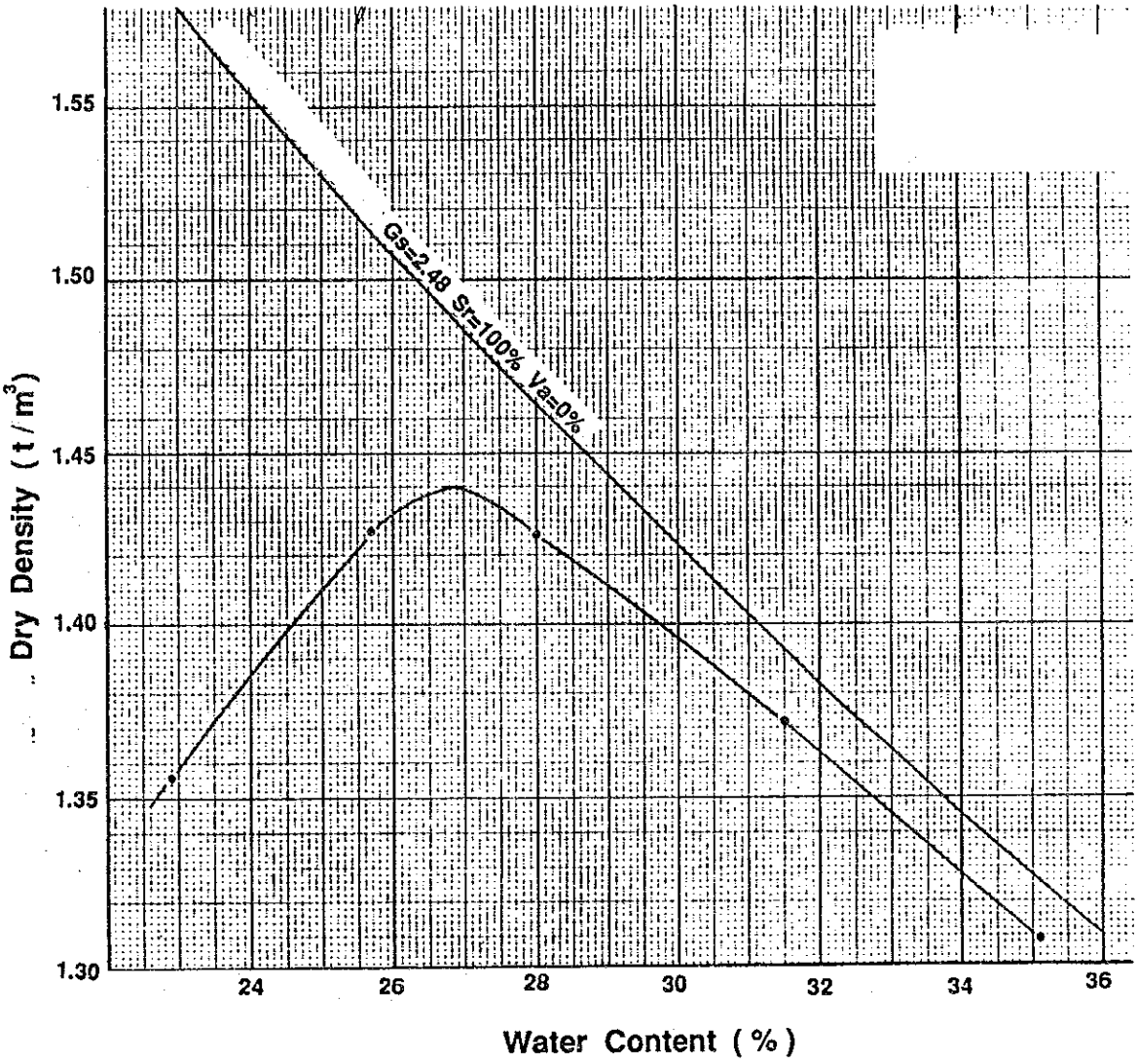
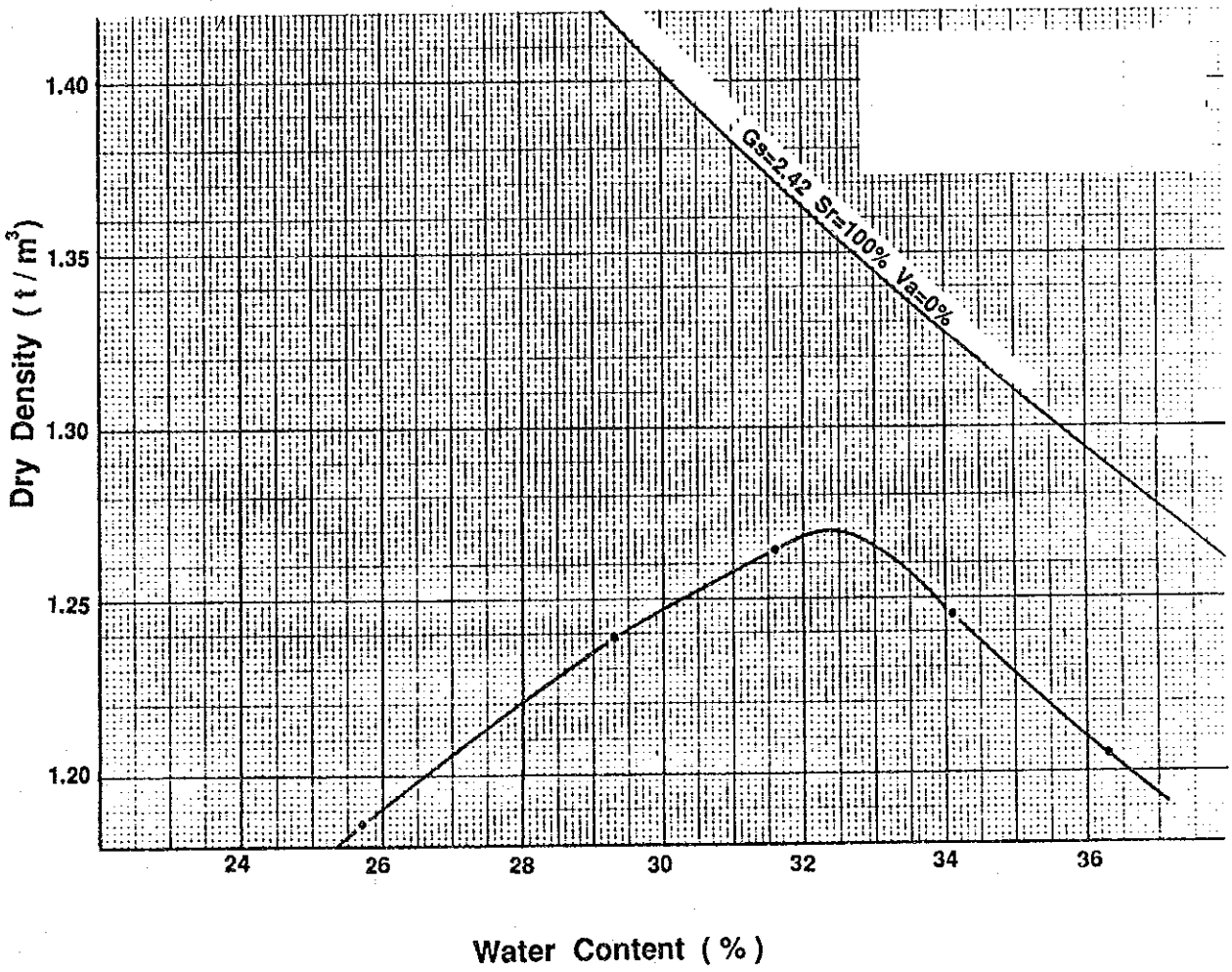
Fig. C.3.9



THE REPUBLIC OF KENYA MINISTRY OF WATER DEVELOPMENT NATIONAL WATER CONSERVATION AND PIPELINE CORPORATION	THE STUDY FOR CONSTRUCTION OF DAM IN MALEWA RIVER SYSTEM GREATER NAKURU WATER SUPPLY PROJECT EASTERN DIVISION JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Compaction Characteristicsns of Soil (EP-3)

Fig. C.3.10



THE REPUBLIC OF KENYA MINISTRY OF WATER DEVELOPMENT NATIONAL WATER CONSERVATION AND PIPELINE CORPORATION	THE STUDY FOR CONSTRUCTION OF DAM IN MALEWA RIVER SYSTEM GREATER NAKURU WATER SUPPLY PROJECT EASTERN DIVISION JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Compaction Characteristicsns of Soil (EP-4)

Fig. C.3.11

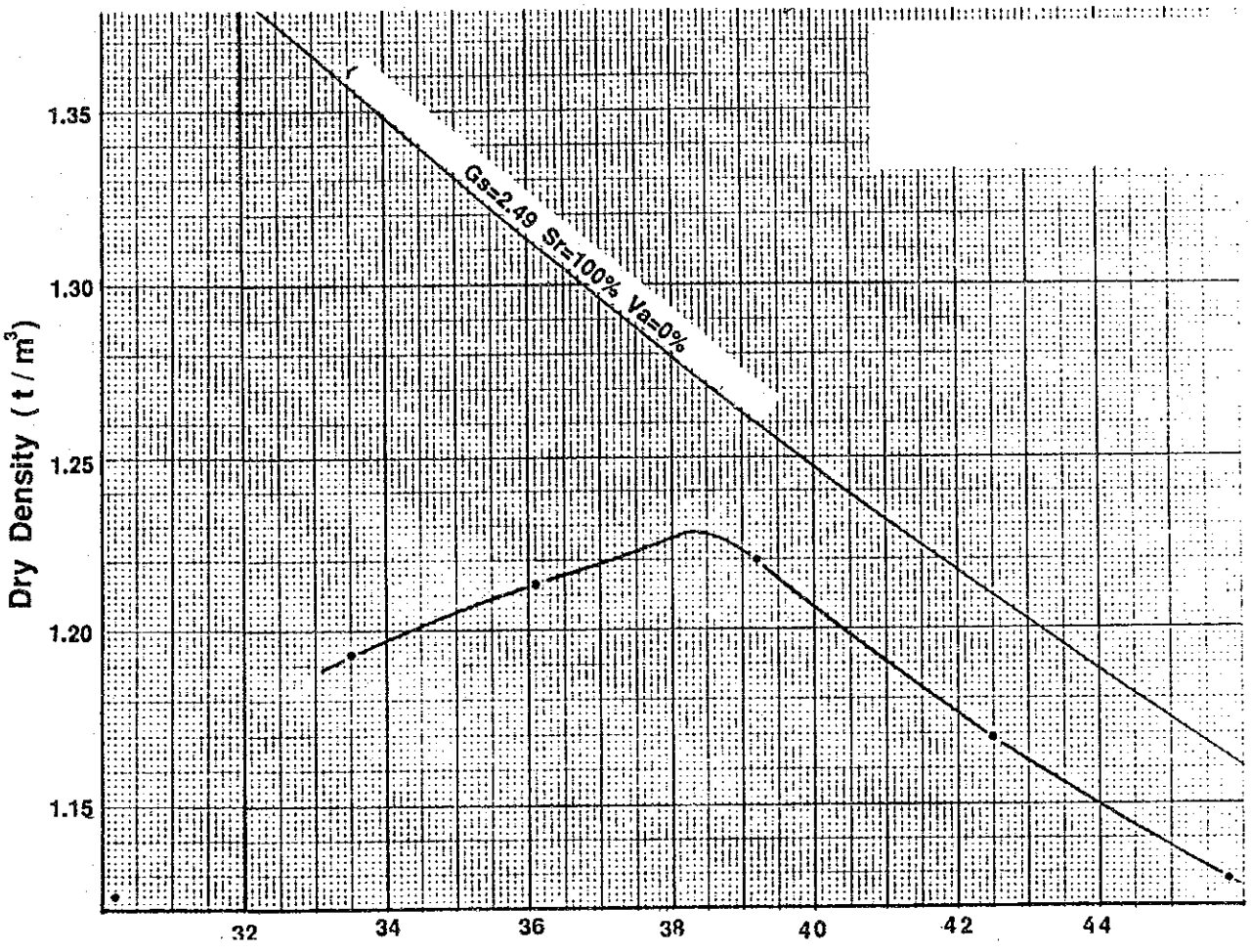


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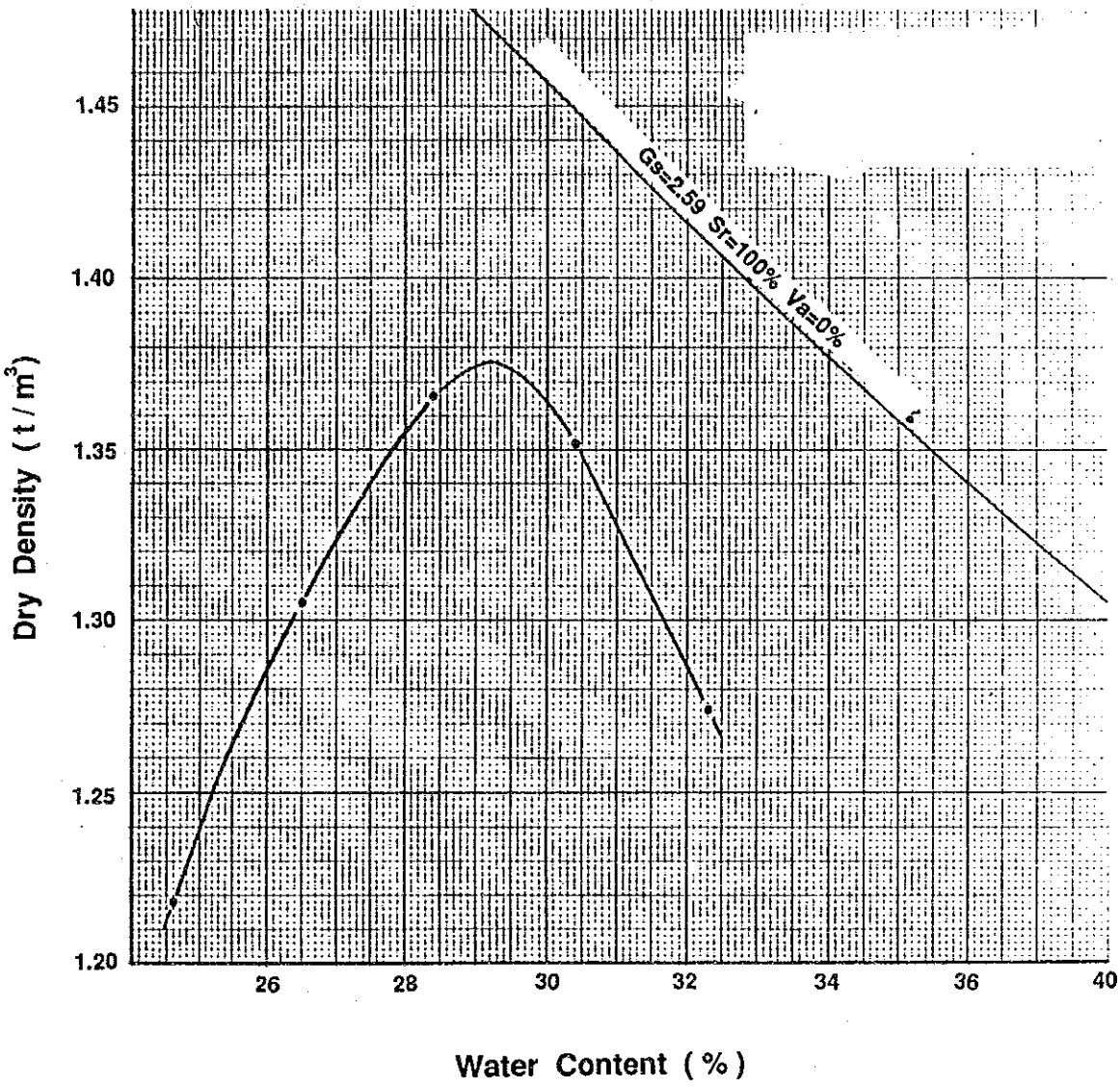
Fig. C.3.12



THE REPUBLIC OF KENYA MINISTRY OF WATER DEVELOPMENT NATIONAL WATER CONSERVATION AND PIPELINE CORPORATION	THE STUDY FOR CONSTRUCTION OF DAM IN MALEWA RIVER SYSTEM GREATER NAKURU WATER SUPPLY PROJECT EASTERN DIVISION JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Compaction Characteristicsns of Soil (EP-6)

Fig. C.3.13

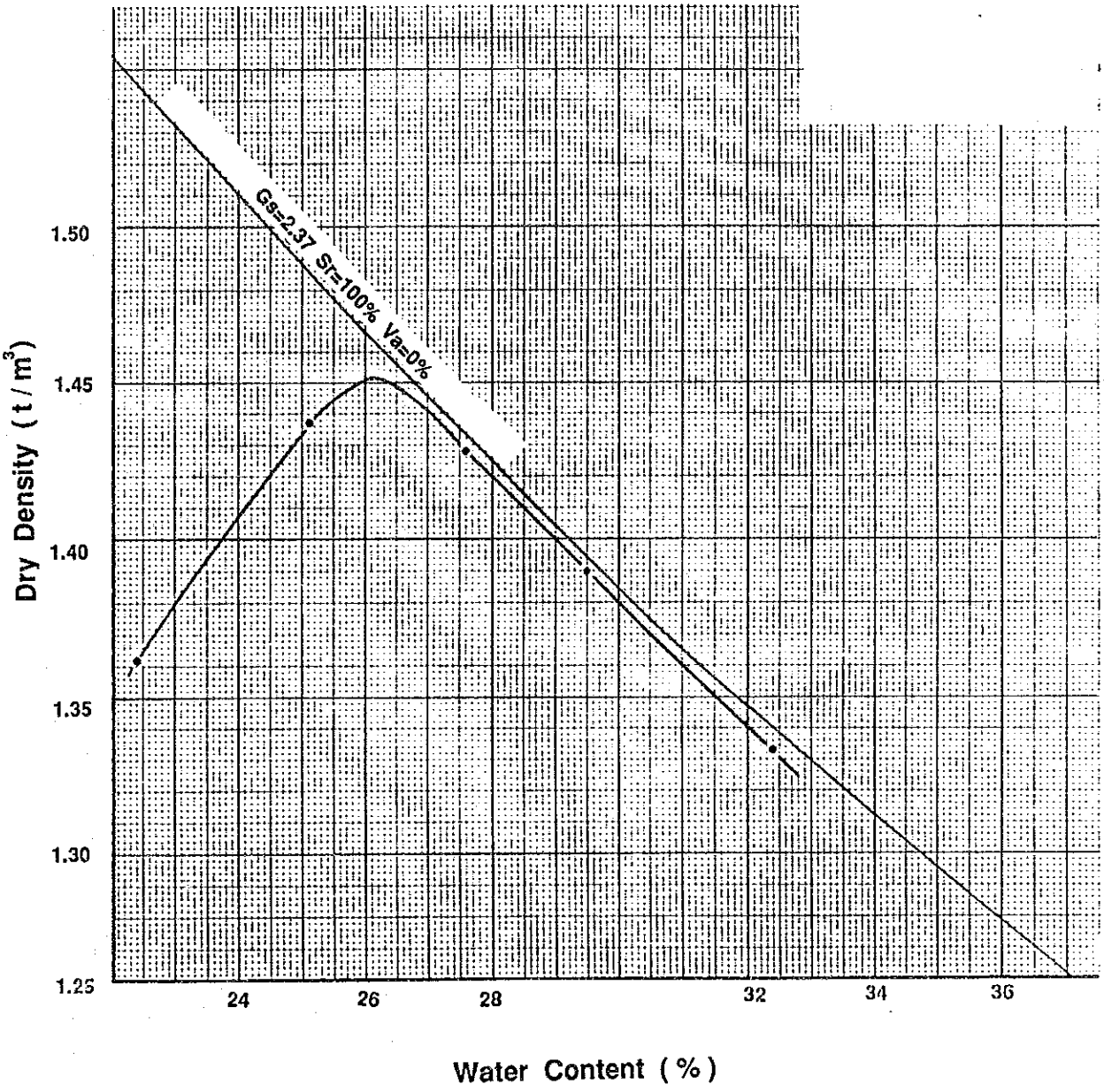


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Fig. C.3.14

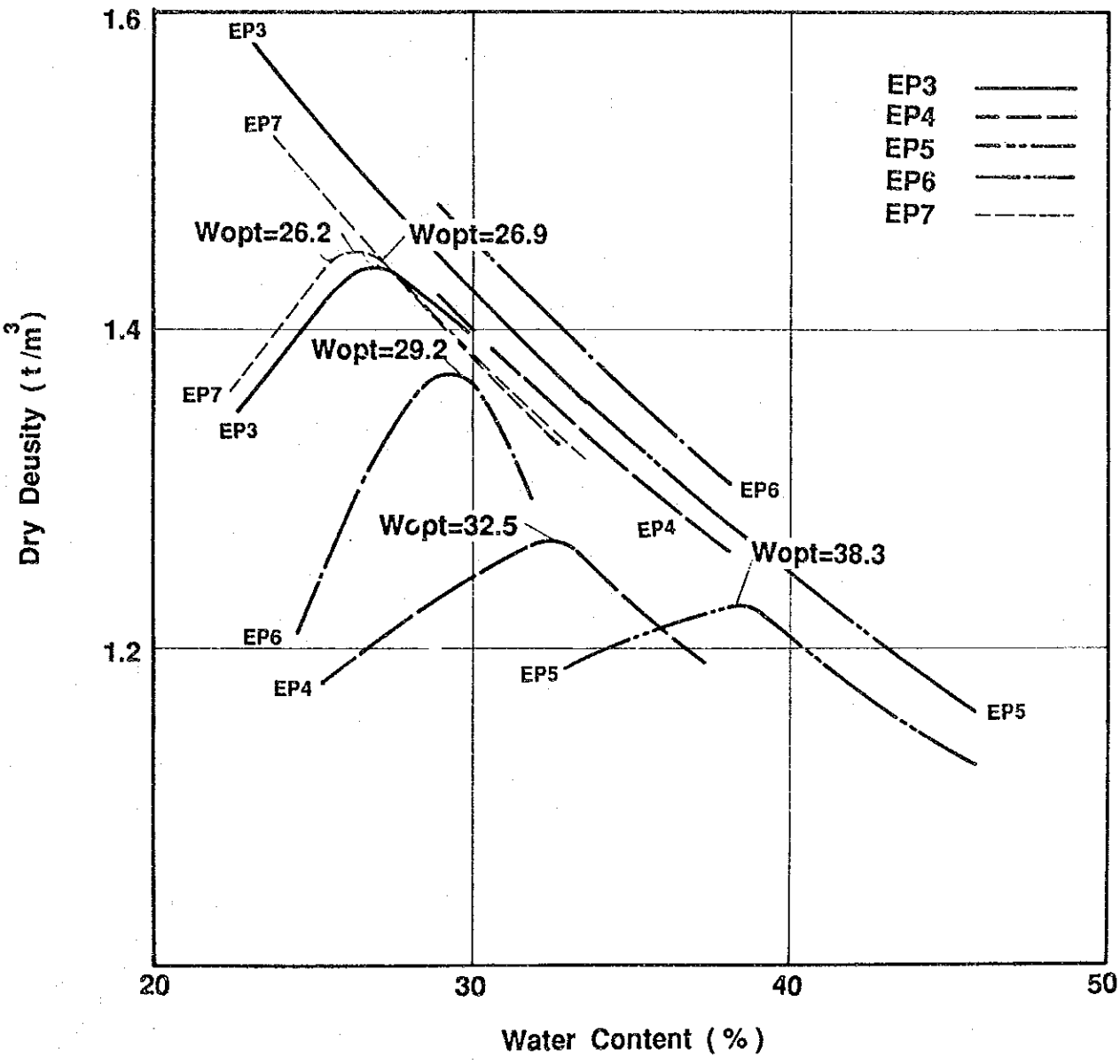

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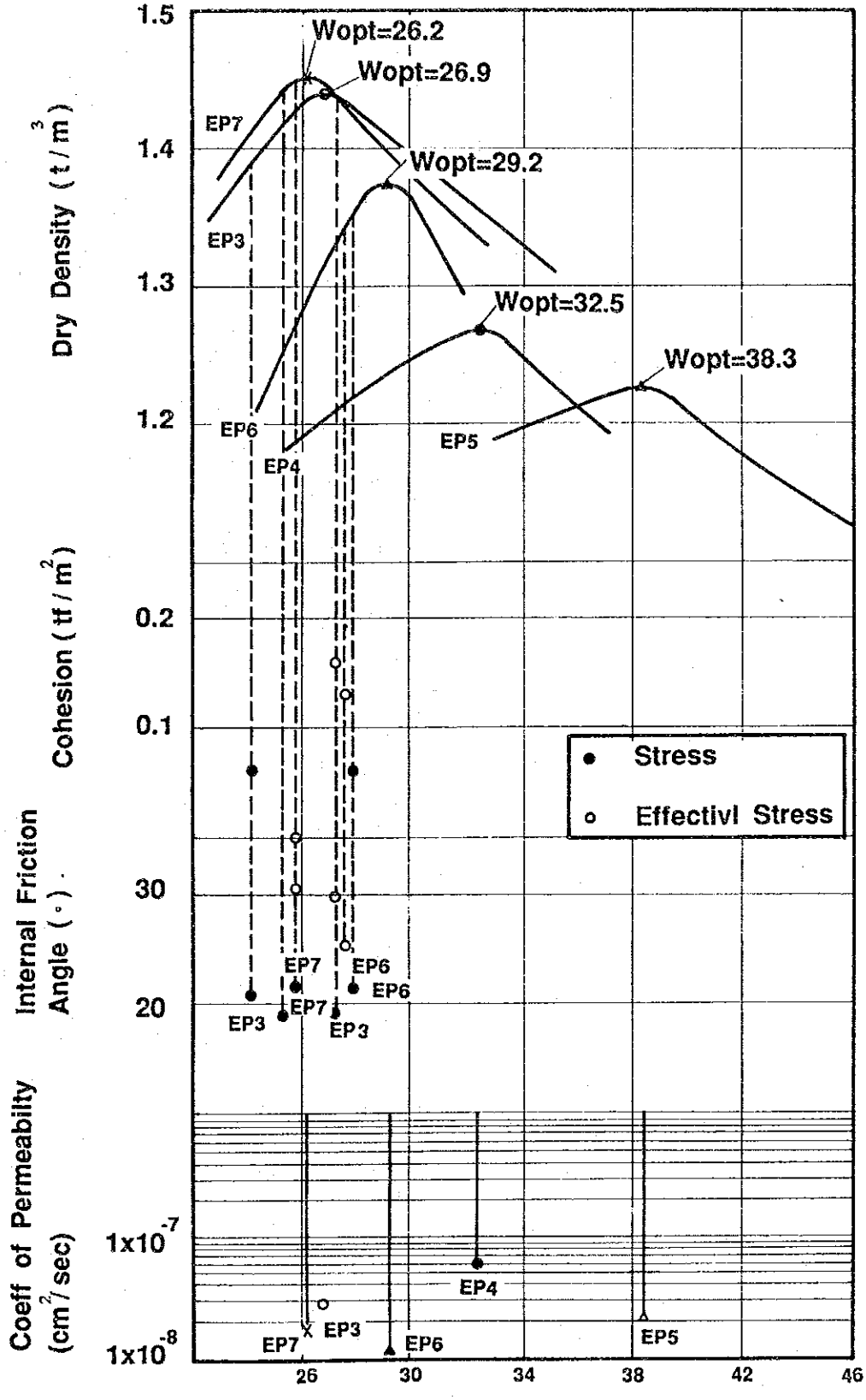
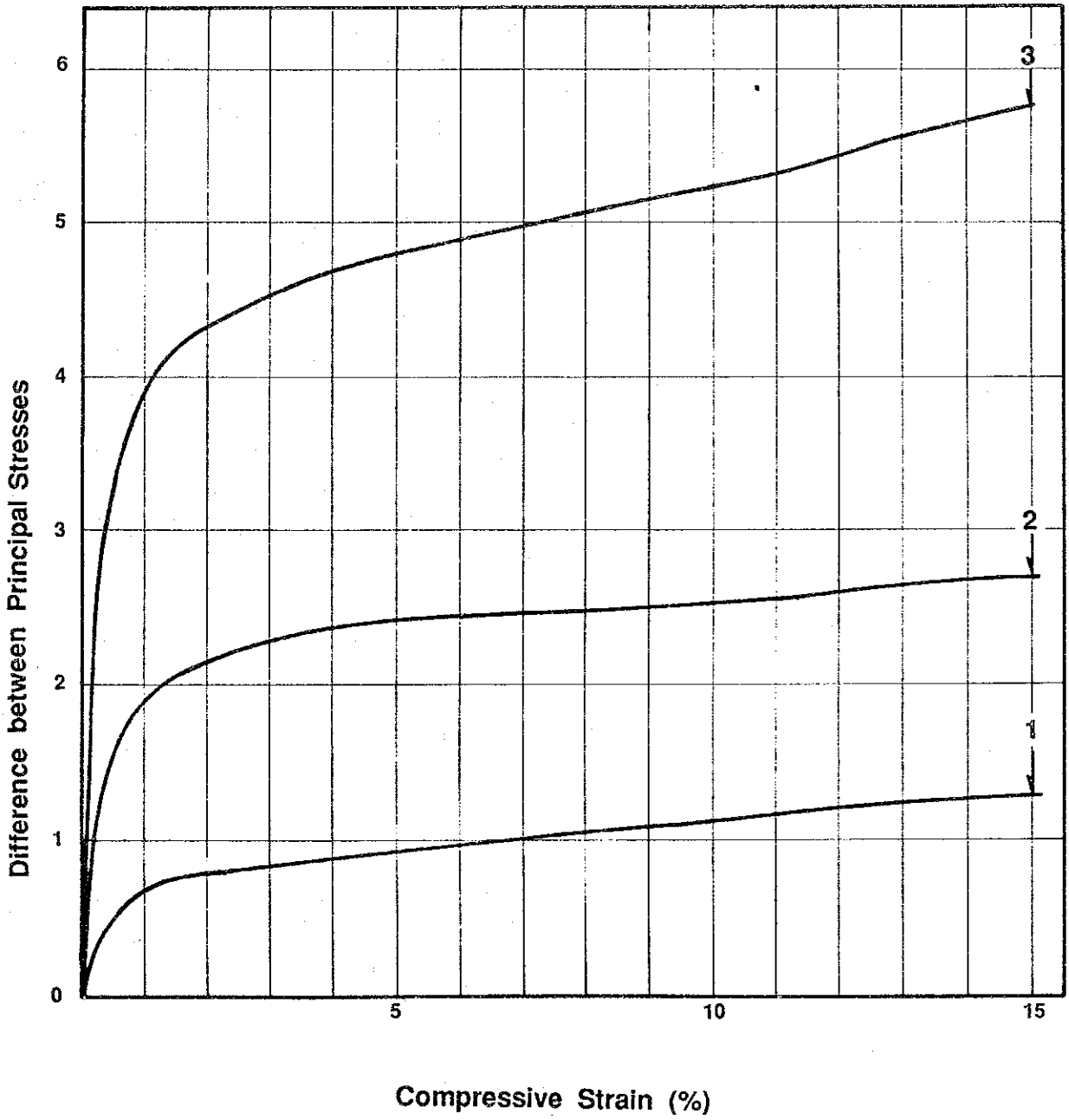
Fig. C.3.15



THE REPUBLIC OF KENYA MINISTRY OF WATER DEVELOPMENT NATIONAL WATER CONSERVATION AND PIPELINE CORPORATION	THE STUDY FOR CONSTRUCTION OF DAM IN MALEWA RIVER SYSTEM GREATER NAKURU WATER SUPPLY PROJECT EASTERN DIVISION JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Water Content and Mechanical Characteristics of Soil

Fig. C.3.16



THE REPUBLIC OF KENYA MINISTRY OF WATER DEVELOPMENT NATIONAL WATER CONSERVATION AND PIPELINE CORPORATION	THE STUDY FOR CONSTRUCTION OF DAM IN MALEWA RIVER SYSTEM GREATER NAKURU WATER SUPPLY PROJECT EASTERN DIVISION JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE $(\sigma_1-\sigma_3)-\varepsilon$ Curves of Soil, UU Test (EP-3)

Fig. C.3.17

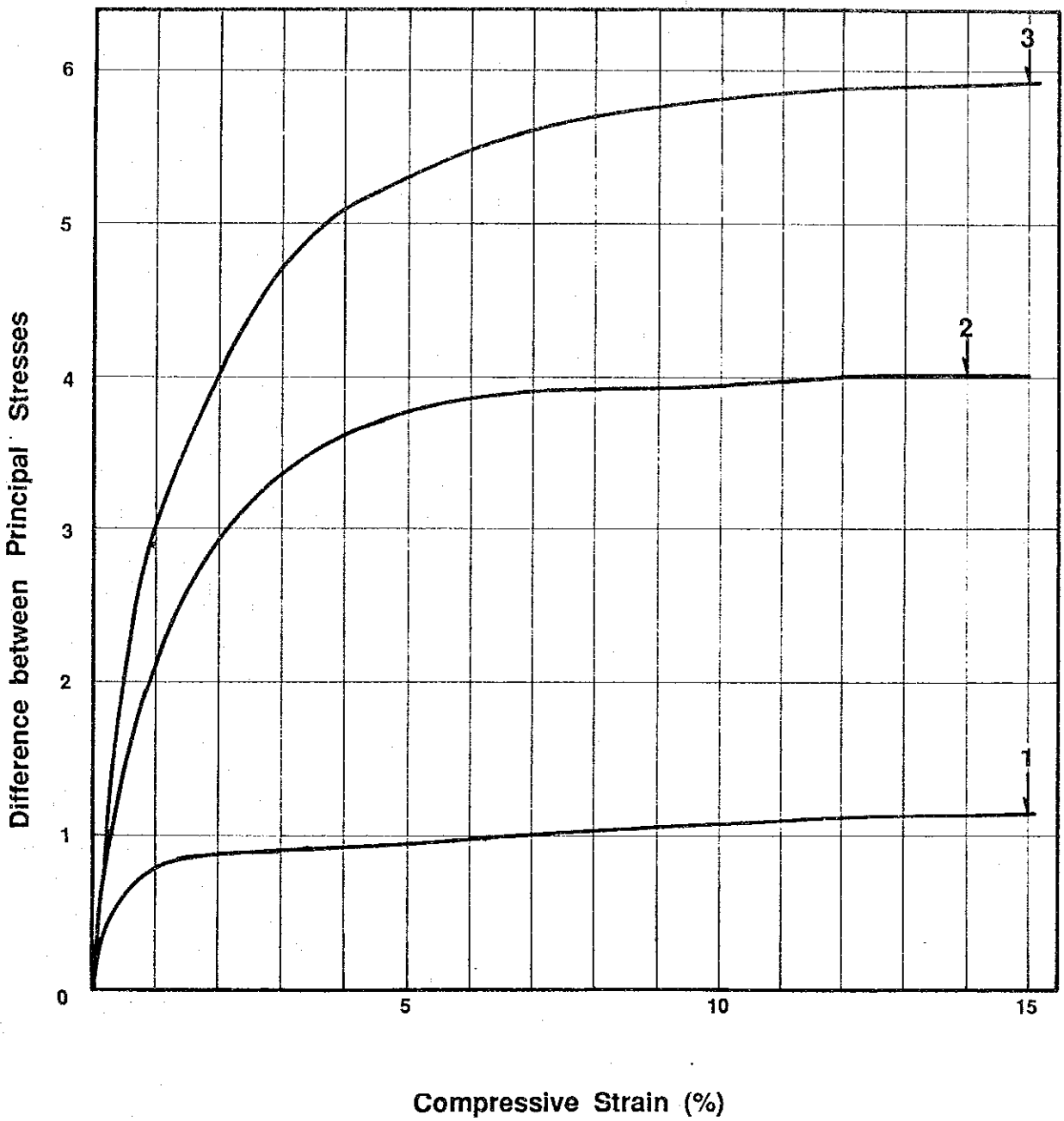


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Fig. C.3.18

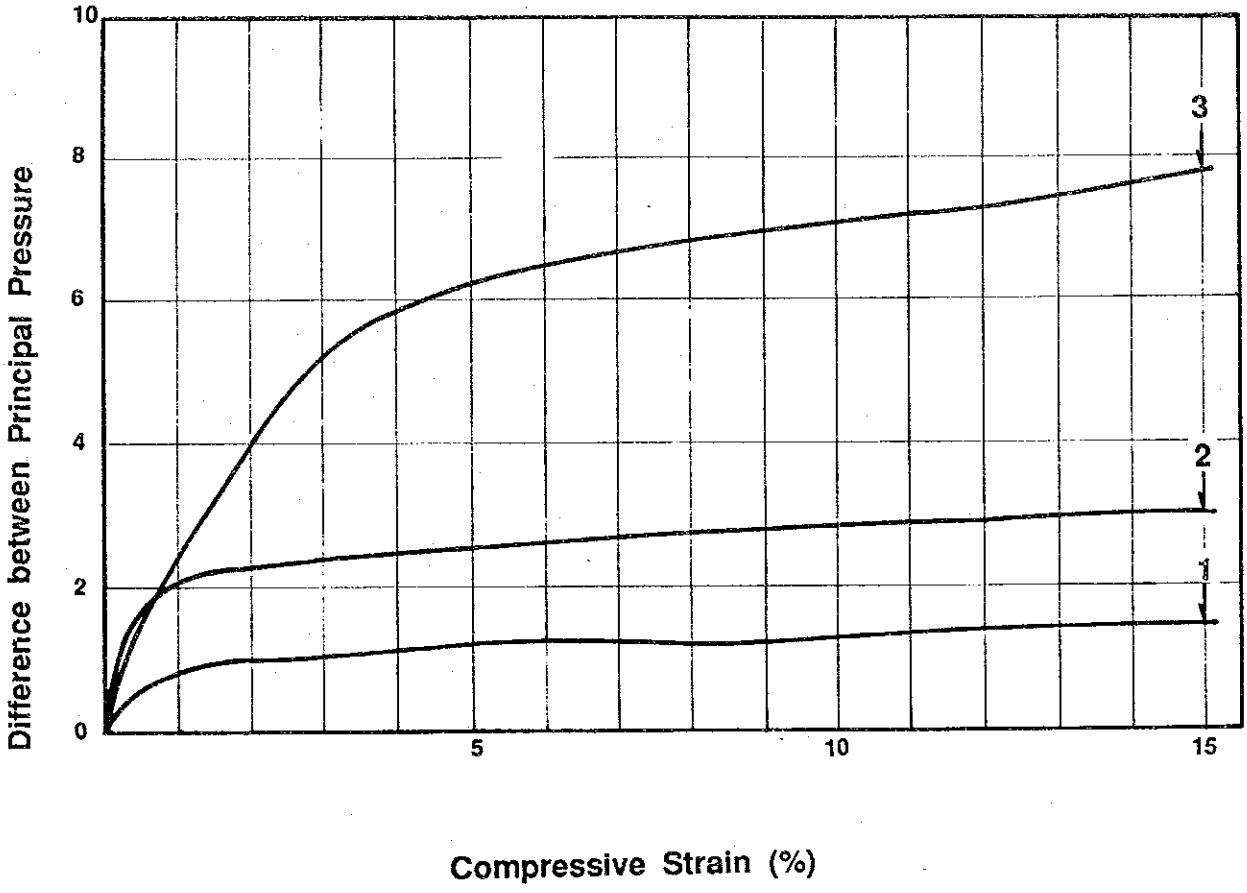

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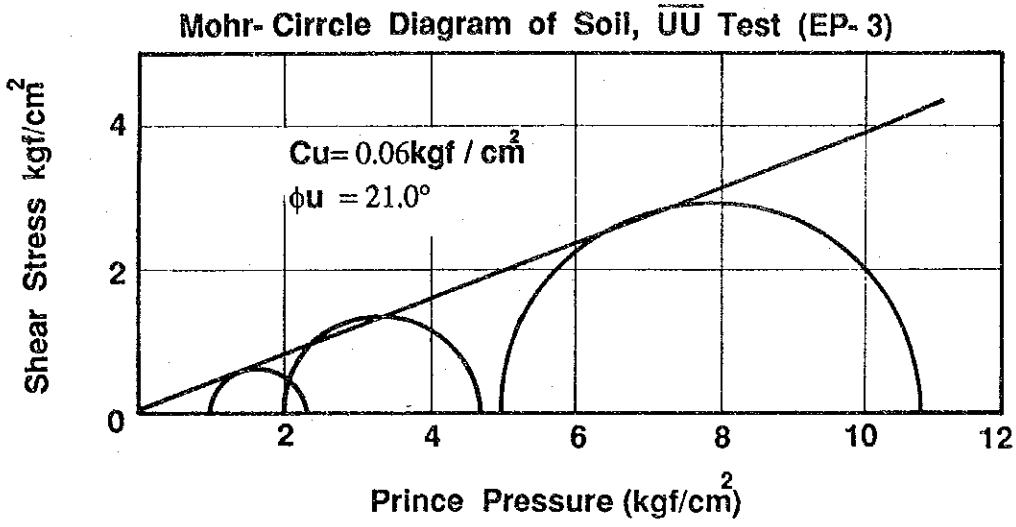
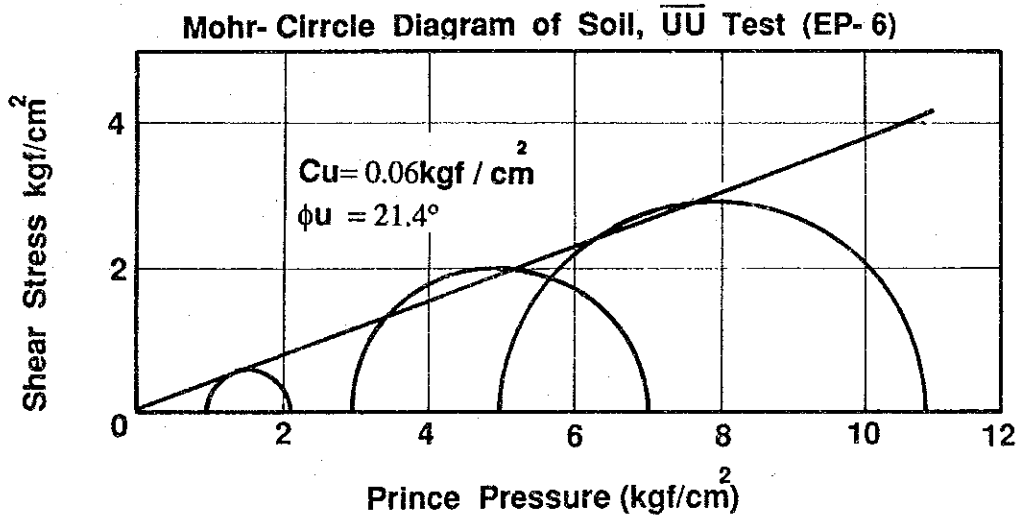
Fig. C.3.19





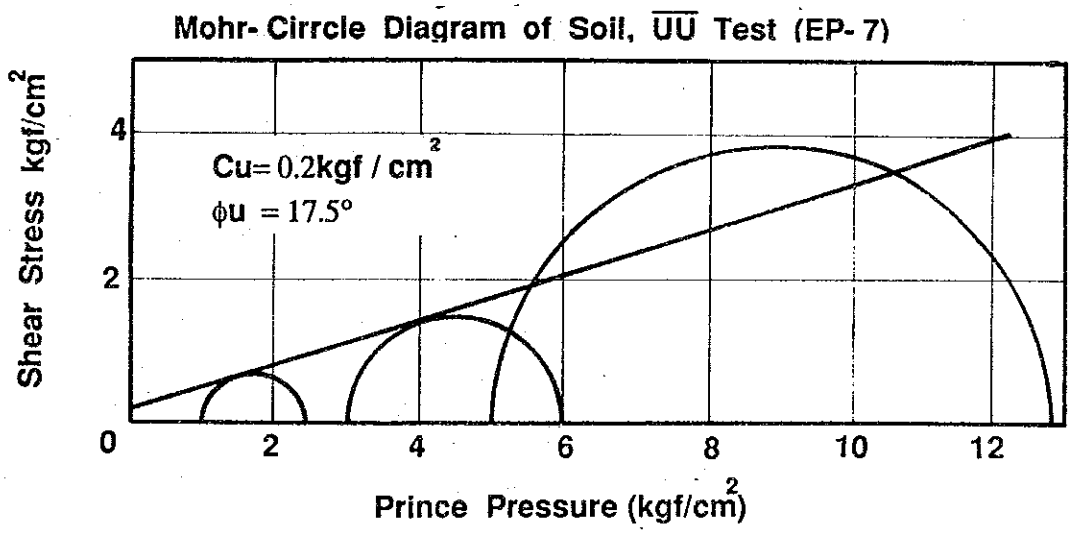


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Fig. C.3.20

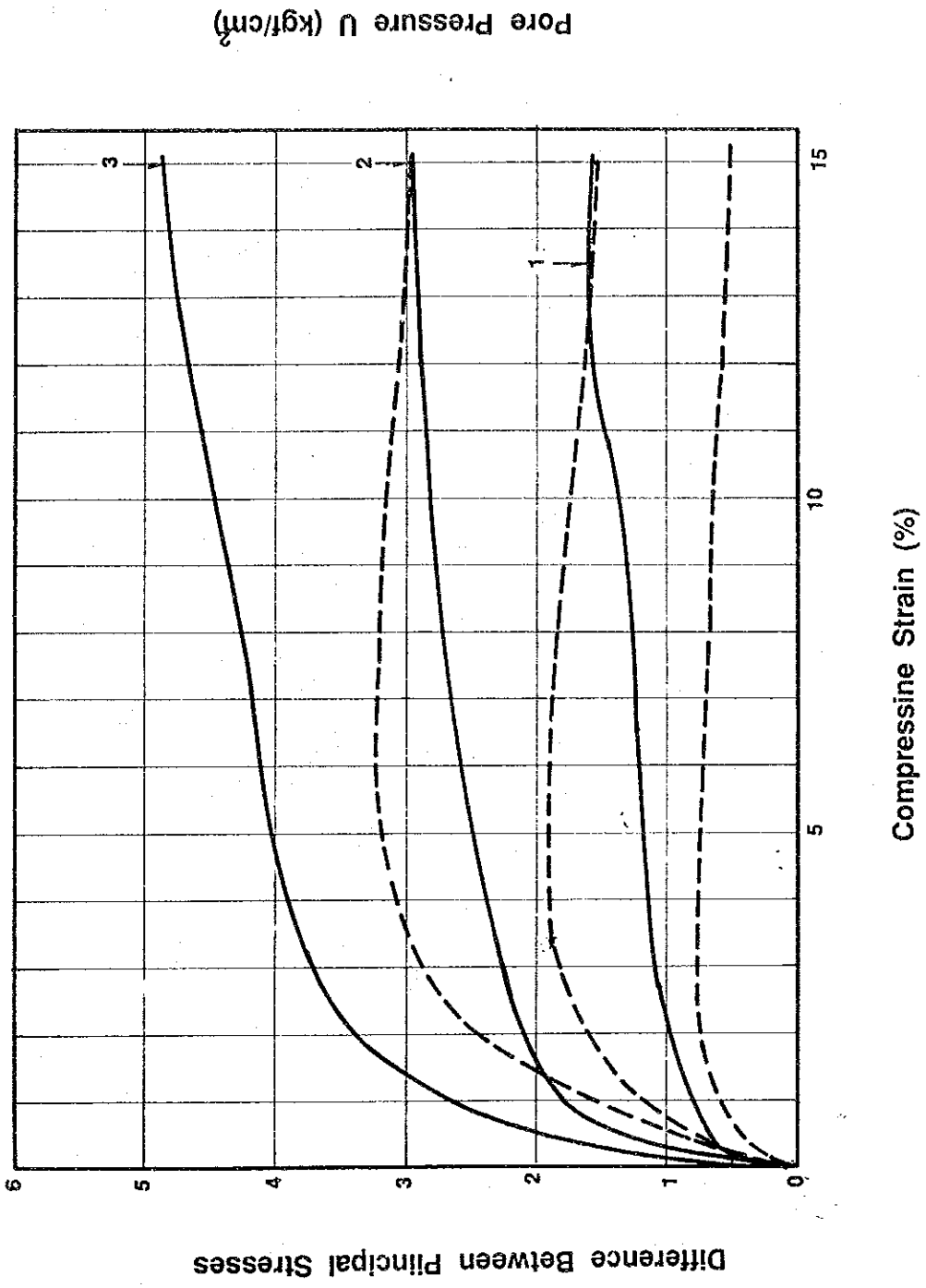

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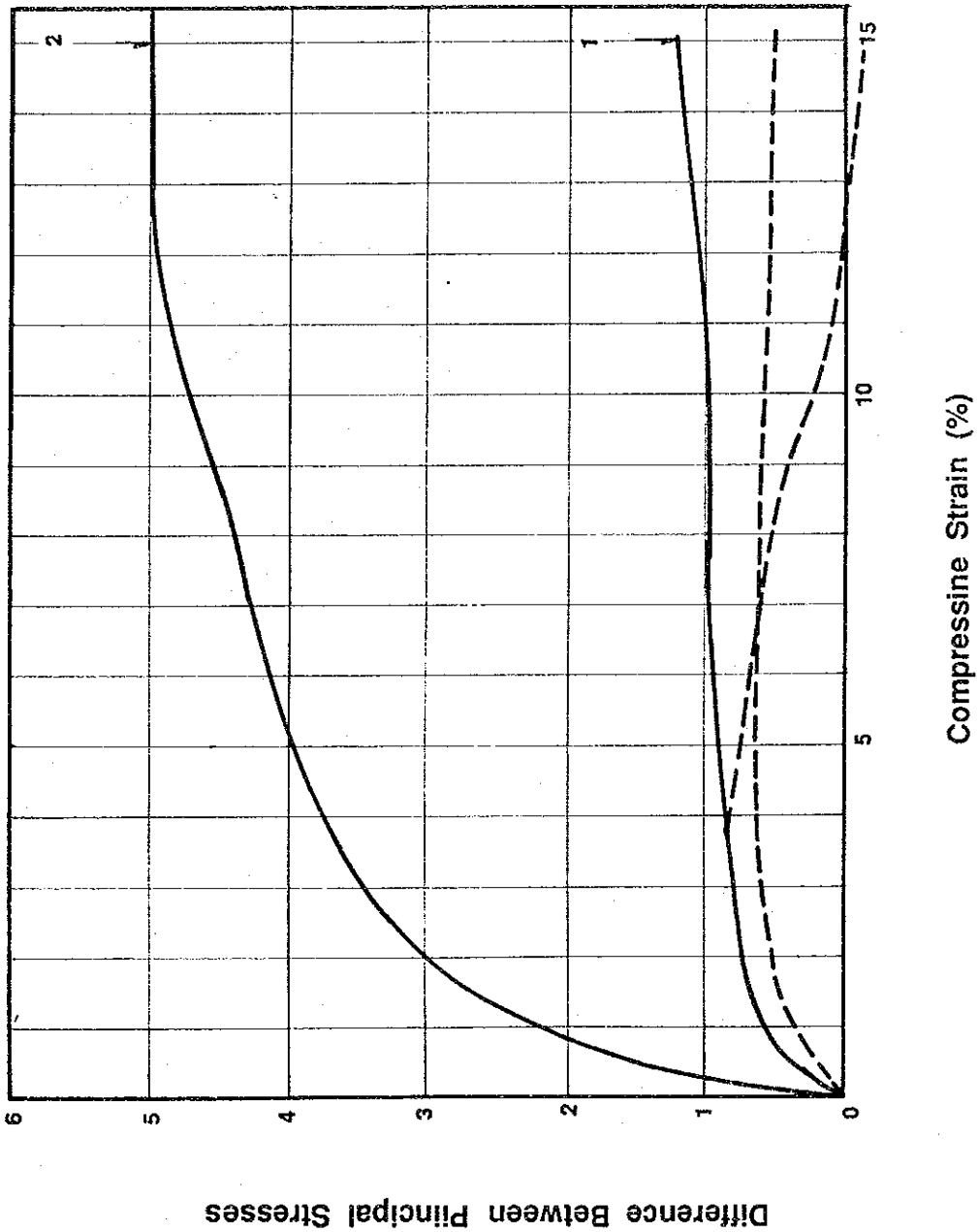
Fig. C.3.21



THE REPUBLIC OF KENYA MINISTRY OF WATER DEVELOPMENT NATIONAL WATER CONSERVATION AND PIPELINE CORPORATION	THE STUDY FOR CONSTRUCTION OF DAM IN MALEWA RIVER SYSTEM GREATER NAKURU WATER SUPPLY PROJECT EASTERN DIVISION JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE $(\sigma_1 - \sigma_3)$ U - ε Curves of Soil, $\overline{CU}$ Test (EP-6)

Fig. C.3.22

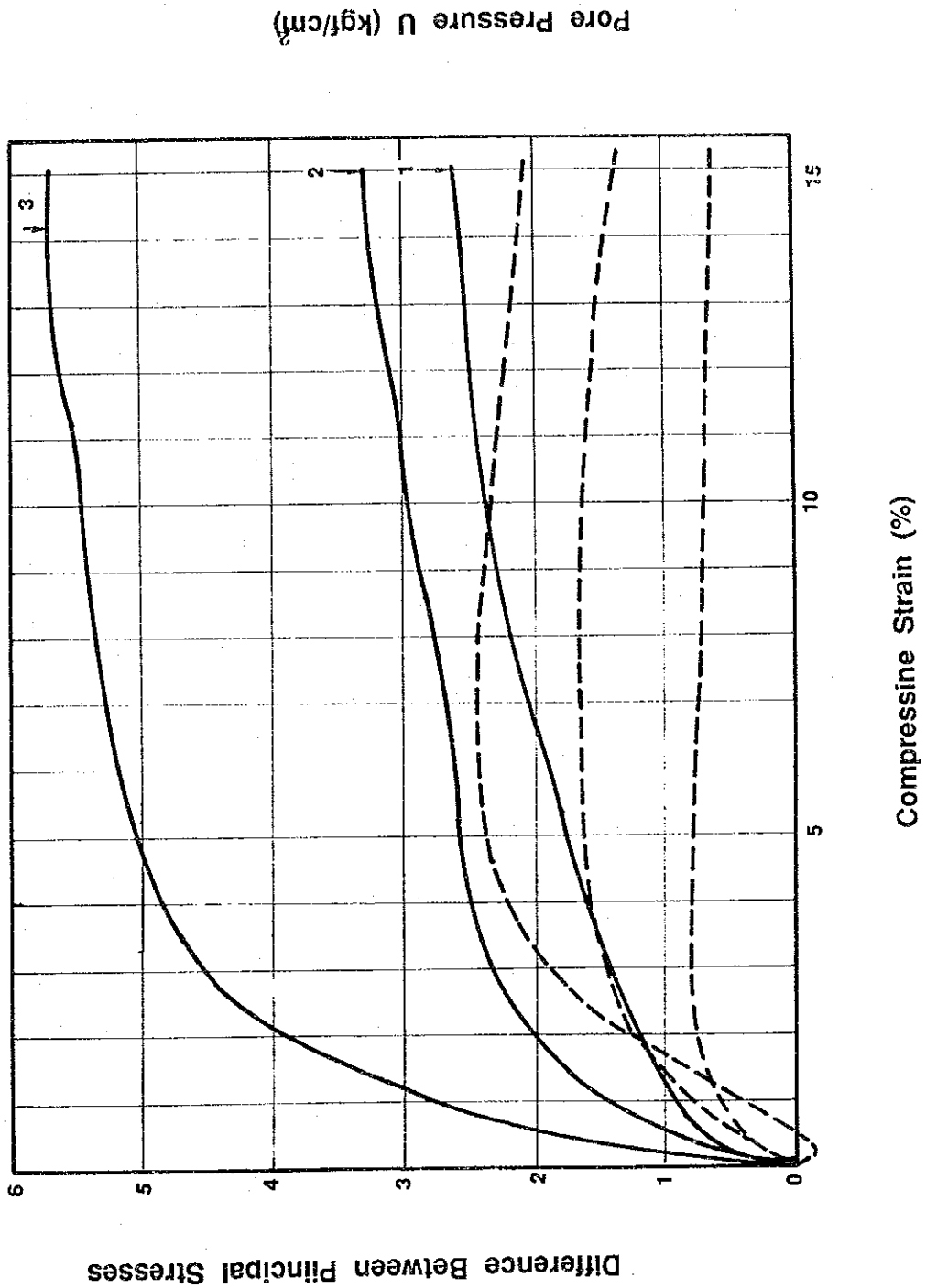


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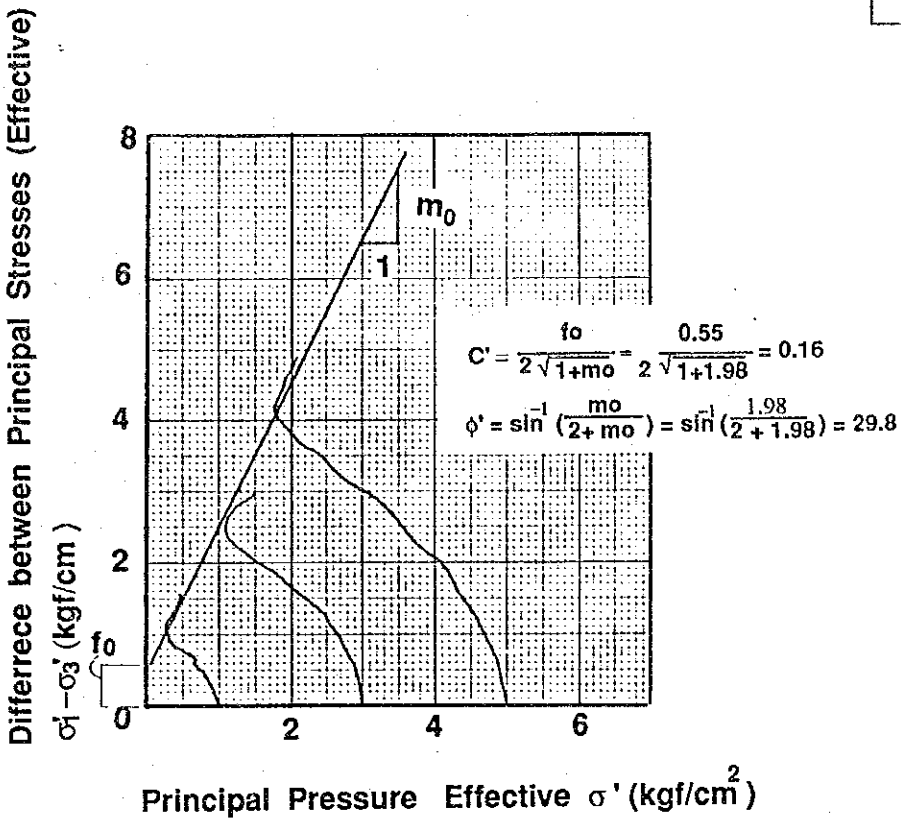
Fig. C.3.23



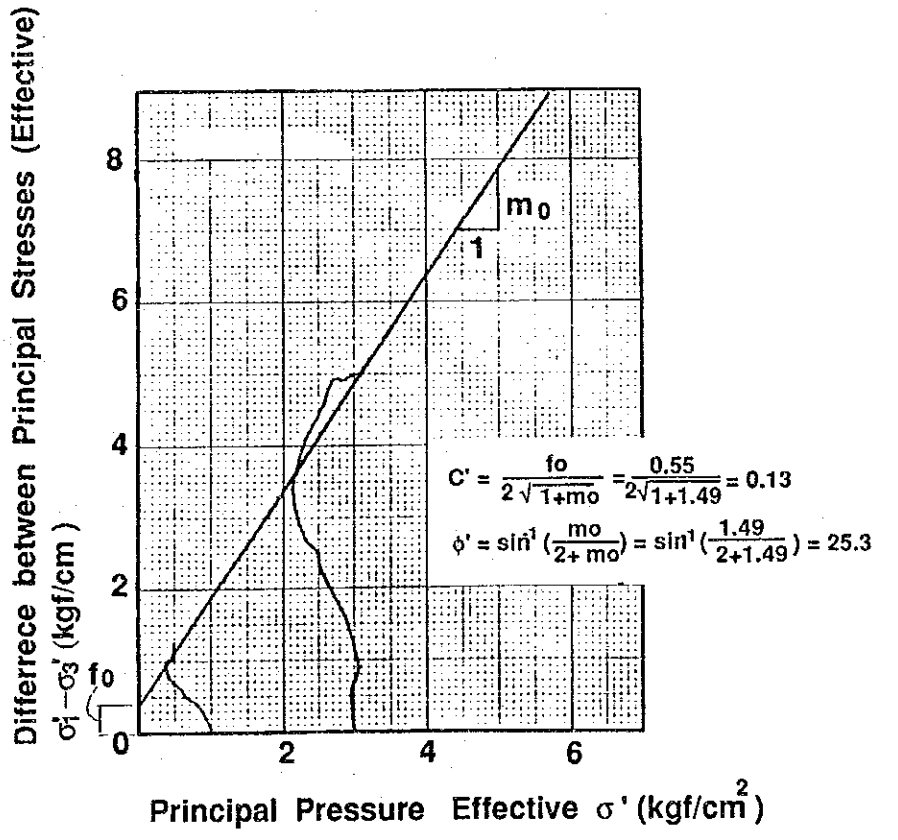


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Fig. C.3.24

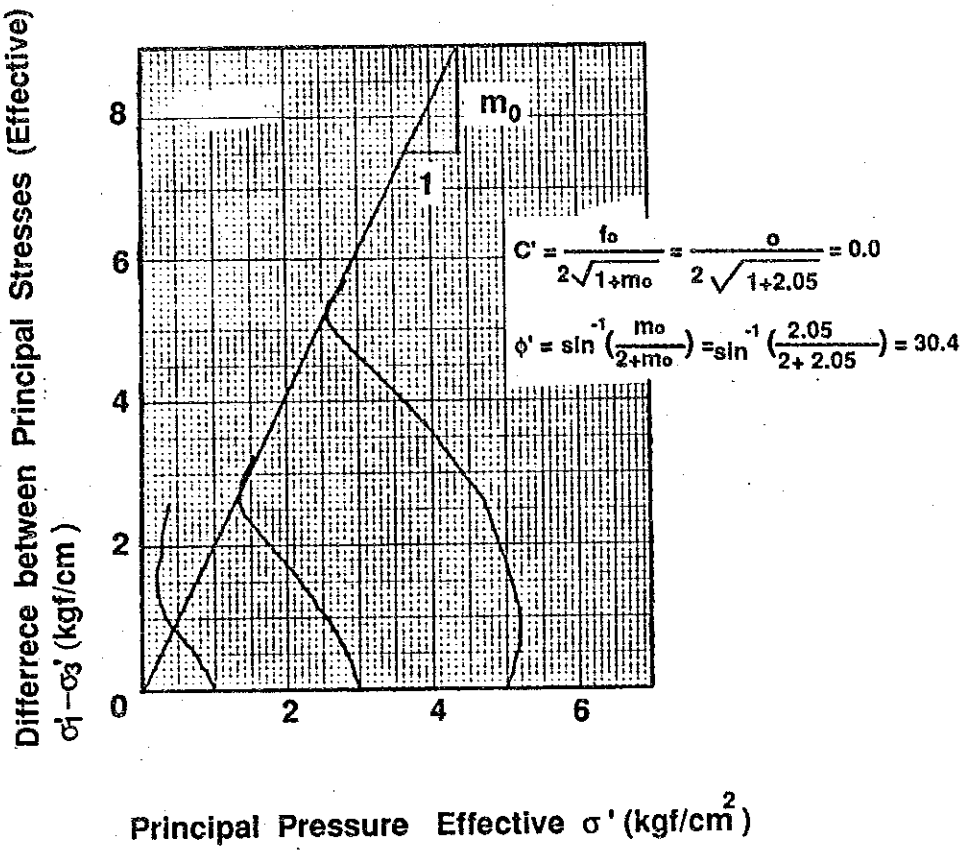

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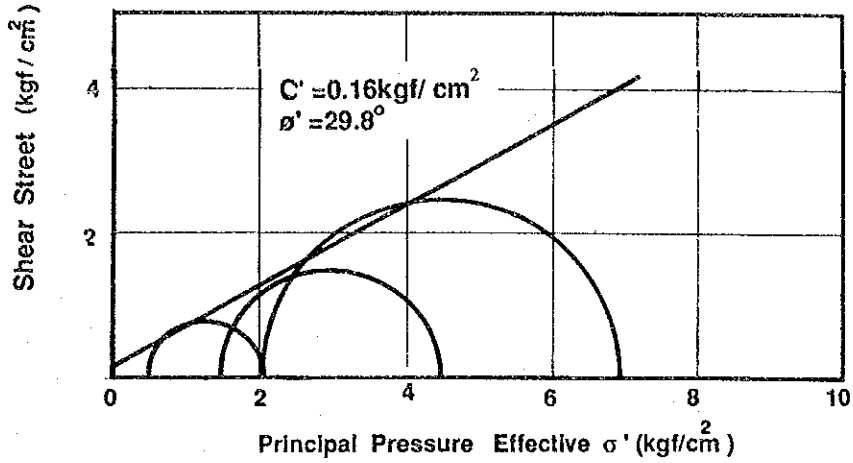
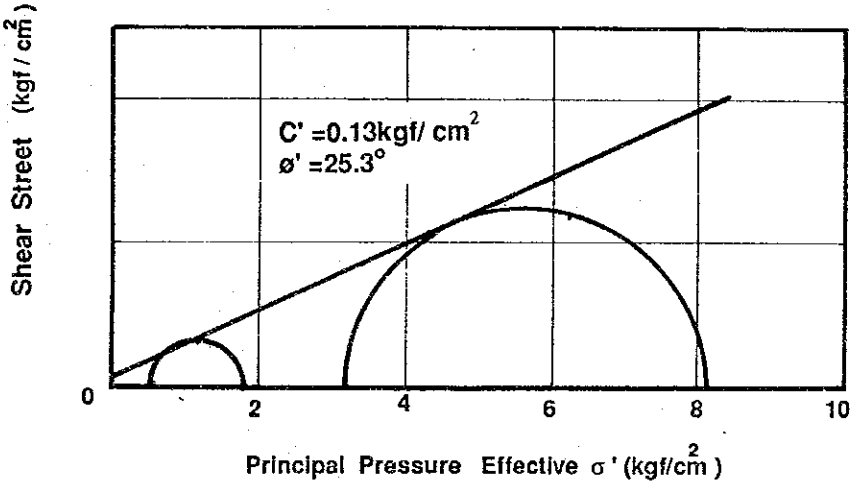
Fig. C.3.25

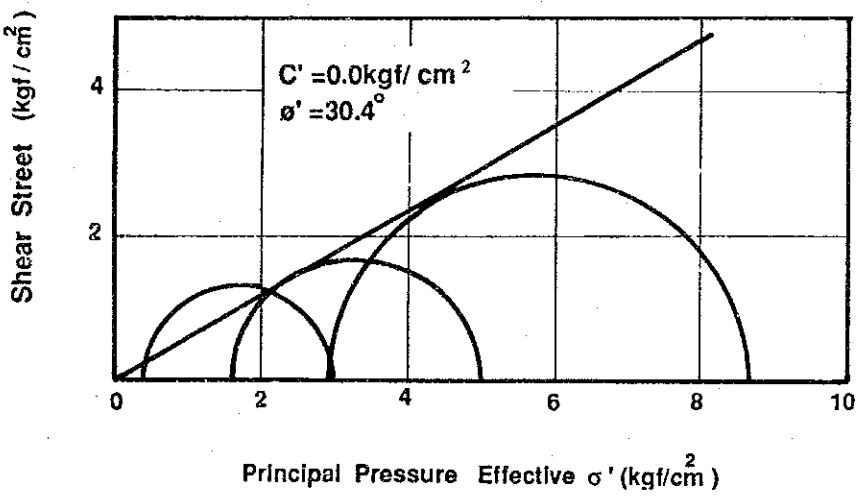
Mhor - Circle Diagram of Soil, CU Test (EP-3)



Mhor - Circle Diagram of Soil, CU Test (EP-6)



Mhor - Circle Diagram of Soil, CU Test (EP-7)



THE REPUBLIC OF KENYA MINISTRY OF WATER DEVELOPMENT NATIONAL WATER CONSERVATION AND PIPELINE CORPORATION	THE STUDY FOR CONSTRUCTION OF DAM IN MALEWA RIVER SYSTEM GREATER NAKURU WATER SUPPLY PROJECT EASTERN DIVISION JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Mohr - Circcli Diagram of soil, $\overline{CU}$ Test

Fig. C.3.26

LEGEND

KB - 1
Borehole

Distributed Area
of Welded Tuff

KB-1
KB-2
KB-3
KB-4

KIPIPIRI ROAD

ROCKS

CULTIVATION

CULT.

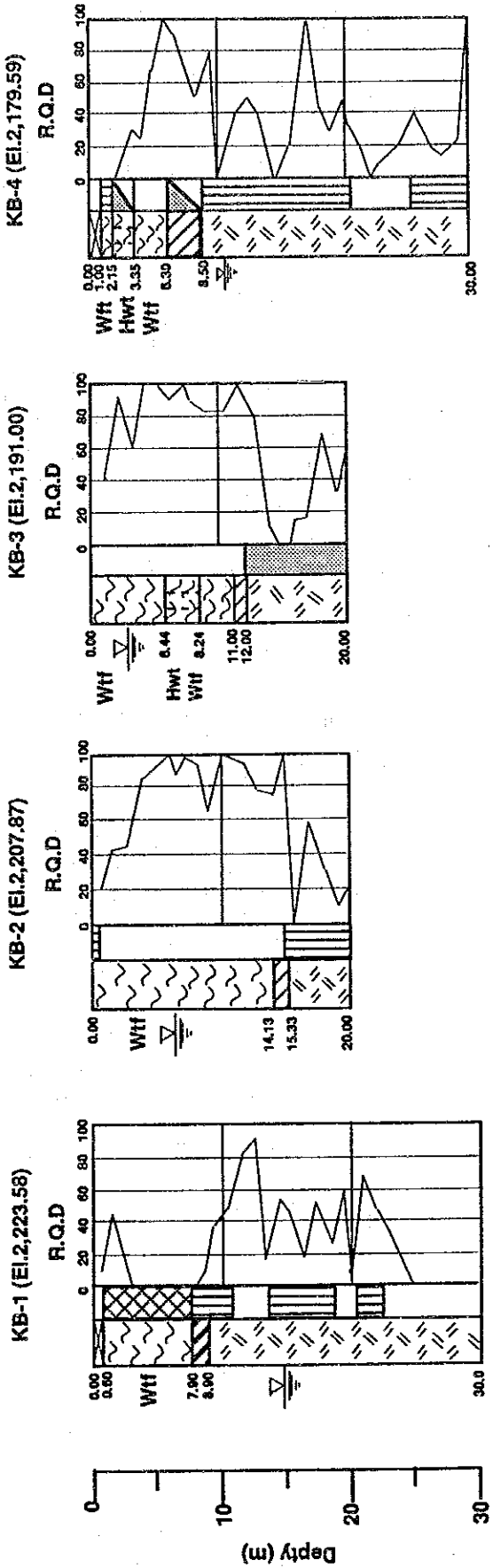
LT.

N

Scale
0 100 200 300 400 500m

THE REPUBLIC OF KENYA MINISTRY OF WATER DEVELOPMENT NATIONAL WATER CONSERVATION AND PIPELINE CORPORATION	THE STUDY FOR CONSTRUCTION OF DAM IN MALEWA RIVER SYSTEM GREATER NAKURU WATER SUPPLY PROJECT EASTERN DIVISION JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Location Map of Drillings in Quarry Site

Fig. C.3.27



LEGEND

WEATHERING GRADE & FAULT

- Fresh or faint ; non visible sign of weathering or Discolouration only on discontinuities
- Slightly ; Weathering extends throughout but rock is not friable
- Moderately ; Weathering extends throughout and rock is slightly friable
- Highly ; Weathering extends throughout and rock is friable and soft
- Fault

: Recorded lowest water level in borehole

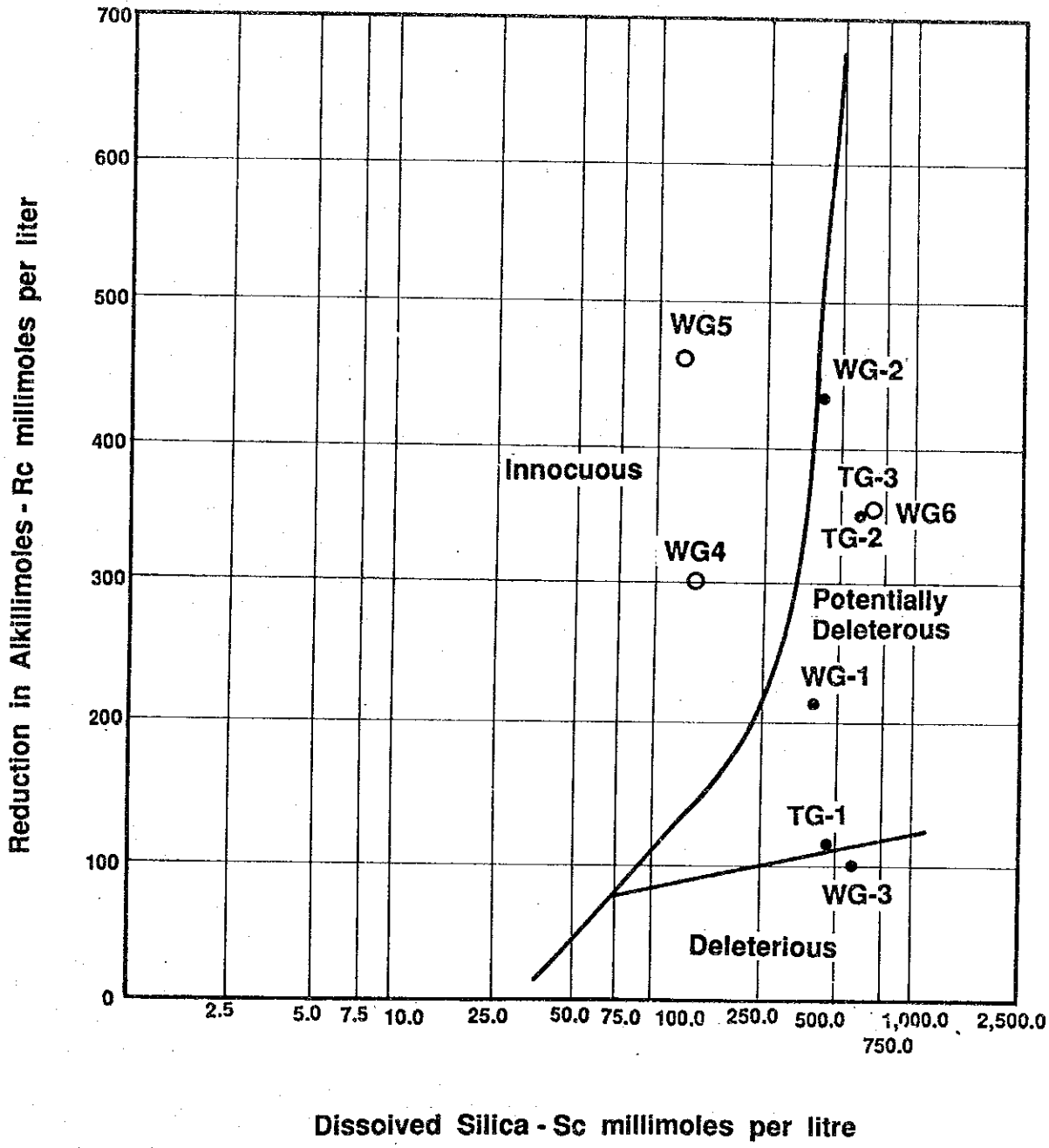
R.Q.D : Rock Quality Designation

- Top soil
- Colluvium
- Welded tuff
- Non-Welded tuff
- High degree welded tuff
- Massive tuffs & Lake sediments

THE REPUBLIC OF KENYA MINISTRY OF WATER DEVELOPMENT NATIONAL WATER CONSERVATION AND PIPELINE CORPORATION	THE STUDY FOR CONSTRUCTION OF DAM IN MALEWA RIVER SYSTEM GREATER NAKURU WATER SUPPLY PROJECT EASTERN DIVISION JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Drilling Loges at Kipipiri Road Quarry Site

3.33

Fig. C.3.28



THE REPUBLIC OF KENYA MINISTRY OF WATER DEVELOPMENT NATIONAL WATER CONSERVATION AND PIPELINE CORPORATION	THE STUDY FOR CONSTRUCTION OF DAM IN MALEWA RIVER SYSTEM GREATER NAKURU WATER SUPPLY PROJECT EASTERN DIVISION JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Potential Reactivity of Concreete Aggreate (Chemical Metlod)

ANNEX D

HYDROLOGICAL INVESTIGATION

TABLE OF CONTENTS

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LIST OF FIGURES

Abbreviation and Local Terms

1. Abbreviation of Measures

1.1 Length

mm	=	millimeter
cm	=	centimeter
m	=	meter
km	=	kilometer

1.2 Area

m^2, sq.m	=	square meter
ha	=	hectare
km^2, sq.km	=	square kilometer

1.3 Volume

lit, l	=	liter
lcd	=	liter per capita per day
cu.m, m^3	=	cubic meter
cu.m/day, m^3/day	=	cubic meter per day
MCM	=	million cubic meter

1.4 Weight

mg	=	milligram
mg/l	=	milligram per liter
g	=	gramme
kg	=	kilogram
t	=	ton

1.5 Time

s, sec	=	second
min	=	minute
h, hr	=	hour
d	=	day
yr	=	year

1.6 Money

Kshs.	=	Kenya Shilling(unit of Kenya currency, US$1.00 = Ksh 23.0 = ¥ 150)
US$, $	=	US dollar
¥	=	Japanese Yen

1.7 Electric Measures

kV	=	kilovolt
kW	=	kilowatt
MW	=	megawatt
kWh	=	kilowatt hour
kVA	=	kilovolt ampere

1.8 Other Measures

mmho	=	micromho = conductance
ppm	=	parts per million
ppb	=	parts per billion
MPN	=	most probable number
‰	=	mill
%	=	per cent
PS	=	0.736 kW
°	=	degree
'	=	minute
"	=	second
℃	=	degree centigrade
n.a.	=	not available
COD	=	Chemical Oxygen Demand
T-N	=	Total Nitrogen
I -	=	Inorganic -
O -	=	Organic -
T-P	=	Total - Phosphorus
DO	=	Dissolved Oxygen
pH	=	Exponent of hydrogen ion concentration

1.9 Derived Measures Based on the Same Symbols

cu.m/sec, m^3/s	=	cubic meter per second
cu.m/day, m^3/day	=	cubic meter per day
t/ha	=	ton per hectare
lpcd	=	liter per capita per day

2. Other Abbreviations

BS	=	British Standards
JIS	=	Japanese Industrial Standards
ASTM	=	American Society for Testing and Material
GNP	=	gross national products

GDP	=	gross domestic product
GRDP	=	gross regional domestic product
El.	=	elevation
FWL	=	flood water level
FSL	=	full supply level
MSL	=	minimum supply level
HWL	=	normal operation level
LWL	=	minimum operation level
f.o.b	=	free on board
c.i.f.	=	cost, insurance and freight
ICB	=	international competitive bid
LCB	=	local competitive bid

3. Abbreviation of Organizations

MOA	=	Ministry of Agriculture
MENR	=	Ministry of Environment & Natural Resources
MOF	=	Ministry of Finance
MOLD	=	Ministry of Livestock Development
MOLG	=	Ministry of Local Government
MOTW	=	Ministry of Tourism & Wildlife
MOTC	=	Ministry of Transport & Communication
MORD	=	Ministry of Regional Development
MOWD	=	Ministry of Water Development
NES	=	National Environmental Secretariat
NWCPC	=	National Water Conservation & Pipeline Corporation
SOK	=	Survey of Kenya
KWS	=	Kenya Wildlife Service
NMC	=	Nakuru Municipal Council
NTC	=	Naivasha Town Council

ASTU	=	Anti-Stock Theft Unit
KYSTC	=	National Youth Service Training Center
GMB	=	Gilgil Military Barracks
KMB	=	Kenyatta Military Barracks
WWF	=	World Wide Fund for Nature
JICA	=	Japan International Cooperation Agency
OECF	=	Overseas Economic Cooperation Fund, Japan

I. INTRODUCTION

1.1 General Description

The Greater Nakuru Water Supply Project, Eastern Division contemplates to develop the surface water resources of the Malewa river basin by means of creating a reservoir by construction of a dam. For this purpose the hydrological investigation has been programmed to be carried out throughout the Phase 1 to Phase 3 Studies. The investigation comprised the low and flood flow analyses, sediment transports and river maintenance flow estimate.

The Phase 1 Study mainly concentrated on the low and flood analyses, estimate of sediment deposits in the proposed reservoir and the river maintenance flow. The field investigation carried out during a 2.5-month period from February to June, 1989.

During the Phase 2 Study, emphasis was placed on a simulation study of Lake Naivasha water balance. A simulation of Lake Nakuru water balance was also studied. The additional field investigation was executed during a 1.5-month period from October to November, 1989.

The Lake Nakuru water balance studies were reviewed during the Phase 3 Study based on the newly prepared topographic maps.

Findings of the low and flood analyses and sediment analyses are presented in this Annex D. The Lake Naivasha and Lake Nakuru water balance analyses are presented in the Annex G.

For performance of the hydrological study, Mr. Nyaoro, Hydrologist of MOWD provided great support and assistance to the Study Team.

1.2 Study Area

The hydrological investigation covered two lake drainage basin as follows:

(1) Lake Naivasha drainage basin

The Malewa river basin is the largest water source feeding Lake Naivasha, which is located in floor of the Rift Valley. The drainage area of Lake Naivasha covers a vast area of approximately 3,400 sq.km as shown in Fig.D.1.1 and mainly comprises three sub-basins as follows.

Sub-basins	Drainage Area(sq.km)
Malewa river basin	1,653
Gilgil river basin	511
Lake Naivasha and minor river basins	1,237
Total	3,401

The drainage area of Lake Naivasha receives fairly abundant rainfall annually. The rainfall distribution within the drainage area, however, shows large variation ; in the western slopes of the Abardare Range the average annual rainfall amounts to 1,000 to 1,200 mm, while that in Lake Naivasha is as small as 600 mm.

(a) The Malewa River basin

The Malewa River is named as the Wanjohi river in its upstream and takes its origin in the western slope of the unnamed mountain with its summit altitude El. 3,886 m in the Abardare Range. The Wanjohi River flows down in rapid in the western slopes and at the foot of the Abardare Range it changes its course towards the northwest. It joints the Malewa River in the vicinity of Ndiara. In reach between Ndiara and Ol Kalou, the Malewa River forms two large bends and sharply changes its direction towards the south in the vicinity of Ol Kalou. It then runs through Malewa Gorge with a steep and narrow cliff for about 10 km and joints the Turasha River at about 8 km west from Gilgil town. The proposed Malewa damsite is approximately eight km upstream from Gilgil town. The elevation at the confluence is approximately El. 1,960 m. The Malewa River finally debouches Lake Naivasha at about 7 km to the west from the Naivasha town.

The Turasha River is the largest tributary of the Malewa River and originates in the western slope of the Mount II Kinangop with its summit at El. 3,906 m in the Abardare Range and runs through the Kinangop Plateau towards the northwest until it joints the Kianjoga River at about 15 km northeast of Gilgil Town. The Turasha River swings sharply changing its flow direction towards the southwest and flows in rapid through steep and narrow Turasha Gorge for about 5 km.

(b) Gilgil River basin

The Gilgil River basin is the second largest river flowing into Lake Naivasha and bounds with the Malewa river basin on its eastern watershed. It takes its origin in the northern slope of a small hill with its summit altitude El.2,700 m in the Bahati Forest and flows down maintaining its flow direction almost towards the south till it reaches Lake Naivasha. It appears that the Gilgil River downstream from the Gilgil town runs dry during the dry season.

(c) Lake Naivasha and minor rivers

The Lake Naivasha is situated at the eastern edge of the Kenya Rift Valley and is the second largest fresh lake in Kenya, having a surface area of approximately 170 sq. km at El. 1,885 m.

The Malewa River is the largest river flowing 95% of inflow to Lake Naivasha. The second largest river is the Gilgil River. There are also a large number of another small tributaries flowing into Lake Naivasha. Among them, both the Karati and Marmonet rivers have relatively large catchment area but they supply with Lake Naivasha only seasonal flow. There is no river outgoing from the lake.

The general characteristics of the lake are summarized below.

	Descriptions	Unit	Values
(a)	Water level fluctuation : 1961-1984		
	- Maximum	El. m	1,886.9
	- Minimum	El. m	1,883.2
	- Average	El. m	1,885.2
	- Present (July, 1990)	El. m	1,884.6
(b)	Maximum water depth at average level		
	- Crescent Island Bay	m	13
	- Main lake	m	8
(c)	Lake surface area at average level	sq.km	170
(d)	Water volume at average level	10^6 cu.m	760
(e)	Average discharge		
	- Malewa River	cu.m/s	7.6
	- Gilgil River	cu.m	0.3
(f)	Average annual rainfall	mm	670
(g)	Average annual evaporation	mm	1,900

(2) Lake Nakuru drainage basin

The Lake Nakuru is located at the floor of Rift Valley and bounds with the southern boundary of Nakuru municipality. It has a surface area of approximately 43 sq. km at El. 1,760 m. The Lake Nakuru is surrounded by the Mau Escarpment in the west and Bahati Uplands in the east. Its drainage area covers an area of approximately 1,536 sq.km and mainly comprises the following six sub-basins. There is no river outgoing from the lake.

Sub-basins	Drainage Area (sq.km)
Enjoro river basin	273
Makalia river basin	331
Enderit river basin	523
Lamudiac river basis	131
Ngosor river basin	80
Lake Nakuru and minor river basins	198
Total	1,536

The Enjoro, Lamudiac, Makalia, and Nderit rivers are seasonable rivers and they originates from the Mau Escarpment into Lake Nakuru. The surface flow of these rivers is reduced as they pass through pumiceous and porous soils especially in the mouth of the Makalia and Nderit rivers. The Ngosor River and takes its origin in the Bahati Uplands to the Bahati plains but its flow disappears near Lake Nakuru.

The general characteristics of the lake are summarized below.

	Descriptions	Unit	Values
(a)	Water level fluctuation : 1959-1982		
	- Maximum	El. m	1,760.6
	- Minimum	El. m	1,756.3
	- Average	El. m	1,758.6
	- Present level (July, 1990)	El. m	1,758.5
(b)	Maximum water depth at average level	m	2.3
(c)	Lake surface area at average level	sq.km	43
(d)	Water volume at average level	10^6 cu.m	72
(e)	Average discharge		
	- Enjoro River	cu.m/s	0.8
	- Other rivers	cu.m	0.4
(f)	Average annual rainfall	mm/year	900
(g)	Average annual evaporation	mm/year	1,970

II. CLIMATE

2.1 General

The climate in the Study Area is largely influenced by movement of Inter Tropical Convergence Zone. Generally hot and dry climate prevails during the period from December to March, while rainy and relatively cold climate is predominant during the periods from April to June (major wet season) and from October to November (minor wet reason). Meteorological observation in the Study Area has been conducting in operation of the Kenya Meteorological Department. Some meteorological records such as rainfall and evaporation are collected by the provincial quarters of MOWD in Naivasha and Nakuru.

2.2 Existing Meteorological and Rain Gauging Stations

There are three meteorological stations and 11 rain gauging stations in the study area as listed below and shown in Fig. D.2.1.

Registered No.	Name of Stations
Meteorological stations	
9036261	Nakuru Meteorological Station
9036281	Naivasha Water Supply
9036135	Ol Joro Orok Agriculture Research Station
Rain gauging stations	
9036032	Bahati Forest Station
9036055	Ol Kalou railway station
9036029	Gilgil Kwetu farm
9036034	Gilgil Railway Station
9036025	N. Kinangop Forest Station
9036002	Naivasha District Office
9036152	S. Kinangop Njabini F. Tc.
9036179	Naivasha Korongo Farm
9036214	Longonot Farm B. Naivasha
9036065	Naivasha Nangagerri
9036285	Longonot Akira Ranch

2.3 Rainfall

The under-listed rainfall records were collected during the study period.

	Records	Stations/Gauges	Period of Data Collected
(1)	Daily rainfall	Bahati forest station	1950 - 1987
		Ol Kalou railway station	1950 - 1987
		Gilgil Kwetu farm	1929 - 1987
		Nakuru railway station	1956 - 1989
		Gilgil railway station	1950 - 1987
		N. Kinangop forest station	1957 - 1987
		Naivasha district office	1935 - 1987
		S. Kinangop Njabini F. Tc.	1950 - 1987
		Naivasha Korongo farm	1961 - 1985
		Longonot Farm B. Naivasha	1969 - 1976
		Naivasha Nangagerri	1936 - 1978
		Longonot Akira ranch	1967 - 1975
		Marula farm	1961 - 1989
(2)	Hourly rainfall	Nakuru meteorological station	1961/62/63/67 1968/77/85/86 1987
		Naivasha water supply station	1962 - 1980

The amount of annual rainfall tends to decrease with decreasing elevation: approximately 1,400 mm on top of Abardare Range and 600 mm in floor of the Rift Valley as shown in Fig.D.2.2. The monthly mean rainfalls in the South Kinangop, Naivasha District Office and Nakuru meteorological station are as listed below.

(Unit : mm)

Location	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
(1) South Kinangop (El. 2,591 m)													
	70	85	153	274	220	92	71	64	61	130	154	769	1,453
(2) Naivasha													
	24	39	59	123	94	41	34	54	44	47	69	39	667
(3) Nakuru Meteorological (El. 1,872 m)													
	31	35	55	123	109	71	76	106	75	85	84	45	895

Annual maximum one-day rainfall recorded at each rain gauging station are listed in Table D.2.1. The maximum one-day rainfall of 110 mm/day was recorded at the Geta farm rain gauging station in the Turasha river basin on April 11, 1985.

Automatic rainfall recorders have been operated in the Nakuru meteorological station and the Naivasha water supply station. Hourly hyetograph of storms exceeding 20 mm/day recorded at both stations have been collected.

2.4 Evaporation

Evaporation records have been measured at the under-listed stations. Monthly mean evaporation records were collected for the purpose of Lake Naivasha and Lake Nakuru water balance studies.

Stations/Gauges	Recording Period
Nakuru meteorological station	1959 - 1989
Ol Joro Orok agricultural research station	1963 - 1980
Naivasha meteorological station	1961 - 1989

The annual mean evaporation in the Study Area is approximately 1,700 mm/year. Monthly mean evaporation recorded at three meteorological stations are summarized below.

(Unit : mm)

Location	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
(1) Nakuru : 1967 - 1987													
	184	181	191	133	130	121	120	128	136	130	116	155	1,725
(2) Naivasha : 1966 - 1988													
	191	183	199	148	139	130	130	146	160	180	132	155	1,892
(3) Ol Joro Orok : 1963 - 1988													
	167	160	190	149	120	107	100	100	123	131	115	144	1,605

2.5 Dew Point Temperature

Dew point temperature records are available at the under-listed stations. Daily records were collected to facilitate the estimate of probable maximum precipitation (PMP). The monthly maximum dew point temperature are presented in Table D.2.2. and also plotted in Figs.D.2.3 and D.2.4. These records were adopted for estimate of PMP of the Malewa river drainage basin.

Stations	Recording Period
Ol Joro Orok meteorological station	1961 - 1985
Naivasha meteorological station	1966 - 1987

2.6 Air Temperature and Relative Humidity

The other climatological features are presented hereunder.

Description	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
(1) Nakuru Climatological Station (El. 1,872 m)													
Air temperature (C°)													
Mean max	27.3	27.3	27.2	25.0	23.6	22.8	22.4	23.0	24.5	25.5	24.5	25.7	24.9
Mean min	7.9	8.1	9.4	11.0	10.6	9.2	8.6	8.6	7.9	8.9	9.1	8.3	9.0
Relative humidity (%)													
0600 GMT	65	65	70	78	80	81	79	77	74	71	74	70	74
1200 GMT	32	33	38	53	55	54	53	51	46	44	50	43	46
(2) South Kinangop Station (El. 2,591 m)													
Air temperature (C°)													
Mean max	19.4	20.1	19.8	18.2	17.5	16.6	15.5	15.9	16.8	17.4	17.5	18.3	17.7
Mean min	3.6	3.7	5.6	7.8	6.9	5.2	5.1	4.8	4.6	6.2	6.8	4.7	5.4
Relative humidity (%)													
0600 GMT	80	77	80	85	87	86	89	88	84	81	83	84	84
1200 GMT	67	59	68	75	77	78	81	81	76	70	76	76	74

III. RUNOFFS OF MALEWA AND TURASHA RIVERS

3.1 Existing Stream Gauging Stations

In the Malewa river basin, there are three key stream gauge stations, which have been operated and maintained by the MOWD for more than three decades. Their locations are as shown in Fig.D.3.1. The availability of the stream gauging records are shown in Figs. D.3.2 and D.3.3. The Study Team, in a joint effort with the Surface Water Division, MOWD, made an examination of the catchment areas of the three gauging stations based on the topographic maps on a scale of 1 to 50,000. As the result, the catchment areas have been authorized to be revised as tabulated below as well as recording periods.

Stream Gauge Station	River	Catchment Area	Recording Period
2GB1	Malewa	1,551	1931-1985
2GB5	Malewa	776	1959-1987
2GC4	Turasha	724	1951-1988

2GC4 is located close to the Turasha damsite, only 2 km downstream from the proposed Turasha damsite, while 2GB1 is situated at about 7 km downstream from the confluence of the Malewa and Turasha rivers. 2GB5 is located at about 0.5 km upstream from the confluence of the Malewa and Turasha rivers.

At both 2GB1 and 2GC4, stream flows have been recorded by means of a fixed weir and an automatic water level recorder, while at 2GB5 river stages have been observed intermittently, once every 4 - 5 days, by means of staff gauges and water level there is subjected by backwater from the confluence of the Turasha River particularly during the flood season. The stream gauging records at 2GB5 are therefore judged far from reliable and are not adequate to apply the present water resources development study.

3.2 Stage-Discharge Curves

Stage-discharge curves at 2GC4 and 2GB1 constructed by MOWD are as shown in Figs. D.3.4 and D.3.5 respectively.

The Study Team examined the existing stage-discharge curves by means of hydraulic calculation and direct stream flow measurement by a current meter. For examination by the hydraulic calculations, the Study Team has surveyed cross section of weirs and rivers and made hydraulic calculations under the condition that critical flow occurs on the fixed weir. The results of the direct flow measurement by a current meter are shown in Table D.3.1 and plotted in Figs D.3.4 and D.3.5. Through these examinations the existing stage - discharge curves are verified to be satisfactorily accurate.

3.3 Runoffs at Proposed Damsite

It is necessary to estimate runoffs at the proposed damsites in order to analyze yield from the proposed reservoirs on Malewa and Turasha rivers. 2GC4 is located close to the Turasha damsite, only 2 km downstream and accordingly there is no significant difference in catchment area between the stream gauge station and the damsite. Moreover the upper Malewa river basin is deemed lying in the same hydrological region with the Turasha river basin, extending on the western slopes of the Abardare Range and receiving the same amount of rainfall annually. It is, therefore, concluded that the runoffs at both damsites could be extrapolated from those recorded at the stream gauge 2GC4.

The missing records at 2GC4 could be supplemented by the recorded runoffs at 2GB1 during the same period by means of a runoff relationship between the two stations. High correlation coefficient of 0.893 has been found between the recorded runoffs at 2GB1 and the recorded runoffs at 2GC4. The runoff correlation is shown in Fig. D.3.6 and is expressed by the following equation.

$$\text{Log } Qc = 1.007 . \text{Log } Qb - 0.287$$

where,

Log Qb : Logarithm of 5-day runoffs at 2GB1

Log Qc : Logarithm of 5-day runoffs at 2GC4

The water balance calculation has been worked out at the intervals of 5 days. Accordingly the daily runoffs at 2GC4 and 2GB1 were initially converted into the 5-day runoffs as shown in Tables D.3.2 to D.3.3 respectively.

The runoffs at both the Turasha and Malewa damsites were estimated from those recorded at 2GC4 in proportion of catchment areas. The estimated 5-day runoffs at the Malewa and Turasha damsites are presented in Tables D.3.4 and D.3.5 respectively.

IV. FLOOD OF MALEWA RIVER

4.1 General

A flood analysis was conducted in order to provide design floods for designs of dam and its appartment structures. Safety of the proposed Malewa dam should be checked against probable maximum flood (PMF), which is generated by PMP.

PMP is defined as the theoretically greatest depth of precipitation for a given duration that is particularly possible over a particular drainage basin. PMP is usually estimated from recorded storms. PMF is defined as the largest flood that can reasonably be expected to occur under a given PMP. The flood analysis consisted of the following two studies:

- Estimate of probable floods based on frequency analysis of recorded floods.

- Estimate of PMF based on PMP.

4.2 Available Flood Data

Flood hydrographs of the Malewa River are available at the stream gauging station 2GC4 for a 37-year period from 1954 to 1983, which were recorded by the automatic water level recorder. The recorded annual maximum peak discharges are as tabulated in Table D.4.1. The recorded maximum discharge was 292 cu.m/sec in November 18, 1961. The hydrographs with peak discharge more than 100 cu.m/sec are as shown in Figs. D.4.1 to D.4.5.

4.3 Probable Floods

The probable floods necessary for design of the spillway and diversion works during dam construction have been estimated by meas of statistical treatment of the recorded annual maximum instantaneous peak discharge at 2GC4.

The Pearson III distribution fits well to the recorded floods as shown in Fig. D.4.6. The estimated probable floods at 2GC4 are as summarized below.

Return Period (years)	Instantaneous Peak Discharge (cu.m/sec)
5	120
20	270
100	520
200	666
1,000	1,100

The design floods for the river diversion works and spillway have been estimated for the preliminary design of the Malewa dam. The flood at the Malewa damsite has been extrapolated in due consideration of difference in the catchment areas.

Design Flood	Return Period	Malewa Damsite
River diversion works	20 years	240 cu.m/sec
Spillway	1,000 years	960 cu.m/sec

4.4 Probable Maximum Precipitation

4.4.1 Recorded Storms

(1) Mass curve of storm rainfall

Hourly rainfall records are available from Nakuru meteorological station for 27-year period since 1961 and at the Naivasha water supply station for 19-year period since 1962. Mass curves of storm rainfalls more than 20 mm are prepared as shown in Fig. D.4.7.

(2) Maximum recorded precipitation over the basin

Judging from the hourly rainfall records, duration of storms is estimated to be less than 14 hours in the Malewa river basin. It is clear that the rainfall tends to decrease with decreasing elevation. Therefore the maximum precipitation over the basin has been estimated by averaging the point rainfall records at the seven key rain gauge stations. The

maximum rainfall over the basin was estimated at 31 mm/day based on the rainfall records during the period from 1940 to 1985.

4.4.2 Cyclonic-adjustment Method

PMP in the Malewa river basin is derived to by means of the cyclonic-adjustment method expressed by the following equation:

$$PMP = Rmax * K$$
$$K = (W_t)_e / (W_{to})_{eo}$$

where,
- PMP : Probable maximum basin precipitation, mm/day
- Rmax : Maximum recorded basin precipitation, mm/day
- K : Storm maximization factor
- $(W_t)_e$: Precipitable water from ground at altitude of eø to 200 mb at the recorded maximum dew point temperature, t , in mm
- $(W_{to})_{eo}$: Precipitable water from ground at altitude eo to 200 mb at dew point temperature of to, which was recorded on the day of the recorded storm occurred in mm

4.4.3 Probable Maximum Precipitation of Malewa River Basin

(1) Moisture adjustment

The maximum instantaneous peak discharge of 292 cu.m/s was recorded at 2GC4 on November 18, 1961. The maximum one-day basin precipitation occurred on the same day and its amount reached 31 mm/day. During the storm, the 12-hour persisting dew point temperature was recorded at 11.2 °C at the Ol Joro Orok meteorological station at altitude of El. 2,380m. On the other hand, the possible maximum dew point temperature was recorded at 25.1 °C in October at the same station. Precipitable water at the dew point temperature 11.2 °C at altitude of El. 2,380 m , $(W_{11.2})_{2380}$, is 6.4 mm and that at the dew point temperature of 25.1 °C at the same altitude, $(W_{25.1})_{2380}$, is 36.1 mm, respectively.

(2) Altitude adjustment

Ol Joro Orok is situated at El. 2,380 m and the average altitude of the Turasha drainage area is El. 2,600 m. Precipitable water at the dew point temperature 25.1 °C at altitude of El. 2,600 m , $(W_{25.1})_{2600}$, is 36.1 mm.

(3) Storm maximization factor

The storm maximization factor, K , was calculated bbased on the above-mentioned moisture maximization and altitude adjustment as shown below.

$$K = \frac{(W_{25.1})_{2380} * (W_{25.1})_{2600}}{(W_{11.2})_{2380} * (W_{25.1})_{2380}} = 36.1 / 6.35 = 5.68$$

(4) Probable Maximum Precipitation

As the result, the PMP of the Malewa river basin was estimated at 176 mm/day by multiplying the maximum recorded one-day basin precipitation, 31 mm/day , by the storm maximization factor of 5.68.

4.5 Probable Maximum Flood

4.5.1 Dimensionless Flood Hydrograph

Dimensionless direct runoff hydrographs are derived by subtracting base flow from the hydrograph of the following typical floods in order to establish unit hydrograph.

Flood No.	Date of floods	Peak discharge (cu.m/sec)	Tcv (hrs)	Base flow (cu.m / sec)
1	Nov. 18-19 '63	291	14	30
2	Apr. 26-27 '68	279	14	70
3	May 27 '63	237	23	26
4	Apr. 23-25 '68	259	15	37
5	Apr. 29-May 1 '77	192	15	15
6	May 9 '62	188	13	46
7	Nov.20 '61	101	14	36

In the above table, Tcv is the time from the beginning of increasing runoff to the center of the flood volume. The dimensionless hydrographs are shown in Fig. D.4.8, in which q denotes discharge in cu.m/sec, T duration hours of time, and Vol. volume of the accumulated direct flow discharge in thousand cu.m.

Fig. D.4.8 reveals that all selected dimensionless flood hydrographs have similar shapes.

4.5.2 Effective Rainfall

Effective rainfall is defined as a part of rainfall which is discharged as flood or intermediate flow through river basins. Nine floods and the storms have been selected to assess flood runoff coefficient. Runoff coefficient of each recorded flood is estimated against the total daily basin precipitation as plotted in Fig. D.4.9. Judging from the result, the runoff coefficient of PMP is determined at 0.65.

Effective rainfall, Re , is calculated at 114 mm by multiplying, 176 mm by the runoff coefficient of 0.65.

4.5.3 Probable Maximum Flood at Proposed Malewa Damsite

PMP was arranged to a hourly hyetograph as shown in Fig. D.4.10. The Dimensionless unit hydrograph is shown in Fig.D.4.11.

PMF at 2GC4 was initially derived from the hyetograph and the unit hydrograph, assuming Tcv at 11 hours and the base flow at 70 cu.m/sec. PMF at the proposed Malewa damsite was estimated by multiplying the ratio of catchment area of the proposed Malewa damsite to that of 2GC4 as shown in Fig. D.4.12. Peak flow is 1,753 cu.m/sec. The magnitude of PMF was evaluated by the Creager's equation.

$$q = 46 * C * (0.386A)^{(m - 1)} * 0.02832 * 0.386$$
$$m = 0.894 * (0.386 A)^{- 0.048}$$

where, q = Specific discharge in cu.m /sec / sq.km (= 2.41 cu.m/s/sq.km)
C = Coefficient depending upon characteristic of the basin
A = Drainage area in sq.km (= 728 sq.km)

The peak discharge of the PMF corresponding to C = 29. Fig. D.4.13 shows estimate of peak discharge of PMF of the Thika river basin near the project area in relation to the catchment area. It is judged that the PMF of the proposed Malewa damsite is quite similar to the regional envelop of estimate of PMF.

V. SEDIMENT

5.1 Available Data

The actual suspended loads measurement records are made available from MOWD. The MOWD's records are more than 250 in measurement numbers as shown in Table D.5.1 and had been observed at the stream gauge station 2GB1 during the period from 1948 to 1957.

5.2 Suspended Loads Measurement

The Study Team has conducted suspended loads measurements by using a suspended loads sampler also at 2GB1 throughout the Phase 1 field investigation period in order to supplement the existing data. The measurement results obtained so far are also presented in Fig. D.5.1

5.3 Suspended Load Transport by Malewa River

Based on the MOWD's records and supplemental data, a relationship between discharge and suspended loads are preliminarily constructed based on the existing data and additional measurements results as shown in Fig. D.5.1. The supplemental data shows the same tendency as the MOWD's records as they are plotted within the range of the MOWD's records. For the conservative estimate of the suspended loads transport, an enveloping curve is preliminarily constructed as shown in Fig. D.5.1 and is expressed by the following equation.

$$S = 6.97.Q^{1.77}$$

where,

S : suspended loads, ton/day,

Q : discharge, cu.m/sec.

The annual mean suspended load transport by the Malewa River is preliminarily estimated at 2GB1 on the basis of the above enveloping curve and flow duration curve. The estimated average annual suspended loads amount to about 81,800 ton/year, corresponding to 0.04 mm/sq.km/year, assuming bulk density of suspended load at 1.5 ton/cu.m.

5.4 Sediment Deposit in Reservoir

The slopes in the proposed reservoir area are highly vulnerable to considerable erosion, particularly below cultivated lands and barren lands. It is foreseeable that rapid population increase in the region would inevitably enhance such human activities as deforestation, intensive land uses for agriculture and livestock grazing, land development for housings etc., resulting in accelerating erosion a rate of erosion. In due consideration of of these facts, MOWD and the Study Team have mutually accepted to apply the following design criteria for design of the reservoir.

- Sediment yield from the catchment area : 0.5 mm/sq.km/year
- Duration of sediment deposit : 50 years
- Deposit form in the reservoir : Horizontal

According to MOWD, the above sediment yield is widely adopted to the catchment areas similar to the Malewa river basin in Kenya.

The quantity of the sediment deposit is accordingly calculated at 15.9 million cu.m for the Malewa reservoir and 18.0 million cu.m for the Turasha reservoir.

VI. INSTALLAITON OF AUTOMATIC WATER LEVEL RECORDERS

6.1 Need for New Stream Gauge Station

(1) Malewa River

2GB5 on the Malewa River has been influenced by backwater from the confluence of the Turasha River particularly during the flood season. Therefore it is required to establish a new gauge in place of 2GB5. Moreover it is indispensable to set a stream gauging station upstream of the proposed Malewa reservoir for monitoring inflow into the reservoir in future.

(2) Lake Nakuru

The water level of Lake Nakuru was monitored by MOWD by means of staff gauges at the gauging station 2FC4, near the mouth of Njoro River, since 1951 up to 1984. It has been out of work, since the lake level falls below the zero point of the gauges since 1984.

There are five rivers feeding Lake Nakuru ; namely Njoro, Ngosor, Makalia, Enderit, and Lamudiac rivers. Among these rivers, the stream gauging has been carrying out on the Njoro and Ngosor Rivers. The Makalia and Enderit rivers have no stream gauging stations, although their drainage areas are more than 1.5 times as large as those of the Njoro and Ngosor rivers. Therefore it is important to establish new stream flow gauging stations on the Makalia and Enderit Rivers.

(3) Lake Naivasha

The water level of Lake Naivasha had been monitored by MOWD at 2GD1 since 1933 up to 1985 by means of staff gauges. The staff gauges are in need of relocation, because of the lake level sometimes falls below zero point of gauge.

6.2 Installation of New Gauges

Three automatic water level recorders has been installed at the following locations for the future monitoring, of which locations are plotted in Fig. D.6.1.

(a) Upstream of the Malewa River

(b) The Makalia River feeding Lake Nakuru

(c) The Enderit River feeding Lake Nakuru

The automatic water level recorders were furnished by JICA and transferred to NWCPC at the beginning of July, 1990. An automatic water level recorder station is composed of a stilling well with a ladder, a desilting pipe, perforated pipes, and a recorder hut installing an automatic water level recorder. The construction was entrusted to the local contractor and was completed in September, 1990.

The existing staff gauges was reinstalled at 2GD1 by the same local contractor in July, 1990.

TABLES

Table D.2.1 Maximum One-day Rainfall Records

(Unit : mm/day)

R.G.No. 9036-																
Year	179	214	65	81	162	281	262	253	2	73	241	289	25	152	290	301
1920													40.6			
1921													34.5			
1922													47.5			
1923													77.0			
1924													28.4			
1925													30.7			
1926													51.1			
1927																
1928																
1929													51.8			
1930													43.4			
1931													45.7			
1932													42.4			
1933													33.0			
1934			60.2										38.6			
1935			38.6						30.5				45.7			
1936			19.1	25.4					74.9				50.8			
1937			38.6	46.7					39.9				37.3			
1938			27.7	35.6					23.6				43.2			
1939			49.3	69.9					23.4				27.9			
1940			37.3	26.9					61.2				39.6			
1941			24.1	46.2					33.5				35.6			
1942			50.5	37.1					44.7				46.5			
1943			43.2	36.3					33.8				42.9			
1944			39.9	50.3					31.8				47.5			
1945			45.5	30.2					33.3				36.1			
1946			42.7	33.0					33.5				44.2			
1947			61.0	44.5					45.0				50.8			
1948		69.9	41.1	41.1	50.8				34.5				**81.0**			
1949	34.3	40.6	27.2	37.6	25.4				45.5				22.4			
1950	56.9	38.1	28.2	39.4	39.4				53.3				22.6	24.9		
1951	33.3	27.2	56.1	49.5	**104.9**				27.9				39.1	34.3		
1952	27.9	33.0	54.4	38.1	54.6				53.3				56.6	43.4		
1953	45.2	35.1	29.2	32.3	40.4				31.5				49.0	21.3		
1954	32.3	38.1	48.5	40.6	54.6				76.2				39.9	25.7		
1955	41.4	42.4	29.0	43.7	38.1				75.9				36.8	28.7		
1956			33.5	61.5	38.9				49.5				29.2	29.2		
1957			44.7	61.5	43.2				**76.2**	33.0			31.8	66.5		
1958			37.3	49.5					20.8	55.9			35.3	53.3		
1959	50.5	76.2		49.5					21.6	45.0			25.4	53.6		
1960	32.2	33.0		27.2					40.6	35.1			23.9	44.2		
1961	50.8		56.4	35.6	50.8				21.6	55.4			39.4	46.2		
1962	44.7	63.5	45.5	53.8	42.4			60.2	22.4	47.5			48.0	45.0		
1963	55.4	**101.6**	56.4	61.5	81.3			45.7	50.0	**70.1**			50.8	47.2		
1964	40.9	38.6	33.8	41.1	56.6		34.0	56.9	27.2	39.6			53.3			
1965	27.9	38.1	45.0	34.3			31.7	61.0	48.0	36.6			34.3			
1966	32.3	31.7	37.1	30.5			37.6	37.6	33.3	45.0			39.4	57.1		
1967	45.7	33.0	42.4	59.9	72.5	33.0	41.9	49.3	26.2	45.2			43.2	39.0		
1968	53.3	48.0	41.4	38.1	77.5	45.2	38.9	94.0	47.0	35.6			43.2	61.2		
1969	52.1	57.7	48.3	33.0	64.3	39.6			25.4	31.1			45.1	**71.4**		
1970	55.9	55.3	41.4	50.8	69.8	51.3			44.7	61.5			50.0	52.5		
1971	55.9	40.0	31.3	21.5	50.9			49.0	45.5	39.2		40.4	30.2	29.6	**69.2**	22.1
1972	53.3	47.3	45.0	81.3	57.8	60.0		66.0	39.9	64.7		30.3	33.3	48.0	31.7	**73.7**
1973	27.9	50.0	45.1	25.2	38.6	33.3		62.0	70.7	38.5	29.3	20.6	34.4	28.0	34.6	20.6
1974	32.5	35.6	**65.1**	28.5	59.0	39.0		43.0	55.8	33.8	31.1	25.0	27.9	31.6	15.2	27.7
1975	37.6	29.5	53.2	32.3	39.0	45.0		28.1	41.9	51.4	30.1	40.0	35.0	43.0	32.0	50.0
1976	33.0	25.7	50.4	28.0	51.7	22.2		39.3	39.5	24.0	36.5	29.1	78.0	35.5	30.0	41.4
1977	**61.0**		54.2	46.9	72.0	39.8		**108.0**	52.0	25.5	57.1	80.6	70.8	30.7	40.0	55.1
1978	37.3			44.2	41.3	51.9		82.0	28.2	44.0	40.5	30.0	35.0	30.0	25.5	57.2
1979	30.0			36.6	62.6	**61.2**			25.6	52.5	46.5	37.0	30.0	45.5	20.5	
1980	52.3			26.5	47.3	44.2			29.3	49.4	50.7	49.3	62.5	61.0	30.0	34.2
1981	43.2			30.1	53.7	42.6		64.8	38.5	40.3	44.5	47.5	55.4	44.7	43.0	48.3
1982	38.1			51.0	82.8			90.4	42.3	36.0	29.2	29.1	47.0	37.2	36.0	
1983				41.1	59.0				33.8	49.0	50.5	36.5	60.0	39.6		
1984	21.3			29.2	44.0				55.3	41.3	37.5	25.2	34.5	46.5		
1985	35.1			88.0	50.0			61.2	43.6	60.0	**110.0**	15.0	40.0	47.2		
1986								55.6	47.4		54.4	21.5				
1987								50.3	30.5		35.2	26.0				
Max.	**61.0**		**65.1**		**104.9**		**41.9**		**76.2**			**80.6**		**71.4**	**69.2**	
		101.6		**88.0**		**61.2**		**108.0**		**70.1**	**110.0**		**81.0**			**73.7**

Table D.2.2 Maximum Monthly Dew Point Temperature

Station name = Nakuru (Unit : oC)

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Max
1974	12.4	**16.4**	16.1	**16.4**	16.3	14.5	14.8	14.9	-	14.9	15.0	14.6	16.4
1975	13.7	15.0	15.7	15.4	15.3	14.8	**16.1**	-	14.5	14.8	15.1	14.2	16.1
1976	14.7	14.1	14.3	15.7	15.3	13.7	15.2	13.9	13.9	14.3	**16.5**	14.3	16.5
1977	14.8	16.0	15.2	-	-	14.8	14.6	15.5	14.8	**18.4**	16.3	15.2	18.4
1978	14.5	16.3	16.6	-	-	**17.6**	15.5	14.5	16.4	16.0	16.4	15.7	17.6
1979	**17.4**	16.6	16.1	16.0	16.7	14.6	15.0	13.8	13.6	13.8	16.0	14.4	17.4
1980	15.1	14.8	14.6	16.0	-	15.8	13.8	14.9	13.4	14.8	**16.3**	14.8	16.3
1981	11.6	16.5	16.3	**16.7**	-	15.2	15.5	15.6	15.0	14.4	14.7	15.4	16.7
1982	14.6	14.4	14.7	16.0	**17.1**	15.1	13.5	14.1	15.9	15.4	-	-	17.1
1983	13.6	15.5	14.6	15.9	**16.8**	14.7	14.8	15.6	16.1	16.0	14.8	14.8	16.8
1984	11.7	12.3	11.1	14.9	14.3	13.5	14.2	14.0	13.6	15.4	**15.8**	14.1	15.8
1985	10.6	10.8	15.6	15.6	**15.8**	14.7	15.1	14.6	13.4	14.4	14.8	15.2	15.8
Max.	17.4	16.6	16.6	16.7	17.1	17.6	16.1	15.6	16.4	18.4	16.5	15.7	18.4

Station name = Ol Joro Orok (Unit : oC)

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Max
1963	11.8	16.1	9.4	12.8	-	12.8	10.6	13.9	**18.3**	9.4	**18.3**	17.2	18.3
1964	-	-	13.3	-	15.0	12.2	12.2	**15.6**	12.2	13.9	11.1	12.2	15.6
1965	-	-	-	-	-	-	-	-	-	-	-	-	0.0
1966	11.8	14.5	10.6	13.9	13.5	12.5	13.2	13.0	**16.5**	11.8	12.4	12.9	16.5
1967	12.3	15.3	10.3	12.8	13.2	12.3	11.8	**16.8**	11.8	14.1	13.2	11.2	16.8
1968	9.1	-	-	-	-	-	-	-	-	**25.1**	22.1	**23.9**	25.1
1969	-	-	14.5	13.3	-	12.5	**15.0**	12.4	13.5	13.5	12.8	13.8	15.0
1970	13.4	11.6	12.8	13.2	13.4	-	**14.3**	14.3	13.0	12.11	13.2	11.1	14.3
1971	11.6	12.7	12.3	12.9	**13.4**	12.8	12.8	12.2	11.6	11.9	11.9	12.0	13.4
1972	11.8	13.2	19.1	23.0	14.5	13.6	13.9	13.3	11.5	23.0	19.7	12.0	23.0
1973	**22.8**	16.3	15.7	20.4	21.0	22.5	19.4	14.4	14.4	19.0	13.0	13.4	22.8
1974	11.9	11.4	12.8	12.4	13.7	13.4	14.5	15.6	-	19.1	**19.4**	10.5	19.4
1975	21.4	**23.0**	22.6	16.5	13.8	15.4	12.7	13.4	12.5	12.9	12.5	13.2	23.0
1976	19.2	21.6	**22.9**	22.1	13.4	21.6	17.5	19.8	21.0	16.7	12.5	12.9	22.9
1977	11.5	12.9	17.6	14.4	18.6	**19.6**	12.9	12.4	13.0	13.6	13.8	12.7	19.6
1978	14.1	13.8	**14.2**	13.8	13.8	13.3	13.0	13.8	13.5	13.2	-	-	14.2
1979	13.2	13.8	14.6	13.8	13.9	-	13.5	13.9	12.8	14.0	6.5	**14.9**	14.9
Max.	22.8	23.0	22.9	23.0	21.0	22.5	19.4	19.8	21.0	25.1	22.1	23.9	25.1

Table D.3.1 Direct Stream Flow Measurement Result at 2GC4

Recorded date in 1989	Gage height measured m	Gage height measured f t	Runoff measured cusec
Apr. 20	0.53	1.74	99.7
Apr. 22	0.22	0.72	16.2
Apr. 30	0.51	1.67	84.1
May. 7	0.30	0.98	36.1
May. 20	0.38	1.25	56.8
Jun. 7	0.38	1.25	40.3
Jun. 8	0.52	1.71	95.6
Jun. 9	0.52	1.71	98.2
Jun. 10	0.40	1.31	56.8

Table D.3.2 5-Day Runoff at 2GB1 (1/6) Unit : m3/s

Month	Date	1931	1932	1933	1934	1935	1936	1937	1938	1939
JAN	1-5	-	1.33	1.35	1.42	-	2.57	1.29	1.40	1.26
JAN	6-10	-	1.08	2.09	0.92	-	3.02	1.28	1.13	1.51
JAN	11-15	-	1.09	5.22	0.68	-	1.96	1.01	1.75	1.28
JAN	16-20	-	1.24	4.41	0.59	-	1.40	0.89	2.22	1.02
JAN	21-25	-	1.45	2.83	0.59	-	1.98	0.90	2.59	0.98
JAN	26-31	-	1.27	1.75	0.59	-	2.25	0.86	1.44	0.93
FEB	1-5	-	1.26	1.67	0.59	-	1.76	1.06	1.21	1.00
FEB	6-10	-	1.11	1.52	0.59	-	1.39	0.92	1.20	0.94
FEB	11-15	-	1.32	1.47	0.59	-	2.45	0.81	1.25	0.94
FEB	16-20	-	1.16	1.42	0.59	-	3.71	0.73	1.25	0.90
FEB	21-25	-	0.98	1.13	0.59	-	16.40	0.71	1.21	0.83
FEB	26-28	-	0.98	1.09	0.59	-	14.12	0.79	1.18	0.82
MAR	6-10	-	1.02	1.08	0.59	-	5.14	0.86	1.15	0.94
MAR	5-10	-	1.73	0.95	0.59	-	7.19	0.73	1.12	0.91
MAR	11-15	-	2.23	0.91	0.59	-	15.85	0.90	1.35	0.83
MAR	16-20	-	1.79	0.93	0.59	-	7.38	1.15	1.07	0.73
MAR	21-25	-	2.34	1.06	0.59	0.91	4.15	0.71	1.36	0.85
MAR	26-31	-	1.47	2.26	0.47	0.92	4.60	0.68	1.68	0.77
APR	1-5	-	2.48	0.94	0.33	0.96	4.03	2.71	1.32	1.04
APR	6-10	-	2.01	1.07	0.39	1.01	-	5.40	1.33	1.19
APR	11-15	-	1.39	0.95	0.39	2.12	-	8.31	1.37	2.21
APR	16-20	-	1.27	0.57	0.39	1.78	17.67	9.24	1.24	3.34
APR	21-25	-	3.67	0.34	-	1.06	11.08	-	1.35	1.83
APR	26-30	-	10.11	-	-	1.02	7.68	12.81	1.20	1.31
MAY	6-10	-	6.10	-	1.68	1.46	14.77	11.53	1.42	1.32
MAY	5-10	-	7.75	-	1.85	1.67	7.97	5.90	1.69	1.00
MAY	11-15	-	3.46	-	2.11	2.83	11.65	12.59	2.48	0.95
MAY	16-20	-	3.54	-	2.11	3.46	13.97	-	1.70	1.09
MAY	21-25	-	8.78	-	2.01	2.56	9.15	16.33	1.47	1.38
MAY	26-31	-	7.65	-	1.69	1.61	5.55	8.02	1.17	0.84
JUN	1-5	-	5.48	-	1.62	1.34	4.06	10.73	1.64	0.95
JUN	6-10	-	4.21	-	1.27	2.92	2.93	15.91	1.33	1.24
JUN	11-15	-	3.66	-	5.36	2.88	2.49	-	1.77	1.26
JUN	16-20	-	4.02	-	-	7.13	2.48	-	1.22	1.02
JUN	21-25	2.80	4.36	-	-	6.57	2.58	-	1.32	0.91
JUN	26-30	2.48	3.06	-	-	7.45	4.70	15.54	1.37	1.00
JUL	1-5	2.12	3.93	-	-	6.87	8.30	14.20	1.29	1.22
JUL	6-10	2.27	7.12	-	-	5.44	5.13	14.47	1.44	1.33
JUL	11-15	2.79	7.36	-	-	4.43	3.11	8.53	2.16	2.09
JUL	16-20	3.12	8.93	-	-	6.57	2.25	16.82	3.66	1.75
JUL	21-25	2.39	5.56	-	-	5.03	1.96	52.86	3.53	2.42
JUL	26-31	2.35	5.75	-	-	3.51	1.95	31.69	3.94	5.06
AUG	1-5	2.39	6.00	-	-	3.47	5.77	29.31	5.75	3.83
AUG	6-10	3.58	5.41	-	-	3.31	12.84	45.94	3.42	2.36
AUG	11-15	2.70	4.13	5.91	9.11	2.79	11.00	36.65	3.80	2.01
AUG	16-20	3.17	4.09	5.98	13.91	5.26	5.01	15.00	6.72	2.88
AUG	21-25	3.91	2.80	6.82	-	3.65	9.42	10.45	5.74	5.44
AUG	26-31	11.41	7.80	7.61	-	4.57	8.46	10.10	7.31	5.63
SEP	1-5	10.77	16.30	-	-	7.79	7.31	6.97	11.85	3.33
SEP	6-10	7.60	14.35	22.78	-	11.51	5.94	4.53	6.70	2.46
SEP	11-15	4.15	12.06	25.07	-	9.94	5.67	3.57	4.92	1.80
SEP	16-20	3.92	11.99	17.22	3.15	6.95	4.96	3.10	3.22	3.02
SEP	21-25	4.22	10.70	8.49	2.02	4.62	3.53	2.37	4.32	2.31
SEP	26-30	4.22	-	6.01	-	3.38	3.03	2.34	3.71	1.65
OCT	1-5	5.21	15.00	3.42	1.76	3.46	6.02	3.81	3.59	1.25
OCT	6-10	4.09	5.90	3.12	1.77	2.64	5.61	5.02	3.92	1.48
OCT	11-15	3.53	5.63	3.30	1.81	2.86	3.21	3.07	5.34	1.21
OCT	16-20	2.84	7.26	4.70	1.83	4.64	2.55	3.57	3.76	1.12
OCT	21-25	2.74	9.24	8.44	1.93	5.14	2.61	5.07	2.47	1.01
OCT	26-31	4.16	6.11	6.03	2.84	11.14	2.00	3.50	2.76	1.05
NOV	1-5	4.22	3.97	4.46	3.08	5.45	2.50	3.13	5.31	1.11
NOV	6-10	4.13	4.27	4.72	4.32	3.72	2.27	3.64	3.96	1.29
NOV	11-15	3.92	3.53	2.87	5.63	2.82	2.80	4.13	2.58	1.55
NOV	16-20	3.74	2.89	3.35	-	2.25	2.43	2.33	1.99	2.23
NOV	21-25	3.66	2.99	2.64	-	2.36	1.80	8.33	2.51	1.42
NOV	26-30	3.65	2.79	2.59	-	2.67	2.14	14.34	2.47	0.97
DEC	1-5	2.77	3.29	2.11	-	2.49	1.75	13.77	1.96	0.95
DEC	6-10	5.29	2.52	3.16	-	2.15	1.52	13.64	2.87	0.92
DEC	11-15	4.91	2.21	2.13	-	1.75	1.38	4.92	1.88	0.97
DEC	16-20	2.62	2.57	3.62	-	1.58	1.71	3.17	1.48	0.87
DEC	21-25	1.79	1.98	3.34	-	1.49	1.66	2.59	1.78	0.87
DEC	26-31	1.44	1.59	2.13	-	3.23	1.61	2.00	2.04	0.85
					-					
Mean		-	4.59	-	-	3.79	-	-	2.61	1.57

Table D.3.2 5-Day Runoff at 2GB1 (2/6) Unit : m3/s

Month	Date	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949
JAN	1-5	0.74	0.91	1.53	0.98	0.70	1.01	1.20	1.02	1.22	1.11
JAN	6-10	0.82	0.89	1.31	0.93	0.67	0.83	1.11	0.91	1.13	0.94
JAN	11-15	2.45	0.91	1.49	0.87	0.52	0.78	1.08	1.29	1.10	0.85
JAN	16-20	1.33	0.80	1.05	0.82	0.58	0.81	1.08	1.67	1.07	0.82
JAN	21-25	1.03	0.81	0.94	0.73	0.55	0.74	0.97	1.23	1.06	0.85
JAN	26-31	1.08	0.88	0.86	0.73	0.56	0.86	0.79	0.81	0.85	0.80
FEB	1-5	0.96	0.79	0.73	0.73	0.48	0.78	0.71	0.86	0.72	0.71
FEB	6-10	1.02	0.72	0.69	0.70	0.41	0.73	0.71	0.78	0.67	0.69
FEB	11-15	0.95	0.68	0.69	0.63	0.43	0.82	0.71	0.86	0.74	0.75
FEB	16-20	0.86	0.76	0.81	0.73	0.37	0.74	0.64	0.70	0.73	0.66
FEB	21-25	0.88	1.28	0.82	0.78	0.36	0.67	0.62	0.61	0.71	0.70
FEB	26-28	1.02	0.99	0.89	0.76	0.36	0.67	0.54	0.60	0.70	0.70
MAR	1-5	3.05	1.75	0.88	0.65	0.45	0.75	0.65	1.51	0.71	0.64
MAR	6-10	4.41	2.66	0.99	0.69	0.39	0.74	0.67	3.15	1.11	0.63
MAR	11-15	2.75	2.37	2.27	0.64	0.42	0.66	0.53	2.46	1.25	0.61
MAR	16-20	2.85	1.41	1.31	0.70	0.45	0.64	0.53	1.08	0.96	0.64
MAR	21-25	2.94	1.06	1.15	0.65	0.61	0.67	0.61	1.23	0.76	0.63
MAR	26-31	1.84	0.88	1.97	0.66	0.61	0.80	0.61	3.39	0.67	0.62
APR	1-5	1.52	0.80	1.12	0.74	0.74	1.00	0.56	3.80	0.71	0.59
APR	6-10	1.84	1.12	1.32	0.95	1.21	0.88	0.60	3.76	0.81	0.60
APR	11-15	2.24	3.55	1.14	0.92	0.94	-	0.71	1.81	1.02	0.97
APR	16-20	3.25	9.89	1.23	0.86	0.75	-	1.31	7.28	1.06	1.85
APR	21-25	3.61	3.15	6.53	1.16	1.37	0.74	1.89	-	2.05	4.91
APR	26-30	27.20	5.87	9.48	1.78	0.84	0.84	1.92	44.69	1.78	3.93
MAY	6-10	34.60	12.13	4.69	2.34	1.26	0.78	2.47	18.66	3.57	2.49
MAY	5-10	45.88	7.10	2.12	1.63	0.96	1.16	3.78	-	6.81	1.37
MAY	11-15	25.02	39.22	13.02	2.31	1.12	1.09	2.32	51.97	2.80	1.51
MAY	16-20	15.10	32.64	45.31	1.33	0.88	0.94	2.12	13.71	2.77	1.33
MAY	21-25	5.07	35.03	32.69	0.78	0.83	1.64	1.92	17.74	2.40	1.28
MAY	26-31	11.86	11.95	10.23	0.95	0.69	1.68	21.39	10.26	2.85	1.68
JUN	1-5	5.33	8.46	10.17	1.85	0.66	1.39	6.53	25.30	7.59	-
JUN	6-10	3.12	9.42	4.61	1.18	0.71	1.89	8.11	22.22	3.80	9.79
JUN	11-15	2.39	8.77	4.13	1.15	0.72	2.40	3.60	11.15	10.87	2.66
JUN	16-20	1.82	6.35	14.57	1.27	0.81	4.48	10.53	5.89	12.12	2.00
JUN	21-25	1.49	4.83	25.58	2.67	0.65	10.40	5.09	4.87	3.43	2.39
JUN	26-30	1.60	4.17	14.25	1.94	1.15	3.42	2.64	4.97	3.35	4.31
JUL	1-5	2.46	4.69	11.26	1.15	2.35	6.32	3.05	11.19	3.12	4.08
JUL	6-10	5.65	4.72	5.29	1.00	1.56	4.09	4.23	14.49	2.01	5.67
JUL	11-15	6.17	4.78	8.64	1.85	3.61	3.05	5.70	14.81	4.64	5.11
JUL	16-20	4.52	10.35	13.22	1.47	7.44	5.52	2.43	31.92	11.09	3.45
JUL	21-25	2.58	4.69	11.13	7.12	6.52	3.98	2.84	23.91	8.07	6.02
JUL	26-31	2.14	3.31	5.88	9.57	4.66	4.95	3.32	24.76	5.02	6.29
AUG	1-5	1.97	7.51	9.07	8.16	3.65	12.18	3.54	-	15.01	10.31
AUG	6-10	1.98	7.06	4.96	6.57	3.43	15.19	15.46	7.33	16.42	22.05
AUG	11-15	4.84	4.85	4.91	7.29	3.38	21.26	21.30	6.59	11.53	11.63
AUG	16-20	4.27	5.22	8.55	7.24	4.18	13.24	20.23	5.72	9.28	5.95
AUG	21-25	3.10	5.46	9.72	8.34	3.88	6.75	39.85	9.88	6.44	4.95
AUG	26-31	5.01	7.66	12.93	5.62	8.01	6.81	12.61	21.86	5.17	13.91
SEP	1-5	4.59	5.50	31.87	8.53	4.75	12.33	10.64	30.93	11.30	13.23
SEP	6-10	3.86	4.08	24.85	7.09	3.71	10.44	16.83	19.16	24.32	9.83
SEP	11-15	2.75	3.83	8.94	9.31	3.38	8.18	17.65	9.57	17.83	10.90
SEP	16-20	2.16	5.08	5.42	9.44	5.66	5.90	13.74	5.72	8.14	8.75
SEP	21-25	1.77	3.71	3.81	5.69	9.91	6.08	8.23	4.67	5.82	10.67
SEP	26-30	1.65	3.19	2.71	2.76	9.01	9.04	5.87	5.29	5.72	7.76
OCT	1-5	1.27	2.59	2.79	1.93	3.70	5.99	3.63	11.14	3.69	6.66
OCT	6-10	1.78	2.90	2.30	1.57	3.52	3.57	4.20	10.34	2.78	4.51
OCT	11-15	1.74	4.54	1.76	2.25	2.79	2.88	6.03	4.66	1.88	3.27
OCT	16-20	1.50	2.45	1.44	2.18	2.12	1.99	2.79	3.54	2.04	2.51
OCT	21-25	1.30	1.89	1.38	1.71	3.61	4.73	1.97	2.83	2.29	1.80
OCT	26-31	1.18	2.01	1.25	1.23	3.96	3.40	4.04	2.78	4.17	2.33
NOV	1-5	1.12	1.95	1.30	1.25	3.19	2.29	4.98	2.73	3.95	4.77
NOV	6-10	1.10	2.88	1.10	1.26	1.72	1.98	9.97	3.98	3.84	3.79
NOV	11-15	1.02	4.81	1.06	1.43	2.44	3.48	11.32	5.41	3.35	3.21
NOV	16-20	0.94	8.70	1.69	1.14	2.63	2.36	3.19	2.93	2.84	2.27
NOV	21-25	0.91	3.71	1.59	1.21	1.77	3.73	2.43	2.30	2.56	1.69
NOV	26-30	1.17	3.13	1.82	1.14	2.92	3.20	2.08	2.22	1.84	1.56
DEC	1-5	1.21	7.47	1.37	1.07	7.16	2.48	2.13	3.71	1.64	1.48
DEC	6-10	1.07	17.28	1.27	1.07	9.92	2.07	1.83	3.10	1.82	-
DEC	11-15	0.82	5.80	1.26	0.96	3.50	1.63	3.12	2.45	2.07	1.35
DEC	16-20	0.78	3.65	1.17	0.92	2.35	1.42	1.68	1.89	2.39	1.58
DEC	21-25	0.89	5.05	1.08	1.01	2.50	1.35	1.30	1.80	1.53	2.69
DEC	26-31	0.93	2.33	1.03	0.94	1.90	1.12	1.12	1.39	1.24	2.18
Mean		4.25	5.61	6.00	2.38	2.44	3.62	5.09	8.54	4.21	3.79

Table D.3.2 5-Day Runoff at 2GB1 (3/6) Unit : m3/s

Month	Date	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
JAN	1-5	2.03	0.92	6.39	1.06	1.02	1.47	13.39	1.59	1.76	3.22
JAN	6-10	1.94	0.88	3.98	1.12	-	1.19	5.24	1.73	1.34	2.30
JAN	11-15	1.24	0.82	2.79	0.91	1.09	-	3.13	1.33	1.22	2.12
JAN	16-20	1.25	0.92	1.89	0.81	0.73	1.09	7.86	1.12	1.14	1.77
JAN	21-25	1.27	0.94	1.35	0.72	0.74	1.17	6.48	1.21	1.10	1.72
JAN	26-31	1.19	0.81	1.39	0.80	0.67	0.95	15.20	1.44	1.98	1.92
FEB	1-5	-	0.81	1.30	0.79	0.64	-	5.70	3.28	1.18	1.60
FEB	6-10	1.15	0.77	1.20	0.72	0.54	2.89	3.13	2.84	1.69	1.61
FEB	11-15	1.08	0.73	1.21	0.71	0.53	1.94	2.11	1.64	9.00	1.53
FEB	16-20	0.83	0.74	1.43	0.71	-	0.82	2.07	1.14	-	1.40
FEB	21-25	0.84	0.78	1.05	-	-	0.97	5.95	1.22	4.27	1.36
FEB	26-28	0.77	0.69	1.14	-	-	1.29	2.82	1.12	2.03	1.43
MAR	1-5	0.69	0.64	0.93	-	-	1.36	1.94	2.30	1.51	1.87
MAR	6-10	0.81	0.63	0.96	0.82	0.55	0.95	1.63	1.89	1.47	1.65
MAR	11-15	1.14	0.99	0.95	0.82	0.53	0.80	1.48	3.10	1.20	1.17
MAR	16-20	1.28	1.29	0.83	0.78	0.52	0.76	1.39	1.58	-	0.94
MAR	21-25	1.72	1.13	0.72	0.78	0.55	0.81	1.32	1.29	8.46	1.31
MAR	26-31	1.36	1.67	0.91	0.76	0.56	1.10	1.96	1.27	2.56	1.95
APR	1-5	1.11	3.11	1.25	0.74	0.93	1.08	3.18	1.52	2.44	1.30
APR	6-10	1.15	9.64	1.82	0.82	1.69	0.71	2.18	1.29	1.29	1.24
APR	11-15	2.55	13.52	1.06	1.30	2.33	2.55	2.54	2.89	1.82	1.34
APR	16-20	5.25	5.23	1.31	1.31	2.60	2.17	2.68	3.85	1.79	2.76
APR	21-25	2.56	-	1.48	-	1.81	1.76	4.26	10.15	2.16	2.32
APR	26-30	1.45	-	3.78	2.10	-	3.54	-	8.21	3.31	1.59
MAY	6-10	1.61	-	7.05	4.00	-	2.12	-	-	-	1.75
MAY	5-10	1.41	5.72	-	3.03	-	2.21	13.70	13.70	-	1.77
MAY	11-15	1.63	6.37	-	1.92	-	4.37	8.86	8.86	-	1.67
MAY	16-20	1.82	4.69	-	1.25	-	2.44	11.16	11.16	-	3.48
MAY	21-25	3.13	7.85	7.00	1.30	-	-	11.36	11.36	-	7.35
MAY	26-31	2.42	12.11	4.83	1.25	-	-	9.02	9.02	5.45	11.49
JUN	1-5	1.39	12.54	8.12	-	-	-	6.98	-	4.33	9.80
JUN	6-10	1.46	-	3.01	-	-	1.42	-	11.64	4.33	3.23
JUN	11-15	1.82	10.36	1.76	3.52	-	0.91	2.96	6.84	4.08	1.95
JUN	16-20	3.67	5.78	1.48	2.30	-	0.98	2.57	4.95	3.74	1.90
JUN	21-25	3.59	4.89	1.30	2.42	6.03	1.11	3.55	7.60	9.40	1.81
JUN	26-30	2.69	3.79	1.32	2.14	5.58	1.49	15.41	17.26	9.65	4.35
JUL	1-5	2.68	-	1.31	1.94	9.00	1.81	9.92	8.86	8.89	2.87
JUL	6-10	3.90	-	1.38	1.79	8.81	-	5.94	6.35	-	2.32
JUL	11-15	6.42	-	1.42	1.56	8.05	1.55	4.57	10.05	-	1.79
JUL	16-20	7.83	4.61	1.95	1.29	5.69	2.09	5.45	5.25	-	1.46
JUL	21-25	12.32	4.61	1.86	1.03	5.31	4.14	12.10	3.85	15.84	4.05
JUL	26-31	9.79	7.38	2.42	1.10	-	3.56	17.49	10.65	26.23	9.91
AUG	1-5	11.52	5.25	3.98	1.47	-	3.67	12.38	-	11.08	7.97
AUG	6-10	6.01	4.68	7.01	1.79	6.76	5.48	10.26	8.91	11.53	9.30
AUG	11-15	16.52	6.55	3.84	2.20	8.35	11.47	12.48	6.24	6.84	5.11
AUG	16-20	-	-	5.00	3.47	8.29	10.77	9.58	7.20	21.09	10.14
AUG	21-25	7.33	-	10.56	3.18	-	-	21.45	5.28	8.59	9.43
AUG	26-31	8.83	-	8.17	1.81	11.31	14.91	24.10	22.46	15.17	10.40
SEP	1-5	13.07	-	6.83	1.51	10.93	17.33	27.97	14.60	8.87	13.04
SEP	6-10	10.10	-	7.26	1.37	10.00	12.63	32.48	10.42	6.97	10.49
SEP	11-15	7.86	-	5.74	1.52	-	9.74	14.50	11.74	4.81	7.52
SEP	16-20	9.91	-	4.66	1.89	7.99	7.66	11.68	7.77	4.63	5.95
SEP	21-25	10.99	-	2.85	1.43	6.16	10.56	6.96	4.61	5.47	4.09
SEP	26-30	7.69	-	2.58	1.04	6.61	16.85	10.22	3.57	3.88	3.88
OCT	1-5	4.05	-	6.68	0.99	9.79	-	23.60	4.51	2.49	7.19
OCT	6-10	3.12	-	7.61	0.92	6.31	9.71	17.73	4.36	9.00	-
OCT	11-15	2.87	-	5.25	1.14	3.75	7.73	-	3.36	16.14	-
OCT	16-20	3.26	-	6.00	2.98	3.12	7.38	-	2.59	6.21	-
OCT	21-25	3.21	-	5.50	2.65	3.46	9.25	-	2.07	5.66	-
OCT	26-31	3.40	-	5.53	2.61	5.62	4.93	-	3.04	3.75	-
NOV	1-5	2.41	-	4.29	3.61	4.49	4.00	-	2.69	2.62	-
NOV	6-10	2.15	-	3.19	2.03	3.16	6.73	6.14	3.17	3.37	-
NOV	11-15	1.76	-	2.49	2.27	2.47	6.66	4.66	4.41	2.71	-
NOV	16-20	2.46	-	2.65	2.71	2.25	6.02	3.91	3.95	2.54	-
NOV	21-25	1.75	-	2.94	2.36	2.03	4.48	4.37	2.67	2.76	-
NOV	26-30	1.52	-	2.29	2.42	2.34	3.38	3.36	2.96	3.30	-
DEC	1-5	2.09	-	2.53	1.99	3.46	3.45	3.65	2.73	2.13	-
DEC	6-10	1.54	-	1.76	1.53	3.96	2.39	2.92	3.44	1.97	-
DEC	11-15	1.48	-	1.45	1.67	2.40	2.01	2.74	3.79	2.10	-
DEC	16-20	1.23	-	1.31	1.74	2.32	4.62	2.15	2.05	7.22	-
DEC	21-25	1.16	-	1.27	-	1.87	5.57	1.88	1.59	22.07	-
DEC	26-31	1.01	-	1.17	-	1.61	4.00	-	1.63	7.45	-
Mean		3.64	-	3.18	1.67	3.99	4.30	8.09	5.28	5.79	-

Table D.3.2 5-Day Runoff at 2GB1 (4/6) Unit : m3/s

Month	Date	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
JAN	1-5	1.87	1.16	33.39	3.98	9.56	4.68	1.28	1.23	1.31	1.49
JAN	6-10	1.76	1.11	34.07	3.68	5.23	5.16	1.12	1.10	1.23	1.29
JAN	11-15	1.38	1.06	11.35	4.64	3.56	2.65	1.11	1.01	1.12	1.41
JAN	16-20	1.09	0.92	7.00	5.48	2.72	1.96	0.99	0.95	1.09	1.41
JAN	21-25	1.02	0.97	4.01	4.51	2.31	1.82	1.06	0.95	1.12	1.35
JAN	26-31	1.54	0.84	3.30	3.35	1.92	1.87	1.06	1.04	0.93	1.58
FEB	1-5	1.50	0.60	2.48	2.17	1.67	1.51	1.06	0.90	1.00	2.86
FEB	6-10	1.22	1.02	2.19	1.89	1.67	1.56	0.92	1.00	1.12	1.71
FEB	11-15	0.92	0.86	1.87	2.33	1.55	1.35	0.99	0.83	1.12	2.24
FEB	16-20	0.84	0.73	1.58	2.27	1.46	1.18	1.05	0.94	1.76	1.67
FEB	21-25	0.81	0.75	1.21	1.57	1.52	1.07	0.96	0.79	-	1.82
FEB	26-28	0.88	0.80	1.22	1.58	1.72	1.10	1.16	0.80	-	1.79
MAR	1-5	1.00	0.83	1.29	1.97	3.80	1.00	1.15	0.82	6.59	1.84
MAR	6-10	1.28	0.76	1.31	1.84	3.42	1.01	1.05	1.02	8.07	1.72
MAR	11-15	1.31	0.73	1.33	1.44	1.62	1.00	0.94	0.85	19.67	1.53
MAR	16-20	1.65	0.85	2.33	2.97	1.76	1.04	1.14	0.92	6.08	1.38
MAR	21-25	1.78	0.81	2.48	-	2.25	1.09	1.70	0.81	15.56	1.44
MAR	26-31	1.94	0.97	1.87	1.84	3.99	1.40	1.32	0.73	10.03	1.80
APR	1-5	2.33	0.91	1.73	1.73	2.06	1.32	1.43	0.91	39.38	1.44
APR	6-10	2.62	1.31	3.01	1.59	5.52	1.46	2.18	1.32	26.32	1.55
APR	11-15	2.26	2.02	3.89	-	4.50	1.86	4.02	1.94	11.35	1.68
APR	16-20	2.31	1.88	2.68	4.80	-	1.91	8.74	2.15	8.28	1.92
APR	21-25	2.28	1.92	3.55	-	-	2.67	22.02	1.44	54.28	1.41
APR	26-30	2.25	1.39	5.38	-	17.61	3.86	15.51	1.75	102.20	1.14
MAY	6-10	3.37	1.84	16.46	39.31	-	6.03	18.55	2.49	46.99	2.91
MAY	5-10	2.64	4.23	-	28.12	-	10.90	7.95	33.42	23.94	6.47
MAY	11-15	1.85	3.15	-	36.55	-	8.00	2.74	39.58	20.18	9.31
MAY	16-20	1.50	1.83	27.75	24.20	-	6.26	2.07	10.05	10.99	13.24
MAY	21-25	1.80	2.18	6.59	14.21	-	12.35	2.19	9.94	8.45	3.31
MAY	26-31	3.04	1.62	6.80	48.95	3.88	3.39	2.11	9.57	8.66	1.90
JUN	1-5	3.29	2.24	4.78	15.51	4.37	1.93	1.86	9.77	7.80	1.44
JUN	6-10	1.75	1.66	4.56	23.19	4.67	1.73	1.61	7.53	6.46	1.31
JUN	11-15	1.69	1.84	6.17	7.20	4.10	1.50	5.29	8.80	7.02	1.22
JUN	16-20	1.27	1.36	10.67	4.47	3.22	1.42	3.88	8.35	19.66	1.32
JUN	21-25	1.19	1.15	10.69	2.75	3.03	1.49	2.22	8.04	15.28	1.27
JUN	26-30	1.43	1.25	13.14	3.36	-	2.39	1.78	5.78	9.02	1.19
JUL	1-5	1.74	1.66	6.17	3.63	-	2.09	1.51	5.67	5.87	1.15
JUL	6-10	2.09	1.37	7.11	3.73	-	4.59	1.52	6.24	9.73	1.41
JUL	11-15	2.04	1.09	7.26	2.55	-	2.86	1.70	7.43	-	1.60
JUL	16-20	1.72	1.18	7.61	2.50	-	3.22	1.97	19.23	5.68	1.43
JUL	21-25	2.01	-	7.34	2.30	-	3.40	1.90	42.50	5.18	1.30
JUL	26-31	-	-	9.68	2.58	-	2.63	4.14	11.30	11.41	1.44
AUG	1-5	1.88	7.74	4.44	3.74	-	1.77	3.00	6.04	9.59	1.85
AUG	6-10	3.99	6.66	7.41	2.93	-	1.68	2.74	17.20	-	1.57
AUG	11-15	3.51	9.01	6.47	4.33	-	2.64	4.31	9.16	-	1.86
AUG	16-20	-	10.37	7.50	13.00	-	3.58	6.16	9.99	-	2.03
AUG	21-25	-	7.27	5.26	9.82	-	3.20	6.45	13.17	15.90	2.90
AUG	26-31	-	4.08	6.76	13.35	-	2.97	22.47	9.30	7.72	2.17
SEP	1-5	-	10.63	7.02	12.23	-	2.78	20.79	6.12	4.57	2.99
SEP	6-10	-	6.56	19.47	5.72	-	2.17	25.65	4.95	3.54	2.53
SEP	11-15	12.23	5.04	33.92	3.69	-	2.42	18.91	3.50	3.23	6.50
SEP	16-20	9.51	5.00	22.65	2.99	-	2.09	5.86	2.97	3.24	6.67
SEP	21-25	5.98	6.62	32.05	2.59	-	2.72	3.95	3.20	2.85	4.00
SEP	26-30	6.06	5.00	26.60	2.31	-	2.40	4.71	3.89	2.38	2.47
OCT	1-5	9.24	3.39	11.13	2.23	-	1.88	3.74	2.91	1.61	1.62
OCT	6-10	5.46	6.68	7.40	2.49	-	1.58	5.59	2.27	2.22	1.32
OCT	11-15	4.15	10.46	6.70	2.63	-	1.26	6.25	2.35	2.24	1.76
OCT	16-20	3.06	18.83	18.79	3.17	-	1.27	3.00	6.28	2.09	1.87
OCT	21-25	2.24	15.43	27.84	2.37	-	2.06	3.06	11.95	2.11	1.58
OCT	26-31	4.35	17.99	26.42	1.86	-	3.55	3.26	7.73	4.93	1.35
NOV	1-5	7.21	22.31	-	1.94	5.51	4.70	11.79	4.25	4.79	1.49
NOV	6-10	7.13	34.31	7.53	2.03	4.80	4.19	25.43	3.48	6.04	1.30
NOV	11-15	5.60	89.94	-	1.78	6.45	4.79	12.45	2.81	3.81	1.39
NOV	16-20	6.61	-	-	2.64	4.75	4.88	6.45	9.80	3.44	1.42
NOV	21-25	4.70	82.73	8.31	4.57	4.22	3.17	9.48	7.13	6.86	2.48
NOV	26-30	3.15	-	5.68	3.63	3.77	3.47	6.32	10.67	10.27	2.61
DEC	1-5	2.40	36.83	6.97	9.58	3.00	2.60	3.36	7.66	13.43	2.11
DEC	6-10	1.81	-	3.95	76.24	-	1.84	2.46	6.05	9.80	1.53
DEC	11-15	1.50	-	2.85	41.21	2.74	1.88	1.96	3.08	4.24	1.38
DEC	16-20	1.49	-	2.60	10.66	2.43	3.23	1.80	2.32	3.26	1.02
DEC	21-25	1.95	-	2.07	8.14	2.95	2.04	1.50	2.05	-	0.95
DEC	26-31	1.37	-	2.97	24.71	2.90	1.52	1.20	1.80	1.84	0.90
Mean		2.86	7.58	9.08	8.81	-	2.81	5.18	6.33	10.43	2.20

Table D.3.2 5-Day Runoff at 2GB1 (5/6) Unit : m3/s

Month	Date	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
JAN	1-5	0.87	1.27	2.71	1.25	0.77	1.14	2.79	-	4.32	1.98
JAN	6-10	1.10	1.20	1.92	1.43	0.79	1.09	1.11	-	2.67	1.43
JAN	11-15	1.67	1.11	2.53	1.50	0.74	0.88	0.99	-	1.72	1.18
JAN	16-20	2.19	1.59	1.37	2.67	0.63	0.90	0.82	-	4.98	1.12
JAN	21-25	1.70	1.35	1.16	1.99	0.57	0.80	0.77	-	7.39	1.09
JAN	26-31	-	1.34	1.08	1.22	0.56	0.83	0.70	-	2.30	3.63
FEB	1-5	-	1.33	1.39	0.84	0.59	0.79	0.75	-	0.87	21.54
FEB	6-10	1.31	1.27	5.31	0.84	0.61	0.83	0.78	-	1.32	40.60
FEB	11-15	1.59	1.12	5.55	1.00	0.56	0.76	0.75	-	-	29.30
FEB	16-20	1.05	0.89	2.58	1.76	0.61	0.70	0.74	-	-	15.93
FEB	21-25	1.31	0.86	1.55	2.24	0.68	0.61	0.75	-	2.38	6.04
FEB	26-28	1.11	0.85	2.64	1.63	0.52	0.48	0.73	-	3.87	3.85
MAR	1-5	1.48	0.83	2.85	1.26	0.68	0.52	0.82	-	5.26	2.62
MAR	6-10	1.12	0.77	1.44	0.88	1.06	0.49	0.85	-	6.44	1.87
MAR	11-15	1.68	0.84	1.20	0.74	0.62	0.78	0.68	-	8.72	1.86
MAR	16-20	1.70	0.69	1.14	0.68	0.60	1.24	0.68	-	12.16	3.18
MAR	21-25	1.20	0.74	1.44	0.73	1.02	0.89	0.68	-	12.01	4.37
MAR	26-31	5.81	0.76	0.93	0.66	0.89	0.72	1.01	-	19.90	2.79
APR	1-5	10.49	0.87	0.84	0.63	2.19	0.54	0.68	-	16.52	4.27
APR	6-10	17.68	1.02	0.85	0.62	2.52	0.55	-	-	23.99	5.61
APR	11-15	8.83	1.26	1.07	0.62	3.62	0.81	-	-	25.45	5.30
APR	16-20	2.55	2.19	1.20	2.49	11.43	1.61	-	-	14.85	7.08
APR	21-25	25.31	2.42	1.21	-	7.54	3.61	-	-	6.73	9.64
APR	26-30	20.53	3.98	0.82	-	4.96	2.04	-	-	8.76	11.35
MAY	6-10	12.25	8.38	1.24	-	6.16	0.97	-	-	46.84	9.00
MAY	5-10	9.61	9.77	1.61	-	1.83	0.86	-	-	25.71	10.80
MAY	11-15	13.12	6.81	1.45	-	1.50	0.85	-	-	20.18	10.12
MAY	16-20	8.43	15.60	1.36	-	1.83	3.13	-	-	14.80	6.94
MAY	21-25	5.95	10.96	1.13	-	1.72	3.68	-	-	6.07	15.73
MAY	26-31	9.34	8.34	1.03	-	1.41	4.02	-	-	5.10	13.30
JUN	1-5	12.87	12.86	1.34	-	5.03	4.45	-	-	3.98	7.68
JUN	6-10	6.91	17.65	1.55	-	3.18	2.89	-	-	2.35	5.14
JUN	11-15	3.75	6.82	1.53	-	2.26	1.67	-	-	2.28	6.04
JUN	16-20	9.31	3.37	3.86	-	1.65	1.48	-	-	2.84	7.16
JUN	21-25	14.03	2.97	3.00	-	6.81	9.72	-	-	4.01	10.00
JUN	26-30	4.88	3.75	8.96	-	7.12	6.91	-	-	3.20	13.44
JUL	1-5	11.00	5.95	5.16	-	14.89	3.51	-	12.74	7.95	13.36
JUL	6-10	13.07	6.48	2.79	-	21.42	2.15	-	28.26	13.10	8.72
JUL	11-15	5.26	10.69	2.03	-	16.23	5.14	-	51.36	9.77	6.14
JUL	16-20	3.95	15.40	1.93	-	8.16	9.22	-	33.82	6.96	5.13
JUL	21-25	2.97	11.46	1.71	-	8.84	15.00	-	16.37	4.60	3.60
JUL	26-31	2.27	7.08	1.79	-	11.22	11.56	-	11.53	3.05	6.53
AUG	1-5	2.85	10.14	3.28	-	7.51	6.23	-	17.60	10.25	3.83
AUG	6-10	3.01	12.11	5.32	-	7.73	12.71	-	31.92	11.04	2.94
AUG	11-15	7.49	27.54	5.19	-	4.41	12.13	-	19.57	7.70	7.95
AUG	16-20	12.82	31.89	8.65	-	4.25	28.20	-	6.45	7.41	7.64
AUG	21-25	12.93	42.31	15.66	-	7.82	44.55	-	4.66	8.92	6.14
AUG	26-31	13.18	52.97	7.95	-	9.37	24.51	-	4.22	8.36	2.84
SEP	1-5	6.71	31.43	3.23	-	18.80	30.25	-	-	-	2.94
SEP	6-10	7.73	13.26	2.82	-	23.71	25.72	-	-	7.97	3.47
SEP	11-15	17.67	11.02	2.27	-	13.98	14.69	-	7.88	11.45	3.05
SEP	16-20	10.77	7.73	1.90	-	12.03	15.85	-	9.39	8.42	2.34
SEP	21-25	11.31	6.06	1.66	-	10.13	9.14	-	7.50	8.10	5.89
SEP	26-30	13.18	-	2.00	-	11.50	13.17	-	4.63	23.49	3.91
OCT	1-5	8.70	-	1.78	-	14.46	14.22	-	2.58	22.92	4.96
OCT	6-10	6.67	8.14	1.78	-	11.45	19.89	-	2.21	12.08	4.70
OCT	11-15	14.38	5.27	1.39	-	7.22	18.65	-	7.59	9.12	3.03
OCT	16-20	15.51	4.04	4.01	-	7.01	12.83	-	1.85	5.72	2.24
OCT	21-25	8.54	4.05	3.99	-	11.76	16.99	-	3.07	6.93	3.10
OCT	26-31	5.43	3.51	4.59	-	8.59	9.22	-	7.20	8.91	3.82
NOV	1-5	3.42	3.44	7.53	-	4.82	7.34	-	9.04	12.79	2.49
NOV	6-10	4.73	2.99	7.14	-	4.90	4.06	-	6.75	10.57	3.67
NOV	11-15	3.25	2.93	10.24	-	8.78	3.51	-	10.08	7.63	3.48
NOV	16-20	3.76	2.29	4.20	-	5.10	3.26	-	14.08	5.49	3.04
NOV	21-25	3.34	2.24	3.95	-	4.23	2.91	-	14.56	6.04	3.21
NOV	26-30	3.85	2.90	8.58	-	4.77	2.25	-	14.69	4.35	2.73
DEC	1-5	8.19	2.40	3.78	-	2.64	1.74	-	-	2.35	1.96
DEC	6-10	2.03	1.91	2.30	1.47	1.96	2.38	-	-	4.03	1.37
DEC	11-15	1.68	1.55	1.80	1.23	1.74	1.77	-	4.40	2.84	1.07
DEC	16-20	1.73	1.84	1.48	1.09	1.64	1.39	-	3.83	3.04	1.01
DEC	21-25	1.46	4.44	1.56	0.97	1.40	1.18	-	15.31	4.60	0.93
DEC	26-31	1.26	5.34	1.15	0.81	1.20	1.16	-	6.63	3.17	0.70
Mean		6.84	7.15	3.05	-	5.57	6.57	-	-	9.00	6.21

Table D.3.2 5-Day Runoff at 2GB1 (6/6) Unit : m3/s

Month	Date	1980	1981	1982	1983	1984	1985
JAN	1-5	0.79	0.80	1.76	-	3.92	-
JAN	6-10	0.75	0.76	1.07	-	2.55	-
JAN	11-15	0.70	0.63	0.94	-	2.12	-
JAN	16-20	0.68	0.69	1.14	-	1.74	0.87
JAN	21-25	0.72	0.75	1.04	-	1.48	0.87
JAN	26-31	0.98	0.83	0.84	-	1.35	0.87
FEB	1-5	0.98	0.75	1.55	-	1.35	0.87
FEB	6-10	0.95	0.66	1.35	-	1.26	1.97
FEB	11-15	0.68	0.68	1.35	-	1.12	1.28
FEB	16-20	0.68	0.68	1.03	-	1.12	0.98
FEB	21-25	0.63	0.68	0.70	-	1.12	0.82
FEB	26-28	0.53	0.65	0.62	-	1.12	0.78
MAR	1-5	1.12	0.60	0.60	-	1.12	0.78
MAR	6-10	1.11	0.49	0.83	-	1.12	0.78
MAR	11-15	1.66	0.48	0.80	-	1.12	0.78
MAR	16-20	0.75	0.69	0.78	-	1.12	0.78
MAR	21-25	0.48	1.49	0.85	-	1.12	1.03
MAR	26-31	0.47	1.83	0.83	-	1.12	1.24
APR	1-5	0.72	2.21	1.12	-	0.71	-
APR	6-10	0.94	3.73	1.66	-	0.76	-
APR	11-15	1.46	57.30	1.43	-	0.87	-
APR	16-20	5.06	44.12	1.71	-	1.00	-
APR	21-25	5.90	19.86	3.07	-	1.04	-
APR	26-30	3.91	14.62	5.27	-	1.70	-
MAY	6-10	5.67	-	4.70	-	1.35	-
MAY	5-10	7.30	-	5.13	-	1.12	10.22
MAY	11-15	7.56	-	2.53	-	1.04	10.83
MAY	16-20	9.37	-	3.42	-	0.98	16.30
MAY	21-25	9.25	-	11.46	-	0.98	15.86
MAY	26-31	6.87	-	9.80	-	0.98	12.24
JUN	1-5	6.24	-	9.17	-	0.98	8.10
JUN	6-10	9.08	-	4.50	-	0.98	7.43
JUN	11-15	7.30	-	3.03	2.14	0.98	4.68
JUN	16-20	4.21	-	3.10	0.66	0.98	8.62
JUN	21-25	19.27	-	5.26	0.48	0.96	8.92
JUN	26-30	26.70	-	3.51	1.11	0.87	4.29
JUL	1-5	-	-	2.55	0.65	1.64	-
JUL	6-10	5.79	-	2.77	0.92	1.64	-
JUL	11-15	4.58	-	2.22	1.20	1.64	-
JUL	16-20	3.62	-	3.49	1.01	1.33	0.87
JUL	21-25	1.98	-	2.61	0.57	1.55	0.87
JUL	26-31	1.98	-	2.43	1.46	1.80	0.87
AUG	1-5	1.82	-	3.90	2.09	1.41	0.87
AUG	6-10	1.65	-	6.33	3.83	1.90	1.97
AUG	11-15	1.61	28.44	6.63	4.32	1.63	1.28
AUG	16-20	1.75	21.91	12.51	2.21	1.64	0.98
AUG	21-25	1.43	9.11	9.86	1.34	1.54	0.82
AUG	26-31	4.05	10.84	9.74	3.20	1.58	0.78
SEP	1-5	2.40	11.69	-	-	2.09	0.78
SEP	6-10	2.31	5.84	-	-	1.76	0.78
SEP	11-15	2.77	4.74	-	11.55	1.76	0.78
SEP	16-20	1.95	4.50	-	10.44	1.57	0.78
SEP	21-25	1.57	8.04	-	9.76	1.01	1.03
SEP	26-30	1.30	17.41	-	9.88	0.98	1.24
OCT	1-5	0.98	11.70	-	9.57	1.31	-
OCT	6-10	0.92	4.82	-	17.42	3.35	-
OCT	11-15	1.37	4.09	-	27.12	10.44	-
OCT	16-20	2.11	2.95	-	15.78	-	-
OCT	21-25	2.27	3.48	-	18.46	-	-
OCT	26-31	1.59	6.25	-	9.57	-	-
NOV	1-5	1.59	7.33	-	12.93	-	-
NOV	6-10	2.68	3.39	-	17.26	-	10.22
NOV	11-15	2.10	4.79	-	8.93	-	10.83
NOV	16-20	3.35	3.07	-	13.84	-	16.30
NOV	21-25	3.70	-	-	9.40	2.07	15.86
NOV	26-30	2.18	-	-	7.17	2.56	12.24
DEC	1-5	1.49	-	-	3.85	3.18	8.10
DEC	6-10	1.60	1.64	-	2.86	2.24	7.43
DEC	11-15	1.44	1.51	-	3.63	7.43	4.68
DEC	16-20	1.06	3.58	-	2.83	2.72	8.62
DEC	21-25	1.06	2.47	-	9.92	1.74	8.92
DEC	26-31	0.91	1.57	-	11.34	1.35	4.29
Mean		3.19	-	-	-	1.72	4.70

Table D.3.3 5-Day Runoff at 2GC4 (1/4) Unit : m3/s

Month	Date	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
JAN	1-5	-	0.59	0.46	0.64	0.44	0.61	6.25	0.90	0.76	1.93
JAN	6-10	-	0.55	0.62	0.62	0.42	0.56	-	0.91	0.73	1.41
JAN	11-15	-	0.50	1.15	0.52	0.39	0.51	2.44	0.72	0.66	1.21
JAN	16-20	-	0.60	0.94	0.45	0.47	0.53	2.76	0.63	0.60	1.02
JAN	21-25	-	0.55	1.23	0.42	0.45	0.52	6.94	0.71	0.75	0.85
JAN	26-31	-	0.49	2.00	0.42	-	0.48	14.44	0.88	0.93	1.10
FEB	1-5	-	0.48	1.73	0.41	0.32	-	3.76	1.53	0.59	0.75
FEB	6-10	-	0.44	0.79	-	0.30	1.06	2.15	1.35	0.95	0.65
FEB	11-15	-	0.44	0.63	-	0.28	0.55	1.40	0.91	3.61	0.67
FEB	16-20	-	0.48	0.57	-	0.16	0.45	4.68	0.68	6.20	0.63
FEB	21-25	-	0.53	0.79	-	0.29	0.65	8.83	0.63	2.08	0.59
FEB	26-28	-	0.46	0.67	-	0.33	1.03	1.76	0.68	0.98	0.70
MAR	6-10	-	0.45	0.95	0.44	0.34	1.09	0.94	0.93	0.80	0.80
MAR	5-10	-	0.43	0.71	0.42	0.33	0.66	0.99	0.82	0.67	0.67
MAR	11-15	-	0.69	1.04	0.45	0.37	0.51	0.79	1.15	0.69	0.57
MAR	16-20	-	0.61	1.17	0.38	0.27	0.43	0.78	0.71	10.65	0.47
MAR	21-25	-	0.54	0.71	0.40	0.27	0.57	0.82	0.68	8.19	0.72
MAR	26-31	-	1.25	4.99	0.36	0.28	0.75	1.14	0.68	1.74	0.91
APR	1-5	-	2.17	8.12	-	0.57	0.62	1.99	0.74	1.17	0.73
APR	6-10	-	8.35	15.34	0.54	1.30	0.48	0.98	0.71	1.34	0.65
APR	11-15	-	11.76	5.92	0.91	2.13	1.87	1.67	1.45	1.00	0.94
APR	16-20	-	-	1.77	0.64	2.52	1.17	1.48	1.81	1.21	1.62
APR	21-25	-	-	17.40	0.67	1.07	1.03	1.95	3.95	1.28	1.32
APR	26-30	-	-	8.60	1.04	3.38	1.93	-	4.14	2.50	0.91
MAY	6-10	-	3.49	7.13	-	4.50	1.15	8.41	3.43	14.36	1.13
MAY	5-10	-	1.91	7.94	1.04	2.69	1.30	18.03	15.18	18.42	1.09
MAY	11-15	-	1.56	9.54	-	10.19	2.45	5.67	7.03	38.80	1.18
MAY	16-20	-	-	5.57	-	20.66	1.56	7.16	4.96	11.82	2.03
MAY	21-25	-	-	4.32	-	17.62	1.15	5.36	6.87	6.82	5.41
MAY	26-31	-	-	7.27	0.61	10.21	0.86	5.07	17.37	5.09	7.39
JUN	1-5	-	-	9.44	0.67	13.97	0.80	3.05	14.34	2.98	6.26
JUN	6-10	-	-	5.18	0.99	15.12	0.80	2.56	7.72	3.34	2.24
JUN	11-15	-	-	2.85	1.30	25.48	0.58	1.97	4.48	2.88	1.33
JUN	16-20	-	-	4.91	1.32	12.62	0.63	1.61	3.87	2.58	1.22
JUN	21-25	-	-	6.36	1.37	5.18	0.61	1.87	5.02	7.02	1.22
JUN	26-30	-	-	3.14	0.98	3.63	0.77	6.70	7.89	7.70	2.77
JUL	1-5	-	-	9.23	0.91	6.59	1.00	3.58	5.10	5.56	1.51
JUL	6-10	-	-	9.21	0.67	3.66	1.07	2.49	3.61	5.47	1.22
JUL	11-15	-	-	3.62	0.66	2.74	0.80	1.95	4.86	7.13	0.99
JUL	16-20	-	-	2.72	0.54	2.20	1.09	2.90	2.64	25.44	0.89
JUL	21-25	-	-	1.70	0.46	2.37	1.46	4.28	2.24	10.45	1.51
JUL	26-31	-	-	1.33	0.48	11.78	1.57	5.84	4.98	9.33	1.77
AUG	1-5	2.51	-	1.34	0.56	6.78	1.50	5.05	5.01	5.23	2.31
AUG	6-10	1.71	-	1.37	0.67	2.96	2.12	3.00	4.15	4.09	3.04
AUG	11-15	7.90	-	2.33	0.86	2.92	2.99	3.83	2.93	2.48	1.85
AUG	16-20	7.96	-	3.02	1.03	2.99	3.79	6.32	2.51	5.13	2.20
AUG	21-25	3.56	-	4.92	0.81	7.97	7.03	5.65	2.13	3.25	1.72
AUG	26-31	9.63	-	5.82	0.63	5.04	7.02	6.26	6.19	4.21	2.61
SEP	1-5	6.65	-	2.67	0.60	5.40	-	11.18	4.76	3.39	3.13
SEP	6-10	5.10	-	3.41	0.53	-	3.69	38.13	2.94	3.02	2.23
SEP	11-15	-	-	7.23	0.63	6.18	3.15	8.13	3.38	2.00	1.84
SEP	16-20	-	-	5.21	0.74	3.09	2.06	5.07	3.60	2.38	1.60
SEP	21-25	-	-	6.75	0.63	2.62	3.66	4.07	2.32	2.23	1.31
SEP	26-30	-	-	5.86	0.47	3.25	6.96	2.69	1.85	1.68	1.45
OCT	1-5	2.03	-	4.40	0.49	4.60	18.02	7.58	2.00	2.19	2.75
OCT	6-10	1.54	-	3.64	0.45	2.34	11.35	12.34	3.65	6.00	2.93
OCT	11-15	1.30	-	8.73	1.45	1.62	7.59	8.78	1.59	11.58	2.26
OCT	16-20	1.33	-	7.19	1.51	1.49	5.54	4.62	1.62	4.09	1.45
OCT	21-25	2.07	-	3.38	1.43	1.84	4.17	4.94	1.06	4.00	1.25
OCT	26-31	2.16	-	2.77	1.52	3.23	3.32	7.93	1.96	2.50	1.13
NOV	1-5	1.71	-	1.67	1.55	2.77	2.91	4.19	1.52	1.70	1.65
NOV	6-10	1.37	-	2.54	1.00	1.71	4.08	9.13	1.46	2.01	2.07
NOV	11-15	1.21	-	1.51	0.99	1.32	5.47	4.10	1.74	1.56	1.25
NOV	16-20	1.77	-	1.73	1.13	1.13	3.54	2.77	1.85	1.81	1.12
NOV	21-25	1.20	-	1.61	0.91	1.02	2.89	2.84	1.34	1.73	0.96
NOV	26-30	1.02	-	1.84	1.48	1.03	1.91	1.79	1.31	1.74	1.50
DEC	1-5	1.24	-	1.28	0.86	1.73	1.76	1.59	1.82	1.19	1.32
DEC	6-10	1.00	-	1.00	0.72	1.59	1.34	2.00	1.37	1.09	0.76
DEC	11-15	0.94	-	0.90	0.73	1.05	1.18	1.57	1.24	1.31	0.64
DEC	16-20	0.74	-	0.86	0.61	0.98	3.79	1.30	0.93	4.99	1.07
DEC	21-25	0.68	-	0.75	0.75	0.85	8.33	-	0.91	13.42	0.86
DEC	26-31	0.61	8.58	0.70	0.60	0.68	5.74	-	0.93	4.00	0.76
Mean		-	-	3.84	0.78	3.83	2.49	4.92	3.06	4.74	1.58

Table D.3.3 5-Day Runoff at 2GC4 (2/4) Unit : m3/s

Month	Date	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969
JAN	1-5	0.60	0.57	22.58	2.99	1.55	1.67	0.73	0.73	0.85	0.56
JAN	6-10	0.50	0.56	23.41	2.59	2.46	2.56	0.65	0.60	0.79	0.48
JAN	11-15	0.51	0.48	9.02	2.56	1.65	1.32	0.67	0.54	0.68	0.43
JAN	16-20	0.44	0.46	6.32	-	1.29	0.96	0.59	0.54	0.61	0.40
JAN	21-25	0.47	0.45	3.88	2.95	1.21	0.88	0.76	0.53	0.62	0.56
JAN	26-31	0.62	0.44	2.90	2.24	0.97	0.96	0.80	0.49	0.58	1.12
FEB	1-5	0.61	0.49	1.95	1.45	0.75	0.76	0.65	0.44	0.56	2.66
FEB	6-10	0.41	0.60	1.46	1.48	0.78	0.82	0.58	0.48	0.63	1.66
FEB	11-15	0.38	0.47	1.04	1.89	0.83	0.69	0.81	0.50	0.66	1.61
FEB	16-20	0.46	0.40	0.91	1.56	0.67	0.59	0.81	0.41	0.83	1.31
FEB	21-25	0.37	0.44	0.81	1.03	0.71	0.56	0.63	0.35	1.47	1.07
FEB	26-28	0.56	0.43	0.78	1.21	0.74	0.54	0.70	0.34	1.79	1.32
MAR	6-10	0.51	0.46	0.93	1.21	1.75	0.56	0.68	0.50	7.84	1.36
MAR	5-10	0.51	0.42	0.82	1.13	2.41	0.66	0.71	0.53	-	1.13
MAR	11-15	0.40	0.41	0.78	0.94	1.01	0.55	0.61	0.44	3.71	0.98
MAR	16-20	0.93	0.43	1.44	2.48	0.99	0.57	0.84	0.61	2.14	0.75
MAR	21-25	0.92	0.45	1.38	1.35	1.76	0.61	1.12	0.49	7.18	0.81
MAR	26-31	1.17	0.49	1.01	1.34	2.47	0.95	0.97	0.40	5.38	1.03
APR	1-5	1.33	0.50	1.17	1.29	14.51	0.71	1.08	0.57	16.30	0.82
APR	6-10	1.52	0.90	1.61	0.85	1.68	0.96	1.59	0.83	7.10	0.70
APR	11-15	1.25	1.23	2.88	1.06	-	1.54	2.27	1.51	1.90	0.85
APR	16-20	1.23	1.00	1.88	3.70	-	1.45	3.91	1.52	2.13	0.95
APR	21-25	1.16	0.87	2.83	11.56	31.30	1.93	8.31	0.80	-	0.73
APR	26-30	1.38	0.65	4.34	44.46	20.11	3.07	9.94	1.20	-	0.61
MAY	6-10	2.44	2.00	11.98	24.29	9.90	4.49	13.80	1.47	19.28	2.43
MAY	5-10	1.30	2.81	40.21	17.20	11.00	7.12	6.48	10.74	8.07	3.46
MAY	11-15	0.80	1.58	25.01	24.34	17.36	5.03	2.00	34.40	4.63	7.98
MAY	16-20	0.64	1.65	11.82	24.72	13.54	4.90	1.38	4.83	2.11	6.94
MAY	21-25	0.90	1.00	4.82	19.91	7.02	9.26	1.50	7.91	1.59	1.83
MAY	26-31	1.55	1.30	5.98	42.66	3.10	2.77	1.60	6.80	1.85	1.44
JUN	1-5	1.40	2.00	3.75	25.51	3.25	1.51	1.16	7.04	2.25	0.91
JUN	6-10	0.97	1.28	3.46	29.64	3.84	1.24	1.03	3.91	1.46	0.85
JUN	11-15	0.83	1.35	4.51	9.81	3.11	0.99	1.97	6.59	1.63	0.85
JUN	16-20	0.71	0.90	7.81	4.29	5.94	0.82	2.15	5.05	4.11	0.84
JUN	21-25	0.56	0.76	8.72	2.51	1.84	1.22	1.39	4.70	3.09	0.74
JUN	26-30	1.07	0.79	8.79	2.17	2.14	2.06	1.09	3.50	1.84	0.65
JUL	1-5	0.93	0.77	5.41	2.26	3.18	1.67	0.89	2.97	1.20	0.66
JUL	6-10	1.05	0.62	4.86	2.10	2.65	2.56	0.94	3.25	1.26	0.84
JUL	11-15	0.82	0.60	3.25	1.65	2.10	1.32	1.06	3.84	1.13	0.92
JUL	16-20	0.81	0.54	3.18	1.29	2.19	0.96	1.06	6.34	0.91	0.76
JUL	21-25	0.90	0.52	3.07	1.13	2.04	0.88	1.08	10.68	0.84	0.74
JUL	26-31	0.72	0.62	2.47	1.22	5.34	0.96	2.06	4.01	1.19	0.73
AUG	1-5	0.69	0.62	2.14	1.23	5.54	0.76	1.53	2.50	1.10	0.78
AUG	6-10	1.00	1.76	2.50	1.37	12.00	0.82	1.39	2.99	1.15	0.66
AUG	11-15	0.76	3.87	2.54	1.48	5.84	0.69	1.39	2.61	1.18	0.65
AUG	16-20	1.04	3.59	2.59	2.75	3.51	0.59	1.40	2.27	2.27	0.86
AUG	21-25	1.04	2.65	2.04	2.63	2.97	0.56	1.29	3.70	2.16	0.84
AUG	26-31	1.74	1.91	2.83	3.40	3.22	0.54	3.71	2.23	1.73	0.72
SEP	1-5	2.09	3.87	2.67	2.66	3.70	0.56	10.42	1.74	1.11	1.32
SEP	6-10	4.55	2.50	5.44	2.00	2.64	0.66	6.86	1.59	0.87	1.36
SEP	11-15	4.36	2.53	12.49	1.41	2.39	0.55	6.81	1.31	0.76	2.44
SEP	16-20	2.56	2.35	13.68	1.19	3.76	0.57	2.28	1.42	0.84	3.09
SEP	21-25	2.16	3.71	12.14	1.17	5.40	0.61	1.61	1.44	0.70	2.14
SEP	26-30	2.55	2.76	14.90	1.07	4.23	0.95	2.64	2.13	0.65	1.37
OCT	1-5	5.16	1.65	5.99	1.16	6.15	0.71	2.18	1.59	0.63	1.04
OCT	6-10	2.63	3.28	4.21	1.11	7.71	0.96	3.27	1.28	0.67	0.87
OCT	11-15	2.04	4.80	4.49	1.65	9.15	1.54	4.19	1.29	0.64	1.22
OCT	16-20	1.59	7.92	13.19	1.49	7.79	1.45	1.82	3.23	0.63	4.09
OCT	21-25	1.21	6.81	19.05	0.82	3.97	1.93	1.72	5.50	0.55	0.93
OCT	26-31	1.82	7.37	16.72	0.70	3.17	3.07	1.63	4.86	1.51	0.69
NOV	1-5	3.88	9.04	6.60	1.03	2.28	4.49	6.07	2.22	1.56	0.85
NOV	6-10	4.08	12.38	5.27	0.97	2.07	7.12	10.79	1.74	1.96	0.68
NOV	11-15	3.57	39.13	2.96	0.72	2.48	5.03	6.53	1.37	1.20	0.74
NOV	16-20	2.45	58.86	2.27	0.95	3.06	4.90	3.42	2.63	1.11	0.81
NOV	21-25	2.42	35.17	2.18	1.86	1.90	9.26	5.19	3.33	2.84	1.28
NOV	26-30	1.67	50.03	4.35	1.96	2.05	2.77	3.91	4.45	2.52	1.00
DEC	1-5	1.28	18.46	5.53	3.88	1.37	1.51	1.86	6.40	3.57	0.88
DEC	6-10	1.05	15.22	2.75	26.26	1.65	1.24	1.45	3.07	2.07	0.65
DEC	11-15	0.86	32.62	1.99	23.69	1.32	0.99	1.18	1.53	1.18	0.64
DEC	16-20	0.82	12.13	1.68	4.85	1.27	0.82	1.10	1.20	0.88	0.53
DEC	21-25	1.08	12.35	1.33	2.97	1.31	1.22	0.88	1.03	1.28	0.50
DEC	26-31	0.72	34.14	4.25	18.41	1.30	2.06	0.71	1.04	0.61	0.46
Mean		1.38	5.95	6.06	6.29	4.38	1.87	2.53	3.01	2.35	1.27

Table D.3.3 5-Day Runoff at 2GC4 (3/4) Unit : m3/s

Month	Date	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
JAN	1-5	0.46	0.80	1.21	0.88	0.52	0.73	0.68	1.45	8.41	1.58
JAN	6-10	0.62	0.61	1.02	1.03	0.52	0.59	0.67	1.08	1.82	1.19
JAN	11-15	1.15	0.56	0.99	0.98	0.51	0.57	0.59	0.73	1.42	0.91
JAN	16-20	0.94	0.93	0.73	2.76	0.46	0.53	0.53	0.76	5.87	0.83
JAN	21-25	1.23	0.66	0.64	1.31	0.41	0.49	0.49	0.63	12.51	0.90
JAN	26-31	2.00	0.59	0.60	0.79	0.38	0.49	0.47	0.75	2.57	1.52
FEB	1-5	1.73	0.58	0.66	0.60	0.36	0.49	0.43	0.65	1.39	-
FEB	6-10	0.79	0.53	2.38	0.53	0.38	0.41	0.45	0.57	0.96	-
FEB	11-15	0.63	0.46	2.74	0.72	0.37	0.41	0.45	0.45	1.01	-
FEB	16-20	0.57	0.44	1.46	1.67	0.46	0.39	0.44	0.41	1.09	-
FEB	21-25	0.79	0.42	0.88	1.73	0.44	0.38	0.43	0.70	3.93	-
FEB	26-28	0.67	0.37	2.15	1.15	0.36	0.48	0.46	0.87	4.84	-
MAR	6-10	0.95	0.36	2.40	0.79	0.58	0.45	0.47	0.57	1.96	1.46
MAR	5-10	0.71	0.35	0.99	0.57	0.93	0.44	0.59	0.54	6.59	1.34
MAR	11-15	1.04	0.39	0.78	0.48	0.44	0.43	0.41	0.74	8.85	1.24
MAR	16-20	1.17	0.41	0.72	0.45	0.46	0.46	0.35	0.71	23.61	1.44
MAR	21-25	0.71	0.41	0.70	0.46	0.66	0.49	0.37	1.04	12.76	2.95
MAR	26-31	4.99	0.43	0.62	0.43	0.83	0.39	0.74	0.74	17.25	1.65
APR	1-5	8.12	0.48	0.58	0.38	1.39	0.46	0.62	0.86	20.57	-
APR	6-10	15.34	0.53	0.62	0.37	1.25	0.40	0.64	3.90	41.41	-
APR	11-15	5.92	0.63	0.94	0.41	4.32	0.58	1.25	17.08	31.24	-
APR	16-20	1.77	1.47	1.02	1.52	12.60	1.26	0.86	10.15	20.23	-
APR	21-25	17.40	1.25	0.92	1.02	6.94	2.39	0.60	3.61	2.64	-
APR	26-30	8.60	2.20	0.57	1.06	4.20	0.87	1.04	20.37	5.24	-
MAY	6-10	7.13	4.45	0.94	0.73	3.77	0.57	0.78	40.96	40.74	-
MAY	5-10	7.94	4.28	1.48	0.95	1.38	0.67	0.83	36.52	13.21	-
MAY	11-15	9.54	4.61	1.05	0.81	1.30	0.56	0.85	32.67	4.26	-
MAY	16-20	5.57	9.98	1.10	0.60	1.52	2.37	0.81	18.69	5.95	-
MAY	21-25	4.32	3.96	0.78	0.56	1.74	2.37	1.13	7.58	3.67	-
MAY	26-31	7.27	6.95	0.86	1.63	1.19	3.62	1.76	4.45	3.12	-
JUN	1-5	9.44	10.32	1.07	6.17	4.74	3.47	0.85	2.70	2.87	5.04
JUN	6-10	5.18	12.46	1.18	2.49	2.48	1.71	0.81	2.84	1.69	3.70
JUN	11-15	2.85	3.94	1.28	2.52	2.04	1.08	0.98	3.51	1.78	10.60
JUN	16-20	4.91	2.09	2.98	1.18	1.33	1.16	0.69	4.22	2.85	5.66
JUN	21-25	6.36	1.51	4.46	1.25	6.97	1.52	1.94	2.29	3.05	6.81
JUN	26-30	3.14	1.69	6.28	0.92	6.05	-	1.67	3.38	2.51	8.48
JUL	1-5	9.23	3.22	2.52	0.95	15.93	1.62	1.64	3.05	3.69	-
JUL	6-10	9.21	3.24	1.40	1.21	18.31	1.06	1.98	8.09	4.93	-
JUL	11-15	3.62	4.70	1.19	0.93	10.22	1.45	4.53	21.72	4.00	-
JUL	16-20	2.72	6.93	1.10	1.06	5.03	3.27	4.11	8.38	3.14	-
JUL	21-25	1.70	3.87	1.06	0.82	4.54	5.08	1.88	2.88	2.36	-
JUL	26-31	1.33	2.67	1.42	1.40	5.08	4.68	1.38	3.12	2.01	-
AUG	1-5	1.34	3.44	1.84	1.76	-	1.93	1.21	4.88	3.23	-
AUG	6-10	1.37	4.67	2.24	4.91	-	2.72	2.52	7.70	4.35	-
AUG	11-15	2.33	6.81	2.75	4.23	-	3.49	3.06	4.41	2.69	-
AUG	16-20	3.02	8.28	5.19	1.84	-	7.44	2.64	2.40	2.21	-
AUG	21-25	4.92	11.55	8.81	1.42	-	17.78	2.05	2.22	3.03	-
AUG	26-31	5.82	18.21	4.08	1.05	-	7.76	6.09	2.15	2.91	-
SEP	1-5	2.67	9.98	1.93	1.90	9.86	5.70	6.48	3.87	7.96	-
SEP	6-10	3.41	5.16	1.78	1.56	19.64	-	5.10	3.50	5.01	-
SEP	11-15	7.23	4.15	1.35	1.55	7.36	5.27	3.18	4.66	5.90	-
SEP	16-20	5.21	2.82	1.21	1.32	7.48	4.82	3.03	5.08	4.41	-
SEP	21-25	6.75	2.81	1.26	2.48	6.12	4.14	1.55	2.98	5.43	-
SEP	26-30	5.86	3.00	1.46	3.93	8.29	6.08	1.44	1.96	17.75	-
OCT	1-5	4.40	3.84	1.18	2.54	12.47	7.78	1.74	1.36	11.80	4.11
OCT	6-10	3.64	2.83	1.43	1.71	8.98	11.40	2.01	1.08	5.03	3.71
OCT	11-15	8.73	2.05	0.96	1.29	4.82	8.99	1.12	0.99	3.57	2.24
OCT	16-20	7.19	1.77	3.86	1.94	4.13	13.07	2.62	0.92	2.83	1.70
OCT	21-25	3.38	1.54	3.13	1.46	7.13	7.58	2.10	1.57	2.57	1.71
OCT	26-31	2.77	2.46	5.17	1.62	4.92	24.78	1.57	3.39	2.81	1.84
NOV	1-5	1.67	2.53	5.66	1.40	2.92	5.51	0.91	3.62	7.52	1.73
NOV	6-10	2.54	1.70	3.46	1.79	3.72	2.36	1.19	3.36	6.46	2.28
NOV	11-15	1.51	1.68	9.86	3.51	5.66	1.64	0.98	4.17	5.67	2.08
NOV	16-20	1.73	1.21	4.60	1.90	3.57	1.92	0.71	9.19	3.03	1.99
NOV	21-25	1.61	1.09	3.89	2.01	4.47	1.71	0.77	14.74	3.87	2.01
NOV	26-30	1.84	1.27	9.83	1.32	3.16	1.49	1.25	16.80	2.22	1.32
DEC	1-5	1.28	1.21	3.23	1.00	1.62	1.06	1.59	3.73	1.81	1.23
DEC	6-10	1.00	0.90	1.93	0.80	1.27	1.87	0.89	2.13	2.07	1.07
DEC	11-15	0.90	0.78	1.51	0.68	1.09	1.01	0.78	1.70	1.60	0.94
DEC	16-20	0.86	1.02	1.46	0.59	0.97	0.87	0.91	1.55	1.58	0.84
DEC	21-25	0.75	1.72	1.21	0.64	0.81	0.70	0.78	16.06	1.80	0.79
DEC	26-31	0.70	1.87	0.96	0.58	0.74	0.57	0.67	21.95	1.85	0.85
Mean		3.84	3.04	2.16	1.43	4.01	3.03	1.44	5.98	6.62	-

Table D.3.3 5-Day Runoff at 2GC4 (4/4) Unit : m3/s

Month	Date	1980	1981	1982	1983	1984	1985	1986	1987	1988
JAN	1-5	0.71	0.65	1.46	1.79	2.29	-	0.59	0.75	0.59
JAN	6-10	0.65	0.56	0.81	1.15	-	-	0.73	0.79	0.53
JAN	11-15	0.61	0.47	0.71	0.78	-	-	0.65	0.63	0.54
JAN	16-20	0.57	0.43	0.98	0.46	-	0.50	0.57	0.53	0.85
JAN	21-25	0.53	0.40	0.78	0.78	-	0.53	0.51	0.51	0.96
JAN	26-31	0.70	0.29	0.60	1.26	-	0.60	0.53	0.51	0.82
FEB	1-5	0.77	0.29	0.52	1.17	-	0.57	0.50	0.50	0.43
FEB	6-10	0.57	0.27	0.53	0.83	-	1.65	0.51	0.54	0.39
FEB	11-15	0.59	0.28	0.60	0.95	-	1.22	0.50	0.60	0.39
FEB	16-20	0.44	0.72	0.89	1.08	-	0.56	0.51	0.59	0.39
FEB	21-25	0.44	-	0.56	0.70	-	0.43	0.49	0.59	0.40
FEB	26-28	-	-	0.51	0.55	-	0.46	0.46	0.64	0.40
MAR	6-10	-	-	0.45	0.57	-	0.52	0.46	0.70	0.49
MAR	5-10	-	0.42	0.50	0.45	-	0.51	0.56	1.11	0.50
MAR	11-15	-	0.36	0.51	0.73	-	0.46	0.51	1.40	0.52
MAR	16-20	-	0.53	0.50	0.65	-	0.49	0.50	1.45	0.57
MAR	21-25	-	1.47	0.50	1.10	-	1.35	0.51	0.95	0.81
MAR	26-31	-	2.03	0.50	1.07	-	2.48	0.51	0.99	0.64
APR	1-5	0.49	5.24	0.68	2.41	-	2.02	0.50	1.08	0.97
APR	6-10	0.71	4.94	1.33	2.98	1.05	3.71	0.65	1.21	1.31
APR	11-15	1.30	26.69	0.96	1.65	0.84	4.68	0.75	0.95	25.26
APR	16-20	1.51	29.81	1.04	4.50	0.95	17.52	0.88	0.53	42.80
APR	21-25	3.93	3.86	2.11	6.90	0.80	11.92	2.65	0.66	61.13
APR	26-30	1.29	2.78	2.94	9.99	1.23	11.78	57.91	1.26	75.94
MAY	6-10	1.67	3.40	3.02	12.53	0.74	9.30	28.88	1.93	30.86
MAY	5-10	16.31	11.54	3.37	9.25	0.74	2.31	38.69	1.95	16.82
MAY	11-15	9.76	27.08	1.48	5.72	0.67	3.46	3.81	1.22	11.38
MAY	16-20	14.05	37.72	1.80	5.07	0.58	16.32	2.66	0.99	11.86
MAY	21-25	8.13	15.61	8.44	4.39	0.58	16.99	2.37	2.34	6.84
MAY	26-31	10.51	-	3.55	1.49	0.55	7.22	2.33	3.14	4.59
JUN	1-5	5.85	6.68	2.78	1.21	0.53	6.33	1.89	2.82	3.54
JUN	6-10	4.73	4.53	3.47	0.83	0.53	4.90	2.29	11.83	7.45
JUN	11-15	3.55	2.43	2.24	0.95	0.52	4.13	2.86	7.51	10.85
JUN	16-20	2.24	1.92	2.29	1.17	0.55	7.41	3.32	3.24	4.10
JUN	21-25	-	2.22	3.68	1.42	0.57	5.97	4.65	1.42	3.71
JUN	26-30	-	6.33	1.93	3.98	0.51	2.59	3.03	1.24	2.98
JUL	1-5	-	-	1.40	2.59	0.53	1.86	2.37	1.21	2.46
JUL	6-10	-	-	1.04	1.35	0.53	1.42	1.99	1.08	2.80
JUL	11-15	-	-	3.33	1.37	0.52	3.17	3.03	1.12	4.36
JUL	16-20	2.37	-	2.50	2.13	0.76	6.10	1.29	1.03	9.35
JUL	21-25	1.72	-	1.46	4.77	1.30	3.16	1.39	0.80	7.69
JUL	26-31	1.37	-	0.69	5.53	1.56	-	2.16	0.84	2.31
AUG	1-5	1.43	6.10	3.78	2.30	1.13	-	1.92	0.82	2.13
AUG	6-10	1.48	6.30	7.36	1.56	0.92	-	1.39	0.75	6.66
AUG	11-15	1.18	8.57	7.78	1.22	1.09	-	1.70	0.67	5.89
AUG	16-20	1.06	8.50	3.01	1.58	1.24	-	3.79	0.64	1.74
AUG	21-25	0.97	5.70	3.53	4.59	1.02	-	6.22	0.76	9.90
AUG	26-31	1.38	5.77	2.30	3.97	1.22	-	3.12	0.96	9.74
SEP	1-5	0.99	-	3.97	4.55	1.84	-	2.81	0.93	6.20
SEP	6-10	1.53	-	9.70	5.76	2.43	-	1.64	0.98	3.07
SEP	11-15	1.98	-	8.29	5.14	0.99	-	1.16	1.27	1.93
SEP	16-20	1.11	-	2.90	2.59	0.92	-	8.30	1.39	2.32
SEP	21-25	0.96	-	2.82	3.68	0.67	-	4.91	1.49	8.08
SEP	26-30	0.87	-	1.75	4.75	0.45	-	2.29	1.13	42.20
OCT	1-5	0.68	-	1.28	6.46	1.32	-	1.94	0.92	-
OCT	6-10	0.68	-	0.91	11.91	3.55	-	4.32	0.90	-
OCT	11-15	1.05	-	1.21	18.23	4.92	-	3.02	0.92	-
OCT	16-20	2.99	-	2.11	8.67	1.38	-	1.80	0.92	-
OCT	21-25	1.99	-	2.23	13.60	-	-	1.71	0.95	-
OCT	26-31	1.22	-	5.11	5.93	-	-	1.78	0.69	-
NOV	1-5	1.33	-	10.92	5.33	-	-	2.75	0.72	-
NOV	6-10	1.37	2.30	10.01	8.43	-	-	3.37	1.57	-
NOV	11-15	1.53	3.11	8.27	4.69	-	-	3.05	6.31	-
NOV	16-20	2.63	2.11	2.85	8.51	-	-	2.82	5.21	-
NOV	21-25	3.20	2.07	3.02	5.80	-	-	1.64	6.38	-
NOV	26-30	1.62	1.37	27.25	4.60	-	-	1.75	2.67	-
DEC	1-5	1.10	1.05	37.94	2.74	-	-	1.76	1.54	-
DEC	6-10	1.26	1.17	9.45	2.19	-	-	1.38	1.09	-
DEC	11-15	0.87	0.89	3.17	1.85	-	-	1.35	0.98	-
DEC	16-20	0.69	2.20	2.23	1.45	-	-	1.32	0.91	-
DEC	21-25	0.79	2.11	1.55	8.29	-	-	1.20	0.85	-
DEC	26-31	0.64	1.22	2.03	6.33	-	-	0.85	0.66	-
						-				
Mean		2.31	-	3.59	3.85	-	-	3.60	1.54	-

Table D.3.4 5-Day Runoff at Malewa Damsite (1/4)

Unit : m3/s

Month	Date	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
JAN	1-5	0.40	0.56	0.38	0.53	5.45	0.79	0.66	1.69	0.53	0.50
JAN	6-10	0.54	0.54	0.36	0.49	5.08	0.79	0.63	1.23	0.43	0.49
JAN	11-15	1.00	0.45	0.34	0.45	2.13	0.63	0.58	1.05	0.45	0.42
JAN	16-20	0.82	0.39	0.41	0.46	2.41	0.55	0.52	0.89	0.39	0.40
JAN	21-25	1.07	0.37	0.39	0.45	6.06	0.62	0.65	0.74	0.41	0.39
JAN	26-31	1.74	0.37	1.03	0.42	12.59	0.77	0.81	0.96	0.54	0.39
FEB	1-5	1.51	0.36	0.28	0.67	3.28	1.33	0.51	0.65	0.53	0.42
FEB	6-10	0.68	1.08	0.26	0.92	1.88	1.18	0.83	0.57	0.36	0.52
FEB	11-15	0.55	1.07	0.24	0.48	1.23	0.80	3.15	0.59	0.33	0.41
FEB	16-20	0.50	1.07	0.14	0.39	4.08	0.59	5.41	0.55	0.40	0.35
FEB	21-25	0.69	0.38	0.25	0.56	7.70	0.55	1.82	0.51	0.32	0.38
FEB	26-28	0.59	0.38	0.29	0.90	1.54	0.60	0.85	0.61	0.49	0.38
MAR	6-10	0.83	0.38	0.30	0.95	0.82	0.81	0.70	0.70	0.44	0.41
MAR	5-10	0.62	0.37	0.28	0.57	0.87	0.72	0.58	0.59	0.44	0.37
MAR	11-15	0.91	0.39	0.32	0.44	0.69	1.01	0.60	0.50	0.35	0.36
MAR	16-20	1.02	0.33	0.23	0.37	0.68	0.62	9.29	0.41	0.81	0.38
MAR	21-25	0.62	0.35	0.23	0.50	0.71	0.60	7.15	0.63	0.80	0.39
MAR	26-31	4.35	0.32	0.24	0.66	1.00	0.59	1.52	0.80	1.02	0.42
APR	1-5	7.08	1.10	0.49	0.54	1.73	0.65	1.02	0.64	1.16	0.43
APR	6-10	13.38	0.47	1.13	0.42	0.86	0.62	1.17	0.57	1.33	0.78
APR	11-15	5.16	0.80	1.86	1.63	1.46	1.27	0.87	0.82	1.09	1.08
APR	16-20	1.54	0.56	2.19	1.02	1.29	1.58	1.06	1.41	1.07	0.87
APR	21-25	15.18	0.59	0.93	0.89	1.70	3.44	1.12	1.15	1.01	0.76
APR	26-30	7.50	0.91	2.95	1.68	1.70	3.61	2.18	0.80	1.20	0.57
MAY	6-10	6.22	3.98	3.92	1.00	7.33	2.99	12.52	0.99	2.13	1.74
MAY	5-10	6.92	0.91	2.34	1.13	15.72	13.24	16.07	0.96	1.14	2.45
MAY	11-15	8.32	2.13	8.89	2.14	4.94	6.13	33.85	1.03	0.70	1.38
MAY	16-20	4.86	1.54	18.02	1.36	6.25	4.33	10.31	1.77	0.56	1.44
MAY	21-25	3.77	1.59	15.37	1.00	4.68	5.99	5.95	4.72	0.78	0.87
MAY	26-31	6.34	0.53	8.91	0.75	4.42	15.15	4.44	6.44	1.36	1.13
JUN	1-5	8.23	0.59	12.18	0.69	2.66	12.51	2.60	5.46	1.22	1.75
JUN	6-10	4.52	0.86	13.19	0.70	2.24	6.74	2.91	1.96	0.84	1.12
JUN	11-15	2.48	1.14	22.23	0.51	1.72	3.91	2.51	1.16	0.72	1.18
JUN	16-20	4.28	1.15	11.01	0.55	1.40	3.38	2.25	1.06	0.62	0.78
JUN	21-25	5.55	1.19	4.52	0.53	1.63	4.38	6.12	1.06	0.49	0.66
JUN	26-30	2.74	0.86	3.17	0.67	5.85	6.88	6.71	2.41	0.93	0.69
JUL	1-5	8.05	0.79	5.75	0.87	3.12	4.45	4.85	1.31	0.81	0.67
JUL	6-10	8.04	0.59	3.19	0.93	2.17	3.15	4.77	1.07	0.92	0.54
JUL	11-15	3.16	0.58	2.39	0.70	1.70	4.24	6.22	0.86	0.71	0.52
JUL	16-20	2.37	0.47	1.92	0.95	2.53	2.31	22.19	0.77	0.71	0.47
JUL	21-25	1.49	0.40	2.06	1.27	3.73	1.95	9.11	1.31	0.78	0.45
JUL	26-31	1.16	0.42	10.27	1.37	5.09	4.34	8.14	1.54	0.63	0.54
AUG	1-5	1.17	0.48	5.92	1.31	4.40	4.37	4.56	2.01	0.61	0.54
AUG	6-10	1.19	0.58	2.58	1.85	2.61	3.62	3.57	2.65	0.88	1.54
AUG	11-15	2.04	0.75	2.55	2.61	3.34	2.56	2.16	1.62	0.67	3.38
AUG	16-20	2.63	0.90	2.61	3.31	5.51	2.19	4.47	1.92	0.91	3.13
AUG	21-25	4.29	0.71	6.96	6.13	4.92	1.86	2.83	1.50	0.91	2.31
AUG	26-31	5.08	0.55	4.39	6.12	5.46	5.40	3.68	2.28	1.52	1.66
SEP	1-5	2.33	0.53	4.71	15.88	9.76	4.15	2.95	2.73	1.82	3.38
SEP	6-10	2.97	0.46	9.32	3.22	33.26	2.56	2.64	1.95	3.97	2.18
SEP	11-15	6.31	0.55	5.39	2.75	7.09	2.95	1.74	1.60	3.80	2.21
SEP	16-20	4.54	0.64	2.69	1.80	4.43	3.14	2.08	1.39	2.24	2.05
SEP	21-25	5.88	0.55	2.28	3.19	3.55	2.02	1.94	1.14	1.89	3.23
SEP	26-30	5.11	0.41	2.84	6.07	2.35	1.61	1.47	1.27	2.22	2.41
OCT	1-5	3.84	0.43	4.01	15.71	6.61	1.75	1.91	2.40	4.50	1.44
OCT	6-10	3.17	0.39	2.04	9.90	10.76	3.18	5.23	2.56	2.29	2.86
OCT	11-15	7.61	1.26	1.41	6.62	7.66	1.39	10.10	1.97	1.78	4.19
OCT	16-20	6.27	1.32	1.30	4.83	4.03	1.41	3.56	1.26	1.39	6.91
OCT	21-25	2.95	1.25	1.61	3.64	4.31	0.93	3.49	1.09	1.05	5.94
OCT	26-31	2.42	1.33	2.82	2.90	6.92	1.71	2.18	0.98	1.59	6.43
NOV	1-5	1.46	1.35	2.42	2.53	3.65	1.32	1.48	1.44	3.38	7.89
NOV	6-10	2.21	0.87	1.49	3.56	7.96	1.28	1.75	1.81	3.56	10.80
NOV	11-15	1.31	0.86	1.15	4.77	3.57	1.52	1.36	1.09	3.11	34.13
NOV	16-20	1.51	0.99	0.99	3.09	2.41	1.61	1.58	0.97	2.14	51.34
NOV	21-25	1.41	0.79	0.89	2.52	2.47	1.17	1.51	0.83	2.11	30.67
NOV	26-30	1.61	1.29	0.89	1.67	1.56	1.14	1.52	1.30	1.46	43.64
DEC	1-5	1.11	0.75	1.51	1.54	1.39	1.59	1.04	1.15	1.11	16.10
DEC	6-10	0.88	0.63	1.38	1.17	1.75	1.20	0.95	0.67	0.92	13.27
DEC	11-15	0.78	0.63	0.92	1.03	1.37	1.08	1.14	0.56	0.75	28.46
DEC	16-20	0.75	0.54	0.86	3.30	1.14	0.81	4.35	0.94	0.71	10.58
DEC	21-25	0.65	0.65	0.74	7.27	2.10	0.79	11.71	0.75	0.94	10.77
DEC	26-31	0.61	0.53	0.60	5.01	0.79	0.81	3.49	0.66	0.62	29.78
Mean		3.35	0.78	3.39	2.34	4.18	2.67	4.13	1.38	1.21	5.19

Table D.3.4 5-Day Runoff at Malewa Damsite (2/4)

Unit : m3/s

Month	Date	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
JAN	1-5	19.69	2.61	1.36	1.46	0.64	0.64	0.74	0.49	0.40	0.70
JAN	6-10	20.42	2.26	2.14	2.24	0.57	0.52	0.69	0.42	0.54	0.53
JAN	11-15	7.87	2.23	1.44	1.15	0.58	0.47	0.59	0.37	1.00	0.49
JAN	16-20	5.51	5.29	1.12	0.84	0.52	0.47	0.53	0.35	0.82	0.81
JAN	21-25	3.38	2.57	1.05	0.77	0.66	0.46	0.54	0.49	1.07	0.58
JAN	26-31	2.53	1.95	0.84	0.84	0.70	0.42	0.51	0.98	1.74	0.52
FEB	1-5	1.70	1.27	0.66	0.66	0.57	0.38	0.49	2.32	1.51	0.51
FEB	6-10	1.27	1.29	0.68	0.72	0.50	0.42	0.55	1.45	0.68	0.46
FEB	11-15	0.91	1.65	0.73	0.60	0.71	0.44	0.58	1.41	0.55	0.40
FEB	16-20	0.79	1.36	0.59	0.51	0.71	0.36	0.73	1.14	0.50	0.38
FEB	21-25	0.71	0.90	0.62	0.49	0.55	0.31	1.28	0.93	0.69	0.36
FEB	26-28	0.68	1.05	0.65	0.47	0.61	0.29	1.56	1.15	0.59	0.32
MAR	6-10	0.81	1.06	1.53	0.49	0.59	0.44	6.84	1.18	0.83	0.32
MAR	5-10	0.71	0.98	2.10	0.57	0.62	0.46	7.59	0.98	0.62	0.30
MAR	11-15	0.68	0.82	0.88	0.48	0.53	0.38	3.23	0.86	0.91	0.34
MAR	16-20	1.26	2.16	0.87	0.50	0.73	0.53	1.87	0.65	1.02	0.36
MAR	21-25	1.21	1.18	1.53	0.53	0.98	0.43	6.26	0.71	0.62	0.36
MAR	26-31	0.88	1.17	2.15	0.83	0.85	0.35	4.69	0.90	4.35	0.38
APR	1-5	1.02	1.13	12.66	0.62	0.94	0.50	14.22	0.72	7.08	0.42
APR	6-10	1.40	0.74	1.46	0.84	1.39	0.72	6.19	0.61	13.38	0.46
APR	11-15	2.51	0.93	4.42	1.35	1.98	1.32	1.65	0.74	5.16	0.55
APR	16-20	1.64	3.23	4.36	1.27	3.41	1.32	1.86	0.83	1.54	1.28
APR	21-25	2.47	10.08	27.30	1.69	7.25	0.70	49.15	0.64	15.18	1.09
APR	26-30	3.78	38.78	17.54	2.68	8.67	1.04	92.55	0.53	7.50	1.92
MAY	6-10	10.45	21.18	8.63	3.92	12.03	1.29	16.82	2.12	6.22	3.89
MAY	5-10	35.08	15.00	9.59	6.21	5.65	9.37	7.04	3.02	6.92	3.73
MAY	11-15	21.81	21.23	15.15	4.39	1.74	30.00	4.04	6.96	8.32	4.02
MAY	16-20	10.31	21.56	11.81	4.27	1.21	4.21	1.84	6.05	4.86	8.70
MAY	21-25	4.20	17.36	6.12	8.08	1.31	6.90	1.38	1.60	3.77	3.45
MAY	26-31	5.21	37.21	2.71	2.42	1.39	5.93	1.61	1.25	6.34	6.06
JUN	1-5	3.27	22.25	2.83	1.32	1.01	6.14	1.96	0.79	8.23	9.00
JUN	6-10	3.01	25.85	3.35	1.08	0.90	3.41	1.28	0.74	4.52	10.87
JUN	11-15	3.94	8.55	2.71	0.86	1.72	5.75	1.42	0.74	2.48	3.44
JUN	16-20	6.81	3.74	5.18	0.72	1.88	4.41	3.59	0.73	4.28	1.82
JUN	21-25	7.60	2.19	1.60	1.06	1.22	4.10	2.70	0.64	5.55	1.32
JUN	26-30	7.66	1.89	1.87	1.79	0.95	3.05	1.61	0.57	2.74	1.48
JUL	1-5	4.71	1.97	2.78	1.46	0.78	2.59	1.05	0.58	8.05	2.81
JUL	6-10	4.24	1.84	2.31	2.24	0.82	2.83	1.10	0.73	8.04	2.82
JUL	11-15	2.84	1.44	1.83	1.15	0.93	3.35	0.99	0.80	3.16	4.10
JUL	16-20	2.77	1.13	1.91	0.84	0.93	5.53	0.80	0.67	2.37	6.05
JUL	21-25	2.68	0.99	1.78	0.77	0.94	9.32	0.73	0.65	1.49	3.38
JUL	26-31	2.15	1.06	4.66	0.84	1.79	3.50	1.04	0.64	1.16	2.33
AUG	1-5	1.87	1.08	4.83	0.66	1.33	2.18	0.96	0.68	1.17	3.00
AUG	6-10	2.18	1.19	10.46	0.72	1.21	2.61	1.01	0.57	1.19	4.07
AUG	11-15	2.22	1.29	5.10	0.60	1.21	2.27	1.03	0.57	2.04	5.94
AUG	16-20	2.26	2.40	3.07	0.51	1.22	1.98	1.98	0.75	2.63	7.22
AUG	21-25	1.78	2.30	2.59	0.49	1.13	3.23	1.88	0.73	4.29	10.07
AUG	26-31	2.47	2.96	2.81	0.47	3.24	1.95	1.51	0.63	5.08	15.88
SEP	1-5	2.33	2.32	3.23	0.49	9.09	1.52	0.97	1.15	2.33	8.71
SEP	6-10	4.74	1.74	2.30	0.57	5.98	1.39	0.76	1.19	2.97	4.50
SEP	11-15	10.89	1.23	2.09	0.48	5.94	1.14	0.66	2.13	6.31	3.62
SEP	16-20	11.93	1.04	3.28	0.50	1.99	1.24	0.73	2.69	4.54	2.46
SEP	21-25	10.59	1.02	4.71	0.53	1.41	1.26	0.61	1.87	5.88	2.45
SEP	26-30	13.00	0.93	3.69	0.83	2.30	1.86	0.57	1.20	5.11	2.62
OCT	1-5	5.22	1.01	5.36	0.62	1.90	1.39	0.55	0.91	3.84	3.35
OCT	6-10	3.67	0.97	6.72	0.84	2.86	1.12	0.58	0.76	3.17	2.47
OCT	11-15	3.92	1.44	7.98	1.35	3.66	1.12	0.56	1.06	7.61	1.79
OCT	16-20	11.51	1.30	6.80	1.27	1.58	2.81	0.55	3.56	6.27	1.54
OCT	21-25	16.62	0.71	3.47	1.69	1.50	4.79	0.48	0.81	2.95	1.34
OCT	26-31	14.58	0.61	2.76	2.68	1.42	4.24	1.32	0.60	2.42	2.15
NOV	1-5	5.76	0.90	1.99	3.92	5.29	1.94	1.36	0.75	1.46	2.21
NOV	6-10	4.60	0.84	1.80	6.21	9.41	1.52	1.71	0.59	2.21	1.49
NOV	11-15	2.58	0.63	2.16	4.39	5.69	1.19	1.05	0.64	1.31	1.46
NOV	16-20	1.98	0.83	2.67	4.27	2.98	2.29	0.96	0.71	1.51	1.05
NOV	21-25	1.90	1.62	1.65	8.08	4.53	2.91	2.48	1.12	1.41	0.95
NOV	26-30	3.80	1.71	1.79	2.42	3.41	3.89	2.19	0.87	1.61	1.11
DEC	1-5	4.82	3.39	1.19	1.32	1.62	5.59	3.11	0.77	1.11	1.05
DEC	6-10	2.39	22.91	1.44	1.08	1.26	2.68	1.81	0.57	0.88	0.79
DEC	11-15	1.74	20.66	1.15	0.86	1.03	1.33	1.03	0.55	0.78	0.68
DEC	16-20	1.47	4.23	1.10	0.72	0.96	1.05	0.77	0.46	0.75	0.89
DEC	21-25	1.16	2.59	1.14	1.06	0.77	0.90	1.12	0.43	0.65	1.50
DEC	26-31	3.70	16.06	1.13	1.79	0.62	0.91	0.54	0.40	0.61	1.63
Mean		5.28	5.49	3.83	1.63	2.21	2.63	4.04	1.11	3.35	2.65

Table D.3.4 5-Day Runoff at Malewa Damsite (3/4)

Unit : m3/s

Month	Date	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
JAN	1-5	1.05	0.77	0.45	0.64	0.59	1.27	7.34	1.37	0.62	0.56
JAN	6-10	0.89	0.90	0.46	0.52	0.58	0.94	1.59	1.04	0.56	0.49
JAN	11-15	0.86	0.85	0.45	0.50	0.52	0.64	1.24	0.79	0.53	0.41
JAN	16-20	0.63	2.41	0.40	0.46	0.46	0.67	5.12	0.73	0.49	0.38
JAN	21-25	0.56	1.14	0.35	0.43	0.43	0.55	10.92	0.78	0.46	0.34
JAN	26-31	0.52	0.69	0.33	0.42	0.41	0.65	2.24	1.32	0.61	0.26
FEB	1-5	0.57	0.52	0.32	0.43	0.38	0.57	1.21	19.65	0.67	0.25
FEB	6-10	2.07	0.46	0.33	0.36	0.40	0.50	0.83	36.80	0.50	0.24
FEB	11-15	2.39	0.62	0.32	0.36	0.39	0.39	0.88	26.62	0.51	0.24
FEB	16-20	1.28	1.46	0.40	0.34	0.38	0.36	0.95	14.62	0.39	0.63
FEB	21-25	0.76	1.51	0.39	0.33	0.38	0.61	3.43	5.79	0.39	1.04
FEB	26-28	1.87	1.00	0.31	0.42	0.40	0.75	4.23	3.84	0.91	1.01
MAR	6-10	2.09	0.69	0.50	0.39	0.41	0.50	1.71	1.27	1.43	0.97
MAR	5-10	0.87	0.50	0.81	0.39	0.52	0.47	5.75	1.17	1.42	0.37
MAR	11-15	0.68	0.42	0.38	0.37	0.36	0.65	7.72	1.08	1.91	0.31
MAR	16-20	0.63	0.39	0.40	0.40	0.31	0.62	20.59	1.25	1.10	0.46
MAR	21-25	0.61	0.40	0.58	0.42	0.33	0.91	11.13	2.58	0.86	1.28
MAR	26-31	0.54	0.38	0.73	0.34	0.64	0.64	15.05	1.44	0.86	1.77
APR	1-5	0.51	0.33	1.21	0.40	0.54	0.75	17.94	4.22	0.43	4.57
APR	6-10	0.54	0.32	1.09	0.35	0.56	3.40	36.12	5.41	0.62	4.31
APR	11-15	0.82	0.36	3.76	0.51	1.09	14.90	27.25	5.13	1.13	23.28
APR	16-20	0.89	1.32	10.99	1.10	0.75	8.85	17.65	6.71	1.32	26.00
APR	21-25	0.81	0.89	6.06	2.08	0.52	3.15	2.30	8.99	3.42	3.37
APR	26-30	0.49	0.93	3.66	0.76	0.91	17.77	4.57	10.52	1.12	2.42
MAY	6-10	0.82	0.64	3.29	0.50	0.68	35.72	35.53	8.42	1.46	2.96
MAY	5-10	1.29	0.83	1.20	0.59	0.72	31.85	11.52	10.03	14.22	10.06
MAY	11-15	0.92	0.71	1.14	0.49	0.74	28.50	3.72	9.42	8.51	23.62
MAY	16-20	0.96	0.52	1.33	2.07	0.71	16.30	5.19	6.58	12.25	32.90
MAY	21-25	0.68	0.49	1.52	2.07	0.99	6.62	3.20	14.44	7.09	13.62
MAY	26-31	0.75	1.42	1.04	3.16	1.53	3.88	2.72	12.26	9.17	5.83
JUN	1-5	0.94	5.38	4.14	3.03	0.74	2.36	2.50	4.39	5.10	5.83
JUN	6-10	1.03	2.17	2.16	1.49	0.70	2.48	1.47	3.22	4.13	3.95
JUN	11-15	1.11	2.19	1.78	0.95	0.85	3.07	1.56	9.25	3.10	2.12
JUN	16-20	2.60	1.03	1.16	1.01	0.60	3.68	2.48	4.94	1.95	1.68
JUN	21-25	3.89	1.09	6.08	1.33	1.69	2.00	2.66	5.94	17.61	1.94
JUN	26-30	5.48	0.80	5.28	6.56	1.46	2.95	2.19	7.40	24.29	5.52
JUL	1-5	2.20	0.83	13.90	1.41	1.43	2.66	3.22	12.32	5.56	5.41
JUL	6-10	1.22	1.06	15.97	0.92	1.73	7.06	4.30	8.17	5.57	5.41
JUL	11-15	1.04	0.81	8.92	1.27	3.95	18.95	3.49	5.88	4.49	5.41
JUL	16-20	0.96	0.93	4.39	2.85	3.59	7.31	2.74	4.98	2.07	5.41
JUL	21-25	0.93	0.72	3.96	4.43	1.64	2.51	2.06	3.62	1.50	5.41
JUL	26-31	1.24	1.22	4.43	4.08	1.20	2.72	1.75	6.22	1.19	5.41
AUG	1-5	1.60	1.53	7.10	1.68	1.05	4.26	2.81	3.82	1.25	5.32
AUG	6-10	1.95	4.29	7.29	2.37	2.20	6.72	3.80	3.04	1.29	5.49
AUG	11-15	2.40	3.69	4.34	3.04	2.67	3.85	2.34	7.49	1.03	7.48
AUG	16-20	4.52	1.60	4.20	6.49	2.30	2.09	1.92	7.21	0.92	7.42
AUG	21-25	7.69	1.24	7.37	15.51	1.79	1.94	2.64	5.88	0.84	4.97
AUG	26-31	3.56	0.92	8.75	6.77	5.31	1.87	2.54	2.94	1.20	5.03
SEP	1-5	1.69	1.66	8.60	4.97	5.65	3.37	6.95	3.03	0.86	10.83
SEP	6-10	1.55	1.36	17.13	23.40	4.45	3.05	4.37	3.50	1.34	5.61
SEP	11-15	1.18	1.35	6.42	4.60	2.78	4.07	5.15	3.13	1.73	4.63
SEP	16-20	1.05	1.15	6.53	4.21	2.64	4.43	3.85	2.50	0.97	4.42
SEP	21-25	1.10	2.17	5.34	3.61	1.35	2.60	4.74	5.65	0.84	7.56
SEP	26-30	1.28	3.43	7.23	5.30	1.26	1.71	15.48	3.90	0.76	15.95
OCT	1-5	1.03	2.21	10.88	6.79	1.52	1.18	10.29	3.59	0.59	10.83
OCT	6-10	1.24	1.49	7.83	9.95	1.75	0.94	4.39	3.23	0.59	4.70
OCT	11-15	0.83	1.12	4.21	7.84	0.98	0.87	3.11	1.95	0.92	4.05
OCT	16-20	3.36	1.69	3.60	11.40	2.29	0.80	2.47	1.48	2.61	3.04
OCT	21-25	2.73	1.28	6.22	6.61	1.83	1.37	2.24	1.49	1.73	3.51
OCT	26-31	4.51	1.41	4.29	21.62	1.37	2.96	2.45	1.61	1.06	5.98
NOV	1-5	4.94	1.22	2.55	4.81	0.79	3.16	6.56	1.51	1.16	6.93
NOV	6-10	3.02	1.56	3.24	2.06	1.04	2.93	5.63	1.99	1.20	2.01
NOV	11-15	8.60	3.06	4.94	1.43	0.85	3.63	4.94	1.82	1.33	2.72
NOV	16-20	4.01	1.65	3.11	1.68	0.62	8.02	2.64	1.73	2.29	1.84
NOV	21-25	3.40	1.75	3.90	1.49	0.67	12.86	3.38	1.75	2.79	1.81
NOV	26-30	8.57	1.15	2.76	1.30	1.09	14.65	1.94	1.15	1.42	1.20
DEC	1-5	2.81	0.87	1.42	0.93	1.39	3.25	1.58	1.07	0.96	0.92
DEC	6-10	1.68	0.70	1.11	1.63	0.78	1.86	1.80	0.94	1.10	1.02
DEC	11-15	1.32	0.59	0.95	0.88	0.68	1.48	1.40	0.82	0.76	0.78
DEC	16-20	1.28	0.52	0.84	0.76	0.79	1.35	1.37	0.74	0.60	1.92
DEC	21-25	1.06	0.55	0.70	0.61	0.68	14.00	1.57	0.69	0.69	1.84
DEC	26-31	0.84	0.50	0.65	0.50	0.59	19.15	1.61	0.74	0.56	1.06
Mean		1.89	1.25	3.75	2.99	1.25	5.22	5.78	5.29	2.60	4.98

Table D.3.4 5-Day Runoff at Malewa Damsite (4/4)

Unit : m3/s

Month	Date	1982	1983	1984	1985	1986	1987	1988
JAN	1-5	1.27	1.56	2.00	1.05	0.51	0.66	0.51
JAN	6-10	0.71	1.00	2.69	1.05	0.64	0.69	0.46
JAN	11-15	0.62	0.68	2.31	1.05	0.57	0.55	0.47
JAN	16-20	0.86	0.40	1.97	0.44	0.50	0.46	0.74
JAN	21-25	0.68	0.68	1.75	0.46	0.44	0.44	0.83
JAN	26-31	0.52	1.10	1.63	0.53	0.46	0.44	0.71
FEB	1-5	0.46	1.02	1.63	0.50	0.44	0.44	0.38
FEB	6-10	0.46	0.73	1.55	1.44	0.44	0.47	0.34
FEB	11-15	0.52	0.83	1.43	1.06	0.44	0.53	0.34
FEB	16-20	0.77	0.94	1.43	0.49	0.45	0.52	0.34
FEB	21-25	0.49	0.61	1.43	0.37	0.43	0.51	0.35
FEB	26-28	0.45	0.48	1.43	0.40	0.40	0.56	0.35
MAR	6-10	0.40	0.50	1.43	0.45	0.40	0.61	0.43
MAR	5-10	0.43	0.40	1.43	0.45	0.49	0.97	0.44
MAR	11-15	0.44	0.63	1.43	0.41	0.44	1.22	0.46
MAR	16-20	0.44	0.57	1.43	0.43	0.44	1.26	0.49
MAR	21-25	0.44	0.96	1.43	1.18	0.45	0.83	0.70
MAR	26-31	0.43	0.93	1.43	2.16	0.44	0.87	0.55
APR	1-5	0.59	2.10	1.07	1.76	0.44	0.94	0.85
APR	6-10	1.16	2.60	0.92	3.24	0.56	1.06	1.14
APR	11-15	0.84	1.44	0.73	4.08	0.65	0.83	22.03
APR	16-20	0.91	3.92	0.83	15.28	0.77	0.46	37.33
APR	21-25	1.84	6.02	0.70	10.40	2.31	0.57	53.32
APR	26-30	2.57	8.71	1.07	10.27	50.51	1.10	66.24
MAY	6-10	2.64	10.93	0.65	8.12	25.19	1.68	26.92
MAY	5-10	2.94	8.07	0.65	2.01	33.75	1.70	14.67
MAY	11-15	1.29	4.99	0.59	3.02	3.32	1.06	9.93
MAY	16-20	1.57	4.42	0.51	14.23	2.32	0.86	10.34
MAY	21-25	7.37	3.83	0.51	14.82	2.07	2.04	5.97
MAY	26-31	3.10	1.30	0.48	6.30	2.03	2.74	4.01
JUN	1-5	2.42	1.05	0.47	5.52	1.65	2.46	3.09
JUN	6-10	3.03	0.72	0.47	4.28	2.00	10.32	6.50
JUN	11-15	1.95	0.83	0.45	3.61	2.49	6.55	9.47
JUN	16-20	2.00	1.02	0.48	6.47	2.90	2.83	3.58
JUN	21-25	3.21	1.24	0.50	5.21	4.06	1.24	3.24
JUN	26-30	1.68	3.47	0.45	2.26	2.64	1.08	2.60
JUL	1-5	1.22	2.26	0.46	1.62	2.07	1.06	2.15
JUL	6-10	0.91	1.18	0.47	1.24	1.74	0.94	2.45
JUL	11-15	2.91	1.20	0.46	2.77	2.64	0.98	3.80
JUL	16-20	2.18	1.86	0.67	5.32	1.13	0.90	8.16
JUL	21-25	1.27	4.16	1.14	2.75	1.21	0.70	6.71
JUL	26-31	0.60	4.83	1.36	1.21	1.88	0.73	2.01
AUG	1-5	3.30	2.01	0.99	1.21	1.67	0.72	1.85
AUG	6-10	6.42	1.36	0.81	2.18	1.21	0.65	5.81
AUG	11-15	6.79	1.06	0.95	1.57	1.49	0.58	5.14
AUG	16-20	2.62	1.38	1.08	1.30	3.30	0.55	1.52
AUG	21-25	3.08	4.00	0.89	1.16	5.42	0.66	8.64
AUG	26-31	2.00	3.46	1.06	1.13	2.72	0.83	8.50
SEP	1-5	3.46	3.97	1.60	1.13	2.45	0.81	5.41
SEP	6-10	8.46	5.02	2.12	1.13	1.43	0.85	2.68
SEP	11-15	7.23	4.49	0.86	1.13	1.01	1.11	1.69
SEP	16-20	2.53	2.26	0.80	1.13	7.24	1.21	2.02
SEP	21-25	2.46	3.21	0.58	1.34	4.28	1.30	7.05
SEP	26-30	1.53	4.14	0.39	1.53	2.00	0.99	36.81
OCT	1-5	1.12	5.63	1.15	1.53	1.69	0.80	-
OCT	6-10	0.79	10.39	3.10	1.53	3.77	0.79	-
OCT	11-15	1.06	15.90	4.29	1.53	2.63	0.80	-
OCT	16-20	1.84	7.56	1.20	1.53	1.57	0.80	-
OCT	21-25	1.94	11.86	1.74	1.53	1.49	0.83	-
OCT	26-31	4.46	5.17	1.74	1.53	1.55	0.60	-
NOV	1-5	9.53	4.65	1.74	1.53	2.40	0.62	-
NOV	6-10	8.73	7.36	1.74	9.51	2.94	1.37	-
NOV	11-15	7.21	4.09	1.74	10.05	2.66	5.50	-
NOV	16-20	2.48	7.43	1.74	14.95	2.46	4.54	-
NOV	21-25	2.64	5.06	2.26	14.55	1.43	5.57	-
NOV	26-30	23.77	4.01	2.70	11.31	1.53	2.33	-
DEC	1-5	33.10	2.39	3.24	7.62	1.54	1.34	-
DEC	6-10	8.24	1.91	2.41	7.02	1.21	0.95	-
DEC	11-15	2.76	1.61	7.03	4.57	1.18	0.85	-
DEC	16-20	1.94	1.26	2.84	8.09	1.15	0.79	-
DEC	21-25	1.35	7.23	1.97	8.35	1.05	0.74	-
DEC	26-31	1.77	5.52	1.63	4.23	0.74	0.58	-
Mean		3.13	3.36	1.42	3.84	3.14	1.35	-

Table D.3.5 5-Day Runoff at Turasha Damsite (1/4)

Unit : m3/s

Month	Date	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961
JAN	1-5	0.45	0.62	0.43	0.59	6.10	0.88	0.74	1.89	0.59	0.56
JAN	6-10	0.61	0.60	0.41	0.55	5.69	0.89	0.71	1.38	0.48	0.54
JAN	11-15	1.12	0.51	0.39	0.50	2.38	0.71	0.65	1.18	0.50	0.47
JAN	16-20	0.91	0.44	0.45	0.52	2.70	0.62	0.59	1.00	0.43	0.45
JAN	21-25	1.20	0.41	0.44	0.51	6.78	0.69	0.73	0.83	0.45	0.44
JAN	26-31	1.95	0.41	1.15	0.47	14.10	0.86	0.90	1.08	0.61	0.43
FEB	1-5	1.69	0.40	0.31	0.75	3.67	1.49	0.57	0.73	0.59	0.47
FEB	6-10	0.77	1.20	0.29	1.03	2.10	1.32	0.93	0.64	0.40	0.59
FEB	11-15	0.62	1.20	0.27	0.54	1.37	0.89	3.53	0.66	0.37	0.46
FEB	16-20	0.56	1.20	0.16	0.44	4.57	0.66	6.05	0.61	0.45	0.39
FEB	21-25	0.77	0.43	0.29	0.63	8.62	0.61	2.04	0.58	0.36	0.43
FEB	26-28	0.66	0.43	0.33	1.00	1.72	0.67	0.95	0.69	0.55	0.42
MAR	6-10	0.93	0.43	0.33	1.06	0.92	0.91	0.78	0.78	0.50	0.45
MAR	5-10	0.69	0.41	0.32	0.64	0.97	0.80	0.65	0.66	0.50	0.41
MAR	11-15	1.02	0.44	0.36	0.50	0.78	1.13	0.67	0.56	0.39	0.40
MAR	16-20	1.14	0.37	0.26	0.42	0.76	0.69	10.40	0.46	0.90	0.42
MAR	21-25	0.70	0.39	0.26	0.56	0.80	0.67	8.00	0.71	0.90	0.44
MAR	26-31	4.87	0.36	0.27	0.74	1.12	0.66	1.70	0.89	1.14	0.47
APR	1-5	7.93	1.23	0.55	0.60	1.94	0.73	1.14	0.71	1.30	0.49
APR	6-10	14.99	0.53	1.27	0.47	0.96	0.69	1.31	0.63	1.48	0.88
APR	11-15	5.78	0.89	2.08	1.83	1.63	1.42	0.98	0.92	1.22	1.21
APR	16-20	1.73	0.63	2.46	1.14	1.44	1.77	1.19	1.58	1.20	0.97
APR	21-25	17.00	0.66	1.04	1.00	1.91	3.86	1.25	1.29	1.13	0.85
APR	26-30	8.40	1.02	3.31	1.88	1.90	4.04	2.44	0.89	1.35	0.63
MAY	6-10	6.96	4.45	4.39	1.12	8.21	3.35	14.02	1.11	2.38	1.95
MAY	5-10	7.75	1.01	2.62	1.27	17.60	14.83	17.99	1.07	1.27	2.74
MAY	11-15	9.32	2.39	9.95	2.39	5.54	6.87	37.90	1.15	0.78	1.54
MAY	16-20	5.44	1.72	20.18	1.52	7.00	4.84	11.54	1.98	0.62	1.61
MAY	21-25	4.22	1.78	17.21	1.12	5.24	6.71	6.66	5.28	0.87	0.97
MAY	26-31	7.10	0.60	9.98	0.84	4.95	16.96	4.97	7.21	1.52	1.27
JUN	1-5	9.22	0.66	13.64	0.78	2.98	14.01	2.91	6.11	1.37	1.95
JUN	6-10	5.06	0.96	14.77	0.78	2.50	7.54	3.26	2.19	0.95	1.25
JUN	11-15	2.78	1.27	24.89	0.57	1.92	4.38	2.81	1.30	0.81	1.32
JUN	16-20	4.79	1.29	12.33	0.61	1.57	3.78	2.52	1.19	0.70	0.88
JUN	21-25	6.21	1.34	5.06	0.60	1.82	4.91	6.85	1.19	0.54	0.74
JUN	26-30	3.06	0.96	3.55	0.75	6.55	7.70	7.52	2.70	1.04	0.77
JUL	1-5	9.02	0.89	6.44	0.97	3.50	4.98	5.43	1.47	0.91	0.75
JUL	6-10	9.00	0.66	3.57	1.04	2.43	3.53	5.34	1.20	1.03	0.61
JUL	11-15	3.54	0.65	2.67	0.78	1.91	4.75	6.96	0.96	0.80	0.58
JUL	16-20	2.66	0.53	2.15	1.06	2.83	2.58	24.85	0.87	0.79	0.53
JUL	21-25	1.66	0.45	2.31	1.42	4.18	2.19	10.20	1.47	0.88	0.51
JUL	26-31	1.30	0.47	11.50	1.54	5.70	4.86	9.11	1.73	0.71	0.61
AUG	1-5	1.31	0.54	6.62	1.47	4.93	4.90	5.10	2.25	0.68	0.61
AUG	6-10	1.34	0.65	2.89	2.07	2.93	4.06	3.99	2.97	0.98	1.72
AUG	11-15	2.28	0.84	2.86	2.92	3.74	2.87	2.42	1.81	0.75	3.78
AUG	16-20	2.95	1.00	2.92	3.70	6.17	2.45	5.01	2.15	1.02	3.50
AUG	21-25	4.80	0.79	7.79	6.86	5.51	2.08	3.17	1.68	1.01	2.59
AUG	26-31	5.68	0.61	4.92	6.86	6.12	6.04	4.11	2.55	1.70	1.86
SEP	1-5	2.61	0.59	5.27	17.78	10.92	4.65	3.31	3.06	2.04	3.78
SEP	6-10	3.33	0.52	10.43	3.61	37.24	2.87	2.95	2.18	4.44	2.44
SEP	11-15	7.06	0.62	6.03	3.08	7.94	3.30	1.95	1.80	4.26	2.47
SEP	16-20	5.09	0.72	3.02	2.02	4.96	3.52	2.33	1.56	2.50	2.29
SEP	21-25	6.59	0.62	2.55	3.58	3.97	2.26	2.18	1.27	2.11	3.62
SEP	26-30	5.73	0.45	3.18	6.80	2.63	1.81	1.64	1.42	2.49	2.70
OCT	1-5	4.30	0.48	4.49	17.59	7.41	1.96	2.14	2.69	5.04	1.61
OCT	6-10	3.55	0.44	2.28	11.08	12.05	3.56	5.86	2.86	2.56	3.21
OCT	11-15	8.52	1.41	1.58	7.42	8.58	1.55	11.31	2.20	1.99	4.69
OCT	16-20	7.02	1.47	1.46	5.41	4.52	1.58	3.99	1.41	1.56	7.74
OCT	21-25	3.30	1.40	1.80	4.07	4.82	1.04	3.90	1.22	1.18	6.65
OCT	26-31	2.71	1.49	3.15	3.24	7.74	1.91	2.44	1.10	1.78	7.20
NOV	1-5	1.63	1.51	2.71	2.84	4.09	1.48	1.66	1.61	3.79	8.83
NOV	6-10	2.48	0.98	1.67	3.99	8.92	1.43	1.96	2.02	3.99	12.09
NOV	11-15	1.47	0.97	1.29	5.35	4.00	1.70	1.52	1.22	3.49	38.22
NOV	16-20	1.69	1.11	1.11	3.45	2.70	1.81	1.77	1.09	2.39	57.49
NOV	21-25	1.57	0.89	1.00	2.83	2.77	1.31	1.69	0.93	2.36	34.34
NOV	26-30	1.80	1.44	1.00	1.87	1.75	1.28	1.70	1.46	1.63	48.87
DEC	1-5	1.25	0.84	1.69	1.72	1.55	1.78	1.16	1.29	1.25	18.03
DEC	6-10	0.98	0.70	1.55	1.31	1.96	1.34	1.07	0.75	1.02	14.86
DEC	11-15	0.88	0.71	1.03	1.15	1.53	1.21	1.28	0.63	0.84	31.86
DEC	16-20	0.84	0.60	0.96	3.70	1.27	0.90	4.88	1.05	0.80	11.85
DEC	21-25	0.73	0.73	0.83	8.14	2.35	0.89	13.11	0.84	1.05	12.06
DEC	26-31	0.68	0.59	0.67	5.60	0.89	0.91	3.91	0.74	0.70	33.35
Mean		3.75	0.87	3.80	2.63	4.69	2.98	4.63	1.55	1.35	5.81

Table D.3.5 5-Day Runoff at Turasha Damsite (2/4)

Unit : m3/s

Month	Date	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
JAN	1-5	22.05	2.92	1.52	1.63	0.72	0.71	0.83	0.55	0.45	0.78
JAN	6-10	22.86	2.53	2.40	2.50	0.64	0.59	0.77	0.46	0.61	0.60
JAN	11-15	8.81	2.50	1.61	1.29	0.65	0.53	0.66	0.42	1.12	0.55
JAN	16-20	6.17	5.93	1.26	0.94	0.58	0.52	0.60	0.39	0.91	0.91
JAN	21-25	3.79	2.88	1.18	0.86	0.74	0.51	0.60	0.55	1.20	0.65
JAN	26-31	2.84	2.19	0.94	0.94	0.78	0.48	0.57	1.09	1.95	0.58
FEB	1-5	1.91	1.42	0.73	0.74	0.64	0.43	0.55	2.60	1.69	0.57
FEB	6-10	1.43	1.45	0.76	0.81	0.56	0.47	0.62	1.62	0.77	0.52
FEB	11-15	1.02	1.85	0.81	0.67	0.79	0.49	0.64	1.57	0.62	0.45
FEB	16-20	0.88	1.52	0.66	0.58	0.79	0.40	0.81	1.28	0.56	0.43
FEB	21-25	0.79	1.01	0.69	0.55	0.61	0.34	1.44	1.04	0.77	0.41
FEB	26-28	0.76	1.18	0.73	0.53	0.68	0.33	1.75	1.29	0.66	0.36
MAR	6-10	0.91	1.18	1.71	0.55	0.66	0.49	7.66	1.32	0.93	0.36
MAR	5-10	0.80	1.10	2.36	0.64	0.69	0.52	8.50	1.10	0.69	0.34
MAR	11-15	0.76	0.92	0.99	0.53	0.60	0.43	3.62	0.96	1.02	0.38
MAR	16-20	1.41	2.42	0.97	0.56	0.82	0.60	2.09	0.73	1.14	0.40
MAR	21-25	1.35	1.32	1.72	0.60	1.10	0.48	7.01	0.79	0.70	0.40
MAR	26-31	0.99	1.31	2.41	0.93	0.95	0.39	5.25	1.00	4.87	0.42
APR	1-5	1.14	1.26	14.17	0.69	1.05	0.56	15.92	0.80	7.93	0.47
APR	6-10	1.57	0.83	1.64	0.94	1.55	0.81	6.94	0.69	14.99	0.52
APR	11-15	2.81	1.04	4.95	1.51	2.22	1.48	1.85	0.83	5.78	0.61
APR	16-20	1.84	3.61	4.88	1.42	3.82	1.48	2.08	0.93	1.73	1.43
APR	21-25	2.77	11.29	30.57	1.89	8.12	0.78	55.03	0.72	17.00	1.22
APR	26-30	4.24	43.42	19.64	3.00	9.71	1.17	103.63	0.59	8.40	2.15
MAY	6-10	11.70	23.72	9.66	4.39	13.47	1.44	18.83	2.37	6.96	4.35
MAY	5-10	39.28	16.79	10.74	6.95	6.32	10.49	7.88	3.38	7.75	4.18
MAY	11-15	24.42	23.78	16.96	4.91	1.95	33.59	4.52	7.80	9.32	4.51
MAY	16-20	11.55	24.15	13.22	4.78	1.35	4.72	2.07	6.78	5.44	9.75
MAY	21-25	4.70	19.44	6.85	9.04	1.47	7.72	1.55	1.79	4.22	3.86
MAY	26-31	5.84	41.67	3.03	2.71	1.56	6.64	1.80	1.40	7.10	6.79
JUN	1-5	3.66	24.91	3.17	1.48	1.13	6.87	2.20	0.89	9.22	10.08
JUN	6-10	3.38	28.94	3.75	1.21	1.01	3.81	1.43	0.83	5.06	12.17
JUN	11-15	4.41	9.58	3.04	0.97	1.93	6.43	1.59	0.83	2.78	3.85
JUN	16-20	7.63	4.19	5.80	0.80	2.10	4.94	4.02	0.82	4.79	2.04
JUN	21-25	8.51	2.45	1.79	1.19	1.36	4.59	3.02	0.72	6.21	1.48
JUN	26-30	8.58	2.12	2.09	2.01	1.07	3.42	1.80	0.64	3.06	1.66
JUL	1-5	5.28	2.21	3.11	1.63	0.87	2.90	1.18	0.65	9.02	3.14
JUL	6-10	4.74	2.05	2.59	2.50	0.92	3.17	1.23	0.82	9.00	3.16
JUL	11-15	3.18	1.61	2.05	1.29	1.04	3.75	1.10	0.90	3.54	4.59
JUL	16-20	3.10	1.26	2.14	0.94	1.04	6.20	0.89	0.75	2.66	6.77
JUL	21-25	3.00	1.10	1.99	0.86	1.05	10.43	0.82	0.72	1.66	3.78
JUL	26-31	2.41	1.19	5.22	0.94	2.01	3.91	1.17	0.71	1.30	2.61
AUG	1-5	2.09	1.21	5.41	0.74	1.49	2.44	1.08	0.76	1.31	3.36
AUG	6-10	2.45	1.33	11.72	0.81	1.36	2.92	1.13	0.64	1.34	4.56
AUG	11-15	2.48	1.45	5.71	0.67	1.36	2.55	1.15	0.64	2.28	6.65
AUG	16-20	2.53	2.68	3.43	0.58	1.36	2.22	2.22	0.84	2.95	8.09
AUG	21-25	1.99	2.57	2.90	0.55	1.26	3.61	2.11	0.82	4.80	11.28
AUG	26-31	2.77	3.32	3.14	0.53	3.62	2.18	1.69	0.71	5.68	17.79
SEP	1-5	2.61	2.60	3.61	0.55	10.18	1.70	1.08	1.29	2.61	9.75
SEP	6-10	5.31	1.95	2.58	0.64	6.70	1.56	0.85	1.33	3.33	5.04
SEP	11-15	12.19	1.38	2.34	0.53	6.65	1.28	0.74	2.39	7.06	4.05
SEP	16-20	13.36	1.17	3.67	0.56	2.23	1.39	0.82	3.02	5.09	2.75
SEP	21-25	11.86	1.14	5.28	0.60	1.57	1.41	0.68	2.09	6.59	2.74
SEP	26-30	14.55	1.05	4.13	0.93	2.58	2.08	0.64	1.34	5.73	2.93
OCT	1-5	5.85	1.13	6.01	0.69	2.13	1.55	0.62	1.02	4.30	3.75
OCT	6-10	4.11	1.08	7.53	0.94	3.20	1.25	0.65	0.85	3.55	2.77
OCT	11-15	4.39	1.61	8.94	1.51	4.09	1.26	0.62	1.19	8.52	2.00
OCT	16-20	12.89	1.45	7.61	1.42	1.77	3.15	0.61	3.99	7.02	1.73
OCT	21-25	18.61	0.80	3.88	1.89	1.68	5.37	0.54	0.91	3.30	1.50
OCT	26-31	16.33	0.68	3.10	3.00	1.59	4.75	1.48	0.68	2.71	2.40
NOV	1-5	6.45	1.01	2.22	4.39	5.93	2.17	1.52	0.83	1.63	2.48
NOV	6-10	5.15	0.94	2.02	6.95	10.54	1.70	1.91	0.67	2.48	1.66
NOV	11-15	2.89	0.70	2.42	4.91	6.37	1.33	1.17	0.72	1.47	1.64
NOV	16-20	2.22	0.93	2.99	4.78	3.34	2.57	1.08	0.79	1.69	1.18
NOV	21-25	2.13	1.81	1.85	9.04	5.07	3.25	2.77	1.25	1.57	1.07
NOV	26-30	4.25	1.92	2.01	2.71	3.82	4.35	2.46	0.97	1.80	1.24
DEC	1-5	5.40	3.79	1.34	1.48	1.81	6.26	3.49	0.86	1.25	1.18
DEC	6-10	2.68	25.65	1.62	1.21	1.41	3.00	2.02	0.64	0.98	0.88
DEC	11-15	1.95	23.13	1.29	0.97	1.15	1.49	1.15	0.62	0.88	0.76
DEC	16-20	1.64	4.74	1.24	0.80	1.07	1.18	0.86	0.52	0.84	1.00
DEC	21-25	1.30	2.90	1.28	1.19	0.86	1.00	1.25	0.49	0.73	1.68
DEC	26-31	4.15	17.98	1.27	2.01	0.69	1.02	0.60	0.45	0.68	1.82
Mean		5.91	6.14	4.29	1.83	2.47	2.94	4.52	1.24	3.75	2.97

Table D.3.5 5-Day Runoff at Turasha Damsite (3/4)

Unit : m3/s

Month	Date	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
JAN	1-5	1.18	0.86	0.51	0.71	0.66	1.42	8.21	1.54	0.70	0.63
JAN	6-10	1.00	1.01	0.51	0.58	0.65	1.06	1.78	1.17	0.63	0.55
JAN	11-15	0.97	0.95	0.50	0.55	0.58	0.72	1.38	0.89	0.60	0.46
JAN	16-20	0.71	2.70	0.44	0.51	0.52	0.74	5.73	0.81	0.55	0.42
JAN	21-25	0.63	1.28	0.40	0.48	0.48	0.62	12.22	0.88	0.51	0.39
JAN	26-31	0.59	0.77	0.37	0.47	0.46	0.73	2.51	1.48	0.68	0.29
FEB	1-5	0.64	0.58	0.36	0.48	0.42	0.64	1.36	22.00	0.76	0.28
FEB	6-10	2.32	0.52	0.37	0.40	0.44	0.56	0.93	41.21	0.56	0.27
FEB	11-15	2.68	0.70	0.36	0.40	0.44	0.44	0.98	29.81	0.57	0.27
FEB	16-20	1.43	1.63	0.45	0.39	0.43	0.41	1.06	16.37	0.43	0.70
FEB	21-25	0.86	1.69	0.43	0.37	0.42	0.68	3.84	6.48	0.43	1.17
FEB	26-28	2.10	1.12	0.35	0.47	0.44	0.84	4.73	4.30	1.02	1.13
MAR	6-10	2.34	0.77	0.56	0.44	0.46	0.56	1.92	1.43	1.60	1.08
MAR	5-10	0.97	0.56	0.91	0.43	0.58	0.53	6.43	1.31	1.59	0.41
MAR	11-15	0.76	0.47	0.43	0.42	0.40	0.73	8.65	1.21	2.14	0.35
MAR	16-20	0.70	0.44	0.45	0.45	0.34	0.69	23.06	1.41	1.24	0.51
MAR	21-25	0.69	0.45	0.65	0.48	0.36	1.02	12.47	2.88	0.97	1.44
MAR	26-31	0.60	0.42	0.81	0.38	0.72	0.72	16.85	1.61	0.96	1.98
APR	1-5	0.57	0.37	1.35	0.44	0.60	0.84	20.09	4.72	0.48	5.12
APR	6-10	0.60	0.36	1.23	0.39	0.63	3.81	40.44	6.05	0.69	4.83
APR	11-15	0.92	0.40	4.21	0.57	1.22	16.68	30.51	5.74	1.27	26.06
APR	16-20	1.00	1.48	12.30	1.23	0.84	9.91	19.76	7.51	1.47	29.12
APR	21-25	0.90	1.00	6.78	2.33	0.58	3.53	2.58	10.07	3.83	3.77
APR	26-30	0.55	1.04	4.10	0.85	1.02	19.89	5.12	11.78	1.26	2.71
MAY	6-10	0.92	0.71	3.69	0.56	0.76	40.00	39.78	9.43	1.64	3.32
MAY	5-10	1.44	0.93	1.35	0.66	0.81	35.67	12.90	11.23	15.93	11.27
MAY	11-15	1.03	0.79	1.27	0.55	0.83	31.91	4.16	10.55	9.53	26.45
MAY	16-20	1.07	0.59	1.49	2.32	0.79	18.25	5.81	7.37	13.72	36.84
MAY	21-25	0.76	0.55	1.70	2.32	1.11	7.41	3.59	16.17	7.94	15.25
MAY	26-31	0.84	1.59	1.16	3.54	1.71	4.35	3.05	13.73	10.26	6.52
JUN	1-5	1.05	6.03	4.63	3.39	0.83	2.64	2.80	4.92	5.71	6.52
JUN	6-10	1.15	2.44	2.42	1.67	0.79	2.77	1.65	3.61	4.62	4.42
JUN	11-15	1.25	2.46	1.99	1.06	0.96	3.43	1.74	10.35	3.47	2.37
JUN	16-20	2.91	1.15	1.30	1.13	0.67	4.12	2.78	5.53	2.18	1.88
JUN	21-25	4.36	1.22	6.81	1.49	1.89	2.24	2.98	6.66	19.72	2.17
JUN	26-30	6.13	0.90	5.91	7.35	1.64	3.31	2.45	8.29	27.19	6.18
JUL	1-5	2.46	0.93	15.56	1.58	1.60	2.98	3.60	13.80	6.23	6.06
JUL	6-10	1.37	1.19	17.88	1.03	1.94	7.90	4.81	9.15	6.23	6.06
JUL	11-15	1.17	0.91	9.98	1.42	4.42	21.22	3.91	6.58	5.02	6.06
JUL	16-20	1.07	1.04	4.91	3.19	4.02	8.19	3.07	5.58	2.32	6.06
JUL	21-25	1.04	0.81	4.43	4.96	1.84	2.81	2.31	4.06	1.68	6.06
JUL	26-31	1.39	1.37	4.96	4.57	1.35	3.04	1.96	6.97	1.34	6.06
AUG	1-5	1.80	1.72	7.94	1.89	1.18	4.77	3.15	4.28	1.39	5.96
AUG	6-10	2.19	4.80	8.17	2.66	2.46	7.52	4.25	3.40	1.45	6.15
AUG	11-15	2.69	4.13	4.86	3.41	2.98	4.31	2.62	8.39	1.15	8.37
AUG	16-20	5.07	1.79	4.70	7.26	2.58	2.34	2.15	8.07	1.04	8.30
AUG	21-25	8.61	1.39	8.26	17.36	2.00	2.17	2.96	6.58	0.94	5.56
AUG	26-31	3.98	1.03	9.80	7.58	5.95	2.10	2.85	3.30	1.35	5.63
SEP	1-5	1.89	1.86	9.63	5.56	6.32	3.78	7.78	3.39	0.97	12.12
SEP	6-10	1.74	1.53	19.18	26.20	4.98	3.42	4.90	3.92	1.50	6.28
SEP	11-15	1.32	1.51	7.19	5.15	3.11	4.55	5.77	3.51	1.93	5.19
SEP	16-20	1.18	1.29	7.31	4.71	2.96	4.96	4.31	2.80	1.08	4.95
SEP	21-25	1.23	2.42	5.98	4.05	1.51	2.91	5.31	6.33	0.94	8.47
SEP	26-30	1.43	3.84	8.10	5.94	1.41	1.91	17.34	4.36	0.85	17.85
OCT	1-5	1.15	2.48	12.18	7.60	1.70	1.32	11.52	4.02	0.66	12.13
OCT	6-10	1.39	1.67	8.77	11.14	1.96	1.05	4.91	3.62	0.66	5.26
OCT	11-15	0.93	1.26	4.71	8.78	1.09	0.97	3.48	2.19	1.03	4.54
OCT	16-20	3.77	1.89	4.03	12.77	2.56	0.89	2.76	1.66	2.92	3.41
OCT	21-25	3.06	1.43	6.96	7.41	2.05	1.53	2.51	1.67	1.94	3.93
OCT	26-31	5.05	1.58	4.80	24.20	1.54	3.31	2.74	1.80	1.19	6.69
NOV	1-5	5.53	1.37	2.85	5.38	0.89	3.54	7.34	1.69	1.30	7.76
NOV	6-10	3.38	1.75	3.63	2.30	1.16	3.28	6.31	2.22	1.34	2.25
NOV	11-15	9.63	3.42	5.53	1.60	0.96	4.07	5.53	2.03	1.49	3.04
NOV	16-20	4.49	1.85	3.48	1.88	0.69	8.98	2.96	1.94	2.56	2.06
NOV	21-25	3.80	1.96	4.37	1.67	0.75	14.40	3.78	1.96	3.13	2.02
NOV	26-30	9.60	1.28	3.09	1.46	1.22	16.41	2.17	1.29	1.59	1.34
DEC	1-5	3.15	0.97	1.59	1.04	1.55	3.64	1.77	1.20	1.08	1.03
DEC	6-10	1.88	0.78	1.24	1.83	0.87	2.08	2.02	1.05	1.23	1.14
DEC	11-15	1.48	0.66	1.06	0.99	0.76	1.66	1.56	0.92	0.85	0.87
DEC	16-20	1.43	0.58	0.94	0.85	0.89	1.51	1.54	0.82	0.67	2.15
DEC	21-25	1.18	0.62	0.79	0.68	0.76	15.68	1.76	0.77	0.77	2.06
DEC	26-31	0.94	0.57	0.72	0.56	0.66	21.44	1.81	0.83	0.62	1.19
Mean		2.11	1.40	4.20	3.35	1.40	5.84	6.47	5.93	2.91	5.57

Table D.3.5 5-Day Runoff at Turasha Damsite (4/4)

Unit : m3/s

Month	Date	1982	1983	1984	1985	1986	1987	1988
JAN	1-5	1.42	1.75	2.24	1.17	0.57	0.74	0.57
JAN	6-10	0.80	1.12	3.01	1.17	0.71	0.77	0.52
JAN	11-15	0.69	0.77	2.59	1.17	0.64	0.61	0.53
JAN	16-20	0.96	0.45	2.21	0.49	0.56	0.51	0.83
JAN	21-25	0.76	0.76	1.95	0.52	0.49	0.49	0.93
JAN	26-31	0.59	1.23	1.83	0.59	0.52	0.50	0.80
FEB	1-5	0.51	1.14	1.83	0.56	0.49	0.49	0.42
FEB	6-10	0.52	0.81	1.74	1.61	0.49	0.53	0.38
FEB	11-15	0.58	0.93	1.60	1.19	0.49	0.59	0.38
FEB	16-20	0.87	1.06	1.60	0.55	0.50	0.58	0.38
FEB	21-25	0.55	0.69	1.60	0.42	0.48	0.57	0.39
FEB	26-28	0.50	0.54	1.60	0.44	0.45	0.62	0.39
MAR	6-10	0.44	0.56	1.60	0.50	0.45	0.69	0.48
MAR	5-10	0.49	0.44	1.60	0.50	0.55	1.09	0.49
MAR	11-15	0.50	0.71	1.60	0.45	0.49	1.37	0.51
MAR	16-20	0.49	0.64	1.60	0.48	0.49	1.41	0.55
MAR	21-25	0.49	1.08	1.60	1.32	0.50	0.93	0.79
MAR	26-31	0.49	1.05	1.60	2.42	0.49	0.97	0.62
APR	1-5	0.66	2.35	1.20	1.97	0.49	1.06	0.95
APR	6-10	1.30	2.91	1.03	3.63	0.63	1.18	1.28
APR	11-15	0.94	1.61	0.82	4.57	0.73	0.93	24.67
APR	16-20	1.02	4.39	0.92	17.11	0.86	0.51	41.80
APR	21-25	2.06	6.74	0.78	11.64	2.58	0.64	59.70
APR	26-30	2.88	9.76	1.20	11.50	56.56	1.23	74.17
MAY	6-10	2.95	12.23	0.72	9.09	28.20	1.88	30.14
MAY	5-10	3.29	9.04	0.72	2.25	37.78	1.90	16.42
MAY	11-15	1.44	5.58	0.66	3.38	3.72	1.19	11.11
MAY	16-20	1.76	4.95	0.57	15.94	2.60	0.96	11.58
MAY	21-25	8.25	4.29	0.57	16.59	2.31	2.29	6.68
MAY	26-31	3.47	1.46	0.53	7.05	2.27	3.07	4.49
JUN	1-5	2.71	1.18	0.52	6.19	1.85	2.75	3.46
JUN	6-10	3.39	0.81	0.52	4.79	2.24	11.56	7.28
JUN	11-15	2.18	0.93	0.51	4.04	2.79	7.33	10.60
JUN	16-20	2.24	1.14	0.54	7.24	3.24	3.17	4.01
JUN	21-25	3.60	1.39	0.56	5.83	4.54	1.38	3.62
JUN	26-30	1.89	3.89	0.50	2.53	2.96	1.21	2.91
JUL	1-5	1.37	2.53	0.52	1.81	2.32	1.18	2.40
JUL	6-10	1.02	1.32	0.52	1.39	1.95	1.05	2.74
JUL	11-15	3.26	1.34	0.51	3.10	2.96	1.09	4.25
JUL	16-20	2.44	2.08	0.74	5.95	1.26	1.01	9.13
JUL	21-25	1.42	4.66	1.27	3.08	1.36	0.79	7.51
JUL	26-31	0.68	5.40	1.52	1.36	2.11	0.82	2.25
AUG	1-5	3.69	2.25	1.11	1.36	1.87	0.80	2.08
AUG	6-10	7.19	1.52	0.90	2.44	1.36	0.73	6.50
AUG	11-15	7.60	1.19	1.06	1.76	1.66	0.65	5.75
AUG	16-20	2.94	1.55	1.21	1.46	3.70	0.62	1.70
AUG	21-25	3.45	4.48	1.00	1.30	6.07	0.74	9.67
AUG	26-31	2.24	3.88	1.19	1.26	3.04	0.93	9.51
SEP	1-5	3.88	4.44	1.79	1.26	2.74	0.91	6.05
SEP	6-10	9.47	5.62	2.37	1.26	1.61	0.95	3.00
SEP	11-15	8.09	5.02	0.97	1.26	1.13	1.24	1.89
SEP	16-20	2.83	2.53	0.90	1.26	8.11	1.36	2.26
SEP	21-25	2.75	3.60	0.65	1.51	4.80	1.45	7.90
SEP	26-30	1.71	4.64	0.44	1.71	2.24	1.11	41.21
OCT	1-5	1.25	6.31	1.28	1.71	1.89	0.90	-
OCT	6-10	0.89	11.63	3.47	1.71	4.22	0.88	-
OCT	11-15	1.18	17.80	4.81	1.71	2.95	0.90	-
OCT	16-20	2.06	8.46	1.35	1.71	1.76	0.90	-
OCT	21-25	2.17	13.28	1.95	1.71	1.67	0.93	-
OCT	26-31	4.99	5.79	1.95	1.71	1.74	0.68	-
NOV	1-5	10.67	5.20	1.95	1.71	2.69	0.70	-
NOV	6-10	9.78	8.24	1.95	10.65	3.29	1.54	-
NOV	11-15	8.08	4.58	1.95	11.26	2.98	6.16	-
NOV	16-20	2.78	8.31	1.95	16.74	2.75	5.08	-
NOV	21-25	2.95	5.67	2.54	16.29	1.61	6.23	-
NOV	26-30	26.61	4.49	3.02	12.67	1.71	2.60	-
DEC	1-5	37.06	2.68	3.63	8.53	1.72	1.50	-
DEC	6-10	9.23	2.14	2.70	7.87	1.35	1.06	-
DEC	11-15	3.10	1.81	7.87	5.12	1.32	0.96	-
DEC	16-20	2.18	1.42	3.18	9.06	1.29	0.89	-
DEC	21-25	1.51	8.10	2.21	9.35	1.17	0.83	-
DEC	26-31	1.98	6.18	1.83	4.74	0.83	0.65	-
Mean		3.50	3.76	1.59	4.30	3.51	1.51	-

Table D.4.1 Recorded Floods at 2GC4

Year	Recorded Date	Max. Water Level (ft)	Discharge (cu.m/s)
1954	May. 24	6.03	68.5
1955	Oct.2	4.00	25.2
1956	Apr. 30	5.56	56.0
1957	May. 30	4.65	36.2
1958	May. 13	6.90	96.8
1959	May. 25	3.31	16.0
1960	Oct. 2	3.16	14.3
1961	Nov. 18	10.55	292.0
1962	May.10	8.92	188.0
1963	May. 27	9.75	239.0
1964	Apr. 23	6.40	80.4
1965	May. 7	3.67	20.5
1966	Sept. 4	4.44	32.5
1967	May. 11	8.05	144.0
1968	Apr. 26	10.38	280.0
1969	May. 18	4.40	31.7
1970	Jul. 4	5.74	60.6
1971	Jun. 6	5.07	44.7
1972	Nov. 13	4.57	34.8
1973	Aug. 11	2.60	8.3
1974	Sept. 9	5.35	50.9
1975	Aug. 20	4.76	38.5
1976	Aug. 30	3.43	17.4
1977	Apr. 30	8.99	192.0
1978	May. 3	7.43	118.0
1979	Jun. 24	3.76	21.7
1980	May. 9	6.00	67.4
1981	Apr. 10	6.70	90.3
1982	Dec. 1	6.00	67.4
1983	Oct. 22	5.18	47.3

Table D.5.1 Suspended Loads Measurement Records (1/3)

Date	Discharge (cusecs)	Discharge (cu.m/sec)	Sus.Loads (ton/day)	Date	Discharge (cusecs)	Discharge (cu.m/sec)	Sus. Loads (ton/day)
(1) MOWD's Records							
Year : 1948				Apr.22	105	2.97	14.77
Apr.2	25	0.71	0.36	Apr.20	156	4.41	12.73
				Apr.18	192	5.43	129.76
Year : 1949				Apr.27	56	1.59	0.84
Mar.30	24	0.68	2.52	May.19	67	1.88	5.99
Apr.14	51	1.43	5.57	May.16	62	1.76	3.03
Apr.14	59	1.67	5.54	May.12	58	1.63	6.13
Apr.22	147	4.16	14.08	May.11	68	1.93	10.34
Apr.27	111	3.14	22.41	May.5	49	1.39	3.46
May.26	56	1.59	6.06	May.3	64	1.80	9.04
Jun.8	59	1.67	14.52	May.1	59	1.67	6.42
Jun.17	70	1.97	17.16	Jun.17	135	3.82	43.71
Jun.29	179	5.07	68.91	Jun.14	79	2.24	11.72
Jul.15	137	3.88	36.02	Jun.2	53	1.51	8.30
Aug.16	222	6.28	35.74	Jun.8	59	1.67	7.91
Aug.19	205	5.80	23.62	Jun.27	78	2.20	22.59
Aug.31	670	18.96	63.78	Jun.23	107	3.03	39.05
Aug.31	568	16.07	91.81	Jul.15	345	9.76	240.34
Sep.4	445	12.59	37.96	Jul.20	395	11.18	16.59
Sep.8	260	7.36	12.41	Aug.2	433	12.25	260.47
Sep.20	445	12.59	98.38	Aug.18	425	12.03	1,196.73
Sep.27	260	7.36	13.12	Aug.28	536	15.17	195.74
Oct.256	65	1.84	3.34	Aug.29	1,060	30.00	1,094.90
Nov.17	83	2.34	4.14	Sep.6	483	13.67	150.25
Dec.1	49	1.39	1.95	Sep.13	116	3.28	27.25
Dec.12	48	1.35	2.74	Sep.22	544	15.40	157.06
Dec.28	70	1.97	3.49	Sep.18	460	13.02	166.14
				Oct.12	116	3.28	20.88
Year : 1950				Nov.14	71	2.02	7.12
Jan.26	44	1.23	0.78	Nov.18	102	2.89	7.42
Mar.3	24	0.68	0.98	Oct.3	135	3.82	20.30
Mar.9	32	0.91	0.65	Dec.5	58	1.63	3.84
Mar.10	44	1.23	0.27	DEc.14	48	1.35	2.28
Mar.11	41	1.16	0.77				
Feb.18	30	0.84	1.32	**Year : 1951**			
Mar.29	45	1.27	0.69	Jan.16	32	0.91	0.51
Feb.23	30	0.84	1.21	Feb.27	23	0.65	2.98
Mar.24	61	1.71	0.48	Feb.20	26	0.74	2.68
Apr.12	52	1.47	3.27	Feb.13	24	0.68	1.50
Apr.13	96	2.72	4.51	Feb.7	27	0.77	2.43
Apr.14	130	3.68	18.92	Mar.26	41	1.16	1.58
Apr.15	109	3.08	19.36	Mar.15	40	1.12	1.01
Apr.25	73	2.06	0.86	Mar.12	29	0.81	2.35
Apr.22	105	2.97	14.77	Mar.13	33	0.94	2.72

Table D.5.1 Suspended Loads Measurement Records (2/3)

Date	Discharge (cusecs)	Discharge (cu./sec)	Sus.Loads (ton/day)	Date	Discharge (cusecs)	Discharge (cu.m/sec)	Sus. Loads (ton/day)
Year : 1951				**Year : 1953**			
Apr.14	133	3.76	12.29	Jun.25	73	2.06	12.00
Apr.1	89	2.53	6.13	Jul.27	36	1.01	1.10
Apr.5	168	4.75	16.59	Jul.25	41	1.16	1.68
Mar.30	75	2.11	7.20	Sep.28	35	0.98	1.45
Apr.25	2,802	79.30	1,807.05	Sep.21	53	1.51	2.65
Apr.24	3,826	108.28	5,608.12	Oct.5	35	0.98	0.63
Apr.19	1,598	45.22	843.15	Oct.19	98	2.77	7.34
Apr.25	2,432	68.83	1,707.21	Oct.12	33	0.94	2.99
Apr.27	1,968	55.69	1,311.60	Oct.26	86	2.43	4.90
May.3	592	16.75	267.66	Nov.2	139	3.93	9.19
May.2	885	25.05	419.91	Nov.9	59	1.67	1.91
Apr.16	2,200	62.26	8,533.57	Nov.16	81	2.29	4.37
Apr.9	720	20.38	451.61	Dec.21	49	1.39	1.51
Apr.13	895	25.33	453.02	Dec.14	100	2.82	4.38
Apr.11	496	14.04	88.02				
Jun.23	168	4.75	17.06				
Year : 1952				**Year : 1954**			
May.5	368	10.41	181.63	Jan.11	26	0.74	0.60
May.6	609	17.23	463.11	Jan.18	25	0.71	0.40
May.23	275	7.78	112.34	Jan.25	25	0.71	0.41
May.26	177	5.01	15.24	Feb.8	20	0.56	0.22
May.27	356	10.07	96.06	Feb.1	23	0.65	0.33
May.27	139	3.93	25.36	Feb.2	22	0.62	0.34
May.15	916	25.92	266.53	Feb.8	20	0.56	0.22
May.15	820	23.21	357.36	Feb.15	22	0.62	0.51
May.15	790	22.36	233.16	Mar.1	22	0.62	0.47
May.16	855	24.20	379.00	Mar.8	20	0.56	0.37
May.2	181	5.12	92.42	Mar.15	22	0.62	0.31
May.14	613	17.35	202.64	Mar.22	18	0.50	0.22
May.23	277	7.84	120.10	Apr.5	36	1.01	4.68
May.23	277	7.84	122.81	Apr.12	98	2.76	10.53
May.15	940	26.60	359.52	Apr.26	51	1.43	2.20
May.15	1,034	29.26	646.41	Apr.29	20	0.56	0.21
May.16	780	22.07	311.48	May.10	377	10.67	170.35
May.16	670	18.96	324.39	May.17	1,598	45.22	2,978.89
May.14	556	15.73	194.47	May.24	1,120	31.70	602.19
May.14	496	14.04	309.96	May.31	365	10.33	62.37
May.15	508	14.38	388.67	Jun.7	577	16.33	422.46
May.15	508	14.38	296.68	Jun.21	425	12.03	64.05
May.23	319	9.03	127.70	Jun.28	425	12.03	44.86
May.23	311	8.80	157.52	May.3	255	7.22	46.28
May.24	236	6.68	62.05	Jul.5	311	8.80	44.67
May.26	137	3.88	22.48	Jul.12	337	9.54	63.51
May.27	277	7.84	73.19				

Table D.5.1 Suspended Loads Measurement Records (3/3)

Date	Discharge (cusecs)	Discharge (cu./sec)	Sus.Loads (ton/day)
Year : 1954			
Jul.19	194	5.49	23.70
Jul.26	496	14.04	310.43
Aug.2	820	23.21	351.57
Aug.9	205	5.80	18.87
Aug.16	321	9.08	45.80
Aug.23	1,034	29.26	896.35
Aug.30	416	11.77	47.42
Sep.6	260	7.36	50.57
Sep.13	658	18.62	261.17
Sep.20	243	6.88	20.67
Sep.27	240	6.79	31.87
Oct.4	433	12.25	117.40
Oct.11	147	4.16	8.79
Oct.18	109	3.08	5.54
Oct.25	135	3.82	12.53
Nov.1	162	4.58	17.41
Nov.8	105	2.97	6.50
Nov.15	84	2.39	5.16
Nov.22	70	1.97	2.74
Nov.29	71	2.02	2.25
Dec.6	162	4.58	8.55
Dec.13	83	2.34	5.04
Dec.14	100	2.82	4.38
Dec.20	70	1.97	1.86
Dec.21	58	1.63	1.15
Dec.21	49	1.39	1.51
Year: 1955			
Jan.3	58	1.63	4.26
Jan.10	41	1.16	3.57
Jan.17	38	1.09	2.68
Jan.24	37	1.05	3.34
Jan.31	33	0.94	2.09
Feb.7	58	1.63	5.65
Feb.14	51	1.43	6.21
Feb.21	32	0.91	2.41
Feb.28	64	1.80	5.13
Mar.2	26	0.74	2.60
Mar.7	37	1.05	3.82
Mar.14	29	0.81	2.31
Mar.28	30	0.84	2.39
Apr.4	32	0.91	2.56
Apr.11	53	1.51	4.21
Apr.18	75	2.11	12.32
Apr.25	124	3.51	14.75
May.16	86	2.43	15.65
May.30	56	1.59	5.98

Date	Discharge (cusecs)	Discharge (cu.m/sec)	Sus. Loads (ton/day)
Year : 1954			
June.13	33	0.94	2.14
June.20	38	1.09	2.30
Aug.24	536	15.17	185.50
Sep.5	536	15.17	171.16
Dec.19	240	6.79	48.41
Year: 1956			
Jan.2	633	17.91	386.87
Jan.9	139	3.93	20.17
Jan.16	89	2.53	7.17
Jan.23	224	6.34	31.90
Jan.30	324	9.17	54.97
Feb.6	130	3.68	11.28
Feb.13	76	2.15	3.26
Feb.20	1,134	32.09	937.95
Feb.27	93	2.63	13.15
Mar.5	61	1.71	4.78
Mar.12	53	1.51	2.35
Mar.19	52	1.47	2.99
Mar.26	45	1.27	2.46
Apr.9	58	1.63	2.86
Apr.16	86	2.43	3.98
May.7	1,034	29.26	696.75
May.14	365	10.33	73.80
May.21	536	15.17	211.20
May.28	356	10.07	79.53
June.4	203	5.74	44.76
June.11	128	3.62	19.62
June.18	91	2.58	7.79
June.25	272	7.70	51.46
July.16	137	3.88	21.03
Sep.3	922	26.09	278.64
Sep.10	820	23.21	188.73
Sep.17	365	10.33	73.10
Sep.24	226	6.40	31.43
Oct.1	623	17.63	260.50
Oct.8	670	18.96	182.14
Oct.15	351	9.93	56.76
Oct.22	260	7.36	33.96
Year: 1957			
Jan.28	51	1.43	6.15
Feb.4	116	3.28	6.68
Feb.11	71	2.02	4.02
Feb.18	41	1.16	1.98
Feb.11	536	15.17	363.11