/68	2617.8	418.6	157.7	71.0	
10	1968/69	301.2	86.5	35.0	16.2	
11	1969/70	1040.9	336.0	175.7	105.5	
12	1970/71	1023.1	304.5	139.7	99.3	
13	1971/72	513.7	241.9	130.4	86.6	
14	1972/73	512.3	196.7	107.8	71.7	
15	1973/74	989.8	208.1	97.8	68.1	
16	1974/75	1495.1	307.2	119.7	68.1	
17	1975/76	1333.8	254.5	115.6	73.3	
18	1976/77	1156.4	281.8	149.3	106.2	
19	1977/78	874.9	322.5	121.7	80.9	
20	1978/79	1132.4	360.2	170.4	94.2	
21	1979/80	1650.1	350.9	149.3	95.4	
22	1980/81	748.5	215.3	119.7	86.0	
23	1981/82	401.7	174.0	103.1	72.5	
24	1982/83	405.4	188.1	96.9	64.9	
25	1983/84	636.4	121.7	71.2	49.1	
26	1984/85	572.7	198.4	91.2	57.4	
27	1985/86	574.2	152.0	74.4	55.8	
28	1986/87	752.6	292.3	129.0	69.2	
29	1987/88	633.3	155.4	90.6	71.0	
30	1988/89	1153.3	300.2	131.1	68.4	
	MEAN	974.0	254.0	118.5	75.1	

3rd drought year

Flow Regime by years

<<< DB-09 >>> RIVER WATER ANALYSIS

This system prepares the annual and monthly tables of river flow, using the data obtained from DB-05B and DB-10.

*** for example ***

Diskette No.	DB-09 (3)
Select	/File
Select	/Retrieve
Highlight	\30Y\DB09.WK1.....Water Balance for 30Y
Press	ENTER to retrieve DB09.WK1

The flow pattern of main river can be described as the following. The discharge point exists 45 points and each discharge can be estimated by the formula after substituting actual mean monthly discharge into DB-09 table.
The following table shows period of between 1979/80 and 1988/89.

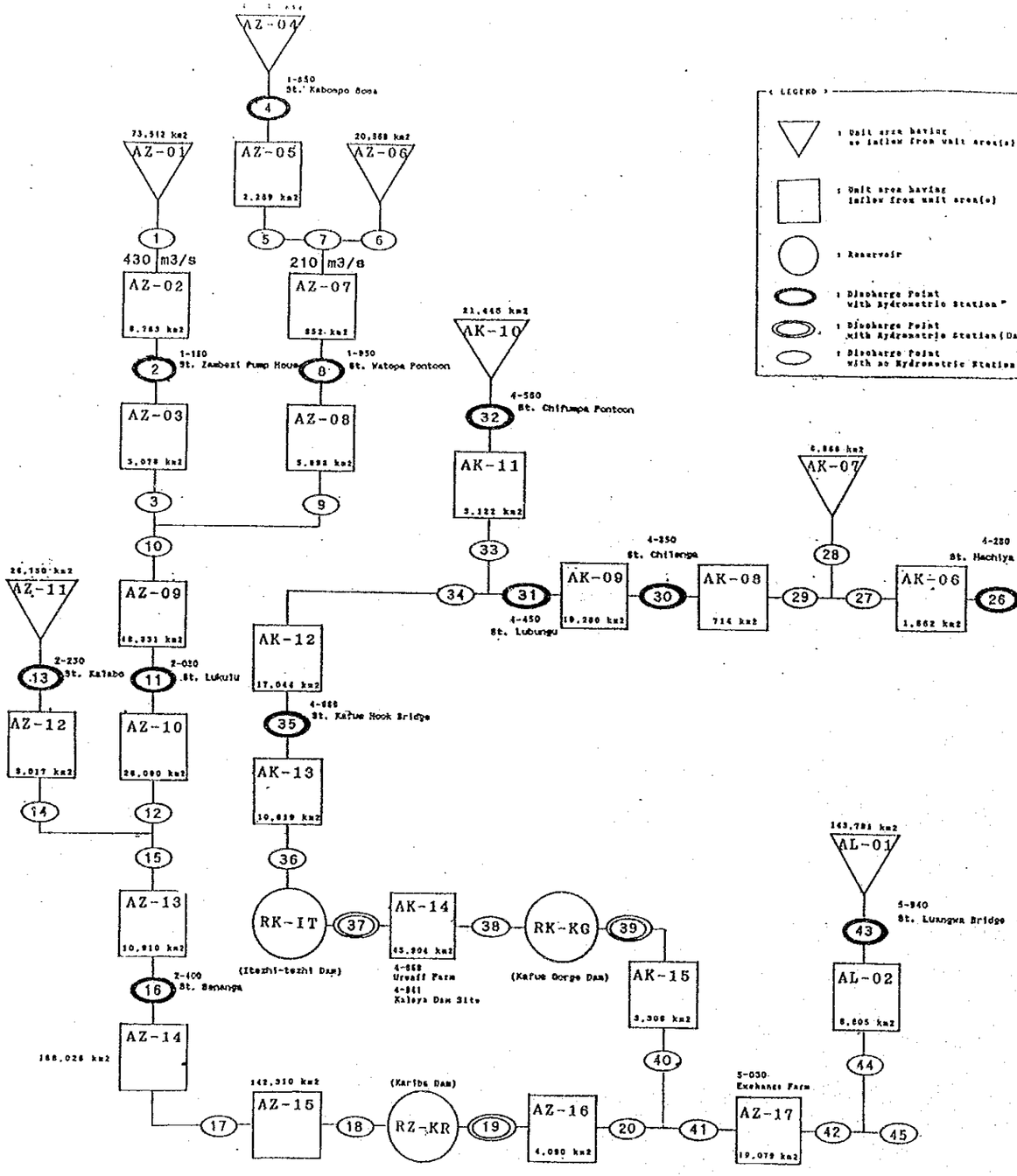
Annual Mean Discharge (30 Years : 1959/60 - 1988/89)

(3/3)

AREAS	BASINS	No.	ST.	POINT & STATION NAME	AREA(km2)	79/80	80/81	81/82	82/83	83/84	84/85	85/86	86/87	87/88	88/89	MEAN
UPPER ZAMBEZI		(1)		Chalose	73,512	749	483	285	237	355	382	413	481	370	698	575
"	"	(2)	1-150	St. Zambezi Pump House	87,275	890	573	338	281	469	453	490	571	440	816	683
"	"	(3)		Zambezi R. Portion	90,353	921	593	350	291	485	469	508	591	455	845	707
"	"	(4)	1-650	St. Kabompo Boma	42,740	293	240	109	201	124	153	181	243	208	153	223
"	"	(5)		Kabompo R. Portion	45,029	296	247	118	201	126	157	184	241	207	155	227
"	"	(6)		Dongwe R. Portion	20,568	28	62	74	1	15	35	26	-17	-6	20	41
"	"	(7)		Confluence	65,597	325	309	191	201	141	192	210	224	201	176	268
"	"	(8)	1-950	St. Ndopa Pontoon	65,449	326	312	194	201	142	193	211	223	201	177	270
"	"	(9)		Kabompo R. Portion	72,347	334	329	216	201	146	203	218	218	199	182	282
"	"	(10)		Confluence	162,700	1255	922	565	492	632	673	726	810	654	1028	989
"	"	(11)	2-030	St. Lukulu	206,531	1003	795	578	637	594	626	628	708	671	871	822
"	"	(12)		Zambezi R. Portion	228,076	1031	833	629	645	639	700	674	780	722	896	884
"	"	(13)	2-250	St. Kalabo	34,621	76	78	32	40	38	51	47	36	65	115	76
"	"	(14)		Luanginga R. Portion	41,233	85	89	48	43	51	73	61	61	80	183	95
"	"	(15)		Confluence	269,309	1115	922	677	688	691	773	735	840	802	1080	990
"	"	(16)	2-400	St. Senanga	278,298	1127	938	699	692	709	804	754	870	823	1090	1006
"	KAFUE	(21)	4-050	St. Raglan Farm	4,999	57	35	21	29	21	30	43	37	26	28	38
"	"	(22)		Kafue R. Portion	7,730	92	64	46	64	50	76	98	75	56	69	72
"	"	(23)	4-120	St. Mwenbashi	859	8	10	5	6	4	9	13	7	6	6	8
"	"	(24)	4-130	St. Smith's Bridge	8,559	101	74	51	70	54	85	111	82	61	75	80
"	"	(25)	4-200	St. Mpatamato	11,655	123	109	58	76	60	121	176	80	78	90	100
"	"	(26)	4-280	St. Machiya Ferry	22,920	196	174	90	103	79	178	196	117	114	134	148
"	"	(27)		Kafue R. Portion	24,582	207	183	95	107	83	185	203	120	118	139	155
"	"	(28)		Luswishi R. Portion	8,866	58	49	26	20	20	34	38	21	25	27	37
"	"	(29)		Confluence	33,448	265	233	121	127	103	219	241	141	143	167	192
"	"	(30)	4-350	St. Chilenga	34,162	270	237	123	129	104	222	244	143	145	169	194
"	"	(31)	4-450	St. Lubungu	54,442	279	269	128	125	111	212	237	148	139	164	206
"	"	(32)	4-550	St. Chifunpa Pontoon	21,445	145	125	56	44	51	269	274	74	89	71	112
"	"	(33)		Lunga R. Portion	24,416	147	135	62	48	55	243	245	72	92	70	114
"	"	(34)		Confluence	78,858	426	405	190	173	166	455	482	220	231	235	320
"	"	(35)	4-669	St. Kafue Hook Bridge	95,053	440	461	221	193	190	310	324	209	245	234	329
LOWER ZAMBEZI		(17)		Livingstone	455,324	1486	1325	791	816	816	898	899	977	935	1458	1041
"	"	(18)		In (Kariba Dam)	608,634	1772	1972	844	902	915	1312	1240	1053	1233	1828	1308
"	"	(18E)		Evaporation	—	285	303	331	305	294	282	247	278	262	260	285
"	"	(18S)		Storage	—	14	13	-456	-434	-342	57	82	-64	216	510	-40
"	"	(19)		Out (Kariba Dam)	—	1473	1657	969	1031	967	972	911	839	755	1057	1063
"	"	(20)		Zambezi R. Portion	612,724	1481	1676	971	1033	970	984	921	841	764	1067	1071
"	KAFUE	(36)		In (Itezhi-tezhi Dam)	105,672	466	469	193	171	158	329	319	199	242	242	279
"	"	(36E)		Evaporation	—	18	19	18	17	14	15	18	19	18	17	17
"	"	(36S)		Storage	—	3	-2	-33	-24	-48	79	21	-20	0	6	-2
"	"	(37)		Out (Itezhi-tezhi Dam)	—	444	452	208	178	193	236	281	201	224	219	264
"	"	(38)		In (Kafue Gorge Dam)	151,576	520	661	216	182	178	203	312	214	197	328	301
"	"	(38E)		Evaporation	—	31	38	35	19	12	25	39	36	31	27	29
"	"	(38S)		Storage	—	18	1	-10	-5	2	11	2	1	-2	-7	1
"	"	(39)		Out (Kafue Gorge Dam)	—	471	622	191	169	164	168	271	177	168	308	271
"	"	(40)		Kafue R. Portion	154,882	474	634	197	173	169	138	239	174	171	308	268
"	ZAMBEZI	(41)		Confluence	787,606	1955	2309	1168	1206	1139	1122	1160	1015	934	1375	1338
"	"	(42)		Zambezi R. Portion	786,686	1993	2396	1175	1218	1152	1178	1205	1026	974	1423	1374
"	LUANGWA	(43)	5-940	St. Luangwa Bridge	143,781	722	569	407	363	342	707	962	469	582	831	605
"	"	(44)		Luangwa R. Portion	150,586	756	590	426	380	359	740	1008	492	610	870	634
"	ZAMBEZI	(45)		Confluence	937,272	2749	2986	1601	1598	1511	1918	2213	1517	1584	2293	1997

Brought from DB-10

Selected station in Study



METHOD TO OBTAIN DISCHARGE Q(x)

Q(1) = Q(2) x (73,512/82,275) = Q(2) x 0.893
Q(2) : Calculated with water level & rating curve
Q(3) = Q(2) x (85,353/82,275) = Q(2) x 1.037
Q(4): Obtained from water level & rating curve
Q(5) = Q(4) + (Q(8)-Q(4)) x (2,287/23,707)
Q(6) = (Q(8)-Q(4)) x (20,568/23,707)
Q(7) = Q(5) + Q(6)
Q(8) : Calculated with water level & rating curve
Q(9) = Q(8) + (Q(8)-Q(4)) x (5,898/23,707)
Q(10) = Q(3) + Q(9)
Q(11) : Calculated with water level & rating curve
Q(12) = Q(11) + (Q(16)-Q(11)-Q(13)) x (26,090/45,017)
Q(13) : Calculated with water level & rating curve
Q(14) = Q(13) + (Q(16)-Q(11)-Q(13)) x (8,017/45,017)
Q(15) = Q(12) + Q(14)
Q(16) : Calculated with water level & rating curve
Q(17) = Q(16) + (Q(18)-Q(16)) x (188,026/202,326)
Q(18) : Obtained from res. water level & H-V curve
Q(18E): Water Use for Irrigation and Drinking
Q(18S): Variation of Reservoir Water Level
Q(19) : Obtained from dam gate operation data
Q(20) = Q(19) + 4,090 x C
Q(21) : Calculated with water level & rating curve
Q(22) = Q(24) - Q(21) - Q(23)
Q(23) : Calculated with water level & rating curve
Q(24) : Calculated with water level & rating curve
Q(25) : Calculated with water level & rating curve
Q(26) : Calculated with water level & rating curve
Q(27) = Q(26) + (Q(30)-Q(26)) x (1,662/11,242)
Q(28) = (Q(30)-Q(26)) x (8,866/11,242)
Q(29) = Q(27) + Q(28)
Q(30) : Calculated with water level & rating curve
Q(31) : Calculated with water level & rating curve
Q(32) : Calculated with water level & rating curve
Q(33) = Q(32) + (Q(35)-Q(31)-Q(32)) x (3,122/39,446)
Q(34) = Q(31) + Q(33)
Q(35) : Calculated with water level & rating curve
Q(36) : Obtained from res. water level & H-V curve
Q(36E): Water Use for Irrigation and Drinking
Q(36S): Variation of Reservoir Water Level
Q(37) : Obtained from dam gate operation data
Q(38) : Obtained from res. water level & H-V curve
Q(38E): Water Use for Irrigation and Drinking
Q(38S): Variation of Reservoir Water Level
Q(39) : Obtained from dam gate operation data
Q(40) = Q(39) + 3,306 x C
Q(41) = Q(20) + Q(40)
Q(42) = Q(40) + 19,079 x C
Q(43) : Calculated with water level & rating curve
Q(44) = Q(43) + 6,805 x C
Q(45) = Q(42) + Q(44)
Q(46) : Calculated with water level & rating curve
Q(47) : Calculated with water level & rating curve
Q(48) : Calculated with water level & rating curve

<<< DB-10 >>> RESERVOIR WATER BALANCE

This system calculate the monthly reservoir water balance as the following manner.

Generally, dam and reservoir balance is expressed as the following equation.

$$Qo = Qi + dV + R - E + Qgi - Qgo$$

where,

- Qo : Outflow to reservoir
- Qi : Inflow from reservoir
- dV : Change of storage volume
- R : Rainfall to reservoir $R = r \times (A1 + A2)/2$
- E : Evaporation from reservoir $E = Eo \times (A1 + A2)/2$
- Qgi: Groundwater inflow to reservoir
- Qgo: Leakage from reservoir
- A1 : Starting reservoir area of calculation period
- A2 : Ending reservoir area of calculation period
- r : Rainfall height
- Eo : Potential free water evaporation height

Above two factors : Qgi and Ggo are neglected as these parameters do not much affect the balance and data are not available, and inflow (Qi) is calculated on monthly base as an unknown variable. The above equation can be rewritten as follow:

$$Qi = Qo - dV - R + E$$

To begin this filing, use the following steps,

*** for example ***

Diskette No.	**DB-10**
Select	**/File**
Select	**/Retrieve**
Highlight	**\ITEZHI\9091.WK1**.....Itezhi-Tezhi Dam 1990/91
Press	**ENTER** to retrieve 9091.WK1

Entering Values

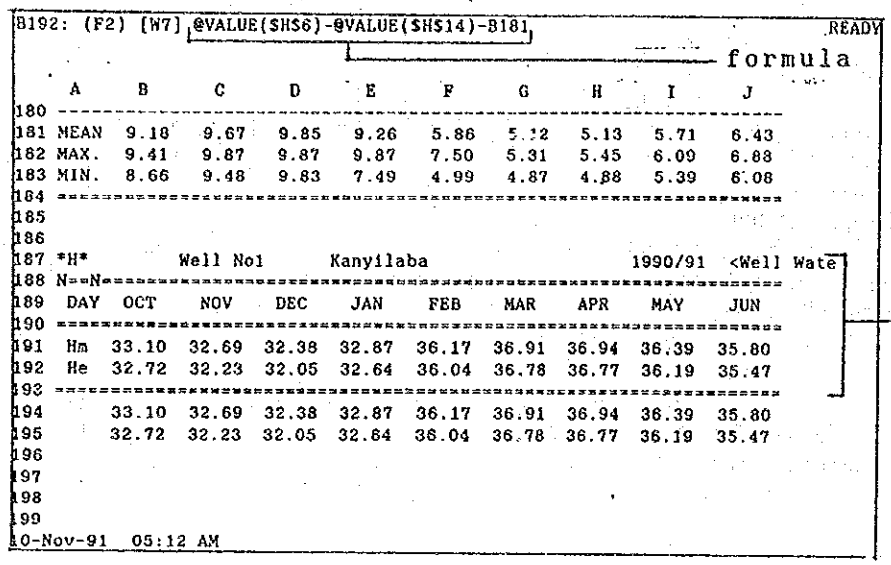
[RESERVOIR OPERATION] (12) DAM: ITEZHI-TEZHI Year:1990/91

90/91 Month	W/Level H(m)	Volume V(mcm)	R.Area A(Km2)	Rain R(mm)	P.Evap Eo(mm)	Change/V dV(m3/s)	Inflow: Qi(m3/s)	A.Evap. E(m3/s)	Outflow Qo(m3/s)	Xafue Qf(m3/s)	H/B Qi-Qf (m3/s)
SEP	1025.82	4797	315								
OCT	1024.29	4297	292	0	210	-186.8	10.0	23.8	173.0	19.0	-9.0
NOV	1022.77	3835	271	87	140	-178.0	-10.8	15.2	152.0	12.0	-22.8
DEC	1021.47	3466	253	197	140	-137.1	28.6	13.7	152.0	32.0	-3.4
JAN	1021.46	3466	253	225	120	-1.0	123.3	11.3	113.0	234.0	-110.7
FEB	1024.27	4290	292	42	100	341.0	458.2	11.3	106.0	512.0	-53.8
MAR	1027.59	5423	342	91	140	422.9	549.5	16.6	110.0	514.0	35.5
APR	1029.48	6150	372	0	150	280.2	396.2	17.9	298.0	417.0	179.2
MAY	1029.55	6178	373	0	120	10.5	228.2	16.7	201.0	209.0	19.2
JUN	1029.32	6086	370	0	90	-35.5	139.4	12.9	162.0	101.0	38.4
JUL	1028.65	5823	359	0	120	-98.1	74.3	18.3	166.0	69.0	5.3
AUG	1027.84	5516	348	0	140	-114.7	60.7	18.4	157.0	53.0	7.7
SEP	1025.60	4723	312	0	170	-305.9	-53.3	21.6	231.0	38.0	-91.3
MEAN(mm & m3/s)				53	135	-2.4	181.6	16.3	167.6	181.9	-0.3
TOTAL(mm & mcm)				640	1620	-74	5727	515	5286	5737	-10

<<< DB-12 >>> CORRELATION BETWEEN RIVER AND WELL WATER LEVEL

This system analyzed the relationship between the mean monthly river water level and mean monthly well water level.

In DB-11 (Dairy Well Water Level) for each station, the table of the system are existing.
Now, retrieve the same file as DB-11, it appears the following worksheet in your computer.



B192: (F2) [W7] @VALUE(H6)-@VALUE(H14)-B181 READY

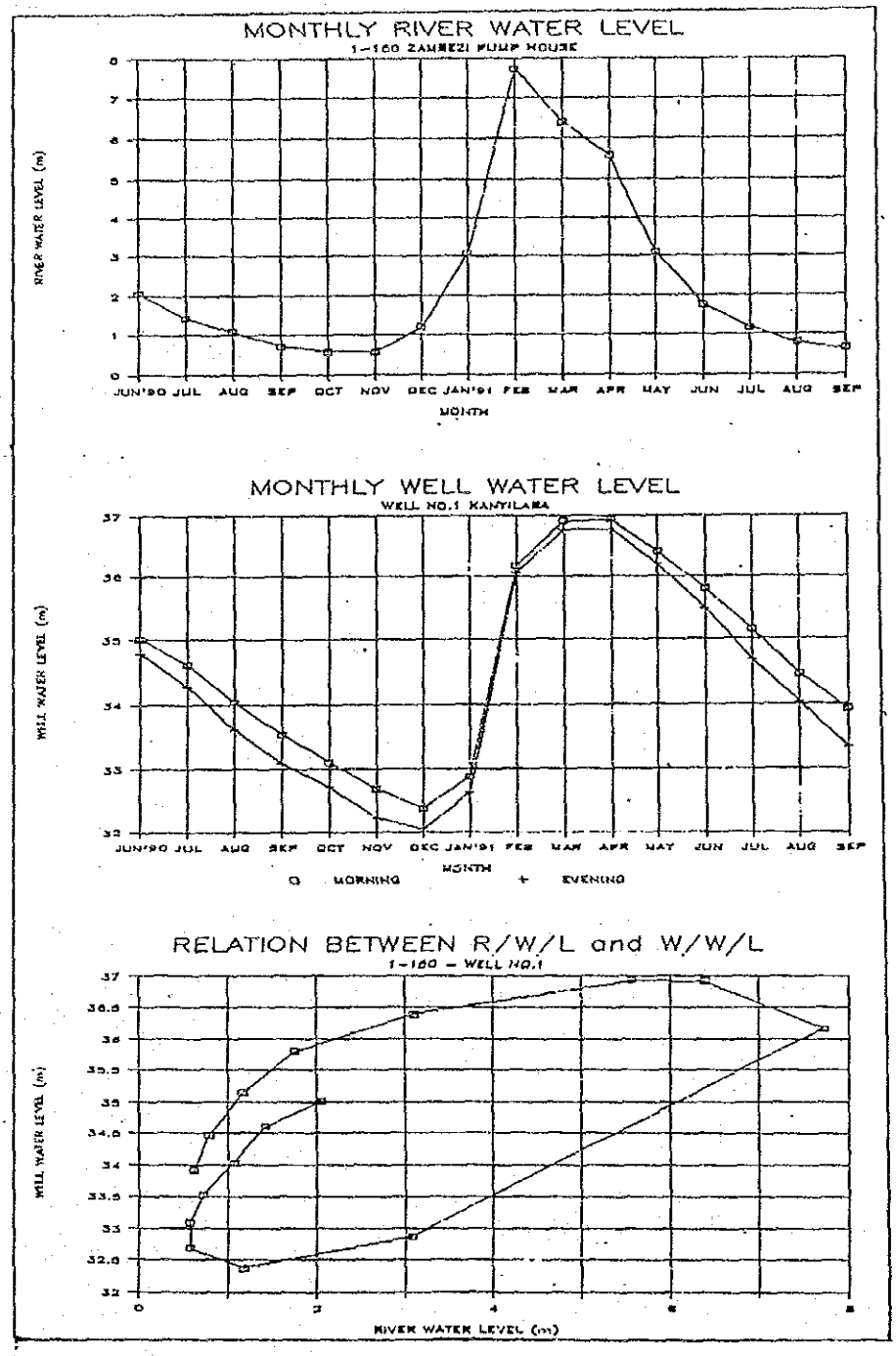
formula

	A	B	C	D	E	F	G	H	I	J
180										
181	MEAN	9.18	9.67	9.85	9.26	5.86	5.12	5.13	5.71	6.43
182	MAX.	9.41	9.87	9.87	9.87	7.50	5.31	5.45	6.09	6.88
183	MIN.	8.66	9.48	9.83	7.49	4.99	4.87	4.88	5.39	6.08
184										
185										
186										
187	*H*		Well No1		Kanyilaba				1990/91	<Well Wate
188	N==N									
189	DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
190										
191	Hm	33.10	32.69	32.38	32.87	36.17	36.91	36.94	36.39	35.80
192	He	32.72	32.23	32.05	32.64	36.04	36.78	36.77	36.19	35.47
193										
194		33.10	32.69	32.38	32.87	36.17	36.91	36.94	36.39	35.80
195		32.72	32.23	32.05	32.64	36.04	36.78	36.77	36.19	35.47
196										
197										
198										
199										

10-Nov-91 05:12 AM

Monthly well water table

[Creating Graph]
The following three type of graphs will be required for the system such as monthly river water level and monthly well water levels and relation between R/W/L and W/W/L in this system.
Summary of Reservoir Water Balance



SUPPLEMENT - 4.2

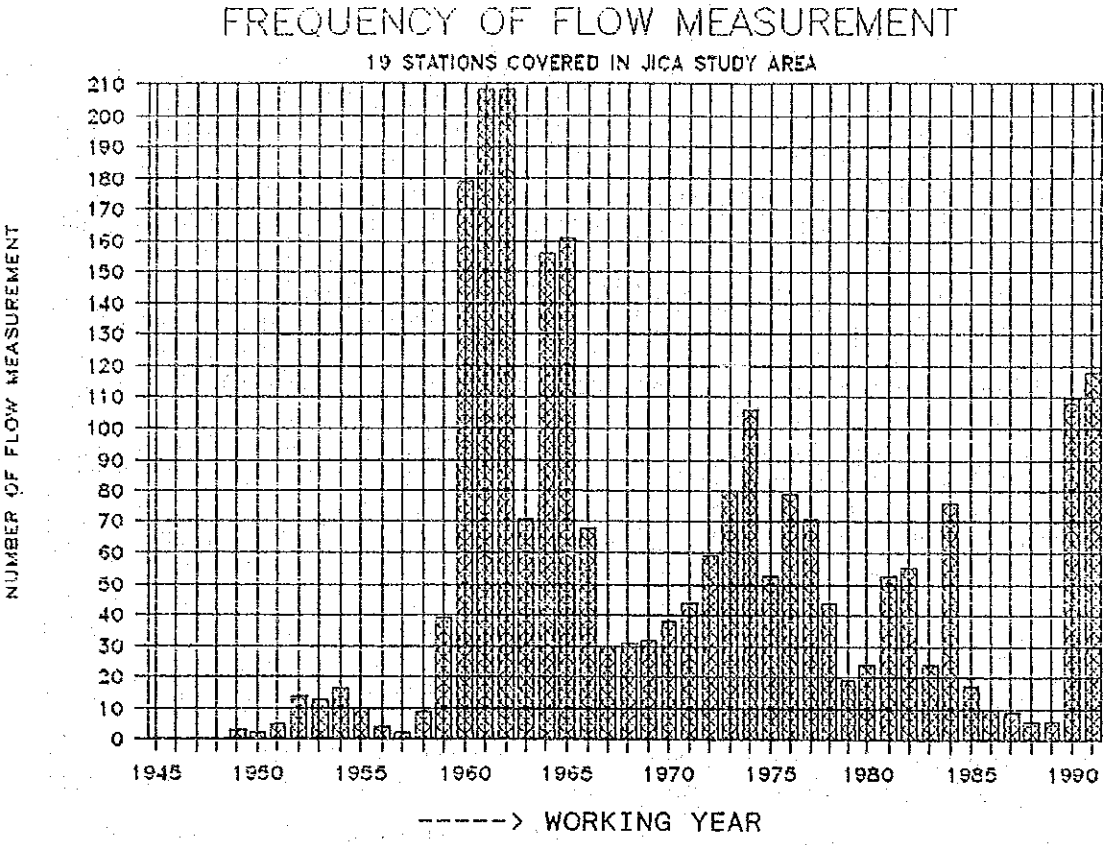
DISCHARGE RATING CURVE BY STATION

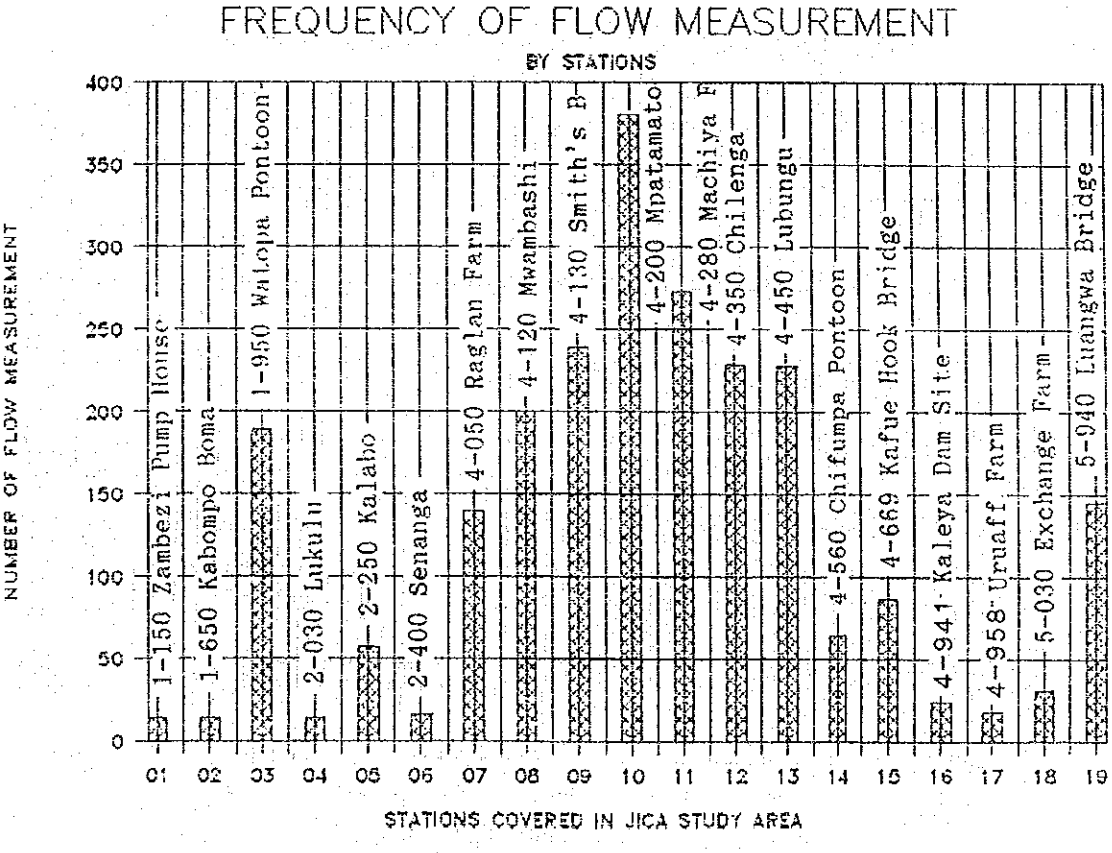
DISCHARGE RATING CURVE

No.	Hydrometric St.	Rating Curve	Range
1	1-150 Zambezi Pump House	Q = 25.626 *(H + 1.085)^2	
2	1-650 Kabompo Boma	Q = 66.342 *(H - 0.715)^2	
3	1-950 Watopa Pontoon	Q = 29.791 *(H - 0.262)^2	
4	2-030 Lukulu	Q = 28.448 *(H + 2.567)^2	
5	2-250 Kalabo	Q = 7.404 *(H + 0.654)^2	H < 3.179 m
		Q = 132.763 *(H - 2.270)^2	H >= 3.179 m
6	2-400 Senanga	Q = 50.805 *(H + 1.747)^2	
7	4-050 Raglam Farm	Q = 5.677 *(H + 0.167)^2	
8	4-120 Mwambashi	Q = 6.058 *(H - 1.262)^2	H < 2.920 m
		Q = 1.989 *(H - 0.019)^2	H >= 2.920 m
9	4-130 Smith's Bridge	Q = 6.078 *(H + 0.184)^2	
10	4-200 Mpatamato	Q = 7.269 *(H + 0.676)^2	
11	4-280 Machiya Ferry	Q = 10.964 *(H - 1.012)^2	
12	4-350 Chilenga	Q = 8.771 *(H + 0.439)^2	H < 5.134 m
		Q = 40.036 *(H - 2.525)^2	H >= 5.134 m
13	4-450 Lubungu	Q = 31.695 *(H - 0.476)^2	
14	4-560 Chifumpa pontoon	Q = 25.326 *(H + 0.562)^2	
15	4-669 Kafue Hook Bridge	Q = 110.511 *(H - 0.937)^2	
16	4-941 Kaleya Dam Site	Q = 1.780 *(H - 0.115)^2	H < 4.663 m
		Q = 32.948 *(H - 3.603)^2	H >= 4.663 m
17	4-958 Uruaff Farm	Q = 8.421 *(H - 0.009)^2	
18	5-030 Exchange Farm	Q = 1.684 *(H + 0.084)^2	H < 0.720 m
		Q = 9.681 *(H - 0.386)^2	0.720m <= H < 1.640m
		Q = 21.059 *(H - 0.729)^2	H >= 1.640 m
19	5-940 Luangwa Bridge	Q = 60.157 *(H - 1.003)^2	

LIST OF FLOW MEASUREMENT FREQUENCY FOR STATIONS COVERED BY JICA STUDY

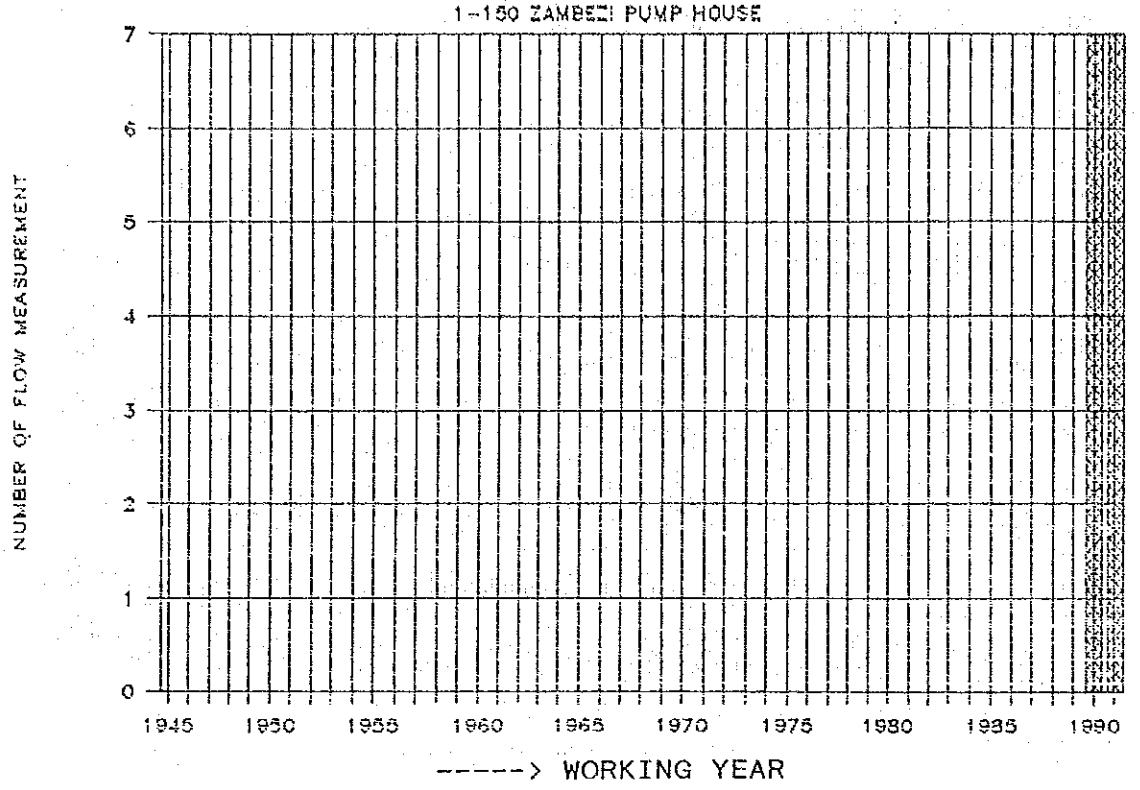
ST. / YEAR	01 1-150	02 1-650	03 1-950	04 2-030	05 2-250	06 2-400	07 4-050	08 4-120	09 4-130	10 4-200	11 4-280	12 4-350	13 4-450	14 4-560	15 4-669	16 4-941	17 4-958	18 5-030	19 5-940	TOTAL
1945																				0
46																				0
47																				0
48																				0
49																			3	3
1950																			2	2
51																			5	5
52										13									1	14
53										13										13
54										16										16
1955										9									1	10
56										2									2	4
57										1									1	2
58			3																6	9
59			21				2	1	2	9				3					1	39
1960			27				13	24	23	19			37	35					1	179
61			14		7		26	29	23	77			16	14						208
62			16		24		16	25	20	81	2	3	20	1						208
63			2		5				1		8	45	8						2	71
64			8		4				9	28	45	48	11						3	156
1965			5		3					32	43	44	34							161
66							14		1	21	15	4	13							68
67										4	19	3	4							30
68											14	8	9							31
69											22	6							4	32
1970			2								18	12	3	1		1		1		38
71			7					1	4		12	6	4			3	3	4		44
72			5				3	10	7	7	11	8				4		4		59
73			9				15	13	19	2	7	7	4		3	1				80
74			7				7	24	27	4	4	2	15		16					106
1975			8				3	7	16	2	4		6		4		3			53
76			10		1		3	15	18	5	10	3	3		8		3			79
77			9				4	13	13	8	9	6	7		2					71
78			3				2	3	7	2	3	1	3		19		1			44
79													4		11	2		2		19
1980			2				1		2	3	3	1	5		3	2			2	24
81			3				7	6	11	4	4	4	2		2	1	1	3	5	53
82							2	3	8	2	3	2	1					1	33	55
83			5				2	4	9	1			1						2	24
84			3				3	1	3	2	1	3	2		3				55	76
1985			2		1			4	1	1			1		2	1		3	1	17
86			2						1		1	1						3	2	10
87							1	1	1		2	2	1						1	9
88						2		1					2		1					6
89							1	1			1	1			1			1		6
1990	7	7	9	7	7	7	5	7	6	6	6	5	6	5	6	3	3	3	5	110
91	7	7	7	7	5	7	7	7	7	7	6	4	6	5	6	6	4	6	7	118
TOTAL	14	14	189	14	57	16	139	200	239	381	273	229	228	64	87	24	18	31	145	2362


FREQUENCY OF FLOW MEASUREMENT
19 STATIONS COVERED IN JICA STUDY AREA
NUMBER OF FLOW MEASUREMENT
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
210
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
------> WORKING YEAR


FREQUENCY OF FLOW MEASUREMENT
BY STATIONS
NUMBER OF FLOW MEASUREMENT
0
50
100
150
200
250
300
350
400
1-150 Zambezi Pump House
1-650 Kabompo Boma
1-950 Watopa Pontoon
2-030 Lukulu
2-250 Kalabo
2-400 Senanga
4-050 Raglan Farm
4-120 Mwambashi
4-130 Smith's B
4-200 Mpatamato
4-280 Machiya F
4-350 Chilenga
4-450 Lubungu
4-560 Chifumpa Pontoon
4-669 Kafue Hook Bridge
4-941 Kaleya Dam Site
4-958 Uruaff Farm
5-030 Exchange Farm
5-940 Luangwa Bridge
01
02
03
04
05
06
07
08
09
10
11
12
13
14
15
16
17
18
19
STATIONS COVERED IN JICA STUDY AREA

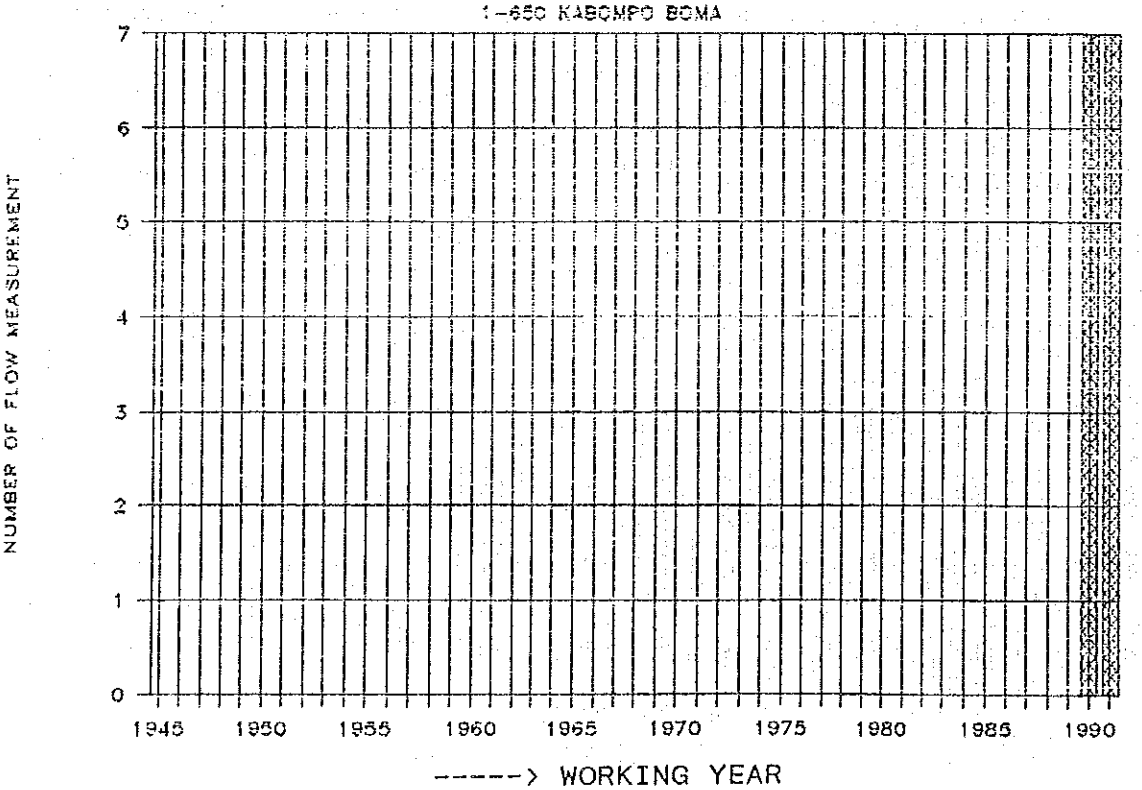
FREQUENCY OF FLOW MEASUREMENT

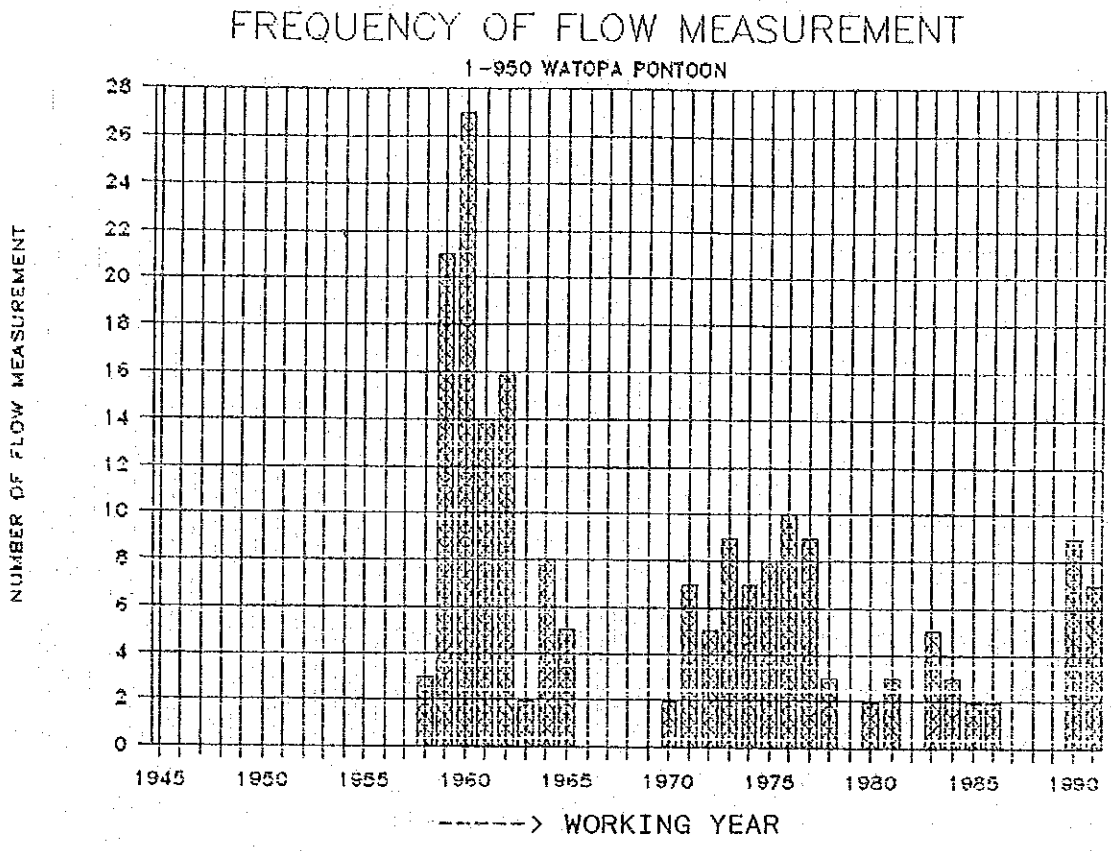
1-150 ZAMBEZI PUMP HOUSE

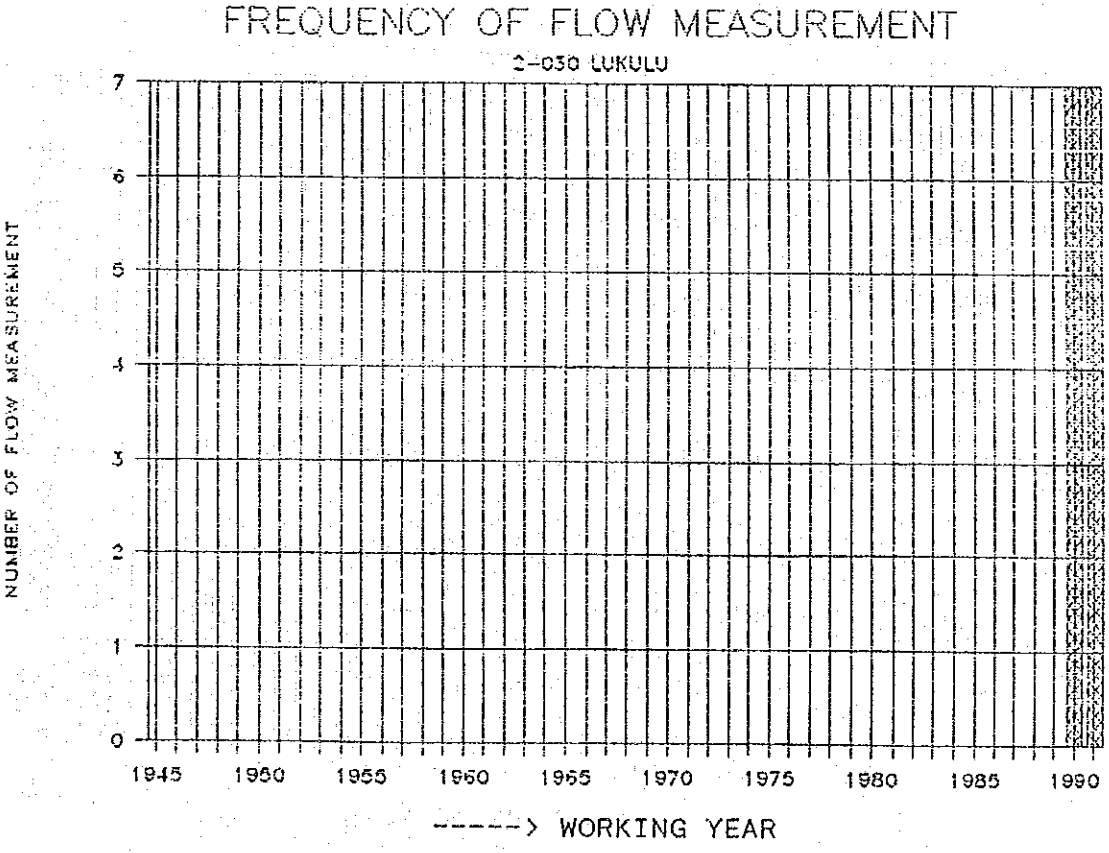


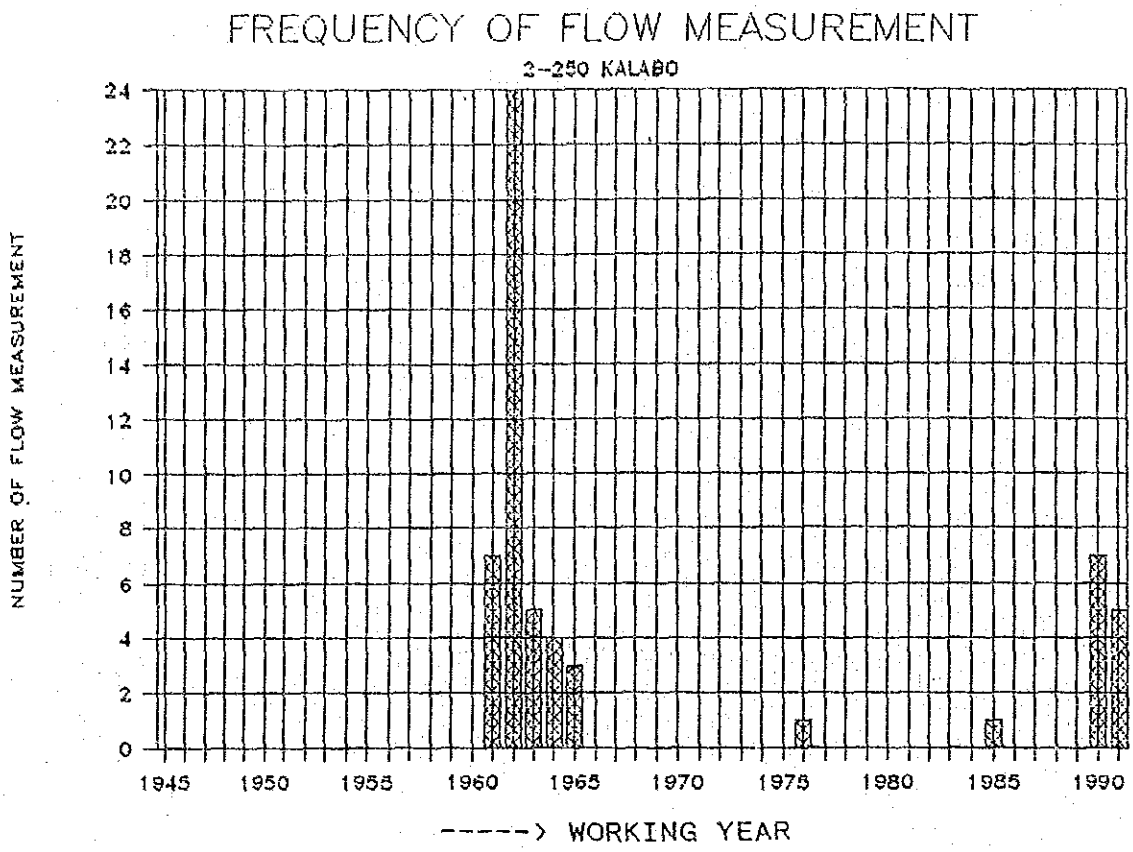
FREQUENCY OF FLOW MEASUREMENT

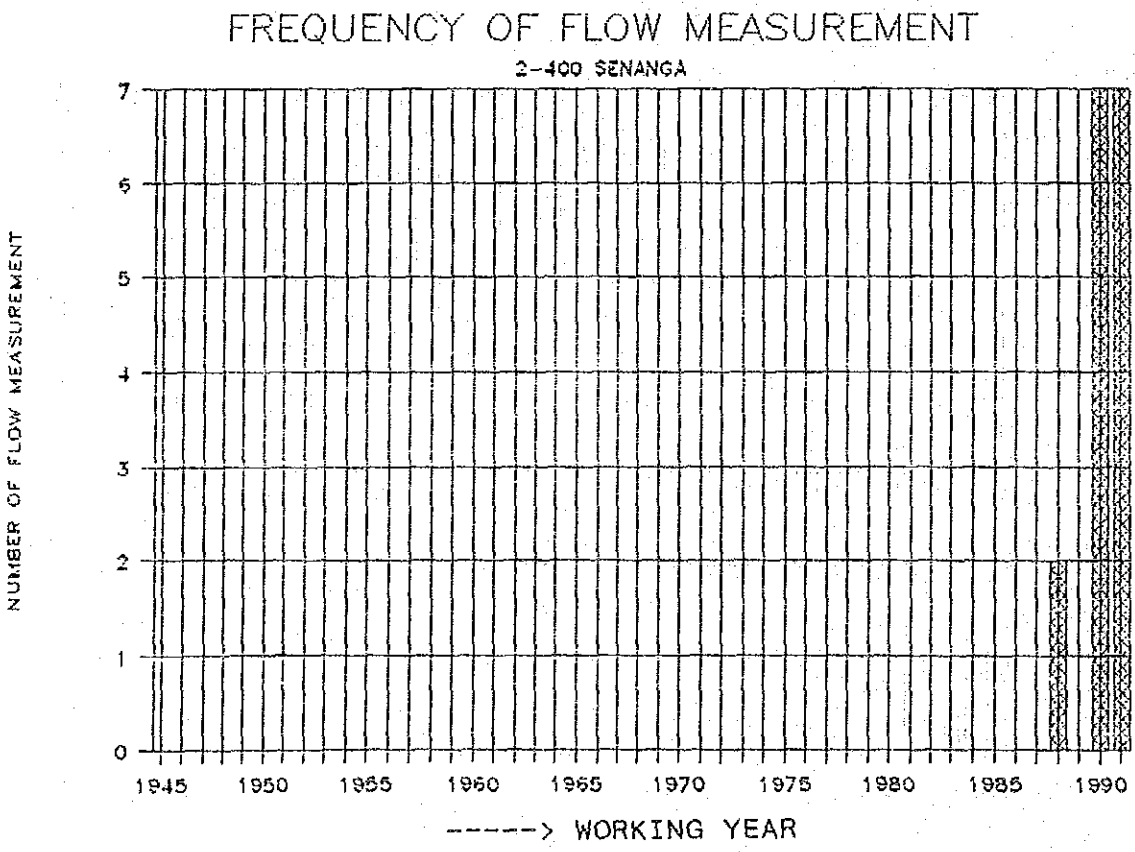
1-650 KABOMPO BOMA

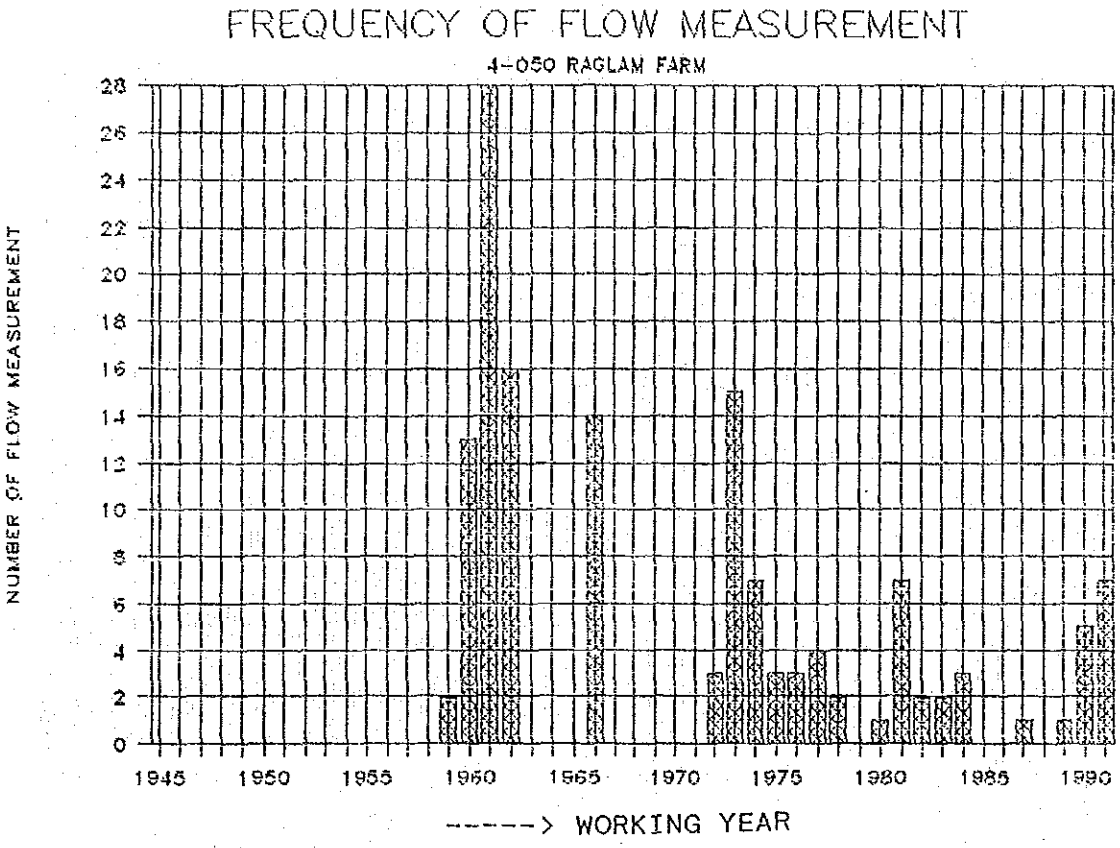


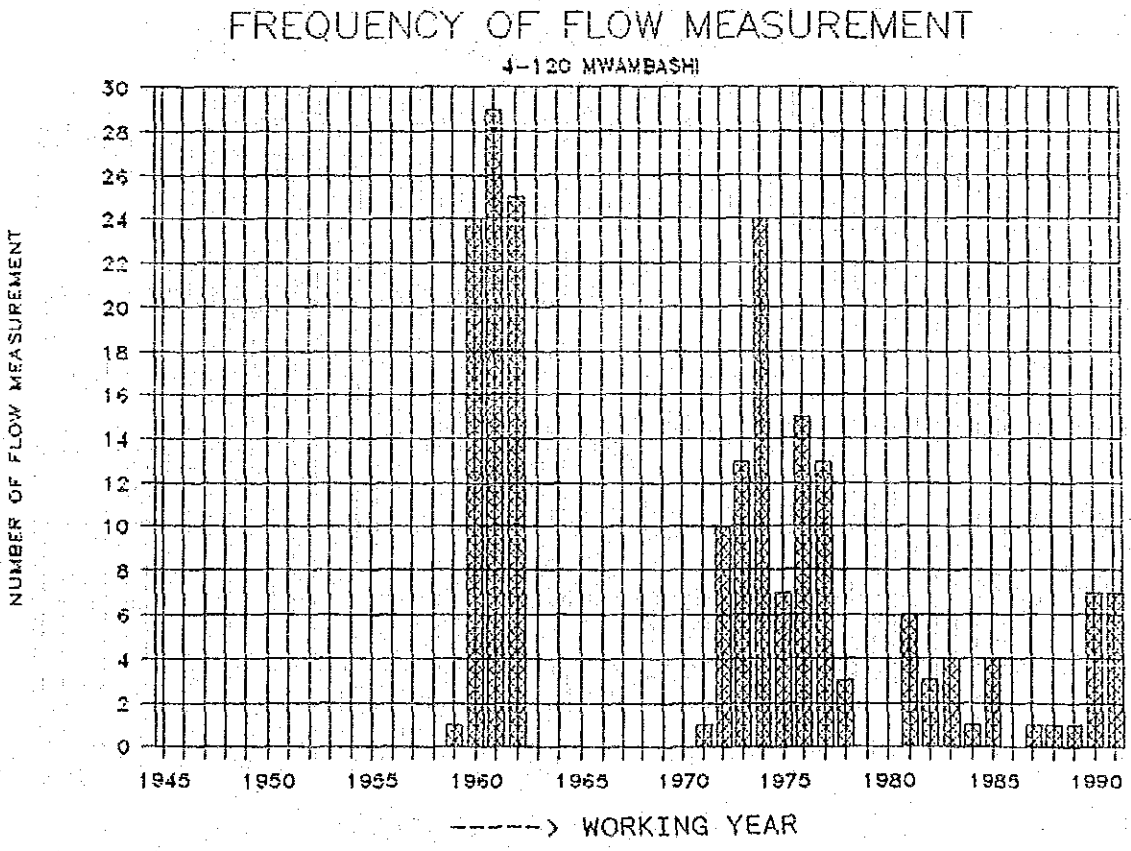

FREQUENCY OF FLOW MEASUREMENT
1-950 WATOPA PONTOON
NUMBER OF FLOW MEASUREMENT
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
------> WORKING YEAR

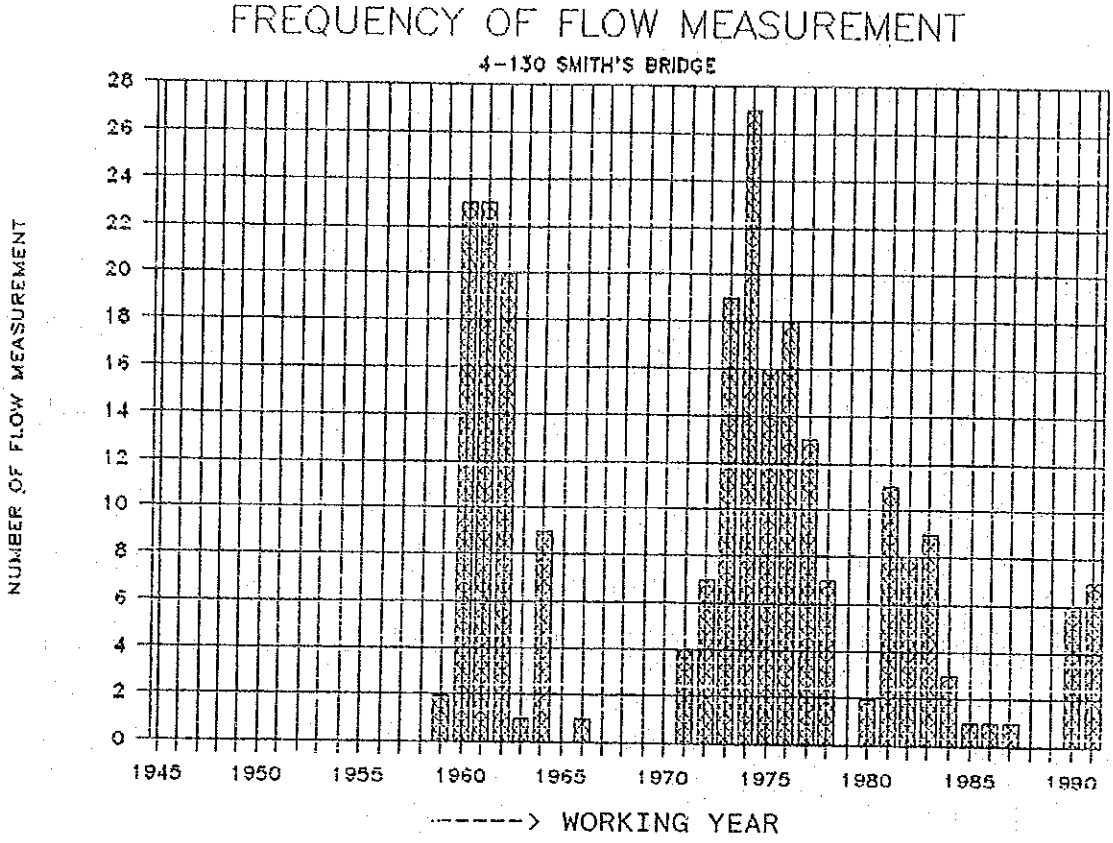

FREQUENCY OF FLOW MEASUREMENT
2-030 LUKULU
NUMBER OF FLOW MEASUREMENT
0
1
2
3
4
5
6
7
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
------> WORKING YEAR

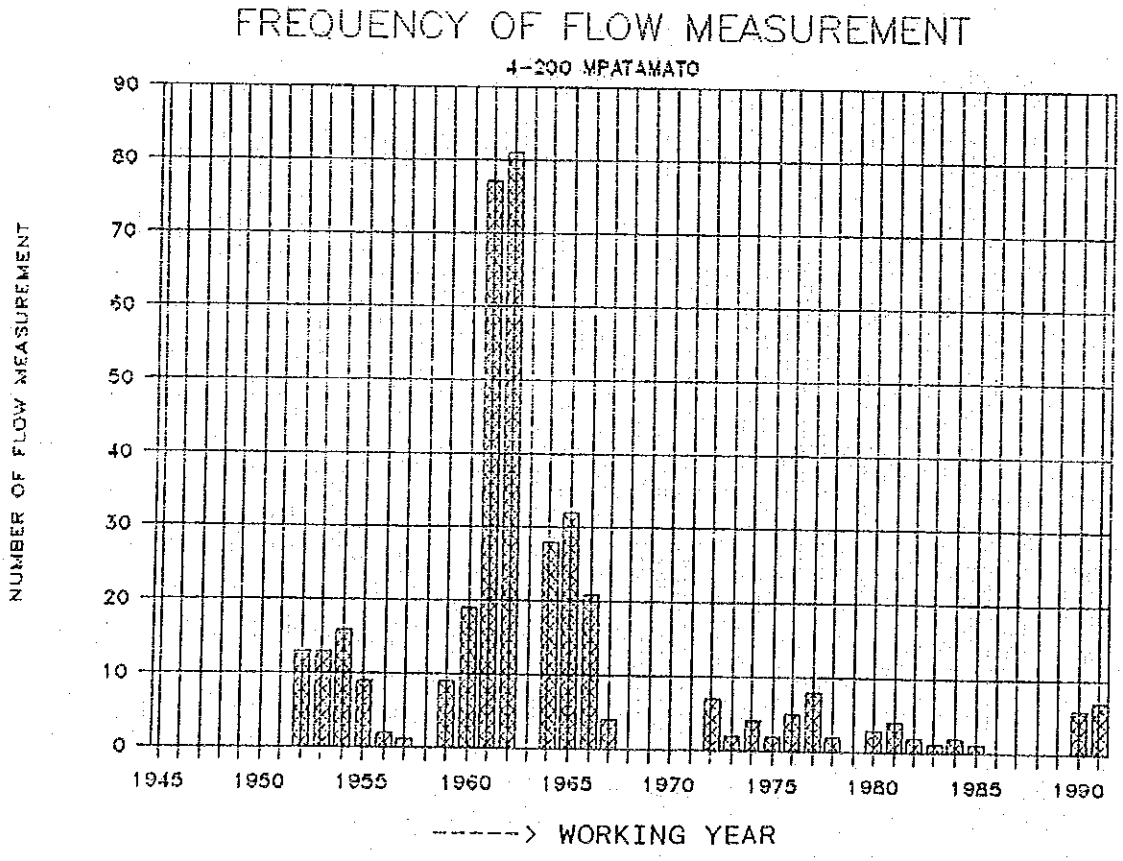

FREQUENCY OF FLOW MEASUREMENT
2-250 KALABO
NUMBER OF FLOW MEASUREMENT
24
22
20
18
16
14
12
10
8
6
4
2
0
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
-----> WORKING YEAR

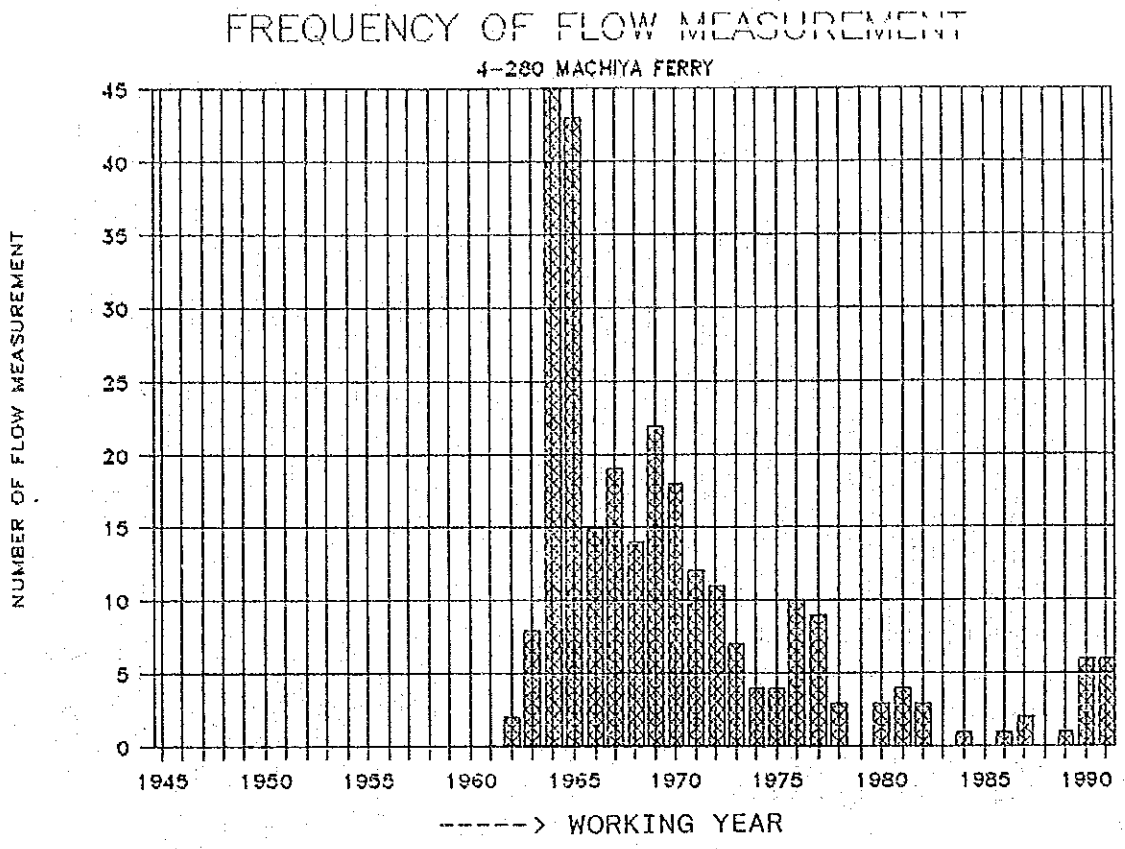

FREQUENCY OF FLOW MEASUREMENT
2-400 SENANGA
NUMBER OF FLOW MEASUREMENT
7
6
5
4
3
2
1
0
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
-----> WORKING YEAR

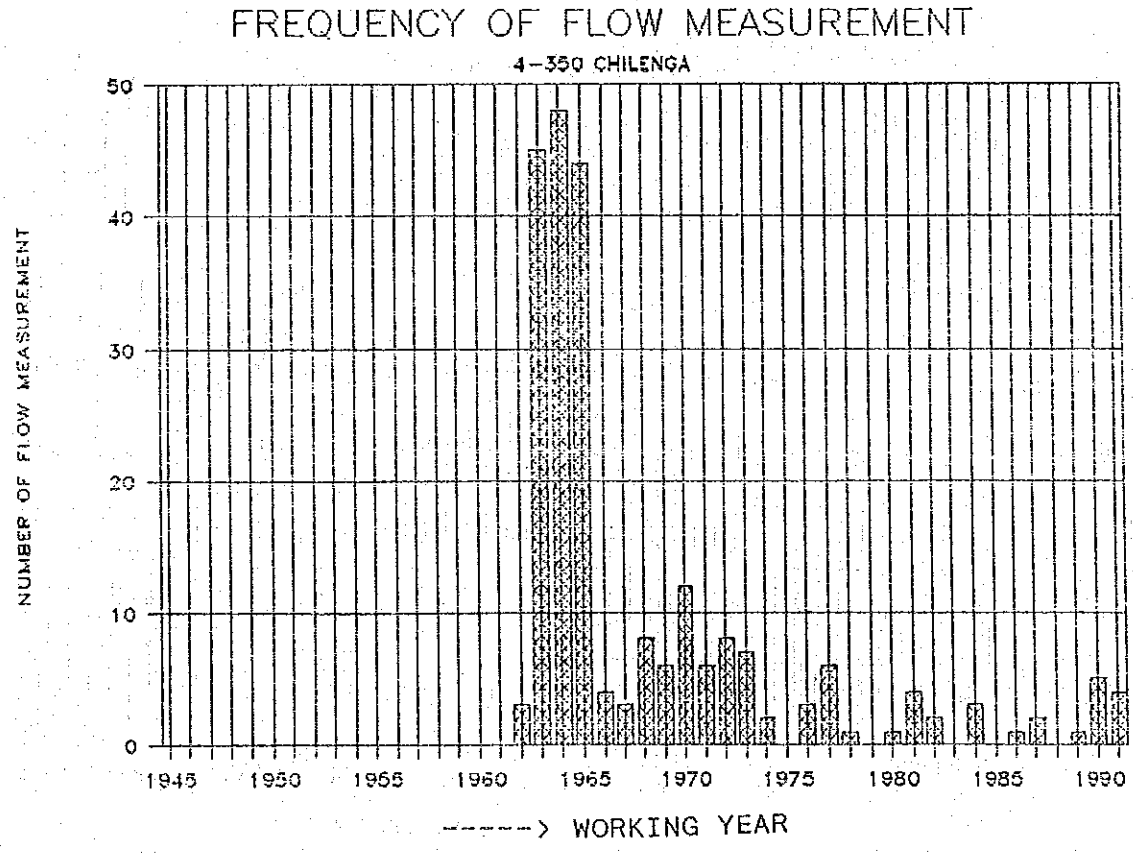

FREQUENCY OF FLOW MEASUREMENT
4-050 RAGLAM FARM
NUMBER OF FLOW MEASUREMENT
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
-----> WORKING YEAR

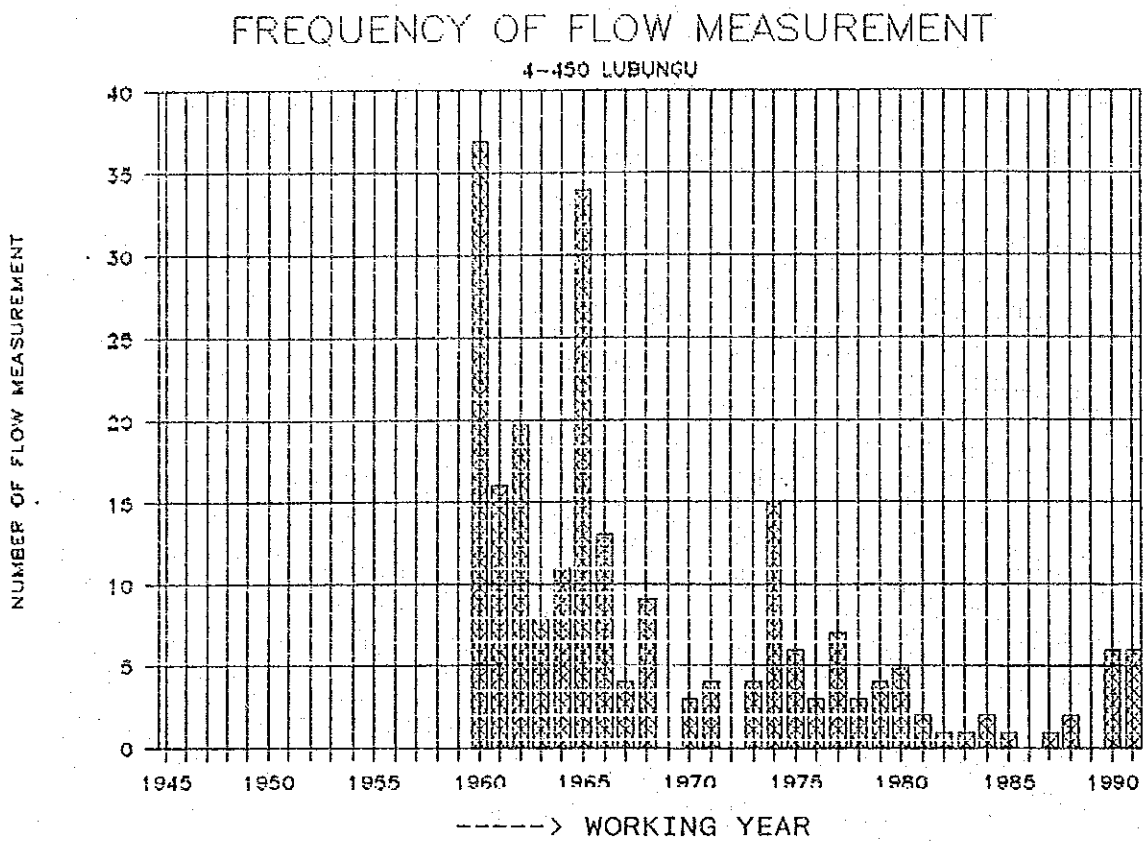

FREQUENCY OF FLOW MEASUREMENT
4-120 MWAMBASHI
NUMBER OF FLOW MEASUREMENT
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
-----> WORKING YEAR

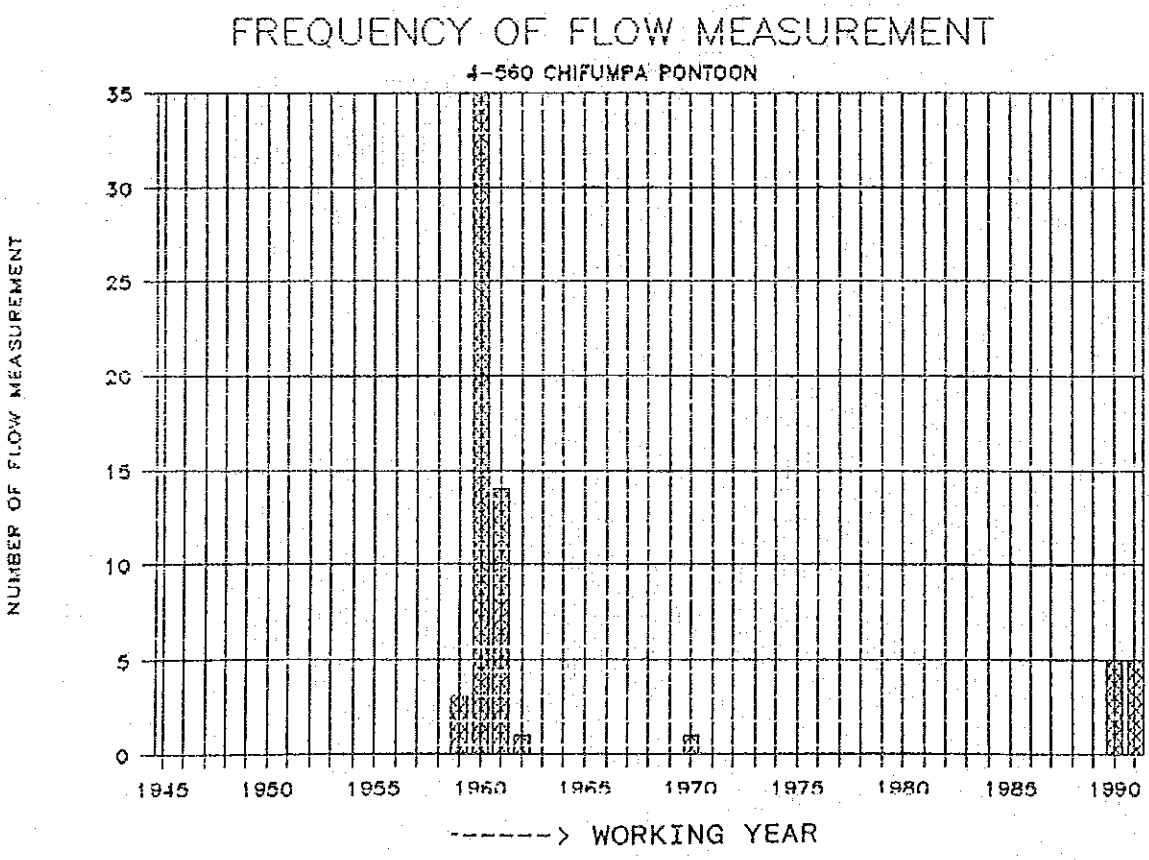

FREQUENCY OF FLOW MEASUREMENT
4-130 SMITH'S BRIDGE
NUMBER OF FLOW MEASUREMENT
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
------> WORKING YEAR

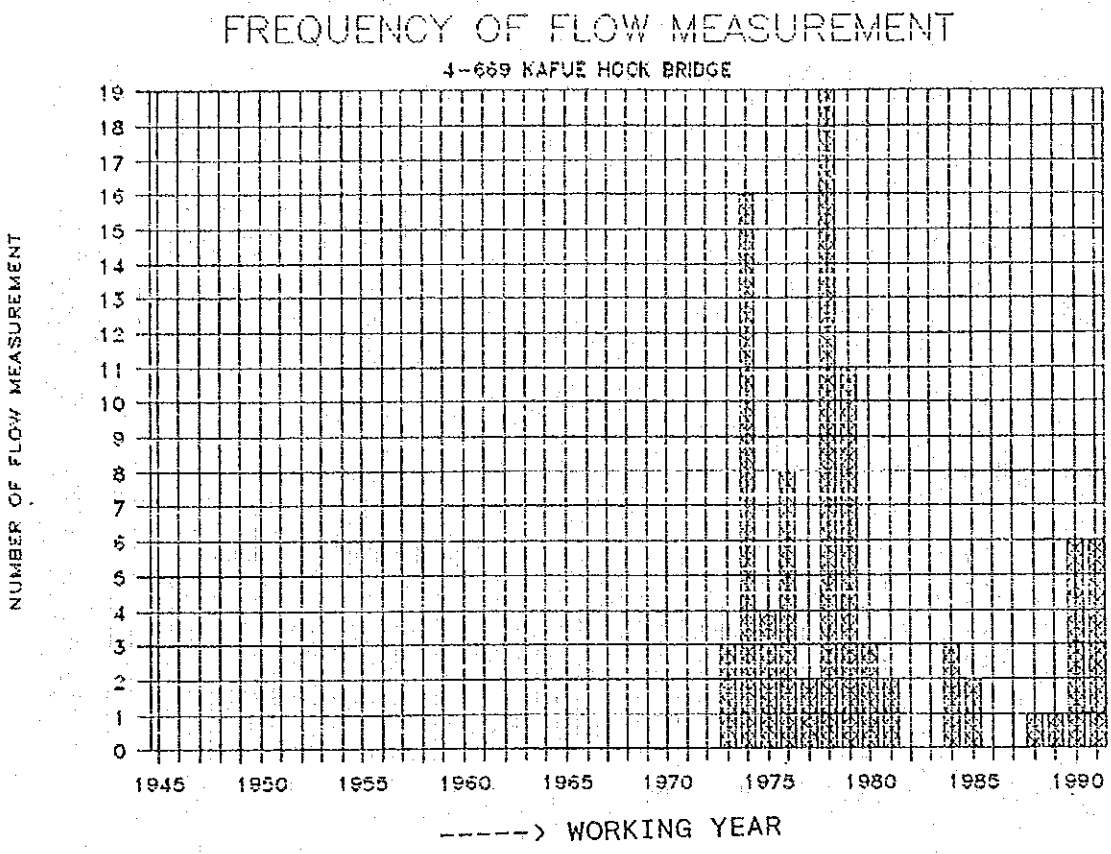

FREQUENCY OF FLOW MEASUREMENT
4-200 MPATAMATO
NUMBER OF FLOW MEASUREMENT
0
10
20
30
40
50
60
70
80
90
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
------> WORKING YEAR

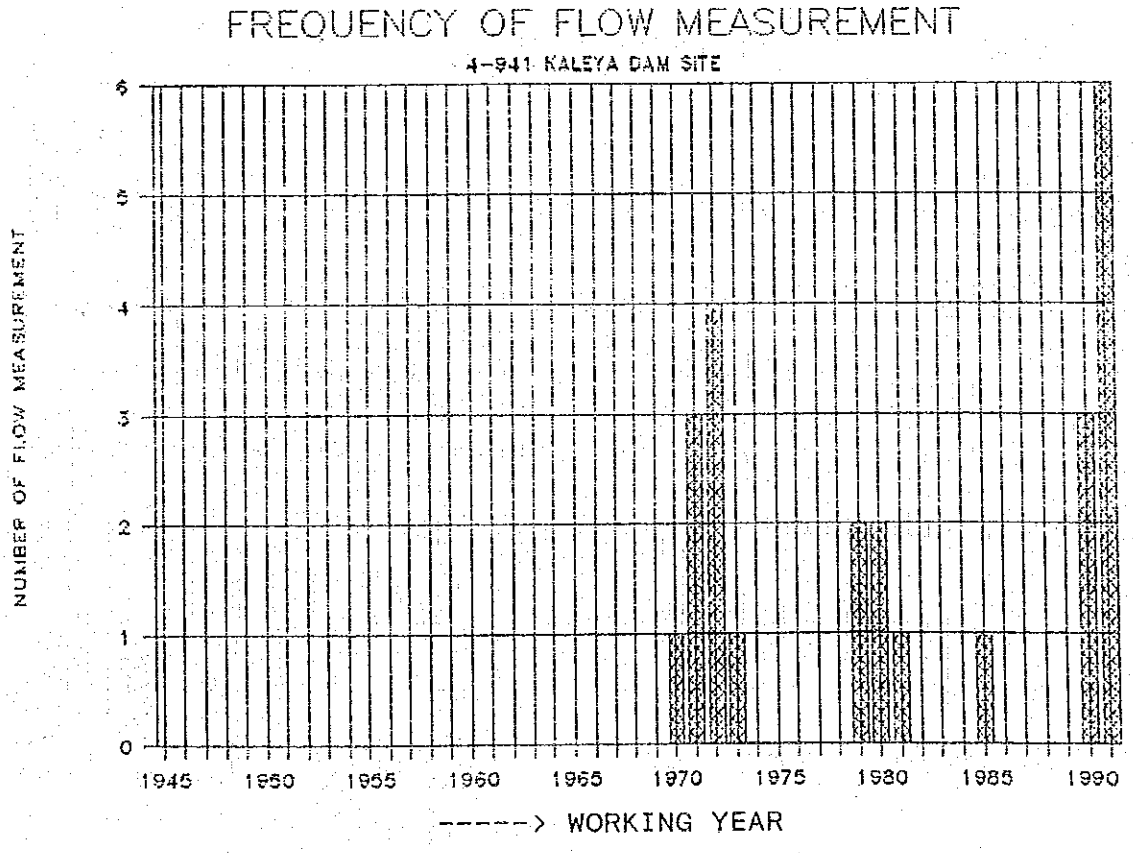

FREQUENCY OF FLOW MEASUREMENT
4-280 MACHIYA FERRY
NUMBER OF FLOW MEASUREMENT
0
5
10
15
20
25
30
35
40
45
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
-----> WORKING YEAR

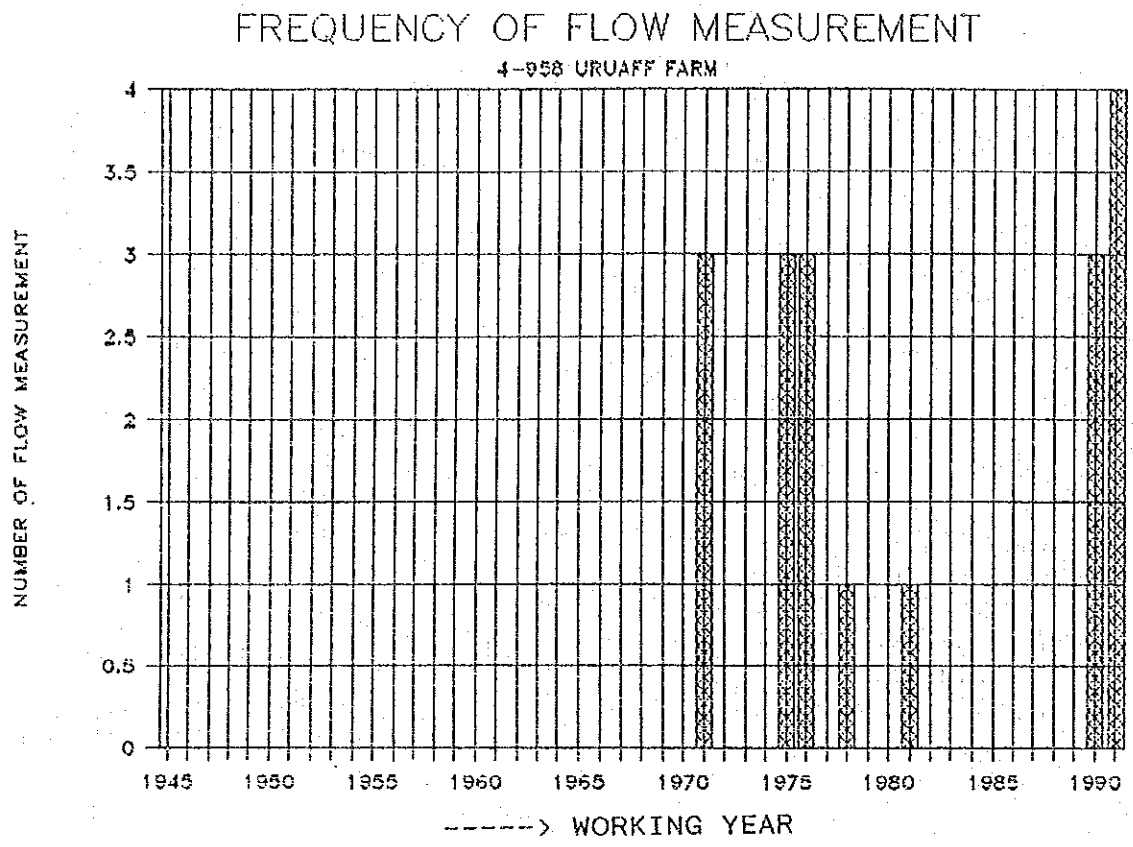

FREQUENCY OF FLOW MEASUREMENT
4-350 CHILENGA
NUMBER OF FLOW MEASUREMENT
0
10
20
30
40
50
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
-----> WORKING YEAR

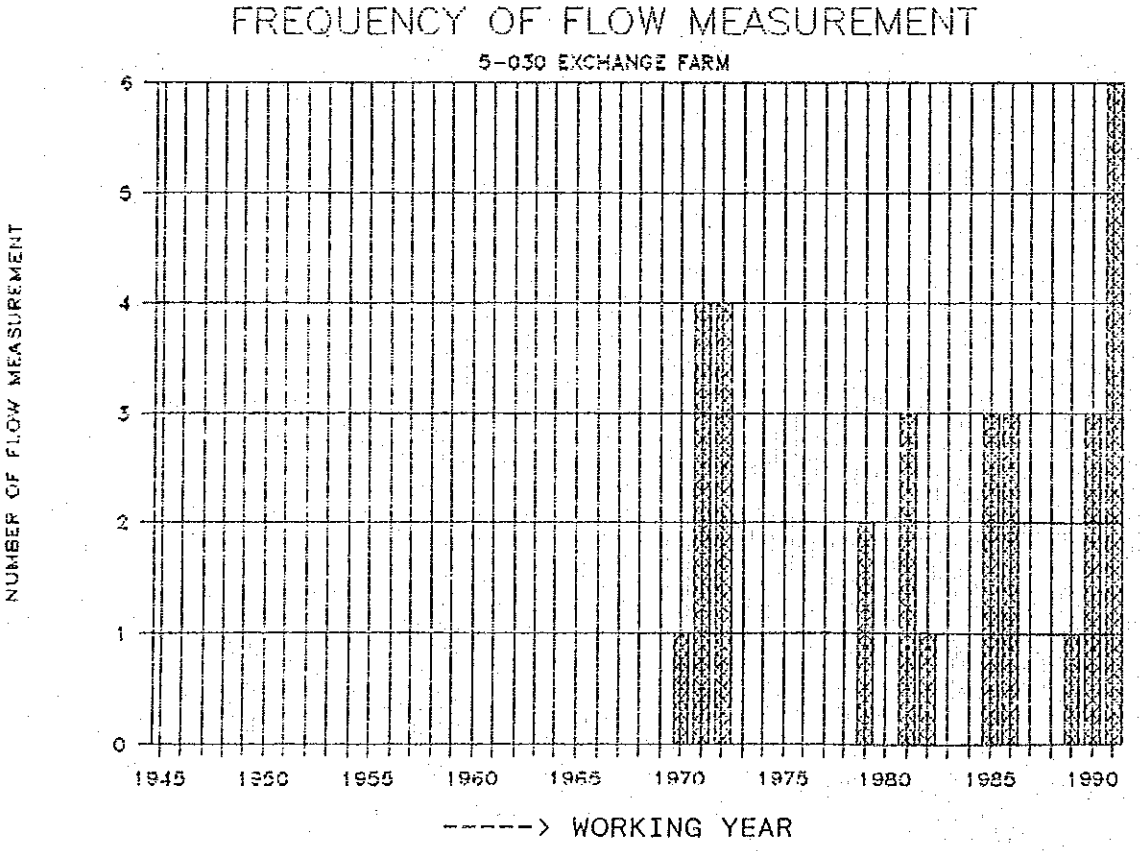

FREQUENCY OF FLOW MEASUREMENT
4-450 LUBUNGU
NUMBER OF FLOW MEASUREMENT
40
35
30
25
20
15
10
5
0
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
-----> WORKING YEAR

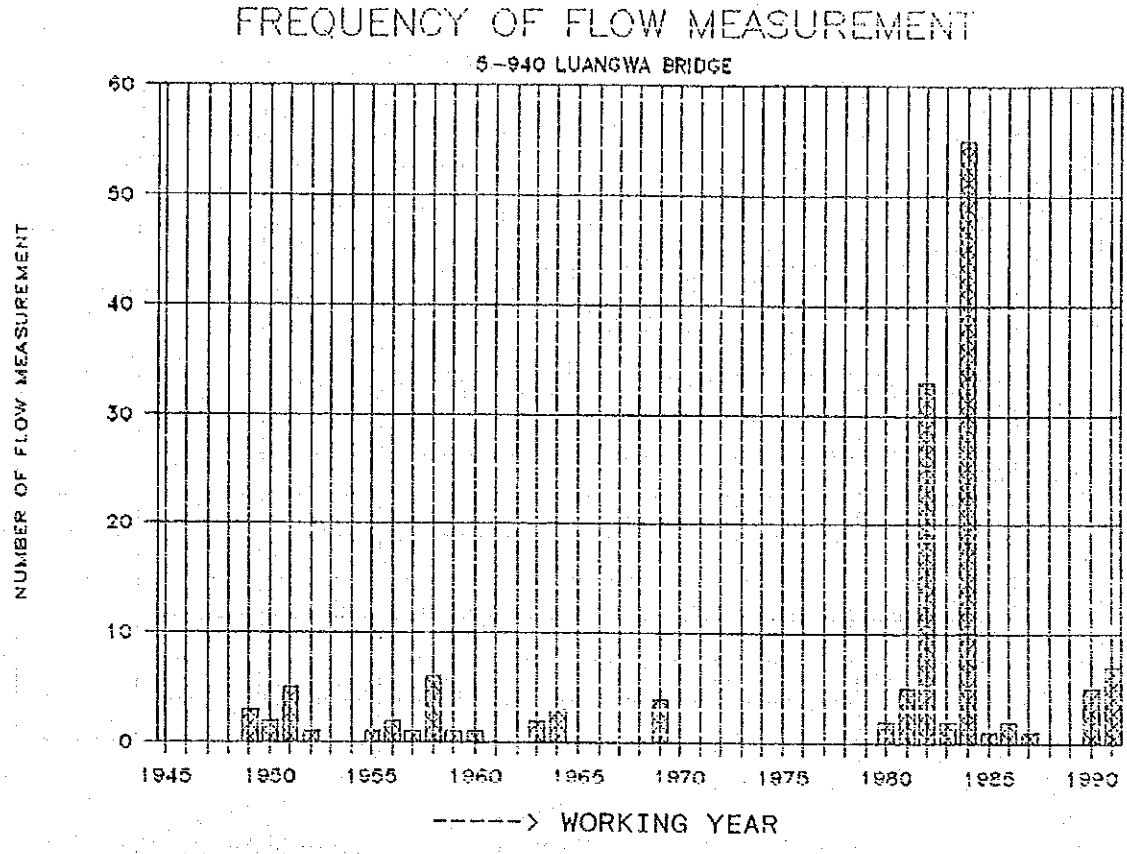

FREQUENCY OF FLOW MEASUREMENT
4-560 CHIFUMPA PONTOON
NUMBER OF FLOW MEASUREMENT
35
30
25
20
15
10
5
0
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
------> WORKING YEAR

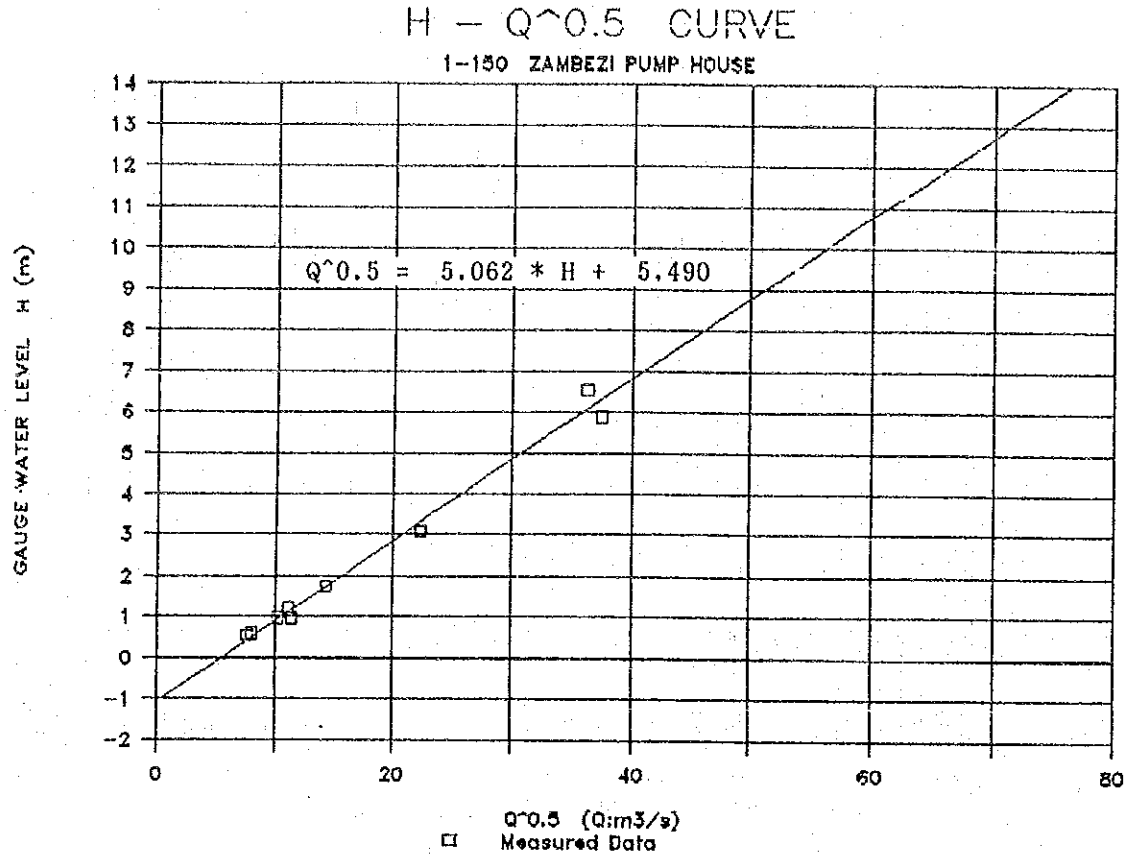

FREQUENCY OF FLOW MEASUREMENT
4-669 KAFUE HOOK BRIDGE
NUMBER OF FLOW MEASUREMENT
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
1945 1950 1955 1960 1965 1970 1975 1980 1985 1990
-----> WORKING YEAR

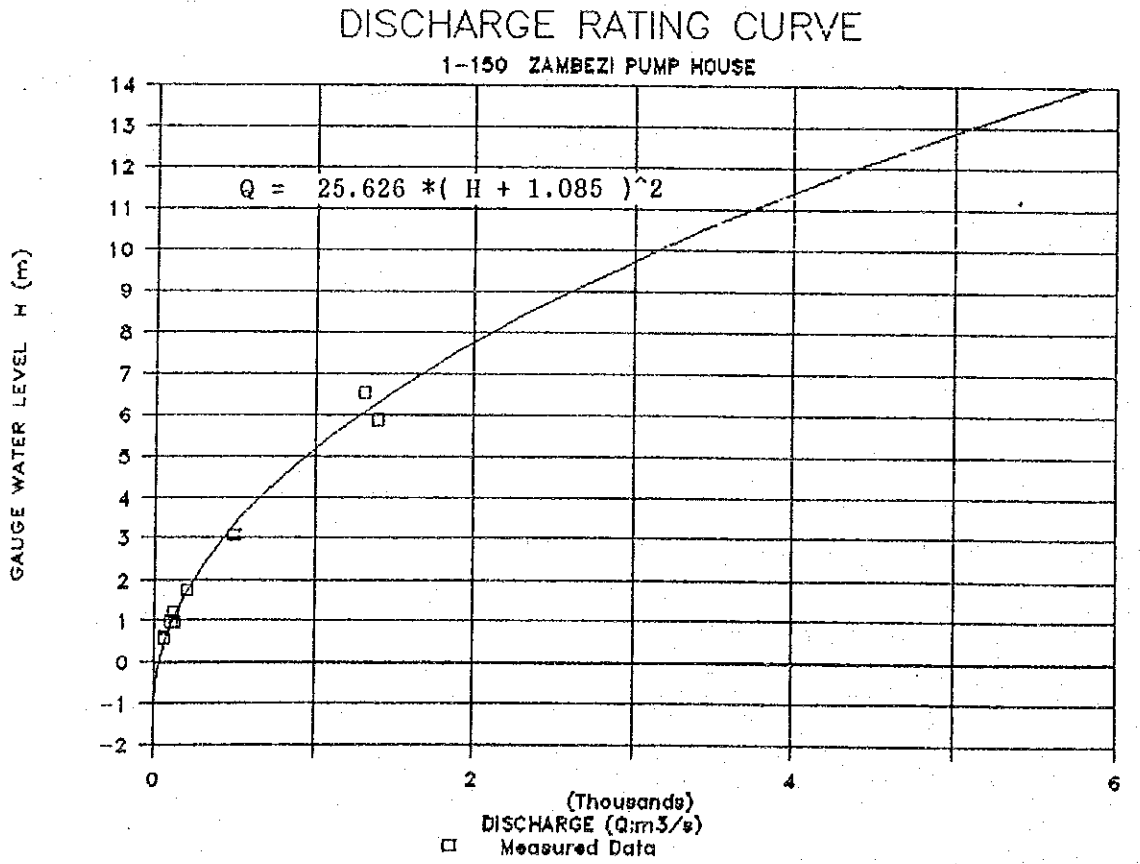

FREQUENCY OF FLOW MEASUREMENT
4-941 KALEYA DAM SITE
NUMBER OF FLOW MEASUREMENT
0 1 2 4
1945 1950 1955 1960 1965 1970 1975 1980 1985 1990
-----> WORKING YEAR


FREQUENCY OF FLOW MEASUREMENT
4-058 URUAFF FARM
NUMBER OF FLOW MEASUREMENT
4
3.5
3
2.5
2
1.5
1
0.5
0
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
------> WORKING YEAR


FREQUENCY OF FLOW MEASUREMENT
5-030 EXCHANGE FARM
NUMBER OF FLOW MEASUREMENT
6
5
4
3
2
1
0
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
-----> WORKING YEAR

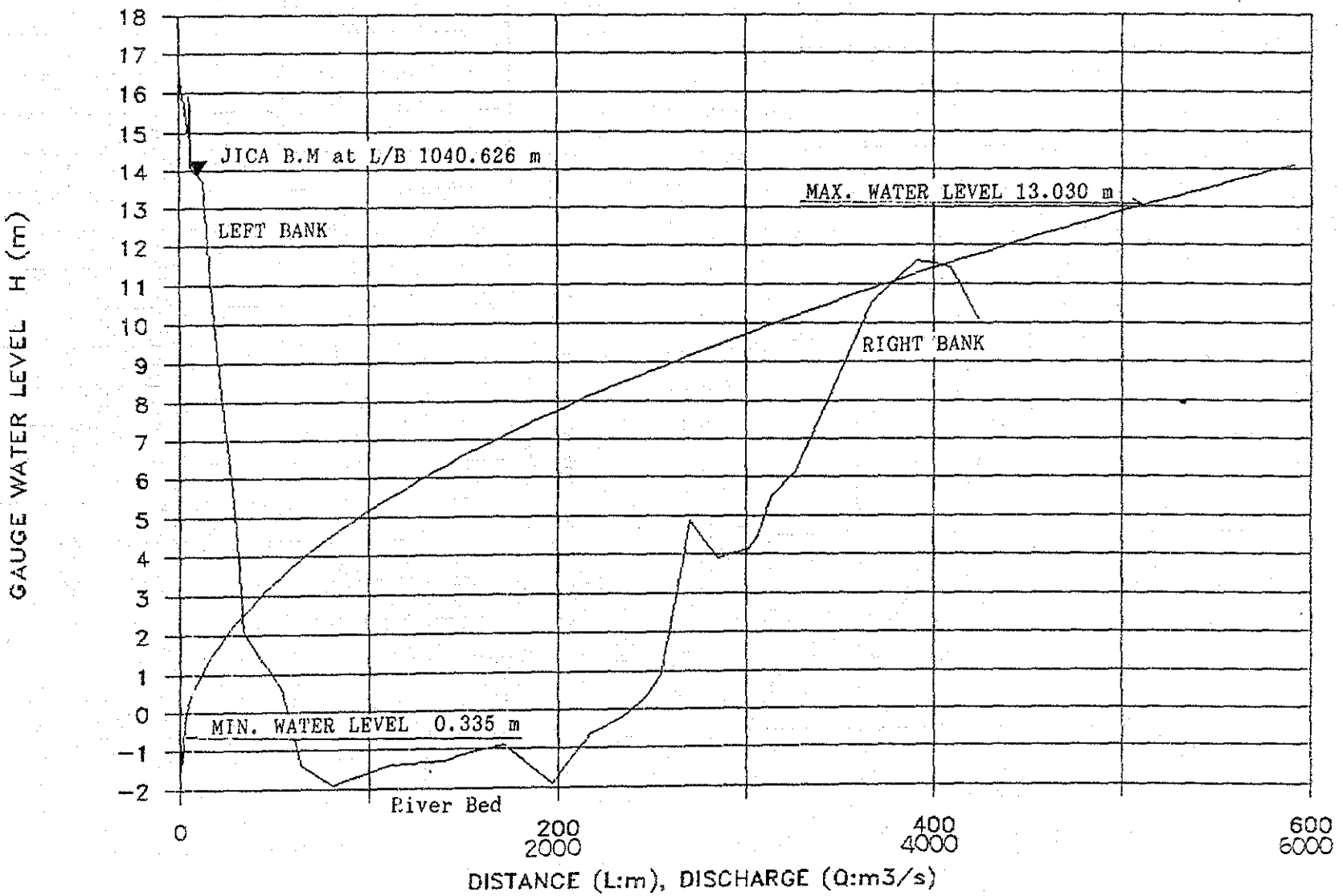

FREQUENCY OF FLOW MEASUREMENT
5-940 LUANGWA BRIDGE
NUMBER OF FLOW MEASUREMENT
60
50
40
30
20
10
0
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
-----> WORKING YEAR

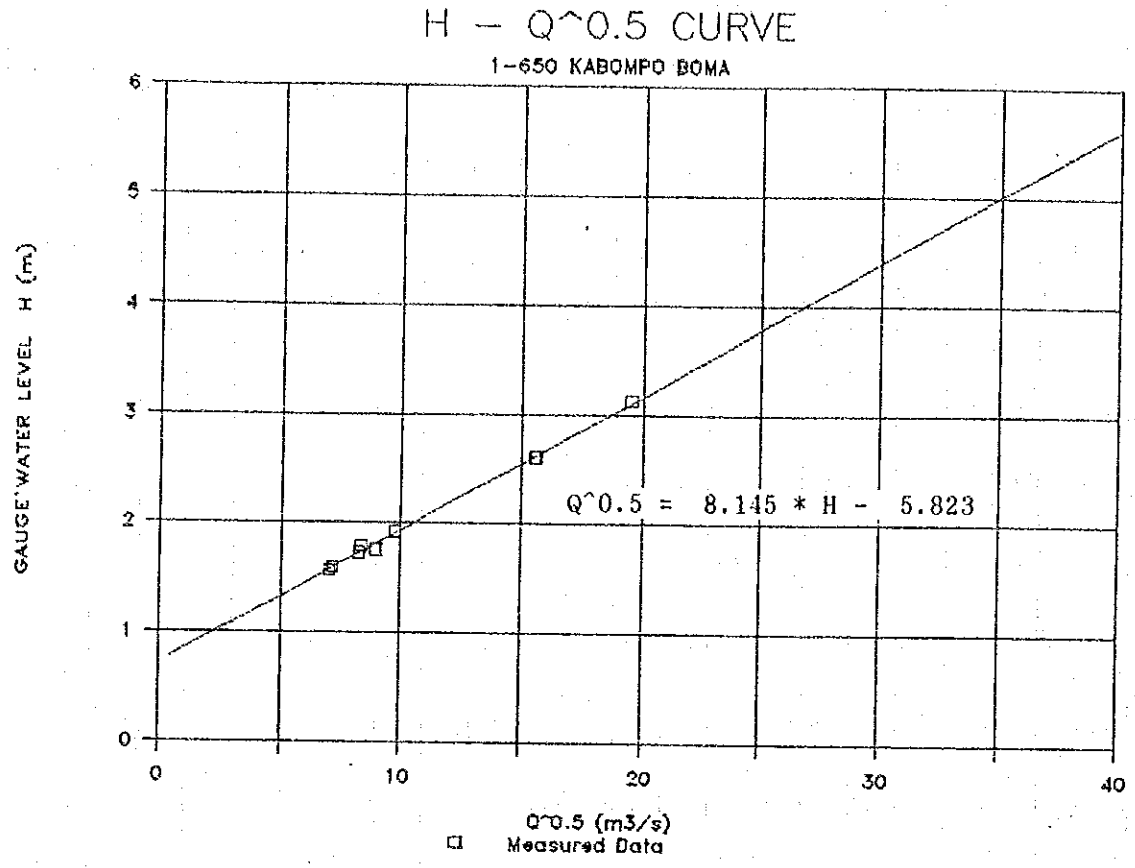

H – Q^0.5 CURVE
1-150 ZAMBEZI PUMP HOUSE
Q^0.5 = 5.062 * H + 5.490
GAUGE WATER LEVEL H (m)
Q^0.5 (Q:m3/s)
Measured Data

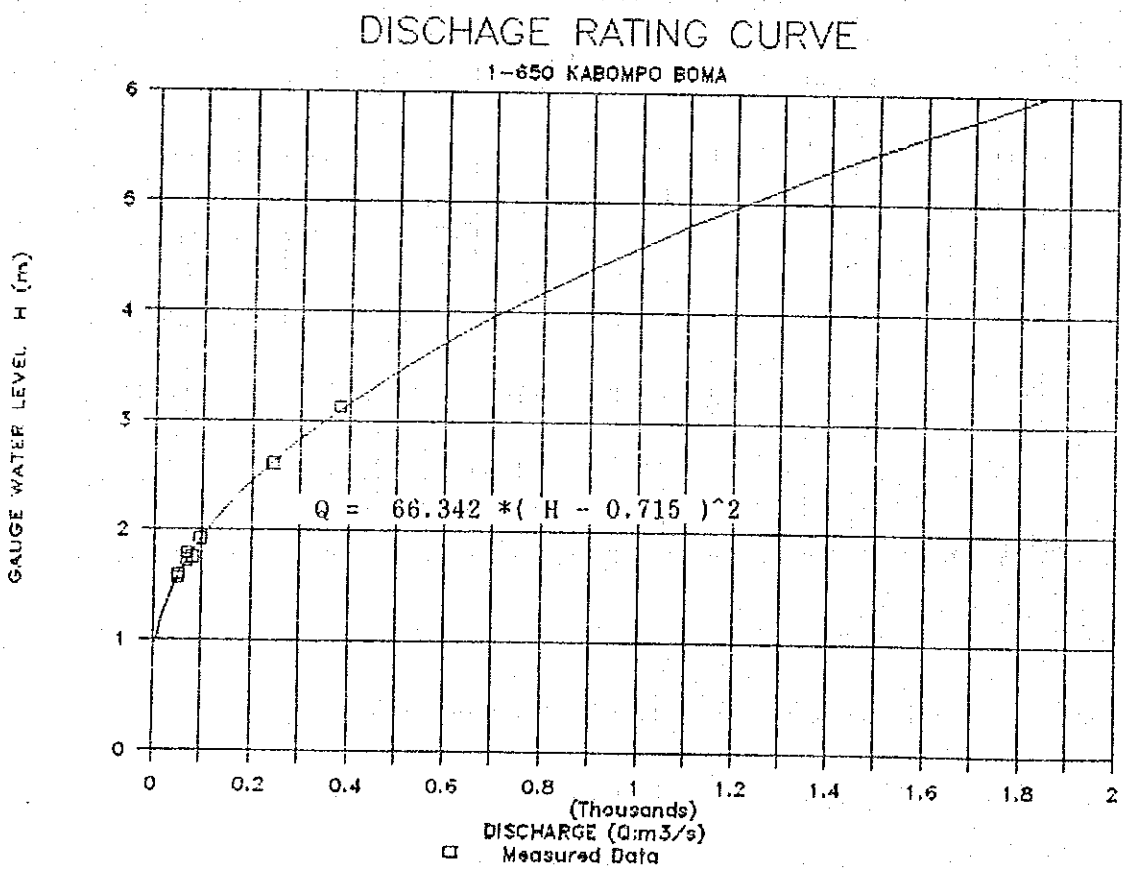

DISCHARGE RATING CURVE
1-150 ZAMBEZI PUMP HOUSE
Q = 25.626 *(H + 1.085)^2
GAUGE WATER LEVEL H (m)
(Thousands)
DISCHARGE (Q:m3/s)
Measured Data

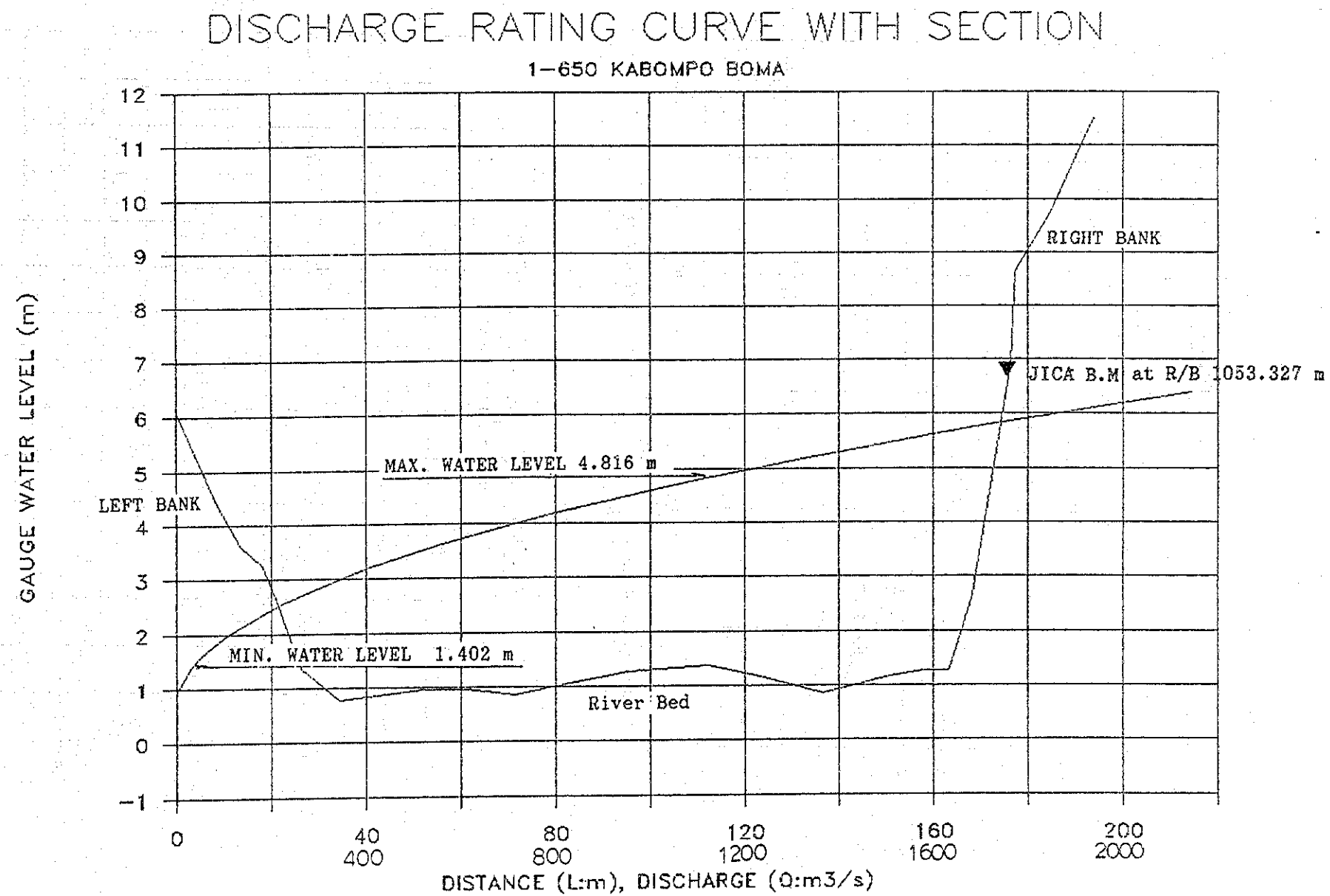
H –Q CURVE WITH CROSS SECTION

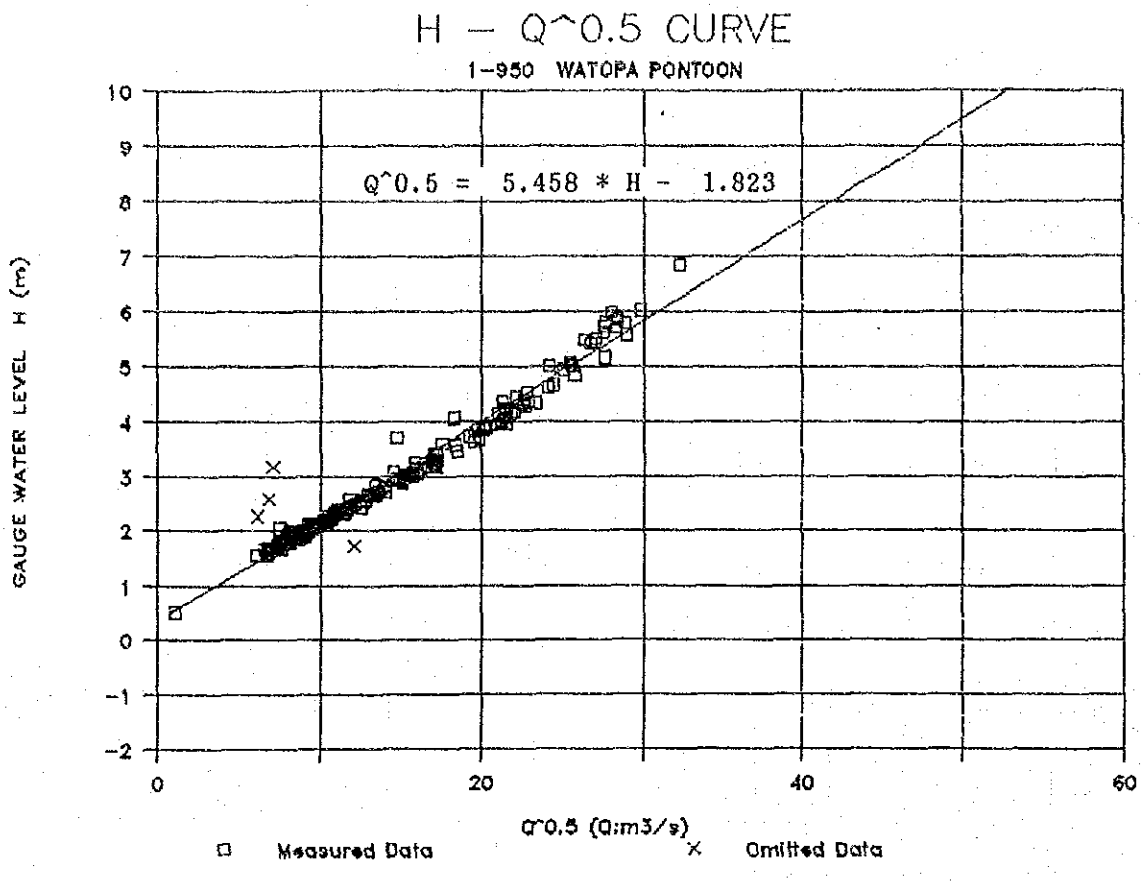
1–150 ZAMBEZI PUMP HOUSE

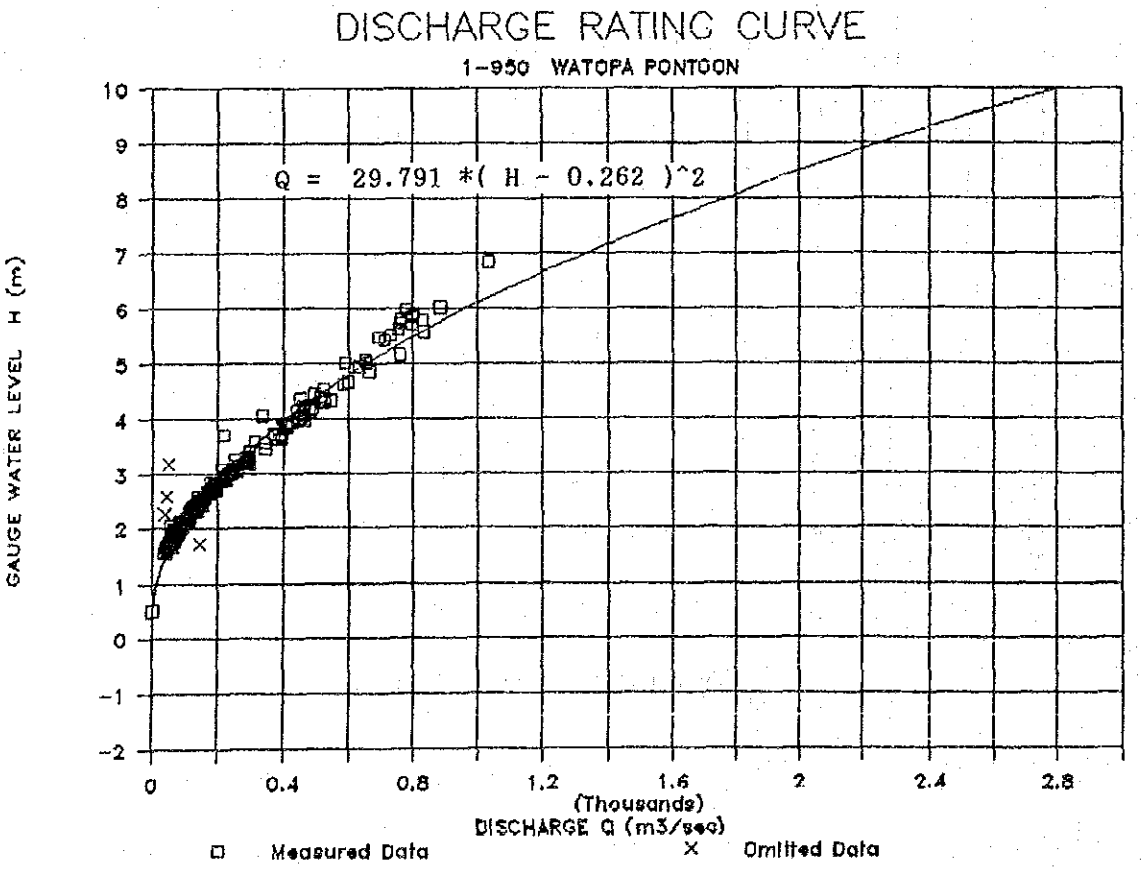



H - Q^0.5 CURVE
1-650 KABOMPO BOMA
GAUGE WATER LEVEL H (m)
Q^0.5 = 8.145 * H - 5.823
0
10
20
30
40
1
2
3
4
5
6
Q^0.5 (m3/s)
Measured Data


DISCHAGE RATING CURVE
1-650 KABOMPO BOMA
GAUGE WATER LEVEL H (m)
Q = 66.342 *(H - 0.715)^2
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
(Thousands)
DISCHARGE (Q:m3/s)
Measured Data

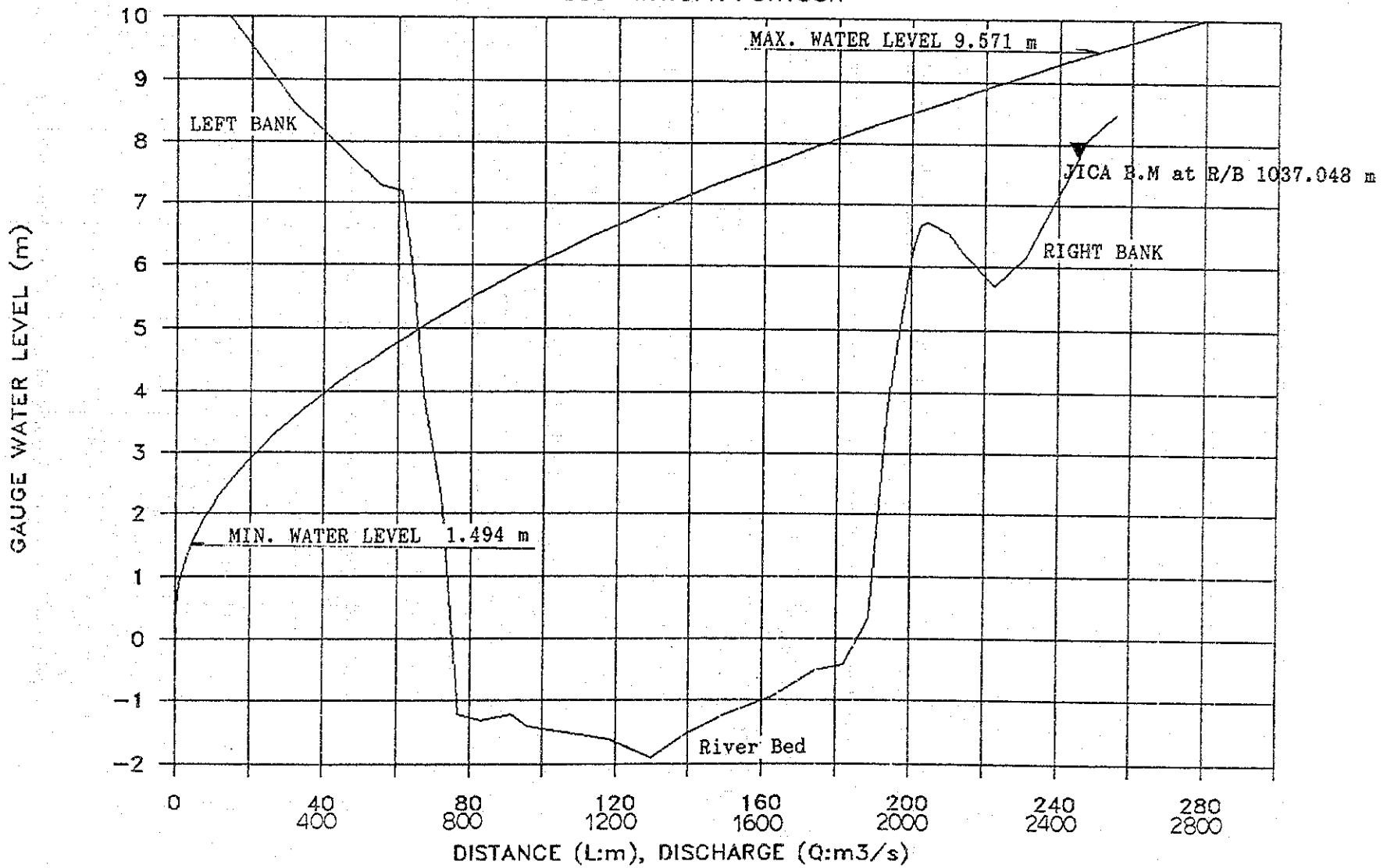

DISCHARGE RATING CURVE WITH SECTION
1-650 KABOMPO BOMA
GAUGE WATER LEVEL (m)
12
11
10
9
8
7
6
5
4
3
2
1
0
-1
RIGHT BANK
JICA B.M at R/B 1053.327 m
MAX. WATER LEVEL 4.816 m
LEFT BANK
MIN. WATER LEVEL 1.402 m
River Bed
0
40
400
80
800
120
1200
160
1600
200
2000
DISTANCE (L:m), DISCHARGE (Q:m3/s)

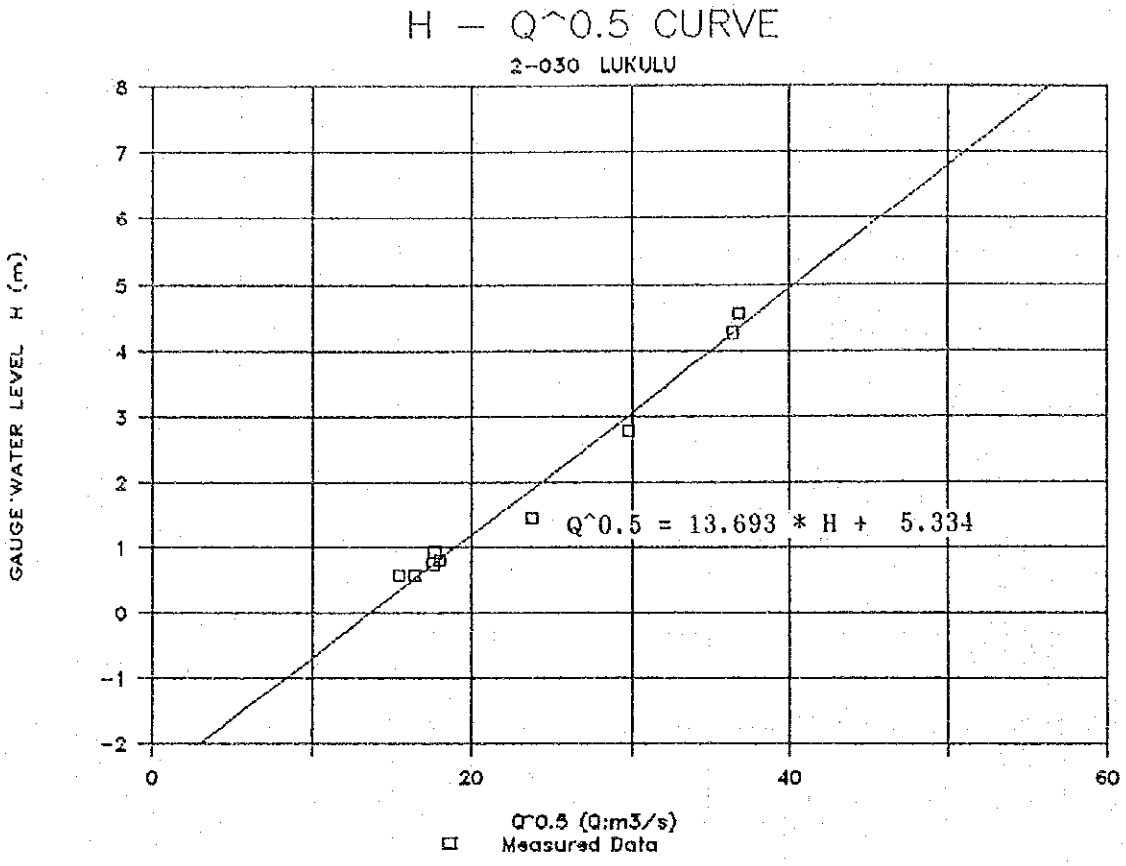

H - Q^0.5 CURVE
1-950 WATOPA PONTOON
Q^0.5 = 5.458 * H - 1.823
GAUGE WATER LEVEL H (m)
Q^0.5 (Q:m3/s)
Measured Data
Omitted Data

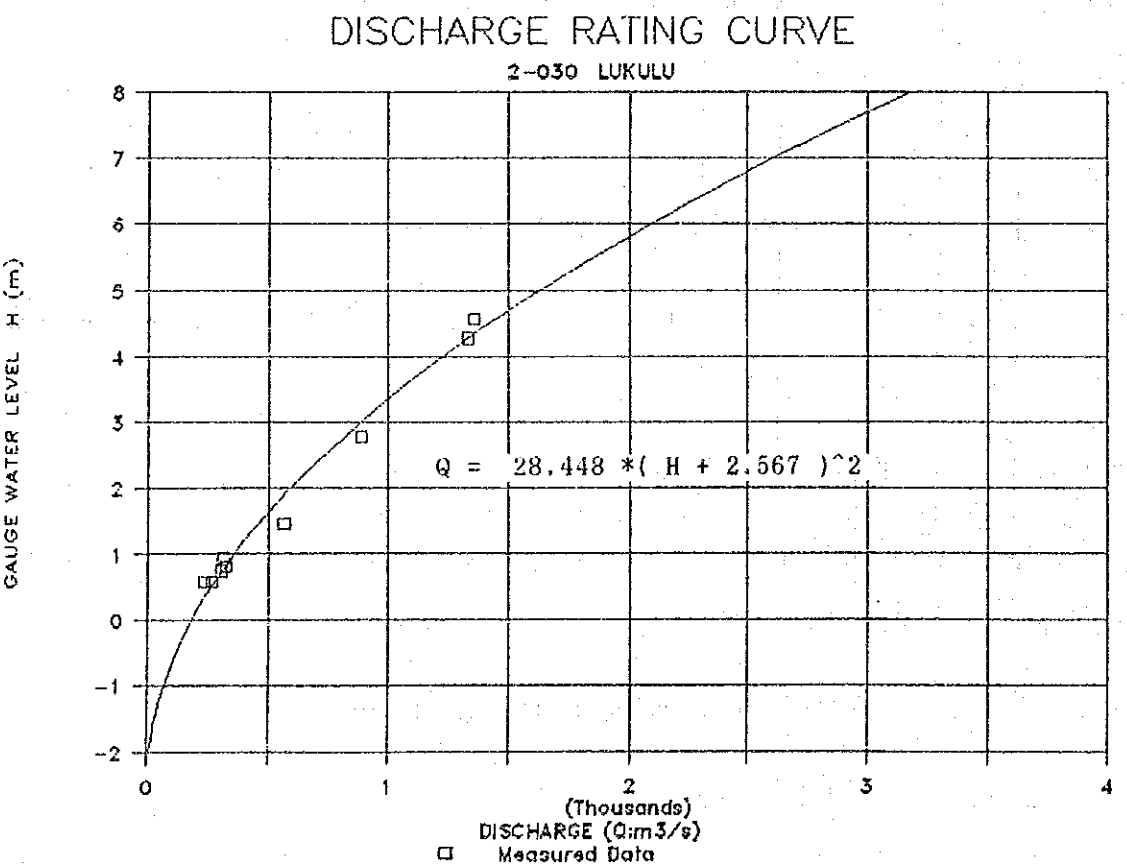

DISCHARGE RATING CURVE
1-950 WATOPA PONTOON
Q = 29.791 *(H - 0.262)^2
GAUGE WATER LEVEL H (m)
(Thousands)
DISCHARGE Q (m3/sec)
Measured Data
Omitted Data

DISCHARGE RATING CURVE WITH SECTION

1-950 WATOPA PONTOON

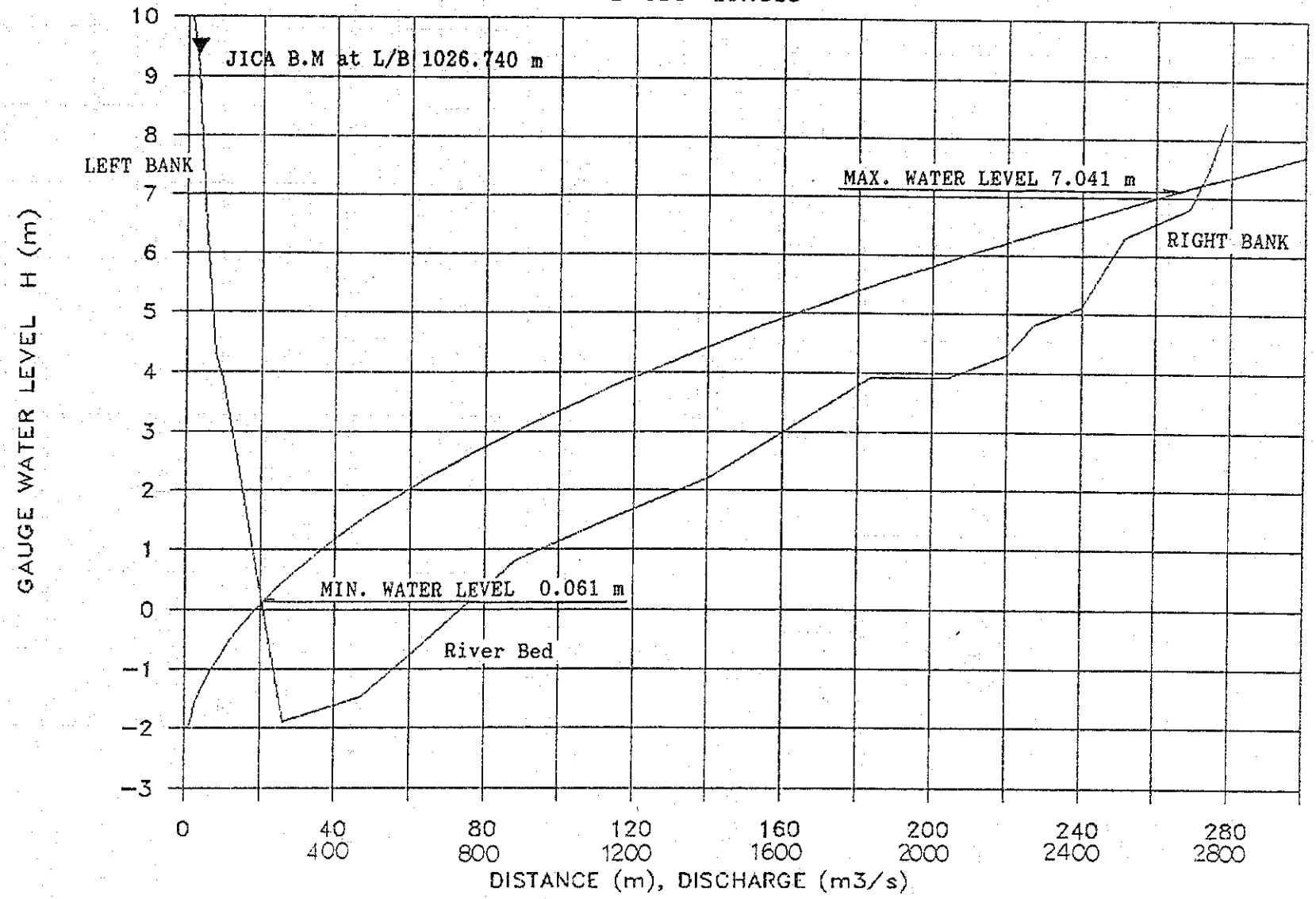


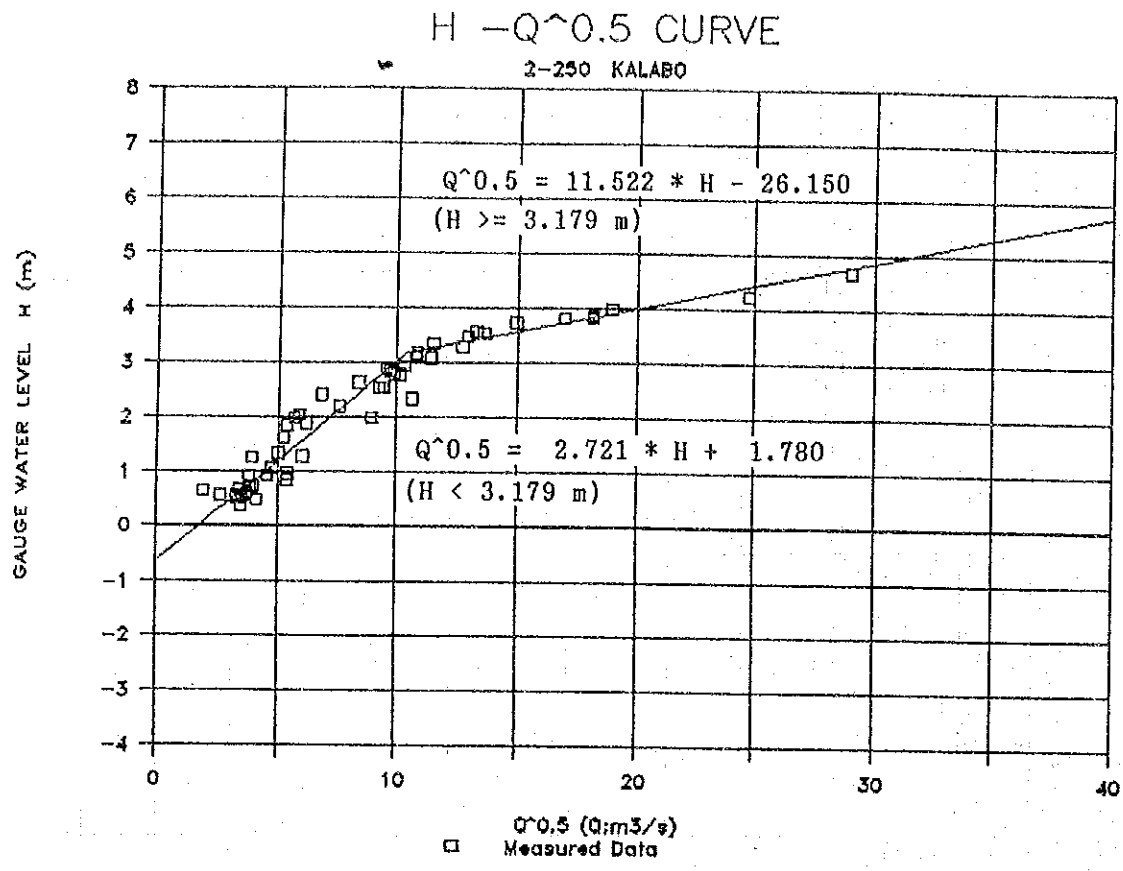

H — Q^0.5 CURVE
2-030 LUKULU
GAUGE WATER LEVEL H (m)
Q^0.5 = 13.693 * H + 5.334
Q^0.5 (Q:m3/s)
Measured Data

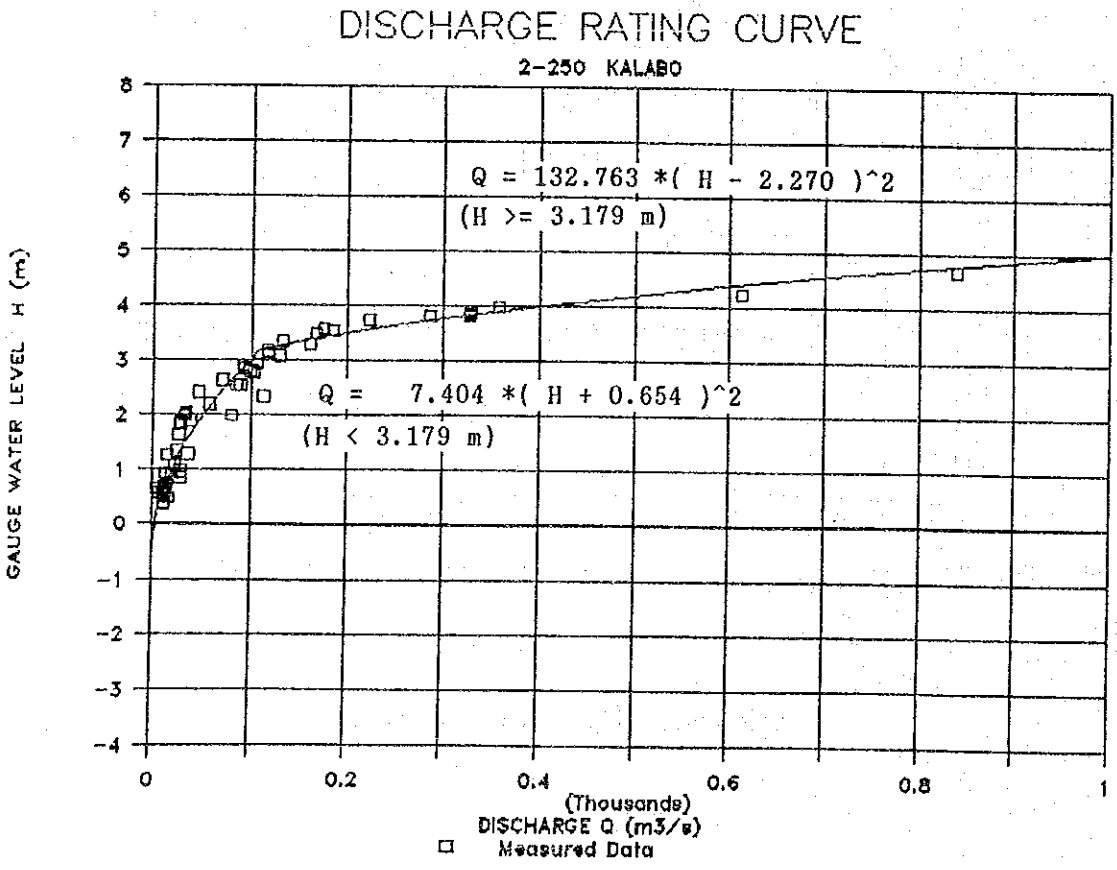

DISCHARGE RATING CURVE
2-030 LUKULU
GAUGE WATER LEVEL H (m)
Q = 28.448 *(H + 2.567)^2
(Thousands)
DISCHARGE (Q:m3/s)
Measured Data

DISCHARGE RATING CURVE WITH SECTION

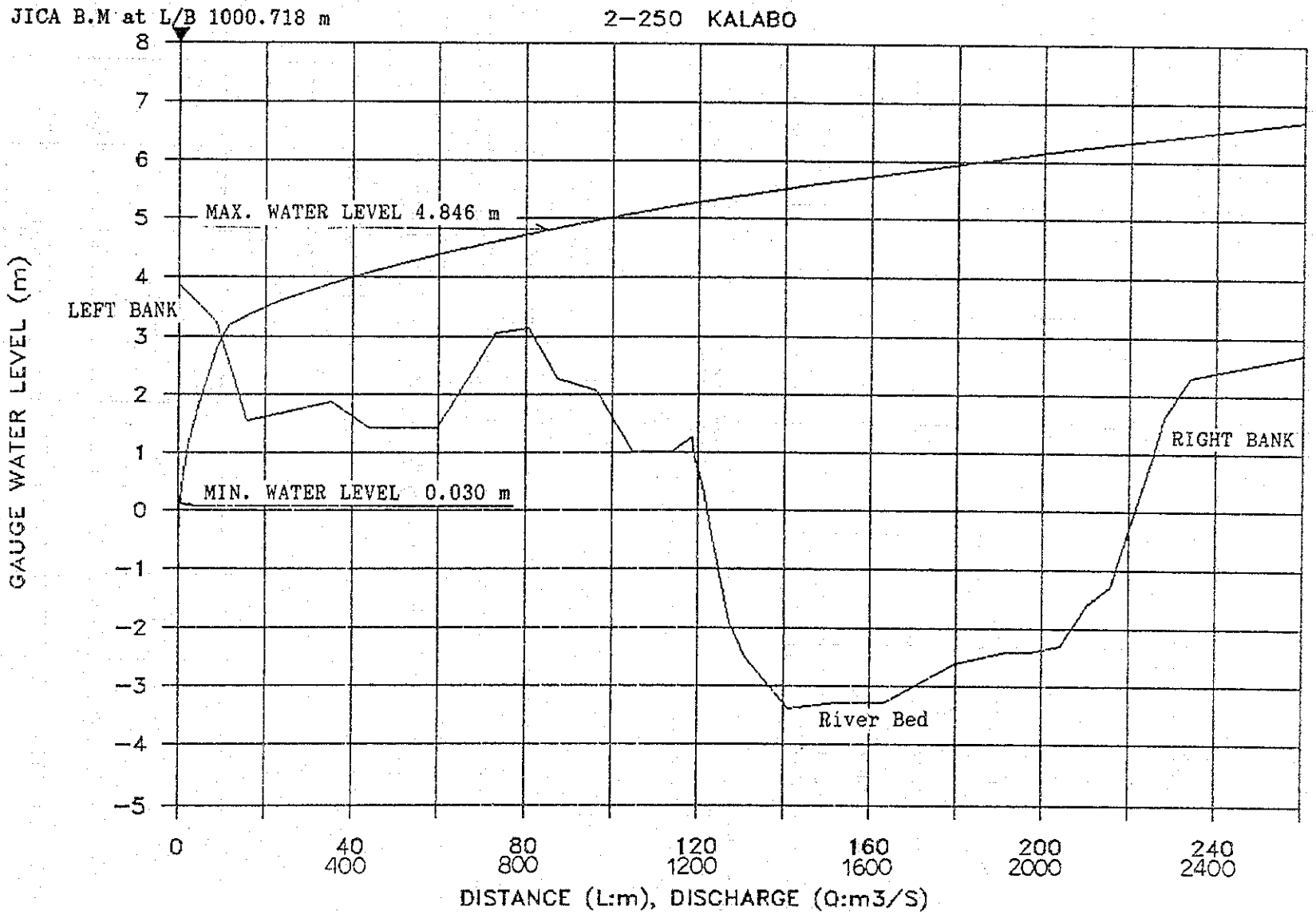
2-030 LUKULU



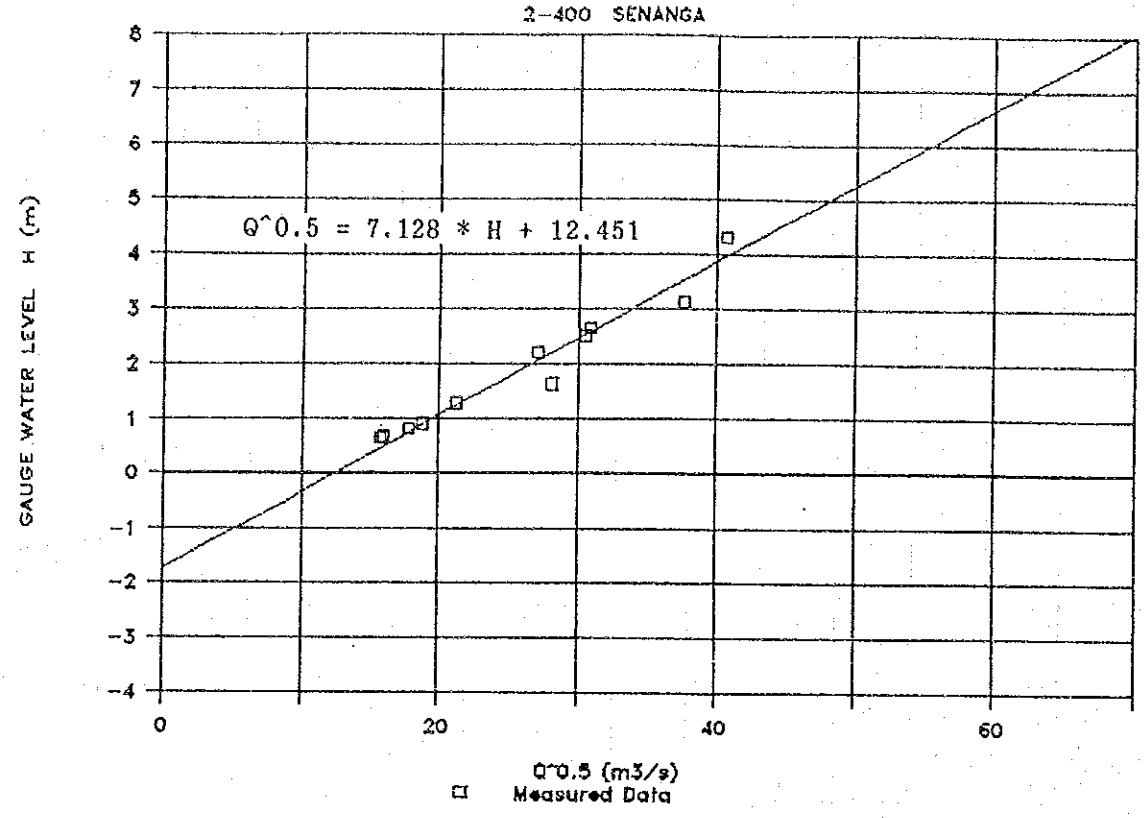

H -Q^0.5 CURVE
2-250 KALABO
Q^0.5 = 11.522 * H - 26.150
(H >= 3.179 m)
Q^0.5 = 2.721 * H + 1.780
(H < 3.179 m)
GAUGE WATER LEVEL H (m)
Q^0.5 (Q:m3/s)
Measured Data


DISCHARGE RATING CURVE
2-250 KALABO
Q = 132.763 *(H - 2.270)^2
(H >= 3.179 m)
Q = 7.404 *(H + 0.654)^2
(H < 3.179 m)
GAUGE WATER LEVEL H (m)
(Thousands)
DISCHARGE Q (m3/s)
Measured Data

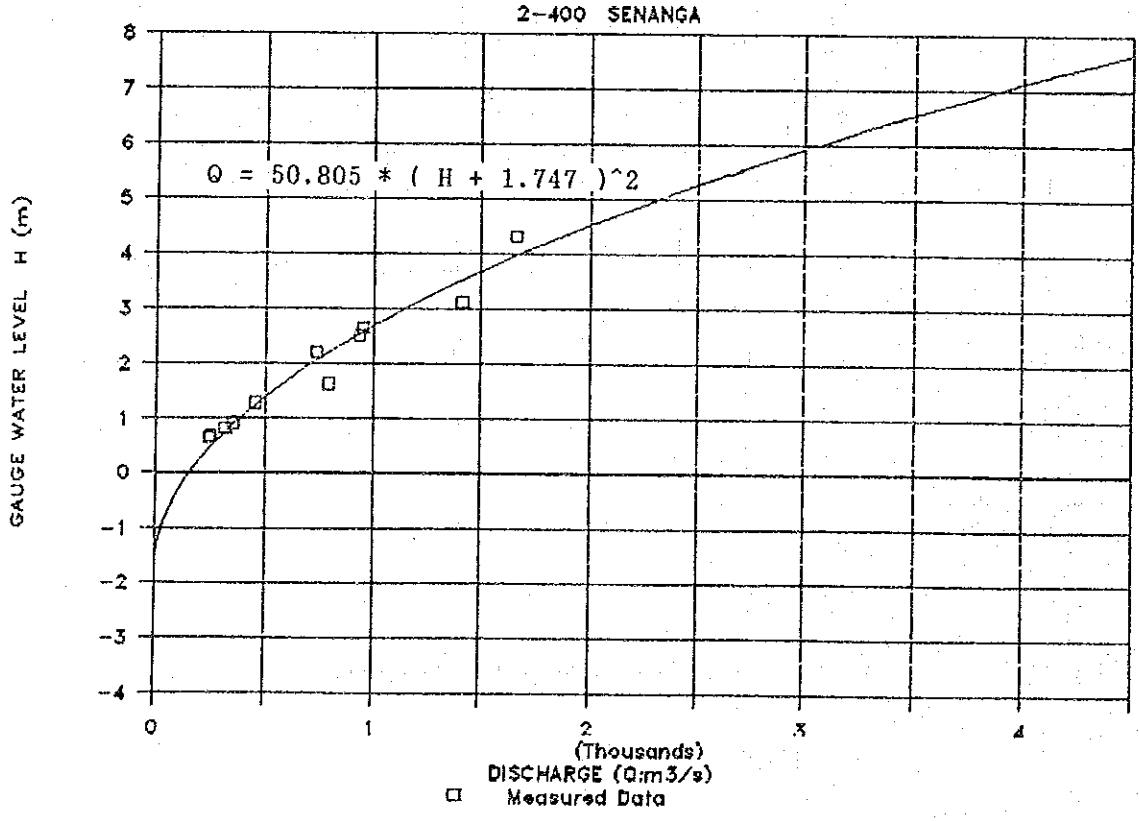
DISCHARGE RATING CURVE WITH SECTION

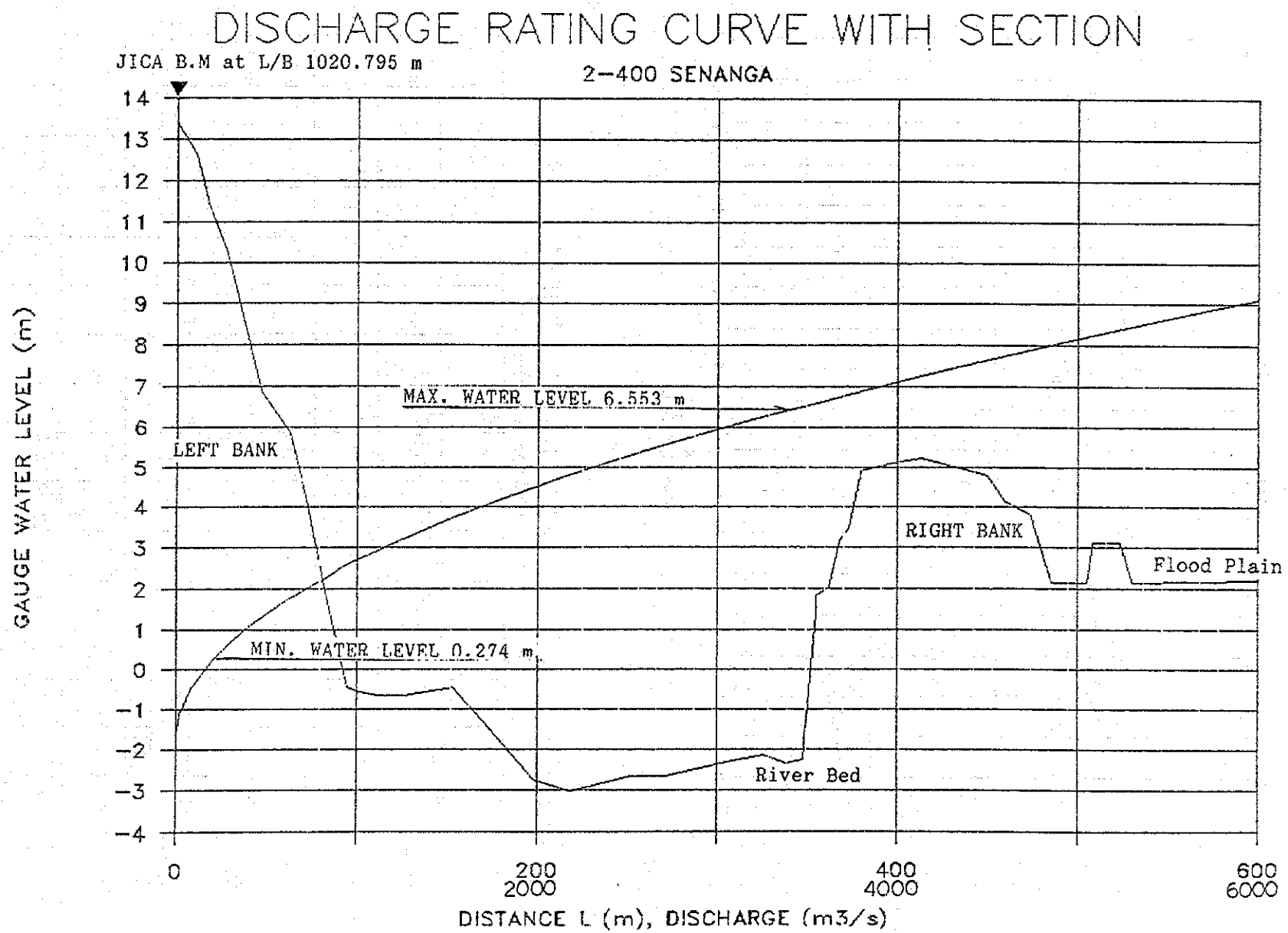


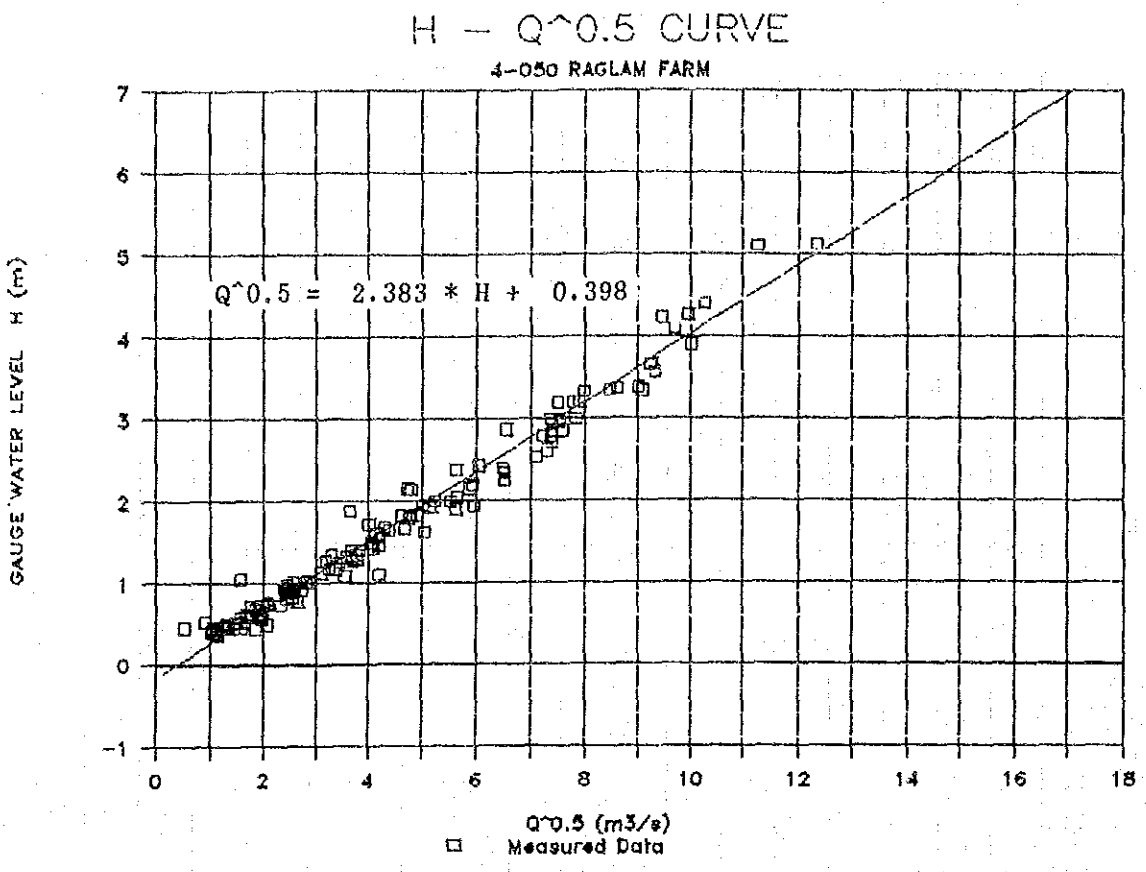
H – Q^0.5 CURVE

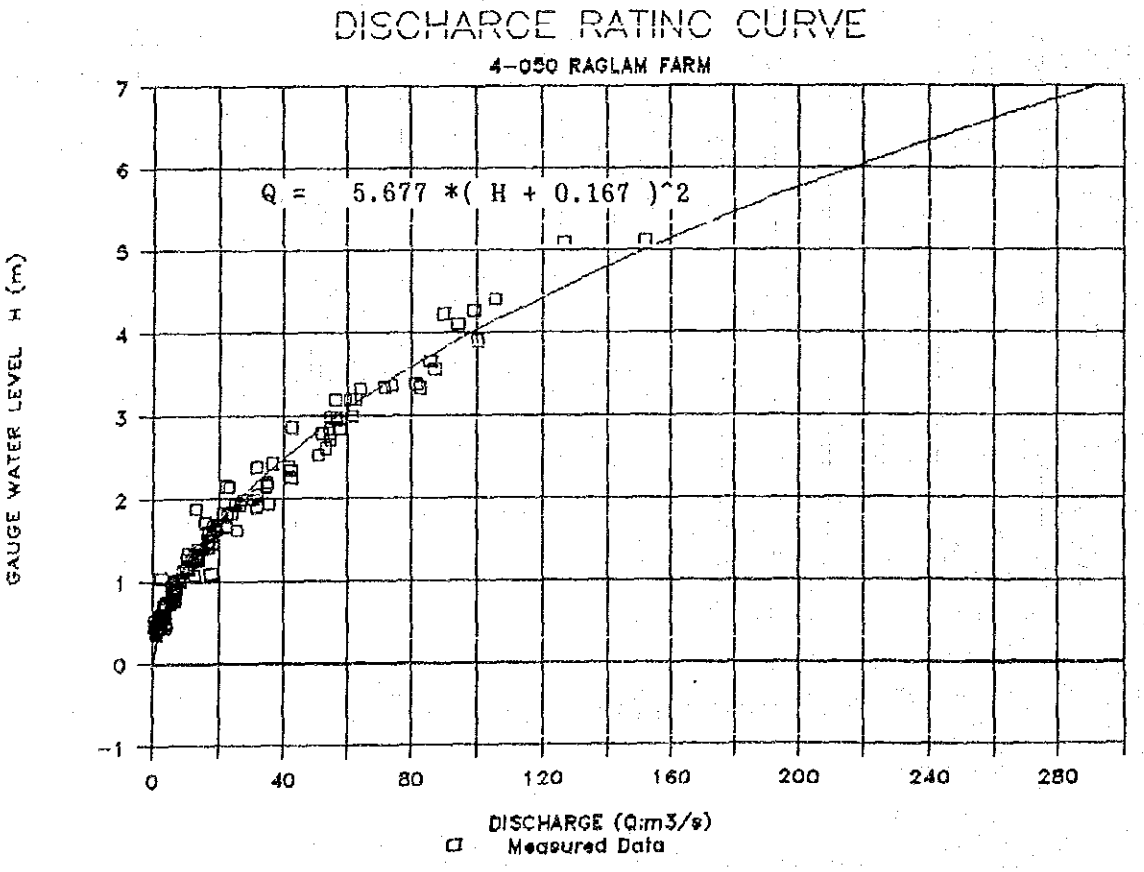


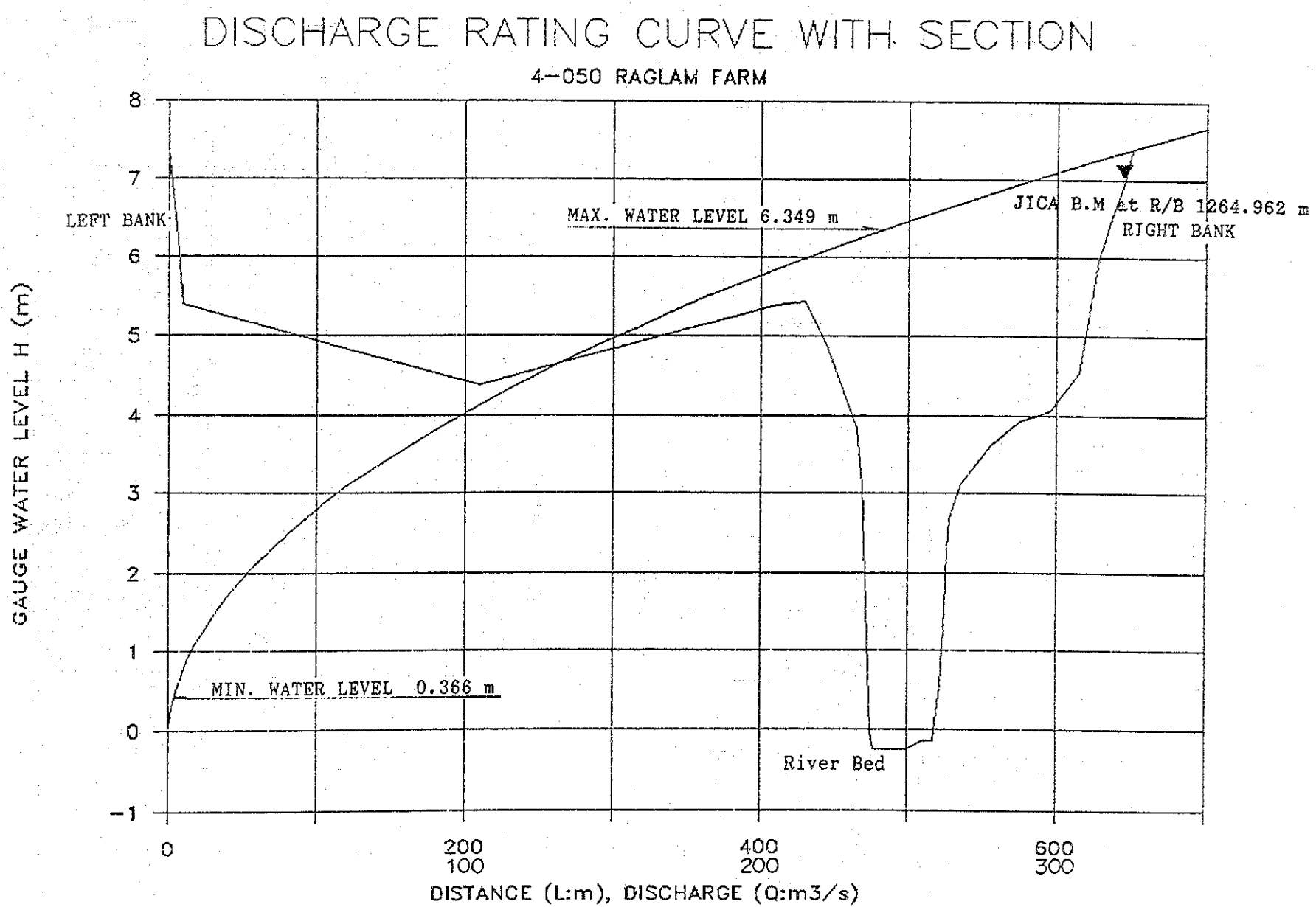
DISCHARGE RATING CURVE



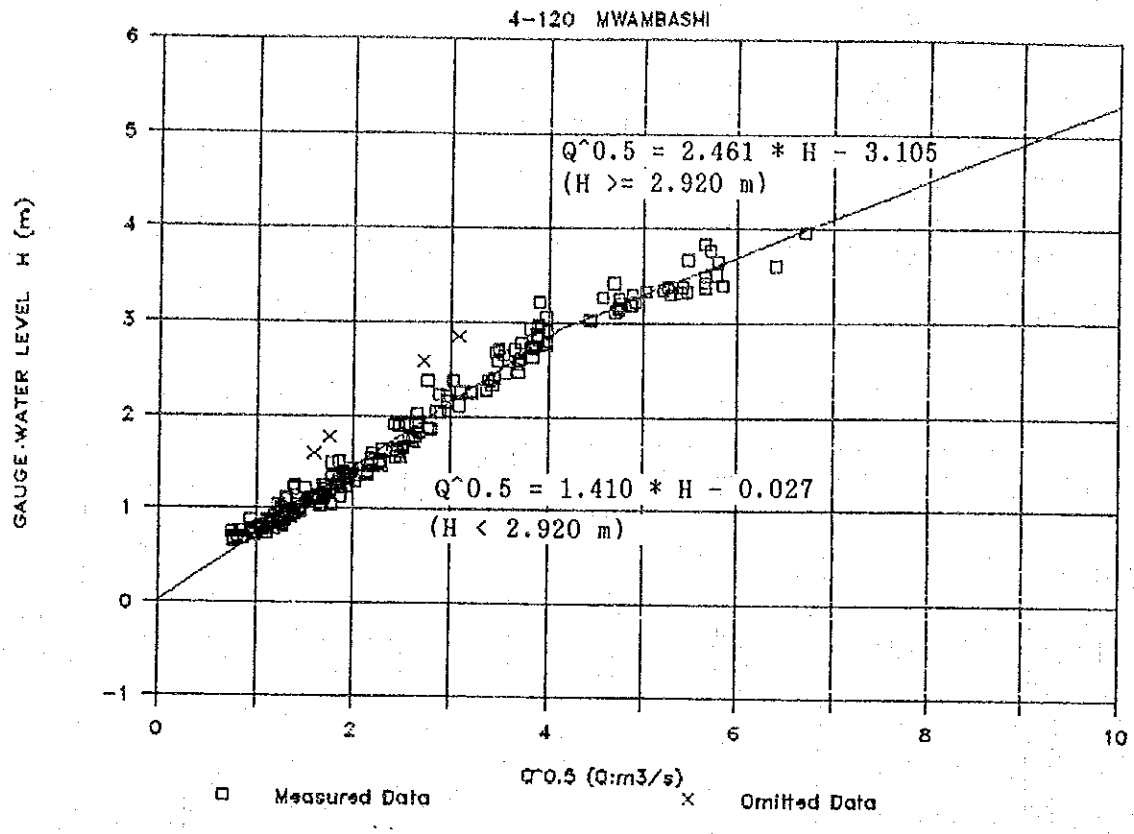

DISCHARGE RATING CURVE WITH SECTION
JICA B.M at L/B 1020.795 m
2--400 SENANGA
GAUGE WATER LEVEL (m)
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
−1
−2
−3
−4
MAX. WATER LEVEL 6.553 m
LEFT BANK
RIGHT BANK
Flood Plain
MIN. WATER LEVEL 0.274 m
River Bed
0
200
2000
400
4000
600
6000
DISTANCE L (m), DISCHARGE (m3/s)


H - Q^0.5 CURVE
4-050 RAGLAM FARM
Q^0.5 = 2.383 * H + 0.398
GAUGE WATER LEVEL H (m)
Q^0.5 (m3/s)
Measured Data

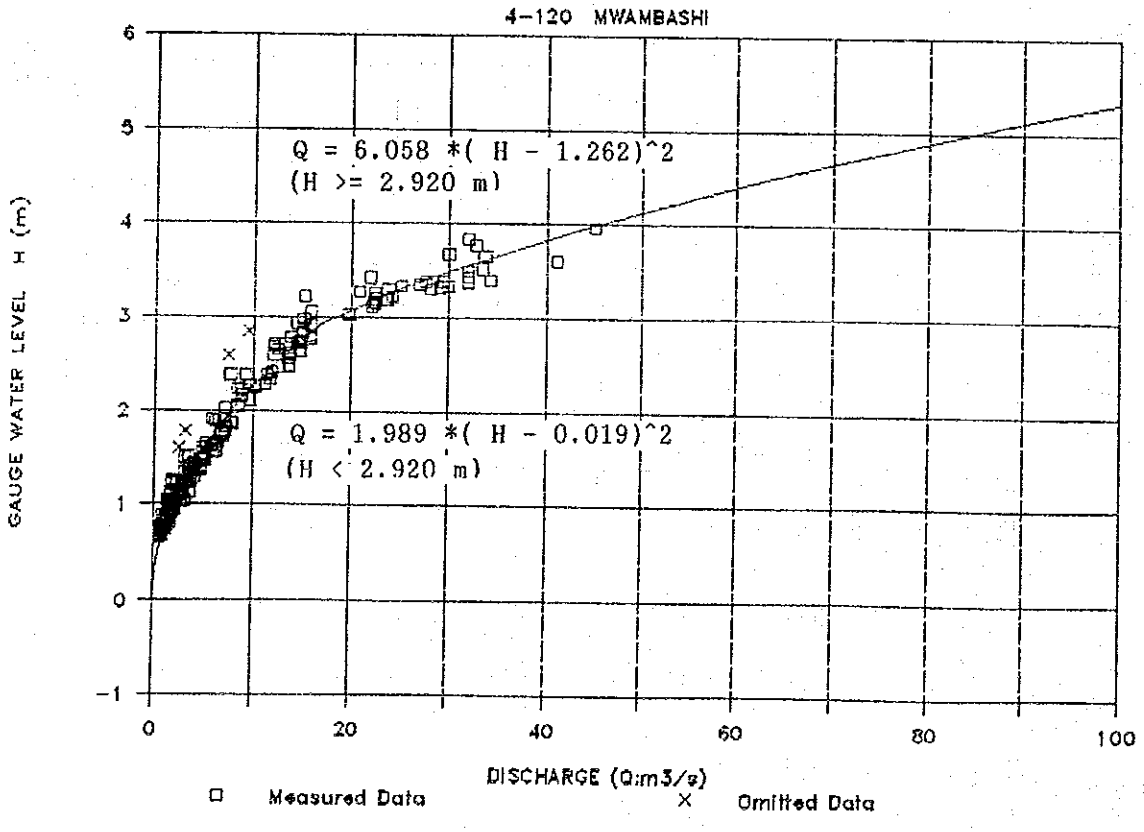

DISCHARGE RATING CURVE
4-050 RAGLAM FARM
Q = 5.677 *(H + 0.167)^2
GAUGE WATER LEVEL H (m)
DISCHARGE (Q:m3/s)
Measured Data

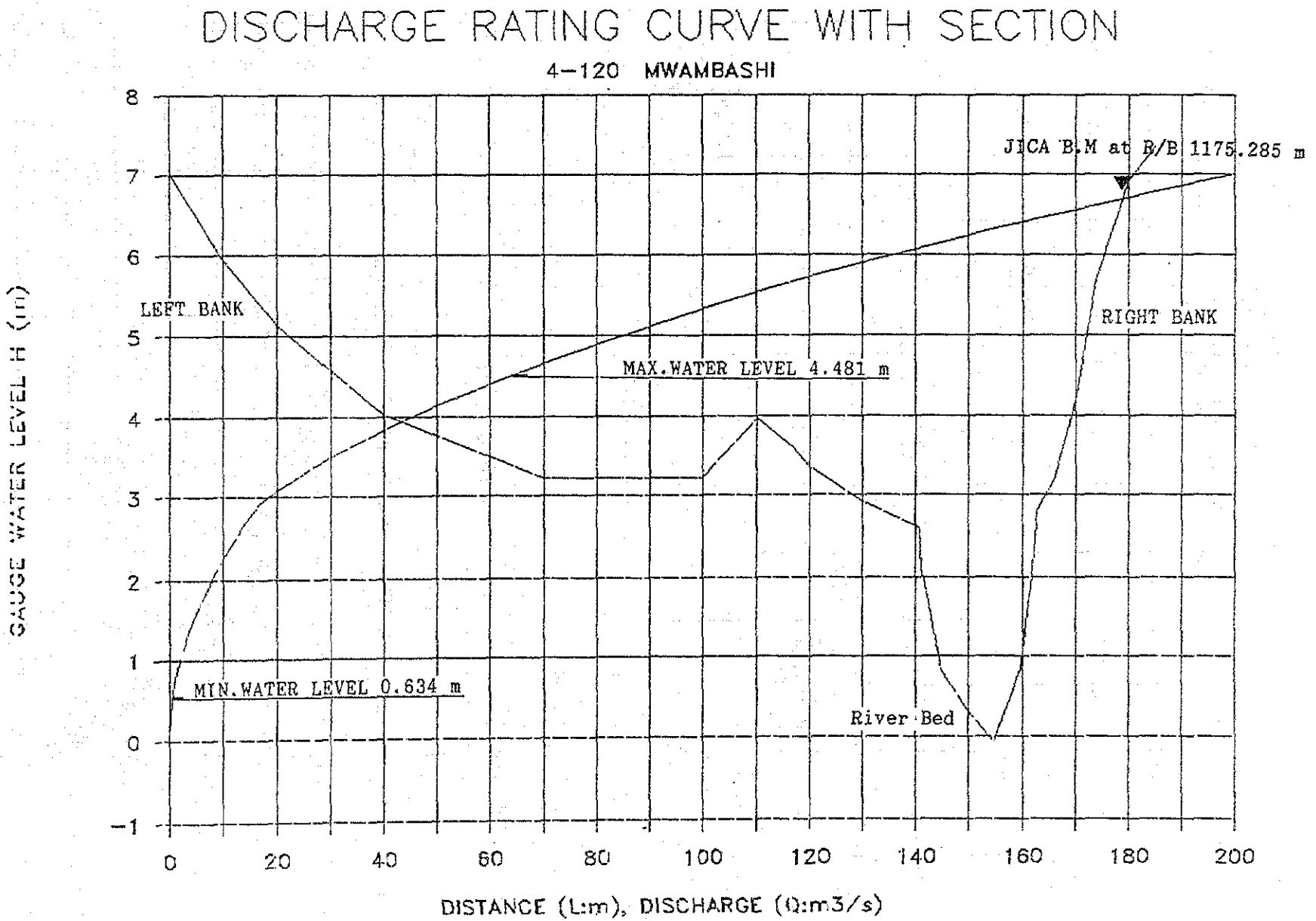

DISCHARGE RATING CURVE WITH SECTION
4-050 RAGLAM FARM
LEFT BANK
MAX. WATER LEVEL 6.349 m
JICA B.M at R/B 1264.962 m
RIGHT BANK
MIN. WATER LEVEL 0.366 m
River Bed
GAUGE WATER LEVEL H (m)
8
7
6
5
4
3
2
1
0
-1
0
200
100
400
200
600
300
DISTANCE (L:m), DISCHARGE (Q:m3/s)

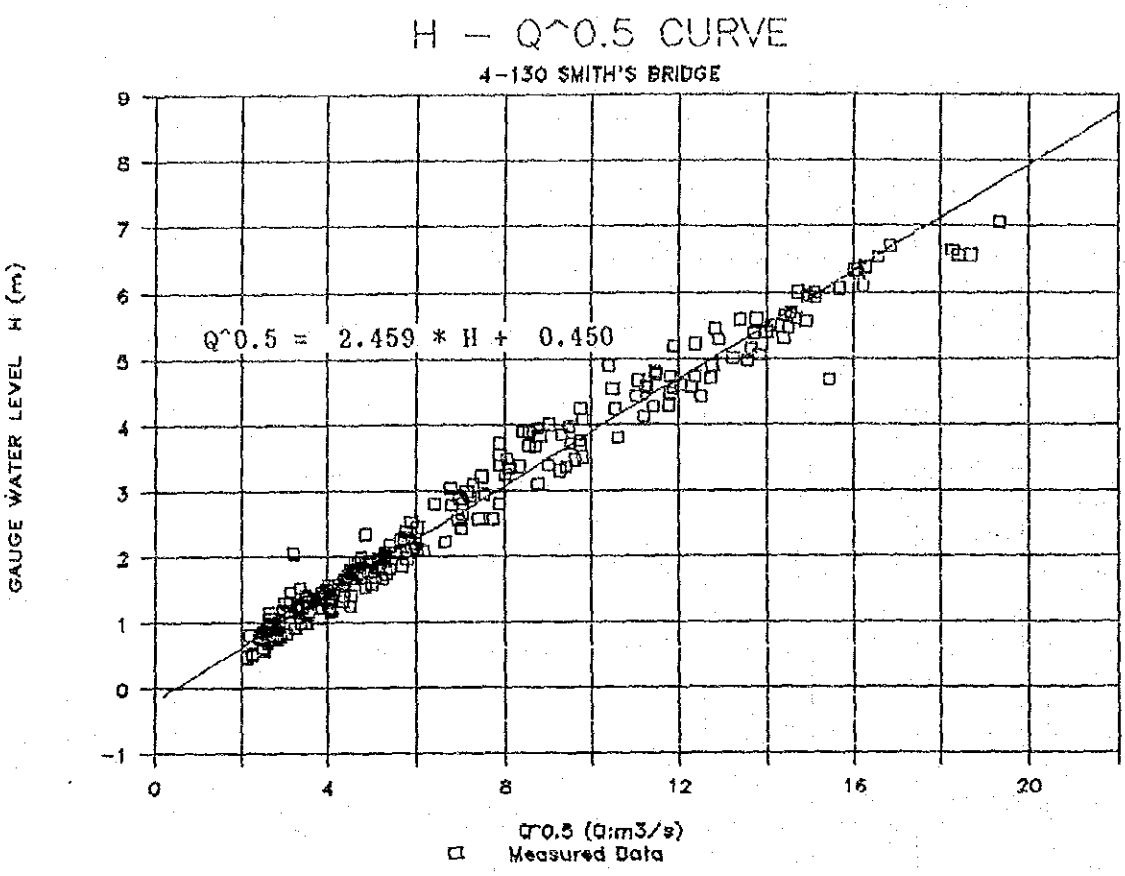
H – Q^0.5 CURVE

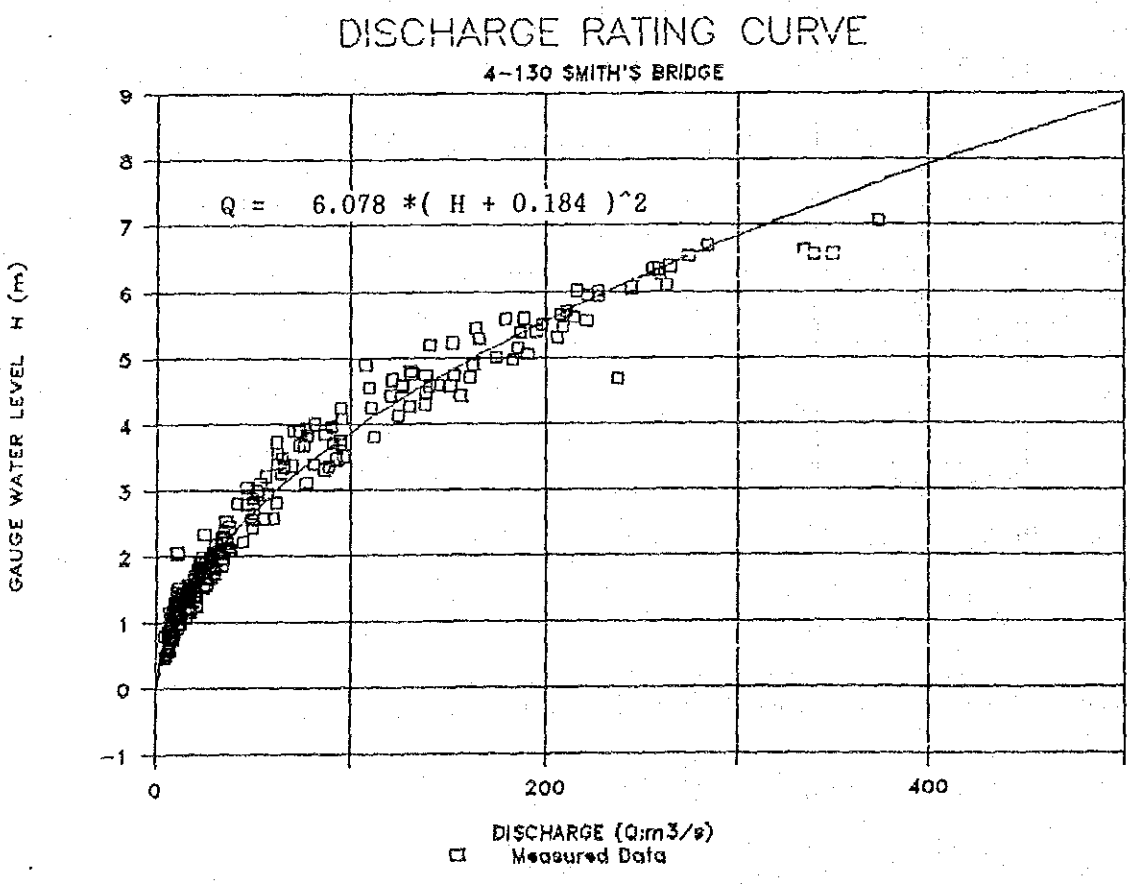


DISCHARGE RATING CURVE



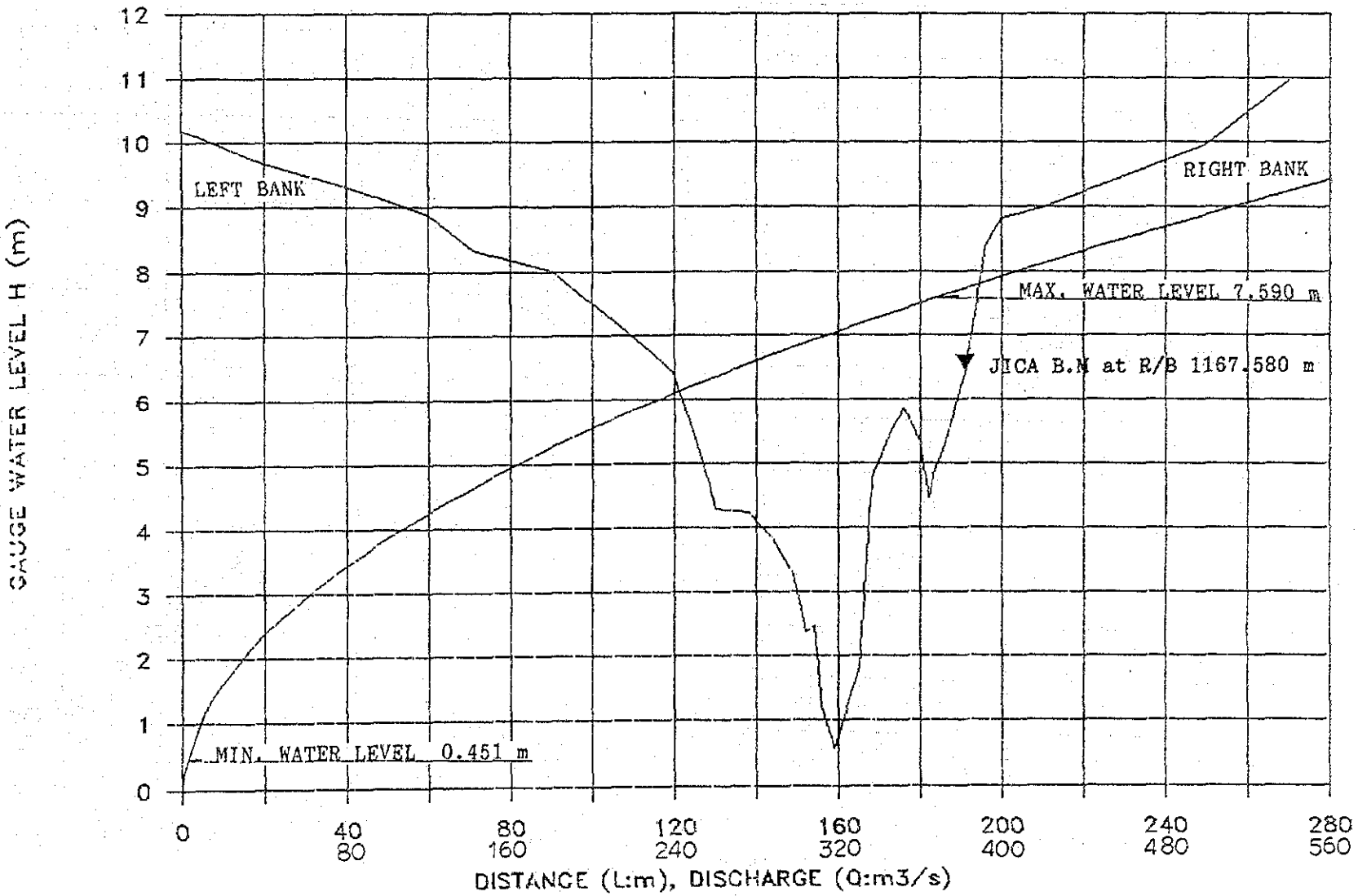

DISCHARGE RATING CURVE WITH SECTION
4—120 MWAMBASHI
JICA B.M at R/B 1175.285 m
LEFT BANK
RIGHT BANK
MAX.WATER LEVEL 4.481 m
MIN.WATER LEVEL 0.634 m
River Bed
GAUGE WATER LEVEL H (m)
DISTANCE (L:m), DISCHARGE (Q:m3/s)
8
7
6
5
4
3
2
1
0
-1
0
20
40
60
80
100
120
140
160
180
200

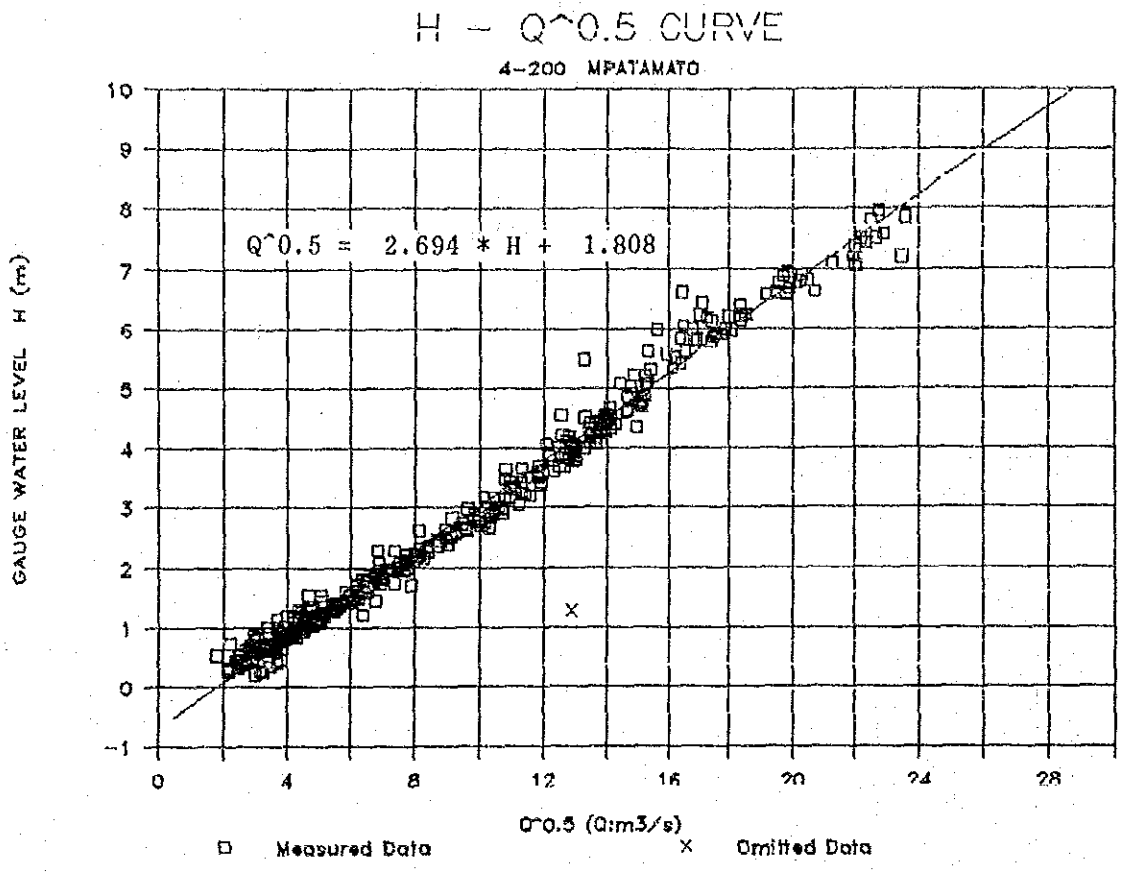

H — Q^0.5 CURVE
4-130 SMITH'S BRIDGE
Q^0.5 = 2.459 * H + 0.450
GAUGE WATER LEVEL H (m)
Q^0.5 (Q:m3/s)
Measured Data

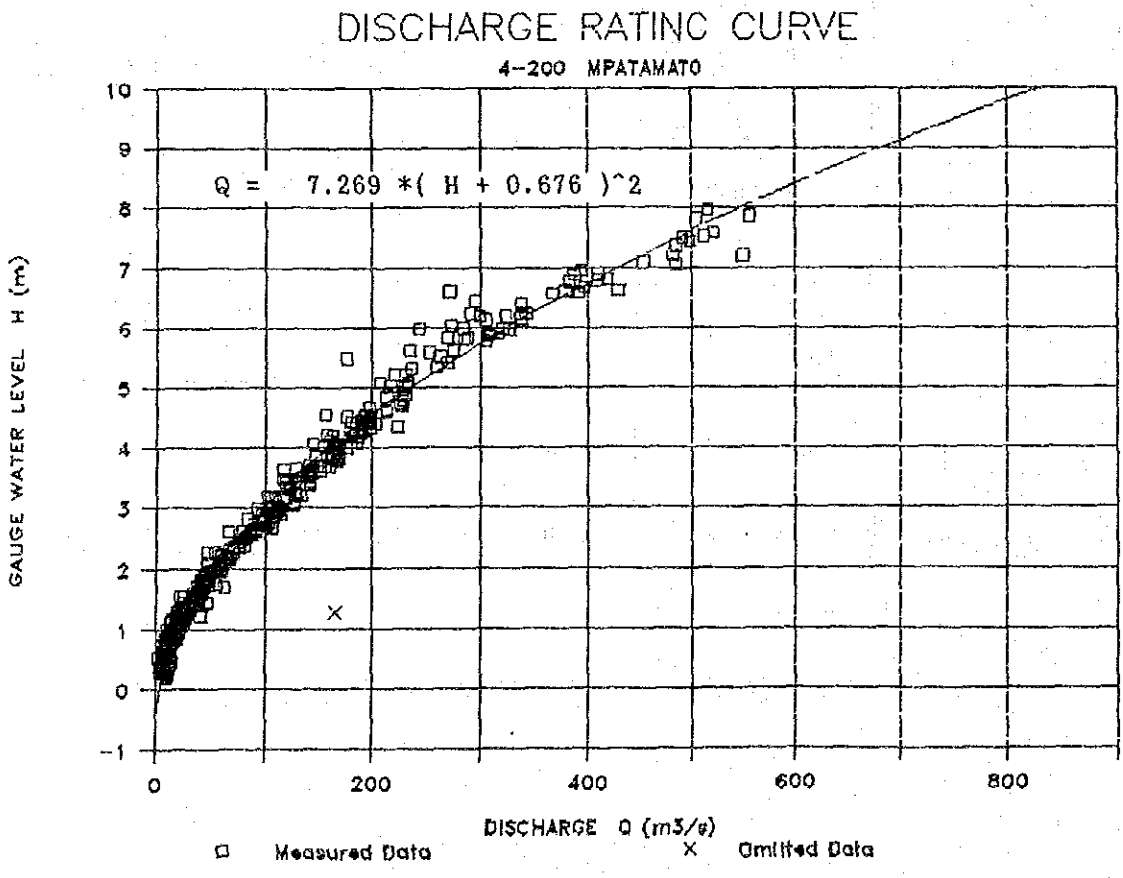

DISCHARGE RATING CURVE
4-130 SMITH'S BRIDGE
Q = 6.078 *(H + 0.184)^2
GAUGE WATER LEVEL H (m)
DISCHARGE (Q:m3/s)
Measured Data

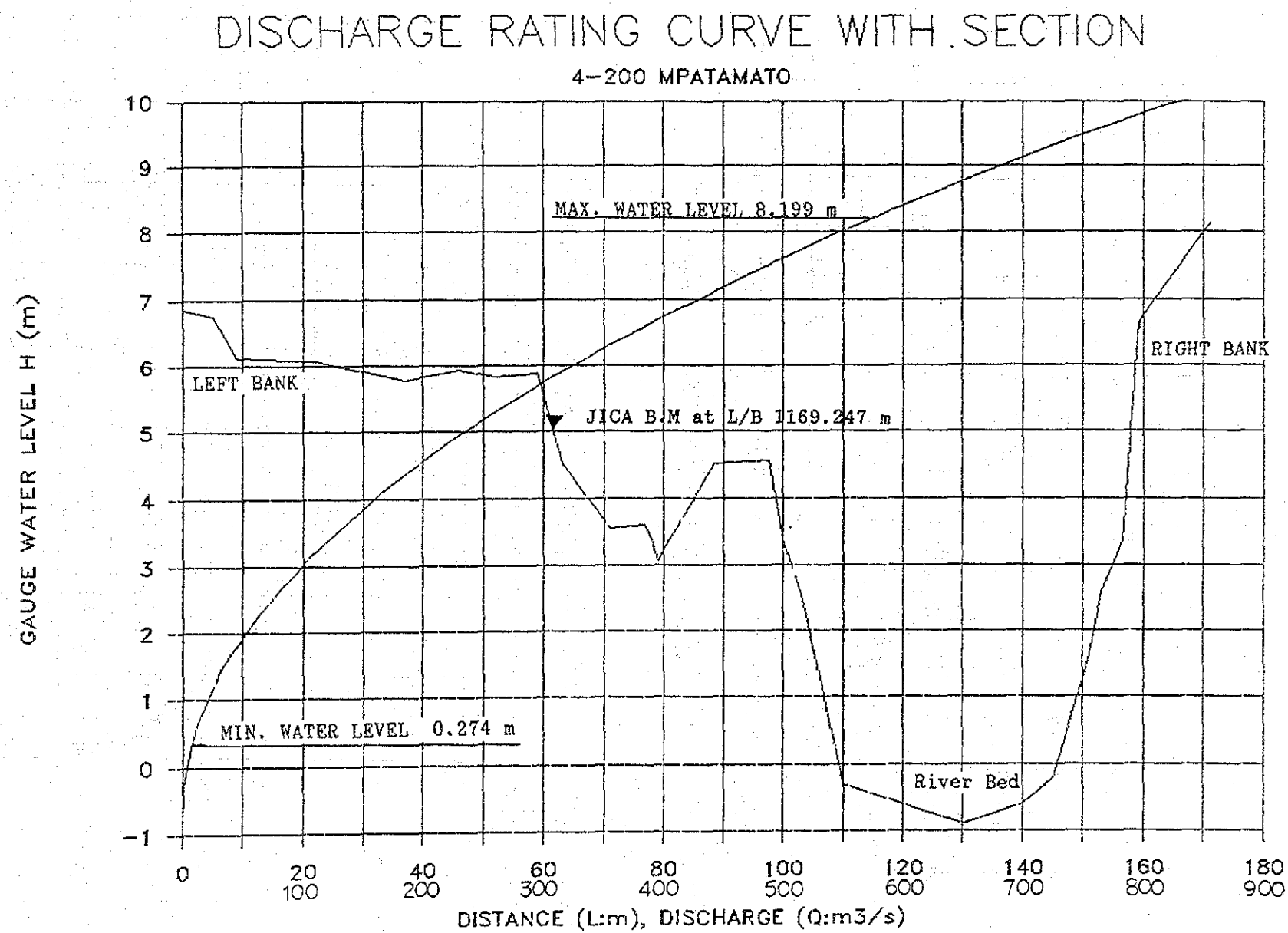
DISCHARGE RATING CURVE WITH SECTION

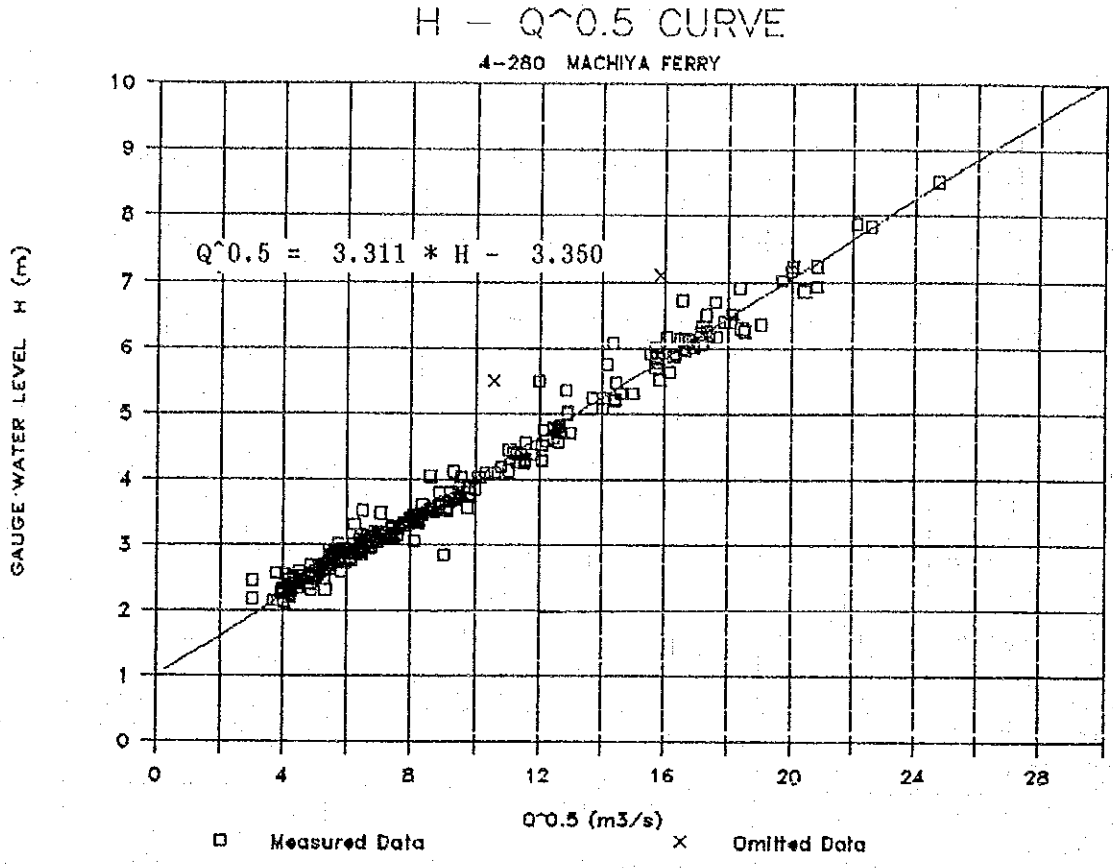
4-130 SMITH'S BRIDGE

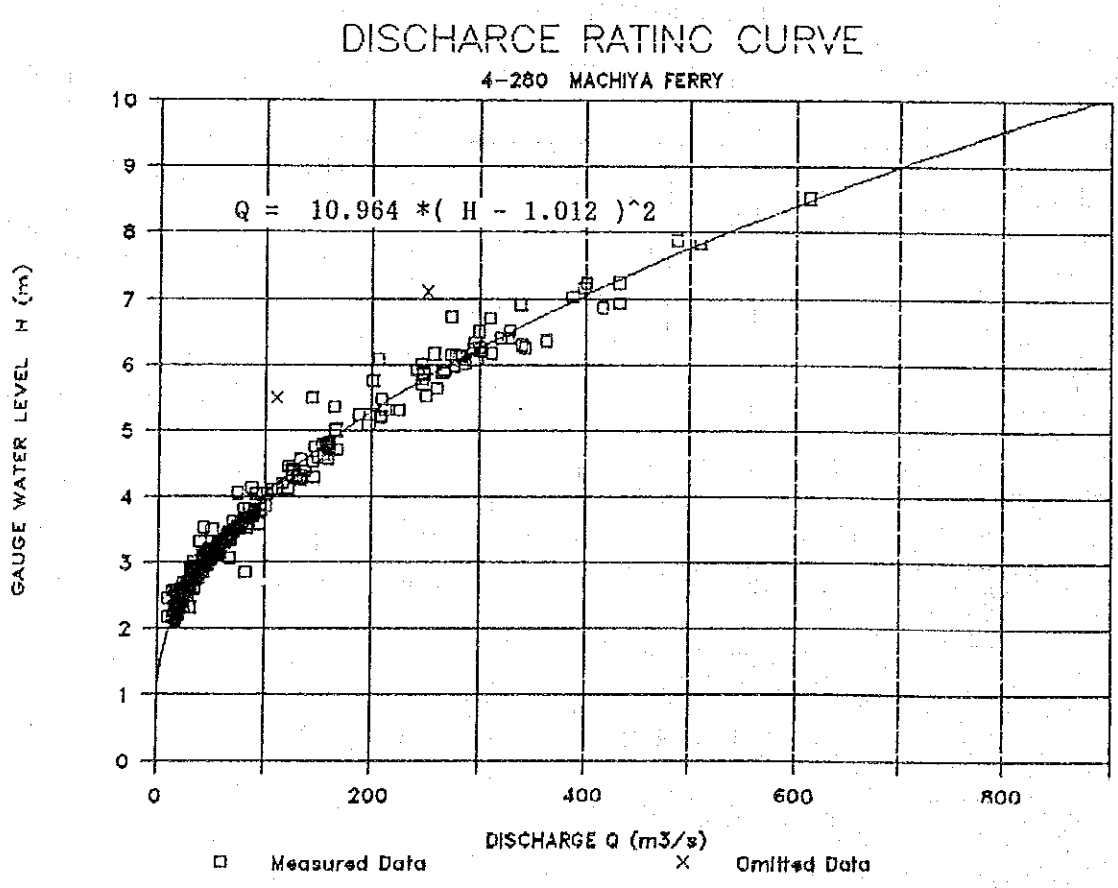



H - Q^0.5 CURVE
4-200 MPATAMATO
Q^0.5 = 2.694 * H + 1.808
GAUGE WATER LEVEL H (m)
Q^0.5 (Q:m3/s)
Measured Data
Omitted Data


DISCHARGE RATING CURVE
4-200 MPATAMATO
Q = 7.269 *(H + 0.676)^2
GAUGE WATER LEVEL H (m)
DISCHARGE Q (m3/s)
Measured Data
Omitted Data

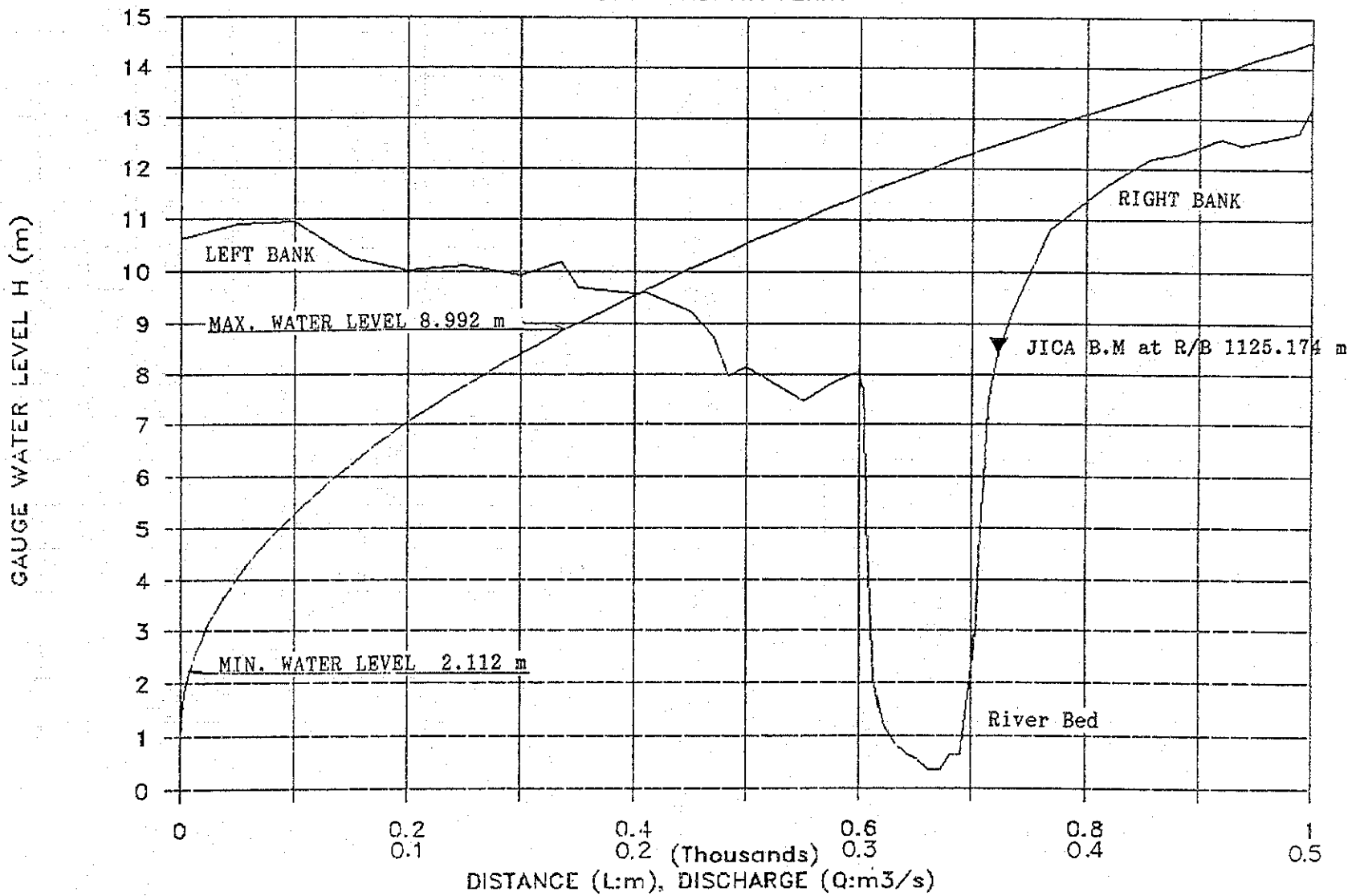

DISCHARGE RATING CURVE WITH SECTION
4-200 MPATAMATO
GAUGE WATER LEVEL H (m)
10
9
8
7
6
5
4
3
2
1
0
-1
MAX. WATER LEVEL 8.199 m
LEFT BANK
JICA B.M at L/B 1169.247 m
RIGHT BANK
MIN. WATER LEVEL 0.274 m
River Bed
0
20
100
40
200
60
300
80
400
100
500
120
600
140
700
160
800
180
900
DISTANCE (L:m), DISCHARGE (Q:m3/s)


H – Q^0.5 CURVE
4-280 MACHIYA FERRY
Q^0.5 = 3.311 * H - 3.350
GAUGE WATER LEVEL H (m)
Q^0.5 (m3/s)
Measured Data
Omitted Data

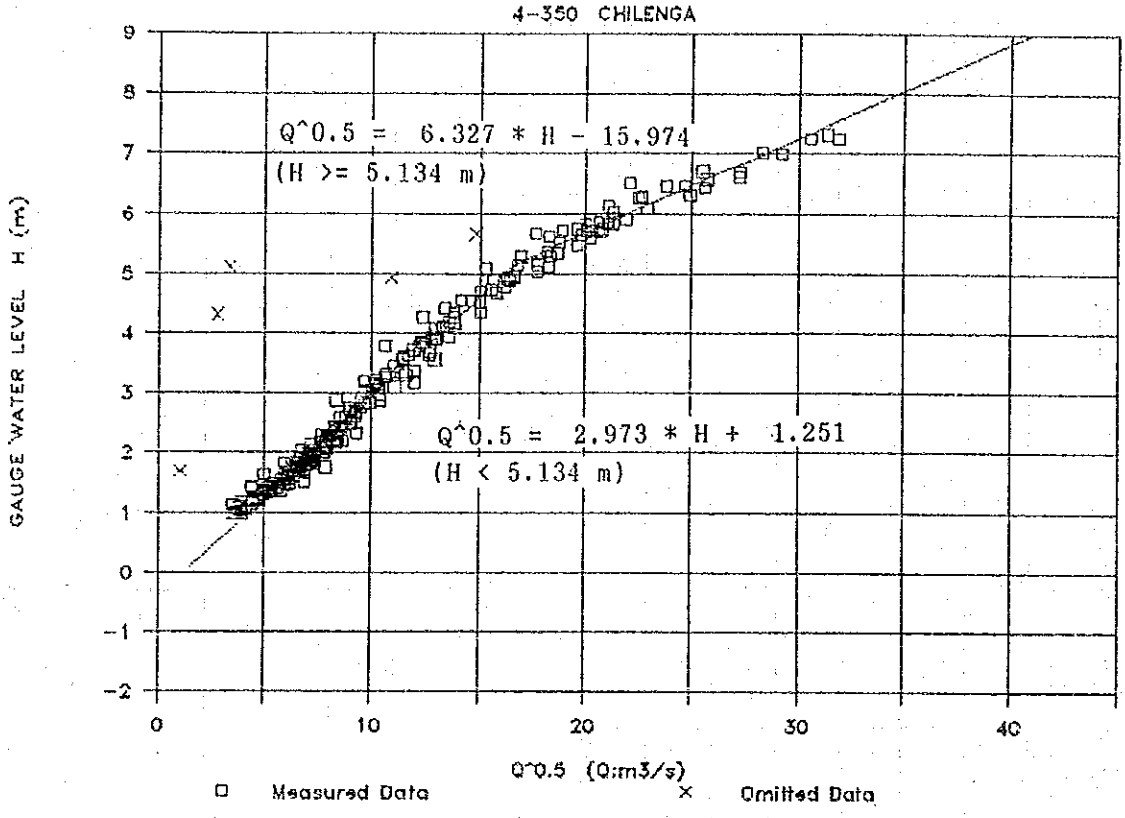

DISCHARGE RATING CURVE
4-280 MACHIYA FERRY
Q = 10.964 *(H - 1.012)^2
GAUGE WATER LEVEL H (m)
DISCHARGE Q (m3/s)
Measured Data
Omitted Data

DISCHARGE RATING CURVE WITH SECTION

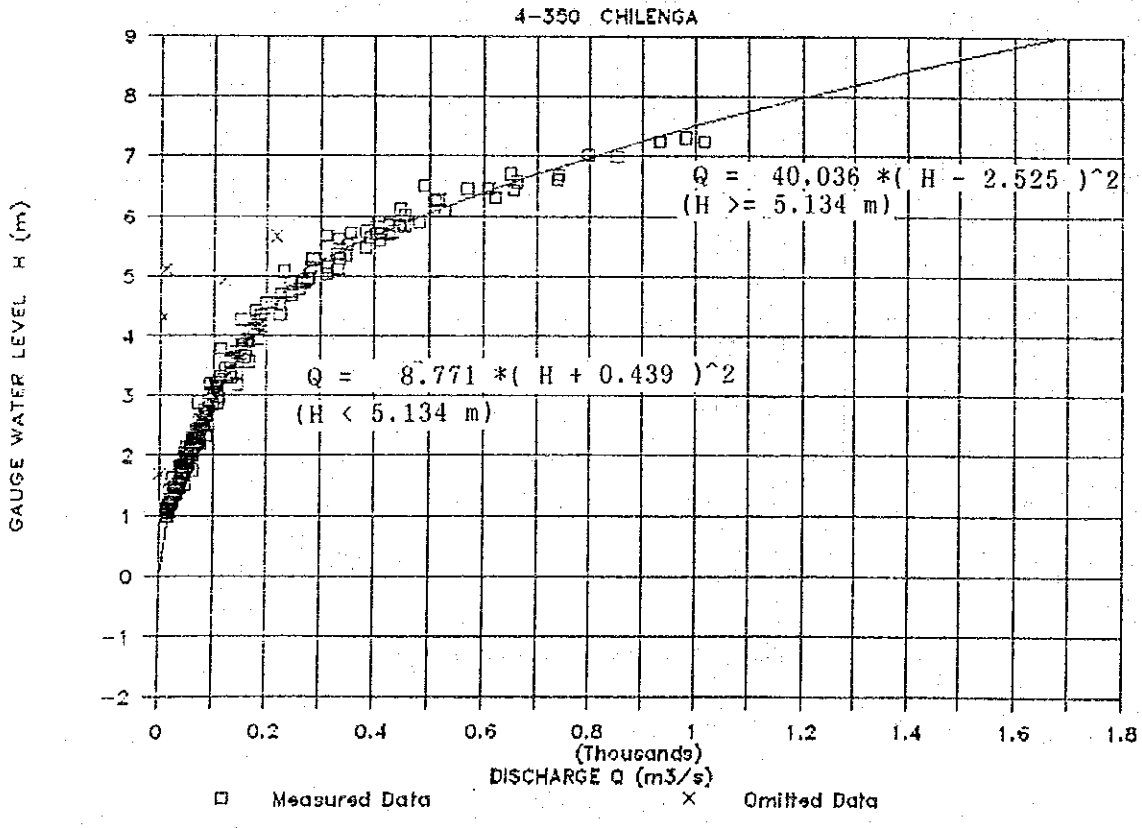
4-280 MACHIYA FERRY

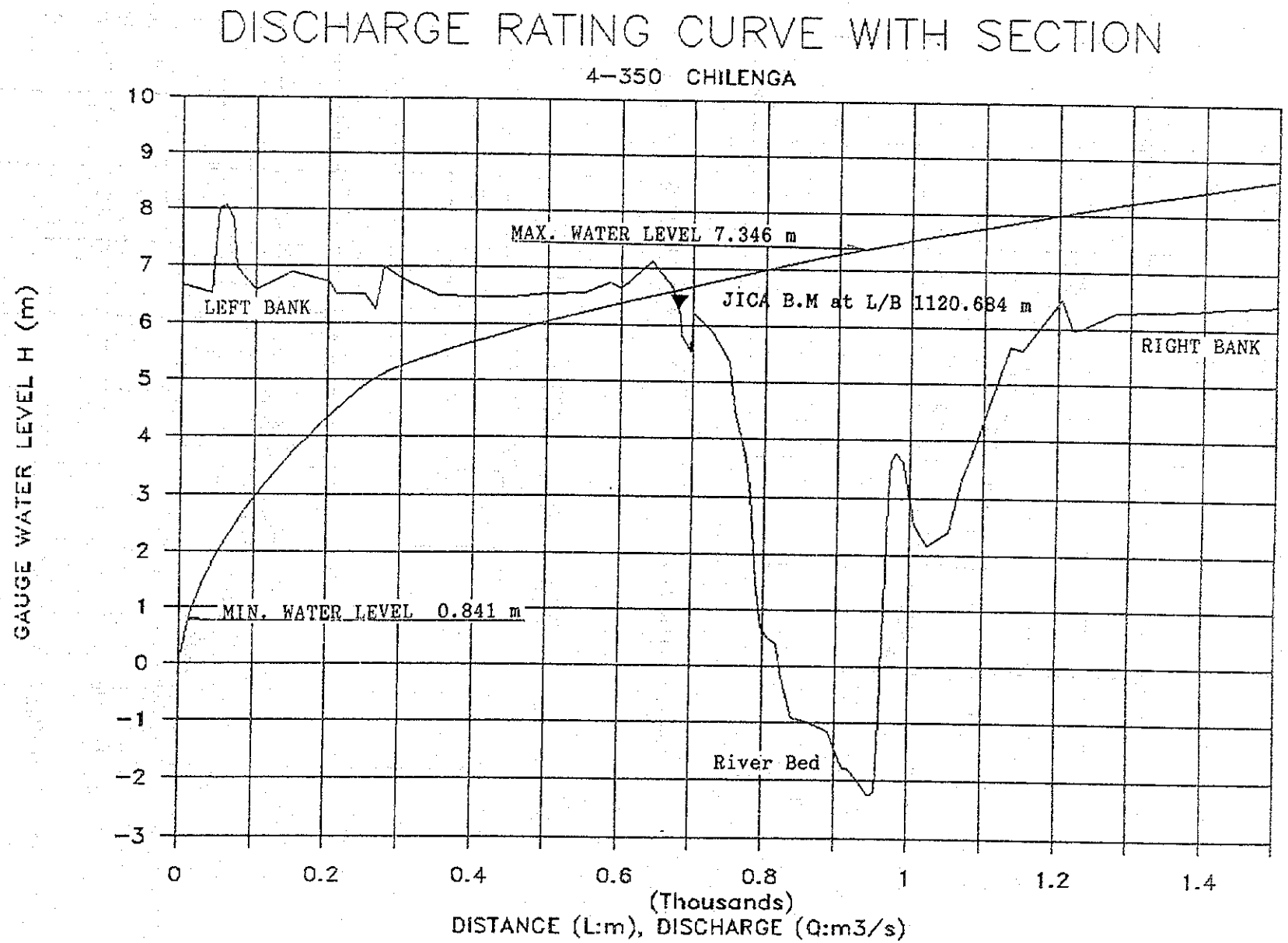


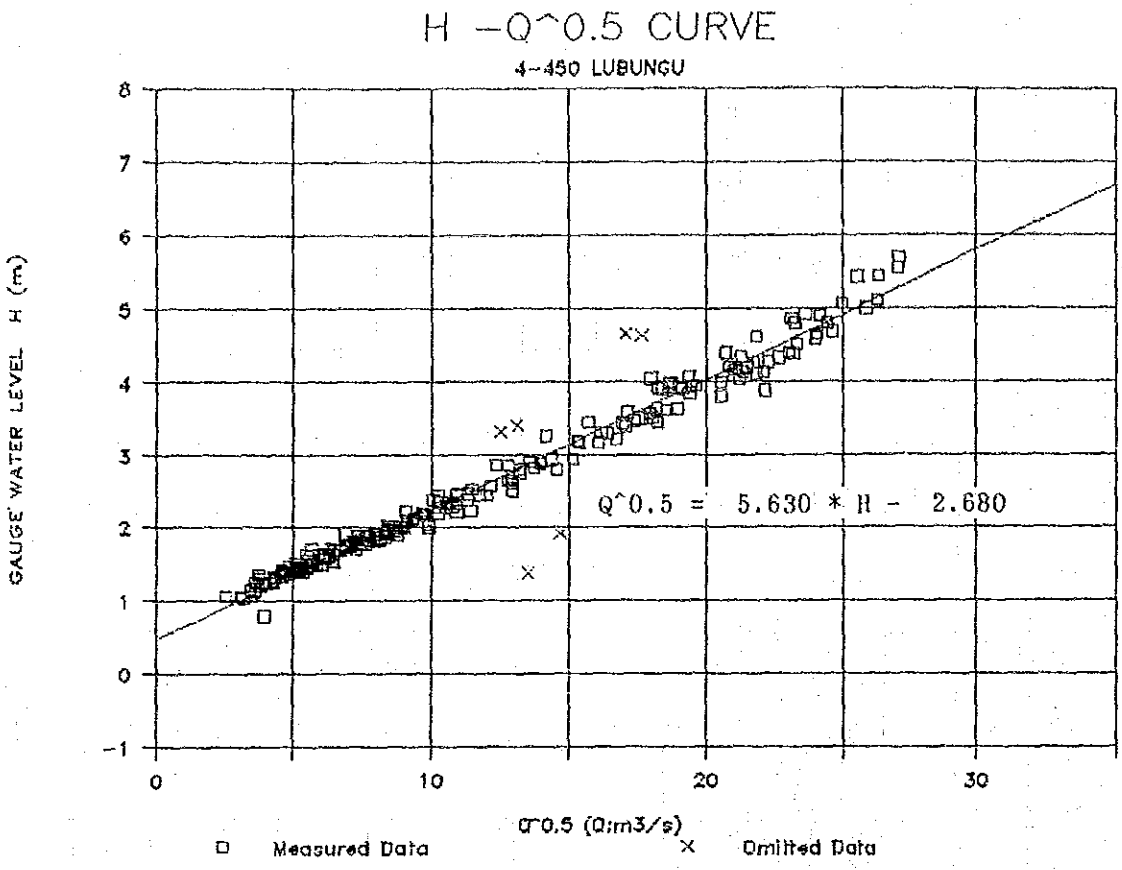
H – Q^0.5 CURVE

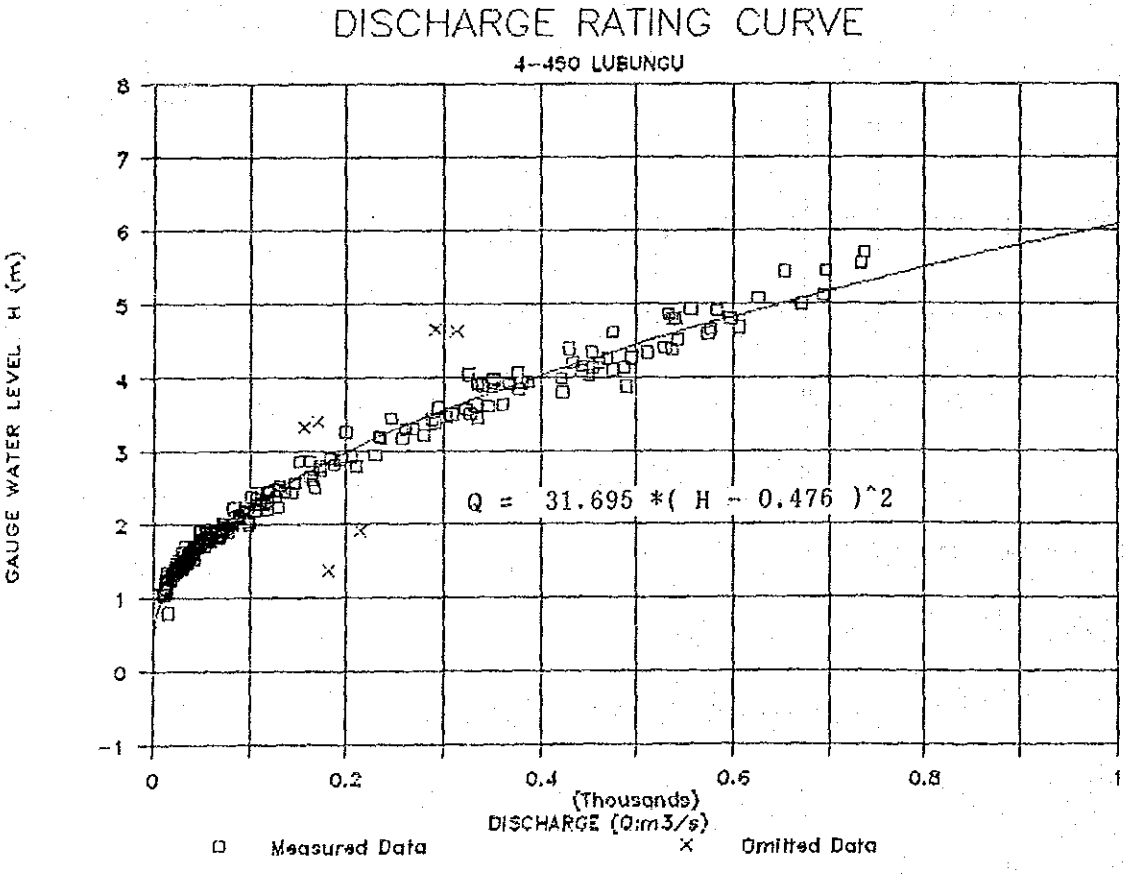


DISCHARGE RATING CURVE

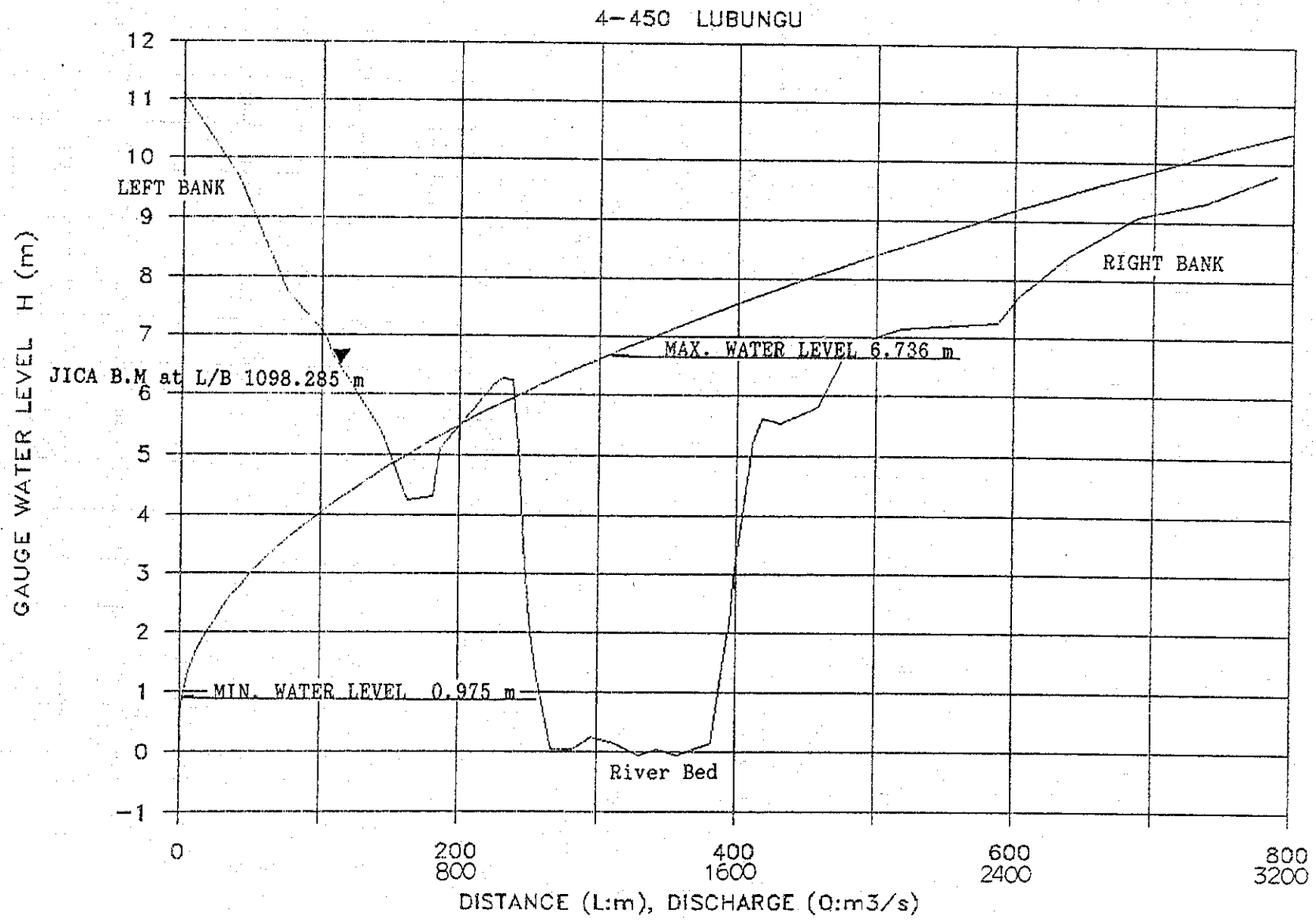


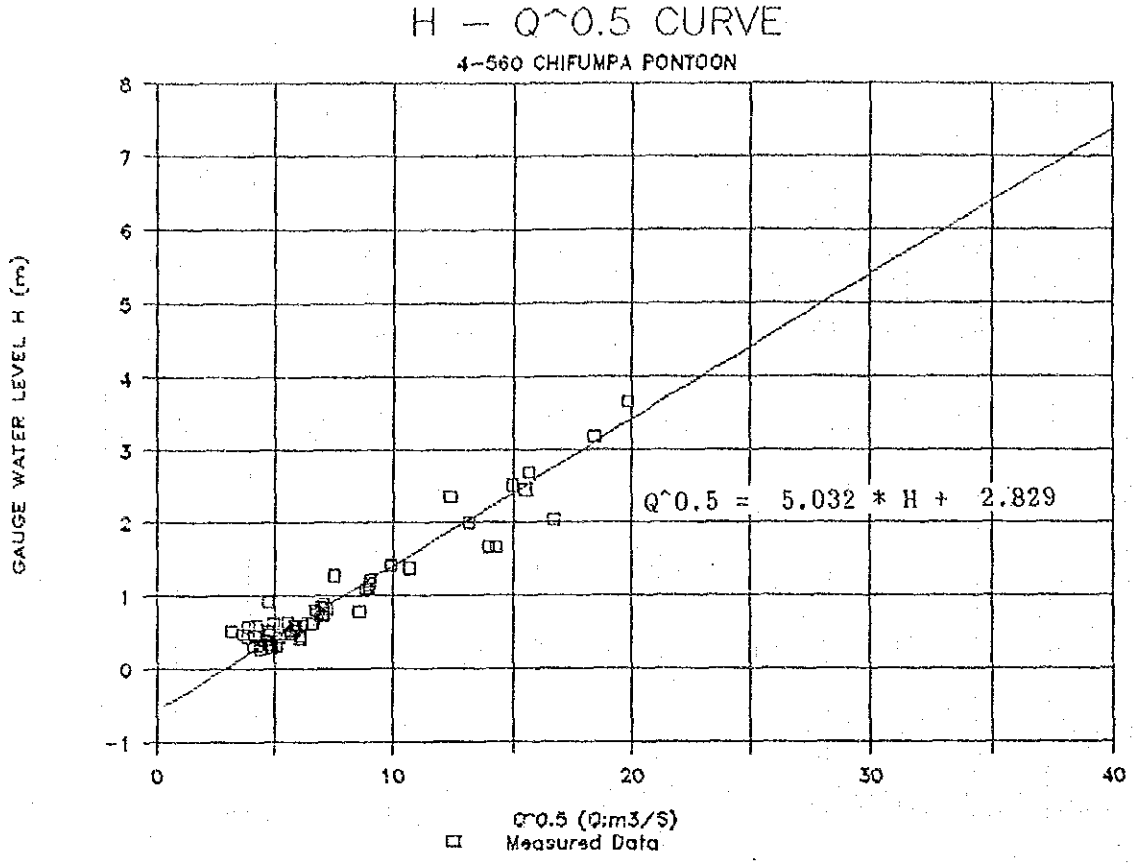

DISCHARGE RATING CURVE WITH SECTION
4-350 CHILENGA
GAUGE WATER LEVEL H (m)
10
9
8
7
6
5
4
3
2
1
0
-1
-2
-3
MAX. WATER LEVEL 7.346 m
JICA B.M at L/B 1120.684 m
LEFT BANK
RIGHT BANK
MIN. WATER LEVEL 0.841 m
River Bed
0
0.2
0.4
0.6
0.8
1
1.2
1.4
(Thousands)
DISTANCE (L:m), DISCHARGE (Q:m3/s)

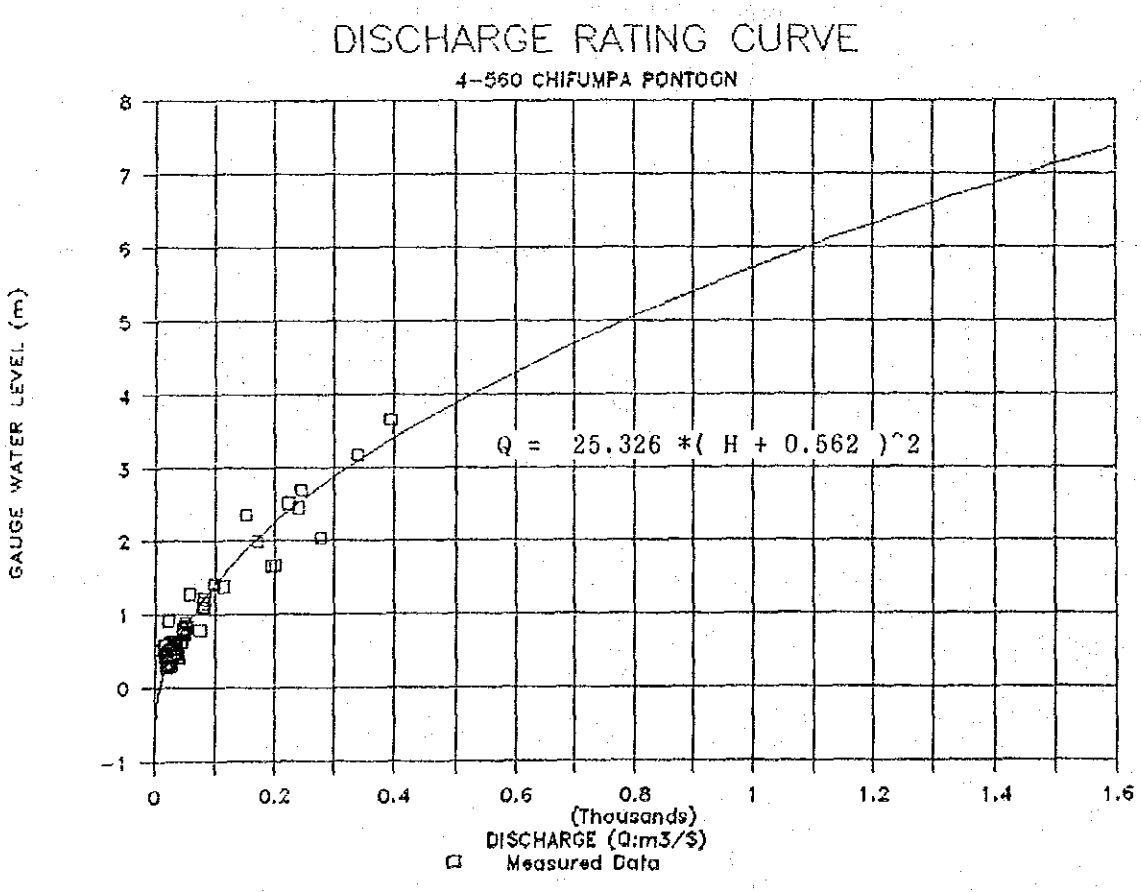

H -Q^0.5 CURVE
4-450 LUBUNGU
GAUGE WATER LEVEL H (m)
Q^0.5 = 5.630 * H - 2.680
Q^0.5 (Q:m3/s)
Measured Data
Omitted Data


DISCHARGE RATING CURVE
4-450 LUBUNGU
GAUGE WATER LEVEL H (m)
Q = 31.695 *(H - 0.476)^2
(Thousands)
DISCHARGE (Q:m3/s)
Measured Data
Omitted Data

DISCHARGE RATING CURVE WITH SECTION




H - Q^0.5 CURVE
4-560 CHIFUMPA PONTOON
GAUGE WATER LEVEL H (m)
Q^0.5 = 5.032 * H + 2.829
Q^0.5 (Q:m3/S)
Measured Data


DISCHARGE RATING CURVE
4-560 CHIFUMPA PONTOON
GAUGE WATER LEVEL (m)
Q = 25.326 *(H + 0.562)^2
(Thousands)
DISCHARGE (Q:m3/S)
Measured Data