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SWHP Publication No. 1

Pakistan
Water And Power Development Authority
Hydrology And System Analysis
Surface Water Hydrology Project

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N.O.A.A.
U. S. Dept. of Commerce

1975 Annual Report
Of
River And Climatological Data
Of
Pakistan

Vol. I

RIVER DISCHARGE, SEDIMENT AND QUALITY DATA

PREPARED BY SUREACE WATER HYDROLOGY PROJECT
H & S A ORG. WAPDA, LAHORE.

National Oceanic and Atmospheric Administration

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PREFACE

This report is published by Surface Water Hydrology Project, under the direct supervision of Chief Engineer Hydrology & System Analysis with co-operation and support of other Divisions of WAPDA. The record presented in this report has been collected during the year 1975.

The report consist of three Volumes, Surface Water flow, sediment and chemical composition data as Volume- I daily and hourly precipitation data as Volume- II, evaporation, temperatures, solar radiation, relative humidity and wind movement data as Volume- III. Previously the report was published in one volume from 1960 to 1962 two volumes from 1963 to 1965 and in three volumes thereafter. These changes from time to time were necessitated because of an increase in the number of stations, all of which could not be accomodated in one volume.

All the field record presented herein was collected analysed, interpretted and compiled by the personnel of Surface Water Hydrology Project. Chemical analysis of Water Samples was done in the quality of Water Laboratory, Central Monitoring Organisation.

(Syed Amjad Hussain)
Project Director,
Surface Water Hydrology Project,
WAPDA, 88- Main Gulberg, Lahore.

Dated: June, 1980.

M.S.AASI

TECHNICAL STAFF
OF
SURFACE WATER HYDROLOGY PROJECT

Syed Amjad Hussain	Project Director
Mohammad Saleem Warsi	Senior Engineer
Mohammad Jahangir Khan	Senior Research Officer

JUNIOR ENGINEERS

Zafar Iqbal Kang	Manzoor Ahmad Memon
Syed Wali Waheed	Farooq Akhtar
Wali Akbar Khan	

JUNIOR RESEARCH OFFICERS

Mohammad Rafique	Ashfaq Ahmad

SENIOR RESEARCH ASSISTANTS

Shahzad Rafique	Ghazanfar Ali
Mukhtar Hussain	Altaf Hussain

JUNIOR RESEARCH ASSISTANTS

Naeem Akhtar	Abdul Mukhtar
Atiq-ur-Rehman	Salah-ud-Din
Syed Sarwat Ali	Najam-ul-Hassan

REPORT TYPED
BY

Zarar Ali
Stenographer Grade-II.

M.S.AASI

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(Typed by Zarar Ali Stenographer Grade - II T.C. Section)

INTRODUCTION

Organisation

The Surface Water Circle was created by WAPDA with effect from Ist July 1960 with the responsibility of Collecting surface water data required for WAPDA Projects and General Investigations. The Mangla Hydrometeorological Division was used as a nucleus and various project hydrologic activities were included. The Circle was designated as Surface Water Hydrology Project in June 1966.

Purpose and scope of report

The purpose of this report is to present the data collected by the Surface Water Hydrology Project in 1975, its sixteenth year of operation. This is the sixteenth in a series of annual reports to be published. The report is being published in three volumes. In this volume of the report observations taken at discharge stations by the Surface Water Hydrology Project are documented. The data in this volume include river discharge, suspended sediment concentration, chemical analysis and water temperature.

Maps on pages 9 to 14 show the hydrologic stations that have been operated and for which data are published. Some stations were operated for which only field data have been published because the records were incomplete or found to be below acceptable standards. These are indicated on the map as "Partial records". Only stations that are operated by the Surface Water Hydrology Project and for which records are published in this report are shown on the maps.

Discharge records are being collected by other agencies at some of the stations operated by the Surface Water Hydrology Project. Past records are available for some of these stations. These are discussed under "records available" in each station description. A more complete listing of availability of records is given in the "Inventory of Surface Water Hydrology Stations".

The data given herein were collected and computed by the best methods available and are considered to be accurate enough for general use. All field data and computations by the Surface Water Hydrology Project are on record in Lahore and open to inspection.

DEFINITION OF TERMS AND ABBREVIATIONS

The definition of hydrologic terms as used in this report are given below:

Cusecs: (Cubic foot per second) is the rate of discharge of a stream whose cross-sectional area is one square foot and whose velocity is one foot per second.

Cusecs per square mile (Cs/mi) is the average rate of discharge from each square mile of area drained, assuming that the runoff is distributed uniformly in time and area.

Runoff in inches (in) is the quantity of water discharged from an area (drainage basin) in a given period of time, measured in terms of mean depth over the area.

Acre foot (ac-ft) is the quantity of water required to cover an acre of area to a depth of one foot.

PPM Parts per million.

me/l (Milliequivalents per litre), one thousandth of an equivalent of an ion or a compound in one litre of solution.

EXPLANATION OF DATA

RIVER DISCHARGE, SEDIMENT AND CHEMICAL COMPOSITION DATA

Gauge height record

Records of river stage are obtained either from periodic readings of a staff gauge, or wire weight gauge, or from an automatic water-stage recorder which gives a continuous record of stage fluctuations. The non-recording gauges are generally read from 08:00 to 16:00 hours daily during periods of low flow and at more frequent intervals during floods.

Daily mean gauge heights for non-recording gauges are the arithmetic average of the observations during periods of uniform flow or are computed from gauge-height graphs based on observations during periods of rapidly changing stage. Daily mean gauge heights for automatic recording gauges are computed directly from the pen trace.

Discharge measurement

Measurements of discharge are made using the small price AA current meter and following the general methods used by the U.S. Geological Survey. This method consists of taking depths and observations of velocity in a cross-section of the stream, with the sections spaced so that not more than 5 percent of the discharge is measured in any one section. Velocity observations between 40 and 70 seconds are taken at 0.2 and 0.8 of the depth. If the flow is shallow, the velocity observation is taken only at 0.6 or 0.5 of the depth. In very small streams a pygmy current meter is used. Various suspensions for the current meters are used. These include calibrated rods for wading measurements and lines with sounding weights suspended from reels for use on bridges, overhead cableways, or boats.

The frequency of discharge measurement varies from station to station depending on such factors as stability of the channel and importance or accessibility of the station. At most stations, measurements are made twice a month except during flood periods when these may be made as often as serval times a day.

Discharge computations

Daily mean discharges are computed by application of daily mean gauge heights to rating tables prepared from stage-discharge relation curves based on discharge measurements. Any day showing rapid changes of gauge height is sub divided for daily discharge computation. Any extensions to the rating curves that are necessary to define extremes of discharge are made on the basis of logarithmic plotting, Velocity area studies, or indirect determinations of peak discharge such as slope-area or contracted opening measurements or computation of flow over dams or weirs.

EXPLANATION OF DATA

The discharge is computed by the shifting-control methods if the stage-discharge relation is subject to change because of frequent changes in the physical features that form the control. In this method correction factors, based on discharge measurements are used in applying the gauge heights to the rating tables.

Presentation of discharge data

The data presented for a discharge station include a station description and a table of daily, monthly and yearly discharges. Observations of sediment concentration and results of chemical analysis which are also listed, are described separately.

The description of each discharge station gives location, drainage area, records available, average discharge, extremes of discharge, description of the gauge, methods of measurements and remarks concerning accuracy, factors affecting the record and items of general interest. The location of the discharge station and the drainage area are taken from the most accurate maps available. Under "Records available" are listed, first those records obtained by the Surface Water Hydrology Project and then known records obtained by other agencies. "Average discharge" for the period of record is given only for stations with four years or more of record. Under "Extremes", the maximum instantaneous gauge heights and discharges observed for the current year and for the period of record are given. It should be noted that in the case of a non-recording gauge the highest gauge height observed may be considerably lower than the actual maximum figure. For the minimum discharge, the daily mean figure is given rather than an intantaneous value because, quite frequently, the instantaneous minimum discharge is caused by artificial means such as changes in irrigation diversion and is, therefore not representative of the flow except for a very short period.

In the table of daily discharge, the figures given are derived from gauge heights, with exceptions noted at the bottom of the page. Days on which discharge measurements were made are indicated by asterisks except where they were made very frequently in which case the frequency is indicated under "Discharge measurements" in the station description.

In the monthly summary at the bottom of the table of daily discharge, the line headed "mean" gives the average flow ~~for the~~ month in cubic feet per second; mean per square mile (cs/mi); runoff depth in inches over the drainage basin (in) and acre-feet (af) or million acre-feet (Maf). Values for cubic feet per second per square mile and runoff depth in inches are omitted if consumptive use or diversions in or out of the drainage basin make these values unrepresentative of natural conditions.

EXPLANATION OF DATA

The yearly values shown are the average flow in cubic feet per second, the average runoff in cubic feet per second per square mile, the total runoff depth in inches over the drainage basin, the total runoff in acre feet and the maximum and minimum daily mean discharge.

Downstream order of stations

Discharge stations are listed in downstream order along the Indus main stem. Stations on a tributary entering above a main stem station are listed before that station. If the tributary enters between two main stem station it is listed between them. A similar order is followed in listing stations as first rank, second rank and other ranks of tributaries. To indicate the rank of any tributary, each indention in the listing of gauging stations in the table of contents of this report represents one rank. This downstream order and system of indention show which gauging stations are on tributaries between any two stations on a main stem and the rank of the tributary on which each gauging station is located.

Accuracy of discharge data

Accuracy of stream flow records depends primarily on (1) stability of the stage-discharge relation, or if the relation is unstable, frequency of discharge measurements; (2) accuracy of observations of stage and measurements of discharge; (3) accuracy of interpretation of the field data.

In this volume, probable accuracy of discharge records is evaluated as follows:

Excellent	. . Probable error less than	5%
Good	. . Probable error less than	10%
Fair	. . Probable error less than	15%
Poor	. . Probable error greater than	15%

In general, monthly and annual mean values are more accurate than daily values because of compensation of random errors.

Discharge at partial-record stations and miscellaneous sites

The number of streams on which stream flow information is desired exceeds the number of stream-gauging stations it is feasible to operate at one time, so the Surface Water Hydrology Project, WAPDA has collected limited stream flow data at sites other than full time stream gauging stations. Data collected at these partial record stations or at miscellaneous sites are useable in preliminary, low or perennial flow analysis. Often partial-record stations are operated initially untill the necessity of the data justifies building major discharge measuring cableways or security and access allow full time collection of stream flow data.

EXPLANATION OF DATA

Discharge measurements made in 1975 for these sites in the area covered in this report are presented under "data at Miscellaneous sites".

Sedimentation data

Suspended sediment concentration is determined from water samples collected using sediment samplers designed to take in water without disturbing the flow. The samplers are of two general types. The depth-integrating sampler takes water in continuously while the sampler is moved at a uniform rate in a vertical section, from the surface to the bottom and back. The point-integrating sampler is used to obtain a sample at a specific point in the vertical.

Samples are usually taken at three verticals in the stream, so located that each represents approximately one-third of the flow. At low stages when the water is relatively clear, only one sample is taken at the centre of the flow. A set of samples is taken at the time of each discharge measurement, but may be taken more frequently during monsoon season at certain important stations. Water temperature is observed at the time of each sampling.

The samples are analysed either for total concentration by drying and weighing, or for particle size distribution by use of bottom withdrawal or visual accumulation tubes, pipettes and sieves using distilled water as settling media. It should be noted that these samples include only sediment suspended in water and not that transported as bed load.

Results of analysis of sediment samples for each discharge station are listed in chronological order following the table of daily discharges. The figures given on each line are the total concentration in parts per million of suspended solids by weight and the size distribution in percent of the total. The temperatures and discharge given are instantaneous values for the time at which samples were taken.

Chemical analysis

All natural waters contain dissolved mineral matter. As stream flow from the head reaches to the plains or sea, the water is in contact with soils or rocks and dissolves some minerals. The quantities of dissolved mineral matter depend primarily on the type of rocks or soils the water comes in contact with and the duration of the contact. Most streams are fed by both surface runoff and ground water, which reflect the chemical character of their concentration. Groundwater is generally more highly mineralized than natural surface runoff because it remains in contact with the rocks and soils for much longer periods. The concentration of dissolved solids in a river is frequently increased by man made causes namely for drainage of mines or oil fields, increased disposal of industrial and municipal wastes and drainage from irrigated lands.

EXPLANATION OF DATA

The samples for chemical analysis have been collected at or near points on streams where gauging stations are operated by the surface Water Hydrology Project, for which chemical analysis has been made by the Quality of Water Laboratory of Central Monitoring Organization of WAPDA.

The following determination are made on the samples:

Calcium (Ca) is determined by titration with the versenate (E.D.Y.S) using ammonium purpurate indicator in the presence of sodium hydroxide solution and colour change.

Magnesium (Mg) is determined by titration similar to calcium and colour change. Calcium and Magnesium are calculated as Vol. of versenate X normality of versenate X 1000/ml in aliquat.

Sodium (Na) is determined by Sodium Flame Photometer.

Carbonate and Bicarbonate (CO_3 and HCO_3) are determined by titrating the water samples with a standard solution of sulphuric acid using phenol-phathalein and methyle orange indicators. The end points of titration are selected as the inflection point in the titration of sodium carbonate with sulphuric acid. The carbonate end-point is taken at PH 8.2 and the bicarbonate at PH 4.5.

Chloride (Cl) is determined by titrating the sample with standard silver nitrate solution using potassium chromate as indicator.

Sulphate (SO_4) is determined by adding known quantity of barium chloride to the sample to precipitate all the sulphate ions.

Dissolved Solids (D.S) are determined by evaporation to give the total amount of soluble salt per million cc of water. A know volume of the water sample is evaporated at 105 °C.

Electrical conductivity (EC) is measured by means of a Wheat-stone Bridge where resistance is equated to the resistance of the unknown solution surrounding electrodes in a conductivity cell. The conductivity is expressed in micro-mhos per centimeter usually at 25 °C. Conductivity is closely related to the sum of cations and anions in solution and is a rapid method to know the total dissolved solids in a solution.

EXPLANATION OF DATA

pH — the hydrogen ion concentration is determined by a pH meter using glass and calomel-Kol electrodes.

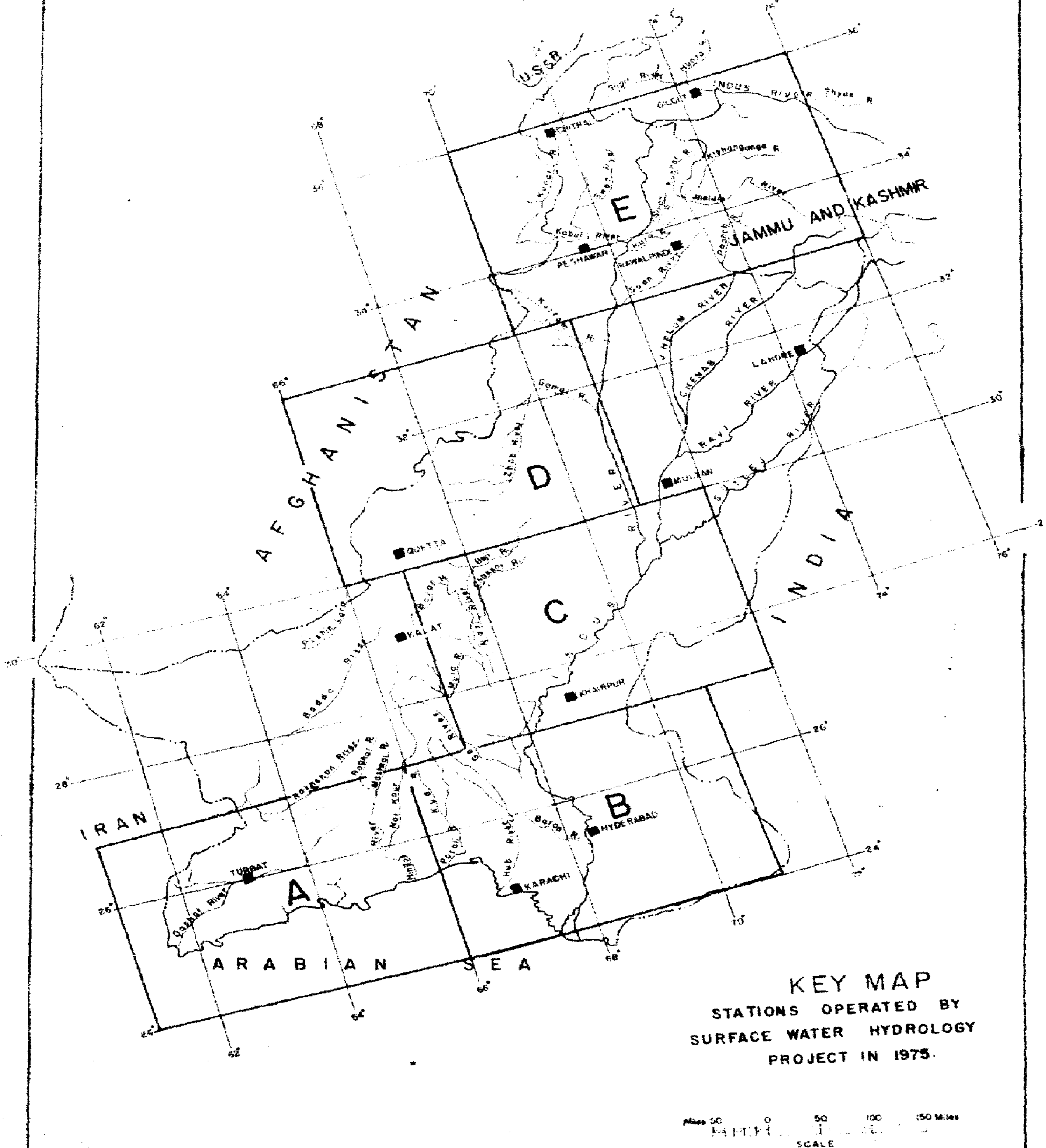
Sodium Adsorption Ratio (SAR) is an index of the sodium or alkali hazard expressing the relative activity of sodium ions in exchange reactions with the soil. It is expressed as follows.

$$SAR = \frac{Na^{+}}{\left(\frac{Ca^{++} + Mg^{++}}{2}\right)^{\frac{1}{2}}}$$

Where the concentrations of the three soluable cations are given in milliequivalents per litre (me/l).

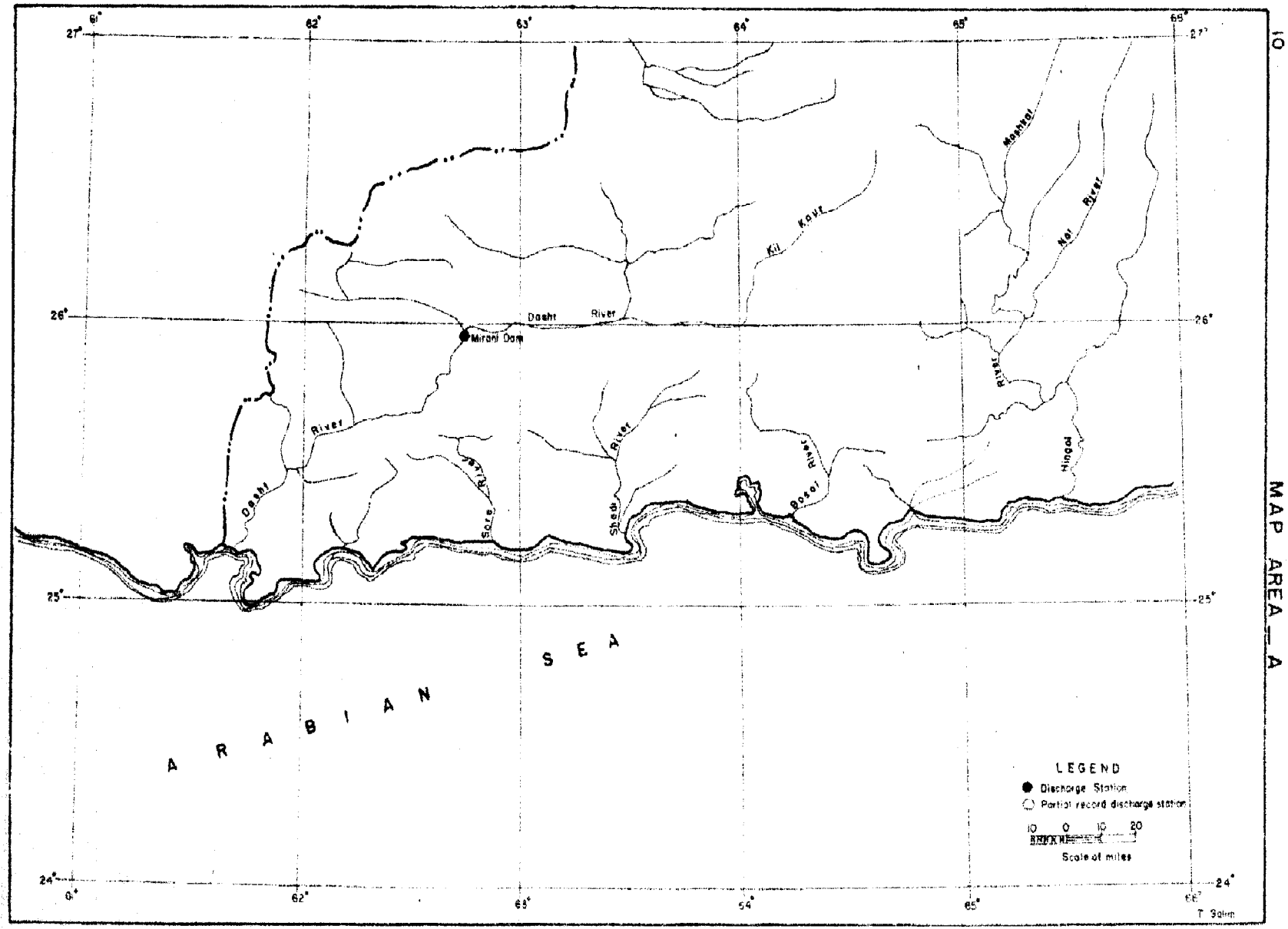
Residual Carbonate (Res CO_3) is expressed as the sum of the Carbonate and Bicarbonate anions minus the sum of the Calcium and Magnesium cations.

$$Res\ CO_3 = (CO_3^{--} + HCO_3^{--}) - (Ca^{++} + Mg^{++}).$$

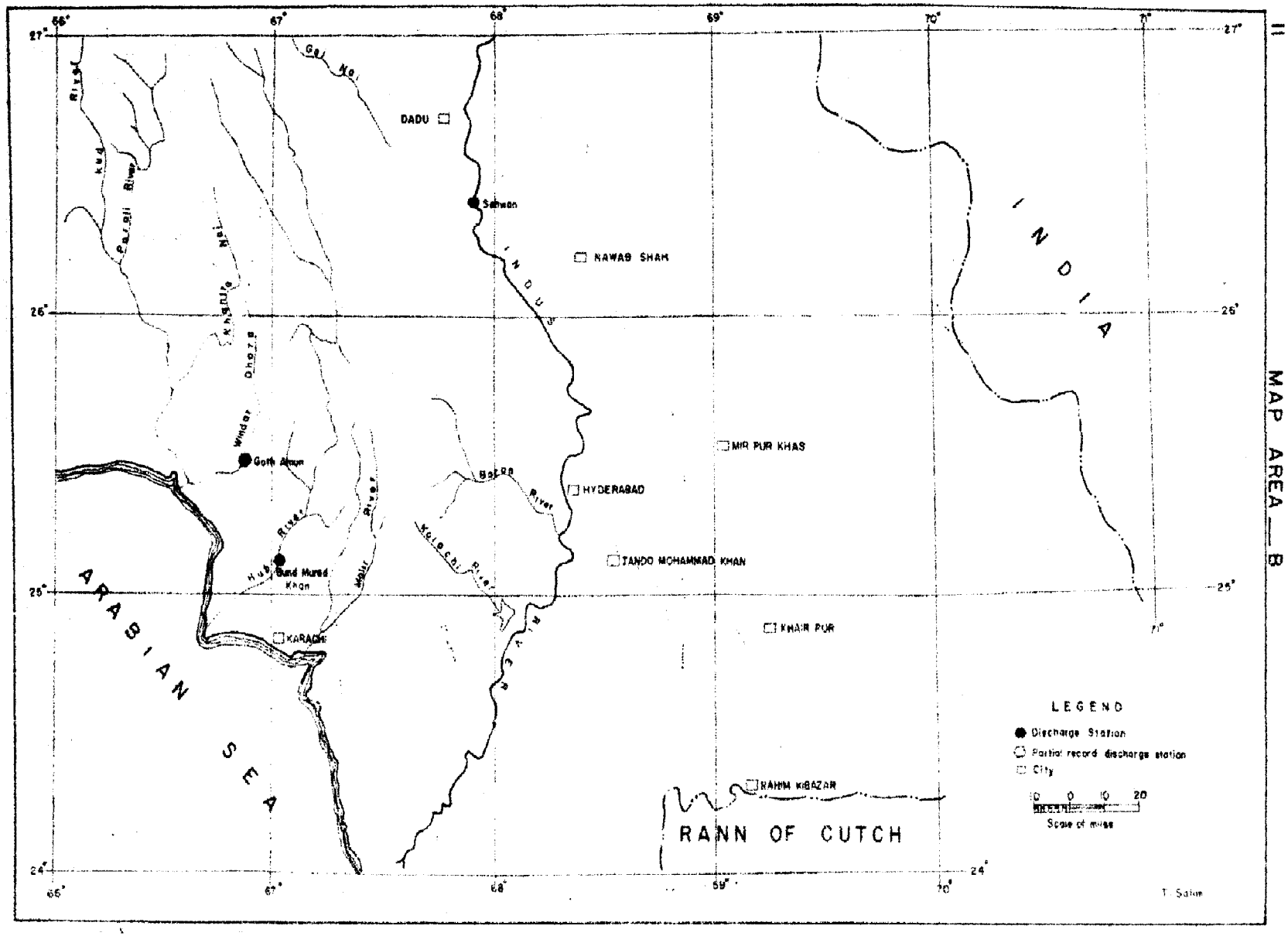


KEY MAP

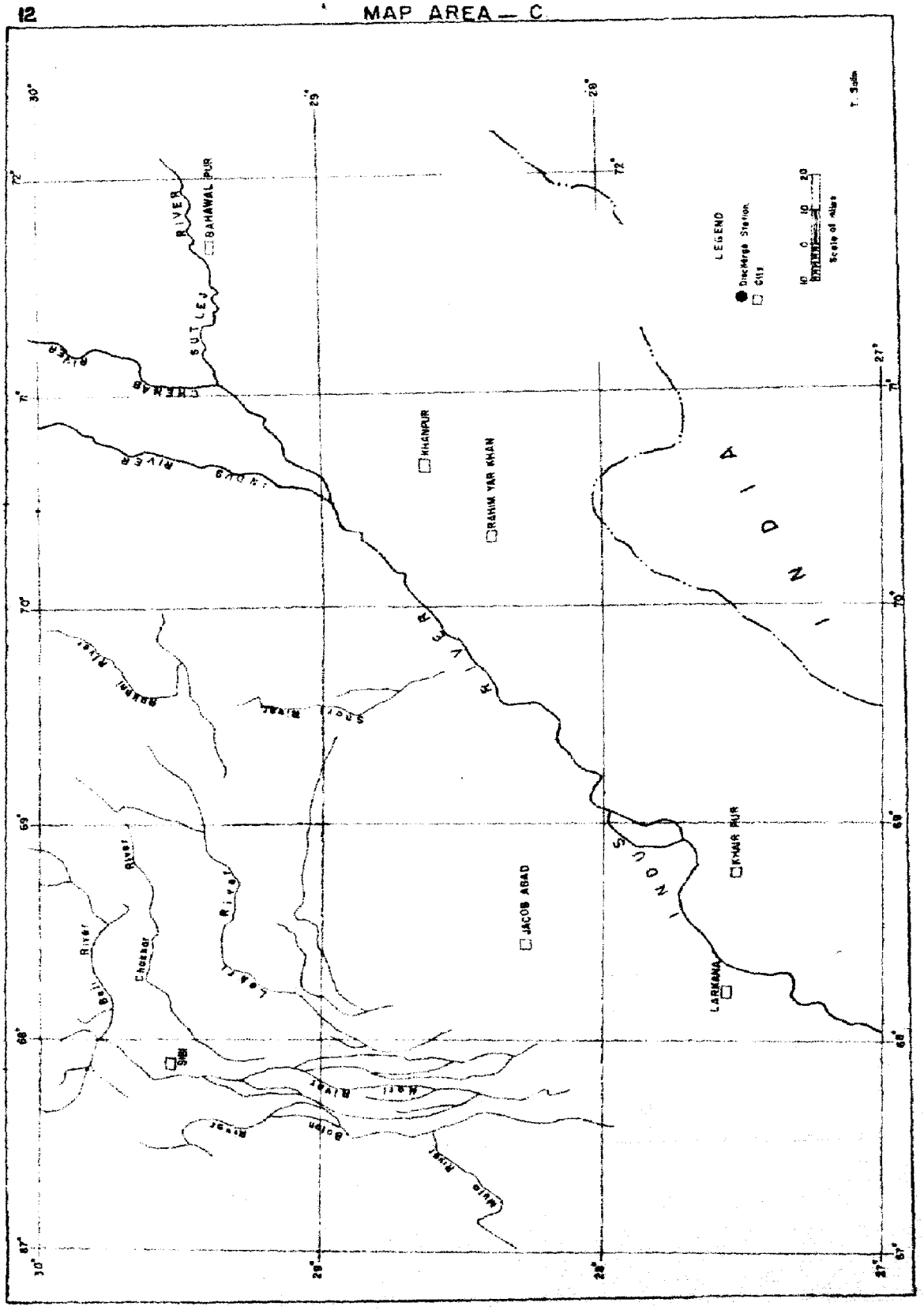
STATIONS OPERATED BY SURFACE WATER HYDROLOGY PROJECT IN 1975.


27°
26°
25°
24°
61°
62°
63°
64°
65°
66°
Dasht River
Mirani Dam
Dasht River
Sore River
Shadi River
Basol River
Kil Kaur
Mashkai
Nal River
Rakhshi River
Hingol
A R A B I A N S E A
LEGEND
Discharge Station
Partial record discharge station
10 0 10 20
Scale of miles
T 9alm

MAP AREA _ A


MAP AREA — B
66°
67°
68°
69°
70°
71°
27°
26°
25°
24°
DADU
Sehwan
NAWAB SHAH
MIR PUR KHAS
HYDERABAD
TANDO MOHAMMAD KHAN
KHAIR PUR
RAHIM KIBAZAR
KARACHI
Gotti Abun
Gund Murad Khan
INDIA
ARABIAN SEA
RANN OF CUTCH
INDUS
Gai Nai
Kalu River
Parali River
Khanpur Nai
Dhoria
Windar
Hub River
Mulir River
Baran River
Mulesri River
Nara
LEGEND
Discharge Station
Partial record discharge station
City
10 0 10 20
Scale of miles
T. Salim

MAP AREA — C


SUTLEJ RIVER
CHENAB RIVER
JHELUM RIVER
INDUS RIVER
BAHAWALPUR
KHANPUR
RAHIM YAR KHAN
JACOB ABAD
KHAIR PUR
LARKANA
SIBI
Bolan River
Nari River
Mula River
Sindh River
Bhakhri River
Chaghai River
Bali River
LEGEND
Discharge Station
City
Scale of Miles
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10
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72°
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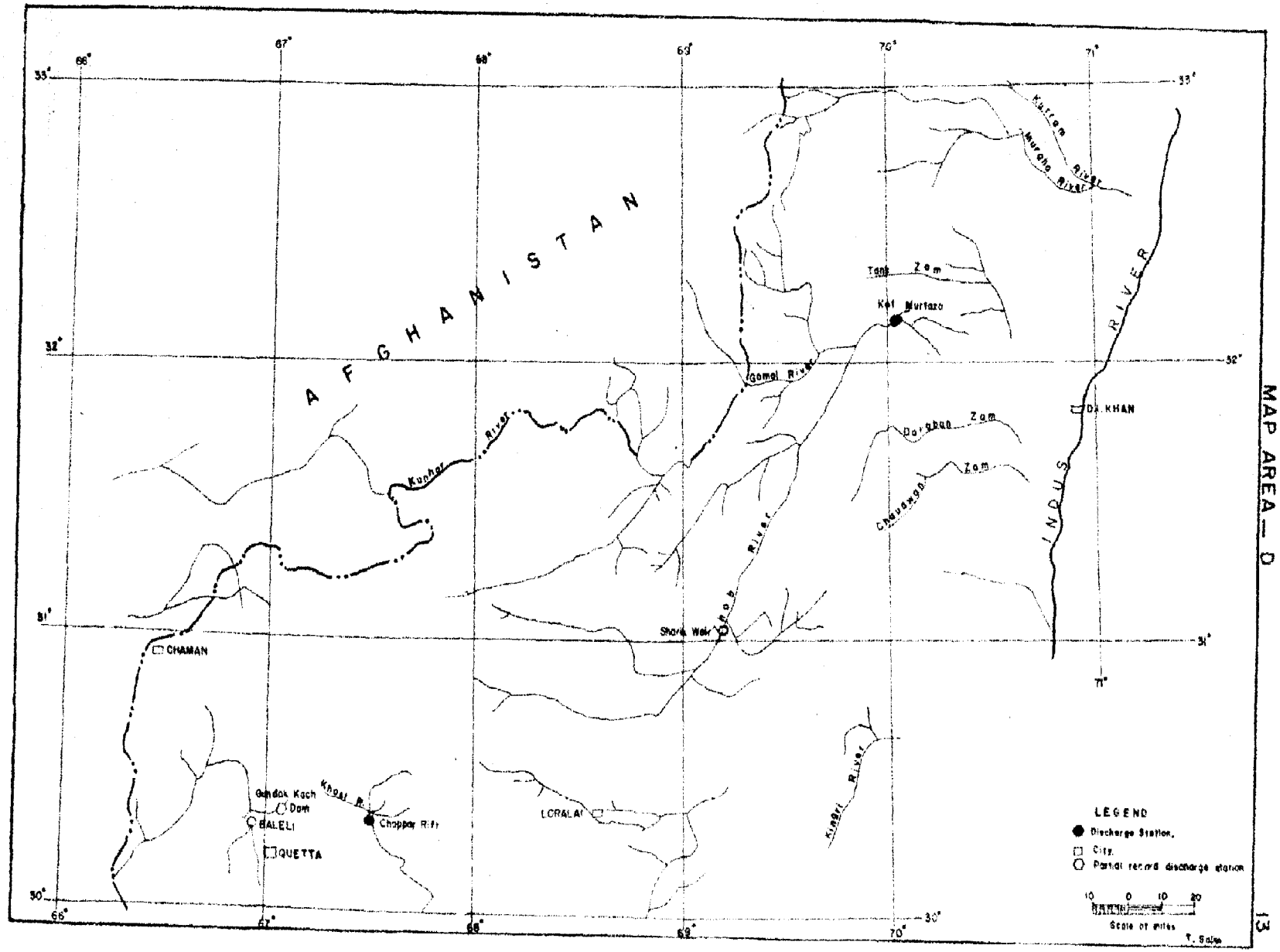
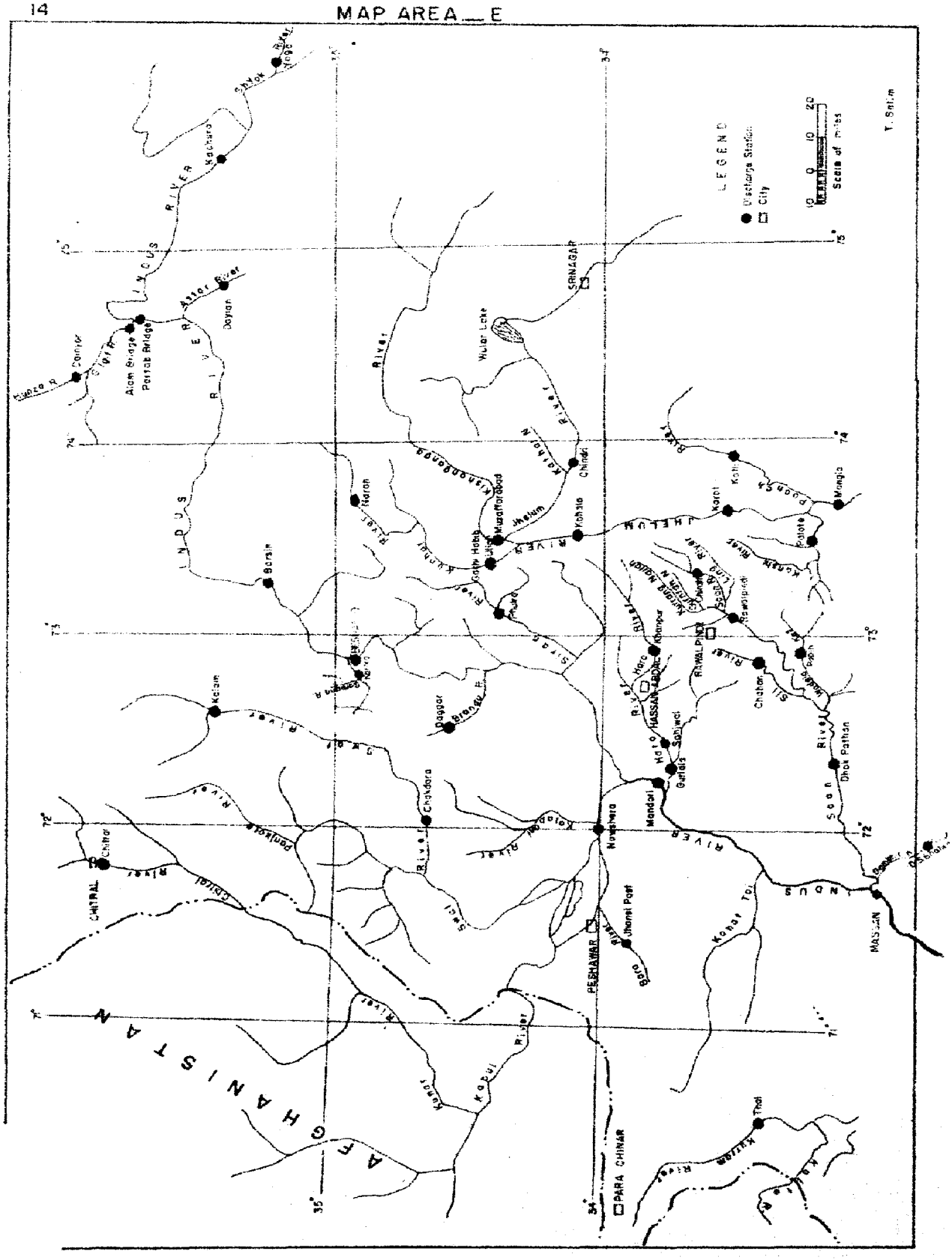
28°
29°
30°
67°
68°
69°


AFGHANISTAN
INDUS RIVER
Kurram River
Murghe River
Tank Zam
Kot Murtaza
Gomal River
Dera Ghazi Khan
Dargai Zam
Chaudwan Zam
Sharia Weir
Kunhar River
CHAMAN
Gandak Kach
Dam
BALELI
QUETTA
Khojak R.
Chappar Rift
LORALAI
Kingri River
LEGEND
Discharge Station.
City.
Partial record discharge station
Scale of miles
T. Sales
66°
67°
68°
69°
70°
71°
33°
32°
31°
30°

MAP AREA — D

MAP AREA — E


LEGEND
Discharge Station
City
Scale of miles
T. Salim
INDUS RIVER
JHELUM RIVER
KABUL RIVER
KURRAM RIVER
SWAT RIVER
KUNAR RIVER
KOHAT TOI
SOAN RIVER
SIRAN RIVER
KANSHI RIVER
KAPUL RIVER
AFGHANISTAN
CHITRAL
PESHAWAR
RAWALPINDI
SRINAGAR
MASJID
PARA CHINAR
Skardu
Dainar
Alam Bridge
Partab Bridge
Astor River
Doyian
Kachora
Water Lake
Chilar
Kohala
Muzaffarabad
Jhelum
Kotli Habib
Barsin
Karam
Daggar
Brandu
Chakdara
Chitral
Nowshera
Mandoi
Jhanki Post
Kohat
Chakwal
Dhok Pathan
Mangla
Kotli
Karot
Potota
Thal

RIVER DISCHARGE, SEDIMENT AND
CHEMICAL STATION RECORD
(Arranged in downstream order)

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Location Latitude 35°11', Longitude 75°06', about 2 furlongs from Yugo village on Skardu Khaplu road and 1½ miles from confluence with Indus River.

Drainage area 13,000 square miles.

Record available Gauge record at this location since March 1971. Mean daily discharges record from January 1973 to date by Surface Water Hydrology Project, WASID, WAPDA.

Average Discharge 10,900 cusecs (8,250,000 acre feet per year or 11.42 inches runoff per year). Average taken for Three years (1973 to 1975).

Extremes Maximum discharge observed during the year 76,[illegible]00 cusecs on 21 August (gauge height 36.60). Minimum daily discharge 1,300 cusecs on 18, 29 April.

Gauge Staff gauge graduated to tenth of a foot and read to hundredth of a foot from 0800 to 1600 hours during low flows and more often during floods; gauge set to arbitrary datum.

Measurements Ten discharge measurements were made during the year by current meter using 0.2 and 0.8 or 0.6 depth method from bridge. The river bed consists of sand, boulders and shingle and is liable to shifting. A mild turn in the river bed 300 ft. downstream may control the low flow at this location. Only two sets of sediment samples were taken by depth integrating method using D-49 sampler, and were analysed by particle size analysis method.

Determination of discharge Rating table dated 29.4.74 was used throughout the year for computation of mean daily discharges, actual shifts were used below 20.00 feet gauge as the gauges was temporary and datum of gauge changed occassionally.

Remarks Record fair.

SHYOK RIVER AT YUGO

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	2,030	1,740	1,610	1,430	1,320	5,300
2	1,990	*1,710	1,580	1,440	1,310	5,120
3	1,920	1,700	1,550	1,450	1,350	5,410
4	1,870	1,730	1,520	1,430	1,380	6,160
5	1,870	1,700	1,490	1,440	1,400	6,060
6	1,860	1,740	1,460	1,410	1,380	6,880
7	1,820	1,750	1,520	1,440	1,370	7,060
8	1,860	1,700	1,500	1,420	1,380	7,040
9	1,880	1,690	1,550	1,430	1,320	6,860
10	1,980	1,650	1,560	1,390	1,350	7,320
11	1,930	1,650	1,500	1,350	1,390	8,700
12	1,900	1,640	1,500	1,370	1,490	9,400
13	1,950	1,680	1,510	1,370	1,680	8,180
14	1,940	1,680	1,560	1,380	1,820	11,500
15	1,900	1,720	1,560	1,390	*1,920	13,500
16	1,830	1,700	1,520	1,330	2,010	17,300
17	1,770	1,720	1,480	1,310	2,110	24,000
18	1,710	1,700	1,490	1,300	2,020	25,200
19	1,690	1,670	1,550	1,340	1,990	25,000
20	1,670	1,720	1,570	1,370	2,020	18,200
21	1,670	1,740	1,560	1,390	2,070	17,200
22	1,700	1,770	1,530	1,360	2,120	15,100
23	1,760	1,700	1,500	1,390	2,070	14,100
24	1,800	1,720	1,470	1,400	2,010	12,600
25	1,890	1,690	1,490	1,370	1,990	12,400
26	1,810	1,660	1,460	1,410	2,020	14,300
27	1,740	1,640	1,440	*1,390	2,310	15,700
28	1,770	1,610	1,430	1,350	2,770	*16,500
29	1,820	-----	*1,410	1,300	3,870	15,600
30	1,820	-----	1,410	1,310	5,050	11,700
31	1,780	-----	1,430	-----	5,300	------
Mean	1,840	1,700	1,510	1,380	2,050	12,300
Cs/mi	0.14	0.13	0.12	0.11	0.16	0.95
In	0.16	0.14	0.13	0.12	0.18	1.06
Ac.ft.	112,900	94,300	92,600	82,200	126,000	733,000

1975 Year: Mean 8,660 Cs/sq mi 0.67 Inches 9.05

Note : *Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	11,300	24,500	17,300	6,780	3,730	2,340
2	11,000	29,900	16,900	6,400	3,670	2,290
3	10,600	30,200	16,100	6,780	3,600	2,370
4	10,800	39,400	14,800	6,340	*3,530	2,390
5	10,600	34,200	15,600	6,200	3,470	2,410
6	10,200	39,500	14,800	5,940	3,410	2,350
7	10,700	30,800	14,500	5,880	3,330	2,290
8	10,700	26,700	15,100	5,820	3,330	2,130
9	10,900	24,400	15,600	6,580	3,270	2,040
10	12,400	22,900	14,800	6,400	3,190	1,960
11	15,300	25,800	14,300	6,180	3,110	1,860
12	19,800	32,700	14,500	6,000	3,060	2,080
13	24,400	39,100	13,800	5,780	3,010	1,980
14	32,900	43,600	13,300	5,650	3,010	2,020
15	43,500	50,700	12,300	5,590	3,050	2,050
16	45,100	63,600	*11,600	5,430	3,020	2,180
17	32,200	69,900	11,200	5,320	3,010	2,230
18	23,700	67,100	10,800	5,250	3,050	2,150
19	21,700	68,900	10,600	5,020	2,990	2,040
20	21,900	73,400	11,800	4,890	2,980	1,950
21	19,800	75,800	11,300	4,720	2,940	1,940
22	17,900	71,600	11,100	4,560	2,890	1,870
23	18,200	56,700	10,400	4,400	2,820	1,940
24	22,400	37,100	9,490	4,210	2,770	1,980
25	20,400	24,100	8,940	4,060	2,700	2,040
26	20,600	23,200	8,610	3,950	2,650	2,060
27	19,800	24,100	7,780	3,950	2,580	2,110
28	20,300	*23,900	7,580	4,020	2,520	2,110
29	*20,900	20,900	7,380	3,950	2,460	2,070
30	21,600	20,500	7,180	*3,920	2,390	2,110
31	23,200	18,600	-----	3,890	-----	2,050
Mean	19,800	39,700	12,300	5,250	3,050	2,110
Cs/mi	1.52	3.05	0.95	0.40	0.23	0.16
In	1.76	3.52	1.06	0.47	0.26	0.19
Maf.	1.22	2.44	.732	.323	.182	.130

M.Acre-feet. 6.27 Maximum day 75,800 Minimum day 1,300

SHYOK RIVER AT YOGU

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
29 Jul	20,600	60	4,710	86	8	6
28 Aug	23,900	52	4,460	89	6	5

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

Location Latitude 35°27', Longitude 75°25', on right bank, twenty miles downstream from Skardu town, Two miles upstream from Ayub Bridge situated on Kachura Kuwardo Road.

Drainage area 43,500 square miles.

Record available Gauge height record from July 1969 to date, mean daily discharges computed from January 1970 to date by Surface Water Hydrology Project, WASID, WAPDA. Periodic discharge measurements started from July 1970.

Average discharge 33,800 cusecs (24,450,000 acre feet per year or 10.54 inches per year). Average taken for six years from 1970 to 1975.

Extremes Maximum discharge observed during the year 187,000 cusecs on 21 August (gauge height 52.90 feet); minimum daily discharge 5,400 cusecs on 9th March.

1970-75: Maximum discharge observed 215,000 cusecs on 19 July 1973: minimum daily discharge 4,360 cusecs on 21 February 1972.

Gauge Staff gauge graduated in tenth and read to hundredth of a foot at one hour interval for whole day throughout the year. Gauge set to arbitrary datum.

Measurements Sixty discharge measurements were made during the year using 0.2 and 0.8 depth method from cableway. Twenty two sets of sediment samples were taken by depth integration method using D-49 sampler from cableway. Fifteen of these were analysed for particle size distribution.

Determination of discharge Rating table dated 5.10.73 was used below 39.00 ft and Rating dated 20.2.75 above 39.00 ft was used for the whole year.

Remarks Records fair. Surface samples were not collected. This is a flood warning station for Tarbela Dam.

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	7,410	5,810	*5,470	6,490	11,000	44,900
2	7,350	*5,790	5,470	6,540	11,000	42,600
3	7,300	5,710	5,470	6,510	11,400	*45,000
4	7,240	5,670	5,500	6,560	12,000	45,800
5	7,170	5,660	5,540	*6,650	12,800	46,000
6	7,100	5,680	5,510	6,710	12,700	47,500
7	7,020	5,680	5,460	6,810	11,900	51,000
8	6,990	5,660	*5,410	6,950	11,100	*51,400
9	6,950	*5,640	5,400	7,060	10,200	47,500
10	6,920	5,600	5,420	7,270	*10,400	44,900
11	*6,930	5,580	5,490	7,510	*11,000	42,300
12	6,890	5,550	5,510	*7,550	*11,600	45,900
13	6,840	5,550	*5,510	7,610	12,500	53,100
14	6,880	5,620	5,500	7,650	14,700	*60,900
15	6,860	5,660	5,510	7,730	17,900	71,400
16	6,810	5,600	5,630	7,830	20,300	86,000
17	6,720	5,560	5,750	7,980	23,400	*108,000
18	*6,640	*5,550	5,860	8,080	22,300	126,000
19	6,570	5,510	6,020	*8,200	20,300	141,000
20	6,510	5,510	6,240	8,440	19,100	134,000
21	6,340	5,510	6,340	8,760	19,900	*113,000
22	6,230	5,510	*6,450	9,100	*20,700	93,900
23	6,160	5,490	6,470	9,450	18,500	78,400
24	6,100	5,460	6,510	9,750	*16,700	*75,500
25	6,070	5,490	6,510	10,300	17,800	70,700
26	*5,980	5,510	6,490	*11,300	19,900	73,400
27	5,940	5,490	*6,410	11,900	*24,200	87,400
28	5,900	5,460	6,330	11,900	29,000	96,600
29	5,880	------	6,330	11,500	34,300	89,600
30	5,850	-----	6,380	11,200	39,700	73,800
31	5,820	-----	6,440	------	43,900	------
Mean	6,630	5,590	5,880	8,380	18,500	72,900
Cs/mi	.15	.13	.14	.19	.42	1.68
In	.18	.13	.16	.21	.49	1.87
Maf.	.407	.310	.362	.498	1.13	4.34

1975 Year : Mean 33,500 Cs/sq mi .77 Inches 10.46

Note : * Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	59,300	90,200	58,000	18,200	12,500	8,670
2	51,600	110,000	61,700	17,300	12,300	8,640
3	49,500	122,000	65,300	16,600	12,100	8,610
4	54,600	126,000	69,100	*16,600	11,900	8,550
5	64,200	124,000	70,500	17,100	11,700	8,490
6	67,400	*118,000	*67,900	17,500	11,600	8,380
7	68,800	114,000	57,900	17,600	11,600	*8,350
8	67,300	102,000	50,600	17,900	11,500	8,460
9	67,100	*93,600	*41,300	*18,000	*11,400	8,530
10	*75,100	93,900	38,400	17,800	11,400	8,550
11	87,800	106,000	38,100	17,200	11,200	8,410
12	109,000	*119,000	38,900	16,500	10,900	*8,380
13	130,000	126,000	*38,500	18,000	*10,900	8,320
14	135,000	131,000	37,400	15,600	10,800	8,260
15	143,000	*140,000	37,200	15,100	10,700	8,170
16	*150,000	150,000	38,900	14,900	10,700	8,500
17	145,000	162,000	*39,200	14,700	10,600	8,500
18	123,000	*170,000	39,700	*14,400	10,500	8,440
19	106,000	178,000	39,200	14,600	10,300	*8,500
20	*100,000	182,000	37,900	14,700	*10,200	8,350
21	94,000	182,000	35,300	14,700	9,990	8,170
22	85,400	*169,000	*32,300	*14,600	9,750	8,020
23	81,600	143,000	30,500	14,200	9,580	7,950
24	*93,500	105,000	28,800	13,900	9,420	7,930
25	*80,300	73,300	27,500	13,600	9,280	7,870
26	76,000	*66,000	*25,300	13,300	9,180	7,790
27	77,900	65,600	24,000	13,200	*8,980	*7,700
28	79,400	66,200	23,700	13,100	8,920	7,680
29	81,400	64,900	22,500	13,000	8,800	7,700
30	81,800	*59,600	*20,100	12,900	8,730	7,590
31	81,800	57,100	------	12,700	-----	7,480
Mean	89,300	116,000	41,200	15,500	10,600	8,220
Cs/mi	2.05	2.68	.95	.36	.24	.19
In	2.37	3.09	1.06	.41	.27	.22
Maf.	5.49	7.16	2.45	.951	.630	.506

M. Acre-feet. 24.2 Maximum day 182,000 Minimum day 5,400

INDUS RIVER AT KACHURA

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
8 Mar	5,410	39	38			
13 Mar	5,510	38	68			
22 Mar	6,460	44	36			
27 Mar	6,370	48	54			
5 Apr	6,670	53	90			
12 Apr	7,550	46	125			
19 Apr	8,200	55	144			
26 Apr	11,600	52	5,180	86	12	2
10 May	10,700	57	2,520	90	9	1
22 May	20,900	56	5,050	83	15	2
3 Jun	46,800	54	5,190	80	15	5
14 Jun	60,200	55	1,990	60	25	15
10 Jul	76,500	58	2,950	76	11	13
16 Jul	153,000	60	2,830	79	14	7
20 Jul	99,600	58	3,350	87	6	7
25 Jul	81,500	56	2,870	82	11	7
6 Aug	118,000	54	8,490	89	8	3
12 Aug	125,000	58	4,630	77	10	13
18 Aug	170,000	53	6,550	83	11	6
26 Aug	68,100	56	5,050	78	8	14
30 Aug	57,300	56	8,510	92	5	3
4 Oct	16,700	58	9,030	93	6	1

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

Location Latitude 35°55', Longitude 74°23', near Dainyor village about 5 miles East of Gilgit Town and ½ miles upstream from confluence with Gilgit River.

Drainage area 5,080 square miles.

Record available Record available from September 1965 to date with Surface Water Hydrology Project, WAPDA. Periodic discharge measurements started from 5 Nov'1965.

Average discharge 13,400 cusecs (9,700,000 acre feet per year or 35.79 inches runoff per year). Average taken for 10 years from 1966 to 1975.

Extremes Maximum discharge observed during the year 66,300 cusecs on 20 August (gauge 12.50 feet); minimum daily discharge 1,310 cusecs on 29, 30, 31 December.

1966-74: Maximum discharge observed 182,000 cusecs on 30 June 1967 (gauge height 21.90 feet gauge set to arbitrary datum): Minimum discharge 1,030 on 25 March 1968.

Gauge Staff gauge with 0.1 foot graduation on left bank downstream of bridge; gauge read to hundredth of a foot from 0800 to 1600 hours daily during low flows and more often during floods. Gauge set to an arbitrary datum.

Measurements Twenty eight discharge measurements were made during the year using 0.2 and 0.8 depth method from the bridge. Twenty eight sediment samples were taken by depth integration method using D-49 sampler f om the bridge. Sixteen of these were analysed for particle size distribution and the rest for total concentration.

Determination of discharge Rating table dated 26.5.1976 was used to compute discharge with shift adjustiment as necessitated by periodic discharge measurements.

Remarks Record good. Surface samples were not collected during the year.

HUNZA RIVER AT DAINYOR BRIDGE

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	1,680	1,510	1,500	1,380	3,350	7,560
2	1,670	1,510	1,490	1,390	3,680	8,370
3	1,660	1,510	1,490	1,390	*3,790	*10,700
4	1,660	1,500	1,490	1,390	3,890	10,800
5	1,640	1,520	1,490	1,390	3,990	10,900
6	1,630	1,530	1,480	1,400	4,070	11,000
7	1,620	*1,530	1,480	1,400	4,090	11,000
8	1,620	1,530	1,470	*1,400	4,190	11,200
9	1,600	1,530	1,470	1,390	4,210	11,400
10	1,600	1,530	1,460	1,370	4,230	11,400
11	1,590	1,530	1,450	1,370	4,420	10,500
12	1,590	1,540	1,440	1,370	4,270	10,600
13	1,580	1,540	*1,440	1,380	4,270	*10,100
14	1,580	1,540	1,430	1,410	4,420	11,500
15	1,580	1,540	1,420	1,450	4,510	14,500
16	1,580	1,550	1,410	1,520	4,730	17,100
17	1,570	1,550	1,400	1,590	4,580	21,800
18	1,570	1,550	1,390	1,760	4,510	27,400
19	1,560	1,550	1,390	1,870	4,620	31,200
20	1,560	1,550	1,370	2,090	4,840	26,700
21	1,560	*1,550	1,360	*2,370	5,060	23,900
22	1,550	1,550	1,350	2,510	*5,150	27,000
23	1,550	1,540	1,340	2,430	5,300	21,000
24	1,540	1,530	1,340	2,390	5,410	*13,700
25	1,540	1,520	*1,340	2,520	5,730	13,700
26	1,540	1,510	1,340	2,670	6,200	17,100
27	1,540	1,510	1,340	2,570	6,450	19,700
28	1,530	1.500	1,340	2,600	6,780	23,100
29	1,520	-----	1,350	2,750	7,190	25,100
30	1,620	-----	1,360	3,070	7,470	22,000
31	1,620	-----	1,360	-----	7,530	------
Mean	1,590	1,530	1,410	1,850	4,930	16,400
Cs/mi	.31	.30	.28	.36	.97	3.23
In	.36	.31	.32	.41	1.12	3.60
Ac.ft.	97,700	85,000	86,800	110,000	303,000	976,000

1975 Year: Mean 11,300 Cs/sq mi 2.22 Inches 30.17

Note: *Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	19,100	36,300	27,900	6,380	3,280	2,040
2	16,600	42,500	28,800	6,570	3,230	2,000
3	18,900	47,400	28,900	6,740	3,160	*1,960
4	22,200	53,000	29,500	6,910	3,100	1,910
5	22,100	51,700	*30,100	6,780	3,050	1,870
6	20,600	49,400	28,200	7,560	3,020	1,850
7	20,900	*47,000	26,700	7,670	2,980	1,810
8	23,600	43,500	21,000	7,770	2,910	1,770
9	26,800	41,300	20,000	7,410	2,820	1,730
10	*30,900	42,700	19,500	7,130	2,710	1,690
11	36,300	42,500	18,200	6,830	2,630	1,650
12	41,300	*47,900	*18,000	6,690	2,560	1,620
13	47,200	56,100	18,300	6,410	2,520	1,590
14	54,400	52,900	18,000	6,380	2,470	1,560
15	48,300	51,000	20,000	6,270	2,430	1,530
16	43,900	51,200	21,900	6,010	2,390	1,510
17	40,500	59,800	*21,700	5,870	*2,370	1,490
18	39,400	62,200	22,000	5,730	2,350	1,460
19	*38,400	59,700	21,600	5,330	2,330	1,440
20	39,200	62,500	20,500	5,150	2,310	1,420
21	39,700	*57,300	17,500	5,040	2,290	1,400
22	42,000	51,100	14,100	4,910	2,260	1,390
23	37,800	39,200	12,700	4,780	2,230	1,370
24	32,500	29,400	12,300	4,400	2,210	1,350
25	28,400	28,900	*11,700	4,190	2,180	1,340
26	30,000	32,200	10,900	3,850	2,170	1,330
27	32,500	35,200	9,930	3,560	2,150	*1,320
28	*35,600	30,100	9,210	3,480	2,140	1,320
29	37,400	*25,600	7.680	3,420	*2,120	1,310
30	30,400	23,800	6,880	3,350	2,080	1,310
31	*32,500	24,800	------	3,300	------	1,310
Mean	33,300	44,500	19,100	5,670	2,550	1,570
Cs/mi	6.55	8.75	3.76	1.12	.50	.31
In	7.55	10.09	4.20	1.29	.56	.36
Maf.	2.05	2.73	1.14	.349	.152	96,500

M.Acre-feet. 8.17 Maximum day 62,500 Minimum day 1,310

HUNZA RIVER AT DAINYOR BRIDGE

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Percent Silt	Percent Clay
7 Feb	1,530	40	35			
21 Feb	1,600	46	15			
13 Mar	1,440	80	57			
25 Mar	1,340	60	56			
8 Apr	1,430	-	92			
21 Apr	2,370	59	778	16	29	55
3 May	3,830	65	1,190	48	14	38
22 May	5,220	58	1,150	4	58	38
3 Jun	11,100	63	3,000	49	33	18
13 Jun	10,300	60	1,980	23	49	28
24 Jun	13,800	53	1,230	22	48	30
10 Jul	34,700	62	1,980	6	71	23
19 Jul	37,700	68	3,120	26	64	10
28 Jul	35,600	58	2,050	16	67	17
31 Jul	32,400	58	3,270	25	60	15
7 Aug	47,900	58	4,400	33	57	10
12 Aug	52,300	62	6,120	34	53	13
21 Aug	53,900	64	2,750	1	84	15
29 Aug	25,400	56	1,210	17	59	24
5 Sep	30,200	59	3,250	37	51	12
12 Sep	17,700	58	627	9	59	32
17 Sep	22,000	60	498			
25 Sep	11,700	52	399			
27 Oct	3,580	58	65			
17 Oct	2,370	50	61			
29 Nov	2,120	38	89			
3 Dec	1,960	56	38			
26 Dec	1,330	50	26			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

Location Latitude 35°45', Longitude 74°37', on left bank about two miles upstream from confluence with Indus River and ½ miles upstream from Alam Bridge on Gilgit Bunji Road.

Drainage area 10,100 square miles.

Record available Discharge record by Surface Water Hydrology Project, WASID, WAPDA, from Ist January 1966 to date. Gauge height record since 29 December 1965.

Average discharge 24,800 cusecs (17,920,000 acre feet per year or 33.26 inches runoff per year) average taken for 9 years i.e. 1966 to 1967 and 1969 to 1975.

Extremes Maximum discharge observed during the year 92,200 cusecs on 21 August (gauge height 21.60); minimum daily discharge 2,740 cusecs on 31 March and 1 April.

1966-74: Maximum discharge 208,000 cusecs on 30 June 1967 (estimated; minimum daily discharge 2,740 cusecs on 31 March and 1 April 1975.

Gauge Enamelled plates graduated to 0.1 and read from 0800 to 1600 hours daily during low flow and more often during floods. Gauge set to arbitrary datum. Initially the gauge was on right bank but shifted to left bank on 16.4.69.

Measurements Twenty five discharge measurements were made during the year using 0.2 and 0.8 depth method from the bridge. Twenty one sets of sediment samples were taken by depth integration method using D-49 sampler from the bridge. Ten of these were analysed for particle size distribution and the rest for total concentration.

Determination of discharge Rating table dated 18.6.76 was used to compute discharges with shift adjustments as necessitated by periodic discharge observations.

Remarks Record fair. Surface samples for analysis of chemical composition were not collected during the year.

GILGIT RIVER AT ALAM BRIDGE

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	3,230	2,880	2,850	2,740	5,560	22,500
2	3,200	2,880	2,850	2,750	5,830	23,800
3	3,160	2,880	2,850	2,760	6,850	25,000
4	3,130	2,880	2,850	2,760	6,960	20,300
5	3,110	2,880	2,850	2,780	6,330	19,800
6	3,090	2,880	2,850	2,780	*6,200	*22,400
7	3,050	2,880	2,860	2,780	6,060	23,700
8	3,020	*2,880	2,850	2,770	5,930	24,300
9	3,000	2,880	2,850	*2,780	5,800	25,100
10	2,980	2,880	2,840	2,790	5,770	24,700
11	2,960	2,880	2,840	2,790	5,530	22,600
12	2,940	2,880	2,830	2,800	5,400	22,200
13	2,920	2,880	2,820	2,790	6,460	24,300
14	2,900	2,880	*2,830	2,770	9,690	30,100
15	2,880	2,880	2,820	2,770	10,500	37,600
16	2,870	2,880	2,810	2,820	12,900	43,200
17	*2,840	2,880	2,800	2,840	12,700	52,600
18	2,850	2,880	2,800	2,850	10,300	*55,700
19	2,850	2,870	2,800	3,040	8,640	60,600
20	2,850	2,870	2,800	3,300	9,620	59,700
21	2,850	2,870	2,790	3,670	9,640	55,100
22	2,850	2,870	2,790	3,930	7,620	42,200
23	2,850	2,860	2,790	4,080	8,060	29,300
24	2,840	2,860	2,790	4,430	10,100	25,900
25	2,830	2,850	2,790	4,740	11,700	*28,300
26	2,840	*2,850	2,780	4,980	12,900	27,400
27	2,850	2,840	2,770	5,170	13,800	30,700
28	2,860	2,850	2,760	5,190	16,000	*41,400
29	2,870	-----	2,760	5,230	20,100	52,000
30	2,880	-----	2,750	5,350	22,700	43,200
31	2,890	-----	2,740	-----	23,600	------
Mean	2,940	2,870	2,810	3,430	9,980	33,900
Cs/mi	.29	.28	.28	.34	.99	3.36
In	.36	.30	.32	.38	1.14	3.74
Maf.	.181	.160	.173	.204	.613	2.01

1975 Year: Mean 18,200 Cs/sq mi 1.80 Inches 24.45

Note : *Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	42,000	46,000	31,600	10,200	6,090	4,400
2	39,700	*51,900	38,000	10,200	6,010	4,370
3	38,500	61,300	38,300	10,100	5,940	4,360
4	43,800	64,700	40,700	10,300	5,860	4,340
5	45,500	64,600	34,400	10,300	5,780	4,310
6	47,500	64,200	40,700	10,100	5,710	4,280
7	43,100	64,900	*35,700	9,830	5,630	4,270
8	*44,300	63,900	30,700	11,100	5,560	4,260
9	45,000	*57,200	27,300	10,500	5,480	4,230
10	48,300	58,300	27,300	9,730	5,400	4,220
11	57,100	59,800	26,000	9,500	5,320	4,190
12	58,400	69,200	26,200	9,550	5,230	4,180
13	64,300	74,500	*27,300	9,340	5,200	4,150
14	78,600	72,100	27,400	9,260	5,190	4,140
15	*78,700	75,500	28,900	8,500	5,080	4,130
16	75,800	79,400	30,500	8,340	5,070	4,110
17	70,200	82,400	28,300	8,160	4,960	4,100
18	68,600	84,100	30,300	8,120	4,870	4,090
19	66,700	81,400	*28,600	8,000	4,840	4,060
20	67,200	87,400	27,500	7,860	4,750	4,050
21	68,000	88,600	23,200	7,480	4,720	4,020
22	67,500	77,400	17,600	7,120	4,690	4,010
23	*61,800	*60,400	16,900	6,850	4,600	3,990
24	54,600	48,800	*16,000	6,750	4,570	3,980
25	50,200	46,300	15,500	6,680	4,530	3,970
26	*44,600	44,700	15,000	6,630	4,490	3,960
27	48,500	45,000	13,200	6,560	*4,440	3,940
28	48,800	*42,200	12,300	*6,580	4,400	3,930
29	48,700	35,900	10,800	6,480	4,360	3,930
30	47,100	33,000	10,300	6,240	4,320	3,920
31	45,700	32,100	------	6,160	-----	3,920
Mean	55,100	61,800	25,900	8,470	5,100	4,120
Cs/mi	5.46	6.12	2.56	.84	.51	.41
In	6.29	7.06	2.86	.97	.56	.47
Maf.	3.39	3.80	1.54	.521	.304	.254

M. Acre-feet.13.2 Maximum day 88,600 Minimum day 2,740

GILGIT RIVER AT ALAM BRIDGE

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
17 Jan	2,840	42	47			
30 Jan	2,880	27	26			
26 Feb	2,850	42	21			
14 Mar	2,870	68	33			
9 Apr	2,790	-	48			
6 May	4,600	50	175			
6 Jun	10,900	76	722	14	50	36
18 Jun	58,300	53	3,550	17	58	25
25 Jun	27,400	53	807	33	39	28
28 Jun	49,900	58	2,880	35	49	16
8 Jul	45,800	56	2,010	3	76	21
15 Jul	78,500	58	1,010	2	65	33
23 Jul	61,400	54	2,390	24	64	12
2 Aug	54,500	56	2,370	2	76	22
23 Aug	56,200	61	2,780	45	41	14
28 Aug	40,800	63	687	3	58	39
19 Sep	28,700	60	467			
24 Sep	15,700	60	207			
28 Oct	6,580	55	37			
14 Nov	5,780	40	46			
25 Dec	3,920	41	49			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

Location Latitude 35°44', Longitude 74°37', on right bank under the bridge, 1 mile downstream from the confluence of Gilgit River.

Drainage area 55,100 square miles (revised in 1969).

Record available Discharge record by Surface Water Hydrology Project, WASID, WAPDA, from January 1962 to date. Gauge height record by Hydrology Directorate of Irrigation Department from September to June 1962 with partial discharge record.

Average discharge 61,700 cusecs (44,720,000 acre feet per year or 14.90 inches runoff per year). Average taken for 14 years from 1962 to 1975.

Extremes Maximum discharge observed during the year 324,000 cusecs on 21 August (gauge height 69.78 feet); minimum daily discharge 9,840 cusecs on 23 February.

1962-74: Maximum discharge observed 437,000 cusecs on 29 July 1963; minimum daily discharge 8,000 cusecs on 13 March 1963.

Gauge Enamelled plates fixed on concrete blocks on right bank and set to arbitrary datum. Prior to 5.8.69 gauge painted on plastered strip on left abutment under the bridge. Gauge read at one hour interval for whole day throughout the year.

Measurements Fifty seven discharge measurements were made from bridge by current meter using 0.2 and 0.8 depth method. Fifty one sets of samples were taken by depth integration method using D-49 or P-50 sampler. Twenty two of these were analysed for particle size distribution and the rest for total concentration.

Determination of discharge Rating table dated 23.4.76 was used throughout the year with shift adjustment as necessitated by periodic discharge measurements.

Remarks Record fair. This is a flood warning station for Tarbela Dam. Surface Samples for analysis of chemical Composition were not collected during the year.

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	13,000	11,300	11,000	11,600	17,000	85,700
2	12,900	11,400	11,200	11,600	18,100	86,500
3	12,800	11,400	11,100	11,600	*20,100	*85,000
4	12,700	*11,300	11,100	*11,500	21,500	84,100
5	12,500	11,300	*11,100	11,700	21,800	81,600
6	12,300	11,300	11,200	11,900	20,800	*84,700
7	11,900	11,400	11,300	12,200	19,000	91,300
8	11,900	11,400	11,400	12,300	17,300	93,300
9	11,900	11,500	11,100	12,300	17,300	88,900
10	11,900	11,500	10,600	11,900	*17,600	85,100
11	12,000	*11,600	*10,400	*11,600	19,100	*79,600
12	12,000	11,500	10,400	11,500	21,300	79,400
13	12,000	11,500	10,500	11,600	24,100	90,300
14	12,000	11,400	10,700	12,000	29,600	*98,600
15	11,900	11,500	10,900	12,200	35,900	121,000
16	11,900	11,300	11,100	12,200	41,800	*143,000
17	11,900	11,100	11,400	*12,200	*43,700	163,000
18	11,800	11,000	11,500	12,300	42,300	188,000
19	11,700	*10,800	11,500	12,800	38,400	215,000
20	11,700	10,400	11,900	13,700	34,200	237,000
21	11,600	10,100	12,100	14,300	34,200	*216,000
22	11,500	9,880	12,200	14,600	34,200	194,000
23	11,400	9,840	12,300	15,200	33,600	*161,000
24	11,400	9,920	12,300	15,300	*34,400	142,000
25	11,400	10,100	12,200	16,100	35,800	147,000
26	11,400	*10,400	11,800	*17,200	39,200	150,000
27	11,300	10,600	11,500	18,000	44,200	174,000
28	11,300	10,900	11,600	19,500	51,500	*192,000
29	11,300	------	*11,800	18,400	60,300	181,000
30	*11,300	------	11,800	17,100	73,300	156,000
31	11,300	------	11,600	------	82,500	-------
Mean	11,900	11,000	11,400	13,500	33,700	133,000
Cs/mi	0.22	0.20	0.21	.25	0.61	2.41
In	0.25	0.21	0.24	0.27	0.70	2.70
Maf.	.730	.610	.699	.806	2.07	7.92

1975 Year: Mean 64,100 Cs/sq mi 1.16 Inches 15.71

Note : * Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	145,000	181,000	130,000	41,100	22,400	15,100
2	*119,000	*202,000	*133,000	33,600	22,100	15,300
3	113,000	229,000	134,000	30,300	21,900	15,500
4	124,000	241,000	121,000	28,900	21,600	15,700
5	129,000	*247,000	126,000	29,700	21,200	*15,900
6	138,000	234,000	*138,000	28,700	20,800	16,300
7	*142,000	217,000	120,000	27,900	20,400	16,400
8	*145,000	206,000	105,000	27,600	*20,200	16,600
9	145,000	*204,000	96,600	27,700	19,900	16,500
10	161,000	195,000	*86,000	28,200	19,700	16,300
11	184,000	191,000	77,600	28,000	19,500	16,100
12	*207,000	*219,000	83,800	28,300	19,300	15,900
13	230,000	242,000	*84,000	28,300	19,100	*15,700
14	252,000	243,000	84,000	27,900	*18,900	15,500
15	*259,000	258,000	86,200	28,200	18,500	15,200
16	257,000	*269,000	*88,500	28,600	18,100	14,900
17	265,000	281,000	90,000	28,700	17,900	14,700
18	240,000	295,000	89,100	28,000	17,500	15,000
19	*213,000	299,000	88,000	27,700	17,100	*15,200
20	196,000	*314,000	*86,400	27,300	16,800	15,300
21	191,000	323,000	81,200	26,100	*16,500	15,200
22	189,000	309,000	*74,900	25,500	16,300	15,100
23	*174,000	*268,000	68,900	25,200	16,000	15,000
24	156,000	209,000	63,000	25,100	15,900	14,700
25	174,000	*177,000	*60,100	24,800	*15,700	*14,400
26	*157,000	161,000	54,500	24,700	15,400	14,400
27	143,000	148,000	52,400	23,700	15,200	14,300
28	162,000	141,000	51,100	23,300	15,000	14,400
29	172,000	132,000	48,400	23,100	14,900	14,600
30	175,000	*129,000	46,400	22,900	14,900	14,700
31	167,000	126,000	------	22,600	------	14,600
Mean	178,000	222,000	88,300	27,500	18,300	15,300
Cs/mi	3.23	4.03	1.60	0.50	0.33	0.28
In	3.73	4.65	1.79	0.57	0.37	0.32
Maf.	11.0	13.7	5.25	1.69	1.09	.941

M.Acre-feet. 46.5 Maximum day .323 Minimum day 9,840

INDUS RIVER AT PARTAN BRIDGE

Suspended sediment concentration - 1975

1975 Date	Discharge in cubsec	Temp. of Water °F	Total PPM by weight	Percent Sand	Percent Silt	Percent Clay
30 Jan	11,300	42	14			
4 Feb	11,300	40	28			
11 Feb	11,600	42	6			
19 Feb	10,900	42	12			
26 Feb	10,400	58	26			
5 Mar	11,100	46	22			
11 Mar	10,400	56	27			
29 Mar	11,700	56	26			
4 Apr	11,900	53	48			
11 Apr	11,600	55	91			
17 Apr	12,100	59	3,360	55	11	34.0
26 Apr	17,200	58	421			
3 May	19,600	60	811			
10 May	17,400	59	857			
17 May	43,800	56	784			
24 May	22,500	57	1,760			
3 Jun	84,200	59	1,560	42	49	9
7 Jun	92,300	58	726			
11 Jun	79,000	60	793	29	60	11
14 Jun	94,900	57	1,350	43	48	9
16 Jun	141,000	58	1,390	19	61	20
21 Jun	217,000	55	2,520	47	41	12
23 Jun	167,000	56	2,440	34	51	15
28 Jun	193,000	56	1,390	37	52	11
2 Jul	119,000	55	1,270	34	50	16
5 Jul	135,000	57	527	12	71	17
8 Jul	149,000	56	1,650	15	66	19
12 Jul	209,000	57	1,620	10	71	19
15 Jul	261,000	57	1,580	11	67	22
19 Jul	213,000	55	2,020	41	46	13
23 Jul	178,000	56	1,490	35	54	11
26 Jul	160,000	54	2,280	52	36	12
2 Aug	200,000	56	2,750	19	66	15
5 Aug	253,000	56	3,080	31	50	19
9 Aug	205,000	56	961	5	64	31

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
12 Aug	216,000	61	907	5	67	28
16 Aug	266,000	60	1,030	10	74	16
23 Aug	270,000	60	601	38	42	20
30 Aug	127,000	60	314			
16 Sep	88,500	58	402			
20 Sep	86,500	55	348			
22 Sep	75,400	54	399			
25 Sep	60,800	54	434			
8 Nov	19,100	45	27			
14 Nov	18,900	44	50			
21 Nov	16,500	44	43			
25 Nov	15,600	44	50			
5 Dec	16,300	46	20			
13 Dec	15,700	47	54			
19 Dec	15,200	46	41			
25 Dec	14,400	46	46			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

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Location: Latitude 35°39', Longitude 78°40', Fourteen miles east from Bungi. Eighteen miles S/E from Patton Bridge.

Drainage area: 1,260 square miles.

Record available: Gauge height records from 23.10.73 to date with Surface Water Hydrology Project, WASID, WAPDA. Periodic discharge measurements by the same organization started on 1.2.74. Mean daily discharge records available from 1.1.74 to date with the above mentioned organization.

Extremes: Maximum discharge observed during the year 22,000 cusecs on 1 August (gauge height 23.50 feet); minimum daily discharge 700 cusecs on 14 February.

Gauge: Staff gauge on left bank graduated in hundredth of a foot for low flow and in tenth of a foot for high stages.

Measurements: Sixty two discharge measurements were made during the year by current meter using 0.2 and 0.8 or 0.6 depth method by wading at low stages and from cableway at medium and high stages. Forty six lots of sediment samples were taken by depth integration method using DH-48 sampler while wading. Two of these were analysed for particle size distribution and the rest for total concentration method.

Determination of discharge: Rating table dated 15.12.74 was developed and used upto 4.8.75, and rating table dated 26.5.75 used from 5.8.75 onwards, with shift adjustments to compute mean daily discharges.

Remarks: Record good.

ASTORE RIVER AT DOYIAN

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	832	850	886	898	1,990	8,930
2	850	850	892	922	2,250	10,200
3	832	856	886	958	2,530	9,650
4	832	856	904	977	2,460	*8,710
5	850	910	790	*991	2,190	7,800
6	874	910	785	958	*1,780	9,500
7	856	*928	*795	1,020	1,640	*9,500
8	874	934	880	998	1,680	8,970
9	856	916	922	958	1,890	8,880
10	862	886	910	*952	2,110	*9,170
11	856	*844	946	977	2,140	8,770
12	838	868	*958	1,090	*2,530	9,480
13	838	868	886	1,140	3,500	*9,650
14	*826	700	862	1,060	4,730	12,000
15	850	874	904	*1,030	5,680	14,800
16	880	910	886	1,030	6,240	15,500
17	856	946	*868	1,120	5,640	*17,400
18	844	964	868	1,220	*4,520	17,800
19	892	928	880	1,340	4,210	18,300
20	892	928	856	*1,210	4,570	17,400
21	910	916	*862	1,250	4,060	*14,500
22	922	868	910	1,340	3,520	10,600
23	910	928	898	1,230	3,580	10,300
24	862	916	868	1,330	4,430	*9,480
25	826	886	*850	1,540	*5,260	11,600
26	892	898	844	1,630	6,300	12,600
27	874	892	856	1,580	7,180	13,500
28	898	910	862	1,530	8,400	13,700
29	910	---	880	*1,580	8,910	*11,400
30	886	---	*898	1,770	9,720	9,350
31	880	---	910	-----	*9,500	------
Mean	866	891	877	1,190	4,360	11,600
Cs/mi	0.56	0.57	0.56	0.76	2.79	7.47
In	0.64	0.59	0.65	0.85	3.22	8.33
Ac.ft.	53,300	49,500	54,000	70,700	268,000	693,000

1975 Year: Mean 4,170 Cs/sq mi 0.27 Inches 36.33

Note : * Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	7,430	10,700	6,880	2,440	1,530	[illegible]
2	6,920	11,500	6,850	2,400	1,500	931
3	8,180	11,500	6,560	2,510	1,500	931
4	*10,200	*7,650	*6,230	2,450	1,440	981
5	10,900	16,200	6,210	2,470	*1,300	*931
6	10,600	13,800	*5,640	*2,510	1,390	972
7	9,740	12,600	5,220	2,560	1,430	946
8	*9,370	12,400	4,790	2,570	1,470	907
9	11,700	*10,300	4,450	2,370	1,510	846
10	12,500	10,900	4,350	2,350	1,260	*891
11	14,900	*9,740	*4,660	2,150	1,170	891
12	*17,800	10,200	4,660	2,210	*1,080	916
13	17,200	10,900	*4,510	*2,240	1,020	891
14	16,400	10,800	4,340	2,250	1,040	891
15	16,800	10,100	4,660	2,240	1,040	864
16	*16,200	*10,700	4,490	2,270	1,010	882
17	14,500	10,400	**4,410	2,210	1,030	873
18	14,200	11,400	4,430	2,180	1,030	*913
19	*13,800	*10,700	4,320	1,970	*1,040	864
20	13,200	10,700	4,030	1,920	1,060	873
21	12,500	9,840	3,690	*1,900	1,040	891
22	*10,700	8,350	3,670	1,810	954	864
23	11,800	*7,500	3,440	1,740	945	828
24	10,200	6,420	3,160	1,720	1,010	855
25	8,770	5,660	*3,070	1,680	1,010	891
26	*8,840	*5,700	2,930	1,630	*999	*891
27	9,480	6,030	*2,830	1,600	999	891
28	10,300	6,950	2,740	*1,510	972	891
29	10,400	6,830	2,610	1,550	936	891
30	9,850	5,930	2,400	1,520	927	882
31	*10,000	6,990	-----	1,530	-----	864
Mean	11,800	9,660	4,410	2,080	1,160	900
Cs/mi	7.56	6.19	2.83	1.33	0.74	0.58
In	8.71	7.14	3.16	1.54	0.83	0.67
Ac.ft.	725,000	594,000	263,000	128,000	68,900	55,400

M.Acre-feet. 3.02 Maximum day 18,300 Minimum day 700

ASTORE RIVER AT DOYIAN

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
14 Jan	808	48	159			
7 Feb	910	45	54			
11 Feb	780	38	57			
19 Feb	880	50	30			
27 Feb	968	60	52			
7 Mar	765	44	70			
12 Mar	946	48	66			
17 Mar	790	48	84			
21 Mar	838	48	68			
25 Mar	790	48	37			
30 Mar	868	50	77			
5 Apr	964	48	191			
10 Apr	934	50	80			
15 Apr	1,010	52	77			
20 Apr	1,190	50	149			
29 Apr	1,610	50	83			
6 May	1,700	52	601	26	19	55
12 May	2,440	52	52			
18 May	4,110	52	584			
25 May	5,070	50	83			
31 May	9,190	50	575	15	26	59
4 Jun	9,540	48	177			
7 Jun	10,900	50	225			
10 Jun	9,460	50	208			
13 Jun	9,100	52	482			
21 Jun	13,900	48	487			
24 Jun	8,910		274			
31 Jun	9,790	50	148			
4 Jul	9,040	50	182			
8 Jul	9,300	50	161			
12 Jul	16,400	50	164			
16 Jul	15,300	52	151			
19 Jul	13,900	52	197			
22 Jul	10,000	50	185			
26 Jul	15,300	52	157			

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Percent Silt	Percent Clay
31 Jul	9,500	54	248			
4 Aug	7,270	52	232			
11 Aug	8,440	50	164			
16 Aug	9,790	52	116			
19 Aug	9,063	50	115			
23 Aug	7,450	52	73			
26 Aug	5,020	55	55			
4 Sep	6,000	54	49			
6 Sep	5,470	52	57			
18 Dec	855	38	418			
25 Dec	891	40	358			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0005 mm.
Clay is all sizes smaller than 0.0005 mm.

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INDUS RIVER AT BARASIN - 1975

Location Latitude 35°15', Longitude 73°15', eight miles upstream from confluence of Jalkot Nullah with Indus River. Fifty five miles U/S from Besham Qila.

Drainage area 16,600 square miles.

Record available Gauge height record from 23.1.74 to date with Surface Water Hydrology Project, WASID, WAPDA. Periodic discharge measurements started from 18.6.74. Mean daily discharge available from 23.1.74 to date with same organization.

Extremes Maximum discharge observed during the year 413,000 cusecs on 21 August (gauge height 49.35); Minimum daily discharge 11,200 cusecs on 10 March.

Gauge Staff gauge on left bank with 0.1 foot graduations. Gauge read at one hour interval for whole day throughout the year.

Measurements Fifty eight discharge measurements were made during the year using 0.2 and 0.8 or 0.6 depth method from the cableway. Fifty six sets of sediment samples were taken by depth integration method using D-49 sampler. Twenty five samples out of these were analysed for particle size distribution and the rest for total concentration. Twelve surface samples were collected and analysed for chemical composition.

Determination of discharge Rating table dated 28.7.75 changed from gauge height 11.0 to onward on 9.6.76 was used with shft adjustment to compute mean daily discharge.

Remarks Record fair.

INDUS RIVER AT BARASIN

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	14,300	12,800	12,300	13,400	24,100	*108,000
2	13,900	12,600	12,200	13,800	24,900	109,000
3	13,500	12,500	12,300	*14,000	26,700	108,000
4	*13,200	*12,400	*12,600	14,400	27,900	108,000
5	13,100	12,300	12,800	15,400	*27,800	*103,000
6	13,200	12,400	12,800	15,600	26,300	110,000
7	13,300	12,800	12,600	15,500	24,500	118,000
8	13,600	12,700	12,300	15,400	23,200	118,000
9	13,600	12,700	11,600	15,300	23,100	*116,000
10	13,500	12,700	11,200	15,200	23,900	112,000
11	13,400	12,600	11,500	15,000	25,300	107,000
12	*13,300	*12,500	*11,900	*14,800	27,900	109,000
13	13,400	12,600	*12,000	14,700	*32,800	*117,000
14	13,300	12,500	11,900	14,700	41,300	135,000
15	13,200	12,400	11,800	14,600	54,400	159,000
16	13,000	12,300	12,000	*15,200	72,800	184,000
17	12,900	12,100	12,300	15,500	67,200	*214,000
18	12,800	11,800	12,300	16,500	60,100	*240,000
19	*12,800	*12,000	*12,200	*17,300	54,800	263,000
20	12,800	11,900	12,500	17,600	53,300	266,000
21	12,800	11,800	13,200	18,700	52,700	236,000
22	*12,900	11,800	12,900	19,400	52,100	*210,000
23	13,100	12,000	13,000	19,800	51,500	181,000
24	13,000	11,900	13,000	20,700	*50,800	160,000
25	12,900	11,900	13,000	22,300	52,600	*160,000
26	*12,900	*12,300	*12,800	23,700	58,000	168,000
27	12,700	*12,400	12,600	*24,800	65,200	190,000
28	12,700	12,300	12,500	24,600	*75,800	206,000
29	12,900	------	12,700	23,700	85,800	*199,000
30	12,900	------	12,800	23,600	98,900	180,000
31	12,900	------	13,100	------	108,000	-------
Mean	13,200	12,300	12,400	17,500	48,200	160,000
Cs/mi	0.22	0.20	0.20	0.29	0.79	2.63
In	0.25	0.21	0.24	0.32	0.91	2.93
Maf.	.809	.684	.763	1.04	2.96	9.51

1975 Year : Mean 74,000 Cs/sq mi 1.22 Inches 16.53

Note : * Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	157,000	192,000	137,000	44,800	24,800	18,800
2	*141,000	*214,000	*140,000	42,300	24,500	18,700
3	136,000	240,000	141,000	41,300	24,000	18,700
4	139,000	257,000	142,000	40,800	23,700	18,500
5	149,000	253,000	145,000	40,500	23,400	18,500
6	*150,000	*250,000	*144,000	41,400	23,100	18,500
7	154,000	241,000	134,000	42,300	23,600	18,400
8	160,000	229,000	120,000	43,000	23,000	18,300
9	162,000	*215,000	110,000	42,300	22,500	17,900
10	*171,000	207,000	*100,000	41,300	22,200	17,500
11	200,000	213,000	95,700	39,900	22,000	17,200
12	226,000	236,000	92,100	38,300	21,500	*17,100
13	*265,000	*258,000	*92,100	37,000	*21,000	17,000
14	294,000	271,000	92,800	35,900	20,700	17,200
15	325,000	287,000	94,700	34,900	20,600	17,400
16	*321,000	*299,000	96,000	34,200	20,400	17,400
17	319,000	*315,000	97,600	33,400	20,300	17,100
18	*284,000	334,000	98,200	*33,600	20,200	17,000
19	248,000	342,000	97,200	33,400	20,000	17,100
20	*231,000	367,000	95,500	31,800	19,800	17,200
21	220,000	*385,000	91,000	30,500	19,600	17,100
22	211,000	351,000	80,600	29,500	19,400	17,000
23	194,000	290,000	*72,800	28,700	19,400	17,000
24	*189,000	*231,000	65,700	27,900	19,400	16,800
25	196,000	183,000	60,800	27,400	19,400	16,700
26	182,000	155,000	57,900	26,900	19,300	16,700
27	181,000	154,000	55,200	26,500	19,300	16,700
28	183,000	154,000	52,700	26,000	19,100	16,800
29	*189,000	*151,000	51,100	25,700	19,000	16,800
30	191,000	135,000	49,000	25,400	18,800	16,800
31	150,000	133,000	------	25,100	------	16,800
Mean	205,000	244,000	96,800	34,600	21,100	17,400
Cs/mi	3.37	4.01	1.59	0.57	0.35	0.29
In	3.89	4.62	1.78	0.66	0.39	0.33
Maf.	12.6	15.0	5.76	2.13	1.26	1.07

M. Acre-feet. 53.6 Maximum day 385,000 Minimum day 11,200

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Cla
4 Jan	13,300	42	21			
12 Jan	13,300	42	22			
19 Jan	12,900	40	37			
22 Jan	12,900	42	39			
26 Jan	12,900	42	16			
4 Feb	12,500	44	18			
12 Feb	12,500	44	14			
19 Feb	12,100	46	13			
26 Feb	12,400	46	11			
27 Feb	12,300	47	32			
4 Mar	12,400	48	50			
12 Mar	12,000	50	21			
13 Mar	12,000	50	30			
19 Mar	12,200	52	17			
26 Mar	12,800	54	27			
3 Apr	14,000	56	100			
12 Apr	14,800	57	67			
16 Apr	15,200	58	49			
19 Apr	17,300	59	73			
27 Apr	24,800	60	125			
5 May	27,800	60	144			
13 May	32,000	62	229			
24 May	51,000	60	668	28	38	38
28 May	76,900	60	655	10	56	34
1 Jun	109,000	57	1,070	9	63	28
5 Jun	103,000	58	729	15	39	46
9 Jun	115,000	57	700	4	40	56
13 Jun	120,000	58	1,100	37	27	36
17 Jun	220,000	56	5,180	60	32	8
18 Jun	238,000	60	2,510	13	75	12
22 Jun	211,000	59	2,110	19	68	13
25 Jun	162,000	60	782	7	64	29
29 Jun	198,000	59	1,130	24	54	22
2 Jul	142,000	58	732	11	63	26
6 Jul	162,000	60	1,030	32	55	13

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
10 Jul	175,000	60	1,170	29	51	20
13 Jul	273,000	61	1,910	9	74	17
24 Jul	188,000	58	2,100	51	38	11
29 Jul	190,000	60	2,440	30	62	8
2 Aug	217,000	63	2,450	8	62	30
6 Aug	247,000	60	3,330	9	82	9
9 Aug	209,000	60	3,030	43	46	11
13 Aug	258,000	60	5,070	16	67	17
16 Aug	294,000	60	3,130	6	83	11
17 Aug	316,000	60	2,760	11	75	14
21 Aug	388,000	58	3,330	9	72	19
24 Aug	235,000	58	3,060	24	64	12
29 Aug	151,000	60	1,080	6	53	41
2 Sep	134,000	62	2,080	40	36	24
23 Sep	72,700	60	896	43	30	27
18 Oct	33,600	59	438			
12 Nov	21,400	55	69			
13 Nov	20,900	54	19			
28 Dec	16,800	42	72			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

INDUS RIVER NEAR BARRASIN

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	TOTAL Cations	TOTAL Anions	PARTS PER MILLION SiO_2	Fe	B	D.S. by Evap.	$EC \times 10^6$ at 25 °C	pH	Res CO_3 me/l	SAR
Jan 4	1.0	1.0	.39			1.76	.19	.4			2.39	2.35				130	230	8.0	0	.4
Feb 26	1.50	.90	.40		0	2.04	.29	.50			2.80	2.83				176	280	7.7	0	.4
Mar 13	1.20	1.20	.40		0	2.09	.29	.50			2.80	2.84				156	270	7.6	0	.4
Apr 16	1.40	1.00	.30		0	1.73	.29	.70			2.70	2.72				152	270	7.9	0	1.3
May 24	1.00	.30	.43		0	1.38	.20	.20			1.73	1.78				96	170	7.7	.08	.5
Jun 17	1.40	.50	.20		0	1.70	.20	.20			2.10	2.10				112	200	8.0	0	.2
Jul 16	1.20	.60	.33		0	1.73	.20	.20			2.13	2.13				116	200	7.7	0	.4
Aug 17	1.20	.60	.30		0	1.60	.10	.40			2.10	2.10				116	200	7.4	0	.3
Sep 23	1.30	.50	.35		0	1.55	.20	.40			2.15	2.15				120	210	7.9	0	.4
Oct 18	1.45	.40	.79		0	1.74	.20	.70			2.64	2.64				148	250	8.0	0	.8
Nov 11	1.30	1.05	.25		0	2.35	.10	.20			2.65	2.65				148	250	8.1	0	.2
Dec 29	1.40	1.0	.32		0	1.80	.10	.70			2.72	2.68				152	260	8.0	0	.3

Location Latitude 34°56', Longitude 72°53', on right bank about half a mile from Besham Qila Pass and about 55 miles from Saidu Sharif on Indus Valley Road.

Drainage area 62,700 square miles.

Record available Mean daily discharge record computed from January 1969 to date by Surface Water Hydrology Project, WASID, WAPDA. The discharge measurements were started in November 1968 and the staff gauge was installed on 23.5.1968.

Average discharge 82,700 cusecs (60,200,000 acre feet per year or 17.98 inches runoff per year). Average taken for Seven years from 1969 to 1975.

Extremes Maximum discharge during the year 400,000 cusecs on 21 August (gauge height 56.15); minimum daily discharge 13,800 cusecs on 4,5,6 February and 10,11 March 1975.

1969-74: Maximum discharge observed 443,050 cusecs on 20.7.73 (gauge height 60.15); Minimum daily discharge 12,500 cusecs on 8th February 1972.

Gauge Enamelled plates installed in steps on right bank and read at one hour interval for the whole day throughout the year. Gauge set to arbitrary datum.
Servo-manometer with a recorder in masonry shelter fixed in July 1970. A new staff gauge near the servo-manometer termed as U/S gauge installed in August 1973. The servo-manometer and U/S gauge was used for this year.

Measurements Seventy discharge measurements were made from the cableway by current meter using 0.2 and 0.8 depth method. Ninety three sets of sediment samples were taken by depth integration or by point sampling method using D-49 or P-50 samplers from the cableway. Sixty one of these were analysed for particle size distribution and the rest for total concentration. Six Surface samples were collected and analysed for chemical composition.

Determination of discharge The rating dated 29.7.75 based on servo-manometer gauge was used with shift adjustments to compute mean daily discharges.

Remarks Record fair. This is a flood warning station for Tarbela Dam.

INDUS RIVER AT BESHAM QILA

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	*16,400	14,200	14,400	*20,000	37,600	*132,000
2	16,000	14,100	*14,200	21,100	38,000	133,000
3	15,700	*13,900	14,200	21,700	*40,400	133,000
4	15,100	13,800	*17,300	22,100	41,000	129,000
5	15,500	13,800	17,500	23,400	40,500	124,000
6	*14,000	13,800	16,300	*24,800	38,000	134,000
7	15,200	14,000	15,600	24,900	35,300	141,000
8	15,300	14,300	15,000	23,700	34,000	139,000
9	15,300	14,300	14,300	22,500	*34,400	137,000
10	15,200	14,100	13,800	21,500	36,300	134,000
11	15,200	14,100	13,800	21,300	36,800	*127,000
12	15,300	14,200	13,900	21,400	39,900	130,000
13	15,300	14,500	14,100	20,700	*46,300	139,000
14	15,200	14,300	*14,100	*20,100	56,100	160,000
15	15,300	14,000	14,000	19,900	*72,600	*189,000
16	15,200	*14,000	14,100	21,200	*106,000	224,000
17	14,900	13,900	14,200	22,600	101,000	257,000
18	*14,500	13,900	14,700	*24,900	82,900	283,000
19	14,500	13,900	14,800	27,100	74,100	*307,000
20	14,400	13,900	14,900	26,800	71,400	309,000
21	14,300	13,800	16,100	28,800	66,600	276,000
22	14,400	13,800	*20,100	31,300	64,700	230,000
23	14,400	13,800	20,400	30,900	65,500	*187,000
24	14,400	13,900	19,100	32,800	67,100	171,000
25	14,400	*13,900	18,600	*40,400	*68,300	172,000
26	14,300	13,900	18,500	42,800	74,200	185,000
27	14,300	14,100	18,100	43,200	83,400	211,000
28	14,200	14,700	18,000	40,600	97,300	*228,000
29	14,200	------	18,500	38,100	108,000	228,000
30	14,300	------	18,800	36,900	123,000	*202,000
31	*14,300	------	19,300	------	131,000	-------
Mean	14,900	14,000	16,200	27,300	64,900	185,000
Cs/mi	0.24	0.22	0.26	0.44	1.04	2.95
In	0.27	0.23	0.30	0.48	1.19	3.29
Maf.	.916	.779	.993	1.62	3.99	11.0

1975 Year: Mean 82,500 Cs/sq mi 1.32 Inches 17.90

Note : * Discharge measurement made on this day.

INDUS RIVER AT BESHAM QILA

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	165,000	*207,000	*137,000	*50,300	27,500	20,400
2	*146,000	232,000	141,000	48,100	*27,300	20,400
3	144,000	259,000	147,000	46,600	27,000	20,100
4	156,000	277,000	*150,000	*46,100	26,700	20,100
5	167,000	286,000	152,000	45,800	26,600	20,300
6	173,000	273,000	154,000	46,000	26,700	20,100
7	*169,000	260,000	*143,000	46,400	28,400	20,000
8	*175,000	248,000	128,000	46,900	*27,100	19,800
9	178,000	229,000	115,000	47,200	26,100	19,300
10	179,000	*223,000	106,000	45,500	25,700	18,700
11	212,000	230,000	*100,000	44,000	25,400	18,300
12	*249,000	*252,000	96,000	42,500	25,000	18,000
13	*288,000	*275,000	96,000	*41,000	24,500	18,100
14	311,000	287,000	95,700	39,900	*24,300	18,200
15	*335,000	296,000	96,900	39,100	*24,000	18,200
16	338,000	*307,000	98,700	38,300	23,700	18,100
17	331,000	320,000	100,000	37,900	23,600	18,100
18	*303,000	339,000	100,000	37,600	23,300	18,100
19	270,000	*348,000	99,800	38,000	22,800	17,900
20	252,000	*374,000	*98,300	36,400	22,600	17,900
21	242,000	*390,000	94,300	*35,200	22,400	18,000
22	231,000	358,000	85,000	34,200	22,200	17,900
23	*216,000	*318,000	*77,800	*33,200	*22,000	17,900
24	210,000	*250,000	71,400	30,700	21,800	17,600
25	216,000	198,000	67,000	29,700	21,600	17,400
26	201,000	168,000	64,000	29,400	21,200	17,400
27	200,000	164,000	61,500	28,900	20,800	17,400
28	*204,000	162,000	*58,700	28,500	*20,600	17,300
29	*210,000	158,000	56,400	28,300	20,500	17,100
30	212,000	146,000	53,100	28,100	20,400	17,300
31	*200,000	134,000	------	27,800	------	17,400
Mean	222,000	257,000	101,000	38,600	24,100	18,500
Cs/mi	3.54	4.10	1.61	0.62	0.38	0.30
In	4.08	4.73	1.81	0.71	0.43	0.34
Maf.	13.7	15.8	6.04	2.38	1.43	1.14

M. Acre-feet. 59.8 Maximum day 390,000 Minimum day 13,800

INDUS RIVER AT BESHAM QILA

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Percent Silt	Percent Clay
1 Jan	15,500	44	40			
6 Jan	14,600	43	28			
18 Jan	14,100	42	27			
31 Jan	14,100	42	19			
3 Feb	13,800	42	46			
16 Feb	14,100	42	50			
25 Feb	14,000	43	54			
2 Mar	14,200	48	57			
4 Mar	17,700	49	576	37	24	39
14 Mar	13,900	50	49			
22 Mar	18,900	50	119			
1 Apr	19,200	52	91			
6 Apr	23,000	54	43			
14 Apr	18,700	54	52			
18 Apr	23,700	56	38			
25 Apr	39,600	58	82			
3 May	37,200	58	85			
9 May	32,000	59	57			
13 May	32,000	60	66			
15 May	61,500	59	50			
16 May	96,500	56	3,140	48	27	25
25 May	57,400	58	21			
1 Jun	106,000	56	86			
15 Jun	153,000	57	4,070	45	24	31
19 Jun	271,000	56	4,840	46	25	29
28 Jun	191,000	56	3,840	53	27	20
30 Jun	154,000	57	2,940	58	21	21
2 Jul	111,000	58	3,170	58	26	15
8 Jul	138,000	60	2,990	56	28	14
12 Jul	205,000	60	3,070	39	36	26
13 Jul	248,000	60	3,970	36	43	21
15 Jul	303,000	61	3,560	63	30	7
28 Jul	165,000	61	3,340	60	35	5
10 Aug	180,000	62	3,430	35	53	12
13 Aug	228,000	62	2,940	27	56	17

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
19 Aug	313,000	61	3,610	76	22	22
20 Aug	320,000	60	3,440	64	34	2
23 Aug	262,000	60	3,470	74	24	2
11 Sep	81,900	60	2,150	51	37	11
14 Sep	76,000	60	2,470	62	35	3
23 Sep	64,000	60	183			
28 Sep	48,700	59	206			
1 Oct	41,800	60	164			
4 Oct	37,900	60	218			
13 Oct	33,900	60	127			
21 Oct	29,000	57	47			
23 Oct	26,500	54	74			
2 Nov	24,900	50	19			
8 Nov	24,700	50	39			
14 Nov	21,900	43	43			
15 Nov	21,700	48	53			
23 Nov	18,100	44	49			
3 Dec	18,100	44	57			
11 Dec	17,100	42	45			
25 Dec	15,900	42	44			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

INDUS RIVER AT BESHAM QILA

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	TOTAL Cations	TOTAL Anions	PARTS PER MILLION SiO_2	Fe	B	D.S. by Evap.	$ECx10^6$ at 25 °C	pH	Res CO_3 me/l	SAR
Jan 6	1.50	1.0	.35		0	1.57	.19	1.10			2.85	2.86				160	280	7.8	0	.3
Feb 16	1.40	.90	.40		0	1.76	.29	.60			2.70	2.65				152	260	7.8	0	.4
May 15	.90	.30	.80		0	1.17	.20	.60			2.00	1.97				102	190	7.8	0	1.0
Aug 16	1.20	.40	.50		0	1.60	.10	.40			2.10	2.10				116	200	8.1	0	.6
Oct 23	1.40	.90	.35		0	1.85	.20	.60			2.65	2.65				144	250	8.0	0	.3
Dec 25	1.30	1.00	.32		0	1.90	.18	.50			2.62	2.58				144	250	8.0	0	.3

GORBAND RIVER NEAR KARORA - 1975

Location Latitude 34°53', Longitude 72°47', it is 7 miles from the confluence with Indus on Khawal Khela- Besham Road.

Drainage area 245 sq miles.

Record available Mean daily discharges available w.e.f. 12.12.74 by Surface Water Hydrology Project Wapda.

Extremes Maximum discharge observed during the year 21,600 cusecs on 18 August (gauge height 13.20). Minimum daily discharge 125 cusecs on 27, 28 Jan.

Gauge Staff gauge fixed at about 60 feet upstream of the cable-way site and read from 0800 to 1600 hours daily during low flows and on hourly basis for 24 hours during the period 1.7.75 to 30.9.75. Gauge set to arbitrary datum.

Measurements Sixty four discharge measurements were made during the year by current meter using 0.2, 0.8 or 0.6 methods. Fourty nine sets of sediment samples were taken by depth integration method using D-48 while wading and D-49 in high flows. Eleven of these were analysed for particle size distribution and the rest for total concentration. Five surface samples were collected and analysed for chemical composition.

Determination of discharge Rating table dated 16.10.76 based on 64 observations during 1975 were used with shift adjustments to compute mean daily discharges.

Remarks Record good.

CORGAND RIVER NEAR KANDRA

Discharge in cfsecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	177	147	581	1,600	1,350	869
2	166	136	490	1,990	1,260	834
3	*170	170	1,170	1,840	1,310	914
4	169	160	1,860	1,810	1,380	1,070
5	165	177	1,720	1,610	1,470	827
6	179	156	890	2,060	1,150	820
7	176	174	764	1,650	1,090	834
8	177	179	636	1,570	1,020	714
9	163	184	575	1,380	978	785
10	156	197	553	1,250	1,070	678
11	156	206	614	1,160	1,030	785
12	152	230	520	1,230	1,020	750
13	146	248	537	1,070	1,080	744
14	142	267	*586	906	1,190	820
15	150	227	619	906	1,350	806
16	150	206	586	1,000	2,050	750
17	150	215	592	1,130	2,090	*744
18	136	207	636	1,260	1,650	*771
19	*138	285	696	1,300	1,280	*799
20	140	*295	792	1,220	1,200	*792
21	144	292	2,870	1,730	1,080	744
22	142	315	6,000	1,970	1,050	581
23	*134	335	3,020	1,480	1,060	537
24	130	355	1,840	1,890	1,010	*531
25	127	416	1,370	3,440	962	*575
26	127	445	1,390	3,450	946	*614
27	*125	470	1,370	3,810	914	559
28	125	799	1,340	2,170	978	*693
29	148	---	1,340	1,740	954	780
30	152	---	1,340	1,500	938	691
31	154	---	1,410	-----	930	---
Mean	152	268	1,260	1,720	1,190	747
Cs/mi	.62	1.09	5.14	7.02	4.86	3.05
In	.72	1.14	5.91	7.97	5.60	3.40
Ac.ft.	9,360	14,900	77,200	102,000	73,100	44,500

1975 Year: Mean 771 Cs/sq mi 3.15 Inches 42.88

Note : * Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	526	*614	690	475	221	182
2	553	586	666	*367	218	174
3	500	648	678	359	215	174
4	1,110	2,250	608	363	*212	172
5	*889	2,150	890	*343	206	*200
6	1,310	*1,300	*1,190	327	215	200
7	548	1,070	*970	315	714	184
8	*636	820	*827	319	*274	*174
9	537	714	720	331	227	172
10	500	630	922	339	221	163
11	505	*608	696	319	*212	*152
12	520	*654	*648	315	206	150
13	*672	2,990	597	*295	200	152
14	*878	2,000	570	285	*198	161
15	1,220	1,320	*575	271	192	163
16	*1,540	1,290	614	264	1 7	161
17	986	2,410	537	*260	179	159
18	732	3,870	495	260	179	156
19	*660	5,410	531	*389	*177	154
20	666	6,870	526	339	174	*150
21	608	3,550	*480	281	174	159
22	965	*3,020	460	264	*170	156
23	1,280	2,140	440	*254	161	*152
24	*855	1,630	411	239	165	152
25	*744	1,330	407	242	*159	154
26	636	*1,160	510	242	152	*156
27	757	994	510	*239	150	146
28	970	1,180	470	236	148	*140
29	1,110	970	430	218	*148	138
30	841	834	420	221	146	138
31	*672	744	---	224	---	134
Mean	804	1,800	616	296	207	161
Cs/mi	3.28	7.35	2.51	1.21	0.84	0.66
In	3.78	8.46	2.81	1.39	0.94	0.76
Ac.ft.	49,400	111,000	36,700	18,200	12,300	9,870

Maf. .559 Maximum day 6,870 Minimum day 125

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
17 June	726	69	39			
18 Jun	732	70	68			
19 Jun	778	68	93			
20 Jun	750	60	50			
24 Jun	537	58	40			
25 Jun	553	69	109			
26 Jun	672	68	65			
28 Jun	608	62	252			
8 Jul	526	60	95			
13 Jul	690	70	81			
16 Jul	1,180	62	2,800	70	24	6
19 Jul	619	64	77			
24 Jul	820	62	5,110	64	25	11
25 Jul	890	65	6,700	27	45	28
31 Jul	678	62	2,200	61	32	7
6 Aug	1,400	65	63			
8 Aug	771	78	3,400	73	14	13
11 Aug	575	71	67			
12 Aug	1,050	74	4,600	60	26	14
23 Aug	2,380	70	28			
26 Aug	1,130	70	133			
6 Sep	1,100	64	2,000	63	26	11
7 Sep	1,180	64	30,500	54	40	6
8 Sep	799	70	3,200	69	25	6
12 Sep	642	72	1,610	81	13	6
15 Sep	553	71	2,200	72	18	10
21 Sep	480	64	122			
28 Sep	470	64	40			
2 Oct	363	76	30			
5 Oct	343	75	50			
13 Oct	295	61	54			
17 Oct	281	63	50			
19 Oct	389	60	76			
23 Oct	242	58	53			
27 Oct	236	59	62			

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
4 Nov	212	54	23			
8 Nov	267	53	45			
11 Nov	200	52	44			
14 Nov	197	56	26			
19 Nov	177	49	53			
22 Nov	172	48	55			
25 Nov	156	48	22			
29 Nov	148	47	20			
5 Dec	206	42	30			
8 Dec	174	48	76			
11 Dec	152	49	108			
20 Dec	150	47	60			
23 Dec	154	48	110			
26 Dec	42	47	63			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

CORBAND RIVER NEAR KARORA

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	CO_3	F	TOTAL Cations	TOTAL Anions	PARTS PER MILLION SiO_2	Fe	B	D.S. by Evap.	$EC \times 10^6$ at 25 °C	pH	Res CO_3 me/l	SAR
Jun 25	.70	.50	.35		0	1.15	.20	.20			1.55	1.55				80	140	7.9	0	.4
Aug 23	.80	.60	.28		0	1.28	.10	.30			1.68	1.68				92	160	8.0	0	.3
Oct 23	1.50	.80	.26		0	1.96	.20	.40			2.56	2.56				148	250	8.0	0	.2
Nov 25	1.30	.90	.35		0	1.55	.09	.90			2.55	2.54				140	240	8.0	0	.3
Dec 28	1.30	1.00	.34		0	1.80	.10	.70			2.64	2.60			0	140	250	7.9	0	.3

Location Latitude 34°29', Longitude 72°29', on right bank about 2 furlong downstream from bridge on Swat Daggar - Pir Baba Road.

Drainage area 231 square miles.

Record available Mean daily discharge record from January 1970 to date by Surface Water Hydrology Project, WASID, WAPDA. Gauge height record from September 1969 to date with periodic discharge measurements started from September 1969.

Average discharge 122 cusecs (63,100 acre feet per year or 7.16 inches runoff per year). Average taken for 6 years from 1970 to 1975.

Extremes Maximum discharge observed during the year 8,260 cusecs on 3 August (gauge height 8.96 feet); minimum daily discharge 42 cusecs on 12,13 May, 16 to 19 June.

1970-75: Maximum discharge observed 12,000 cusecs on Ist September 1970 (gauge height 8.15 feet); Minimum daily discharge 33 cusecs on 2 June 1971.

Gauge Staff gauge read to hundredth of a foot at one hour interval for whole day throughout the year. Gauge set to arbitrary datum.

Measurements Seventy one discharge measurements were made during the year by current meter using 0.2 and 0.8 depth method by wading at low stages and from Cableway at medium and high stages. Fifty nine sets of sediment samples were taken by depth integration method using D-48 sampler while wading. Ten of these were analysed for particle size distribution and rest for total concentration. Eight Surface samples were collected and analysed for chemical composition.

Determination of discharge Rating dated 23.7.74 was used with shift adjustments to compute mean daily discharge.

Remarks Record fair. This is a flood warning station for Tarbela Dam.

BRANDU RIVER NEAR DAGGAR

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	*55	51	122	108	67	51
2	55	50	114	109	67	50
3	55	50	110	107	63	51
4	54	*49	*110	101	63	*53
5	54	58	108	105	*63	56
6	52	66	101	*106	59	52
7	52	*72	89	108	55	*51
8	*52	81	80	103	52	49
9	*52	85	74	98	48	48
10	51	79	*72	91	45	47
11	51	75	105	87	43	*48
12	50	76	95	*86	*42	47
13	50	101	84	85	*42	*45
14	50	95	81	79	*47	43
15	50	89	78	76	47	43
16	51	83	77	74	91	*42
17	50	79	74	72	128	42
18	50	*77	71	67	*63	42
19	49	79	70	64	*65	42
20	49	80	*69	63	62	*56
21	49	81	71	61	60	49
22	50	82	523	59	57	46
23	*50	*82	365	59	55	*52
24	49	82	245	*59	54	49
25	49	82	174	120	52	45
26	49	82	151	84	49	*45
27	49	81	142	103	51	49
28	49	102	130	86	49	56
29	49	---	120	76	*48	*99
30	52	---	117	70	51	74
31	53	---	110	--	50	--
Mean	51	77	127	86	58	51
Cs/mi	.22	.33	.55	.37	.25	.22
In	.25	.35	.63	.41	.29	.25
Ac.ft.	3,130	4,260	7,800	5,090	3,550	3,020

1975 Year: Mean 108 Cs/sq mi .47 Inches 6.35

Note : * Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	71	76	87	95	95	*130
2	*195	80	86	92	95	119
3	99	*888	*584	91	95	107
4	405	103	156	*91	95	106
5	*147	*944	338	90	96	115
6	84	148	196	91	97	109
7	69	119	210	91	*130	101
8	59	100	*126	89	123	98
9	*71	*94	124	89	111	97
10	53	87	316	89	106	*95
11	51	84	*130	89	*103	95
12	48	94	131	88	103	96
13	71	*682	124	88	105	94
14	*62	153	124	87	105	92
15	61	170	*129	*85	105	94
16	57	182	*167	85	106	94
17	58	136	162	85	107	92
18	54	*462	*150	85	108	*91
19	*79	497	134	*97	109	92
20	64	*2,830	145	95	107	91
21	62	622	140	92	103	91
22	56	184	139	91	99	90
23	*49	147	*131	91	97	*90
24	115	142	119	92	95	90
25	53	123	110	*94	90	89
26	51	111	*105	95	*90	90
27	*46	106	107	94	89	89
28	*59	100	107	95	88	*89
29	*76	*95	102	94	*90	87
30	74	89	98	95	97	87
31	72	*88	---	95	--	87
Mean	83	314	159	91	101	96
Cs/mi	.36	1.36	.69	.39	.44	.42
In	.41	1.57	.77	.45	.49	.48
Ac.ft.	5,100	19,300	9,480	5,590	6,030	5,920

Acre-feet. 78,270 Maximum day 2,830 Minimum day 42

BRANDU RIVER NEAR DAGGAR

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Percent Silt	Percent Clay
19 Jan	52.4		33			
18 Feb	78	60	25			
23 Feb	82	60	57			
4 Mar	113	50	100			
10 Mar	70.8	62	24			
20 Mar	69	68	40			
6 Apr	108	63	52			
12 Apr	86	64	23			
24 Apr	57	79	58			
5 May	64	74	37			
12 May	42	75	3			
19 May	65	76	89			
23 May	80		27			
30 May	50.6		38			
4 Jun	56.2		39			
11 Jun	50.6	75	47			
13 Jun	43.5	79	59			
18 Jun	41.5	88	68			
20 Jun	73.5	80	1,790	3	63	34
23 Jun	43.5	74	58			
26 Jun	45	80	35			
29 Jun	215	60	7,130	6	74	20
2 Jul	136	80	7,450	20	59	21
5 Jul	115	83	133			
9 Jul	51.8	70	200			
14 Jul	60.2	68	128			
19 Jul	60.2	70	6,210	3	71	26
23 Jul	49.4	72	107			
27 Jul	46	80	144			
28 Jul		74	67			
29 Jul	75.3	72	47			
3 Aug	1,290	63	5,620	8.0	62	30
5 Aug	2,210	73	5,630	3	79	18
9 Aug	97	80	70			
13 Aug	930	70	2,400	25	63	12
18 Aug	730	72	4,000	39	54	7
20 Aug	4,860		4,620	38	50	12
29 Aug	115	79	80			
31 Aug	88	79	154			
3 Sep	1,620		7,000	15	56	29

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Percent Silt	Percent Clay
8 Sep	100		146			
11 Sep	129		140			
15 Sep	129		50			
18 Sep	136		37			
23 Sep	131		50			
26 Sep	105		60			
4 Oct	90		31			
15 Oct	86		30			
19 Oct	106		50			
25 Oct	94		50			
7 Nov	190	63	31			
11 Nov	105	70	36			
19 Nov	110	70	22			
26 Nov	90	65	37			
1 Dec	56.2	60	55			
10 Dec	95	62	71			
18 Dec	92	66	64			
23 Dec	88	50	72			
28 Dec	88	65	68			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

BRANDU RIVER NEAR DAGGAR

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE										TOTAL		PARTS PER MILLION				$EC \times 10^6$ at 25 °C	pH	Res CO_3	SAR
	Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	Cations	Anions	SiO_2	Fe	B	D.S. by Evap.			ma/l	
Jan 8	1.60	1.90	.25		0	3.43	.19	.10			3.75	3.73				204	350	7.7	0	.2
Feb 7	1.60	2.20	.89		.39	3.68	.39	.20			4.65	4.66				264	8.3	8.3	.27	.6
May 19	.90	1.30	.30		0	2.12	.20	.20			2.50	2.52				140	240	7.7	0	.3
Jun 26	1.00	1.40	.20		0	2.30	.10	.20			2.60	2.60				148	250	7.9	0	.2
Aug 29	1.44	1.36	.41		0	2.72	.29	.20			3.21	3.21				176	300	8.1	0	.3
Oct 25	1.35	1.40	1.24		0	3.49	.20	.30			3.99	3.99				216	370	8.1	.74	1.1
Nov 26	1.90	1.50	.40		0	3.19	.18	.40			3.80	3.77				208	360	8.0	0	.3
Dec 28	1.70	1.90	.54		0	3.00	.18	.50			3.74	3.68			0	204	350	8.0	0	.4

Location Latitude 34°20', Longitude 73°05', on right bank 3 miles from Phulra village, the site approachable from Mansehra - Oghi Road.

Drainage area 408 square miles.

Record available Mean daily discharge record from January 1969 to date by Surface Water Hydrology Project, WASID, WAPDA. Periodic discharge measurements started from September 1968.

Average discharge 559 cusecs per year (405,000 runoff in acre feet per year. 18.61 Runoff in inches per year). Average taken for six years from 1970 to 1975.

Extremes Maximum discharge observed during the year 18,400 cusecs on 13 August (gauge height 26.25 feet); minimum daily discharge 132 cusecs on 5 and 6 January 1975.

1970-75: Maximum discharge observed 25,500 cusecs on 1 September 1970 (gauge height 32.50 feet); minimum daily discharge 132 cusecs on 5 and 6 January'75.

Gauge Enamelled plates fixed in steps and read at one hour interval for the whole day throughout the year. Zero R.L. of gauge as per levelling in January 1969 is 2274.78 feet above mean sea level.

Measurements Seventy six discharge measurement were made during the year by current meter using 0.2 and 0.8 or 0.6 depth method. Low flow measurements were made by wading and high flow measurements were made from the cableway 150 feet upstream of that gauge. Sixty nine sets of sediment samples were taken by depth integration method using DH-48 sampler while wading and D-49 sampler from the cableway. Thirty five of these were analysed for particle size distribution and rest for total concentration. Twelve Surface samples were collected and analysed for chemical composition.

Determination of discharge The channel has a unstable bed liable to shifting. The stage discharge relation is controlled by channel characteristics. Rating table dated 30.3.71 was applied to mean daily gauge heights to compute mean daily discharges with shift adjustments where indicated by the periodic measurements.

Remarks Record fair as the high flow observations were not made properly. This is a flood warning station for Tarbela Dam.

SIRAN RIVER NEAR PHULRA

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	167	328	947	953	941	517
2	167	262	559	*1,040	854	546
3	152	215	*505	1,120	838	612
4	138	199	1,390	1,110	*1,030	562
5	*132	236	1,280	993	997	*611
6	132	272	808	1,020	854	556
7	143	248	667	1,040	721	487
8	156	333	612	917	688	442
9	*163	673	592	846	717	413
10	156	*499	589	736	743	454
11	152	407	*922	677	702	454
12	159	333	752	677	717	*433
13	165	1,700	572	663	724	*380
14	*156	1,000	569	*636	724	385
15	148	*556	565	602	740	415
16	181	517	559	636	1,340	427
17	191	490	546	713	1,740	407
18	173	475	553	816	1,220	393
19	173	433	565	*854	*965	*377
20	171	404	592	816	781	410
21	159	380	*582	905	743	442
22	183	351	1,050	937	643	477
23	197	357	2,550	937	606	305
24	*181	370	1,910	1,040	626	225
25	159	*390	1,220	2,090	609	*232
26	159	421	981	*2,530	*569	228
27	147	430	*917	2,070	559	195
28	140	1,140	889	1,440	569	219
29	152	-----	873	1,630	592	534
30	193	-----	917	1,050	592	737
31	313	-----	945	-----	546	---
Mean	166	479	870	1,050	796	429
Cs/mi	.41	1.17	2.13	2.57	1.95	1.05
In	.47	1.22	2.46	2.87	2.25	1.17
Ac-ft.	10,200	26,600	53,500	62,500	48,900	25,500

1975 Year: Mean 708 Cs/sq mi 1.73 Inches 23.54

Note : * Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	*502	487	*977	424	*195	232
2	415	*451	939	413	197	344
3	401	*1,010	*1,650	399	195	279
4	510	*5,190	993	399	195	*257
5	*949	*4,780	1,020	*383	185	*262
6	445	*1,990	*1,160	370	181	385
7	367	*3,400	1,070	362	223	354
8	296	1,420	941	367	*362	296
9	*436	1,080	873	359	265	274
10	349	*881	*1,060	385	248	262
11	293	781	881	388	228	255
12	*494	*1,860	774	370	219	257
13	*3,140	*4,790	699	349	*209	250
14	*1,820	1,370	*612	331	219	245
15	1,260	1,130	*1,170	318	219	239
16	1,230	*2,510	721	*310	223	236
17	*1,500	*2,590	797	298	223	236
18	691	*3,960	*626	303	223	234
19	517	*2,360	559	298	221	228
20	*478	6,510	616	303	209	221
21	*991	*3,550	517	286	*211	217
22	562	*4,030	*524	265	215	219
23	763	*2,900	493	255	211	215
24	*1,250	2,090	*472	250	211	223
25	670	1,650	481	234	205	230
26	612	1,470	472	225	201	267
27	507	*1,320	487	219	205	269
28	*1,480	*1,890	*581	215	201	253
29	1,380	1,300	481	205	197	*248
30	762	1,190	439	*211	191	232
31	572	1,050	---	199	---	*217
Mean	827	2,290	767	313	216	256
Cs/mi	2.03	5.61	1.88	.77	.53	.63
In	2.34	6.47	2.10	.88	.59	.72
Ac-ft.	50,900	141,000	45,700	19,200	12,900	15,700

M.Acre-feet. .513 Maximum day 6,510 Minimum day 132

SIRAN RIVER NEAR PHULRA

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Percent Silt	Percent Clay
25 Feb	404	55	38			
3 Mar	511	52	36			
11 Mar	861	48	164			
21 Mar	575	55	67			
27 Mar	897	60	55			
2 Apr	1,090	60	185			
14 Apr	602	61	11			
19 Apr	838	60	112			
26 Apr	2,780	55	4,940	39	56	5
4 May	1,050	66	154			
19 May	925	75	176			
26 May	565	76	66			
5 Jun	819	65	13,000	4	83	13
12 Jun	448	78	104			
13 Jun	359	80	117			
19 Jun	336	75	89			
25 Jun	219	76	56			
1 Jul	616	66	385			
5 Jul	1,050	66	3,650	16	66	18
9 Jul	549	74	997	2	45	53
12 Jul	762	78	448			
13 Jul	1,900	75	5,150	45	46	9
13 Jul	1,670	74	1,910	30	49	21
14 Jul	1,420	69	3,500	23	64	13
17 Jul	1,430	70	4,870	4	77	19
20 Jul	543	81	117			
21 Jul	1,680	71	13,400	12	65	23
24 Jul	1,690	74	21,200	4	82	14
28 Jul	1,160	74	1,300	13	53	34
2 Aug	490	81	300			
3 Aug	1,290	75	2,570	27	48	25
4 Aug	4,670	74	12,100	33	43	24
4 Aug	3,190	75	5,540	17	71	12
5 Aug	4,360	75	4,660	34	50	16
6 Aug	2,050	75	1,880	16	32	52

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
7 Aug	3,110	75	10,900	5	73	22
10 Aug	929	79	1,740	5	56	39
12 Aug	3,920	79	9,940	19	60	21
13 Aug	3,630	75	11,200	9	53	38
16 Aug	2,060	74	7,830	11	59	30
17 Aug	4,060	73	4,450	26	62	12
18 Aug	4,600	74	17,700	23	61	16
19 Aug	1,980	81	2,050	20	63	17
21 Aug	3,760	69	3,200	45	37	18
22 Aug	4,050	70	20,700	26	51	23
23 Aug	2,800	69	3,560	30	55	15
27 Aug	1,370	68	1,030	21	35	44
28 Aug	2,050	70	10,300	5	66	29
1 Sep	1,010	75	1,710	18	47	35
3 Sep	1,630	70	9,430	13	56	31
6 Sep	1,120	72	1,470	32	58	10
10 Sep	1,200	71	3,310	20	62	18
14 Sep	612	74	765	8	35	57
15 Sep	2,170	72	3,260	29	33	38
18 Sep	640	73	271			
22 Sep	549	67	239			
24 Sep	481	76	221			
28 Sep	543	63	150			
5 Oct	380	77	123			
16 Oct	296	68	46			
30 Oct	213	62	20			
1 Nov	197	55	56			
8 Nov	413	60	150			
13 Nov	205	50	23			
21 Nov	211	51	33			
4 Dec	257	55	30			
5 Dec	253	52	33			
29 Dec	243	42	54			
31 Dec	219	49	70			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

SIRAN RIVER NEAR PHULRA

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	TOTAL Cations	TOTAL Anions	PARTS PER MILLION SiO_2	Fe	B	D.S. by Evap.	ECx10^6 at 25 °C	pH	Res CO_3 ma/l	SAR
Jan 5	1.60	1.20	.35		0	2.45	.19	.50			3.15	3.14				188	310	8.0	0	.3
Feb 10	1.20	1.00	.39		0	2.06	.19	.30			2.55	2.55				128	240	7.8	0	.3
Mar 3	.80	1.20	.40		0	1.94	.19	.30			2.40	2.43				136	240	7.7	0	.4
Apr 2	1.00	.60	.20		0	1.32	.10	.40			1.80	1.82				104	180	7.8	0	.2
May 4	.90	.40	.30		0	1.20	.20	.20			1.60	1.60				84	150	7.8	0	.4
Jun 3	1.40	1.00	.22		0	2.12	.20	.30			2.62	2.62				144	250	7.8	0	.2
Jul 1	1.20	.70	.22		0	1.82	.20	.10			2.12	2.12				112	200	7.8	0	.2
Aug 2	1.60	.70	.40		0	2.40	.20	.10			2.70	2.70				148	250	7.9	.10	.4
Sep 1	1.15	1.05	.54		0	2.34	.20	.20			2.74	2.74				152	260	7.9	.14	.5
Oct 5	1.75	.70	.57		0	2.52	.20	.30			3.02	3.02				172	290	8.1	.07	.5
Nov 8	1.60	1.15	.51		0	2.52	.49	.20			3.21	3.21				176	300	8.1	0	.4
Dec 4	1.75	1.00	.45		0	2.70	.18	.30			3.20	3.18			0	176	300	8.0	0	.4

Location Latitude 35°50', Longitude 71°48', on left bank just downstream from the suspension bridge, nearly half a mile from Chitral.

Drainage area 4,400 square miles.

Records available Discharge record by Surface Water Hydrology Project, WASID, WAPDA from August 1963. Gauge height only, at times from January 1960 to October 1963 by P.W.D, B&R.

Average discharge 9,350 cusecs (6,820,000 acre feet per year or 28.97 inches runoff per year). Average taken for 11 years from 1964 to 1967 and 1969 to 1975.

Extremes Maximum discharge observed during the year 35,600 cusecs on 21 August (gauge height 14.44 feet); minimum daily discharge 1,930 cusecs on 7 March.

1964-67: 69-75: Maximum discharge 56,000 cusecs on 16 July 1973: minimum daily discharge 1,640 cusecs on 10 March 1964.

Gauge Wire weight gauge installed in October 1969, prior to this staff gauge fixed on pillars on left bank downstream of the bridge and set to arbitrary datum was used. Gauge read from 0800 to 1600 hours daily during low flow and more often during floods.

Measurements Fifty six discharge measurements were made during the year using 0.2 and 0.8 depth method from bridge. Thirty three sets of sediment samples were taken by depth integration method using D-49 sampler. Twenty of these were analysed for particle size distribution and the rest for total concentration.

Determination of discharge The control for this station is a rocky riffle which shifts nearly continuously. Rating table dated 4.6.76 based on wire weight gauge was used from 1.1.75 to 14.10.75, and rating table dated 5.2.75 used from 15.10.75 to date. Discharges were computed by applying daily mean gauge heights to above rating with shift adjustments as indicated necessary by the measurements.

Remarks Record fair.

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	2,470	2,100	2,090	2,540	3,650	12,500
2	2,490	2,140	*2,160	2,540	3,550	12,900
3	2,460	2,250	2,070	2,900	3,500	12,600
4	2,440	2,160	2,130	2,840	3,720	12,700
5	2,460	2,160	2,020	2,900	3,880	13,100
6	2,470	2,200	2,000	4,110	3,970	*13,600
7	*2,460	2,160	1,930	3,420	3,970	14,000
8	2,420	2,140	2,030	*3,200	4,000	14,200
9	2,360	2,100	2,030	3,240	4,090	13,900
10	2,340	2,120	2,000	3,020	*4,160	14,100
11	2,390	2,120	2,020	2,810	4,230	14,100
12	2,310	2,160	2,030	2,860	4,280	13,900
13	2,330	*2,190	2,030	2,790	4,880	*13,600
14	2,310	2,130	*2,030	2,700	5,960	14,800
15	2,300	2,100	2,050	2,840	7,640	18,200
16	2,300	2,160	2,070	2,920	*12,300	19,700
17	2,330	2,190	2,060	3,100	6,290	21,600
18	2,280	2,170	2,060	3,260	5,730	22,700
19	2,280	2,190	2,100	3,420	6,420	23,100
20	2,260	2,220	2,130	3,440	8,650	*22,800
21	2,280	2,190	2,070	3,520	6,950	22,200
22	2,260	*2,130	2,200	*3,970	7,130	20,600
23	*2,360	2,140	2,230	4,090	7,710	*19,400
24	2,250	2,160	2,230	4,090	*7,550	18,800
25	2,260	2,170	2,300	4,470	8,520	19,200
26	2,250	2,220	2,200	4,140	8,980	20,000
27	2,280	2,180	2,230	3,940	9,550	21,100
28	2,230	2,090	2,300	*3,770	11,300	22,800
29	2,190	-----	2,300	3,770	11,000	23,400
30	*2,250	-----	2,380	3,270	12,000	*22,500
31	2,160	-----	*2,490	-----	*12,100	-----
Mean	2,330	2,160	2,130	3,350	6,640	17,600
Cs/mi	0.53	0.49	0.48	0.76	1.51	4.00
In	0.61	0.51	0.56	0.85	1.74	4.46
Ac.ft.	*143	*120	*131	*199	*408	1.05

1975 Year: Mean 9,710 Cs/sq mi 2.21 Inches 30.0

Note : * Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	21,600	27,500	16,700	7,390	4,260	3,320
2	21,300	29,500	16,900	6,800	4,280	3,370
3	22,100	30,400	17,400	6,890	4,300	3,360
4	*23,400	31,000	*18,000	6,800	4,160	3,320
5	23,700	*31,400	17,900	6,620	4,100	3,340
6	23,100	30,700	18,000	6,590	4,020	3,270
7	22,600	29,900	17,700	6,490	4,040	3,260
8	22,800	*29,000	*16,700	6,390	*3,930	*3,240
9	23,500	28,900	16,200	6,290	3,920	3,200
10	*24,200	29,400	16,000	6,230	3,930	3,210
11	25,500	30,000	15,900	5,820	3,880	3,200
12	28,600	30,600	*16,000	5,900	3,840	3,210
13	*30,400	*31,900	16,100	5,260	3,860	3,240
14	30,300	32,300	15,600	*5,360	3,900	3,200
15	29,200	32,700	15,700	5,390	3,880	3,170
16	*29,100	32,700	15,600	5,240	*3,860	3,130
17	28,600	*32,900	*15,700	5,170	3,790	*3,130
18	28,300	33,300	15,700	5,070	3,790	3,130
19	28,300	*33,700	15,700	4,900	3,650	3,080
20	*28,500	33,800	15,300	4,810	3,600	3,090
21	*28,600	33,000	14,300	4,790	3,530	3,130
22	*28,800	29,700	*13,100	4,680	3,530	3,100
23	28,600	*26,300	11,600	4,660	*3,510	3,130
24	27,300	24,800	10,400	*4,460	3,480	3,130
25	27,100	24,100	9,660	4,460	3,500	3,120
26	28,600	24,600	*9,410	4,540	3,460	3,090
27	*28,700	*22,600	8,870	4,400	3,410	3,090
28	29,000	20,100	8,590	4,440	3,410	3,120
29	28,400	17,900	7,770	4,460	3,390	3,090
30	27,300	16,400	7,520	4,280	*3,330	3,140
31	*26,300	*16,500	------	*4,260	-----	*3,040
Mean	26,600	28,300	14,300	5,460	3,790	3,180
Cs/mi	6.04	6.43	3.26	1.24	0.86	0.72
In	6.96	7.42	3.63	1.43	0.96	0.83
Maf.	1.63	1.74	.853	.336	.225	.196

M. Acre-feet. 7.03 Maximum day 33,800 Minimum day 1,930

CHITRAL RIVER AT CHITRAL

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
7 Jan	3,010	42	29			
23 Jan	2,980	38	3			
30 Jan	2,850	40	30			
13 Feb	2,810	44	13			
22 Feb	2,810	42	15			
2 Mar	2,820	46	82			
14 Mar	2,740	44	50			
31 Mar	3,030	56	190			
8 Apr	3,540	50	1,760	9	48	43
10 Jul	24,400	60	4,500	56	26	18
13 Jul	30,600	62	6,520	40	42	18
16 Jul	29,100	60	4,630	41	41	18
20 Jul	28,800	58	4,640	47	44	9
21 Jul	29,300	58	5,330	51	45	4
22 Jul	27,900	60	4,640	62	31	7
27 Jul	29,200	68	5,740	56	41	3
31 Jul	26,300	64	3,060	31	54	15
5 Aug	31,700	58	6,000	44	45	11
8 Aug	29,400	56	3,100	22	52	26
13 Aug	32,800	62	7,540	44	37	19
17 Aug	17,500	56	8,000	43	40	17
19 Aug	34,500	58	9,840	14	71	15
23 Aug	26,500	56	7,700	57	34	9
27 Aug	23,500	54	4,640	55	30	15
31 Aug	16,500	60	2,580	54	33	13
4 Sep	18,200	58	2,050			
8 Sep	16,700	58	4,000	92	7	1
12 Sep	15,900	58	8,650	62	32	6
17 Sep	15,900	58	7,050	63	33	4
22 Sep	12,700	56	46			
30 Sep	7,610	54	50			
17 Dec	3,140	40	45			
31 Dec	3,040	40	33			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

Location Latitude 35°30', Longitude 72°35', on right bank about 2 miles downstream from Kalam.

Drainage area 780 square miles.

Records available January 1961 to date by Surface Water Hydrology Project, WASID, WAPDA. September 1958 to June 1962 by Hydrology Directorate of Irrigation Department, Peshawar. Record from 1955 to 1958 by Malakand Division of Irrigation Department.

Average discharge 3,170 cusecs (2,300,000 acre feet per year or 54.59 inches runoff per year). Average taken for 15 years from 1961 to 1975.

Extremes Maximum discharge observed during the year 16,400 cusecs on 16 May (gauge height 14.50 feet); minimum daily discharge 399 cusecs on 22,23,24 February.

1961-1975: Maximum discharge 18,400 on 4 July 1964; minimum daily discharge 293 cusecs on 9 February 1967.

Gauge Staff gauge graduated and read to hundredth of a foot. Gauge readings taken from 0600 to 1600 hours daily during low flow and more often during floods. Gauge set to 6004.90 datum (checked in 1968).

Measurements Thirty discharge measurements were made during the year using 0.2 and 0.8 and 0.6 depth method from car on overhead cableway near the gauge. Twenty eight sets of sediment samples were taken by the depth integration method using D-49 sampler from the cableway. All of these were analysed by total concentration. Eight surface samples were collected and analysed for chemical composition.

Determination of discharge Rating table dated 27.2.75 was used from 1.1.75 to 26.5.75, and rating table dated 1.6.76 was used from 27.5.75 to date. Daily mean discharges were computed using above rating table with shift adjustments as indicated necessary by discharge measurements.

Remarks Record good. Probable diurnal fluctuations during melting period have not been defined.

SWAT RIVER NEAR KALAM

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	465	429	414	608	2,920	9,680
2	459	432	417	770	2,950	8,800
3	456	435	417	870	3,060	8,250
4	450	438	411	928	3,090	7,750
5	450	438	423	983	3,020	7,950
6	453	441	429	1,030	2,300	*6,690
7	450	444	399	1,050	2,160	8,930
8	453	447	*414	1,040	*2,290	8,140
9	450	438	417	1,040	2,420	9,030
10	453	441	414	1,090	2,440	9,470
11	447	*438	411	1,140	3,140	8,850
12	447	438	411	1,110	3,940	8,800
13	447	438	402	1,050	4,680	*8,140
14	459	429	405	982	5,000	9,550
15	474	432	408	1,020	6,660	11,700
16	465	429	411	1,180	16,100	13,300
17	459	426	414	1,450	15,900	12,400
18	456	438	411	1,850	11,300	12,600
19	456	435	438	2,140	7,340	12,300
20	450	438	459	1,790	7,420	11,100
21	444	438	*456	1,990	7,000	9,600
22	*447	399	447	*2,170	7,360	*8,490
23	432	399	444	2,060	7,680	7,450
24	426	399	444	2,080	7,820	7,490
25	426	405	456	2,040	8,000	6,940
26	432	411	480	2,040	8,220	8,320
27	426	417	524	2,510	*8,140	10,300
28	438	414	532	2,470	9,840	*10,300
29	441	---	548	2,590	8,750	10,500
30	453	---	564	2,800	9,210	10,200
31	447	---	532	-----	9,530	-----
Mean	449	429	444	1,530	6,440	9,500
Cs/mi	.58	.55	.57	1.96	8.26	12.18
In	.66	.57	.66	2.19	9.52	13.60
Ac-ft.	27,600	23,800	27,300	91,000	396,000	565,000

1975 Year: Mean 3,480 Cs/sq mi 4.46 Inches 60.68

Note: * Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	9,010	7,010	4,370	1,510	1,100	780
2	8,980	7,490	4,290	1,550	1,090	760
3	9,470	8,020	4,310	1,520	1,080	750
4	9,600	8,070	4,200	1,490	1,080	750
5	8,590	8,000	4,220	1,470	1,080	730
6	*7,260	8,020	4,080	1,430	1,080	730
7	7,220	7,170	*3,870	1,420	1,060	740
8	8,210	*6,830	3,690	1,380	1,040	*750
9	8,690	6,710	3,510	1,370	982	740
10	*8,850	6,670	3,210	1,360	976	735
11	9,240	6,920	3,030	1,340	970	730
12	9,470	7,060	2,930	1,330	*940	705
13	11,000	7,840	*3,050	1,310	934	690
14	11,400	8,950	3,120	1,280	916	675
15	11,300	9,010	2,980	*1,270	910	665
16	11,800	8,620	3,210	1,270	910	655
17	11,200	*9,400	3,090	1,270	898	635
18	9,890	10,900	3,020	1,290	892	630
19	9,660	14,300	*3,110	1,270	868	616
20	9,160	14,200	3,080	1,260	862	608
21	*9,400	13,200	3,040	1,250	826	608
22	8,950	*9,500	3,000	1,220	820	596
23	8,020	6,690	2,820	1,210	844	592
24	7,200	6,140	2,550	1,170	850	*608
25	6,760	6,140	*2,190	1,160	844	604
26	7,010	6,140	2,050	1,130	*832	592
27	8,020	*5,630	1,980	*1,110	805	584
28	7,950	5,360	1,920	1,100	795	584
29	7,610	5,190	1,720	1,130	790	584
30	6,300	4,990	1,460	1,100	780	588
31	*6,320	4,530	-----	1,100	-----	584
Mean	8,820	7,890	3,100	1,290	928	664
Cs/mi	11.31	10.12	3.98	1.66	1.19	0.851
In	13.04	11.67	4.44	1.91	1.33	0.982
Ac-ft.	543,000	485,000	85,000	79,500	55,200	40,900

M.Acre-feet. 2.52 Maximum day 16,100 Minimum day 399

SWAT RIVER NEAR KALAM

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
14 Jan	456		6			
22 Jan	444		7			
11 Feb	438	39	59			
8 Mar	414	40	102			
21 Mar	453	39	24			
22 Mar	2,190	42	281			
8 May	2,260	45	32			
27 May	8,120	48	41			
6 Jun	8,560	50	32			
13 Jun	7,840	52	51			
28 Jun	9,630	52	161			
6 Jul	6,830	54	192			
10 Jul	8,350	54	138			
21 Jul	8,880	52	84			
31 Jul	5,920	52	78			
17 Aug	9,060	56	94			
22 Aug	8,510	56	79			
27 Aug	5,400	55	32			
7 Sep	3,690	55	51			
13 Sep	3,000	64	66			
19 Sep	3,050	54	12			
25 Sep	2,030	50	27			
15 Oct	1,250	50	39			
27 Oct	1,100	49	27			
12 Nov	928	48	24			
26 Nov	832	48	22			
8 Dec	750	45	40			
24 Dec	604	-	63			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

SWAT RIVER NEAR KALAM

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	TOTAL Cations	TOTAL Anions	PARTS PER MILLION SiO_2	Fe	B	D.S. by Evap.	$EC \times 10^6$ at 25 °C	pH	Res CO_3 me/l	SAR
Jan 14	1.00	1.20	.20		0	1.96	.19	.30			2.40	2.45				136	240	7.8	0	.2
Feb 11	1.00	1.00	.30		0	1.93	.19	.20			2.30	2.32				120	210	8.0	0	.3
May 3	.60	.20	.28		0	.70	.20	.20			1.08	1.10				54	100	7.9	0	.4
Jun 22	.50	.25	.23		0	.38	.10	.50			.98	.98				52	90	7.8	0	.4
Aug 22	.50	.30	.24		0	.64	.20	.20			1.04	1.04				56	100	8.1	0	.4
Oct 15	1.00	.80	.26		0	1.36	.10	.60			2.06	2.06				116	200	8.1	0	.3
Nov 26	.60	.40	.15		0	.77	.18	.20			1.15	1.15				60	110	8.1	0	.2
Dec 24	.65	.55	.30		0	1.00	.18	.30			1.50	1.48				80	140	7.9	0	.2

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Location Latitude 34°38', Longitude 72°02', on downstream railing of Chakdara Bridge near left bank, and 4 miles upstream from Amandara Headworks of Upper Swat Canal.

Drainage area 2,230 square miles.

Records available Discharge record November 1960 to date by Surface Water Hydrology Project, WASID, WAPDA. Gauge heights December 1958 to June 1962 by Hydrology Directorate of Irrigation and Power Department, Peshawar. Record based on estimated discharges September 1911 to date with some periods missing by Malakand Division of Irrigation Department.

Average discharge 6,220 cusecs (4,510,000 acre feet or 3,785 inches runoff per year). Average taken for 15 years from 1961 to 1975.

Extremes Maximum discharge observed during the year 32,000 cusecs on 16 May (gauge height 7,50 feet); minimum daily discharge 926 cusecs on 26,27 January 1975.

1961-1975: Maximum discharge observed 35,400 cusecs on 31 Jul 1966; minimum daily discharge 708 cusecs on 27 February 1963.

Gauge Wire weight gauge read to 0.01 foot from 0800 to 1600 hours daily during low flow and more often during floods. Gauge set to 2238.55 datum (checked in 1969). Check bar in forward position 28.80.

Measurements Thirty five discharge measurements were made during the year by current meter using 0.2 and 0.8 depth method from Chakdara Bridge. Thirty three sets of sediment samples were taken by the depth integration method using D-49 sampler from the bridge. Three of these were analysed by Particle size distribution and the rest for total concentration method. Eight surface samples were collected and analysed for chemical composition.

Determination of discharge Rating table dated 21.7.1976 was used to compute discharges from 1.1.75 to 15.5.75 and rating table dated 11.1.72 used from 16.5.75 to 31.12.75.

Remarks Record good.

SWAT RIVER AT CHAKDARA

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	1,210	1,020	1,750	3,670	9,540	16,800
2	1,170	982	1,490	4,320	9,400	17,600
3	1,120	966	1,380	5,780	9,130	*15,600
4	1,090	9589	3,910	4,790	9,780	13,400
5	1,050	1,230	3,450	8,780	8,510	13,600
6	1,010	1,360	2,450	9,540	7,270	15,300
7	1,040	1,250	*1,980	8,880	6,500	15,300
8	1,050	1,220	1,620	6,600	6,240	15,600
9	1,010	1,340	1,580	5,660	6,760	15,300
10	* 998	1,280	1,390	5,290	6,910	14,500
11	998	1,260	1,920	4,600	7,670	*13,900
12	990	1,250	1,740	4,340	7,950	14,100
13	982	1,670	1,560	3,840	9,830	13,700
14	974	1,630	1,518	3,610	10,600	15,600
15	966	1,420	1,500	3,300	12,800	17,400
16	1,040	1,340	1,560	*3,560	30,500	18,900
17	1,020	*1,250	1,470	4,260	21,000	20,200
18	*982	1,220	1,470	6,060	15,700	20,800
19	966	1,200	*1,540	6,870	14,000	21,100
20	966	1,210	1,690	6,420	13,700	20,700
21	986	1,240	1,840	6,830	13,000	*18,400
22	968	1,200	11,000	9,260	13,400	15,500
23	998	1,210	9,220	7,950	13,700	13,700
24	966	1,210	6,240	8,560	14,100	12,900
25	950	1,190	4,540	15,100	13,900	15,700
26	926	1,200	3,470	16,000	14,300	17,200
27	926	1,220	3,210	10,000	14,900	*17,600
28	934	1,500	3,190	11,300	*16,200	18,400
29	974	------	3,170	10,200	15,600	18,100
30	1,020	------	3,120	9,640	16,900	17,100
31	1,050	------	3,320	------	16,000	------
Mean	1,010	1,260	2,880	7,400	12,500	16,500
Cs/mi	0.45	0.56	1.29	3.32	5.61	7.38
In	0.52	0.59	1.49	3.70	6.47	8.24
Ac.ft.	62,100	69,900	177,000	441,000	769,000	980,000

1975 Year: Mean 6,990 Cs/sq mi 31.4 Inches 42.56

Note : * Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	15,400	11,300	7,740	3,230	1,780	1,550
2	15,200	11,600	7,540	*2,610	1,760	1,730
3	15,600	15,100	8,260	2,680	1,730	1,600
4	16,300	14,900	7,620	2,780	1,700	1,640
5	*15,600	15,600	8,020	2,800	1,670	1,730
6	13,700	13,500	*8,380	2,730	1,640	1,820
7	12,900	*12,500	7,900	2,750	2,390	1,780
8	14,000	11,900	7,300	2,780	2,230	1,780
9	15,700	11,000	6,820	2,800	1,780	1,780
10	14,900	10,700	7,940	2,930	*1,790	*1,810
11	*15,900	10,700	6,090	2,550	1,760	1,780
12	17,400	11,200	*5,810	2,390	1,730	1,760
13	18,800	*19,000	5,600	2,350	1,700	1,750
14	18,800	17,700	5,530	2,310	1,700	1,730
15	18,500	15,800	5,390	2,250	1,670	1,710
16	21,200	15,100	7,020	2,190	1,660	1,690
17	19,500	17,500	5,920	2,150	1,650	1,670
18	17,400	23,600	5,740	*2,330	1,640	1,660
19	*16,100	23,000	5,570	2,750	1,630	1,680
20	16,500	26,200	*5,710	3,000	1,620	1,640
21	16,000	25,800	5,220	2,550	1,610	1,640
22	15,800	21,800	5,250	2,450	1,610	*1,630
23	16,200	17,800	4,630	2,370	1,610	1,610
24	15,400	14,100	4,300	2,250	1,600	1,580
25	12,500	11,600	3,970	2,170	1,600	1,580
26	12,300	10,800	3,670	2,830	1,600	1,640
27	*13,300	11,200	4,060	2,010	1,590	1,550
28	13,900	*9,780	4,150	1,970	*1,580	1,550
29	13,500	9,550	3,670	1,890	1,570	1,570
30	11,600	8,580	*3,380	1,850	1,560	1,550
31	10,500	7,060	-----	1,810	-----	1,550
Mean	15,500	14,700	5,940	2,440	1,700	1,670
Cs/mi	6.95	6.60	2.66	1.10	0.76	0.75
In	8.01	7.60	2.97	1.26	0.85	0.86
Maf.	.953	.904	.353	.150	.101	.103

M.Acre-feet. 5.06 Maximum day 30,500 Minimum day 926

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
10 Jan	998		7			
18 Jan	982		10			
8 Feb	1,430		12			
17 Feb	1,240	48	39			
7 Mar	1,960	61	54			
2 Apr	4,340	60	43			
10 Apr	1,480	63	19			
16 Apr	3,650	64	45			
9 May	6,760	70	51			
28 May	15,400	66	41			
3 Jun	15,800	66	86			
11 Jun	13,600	66	70			
21 Jun	13,500	60	64			
27 Jun	15,400	70	39			
5 Jul	15,500	67	294			
11 Jul	16,100	68	282			
19 Jul	16,500	68	75			
27 Jul	13,400	69	99			
7 Aug	14,000	65	63			
13 Aug	18,200	72	1,090	14	70	16
20 Aug	28,200	70	2,400	35	58	7
24 Aug	10,600	70	1,260	54	26	20
28 Aug	10,300	70	61			
6 Sep	12,800	69	23			
12 Sep	5,880	67	48			
20 Sep	5,740	65	183			
30 Sep	3,380	67	29			
2 Oct	2,610	67	31			
18 Oct	2,330	66	43			
10 Nov	1,790	64	35			
28 Nov	1,290	63	30			
10 Dec	1,810	55	21			
22 Dec	1,630	54	30			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

SWAT RIVER AT CHAKDARA

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	TOTAL Cations	TOTAL Anions	PARTS PER MILLION SiO_2	Fe	B	D.S. by Evap.	$EC \times 10^6$ at 25 °C	pH	Res CO_3 me/l	SAR
Jan 10	1.0	.90	.20		0	1.27	.19	.70			2.10	2.16				120	210	7.8	0	.2
Feb 8	1.00	.70	.40		0	1.67	.19	.20			2.10	2.06				116	200	7.9	0	.4
May 28	.60	.20	.28		0	.70	.20	.20			1.08	1.10				56	100	7.8	0	.4
Jun 27	.60	.20	.28		0	.58	.10	.40			1.08	1.08				56	100	7.9	0	.4
Aug 28	1.00	.40	.24		0	1.34	.10	.20			1.64	1.64				88	150	8.0	0	.3
Oct 18	.55	.40	.23		0	.68	.10	.40			1.18	1.18				60	110	8.1	0	.3
Nov 28	.90	.60	.16		0	1.45	.09	.10			1.66	1.64				92	160	8.1	0	.2
Dec 22	.70	.50	.32		0	1.20	.10	.20			1.52	1.50				76	140	8.0	0	.2

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Location Latitude 33°52', Longitude 71°24', on right bank 200 feet downstream from Jhansi Post Bridge. 6 miles downstream from Mastura River and 12 miles South-West of Peshawar.

Drainage area 713 square miles.

Record available Discharge record January 1961 to date by Surface Water Hydrology Project, WASID, WAPDA. Gauge height record from January 1959 to June 1962, with discharge measurements starting in 1961 by Peshawar Division of Hydrology Directorate, Irrigation and Power Department.

Average discharge 304 cusecs per year (233,000 acre feet per year or 5.78 inches runoff per year). Average taken for 15 years from 1961 to 1975.

Extremes Maximum discharge observed during the year 30,600 cusecs on 13 July (gauge height 13.70 feet), minimum daily discharge 46 cusecs on 26 February.

1961-75: Maximum discharge 30,600 cusecs on 13 July 1975; minimum daily discharge 41 cusecs on 29 August 1974.

Gauge Enamelled staff gauge graduated to 0.02 foot and read to 0.01 foot from 0800 to 1600 hours daily during low flow and more often during floods. Gauge height datum was changed due to refixing in late 1970. Hence, the present gauge is set to arbitrary datum.

Measurements Twenty four discharge measurements were made during the year by current method using 0.2 and 0.8 depth method. Low flow was measured by wading in vicinity of gauge and high water was measured from Jhansi Post Bridge. Twenty two sets of sediment samples were taken by depth integration method using DH-48 sampler when wading or D-49 sampler from the bridge. Six of these were analysed for particle size distribution and the rest for total concentration. Nine surface samples were taken and analysed for chemical composition.

Determination of discharge Rating dated 24.4.71 used to compute the daily discharge for the whole year.

Remarks. Record fair.

BARA RIVER AT JHANSI POST

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	111	90	*70	413	640	370
2	111	80	62	739	689	453
3	109	78	96	890	672	631
4	113	96	150	1,210	2,100	401
5	113	91	163	*1,160	2,060	375
6	109	88	145	794	1,850	380
7	111	91	124	714	1,240	370
8	111	96	113	663	*940	365
9	107	74	132	558	632	370
10	*103	60	107	430	663	354
11	105	53	186	472	594	349
12	103	70	*217	460	579	419
13	100	94	181	430	545	365
14	105	67	168	407	510	294
15	99	53	161	375	538	321
16	102	60	321	344	1,180	303
17	103	66	2,210	441	*785	299
18	105	61	1,180	401	609	308
19	105	61	850	*585	558	326
20	96	59	655	385	504	354
21	96	54	2,080	390	441	625
22	*96	53	632	970	430	198
23	94	52	928	1,260	424	*224
24	97	49	267	1,280	401	220
25	93	48	*234	3,130	375	224
26	91	49	167	1,460	380	220
27	*90	58	234	722	447	220
28	85	66	248	722	380	214
29	83	---	290	625	375	222
30	82	---	303	572	378	288
31	93	---	349	---	365	---
Mean	101	68	420	760	718	335
Cs/mi	0.14	0.10	0.59	1.07	1.00	0.47
In	0.16	0.10	0.68	1.19	1.16	0.52
Ac.ft.	6,190	3,880	25,800	45,200	44,200	20,000

1975 Year: Mean 322 Cs/sq mi 0.45 Inches 6.14

Note : Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	300	184	132	198	118	173
2	275	152	132	189	120	171
3	217	132	148	186	120	166
4	201	128	148	179	122	161
5	*201	110	179	179	124	159
6	255	125	282	179	126	159
7	255	93	321	175	126	156
8	275	74	214	171	118	*135
9	441	65	168	168	114	133
10	317	67	163	168	114	133
11	344	71	139	168	116	133
12	341	127	132	163	116	132
13	5,450	4,830	128	163	114	132
14	1,160	884	126	163	116	132
15	472	286	132	163	*116	133
16	*282	192	179	161	118	133
17	241	161	189	161	120	133
18	214	201	154	159	120	132
19	198	179	139	156	168	132
20	195	145	179	154	150	132
21	*161	181	330	152	145	130
22	154	150	205	150	148	128
23	156	150	195	150	150	128
24	152	145	179	148	152	124
25	159	135	177	148	154	124
26	163	1,320	524	150	156	126
27	392	248	396	137	156	*126
28	263	228	275	126	159	128
29	438	431	238	120	159	130
30	282	181	217	120	161	128
31	*189	152	---	118	---	127
Mean	456	356	204	159	133	138
Cs/mi	0.64	0.50	.29	0.22	0.19	0.19
In	0.74	0.58	.32	0.26	0.21	0.22
Ac.ft.	28,000	21,900	12,100	9,770	7,930	8,470

M. Acre-feet. .233 Maximum day 5,450 Minimum day 46

BARA RIVER AT JHANSI POST

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
10 Jan	103		6			
22 Jan	94		5			
27 Jan	88		10			
1 Mar	66	66	113			
12 Mar	201	60	693	19	32	49
25 Mar	245	66	792	18	15	67
5 Apr	980	68	11,300	9	44	47
19 Apr	390	64	2,460	13	37	50
8 May	880	74	4,810	9	52	39
17 May	655		7,170	23	63	14
23 Jun	234	82	138			
5 Jul	201	77	52			
16 Jul	275	86	200			
21 Jul	159	86	105			
31 Jul	189	84	47			
25 Sep	159	73	56			
29 Sep	238	60	44			
17 Oct	161	66	63			
21 Oct	152	74	50			
15 Nov	35	52	77			
27 Nov	156	50	57			
27 Dec	126	47	14			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

BARA RIVER AT BHANSI POST

Chemical Analysis of Water Samples - 1973

Date	MILLIEQUIVALENTS PER LITRE Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	TOTAL Cations	TOTAL Anions	PARTS PER MILLION SiO_2	Fe	B	D.S. by Evap.	$EC \times 10^6$ at 23 °C	pH	Res CO_3 me/l	SAR
Jan 10	2.00	1.80	.35		0	3.63	.19	.40			4.15	4.22				228	390	7.7	0	.2
Mar 1	1.60	1.40	.65		0	3.10	.29	.20			3.65	3.59				208	350	8.1	.10	.5
Apr 5	1.20	1.30	.65		0	2.24	.20	.70			3.15	3.14				176	300	8.1	0	.2
May 17	1.10	.50	1.80		0	2.65	.29	.40			3.40	3.34				184	320	7.7	1.05	2.0
Jun 23	1.00	1.80	.39		0	2.54	.39	.30			3.19	3.19				172	300	7.7	0	.3
Jul 5	1.50	1.30	.49		0	2.70	.39	.20			3.29	3.29				180	310	7.8	0	.4
Oct 21	1.50	1.95	.28		0	1.94	.29	1.50			3.73	3.73				204	350	8.0	0	.2
Nov 27	1.50	1.80	.45		0	3.00	.18	.60			3.75	3.79				204	350	8.0	0	.3
Dec 27	1.50	1.60	.70		0	2.80	.18	.80			3.80	3.78			0	208	350	8.0	0	.4

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Location Latitude 34°01', Longitude 71°58', on left bank at upstream side of boat bridge on Kabul River at Nowshera.

Drainage area 34,200 square miles.

Records available January 1961 to date by Surface Water Hydrology Project, WASID, WAPDA (periodic discharge measurements started in May 1960). Gauge heights only, at various times for many years, by Building and Roads Branch P.W.D. Nowshera.

Average discharge 31,800 cusecs per year (23,040,000 acre feet per year or 12.69 inches runoff per year). Average taken for 15 years from 1961 to 1975.

Extremes Maximum discharge observed during the year 171,000 cusecs on 20 August (gauge height 13.96 feet); minimum daily discharge 4,180 cusecs on 30 January, 7 February 1975.

1961-75: Maximum discharge observed 223,000 cusecs on 23 May 1965: minimum daily discharge 3,960 cusecs on 30 November 1974.

Gauge Automatic water stage recorder installed in gauge shelter on left bank about 300 feet upstream from the boat bridge and about ½ mile upstream from road-rail bridge. Prior to 22 February 1962 enamelled gauge plates graduated to 0.02 foot fastened on downstream end of first bridge pier from left bank. Zero R.L. of inside staff gauge 925.33 (checked in 1968).

Measurements Twenty discharge measurements were made periodically during the year by current meter using 0.2 and 0.8 depth method from upstream side of railway bridge. Twenty seven sets of sediment samples were taken by depth integration method using D-49 sampler from the railway bridge. Eleven of these were analysed for particle size distribution and the rest for total concentration. Six surface samples were collected and analysed for chemical composition.

Determination of discharge This station has a sandy bed which appears to shift nearly continuously. Discharge were computed for the year by applying daily mean gauge heights to rating table dated 27.7.64 with shifts as indicated necessary by discharge measurements.

Remarks Record fair.

KABUL RIVER AT NOWSHERA

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	5,680	4,520	5,200	15,200	44,000	68,800
2	6,010	4,880	4,900	17,500	42,700	69,200
3	6,250	4,650	3,680	21,200	40,700	73,700
4	5,900	*4,230	4,450	*25,400	41,000	67,100
5	6,040	4,520	7,990	31,700	41,200	62,100
6	5,550	4,450	8,790	34,100	38,700	65,300
7	*5,840	4,180	6,850	43,700	31,800	*68,700
8	5,680	5,610	5,640	44,600	29,700	69,200
9	5,580	6,040	5,320	34,600	28,800	65,700
10	6,710	5,800	4,420	30,000	32,000	63,600
11	5,230	6,250	5,710	28,600	32,300	63,200
12	5,080	5,520	9,710	26,900	31,500	62,900
13	5,580	6,230	*11,100	25,600	35,200	61,000
14	6,010	7,670	10,100	24,200	41,200	60,200
15	5,500	7,470	8,430	22,900	47,000	65,600
16	6,180	6,850	8,150	22,200	77,000	72,800
17	5,770	6,360	8,030	22,200	128,000	*82,000
18	5,450	5,640	8,750	25,900	101,000	94,900
19	5,610	5,230	7,350	30,100	67,200	99,300
20	*4,900	5,640	7,070	32,600	58,600	97,800
21	5,230	5,830	7,150	*32,600	53,300	93,300
22	5,800	*5,840	11,100	35,080	52,200	81,500
23	7,070	5,940	19,200	37,600	49,200	69,300
24	4,790	5,290	19,000	39,400	51,000	60,900
25	5,020	5,390	18,100	44,900	51,300	56,600
26	5,940	5,370	13,300	61,000	54,300	60,000
27	4,470	5,370	13,800	60,400	57,300	66,800
28	4,420	5,310	*13,400	57,600	62,900	71,100
29	4,500	-----	12,800	45,100	66,800	72,300
30	4,180	-----	13,900	42,500	67,500	68,400
31	4,300	-----	13,500	------	69,400	------
Mean	5,500	5,380	9,630	33,800	52,400	71,100
Cs/mi	0.16	0.16	0.28	0.99	1.53	2.08
In	0.18	0.17	0.32	1.10	1.77	2.32
Mef.	.338	.310	.592	2.01	3.22	4.23

1975 Year: Mean 31,000 Cs/sq mi 0.94 Inches 12.33

KABUL RIVER AT NOWSHERA

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	62,000	45,300	41,600	11,600	7,830	7,470
2	59,700	45,600	38,000	11,300	7,710	8,990
3	57,000	45,900	37,900	11,100	6,600	9,350
4	60,400	*51,300	37,500	10,800	7,270	9,150
5	66,300	72,500	35,700	10,700	7,910	9,670
6	62,700	*81,700	39,500	10,600	8,190	9,350
7	56,300	69,200	36,700	10,400	8,550	10,800
8	54,200	67,500	32,900	10,300	7,830	9,990
9	54,900	63,200	30,700	10,600	10,300	8,870
10	56,700	58,500	32,000	10,400	9,550	*8,910
11	56,400	57,900	29,600	10,600	8,750	8,390
12	58,600	57,600	25,400	10,000	9,510	8,870
13	67,900	68,100	23,400	9,470	9,510	8,630
14	77,200	96,000	24,600	9,510	*9,510	8,910
15	82,800	104,000	20,700	9,430	8,510	7,710
16	89,800	107,000	20,900	*8,430	8,470	8,310
17	82,100	102,000	22,500	8,470	8,080	8,750
18	66,600	110,000	20,600	7,830	8,230	8,750
19	62,000	125,000	19,700	7,950	7,750	8,350
20	60,200	145,000	19,200	10,500	7,670	7,910
21	60,600	163,000	18,600	10,800	6,950	8,110
22	60,200	150,000	18,100	10,100	7,230	7,950
23	59,600	111,000	17,000	9,470	7,750	8,230
24	59,000	83,400	*15,800	9,150	7,550	8,230
25	55,800	69,100	14,300	8,750	7,830	10,300
26	51,000	62,600	13,100	8,590	*6,600	*8,830
27	49,900	65,300	12,600	8,390	8,030	9,950
28	50,300	62,700	12,700	*6,950	8,310	10,300
29	52,300	61,100	12,900	6,810	8,030	10,100
30	50,300	53,100	12,000	7,790	7,510	10,100
31	45,100	46,900	------	8,270	-----	10,100
Mean	60,900	80,700	24,400	9,520	8,120	9,010
Cs/mi	1.78	2.36	0.72	0.28	0.24	0.26
In	2.05	2.72	0.80	0.32	0.26	0.30
Maf.	3.74	4.96	1.45	.585	.483	.554

M. Acre-feet. 22.5 Maximum day 163,000 Minimum day 4,180

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPMM by weight	Percent Sand	Silt	Clay
7 Jan	6,150	50	63			
20 Jan	4,820		46			
4 Feb	3,560	50	72			
22 Feb	5,320	59	43			
13 Mar	11,900	58	243			
28 Mar	13,500	69	136			
4 Apr	25,200	64	1,030	15	63	22
21 Apr	33,100	68	260			
7 May	34,900	72	1,150	11	68	21
20 May	59,300	71	2,260	33	38	29
7 Jun	69,400	74	430	16	33	51
17 Jun	82,900	80	1,960	34	57	9
21 Jun	93,200	74	3,110	23	64	13
3 Jul			2,000	41	58	1
12 Jul	59,300	79	1,910	23	39	38
15 Jul	84,900	74	2,600	20	41	39
4 Aug	60,800	79	2,540	26	55	19
6 Aug	61,000	82	3,150	22	54	24
11 Sep	28,200		2,900	38	54	8
24 Sep	15,800	78	65			
30 Sep	12,000	84	41			
16 Oct	8,030	74	69			
28 Oct	5,840	66	65			
14 Nov	9,510	54	59			
26 Nov	6,850		33			
10 Dec	9,270	54	71			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

KABUL RIVER AT NOWSHERA

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE												PARTS PER MILLION				$EC \times 10^6$ at 25 °C	pH	Res CO_3 me/l	SAR
											TOTAL									
	Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	Cations	Anions	SiO_2	Fe	B	D.S. by Evap.				
Jan 20	1.20	1.40	.90		0	2.34	.38	.60			3.50	3.32				196	340	7.9	0	.8
Mar 28	1.10	1.90	.60		0	2.48	.29	.20			3.60	3.53				204	350	7.8	0	.5
May 23	1.05	1.35	.45		0	1.80	.29	.40			2.55	2.49				136	240	7.7	0	.4
Jul 12	.80	.80	.24		0	1.34	.20	.30			1.84	1.84				96	170	7.3	0	.3
Nov 26	1.10	2.40	1.10		0	2.81	.45	1.30			4.60	4.56				244	420	7.9	0	.6
Dec 26	2.25	1.35	.90		0	3.20	.27	1.00			4.50	4.47			0	244	420	7.9	0	.7

INDUS RIVER AT MANDORI - 1975

Location Latitude 33°47', Longitude 72°15, on right bank near Mandori village, about 6 miles downstream from old site and about 7 miles downstream from the confluence of Kabul River.

Drainage area 102,000 square miles.

Record available The daily discharge record (preliminary) from April 1868 to December 1961 with Surface Water Hydrology Project, record computed from rating curve based on float measurements made in May to October 1948 by Irrigation Research Institute Lahore, and the measurements made by Surface Water Hydrology Project on 1960. Gauge height record of old gauge from April 1868 to date in the office of discharge Division, Hydrology and Floods Directorate of Irrigation and Power Department, Lahore.

Discharge measurements were made by current meter from a boat near Mandori village by Surface Water Hydrology Project starting from July 1960 and daily discharge record available since January 1960. A new gauge was installed near Mandori village on right bank in late 1964.

Average discharge 12,2,000 cusecs (38,570,000 acre feet per year or 16.3 inches runoff per year) for 92 years, 1869 to 1961, from preliminary computations by Tippate-Abbett Mc Carthy-Stratton International corp.
12,5000 cusecs (90,300,000 acre feet per year or 16.60 inches runoff per year) Average taken for 16 years from 1960 to 1975.

Extremes Maximum discharge observed during the year 698,000 cusecs on 20 August (gauge height 54.75); minimum daily discharge 5,600 cusecs on 5 February.

1868-1975: Maximum discharge observed 820,000 cusecs on 28 August 1929 (gauge height 66.5 feet). Peak of 18 August 1929 (689,000 cusecs) was caused by breaching of glacial dam on Shyok River. Flood peak of 1841, caused by breaching of land slide block on main Indus River is reputed to have been considerably higher than any other peak known. Minimum discharge observed 5,600 cusecs on 5 February 1975.

Gauge Staff gauge (enamelled plates) fixed on masonry pillars on right bank near Mandori village, read at one hour interval for the whole day. Gauge installed in late 1964 Servomanometer with recorder installed in masonry shelter in May 1966. Prior to this, staff gauge on left bank painted on weall of Attock Fort (0.32 feet), on masonry pillar on right bank (32-54) feet and on downstream right corner of Kass Nallah Bridge about one furlong upstream (54-70 feet). About 5 miles downstream from Attock Bridge).

Measurements Twenty two discharge measurements were made by current meter using 0.2 and 0.8 depth method from a boat equiped with 40 H.P. outboard motor. Ten sets of sediment samples were taken by depth integration method using D-49 sampler from boat. Two of these were analysed for particle size distribution and rest for total concentration. 3 Surface samples were collected and analysed for chemical composition.

Determination of discharge Rating dated 4.2.76 was used with shift adjustment where indicated necessary by periodic discharge measurements.

Remarks Record fair.

INDUS RIVER AT MANDORI

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	24,100	19,400	19,000	37,600	76,800	168,000
2	24,700	18,600	21,100	39,500	80,000	171,000
3	24,400	*9,580	20,300	*43,300	78,000	186,000
4	23,700	8,940	21,700	53,800	78,500	165,000
5	23,500	5,600	24,600	55,000	78,800	193,000
6	22,800	6,370	29,000	57,600	76,200	196,000
7	22,800	8,190	27,000	67,500	72,000	200,000
8	23,200	11,700	25,500	70,000	67,300	200,000
9	22,300	14,400	24,700	60,500	57,000	196,000
10	23,900	15,600	23,400	54,500	*66,500	*180,000
11	*22,800	16,500	23,700	57,100	66,500	161,000
12	22,100	18,700	28,200	54,600	69,000	195,000
13	22,700	19,500	28,500	51,600	73,000	190,000
14	22,500	22,600	*27,700	48,600	81,000	190,000
15	22,500	23,200	23,800	46,000	88,000	197,000
16	22,000	22,600	23,800	44,500	120,000	215,000
17	22,000	21,400	23,400	44,000	170,000	230,000
18	21,100	20,900	23,800	48,000	138,000	247,000
19	21,300	20,200	22,500	52,000	110,000	255,000
20	20,000	19,900	22,000	58,200	105,000	258,000
21	20,000	20,100	22,200	59,900	100,000	258,000
22	21,300	19,100	28,000	63,000	99,500	250,000
23	22,100	19,400	38,000	67,200	96,700	239,000
24	20,800	19,000	40,000	69,100	99,000	231,000
25	19,800	18,600	42,000	76,500	101,000	218,000
26	20,800	18,700	39,000	96,600	110,000	163,000
27	19,600	*17,600	40,000	98,100	109,000	239,000
28	19,000	18,900	39,000	93,000	110,000	250,000
29	*18,800	------	*38,000	81,000	186,000	250,000
30	19,100	------	37,000	*80,000	166,000	244,000
31	19,000	------	36,600	------	168,000	
Mean	21,800	17,000	28,500	60,900	99,900	211,000
Cs/mi	0.21	0.17	0.28	0.60	0.98	2.07
In	0.25	0.17	0.32	0.67	1.13	2.31
Maf.	1.34	.942	1.75	3.63	6.14	12.6

1975 Year: Mean 98,900 Cs/sq mi 0.70 Inches 13.21

Note : *Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	240,000	48,900	183,000	63,000	28,500	33,600
2	236,000	134,000	174,000	61,600	25,000	34,900
3	233,000	148,000	174,000	64,500	34,800	38,200
4	235,000	156,000	183,000	52,000	34,900	38,400
5	100,000	180,000	184,000	50,500	35,900	38,900
6	235,000	181,000	209,000	51,000	35,100	38,300
7	232,000	178,000	208,000	51,000	35,000	39,000
8	170,000	184,000	201,000	51,000	39,700	34,000
9	201,000	252,000	173,000	51,500	42,100	30,500
10	236,000	288,000	141,000	56,000	41,300	31,000
11	236,000	280,000	126,000	55,500	40,100	30,500
12	238,000	280,000	120,000	55,800	40,500	31,200
13	248,000	299,000	119,000	55,200	38,000	30,500
14	260,000	334,000	117,000	55,000	37,000	30,100
15	268,000	379,000	117,000	55,000	36,100	29,000
16	277,000	356,000	130,000	45,000	37,000	29,200
17	242,000	252,000	130,000	39,000	36,000	29,700
18	*179,000	291,000	135,000	39,000	36,000	29,500
19	*256,000	484,000	133,000	39,000	35,500	29,000
20	*252,000	529,000	131,000	42,000	35,000	28,300
21	*258,000	670,000	115,000	42,400	38,100	8,300
22	*258,000	660,000	114,000	58,600	38,700	8,100
23	258,000	500,000	113,000	60,000	39,000	8,400
24	*257,000	366,000	88,400	57,800	38,400	8,500
25	223,000	356,000	73,200	45,000	35,000	10,400
26	*119,000	210,000	71,000	34,500	33,700	9,400
27	*147,000	236,000	69,900	34,200	34,300	10,200
28	*147,000	246,000	64,700	35,800	34,900	10,400
29	*95,400	240,000	65,100	56,800	34,500	10,200
30	*55,300	233,000	64,400	54,200	33,700	10,200
31	*49,600	218,000	-------	24,000	------	10,200
Mean	208,000	296,000	131,000	49,500	36,100	24,500
Cs/mi	2.04	2.90	1.28	0.49	0.35	0.24
In	2.35	3.34	1.43	0.56	0.40	0.28
Maf.	12.8	18.2	7.79	3.05	2.15	1.50

M. Acre-feet. 71.9 Maximum day 670,000 Minimum day 5,600

INDUS RIVER AT MANDORI

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Percent Silt	Percent Clay
11 Jan	22,600	53	41			
29 Jan	19,000	51	79			
3 Feb	8,260		23			
27 Feb	17,000	58	90			
14 Mar	27,800	61	46			
3 Apr	43,600	72	54			
30 Apr	61,000	74	1,020	22	66	12
10 May	65,700	71	998	20	61	19
10 Jun	119,000	68	562			
27 Jun	197,000	71	260			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

INDUS RIVER AT MANDORI

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	TOTAL Cations	TOTAL Anions	PARTS PER MILLION SiO_2	Fe	B	D.S. by Evap.	$EC \times 10^6$ at 25 °C	pH	Res CO_3 me/l	SAR
Feb 3	1.70	1.50	.90		0	2.84	.48	.80			4.10	4.12				2,34	400	7.7	0	.7
Apr 3	1.30	1.20	.65		T	2.04	.29	.80			3.15	3.13				176	300	8.2	0	.6
May 10	.90	.90	.90		0	1.59	.29	.40			2.30	2.28				126	220	7.8	0	.5

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Location Latitude 33°48', Longitude 72°54', on right bank two furlong upstream from Taxila-Haripur Road bridge and 2½ miles South West of Khanpur.

Drainage area 300 square miles.

Records available Discharge record January 1960 to date by Surface Water Hydrology Project, WASID, WAPDA.

Average discharge 297 cusecs (213,000 acre feet per year or 12.86 inches runoff per year). Average taken for 16 years from 1960 to 1975.

Extremes Maximum discharge observed during the year 19,500 cusecs on 20 August (gauge height 7.23 feet); minimum daily discharge 22 cusecs on 29 January'75.

1960-75: Maximum discharge 28,800 cusecs on 23 June 1971; minimum daily discharge 4 cusecs on 29 June'1970.

Gauge Enamelled gauge plates read to hundredths of a foot from 0800 to 1600 hours daily during low flow and more often during flood period. Prior to 1971, old gauge nearly 500 feet downstream of the present gauge was used.

Measurements Eighty two discharge measurements were made periodically during the year by current meter using 0.2 and 0.8 depth method by wading at low discharges and from Bridge at medium and high discharges. Eighty one sets of sediment samples were taken by depth integration method using DH-48 sampler while wading and D-49 sampler from the bridge. Thirty two of these were analysed for particle size distribution and the rest for total concentration. Twelve surface samples were collected and analysed for chemical composition.

Determination of discharge Low Water rating affected by changes in heading of a small Irrigation Canal downstream from the gauge on right bank, discharges were computed using rating table dated 15.5.75 from 1.1.75 to 31.12.75 with shift adjustments.

Remarks Record good, does not include the canal on left bank which may carry considerable portion of low water discharge.

HARO RIVER NEAR KHANPUR

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	25	*71	*153	179	205	56
2	25	45	107	184	149	51
3	34	42	86	179	*139	*65
4	*42	42	*164	*171	149	63
5	42	*40	227	167	146	126
6	42	40	167	160	135	65
7	40	40	139	153	129	60
8	40	78	123	146	123	132
9	40	*99	110	142	113	69
10	40	60	101	135	116	*123
11	40	40	*300	132	*113	81
12	40	31	227	*123	110	116
13	*40	*975	188	*113	101	63
14	37	391	175	110	91	58
15	37	*218	*160	104	83	51
16	35	167	157	101	78	45
17	35	142	139	99	660	45
18	35	139	132	99	272	*43
19	35	123	*126	94	*146	38
20	*34	104	110	*94	126	42
21	34	104	96	91	94	*725
22	34	88	*242	91	88	67
23	34	78	*370	88	83	49
24	34	76	*430	83	74	63
25	34	76	305	607	76	58
26	32	*76	*261	1,360	74	47
27	*29	71	237	462	71	*47
28	31	96	223	*247	*67	47
29	22	--	209	267	65	91
30	35	--	196	223	63	51
31	60	--	192	---	60	--
Mean	36	127	189	203	129	88
Cs/mi	0.12	0.42	0.63	0.68	0.43	0.29
In	0.14	0.44	0.73	0.76	0.50	0.33
Ac.ft.	2,220	7,050	11,600	12,100	7,930	5,230

1975 Year: Mean 226 Cs/sq mi 0.75 Inches 10.23

Note : * Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	*56	242	564	146	96	58
2	49	*247	*585	153	96	60
3	60	*350	574	153	94	58
4	*38	213	443	142	91	*52
5	*175	1,320	*1,640	*139	86	47
6	65	480	526	135	*86	47
7	*123	376	*607	139	86	45
8	96	323	376	142	83	45
9	*63	*289	350	142	83	45
10	52	242	526	146	83	45
11	38	209	*553	146	81	43
12	*32	*336	383	149	78	*43
13	*579	*430	343	*146	78	42
14	*630	329	343	129	*76	41
15	184	383	*370	113	76	40
16	*750	*834	343	*99	76	48
17	383	535	324	99	76	38
18	188	471	305	110	74	38
19	*378	*574	*356	113	69	40
20	146	*9,360	305	123	69	*40
21	508	804	232	132	*65	40
22	218	*1,950	192	*135	65	37
23	*251	1,790	*184	132	65	37
24	209	1,190	167	126	63	37
25	188	1,080	146	120	60	34
26	*356	*1,060	*142	116	58	34
27	305	940	157	110	56	*34
28	391	*4,240	153	104	*56	34
29	311	895	*160	99	56	34
30	*278	*686	149	*99	56	34
31	256	574	---	99	--	32
Mean	237	1,060	383	127	75	42
Cs/mi	0.79	3.52	1.28	0.42	0.25	0.14
In	0.91	4.06	1.43	0.49	0.28	0.16
Ac.ft.	14,600	65,000	22,800	7,810	4,440	2,570

M.Acre-feet. .163 Maximum day 9,360 Minimum day 22

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Percent Silt	Percent Clay
4 Jan	42	49	21			
13 Jan	38	64	24			
20 Jan	34	58	25			
27 Jan	29	57	16			
1 Feb	58	55	18			
4 Feb	40	49	32			
9 Feb	101	60	23			
13 Feb	1,525	53	7,910	10	63	27
19 Feb	110	62	43			
25 Feb	74	66	21			
1 Mar	153	58	80			
4 Mar	329	67	269			
11 Mar	323	52	416			
15 Mar	160	60	65			
19 Mar	123	67	113			
22 Mar	223	68	828	4	29	67
24 Mar	423	60	2,930	4	25	71
26 Mar	261	69	248			
4 Apr	171	71	40			
12 Apr	116	72	28			
13 Apr	133	71	41			
20 Apr	194	60	43			
28 Apr	261	68	290			
5 May	[illegible]	70	110			
11 May	110	67	128			
19 May	146	78	58			
28 May	167	70	51			
3 Jun	257	74	79			
10 Jun	226	77	150			
18 Jun	45	77	68			
21 Jun	673	72	7,020	7	76	17
27 Jun	247	82	218			
1 Jul	253	84	155			
4 Jul	189	80	155			
5 Jul	278	74	4,990	1	83	16

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
7 Jul	37	84	174			
7 Jul	776	78	18,300	1	50	49
9 Jul	91	85	136			
12 Jul	32	84	57			
13 Jul	2,780	78	16,800	6	58	36
14 Jul	2,430	75	25,200	2	60	38
16 Jul	2,340	74	28,600	4	71	25
19 Jul	726	78	5,920	3	78	19
23 Jul	383	82	2,480	2	44	54
26 Jul	446	82	8,180	3	52	45
30 Jul	289	78	550	11	33	56
2 Aug	247	82	1,480	7	38	55
3 Aug	732	78	7,190	1	64	35
5 Aug	2,290	76	16,600	5	61	34
6 Aug	407	80	1,350	4	47	49
9 Aug	289	82	162			
12 Aug	750	76	7,580	2	68	30
13 Aug	423	78	1,590	1	50	49
15 Aug	356	75	1,410	16	53	31
16 Aug	925	76	12,800	2	69	29
19 Aug	553	80	5,010	55	26	19
20 Aug	17,900	74	26,900	8	72	20
22 Aug	4,650	80	24,600	3	80	17
26 Aug	975	78	14,300	43	36	21
28 Aug	10,300	74	26,500	4	72	24
30 Aug	673	76	1,770	21	47	32
2 Sep	505	76	9,110	18	58	24
5 Sep	1,820	74	11,300	13	56	31
7 Sep	574	76	1,090	7	49	44
11 Sep	446	76	8,520	5	56	39
19 Sep	407	76	1,480	6	68	26
23 Sep	200	74	306			
26 Sep	149	74	165			
30 Sep	149	76	478			
5 Oct	139	67	139			

HARO RIVER NEAR KHANPUR

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Percent Silt	Percent Clay
13 Oct	146	64	66			
16 Oct	96	77	74			
22 Oct	135	70	61			
30 Oct	99	64	78			
6 Nov	86	68	62			
14 Nov	76	64	44			
21 Nov	65	60	12			
28 Nov	56	58	22			
4 Dec	49	60	19			
12 Dec	43	58	112			
20 Dec	40	59	45			
27 Dec	34	60	34			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

HARD RIVER NEAR KHANPUR

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	TOTAL Cations	TOTAL Anions	PARTS PER MILLION SiO_2	Fe	B	D.S. by Evap.	$EC \times 10^6$ at 25 °C	pH	Res CO_3 me/l	SAR
Jan 4	2.00	2.00	.25	-	0	2.65	.19	1.40			4.25	4.24				240	410	7.9	0	.2
Feb 1	1.80	2.00	.25	-	0	2.45	.19	1.50			4.05	4.14				228	390	7.9	0	.2
Mar 1	1.80	1.60	.30	-	0	2.72	.19	.80			3.70	3.71				220	360	7.8	0	.2
Apr 4	.80	1.30	.25	-	0	1.84	.20	.30			2.35	2.34				124	220	7.9	0	.3
May 3	1.40	1.70	.20	-	0	1.48	.20	1.60			3.30	3.28				180	310	7.7	0	.2
Jun 3	1.40	1.50	.28	-	0	1.48	.20	1.50			3.18	3.18				180	300	8.1	0	.2
Jul 13	1.20	.80	.90	-	0	2.50	.20	.20			2.90	2.90				152	270	7.8	.50	.9
Aug 3	1.60	1.60	.48	-	0	3.08	.20	.40			3.68	3.68				208	350	7.8	0	.4
Sep 11	1.50	1.15	.59	-	0	1.54	.20	1.40			3.24	3.24				176	300	8.0	0	.5
Oct 16	1.80	1.80	.61	-	0	2.71	.20	1.30			4.21	4.21				236	400	8.0	0	.5
Nov 5	2.55	1.35	.41	-	0	2.91	.20	1.20			4.31	4.31				240	410	8.0	0	.3
Dec 4	1.30	2.10	.95	-	0	2.60	.10	1.50			4.35	4.28			0	232	400	8.0	0	.7

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Location Latitude 33°45', Longitude 72°26', near dam site at Sanjwal village, about 5 miles downstream from Grand Trunk Road, about 20 miles upstream from Indus River.

Drainage area 695 square miles.

Records available Discharge record January 1960 to date by Surface Water Hydrology Project, WASID, WAPDA. Gauge height record and measurements 1959 to Jun'62 by Hydrology Directorate of Irrigation and Power Department. Details of record obtained from old Irrigation Project Circle gauge, a quarter of a mile upstream from present gauge not known.

Average discharge 571 cusecs (424,000 acre feet per year or 11.16 inches runoff per year). Average taken for 16 years from 1960 to 1975.

Extremes Maximum discharge observed duringtthe year 43,400 cusecs on 20 August (gauge height 37.10 feet); minimum daily discharge 158 cusecs on 1 july 1975.

1960-75: Maximum discharge 55,300 cusecs on 2 September 1961: minimum daily discharge 158 cusecs on 1 july 1975.

Gauge Staff gauge graduated at 0.1 foot intervals painted on masonry base on bed rock from 4.5 to 37.0 feet on left bank and on angle iron from 36.0 to 46.0 on right bank gauge read from 0800 to 1600 hours daily during low flow and more often during floods.

Measurements Sixty three discharge measurements were made periodically by current meter using 0.2 and 0.8 depth method by wading in low flow and from car on overhead cableway half a mile upstream from gauge in high flows. Fifty eight sets of sediment samples were taken by depth integration method using DH-48 sampler while wading and D-49 sampler from cableway. Twenty of these were analysed for particle size distribution and the rest for total concentration. Twelve surface samples were collected and analysed for chemical composition.

Determination of dishcarge This station has a rock control apparently not affected by sand movement. Discharges were computed by applying daily mean gauge heights to previous rating dated 11.5.1962 with shift adjustments where necessary.

Remarks Record good.

HARO RIVER AT SANJWAL

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	226	253	213	226	250	168
2	221	228	224	216	216	169
3	225	225	222	*211	*202	168
4	222	222	222	211	207	169
5	217	*222	219	212	247	*169
6	217	224	*236	219	222	168
7	217	212	213	199	204	170
8	*216	298	207	188	190	167
9	224	245	201	*182	*180	170
10	224	235	201	190	180	199
11	224	*226	295	177	179	179
12	211	228	*377	175	174	*175
13	213	357	258	177	171	170
14	213	*752	232	*177	172	168
15	*212	368	217	176	172	164
16	208	289	207	176	*179	174
17	207	258	195	175	801	170
18	208	*236	197	170	293	162
19	210	233	196	173	219	*159
20	207	224	*190	173	199	180
21	207	219	198	173	187	900
22	*207	216	*808	*172	180	586
23	211	212	380	173	*179	213
24	204	207	920	171	195	207
25	210	*207	*478	181	175	197
26	211	199	383	*1,670	170	*193
27	210	200	336	624	170	187
28	204	211	291	397	*170	182
29	*208	---	265	295	169	170
30	216	---	254	295	169	162
31	235	---	235	---	169	
Mean	214	257	325	265	213	214
Cs/mi	0.31	0.37	0.47	0.38	0.31	0.31
In	0.36	0.39	0.54	0.43	0.35	0.34
Ac.ft.	13,200	14,300	20,000	15,800	13,100	12,700

1975 Year: Mean 507 Cs/sq mi 0.73 Inches 9.90

Note : *Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	*158	346	1,170	311	221	225
2	164	316	1,240	295	220	241
3	204	*435	*1,170	280	217	*247
4	335	1,040	990	*278	*216	241
5	*304	*3,250	*7,870	263	216	242
6	244	*1,180	1,440	254	221	239
7	207	620	*4,290	244	*217	232
8	242	955	1,140	254	217	225
9	263	454	955	245	215	228
10	225	385	1,080	247	216	228
11	*189	*344	1,660	233	222	228
12	193	326	915	222	217	222
13	*405	516	806	224	217	221
14	*2,640	435	747	213	219	220
15	1,610	394	*1,490	217	222	222
16	1,020	*3,200	845	222	224	221
17	*770	925	945	216	225	220
18	515	649	885	*217	*225	219
19	1,460	*664	632	208	222	219
20	658	14,700	830	207	222	219
21	*2,720	*3,810	628	220	219	217
22	1,069	8,660	616	215	219	216
23	597	4,110	*531	216	224	*219
24	*1,240	1,750	502	*213	217	219
25	461	1,410	461	215	213	215
26	686	2,370	428	216	*211	217
27	495	1,680	*413	217	213	220
28	513	2,650	397	216	213	217
29	*930	*1,780	341	225	216	217
30	509	1,360	324	*213	217	219
31	406	1,210	---	215	---	217
Mean	691	2,000	1,190	233	218	224
Cs/mi	0.99	2.86	1.72	0.34	0.31	0.32
In	1.15	3.32	1.91	0.39	0.35	0.37
Ac.ft.	42,500	123,000	70,900	14,300	13,000	13,800

M. Acre-feet. .367 Maximum day 14,700 Minimum day 158

HARD RIVER AT SANJWAL

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of water °F	Total PPM by weight	Percent Sand	Percent Silt	Percent Clay
8 Jan	215	62	27			
15 Jan	212	58	60			
22 Jan	207	57	22			
29 Jan	208	54	26			
5 Feb	222	54	11			
11 Feb	224	69	37			
14 Feb	195	58	1,660	8	27	65
18 Feb	238	58	20			
25 Feb	207	63	7			
6 Mar	239	63	15			
12 Mar	313	58	1,980	12	29	59
20 Mar	189	63	52			
22 Mar	620	64	3,310	10	45	45
25 Mar	408	62	23			
3 Apr	212	72	27			
9 Apr	181	68	27			
14 Apr	178	70	33			
22 Apr	171	74	75			
26 Apr	1,630	68	4,300	1	51	48
3 May	204	72	69			
9 May	180	77	209			
16 May	184	78	119			
23 May	179	76	89			
28 May	169	80	57			
5 Jun	180	81	26			
12 Jun	174	83	72			
19 Jun	159	85	150			
26 Jun	195	88	148			
1 Jul	189	91	100			
5 Jul	298	79	2,000	2	60	38
11 Jul	192	85	176			
13 Jul	250	85	249			
14 Jul	2,190	84	4,330	2	65	33
17 Jul	[illegible]	84	9,400	2	41	57
21 Jul	5,000	78	14,100	1	73	26

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
24 Jul	2,420	83	8,520	3	56	41
29 Jul	725	84	3,220	2	67	31
3 Aug	311	86	155			
5 Aug	8,450	79	21,100	2	73	25
6 Aug	1,320	82	4,010	1	64	35
11 Aug	352	91	143			
16 Aug	3,440	86	13,100	4	62	34
19 Aug	572	86	616	5	39	56
21 Aug	3,270	80	4,820	2	37	61
29 Aug	1,720	85	3,330	1	37	62
3 Sep	1,120	86	56			
5 Sep	25,700	70	19,700	12	37	51
7 Sep	8,010	82	1,160	6	57	37
15 Sep	1,190	84	1,520	5	27	68
23 Sep	558	82	1,600	3	28	69
27 Sep	403	78	63			
4 Oct	283	82	69			
18 Oct	213	72	35			
24 Oct	217	66	33			
30 Oct	213	65	14			
4 Nov	212	66	20			
7 Nov	224	69	12			

Note: Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

HARD RIVER AT SANDWAL

Chemical Analysis of Water Samples - 1972

Date	Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	Total Cations	Total Anions	SiO_2	Fe	B	D.S. by Evap.	$EC \times 10^6$ at 25 °C	pH	Res CO_3 me/l	SAR
	Millieqvivalents per Litre												Parts per Million							
Jan 8	2.00	2.20	.50	-	0	3.33	.19	1.20			4.70	4.72				270	460	7.9	0	.3
Feb 5	2.30	1.95	.65	-	0	3.53	.29	1.00			4.90	4.82				264	480	7.6	0	.4
Mar 6	1.80	1.80	.75	-	0	3.31	.33	.60			4.35	4.30				264	430	8.0	0	.6
Apr 3	.90	2.10	.65	-	T	2.14	.39	1.10			3.65	3.63				204	350	8.2	0	.5
May 3	1.00	1.40	.65	-	0	2.44	.20	.40			3.05	3.04				176	300	8.0	.04	.6
Jun 5	1.10	2.00	.51	-	0	2.12	.39	1.10			3.61	3.61				204	350	8.1	0	.4
Jul 1	1.60	1.60	.77	-	0	2.68	.39	.90			3.97	3.97				216	370	7.7	0	.6
Aug 5	1.40	.80	.70	-	0	2.40	.20	.30			2.90	2.90				164	280	7.6	.20	.7
Sep 3	1.50	1.50	.34	-	0	1.64	.20	1.50			3.34	3.34				184	320	8.0	0	.3
Oct 4	2.00	1.40	.82	-	0	2.52	.30	1.50			4.22	4.22				236	400	8.1	0	.6
Nov 4	2.75	1.60	.54	-	0	3.30	.29	1.30			4.89	4.89				272	470	8.1	0	.4
Dec 3	2.40	2.00	1.05	-	0	3.40	.27	1.70			5.45	5.37				296	500	8.0	0	.7

Location Latitude 33°45', Longitude 72°15', about 100 feet upstream of the bridge on Campbellpur Basal Road, nearly 5 miles from Campbellpur.

Drainage area 1,180 square miles.

Records available Mean daily discharge record from January 1969 to date by Surface Water Hydrology Project, WASID, WAPDA. Periodic discharge measurements started from 15 October 1968.

Average discharge 727 cusecs (526,000 acre feet per year or 8.36 inches runoff per year). Average taken for 7 year from 1969 to 1975.

Extremes Maximum discharge observed during the year 61,100 cusecs on 20 August (gauge height 17.10); minimum daily discharge 164 cusecs on 3,7,8,19 June.

1969-75: Maximum discharge 64,900 cusecs on 26 August 1970; minimum daily discharge 164 cusecs on 3,7,8,19 June.

Gauge Staff gauge (enamelled plates installed in steps from 0-37.5 ft. on right bank and read to hundredth of a foot from 0800 to 1600 hours daily during low flows and more often during floods; Zero R.L. of gauge 887.31 as per levelling carried out in March 1969.

Measurements Seventy one discharge measurements were made during the year by current meter using 0.2 and 0.8 or 0.6 depth method. Low flow measurements were made by wading and the high flow measurements were made from cableway about 250 ft. upstream from the gauge. Seventy three sets of sediment samples were taken by depth integration method using DB-48 sampler while wading and D-49 sampler from the cableway. Twenty three of these were analysed for particle size distribution and the rest for total concentration. Twelve surface water samples were taken for chemical analysis.

Determination of discharge The river bed is liable to shifting. Rating curve dated 31.3.72 revised on 6.1.75 below 2.3 feet was used to compute mean daily discharge with shift adjustment as indicated necessary by the periodic discharge measurements.

Remarks Record good

HARO RIVER AT GARRABAR

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	248	311	233	218	213	168
2	248	271	259	213	208	168
3	248	271	223	218	213	*164
4	243	*259	*218	218	213	168
5	238	259	228	218	243	168
6	338	259	277	213	271	168
7	*238	259	218	213	248	164
8	238	*331	208	*208	*213	164
9	238	324	208	198	203	168
10	243	294	208	194	198	*369
11	233	*271	*[illegible]	189	185	213
12	233	*265	*617	189	*177	*198
13	223	*578	356	189	177	194
14	*223	1,350	282	*185	172	194
15	*218	578	265	185	172	185
16	223	441	243	185	662	177
17	218	*324	218	185	1,170	*168
18	218	299	*208	181	593	168
19	223	265	203	181	363	164
20	*213	243	198	177	*259	*941
21	213	233	*228	*177	223	1,220
22	213	228	1,460	177	208	937
23	218	223	2,300	177	203	455
24	218	*223	*2,080	185	185	*356
25	213	213	1,010	233	185	271
26	213	208	617	*2,200	*177	254
27	208	208	427	1,330	177	223
28	*213	238	376	601	172	203
29	208	---	331	248	172	189
30	213	---	288	218	168	189
31	277	---	238	---	168	---
Mean	227	330	468	317	264	292
Cs/mi	0.19	0.28	0.40	0.27	0.22	0.25
In	0.22	0.29	0.46	0.30	0.26	0.28
Ac.ft.	14,000	18,300	28,800	18,800	16,200	17,400

1975 Year: Mean [illegible] Cs/sq mi 0.[illegible] Inches 8.89

Note: * Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	185	376	1,030	398	233	265
2	177	356	*1,160	350	233	*294
3	*189	552	1,160	*311	233	277
4	921	*1,030	1,050	299	228	277
5	*1,250	*3,980	*12,900	294	233	277
6	369	*5,180	4,830	288	233	277
7	228	844	*3,210	3,210	*233	277
8	213	1,320	1,970	277	233	271
9	*419	549	1,140	277	238	271
10	350	427	911	271	233	*265
11	218	369	*1,460	271	233	265
12	*177	369	777	265	238	259
13	754	*477	625	259	238	259
14	1,780	470	617	254	233	254
15	*2,150	412	1,060	243	238	254
16	858	*10,200	*1,210	233	238	254
17	802	560	1,160	*228	*233	254
18	506	681	1,230	223	238	259
19	*1,290	1,960	697	223	238	259
20	1,230	*24,900	689	228	233	*259
21	*8,080	23,300	713	228	238	254
22	1,740	17,600	729	223	238	248
23	633	7,420	705	*223	238	248
24	*925	1,320	633	228	238	*248
25	625	948	571	228	*238	248
26	571	*4,150	527	228	233	248
27	520	*4,300	484	223	238	254
28	*441	3,030	*470	223	243	254
29	689	4,330	441	*223	243	248
30	513	1,400	412	228	243	248
31	441	1,280	---	228	---	254
Mean	943	4,030	1,490	351	236	261
Cs/mi	0.80	3.42	1.25	0.30	0.20	0.22
In	0.92	3.94	1.40	0.34	0.22	0.25
Ac.ft.	58,000	248,000	88,400	21,600	14,000	16,000

M.Acre-feet. .560 Maximum day 24,900 Minimum day 164

HARO RIVER AT GARIALA

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
7 Jan	238	64	37			
14 Jan	223	58	11			
15 Jan	223	65	11			
20 Jan	213	60	51			
28 Jan	213	54	24			
4 Feb	259	54	35			
8 Feb	350	55	35			
11 Feb	271	60	11			
12 Feb	265	63	11			
14 Feb	1,580	52	1,500	29	30	41
17 Feb	324	54	14			
24 Feb	223	60	16			
4 Mar	218	62	11			
11 Mar	259	55	16			
12 Mar	601	66	128			
18 Mar	208	64	11			
22 Mar	4,300	62	2,410	12	52	36
24 Mar	1,880	61	2,090	12	32	56
2 Apr	218	75	26			
8 Apr	208	69	26			
14 Apr	185	76	44			
21 Apr	177	76	206			
26 Apr	2,800	70	3,730	5	70	25
2 May	208	80	250			
8 May	213	78	190			
12 May	177	86	200			
20 May	265	76	352	4	16	80
26 May	181	82	93			
3 Jun	164	83	76			
12 Jun	198	85	103			
17 Jun	168	83	35			
20 Jun	1,890	78	5,770			
24 Jun	369	82	364			
3 Jul	177	84	127			
5 Jul	825	80	2,890	2	59	39

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
9 Jul	238	79	419			
13 Jul	649	82	3,370	2	75	23
15 Jul	1,250	81	6,320	4	83	13
19 Jul	441	85	1,060	6	44	50
21 Jul	14,000	78	30,400	4	82	14
24 Jul	1,950	85	2,460	1	53	46
28 Jul	455	87	1,310	1	40	59
4 Aug	601	80	7,770	3	62	35
5 Aug	8,100	80	13,600	3	65	32
6 Aug	5,680	84	7,770	2	65	33
13 Aug	630	88	251			
16 Aug	29,100	85	12,700	16	75	9
20 Aug	54,500	80	18,400	13	34	53
26 Aug	1,130	85	298			
27 Aug	4,180	85	2,090	2	30	68
2 Sep	1,500	85	1,890	10	60	30
5 Sep	21,100	78	14,000	15	71	14
7 Sep	5,180	84	8,810	11	62	27
11 Sep	2,900	81	2,400	11	62	27
16 Sep	1,100	84	743	2	54	44
24 Sep	593	83	161			
28 Sep	463	76	532			
3 Oct	311	79	106			
17 Oct	228	72	21			
23 Oct	223	66	12			
29 Oct	223	63	11			
3 Nov	233	70	17			
7 Nov	233	62	60			
17 Nov	238	54	47			
18 Nov	7,920	58	27			
25 Nov	238	55	32			
26 Nov	7,920	54	36			
2 Dec	294	57	24			
3 Dec	8,400	59	56			
10 Dec	265	58	36			

HARO RIVER AT GARIALA

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
20 Dec	259	54	95			
23 Dec	8,040	57	42			
24 Dec	248	55	90			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

HARO RIVER AT GARIALA

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	TOTAL Cations	TOTAL Anions	PART PER MILLION SiO_2	Fe	B	D.S. by Evap.	EC×10⁵ at 25 °C	pH	Res CO_3 me/l	SAR
Jan 7	1.80	2.40	.60	-	0	3.04	.29	1.40			4.80	4.73				266	460	7.6	0	.4
Feb 4	1.60	2.10	.90	-	0	3.33	.49	.80			4.60	4.62				264	450	7.5	0	.7
Mar 4	1.70	1.80	.90	-	T	3.51	.29	.60			4.40	4.40				268	430	8.2	.01	.6
Apr 2	1.40	1.30	.70	-	T	2.44	.39	.20			3.60	3.63				204	350	8.2	0	.4
May 2	1.30	2.00	.95	-	0	2.54	.29	1.40			4.25	4.23				232	400	8.0	0	.7
Jun 3	1.20	2.00	.41	-	0	2.12	.39	1.10			3.61	3.61				208	350	8.0	0	.3
Jul 3	1.10	1.20	1.09	-	0	2.50	.39	.80			3.69	3.69				212	360	7.7	0	.9
Aug 4	1.20	1.40	.42	-	0	2.52	.20	.30			3.02	3.02				176	300	7.2	0	.4
Sep 2	1.55	1.25	.54	-	0	1.74	.20	.10			3.34	3.34				194	320	8.1	0	.5
Oct 3	2.35	1.45	.72	-	0	2.82	.20	1.50			4.52	4.32				246	430	7.9	0	.5
Nov 3	2.00	2.00	.79	-	0	3.10	.29	1.40			4.79	4.79				264	450	8.1	0	.6
Dec 2	1.95	2.00	1.10	-	0	2.90	.36	1.70			5.05	4.96			0	272	470	7.9	0	.6

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Location Latitude 33°39', Longitude 73°18', on Rawalpindi Lehtrar Road Bridge, one mile North-East of Chirah; 12 miles upstream from Long River and 14 miles East of Rawalpindi.

Drainage area 126 square miles.

Records available Discharge record April 1960 to date by Surface Water Hydrology Project, WASID, WAPDA. Record 1959 to June 1962 by Hydrology Directorate of Irrigation and Power Department.

Average discharge 167 cusecs (121,000 acre-feet per year or 18.07 inches runoff per year). Average taken for 15 years from 1961 to 1975.

Extremes Maximum discharge observed during the year 96,200 cusecs on 20 August (gauge height 22.35) minimum daily discharge 0.2 cusecs on 2, 3 June.

1960-75: Maximum discharge observed 96,200 cusecs on 20 August 1975; minimum daily discharge 0 cusecs on many days on June 1963, 1970 and 1974.

Gauge Wire weight gauge installed on 9 November 1961 prior to this staff gauge on central bridge pier was used. Gauge read to hundredths of a foot from 0800 to 1600 hours daily during low flow and more often during floods. Zero of gauge datum is at R.L. 1845.75.(checked in 1969).

Measurements Thirty six discharge measurements were made periodically by current meter using 0.2 and 0.8 or 0.6 depth method by wading at low discharges and from bridge at medium and high discharges. Thirty six sets of sediment samples were taken by depth integration method using DH-48 samples by wading and D-49 sampler from bridge. Thirteen of these were analysed for particle size distribution and the rest for total concentration. Twelve surface samples were collected and analysed for chemical composition.

Determination of discharge Previous Rating dated 6.6.1974 was used to compute discharges. Shift adjustments were applied as determined by periodical discharge measurements.

Remarks Records good. Data including left bank small channel feeding flour mills.

SOAN RIVER AT CHIRAH

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	2.4	70.0	48.0	18.0	15.0	0.4
2	2.4	30.0	24	17.0	13.0	0.2
3	2.6	15.0	15.0	20.0	9.8	0.2
4	2.6	7.4	15.0	20.0	15.0	0.3
5	2.8	3.6	69	18.0	50.0	38.0
6	2.6	4.0	33.0	19.0	25.0	33.0
7	2.4	2.4	25.0	15.0	15.0	*9.4
8	2.6	*33.0	*18.0	13.0	*6.4	4.9
9	2.6	42.0	17.0	*9.8	5.5	2.2
10	2.4	22.0	16.0	9.0	2.8	1.7
11	*2.8	12.0	41	9.0	1.4	36.0
12	2.4	9.0	110.0	9.0	1.3	10.0
13	1.8	719.0	47.0	9.4	0.9	4.6
14	1.5	110.0	37.0	9.4	1.2	2.2
15	1.5	45.0	32.0	9.0	1.2	1.2
16	1.4	35.0	28.0	7.4	1.4	0.4
17	1.5	29.0	24.0	5.8	289.0	0.5
18	1.4	24.0	23.0	4.9	61.0	0.6
19	1.1	20.0	20.0	4.9	35.0	0.5
20	*3.6	16.0	17.0	4.3	22.0	1.4
21	1.7	*15.0	20.0	4.6	14.0	35.0
22	1.6	13.0	*23.0	*4.6	*9.4	28.0
23	1.8	11.0	30.0	4.3	4.0	25.0
24	1.1	9.8	45.0	4.6	2.2	15.0
25	1.4	8.6	46.0	176	2.0	5.8
26	1.5	7.4	43.0	569.0	1.3	*3.2
27	1.6	7.0	37.0	131.0	1.0	1.5
28	1.8	7.8	27.0	52.0	0.9	1.6
29	1.5	----	25.0	29.0	0.4	84.0
30	*4.0	----	23.0	19.0	0.7	44.0
31	64	----	21.0	----	0.9	----
Mean	4.1	47	32.0	41.0	20.0	13
Cs/mi	0.03	0.38	0.26	0.32	0.16	0.10
In	0.04	0.39	0.29	0.36	0.18	0.12
Ac.ft.	221	2,630	1,980	2,430	1,210	775

1975 Year: Mean 260.0 Cs/sq mi 2.06 Inches 28.02

Note: *Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	23.0	35.0	893	70.0	22.0	11.0
2	12.0	2,940.0	1,770	74.0	21.0	12.0
3	7.4	1,500.0	875	77.0	22.0	16.0
4	5.2	198	681	77.0	21.0	14.0
5	*124.0	*4,150	*4,950	77.0	*21.0	12.0
6	40.0	*260	1,140	83.0	22.0	11.0
7	16.0	187	2,620	87	23.0	11.0
8	11.0	173	762	90	23.0	9.8
9	*4.6	139	792	92.0	24.0	*9.0
10	3.0	139	1,640	45.0	24.0	8.6
11	3.4	144	721	43.0	24.0	8.2
12	69.0	*7,880	520	42.0	21.0	7.4
13	2,810.0	*205	439	41.0	20.0	7.0
14	534.0	124	583	40.0	17.0	6.4
15	*2,730.0	102	586	*39.0	14.0	6.7
16	*3,700.0	*689	311	37.0	14.0	6.1
17	339.0	520	452	36.0	14.0	6.7
18	88.0	*613	251	35.0	12.0	6.4
19	81.0	894	363	33.0	15.0	6.1
20	*41.0	*15,400	187	32.0	*12.0	5.8
21	2,810	2,560	152	31.0	13.0	5.5
22	*106	4,630	136	29.0	13.0	5.5
23	65.0	890	119	28.0	13.0	5.2
24	86.0	513	102	27.0	13.0	5.2
25	46.0	357	*93	25.0	12.0	5.2
26	86.0	387	88	24.0	10.0	4.6
27	50.0	260	83	*24.0	10.0	*4.3
28	*126.0	2,500	77	24.0	9.4	4.0
29	115.0	*2,360	74	24.0	9.0	3.8
30	54.0	866	72	23.0	9.0	3.4
31	37.0	697	--	22.0	----	3.0
Mean	459.0	1,690	718	46.0	17.0	7.40
Cs/mi	3.64	13.39	5.70	0.37	0.13	0.06
In	4.20	15.44	6.36	0.42	0.15	0.07
Ac.Ft.	28,200	104,000	42,700	2,840	987	458

M. Acre-feet. .188 Maximum day 15,400 Minimum day 0.2

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
11 Jan	2.8	59	24			
20 Jan	3.6	60	29			
30 Jan	3.6	60	12			
8 Feb	47	59	28			
21 Feb	15	63	13			
8 Mar	18.4	68	33			
22 Mar	22.8	70	35			
9 Apr	9.8	77	49			
22 Apr	4.6	82	131			
8 May	6.1	80	75			
22 May	4.9	86	154			
7 Jun	7	84	81			
26 Jun	2.8	89	45			
5 Jul	190	80	1,130	12	53	35
9 Jul	3.8	90	114			
15 Jul	5,340	76	2,800	14	62	24
16 Jul	911	80	1,870	5	44	51
21 Jul	18,700	77	3,030	15	53	32
28 Jul	9,830	86	1,080	7	26	67
5 Aug	7,100	87	5,910	3	67	30
5 Aug	13,400	82	2,900	1	41	58
6 Aug	10,500	87	532	7	44	49
12 Aug	6,880	80	8,010	47	41	22
13 Aug	180	96	607	5	28	67
16 Aug	133	84	120			
18 Aug	1,000	80	1,920	15	58	27
20 Aug	44,800	78	12,000	44	37	19
29 Aug	2,290	76	811	4	60	36
5 Sep	2,230	80	2,640	19	56	25
25 Sep	93	85	33			
15 Oct	39	79	75			
27 Oct	24.4	71	39			
5 Nov	21.4	71	30			
20 Nov	11.5	60	45			
9 Dec	9	56	58			
27 Dec	4.3	75	45			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

SOAN RIVER AT CHIRAH

Chemical Analysis of Water Samples - 1975

Date	Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	TOTAL Cations	TOTAL Anions	SiO_2	Fe	B	D.S. by Evap.	$EC \times 10^6$ at 25 °C	pH	Res CO_3 me/l	SAR
	MILLIEQUIVALENTS PER LITRE												PARTS PER MILLION							
Jan 11	1.40	1.30	1.00	-	0	3.23	.29	.20			3.70	3.72				204	350	7.9	.53	.9
Feb 8	1.50	1.10	.65	-	0	2.84	.19	.20			3.25	3.23				174	300	7.8	.24	.6
Mar 8	1.20	1.60	.55	-	T	2.88	.29	.20			3.35	3.37				184	320	8.2	.08	.5
Apr 9	.80	1.20	.85	-	.41	1.84	.29	.30			2.85	2.84				156	270	8.3	.25	.9
May 3	1.20	1.50	.80	-	T	3.06	.10	.30			3.50	3.46				192	330	8.2	.36	.7
Jun 7	1.00	1.40	1.47	-	0	3.18	.39	.30			3.87	3.87				204	350	7.9	.78	1.3
Jul 5	1.00	.60	1.28	-	0	2.58	.20	.10			2.88	2.88				156	270	7.7	.98	.5
Aug 5	1.20	.50	.14	-	0	1.54	.20	.10			1.84	1.84				100	170	7.6	0	.2
Sep 5	1.24	.76	.14	-	0	1.74	.10	.30			2.14	2.14				116	200	8.0	0	.1
Oct 15	1.14	1.31	1.26	-	0	3.31	.10	.30			3.71	3.71				200	340	8.0	.86	1.2
Nov 5	1.50	1.50	.78	-	0	3.49	.49	.20			3.78	3.78				208	350	8.1	.49	.6
Dec 9	1.40	1.40	1.10	-	0	3.40	.27	.20			3.90	3.87			0	204	360	8.0	.60	.9

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Location Latitude 33°33', Longitude 73°06', one quarter mile downstream from mouth of Leh River and Grand Trunk Road bridge and 4 miles South-East of Rawalpindi.

Drainage area 650 square miles.

Record available Discharge record January 1960 to date by Surface Water Hydrology Project, WASID, WAPDA. Gauge heights only May 1953 to 1958 and discharge record 1958 to June 1962 by Discharge Division of Hydrology Directorate of Irrigation Department.

Average discharge 645 cusecs (467,000 acre feet per year or 13.49 inches runoff per year). Average taken for 16 years from 1960 to 1975.

Extremes Maximum discharge observed during the year 86,000 cusecs on 20 August (gauge height 21.00 feet); minimum daily discharge 23 cusecs on 2 july.

1953-75: Maximum discharge observed 107,000 cusecs on 13 August 1970; minimum daily discharge 15 cusecs on 11, 15 May'1953.

Gauge Enamelled gauge plates graduated to 0.02 foot upto 3.33 feet and to 0.1 foot beyond read from 0800 to 1600 hours daily during low flows and more often during floods Zero of gauge datum is at R.L. 1,375.19(checked in 1969).

Measurements Forty one discharge measurements were made periodically by current meter using 0.2 and 0.8 or 0.6 depth method by wading at low flows and from Grand Trunk Road bridge at medium and high flows. Thirty six sets of sediment samples were taken by depth integration method using DH-48 sampler while wading or D-49 sampler from bridge. Fifteen of these were analysed for particle size distribution and the rest for total concentration. Twelve surface samples were collected and analysed for chemical composition.

Determination of discharge The control at this station is unstable at high flows. Rating dated 8.6.74 was used and discharges were computed by applying shifts to gauge heights, as indicated by periodic discharge measurements.

Remarks Record fair.

SOAN RIVER NEAR RAWALPINDI

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	82	235	107	82	82	30
2	82	207	142	75	79	30
3	79	142	114	75	57	35
4	79	118	118	86	96	35
5	75	118	114	82	79	30
6	75	118	138	82	72	60
7	79	122	126	79	82	*72
8	79	*175	*118	75	*69	72
9	82	242	114	*72	63	54
10	82	221	*103	72	63	54
11	*82	185	138	72	63	51
12	82	256	270	69	69	63
13	82	366	200	69	72	66
14	82	980	142	75	60	63
15	82	235	134	82	51	57
16	82	207	*122	82	118	60
17	82	134	107	79	*1,300	54
18	82	165	103	75	249	51
19	79	110	96	75	150	54
20	*79	103	86	79	103	66
21	79	*93	79	93	72	57
22	79	89	*138	*93	*63	57
23	79	89	1,020	93	57	57
24	72	79	1,040	89	60	54
25	79	75	207	114	57	60
26	72	69	146	767	45	*51
27	72	66	114	520	35	51
28	72	122	110	165	30	51
29	72	---	103	110	28	897
30	*138	---	100	86	35	100
31	249	---	93	--	30	---
Mean	86	183	185	122	113	83
Cs/mi	.13	.28	.28	.19	.17	.13
In	.15	.29	.33	.21	.20	.14
Ac.ft.	5,300	10,200	11,400	7,270	6,920	4,940

1975 Year: Mean 662 Cs/sq mi 1.02 Inches 13.82

Note: * Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	48	48	728	214	118	93
2	23	155	3,440	207	118	96
3	86	4,910	3,490	200	114	93
4	1,570	406	741	200	108	93
5	*1,050	*5,900	*15,600	207	*114	96
6	122	*6,010	2,000	200	110	89
7	100	754	*6,300	188	107	89
8	89	302	2,750	175	107	93
9	*82	286	4,750	160	110	*96
10	100	190	1,210	155	110	96
11	114	160	2,240	138	122	96
12	130	*8,480	590	138	122	96
13	2,180	*1,060	474	130	114	96
14	2,090	350	358	126	110	96
15	5,640	334	3,310	*118	110	96
16	*8,480	1,670	2,550	122	110	100
17	1,490	2,340	3,120	118	110	96
18	1,160	*2,920	910	118	110	96
19	*5,820	4,070	1,080	118	107	96
20	1,570	*25,700	1,120	114	*103	96
21	*8,780	2,000	414	118	110	96
22	1,690	*12,900	342	107	107	96
23	286	*7,730	326	110	103	96
24	310	530	390	107	103	100
25	195	382	*326	107	100	100
26	142	358	310	107	100	100
27	*221	440	256	*107	96	*96
28	*1,190	3,900	242	107	96	96
29	1,960	*4,370	200	107	100	93
30	150	1,660	221	107	96	96
31	60	767	---	107	---	96
Mean	1,510	3,260	1,990	140	109	96
Cs/mi	2.33	5.02	3.07	.22	.17	.15
In	2.69	5.78	3.42	.25	.19	.17
Ac.ft.	93,100	200,000	119,000	8,600	6,460	5,880

M. Acre-feet. .479 Maximum day 25,700 Minimum day 23

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
8 Feb	185	63	83			
21 Feb	93	66	43			
8 Mar	118	75	76			
10 Mar	103	65	61			
16 Mar	126	70	31			
22 Mar	138	75	30			
9 Apr	75	73	29			
22 Apr	96	81	79			
8 May	63	89	25			
17 May	1,160	98	1,520	2	53	45
22 May	63	86	101			
7 Jun	72	86	37			
26 Jun	51	90	62			
5 Jul	740	87	2,250	4	38	58
16 Jul	18,700	80	7,230	25	61	14
19 Jul	9,690	82	9,400	7	53	40
21 Jul	9,580	87	5,350	10	47	43
27 Jul	334	90	313			
28 Jul	1,450	91	2,190	8	57	35
6 Aug	6,750		8,560	9	65	26
12 Aug	27,100	82	12,800	25	50	25
13 Aug	590	87	1,360	1	21	78
18 Aug	4,100	85	6,340	43	31	26
20 Aug	51,500	78	11,500	24	42	34
22 Aug	24,200	80	8,120	13	71	26
23 Aug	6,100	82	3,020	34	37	29
29 Aug	4,120	82	1,700	17	65	18
5 Sep	23,700	80	9,780	17	68	25
7 Sep	16,600	80	6,440	62	28	10
25 Sep	302	87	24			
15 Oct	122	80	138			
27 Oct	106	73	41			
5 Nov	110	83	54			
20 Nov	103	76	36			
9 Dec	100	64	84			
27 Dec	96	66	89			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

SOAN RIVER NEAR RAWALPINDI

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	TOTAL Cations	TOTAL Anions	PARTS PER MILLION SiO_2	Fe	B	D.S. by Evap.	EC$\times 10^6$ at 25 °C	pH	Res CO_3 ma/l	SAR
Jan 11	2.00	2.50	1.60	-	0	4.12	.78	1.20			6.10	6.10				352	600	7.9	0	1.1
Feb 8	2.00	2.60	1.60	-	0	4.51	.87	.80			6.20	6.18				344	580	7.9	0	1.1
Mar 8	2.00	1.60	1.50	-	0	3.80	.78	.60			5.10	5.18				288	490	7.8	.20	1.1
Apr 9	1.60	1.60	1.70	-	0	3.28	.89	.80			4.90	4.97				280	450	7.8	.08	1.3
May 8	1.80	2.00	1.65	-	0	3.77	.79	.80			5.45	5.36				308	520	8.0	0	1.2
Jun 7	2.00	2.00	2.32	-	0	4.24	1.08	1.00			6.32	6.32				348	590	7.9	.24	1.[illegible]
Jul 5	1.20	1.20	.21	-	0	2.12	.29	.20			2.61	2.61				144	250	7.8	0	.2
Aug 5	1.40	.60	.71	-	0	2.32	.29	.10			2.71	2.71				144	250	7.7	.32	.7
Sep 5	1.10	.40	.54	-	0	1.74	.10	.20			2.04	2.04				108	[illegible]	[illegible]	[illegible]	.6
Oct 15	1.15	2.15	1.57	-	0	3.88	.59	.40			4.87	4.87				260	450	8.0	.58	1.3
Nov 5	2.45	1.65	1.37	-	0	3.98	.29	1.20			5.47	5.47				300	500	8.1	0	1.0
Dec 9	2.40	1.70	1.80	-	0	4.00	.45	1.40			5.90	5.85			0	324	550	7.9	0	1.3

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WADALA KASS AT PAPIN - 1975

Location Latitude 33°17', Longitude 72°55', it is 1 mile upstream of Papin village on Wadala Kass one of the left bank tributaries of Soan River at a distance of about 36 miles from Rawalpindi.

Drainage area 214 square miles.

Record available Mean daily discharges from 1.1.75 to date by surface Water Hydrology Project Wapda.

Extremes Maximum discharge observed during the year 36,600 cusecs on 18 August (gauge height 17.48 ft) minimum daily discharge Zero on many days of April, May and June.

Gauge Wire weight gauge installed on 30.12.74 and read from 0800 to 1600 hours daily during low flow and on hourly basis for 24 hours during the period 1.7.75 to 30.9.75. Gauge set to arbitrary datum.

Measurements Ninety eight discharge measurements were made during the year by current meter using 0.2, 0.8 or 0.6 method. Seventy four sets of sediment samples were taken by depth integration method using DH-48 sampler while wading and D-49 in high flows. Fifty six of these were analysed for particle size distribution and rest for total concentration. Ten surface samples were collected and analysed for chemical composition.

Determination of discharge Rating table dated 26.2.76 was used with shift adjustments to compute mean daily discharges.

Remarks Record good.

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	1.8	30	4.5	0.15	0	0
2	2.1	5.5	2.4	0.15	0	0
3	1.8	1.8	1.8	0.15	0	0
4	1.8	1.8	5.5	0.10	*0.3	0
5	1.8	1.5	3.5	0.10	0.25	0
6	1.5	1.8	2.4	0.10	0.1	0
7	1.5	1.2	0.6	0.10	0	0
8	2.1	7.5	0.3	0.05	0	0
9	1.8	15	0.3	0	*0	0
10	1.5	6.5	*4.5	*0	0	0
11	1.2	3.0	*343	0	0	0
12	*1.2	*2.7	41	*0	0	0
13	1.2	*8.0	16	0	0	0
14	1.2	32	4.5	0	0	0
15	1.2	12	2.4	0	0	0
16	1.2	6.5	*1.5	*0	*0.05	0
17	0.6	5.5	0.25	0	*67	0
18	0.3	4.5	0.25	0	*0.6	0
19	0.3	3.0	0.25	0	0.3	*0
20	0.6	2.7	0.25	0	0.3	*18
21	0.3	2.4	0.25	0	0	*0.6
22	0.6	1.8	114	0	0	0
23	0.6	1.5	180	*0	0	0
24	0.3	1.2	52	0	0	0
25	0.3	*0.9	*18	0	0	0
26	0.3	0.6	9.0	0	0	0
27	0.3	0.6	4.0	0	0	46
28	0.6	6.0	1.5	0	0	*174
29	0.9	---	0.30	0	0	*858
30	4.5	---	0.25	*0	0	*8.5
31	*5.5	---	0.25	-	*0	-----
Mean	1.3	6	26	.03	2.2	37
Cs/mi	0.01	.03	0.12	0	.01	0.17
In	0.01	.03	0.14	0	.01	0.19
Ac.ft.	81	332	1,610	1.79	136	2,190

1975 Year: Mean 124 Cs/sq mi 0.58 Inches 7.86

Note : * Discharge measurements made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	*0.3	0	17	3.0	0.9	0.9
2	0	0	*889	2.7	0.9	0.9
3	0	*1,320	175	2.1	0.6	0.9
4	*92	*76	11	1.8	0.6	0.9
5	*146	36	*7,130	1.5	0.9	0.9
6	18	*4,730	251	1.2	0.6	1.2
7	*255	241	*1,840	1.1	*0.45	0.6
8	*144	106	61	0.90	0.45	0.3
9	11	52	41	0.90	0.30	0.3
10	4.5	31	28	0.60	0.30	0.3
11	3.0	15	15	0.60	0.30	*0.6
12	1.2	5.5	12	0.60	0.30	0.6
13	*648	*1.2	*9.5	0.60	0.30	0.9
14	*24	0.3	7.5	0.60	0.3	0.9
15	*738	0.6	*1,650	*0.60	0.6	0.9
16	209	*241	1,190	0.3	0.9	0.9
17	37	*881	362	0.3	0.6	1.2
18	13	*6,450	265	0.30	0.6	1.2
19	*15	*472	*374	0.25	0.6	1.2
20	3,000	*731	24	0.25	0.3	1.2
21	*2,940	53	*14	0.25	0.6	1.2
22	73	*1,910	*541	0.25	0.6	0.9
23	15	*680	28	0.25	0.6	0.6
24	8.0	72	14	0.25	0.6	0.9
25	7.5	38	8.5	0.25	0.9	0.9
26	*3.0	*28	*5.0	0.20	0.9	0.9
27	2.1	23	4.5	0.20	*0.6	*1.2
28	1.5	*280	4.5	0.90	0.9	1.2
29	0.9	*1,060	4.0	*0.30	0.6	0.6
30	2.7	114	3.5	0.30	0.6	0.6
31	0.9	32	---	0.30	---	0.6
Mean	271	635	499	.76	.59	.85
Cs/mi	1.27	2.97	2.33	0	0	0
In	1.46	3.42	2.60	0	0	0
Ac.ft.	16,700	39,000	29,700	46.8	31.1	52.3

Acre-feet. 89,900 Maximum day 7,130 Minimum day 0

WADALA KASS AT PAPIN

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
12 Jan	1.20	64	22			
31 Jan	5	63	82			
13 Feb	8	64	128			
25 Feb	.9	76	57			
10 Mar	0.3	65	101			
11 Mar	253	58	12,600	11	37	52
25 Mar	15.8	71	342			
4 May	0.6	68	8,380	1	61	38
16 May	.05	76	27,100	8	82	10
17 May	74	80	28,100	1	76	23
18 May	6.5	81	2,390	2	50	48
20 Jun	37	80	25,400		31	69
21 Jun	0.9	84	1,130	25	25	50
28 Jun	39	88	21,800		38	62
29 Jun	5,880	88	26,400	6	19	75
30 Jun	15.8	88	790			
1 Jul	2.1	90	263			
4 Jul	0	88	52			
5 Jul	153	76	8,860	5	41	54
7 Jul	8,330	82	30,900		47	53
8 Jul	153	86	10,800	9	32	59
13 Jul	3,880	79	35,400	5	24	71
14 Jul	41	82	13,200		50	50
15 Jul	466	78	25,700	4	30	66
19 Jul	15,300	80	41,800	6	17	77
21 Jul	15,000	81	31,300	5	76	19
26 Jul	5	90	79			
3 Aug	1,260	80	34,600	4	42	54
4 Aug	65	82	2,130	7	26	67
6 Aug	18,700	78	45,400	4	41	55
13 Aug	0.9	82	65			
16 Aug	611	77	14,200	6	73	21
17 Aug	3,080	80	16,300	9	67	25
18 Aug	12,900	78	17,800	9	59	32
19 Aug	1,120	80	15,500	10	63	27

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
20 Aug	658	80	14,500	13	52	40
22 Aug	7,650	79	25,100	9	46	45
23 Aug	3,220	78	14,700	14	53	33
26 Aug	26	80	312			
28 Aug	990	80	12,900	17	48	35
29 Aug	1,100	79	18,400	9	61	30
2 Sep	2,210	80	16,700	7	23	70
5 Sep	17,500	80	22,100	9	47	45
7 Sep	2,390	74	14,700	12	55	34
15 Sep	4,240	78	9,320	10	78	12
22 Sep	3,400	70	2,300	1	27	72
15 Oct	0.6	88	69			
29 Oct	0.3	79	82			
6 Nov	0.6	67	102			
27 Nov	0.6	59	43			
11 Dec	0.6	58	19			
27 Dec	1.2	65	576			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

WADALA KASS AT PAPIN

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	TOTAL Cations	TOTAL Anions	PARTS PER MILLION SiO_2	Fe	B	D.S. by Evap.	$EC \times 10^6$ at 25 °C	pH	Res CO_3 me/l	SAR
Jan 12	1.20	1.60	8.50		0	4.70	6.26	.40			11.30	11.36				670	1090	7.8	1.90	7.2
Feb 13	1.00	1.80	8.90		0	5.48	3.88	2.20			11.70	11.56				670	1100	7.8	2.68	7.5
Mar 10	1.60	1.40	8.70		T	4.37	4.75	2.60			11.70	11.72				676	1100	8.2	1.37	7.1
Jun 28	1.00	1.50	5.00		0	3.94	2.26	1.30			7.50	7.50				424	700	7.8	1.44	4.5
Jul 7	1.20	1.40	2.94		0	2.98	1.86	.70			5.54	5.54				308	520	7.8	.38	2.6
Aug 3	1.20	1.70	4.34		0	2.88	2.16	2.20			7.24	7.24				424	700	7.6	0	3.6
Sep 2	1.20	.75	1.27		0	2.53	.39	.30			3.22	3.22				172	300	8.1	.58	1.3
Oct 4	1.00	.80	5.85		0	3.11	2.54	2.00			7.65	7.65				432	710	8.1	1.31	6.2
Nov 6	1.25	1.10	6.30		0	3.21	2.84	2.60			8.65	8.65				488	800	8.1	.86	5.8
Dec 11	1.30	1.20	7.80		0	3.30	.80	6.00			10.30	10.10			0	580	960	7.9	.80	7.0

Location Latitude 33°37', Longitude 72°52', on left bank about 2 miles upstream from Chahan village, about 17 miles South west of Rawalpindi on Pindi Chakri Road.

Drainage area 93 square miles.

Record available Discharge and gauge height record May 1962 to date by Surface Water Hydrology Project, WASID, WAPDA.

Average discharge 49 cusecs (35,200 acre feet per year or 7.08 inches runoff per year). Average taken for 13 years from 1963 to 1975.

Extremes Maximum discharge observed during the year 31,400 cusecs on 20 August (gauge height 18.60 feet); minimum daily discharge 1.4 cusecs on 9 June.

1962-75: Maximum discharge observed 31,400 cusecs on 20 August 1975; minimum daily discharge 0.4 cusecs on 10 April 1970.

Gauge Continuous automatic water stage recorder in masonry stilling well installed on 26 January 1964. Prior to this staff gauge (enamelled plates) graduated to .01 foot. Zero R.L. inside staff gauge 1288.13 (checked in 1969).

Measurements Sixty seven discharge measurements were made during the year by current meter using 0.6 or 0.2 and 0.8 depth method. Low flow measurements were made by wading and high water measurements from Cableway. Sixty six sets of sediment samples were taken by depth integration method using DH-48 sampler while wading and D-49 sampler from cableway. Twenty nine of these were analysed for particle size distribution and the rest for total concentration. Twelve surface samples were collected and analysed for chemical composition.

Determination of discharge The channel is composed of small shingle and sand which shifts nearly continuously; mean daily gauge heights with shift adjustments based on periodic discharge measurements were applied to rating table dated 20.4.77 to compute mean daily discharge.

Remarks Record good.

SIL RIVER NEAR CHAMAN

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	5.4	*12	*7.4	4.8	7.4	*1.9
2	4.6	9.8	7.4	5.0	5.0	1.4
3	5.0	8.4	6.3	5.2	*3.2	1.4
4	4.6	7.4	5.9	5.0	5.0	1.6
5	4.8	7.4	6.5	4.2	4.4	1.8
6	4.8	7.2	6.7	4.2	*4.4	1.6
7	*4.6	7.0	*5.4	4.2	3.8	1.4
8	4.4	*7.6	6.7	4.2	5.4	2.1
9	4.4	7.9	8.8	4.4	6.9	1.4
10	*5.0	8.1	14	*4.8	8.1	1.8
11	4.8	7.0	*59	*4.8	9.8	3.8
12	5.0	6.7	27	4.6	10	4.4
13	4.8	7.6	20	4.8	11	*3.0
14	5.0	*8.6	17	3.8	14	3.6
15	4.8	7.6	14	3.8	15	5.2
16	5.4	6.7	13	3.6	*42	6.7
17	5.4	5.6	12	3.2	21	8.8
18	*5.2	*4.8	11	2.7	17	11
19	5.4	5.2	8.4	*1.9	14	14
20	4.6	4.8	8.6	2.8	11	*55
21	5.0	4.8	7.2	4.6	8.6	31
22	5.6	5.4	*7.6	7.2	6.7	25
23	5.0	5.9	25	8.4	5.4	21
24	5.0	5.2	24	11	3.4	25
25	*5.4	5.6	17	16	*2.1	15
26	5.0	5.9	16	*250	2.5	10
27	6.3	6.1	16	27	1.6	6.5
28	6.3	6.1	*17	19	1.8	5.4
29	7.4	7.0	11	13	2.1	*3.8
30	7.9	---	8.4	9.8	1.9	5.2
31	10	---	*5.6	---	1.8	---
Mean	5.4	7.1	14	15	8.3	9.3
Cs/mi	0.06	0.08	0.15	0.16	0.09	0.10
In	0.07	0.08	0.17	0.18	0.10	0.11
Ac.ft.	331	396	833	889	508	555

1975 Year: Mean 50 Cs/sq mi 0.54 Inches 7.32

Note : *Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	6.3	8.6	11	4.4	3.4	4.6
2	7.9	6.3	8.6	4.2	3.0	4.6
3	9.3	4.2	6.5	*4.6	*3.4	4.6
4	18	*2.8	4.2	4.6	3.4	*5.0
5	*42	*24	*93	4.8	3.4	5.0
6	21	*405	17	4.6	3.4	4.6
7	*88	17	65	4.4	3.4	4.6
8	33	10	23	3.6	3.4	4.8
9	7.9	9.8	12	3.6	*3.4	4.8
10	*6.3	10	9.3	3.8	3.6	4.6
11	5.6	11	9.1	3.6	3.6	*4.2
12	4.0	12	*8.8	3.4	3.6	4.0
13	*172	12	8.6	3.4	3.8	4.2
14	35	15	8.1	3.4	3.4	4.0
15	*15	*29	*118	*3.6	3.6	4.0
16	17	*467	33	3.4	3.4	4.4
17	12	*35	21	3.6	3.6	4.2
18	11	*125	18	3.6	3.6	4.2
19	*1,300	*616	*15	3.4	3.6	4.6
20	44	*8,270	42	3.6	3.0	4.6
21	1,920	*645	21	3.6	3.4	4.2
22	*42	*303	12	3.2	*3.6	4.0
23	26	24	9.3	3.8	4.2	4.2
24	29	10	7.6	3.4	4.0	*4.4
25	20	6.7	6.5	4.0	3.8	4.2
26	15	*305	5.2	*3.4	3.8	4.2
27	13	110	*4.6	3.6	4.2	4.8
28	11	34	4.2	3.2	4.4	5.2
29	10	29	4.6	3.0	3.6	5.4
30	12	18	4.6	2.8	*4.6	5.6
31	*13	14	---	3.0	---	6.3
Mean	128	374	20	3.7	3.6	4.6
Cs/mi	1.38	4.02	0.22	0.04	0.04	0.05
In	1.59	4.63	0.24	0.05	0.04	0.06
Ac.ft.	7,870	23,000	1,210	227	215	282

Acre-feet. 36,300 Maximum day 8,270 Minimum day 1.4

SIL RIVER NEAR CHAHAN

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
18 Jan	5.2	64	20			
25 Jan	5.6	54	80			
1 Feb	10.9	58	26			
8 Feb	7.6	56	29			
14 Feb	8.4	54	29			
18 Feb	4.8	58	24			
1 Mar	8.1	72	23			
7 Mar	4.6	76	14			
11 Mar	14.8	58	898	3	25	72
22 Mar	7.9	70	25			
23 Mar	8.6	62	215			
31 Mar	6.3	76	10			
10 Apr	4.6	74	20			
11 Apr	5.0	76	11			
19 Apr	1.9	78	16			
26 Apr	286	70	4,160	6	35	59
3 May	3.6	72	32			
6 May	4.0	82	48			
16 May	100	78	3,170	2	60	38
25 May	2.1	80	99			
1 Jun	1.6	84	64			
6 Jun	1.6	90	117			
13 Jun	2.5	86	48			
20 Jun	60	72	3,070	4	35	61
29 Jun	4	92	47			
5 Jul	55.4	78	910	3	18	79
7 Jul	88	84	9,320	8	59	33
10 Jul	6.5	94	85			
13 Jul	3,470	82	22,800	6	37	57
13 Jul	539	80	19,600	5	65	30
15 Jul	14.2	87	672	3	20	77
19 Jul	2,890	80	17,600	6	64	30
21 Jul	5,440	80	15,300	2	57	41
21 Jul	767	82	4,170	6	40	54
31 Jul	12.6	90	115			

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
4 Aug	2.7	86	131			
5 Aug	1,840	82	16,400	9	40	51
15 Aug	27.5	88	146			
16 Aug	1,360	76	7,770	1	63	36
17 Aug	27.1	86	156			
18 Aug	1,330	82	9,920	7	71	22
19 Aug	486	84	8,420	25	24	51
20 Aug	25,900	84	10,400	37	56	7
21 Aug	175	84	1,480	1	55	44
22 Aug	454	78	2,590	1	54	45
26 Aug	4,430	78	12,700	19	53	28
5 Sep	1,020	80	6,900	11	59	30
12 Sep	8.6	88	97			
15 Sep	49.8	78	2,610	1	48	51
15 Sep	844	82	2,380	1	77	22
19 Sep	210	90	2,080	3	74	23
27 Sep	4.4	80	83			
3 Oct	4.6	86	95			
15 Oct	3.6	80	39			
26 Oct	3.4	56	32			
3 Nov	3	80	52			
9 Nov	2.7		82			
22 Nov	3		26			
30 Nov	4.4		67			
4 Dec	4.8	58	48			
11 Dec	4.4	58	33			
24 Dec	4.4	54	70			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

SIL RIVER NEAR GHAHAR

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE										TOTAL		PARTS PER MILLION				$EC \times 10^6$ at 25 °C	pH	Res CO_3	SAR
	Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	Cations	Anions	SiO_2	Fe	B	D.S. by Evap.			me/l	
Jan 7	1.00	1.50	2.60	-	0	3.72	.97	.40			5.10	5.09				290	480	7.8	1.22	2.3
Feb 1	1.40	1.00	2.70	-	0	3.82	.83	.40			5.10	5.05				284	480	7.7	1.42	2.3
Mar 1	.70	1.50	2.60	-	.39	2.72	.97	.70			4.80	4.78				260	450	8.3	.91	2.5
Apr 10	.60	1.00	2.60	-	.41	2.44	.79	.60			4.20	4.24				236	400	8.3	1.25	2.9
May 3	1.00	1.10	1.80	-	.41	2.45	.49	.50			3.90	3.85				220	360	8.3	.75	1.8
Jun 1	.90	1.10	1.74	-	0	2.56	.78	.40			3.74	3.74				204	350	7.9	.56	1.7
Jul 5	.80	2.10	.29	-	0	2.30	.59	.30			3.19	3.19				172	300	7.8	0	.3
Aug 6	1.00	.70	.16	-	0	1.37	.29	.20			1.86	1.86				96	170	7.5	0	.2
Sep 5	1.00	.35	.79	-	0	1.74	.20	.20			2.14	2.15				112	200	8.0	.39	.9
Oct 3	1.10	.60	1.23	-	0	2.14	.39	.40			2.93	2.93				156	270	8.1	.44	1.3
Nov 3	1.30	.95	1.84	-	0	2.81	.88	.40			4.09	4.09				224	380	8.1	.56	1.4
Dec 4	1.20	1.20	2.40	-	0	3.40	.54	.80			4.80	4.74				256	450	7.9	1.00	2.2

Location Latitude 33°08', Longitude 72°20', wire weight gauge fixed on the Bridge near Dhok Pathan village on Fateh-Jang Talagang Road.

Drainage area 2,500 square miles.

Record available December 1963 to date by Surface Water Hydrology Project, WASID, WAPDA.

Average discharge 1,380 cusecs (1,000,000 acre feet per year or 7.49 inches runoff per year). Average taken for 12 years from 1964 to 1975.

Extremes Maximum discharge observed during the year 64,100 cusecs on 26 August (gauge height 13.60 feet); minimum daily discharge 9 cusecs on 17 June.

1964-75: Maximum discharge observed 209,000 cusecs on 30 July 1967; minimum daily discharge 4.5 cusecs on 12 June 1964.

Gauge Wire weight gauge fastened to upstream hand rail of the Bridge. Gauge read to 0.01 foot from 0800 to 1600 hours daily during low flow and more often during floods.

Measurements One hundred ten discharge measurements were made during the year by current meter using 0.2 and 0.8 or 0.6 depth method by wading or from bridge. One hundred and four sets of sediment samples were taken by depth integration method using DH-48 sampler while wading or D-49 sampler from bridge. Sixty of these were analysed for particle size distribution and the rest for total concentration. Eleven surface samples were collected and analysed for chemical composition.

Determination of discharge This station has a sandy bed which shifts continuously. Previous rating dated 25.3.1970 was used to compute mean daily discharges from mean daily gauge heights with shift adjustments as indicated necessary by periodic discharge measurements.

Remarks Record fair.

SOAN RIVER AT DHOK PATHAN

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	123	127	151	127	205	24
2	*146	*251	120	*127	170	23
3	132	378	109	120	*120	*19
4	116	446	146	*137	161	*678
5	109	307	*137	101	120	156
6	109	235	175	*90	*97	50
7	109	205	156	*105	82	48
8	116	217	161	*65	76	35
9	*101	205	*229	*65	60	22
10	101	*161	199	68	52	*30
11	101	*211	205	76	*52	41
12	105	485	*410	70	52	27
13	101	524	459	73	44	17
14	112	614	359	*79	35	8.8
15	90	*1,620	378	76	26	17
16	90	862	336	68	*729	13
17	90	*472	*199	60	498	*8.8
18	*87	378	181	52	181	11
19	87	336	156	*46	*786	17
20	87	283	165	42	357	*3,960
21	87	251	178	41	181	1,010
22	87	229	156	41	97	283
23	*85	205	913	41	76	97
24	84	175	1,670	42	60	*56
25	84	*146	*1,230	*41	56	84
26	82	161	890	*710	58	90
27	*82	175	550	1,320	48	175
28	90	163	*147	1,160	48	132
29	97	---	*123	1,010	39	*4,830
30	123	---	123	537	35	498
31	116	---	*132	-----	26	-----
Mean	101	351	341	220	149	415
Cs/mi	0.04	0.14	0.14	0.09	0.06	0.17
In	0.05	0.15	0.16	0.1	0.07	0.19
Ac-ft.	6,218	19,900	21,000	13,100	9,180	24,700

1975 Year: Mean 1,240 Cs/sq mi 0.50 Inches 6.73

Note : * Discharge measurement made on this day.

SOAN RIVER AT DHOK PATHAN

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	*498	630	1,250	*378	156	123
2	710	*420	*1,460	283	175	*109
3	378	*705	*3,370	336	187	120
4	1,760	*7,760	*3,260	326	199	120
5	*5,210	1,670	9,720	*299	*170	132
6	*1,950	*11,200	7,420	211	141	141
7	1,930	6,220	*7,080	223	146	137
8	*1,730	*3,840	6,520	235	116	132
9	*1,390	1,230	*2,120	211	116	*127
10	598	1,190	4,160	193	122	132
11	283	1,210	2,540	187	*127	132
12	*156	1,420	*3,230	181	119	120
13	*1,650	*5,250	2,420	181	109	121
14	*3,070	3,520	2,070	*211	119	122
15	3,600	3,330	*5,110	205	119	123
16	*4,970	*13,900	19,200	205	127	116
17	*6,570	4,520	*3,760	211	132	116
18	2,360	*18,700	3,720	205	141	*116
19	*7,220	7,170	3,330	229	*146	116
20	*7,120	*19,000	1,760	223	146	116
21	*12,800	25,700	*1,790	229	156	116
22	*8,940	9,240	1,470	*223	165	116
23	805	31,400	1,370	205	165	105
24	*1,470	5,070	1,250	193	165	105
25	1,840	275	966	187	175	*120
26	*988	1,094	824	175	170	120
27	900	2,570	*511	175	161	127
28	*582	*1,600	485	181	*161	120
29	498	*6,090	498	181	151	120
30	*2,390	4,400	*433	*137	132	*116
31	614	*1,620	---	141	---	116
Mean	2,740	6,510	3,440	218	147	121
Cs/mi	1.10	2.61	1.38	0.09	0.06	0.05
In	1.26	3.00	1.53	0.10	0.07	0.06
Maf.	169,000	401,000	206,000	13,400	8,750	7,440

M.Acre-feet. .897 Maximum day 31,400 Minimum day 9

SOAN RIVER AT DHOK PATHAN

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
2 Jan	127	52	115			
9 Jan	101	60	84			
18 Jan	*84.4	58	139			
23 Jan	87.2	57	102			
27 Jan	81.6	62	64			
2 Feb	389	62	411			
10 Feb	156	62	310			
11 Feb	211	59	347			
15 Feb	1,620	53	2,510	12	49	39
17 Feb	459	60	1,680	27	28	45
25 Feb	141	72	336			
1 Mar	235	67	200			
5 Mar	132	73	329			
12 Mar	433	61	7,110	3	28	69
17 Mar	193	75	304			
25 Mar	1,230	71	2,760	9	52	39
28 Mar	357	73	1,770	54	28	18
4 Apr	127	76	623	9	25	66
6 Apr	90	73	120			
8 Apr	87.2	76	169			
14 Apr	78.8	71	76			
19 Apr	44	74	142			
25 Apr	40.5	71	60			
26 Apr	862		6,680	2	40	58
3 May	127	74	72			
6 May	101	75	306			
11 May	54	76	425	6	46	48
13 May	37.5	94	190			
16 May	550	74	22,900	6	38	56
19 May	862	82	3,240	2	56	42
28 May	50	83	226			
3 Jun	21.5	79	162			
4 Jun	988	79	1,800	9	62	29
10 Jun	31.5	80	360			
17 Jun	10.6	81	541			

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of water °F	Total PPM by weight	Percent Sand	Silt	Clay
20 Jun	2,900	78	21,700		26	74
20 Jun	3,330	81	26,500	1	41	58
24 Jun	50	91	262			
29 Jun	5,410	82	23,400	10	49	41
29 Jun	13,700	81	44,600	27	41	32
1 Jul	4,000	89	2,390			
5 Jul	6,280	75	24,700	5	43	52
6 Jul	2,700	84	9,630			
8 Jul	1,140	77	11,600	5	33	62
9 Jul	786	86	5,140	1	87	12
12 Jul	132	90	660	6	37	57
13 Jul	1,760	78	12,200	4	43	53
14 Jul	7,770	79	29,800	9	83	8
16 Jul	7,220	89	20,200	13	73	14
17 Jul	8,750	80	16,600	14	56	30
19 Jul	28,700	85	42,200	4	86	10
20 Jul	6,830	82	24,100	8	74	18
21 Jul	27,100	78	37,400	20	73	7
24 Jul	1,950	89	9,530	3	58	39
26 Jul	900	83	1,990	1	58	41
28 Jul	389	89	3,460	6	74	20
30 Jul	1,210	85	3,820	2	73	25
30 Jul	3,050	94	3,460	1	68	31
3 Aug	378	82	5,830	5	69	26
3 Aug	193	91	1,110	1	26	73
4 Aug	8,610	80	22,800	15	64	21
6 Aug	15,700	79	29,500	1	84	15
8 Aug	7,520	87	11,800	2	56	42
11 Aug	1,210	98	14,500	1	60	39
13 Aug	14,500	80	20,700	6	72	22
16 Aug	28,700	79	20,700	11	39	50
18 Aug	6,770		17,900	14	65	21
18 Aug	21,100	81	18,900	12	63	25
20 Aug	46,300	74	23,200	11	60	29
20 Aug	6,830	82	9,810	7	73	20

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Percent Silt	Percent Clay
22 Aug	3,190	83	9,900	11	64	25
23 Aug	20,400	79	11,600	11	74	15
23 Aug	32,100	82	15,000	10	41	49
27 Aug	1,340	88	6,570	17	59	24
28 Aug	3,800	89	9,510	25	37	38
29 Aug	7,700	79	6,960	19	63	18
31 Aug	1,810	87	2,690	15	52	33
2 Sep	1,160	87	2,260	14	50	36
3 Sep	3,230	84	6,570	17	61	22
4 Sep	3,600	88	7,200	34	48	18
5 Sep	21,800	83	17,980	8	68	24
7 Sep	17,500	72	14,600	7	68	25
9 Sep	3,480	86	7,910	36	43	21
10 Sep	6,170	84	8,790	36	46	18
12 Sep	4,520	84	15,200	31	33	36
15 Sep	5,010	80	15,400	35	50	15
17 Sep	3,800	89	14,900	37	45	18
21 Sep	1,650	78	6,500	41	37	22
27 Sep	511	84	132			
30 Sep	420	88	496			
1 Oct	378	88	482			
5 Oct	307	76	350			
14 Oct	211	79	197			
22 Oct	217	79	104			
30 Oct	144	80	107			
5 Nov	156	75	143			
11 Nov	127	66	51			
19 Nov	141	70	271			
28 Nov	170	62	103			
2 Dec	108	59	82			
9 Dec	127	60	144			
18 Dec	116	56	90			
25 Dec	120	58	99			
30 Dec	112	64	68			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

SOAN RIVER AT CHOR PATHAN

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	TOTAL Cations	TOTAL Anions	PARTS PER MILLION SiO_2	Fe	B	D.S. by Evap.	EC x 10^6 at 25 °C	pH	Res CO_3 me/l	SAR
Jan 2	1.40	1.60	1.85		0	3.72	.87	.30		4.85	4.89				284	470	7.9	.72	1.5
Feb 2	1.45	2.00	1.93		0	3.93	1.07	.60		5.38	5.40				294	500	7.9	.13	1.5
Mar 5	1.00	1.80	1.95		0	3.21	.87	.30		4.35	4.38				232	400	7.7	.41	1.3
Apr 4	.80	.80	1.60		T	1.34	.89	.50		3.20	3.23				176	300	8.2	.24	1.2
May 5	1.20	1.10	1.95		0	3.06	.59	.50		4.15	4.15				228	400	8.0	.76	1.7
Jun 3	1.20	1.20	2.97		0	3.49	1.28	0.60		5.37	5.37				288	490	8.1	1.09	2.7
Jul 5	1.00	.60	2.60		0	3.08	.98	.20		4.26	4.26				232	400	7.7	1.46	2.0
Aug 3	1.20	.70	2.02		0	2.24	1.08	.60		3.92	3.92				220	380	7.5	.34	2.0
Sep 4	1.35	.85	1.01		0	2.62	.24	.30		3.21	3.21				172	300	7.8	.42	1.0
Oct 1	1.20	.50	1.63		0	2.34	.59	.40		3.33	3.33				180	310	8.0	.64	1.8
Nov 5	1.35	1.45	1.68		0	3.10	.78	.60		4.48	4.48				244	420	8.0	.30	1.4
Dec 2	1.10	1.40	2.20		0	3.10	.63	.90		4.70	4.63			0	248	430	8.0	.40	2.0

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Location Latitude 32°47', Longitude 71°58', It is situated on Talagang Danda Shah Bilawal Road and one mile from Danda Shah Bilawal village.

Drainage area 200 sq miles.

Record available Gauge height and mean daily discharge record at this location since 9.1.75 to date by Surface Water Hydrology Project WAPDA.

Extremes Maximum discharge observed during the year 42,600 cusecs on 20 August (gauge height 17.65 ft) minimum daily discharge zero on many days of April, May and June.

Gauge Wire weight gauge installed on 9.1.75, and set to arbitrary datum. Gauge read from 0800 to 1600 hours daily during low flows and on hourly basis for 24 hours during the period 1.7.75 to 30.9.75.

Measurements Eighty nine discharge measurements were made during the year by current meter using 0.2, 0.8 or 0.6 method. Eighty five sets of sediment samples were taken by depth integration method using DH-48 sampler while wading and D-49 in high flows. Fifty two of these were analysed for particle size distribution and the rest for total concentration. 11 Surface samples were collected and analysed for chemical composition.

Determination of discharge Rating table dated 2.11.76 was used with shift adjustments to compute mean daily discharges.

Remarks Record good.

GHAMBIR NALLAH AT DANDA SHAH BILAWAL

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	3.8	3.8	1.5	1.2	6.5	5.0
2	3.7	3.7	1.5	.1	3.8	15
3	3.6	2.9	*1.8	.1	2.6	5.5
4	3.6	4.1	1.8	.1	2.0	2.3
5	3.5	5.0	1.8	*.1	2.3	1.6
6	3.4	3.8	1.4	.1	2.3	0.9
7	3.3	*4.1	1.4	.1	2.0	0.2
8	3.2	8.0	1.4	.1	1.4	0
9	*3.2	8.0	1.4	9.5	0.8	0
10	2.9	6.5	1.4	3.5	0.2	*94
11	2.9	4.1	5.5	1.5	0	*7.0
12	2.6	7.5	16	1.3	0	5.3
13	2.3	*7.5	7.5	*0.1	0	3.5
14	2.3	7.5	2.6	0	0	1.8
15	2.0	5.5	2.3	0	0	0.1
16	2.0	3.8	2.0	0	499	0
17	2.0	2.6	1.5	0	55	0
18	1.9	1.5	1.5	0	43	0
19	1.9	1.5	1.5	0	*20	0
20	1.9	1.5	1.4	0	10	0
21	*2.0	*1.5	*1.3	0	6.0	*107
22	2.0	1.5	1.5	0	4.1	*12
23	2.0	1.5	4.4	*27	2.6	3.2
24	7.5	1.5	16	14	2.0	*53
25	*4.4	1.5	11	8.0	1.4	*45
26	2.9	1.5	2.8	94	0.8	12
27	2.3	1.5	1.5	28	0.2	4.4
28	2.0	1.5	1.5	39	0	2.0
29	2.6	---	1.4	20	0	*3,100
30	3.5	---	1.4	11	0	170
31	*5.5	---	1.4	----	0	-------
Mean	3.0	3.7	3.3	8.6	21.5	122
Cs/mi	0.01	0.02	0.02	0.04	0.11	0.61
In	0.02	0.02	0.02	0.05	0.12	0.68
Ac.ft.	184	208	201	513	1,320	7,240

1975 Year: Mean 141 Cs/sq mi 0.7 Inches 9.57

Note: *Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	19	3.8	28	2.0	1.2	2.3
2	16	2.0	*203	2.0	1.2	2.6
3	11	0.5	66	1.5	1.2	2.9
4	*1.1	0	*35	*1.9	*1.2	*3.5
5	*18	0	807	1.9	1.2	2.9
6	38	*888	273	1.8	1.3	2.6
7	22	158	*418	1.9	*1.3	2.6
8	*30	*236	663	1.8	1.4	2.3
9	*22	65	102	1.7	*1.4	2.6
10	*31	32	*120	1.7	1.5	2.6
11	5.5	16	28	1.7	1.6	*2.6
12	*2.3	*50	*30	*1.6	1.6	2.6
13	*5,170	*7,410	18	1.6	1.6	2.3
14	*4,580	237	*788	1.6	1.7	2.6
15	655	204	*595	1.5	1.7	2.9
16	35	*984	78	1.5	1.8	2.9
17	14	*1,250	37	1.4	1.8	2.9
18	6.0	851	24	1.4	1.9	2.9
19	*3.5	165	*15	*1.4	*2.0	3.2
20	2.0	*5,030	*93	1.4	2.0	3.2
21	*2,980	5,870	109	1.4	2.1	3.2
22	58	2,260	96	1.3	2.2	3.5
23	18	577	68	1.3	2.6	3.2
24	807	43	35	1.3	3.5	3.5
25	132	32	14	1.3	3.5	3.5
26	187	*40	[illegible]	[illegible]	*3.2	3.2
27	*27	21	2.6	1.2	2.0	3.2
28	*52	18	2.6	1.2	1.9	3.5
29	15	47	2.6	1.2	1.9	3.5
30	8.0	34	2.0	1.2	2.0	3.5
31	4.7	20	----	1.2	----	*3.5
Mean	483	856	161	1.5	1.9	3.0
Cs/mi	2.41	4.28	0.81	0.01	0.01	0.01
In	2.78	4.94	0.90	0.01	0.01	0.02
Ac.ft.	29,700	52,700	9,590	93	111	185

M.Acre-feet. .102 Maximum day 5,870 Minimum day 0.

GHAMBIR NALLAH AT DANDA SHAH BILAWAL

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
9 Jan	166	63	51			
21 Jan	150	62	62			
25 Jan	178	58	63			
31 Jan	5.5	66	100			
7 Feb	182	52	42			
13 Feb	210	61	61			
21 Feb	137	68	286			
3 Mar	1.82	73	8			
11 Mar	195	70	106			
21 Mar	1.26	64	50			
5 Apr	0.084	76	70			
13 Apr	0.085	90	72			
23 Apr	385	90	10,500	4	21	75
19 May	21	90	957	12	42	46
2 Jun	9.5	84	1,460	1	45	54
10 Jun	736	80	14,400	8	85	7
11 Jun	190	86	6,000	4	52	44
21 Jun	166	83	23,800		45	55
22 Jun	13.5	95	12,100	7	36	57
24 Jun	18	86	8,370		75	25
24 Jun	91	93	18,900		62	38
25 Jun	30.9	96	9,170		67	33
29 Jun	9,700	86	41,700	24	47	29
29 Jun	10,600	83	27,500	2	63	35
29 Jun	406	86	14,000	5	70	25
1 Jul	20	94	1,250	11	36	53
4 Jul	1.08	96	221			
5 Jul	84.7	91	4,040	11	36	53
8 Jul	45.2	85	3,200	1	59	40
10 Jul	45.2	86	7,190	2	37	61
12 Jul	2.3	90	150			
13 Jul	6,500	84	29,100	3	87	10
13 Jul	10,700	85	26,800	14	70	16
14 Jul	2,830	85	14,200	5	54	41
14 Jul	13,800	86	16,300	15	63	22

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
19 Jul	3.5	80	72			
21 Jul	910	85	35,200	3	86	11
21 Jul	13,400	88	24,300	1	84	15
21 Jul	7,000	88	26,200	1	87	12
24 Jul	2,170	89	31,100	3	88	9
24 Jul	483	93	21,900	15	68	17
27 Jul	24	95	1,400	13	30	57
28 Jul	66.6	87	8,790	4	62	34
6 Aug	2,000	85	23,700	3	81	16
6 Aug	580	87	16,600	12	60	28
6 Aug	1,720	89	27,600	3	66	31
8 Aug	747	96	38,300	25	53	22
12 Aug	9	89	99			
12 Aug	117	90	25,400	16	65	19
13 Aug	15,500	85	28,400	12	76	12
[illegible] Aug			16,500	7	61	32
16 Aug	1,700	88	22,000	7	63	30
16 Aug	5,140	92	7,090	1	71	28
16 Aug	2,720	92	21,200	6	52	42
17 Aug	4,340	91	30,500	16	57	27
20 Aug	7,830	81	19,900	12	84	4
26 Aug	32	81	3,390	12	76	12
2 Sep	670	85	8,150	10	63	27
4 Sep	26	93	194			
5 Sep	4,920	89	36,900	2	24	74
7 Sep	413	89	16,200	13	57	30
9 Sep	1,850	85	13,600	23	71	16
10 Sep	240	85	6,860	8	57	35
12 Sep	30.9	91	266			
14 Sep	3,210	87	16,100	8	57	35
15 Sep	150	86	3,510	3	90	7
15 Sep	1,340	86	8,360	15	65	20
[illegible]	371	86	16,300	10	61	29
19 Sep	[illegible]	90	224			
20 Sep	162	84	4,590	3	81	16

CHAMBIR NALLAH AT DANDA SHAH BILAWAL

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Cla
26 Sep	3.8	90	100			
4 Oct	1.89	90	106			
12 Oct	1.62	76	39			
19 Oct	1.40	76	31			
26 Oct	1.23	70	16			
4 Nov	1.23	84	17			
7 Nov	1.30	72	54			
12 Nov	1.80	83	20			
19 Nov	1.97	80	20			
26 Nov	3.2	72	22			
4 Dec	3.5	80	170			
11 Dec	2.6	64	90			
31 Dec	3.5	74	81			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

SHAMBIR NALLAH NEAR DANDA SHAH BILAWAL

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	TOTAL Cations	TOTAL Anions	PARTS PER MILLION SiO_2	Fe	B	D.S. by Evap.	$EC \times 10^6$ at 25 °C	pH	Res CO_3 me/l	SAR
Jan 9	1.00	1.50	5.80		0	3.72	1.55	3.00			8.30	8.27				480	810	7.8	1.22	5.2
Feb 13	.80	1.00	6.50		0	3.92	1.45	2.80			8.30	8.17				474	790	7.8	2.12	6.8
Mar 11	.80	1.00	6.70		T	3.80	1.64	3.20			8.50	8.64				484	800	8.2	2.03	7.0
Apr 13	.80	.80	5.80		0	3.77	.89	2.80			7.40	7.46				424	700	8.1	2.12	6.5
Jun 2	.50	.80	3.48		0	3.29	.69	.80			4.78	4.78				260	450	8.0	1.99	4.3
Jul 4	.80	1.40	3.54		0	3.46	.78	1.50			5.74	5.74				344	550	7.9	1.26	3.4
Aug 6	.70	.80	2.21		0	2.72	.39	.60			3.71	3.71				204	350	7.7	1.22	2.5
Sep 30	1.10	.80	4.99		0	3.31	.98	2.60			6.89	6.89				392	660	8.1	1.41	5.1
Oct 4	.80	.60	5.30		0	3.11	1.09	2.50			6.70	6.70				380	630	8.1	1.71	6.3
Nov 4	1.35	1.80	6.27		0	5.54	2.78	1.10			9.42	9.42				548	900	8.0	2.39	5.0
Dec 4	1.15	1.05	7.50		0	3.30	1.26	5.00			9.70	9.56			0	548	900	8.0	1.10	[illegible]

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Location Latitude 32°59', Longitude 71°41', on left bank near Massan Railway Station about 3 miles downstream of confluence of Soan River and 11 miles upstream of Jinnah Barrage.

Drainage area 1,11,000 square miles.

Record available Gauge height record at Kalabagh Jan'1873 to date and discharge measurements at low and medium flow since 23.9.1921 with Directorate of Hydrology and Floods Irrigation Department (Punjab), Lahore. Gauge height record and occasional discharge measurements May'58 August 1960 by Ground Water Development organization are lying in records of Surface Water Hydrology Project, WASID, WAPDA, Lahore. Gauge installed at Massan by Surface Water Hydrology Project on 6.1.1971 and mean daily discharge available at this site since 1.1.1972.

Extremes Maximum discharge observed during the year 617,000 cusecs on 21 August (gauge height 42.10) minimum daily discharge 7,300 cusecs on 5 February.

1873-75: Highest flood level occurred in August 1929. Flood peak of 1841 is considered higher than 1929 peak.

Gauge Staff gauge (enamelled plates) graduated at 0.10 foot intervals in 5 feet steps from 0.50 to 60.0 ft. 200 feet upstream cableway. Another staff gauge 2900 feet upstream of cableway from 11.00 to 65.00 ft. at the same datum. Lower pieces marked in hundredths of a foot. Gauge read on hourly basis for 24 hours July to Sept and for eight hour for rest of the year.

Measurements One hundred forty two discharge measurements were made by current meter using 0.2 and 0.6 depth method during the year from cableway. One hundred and fifteen sets of sediment samples were taken by D-49 sediment sampler from cableway, Eighty of these were analysed for particle size distribution and rest for total concentration. 24 Nos Surface samples were collected and analysed for chemical composition.

Determination of discharge Rating table dated 24.4.74 was used for the period 1.1.75 to 10.6.75, and rating table dated 23.1.78 used from 11.6.75 to 31.12.75, with shift adjustment to compute mean daily discharge.

Remarks Record Fair.

INDUS RIVER AT MASSAN

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	27,000	23,200	25,300	37,600	83,700	163,000
2	27,400	24,600	22,000	*39,500	*88,700	*162,000
3	27,400	*20,600	25,600	40,500	82,600	189,000
4	27,300	11,000	*24,500	46,900	79,500	163,000
5	27,100	7,900	25,600	51,500	88,100	*186,000
6	*27,600	8,400	30,200	56,100	91,200	*211,000
7	26,300	10,400	28,200	63,100	84,900	215,000
8	25,000	12,900	27,300	69,300	80,900	217,000
9	25,300	*15,500	27,600	*70,000	68,700	*218,000
10	26,000	16,900	27,000	64,500	*75,100	188,000
11	26,400	23,900	26,300	61,700	81,100	159,000
12	*25,300	24,600	*30,100	58,200	82,400	*193,000
13	24,800	27,700	35,400	57,700	80,300	193,000
14	26,700	25,800	34,400	55,200	91,600	194,000
15	29,000	27,700	28,200	54,400	95,600	*197,000
16	25,600	*26,700	28,600	53,500	111,000	206,000
17	*27,600	25,000	29,100	53,200	151,000	218,000
18	24,800	25,900	27,800	53,700	*172,000	*231,000
19	25,500	24,800	30,000	57,300	133,000	245,000
20	27,600	24,600	*27,900	64,900	116,000	261,000
21	25,700	23,400	28,200	65,900	108,000	*262,000
22	25,600	22,500	31,000	67,900	106,000	251,000
23	25,100	24,600	47,000	*71,700	103,000	236,000
24	24,800	22,800	49,100	74,500	100,000	223,000
25	21,000	22,200	46,600	83,900	109,000	*210,000
26	*23,200	*23,800	45,700	95,800	111,000	*171,000
27	25,500	23,100	*44,500	99,800	*134,000	*226,000
28	24,100	24,200	43,000	99,600	167,000	*236,000
29	25,500	-------	39,800	*91,000	200,000	*243,000
30	25,700	-------	40,000	82,400	159,000	*245,000
31	24,300	-------	38,200	-------	166,000	-------
Mean	25,800	21,300	32,600	65,400	110,000	214,000
Cs/mi	0.233	0.192	0.293	0.558	0.988	1.93
In	0.268	0.207	0.338	0.657	1.14	2.15
Maf.	1.59	1.23	2.00	3.89	6.74	12.7

1975 Year: Mean 103,000 Cs/sq mi 0.926 Inches 12.58

Note: *Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	*233,000	*48,500	*177,000	*71,000	*27,000	37,800
2	*226,000	*116,000	*172,000	60,200	29,400	36,500
3	*222,000	*156,000	*172,000	63,800	49,900	39,200
4	*198,000	*178,000	*173,000	67,600	*45,100	39,800
5	*127,000	*180,000	*176,000	63,300	45,900	*39,700
6	*219,000	*250,000	*206,000	58,900	47,400	38,600
7	*223,000	*187,000	*196,000	59,900	40,000	36,500
8	*161,000	*181,000	*195,000	61,000	47,200	*33,300
9	*207,000	*228,000	*183,000	62,000	48,000	29,100
10	*230,000	*266,000	*143,000	68,300	45,800	31,500
11	*232,000	*261,000	*130,000	67,200	44,200	31,300
12	*232,000	*266,000	*119,000	67,400	47,700	29,400
13	*275,000	*303,000	*116,000	66,300	45,000	*30,300
14	*314,000	*311,000	*113,000	66,100	41,400	30,400
15	*291,000	*334,000	*116,000	64,200	41,100	30,600
16	*274,000	*363,000	*128,000	58,000	43,000	30,200
17	*282,000	*340,000	*131,000	*47,400	44,300	32,000
18	*201,000	*234,000	*129,000	48,200	*43,000	33,200
19	*256,000	*463,000	*128,000	51,400	42,100	31,200
20	*266,000	*446,000	*125,000	49,200	45,000	*32,000
21	*279,000	570,000	*111,000	55,700	43,800	9,000
22	*280,000	*541,000	*107,000	63,400	43,500	9,200
23	*257,000	*554,000	*105,000	*66,000	43,500	9,800
24	*252,000	*388,000	*91,300	67,900	45,000	10,000
25	*251,000	*316,000	*79,000	63,100	44,300	11,000
26	*133,000	*213,000	*78,200	49,400	43,400	10,000
27	*160,000	*204,000	*77,300	48,500	39,800	11,300
28	*164,000	*223,000	*75,200	46,200	*41,000	*11,200
29	*122,000	*213,000	*73,300	61,300	*37,000	11,100
30	*89,600	*207,000	*72,400	*66,100	35,300	11,000
31	*57,300	*198,000	-------	55,900	------	10,900
Mean	217,000	282,000	130,000	60,000	43,600	25,400
Cs/mi	1.96	2.54	1.17	0.54	0.384	0.229
In	2.26	2.93	1.31	0.624	0.429	0.264
Maf.	13.4	17.4	7.75	3.70	2.54	1.56

M.Acre-Feet 74.5 Maximum day 570,000 Minimum day 7,300

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
12 Jan	24,900	48	282			
17 Jan	26,700	50	167			
26 Jan	23,100	44	110			
3 Feb	18,200	48	118			
9 Feb	15,700	51	209			
16 Feb	26,000	50	205			
26 Feb	22,900	52	29			
4 Mar	24,500	51	22			
12 Mar	30,800	55	227			
20 Mar	27,600	63	134			
27 Mar	41,400	63	580	22	53	25
2 Apr	40,600	68	173			
9 Apr	70,800	63	2,430	30	53	17
23 Apr	71,000	68	1,130	54	35	11
29 Apr	90,800	68	1,680	15	62	23
2 May	89,500	69	721	18	61	21
10 May	76,900	73	761	37	52	11
18 May	174,000	65	4,510	10	64	26
27 May	133,000	70	846	12	68	20
2 Jun	206,000	70	1,770	42	42	16
5 Jun	212,000	68	3,870	65	30	5
9 Jun	220,000	69	1,490	56	34	10
11 Jun	167,000	68	1,140	57	31	12
15 Jun	198,000	69	557	35	43	22
18 Jun	230,000	70	1,620	55	30	15
21 Jun	262,000	68	1,620	9	51	40
26 Jun	104,000	66	927	35	39	26
28 Jun	233,000	70	2,160	74	21	5
30 Jun	245,000	70	1,600	48	40	12
2 Jul	229,000	70	5,640	47	43	10
4 Jul	223,000	68	1,360	61	32	7
5 Jul	104,000	69	598	37	46	17
7 Jul	228,000	70	4,240	70	27	3
8 Jul	147,000	69	1,810	65	25	10
10 Jul	232,000	69	2,360	56	37	7

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
13 Jul	291,000	72	7,160	44	45	11
14 Jul	274,000	70	2,870	43	50	7
15 Jul	285,000	69	2,530	43	42	15
17 Jul	288,000	71	2,040	53	36	11
18 Jul	158,000	71	4,550	25	67	8
19 Jul	252,000	70	3,420	23	52	25
21 Jul	294,000	70	4,400	53	37	10
22 Jul	281,000	66	4,370	60	35	5
24 Jul	253,000	70	976	47	38	15
26 Jul	97,400	72	1,080	23	57	20
28 Jul	161,000	74	1,540	43	44	13
30 Jul	72,100	73	1,540	19	76	5
1 Aug	48,000	82	1,540	9	73	18
3 Aug	154,000	74	2,460	28	58	14
6 Aug	293,000	74	7,470	7	58	35
8 Aug	181,000	73	1,670	38	49	13
9 Aug	263,000	70	1,540	60	35	5
15 Aug	353,000	71	2,530	30	52	18
19 Aug	414,000	73	5,260	46	41	13
20 Aug	439,000	74	3,010	59	31	10
22 Aug	540,000	70	2,250	25	52	23
24 Aug	382,000	71	2,830	30	53	17
25 Aug	319,000	71	1,980	52	39	9
27 Aug	218,000	73	4,320	41	52	7
29 Aug	211,000	73	2,300	50	31	19
31 Aug	198,000	72	832	41	44	15
2 Sep	173,000	74	1,060	45	39	16
4 Sep	176,000	73	748	53	30	17
6 Sep	209,000	76	2,400	37	38	25
8 Sep	198,000	74	1,430	60	31	9
10 Sep	138,000	73	937	19	55	26
12 Sep	119,000	74	927	24	48	29
14 Sep	112,000	73	540	62	27	11
18 Sep	127,000	73	855	63	26	11
20 Sep	125,000	74	1,870	80	15	5

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
22 Sep	107,000	72	1,690	80	15	5
30 Oct	65,200	66	186			
4 Nov	44,800	62	59			
10 Nov	45,300	62	46			
18 Nov	41,000	62	174			
28 Nov	40,200	60	17			
29 Nov	36,300	56	55			
8 Dec	30,700	54	25			
13 Dec	29,700	50	18			
20 Dec	31,200	54	54			
28 Dec	11,200	51	58			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

INDUS RIVER AT MASSAN - 1975

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	TOTAL Cations	TOTAL Anions	PARTS PER MILLION SiO_2	Fe	B	D.S. by Evap.	$EC \times 10^6$ at 25 °C	pH	Res CO_3 me/l	SAR
Jan																				
17	1.60	1.40	.50		0	2.16	.39	1.00			3.50	3.45				192	340	7.8	0	.4
26	1.30	1.60	.60		0	2.25	.39	.80			3.50	3.44				194	340	7.9	0	.5
Feb																				
3	1.40	1.70	.65		0	2.16	.39	1.20			3.75	3.75				212	360	7.8	0	.5
9	1.30	2.30	4.60		0	2.94	4.07	1.30			8.20	8.31				480	800	7.8	0	3.4
Mar																				
12	1.60	0.90	2.00		0	2.13	1.55	.80			4.50	4.48				268	440	7.7	0	1.8
27	1.60	0.40	0.70		T	2.04	.39	.30			2.70	2.73				152	260	8.0	.04	.7
Apr																				
2	1.60	.60	.45		0	2.04	.20	.40			2.65	2.64				148	250	7.9	0	.6
29	1.10	1.00	.50		0	1.83	.29	.50			2.60	2.62				144	230	8.0	0	.5
May																				
10	.75	1.05	.45		0	1.48	.20	.50			2.25	2.18				124	210	7.7	0	.5
27	.90	.60	.54		0	1.38	.20	.40			2.04	1.98				108	190	7.8	0	.6
Jun																				
6	.90	.50	.60		0	1.38	.20	.40			2.00	1.98				108	190	7.8	0	.7
26	.90	.60	.25		0	1.27	.29	.20			1.76	1.76				88	160	8.1	0	.3
Jul																				
17	.80	.90	.33		0	1.44	.39	.20			2.03	2.03				108	190	7.4	0	.4
30	1.40	1.00	.27		0	2.08	.39	.20			2.67	2.67				148	250	7.3	0	.3
Aug																				
31	1.10	.55	.50		0	1.75	.10	.30			2.15	2.15				116	200	8.1	.10	.6
Sep																				
24	1.15	.70	.39		0	1.84	.20	.20			2.24	2.24			0	128	220	7.9	0	.4
24	1.20	.60	.73		0	1.34	.39	.30			2.53	2.53			0	134	240	8.0	.04	.8
30	1.20	.70	.34		0	1.64	.20	.40			2.24	2.24			0	124	220	8.1	0	.4
Oct																				
17	1.20	1.00	.35		0	1.65	.10	.80			2.55	2.55			0	136	240	8.1	0	.3
23	1.40	.60	.26		0	1.46	.20	.60			2.26	2.26			0	120	240	8.1	0	.3
Nov																				
28	1.10	1.00	.55		0	1.65	.27	.70			2.65	2.62			0	148	250	8.0	0	.5
29	1.20	.80	.55		0	1.55	.27	.70			2.55	2.52			0	136	240	8.1	0	.6
Dec																				
13	1.25	1.15	.50		0	1.80	.27	.80			2.90	2.87			0	156	270	8.0	0	.5
28	1.80	1.60	1.20		0	2.80	.45	1.30			4.60	4.55			0	248	430	8.0	0	.9

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Location Latitude 33°21', Longitude 70°31', wire weight gauge fixed on the bridge just near Thal village on Thal-Miran Shah Road, nearly 61 miles from Kohat.

Drainage area 2,140 square miles.

Record available July 1967 to date by Surface Water Hydrology Project, WASID, WAPDA. Previous records with Director Hydrology Irrigation and Power Department.

Average discharge 984 cusecs (711,000 acre feet per year or 6.23 inches runoff per year). Average taken for 8 years from 1968 to 1975.

Extremes Maximum discharge observed during the year 16,900 cusecs on 13 August (gauge height 15.90 feet); minimum daily discharge 349 cusecs on 11 August.

1968-75: Maximum discharge observed 38,600 cusecs on 22 August 1970; minimum daily discharge 143 cusecs on 25 August 1971.

Gauge Wire weight gauge fastened to upstream hand rail of bridge; read from 0800 to 1600 hours daily during low flow and more often during floods. Gauge set to arbitrary datum. Check bar reading changed from 50.66 to 51.30 on 28.7.72; again it was changed to 50.66 on 24.8.72.

Measurements Forty seven discharge measurements were made by current meter using 0.6 or 0.2 and 0.8 depth method by wading in low flows and from the bridge in high flows. Forty two sets of sediment samples were taken by depth integration method using DH-48 sampler while wading and D-49 sampler from the bridge. Fourteen of these were analysed for particle size distribution and the rest for total concentration. Seven surface samples were collected and analysed for chemical composition.

Determination of discharge The river flows in two or three channels under the bridge during high flows. The gauge is fixed in the main channel. The river bed consists of stones and shingles, liable to excessive Scouring or deposition. Rating table dated 20.7.77 was used with shift adjustments based on discharge measurements.

Remarks Record fair.

KURRAM RIVER AT THAL

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	702	599	630	976	3,950	3,800
2	651	581	630	*1,110	1,830	3,440
3	595	576	646	1,640	1,550	3,220
4	586	784	874	2,530	2,520	2,740
5	740	697	752	1,920	4,930	2,340
6	668	625	*727	2,040	1,320	1,590
7	*604	*[illegible]	635	2,070	1,270	1,230
8	702	646	679	2,300	*1,180	1,150
9	702	614	679	2,060	1,400	1,110
10	646	604	1,020	1,990	1,440	1,140
11	635	586	629	1,820	1,650	1,120
12	651	848	752	1,740	1,680	*1,110
13	646	651	686	1,670	1,910	1,090
14	599	614	679	1,660	1,920	1,060
15	590	567	635	1,600	9,790	1,080
16	536	567	691	1,560	6,070	1,050
17	572	558	679	1,710	9,160	1,010
18	549	553	630	1,590	4,090	941
19	535	563	634	1,600	2,390	900
20	544	549	590	1,590	1,960	3,530
21	544	540	931	1,710	1,950	4,780
22	590	*535	1,120	2,160	1,660	1,420
23	576	553	1,110	1,950	*1,650	697
24	590	563	1,020	2,070	1,670	685
25	586	572	906	*3,330	1,730	662
26	581	[illegible]	[illegible]	3,910	5,030	*572
27	572	586	*800	4,290	4,470	563
28	567	568	887	3,290	4,250	567
29	673	---	803	3,070	4,370	614
30	625	---	927	3,540	4,210	609
31	614	---	968	-----	3,970	-----
Mean	614	604	796	2,140	3,130	1,530
Cs/mi	0.29	0.28	0.37	1.00	1.46	0.71
In	0.33	[illegible]	[illegible]	[illegible]	1.69	0.80
Ac.ft.	37,700	33,500	48,900	127,000	192,000	90,900

1975 Year: Mean 1,210 Cs/sq mi 0.57 Inches 7.70

Note : *Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	4,310	*662	656	*472	855	733
2	1,500	609	1,100	465	855	720
3	890	784	1,400	458	829	714
4	2,110	708	1,470	452	823	708
5	1,960	*673	1,150	542	836	702
6	*1,390	*1,960	1,010	435	823	697
7	*1,180	673	1,410	443	804	727
8	772	549	1,200	451	791	720
9	*913	458	991	458	791	759
10	620	400	1,500	448	784	740
11	*581	*349	1,060	441	752	772
12	*1,100	1,210	893	414	746	*746
13	1,640	*4,780	740	458	759	727
14	*1,770	3,100	625	458	772	789
15	1,220	*2,390	540	558	765	854
16	1,090	823	526	614	784	913
17	*955	540	976	740	778	874
18	740	*962	829	739	753	836
19	927	1,090	708	733	714	797
20	874	1,900	572	739	702	759
21	646	2,110	727	739	673	727
22	455	*3,860	868	746	668	720
23	385	3,190	714	746	673	702
24	429	2,580	714	772	691	733
25	517	1,970	848	791	708	714
26	*488	*1,470	*1,760	842	691	697
27	*1,900	1,080	*3,320	848	720	679
28	945	1,170	1,070	855	714	685
29	740	*1,430	*1,050	861	*702	*679
30	984	874	*488	868	691	679
31	*759	*586	-----	*868	---	662
Mean	1,120	1,450	1,030	624	754	740
Cs/mi	0.52	0.68	0.48	0.29	0.35	0.35
In	0.60	0.78	0.54	0.34	0.39	0.40
Ac.ft.	69,000	89,100	61,300	38,400	44,900	45,500

M.Acre-feet. .878 Maximum day 9,790 Minimum day 349

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
7 Jan	599		4			
25 Jan	581		21			
7 Feb	625		23			
22 Feb	535	56	22			
6 Mar	697	62	94			
27 Mar	868	67	104			
8 Apr	2,210	62	3,570	12	31	37
25 Apr	3,290	67	11,200	5	60	35
8 May	1,160	76	2,050	4	57	39
12 Jun	1,100	80	60			
26 Jun	553	88	55			
6 Jul	1,030	78	108			
7 Jul	1,360	76	1,270	13	52	35
9 Jul	999	78	9,700	20	65	15
11 Jul	581	82	171			
12 Jul	1,330	80	4,000	21	48	31
14 Jul	1,250	78	95			
17 Jul	948		83			
23 Jul	390	78	70			
26 Jul	492	82	35			
27 Jul	5,680	80	6,610	21	60	19
30 Jul	1,360	77	6,300	9	37	54
1 Aug	679	78	35			
5 Aug	691	84	32			
6 Aug	6,530	77	8,600	18	57	25
11 Aug	354	84	40			
13 Aug	14,300	77	7,330	20	56	24
14 Aug	12,300	78	8,400	21	59	20
19 Aug	880	80	90			
22 Aug	3,840	74	4,200	31	56	13
26 Aug	1,510	77	4,620	1	82	17
29 Aug	1,490	76	8,340	19	58	23
31 Aug	604	81	140			
1 Sep	656		100			
21 Sep	702		103			

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
22 Sep	868		63			
24 Sep	714		88			
26 Sep	1,860		54			
27 Sep	1,900		45			
29 Nov	691	56	63			
12 Dec	740	56	40			
30 Dec	772	55	40			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

KURRAM RIVER AT THAL

Chemical Analysis of Water Samples - 1975

Date	Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	TOTAL Cations	TOTAL Anions	SiO_2	Fe	B	D.S. by Evap.	$EC \times 10^6$ at 25 °C	pH	Res CO_3 me/l	SAR
	MILLIEQUIVALENTS PER LITRE												PART PER MILLION							
Jan 7	1.80	2.20	.40		0	3.53	.19	.60			4.40	4.32				242	410	7.8	0	.3
Feb 13	1.40	2.10	.75		T	3.21	.38	.60			4.25	4.19				240	410	8.2	0	.6
Mar 5	1.60	1.80	.75		0	3.21	.29	.60			4.15	4.10				236	400	8.0	0	.5
May 8	1.10	1.60	.65		0	2.23	.29	.80			3.35	3.32				188	320	7.7	0	.6
Jun 17	2.00	1.80	.14		0	3.44	.20	.30			3.94	3.94				220	380	7.9	0	.1
Nov 29	1.50	2.30	.55		0	3.30	.27	.80			4.35	4.37				236	400	8.0	0	.4
Dec 30	1.60	2.40	.85		0	3.70	.18	1.00			4.85	4.88			0	268	460	8.1	0	.6

GOMAL RIVER AT KOT MURTAZA - 1975

Location Latitude 32°09', Longitude 70°04', on left bank one furlong from WAPDA Rest House, one mile North-West of Kot Murtaza, 15 miles from Zhob River and 22 miles West of Tank.

Drainage area 13,900 square miles.

Record available Discharge January 1960 to date by Surface Water Hydrology Project, WASID, WAPDA. Gauge heights 1956 to 1960 by Dams Investigation Circle and August 1959 to June 1962 by Hydrology Directorate of Irrigation Department.

Average discharge 481 cusecs (353,000 acre feet per year or 0.48 inches runoff per year). Average taken for 16 years from 1960 to 1975.

Extremes Maximum discharge observed during the year 42,400 cusecs on 19 August (gauge height 12.70 feet); minimum daily discharge 46 cusecs on 3 June.

1960-75: Maximum discharge observed 47,000 cusecs on 16 July 1973; minimum daily discharge 22 cusecs on 13 July 1971 and 22 June 1973.

Gauge Wire weight gauge fixed on newly constructed bridge in late 1964, 1000 upstream from old gauge consisting of angle iron painted with 0.1 foot graduations and set in river bed; wire weight gauge read from 0800 to 1600 hours daily during low flows and more often during floods. Gauge set to arbitrary datum.

Measurements Forty three discharge measurements were made during the year by current meter using 0.2 and 0.8 depth method by wading at low stages and from car suspended from overhead cableway at medium and high stages. Fourteen sets of sediment samples were taken by depth integration method using DH-48 sampler while wading and D-49 sampler from cableway. Five of these were analysed for particle size distribution and the rest for total concentration. Six surface samples were collected and analysed for chemical composition.

Determination of discharge Rating tables dated 26.9.75 with shift adjustments were used from 1.1.75 to 31.12.75 for computation of mean daily discharges.

Remarks Record fair.

GOMAL RIVER AT KOT MURTAZA

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	105	105	2,090	555	390	60
2	98	103	1,390	525	334	52
3	95	100	890	535	272	46
4	93	122	1,930	515	234	635
5	91	117	2,020	510	210	520
6	88	112	1,490	471	244	342
7	88	129	1,180	426	210	201
8	91	129	983	399	186	146
9	88	*136	898	374	240	117
10	*91	186	803	366	216	382
11	91	177	868	322	198	143
12	88	725	838	296	183	141
13	88	630	737	265	167	107
14	91	366	*713	*247	*172	*105
15	88	326	689	234	167	110
16	88	314	*695	*222	*158	*86
17	86	303	597	222	153	86
18	*86	286	545	210	151	86
19	86	326	520	195	172	88
20	88	330	500	216	169	117
21	86	350	3,070	322	148	110
22	86	382	3,570	992	134	119
23	86	435	2,270	992	119	330
24	88	426	1,480	1,040	103	198
25	86	580	1,080	838	100	198
26	88	586	913	5,490	98	192
27	88	500	823	3,000	93	192
28	88	591	743	1,040	93	213
29	95	---	671	647	88	210
30	117	---	641	495	79	1,099
31	110	---	586	---	66	-----
Mean	91	317	1,170	732	172	214
Cs/mi	0.01	0.02	0.08	0.05	0.01	.015
In	0.01	0.02	0.10	0.06	0.01	.017
Ac.ft.	5,600	17,600	71,800	43,600	10,600	12,800

1975 Year: Mean 733 Cs/sq mi .05 Inches .713

Note : * Discharge measurement made on this day.

GOMAL RIVER AT KOT MURTAZA

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	920	668	415	255	89	101
2	749	*505	*961	*128	89	185
3	471	259	3,430	122	86	143
4	386	*119	2,500	119	86	113
5	*1,370	1,170	482	116	83	119
6	*4,360	*1,050	355	114	89	122
7	*1,724	644	1,350	112	95	116
8	*1,321	638	375	111	95	113
9	1,660	415	295	110	92	113
10	*6,930	259	164	110	98	110
11	2,950	*160	*104	107	98	107
12	1,400	360	299	107	98	113
13	958	815	311	104	101	111
14	2,800	*9,970	211	101	101	109
15	*2,920	6,670	*160	101	101	107
16	2,080	4,620	470	98	98	104
17	3,520	2,260	1,240	95	98	104
18	1,880	*2,340	1,170	95	101	101
19	719	*18,000	*680	92	101	98
20	624	13,500	192	92	101	98
21	1,400	8,920	53	92	101	95
22	*4,270	2,800	259	95	98	101
23	5,610	*785	*227	95	98	101
24	4,690	1,030	153	92	98	104
25	7,050	722	150	89	101	101
26	3,540	*259	*116	92	101	101
27	1,500	633	125	89	*101	119
28	680	1,340	116	86	101	110
29	295	1,910	171	95	101	104
30	2,690	*2,950	*153	95	101	101
31	1,460	920	---	92	---	*101
Mean	2,350	2,800	556	107	97	110
Cs/mi	0.17	0.20	.04	.008	.007	.008
In	0.20	0.23	.04	.009	.008	.009
Ac.ft.	145,000	172,000	33,100	6,550	5,750	6,790

M. Acre-feet. .540 Maximum day 18,000 Minimum day 46

GOMAL RIVER AT KOT MURTAZA

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Percent Silt	Percent Clay
10 Jan	90.6		66			
18 Jan	85.8	56	33			
9 Feb	134		24			
28 Feb	591	58	15,100	23	52	25
14 Mar	689	63	2,140	29	39	32
16 Mar	731	50	1,690	36	36	28
15 Apr	231	79	106			
17 Apr	225	60	94			
14 May	172	85	82			
16 May	161	76	86			
14 Jun	100	85	7,670	3	29	68
16 Jun	81	71	2,000			
27 Nov	178	55	54			
31 Dec	178	54	35			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

GOMAL RIVER AT KOT MURTAZA

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE										TOTAL		PARTS PER MILLION				$EC \times 10^6$ at 25 °C	pH	Res CO_3 me/l	SAR
	Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	Cations	Anions	SiO_2	Fe	B	D.S. by Evap.				
Jan 10	2.30	4.30	7.40		0	3.14	2.54	8.00			14.00	14.18				850	1370	7.8	0	4.1
Feb 9	3.30	3.30	7.10		0	3.34	2.52	8.10			13.70	13.96				812	1310	7.8	0	3.9
28	1.60	3.20	3.40		0	3.49	.97	3.70			8.20	8.16				472	780	8.0	0	2.2
May 16	1.25	4.45	5.80		0	2.76	1.78	6.80			11.50	11.34				672	1100	7.8	0	3.4
Nov 27	2.80	4.40	7.20		0	3.39	2.16	9.00			14.40	14.55				840	1350	7.9	0	3.6
Dec 31	2.10	3.40	5.30		0	2.10	.90	7.60			10.80	10.60			0	600	1000	8.0	0	3.2

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Location Latitude 34°09', Longitude 73°50', staff gauge 32 miles from Muzaffarabad on Muzaffarabad Sirinagar Road.

Drainage area 5,250 square miles.

Record available Mean daily discharge record from January 1970 to date by Surface Water Hydrology Project, WASID, WAPDA. Gauge height observations with periodic discharge measurements started October 1969.

Average discharge 9.790 cusecs (7,080,000 acre feet per year and 25.32 Runoff in inches per year). Average taken for six years from 1970 to 1975.

Extremes Maximum discharge observed during the year 43,800 cusecs on 28 August (gauge height 22.20 feet); minimum daily discharge 2,360 cusecs on 20 and 21 January.

1970-75: Maximum discharge observed 43,800 cusecs on 28 August 1975 (gauge height 22.20 feet); minimum discharge 1,520 cusecs on 27 October 1971.

Gauge Staff gauge graduated to tenth of a foot and read to hundredth of a foot from 0000 to 1600 hours during low flows and more often during floods. Gauge set to arbitrary datum.

Measurements Forty three discharge observations were made during the year, from the bridge, using 0.2 and 0.8 depth method. Thirty three sets of sediment samples were taken by depth integration method using D-49 sampler from the bridge. Eight of those were analysed for particle size and rest for total concentration. Seven surface samples were collected and analysed for chemical composition.

Determination of discharge Rating table dated 14.1.75 was used to compute mean daily discharges with shift adjustments as indicated necessary by periodic discharge measurements.

Remarks Record fair.

JHELUM RIVER AT CHINARI

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	2,580	3,380	9,240	20,900	30,800	28,800
2	2,600	3,510	9,200	21,100	30,500	28,400
3	2,570	3,490	9,090	21,900	30,400	28,300
4	2,530	3,410	14,300	22,700	31,500	*27,700
5	2,470	3,320	17,400	*22,500	31,300	27,300
6	2,420	3,290	14,700	22,300	*30,800	26,200
7	2,430	3,290	14,500	22,000	29,400	25,800
8	2,470	3,510	13,600	22,100	28,700	25,400
9	2,490	3,740	13,100	21,200	28,100	24,900
10	2,530	3,990	*13,000	20,800	27,700	24,300
11	2,560	4,090	14,200	20,200	27,700	23,800
12	*2,600	4,130	14,800	19,500	27,500	23,300
13	2,600	4,760	14,700	18,500	27,600	22,500
14	2,580	4,680	14,300	*17,800	*27,700	21,400
15	2,570	5,020	14,100	16,900	27,700	20,700
16	2,540	5,100	14,200	16,300	29,500	20,400
17	2,480	5,200	14,200	16,200	36,200	20,600
18	2,460	* 5,350	*14,400	16,500	35,600	20,800
19	2,380	5,730	14,600	16,800	35,300	21,500
20	2,360	6,050	14,800	16,400	35,200	22,000
21	2,360	6,010	15,000	17,500	35,200	22,200
22	2,430	6,050	19,400	18,500	34,900	22,400
23	2,500	6,330	22,000	20,900	34,800	22,300
24	*2,560	6,480	20,700	20,900	34,100	21,800
25	2,480	*6,750	21,100	22,800	33,000	21,400
26	2,420	7,220	21,100	30,800	32,100	20,900
27	2,380	7,380	*21,100	*34,300	*31,500	*20,400
28	2,420	8,280	20,900	32,700	30,800	20,400
29	2,480	-----	20,900	31,300	30,200	20,500
30	2,710	-----	20,800	30,800	29,800	20,100
31	3,240	-----	20,900	------	29,200	------
Mean	2,520	4,980	16,000	21,800	31,100	23,200
Cs/mi	0.48	0.95	3.05	4.15	5.92	4.42
In	0.55	0.99	3.52	4.63	6.83	4.93
Maf.	.155	.277	.984	1.30	1.91	1.38

1975 Year: Mean 15,100 Cs/sq mi 2.88 Inches 39.07

Note : *Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	19,400	27,600	31,300	9,180	3,540	2,980
2	*19,200	25,900	31,600	*8,800	3,490	*2,920
3	18,400	24,800	31,500	8,540	3,490	2,920
4	17,500	*23,800	31,400	7,960	3,370	2,920
5	16,800	23,400	31,300	7,740	3,320	2,980
6	16,400	22,800	30,500	7,460	3,230	2,980
7	*16,300	21,900	*30,000	7,260	3,260	3,040
8	16,300	20,400	28,600	7,050	3,710	3,000
9	16,200	19,500	27,500	6,770	4,370	2,980
10	16,000	19,000	26,600	6,510	4,210	*2,860
11	15,700	18,200	*25,700	6,260	4,020	2,860
12	15,600	*17,600	25,400	5,990	3,740	2,860
13	15,400	16,600	25,200	5,580	3,680	2,860
14	15,300	16,200	24,100	5,370	3,560	2,840
15	15,700	15,800	*22,800	5,180	3,540	2,820
16	*28,700	*16,000	21,600	4,930	3,500	2,800
17	26,700	17,400	20,600	4,800	3,420	2,780
18	26,800	20,700	*19,900	4,680	3,370	2,750
19	*28,900	*22,700	18,800	4,580	*3,300	2,750
20	30,700	24,700	17,300	4,410	3,230	2,750
21	*31,100	25,600	16,400	4,270	3,230	2,750
22	32,300	*25,400	*15,300	4,270	3,230	2,710
23	32,500	26,100	14,400	4,240	3,200	2,660
24	*32,200	*26,900	13,600	*4,240	3,160	2,640
25	32,300	26,600	13,000	4,130	3,100	2,640
26	32,300	26,100	*12,300	4,090	3,100	2,640
27	32,300	25,900	11,600	3,960	3,080	*2,580
28	31,900	*38,100	10,900	3,830	3,030	2,580
29	*31,400	35,400	*10,300	3,780	2,980	2,530
30	30,100	32,800	10,000	3,670	2,980	2,530
31	29,000	31,700	------	3,630	-----	2,530
Mean	23,900	23,700	21,700	5,590	3,410	2,790
Cs/mi	4.54	4.52	4.12	1.06	0.65	0.53
In	5.24	5.21	4.60	1.23	0.73	0.61
Maf.	1.47	1.46	1.29	.343	.203	.171

M. Acre-feet. 10.9 Maximum day 38,100 Minimum day 2,360

JHELUM RIVER AT CHINARI

Suspended sediment concentration - 1975

Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Percent Silt	Percent Clay
12 Jan	2,600	45	144			
24 Jan	2,560	45	15			
18 Feb	5,320	45	88			
25 Feb	6,730	50	217			
10 Mar	12,900	50	478	4	63	33
27 Mar	21,100	60	490	15	58	27
5 Apr	22,300	58	338	10	62	28
27 Apr	34,400	60	2,380	16	54	30
6 May	30,700	61	3,540	38	45	17
27 May	31,500	65	146			
4 Jun	27,700	70	226			
27 Jun	20,400	77	85			
2 Jul	19,400	76	118			
7 Jul	16,400	72	134			
16 Jul	27,300	70	2,590	22	59	19
19 Jul	28,400	77	439	44	45	11
21 Jul	31,100	73	560	31	51	18
24 Jul	32,300	74	282			
29 Jul	31,100	75	259			
4 Aug	24,000	80	94			
8 Aug	20,100	80	376			
12 Aug	17,700	76	79			
16 Aug	16,100	80	343			
24 Aug	26,900	78	421			
11 Sep	25,800	74	161			
18 Sep	20,100	78	70			
22 Sep	15,500	70	165			
29 Sep	10,400	69	101			
2 Oct	8,870	69	76			
24 Oct	4,240	62	124			
19 Nov	3,290	57	56			
2 Dec	2,920	48	77			
27 Dec	2,580	49	27			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

JHELUM RIVER AT CHINARI

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	TOTAL Cations	TOTAL Anions	PARTS PER MILLION SiO_2	Fe	B	O.S. by Evap.	$EC \times 10^6$ at 25 °C	pH	Res CO_3 me/l	SAR
Jan 24	1.30	.90	.35		0	2.30	.19	.10			2.55	2.59				138	240	7.8	.10	.3
May 27	1.30	.60	.30		0	1.70	.20	.30			2.20	2.20				112	400	7.9	0	.3
Jun 27	1.00	.40	.24		0	1.44	.10	.10			1.64	1.64				96	150	7.9	.04	.3
Jul 16	1.04	.46	.24		0	1.44	.20	.10			1.74	1.74				100	160	7.8	0	.3
Oct 24	1.80	.90	.33		0	2.43	.20	.40			3.03	3.03				172	290	8.1	0	.3
Nov 19	1.60	.90	.30		0	2.33	.18	.33			2.80	2.81				148	260	8.0	0	.3
Dec 2	1.60	1.20	.45		0	2.63	.19	.40			3.25	3.21				180	300	8.0	0	.4

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Location Latitude 34°22', Longitude 73°28', on left bank under Muzaffarabad Road Bridge.

Drainage area 2,810 square miles.

Record available Gauge height record from January 1957 to date with Surface Water Hydrology Project, WASID,WAPDA. Discharge measurement started in November 1962 by Surface Water Hydrology Project and discharges computed since January 1963. Gauge height record only with Indus Basin Development Board, Lahore from 1954 December 1956.

Average discharge 12,400 cusecs (9,010,000 acre feet per year or 60.16 inches runoff per year). Average taken for 13 years from 1963 to 1975.

Extremes Maximum discharge observed during the year 52,400 cusecs on 16 and 17 May (gauge height 2218.00 feet); minimum daily discharge 1340 cusecs on 2 February.

1963-75: Maximum discharge observed 70,800 cusecs on 18 June 1966; minimum daily discharge observed 1320 cusecs on many days of January 1972.

Gauge Enamelled plates, staff gauge read to .01 foot. Gauge read in reduced levels at one hour interval, zero R.L. of gauge being 2200.00 feet.

Measurements Forty three discharge measurements were made during the year by current meter using 0.2 and 0.8 depth method from road bridge or foot bridge about one furlong downstream of gauge. Twenty eight sets of sediment samples were taken by the depth integration or point sampling method using D-49 or P-46 sampler. Ten of these were analysed for particle size distribution and the rest for total concentration. Eleven surface samples were collected and analysed for chemical composition.

Determination of discharge This station has a rock channel control, affected at times by sand deposits. Rating dated 17.11.1972 was used for the period 1.1.75 to 1.6.75 and rating dated 14.7.76 was used from 2.6.75 to 31.12.75, to compute mean daily discharges.

Remarks Record good.

KISHANGANGA AT MUZAFFARABAD

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	1,800	1,390	*2,970	*8,710	19,300	34,000
2	*1,780	1,340	2,670	8,550	19,700	*30,500
3	1,790	*1,380	2,560	10,100	22,400	31,600
4	1,800	1,450	5,330	11,200	*21,800	28,200
5	1,800	1,770	4,420	10,500	19,100	27,400
6	1,810	1,790	4,080	10,100	17,300	30,500
7	1,890	1,790	3,610	10,200	15,600	30,600
8	1,900	1,890	*3,140	9,970	16,200	*27,900
9	*1,840	1,710	3,070	9,520	18,900	28,000
10	1,810	1,600	2,910	9,170	20,400	26,000
11	1,720	1,680	3,260	*9,810	22,100	24,000
12	1,700	1,770	2,900	10,700	24,300	27,500
13	1,660	2,310	2,500	10,400	29,200	28,800
14	1,600	1,770	2,500	9,310	32,500	33,500
15	1,560	*1,820	2,640	8,030	*34,800	34,900
16	1,690	1,880	2,880	8,610	46,200	36,700
17	1,600	1,900	*2,990	10,900	45,800	37,600
18	1,470	2,050	3,340	13,700	34,300	37,300
19	1,370	*2,180	3,880	*15,000	30,100	38,600
20	1,500	2,150	4,370	12,800	28,400	36,600
21	1,540	2,100	4,590	13,000	26,400	32,900
22	1,600	2,000	5,280	13,900	23,700	25,200
23	*1,470	1,970	5,710	12,900	24,400	24,900
24	1,430	*2,060	*4,830	15,700	25,800	25,000
25	1,350	2,160	4.480	23,000	27,500	28,300
26	1,370	2,420	4,380	*25,000	*29,100	*30,900
27	1,370	2,560	4,610	23,600	32,000	30,300
28	1,400	3,130	5,340	21,000	34,200	29,300
29	1,410	-----	6,520	19,000	34,500	24,800
30	1,450	-----	7,470	18,000	37,700	19,500
31	1,460	-----	8,210	------	35,900	------
Mean	1,610	1,930	4,110	13,100	27,400	30,000
Cs/mi	0.57	0.69	1.46	4.66	9.75	10.7
In	0.66	0.71	1.69	5.19	11.2	11.9
Maf.	.099	.107	.253	.778	1.69	1.79

1975 Year: Mean 11,600 Cs/sq mi 4.13 Inches 55.99

Note : *Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	*17,100	18,400	14,100	5,950	3,040	2,140
2	16,800	19,800	13,700	5,890	*2,990	2,180
3	18,700	19,300	15,600	5,880	2,910	*2,130
4	23,300	18,900	13,300	5,750	2,830	2,250
5	26,100	19,700	12,300	5,820	2,840	2,360
6	*24,500	16,400	11,800	5,820	2,810	2,370
7	23,000	15,600	*12,000	5,700	3,050	2,520
8	22,300	*14,900	10,900	5,570	3,480	*2,490
9	23,800	14,400	10,300	5,380	3,160	2,250
10	23,800	14,200	*10,500	5,140	3,050	2,390
11	27,600	14,500	10,300	*4,770	3,010	2,360
12	30,400	*15,300	10,900	4,540	2,940	2,360
13	30,700	16,700	10,600	4,380	*2,810	2,380
14	*28,000	14,500	10,400	4,260	2,780	2,370
15	31,600	14,600	*10,400	4,210	2,780	2,260
16	41,600	15,500	10,500	4,220	2,720	2,230
17	34,200	16,500	9,810	4,190	2,700	2,280
18	29,200	*20,300	9,250	4,000	2,620	2,280
19	27,500	19,400	*9,330	3,850	2,500	2,320
20	25,100	22,300	8,930	3,660	2,490	2,360
21	25,300	*21,300	8,450	3,730	2,440	2,380
22	22,200	18,200	8,010	3,570	2,460	2,440
23	21,100	17,200	7,810	3,490	2,370	*2,340
24	22,600	14,300	7,530	3,420	2,270	2,310
25	21,400	*12,400	7,360	*3,340	2,210	2,320
26	20,400	12,200	7,240	3,320	2,240	2,420
27	20,200	11,700	6,730	3,210	2,180	2,320
28	20,400	19,600	6,620	3,210	2,150	2,320
29	20,500	*23,300	*6,400	3,140	2,140	2,320
30	17,700	16,500	6,130	3,080	2,080	2,260
31	17,900	14,700	-----	2,990	-----	2,260
Mean	24,400	16,900	9,910	4,370	2,670	2,320
Cs/mi	8.68	6.00	3.53	1.56	0.95	0.83
In	9.99	6.92	3.93	1.79	1.06	0.95
Maf.	1.50	1.04	.589	.269	.159	.143

M.Acre-feet. 8.40 Maximum day 46,200 Minimum day 1340

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of water °F	Total PPM by weight	Percent Sand	Silt	Clay
2 Jan	1,760	48	20			
15 Feb	1,830	48	21			
24 Feb	2,150	49	35			
1 Mar	3,000	52	42			
24 Mar	4,890	50	85			
1 Apr	8,890	56	146			
26 Apr	24,500	65	1,390	21	61	18
4 May	22,100	54	430	13	57	30
26 May	28,000	58	247			
2 Jun	31,200	58	472	21	45	34
1 Jul	17,800	65	138			
14 Jul	29,400	52	2,250	10	65	25
16 Jul	41,800	58	1,270	11	62	27
22 Jul	23,000	58	314			
28 Jul	19,900	70	340			
12 Aug	15,500	70	274			
18 Aug	18,200	68	4,110	25	64	11
21 Aug	18,300	68	953	21	54	25
29 Aug	20,300	62	2,720	21	54	25
5 Sep	10,500	70	678	34	52	14
7 Sep	12,000	60	2,480	85	12	3
10 Sep	10,600	68	204			
19 Sep	9,600	66	136			
29 Sep	6,660	55	39			
11 Oct	4,800	60	75			
2 Nov	3,070	56	17			
3 Dec	2,150	42	16			
23 Dec	2,320	47	25			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

KISHANGANGA RIVER AT MUZAFFARABAD

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	TOTAL Cations	TOTAL Anions	PARTS PER MILLION SiO_2	Fe	B	D.S. by Evap.	$EC \times 10^6$ at 25 °C	pH	Res CO_3 me/l	SAR
Jan 23	1.40	.80	.35		0	1.57	.10	.90			2.55	2.57				142	250	7.8	0	.3
Feb 24	1.20	1.00	.20		0	1.73	.20	.50			2.40	2.43				132	240	7.9	0	.2
Mar 24	1.20	.90	.25		0	1.63	.20	.50			2.35	2.33				130	230	7.8	0	.3
May 25	1.15	.50	.15		0	1.40	.20	.20			1.80	1.80				96	170	8.0	0	.2
Jun 8	1.10	.40	.13		0	1.23	.20	.20			1.63	1.63				76	150	8.1	0	.2
Jul 14	.80	.60	.24		0	1.34	.20	.10			1.64	1.64				84	150	7.8	0	.3
Aug 12	.80	.60	.18		0	1.28	.20	.10			1.58	1.58				88	150	7.4	0	.2
Oct 11	1.10	.55	.19		0	1.14	.20	.50			1.84	1.84				104	182	8.0	0	.2
25	1.30	.60	.25		0	1.55	.20	.40			2.15	2.15				112	200	8.0	0	.2
Nov 18	1.30	.40	.25		0	1.55	.18	.20			1.95	1.93				108	190	8.1	0	.3
Dec 3	1.20	.90	.25		0	1.65	.18	.50			2.35	2.33				124	220	8.1	0	.2

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KUNHAR RIVER AT NARAN - 1975

Location Latitude 34°55', Longitude 73°38', near P.W.D. Guest House, 2 furlong upstream from Saiful Maluk Nallah and about half a mile North of Naran.

Drainage area 400 square miles.

Record available Discharge January 1960 to date by Surface Water Hydrology Project, WASID, WAPDA. Gauge heights October 1958 to June 1962 by Hydrology Directorate of Irrigation Department.

Average Discharge 1,760 cusecs (1,130,000 acre feet per year or 59.8 inches runoff per year). Average taken for 16 years from 1960 to 1975.

Extremes Maximum discharge observed during the year 7,750 cusecs on 19 June (gauge height 8.50 feet); minimum daily discharge 309 cusecs on 11,12 February.

1959-75: Maximum discharge observed 16,400 cusecs on 25.6.66; Minimum daily discharge 100 cusecs on 28 March 1966 and 24 February 1972.

Gauge Enamelled plates graduated to 0.01 foot and read from 0800 to 1600 hours daily during low flow and more often during flood. Servo-manometer with a record (Bubble gauge) in masonry shelter fixed in November 1966; both gauges set to arbitrary datum.

Measurements Fifty four discharge measurements were made periodically during the year by current meter using 0.2 bridge at the gauge. Fifty three sets of sediment samples were taken by depth integration method using D-49 sampler; one of these was analysed by bottom with drawal tube and the rest for total concentration. Eleven surface samples were collected and analysed for chemical composition.

Determination of discharge Discharges were computed by applying rating dated 22.6.72 to the mean daily gauge heights with shift adjustments as indicated by the periodic discharge measurements.

Remarks Record good.

KUNHAR RIVER AT NARAN

Discharge in cusecs for year 1973

Date	Jan	Feb	Mar	Apr	May	Jun
1	335	315	335	446	1,850	5,990
2	335	315	342	453	1,990	6,120
3	335	316	340	456	2,060	6,170
4	335	316	*335	*466	*2,040	*6,070
5	335	316	346	453	2,230	5,710
6	335	314	354	464	2,350	5,080
7	*337	314	354	461	2,390	4,610
8	337	311	344	464	2,350	4,500
9	338	311	350	461	2,390	4,560
10	338	310	358	466	2,460	4,590
11	338	309	366	466	2,510	4,740
12	333	309	*382	*508	2,530	4,790
13	332	311	378	482	*2,400	*4,900
14	330	311	374	491	2,460	5,870
15	329	313	370	499	2,900	6,430
16	327	315	380	566	3,150	6,650
17	325	318	374	638	3,500	6,380
18	*314	321	370	712	3,770	6,580
19	321	329	370	*789	*3,720	*7,450
20	323	*323	372	757	3,770	5,930
21	324	324	382	680	3,910	4,490
22	324	330	385	656	4,210	4,210
23	320	335	380	715	4,450	4,150
24	319	332	382	*799	4,640	3,910
25	318	331	387	796	4,780	3,640
26	316	331	396	824	5,170	3,640
27	316	325	*436	*1,260	*5,500	*4,490
28	316	*331	429	1,470	5,540	4,610
29	316	---	441	1,650	5,690	4,650
30	316	---	436	1,730	5,690	4,260
31	315	---	436	-----	5,820	-----
Mean	327	319	377	703	3,490	5,170
Cs/mi	.82	.80	.94	1.76	8.73	12.9
In	.94	.83	1.09	1.96	10.06	14.4
Ac-ft.	20,100	17,700	23,200	41,800	215,000	308,000

1975 Year: Mean 1,610 Cs/sq mi 4.03 Inches 54.61

Note : * Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	3,850	2,660	1,570	705	518	448
2	3,020	2,910	1,550	715	513	446
3	3,520	3,120	1,860	708	505	443
4	3,940	*2,890	*1,670	*708	*500	*441
5	4,280	2,780	1,580	687	492	441
6	3,990	2,580	1,780	677	489	441
7	3,850	2,690	1,410	680	482	402
8	3,960	2,760	1,430	680	480	*374
9	4,090	2,590	1,390	677	477	370
10	4,070	2,290	1,360	680	474	376
11	*4,490	2,340	1,300	653	474	376
12	4,540	*2,650	*1,340	*638	*474	395
13	4,670	2,590	1,380	638	474	410
14	4,700	*2,330	1,310	632	474	445
15	4,930	2,350	1,370	635	474	*470
16	5,120	2,350	*1,260	632	474	480
17	4,970	2,380	1,260	626	441	475
18	4,680	*2,670	1,230	623	*414	455
19	*4,540	3,110	*1,170	626	443	445
20	3,980	3,240	1,080	*614	480	*435
21	3,570	2,500	990	611	519	430
22	3,200	*2,190	936	605	*519	425
23	3,020	1,810	*896	602	510	420
24	2,750	1,570	892	599	502	417
25	2,670	1,550	*832	590	491	412
26	2,690	1,600	810	539	480	*410
27	*2,550	*1,540	868	*502	*471	405
28	2,590	1,950	844	499	456	405
29	2,610	1,670	778	502	456	405
30	2,540	*1,540	*729	505	456	*400
31	2,660	*1,510	---	512	---	405
Mean	3,740	2,350	1,230	623	480	423
Cs/mi	9.36	5.86	3.08	1.56	1.20	1.06
In	10.79	6.76	3.43	1.79	1.34	1.22
Ac-ft.	230,000	71,500	73,100	38,300	28,600	26,000

M.Acre-feet. 1.09 Maximum day 7,450 Minimum day 309

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
7 Jan	338	28	16			
18 Jan	328	31	20			
20 Feb	324	33	29			
28 Feb	334	36	33			
4 Mar	338	36	27			
12 Mar	382	38	21			
27 Mar	448	40	31			
4 Apr	496	43	22			
12 Apr	536	46	31			
19 Apr	806	43	24			
24 Apr	796	45	36			
27 Apr	1,660	39	245			
4 May	1,990	40	220			
13 May	2,430	42	140			
19 May	3,830	40	185			
27 May	5,410	42	191			
4 Jun	6,320	42	2,620	63	11	26
13 Jun	4,840	49	108			
19 Jun	7,480	47	197			
27 Jun	6,120	50	116			
4 Jul	3,610	50	78			
11 Jul	3,620	50	81			
19 Jul	3,980	55	44			
27 Jul	2,270	50	67			
4 Aug	2,620	52	75			
12 Aug	2,250	53	410			
14 Aug	2,170	52	133			
18 Aug	2,080	56	88			
22 Aug	2,050	52	61			
27 Aug	1,290	51	38			
31 Aug	1,360	53	51			
4 Sep	1,510	50	30			
8 Sep	1,160	54	45			
12 Sep	1,180	54	20			
16 Sep	1,160	51	17			

KUNHAR RIVER AT NARAN

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
19 Sep	1,010	45	29			
23 Sep	828	51	32			
25 Sep	792	58	20			
30 Sep	715	50	23			
4 Oct	708	46	89			
12 Oct	638	49	87			
20 Oct	614	41	66			
27 Oct	502	41	24			
4 Nov	488	40	63			
12 Nov	474	39	31			
18 Nov	414	38	33			
22 Nov	516	35	37			
4 Dec	441	31	26			
8 Dec	374	32	9			
15 Dec	434	33	59			
20 Dec	419	36	35			
26 Dec	405	32	65			
30 Dec	400	31	51			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

KUNHAR RIVER AT NARAN

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE										TOTAL		PARTS PER MILLION				EC x 10^6 at 25 °C	pH	Res CO_3
	Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	Cations	Anions	SiO_2	Fe	B	D.S. by Evap.			mg/l
Jan 18	1.20	.70	.20		0	1.08	.10	.90			2.10	2.08				112	200	7.8	0
Feb 28	.90	.95	.15		0	1.36	.19	.90			2.00	1.99				108	190	7.7	0
Apr 24	.80	.60	.20		0	1.22	.10	.30			1.60	1.62				92	160	7.9	0
May 13	.80	.25	.30		0	.95	.10	.30			1.35	1.35				72	130	7.8	0
Jun 13	.70	1.35	.15		0	.95	.15	.10			1.20	1.20				60	110	7.9	0
Jul 11	.60	.60	.06		0	.86	.10	.30			1.26	1.26				68	120	7.7	0
Aug 14	.70	.50	.25		0	1.06	.29	.10			1.45	1.45				80	140	7.4	0
Sep 25	1.00	.45	.12		0	1.17	0.10	.30			1.57	1.57				88	150	8.1	0
Oct 20	.85	.35	.37		0	1.17	.20	.20			1.57	1.57				84	150	7.9	0
Nov 18	.90	.65	.19		0	1.24	.20	.30			1.74	1.74				96	170	8.0	0
Dec 3	1.00	.50	.20		0	1.30	.18	.20			1.70	1.68			0	92	160	8.0	0

Location Latitude 34°24', Longitude 73°22', on right bank near Jagir village, 2 miles upstream from Garhi Habib Ullah and 14 miles upstream from Jhelum River.

Drainage area 920 square miles.

Record available Discharge record January 1960 to date by Surface Water Hydrology Project, WASID, WAPDA. Gauge heights were observed at bridge near Garhi Habib Ullah from 1944 to 1954 by Irrigation and Power Department, from 1954 to 1958 by Dams Investigation Circle and 1958 to June 1962 by Hydrology Directorate of Irrigation Department.

Average discharge 3,750 cusecs (2,690,000 acre feet per year or 52.60 inches runoff per year). Average taken for 16 years from 1960 to 1975.

Extremes Maximum discharge observed during the year 16,800 cusecs on 17 June (gauge height 13.69 feet); minimum daily discharge 436 cusecs on 9 February.

1960-75: Maximum discharge observed 40,900 cusecs on 10 August 1969; minimum daily discharge 268 cusecs on 9 February 1967.

Gauge Continuous automatic water stage recorder in masonry shelter; Zero R.L. of inside gauge 2691.41. Prior to 21 June 1961 staff gauge a short distance upstream set to Reduced level.

Measurements Seventy five discharge measurements were made periodically by current meter using 0.2 and 0.8 or 0.6 depth method from car on overhead cableway at the gauge. Seventy three sets of sediment samples were taken by depth integration method using D-49 sampler. Twenty three of these were analysed for particle size distribution and the rest for total concentration. Twelve surface samples were collected and analysed for chemical composition.

Determination of discharge Rating table dated 4.8.76 used for computation of discharge.

Remarks Record excellent.

KUNHAR RIVER NEAR GARHI HABIB ULLAH

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	768	708	1,070	2,230	4,360	10,000
2	756	*660	1,000	2,330	4,530	9,440
3	744	690	986	*2,530	4,780	9,990
4	*738	720	*1,910	2,410	*4,530	8,680
5	744	756	1,510	2,200	4,050	8,900
6	750	744	1,310	2,330	3,610	*9,990
7	756	738	1,200	2,270	3,700	9,630
8	756	*774	1,130	2,150	3,960	8,100
9	738	*436	1,070	*1,950	4,600	8,390
10	732	560	1,060	1,980	5,050	7,830
11	744	890	1,110	2,160	4,930	7,810
12	*732	882	*994	*2,320	*5,430	*8,630
13	720	*986	978	2,180	6,510	9,100
14	714	*490	*994	2,010	7,080	11,000
15	*714	552	1,030	2,040	8,010	12,100
16	756	615	978	2,400	*12,800	13,000
17	732	808	994	2,820	9,760	13,800
18	702	994	1,070	3,340	7,380	*13,500
19	714	*922	*1,160	*3,480	6,540	14,100
20	732	978	1,260	3,210	6,220	12,900
21	720	906	1,310	3,210	5,740	10,900
22	*720	906	*1,730	3,310	5,550	7,750
23	714	930	1,770	3,130	*6,130	7,750
24	696	922	1,550	4,060	*6,780	8,150
25	690	962	1,430	*5,920	*7,000	9,640
26	702	978	1,420	5,170	7,260	*10,700
27	714	*1,000	*1,470	4,990	8,180	10,600
28	720	*1,200	1,630	*4,300	9,190	10,500
29	720	-----	1,810	4,150	9,220	9,680
30	*762	-----	1,920	4,240	*9,900	7,960
31	762	-----	2,120	-----	10,100	------
Mean	731	811	1,320	3,030	6,550	10,000
Cs/mi	0.79	0.88	1.43	3.29	7.12	10.87
In	0.92	.92	1.66	3.66	8.20	12.2
Ac-ft.	45,000	45,000	81,300	180,000	402,000	596,000

1975 Year: Mean 4,230 Cs/sq mi 4.60 Inches 52.7

Note : * Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	*5,920	*6,010	3,960	1,840	1,160	938
2	6,010	6,640	4,480	1,770	1,150	922
3	7,350	*6,930	*5,050	1,730	1,140	922
4	*8,850	7,150	4,150	*1,640	1,130	*946
5	8,910	*7,750	3,880	1,600	*1,100	962
6	7,570	6,330	*4,450	1,520	1,100	890
7	7,230	6,130	3,820	1,460	1,270	*938
8	*7,450	5,650	3,520	1,380	1,200	922
9	7,830	*5,280	*3,340	1,290	1,160	898
10	*7,740	5,200	3,310	1,260	1,140	*890
11	8,710	5,280	3,300	1,140	1,100	898
12	9,290	5,760	3,220	1,080	1,090	898
13	9,650	*5,880	3,130	*1,060	*1,070	906
14	9,170	5,170	3,270	1,100	1,080	874
15	10,800	5,350	*4,860	1,140	1,060	858
16	11,000	5,260	3,600	1,200	1,060	850
17	*9,610	6,180	3,100	1,240	1,020	858
18	8,710	8,710	2,960	1,300	1,000	829
19	8,580	7,530	*3,300	1,360	*1,010	*822
20	*7,650	*12,500	2,880	1,380	994	815
21	7,810	8,600	2,620	*1,370	986	858
22	6,520	7,890	*2,370	1,320	970	822
23	6,850	6,630	2,300	1,280	*954	815
24	*6,220	5,580	2,200	1,280	938	822
25	5,770	4,930	2,120	1,270	938	829
26	5,710	*4,660	*2,110	1,270	938	850
27	*6,060	4,270	2,150	1,230	946	*822
28	6,010	5,200	2,090	1,220	930	822
29	5,910	4,500	1,950	*1,210	*914	808
30	5,530	4,090	*1,870	1,180	906	808
31	5,800	3,930	-----	1,160	-----	801
Mean	7,620	6,160	3,180	1,330	1,050	867
Cs/mi	8.28	6.70	3.46	1.45	1.14	0.94
In	9.55	7.72	3.85	1.66	1.27	1.09
Ac.ft.	469,000	389,000	189,000	81,900	62,400	53,300

M.Acre-feet. 2.59 Maximum day 14,100 Minimum day 436

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
4 Jan	732	40	11			
12 Jan	732	41	25			
15 Jan	726	42	19			
22 Jan	732	40	14			
30 Jan	794	41	26			
2 Feb	690	44	4			
8 Feb	756	40	12			
9 Feb	570	46	29			
13 Feb	1,040	37	226			
14 Feb	460	40	20			
19 Feb	938	43	36			
27 Feb	1,000	44	13			
28 Feb	1,370	45	776	10	52	38
4 Mar	2,220	46	1,800	26	56	18
12 Mar	1,010	45	56			
14 Mar	970	48	44			
19 Mar	1,190	47	73			
22 Mar	1,700	47	3,400	7	46	47
27 Mar	1,420	54	65			
3 Apr	2,400	60	392			
9 Apr	1,880	54	63			
12 Apr	2,270	52	221			
19 Apr	3,610	49	720	41	39	20
25 Apr	6,850	52	7,280	24	55	21
28 Apr	4,060	54	288			
4 May	4,800	53	332			
12 May	5,290	50	1,230	24	14	62
16 May	13,300	52	4,020	3	88	9
23 May	6,100	55	207			
25 May	6,820	58	191			
30 May	10,500	50	1,840	48	9	43
6 Jun	10,400	50	1,360	29	17	54
12 Jun	8,780	55	189			
14 Jun	10,800	58	497	32	45	23
18 Jun	13,200	62	1,040	55	31	14

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
26 Jun	10,300	56	453			
1 Jul	5,830	52	180			
4 Jul	8,340	60	5,360	13	76	11
8 Jul	6,850	49	108			
10 Jul	7,390	56	110			
17 Jul	8,230	60	361			
20 Jul	6,670	60	125			
24 Jul	6,370	58	456	42	27	31
27 Jul	5,350		94			
1 Aug	6,100	61	162			
3 Aug	6,880	64	6,680	62	35	3
5 Aug	8,710	64	16,800	10	65	25
9 Aug	4,980	65	431			
13 Aug	6,180	64	3,850	11	77	12
20 Aug	12,500	60	9,100	59	35	6
26 Aug	4,320	64	1,290	33	27	40
3 Sep	4,350	65	2,080	39	44	17
6 Sep	4,870	64	4,170	28	49	23
9 Sep	3,130	69	246			
15 Sep	4,350	66	1,460	35	43	22
19 Sep	3,520	64	4,720	12	52	36
22 Sep	2,330	64	129			
26 Sep	2,130	61	1,780	7	56	37
30 Sep	1,910	56	60			
5 Oct	1,600	65	55			
13 Oct	1,060	62	100			
21 Oct	1,330	56	36			
29 Oct	1,210	55	22			
5 Nov	1,090	53	39			
13 Nov	1,090	50	37			
19 Nov	1,060	44	30			
23 Nov	986	46	47			
29 Nov	938	44	48			
4 Dec	970	47	41			
7 Dec	986	46	59			
10 Dec	946	40	48			
19 Dec	815	44	44			
27 Dec	822	45	61			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

KUNHAR RIVER NEAR GARHI HABIB ULLAH

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	TOTAL Cations	TOTAL Anions	PARTS PER MILLION SiO_2	Fe	B	D.S. by Evap.	EC x 10^6 at 25 °C	pH	Res CO_3 me/l	SAR
Jan 4	1.60	1.10	.25		0	1.67	.10	1.20			2.95	2.97				170	290	7.8	0	.2
Feb 2	2.00	1.00	.25		0	1.70	.10	1.40			3.25	3.26				184	320	7.8	0	.2
Mar 4	1.50	1.00	.40		0	2.06	.29	.60			2.90	2.95				160	280	7.8	0	.4
Apr 3	1.30	.60	.20		T	1.63	.10	.40			2.10	2.13				112	200	8.2	0	.6
May 4	1.10	.70	.30		0	1.48	.20	.40			2.10	2.08				116	200	7.8	0	.3
Jun 6	1.30	1.50	.28		0	1.38	.20	.50			2.08	2.08				112	2.00	8.1	0	.3
Jul 4	1.00	1.10	.42		0	1.92	.20	.40			2.52	2.52				1.36	240	7.7	0	.4
Aug 1	.80	.40	.38		0	1.28	.20	.10			1.58	1.58				88	150	7.5	.08	.5
Sep 3	1.15	.65	.25		0	1.55	.10	.40			2.05	2.05				112	200	7.9	0	.3
Oct 6	1.50	.70	.54		0	1.84	.20	.70			2.74	2.74				152	260	8.1	0	.5
Nov 5	1.50	1.10	.25		0	1.65	.10	1.10			2.85	2.85				156	270	8.0	0	.2
Dec 4	1.70	1.00	.55		0	2.70	.10	.40			3.25	3.20			0	180	300	8.1	0	.5

Location Latitude 34°07', Longitude 73°30', on right bank nearly 1½ miles downstream of Kohala Bridge on Murree Muzaffarabad Road.

Drainage area 9,610 square miles.

Record available Gauge height record of old gauge from January 1960 to December 1968 by Surface Water Hydrology Project, WASID, WAPDA. Periodic discharge measurements started from December 1964. Gauge height record from 1899 to date with Hydrology and Floods Directorate of Irrigation Department, Lahore. The new gauge was established by Surface Water Hydrology Project, on right bank since April 1968.

Average discharge 28,000 cusecs (18,660,000 acre feet per year or 39.46 inches runoff per year). Average taken for 11 years from 1965 to 1975.

Extremes Maximum discharge during the year 99,800 cusecs on 17 May (gauge height 31.05 feet); minimum daily discharge 4,680 cusecs on 26 January.

1965-75: Maximum discharge observed 132,000 cusecs on 24 April 1965 (gauge height 64.00 feet old gauges); minimum daily discharge 3,540 cusecs on 8 January 1972.

Gauge Staff gauge fixed on steps on right bank near the cableway nearly 1½ miles downstream of Kohala Bridge. Gauge being read at one hour interval throughout the year. R.L. of gauge 1843.27 (levelling in May 1969). Prior to this a staff gauge was fixed on left bank upstream of Kohala bridge and used upto December 1968.

Measurements Fifty three discharge observations were made during the year by 0.2 and 0.8 on 0.6 depth method. Thirty six sets of sediment samples were taken by depth integration or point sampling method using D-49 or P-50 sampler from cableway. Ten of these were analysed for particle size distribution and the rest for total concentration. Eight surface samples were collected and analysed for chemical composition.

Determination of discharge The station is controlled by the channel characteristics. The gauge discharge relation could be affected by movement of stones and boulders on the bed of the channel. Rating dated 25.1.75 was used from 1.175 to 30.6.75, and rating dated 24.8.76 was used from 1.7.75 to 31.12.75, to compute the mean daily discharges with shift adjustments where indicated necessary by periodic measurements.

Remarks Record fair.

JHELUM RIVER AT KOHALA

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	5,230	5,510	14,200	31,600	53,100	69,600
2	5,200	5,340	13,700	32,100	54,800	67,300
3	5,050	5,400	13,200	*34,200	*56,200	*69,900
4	4,920	5,440	21,900	36,700	57,100	63,200
5	4,950	5,750	24,800	35,100	53,400	61,700
6	4,930	5,910	22,000	35,000	50,800	61,900
7	5,010	5,770	20,600	35,100	47,700	63,700
8	5,050	6,290	19,100	34,200	46,800	59,600
9	5,010	6,370	*18,400	32,500	49,400	59,000
10	5,000	5,790	18,400	30,800	51,300	57,100
11	4,980	6,100	21,200	31,100	52,000	53,200
12	5,010	6,760	19,200	31,800	53,900	55,800
13	*4,910	10,980	19,100	*31,400	*59,300	57,800
14	4,830	7,970	18,400	29,300	63,200	62,100
15	4,960	7,540	18,200	27,200	67,100	64,200
16	5,090	*7,690	*18,400	27,200	81,000	67,200
17	5,000	7,780	18,800	29,700	88,700	69,800
18	4,870	8,160	19,300	33,000	75,400	69,400
19	4,770	8,500	19,700	36,100	70,200	73,400
20	4,770	8,660	20,200	32,700	68,700	70,700
21	4,820	8,630	20,500	33,000	66,400	65,300
22	4,970	8,580	23,900	36,100	63,800	53,700
23	4,920	*8,760	31,600	37,200	64,400	52,500
24	4,860	8,970	28,200	*40,600	65,200	52,900
25	4,780	9,330	*26,900	50,400	66,100	57,700
26	4,680	9,840	26,700	60,800	66,600	61,000
27	*4,740	10,300	26,400	63,400	68,700	60,700
28	4,790	13,700	27,200	57,600	*71,200	*62,200
29	4,910	------	28,200	53,300	71,400	55,900
30	5,220	------	29,300	52,300	73,300	48,200
31	5,680	------	30,500	------	72,100	------
Mean	4,970	7,710	21,900	37,700	62,900	61,600
Cs/mi	0.52	0.80	2.28	3.92	6.54	6.41
In	0.60	0.83	2.62	4.38	7.54	7.15
Maf.	.305	.428	1.35	2.24	3.87	3.66

1975 Year: Mean 30,600 Cs/sq mi 3.18 Inches 43.2

Note : * Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	*46,000	52,500	52,700	*18,700	7,640	5,830
2	44,800	*53,600	*50,800	18,100	7,410	5,890
3	46,100	53,600	52,800	17,600	7,280	5,860
4	*50,900	53,500	50,600	17,000	7,190	*5,900
5	54,100	*54,800	49,500	16,500	7,080	6,190
6	51,000	47,900	*47,900	16,400	6,920	6,480
7	48,200	*45,600	47,100	16,200	7,190	*6,900
8	*47,200	43,400	44,800	15,800	8,590	6,860
9	48,600	41,400	*42,100	15,000	9,380	6,580
10	47,800	41,500	40,000	14,500	8,330	6,430
11	*52,300	40,100	*39,900	14,100	7,930	6,380
12	57,000	*41,600	39,900	13,400	7,580	6,290
13	58,300	42,500	38,900	12,800	7,410	6,190
14	54,700	38,600	*37,500	12,500	7,320	6,090
15	62,300	*38,000	38,700	12,100	7,220	6,050
16	*90,000	41,800	*36,100	11,700	7,100	6,140
17	*75,500	43,800	34,400	11,400	6,990	6,090
18	*65,700	49,200	32,300	11,000	6,840	6,110
19	66,400	*49,900	31,500	10,600	6,740	6,110
20	63,900	*70,000	30,000	10,100	*6,630	5,980
21	65,200	*62,500	28,100	9,820	6,550	*5,920
22	59,800	56,800	*26,500	9,520	6,500	5,970
23	59,500	55,700	25,300	*9,210	6,360	5,930
24	60,800	*49,100	*24,100	8,940	6,240	5,800
25	*59,200	46,500	23,200	8,730	6,170	5,750
26	58,100	44,800	*22,200	8,570	6,110	5,870
27	*59,100	43,600	21,400	8,410	*6,090	5,830
28	58,800	*71,600	20,800	8,210	*6,080	5,710
29	57,700	70,300	*19,900	8,050	6,010	5,690
30	*53,700	59,200	19,100	7,890	5,890	5,650
31	52,900	54,900	------	7,790	-----	5,600
Mean	57,300	50,300	35,600	12,300	7,030	6,070
Cs/mi	5.96	5.23	3.70	1.28	0.73	0.63
In	6.87	6.03	4.13	1.47	0.82	0.73
Maf.	3.52	3.09	2.12	.755	.418	.373

M. Acre-feet. 22.1 Maximum day 90,000 Minimum day 4,680

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
13 Jan	4,900	49	11			
27 Jan	4,800	52	9			
16 Feb	7,720	43	64			
23 Feb	8,840	60	68			
9 Mar	18,400	58	249			
25 Mar	27,600	58	857	17	49	34
3 Apr	35,200	59	637	18	39	43
24 Apr	40,700	72	597	10	55	35
3 May	56,300	62	710	29	32	39
28 May	73,000	60	652	19	46	35
3 Jun	72,100	60	273			
28 Jun	62,100	62	642	16	57	27
1 Jul	46,600	61	162			
4 Jul	53,600	68	370			
8 Jul	49,000	63	295			
11 Jul	56,100	65	320			
16 Jul	97,900	62	2,980	26	56	18
27 Jul	60,200	70	384			
30 Jul	53,400	70	269			
2 Aug	52,100	70	211			
9 Sep	42,600	74	272			
11 Sep	40,900	70	275			
14 Sep	38,500	72	232			
16 Sep	36,700	71	204			
24 Sep	24,500	68	349			
26 Sep	22,800	66	195			
29 Sep	20,100	64	216			
23 Oct	9,210	58	42			
20 Nov	6,650	48	39			
4 Dec	6,000	45	28			
21 Dec	5,930	46	19			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

JHELUM RIVER AT KOHALA

Chemical Analysis of Water Samples - 1975

Date	Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	TOTAL Cations	TOTAL Anions	SiO_2	Fe	B	D.S. by Evap.	EC x 10^6 at 25 °C	pH	Res. CO_3	SAR
	MILLIEQUIVALENTS PER LITRE												PARTS PER MILLION						me/l	
Feb 23	1.30	1.10	.40		T	2.14	.10	.60			2.80	2.84				164	280	8.2	0	.4
27	1.20	1.30	.30		0	2.04	.20	.60			2.80	2.84				164	280	7.9	0	.3
Mar 25	1.20	.60	.20		0	1.63	.10	.30			2.00	2.03				116	200	7.8	0	.2
May 28	1.20	.60	.30		0	1.60	.20	.30			2.10	2.10				116	200	8.1	0	.2
Jun 5	1.40	.40	.38		0	1.69	.20	.20			2.18	2.18				116	200	8.1	0	.4
Jul 4	1.00	.40	.24		0	1.34	.20	.10			1.64	1.64				96	190	7.7	0	.3
Sep 29	1.40	.60	.25		0	1.65	.20	.40			2.25	2.25				128	220	8.0	0	.3
Oct 23	1.60	.80	.24		0	1.94	.20	.50			2.64	2.64				144	250	8.0	0	.3
Nov 20	1.50	.70	.30		0	1.98	.18	.60			2.70	2.76				152	260	8.1	0	.3
Dec 4	1.40	1.00	.35		0	2.42	.18	.20			2.76	2.80				152	260	8.1	0	.3

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Location Latitude 33°36', Longitude 73°37', wire weight gauge fixed on downstream side of the bridge on Rawalpindi Kotli (Azad Kashmir) Road, nearly 45 miles from Rawalpindi.

Drainage area 10,300 square miles.

Record available Mean daily discharge record from April 1969 to date by Surface Water Hydrology Project, WASID, WAPDA. Gauge height observations were started from 27 January 1969.

Average discharge 25,500 cusecs (18,450,000 runoff in acre feet per year and 33.56 runoff in Inches per year) Average taken for six year from 1970 to 1975.

Extremes Maximum discharge observed during the year 117,000 cusecs on 16 July (gauge height 62.30 feet); minimum daily discharge 4,920 cusecs on 20 January.

1970-75: Maximum discharge observed 117,000 cusecs on 16 July 1975 (gauge height 62.30); minimum daily discharge, 3,730 cusecs on 8 and 13 January 1972.

Gauge Wire weight gauge read to hundredth of a foot at one hour interval for whole day throughout the year. Gauge set to arbitrary datum.

Measurements Sixty five discharge observations were made during the year from the bridge using 0.2 and 0.8 depth method. Forty nine sets of sediment samples were taken by depth integration or point sampling method using D-49 or P-50 sampler from the bridge. Twenty four of these were analysed for particle size distribution and the rest for total concentration. Eight surface samples were collected and analysed for chemical composition.

Determination of discharge Previous rating table dated 30.5.70 was used to compute mean daily discharges with shift adjustment as indicated necessary by periodic discharge observations.

Remarks Record fair.

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	5,620	6,650	14,000	32,500	53,600	66,400
2	5,530	*6,040	13,400	32,500	*55,100	64,500
3	5,350	5,980	12,900	34,800	55,700	67,400
4	5,180	6,000	*21,500	36,300	56,300	62,600
5	5,080	6,400	27,700	*35,800	54,100	61,200
6	5,270	6,590	22,800	35,300	51,400	*62,800
7	5,320	6,320	21,000	35,500	*47,800	63,800
8	5,410	*7,690	19,700	35,100	47,200	61,300
9	5,360	7,800	18,700	*33,200	49,600	59,300
10	5,320	6,640	*18,500	31,500	*51,000	57,600
11	5,340	7,070	24,400	31,800	51,400	53,900
12	5,390	*7,480	21,200	32,400	52,800	56,400
13	5,330	15,700	20,200	*31,800	56,100	*57,400
14	5,190	10,300	*19,700	30,000	60,700	61,500
15	5,090	7,840	19,600	27,700	63,500	61,400
16	*5,400	7,890	19,700	27,700	*72,600	67,600
17	5,370	7,840	19,800	30,100	*87,300	70,300
18	5,170	8,240	20,300	33,600	75,300	70,100
19	4,960	*8,690	*20,900	36,100	*67,800	71,700
20	4,920	8,790	21,300	34,300	65,100	71,100
21	5,060	8,940	21,900	33,600	63,300	66,200
22	*5,180	8,790	25,400	36,800	60,700	56,900
23	5,310	8,910	*37,800	37,700	60,400	54,000
24	5,190	9,240	32,000	39,900	61,900	54,000
25	5,100	9,580	29,100	50,200	62,600	56,600
26	5,370	*10,300	28,400	60,800	*63,200	60,000
27	4,960	10,900	28,200	63,600	65,100	61,000
28	5,100	13,300	28,400	57,900	67,800	61,600
29	5,200	------	29,200	*54,700	67,800	58,100
30	5,620	------	30,000	53,300	69,900	*51,800
31	*7,040	------	*31,400	------	*69,300	------
Mean	5,310	8,430	23,200	38,200	60,900	61,600
Cs/mi	0.52	0.82	2.25	3.71	5.91	5.98
In	0.59	0.85	2.60	4.14	6.81	6.67
Maf.	.327	.468	1.43	2.27	3.74	3.67

1975 Year: Mean 31,100 Cs/sq mi 3.02 Inches 40.95

Note : *Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	46,200	51,500	52,900	18,700	8,460	6,940
2	44,500	*52,500	57,000	18,100	8,370	7,130
3	45,000	54,700	56,000	17,800	8,220	7,060
4	50,100	52,300	*52,700	17,500	8,060	6,990
5	53,300	56,300	53,600	*17,000	7,970	*7,110
6	49,900	50,100	49,900	16,600	7,870	7,360
7	48,100	*47,000	50,600	16,200	7,950	7,230
8	46,700	44,700	47,400	15,600	*9,560	7,280
9	48,000	42,500	*45,700	15,200	10,200	6,840
10	47,000	*41,500	44,300	15,000	9,410	6,660
11	51,500	40,800	42,900	14,300	8,810	*6,620
12	*55,400	*48,800	42,300	13,800	8,420	6,620
13	56,500	46,000	40,500	13,500	*8,240	6,670
14	57,100	39,900	*39,900	*13,100	8,100	6,700
15	64,400	38,700	41,100	12,700	8,110	6,720
16	*92,300	*42,200	38,800	12,300	8,020	6,730
17	75,400	41,500	37,500	11,700	7,910	6,650
[illegible]	64,300	*50,200	*35,400	*11,400	7,730	[illegible]
19	[illegible]	51,500	34,300	11,100	[illegible]	[illegible]
20	61,700	[illegible]	[illegible]	[illegible]	[illegible]	6,690
21	*65,100	63,000	30,500	10,500	*7,740	6,700
22	58,200	*62,100	*28,900	10,200	7,670	*6,830
23	*57,400	58,400	27,400	9,940	7,570	6,720
24	58,400	50,700	25,800	9,650	7,390	6,640
25	57,000	46,300	*24,500	*9,510	7,250	6,610
26	56,700	44,800	23,500	9,350	7,180	6,730
27	56,900	*43,200	22,600	9,200	7,130	6,700
28	58,000	*78,500	21,700	9,000	7,070	*6,590
29	*57,200	69,600	20,400	8,800	*6,990	6,520
30	53,500	58,000	*19,300	8,680	6,980	6,450
31	51,500	*54,100	------	*8,580	-----	6,430
Mean	56,400	51,700	38,000	12,800	7,990	6,790
Cs/mi	5.48	5.02	3.69	1.24	0.78	0.66
In	6.32	5.79	4.12	1.43	0.87	0.76
Maf.	3.47	3.18	2.26	.785	.476	.416

M.Acre-feet. 22.5 Maximum day 92,300 Minimum day 4,920

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
22 Jan	5,160	50	112			
31 Jan	6,900	50	859	11	39	50
2 Feb	6,020	54	46			
8 Feb	7,880	52	668	51	15	34
19 Feb	8,800	52	69			
26 Feb	10,300	54	134			
4 Mar	33,400	54	511	6	29	65
10 Mar	18,200		263			
19 Mar	21,000		351	9	62	29
23 Mar	41,500	52	3,090	13	48	39
31 Mar	32,000	62	530	8	50	42
5 Apr	36,400	59	172			
13 Apr	32,000	60	194			
29 Apr	55,200	64	236			
2 May	54,900	64	619	23	49	28
3 May	71,600	66	208			
7 May	47,500	66	436	7	56	37
10 May	51,100	62	645	46	39	15
16 May	79,600	76	1,010	20	41	39
17 May	92,400	66	1,780	17	61	22
19 May	68,800	67	1,140	31	52	17
26 May	63,700	64	774	51	24	25
6 Jun	60,300	66	277			
12 Jul	56,000	72	1,260	28	51	21
16 Jul	82,500	74	3,320	31	50	19
23 Jul	58,900	73	1,170	23	42	35
29 Jul	56,600	72	478	24	49	27
2 Aug	50,400	76	302			
7 Aug	50,300	76	371			
10 Aug	41,100	76	313			
12 Aug	60,400	77	5,750	10	64	26
16 Aug	44,600	77	2,340	10	40	50
18 Aug	56,300	78	3,190	22	44	34
20 Aug	86,800	75	6,380	14	64	22
22 Aug	68,800	76	21,400	1	53	46

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Percent Silt	Percent Clay
28 Aug	79,500	70	11,700	55	34	11
4 Sep	51,800	76	2,470	7	64	29
14 Sep	39,900	75	265			
18 Sep	34,900	77	260			
22 Sep	28,900	71	258			
30 Sep	19,500	69	123			
14 Oct	13,200	66	418			
18 Oct	11,500	64	57			
25 Oct	9,460	60	148			
8 Nov	9,820	60	140			
21 Nov	7,660		63			
5 Dec	7,110	49	54			
11 Dec	6,550	50	52			
22 Dec	6,600	50	23			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

JHELUM RIVER AT KAROT

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE										TOTAL		PARTS PER MILLION				$EC \times 10^6$ at 25 °C	pH	Res CO_3 me/l	SAR
	Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	Cations	Anions	SiO_2	Fe	B	D.S. by Evap.				
Jan 16	1.40	1.0	.50		0	1.96	.19	.80			2.90	2.95				160	280	7.8	0	.5
Mar 14	1.30	.60	.40		0	1.94	.19	.20			2.30	2.33				132	230	7.7	.04	.4
Jun 30	1.20	.70	.18		0	1.40	.20	.40			2.08	2.08				112	200	8.0	0	.2
Aug 27	1.20	.80	.35		0	1.76	.39	.20			2.35	2.35				128	220	7.6	0	.4
Sep 25	1.30	.66	.28		0	1.84	.20	.20			2.24	2.24				124	220	8.0	0	.3
Oct 31	.90	1.30	.45		0	2.04	.18	.40			2.65	2.62				144	250	8.0	0	.4
Nov 29	1.40	.80	.20		0	2.04	.18	.20			2.40	2.42				128	220	8.1	0	.2
Dec 28	2.01	.94	.30		0	2.10	.20	.90			3.25	3.20			.10	180	300	7.8	0	.2

Location Latitude 33°14', Longitude 73°26', on right bank about 2 miles downstream from Palote village and about 10 miles South east of Gujar Khan, about 5 miles upstream from old site near Jhangi.

Drainage area 429 square miles.

Record available Mean daily discharge record from April 1970 to date by Surface Water Hydrology Project, WASID, WAPDA.

Average discharge 163 cusecs (117,000 runoff in acre feet per year and 5.15 runoff in inches per year); Average taken for five years from 1971 to 1975.

Extremes Maximum discharge observed 13,400 cusecs on 22 August (gauge height 11.20 feet); min daily discharge 1.1 cusecs on 4 July.

1970-75: Maximum discharge observed 53,700 cusecs on 23 June 1971; (gauge height 21.80), minimum daily discharge 1.1 cusecs on 19 June 1973 and 4 July 1975.

Gauge Staff gauge graduated and read to hundredth of a foot 9 times a day or more often during floods.

Measurements Seventy six discharge observations were made during the year by current meter using 0.2 and 0.8 or 0.6 depth method. Low flow measurements were made by wading and high flow measurements from cableway. Forty four sets of sediment samples were taken by depth integration method using DH-48 sampler while wading and D-49 sampler from cableway. Seventeen of these were analysed for particle size and rest for total concentration. Eight surface samples were collected and analysed for chemical composition.

Determination of discharge This station has channel control and sandy channel seems to shift nearly continuously. Previous rating table dated 7.4.71 was used to compute mean daily discharges with shift adjustments as indicated necessary by periodic discharge measurements.

Remarks Record fair, low flow gauges affected by back water due to diversion of water for flour mills.

KANSHI RIVER NEAR PALOTE

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	22	20	62	15	8.4	3.0
2	18	*64	51	17	5.2	4.0
3	18	*44	24	*21	7.0	3.0
4	17	*30	25	22	*93	4.0
5	*21	*29	26	48	33	4.0
6	20	*29	24	51	11	*12
7	20	*26	22	39	12	4.0
8	20	*44	13	25	8.2	3.0
9	21	*64	13	23	*6.6	3.0
10	21	*40	12	20	4.2	3.0
11	23	34	15	22	4.2	4.0
12	20	39	*44	18	3.5	5.0
13	*20	38	36	19	3.0	*5.0
14	19	122	16	14	3.0	6.0
15	19	48	10	11	3.0	5.0
16	21	47	10	11	*11	4.0
17	19	40	8	*8.2	*206	2.0
18	19	31	*8	8.4	83	3.0
19	*17	*35	17	8.6	40	2.0
20	17	25	16	9.2	*14	3.0
21	17	23	16	9.8	15	*9.0
22	17	21	*127	10	9.8	3.0
23	17	20	*184	*20	*8.4	3.0
24	18	20	107	20	7.0	3.0
25	18	20	88	20	6.0	2.0
26	18	21	48	12	6.0	2.0
27	*18	19	*38	11	5.0	4.0
28	18	46	29	*14	4.0	*4.0
29	19	---	27	13	5.0	17
30	19	---	23	12	*5.0	12
31	19	---	19	---	4.0	-----
Mean	19	37	37	18	20	4.7
Cs/mi	0.04	0.09	0.09	0.04	0.05	0.01
In	0.05	0.09	0.10	0.05	0.06	0.01
Ac-ft.	1,170	2,060	2,300	1,100	1,260	280

1975 Year: Mean 107 Cs/sq mi 0.25 Inches 3.4

Note : *Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	4.2	24	30	23	15	16
2	10	16	29	23	15	17
3	1.6	*676	39	22	15	17
4	1.1	268	35	20	15	17
5	*70	*366	127	18	15	17
6	24	*1,990	*1,910	19	*15	*18
7	26	*358	988	19	15	18
8	11	66	2,310	19	15	17
9	*29	39	536	19	15	17
10	18	30	*98	*19	15	17
11	19	27	72	19	15	16
12	14	*64	60	18	15	*16
13	14	42	47	17	16	17
14	*456	26	83	18	15	17
15	*1,590	24	184	18	15	17
16	*428	27	*275	17	15	17
17	120	39	199	17	15	16
18	115	140	*288	*16	*16	16
19	167	*542	*721	18	15	16
20	*202	848	316	17	15	*17
21	*1,780	*2,640	64	18	*15	17
22	1,530	*4,080	*80	20	15	16
23	79	*2,990	93	19	17	16
24	33	711	56	*20	16	17
25	22	320	38	16	15	17
26	17	*103	*26	15	16	17
27	25	41	26	15	16	*17
28	83	*726	23	15	16	17
29	83	205	23	15	*17	17
30	103	110	23	15	17	17
31	*42	40	-----	*15	---	17
Mean	229	567	293	18	15	17
Cs/mi	0.53	1.32	0.68	0.04	0.04	0.04
In	0.62	1.52	0.76	0.05	0.04	0.05
Ac-ft.	14,100	34,900	17,400	1,110	916	1,030

Acre-feet. 77,600 Maximum day 4,080 Minimum day 1.1

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
5 Jan	20.8	56	27			
13 Jan	19.6	52	36			
28 Jan	18	52	48			
2 Feb	62	52	198			
10 Feb	40	54	57			
14 Feb	142	54	356			
3 Mar	23.5	62	61			
12 Mar	45	63	120			
22 Mar	133	60	2,770	1	29	70
23 Mar	209	60	2,250	2	32	66
3 Apr	21.2	68	91			
28 Apr	14.4	80	50			
4 May	95	76	218			
9 May	6.6	86	295			
16 May	10.8	74	11			
17 May	209	74	1,450	8	36	56
30 May	4.6	86	165			
6 Jun	12	84	197			
13 Jun	5.4	90	51			
28 Jun	11	80	218			
5 Jul	85	84	4,910	1	70	29
9 Jul	31	90	557	2	31	67
14 Jul	1,050	84	22,700	7	70	23
15 Jul	3,100	82	4,650	6	54	40
16 Jul	164	92	561			
21 Jul	4,350	84	19,200	5	66	29
3 Aug	2,300	76	184			
6 Aug	6,670	76	6,160	17	55	28
17 Aug	3,400	74	16,600	11	61	28
19 Aug	2,790	76	13,000	12	47	41
22 Aug	11,200	66	4,730	26	54	20
28 Aug	2,880	64	5,970	11	55	34
6 Sep	1,070	70	3,700	2	39	59
10 Sep	82.5	82	104			
10 Sep	97.5	74	25,200	26	52	22

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
14 Sep	11,700	78	36,500		52	48
16 Sep	223	71	1,290	2	25	73
18 Sep	139	72	590			
19 Sep	1,520	70	331			
10 Oct	18.8	68	46			
25 Oct	16.2	60	19			
6 Nov	15.3	52	18			
13 Nov	15.6	52	9			
29 Nov	15.9	44	26			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

KANSHI RIVER NEAR PALOTE

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	TOTAL Cations	TOTAL Anions	PARTS PER MILLION SiO_2	Fe	B	D.S. by Evap.	EC×10^6 at 25 °C	pH	Res CO_3 me/l	SAR
Feb 26	1.20	1.00	3.30		.39	3.60	1.06	.40			5.50	5.45				320	530	8.3	1.79	2.4
May 20	.85	1.05	3.45		0	3.60	1.29	.40			5.35	5.29				300	510	7.7	1.70	3.5
Jun 21	1.20	.80	5.80		0	4.24	2.36	1.20			7.80	7.80				440	730	7.7	2.24	5.8
Jul 20	1.40	1.00	.79		0	2.30	.59	.30			3.19	3.19				176	300	7.7	0	.7
Aug 23	.80	.60	1.69		0	2.40	.39	.30			3.09	3.09				168	290	7.7	1.00	.6
Sep 22	1.04	.95	2.30		0	2.71	.88	.70			4.29	4.29				232	400	8.1	.72	2.4
Oct 18	1.30	1.00	3.10		0	3.59	.90	1.00			5.40	5.49				296	500	8.1	1.29	2.9
Nov 21	1.10	1.30	3.00		0	3.88	.81	.80			5.40	5.49				300	510	7.9	1.48	2.7

POONCH RIVER NEAR KOTLI - 1975

Location Latitude 33°29', Longitude 73°53', on left bank just downstream from Ban Nullah, 3 miles South west of Kotli.

Drainage area 1,250 square miles.

Record available Discharge records November 1959 to date (with automatic water stage recorder since September 1960) by Surface Water Hydrology Project, WASID, WAPDA. Augst 1954 to December 1956 by Dams Investigation Circle, data with Indus Basin Development Board, Lahore.

Average discharge 3,980 cusecs (2,860,000 acre feet per year or 42.79 inches runoff per year). Average taken for 16 years from 1960 to 1975.

Extremes Maximum discharge observed during the year 241,000 cusecs on 28 Augst (gauge height 1717.05 feet); minimum daily discharge 434 cusecs on 21 January.

1960-75: Maximum discharge 327,000 cusecs on 8 September 1966; minimum daily discharge 203 cusecs on 23 January 1961.

Gauge Automatic water stage recorder in masonry shelter. Prior to September 1960 staff gauge near same site. Zero gauge datum of staff gauge at 1673.31 R.L. The gauge being read at one hour interval daily and used during the year. The recorder worked during high flow periods only.

Measurements Sixty three discharge measurements were made periodically by current meter using 0.2 and 0.8 or 0.6 depth method from car on overhead cableway near the gauge. Forty three sets of sediment samples were taken by depth integration method using D-49 sampler. Sixteen of these were analysed for particle size distribution and the rest for total concentration. Eight surface samples were collected and analysed for chemical composition.

Determination of discharge This station has an unstable control that shifts readily during the numerous rises that occur. Rating dated 19.3.74 was used. Discharge were computed by shift adjustments based on discharge measurements.

Remarks Record fair.

POONCH RIVER NEAR KOTLI

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	518	2,130	3,830	5,140	3,350	3,420
2	518	1,220	3,000	5,380	3,220	3,260
3	512	*940	2,840	6,440	*3,350	3,510
4	506	881	*6,500	*5,920	4,800	3,170
5	500	809	5,490	5,250	4,800	3,110
6	494	950	3,480	4,920	3,530	3,040
7	482	881	2,980	4,720	3,220	*3,150
8	482	1,890	2,800	4,550	3,170	3,960
9	494	2,620	2,700	3,800	2,390	3,730
10	476	1,810	4,270	3,370	*3,530	3,310
11	488	*1,420	*10,400	*3,420	3,370	2,760
12	488	1,380	4,600	*3,350	3,460	2,780
13	*494	12,900	3,680	3,330	3,730	2,860
14	488	5,420	3,730	2,900	3,780	*3,360
15	*482	3,090	3,860	2,580	3,510	3,370
16	470	2,420	3,600	2,600	4,920	3,370
17	458	2,210	3,650	3,310	*10,600	3,650
18	452	2,140	*3,650	3,560	5,560	3,420
19	446	*2,080	3,680	*3,830	3,730	3,680
20	440	2,130	3,600	3,390	3,690	4,740
21	434	2,020	3,440	3,350	3,690	*3,730
22	518	1,870	5,100	4,070	3,170	3,090
23	702	2,000	*17,400	7,440	2,980	3,150
24	574	1,950	8,280	4,550	*3,170	2,980
25	548	2,190	5,770	5,170	3,220	2,580
26	548	2,480	5,100	*10,400	3,390	2,700
27	*567	*2,540	4,890	10,900	3,240	2,880
28	554	4,380	4,830	5,140	3,460	*6,200
29	560	-----	4,860	3,830	4,180	5,770
30	1,030	-----	*4,920	3,480	4,040	2,960
31	2,920	-----	4,920	-----	*3,240	-----
Mean	601	2,460	4,900	4,620	3,890	3,460
Cs/mi	0.48	1.96	3.92	3.70	3.11	2.76
In	0.55	2.05	4.52	4.13	3.58	3.08
Ac.ft.	37,000	136,000	301,000	275,000	239,000	206,000

1975 Year: Mean 4,750 Cs/sq mi 3.80 Inches 51.55

Note : *Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	3,060	3,830	11,900	3,440	1,270	854
2	3,350	13,100	16,700	3,390	1,250	818
3	*2,680	*9,440	*11,300	*2,480	1,250	*764
4	3,280	9,800	8,360	2,560	*1,250	764
5	3,460	*20,700	10,700	2,480	1,220	755
6	2,940	10,600	6,840	2,480	1,190	755
7	3,310	9,440	*12,600	2,370	1,160	746
8	3,420	7,360	6,720	2,290	1,180	737
9	3,170	*6,520	7,280	2,240	1,190	728
10	3,170	4,890	7,520	2,110	1,160	719
11	3,020	5,800	*28,200	2,050	1,060	710
12	5,070	*31,700	12,100	*2,020	*960	710
13	4,040	10,600	9,640	1,970	1,030	702
14	6,080	6,640	8,680	1,940	*970	702
15	24,600	*5,770	10,500	1,870	930	694
16	*49,700	7,800	5,100	1,810	950	686
17	13,100	8,280	11,000	1,780	960	678
18	6,400	*26,000	8,000	1,740	960	670
19	8,920	31,100	8,920	*1,710	980	*662
20	7,000	*71,000	8,500	1,680	990	662
21	14,000	*18,900	8,560	1,600	980	654
22	6,440	27,800	8,720	1,530	*1,010	654
23	5,420	30,100	*4,830	1,520	990	662
24	7,120	*13,700	4,020	1,490	990	662
25	*6,240	10,000	3,390	1,420	980	670
26	5,590	7,000	3,150	*1,390	970	*678
27	5,040	*6,120	2,480	1,420	970	678
28	6,320	71,500	2,500	1,420	960	670
29	*9,100	21,900	2,780	1,360	*950	662
30	4,740	*15,600	*2,780	1,360	910	670
31	4,020	13,200	-----	*1,320	-----	670
Mean	7,540	17,300	8,450	1,710	1,050	700
Cs/mi	6.03	13.85	6.76	1.37	0.84	0.56
In	6.96	15.97	7.55	1.58	0.94	0.69
Ac.ft.	463,000	106,0000	503,000	105,000	62,700	43,000

M.Acre-feet. 3.44 Maximum day 71,500 Minimum day 434

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
15 Jan	482	51	122			
27 Jan	567	51	31			
3 Feb	950	54	28			
11 Feb	1,450	58	20			
19 Feb	2,820	56	23			
4 Mar	3,330	60	31			
4 Mar	11,300	58	4,060	12	65	23
11 Mar	10,400	58	849	4	46	50
18 Mar	3,800	58	44			
23 Mar	14,200	58	1,960	5	52	43
4 Apr	6,400		510			
11 Apr	3,580	68	52			
19 Apr	4,180	78	91			
26 Apr	9,160	66	755	7	36	57
3 May	3,630	72	124			
10 May	3,530	64	121			
17 May	10,000	65	1,450	2	39	59
24 May	3,480	66	133			
7 Jun	3,420	67	89			
13 Jun	2,860	65	326			
14 Jun	3,780	72	92			
21 Jun	3,800	70	663	4	28	68
3 Jul	2,840	76	768	21	39	40
10 Jul	3,630	79	1,190	8	68	24
16 Jul	61,000	72	3,650	25	60	15
25 Jul	6,280	72	574	13	56	31
29 Jul	9,760	75	4,130	4	52	44
2 Aug	9,840	79	13,700	32	60	8
3 Aug	7,840	79	1,600	39	60	1
5 Aug	21,300	78	4,970	35	57	8
9 Aug	9,640	78	710	10	41	49
15 Aug	7,680	79	470			
18 Aug	36,900	78	4,810	44	50	6
30 Aug	15,700	72	319			
23 Sep	4,860	74	32			

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
12 Oct	2,050	72	13			
19 Oct	1,730	72	7			
4 Nov	1,250	62	11			
12 Nov	970	58	17			
22 Nov	1,030	60	18			
3 Dec	764	56	20			
10 Dec	719	50	15			
19 Dec	662	56	20			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

POONCH RIVER NEAR KOTLI

Chemical Analysis of Water Samples - 1975

Date	Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	TOTAL Cations	TOTAL Anions	SiO_2	Fe	B	D.S. by Evap.	EC x 10^6 at 25 °C	pH	Res CO_3 me/l	SAR
	MILLIEQUIVALENTS PER LITRE												PARTS PER MILLION							
Feb 27	1.0	1.60	.30		T	2.17	.19	.50			2.90	2.86				164	280	8.2	0	.3
Jun 28	1.40	1.80	.67		0	3.18	.29	.40			3.87	3.87				208	360	7.9	0	.5
Aug 12	1.20	.60	.34		0	1.84	.20	.10			2.14	2.14				116	200	7.6	.04	.4
27	1.00	.80	.79		0	2.10	.39	.10			2.59	2.59				140	240	7.5	.30	.8
Sep 30	1.44	.92	.85		0	2.91	.20	.10			3.21	3.21				176	300	8.0	.59	.8
Oct 26	1.60	.90	.55		0	2.72	.18	.20			3.05	3.10				168	290	8.0	.22	.5
Nov 29	1.56	1.40	.70		0	3.30	.09	.30			3.67	3.69				200	340	8.0	.35	.6
Dec 26	1.71	1.36	.30		0	2.10	.20	1.00			3.37	3.30			.10	188	320	7.8	0	.2

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Location Latitude 33°08', Longitude 73°38', on right bank one furlong downstream from Mangla Bridge.

Drainage area 12,900 square miles.

Records available Discharge record June 1958 to December 1966 with automatic water stage recorder from June 1959 to September 1965 by Surface Water Hydrology Project, WASID, WAPDA. Gauge height record December 1906 to 1921 and discharge record 1921 to date by Headworks Division. Data available in Hydrology Directorate Irrigation and Power Department, Lahore. From 1967 the discharge figures published are the releases through Mangla Dam Spillway only.

Average discharge 31,000 cusecs (22,500,000 acre feet per year or 32.9 inches runoff per year) for 35 year 1922-1956 computed by Hydrology Directorate of Irrigation Department. 33,300 cusecs (24,100,000 acre feet per year or 35.1 inches runoff per year), average taken for 9 years from 1958 to 1966. Record computed by Surface Water Hydrology Project from 1967 to date published is the release through Mangla Dam spillway hence not included in the average.

Extremes 1922-66: Maximum discharge 1,060,000 cusecs on 29 August 1929; minimum discharge approximately 4,500 cusecs.

Gauge Prior to June 1959, staff gauge near the present recorder site was in use. An automatic water stage recorder nearly one furlong downstream of the Mangla Bridge was used upto 13.9.65. From 14.9.65 to 11.5.67, old gauge downstream of Mangla Headworks and an automatic water stage recorder on U.J.C. at R.D. 16,000 were in use. The total flows were computed as discharges downstream of Mangla Headworks plus discharges in U.J.C.

The water stage recorder was reinstalled on 12.5.67 and a wire-weight gauge was fixed on downstream side on Mangla bridge on 8.6.67. The recorder gauges were used except for the period when water went below the lowest intake pipe of the well. Gauges were computed with the help of wire-weight gauge for such periods.

Measurements Twenty three discharge measurements were made periodically by current meter using 0.2 and 0.8 or 0.6 depth method. No sediment or quality of water sample was collected.

Determination of discharge Rating table dated 8.1.79 was used with shift adjustments as indicated necessary by the periodic discharge measurements.

Remarks Record good. The spillway gates were completely closed, Jan to April and November to December 1975.

JHELUM RIVER AT MANGLA CABLEWAY

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	0	0	0	0	12,900	41,900
2	0	0	0	0	10,500	*45,500
3	0	0	0	0	7,730	27,200
4	0	0	0	0	8,580	15,800
5	0	0	0	0	8,080	31,200
6	0	0	0	0	8,150	28,500
7	0	0	0	0	6,960	30,200
8	0	0	0	0	7,740	27,900
9	0	0	0	0	7,980	*26,300
10	0	0	0	0	*9,250	28,200
11	0	0	0	0	10,500	25,400
12	0	0	0	0	10,600	23,400
13	0	0	0	0	10,900	27,800
14	0	0	0	0	9,880	24,000
15	0	0	0	17,500	5,270	27,500
16	SPILLWAY CLOSED 0	SPILLWAY CLOSED 0	SPILLWAY CLOSED 0	*15,300	*10,800	29,900
17	0	0	0	17,300	6,080	36,700
18	0	0	0	17,100	9,580	*36,400
19	0	0	0	18,600	5,640	38,500
20	0	0	0	15,500	6,520	41,900
21	0	0	0	18,200	9,210	40,600
22	0	0	0	*16,900	9,240	40,700
23	0	0	0	15,300	6,010	40,500
24	0	0	0	10,300	*9,770	35,900
25	0	0	0	12,600	13,200	25,200
26	0	0	0	23,200	13,700	15,000
27	0	0	0	15,700	14,000	*20,500
28	0	0	0	*12,800	11,300	21,300
29	0	-	0	0	11,400	26,100
30	0	-	0	1,130	*12,300	25,000
31	0	-	0	------	22,600	------
Mean Cs/mi	0	0	0	7,580	9,880	30,200
In Ac.ft.	0	0	0	451,000	608,000	180,0000

1975 Year: Mean 11,800 Cs/sq mi Inches

Note : *Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	24,500	15,600	38,900	4,970		
2	22,800	15,700	41,200	*7,250		
3	14,600	25,100	41,100	10,800		
4	9,600	30,800	41,000	7,210		
5	11,400	*30,900	*57,100	7,200		
6	9,660	40,300	55,800	7,190		
7	9,820	36,800	52,000	12,100		
8	9,800	21,800	43,100	10,300		
9	9,800	15,600	23,800	11,000		
10	5,900	10,500	35,800	9,710		
11	3,370	15,300	49,500	11,100		
12	6,520	14,300	26,500	10,600		
13	5,000	22,200	*24,800	7,080		
14	5,000	22,200	26,900	7,070		
15	5,000	*18,200	28,900	*7,050		
16	6,240	0	23,300	7,020	SPILLWAY CLOSED	SPILLWAY CLOSED
17	18,700	7,750	31,200	8,200		
18	30,000	29,800	8,930	5,020		
19	*57,300	55,100	*18,800	0		
20	65,600	*77,200	14,800	0		
21	65,700	97,600	6,940	0		
22	65,600	97,200	12,100	0		
23	62,600	96,700	578	0		
24	40,500	57,000	5,940	0		
25	39,800	16,800	0	0		
26	*55,500	15,200	0	0		
27	38,000	*23,800	0	0		
28	24,600	63,300	0	0		
29	30,300	105,000	3,540	0		
30	25,900	70,700	8,910	929		
31	14,300	40,500	-------	0		
Mean	25,600	38,400	24,000	4,870		
Cs/mi		2.97				
In Maf.	1.57	2.36	1.43	.299	0	0

M. Acre-feet. 8.52 Maximum day 105,000 Minimum day 0

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KHOST RIVER AT CHAPPER RIFT - 1975

Location Latitude 30°20', Longitude 67°30', on right bank just upstream from the mouth of Chapper Rift nine miles upstream from Khost and 20 miles North east of Quetta.

Drainage area 510 square miles.

Record available July 1961 to date by Surface Water Hydrology Project, WASID, WAPDA. Periodic discharge measurements started in March 1961.

Average discharge 11.7 cusecs (8,430 acre feet per year or .33 inches runoff per year). Average taken for 14 years from 1962 to 1975.

Extremes Maximum discharge during the year 6,050 cusecs on 18 August (gauge height 10.10 feet); minimum daily discharge 3.3.cusecs on Ist January.

1961-75: Maximum discharge observed 13,800 cusecs on 17 July 1973. High water mark at 20.4 feet (or unknown date believed to be highest in recent years; estimated discharge 24,000 cusecs; minimum discharge 1.5 cusecs on 30 June 1972.

Gauge Automatic water stage recorder since 14.1.62 set to arbitrary datum. Prior to this ' gauge readings were taken from a staff fastendd to boulders and read to 0.01 foot.

Measurements Fourteen discharge measurements were made by current meter using 0.2 and 0.8 or 0.6 depth method. Low water measurements were made by wading and high water ones from car suspended on overhead cableway. Thirteen sets of sediment samples were taken by depth integration method using DH-48 sampler while wading and D-49 sampler from the cableway. One of these were analysed for particle size distribution and the rest for total concentration. Fourteen surface samples were taken and analysed for chemical composition.

Determination of discharge This station has an unstable bed that shifts continuously. Rating dated 18.7.74 with shift adjustments based on periodic discharge measurements, has been used to compute discharges.

Remarks Record fair.

KHOST RIVER AT CHAPPER RIFT

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	3.3	4.6	12	15	10	7.6
2	3.5	4.8	11	15	10	7.6
3	3.6	4.7	12	14	10	7.6
4	3.7	5.2	12	15	*9.2	7.6
5	3.8	5.5	12	*14	9.4	7.6
6	3.9	5.0	14	14	10	7.6
7	4.0	5.9	14	13	10	7.6
8	4.1	7.1	14	14	11	7.3
9	4.3	12	14	14	11	7.3
10	4.5	11	15	14	10	7.3
11	4.6	12	15	14	10	7.0
12	*4.6	12	15	14	10	7.0
13	4.6	10	16	14	9.9	7.0
14	4.7	10	15	14	9.5	6.7
15	4.6	10	*15	15	9.5	*6.3
16	4.3	11	14	14	9.5	6.0
17	3.6	11	14	14	9.5	5.9
18	3.9	11	14	13	9.5	5.9
19	3.7	10	16	13	9.2	5.8
20	3.8	9.9	14	13	8.8	5.6
21	3.9	9.5	195	13	8.8	5.8
22	3.8	*9.4	25	14	8.8	5.4
23	3.7	9.4	18	14	8.5	5.6
24	3.5	9.7	17	18	8.5	5.6
25	3.4	9.7	16	17	8.5	5.6
26	4.0	9.9	16	19	8.2	5.6
27	4.9	10	16	14	8.4	6.0
28	4.9	12	16	12	8.4	6.1
29	6.0	----	15	11	8.0	6.1
30	5.9	----	14	10	8.2	6.3
31	4.4	----	13	--	8.2	---
Mean	4.2	9.0	21	14	9.3	6.6
Cs/mi	0.01	0.02	0.04	0.03	0.02	0.01
In	0.01	0.02	0.05	0.03	0.02	0.01
Ac.ft.	257	500	1,270	837	572	390

1975 Year: Mean 12 Cs/sq mi 0.02 Inches 0.32

Note : *Discharge measurement made on this day.

KHOST RIVER AT CHAPPER RIFT

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	6.0	4.6	22	6.4	5.4	5.6
2	5.6	4.5	8.5	6.6	5.3	5.5
3	5.6	4.5	6.8	6.6	5.3	5.6
4	5.5	4.6	6.6	6.6	5.2	5.8
5	5.4	4.6	6.6	6.6	5.2	5.8
6	5.0	4.5	6.7	6.6	5.0	5.9
7	5.0	4.5	6.7	6.6	5.0	6.0
8	4.9	4.4	*6.7	6.6	4.9	6.0
9	4.6	4.1	6.6	6.6	4.9	6.3
10	4.6	4.1	6.6	6.6	4.8	6.3
11	4.6	4.1	6.7	6.6	4.8	6.6
12	4.9	4.1	6.7	6.6	4.7	6.4
13	4.8	4.1	6.7	6.6	4.7	6.6
14	5.5	5.1	*6.7	*6.6	4.6	6.6
15	4.9	14	6.6	6.6	*4.6	6.7
16	4.9	11	6.4	6.4	4.7	6.7
17	4.9	192	6.3	6.4	4.7	6.8
18	4.7	294	6.7	6.3	4.8	7.0
19	4.5	610	7.0	6.1	4.8	7.0
20	4.4	118	6.8	6.1	4.9	*7.1
21	4.0	16	6.7	6.0	5.0	7.3
22	*3.9	13	*6.4	6.0	5.0	7.3
23	4.7	12	6.6	5.9	5.2	7.3
24	3.8	*11	6.4	5.9	5.2	7.3
25	4.6	11	6.4	5.8	5.3	7.3
26	4.1	11	6.4	5.8	5.3	7.1
27	4.5	19	6.6	5.6	5.4	7.3
28	4.5	17	6.6	5.6	5.4	7.3
29	4.6	17	6.6	5.5	5.5	7.4
30	4.7	17	6.4	5.5	5.5	7.6
31	4.7	42	---	5.5	---	7.7
Mean	4.8	48	7.2	6.2	5.0	6.7
Cs/mi	0.01	0.09	0.01	0.01	0.01	0.01
In	0.01	0.11	0.02	0.01	0.01	0.02
Ac.ft.	294	2,950	427	385	300	411

Acre-feet. 8,690 Maximum day 610 Minimum day 3.3

KHOST RIVER AT CHAPPER RIFT

Suspended sediment concentration - 1975

Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
12 Jan	78.2	42	334			
15 Mar	265	48	453			
5 Apr	261	47	397			
4 May	164	58	533			
15 Jun	97.5	78	399			
22 Jul	3.9	76	100			
24 Aug	209	74	1,430	3	27	70
8 Sep	123	68	59			
14 Sep	123	65	424			
22 Sep	120	66	18			
14 Oct	120	60	61			
15 Nov	82.4	58	110			
20 Nov	4.9	55	142			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

KAOSI RIVER AT CHAPPER RIFT

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	TOTAL Cations	TOTAL Anions	PARTS PER MILLION SiO_2	Fe	B	D.S. by Evap.	$EC \times 10^6$ at 25 °C	pH	Res CO_3 me/l	SAR
Jan 12	2.7	2.9	0.3			3.9	1.3	0.7			5.90	5.90				352	550	8.2	0	0.17
Feb 22	1.76	3.31	0.49		0.17	2.90	0.98	1.51			5.56	5.56				409	640	8.5	0	0.3
Mar 15	2.44	2.82	4.37			3.76	1.53	4.34			9.63	9.63				576	900	8.1	0	2.7
Apr 5	1.96	3.96	3.44			3.93	1.53	3.90			9.36	9.36				576	900	7.9	0	1.9
May 4	1.74	3.20	2.14			3.42	1.34	2.32			7.08	7.08				454	710	8.2	0	1.3
Jun 15	1.84	2.91	2.33			3.42	1.72	1.94			7.08	7.08				448	700	8.1	0	1.5
Jul 22	0.97	4.25	1.25		0.68	2.05	1.34	2.40			6.47	6.47				384	600	5.4	0	0.77
Aug 24	2.13	2.43	3.75		0.34	2.56	1.53	3.88			8.31	8.31				512	800	8.3	0	[illegible]
Sep 8	1.70	3.05	1.99		0.34	2.39	1.34	2.67			6.74	6.74				416	650	8.4	0	1.29
14	2.30	2.35	1.26		0.34	3.07	1.53	0.97			5.91	5.91				384	600	8.4	0	0.81
22	1.70	3.82	0.71		0.08	3.16	1.53	1.16			6.23	6.23				384	600	8.5	0	0.42
Oct 14	1.80	3.43	1.30			2.56	1.34	2.63			6.53	6.53				399	640	8.2	0	0.8
Nov 15	1.60	3.54	1.50		0.33	2.89	1.34	2.17			6.64	6.64				416	650	8.3	0	0.93
Dec 20	1.41	3.12	1.24			3.30	1.14	1.33			5.77	5.77				376	590	7.8	0	0.8

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Location Latitude 26°23', Longitude 67°53', nearly 5 miles downstream of Sehwan village, 30 miles from Dadu.

Record available Discharge record from January 1968 to date with periodic discharge measurements since June 1967, by Surface Water Hydrology Project, WASID,WAPDA.

Average discharge 66,700 cusecs (48,320,000 acre feet per year); Average taken for eight years from 1968 to 1975.

Extremes Maximum discharge during the year 517,000 cusecs on 5 September (gauge height 115.57 feet S.P.D); minimum daily discharge 895 cusecs on 10 April to 16 April.

1968-75: Maximum discharge 572,000 cusecs on 27 August 1973 (gauge height 117.68 feet S.P.D); minimum daily discharge 895 cusecs on 10 to 16 April 1975.

Gauge Staff gauge (enamelled plates) on right bank in two steps, graduated to 0.01 foot and read from 0800 to 1600 hours daily during low flow and more often during high flows. (Zero R.L. of the gauge = 81.20 S.P.D).

Measurements Forty nine discharge measurements were made periodically during the year by current meter using 0.2 and 0.8 depth method, with the help of a boat and outboard motor. Twenty nine sets of sediment samples were taken by boat. Fourteen of these were analysed for particle size distribution and the rest for total concentration. Fifteen surface samples were collected and analysed for chemical composition.

Determination of discharge Previous rating table dated 22.5.69 was used with shift adjustments as indicated necessary by periodic discharge measurements.

Remarks Record fair.

INDUS RIVER NEAR SEHWAN

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	1,580	2,730	1,470	980	3,360	21,300
2	1,570	2,580	1,460	980	3,000	18,600
3	1,570	2,490	1,450	970	2,740	15,600
4	1,570	2,360	1,440	970	2,500	13,300
5	12,500	2,310	1,440	950	2,260	12,500
6	16,200	2,200	1,430	940	2,050	12,000
7	18,000	2,120	1,400	920	2,170	11,800
8	18,200	2,080	1,370	910	11,700	13,900
9	17,500	2,050	1,350	905	21,700	28,300
10	16,200	*1,980	1,320	895	25,000	46,600
11	14,900	1,940	1,280	895	23,500	52,900
12	13,900	1,920	1,280	895	21,100	*52,600
13	13,700	1,910	1,280	895	*18,100	56,100
14	13,300	1,870	1,280	895	17,100	72,200
15	13,000	1,870	1,270	*895	15,900	80,300
16	12,500	1,850	*1,310	895	14,100	82,100
17	12,300	1,840	1,310	935	13,600	79,900
18	12,200	1,800	1,280	980	13,300	71,900
19	12,000	1,800	1,260	1,030	12,900	65,000
20	9,920	1,800	1,240	1,060	*12,300	59,100
21	8,500	1,790	1,230	1,100	10,900	55,800
22	7,100	1,790	1,180	1,390	9,360	56,600
23	6,220	1,770	1,130	4,880	8,040	59,700
24	5,530	1,760	1,120	*6,500	6,950	61,000
25	4,900	1,540	1,110	6,300	6,050	63,600
26	4,300	*1,540	1,080	5,680	6,140	73,200
27	3,900	1,520	*1,060	5,110	7,100	84,100
28	3,510	1,500	1,050	4,480	19,300	*97,800
29	*3,230	-----	1,020	3,920	27,500	105,000
30	3,030	-----	1,010	3,760	27,700	115,000
31	2,880	-----	990	-----	24,600	-------
Mean Cs/mi	9,220	1,950	1,250	2,060	12,600	54,600
In Maf	.567	.109	.077	.123	.778	3.25

1975 Year: Mean 68,500 Cs/sq mi Inches

Note : * Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	112,000	282,000	442,000	120,000	6,750	4,000
2	102,000	*290,000	455,000	113,000	6,530	3,940
3	89,400	284,000	468,000	96,100	6,360	3,700
4	76,100	267,000	*481,000	80,800	6,220	3,560
5	86,000	213,000	517,000	68,600	5,910	3,560
6	98,800	121,000	512,000	61,100	5,650	3,510
7	*109,000	83,800	491,000	52,900	5,580	3,390
8	114,000	71,600	462,000	44,800	5,580	3,270
9	120,000	65,800	419,000	*36,700	5,550	3,270
10	113,000	97,600	381,000	32,700	5,430	3,090
11	*108,000	129,000	345,000	28,000	5,250	*3,090
12	87,200	160,000	318,000	25,400	5,040	3,060
13	69,000	182,000	*306,000	22,700	4,900	3,090
14	54,600	196,000	305,000	20,800	*5,010	3,000
15	52,300	196,000	301,000	19,600	4,950	2,910
16	55,800	207,000	295,000	18,700	4,810	2,820
17	58,500	224,000	290,000	17,500	4,700	2,770
18	62,000	237,000	285,000	17,700	4,590	2,740
19	75,100	251,000	277,000	12,300	4,480	2,770
20	92,000	267,000	256,000	11,000	4,380	2,740
21	113,000	283,000	231,000	9,890	4,320	*2,740
22	175,000	*291,000	204,000	9,010	4,280	2,740
23	199,000	306,000	190,000	*8,180	4,280	2,740
24	218,000	323,000	184,000	8,180	4,220	2,900
25	231,000	336,000	*184,000	8,180	4,200	3,960
26	*236,000	353,000	173,000	8,180	4,200	4,390
27	241,000	374,000	167,000	8,080	*4,200	4,320
28	243,000	384,000	*159,000	7,730	4,180	4,480
29	256,000	398,000	141,000	7,330	4,160	6,530
30	266,000	*413,000	128,000	7,010	4,100	8,840
31	273,000	427,000	-------	6,560	-----	12,200
Mean	135,000	249,000	312,000	31,800	4,990	3,870
Cs/mi In Maf.	8.30	15.3	18.6	1.95	.297	.238

M.Acre-feet. 49.6 Maximum day .517 Minimum day 895

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Percent Silt	Percent Clay
19 Jan	11,900	60	170			
29 Jan	3,210	60	55			
10 Feb	1,960	68	110			
26 Feb	1,540	72	50			
16 Mar	1,310	74	20			
27 Mar	1,060	80	23			
15 Apr	895	83	21			
24 Apr	6,530	82	155			
13 May	17,900	95	341			
20 May	12,200	90	245			
12 Jun	52,600		1,490	6	66	28
28 Jun	96,100	80	2,560	8	54	38
7 Jul	110,000	91	2,230	9	45	46
12 Jul	85,400	90	1,720	7	42	51
26 Jul	239,000	84	5,620	29	44	27
2 Aug	289,000	89	3,210	39	44	17
9 Aug	64,900	95	1,610	4	56	40
10 Aug	101,000	93	2,930	9	51	40
22 Aug	293,000	88	4,520	17	58	25
30 Aug	412,000	88	4,500	20	49	31
4 Sep	481,000	89	3,460	27	51	22
14 Sep	306,000	90	3,770	14	71	15
25 Sep	184,000	87	2,700	5	59	36
9 Oct	35,900	86	838	1	34	65
23 Oct	8,140	80	69			
14 Nov	5,130	74	29			
27 Nov	4,180	78	21			
11 Dec	3,090	69	136			
21 Dec	2,740	69	68			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

INDUS RIVER NEAR SEHWAN

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE										TOTAL		PARTS PER MILLIONS				$EC \times 10^6$ at 25 °C	pH	Res CO_3	SAR
	Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	Cations	Anions	SiO_2	Fe	B	D.S. by Evap.			me/l	
Jan																				
19	1.94	1.59	2.13			2.73	1.57	1.33			5.66	5.66				288	450	7.5	-	1.5
29	2.13	1.59	0.28			2.56	0.98	0.46			4.0	4.0				256	400	7.6	-	0.2
Feb																				
10	2.03	2.15	0.45			3.07	1.37	0.19			4.63	4.63				288	450	8.2	-	0.3
26	1.06	1.31	2.14			2.39	1.67	.45			4.51	4.51				256	400	8.2	.02	1.9
Mar																				
27	.97	1.31	2.32			2.73	1.53	.34			4.60	4.60				288	450	8.2	.45	2.1
Apr																				
24	1.26	1.40	2.19		.17	2.22	1.53	.93			4.85	4.85				281	440	8.3	-	2.0
May																				
13	1.64	1.02	1.20			1.88	1.53	0.45			3.86	3.86				224	350	8.1	-	1.0
Jun																				
12	1.26	0.92	1.66			1.53	1.15	1.16			3.84	3.84				192	310	8.1	-	1.6
28	1.06	1.03	0.84			1.71	1.15	0.07			2.93	2.93				160	250	8.2	-	.81
Jul																				
7	1.26	0.73	0.91			1.71	0.96	0.23			2.90	2.90				166	260	8.1	0.06	0.92
26	1.35	0.83	0.87			1.71	1.15	0.19			3.05	3.05				192	300	8.1	-	0.84
Aug																				
9	1.26	0.92	0.57		0.34	1.34	0.96	0.09			2.75	2.75				172	270	8.3	-	0.55
Sep																				
14	1.50	1.31	2.01			2.05	1.15	0.79			3.99	3.99				220	345	8.0	-	1.66
Oct																				
9	1.50	1.15	0.67			1.88	1.34	0.75			3.97	3.97				224	350	8.0	-	0.43
Nov																				
14	1.90	1.88	0.67			2.80	0.96	0.69			4.45	4.45				281	440	8.2	-	0.48

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Location Latitude 25°09', Longitude 67°01', at Pump House on left bank 2 furlong upstream from weir, 19 miles North of Karachi and 30 miles upstream from Arabian Sea.

Drainage area 3,640 square miles.

Record available Daily discharge 1 July to 10 October 1959 and 30 June 1960 to date by Surface Water Hydrology Project, WASID, WAPDA. (gauge heights I July to 10 Oct: 1959 furnished by WAPDA Karachi Irrigation Project).

Average discharge 328 cusecs (241,000 acre feet per year or 1.24 inches runoff per year). Average taken for 15 years from 1961 to 1975.

Extremes Maximum discharge observed during year 139,000 cusecs on 20 August (gauge height 16.26 feet); no flow on many days.

1959-75: Maximum estimated discharge 237,000 cusecs from observed gauge height on 5 July 1959. Maximum flood discharge believed to have been 30 to 50 percent higher than this estimated peak. Periods of no flow occur during most years.

Gauge Automatic water stage recorder installed on 25.9.62 Also enamelled plates graduated to 0.1 foot and read to 0.01 foot. Zero of gauge datum at R.L. 124.95. Recorder was used to compute the discharges.

Measurements Thirty discharge measurements were made by wading downstream from bund at low flow. High water rating is computed by weir formulas. Twenty nine sets of sediment samples were taken by use of DH-48 sampler. Six of these were analysed for particle size distribution and the rest for total concentration. Fourteen surface samples were collected and analysed for chemical composition.

Determination of discharge Rating curve based on discharge measurements at low stages and weir formulas at high stage is used at this station. This rating table dated 13.11.62 was used through the year with shift adjustments.

Remarks Record good.

HUB RIVER AT BUND MURAD KHAN

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	0	0.9	3.8	0	93	0
2	0	0.5	3.3	0	159	0
3	0	0.2	2.6	0	175	0
4	0	0.1	2.1	0	13	0
5	0	0	1.5	0	7.3	1,760
6	0	0	1.1	0	4.6	448
7	0	0	0.7	0	2.9	128
8	0	3,070	0.3	0	1.5	74
9	0	3,330	0.1	0	0.8	50
10	0	985	0	0	0.2	36
11	0	354	0	0	0	25
12	0	144	0	0	0	18
13	0	83	0	0	0	10
1	0	57	0	0	0	16
15	2,660	39	0	0	0	74
16	735	32	0	0	0	45
17	535	29	0	0	0	30
18	462	34	0	0	0	21
19	32	39	0	0	0	14
20	39	32	0	0	0	9.4
21	32	25	0	0	0	5.8
22	25	20	0	0	0	3.8
23	20	15	0	0	0	25
24	14	11	0	0	0	107
25	9.4	8.5	0	0	0	*93
26	0.6	6.6	0	0	0	52
27	5.2	5.2	0	0	0	64
28	4.0	4.4	0	322	0	*64
29	3.1	---	0	462	0	45
30	2.3	---	0	*144	0	27
31	*1.4	---	0	---	0	--
Mean	148	297	5	31	15	108
Cs/mi	.04	.08	0	.008	.004	.03
In	.05	.09	0	.009	.005	.03
Ac.t.	9,080	16,500	31	1,840	907	6,440

1975 Year: Mean 1,050 Cs/sq mi .29 Inches 3.91

Note : *Discharge measurement made on this day.

HUB RIVER AT BUND MURAD KHAN

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	20	1,090	19,000	102	24	14
2	13	*448	2,220	88	23	14
3	9.1	*302	1,120	83	23	13
4	7.9	202	*818	74	22	13
5	14	*152	12,900	64	22	13
6	752	120	14,900	62	22	14
7	1,210	93	6,450	62	22	13
8	1,110	*74	1,930	59	21	10
9	521	59	1,090	57	21	11
10	595	*407	*1,380	52	20	12
11	2,860	291	2,830	50	20	12
12	641	202	1,000	50	19	12
13	433	*152	506	50	18	11
14	*341	107	*420	50	18	12
15	2,770	37,000	328	47	17	12
16	7,340	24,900	*258	45	17	12
17	1,540	17,800	315	42	17	12
18	*521	58,200	368	42	16	11
19	1,070	41,700	315	40	16	10
20	*768	44,700	*420	37	16	10
21	341	8,880	*354	36	15	10
22	*213	4,280	291	33	16	9.7
23	144	1,970	*247	30	16	9.7
24	*107	1,050	1,970	25	*16	9.7
25	78	688	*688	24	16	9.7
26	64	*506	368	23	16	11
27	*93	550	*269	25	15	11
28	69	535	202	24	15	10
29	57	394	159	23	14	9.4
30	*59	*269	*128	23	14	9.4
31	1,700	15,900	---	23	--	9.4
Mean	821	8,490	2,440	47	18	11
Cs/mi	.23	2.33	.67	.01	.01	.003
In	.26	2.69	.75	.01	.01	.004
Ac.ft.	50,500	522,000	145,000	2,870	1,090	694

Acre-feet. 757,000 Maximum day 44,700 Minimum day 0

Suspended sediment concentration - 1975

1975 Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
30 Jan	1.8	67	45			
30 Apr	73.6	83	255			
8 Jun	102		332			
28 Jun	68.8	84	36			
14 Jul	291	84	1,760	1	4	75
18 Jul	550	84	2,600	1	32	67
20 Jul	626	85	2,940	1	24	75
22 Jul	213	81	347			
24 Jul	175	81	258			
27 Jul	93	82	73			
30 Jul	62	84	159			
2 Aug	462	82	4,480	1	24	75
3 Aug	328	81	3,480	1	15	84
5 Aug	167	83	368			
8 Aug	74	79	115			
10 Aug	420	85	1,440	4	19	77
13 Aug	136	82	174			
26 Aug	407	80	209			
30 Aug	235	79	120			
4 Sep	917	82	173			
10 Sep	850	83	434			
14 Sep	433	80	166			
16 Sep	269	83	185			
20 Sep	433	83	86			
21 Sep	381	84	40			
23 Sep	235	83	113			
25 Sep	657	79	318			
27 Sep	280	81	120			
30 Sep	128	82	44			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

HUB RIVER AT BUND MURAD KHAN

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	TOTAL Cations	TOTAL Anions	PARTS PER MILLION SiO_2	Fe	B	D.S. by Evap.	EC x 10^6 at 25 °C	pH	Res CO_3 mg/l	SAR
Jan 30	1.55	0.12	10.21			2.73	6.30	2.85			11.88	11.88				672	1050	7.4	1.36	11
Apr 30	2.03	1.10	2.35		0.51	2.05	2.30	0.62			5.48	5.48				364	600	8.3		1.8
Jun 9	1.84	1.01	1.65		0.17	1.88	1.72	0.73			4.50	4.50				320	500	8.3		1.3
28	2.61	1.97	4.81			2.22	4.60	2.17			8.99	8.99				640	1000	7.7		3.2
Jul 14	0.97	1.21	1.72			1.53	1.72	0.65			3.90	3.90				224	360	8.0		1.5
18	1.26	0.73	1.21			1.71	1.34	0.15			3.20	3.20				204	320	8.1		1.2
20	1.64	0.92	1.18			1.88	1.34	0.52			3.74	3.74				224	350	8.0		1.0
22	1.64	0.83	1.45			1.71	1.72	0.29			3.92	3.92				252	410	8.1		1.3
Aug 3	1.74	0.92	1.65		0.34	1.53	1.92	0.52			4.31	4.31				256	400	8.4		1.4
26	1.80	1.40	4.41			2.56	3.07	1.98			7.61	7.61				454	710	8.2		3.48
Sep 4	1.90	1.39	2.96			1.71	2.88	1.66			6.25	6.25				403	630	8.1		2.33
10	1.80	1.20	3.91			2.05	2.88	1.98			6.91	6.91				428	670	7.9		3.16
20	2.20	2.26	4.56			1.71	4.60	2.71			9.02	9.02				608	950	8.1		3.05
25	1.90	1.39	3.13			2.22	2.30	1.90			6.42	6.42				377	590	8.0		2.47

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Location Latitude 25°26', Longitude 66°52', near Goth Amun village, about 6 miles of Karachi-Bela Road.

Drainage area 355 square miles.

Record available Gauge height record with partial discharge observations from May'1965 to June'1968 and mean daily discharge from July 1970 to date with Surface Water Hydrology Project, WAPDA.

Average discharge 33.9 cusecs (24,700 acre feet per year or 1.30 inches runoff per year). Average taken for five years from 1971 to 1975.

Extremes Maximum discharge observed during the year 46,800 cusecs on 20 August (gauge height 17.50 feet); minimum daily discharge zero cusecs on many days of the year.

July 1970 December 1975: Maximum discharge observed 73,000 cusecs on 5 July 1970; minimum daily discharge zero cusecs on many days during every year.

Gauge Staff gauge (enamelled plates) read to hundredth of a foot from 0800 to 1600 hours daily and more often during high flows; gauge set to arbitrary datum.

Measurements Eight discharge measurements were made during the year by current meter using 0.2 and 0.8 or 0.6 depth method by wading or by float method. Six sets of sediment samples were taken by depth integration method using DH-48 sampler. Two of these were analysed for particle size distribution, and the rest for total concentration.

Determination of discharge This station has a rocky bed affected at times by the deposition and scour of silt. Previous rating table dated 15.5.72 was used to compute mean daily discharge with shift adjustments as indicated necessary by periodic discharge observations.

Remarks Record fair in low flows and poor in high flows.

WINDOR DHORA NEAR GOTH AMUN

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	2,830	0	0	0	0
9	383	1,640	0	0	0	0
10	35	1,020	0	0	0	0
11	3.5	685	0	0	0	0
12	0	468	0	0	0	0
13	0	302	0	0	0	0
14	0	164	0	0	0	0
15	566	65	0	0	0	0
16	30	26	0	0	0	0
17	9.5	21	0	0	0	0
18	5.5	18	0	0	0	0
19	4.4	14	0	0	0	0
20	0.2	11	0	0	0	0
21	0	7.5	0	0	0	0
22	0	3.8	0	0	0	0
23	0	0.2	0	0	0	155
24	0	0	0	0	0	22
25	0	0	0	0	0	1.8
26	0	0	0	0	0	0.1
27	0	0	0	0	0	0
28	0	0	0	0	0	0
29	0	-	0	0	0	0
30	0	-	0	0	0	0
31	0	-	0	-	0	-
Mean	33	260	0	0	0	6.0
Cs/mi	0.09	0.73	0	0	0	0.02
In	0.11	0.76	0	0	0	0.02
Ac.ft.	2,060	14,400	0	0	0	355

1975 Year: Mean 132 Cs/sq mi 0.37 Inches 5.06

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	0	0	54	4.7	0.6	0
2	0	0	28	4.7	0.6	0
3	0	0	213	4.7	0.4	0
4	0	0	139	4.7	0.4	0
5	0	0	659	4.1	0.4	0
6	0	0	164	4.1	0.2	0
7	0	0	84	4.1	0.2	0
8	0	0	40	4.1	0.2	0
9	0	0	34	4.1	0	0
10	0	496	30	4.1	0	0
11	0	1,610	28	3.5	0	0
12	0	28	26	2.9	0	0
13	0	3.5	26	2.9	0	0
14	0	0.2	24	2.9	0	0
15	0	3,510	23	2.9	0	0
16	0	4,540	22	2.6	0	0
17	0	5,740	20	2.6	0	0
18	0	2,350	18	2.3	0	0
19	0	2,760	17	2.3	0	0
20	0	15,700	14	2.0	0	0
21	0	676	13	2.0	0	0
22	0	149	12	2.0	0	0
23	0	86	10	1.6	0	0
24	0	50	9.0	1.6	0	0
25	0	40	7.5	1.4	0	0
26	0	31	6.5	1.4	0	0
27	0	27	6.5	1.2	0	0
28	0	22	5.5	1.0	0	0
29	0	17	5.5	0.8	0	0
30	0	16	4.7	0.8	0	0
31	0	100	---	0.6	-	0
Mean	0	1,220	58	2.70	0.1	0
Cs/mi	0	3.45	0.16	0.01	0	0
In	0	3.98	0.18	0.01	0	0
Ac.ft.	0	75,300	3,460	168	6.0	0

Acre-feet. 95,700 Maximum day 15,700 Minimum day 0

264 WINDOR DHORA NEAR GOTH AMUN

Suspended sediment concentration - 1975

Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
2 Sep	24.8	90	71			
4 Sep	87.2	89	220			
5 Sep	280	86	3,870	2	67	31
5 Sep	440	84	4,800	1	72	27
6 Sep	2,760	89	197			
8 Sep	39	81	25			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

Location Latitude 25°58', Longitude 62°45', nearly 25 miles in the west of Turbat near Mirani Dam site.

Drainage area 8,700 square miles.

Record available Periodic discharge observations were started in June 1970. Mean daily discharges are available since January 1971, with Surface Water Hydrology Project, WAPDA.

Extremes Maximum discharge observed during the year 32,500 cusecs on 24 August (gauge height 13.78 feet); river dry during most of the year.

Gauge Enamelled plates fixed in steps and read to .01 foot from 0800 and 1600 hours daily and more often during high flow periods.

Measurements Thirty one discharge measurements were made during the year by current meter using 0.2 and 0.8 or 0.6 depth method. Low flow measurements were made by wading and high flow measurements were made by cableway. Twenty nine sets of sediment samples were taken by depth integration method using DH-48 sampler while wading and twenty one sets were analysed for particle size distribution. Ten surface samples were collected and analysed for chemical composition, the results of these are reported under miscellaneous sites.

Determination of discharge The channel has an unstable sandy bed liable to shifting. The stage discharge relation is controlled by channel characteristics. Rating table dated 3.7.75 was used to compute mean daily discharges with shift adjustments where indicated necessary by the periodic measurements.

Remarks Record fair.

DASHT RIVER NEAR MIRANI DAM

Discharge in cusecs for year 1975

Date	Jan	Feb	Mar	Apr	May	Jun
1	0	668	0	0	0	0
2	0	379	0	0	0	0
3	0	*42	0	0	0	0
4	0	28	0	0	0	0
5	0	*19	0	0	0	0
6	0	12	0	0	0	0
7	0	*8.4	0	0	0	0
8	0	*3,230	0	0	0	0
9	*5,660	*5,110	0	0	0	0
10	2,640	*1,300	*4,660	0	0	0
11	*996	724	2,270	0	0	0
12	708	*3,390	*1,130	0	0	0
13	428	*7,910	908	0	0	0
14	*118	1,320	708	0	0	0
15	97	796	393	0	0	0
16	78	379	134	0	0	0
17	75	*44	*29	0	0	0
18	*55	*25	7.6	0	0	0
19	34	4.4	0	0	0	0
20	18	0	0	0	0	0
21	12	0	*1,030	0	0	0
22	3.6	0	756	0	0	0
23	0	0	428	0	0	0
24	0	0	212	0	0	0
25	0	0	57	0	0	0
26	0	0	*24	0	0	0
27	*16,900	0	6.8	0	0	0
28	*9,510	0	0	0	0	0
29	2,560	---	0	0	0	0
30	*1,140	---	0	0	0	0
31	876	---	0	---	0	---
Mean	1,350	907	411	0	0	0
Cs/mi	0.16	0.10	.05	0	0	0
In	0.18	0.11	0.06	0	0	0
Ac.ft.	83,100	50,400	25,300	0	0	0

1975 Year: Mean 398 Cs/sq mi .05 Inches 0.62

Note : *Discharge measurement made on this day.

Discharge in cusecs for year 1975

Date	Jul	Aug	Sep	Oct	Nov	Dec
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	1,510	0	0	0	0
12	0	*1,150	0	0	0	0
13	0	* 225	0	0	0	0
14	0	0	0	0	0	0
15	0	*5,660	0	0	0	0
16	0	1,500	0	0	0	0
17	0	119	0	0	0	0
18	0	0	0	0	0	0
19	0	0	0	0	0	0
20	0	0	0	0	0	0
21	0	0	0	0	0	0
22	0	0	0	0	0	0
23	0	0	0	0	0	0
24	0	*27,300	0	0	0	0
25	0	*15,500	0	0	0	0
26	0	8,530	0	0	0	0
27	0	*2,260	0	0	0	0
28	0	*1,390	0	0	0	0
29	0	*18	0	0	0	0
30	0	0	0	0	0	0
31	0	0	---	0	---	0
Mean	0	2,100	0	0	0	0
Cs/mi	0	0.24	0	0	0	0
In	0	0.28	0	0	0	0
Ac.ft.	0	129,000	0	0	0	0

M. Acre-feet: .288 Maximum day 27,300 Minimum day 0

DASHT RIVER NEAR MIRANI DAM

Suspended sediment concentration - 1975

Date	Discharge in cusecs	Temp. of Water °F	Total PPM by weight	Percent Sand	Silt	Clay
9 Jan	7,500	68	7,000	2	52	46
11 Jan	1,030	64	1,370	2	38	60
14 Jan	122	65	566	5	27	68
18 Jan	50	68	462			
27 Jan	22,300	64	31,400	1	65	34
28 Jan	9,930	65	25,100	3	57	40
30 Jan	1,160	62	6,740	25	62	13
3 Feb	42	66	260			
4 Feb	29	65	197			
5 Feb	18	70	150			
7 Feb	9.2	66	145			
8 Feb	6,470	68	18,300		66	34
9 Feb	4,240	64	14,200		58	42
10 Feb	1,320	67	3,410	1	28	71
12 Feb	1,160		2,570	1	39	60
13 Feb	12,500	66	18,000	1	59	40
17 Feb	52		463			
18 Feb	26.4		314			
10 Mar	6,800	77	2,420	1	29	70
12 Mar	1,180	80	2,350	1	22	77
17 Mar	38	73	1,060	1	30	69
21 Mar	1,260	74	2,090	1	32	67
12 Aug	1,230	70	6,310	3	81	16
13 Aug	14	68	6,440	3	79	18
15 Aug	8,310	68	28,400	12	87	1
24 Aug	17,100	79	35,800	2	92	6
25 Aug	13,300	69	7,570	3	78	19
27 Aug	2,320	82	41,200		88	12
29 Aug	17.2	69	45			

Note : Sand is all sizes above 0.0625 mm.
Silt is all sizes between 0.0625 mm and 0.0055 mm.
Clay is all sizes smaller than 0.0055 mm.

CASHT RIVER NEAR MIRANI DAM

Chemical Analysis of Water Samples - 1975

Date	Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	Total Cations	Total Anions	SiO_2	Fe	B	D.S. by Evap.	EC x 10^6 at 25 °C	pH	Res CO_3 me/l	SAR
	MILLIEQUIVALENTS PER LITRE												PARTS PER MILLION							
Jan																				
9	2.13	6.05	0.08			3.78	2.15	2.85			8.76	8.76				524	820	7.4	0	0.03
27	1.94	1.31	2.79			2.56	2.15	1.33			6.04	6.04				384	600	7.9	0	2.1
Feb																				
3	1.64	0.96	2.82			1.53	2.56	1.33			5.42	5.42				352	550	7.3	0	2.4
9	1.55	0.96	2.08			3.42	0.98	0.19			4.59	4.59				288	450	7.3	0.91	1.8
13	0.97	1.44	1.03			1.68	1.37	0.19			3.44	3.44				227	350	7.7	0	0.9
Mar																				
10	3.39	.12	1.61			3.42	1.53	.17			5.12	5.12				371	580	7.2	0	1.2
24	1.74	1.01	3.04			2.90	2.11	.78			5.79	5.79				384	600	7.4	.15	2.4
Aug																				
15	1.90	1.78	3.05			2.14	1.72	2.37			6.73	6.73				409	640	8.2	0	2.29
24	2.00	1.49	6.02			2.14	4.60	2.77			9.51	9.51				576	900	8.0	0	4.97
25	1.30	1.22	3.14			1.98	2.30	1.38			5.66	5.66				339	530	8.1	0	2.79

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MISCELLANEOUS SITES
SUMMARY OF DISCHARGE MEASUREMENTS

DISCHARGE MEASUREMENTS MADE AT MISCELLANEOUS SITES DURING YEAR - 1975

Stream	Location of measurement site	Drainage area square miles	Measurements Date	Cusecs
Gundak Rud.	Kach Dam		7 Feb	1
	Lat. 30°20'		3 Mar	0.87
	Long 67°06'		12 Apr	1.2
			8 May	1.7
			16 Jun	1.20
			24 Jul	1.30
			16 Aug	1.0
			16 Sep	1.60
			11 Oct	1.30
			13 Nov	1.80
			19 Dec	1.20
Sariab Lora	Brewary Bridge		2 Feb	1.67
	Lat. 30°11'		4 Mar	2.16
	Long 66°58'		4 Apr	1.88
			2 May	1.72
			17 Jun	3.40
			24 Jul	3.00
			12 Aug	0.83
			16 Sep	0.63
			10 Oct	0.85
			13 Nov	1.08
			19 Dec	0.27
Zhob	Sharik Weir		18 Jan	26
	Lat. 31°08'		3 Feb	23.4
	Long 69°15'		20 Feb	19.5
			8 Mar	18.6
			25 Mar	40.0
			2 Apr	45.6
			17 Apr	18.2
			19 Jun	7.04
			18 Jul	314
			22 Aug	730
			11 Sep	36.20
			21 Sep	37.20
			22 Oct	22.20
			9 Nov	22
			22 Nov	23.1
			4 Dec	34.7
			20 Dec	25.66

DISCHARGE MEASUREMENTS MADE AT MISCELLANEOUS SITES DURING YEAR - 1975

Stream	Location of measurement sits	Drainage area square miles	Measurements Date	Cusecs
Sehan River	Mekhtar		30 Aug	5.20
			28 Sep	1.85
			2 Oct	1.76
			25 Oct	1.45
			6 Nov	2.60
			15 Nov	3.60
			4 Dec	2.60
			27 Dec	2.30
Baleli Nallah	Check Post		7 Feb	1.2
			3 Mar	1.0
			11 Apr	1.1
			7 May	0.7
			17 Jun	0.9
			24 Jul	0.6
			12 Aug	0.1
			10 Sep	0.2
			11 Oct	0.1
			19 Dec	0.02
Chankani Nallah	Levis Thana		11 Nov	0
			18 Dec	0
Malir River	Super Highway		1 Sep	526
			2 Sep	131
			27 Dec	0.9
Kahan River	Malote		10 Sep	64.1
			22 Sep	431
			27 Sep	45.4
			3 Oct	33.1
			14 Oct	23.5
			19 Oct	25.2
			6 Nov	25.9
			15 Nov	19.5
			22 Nov	20.3
			26 Nov	21.7
			9 Dec	18.3
			10 Dec	17.8
Jhelum River	Domel		9 Dec	2960
			29 Dec	2810

274 DISCHARGE MEASUREMENTS MADE AT MISCELLANEOUS SITES DURING YEAR - 1975

Stream	Location of measurement site	Drainage area square miles	Measurements Date	Cusecs
Bhimber Nallah	G.T. Road Bridge		24 Jul	1,790
			25 Jul	1,530
			28 Jul	2,890
			31 Jul	702
			7 Aug	230
			10 Aug	173
			15 Aug	201
			20 Aug	4,040
			22 Aug	1,320
			29 Aug	2,700
			31 Aug	3,940
			2 Sep	8,490
			4 Sep	3,000
			8 Sep	4,950
			13 Sep	1,460
			17 Sep	12,100
			19 Sep	4,340
			27 Sep	293

DISCHARGE MEASUREMENTS MADE AT MISCELLANEOUS SITES DURING YEAR - 1975

DRAINS IN N.W.F.P.

Stream	Location of measurement site	Drainage area square miles	Measurements Date	Cusecs
Charpriza	Drain	1974	11 Jan	20.3
			30 Jan	9.7
			15 Feb	27.0
			22 Feb	43.6
			7 Mar	28.8
			20 Mar	20.7
			10 Mar	5.6
			22 Mar	11.3
			7 Jun	12.1
			25 Jun	3.7
			4 Jul	12.4
			12 Jul	22.7
			23 Jul	15.3
			29 Jul	19.0
			3 Aug	13.7
			17 Aug	13.0
			27 Aug	13.4
			30 Aug	11.2
			20 Sep	18.0
			25 Sep	21.0
			12 Oct	23.0
			26 Oct	28.0
			11 Nov	40.5
			29 Nov	36.5
			6 Dec	43.4
			30 Dec	27
		1975	10 Jan	13
			27 Jan	8.0
			13 Feb	24.9
			1 Mar	15.0
			12 Mar	56.4
			25 Mar	48.3
			5 Apr	42.3
			19 Apr	29.9
			3 May	43.8
			17 May	69.7
			8 Jun	19.9
			23 Jun	15.0
			5 Jul	10.4
			16 Jul	41.8
			23 Jul	21.8
			31 Jul	17.5
			25 Sep	22.9
			29 Sep	27.3
			30 Oct	40.0
			15 Nov	36.4

DISCHARGE MEASUREMENTS MADE AT MISCELLANEOUS SITES DURING YEAR - 1975

DRAINS IN N.W.F.P.

Stream	Location of measurement site	Drainage area square miles	Measurements Date	Cusecs
Dallas	Drain	1974	11 Jan	63.5
			30 Jan	41.9
			15 Feb	30.0
			22 Feb	66.5
			7 Mar	40.6
			20 Mar	38.6
			12 Apr	42.3
			29 Apr	31.4
			7 May	29.1
			22 May	24.0
			7 Jun	68.3
			25 Jun	38.5
			4 Jul	35.6
			13 Jul	41.9
			23 Jul	29.7
			29 Jul	45.5
			3 Aug	46.6
			17 Aug	56.8
			27 Aug	45.0
			30 Aug	48.4
			20 Sep	63.0
			25 Sep	58.0
			12 Oct	53.0
			26 Oct	42.4
			11 Nov	52.0
			29 Nov	83.4
			6 Dec	62.8
			30 Dec	53.4
		1975	10 Jan	39.6
			27 Jan	25.7
			13 Feb	69.0
			1 Mar	26.4
			12 Mar	98.4
			25 Mar	41.7
			5 Apr	47.6
			8 May	59.8
			17 May	44.1
			8 Jun	93.3
			23 Jun	20.0
			5 Jul	55.0
			10 Jul	27.9
			23 Jul	35.6
			31 Jul	22.6

DISCHARGE MEASUREMENTS MADE AT MISCELLANEOUS SITES DURING YEAR - 1975

DRAINS IN N.W.F.P.

Stream	Location of measurement site	Drainage area square miles	Measurements Date	Cusecs
			25 Sep	31.8
			29 Sep	34.8
			17 Oct	40.6
			30 Oct	52.7
			15 Nov	56.0
			27 Nov	77.1
Budhni	Drain	1974	11 Jan	192
			30 Jan	133
			17 Feb	163
			7 Mar	180
			20 Mar	161
			10 May	139
			22 May	190
			7 Jun	157
			25 Jun	164
			4 Jul	205
			16 Jul	416
			23 Jul	186
			29 Jul	204
			3 Aug	215
			17 Aug	194
			27 Aug	191
			30 Aug	215
			20 Sep	279
			25 Sep	245
			12 Oct	266
			30 Oct	253
			11 Nov	215
			29 Nov	203
			6 Dec	238
			30 Dec	176
		1975	10 Jan	169
			27 Jan	146
			13 Feb	228
			1 Mar	170
			12 Mar	450
			25 Mar	185
			5 Apr	255
			19 Apr	177
			8 May	176
			17 May	239
			8 Jun	188
			23 Jun	159

 DISCHARGE MEASUREMENTS MADE AT MISCELLANEOUS SITES DURING YEAR - 1975

DRAINS IN N.W.F.P.

Stream	Location of measurement site	Drainage area square miles	Measurements Date	Cusecs
			5 Jul	161
			16 Jul	280
			23 Jul	221
			25 Sep	190
			30 Oct	193
			15 Nov	189
			27 Nov	257

DISCHARGE MEASUREMENTS MADE AT MISCELLANEOUS SITES DURING YEAR - 1975

SMALL STREAMS IN AZAD KASHMIR AREA

Stream	Location of measurement site	Drainage area square miles	Measurements Date	Cusecs
Surgan Nallah at Shadri		1975	27 Dec	218
Kharigum Nallah at Kharigum			27 Dec	10.6
Ratti Gali Nallah near Doarian			28 Jan	39.2
			18 Feb	39.2
			28 Dec	54.6
Nagdar Nallah at Nagdar			22 Jan	24
			18 Feb	26.9
			26 Dec	32.7
Jagran Nallah at Kundal Shahi			26 Dec	145
Jing Nallah near Jing.			21 Jan	13.9
			17 Feb	18.9
			25 Mar	81.0
			25 Dec	38.1
Bhattika Nallah near Bhattika			21 Jan	26.6
			16 Feb	50.0
			24 Mar	199
			25 Dec	29.2
Kathai Nallah at Chinari			25 Jan	23.6
			15 Feb	40.5
			24 Mar	180.0
			24 Dec	43.7
Reshian Nallah near Sharian			25 Jan	12.7
			15 Feb	20.2
			24 Mar	81.4
			24 Dec	20.4
Katha Nowshera Nallah near Garhi Dopatta			24 Dec	9.3

280 DISCHARGE MEASUREMENTS MADE AT MISCELLANEOUS SITES DURING YEAR - 1975

SMALL STREAMS IN AZAD KASHMIR AREA

Stream	Location of measurement site	Drainage area square miles	Measurements Date	Cusecs
Jandar Bain Nallah near Manjdhi		1975	26 Jan	7.3
			16 Feb	19.8
			22 Mar	128
			23 Dec	9.8
Guin Nallah Near Chalar			31 Jan	135
			21 Feb	78.6
			27 Mar	142
			31 Dec	13.3
Chanjal Nallah near Chanjal			22 Feb	107
			26 Mar	561
			30 Dec	54.5
Ali Abad Nallah at Kahuta			30 Dec	5.08
Rangar Nallah at Hajira			30 Jan	133
			24 Feb	70.7
			26 Mar	164.00
			31 Dec	15.6
Rangar Nallah at Thalolot village			39 Jan	20.8
			26 Feb	58.4
			29 Mar	82.7
			5 Dec	32.5
Mamhuli Nallah near Nar.			30 Jan	7.8
			25 Feb	7.36
			29 Mar	11.4
			4 Dec	19.1

DISCHARGE MEASUREMENTS MADE AT MISCELLANEOUS SITE DURING YEAR - 1975

SMALL STREAMS OF SHANGLAPAR BESHAM PATTAN

Stream	Location of measurement site	Drainage area square miles	Measurements Date	Cusecs
Kundian Nallah near Tuti			28 Dec	400
Jalkot Nallah near Kota			29 Dec	49.8
Kayal Khawar near Kayal			30 Dec	35.5
Pattan Nallah at Pattan			30 Dec	10.9
Dubair Nallah near Dubair			10 Dec	260
Allai Khakjar near Bairi			29 Nov	72.3
			5 Dec	70.7

SMALL STREAMS IN SWAT AREA

Behandra Gol near Kalam			29 Dec	88.9
Kedam Khawar at Kooam			25 Dec	17.3
Barwal Khawar near Fateh Pur			25 Dec	5.8

282 DISCHARGE MEASUREMENTS MADE AT MISCELLANEOUS SITES DURING YEAR - 1975

SMALL STREAMS IN CHITRAL DIR AND KALAM AREAS

Stream	Location of measurement site	Drainage area square miles	Measurements Date	Cusecs
Yar Khan River near Mastuj		1975	4 Jan	429
			20 Jan	405
			6 Feb	376
			20 Feb	351
			6 Mar	394
			21 Mar	413
Las pur River near Jastuj			4 Jan	290
			19 Jan	267
			5 Feb	240
			19 Feb	215
			6 Mar	219
			20 Mar	234
Mustuj River near Brainis			6 Jan	1,700
			22 Jan	1,620
			4 Feb	1,502
			18 Feb	1,420
			4 Mar	1,404
			18 Mar	1,350
Golan Gol near Marshlik			7 Jan	169
			22 Jan	160
			3 Feb	145
			17 Feb	137
			3 Mar	129
			18 Mar	134
Koghazi Gol near Koghazi			2 Jan	14
			17 Jan	13.4
			3 Feb	13.6
			17 Feb	12.9
			3 Mar	12.9
			18 Mar	12.9
Baghaht Gol near Garam Chashma			10 Jan	41.4
			25 Jan	38.0
			11 Feb	31.1
			24 Feb	30.2
			10 Mar	33.8
			28 Mar	37.0

DISCHARGE MEASUREMENTS MADE AT MISCELLANEOUS SITES DURING YEAR - 1975

SMALL STREAMS IN CHITRAL DIR AND KALAM AREAS

Stream	Location of measurement site	Drainage area square miles	Measurements Date	Cusecs
Lat koo River at Garam Chashma			9 Jan	186
			25 Jan	178
			11 Feb	169
			24 Feb	163
			11 Mar	143
			20 Mar	154
Shaghur Gol near Sirahat			10 Jan	43.1
			24 Jan	42.3
			10 Feb	38.3
			23 Feb	35.6
			10 Mar	35.2
			27 Mar	36.2
Ayun Gol near Gohan Village			12 Jan	63.7
			27 Jan	56
			9 Feb	52.8
			27 Feb	57.7
			12 Mar	58.8
			25 Mar	68.8
Barear Gol near Barear			12 Jan	10.5
			27 Jan	9.77
			9 Feb	10.6
			27 Feb	10.9
			12 Mar	12.9
			25 Mar	17.8
Domal Gol near Domal Nisai			14 Jan	6.27
			29 Jan	5.92
			14 Feb	6.37
			26 Feb	6.68
			13 Mar	6.97
			29 Mar	7.38
Kohistan River near Shahead Dand.			7 Jan	362
			29 Jan	398
			31 Jan	350
			27 Feb	327
			16 Mar	362
			28 Mar	414

DISCHARGE MEASUREMENTS MADE AT MISCELLANEOUS SITES DURING YEAR - 1975

SMALL STREAMS IN CHITRAL DIR AND KALAM AREAS

Stream	Location of measurement site	Drainage area square miles	Measurements Date	Cusecs
Dhok Dara Nallah near Sherignal			6 Jan	14.2
			29 Jan	16.0
			13 Feb	46.6
			27 Feb	54.9
			16 Mar	56.5
			28 Mar	64.2
Breal Nallah near Branal Bundai			18 Jan	36.0
			30 Jan	37.9
			15 Feb	225
			26 Feb	250
			14 Mar	204
			27 Mar	239
Alpuri Nallah near Alpuri			11 Jan	53
			24 Jan	69
			21 Feb	84.2
			28 Feb	86.3
			14 Mar	84.0
			25 Mar	87
Gorband Nallah near Karora			11 Jan	106.0
			24 Jan	187.0
			20 Feb	194.0
			27 Feb	204.0
			16 Mar	208.0
			23 Mar	198.0
Domori Nallah near Domori			25 Jan	81.5
			19 Feb	105.0
			26 Feb	98.2
			15 Mar	102.0
			24 Mar	109.0
Besham Nallah near Besham			12 Jan	199
			25 Jan	265
			19 Feb	396
			26 Feb	393
			13 Mar	285
			24 Mar	401

DISCHARGE MEASUREMENTS MADE AT MISCELLANEOUS SITES DURING YEAR - 1975

SMALL STREAMS IN CHITRAL DIR AND KALAM AREAS

Stream	Location of measurement site	Drainage area square miles	Measurements Date	Cusecs
Kangla Nallah near chakaser			10 Jan	16
			26 Jan	17
			9 Feb	40.6
			19 Feb	22.8
			7 Mar	37.6
			25 Mar	36.9
Choga Nallah near Choga			12 Jan	16.4
			24 Jan	18.9
			11 Feb	19.2
			21 Feb	21.1
			10 Mar	52
			28 Mar	54.4
Puran Nallah near puran			11 Jan	16
			23 Jan	17
			10 Feb	21.7
			20 Feb	26.9
			9 Mar	31.2
			27 Mar	34.7

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MISCELLANEOUS SITES
SUMMARY OF QUALITY DATA

JHELUM RIVER AT MAJOKA

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	TOTAL Cations	TOTAL Anions	PARTS PER MILLION SiO_2	Fe	B	D.S. by Evap.	EC×10^6 at 25 °C	pH	Res CO_3 me/l	SAR
Mar																				
3	1.80	2.20	8.00		0	3.06	5.94	3.20			12.00	12.20				704	1150	8.1	0	5.7
29	1.80	2.60	20.30		0	1.62	16.26	6.60			24.70	24.46				1480	2300	7.9	0	14
Apr																				
7	1.40	2.30	7.50		0	3.06	8.14	2.80			11.20	11.00				652	1060	7.8	0	5.5

JHELUM RIVER AT KHUSHAB BRIDGE

Chemical Analysis for Water Samples - 1975

Date	Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	TOTAL Cations	TOTAL Anions	SiO_2	Fe	B	D.S. by Evap.	$EC \times 10^6$ at 25 °C	pH	Res CO_3 ms/l	SAR
	MILLIEQUIVALENTS PER LITE												PARTS PER MILLION							
Jan 5	1.00	1.20	.65		0	2.06	.48	.30			2.85	2.84				156	270	7.8	0	.6
28	2.00	2.10	5.10		0	2.74	5.37	1.20			9.20	9.31				540	900	7.8	0	3.6
Mar 27	1.60	2.60	9.20		T	2.04	7.92	3.40			13.40	13.36				808	1300	8.2	0	6.3
May 22	.80	1.00	.30		0	1.52	.20	.40			2.10	2.12				116	200	7.9	0	.3
Jun 26	.90	.50	.28		0	1.28	.20	.20			1.66	1.68				84	160	8.0	0	.3
Nov 15	1.90	1.60	7.20		0	2.62	4.59	3.60			10.70	10.81				604	1000	7.9	0	5.4

SEHAN RIVER AT MEKHTAR

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	TOTAL Cations	TOTAL Anions	PARTS PER MILLION SiO_2	Fe	B	D.S. by Evap.	$EC \times 10^6$ at 25 °C	pH	Res CO_3 me/l	SAR
Sep 28	2.70	2.24	9.60		0.34	2.31	2.11	9.78			14.54	14.54				889	1390	9.3	0	6.0
Oct 2	2.90	1.95	9.39		0.34	2.39	2.49	9.02			14.24	14.24				832	1300	8.3	0	6.00
3	2.30	2.06	6.78		0.34	2.56	2.30	5.94			11.14	11.14				800	1250	8.3	0	4.61
3	2.90	2.04	8.05		0.34	2.90	2.30	7.42			12.99	12.99				819	1280	8.5	0	5.07
25	2.40	3.71	2.98		0.16	2.88	2.11	3.94			9.09	9.09				640	1000	8.4	0	1.66
Nov 6	2.40	3.32	1.26		0.33	3.13	1.72	1.80			6.98	6.98				435	680	8.4	0	0.71
15	2.30	3.42	1.87		0.33	3.13	1.72	2.41			7.59	7.59				486	760	8.4	0	1.10
Dec 4	3.50	4.59	15.50		0.33	3.13	4.22	15.91			23.59	23.59				1408	2200	8.4	0	7.75
27	2.25	4.69	14.23		0.99	2.80	3.42	13.96			21.17	21.17				1408	2200	8.4	0	7.70

ZHOB RIVER AT KIRZAI

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	TOTAL Cations	TOTAL Anions	PARTS PER MILLION SiO_2	Fe	B	D.S. by Evap.	$EC \times 10^6$ at 25 °C	pH	Res CO_3 me/l	SAR
Jan																				
8	3.2	7.5	12.9		-	2.9	6.9	10.6			20.4	20.4				1216	1900	8.1	0	6.5
17	2.1	3.7	4.3		-	3.7	2.5	3.9			10.1	10.1				608	950	8.2	0	2.4
18	3.2	4.6	10.5		0.34	3.2	6.9	7.9			18.3	18.3				1152	1800	8.5	0	5.51
Feb																				
3	3.29	3.40	11.02		0.17	3.24	6.89	7.41			17.71	17.71				1152	1800	8.7	0	5.9
20	2.91	3.69	10.71		0.17	3.42	6.69	7.03			17.31	17.31				1152	1800	8.3	0	5.8
Mar																				
8	2.94	4.23	7.39		0.17	2.90	8.25	14.53			25.85	25.85				1536	2400	8.3	0	3.9
25	3.82	2.47	13.02		0.17	2.73	5.56	10.85			19.31	19.31				1152	1800	8.3	0	7.2
Apr																				
2	2.35	2.61	6.54		-	3.42	2.68	5.42			11.52	11.52				704	1100	7.8	0	-
17	2.74	4.59	14.76		0.51	2.56	8.44	10.58			22.09	22.09				1472	2300	8.3	0	7.6
Jun																				
19	2.32	4.80	18.38		-	2.39	10.17	15.07			25.50	25.50				1683	2630	8.1	0	5.5
Jul																				
18	1.45	1.49	5.00		0.68	1.71	2.49	3.06			7.94	7.94				512	800	8.3	0	4.1
Aug																				
22	3.49	2.87	11.57		0.17	2.30	4.60	10.86			17.93	17.93				960	1600	8.3	0	5.4
Sep																				
11	3.20	2.81	9.87		0.34	2.56	3.64	9.34			15.88	15.88				926	1450	8.4	0	5.42
21	3.20	3.29	7.61		0.34	2.56	2.49	8.71			14.10	14.10				960	1500	8.5	0	4.18
Oct																				
22	2.40	5.36	13.00		0.16	2.88	5.61	12.11			20.76	20.76				1216	1900	8.3	0	6.50
Nov																				
9	2.90	4.76	12.75		0.33	3.30	6.33	10.45			20.41	20.41				1241	1940	8.4	0	6.50
22	2.90	4.76	14.10		0.33	1.85	6.52	13.26			21.76	21.76				1280	2000	8.4	0	7.19
Dec																				
4	4.23	3.78	19.04		0.33	2.97	7.41	16.34			27.05	27.05				1680	2640	8.5	0	9.5
20	3.00	4.12	15.08		0.33	2.80	3.61	15.46			22.20	22.20				1344	2100	8.4	0	8.0

ZHOB RIVER AT BADANZAI

Chemical Analysis of Water Samples - 1975

Date	Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	TOTAL Cations	TOTAL Anions	SiO_2	Fe	B	D.S. by Evap.	EC×10^6 at 25 °C	pH	Res CO_3	SAR
	MILLIEQUIVALENTS PER LITRE												PARTS PER MILLION						me/l	
Jan 7	2.9	2.3	5.8		-	3.4	2.5	5.1			11.0	11.0				704	1100	8.2	0	3.5
Feb 2	3.09	3.88	10.90		-	3.76	6.89	7.22			17.87	17.87				1152	1800	8.0	0	5.7
21	3.00	3.23	11.85		0.17	3.24	6.69	7.99			18.08	18.08				1152	1800	8.3	0	6.6
Mar 9	3.03	4.02	16.59			3.07	8.64	11.93			23.64	23.64				1408	2200	8.2	0	8.7
26	1.47	1.91	5.89			2.39	2.11	4.77			9.27	9.27				582	910	7.9	0	4.4
Apr 3	2.54	2.34	6.79			3.59	2.88	5.20			11.67	11.67				704	1100	7.7	0	4.3
16	2.84	4.21	15.36			2.42	8.44	10.54			22.40	22.40				1472	2300	8.0	0	8.1
Jun 19	2.81	4.12	19.25			3.24	9.60	13.34			26.18	26.18				1536	2400	8.1	0	10.2
Jul 18	2.03	0.91	8.3		0.68	1.53	3.45	5.58			11.24	11.24				852	1020	8.3	0	6.9
Aug 22	3.58	2.50	10.35		0.34	2.05	3.84	10.20			16.43	16.43				896	1500	8.3	0	5.8
Sep 11	2.70	2.44	6.57		0.68	2.05	2.49	6.49			11.71	11.71				768	1200	8.3	0	4.07
21	3.00	2.04	8.56		0.34	2.56	2.49	8.21			13.60	13.60				768	1200	8.5	0	5.39
Oct 23	2.80	4.66	12.25		0.33	2.64	5.95	10.79			19.71	19.71				1216	1900	8.3	0	6.24
Nov 10	2.90	5.05	11.55		0.33	3.46	5.76	9.95			19.50	19.50				1120	1750	8.4	0	5.77
21	3.50	3.87	7.66		0.66	2.97	4.80	7.10			15.53	15.53				960	1500	8.4	0	3.83
Dec 3	2.72	5.37	19.12		0.66	2.80	5.51	18.24			27.21	27.21				1664	2600	8.4	0	9.6
19	2.16	5.04	14.16		0.33	2.97	5.51	12.55			21.36	21.36				1304	2040	8.5	0	7.5

ZHOB RIVER AT SHARIK WEIR

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	TOTAL Cations	TOTAL Anions	PARTS PER MILLION SiO_2	Fe	B	D.S. by Evap.	EX$\times 10^6$ at 25 °C	pH	Res CO_3 me/l	SAR
Jan																				
8	3.0	4.4	8.8		-	3.7	6.9	6.6			16.2	16.2				1024	1600	8.3	0	4.4
18	3.1	5.2	10.0		-	3.5	6.7	8.1			18.3	18.3				1152	1800	8.2	0	4.9
Feb																				
3	3.49	3.85	12.84		0.17	3.42	7.48	9.11			20.18	20.18				1280	2000	8.9	0	6.6
20	3.58	3.95	12.28		0.17	3.24	7.28	9.12			19.81	19.81				1248	1950	8.4	0	6.2
Mar																				
9	3.13	3.92	15.38		0.17	2.73	8.25	11.28			22.43	22.43				1408	2200	8.3	0	8.1
25	3.24	2.77	11.23		-	2.90	4.80	9.54			17.24	17.24				1024	1600	8.2	0	6.4
Apr																				
2	2.64	2.71	10.13		-	3.24	4.22	8.02			15.48	15.48				960	1500	7.7	0	6.1
17	2.74	4.78	15.73		-	2.90	8.44	11.91			23.25	23.25				1472	2300	8.2	0	8.0
Jun																				
19	3.10	4.12	19.30		0.34	1.88	9.6	14.70			26.52	26.52				1600	2500	8.3	0	10.0
Jul																				
18	2.13	1.48	7.14		0.34	1.53	3.45	5.43			10.75	10.75				640	1000	8.3	0	5.3
Aug																				
22	1.84	2.24	2.47		0.34	3.76	2.11	0.34			6.55	6.55				384	400	8.3	0.02	1.7
Sep																				
11	3.00	3.20	6.88		0.34	3.07	4.03	5.64			13.08	13.08				896	1400	8.3	0	3.85
21	2.90	3.21	8.06		0.34	1.88	4.03	7.92			14.17	14.17				896	1400	8.3	0	4.59
Oct																				
22	1.30	6.43	13.51		0.33	2.47	6.33	12.11			21.24	21.24				1216	1900	8.3	0	6.75
Nov																				
22	2.70	3.99	7.14		0.33	2.97	3.64	6.89			13.83	13.83				761	1190	8.3	0	2.71
23	2.60	3.89	8.78		0.33	3.13	4.41	7.40			15.27	15.27				896	1400	8.3	0	4.82
Dec																				
4	3.47	5.17	18.96		0.66	2.97	5.70	18.27			27.60	27.60				1664	2600	8.3	0	9.1
20	2.93	4.95	12.10		0.99	2.64	5.51	10.08			19.22	19.22				1326	2060	8.5	0	6.4

SARIAS LORA AT BREWERY BRIDGE

Chemical Analysis of Water Samples - 1975

Date	MILLIEQUIVALENTS PER LITRE Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	TOTAL Cations	TOTAL Anions	PARTS PER MILLION SiO_2	Fe	B	D.S. by Evap.	$EC \times 10^5$ at 25 °C	pH	Res CO_3 me/l	SAR
Jan 16	3.9	13.3	7.0		0.6	7.5	4.7	11.6			24.20	24.20				1536	2400	8.5	0	2.3
Feb 1	2.74	3.66	2.78			3.70	1.67	3.90			9.17	9.17				588	920	8.1	0	1.5
Mar 4	2.15	11.10	12.33		1.02	5.98	5.56	13.02			25.58	25.58				1536	2410	8.6	0	4.7
Apr 11	1.75	12.54	9.21		1.19	5.98	5.56	10.58			23.31	23.31				1536	2400	8.5	0	3.4
May 2	3.35	10.02	10.98		0.85	5.98	5.76	15.40			22.83	22.83				1408	2200	8.8	0	4.2
Jun 17	1.94	10.03	10.60		0.80	5.64	4.80	1.51			22.57	22.57				1344.	2100	8.6	0	4.3
Jul 24	2.13	1.67	10.37		0.68	2.05	4.05	7.41			14.17	14.17				896	1400	8.5	0	7.4
Aug 12	1.64	9.09	10.99		1.71	3.76	4.60	11.64			21.71	21.71				1216	2000	8.9	0	4.7
Sep 16	1.90	9.74	12.83		1.36	5.13	4.60	13.38			24.47	24.47				1408	2200	8.7	0	5.26
Oct 19	1.90	10.77	8.84		1.36	5.64	4.80	10.71			22.51	22.51				1408	2200	8.6	0	3.35
Nov 13	2.80	12.05	11.94		0.20	6.23	5.95	14.11			26.49	26.49				1561	2440	8.7	0	4.41
Dec 17	3.29	12.99	10.73		1.65	6.27	5.70	13.39			27.01	27.01				1690	2640	8.7	0	3.8

GHUNDAK RUD NEAR KACH DAM

Chemical Analysis of Water Samples - 1975

Date	Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	?	TOTAL Cations	TOTAL Anions	SiO_2	Fe	B	D.S. by Evap.	$EC \times 10^6$ at 25 °C	pH	Res CO_3 me/l	SAR
	MILLIEQUIVALENTS PER LITRE												PARTS PER MILLION							
Jan 15	2.1	3.5	3.8			3.8	1.5	0.9			9.40	9.40				320	503	8.2	0	0.47
Feb 7	1.66	2.85	1.88			3.07	1.37	1.95			6.39	6.39				384	600	8.2	0	1.2
Mar 3	1.96	2.27	4.31			3.78	1.53	3.25			8.54	8.54				499	780	8.1	0	2.9
Apr 12	1.66	3.22	2.84			3.42	1.53	2.77			7.72	7.72				512	800	8.0	0	1.8
May 8	1.26	2.54	2.43		0.17	2.56	2.11	1.39			6.23	6.23				364	600	8.4	0	1.7
Jun 16	1.16	2.64	2.57		0.17	2.73	1.53	1.94			6.37	6.37				377	590	8.4	0	1.8
Jul 24	1.16	0.83	3.68		0.34	1.71	1.92	1.70			5.67	5.67				352	550	8.4	0.06	3.7
Aug 15	1.64	2.63	2.89		0.34	2.39	1.72	2.71			7.16	7.16				435	680	8.4	0	1.9
Sep 18	1.80	3.24	1.66		0.08	2.82	1.92	1.78			6.70	6.70				384	600	8.4	0	1.04
Oct 11	1.70	2.95	1.78		0.34	3.07	1.53	1.76			6.43	6.43				390	610	8.4	0	1.15
Nov 15	2.00	3.14	1.59		0.33	2.97	1.34	2.09			6.73	6.73				403	630	8.4	0	0.98

BALELI RIVER AT BALELI BRIDGE

Chemical Analysis of Water Samples - 197

Date	MILLIEQUIVALENTS PER LITRE										TOTAL		PARTS PER MILLION				$EC \times 10^6$ at 25 °C	pH	Res CO_3 me/l	SAR
	Ca	Mg	Na	K	CO_3	HCO_3	Cl	SO_4	NO_3	F	Cations	Anions	SiO_2	Fe	B	D.S. by Evap.				
Jan 10	2.2	2.4	3.4			3.7	1.7	2.6			8.00	8.00				512	800	8.4	0	2.2
Feb 7	1.31	3.01	1.86			2.90	1.77	1.51			6.18	6.18				435	680	8.2	0	1.2
Mar 3	2.29	2.63	5.07			4.78	1.92	3.25			9.95	9.95				576	900	7.6	0	3.2
Apr 11	2.25	3.20	3.24			4.78	1.92	1.99			8.69	8.69				544	850	8.1	0	1.9
May 7	1.64	2.94	2.52			3.42	2.30	0.98			6.70	6.70				390	610	7.9	0	1.7
Jun 17	1.84	2.24	3.55			3.59	2.30	1.74			7.63	7.63				448	700	8.1	0	2.4
Jul 24	1.28	0.64	4.13		0.34	2.22	1.34	2.13			6.03	6.03				390	610	8.4	0.66	4.2
Aug 12	2.81	6.51	14.17		0.34	4.44	6.14	12.37			23.29	23.29				1400	2200	8.3	0	6.5
Sep 3	1.89	7.12	13.13		0.68	4.78	5.37	11.22			22.05	22.05				1280	2000	8.4	0	6.17
Oct 11	2.30	5.65	10.82			5.64	4.22	8.91			18.77	18.77				1088	1700	8.0	0	5.41
Nov 14	1.70	5.96	9.70		0.68	4.62	4.60	7.28			17.36	17.36				1056	1700	8.4	0	4.94
Dec 19	1.31	1.59	9.17		1.45	4.45	4.18	7.79			18.07	18.07				1076	1680	8.4	-	4.30