

TABLES



Table C2.1 Inventory of Climatological Stations

No.	Station	Location		Elev. ft	River Basin	Operating Agency	Instruments	Period of Record
		Lat.	Long.					
1	Karora	34D-52M	72D-46M	-	Swat	IRR(F)	1	1962-
2	Abazai	34D-23M	71D-34M	1,500	Swat	IRR(F)	1	
3	Tota Khan	34D-38M	71D-49M	-	Swat	IRR(F)	1	1972-
4	Char Saddah	34D-09M	71D-45M	970	Swat	PRO(F)	1	
5	Utmanzai	34D-10M	71D-45M	942	Swat	IRR(F)	1	
6	Kulangi	34D-39M	71D-47M	2,200		IRR(F)	1	
7	Amandara	34D-37M	71D-59M	2,152	Swat	IRR(F)	1	
8	Chakdara	34D-39M	72D-02M	2,220	Swat	PMS SWHP	1,4,5,7	1940- 1962-
9	Saidu Sharif	34D-45M	72D-22M	3,200	Swat	PMS	1,2,4,5,6,7	1966-
10	Charbagh	34D-45M	72D-27M	3,400	Swat	IRR(F)	1	
11	Kalako	35D-03M	72D-28M	-	Swat	IRR(F)	1	
12	Kalam	35D-32M	72D-35M	7,500	Swat	SWHP	1,2,4,5,6	1962-
13	Malakand	34D-34M	71D-55M	3,000	Kalpan	IRR(F)	1	1866-
14	Peshawar	34D-00M	71D-31M	1,180	Kabul	FOR	1,2,4,5,6,7 10,11,12,13	1866 1966
15	Peshawar P.A.F	34D-01M	71D-35M	1,177	Bara	PMS	1,3,4,5,7,8,9	1966

Source: Inventory of stream gauging and climatological stations SWHP-WAPDA.

Instruments Description

- 1: 5 inch non-recording rain gauge
- 2: U.S. Weighing type Recording Rain Gauge
- 3: Casella Natural Siphon Recording Rain Gauge
- 4: Dry and Wet Bulb Thermometers
- 5: Maximum - Minimum Thermometer
- 6: Evaporation Pan/Evaporation Balance
- 7: Anemometer
- 8: Pilot Baloon
- 9: Radiosonde
- 10: Sunshine instruments
- 11: Soil temperature recording instrument
- 12: Soil moisture recording instrument
- 13: Dew observation gauges and balance

Operating Agencies

- IRR(F) - Irrigation Department
NWFP
- SWHP - Surface Water Hydrology
Project WAPDA
- PRO(F) - Provincial Authorities
NWFP
- PMS - Pakistan Meteorological
Services
- FOR - Pakistan Forest Institute
Peshawar

Table C2.2 Inventory of Stream Gauging Stations

No.	Station	Location		Drainage Area (Sq.mile)	Operatin Agency	Period Of Record
		Lat.	Long.			
1	Swat River near Kalam	35D-30M	72D-35M	780	IRR(F) SWHP	1956-62 1961-
2	Swat River at Chakdara	34D-38M	72D-02M	2,230	IRR(F) SWHP	1911- 1960-
3	Swat River at Munda	34D-20M	71D-34M	5,560	IRR(F)	1956- 1927-58
4	Kaul River at Warsak	34D-11M	71D-24M	26,000	IRR(F) PWD(F)	1897- 1949-60
5	Khyber River at Ali Masjid	34D-01M	71D-16M	-	IRR(F)	1970-
6	Bara River at Jhansi Post	33D-52M	71D-24M	713	IRR(F) SWHP	1959-62 1961-
7	Kabul River at Nowshera	34D-01M	71D-58M	34,200	SWHP	DEC 1960-

Source: Inventory of stream gauging and climatological stations SWHP-WAPDA.

Operating Agencies

- IRR(Irrigation Department N.W.F.P
- SW Surface Water Hydrology Project WAPDA
- PW Public Works Department N.W.F.P

Table C2.3 Monthly Flow Records at Kalam Station

Units: m³/sec

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1956	15.2	14.8	17.5	50.9	200.3	240.8	290.1	181.9	82.3	36.8	20.5	16.1	97.3
1957	14.7	13.8	14.7	27.6	87.5	237.5	323.7	231.6	93.7	59.4	48.1	29.5	98.5
1958	14.3	11.2	15.7	61.4	136.8	278.4	438.0	246.4	157.0	54.8	26.2	19.3	121.6
1959	15.2	12.7	16.1	60.0	167.2	299.3	387.8	256.1	145.1	66.3	38.5	28.1	124.4
1960	21.6	20.4	25.8	36.6	143.7	305.0	469.7	268.0	119.9	44.2	25.2	18.4	124.9
1961	13.8	11.2	13.4	34.3	121.6	235.1	263.4	187.4	124.2	49.3	25.2	19.8	91.6
1962	16.1	14.3	14.7	31.9	73.7	187.5	211.8	147.4	68.5	32.7	20.9	13.8	69.4
1963	13.4	11.7	16.1	42.4	96.7	265.5	251.4	165.8	83.8	35.5	21.9	16.6	85.1
1964	15.2	14.8	16.1	37.6	111.0	234.6	286.0	189.7	92.3	35.5	23.3	23.5	90.0
1965	12.9	11.1	13.9	36.9	129.8	335.3	318.3	184.3	88.6	38.3	22.9	16.2	100.7
1966	13.6	13.7	19.5	40.7	100.9	282.2	225.9	185.8	92.6	35.6	21.9	16.5	87.4
1967	13.8	11.9	12.7	31.7	95.1	251.7	337.7	190.1	94.3	32.2	21.2	16.6	92.4
1968	14.5	13.0	15.3	40.6	101.8	246.4	280.3	179.1	75.8	34.5	21.2	17.3	86.6
1969	14.0	13.5	22.7	52.3	105.4	270.8	367.1	251.8	76.2	38.2	25.8	19.2	104.7
1970	15.7	13.6	14.7	46.7	124.3	231.2	196.9	181.6	108.0	39.8	24.0	18.1	84.5
1971	14.9	13.4	17.8	54.1	142.2	241.0	174.7	154.5	62.3	28.0	18.8	14.6	78.0
1972	13.0	11.4	15.1	45.2	125.2	317.0	282.0	181.0	95.4	34.7	21.2	16.0	96.4
1973	12.9	11.2	13.7	58.0	154.3	311.5	269.6	211.2	107.3	40.5	21.2	16.0	102.3
1974	12.9	11.9	19.2	54.9	96.0	194.8	217.5	144.7	59.7	30.6	19.7	15.5	73.1
1975	12.7	12.1	12.6	43.3	182.3	268.9	249.7	223.4	87.8	36.6	26.3	18.8	97.9
1976	14.6	13.1	14.3	27.4	144.8	248.0	305.0	171.6	81.2	38.0	22.7	16.5	91.4
1977	13.8	13.2	17.9	48.0	106.9	213.6	218.8	145.9	64.1	31.5	20.5	16.1	75.9
1978	14.1	12.9	13.4	41.7	136.3	260.1	257.2	136.8	52.1	31.0	21.5	18.2	82.9
1979	14.0	12.5	13.1	54.7	94.3	249.2	293.5	144.7	63.2	28.5	20.7	15.2	83.6
1980	16.6	13.1	13.4	43.7	133.5	256.6	215.1	128.9	63.4	32.3	23.3	17.9	79.8
1981	16.7	15.6	18.1	62.0	186.1	232.8	259.0	141.4	57.6	30.0	20.5	16.9	88.1
1982	14.5	13.5	13.5	36.0	94.8	138.8	150.8	142.6	45.2	26.8	21.5	18.7	59.7
1983	16.1	14.6	15.4	30.1	105.4	193.9	209.6	167.5	79.9	34.4	25.4	20.0	76.0
1984	16.2	13.1	16.8	41.4	125.2	320.9	207.0	180.3	80.3	29.7	20.1	16.3	88.9
1985	14.4	13.0	14.5	34.9	92.1	186.1	214.5	157.5	64.4	33.9	21.6	17.2	72.0
1986	14.8	12.8	15.8	47.0	113.5	217.6	294.9	173.0	62.4	35.4	21.9	16.4	85.5
1987	15.6	15.4	18.2	52.9	127.8	233.7	271.1	196.6	96.4	39.4	26.3	19.2	92.7
1988	18.6	16.8	18.2	73.1	183.7	258.5	266.5	151.8	66.9	32.3	20.6	17.0	93.7
1989	14.7	13.0	15.4	27.5	99.4	263.0	226.9	157.0	77.5	33.5	22.8	18.0	80.7
1990	15.3	14.4	19.6	38.3	213.4	252.9	248.7	162.3	96.3	36.0	22.5	16.3	94.7
1991	14.9	15.8	19.8	47.1	114.1	300.3	369.1	234.5	115.8	42.3	25.6	20.8	110.0
1992	16.8	15.1	17.3	35.0	139.0	292.8	293.6	186.6	81.8	31.7	22.4	19.3	95.9
1993	15.8	14.7	19.5	31.7	124.9	250.6	263.8	174.4	88.3	34.3	22.8	20.4	88.4
1994	17.0	16.2	19.0	42.2	139.4	288.0	335.7	200.7	91.9	35.7	25.1	19.2	102.5
1995	15.4	13.6	15.5	42.1	118.9	262.4	337.1	198.8	71.8	38.0	23.0	17.9	96.2
1996	16.7	13.5	14.7	42.1	120.3	268.7	289.8	185.0	75.1	34.3	22.4	20.1	91.9
1997	21.6	14.3	15.7	39.4	122.4	257.2	288.9	182.7	87.5	NA	NA	NA	NA
Average	15.2	13.6	16.3	43.5	126.9	254.3	277.6	182.9	85.2	36.9	23.6	18.2	91.7

Table C2.4 Monthly Flow Records at Chakdara Station

Units: m³/sec

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1956	36.8	42.3	65.9	192.3	432.9	406.9	478.9	279.5	139.9	54.8	37.1	38.2	183.8
1957	36.4	39.8	55.3	104.7	188.8	401.2	534.2	335.7	159.4	88.4	86.6	70.0	175.0
1958	35.5	32.6	59.9	232.2	295.7	470.6	722.6	379.5	267.0	81.5	46.6	46.1	222.5
1959	37.3	37.2	60.8	226.5	361.1	505.9	639.7	394.2	247.0	99.0	70.0	67.2	228.8
1960	53.4	59.7	97.2	139.0	310.4	527.3	775.1	412.6	203.7	65.9	45.2	44.2	227.8
1961	38.7	40.3	59.9	157.5	273.1	422.1	429.7	269.9	197.5	77.8	50.0	40.5	171.4
1962	34.5	35.2	52.0	117.1	166.2	275.5	343.1	236.7	116.6	56.2	43.8	39.6	126.4
1963	30.9	28.0	93.5	186.5	322.8	440.7	378.6	248.7	114.7	55.7	51.9	35.9	165.7
1964	39.1	44.9	81.5	169.4	233.0	356.9	492.8	319.6	147.0	61.7	35.7	44.7	168.9
1965	38.7	62.6	80.6	263.3	370.3	568.3	526.4	294.3	125.1	66.5	50.0	38.5	207.0
1966	33.2	46.6	107.5	234.0	298.5	508.7	404.8	301.3	168.1	79.0	46.6	35.8	188.7
1967	31.9	51.0	85.2	175.3	234.3	525.4	523.5	282.4	142.8	71.5	44.4	46.9	184.6
1968	40.3	40.6	80.5	169.9	260.7	551.5	545.4	348.7	102.6	61.6	48.3	55.0	192.1
1969	40.6	55.7	139.5	197.9	282.2	478.6	567.8	395.6	136.8	91.2	58.8	40.9	207.1
1970	36.7	35.3	65.2	147.4	254.0	387.8	292.3	264.9	214.5	78.4	42.0	33.6	154.4
1971	28.0	28.8	51.7	162.7	288.4	386.9	320.6	267.2	102.7	47.9	34.0	28.6	145.6
1972	30.1	42.5	98.6	169.0	307.7	527.9	452.6	298.6	150.1	66.9	53.6	45.4	186.9
1973	43.7	57.7	109.5	211.2	340.9	514.1	459.6	401.6	173.9	70.8	39.0	37.1	204.9
1974	34.0	40.7	78.7	156.3	197.4	329.2	335.3	218.7	88.3	54.2	34.3	34.3	133.5
1975	28.6	35.6	81.5	209.5	354.0	466.0	438.6	416.3	168.0	69.1	48.3	47.2	196.9
1976	46.7	58.7	87.6	233.9	318.3	398.2	450.3	332.2	148.7	70.3	43.8	36.7	185.4
1977	44.2	41.4	59.9	168.4	227.8	387.8	417.6	225.6	111.1	78.9	52.1	42.4	154.8
1978	38.1	37.0	122.6	193.8	320.2	451.8	452.1	312.1	110.9	63.8	56.3	40.3	183.2
1979	34.8	41.4	76.4	209.6	233.1	379.8	426.3	258.5	134.7	58.0	45.3	37.3	161.3
1980	37.6	50.2	131.7	217.4	308.6	444.6	359.1	232.7	114.6	69.9	54.9	44.3	172.1
1981	39.0	49.6	120.5	299.8	402.5	339.0	407.6	241.2	105.3	62.8	42.9	31.0	178.4
1982	32.4	34.6	68.3	144.3	208.4	231.2	223.7	250.7	73.9	60.4	72.3	53.8	121.2
1983	43.8	48.5	114.3	171.6	269.5	317.6	301.0	316.1	162.4	67.0	49.2	46.9	159.0
1984	43.8	44.5	67.8	132.3	249.9	501.9	312.0	283.1	151.5	57.5	51.5	45.6	161.8
1985	43.4	39.8	53.7	116.5	184.9	272.7	329.9	224.9	92.9	61.3	30.7	37.9	124.0
1986	38.1	48.5	106.9	197.0	238.3	301.1	431.1	320.2	91.0	59.2	41.8	45.6	159.9
1987	24.4	36.3	132.9	199.6	248.7	367.6	421.9	261.5	133.0	138.3	66.2	48.1	173.2
1988	35.9	44.8	127.4	229.2	334.5	389.9	477.3	268.6	105.9	56.1	35.9	35.4	178.4
1989	43.8	36.6	59.3	107.9	281.8	395.8	347.6	255.8	110.2	67.3	55.2	65.2	152.2
1990	46.4	73.2	180.7	275.7	459.3	396.9	365.6	282.6	167.6	97.9	69.7	63.5	206.6
1991	75.1	131.3	221.9	369.7	373.7	604.0	523.4	335.5	196.4	84.0	52.2	45.4	251.1
1992	34.9	42.9	110.0	201.9	334.2	494.9	466.2	308.4	147.7	65.0	44.0	36.4	190.5
1993	32.3	34.5	89.6	211.6	310.2	420.2	398.0	285.3	136.3	61.1	48.7	61.7	174.1
1994	46.0	57.9	106.5	203.8	352.0	508.5	588.9	421.4	163.4	95.7	68.0	62.9	222.9
1995	49.1	54.6	180.6	268.3	262.7	426.9	605.3	403.6	115.6	75.7	49.7	44.8	211.4
1996	32.8	45.3	94.4	175.0	280.5	312.8	410.7	348.6	118.0	61.3	46.1	45.1	164.2
1997	36.2	48.4	98.3	188.8	291.2	373.1	414.8	334.4	123.4	NA	NA	NA	NA
Average	38.7	46.6	95.6	193.8	292.0	423.0	447.4	306.4	142.4	71.0	49.8	44.9	180.2

Table C2.5 Monthly Flow Records at Nowshera Station

Units: m³/sec

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1956	225	185	391	1,110	1,752	1,557	2,094	585	376	376	243	163	755
1957	185	161	248	720	1,189	1,894	2,229	428	274	274	290	268	680
1958	237	192	390	1,122	1,047	1,837	2,532	741	305	305	209	265	765
1959	254	273	501	950	1,496	2,242	2,716	1,288	538	538	437	366	967
1960	315	304	615	1,337	2,090	2,750	3,446	772	289	289	237	221	1,055
1961	307	315	264	963	1,440	2,141	2,243	881	343	343	321	282	820
1962	264	211	194	699	913	1,577	1,606	529	221	221	210	236	573
1963	190	166	350	747	1,902	2,422	1,989	543	257	257	255	269	779
1964	296	276	408	1,303	1,445	1,812	2,270	626	270	270	230	266	789
1965	268	334	398	1,671	2,629	3,529	3,227	1,452	539	309	318	298	1,248
1966	285	295	685	1,376	1,683	3,056	2,219	1,475	730	322	258	245	1,053
1967	234	241	507	1,011	1,584	2,509	2,654	1,638	731	354	316	375	1,013
1968	389	306	561	1,052	1,583	3,070	2,850	1,925	536	317	305	313	1,101
1969	287	272	594	1,135	1,254	2,327	2,503	1,697	551	347	295	239	958
1970	270	203	298	684	1,132	1,453	1,178	1,168	858	265	209	203	660
1971	200	173	199	522	1,121	1,547	1,140	1,254	526	193	193	175	604
1972	176	247	374	937	1,775	2,832	2,115	1,240	640	289	257	245	927
1973	262	306	484	1,521	2,172	2,860	2,444	1,586	900	365	251	223	1,115
1974	209	207	307	696	946	1,490	1,523	952	434	252	158	151	611
1975	156	158	272	934	1,483	2,013	1,723	2,284	685	269	230	255	872
1976	280	318	357	1,095	1,443	1,764	1,667	1,499	658	310	244	229	822
1977	348	270	263	850	872	1,553	1,816	1,236	587	376	276	246	724
1978	281	211	659	972	1,502	2,044	2,377	1,620	655	370	348	235	940
1979	306	314	399	1,138	1,240	1,985	2,234	1,416	515	306	303	206	864
1980	270	254	406	1,025	1,541	2,056	1,598	1,144	555	221	245	196	793
1981	255	274	446	1,208	1,953	1,674	1,928	1,103	487	258	247	212	837
1982	220	203	277	557	949	1,125	1,022	1,264	340	217	246	219	553
1983	190	190	358	1,031	1,752	1,630	1,720	1,962	867	313	214	245	873
1984	244	295	320	688	1,147	2,278	1,536	1,858	819	227	254	257	827
1985	274	200	163	457	678	1,001	1,476	1,168	469	293	196	232	551
1986	260	259	453	934	1,223	1,561	2,090	1,500	489	310	295	396	814
1987	276	255	793	1,109	1,158	1,671	1,584	1,059	662	461	261	209	792
1988	240	217	492	1,015	1,618	1,792	2,038	1,437	542	268	207	233	842
1989	305	185	284	615	1,167	1,738	1,479	1,134	527	259	208	198	675
1990	268	360	664	814	2,019	1,649	1,582	1,349	735	351	257	260	859
1991	326	319	856	1,775	2,126	3,058	2,779	1,671	975	465	315	278	1,245
1992	306	261	475	1,805	1,827	2,093	2,242	1,496	821	333	647	276	1,049
1993	260	559	507	1,192	1,472	1,896	1,809	1,354	663	292	279	263	879
1994	255	226	392	836	1,334	1,940	2,485	1,641	661	369	313	289	895
1995	284	258	510	1,184	1,484	2,147	2,497	1,538	605	358	227	230	943
1996	232	355	597	923	1,300	2,059	1,960	1,393	762	339	269	261	871
1997	261	279	636	988	1,293	1,826	1,943	1,342	799	NA	NA	NA	NA
Average	261	259	437	1,017	1,470	2,035	2,061	1,292	576	313	270	249	858

Table C3.1 Monthly Rainfall at Kalam Station

Units: mm

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1960	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1961	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1962	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	101.9	85.6	187.5
1963	0.0	70.1	313.7	206.0	169.9	5.1	38.1	31.2	20.6	18.8	60.5	48.5	982.5
1964	159.8	136.1	111.0	253.5	67.3	12.4	62.0	28.7	15.7	27.4	28.7	157.7	1,060.5
1965	156.7	232.4	223.5	314.7	117.9	0.8	38.6	20.8	23.4	25.1	37.3	39.6	1,230.9
1966	0.0	152.7	214.6	294.6	27.4	2.5	32.0	20.3	74.4	71.1	0.0	25.4	915.2
1967	50.8	192.8	125.2	210.6	122.7	16.5	11.9	22.4	40.6	64.0	5.3	104.9	967.7
1968	40.4	62.2	135.4	249.7	132.3	7.6	2.8	65.3	6.4	43.2	35.8	NA	NA
1969	80.3	175.5	211.3	213.1	80.0	27.9	16.0	31.5	43.4	89.7	21.3	7.9	998.0
1970	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1971	7.4	169.4	69.1	216.2	12.4	26.9	49.0	8.9	30.0	14.7	6.9	24.4	635.3
1972	131.6	150.6	105.7	231.1	144.3	31.0	22.1	75.9	82.3	43.9	32.5	121.7	1,172.7
1973	125.5	179.6	191.5	157.0	57.4	1.0	35.3	38.4	56.9	33.3	8.1	21.8	905.8
1974	77.7	168.9	74.4	135.9	94.2	33.3	33.8	26.2	76.5	11.7	0.0	106.2	838.7
1975	56.9	154.7	216.9	253.7	195.1	1.5	48.5	113.3	28.4	49.8	35.8	59.9	1,214.6
1976	86.1	205.2	191.3	136.9	61.7	26.9	29.2	67.8	42.9	30.5	24.1	31.0	933.7
1977	123.4	29.2	99.8	138.9	42.4	4.8	16.0	32.5	13.5	29.5	48.8	35.6	614.4
1978	73.2	46.0	148.6	123.2	62.2	20.8	129.5	19.1	34.3	12.7	112.3	10.2	792.0
1979	42.4	92.2	176.3	200.7	139.7	13.2	11.7	75.2	14.5	1.3	44.2	22.4	833.6
1980	114.8	36.3	4.8	104.6	89.2	31.5	43.7	25.4	32.0	87.9	84.1	26.7	681.0
1981	78.5	216.7	222.0	219.2	69.3	19.8	28.4	59.4	31.5	65.5	31.8	5.1	1,047.2
1982	56.6	185.2	167.4	63.5	49.0	11.7	27.7	11.9	25.7	32.3	123.4	1.3	755.7
1983	49.3	32.3	278.6	62.7	59.4	10.9	15.2	44.5	16.3	9.9	16.3	25.1	620.5
1984	37.1	160.0	176.8	145.5	89.9	10.7	23.6	22.4	45.7	6.6	83.3	76.7	878.3
1985	78.5	26.2	52.8	137.4	85.3	6.9	37.1	53.8	10.7	72.4	27.9	145.0	734.1
1986	27.2	147.3	363.2	178.1	52.6	19.6	27.2	97.0	12.4	9.7	182.9	39.1	1,156.2
1987	0.0	82.3	323.6	235.0	101.9	80.0	26.9	3.3	18.5	206.8	0.0	63.5	1,141.7
1988	58.4	96.0	193.5	91.2	52.1	50.0	38.6	40.9	7.9	3.0	0.5	133.1	765.3
1989	NA	NA	NA	79.0	185.4	7.9	48.2	NA	26.1	35.8	92.2	0.5	NA
1990	NA	NA	NA	NA	14.0	29.5	NA	23.3	9.9	NA	NA	NA	NA
1991	172.7	263.2	336.5	201.9	172.2	30.3	30.5	10.9	117.3	3.1	6.3	70.9	1,415.8
1992	235.7	171.1	336.9	228.9	167.3	38.6	6.6	47.6	121.1	71.6	17.8	71.9	1,515.1
1993	0.0	0.0	0.0	9.9	76.8	56.9	85.1	37.9	9.6	60.9	58.8	33.8	429.7
1994	164.3	149.4	181.6	247.9	NA	25.1	23.1	24.9	61.5	78.2	30.7	104.9	NA
1995	9.1	101.1	NA	231.1	NA	103.9	53.6	12.2	29.5	110.2	27.9	59.4	NA
1996	66.8	148.3	323.1	207.5	128.3	46.0	28.7	28.2	8.6	75.7	19.8	21.6	1,102.6
1997	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table C3.2 Monthly Rainfall at Charbagh Station

Units: mm

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1960	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1961	58.2	37.1	23.4	78.7	1.8	7.1	172.0	71.1	81.3	5.1	39.4	-	NA
1962	NA	NA	NA	NA	NA	NA	195.3	130.6	61.7	9.9	30.0	80.0	507.5
1963	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1964	104.1	73.7	70.6	88.4	40.6	11.4	165.4	103.6	102.9	29.2	11.4	82.6	883.9
1965	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1966	1.3	138.4	174.0	137.2	52.1	25.4	88.9	285.8	75.9	66.8	-	1.5	1,047.2
1967	10.7	144.0	149.6	133.9	58.4	29.2	151.9	147.3	56.1	97.3	3.3	97.5	1,079.2
1968	26.7	60.2	96.0	103.4	61.5	19.8	94.7	87.9	21.8	67.1	5.6	97.0	NA
1969	NA	NA	NA	NA	NA	NA	25.7	124.7	54.1	94.5	22.4	-	321.3
1970	49.5	61.0	46.0	33.0	24.1	25.1	93.7	84.3	83.8	48.8	-	26.7	NA
1971	3.8	88.1	41.1	100.1	68.3	137.2	220.7	109.0	10.2	19.1	-	24.1	821.7
1972	108.7	84.6	81.8	121.4	47.8	45.7	169.4	157.5	77.5	51.3	23.6	82.6	1,051.8
1973	59.7	86.4	119.4	69.9	26.2	15.2	227.8	221.2	49.0	35.1	4.3	28.4	942.6
1974	44.5	150.9	41.9	44.5	27.2	38.9	196.9	96.5	72.4	-	-	78.7	792.2
1975	30.5	128.3	134.6	114.3	80.0	69.9	110.5	309.9	26.7	30.5	29.2	31.8	1,096.0
1976	109.2	102.9	148.6	77.5	31.8	70.6	77.5	170.2	14.0	36.8	2.5	11.4	852.9
1977	188.0	27.9	21.6	165.1	109.2	119.9	118.1	22.9	63.5	53.3	36.8	26.7	953.0
1978	47.0	52.1	61.0	52.1	25.4	40.6	120.7	134.6	7.6	-	58.4	-	599.4
1979	58.4	78.5	185.4	128.3	100.3	2.5	153.7	95.3	61.0	3.8	22.9	NA	890.0
1980	102.9	109.2	-	47.0	14.0	73.7	216.7	103.6	40.6	22.9	8.9	-	739.4
1981	83.8	-	95.3	139.7	101.1	20.3	110.0	81.3	9.7	32.5	8.9	-	682.5
1982	31.8	75.4	107.4	78.7	61.0	30.5	55.9	111.8	39.4	45.7	76.2	95.3	809.0
1983	114.3	55.9	170.2	101.6	99.1	50.8	-	119.4	110.5	3.8	6.4	25.4	857.3
1984	106.7	106.7	69.9	102.9	-	39.4	-	121.9	87.6	-	92.7	31.8	759.5
1985	79.5	15.7	20.3	-	-	-	113.0	72.4	61.0	-	-	119.4	481.3
1986	22.9	102.9	165.1	190.5	44.5	38.1	-	-	230.4	63.5	256.5	-	1,590.5
1987	14.0	307.3	680.5	322.8	164.6	138.9	251.7	47.5	146.1	111.3	-	227.6	2,412.2
1988	168.9	200.4	558.3	33.3	34.0	248.2	677.2	349.3	47.0	52.8	-	163.6	2,532.9
1989	200.7	90.4	117.3	24.9	33.0	22.9	143.8	175.0	37.3	49.8	22.4	38.9	NA
1990	77.0	156.5	142.5	93.7	76.7	38.1	92.7	110.2	28.4	98.8	22.6	133.4	NA
1991	78.0	138.2	156.7	192.0	99.8	27.9	183.1	57.9	95.5	12.7	4.6	8.9	1,055.4
1992	213.9	62.0	114.6	86.9	101.1	29.5	218.2	134.1	120.9	115.3	14.0	37.1	1,247.4
1993	33.3	77.5	242.6	117.3	24.9	70.1	185.2	22.4	48.8	30.5	52.3	1.3	906.0
1994	54.6	85.6	95.3	197.4	74.4	58.2	105.4	167.4	46.7	95.0	6.4	103.1	NA
1995	14.5	114.6	190.8	145.5	32.8	9.1	356.6	189.5	20.1	46.0	-	23.9	NA
1996	63.2	133.6	186.4	78.5	77.7	112.5	78.0	175.8	27.7	77.2	2.5	NA	1,013.2
1997	35.6	26.9	113.3	174.2	-	57.7	104.4	70.9	9.9	74.7	34.3	5.4	NA

Table C3.3 Monthly Rainfall at Amandara Station

Units: mm

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1960	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1961	128.8	54.9	56.6	153.7	-	-	142.7	84.3	62.2	11.4	63.0	2.5	760.2
1962	2.5	86.6	64.5	60.7	6.4	1.8	99.8	129.3	28.4	11.4	24.6	89.7	605.8
1963	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1964	76.2	61.0	65.0	38.4	26.7	-	120.1	71.6	54.9	20.3	6.4	30.0	570.5
1965	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1966	-	131.8	141.7	112.3	48.3	17.8	26.7	56.6	54.6	10.2	-	-	599.9
1967	-	132.8	221.7	88.1	37.8	-	52.3	115.3	30.5	22.9	2.5	62.2	766.3
1968	32.0	22.9	94.0	27.9	37.1	-	33.3	58.7	1.5	5.6	16.0	42.4	371.3
1969	17.8	93.2	84.3	48.0	22.9	6.4	42.2	82.6	103.6	176.5	5.3	-	682.8
1970	63.5	61.0	82.6	21.3	4.3	4.6	58.2	121.2	114.3	18.8	-	38.6	588.3
1971	4.3	109.5	17.5	64.8	11.2	48.8	115.3	72.4	-	0.8	4.1	34.5	483.1
1972	94.7	106.4	111.0	71.6	40.6	39.6	74.4	30.0	35.1	14.2	61.0	90.2	768.9
1973	62.2	237.0	117.6	42.2	33.3	75.4	164.3	264.7	25.1	5.3	-	14.0	1,041.1
1974	32.5	119.1	16.8	32.3	38.4	17.3	98.8	140.5	56.9	-	-	58.4	610.9
1975	15.2	136.1	110.2	101.1	61.0	1.5	83.6	351.5	35.3	-	1.0	24.6	921.3
1976	51.8	164.1	112.8	79.0	14.5	33.8	41.9	235.0	35.1	21.1	-	-	788.9
1977	179.3	26.2	3.0	168.4	1.5	4.8	126.7	161.8	65.0	104.9	41.4	12.2	895.4
1978	64.8	20.8	324.4	10.4	2.8	42.4	119.6	126.0	15.5	10.9	31.0	4.3	772.9
1979	51.1	155.2	98.6	36.6	64.8	4.6	37.6	44.2	23.9	-	10.2	7.9	534.4
1980	97.0	77.5	165.1	7.6	3.0	45.7	31.0	13.2	17.8	40.1	49.8	14.0	561.8
1981	38.6	103.1	160.3	55.0	13.2	-	242.7	31.5	22.1	-	-	-	666.4
1982	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1983	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1984	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1985	50.4	-	0.3	1.2	0.7	-	2.9	341.3	17.8	26.7	20.3	-	461.4
1986	6.9	73.9	-	48.3	19.8	1.8	-	-	-	-	93.7	54.3	298.6
1987	5.9	59.2	-	24.9	-	15.0	41.2	68.5	16.2	-	-	-	230.8
1988	44.7	8.2	154.6	8.9	-	62.3	62.0	96.7	23.9	12.7	-	-	473.8
1989	53.1	0.8	48.2	40.6	20.3	-	53.3	216.8	5.1	9.7	5.7	41.7	495.2
1990	42.4	131.3	-	45.7	8.1	-	-	148.8	15.8	31.0	17.8	104.4	545.3
1991	73.9	120.3	124.3	148.2	32.3	3.8	60.4	16.0	26.1	-	-	11.2	616.5
1992	90.2	33.5	139.9	-	1,192	3.8	64.8	167.6	19.1	158.8	10.2	15.2	1,895.0
1993	0.4	0.3	148.8	57.4	0.7	26.4	3.7	2.3	11.9	27.2	-	-	279.0
1994	20.1	58.4	20.6	42.1	34.5	9.8	-	1.6	17.3	41.4	-	62.5	308.1
1995	-	50.8	84.4	100.8	5.8	5.8	140.4	61.9	12.2	13.5	11.7	15.5	502.8
1996	45.0	38.6	71.6	19.3	14.7	10.9	2.5	56.6	21.6	50.8	NA	5.6	NA
1997	48.3	26.7	107.7	-	75.5	37.0	67.3	205.6	34.3	17.7	39.4	14.7	674.1

Table C3.4 Monthly Rainfall at Malakand Station

Units: mm

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1960	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1961	134.1	39.6	56.4	147.1	-	-	184.7	57.7	53.3	6.9	63.5	-	743.2
1962	3.3	80.8	68.1	42.9	9.7	5.6	121.4	186.2	66.5	10.2	25.4	93.7	713.7
1963	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1964	87.6	52.1	71.9	32.0	21.6	3.8	147.6	123.2	55.9	8.4	1.3	38.4	643.6
1965	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1966	-	96.8	148.6	256.5	19.1	8.6	20.6	112.0	61.5	14.5	-	-	738.1
1967	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1968	92.2	73.2	139.7	41.9	28.2	-	35.6	151.6	6.4	12.7	19.1	42.4	642.9
1969	10.2	123.7	73.4	38.4	20.1	-	90.2	185.4	24.1	107.4	7.6	-	680.5
1970	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1971	-	99.6	17.3	68.6	8.6	90.7	65.0	21.6	25.9	-	-	-	397.3
1972	108.7	99.1	101.1	66.3	41.1	5.6	40.9	5.6	62.5	2.5	50.5	61.0	644.9
1973	49.8	202.2	126.0	38.1	30.7	106.7	157.7	268.7	47.0	8.9	-	10.9	1,046.7
1974	26.7	99.1	7.6	31.2	31.2	27.9	201.9	175.3	43.2	-	-	79.2	723.4
1975	8.9	165.1	112.3	81.3	44.5	7.6	139.7	304.8	69.9	-	-	-	934.0
1976	50.8	209.6	138.9	109.2	3.8	-	150.6	478.8	21.3	24.1	-	5.1	1,192.3
1977	177.5	19.1	3.3	115.1	17.0	9.4	207.3	246.1	25.1	9.9	51.6	29.2	910.6
1978	57.2	16.0	180.3	13.2	1.5	68.3	190.0	259.3	47.0	2.5	20.8	-	856.2
1979	64.8	199.4	111.8	38.6	35.3	157.7	236.7	122.4	31.5	-	16.8	-	1,015.0
1980	66.5	79.5	180.1	2.8	3.0	78.7	5.6	17.0	57.2	28.2	36.8	12.7	568.2
1981	60.7	139.1	186.1	82.0	14.9	-	233.9	171.5	12.7	7.6	-	-	908.6
1982	31.3	82.6	156.2	25.4	53.3	-	20.3	41.8	2.0	4.6	66.8	48.8	533.1
1983	44.7	67.3	106.0	-	36.6	11.4	48.3	359.2	101.6	18.3	-	10.2	803.5
1984	20.3	26.4	100.5	78.7	-	27.2	72.0	259.2	97.8	3.8	148.6	13.7	848.1
1985	68.6	-	0.5	1.7	0.4	-	9.1	150.2	16.4	23.7	11.2	-	281.6
1986	39.4	79.5	-	-	-	58.4	69.9	224.8	-	-	58.4	94.0	624.3
1987	-	94.7	56.7	49.2	65.6	12.2	NA	NA	NA	NA	NA	NA	NA
1988	62.2	120.8	189.3	11.4	-	13.5	127.8	302.4	17.8	22.9	119.4	193.7	1,181.2
1989	115.6	-	63.8	49.0	7.6	-	64.8	95.0	12.7	6.9	4.8	48.8	468.9
1990	37.8	144.0	-	120.7	7.6	2.5	-	321.3	62.0	23.4	38.1	185.4	942.8
1991	80.8	292.4	236.8	264.4	27.9	2.5	93.5	175.0	115.1	40.1	0.1	24.1	1,352.6
1992	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1993	-	-	229.5	108.6	-	24.9	-	24.6	61.0	33.0	6.4	-	487.9
1994	36.8	97.0	50.0	80.0	81.8	-	-	-	29.2	44.7	-	108.7	528.3
1995	-	69.6	123.2	189.4	6.4	6.4	291.1	269.7	72.4	17.8	12.7	12.7	1,071.2
1996	70.8	68.8	122.4	35.6	33.8	56.4	16.5	154.9	17.8	52.1	NA	7.6	636.7
1997	53.3	21.3	78.2	-	49.6	24.1	101.6	283.7	32.5	98.0	30.5	21.1	794.0

Table C3.5 Monthly Rainfall at Abazai Station

Units: mm

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1960	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1961	58.2	37.1	23.4	78.7	1.8	7.1	172.0	71.1	81.3	5.1	39.4	-	575.1
1962	1.3	57.2	55.4	32.5	5.1	-	39.9	50.0	22.9	3.8	14.0	38.1	320.0
1963	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1964	48.3	17.8	63.2	29.0	27.2	-	222.8	8.6	40.6	0.8	-	10.7	468.9
1965	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1966	-	124.0	152.4	55.6	7.6	-	10.2	17.8	3.8	3.8	-	-	375.2
1967	-	73.2	196.3	71.6	-	19.1	38.6	52.1	3.8	28.4	-	188.0	671.1
1968	72.4	NA	113.5	41.9	47.0	-	53.3	35.8	-	15.2	15.2	24.1	NA
1969	NA	NA	NA	NA	NA	NA	73.9	86.4	1.3	31.3	11.4	-	NA
1970	11.7	57.2	33.3	10.2	-	3.8	35.3	144.8	71.4	-	5.1	-	372.6
1971	1.8	30.5	33.0	47.0	1.3	27.2	52.1	34.8	38.1	0.5	-	8.1	274.3
1972	42.4	66.0	52.8	52.1	62.2	10.2	11.9	10.2	16.5	4.3	15.2	37.3	381.3
1973	16.5	71.1	52.8	7.6	61.5	24.1	118.1	83.6	51.3	2.5	-	-	496.8
1974	7.6	47.0	0.5	22.1	-	-	123.2	7.1	15.2	-	-	35.8	258.6
1975	1.3	53.1	71.6	48.3	19.6	-	25.1	131.3	57.2	-	-	5.1	412.5
1976	7.6	85.9	77.5	55.9	0.3	-	130.8	199.4	38.1	15.2	-	-	610.6
1977	61.0	1.3	-	58.4	6.4	-	252.7	138.4	-	31.8	81.3	6.4	637.5
1978	10.2	14.0	297.2	119.4	-	-	280.7	153.7	12.7	2.5	30.5	5.1	925.8
1979	81.7	105.4	81.3	38.1	-	-	48.3	154.9	12.7	-	-	-	522.4
1980	48.3	67.6	148.6	3.0	-	10.2	200.7	182.9	30.5	NA	-	5.6	NA
1981	43.2	48.3	141.0	30.5	15.2	-	78.7	101.6	-	0.3	1.3	-	460.0
1982	26.7	22.9	100.3	17.3	-	-	-	35.4	-	-	13.2	-	215.7
1983	2.5	61.0	115.6	132.4	-	58.4	6.3	NA	73.2	-	-	-	NA
1984	-	7.6	39.9	55.9	-	-	84.1	450.6	17.7	-	25.4	-	681.2
1985	12.7	2.5	27.2	18.8	-	-	409.5	76.2	15.8	58.3	2.5	89.4	713.0
1986	17.8	35.6	93.5	20.3	10.2	17.8	-	88.9	1.3	-	40.6	66.0	392.0
1987	-	41.9	238.7	-	7.6	15.2	-	-	-	-	-	-	303.5
1988	24.1	6.4	168.6	2.5	-	15.5	165.1	41.6	66.6	77.2	114.5	100.2	782.4
1989	23.9	10.0	63.4	6.3	2.2	14.3	48.3	44.1	81.3	70.9	146.2	125.8	636.6
1990	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1991	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1992	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1993	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1994	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1995	-	-	88.9	78.7	2.5	-	77.5	247.4	48.3	12.7	7.6	5.1	568.6
1996	27.2	NA	NA	43.0	5.1	15.2	12.7	72.4	26.6	127.0	NA	NA	NA
1997	5.1	27.9	27.7	101.6	37.3	6.4	102.0	33.0	35.6	102.9	-	33.0	512.5

Table C3.6 Monthly Rainfall at Utmanzai Station

Units: mm

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1960	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1961	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1962	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1963	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1964	47.8	29.7	50.5	36.6	4.3	-	124.2	32.8	6.1	-	3.6	16.0	351.5
1965	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1966	-	87.4	66.8	58.9	22.1	-	14.2	19.3	19.8	24.1	-	-	312.7
1967	-	52.1	77.5	46.5	16.0	19.1	28.2	62.2	5.1	19.8	0.8	126.2	453.4
1968	54.6	37.6	31.8	36.8	21.6	-	32.8	140.0	1.8	16.0	21.8	16.5	411.2
1969	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1970	19.1	51.1	33.5	14.7	3.8	14.5	48.3	137.2	63.5	0.8	-	6.4	392.7
1971	0.5	63.8	20.3	25.9	1.0	69.9	143.5	111.8	77.5	0.8	-	4.3	519.2
1972	27.4	61.0	50.3	31.2	22.9	0.5	19.1	1.3	12.7	4.6	20.8	32.5	284.2
1973	10.7	61.0	98.6	9.1	68.8	30.5	39.9	66.3	13.2	1.8	-	11.4	411.2
1974	6.6	36.1	7.9	18.0	2.5	-	103.1	22.1	40.6	-	-	40.9	277.9
1975	3.0	51.6	85.1	42.2	34.3	0.8	66.0	247.7	26.4	-	-	6.4	563.4
1976	17.8	123.7	30.7	47.0	5.6	-	125.5	432.6	44.5	-	-	-	827.3
1977	64.8	6.9	-	75.2	4.3	-	187.2	126.2	-	14.0	33.8	11.4	523.7
1978	20.8	14.5	298.5	11.4	-	29.2	275.3	221.0	10.2	10.7	54.1	-	945.6
1979	85.1	133.4	85.1	29.2	8.6	-	22.1	68.3	21.6	-	-	-	453.4
1980	55.4	68.3	107.2	2.3	-	15.2	80.0	81.3	46.0	2.5	-	5.1	463.3
1981	47.8	46.5	116.5	39.7	20.6	-	48.3	110.6	-	17.8	20.3	-	468.0
1982	25.9	24.1	97.2	49.8	-	2.7	20.3	242.6	-	7.6	48.8	26.4	545.3
1983	23.6	51.8	99.6	161.8	-	-	143.3	201.9	77.1	-	1.8	-	760.8
1984	15.1	29.5	32.6	64.8	-	-	100.6	283.6	3.8	-	11.4	3.8	545.3
1985	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1986	19.3	52.1	79.2	19.1	-	-	-	66.5	15.2	-	29.2	32.8	313.4
1987	-	52.2	212.6	-	20.3	14.0	-	-	7.6	-	-	-	306.7
1988	31.8	14.0	140.0	3.8	-	-	137.3	-	-	-	-	-	326.8
1989	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1990	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1991	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1992	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1993	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1994	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1995	-	-	96.5	116.8	5.4	-	127.0	267.7	5.1	-	12.7	-	631.2
1996	25.7	NA	NA	40.6	5.1	38.1	15.2	48.3	10.2	73.8	NA	NA	NA
1997	5.0	12.7	30.8	204.7	35.6	10.5	169.4	33.0	40.1	75.2	-	25.1	642.1

Table C3.7 Monthly Rainfall at Mardan Station

Units: mm

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1960	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1961	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1962	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1963	NA	NA	NA	NA	48.8	0.8	44.2	99.6	31.2	20.3	30.2	59.7	NA
1964	62.5	43.9	45.2	33.0	17.5	3.0	176.0	72.6	101.3	1.8	2.3	26.2	585.5
1965	27.2	33.3	65.8	120.9	119.1	1.5	167.9	151.6	8.9	1.3	20.6	9.9	728.0
1966	-	83.8	71.6	71.9	21.1	-	22.6	49.8	26.7	16.0	-	-	363.5
1967	-	68.8	196.6	48.5	1.3	21.6	95.3	239.3	18.8	19.8	1.8	140.2	851.9
1968	70.9	34.8	47.5	40.6	5.8	1.5	66.5	244.6	8.4	24.1	17.8	23.9	586.5
1969	-	68.3	21.8	17.0	30.0	-	24.6	165.9	8.1	43.9	9.4	-	389.1
1970	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1971	0.5	45.2	30.7	41.7	3.0	184.9	160.0	240.0	70.1	21.1	1.3	12.4	811.0
1972	41.1	50.0	49.0	27.2	15.2	13.0	3.8	7.9	13.7	8.4	16.8	33.5	279.7
1973	23.4	78.2	78.5	16.0	40.1	6.4	156.7	132.1	78.5	4.3	-	12.7	626.9
1974	13.5	38.1	21.1	19.1	14.7	3.3	124.2	30.7	37.8	-	-	42.9	345.4
1975	6.1	56.6	61.0	17.0	39.9	21.8	93.2	407.4	31.8	-	-	8.6	743.5
1976	30.0	96.3	70.1	51.8	8.6	31.2	243.1	299.7	45.2	15.7	-	-	891.8
1977	72.9	8.1	-	54.4	35.6	74.4	294.6	155.2	NA	32.0	NA	11.7	NA
1978	24.4	17.0	206.8	15.2	3.3	89.4	140.7	333.0	1.0	13.2	43.9	3.6	891.5
1979	69.9	147.1	71.1	19.3	13.5	2.5	69.3	21.8	51.1	-	39.6	2.8	508.0
1980	20.1	75.7	76.2	5.6	10.9	50.0	223.8	204.0	16.5	25.1	12.2	5.6	725.7
1981	48.8	34.3	121.2	32.8	29.0	3.8	126.0	116.8	33.5	31.0	13.2	-	590.3
1982	28.2	23.6	81.8	11.4	9.1	-	28.4	238.8	1.3	5.1	65.0	8.6	501.4
1983	21.6	39.1	100.3	146.8	3.0	43.9	73.2	227.6	41.4	33.3	1.3	4.3	735.8
1984	4.6	23.6	43.7	62.0	1.5	-	177.5	323.9	29.7	-	21.3	2.3	690.1
1985	23.6	5.1	12.7	47.2	6.4	-	160.0	106.7	13.7	19.8	7.6	98.3	501.1
1986	16.8	66.0	63.8	29.7	2.5	3.3	72.9	69.9	93.5	-	43.9	56.6	518.9
1987	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1988	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1989	53.3	3.5	55.8	14.2	17.2	-	46.5	87.6	18.0	12.4	2.0	29.2	339.7
1990	36.1	56.2	96.5	54.6	7.6	2.5	114.2	209.7	46.7	51.1	10.6	78.0	763.8
1991	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1992	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1993	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1994	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1995	-	-	96.5	116.8	5.4	-	127.0	267.7	5.1	-	12.7	-	631.2
1996	25.7	NA	NA	40.6	5.1	38.1	15.2	48.3	10.2	73.8	NA	NA	NA
1997	5.0	12.7	30.8	204.7	35.6	10.5	169.4	33.0	40.1	75.2	-	25.1	642.1

Table C3.8 Average Monthly and Annual Rainfall for the Period 1961-1997

Units: mm

Station	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Abazai	22.5	43.4	91.3	44.1	11.0	8.4	95.8	95.0	28.8	20.6	19.4	27.3	489
Amandara	46.7	78.2	92.1	54.9	27.3	16.3	69.1	111.7	31.3	27.0	16.6	26.6	628
Charbagh	70.5	93.3	135.9	105.1	52.7	50.7	150.7	127.5	60.8	45.2	25.7	65.5	965
Kalam	76.2	130.1	185.6	180.6	94.2	24.6	35.0	38.2	36.0	46.8	42.6	55.7	873
Malakand	51.9	92.4	101.1	69.4	21.9	25.3	101.4	179.0	43.5	20.4	26.3	36.8	756
Kulangji	45.8	166.0	214.8	143.0	78.2	24.3	101.3	165.3	81.7	56.3	22.3	94.0	1,089
Mardan	29.0	49.9	70.4	41.6	20.2	22.4	116.2	169.4	34.5	16.0	15.0	26.8	602
Peshawar	24.9	41.7	56.4	48.9	17.7	31.3	39.3	51.2	17.8	15.5	13.3	16.9	387
Saidu Sharif	38.0	102.1	131.6	107.5	61.5	25.8	121.3	115.4	40.9	39.4	21.2	42.2	769
Utmanzai	24.3	48.4	81.2	47.5	12.1	9.8	82.8	121.0	21.9	10.8	10.8	15.2	479
Average	43.0	84.5	116.1	84.3	39.7	23.9	91.3	117.4	39.7	29.8	21.3	40.7	704

Table C3.9 Monthly Pan Evaporation Data at Peshawar 1966-97

Units: mm

	Jan.	Feb.	Mar.	Apr.	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1986	40.6	78.5	137.5	141.1	229.1	270.4	205.6	172.0	156.7	116.6	62.3	37.9	1,648
1987	44.4	67.8	163.7	148.3	132.3	209.4	225.1	223.7	162.2	111.5	69.3	46.1	1,604
1988	53.2	73.1	147.7	121.2	188.3	224.6	202.9	134.7	139.8	119.0	63.2	44.7	1,512
1989	66.3	67.7	83.9	164.1	222.9	266.2	246.0	179.8	158.9	105.9	60.4	41.9	1,664
1990	36.6	65.2	100.0	131.4	245.5	217.8	235.2	141.0	157.7	98.2	51.9	31.5	1,512
1991	48.9	79.0	150.8	167.3	175.9	196.3	211.2	208.4	129.2	98.9	48.8	33.4	1,548
1992	37.1	72.6	131.1	101.2	147.2	231.6	241.5	179.6	136.1	92.6	44.2	36.8	1,452
1993	37.6	71.0	153.3	123.5	222.6	200.0	235.7	198.0	150.0	101.1	44.0	38.4	1,575
1994	38.7	49.7	94.1	153.3	105.9	226.6	231.5	142.3	131.5	98.9	49.6	47.6	1,370
1995	51.4	82.5	156.9	112.2	189.3	268.2	224.9	191.4	196.6	119.6	58.5	50.5	1,702
1996	57.8	81.7	102.6	121.1	169.4	283.4	224.4	133.4	189.8	117.0	54.4	30.9	1,566
1997	30.1	65.8	83.4	156.4	166.5	185.5	172.8	278.0	126.2	214.3	40.9	50.8	1,571
Av. 1986-97	45.2	71.2	125.4	136.7	182.9	231.7	21.4	181.9	152.9	116.1	54.0	40.9	1,560
Av. 1966-85	48.3	66.0	94.0	147.3	243.8	302.3	241.3	185.4	172.7	129.5	71.1	40.6	1,742
Av. 1966-97	47.1	68.0	105.8	143.4	221.0	275.8	233.8	184.1	165.3	124.5	64.7	40.7	1,674

Source : ref. 4 and Mean Monthly Data at Forest Institute, Peshawar

Table C4.1 Present and Future Water Use in Swat River Basin

(Unit : m³/sec)

Irrigation Scheme	Canal Capacity	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	
Nipkikhel	Present	2.403	1.330	1.358	1.585	2.179	2.406	2.406	2.406	2.179	2.264	1.924	1.557	1.472
	Future	4.245	2.349	2.406	2.802	3.849	4.245	4.245	4.245	3.849	3.990	3.396	2.745	2.604
	Add.	1.842	1.019	1.047	1.217	1.670	1.840	1.840	1.840	1.670	1.726	1.472	1.189	1.132
Fatehpur	Present	0.425	0.226	0.255	0.283	0.396	0.425	0.425	0.425	0.396	0.396	0.340	0.283	0.255
	Future	0.934	0.509	0.566	0.623	0.877	0.934	0.934	0.934	0.877	0.877	0.736	0.623	0.566
	Add.	0.509	0.283	0.311	0.340	0.481	0.509	0.509	0.509	0.481	0.481	0.396	0.340	0.311
Badwan Kharif	Present	0.566	0.311	0.311	0.368	0.509	0.566	0.566	0.566	0.509	0.538	0.453	0.368	0.340
	Future	0.566	0.311	0.311	0.368	0.509	0.566	0.566	0.566	0.509	0.538	0.453	0.368	0.340
	Add.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Darora Jaghabanj	Present	0.255	0.000	0.000	0.000	0.226	0.255	0.255	0.255	0.226	0.226	0.000	0.000	0.000
	Future	0.849	0.000	0.000	0.000	0.764	0.849	0.849	0.849	0.764	0.792	0.000	0.000	0.000
	Add.	0.594	0.000	0.000	0.000	0.538	0.594	0.594	0.594	0.538	0.566	0.000	0.000	0.000
Ganidigar	Present	2.264	1.245	1.245	1.472	2.038	2.264	2.264	2.264	2.038	2.151	1.811	1.472	1.358
	Future	2.264	1.245	1.245	1.472	2.038	2.264	2.264	2.264	2.038	2.151	1.811	1.472	1.358
	Add.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Balambat	Present	1.443	0.283	0.821	0.962	1.302	1.443	1.443	1.443	1.302	1.358	1.160	0.934	0.877
	Future	3.113	0.623	1.783	2.066	2.802	3.113	3.113	3.113	2.802	2.943	2.490	2.009	1.896
	Add.	1.670	0.340	0.962	1.104	1.500	1.670	1.670	1.670	1.500	1.585	1.330	1.075	1.019
Gopalam	Present	4.273	0.000	0.000	0.000	3.877	4.273	4.273	4.273	3.877	4.019	0.000	0.000	0.000
	Future	6.792	0.000	0.000	0.000	6.169	6.792	6.792	6.792	6.169	6.396	0.000	0.000	0.000
	Add.	2.519	0.000	0.000	0.000	2.292	2.519	2.519	2.519	2.292	2.377	0.000	0.000	0.000
Others (upper Swat)	Present	-	5.660	5.660	5.660	5.660	5.660	5.660	5.660	5.660	5.660	5.660	5.660	5.660
	Future	-	5.660	5.660	5.660	5.660	5.660	5.660	5.660	5.660	5.660	5.660	5.660	5.660
	Add.	-	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Upper Swat Canal	Present	50.940	21.168	26.376	35.403	50.940	50.940	50.940	47.629	50.940	50.940	50.940	29.517	21.593
	Future	92.994	21.168	26.376	35.403	68.939	84.334	92.994	47.629	51.365	85.353	59.741	29.517	21.593
	Add.	42.054	0.000	0.000	0.000	17.999	33.394	42.054	0.000	0.425	34.413	8.801	0.000	0.000

Table C4.2 Adjusted Monthly Flow Records at Chaklara Station

Units: m³/sec

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1956	38.4	43.9	67.7	194.8	435.7	409.7	481.8	282.1	142.6	57.1	39.0	39.9	186.1
1957	37.9	41.4	57.1	107.3	191.6	404.0	537.0	338.3	162.1	90.7	88.4	71.7	177.3
1958	37.0	34.2	61.7	234.8	298.5	473.5	725.4	382.0	269.6	83.8	48.5	47.8	224.7
1959	38.9	38.8	62.7	229.1	363.9	508.7	642.5	396.8	249.6	101.3	71.8	69.0	231.1
1960	55.0	61.3	99.0	141.5	313.2	530.1	777.9	415.2	206.3	68.1	47.0	45.9	230.1
1961	40.2	41.9	61.7	160.1	275.9	424.9	432.5	272.4	200.1	80.1	51.8	42.3	173.7
1962	36.1	36.8	53.9	119.6	169.1	278.4	345.9	239.3	119.2	58.4	45.6	41.3	128.6
1963	32.4	29.7	95.4	189.1	325.7	443.5	381.4	251.3	117.3	58.0	53.7	37.6	167.9
1964	40.7	46.5	83.4	172.0	235.9	359.7	495.6	322.2	149.7	64.0	37.5	46.4	171.1
1965	40.3	64.2	82.4	265.8	373.2	571.1	529.2	296.8	127.8	68.8	51.9	40.2	209.3
1966	34.8	48.2	109.4	236.6	301.3	511.5	407.7	303.9	170.7	81.3	48.5	37.5	190.9
1967	33.4	52.7	87.1	177.9	237.1	528.3	526.3	284.9	145.4	73.8	46.2	48.6	186.8
1968	41.9	42.2	82.4	172.5	263.5	554.3	548.2	351.3	105.3	63.9	50.2	56.7	194.4
1969	42.1	57.3	141.3	200.5	285.0	481.4	570.7	398.2	139.5	93.5	60.6	42.6	209.4
1970	38.3	37.0	67.1	150.0	256.9	390.6	295.2	267.5	217.1	80.7	43.8	35.4	156.6
1971	29.5	30.4	53.6	165.3	291.2	389.7	323.4	269.8	105.4	50.1	35.8	30.3	147.9
1972	31.6	44.1	100.5	171.5	310.6	530.7	455.4	301.1	152.8	69.1	55.5	47.1	189.2
1973	45.2	59.3	111.4	213.8	343.7	516.9	462.5	404.2	176.5	73.1	40.8	38.8	207.2
1974	35.5	42.3	80.6	158.9	200.2	332.1	338.2	221.3	91.0	56.5	36.2	36.0	135.7
1975	30.1	37.2	83.3	212.1	356.8	468.8	441.4	418.8	170.7	71.4	50.1	48.9	199.2
1976	48.3	60.4	89.5	236.4	321.1	401.0	453.2	334.8	151.3	72.6	45.6	38.4	187.7
1977	45.8	43.1	61.8	171.0	230.6	390.6	420.4	228.1	113.7	81.2	53.9	44.1	157.0
1978	39.7	38.6	124.4	196.3	323.0	454.6	454.9	314.7	113.5	66.0	58.1	42.0	185.5
1979	36.4	43.0	78.3	212.2	235.9	382.7	429.1	261.0	137.3	60.2	47.1	39.0	163.5
1980	39.1	51.8	133.6	220.0	311.4	447.4	361.9	235.3	117.3	72.2	56.8	46.0	174.4
1981	40.5	51.2	122.4	302.4	405.3	341.8	410.4	243.8	107.9	65.0	44.7	32.7	180.7
1982	33.9	36.2	70.2	146.9	211.2	234.0	226.6	253.2	76.5	62.7	74.2	55.5	123.4
1983	45.4	50.1	116.2	174.2	272.3	320.4	303.8	318.7	165.1	69.2	51.0	48.6	161.3
1984	45.4	46.1	69.6	134.9	252.7	504.7	314.8	285.7	154.2	59.7	53.3	47.4	164.0
1985	44.9	41.4	55.6	119.1	187.7	275.5	332.7	227.4	95.6	63.5	32.5	39.7	126.3
1986	39.7	50.1	108.8	199.6	241.2	303.9	433.9	322.7	93.6	61.5	43.6	47.4	162.2
1987	26.0	37.9	134.8	202.1	251.5	370.4	424.8	264.1	135.6	140.6	68.1	49.8	175.5
1988	37.5	46.4	129.2	231.7	337.3	392.7	480.2	271.2	108.6	58.3	37.7	37.2	180.7
1989	45.4	38.2	61.2	110.5	284.7	398.7	350.4	258.4	112.9	69.5	57.1	66.9	154.5
1990	48.0	74.9	182.5	278.3	462.2	399.7	368.4	285.2	170.2	100.2	71.5	65.3	208.9
1991	76.6	132.9	223.7	372.3	376.5	606.8	526.3	338.1	199.0	86.3	54.1	47.2	253.3
1992	36.4	44.5	111.8	204.5	337.1	497.7	469.0	310.9	150.3	67.3	45.8	38.2	192.8
1993	33.8	36.1	91.4	214.2	313.0	423.1	400.9	287.9	139.0	63.4	50.5	63.4	176.4
1994	47.6	59.6	108.4	206.4	354.8	511.4	591.7	424.0	166.0	98.0	69.9	64.7	225.2
1995	50.6	56.2	182.5	270.9	265.6	429.7	608.1	406.2	118.2	78.0	51.6	46.5	213.7
1996	34.4	46.9	96.3	177.6	283.3	315.6	413.5	351.2	120.7	63.6	47.9	46.8	166.5
1997	37.8	50.0	100.2	191.3	294.1	375.9	417.6	337.0	126.0	NA	NA	NA	NA
Average	40.3	48.2	97.5	196.3	294.8	425.9	450.3	309.0	145.0	73.2	51.7	46.6	181.7

Table C4.3 Monthly Synthesized Flow at Munda Dam Site

	Units: m ³ /sec												Average
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
1956	63.7	71.2	107.7	344.8	690.1	623.7	741.4	431.1	196.1	96.7	62.7	63.1	291.0
1957	63.0	67.0	90.8	189.9	302.4	615.0	826.8	533.6	223.1	154.9	142.4	113.3	276.9
1958	61.4	55.5	98.2	415.6	471.9	720.9	1117.6	583.9	372.5	143.0	78.0	75.5	349.5
1959	64.5	62.9	99.6	405.5	576.1	774.8	989.7	606.6	344.6	173.0	115.6	109.0	360.2
1960	91.3	99.3	157.5	250.5	495.5	798.6	1198.6	634.8	284.7	115.8	75.7	72.6	356.2
1961	66.8	67.9	98.2	283.4	427.7	628.1	669.3	430.8	285.4	132.2	83.4	66.8	270.0
1962	59.9	59.6	85.7	211.8	260.6	454.3	536.7	357.1	163.7	91.7	73.4	65.3	201.7
1963	53.8	48.0	151.6	334.7	421.9	681.4	614.3	388.6	180.1	95.4	86.5	59.5	259.7
1964	67.6	75.3	132.6	304.4	378.1	577.3	746.9	470.2	212.8	99.9	60.4	73.3	266.6
1965	66.9	104.0	131.1	470.5	517.1	869.0	813.9	444.9	193.1	107.7	83.5	63.6	322.1
1966	57.7	78.0	173.9	418.8	410.7	755.0	602.6	451.8	227.8	113.2	78.0	59.3	285.6
1967	55.5	85.3	138.5	314.9	350.8	728.9	836.1	443.3	212.2	102.6	74.4	76.8	284.9
1968	69.5	68.3	131.0	305.3	383.1	742.2	780.7	478.6	162.4	98.4	80.8	89.6	282.5
1969	69.9	92.8	224.7	354.8	406.0	717.3	907.7	602.3	186.8	126.1	97.6	67.3	321.1
1970	63.5	59.9	106.6	265.5	417.7	596.7	478.4	420.0	278.3	118.9	70.5	55.9	244.3
1971	49.0	49.3	85.2	292.6	475.9	608.5	472.4	388.3	146.6	78.5	57.7	47.9	229.3
1972	52.5	71.5	159.8	303.6	460.8	814.4	710.6	444.0	218.6	102.6	89.3	74.5	291.8
1973	75.1	96.1	177.1	378.4	537.8	796.8	700.4	556.9	249.1	114.1	65.7	61.3	317.4
1974	59.0	68.6	128.1	281.2	324.1	505.1	537.8	340.6	133.6	87.1	58.2	56.9	215.0
1975	50.0	60.3	132.5	375.4	597.4	705.2	658.9	582.6	222.2	107.1	80.7	77.3	304.1
1976	80.2	97.8	142.2	418.5	503.6	626.3	737.8	457.2	200.9	110.2	73.4	60.7	292.4
1977	76.0	69.7	98.2	302.7	366.8	574.2	603.6	347.1	154.6	107.1	86.8	69.7	238.0
1978	65.8	62.6	197.9	347.5	489.9	683.0	678.9	399.6	140.4	95.0	93.5	66.4	276.7
1979	60.4	69.6	124.4	375.5	348.6	613.7	704.6	369.8	170.1	86.9	75.9	61.7	255.1
1980	65.0	84.0	212.4	389.3	476.1	673.0	553.3	331.5	156.2	101.5	91.4	72.7	267.2
1981	67.3	82.9	194.6	535.3	641.5	561.2	646.5	353.1	143.0	92.7	72.0	51.6	286.8
1982	56.3	58.6	111.6	259.9	330.4	357.9	366.8	361.5	106.4	86.3	119.4	87.7	191.9
1983	75.3	81.2	184.8	308.3	396.2	494.9	501.1	440.3	209.0	102.3	82.2	76.8	246.0
1984	75.3	74.7	110.7	238.7	416.2	799.4	506.3	431.7	201.8	88.3	85.8	74.8	258.7
1985	74.6	67.0	88.3	210.8	307.6	450.3	529.8	360.9	142.2	97.3	52.4	62.7	203.7
1986	65.8	81.2	172.9	353.3	386.6	512.5	710.1	450.0	138.5	98.0	70.3	74.8	259.5
1987	43.2	61.5	214.3	357.8	419.8	584.4	672.8	435.9	207.8	163.5	109.6	78.7	279.1
1988	62.2	75.2	205.5	410.2	584.9	633.2	710.3	386.0	154.3	91.0	60.7	58.7	286.0
1989	75.4	61.9	97.2	195.5	395.2	643.7	559.2	383.0	169.7	101.2	91.9	105.8	240.0
1990	79.7	121.3	290.2	492.6	733.5	631.5	600.7	409.2	231.9	128.0	115.2	103.1	328.1
1991	127.2	215.3	355.7	659.0	491.8	851.7	875.6	536.9	274.8	126.7	87.1	74.5	389.7
1992	60.5	72.1	177.8	362.0	505.5	758.0	735.8	458.1	201.0	96.9	73.8	60.3	296.8
1993	56.2	58.5	145.4	379.1	462.0	646.5	645.1	426.1	200.7	97.7	81.3	100.2	274.9
1994	79.0	96.5	172.3	365.3	520.0	762.4	884.5	558.5	223.7	126.0	112.5	102.2	333.6
1995	84.0	91.1	290.2	479.5	414.9	666.8	899.0	543.0	166.8	114.2	83.0	73.4	325.5
1996	57.1	76.0	153.1	314.4	431.1	587.0	687.7	485.7	172.3	97.9	77.1	73.9	267.8
1997	62.7	81.0	159.3	338.7	443.1	618.6	689.7	472.3	190.6	NA	NA	NA	NA
Average	66.9	78.1	155.0	347.5	451.7	653.4	700.9	452.1	201.2	109.0	83.2	73.6	281.2

Table C4.4 Monthly Historical Diversion to Upper Swat Canal

Units: m³/sec

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1956	26.7	23.5	45.6	44.3	49.7	49.0	43.7	42.8	50.0	46.5	36.6	31.3	40.8
1957	32.2	35.2	36.8	41.9	48.4	50.9	48.8	49.3	50.0	39.6	43.8	41.0	43.2
1958	35.5	32.6	40.5	47.6	49.3	51.4	47.9	39.1	49.0	44.2	43.3	33.2	42.8
1959	37.3	37.2	41.0	44.7	49.7	51.9	53.0	47.9	44.7	45.1	38.5	42.4	44.5
1960	40.5	44.9	41.9	40.9	50.7	51.4	48.8	53.0	50.4	49.3	35.7	34.1	45.1
1961	30.4	34.2	35.0	40.4	50.2	53.8	50.7	52.5	57.1	53.4	44.3	40.5	45.2
1962	31.8	32.1	38.7	47.6	52.0	52.8	51.6	53.0	51.9	46.5	39.5	36.8	44.5
1963	30.9	27.4	44.8	49.5	48.5	54.8	54.5	50.7	53.7	46.3	42.6	23.8	44.0
1964	26.4	27.4	31.1	34.2	38.9	40.1	38.3	37.5	39.2	36.1	31.3	28.8	34.1
1965	26.4	27.4	31.1	34.2	38.9	40.1	38.3	37.5	39.2	36.1	31.3	28.8	34.1
1966	28.3	38.1	40.8	40.3	52.3	54.8	50.5	52.0	51.3	49.3	40.2	35.8	44.5
1967	31.7	32.8	39.1	50.0	58.9	61.1	61.1	42.4	57.2	50.5	44.4	38.4	47.3
1968	36.1	33.2	40.0	46.1	51.2	52.9	50.4	41.9	49.6	48.0	36.8	33.2	43.3
1969	26.4	27.4	31.1	34.2	38.9	40.1	38.3	37.5	39.2	36.1	31.3	28.8	34.1
1970	26.4	27.4	31.1	34.2	38.9	40.1	38.3	37.5	39.2	36.1	31.3	28.8	34.1
1971	7.6	24.5	41.9	52.9	52.4	49.0	46.2	45.3	45.9	38.3	28.2	22.9	37.9
1972	26.4	27.4	31.1	34.2	38.9	40.1	38.3	37.5	39.2	36.1	31.3	28.8	34.1
1973	32.9	33.2	40.4	51.9	51.1	50.9	47.9	49.5	46.6	49.1	33.9	31.0	43.2
1974	26.4	27.4	31.1	34.2	38.9	40.1	38.3	37.5	39.2	36.1	31.3	28.8	34.1
1975	26.4	27.4	31.1	34.2	38.9	40.1	38.3	37.5	39.2	36.1	31.3	28.8	34.1
1976	26.4	27.4	31.1	34.2	38.9	40.1	38.3	37.5	39.2	36.1	31.3	28.8	34.1
1977	30.5	32.0	45.8	49.9	47.7	50.8	45.0	42.2	52.2	53.0	45.6	38.2	44.4
1978	36.0	30.4	40.0	53.3	55.3	55.1	46.9	42.6	50.0	48.7	43.2	40.3	45.1
1979	34.8	30.1	40.7	50.1	53.9	53.4	53.5	52.5	50.0	46.1	38.1	30.2	44.5
1980	29.7	31.4	37.5	48.4	53.2	52.7	52.9	52.7	53.7	52.1	45.0	38.1	45.6
1981	35.1	37.3	39.4	44.7	51.4	53.0	51.7	50.4	52.3	48.8	37.7	31.0	44.4
1982	30.1	32.1	37.2	49.0	51.8	51.6	51.4	52.8	51.8	45.3	43.5	40.4	44.7
1983	26.4	27.4	31.1	34.2	38.9	40.1	38.3	37.5	39.2	36.1	31.3	28.8	34.1
1984	26.4	27.4	31.1	34.2	38.9	40.1	38.3	37.5	39.2	36.1	31.3	28.8	34.1
1985	36.4	30.2	34.2	49.3	51.6	52.6	49.6	51.0	51.1	48.6	30.7	37.9	43.6
1986	36.8	27.4	41.8	39.8	52.3	50.5	51.6	50.5	51.0	47.7	38.7	35.6	43.6
1987	24.4	27.4	31.1	34.2	38.9	40.1	38.3	37.5	39.2	36.1	31.3	28.8	33.9
1988	26.4	27.4	31.1	34.2	38.9	40.1	38.3	37.5	39.2	36.1	31.3	28.8	34.1
1989	26.4	27.4	31.1	34.2	38.9	40.1	38.3	37.5	39.2	36.1	31.3	28.8	34.1
1990	26.4	27.4	31.1	34.2	38.9	40.1	38.3	37.5	39.2	36.1	31.3	28.8	34.1
1991	26.4	27.4	31.1	34.2	38.9	40.1	38.3	37.5	39.2	36.1	31.3	28.8	34.1
1992	26.4	27.4	31.1	34.2	38.9	40.1	38.3	37.5	39.2	36.1	31.3	28.8	34.1
1993	26.4	27.4	31.1	34.2	38.9	40.1	38.3	37.5	39.2	36.1	31.3	28.8	34.1
1994	26.4	27.4	31.1	34.2	38.9	40.1	38.3	37.5	39.2	36.1	31.3	28.8	34.1
1995	26.4	27.4	31.1	34.2	38.9	40.1	38.3	37.5	39.2	36.1	31.3	28.8	34.1
1996	26.4	27.4	31.1	34.2	38.9	40.1	38.3	37.5	39.2	36.1	31.3	28.8	34.1
1997	26.4	27.4	31.1	34.2	38.9	40.1	38.3	37.5	39.2	36.1	31.3	28.8	34.1
Average	29.1	29.9	35.6	40.5	45.2	46.4	44.3	42.9	45.1	41.9	35.5	32.0	39.0

Table C4.5 Estimated Monthly Flow at Munda Dam Site (Present Condition)

Units: m³/sec

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1956	28.0	38.1	51.8	284.4	623.1	557.4	680.3	372.1	129.5	38.8	15.8	21.8	236.8
1957	21.7	22.2	43.7	131.8	236.8	546.8	760.7	468.1	156.6	104.0	88.3	62.4	220.3
1958	16.9	13.2	47.3	351.8	405.4	652.2	1052.5	528.5	306.8	87.4	24.5	32.4	293.2
1959	18.1	16.0	48.3	344.6	509.1	705.7	919.5	542.5	283.2	116.5	66.8	56.6	302.2
1960	41.7	44.7	105.2	193.4	427.6	729.9	1132.5	565.7	217.7	55.1	29.8	28.5	297.7
1961	27.3	24.1	52.8	226.7	360.2	557.0	601.3	362.1	211.7	67.4	28.9	16.3	211.3
1962	19.1	17.8	36.7	148.0	191.3	384.2	467.9	288.0	95.2	33.8	23.7	18.5	143.7
1963	13.9	11.0	96.5	269.0	356.1	609.3	542.5	321.7	109.8	37.7	33.6	25.7	202.2
1964	32.2	38.3	91.2	254.1	321.9	519.9	691.3	416.5	157.0	52.5	18.8	34.5	219.0
1965	31.4	67.0	89.7	420.2	460.9	811.5	758.3	391.2	137.3	60.2	41.9	24.8	274.5
1966	20.3	30.3	122.8	362.3	341.1	682.9	534.8	383.6	159.9	52.5	27.6	13.5	227.6
1967	14.8	42.9	89.0	248.7	274.6	650.6	757.6	384.7	138.4	40.7	19.8	28.5	224.2
1968	24.3	25.4	80.6	243.0	314.6	672.1	713.0	420.5	96.2	39.0	33.7	46.5	225.8
1969	34.5	55.8	183.3	304.5	349.8	659.9	852.1	548.6	131.0	78.7	56.0	28.6	273.6
1970	28.1	22.9	65.2	215.1	361.6	539.2	422.8	366.3	222.5	71.5	28.9	17.1	196.8
1971	32.4	15.2	32.9	223.5	406.2	542.2	408.9	326.8	84.1	28.9	19.2	15.0	178.0
1972	17.1	34.5	118.4	253.3	404.6	757.0	655.0	390.3	162.8	55.2	47.7	35.7	244.3
1973	33.1	53.2	126.3	310.3	469.4	728.6	635.2	491.2	185.9	53.6	21.5	20.3	260.7
1974	23.6	31.6	86.7	230.8	267.9	447.6	482.2	286.9	77.7	39.7	16.7	18.2	167.5
1975	14.6	23.3	91.1	325.0	541.2	647.7	603.4	528.9	166.4	59.7	39.1	38.6	256.6
1976	44.7	60.8	100.8	368.1	447.4	568.8	682.2	403.5	145.1	62.7	31.8	22.0	244.8
1977	36.5	28.1	42.1	236.6	301.8	506.1	541.3	288.8	85.8	42.7	31.0	21.5	180.2
1978	20.8	22.5	147.6	278.0	417.3	610.5	614.6	340.8	73.9	34.9	40.1	16.1	218.1
1979	16.5	29.9	73.4	309.2	277.4	543.0	633.7	301.1	103.5	29.4	27.5	21.5	197.2
1980	26.2	42.9	164.6	324.7	405.6	603.0	483.1	262.7	86.0	38.0	36.2	24.7	208.1
1981	23.1	35.9	145.0	474.4	572.9	490.9	577.5	286.5	74.0	32.6	24.1	10.7	229.0
1982	17.1	16.9	64.1	194.7	261.2	289.0	298.1	292.6	38.0	29.7	65.6	37.4	133.7
1983	39.9	44.1	143.4	258.0	340.0	437.5	445.5	386.6	153.2	54.8	40.6	38.0	198.5
1984	39.9	37.7	69.3	188.4	360.0	741.9	450.7	378.0	146.0	40.9	44.2	36.1	211.1
1985	29.1	27.2	43.8	145.3	238.8	380.4	462.9	293.7	74.6	37.3	11.4	14.8	146.6
1986	19.9	44.1	120.8	297.3	317.0	444.8	641.2	383.3	70.9	38.9	21.3	29.2	202.4
1987	9.7	24.5	172.9	307.5	363.6	527.0	617.3	382.2	151.9	116.0	68.0	40.0	231.7
1988	26.8	38.2	164.1	359.9	528.7	575.8	654.7	332.3	98.5	43.6	19.2	20.0	238.5
1989	40.0	24.9	55.8	145.2	339.0	586.2	503.6	329.3	113.9	53.8	50.3	67.0	192.4
1990	44.3	84.3	248.8	442.3	677.3	574.0	545.1	355.5	176.0	80.6	73.6	64.4	280.5
1991	91.8	178.2	314.3	608.6	435.6	794.3	820.0	483.2	219.0	79.3	45.5	35.7	342.1
1992	25.1	35.1	136.4	311.6	449.3	700.5	680.2	404.4	145.1	49.5	32.2	21.5	249.3
1993	20.8	21.5	104.0	328.7	405.9	589.1	589.5	372.4	144.8	50.3	39.7	61.5	227.4
1994	43.6	59.5	130.9	314.9	463.8	705.0	829.0	504.8	167.9	78.5	70.9	63.4	286.0
1995	48.6	54.1	248.8	429.2	358.7	609.4	843.5	489.3	111.0	66.8	41.4	34.7	277.9
1996	21.7	39.0	111.7	264.0	374.9	529.5	632.1	432.0	116.5	50.5	35.5	35.1	220.2
1997	27.3	44.0	117.9	288.3	387.0	561.2	634.2	418.7	134.7	NA	NA	NA	NA
Average	28.7	38.6	109.1	290.8	389.2	589.8	639.3	393.0	139.5	55.7	37.4	31.7	228.6

Table C4.6 Extended Diversion to Upper Swat Canal (Future Extension Scheme)

Units: m³/sec

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1956	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	47.3	35.2	27.3	56.2
1957	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	65.4	35.2	27.3	57.7
1958	26.8	25.6	41.1	74.6	90.0	98.7	53.3	57.0	91.0	65.4	35.2	27.3	57.2
1959	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	65.4	35.2	27.3	57.7
1960	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	58.3	35.2	27.3	57.1
1961	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	65.4	35.2	27.3	57.7
1962	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	48.7	35.2	27.3	56.3
1963	26.8	21.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	48.2	35.2	27.3	55.3
1964	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	54.2	28.5	27.3	56.2
1965	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	59.0	35.2	27.3	57.2
1966	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	65.4	35.2	27.3	57.7
1967	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	65.4	35.2	27.3	57.7
1968	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	54.1	35.2	27.3	56.8
1969	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	65.4	35.2	27.3	57.7
1970	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	65.4	35.2	27.3	57.7
1971	21.0	21.8	41.1	74.6	90.0	98.7	53.3	57.0	91.0	40.3	26.8	21.5	53.1
1972	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	59.3	35.2	27.3	57.2
1973	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	65.4	35.2	27.3	57.7
1974	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	80.4	46.7	27.1	27.3	54.6
1975	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	65.4	35.2	27.3	57.7
1976	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	65.4	35.2	27.3	57.7
1977	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	65.4	35.2	27.3	57.7
1978	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	56.2	35.2	27.3	56.9
1979	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	50.4	35.2	27.3	56.4
1980	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	65.4	35.2	27.3	57.7
1981	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	55.2	35.2	27.3	56.8
1982	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	66.0	52.9	35.2	27.3	54.6
1983	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	59.4	35.2	27.3	57.2
1984	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	49.9	35.2	27.3	56.4
1985	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	85.0	53.7	23.5	27.3	55.3
1986	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	83.1	51.7	35.2	27.3	55.9
1987	17.5	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	65.4	35.2	27.3	56.9
1988	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	48.5	28.7	27.3	55.7
1989	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	65.4	35.2	27.3	57.7
1990	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	65.4	35.2	27.3	57.7
1991	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	65.4	35.2	27.3	57.7
1992	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	57.5	35.2	27.3	57.0
1993	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	53.6	35.2	27.3	56.7
1994	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	65.4	35.2	27.3	57.7
1995	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	65.4	35.2	27.3	57.7
1996	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	53.8	35.2	27.3	56.7
1997	26.8	32.0	41.1	74.6	90.0	98.7	53.3	57.0	91.0	53.8	35.2	27.3	56.7
Average	26.5	31.4	41.1	74.6	90.0	98.7	53.3	57.0	89.8	58.6	34.2	27.1	56.8

Table C4.7 Monthly Estimated Flow at Munda Dam Site (Future Condition)

Units: m³/sec

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1956	26.2	27.2	53.6	247.6	575.7	500.6	663.6	351.4	81.8	34.9	14.7	23.4	216.7
1957	25.5	23.0	36.8	92.6	188.0	492.0	749.1	453.9	108.8	75.0	94.3	73.7	201.0
1958	23.9	17.9	44.1	318.3	357.5	597.8	1039.9	504.2	258.1	63.0	30.0	35.8	274.2
1959	27.0	18.9	45.6	308.2	461.7	651.8	912.0	526.9	230.2	93.0	67.5	69.3	284.3
1960	53.7	55.2	103.4	153.2	381.1	675.5	1120.9	555.2	170.4	42.9	27.7	32.9	281.0
1961	29.3	23.9	44.1	186.1	313.2	505.0	591.5	351.1	171.1	52.2	35.4	27.1	194.2
1962	22.4	15.6	31.7	114.5	146.2	331.3	459.0	277.4	49.3	28.5	25.4	25.6	127.2
1963	16.3	15.0	97.6	237.5	307.5	558.3	536.6	308.9	65.8	32.6	38.4	19.8	186.2
1964	30.0	31.3	78.5	207.2	263.6	454.2	669.2	390.5	98.4	31.2	19.0	33.6	192.2
1965	29.3	60.0	77.0	373.3	402.6	745.9	736.2	365.2	78.8	34.2	35.4	23.9	246.8
1966	20.2	34.0	119.8	321.5	296.3	632.0	524.9	372.1	113.5	33.2	30.0	19.6	209.8
1967	18.0	41.3	84.4	217.6	236.4	605.8	758.4	363.6	97.8	22.7	26.4	37.1	209.1
1968	31.9	24.3	76.9	208.0	268.7	619.2	703.0	398.9	48.0	29.7	32.7	50.0	207.6
1969	32.4	48.8	170.7	257.6	291.6	594.2	830.0	522.6	72.4	46.2	49.5	27.7	245.3
1970	26.0	15.9	52.6	168.2	303.3	473.6	400.6	340.3	164.0	39.0	22.4	16.2	168.5
1971	17.3	15.5	31.1	195.3	361.5	485.5	394.7	308.6	32.2	23.7	18.0	14.0	158.1
1972	15.0	27.5	105.7	206.4	346.4	691.3	632.9	364.3	104.3	28.8	41.3	34.8	216.5
1973	37.5	52.1	123.0	281.1	423.4	673.7	622.7	477.2	134.8	34.1	17.6	21.6	241.6
1974	21.4	24.6	74.0	183.9	209.6	382.0	460.1	260.9	29.8	25.9	18.2	17.3	142.3
1975	12.5	16.3	78.5	278.1	483.0	582.1	581.2	502.9	107.9	27.2	32.6	37.7	228.3
1976	42.6	53.8	88.2	321.2	389.2	503.2	660.1	377.5	86.5	30.2	25.3	21.1	216.6
1977	38.5	25.7	44.2	205.4	252.4	451.1	525.9	267.4	40.2	27.2	38.7	30.0	162.2
1978	28.3	18.6	143.8	250.2	375.5	559.9	601.1	319.9	26.1	24.2	45.5	26.7	201.7
1979	22.9	25.6	70.4	278.2	234.2	490.6	626.8	290.1	55.7	21.9	27.8	22.0	180.5
1980	27.4	40.0	158.4	292.1	361.7	549.9	475.6	251.8	41.9	21.5	43.4	33.0	191.4
1981	29.7	38.9	140.6	438.0	527.1	438.1	568.8	273.4	28.6	23.0	24.0	12.0	211.8
1982	18.8	14.6	57.6	162.7	215.9	234.8	289.1	281.8	17.1	18.9	71.3	48.1	119.2
1983	37.8	37.2	130.7	211.0	281.8	371.8	423.4	360.6	94.7	28.3	34.1	37.1	170.7
1984	37.8	30.7	56.7	141.4	301.7	676.3	428.6	352.0	87.5	23.8	37.8	35.2	184.1
1985	37.0	23.0	34.3	113.5	193.2	327.2	452.0	281.2	33.8	29.0	16.0	23.0	130.3
1986	28.3	37.2	118.9	256.0	272.2	389.5	632.3	370.3	32.1	31.7	22.2	35.2	185.5
1987	15.0	17.5	160.2	260.5	305.4	461.3	595.1	356.2	93.4	83.5	61.6	39.1	204.1
1988	24.7	31.2	151.4	312.9	470.4	510.2	632.6	306.3	40.0	27.9	19.2	19.1	212.2
1989	37.8	17.9	43.2	98.3	280.8	520.6	481.5	303.3	55.3	21.3	43.8	66.1	164.2
1990	42.2	77.3	236.2	395.4	619.1	508.4	523.0	329.5	117.5	48.1	67.1	63.4	252.3
1991	89.7	171.2	301.7	561.7	377.4	728.6	797.9	457.2	160.4	46.7	39.0	34.8	313.9
1992	22.9	28.1	123.8	264.7	391.1	634.9	658.1	378.4	86.6	24.9	25.8	20.6	221.7
1993	18.6	14.5	91.3	281.8	347.6	523.4	567.4	346.4	86.3	29.6	33.2	60.6	200.1
1994	41.4	52.5	118.3	268.0	405.5	639.3	806.8	478.8	109.4	46.0	64.4	62.5	257.7
1995	46.5	47.1	236.1	382.3	300.5	543.7	821.3	463.3	52.5	34.3	35.0	33.8	249.7
1996	19.5	32.0	99.0	217.1	316.7	463.9	610.0	406.0	58.0	29.6	29.1	34.2	192.9
1997	25.2	37.0	105.3	241.4	328.7	495.6	612.0	392.7	76.2	NA	NA	NA	NA
Average	29.7	34.8	100.9	250.2	337.3	530.3	623.2	372.4	88.0	35.8	36.1	34.1	206.2

Table C5.1 Annual Maximum 24-hours Rainfall

Units: mm

Year	Abazai	Amandara	Charbagh	Kalam
1961	55.9	58.4	NA	NA
1962	38.1	67.3	NA	NA
1963	NA	NA	NA	47.5
1964	121.9	38.9	44.5	63.5
1965	NA	NA	NA	84.6
1966	43.2	48.3	96.5	40.9
1967	76.2	85.1	50.8	61.0
1968	48.3	61.0	47.5	66.8
1969	41.9	90.2	59.7	45.0
1970	63.5	36.8	54.6	NA
1971	27.9	67.3	66.0	39.6
1972	47.0	58.4	51.6	43.2
1973	64.8	105.4	63.5	57.9
1974	58.4	59.2	38.1	34.3
1975	57.2	119.1	58.4	138.4
1976	50.8	66.5	63.5	56.4
1977	66.0	78.7	53.3	62.2
1978	83.8	71.4	48.3	59.7
1979	61.0	81.8	63.5	63.2
1980	73.7	58.9	71.1	39.6
1981	38.1	111.8	55.9	116.3
1982	38.1	NA	67.3	56.6
1983	76.2	NA	81.3	85.3
1984	101.2	NA	45.7	49.0
1985	76.2	88.9	48.3	33.0
1986	45.7	43.2	162.2	81.0
1987	30.5	26.2	147.6	48.8
1988	50.1	38.1	NA	51.8
1989	45.2	108.4	142.5	NA
1990	NA	56.6	50.3	19.3
1991	NA	40.0	55.9	80.0
1992	NA	101.6	77.5	94.0
1993	NA	36.8	63.5	38.4
1994	NA	27.2	72.4	58.4
1995	48.3	36.8	133.4	108.0
1996	111.8	15.2	53.3	52.1
1997	45.7	39.4	48.3	NA

Table C5.2 Precipitable Water (mm) between 1,000-mb surface and indicated pressure (mb) in a saturated pseudo-adiabatic atmosphere as a function of the 1,000-mb dew point (°C) (1/2)

Pressure (mb)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	°C
990	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
980	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
970	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
960	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
950	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
940	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
930	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
920	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
910	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
900	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
890	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
880	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
870	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
860	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
850	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
840	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
830	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
820	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
810	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
800	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
790	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
780	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
770	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
760	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
750	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
740	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
730	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
720	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
710	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
700	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
690	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
680	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
670	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
660	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
650	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
640	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
630	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
620	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
610	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
600	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
590	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
580	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
570	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
560	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
550	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
540	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
530	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
520	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
510	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
500	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
490	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
480	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
470	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
460	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
450	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
440	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
430	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
420	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
410	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
400	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
390	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
380	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
370	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
360	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
350	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
340	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
330	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
320	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
310	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
300	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
290	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
280	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
270	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
260	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
250	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
240	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
230	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
220	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
210	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0
200	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0

Table C5.2 Precipitable Water (mm) between 1,000-mb surface and indicated pressure (mb) in a saturated pseudo-adiabatic atmosphere as a function of the 1,000-mb dew point (°C) (2/2)

MB	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	DEG C
990	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3
980	2	2	2	3	3	3	3	4	4	4	4	4	4	5	5	5
970	3	4	4	4	5	5	5	5	6	6	6	7	7	7	8	
960	4	5	5	5	6	6	6	7	7	8	8	9	9	10	11	
950	6	6	7	7	8	8	9	9	10	10	11	12	12	13	13	
940	7	7	8	8	9	9	10	10	11	11	12	13	13	14	15	
930	8	8	9	9	10	10	11	11	12	12	13	14	14	15	16	
920	9	9	10	10	11	11	12	12	13	13	14	15	15	16	17	
910	10	10	11	11	12	12	13	13	14	14	15	16	16	17	18	
900	11	11	12	12	13	13	14	14	15	15	16	17	17	18	19	
890	12	12	13	13	14	14	15	15	16	16	17	18	18	19	20	
880	12	13	14	14	15	15	16	16	17	17	18	19	19	20	21	
870	13	14	15	15	16	16	17	17	18	18	19	20	20	21	22	
860	14	15	16	16	17	17	18	18	19	19	20	21	21	22	23	
850	15	16	17	17	18	18	19	19	20	20	21	22	22	23	24	
840	16	17	18	18	19	19	20	20	21	21	22	23	23	24	25	
830	17	18	19	19	20	20	21	21	22	22	23	24	24	25	26	
820	18	19	20	20	21	21	22	22	23	23	24	25	25	26	27	
810	19	20	21	21	22	22	23	23	24	24	25	26	26	27	28	
800	19	21	22	22	23	23	24	24	25	25	26	27	27	28	29	
790	20	22	23	23	24	24	25	25	26	26	27	28	28	29	30	
780	21	23	24	24	25	25	26	26	27	27	28	29	29	30	31	
770	21	23	25	25	26	26	27	27	28	28	29	30	30	31	32	
760	22	24	26	26	27	27	28	28	29	29	30	31	31	32	33	
750	23	25	27	27	28	28	29	29	30	30	31	32	32	33	34	
740	24	26	28	28	29	29	30	30	31	31	32	33	33	34	35	
730	24	26	28	28	30	30	31	31	32	32	33	34	34	35	36	
720	25	27	29	29	30	30	31	31	32	32	33	34	34	35	36	
710	26	28	30	30	31	31	32	32	33	33	34	35	35	36	37	
700	26	28	31	31	32	32	33	33	34	34	35	36	36	37	38	
690	27	29	31	31	32	32	33	33	34	34	35	36	36	37	38	
680	28	30	32	32	33	33	34	34	35	35	36	37	37	38	39	
670	28	30	33	33	34	34	35	35	36	36	37	38	38	39	40	
660	29	31	33	33	34	34	35	35	36	36	37	38	38	39	40	
650	29	31	34	34	35	35	36	36	37	37	38	39	39	40	41	
640	29	32	35	35	36	36	37	37	38	38	39	40	40	41	42	
630	30	32	35	35	36	36	37	37	38	38	39	40	40	41	42	
620	30	33	36	36	37	37	38	38	39	39	40	41	41	42	43	
610	31	33	36	36	37	37	38	38	39	39	40	41	41	42	43	
600	31	34	37	37	38	38	39	39	40	40	41	42	42	43	44	
590	32	34	37	37	38	38	39	39	40	40	41	42	42	43	44	
580	32	35	38	38	39	39	40	40	41	41	42	43	43	44	45	
570	32	35	38	38	39	39	40	40	41	41	42	43	43	44	45	
560	33	36	39	39	40	40	41	41	42	42	43	44	44	45	46	
550	33	36	39	39	40	40	41	41	42	42	43	44	44	45	46	
540	33	36	39	39	40	40	41	41	42	42	43	44	44	45	46	
530	34	37	40	40	41	41	42	42	43	43	44	45	45	46	47	
520	34	37	40	40	41	41	42	42	43	43	44	45	45	46	47	
510	34	37	40	40	41	41	42	42	43	43	44	45	45	46	47	
500	34	37	41	41	42	42	43	43	44	44	45	46	46	47	48	
490	35	38	41	41	42	42	43	43	44	44	45	46	46	47	48	
480	35	38	41	41	42	42	43	43	44	44	45	46	46	47	48	
470	35	38	42	42	43	43	44	44	45	45	46	47	47	48	49	
460	35	38	42	42	43	43	44	44	45	45	46	47	47	48	49	
450	35	39	42	42	43	43	44	44	45	45	46	47	47	48	49	
440	35	39	42	42	43	43	44	44	45	45	46	47	47	48	49	
430	36	39	42	42	43	43	44	44	45	45	46	47	47	48	49	
420	36	39	43	43	44	44	45	45	46	46	47	48	48	49	50	
410	36	39	43	43	44	44	45	45	46	46	47	48	48	49	50	
400	36	39	43	43	44	44	45	45	46	46	47	48	48	49	50	
390	36	39	43	43	44	44	45	45	46	46	47	48	48	49	50	
380	36	39	43	43	44	44	45	45	46	46	47	48	48	49	50	
370	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
360	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
350	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
340	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
330	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
320	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
310	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
300	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
290	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
280	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
270	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
260	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
250	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
240	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
230	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
220	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
210	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
200	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
190	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
180	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
170	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
160	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
150	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
140	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
130	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
120	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
110	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
100	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
90	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
80	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
70	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
60	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
50	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
40	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
30	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
20	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
10	36	40	43	43	44	44	45	45	46	46	47	48	48	49	50	
0	36	40	43	43	44	44	45	45	46	46	47	48	48	49		

Table C5.3 Precipitable Water (mm) between 1,000-mb surface and indicated height (m) above that surface in a saturated pseudo-adiabatic atmosphere as a function of the 1,000-mb dew point (°C) (1/2)

Height (m)	1 000 mb Temperature (°C)															
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
200	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2
400	2	2	2	2	2	3	3	3	3	3	4	4	4	4	5	5
600	3	3	3	3	3	4	4	4	4	5	5	5	6	6	7	7
800	3	3	4	4	4	5	5	5	6	6	7	7	8	8	9	9
1 000	4	4	4	5	5	6	6	6	7	7	8	9	9	10	10	11
1 200	4	5	5	6	6	7	7	8	8	9	9	10	11	11	12	13
1 400	5	5	6	6	7	7	8	8	9	10	10	11	12	13	14	15
1 600	5	6	6	7	7	8	9	9	10	11	11	12	13	14	15	16
1 800	6	6	7	7	8	9	9	10	11	12	12	13	14	15	17	18
2 000	6	7	7	8	9	9	10	11	11	12	13	14	16	17	19	20
2 200	7	7	8	8	9	10	10	11	12	13	14	15	16	18	19	21
2 400	7	8	8	9	9	10	11	12	13	14	15	16	17	19	20	22
2 600	7	8	8	9	10	11	11	12	13	14	15	17	18	20	21	23
2 800	7	8	9	9	10	11	12	13	14	15	16	18	19	21	22	24
3 000	8	8	9	10	10	11	12	13	14	15	17	18	20	21	23	25
3 200	8	8	9	10	11	12	13	14	15	16	17	19	20	22	24	26
3 400	8	8	9	10	11	12	13	14	15	16	18	19	21	22	24	26
3 600	8	9	9	10	11	12	13	14	15	17	18	20	22	23	25	27
3 800	8	9	10	10	11	12	13	14	16	17	19	20	22	24	26	28
4 000	8	9	10	11	11	12	14	15	16	17	19	21	22	24	26	28
4 200	8	9	10	11	12	13	14	15	16	18	19	21	23	25	27	29
4 400	8	9	10	11	12	13	14	15	16	18	20	21	23	25	27	29
4 600	8	9	10	11	12	13	14	15	17	18	20	22	24	25	28	30
4 800	8	9	10	11	12	13	14	15	17	18	20	22	24	26	28	30
5 000	8	9	10	11	12	13	14	16	17	19	20	22	24	26	29	31
5 200	8	9	10	11	12	13	14	16	17	19	20	22	24	26	29	31
5 400	8	9	10	11	12	13	14	16	17	19	21	22	24	27	29	32
5 600	8	9	10	11	12	13	14	16	17	19	21	22	24	27	29	32
5 800	8	9	10	11	12	13	14	16	17	19	21	22	25	27	29	32
6 000	8	9	10	11	12	13	15	16	17	19	21	23	25	27	30	32
6 200	8	9	10	11	12	13	15	16	17	19	21	23	25	27	30	32
6 400	8	9	10	11	12	13	15	16	18	19	21	23	25	27	30	33
6 600	8	9	10	11	12	13	15	16	18	19	21	23	25	27	30	33
6 800	8	9	10	11	12	13	15	16	18	19	21	23	25	27	30	33
7 000	8	9	10	11	12	14	15	16	18	19	21	23	25	28	30	33
7 200	8	9	10	11	12	14	15	16	18	19	21	23	25	28	30	33
7 400	8	9	10	11	12	14	15	16	18	19	21	23	25	28	30	33
7 600	8	9	10	11	12	14	15	16	18	19	21	23	25	28	30	33
7 800	8	9	10	11	12	14	15	16	18	19	21	23	25	28	30	33
8 000	8	9	10	11	12	14	15	16	18	19	21	23	25	28	30	33
8 200	8	9	10	11	12	14	15	16	18	19	21	23	25	28	30	33
8 400	8	9	10	11	12	14	15	16	18	19	21	23	25	28	30	33
8 600	8	9	10	11	12	14	15	16	18	19	21	23	25	28	30	33
8 800	8	9	10	11	12	14	15	16	18	19	21	23	25	28	30	33
9 000	8	9	10	11	12	14	15	16	18	19	21	23	25	28	30	33
9 200	8	9	10	11	12	14	15	16	18	19	21	23	25	28	30	33
9 400						14	15	16	18	19	21	23	25	28	30	33
9 600						14	15	16	18	19	21	23	25	28	30	33
9 800						14	15	16	18	19	21	23	25	28	30	33
10 000						14	15	16	18	19	21	23	25	28	30	33
11 000											21	23	25	28	30	33
12 000											21	23	25	28	30	33

Table C5.3 Precipitable Water (mm) between 1,000-mb surface and indicated height (m) above that surface in a saturated pseudo-adiabatic atmosphere as a function of the 1,000-mb dew point (°C) (2/2)

Height (m)	1 000 mb Temperature (°C)														
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
200	3	3	3	3	3	4	4	4	4	4	5	5	5	6	6
400	5	5	6	6	6	7	7	8	8	9	9	10	10	11	12
600	7	8	8	9	10	10	11	11	12	13	14	15	15	16	17
800	10	10	11	12	13	13	14	15	16	17	18	19	20	21	22
1 000	12	13	13	14	15	16	17	18	20	21	22	23	25	26	28
1 200	14	15	16	17	18	19	20	21	23	24	26	27	29	31	32
1 400	16	17	18	19	20	22	23	24	26	28	29	31	33	35	37
1 600	17	19	20	21	23	24	25	27	29	31	33	35	37	39	41
1 800	19	20	22	23	25	26	28	30	32	34	36	38	41	43	46
2 000	21	22	24	25	27	29	31	33	35	37	39	42	44	47	50
2 200	22	24	25	27	29	31	33	35	37	40	42	45	48	51	54
2 400	23	25	27	29	31	33	35	37	40	43	45	48	51	54	57
2 600	24	26	28	30	31	35	37	40	42	45	48	51	55	58	61
2 800	26	27	30	32	34	36	39	42	45	48	51	54	58	61	65
3 000	27	29	31	33	35	38	41	44	47	50	53	57	61	64	68
3 200	28	30	32	34	37	40	42	45	49	52	56	59	63	67	71
3 400	29	31	33	36	39	41	44	47	51	54	58	62	66	70	74
3 600	29	32	34	37	39	42	45	49	52	56	60	64	68	73	77
3 800	30	32	35	38	41	44	47	50	54	58	62	66	70	75	80
4 000	31	33	36	39	42	45	48	52	56	60	64	68	73	78	83
4 200	31	34	37	40	43	46	49	53	57	61	65	70	75	80	85
4 400	32	34	37	40	44	47	51	54	58	63	67	72	77	82	87
4 600	32	35	38	41	44	48	52	56	60	64	69	74	79	84	90
4 800	33	36	39	42	45	49	53	57	62	65	70	75	81	86	92
5 000	33	36	39	42	46	50	54	58	62	67	72	77	82	88	94
5 200	34	37	40	43	47	50	54	59	63	68	73	78	84	90	96
5 400	34	37	40	44	47	51	55	60	64	69	74	80	85	92	98
5 600	35	38	41	44	48	52	56	60	65	70	76	81	87	93	100
5 800	35	38	41	45	48	52	57	61	65	71	77	82	88	95	101
6 000	35	38	42	45	49	53	57	62	67	72	78	84	90	95	103
6 200	35	38	42	45	49	54	58	63	68	73	79	85	91	97	104
6 400	35	39	42	46	50	54	58	63	68	74	80	86	92	99	106
6 600	36	39	42	46	50	54	59	64	69	74	80	87	93	100	107
6 800	36	39	42	46	50	55	60	65	70	75	81	87	94	101	108
7 000	36	39	43	46	51	55	60	65	70	75	82	88	95	102	110
7 200	36	39	43	47	51	55	60	65	71	75	82	89	96	103	111
7 400	36	39	43	47	51	55	61	66	71	77	83	90	97	104	112
7 600	36	39	43	47	51	55	61	66	72	77	83	90	98	105	113
7 800	36	39	43	47	51	56	61	66	72	78	84	91	98	106	114
8 000	36	40	43	47	52	56	61	67	72	78	83	92	99	107	115
8 200	36	40	43	47	52	57	62	67	73	78	85	92	100	108	115
8 400	36	40	43	47	52	57	62	67	73	79	85	92	100	108	115
8 600	36	40	43	47	52	57	62	68	73	79	86	93	101	109	117
8 800	36	40	43	47	52	57	62	68	73	79	86	93	101	109	117
9 000	36	40	43	47	52	57	62	68	74	80	86	94	102	110	118
9 200	36	40	43	48	52	57	62	68	74	80	87	94	102	110	118
9 400	36	40	44	48	52	57	62	68	74	80	87	94	102	111	120
9 600	36	40	44	48	52	57	63	68	74	80	87	95	103	111	120
9 800	36	40	44	48	52	57	63	68	74	80	87	95	103	111	120
10 000	37	40	44	48	52	57	63	68	74	80	87	95	103	112	121
11 000	37	40	44	48	52	57	63	68	74	81	88	96	104	112	121
12 000	37	40	44	48	52	57	63	68	74	81	88	96	105	112	121
13 000					52	57	63	68	74	81	88	97	105	114	122
14 000					52	57	63	68	74	81	88	97	105	115	122
15 000										81	88	97	105	115	122
16 000										81	88	97	105	115	122
17 000										81	88	97	105	115	122

Table C5.4 Storm 1929 Distribution
Among the Subbasins

Sub-basin	Region	(a) Area units	(b) Rainfall inch	(a) * (b)
B1	1	7.73	2	15.46
	2	3.75	3	11.25
	3	1.78	5	8.90
	4	2.00	7	14.00
	5	1.40	9	12.60
	6	1.79	11	19.69
	7	0.47	11	5.17
	8	2.63	13	34.19
	9	0.95	14	13.30
	10	0.51	15	7.65
	11	0.35	16	5.60
	12	0.30	9	2.70
	13	0.05	8	0.40
total		23.71	6.36	150.91
B2	1	2.76	2	5.52
	2	5.15	3	15.45
	3	0.08	4	0.32
	4	2.12	5	10.60
	5	3.69	7	25.83
	6	2.86	9	25.74
	7	3.51	11	38.61
	8	1.33	12	15.96
	9	1.99	13	25.87
	10	0.82	15	12.30
	11	0.07	16	1.12
	12	1.91	6	11.46
	13	0.49	6	2.94
total		26.78	7.16	191.72
B3	1	0.09	2	0.18
	2	3.38	3	10.14
	3	0.16	4	0.64
	4	1.24	5	6.20
	5	0.62	7	4.34
	6	0.16	9	1.44
	7	0.09	11	0.99
	8	0.07	13	0.91
	9	0.13	15	1.95
	10	0.01	16	0.16
total		5.95	4.53	26.95
B4	1	0.48	4	1.92
	2	0.21	5	1.05
	3	0.14	7	0.98
	4	0.12	9	1.08
	5	0.11	11	1.21
	6	0.11	13	1.43
	8	0.56	16	8.96
	9	0.70	15	10.50
	10	0.37	13	4.81
	11	0.20	11	2.20
	12	0.55	8	4.40
	13	0.43	9	3.87
	14	0.02	11	0.22
	total		4.00	10.66
Total Basin		60.3	6.82	411.21

Table C5.5 48-hours Hydrographs at Chakdara

Units: m³/sec

Time	19/7/85	18/7/86	15/7/88	13/7/91	24/7/95
0.00	372	435	673	1,366	833
1.00	378	442	678	1,375	1,126
2.00	391	447	690	1,450	1,605
3.00	424	453	716	1,467	2,000
4.00	612	458	822	1,474	2,156
5.00	983	483	884	1,493	2,772
6.00	1,133	486	928	1,511	2,452
7.00	1,327	533	982	1,524	1,923
8.00	1,307	529	1,088	1,480	2,031
9.00	1,133	522	1,186	1,437	2,031
10.00	1,085	516	1,359	1,408	2,318
11.00	974	485	1,576	1,354	1,940
12.00	833	485	1,518	1,295	1,738
13.00	756	519	1,462	1,256	1,711
14.00	707	1,167	1,526	1,235	1,711
15.00	667	1,284	1,564	1,224	1,711
16.00	604	1,053	1,545	1,218	1,711
17.00	589	926	1,425	1,200	1,711
18.00	574	795	1,334	1,181	1,711
19.00	522	753	1,282	1,174	1,683
20.00	500	704	1,250	1,170	1,594
21.00	486	655	1,233	1,153	1,607
22.00	479	609	1,213	1,160	1,587
23.00	475	590	1,183	1,156	1,518
24.00	472	587	1,149	829	1,667
25.00	478	586	1,163	837	1,613
26.00	485	583	1,136	846	1,560
27.00	496	578	1,136	846	1,544
28.00	496	574	1,110	851	1,529
29.00	468	561	1,047	854	1,513
30.00	461	557	997	851	1,498
31.00	451	553	997	846	1,488
32.00	440	544	973	843	1,478
33.00	427	539	943	840	1,467
34.00	413	536	928	837	1,457
35.00	407	528	928	837	1,447
36.00	400	520	893	832	1,427
37.00	374	517	879	824	1,417
38.00	362	517	867	815	1,408
39.00	362	513	859	815	1,398
40.00	356	513	781	813	1,388
41.00	349	513	742	810	1,364
42.00	331	510	721	805	1,378
43.00	329	510	721	802	1,364
44.00	326	509	726	799	1,349
45.00	325	510	731	818	1,340
46.00	318	512	736	791	1,330
47.00	318	510	732	783	1,321

**Table C5.6 Estimated Unit Hydrograph
Using HEC-1 Model**

TIME	Units: m ³ /sec/1-mm Rain				
	UH95	UH91	UH88	UH86	UH85
1.00	25.82	78.47	8.00	0.00	0.18
2.00	91.82	149.85	28.00	0.00	1.37
3.00	150.06	135.75	53.00	0.00	3.58
4.00	158.22	122.44	74.00	0.00	8.95
5.00	139.61	110.43	103.00	0.00	38.73
6.00	123.18	99.60	125.00	10.87	97.59
7.00	108.69	89.83	144.00	17.90	121.30
8.00	95.91	81.02	156.00	150.74	152.20
9.00	84.62	73.08	158.00	174.66	149.25
10.00	74.67	65.91	153.00	127.48	121.85
11.00	65.88	59.45	143.00	101.29	114.57
12.00	58.13	53.62	125.00	74.49	97.25
13.00	51.29	48.36	98.00	65.88	75.06
14.00	45.26	43.62	70.00	55.76	63.19
15.00	39.93	39.34	49.00	45.89	55.57
16.00	35.24	35.48	34.00	36.29	49.39
17.00	31.09	32.00	24.00	32.52	39.70
18.00	27.43	28.86	17.00	31.89	37.47
19.00	24.21	26.03	12.00	31.58	35.26
20.00	21.36	23.48	8.00	30.96	27.27
21.00	18.84	21.18	6.00	30.03	24.04
22.00	16.63	19.10	4.00	29.10	21.98
23.00	14.67	17.23	3.00	26.64	21.05
24.00	12.95	15.54	2.00	25.73	20.57
25.00	11.42	14.01	0.00	24.81	19.87
26.00	10.08	12.64	0.00	22.99	19.18
27.00	8.89	11.40	0.00	22.09	18.48
28.00	7.85	10.28	0.00	21.48	18.90
29.00	6.92	9.27	0.00	19.69	17.08
30.00	6.11	8.37	0.00	18.20	16.38
31.00	5.39	7.54	0.00	17.60	15.69
32.00	4.76	6.81	0.00	17.60	14.98
33.00	4.20	6.14	0.00	16.71	14.29
34.00	3.70	5.54	0.00	16.71	13.59
35.00	3.27	4.99	0.00	16.71	12.90
36.00	2.88	4.50	0.00	16.12	12.04
37.00	2.54	4.06	0.00	16.12	11.18
38.00	2.24	3.66	0.00	15.83	7.30
39.00	1.98	3.30	0.00	16.12	5.48
40.00	1.75	2.98	0.00	16.42	5.67
41.00	1.54	2.69	0.00	16.71	4.86
42.00	1.36	2.42	0.00	16.42	4.06
43.00	1.20	2.19	0.00	15.24	1.35
44.00	1.06	1.97	0.00	14.36	1.15
45.00	0.00	1.78	0.00	13.77	0.95
46.00	0.00	1.60	0.00	13.48	0.95
47.00	0.00	1.45	0.00	13.12	0.00
48.00	0.00	1.31	0.00	12.54	0.00
49.00	0.00	1.18	0.00	11.82	0.00
50.00	0.00	1.06	0.00	11.09	0.00
51.00	0.00	0.96	0.00	10.37	0.00
52.00	0.00	0.86	0.00	9.64	0.00
53.00	0.00	0.00	0.00	8.92	0.00
54.00	0.00	0.00	0.00	8.19	0.00
55.00	0.00	0.00	0.00	7.46	0.00
56.00	0.00	0.00	0.00	6.74	0.00
57.00	0.00	0.00	0.00	6.01	0.00
58.00	0.00	0.00	0.00	5.29	0.00
59.00	0.00	0.00	0.00	4.56	0.00
60.00	0.00	0.00	0.00	3.84	0.00
61.00	0.00	0.00	0.00	3.11	0.00
62.00	0.00	0.00	0.00	2.39	0.00
63.00	0.00	0.00	0.00	1.66	0.00
64.00	0.00	0.00	0.00	0.93	0.00

UH: Unit Hydrograph

Table C5.7 Adopted Unit Hydrograph for the Study

TIME	Units: m ³ /sec/1-mm Rain	
	AV(91,95)	AV(85,86,88)
1.00	52.14	2.73
2.00	120.83	9.79
3.00	142.91	18.86
4.00	140.33	27.65
5.00	125.02	47.24
6.00	111.39	77.82
7.00	99.26	94.40
8.00	88.46	152.98
9.00	78.85	160.64
10.00	70.29	134.11
11.00	62.67	119.62
12.00	55.88	98.91
13.00	49.83	79.64
14.00	44.44	62.98
15.00	39.64	50.15
16.00	35.36	39.89
17.00	31.55	32.07
18.00	28.15	28.79
19.00	25.12	26.28
20.00	22.42	22.08
21.00	20.01	20.02
22.00	17.86	18.36
23.00	15.95	16.90
24.00	14.24	16.10
25.00	12.72	14.90
26.00	11.36	14.06
27.00	10.15	13.52
28.00	9.06	13.46
29.00	8.10	12.26
30.00	7.24	11.53
31.00	6.47	11.10
32.00	5.78	10.86
33.00	5.17	10.34
34.00	4.62	10.10
35.00	4.13	9.87
36.00	3.69	9.39
37.00	3.30	9.10
38.00	2.95	7.71
39.00	2.64	7.20
40.00	2.36	7.36
41.00	2.12	7.19
42.00	1.89	6.83
43.00	1.69	5.53
44.00	1.52	5.17
45.00	0.89	4.91
46.00	0.80	4.81
47.00	0.72	4.37
48.00	0.65	4.18
49.00	0.59	3.94
50.00	0.53	3.70
51.00	0.48	3.46
52.00	0.43	3.21
53.00	0.00	2.97
54.00	0.00	2.73
55.00	0.00	2.49
56.00	0.00	2.25
57.00	0.00	2.00
58.00	0.00	1.76
59.00	0.00	1.52
60.00	0.00	1.28
61.00	0.00	1.04
62.00	0.00	0.80
63.00	0.00	0.55
64.00	0.00	0.31

AV(91,95): Average of 1991 and 1995's Unit Hydrographs

AV(85,86,88): Average of 1985, 1986 and 1988's Unit Hydrographs

Table C5.8 Hourly Composite Flood at Munda Dam Site

Units: m³/sec

Time Hour	DAY1				DAY2				DAY3					
	24-PMP		72-PMP		24-PMP		72-PMP		24-PMP		72-PMP			
	Case1	Case2	Case3	Case4	Time Hour	Case1	Case2	Case3	Case4	Time Hour	Case1	Case2	Case3	Case4
0.00	650	650	650	650	0.00	7,286	9,498	6,894	9,340	0.00	1,096	1,911	1,230	2,070
1.00	650	650	650	650	1.00	6,566	8,346	6,217	8,071	1.00	1,045	1,813	1,167	1,974
2.00	713	650	677	650	2.00	5,925	7,268	5,614	6,960	2.00	988	1,732	1,107	1,872
3.00	969	666	717	650	3.00	5,355	6,331	5,076	6,029	3.00	934	1,665	1,050	1,766
4.00	1,503	916	877	721	4.00	4,848	5,547	4,598	5,250	4.00	892	1,602	999	1,662
5.00	2,101	1,391	973	898	5.00	4,396	4,912	4,172	4,610	5.00	859	1,541	952	1,575
6.00	3,190	2,077	1,555	1,214	6.00	3,993	4,399	3,793	4,102	6.00	832	1,488	909	1,504
7.00	8,235	2,772	3,712	1,661	7.00	3,634	3,992	3,455	3,705	7.00	812	1,439	876	1,443
8.00	13,348	3,291	6,463	2,147	8.00	3,314	3,691	3,156	3,408	8.00	795	1,391	849	1,389
9.00	16,665	3,950	9,500	2,770	9.00	3,028	3,467	2,881	3,182	9.00	774	1,342	824	1,337
10.00	18,054	4,787	12,539	3,477	10.00	2,774	3,269	2,631	2,991	10.00	746	1,294	799	1,289
11.00	18,169	6,366	14,837	4,424	11.00	2,547	3,085	2,429	2,831	11.00	718	1,249	775	1,244
12.00	17,713	9,290	15,924	6,040	12.00	2,344	2,933	2,272	2,703	12.00	698	1,206	752	1,203
13.00	17,052	13,356	15,988	8,344	13.00	2,163	2,809	2,151	2,593	13.00	686	1,165	731	1,164
14.00	16,300	17,155	15,455	10,945	14.00	2,002	2,706	2,052	2,493	14.00	677	1,123	713	1,126
15.00	15,577	19,081	14,777	13,302	15.00	1,858	2,616	1,976	2,420	15.00	671	1,082	701	1,088
16.00	14,933	19,393	14,143	15,291	16.00	1,730	2,546	1,915	2,362	16.00	666	1,041	692	1,051
17.00	14,202	18,792	13,433	16,596	17.00	1,615	2,483	1,840	2,333	17.00	662	1,000	685	1,014
18.00	13,273	17,571	12,546	16,706	18.00	1,512	2,404	1,750	2,321	18.00	659	959	679	978
19.00	12,191	16,095	11,520	15,934	19.00	1,420	2,297	1,650	2,305	19.00	655	919	674	942
20.00	11,066	14,597	10,457	14,759	20.00	1,339	2,186	1,551	2,284	20.00	653	878	669	905
21.00	9,986	13,106	9,438	13,358	21.00	1,266	2,113	1,458	2,255	21.00	651	833	666	868
22.00	8,992	11,788	8,500	11,979	22.00	1,200	2,064	1,373	2,223	22.00	650	789	664	831
23.00	8,092	10,642	7,653	10,668	23.00	1,145	2,002	1,297	2,159	23.00	650	753	662	796

PMP			
Qp	Tp	Case	Unit Hydrograph Condition
18,169	11	1	Average Unit Hydrograph 1991 and 1995
19,393	16	2	Average Unit Hydrograph 1985, 1986 and 1988
15,988	13	3	Average Unit Hydrograph 1991 and 1995
16,706	18	4	Average Unit Hydrograph 1985, 1986 and 1988

Qp Peak Flow, m³/sec
Tp Time to Peak, hours

Table C5.9 Basin Maximum Annual 24-hours Rainfall

Units: mm

Date	Abazai	Amandara	Charbagh	Kalam	Basin
08-Sep-61	33.0	58.4			52.1
30-Aug-62	-	67.3			50.5
09-May-63				47.5	23.8
14-Jul-64	121.9	8.6	3.8	-	26.6
22-May-65				84.6	66.9
18-Mar-66	43.2	21.1	17.8	40.9	32.6
25-Mar-67	68.6	85.1	50.8	-	42.2
30-Apr-68	10.2	7.6	-	66.8	30.0
14-Sep-69	-	90.2	12.7	11.4	27.5
01-Sep-70	63.5	29.2	54.6		50.3
26-Feb-71	15.2	67.3	58.4	32.8	41.9
27-Dec-72	12.7	51.6	-	43.2	31.3
25-Feb-73	21.6	105.4	-	30.5	40.4
03-Feb-74	5.1	18.3	-	34.3	18.7
20-Aug-75	12.7	119.1	53.3	17.0	60.6
02-Aug-76	50.8	53.8	63.5	15.7	40.0
05-Apr-77	20.3	36.3	-	62.2	36.8
16-Mar-78	63.5	71.4	-		28.8
19-Apr-79	38.1	16.0	63.5	63.2	47.5
06-Mar-80	38.1	58.9	-	-	21.0
21-Apr-81	-	-	55.9	116.3	55.8
16-Nov-82	-		67.3	5.3	26.7
26-Mar-83	12.7		22.9	85.3	40.2
02-Apr-84	20.3		45.7	49.0	31.5
18-Jan-85	5.1	13.7	48.3	25.4	22.9
15-Nov-86	-	43.2	-	56.1	32.0
21-Mar-87	20.3	-	147.6	45.7	48.7
11-Mar-88	17.8	38.1	72.4	51.8	45.7
06-Jan-89	-	36.8	-		62.9
05-Aug-90		56.6	1.3	2.8	26.8
10-Feb-91		40.0	24.1	52.1	42.1
03-Aug-92		101.6	-	-	45.7
11-Mar-93		31.2	61.0	-	24.0
05-Feb-94		27.2	-	58.4	34.8
25-Mar-95	17.7	33.5	33.0	108.0	59.6
03-Oct-96	111.8	14.0	2.5	15.2	31.6
09-Jul-97	-	-	48.3		25.5

Table C5.10 Floods for Different Return Period at Munda Dam Site

Time	Unit: m ³ /sec										
	2	5	10	20	25	50	100	200	500	1,000	10,000
0.00	650	650	650	650	650	650	650	650	650	650	650
1.00	650	650	650	650	650	650	650	650	650	650	650
2.00	650	650	650	650	650	650	650	650	650	650	650
3.00	650	650	650	650	650	650	650	650	650	650	651
4.00	650	650	650	654	656	663	672	683	698	711	756
5.00	650	650	658	679	685	711	741	773	815	851	973
6.00	650	650	684	733	746	802	862	925	1,007	1,075	1,304
7.00	654	667	737	815	837	924	1,014	1,107	1,228	1,327	1,657
8.00	666	708	803	904	933	1,044	1,154	1,269	1,416	1,534	1,932
9.00	675	758	879	1,003	1,040	1,179	1,312	1,452	1,632	1,773	2,262
10.00	709	851	1,004	1,157	1,205	1,378	1,537	1,707	1,925	2,094	2,700
11.00	744	995	1,209	1,419	1,488	1,728	1,943	2,173	2,471	2,697	3,534
12.00	797	1,192	1,510	1,821	1,925	2,285	2,604	2,949	3,394	3,732	5,019
13.00	916	1,553	2,031	2,491	2,647	3,179	3,644	4,149	4,799	5,288	7,176
14.00	1,018	1,912	2,543	3,149	3,354	4,041	4,637	5,289	6,119	6,741	9,200
15.00	1,052	2,053	2,743	3,406	3,630	4,373	5,013	5,720	6,613	7,282	10,052
16.00	1,042	2,026	2,695	3,337	3,555	4,271	4,888	5,569	6,429	7,074	9,917
17.00	1,007	1,909	2,518	3,101	3,299	3,947	4,504	5,121	5,898	6,482	9,252
18.00	958	1,743	2,268	2,772	2,943	3,501	3,981	4,512	5,180	5,684	8,253
19.00	906	1,562	2,000	2,420	2,562	3,026	3,425	3,867	4,422	4,841	7,154
20.00	859	1,393	1,749	2,091	2,206	2,583	2,906	3,265	3,715	4,056	6,085
21.00	817	1,245	1,530	1,804	1,896	2,197	2,456	2,743	3,103	3,376	5,111
22.00	782	1,123	1,351	1,569	1,643	1,885	2,092	2,322	2,610	2,829	4,304
23.00	758	1,037	1,223	1,402	1,463	1,661	1,831	2,020	2,257	2,437	3,689
24.00	743	979	1,138	1,290	1,341	1,510	1,655	1,816	2,017	2,170	3,233
25.00	730	934	1,070	1,202	1,246	1,392	1,517	1,655	1,829	1,961	2,864
26.00	719	896	1,015	1,129	1,168	1,294	1,403	1,523	1,675	1,790	2,558
27.00	711	868	973	1,074	1,108	1,220	1,317	1,424	1,558	1,660	2,321
28.00	705	846	941	1,032	1,063	1,164	1,251	1,348	1,470	1,561	2,140
29.00	701	830	917	1,001	1,029	1,122	1,202	1,291	1,403	1,487	2,000
30.00	697	817	897	974	1,001	1,087	1,161	1,243	1,346	1,424	1,886
31.00	694	805	880	952	976	1,056	1,126	1,202	1,298	1,371	1,792
32.00	691	796	867	935	958	1,034	1,100	1,172	1,263	1,332	1,723
33.00	690	790	859	924	946	1,019	1,082	1,152	1,239	1,305	1,672
34.00	688	784	849	911	933	1,002	1,062	1,128	1,212	1,275	1,619
35.00	686	776	837	896	916	982	1,038	1,100	1,179	1,238	1,562
36.00	684	769	827	883	901	964	1,017	1,076	1,151	1,207	1,513
37.00	682	764	819	872	890	950	1,001	1,057	1,128	1,182	1,473
38.00	681	759	812	863	881	938	987	1,041	1,110	1,161	1,439
39.00	680	755	807	856	872	927	975	1,027	1,093	1,143	1,410
40.00	679	752	802	850	866	920	966	1,017	1,081	1,130	1,388
41.00	678	750	798	845	861	913	958	1,008	1,071	1,118	1,368
42.00	678	747	794	839	854	904	947	994	1,054	1,100	1,339
43.00	675	740	783	825	839	886	926	970	1,025	1,067	1,292
44.00	673	732	771	809	822	865	901	942	993	1,031	1,241
45.00	672	727	764	800	813	853	888	926	974	1,011	1,211
46.00	671	725	762	797	809	848	882	920	967	1,002	1,195
47.00	671	723	759	793	804	842	875	910	956	990	1,173
48.00	669	718	750	781	792	827	857	890	931	963	1,133
49.00	667	710	740	768	777	809	835	865	903	931	1,088
50.00	666	705	732	758	766	795	820	847	881	907	1,053
51.00	665	702	727	751	759	786	809	835	867	891	1,027
52.00	664	699	722	745	753	778	800	824	854	877	1,004
53.00	663	696	718	739	746	770	790	813	842	863	982
54.00	662	693	714	734	741	763	782	804	831	851	963
55.00	662	691	710	729	736	757	775	795	820	839	945
56.00	661	688	707	725	731	750	768	786	810	828	927
57.00	660	686	703	720	726	744	760	778	800	817	909
58.00	659	683	700	715	720	738	753	769	790	806	892
59.00	659	681	696	711	715	731	745	761	780	794	875
60.00	658	679	693	706	710	725	738	752	770	783	858
61.00	657	676	689	701	705	719	731	744	760	772	841
62.00	657	674	685	697	700	713	723	735	750	761	824
63.00	656	672	682	692	695	706	716	726	740	750	807
64.00	655	669	678	687	690	700	708	718	730	738	790
65.00	655	667	675	683	685	694	701	709	719	727	773
66.00	654	664	671	678	680	687	694	701	709	716	756
67.00	653	662	668	673	675	681	687	692	700	705	740
68.00	653	660	664	669	670	675	679	684	690	694	723
69.00	652	657	660	664	665	668	671	674	678	681	704
70.00	651	654	656	658	659	661	662	664	667	669	685
71.00	651	652	653	654	654	655	656	657	658	659	670

Table C6.1 Annual Water Yield and Suspended Sediment Records (1/2)

River Station	Year	Water Yield			Suspended sediment			Sed/Dis Ratio		Observed Conc	
		Total Flow	Max. Flow	Min. Flow	Million			By Wt	By Vel	Max	Min
		10 ⁶ m ³	m ³ /s	m ³ /s	Tons	10 ³ m ³	m ³ /km ²	kg/m ³	mm %	PPM	PPM
Swat near Kalam C.A = 2,020 km ²	1961	2,903	314	10	0.31	344	170.48	0.11	0.1186	210	12
	1962	2,202	405	14	0.19	209	103.50	0.09	0.0950	607	6
	1963	2,681	473	11	0.25	283	140.04	0.09	0.1055	2,020	10
	1964	2,841	521	12	0.31	344	170.48	0.11	0.1212	299	19
	1965	3,186	464	10	0.39	431	213.10	0.12	0.1351	320	10
	1966	2,780	425	12	0.22	246	121.77	0.08	0.0885	198	10
	1967	2,927	422	8	0.27	308	152.21	0.09	0.1050	134	10
	1968	2,755	439	12	0.22	246	121.77	0.08	0.0893	204	7
	1969	3,321	456	12	0.32	258	127.86	0.10	0.0778	245	10
	1970	2,669	371	12	0.20	221	109.59	0.07	0.0829	315	9
	1971	2,472	351	12	0.18	197	97.42	0.07	0.0796	188	10
	1972	3,050	473	10	0.19	209	103.50	0.06	0.0685	112	21
	1973	3,235	388	10	0.23	246	121.77	0.07	0.0760	137	10
	1974	2,312	337	12	0.12	135	66.97	0.05	0.0585	1,180	3
	1975	3,100	464	11	0.25	283	140.04	0.08	0.0913	92	6
	1976	2,903	393	13	0.22	241	119.33	0.07	0.0831	363	3
	1977	2,399	342	12	0.15	171	84.63	0.06	0.0713	322	3
	1978	2,632	597	18	0.55	606	300.16	0.21	0.2304	3,430	13
	1979	2,645	470	10	0.23	256	126.64	0.09	0.0967	204	6
	1980	2,522	393	11	0.31	346	171.09	0.12	0.1371	477	5
	1981	2,792	408	14	0.40	448	221.62	0.14	0.1604	176	7
1982	1,894	233	12	0.15	164	80.98	0.08	0.0864	211	7	
1983	2,411	368	12	0.27	280	138.82	0.11	0.1163	191	6	
1984	2,804	413	12	0.40	412	203.96	0.14	0.1469	2,580	18	
1985	2,312	308	12	0.23	237	117.51	0.10	0.1027	265	15	
1986	2,706	430	11	0.40	411	203.36	0.15	0.1518	297	17	
1987	2,940	342	14	0.41	416	205.79	0.14	0.1414	345	14	
1988	2,964	376	14	0.42	426	210.66	0.14	0.1436	1,310	18	
1989	2,546	328	12	0.40	410	202.75	0.16	0.1609	590	16	
1990	3,001	422	13	0.40	413	204.57	0.13	0.1377	332	13	
Mean		2,743			0.29	308	152.21	0.10	0.1121		
Swat at Chakdara. C.A = 5,776 km ²	1961	5,412	744	32	1.36	1,624	281.11	0.25	0.3000	872	5
	1962	3,998	942	29	0.91	1,082	187.41	0.23	0.2708	647	6
	1963	5,240	608	20	1.31	1,562	270.46	0.25	0.2981	1,210	14
	1964	5,264	945	31	1.37	1,636	283.24	0.26	0.3107	1,280	5
	1965	6,531	809	29	1.03	1,242	215.09	0.16	0.1902	1,430	2
	1966	5,953	1,002	29	1.00	1,193	206.57	0.17	0.2004	1,560	5
	1967	5,843	900	26	1.06	1,267	219.35	0.18	0.2168	355	6
	1968	6,076	925	30	0.83	984	170.37	0.14	0.1619	1,700	4
	1969	6,556	985	34	0.97	1,169	202.31	0.15	0.1782	994	11
	1970	4,846	674	29	0.63	750	129.91	0.13	0.1548	7,130	13
	1971	4,600	572	23	0.62	738	127.78	0.13	0.1604	173	10
	1972	5,904	818	26	0.51	603	104.35	0.09	0.1021	135	32
	1973	6,470	611	34	1.25	1,501	259.81	0.19	0.2319	3,750	10
	1974	4,219	583	30	0.27	320	55.37	0.06	0.0758	216	7
	1975	6,224	906	26	1.35	1,624	281.11	0.22	0.2609	2,400	7
	1976	5,855	685	31	0.80	962	166.54	0.14	0.1643	959	3
	1977	4,895	1,208	31	1.26	1,513	261.94	0.26	0.3090	8,400	5
	1978	5,793	942	33	1.96	2,349	406.76	0.34	0.4055	1,380	19
	1979	5,092	611	29	0.79	945	163.55	0.15	0.1855	157	3
	1980	5,437	1,282	31	1.55	1,857	321.57	0.29	0.3416	5,990	26
	1981	5,646	897	29	0.83	999	172.92	0.15	0.1769	472	7
1982	3,838	642	28	0.36	435	75.39	0.09	0.1135	242	8	
1983	5,031	883	36	0.25	48	8.31	0.05	0.0095	91	6	
1984	5,105	951	32	0.92	1,097	189.96	0.18	0.2149	1,800	31	
1985	5,781	1,330	24	0.76	909	157.38	0.13	0.1572	1,080	23	
1986	5,055	659	27	1.09	1,216	210.62	0.22	0.2406	1,190	31	
1987	5,486	679	20	1.03	1,156	200.18	0.19	0.2108	1,220	10	
1988	5,646	1,602	28	5.47	6,113	1,058.42	0.97	1.0828	1,270	14	
1989	4,809	744	32	1.56	1,747	302.40	0.32	0.3632	1,920	11	
1990	6,519	778	39	2.88	3,223	557.96	0.44	0.4943	605	19	
Mean		5,375				1,402	242.78	0.00	0.2609		

Table C6.1 Annual Water Yield and Suspended Sediment Records (2/2)

River Station	Year	Water Yield			Suspended sediment			Sed/Dis Ratio		Observed Conc.	
		Total Flow 10 ⁶ m ³	Max. Flow m ³ /s	Min. Flow m ³ /s	Million Tons	10 ³ m ³	m ³ /km ²	By Wt kg/m ³	By Vel mm %	Max PPM	Min PPM
Kabul at Nowshera. C.A = 88,578 km ²	1961	28,659	3,141	136	29.03	30,627	345.76	1.01	1.0687	1,770	72
	1962	20,664	3,255	142	17.24	18,204	205.51	0.83	0.8810	2,110	31
	1963	27,306	4,075	140	26.67	28,167	317.99	0.98	1.0315	2,540	9
	1964	27,429	3,849	170	26.76	28,290	319.38	0.98	1.0314	9,100	42
	1965	39,360	6,311	179	51.89	54,735	617.93	1.32	1.3906	5,230	42
	1966	33,210	4,585	179	34.84	36,777	415.19	1.05	1.1074	3,880	34
	1967	31,980	5,037	163	32.75	34,563	390.20	1.02	1.0808	3,740	26
	1968	34,932	4,047	187	53.16	56,088	633.20	1.52	1.6056	3,820	28
	1969	30,258	3,028	181	35.47	37,392	422.14	1.17	1.2358	6,030	44
	1970	20,787	1,981	126	15.15	15,990	180.52	0.73	0.7692	2,210	55
	1971	19,065	2,323	145	14.33	15,129	170.80	0.75	0.7935	6,220	36
	1972	29,274	3,934	132	40.55	42,804	483.24	1.39	1.4622	6,600	70
	1973	35,178	3,622	190	56.70	59,778	674.86	1.61	1.6993	4,380	51
	1974	19,311	2,541	112	25.58	26,937	304.10	1.32	1.3949	4,570	6
	1975	27,675	4,839	118	39.19	41,328	466.57	1.42	1.4933	3,150	33
	1976	25,953	577	199	36.74	38,745	437.41	1.42	1.4929	3,790	19
	1977	22,878	2,972	197	27.13	28,659	323.55	1.19	1.2527	3,970	81
	1978	29,520	4,754	156	47.54	50,184	566.55	1.61	1.7000	7,520	25
	1979	27,306	2,972	136	23.50	24,846	280.50	0.86	0.9099	6,200	26
	1980	24,969	2,972	134	55.97	59,040	666.53	2.24	2.3645	15,000	35
1981	26,445	3,339	173	64.59	68,142	769.29	2.44	2.5767	5,980	33	
1982	17,466	2,216	98	29.12	30,750	347.15	1.67	1.7606	6,220	7	
1983	27,675	2,915	198	50.08	50,307	567.94	1.81	1.8178	3,880	21	
1984	26,076	3,226	159	60.51	60,885	687.36	2.32	2.3349	6,950	80	
1985	17,466	2,858	99	19.78	19,926	224.95	1.13	1.1408	3,830	67	
1986	25,707	3,056	154	33.66	33,825	381.87	1.31	1.3158	4,620	83	
1987	24,969	2,649	169	26.04	26,199	295.77	1.04	1.0493	3,880	78	
1988	26,691	3,453	174	66.23	66,543	751.24	2.48	2.4931	9,050	76	
1989	21,279	2,473	121	21.59	21,771	245.78	1.01	1.0231	5,610	81	
1990	27,183	3,311	190	35.20	35,424	399.92	1.29	1.3032	4,910	47	
Mean		26,691			36.56	38,130	430.47	1.37	1.4286		
Kabul at Warsak C.A = 67,340 km ²	1961	22,386	2,377	87	9.80	10,332	153.43	0.44	0.4615	2,900	19
	1962	15,498	1,916	103	3.54	3,727	55.34	0.23	0.2405	743	10
	1963	20,787	3,028	91	16.06	16,974	252.06	0.77	0.8166	2,240	9
	1964	19,926	2,567	122	13.25	14,022	208.23	0.66	0.7037	19,200	13
	1965	29,274	4,273	125	39.83	42,066	624.68	1.36	1.4370	3,070	19
	1966	23,616	3,283	172	18.23	19,188	284.94	0.77	0.8125	2,350	24
	1967	22,386	3,679	152	16.69	17,589	261.20	0.75	0.7857	2,090	7
	1968	24,969	3,028	186	21.77	23,001	341.57	0.87	0.9212	6,910	9
	1969	21,033	2,270	171	12.70	13,407	199.09	0.60	0.6374	13,000	33
	1970	16,482	1,562	139	5.90	6,273	93.15	0.36	0.3806	10,600	33
Mean		21,648			15.79	16,605	246.58	0.73	0.7670		

Table C6.2 Sediment Yield Results at Munda Dam Site

Year	Annual Flow m ³ /sec	Water Yield Q/CA	Sediment Yield ton/d	Sediment Yield ton/km ²
1956	236.76	0.017	0.844	308
1957	220.25	0.016	0.864	315
1958	293.24	0.021	0.775	283
1959	302.24	0.022	0.765	279
1960	297.66	0.022	0.770	281
1961	211.32	0.015	0.875	319
1962	143.68	0.011	0.957	349
1963	202.23	0.015	0.886	323
1964	219.01	0.016	0.865	316
1965	274.54	0.020	0.798	291
1966	227.64	0.017	0.855	312
1967	224.19	0.016	0.859	314
1968	225.75	0.017	0.857	313
1969	273.57	0.020	0.799	292
1970	196.78	0.014	0.892	326
1971	177.95	0.013	0.915	334
1972	244.29	0.018	0.835	305
1973	260.72	0.019	0.815	297
1974	167.47	0.012	0.928	339
1975	256.59	0.019	0.820	299
1976	244.83	0.018	0.834	304
1977	180.18	0.013	0.912	333
1978	218.11	0.016	0.866	316
1979	197.18	0.014	0.892	326
1980	208.14	0.015	0.879	321
1981	228.96	0.017	0.853	311
1982	133.71	0.010	0.969	354
1983	198.47	0.015	0.890	325
1984	211.10	0.015	0.875	319
1985	146.60	0.011	0.953	348
1986	202.40	0.015	0.886	323
1987	231.71	0.017	0.850	310
1988	238.47	0.017	0.842	307
1989	192.42	0.014	0.898	328
1990	280.52	0.021	0.791	289
1991	342.14	0.025	0.716	261
1992	249.26	0.018	0.829	302
1993	227.35	0.017	0.855	312
1994	286.01	0.021	0.784	286
1995	277.95	0.020	0.794	290
1996	220.21	0.016	0.864	315
Average	228.58	0.017	0.852	311

Table C6.3-1 Sediment Accumulation at Munda Dam, Case 505

Start (Year)	Reservoir Capacity (10 ⁶ m ³)	Capacity Inflow Ratio (%)	Trap Efficiency (Brune Method) (%)	10 Year Suspended Sediment (10 ⁶ ton)	10 year Bed Load (10 ⁶ ton)	Unit Weight Suspended (t/m ³)	Unit Weight Bed (t/m ³)	10 year Total Sediment (10 ⁶ m ³)	Sediment Trapped (10 ⁶ m ³)	Cumulative Sediment Trapped (10 ⁶ ton)	Remaining Reservoir Capacity (10 ⁶ m ³)	Periods (Year)
1.00	690.00	9.57	84.75	42.45	8.50	0.982	1.76	48.06	40.73	40.73	649.27	10.00
11.00	649.27	9.01	84.13	42.45	8.50	1.105	1.76	43.23	36.37	77.10	612.90	20.00
21.00	612.90	8.50	83.51	42.45	8.50	1.148	1.76	41.82	34.93	112.03	577.97	30.00
31.00	577.97	8.02	82.86	42.45	8.50	1.174	1.76	40.99	33.96	145.99	544.01	40.00
41.00	544.01	7.55	82.17	42.45	8.50	1.193	1.76	40.40	33.20	179.19	510.81	50.00
51.00	510.81	7.09	81.42	42.45	8.50	1.209	1.76	39.95	32.53	211.71	478.29	60.00
61.00	478.29	6.64	80.61	42.45	8.50	1.222	1.76	39.58	31.91	243.62	446.38	70.00
71.00	446.38	6.19	79.73	42.45	8.50	1.232	1.76	39.27	31.31	274.93	415.07	80.00
81.00	415.07	5.76	78.77	42.45	8.50	1.242	1.76	39.01	30.73	305.66	384.34	90.00
91.00	384.34	5.33	77.70	42.45	8.50	1.250	1.76	38.78	30.13	335.79	354.21	100.00
101.00	354.21	4.91	76.52	42.45	8.50	1.258	1.76	38.58	29.52	365.31	324.69	110.00
111.00	324.69	4.50	75.21	42.45	8.50	1.265	1.76	38.39	28.87	394.19	295.81	120.00
121.00	295.81	4.10	73.73	42.45	8.50	1.271	1.76	38.23	28.19	422.37	267.63	130.00
131.00	267.63	3.71	72.07	42.45	8.50	1.277	1.76	38.08	27.44	449.81	240.19	140.00
141.00	240.19	3.33	70.18	42.45	8.50	1.282	1.76	37.94	26.62	476.43	213.57	150.00
151.00	213.57	2.96	68.01	42.45	8.50	1.287	1.76	37.81	25.71	502.15	187.85	160.00
161.00	187.85	2.61	65.52	42.45	8.50	1.292	1.76	37.69	24.69	526.84	163.16	170.00
171.00	163.16	2.26	62.62	42.45	8.50	1.296	1.76	37.58	23.53	550.37	139.63	180.00
181.00	139.63	1.94	59.23	42.45	8.50	1.301	1.76	37.47	22.19	572.56	117.44	190.00
191.00	117.44	1.63	55.25	42.45	8.50	1.304	1.76	37.37	20.65	593.21	96.79	200.00
201.00	96.79	1.34	50.55	42.45	8.50	1.308	1.76	37.28	18.84	612.06	77.94	210.00
211.00	77.94	1.08	45.05	42.45	8.50	1.312	1.76	37.19	16.75	628.81	61.19	220.00
221.00	61.19	0.85	38.69	42.45	8.50	1.315	1.76	37.10	14.36	643.17	46.83	230.00
231.00	46.83	0.65	31.62	42.45	8.50	1.319	1.76	37.02	11.71	654.87	35.13	240.00
241.00	35.13	0.49	24.25	42.45	8.50	1.322	1.76	36.95	8.96	663.83	26.17	250.00
251.00	26.17	0.36	17.34	42.45	8.50	1.325	1.76	36.88	6.39	670.22	19.78	260.00
261.00	19.78	0.27	11.71	42.45	8.50	1.328	1.76	36.81	4.31	674.54	15.46	270.00
271.00	15.46	0.21	7.73	42.45	8.50	1.330	1.76	36.74	2.84	677.37	12.63	280.00
281.00	12.63	0.18	5.16	42.45	8.50	1.333	1.76	36.67	1.89	679.27	10.73	290.00
291.00	10.73	0.15	3.57	42.45	8.50	1.336	1.76	36.61	1.31	680.57	9.43	300.00
301.00	9.43	0.13	2.57	42.45	8.50	1.338	1.76	36.55	0.94	681.52	8.48	310.00
311.00	8.48	0.12	1.93	42.45	8.50	1.341	1.76	36.50	0.70	682.22	7.78	320.00
321.00	7.78	0.11	1.50	42.45	8.50	1.343	1.76	36.44	0.55	682.76	7.24	330.00
331.00	7.24	0.10	1.19	42.45	8.50	1.345	1.76	36.39	0.43	683.20	6.80	340.00
341.00	6.80	0.09	0.97	42.45	8.50	1.347	1.76	36.34	0.35	683.55	6.45	350.00
351.00	6.45	0.09	0.81	42.45	8.50	1.350	1.76	36.29	0.29	683.85	6.15	360.00
361.00	6.15	0.09	0.69	42.45	8.50	1.352	1.76	36.24	0.25	684.10	5.90	370.00
371.00	5.90	0.08	0.59	42.45	8.50	1.354	1.76	36.19	0.21	684.31	5.69	380.00
381.00	5.69	0.08	0.52	42.45	8.50	1.356	1.76	36.14	0.19	684.50	5.50	390.00
391.00	5.50	0.08	0.45	42.45	8.50	1.358	1.76	36.10	0.16	684.66	5.34	400.00
401.00	5.34	0.07	0.40	42.45	8.50	1.359	1.76	36.06	0.15	684.81	5.19	410.00
411.00	5.19	0.07	0.36	42.45	8.50	1.361	1.76	36.01	0.13	684.94	5.06	420.00
421.00	5.06	0.07	0.33	42.45	8.50	1.363	1.76	35.97	0.12	685.05	4.95	430.00
431.00	4.95	0.07	0.29	42.45	8.50	1.365	1.76	35.93	0.11	685.16	4.84	440.00
441.00	4.84	0.07	0.27	42.45	8.50	1.367	1.76	35.89	0.10	685.26	4.74	450.00
451.00	4.74	0.07	0.25	42.45	8.50	1.368	1.76	35.86	0.09	685.34	4.66	460.00
461.00	4.66	0.06	0.23	42.45	8.50	1.370	1.76	35.82	0.08	685.43	4.57	470.00
471.00	4.57	0.06	0.21	42.45	8.50	1.371	1.76	35.78	0.08	685.50	4.50	480.00
481.00	4.50	0.06	0.20	42.45	8.50	1.373	1.76	35.75	0.07	685.57	4.43	490.00
491.00	4.43	0.06	0.18	42.45	8.50	1.375	1.76	35.71	0.06	685.64	4.36	500.00

Table C6.3-2 Sediment Accumulation at Munda Dam, Case 530

Start (Year)	Reservoir Capacity (10 ⁶ m ³)	Capacity Inflow Ratio (%)	Trap Efficiency (Brune Method) (%)	10 Year Suspended Sediment (10 ⁵ ton)	10 year Bed Load (10 ⁶ ton)	Unit Weight Suspended (t/m ³)	Unit Weight Bed (t/m ³)	10 year Total Sediment (10 ⁶ m ³)	Sediment Trapped (10 ⁶ m ³)	Cumulative Sediment Trapped (10 ⁶ ton)	Remaining Reservoir Capacity (10 ⁶ m ³)	Periods (Year)
1.00	1,070	14.84	88.64	42.45	8.50	0.982	1.76	48.06	42.60	42.60	1,027	10.00
11.00	1,027	14.25	88.32	42.45	8.50	1.105	1.76	43.23	38.18	80.79	989	20.00
21.00	989	13.72	88.02	42.45	8.50	1.148	1.76	41.82	36.81	117.60	952	30.00
31.00	952	13.21	87.71	42.45	8.50	1.174	1.76	40.99	35.95	153.55	916	40.00
41.00	916	12.71	87.39	42.45	8.50	1.193	1.76	40.40	35.30	188.85	881	50.00
51.00	881	12.22	87.05	42.45	8.50	1.209	1.76	39.95	34.77	223.63	846	60.00
61.00	846	11.74	86.69	42.45	8.50	1.222	1.76	39.58	34.31	257.94	812	70.00
71.00	812	11.27	86.32	42.45	8.50	1.232	1.76	39.27	33.90	291.84	778	80.00
81.00	778	10.80	85.92	42.45	8.50	1.242	1.76	39.01	33.52	325.36	745	90.00
91.00	745	10.33	85.51	42.45	8.50	1.250	1.76	38.78	33.16	358.52	711	100.00
101.00	711	9.87	85.06	42.45	8.50	1.258	1.76	38.58	32.81	391.33	679	110.00
111.00	679	9.42	84.58	42.45	8.50	1.265	1.76	38.39	32.47	423.81	646	120.00
121.00	646	8.97	84.08	42.45	8.50	1.271	1.76	38.23	32.14	455.95	614	130.00
131.00	614	8.52	83.53	42.45	8.50	1.277	1.76	38.08	31.81	487.75	582	140.00
141.00	582	8.08	82.94	42.45	8.50	1.282	1.76	37.94	31.47	519.22	551	150.00
151.00	551	7.64	82.31	42.45	8.50	1.287	1.76	37.81	31.12	550.34	520	160.00
161.00	520	7.21	81.63	42.45	8.50	1.292	1.76	37.69	30.76	581.10	489	170.00
171.00	489	6.78	80.89	42.45	8.50	1.296	1.76	37.58	30.39	611.50	459	180.00
181.00	459	6.36	80.08	42.45	8.50	1.301	1.76	37.47	30.01	641.50	428	190.00
191.00	428	5.94	79.19	42.45	8.50	1.304	1.76	37.37	29.60	671.10	399	200.00
201.00	399	5.53	78.22	42.45	8.50	1.308	1.76	37.28	29.16	700.26	370	210.00
211.00	370	5.13	77.15	42.45	8.50	1.312	1.76	37.19	28.69	728.95	341	220.00
221.00	341	4.73	75.96	42.45	8.50	1.315	1.76	37.10	28.18	757.13	313	230.00
231.00	313	4.34	74.63	42.45	8.50	1.319	1.76	37.02	27.63	784.76	285	240.00
241.00	285	3.96	73.14	42.45	8.50	1.322	1.76	36.95	27.02	811.78	258	250.00
251.00	258	3.58	71.45	42.45	8.50	1.325	1.76	36.88	26.35	838.13	232	260.00
261.00	232	3.22	69.54	42.45	8.50	1.328	1.76	36.81	25.59	863.73	206	270.00
271.00	206	2.86	67.35	42.45	8.50	1.330	1.76	36.74	24.74	888.47	182	280.00
281.00	182	2.52	64.83	42.45	8.50	1.333	1.76	36.67	23.78	912.25	158	290.00
291.00	158	2.19	61.90	42.45	8.50	1.336	1.76	36.61	22.66	934.91	135	300.00
301.00	135	1.87	58.49	42.45	8.50	1.338	1.76	36.55	21.38	956.29	114	310.00
311.00	114	1.58	54.48	42.45	8.50	1.341	1.76	36.50	19.88	976.17	94	320.00
321.00	94	1.30	49.78	42.45	8.50	1.343	1.76	36.44	18.14	994.31	76	330.00
331.00	76	1.05	44.28	42.45	8.50	1.345	1.76	36.39	16.11	1010.43	60	340.00
341.00	60	0.83	37.98	42.45	8.50	1.347	1.76	36.34	13.80	1024.23	46	350.00
351.00	46	0.64	31.02	42.45	8.50	1.350	1.76	36.29	11.25	1035.48	35	360.00
361.00	35	0.48	23.81	42.45	8.50	1.352	1.76	36.24	8.63	1044.11	26	370.00
371.00	26	0.36	17.11	42.45	8.50	1.354	1.76	36.19	6.19	1050.30	20	380.00
381.00	20	0.27	11.64	42.45	8.50	1.356	1.76	36.14	4.21	1054.51	15	390.00
391.00	15	0.21	7.75	42.45	8.50	1.358	1.76	36.10	2.80	1057.31	13	400.00
401.00	13	0.18	5.22	42.45	8.50	1.359	1.76	36.06	1.88	1059.19	11	410.00
411.00	11	0.15	3.63	42.45	8.50	1.361	1.76	36.01	1.31	1060.50	10	420.00
421.00	10	0.13	2.63	42.45	8.50	1.363	1.76	35.97	0.95	1061.44	9	430.00
431.00	9	0.12	1.98	42.45	8.50	1.365	1.76	35.93	0.71	1062.15	8	440.00
441.00	8	0.11	1.53	42.45	8.50	1.367	1.76	35.89	0.55	1062.70	7	450.00
451.00	7	0.10	1.23	42.45	8.50	1.368	1.76	35.86	0.44	1063.14	7	460.00
461.00	7	0.10	1.00	42.45	8.50	1.370	1.76	35.82	0.36	1063.50	6	470.00
471.00	6	0.09	0.83	42.45	8.50	1.371	1.76	35.78	0.30	1063.80	6	480.00
481.00	6	0.09	0.71	42.45	8.50	1.373	1.76	35.75	0.25	1064.05	6	490.00
491.00	6	0.08	0.61	42.45	8.50	1.375	1.76	35.71	0.22	1064.27	6	500.00

Table C6.3-3 Sediment Accumulation at Munda Dam, Case 555

Start (Year)	Reservoir Capacity (10 ⁶ m ³)	Capacity Inflow Ratio (%)	Trap Efficiency (Brune Method) (%)	10 Year Suspended Sediment (10 ⁶ ton)	10 year Bed Load (10 ⁶ ton)	Unit Weight Suspended (t/m ³)	Unit Weight Bed (t/m ³)	10 year Total Sediment (10 ⁶ m ³)	Sediment Trapped (10 ⁶ m ³)	Cumulative Sediment Trapped (10 ⁶ ton)	Remaining Reservoir Capacity (10 ⁶ m ³)	Periods (Year)
1.00	1,600	22.20	91.38	42.45	8.50	0.982	1.76	48.06	43.92	43.92	1,026	10.00
11.00	1,026	14.24	88.31	42.45	8.50	1.105	1.76	43.23	38.18	82.10	988	20.00
21.00	988	13.71	88.01	42.45	8.50	1.148	1.76	41.82	36.81	118.90	951	30.00
31.00	951	13.20	87.70	42.45	8.50	1.174	1.76	40.99	35.95	154.85	915	40.00
41.00	915	12.70	87.38	42.45	8.50	1.193	1.76	40.40	35.30	190.15	880	50.00
51.00	880	12.21	87.04	42.45	8.50	1.209	1.76	39.95	34.77	224.92	845	60.00
61.00	845	11.72	86.68	42.45	8.50	1.222	1.76	39.58	34.31	259.22	811	70.00
71.00	811	11.25	86.31	42.45	8.50	1.232	1.76	39.27	33.90	293.12	777	80.00
81.00	777	10.78	85.91	42.45	8.50	1.242	1.76	39.01	33.51	326.63	743	90.00
91.00	743	10.31	85.49	42.45	8.50	1.250	1.76	38.78	33.15	359.79	710	100.00
101.00	710	9.85	85.04	42.45	8.50	1.258	1.76	38.58	32.81	392.59	677	110.00
111.00	677	9.40	84.56	42.45	8.50	1.265	1.76	38.39	32.47	425.06	645	120.00
121.00	645	8.95	84.06	42.45	8.50	1.271	1.76	38.23	32.13	457.19	613	130.00
131.00	613	8.50	83.51	42.45	8.50	1.277	1.76	38.08	31.80	488.99	581	140.00
141.00	581	8.06	82.92	42.45	8.50	1.282	1.76	37.94	31.46	520.45	550	150.00
151.00	550	7.62	82.29	42.45	8.50	1.287	1.76	37.81	31.11	551.56	518	160.00
161.00	518	7.19	81.60	42.45	8.50	1.292	1.76	37.69	30.75	582.31	488	170.00
171.00	488	6.77	80.86	42.45	8.50	1.296	1.76	37.58	30.38	612.69	457	180.00
181.00	457	6.34	80.05	42.45	8.50	1.301	1.76	37.47	29.99	642.69	427	190.00
191.00	427	5.93	79.16	42.45	8.50	1.304	1.76	37.37	29.58	672.27	398	200.00
201.00	398	5.52	78.18	42.45	8.50	1.308	1.76	37.28	29.14	701.41	369	210.00
211.00	369	5.11	77.10	42.45	8.50	1.312	1.76	37.19	28.67	730.08	340	220.00
221.00	340	4.72	75.91	42.45	8.50	1.315	1.76	37.10	28.16	758.25	312	230.00
231.00	312	4.33	74.57	42.45	8.50	1.319	1.76	37.02	27.61	785.86	284	240.00
241.00	284	3.94	73.07	42.45	8.50	1.322	1.76	36.95	27.00	812.86	257	250.00
251.00	257	3.57	71.38	42.45	8.50	1.325	1.76	36.88	26.32	839.18	231	260.00
261.00	231	3.20	69.46	42.45	8.50	1.328	1.76	36.81	25.56	864.74	205	270.00
271.00	205	2.85	67.26	42.45	8.50	1.330	1.76	36.74	24.71	889.45	181	280.00
281.00	181	2.50	64.72	42.45	8.50	1.333	1.76	36.67	23.74	913.19	157	290.00
291.00	157	2.18	61.78	42.45	8.50	1.336	1.76	36.61	22.62	935.81	134	300.00
301.00	134	1.86	58.34	42.45	8.50	1.338	1.76	36.55	21.32	957.13	113	310.00
311.00	113	1.57	54.30	42.45	8.50	1.341	1.76	36.50	19.82	976.95	93	320.00
321.00	93	1.29	49.57	42.45	8.50	1.343	1.76	36.44	18.06	995.01	75	330.00
331.00	75	1.04	44.04	42.45	8.50	1.345	1.76	36.39	16.03	1011.04	59	340.00
341.00	59	0.82	37.71	42.45	8.50	1.347	1.76	36.34	13.70	1024.74	45	350.00
351.00	45	0.63	30.72	42.45	8.50	1.350	1.76	36.29	11.15	1035.89	34	360.00
361.00	34	0.47	23.52	42.45	8.50	1.352	1.76	36.24	8.52	1044.41	26	370.00
371.00	26	0.36	16.85	42.45	8.50	1.354	1.76	36.19	6.10	1050.51	19	380.00
381.00	19	0.27	11.45	42.45	8.50	1.356	1.76	36.14	4.14	1054.65	15	390.00
391.00	15	0.21	7.62	42.45	8.50	1.358	1.76	36.10	2.75	1057.40	13	400.00
401.00	13	0.17	5.14	42.45	8.50	1.359	1.76	36.06	1.85	1059.25	11	410.00
411.00	11	0.15	3.58	42.45	8.50	1.361	1.76	36.01	1.29	1060.54	9	420.00
421.00	9	0.13	2.60	42.45	8.50	1.363	1.76	35.97	0.93	1061.48	9	430.00
431.00	9	0.12	1.95	42.45	8.50	1.365	1.76	35.93	0.70	1062.18	8	440.00
441.00	8	0.11	1.52	42.45	8.50	1.367	1.76	35.89	0.55	1062.72	7	450.00
451.00	7	0.10	1.21	42.45	8.50	1.368	1.76	35.86	0.44	1063.16	7	460.00
461.00	7	0.09	0.99	42.45	8.50	1.370	1.76	35.82	0.36	1063.52	6	470.00
471.00	6	0.09	0.83	42.45	8.50	1.371	1.76	35.78	0.30	1063.81	6	480.00
481.00	6	0.09	0.70	42.45	8.50	1.373	1.76	35.75	0.25	1064.06	6	490.00
491.00	6	0.08	0.60	42.45	8.50	1.375	1.76	35.71	0.22	1064.28	6	500.00

Table C6.3-4 Sediment Accumulation at Munda Dam, Case 580

Start (Year)	Reservoir Capacity (10 ⁶ m ³)	Capacity Inflow Ratio (%)	Trap Efficiency (Brune Method) (%)	10 Year Suspended Sediment (10 ⁶ ton)	10 year Bed Load (10 ⁶ ton)	Unit Weight Suspended (t/m ³)	Unit Weight Bed (t/m ³)	10 year Total Sediment (10 ⁶ m ³)	Sediment Trapped (10 ⁶ m ³)	Cumulative Sediment Trapped (10 ⁶ ton)	Remaining Reservoir Capacity (10 ⁶ m ³)	Periods (Year)
1.00	2,340	32.46	93.37	42.45	8.50	0.982	1.76	48.06	44.88	44.88	2,295	10.00
11.00	2,295	31.84	93.28	42.45	8.50	1.105	1.76	43.23	40.33	85.21	2,255	20.00
21.00	2,255	31.28	93.20	42.45	8.50	1.148	1.76	41.82	38.98	124.18	2,216	30.00
31.00	2,216	30.74	93.12	42.45	8.50	1.174	1.76	40.99	38.17	162.35	2,178	40.00
41.00	2,178	30.21	93.03	42.45	8.50	1.193	1.76	40.40	37.58	199.93	2,140	50.00
51.00	2,140	29.69	92.95	42.45	8.50	1.209	1.76	39.95	37.13	237.06	2,103	60.00
61.00	2,103	29.18	92.86	42.45	8.50	1.222	1.76	39.58	36.75	273.82	2,066	70.00
71.00	2,066	28.67	92.77	42.45	8.50	1.232	1.76	39.27	36.44	310.25	2,030	80.00
81.00	2,030	28.16	92.68	42.45	8.50	1.242	1.76	39.01	36.16	346.41	1,994	90.00
91.00	1,994	27.66	92.59	42.45	8.50	1.250	1.76	38.78	35.91	382.32	1,958	100.00
101.00	1,958	27.16	92.50	42.45	8.50	1.258	1.76	38.58	35.68	418.00	1,922	110.00
111.00	1,922	26.67	92.40	42.45	8.50	1.265	1.76	38.39	35.48	453.48	1,887	120.00
121.00	1,887	26.17	92.30	42.45	8.50	1.271	1.76	38.23	35.29	488.76	1,851	130.00
131.00	1,851	25.68	92.20	42.45	8.50	1.277	1.76	38.08	35.11	523.87	1,816	140.00
141.00	1,816	25.20	92.10	42.45	8.50	1.282	1.76	37.94	34.94	558.81	1,781	150.00
151.00	1,781	24.71	91.99	42.45	8.50	1.287	1.76	37.81	34.78	593.59	1,746	160.00
161.00	1,746	24.23	91.88	42.45	8.50	1.292	1.76	37.69	34.63	628.21	1,712	170.00
171.00	1,712	23.75	91.77	42.45	8.50	1.296	1.76	37.58	34.48	662.70	1,677	180.00
181.00	1,677	23.27	91.65	42.45	8.50	1.301	1.76	37.47	34.34	697.04	1,643	190.00
191.00	1,643	22.79	91.53	42.45	8.50	1.304	1.76	37.37	34.21	731.24	1,609	200.00
201.00	1,609	22.32	91.41	42.45	8.50	1.308	1.76	37.28	34.07	765.32	1,575	210.00
211.00	1,575	21.85	91.28	42.45	8.50	1.312	1.76	37.19	33.95	799.26	1,541	220.00
221.00	1,541	21.38	91.15	42.45	8.50	1.315	1.76	37.10	33.82	833.08	1,507	230.00
231.00	1,507	20.91	91.01	42.45	8.50	1.319	1.76	37.02	33.70	866.78	1,473	240.00
241.00	1,473	20.44	90.87	42.45	8.50	1.322	1.76	36.95	33.58	900.36	1,440	250.00
251.00	1,440	19.97	90.73	42.45	8.50	1.325	1.76	36.88	33.46	933.81	1,406	260.00
261.00	1,406	19.51	90.57	42.45	8.50	1.328	1.76	36.81	33.34	967.15	1,373	270.00
271.00	1,373	19.05	90.42	42.45	8.50	1.330	1.76	36.74	33.22	1000.37	1,340	280.00
281.00	1,340	18.59	90.26	42.45	8.50	1.333	1.76	36.67	33.10	1033.47	1,307	290.00
291.00	1,307	18.13	90.09	42.45	8.50	1.336	1.76	36.61	32.98	1066.45	1,274	300.00
301.00	1,274	17.67	89.91	42.45	8.50	1.338	1.76	36.55	32.87	1099.32	1,241	310.00
311.00	1,241	17.21	89.73	42.45	8.50	1.341	1.76	36.50	32.75	1132.06	1,208	320.00
321.00	1,208	16.76	89.54	42.45	8.50	1.343	1.76	36.44	32.63	1164.69	1,175	330.00
331.00	1,175	16.31	89.34	42.45	8.50	1.345	1.76	36.39	32.51	1197.20	1,143	340.00
341.00	1,143	15.85	89.14	42.45	8.50	1.347	1.76	36.34	32.39	1229.59	1,110	350.00
351.00	1,110	15.41	88.92	42.45	8.50	1.350	1.76	36.29	32.27	1261.86	1,078	360.00
361.00	1,078	14.96	88.70	42.45	8.50	1.352	1.76	36.24	32.14	1294.00	1,046	370.00
371.00	1,046	14.51	88.47	42.45	8.50	1.354	1.76	36.19	32.02	1326.01	1,014	380.00
381.00	1,014	14.07	88.22	42.45	8.50	1.356	1.76	36.14	31.89	1357.90	982	390.00
391.00	982	13.63	87.96	42.45	8.50	1.358	1.76	36.10	31.75	1389.65	950	400.00
401.00	950	13.18	87.69	42.45	8.50	1.359	1.76	36.06	31.62	1421.27	919	410.00
411.00	919	12.75	87.41	42.45	8.50	1.361	1.76	36.01	31.48	1452.75	887	420.00
421.00	887	12.31	87.11	42.45	8.50	1.363	1.76	35.97	31.34	1484.09	856	430.00
431.00	856	11.87	86.79	42.45	8.50	1.365	1.76	35.93	31.19	1515.28	825	440.00
441.00	825	11.44	86.46	42.45	8.50	1.367	1.76	35.89	31.03	1546.31	794	450.00
451.00	794	11.01	86.11	42.45	8.50	1.368	1.76	35.86	30.88	1577.19	763	460.00
461.00	763	10.58	85.74	42.45	8.50	1.370	1.76	35.82	30.71	1607.90	732	470.00
471.00	732	10.16	85.34	42.45	8.50	1.371	1.76	35.78	30.54	1638.43	702	480.00
481.00	702	9.73	84.92	42.45	8.50	1.373	1.76	35.75	30.36	1668.79	671	490.00
491.00	671	9.31	84.47	42.45	8.50	1.375	1.76	35.71	30.17	1698.96	641	500.00