Table 7.2 Flow Regime at Penut

(C.A = 1380 km²)

YEAR	QMAX	95 DAY	185 DAY	275 DAY	355 DAY	QMIN	AVERG.	TOTAL
1961	360.38	61.60	45.20	26.69	13.37	10.86	48.99	17882.48
1962	187.07	52.35	28.94	21.37	12.56	11.22	37.52	13694.87
1963	130.12	44.60	18.10	11.45	7.67	7.14	29.92	10921.49
1964	200.39	49.21	34.45	25.05	13.43	11.41	39.59	14490.51
1965	239.48	57.91	28.26	13.29	9.30	8.99	40.18	14665.69
1966	171.71	53.89	40.62	29.39	15.48	11.68	42.80	15623.72
1967	420.73	79.14	48.16	26.17	12.64	12.02	59.77	21816.42
1968	231.43	37.26	26.26	17.99	12.40	11.00	29.69	10866.06
1969	146.32	56.77	36.78	17.57	9.56	8.88	39.99	14594.96
1970	294.91	55.62	33.59	23.87	11.12	10.27	43.40	15841.55
1971	681.31	55.34	35.39	23.11	13.49	12.32	58.39	21312.28
1972	1118.10	36.82	23.29	12.76	7.75	6.68	42.50	15556.09
1973	971.35	39.73	21.60	14.74	8.96	7.79	43.53	15889.25
1974	203.22	46.30	32.19	24.30	15.60	12.03	39.67	14481.14
1975	1401.46	61.25	34.33	24.34	15.36	13.33	58.68	21418.43
1976	220.34	32.00	19.98	12.87	8.14	7.44	27.48	10057.08
1977	155.92	25.86	16.28	8.87	5.81	5.12	22.56	8233.68
1978	315.39	28.38	19.54	14.07	10.24	8.50	28.68	10469.25
1979	632.95	37.34	22.66	14.35	9.98	7.62	37.83	13806.90
1980	206.49	37.04	22.05	16.08	12.43	9.47	30.22	11059.51
AVERG.	414.48	47.47	29.39	19.19	11.26	9.69	40.07	14634.07

(Unit: m³/s)

Table 7.3 (1) Flow Regime at the Lower Damsite

(C.A = 1380 km²)

YEAR	QMAX	95 DAY	185 DAY	275 DAY	355 DAY	QMIN	AVERG.	TOTAL
1961	360.98	61.60	45.26	26.69	13.37	10.86	48.99	17882.48
1962	187.07	52.36	28.94	21.37	12.56	11.22	37.52	13694.87
1963	130.12	44.60	18.10	11.45	7.67	7.14	29.92	10921.49
1964	200.39	49.21	34.45	25.05	13.43	11.41	39.59	14490.51
1965	239.48	57.91	28.26	18.29	9.30	8.99	40.18	14665.69
1966	171.71	53.89	40.62	29.39	15.48	11.68	42.80	15623.72
1967	420.73	79.14	48.16	26.17	12.64	12.02	59.77	21816.42
1968	231.43	37.26	26.26	17.99	12.40	11.00	29.69	10866.06
1969	146.32	56.77	36.78	17.57	9.56	8.88	39.99	14594.96
1970	294.91	55.62	33.59	23.87	11.12	10.27	43.40	15841.55
1971	681.31	55.34	35.39	23.11	13.49	12.32	58.39	21312.28
1972	1118.10	36.82	23.29	12.76	7.75	6.68	42.50	15556.09
1973	971.35	39.73	21.60	14.74	8.96	7.78	43.53	15889.25
1974	203.22	46.30	32.19	24.80	15.60	12.03	39.67	14481.14
1975	1401.46	61.25	34.33	24.34	15.36	13.33	58.48	21418.43
1976	220.34	32.00	19.98	12.37	8.14	7.44	27.38	10057.08
1977	155.92	26.86	16.28	8.87	5.81	5.12	22.56	8233.68
1978	315.39	28.38	19.54	14.07	10.24	9.50	28.68	10469.25
1979	632.95	37.34	22.66	14.35	9.98	7.62	37.83	13806.90
1980	206.49	37.04	22.05	16.03	12.43	9.47	30.22	11059.51
AVERG.	414.48	47.47	29.39	19.19	11.26	9.69	40.07	14534.07

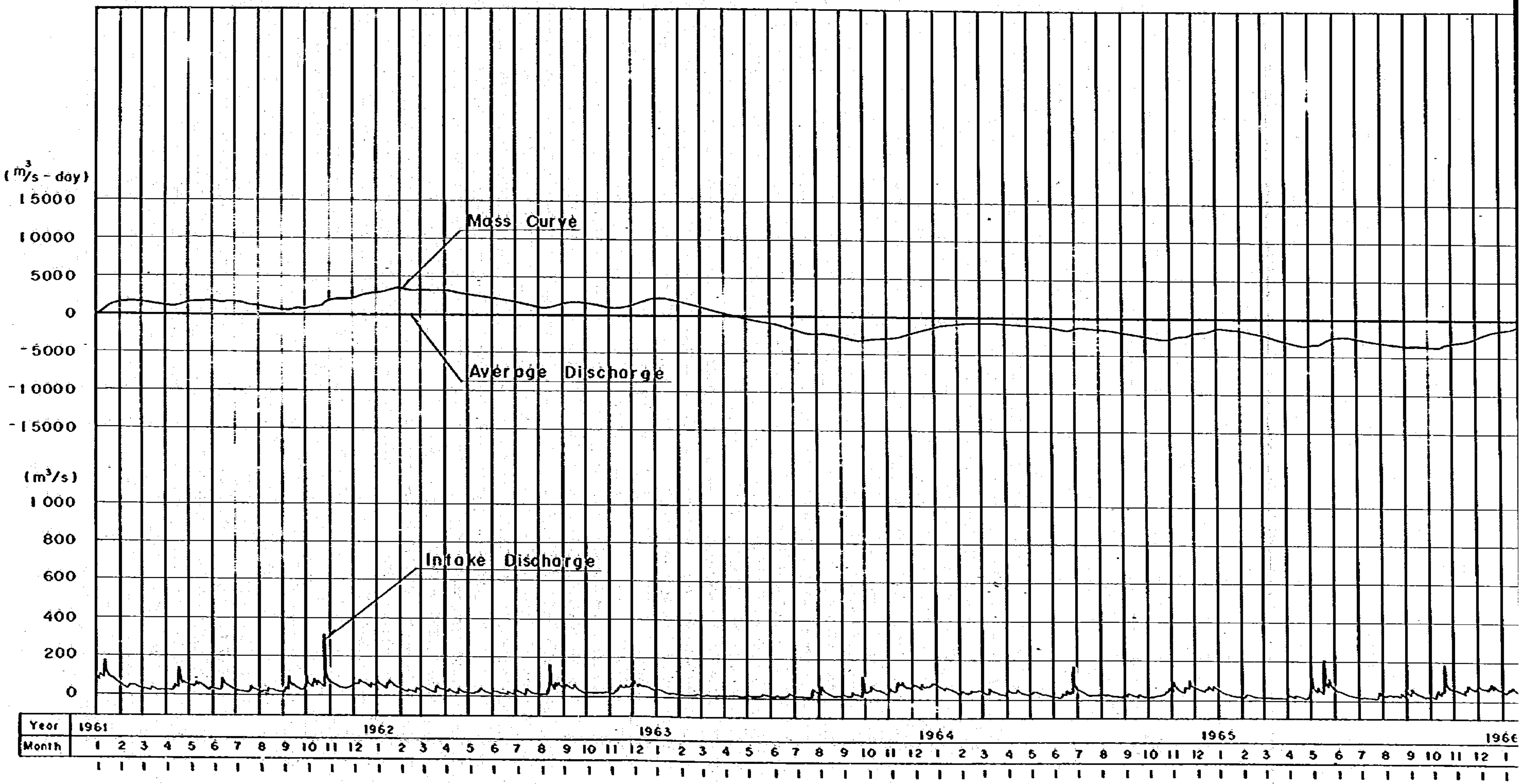
(Unit: m³/s)

Table 7.3 (2) Flow Regime at the Upper Damsite

(C.A = 1200 km²)

YEAR	QMAX	95 DAY	185 DAY	275 DAY	355 DAY	QMIN	AVERG.	TOTAL
1961	313.90	53.57	39.96	23.21	11.63	9.44	42.60	15549.38
1962	162.67	45.53	25.17	18.58	10.92	9.76	32.63	11908.58
1963	113.15	38.78	15.74	9.96	6.67	6.21	26.02	9496.95
1964	174.25	42.79	29.96	21.78	11.68	9.92	34.43	12600.44
1965	203.24	50.36	24.57	15.90	8.09	7.82	34.94	12752.77
1966	149.31	46.86	35.32	25.56	13.46	10.16	37.22	13585.84
1967	365.85	68.82	41.88	22.76	10.99	10.45	51.97	18970.30
1968	201.24	32.40	22.83	15.64	10.78	9.57	25.82	9448.75
1969	127.23	49.37	31.98	15.28	8.31	7.72	34.77	12691.27
1970	256.44	48.37	29.21	20.76	9.67	8.93	37.74	13775.26
1971	592.44	48.12	30.77	20.10	11.73	10.71	50.77	18532.42
1972	972.26	32.02	20.25	11.10	6.74	5.81	36.96	13527.03
1973	944.65	34.55	18.79	12.82	7.79	6.77	37.85	13816.74
1974	176.71	40.26	27.99	21.13	13.57	10.46	34.50	12592.30
1975	1218.66	53.26	29.85	21.60	13.36	11.59	51.03	19624.72
1976	191.60	27.83	17.37	11.19	7.08	6.47	23.89	8745.29
1977	135.54	23.36	14.16	7.71	5.05	4.45	19.62	7159.72
1978	274.25	24.68	16.99	12.23	8.90	7.39	24.94	9103.70
1979	550.39	32.47	19.70	12.43	8.68	6.63	32.89	12006.00
1980	179.56	32.21	19.17	13.94	10.81	8.23	26.28	9616.97
AVERG.	360.42	41.28	25.55	16.69	9.80	8.42	34.84	12725.28

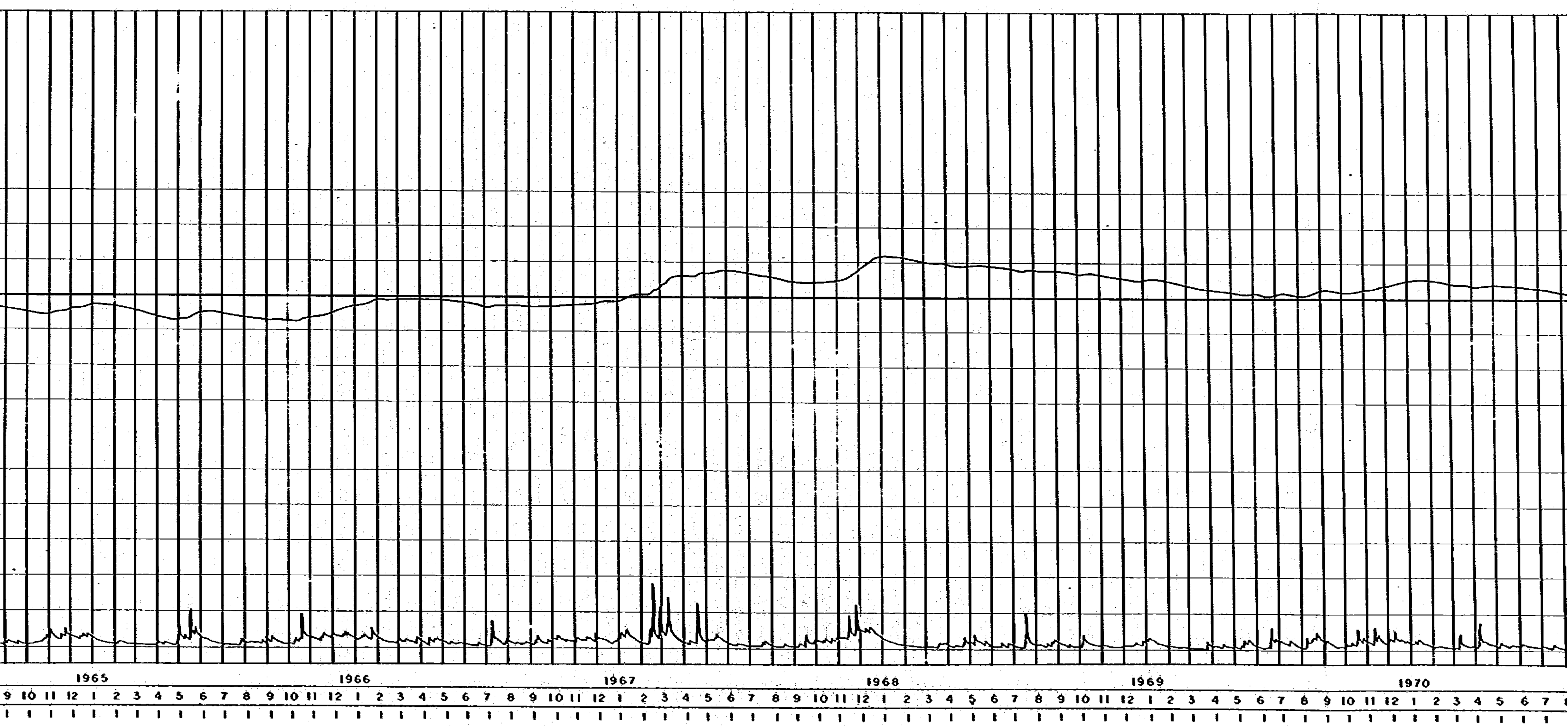
(Unit; m³/s)



(m3/s - day)
15000
10000
5000
0
-5000
-10000
-15000
Mass Curve
Average Discharge
(m3/s)
1000
800
600
400
200
0
Intake Discharge
Year
1961
1962
1963
1964
1965
1966
Month
1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1

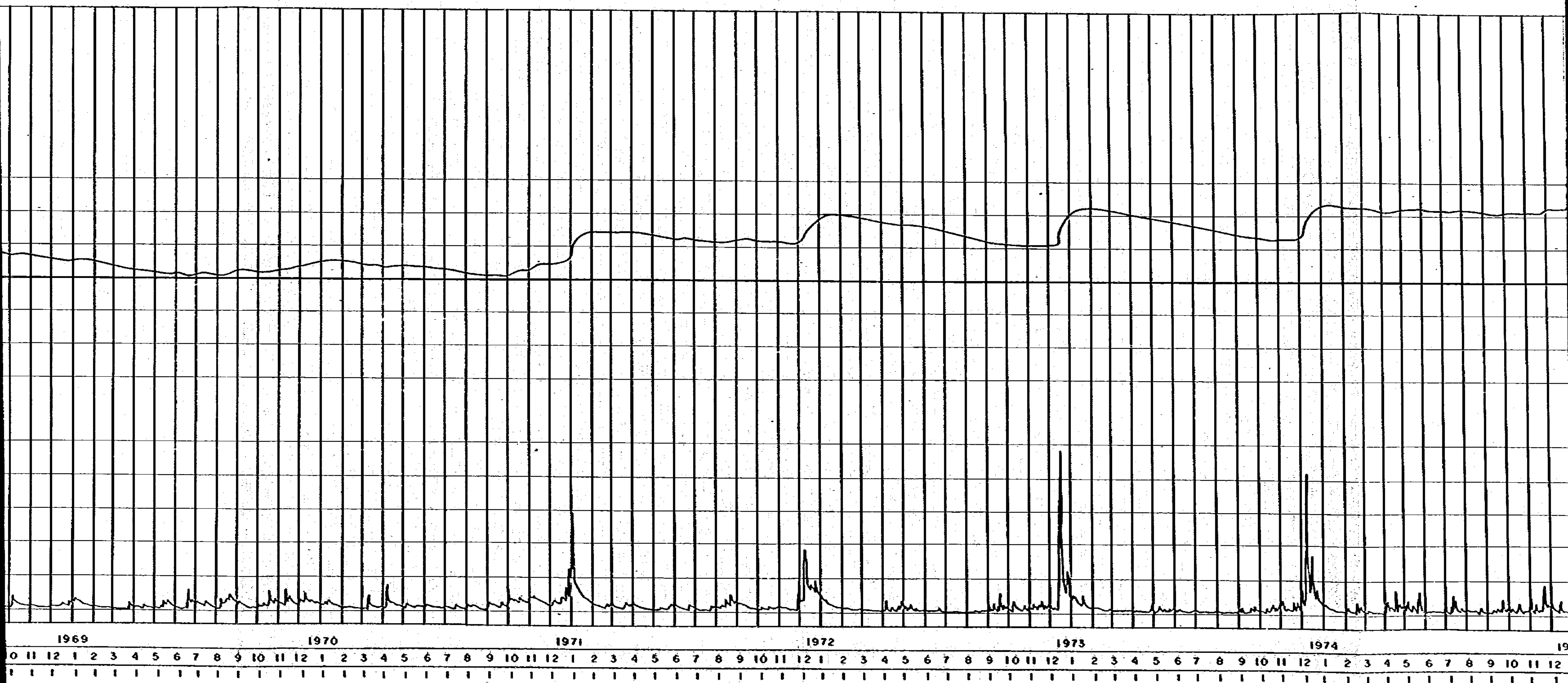
MASS CURVE (UPPER

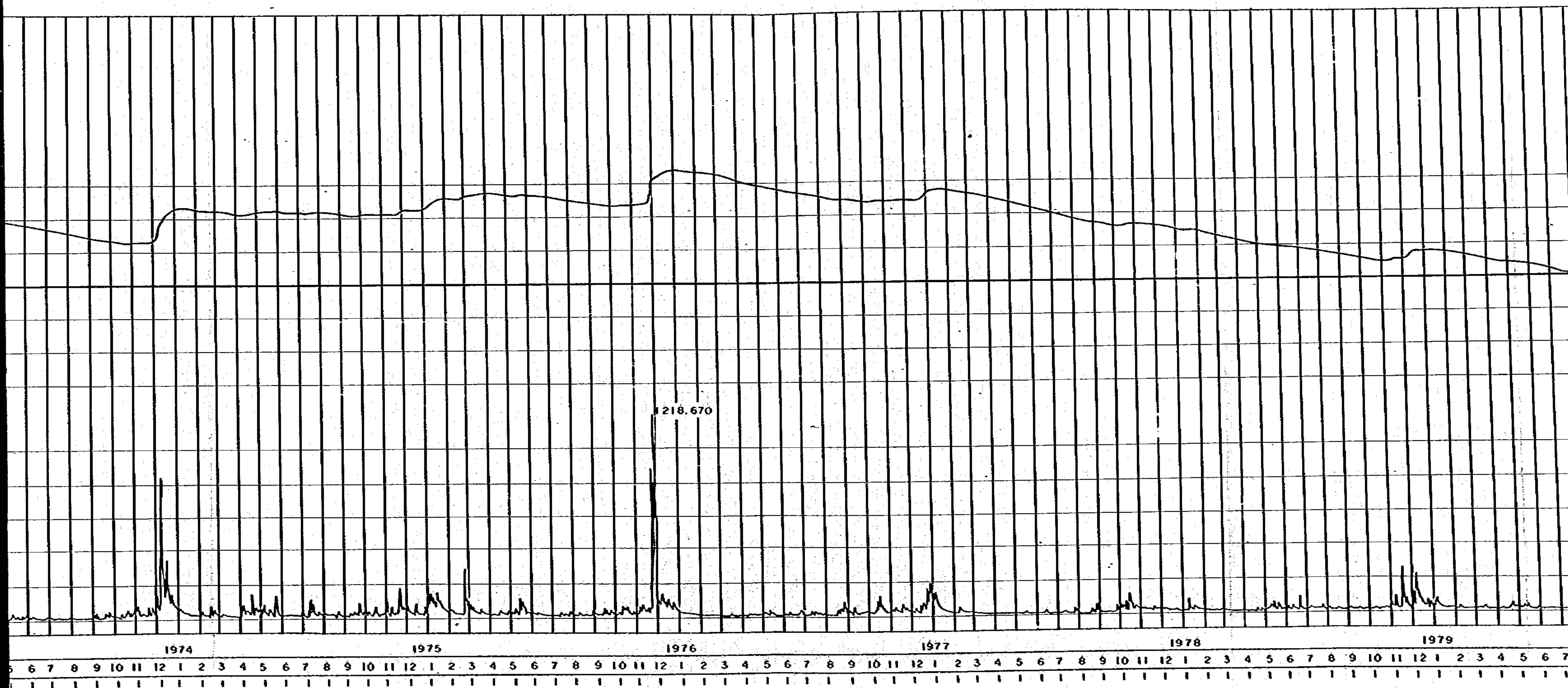
Q AVERAGE = 34.840 m^3/s



MASS CURVE (UPPER TEKAI RESERVOIR)

Q AVERAGE = 34.840 m^3/s





Fi

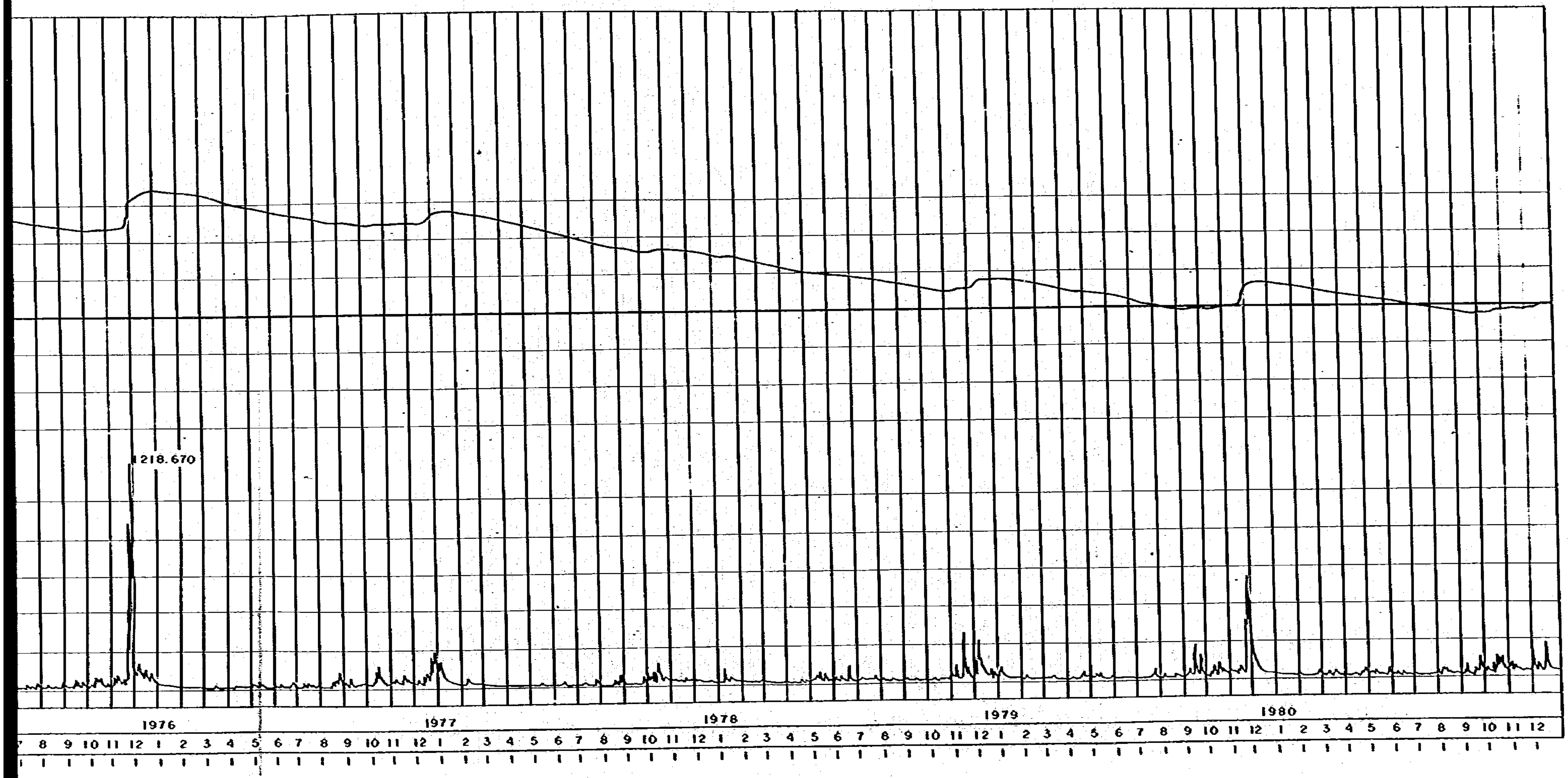
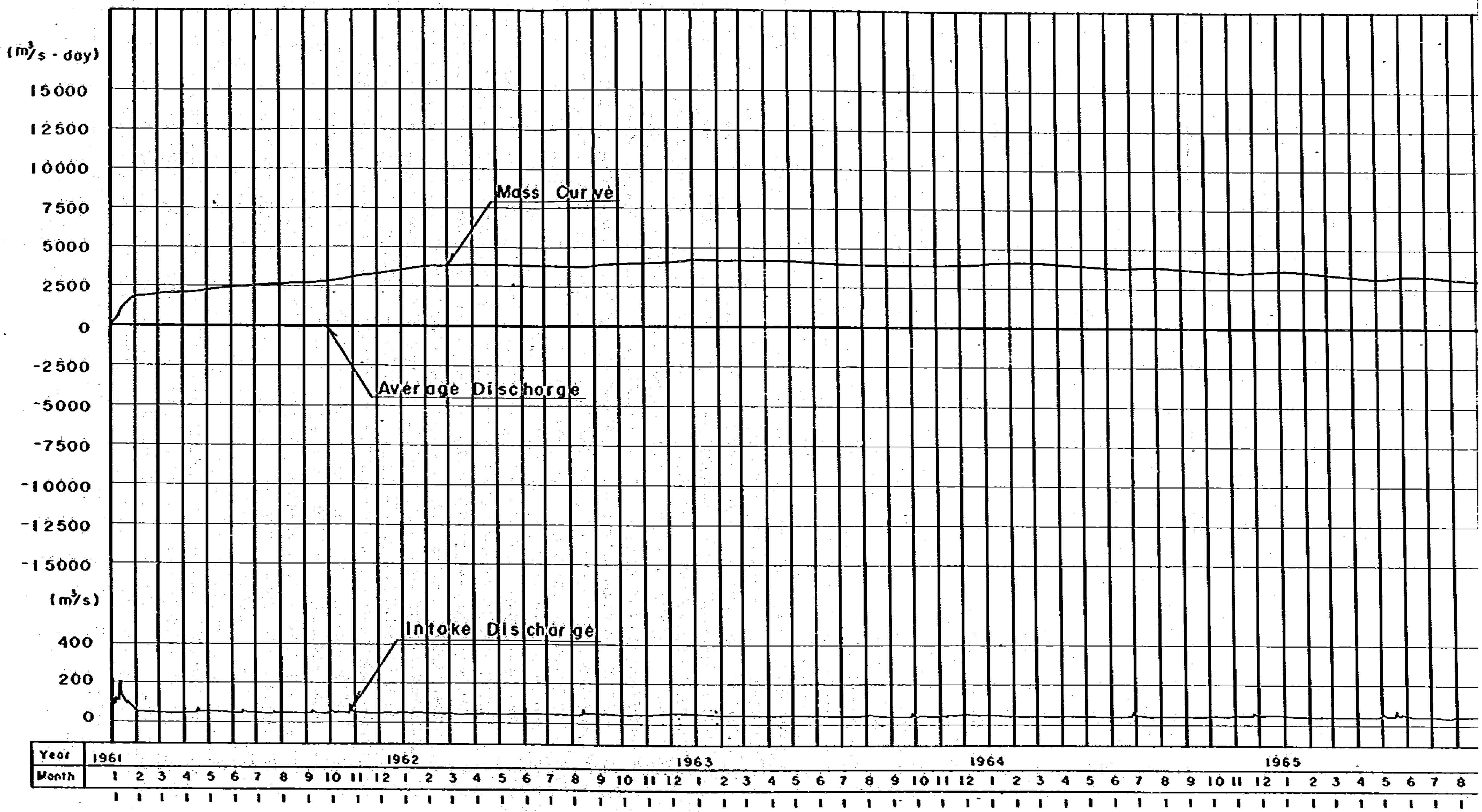
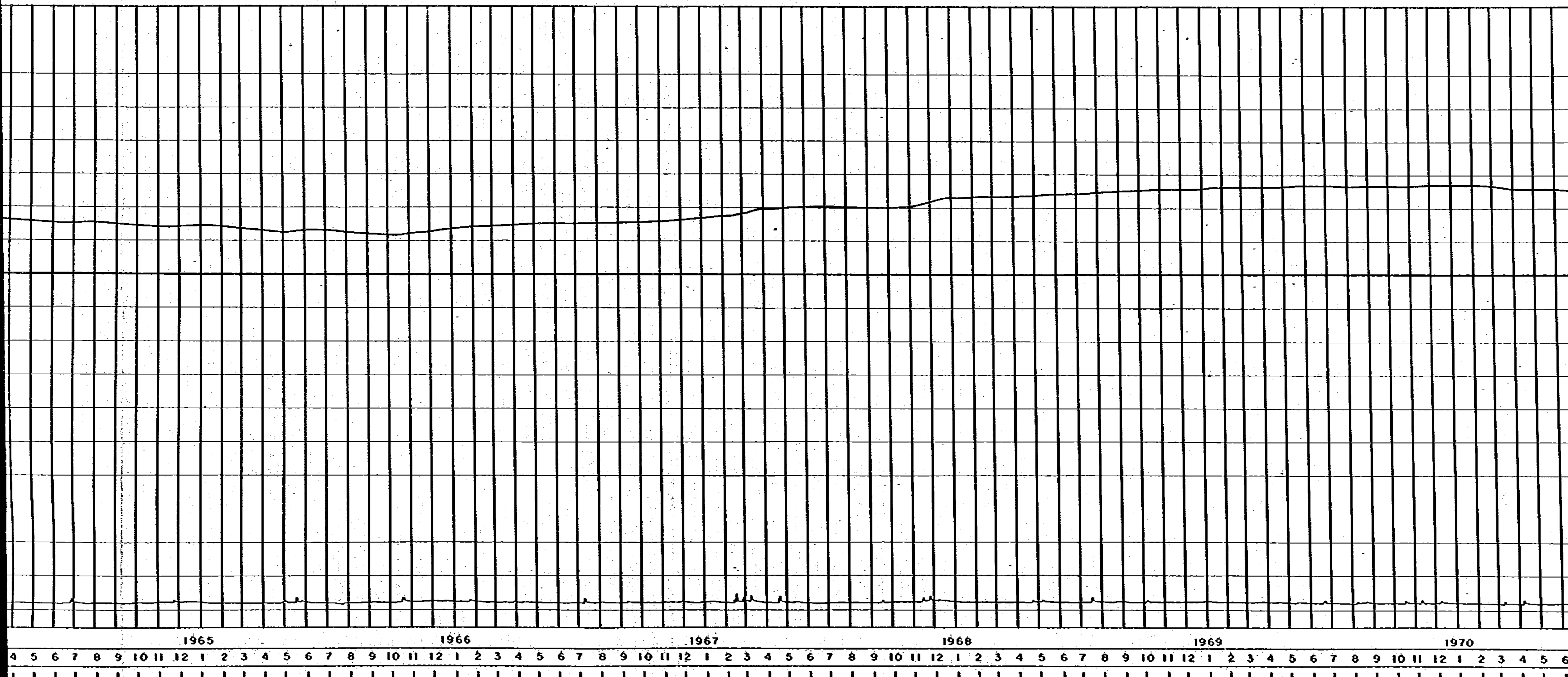

1218.670
1976
1977
1978
1979
1980
7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12

Fig. 7.4


(m³/s - day)
15000
12500
10000
7500
5000
2500
0
-2500
-5000
-7500
-10000
-12500
-15000
Mass Curve
Average Discharge
(m³/s)
400
200
0
Intake Discharge
Year
Month
1961
1962
1963
1964
1965
1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8

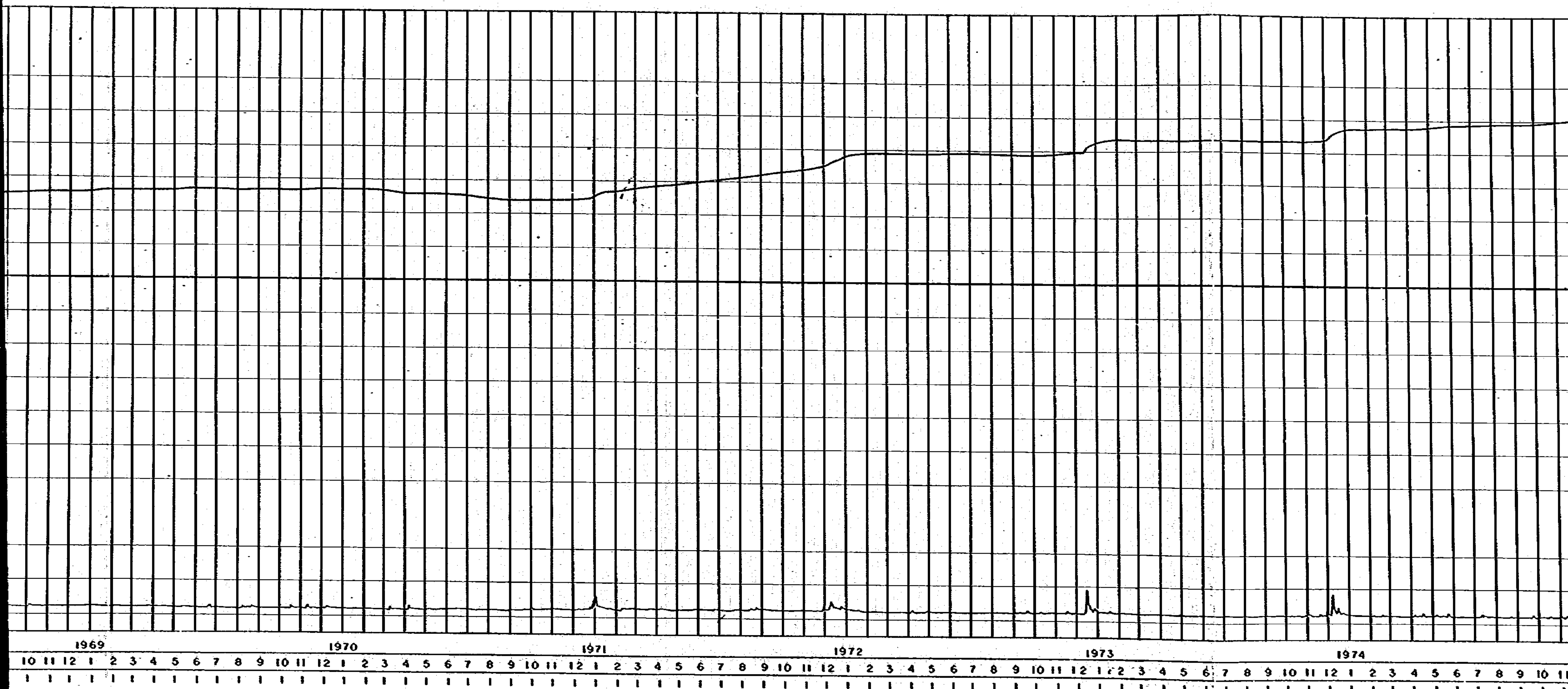
MASS CURVE (LOWER

Q AVERAGE = 40.070 m^3/s



MASS CURVE (LOWER TEKAI RESERVOIR)

Q AVERAGE = 40.070 m³/s




229.770
1973
1974
1975
1976
1977
1978

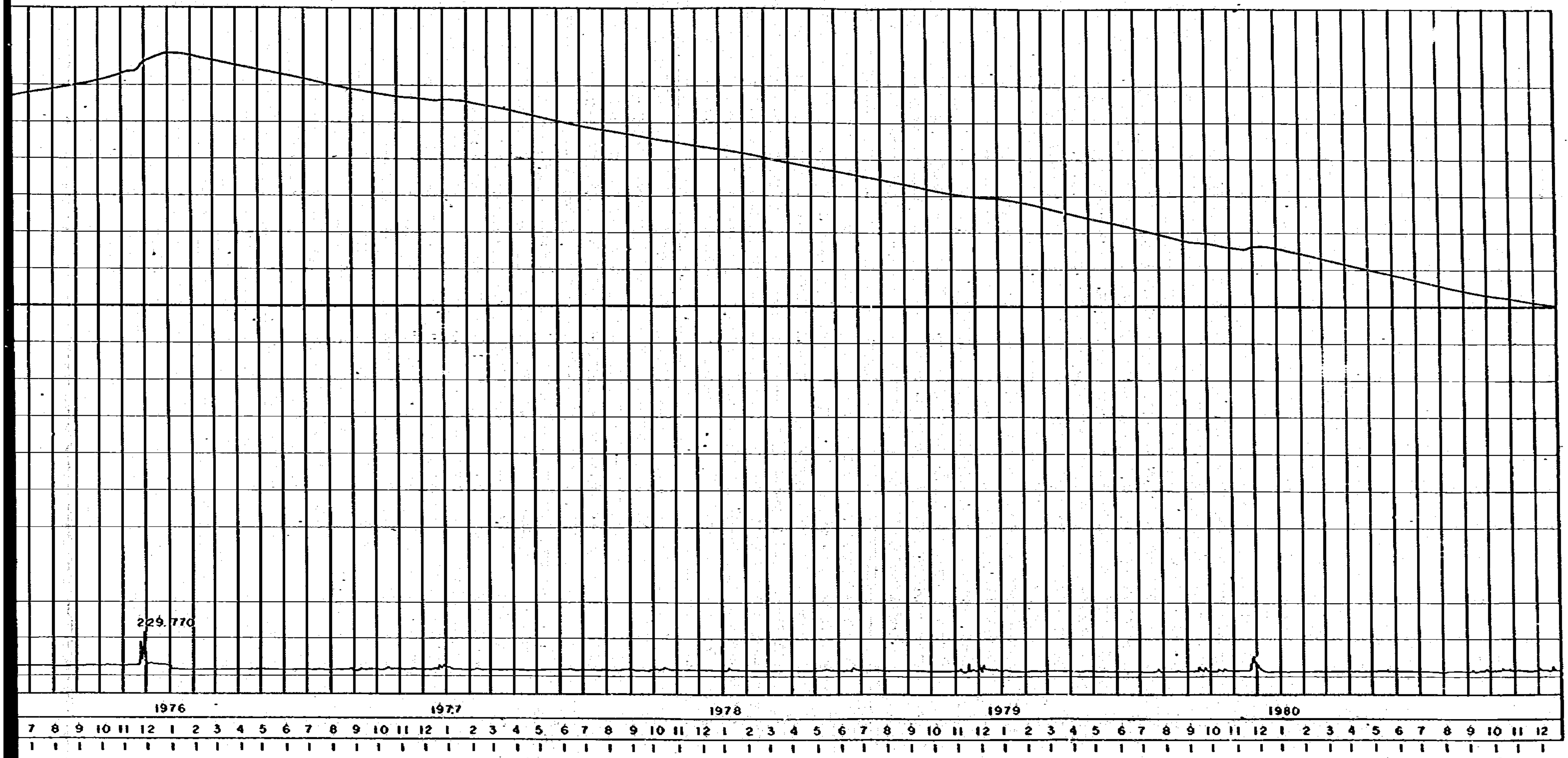

229.770
1976
1977
1978
1979
1980
7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5 6 7 8 9 10 11 12

Fig. 7.5

8. ESTIMATION OF FLOOD HYDROGRAPH

8. ESTIMATION OF FLOOD HYDROGRAPH

Flood hydrograph estimations are required for design floods at the proposed damsite, to determine the flood mitigation effect of the storage. This section describes the assessment of storm rainfall, an estimation method to convert rainfall to runoff, its application to reproduce recorded floods.

8.1 Basic Data

Floods in S. Tekai occured in December 1972, November 1975 and November 1979.

The Calibration of model was carried out by comparing the calculated hydrographs with the recorded hydrographs based on the abovementioned floods.

The basic data for reproduction of the hydrographs and computation for the calibration are described in this section.

8.1.1 Flood hydrographs

The December 1972 flood hydrograph was recorded from December 14 to December 20. The rise at Penut was 9.6m reaching its peak at midnight of the 17th. Peak discharge was estimated to be 1,260 m^3/s at Penut.

The November 1975 flood hydrograph was recorded from November 24 to November 30. Two big rises were recorded, the first rise was 7.1 m reaching its peak on the morning of the 25th, the second rise was of 7.0m in the evening of the 28th. Peak discharge was estimated to be 1,620 m^3/s at Penut from the rating curve.

The November 1979 flood hydrograph was recorded from November 24 to November 30. The rise at Penut was 11.3m on the morning of the 27th. Peak discharge was estimated to be 1,330 m^3/s at Penut from the rating curve.

Runoff depth for the period of recorded floods are shown in Table 8.1.

8.1.2 Rainfalls

Records of the heavy rainfall causing the abovementioned floods were obtained at Kg. Merting, Kuala Tahan, Kamgsar and Ulu. Tekai.

The only record of heavy rainfall during the December 1972 flood was obtained at Kg. Merting, near to the catchment area of S.Tekai. The hourly rainfall records were obtained at Kuala Tahan and Kamgsar in during November 1975 flood, and at Ulu. Tekai, Kuala Tahan and Kangsar in during November 1979 flood.

Rainfalls at each station for the period of recorded floods are shown in Table 8.1.

Table 8.1 Rainfalls and Runoff Depth During Floods

	December 1972 Flood	November 1975 Flood	November 1979 Flood
Catchment Runoff (mm)	243	252	276
Peak Discharge (m^3/s)	1,260	1,620	1,330
Rainfall at			
Kg. Merting	284*	-	-
Kuala Tahan	-	279	192
Kamgsar	-	162	210
Ulu. Tekai (mm)	-	-	224

* This value included the daily rainfall values.

8.2 Estimation Method

Three methods of flood hydrograph estimation are available for possible use in this study. These are the storage function method, the synthetic unit hydrograph method and the rational formula method. If there is no need to consider storage in rivers, a rational formula may be applied. However, if water resources development plans include a flood control dam, power-generation dam and retarding basin within the basin, the storage function method and the synthetic unit hydrograph method are adequate to calculate the hydrograph at many points on rivers. The storage function method was adopted to calculate the discharge at damsites considered in this report.

8.2.1 Constants of the Model

Constants and division of the catchment area for the Storage Function Method are described as follows.

(a) Division and layout of river basins and channels

The river basin was divided into four parts and the channel was divided into two. These were determined using a topographical map of 1/63360 and in view of damsite and accuracy of basin mean rainfall (the mean rainfall at the basin was assumed as a point rainfall of representative station). Fig. 8.1 shows the basin and channel model.

(b) Coefficient of the function

The values of K and T_L were obtained from empirical equations as rough estimates. It is preferable to obtain them from river discharge data by trial calculation.

(i) K

For the basin

$$K = 43.4\ C \cdot I_1^{-1/3} \cdot L^{1/3}$$

For the channel

$$K = 0.166\ L \cdot I_2^{-1/2}$$

C : Izzard constant (=0.12)

I_1 : Average basin slope

L : Length of river channel

I_2 : Average channel slope

(ii) T_L

<u>For the basin</u>

$$T_L = 0.047 \cdot L - 0.56 \text{ (hr)} \quad (L > 11.9 \text{ km})$$

$$T_L = 0 \quad (L \geq 11.9 \text{ km})$$

L : Length of channel reach (km)

I : Average channel slope

<u>For the channel</u>

$$T_L = (7.36 \times 10^{-4}) \cdot L \cdot I^{-0.5}$$

(iii) P

<u>For the basin</u>

$$p = 0.33$$

<u>For the channel</u>

$$p = 0.6$$

Constants

	No.	Basin Area (km^2)	Length of River Channel	Basin or Channel Slope	Constants		
					K	P	TL(hr)
Basin	1	180.0	22.2	0.0239	50.7	0.33	0.48
	2	293.0	50.0	0.0098	89.4	0.33	1.79
	3	244.0	37.4	0.0131	73.7	0.33	1.20
	4	663.0	52.0	0.0181	73.8	0.33	1.88
Channel	I	-	18.1	0.0017	73.0	0.6	0.32
	II	-	24.2	0.0019	92.0	0.6	0.41

Model

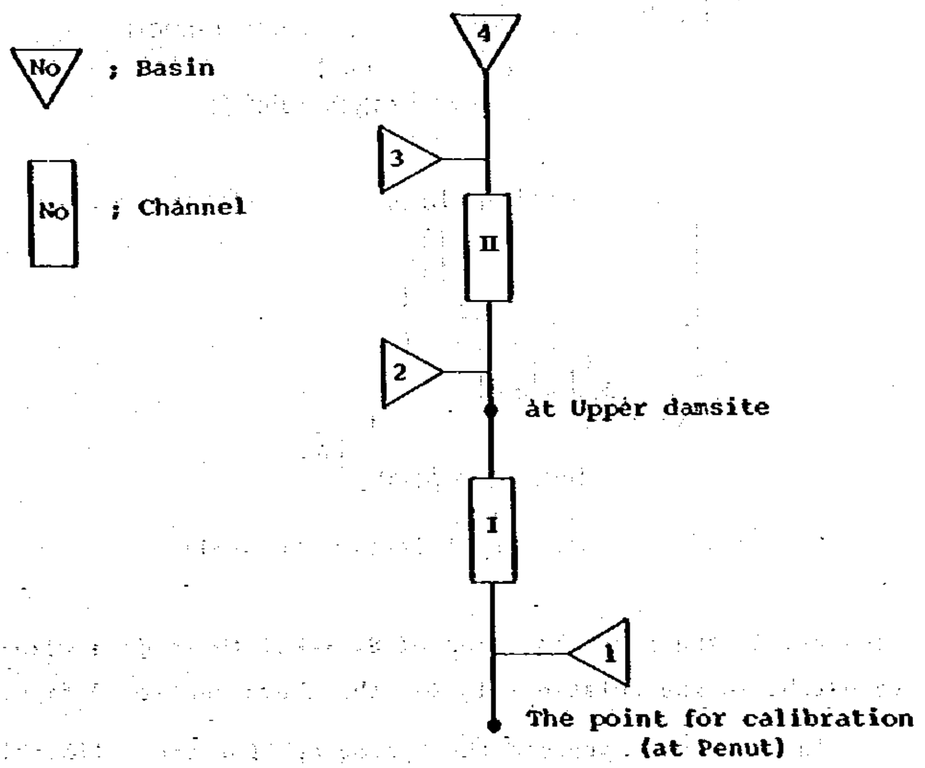


Fig. 8.1 Model of River System in S. Tekai

8.2.2 Effective rainfall

Effective rainfall is the most difficult to calculate when making flood runoff calculations. Since the loss phenomenon of rainfall (percolation, storage in low-lying areas, etc.) is not clear, effective rainfall must be estimated on the basis of many assumptions. Where substantial runoff data for the past are available, total rainfall on the total direct runoff depth are obtained for each flood as shown in Figure 8.2

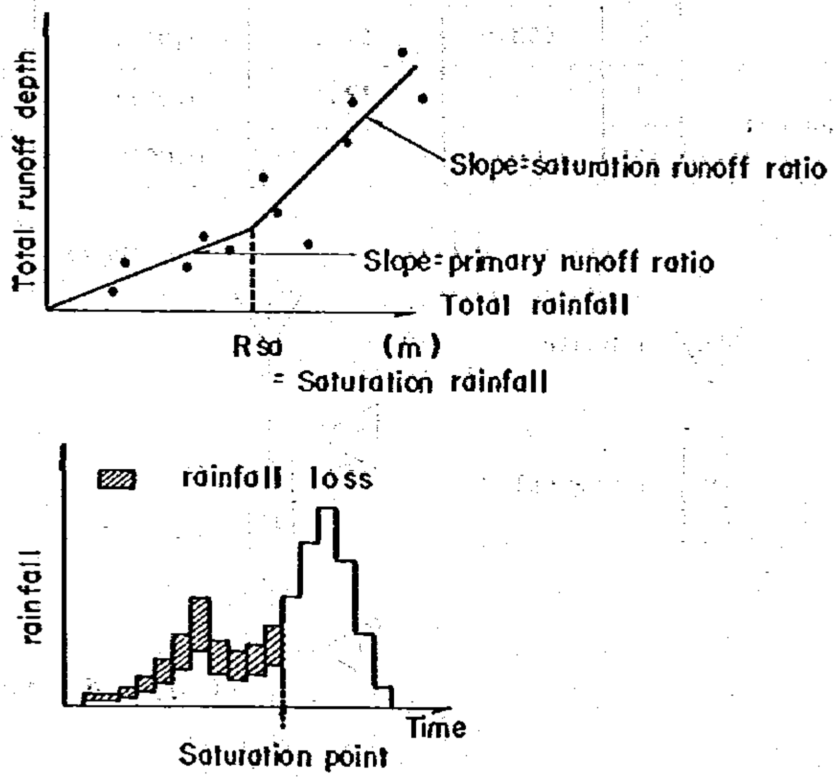


Fig.8.2 Consept of Effective Rainfall

However, in the catchment area of S. Tekai these data were unsufficient to establish the relationship for the above-mentioned figure.

In order to reproduce the hydrograph for the calibration, effective rainfall was calculated using the following assumption:

(i) The saturation rainfall (Rsa) ...... 100 mm to 150 mm

(ii) The primary runoff ratio (f_1) ...... 0.3 to 0.8

(iii) The saturation runoff ratio (f_2) 1.0

Thee coefficients were estimated by trial and error.

8.3 Verification of the Flood Runoff Model

The verification calculation was made using a large IBM computer, model IBM 4341. The constant of the reservoir function was corrected from time to time by comparing the actual hydrograph and the calculated hydrograph for the flood described in 8.1.

The comparative verification finally produced the calculated hydrograph shown in Fig. 8.3. Constants used in this calculation are as follows:

- o Primary runoff ratio 0.5
- o Saturation rainfall .... 100 mm
- o Saturation runoff ratio 1.0

Constants of the Model

	No.	Basin Area (km^2)	Constants		
			K	P	TL(hr)
Basin	1	180.0	70.7	0.33	0.48
	2	293.0	89.4	0.33	1.79
	3	244.0	73.7	0.33	1.20
	4	663.0	73.8	0.33	1.88
Channel	I	-	73.0	0.6	0.32
	II	-	92.0	0.6	0.41

Representative stations for catchment rainfall during the floods were selected as follows:

- o The December 1972 flood .... Kg. Merting
- o The November 1975 flood .... Kuala Tahan
- o The November 1979 flood .... Ulu. Tekai, Kuala Tahan

The above constants were judged as reasonable for the flood runoff model for the Tekai River Basin for the following reasons:

a. Flood in 1972

The discharge hydrograph observed at Penut has two conspicuous peaks as shown in Fig. 8.3.

The timely rainfall of Kg. Merting used in this reproduction calculation, however, has no conspicuous first peak.

This calculation hydrograph does not have the first peak and thus does not agree with the actual hydrograph.

b. Flood in 1975

As in the case of the flood in 1972, there is a substantial difference between calculated and measured discharges at the first peak. These values agree well at the second peak.

This may be attributed to the fact that, as in the case of the flood in 1972, the first-peak timely rainfall at Kuala Tahan does not represent the entire basin. The effect f backwater from the Tembeling River may also be considered responsible because the difference between the measured and calculated discharges is large at around the peak.

However, due to lack of discharge data of this river, it is impossible to grasp the above effect qualitatively and quantitatively.

c. Flood in 1979

The calculated discharge as a whole is relatively small as compared with the mesured discharge.

This is attributed to the fact that the total rainfall (224 mm, 192 mm) at Ulu. Tekai, Kuala Tahan chosen as a mean rainfall of the basin is smaller than the discharge (276 mm).

Fig. 4.2 shows the rainfall in the upstream area rather larger than that at both stations. In this flood, it is estimated that the actual rain fall is far above the rainfall at both stations.

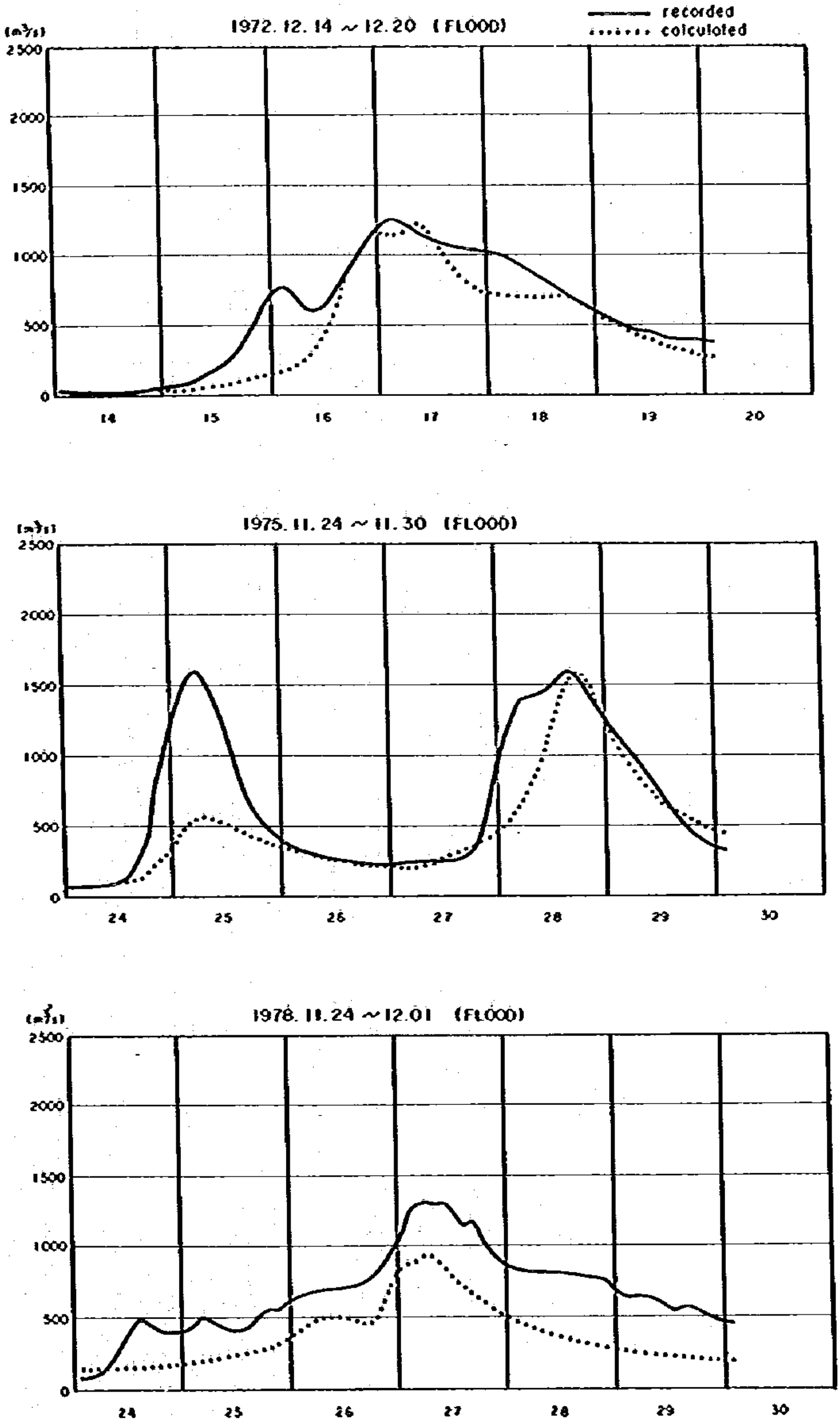


Fig 5.3 Comparison between the calculated and recorded hydrographs

9. FLOOD CONTROL

9. FLOOD CONTROL

9.1 Introduction

To determine the spillway capacity required to provide safety for the most critical flood runoff from a particular basin, it will be necessary to estimate the spillway design flood, the method of operation and the reservoir flood-routing computations.
The procedure for making these estimations is described in this section.

9.2 Basic Flood Discharge

Basic flood discharge at the damsite would be obtained by converting from the spillway design storm through the previously calibrated model. Basic flood discharge' is a discharge hydrograph without considering the flood control by dam, etc. In this study the design scale is established as follows, by taking into consideration the type of dam.

- Upper Dam: The design scale is established by assuming a 10,000 years return period flood because the Upper Dam is a rockfill type dam and the overflow exerts a very bad influence on the dam.
- Lower Dam: In this case the influence of the overflow is minor compared with a fill dam because the Lower Dam is a gravity-type concrete dam. Therefore, the design scale is established by assuming period of 1,000 years.

9.2.1 The design storm

(a) The design rainfall depth

The 3 cases of flood mentioned in the Chapter 8 are typical examples of flood occurred in the past in the Tekai River.

The rainfall duration was approximately 5 days in the 3 cases of flood mentioned above. Therefore, the design rainfall depth is determined by assuming a rainfall duration of 5 days.

The rainfall depths for 10,000 years return period and 1,000 years return period in Kg. Merting and Jerantut, located nearby the Tekai River basin, are shown in the Table 9.1.

The design scale of the Upper Dam assumes a period of 10,000 years and the rainfall depth for 10,000 years return period is 750mm to 840mm according to the Table 9.1.

On the other hand, according to the distribution of rainfall for 10,000 years return period shown in the Fig 4.2 of the Chapter 4, the rainfall depth in the basin of the Tekai River is 600 mm to 1,100 mm, with an average value of 850mm. Therefore, the rainfall for 10,000 years return period in the basin of the Tekai River is assumed to be 840mm, which is the value observed at the Kg. Merting Station.

Kg. Merting was close to the rainfall of a period of 1,000 years at Jerantut and Kg. Merting, the design rainfall depth for the catchment area of S. Tekai was estimated to be about 600 mm.

Table 9.1 Five Day Rainfalls for a Period of 10,000 Years and 1,000 Years

Jerantut 3922069	I G	753 (567) 736 (583)
Kg. Merting 4223115	I G	577 (501) 842 (670)

( ): 1,000 years

(b) Adjustment between the actual storm and the design storm

The adjustment means that the actual storm depth is enlarged so that it becomes equal to the design storm depth as shown in Figure 9.1

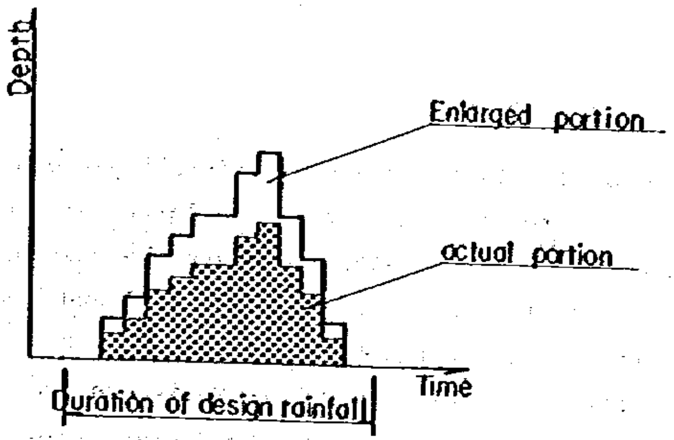


Fig 9.1 Adjustment between the Actual Storm and Design Storm

The adjustment factors used to enlarge from the actual storm during experienced floods to the design storm are listed in Table 9.2.

Table 9.2 Adjustment Factors

A period of 1,000 years

	1972	1975	1979
*Actual rainfall	284	279	221
Design rainfall	600	600	600
Adjustment factor	2.112	2.151	2.715

A period of 10,000 years

	1972	1975	1979
*Actual rainfall	284	279	221
Design rainfall	840	840	840
Adjustment factor	2.958	3.011	3.801

* The value in five day's duration.

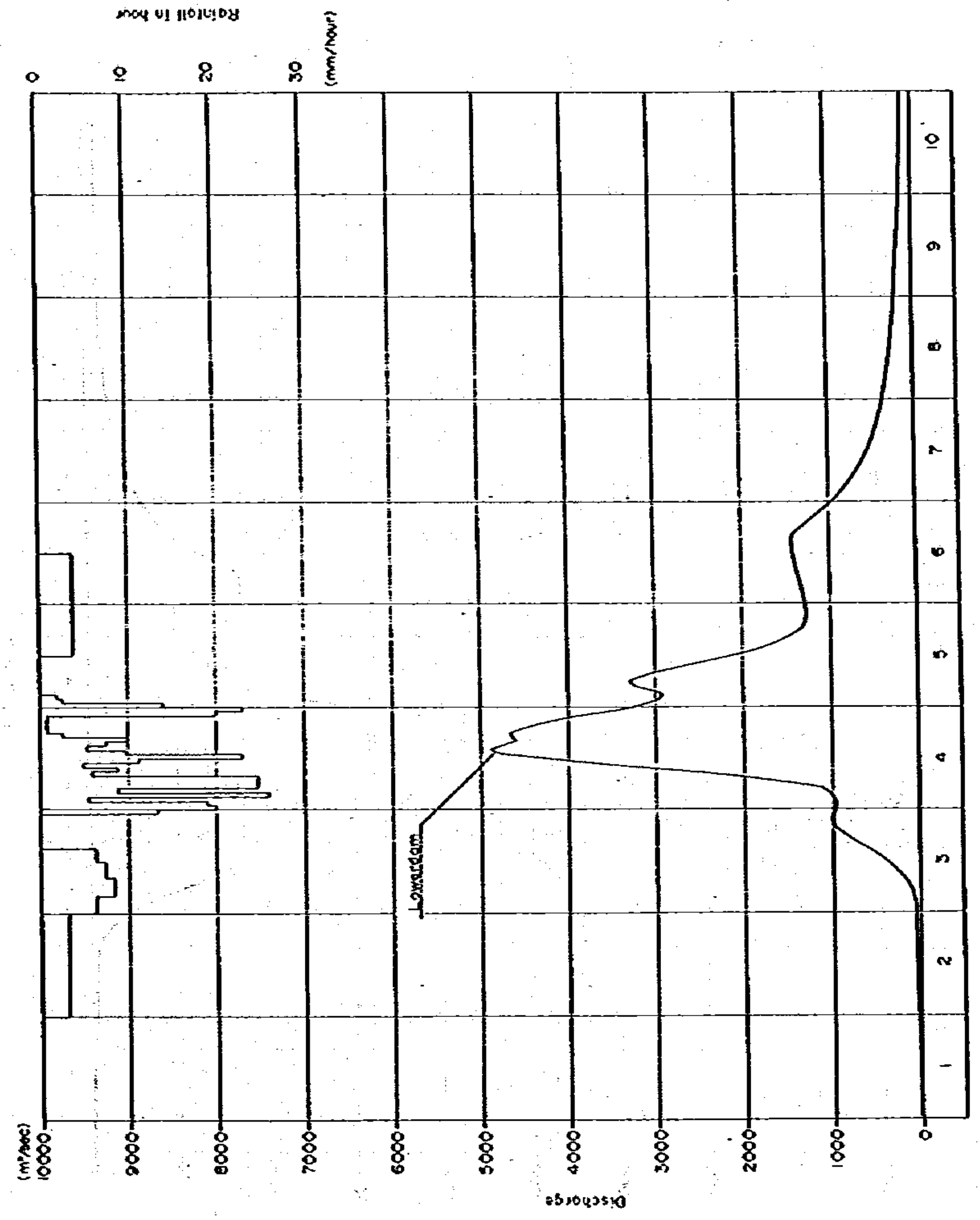
In the case of selecting the design rainfall pattern it is necessary to take care not to make an excessively large adjustment between the actual storm and the design storm, because the rain pattern pronounced differences in the cases of large rainfall and small rainfall.

Such being the case, the rainfall pattern of 1972 is adopted as design rainfall pattern of this study because it has the smallest adjustment between the actual storm and the design storm.

9.2.2 Basic Flood discharge

The basic flood discharges of the Upper Dam and Lower Dam are calculated from the design rainfall, by means of the calibrated model based on the storage function method.

The results of calculation are shown in the Fig 9.2 and the peak values of the basic flood discharge are shown in the next table.



Rainfall in hour
0
10
20
30
(mm/hour)
(m³/sec)
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Discharge
Lowardam
1
2
3
4
5
6
7
8
9
10

Fig. 9.2.1

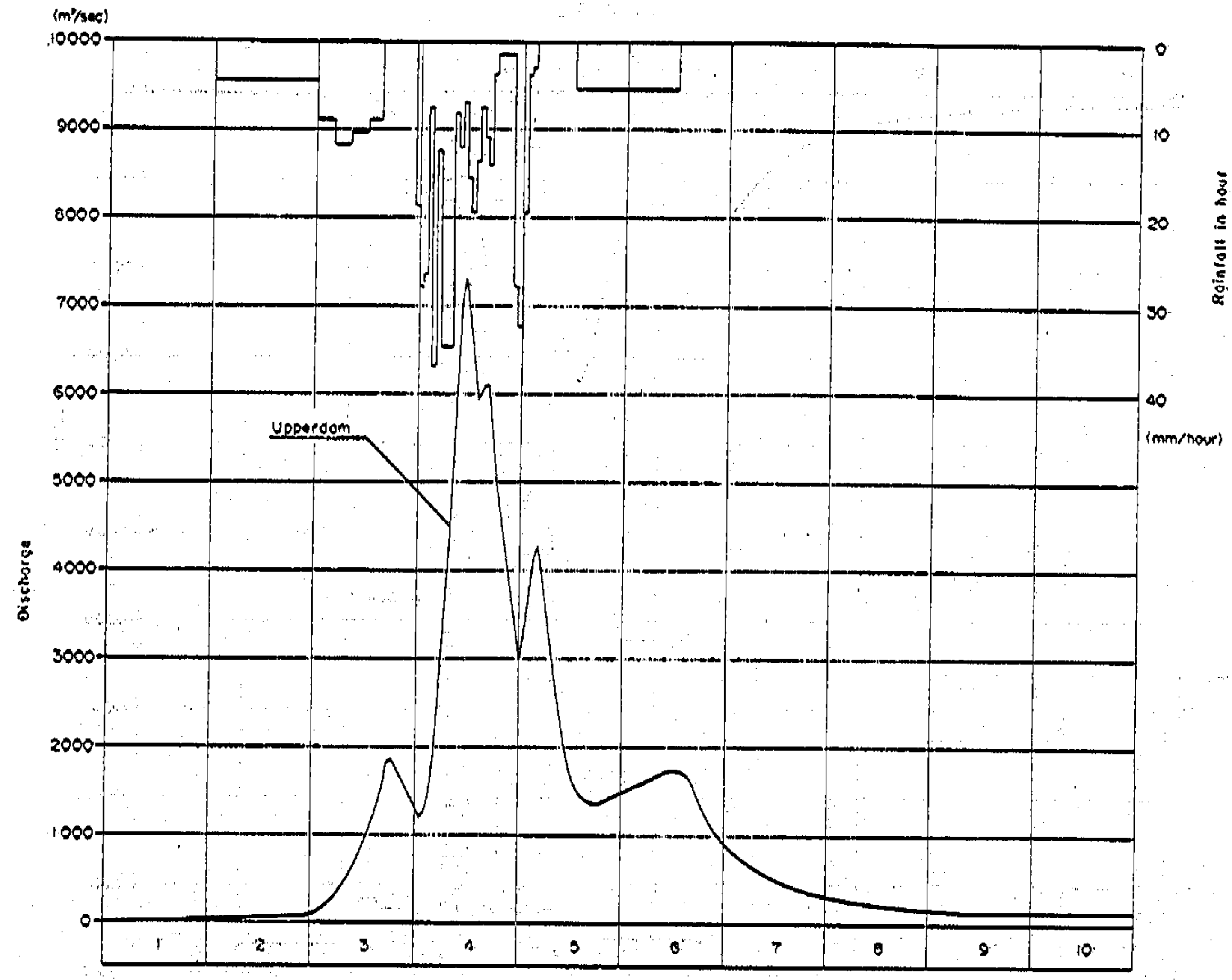

(m³/sec)
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Discharge
Upperdam
0
10
20
30
40
(mm/hour)
Rainfall in hour
1
2
3
4
5
6
7
8
9
10

Fig. 9.2.2

9.3 Calculation of Control

Flood control by upper and lower damsites is made for the case where the above basic flood discharge occurs. Then the maximum discharge at dam flood is determined. The scales of flood to be considered are Upper Dam = 10,000 years return period flood and Lower Dam = 1,000 years return period flood. In the Lower Dam the object of consideration is the flood hydrograph of the 1,000 years return period flood (peak discharge at the Upper Dam = 4,600 m^3/s) submitted to flood control at the Upper Dam.

9.3.1 Flood control calculation

The process of computing the reservoir stage, storage volumes and outflow rates corresponding to the hydrograph of inflow is commonly referred to as "flood-routing".

The maximum reservoir level obtained by routing the flood through the reservoir is determined by the following:

- o Initial reservoir stage
- o Rate and volume of inflow into the reservoir
- o Rate of outflow: Discharge over spillway
- o Storage capacity above initial reservoir level

The increase or decrease in storage and rate of outflow resulting from the volumes of inflow during successive short increments of time are computed using a step-by-step computation.

9.3.2 Flood control calculation of the upper damsite

In the case of the upper damsite, there is no dam which can control the flood on its upstream. Therefore, the inflow hydrograph (dam design flood discharge) becomes the following basic flood discharge.

Sample flood routings at the Upper Tekai Reservoir were carried out under the following conditions:

(a) Initial reservoir stage ..... EL 157.00

The initial reservoir stage was at the same water level as H.W.L.

(b) Inflow into the reservoir ..... The design flood (7,300 m^3/s)

(c) Discharge over the spillway

The crest length of the spillway is 40m and the rating-curve of the spillway is shown in Figure 9.3

(d) Storage capacity

The storage capacity curve above the crest of the spillway is shown in Figure 9.3

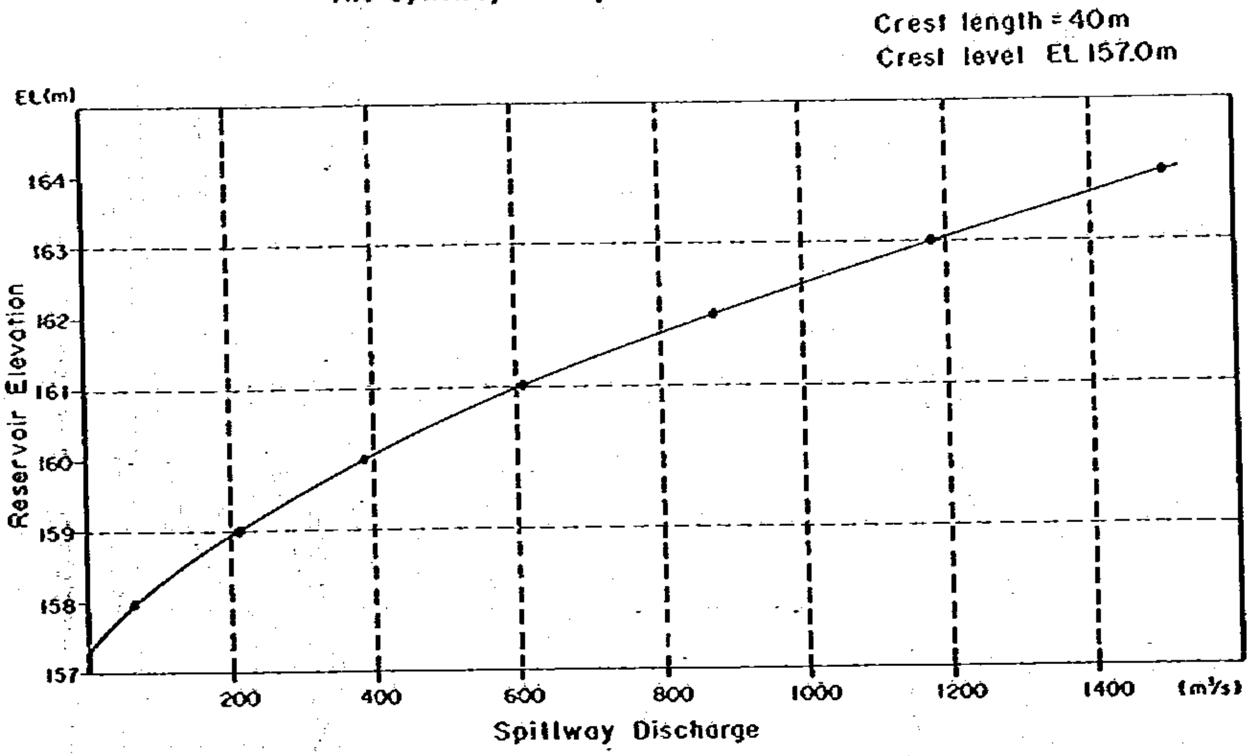
After step-by-step computation, the relation between the reservoir stages and rate of outflow during the spillway design flood was obtained as shown in Figure 9.4

The maximum water level, the surcharge volumes and the maximum outflow during the flood are listed in Table 9.3

Table 9.3 Design Flood at the Upper Damsite

Peak discharge of inflow	7,300 m^3/s
Maximum water level	EL 164.0
Surcharge volumes	580.0 x 10^6 m^3
Maximum outflow	1,504 m^3/s

The Spillway Rating Curve



The Reservoir Storage Curve

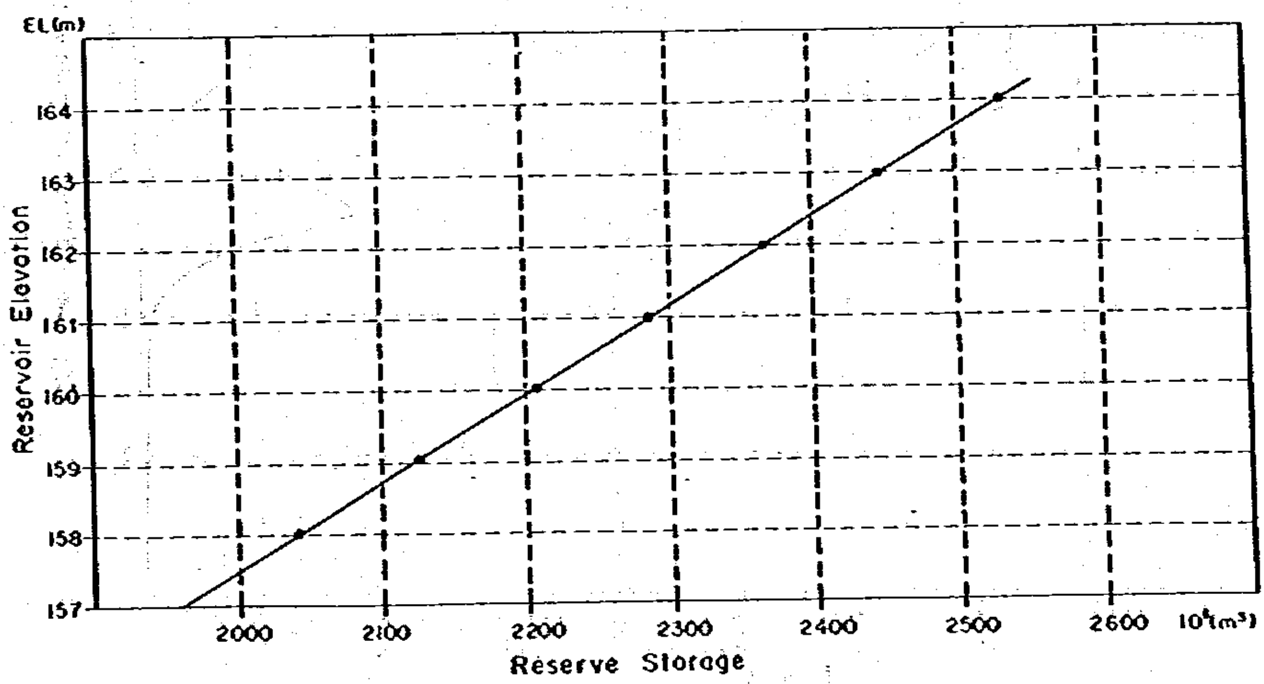


Fig. 9.3 The Spillway Rating Curve and the Reservoir Storage Curve (Uppen Dam)

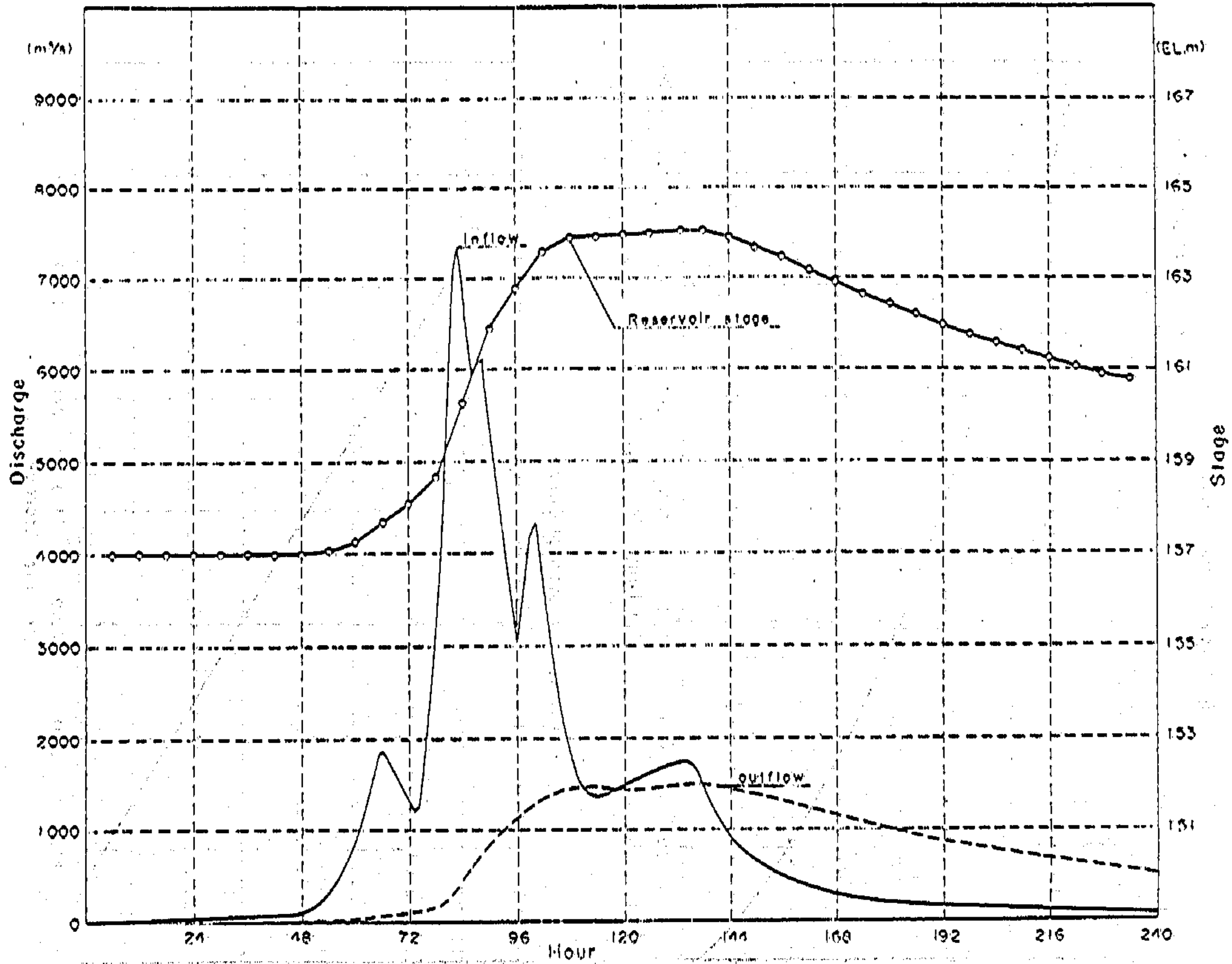


Fig 9.4 Reservoir Inflow, Stage, Outflow hydrograph (Upper Dam)

9.3.3 Lower Damsite Flood Control Calculation

The peak value of the flood with 1,000 years return period is 4,600 m^3/s. Of that total approximately 3,750 m^3/s are cut by the flood control at the Upper Dam and as consequence the maximum discharge of the Upper Dam becomes 850 m^3/s. Therefore, the design flood discharge of the Lower Dam becomes approximately 1,100 m^3/s, i.e., 850 m^3/s plus run-off of residual area.

Therefore, the dam design flow discharge of the lower damsite is about 1,100 m^3/s.

The flood control calculation for the lower damsite is made under the following conditions:

a) Initial water level of reservoir: EL 75,000m (H.W.L.)

b) Flood amount: Dam design flood discharge

c) Flood discharge rate

The crest length of the flood discharge is 84m. The crest elevation of the central 42m section is at EL 75.00 and that of other sections is at EL 76.00 m.

Fig. 9.5 shows the water level - discharge curve.

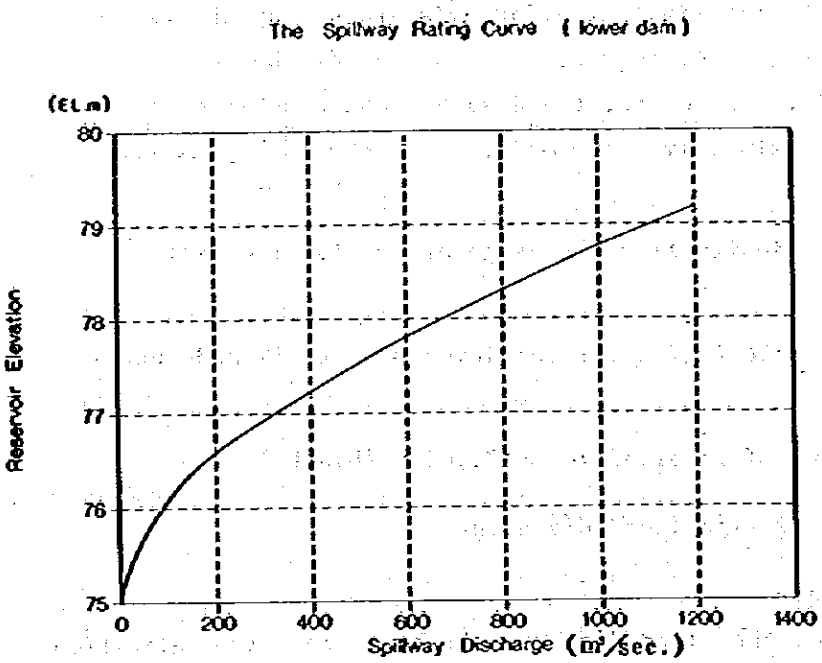
d) Reservoir capacity

Fig. 9.5 shows the reservoir capacity curve above the flood discharge crest top end.

The relationship between the inflow rate, reservoir water level and discharge rate is shown in Fig. 9.6. Table 9.4 shows the maximum reservoir level, control capacity and maximum discharge rate.

Table 9.4 Design Flood at the Lower Damsite

Peak discharge of inflow	1,100 m^3/s
Maximum water level	EL 79.00
Surcharge volumes	30.5 x 10^6 m^3
Maximum outflow	1,100 m^3/s



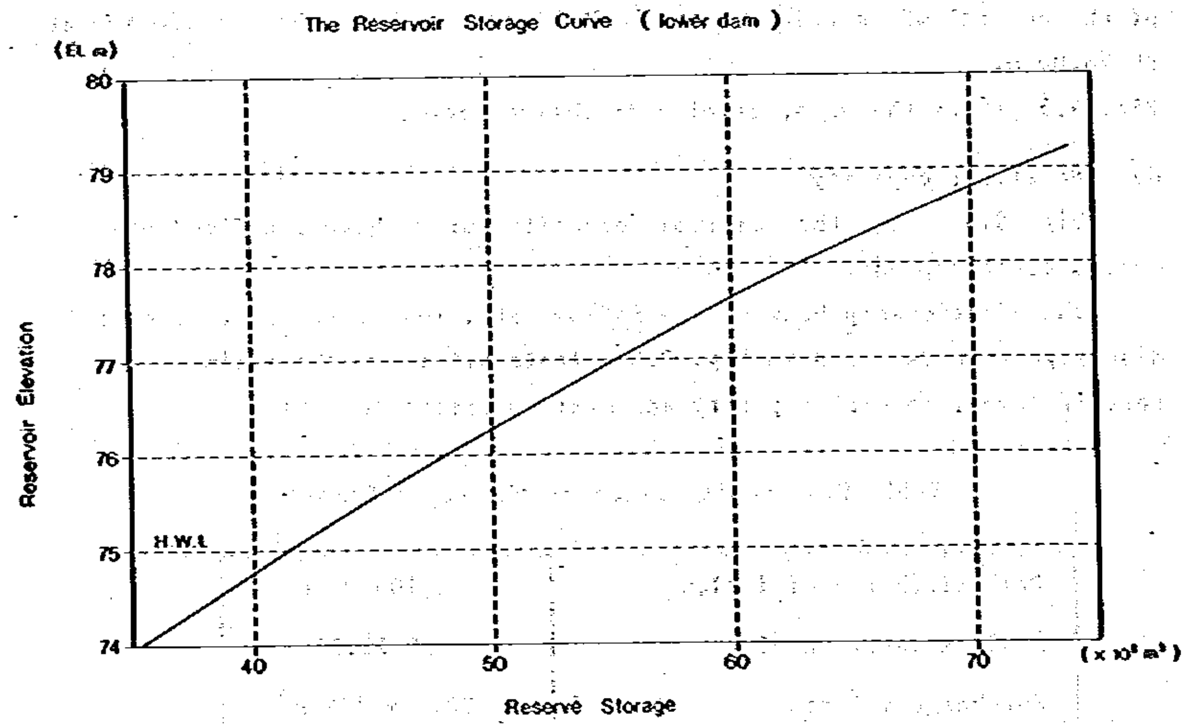


Fig.9.5 The Spillway Rating Curve and the Reservoir Storage Curve (Lower Dam)

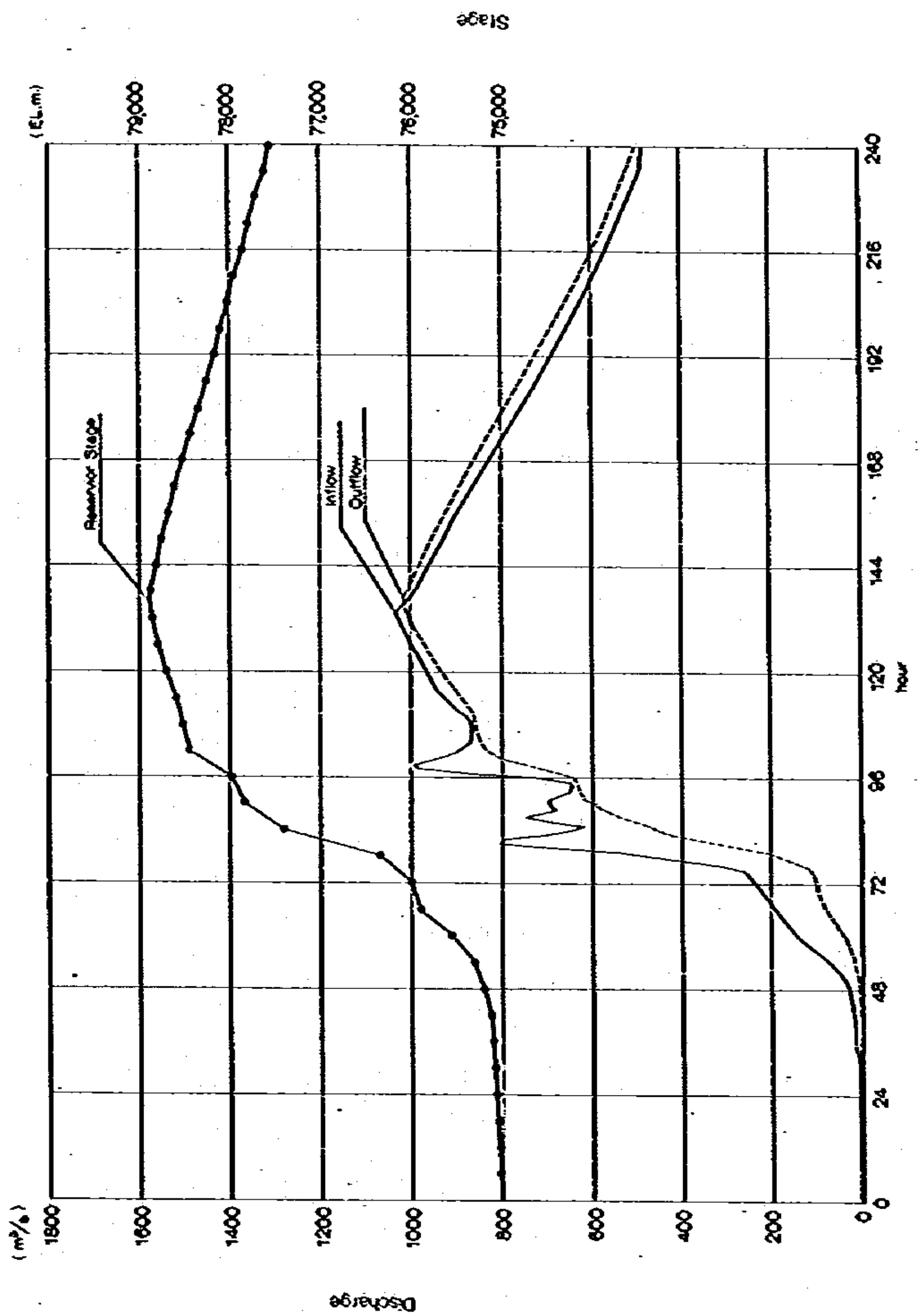


Fig.9.6 Reservior Inflow, Stage, Outflow hydrograph (Lower Dam)

APPENDICES

[illegible]

Appendix A

Maximum Rainfall Data Used in Analysis

** MENTAKAB ESTATE (STN.3523137) 1930-1978 (43 FULL YEARS)

1 DAY — RANK OF VALUES

NO	TIME IN YEARS	(R)	NO	TIME IN YEARS	(R)	THOMAS	HAZEN
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6	[illegible]	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]
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8	[illegible]	[illegible]	8	1975	[illegible]	[illegible]	[illegible]
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11	[illegible]	[illegible]	11	[illegible]	[illegible]	[illegible]	[illegible]
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2 DAY — RANK OF VALUES

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3 DAY — RANK OF VALUES

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43	1978	[illegible]	43	[illegible]	[illegible]	[illegible]	[illegible]

** PAYA BUNGOR (STN.3629098) 1931-1980 (34 FULL YEARS)

1 DAY — RANK OF VALUES

NO	TIME IN YEARS	(R)	NO	TIME IN YEARS	(R)	THOMAS	HAZEN
1	1931--1932	39.1	1	1966--1967	254.0	0.029	0.015
2	1932--1933	94.0	2	1949--1950	241.3	0.057	0.044
3	1933--1934	60.5	3	1947--1948	235.0	0.086	0.074
4	1936--1937	37.8	4	1970--1971	232.4	0.114	0.103
5	1938--1939	111.8	5	1950--1951	193.0	0.143	0.132
6	1939--1940	45.7	6	1965--1966	186.2	0.171	0.162
7	1947--1948	235.0	7	1953--1954	165.1	0.200	0.191
8	1948--1949	119.4	8	1960--1961	154.9	0.229	0.221
9	1949--1950	241.3	9	1971--1972	154.9	0.257	0.250
10	1950--1951	193.0	10	1955--1956	152.4	0.286	0.279
11	1951--1952	78.7	11	1972--1973	145.0	0.314	0.309
12	1952--1953	76.2	12	1973--1974	131.6	0.343	0.338
13	1953--1954	165.1	13	1975	131.5	0.371	0.368
14	1954--1955	76.2	14	1961--1962	121.4	0.400	0.397
15	1955--1956	152.4	15	1948--1949	119.4	0.429	0.426
16	1960--1961	154.9	16	1980	117.0	0.457	0.456
17	1961--1962	121.4	17	1976	112.5	0.486	0.485
18	1963--1964	76.2	18	1938--1939	111.8	0.514	0.515
19	1965--1966	186.2	19	1969--1970	105.9	0.543	0.544
20	1966--1967	254.0	20	1979	100.5	0.571	0.574
21	1967--1968	93.5	21	1977	97.5	0.600	0.603
22	1968--1969	88.4	22	1932--1933	94.0	0.629	0.632
23	1969--1970	105.9	23	1967--1968	93.5	0.657	0.662
24	1970--1971	232.4	24	1968--1969	88.4	0.686	0.691
25	1971--1972	154.9	25	1951--1952	78.7	0.714	0.721
26	1972--1973	145.0	26	1974--1975	77.0	0.743	0.750
27	1973--1974	131.6	27	1952--1953	76.2	0.771	0.779
28	1974--1975	77.0	28	1954--1955	76.2	0.800	0.809
29	1975	131.5	29	1963--1964	76.2	0.829	0.838
30	1976	112.5	30	1978	70.5	0.857	0.868
31	1977	97.5	31	1933--1934	60.5	0.886	0.897
32	1978	70.5	32	1939--1940	45.7	0.914	0.926
33	1979	100.5	33	1931--1932	39.1	0.943	0.956
34	1980	117.0	34	1936--1937	37.8	0.971	0.985

2 DAY — RANK OF VALUES

NO	TIME IN YEARS	(R)	NO	TIME IN YEARS	(R)	THOMAS	HAZEN
1	1931--1932	62.7	1	1970--1971	443.2	0.029	0.015
2	1932--1933	148.6	2	1966--1967	325.1	0.057	0.044
3	1933--1934	73.4	3	1949--1950	309.9	0.086	0.074
4	1936--1937	37.8	4	1955--1956	281.0	0.114	0.103
5	1938--1939	200.7	5	1972--1973	277.4	0.143	0.132
6	1939--1940	68.6	6	1971--1972	274.3	0.171	0.162
7	1947--1948	269.2	7	1947--1948	269.2	0.200	0.191
8	1948--1949	190.5	8	1950--1951	256.5	0.229	0.221
9	1949--1950	309.9	9	1965--1966	235.0	0.257	0.250
10	1950--1951	256.5	10	1975	234.5	0.286	0.279
11	1951--1952	111.8	11	1953--1954	228.6	0.314	0.309
12	1952--1953	129.5	12	1973--1974	220.7	0.343	0.338
13	1953--1954	228.6	13	1938--1939	200.7	0.371	0.368
14	1954--1955	91.4	14	1948--1949	190.5	0.400	0.397
15	1955--1956	281.0	15	1960--1961	182.9	0.429	0.426
16	1960--1961	182.9	16	1976	158.0	0.457	0.456
17	1961--1962	121.4	17	1979	158.0	0.486	0.485
18	1963--1964	99.1	18	1932--1933	148.6	0.514	0.515
19	1965--1966	235.0	19	1967--1968	148.6	0.543	0.544
20	1966--1967	325.1	20	1980	132.0	0.571	0.574
21	1967--1968	148.6	21	1968--1969	131.6	0.600	0.603
22	1968--1969	131.6	22	1952--1953	129.5	0.629	0.632
23	1969--1970	105.9	23	1977	128.0	0.657	0.662
24	1970--1971	443.2	24	1961--1962	121.4	0.686	0.691
25	1971--1972	274.3	25	1978	112.0	0.714	0.721
26	1972--1973	277.4	26	1951--1952	111.8	0.743	0.750
27	1973--1974	220.7	27	1969--1970	105.9	0.771	0.779
28	1974--1975	87.4	28	1963--1964	99.1	0.800	0.809
29	1975	234.5	29	1954--1955	91.4	0.829	0.838
30	1976	158.0	30	1974--1975	87.4	0.857	0.868
31	1977	128.0	31	1933--1934	73.4	0.886	0.897
32	1978	112.0	32	1939--1940	68.6	0.914	0.926
33	1979	158.0	33	1931--1932	62.7	0.943	0.956
34	1980	132.0	34	1936--1937	37.8	0.971	0.985

3 DAY — RANK OF VALUES

NO	TIME IN YEARS	(R)	NO	TIME IN YEARS	(R)	THOMAS	HAZEN
1	1931--1932	83.6	1	1970--1971	523.2	0.029	0.015
2	1932--1933	170.4	2	1955--1956	419.1	0.057	0.044
3	1933--1934	83.1	3	1949--1950	386.1	0.086	0.074
4	1936--1937	44.2	4	1972--1973	365.5	0.114	0.103
5	1938--1939	284.5	5	1971--1972	350.5	0.143	0.132
6	1939--1940	94.0	6	1950--1951	345.4	0.171	0.162
7	1947--1948	275.6	7	1966--1967	340.4	0.200	0.191
8	1948--1949	203.2	8	1938--1939	284.5	0.229	0.221
9	1949--1950	386.1	9	1973--1974	283.7	0.257	0.250
10	1950--1951	345.4	10	1947--1948	275.6	0.286	0.279
11	1951--1952	142.2	11	1979	248.5	0.314	0.309
12	1952--1953	160.0	12	1965--1966	246.4	0.343	0.338
13	1953--1954	233.7	13	1975	245.0	0.371	0.368
14	1954--1955	114.3	14	1953--1954	233.7	0.400	0.397
15	1955--1956	419.1	15	1967--1968	209.6	0.429	0.426
16	1960--1961	194.3	16	1948--1949	203.2	0.457	0.456
17	1961--1962	138.4	17	1960--1961	194.3	0.486	0.485
18	1963--1964	105.4	18	1976	181.0	0.514	0.515
19	1965--1966	246.4	19	1932--1933	170.4	0.543	0.544
20	1966--1967	340.4	20	1968--1969	162.1	0.571	0.574
21	1967--1968	209.6	21	1952--1953	160.0	0.600	0.603
22	1968--1969	162.1	22	1974--1975	155.2	0.629	0.632
23	1969--1970	109.7	23	1951--1952	142.2	0.657	0.662
24	1970--1971	523.2	24	1961--1962	138.4	0.686	0.691
25	1971--1972	350.5	25	1980	135.5	0.714	0.721
26	1972--1973	365.5	26	1978	129.5	0.743	0.750
27	1973--1974	283.7	27	1977	128.0	0.771	0.779
28	1974--1975	155.2	28	1954--1955	114.3	0.800	0.809
29	1975	245.0	29	1969--1970	109.7	0.829	0.838
30	1976	181.0	30	1963--1964	105.4	0.857	0.868
31	1977	128.0	31	1939--1940	94.0	0.886	0.897
32	1978	129.5	32	1931--1932	83.6	0.914	0.926
33	1979	248.5	33	1933--1934	83.1	0.943	0.956
34	1980	135.5	34	1936--1937	44.2	0.971	0.985

** J.K.R JERPOL (STN.37260091 1930-1980 (40 FULL YEARS)

1 DAY

RANK OF VALUES

NO	TIME IN YEARS	(R)	NO	TIME IN YEARS	(R)	THOMAS	HAZEN
1	1930--1931	[illegible]	1	1970--1971	[illegible]	[illegible]	0.012
2	[illegible]	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible]	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]
6	[illegible]	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]
7	[illegible]	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]
8	[illegible]	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]
9	[illegible]	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]
10	[illegible]	160.0	10	[illegible]	[illegible]	[illegible]	[illegible]
11	[illegible]	[illegible]	11	[illegible]	[illegible]	[illegible]	[illegible]
12	[illegible]	[illegible]	12	[illegible]	[illegible]	[illegible]	[illegible]
13	[illegible]	[illegible]	13	[illegible]	[illegible]	[illegible]	[illegible]
14	[illegible]	[illegible]	14	[illegible]	[illegible]	[illegible]	[illegible]
15	[illegible]	[illegible]	15	[illegible]	[illegible]	[illegible]	[illegible]
16	[illegible]	[illegible]	16	[illegible]	[illegible]	[illegible]	[illegible]
17	[illegible]	[illegible]	17	[illegible]	[illegible]	[illegible]	[illegible]
18	[illegible]	[illegible]	18	[illegible]	[illegible]	[illegible]	[illegible]
19	[illegible]	[illegible]	19	[illegible]	[illegible]	[illegible]	[illegible]
20	[illegible]	[illegible]	20	[illegible]	[illegible]	[illegible]	[illegible]
21	[illegible]	[illegible]	21	[illegible]	[illegible]	[illegible]	[illegible]
22	[illegible]	[illegible]	22	[illegible]	[illegible]	[illegible]	[illegible]
23	[illegible]	[illegible]	23	[illegible]	[illegible]	[illegible]	[illegible]
24	[illegible]	[illegible]	24	[illegible]	[illegible]	[illegible]	[illegible]
25	[illegible]	[illegible]	25	[illegible]	[illegible]	[illegible]	[illegible]
26	[illegible]	[illegible]	26	[illegible]	[illegible]	[illegible]	[illegible]
27	[illegible]	[illegible]	27	[illegible]	[illegible]	[illegible]	[illegible]
28	[illegible]	[illegible]	28	[illegible]	[illegible]	[illegible]	[illegible]
29	[illegible]	[illegible]	29	[illegible]	[illegible]	[illegible]	[illegible]
30	[illegible]	[illegible]	30	[illegible]	[illegible]	[illegible]	[illegible]
31	[illegible]	[illegible]	31	[illegible]	[illegible]	[illegible]	[illegible]
32	[illegible]	[illegible]	32	[illegible]	[illegible]	[illegible]	[illegible]
33	[illegible]	[illegible]	33	[illegible]	[illegible]	[illegible]	[illegible]
34	[illegible]	[illegible]	34	[illegible]	[illegible]	[illegible]	[illegible]
35	[illegible]	[illegible]	35	[illegible]	[illegible]	[illegible]	[illegible]
36	[illegible]	[illegible]	36	[illegible]	[illegible]	[illegible]	[illegible]
37	[illegible]	[illegible]	37	[illegible]	[illegible]	[illegible]	[illegible]
38	[illegible]	[illegible]	38	[illegible]	[illegible]	[illegible]	[illegible]
39	[illegible]	[illegible]	39	[illegible]	[illegible]	[illegible]	[illegible]
40	[illegible]	[illegible]	40	1952--1963	[illegible]	[illegible]	[illegible]

2 DAY

RANK OF VALUES

NO	TIME IN YEARS	(R)	NO	TIME IN YEARS	(R)	THOMAS	HAZEN
1	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible]	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]
6	[illegible]	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]
7	[illegible]	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]
8	[illegible]	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]
9	[illegible]	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]
10	[illegible]	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]
11	[illegible]	[illegible]	11	[illegible]	[illegible]	[illegible]	[illegible]
12	[illegible]	[illegible]	12	[illegible]	[illegible]	[illegible]	[illegible]
13	[illegible]	[illegible]	13	[illegible]	[illegible]	[illegible]	[illegible]
14	[illegible]	[illegible]	14	[illegible]	[illegible]	[illegible]	[illegible]
15	[illegible]	[illegible]	15	[illegible]	[illegible]	[illegible]	[illegible]
16	[illegible]	[illegible]	16	[illegible]	[illegible]	[illegible]	[illegible]
17	[illegible]	[illegible]	17	[illegible]	[illegible]	[illegible]	[illegible]
18	[illegible]	[illegible]	18	[illegible]	[illegible]	[illegible]	[illegible]
19	[illegible]	[illegible]	19	[illegible]	[illegible]	[illegible]	[illegible]
20	[illegible]	[illegible]	20	[illegible]	[illegible]	[illegible]	[illegible]
21	[illegible]	[illegible]	21	[illegible]	[illegible]	[illegible]	[illegible]
22	[illegible]	[illegible]	22	[illegible]	[illegible]	[illegible]	[illegible]
23	[illegible]	[illegible]	23	[illegible]	[illegible]	[illegible]	[illegible]
24	[illegible]	[illegible]	24	[illegible]	[illegible]	[illegible]	[illegible]
25	[illegible]	[illegible]	25	[illegible]	[illegible]	[illegible]	[illegible]
26	[illegible]	[illegible]	26	[illegible]	[illegible]	[illegible]	[illegible]
27	[illegible]	[illegible]	27	[illegible]	[illegible]	[illegible]	[illegible]
28	[illegible]	[illegible]	28	[illegible]	[illegible]	[illegible]	[illegible]
29	[illegible]	[illegible]	29	[illegible]	[illegible]	[illegible]	[illegible]
30	[illegible]	[illegible]	30	[illegible]	[illegible]	[illegible]	[illegible]
31	[illegible]	[illegible]	31	[illegible]	[illegible]	[illegible]	[illegible]
32	[illegible]	[illegible]	32	[illegible]	[illegible]	[illegible]	[illegible]
33	[illegible]	[illegible]	33	[illegible]	[illegible]	[illegible]	[illegible]
34	[illegible]	[illegible]	34	[illegible]	[illegible]	[illegible]	[illegible]
35	[illegible]	[illegible]	35	[illegible]	[illegible]	[illegible]	[illegible]
36	[illegible]	[illegible]	36	[illegible]	[illegible]	[illegible]	[illegible]
37	[illegible]	[illegible]	37	[illegible]	[illegible]	[illegible]	[illegible]
38	[illegible]	[illegible]	38	[illegible]	[illegible]	[illegible]	[illegible]
39	[illegible]	[illegible]	39	[illegible]	[illegible]	[illegible]	[illegible]
40	[illegible]	[illegible]	40	[illegible]	[illegible]	[illegible]	[illegible]

3 DAY

RANK OF VALUES

NO	TIME IN YEARS	(R)	NO	TIME IN YEARS	(R)	THOMAS	HAZEN
1	[illegible]	[illegible]	1	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	2	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	3	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	4	[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible]	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]
6	[illegible]	[illegible]	6	[illegible]	[illegible]	[illegible]	[illegible]
7	[illegible]	[illegible]	7	[illegible]	[illegible]	[illegible]	[illegible]
8	[illegible]	[illegible]	8	[illegible]	[illegible]	[illegible]	[illegible]
9	[illegible]	[illegible]	9	[illegible]	[illegible]	[illegible]	[illegible]
10	[illegible]	[illegible]	10	[illegible]	[illegible]	[illegible]	[illegible]
11	[illegible]	[illegible]	11	[illegible]	[illegible]	[illegible]	[illegible]
12	[illegible]	[illegible]	12	[illegible]	[illegible]	[illegible]	[illegible]
13	[illegible]	[illegible]	13	[illegible]	[illegible]	[illegible]	[illegible]
14	[illegible]	[illegible]	14	[illegible]	[illegible]	[illegible]	[illegible]
15	[illegible]	[illegible]	15	[illegible]	[illegible]	[illegible]	[illegible]
16	[illegible]	[illegible]	16	[illegible]	[illegible]	[illegible]	[illegible]
17	[illegible]	[illegible]	17	[illegible]	[illegible]	[illegible]	[illegible]
18	[illegible]	[illegible]	18	[illegible]	[illegible]	[illegible]	[illegible]
19	[illegible]	[illegible]	19	[illegible]	[illegible]	[illegible]	[illegible]
20	[illegible]	[illegible]	20	[illegible]	[illegible]	[illegible]	[illegible]
21	[illegible]	[illegible]	21	[illegible]	[illegible]	[illegible]	[illegible]
22	[illegible]	[illegible]	22	[illegible]	[illegible]	[illegible]	[illegible]
23	[illegible]	[illegible]	23	[illegible]	[illegible]	[illegible]	[illegible]
24	[illegible]	[illegible]	24	[illegible]	[illegible]	[illegible]	[illegible]
25	[illegible]	[illegible]	25	[illegible]	[illegible]	[illegible]	[illegible]
26	[illegible]	[illegible]	26	[illegible]	[illegible]	[illegible]	[illegible]
27	[illegible]	[illegible]	27	[illegible]	[illegible]	[illegible]	[illegible]
28	[illegible]	[illegible]	28	[illegible]	[illegible]	[illegible]	[illegible]
29	[illegible]	[illegible]	29	[illegible]	[illegible]	[illegible]	[illegible]
30	[illegible]	[illegible]	30	[illegible]	[illegible]	[illegible]	[illegible]
31	[illegible]	[illegible]	31	[illegible]	[illegible]	[illegible]	[illegible]
32	[illegible]	[illegible]	32	[illegible]	[illegible]	[illegible]	[illegible]
33	[illegible]	[illegible]	33	[illegible]	[illegible]	[illegible]	[illegible]
34	[illegible]	[illegible]	34	[illegible]	[illegible]	[illegible]	[illegible]
35	[illegible]	[illegible]	35	[illegible]	[illegible]	[illegible]	[illegible]
36	[illegible]	[illegible]	36	[illegible]	[illegible]	[illegible]	[illegible]
37	[illegible]	[illegible]	37	[illegible]	[illegible]	[illegible]	[illegible]
38	[illegible]	[illegible]	38	[illegible]	[illegible]	[illegible]	[illegible]
39	[illegible]	[illegible]	39	[illegible]	[illegible]	[illegible]	[illegible]
40	[illegible]	[illegible]	40	[illegible]	[illegible]	[illegible]	[illegible]

** KG. MERTING (STN.4223115) 1948-1977 (26 FULL YEARS)

1 DAY — RANK OF VALUES

NO	TIME IN YEARS	(R)	NO	TIME IN YEARS	(R)	THOMAS	HAZEN
1	1948--1949	89.9	1	1955--1956	287.0	0.037	0.019
2	1949--1950	108.2	2	1952--1953	148.1	0.074	0.058
3	1950--1951	99.8	3	1962--1963	137.7	0.111	0.096
4	1951--1952	80.3	4	1957--1958	135.1	0.148	0.135
5	1952--1953	148.1	5	1956--1957	132.3	0.185	0.173
6	1953--1954	92.2	6	1973--1974	127.5	0.222	0.212
7	1954--1955	89.9	7	1965--1966	122.4	0.259	0.250
8	1955--1956	287.0	8	1972--1973	122.4	0.296	0.288
9	1956--1957	132.3	9	1963--1964	117.3	0.333	0.327
10	1957--1958	135.1	10	1949--1950	108.2	0.370	0.365
11	1958--1959	95.0	11	1968--1969	102.9	0.407	0.404
12	1960--1961	79.8	12	1950--1951	99.8	0.444	0.442
13	1961--1962	62.0	13	1958--1959	95.0	0.481	0.481
14	1962--1963	137.7	14	1975	94.0	0.519	0.519
15	1963--1964	117.3	15	1953--1954	92.2	0.556	0.558
16	1965--1966	122.4	16	1969--1970	90.7	0.593	0.596
17	1968--1969	102.9	17	1948--1949	89.9	0.630	0.635
18	1969--1970	90.7	18	1954--1955	89.9	0.667	0.673
19	1970--1971	56.9	19	1974--1975	87.9	0.704	0.712
20	1971--1972	50.8	20	1951--1952	80.3	0.741	0.750
21	1972--1973	122.4	21	1960--1961	79.8	0.778	0.788
22	1973--1974	127.5	22	1976	78.5	0.815	0.827
23	1974--1975	87.9	23	1977	70.0	0.852	0.865
24	1975	94.0	24	1961--1962	62.0	0.889	0.904
25	1976	78.5	25	1970--1971	56.9	0.926	0.942
26	1977	70.0	26	1971--1972	50.8	0.963	0.981

2 DAY — RANK OF VALUES

NO	TIME IN YEARS	(R)	NO	TIME IN YEARS	(R)	THOMAS	HAZEN
1	1948--1949	103.1	1	1955--1956	478.0	0.037	0.019
2	1949--1950	165.1	2	1956--1957	183.9	0.074	0.058
3	1950--1951	99.8	3	1975	177.5	0.111	0.096
4	1951--1952	81.0	4	1962--1963	173.5	0.148	0.135
5	1952--1953	154.7	5	1957--1958	172.7	0.185	0.173
6	1953--1954	124.5	6	1973--1974	169.9	0.222	0.212
7	1954--1955	100.3	7	1949--1950	165.1	0.259	0.250
8	1955--1956	478.0	8	1952--1953	154.7	0.296	0.288
9	1956--1957	183.9	9	1972--1973	147.3	0.333	0.327
10	1957--1958	172.7	10	1969--1970	139.7	0.370	0.365
11	1958--1959	128.5	11	1960--1961	136.1	0.407	0.404
12	1960--1961	136.1	12	1965--1966	136.1	0.444	0.442
13	1961--1962	95.5	13	1963--1964	135.9	0.481	0.481
14	1962--1963	173.5	14	1974--1975	130.3	0.519	0.519
15	1963--1964	135.9	15	1958--1959	128.5	0.556	0.558
16	1965--1966	136.1	16	1953--1954	124.5	0.593	0.596
17	1968--1969	102.9	17	1977	120.0	0.630	0.635
18	1969--1970	139.7	18	1948--1949	103.1	0.667	0.673
19	1970--1971	59.9	19	1968--1969	102.9	0.704	0.712
20	1971--1972	58.4	20	1954--1955	100.3	0.741	0.750
21	1972--1973	147.3	21	1950--1951	99.8	0.778	0.788
22	1973--1974	169.9	22	1961--1962	95.5	0.815	0.827
23	1974--1975	130.3	23	1976	82.5	0.852	0.865
24	1975	177.5	24	1951--1952	81.0	0.889	0.904
25	1976	82.5	25	1970--1971	59.9	0.926	0.942
26	1977	120.0	26	1971--1972	58.4	0.963	0.981

3 DAY — RANK OF VALUES

NO	TIME IN YEARS	(R)	NO	TIME IN YEARS	(R)	THOMAS	HAZEN
1	1948--1949	114.3	1	1955--1956	562.9	0.037	0.019
2	1949--1950	178.8	2	1956--1957	210.8	0.074	0.058
3	1950--1951	162.8	3	1962--1963	207.5	0.111	0.096
4	1951--1952	109.5	4	1957--1958	203.7	0.148	0.135
5	1952--1953	160.8	5	1975	190.0	0.185	0.173
6	1953--1954	137.7	6	1973--1974	185.9	0.222	0.212
7	1954--1955	153.9	7	1960--1961	180.1	0.259	0.250
8	1955--1956	562.9	8	1949--1950	178.8	0.296	0.288
9	1956--1957	210.8	9	1972--1973	175.8	0.333	0.327
10	1957--1958	203.7	10	1969--1970	172.7	0.370	0.365
11	1958--1959	128.5	11	1963--1964	166.6	0.407	0.404
12	1960--1961	180.1	12	1950--1951	162.8	0.444	0.442
13	1961--1962	95.5	13	1952--1953	160.8	0.481	0.481
14	1962--1963	207.5	14	1954--1955	153.9	0.519	0.519
15	1963--1964	166.6	15	1977	150.0	0.556	0.558
16	1965--1966	141.0	16	1965--1966	141.0	0.593	0.596
17	1968--1969	104.1	17	1953--1954	137.7	0.630	0.635
18	1969--1970	172.7	18	1976	132.5	0.667	0.673
19	1970--1971	70.6	19	1974--1975	132.3	0.704	0.712
20	1971--1972	59.4	20	1958--1959	128.5	0.741	0.750
21	1972--1973	175.8	21	1948--1949	114.3	0.778	0.788
22	1973--1974	185.9	22	1951--1952	109.5	0.815	0.827
23	1974--1975	132.3	23	1968--1969	104.1	0.852	0.865
24	1975	190.0	24	1961--1962	95.5	0.889	0.904
25	1976	132.5	25	1970--1971	70.6	0.926	0.942
26	1977	150.0	26	1971--1972	59.4	0.963	0.981

** PADANG LALLANG (STN.3833022) 1947-1979 (30 FULL YEARS)

1 DAY — RANK OF VALUES

NO	TIME IN YEARS	(R)	NO	TIME IN YEARS	(R)	THOMAS	HAZEN
1	1947--1948	310.4	1	1947--1948	310.4	0.032	0.017
2	1948--1949	159.3	2	1973--1974	233.5	0.065	0.050
3	1949--1950	252.5	3	1965--1966	286.3	0.097	0.083
4	1950--1951	165.1	4	1960--1961	235.5	0.129	0.117
5	1951--1952	116.8	5	1966--1967	279.1	0.161	0.150
6	1952--1953	260.6	6	1952--1953	260.6	0.194	0.183
7	1953--1954	157.5	7	1977	257.0	0.226	0.217
8	1954--1955	163.1	8	1949--1950	252.5	0.258	0.250
9	1955--1956	215.9	9	1970--1971	248.9	0.290	0.283
10	1956--1957	163.1	10	1979	236.5	0.323	0.317
11	1957--1958	213.9	11	1955--1956	215.9	0.355	0.350
12	1958--1959	92.7	12	1957--1958	213.9	0.387	0.383
13	1960--1961	285.5	13	1974--1975	177.4	0.419	0.417
14	1961--1962	131.6	14	1971--1972	190.5	0.452	0.450
15	1963--1964	116.8	15	1976	193.0	0.484	0.483
16	1964--1965	177.8	16	1964--1965	177.8	0.516	0.517
17	1965--1966	236.3	17	1956--1957	163.1	0.548	0.550
18	1966--1967	279.1	18	1950--1951	165.1	0.581	0.583
19	1967--1968	143.3	19	1954--1955	153.1	0.613	0.617
20	1968--1969	118.6	20	1948--1949	159.3	0.645	0.650
21	1969--1970	118.6	21	1953--1954	157.5	0.677	0.683
22	1970--1971	248.9	22	1967--1968	143.3	0.710	0.717
23	1971--1972	190.5	23	1961--1962	131.6	0.742	0.750
24	1972--1973	76.2	24	1968--1969	118.6	0.774	0.783
25	1973--1974	233.5	25	1969--1970	118.6	0.806	0.817
26	1974--1975	177.4	26	1951--1952	116.8	0.839	0.850
27	1976	193.0	27	1963--1964	116.8	0.871	0.883
28	1977	257.0	28	1978	108.5	0.903	0.917
29	1978	108.5	29	1958--1959	92.7	0.935	0.950
30	1979	236.5	30	1972--1973	76.2	0.968	0.983

2 DAY — RANK OF VALUES

NO	TIME IN YEARS	(R)	NO	TIME IN YEARS	(R)	THOMAS	HAZEN
1	1947--1948	470.9	1	1947--1948	470.9	0.032	0.017
2	1948--1949	238.0	2	1973--1974	444.2	0.065	0.050
3	1949--1950	354.6	3	1970--1971	395.7	0.097	0.083
4	1950--1951	203.2	4	1952--1953	357.3	0.129	0.117
5	1951--1952	194.6	5	1971--1972	355.6	0.161	0.150
6	1952--1953	367.3	6	1949--1950	354.6	0.194	0.183
7	1953--1954	216.9	7	1979	351.0	0.226	0.217
8	1954--1955	285.0	8	1966--1967	350.5	0.258	0.250
9	1955--1956	280.9	9	1965--1966	324.4	0.290	0.283
10	1956--1957	247.4	10	1957--1958	335.3	0.323	0.317
11	1957--1958	335.3	11	1954--1955	235.0	0.355	0.350
12	1958--1959	154.4	12	1960--1961	234.5	0.387	0.383
13	1960--1961	284.5	13	1955--1956	230.9	0.419	0.417
14	1961--1962	206.0	14	1964--1965	219.4	0.452	0.450
15	1963--1964	167.6	15	1953--1954	276.9	0.484	0.483
16	1964--1965	279.4	16	1977	257.5	0.516	0.517
17	1965--1966	324.4	17	1956--1957	247.4	0.548	0.550
18	1966--1967	350.5	18	1948--1949	238.0	0.581	0.583
19	1967--1968	148.3	19	1974--1975	218.9	0.613	0.617
20	1968--1969	158.9	20	1961--1962	206.0	0.645	0.650
21	1969--1970	193.1	21	1950--1951	203.2	0.677	0.683
22	1970--1971	395.7	22	1969--1970	193.1	0.710	0.717
23	1971--1972	355.6	23	1951--1952	194.6	0.742	0.750
24	1972--1973	77.9	24	1976	190.0	0.774	0.783
25	1973--1974	444.2	25	1963--1964	167.6	0.806	0.817
26	1974--1975	218.9	26	1968--1969	159.0	0.839	0.850
27	1976	190.0	27	1958--1959	154.4	0.871	0.883
28	1977	257.5	28	1967--1968	148.3	0.903	0.917
29	1978	120.5	29	1978	120.5	0.935	0.950
30	1979	351.0	30	1972--1973	77.0	0.968	0.983

3 DAY — RANK OF VALUES

NO	TIME IN YEARS	(R)	NO	TIME IN YEARS	(R)	THOMAS	HAZEN
1	1947--1948	570.2	1	1973--1974	658.3	0.032	0.017
2	1948--1949	263.4	2	1947--1948	570.2	0.065	0.050
3	1949--1950	372.1	3	1970--1971	524.0	0.097	0.083
4	1950--1951	227.1	4	1971--1972	469.9	0.129	0.117
5	1951--1952	240.3	5	1965--1966	459.7	0.161	0.150
6	1952--1953	382.5	6	1964--1965	392.4	0.194	0.183
7	1953--1954	353.1	7	1952--1953	332.5	0.226	0.217
8	1954--1955	303.5	8	1955--1956	372.9	0.258	0.250
9	1955--1956	372.9	9	1949--1950	372.1	0.290	0.283
10	1956--1957	313.9	10	1966--1967	356.9	0.323	0.317
11	1957--1958	346.5	11	1979	355.5	0.355	0.350
12	1958--1959	116.3	12	1953--1954	353.1	0.387	0.383
13	1960--1961	237.0	13	1957--1958	346.5	0.419	0.417
14	1961--1962	273.3	14	1974--1975	341.4	0.452	0.450
15	1963--1964	211.8	15	1956--1957	313.9	0.484	0.483
16	1964--1965	392.4	16	1954--1955	303.5	0.516	0.517
17	1965--1966	459.7	17	1960--1961	237.0	0.548	0.550
18	1966--1967	356.9	18	1961--1962	273.3	0.581	0.583
19	1967--1968	130.1	19	1977	264.5	0.613	0.617
20	1968--1969	112.7	20	1948--1949	263.4	0.645	0.650
21	1969--1970	245.1	21	1969--1970	245.1	0.677	0.683
22	1970--1971	524.0	22	1951--1952	240.3	0.710	0.717
23	1971--1972	469.9	23	1950--1951	227.1	0.742	0.750
24	1972--1973	128.8	24	1963--1964	211.8	0.774	0.783
25	1973--1974	658.3	25	1976	197.5	0.806	0.817
26	1974--1975	341.4	26	1967--1968	130.1	0.839	0.850
27	1976	197.5	27	1958--1959	116.3	0.871	0.883
28	1977	264.5	28	1968--1969	112.7	0.903	0.917
29	1978	120.5	29	1972--1973	128.8	0.935	0.950
30	1979	355.5	30	1978	120.5	0.968	0.983

** KG.SHAFU JERANTUT(STN.3922069) 1955-1980 (25 FULL YEARS)

1 DAY — RANK OF VALUES

NO	TIME IN YEARS	(R)	NO	TIME IN YEARS	(R)	THOMAS	HAZEN
1	1955--1956	356.9	1	1955--1956	356.9	0.038	0.020
2	1956--1957	66.0	2	1958--1959	204.0	0.077	0.060
3	1957--1958	56.5	3	1973--1974	141.0	0.115	0.100
4	1958--1959	204.0	4	1967--1968	132.1	0.154	0.140
5	1960--1961	81.5	5	1971--1972	108.0	0.192	0.180
6	1961--1962	67.1	6	1969--1970	106.4	0.231	0.220
7	1962--1963	31.0	7	1976	101.0	0.269	0.260
8	1963--1964	51.1	8	1966--1967	99.1	0.308	0.300
9	1964--1965	53.8	9	1957--1958	96.5	0.346	0.340
10	1965--1966	76.2	10	1968--1969	95.5	0.385	0.380
11	1966--1967	99.1	11	1977	86.0	0.423	0.420
12	1967--1968	132.1	12	1974--1975	85.9	0.462	0.460
13	1968--1969	95.5	13	1960--1961	81.5	0.500	0.500
14	1969--1970	106.4	14	1975	81.0	0.538	0.540
15	1970--1971	79.5	15	1970--1971	79.5	0.577	0.580
16	1971--1972	108.0	16	1980	78.0	0.615	0.620
17	1972--1973	47.0	17	1965--1966	76.2	0.654	0.660
18	1973--1974	141.0	18	1978	71.0	0.692	0.700
19	1974--1975	85.9	19	1979	71.0	0.731	0.740
20	1975	81.0	20	1961--1962	67.1	0.769	0.780
21	1976	101.0	21	1956--1957	66.0	0.808	0.820
22	1977	86.0	22	1964--1965	53.8	0.846	0.860
23	1978	71.0	23	1963--1964	51.1	0.885	0.900
24	1979	71.0	24	1972--1973	47.0	0.923	0.940
25	1980	78.0	25	1962--1963	31.0	0.952	0.980

2 DAY — RANK OF VALUES

NO	TIME IN YEARS	(R)	NO	TIME IN YEARS	(R)	THOMAS	HAZEN
1	1955--1956	369.6	1	1955--1956	369.6	0.038	0.020
2	1956--1957	100.3	2	1958--1959	204.0	0.077	0.060
3	1957--1958	161.3	3	1957--1958	161.3	0.115	0.100
4	1958--1959	204.0	4	1977	154.0	0.154	0.140
5	1960--1961	103.1	5	1967--1968	148.3	0.192	0.180
6	1961--1962	73.4	6	1973--1974	141.0	0.231	0.220
7	1962--1963	40.6	7	1970--1971	140.7	0.269	0.260
8	1963--1964	55.1	8	1975	123.5	0.308	0.300
9	1964--1965	80.8	9	1974--1975	123.4	0.346	0.340
10	1965--1966	76.2	10	1969--1970	116.3	0.385	0.380
11	1966--1967	112.8	11	1966--1967	112.8	0.423	0.420
12	1967--1968	148.3	12	1976	111.0	0.462	0.460
13	1968--1969	97.3	13	1979	109.0	0.500	0.500
14	1969--1970	116.3	14	1971--1972	108.0	0.538	0.540
15	1970--1971	140.7	15	1960--1961	103.1	0.577	0.580
16	1971--1972	108.0	16	1978	101.0	0.615	0.620
17	1972--1973	66.8	17	1956--1957	100.3	0.654	0.660
18	1973--1974	141.0	18	1980	99.0	0.692	0.700
19	1974--1975	123.4	19	1968--1969	97.3	0.731	0.740
20	1975	123.5	20	1964--1965	80.8	0.769	0.780
21	1976	111.0	21	1965--1966	76.2	0.808	0.820
22	1977	154.0	22	1961--1962	73.4	0.846	0.860
23	1978	101.0	23	1972--1973	66.8	0.885	0.900
24	1979	109.0	24	1963--1964	55.1	0.923	0.940
25	1980	99.0	25	1962--1963	40.6	0.952	0.980

3 DAY — RANK OF VALUES

NO	TIME IN YEARS	(R)	NO	TIME IN YEARS	(R)	THOMAS	HAZEN
1	1955--1956	384.8	1	1955--1956	384.8	0.038	0.020
2	1956--1957	112.3	2	1958--1959	204.0	0.077	0.060
3	1957--1958	201.9	3	1957--1958	201.9	0.115	0.100
4	1958--1959	204.0	4	1970--1971	190.5	0.154	0.140
5	1960--1961	113.0	5	1967--1968	167.4	0.192	0.180
6	1961--1962	75.9	6	1977	166.0	0.231	0.220
7	1962--1963	52.3	7	1969--1970	151.6	0.269	0.260
8	1963--1964	55.1	8	1973--1974	150.1	0.308	0.300
9	1964--1965	81.8	9	1971--1972	143.8	0.346	0.340
10	1965--1966	84.6	10	1974--1975	140.0	0.385	0.380
11	1966--1967	123.4	11	1975	138.5	0.423	0.420
12	1967--1968	167.4	12	1966--1967	123.4	0.462	0.460
13	1968--1969	104.9	13	1980	118.5	0.500	0.500
14	1969--1970	151.6	14	1960--1961	113.0	0.538	0.540
15	1970--1971	190.5	15	1956--1957	112.3	0.577	0.580
16	1971--1972	143.8	16	1978	112.0	0.615	0.620
17	1972--1973	81.3	17	1976	111.0	0.654	0.660
18	1973--1974	150.1	18	1979	109.0	0.692	0.700
19	1974--1975	140.0	19	1968--1969	104.9	0.731	0.740
20	1975	138.5	20	1965--1966	84.6	0.769	0.780
21	1976	111.0	21	1964--1965	81.8	0.808	0.820
22	1977	166.0	22	1972--1973	81.3	0.846	0.860
23	1978	112.0	23	1961--1962	75.9	0.885	0.900
24	1979	109.0	24	1963--1964	55.1	0.923	0.940
25	1980	118.5	25	1962--1963	52.3	0.952	0.980

** J.K.R BENTA (STN.4919001) 1947-1975 (23 FULL YEARS)

1 DAY

RANK OF VALUES

NO	TIME IN YEARS	(R)	NO	TIME IN YEARS	(R)	THOMAS	HAZEN
1	1947--1948	63.5	1	1956--1957	133.4	0.042	0.022
2	1950--1951	61.0	2	1968--1969	130.8	0.083	0.065
3	1951--1952	68.6	3	1966--1967	129.5	0.125	0.109
4	1952--1953	63.5	4	1970--1971	121.9	0.167	0.152
5	1953--1954	63.5	5	1969--1970	113.5	0.208	0.196
6	1954--1955	53.3	6	1964--1965	102.6	0.250	0.239
7	1955--1956	96.5	7	1961--1962	101.6	0.292	0.283
8	1956--1957	133.4	8	1955--1956	96.5	0.333	0.326
9	1957--1958	83.1	9	1971--1972	95.3	0.375	0.370
10	1958--1959	59.2	10	1974--1975	94.5	0.417	0.413
11	1961--1962	101.6	11	1962--1963	87.6	0.458	0.457
12	1962--1963	87.6	12	1973--1974	85.1	0.500	0.500
13	1963--1964	47.5	13	1957--1958	83.1	0.542	0.543
14	1964--1965	102.6	14	1967--1968	79.0	0.583	0.587
15	1966--1967	129.5	15	1951--1952	68.6	0.625	0.630
16	1967--1968	79.0	16	1972--1973	64.8	0.667	0.674
17	1968--1969	130.8	17	1947--1948	63.5	0.708	0.717
18	1969--1970	113.5	18	1952--1953	63.5	0.750	0.761
19	1970--1971	121.9	19	1953--1954	63.5	0.792	0.804
20	1971--1972	95.3	20	1950--1951	61.0	0.833	0.848
21	1972--1973	64.8	21	1958--1959	59.2	0.875	0.891
22	1973--1974	85.1	22	1954--1955	53.3	0.917	0.935
23	1974--1975	94.5	23	1963--1964	47.5	0.958	0.978

2 DAY

RANK OF VALUES

NO	TIME IN YEARS	(R)	NO	TIME IN YEARS	(R)	THOMAS	HAZEN
1	1947--1948	88.9	1	1956--1957	215.4	0.042	0.022
2	1950--1951	101.6	2	1970--1971	177.8	0.083	0.065
3	1951--1952	114.3	3	1969--1970	168.9	0.125	0.109
4	1952--1953	101.6	4	1966--1967	151.1	0.167	0.152
5	1953--1954	116.8	5	1962--1963	141.0	0.208	0.196
6	1954--1955	73.7	6	1968--1969	137.2	0.250	0.239
7	1955--1956	119.4	7	1957--1958	130.8	0.292	0.283
8	1956--1957	215.4	8	1964--1965	129.3	0.333	0.326
9	1957--1958	130.8	9	1955--1956	119.4	0.375	0.370
10	1958--1959	76.7	10	1953--1954	116.8	0.417	0.413
11	1961--1962	112.5	11	1951--1952	114.3	0.458	0.457
12	1962--1963	141.0	12	1961--1962	112.5	0.500	0.500
13	1963--1964	70.9	13	1973--1974	108.0	0.542	0.543
14	1964--1965	129.3	14	1967--1968	107.2	0.583	0.587
15	1966--1967	151.1	15	1971--1972	106.7	0.625	0.630
16	1967--1968	107.2	16	1950--1951	101.6	0.667	0.674
17	1968--1969	137.2	17	1952--1953	101.6	0.708	0.717
18	1969--1970	168.9	18	1974--1975	97.0	0.750	0.761
19	1970--1971	177.8	19	1947--1948	85.9	0.792	0.804
20	1971--1972	106.7	20	1958--1959	76.7	0.833	0.848
21	1972--1973	76.7	21	1972--1973	76.7	0.875	0.891
22	1973--1974	108.0	22	1954--1955	73.7	0.917	0.935
23	1974--1975	97.0	23	1963--1964	70.9	0.958	0.978

3 DAY

RANK OF VALUES

NO	TIME IN YEARS	(R)	NO	TIME IN YEARS	(R)	THOMAS	HAZEN
1	1947--1948	88.9	1	1970--1971	264.2	0.042	0.022
2	1950--1951	147.3	2	1956--1957	229.4	0.083	0.065
3	1951--1952	177.8	3	1951--1952	177.8	0.125	0.109
4	1952--1953	121.9	4	1969--1970	168.9	0.167	0.152
5	1953--1954	160.0	5	1966--1967	160.5	0.208	0.196
6	1954--1955	101.6	6	1953--1954	160.0	0.250	0.239
7	1955--1956	139.7	7	1971--1972	149.9	0.292	0.283
8	1956--1957	229.4	8	1950--1951	147.3	0.333	0.326
9	1957--1958	144.8	9	1957--1958	144.8	0.375	0.370
10	1958--1959	103.4	10	1962--1963	144.8	0.417	0.413
11	1961--1962	112.5	11	1968--1969	142.2	0.458	0.457
12	1962--1963	144.8	12	1964--1965	142.0	0.500	0.500
13	1963--1964	83.6	13	1955--1956	139.7	0.542	0.543
14	1964--1965	142.0	14	1974--1975	136.1	0.583	0.587
15	1966--1967	160.5	15	1952--1953	121.9	0.625	0.630
16	1967--1968	111.3	16	1961--1962	112.5	0.667	0.674
17	1968--1969	142.2	17	1967--1968	111.3	0.708	0.717
18	1969--1970	168.9	18	1973--1974	110.5	0.750	0.761
19	1970--1971	264.2	19	1958--1959	103.4	0.792	0.804
20	1971--1972	149.9	20	1954--1955	101.6	0.833	0.848
21	1972--1973	85.3	21	1947--1948	88.9	0.875	0.891
22	1973--1974	110.5	22	1972--1973	85.3	0.917	0.935
23	1974--1975	136.1	23	1963--1964	83.6	0.958	0.978

** HOS. KUALA LIPIS (STN.4120064) 1946-1980 (32 FULL YEARS)

1 DAY — RANK OF VALUES

NO	TIME IN YEARS	(P)	NO	TIME IN YEARS	(R)	THOMAS	HAZEN
1	1946--1947	25.1	1	1964--1965	261.6	0.030	0.016
2	1947--1948	109.2	2	1954--1955	172.7	0.061	0.047
3	1948--1949	139.7	3	1976	148.0	0.091	0.078
4	1949--1950	121.9	4	1955--1956	144.0	0.121	0.109
5	1950--1951	88.9	5	1948--1949	139.7	0.152	0.141
6	1951--1952	106.7	6	1949--1950	121.9	0.182	0.172
7	1952--1953	108.7	7	1953--1954	121.9	0.212	0.203
8	1953--1954	121.9	8	1965--1966	114.3	0.242	0.234
9	1954--1955	172.7	9	1960--1961	113.3	0.273	0.266
10	1955--1956	144.0	10	1947--1948	109.2	0.303	0.297
11	1956--1957	107.4	11	1952--1953	108.7	0.333	0.328
12	1957--1958	84.1	12	1956--1957	107.4	0.364	0.359
13	1958--1959	84.8	13	1951--1952	106.7	0.394	0.391
14	1960--1961	113.3	14	1970--1971	105.4	0.424	0.422
15	1961--1962	68.6	15	1969--1970	104.6	0.455	0.453
16	1964--1965	261.6	16	1978	95.5	0.485	0.484
17	1965--1966	114.3	17	1966--1967	93.7	0.515	0.516
18	1966--1967	93.7	18	1977	93.5	0.545	0.547
19	1967--1968	89.9	19	1967--1968	89.9	0.576	0.578
20	1968--1969	73.7	20	1979	89.5	0.606	0.609
21	1969--1970	104.6	21	1950--1951	88.9	0.636	0.641
22	1970--1971	105.4	22	1958--1959	84.8	0.667	0.672
23	1971--1972	81.8	23	1957--1958	84.1	0.697	0.703
24	1972--1973	55.4	24	1971--1972	81.8	0.727	0.734
25	1973--1974	58.4	25	1968--1969	73.7	0.758	0.766
26	1974--1975	70.1	26	1980	72.5	0.788	0.797
27	1975	70.0	27	1974--1975	70.1	0.818	0.828
28	1976	148.0	28	1975	70.0	0.848	0.859
29	1977	93.5	29	1961--1962	68.6	0.879	0.891
30	1978	95.5	30	1973--1974	58.4	0.909	0.922
31	1979	89.5	31	1972--1973	55.4	0.939	0.953
32	1980	72.5	32	1946--1947	25.1	0.970	0.984

2 DAY — RANK OF VALUES

NO	TIME IN YEARS	(R)	NO	TIME IN YEARS	(R)	THOMAS	HAZEN
1	1946--1947	30.5	1	1964--1965	266.2	0.030	0.016
2	1947--1948	109.2	2	1970--1971	185.7	0.061	0.047
3	1948--1949	139.7	3	1954--1955	172.7	0.091	0.078
4	1949--1950	133.4	4	1956--1957	160.5	0.121	0.109
5	1950--1951	136.9	5	1976	151.5	0.152	0.141
6	1951--1952	109.2	6	1955--1956	144.0	0.182	0.172
7	1952--1953	135.9	7	1948--1949	139.7	0.212	0.203
8	1953--1954	135.6	8	1971--1972	137.7	0.242	0.234
9	1954--1955	172.7	9	1950--1951	136.9	0.273	0.266
10	1955--1956	144.0	10	1965--1966	136.7	0.303	0.297
11	1956--1957	160.5	11	1952--1953	135.9	0.333	0.328
12	1957--1958	116.8	12	1953--1954	135.6	0.364	0.359
13	1958--1959	124.5	13	1949--1950	133.4	0.394	0.391
14	1960--1961	118.1	14	1979	125.5	0.424	0.422
15	1961--1962	114.6	15	1958--1959	124.5	0.455	0.453
16	1964--1965	266.2	16	1966--1967	118.9	0.485	0.484
17	1965--1966	136.7	17	1960--1961	118.1	0.515	0.516
18	1966--1967	118.9	18	1977	117.0	0.545	0.547
19	1967--1968	100.6	19	1957--1958	116.8	0.576	0.578
20	1968--1969	85.3	20	1974--1975	115.1	0.606	0.609
21	1969--1970	113.3	21	1961--1962	114.6	0.636	0.641
22	1970--1971	185.7	22	1969--1970	113.3	0.667	0.672
23	1971--1972	137.7	23	1947--1948	109.2	0.697	0.703
24	1972--1973	81.5	24	1951--1952	109.2	0.727	0.734
25	1973--1974	84.8	25	1967--1968	100.6	0.758	0.766
26	1974--1975	115.1	26	1980	99.5	0.788	0.797
27	1975	81.0	27	1978	97.5	0.818	0.828
28	1976	151.5	28	1968--1969	85.3	0.848	0.859
29	1977	117.0	29	1973--1974	84.8	0.879	0.891
30	1978	97.5	30	1972--1973	81.5	0.909	0.922
31	1979	125.5	31	1975	81.0	0.939	0.953
32	1980	99.5	32	1946--1947	30.5	0.970	0.984

3 DAY — RANK OF VALUES

NO	TIME IN YEARS	(P)	NO	TIME IN YEARS	(R)	THOMAS	HAZEN
1	1946--1947	30.5	1	1964--1965	266.2	0.030	0.016
2	1947--1948	126.5	2	1970--1971	239.5	0.061	0.047
3	1948--1949	156.7	3	1955--1956	199.9	0.091	0.078
4	1949--1950	176.8	4	1956--1957	194.6	0.121	0.109
5	1950--1951	185.4	5	1950--1951	185.4	0.152	0.141
6	1951--1952	129.5	6	1949--1950	176.8	0.182	0.172
7	1952--1953	176.5	7	1952--1953	176.5	0.212	0.203
8	1953--1954	143.5	8	1969--1970	174.5	0.242	0.234
9	1954--1955	172.7	9	1954--1955	172.7	0.273	0.266
10	1955--1956	199.9	10	1957--1958	168.9	0.303	0.297
11	1956--1957	194.6	11	1971--1972	161.0	0.333	0.328
12	1957--1958	168.9	12	1977	159.5	0.364	0.359
13	1958--1959	149.1	13	1948--1949	156.7	0.394	0.391
14	1960--1961	133.1	14	1976	151.5	0.424	0.422
15	1961--1962	134.1	15	1958--1959	149.1	0.455	0.453
16	1964--1965	266.2	16	1953--1954	143.5	0.485	0.484
17	1965--1966	140.2	17	1965--1966	140.2	0.515	0.516
18	1966--1967	140.2	18	1966--1967	140.2	0.545	0.547
19	1967--1968	122.9	19	1961--1962	134.1	0.576	0.578
20	1968--1969	111.3	20	1960--1961	133.1	0.606	0.609
21	1969--1970	174.5	21	1979	131.0	0.636	0.641
22	1970--1971	239.5	22	1951--1952	129.5	0.667	0.672
23	1971--1972	161.0	23	1947--1948	126.5	0.697	0.703
24	1972--1973	95.3	24	1973--1974	124.5	0.727	0.734
25	1973--1974	124.5	25	1967--1968	122.9	0.758	0.766
26	1974--1975	122.2	26	1974--1975	122.2	0.788	0.797
27	1975	109.0	27	1978	120.0	0.818	0.828
28	1976	151.5	28	1980	114.0	0.848	0.859
29	1977	159.5	29	1968--1969	111.3	0.879	0.891
30	1978	120.0	30	1975	109.0	0.909	0.922
31	1979	131.0	31	1972--1973	95.3	0.939	0.953
32	1980	114.0	32	1946--1947	30.5	0.970	0.984

** KUANTAN AIRPORT (STN.3732019) 1954-1980 (26 FULL YEARS)

1 DAY — RANK OF VALUES

NO	TIME IN YEARS	(R)	NO	TIME IN YEARS	(R)	THOMAS	HAZEN
1	1954--1955	74.9	1	1975	527.5	0.037	0.019
2	1955--1956	175.3	2	1973--1974	352.0	0.074	0.058
3	1956--1957	111.8	3	1978	329.0	0.111	0.096
4	1957--1958	200.9	4	1970--1971	327.2	0.148	0.135
5	1958--1959	70.6	5	1966--1967	315.7	0.185	0.173
6	1960--1961	294.6	6	1960--1961	294.6	0.222	0.212
7	1961--1962	167.6	7	1972--1973	265.7	0.259	0.250
8	1962--1963	135.1	8	1974--1975	240.5	0.296	0.288
9	1963--1964	235.7	9	1963--1964	235.7	0.333	0.327
10	1964--1965	186.9	10	1971--1972	229.6	0.370	0.365
11	1965--1966	173.7	11	1957--1958	200.9	0.407	0.404
12	1966--1967	315.7	12	1964--1965	186.9	0.444	0.442
13	1967--1958	137.9	13	1979	178.5	0.481	0.481
14	1968--1969	142.2	14	1955--1956	175.3	0.519	0.519
15	1969--1970	161.0	15	1965--1966	173.7	0.556	0.558
16	1970--1971	327.2	16	1961--1962	167.6	0.593	0.596
17	1971--1972	229.6	17	1969--1970	161.0	0.630	0.635
18	1972--1973	265.7	18	1968--1969	142.2	0.657	0.673
19	1973--1974	352.0	19	1967--1968	137.9	0.704	0.712
20	1974--1975	240.5	20	1962--1963	135.1	0.741	0.750
21	1975	527.5	21	1976	124.0	0.778	0.788
22	1976	124.0	22	1956--1957	111.8	0.815	0.827
23	1977	79.0	23	1980	87.5	0.852	0.865
24	1978	329.0	24	1977	79.0	0.889	0.934
25	1979	178.5	25	1954--1955	74.9	0.926	0.942
26	1980	87.5	26	1958--1959	70.6	0.953	0.981

2 DAY — RANK OF VALUES

NO	TIME IN YEARS	(R)	NO	TIME IN YEARS	(R)	THOMAS	HAZEN
1	1954--1955	81.3	1	1975	608.5	0.037	0.019
2	1955--1956	340.6	2	1970--1971	579.4	0.074	0.058
3	1956--1957	196.9	3	1973--1974	561.5	0.111	0.096
4	1957--1958	283.5	4	1971--1972	448.6	0.148	0.135
5	1958--1959	76.2	5	1972--1973	436.6	0.185	0.173
6	1960--1961	296.4	6	1966--1967	434.6	0.222	0.212
7	1961--1962	225.6	7	1978	349.0	0.259	0.250
8	1962--1963	204.7	8	1955--1956	340.6	0.295	0.288
9	1963--1964	271.3	9	1965--1966	328.9	0.333	0.327
10	1964--1965	212.9	10	1979	324.0	0.370	0.365
11	1965--1966	328.9	11	1960--1961	296.4	0.437	0.404
12	1966--1967	434.6	12	1957--1958	288.5	0.444	0.442
13	1967--1968	172.7	13	1963--1964	271.3	0.481	0.481
14	1968--1969	204.0	14	1974--1975	258.6	0.519	0.519
15	1969--1970	184.2	15	1961--1962	225.6	0.556	0.558
16	1970--1971	579.4	16	1964--1965	212.9	0.593	0.596
17	1971--1972	448.6	17	1962--1963	204.7	0.633	0.635
18	1972--1973	436.6	18	1968--1969	204.0	0.667	0.673
19	1973--1974	561.5	19	1956--1957	196.9	0.704	0.712
20	1974--1975	258.6	20	1969--1970	184.2	0.741	0.750
21	1975	608.5	21	1967--1968	172.7	0.778	0.788
22	1976	170.0	22	1976	170.0	0.815	0.827
23	1977	113.5	23	1980	155.5	0.852	0.865
24	1978	349.0	24	1977	113.5	0.899	0.934
25	1979	324.0	25	1954--1955	81.3	0.926	0.942
26	1980	155.5	26	1958--1959	76.2	0.953	0.981

3 DAY — RANK OF VALUES

NO	TIME IN YEARS	(R)	NO	TIME IN YEARS	(R)	THOMAS	HAZEN
1	1954--1955	83.6	1	1970--1971	709.7	0.037	0.019
2	1955--1956	486.7	2	1975	610.5	0.074	0.058
3	1956--1957	257.6	3	1971--1972	659.9	0.111	0.096
4	1957--1958	327.9	4	1972--1973	653.0	0.148	0.135
5	1958--1959	80.5	5	1973--1974	617.7	0.185	0.173
6	1960--1961	296.4	6	1955--1956	486.7	0.222	0.212
7	1961--1962	267.5	7	1979	453.0	0.259	0.250
8	1962--1963	223.3	8	1966--1967	451.1	0.296	0.288
9	1963--1964	272.8	9	1974--1975	382.8	0.333	0.327
10	1964--1965	253.0	10	1965--1966	360.9	0.370	0.365
11	1965--1966	360.9	11	1978	352.0	0.407	0.404
12	1966--1967	451.1	12	1957--1958	327.9	0.444	0.442
13	1967--1968	237.0	13	1960--1961	296.4	0.481	0.481
14	1968--1969	252.7	14	1963--1964	272.8	0.519	0.519
15	1969--1970	210.8	15	1961--1962	267.5	0.556	0.558
16	1970--1971	709.7	16	1956--1957	257.6	0.593	0.596
17	1971--1972	659.9	17	1964--1965	253.0	0.633	0.635
18	1972--1973	653.0	18	1968--1969	252.7	0.667	0.673
19	1973--1974	617.7	19	1976	238.5	0.704	0.712
20	1974--1975	382.8	20	1967--1968	237.0	0.741	0.750
21	1975	610.5	21	1962--1963	223.3	0.778	0.788
22	1976	238.5	22	1969--1970	210.8	0.815	0.827
23	1977	131.0	23	1980	208.0	0.852	0.865
24	1978	352.0	24	1977	131.0	0.889	0.934
25	1979	463.0	25	1954--1955	83.6	0.926	0.942
26	1980	208.0	26	1958--1959	80.5	0.963	0.981

** CAMERON HIGHLANDS(STN.4413034) 1954-1980 (24 FULL YEARS)

1 DAY — RANK OF VALUES

NO	TIME IN YEARS	(R)	NO	TIME IN YEARS	(R)	THOMAS	HAZEN
1	1954--1955	64.8	1	1973--1974	123.2	0.040	0.021
2	1955--1956	96.8	2	1956--1957	119.4	0.080	0.063
3	1956--1957	119.4	3	1961--1962	107.2	0.120	0.104
4	1960--1961	71.4	4	1971--1972	102.6	0.160	0.146
5	1961--1962	107.2	5	1955--1956	96.8	0.200	0.188
6	1962--1963	58.7	6	1978	93.0	0.240	0.229
7	1963--1964	72.9	7	1968--1969	91.4	0.280	0.271
8	1964--1965	71.6	8	1980	85.0	0.320	0.313
9	1965--1966	65.0	9	1966--1967	83.3	0.360	0.354
10	1966--1967	83.3	10	1970--1971	81.5	0.400	0.396
11	1967--1968	75.2	11	1967--1968	75.2	0.440	0.438
12	1968--1969	91.4	12	1976	74.5	0.480	0.479
13	1969--1970	71.1	13	1963--1964	72.9	0.520	0.521
14	1970--1971	81.5	14	1964--1965	71.6	0.560	0.563
15	1971--1972	102.6	15	1960--1961	71.4	0.600	0.604
16	1972--1973	58.4	16	1969--1970	71.1	0.640	0.646
17	1973--1974	123.2	17	1977	68.5	0.680	0.688
18	1974--1975	60.5	18	1965--1966	65.0	0.720	0.729
19	1975	61.5	19	1979	65.0	0.760	0.771
20	1976	74.5	20	1954--1955	64.8	0.800	0.813
21	1977	68.5	21	1975	61.5	0.840	0.854
22	1978	93.0	22	1974--1975	60.5	0.880	0.896
23	1979	65.0	23	1962--1963	58.7	0.920	0.938
24	1980	85.0	24	1972--1973	58.4	0.960	0.979

2 DAY — RANK OF VALUES

NO	TIME IN YEARS	(R)	NO	TIME IN YEARS	(R)	THOMAS	HAZEN
1	1954--1955	105.4	1	1971--1972	159.5	0.040	0.021
2	1955--1956	128.3	2	1973--1974	158.0	0.080	0.063
3	1956--1957	152.9	3	1956--1957	152.9	0.120	0.104
4	1960--1961	90.2	4	1978	132.0	0.160	0.146
5	1961--1962	115.6	5	1955--1956	128.3	0.200	0.188
6	1962--1963	91.2	6	1961--1962	115.6	0.240	0.229
7	1963--1964	73.9	7	1968--1969	115.3	0.280	0.271
8	1964--1965	84.8	8	1977	112.5	0.320	0.313
9	1965--1966	87.9	9	1974--1975	111.5	0.360	0.354
10	1966--1967	99.6	10	1975	111.5	0.400	0.396
11	1967--1968	106.9	11	1970--1971	110.0	0.440	0.438
12	1968--1969	115.3	12	1967--1968	106.9	0.480	0.479
13	1969--1970	99.8	13	1979	106.0	0.520	0.521
14	1970--1971	110.0	14	1954--1955	105.4	0.560	0.563
15	1971--1972	159.5	15	1969--1970	99.8	0.600	0.604
16	1972--1973	89.9	16	1966--1967	99.6	0.640	0.646
17	1973--1974	158.0	17	1962--1963	91.2	0.680	0.688
18	1974--1975	111.5	18	1960--1961	90.2	0.720	0.729
19	1975	111.5	19	1972--1973	89.9	0.760	0.771
20	1976	76.0	20	1965--1966	87.9	0.800	0.813
21	1977	112.5	21	1980	87.5	0.840	0.854
22	1978	132.0	22	1964--1965	84.8	0.880	0.896
23	1979	106.0	23	1976	76.0	0.920	0.938
24	1980	87.5	24	1963--1964	73.9	0.960	0.979

3 DAY — RANK OF VALUES

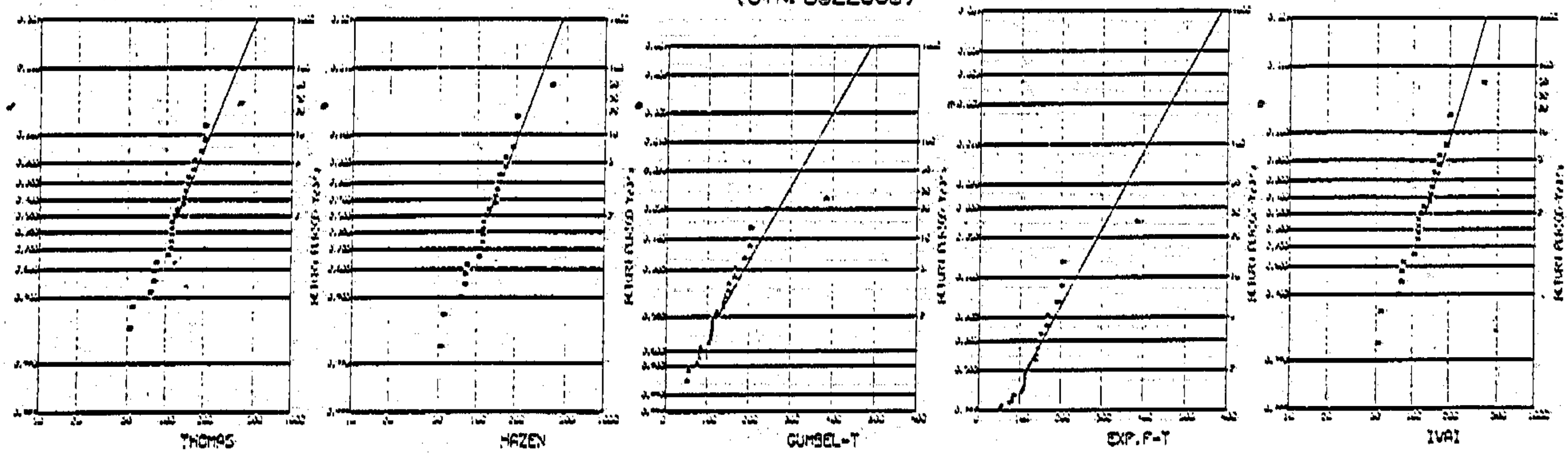
NO	TIME IN YEARS	(R)	NO	TIME IN YEARS	(R)	THOMAS	HAZEN
1	1954--1955	115.6	1	1971--1972	175.3	0.040	0.021
2	1955--1956	133.4	2	1973--1974	170.7	0.080	0.063
3	1956--1957	166.1	3	1956--1957	166.1	0.120	0.104
4	1960--1961	99.1	4	1978	164.0	0.160	0.146
5	1961--1962	153.4	5	1961--1962	153.4	0.200	0.188
6	1962--1963	119.4	6	1977	147.5	0.240	0.229
7	1963--1964	110.5	7	1970--1971	138.7	0.280	0.271
8	1964--1965	102.4	8	1975	134.5	0.320	0.313
9	1965--1966	117.9	9	1955--1956	133.4	0.360	0.354
10	1966--1967	117.6	10	1967--1968	131.6	0.400	0.396
11	1967--1968	131.6	11	1968--1969	128.3	0.440	0.438
12	1968--1969	128.3	12	1979	126.5	0.480	0.479
13	1969--1970	117.9	13	1962--1963	119.4	0.520	0.521
14	1970--1971	138.7	14	1965--1966	117.9	0.560	0.563
15	1971--1972	175.3	15	1969--1970	117.9	0.600	0.604
16	1972--1973	113.0	16	1966--1967	117.6	0.640	0.646
17	1973--1974	170.7	17	1954--1955	115.6	0.680	0.688
18	1974--1975	111.5	18	1972--1973	113.0	0.720	0.729
19	1975	134.5	19	1974--1975	111.5	0.760	0.771
20	1976	94.0	20	1963--1964	110.5	0.800	0.813
21	1977	147.5	21	1980	110.1	0.840	0.854
22	1978	164.0	22	1964--1965	102.4	0.880	0.896
23	1979	126.5	23	1960--1961	99.1	0.920	0.938
24	1980	110.1	24	1976	94.0	0.960	0.979

Appendix B

Probability Curves

The Curves for 5 days maximum Rainfall estimated by each distribution at each station

(STN. 3922089)



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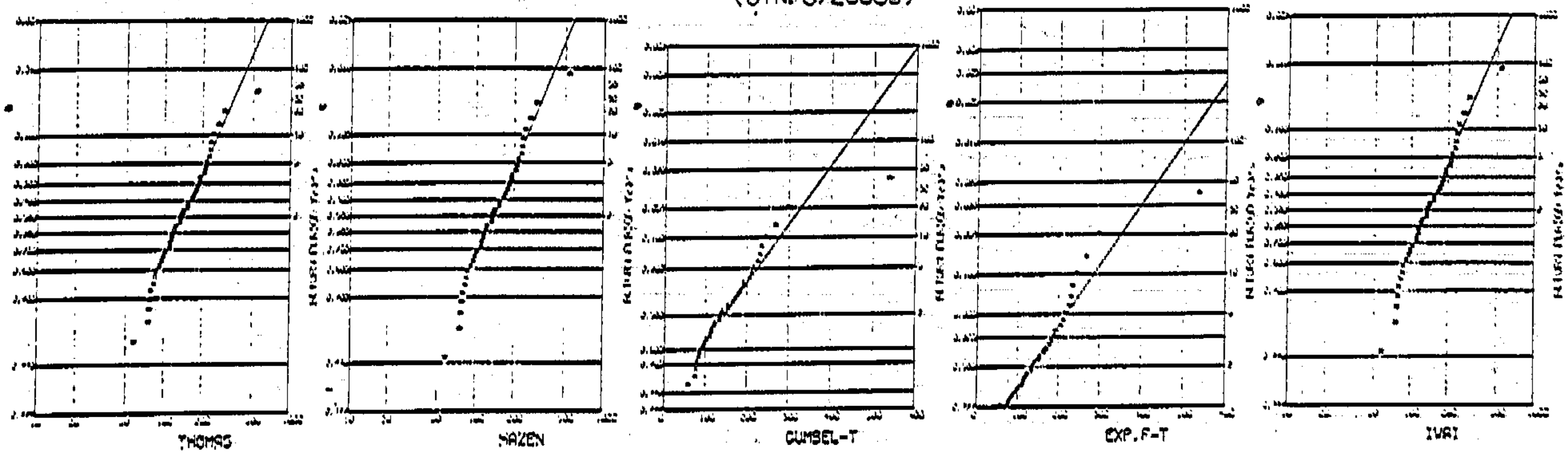

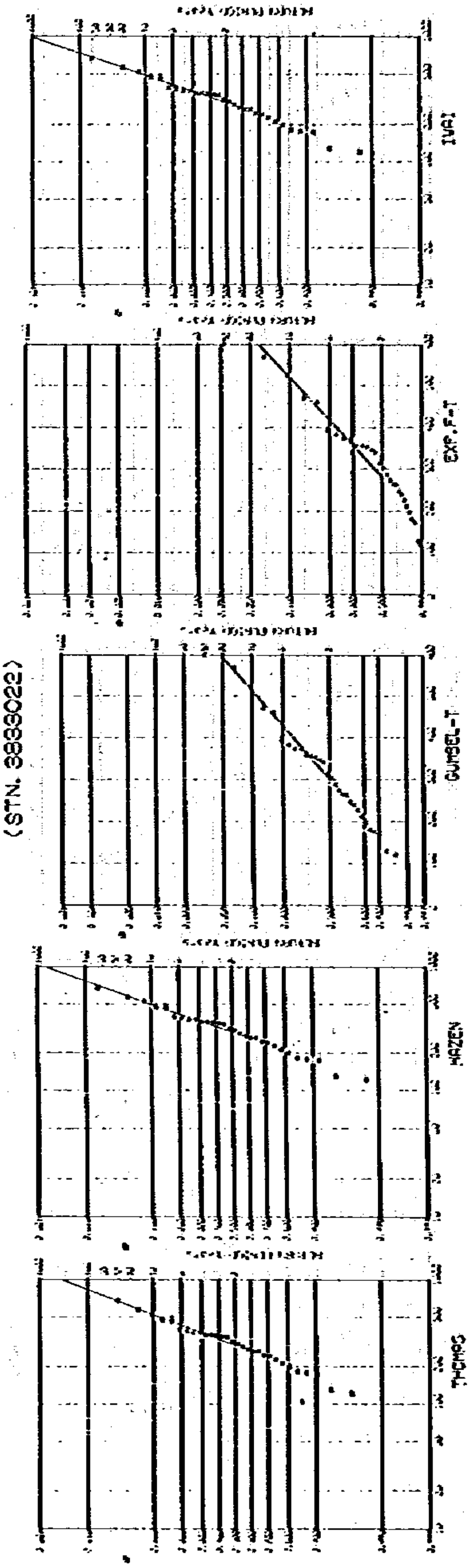

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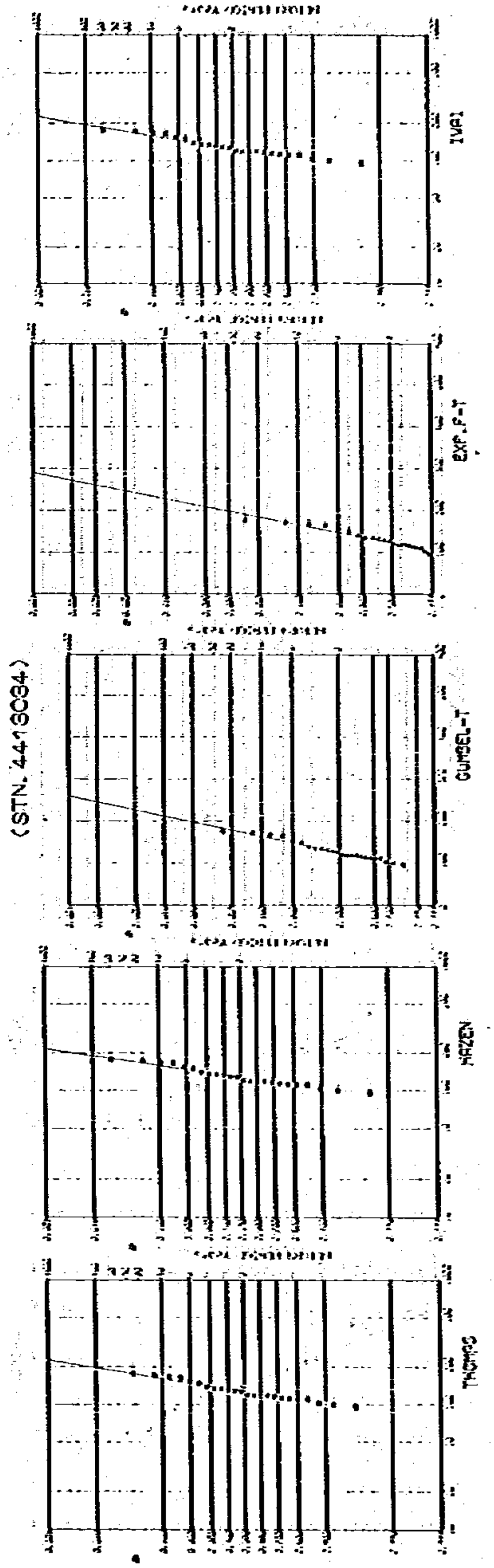
EXP.F-T
GUMBEL-T
HAZEN
THOMAS



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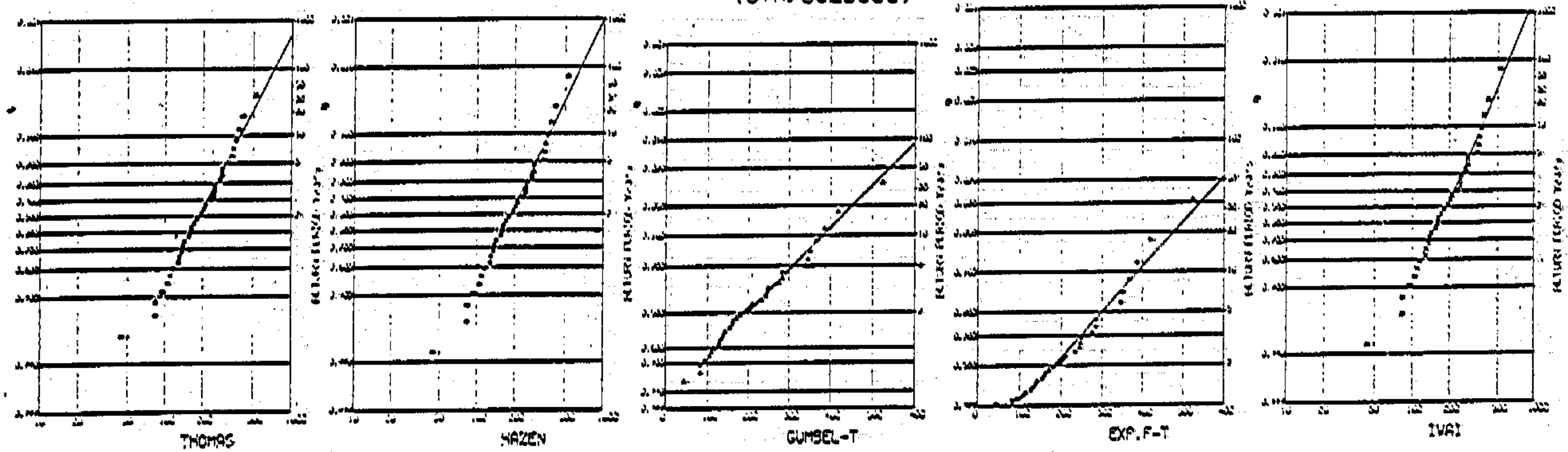

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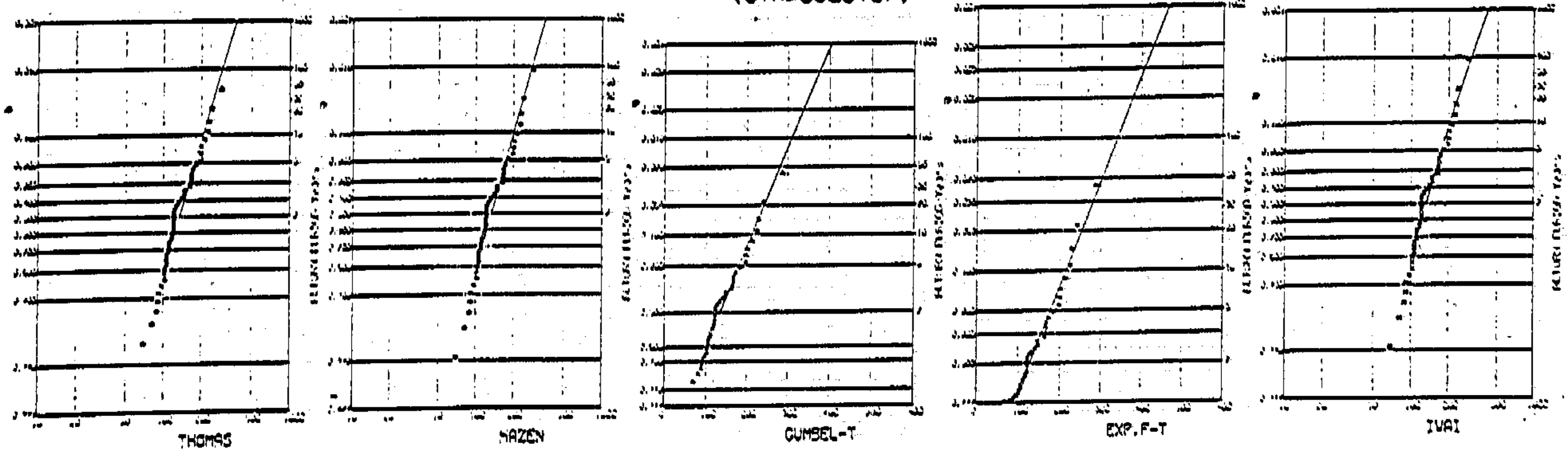

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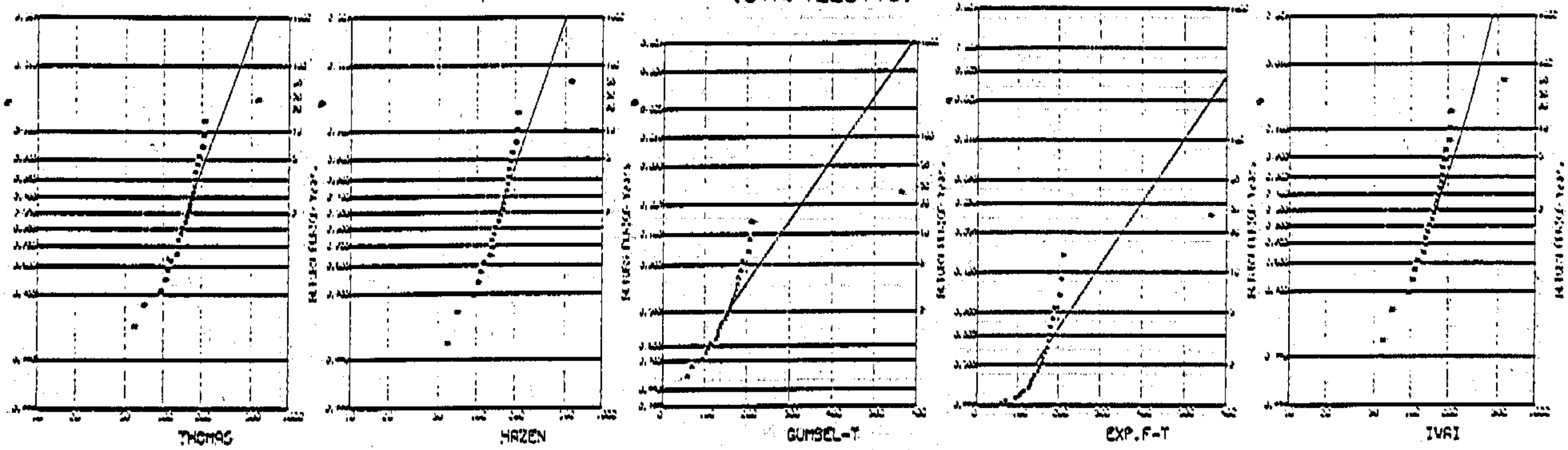

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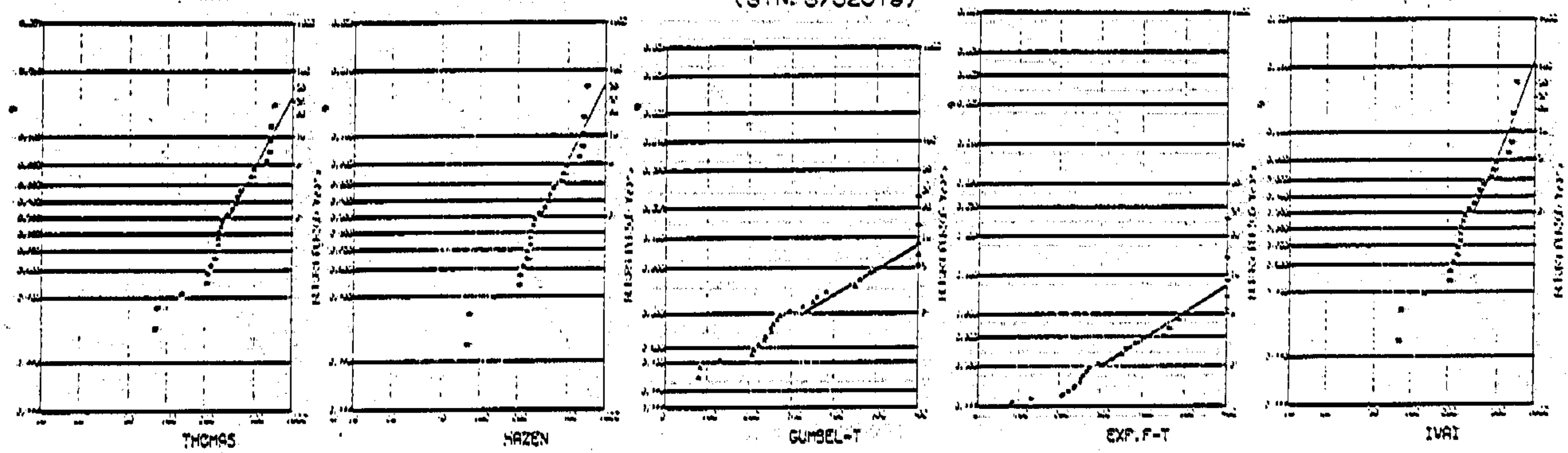

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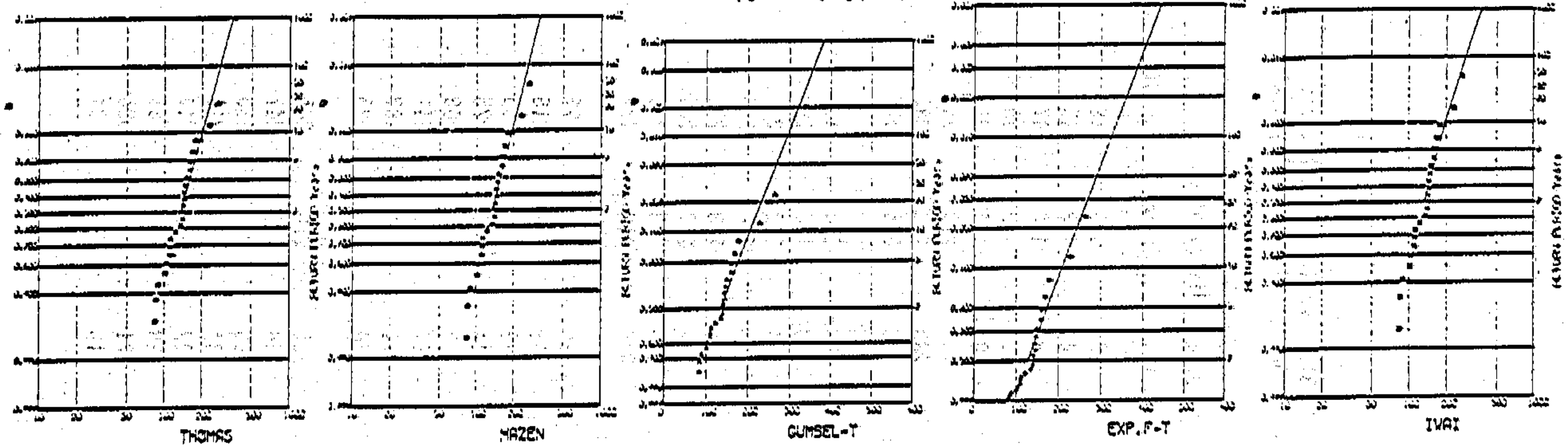

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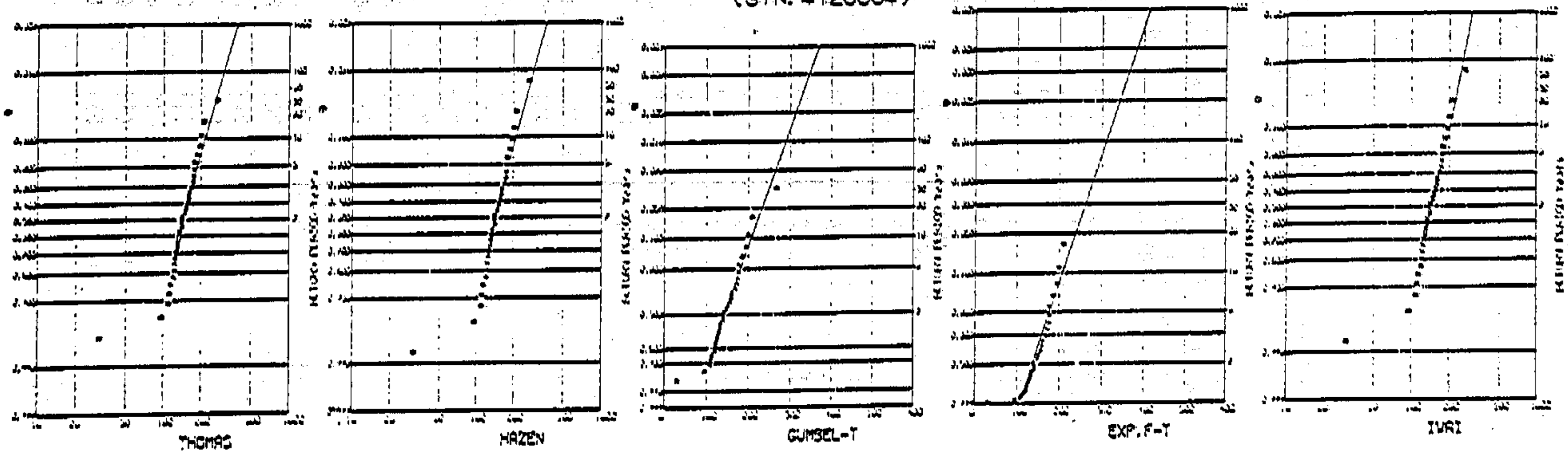


Comparison of 1 and 5 Day Rainfalls at 3523137 estimated with Various Frequency Distributions Period of Record 1930 - 1978 (43 Full years).

Duration (days)	Return Period (years)	Rainfall Estimated by Each Distribution				
		Thomas	Hazen	Iwai	Gumbel	Exp-Dis
One Day	5	124	122	122	126	124
	10	144	140	141	149	151
	20	163	158	160	170	178
	30	174	168	170	182	194
	50	187	180	184	197	215
	100	206	196	202	218	242
	1000	267	251	263	286	333
	10000	331	307	328	355	424
Two Day	5	153	150	150	153	150
	10	176	172	173	178	180
	20	199	192	194	202	211
	30	211	204	206	216	228
	50	227	218	221	233	251
	100	248	237	242	257	281
	1000	318	299	309	333	381
	10000	391	363	379	410	482
Three Day	5	178	175	175	181	177
	10	207	201	203	212	215
	20	234	226	229	242	253
	30	249	240	244	259	275
	50	268	257	262	280	303
	100	294	280	287	309	341
	1000	381	357	371	404	467
	10000	471	436	460	499	593
Five Day	5	209	205	205	210	205
	10	241	235	236	244	247
	20	272	263	265	277	289
	30	289	279	281	296	314
	50	311	298	302	320	344
	100	340	324	329	352	386
	1000	436	410	421	458	525
	10000	536	498	516	564	664

Comparison of 1 and 5 Day Rainfalls at 3629098 estimated with Various Frequency Distributions Period of Record 1931 - 1980 (34 Full years).

Duration (days)	Return Period (years)	Rainfall Estimated by Each Distribution				
		Thomas	Hazen	Iwai	Gumbel	Exp-Dis
One Day	5	171	166	166	171	166
	10	216	205	201	209	212
	20	261	245	235	245	258
	30	289	269	254	266	285
	50	324	300	279	292	319
	100	374	342	312	328	364
	1000	559	496	424	444	517
	10000	779	675	544	560	669
Two Day	5	254	245	245	253	246
	10	329	312	303	313	317
	20	407	380	358	369	389
	30	454	421	391	402	431
	50	516	474	432	443	484
	100	606	549	488	498	555
	1000	946	831	684	680	793
	10000	1367	1170	899	862	1031
Three Day	5	307	296	296	308	299
	10	398	377	370	381	388
	20	492	459	443	451	477
	30	550	509	486	492	529
	50	626	574	541	542	594
	100	735	667	618	610	683
	1000	1152	1011	891	835	978
	10000	1668	1426	1203	1059	1273
Five Day	5	310	300	300	310	300
	10	400	385	375	385	385
	20	495	470	445	455	480
	30	570	540	490	495	530
	50	630	590	545	545	600
	100	740	680	620	615	685
	1000	1155	1040	920	840	980
	10000	1670	1480	1290	1060	1280

Comparison of 1 and 5 Day Rainfalls at 3732019 estimated with Various Frequency Distributions Period of Record 1954 - 1980 (26 Full years).

Duration (days)	Return Period (years)	Rainfall Estimated by Each Distribution				
		Thomas	Hazen	Iwai	Gumbel	Exp-Dis
One Day	5	291	279	281	295	288
	10	373	350	342	365	375
	20	457	422	401	433	461
	30	509	465	434	471	512
	50	576	520	476	520	575
	100	672	599	534	585	662
	1000	1033	887	727	801	949
	10000	1474	1226	933	1016	1236
Two Day	5	417	399	399	415	403
	10	542	507	492	512	522
	20	672	617	583	606	641
	30	753	684	636	660	710
	50	858	771	703	727	798
	100	1008	894	795	818	917
	1000	1587	1352	1114	1118	1311
	10000	2309	1903	1464	1417	1706
Three Day	5	512	489	491	508	494
	10	673	628	603	629	640
	20	843	771	710	744	787
	30	948	858	772	811	873
	50	1086	972	848	894	981
	100	1285	1134	952	1007	1127
	1000	2061	1746	1305	1378	1615
	10000	3045	2493	1678	1749	2102
Five Day	5	611	582	584	627	611
	10	815	758	751	790	814
	20	1035	942	922	947	1016
	30	1172	1055	1025	1037	1134
	50	1354	1204	1159	1150	1283
	100	1618	1417	1349	1302	1485
	1000	2669	2238	2058	1804	2157
	10000	4035	3263	2910	2306	2829

Comparison of 1 and 5 Day Rainfalls at 3726089 estimated with Various Frequency Distributions Period of Record 1930 - 1980 (40 Full years).

Duration (days)	Return Period (years)	Rainfall Estimated by Each Distribution				
		Thomas	Hazen	Iwai	Gumbel	Exp-Dis
One Day	5	116	113	113	118	115
	10	138	133	134	141	144
	20	159	152	154	163	172
	30	171	164	166	176	188
	50	187	177	181	192	209
	100	208	196	202	213	238
	1000	282	261	273	284	331
	10000	362	329	351	354	425
Two Day	5	173	169	169	182	177
	10	214	206	207	223	229
	20	255	242	244	263	281
	30	279	264	266	286	311
	50	310	291	294	315	349
	100	353	329	333	354	401
	1000	510	464	472	482	573
	10000	690	616	629	608	745
Three Day	5	213	207	208	224	219
	10	264	254	257	277	285
	20	316	300	306	327	350
	30	347	327	336	356	389
	50	386	362	373	393	437
	100	442	411	427	442	502
	1000	643	583	621	603	720
	10000	876	780	848	764	938
Five Day	5	287	260	261	281	274
	10	337	323	325	349	359
	20	409	387	391	414	443
	30	452	424	430	452	492
	50	508	473	480	493	555
	100	588	541	551	562	639
	1000	878	789	810	771	920
	10000	1224	1077	1114	979	1200

Comparison of 1 and 5 Day Rainfalls at 3833022 estimated with Various Frequency Distributions Period of Record 1947 - 1978 (30 Full years).

Duration (days)	Return Period (years)	Rainfall Estimated by Each Distribution Thomas	Hazen	Iwai	Gumbel	Exp-Dis
One Day	5	251	244	246	246	240
	10	300	288	282	290	290
	20	348	329	313	331	341
	30	376	353	331	355	371
	50	410	383	352	385	409
	100	458	424	379	425	459
	1000	624	563	463	558	628
	10000	805	711	541	691	797
Two Day	5	353	343	342	344	335
	10	427	409	396	407	409
	20	500	473	445	468	484
	30	543	511	472	502	528
	50	597	558	505	546	582
	100	672	622	548	604	657
	1000	935	844	683	798	904
	10000	1229	1086	814	991	1152
Three Day	5	429	417	417	428	418
	10	523	500	496	513	521
	20	616	581	572	595	624
	30	670	629	615	642	684
	50	740	688	669	700	760
	100	836	770	742	780	863
	1000	1176	1055	991	1041	1205
	10000	1560	1369	1254	1302	1547
Five Day	5	512	497	498	513	501
	10	626	598	597	617	627
	20	739	697	694	717	754
	30	806	754	750	775	828
	50	891	827	820	847	922
	100	1009	928	917	944	1048
	1000	1429	1279	1251	1265	1469
	10000	1906	1667	1616	1585	1890

Comparison of 1 and 5 Day Rainfalls at 3922069 estimated with Various Frequency Distributions Period of Record 1955 - 1980 (25 Full years).

Duration (days)	Return Period (years)	Rainfall Estimated by Each Distribution Thomas	Hazen	Iwai	Gumbel	Exp-Dis
One Day	5	132	128	130	147	145
	10	165	157	161	184	194
	20	198	186	194	220	242
	30	218	202	214	241	270
	50	243	224	239	266	306
	100	278	254	275	301	354
	1000	408	361	407	416	514
	10000	559	483	565	530	674
Two Day	5	161	156	159	170	167
	10	197	188	189	208	216
	20	233	220	217	245	264
	30	254	238	233	266	292
	50	281	261	253	292	328
	100	319	293	279	327	376
	1000	452	404	365	444	536
	10000	604	527	453	561	696
Three Day	5	182	176	179	189	186
	10	223	212	212	230	238
	20	264	248	241	270	290
	30	288	268	258	293	321
	50	319	295	278	322	359
	100	362	331	304	361	411
	1000	516	457	390	489	585
	10000	691	598	474	617	758
Five Day	5	217	210	210	225	221
	10	266	252	254	275	284
	20	315	294	298	323	346
	30	343	319	324	350	383
	50	380	350	357	384	428
	100	431	392	403	431	491
	1000	614	541	567	583	698
	10000	821	706	753	736	905

Comparison of 1 and 5 Day Rainfalls at 4018061 estimated with Various Frequency Distributions Period of Record 1947 - 1975 (23 Full years).

Duration (days)	Return Period (years)	Rainfall Estimated by Each Distribution				
		Thomas	Hazen	Iwai	Gumbel	Exp-Dis
One Day	5	110	107	108	110	107
	10	128	122	122	127	128
	20	144	137	136	144	150
	30	154	145	143	153	162
	50	165	154	152	166	177
	100	181	168	164	182	198
	1000	234	211	203	236	268
	10000	288	255	240	289	338
Two Day	5	148	145	145	149	147
	10	170	164	165	173	176
	20	191	182	183	196	206
	30	203	192	194	209	223
	50	217	204	207	226	245
	100	236	221	225	248	274
	1000	300	274	283	321	372
	10000	366	328	343	394	470
Three Day	5	175	171	172	177	175
	10	201	194	195	206	210
	20	226	215	218	233	245
	30	239	227	230	249	266
	50	257	242	246	268	292
	100	279	261	267	295	327
	1000	355	324	336	383	444
	10000	432	388	407	470	567
Five Day	5	221	216	216	224	221
	10	256	247	247	262	268
	20	289	276	275	299	315
	30	308	292	291	320	343
	50	332	312	310	346	378
	100	364	340	338	381	425
	1000	470	429	420	499	582
	10000	581	520	503	616	739

Comparison of 1 and 5 Day Rainfalls at 4120064 estimated with Various Frequency Distributions Period of Record 1946 - 1980 (32 Full years).

Duration (days)	Return Period (years)	Rainfall Estimated by Each Distribution				
		Thomas	Hazen	Iwai	Gumbel	Exp-Dis
One Day	5	134	131	132	136	133
	10	161	156	156	162	165
	20	187	179	179	187	197
	30	202	192	192	201	216
	50	221	209	208	219	239
	100	247	232	230	243	271
	1000	338	311	303	323	378
	10000	438	397	379	403	484
Two Day	5	157	155	157	156	153
	10	183	178	181	180	182
	20	207	200	203	204	212
	30	221	212	215	217	229
	50	238	228	230	234	251
	100	261	249	251	257	281
	1000	339	318	317	332	379
	10000	420	389	384	408	478
Three Day	5	186	183	183	181	177
	10	215	210	204	207	208
	20	243	235	222	232	239
	30	258	249	231	247	257
	50	278	267	243	265	280
	100	304	290	258	289	311
	1000	392	368	301	369	413
	10000	483	448	340	449	517
Five Day	5	225	221	235	220	215
	10	262	254	267	253	254
	20	297	286	293	285	294
	30	317	304	307	303	317
	50	341	326	323	326	346
	100	375	356	343	357	386
	1000	488	455	400	459	517
	10000	608	558	448	561	649

Comparison of 1 and 5 Day Rainfalls at 4223115 estimated with Various Frequency Distributions Period of Record 1948 - 1977 (26 Full years).

Duration (days)	Return Period (years)	Rainfall Estimated by Each Distribution				
		Thomas	Hazen	Iwai	Gumbel	Exp-Dis
One Day	5	136	132	143	141	139
	10	160	154	163	168	173
	20	183	174	180	194	207
	30	196	186	189	209	227
	50	212	200	200	228	253
	100	235	219	213	253	287
	1000	311	284	252	337	400
	10000	393	352	286	420	514
Two Day	5	184	178	188	197	194
	10	221	212	221	240	249
	20	259	245	250	281	304
	30	280	264	267	305	336
	50	308	288	286	335	377
	100	346	320	313	376	432
	1000	479	432	395	509	615
	10000	627	554	474	642	797
Three Day	5	215	209	222	229	226
	10	259	248	260	279	289
	20	302	286	294	327	352
	30	327	308	312	354	389
	50	359	336	334	388	435
	100	402	374	363	435	499
	1000	556	504	453	588	708
	10000	727	645	538	740	913
Five Day	5	253	246	266	266	262
	10	304	291	308	322	333
	20	353	335	344	376	404
	30	382	360	363	407	446
	50	418	391	388	446	498
	100	468	434	416	498	569
	1000	642	581	501	670	804
	10000	833	740	577	842	1039

Comparison of 1 and 5 Day Rainfalls at 4413034 estimated with Various Frequency Distributions Period of Record 1954 - 1980 (24 Full years).

Duration (days)	Return Period (years)	Rainfall Estimated by Each Distribution				
		Thomas	Hazen	Iwai	Gumbel	Exp-Dis
One Day	5	96	94	94	96	95
	10	106	103	104	109	111
	20	116	111	113	121	126
	30	121	116	118	128	135
	50	128	122	124	136	147
	100	136	129	132	148	162
	1000	163	152	158	186	214
	10000	190	174	183	225	265
Two Day	5	129	127	127	129	127
	10	142	139	139	145	147
	20	155	149	151	160	166
	30	162	155	157	168	177
	50	170	163	165	179	191
	100	181	172	175	194	210
	1000	215	202	207	242	274
	10000	248	230	237	291	338
Three Day	5	149	147	147	149	147
	10	162	159	159	165	166
	20	174	169	170	179	185
	30	180	175	176	188	196
	50	188	181	183	198	210
	100	198	190	192	213	229
	1000	229	217	220	260	291
	10000	258	241	247	308	357
Five Day	5	194	191	191	193	191
	10	213	207	208	214	216
	20	229	222	223	235	242
	30	238	230	231	246	257
	50	249	239	241	261	275
	100	263	252	254	280	301
	1000	308	290	294	345	385
	10000	351	326	332	410	470

Appendix C

Daily Discharge Tables and Duration Curves at Four stations

Jeram Teras

Penut

Kuala Tahan

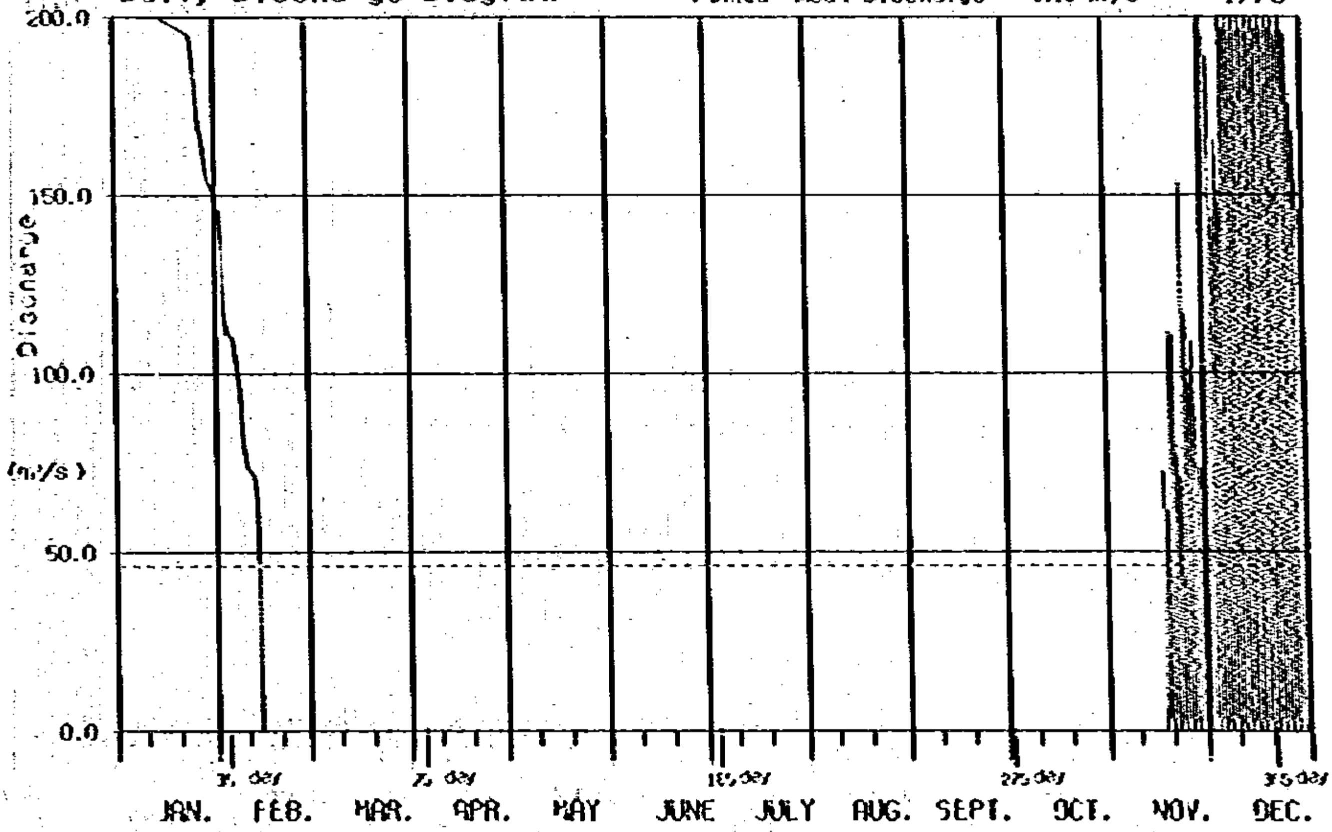
Kg. Pagi

Daily Discharge Table (C. A. = 2700.0 km²) (Unit. m³/s) 1973

day	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1												378.73
2												255.32
3												189.00
4												149.97
5												155.27
												(227.05)
6												151.03
7												235.54
8												1332.78
9												2755.06
10												1355.53
												(828.31)
11												1020.47
12												515.20
13												374.06
14												347.17
15												420.75
												(535.57)
16												531.44
17												774.24
18											72.22	575.47
19											51.54	377.55
20											111.42	322.32
											(97.34)	(550.35)
21											110.43	275.42
22											77.74	312.32
23											70.74	390.47
24											152.85	221.78
25											115.34	238.22
											(105.05)	(303.25)
26											100.82	225.10
27											108.75	174.97
28											74.65	178.31
29											73.47	157.81
30											222.45	157.17
31												145.52
											(120.04)	(178.15)
Total											1375.47	15451.33
Mean											45.85	498.43
Max.											222.45	2755.06
Min.												145.52

Max.	95 day	185 day	185 day	275 day	355 day	Min.	Mean	Total
2755.06	111.42						45.10	16826.79

Daily Discharge Diagram ---- Annual Mean Discharge 45.10 m³/s 1973

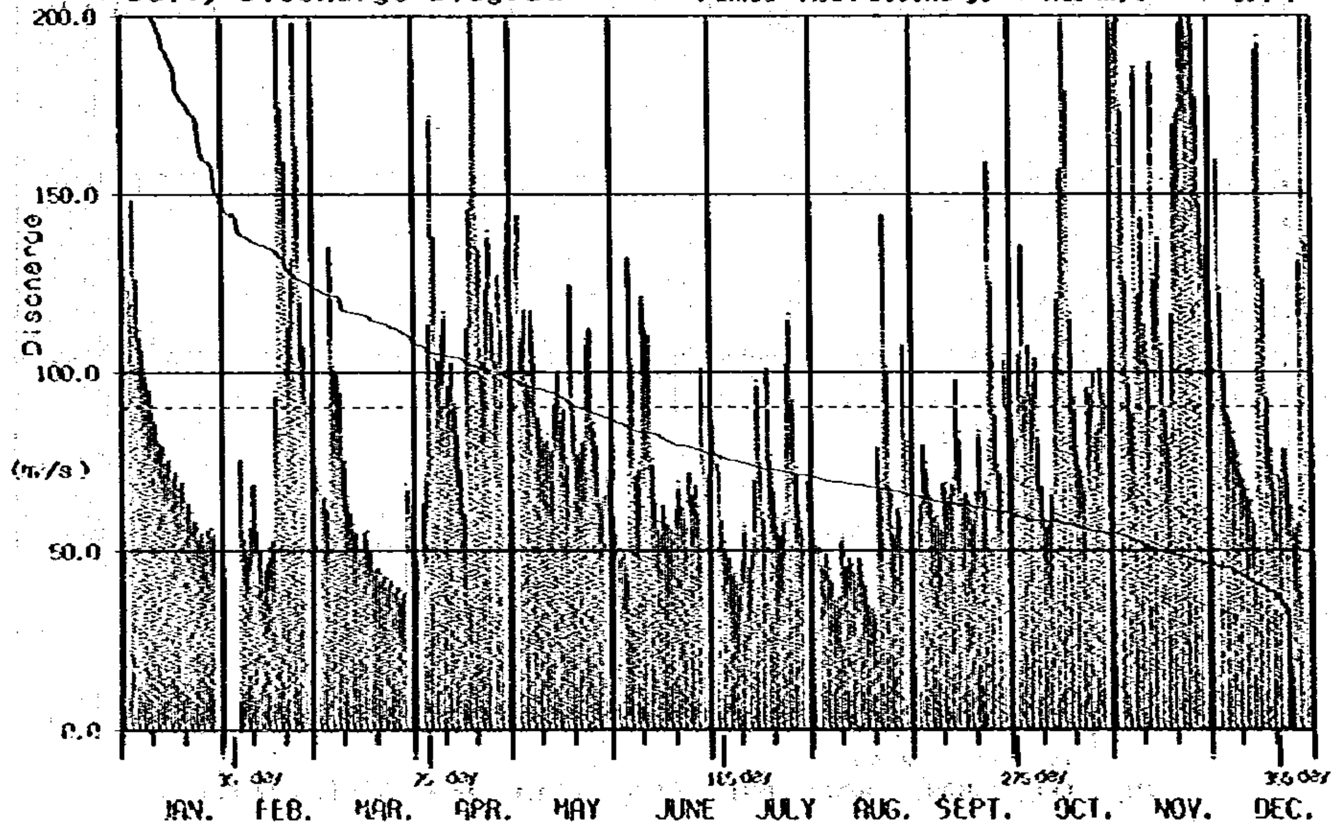


Daily Discharge Table (C. A. = 2700.0 km²) (Unit: m³/s) 1974

day	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1	137.13		83.27	48.66	115.24	55.70	65.97	53.69	54.25	98.43	121.52	122.53
2	127.41		73.21	40.50	135.34	54.77	65.53	56.59	59.08	81.59	257.48	114.54
3	121.53		55.56	53.33	144.42	51.01	75.63	51.11	55.21	104.69	227.06	152.84
4	150.26		55.31	71.51	111.52	50.50	55.56	48.21	79.75	135.55	175.28	123.78
5	125.41		54.06	113.55	117.83	48.89	52.77	49.22	75.01	94.42	125.51	99.54
	(133.35)		(71.02)	(57.17)	(125.35)	(52.77)	(71.75)	(53.52)	(65.55)	(101.02)	(181.60)	(124.13)
6	112.22	75.57	135.34	172.21	92.57	132.40	48.38	45.35	55.81	107.48	98.82	90.49
7	105.42	55.59	102.09	138.25	117.54	104.14	45.52	41.28	51.41	95.37	88.53	87.01
8	101.15	42.56	100.21	135.65	104.56	71.35	43.76	38.54	59.79	104.37	165.59	83.14
9	95.50	55.56	95.95	110.70	87.51	74.83	43.52	37.25	59.81	63.77	121.85	78.33
10	91.13	55.54	95.57	117.15	84.15	121.56	47.39	53.81	58.70	58.22	145.47	74.25
	(101.29)	(51.55)	(132.03)	(128.83)	(98.47)	(100.87)	(45.77)	(43.27)	(55.19)	(92.13)	(128.06)	(82.59)
11	85.87	57.67	55.71	75.53	80.65	114.02	57.04	45.70	57.09	51.28	113.82	70.24
12	83.21	50.18	50.95	104.87	82.74	110.83	45.55	50.04	55.53	55.60	104.42	57.24
13	77.57	45.51	59.77	71.53	78.15	75.08	50.30	45.95	70.55	47.45	187.14	54.18
14	77.21	45.53	56.24	84.82	92.93	55.44	70.01	45.19	78.05	106.35	127.72	51.83
15	75.59	51.04	53.14	73.03	99.71	58.45	77.80	47.78	83.50	122.35	138.13	170.49
	(80.31)	(50.51)	(56.57)	(70.15)	(85.92)	(84.57)	(51.55)	(47.31)	(77.43)	(83.08)	(134.27)	(70.54)
16	72.71	52.71	56.07	42.91	88.85	63.00	74.84	45.25	64.82	157.13	108.20	174.45
17	72.37	94.95	56.71	112.54	89.99	59.57	50.72	40.47	55.11	227.82	89.87	125.30
18	71.22	427.50	49.75	147.22	75.37	57.39	101.27	37.03	54.54	177.19	81.50	94.55
19	67.45	175.77	47.15	209.34	124.90	59.33	77.21	34.19	61.20	115.77	115.45	79.10
20	66.55	152.45	45.42	187.70	89.78	52.15	55.82	34.21	55.72	93.41	171.49	71.44
	(70.47)	(182.16)	(50.43)	(144.50)	(93.98)	(50.09)	(75.21)	(38.42)	(55.08)	(154.91)	(113.56)	(113.17)
21	63.57	114.70	43.96	134.53	77.25	49.37	59.56	79.09	83.55	77.52	173.07	71.51
22	61.06	132.28	42.97	105.08	77.77	62.16	54.49	49.57	55.75	72.97	343.54	72.54
23	58.48	205.52	42.41	123.55	80.72	55.73	50.31	144.39	57.43	70.75	223.97	78.54
24	56.46	153.75	41.74	139.85	102.55	72.10	102.49	101.75	152.13	75.75	214.19	73.15
25	56.36	121.77	40.55	117.13	112.48	57.72	115.56	47.81	125.44	75.75	237.75	62.89
	(59.03)	(147.51)	(42.35)	(124.05)	(92.02)	(57.10)	(78.55)	(92.57)	(100.85)	(82.97)	(238.97)	(71.75)
26	54.22	107.39	40.04	105.42	85.50	55.42	72.55	54.55	58.03	100.41	255.15	55.77
27	56.58	95.47	39.15	127.55	77.57	52.77	73.51	42.00	74.13	87.55	177.35	57.74
28	54.43	94.50	38.35	114.37	57.71	101.44	55.22	52.12	71.85	101.06	149.59	133.28
29	54.25		55.76	134.82	55.56	75.54	65.45	107.87	108.21	98.17	135.97	355.08
30			57.33	144.47	72.82	71.51	52.54	82.90	90.37	95.40	134.75	158.52
31			52.92		59.47		73.16	57.55		102.72		115.11
	(37.03)	(99.12)	(52.75)	(125.39)	(73.52)	(75.04)	(71.78)	(71.50)	(85.92)	(97.55)	(170.73)	(145.45)
Total	2441.43	2505.47	1937.54	3410.74	2925.00	2207.39	2115.55	1804.25	2275.49	3155.78	4537.97	3285.49
Mean	78.85	89.52	62.57	113.69	94.39	73.59	68.28	58.22	75.52	101.80	151.27	105.99
Max.	150.26	427.50	135.34	207.34	144.42	132.40	115.56	144.39	152.13	227.82	343.54	355.08
Min.			38.35	48.50	55.56	48.89	43.52	34.14	54.25	59.60	81.50	57.74

Max.	35 day	95 day	185 day	275 day	355 day	Min.	Mean	Total
427.50	144.42	104.42	75.37	59.99	37.25		90.22	32731.25

Daily Discharge Diagram ---. Annual Mean Discharge 90.22 m³/s 1974



JERAM TERAS

Daily Discharge Table

(C. A. = 2700.0 km²) (Unit. m³/s) 1975

day	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1	169.06	88.34	158.42	51.75	98.84	95.42	53.77	43.24	50.78	42.06	66.60	311.92
2	233.54	87.33	181.83	52.24	128.42	120.40	43.83	39.29	70.37	41.34	62.02	244.42
3	346.65	125.55	165.31	55.20	116.76	92.53	40.94	37.01	57.49	38.23	49.86	202.43
4	232.75	107.16	197.19	52.52	150.41	82.65	40.24	38.36	59.56	36.73	55.66	191.66
5	336.67	103.27	154.37	43.37	110.65	51.48	37.24	40.02	53.93	34.07	47.54	182.11
	(271.74)	(102.34)	(172.48)	(56.02)	(121.47)	(94.55)	(43.50)	(37.57)	(58.25)	(37.94)	(54.74)	(226.50)
6	371.00	100.57	113.23	93.21	97.43	77.75	41.00	34.47	41.33	37.35	86.06	175.44
7	308.38	83.23	140.39	127.35	130.32	83.51	42.45	32.97	41.33	112.50	95.20	147.31
8	217.35	77.11	136.50	73.77	90.62	73.21	52.44	32.07	58.34	124.06	77.28	171.21
9	273.47	73.71	112.56	70.81	153.14	44.23	51.33	37.45	106.56	92.77	47.13	154.39
10	323.27	71.48	96.22	50.44	137.89	103.37	48.96	40.56	78.07	55.42	78.46	148.66
	(299.10)	(81.22)	(120.18)	(85.12)	(122.32)	(80.81)	(47.24)	(35.94)	(65.73)	(85.92)	(81.23)	(163.60)
11	256.57	71.41	89.56	57.45	115.81	96.34	43.44	45.15	93.20	57.34	73.33	135.22
12	206.35	49.71	83.82	60.72	102.97	82.45	37.22	32.97	86.96	103.08	201.24	135.00
13	175.39	42.50	84.41	45.25	85.30	74.13	37.45	27.59	66.83	96.47	116.50	121.31
14	227.36	47.34	81.41	44.33	72.34	73.27	73.47	28.04	59.11	142.47	65.31	137.88
15	422.57	42.70	75.51	40.21	128.52	87.88	81.74	25.83	52.71	113.42	72.01	222.08
	(257.27)	(55.15)	(83.35)	(54.73)	(106.37)	(83.75)	(55.18)	(32.51)	(73.55)	(104.04)	(107.65)	(150.33)
16	257.22	50.96	72.38	97.85	159.74	84.52	43.42	24.70	57.24	73.10	44.17	382.48
17	256.25	55.53	72.55	87.40	244.93	70.55	47.94	24.34	51.06	87.50	55.91	248.40
18	248.77	54.37	75.03	45.17	383.97	50.29	47.45	25.73	78.74	96.39	70.00	183.93
19	257.13	56.94	123.50	84.10	204.47	57.09	50.97	47.32	50.02	82.47	85.27	154.72
20	178.20	55.74	102.00	35.72	145.71	56.91	75.42	57.48	52.17	75.93	65.37	139.14
	(244.31)	(57.71)	(87.12)	(82.00)	(227.60)	(65.88)	(57.18)	(34.72)	(60.45)	(87.08)	(74.14)	(221.74)
21	170.52	53.57	90.53	56.54	137.97	54.33	59.08	51.89	47.71	56.82	84.07	182.72
22	154.42	51.44	81.45	55.77	155.52	56.57	54.37	32.58	43.99	51.14	100.78	149.47
23	145.30	140.44	77.53	55.49	119.95	51.39	41.24	27.57	73.89	45.25	135.65	137.88
24	137.22	1000.13	71.56	44.57	107.08	50.42	40.60	26.65	75.40	41.55	473.09	221.84
25	127.11	247.12	70.45	40.27	95.52	50.55	38.40	57.41	59.96	42.17	1104.50	224.50
	(146.91)	(322.85)	(78.31)	(52.43)	(124.00)	(52.45)	(47.38)	(37.07)	(60.79)	(48.17)	(377.88)	(187.29)
26	117.02	231.81	45.43	52.78	107.48	48.73	37.21	42.83	102.45	55.27	372.22	147.27
27	109.26	247.35	47.02	56.97	111.91	45.67	84.65	42.00	74.94	92.97	445.92	144.75
28	102.84	173.47	51.79	45.17	104.45	45.67	123.73	43.81	77.09	71.94	2383.75	127.19
29	97.41		57.45	43.60	91.72	41.77	77.39	43.75	62.73	53.09	1240.83	116.42
30	94.21		56.18	104.43	90.63	55.99	50.51	41.28	54.41	57.24	451.22	115.62
31	92.10		53.50		83.47		49.22	55.98		47.45		108.21
	(102.17)	(217.55)	(50.26)	(71.03)	(98.41)	(48.57)	(73.15)	(53.27)	(74.32)	(70.51)	(1018.79)	(129.95)
Total	6719.82	3714.06	3112.54	2075.74	4121.77	2135.12	1701.85	1238.79	1760.52	2249.06	8572.28	5627.34
Mean	215.77	132.64	100.40	69.20	132.96	71.17	54.90	39.96	66.02	72.55	285.41	178.30
Max.	422.57	1000.13	197.19	127.35	383.97	120.40	123.73	57.83	106.56	147.47	2383.75	382.48
Min.	92.10	51.44	53.50	51.75	53.47	41.77	37.22	25.45	41.33	34.07	47.54	108.21

Max.	35 day	95 day	185 day	275 day	355 day	Min.	Mean	Total
2383.75	221.84	120.40	77.28	55.99	32.97	25.45	118.33	43190.06

Daily Discharge Diagram

---- Annual Mean Discharge 118.33 m³/s 1975