

ANNEX-B

METEOROLOGY AND HYDROLOGY

ANNEX - B

METEOROLOGY AND HYDROLOGY

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ANNEX-B METEOROLOGY AND HYDROLOGY

B.1 INTRODUCTION

This ANNEX describes the results of the meteorological and hydrological study in the Malir river basin. In 1979, the Feasibility Study on Water Resources Development Project in Malir Basin was carried out by WAPDA, based on very limited hydrological data in the area. In the course of the above study, meteorological and hydrological stations were established in 1975-78 by WAPDA under the Surface Water Hydrological Project. Further valuable data for about 10 years were available for the detailed study.

The study was conducted to clarify the meteorological and hydrological characteristics in and around the study area with the following specific objectives:

- (1) Collection of meteorological and hydrological data,
- (2) Review and examination of available basic data, and the previous study,
- (3) Study of long-term-runoff,
- (4) Study of flood discharge, and
- (5) Study of sediment load and evaporation.

B.2 METEOROLOGY AND HYDROLOGY

B.2.1 Available Data

(1) Meteorological Data

There exist five rainfall gauging stations and two meteorological stations in and around the Malir river basin as shown in Fig. B.2-1. Two rainfall gauging stations in the catchment areas of the two proposed damsites were set up in 1975 by WAPDA in order to collect further rainfall data in the catchment areas. In addition to the above, one meteorological station was established near the confluence of the Mol and Khadeji rivers in 1975. Moreover, long term meteorological data are available at Karachi airport located at the southeast of the project area.

In the previous study, meteorological records were available only at Karachi airport station. All the analyses were exclusively based on these data. In the present study, about 10 years data are available for further analysis. Available meteorological records and its period are shown in Fig. B.2-2.

(2) Hydrological Data

There are five water gauging stations in and around the study area since 1975 as illustrated in Fig. B.2-1 and its recording period in Fig. B.2-2. Runoff measurements for about 13 years are recorded at Khadeji river and Malir river at Super Highway bridge.

B.2.2 River Basin

The physical characteristics of the neighborhood of Karachi are marked by three anticlines and three synclines known as Malir, Layari and Hub. The Malir flows in the east of Karachi; the Layari flows through the heart of the city and Hub lies 30 km to the west and flows along Karachi-Lasbela boundary.

The Malir river, flows in the study area, is formed as the confluence of Mol and Khadeji rivers. The catchment area is about 620 km² of the Mol river and 580 km² of the Khadeji river, respectively. After the confluence of the Mol and Khadeji rivers, the Malir drains the adjoining areas of Malir, Konkar, Drigh and Landhi in the NE-SW direction for a distance of about 50 km before debouching into the Arabian Sea near Karachi. There are other tributaries such as, Jarando, Bazar Nullah, Thaddo and Sukhan Nadi, joining the main river below the Mol-Khadeji confluence.

Of the two principal tributaries, the Mol rises from the Kohistan hills and is draining the Mol plateau with its subsequent streams. It flows for about 105 km from a height of 640 m. The Khadeji, though rising from 440 m height, commands a less catchment area than

the former, and flows for about 55 km. The catchment area of the Malir River is about 2,240 km².

The total watershed area of the Mol and Khadeji lies between the latitude 25°0' to 25°44' and longitude 67°22' to 67°41'. The general characteristics of their river basins, illustrated in Fig. B.2-3, are as follows:

The catchment areas of the Mol and Khadeji, tributaries of the Malir river are generally mountainous and mostly comprise barren hills of low to medium height consisting of pale coloured limestones with some calcareous sandstones.

The area is almost devoid of vegetation and soils contain alluvial deposits, boulders, gravel and sandy clays.

B.2.3 Climate

As a whole, the weather of Karachi is pleasant, occasionally sultry. The average annual rainfall for 60 years between 1929 and 1988 is 220 mm. The mean daily maximum temperature during the above years ranges from 26°C in January to 35°C in May. Relative humidity varies from 36% to 85%. Average wind speed varies from 1.5 to 4.7 m/sec.

General climatic characteristics such as temperature, relative humidity, sunshine hours, wind speed and evaporation at Karachi airport given in Table B.2.1 and illustrated in Fig. B.2-4, and are summarized below:

Average Annual Rainfall (mm)	220
Monthly Mean Temperature (°C)	
Maximum	31.7
Minimum	20.3
Mean	26.0
Monthly Mean Relative Humidity (%)	52.5 - 78.2
Daily Mean Sunshine Hours (hr/day)	8.1
Monthly Mean Evaporation (mm)	3,800
Monthly Mean Wind Velocity (m/sec)	3.0

(1) Rainfall

During the summer season (July-October), the rainfall is predominantly contributed by the South-West monsoon, while the comparatively less significant winter rains are due to secondary low pressure waves, induced by the main western disturbances passing across Russian Turkistan in the north.

As the summer season advances, a low pressure area (the seasonal low) is formed over central India by excessive heating of land, which extends in the month of July to

the Quetta, Kalat and Hyderabad divisions of Pakistan, there by causing the inflow of moist air from the Arabian Sea and the Bay of Bengal.

Generally the storms (depression) originating in the Bay of Bengal move into north westerly direction across the Indian Peninsula. After being fed by moist air currents from the Bay and the Arabian Sea, they regain their activity and occasionally move westwards, giving heavy showers over parts of Sindh and Baluchistan. Storms formed in the Arabian Sea usually take a motherly direction and affect Karachi or Hyderabad Division. The eastward passage of a western disturbance moving over Russian Turkistan also accentuates the season low, thus giving rise to thunder showers over the sea.

The annual mean rainfall of respective stations in the study area (from 1979 to 1983) varies from 125 to 175 mm. The annual mean rainfall at Karachi airport station (from 1929 to 1988) is 240 mm. However, there are ten years which have the annual rainfall less than 50 mm. These monthly rainfall records are given in Table B.2.2.

(2) Temperature

The seasonal trend of temperature in the study area is characterized by narrow variation. The annual mean temperature is 26°C, maximum monthly mean of 35°C in May, and minimum monthly mean of 10°C in January (Karachi airport station record). Temperature records of Karachi airport and Malir Super Highway Bridge are given in Table B.2.3.

(3) Relative Humidity

The relative humidity varies throughout the year, from about 80% (average) in the summer season, and about 60% (average) during winter and spring. The lowest relative humidity was recorded in January, while the highest relative humidity in August. Relative humidity records of Karachi airport are given in Table B.2.4.

(4) Sunshine Hours

Mean monthly sunshine hours at Karachi airport station ranges from 4.8 hr/day in July and August to 9.7 hr/day in May. Sunshine hours records are given in Table B.2.5.

(5) Wind Movement

Wind in Karachi blows practically from all directions throughout the year. However, south westerly direction predominates during the summer months (June to October). The monthly mean wind velocity varies between 1.5 m/sec in January and 4.7 m/sec in June. Wind velocity records are given in Table B.2.6.

(6) Evaporation

The annual mean A-pan evaporation reaches 3800 mm or daily mean of about 10 mm/day at Malir River Super Highway Station. The maximum monthly mean evaporation of 439 mm or 14 mm/day occurs in May and the minimum of 243 mm or 8 mm/day in December. Evaporation observed at Malir Super Highway is extremely high compared to those in arid and semi-arid areas. Evaporation records at the Malir River Super Highway station are shown in Table B.2.7.

B.2.4 Rainfall Relationship

There are seven (7) rainfall stations in and around the study area as shown in Fig. B.2-1. Taking into account the duration and interruption of the records, the meteorological station at Karachi airport is considered to be a representative key station. To examine the rainfall in the study area, correlation coefficients of respective monthly rainfall between Karachi airport and other stations were calculated by single correlation method.

As a result, good correlation is depicted among the records of monsoon months (July to Sept.), but the records of winter and spring (Oct. to June) months show poor correlation as shown in Table B.2.8. The relationship between Karachi airport and other stations is summarized below:

Station	Correlation Coefficient of Monthly Rainfall	
	July to Sep.	Oct. to Jan.
Thano Shah Beg	0.92	0.73
Sari Sang	0.92	0.66
Roop Kani	0.96	0.77
Goth Habit	0.92	0.87
Malir Super Highway	0.87	0.94
Goth Haji	0.93	0.89

Since there is a good correlation of rainfall between Karachi airport and other six stations, to generate the long-term monthly rainfall at other six stations in the study area, rainfall data at Karachi airport station are used in the single regression equation given below:

$$Y = a + b X$$

where, Y: the dependent variable
X: the independent variable
a: the regression constant
b: the regression coefficient

The calculated regression constant "a", the regression coefficient "b" and the correlation coefficient "r" for those of other stations with missing monthly data are given in Tables B.2.8, B.2.9 and Fig. B.2-5.

B.2.5 Rainfall in the River Basin

According to the rainfall of respective stations for the years 1979-1983, it can be said that the rainfall in the study area decreases, gradually toward north. However, the distribution of rainfall is variegated.

Long-term monthly rainfall of respective stations is interpolated on the basis of existing long-term monthly rainfall at Karachi airport by the regression equation (see Table B.2.9). Areal rainfall in the river basin is calculated on the basis of respective monthly rainfall by Thiessen polygon for analysis of runoff at respective points. Distribution of rainfall area by Thiessen polygon is shown in Fig. B.2-6. Calculated long-term monthly rainfall of respective stations is shown in Table B.2.10 and areal rainfall in the river basin is shown in Table B.2.11.

B.2.6 Runoff Data

There are five water gauging stations in and around the study area as shown in Fig. B.2-1. These water level gauging stations were established by the Surface Water Hydrology Project, WAPDA in 1975.

The monthly total and specific discharges at respective stations are shown in Tables B.2.12 and B.2.13.

B.2.7 Runoff Relationship

In order to examine the reliability of discharge records in the study area, single correlation method was adopted. The monthly correlation coefficients were calculated as follows, using the actual observation data:

River Basin	Khadeji River	Malir Super Highway	Layari River	Malir National Highway
<u>July to Sep.</u>				
1. Khadeji River	-	0.92	0.67	0.85
2. Malir Super Highway	0.92	-	0.85	0.96
3. Layari River	0.67	0.85	-	0.92
4. Malir National Highway	0.85	0.96	0.92	-
<u>Oct. to June</u>				
1. Khadeji River	-	0.94	0.47	-
2. Malir Super Highway	0.94	-	0.40	-
3. Layari River	0.47	0.40	-	-
4. Malir National Highway	-	-	-	-

As seen in the above table, it appears that the relations among the discharges in the study area are visible, except Layari River Station located outside the study area.

B.2.8 Rainfall - Runoff Relationship

The season rainfall and runoff data of respective stations are tabulated in Table B.2.15. For the period of July, August and September (monsoon season) during 1976 to 1987, the runoff coefficient in the Khadeji River varies between 12.0% to 31.8%, and average runoff coefficient is 23.6%. For the rest of the year i.e. October through June (winter & spring season) the corresponding values vary from 6.6% to 111.7% and 13.9%, respectively.

The runoff coefficient of monsoon season in the Malir river at the Super Highway during 1976 to 1987 varies from 12.6% to 31.7%, and average runoff coefficient is 24.5%. For the rest of the year i.e. October through June during 1976 to 1987, the corresponding values vary from 1.6% to 49.3% and 17.3%, respectively.

On the other hand, the runoff coefficient of monsoon season in the Malir river at the National Highway during 1978 to 1984 varies from 0.0% to 19.6%, and average runoff coefficient is 15.0%. The corresponding values in winter and spring season come to 0.0%.

The runoff coefficient in the Malir river at the National Highway is decreasing against the runoff coefficient of the Malir river at the Super Highway and the Khadeji river.

B.3 LONG-TERM RUNOFF ANALYSIS

B.3.1 Purpose and Methodology of Analysis

In order to conduct the long-term water resource study in the Malir river basin, the runoff data for sufficient long period are required at respective locations of major stream. The purpose of the long-term runoff analysis is to estimate the stream discharge for the period of missing discharge data by using the available data through hydrological runoff model.

A Tank Model method has been selected to analyze the especially long-term runoff among several hydrological runoff models. The Tank Model is used to estimate the monthly stream flow discharge based on monthly rainfall. Coefficients of Tank are determined through simulation until the nearest possible discharge to the observed discharge is obtained.

The Tank Model is usually composed of three to four tanks; and four tanks model is adopted in the present study. Each tank has several runoff holes at different heights and an infiltration hole at the bottom as illustrated in Fig. B.3-1. It is generally interpreted that the upper two tanks correspond to the surface runoff, the third tank to the intermediate runoff and the bottom tank gives base flow and infiltration to the groundwater. Rainfall is put to the first tank and water will be released through side hole and the bottom to the lower tanks.

B.3.2 Runoff of Respective Rivers

Try and error calculation was made by a computer until the nearest possible discharge values to the observed ones are obtained through simulation of the model, applying rainfall data at respective basins. The coefficients of the tank models generated by try and error method are given in Fig. B.3-1.

Applying these models, monthly discharges are estimated for 60 years from 1929 to 1988 at the Khadeji Super Highway, the Malir Super Highway and the Malir National Highway stations. To assess accuracy of the model, simulated monthly discharge and observed one are plotted in Fig. B.3-2. As seen in Fig. B.3-2, the calculated discharges at respective gauging stations have a good fit for observed discharges.

On the other hand, the monthly discharges at Khadeji dams site are estimated by the ratio according to the proportion of catchment area. Runoff at the Mol dams site is computed applying rainfall in the Mol river basin by the Tank Model with the same coefficients as those of the Khadeji river model. These calculated monthly discharges are shown in Table B.3.1.

The annual runoff of respective rivers are illustrated in Fig. B.3-3 and calculated and observed runoff depths are shown in Tables B.3.2 and B.3.3. The runoff characteristics are summarized below:

Description	Khadeji Dam Site	Mol Dam Site	Malir Super Highway	Malir National Highway
Catchment Area (km ²)	567	596	1,205	1,985
Mean Annual Runoff (MCM) (1929-1988)	34	45	74	60
Maximum Annual Runoff (MCM) (1944)	187	255	392	424
Calculated Runoff Coefficient (%)				
<u>1929-1988</u>				
July to Sep.	30.1	36.1	31.5	16.0
Oct. to June	16.1	16.3	7.8	0.5
Annual	27.8	32.6	27.4	13.4
<u>1976-1987</u>				
July to Sep.	26.5	29.5	27.7	14.2 ¹
Oct. to June	13.5	12.5	6.8	0.0 ¹
Annual	23.8	25.4	23.0	11.2 ¹
Observed Runoff Coefficient (%)				
<u>1979-1987</u>				
July to Sep.	23.6	-	24.5	15.0 ¹
Oct. to June	13.9	-	7.4	0.0 ¹
Annual	21.5	-	20.7	11.9 ¹

Remarks: ¹ Period is from 1978 to 1984.

As seen in the above table, calculated runoff coefficients are almost the same to the observed one.

During the period from 1929 to 1988, the runoff coefficients of the Khadeji river were calculated to be 30% in the monsoon season (July to September) and 16% in the winter and spring season (October to June), respectively. The coefficient of the Malir river at the Super Highway are 30% and 8%, and 16% and 1% at the National Highway, respectively.

The Mol river has a little higher runoff coefficient than the Khadeji river. This difference results mainly from higher rainfall intensity and steeper basin slope than the Khadeji river.

The runoff coefficients range from 27.4% at the Super Highway located in the northern part of the project area to 13.4% at the National Highway in the southern part. This difference results mainly from difference of topographic and hydrogeological conditions in upper and lower basins, and may result in increase of groundwater recharge between two sites.

For comparison purpose, the runoff coefficients are tabulated below along with the runoff coefficients in the feasibility study made by WAPDA:

Runoff Coefficients (%)

	<u>Khadeji River</u>		<u>Mol River</u>		<u>Malir River</u>	
	Monsoon	Spring	Monsoon	Spring	Monsoon	Spring
WAPDA F/Study	28.2 to 34.7	8.8	30.5 to 40.2	-	30.0	-
Adopted By WAPDA	30.0	9.0	30.0	9.0	30.0	9.0
Adopted By JICA (1929-88)	30.1	16.1	36.1	16.3	31.5 ^{/1} 16.0 ^{/2}	7.8 ^{/1} 0.5 ^{/2}

Remarks: /1 ; Malir River Super Highway
/2 ; Malir River National Highway

As seen in the above table, runoff coefficients during the monsoon season calculated in this study show similar coefficient adopted by WAPDA. However, there is some difference in the winter and spring seasons. This difference results mainly from inadequate observed discharge data (only two years in 1976 and 1977), as described in the WAPDA report.

B.4 EVAPORATION AND SEDIMENT LOAD

B.4.1 Evaporation

The class A pan-evaporation data for the years 1979 to 1987 have also been observed by the Surface Water Hydrology Project Circle, WAPDA, which is set up near the Super Highway Bridge. The annual pan-evaporation for the years 1979 to 1987 varies between 3,600 mm and 4,300 mm, and average annual evaporation is 3800 mm.

Some experiments were conducted at the water supply lake at Haleji which is situated about 80 km to the east of Karachi. Here it was found that evaporation losses from the lake water surface are in the order of 2,100 mm per year.

Generally, the ratio of evaporation from the lake surface to that of the pan is found to be 0.6 to 0.7. In the present study, the pan-coefficient of 0.6 is adopted, and reservoir evaporation is estimated at 2,280 mm/year.

B.4.2 Sediment Load

Suspended load transported in the river is highly depending on the river runoff in the monsoon and winter seasons, and is calculated based on the suspended load, bed load and trap efficiency at the reservoir.

In the previous feasibility study, the study on suspended sediments was carried out based on the limited records of sediment yields in 1976 and 1977 in the Malir river, and on records and study in the Hub river. It was concluded that annual sediment yield per km² was estimated at about 260 m³/km²/yr including 25% of bed loads, subject to the further study.

WAPDA has continuously carried out measurements of suspended sediments at Khadeji and Malir at Super Highway since 1976. All the results were compiled in the report "River and Climatological Data of Malir and Layari River Basins, 1989" (Ref. 04). Annual suspended sediment load is summarized in Table B.4.1.

The relations between sediment flux and discharge at the time of sampling are developed from the data in the above report, and shown in Fig. B.4-1. The particle size distribution in percent of total in respective years are also presented in Table B.4.2, and the unit weight of the sediments is calculated to be 1.3 ton/m³. As calculated in Table B.4.1, unit suspended sediment at Khadeji and Malir near the Super Highway Bridge is estimated to be 460 m³/km².

Bed load transportation is so difficult to measure, and in general, the percentage of bed load to the suspended sediments varies from 10% to 30%. In the previous study, 25% of suspended sediment was adopted as bed load and in this study, by adopting the same percentage the unit bed load is estimated at 110 m³/km².

Based on new available data from 1976 to 1988, annual sediment yields for the Khadeji and Mol dams would be $570 \text{ m}^3/\text{km}^2/\text{yr}$ comprising suspended sediment of $460 \text{ m}^3/\text{km}^2$ and bed load of $110 \text{ m}^3/\text{km}^2$, if all the sediment yields would be tapped in the reservoir.

B.5 PROBABLE MAXIMUM PRECIPITATION AND PROBABLE MAXIMUM FLOOD

B.5.1 Probable Maximum Precipitation (PMP)

(1) Data Used

The studies on probable maximum precipitation (PMP) in two sub-basins of the Malir river, i.e. Khadeji and Mol, were made in the "Feasibility Study on Water Resources Development in the Malir Basin" in 1979 and "Probable Maximum Precipitation Over the Hub, Porali, Gaj, Malir and Baran basins" in 1967 by WAPDA.

To determine the probable maximum flood (PMF) in the Khadeji and Mol basins, further study on the PMP was made, based on the above WAPDA study and data made available from the Meteorological Department of Pakistan (from 1982 to 1988) and those collected by WAPDA under the Surface Water Hydrology Project.

(2) Selection of Storms

According to the previous WAPDA study (Ref. 01), the following six (6) storms for 84 years (1892 - 1976) were considered as significant storms:

No.	Storm	Period	No.	Storm	Period
1.	1910	July 3 - 8	4.	1933	July 16 - 23
2.	1913	July 19 - 22	5.	1944	August 2 - 4
3.	1929	July 26 - 29	6.	1959	July 1 - 4

Among the above six storms, 1913 July 19-22 storm was considered as the most critical storm for the basin, and adopted for the PMP study in the said report.

For the last 13 years (1976-1988), a storm during the period of June 29 - July 2, 1977 was observed as the heaviest one. Therefore, three (3) heavy storms having 150 mm or more of rainfall in 24 hrs were considered as significant, and their mass rainfall curves are shown in Fig. B.5-1. Three significant storms are summarized below:

No.	Storm	Heaviest Rainfall in 24 hrs (mm)		Remarks
		at Karachi Airport	In and Around Project Area	
1.	1913 19-22 July	218.0 *1	375.0 *2	Ref. 01
2.	1944 2-4 August	152.4	152.4*3	Ref. 03
3.	1977 29 June-2 July	207.4	207.4*4	

Remarks: *1: Observed at Manora
*2: Observed at Thatta

*3: Observed at Karachi airport
*4: Observed at Karachi airport

Principal features of respective storms are briefly explained as follows (Ref. 01):

July 19-22, 1913 Storm

This storm originated from Bay of Bengal on 18th, and later fed by Arabian Sea Currents, it moved westwards and was centered over Sindh on 20th. It caused heavy rainfall over north Baluchistan, Karachi & Hyderabad on 20th and 21st and finally, disappeared on 23rd.

August 2-4, 1944 Storm

This was a cyclonic storm originated from Bay of Bengal and turned to deep depression near Jabbulpur on 1st August. On 2nd, it was intensified by a west low pressure wave and on 4th another Bey depression merged into it and moved away further inland on the next day. It caused fairly wide spread rain in Sindh and Baluchistan during its pass.

Jun. 29 - Jul. 2, 1977 Storm

Like most storms, it also originated from Bay of Bengal on June 29th. It then moved west and pass through southern side of Karachi on 30th morning. During its cross, caused heavy rainfall and rainfall recorded at Karachi Airport was 230 mm (29-30 June). It moved further inland and finally disappeared on July 3rd.

(3) Storm Analysis

The depth-duration relationship was determined from the mass curves of selected stations, and the depth-area-duration relationships was established after development of the isohyetal map and by combining the depth-area values so obtained with the depth-duration values given by the mass-curves.

The observed isohyetal map of 1913 and 1977 storms are given in Fig. B.5-2, and transposed isohyetal map of respective storms are also shown in Fig. B.5-3. The observed D-A-D values of the above three storms are given in Fig. B.5-4 and Table B.5.1.

(4) Storm Maximization

The maximizing factor for each storm was calculated by the ratio of the maximum 12-hours persisting dewpoint of a particular storm to the maximum 12-hour persisting dewpoint recorded so far. The storm maximization factors for the project basin are given below:

No.	Storm	Highest 12-hour Persisting Dewpoint (Fo)	Maximum 12-hour Persisting Dewpoint (Fo)	Maximi- zation Factor
1	1913 19-22 July	79	84	1.25
2	1944 2-4 August	80	84	1.19
3	1977 29 June 2 July	79	84	1.25

The maximized D-A-D values for the project basin are given in Table. B.5.2.

(5) Seasonal Variation and Storm Duration

The study of storms for the last 90 years indicates that the heaviest rains had occurred during the months of July and August. The highest observed storms were also recorded in these two months.

The main cause for heavy rainfall over the basins is due to the storms which originate from the Bay of Bengal or Arabian Sea and move towards the basins. According to the previous records, the minimum interval for such storms development over the Bay of Bengal or Arabian Sea was six days. These storms may continue to the project basin for a minimum interval of 3 or 4 days.

(6) Determination of Probable Maximum Precipitation

According to the PMP studies of three storms, it can be found that D-A-D values of the 1913-storm are maximum (see Table B.5.2). Therefore, July 19-22, 1913 storm is considered as the most critical storm for the basin. The D-A-D values of the above storm, studied by WAPDA, were adopted for the project basins. Probable D-A-D values of Khadeji and Mol basin were calculated by same maximized D-A-D values shown in Table B.5.2, and are given in Table B.5.3.

Maximum 24 hr-precipitation at Karachi Airport for 58 years from 1931 to 1988 were used in the analysis of probable daily precipitation as presented in Table B.5.4. The probable daily precipitation analysis was also made, based on the annual maximum daily rainfall by Iwai Method. The estimated probable daily precipitations are summarized as follows:

Return Period (Year)	2	5	10	20	50	100	1000	PMP
Probable Daily Precipitation (mm)	54.6	99.4	133.7	169.8	221.3	263.6	427.1	552.5 (Khadeji) 551.4 (Mol)

Each PMP value corresponding to each duration is decided from maximized transposed D-A-D values (see Table B.5.2). Then probable D-A-D values corresponding each return period and each duration are calculated by the following relation and the results are also presented in Table B.5.3:

$$\text{Probable D-A-D value} = \frac{(\text{PMP})_h}{(\text{PMP})_{24}} \times (\text{Daily P})_T$$

where, $(\text{PMP})_{24}$: 24 hr PMP (Table. B.5.3)
 $(\text{PMP})_h$: h hr PMP (Table. B.5.3)
 $(\text{Daily P})_T$: Probable daily precipitation corresponding to T-year return period

B.5.2 Probable Maximum Flood

Probable Maximum Flood (PMF) hydrograph for the basin was determined by developing a unitgraph with the dimensionless unitgraph method as adopted the previous study, because the observed data for determining the actual unitgraphs were not available.

(1) Minimum Precipitation Losses

PMF could only be calculated on the basis of PMP, because it is based on the maximum D-A-D values of all durations. The minimum precipitation losses used to compute effective rainfall are as follows:

- Initial loss 7.6 mm (0.3 inch)
- Retention loss 2.5 mm/hr (0.1 inch/hr)

(2) Unitgraph Analysis

For developing unitgraph, the parameters and coefficients of the Khadeji and Mol rivers were determined in the present study. These parameters and coefficients are as follows:

Description	Symbol	Unit	Khadeji	Mol
Drainage Area	(A)	(km ²)	567	596
Length of Longest Water Course	(L)	(km)	44	86
Length of Water Course, from point of Interest to Intersection from ca (Centroid of Basin) to Stream Alinement	(Lca)	(km)	20	44
Inlet Elevation	(Ei)	(m)	128	132
Highest Elevation of Water Course	(Eh)	(m)	274	594
Overall Slope	S		0.0033	0.0054
$L \cdot Lca / S$			1.53×10^4	5.15×10^4
Lag Time	Lg	(hr)	6.5	10.0

The Probable Flood Hydrographs for the Khadeji and Mol basins, were determined by their unit hydrographs. The hydrographs and flood discharges of both basins were given in Fig. B.5-5, Tables B.5.5 and B.5.6. The PMF and probable floods are summarized below:

Description		Khadeji Damsite	Mol Damsite
Drainage Area	(km ²)	567	596
Time of Peak Discharge	(hr)	7.0	10.0
Peak Discharge	(m ³ /sec)		
PMF		5,117	4,280
Return period	1000-yr	3,869	3,240
	100-yr	2,240	1,872
	50-yr	1,820	1,518
	20-yr	1,036	1,087
	5-yr	605	390
	2-yr	160	122

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05. MANUAL FOR ESTIMATION OF PROBABLE MAXIMUM PRECIPITATION, WMO, 1986
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TABLES

Table B.2.1 METEOROLOGICAL CHARACTERISTICS

YBAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Monthly Rainfall (mm)													
Thana Shah Beg													
1975-1988 Mean	4.5	11.9	8.1	2.3	0.6	14.9	51.5	96.0	15.6	3.3	2.5	6.1	217.3
1979-1983 Mean	1.3	17.5	7.9	2.2	1.4	7.7	19.2	59.2	6.4	7.2	5.9	14.5	150.6
Sari Sang													
1975-1988 Mean	3.1	5.0	5.2	4.0	0.0	19.4	57.9	81.8	18.5	0.8	0.0	4.6	200.3
1979-1983 Mean	0.0	8.3	7.4	9.6	0.0	5.7	21.2	75.0	5.1	1.8	0.0	11.1	145.1
Roop Kani													
1978-1987 Mean	0.5	15.3	4.1	2.0	0.0	5.4	41.3	111.4	3.1	0.0	1.3	7.0	191.2
1979-1983 Mean	0.7	20.2	5.7	2.8	0.0	7.9	24.2	97.3	4.9	0.0	2.0	9.7	175.4
Goth Habit													
1978-1985 Mean	0.9	7.2	9.2	0.0	0.0	4.4	38.4	100.5	2.2	0.5	0.4	11.7	175.3
1979-1983 Mean	1.0	8.6	11.0	0.0	0.0	5.2	17.2	63.5	3.6	0.6	0.5	14.1	125.2
Malir River At Super Highway													
1975-1988 Mean	7.7	8.6	6.4	4.3	0.4	9.4	58.4	96.5	19.0	1.9	1.8	4.7	219.0
1979-1983 Mean	0.2	20.3	11.4	6.6	0.0	7.7	57.5	110.0	3.8	4.9	1.7	12.3	236.3
Goth Haji Sha Moha													
1978-1985 Mean	1.0	17.6	6.9	3.4	0.0	9.5	52.7	131.0	3.1	3.0	0.3	12.3	240.8
1979-1983 Mean	1.2	21.2	8.2	4.1	0.0	11.4	53.1	83.9	3.3	4.3	0.3	14.8	205.7
Karachi Airport													
1929-1988 Mean	7.3	10.1	8.9	3.0	0.1	6.9	95.7	55.0	20.8	2.1	2.8	6.0	218.7
1979-1983 Mean	0.8	29.9	16.9	8.4	0.0	9.3	33.5	114.3	5.1	5.5	1.4	15.6	240.7
Monthly Mean Temperature (°C)													
Karachi Airport (1961-1988)													
Maximum	25.7	27.7	31.6	34.3	35.2	34.8	33.1	31.7	32.8	34.7	31.7	27.3	31.7
Minimum	10.1	12.6	17.6	22.3	25.8	27.9	27.5	26.3	25.2	21.1	15.9	11.5	20.3
Mean	18.0	20.2	24.8	27.9	30.5	31.0	30.3	29.0	28.8	27.5	23.8	19.5	26.0
Malir River At Super Highway (1979-1988)													
Maximum	24.7	27.5	32.0	34.5	36.6	35.2	32.3	32.1	33.7	32.3	29.1	27.2	31.4
Minimum	14.3	15.4	19.3	22.5	25.7	27.7	26.9	25.6	24.6	20.8	18.0	16.1	21.4
Mean	19.5	21.4	25.7	28.5	31.2	31.4	29.6	28.9	29.1	26.6	23.5	21.7	26.4
Sunshine Hours (hour/day)													
Karachi Airport (1947-1987)													
Mean	8.8	9.1	8.9	9.5	9.7	7.9	4.8	4.8	7.2	9.2	9.2	8.7	8.2
Monthly Mean Relative Humidity (%)													
Karachi Airport (1965-1988)													
At 00GMT (5 AM)	65.6	71.3	77.8	83.1	84.3	83.1	84.9	85.6	85.1	80.5	70.3	66.9	78.2
At 03GMT (8 AM)	63.8	68.0	72.8	75.7	75.0	76.1	80.0	81.8	80.8	74.0	64.5	62.7	72.9
At 12GMT (12 AM)	36.2	38.4	44.3	49.5	59.9	65.6	71.1	72.8	65.8	48.0	40.0	38.3	52.5
Monthly Mean Evaporation (mm)													
Malir River At Super Highway (1979-1988)													
Mean	256	245	296	368	439	419	335	286	314	324	278	243	3,802
Monthly Mean Wind Velocity (m/sec)													
Karachi Airport (1961-1988)													
Past 24 Hrs	1.5	1.9	2.6	3.2	4.3	4.7	4.6	4.4	3.5	2.0	1.4	1.4	3.0
DayTime(8AM-5PM)	2.2	2.6	3.5	4.3	5.7	5.7	5.5	5.2	4.5	2.7	2.1	1.9	3.8
Night Time	1.1	1.5	2.0	2.7	3.5	4.1	4.1	3.9	3.0	1.4	1.0	1.1	2.5

Table B.2.2 MONTHLY RAINFALL (1/3)

STATION: THANA SHAH BEG													Latitude = 25°03'		Longitude = 67°25'		Unit: mm
Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL				
1975	*	*	*	*	*	*	*	*	*	*	0.0	0.0	*				
1976	20.3	46.2	54.6	3.6	0.0	0.0	69.6	41.9	128.0	0.0	0.0	0.0	364.2				
1977	26.7	0.0	0.0	*	*	112.0	114.8	0.0	21.6	0.0	0.0	0.0	*				
1978	0.0	0.0	0.0	10.7	0.0	0.0	13.7	239.0	273.0	5.1	0.0	0.0	541.5				
1979	0.0	23.6	0.0	0.0	0.0	0.0	0.0	115.8	0.0	14.2	2.0	36.6	192.2				
1980	2.0	0.0	4.1	0.0	0.0	38.4	16.5	11.4	0.0	21.8	15.2	33.8	143.2				
1981	4.6	50.8	35.6	0.0	0.0	0.0	50.3	40.6	0.0	0.0	12.2	0.0	194.1				
1982	0.0	11.2	0.0	0.0	7.1	0.0	27.4	42.7	0.0	0.0	0.0	2.3	90.7				
1983	0.0	2.0	0.0	11.2	0.0	0.0	2.0	85.6	32.0	0.0	0.0	0.0	132.8				
1984	0.0	0.0	3.0	0.0	0.0	0.0	27.7	389.6	1.0	*	*	*	*				
1985	*	*	*	*	*	*	71.1	25.9	0.0	0.0	0.0	0.0	*				
1986	0.0	8.6	0.0	0.0	0.0	0.0	0.0	125.5	0.0	0.0	0.0	0.0	134.1				
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
1988	0.0	0.0	0.0	0.0	0.0	*	*	*	*	*	*	*	*				
MEAN	4.5	11.9	8.1	2.3	0.6	14.9	51.5	96.0	15.6	3.3	2.5	6.1	217.3				
1979-83																	
MEAN	1.3	17.5	7.9	2.2	1.4	7.7	19.2	59.2	6.4	7.2	5.9	14.5	150.6				

STATION: SARISANG													Latitude = 25°15'		Longitude = 67°50'		Unit: mm
Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL				
1975	*	*	*	*	*	*	*	*	*	*	0.0	0.0	*				
1976	27.2	11.2	18.8	0.0	0.0	0.0	72.4	23.9	96.8	0.0	0.0	0.0	250.3				
1977	3.3	0.0	0.0	0.0	0.0	114.3	196.3	51.1	53.8	0.0	0.0	0.0	418.8				
1978	6.9	0.0	6.9	0.0	0.0	32.3	202.7	175.3	0.0	0.0	0.0	0.0	424.1				
1979	0.0	15.2	6.6	0.0	0.0	0.0	0.0	35.3	1.3	2.5	0.0	33.8	94.7				
1980	0.0	0.0	0.0	0.0	0.0	28.4	47.0	15.0	0.0	6.3	0.0	21.6	118.3				
1981	0.0	0.0	30.5	0.0	0.0	0.0	33.5	145.3	0.0	0.0	0.0	0.0	209.3				
1982	0.0	21.3	0.0	0.0	0.0	0.0	4.1	43.7	0.0	0.0	0.0	0.0	69.1				
1983	0.0	5.1	0.0	47.8	0.0	0.0	21.3	135.6	24.4	0.0	0.0	0.0	234.2				
1984	0.0	0.0	0.0	0.0	0.0	24.9	24.9	244.6	46.0	*	*	*	*				
1985	*	*	*	*	*	*	92.5	20.8	0.0	0.0	0.0	0.0	113.3				
1986	0.0	6.6	0.0	0.0	0.0	14.0	0.0	90.4	0.0	0.0	0.0	0.0	111.0				
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
1988	0.0	0.0	0.0	0.0	0.0	*	*	*	*	*	*	*	*				
MEAN	3.1	5.0	5.2	4.0	0.0	19.4	57.9	81.8	18.5	0.8	0.0	4.6	200.3				
1979-83																	
MEAN	0.0	6.9	6.2	8.0	0.0	8.9	21.8	103.3	12.0	1.8	0.0	11.1	145.1				

STATION: ROOP KANI													Latitude = 25°07'		Longitude = 67°06'		Unit: mm
Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL				
1978	*	*	*	*	*	3.3	161.3	284.5	0.0	0.0	0.0	0.0	*				
1979	3.3	36.1	0.0	0.0	0.0	0.0	0.0	147.1	0.0	0.0	0.0	20.3	206.8				
1980	0.0	0.0	6.1	0.0	0.0	39.6	26.4	0.0	0.0	0.0	10.2	28.4	110.7				
1981	0.0	11.2	22.4	0.0	0.0	0.0	34.5	25.4	0.0	0.0	0.0	0.0	93.5				
1982	0.0	53.8	0.0	0.0	0.0	0.0	5.6	137.9	0.0	0.0	0.0	0.0	197.3				
1983	0.0	0.0	0.0	14.0	0.0	0.0	54.4	176.0	24.4	0.0	0.0	0.0	268.8				
1984	0.0	0.0	0.0	0.0	0.0	0.0	11.9	257.8	0.0	0.0	*	*	*				
1985	*	*	*	*	*	*	77.7	12.7	0.0	0.0	0.0	0.0	90.4				
1986	0.0	5.8	0.0	0.0	0.0	0.0	0.0	72.4	0.0	*	*	*	*				
1987	*	*	*	*	*	*	*	0.0	0.0	*	*	*	*				
MEAN	0.5	15.3	4.1	2.0	0.0	5.4	41.3	111.4	2.4	0.0	1.5	7.0	190.7				
1979-83																	
MEAN	0.7	20.2	5.7	2.8	0.0	7.9	24.2	97.3	4.9	0.0	2.0	9.7	175.4				

Table B.2.2 MONTHLY RAINFALL (2/3)

STATION: GOTH HABIT													Landitude = 25°58'		Longitude = 67°25'		Unit: mm
Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL				
1978	*	*	*	*	*	5.1	158.2	272.8	0.0	0.0	0.0	0.0	*				
1979	5.1	32.8	0.0	0.0	0.0	0.0	0.0	113.8	0.0	1.3	0.0	22.4	175.4				
1980	0.0	0.0	11.2	0.0	0.0	25.9	12.2	0.0	0.0	1.5	2.3	48.0	101.1				
1981	0.0	3.6	43.7	0.0	0.0	0.0	16.0	12.4	0.0	0.0	0.0	0.0	75.7				
1982	0.0	4.3	0.0	0.0	0.0	0.0	11.9	105.2	0.0	0.0	0.0	0.0	121.4				
1983	0.0	2.5	0.0	0.0	0.0	0.0	46.0	85.9	17.8	0.0	0.0	0.0	152.2				
1984	0.0	0.0	0.0	0.0	0.0	0.0	3.8	213.9	0.0	*	*	*	*				
1985	*	*	*	*	*	*	59.2	0.0	0.0	*	*	*	*				
MEAN	0.9	7.2	9.2	0.0	0.0	4.4	38.4	100.5	2.2	0.5	0.4	11.7	175.3				
1979-83																	
MEAN	1.0	8.6	11.0	0.0	0.0	5.2	17.2	63.5	3.6	0.6	0.5	14.1	125.2				

STATION: MALIR RIVER AT SUPER HIGHWAY BRIDGE													Landitude = 25°03'		Longitude = 67°23'		Unit: mm
Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL				
1975	*	*	*	*	*	*	*	*	26.2	0.0	0.0	0.0	*				
1976	64.8	3.0	20.8	0.0	0.0	0.0	128.3	24.9	81.3	0.0	0.8	0.0	323.9				
1977	4.3	0.0	0.0	1.3	0.0	40.9	*	45.7	119.1	0.0	14.2	0.0	*				
1978	26.4	0.5	0.0	0.0	0.0	33.0	157.7	151.1	0.0	0.0	0.0	0.0	368.7				
1979	1.0	47.2	0.0	0.0	0.0	0.0	0.0	67.6	0.0	2.0	3.8	25.7	147.3				
1980	0.0	6.1	0.0	0.0	0.0	38.6	53.1	0.0	0.0	22.6	4.6	35.6	160.6				
1981	0.0	17.3	56.9	8.1	0.0	0.0	36.6	189.2	0.0	0.0	0.0	0.0	308.1				
1982	0.0	26.9	0.0	0.0	0.0	0.0	87.9	181.9	0.0	0.0	0.0	0.0	296.7				
1983	0.0	3.8	0.0	24.9	0.0	0.0	109.7	111.5	18.8	0.0	0.0	0.0	268.7				
1984	1.5	0.0	0.0	0.0	0.0	0.0	9.7	279.4	1.0	0.0	0.0	0.0	291.6				
1985	0.0	0.0	0.0	21.3	0.0	0.0	59.9	6.6	0.0	0.0	0.0	0.0	87.8				
1986	0.0	6.6	5.6	0.0	0.0	0.0	0.0	100.6	0.0	0.0	0.0	0.0	112.8				
1987	0.0	0.0	0.0	0.0	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.3				
1988	1.5	0.0	0.0	0.0	0.0	*	*	*	*	*	*	*	*				
MEAN	7.7	8.6	6.4	4.3	0.4	9.4	58.4	96.5	19.0	1.9	1.8	4.7	219.0				
1979-83																	
MEAN	0.2	20.3	11.4	6.6	0.0	7.7	57.5	110.0	3.8	4.9	1.7	12.3	236.3				

STATION: GOTH HAJISHA MOHA													Landitude = 24°58'		Longitude = 67°25'		Unit: mm
Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL				
1978	*	*	*	*	*	*	93.0	182.1	0.0	0.0	0.0	0.0	*				
1979	6.1	53.8	0.0	0.0	0.0	0.0	0.0	103.1	0.0	2.5	1.5	39.4	206.4				
1980	0.0	0.0	2.3	0.0	0.0	57.1	71.6	0.0	0.0	18.8	0.0	34.5	184.3				
1981	0.0	21.6	38.9	0.0	0.0	0.0	36.6	87.4	0.0	0.0	0.0	0.0	184.5				
1982	0.0	28.4	0.0	0.0	0.0	0.0	66.0	112.8	0.0	0.0	0.0	0.0	207.2				
1983	0.0	2.0	0.0	20.3	0.0	0.0	91.4	116.1	16.3	0.0	0.0	0.0	246.1				
1984	0.0	0.0	0.0	0.0	0.0	0.0	10.4	249.2	0.0	*	*	*	*				
1985	*	*	*	*	*	*	*	197.4	8.4	0.0	*	*	*				
MEAN	1.0	17.6	6.9	3.4	0.0	9.5	52.7	131.0	3.1	3.0	0.3	12.3	240.8				
1979-83																	
MEAN	1.2	21.2	8.2	4.1	0.0	11.4	53.1	83.9	3.3	4.3	0.3	14.8	205.7				

Table B.2.2 MONTHLY RAINFALL (3/3)

STATION: KARACHI AIRPORT													Landitude = 24°54'		Longitude = 67°08'		Unit: mm
Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL				
1929	1.5	0.0	0.0	0.0	0.0	0.0	53.3	5.1	0.0	0.0	26.2	18.8	104.9				
1930	11.2	0.0	0.0	2.8	0.0	53.1	339.6	1.3	0.3	0.0	0.0	0.0	408.3				
1931	1.5	5.6	5.3	0.0	0.0	0.0	4.8	1.3	0.0	0.0	0.0	0.0	18.5				
1932	5.3	0.0	0.0	0.0	0.0	0.0	290.6	28.7	0.0	0.0	0.0	0.0	324.6				
1933	1.3	1.3	0.0	1.3	5.6	0.0	392.2	77.0	32.3	0.0	0.0	0.0	511.0				
1934	0.0	0.0	2.0	0.0	0.0	32.5	164.8	5.8	0.0	0.0	0.0	9.1	214.2				
1935	16.3	29.5	0.0	30.5	0.0	0.0	7.9	4.8	0.3	0.8	0.0	0.3	90.4				
1936	1.3	14.5	1.8	0.0	0.0	18.3	67.1	0.3	0.8	0.0	0.3	2.8	107.2				
1937	0.0	24.4	0.0	0.3	0.0	0.0	206.8	0.8	0.0	0.0	0.0	65.5	297.8				
1938	0.3	0.0	0.0	1.0	3.0	1.5	42.2	66.3	0.3	0.0	0.0	5.6	120.2				
1939	0.3	51.1	56.1	2.0	0.0	0.5	0.5	0.5	0.3	0.0	4.1	0.0	115.4				
1940	68.6	32.3	46.5	0.0	0.0	10.2	53.1	54.6	0.0	0.0	0.8	9.4	275.5				
1941	2.5	0.0	0.0	0.0	0.0	0.0	45.0	0.3	0.0	0.0	0.0	0.8	48.6				
1942	15.5	27.7	4.6	0.0	0.0	0.0	256.8	18.0	0.0	0.0	0.0	10.4	333.0				
1943	18.0	0.0	0.0	0.0	0.0	3.3	50.5	2.3	0.3	0.0	0.0	0.0	74.4				
1944	5.8	47.5	0.0	0.0	0.0	0.0	286.5	335.0	0.0	0.0	0.0	1.5	676.3				
1945	51.3	0.0	0.0	0.0	0.0	0.0	106.7	2.3	3.6	0.0	0.0	2.0	165.9				
1946	0.0	0.0	0.0	0.0	0.0	2.3	55.6	41.7	0.0	0.0	0.0	0.0	99.6				
1947	0.0	1.3	0.0	0.0	0.0	0.0	0.8	47.2	2.0	0.0	0.0	7.9	59.2				
1948	0.5	26.2	30.7	0.0	0.0	41.4	35.3	0.0	0.0	0.0	0.0	7.9	142.0				
1949	0.5	0.3	0.5	0.0	0.0	0.0	138.4	183.9	0.0	0.0	0.0	0.0	323.6				
1950	11.7	0.0	0.0	0.0	0.0	0.0	73.7	0.5	0.0	0.0	0.0	0.0	85.9				
1951	0.0	0.0	0.3	2.3	0.0	0.0	39.9	33.3	1.3	0.0	0.0	0.0	77.1				
1952	0.0	35.1	0.0	0.0	0.0	0.3	160.5	0.5	24.6	0.0	0.0	3.3	224.3				
1953	1.8	0.0	0.0	0.0	0.0	41.1	1.8	210.3	0.0	0.0	0.0	7.1	262.1				
1954	18.8	30.0	0.0	0.0	0.0	0.5	55.6	34.3	150.4	0.0	0.0	0.0	289.6				
1955	10.4	12.7	0.3	0.0	0.0	0.8	0.3	30.7	96.3	0.8	0.0	3.3	155.6				
1956	21.8	0.0	0.0	4.1	0.0	43.4	157.7	89.2	0.0	98.0	0.0	0.0	414.2				
1957	3.3	0.0	0.0	5.1	0.0	0.0	16.8	6.6	0.0	0.0	4.1	5.3	41.2				
1958	6.6	2.5	0.0	0.0	0.0	0.0	131.3	0.3	32.0	0.0	1.3	52.1	226.1				
1959	3.8	2.5	0.0	0.0	0.0	0.8	234.9	46.7	315.7	0.0	83.1	1.3	688.8				
1960	2.3	0.0	32.5	0.0	0.0	0.0	43.7	28.4	0.0	0.0	0.0	22.6	129.5				
1961	17.8	53.8	0.0	11.7	0.0	16.8	168.1	185.7	166.4	0.0	0.0	1.5	621.8				
1962	0.0	0.0	0.0	0.0	0.0	0.0	81.3	42.7	148.6	0.0	0.0	6.1	278.7				
1963	0.0	0.0	0.0	1.8	0.0	0.0	1.8	9.9	0.0	0.0	30.2	0.0	43.7				
1964	2.0	5.1	0.0	0.0	0.0	2.5	77.0	49.0	3.0	0.0	0.0	0.3	138.9				
1965	0.0	0.0	0.0	3.3	0.0	0.0	107.7	18.5	0.0	0.0	0.0	0.0	129.5				
1966	0.0	0.0	1.5	0.0	0.0	0.3	68.3	0.0	0.0	0.0	0.0	0.0	70.1				
1967	0.0	0.0	130.0	24.4	0.0	11.2	429.3	98.8	0.0	0.0	5.1	14.2	713.0				
1968	11.4	4.8	0.0	0.0	0.0	0.8	0.5	5.3	0.0	0.0	0.0	6.1	28.9				
1969	0.0	1.0	0.0	0.0	0.0	0.0	38.4	0.0	0.0	0.0	0.0	0.0	39.4				
1970	7.1	7.1	62.2	0.0	0.0	5.1	151.9	155.2	86.4	0.0	0.0	0.0	475.0				
1971	3.8	0.0	0.0	0.0	0.0	0.0	33.3	30.5	0.0	0.0	0.0	1.0	68.6				
1972	0.0	3.3	0.0	0.0	0.0	20.8	16.0	0.0	0.0	0.0	0.0	4.1	44.2				
1973	0.0	0.0	0.0	0.0	0.0	0.0	184.9	20.1	0.0	0.0	0.0	8.4	213.4				
1974	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.6	0.0	5.6	7.2				
1975	13.7	21.3	30.2	0.0	0.0	0.3	0.0	76.9	21.1	0.0	0.0	0.3	163.8				
1976	66.8	10.1	30.7	0.0	0.0	0.0	217.2	36.5	44.8	0.0	0.0	0.0	406.1				
1977	10.3	0.5	0.0	2.3	0.0	34.8	302.6	44.8	88.5	0.0	5.2	0.0	489.0				
1978	14.3	4.7	0.0	0.0	0.0	6.8	5.0	175.5	0.0	0.0	0.0	0.0	206.3				
1979	1.7	96.0	0.0	0.0	0.0	3.4	0.0	262.5	0.0	3.9	0.0	13.5	381.0				
1980	0.0	0.0	10.9	0.0	0.0	43.2	45.0	0.4	0.0	23.8	6.9	63.6	193.8				
1981	0.0	25.0	73.4	3.6	0.0	0.0	40.2	43.4	0.0	0.0	0.0	0.0	185.6				
1982	2.1	24.9	0.0	0.0	0.0	0.0	27.7	105.5	0.0	0.0	0.0	1.0	161.2				
1983	0.0	3.7	0.0	38.5	0.0	0.0	54.7	159.7	25.5	0.0	0.0	0.0	282.1				
1984	0.3	0.0	0.6	0.0	0.0	0.0	19.4	245.7	4.0	0.0	0.0	0.0	270.0				
1985	0.9	0.0	0.0	47.6	0.0	0.5	80.6	25.0	0.0	0.0	0.0	0.0	154.6				
1986	0.0	0.8	11.4	0.0	0.0	17.0	0.0	62.4	0.0	0.0	0.0	0.0	91.6				
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
1988	1.0	0.0	0.0	0.0	0.0	0.0	74.0	85.0	0.0	0.0	0.0	0.0	160.0				
MEAN	7.3	10.1	8.9	3.0	0.1	6.9	95.7	55.0	20.8	2.1	2.8	6.0	218.7				
1979-83	0.8	29.9	16.9	8.4	0.0	9.3	33.5	114.3	5.1	5.5	1.4	15.6	240.7				

Table B.2.3 MONTHLY TEMPERATURE (1/3)

STATION: KARACHI AIRPORT Latitude = 24° 54' Longitude = 67° 08'

MEAN MONTHLY MAXIMUM TEMPERATURE

YEAR													Unit: °C
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
1961	25.6	25.4	32.5	32.9	33.9	34.9	33.6	31.9	31.8	33.5	30.7	27.2	31.2
1962	25.7	28.9	31.1	33.3	36.2	34.6	33.7	31.6	32.8	34.1	30.6	26.3	31.6
1963	27.0	30.7	31.6	33.4	34.7	33.6	33.1	32.0	32.2	33.3	30.4	26.3	31.5
1964	22.9	27.4	33.2	35.1	35.4	34.3	33.1	32.7	32.0	33.8	30.4	26.0	31.4
1965	27.3	28.5	31.3	32.1	34.1	33.6	32.3	31.8	31.7	34.3	32.0	26.8	31.3
1966	28.0	29.8	31.1	33.7	36.1	33.8	33.5	31.2	33.1	35.1	31.5	26.8	32.0
1967	25.1	28.9	29.9	32.6	35.9	34.0	33.9	31.4	31.4	34.7	31.7	24.6	31.2
1968	23.8	25.1	31.1	34.4	35.2	34.3	33.7	31.6	31.7	34.9	33.1	27.4	31.4
1969	26.1	27.3	33.7	35.6	35.8	34.7	33.4	30.7	32.2	35.1	32.1	29.4	32.2
1970	26.0	28.1	30.0	35.3	35.3	35.2	33.4	32.8	35.0	33.7	29.9	27.7	31.9
1971	25.7	28.8	31.9	37.2	34.3	34.2	32.3	31.1	38.8	33.6	31.6	27.9	32.3
1972	26.4	24.9	31.3	32.7	36.0	34.9	33.5	31.9	32.8	35.2	32.3	26.1	31.5
1973	24.3	28.5	32.4	36.1	34.9	34.4	32.8	31.6	31.7	35.0	31.4	26.0	31.6
1974	25.8	25.9	33.1	33.6	34.7	34.4	33.4	32.2	33.3	37.0	31.1	26.4	31.7
1975	24.3	26.6	30.4	34.9	34.3	34.8	33.5	33.0	33.0	34.6	31.2	28.5	31.6
1976	25.1	26.8	30.2	32.3	33.6	33.8	32.8	31.8	31.3	32.8	32.7	27.5	30.9
1977	24.6	28.9	35.0	34.4	36.1	35.2	32.2	31.4	32.1	36.5	33.1	28.6	32.3
1978	25.9	27.4	30.1	34.3	35.5	35.1	31.9	30.8	31.1	34.7	31.8	28.5	31.4
1979	27.1	27.1	30.5	35.3	35.5	36.3	33.4	31.6	32.9	32.5	32.4	26.9	31.8
1980	25.3	28.6	31.2	35.9	34.9	35.0	32.7	32.0	31.8	34.3	31.2	26.6	31.6
1981	25.7	28.4	30.3	34.8	35.5	35.6	33.1	31.2	33.9	35.1	30.4	28.3	31.9
1982	25.5	26.0	30.8	34.1	36.3	35.5	34.5	32.6	34.1	34.7	31.3	27.3	31.9
1983	26.3	26.4	30.2	32.2	34.7	35.6	33.7	32.2	33.3	34.9	31.9	27.7	31.6
1984	25.8	26.6	32.9	35.8	34.4	35.2	32.3	30.5	32.1	34.2	31.6	28.3	31.6
1985	26.2	29.7	33.7	32.9	36.2	34.3	31.9	30.9	31.7	35.5	32.9	29.2	32.1
1986	26.4	27.3	31.4	33.6	36.4	35.6	32.5	30.8	31.6	36.8	32.7	25.9	31.8
1987	26.8	29.4	31.4	35.2	34.6	36.0	33.8	32.9	32.8	36.3	33.8	28.6	32.6
1988	25.6	29.3	31.4	35.8	35.5	36.1	34.1	32.5	36.2	34.6	32.7	28.6	32.7
MEAN	25.7	27.7	31.6	34.3	35.2	34.8	33.1	31.7	32.8	34.7	31.7	27.3	31.7

MEAN MONTHLY MINIMUM TEMPERATURE

YEAR													Unit: °C
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
1961	10.9	12.4	18.3	21.1	26.3	27.9	27.4	26.7	25.9	19.9	14.4	10.7	20.2
1962	9.1	13.9	17.6	22.1	25.2	27.4	27.4	26.1	25.1	18.8	15.2	10.7	19.9
1963	10.3	13.1	18.1	22.9	25.5	27.7	27.6	26.1	24.6	23.2	18.7	13.1	20.9
1964	10.1	12.9	19.1	22.9	26.4	27.8	28.1	27.6	24.8	18.8	12.6	10.0	20.1
1965	13.3	13.8	17.3	21.1	25.5	28.1	26.7	26.4	25.6	23.2	17.4	10.8	20.8
1966	10.5	15.1	16.6	21.9	25.4	27.1	27.5	25.5	24.9	22.3	13.6	9.1	20.0
1967	7.6	14.2	18.1	21.5	25.4	27.3	27.3	26.2	25.4	17.9	17.9	12.0	20.1
1968	9.2	11.1	17.4	21.2	24.1	27.8	27.8	25.2	24.8	21.3	16.7	11.1	19.8
1969	10.1	11.8	17.8	22.7	24.7	26.9	27.5	25.5	24.2	22.2	17.1	12.0	20.2
1970	10.9	12.3	17.6	21.8	25.3	28.0	27.1	27.1	25.7	22.4	14.9	11.4	20.4
1971	8.9	12.1	16.3	23.9	26.6	28.4	26.9	26.9	24.9	20.9	15.8	11.5	20.3
1972	11.7	9.3	16.9	21.7	25.6	28.1	28.5	26.1	24.4	20.8	15.8	12.1	20.1
1973	9.0	13.3	16.5	22.9	27.1	28.4	27.2	26.6	25.2	20.4	15.4	11.6	20.3
1974	10.1	10.7	18.3	22.1	25.2	26.7	27.1	26.0	24.9	20.4	14.9	11.9	19.9
1975	9.4	12.8	15.5	22.0	26.2	28.2	27.8	26.5	25.6	22.0	14.5	12.7	20.3
1976	12.7	14.4	18.2	22.1	25.6	27.6	27.3	25.9	25.5	23.0	16.3	11.9	20.9
1977	9.6	13.4	18.6	24.3	26.9	28.0	27.4	26.1	24.7	20.4	17.3	13.4	20.8
1978	10.4	13.1	17.7	23.5	24.7	28.2	27.1	26.2	25.1	20.6	17.6	12.2	20.5
1979	10.2	12.2	16.2	21.4	24.7	28.4	27.8	26.1	25.8	23.0	17.9	13.1	20.6
1980	10.7	13.5	18.3	24.2	27.9	28.4	27.6	26.6	25.5	22.1	16.8	12.0	21.1
1981	10.2	13.1	17.8	21.9	25.4	27.5	27.4	26.3	25.1	21.0	15.9	11.1	20.2
1982	10.0	12.9	16.5	22.1	25.4	28.1	27.6	27.1	25.4	22.4	16.1	13.2	20.6
1983	11.4	12.5	16.8	21.3	26.3	28.1	28.1	26.6	26.0	20.5	14.3	10.9	20.2
1984	8.6	9.5	17.9	23.1	25.9	28.1	27.0	25.4	24.9	18.1	15.1	11.5	19.6
1985	10.1	11.8	18.8	22.1	26.0	27.8	26.6	24.7	24.9	21.1	16.1	10.6	20.1
1986	8.4	11.8	16.9	22.9	26.3	28.5	27.2	25.2	24.5	20.9	15.7	9.2	19.8
1987	9.4	12.4	19.1	21.5	26.2	28.3	28.2	26.9	25.8	21.0	15.7	10.5	20.4
1988	10.6	14.2	18.6	23.2	26.8	28.4	28.1	27.4	27.4	22.9	15.8	12.8	21.4
MEAN	10.1	12.6	17.6	22.3	25.8	27.9	27.5	26.3	25.2	21.1	15.9	11.5	20.3

Table B.2.3 MONTHLY TEMPERATURE (2/3)

STATION: KARACHI AIRPORT Latitude = 24° 54' Longitude = 67° 08'

MONTHLY MEAN TEMPERATURE

Unit: °C

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
1929	19.0	19.6	24.9	27.8	29.2	30.2	29.8	27.4	26.9	27.1	25.2	19.1	25.5
1930	18.2	20.3	24.2	26.7	28.6	30.4	29.2	27.1	27.3	27.2	24.5	21.1	25.4
1931	19.4	18.6	23.2	27.5	29.4	30.6	32.2	29.6	26.8	26.6	24.6	21.7	25.9
1932	20.1	21.5	24.7	27.2	28.8	29.7	29.5	27.7	27.4	27.7	23.9	20.9	25.8
1933	18.6	19.9	23.8	26.8	28.9	30.4	29.1	27.3	27.9	27.1	25.2	21.8	25.6
1934	16.7	20.7	23.5	27.2	29.1	29.8	29.6	28.9	27.7	26.4	24.9	21.9	25.5
1935	17.3	20.6	24.2	26.4	29.1	30.5	28.9	27.8	27.2	26.8	24.5	21.5	25.4
1936	18.8	21.7	22.9	26.4	29.1	30.5	28.9	27.8	27.2	26.8	24.5	21.5	25.5
1937	19.6	21.8	23.6	26.3	28.5	30.1	29.4	28.1	27.5	27.2	25.1	19.6	25.6
1938	18.3	20.1	23.9	26.1	29.1	30.8	28.7	27.2	26.8	26.1	23.5	20.5	25.1
1939	19.8	20.4	22.7	25.4	27.3	29.9	27.9	26.9	26.8	26.3	25.6	22.6	25.1
1940	20.7	20.9	23.2	25.9	29.2	30.2	29.7	27.6	26.4	27.4	26.1	21.7	25.8
1941	19.7	22.6	25.2	27.2	29.3	30.4	28.6	28.4	27.4	28.2	25.5	21.5	26.2
1942	19.3	21.2	24.7	27.2	29.1	29.8	29.4	27.2	27.2	26.8	25.5	20.4	25.6
1943	17.7	21.1	24.4	27.1	29.2	30.4	28.5	27.2	27.0	27.4	25.7	22.9	25.7
1944	20.1	20.9	24.3	26.3	28.5	30.2	28.8	28.7	28.7	27.2	25.6	21.6	25.9
1945	17.6	21.2	23.9	25.8	28.9	30.3	29.1	28.1	27.4	26.7	24.9	20.6	25.4
1946	19.7	21.5	24.1	27.7	28.9	31.5	29.7	28.5	28.1	27.4	24.5	19.4	25.9
1947	19.8	21.5	24.3	27.4	28.8	29.4	28.1	28.4	27.9	26.3	25.5	21.4	25.7
1948	19.6	20.9	24.6	27.6	29.6	29.7	29.3	26.7	27.9	28.1	24.2	21.7	25.8
1949	19.2	21.5	24.8	28.1	29.5	31.3	29.9	28.6	28.0	26.6	24.2	19.8	26.0
1950	19.4	19.0	24.2	26.4	28.9	30.3	28.6	28.4	28.2	27.4	24.2	19.8	25.4
1951	19.5	20.5	24.8	25.9	28.7	30.8	29.7	27.8	27.8	26.9	25.5	22.2	25.8
1952	19.8	21.9	24.6	27.8	29.9	31.2	29.2	27.8	27.5	26.4	24.3	20.9	25.9
1953	19.6	22.6	25.9	26.9	28.7	30.6	30.2	29.2	28.0	27.9	25.6	24.0	26.6
1954	19.7	21.2	25.1	27.2	29.2	30.7	29.7	28.5	27.1	26.9	25.5	21.8	26.1
1955	19.3	22.4	26.6	29.4	30.3	29.6	28.2	28.8	27.6	25.2	21.7	*	*
1956	18.8	21.4	24.7	26.9	29.6	31.2	28.8	27.7	28.2	26.6	24.4	21.2	25.8
1957	18.6	20.1	23.8	26.4	29.4	30.7	29.9	28.7	27.6	26.3	24.8	21.2	25.6
1958	20.5	22.1	25.2	28.1	30.4	31.1	29.4	29.1	27.9	28.1	25.7	21.5	26.6
1959	19.1	20.9	24.8	28.8	30.0	30.0	29.5	28.9	28.2	28.4	23.8	19.7	26.0
1960	18.9	23.3	25.1	29.1	31.1	31.1	30.1	29.2	28.6	26.1	24.1	20.9	27.2
1961	18.3	18.9	25.4	26.9	30.1	31.4	30.5	29.3	28.8	26.7	22.5	18.9	25.6
1962	17.4	21.4	24.3	27.7	30.7	31.7	30.5	28.8	29.1	26.4	22.9	18.5	25.8
1963	18.7	21.8	24.8	28.2	30.1	30.6	30.3	29.2	26.4	26.3	24.6	20.4	26.0
1964	16.5	20.3	26.2	29.4	30.9	31.1	30.6	30.2	28.4	26.3	21.5	18.0	25.8
1965	20.3	21.2	24.3	26.6	29.8	30.8	29.5	29.1	28.6	28.7	24.7	18.8	26.0
1966	19.3	22.4	23.8	27.8	30.7	30.5	30.5	28.3	29.0	28.7	22.6	17.9	26.0
1967	16.3	21.6	23.9	27.1	30.7	30.9	30.6	28.8	28.4	26.3	24.8	18.3	25.6
1968	16.5	18.1	24.2	27.8	29.6	31.1	30.8	28.4	28.2	28.1	24.9	19.2	25.6
1969	18.1	19.6	25.8	29.1	30.3	30.8	30.5	28.1	28.2	28.6	24.6	20.7	26.2
1970	18.4	20.2	30.8	26.6	30.3	31.6	30.3	29.9	29.3	28.1	23.4	19.5	26.5
1971	17.3	20.4	23.9	30.5	30.4	31.3	29.6	28.7	29.3	27.3	23.7	19.7	26.0
1972	19.1	17.1	24.1	27.2	30.8	31.5	31.0	29.1	28.6	27.9	24.0	19.4	25.8
1973	16.7	20.9	24.4	19.5	31.0	31.4	29.9	29.3	28.3	27.7	23.4	18.8	25.1
1974	17.9	18.3	25.7	27.9	29.9	30.5	30.3	29.1	29.1	28.7	23.0	19.1	25.8
1975	16.9	19.7	22.9	28.5	30.3	31.5	30.7	29.7	29.3	28.3	22.8	20.6	25.9
1976	18.9	20.6	24.2	27.2	29.6	20.7	30.1	28.9	28.4	27.9	24.5	19.7	25.1
1977	17.1	21.2	26.8	29.3	31.5	31.6	29.8	28.7	28.4	28.5	25.2	21.0	26.6
1978	18.1	20.3	23.9	28.9	30.7	31.7	29.5	28.5	28.1	27.7	24.7	20.3	26.0
1979	18.7	19.7	23.3	28.3	30.1	32.3	30.6	28.9	29.3	27.7	25.1	20.0	26.2
1980	18.0	21.1	24.7	30.7	31.4	31.7	30.7	29.3	28.6	26.2	24.0	19.3	26.3
1981	19.1	20.9	24.5	28.9	30.8	31.9	30.3	28.5	29.9	28.1	23.0	19.9	26.3
1982	17.7	19.4	23.7	28.1	30.9	31.8	31.0	29.9	29.7	28.5	23.7	20.2	26.2
1983	18.9	19.5	23.5	26.7	30.5	31.9	30.9	29.4	29.7	27.7	23.1	19.3	25.9
1984	17.2	18.1	25.4	29.5	30.1	31.7	29.7	27.9	28.5	26.1	23.3	19.9	25.6
1985	18.1	20.7	26.3	27.5	31.1	29.3	27.8	28.3	28.3	24.5	24.5	19.9	25.5
1986	17.4	19.5	24.1	28.3	31.3	32.0	29.8	28.0	28.1	28.9	24.2	17.6	25.8
1987	18.1	20.9	25.3	28.3	30.4	32.1	31.0	29.9	29.3	26.7	24.7	19.5	26.4
1988	19.6	21.7	25.0	29.5	31.1	32.3	31.1	29.9	31.8	28.7	24.3	20.7	27.1
MEAN	18.6	20.7	24.6	27.5	29.8	30.7	29.8	28.5	28.2	27.2	24.3	20.5	25.9
1961-1988 Mean	18.0	20.2	24.8	27.9	30.5	31.0	30.3	29.0	28.8	27.5	23.8	19.5	26.0

Table B.2.3 MONTHLY TEMPERATURE (3/3)

STATION: MALIR RIVER Latitude = 25°03' Longitude = 67°23'
 AT SUPER HIGHWAY

MEAN MONTHLY MAXIMUM TEMPERATURE													Unit: °C
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
1979	25.0	26.0	30.0	36.0	37.0	37.0	31.0	32.0	34.0	33.0	32.0	26.0	31.6
1980	24.0	*	*	*	*	36.0	33.0	33.0	33.0	34.0	31.0	*	*
1981	23.3	28.3	31.7	35.0	36.1	36.7	32.8	31.7	34.4	35.6	29.4	26.7	31.8
1982	25.0	30.0	34.0	37.0	37.0	34.0	33.0	34.0	34.0	29.0	28.0	*	*
1983	26.1	26.1	31.1	32.2	36.1	37.2	35.0	32.2	33.9	35.0	32.2	30.0	32.3
1984	25.0	26.1	32.8	35.0	36.1	35.0	32.2	30.0	32.2	26.7	*	*	*
1985	25.0	28.9	35.0	33.9	37.2	32.2	30.6	32.2	35.0	31.1	25.0	*	*
1986	23.9	26.1	32.2	35.6	36.7	32.2	30.6	31.7	34.4	31.1	22.8	*	*
1987	25.6	27.8	31.1	35.0	35.6	36.1	32.8	32.2	32.2	35.6	32.2	26.1	31.9
1988	23.9	27.8	30.5	30.6	37.8	*	*	*	*	*	*	*	*
MEAN	24.7	27.5	32.0	34.5	36.6	35.2	32.3	32.1	33.7	32.3	29.1	27.2	31.4

MEAN MONTHLY MINIMUM TEMPERATURE													Unit: °C
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
1979	13.0	14.0	17.0	22.0	24.0	28.0	27.0	26.0	25.0	23.0	20.0	15.0	21.2
1980	12.0	*	*	*	*	30.0	27.0	26.0	24.0	25.0	23.0	*	*
1981	17.8	15.6	17.8	21.1	25.0	27.8	26.7	25.6	25.0	23.3	18.3	16.1	21.7
1982	17.0	21.0	24.0	27.0	29.0	27.0	27.0	25.0	25.0	19.0	20.0	*	*
1983	18.3	17.2	18.9	21.1	23.9	27.2	27.8	26.1	26.1	22.7	21.1	21.1	22.6
1984	16.1	15.0	20.0	22.2	25.0	27.2	27.2	26.1	26.1	17.2	*	*	*
1985	12.8	13.9	18.9	22.2	26.1	26.1	25.6	24.4	21.1	17.8	12.2	*	*
1986	11.1	12.8	17.8	22.2	26.1	27.2	25.6	24.4	22.7	17.2	11.1	*	*
1987	10.6	13.9	20.0	21.6	26.1	28.9	27.8	27.2	26.1	22.2	18.3	12.2	21.2
1988	14.4	15.0	18.9	23.3	26.1	*	*	*	*	*	*	*	*
MEAN	14.3	15.4	19.3	22.5	25.7	27.7	26.9	25.6	24.6	20.8	18.0	16.1	21.4

MONTHLY MEAN TEMPERATURE													Unit: °C
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
1979	19.0	20.0	23.5	29.0	30.5	32.5	29.0	29.0	29.5	28.0	26.0	20.5	26.4
1980	18.0	*	*	*	*	33.0	30.0	29.5	28.5	29.5	27.0	*	*
1981	20.6	22.0	24.8	28.1	30.6	32.3	29.8	28.7	29.7	29.5	23.9	21.4	26.7
1982	21.0	25.5	29.0	32.0	33.0	30.5	30.0	29.5	29.5	24.0	24.0	*	*
1983	22.2	21.7	25.0	26.7	30.0	32.2	31.4	29.2	30.0	28.9	26.7	25.6	27.4
1984	20.6	20.6	26.4	28.6	30.6	31.1	29.7	28.1	29.2	22.0	*	*	*
1985	18.9	21.4	27.0	28.1	31.7	29.2	28.1	28.3	28.1	24.5	18.6	*	*
1986	17.5	19.5	25.0	28.9	31.4	29.7	28.1	28.1	28.6	24.2	17.0	*	*
1987	18.1	20.9	25.6	28.3	30.9	32.5	30.3	29.7	29.2	28.9	25.3	19.2	26.6
1988	19.2	21.4	24.7	27.0	32.0	*	*	*	*	*	*	*	*
MEAN	19.5	21.4	25.7	28.5	31.2	31.4	29.6	28.9	29.1	26.6	23.5	21.7	26.4

Table B.2.4 RELATIVE HUMIDITY (1/2)

STATION: KARACHI AIRPORT

Latitude = 24° 54' Longitude = 67° 08'

YEAR	AT 0:00 GMT (AT 5:00 AM)												Unit: %
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
1961	67.0	83.0	81.0	85.0	89.0	81.0	90.0	92.0	90.0	83.0	65.0	64.0	80.8
1962	63.0	69.0	76.0	88.0	85.0	86.0	87.0	88.0	85.0	83.0	64.0	66.0	78.3
1963	58.0	73.0	80.0	91.0	89.0	88.0	86.0	87.0	89.0	86.0	74.0	64.0	80.4
1964	71.0	64.0	82.0	86.0	89.0	81.0	97.0	89.0	89.0	75.0	66.0	57.0	78.8
1965	68.0	75.0	83.0	83.0	84.0	83.0	87.0	85.0	88.0	94.0	76.0	58.0	80.3
1966	60.0	76.0	71.0	85.0	79.0	85.0	83.0	84.0	84.0	83.0	54.0	83.0	77.3
1967	53.0	81.0	78.0	84.0	79.0	86.0	89.0	88.0	87.0	77.0	84.0	74.0	80.0
1968	70.0	73.0	74.0	82.0	79.0	84.0	86.0	85.0	87.0	83.0	70.0	72.0	78.8
1969	70.0	75.0	80.0	83.0	86.0	85.0	83.0	84.0	81.0	80.0	58.0	56.0	76.8
1970	62.0	62.0	81.0	79.0	86.0	82.0	78.0	84.0	84.0	81.0	76.0	72.0	77.3
1971	64.0	74.0	75.0	79.0	88.0	83.0	86.0	88.0	87.0	84.0	72.0	67.0	78.9
1972	64.0	55.0	80.0	87.0	86.0	85.0	83.0	84.0	86.0	80.0	66.0	59.0	76.3
1973	53.0	71.0	65.0	72.0	85.0	83.0	88.0	88.0	85.0	71.0	75.0	67.0	75.3
1974	65.0	56.0	77.0	83.0	86.0	77.0	80.0	81.0	84.0	61.0	67.0	58.0	72.9
1975	62.0	62.0	72.0	70.0	84.0	81.0	80.0	83.0	85.0	68.0	65.0	66.0	73.2
1976	78.0	75.0	81.0	85.0	88.0	84.0	85.0	84.0	86.0	88.0	53.0	64.0	79.3
1977	63.0	70.0	71.0	86.0	85.0	83.0	87.0	87.0	87.0	85.0	75.0	78.0	79.8
1978	68.0	75.0	81.0	84.0	85.0	82.0	86.0	82.0	85.0	81.0	69.0	62.0	78.3
1979	67.0	79.0	81.0	89.0	83.0	84.0	83.0	85.0	83.0	84.0	64.0	73.0	79.6
1980	71.0	75.0	80.0	87.0	83.0	84.0	84.0	80.0	84.0	82.0	69.0	74.0	79.4
1981	71.0	75.0	83.0	83.0	82.0	82.0	82.0	84.0	82.0	76.0	78.0	68.0	78.8
1982	66.0	74.0	74.0	82.0	78.0	80.0	84.0	85.0	82.0	88.0	71.0	73.0	78.1
1983	64.0	71.0	70.0	79.0	85.0	84.0	84.0	89.0	89.0	83.0	77.0	69.0	78.7
1984	71.0	60.0	81.0	81.0	86.0	83.0	84.0	90.0	86.0	82.0	84.0	75.0	80.3
1985	77.0	78.0	81.0	87.0	83.0	82.0	87.0	86.0	86.0	81.0	83.0	72.0	81.9
1986	60.0	74.0	82.0	85.0	80.0	82.0	83.0	87.0	82.0	78.0	67.0	61.0	76.8
1987	68.0	74.0	83.0	80.0	83.0	83.0	81.0	83.0	84.0	75.0	69.0	59.0	76.8
1988	63.0	66.0	76.0	82.0	84.0	83.0	83.0	84.0	76.0	83.0	76.0	62.0	76.5
MEAN	65.6	71.3	77.8	83.1	84.3	83.1	84.9	85.6	85.1	80.5	70.3	66.9	78.2

YEAR	AT 03:00 GMT (AT 8:00 AM)												Unit: %
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
1961	65.0	82.0	79.0	74.0	81.0	75.0	86.0	88.0	87.0	76.0	57.0	61.0	75.9
1962	65.0	63.0	70.0	80.0	75.0	79.0	81.0	85.0	81.0	77.0	57.0	66.0	73.3
1963	55.0	67.0	75.0	81.0	80.0	81.0	82.0	83.0	85.0	79.0	71.0	60.0	74.9
1964	68.0	61.0	77.0	77.0	81.0	77.0	83.0	85.0	85.0	70.0	61.0	57.0	73.5
1965	66.0	73.0	78.0	74.0	76.0	77.0	84.0	81.0	83.0	85.0	71.0	56.0	75.3
1966	60.0	75.0	65.0	78.0	71.0	79.0	78.0	81.0	78.0	78.0	50.0	74.0	72.3
1967	52.0	79.0	72.0	79.0	70.0	77.0	85.0	85.0	82.0	71.0	78.0	74.0	75.3
1968	70.0	72.0	71.0	75.0	65.0	75.0	81.0	72.0	84.0	76.0	67.0	55.0	71.9
1969	68.0	74.0	74.0	75.0	70.0	77.0	78.0	81.0	78.0	78.0	55.0	54.0	71.8
1970	62.0	62.0	78.0	73.0	77.0	77.0	75.0	81.0	79.0	75.0	69.0	70.0	73.2
1971	64.0	71.0	70.0	74.0	81.0	77.0	82.0	84.0	82.0	80.0	67.0	66.0	74.8
1972	63.0	54.0	78.0	79.0	76.0	78.0	81.0	81.0	81.0	72.0	62.0	58.0	71.9
1973	50.0	69.0	58.0	67.0	76.0	76.0	83.0	84.0	83.0	65.0	71.0	67.0	70.8
1974	62.0	52.0	73.0	77.0	77.0	70.0	75.0	77.0	80.0	48.0	64.0	57.0	67.7
1975	64.0	59.0	66.0	64.0	77.0	75.0	75.0	83.0	80.0	62.0	58.0	62.0	68.8
1976	77.0	72.0	78.0	78.0	79.0	76.0	83.0	81.0	81.0	83.0	47.0	61.0	74.7
1977	61.0	65.0	66.0	78.0	76.0	76.0	85.0	84.0	82.0	82.0	68.0	71.0	74.5
1978	66.0	71.0	77.0	76.0	76.0	76.0	83.0	83.0	81.0	74.0	65.0	56.0	73.7
1979	66.0	74.0	77.0	77.0	71.0	75.0	76.0	79.0	77.0	77.0	52.0	65.0	72.2
1980	69.0	67.0	72.0	77.0	74.0	77.0	80.0	76.0	78.0	75.0	60.0	68.0	72.8
1981	64.0	72.0	77.0	78.0	73.0	75.0	78.0	81.0	79.0	71.0	72.0	67.0	73.9
1982	64.0	70.0	69.0	75.0	68.0	77.0	78.0	81.0	78.0	76.0	63.0	65.0	72.0
1983	66.0	71.0	65.0	75.0	80.0	77.0	80.0	87.0	86.0	78.0	72.0	68.0	75.4
1984	68.0	56.0	77.0	78.0	78.0	77.0	80.0	88.0	83.0	74.0	78.0	68.0	75.4
1985	72.0	73.0	74.0	79.0	75.0	76.0	80.0	78.0	81.0	74.0	76.0	62.0	75.0
1986	52.0	67.0	71.0	77.0	70.0	74.0	78.0	81.0	77.0	70.0	61.0	55.0	69.4
1987	65.0	72.0	80.0	70.0	72.0	73.0	73.0	79.0	79.0	68.0	62.0	51.0	70.3
1988	61.0	62.0	71.0	74.0	76.0	73.0	78.0	81.0	71.0	79.0	71.0	61.0	71.5
MEAN	63.8	68.0	72.8	75.7	75.0	76.1	80.0	81.8	80.8	74.0	64.5	62.7	72.9

Table B.2.4 RELATIVE HUMIDITY (2/2)

STATION: KARACHI AIRPORT

Latitude = 24° 54' Longitude = 67° 08'

YEAR	AT 12:00 GMT (AT 5:00 PM)												Unit: %
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
1961	39.0	50.0	46.0	55.0	69.0	64.0	80.0	83.0	76.0	42.0	31.0	32.0	55.6
1962	32.0	34.0	42.0	58.0	54.0	69.0	72.0	74.0	60.0	38.0	40.0	40.0	51.1
1963	26.0	42.0	59.0	61.0	66.0	75.0	73.0	72.0	72.0	62.0	54.0	38.0	58.3
1964	48.0	42.0	49.0	49.0	67.0	67.0	71.0	75.0	69.0	48.0	52.0	39.0	56.3
1965	40.0	43.0	55.0	48.0	63.0	68.0	76.0	71.0	77.0	68.0	48.0	42.0	58.3
1966	40.0	49.0	43.0	52.0	54.0	69.0	71.0	71.0	66.0	56.0	33.0	32.0	53.0
1967	32.0	48.0	46.0	50.0	46.0	64.0	77.0	74.0	69.0	46.0	51.0	45.0	54.0
1968	41.0	39.0	45.0	50.0	52.0	66.0	71.0	76.0	72.0	55.0	48.0	56.0	55.9
1969	46.0	44.0	50.0	43.0	54.0	65.0	69.0	70.0	60.0	45.0	33.0	33.0	51.0
1970	34.0	33.0	43.0	45.0	62.0	62.0	68.0	72.0	65.0	50.0	41.0	46.0	51.8
1971	36.0	41.0	40.0	43.0	68.0	68.0	72.0	77.0	63.0	55.0	42.0	43.0	54.0
1972	41.0	35.0	47.0	54.0	57.0	67.0	75.0	72.0	60.0	47.0	35.0	35.0	52.1
1973	29.0	36.0	30.0	39.0	64.0	67.0	75.0	74.0	68.0	45.0	45.0	37.0	50.8
1974	35.0	26.0	36.0	52.0	63.0	58.0	67.0	68.0	63.0	28.0	37.0	26.0	46.6
1975	32.0	34.0	33.0	37.0	58.0	65.0	65.0	69.0	61.0	44.0	33.0	37.0	47.3
1976	45.0	40.0	45.0	53.0	64.0	67.0	71.0	69.0	71.0	54.0	28.0	37.0	53.7
1977	38.0	30.0	32.0	58.0	61.0	66.0	73.0	71.0	65.0	46.0	47.0	46.0	52.8
1978	38.0	36.0	48.0	51.0	59.0	64.0	75.0	72.0	64.0	41.0	37.0	31.0	51.3
1979	33.0	42.0	50.0	49.0	59.0	64.0	66.0	71.0	61.0	57.0	30.0	44.0	52.2
1980	40.0	40.0	47.0	49.0	69.0	76.0	73.0	66.0	64.0	50.0	35.0	41.0	54.2
1981	37.0	34.0	51.0	51.0	57.0	62.0	69.0	73.0	59.0	41.0	46.0	40.0	51.7
1982	35.0	47.0	37.0	47.0	51.0	66.0	67.0	73.0	61.0	56.0	43.0	40.0	51.9
1983	36.0	41.0	40.0	51.0	66.0	63.0	70.0	78.0	71.0	53.0	39.0	37.0	53.8
1984	36.0	27.0	47.0	48.0	63.0	65.0	70.0	81.0	71.0	42.0	49.0	54.0	54.4
1985	39.0	46.0	44.0	59.0	55.0	65.0	72.0	72.0	68.0	43.0	44.0	34.0	53.4
1986	24.0	36.0	44.0	50.0	56.0	62.0	69.0	73.0	66.0	46.0	38.0	27.0	49.3
1987	29.0	29.0	48.0	39.0	60.0	62.0	66.0	67.0	65.0	37.0	28.0	26.0	46.3
1988	33.0	31.0	42.0	46.0	60.0	61.0	68.0	73.0	54.0	48.0	32.0	35.0	48.6
MEAN	36.2	38.4	44.3	49.5	59.9	65.6	71.1	72.8	65.8	48.0	40.0	38.3	52.5

Table B.2.5 MONTHLY TOTAL SUNSHINE HOUR

STATION : KARACHI AIRPORT

Latitude = 24° 54' Longitude = 67° 08'

YEAR	Unit: Hour												MBAN
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
1947	*	*	*	278.4	227.8	200.8	117.9	148.6	170.6	287.6	280.6	291.7	*
1948	280.0	254.0	294.1	302.2	327.2	252.5	89.0	126.0	187.1	280.2	282.2	263.4	244.8
1949	279.4	257.5	238.1	313.1	323.2	246.0	115.0	149.0	210.4	263.9	276.2	276.1	245.7
1950	*	*	*	*	*	*	*	*	*	*	*	*	*
1951	272.7	265.1	255.6	312.1	296.9	241.5	148.1	160.8	246.4	299.9	249.5	292.4	253.4
1952	275.9	268.2	287.6	276.1	304.4	238.5	118.3	126.3	204.1	285.1	284.3	268.8	244.8
1953	280.4	251.0	282.4	299.1	312.9	230.8	114.0	163.1	219.6	280.8	283.8	271.3	249.1
1954	270.3	225.0	287.3	301.5	327.1	241.1	202.4	202.2	223.7	297.3	289.2	293.4	263.4
1955	251.1	277.1	292.7	307.2	310.7	229.4	216.3	127.6	202.1	311.6	292.4	260.3	256.5
1956	275.2	268.4	286.5	304.0	297.9	197.5	104.3	108.3	223.8	298.6	284.6	234.6	240.3
1957	265.2	266.7	279.5	276.2	318.1	255.4	164.9	205.2	263.5	284.8	280.1	263.8	260.3
1958	276.1	262.4	290.4	286.9	309.9	224.3	104.1	200.0	214.6	270.8	276.5	262.9	248.2
1959	276.8	259.7	287.7	298.3	295.2	215.0	137.9	116.3	135.0	290.7	271.8	286.9	239.3
1960	278.3	288.5	257.1	291.9	324.7	242.0	119.1	88.5	212.4	301.2	285.8	250.6	245.0
1961	270.2	258.2	253.8	276.7	276.6	207.5	148.4	130.0	176.0	292.9	280.6	287.5	238.2
1962	282.3	213.1	282.2	287.0	315.2	193.8	154.2	129.5	174.0	268.2	263.5	278.1	236.8
1963	294.4	277.4	270.3	274.4	308.8	169.2	91.1	138.9	195.4	255.9	258.2	262.1	233.0
1964	241.6	259.4	277.3	285.1	298.1	219.6	172.0	170.9	234.0	304.8	285.7	245.2	249.5
1965	262.1	262.8	289.5	242.4	294.1	208.0	168.8	212.7	260.0	267.5	307.8	300.3	256.3
1966	308.5	263.8	272.3	300.3	325.2	230.8	226.8	158.6	226.8	281.9	287.4	280.2	263.6
1967	285.7	242.6	227.6	276.2	327.0	250.9	168.5	118.8	174.4	276.8	268.4	244.9	238.5
1968	258.6	241.3	280.2	288.7	317.7	267.9	184.4	145.7	262.2	294.8	265.2	272.3	256.6
1969	279.3	250.8	270.2	264.3	293.8	250.6	170.6	118.8	236.5	287.2	266.6	282.7	247.6
1970	268.8	262.6	292.4	298.8	326.3	250.5	193.6	169.6	198.3	304.4	295.1	279.4	261.7
1971	277.6	273.7	297.4	279.0	279.7	185.4	134.7	134.8	249.6	281.6	273.0	270.4	244.7
1972	262.8	270.8	293.7	269.0	319.8	274.5	177.2	199.4	263.0	291.9	292.3	254.2	264.1
1973	279.9	228.2	284.0	295.4	209.4	155.8	155.7	203.8	281.1	269.1	271.8	236.0	239.2
1974	278.4	266.3	269.8	248.7	301.1	236.0	187.6	159.1	220.0	294.4	285.1	281.9	252.4
1975	258.2	220.1	305.5	290.2	306.2	251.5	196.0	158.0	233.2	296.6	285.7	276.6	256.5
1976	250.4	267.1	253.8	289.9	313.3	257.4	148.4	121.8	224.3	293.0	273.4	278.3	247.6
1977	273.3	260.6	305.5	275.4	306.9	255.9	149.4	192.0	235.0	298.6	270.8	268.3	257.6
1978	264.4	233.8	286.3	293.0	304.5	218.5	93.2	119.4	216.6	292.2	256.9	283.1	238.5
1979	277.8	241.5	283.8	279.5	305.1	272.4	150.6	182.1	241.7	279.1	261.3	247.2	251.8
1980	285.6	264.1	264.4	291.6	306.6	252.9	252.9	164.4	209.8	257.6	272.5	275.9	258.2
1981	272.1	268.3	269.5	288.1	312.0	247.1	123.8	162.0	255.6	296.8	256.2	270.3	251.8
1982	248.7	193.7	277.7	287.0	282.5	254.4	186.8	134.1	248.4	263.4	241.5	248.2	238.9
1983	247.5	215.3	270.2	267.4	294.5	275.4	185.8	138.3	127.8	300.8	283.2	269.1	239.6
1984	284.2	276.5	269.9	294.7	320.7	250.8	110.3	71.2	180.7	285.6	279.1	275.4	241.6
1985	262.9	262.9	272.6	291.4	308.6	212.7	132.8	108.3	229.8	296.5	269.5	275.4	243.6
1986	286.4	242.7	264.1	258.0	291.9	271.4	59.8	107.1	218.3	273.3	267.4	265.2	233.8
1987	286.0	262.5	231.4	267.5	262.6	291.8	130.4	167.7	165.3	258.2	272.3	279.4	239.6
MEAN	272.5	254.5	275.8	285.2	302.1	235.7	150.1	148.5	216.3	285.4	275.7	270.1	247.6
DAYLY MEAN	8.8	9.1	8.9	9.5	9.7	7.9	4.8	4.8	7.2	9.2	9.2	8.7	8.2

Table B.2.6 MONTHLY MEAN WIND VELOCITY (1/2)

STATION: KARACHI AIRPORT

Latitude = 24°54' Longitude = 67° 08'

AT PAST 24 HRS													Unit: m/sec
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
1961	1.6	1.9	2.8	3.5	5.7	5.2	4.5	4.4	3.3	2.1	1.6	1.5	3.2
1962	1.7	2.2	2.8	3.9	4.4	6.7	5.5	5.5	3.5	1.5	1.4	1.5	3.4
1963	1.5	1.7	3.1	4.1	5.7	5.9	6.0	6.1	4.7	2.8	1.5	1.6	3.7
1964	1.3	1.9	2.8	3.6	4.4	4.9	5.1	4.6	4.4	2.1	1.4	1.5	3.2
1965	1.9	2.2	3.0	3.6	4.8	5.9	5.2	6.1	4.4	2.9	1.7	1.6	3.6
1966	1.5	2.3	3.4	4.1	4.7	5.0	5.2	5.4	4.1	2.5	1.6	1.5	3.5
1967	1.9	2.1	2.3	3.2	3.5	4.4	3.9	3.1	3.8	2.0	1.6	2.2	2.8
1968	1.4	1.5	2.9	2.7	4.2	5.0	4.9	5.3	3.8	1.9	1.4	1.6	3.1
1969	1.8	2.0	2.6	3.0	4.1	4.9	5.2	5.1	4.3	2.7	2.0	1.7	3.3
1970	2.0	2.3	2.8	3.0	4.6	4.2	4.2	3.5	3.0	1.9	1.1	1.1	2.8
1971	1.2	1.7	2.1	3.5	5.2	4.8	4.9	5.2	3.5	2.6	1.4	1.0	3.1
1972	1.5	3.0	2.7	3.5	3.7	3.9	5.0	5.0	4.2	2.0	1.4	1.6	3.1
1973	1.9	2.1	2.6	3.1	4.7	5.2	3.9	4.5	4.4	1.7	1.5	2.0	3.1
1974	1.9	2.3	2.4	4.3	4.3	6.0	4.3	4.7	4.0	1.7	1.4	1.9	3.2
1975	1.8	2.1	2.4	3.4	4.5	4.0	4.8	3.8	3.7	2.1	1.2	1.1	2.9
1976	1.4	2.0	2.2	1.1	4.9	4.9	4.3	4.6	3.3	2.2	1.5	1.2	2.8
1977	1.4	1.6	2.3	3.6	4.4	4.6	4.7	4.5	3.7	1.7	1.5	1.3	3.0
1978	1.3	1.5	2.7	3.0	4.6	3.9	3.5	4.4	3.5	1.3	1.6	1.4	2.7
1979	1.5	1.5	2.5	2.7	3.8	3.8	4.4	4.0	3.0	1.9	1.0	1.3	2.6
1980	1.5	1.6	2.2	2.6	4.0	3.7	4.8	3.9	3.9	2.2	1.4	1.4	2.8
1981	1.8	1.4	2.4	2.7	4.0	4.3	4.4	3.5	3.2	1.7	1.3	1.1	2.7
1982	1.3	1.6	2.2	3.3	3.3	4.2	4.1	3.6	3.1	2.2	1.4	1.5	2.7
1983	1.5	1.9	3.1	3.1	3.8	3.4	3.9	3.7	2.6	1.4	0.9	0.9	2.5
1984	1.1	1.6	1.9	2.5	4.0	4.4	3.7	2.5	3.1	1.2	0.9	1.1	2.3
1985	1.2	1.7	2.5	3.1	3.4	5.0	4.1	3.7	3.6	1.7	0.9	0.7	2.6
1986	1.0	1.6	2.2	2.8	3.0	2.1	*	*	1.4	1.9	0.1	0.8	*
1987	1.5	1.6	2.7	3.0	*	5.2	5.5	4.6	2.1	1.6	1.7	0.6	*
MEAN	1.5	1.9	2.6	3.2	4.3	4.7	4.6	4.4	3.5	2.0	1.4	1.4	3.0

DAY TIME													Unit: m/sec
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
1961	2.3	2.4	3.9	4.7	7.2	6.1	5.2	5.2	4.3	3.0	2.2	2.1	4.0
1962	2.3	2.9	3.6	5.6	5.9	7.6	6.3	6.2	4.9	2.6	2.3	2.2	4.4
1963	2.3	2.5	4.0	5.4	6.9	7.2	7.2	7.4	5.9	4.1	3.1	2.5	4.9
1964	1.7	2.3	3.4	5.1	6.2	6.1	7.5	5.5	5.7	3.2	2.1	1.9	4.2
1965	2.4	2.7	4.1	4.7	6.1	7.1	6.5	6.5	5.6	3.2	2.7	2.2	4.5
1966	2.0	3.3	4.5	5.2	6.4	6.0	6.2	6.3	5.0	2.2	2.2	1.9	4.3
1967	2.4	2.7	3.0	4.3	4.8	5.5	4.6	4.1	4.8	3.1	2.3	3.0	3.7
1968	2.0	2.4	4.0	3.9	5.5	5.5	5.9	6.4	5.0	2.9	2.2	2.3	4.0
1969	2.5	2.9	3.4	4.0	5.4	6.1	6.0	6.0	5.4	3.6	2.7	2.4	4.2
1970	2.8	3.2	4.0	4.3	5.9	4.8	5.1	4.2	3.8	2.7	1.7	1.6	3.7
1971	1.8	2.6	3.3	4.2	6.5	5.8	6.0	6.0	4.5	3.7	1.9	1.5	4.0
1972	2.2	3.9	3.7	4.9	4.9	4.8	6.1	6.0	5.5	3.0	2.0	2.2	4.1
1973	2.5	2.9	3.5	4.3	5.9	6.0	4.7	4.9	5.5	2.5	2.3	2.8	4.0
1974	2.2	3.2	3.3	5.6	6.1	6.7	5.0	5.7	4.7	2.5	2.0	2.6	4.1
1975	2.3	2.9	4.2	4.6	5.7	4.9	5.1	4.4	4.4	2.8	1.9	1.5	3.7
1976	1.9	2.6	3.3	4.7	6.4	6.0	4.7	5.4	4.3	3.4	2.2	1.9	3.9
1977	2.2	2.9	3.5	4.9	5.8	6.0	5.3	5.8	5.2	2.7	2.9	2.4	4.1
1978	2.5	2.4	3.9	4.3	6.0	5.7	5.5	6.9	4.0	2.4	2.7	2.3	4.0
1979	2.6	2.4	3.2	4.3	5.8	4.9	5.2	5.0	4.0	2.2	1.4	2.0	3.6
1980	2.0	1.6	2.4	3.7	5.7	4.5	5.4	4.0	4.7	2.5	1.9	1.6	3.3
1981	2.5	1.6	2.8	3.6	4.8	5.4	5.1	4.2	3.9	2.8	2.0	1.9	3.4
1982	2.1	2.3	2.8	2.5	4.5	5.9	4.6	3.9	2.9	2.3	2.2	1.5	3.1
1983	2.4	2.8	4.0	3.9	4.8	4.2	4.9	5.0	3.4	2.4	1.5	1.5	3.4
1984	1.9	2.4	2.8	3.6	4.9	5.5	4.0	1.2	3.5	1.4	1.4	1.6	2.8
1985	1.6	2.6	3.5	4.3	4.9	6.3	5.4	4.7	4.6	2.7	1.6	1.3	3.6
1986	1.9	2.2	2.9	3.1	4.1	2.7	*	*	1.8	1.1	0.3	0.8	*
1987	2.4	2.2	3.2	2.4	*	5.8	6.0	5.1	3.5	2.3	2.4	0.6	*
MEAN	2.2	2.6	3.5	4.3	5.7	5.7	5.5	5.2	4.5	2.7	2.1	1.9	3.8

Table B.2.6 MONTHLY MEAN WIND VELOCITY (2/2)

STATION: KARACHI AIRPORT

Latitude = 24°54' Longitude = 67° 08'

NIGHT TIME												Unit: m/sec	
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
1961	1.3	1.6	2.3	2.8	4.7	4.7	4.1	3.7	2.9	1.4	1.1	1.2	2.6
1962	1.4	1.7	2.3	2.9	3.5	6.2	5.1	5.0	2.7	0.8	0.9	1.1	2.8
1963	1.1	1.2	2.4	3.3	5.0	5.3	5.4	5.6	3.7	1.9	1.2	1.0	3.1
1964	1.1	1.6	2.2	2.7	3.4	4.3	4.5	4.1	3.6	1.4	1.0	1.2	2.6
1965	1.4	1.6	2.3	3.0	4.0	5.2	4.7	4.7	3.6	2.1	1.2	1.3	2.9
1966	1.2	1.7	2.8	3.2	3.9	4.5	4.8	4.7	3.6	2.9	1.1	1.3	3.0
1967	1.5	1.7	1.9	2.3	2.8	3.9	3.4	2.5	2.9	1.4	1.1	1.7	2.3
1968	1.1	0.9	2.0	2.0	3.3	4.3	4.3	4.6	3.1	1.2	0.9	1.1	2.4
1969	1.2	1.4	2.1	2.3	3.4	4.1	4.7	4.6	3.8	1.9	1.6	1.2	2.7
1970	1.6	1.7	2.0	2.3	3.8	3.8	3.6	3.2	2.6	1.3	0.5	0.7	2.3
1971	0.9	1.1	1.4	2.9	4.3	4.3	4.3	4.6	2.9	1.8	1.2	1.0	2.6
1972	1.1	2.9	2.1	2.8	3.0	3.4	4.5	4.7	3.5	1.4	1.0	1.3	2.6
1973	1.7	1.7	2.1	2.5	4.0	4.8	3.6	4.3	3.9	1.2	1.1	1.5	2.7
1974	1.4	1.9	1.9	3.5	3.5	5.4	4.0	4.4	3.5	1.5	0.9	1.3	2.8
1975	1.3	1.5	1.4	2.8	3.9	3.4	4.4	3.4	3.2	1.6	0.8	0.9	2.4
1976	1.1	1.4	1.7	3.2	4.0	4.4	4.1	4.1	2.6	1.4	1.1	0.9	2.5
1977	1.1	1.2	1.6	2.8	3.6	3.9	4.0	3.7	3.1	1.1	0.8	0.7	2.3
1978	0.5	1.0	1.9	2.4	3.7	2.8	2.3	2.8	3.2	0.7	1.0	0.8	1.9
1979	0.8	1.1	2.0	1.7	2.6	3.2	4.0	3.5	2.6	1.6	0.8	0.9	2.1
1980	1.1	1.6	2.2	1.9	3.0	3.1	4.4	3.9	3.4	1.4	1.2	1.2	2.4
1981	1.4	1.2	2.0	2.1	3.5	3.8	4.3	3.2	2.7	1.1	0.9	0.6	2.2
1982	1.0	1.2	1.6	4.2	2.7	3.5	3.6	3.5	3.4	1.6	0.9	1.2	2.4
1983	1.1	1.3	2.7	2.6	3.2	3.1	3.4	2.8	2.0	0.8	0.5	0.5	2.0
1984	0.6	1.3	1.3	1.9	3.3	3.7	3.5	3.3	2.9	0.9	0.4	0.7	2.0
1985	0.9	1.4	1.8	2.4	2.4	4.2	3.3	3.4	3.0	1.1	0.5	0.4	2.1
1986	0.5	1.2	1.9	2.5	2.2	1.7	*	*	1.2	1.4	2.8	3.0	*
1987	0.9	1.2	2.3	2.6	*	4.9	5.1	4.1	1.4	1.1	1.4	2.0	*
MEAN	1.1	1.5	2.0	2.7	3.5	4.1	4.1	3.9	3.0	1.4	1.0	1.1	2.5

Table B.2.7 MONTHLY MEAN EVAPOLATION

STATION: MALIR RIVER
AT SUPER HIGHWAY BRIDGE

Latitude = 25° 03' Longitude = 67° 23'

													Unit: mm
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1979	220	182	235	309	454	405	354	282	312	270	348	224	3,595
1980	202	195	176	300	451	451	370	383	370	351	281	207	3,736
1981	225	222	299	371	401	420	322	281	312	345	276	312	3,785
1982	285	332	343	416	410	388	285	315	314	320	303	203	3,912
1983	324	299	299	324	340	396	329	228	275	305	252	256	3,627
1984	220	214	299	385	407	382	308	167	256	251	191	195	3,276
1985	231	224	326	332	451	417	308	265	298	324	280	252	3,708
1986	296	251	318	390	483	455	356	269	316	347	281	263	4,026
1987	267	248	328	420	480	461	381	387	368	401	291	276	4,308
1988	288	278	336	430	514	*	*	*	*	*	*	*	*
MEAN	256	245	296	368	439	419	335	286	314	324	278	243	3,802

Table B.2.8 MONTHLY RAINFALL CORRELATION CO-EFFICIENT

(MONSOON JULY TO SEP.)

	Thana Shah Beg	Sari Sang	Poop Kani	Goth Habit	Super Highway Bridge	Goth Haji Shah Mohammad	Karachi Airport
1 Thana Shah Beg		0.9041	0.8966	0.9192	0.7697	0.8552	0.9182
2 Sari Sang	0.9041		0.8574	0.8361	0.8454	0.8495	0.9162
3 Roop Kani	0.8966	0.8574		0.9758	0.8022	0.9122	0.9632
4 Goth Habit	0.9192	0.8361	0.9758		0.7734	0.8803	0.9232
5 Super Highway Bridge	0.7697	0.8454	0.8022	0.7734		0.9336	0.8651
6 Goth Haji Shah Mohammad	0.8552	0.8495	0.9122	0.8803	0.9336		0.9284
7 Karachi Airport	0.9182	0.9162	0.9632	0.9232	0.8651	0.9284	

Remarks: Except rainfall at August 1979 & August 1985

(WINTER & SPRING JAN. TO JUNE & OCT. TO DEC.)

	Thana Shah Beg	Sari Sang	Poop Kani	Goth Habit	Super Highway Bridge	Goth Haji Shah Mohammad	Karachi Airport
1 Thana Shah Beg		0.5834	0.6694	0.7224	0.8075	0.8363	0.7272
2 Sari Sang	0.5834		0.6837	0.6006	0.7616	0.7501	0.6604
3 Roop Kani	0.6694	0.6837		0.7022	0.8302	0.8785	0.7743
4 Goth Habit	0.7224	0.6006	0.7022		0.8580	0.8305	0.8673
5 Super Highway Bridge	0.8075	0.7616	0.8302	0.8580		0.9453	0.9431
6 Goth Haji Shah Mohammad	0.8363	0.7501	0.8785	0.8305	0.9453		0.8874
7 Karachi Airport	0.7272	0.6604	0.7743	0.8673	0.9431	0.8874	

Table B.2.9 REGRESSION EQUATION OF MONTHLY RAINFALL

Y	Monsoon July to Sep	Winter & Spring Jan to June Oct to Dec
1 Thana Shah Beg	$Y=1.3167X - 11.3729$	$Y=0.4456X + 2.5120$
2 Sari Sang	$Y=0.9404X + 5.0324$	$Y=0.3546X + 1.6296$
3 Roop Kani	$Y=1.1660X - 5.3752$	$Y=0.4460X + 0.9106$
4 Goth Habit	$Y=0.9776X - 6.8929$	$Y=0.4632X + 0.0149$
5 Super Highway Bridge	$Y=0.9754X + 11.7708$	$Y=0.6305X + 0.9111$
6 Goth Haji Shah Mohammad	$Y=0.8646X + 7.9847$	$Y=0.6337X + 0.8959$

Remarks: X is monthly rainfall at Karachi airport

Table B.2.10 CALCULATED MONTHLY RAINFALL (1/6)

STATION: THANA SHAH BEG													Latitude = 25°03' Longitude = 67°25'		Unit: mm
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL		
1929	3.2	2.5	2.5	2.5	2.5	2.5	58.8	0.0	0.0	2.5	14.2	10.9	102.1		
1930	7.5	2.5	2.5	3.8	2.5	26.2	435.8	0.0	0.0	2.5	2.5	2.5	488.3		
1931	3.2	5.0	4.9	2.5	2.5	2.5	0.0	0.0	0.0	2.5	2.5	2.5	28.1		
1932	4.9	2.5	2.5	2.5	2.5	2.5	371.3	26.4	0.0	2.5	2.5	2.5	422.6		
1933	3.1	3.1	2.5	3.1	5.0	2.5	505.0	90.0	31.2	2.5	2.5	2.5	653.0		
1934	2.5	2.5	3.4	2.5	2.5	17.0	205.6	0.0	0.0	2.5	2.5	6.6	247.6		
1935	9.8	15.7	2.5	16.1	2.5	2.5	0.0	0.0	0.0	2.9	2.5	2.6	57.1		
1936	3.1	9.0	3.3	2.5	2.5	10.7	77.0	0.0	0.0	2.5	2.6	3.8	117.0		
1937	2.5	13.4	2.5	2.6	2.5	2.5	260.9	0.0	0.0	2.5	2.5	31.7	323.6		
1938	2.6	2.5	2.5	3.0	3.8	3.2	44.2	75.9	0.0	2.5	2.5	5.0	147.7		
1939	2.6	25.3	27.5	3.4	2.5	2.7	0.0	0.0	0.0	2.5	4.3	2.5	73.3		
1940	33.1	16.9	23.2	2.5	2.5	7.1	58.5	60.5	0.0	2.5	2.9	6.7	216.4		
1941	3.6	2.5	2.5	2.5	2.5	2.5	47.9	0.0	0.0	2.5	2.5	2.9	71.9		
1942	9.4	14.9	4.6	2.5	2.5	2.5	326.8	12.3	0.0	2.5	2.5	7.1	387.6		
1943	10.5	2.5	2.5	2.5	2.5	4.0	55.1	0.0	0.0	2.5	2.5	2.5	87.1		
1944	5.1	23.7	2.5	2.5	2.5	2.5	365.9	429.7	0.0	2.5	2.5	3.2	842.6		
1945	25.4	2.5	2.5	2.5	2.5	2.5	129.1	0.0	0.0	2.5	2.5	3.4	175.4		
1946	2.5	2.5	2.5	2.5	2.5	3.5	61.8	43.5	0.0	2.5	2.5	2.5	128.8		
1947	2.5	3.1	2.5	2.5	2.5	2.5	0.0	50.8	0.0	2.5	2.5	6.0	77.4		
1948	2.7	14.2	16.2	2.5	2.5	21.0	35.1	0.0	0.0	2.5	2.5	6.0	105.2		
1949	2.7	2.6	2.7	2.5	2.5	2.5	170.9	230.8	0.0	2.5	2.5	2.5	424.7		
1950	7.7	2.5	2.5	2.5	2.5	2.5	85.7	0.0	0.0	2.5	2.5	2.5	113.4		
1951	2.5	2.5	2.6	3.5	2.5	2.5	41.2	32.5	0.0	2.5	2.5	2.5	97.3		
1952	2.5	18.2	2.5	2.5	2.5	2.6	200.0	0.0	21.0	2.5	2.5	4.0	260.8		
1953	3.3	2.5	2.5	2.5	2.5	20.8	0.0	265.5	0.0	2.5	2.5	5.7	310.3		
1954	10.9	15.9	2.5	2.5	2.5	2.7	61.8	33.8	186.7	2.5	2.5	2.5	326.8		
1955	7.1	8.2	2.6	2.5	2.5	2.9	0.0	29.0	115.4	2.9	2.5	4.0	179.6		
1956	12.2	2.5	2.5	4.3	2.5	21.9	196.3	106.1	0.0	46.2	2.5	2.5	399.5		
1957	4.0	2.5	2.5	4.8	2.5	2.5	10.7	0.0	0.0	2.5	4.3	4.9	41.2		
1958	5.5	3.6	2.5	2.5	2.5	2.5	161.5	0.0	30.8	2.5	3.1	25.7	242.7		
1959	4.2	3.6	2.5	2.5	2.5	2.9	297.9	50.1	404.3	2.5	39.5	3.1	815.6		
1960	3.5	2.5	17.0	2.5	2.5	2.5	46.2	26.0	0.0	2.5	2.5	12.6	120.3		
1961	10.4	26.5	2.5	7.7	2.5	10.0	210.0	233.1	207.7	2.5	2.5	3.2	718.6		
1962	2.5	2.5	2.5	2.5	2.5	2.5	95.7	44.9	184.3	2.5	2.5	5.2	350.1		
1963	2.5	2.5	2.5	3.3	2.5	2.5	0.0	1.7	0.0	2.5	16.0	2.5	38.5		
1964	3.4	4.8	2.5	2.5	2.5	3.6	90.0	53.1	0.0	2.5	2.5	2.6	170.0		
1965	2.5	2.5	2.5	4.0	2.5	2.5	130.4	13.0	0.0	2.5	2.5	2.5	167.4		
1966	2.5	2.5	3.2	2.5	2.5	2.6	78.6	0.0	0.0	2.5	2.5	2.5	101.9		
1967	2.5	2.5	60.4	13.4	2.5	7.5	553.9	118.7	0.0	2.5	4.8	8.8	777.5		
1968	7.6	4.7	2.5	2.5	2.5	2.9	0.0	0.0	0.0	2.5	2.5	5.2	32.9		
1969	2.5	3.0	2.5	2.5	2.5	2.5	39.2	0.0	0.0	2.5	2.5	2.5	62.2		
1970	5.7	5.7	30.2	2.5	2.5	4.8	188.6	193.0	102.4	2.5	2.5	2.5	542.9		
1971	4.2	2.5	2.5	2.5	2.5	2.5	32.5	28.8	0.0	2.5	2.5	3.0	86.0		
1972	2.5	4.0	2.5	2.5	2.5	11.8	9.7	0.0	0.0	2.5	2.5	4.3	44.8		
1973	2.5	2.5	2.5	2.5	2.5	2.5	232.1	15.1	0.0	2.5	2.5	6.3	273.5		
1974	2.5	2.8	2.5	2.5	2.5	2.5	0.0	0.0	0.0	2.8	2.5	5.0	25.6		
1975	8.6	12.0	16.0	2.5	2.5	2.6	0.0	89.9	16.4	2.5	0.0	0.0	153.0		
1976	20.3	46.2	54.6	3.6	0.0	0.0	69.6	41.9	128.0	0.0	0.0	0.0	364.2		
1977	26.7	0.0	0.0	3.5	2.5	112.0	114.8	0.0	21.6	0.0	0.0	0.0	281.1		
1978	0.0	0.0	0.0	10.7	0.0	13.7	239.0	273.0	5.1	0.0	0.0	0.0	541.5		
1979	0.0	23.6	0.0	0.0	0.0	0.0	0.0	115.8	0.0	14.2	2.0	36.6	192.2		
1980	2.0	0.0	4.1	0.0	0.0	38.4	16.5	11.4	0.0	21.8	15.2	33.8	143.2		
1981	4.6	50.8	35.6	0.0	0.0	0.0	50.3	40.6	0.0	0.0	12.2	0.0	194.1		
1982	0.0	11.2	0.0	0.0	7.1	0.0	27.4	42.7	0.0	0.0	0.0	2.3	90.7		
1983	0.0	2.0	0.0	11.2	0.0	0.0	2.0	85.6	32.0	0.0	0.0	0.0	132.8		
1984	0.0	0.0	3.0	0.0	0.0	0.0	27.7	389.6	1.0	2.5	2.5	2.5	428.8		
1985	2.9	2.5	2.5	23.7	2.5	2.7	71.1	25.9	0.0	0.0	0.0	0.0	133.8		
1986	0.0	8.6	0.0	0.0	0.0	0.0	0.0	125.5	0.0	0.0	0.0	0.0	134.1		
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
1988	0.0	0.0	0.0	0.0	0.0	2.5	86.1	100.5	0.0	2.5	2.5	2.5	196.6		
MEAN	5.4	7.7	6.6	3.5	2.2	7.1	111.3	60.1	24.8	3.4	3.6	5.3	241.1		

Table B.2.10 CALCULATED MONTHLY RAINFALL (2/6)

STATION: SARI SANG												Latitude = 25°15' Longitude = 67°50'		Unit: mm
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	
1929	2.2	1.6	1.6	1.6	1.6	1.6	55.2	9.8	5.0	1.6	10.9	8.3	101.0	
1930	5.6	1.6	1.6	2.6	1.6	20.5	324.4	6.3	5.3	1.6	1.6	1.6	374.3	
1931	2.2	3.6	3.5	1.6	1.6	1.6	9.5	6.3	5.0	1.6	1.6	1.6	39.7	
1932	3.5	1.6	1.6	1.6	1.6	1.6	278.3	32.0	5.0	1.6	1.6	1.6	331.6	
1933	2.1	2.1	1.6	2.1	3.6	1.6	373.9	77.4	35.4	1.6	1.6	1.6	504.6	
1934	1.6	1.6	2.3	1.6	1.6	13.2	160.0	10.5	5.0	1.6	1.6	4.9	205.5	
1935	7.4	12.1	1.6	12.4	1.6	1.6	12.5	9.5	5.3	1.9	1.6	1.7	69.2	
1936	2.1	6.8	2.3	1.6	1.6	8.1	68.1	5.3	5.8	1.6	1.7	2.6	107.6	
1937	1.6	10.3	1.6	1.7	1.6	1.6	199.5	5.8	5.0	1.6	1.6	24.9	256.8	
1938	1.7	1.6	1.6	2.0	2.7	2.2	44.7	67.4	5.3	1.6	1.6	3.6	136.0	
1939	1.7	19.7	21.5	2.3	1.6	1.8	5.5	5.5	5.3	1.6	3.1	1.6	71.2	
1940	26.0	13.1	18.1	1.6	1.6	5.2	55.0	56.4	5.0	1.6	1.9	5.0	190.5	
1941	2.5	1.6	1.6	1.6	1.6	1.6	47.4	5.3	5.0	1.6	1.6	1.9	73.3	
1942	7.1	11.5	3.3	1.6	1.6	1.6	246.5	22.0	5.0	1.6	1.6	5.3	308.7	
1943	8.0	1.6	1.6	1.6	1.6	2.8	52.5	7.2	5.3	1.6	1.6	1.6	87.0	
1944	3.7	18.5	1.6	1.6	1.6	1.6	274.5	320.1	5.0	1.6	1.6	2.2	633.6	
1945	19.8	1.6	1.6	1.6	1.6	1.6	105.4	7.2	8.4	1.6	1.6	2.3	154.3	
1946	1.6	1.6	1.6	1.6	1.6	2.4	57.3	44.2	5.0	1.6	1.6	1.6	121.7	
1947	1.6	2.1	1.6	1.6	1.6	1.6	5.8	49.4	6.9	1.6	1.6	4.4	79.8	
1948	1.8	10.9	12.5	1.6	1.6	16.3	38.2	5.0	5.0	1.6	1.6	4.4	100.5	
1949	1.8	1.7	1.8	1.6	1.6	1.6	135.2	178.0	5.0	1.6	1.6	1.6	333.1	
1950	5.8	1.6	1.6	1.6	1.6	1.6	74.3	5.5	5.0	1.6	1.6	1.6	103.4	
1951	1.6	1.6	1.7	2.4	1.6	1.6	42.6	36.3	6.3	1.6	1.6	1.6	100.5	
1952	1.6	14.1	1.6	1.6	1.6	1.7	156.0	5.5	28.2	1.6	1.6	2.8	217.9	
1953	2.3	1.6	1.6	1.6	1.6	16.2	6.7	202.8	5.0	1.6	1.6	4.1	246.7	
1954	8.3	12.3	1.6	1.6	1.6	1.8	57.3	37.3	146.5	1.6	1.6	1.6	273.1	
1955	5.3	6.1	1.7	1.6	1.6	1.9	5.3	33.9	95.6	1.9	1.6	2.8	159.3	
1956	9.4	1.6	1.6	3.1	1.6	17.0	153.3	88.9	5.0	36.4	1.6	1.6	321.1	
1957	2.8	1.6	1.6	3.4	1.6	1.6	20.8	11.2	5.0	1.6	3.1	3.5	57.8	
1958	4.0	2.5	1.6	1.6	1.6	1.6	128.5	5.3	35.1	1.6	2.1	20.1	205.6	
1959	3.0	2.5	1.6	1.6	1.6	1.9	225.9	48.9	301.9	1.6	31.1	2.1	623.7	
1960	2.4	1.6	13.2	1.6	1.6	1.6	46.1	31.7	5.0	1.6	1.6	9.6	117.6	
1961	7.9	20.7	1.6	5.8	1.6	7.6	163.1	179.7	161.5	1.6	1.6	2.2	554.9	
1962	1.6	1.6	1.6	1.6	1.6	1.6	81.5	45.2	144.8	1.6	1.6	3.8	288.1	
1963	1.6	1.6	1.6	2.3	1.6	1.6	6.7	14.3	5.0	1.6	12.3	1.6	51.8	
1964	2.3	3.4	1.6	1.6	1.6	2.5	77.4	51.1	7.9	1.6	1.6	1.7	154.3	
1965	1.6	1.6	1.6	2.8	1.6	1.6	106.3	22.4	5.0	1.6	1.6	1.6	149.3	
1966	1.6	1.6	2.2	1.6	1.6	1.7	69.3	5.0	5.0	1.6	1.6	1.6	94.4	
1967	1.6	1.6	47.7	10.3	1.6	5.6	408.7	97.9	5.0	1.6	3.4	6.7	591.7	
1968	5.7	3.3	1.6	1.6	1.6	1.9	5.5	10.0	5.0	1.6	1.6	3.8	43.2	
1969	1.6	2.0	1.6	1.6	1.6	1.6	41.1	5.0	5.0	1.6	1.6	1.6	65.9	
1970	4.1	4.1	23.7	1.6	1.6	3.4	147.9	151.0	86.3	1.6	1.6	1.6	428.5	
1971	3.0	1.6	1.6	1.6	1.6	1.6	36.3	33.7	5.0	1.6	1.6	2.0	91.2	
1972	1.6	2.8	1.6	1.6	1.6	9.0	20.1	5.0	5.0	1.6	1.6	3.1	54.6	
1973	1.6	1.6	1.6	1.6	1.6	1.6	178.9	23.9	5.0	1.6	1.6	4.6	225.2	
1974	1.6	1.8	1.6	1.6	1.6	1.6	5.0	5.4	5.0	1.8	1.6	3.6	32.2	
1975	6.5	9.2	12.3	1.6	1.6	1.7	5.0	77.3	24.9	1.6	0.0	0.0	141.7	
1976	27.2	11.2	18.8	0.0	0.0	0.0	72.4	23.9	96.8	0.0	0.0	0.0	250.3	
1977	3.3	0.0	0.0	0.0	0.0	114.3	196.3	51.1	53.8	0.0	0.0	0.0	418.8	
1978	6.9	0.0	6.9	0.0	0.0	32.3	202.7	175.3	0.0	0.0	0.0	0.0	424.1	
1979	0.0	15.2	6.6	0.0	0.0	0.0	0.0	35.3	1.3	2.5	0.0	33.8	94.7	
1980	0.0	0.0	0.0	0.0	0.0	28.4	47.0	15.0	0.0	6.3	0.0	21.6	118.3	
1981	0.0	0.0	30.5	0.0	0.0	0.0	33.5	145.3	0.0	0.0	0.0	0.0	209.3	
1982	0.0	21.3	0.0	0.0	0.0	0.0	4.1	43.7	0.0	0.0	0.0	0.0	69.1	
1983	0.0	5.1	0.0	47.8	0.0	0.0	21.3	135.6	24.4	0.0	0.0	0.0	234.2	
1984	0.0	0.0	0.0	0.0	0.0	24.9	24.9	244.6	46.0	1.6	1.6	1.6	345.2	
1985	1.9	1.6	1.6	18.5	1.6	1.8	92.5	20.8	0.0	0.0	0.0	0.0	140.3	
1986	0.0	6.6	0.0	0.0	0.0	14.0	0.0	90.4	0.0	0.0	0.0	0.0	111.0	
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
1988	0.0	0.0	0.0	0.0	0.0	1.6	74.6	85.0	5.0	1.6	1.6	1.6	171.0	
MEAN	3.9	4.9	4.7	2.9	1.3	6.7	93.1	53.8	24.7	2.0	2.2	3.9	204.3	

Table B.2.10 CALCULATED MONTHLY RAINFALL (3/6)

STATION: ROOP KANI												Latitude = 25°07' Longitude = 67°06'		Unit: mm
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	
1929	1.6	0.9	0.9	0.9	0.9	0.9	56.8	0.6	0.0	0.9	12.6	9.3	86.3	
1930	5.9	0.9	0.9	2.2	0.9	24.6	390.6	0.0	0.0	0.9	0.9	0.9	428.7	
1931	1.6	3.4	3.3	0.9	0.9	0.9	0.2	0.0	0.0	0.9	0.9	0.9	13.9	
1932	3.3	0.9	0.9	0.9	0.9	0.9	333.5	28.1	0.0	0.9	0.9	0.9	372.1	
1933	1.5	1.5	0.9	1.5	3.4	0.9	451.9	84.4	32.3	0.9	0.9	0.9	581.0	
1934	0.9	0.9	1.8	0.9	0.9	15.4	186.8	1.4	0.0	0.9	0.9	5.0	215.8	
1935	8.2	14.1	0.9	14.5	0.9	0.9	3.8	0.2	0.0	1.3	0.9	1.0	46.7	
1936	1.5	7.4	1.7	0.9	0.9	9.1	72.9	0.0	0.0	0.9	1.0	2.2	98.5	
1937	0.9	11.8	0.9	1.0	0.9	0.9	235.8	0.0	0.0	0.9	0.9	30.1	284.1	
1938	1.0	0.9	0.9	1.4	2.2	1.6	43.8	71.9	0.0	0.9	0.9	3.4	128.9	
1939	1.0	23.7	25.9	1.8	0.9	1.1	0.0	0.0	0.0	0.9	2.7	0.9	58.9	
1940	31.5	15.3	21.6	0.9	0.9	5.5	56.5	58.3	0.0	0.9	1.3	5.1	197.8	
1941	2.0	0.9	0.9	0.9	0.9	0.9	47.1	0.0	0.0	0.9	0.9	1.3	56.7	
1942	7.8	13.3	3.0	0.9	0.9	0.9	294.1	15.6	0.0	0.9	0.9	5.5	343.8	
1943	8.9	0.9	0.9	0.9	0.9	2.4	53.5	0.0	0.0	0.9	0.9	0.9	71.1	
1944	3.5	22.1	0.9	0.9	0.9	0.9	328.7	385.2	0.0	0.9	0.9	1.6	746.5	
1945	23.8	0.9	0.9	0.9	0.9	0.9	119.0	0.0	0.0	0.9	0.9	1.8	150.9	
1946	0.9	0.9	0.9	0.9	0.9	1.9	59.5	43.2	0.0	0.9	0.9	0.9	111.8	
1947	0.9	1.5	0.9	0.9	0.9	0.9	0.0	49.7	0.0	0.9	0.9	4.4	61.9	
1948	1.1	12.6	14.6	0.9	0.9	19.4	35.8	0.0	0.0	0.9	0.9	4.4	91.5	
1949	1.1	1.0	1.1	0.9	0.9	0.9	156.0	209.1	0.0	0.9	0.9	0.9	373.7	
1950	6.1	0.9	0.9	0.9	0.9	0.9	80.6	0.0	0.0	0.9	0.9	0.9	93.9	
1951	0.9	0.9	1.0	1.9	0.9	0.9	41.1	33.5	0.0	0.9	0.9	0.9	83.8	
1952	0.9	16.6	0.9	0.9	0.9	1.0	181.8	0.0	23.3	0.9	0.9	2.4	230.5	
1953	1.7	0.9	0.9	0.9	0.9	19.2	0.0	239.8	0.0	0.9	0.9	4.1	270.2	
1954	9.3	14.3	0.9	0.9	0.9	1.1	59.5	34.6	170.0	0.9	0.9	0.9	294.2	
1955	5.5	6.6	1.0	0.9	0.9	1.3	0.0	30.4	106.9	1.3	0.9	2.4	158.1	
1956	10.6	0.9	0.9	2.7	0.9	20.3	178.5	98.6	0.0	44.6	0.9	0.9	359.8	
1957	2.4	0.9	0.9	3.2	0.9	0.9	14.2	2.3	0.0	0.9	2.7	3.3	32.6	
1958	3.9	2.0	0.9	0.9	0.9	0.9	147.7	0.0	31.9	0.9	1.5	24.1	215.6	
1959	2.6	2.0	0.9	0.9	0.9	1.3	268.5	49.1	362.7	0.9	38.0	1.5	729.3	
1960	1.9	0.9	15.4	0.9	0.9	0.9	45.6	27.7	0.0	0.9	0.9	11.0	107.0	
1961	8.8	24.9	0.9	6.1	0.9	8.4	190.6	211.2	188.6	0.9	0.9	1.6	643.8	
1962	0.9	0.9	0.9	0.9	0.9	0.9	89.4	44.4	167.9	0.9	0.9	3.6	312.5	
1963	0.9	0.9	0.9	1.7	0.9	0.9	0.0	6.2	0.0	0.9	14.4	0.9	28.6	
1964	1.8	3.2	0.9	0.9	0.9	2.0	84.4	51.8	0.0	0.9	0.9	1.0	148.7	
1965	0.9	0.9	0.9	2.4	0.9	0.9	120.2	16.2	0.0	0.9	0.9	0.9	146.0	
1966	0.9	0.9	1.6	0.9	0.9	1.0	74.3	0.0	0.0	0.9	0.9	0.9	83.2	
1967	0.9	0.9	58.9	11.8	0.9	5.9	495.2	109.8	0.0	0.9	3.2	7.2	695.6	
1968	6.0	3.1	0.9	0.9	0.9	1.3	0.0	0.8	0.0	0.9	0.9	3.6	19.3	
1969	0.9	1.4	0.9	0.9	0.9	0.9	39.4	0.0	0.0	0.9	0.9	0.9	48.0	
1970	4.1	4.1	28.7	0.9	0.9	3.2	171.7	175.6	95.4	0.9	0.9	0.9	487.3	
1971	2.6	0.9	0.9	0.9	0.9	0.9	33.5	30.2	0.0	0.9	0.9	1.4	74.0	
1972	0.9	2.4	0.9	0.9	0.9	10.2	13.3	0.0	0.0	0.9	0.9	2.7	34.0	
1973	0.9	0.9	0.9	0.9	0.9	0.9	210.2	18.1	0.0	0.9	0.9	4.7	240.2	
1974	0.9	1.2	0.9	0.9	0.9	0.9	0.0	0.0	0.0	1.2	0.9	3.4	11.2	
1975	7.0	10.4	14.4	0.9	0.9	1.0	0.0	84.3	19.2	0.9	0.9	1.0	140.9	
1976	30.7	5.4	14.6	0.9	0.9	0.9	247.9	37.2	46.9	0.9	0.9	0.9	388.1	
1977	5.5	1.1	0.9	1.9	0.9	16.4	347.5	46.9	97.8	0.9	3.2	0.9	523.9	
1978	7.3	3.0	0.9	0.9	0.9	3.3	161.3	284.5	0.0	0.0	0.0	0.0	462.1	
1979	3.3	36.1	0.0	0.0	0.0	0.0	0.0	147.1	0.0	0.0	0.0	20.3	206.8	
1980	0.0	0.0	6.1	0.0	0.0	39.6	26.4	0.0	0.0	0.0	10.2	28.4	110.7	
1981	0.0	11.2	22.4	0.0	0.0	0.0	34.5	25.4	0.0	0.0	0.0	0.0	93.5	
1982	0.0	53.8	0.0	0.0	0.0	0.0	5.6	137.9	0.0	0.0	0.0	0.0	197.3	
1983	0.0	0.0	0.0	14.0	0.0	0.0	54.4	176.0	24.4	0.0	0.0	0.0	268.8	
1984	0.0	0.0	0.0	0.0	0.0	0.0	11.9	257.8	0.0	0.0	0.9	0.9	271.5	
1985	1.3	0.9	0.9	22.1	0.9	1.1	77.7	12.7	0.0	0.0	0.0	0.0	117.6	
1986	0.0	5.8	0.0	0.0	0.0	0.0	0.0	72.4	0.0	0.9	0.9	0.9	80.9	
1987	0.9	0.9	0.9	0.9	0.9	0.9	0.0	0.0	0.0	0.9	0.9	0.9	8.1	
1988	1.4	0.9	0.9	0.9	0.9	0.9	80.9	93.7	0.0	0.9	0.9	0.9	183.2	
MEAN	4.1	6.0	4.5	2.1	0.9	4.0	108.6	58.4	22.8	1.5	2.2	3.7	218.7	

Table B.2.10 CALCULATED MONTHLY RAINFALL (4/6)

STATION: GOTH HABIT

Latitude = 25°58' Longitude = 67°25'

Unit: mm

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1929	0.7	0.0	0.0	0.0	0.0	0.0	45.2	0.0	0.0	0.0	12.2	8.7	66.8
1930	5.2	0.0	0.0	1.3	0.0	24.6	325.1	0.0	0.0	0.0	0.0	0.0	356.2
1931	0.7	2.6	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.8
1932	2.5	0.0	0.0	0.0	0.0	0.0	277.2	21.2	0.0	0.0	0.0	0.0	300.9
1933	0.6	0.6	0.0	0.6	2.6	0.0	376.5	68.4	24.7	0.0	0.0	0.0	474.0
1934	0.0	0.0	0.9	0.0	0.0	15.1	154.2	0.0	0.0	0.0	0.0	4.2	174.4
1935	7.6	13.7	0.0	14.1	0.0	0.0	0.8	0.0	0.0	0.4	0.0	0.2	36.8
1936	0.6	6.7	0.8	0.0	0.0	8.5	58.7	0.0	0.0	0.0	0.2	1.3	76.8
1937	0.0	11.3	0.0	0.2	0.0	0.0	195.3	0.0	0.0	0.0	0.0	30.4	237.2
1938	0.2	0.0	0.0	0.5	1.4	0.7	34.4	57.9	0.0	0.0	0.0	2.6	97.7
1939	0.2	23.7	26.0	0.9	0.0	0.2	0.0	0.0	0.0	0.0	1.9	0.0	52.9
1940	31.8	15.0	21.6	0.0	0.0	4.7	45.0	46.5	0.0	0.0	0.4	4.4	169.4
1941	1.2	0.0	0.0	0.0	0.0	0.0	37.1	0.0	0.0	0.0	0.0	0.4	38.7
1942	7.2	12.8	2.1	0.0	0.0	0.0	244.2	10.7	0.0	0.0	0.0	4.8	281.8
1943	8.4	0.0	0.0	0.0	0.0	1.5	42.5	0.0	0.0	0.0	0.0	0.0	52.4
1944	2.7	22.0	0.0	0.0	0.0	0.0	273.2	320.6	0.0	0.0	0.0	0.7	619.2
1945	23.8	0.0	0.0	0.0	0.0	0.0	97.4	0.0	0.0	0.0	0.0	0.9	122.1
1946	0.0	0.0	0.0	0.0	0.0	1.1	47.5	33.9	0.0	0.0	0.0	0.0	82.5
1947	0.0	0.6	0.0	0.0	0.0	0.0	0.0	39.2	0.0	0.0	0.0	0.0	43.5
1948	0.2	12.2	14.2	0.0	0.0	19.2	27.6	0.0	0.0	0.0	0.0	3.7	77.1
1949	0.2	0.2	0.2	0.0	0.0	0.0	128.4	172.9	0.0	0.0	0.0	0.0	301.9
1950	5.4	0.0	0.0	0.0	0.0	0.0	65.2	0.0	0.0	0.0	0.0	0.0	70.6
1951	0.0	0.0	0.2	1.1	0.0	0.0	32.1	25.7	0.0	0.0	0.0	0.0	59.1
1952	0.0	16.3	0.0	0.0	0.0	0.2	150.0	0.0	17.2	0.0	0.0	1.5	185.2
1953	0.8	0.0	0.0	0.0	0.0	19.1	0.0	198.7	0.0	0.0	0.0	3.3	221.9
1954	8.7	13.9	0.0	0.0	0.0	0.2	47.5	26.6	140.1	0.0	0.0	0.0	237.0
1955	4.8	5.9	0.2	0.0	0.0	0.4	0.0	23.1	87.2	0.4	0.0	1.5	123.5
1956	10.1	0.0	0.0	1.9	0.0	20.1	147.3	80.3	0.0	45.4	0.0	0.0	305.1
1957	1.5	0.0	0.0	2.4	0.0	0.0	9.5	0.0	0.0	0.0	1.9	2.5	17.8
1958	3.1	1.2	0.0	0.0	0.0	0.0	121.5	0.0	24.4	0.0	0.6	24.1	174.9
1959	1.8	1.2	0.0	0.0	0.0	0.4	222.7	38.8	301.7	0.0	38.5	0.6	605.7
1960	1.1	0.0	15.1	0.0	0.0	0.0	35.8	20.9	0.0	0.0	0.0	10.5	83.4
1961	8.3	24.9	0.0	5.4	0.0	7.8	157.4	174.6	155.8	0.0	0.0	0.7	534.9
1962	0.0	0.0	0.0	0.0	0.0	0.0	72.6	34.9	138.4	0.0	0.0	2.8	248.7
1963	0.0	0.0	0.0	0.8	0.0	0.0	0.0	2.8	0.0	0.0	14.0	0.0	17.6
1964	0.9	2.4	0.0	0.0	0.0	1.2	68.4	41.0	0.0	0.0	0.0	0.2	114.1
1965	0.0	0.0	0.0	1.5	0.0	0.0	98.4	11.2	0.0	0.0	0.0	0.0	111.1
1966	0.0	0.0	0.7	0.0	0.0	0.2	59.9	0.0	0.0	0.0	0.0	0.0	60.8
1967	0.0	0.0	60.2	11.3	0.0	5.2	412.8	89.7	0.0	0.0	2.4	6.6	588.2
1968	5.3	2.2	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	2.8	10.7
1969	0.0	0.5	0.0	0.0	0.0	0.0	30.6	0.0	0.0	0.0	0.0	0.0	31.1
1970	3.3	3.3	28.8	0.0	0.0	2.4	141.6	144.8	77.6	0.0	0.0	0.0	401.8
1971	1.8	0.0	0.0	0.0	0.0	0.0	25.7	22.9	0.0	0.0	0.0	0.5	50.9
1972	0.0	1.5	0.0	0.0	0.0	9.6	8.7	0.0	0.0	0.0	0.0	1.9	21.7
1973	0.0	0.0	0.0	0.0	0.0	0.0	173.9	12.8	0.0	0.0	0.0	3.9	190.6
1974	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	2.6	3.2
1975	6.4	9.9	14.0	0.0	0.0	0.2	0.0	68.3	13.7	0.0	0.0	0.2	112.7
1976	31.0	4.7	14.2	0.0	0.0	0.0	205.4	28.8	36.9	0.0	0.0	0.0	321.0
1977	4.8	0.2	0.0	1.1	0.0	16.1	288.9	36.9	79.6	0.0	2.4	0.0	430.0
1978	6.6	2.2	0.0	0.0	0.0	5.1	158.2	272.8	0.0	0.0	0.0	0.0	444.9
1979	5.1	32.8	0.0	0.0	0.0	0.0	0.0	113.8	0.0	1.3	0.0	22.4	175.4
1980	0.0	0.0	11.2	0.0	0.0	25.9	12.2	0.0	0.0	1.5	2.3	48.0	101.1
1981	0.0	3.6	43.7	0.0	0.0	0.0	16.0	12.4	0.0	0.0	0.0	0.0	75.7
1982	0.0	4.3	0.0	0.0	0.0	0.0	11.9	105.2	0.0	0.0	0.0	0.0	121.4
1983	0.0	2.5	0.0	0.0	0.0	0.0	46.0	85.9	17.8	0.0	0.0	0.0	152.2
1984	0.0	0.0	0.0	0.0	0.0	0.0	3.8	213.9	0.0	0.0	0.0	0.0	217.7
1985	0.4	0.0	0.0	22.1	0.0	0.2	59.2	0.0	0.0	0.0	0.0	0.0	81.9
1986	0.0	0.4	5.3	0.0	0.0	7.9	0.0	54.1	0.0	0.0	0.0	0.0	67.7
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	0.5	0.0	0.0	0.0	0.0	0.0	65.4	76.2	0.0	0.0	0.0	0.0	142.1
MEAN	3.4	4.3	4.4	1.1	0.1	3.3	89.3	46.5	18.6	0.8	1.3	3.4	176.4

Table B.2.10 CALCULATED MONTHLY RAINFALL (5/6)

STATION MALIR RIVER		Latitude = 25°03' Longitude = 67°23'											Unit: mm
AT SUPER HIGHWAY BRIDGE													
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1929	1.9	0.9	0.9	0.9	0.9	0.9	65.8	18.7	13.8	0.9	17.4	12.8	135.8
1930	8.0	0.9	0.9	2.7	0.9	34.4	345.0	15.0	14.1	0.9	0.9	0.9	424.6
1931	1.9	4.4	4.3	0.9	0.9	0.9	18.5	15.0	13.8	0.9	0.9	0.9	63.3
1932	4.3	0.9	0.9	0.9	0.9	0.9	297.2	41.8	13.8	0.9	0.9	0.9	364.3
1933	1.7	1.7	0.9	1.7	4.4	0.9	396.3	88.9	45.3	0.9	0.9	0.9	544.5
1934	0.9	0.9	2.2	0.9	0.9	21.4	174.5	19.4	13.8	0.9	0.9	6.6	243.3
1935	11.2	19.5	0.9	20.1	0.9	0.9	21.5	18.5	14.1	1.4	0.9	1.1	111.0
1936	1.7	10.1	2.0	0.9	0.9	12.4	79.2	14.1	14.6	0.9	1.1	2.7	140.6
1937	0.9	16.3	0.9	1.1	0.9	0.9	215.5	14.6	13.8	0.9	0.9	42.2	308.9
1938	1.1	0.9	0.9	1.5	2.8	1.9	54.9	78.4	14.1	0.9	0.9	4.4	162.7
1939	1.1	33.1	36.3	2.2	0.9	1.2	14.3	14.3	14.1	0.9	3.5	0.9	122.8
1940	44.2	21.3	30.2	0.9	0.9	7.3	65.6	67.0	13.8	0.9	1.4	6.8	260.3
1941	2.5	0.9	0.9	0.9	0.9	0.9	57.7	14.1	13.8	0.9	0.9	1.4	95.8
1942	10.7	18.4	3.8	0.9	0.9	0.9	264.3	31.3	13.8	0.9	0.9	7.5	354.3
1943	12.3	0.9	0.9	0.9	0.9	3.0	63.0	16.0	14.1	0.9	0.9	0.9	114.7
1944	4.6	30.9	0.9	0.9	0.9	0.9	293.2	340.5	13.8	0.9	0.9	1.9	690.3
1945	33.3	0.9	0.9	0.9	0.9	0.9	117.8	16.0	17.3	0.9	0.9	2.2	192.9
1946	0.9	0.9	0.9	0.9	0.9	2.4	68.0	54.4	13.8	0.9	0.9	0.9	145.8
1947	0.9	1.7	0.9	0.9	0.9	0.9	14.6	59.8	15.7	0.9	0.9	5.9	104.0
1948	1.2	17.4	20.3	0.9	0.9	27.0	48.2	13.8	13.8	0.9	0.9	5.9	151.2
1949	1.2	1.1	1.2	0.9	0.9	0.9	148.8	193.1	13.8	0.9	0.9	0.9	364.6
1950	8.3	0.9	0.9	0.9	0.9	0.9	85.7	14.3	13.8	0.9	0.9	0.9	129.3
1951	0.9	0.9	1.1	2.4	0.9	0.9	52.7	46.3	15.0	0.9	0.9	0.9	123.8
1952	0.9	23.0	0.9	0.9	0.9	1.1	170.3	14.3	37.8	0.9	0.9	3.0	254.9
1953	2.0	0.9	0.9	0.9	0.9	26.8	15.5	218.9	13.8	0.9	0.9	5.4	287.8
1954	12.8	19.8	0.9	0.9	0.9	1.2	68.0	47.2	160.5	0.9	0.9	0.9	314.9
1955	7.5	8.9	1.1	0.9	0.9	1.4	14.1	43.7	107.7	1.4	0.9	3.0	191.5
1956	14.7	0.9	0.9	3.5	0.9	28.3	167.6	100.8	13.8	62.7	0.9	0.9	395.9
1957	3.0	0.9	0.9	4.1	0.9	0.9	30.2	20.2	13.8	0.9	3.5	4.3	83.6
1958	5.1	2.5	0.9	0.9	0.9	0.9	141.8	14.1	45.0	0.9	1.7	33.8	248.5
1959	3.3	2.5	0.9	0.9	0.9	1.4	242.9	59.3	321.7	0.9	53.3	1.7	689.7
1960	2.4	0.9	21.4	0.9	0.9	0.9	56.4	41.5	13.8	0.9	0.9	15.2	156.1
1961	12.1	34.8	0.9	8.3	0.9	11.5	177.7	194.9	176.1	0.9	0.9	1.9	620.9
1962	0.9	0.9	0.9	0.9	0.9	0.9	93.1	55.4	158.7	0.9	0.9	4.8	319.2
1963	0.9	0.9	0.9	2.0	0.9	0.9	15.5	23.4	13.8	0.9	20.0	0.9	81.0
1964	2.2	4.1	0.9	0.9	0.9	2.5	88.9	61.6	16.7	0.9	0.9	1.1	181.6
1965	0.9	0.9	0.9	3.0	0.9	0.9	118.8	31.8	13.8	0.9	0.9	0.9	174.6
1966	0.9	0.9	1.9	0.9	0.9	1.1	80.4	13.8	13.8	0.9	0.9	0.9	117.3
1967	0.9	0.9	82.9	16.3	0.9	8.0	432.5	110.1	13.8	0.9	4.1	9.9	681.2
1968	8.1	3.9	0.9	0.9	0.9	1.4	14.3	18.9	13.8	0.9	0.9	4.8	69.7
1969	0.9	1.5	0.9	0.9	0.9	0.9	51.2	13.8	13.8	0.9	0.9	0.9	87.5
1970	5.4	5.4	40.1	0.9	0.9	4.1	161.9	165.2	98.0	0.9	0.9	0.9	484.6
1971	3.3	0.9	0.9	0.9	0.9	0.9	46.3	43.5	13.8	0.9	0.9	1.5	114.7
1972	0.9	3.0	0.9	0.9	0.9	14.0	29.4	13.8	13.8	0.9	0.9	3.5	82.9
1973	0.9	0.9	0.9	0.9	0.9	0.9	194.1	33.4	13.8	0.9	0.9	6.2	254.7
1974	0.9	1.3	0.9	0.9	0.9	0.9	13.8	14.2	13.8	1.3	0.9	4.4	54.2
1975	9.5	14.3	20.0	0.9	0.9	1.1	13.8	88.8	26.2	0.0	0.0	0.0	175.5
1976	64.8	3.0	20.8	0.0	0.0	0.0	128.3	24.9	81.3	0.0	0.8	0.0	323.9
1977	4.3	0.0	0.0	1.3	0.0	40.9	308.9	45.7	119.1	0.0	14.2	0.0	534.4
1978	26.4	0.5	0.0	0.0	0.0	33.0	157.7	151.1	0.0	0.0	0.0	0.0	368.7
1979	1.0	47.2	0.0	0.0	0.0	0.0	0.0	67.6	0.0	2.0	3.8	25.7	147.3
1980	0.0	6.1	0.0	0.0	0.0	38.6	53.1	0.0	0.0	22.6	4.6	35.6	160.6
1981	0.0	17.3	56.9	8.1	0.0	0.0	36.6	189.2	0.0	0.0	0.0	0.0	308.1
1982	0.0	26.9	0.0	0.0	0.0	0.0	87.9	181.9	0.0	0.0	0.0	0.0	296.7
1983	0.0	3.8	0.0	24.9	0.0	0.0	109.7	111.5	18.8	0.0	0.0	0.0	268.7
1984	1.5	0.0	0.0	0.0	0.0	0.0	9.7	279.4	1.0	0.0	0.0	0.0	291.6
1985	0.0	0.0	0.0	21.3	0.0	0.0	59.9	6.6	0.0	0.0	0.0	0.0	87.8
1986	0.0	6.6	5.6	0.0	0.0	0.0	0.0	100.6	0.0	0.0	0.0	0.0	112.8
1987	0.0	0.0	0.0	0.0	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.3
1988	1.5	0.0	0.0	0.0	0.0	0.9	86.0	96.7	13.8	0.9	0.9	0.9	201.6
MBAN	5.9	7.2	6.3	2.6	0.9	5.8	107.3	65.1	32.2	2.2	2.7	4.7	243.0

Table B.2.10 CALCULATED MONTHLY RAINFALL (6/6)

STATION: GOTH HAJI SHA MOHA												Latitude = 24°58' Longitude = 67°25'		Unit: mm
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	
1929	1.8	0.9	0.9	0.9	0.9	0.9	54.1	12.4	8.0	0.9	17.5	12.8	112.0	
1930	8.0	0.9	0.9	2.7	0.9	34.5	301.6	9.1	8.2	0.9	0.9	0.9	369.5	
1931	1.8	4.4	4.3	0.9	0.9	0.9	12.1	9.1	8.0	0.9	0.9	0.9	45.1	
1932	4.3	0.9	0.9	0.9	0.9	0.9	259.2	32.8	8.0	0.9	0.9	0.9	311.5	
1933	1.7	1.7	0.9	1.7	4.4	0.9	347.1	74.6	35.9	0.9	0.9	0.9	471.6	
1934	0.9	0.9	2.2	0.9	0.9	21.5	150.5	13.0	8.0	0.9	0.9	6.7	207.3	
1935	11.2	19.6	0.9	20.2	0.9	0.9	14.8	12.1	8.2	1.4	0.9	1.1	92.2	
1936	1.7	10.1	2.0	0.9	0.9	12.5	66.0	8.2	8.7	0.9	1.1	2.7	115.7	
1937	0.9	16.4	0.9	1.1	0.9	0.9	186.8	8.7	8.0	0.9	0.9	42.4	268.8	
1938	1.1	0.9	0.9	1.5	2.8	1.8	44.5	65.3	8.2	0.9	0.9	4.4	133.2	
1939	1.1	33.3	36.4	2.2	0.9	1.2	8.4	8.4	8.2	0.9	3.5	0.9	105.4	
1940	44.4	21.4	30.4	0.9	0.9	7.4	53.9	55.2	8.0	0.9	1.4	6.9	231.7	
1941	2.5	0.9	0.9	0.9	0.9	0.9	46.9	8.2	8.0	0.9	0.9	1.4	73.3	
1942	10.7	18.4	3.8	0.9	0.9	0.9	230.0	23.5	8.0	0.9	0.9	7.5	306.4	
1943	12.3	0.9	0.9	0.9	0.9	3.0	51.6	10.0	8.2	0.9	0.9	0.9	91.4	
1944	4.6	31.0	0.9	0.9	0.9	0.9	255.7	297.6	8.0	0.9	0.9	1.8	604.1	
1945	33.4	0.9	0.9	0.9	0.9	0.9	100.2	10.0	11.1	0.9	0.9	2.2	163.2	
1946	0.9	0.9	0.9	0.9	0.9	2.4	56.1	44.0	8.0	0.9	0.9	0.9	117.7	
1947	0.9	1.7	0.9	0.9	0.9	0.9	8.7	48.8	9.7	0.9	0.9	5.9	81.1	
1948	1.2	17.5	20.4	0.9	0.9	27.1	38.5	8.0	8.0	0.9	0.9	5.9	130.2	
1949	1.2	1.1	1.2	0.9	0.9	0.9	127.6	167.0	8.0	0.9	0.9	0.9	311.5	
1950	8.3	0.9	0.9	0.9	0.9	0.9	71.7	8.4	8.0	0.9	0.9	0.9	103.6	
1951	0.9	0.9	1.1	2.4	0.9	0.9	42.5	36.8	9.1	0.9	0.9	0.9	98.2	
1952	0.9	23.1	0.9	0.9	0.9	1.1	146.8	8.4	29.3	0.9	0.9	3.0	217.1	
1953	2.0	0.9	0.9	0.9	0.9	26.9	9.5	189.8	8.0	0.9	0.9	5.4	247.0	
1954	12.8	19.9	0.9	0.9	0.9	1.2	56.1	37.6	138.0	0.9	0.9	0.9	271.0	
1955	7.5	8.9	1.1	0.9	0.9	1.4	8.2	34.5	91.2	1.4	0.9	3.0	159.9	
1956	14.7	0.9	0.9	3.5	0.9	28.4	144.3	85.1	8.0	63.0	0.9	0.9	351.5	
1957	3.0	0.9	0.9	4.1	0.9	0.9	22.5	13.7	8.0	0.9	3.5	4.3	63.6	
1958	5.1	2.5	0.9	0.9	0.9	0.9	121.5	8.2	35.7	0.9	1.7	33.9	213.1	
1959	3.3	2.5	0.9	0.9	0.9	1.4	211.1	48.4	280.9	0.9	53.6	1.7	606.5	
1960	2.4	0.9	21.5	0.9	0.9	0.9	45.8	32.5	8.0	0.9	0.9	15.2	130.8	
1961	12.2	35.0	0.9	8.3	0.9	11.5	153.3	168.5	151.9	0.9	0.9	1.8	546.1	
1962	0.9	0.9	0.9	0.9	0.9	0.9	78.3	44.9	136.5	0.9	0.9	4.8	271.7	
1963	0.9	0.9	0.9	2.0	0.9	0.9	9.5	16.5	8.0	0.9	20.0	0.9	62.3	
1964	2.2	4.1	0.9	0.9	0.9	2.5	74.6	50.4	10.6	0.9	0.9	1.1	150.0	
1965	0.9	0.9	0.9	3.0	0.9	0.9	101.1	24.0	8.0	0.9	0.9	0.9	143.3	
1966	0.9	0.9	1.8	0.9	0.9	1.1	67.0	8.0	8.0	0.9	0.9	0.9	92.2	
1967	0.9	0.9	83.3	16.4	0.9	8.0	379.2	93.4	8.0	0.9	4.1	9.9	605.9	
1968	8.1	3.9	0.9	0.9	0.9	1.4	8.4	12.6	8.0	0.9	0.9	4.8	51.7	
1969	0.9	1.5	0.9	0.9	0.9	0.9	41.2	8.0	8.0	0.9	0.9	0.9	65.9	
1970	5.4	5.4	40.3	0.9	0.9	4.1	139.3	142.2	82.7	0.9	0.9	0.9	423.9	
1971	3.3	0.9	0.9	0.9	0.9	0.9	36.8	34.4	8.0	0.9	0.9	1.5	90.3	
1972	0.9	3.0	0.9	0.9	0.9	14.1	21.8	8.0	8.0	0.9	0.9	3.5	63.8	
1973	0.9	0.9	0.9	0.9	0.9	0.9	167.8	25.4	8.0	0.9	0.9	6.2	214.6	
1974	0.9	1.3	0.9	0.9	0.9	0.9	8.0	8.3	8.0	1.3	0.9	4.4	36.7	
1975	9.6	14.4	20.0	0.9	0.9	1.1	8.0	74.5	26.2	0.9	0.9	1.1	158.5	
1976	43.2	7.3	20.4	0.9	0.9	0.9	195.8	39.5	46.7	0.9	0.9	0.9	358.3	
1977	7.4	1.2	0.9	2.4	0.9	22.9	269.6	46.7	84.5	0.9	4.2	0.9	442.5	
1978	10.0	3.9	0.9	0.9	0.9	5.2	163.1	159.7	8.0	0.9	0.9	0.9	355.3	
1979	6.1	53.8	0.0	0.0	0.0	0.0	0.0	103.1	0.0	2.5	1.5	39.4	206.4	
1980	0.0	0.0	2.3	0.0	0.0	57.1	71.6	0.0	0.0	18.8	0.0	34.5	184.3	
1981	0.0	21.6	38.9	0.0	0.0	0.0	36.6	87.4	0.0	0.0	0.0	0.0	184.5	
1982	0.0	28.4	0.0	0.0	0.0	0.0	66.0	112.8	0.0	0.0	0.0	0.0	207.2	
1983	0.0	2.0	0.0	20.3	0.0	0.0	91.4	116.1	16.3	0.0	0.0	0.0	246.1	
1984	0.0	0.0	0.0	0.0	0.0	0.0	10.4	249.2	0.0	0.9	0.9	0.9	262.3	
1985	1.5	0.9	0.9	31.1	0.9	1.2	77.7	197.4	8.4	0.0	0.9	0.9	321.8	
1986	0.9	1.4	8.1	0.9	0.9	11.7	8.0	61.9	8.0	0.9	0.9	0.9	104.5	
1987	0.9	0.9	0.9	0.9	0.9	0.9	8.0	8.0	8.0	0.9	0.9	0.9	32.1	
1988	1.5	0.9	0.9	0.9	0.9	0.9	72.0	81.5	8.0	0.9	0.9	0.9	170.2	
MEAN	5.5	7.4	6.2	2.6	0.9	5.6	94.3	56.9	25.0	2.2	2.5	5.1	214.3	

Table B.2.11 CALCULATED MONTHLY RAINFALL OF CATCHMENT AREA (1/4)

STATION	: KHADEJI RIVER												Latitude = 25°03'	Longitude = 67°25'	
	AT DAM SITE												Catchment Area : 567 Km ² (219 mile ²)		Unit: mm
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL		
1929	2.1	1.4	1.4	1.4	1.4	1.4	57.8	11.9	7.2	1.4	12.9	9.7	110.0		
1930	6.3	1.4	1.4	2.7	1.4	24.7	330.4	8.4	7.5	1.4	1.4	1.4	388.4		
1931	2.1	3.9	3.8	1.4	1.4	1.4	11.6	8.4	7.2	1.4	1.4	1.4	45.4		
1932	3.8	1.4	1.4	1.4	1.4	1.4	283.7	34.3	7.2	1.4	1.4	1.4	340.2		
1933	2.0	2.0	1.4	2.0	3.9	1.4	380.6	80.3	37.7	1.4	1.4	1.4	515.5		
1934	1.4	1.4	2.3	1.4	1.4	15.7	163.9	12.6	7.2	1.4	1.4	5.4	215.5		
1935	8.6	14.3	1.4	14.7	1.4	1.4	14.5	11.6	7.5	1.8	1.4	1.5	80.1		
1936	2.0	7.8	2.2	1.4	1.4	9.4	70.8	7.5	7.9	1.4	1.5	2.7	116.0		
1937	1.4	12.1	1.4	1.5	1.4	1.4	203.9	7.9	7.2	1.4	1.4	30.1	271.1		
1938	1.5	1.4	1.4	1.9	2.8	2.1	47.1	70.1	7.5	1.4	1.4	3.9	142.5		
1939	1.5	23.7	25.9	2.3	1.4	1.6	7.6	7.6	7.5	1.4	3.2	1.4	85.1		
1940	31.4	15.6	21.7	1.4	1.4	5.9	57.6	59.0	7.2	1.4	1.8	5.6	210.0		
1941	2.5	1.4	1.4	1.4	1.4	1.4	49.9	7.5	7.2	1.4	1.4	1.8	78.7		
1942	8.2	13.6	3.5	1.4	1.4	1.4	251.6	24.1	7.2	1.4	1.4	6.0	321.2		
1943	9.3	1.4	1.4	1.4	1.4	2.9	55.0	9.3	7.5	1.4	1.4	1.4	93.8		
1944	4.0	22.2	1.4	1.4	1.4	1.4	279.9	326.1	7.2	1.4	1.4	2.1	649.9		
1945	23.8	1.4	1.4	1.4	1.4	1.4	108.6	9.3	10.5	1.4	1.4	2.3	164.3		
1946	1.4	1.4	1.4	1.4	1.4	2.4	59.9	46.6	7.2	1.4	1.4	1.4	127.3		
1947	1.4	2.0	1.4	1.4	1.4	1.4	7.9	51.9	9.0	1.4	1.4	4.9	85.5		
1948	1.6	12.9	14.8	1.4	1.4	19.5	40.6	7.2	7.2	1.4	1.4	4.9	114.3		
1949	1.6	1.5	1.6	1.4	1.4	1.4	138.8	182.1	7.2	1.4	1.4	1.4	341.2		
1950	6.6	1.4	1.4	1.4	1.4	1.4	77.1	7.6	7.2	1.4	1.4	1.4	109.7		
1951	1.4	1.4	1.5	2.4	1.4	1.4	45.0	38.6	8.4	1.4	1.4	1.4	105.7		
1952	1.4	16.8	1.4	1.4	1.4	1.5	159.9	7.6	30.4	1.4	1.4	2.9	227.5		
1953	2.2	1.4	1.4	1.4	1.4	19.4	8.8	207.3	7.2	1.4	1.4	4.5	257.8		
1954	9.7	14.6	1.4	1.4	1.4	1.6	59.9	39.6	150.2	1.4	1.4	1.4	284.0		
1955	6.0	7.0	1.5	1.4	1.4	1.8	7.5	36.2	98.7	1.8	1.4	2.9	167.6		
1956	11.0	1.4	1.4	3.2	1.4	20.4	157.1	91.9	7.2	44.2	1.4	1.4	342.0		
1957	2.9	1.4	1.4	3.6	1.4	1.4	22.9	13.3	7.2	1.4	3.2	3.8	63.9		
1958	4.3	2.5	1.4	1.4	1.4	1.4	132.0	7.5	37.4	1.4	2.0	24.2	216.9		
1959	3.1	2.5	1.4	1.4	1.4	1.8	230.7	51.4	307.6	1.4	37.7	2.0	642.4		
1960	2.4	1.4	15.7	1.4	1.4	1.4	48.6	34.0	7.2	1.4	1.4	11.3	127.6		
1961	9.2	24.9	1.4	6.6	1.4	8.8	167.1	183.9	165.4	1.4	1.4	2.1	573.6		
1962	1.4	1.4	1.4	1.4	1.4	1.4	84.4	47.6	148.5	1.4	1.4	4.1	295.8		
1963	1.4	1.4	1.4	2.2	1.4	1.4	8.8	16.3	7.2	1.4	14.6	1.4	58.9		
1964	2.3	3.6	1.4	1.4	1.4	2.5	80.3	53.6	10.0	1.4	1.4	1.5	160.8		
1965	1.4	1.4	1.4	2.9	1.4	1.4	109.5	24.5	7.2	1.4	1.4	1.4	155.3		
1966	1.4	1.4	2.1	1.4	1.4	1.5	72.0	7.2	7.2	1.4	1.4	1.4	99.8		
1967	1.4	1.4	58.2	12.1	1.4	6.3	415.8	101.0	7.2	1.4	3.6	7.7	617.5		
1968	6.4	3.5	1.4	1.4	1.4	1.8	7.6	12.1	7.2	1.4	1.4	4.1	49.7		
1969	1.4	1.9	1.4	1.4	1.4	1.4	43.5	7.2	7.2	1.4	1.4	1.4	71.0		
1970	4.5	4.5	28.6	1.4	1.4	3.6	151.6	154.8	89.2	1.4	1.4	1.4	443.8		
1971	3.1	1.4	1.4	1.4	1.4	1.4	38.6	36.0	7.2	1.4	1.4	1.9	96.6		
1972	1.4	2.9	1.4	1.4	1.4	10.5	22.2	7.2	7.2	1.4	1.4	3.2	61.6		
1973	1.4	1.4	1.4	1.4	1.4	1.4	183.1	26.1	7.2	1.4	1.4	5.1	232.7		
1974	1.4	1.7	1.4	1.4	1.4	1.4	7.2	7.5	7.2	1.7	1.4	3.9	37.6		
1975	7.4	10.7	14.6	1.4	1.4	1.5	7.2	80.2	25.1	1.2	0.0	0.1	150.8		
1976	36.9	9.7	20.1	0.1	0.0	0.0	91.9	25.3	91.2	0.0	0.2	0.0	275.4		
1977	4.2	0.1	0.0	0.5	0.1	92.1	225.4	48.6	70.4	0.0	3.6	0.0	445.0		
1978	11.6	0.3	4.8	0.3	0.0	30.7	190.6	170.7	0.5	0.0	0.0	0.0	409.5		
1979	0.5	25.0	4.6	0.0	0.0	0.0	0.0	48.1	0.9	2.6	1.0	32.2	114.9		
1980	0.0	1.5	0.2	0.0	0.0	32.5	49.1	10.6	0.0	11.1	1.4	25.8	132.2		
1981	0.1	6.2	37.4	1.9	0.0	0.0	34.7	150.8	0.0	0.0	0.2	0.0	231.3		
1982	0.0	22.8	0.0	0.0	0.1	0.0	27.8	80.3	0.0	0.0	0.0	0.0	131.0		
1983	0.0	4.6	0.0	40.2	0.0	0.0	45.6	127.8	22.8	0.0	0.0	0.0	241.0		
1984	0.4	0.0	0.1	0.0	0.0	17.2	20.6	256.1	32.0	1.2	1.2	1.2	330.0		
1985	1.4	1.2	1.2	19.9	1.2	1.4	83.5	26.3	0.4	0.0	0.0	0.0	136.5		
1986	0.0	6.4	1.7	0.0	0.0	10.2	0.4	92.1	0.4	0.0	0.0	0.0	111.2		
1987	0.0	0.0	0.0	0.0	1.3	0.0	0.4	0.4	0.4	0.0	0.0	0.0	2.5		
1988	0.4	0.0	0.0	0.0	0.0	1.4	77.4	87.9	7.2	1.4	1.4	1.4	178.5		
MEAN	4.5	5.6	5.2	2.8	1.2	6.4	97.0	56.8	26.6	2.1	2.4	4.2	214.8		

Table B.2.11 CALCULATED MONTHLY RAINFALL OF CATCHMENT AREA (2/4)

STATION	: MOL RIVER												Unit: mm
	AT DAM SITE												
Latitude = 25°03' Longitude = 67°25'													ANNUAL
Catchment Area : 596 Km2 (230 mile2)													
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1929	2.8	2.1	2.1	2.1	2.1	2.1	58.3	4.1	2.4	2.1	13.5	10.3	104.0
1930	7.0	2.1	2.1	3.4	2.1	2.1	25.2	398.3	2.8	2.5	2.1	2.1	451.8
1931	2.8	4.6	4.5	2.1	2.1	2.1	4.0	2.8	2.4	2.1	2.1	2.1	33.7
1932	4.5	2.1	2.1	2.1	2.1	2.1	340.1	29.0	2.4	2.1	2.1	2.1	392.8
1933	2.7	2.7	2.1	2.7	4.6	2.1	460.7	86.4	33.4	2.1	2.1	2.1	603.7
1934	2.1	2.1	3.0	2.1	2.1	2.1	16.2	190.7	4.3	2.4	2.1	6.1	235.3
1935	9.2	15.0	2.1	15.3	2.1	2.1	5.0	4.0	2.5	2.5	2.1	2.2	64.1
1936	2.7	8.5	2.9	2.1	2.1	2.1	10.1	74.7	2.5	2.6	2.1	2.2	115.9
1937	2.1	12.7	2.1	2.2	2.1	2.1	240.5	2.6	2.4	2.1	2.1	30.5	303.5
1938	2.2	2.1	2.1	2.6	3.4	2.8	45.1	73.7	2.5	2.1	2.1	4.6	145.3
1939	2.2	24.3	26.4	3.0	2.1	2.3	2.5	2.5	2.5	2.1	3.9	2.1	75.9
1940	31.9	16.1	22.3	2.1	2.1	6.6	58.0	59.8	2.4	2.1	2.5	6.2	212.1
1941	3.2	2.1	2.1	2.1	2.1	2.1	48.4	2.5	2.4	2.1	2.1	2.5	73.7
1942	8.8	14.2	4.2	2.1	2.1	2.1	299.9	16.3	2.4	2.1	2.1	6.6	362.9
1943	9.9	2.1	2.1	2.1	2.1	2.1	3.6	54.9	3.1	2.5	2.1	2.1	88.7
1944	4.7	22.7	2.1	2.1	2.1	2.1	335.2	392.8	2.4	2.1	2.1	2.8	773.2
1945	24.4	2.1	2.1	2.1	2.1	2.1	121.7	3.1	3.6	2.1	2.1	3.0	170.5
1946	2.1	2.1	2.1	2.1	2.1	3.1	61.0	44.5	2.4	2.1	2.1	2.1	127.8
1947	2.1	2.7	2.1	2.1	2.1	2.1	2.6	51.0	3.0	2.1	2.1	5.5	79.5
1948	2.3	13.5	15.5	2.1	2.1	20.1	36.9	2.4	2.4	2.1	2.1	5.5	107.0
1949	2.3	2.2	2.3	2.1	2.1	2.1	159.4	213.4	2.4	2.1	2.1	2.1	394.6
1950	7.2	2.1	2.1	2.1	2.1	2.1	82.5	2.5	2.4	2.1	2.1	2.1	111.4
1951	2.1	2.1	2.2	3.1	2.1	2.1	42.4	34.5	2.8	2.1	2.1	2.1	99.7
1952	2.1	17.4	2.1	2.1	2.1	2.2	185.6	2.5	24.2	2.1	2.1	3.6	248.1
1953	2.9	2.1	2.1	2.1	2.1	19.9	3.0	244.7	2.4	2.1	2.1	5.2	290.7
1954	10.3	15.2	2.1	2.1	2.1	2.3	61.0	35.7	173.6	2.1	2.1	2.1	310.7
1955	6.6	7.7	2.2	2.1	2.1	2.5	2.5	31.4	109.3	2.5	2.1	3.6	174.6
1956	11.6	2.1	2.1	3.9	2.1	21.0	182.3	100.9	2.4	44.6	2.1	2.1	377.2
1957	3.6	2.1	2.1	4.4	2.1	2.1	14.9	4.6	2.4	2.1	3.9	4.5	48.8
1958	5.1	3.2	2.1	2.1	2.1	2.1	150.9	2.5	33.0	2.1	2.7	24.7	232.6
1959	3.8	3.2	2.1	2.1	2.1	2.5	273.9	50.4	369.8	2.1	38.1	2.7	752.8
1960	3.1	2.1	16.2	2.1	2.1	2.1	46.9	28.7	2.4	2.1	2.1	11.9	121.8
1961	9.8	25.5	2.1	7.2	2.1	9.4	194.6	215.5	192.6	2.1	2.1	2.8	665.8
1962	2.1	2.1	2.1	2.1	2.1	2.1	91.5	45.7	171.4	2.1	2.1	4.8	330.2
1963	2.1	2.1	2.1	2.9	2.1	2.1	3.0	6.7	2.4	2.1	15.2	2.1	44.9
1964	3.0	4.4	2.1	2.1	2.1	3.2	86.4	53.1	3.4	2.1	2.1	2.2	166.2
1965	2.1	2.1	2.1	3.6	2.1	2.1	122.8	16.9	2.4	2.1	2.1	2.1	162.5
1966	2.1	2.1	2.8	2.1	2.1	2.2	76.1	2.4	2.4	2.1	2.1	2.1	100.6
1967	2.1	2.1	58.4	12.7	2.1	7.0	504.7	112.3	2.4	2.1	4.4	8.3	718.6
1968	7.1	4.3	2.1	2.1	2.1	2.5	2.5	4.1	2.4	2.1	2.1	4.8	38.2
1969	2.1	2.6	2.1	2.1	2.1	2.1	40.6	2.4	2.4	2.1	2.1	2.1	64.8
1970	5.2	5.2	29.1	2.1	2.1	4.4	175.3	179.3	97.6	2.1	2.1	2.1	506.6
1971	3.8	2.1	2.1	2.1	2.1	2.1	34.5	31.2	2.4	2.1	2.1	2.6	89.2
1972	2.1	3.6	2.1	2.1	2.1	11.2	14.0	2.4	2.4	2.1	2.1	3.9	50.1
1973	2.1	2.1	2.1	2.1	2.1	2.1	214.5	18.8	2.4	2.1	2.1	5.8	258.3
1974	2.1	2.4	2.1	2.1	2.1	2.1	2.4	2.5	2.4	2.4	2.1	4.6	29.3
1975	8.1	11.4	15.2	2.1	2.1	2.2	2.4	86.3	19.5	2.1	0.0	0.0	151.4
1976	25.3	33.4	42.2	2.3	0.0	0.0	74.5	35.7	116.0	0.0	0.1	0.0	329.5
1977	18.6	0.0	0.0	2.4	1.6	107.7	151.2	17.5	37.4	0.0	1.0	0.0	337.4
1978	3.8	0.0	1.9	7.0	0.0	20.3	223.1	237.1	3.3	0.0	0.0	0.0	496.5
1979	0.1	22.9	1.8	0.0	0.0	0.0	0.0	89.9	0.4	10.1	1.6	35.1	161.9
1980	1.3	0.4	2.7	0.0	0.0	35.6	27.6	11.6	0.0	17.5	10.2	30.5	137.4
1981	3.0	34.2	35.7	0.6	0.0	0.0	44.6	80.3	0.0	0.0	7.9	0.0	206.3
1982	0.0	15.1	0.0	0.0	4.6	0.0	25.1	52.7	0.0	0.0	0.0	1.5	99.0
1983	0.0	3.0	0.0	22.4	0.0	0.0	14.9	101.4	28.9	0.0	0.0	0.0	170.6
1984	0.1	0.0	1.9	0.0	0.0	7.0	25.7	341.3	13.6	2.1	2.1	2.1	395.9
1985	2.4	2.1	2.1	22.1	2.1	2.3	76.3	23.1	0.0	0.0	0.0	0.0	132.5
1986	0.0	7.9	0.4	0.0	0.0	3.9	0.0	113.9	0.0	0.0	0.0	0.0	126.1
1987	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
1988	0.1	0.0	0.0	0.0	0.0	2.1	82.9	95.9	2.4	2.1	2.1	2.1	189.7
MEAN	5.0	6.8	6.1	3.3	1.9	6.9	105.9	58.7	25.3	2.9	3.2	4.9	230.7

Table B.2.11. CALCULATED MONTHLY RAINFALL OF CATCHMENT AREA (3/4)

STATION	: MALIR RIVER												Latitude = 25°02'	Longitude = 67°24'	Unit: mm
	AT SUPERHIGHWAY BRIDGE												Catchment Area : 1205 Km2 (465 mile2)		
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL		
1929	2.5	1.8	1.8	1.8	1.8	1.8	58.4	8.3	5.1	1.8	13.4	10.1	108.6		
1930	6.7	1.8	1.8	3.0	1.8	25.3	364.6	5.9	5.3	1.8	1.8	1.8	421.6		
1931	2.5	4.2	4.1	1.8	1.8	1.8	8.1	5.9	5.1	1.8	1.8	1.8	40.7		
1932	4.1	1.8	1.8	1.8	1.8	1.8	312.2	32.0	5.1	1.8	1.8	1.8	367.8		
1933	2.3	2.3	1.8	2.3	4.2	1.8	420.9	83.7	35.9	1.8	1.8	1.8	560.6		
1934	1.8	1.8	2.6	1.8	1.8	16.2	177.6	8.8	5.1	1.8	1.8	5.8	226.9		
1935	9.0	14.8	1.8	15.2	1.8	1.8	10.1	8.1	5.3	2.1	1.8	1.9	73.7		
1936	2.3	8.2	2.6	1.8	1.8	9.9	73.1	5.3	5.6	1.8	1.9	3.0	117.3		
1937	1.8	12.6	1.8	1.9	1.8	1.8	222.5	5.6	5.1	1.8	1.8	30.8	289.3		
1938	1.9	1.8	1.8	2.2	3.1	2.5	46.5	72.3	5.3	1.8	1.8	4.2	145.2		
1939	1.9	24.4	26.6	2.6	1.8	2.0	5.4	5.4	5.3	1.8	3.6	1.8	82.6		
1940	32.2	16.1	22.3	1.8	1.8	6.3	58.1	59.7	5.1	1.8	2.1	5.9	213.2		
1941	2.9	1.8	1.8	1.8	1.8	1.8	49.5	5.3	5.1	1.8	1.8	2.1	77.5		
1942	8.6	14.1	3.8	1.8	1.8	1.8	276.1	20.6	5.1	1.8	1.8	6.4	343.7		
1943	9.7	1.8	1.8	1.8	1.8	3.2	55.3	6.6	5.3	1.8	1.8	1.8	92.7		
1944	4.4	22.8	1.8	1.8	1.8	1.8	307.8	359.7	5.1	1.8	1.8	2.5	713.1		
1945	24.5	1.8	1.8	1.8	1.8	1.8	115.5	6.6	7.4	1.8	1.8	2.6	169.2		
1946	1.8	1.8	1.8	1.8	1.8	2.8	60.8	45.9	5.1	1.8	1.8	1.8	129.0		
1947	1.8	2.3	1.8	1.8	1.8	1.8	5.6	51.8	6.4	1.8	1.8	5.2	83.9		
1948	2.0	13.4	15.4	1.8	1.8	20.1	39.1	5.1	5.1	1.8	1.8	5.2	112.6		
1949	2.0	1.9	2.0	1.8	1.8	1.8	149.4	198.1	5.1	1.8	1.8	1.8	369.3		
1950	7.0	1.8	1.8	1.8	1.8	1.8	80.2	5.4	5.1	1.8	1.8	1.8	112.1		
1951	1.8	1.8	1.9	2.8	1.8	1.8	44.1	37.0	5.9	1.8	1.8	1.8	104.3		
1952	1.8	17.3	1.8	1.8	1.8	1.9	173.1	5.4	27.7	1.8	1.8	3.2	239.4		
1953	2.6	1.8	1.8	1.8	1.8	19.9	6.2	226.3	5.1	1.8	1.8	4.9	275.8		
1954	10.1	15.1	1.8	1.8	1.8	2.0	60.8	38.0	162.3	1.8	1.8	1.8	299.1		
1955	6.4	7.4	1.9	1.8	1.8	2.1	5.3	34.2	104.3	2.1	1.8	3.2	172.3		
1956	11.4	1.8	1.8	3.6	1.8	21.0	170.0	96.8	5.1	45.2	1.8	1.8	362.1		
1957	3.2	1.8	1.8	4.0	1.8	1.8	19.3	9.3	5.1	1.8	3.6	4.1	57.6		
1958	4.7	2.9	1.8	1.8	1.8	1.8	141.8	5.3	35.6	1.8	2.3	24.8	226.4		
1959	3.5	2.9	1.8	1.8	1.8	2.1	252.6	51.3	339.0	1.8	38.5	2.3	699.4		
1960	2.8	1.8	16.2	1.8	1.8	1.8	48.1	31.7	5.1	1.8	1.8	11.8	126.5		
1961	9.6	25.6	1.8	7.0	1.8	9.2	181.2	200.0	179.3	1.8	1.8	2.5	621.6		
1962	1.8	1.8	1.8	1.8	1.8	1.8	88.3	47.0	160.3	1.8	1.8	4.5	314.5		
1963	1.8	1.8	1.8	2.6	1.8	1.8	6.2	11.9	5.1	1.8	15.1	1.8	53.5		
1964	2.6	4.0	1.8	1.8	1.8	2.9	83.7	53.7	7.0	1.8	1.8	1.9	164.8		
1965	1.8	1.8	1.8	3.2	1.8	1.8	116.5	21.1	5.1	1.8	1.8	1.8	160.3		
1966	1.8	1.8	2.5	1.8	1.8	1.9	74.4	5.1	5.1	1.8	1.8	1.8	101.6		
1967	1.8	1.8	59.3	12.6	1.8	6.7	460.5	107.0	5.1	1.8	4.0	8.1	670.5		
1968	6.8	3.9	1.8	1.8	1.8	2.1	5.4	8.4	5.1	1.8	1.8	4.5	45.2		
1969	1.8	2.2	1.8	1.8	1.8	1.8	42.4	5.1	5.1	1.8	1.8	1.8	69.2		
1970	4.9	4.9	29.3	1.8	1.8	4.0	163.8	167.4	93.8	1.8	1.8	1.8	477.1		
1971	3.5	1.8	1.8	1.8	1.8	1.8	37.0	34.0	5.1	1.8	1.8	2.2	94.4		
1972	1.8	3.2	1.8	1.8	1.8	11.0	18.5	5.1	5.1	1.8	1.8	3.6	57.3		
1973	1.8	1.8	1.8	1.8	1.8	1.8	199.1	22.8	5.1	1.8	1.8	5.5	246.9		
1974	1.8	2.0	1.8	1.8	1.8	1.8	5.1	5.3	5.1	2.0	1.8	4.2	34.5		
1975	7.8	11.2	15.1	1.8	1.8	1.9	5.1	83.6	22.4	1.6	0.0	0.0	152.3		
1976	32.4	21.1	31.0	1.2	0.0	0.0	84.6	30.3	103.1	0.0	0.2	0.0	303.9		
1977	11.3	0.0	0.0	1.5	0.8	97.8	192.3	33.1	56.2	0.0	2.8	0.0	395.8		
1978	8.4	0.2	3.2	3.5	0.0	25.8	205.3	202.6	1.8	0.0	0.0	0.0	450.8		
1979	0.3	24.8	3.0	0.0	0.0	0.0	0.0	69.4	0.6	6.3	1.4	33.3	139.1		
1980	0.7	1.2	1.4	0.0	0.0	34.2	38.6	10.7	0.0	14.8	5.9	28.5	136.0		
1981	1.5	20.5	37.4	1.5	0.0	0.0	39.7	117.9	0.0	0.0	4.0	0.0	222.5		
1982	0.0	19.2	0.0	0.0	2.3	0.0	28.9	71.0	0.0	0.0	0.0	0.8	122.2		
1983	0.0	3.8	0.0	30.8	0.0	0.0	33.1	114.1	25.7	0.0	0.0	0.0	207.5		
1984	0.3	0.0	1.0	0.0	0.0	11.5	22.6	299.2	21.7	1.6	1.6	1.6	361.1		
1985	1.9	1.6	1.6	21.0	1.6	1.7	78.9	23.3	0.2	0.0	0.0	0.0	131.8		
1986	0.0	7.2	1.2	0.0	0.0	6.7	0.2	103.4	0.2	0.0	0.0	0.0	118.9		
1987	0.0	0.0	0.0	0.0	1.0	0.0	0.2	0.2	0.2	0.0	0.0	0.0	1.6		
1988	0.3	0.0	0.0	0.0	0.0	1.8	80.5	92.3	5.1	1.8	1.8	1.8	185.4		
MEAN	4.8	6.3	5.7	3.1	1.6	6.7	101.8	58.1	26.2	2.6	2.8	4.6	224.2		

Table B.2.11 CALCULATED MONTHLY RAINFALL OF CATCHMENT AREA (4/4)

STATION	: MALIR RIVER												Latitude = 25°25'	Longitude = 67°11'	Unit: mm
	AT NATIONAL HIGHWAY BRIDGE												Catchment Area : 1205 Km ² (465 mile ²)		
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL		
1929	2.2	1.4	1.4	1.4	1.4	1.4	58.8	10.1	6.5	1.4	15.0	11.2	112.2		
1930	7.2	1.4	1.4	2.9	1.4	28.9	354.3	7.4	6.7	1.4	1.4	1.4	415.8		
1931	2.2	4.3	4.2	1.4	1.4	1.4	9.9	7.4	6.5	1.4	1.4	1.4	42.9		
1932	4.2	1.4	1.4	1.4	1.4	1.4	303.7	33.4	6.5	1.4	1.4	1.4	359.0		
1933	2.1	2.1	1.4	2.1	4.3	1.4	408.5	83.2	37.1	1.4	1.4	1.4	546.4		
1934	1.4	1.4	2.4	1.4	1.4	18.3	173.8	10.6	6.5	1.4	1.4	6.1	226.1		
1935	9.9	16.7	1.4	17.2	1.4	1.4	12.1	9.9	6.7	1.8	1.4	1.5	81.4		
1936	2.1	9.0	2.3	1.4	1.4	10.9	73.0	6.7	7.1	1.4	1.5	2.9	119.7		
1937	1.4	14.1	1.4	1.5	1.4	1.4	217.2	7.1	6.5	1.4	1.4	35.4	290.2		
1938	1.5	1.4	1.4	1.9	3.0	2.2	47.3	72.2	6.7	1.4	1.4	4.3	144.7		
1939	1.5	27.9	30.5	2.4	1.4	1.7	6.8	6.8	6.7	1.4	3.5	1.4	92.0		
1940	37.0	18.2	25.5	1.4	1.4	6.7	58.6	60.1	6.5	1.4	1.8	6.3	224.9		
1941	2.7	1.4	1.4	1.4	1.4	1.4	50.2	6.7	6.5	1.4	1.4	1.8	77.7		
1942	9.4	15.8	3.8	1.4	1.4	1.4	268.8	22.3	6.5	1.4	1.4	6.8	340.4		
1943	10.7	1.4	1.4	1.4	1.4	3.1	55.9	8.1	6.7	1.4	1.4	1.4	94.3		
1944	4.4	26.0	1.4	1.4	1.4	1.4	299.5	349.5	6.5	1.4	1.4	2.2	696.5		
1945	28.0	1.4	1.4	1.4	1.4	1.4	113.9	8.1	9.0	1.4	1.4	2.4	171.2		
1946	1.4	1.4	1.4	1.4	1.4	2.6	61.1	46.8	6.5	1.4	1.4	1.4	128.2		
1947	1.4	2.1	1.4	1.4	1.4	1.4	7.1	52.5	7.9	1.4	1.4	5.5	84.9		
1948	1.7	15.0	17.3	1.4	1.4	22.9	40.2	6.5	6.5	1.4	1.4	5.5	121.2		
1949	1.7	1.5	1.7	1.4	1.4	1.4	146.6	193.6	6.5	1.4	1.4	1.4	360.0		
1950	7.5	1.4	1.4	1.4	1.4	1.4	79.8	6.8	6.5	1.4	1.4	1.4	111.8		
1951	1.4	1.4	1.5	2.6	1.4	1.4	45.0	38.1	7.4	1.4	1.4	1.4	104.4		
1952	1.4	19.6	1.4	1.4	1.4	1.5	169.4	6.8	29.2	1.4	1.4	3.1	238.0		
1953	2.3	1.4	1.4	1.4	1.4	22.7	7.7	220.8	6.5	1.4	1.4	5.1	273.5		
1954	11.2	17.0	1.4	1.4	1.4	1.7	61.1	39.2	159.0	1.4	1.4	1.4	297.6		
1955	6.8	8.0	1.5	1.4	1.4	1.8	6.7	35.4	103.1	1.8	1.4	3.1	172.4		
1956	12.7	1.4	1.4	3.5	1.4	23.9	166.5	95.8	6.5	52.2	1.4	1.4	368.1		
1957	3.1	1.4	1.4	4.0	1.4	1.4	21.1	11.2	6.5	1.4	3.5	4.2	60.6		
1958	4.9	2.7	1.4	1.4	1.4	1.4	139.3	6.7	36.8	1.4	2.1	28.4	227.9		
1959	3.4	2.7	1.4	1.4	1.4	1.8	246.2	51.9	329.6	1.4	44.5	2.1	687.8		
1960	2.6	1.4	18.3	1.4	1.4	1.4	48.9	33.1	6.5	1.4	1.4	13.1	130.9		
1961	10.6	29.3	1.4	7.5	1.4	10.1	177.2	195.4	175.5	1.4	1.4	2.2	613.4		
1962	1.4	1.4	1.4	1.4	1.4	1.4	87.7	47.8	157.1	1.4	1.4	4.6	308.4		
1963	1.4	1.4	1.4	2.3	1.4	1.4	7.7	14.0	6.5	1.4	17.1	1.4	57.4		
1964	2.4	4.0	1.4	1.4	1.4	2.7	83.2	54.3	8.6	1.4	1.4	1.5	163.7		
1965	1.4	1.4	1.4	3.1	1.4	1.4	114.9	22.8	6.5	1.4	1.4	1.4	158.5		
1966	1.4	1.4	2.2	1.4	1.4	1.5	74.3	6.5	6.5	1.4	1.4	1.4	100.8		
1967	1.4	1.4	68.7	14.1	1.4	7.2	446.8	105.7	6.5	1.4	4.0	8.8	667.4		
1968	7.3	3.9	1.4	1.4	1.4	1.8	6.8	10.2	6.5	1.4	1.4	4.6	48.1		
1969	1.4	1.9	1.4	1.4	1.4	1.4	43.4	6.5	6.5	1.4	1.4	1.4	69.5		
1970	5.1	5.1	33.6	1.4	1.4	4.0	160.5	164.0	92.9	1.4	1.4	1.4	472.2		
1971	3.4	1.4	1.4	1.4	1.4	1.4	38.1	35.2	6.5	1.4	1.4	1.9	94.9		
1972	1.4	3.1	1.4	1.4	1.4	12.2	20.3	6.5	6.5	1.4	1.4	3.5	60.5		
1973	1.4	1.4	1.4	1.4	1.4	1.4	194.6	24.5	6.5	1.4	1.4	5.8	242.6		
1974	1.4	1.7	1.4	1.4	1.4	1.4	6.5	6.8	6.5	1.7	1.4	4.3	35.9		
1975	8.5	12.4	17.1	1.4	1.4	1.5	6.5	83.1	23.0	1.1	0.1	0.1	156.2		
1976	40.7	15.8	27.9	0.9	0.1	0.1	110.2	30.2	90.5	0.1	0.3	0.1	316.9		
1977	9.5	0.1	0.1	1.5	0.6	76.8	227.2	37.1	71.9	0.1	5.1	0.1	430.1		
1978	12.0	0.8	2.2	2.4	0.1	24.2	191.1	191.0	1.8	0.1	0.1	0.1	425.9		
1979	1.0	34.6	2.0	0.0	0.0	0.2	0.0	82.2	0.4	5.0	1.7	31.0	158.1		
1980	0.4	1.9	2.0	0.0	0.0	36.7	43.0	7.2	0.0	16.5	5.2	32.5	145.4		
1981	1.0	19.6	43.0	2.7	0.0	0.0	38.2	122.2	0.0	0.0	2.7	0.0	229.4		
1982	0.1	21.1	0.0	0.0	1.6	0.0	41.6	96.8	0.0	0.0	0.0	0.6	161.8		
1983	0.0	3.6	0.0	28.5	0.0	0.0	52.5	115.3	23.5	0.0	0.0	0.0	223.4		
1984	0.5	0.0	0.7	0.0	0.0	7.7	18.7	286.8	15.0	1.1	1.1	1.1	332.7		
1985	1.4	1.1	1.1	23.1	1.1	1.3	74.9	31.2	0.7	0.0	0.1	0.1	136.1		
1986	0.1	6.1	3.1	0.1	0.1	6.4	0.6	96.5	0.6	0.1	0.1	0.1	113.9		
1987	0.1	0.1	0.1	0.1	1.7	0.1	0.6	0.6	0.6	0.1	0.1	0.1	4.3		
1988	0.6	0.1	0.1	0.1	0.1	1.4	80.2	91.5	6.5	1.4	1.4	1.4	184.8		
MEAN	5.1	6.7	6.0	2.9	1.3	6.3	101.8	58.8	26.7	2.4	2.7	4.7	225.3		

Table B.2.12 MONTHLY RUNOFF

STATION: KHADEJI RIVER		Latitude = 25°03' Longitude = 67°25'											Unit: MCM
AT SUPER HIGHWAY BRIDGE		Catchment Area: 575Km2 (222mile2)											
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
1976	0.42	0.31	0.91	0.00	0.00	0.00	11.76	1.06	21.43	0.24	0.22	0.23	36.58
1977	0.29	0.26	0.20	0.15	0.12	13.58	7.59	1.97	7.27	0.55	0.48	0.42	32.87
1978	0.42	0.33	0.35	0.24	0.22	0.86	6.85	34.74	0.56	0.49	0.43	0.42	45.91
1979	0.42	0.38	0.42	0.40	0.29	0.20	0.23	0.51	0.24	0.14	0.13	0.13	3.49
1980	0.09	0.09	0.10	0.10	0.09	2.06	7.13	0.35	0.27	0.27	0.21	0.26	11.01
1981	0.25	0.25	0.41	0.11	0.10	0.09	2.77	57.65	0.42	0.29	0.24	0.25	62.83
1982	0.26	0.18	0.21	0.19	0.16	0.14	2.55	9.03	0.18	0.19	0.19	0.19	13.47
1983	0.18	0.16	0.17	0.82	0.14	0.24	6.55	9.03	0.37	0.30	0.26	0.21	18.43
1984	0.21	0.22	0.29	0.19	0.17	0.13	0.11	67.13	1.27	0.22	0.24	0.19	70.36
1985	0.27	0.24	0.25	3.99	0.23	0.11	11.30	0.19	0.12	0.10	0.08	0.10	16.97
1986	0.09	0.46	0.11	0.12	0.12	0.16	0.26	8.12	0.08	0.10	0.06	0.07	9.73
1987	0.09	0.06	0.06	0.08	0.08	0.07	0.03	0.00	0.00	0.02	0.02	0.01	0.53
MEAN	0.25	0.24	0.29	0.53	0.14	1.47	4.76	15.81	2.68	0.24	0.21	0.21	26.85

STATION: MALIR RIVER		Latitude = 25°02' Longitude = 67°24'											Unit: MCM
AT SUPER HIGHWAY BRIDGE		Catchment Area: 1205Km2 (465mile2)											
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1976	1.26	1.88	1.51	0.08	0.00	0.00	14.41	1.61	37.36	0.28	0.24	0.24	58.87
1977	0.22	0.15	0.08	0.04	0.00	98.36	34.44	2.12	28.77	0.52	0.49	0.31	165.52
1978	0.43	0.27	0.26	0.14	0.07	2.86	23.82	147.91	0.81	0.44	0.32	0.30	177.64
1979	0.27	0.25	0.13	0.05	0.09	0.08	0.08	4.82	0.08	0.04	0.01	0.00	5.91
1980	0.00	0.00	0.00	0.00	0.00	4.33	5.39	0.05	0.03	0.01	0.00	0.00	9.81
1981	0.00	0.02	0.06	0.00	0.00	0.00	3.22	55.75	0.28	0.24	0.21	0.21	59.99
1982	0.20	0.22	0.16	0.09	0.03	0.00	2.91	6.92	0.15	0.15	0.14	0.12	11.09
1983	0.11	0.07	0.05	0.57	0.00	0.00	7.14	18.58	0.45	0.11	0.09	0.06	27.23
1984	0.06	0.02	0.00	0.00	0.00	0.00	0.00	150.95	3.04	0.00	0.00	0.00	154.07
1985	0.00	0.00	0.00	2.34	0.00	0.00	0.00	18.66	0.05	0.00	0.00	0.00	21.05
1986	0.00	0.01	0.00	0.00	0.00	0.00	0.00	22.53	0.00	0.00	0.00	0.00	22.54
1987	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MEAN	0.21	0.24	0.19	0.28	0.02	8.80	9.17	34.27	5.91	0.15	0.12	0.10	59.48

STATION: LAYARI NAI RIVER		Latitude = 24°56' Longitude = 67°06'											Unit: MCM
AT SUPER HIGHWAY BRIDGE		Catchment Area: 207Km2 (80mile2)											
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1979	0.00	2.60	0.00	0.00	0.00	0.00	0.00	8.65	0.00	0.00	0.00	0.98	12.23
1980	0.44	0.00	0.00	0.00	0.00	2.94	4.17	0.00	0.00	0.99	0.12	2.88	11.53
1981	0.00	0.34	4.91	0.00	0.00	0.00	0.54	0.17	0.00	0.00	0.00	0.00	5.95
1982	0.00	0.00	0.00	0.00	0.00	0.00	1.25	12.59	0.00	0.00	0.00	0.00	13.84
1983	0.00	0.00	0.00	0.23	0.00	0.00	2.23	4.65	0.00	0.00	0.00	0.00	7.11
1984	0.00	0.11	0.00	0.00	0.00	0.00	0.00	32.09	0.00	0.00	*	*	*
MEAN	0.07	0.51	0.82	0.04	0.00	0.49	1.36	9.69	0.00	0.16	0.02	0.77	13.94

STATION: LAYARI NAI RIVER		Latitude = 24°25' Longitude = 67°11'											Unit: MCM
AT SUPER HIGHWAY BRIDGE		Catchment Area: 1985 Km2 (766mile2)											
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1978	*	*	*	*	*	0.00	14.49	141.84	0.00	0.00	0.00	0.00	*
1979	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.52	0.00	0.00	0.00	0.00	0.52
1980	0.00	0.00	0.00	0.00	0.00	0.00	0.45	0.00	0.00	0.00	0.00	0.00	0.45
1981	0.00	0.00	0.00	0.00	0.00	0.00	0.00	32.92	0.00	0.00	0.00	0.00	32.92
1982	0.00	0.00	0.00	0.00	0.00	0.00	8.72	38.76	0.00	0.00	0.00	0.00	47.48
1983	0.00	0.00	0.00	0.00	0.00	0.00	10.54	5.61	0.00	0.00	0.00	0.00	16.16
1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	141.09	0.00	0.00	*	*	*
MEAN	0.00	0.00	0.00	0.00	0.00	0.00	4.89	51.53	0.00	0.00	0.00	0.00	56.42

STATION: KANKAR NAI RIVER		Latitude = 24°58' Longitude = 67°16'											Unit: MCM
AT SUPER HIGHWAY BRIDGE		Catchment Area: 275Km2 (106mile2)											
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1978	*	*	*	*	*	*	6.37	31.48	0.00	0.00	0.00	0.00	*
1979	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.15
MEAN	0.00	0.10	0.00	0.00	0.00	0.00	3.19	15.77	0.00	0.00	0.00	0.00	19.05

Table B.2.13 MONTHLY SPECIFIC RUNOFF

STATION: KHADEJI RIVER		Latitude = 25°03'		Longitude = 67°25'		Catchment Area : 575 Km ² (222mile ²)		Unit: MCM/100 km ²					
AT SUPER HIGHWAY BRIDGE													
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1976	7.26	5.43	15.83	0.00	0.00	0.00	204.47	18.47	372.77	4.22	3.83	3.96	6.36
1977	5.01	4.53	3.43	2.68	2.11	236.17	131.92	34.30	126.39	9.50	8.43	7.26	5.72
1978	7.31	5.68	6.00	4.20	3.79	14.94	119.12	604.18	9.70	8.59	7.49	7.39	7.98
1979	7.39	6.67	7.39	6.89	5.01	3.45	3.96	8.84	4.21	2.37	2.30	2.24	0.61
1980	1.61	1.51	1.68	1.69	1.61	35.75	124.00	6.12	4.69	4.66	3.68	4.54	1.92
1981	4.29	4.34	7.10	1.95	1.78	1.63	48.15	1002.57	7.29	5.01	4.21	4.31	10.93
1982	4.59	3.11	3.68	3.29	2.70	2.40	44.32	156.98	3.20	3.35	3.29	3.26	2.34
1983	3.17	2.73	3.02	14.30	2.35	4.24	113.84	156.98	6.50	5.18	4.53	3.68	3.21
1984	3.71	3.84	4.97	3.24	2.99	2.25	1.87	1167.47	22.09	3.77	4.11	3.39	12.24
1985	4.76	4.25	4.26	69.32	3.93	1.86	196.56	3.31	2.07	1.77	1.34	1.66	2.95
1986	1.50	7.94	1.89	2.02	2.04	2.72	4.51	141.15	1.31	1.82	1.01	1.23	1.69
1987	1.61	0.99	1.07	1.38	1.48	1.22	0.51	0.04	0.00	0.34	0.39	0.24	0.09
MEAN	4.35	4.25	5.03	9.25	2.48	25.55	82.77	275.03	46.68	4.22	3.72	3.60	4.67

STATION: MALIR RIVER		Latitude = 25°02'		Longitude = 67°24'		Catchment Area : 1205 Km ² (465mile ²)		Unit: MCM/100 km ²					
AT SUPER HIGHWAY BRIDGE													
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1976	10.45	15.61	12.53	0.63	0.00	0.00	119.60	13.34	310.07	2.32	2.01	1.99	4.89
1977	1.83	1.25	0.69	0.37	0.00	816.29	285.78	17.63	238.80	4.34	4.08	2.58	13.74
1978	3.59	2.27	2.14	1.16	0.59	23.76	197.66	1227.49	6.70	3.65	2.68	2.52	14.74
1979	2.27	2.12	1.06	0.44	0.74	0.69	0.67	40.03	0.65	0.34	0.05	0.00	0.49
1980	0.00	0.00	0.00	0.00	0.00	35.94	44.69	0.38	0.22	0.08	0.03	0.03	0.81
1981	0.02	0.17	0.49	0.00	0.00	0.00	26.69	462.67	2.32	2.01	1.71	1.76	4.98
1982	1.67	1.82	1.33	0.78	0.27	0.00	24.11	57.41	1.22	1.23	1.13	1.03	0.92
1983	0.93	0.61	0.38	4.69	0.00	0.00	59.23	154.22	3.75	0.94	0.73	0.52	2.26
1984	0.52	0.19	0.00	0.00	0.00	0.00	0.00	1252.66	25.22	0.00	0.00	0.00	12.79
1985	0.00	0.00	0.00	19.43	0.00	0.00	154.85	0.43	0.00	0.00	0.00	0.00	1.75
1986	0.00	0.11	0.00	0.00	0.00	0.00	0.00	186.96	0.00	0.00	0.00	0.00	1.87
1987	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MEAN	1.77	2.01	1.55	2.29	0.13	73.06	76.11	284.43	49.08	1.24	1.04	0.87	4.94

STATION: NAI RIVER		Latitude = 24°56'		Longitude = 67°06'		Catchment Area : 207 Km ² (80mile ²)		Unit: MCM/100 km ²					
AT SUPER HIGHWAY BRIDGE													
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1979	0.00	125.77	0.00	0.00	0.00	0.00	0.00	417.74	0.00	0.00	0.00	47.27	5.91
1980	21.25	0.00	0.00	0.00	0.00	141.85	201.54	0.00	0.00	47.64	5.67	139.25	5.57
1981	0.00	16.55	237.08	0.00	0.00	0.00	25.87	8.17	0.00	0.00	0.00	0.00	2.88
1982	0.00	0.00	0.00	0.00	0.00	0.00	60.46	608.28	0.00	0.00	0.00	0.00	6.69
1983	0.00	0.00	0.00	11.13	0.00	0.00	107.73	224.63	0.00	0.00	0.00	0.00	3.43
1984	0.00	5.38	0.00	0.00	0.00	0.00	0.00	1550.03	0.00	0.00	*	*	*
MEAN	3.54	24.62	39.51	1.86	0.00	23.64	65.93	468.14	0.00	7.94	1.13	37.30	4.90

STATION: MALIR RIVER		Latitude = 24°25'		Longitude = 67°11'		Catchment Area : 1985 Km ² (766mile ²)		Unit: MCM/100 km ²					
AT SUPER HIGHWAY BRIDGE													
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1978	*	*	*	*	*	0.00	72.99	714.58	0.00	0.00	0.00	0.00	*
1979	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.63	0.00	0.00	0.00	0.00	0.03
1980	0.00	0.00	0.00	0.00	0.00	0.00	2.27	0.00	0.00	0.00	0.00	0.00	0.02
1981	0.00	0.00	0.00	0.00	0.00	0.00	0.00	165.84	0.00	0.00	0.00	0.00	1.66
1982	0.00	0.00	0.00	0.00	0.00	0.00	43.94	195.27	0.00	0.00	0.00	0.00	2.39
1983	0.00	0.00	0.00	0.00	0.00	0.00	53.12	28.28	0.00	0.00	0.00	0.00	0.81
1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	710.76	0.00	0.00	*	*	*
MEAN	0.00	0.00	0.00	0.00	0.00	0.00	24.62	259.62	0.00	0.00	0.00	0.00	0.98

STATION: KANKAR NAI RIVER		Latitude = 24°58'		Longitude = 67°16'		Catchment Area : 275 Km ² (106mile ²)		Unit: MCM/100 km ²					
AT SUPER HIGHWAY BRIDGE													
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1978	*	*	*	*	*	*	231.69	1144.68	0.00	0.00	0.00	0.00	*
1979	0.00	3.59	0.00	0.00	0.00	0.00	0.00	1.93	0.00	0.00	0.00	0.00	0.06
MEAN	0.00	3.59	0.00	0.00	0.00	0.00	115.85	573.31	0.00	0.00	0.00	0.00	0.06

Table B.2.14 MONTHLY DISCHARGE CORRELATION CO-EFFICIENT

(MONSOON JULY TO SEP.)

	Khadeji River	Malir Super Highway	Liyali River	Malir National Highway
1 Khadeji River		0.9249	0.6660	0.8526
2 Malir Super Highway	0.9249		0.8458	0.9580
3 Liyali River	0.6660	0.8458		0.9226
4 Malir National Highway	0.8526	0.9580	0.9226	

(WINTER & SPRING JAN TO JUNE & OCT TO DEC)

	Khadeji River	Malir Super Highway	Liyali River	Malir National Highway
1 Khadeji River		0.9439	0.4662	*
2 Malir Super Highway	0.9439		0.3906	*
3 Liyali River	0.4662	0.3906		*
4 Malir National Highway	*	*	*	

Table B.2.15 OBSERVED MONTHLY RUNOFF CO-EFFICIENTS (1/2)

STATION: KHADEJI RIVER

AT SUPER HIGHWAY BRIDGE

Latitude = 25°03' Longitude = 67°25'

Catchment Area : 575 km² (222mile²)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1976 R	36.9	9.7	20.1	0.1	0.0	0.0	91.9	25.3	91.2	0.0	0.2	0.0	275.4
1976 Q	0.7	0.5	1.6	0.0	0.0	0.0	20.4	1.8	37.3	0.4	0.4	0.4	63.6
1976 F	2.0	5.6	7.9	0.0	*	*	22.2	7.3	40.9	*	191.5	*	23.1
1977 R	4.2	0.1	0.0	0.5	0.1	92.1	225.4	48.6	70.4	0.0	3.6	0.0	445.0
1977 Q	0.5	0.5	0.3	0.3	0.2	23.6	13.2	3.4	12.6	0.9	0.8	0.7	57.2
1977 F	11.9	452.8	*	53.6	211.1	25.6	5.9	7.1	18.0	*	23.4	*	12.8
1978 R	11.6	0.3	4.8	0.3	0.0	30.7	190.6	170.7	0.5	0.0	0.0	0.0	409.5
1978 Q	0.7	0.6	0.6	0.4	0.4	1.5	11.9	60.4	1.0	0.9	0.7	0.7	79.8
1978 F	6.3	189.4	12.5	140.0	*	4.9	6.2	35.4	194.0	*	*	*	19.5
1979 R	0.5	25.0	4.6	0.0	0.0	0.0	0.0	48.1	0.9	2.6	1.0	32.2	114.9
1979 Q	0.7	0.7	0.7	0.7	0.5	0.3	0.4	0.9	0.4	0.2	0.2	0.2	6.1
1979 F	147.7	2.7	16.1	*	*	*	*	1.8	46.8	9.1	23.0	0.7	5.3
1980 R	0.0	1.5	0.2	0.0	0.0	32.5	49.1	10.6	0.0	11.1	1.4	25.8	132.2
1980 Q	0.2	0.2	0.2	0.2	0.2	3.6	12.4	0.6	0.5	0.5	0.4	0.5	19.2
1980 F	*	10.0	83.8	*	*	11.0	25.3	5.8	*	4.2	26.3	1.8	14.5
1981 R	0.1	6.2	37.4	1.9	0.0	0.0	34.7	150.8	0.0	0.0	0.2	0.0	231.3
1981 Q	0.4	0.4	0.7	0.2	0.2	0.2	4.8	100.3	0.7	0.5	0.4	0.4	109.3
1981 F	428.7	7.0	1.9	10.3	*	*	13.9	66.5	*	*	*	*	47.2
1982 R	0.0	22.8	0.0	0.0	0.1	0.0	27.8	80.3	0.0	0.0	0.0	0.0	131.0
1982 Q	0.5	0.3	0.4	0.3	0.3	0.2	4.4	15.7	0.3	0.3	0.3	0.3	23.4
1982 F	*	1.4	*	*	270.4	*	15.9	19.5	*	*	*	*	17.9
1983 R	0.0	4.6	0.0	40.2	0.0	0.0	45.6	127.8	22.8	0.0	0.0	0.0	241.0
1983 Q	0.5	0.3	0.4	0.3	0.3	0.2	4.4	15.7	0.3	0.3	0.3	0.3	23.4
1983 F	*	6.8	*	0.8	*	*	9.7	12.3	1.4	*	*	*	9.7
1984 R	0.4	0.0	0.1	0.0	0.0	17.2	20.6	256.1	32.0	1.2	1.2	1.2	330.0
1984 Q	0.4	0.4	0.5	0.3	0.3	0.2	0.2	116.7	2.2	0.4	0.4	0.3	122.4
1984 F	92.7	*	497.3	*	*	1.3	0.9	45.6	6.9	31.4	34.3	28.3	37.1
1985 R	1.4	1.2	1.2	19.9	1.2	1.4	83.5	26.3	0.4	0.0	0.0	0.0	136.5
1985 Q	0.5	0.4	0.4	6.9	0.4	0.2	19.7	0.3	0.2	0.2	0.1	0.2	29.5
1985 F	34.0	35.4	35.5	34.8	32.8	13.3	23.5	1.3	51.7	*	*	*	21.6
1986 R	0.0	6.4	1.7	0.0	0.0	10.2	0.4	92.1	0.4	0.0	0.0	0.0	111.2
1986 Q	0.2	0.8	0.2	0.2	0.2	0.3	0.5	14.1	0.1	0.2	0.1	0.1	16.9
1986 F	*	12.4	11.1	*	*	2.7	112.8	15.3	32.9	*	*	*	15.2
1987 R	0.0	0.0	0.0	0.0	1.3	0.0	0.4	0.4	0.4	0.0	0.0	0.0	2.5
1987 Q	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.9
1987 F	*	*	*	*	11.4	*	12.7	1.0	0.0	*	*	*	37.0
MEAN R	4.6	6.5	5.8	5.2	0.2	15.3	64.2	86.4	18.3	1.2	0.6	4.9	213.4
MEAN Q	0.4	0.4	0.5	0.8	0.3	2.5	7.7	27.5	4.6	0.4	0.4	0.4	46.0
MEAN F	9.7	6.6	8.7	15.9	111.7	16.6	12.0	31.8	25.4	32.7	57.1	7.2	21.5

Remarks: R is Rainfall (mm). Q is Runoff (mm). F is Runoff Coefficients (%).

Table B.2.15 OBSERVED MONTHLY RUNOFF CO-EFFICIENTS (2/2)

STATION: MALIR RIVER		Latitude = 25°02' Longitude = 67°24'												
AT SUPER HIGHWAY BRIDGE		Catchment Area: 1205 km ² (465mile ²)												
YEAR		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1976	R	32.4	21.1	31.0	1.2	0.0	0.0	84.6	30.3	103.1	0.0	0.2	0.0	303.9
1976	Q	1.0	1.6	1.3	0.1	0.0	0.0	12.0	1.3	31.0	0.2	0.2	0.2	48.9
1976	F	3.2	7.4	4.0	5.3	*	*	14.1	4.4	30.1	*	100.5	*	16.1
1977	R	11.3	0.0	0.0	1.5	0.8	97.8	192.3	33.1	56.2	0.0	2.8	0.0	395.8
1977	Q	0.2	0.1	0.1	0.0	0.0	23.5	28.6	1.8	23.9	0.4	0.4	0.3	79.2
1977	F	1.6	*	*	2.4	0.0	24.0	14.9	5.3	42.5	*	14.6	*	20.0
1978	R	8.4	0.2	3.2	3.5	0.0	25.8	205.3	202.6	1.8	0.0	0.0	0.0	450.8
1978	Q	0.4	0.2	0.2	0.1	0.1	2.4	19.8	122.7	0.7	0.4	0.3	0.3	147.4
1978	F	4.3	113.7	6.7	3.3	*	9.2	9.6	60.6	37.2	*	*	*	32.7
1979	R	0.3	24.8	3.0	0.0	0.0	0.0	0.0	69.4	0.6	6.3	1.4	33.3	139.1
1979	Q	0.2	0.2	0.1	0.0	0.1	0.1	0.1	4.0	0.1	0.0	0.0	0.0	4.9
1979	F	75.5	0.9	3.5	*	*	*	*	5.8	10.9	0.5	0.4	0.0	3.5
1980	R	0.7	1.2	1.4	0.0	0.0	34.2	38.6	10.7	0.0	14.8	5.9	28.5	136.0
1980	Q	0.0	0.0	0.0	0.0	0.0	3.6	4.5	0.0	0.0	0.0	0.0	0.0	8.1
1980	F	0.0	0.0	0.0	*	*	10.5	11.6	0.4	*	0.1	0.1	0.0	6.0
1981	R	1.5	20.5	37.4	1.5	0.0	0.0	39.7	117.9	0.0	0.0	4.0	0.0	222.5
1981	Q	0.0	0.0	0.0	0.0	0.0	0.0	2.7	46.3	0.2	0.2	0.2	0.2	49.8
1981	F	0.2	0.1	0.1	0.0	*	*	6.7	39.2	*	*	4.3	*	22.4
1982	R	0.0	19.2	0.0	0.0	2.3	0.0	28.9	71.0	0.0	0.0	0.0	0.8	122.2
1982	Q	0.2	0.2	0.1	0.1	0.0	0.0	2.4	5.7	0.1	0.1	0.1	0.1	9.2
1982	F	*	0.9	*	*	1.2	*	8.3	8.1	*	*	*	12.8	7.5
1983	R	0.0	3.8	0.0	30.8	0.0	0.0	33.1	114.1	25.7	0.0	0.0	0.0	207.5
1983	Q	0.1	0.1	0.0	0.5	0.0	0.0	5.9	15.4	0.4	0.1	0.1	0.1	22.6
1983	F	*	1.6	*	1.5	*	*	17.9	13.5	1.5	*	*	*	10.9
1984	R	0.3	0.0	1.0	0.0	0.0	11.5	22.6	299.2	21.7	1.6	1.6	1.6	361.1
1984	Q	0.1	0.0	0.0	0.0	0.0	0.0	0.0	125.3	2.5	0.0	0.0	0.0	127.9
1984	F	17.2	*	0.0	*	*	0.0	0.0	41.9	11.6	0.0	0.0	0.0	35.4
1985	R	1.9	1.6	1.6	21.0	1.6	1.7	78.9	23.3	0.2	0.0	0.0	0.0	131.8
1985	Q	0.0	0.0	0.0	1.9	0.0	0.0	15.5	0.0	0.0	0.0	0.0	0.0	17.5
1985	F	0.0	0.0	0.0	9.3	0.0	0.0	19.6	0.2	0.0	*	*	*	13.3
1986	R	0.0	7.2	1.2	0.0	0.0	6.7	0.2	103.4	0.2	0.0	0.0	0.0	118.9
1986	Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.7	0.0	0.0	0.0	0.0	18.7
1986	F	*	0.2	0.0	*	*	0.0	0.0	18.1	0.0	*	*	*	15.7
1987	R	0.0	0.0	0.0	0.0	1.0	0.0	0.2	0.2	0.2	0.0	0.0	0.0	1.6
1987	Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	F	*	*	*	*	0.0	*	0.0	0.0	0.0	*	*	*	0.0
MEAN	R	4.7	8.3	6.7	5.0	0.5	14.8	60.4	89.6	17.5	1.9	1.3	5.3	215.9
MEAN	Q	0.2	0.2	0.2	0.2	0.0	2.5	7.6	28.4	4.9	0.1	0.1	0.1	44.5
MEAN	F	3.7	2.4	2.3	4.6	2.8	16.6	12.6	31.7	28.1	6.6	7.8	1.6	20.6

Remarks: R is Rainfall (mm). Q is Runoff (mm). F is Runoff Coefficients (%).

STATION: MALIR RIVER		Latitude = 24°25' Longitude = 67°11'												
AT SUPER HIGHWAY BRIDGE		Catchment Area: 1985 km ² (766mile ²)												
YEAR		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1979	R	1.0	34.6	2.0	0.0	0.0	0.2	0.0	82.2	0.4	5.0	1.7	31.0	158.1
1979	Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.9
1979	F	0.0	0.0	0.0	*	*	0.0	*	1.1	0.0	0.0	0.0	0.0	0.6
1980	R	0.4	1.9	2.0	0.0	0.0	36.7	43.0	7.2	0.0	16.5	5.2	32.5	145.4
1980	Q	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.8
1980	F	0.0	0.0	0.0	*	*	0.0	1.8	0.0	*	0.0	0.0	0.0	0.5
1981	R	1.0	19.6	43.0	2.7	0.0	0.0	38.2	122.2	0.0	0.0	2.7	0.0	229.4
1981	Q	0.0	0.0	0.0	0.0	0.0	0.0	0.0	57.3	0.0	0.0	0.0	0.0	57.3
1981	F	0.0	0.0	0.0	0.0	*	*	0.0	46.9	*	*	0.0	*	25.0
1982	R	0.1	21.1	0.0	0.0	1.6	0.0	41.6	96.8	0.0	0.0	0.0	0.6	161.8
1982	Q	0.0	0.0	0.0	0.0	0.0	0.0	15.2	67.4	0.0	0.0	0.0	0.0	82.6
1982	F	0.0	0.0	*	*	0.0	*	36.5	69.6	*	*	*	0.0	51.0
1983	R	0.0	3.6	0.0	28.5	0.0	0.0	52.5	115.3	23.5	0.0	0.0	0.0	223.4
1983	Q	0.0	0.0	0.0	0.0	0.0	0.0	18.3	9.8	0.0	0.0	0.0	0.0	28.1
1983	F	*	0.0	*	0.0	*	*	34.9	8.5	0.0	*	*	*	12.6
MEAN	R	0.5	16.2	9.4	6.2	0.3	7.4	35.1	84.7	4.8	4.3	1.9	12.8	183.6
MEAN	Q	0.0	0.0	0.0	0.0	0.0	0.0	6.9	27.1	0.0	0.0	0.0	0.0	33.9
MEAN	F	0.0	0.0	0.0	0.0	0.0	0.0	19.6	31.9	0.0	0.0	0.0	0.0	18.5

Remarks: R is Rainfall (mm). Q is Runoff (mm). F is Runoff Coefficients (%).

Table B.3.1 CALCULATED MONTHLY TOTAL RUNOFF (1/5)

STATION: KHADEJI DAMSITE													Latitude = 25°03' Longitude = 67°25'	
Catchment Area : 567Km ² (219mile ²)													Unit: MCM	
YBAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	
1929	0.19	0.18	0.17	0.16	0.16	0.15	3.85	0.16	0.16	0.15	0.14	0.14	5.60	
1930	0.13	0.12	0.12	0.11	0.10	0.38	98.34	3.54	0.37	0.35	0.34	0.32	104.23	
1931	0.31	0.29	0.29	0.27	0.26	0.24	0.23	0.22	0.22	0.21	0.20	0.19	2.93	
1932	0.18	0.17	0.16	0.16	0.15	0.14	78.35	3.84	0.49	0.38	0.36	0.35	84.73	
1933	0.33	0.32	0.30	0.29	0.28	0.26	120.02	11.72	3.78	0.76	0.73	0.70	139.48	
1934	0.67	0.64	0.61	0.59	0.56	0.54	27.35	1.95	0.61	0.58	0.56	0.54	35.21	
1935	0.51	0.49	0.48	0.46	0.44	0.41	0.41	0.39	0.37	0.35	0.35	0.33	4.99	
1936	0.31	0.30	0.29	0.28	0.26	0.25	5.99	0.26	0.25	0.23	0.22	0.22	8.86	
1937	0.21	0.20	0.19	0.18	0.17	0.16	44.14	2.00	0.31	0.29	0.28	0.27	48.91	
1938	0.27	0.25	0.24	0.23	0.22	0.21	2.24	5.85	0.22	0.22	0.21	0.20	10.35	
1939	0.18	0.41	0.51	0.17	0.16	0.16	0.16	0.15	0.15	0.14	0.13	0.12	2.44	
1940	0.67	0.13	0.28	0.12	0.11	0.11	3.78	4.02	0.14	0.13	0.12	0.12	9.74	
1941	0.11	0.10	0.10	0.10	0.09	0.09	2.56	0.10	0.10	0.09	0.08	0.08	3.58	
1942	0.08	0.08	0.07	0.07	0.06	0.06	64.50	2.93	0.27	0.25	0.24	0.23	68.83	
1943	0.22	0.21	0.20	0.19	0.18	0.17	3.44	0.18	0.17	0.16	0.16	0.15	5.43	
1944	0.14	0.31	0.14	0.13	0.12	0.11	76.69	99.50	6.56	1.44	0.82	0.79	186.74	
1945	0.99	0.73	0.70	0.67	0.64	0.61	12.25	0.61	0.59	0.56	0.54	0.52	19.41	
1946	0.49	0.47	0.45	0.43	0.41	0.39	4.42	2.34	0.38	0.36	0.35	0.33	10.81	
1947	0.32	0.30	0.29	0.28	0.26	0.25	0.24	3.02	0.24	0.22	0.22	0.21	5.84	
1948	0.20	0.19	0.19	0.18	0.17	0.24	1.18	0.17	0.16	0.16	0.15	0.14	3.13	
1949	0.13	0.13	0.12	0.11	0.10	0.10	16.49	35.94	3.39	0.41	0.39	0.37	57.69	
1950	0.35	0.34	0.32	0.31	0.29	0.28	7.01	0.29	0.28	0.26	0.25	0.23	10.20	
1951	0.22	0.22	0.21	0.20	0.18	0.17	1.87	1.04	0.18	0.17	0.16	0.16	4.79	
1952	0.15	0.17	0.14	0.13	0.12	0.12	25.24	1.42	0.74	0.23	0.22	0.21	28.88	
1953	0.20	0.19	0.18	0.17	0.16	0.23	0.16	45.60	2.82	0.32	0.30	0.29	50.63	
1954	0.29	0.28	0.26	0.25	0.23	0.22	4.26	1.13	21.19	1.62	0.34	0.32	30.40	
1955	0.31	0.29	0.29	0.27	0.26	0.24	0.23	0.98	10.35	0.25	0.24	0.23	13.95	
1956	0.22	0.22	0.20	0.19	0.18	0.28	24.10	10.69	1.05	1.98	0.39	0.37	39.86	
1957	0.35	0.35	0.33	0.31	0.29	0.29	0.48	0.27	0.26	0.25	0.23	0.22	3.63	
1958	0.22	0.21	0.20	0.19	0.17	0.16	15.50	0.86	1.05	0.25	0.23	0.48	19.54	
1959	0.22	0.22	0.20	0.19	0.18	0.17	55.65	5.25	89.10	3.96	1.49	0.65	157.27	
1960	0.62	0.60	0.58	0.55	0.53	0.50	2.75	1.14	0.47	0.45	0.43	0.41	9.03	
1961	0.40	0.67	0.37	0.35	0.34	0.33	28.53	37.31	31.60	4.84	0.91	0.87	106.51	
1962	0.83	0.79	0.76	0.73	0.70	0.67	8.52	2.76	20.87	1.99	0.70	0.67	39.98	
1963	0.65	0.61	0.59	0.56	0.54	0.52	0.49	0.49	0.46	0.44	0.42	0.41	6.18	
1964	0.39	0.37	0.35	0.34	0.32	0.31	7.53	3.37	0.32	0.30	0.29	0.28	14.18	
1965	0.27	0.25	0.24	0.23	0.22	0.21	12.01	0.56	0.24	0.23	0.22	0.21	14.89	
1966	0.20	0.19	0.18	0.17	0.16	0.16	6.08	0.16	0.16	0.16	0.15	0.14	7.91	
1967	0.13	0.12	3.89	0.14	0.13	0.12	134.97	15.28	3.85	0.70	0.67	0.64	160.63	
1968	0.61	0.59	0.56	0.54	0.52	0.49	0.48	0.46	0.44	0.41	0.40	0.38	5.88	
1969	0.36	0.35	0.34	0.32	0.30	0.29	1.75	0.29	0.27	0.26	0.24	0.23	4.99	
1970	0.22	0.22	0.65	0.21	0.19	0.18	21.74	24.51	12.11	1.81	0.63	0.60	63.07	
1971	0.58	0.55	0.53	0.50	0.48	0.46	1.30	1.18	0.43	0.41	0.40	0.38	7.21	
1972	0.36	0.35	0.33	0.31	0.29	0.29	0.45	0.27	0.26	0.25	0.23	0.22	3.61	
1973	0.22	0.21	0.20	0.18	0.17	0.16	35.23	2.27	0.30	0.29	0.28	0.27	39.78	
1974	0.25	0.24	0.22	0.22	0.21	0.20	0.19	0.18	0.17	0.16	0.16	0.15	2.35	
1975	0.15	0.14	0.14	0.13	0.12	0.12	0.11	7.33	0.43	0.14	0.13	0.12	9.05	
1976	0.91	0.12	0.21	0.12	0.11	0.10	9.15	0.43	9.07	0.16	0.15	0.14	20.67	
1977	0.13	0.13	0.12	0.11	0.10	9.18	53.34	4.72	6.20	0.36	0.35	0.33	75.08	
1978	0.32	0.30	0.29	0.28	0.26	0.78	38.54	31.88	3.77	0.60	0.57	0.54	78.13	
1979	0.52	0.79	0.48	0.47	0.44	0.42	0.41	2.57	0.39	0.37	0.35	0.32	8.15	
1980	0.33	0.32	0.30	0.29	0.27	0.86	2.61	0.27	0.26	0.25	0.23	0.55	6.54	
1981	0.22	0.22	1.02	0.21	0.20	0.19	0.87	21.40	2.00	0.29	0.29	0.27	27.17	
1982	0.26	0.45	0.24	0.22	0.22	0.21	0.60	7.43	0.22	0.21	0.19	0.18	10.43	
1983	0.17	0.16	0.16	1.11	0.16	0.15	1.94	14.83	1.84	0.25	0.24	0.22	21.23	
1984	0.22	0.21	0.19	0.18	0.17	0.20	0.28	66.54	4.22	0.40	0.38	0.36	73.34	
1985	0.35	0.33	0.31	0.38	0.29	0.28	8.00	0.63	0.28	0.27	0.25	0.24	11.60	
1986	0.22	0.22	0.21	0.20	0.19	0.18	0.17	9.25	0.20	0.19	0.18	0.17	11.39	
1987	0.16	0.16	0.15	0.14	0.13	0.12	0.11	0.10	0.10	0.10	0.09	0.09	1.44	
1988	0.08	0.07	0.07	0.06	0.06	0.05	6.83	8.50	0.10	0.10	0.10	0.09	16.11	
MEAN	0.32	0.30	0.36	0.28	0.25	0.42	18.10	8.54	4.12	0.55	0.33	0.33	33.91	
	July - Sep. : 30.76			Oct. - June : 3.15										
1976-1987														
MEAN	0.32	0.28	0.31	0.31	0.21	1.06	9.67	13.34	2.38	0.29	0.27	0.34	28.76	
	July - Sep. : 25.39			Oct. - June : 3.38										

Table B.3.1 CALCULATED MONTHLY TOTAL RUNOFF (2/5)

STATION: MOL DAMSITE													Unit: MCM	
Catchment Area: 596Km ² (230mile ²)														
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	
1929	0.26	0.25	0.24	0.22	0.22	0.21	4.18	0.21	0.20	0.19	0.19	0.18	6.55	
1930	0.17	0.16	0.16	0.15	0.14	0.45	134.01	4.52	0.48	0.46	0.43	0.41	141.53	
1931	0.40	0.38	0.36	0.35	0.33	0.32	0.30	0.29	0.28	0.26	0.25	0.24	3.76	
1932	0.23	0.22	0.21	0.20	0.19	0.18	107.81	4.57	0.74	0.50	0.48	0.46	115.78	
1933	0.43	0.41	0.40	0.38	0.36	0.35	162.33	14.45	4.92	1.30	0.99	0.95	187.27	
1934	0.91	0.87	0.83	0.79	0.76	0.75	41.00	2.38	0.81	0.78	0.74	0.71	51.34	
1935	0.68	0.66	0.63	0.61	0.59	0.56	0.54	0.51	0.49	0.47	0.45	0.43	6.62	
1936	0.41	0.40	0.38	0.36	0.35	0.33	7.00	0.33	0.32	0.30	0.29	0.28	10.73	
1937	0.26	0.26	0.24	0.23	0.22	0.21	62.94	2.51	0.39	0.37	0.35	0.33	68.88	
1938	0.34	0.32	0.30	0.29	0.28	0.27	2.06	6.78	0.28	0.27	0.25	0.24	11.68	
1939	0.23	0.49	0.59	0.22	0.21	0.20	0.19	0.18	0.17	0.16	0.16	0.15	2.95	
1940	0.74	0.16	0.34	0.15	0.14	0.13	4.06	4.37	0.16	0.15	0.14	0.14	10.66	
1941	0.13	0.12	0.11	0.11	0.10	0.10	2.45	0.10	0.10	0.10	0.09	0.09	3.59	
1942	0.09	0.09	0.08	0.08	0.07	0.07	89.58	3.46	0.32	0.31	0.29	0.29	94.71	
1943	0.27	0.26	0.25	0.23	0.22	0.22	3.63	0.22	0.21	0.20	0.19	0.18	6.07	
1944	0.17	0.37	0.16	0.16	0.15	0.14	105.55	135.39	8.23	2.12	1.08	1.04	254.56	
1945	1.27	0.96	0.92	0.88	0.84	0.80	15.20	0.98	0.79	0.76	0.73	0.70	24.83	
1946	0.67	0.64	0.61	0.59	0.56	0.54	4.94	2.23	0.51	0.48	0.47	0.44	12.67	
1947	0.42	0.41	0.39	0.37	0.35	0.34	0.32	3.09	0.31	0.30	0.29	0.28	6.87	
1948	0.26	0.25	0.25	0.23	0.22	0.31	1.05	0.22	0.21	0.20	0.19	0.18	3.57	
1949	0.17	0.16	0.16	0.15	0.14	0.13	26.31	52.22	4.12	0.50	0.48	0.46	85.00	
1950	0.44	0.42	0.41	0.39	0.37	0.35	8.30	0.35	0.34	0.32	0.31	0.29	12.30	
1951	0.28	0.27	0.25	0.24	0.23	0.22	1.58	0.94	0.22	0.21	0.20	0.19	4.83	
1952	0.18	0.22	0.17	0.16	0.16	0.15	38.13	1.74	0.55	0.28	0.27	0.25	42.25	
1953	0.24	0.23	0.22	0.21	0.20	0.28	0.19	64.81	3.37	0.39	0.37	0.35	70.86	
1954	0.35	0.34	0.32	0.30	0.29	0.28	4.69	1.05	32.86	2.06	0.41	0.39	43.34	
1955	0.37	0.35	0.35	0.33	0.31	0.29	0.29	0.86	12.66	0.46	0.32	0.31	16.89	
1956	0.30	0.29	0.27	0.26	0.25	0.37	36.74	13.10	1.71	2.24	0.50	0.48	56.50	
1957	0.46	0.44	0.41	0.40	0.38	0.36	0.35	0.34	0.32	0.31	0.29	0.29	4.35	
1958	0.27	0.26	0.25	0.23	0.22	0.22	22.56	1.34	0.97	0.31	0.29	0.28	27.50	
1959	0.28	0.27	0.25	0.24	0.23	0.22	78.00	5.95	121.97	5.24	1.76	0.86	215.27	
1960	0.82	0.79	0.77	0.73	0.69	0.67	2.74	1.10	0.60	0.58	0.55	0.54	10.57	
1961	0.52	0.82	0.48	0.47	0.44	0.42	42.46	53.90	46.23	6.06	1.31	1.13	154.24	
1962	1.08	1.04	0.99	0.95	0.91	0.87	10.28	2.75	32.41	2.55	0.90	0.86	55.59	
1963	0.83	0.79	0.76	0.73	0.69	0.67	0.64	0.61	0.58	0.56	0.54	0.52	7.91	
1964	0.49	0.48	0.45	0.43	0.41	0.40	8.99	3.53	0.40	0.38	0.36	0.35	16.66	
1965	0.33	0.32	0.30	0.29	0.28	0.26	14.86	0.78	0.33	0.31	0.29	0.29	18.63	
1966	0.27	0.26	0.24	0.23	0.22	0.21	7.12	0.22	0.21	0.20	0.19	0.18	9.56	
1967	0.17	0.16	4.16	0.17	0.16	0.16	181.98	19.11	5.38	1.03	0.89	0.86	214.25	
1968	0.82	0.79	0.75	0.73	0.69	0.67	0.63	0.60	0.58	0.55	0.53	0.51	7.85	
1969	0.48	0.47	0.44	0.42	0.41	0.39	1.44	0.37	0.35	0.34	0.32	0.31	5.75	
1970	0.29	0.29	0.75	0.27	0.26	0.24	33.58	37.16	14.71	2.77	0.79	0.76	91.89	
1971	0.73	0.70	0.67	0.64	0.61	0.59	1.28	1.12	0.54	0.51	0.49	0.47	8.34	
1972	0.45	0.43	0.41	0.39	0.37	0.36	0.35	0.34	0.32	0.30	0.29	0.28	4.29	
1973	0.27	0.25	0.24	0.23	0.22	0.21	51.22	2.52	0.37	0.35	0.34	0.33	56.55	
1974	0.31	0.29	0.29	0.27	0.26	0.24	0.23	0.22	0.21	0.20	0.19	0.18	2.89	
1975	0.17	0.17	0.17	0.16	0.16	0.15	0.14	8.73	0.24	0.16	0.15	0.14	10.53	
1976	0.46	0.80	1.48	0.15	0.14	0.13	6.78	0.92	13.64	0.39	0.22	0.22	25.33	
1977	0.27	0.20	0.19	0.18	0.17	12.29	22.69	1.67	1.17	0.31	0.29	0.29	39.71	
1978	0.27	0.26	0.24	0.23	0.22	0.32	55.11	63.82	5.17	0.69	0.66	0.63	127.61	
1979	0.60	0.79	0.56	0.54	0.51	0.48	0.47	9.63	0.47	0.45	0.42	1.16	16.09	
1980	0.41	0.38	0.36	0.35	0.34	1.09	0.73	0.32	0.30	0.33	0.29	0.82	5.71	
1981	0.27	0.97	1.04	0.26	0.25	0.23	1.95	7.84	0.25	0.24	0.22	0.22	13.74	
1982	0.21	0.20	0.19	0.18	0.17	0.16	0.47	3.22	0.17	0.16	0.15	0.14	5.42	
1983	0.14	0.13	0.12	0.31	0.11	0.10	0.10	11.18	0.95	0.17	0.16	0.16	13.64	
1984	0.15	0.14	0.13	0.12	0.11	0.11	0.44	108.29	4.80	0.42	0.41	0.39	115.51	
1985	0.37	0.35	0.34	0.50	0.32	0.30	7.24	0.53	0.30	0.29	0.27	0.26	11.07	
1986	0.24	0.23	0.22	0.21	0.20	0.19	0.18	13.31	0.75	0.25	0.23	0.22	16.25	
1987	0.21	0.20	0.19	0.18	0.17	0.16	0.15	0.15	0.14	0.13	0.12	0.11	1.91	
1988	0.10	0.10	0.10	0.09	0.08	0.08	8.10	10.27	0.22	0.15	0.14	0.14	19.55	
MEAN	0.39	0.40	0.46	0.33	0.31	0.52	23.81	11.56	5.51	0.71	0.42	0.42	44.85	
	July - Sep.: 40.89				Oct. - June: 3.96									
1976-1987														
MEAN	0.30	0.39	0.42	0.27	0.23	1.30	8.03	18.41	2.34	0.32	0.29	0.38	32.67	
	July - Sep.: 28.77				Oct. - June: 3.89									

Table B.3.1 CALCULATED MONTHLY TOTAL RUNOFF (3/5)

STATION: MALIR RIVER		Latitude = 25°02' Longitude = 67°24'											Unit: MCM
AT SUPER HIGHWAY BRIDGE		Catchment Area : 1205Km2 (465mile2)											
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1929	0.10	0.10	0.09	0.08	0.06	0.05	7.90	0.05	0.05	0.03	0.03	0.03	8.57
1930	0.02	0.01	0.00	0.00	0.00	0.45	193.13	12.80	1.79	0.34	0.33	0.31	209.17
1931	0.29	0.29	0.27	0.25	0.24	0.22	0.22	0.20	0.19	0.18	0.16	0.16	2.67
1932	0.15	0.13	0.12	0.11	0.10	0.09	159.63	13.25	1.96	0.41	0.39	0.37	176.71
1933	0.35	0.35	0.33	0.31	0.29	0.29	229.51	50.92	12.99	2.69	0.91	0.88	299.82
1934	0.85	0.82	0.79	0.77	0.74	0.73	73.94	3.08	0.77	0.74	0.72	0.69	84.65
1935	0.67	0.65	0.63	0.60	0.59	0.56	0.54	0.53	0.51	0.49	0.47	0.45	6.70
1936	0.43	0.41	0.40	0.38	0.36	0.35	15.84	0.35	0.33	0.31	0.29	0.29	19.74
1937	0.27	0.26	0.24	0.23	0.22	0.21	102.22	5.35	0.32	0.31	0.29	1.20	111.12
1938	0.28	0.26	0.24	0.23	0.22	0.21	3.20	15.28	0.21	0.19	0.18	0.16	20.66
1939	0.16	0.52	0.70	0.14	0.12	0.11	0.10	0.10	0.09	0.08	0.07	0.06	2.24
1940	1.13	0.05	0.24	0.04	0.03	0.03	7.72	8.55	0.03	0.03	0.02	0.01	17.88
1941	0.01	0.00	0.00	0.00	0.00	0.00	3.40	0.00	0.00	0.00	0.00	0.00	3.40
1942	0.00	0.00	0.00	0.00	0.00	0.00	136.31	9.33	0.54	0.12	0.10	0.10	146.50
1943	0.09	0.08	0.07	0.06	0.05	0.04	6.27	0.04	0.03	0.03	0.02	0.01	6.79
1944	0.00	0.23	0.00	0.00	0.00	0.00	156.69	205.30	22.19	5.94	0.84	0.81	392.00
1945	1.18	0.77	0.74	0.72	0.69	0.67	38.22	0.66	0.63	0.61	0.59	0.57	46.04
1946	0.54	0.53	0.51	0.48	0.47	0.45	9.53	3.35	0.42	0.41	0.39	0.37	17.45
1947	0.35	0.34	0.33	0.31	0.29	0.28	0.27	4.67	0.26	0.24	0.22	0.22	7.78
1948	0.20	0.19	0.18	0.17	0.16	0.16	2.15	0.15	0.14	0.12	0.11	0.10	3.84
1949	0.10	0.09	0.07	0.06	0.05	0.04	55.27	88.13	6.81	0.29	0.27	0.25	151.42
1950	0.24	0.22	0.22	0.20	0.19	0.17	19.36	0.18	0.16	0.16	0.15	0.13	21.38
1951	0.12	0.11	0.10	0.09	0.08	0.07	2.74	1.79	0.07	0.06	0.05	0.04	5.32
1952	0.03	0.03	0.02	0.01	0.00	0.00	70.35	1.93	0.74	0.08	0.07	0.06	73.31
1953	0.05	0.04	0.03	0.03	0.02	0.02	0.01	104.47	6.93	0.16	0.14	0.13	112.02
1954	0.12	0.11	0.10	0.10	0.09	0.08	9.17	1.93	63.51	1.97	0.16	0.15	77.48
1955	0.14	0.13	0.12	0.11	0.10	0.09	0.08	1.42	31.82	0.10	0.08	0.07	34.24
1956	0.07	0.06	0.04	0.03	0.03	0.11	68.39	30.92	1.09	3.03	0.20	0.19	104.16
1957	0.18	0.16	0.16	0.15	0.13	0.12	0.11	0.10	0.10	0.09	0.08	0.07	1.44
1958	0.06	0.05	0.04	0.03	0.03	0.02	51.29	0.49	1.61	0.08	0.07	0.47	54.23
1959	0.05	0.04	0.03	0.03	0.02	0.01	121.34	12.58	178.43	12.93	4.22	0.70	330.38
1960	0.67	0.65	0.63	0.61	0.59	0.57	3.77	1.56	0.53	0.51	0.48	0.48	11.04
1961	0.46	0.92	0.42	0.41	0.39	0.38	75.91	91.74	84.36	10.32	1.02	0.87	267.20
1962	0.85	0.82	0.79	0.76	0.73	0.72	24.11	3.76	62.83	2.44	0.73	0.71	99.25
1963	0.69	0.67	0.64	0.61	0.60	0.57	0.55	0.54	0.52	0.49	0.48	0.46	6.82
1964	0.44	0.42	0.41	0.39	0.37	0.35	21.37	5.75	0.35	0.34	0.32	0.30	30.82
1965	0.29	0.28	0.26	0.25	0.23	0.22	38.31	0.33	0.22	0.21	0.20	0.18	40.97
1966	0.17	0.16	0.15	0.14	0.13	0.11	16.29	0.12	0.10	0.10	0.09	0.08	17.63
1967	0.07	0.06	8.37	0.06	0.05	0.04	254.67	68.13	13.35	2.19	0.74	0.72	348.45
1968	0.69	0.67	0.65	0.62	0.60	0.58	0.56	0.54	0.52	0.50	0.48	0.47	6.89
1969	0.44	0.42	0.41	0.39	0.37	0.35	2.79	0.34	0.32	0.31	0.29	0.28	6.71
1970	0.27	0.25	1.03	0.23	0.22	0.21	64.59	69.54	33.24	2.13	0.55	0.54	172.80
1971	0.52	0.49	0.48	0.46	0.44	0.42	2.13	1.71	0.39	0.37	0.35	0.34	8.10
1972	0.33	0.31	0.29	0.28	0.27	0.25	0.24	0.23	0.22	0.21	0.19	0.18	3.00
1973	0.17	0.16	0.15	0.14	0.12	0.11	87.13	4.85	0.22	0.21	0.20	0.19	93.65
1974	0.17	0.16	0.15	0.14	0.13	0.12	0.10	0.10	0.09	0.08	0.07	0.06	1.37
1975	0.05	0.04	0.04	0.03	0.03	0.02	0.01	20.97	0.22	0.02	0.01	0.00	21.44
1976	1.10	0.10	0.92	0.00	0.00	0.00	21.47	0.87	31.11	0.01	0.00	0.00	55.58
1977	0.00	0.00	0.00	0.00	0.00	28.34	82.64	5.67	6.80	0.10	0.09	0.08	123.71
1978	0.07	0.06	0.05	0.04	0.03	0.52	91.03	94.64	9.47	0.36	0.35	0.33	196.96
1979	0.31	0.71	0.29	0.28	0.26	0.24	0.23	13.80	0.22	0.22	0.20	1.42	18.18
1980	0.18	0.17	0.16	0.15	0.14	1.47	2.06	0.13	0.11	0.11	0.10	0.81	5.60
1981	0.09	0.13	1.85	0.08	0.07	0.05	2.13	38.88	0.41	0.10	0.09	0.08	43.95
1982	0.07	0.06	0.05	0.04	0.03	0.03	0.78	14.43	0.03	0.02	0.01	0.00	15.54
1983	0.00	0.00	0.00	0.91	0.00	0.00	1.19	36.82	0.93	0.02	0.01	0.00	39.87
1984	0.00	0.00	0.00	0.00	0.00	0.00	0.22	151.16	12.58	1.30	0.23	0.22	165.72
1985	0.21	0.20	0.18	0.26	0.16	0.16	18.67	0.44	0.15	0.14	0.13	0.11	20.81
1986	0.10	0.10	0.09	0.08	0.06	0.05	0.04	31.32	0.14	0.06	0.05	0.04	32.13
1987	0.03	0.03	0.02	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09
1988	0.00	0.00	0.00	0.00	0.00	0.00	19.34	25.47	0.00	0.00	0.00	0.00	44.81
MEAN	0.28	0.25	0.42	0.22	0.19	0.69	39.62	21.03	9.90	0.92	0.32	0.30	74.14
July - Sep. :		70.55		Oct - June :	3.59								
1976-1987													
MEAN	0.18	0.13	0.30	0.15	0.06	2.57	18.37	32.35	5.16	0.20	0.10	0.26	59.84
July - Sep. :		55.88		Oct - June :	3.96								

Table B.3.1 CALCULATED MONTHLY TOTAL RUNOFF (4/5)

STATION: MALIR RIVER		Latitude = 24°25' Longitude = 67°11'											Unit: MCM
AT NATIONAL HIGHWAY BRIDGE		Catchment Area: 1985Km2 (766mile2)											ANNUAL
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
1929	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1930	0.00	0.00	0.00	0.00	0.00	0.00	184.55	10.93	0.00	0.00	0.00	0.00	195.48
1931	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1932	0.00	0.00	0.00	0.00	0.00	0.00	147.80	13.29	0.00	0.00	0.00	0.00	161.08
1933	0.00	0.00	0.00	0.00	0.00	0.00	223.93	76.14	7.37	0.00	0.00	0.00	307.45
1934	0.00	0.00	0.00	0.00	0.00	0.00	60.06	0.00	0.00	0.00	0.00	0.00	60.06
1935	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1936	0.00	0.00	0.00	0.00	0.00	0.00	1.67	0.00	0.00	0.00	0.00	0.00	1.67
1937	0.00	0.00	0.00	0.00	0.00	0.00	88.48	0.00	0.00	0.00	0.00	0.00	88.48
1938	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.23	0.00	0.00	0.00	0.00	1.23
1939	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1940	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1941	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1942	0.00	0.00	0.00	0.00	0.00	0.00	122.44	0.00	0.00	0.00	0.00	0.00	122.44
1943	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1944	0.00	0.00	0.00	0.00	0.00	0.00	144.74	235.56	40.91	3.03	0.00	0.00	424.24
1945	0.00	0.00	0.00	0.00	0.00	0.00	24.40	0.00	0.00	0.00	0.00	0.00	24.40
1946	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1947	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1948	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1949	0.00	0.00	0.00	0.00	0.00	0.00	42.58	74.77	0.00	0.00	0.00	0.00	117.35
1950	0.00	0.00	0.00	0.00	0.00	0.00	5.44	0.00	0.00	0.00	0.00	0.00	5.44
1951	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1952	0.00	0.00	0.00	0.00	0.00	0.00	57.17	0.00	0.00	0.00	0.00	0.00	57.17
1953	0.00	0.00	0.00	0.00	0.00	0.00	0.00	90.84	0.00	0.00	0.00	0.00	90.84
1954	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50.36	0.00	0.00	0.00	50.36
1955	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.39	0.00	0.00	0.00	18.39
1956	0.00	0.00	0.00	0.00	0.00	0.00	55.27	16.94	0.00	0.00	0.00	0.00	72.21
1957	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1958	0.00	0.00	0.00	0.00	0.00	0.00	38.52	0.00	0.00	0.00	0.00	0.00	38.52
1959	0.00	0.00	0.00	0.00	0.00	0.00	107.48	8.93	176.64	9.82	0.00	0.00	302.88
1960	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1961	0.00	0.00	0.00	0.00	0.00	0.00	62.28	84.63	93.83	4.35	0.00	0.00	245.08
1962	0.00	0.00	0.00	0.00	0.00	0.00	9.84	0.00	49.12	0.00	0.00	0.00	58.96
1963	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1964	0.00	0.00	0.00	0.00	0.00	0.00	7.34	0.00	0.00	0.00	0.00	0.00	7.34
1965	0.00	0.00	0.00	0.00	0.00	0.00	24.95	0.00	0.00	0.00	0.00	0.00	24.95
1966	0.00	0.00	0.00	0.00	0.00	0.00	2.39	0.00	0.00	0.00	0.00	0.00	2.39
1967	0.00	0.00	0.00	0.00	0.00	0.00	251.75	104.45	8.77	0.00	0.00	0.00	364.97
1968	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1969	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1970	0.00	0.00	0.00	0.00	0.00	0.00	51.34	56.45	25.54	0.00	0.00	0.00	133.33
1971	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1972	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1973	0.00	0.00	0.00	0.00	0.00	0.00	73.68	0.00	0.00	0.00	0.00	0.00	73.68
1974	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1975	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.28	0.00	0.00	0.00	0.00	7.28
1976	0.00	0.00	0.00	0.00	0.00	0.00	22.34	0.00	11.40	0.00	0.00	0.00	33.74
1977	0.00	0.00	0.00	0.00	0.00	3.78	95.03	0.00	1.05	0.00	0.00	0.00	99.86
1978	0.00	0.00	0.00	0.00	0.00	0.00	71.38	85.90	0.59	0.00	0.00	0.00	157.87
1979	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.78	0.00	0.00	0.00	0.00	6.78
1980	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1981	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29.01	0.00	0.00	0.00	0.00	29.01
1982	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.90	0.00	0.00	0.00	0.00	14.90
1983	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25.18	0.00	0.00	0.00	0.00	25.18
1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	135.51	4.74	0.00	0.00	0.00	140.25
1985	0.00	0.00	0.00	0.00	0.00	0.00	2.72	0.00	0.00	0.00	0.00	0.00	2.72
1986	0.00	0.00	0.00	0.00	0.00	0.00	0.00	14.73	0.00	0.00	0.00	0.00	14.73
1987	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1988	0.00	0.00	0.00	0.00	0.00	0.00	5.67	11.95	0.00	0.00	0.00	0.00	17.62
MEAN	0.00	0.00	0.00	0.00	0.00	0.06	33.09	18.42	8.15	0.29	0.00	0.00	60.01
July - Sep.:		59.66		Oct. - June:	0.35								
1978-1984													
MEAN	0.00	0.00	0.00	0.00	0.00	0.00	10.20	42.47	0.76	0.00	0.00	0.00	53.43
July - Sep.:		53.43		Oct. - June:	0.00								

Table B.3.1 CALCULATED MONTHLY TOTAL RUNOFF (5/5)

STATION: KHADEJI RIVER													Latitude = 25°03' Longitude = 67°25'	
AT SUPER HIGHWAY BRIDGE													Catchment Area : 575Km ² (222mile ²)	
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL	
1929	0.19	0.18	0.18	0.17	0.16	0.15	3.91	0.16	0.16	0.15	0.14	0.14	5.68	
1930	0.13	0.12	0.12	0.11	0.11	0.39	99.72	3.59	0.38	0.36	0.34	0.32	105.69	
1931	0.32	0.30	0.29	0.27	0.26	0.25	0.24	0.23	0.22	0.21	0.20	0.19	2.97	
1932	0.18	0.18	0.17	0.16	0.15	0.14	79.44	3.90	0.50	0.39	0.37	0.35	85.92	
1933	0.33	0.32	0.31	0.29	0.28	0.26	121.70	11.89	3.83	0.77	0.74	0.71	141.43	
1934	0.67	0.65	0.62	0.60	0.57	0.55	27.74	1.98	0.62	0.59	0.57	0.54	35.70	
1935	0.52	0.50	0.48	0.46	0.45	0.42	0.41	0.39	0.38	0.36	0.35	0.33	5.06	
1936	0.32	0.31	0.29	0.28	0.26	0.25	6.07	0.26	0.25	0.24	0.23	0.22	8.98	
1937	0.21	0.20	0.19	0.18	0.18	0.17	44.76	2.03	0.32	0.30	0.28	0.28	49.60	
1938	0.27	0.25	0.25	0.24	0.22	0.21	2.27	5.93	0.23	0.22	0.21	0.20	10.50	
1939	0.18	0.42	0.52	0.18	0.17	0.16	0.16	0.15	0.15	0.14	0.13	0.12	2.47	
1940	0.68	0.13	0.28	0.12	0.11	0.11	3.84	4.07	0.14	0.13	0.12	0.12	9.87	
1941	0.11	0.11	0.11	0.10	0.09	0.09	2.59	0.10	0.10	0.09	0.08	0.08	3.63	
1942	0.08	0.08	0.07	0.07	0.06	0.06	65.40	2.97	0.27	0.25	0.25	0.24	69.80	
1943	0.23	0.21	0.20	0.19	0.18	0.18	3.49	0.18	0.18	0.17	0.16	0.15	5.51	
1944	0.14	0.32	0.14	0.13	0.12	0.11	77.76	100.89	6.65	1.46	0.83	0.80	189.36	
1945	1.01	0.74	0.71	0.67	0.65	0.62	12.42	0.62	0.60	0.57	0.54	0.53	19.68	
1946	0.50	0.47	0.46	0.44	0.41	0.39	4.48	2.37	0.39	0.37	0.35	0.33	10.96	
1947	0.32	0.31	0.29	0.28	0.26	0.25	0.25	3.06	0.25	0.23	0.22	0.21	5.92	
1948	0.20	0.19	0.19	0.18	0.18	0.25	1.19	0.18	0.17	0.16	0.15	0.14	3.17	
1949	0.13	0.13	0.12	0.11	0.11	0.11	16.72	36.45	3.43	0.41	0.39	0.38	58.50	
1950	0.36	0.34	0.32	0.32	0.30	0.28	7.11	0.29	0.28	0.26	0.25	0.24	10.35	
1951	0.23	0.22	0.21	0.20	0.18	0.18	1.90	1.05	0.18	0.18	0.17	0.16	4.85	
1952	0.15	0.18	0.14	0.13	0.12	0.12	25.59	1.44	0.75	0.24	0.22	0.21	29.29	
1953	0.20	0.19	0.18	0.18	0.17	0.24	0.16	46.24	2.86	0.32	0.31	0.30	51.34	
1954	0.29	0.28	0.26	0.25	0.24	0.23	4.32	1.15	21.49	1.65	0.34	0.32	30.82	
1955	0.32	0.30	0.29	0.27	0.26	0.25	0.24	1.00	10.50	0.25	0.25	0.24	14.15	
1956	0.23	0.22	0.20	0.19	0.18	0.28	24.43	10.84	1.07	2.01	0.39	0.38	40.42	
1957	0.36	0.35	0.33	0.32	0.30	0.29	0.48	0.27	0.26	0.25	0.24	0.23	3.68	
1958	0.22	0.21	0.20	0.19	0.18	0.17	15.72	0.88	1.07	0.25	0.24	0.49	19.81	
1959	0.23	0.22	0.20	0.19	0.18	0.18	56.43	5.33	90.34	4.01	1.51	0.66	159.48	
1960	0.63	0.60	0.59	0.56	0.53	0.51	2.79	1.16	0.47	0.46	0.44	0.42	9.16	
1961	0.40	0.67	0.38	0.36	0.34	0.33	28.93	37.83	32.04	4.91	0.92	0.88	108.00	
1962	0.84	0.81	0.77	0.74	0.71	0.67	8.64	2.79	21.16	2.02	0.71	0.68	40.54	
1963	0.66	0.62	0.60	0.57	0.54	0.53	0.50	0.50	0.46	0.45	0.43	0.41	6.26	
1964	0.39	0.38	0.36	0.34	0.32	0.32	7.64	3.42	0.32	0.31	0.30	0.28	14.38	
1965	0.27	0.25	0.25	0.24	0.22	0.21	12.18	0.57	0.25	0.24	0.22	0.21	15.10	
1966	0.20	0.19	0.18	0.18	0.17	0.16	6.17	0.17	0.17	0.16	0.15	0.14	8.03	
1967	0.13	0.12	3.94	0.14	0.13	0.12	136.86	15.49	3.91	0.71	0.67	0.65	162.88	
1968	0.62	0.60	0.57	0.54	0.53	0.50	0.48	0.46	0.45	0.42	0.40	0.39	5.96	
1969	0.37	0.35	0.34	0.32	0.31	0.29	1.77	0.29	0.27	0.26	0.25	0.24	5.06	
1970	0.23	0.22	0.66	0.21	0.19	0.18	22.04	24.85	12.28	1.83	0.64	0.61	63.96	
1971	0.59	0.56	0.53	0.51	0.49	0.46	1.32	1.20	0.44	0.42	0.40	0.39	7.32	
1972	0.37	0.35	0.33	0.32	0.30	0.29	0.46	0.27	0.26	0.25	0.24	0.23	3.66	
1973	0.22	0.21	0.20	0.18	0.18	0.17	35.73	2.30	0.31	0.29	0.28	0.27	40.34	
1974	0.25	0.25	0.23	0.22	0.21	0.20	0.19	0.18	0.18	0.17	0.16	0.15	2.38	
1975	0.15	0.14	0.14	0.13	0.12	0.12	0.11	7.43	0.44	0.14	0.13	0.12	9.18	
1976	0.92	0.12	0.21	0.12	0.11	0.11	9.28	0.44	9.20	0.16	0.15	0.14	20.96	
1977	0.13	0.13	0.12	0.11	0.11	9.31	54.09	4.78	6.29	0.37	0.35	0.33	76.13	
1978	0.32	0.31	0.30	0.28	0.26	0.79	39.08	32.33	3.82	0.60	0.58	0.55	79.23	
1979	0.53	0.81	0.49	0.47	0.45	0.43	0.41	2.61	0.39	0.38	0.36	0.94	8.26	
1980	0.33	0.32	0.31	0.29	0.27	0.88	2.65	0.27	0.26	0.25	0.24	0.56	6.63	
1981	0.23	0.22	1.03	0.21	0.20	0.19	0.88	21.70	2.02	0.30	0.29	0.27	27.55	
1982	0.26	0.46	0.25	0.23	0.22	0.21	0.61	7.53	0.22	0.21	0.19	0.18	10.57	
1983	0.18	0.17	0.16	1.12	0.16	0.15	1.97	15.03	1.87	0.25	0.25	0.23	21.53	
1984	0.22	0.21	0.19	0.18	0.18	0.20	0.28	67.47	4.28	0.40	0.39	0.37	74.36	
1985	0.35	0.33	0.32	0.39	0.30	0.28	8.11	0.64	0.28	0.27	0.25	0.25	11.77	
1986	0.23	0.22	0.21	0.20	0.19	0.18	0.18	9.38	0.20	0.19	0.18	0.18	11.55	
1987	0.17	0.16	0.15	0.14	0.13	0.12	0.11	0.11	0.11	0.10	0.09	0.09	1.46	
1988	0.08	0.07	0.07	0.06	0.06	0.05	6.93	8.62	0.11	0.11	0.10	0.09	16.34	
MEAN	0.33	0.31	0.37	0.28	0.25	0.42	18.36	8.66	4.17	0.56	0.34	0.34	34.38	
July - Sep. :		31.19		Oct. - June :	3.19									
1976-1987														
MEAN	0.32	0.29	0.31	0.31	0.21	1.07	9.80	13.52	2.41	0.29	0.28	0.34	29.17	
July - Sep. :		25.74		Oct. - June :	3.43									

Table B.3.2 CALCULATED RUNOFF CO-EFFICIENTS

Station	Item	Monsoon July to Sep	Winter & Spring Jan to June Oct to Dec	Annual
Khadeji River At Super Highway	Observed Rainfall(mm)	168.8	44.6	213.4
	1976-87 Runoff (mm)	39.8	6.2	46.0
	Runoff Co-eff(%)	23.6	13.9	21.5
	Calculated Rainfall(mm)	168.8	44.6	213.4
	1976-87 Runoff (mm)	44.7	6.0	50.7
	Runoff Co-eff(%)	26.5	13.5	23.8
	Calculated Rainfall(mm)	180.3	34.4	214.8
	1929-1988 Runoff (mm)	54.3	5.6	59.8
	Runoff Co-eff(%)	30.1	16.1	27.8
Mol River At Dam Site	Observed Rainfall(mm)	*	*	*
	1976-87 Runoff (mm)	*	*	*
	Runoff Co-eff(%)	*	*	*
	Calculated Rainfall(mm)	163.9	52.2	216.1
	1976-87 Runoff (mm)	48.3	6.5	54.8
	Runoff Co-eff(%)	29.5	12.5	25.4
	Calculated Rainfall(mm)	189.9	40.8	230.7
	1929-1988 Runoff (mm)	68.6	6.6	75.2
	Runoff Co-eff(%)	36.1	16.3	32.6
Malir River At Super Highway	Observed Rainfall(mm)	167.4	48.5	215.9
	1976-87 Runoff (mm)	41.0	3.6	44.6
	Runoff Co-eff(%)	24.5	7.4	20.7
	Calculated Rainfall(mm)	167.4	48.5	215.9
	1976-87 Runoff (mm)	46.4	3.3	49.7
	Runoff Co-eff(%)	27.7	6.8	23.0
	Calculated Rainfall(mm)	186.1	38.1	224.2
	1929-1988 Runoff (mm)	58.5	3.0	61.5
	Runoff Co-eff(%)	31.5	7.8	27.4
Malir River At National Highway	Observed Rainfall(mm)	189.6	49.9	239.5
	1978-84 Runoff (mm)	28.4	0.0	28.4
	Runoff Co-eff(%)	15.0	0.0	11.9
	Calculated Rainfall(mm)	189.6	49.9	239.5
	1978-84 Runoff (mm)	26.9	0.0	26.9
	Runoff Co-eff(%)	14.2	0.0	11.2
	Calculated Rainfall(mm)	187.3	38.0	225.3
	1929-1988 Runoff (mm)	30.1	0.2	30.2
	Runoff Co-eff(%)	16.0	0.5	13.4

Table B.3.3 CALCULATED SEASON RUNOFF CO-EFFICIENTS (1/4)

STATION: KHADEJI DAMSITE Latitude = 25°03' Longitude = 67°25'
Catchment Area: 567 Km² (219 mile²)

YEAR	MONSOON JUL TO SEP			SPRING & WINTER JAN TO JUN & OCT TO DEC			ANNUAL		
	RAIN FALL	RUNOFF	RUNOFF COEFF	RAIN FALL	RUNOFF	RUNOFF COEFF	RAIN FALL	RUNOFF	RUNOFF COEFF
	(mm)	(mm)	(%)	(mm)	(mm)	(%)	(mm)	(mm)	(%)
1929	76.9	7.3	9.6	33.1	2.5	7.6	110.0	9.9	9.0
1930	346.3	180.3	52.1	42.1	3.5	8.3	388.4	183.8	47.3
1931	27.2	1.2	4.4	18.2	4.0	21.9	45.4	5.2	11.4
1932	325.2	145.8	44.8	15.0	3.6	24.1	340.2	149.4	43.9
1933	498.6	239.0	47.9	16.9	7.0	41.3	515.5	246.0	47.7
1934	183.7	52.8	28.7	31.8	9.3	29.3	215.5	62.1	28.8
1935	33.6	2.1	6.1	46.5	6.7	14.5	80.1	8.8	11.0
1936	86.2	11.5	13.3	29.8	4.2	14.0	116.0	15.6	13.5
1937	219.0	81.9	37.4	52.1	4.3	8.3	271.1	86.3	31.8
1938	124.7	14.7	11.8	17.8	3.6	20.2	142.5	18.3	12.8
1939	22.7	0.8	3.5	62.4	3.5	5.6	85.1	4.3	5.0
1940	123.8	14.0	11.3	86.2	3.2	3.7	210.0	17.2	8.2
1941	64.6	4.8	7.5	14.1	1.5	10.4	78.7	6.3	8.0
1942	282.9	119.4	42.2	38.3	2.0	5.3	321.2	121.4	37.8
1943	71.8	6.7	9.3	22.0	2.9	13.2	93.8	9.6	10.2
1944	613.2	322.3	52.6	36.7	7.1	19.2	649.9	329.4	50.7
1945	128.4	23.7	18.5	35.9	10.5	29.2	164.3	34.2	20.8
1946	113.7	12.6	11.1	13.6	6.5	47.6	127.3	19.1	15.0
1947	68.8	6.2	9.0	16.7	4.1	24.7	85.5	10.3	12.0
1948	55.0	2.7	4.8	59.3	2.8	4.8	114.3	5.5	4.8
1949	328.1	98.5	30.0	13.1	3.3	25.1	341.2	101.7	29.8
1950	91.9	13.3	14.5	17.8	4.6	26.1	109.7	18.0	16.4
1951	92.0	5.5	5.9	13.7	3.0	21.8	105.7	8.4	8.0
1952	197.9	48.3	24.4	29.6	2.6	8.9	227.5	50.9	22.4
1953	223.3	85.7	38.4	34.5	3.6	10.5	257.8	89.3	34.6
1954	249.7	46.9	18.8	34.3	6.7	19.6	284.0	53.6	18.9
1955	142.4	20.4	14.3	25.2	4.2	16.7	167.6	24.6	14.7
1956	256.2	63.2	24.7	85.8	7.1	8.3	342.0	70.3	20.6
1957	43.4	1.8	4.1	20.5	4.6	22.6	63.9	6.4	10.0
1958	176.9	30.7	17.4	40.0	3.7	9.3	216.9	34.5	15.9
1959	589.7	264.5	44.9	52.7	12.8	24.3	642.4	277.4	43.2
1960	89.8	7.7	8.6	37.8	8.2	21.8	127.6	15.9	12.5
1961	516.4	171.8	33.3	57.2	16.0	28.0	573.6	187.8	32.7
1962	280.5	56.7	20.2	15.3	13.8	90.3	295.8	70.5	23.8
1963	32.3	2.5	7.9	26.6	8.4	31.4	58.9	10.9	18.5
1964	143.9	19.8	13.8	16.9	5.2	30.8	160.8	25.0	15.6
1965	141.2	22.6	16.0	14.1	3.7	25.9	155.3	26.3	16.9
1966	86.4	11.3	13.1	13.4	2.7	19.8	99.8	14.0	14.0
1967	524.0	271.8	51.9	93.5	11.5	12.3	617.5	283.3	45.9
1968	26.9	2.4	9.0	22.8	7.9	34.8	49.7	10.4	20.8
1969	57.9	4.1	7.0	13.1	4.7	36.2	71.0	8.8	12.4
1970	395.6	102.9	26.0	48.2	8.3	17.2	443.8	111.2	25.1
1971	81.8	5.2	6.3	14.8	7.6	51.2	96.6	12.7	13.2
1972	36.6	1.7	4.7	25.0	4.6	18.6	61.6	6.4	10.3
1973	216.4	66.7	30.8	16.3	3.5	21.3	232.7	70.2	30.1
1974	21.9	1.0	4.4	15.7	3.2	20.3	37.6	4.1	11.0
1975	112.5	13.9	12.3	38.3	2.1	5.5	150.8	16.0	10.6
1976	208.4	32.9	15.8	67.0	3.6	5.3	275.4	36.4	13.2
1977	344.4	113.3	32.9	100.6	19.1	19.0	445.0	132.4	29.8
1978	361.8	130.8	36.2	47.7	6.9	14.6	409.5	137.8	33.7
1979	49.0	5.9	12.1	65.9	8.4	12.8	114.9	14.4	12.5
1980	59.7	5.5	9.3	72.5	6.0	8.3	132.2	11.5	8.7
1981	185.5	42.8	23.1	45.8	5.1	11.2	231.3	47.9	20.7
1982	108.1	14.6	13.5	22.9	3.8	16.8	131.0	18.4	14.0
1983	196.2	32.8	16.7	44.8	4.6	10.3	241.0	37.4	15.5
1984	308.7	125.3	40.6	21.3	4.1	19.1	330.0	129.3	39.2
1985	110.2	15.7	14.3	26.3	4.8	18.1	136.5	20.5	15.0
1986	92.9	17.0	18.3	18.3	3.1	17.0	111.2	20.1	18.1
1987	1.2	0.6	47.0	1.3	2.0	152.4	2.5	2.5	101.8
1988	172.5	27.2	15.8	6.0	1.2	19.8	178.5	28.4	15.9
MEAN	180.3	54.3	30.1	34.4	5.6	16.1	214.8	59.8	27.8

Table B.3.3 CALCULATED SEASON RUNOFF CO-EFFICIENTS (2/4)

STATION: MOL DAMSITE

Latitude = Longitude =
 Catchment Area: 596 Km² (230mile²)

YEAR	MONSOON JUL TO SEP			SPRING & WINTER JAN TO JUN & OCT TO DEC			ANNUAL		
	RAIN FALL	RUNOFF	RUNOFF COEFF	RAIN FALL	RUNOFF	RUNOFF COEFF	RAIN FALL	RUNOFF	RUNOFF COEFF
	(mm)	(mm)	(%)	(mm)	(mm)	(%)	(mm)	(mm)	(%)
1929	64.8	7.7	11.9	39.2	3.3	8.4	104.0	11.0	10.6
1930	403.6	233.2	57.8	48.2	4.2	8.8	451.8	237.5	52.6
1931	9.2	1.5	15.9	24.5	4.8	19.8	33.7	6.3	18.7
1932	371.5	189.8	51.1	21.3	4.5	21.0	392.8	194.3	49.5
1933	580.5	304.8	52.5	23.2	9.4	40.4	603.7	314.2	52.0
1934	197.4	74.2	37.6	37.9	12.0	31.6	235.3	86.1	36.6
1935	11.5	2.6	22.4	52.6	8.5	16.2	64.1	11.1	17.3
1936	79.8	12.8	16.1	36.1	5.2	14.3	115.9	18.0	15.5
1937	245.5	110.5	45.0	58.0	5.1	8.8	303.5	115.6	38.1
1938	121.3	15.3	12.6	24.0	4.3	17.9	145.3	19.6	13.5
1939	7.5	0.9	12.2	68.4	4.0	5.9	75.9	4.9	6.5
1940	120.2	14.4	12.0	91.9	3.5	3.8	212.1	17.9	8.4
1941	53.3	4.5	8.3	20.4	1.6	7.7	73.7	6.0	8.2
1942	318.6	156.6	49.2	44.3	2.3	5.1	362.9	158.9	43.8
1943	60.5	6.8	11.2	28.2	3.4	12.0	88.7	10.2	11.5
1944	730.4	418.1	57.2	42.8	9.0	21.1	773.2	427.1	55.2
1945	128.4	28.5	22.2	42.1	13.2	31.3	170.5	41.7	24.4
1946	107.9	12.9	11.9	19.9	8.4	42.1	127.8	21.3	16.6
1947	56.6	6.2	11.0	22.9	5.3	23.0	79.5	11.5	14.5
1948	41.7	2.5	5.9	65.3	3.5	5.4	107.0	6.0	5.6
1949	375.2	138.7	37.0	19.4	3.9	20.3	394.6	142.6	36.1
1950	87.4	15.1	17.3	24.0	5.6	23.1	111.4	20.6	18.5
1951	79.7	4.6	5.8	20.0	3.5	17.5	99.7	8.1	8.1
1952	212.3	67.8	31.9	35.8	3.1	8.6	248.1	70.9	28.6
1953	250.1	114.7	45.9	40.6	4.2	10.3	290.7	118.9	40.9
1954	270.3	64.8	24.0	40.4	7.9	19.7	310.7	72.7	23.4
1955	143.2	23.2	16.2	31.4	5.2	16.5	174.6	28.3	16.2
1956	285.6	86.5	30.3	91.6	8.3	9.1	377.2	94.8	25.1
1957	21.9	1.7	7.7	26.9	5.6	20.9	48.8	7.3	15.0
1958	186.4	41.7	22.4	46.2	4.4	9.6	232.6	46.1	19.8
1959	694.1	345.5	49.8	58.7	15.7	26.7	752.8	361.2	48.0
1960	78.0	7.5	9.6	43.8	10.3	23.5	121.8	17.7	14.6
1961	602.7	239.2	39.7	63.1	19.6	31.0	665.8	258.8	38.9
1962	308.6	76.2	24.7	21.6	17.0	78.9	330.2	93.3	28.2
1963	12.1	3.1	25.4	32.8	10.2	31.1	44.9	13.3	29.6
1964	142.9	21.7	15.2	23.3	6.3	27.0	166.2	27.9	16.8
1965	142.1	26.8	18.9	20.4	4.5	21.9	162.5	31.3	19.2
1966	80.9	12.7	15.7	19.7	3.4	17.1	100.6	16.0	15.9
1967	619.4	346.4	55.9	99.2	13.0	13.1	718.6	359.5	50.0
1968	9.0	3.0	33.8	29.2	10.1	34.7	38.2	13.2	34.5
1969	45.4	3.6	8.0	19.4	6.0	30.9	64.8	9.6	14.9
1970	452.2	143.4	31.7	54.4	10.8	19.8	506.6	154.2	30.4
1971	68.1	4.9	7.2	21.1	9.1	42.9	89.2	14.0	15.7
1972	18.8	1.7	8.9	31.3	5.5	17.6	50.1	7.2	14.4
1973	235.7	90.8	38.5	22.6	4.1	18.1	258.3	94.9	36.7
1974	7.3	1.1	15.3	22.0	3.7	17.0	29.3	4.9	16.6
1975	108.2	15.3	14.1	43.2	2.4	5.5	151.4	17.7	11.7
1976	226.2	35.8	15.8	103.3	6.7	6.5	329.5	42.5	12.9
1977	206.1	42.8	20.8	131.3	23.8	18.1	337.4	66.6	19.7
1978	463.5	208.2	44.9	33.0	5.9	17.9	496.5	214.1	43.1
1979	90.3	17.7	19.6	71.6	9.3	12.9	161.9	27.0	16.7
1980	39.2	2.3	5.8	98.2	7.3	7.4	137.4	9.6	7.0
1981	124.9	16.8	13.5	81.4	6.2	7.6	206.3	23.0	11.2
1982	77.8	6.5	8.3	21.2	2.6	12.3	99.0	9.1	9.2
1983	145.2	20.5	14.1	25.4	2.4	9.3	170.6	22.9	13.4
1984	380.6	190.5	50.0	15.3	3.3	21.7	395.9	193.8	49.0
1985	99.4	13.5	13.6	33.1	5.0	15.2	132.5	18.6	14.0
1986	113.9	23.9	21.0	12.2	3.4	27.6	126.1	27.3	21.6
1987	0.0	0.7	*	0.4	2.5	619.7	0.4	3.2	800.9
1988	181.2	31.2	17.2	8.5	1.6	18.9	189.7	32.8	17.3
MEAN	189.9	68.6	36.1	40.8	6.6	16.3	230.7	75.2	32.6

Table B.3.3 CALCULATED SEASON RUNOFF CO-EFFICIENTS (3/4)

STATION: MALIR RIVER			Latitude = 25°02' Longitude = 67°24'			Catchment Area: 1205 Km ² (465 mile ²)					
AT SUPER HIGHWAY BRIDGE			MONSOON JUL TO SEP			SPRING & WINTER JAN TO JUN & OCT TO DEC			ANNUAL		
YEAR	RAIN FALL (mm)	RUNOFF (mm)	RUNOFF COEFF (%)	RAIN FALL (mm)	RUNOFF (mm)	RUNOFF COEFF (%)	RAIN FALL (mm)	RUNOFF (mm)	RUNOFF COEFF (%)		
1929	71.8	6.6	9.2	36.8	0.5	1.3	108.6	7.1	6.5		
1930	375.8	172.4	45.9	45.8	1.2	2.6	421.6	173.6	41.2		
1931	19.1	0.5	2.6	21.6	1.7	7.9	40.7	2.2	5.4		
1932	349.3	145.1	41.5	18.5	1.5	8.4	367.8	146.6	39.9		
1933	540.5	243.5	45.1	20.1	5.3	26.4	560.6	248.8	44.4		
1934	191.5	64.6	33.7	35.4	5.7	16.1	226.9	70.2	31.0		
1935	23.5	1.3	5.6	50.2	4.2	8.5	73.7	5.6	7.5		
1936	84.0	13.7	16.3	33.3	2.7	8.1	117.3	16.4	14.0		
1937	233.2	89.5	38.4	56.1	2.7	4.8	289.3	92.2	31.9		
1938	124.1	15.5	12.5	21.1	1.6	7.7	145.2	17.1	11.8		
1939	16.1	0.2	1.5	66.5	1.6	2.4	82.6	1.9	2.2		
1940	122.9	13.5	11.0	90.3	1.3	1.5	213.2	14.8	7.0		
1941	59.9	2.8	4.7	17.6	0.0	0.0	77.5	2.8	3.6		
1942	301.8	121.3	40.2	41.9	0.3	0.6	343.7	121.6	35.4		
1943	67.2	5.3	7.8	25.5	0.4	1.4	92.7	5.6	6.1		
1944	672.6	318.8	47.4	40.5	6.5	16.0	713.1	325.3	45.6		
1945	129.5	32.8	25.3	39.7	5.4	13.7	169.2	38.2	22.6		
1946	111.8	11.0	9.9	17.2	3.4	20.0	129.0	14.5	11.2		
1947	63.8	4.3	6.8	20.1	2.1	10.7	83.9	6.5	7.7		
1948	49.3	2.0	4.1	63.3	1.2	1.8	112.6	3.2	2.8		
1949	352.6	124.7	35.4	16.7	1.0	6.0	369.3	125.7	34.0		
1950	90.7	16.4	18.0	21.4	1.4	6.5	112.1	17.7	15.8		
1951	87.0	3.8	4.4	17.3	0.6	3.5	104.3	4.4	4.2		
1952	206.2	60.6	29.4	33.2	0.2	0.7	239.4	60.8	25.4		
1953	237.6	92.5	38.9	38.2	0.5	1.3	275.8	93.0	33.7		
1954	261.1	61.9	23.7	38.0	2.4	6.3	299.1	64.3	21.5		
1955	143.8	27.6	19.2	28.5	0.8	2.7	172.3	28.4	16.5		
1956	271.9	83.3	30.6	90.2	3.1	3.5	362.1	86.4	23.9		
1957	33.7	0.3	0.8	23.9	0.9	3.9	57.6	1.2	2.1		
1958	182.7	44.3	24.2	43.7	0.7	1.6	226.4	45.0	19.9		
1959	642.9	259.2	40.3	56.5	15.0	26.5	699.4	274.2	39.2		
1960	84.9	4.9	5.7	41.6	4.3	10.4	126.5	9.2	7.2		
1961	560.5	209.1	37.3	61.1	12.6	20.6	621.6	221.7	35.7		
1962	295.6	75.3	25.5	18.9	7.1	37.6	314.5	82.4	26.2		
1963	23.2	1.3	5.7	30.3	4.3	14.3	53.5	5.7	10.6		
1964	144.4	22.8	15.8	20.4	2.8	13.6	164.8	25.6	15.5		
1965	142.7	32.3	22.6	17.6	1.7	9.9	160.3	34.0	21.2		
1966	84.6	13.7	16.2	17.0	0.9	5.4	101.6	14.6	14.4		
1967	572.6	279.0	48.7	97.9	10.2	10.4	670.5	289.2	43.1		
1968	18.9	1.3	7.1	26.3	4.4	16.6	45.2	5.7	12.7		
1969	52.6	2.9	5.4	16.6	2.7	16.3	69.2	5.6	8.1		
1970	425.0	138.9	32.7	52.1	4.5	8.6	477.1	143.4	30.1		
1971	76.1	3.5	4.6	18.3	3.2	17.6	94.4	6.7	7.1		
1972	28.7	0.6	2.0	28.6	1.9	6.7	57.3	2.5	4.3		
1973	227.0	76.5	33.7	19.9	1.2	6.0	246.9	77.7	31.5		
1974	15.5	0.2	1.5	19.0	0.9	4.7	34.5	1.1	3.3		
1975	111.1	17.6	15.8	41.2	0.2	0.5	152.3	17.8	11.7		
1976	218.0	44.4	20.3	85.9	1.8	2.1	303.9	46.1	15.2		
1977	281.6	78.9	28.0	114.2	23.7	20.8	395.8	102.7	25.9		
1978	409.7	161.9	39.5	41.1	1.5	3.7	450.8	163.5	36.3		
1979	70.0	11.8	16.9	69.1	3.3	4.7	139.1	15.1	10.8		
1980	49.3	1.9	3.9	86.7	2.7	3.2	136.0	4.6	3.4		
1981	157.6	34.4	21.8	64.9	2.1	3.2	222.5	36.5	16.4		
1982	99.9	12.6	12.7	22.3	0.3	1.2	122.2	12.9	10.6		
1983	172.9	32.3	18.7	34.6	0.8	2.2	207.5	33.1	15.9		
1984	343.5	136.1	39.6	17.6	1.5	8.3	361.1	137.5	38.1		
1985	102.4	16.0	15.6	29.4	1.3	4.4	131.8	17.3	13.1		
1986	103.8	26.1	25.2	15.1	0.5	3.5	118.9	26.7	22.4		
1987	0.6	0.0	0.0	1.0	0.1	7.2	1.6	0.1	4.5		
1988	177.9	37.2	20.9	7.5	0.0	0.0	185.4	37.2	20.1		
MEAN	186.1	58.5	31.5	38.1	3.0	7.8	224.2	61.5	27.4		

Table B.3.3 CALCULATED SEASON RUNOFF CO-EFFICIENTS (4/4)

STATION: MALIR RIVER
 AT NATIONAL HIGHWAY BRIDGE
 Latitude = 24°25' Longitude = 67°11'
 Catchment Area: 1985 Km² (766mile²)

YEAR	MONSOON JUL TO SEP			SPRING & WINTER JAN TO JUN & OCT TO DEC			ANNUAL		
	RAIN FALL	RUNOFF	RUNOFF COEFF	RAIN FALL	RUNOFF	RUNOFF COEFF	RAIN FALL	RUNOFF	RUNOFF COEFF
	(mm)	(mm)	(%)	(mm)	(mm)	(%)	(mm)	(mm)	(%)
1929	75.4	0.0	0.0	36.8	0.0	0.0	112.2	0.0	0.0
1930	368.4	98.5	26.7	47.4	0.0	0.0	415.8	98.5	23.7
1931	23.8	0.0	0.0	19.1	0.0	0.0	42.9	0.0	0.0
1932	343.6	81.2	23.6	15.4	0.0	0.0	359.0	81.2	22.6
1933	528.8	154.9	29.3	17.6	0.0	0.0	546.4	154.9	28.3
1934	190.9	30.3	15.8	35.2	0.0	0.0	226.1	30.3	13.4
1935	28.7	0.0	0.0	52.7	0.0	0.0	81.4	0.0	0.0
1936	86.8	0.8	1.0	32.9	0.0	0.0	119.7	0.8	0.7
1937	230.8	44.6	19.3	59.4	0.0	0.0	290.2	44.6	15.4
1938	126.2	0.6	0.5	18.5	0.0	0.0	144.7	0.6	0.4
1939	20.3	0.0	0.0	71.7	0.0	0.0	92.0	0.0	0.0
1940	125.2	0.0	0.0	99.7	0.0	0.0	224.9	0.0	0.0
1941	63.4	0.0	0.0	14.3	0.0	0.0	77.7	0.0	0.0
1942	297.6	61.7	20.7	42.8	0.0	0.0	340.4	61.7	18.1
1943	70.7	0.0	0.0	23.6	0.0	0.0	94.3	0.0	0.0
1944	655.5	212.2	32.4	41.0	1.5	3.7	696.5	213.7	30.7
1945	131.0	12.3	9.4	40.2	0.0	0.0	171.2	12.3	7.2
1946	114.4	0.0	0.0	13.8	0.0	0.0	128.2	0.0	0.0
1947	67.5	0.0	0.0	17.4	0.0	0.0	84.9	0.0	0.0
1948	53.2	0.0	0.0	68.0	0.0	0.0	121.2	0.0	0.0
1949	346.7	59.1	17.1	13.3	0.0	0.0	360.0	59.1	16.4
1950	93.1	2.7	2.9	18.7	0.0	0.0	111.8	2.7	2.5
1951	90.5	0.0	0.0	13.9	0.0	0.0	104.4	0.0	0.0
1952	205.4	28.8	14.0	32.6	0.0	0.0	238.0	28.8	12.1
1953	235.0	45.8	19.5	38.5	0.0	0.0	273.5	45.8	16.7
1954	259.3	25.4	9.8	38.3	0.0	0.0	297.6	25.4	8.5
1955	145.2	9.3	6.4	27.2	0.0	0.0	172.4	9.3	5.4
1956	268.8	36.4	13.5	99.3	0.0	0.0	368.1	36.4	9.9
1957	38.8	0.0	0.0	21.8	0.0	0.0	60.6	0.0	0.0
1958	182.8	19.4	10.6	45.1	0.0	0.0	227.9	19.4	8.5
1959	627.7	147.6	23.5	60.1	4.9	8.2	687.8	152.6	22.2
1960	88.5	0.0	0.0	42.4	0.0	0.0	130.9	0.0	0.0
1961	548.1	121.3	22.1	65.3	2.2	3.4	613.4	123.5	20.1
1962	292.6	29.7	10.2	15.8	0.0	0.0	308.4	29.7	9.6
1963	28.2	0.0	0.0	29.2	0.0	0.0	57.4	0.0	0.0
1964	146.1	3.7	2.5	17.6	0.0	0.0	163.7	3.7	2.3
1965	144.2	12.6	8.7	14.3	0.0	0.0	158.5	12.6	7.9
1966	87.3	1.2	1.4	13.5	0.0	0.0	100.8	1.2	1.2
1967	559.0	183.9	32.9	108.4	0.0	0.0	667.4	183.9	27.5
1968	23.5	0.0	0.0	24.6	0.0	0.0	48.1	0.0	0.0
1969	56.4	0.0	0.0	13.1	0.0	0.0	69.5	0.0	0.0
1970	417.4	67.2	16.1	54.8	0.0	0.0	472.2	67.2	14.2
1971	79.8	0.0	0.0	15.1	0.0	0.0	94.9	0.0	0.0
1972	33.3	0.0	0.0	27.2	0.0	0.0	60.5	0.0	0.0
1973	225.6	37.1	16.5	17.0	0.0	0.0	242.6	37.1	15.3
1974	19.8	0.0	0.0	16.1	0.0	0.0	35.9	0.0	0.0
1975	112.6	3.7	3.3	43.6	0.0	0.0	156.2	3.7	2.3
1976	230.9	17.0	7.4	86.0	0.0	0.0	316.9	17.0	5.4
1977	336.2	48.4	14.4	93.9	1.9	2.0	430.1	50.3	11.7
1978	383.9	79.5	20.7	42.0	0.0	0.0	425.9	79.5	18.7
1979	82.6	3.4	4.1	75.5	0.0	0.0	158.1	3.4	2.2
1980	50.2	0.0	0.0	95.2	0.0	0.0	145.4	0.0	0.0
1981	160.4	14.6	9.1	69.0	0.0	0.0	229.4	14.6	6.4
1982	138.4	7.5	5.4	23.4	0.0	0.0	161.8	7.5	4.6
1983	191.3	12.7	6.6	32.1	0.0	0.0	223.4	12.7	5.7
1984	320.5	70.7	22.0	12.2	0.0	0.0	332.7	70.7	21.2
1985	106.8	1.4	1.3	29.3	0.0	0.0	136.1	1.4	1.0
1986	97.7	7.4	7.6	16.2	0.0	0.0	113.9	7.4	6.5
1987	1.8	0.0	0.0	2.5	0.0	0.0	4.3	0.0	0.0
1988	178.2	8.9	5.0	6.6	0.0	0.0	184.8	8.9	4.8
MEAN	187.3	30.1	16.0	38.0	0.2	0.5	225.3	30.2	13.4

Table B.3.4 ANNUAL RUNOFF

Unit : 1000m³

YEAR	KHADEJI DAMSITE	MOL DAMSITE	MALIR RIVER SUPER HIGHWAY	MALIR RIVER NATIONAL HIGHWAY
1929	5,599	6,549	8,571	0
1930	104,233	141,532	209,166	195,480
1931	2,929	3,758	2,670	0
1932	84,732	115,785	176,705	161,084
1933	139,476	187,272	299,817	307,446
1934	35,208	51,339	84,646	60,057
1935	4,985	6,618	6,696	0
1936	8,856	10,731	19,742	1,668
1937	48,911	68,878	111,119	88,482
1938	10,351	11,681	20,658	1,227
1939	2,436	2,946	2,238	0
1940	9,737	10,662	17,885	0
1941	3,577	3,594	3,404	0
1942	68,835	94,712	146,500	122,437
1943	5,435	6,074	6,791	0
1944	186,745	254,560	391,997	424,241
1945	19,405	24,831	46,043	24,399
1946	10,809	12,675	17,453	0
1947	5,841	6,869	7,776	0
1948	3,128	3,568	3,845	0
1949	57,689	85,000	151,416	117,348
1950	10,204	12,303	21,384	5,443
1951	4,787	4,830	5,322	0
1952	28,884	42,250	73,310	57,171
1953	50,630	70,857	112,018	90,841
1954	30,396	43,338	77,484	50,363
1955	13,954	16,891	34,240	18,395
1956	39,865	56,497	104,164	72,213
1957	3,629	4,355	1,443	0
1958	19,535	27,501	54,233	38,517
1959	157,274	215,274	330,385	302,884
1960	9,029	10,567	11,042	0
1961	106,505	154,241	267,201	245,082
1962	39,977	55,590	99,248	58,959
1963	6,178	7,914	6,817	0
1964	14,178	16,658	30,819	7,335
1965	14,887	18,628	40,971	24,952
1966	7,914	9,556	17,626	2,393
1967	160,635	214,246	348,451	364,971
1968	5,875	7,845	6,895	0
1969	4,985	5,746	6,713	0
1970	63,072	91,886	172,800	133,332
1971	7,214	8,338	8,096	0
1972	3,612	4,285	2,998	0
1973	39,779	56,549	93,649	73,682
1974	2,350	2,894	1,365	0
1975	9,055	10,532	21,444	7,284
1976	20,667	25,332	55,581	33,739
1977	75,082	39,709	123,708	99,861
1978	78,132	127,613	196,957	157,870
1979	8,148	16,088	18,179	6,782
1980	6,540	5,711	5,599	0
1981	27,173	13,738	43,952	29,013
1982	10,428	5,417	15,543	14,895
1983	21,228	13,643	39,874	25,177
1984	73,336	115,508	165,715	140,253
1985	11,604	11,068	20,805	2,722
1986	11,388	16,252	32,132	14,731
1987	1,443	1,909	86	0
1988	16,114	19,552	44,807	17,617
MEAN	33,910	44,846	74,137	60,006

Tale B.3.5 CALCULATED RUNOFF CHARACTERISTICS

Unit: 1,000 m³

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
STATION: KHADEJI DAMSITE													Catchment Area : 567 Km² (219mile²)
1929 - 1988													
Mean	322	304	365	277	247	416	18,102	8,542	4,116	552	334	334	33,910
Maximum	994	795	3,888	1,106	700	9,184	134,974	99,498	89,096	4,838	1,486	924	186,745
Minimum	78	69	69	60	60	52	112	95	95	86	78	78	1,443
STATION: MOL DAMSITE													Catchment Area : 596Km² (230mile²)
1929 - 1988													
Mean	390	395	459	332	311	525	23,810	11,562	5,513	714	416	419	44,846
Maximum	1,270	1,037	4,156	950	907	12,286	181,984	135,389	121,971	6,057	1,763	1,158	254,560
Minimum	86	86	78	78	69	69	104	104	104	95	86	86	1,909
STATION: MALIR RIVER AT SUPER HIGHWAY BRIDGE													Catchment Area : 1205Km² (465mile²)
1929 - 1988													
Mean	278	251	422	218	190	692	39,620	21,028	9,903	917	318	300	74,137
Maximum	1,175	916	8,372	907	743	28,339	254,673	205,295	178,433	12,934	4,216	1,417	391,997
Minimum	0	0	0	0	0	0	0	0	0	0	0	0	86
STATION: MALIR RIVER AT NATIONAL HIGHWAY BRIDGE													Catchment Area : 1985Km² (766mile²)
1929 - 1988													
Mean	0	0	0	0	0	63	33,087	18,424	8,145	287	0	0	60,006
Maximum	0	0	0	0	0	3,776	251,752	235,561	176,645	9,824	0	0	424,241
Minimum	0	0	0	0	0	0	0	0	0	0	0	0	0
STATION: KHADEJI RIVER AT SUPER HIGHWAY BRIDGE													Catchment Area : 575 Km² (222mile²)
1929 - 1988													
Mean	326	308	370	281	250	421	18,355	8,662	4,174	560	338	339	34,385
Maximum	1,008	806	3,942	1,121	710	9,313	136,864	100,891	90,343	4,906	1,507	937	189,359
Minimum	79	70	70	61	61	53	114	96	96	88	79	79	1,463

Table B.4.1 MEASUREMENT RESULTS OF SUSPENDED SEDIMENTS

Year	Suspended Sediment		Measured River Discharge		Suspended Sediment *2		Unit Suspended Sediment	
	Khadeji	Malir	Khadeji	Malir	Khadeji	Malir	Khadeji	Malir
	S. Highway 1000 s. ton	S. Highway 1000 s. ton*1	S. Highway MCM	S. Highway MCM	S. Highway 1000 m3	S. Highway 1000 m3	S. Highway m3 / km2	S. Highway m3 / km2
Catchment A.	575 km2	1205 km2	575 km2	1205 km2	575 km2	1205 km2	575 km2	1205 km2
1976	129	291	36.6	58.9	90	203	157	169
1977	239	960	32.9	165.5	167	670	290	556
1978	444	1,330	45.9	177.6	310	928	539	770
1979	1	17	3.5	5.9	1	12	1	10
1980	130	55	11.0	9.8	91	38	158	32
1981	1,750	2,720	62.8	60.0	1,221	1,898	2,124	1,575
1982	260	127	13.5	11.1	181	89	316	74
1983	17	44	18.4	27.2	12	31	21	25
1984	1,620	4,190	70.4	154.1	1,131	2,924	1,966	2,427
1985	161	285	17.0	21.1	112	199	195	165
1986	153	296	9.7	22.5	107	207	186	171
1987 *3	0	0	0.0	0.0	0	0	0	0
1988 *3	0	0	0.0	0.0	0	0	0	0
Average	377	793	22.9	44.5	263	554	458	460
							(Say: 460)	

Source : River and Climatological Data of Malir and Layari River Basins (Ref.04).

Remarks: *1 S.ton means short ton (=2,000 lb.=907kg)

*2 Unit density = 1.3 ton / m3. (Refer to Table B.4.2).

*3 Remained dry throughout the year.

Table B.4.2 DISTRIBUTION OF SUSPENDED LOADS AND ESTIMATE OF COMBINED DENSITY

	Khadeji			Malir S.H.			Unit: %
	Sand	Silt	Clay	Sand	Silt	Clay	
1976	8	40	52	9	44	47	
1977	2	42	56	5	48	47	
1978	3	32	65	4	37	59	
1979	-	-	-	3	61	36	
1980	4	24	72	3	16	81	
1981	3	40	57	3	31	66	
1982	6	30	64	9	29	62	
1983	4	25	71	4	33	63	
1984	-	-	-	6	37	57	
1985	4	42	54	4	37	59	
1986	-	-	-	-	-	-	
Average	4	34	62	5	37	58	
	(25) Bed Load			(25) Bed Load			
Adjusted	23	27	50	24	30	46	

Remarks: Unit density; Sand = 1.5 ton/m³
Silt = 1.3 ton/m³
Clay = 1.1 ton/m³

Say: Combined density = 1.3 ton/m³

Sand is all particles above 0.0625 mm.

Silt is all particles between 0.0625 mm and 0.0055 mm.

Clay is particles smaller than 0.0055 mm.

Source: Ref. 04.

Table B.5.1 MAXIMUM OBSERVED DEPTH

19-22 JULY 1913 Unit : mm

Area		Duration (hour)					
Km2	Mile2	6	12	18	24	30	36
25.9	10.0	264.2	370.8	444.5	468.1	497.1	519.4
129.5	50.0	260.4	362.0	434.3	458.2	487.7	510.5
259.0	100.0	257.8	358.1	429.3	453.1	482.3	502.9
388.5	150.0	254.5	353.6	424.7	448.3	477.0	497.8
518.0	200.0	251.5	349.8	420.4	443.2	472.4	492.8
559.4	216.0	250.4	349.3	419.4	442.5	470.7	491.5
608.7	235.0	248.9	347.5	417.6	440.9	469.4	489.5

Source : "Feasibility Study on Water Resource Development in Malir Basin" (by WAPDA)

2-4 AUGUST 1944 Unit : mm

Area		Duration (hour)							
Km2	Mile2	6	12	18	24	30	36	48	66
25.9	10.0	115.3	200.6	258.3	301.0	330.8	341.5	347.9	350.1
129.5	50.0	108.9	196.4	249.7	292.4	322.3	328.7	333.0	335.1
259.0	100.0	106.7	192.1	243.3	286.0	311.6	318.0	322.3	326.6
1295.0	500.0	102.5	177.2	207.0	249.7	275.3	275.3	277.5	283.9
2590.0	1000.0	91.8	162.2	183.6	211.3	224.1	243.3	245.5	247.6
3367.0	1300.0	85.4	151.5	170.8	198.5	207.0	224.1	228.4	228.4

Source : "Probable Maximum Precipitation Over The Hub, Porali, Gaji, Malir and Baran Basin" (by WAPDA)

29 JUNE 2 JULY 1977 Unit : mm

Area		Duration (hour)					
Km2	Mile2	6	12	18	24	30	72
25.9	10.0	177.0	226.0	234.0	236.0	245.0	290.0
129.5	50.0	158.0	200.0	229.0	230.0	238.0	286.0
259.0	100.0	154.0	204.0	212.0	226.0	235.0	282.0
1295.0	500.0	132.0	181.0	190.0	202.0	208.0	264.0
1885.0	766.0	118.0	170.0	180.0	192.0	196.0	244.0

Table B.5.2 MAXIMIZED TRANSPOSED DEPTH

19-22 JULY 1913

Unit : mm

Area		Duration (hour)					
Km2	Mile2	6	12	18	24	30	36
25.9	10.0	330.2	463.6	555.2	585.2	621.3	649.2
129.5	50.0	325.4	452.4	543.1	572.8	609.6	638.3
259.0	100.0	322.3	447.8	536.7	566.4	603.0	628.7
388.5	150.0	318.3	442.0	530.9	560.3	596.4	622.3
518.0	200.0	314.5	437.1	525.5	554.0	590.6	616.0
559.4	216.0	313.2	436.6	524.3	553.2	588.3	614.4
608.7	235.0	311.2	434.3	522.0	551.2	586.7	611.9

Source : "Feasibility Study on Water Resource Development in Malir Basin" (by WAPDA)

2-4 AUGUST 1944

Unit : mm

Area		Duration (hour)							
Km2	Mile2	6	12	18	24	30	36	48	66
25.9	10.0	137.2	238.8	307.3	358.1	393.7	406.4	414.0	416.6
129.5	50.0	129.5	233.7	297.2	348.0	383.5	391.2	396.2	398.8
259.0	100.0	127.0	228.6	289.6	340.4	370.8	378.5	383.5	388.6
1295.0	500.0	121.9	210.8	246.4	297.2	327.7	327.7	330.2	337.8
2590.0	1000.0	109.2	193.0	218.4	251.5	266.7	289.6	292.1	294.6
3367.0	1300.0	101.6	180.3	203.2	236.2	246.4	266.7	271.8	271.8

Source : "Probable Maximum Precipitation Over The Hub, Porali Gaji, Malir and Baran Basin" (by WAPDA)

29 JUNE 2 JULY 1977

Unit : mm

Area		Duration (hour)					
Km2	Mile2	6	12	18	24	30	72
25.9	10.0	221.3	282.5	292.5	295.0	306.3	362.5
129.5	50.0	197.5	250.0	286.3	287.5	297.5	357.5
259.0	100.0	192.5	255.0	265.0	282.5	293.8	352.5
1295.0	500.0	165.0	226.3	237.5	252.5	260.0	330.0
1885.0	766.0	147.5	212.5	225.0	240.0	245.0	305.0

Table B.5.3 PROBABLE D-A-D VALUE

Khadeji Dam Site								Unit : mm
Item	Return Period (year)							
	PMP	1000	100	50	20	10	5	2
Probable Daily Precipitation	552.5	427.1	263.6	221.3	169.8	133.7	99.4	54.6
Duration (hr)								
6.0	312.5	241.6	149.1	125.2	96.0	75.6	56.2	30.9
12.0	435.7	336.8	207.9	174.5	133.9	105.4	78.4	43.1
18.0	523.4	404.6	249.7	209.6	160.9	126.7	94.2	51.7
24.0	552.5	427.1	263.6	221.3	169.8	133.7	99.4	54.6
30.0	587.7	454.3	280.4	235.7	180.6	142.2	105.7	58.1
36.0	613.5	474.3	292.7	245.7	188.5	148.5	110.4	60.6

Mol Dam Site								Unit : mm
Item	Return Period (year)							
	PMP	1000	100	50	20	10	5	2
Probable Daily Precipitation	551.4	427.1	263.6	221.3	169.8	133.7	99.4	54.6
Duration (hr)								
6.0	311.4	241.2	148.9	125.0	95.9	75.5	56.1	30.8
12.0	434.6	336.6	207.8	174.5	133.8	105.4	78.3	43.0
18.0	522.2	404.5	249.6	209.5	160.8	126.6	94.1	51.7
24.0	551.4	427.1	263.6	221.3	169.8	133.7	99.4	54.6
30.0	586.9	454.6	280.6	235.6	180.7	142.3	105.8	58.1
36.0	612.2	474.2	292.7	245.7	188.5	148.4	110.4	60.6

Table B.5.4 ANNUAL HEAVEST DAILY RAINFALL

			Unit : mm		
YEAR	MONTH	VALUE	YEAR	MONTH	VALUE
1931	July	5.6	1961	Aug.	98.8
1932	July	54.4	1962	Sep.	128.0
1933	July	119.9	1963	Nov.	30.2
1934	July	94.2	1964	July	69.3
1935	Apr.	25.9	1965	July	65.5
1936	June	50.0	1966	July	33.5
1937	July	109.2	1967	July	120.4
1938	July	94.0	1968	Jan.	7.6
1939	Mar.	21.1	1969	July	29.2
1940	Aug.	42.9	1970	July	97.0
1941	July	26.2	1971	Aug.	23.1
1942	July	75.4	1972	June	20.8
1943	July	25.1	1973	July	104.6
1944	Aug.	152.4	1974	Dec.	5.6
1945	July	49.5	1975	Aug.	31.8
1946	Aug.	27.4	1976	July	122.4
1947	Aug.	16.8	1977	July	207.0
1948	July	37.1	1978	Aug.	133.6
1949	Aug.	138.7	1979	Aug.	166.0
1950	July	49.0	1980	*	*
1951	July	39.9	1981	Mar.	47.6
1952	July	49.3	1982	Aug.	74.0
1953	Aug.	129.0	1983	Aug.	38.9
1954	Sep.	75.7	1984	Aug.	113.7
1955	Sep.	87.6	1985	Apr.	37.0
1956	Oct.	55.6	1986	Aug.	25.4
1957	July	16.5	1987	*	*
1958	July	61.7	1988	Aug.	51.0
1959	Sep.	111.8			
1960	July	37.3			
		Maximum	1977	July	207.0
		Minimum	1974	Dec.	5.6

Table B.5.5 CALCULATION FLOOD DISCHARGE BY UNIT HYDROGRAPH (1/9)

KHADEJI DAM SITE

PMP										
Catchment Area : 567Km ² Lap Time : 6.5 hr										
Duration	Rate of Time	Runoff Co-effi- cient	Unit Runoff	D-A-D Values	D-A-D Values	Increment Rainfall		Loss	Ef. Rain- fall	Runoff
(hr)	(%)		(m ³ /sec)	(mm/6hr)	(mm/hr)	(mm)	(mm)	(mm)	(mm)	(m ³ /sec)
1.0	14.3	0.13	1		139.70	139.70	139.70	10.10	129.60	16
2.0	28.6	1.25	12		179.95	40.25	40.25	2.50	37.75	156
3.0	42.9	6.30	59		217.57	37.62	37.62	2.50	35.12	814
4.0	57.1	20.50	192		252.13	34.56	34.56	2.50	32.06	2,759
5.0	71.4	25.00	234		283.85	31.72	31.72	2.50	29.22	4,012
6.0	85.7	26.00	244	312.5	312.50	28.65	28.65	2.50	26.15	4,945
7.0	100.0	21.00	197		338.37	25.87	25.87	2.50	23.37	5,117
8.0	114.3	14.50	136		361.04	22.67	22.67	2.50	20.17	4,858
9.0	128.6	10.10	95		382.23	21.19	21.19	2.50	18.69	4,565
10.0	142.9	8.80	83		401.70	19.47	19.47	2.50	16.97	4,453
11.0	157.1	6.50	61		419.56	17.86	18.42	2.50	15.92	4,150
12.0	171.4	5.40	51	435.7	435.70	16.14	17.86	2.50	15.36	3,914
13.0	185.7	4.50	42		454.12	18.42	16.14	2.50	13.64	3,678
14.0	200.0	3.90	37		470.25	16.14	16.14	2.50	13.64	3,477
15.0	214.3	3.00	28		485.34	15.08	15.08	2.50	12.58	3,250
16.0	228.6	2.60	24		499.19	13.86	13.86	2.50	11.36	3,072
17.0	242.9	2.20	21		511.91	12.72	12.72	2.50	10.22	2,906
18.0	257.1	1.80	17	523.4	523.40	11.49	11.49	2.50	8.99	2,738
19.0	271.4	1.60	15		529.51	6.11	7.39	2.50	4.89	2,586
20.0	285.7	1.30	12		534.87	5.35	6.48	2.50	3.98	2,413
21.0	300.0	1.05	10		539.87	5.01	6.11	2.50	3.61	2,218
22.0	314.3	0.91	9		544.47	4.60	6.05	2.50	3.55	1,988
23.0	328.6	0.80	8		548.69	4.22	5.56	2.50	3.06	1,754
24.0	342.9	0.62	6	552.5	552.50	3.81	5.42	2.50	2.92	1,523
25.0	357.1	0.50	5		559.89	7.39	5.35	2.50	2.85	1,330
26.0	371.4	0.42	4		566.37	6.48	5.10	2.50	2.60	1,177
27.0	385.7	0.37	3		572.42	6.05	5.01	2.50	2.51	1,055
28.0	400.0	0.31	3		577.98	5.56	4.75	2.50	2.25	948
29.0	414.3	0.26	2		583.09	5.10	4.61	2.50	2.11	857
30.0	428.6	0.21	2	587.7	587.70	4.61	4.60	2.50	2.10	778
31.0	442.9	0.70	7		593.12	5.42	4.44	2.50	1.94	772
32.0	457.1	0.14	1		597.87	4.75	4.22	2.50	1.72	663
33.0	471.4	0.13	1		602.30	4.44	4.08	2.50	1.58	609
34.0	485.7	0.11	1		606.38	4.08	3.81	2.50	1.31	560
35.0	500.0	0.08	1		610.12	3.74	3.74	2.50	1.24	512
36.0	514.3	0.05	0	613.5	613.50	3.38	3.38	2.50	0.88	466
37.0										417
38.0										374
39.0										328
40.0										276
41.0										225
42.0										180
43.0										144
44.0										118
45.0										97
46.0										80
47.0										66
48.0										55
49.0										43
50.0										35
51.0										29
52.0										24
53.0										19
54.0										16
55.0										13
56.0										11
57.0										9
58.0										7
59.0										6
60.0										5
61.0										4
62.0										3
63.0										3
64.0										2
65.0										2
66.0										1
67.0										1
68.0										0
69.0										0
70.0										0
71.0										0
72.0										0

Table B.5.5 CALCULATION FLOOD DISCHARGE BY UNIT HYDROGRAPH (2/9)

MOL DAM SITE										
PMP										
Catchment Area : 596Km ² Lag Time : 10.0 hr										
Duration	Rate of Time	Runoff Co-efficient	Unit Runoff	D-A-D Values	D-A-D Values	Increment Rainfall		Loss	Ef. Rain-fall	Runoff
(hr)	(%)		(m ³ /sec)	(mm/6hr)	(mm/hr)	(mm)	(mm)	(mm)	(mm)	(m ³ /sec)
1.0	9.5	0.10	1		139.20	139.20	139.20	10.10	129.10	8
2.0	19.0	0.45	3		179.31	40.11	40.11	2.50	37.61	41
3.0	28.6	1.25	8		216.80	37.49	37.49	2.50	34.99	119
4.0	38.1	5.00	33		251.24	34.44	34.44	2.50	31.94	467
5.0	47.6	14.80	97		282.85	31.61	31.61	2.50	29.11	1,419
6.0	57.1	20.50	135	311.4	311.40	28.55	28.55	2.50	26.05	2,256
7.0	66.7	22.50	148		337.27	25.87	25.87	2.50	23.37	2,893
8.0	76.2	25.20	166		359.94	22.67	22.67	2.50	20.17	3,600
9.0	85.7	25.00	164		381.13	21.19	21.19	2.50	18.69	4,085
10.0	95.2	22.00	145		400.60	19.47	19.47	2.50	16.97	4,280
11.0	104.8	15.25	100		418.46	17.86	18.40	2.50	15.90	4,036
12.0	114.3	14.50	95	434.6	434.60	16.14	17.86	2.50	15.36	4,096
13.0	123.8	12.00	79		453.00	18.40	16.14	2.50	13.64	3,971
14.0	133.3	10.00	66		469.11	16.12	16.12	2.50	13.62	3,818
15.0	142.9	8.80	58		484.18	15.07	15.07	2.50	12.57	3,685
16.0	152.4	7.00	46		498.02	13.84	13.84	2.50	11.34	3,484
17.0	161.9	6.00	39		510.72	12.70	12.70	2.50	10.20	3,319
18.0	171.4	5.40	35	522.2	522.20	11.48	11.48	2.50	8.98	3,182
19.0	181.0	4.90	32		528.33	6.13	7.45	2.50	4.95	3,053
20.0	190.5	4.20	28		533.70	5.37	6.53	2.50	4.03	2,904
21.0	200.0	3.90	26		538.73	5.02	6.13	2.50	3.63	2,775
22.0	209.5	3.30	22		543.34	4.61	6.11	2.50	3.61	2,610
23.0	219.0	2.90	19		547.57	4.23	5.61	2.50	3.11	2,432
24.0	228.6	2.60	17	551.4	551.40	3.83	5.37	2.50	2.87	2,244
25.0	238.1	2.40	16		558.86	7.45	5.31	2.50	2.81	2,063
26.0	247.6	2.10	14		565.39	6.53	5.15	2.50	2.65	1,877
27.0	257.1	1.80	12		571.49	6.11	5.02	2.50	2.52	1,696
28.0	266.7	1.70	11		577.10	5.61	4.66	2.50	2.16	1,546
29.0	276.2	1.50	10		582.25	5.15	4.65	2.50	2.15	1,414
30.0	285.7	1.30	9	586.9	586.90	4.65	4.61	2.50	2.11	1,292
31.0	295.2	1.10	7		592.21	5.31	4.35	2.50	1.85	1,181
32.0	304.8	1.00	7		596.87	4.66	4.23	2.50	1.73	1,086
33.0	314.3	0.91	6		601.22	4.35	4.00	2.50	1.50	1,002
34.0	323.8	0.81	5		605.22	4.00	3.83	2.50	1.33	926
35.0	333.3	0.76	5		608.89	3.67	3.67	2.50	1.17	860
36.0	342.9	0.62	4	612.2	612.20	3.31	3.31	2.50	0.81	791
37.0										683
38.0										618
39.0										556
40.0										495
41.0										436
42.0										378
43.0										325
44.0										276
45.0										233
46.0										196
47.0										166
48.0										140
49.0										118
50.0										99
51.0										83
52.0										69
53.0										58
54.0										48
55.0										41
56.0										35
57.0										29
58.0										25
59.0										21
60.0										17
61.0										14
62.0										12
63.0										10
64.0										8
65.0										6
66.0										5
67.0										3
68.0										2
69.0										2
70.0										1
71.0										0
72.0										0

Table B.5.5 CALCULATION FLOOD DISCHARGE BY UNIT HYDROGRAGH (3/9)

MOL DAM SITE										
1000 Years Return Period										
Catchment Area : 596Km ² Lag Time : 10.0 hr										
Duration	Rate of Time	Runoff Co-efficient	Unit Runoff	D-A-D Values	D-A-D Values	Increment Rainfall		Loss	Ef. Rain-fall	Runoff
(hr)	(%)		(m ³ /sec)	(mm/6hr)	(mm/hr)	(mm)	(mm)	(mm)	(mm)	(m ³ /sec)
1.0	9.5	0.10	1		107.38	107.38	107.38	10.10	97.28	6
2.0	19.0	0.45	3		138.55	31.17	31.17	2.50	28.67	31
3.0	28.6	1.25	8		167.68	29.14	29.14	2.50	26.64	90
4.0	38.1	5.00	33		194.45	26.76	26.76	2.50	24.26	353
5.0	47.6	14.80	97		219.01	24.56	24.56	2.50	22.06	1,071
6.0	57.1	20.50	135	241.2	241.20	22.19	22.19	2.50	19.69	1,704
7.0	66.7	22.50	148		261.23	20.03	20.03	2.50	17.53	2,188
8.0	76.2	25.20	166		278.79	17.55	17.55	2.50	15.05	2,724
9.0	85.7	25.00	164		295.20	16.41	16.41	2.50	13.91	3,092
10.0	95.2	22.00	145		310.27	15.07	15.07	2.50	12.57	3,240
11.0	104.8	15.25	100		324.10	13.83	14.26	2.50	11.76	3,055
12.0	114.3	14.50	95	336.6	336.60	12.50	13.83	2.50	11.33	3,096
13.0	123.8	12.00	79		350.86	14.26	12.50	2.50	10.00	2,998
14.0	133.3	10.00	66		363.35	12.49	12.49	2.50	9.99	2,878
15.0	142.9	8.80	58		375.03	11.68	11.68	2.50	9.18	2,773
16.0	152.4	7.00	46		385.76	10.73	10.73	2.50	8.23	2,616
17.0	161.9	6.00	39		395.61	9.85	9.85	2.50	7.35	2,487
18.0	171.4	5.40	35	404.5	404.50	8.89	8.89	2.50	6.39	2,380
19.0	181.0	4.90	32		409.25	4.75	5.77	2.50	3.27	2,279
20.0	190.5	4.20	28		413.40	4.16	5.06	2.50	2.56	2,162
21.0	200.0	3.90	26		417.29	3.89	4.75	2.50	2.25	2,061
22.0	209.5	3.30	22		420.86	3.57	4.73	2.50	2.23	1,933
23.0	219.0	2.90	19		424.14	3.28	4.35	2.50	1.85	1,795
24.0	228.6	2.60	17	427.1	427.10	2.96	4.16	2.50	1.66	1,648
25.0	238.1	2.40	16		432.88	5.77	4.12	2.50	1.62	1,507
26.0	247.6	2.10	14		437.94	5.06	3.99	2.50	1.49	1,362
27.0	257.1	1.80	12		442.67	4.73	3.89	2.50	1.39	1,222
28.0	266.7	1.70	11		447.01	4.35	3.61	2.50	1.11	1,105
29.0	276.2	1.50	10		451.00	3.99	3.60	2.50	1.10	1,002
30.0	285.7	1.30	9	454.6	454.60	3.60	3.57	2.50	1.07	908
31.0	295.2	1.10	7		458.72	4.12	3.37	2.50	0.87	821
32.0	304.8	1.00	7		462.32	3.61	3.28	2.50	0.78	747
33.0	314.3	0.91	6		465.69	3.37	3.10	2.50	0.60	682
34.0	323.8	0.81	5		468.79	3.10	2.96	2.50	0.46	623
35.0	333.3	0.76	5		471.63	2.84	2.84	2.50	0.34	571
36.0	342.9	0.62	4	474.2	474.20	2.57	2.57	2.50	0.07	518
37.0										435
38.0										385
39.0										337
40.0										292
41.0										252
42.0										215
43.0										182
44.0										153
45.0										129
46.0										109
47.0										91
48.0										76
49.0										64
50.0										53
51.0										43
52.0										35
53.0										29
54.0										23
55.0										19
56.0										16
57.0										14
58.0										11
59.0										9
60.0										8
61.0										6
62.0										5
63.0										4
64.0										3
65.0										2
66.0										2
67.0										1
68.0										1
69.0										0
70.0										0
71.0										0
72.0										0

Table B.5.5 CALCULATION FLOOD DISCHARGE BY UNIT HYDROGRAPH (4/9)

MOL DAM SITE		Catchment Area : 596Km ² Lag Time : 10.0 hr								
100 Years Return Period										
Duration	Rate of Time	Runoff Co-efficient	Unit Runoff	D-A-D Values	D-A-D Values	Increment Rainfall		Loss	Et. Rain-fall	Runoff
(hr)	(%)		(m ³ /sec)	(mm/6hr)	(mm/hr)	(mm)	(mm)	(mm)	(mm)	(m ³ /sec)
1.0	9.5	0.10	1		66.56	66.56	66.56	10.10	56.46	4
2.0	19.0	0.45	3		85.74	19.18	19.18	2.50	16.68	18
3.0	28.6	1.25	8		103.67	17.93	17.93	2.50	15.43	52
4.0	38.1	5.00	33		120.13	16.47	16.47	2.50	13.97	205
5.0	47.6	14.80	97		135.25	15.11	15.11	2.50	12.61	621
6.0	57.1	20.50	135	148.9	148.90	13.65	13.65	2.50	11.15	989
7.0	66.7	22.50	148		161.27	12.37	12.37	2.50	9.87	1269
8.0	76.2	25.20	166		172.11	10.84	10.84	2.50	8.34	1579
9.0	85.7	25.00	164		182.24	10.13	10.13	2.50	7.63	1790
10.0	95.2	22.00	145		191.54	9.31	9.31	2.50	6.81	1872
11.0	104.8	15.25	100		200.08	8.54	8.78	2.50	6.28	1760
12.0	114.3	14.50	95	207.8	207.80	7.72	8.54	2.50	6.04	1778
13.0	123.8	12.00	79		216.58	8.78	7.72	2.50	5.22	1714
14.0	133.3	10.00	66		224.27	7.69	7.69	2.50	5.19	1638
15.0	142.9	8.80	58		231.46	7.19	7.19	2.50	4.69	1570
16.0	152.4	7.00	46		238.06	6.60	6.60	2.50	4.10	1472
17.0	161.9	6.00	39		244.12	6.06	6.06	2.50	3.56	1390
18.0	171.4	5.40	35	249.6	249.60	5.48	5.48	2.50	2.98	1322
19.0	181.0	4.90	32		252.54	2.94	3.57	2.50	1.07	1257
20.0	190.5	4.20	28		255.12	2.58	3.13	2.50	0.63	1184
21.0	200.0	3.90	26		257.52	2.41	2.94	2.50	0.44	1120
22.0	209.5	3.30	22		259.74	2.21	2.92	2.50	0.42	1039
23.0	219.0	2.90	19		261.77	2.03	2.69	2.50	0.19	953
24.0	228.6	2.60	17	263.6	263.60	1.83	2.58	2.50	0.08	862
25.0	238.1	2.40	16		267.17	3.57	2.54	2.50	0.04	774
26.0	247.6	2.10	14		270.30	3.13	2.46	2.50	0.00	684
27.0	257.1	1.80	12		273.22	2.92	2.41	2.50	0.00	597
28.0	266.7	1.70	11		275.91	2.69	2.23	2.50	0.00	524
29.0	276.2	1.50	10		278.37	2.46	2.23	2.50	0.00	461
30.0	285.7	1.30	9	280.6	280.60	2.23	2.21	2.50	0.00	403
31.0	295.2	1.10	7		283.14	2.54	2.08	2.50	0.00	351
32.0	304.8	1.00	7		285.37	2.23	2.03	2.50	0.00	308
33.0	314.3	0.91	6		287.45	2.08	1.91	2.50	0.00	271
34.0	323.8	0.81	5		289.36	1.91	1.83	2.50	0.00	239
35.0	333.3	0.76	5		291.11	1.75	1.75	2.50	0.00	213
36.0	342.9	0.62	4	292.7	292.70	1.59	1.59	2.50	0.00	187
37.0										145
38.0										123
39.0										103
40.0										87
41.0										72
42.0										60
43.0										50
44.0										41
45.0										34
46.0										27
47.0										22
48.0										17
49.0										13
50.0										10
51.0										7
52.0										5
53.0										3
54.0										1
55.0										1
56.0										1
57.0										0
58.0										0
59.0										0
60.0										0
61.0										0
62.0										0
63.0										0
64.0										0
65.0										0
66.0										0
67.0										0
68.0										0
69.0										0
70.0										0
71.0										0
72.0										0

Table B.5.5 CALCULATION FLOOD DISCHARGE BY UNIT HYDROGRAGH (5/9)

MOL DAM SITE

50 Years Return Period

Catchment Area : 596Km² Lag Time : 10.0 hr

Duration (hr)	Rate of Time (%)	Runoff Co-effi- cient	Unit Runoff (m3/sec)	D-A-D		Increment Rainfall		Loss (mm)	Ef. Rain- fall (mm)	Runoff (m3/sec)
				Values (mm/6hr)	Values (mm/hr)	(mm)	(mm)			
1.0	9.5	0.10	1		56.00	56.00	56.00	10.10	45.90	3
2.0	19.0	0.45	3		72.07	16.07	16.07	2.50	13.57	14
3.0	28.6	1.25	8		87.09	15.02	15.02	2.50	12.52	43
4.0	38.1	5.00	33		100.89	13.80	13.80	2.50	11.30	166
5.0	47.6	14.80	97		113.56	12.66	12.66	2.50	10.16	505
6.0	57.1	20.50	135	125.0	125.00	11.44	11.44	2.50	8.94	804
7.0	66.7	22.50	148		135.40	10.39	10.39	2.50	7.89	1,032
8.0	76.2	25.20	166		144.50	9.11	9.11	2.50	6.61	1,283
9.0	85.7	25.00	164		153.02	8.51	8.51	2.50	6.01	1,453
10.0	95.2	22.00	145		160.84	7.82	7.82	2.50	5.32	1,518
11.0	104.8	15.25	100		168.02	7.18	7.35	2.50	4.85	1,425
12.0	114.3	14.50	95	174.5	174.50	6.48	7.18	2.50	4.68	1,437
13.0	123.8	12.00	79		181.85	7.35	6.48	2.50	3.98	1,382
14.0	133.3	10.00	66		188.29	6.44	6.44	2.50	3.94	1,317
15.0	142.9	8.80	58		194.31	6.02	6.02	2.50	3.52	1,259
16.0	152.4	7.00	46		199.84	5.53	5.53	2.50	3.03	1,177
17.0	161.9	6.00	39		204.92	5.07	5.07	2.50	2.57	1,107
18.0	171.4	5.40	35	209.5	209.50	4.59	4.59	2.50	2.09	1,049
19.0	181.0	4.90	32		211.98	2.48	3.00	2.50	0.50	993
20.0	190.5	4.20	28		214.15	2.17	2.63	2.50	0.13	931
21.0	200.0	3.90	26		216.18	2.03	2.48	2.50	0.00	876
22.0	209.5	3.30	22		218.04	1.86	2.46	2.50	0.00	808
23.0	219.0	2.90	19		219.75	1.71	2.26	2.50	0.00	735
24.0	228.6	2.60	17	221.3	221.30	1.55	2.17	2.50	0.00	658
25.0	238.1	2.40	16		224.30	3.00	2.12	2.50	0.00	584
26.0	247.6	2.10	14		226.93	2.63	2.07	2.50	0.00	510
27.0	257.1	1.80	12		229.39	2.46	2.03	2.50	0.00	440
28.0	266.7	1.70	11		231.65	2.26	1.87	2.50	0.00	383
29.0	276.2	1.50	10		233.73	2.07	1.86	2.50	0.00	335
30.0	285.7	1.30	9	235.6	235.60	1.87	1.86	2.50	0.00	292
31.0	295.2	1.10	7		237.72	2.12	1.74	2.50	0.00	255
32.0	304.8	1.00	7		239.58	1.86	1.71	2.50	0.00	224
33.0	314.3	0.91	6		241.32	1.74	1.60	2.50	0.00	198
34.0	323.8	0.81	5		242.91	1.60	1.55	2.50	0.00	176
35.0	333.3	0.76	5		244.38	1.46	1.46	2.50	0.00	157
36.0	342.9	0.62	4	245.7	245.70	1.32	1.32	2.50	0.00	138
37.0										106
38.0										89
39.0										74
40.0										62
41.0										51
42.0										42
43.0										35
44.0										28
45.0										23
46.0										18
47.0										14
48.0										11
49.0										8
50.0										6
51.0										4
52.0										2
53.0										1
54.0										0
55.0										0
56.0										0
57.0										0
58.0										0
59.0										0
60.0										0
61.0										0
62.0										0
63.0										0
64.0										0
65.0										0
66.0										0
67.0										0
68.0										0
69.0										0
70.0										0
71.0										0
72.0										0

Table B.5.5 CALCULATION FLOOD DISCHARGE BY UNIT HYDROGRAGH (6/9)

MOL DAM SITE			Catchment Area : 596Km ² Lag Time : 10.0 hr							
20 Years Return Period										
Duration	Rate of Time	Runoff Co-eff- cient	Unit Runoff	D-A-D Values	D-A-D Values	Increment Rainfall		Loss	Ef. Rain- fall	Runoff
(hr)	(%)		(m3/sec)	(mm/6hr)	(mm/hr)	(mm)	(mm)	(mm)	(mm)	(m3/sec)
1.0	9.5	0.10	1		42.87	42.87	42.87	10.10	32.77	2
2.0	19.0	0.45	3		55.22	12.35	12.35	2.50	9.85	10
3.0	28.6	1.25	8		66.77	11.55	11.55	2.50	9.05	30
4.0	38.1	5.00	33		77.37	10.61	10.61	2.50	8.11	119
5.0	47.6	14.80	97		87.11	9.73	9.73	2.50	7.23	361
6.0	57.1	20.50	135	95.9	95.90	8.79	8.79	2.50	6.29	576
7.0	66.7	22.50	148		103.86	7.96	7.96	2.50	5.46	740
8.0	76.2	25.20	166		110.83	6.97	6.97	2.50	4.47	920
9.0	85.7	25.00	164		117.35	6.52	6.52	2.50	4.02	1,041
10.0	95.2	22.00	145		123.34	5.99	5.99	2.50	3.49	1,087
11.0	104.8	15.25	100		128.84	5.50	5.67	2.50	3.17	1,017
12.0	114.3	14.50	95	133.8	133.80	4.96	5.50	2.50	3.00	1,022
13.0	123.8	12.00	79		139.47	5.67	4.97	2.50	2.47	978
14.0	133.3	10.00	66		144.44	4.97	4.96	2.50	2.46	927
15.0	142.9	8.80	58		149.08	4.64	4.64	2.50	2.14	880
16.0	152.4	7.00	46		153.35	4.27	4.27	2.50	1.77	816
17.0	161.9	6.00	39		157.26	3.91	3.91	2.50	1.41	762
18.0	171.4	5.40	35	160.8	160.80	3.54	3.54	2.50	1.04	716
19.0	181.0	4.90	32		162.69	1.89	2.29	2.50	0.00	672
20.0	190.5	4.20	28		164.35	1.66	2.01	2.50	0.00	624
21.0	200.0	3.90	26		165.89	1.55	1.89	2.50	0.00	581
22.0	209.5	3.30	22		167.32	1.42	1.87	2.50	0.00	530
23.0	219.0	2.90	19		168.62	1.31	1.72	2.50	0.00	476
24.0	228.6	2.60	17	169.8	169.80	1.18	1.66	2.50	0.00	422
25.0	238.1	2.40	16		172.09	2.29	1.64	2.50	0.00	373
26.0	247.6	2.10	14		174.09	2.01	1.58	2.50	0.00	324
27.0	257.1	1.80	12		175.97	1.87	1.55	2.50	0.00	279
28.0	266.7	1.70	11		177.69	1.72	1.44	2.50	0.00	244
29.0	276.2	1.50	10		179.27	1.58	1.43	2.50	0.00	214
30.0	285.7	1.30	9	180.7	180.70	1.43	1.42	2.50	0.00	187
31.0	295.2	1.10	7		182.34	1.64	1.34	2.50	0.00	163
32.0	304.8	1.00	7		183.77	1.44	1.31	2.50	0.00	144
33.0	314.3	0.91	6		185.11	1.34	1.23	2.50	0.00	128
34.0	323.8	0.81	5		186.35	1.23	1.18	2.50	0.00	113
35.0	333.3	0.76	5		187.48	1.13	1.13	2.50	0.00	102
36.0	342.9	0.62	4	188.5	188.50	1.02	1.02	2.50	0.00	89
37.0										67
38.0										56
39.0										46
40.0										38
41.0										31
42.0										26
43.0										21
44.0										17
45.0										13
46.0										10
47.0										8
48.0										6
49.0										5
50.0										3
51.0										2
52.0										1
53.0										0
54.0										0
55.0										0
56.0										0
57.0										0
58.0										0
59.0										0
60.0										0
61.0										0
62.0										0
63.0										0
64.0										0
65.0										0
66.0										0
67.0										0
68.0										0
69.0										0
70.0										0
71.0										0
72.0										0

Table B.5.5 CALCULATION FLOOD DISCHARGE BY UNIT HYDROGRAGH (7/9)

MOL DAM SITE

10 Years Return Period		Catchment Area : 596Km ² Lag Time : 10.0 hr							Less	Et.	Runoff
Duration	Rate of Time	Runoff Co-efficient	Unit Runoff	D-A-D Values	D-A-D Values	Increment Rainfall			Rain-fall		
(hr)	(%)		(m3/sec)	(mm/6hr)	(mm/hr)	(mm)	(mm)	(mm)	(mm)	(m3/sec)	
1.0	9.5	0.10	1		33.92	33.92	33.92	10.10	23.82	2	
2.0	19.0	0.45	3		43.60	9.68	9.68	2.50	7.18	8	
3.0	28.6	1.25	8		52.66	9.05	9.05	2.50	6.55	22	
4.0	38.1	5.00	33		60.97	8.32	8.32	2.50	5.82	86	
5.0	47.6	14.80	97		68.61	7.63	7.63	2.50	5.13	263	
6.0	57.1	20.50	135	75.5	75.50	6.89	6.89	2.50	4.39	419	
7.0	66.7	22.50	148		81.78	6.28	6.28	2.50	3.78	537	
8.0	76.2	25.20	166		87.28	5.50	5.50	2.50	3.00	667	
9.0	85.7	25.00	164		92.42	5.14	5.14	2.50	2.64	754	
10.0	95.2	22.00	145		97.15	4.72	4.72	2.50	2.22	784	
11.0	104.8	15.25	100		101.48	4.34	4.45	2.50	1.95	731	
12.0	114.3	14.50	95	105.4	105.40	3.92	4.34	2.50	1.84	730	
13.0	123.8	12.00	79		109.85	4.45	3.92	2.50	1.42	695	
14.0	133.3	10.00	66		113.75	3.90	3.90	2.50	1.40	653	
15.0	142.9	8.80	58		117.40	3.65	3.65	2.50	1.15	614	
16.0	152.4	7.00	46		120.75	3.35	3.35	2.50	0.85	564	
17.0	161.9	6.00	39		123.82	3.07	3.07	2.50	0.57	520	
18.0	171.4	5.40	35	126.6	126.60	2.78	2.78	2.50	0.28	483	
19.0	181.0	4.90	32		128.09	1.49	1.81	2.50	0.00	447	
20.0	190.5	4.20	28		129.40	1.31	1.58	2.50	0.00	408	
21.0	200.0	3.90	26		130.62	1.22	1.49	2.50	0.00	374	
22.0	209.5	3.30	22		131.74	1.12	1.48	2.50	0.00	334	
23.0	219.0	2.90	19		132.77	1.03	1.36	2.50	0.00	297	
24.0	228.6	2.60	17	133.7	133.70	0.93	1.31	2.50	0.00	261	
25.0	238.1	2.40	16		135.51	1.81	1.28	2.50	0.00	229	
26.0	247.6	2.10	14		137.09	1.58	1.25	2.50	0.00	199	
27.0	257.1	1.80	12		138.57	1.48	1.22	2.50	0.00	172	
28.0	266.7	1.70	11		139.93	1.36	1.13	2.50	0.00	152	
29.0	276.2	1.50	10		141.17	1.25	1.12	2.50	0.00	134	
30.0	285.7	1.30	9	142.3	142.30	1.13	1.12	2.50	0.00	117	
31.0	295.2	1.10	7		143.58	1.28	1.05	2.50	0.00	103	
32.0	304.8	1.00	7		144.70	1.12	1.03	2.50	0.00	91	
33.0	314.3	0.91	6		145.75	1.05	0.96	2.50	0.00	81	
34.0	323.8	0.81	5		146.72	0.96	0.93	2.50	0.00	72	
35.0	333.3	0.76	5		147.60	0.88	0.88	2.50	0.00	64	
36.0	342.9	0.62	4	148.4	148.40	0.80	0.80	2.50	0.00	56	
37.0										41	
38.0										34	
39.0										28	
40.0										23	
41.0										18	
42.0										14	
43.0										11	
44.0										9	
45.0										7	
46.0										5	
47.0										4	
48.0										3	
49.0										2	
50.0										1	
51.0										1	
52.0										0	
53.0										0	
54.0										0	
55.0										0	
56.0										0	
57.0										0	
58.0										0	
59.0										0	
60.0										0	
61.0										0	
62.0										0	
63.0										0	
64.0										0	
65.0										0	
66.0										0	
67.0										0	
68.0										0	
69.0										0	
70.0										0	
71.0										0	
72.0										0	

Table B.5.5 CALCULATION FLOOD DISCHARGE BY UNIT HYDROGRAGH (8/9)

MOL DAM SITE

5 Years Return Period

Catchment Area : 596Km² Lag Time : 10.0 hr

Duration (hr)	Rate of Time (%)	Runoff Co-effi- cient	Unit Runoff (m ³ /sec)	D-A-D Values (mm/6hr)	D-A-D Values (mm/hr)	Increment Rainfall		Loss (mm)	Ef. Rain- fall (mm)	Runoff (m ³ /sec)
						(mm)	(mm)			
1.0	9.5	0.10	1		33.93	25.08	25.08	10.10	14.98	1
2.0	19.0	0.45	3		39.09	5.16	5.17	2.50	2.67	5
3.0	28.6	1.25	8		43.92	4.83	4.83	2.50	2.33	13
4.0	38.1	5.00	33		48.35	4.43	4.66	2.50	2.16	52
5.0	47.6	14.80	97		52.42	4.07	4.44	2.50	1.94	157
6.0	57.1	20.50	135	56.1	56.10	3.68	4.08	2.50	1.58	238
7.0	66.7	22.50	148		60.76	4.66	4.07	2.50	1.57	289
8.0	76.2	25.20	166		64.85	4.08	3.82	2.50	1.32	348
9.0	85.7	25.00	164		68.67	3.82	3.68	2.50	1.18	380
10.0	95.2	22.00	145		72.17	3.51	3.51	2.50	1.01	379
11.0	104.8	15.25	100		75.39	3.22	3.32	2.50	0.82	334
12.0	114.3	14.50	95	78.3	78.30	2.91	3.22	2.50	0.72	333
13.0	123.8	12.00	79		81.62	3.32	2.91	2.50	0.41	313
14.0	133.3	10.00	66		84.53	2.91	2.91	2.50	0.41	292
15.0	142.9	8.80	58		87.24	2.72	2.72	2.50	0.22	275
16.0	152.4	7.00	46		89.74	2.50	2.50	2.50	0.00	249
17.0	161.9	6.00	39		92.03	2.29	2.29	2.50	0.00	227
18.0	171.4	5.40	35	94.1	94.10	2.07	2.07	2.50	0.00	208
19.0	181.0	4.90	32		95.21	1.11	1.34	2.50	0.00	189
20.0	190.5	4.20	28		96.19	0.98	1.18	2.50	0.00	166
21.0	200.0	3.90	26		97.10	0.91	1.11	2.50	0.00	148
22.0	209.5	3.30	22		97.94	0.84	1.10	2.50	0.00	128
23.0	219.0	2.90	19		98.71	0.77	1.01	2.50	0.00	111
24.0	228.6	2.60	17	99.4	99.40	0.69	0.98	2.50	0.00	96
25.0	238.1	2.40	16		100.74	1.34	0.97	2.50	0.00	84
26.0	247.6	2.10	14		101.92	1.18	0.93	2.50	0.00	74
27.0	257.1	1.80	12		103.02	1.10	0.91	2.50	0.00	64
28.0	266.7	1.70	11		104.03	1.01	0.85	2.50	0.00	58
29.0	276.2	1.50	10		104.96	0.93	0.84	2.50	0.00	51
30.0	285.7	1.30	9	105.8	105.80	0.84	0.84	2.50	0.00	45
31.0	295.2	1.10	7		106.77	0.97	0.79	2.50	0.00	39
32.0	304.8	1.00	7		107.61	0.85	0.77	2.50	0.00	35
33.0	314.3	0.91	6		108.40	0.79	0.73	2.50	0.00	31
34.0	323.8	0.81	5		109.13	0.73	0.69	2.50	0.00	28
35.0	333.3	0.76	5		109.80	0.67	0.67	2.50	0.00	25
36.0	342.9	0.62	4	110.4	110.40	0.60	0.60	2.50	0.00	22
37.0										14
38.0										11
39.0										9
40.0										7
41.0										6
42.0										5
43.0										3
44.0										3
45.0										2
46.0										1
47.0										1
48.0										0
49.0										0
50.0										0
51.0										0
52.0										0
53.0										0
54.0										0
55.0										0
56.0										0
57.0										0
58.0										0
59.0										0
60.0										0
61.0										0
62.0										0
63.0										0
64.0										0
65.0										0
66.0										0
67.0										0
68.0										0
69.0										0
70.0										0
71.0										0
72.0										0

Table B.5.5 CALCULATION FLOOD DISCHARGE BY UNIT HYDROGRAGH (9/9)

MOL DAM SITE										
2 Years Return Period										
Catchment Area : 596Km ² Lag Time : 10.0 hr										
Duration	Rate of Time	Runoff Co-efficient	Unit Runoff	D-A-D Values	D-A-D Values	Increment Rainfall		Loss	Ef. Rain-fall	Runoff
(hr)	(%)		(m ³ /sec)	(mm/6hr)	(mm/hr)	(mm)	(mm)	(mm)	(mm)	(m ³ /sec)
1.0	9.5	0.10	1		13.77	13.77	13.77	10.10	3.67	0
2.0	19.0	0.45	3		17.74	3.97	3.97	2.50	1.47	1
3.0	28.6	1.25	8		21.44	3.71	3.71	2.50	1.21	4
4.0	38.1	5.00	33		24.85	3.41	3.41	2.50	0.91	14
5.0	47.6	14.80	97		27.98	3.13	3.13	2.50	0.63	42
6.0	57.1	20.50	135	30.8	30.80	2.82	2.82	2.50	0.32	69
7.0	66.7	22.50	148		33.36	2.56	2.56	2.50	0.06	89
8.0	76.2	25.20	166		35.61	2.24	2.24	2.50	0.00	110
9.0	85.7	25.00	164		37.71	2.10	2.10	2.50	0.00	122
10.0	95.2	22.00	145		39.63	1.93	1.93	2.50	0.00	122
11.0	104.8	15.25	100		41.40	1.77	1.83	2.50	0.00	107
12.0	114.3	14.50	95	43.0	43.00	1.60	1.77	2.50	0.00	98
13.0	123.8	12.00	79		44.83	1.83	1.60	2.50	0.00	85
14.0	133.3	10.00	66		46.43	1.60	1.60	2.50	0.00	72
15.0	142.9	8.80	58		47.92	1.50	1.50	2.50	0.00	61
16.0	152.4	7.00	46		49.30	1.37	1.37	2.50	0.00	51
17.0	161.9	6.00	39		50.56	1.26	1.26	2.50	0.00	43
18.0	171.4	5.40	35	51.7	51.70	1.14	1.14	2.50	0.00	37
19.0	181.0	4.90	32		52.31	0.61	0.74	2.50	0.00	32
20.0	190.5	4.20	28		52.84	0.53	0.64	2.50	0.00	28
21.0	200.0	3.90	26		53.34	0.50	0.61	2.50	0.00	25
22.0	209.5	3.30	22		53.80	0.46	0.60	2.50	0.00	22
23.0	219.0	2.90	19		54.22	0.42	0.55	2.50	0.00	19
24.0	228.6	2.60	17	54.6	54.60	0.38	0.53	2.50	0.00	17
25.0	238.1	2.40	16		55.34	0.74	0.53	2.50	0.00	15
26.0	247.6	2.10	14		55.98	0.64	0.51	2.50	0.00	14
27.0	257.1	1.80	12		56.58	0.60	0.50	2.50	0.00	12
28.0	266.7	1.70	11		57.13	0.55	0.46	2.50	0.00	11
29.0	276.2	1.50	10		57.64	0.51	0.46	2.50	0.00	10
30.0	285.7	1.30	9	58.1	58.10	0.46	0.46	2.50	0.00	8
31.0	295.2	1.10	7		58.63	0.53	0.43	2.50	0.00	7
32.0	304.8	1.00	7		59.09	0.46	0.42	2.50	0.00	7
33.0	314.3	0.91	6		59.52	0.43	0.40	2.50	0.00	6
34.0	323.8	0.81	5		59.91	0.40	0.38	2.50	0.00	5
35.0	333.3	0.76	5		60.27	0.36	0.36	2.50	0.00	5
36.0	342.9	0.62	4	60.6	60.60	0.33	0.33	2.50	0.00	4
37.0										2
38.0										2
39.0										1
40.0										0
41.0										0
42.0										0
43.0										0
44.0										0
45.0										0
46.0										0
47.0										0
48.0										0
49.0										0
50.0										0
51.0										0
52.0										0
53.0										0
54.0										0
55.0										0
56.0										0
57.0										0
58.0										0
59.0										0
60.0										0
61.0										0
62.0										0
63.0										0
64.0										0
65.0										0
66.0										0
67.0										0
68.0										0
69.0										0
70.0										0
71.0										0
72.0										0

Table B.5.6 PROBABLE MAXIMUM FLOOD (1/2)

Khadeji Dam Site (567Km2)		Unit: m3/sec							
Duration (hr)	Return Period (Year)								
	PMP	1,000	100	50	20	10	5	2	
1.0	16	12	7	6	4	3	2	0	
2.0	156	118	68	55	40	29	18	5	
3.0	814	615	355	289	207	149	95	24	
4.0	2,759	2,085	1,205	979	701	507	322	82	
5.0	4,012	3,033	1,756	1,426	1,023	741	473	124	
6.0	4,945	3,739	2,166	1,760	1,262	915	585	155	
7.0	5,117	3,869	2,240	1,820	1,306	946	605	160	
8.0	4,858	3,672	2,123	1,723	1,235	893	569	145	
9.0	4,565	3,446	1,987	1,610	1,150	828	522	123	
10.0	4,453	3,357	1,928	1,558	1,108	792	493	104	
11.0	4,150	3,123	1,784	1,437	1,016	720	440	81	
12.0	3,914	2,939	1,669	1,340	940	659	393	63	
13.0	3,678	2,756	1,555	1,243	865	599	348	50	
14.0	3,477	2,599	1,456	1,159	800	547	308	41	
15.0	3,250	2,424	1,347	1,068	730	492	266	33	
16.0	3,072	2,285	1,260	994	673	446	232	27	
17.0	2,905	2,156	1,180	927	621	405	200	23	
18.0	2,738	2,027	1,099	859	568	363	169	19	
19.0	2,586	1,909	1,025	796	520	325	141	16	
20.0	2,413	1,774	942	726	466	283	115	13	
21.0	2,218	1,623	848	648	407	240	93	11	
22.0	1,988	1,446	738	557	342	199	77	9	
23.0	1,754	1,265	626	464	281	163	64	8	
24.0	1,523	1,086	516	373	224	131	53	7	
25.0	1,330	937	424	299	180	106	44	5	
26.0	1,177	818	351	242	147	88	36	4	
27.0	1,055	724	292	200	123	73	31	4	
28.0	948	641	242	165	102	61	26	3	
29.0	857	571	200	137	85	51	21	3	
30.0	778	510	166	115	71	42	18	2	
31.0	772	504	165	118	75	47	22	4	
32.0	663	421	122	86	54	33	15	2	
33.0	609	379	103	73	46	28	13	2	
34.0	560	341	87	62	39	24	11	2	
35.0	512	304	73	52	32	20	9	1	
36.0	466	268	60	43	27	16	7	1	
37.0	417	231	48	34	21	12	5	0	
38.0	374	198	39	27	17	10	4	0	
39.0	328	167	32	22	14	8	3	0	
40.0	276	137	26	18	11	6	2	0	
41.0	225	111	21	15	9	5	2	0	
42.0	180	90	17	12	7	4	1	0	
43.0	144	73	14	10	6	3	1	0	
44.0	118	60	12	8	5	3	1	0	
45.0	97	50	10	6	4	2	0	0	
46.0	80	41	8	5	3	1	0	0	
47.0	66	34	6	4	2	1	0	0	
48.0	55	28	5	3	2	1	0	0	
49.0	43	21	3	2	1	0	0	0	
50.0	35	17	2	1	1	0	0	0	
51.0	29	14	1	1	0	0	0	0	
52.0	24	11	1	0	0	0	0	0	
53.0	19	9	1	0	0	0	0	0	
54.0	16	7	0	0	0	0	0	0	
55.0	13	6	0	0	0	0	0	0	
56.0	11	5	0	0	0	0	0	0	
57.0	9	4	0	0	0	0	0	0	
58.0	7	3	0	0	0	0	0	0	
59.0	6	3	0	0	0	0	0	0	
60.0	5	2	0	0	0	0	0	0	
61.0	4	2	0	0	0	0	0	0	
62.0	3	1	0	0	0	0	0	0	
63.0	3	1	0	0	0	0	0	0	
64.0	2	1	0	0	0	0	0	0	
65.0	2	1	0	0	0	0	0	0	
66.0	1	0	0	0	0	0	0	0	
67.0	1	0	0	0	0	0	0	0	
68.0	0	0	0	0	0	0	0	0	
69.0	0	0	0	0	0	0	0	0	
70.0	0	0	0	0	0	0	0	0	
71.0	0	0	0	0	0	0	0	0	
72.0	0	0	0	0	0	0	0	0	

Table B.5.6 PROBABLE MAXIMUM FLOOD (2/2)

Mol Dam Site (567Km2)		Return Period (Year)							Unit: m3/sec
Duration (hr)	PMP	1,000	100	50	20	10	5	2	
1.0	8	6	4	3	2	2	1	0	
2.0	41	31	18	14	10	8	5	1	
3.0	119	90	52	43	30	22	13	4	
4.0	467	353	205	166	119	86	52	14	
5.0	1,419	1,071	621	505	361	263	157	42	
6.0	2,256	1,704	989	804	576	419	238	69	
7.0	2,893	2,188	1,269	1,032	740	537	289	89	
8.0	3,600	2,724	1,579	1,283	920	667	348	110	
9.0	4,085	3,092	1,790	1,453	1,041	754	380	122	
10.0	4,280	3,240	1,872	1,518	1,087	784	379	122	
11.0	4,036	3,055	1,760	1,425	1,017	731	334	107	
12.0	4,096	3,096	1,778	1,437	1,022	730	333	98	
13.0	3,971	2,998	1,714	1,382	978	695	313	85	
14.0	3,818	2,878	1,638	1,317	927	653	292	72	
15.0	3,685	2,773	1,570	1,259	880	614	275	61	
16.0	3,484	2,616	1,472	1,177	816	564	249	51	
17.0	3,319	2,487	1,390	1,107	762	520	227	43	
18.0	3,182	2,380	1,322	1,049	716	483	208	37	
19.0	3,053	2,279	1,257	993	672	447	189	32	
20.0	2,904	2,162	1,184	931	624	408	166	28	
21.0	2,775	2,061	1,120	876	581	374	148	25	
22.0	2,610	1,933	1,039	808	530	334	128	22	
23.0	2,432	1,795	953	735	476	297	111	19	
24.0	2,244	1,648	862	658	422	261	96	17	
25.0	2,063	1,507	774	584	373	229	84	15	
26.0	1,877	1,362	684	510	324	199	74	14	
27.0	1,696	1,222	597	440	279	172	64	12	
28.0	1,546	1,105	524	383	244	152	58	11	
29.0	1,414	1,002	461	335	214	134	51	10	
30.0	1,292	908	403	292	187	117	45	8	
31.0	1,181	821	351	255	163	103	39	7	
32.0	1,086	747	308	224	144	91	35	7	
33.0	1,002	682	271	198	128	81	31	6	
34.0	926	623	239	176	113	72	28	5	
35.0	860	571	213	157	102	64	25	5	
36.0	791	518	187	138	89	56	22	4	
37.0	683	435	145	106	67	41	14	2	
38.0	618	385	123	89	56	34	11	2	
39.0	556	337	103	74	46	28	9	1	
40.0	495	292	87	62	38	23	7	0	
41.0	436	252	72	51	31	18	6	0	
42.0	378	215	60	42	26	14	5	0	
43.0	325	182	50	35	21	11	3	0	
44.0	276	153	41	28	17	9	3	0	
45.0	233	129	34	23	13	7	2	0	
46.0	196	109	27	18	10	5	1	0	
47.0	166	91	22	14	8	4	1	0	
48.0	140	76	17	11	6	3	0	0	
49.0	118	64	13	8	5	2	0	0	
50.0	99	53	10	6	3	1	0	0	
51.0	83	43	7	4	2	1	0	0	
52.0	69	35	5	2	1	0	0	0	
53.0	58	29	3	1	0	0	0	0	
54.0	48	23	1	0	0	0	0	0	
55.0	41	19	1	0	0	0	0	0	
56.0	35	16	1	0	0	0	0	0	
57.0	29	14	0	0	0	0	0	0	
58.0	25	11	0	0	0	0	0	0	
59.0	21	9	0	0	0	0	0	0	
60.0	17	8	0	0	0	0	0	0	
61.0	14	6	0	0	0	0	0	0	
62.0	12	5	0	0	0	0	0	0	
63.0	10	4	0	0	0	0	0	0	
64.0	8	3	0	0	0	0	0	0	
65.0	6	2	0	0	0	0	0	0	
66.0	5	2	0	0	0	0	0	0	
67.0	3	1	0	0	0	0	0	0	
68.0	2	1	0	0	0	0	0	0	
69.0	2	0	0	0	0	0	0	0	
70.0	1	0	0	0	0	0	0	0	
71.0	0	0	0	0	0	0	0	0	
72.0	0	0	0	0	0	0	0	0	

FIGURES

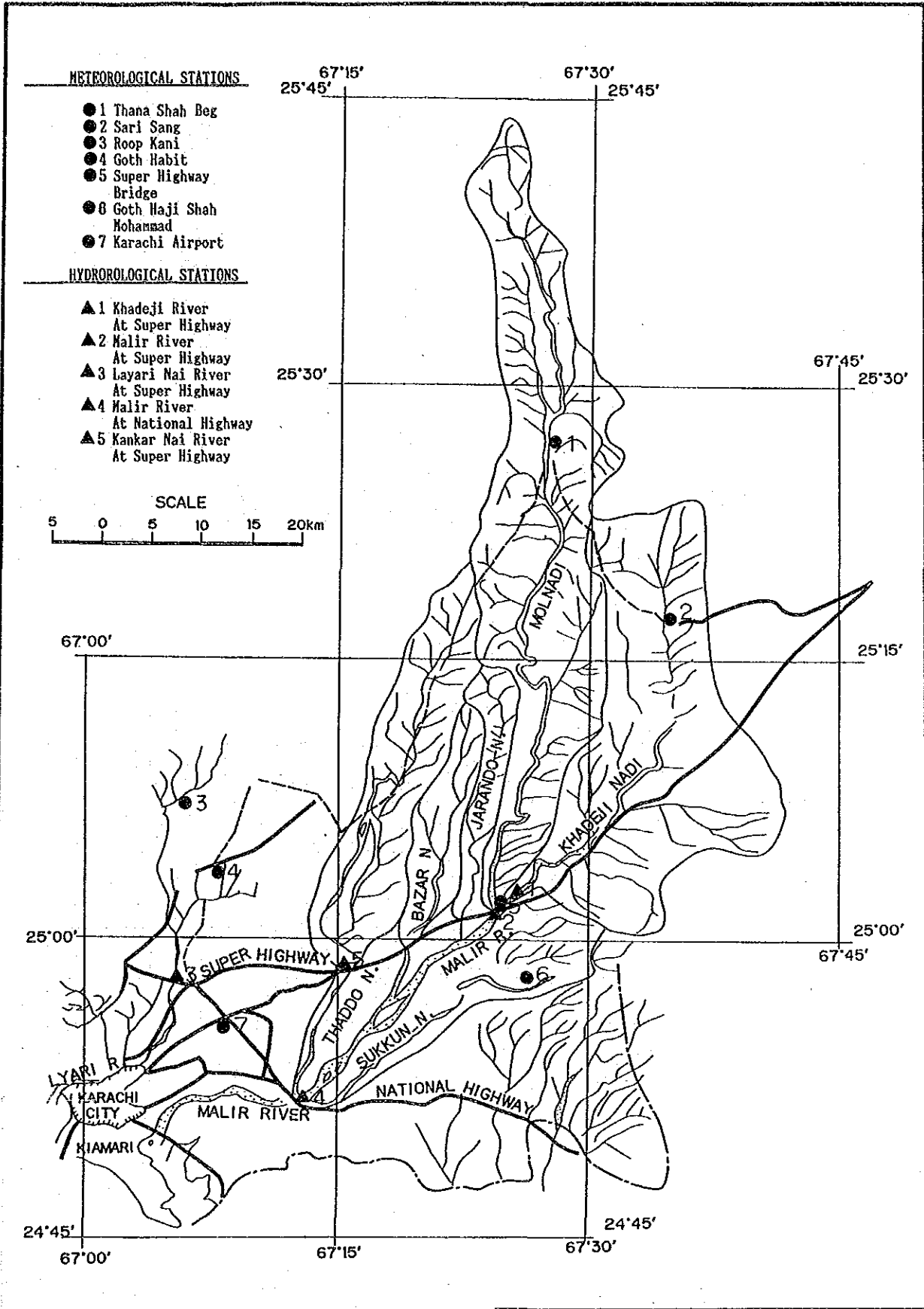


Fig. B.2-1 Location Meteorological and Hydrological Stations

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River Basin	Mol Nadi	Khadeli Nadi	Malir River
Point	Super Highway Bridge	Super Highway Bridge	National Highway Bridge
Catchment Area (Km ²)	824	581	2240
River Length (Km)	105	55	134
Highest Elevation of Catchment Area (m)	641	438	641
Highest Elevation of River (m)	580	270	580
Lowest Elevation of River (m)	110	110	15
Mean Slope of River	1/220	1/340	1/240

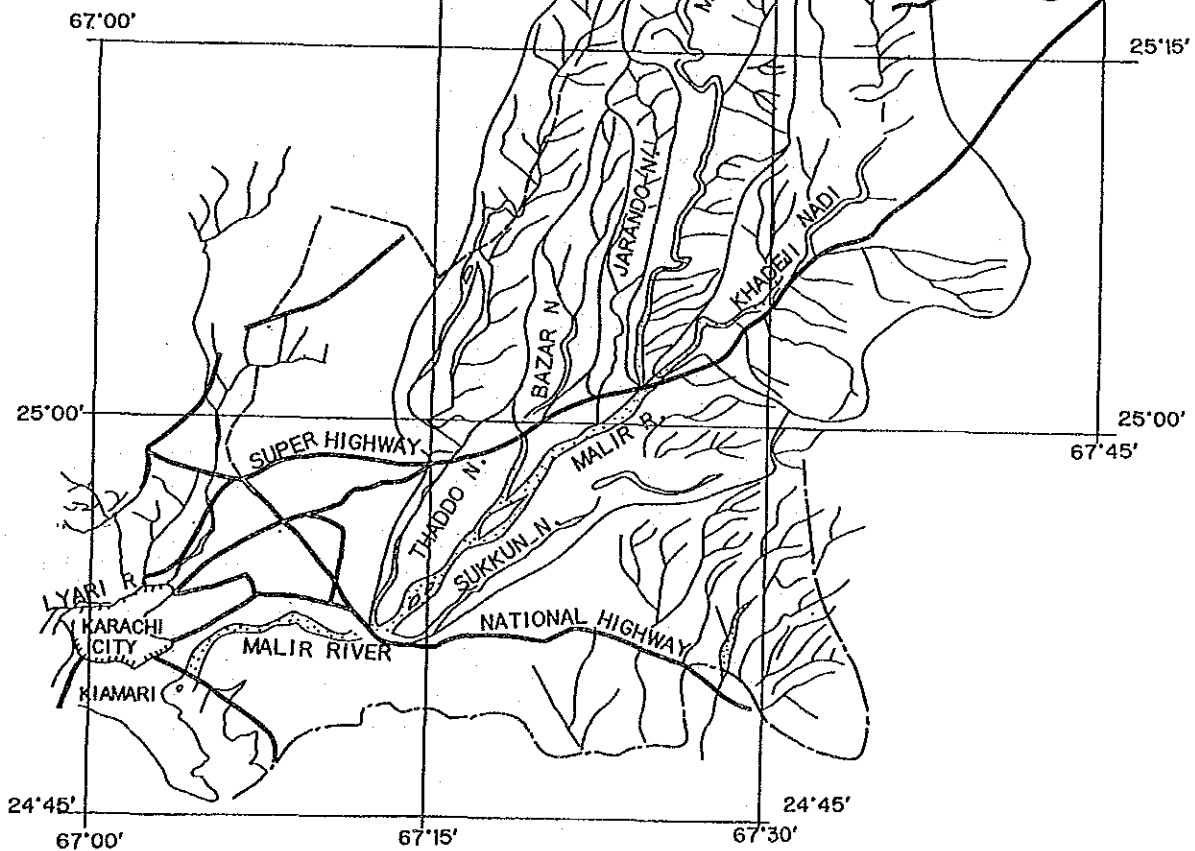
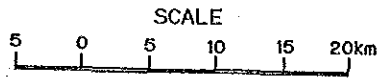


Fig. B.2-3 River Basin

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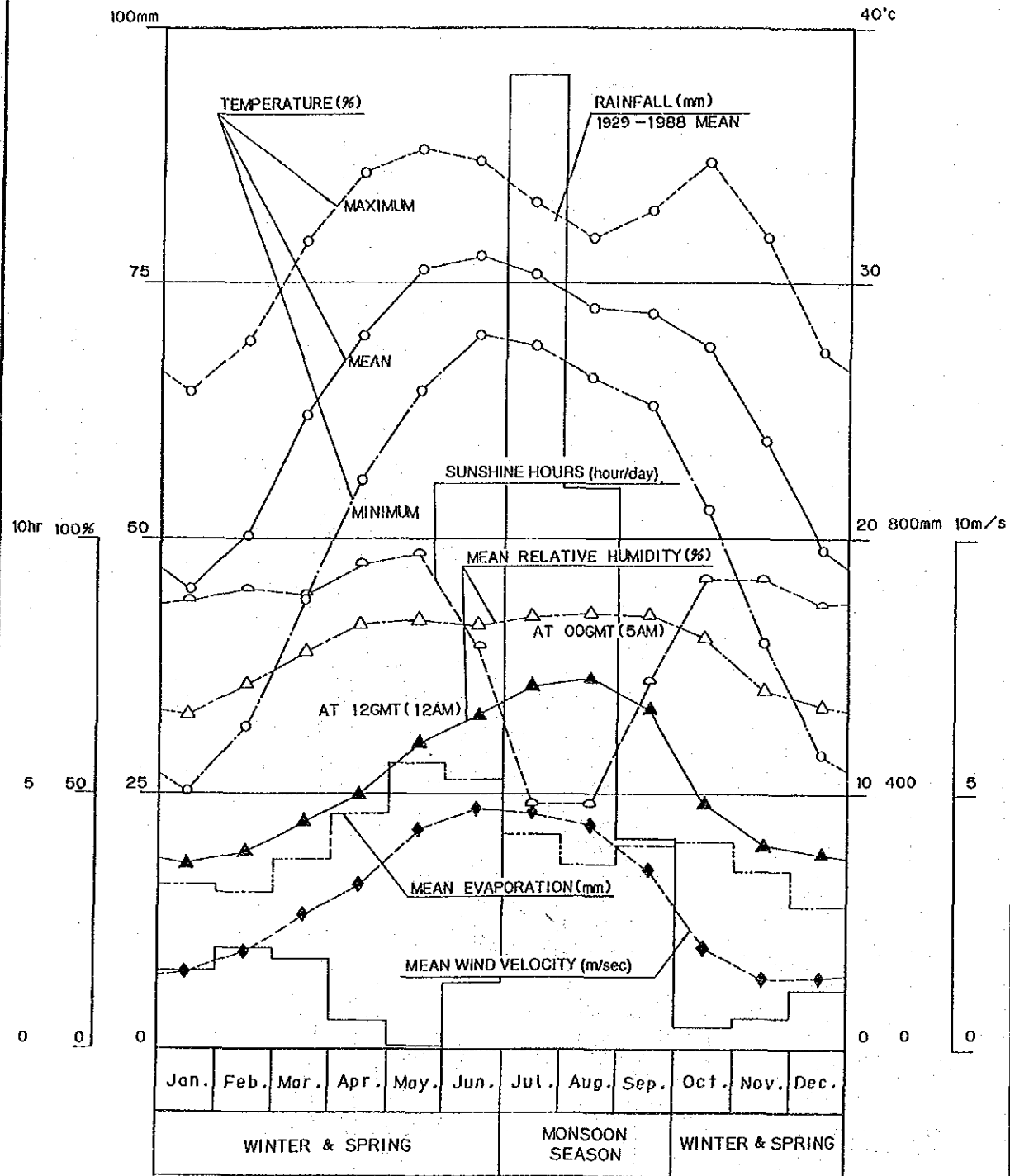


Fig. B.2-4 Meteorological Characteristics

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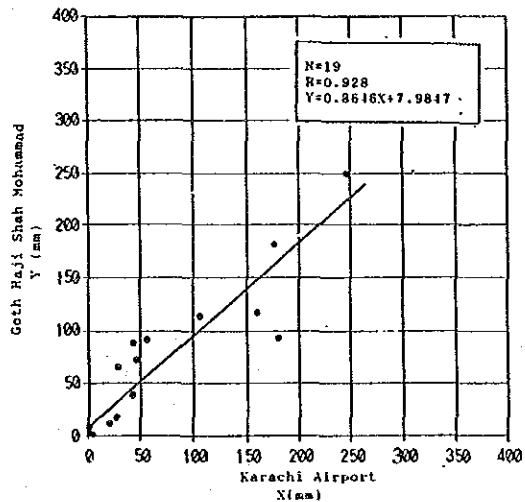
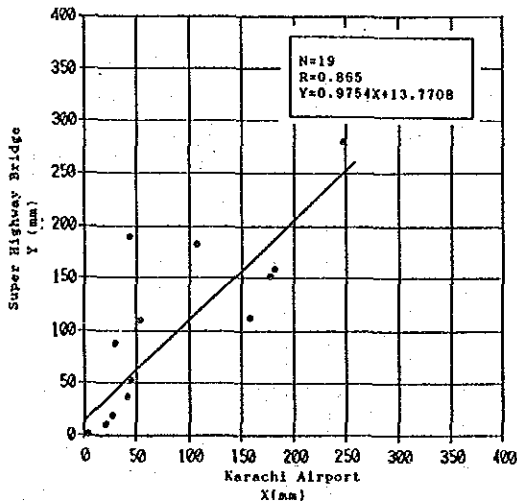
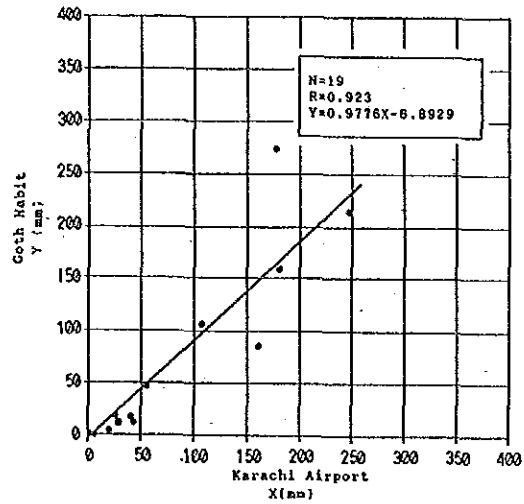
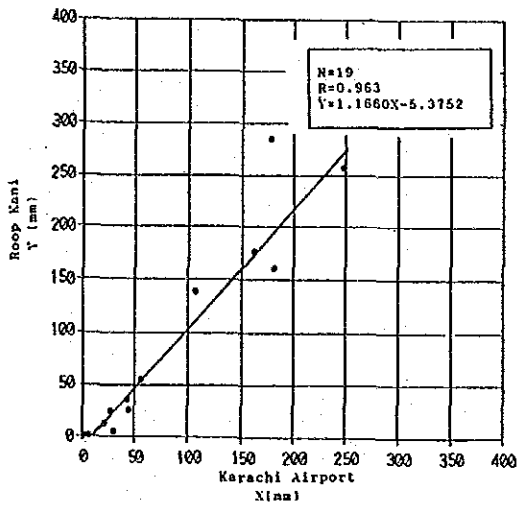
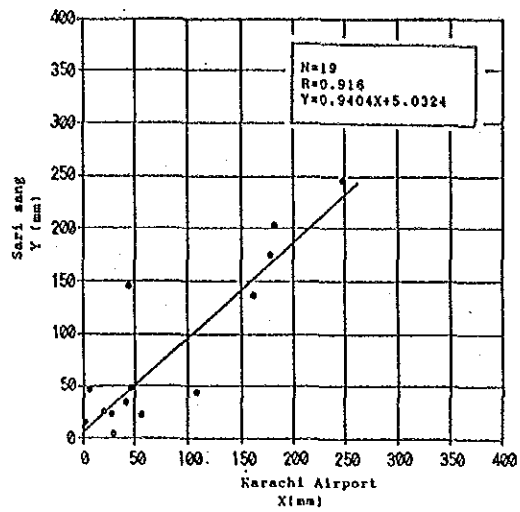
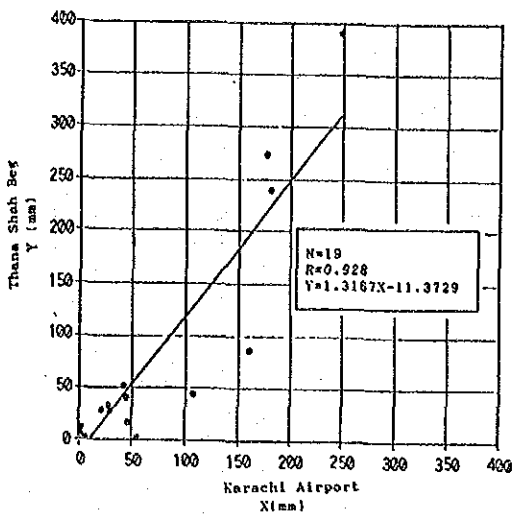


Fig. B.2-5 Monthly Rainfall Relation
(1/2)

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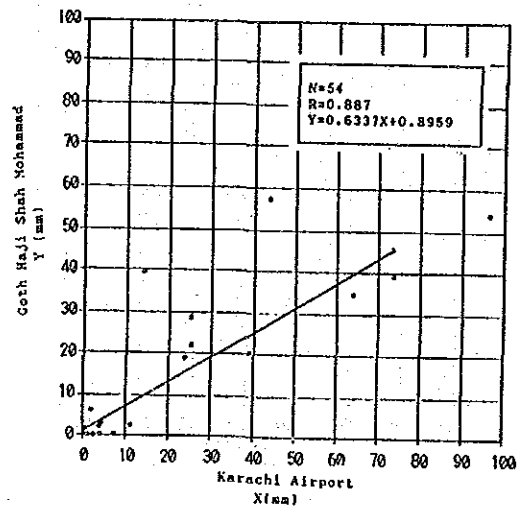
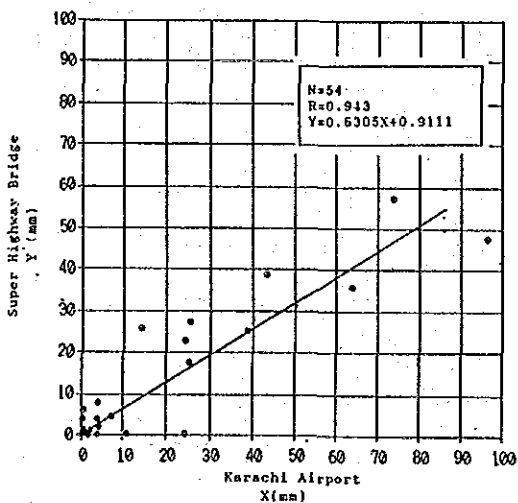
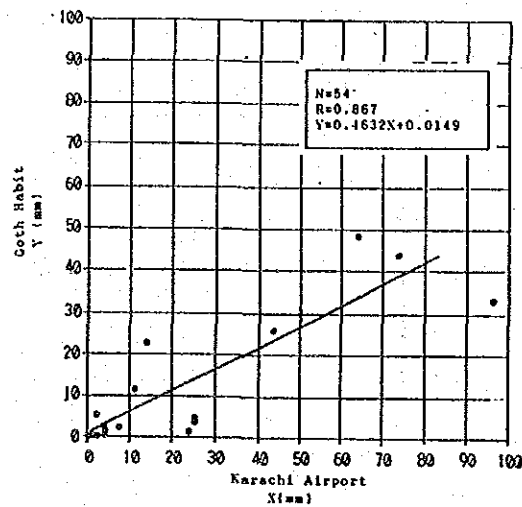
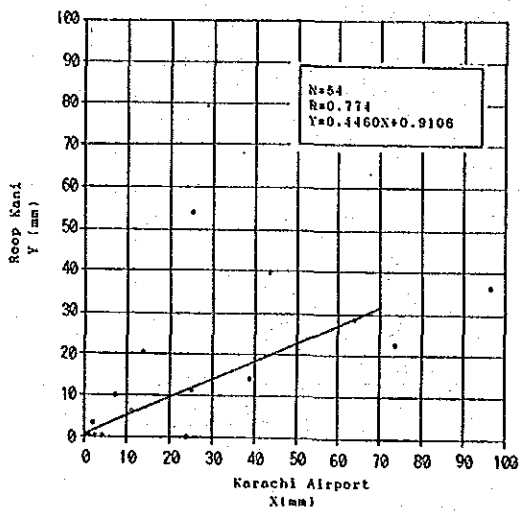
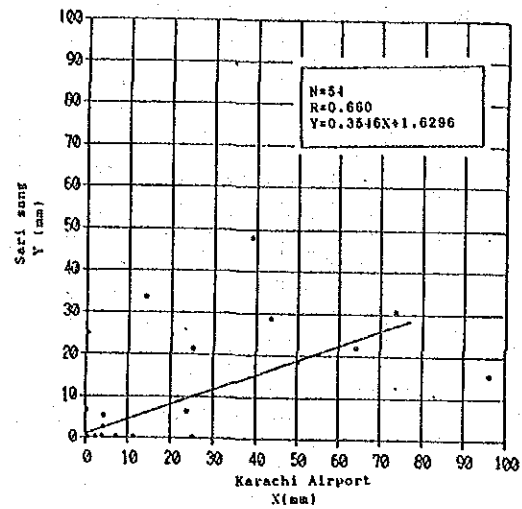
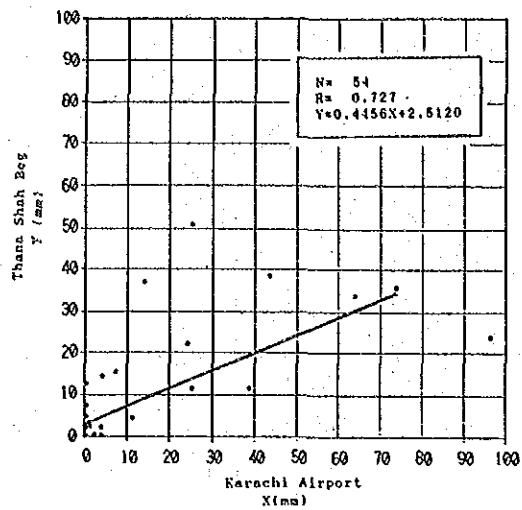
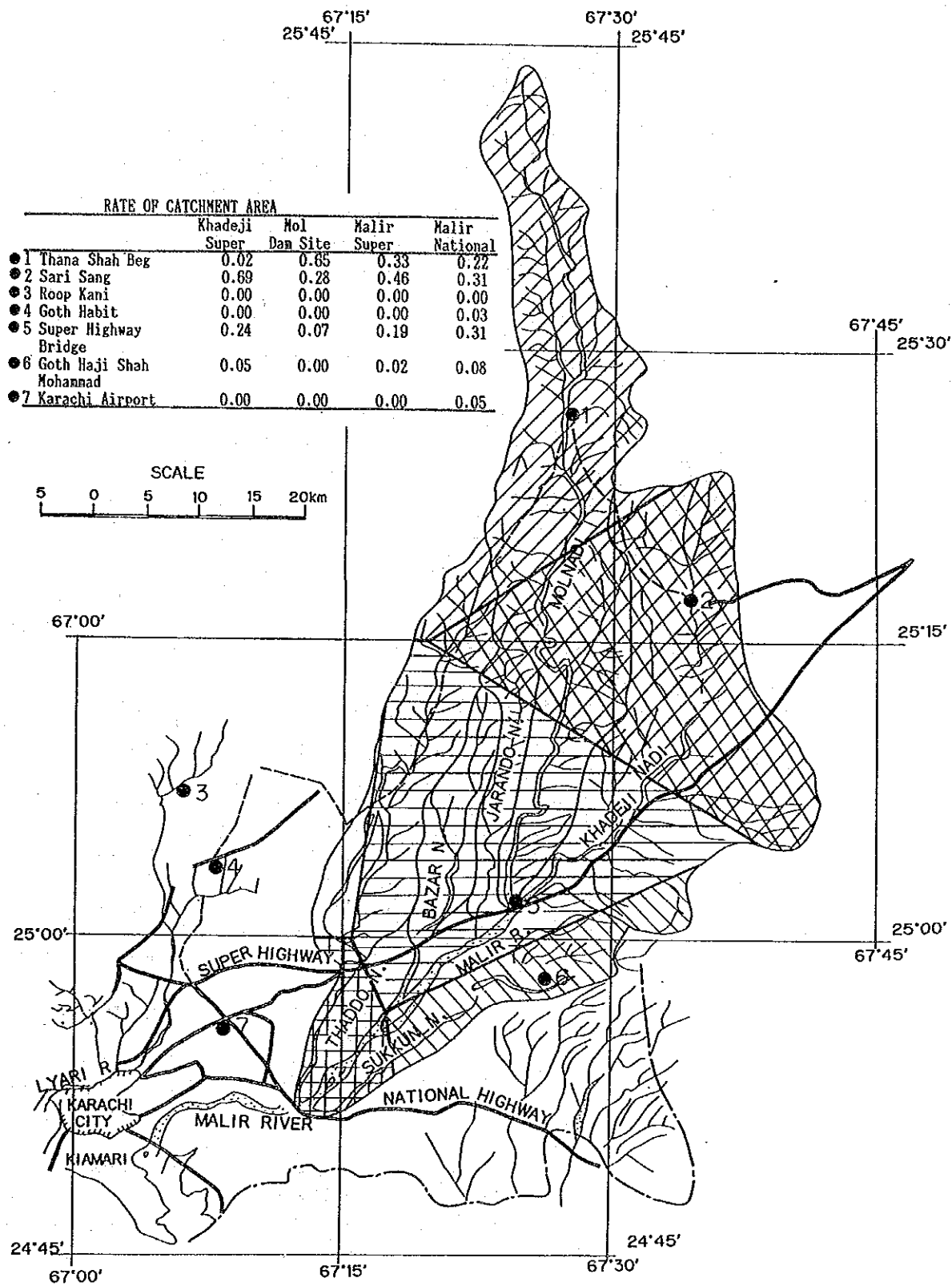


Fig. B.2-5 Monthly Rainfall Relation
(2/2)

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RATE OF CATCHMENT AREA

	Khadeji Super	Mol Dan Site	Malir Super	Malir National
● 1 Thana Shah Beg	0.02	0.65	0.33	0.22
● 2 Sari Sang	0.69	0.28	0.46	0.31
● 3 Roop Kani	0.00	0.00	0.00	0.00
● 4 Goth Habit	0.00	0.00	0.00	0.03
● 5 Super Highway Bridge	0.24	0.07	0.19	0.31
● 6 Goth Haji Shah Mohannad	0.05	0.00	0.02	0.08
● 7 Karachi Airport	0.00	0.00	0.00	0.05

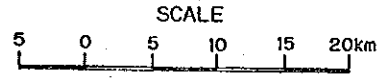


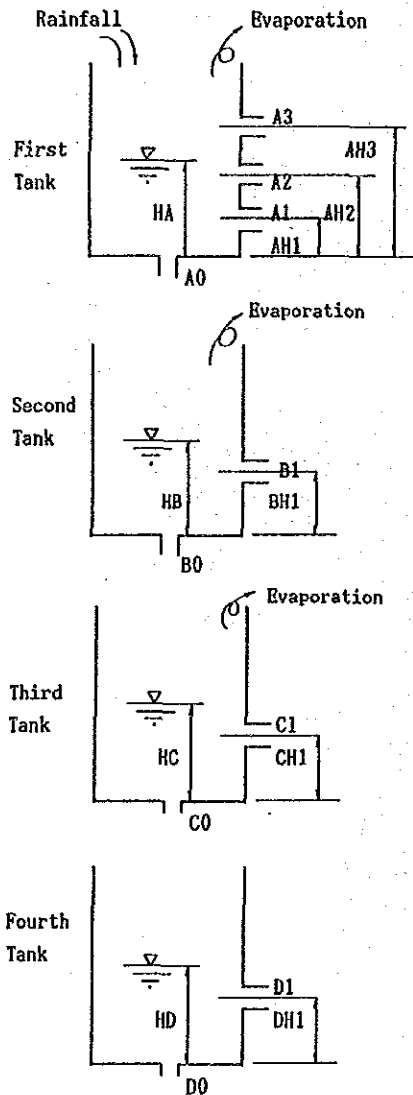
Fig. B.2-6 Distribution of Rainfall Area by Thiessen Polygon

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Evaporation					
Month	Observed	Adopted	Month	Observed	Adopted
JAN.	255.8	127.9	JUL.	334.8	167.4
FEB.	244.7	122.4	AUG.	286.2	143.1
MAR.	295.7	148.0	SEP.	313.5	156.8
APR.	367.6	183.8	OCT.	323.8	161.9
MAY	438.9	219.5	NOV.	278.0	139.0
JUN.	419.4	209.7	DEC.	243.1	121.6
			TOTAL	3801.7	1901.1

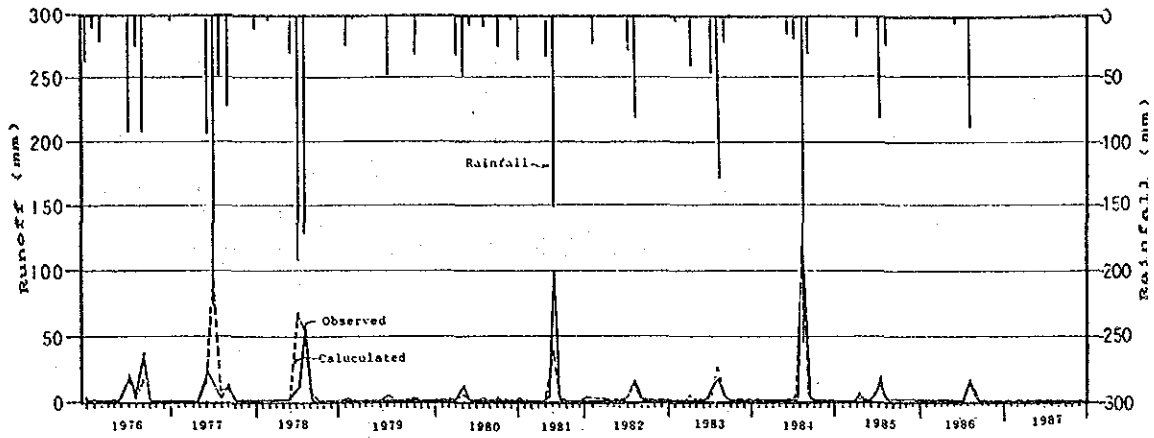


<u>KHADEJI RIVER</u>	<u>MALIR RIVER AT SUPER HIGHWAY</u>	<u>MALIR RIVER AT NATIONAL HIGHWAY</u>
<u>First Tank</u> HA= 0mm A0=0.32 AH1= 20 A1=0.04 AH2= 40 A1=0.20 AH3=140 A3=0.48	<u>First Tank</u> HA= 0mm A0=0.32 AH1= 20 A1=0.07 AH2= 50 A2=0.32 AH3=150 A3=0.10	<u>First Tank</u> HA= 0mm A0=0.30 AH1= 20 A1=0.00 AH2= 70 A2=0.28 AH3=150 A3=0.05
<u>Second Tank</u> HB= 0mm B0=0.28 BH1= 20 B1=0.10	<u>Second Tank</u> HB= 0mm B0=0.27 BH1= 10 B1=0.12	<u>Second Tank</u> HB= 0mm B0=0.27 BH1= 80 B1=0.12
<u>Third Tank</u> HC= 0mm C0=0.2 CH1= 3 C1=0.04	<u>Third Tank</u> HC= 0mm C0=0.15 CH1= 3 C1=0.04	<u>Third Tank</u> HC= 0mm C0=0.20 CH1= 3 C1=0.00
<u>Fourth Tank</u> HD=103mm D0=0.0001 DH1=100 D1=0.04	<u>Fourth Tank</u> HD=100mm D0=0.0035 DH1=100 D1=0.02	<u>Fourth Tank</u> HD=100mm D0=0.0060 DH1=100 D1=0.000
<u>Catchment Area</u> 567 km ²	<u>Catchment Area</u> 1205 km ²	<u>Catchment Area</u> 1985 km ²

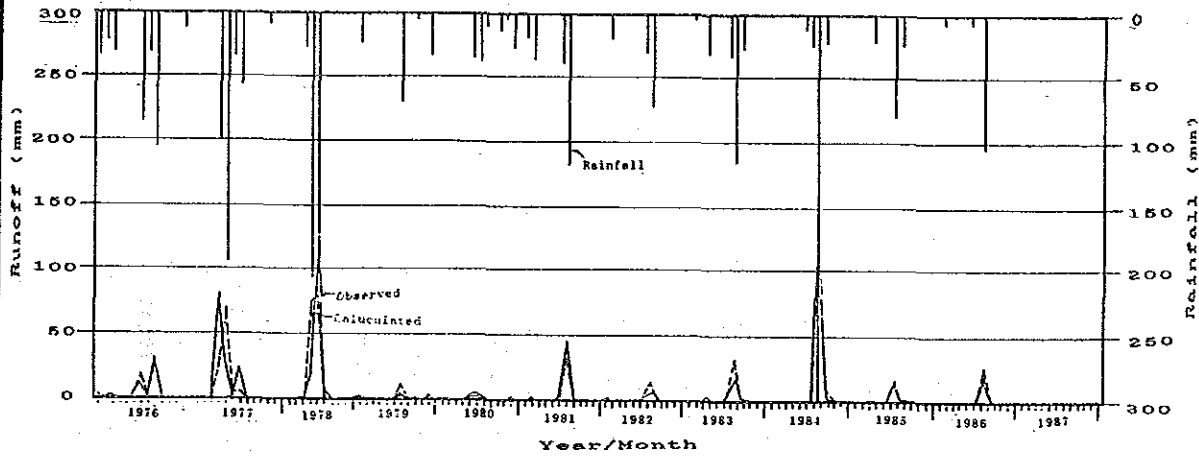
Fig. B.3-1 Co-efficients of Tank Models

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KHADEJI RIVER AT SUPER HIGHWAY BRIDGE



MALIR RIVER AT NATIONAL HIGHWAY BRIDGE



MALIR RIVER AT SUPER HIGHWAY BRIDGE

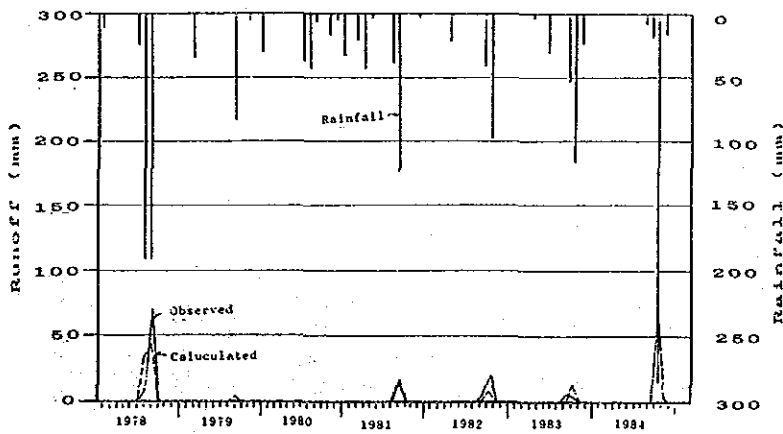


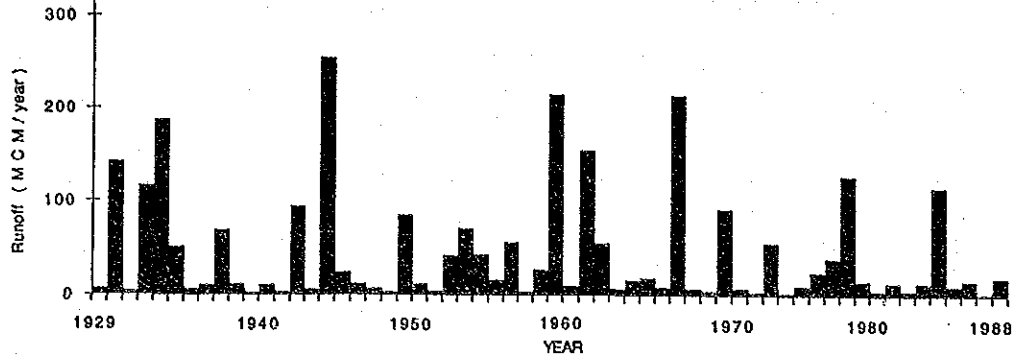
Fig. B.3-2 Comparison of Simulated and Observed Monthly Runoff

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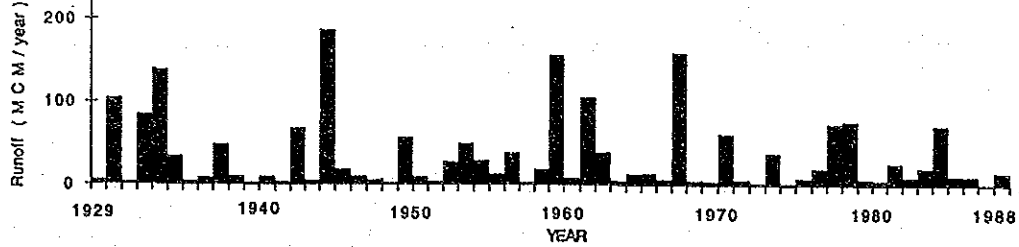
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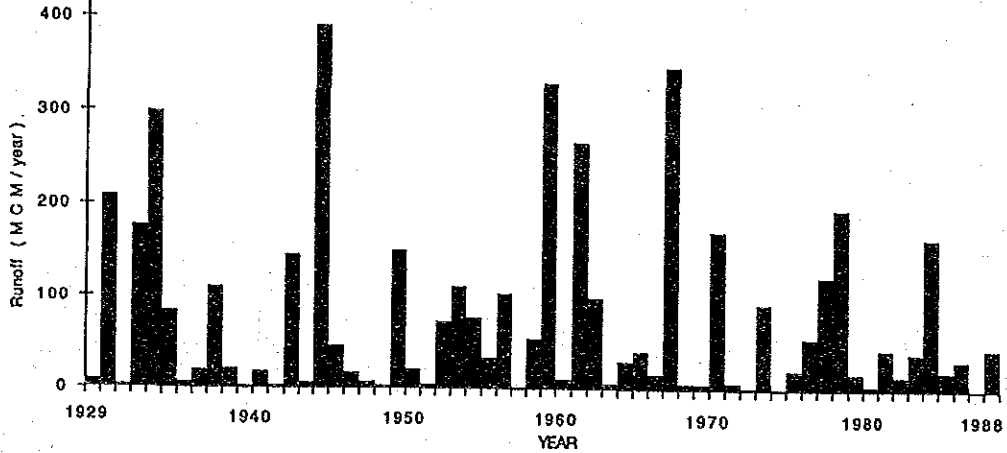
MOL RIVER AT DAM SITE



KHADEJI RIVER AT DAM SITE



MALIR RIVER AT SUPER HIGHWAY BRIDGE



MALIR RIVER AT NATIONAL HIGHWAY BRIDGE

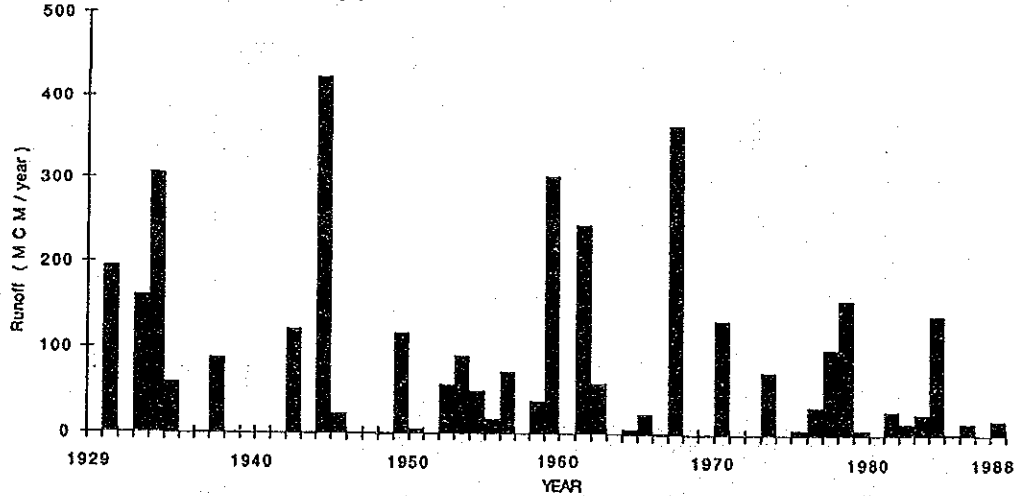
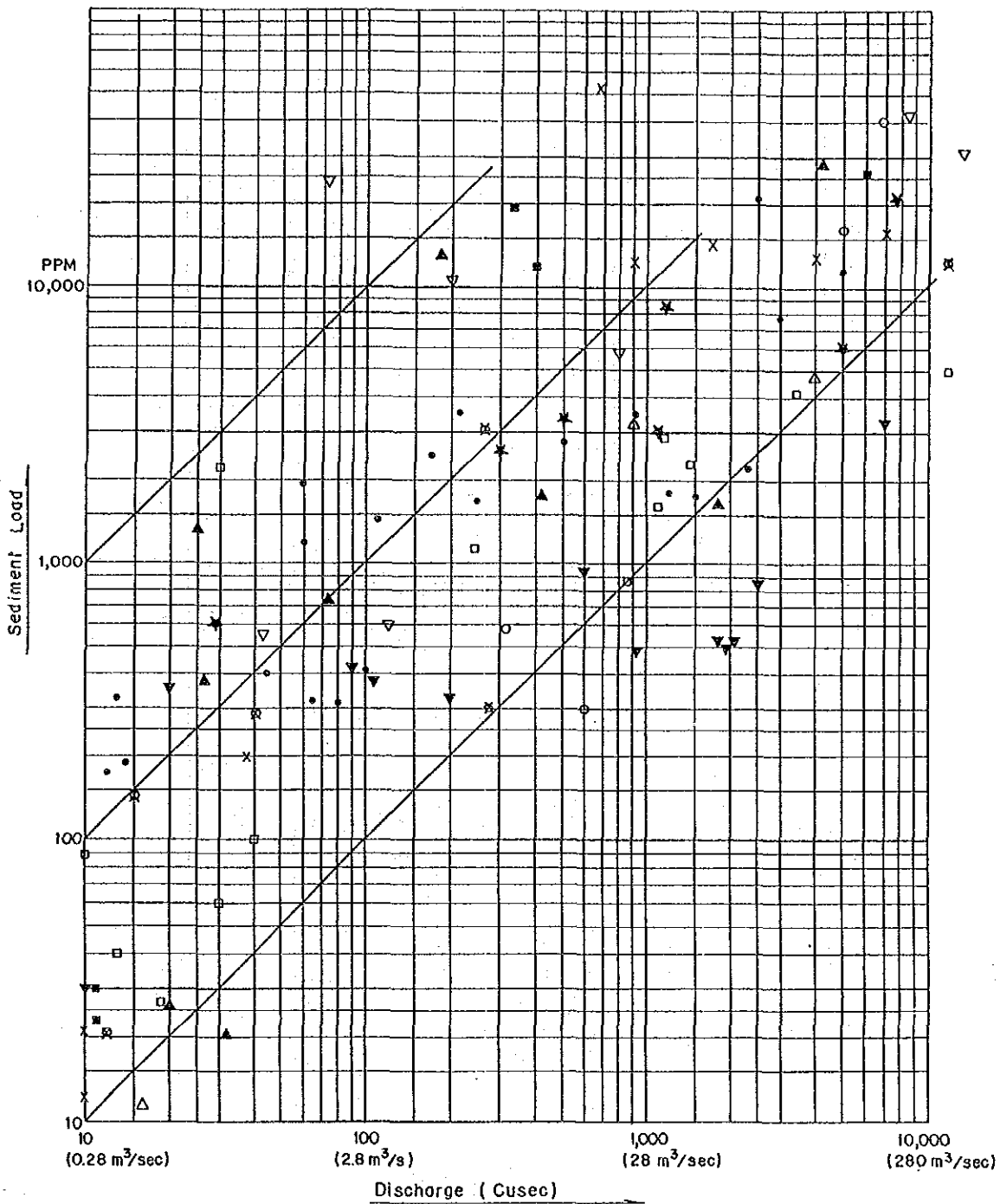


Fig. B.3-3 Simulated Annual Runoff

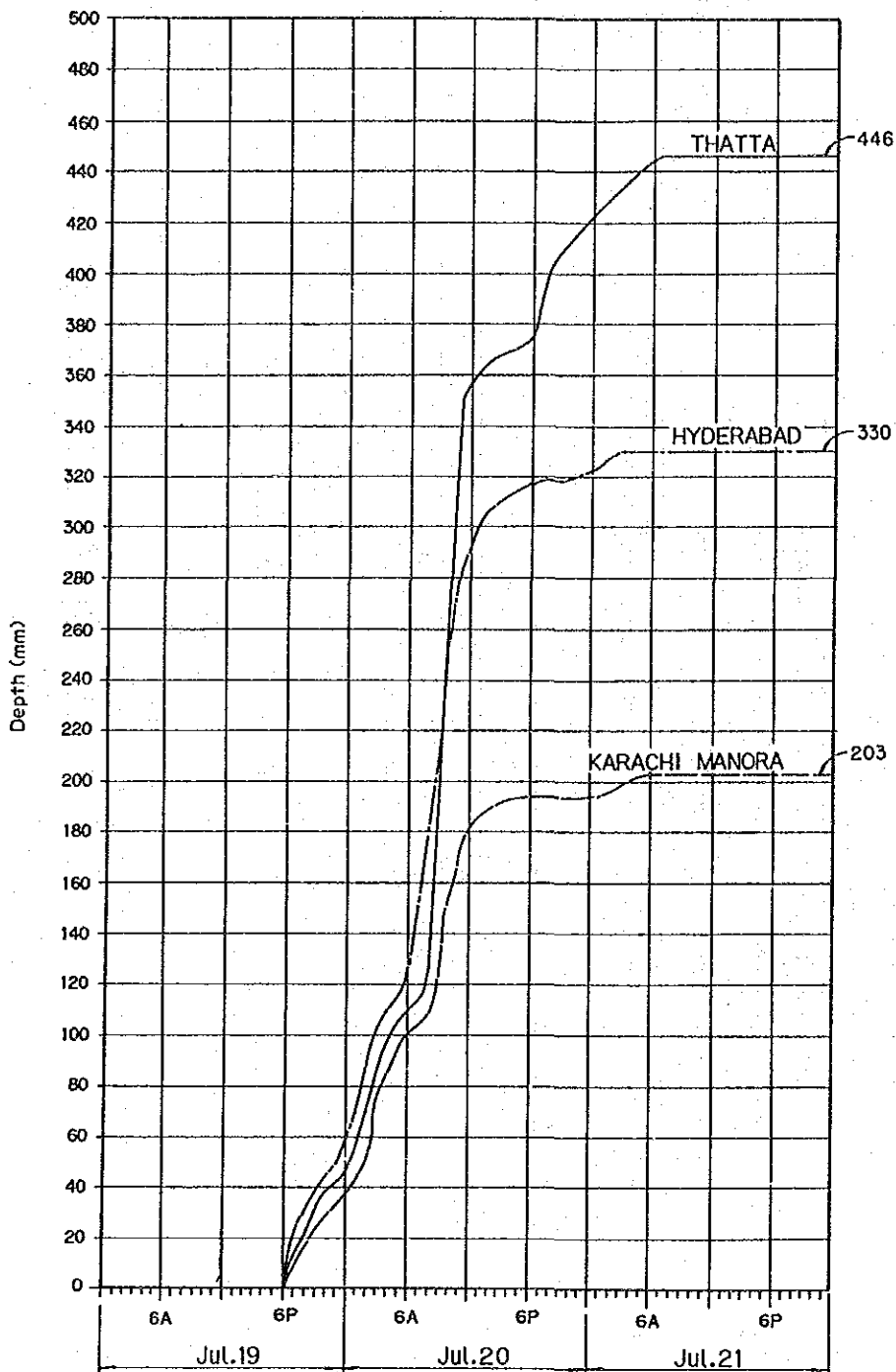
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LEGEND	
• 1976	▲ 1981
◻ 1977	✕ 1982
× 1978	▼ 1983
△ 1979	○ 1984
■ 1980	✱ 1985
	▽ 1986

Fig. B.4-1 Discharge-Sediment Load Relationship

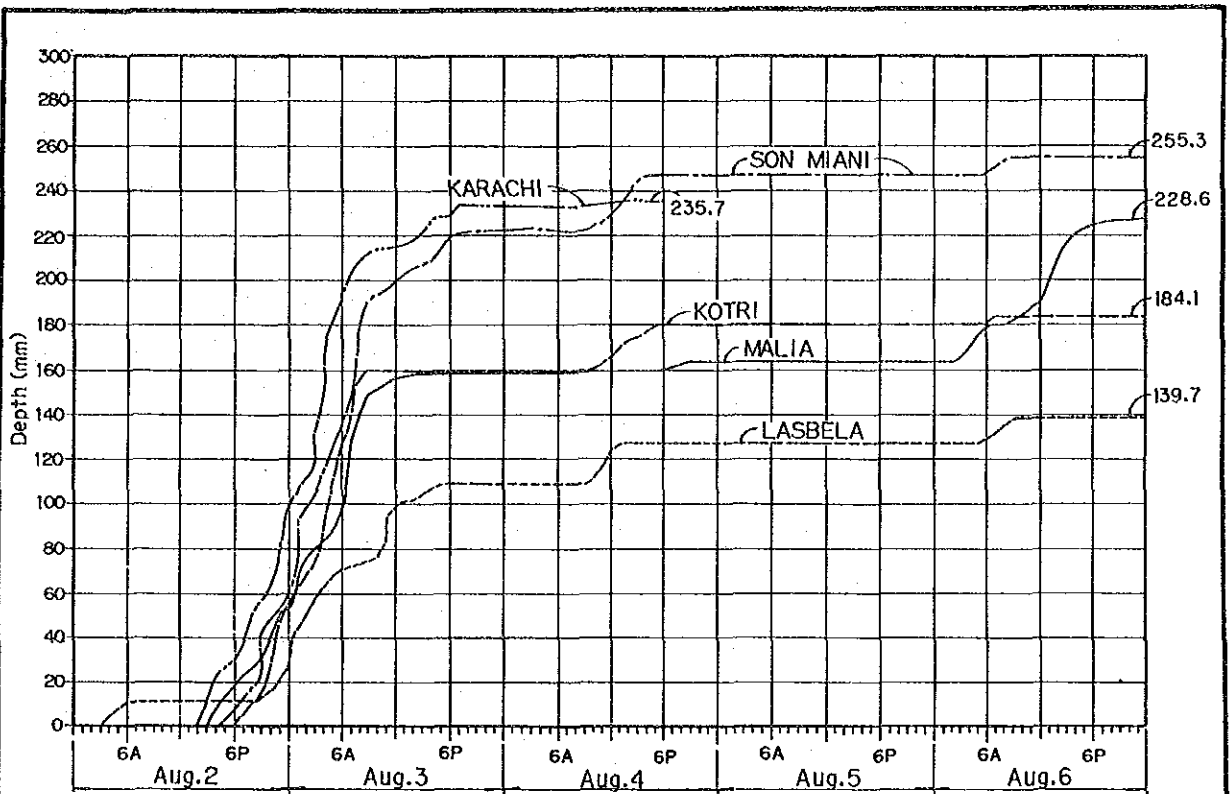
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19-22 July 1913, Storm
 Source: "Feasibility Study on Water Resource Development in Malir Basin" (by WAPDA)

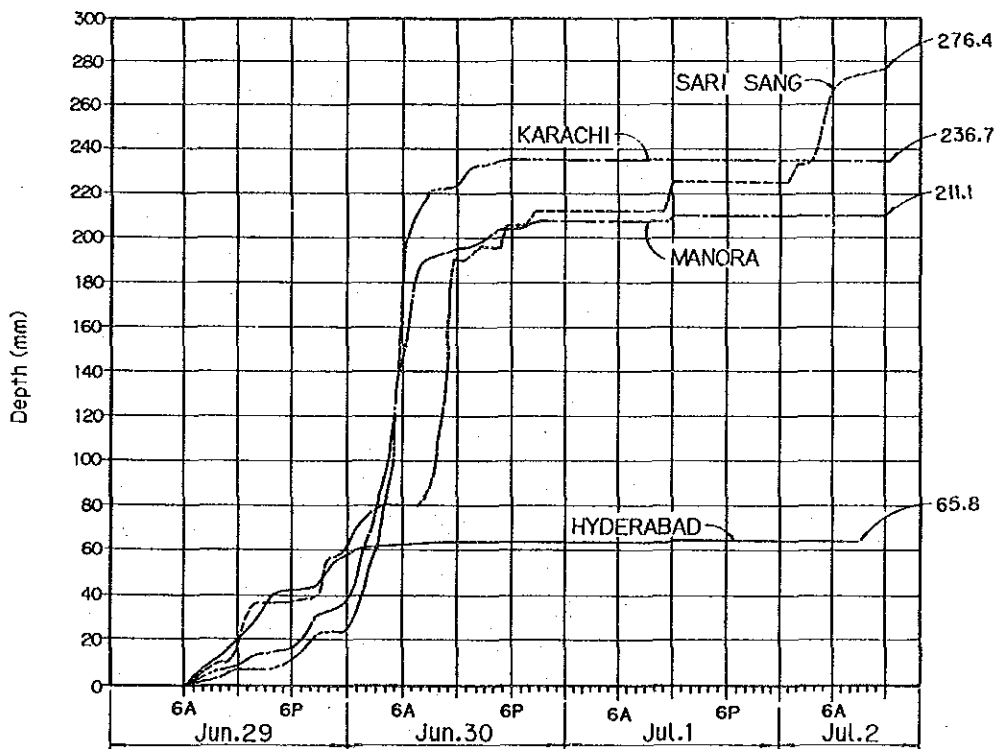
Fig. B.5-1 Mass Rainfall Curves (1/2)

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2-4 August, 1944, Storm

Source: "Probable Maximum Precipitation Over The Hub, Porali, Gaj, Malir and Baran Basin" (by WAPDA)



29 June - 2 July, 1977, Storm

Fig. B.5-1 Mass Rainfall Curves (2/2)

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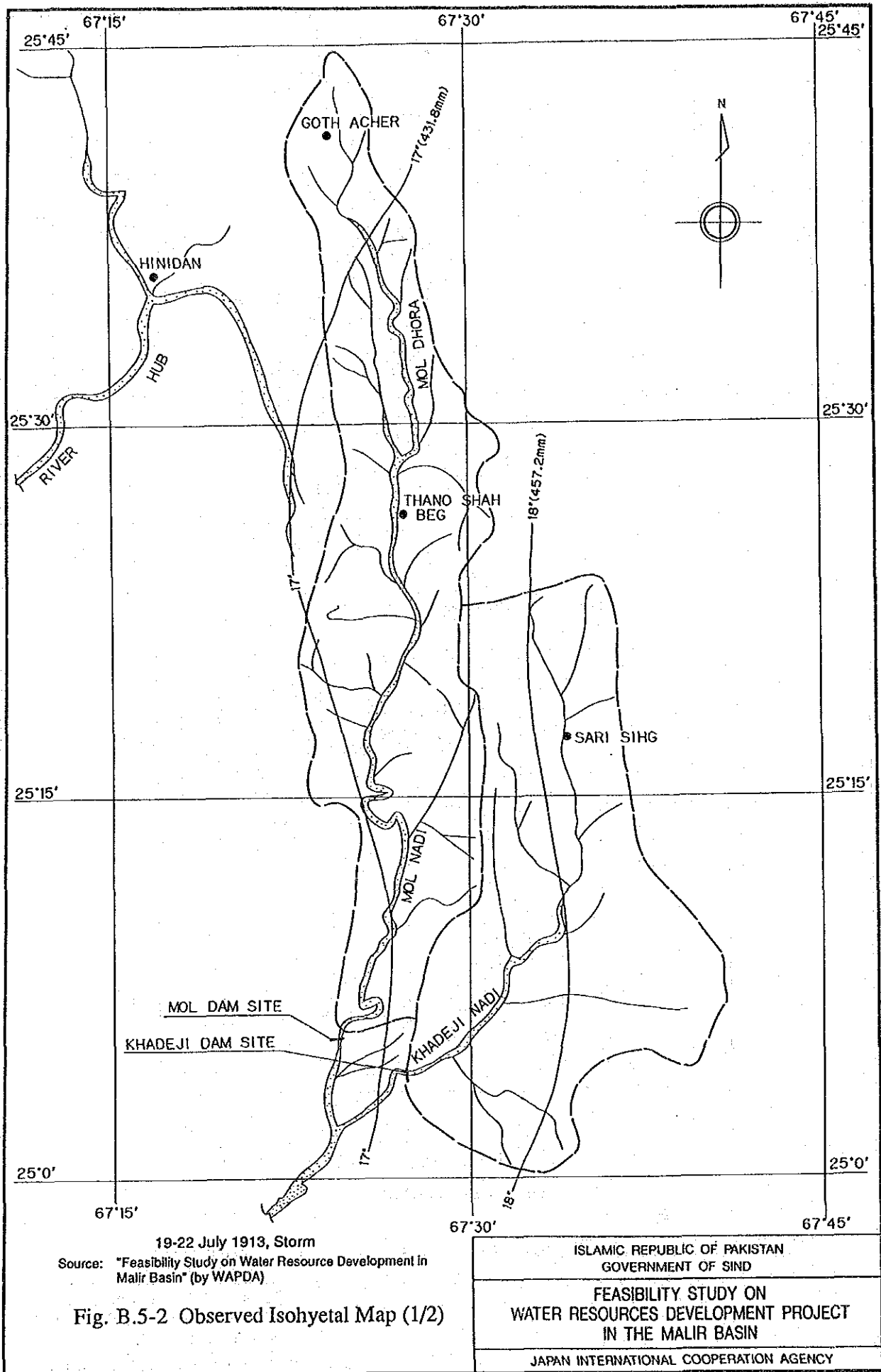


Fig. B.5-2 Observed Isohyetal Map (1/2)

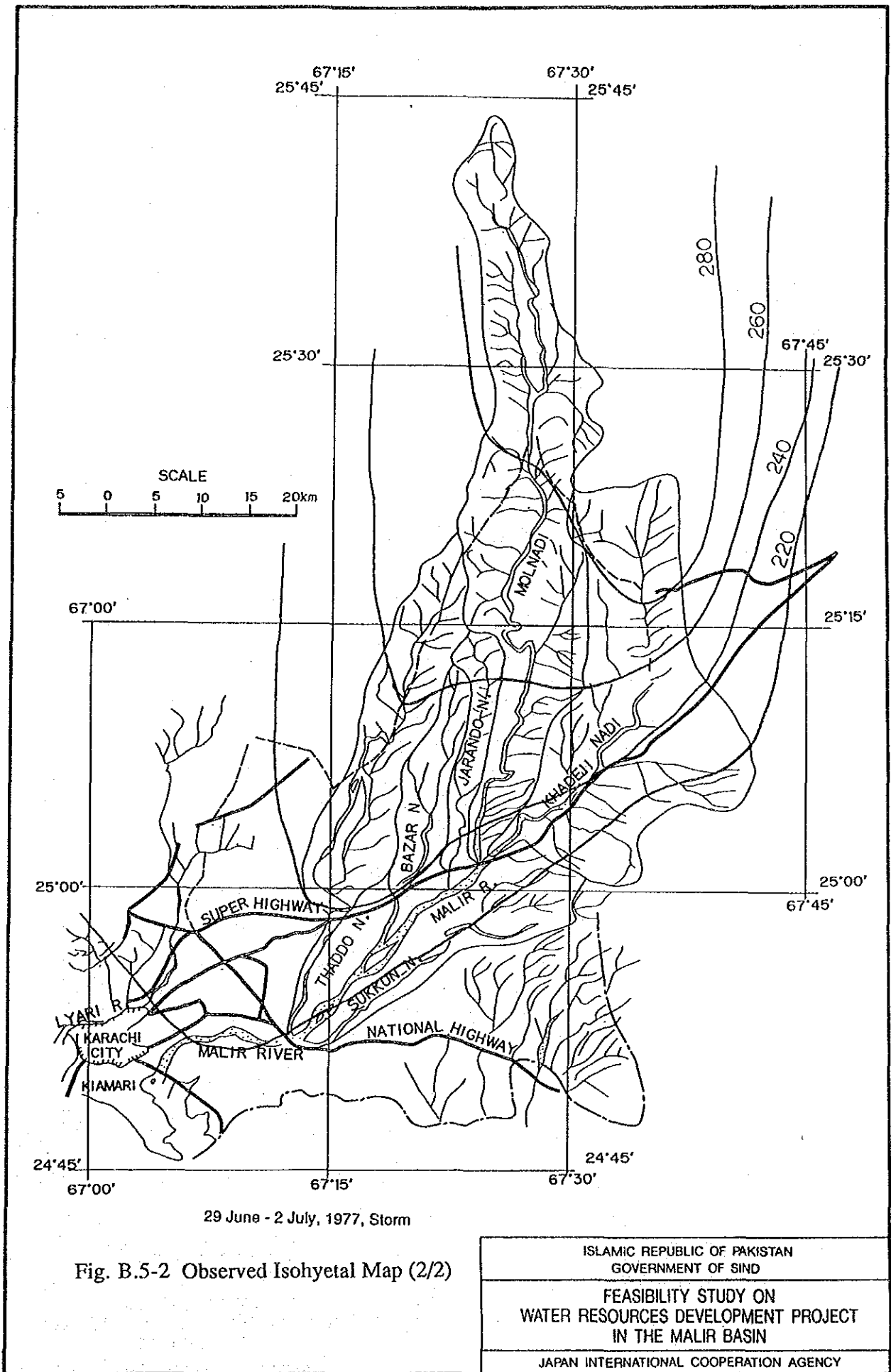
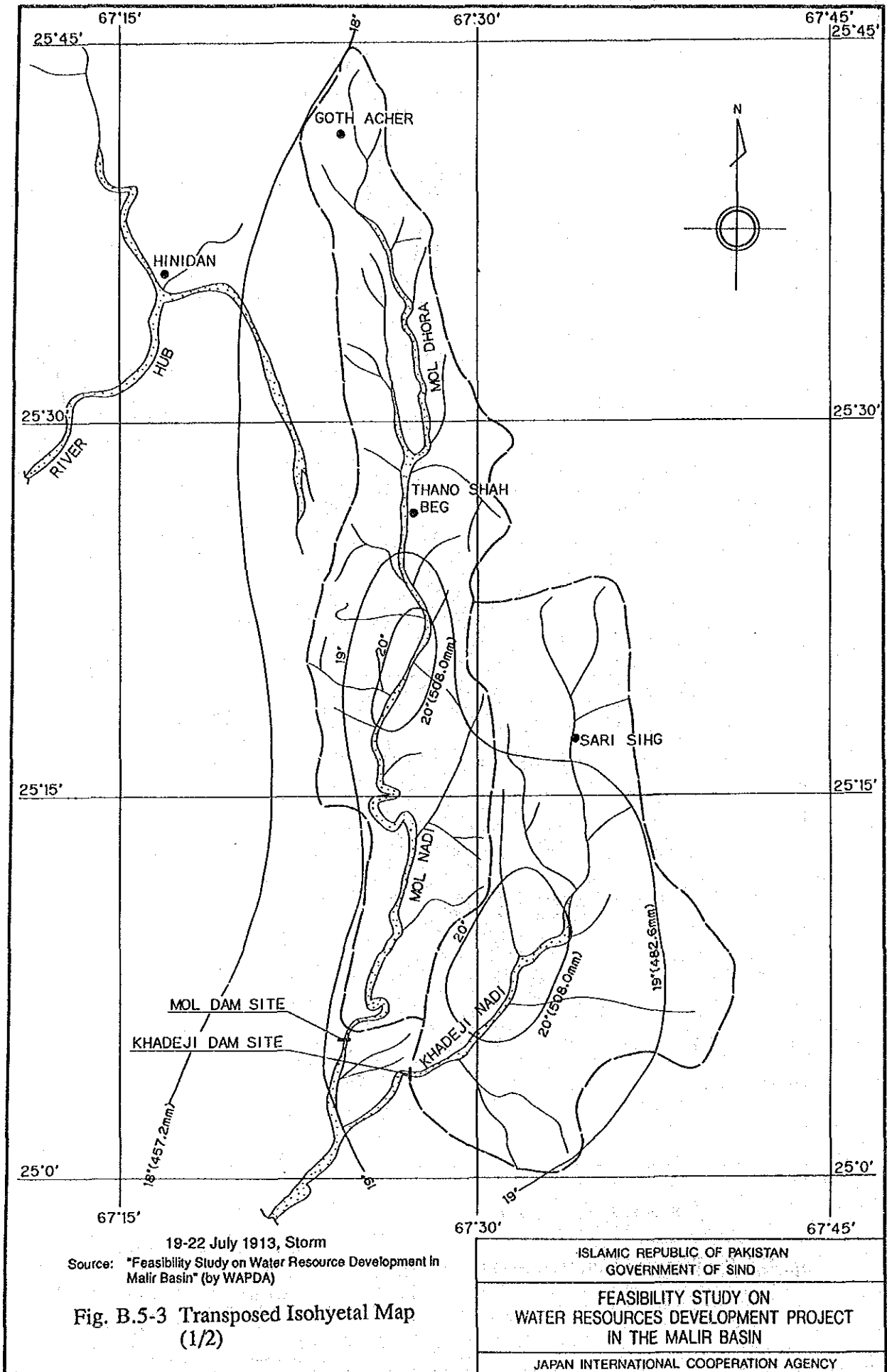
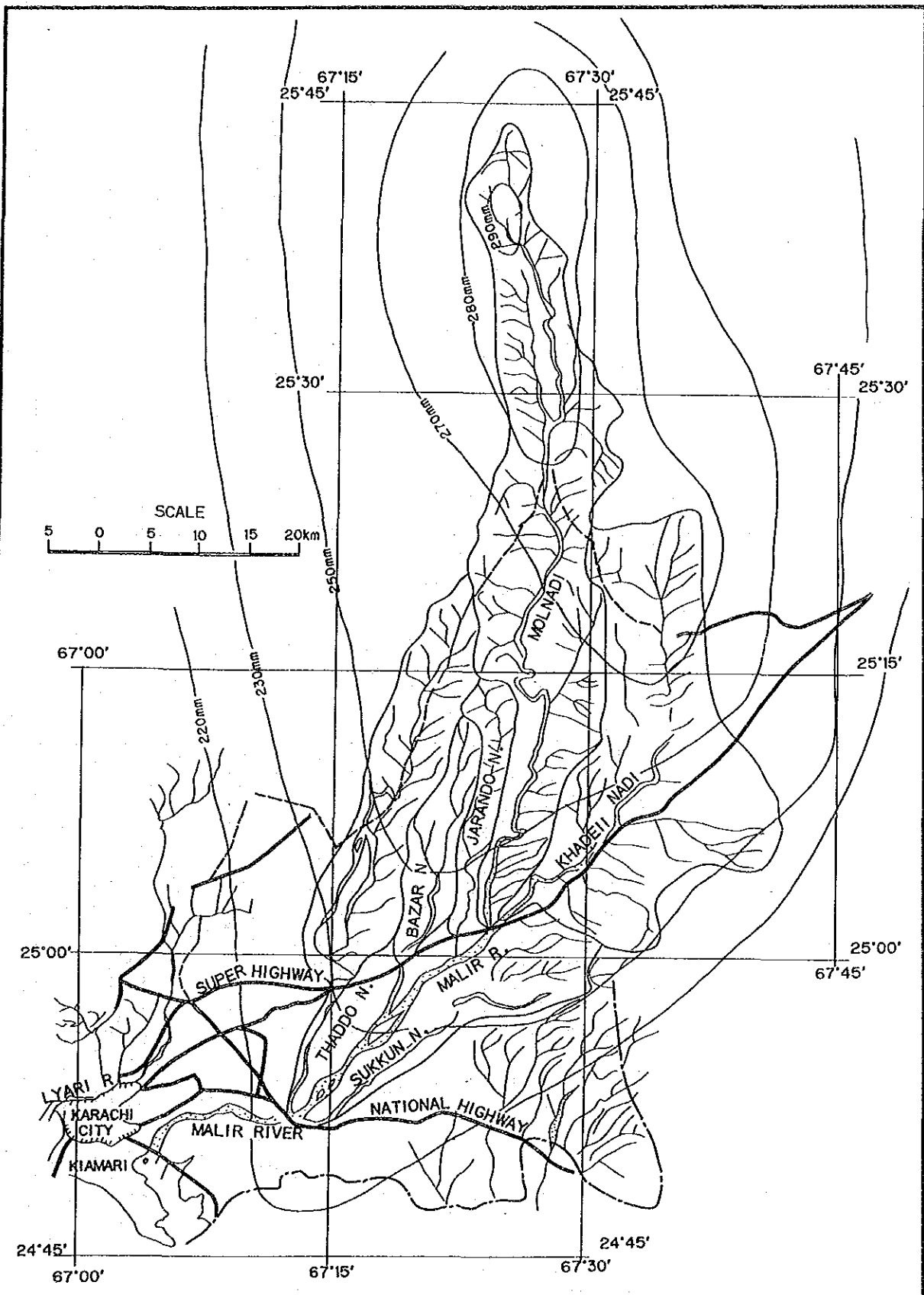


Fig. B.5-2 Observed Isohyetal Map (2/2)

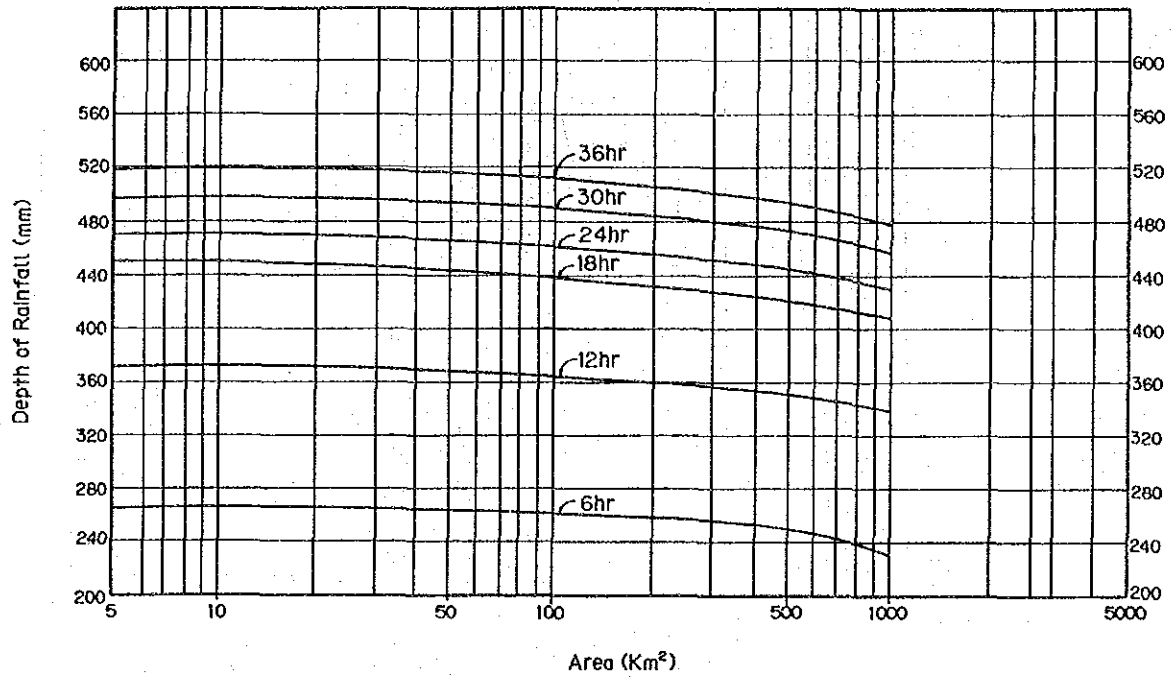




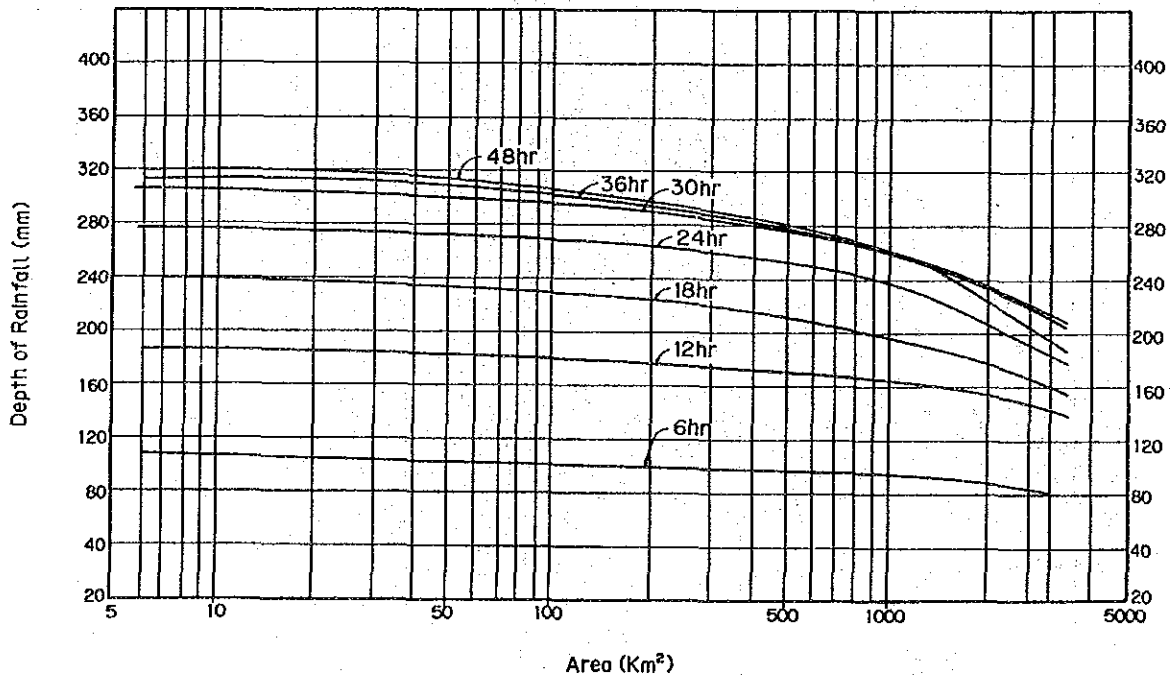
29 June - 2 July, 1977, Storm

Fig. B.5-3 Transposed Isohyetal Map (2/2)

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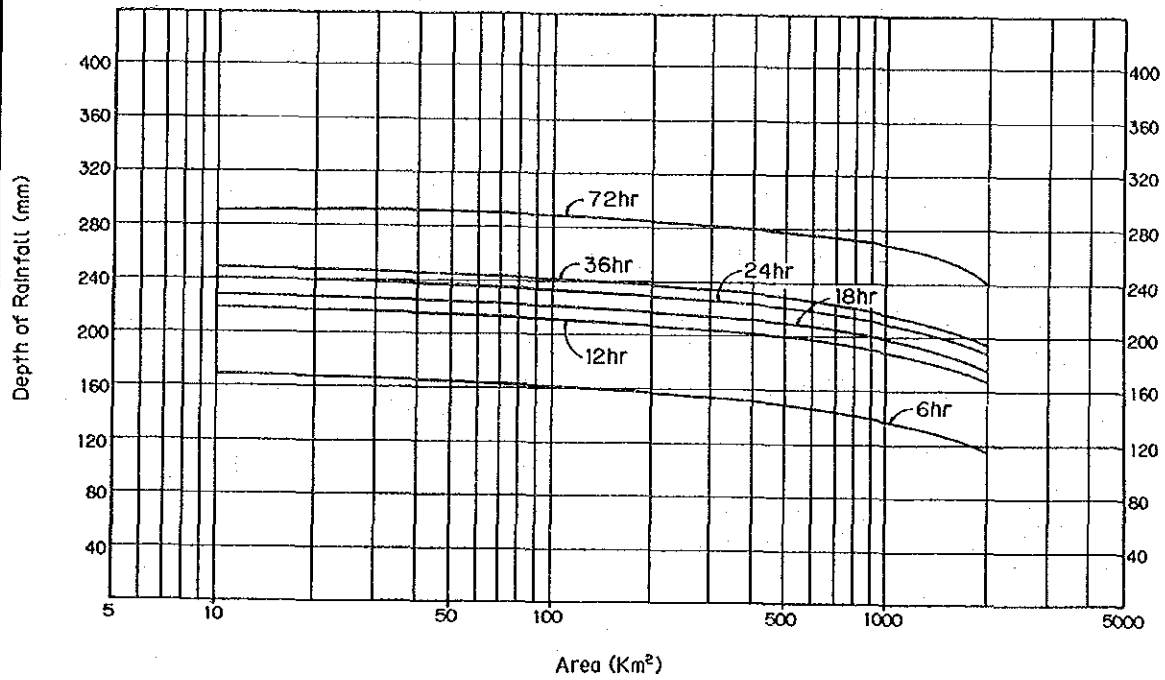
19-22 July 1913, Storm
 Source: "Feasibility Study on Water Resource Development in Malir Basin" (by WAPDA)



2-4 August, 1944, Storm
 Source: "Probable Maximum Precipitation Over The Hub, Porali, Gaj, Malir and Baran Basin" (by WAPDA)

Fig. B.5-4 D-A-D Curves of Storm (1/2)

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29 June - 2 July, 1977, Storm

Fig. B.5-4 D-A-D Curves of Storm (2/2)

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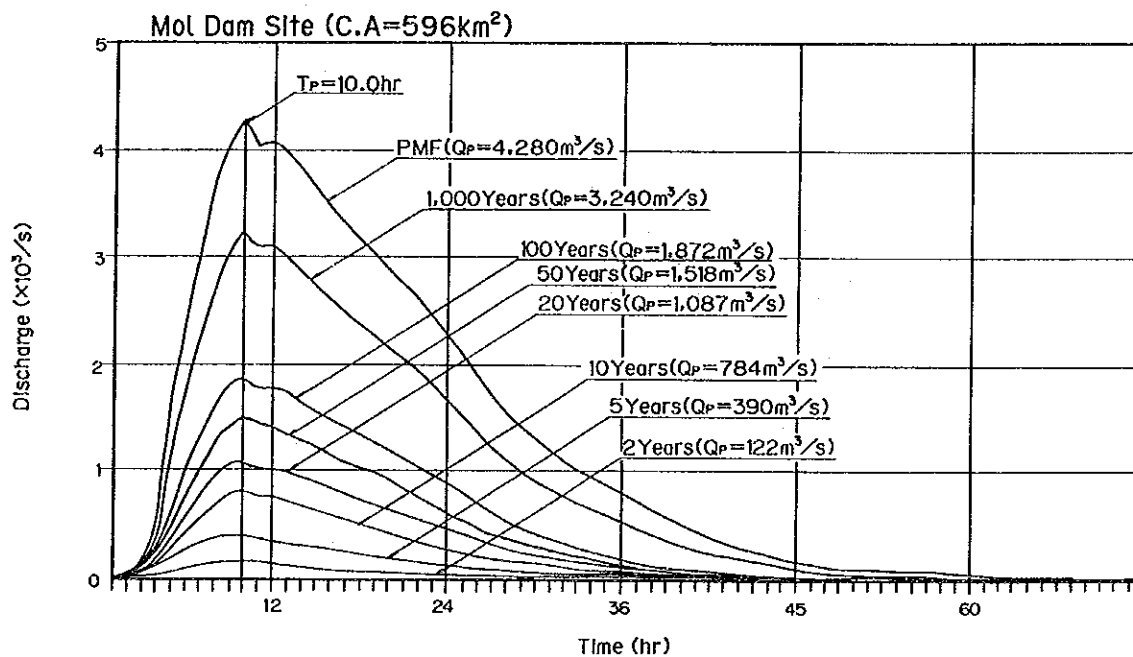
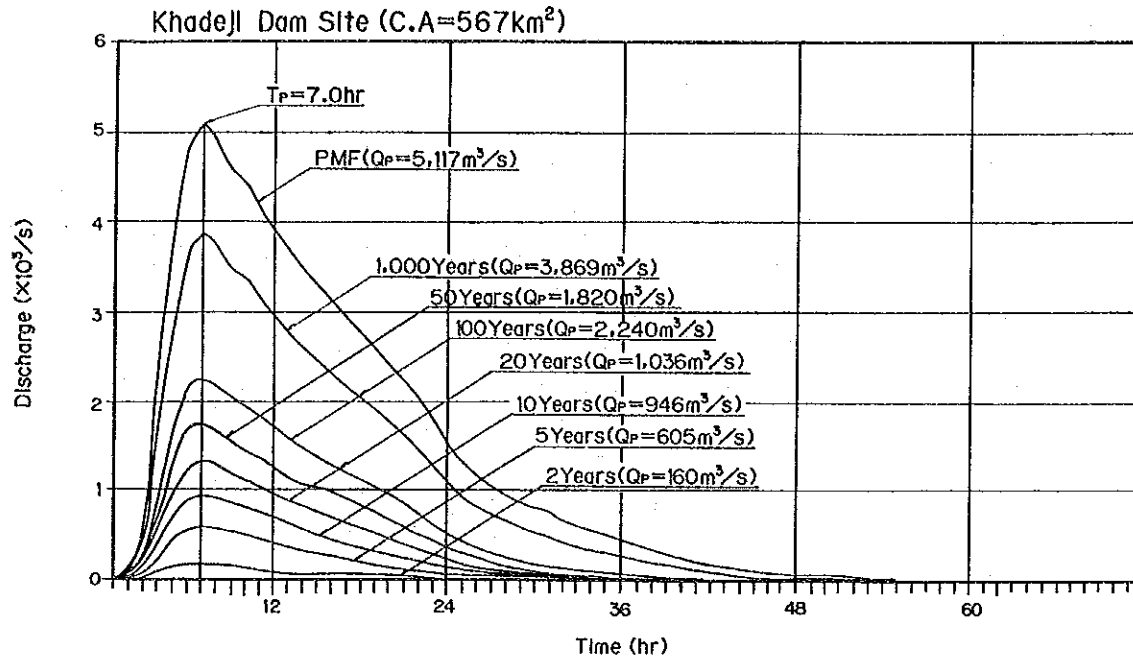


Fig. B.5-5 Probable Flood Hydrograph

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