Table C-3.5 MONTHLY RAINFALL (1/11)

KAKANI Unit : mm

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual	Min.	Max.
1940	--	--	--	--	--	*499.9	*1272.1	*1135.9	*202.4	*0.0	*0.0	*0.0	---	0.0	1272.1
1941	*18.2	*0.0	*0.0	*83.8	*237.4	*1090.1	*732.2	*909.5	*291.2	*97.6	*18.2	*0.0	3478.2	0.0	1090.1
1942	*0.0	*0.0	*0.0	*269.7	*44.6	*516.3	*969.0	*1394.1	*666.8	*9.7	*0.0	*0.0	3870.2	0.0	1394.1
1943	*22.2	*102.7	*30.0	*181.0	*237.3	*500.6	*1158.8	*1321.0	*560.2	*31.5	*0.0	*0.0	4145.3	0.0	1321.0
1944	*43.7	*80.0	*115.6	*139.1	*115.7	*366.2	*815.6	*979.0	*630.7	*54.2	*0.0	*0.0	3339.8	0.0	979.0
1945	*152.6	*15.7	*14.1	*202.5	*177.7	*477.1	*694.8	*1369.1	*693.5	*208.3	*1.3	*0.0	4006.7	0.0	1369.1
1946	*0.0	*102.6	*16.9	*301.4	*239.3	*575.4	*1346.4	*1020.1	*516.7	*348.4	*22.2	*0.0	4489.4	0.0	1346.4
1947	*20.2	*16.4	*10.1	*288.2	*452.4	*281.4	*1203.4	*571.2	*730.7	*21.2	*0.2	*1.1	3596.5	0.2	1203.4
1948	*0.0	*29.1	*39.7	*226.2	*360.2	*551.9	*1038.0	*1094.9	*747.0	*197.1	*21.3	*0.0	4305.4	0.0	1094.9
1949	*0.0	*76.6	*16.0	*201.5	*312.3	*335.2	*962.5	*1023.0	*314.7	*171.1	*0.0	*0.0	3412.9	0.0	1023.0
1950	*17.6	*19.9	*38.8	*6.9	*177.7	*500.9	*534.8	*469.1	*197.7	*10.1	*0.0	*7.0	1980.5	0.0	534.8
1951	*16.6	*23.7	*16.4	*50.0	*37.9	*281.1	*667.6	*862.3	*319.6	*38.8	*15.7	*0.0	2329.7	0.0	862.3
1952	*0.0	*7.9	*57.6	*54.0	*116.4	*378.2	*975.0	*1055.4	*526.9	*0.0	*0.0	*0.0	3171.4	0.0	1055.4
1953	*40.1	*9.0	*101.3	*26.5	*15.8	*658.7	*978.4	*818.2	*400.2	*16.8	*0.0	*0.0	3065.0	0.0	978.4
1954	*7.6	*31.2	*0.0	*0.0	*134.2	*571.8	*1104.7	*1080.7	*588.2	*0.0	*0.0	*0.0	3518.4	0.0	1104.7
1955	*20.4	*6.4	*59.3	*44.2	*159.2	*511.4	*779.8	*1512.5	*446.3	*34.5	*0.0	*0.0	3574.0	0.0	1512.5
1956	*0.0	*4.2	*0.0	*20.9	*430.3	*860.6	*567.6	*786.4	*324.8	*165.7	*20.9	*0.0	3181.4	0.0	860.6
1957	*63.0	*0.0	*24.5	*1.3	*44.3	*178.0	*739.2	*855.2	*177.7	*0.0	*0.0	*0.0	2083.2	0.0	855.2
1958	*33.9	*0.0	*37.9	*87.7	*10.4	*248.6	*438.9	*802.7	*272.6	*163.1	*0.0	*0.0	2095.8	0.0	802.7
1959	*0.0	*0.0	*0.0	*61.7	*182.6	*236.9	*514.9	*1104.8	*582.8	*63.9	*0.0	*0.0	2747.6	0.0	1104.8
1960	*19.5	*27.7	*87.4	*0.0	*88.7	*367.6	*706.4	*704.2	*253.9	*75.2	*0.0	*0.0	2330.6	0.0	706.4
1961	*31.6	*7.0	*175.2	*0.0	*91.1	*301.6	*889.2	*960.3	*227.7	*0.0	*0.0	*0.0	2683.7	0.0	960.3
1962	48.3	54.6	55.4	62.8	161.4	465.3	837.4	1110.2	669.4	30.8	0.0	5.1	3500.7	0.0	1110.2
1963	12.7	5.4	110.2	69.6	192.4	469.7	607.7	955.5	431.4	174.5	37.9	2.0	3069.0	2.0	955.5
1964	5.1	25.4	2.3	50.2	205.4	255.0	611.3	1096.7	597.3	110.4	0.0	0.0	2959.1	0.0	1096.7
1965	0.0	8.7	30.0	32.0	19.9	211.4	497.8	578.2	371.0	19.4	22.9	0.0	1791.3	0.0	578.2
1966	*55.9	*42.2	*0.0	*9.6	*111.1	*476.3	*554.2	*871.1	*235.3	*23.4	*0.1	*0.6	2379.8	0.0	871.1
1967	*0.0	*0.0	*33.1	*165.8	*38.9	*462.0	*912.1	*758.8	*411.6	*0.0	*56.3	*0.0	2838.6	0.0	912.1
1968	*30.1	*26.2	*70.4	*82.4	*87.4	*611.2	*1144.7	*873.4	*285.5	*156.5	*0.0	*0.0	3367.8	0.0	1144.7
1969	*31.7	*4.1	*57.5	*40.3	*160.9	*156.5	*769.6	*703.1	*608.0	*118.8	*4.4	*0.0	2654.9	0.0	769.6
1970	*46.2	*51.2	*32.4	*111.1	*203.1	*477.1	*836.9	*889.7	*393.8	*75.8	*5.6	*0.0	3122.9	0.0	889.7
1971	*0.0	*8.5	*49.2	*193.2	*111.2	*1082.2	*603.4	*884.7	*188.2	*159.0	*0.0	*0.0	3279.6	0.0	1082.2
1972	12.0	33.0	96.7	50.5	111.3	497.6	1193.5	465.0	388.7	119.0	21.0	0.0	2988.3	0.0	1193.5
1973	34.0	49.3	44.5	39.5	178.0	570.5	354.0	738.4	964.2	136.0	11.0	0.0	3119.4	0.0	964.2
1974	0.0	2.0	114.9	12.8	158.0	+179.7	509.9	653.0	392.0	97.0	0.0	11.0	2130.3	0.0	653.0
1975	17.0	31.6	10.8	57.0	113.8	252.7	802.8	829.7	703.0	137.5	0.0	0.0	2955.9	0.0	829.7
1976	37.2	24.6	0.0	112.0	129.8	465.5	641.7	790.4	429.5	22.0	0.0	0.0	2652.7	0.0	790.4
1977	4.5	0.0	27.0	111.0	135.0	390.5	623.8	655.4	250.8	111.0	18.0	66.2	2393.2	0.0	655.4
1978	3.5	19.0	91.7	53.5	215.9	711.9	770.7	726.7	415.1	142.4	2.0	5.2	3157.6	2.0	770.7
1979	7.5	34.0	1.5	100.0	11.2	221.4	743.6	399.1	47.0	84.9	11.0	78.4	1739.6	1.5	743.6
1980	0.0	38.6	32.9	6.5	162.0	830.7	670.7	648.8	382.4	64.7	0.0	4.8	2842.1	0.0	830.7
1981	31.5	0.0	31.3	122.3	111.7	344.8	640.2	700.1	364.5	0.0	28.0	0.0	2374.4	0.0	700.1
1982	17.0	46.8	40.0	37.1	*84.3	356.7	608.5	596.1	245.1	30.4	17.5	2.0	2081.5	2.0	608.5
1983	14.0	7.0	26.7	79.2	160.1	294.6	647.7	961.1	573.9	198.4	0.0	22.5	2985.2	0.0	961.1
1984	34.7	3.3	0.0	61.5	251.6	484.5	606.5	761.6	420.3	40.8	0.0	5.2	2670.0	0.0	761.6
1985	20.8	2.0	0.0	22.3	195.0	494.0	723.7	915.6	693.7	190.2	4.7	25.4	3287.4	0.0	915.6
1986	0.0	24.9	42.1	124.5	163.6	736.3	676.7	703.2	407.0	116.7	0.0	58.2	3053.2	0.0	736.3
Mean	21.1	24.0	40.0	88.1	155.2	463.6	780.4	874.4	437.0	86.5	7.2	6.3	2983.8	0.2	956.5
Min.	0.0	0.0	0.0	0.0	10.4	156.5	354.0	399.1	47.0	0.0	0.0	0.0	1739.6	0.0	534.8
Max.	152.6	102.7	175.2	301.4	452.4	1090.1	1346.4	1512.5	964.2	348.4	56.3	78.4	4489.4	2.0	1512.5

Remarks * : Calculated based on the correlation analysis because no record observed throughout month
+ : Filled-in data based on the correlation analysis at the missing data

Table C-3.5 MONTHLY RAINFALL (2/11)

TOKHA Unit : mm

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual	Min.	Max.
1940	---	---	---	---	---	*269.7	*689.1	*614.8	*108.1	*0.0	*0.0	*0.0	---	0.0	689.1
1941	*9.7	*0.0	*0.0	*44.9	*126.3	*590.5	*395.8	*502.9	*155.7	*51.6	*9.4	*0.0	1886.8	0.0	590.5
1942	*0.0	*0.0	*0.0	*145.1	*23.7	*278.7	*524.5	*754.4	*359.9	*5.0	*0.0	*0.0	2091.3	0.0	754.4
1943	*11.6	*55.2	*15.5	*107.5	*127.8	*291.6	*627.1	*715.8	*312.4	*16.9	*0.0	*0.0	2281.4	0.0	715.8
1944	*34.0	*42.8	*72.8	*73.7	*61.1	*197.1	*440.1	*529.6	*340.9	*29.2	*0.0	*0.0	1821.3	0.0	529.6
1945	*81.9	*8.4	*7.4	*109.2	*117.3	*268.2	*374.3	*741.8	*375.0	*122.9	*0.6	*0.0	2207.0	0.0	741.8
1946	*0.0	*54.6	*8.9	*172.7	*138.8	*310.1	*729.8	*551.7	*277.9	*187.4	*11.8	*0.0	2443.7	0.0	729.8
1947	*10.8	*8.8	*5.2	*156.1	*245.1	*150.2	*720.5	*283.8	*246.2	*8.0	*0.0	*1.4	1836.1	0.0	720.5
1948	*0.0	*22.3	*1.4	*105.9	*250.7	*295.9	*492.7	*461.2	*287.3	*83.4	*56.0	*0.0	2056.8	0.0	492.7
1949	*0.0	*51.0	*4.6	*129.4	*171.7	*144.9	*345.2	*475.8	*142.3	*106.4	*0.0	*6.0	1577.3	0.0	475.8
1950	*21.0	*25.9	*50.4	*24.5	*122.5	*390.8	*583.5	*486.8	*50.8	*8.8	*0.0	*7.6	1772.6	0.0	583.5
1951	*17.2	*32.0	*29.6	*15.5	*64.6	*277.0	*366.6	*479.0	*108.9	*17.5	*4.6	*0.0	1412.5	0.0	479.0
1952	*3.3	*10.6	*79.7	*81.9	*119.3	*174.8	*359.7	*375.8	*253.5	*0.0	*7.6	*0.0	1466.2	0.0	375.8
1953	*21.9	*0.0	*50.1	*18.7	*55.3	*224.3	*675.3	*224.9	*288.5	*4.9	*0.0	*0.0	1563.9	0.0	675.3
1954	*6.0	*18.0	*1.1	*4.6	*104.3	*304.9	*639.8	*598.2	*137.9	*15.0	*0.0	*0.0	1829.8	0.0	639.8
1955	*10.1	*3.1	*29.3	*47.3	*39.6	*191.1	*396.2	*349.2	*194.2	*31.2	*0.0	*2.2	1293.5	0.0	396.2
1956	*23.9	*30.0	*53.4	*65.9	*269.8	*382.2	*486.0	*416.6	*205.0	*74.1	*26.5	*3.8	2037.2	3.8	486.0
1957	*69.5	*0.2	*17.8	*11.4	*96.7	*139.5	*314.8	*414.9	*34.8	*32.7	*0.0	*12.2	1144.5	0.0	414.9
1958	*16.7	*0.2	*18.6	*42.9	*94.6	*136.7	*281.4	*410.7	*234.1	*62.4	*0.0	*0.0	1298.3	0.0	410.7
1959	*49.0	*1.1	*24.0	*24.4	*107.3	*205.4	*274.2	*354.2	*245.6	*103.8	*0.0	*0.0	1389.0	0.0	354.2
1960	*0.0	*8.7	*86.8	*19.4	*143.9	*238.3	*419.8	*251.6	*177.7	*52.5	*0.0	*0.0	1398.7	0.0	419.8
1961	*9.4	*78.1	*24.4	*24.3	*56.1	*341.1	*455.2	*604.3	*148.0	*219.2	*1.8	*14.7	1976.6	1.8	604.3
1962	*70.1	*76.4	*50.9	*125.1	*107.9	*359.2	*215.7	*359.4	*95.6	*1.1	*0.0	*4.5	1465.9	0.0	359.4
1963	*15.0	*1.9	*75.0	*77.1	*83.1	*238.1	*348.9	*380.6	*208.7	*51.8	*21.7	*3.0	1504.9	1.9	380.6
1964	*0.1	*1.8	*10.4	*86.8	*74.9	*321.8	*501.7	*351.6	*233.1	*24.2	*2.2	*11.1	1619.7	0.1	501.7
1965	*1.8	*5.2	*18.6	*42.5	*53.5	*402.5	*396.8	*392.4	*93.9	*71.7	*49.1	*0.0	1528.0	0.0	402.5
1966	*43.0	*46.5	*0.6	*8.9	*95.1	*186.0	*455.7	*502.4	*49.3	*10.4	*1.3	*3.7	1402.9	0.6	502.4
1967	*0.0	*1.3	*58.0	*69.6	*12.7	*281.1	*547.7	*405.5	*163.9	*0.0	*6.7	*0.0	1546.5	0.0	547.7
1968	*36.7	*10.3	*55.2	*30.9	*134.3	*374.5	*465.6	*279.5	*106.0	*197.1	*0.0	*0.0	1690.1	0.0	465.6
1969	*10.5	*1.6	*58.3	*33.6	*106.9	*203.1	*367.3	*397.3	*214.5	*49.5	*2.4	*0.0	1445.0	0.0	397.3
1970	*35.5	*33.6	*32.6	*42.1	*114.4	*237.0	*606.5	*281.6	*200.6	*71.4	*13.7	*0.0	1669.0	0.0	606.5
1971	*3.6	*7.7	*34.7	*221.4	*134.2	*746.6	*250.2	*309.3	*44.1	*99.4	*0.2	*0.0	1851.4	0.0	746.6
1972	*1.6	*31.0	*98.6	*28.9	*69.0	*192.5	*590.1	*189.9	*213.8	*105.6	*24.0	*0.0	1545.0	0.0	590.1
1973	*28.8	*39.6	*59.4	*31.0	*98.9	*417.5	*559.7	*412.4	*393.8	*146.3	*18.9	*0.0	2206.3	0.0	559.7
1974	*20.7	*7.1	*28.5	*37.5	*131.9	*91.1	*416.0	*446.8	*250.8	*55.8	*0.0	*13.8	1500.0	0.0	446.8
1975	*37.4	*30.9	*9.5	*44.2	*84.2	*169.8	*535.0	*465.2	*327.8	*41.7	*0.0	*0.0	1745.7	0.0	535.0
1976	16.6	0.0	10.9	27.6	218.3	537.9	339.0	313.2	9.0	12.2	0.0	0.0	1484.7	0.0	537.9
1977	0.0	0.0	10.3	40.6	164.4	198.0	286.9	304.4	28.8	81.6	22.5	36.2	1173.7	0.0	304.4
1978	0.0	0.0	67.4	65.2	113.9	332.4	371.0	381.6	45.0	71.6	6.0	0.0	1454.1	0.0	381.6
1979	0.0	20.6	18.4	42.9	20.6	194.9	738.7	246.6	31.3	45.6	0.0	81.6	1441.2	0.0	738.7
1980	2.0	44.4	0.0	62.4	102.0	590.7	411.1	222.3	219.1	34.7	4.0	8.6	1701.3	0.0	590.7
1981	*17.4	*0.0	*73.9	*123.5	*265.1	*172.5	*373.6	*327.1	*276.0	*0.0	*51.7	*0.0	1680.8	0.0	373.6
1982	*17.3	*26.7	*43.1	*59.4	*48.4	*246.0	*292.1	*471.3	*190.4	*10.8	*22.5	*4.1	1432.1	4.1	471.3
1983	*22.2	*4.7	*37.0	*96.2	*134.8	*99.5	*613.5	*238.0	*352.8	*159.3	*0.0	*18.7	1776.7	0.0	613.5
1984	*17.0	*21.2	*16.6	*73.4	*117.3	*337.0	*306.1	*370.0	*318.9	*22.6	*0.1	*9.1	1609.3	0.1	370.0
1985	*11.7	*3.8	*4.9	*30.3	*162.3	*196.8	*513.1	*533.1	*460.8	*205.2	*0.0	*67.1	2189.1	0.0	533.1
1986	*0.0	*27.5	*19.3	*114.2	*118.6	*387.2	*467.1	*267.7	*271.4	*97.4	*0.0	*55.0	1825.4	0.0	467.1
Mean	17.5	19.5	32.0	66.1	115.3	283.3	458.7	413.8	201.8	61.7	7.8	7.8	1685.2	0.3	525.6
Min.	0.0	0.0	0.0	4.6	12.7	91.1	215.7	189.9	9.0	0.0	0.0	0.0	1144.5	0.0	304.4
Max.	81.9	78.1	98.6	221.4	269.8	746.6	738.7	754.4	460.8	219.2	56.0	81.6	2443.7	4.1	754.4

Remarks * : Calculated based on the correlation analysis because no record observed throughout month
+ : Filled-in data based on the correlation analysis at the missing data

Table C-3.5 MONTHLY RAINFALL (3/11)

SUNDARIJAL Unit : mm

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual	Min.	Max.
1940	--	--	--	--	--	362.7	922.8	824.1	147.4	0.0	0.0	0.0	---	0.0	922.8
1941	13.2	0.0	0.0	60.9	172.8	790.8	531.5	660.1	211.5	71.0	13.3	0.0	2525.1	0.0	790.8
1942	0.0	0.0	0.0	195.8	32.5	374.7	703.1	1011.4	484.3	7.1	0.0	0.0	2808.9	0.0	1011.4
1943	16.2	74.7	22.1	131.8	172.6	363.7	840.7	958.4	406.9	22.9	0.0	0.0	3010.0	0.0	958.4
1944	31.9	58.1	84.1	101.3	84.4	266.1	592.1	710.2	457.5	39.4	0.0	0.0	2425.1	0.0	710.2
1945	110.9	11.4	10.4	147.2	129.3	346.3	504.7	993.1	503.5	151.5	1.0	0.0	2909.3	0.0	993.1
1946	0.0	74.7	12.4	219.2	174.2	418.0	976.8	740.2	375.2	253.0	16.2	0.0	3259.9	0.0	976.8
1947	14.7	11.9	7.4	209.0	328.4	204.7	873.2	+414.6	+530.5	15.5	0.2	0.8	2610.9	0.2	873.2
1948	0.0	21.3	28.9	164.5	261.6	400.5	753.1	794.3	542.4	143.5	15.5	0.0	3125.6	0.0	794.3
1949	0.0	55.6	11.7	146.5	227.2	243.5	698.4	742.2	228.8	124.3	0.0	0.0	2478.2	0.0	742.2
1950	12.8	14.5	28.2	5.1	129.1	363.9	388.6	340.9	143.8	7.4	0.0	5.1	1439.4	0.0	388.6
1951	12.2	17.3	12.0	36.5	27.6	204.5	484.6	625.8	232.2	28.2	11.4	0.0	1692.3	0.0	625.8
1952	0.0	5.8	41.8	39.4	84.9	274.6	707.6	765.8	382.5	0.0	0.0	0.0	2302.4	0.0	765.8
1953	29.2	6.6	73.6	19.3	11.5	478.1	710.1	593.8	290.5	12.2	0.0	0.0	2224.9	0.0	710.1
1954	5.6	22.8	0.0	0.0	97.6	415.0	801.3	784.2	426.9	0.0	0.0	0.0	2553.4	0.0	801.3
1955	*14.9	*4.7	*43.2	+32.2	115.6	371.0	565.7	1097.1	324.3	25.1	0.0	0.0	2593.8	0.0	1097.1
1956	0.0	3.1	0.0	15.2	312.1	624.3	412.2	570.6	236.0	120.3	15.2	0.0	2309.0	0.0	624.3
1957	45.7	0.0	17.8	1.0	32.2	129.3	536.6	620.7	129.1	0.0	0.0	0.0	1512.4	0.0	620.7
1958	*24.7	*0.0	*27.7	*63.8	7.6	180.7	318.7	582.7	198.1	*118.3	*0.0	0.0	1522.3	0.0	582.7
1959	0.0	0.0	0.0	44.9	132.6	172.1	373.9	801.6	422.9	46.5	0.0	0.0	1994.5	0.0	801.6
1960	14.2	20.1	63.5	0.0	64.5	266.8	512.7	510.9	184.4	54.6	0.0	0.0	1691.7	0.0	512.7
1961	22.9	5.1	127.0	0.0	66.1	219.1	645.1	696.6	165.5	0.0	0.0	0.0	1947.4	0.0	696.6
1962	38.1	0.0	26.7	157.5	57.7	562.4	520.8	614.8	356.2	32.5	0.0	0.0	2366.7	0.0	614.8
1963	17.8	24.1	0.0	28.0	85.3	367.7	520.5	791.9	328.3	46.5	53.0	0.0	2263.1	0.0	791.9
1964	0.0	0.0	0.0	78.0	102.8	274.8	374.8	722.5	283.1	49.9	18.2	0.0	1904.1	0.0	722.5
1965	0.0	5.3	0.0	2.0	28.0	269.4	565.9	482.5	158.3	111.5	26.4	0.0	1649.3	0.0	565.9
1966	40.6	30.7	0.0	7.1	80.8	345.7	402.7	632.3	171.0	17.3	0.1	0.5	1728.8	0.0	632.3
1967	0.0	0.0	24.2	120.7	28.4	335.5	661.9	551.0	299.0	0.0	41.0	0.0	2061.7	0.0	661.9
1968	22.0	19.0	51.4	60.0	63.6	443.8	830.5	633.7	207.5	113.6	0.0	0.0	2445.1	0.0	830.5
1969	23.0	3.0	41.8	29.4	117.3	114.1	558.8	510.5	441.5	86.4	3.2	0.0	1929.0	0.0	558.8
1970	33.6	37.2	23.6	80.8	147.5	346.5	607.5	645.7	286.0	55.3	4.1	0.0	2267.8	0.0	645.7
1971	0.0	6.2	36.1	140.7	81.4	785.1	438.4	642.2	136.7	115.7	0.0	0.0	2382.5	0.0	785.1
1972	8.4	21.0	108.2	18.7	42.3	213.0	651.4	304.3	246.0	68.2	97.7	0.0	1779.2	0.0	651.4
1973	8.4	27.6	65.6	23.4	214.2	+457.4	+464.3	664.9	627.8	168.1	13.8	0.0	2735.5	0.0	664.9
1974	9.4	5.0	21.0	43.5	252.5	252.8	459.2	532.0	376.5	37.2	0.0	18.0	2007.1	0.0	532.0
1975	28.6	40.3	11.3	100.7	149.2	262.3	622.3	772.4	476.1	77.6	0.0	0.0	2540.8	0.0	772.4
1976	25.6	13.2	0.0	74.7	301.3	447.1	568.5	558.8	302.1	40.7	0.0	1.0	2333.0	0.0	568.5
1977	17.5	7.5	26.0	85.3	156.0	381.5	614.0	357.1	148.7	21.2	32.9	52.3	1900.0	7.5	614.0
1978	*6.8	*29.3	*138.6	*103.1	*331.9	*480.3	*781.8	*653.2	*281.5	*182.9	*1.6	*2.9	2993.9	1.6	781.8
1979	*10.6	*63.6	*0.1	*42.9	*117.7	*432.9	*592.9	*424.1	*91.2	*57.6	*9.8	*52.0	1895.4	0.1	592.9
1980	*0.0	*20.0	*29.1	*10.4	*230.7	*411.5	*525.4	*435.6	*189.1	*135.8	*0.0	*6.5	1994.1	0.0	525.4
1981	*7.5	*0.1	*52.0	*144.5	*281.4	*254.9	*495.9	*372.2	*360.8	*0.0	*0.0	*0.0	1969.3	0.0	495.9
1982	*16.4	*16.6	*107.0	*65.3	*61.3	*174.7	*401.9	*591.6	*190.8	*64.2	*2.3	*0.9	1693.0	0.9	591.6
1983	*17.0	*9.1	*24.4	*74.6	*162.9	*195.6	*1002.8	*704.6	*582.6	*298.1	*0.0	*28.8	3100.5	0.0	1002.8
1984	*27.0	*22.6	*10.4	*32.2	*192.9	*342.6	*723.9	*665.2	*427.8	*3.6	*0.0	*2.4	2450.6	0.0	723.9
1985	*3.9	*3.9	*0.0	*45.0	*173.9	*237.5	*753.5	*712.7	*395.1	*161.9	*0.0	*65.1	2552.5	0.0	753.5
1986	*0.0	*25.8	*6.1	*102.3	*63.6	*432.7	*572.1	*244.5	*547.0	*48.6	*7.3	*28.2	2078.2	0.0	572.1
Mean	15.9	18.2	30.8	71.8	134.5	346.6	607.8	639.6	317.8	68.8	8.2	5.6	2265.7	0.2	716.0
Min.	0.0	0.0	0.0	0.0	7.6	114.1	318.7	244.5	91.2	0.0	0.0	0.0	1439.4	0.0	388.6
Max.	110.9	74.7	138.6	219.2	331.9	790.8	1002.8	1097.1	627.8	298.1	97.7	65.1	3259.9	7.5	1097.1

Remarks * : Calculated based on the correlation analysis because no record observed throughout month
+ : Filled-in data based on the correlation analysis at the missing data

Table C-3.5 MONTHLY RAINFALL (4/11)

INDIAN EMBASSY Unit : mm

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual	Min.	Max.
1940	--	--	--	--	--	*238.5	*607.7	*542.6	*96.4	*0.0	*0.0	*0.0	---	0.0	607.7
1941	*8.7	*0.0	*0.0	*39.9	*112.9	*521.0	*349.6	*434.3	*138.7	*46.5	*8.6	*0.0	1660.2	0.0	521.0
1942	*0.0	*0.0	*0.0	*128.6	*21.2	*246.4	*463.2	*665.9	*318.4	*4.6	*0.0	*0.0	1848.3	0.0	665.9
1943	*10.5	*49.0	*14.3	*86.3	*113.4	*238.9	*553.4	*631.2	*267.4	*15.0	*0.0	*0.0	1979.4	0.0	631.2
1944	*20.8	*38.0	*55.1	*66.1	*54.9	*174.5	*389.4	*467.5	*301.3	*25.9	*0.0	*0.0	1593.5	0.0	467.5
1945	*72.6	*7.5	*6.7	*96.7	*84.7	*227.9	*331.6	*654.0	*331.1	*99.3	*0.6	*0.0	1912.7	0.0	654.0
1946	*0.0	*48.9	*8.0	*143.9	*114.0	*274.3	*643.2	*487.2	*246.5	*166.3	*10.5	*0.0	2142.8	0.0	643.2
1947	*9.6	*7.8	*4.8	*137.6	*216.1	*134.0	625.6	247.2	215.4	7.4	0.0	1.3	1606.8	0.0	625.6
1948	0.0	20.0	1.3	92.8	218.6	257.7	428.5	401.6	250.8	73.4	48.7	0.0	1793.4	0.0	428.5
1949	0.0	36.3	4.3	113.1	150.0	127.2	300.8	414.4	124.8	92.7	0.0	5.3	1368.9	0.0	414.4
1950	18.5	14.7	44.1	21.6	107.6	340.0	507.0	423.2	44.9	7.9	0.0	6.6	1536.1	0.0	507.0
1951	15.2	20.0	25.9	14.1	56.4	241.4	319.8	416.8	95.0	15.5	4.3	0.0	1224.4	0.0	416.8
1952	3.1	9.4	69.6	71.8	105.1	152.8	313.8	327.6	220.6	0.0	6.6	0.0	1280.4	0.0	327.6
1953	19.3	0.0	43.7	16.8	48.8	196.1	586.6	196.9	251.1	4.3	0.0	0.0	1363.6	0.0	586.6
1954	5.6	15.9	1.0	4.1	91.3	266.4	555.0	520.2	121.0	13.2	0.0	0.0	1593.7	0.0	555.0
1955	8.9	2.8	25.7	41.7	34.9	167.4	345.4	304.4	169.8	27.6	0.0	2.0	1130.6	0.0	345.4
1956	20.9	26.4	47.1	57.7	234.9	333.1	422.7	363.0	178.9	65.0	23.1	3.6	1776.4	3.6	422.7
1957	60.8	0.0	15.9	10.2	84.4	122.3	275.3	361.6	30.8	28.7	0.0	10.7	1000.7	0.0	361.6
1958	14.7	0.0	16.6	37.9	82.8	119.6	246.2	357.8	204.4	54.3	0.0	0.0	1134.3	0.0	357.8
1959	33.4	1.0	21.2	21.5	84.5	180.0	239.7	309.0	214.3	90.7	0.0	0.0	1195.3	0.0	309.0
1960	0.0	7.6	56.8	17.2	125.4	208.1	365.1	220.0	155.7	45.6	0.0	0.0	1201.5	0.0	365.1
1961	8.4	67.9	21.4	21.3	39.9	288.3	396.2	525.6	130.4	190.7	1.6	13.0	1704.7	1.6	525.6
1962	60.9	66.8	44.5	109.2	95.0	302.9	179.4	313.5	84.0	1.3	0.0	4.0	1261.5	0.0	313.5
1963	13.0	1.8	65.5	68.0	72.7	207.5	304.4	331.5	181.9	45.4	19.1	2.7	1313.5	1.8	331.5
1964	0.2	1.6	9.3	75.9	66.0	279.7	437.0	287.9	203.5	21.4	2.0	0.3	1384.8	0.2	437.0
1965	1.7	4.8	16.5	37.5	47.5	349.8	345.5	342.0	82.7	62.6	42.9	0.0	1333.5	0.0	349.8
1966	37.4	40.4	0.6	8.1	82.9	162.8	396.7	437.0	43.9	9.4	1.2	3.4	1223.8	0.6	437.0
1967	0.0	1.3	51.2	60.8	11.6	245.0	476.4	353.5	142.9	0.0	5.9	0.0	1348.6	0.0	476.4
1968	30.5	9.0	44.8	28.9	130.2	331.8	462.0	279.2	83.3	139.5	0.0	0.0	1539.2	0.0	462.0
1969	9.7	2.2	44.6	31.3	60.5	114.8	315.9	340.9	144.0	65.0	2.3	0.0	1131.2	0.0	340.9
1970	24.2	23.1	24.9	41.9	85.6	235.6	458.1	310.8	197.4	34.5	3.8	0.0	1439.9	0.0	458.1
1971	4.3	7.0	21.9	176.1	145.7	697.5	230.6	256.5	59.7	80.3	1.9	0.0	1681.5	0.0	697.5
1972	2.6	25.3	82.6	35.8	82.6	226.8	529.0	204.7	203.2	93.9	23.0	0.0	1509.5	0.0	529.0
1973	26.3	41.8	43.6	23.6	91.6	400.3	416.0	418.4	373.9	126.7	7.0	0.0	1969.2	0.0	418.4
1974	15.0	4.9	15.1	38.4	119.3	80.8	324.6	290.0	212.4	30.3	0.0	9.7	1140.5	0.0	324.6
1975	26.6	16.4	7.8	58.8	86.9	128.3	494.9	380.6	279.5	46.9	0.0	0.0	1526.7	0.0	494.9
1976	*32.8	*15.7	*0.0	*74.3	*166.5	*421.1	*364.2	*333.6	*184.4	*26.2	*0.0	*0.0	1618.8	0.0	421.1
1977	*12.4	*13.1	*18.4	*112.3	*97.1	*288.7	*350.3	*367.6	*85.4	*31.4	*15.6	*14.7	1407.0	12.4	367.6
1978	*5.0	*11.9	*75.3	*44.9	*155.3	*324.6	*351.3	*427.0	*173.3	*118.0	*0.2	*2.3	1689.1	0.2	427.0
1979	*5.9	*42.5	*0.7	*45.4	*40.3	*280.4	*486.2	*347.7	*107.5	*38.5	*5.9	*70.9	1471.9	0.7	486.2
1980	*1.0	*19.0	*49.3	*10.9	*134.7	*379.7	*321.5	*258.7	*199.3	*74.8	*0.0	*6.1	1455.0	0.0	379.7
1981	*15.6	*0.0	*65.4	*109.4	*234.8	*152.7	*330.9	*289.6	*244.5	*0.0	*45.9	*0.0	1488.8	0.0	330.9
1982	*15.3	*23.6	*38.4	*52.7	*43.1	*217.8	*258.8	*417.6	*168.6	*9.7	*19.9	*3.7	1269.2	3.7	417.6
1983	*19.7	*4.3	*32.8	*85.2	*119.3	*88.2	*543.7	*210.8	*312.3	*141.1	*0.0	*16.6	1574.0	0.0	543.7
1984	*15.1	*18.9	*14.7	*65.0	*103.7	*298.8	*271.5	*327.8	*282.7	*19.9	*0.1	*8.0	1426.2	0.1	327.8
1985	*10.5	*3.4	*4.3	*26.8	*143.5	*174.4	*454.1	*472.2	*408.5	*181.9	*0.0	*59.4	1939.0	0.0	472.2
1986	*0.0	*24.4	*17.1	*101.2	*104.9	*342.9	*413.9	*237.2	*240.3	*86.2	*0.0	*48.8	1616.9	0.0	413.9
Mean	15.6	17.3	27.7	60.1	102.2	250.8	399.6	372.5	187.4	54.5	6.4	6.2	1500.3	0.5	455.3
Min.	0.0	0.0	0.0	4.1	11.6	80.8	179.4	196.9	30.8	0.0	0.0	0.0	1000.7	0.0	309.0
Max.	72.6	67.9	82.6	176.1	234.9	697.5	643.2	665.9	408.5	190.7	48.7	70.9	2142.8	12.4	697.5

Remarks * : Calculated based on the correlation analysis because no record observed throughout month
+ : Filled-in data based on the correlation analysis at the missing data

Table C-3.5 MONTHLY RAINFALL (5/11)

SANKHU Unit : mm

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual	Min.	Max.
1940	--	--	--	--	--	*311.3	*792.2	*707.5	*126.0	*0.0	*0.0	*0.0	---	0.0	792.2
1941	*11.3	*0.0	*0.0	*52.0	*147.5	*679.1	*455.8	*566.5	*181.1	*60.8	*11.3	*0.0	2165.4	0.0	679.1
1942	*0.0	*0.0	*0.0	*167.6	*27.7	*321.3	*603.4	*868.3	*415.2	*6.0	*0.0	*0.0	2409.5	0.0	868.3
1943	*13.8	*64.0	*18.8	*112.6	*147.9	*311.7	*721.7	*822.9	*348.5	*19.6	*0.0	*0.0	2581.5	0.0	822.9
1944	*27.1	*49.7	*72.0	*86.4	*71.9	*228.0	*507.8	*609.7	*392.7	*33.7	*0.0	*0.0	2079.0	0.0	609.7
1945	*95.0	*9.8	*8.9	*126.1	*110.4	*296.8	*432.5	*852.8	*432.1	*129.6	*0.8	*0.0	2494.8	0.0	852.8
1946	*0.0	*63.8	*10.6	*187.4	*148.9	*358.3	*838.8	*635.1	*321.6	*216.6	*13.8	*0.0	2794.9	0.0	838.8
1947	*12.5	*10.2	*6.3	*179.5	*281.7	*175.0	*749.3	*355.4	*454.9	*13.1	*0.1	*0.6	2238.6	0.1	749.3
1948	*0.0	*18.2	*24.6	*140.6	*224.0	*343.5	*646.5	*682.1	*464.9	*122.7	*13.1	*0.0	2680.2	0.0	682.1
1949	*0.0	*47.7	*10.0	*125.1	*194.2	*208.6	*599.2	*636.9	*195.8	*106.6	*0.0	*0.0	2124.1	0.0	636.9
1950	*11.0	*12.4	*24.1	*4.3	*110.6	*312.1	*332.7	*291.8	*122.9	*6.3	*0.0	*4.3	1232.5	0.0	332.7
1951	*10.4	*14.8	*10.3	*31.1	*23.4	*175.1	*415.5	*536.8	*199.2	*24.1	*9.8	*0.0	1450.5	0.0	536.8
1952	*0.0	*4.9	*35.8	*33.7	*72.4	*235.4	*607.2	*657.3	*328.1	*0.0	*0.0	*0.0	1974.8	0.0	657.3
1953	*24.9	*5.6	*63.1	*16.5	*9.8	*410.2	*609.5	*509.2	*249.3	*10.4	*0.0	*0.0	1908.5	0.0	609.5
1954	*4.8	*19.4	*0.0	*0.0	*83.5	*356.2	*688.0	*673.0	*366.4	*0.0	*0.0	*0.0	2191.3	0.0	688.0
1955	*12.8	*4.0	*37.0	*27.4	*99.1	*318.2	*485.6	*941.9	*277.8	*21.5	*0.0	*0.0	2225.3	0.0	941.9
1956	*0.0	*2.6	*0.0	*12.9	*267.7	*535.7	*353.3	*489.5	*202.1	*103.0	*13.0	*0.0	1979.8	0.0	535.7
1957	*39.3	*0.0	*15.2	*0.8	*27.5	*110.8	*460.1	*532.8	*110.7	*0.0	*0.0	*0.0	1297.2	0.0	532.8
1958	*21.1	*0.0	*23.7	*54.5	*6.5	*154.5	*273.2	*500.3	*169.6	*101.5	*0.0	*0.0	1304.9	0.0	500.3
1959	*0.0	*0.0	*0.0	*38.4	*113.7	*147.4	*320.7	*688.1	*362.8	*39.7	*0.0	*0.0	1710.8	0.0	688.1
1960	*12.2	*17.2	*54.3	*0.0	*55.2	*228.8	*439.5	*438.2	*157.9	*46.8	*0.0	*0.0	1450.1	0.0	439.5
1961	*19.6	*4.3	*109.2	*0.0	*56.7	*187.4	*553.6	*597.8	*141.7	*0.0	*0.0	*0.0	1670.3	0.0	597.8
1962	*32.7	*0.0	*22.9	*135.0	*49.3	*482.8	*446.6	*527.2	*305.3	*27.9	*0.0	*0.0	2029.7	0.0	527.2
1963	*15.3	*20.7	*0.0	*23.8	*73.1	*315.4	*446.3	*679.5	*281.5	*39.8	*45.4	*0.0	1940.8	0.0	679.5
1964	*0.0	*0.0	*0.0	*66.8	*88.0	*235.6	*321.4	*619.7	*242.6	*42.5	*15.5	*0.0	1632.1	0.0	619.7
1965	*0.0	*4.5	*0.0	*1.7	*23.7	*230.7	*485.4	*413.6	*135.2	*95.5	*22.5	*0.0	1412.8	0.0	485.4
1966	*34.8	*26.3	*0.0	*6.0	*69.0	*296.6	*353.3	*550.2	*154.5	*22.5	*8.0	*0.3	1521.5	0.0	550.2
1967	*0.0	*0.0	*20.4	*103.3	*24.2	*287.9	*568.1	*472.5	*256.2	*0.0	*35.0	*0.0	1767.6	0.0	568.1
1968	*18.8	*16.3	*44.0	*51.3	*54.5	*380.6	*712.9	*544.0	*177.6	*97.6	*0.0	*0.0	2097.6	0.0	712.9
1969	*19.7	*2.5	*35.7	*25.1	*100.4	*97.3	*479.3	*437.7	*378.5	*74.0	*2.7	*0.0	1652.9	0.0	479.3
1970	*28.8	*31.8	*20.2	*69.1	*126.3	*297.2	*521.2	*554.2	*244.8	*47.2	*3.5	*0.0	1944.3	0.0	554.2
1971	2.8	11.6	46.0	92.0	122.0	668.0	450.4	575.2	182.6	179.6	4.8	0.0	2335.0	0.0	668.0
1972	2.8	27.2	103.6	24.4	93.2	340.8	586.8	344.6	316.4	82.0	20.0	0.0	1941.8	0.0	586.8
1973	27.6	34.8	71.2	34.0	136.0	382.6	435.2	479.6	361.2	154.4	16.4	0.0	2133.0	0.0	479.6
1974	13.4	13.6	40.0	38.4	107.6	232.0	591.4	469.2	295.6	35.2	0.0	13.2	1849.6	0.0	591.4
1975	22.0	31.2	2.0	110.8	122.8	288.8	464.0	537.6	379.6	132.8	0.0	0.0	2091.6	0.0	537.6
1976	24.0	21.2	0.0	87.2	158.0	346.4	409.2	446.8	332.8	27.8	0.0	0.0	1853.4	0.0	446.8
1977	9.2	10.4	23.2	86.6	131.6	276.4	449.6	136.8	95.6	74.0	19.7	40.4	1353.5	9.2	449.6
1978	0.0	17.6	97.8	26.1	384.6	692.2	796.4	916.2	395.9	90.0	0.0	7.7	3424.5	0.0	916.2
1979	3.5	66.8	4.0	84.0	160.8	301.7	513.1	633.9	143.8	46.1	41.2	14.3	2013.2	3.5	633.9
1980	1.0	8.2	17.5	2.7	139.0	549.4	765.1	492.4	85.6	36.7	0.0	0.0	2097.6	0.0	765.1
1981	0.0	0.0	18.6	73.6	191.7	39.8	296.8	299.0	35.3	10.5	0.0	0.0	965.3	0.0	299.0
1982	13.7	158.2	19.1	48.5	37.5	244.0	401.2	596.9	373.6	25.5	30.5	0.0	1948.7	0.0	596.9
1983	14.0	7.5	20.0	61.0	133.0	159.5	816.2	573.7	474.5	242.5	0.0	23.5	2525.4	0.0	816.2
1984	22.0	18.5	8.5	26.4	157.3	279.4	589.5	541.8	348.4	3.0	0.0	2.0	1996.8	0.0	589.5
1985	3.2	3.2	0.0	36.7	141.7	193.5	613.6	580.5	321.8	131.9	0.0	53.0	2079.1	0.0	613.6
1986	0.0	21.0	5.0	83.5	52.0	352.5	466.0	199.5	445.5	40.0	6.0	23.0	1694.0	0.0	466.0
Mean	13.6	19.6	24.9	60.8	112.1	305.9	529.0	557.8	272.0	60.0	7.1	3.9	1966.7	0.3	621.8
Min.	0.0	0.0	0.0	0.0	6.5	39.8	273.2	136.8	35.3	0.0	0.0	0.0	965.3	0.0	299.0
Max.	95.0	158.2	109.2	187.4	384.6	692.2	838.8	941.9	474.5	242.5	45.4	53.0	3424.5	9.2	941.9

Remarks * : Calculated based on the correlation analysis because no record observed throughout month
+ : Filled-in data based on the correlation analysis at the missing data

Table C-3.5 MONTHLY RAINFALL (6/11)

KATHMANDU AIRPORT Unit : mm

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual	Min.	Max.
1940	--	--	--	--	--	*220.0	*561.2	*501.0	*88.5	*0.0	*0.0	*0.0	---	0.0	561.2
1941	*7.9	*0.0	*0.0	*36.7	*103.5	*481.0	*322.7	*409.8	*127.4	*42.5	*7.8	*0.0	1539.3	0.0	481.0
1942	*0.0	*0.0	*0.0	*118.6	*19.4	*227.3	*427.4	*614.5	*293.8	*4.1	*0.0	*0.0	1705.1	0.0	614.5
1943	*9.6	*45.1	*12.9	*88.1	*104.3	*237.9	*510.9	*583.0	*255.0	*13.8	*0.0	*0.0	1860.6	0.0	583.0
1944	*27.9	*35.0	*59.5	*60.7	*50.3	*160.9	*358.9	*431.7	*277.8	*23.8	*0.0	*0.0	1486.5	0.0	431.7
1945	*66.8	*6.9	*6.2	*89.1	*95.8	*218.8	*305.4	*604.2	*306.0	*100.4	*0.5	*0.0	1800.1	0.0	604.2
1946	*0.0	*44.8	*7.4	*141.3	*113.5	*253.1	*594.4	*449.8	*227.1	*153.0	*9.7	*0.0	1994.1	0.0	594.4
1947	*8.8	*7.2	*4.3	*127.2	*199.7	*123.0	*586.8	*231.5	*201.1	*6.7	*0.0	*1.2	1497.5	0.0	586.8
1948	*0.0	*18.4	*1.2	*86.6	*204.5	*241.4	*401.6	*375.9	*234.7	*68.4	*45.6	*0.0	1678.3	0.0	401.6
1949	*0.0	*41.6	*3.8	*105.7	*140.3	*118.7	*281.6	*388.1	*116.3	*86.7	*0.0	*4.9	1287.7	0.0	388.1
1950	*17.2	*21.2	*41.2	*20.1	*100.1	*318.5	*475.4	*396.7	*41.7	*7.3	*0.0	*6.2	1445.6	0.0	475.4
1951	*14.1	*26.2	*24.2	*12.9	*52.8	*225.9	*299.2	*390.6	*88.8	*14.4	*3.8	*0.0	1152.9	0.0	390.6
1952	*2.8	*8.7	*65.1	*67.0	*97.6	*142.8	*293.7	*306.5	*206.6	*0.0	*6.2	*0.0	1197.0	0.0	306.5
1953	*17.9	*0.0	*40.9	*15.4	*45.4	*183.3	*550.2	*183.8	*235.2	*4.0	*0.0	*0.0	1276.1	0.0	550.2
1954	*5.1	*14.7	*0.9	*3.8	*85.2	*249.0	*520.9	*487.4	*112.9	*12.3	*0.0	*0.0	1492.2	0.0	520.9
1955	*8.3	*2.6	*24.0	*38.8	*32.4	*156.2	*323.1	*284.9	*158.6	*25.6	*0.0	*1.8	1056.3	0.0	323.1
1956	*19.5	*24.6	*43.8	*53.8	*220.0	*311.8	*396.0	*340.0	*167.3	*60.7	*21.6	*3.2	1662.3	3.2	396.0
1957	*56.8	*0.2	*14.7	*9.4	*78.9	*114.1	*257.2	*338.5	*28.6	*26.8	*0.0	*10.0	935.2	0.0	338.5
1958	*13.7	*0.2	*15.4	*35.2	*77.3	*111.8	*229.9	*335.0	*191.1	*50.9	*0.0	*0.0	1060.5	0.0	335.0
1959	*40.1	*1.0	*19.7	*20.0	*87.7	*168.0	*224.0	*289.0	*200.4	*84.7	*0.0	*0.0	1134.6	0.0	289.0
1960	*0.0	*7.1	*70.9	*16.0	*117.4	*194.5	*342.2	*205.6	*145.4	*42.7	*0.0	*0.0	1141.8	0.0	342.2
1961	*7.8	*63.6	*20.0	*19.9	*46.0	*278.5	*370.9	*492.5	*121.4	*178.8	*1.5	*12.1	1613.0	1.5	492.5
1962	*57.1	*62.4	*41.6	*102.1	*88.4	*292.8	*176.4	*293.4	*78.3	*1.0	*0.0	*3.7	1197.2	0.0	293.4
1963	*12.2	*1.6	*61.2	*63.2	*67.9	*194.4	*284.8	*310.5	*170.3	*42.4	*17.8	*2.5	1228.8	1.6	310.5
1964	*0.1	*1.5	*8.6	*70.9	*61.4	*262.2	*409.2	*287.1	*190.3	*19.9	*1.8	*9.1	1322.1	0.1	409.2
1965	*1.5	*4.3	*15.3	*34.8	*44.0	*327.9	*323.5	*320.0	*76.9	*58.5	*40.1	*0.0	1246.8	0.0	327.9
1966	*35.0	*37.9	*0.5	*7.4	*77.5	*152.0	*371.6	*409.4	*40.6	*8.6	*1.1	*3.1	1144.7	0.5	409.4
1967	*0.0	*1.1	*47.6	*56.9	*10.6	*229.4	*446.4	*330.8	*133.7	*0.0	*5.5	*0.0	1262.0	0.0	446.4
1968	30.1	8.5	45.3	25.5	109.6	305.7	379.5	228.2	86.9	160.4	0.0	0.0	1379.7	0.0	379.5
1969	8.6	1.4	47.6	27.4	86.9	166.1	299.7	323.9	175.3	40.3	2.0	0.0	1179.2	0.0	323.9
1970	29.1	27.6	26.6	34.4	93.6	193.7	494.3	229.7	163.9	58.2	11.2	0.0	1362.3	0.0	494.3
1971	3.0	6.3	28.4	180.8	109.7	608.1	204.6	252.6	36.4	81.2	0.2	0.0	1511.3	0.0	608.1
1972	1.4	25.5	80.4	23.8	56.6	157.3	480.9	155.3	174.5	86.1	19.6	0.0	1261.4	0.0	480.9
1973	23.7	32.4	48.5	25.3	81.1	340.4	456.0	336.5	321.1	119.3	15.5	0.0	1799.8	0.0	456.0
1974	16.9	5.8	23.3	30.9	108.0	74.8	339.6	364.2	204.6	45.6	0.0	11.4	1225.1	0.0	364.2
1975	30.6	25.4	8.0	36.1	69.1	138.5	436.1	379.0	267.5	34.2	0.0	0.0	1424.5	0.0	436.1
1976	30.2	14.5	0.0	68.6	153.4	387.4	335.0	307.3	169.9	24.3	0.0	0.0	1490.6	0.0	387.4
1977	11.5	12.1	17.1	103.9	90.1	265.6	322.7	338.3	78.9	29.1	14.4	13.6	1297.3	11.5	338.3
1978	4.7	11.1	69.4	41.7	143.3	298.9	323.6	392.5	159.8	108.6	0.2	2.2	1556.0	0.2	392.5
1979	5.6	39.3	0.7	42.1	37.3	258.1	447.3	320.3	99.1	35.7	5.6	65.3	1356.4	0.7	447.3
1980	1.0	17.7	45.7	10.1	124.4	349.3	296.1	238.5	183.5	69.0	0.0	5.6	1340.9	0.0	349.3
1981	14.5	0.0	60.4	100.9	216.2	140.7	304.8	266.9	225.1	0.0	42.2	0.0	1371.7	0.0	304.8
1982	14.2	21.9	35.5	48.8	39.7	200.5	238.2	384.3	155.4	9.0	18.3	3.4	1169.2	3.4	384.3
1983	18.2	4.0	30.2	78.7	110.1	81.4	499.9	194.2	287.7	129.9	0.0	15.3	1449.6	0.0	499.9
1984	13.9	17.4	13.5	60.1	96.0	275.0	250.1	301.9	260.2	18.4	0.1	7.4	1314.0	0.1	301.9
1985	9.7	3.2	4.0	24.8	132.5	160.8	418.3	434.4	375.6	167.2	0.0	54.6	1785.1	0.0	434.4
1986	0.0	22.5	15.8	93.4	96.9	315.6	380.8	218.6	221.3	79.5	0.0	44.9	1489.3	0.0	380.8
Mean	15.2	16.8	27.2	55.6	95.1	232.2	373.5	345.9	173.7	51.8	6.2	6.0	1399.2	0.5	424.8
Min.	0.0	0.0	0.0	3.8	10.6	74.8	176.4	155.3	28.6	0.0	0.0	0.0	935.2	0.0	289.0
Max.	66.8	63.6	80.4	180.8	220.0	608.1	594.4	614.5	375.6	178.8	45.6	65.3	1994.1	11.5	614.5

Remarks * : Calculated based on the correlation analysis because no record observed throughout month
+ : Filled-in data based on the correlation analysis at the missing data

Table C-3.5 MONTHLY RAINFALL (7/11)

NAGARKOT

Unit : mm

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual	Min.	Max.
1940	--	--	--	--	--	*347.5	*884.4	*789.7	*140.7	*0.0	*0.0	*0.0	---	0.0	884.4
1941	*12.6	*0.0	*0.0	*58.2	*164.9	*757.8	*509.3	*632.6	*202.1	*67.7	*12.6	*0.0	2417.8	0.0	757.8
1942	*0.0	*0.0	*0.0	*187.3	*31.0	*358.7	*673.7	*969.6	*463.5	*6.7	*0.0	*0.0	2690.5	0.0	969.6
1943	*15.4	*71.5	*20.9	*125.8	*165.1	*348.1	*805.9	*918.7	*389.4	*21.9	*0.0	*0.0	2882.7	0.0	918.7
1944	*30.4	*55.5	*80.4	*96.5	*80.3	*254.4	*566.9	*680.5	*438.2	*37.7	*0.0	*0.0	2320.8	0.0	680.5
1945	*106.0	*10.9	*9.9	*140.9	*123.6	*331.5	*483.2	*951.9	*482.4	*144.6	*0.9	*0.0	2785.8	0.0	951.9
1946	*0.0	*71.2	*11.8	*209.5	*166.2	*400.2	*936.1	*709.3	*358.8	*242.0	*15.5	*0.0	3120.6	0.0	936.1
1947	*14.1	*11.4	*7.0	*200.4	*314.7	*195.5	*836.6	*397.0	*508.0	*14.7	*0.1	*0.7	2500.2	0.1	836.6
1948	*0.0	*20.2	*27.5	*157.1	*250.6	*383.6	*721.6	*761.3	*519.5	*136.9	*14.7	*0.0	2993.0	0.0	761.3
1949	*0.0	*53.2	*11.2	*140.0	*216.8	*232.9	*669.3	*711.4	*218.9	*119.0	*0.0	*0.0	2372.7	0.0	711.4
1950	*12.2	*13.8	*26.8	*4.8	*123.4	*348.4	*371.3	*326.0	*137.2	*7.0	*0.0	*4.8	1375.7	0.0	371.3
1951	*11.6	*16.5	*11.4	*34.8	*26.1	*195.3	*464.2	*599.5	*222.4	*27.0	*10.9	*0.0	1619.7	0.0	599.5
1952	*0.0	*5.4	*40.0	*37.5	*80.7	*262.7	*678.1	*733.9	*366.1	*0.0	*0.0	*0.0	2204.4	0.0	733.9
1953	*27.8	*6.2	*70.4	*18.3	*10.9	*457.9	*680.0	*569.1	*278.2	*11.7	*0.0	*0.0	2130.5	0.0	680.0
1954	*5.2	*21.8	*0.0	*0.0	*93.3	*397.2	*767.7	*750.9	*408.8	*0.0	*0.0	*0.0	2444.9	0.0	767.7
1955	*14.2	*4.5	*41.1	*30.8	*110.7	*355.2	*541.8	*1051.2	*310.4	*24.0	*0.0	*0.0	2483.9	0.0	1051.2
1956	*0.0	*2.9	*0.0	*14.5	*299.0	*598.0	*394.5	*546.4	*225.7	*115.1	*14.5	*0.0	2210.6	0.0	598.0
1957	*43.8	*0.0	*16.9	*0.9	*30.8	*123.7	*513.7	*594.4	*123.5	*0.0	*0.0	*0.0	1447.7	0.0	594.4
1958	*23.6	*0.0	*26.4	*61.0	*7.2	*172.4	*304.8	*558.0	*189.5	*113.3	*0.0	*0.0	1456.2	0.0	558.0
1959	*0.0	*0.0	*0.0	*42.9	*126.8	*164.5	*358.0	*767.9	*404.7	*44.4	*0.0	*0.0	1909.2	0.0	767.9
1960	*13.6	*19.2	*60.8	*0.0	*61.7	*255.3	*490.6	*489.2	*176.2	*52.2	*0.0	*0.0	1618.8	0.0	490.6
1961	*21.9	*4.8	*121.9	*0.0	*63.3	*209.4	*618.1	*666.9	*158.1	*0.0	*0.0	*0.0	1864.4	0.0	666.9
1962	*36.5	*0.0	*25.5	*150.6	*55.0	*538.9	*498.5	*589.0	*341.0	*31.1	*0.0	*0.0	2266.1	0.0	589.0
1963	*17.0	*23.0	*0.0	*26.6	*81.6	*352.3	*498.4	*758.7	*314.2	*44.5	*50.6	*0.0	2166.9	0.0	758.7
1964	*0.0	*0.0	*0.0	*74.6	*98.2	*263.2	*358.8	*692.1	*270.9	*47.6	*17.3	*0.0	1822.7	0.0	692.1
1965	*0.0	*5.0	*0.0	*1.9	*26.6	*257.8	*542.1	*461.7	*150.8	*106.7	*25.1	*0.0	1577.7	0.0	542.1
1966	*38.9	*29.4	*0.0	*6.7	*77.1	*330.9	*385.3	*605.3	*163.5	*16.2	*0.0	*0.3	1653.6	0.0	605.3
1967	*0.0	*0.0	*22.7	*115.3	*27.1	*321.4	*634.2	*527.6	*286.1	*0.0	*39.1	*0.0	1973.5	0.0	634.2
1968	*20.8	*18.2	*49.1	*57.3	*60.8	*425.0	*796.1	*607.3	*198.6	*108.9	*0.0	*0.0	2342.1	0.0	796.1
1969	*22.0	*2.8	*39.9	*27.9	*112.0	*108.7	*535.0	*489.0	*422.8	*82.6	*3.0	*0.0	1845.7	0.0	535.0
1970	*32.1	*35.5	*22.5	*77.2	*141.3	*331.7	*582.2	*618.6	*273.5	*52.8	*3.9	*0.0	2171.3	0.0	618.6
1971	*0.0	*5.9	*34.4	*134.4	*77.6	549.2	330.8	436.6	58.5	89.2	1.8	0.0	1718.4	0.0	549.2
1972	3.0	6.0	94.2	61.2	57.8	236.6	495.8	328.8	239.2	97.2	20.8	0.0	1640.6	0.0	495.8
1973	24.0	33.2	70.0	5.8	115.4	633.2	812.4	932.2	828.4	160.8	28.8	0.0	3644.2	0.0	932.2
1974	12.0	42.0	56.4	63.6	162.0	197.4	486.6	526.0	247.2	105.2	0.0	16.4	1914.8	0.0	526.0
1975	34.8	46.2	0.0	82.0	198.0	226.4	603.6	282.0	428.4	123.6	0.0	0.0	2025.0	0.0	603.6
1976	27.6	16.4	0.0	124.8	185.9	496.7	487.2	552.1	190.7	44.1	0.0	0.0	2125.5	0.0	552.1
1977	5.3	16.0	5.0	70.0	163.1	432.2	408.7	351.0	224.7	102.7	15.4	15.0	1809.1	5.0	432.2
1978	2.8	8.7	91.4	71.8	220.6	383.2	783.5	645.4	380.4	113.1	2.7	3.9	2707.5	2.7	783.5
1979	5.7	35.5	0.0	87.2	69.0	309.5	454.0	445.0	174.5	47.1	5.6	63.9	1697.0	0.0	454.0
1980	0.0	9.4	24.2	9.8	121.7	459.1	518.9	425.6	171.0	38.5	0.0	5.2	1783.4	0.0	518.9
1981	4.2	0.0	13.9	47.5	146.9	140.0	301.0	221.9	173.4	0.0	15.3	2.1	1066.2	0.0	301.0
1982	0.6	13.4	20.2	45.4	29.4	196.5	294.6	336.7	92.7	11.1	3.4	2.5	1046.5	0.6	336.7
1983	5.9	2.5	24.9	43.7	68.0	75.7	496.7	300.7	151.4	92.6	0.0	2.3	1264.4	0.0	496.7
1984	0.0	3.0	0.0	19.6	100.0	329.0	375.2	342.5	238.5	17.0	0.0	8.5	1433.3	0.0	375.2
1985	9.0	28.0	0.0	*43.1	134.3	191.9	505.3	427.4	315.3	176.4	2.2	0.0	1832.9	0.0	505.3
1986	0.0	10.6	23.2	106.0	128.4	371.6	485.8	333.7	403.6	170.8	0.0	53.9	2087.6	0.0	485.8
Mean	14.2	17.0	26.1	67.7	113.2	325.7	551.9	583.2	286.4	65.2	6.5	3.8	2061.0	0.2	647.0
Min.	0.0	0.0	0.0	0.0	7.2	75.7	294.6	221.9	58.5	0.0	0.0	0.0	1046.5	0.0	301.0
Max.	106.0	71.5	121.9	209.5	314.7	757.8	936.1	1051.2	828.4	242.0	50.6	63.9	3644.2	5.0	1051.2

Remarks * : Calculated based on the correlation analysis because no record observed throughout month
+ : Filled-in data based on the correlation analysis at the missing data

Table C-3.5 MONTHLY RAINFALL (8/11)

THANKOT Unit : mm

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual	Min.	Max.
1940	--	--	--	--	--	*346.7	*884.8	*790.2	*139.1	*0.0	*0.0	*0.0	---	0.0	884.8
1941	*12.4	*0.0	*0.0	*57.7	*162.4	*758.5	*508.4	*646.3	*200.3	*66.7	*12.2	*0.0	2424.9	0.0	758.5
1942	*0.0	*0.0	*0.0	*186.6	*30.4	*357.8	*673.9	*969.1	*463.0	*6.3	*0.0	*0.0	2687.1	0.0	969.1
1943	*15.0	*70.8	*20.1	*138.2	*164.2	*374.6	*805.7	*919.5	*401.4	*21.7	*0.0	*0.0	2931.2	0.0	919.5
1944	*43.9	*55.0	*93.6	*94.9	*78.8	*253.3	*565.3	*680.6	*438.0	*37.5	*0.0	*0.0	2340.9	0.0	680.6
1945	*105.1	*10.9	*9.6	*140.1	*150.9	*344.8	*480.6	*953.0	*482.2	*158.0	*0.7	*0.0	2835.9	0.0	953.0
1946	*0.0	*70.3	*11.5	*222.3	*178.5	*398.4	*937.1	*708.8	*357.9	*240.8	*15.1	*0.0	3140.7	0.0	937.1
1947	*13.8	*11.3	*6.7	*200.7	*314.7	*193.3	*926.1	*364.7	*317.1	*10.5	*0.0	*1.8	2360.7	0.0	926.1
1948	*0.0	*28.9	*1.8	*136.3	*322.1	*380.7	*633.5	*592.7	*369.9	*107.7	*72.0	*0.0	2645.6	0.0	633.5
1949	*0.0	*65.6	*5.9	*166.5	*221.0	*186.7	*444.2	*612.1	*183.2	*136.5	*0.0	*7.7	2029.4	0.0	612.1
1950	*27.1	*33.4	*64.9	*31.7	*157.5	*502.5	*750.1	*625.7	*65.5	*11.5	*0.0	*9.7	2279.6	0.0	750.1
1951	*22.2	*41.3	*38.1	*20.2	*83.1	*356.0	*471.8	*616.0	*140.0	*22.7	*5.9	*0.0	1817.3	0.0	616.0
1952	*4.3	*13.6	*102.7	*105.4	*153.6	*225.1	*463.2	*483.4	*325.7	*0.0	*9.7	*0.0	1886.7	0.0	483.4
1953	*28.2	*0.0	*64.5	*24.2	*71.4	*288.8	*868.0	*289.7	*371.0	*6.3	*0.0	*0.0	2012.1	0.0	868.0
1954	*7.9	*23.1	*1.4	*6.0	*134.2	*392.4	*822.0	*768.8	*177.5	*19.3	*0.0	*0.0	2352.6	0.0	822.0
1955	*13.0	*4.1	*37.7	*61.2	*51.0	*246.1	*509.4	*449.1	*250.1	*40.1	*0.0	*2.8	1664.6	0.0	509.4
1956	*30.8	*38.8	*68.9	*84.8	*346.9	*491.4	*624.5	*536.2	*263.8	*95.7	*34.0	*5.0	2620.8	5.0	624.5
1957	*89.5	*0.3	*23.0	*14.8	*124.4	*179.9	*405.5	*534.1	*44.9	*42.2	*0.0	*15.7	1474.3	0.0	534.1
1958	*21.6	*0.3	*24.1	*55.5	*121.7	*175.9	*362.2	*528.2	*301.2	*80.3	*0.0	*0.0	1671.0	0.0	528.2
1959	*63.1	*1.5	*30.9	*31.4	*137.9	*264.4	*352.7	*455.2	*315.5	*133.2	*0.0	*0.0	1785.8	0.0	455.2
1960	*0.0	*11.2	*111.7	*25.1	*184.7	*306.2	*539.5	*323.8	*228.7	*67.3	*0.0	*0.0	1798.2	0.0	539.5
1961	*12.1	*100.3	*31.4	*31.3	*72.2	*438.7	*584.7	*776.8	*190.7	*282.0	*2.3	*19.1	2541.6	2.3	776.8
1962	*90.0	*98.3	*65.5	*161.0	*138.7	*461.7	*277.6	*462.2	*123.0	*1.4	*0.0	*5.8	1885.2	0.0	462.2
1963	*19.2	*2.5	*96.3	*99.3	*106.7	*306.3	*449.0	*489.4	*268.3	*66.8	*28.0	*3.9	1935.7	2.5	489.4
1964	*0.1	*2.3	*13.4	*111.6	*96.1	*413.6	*645.4	*452.3	*299.9	*31.3	*2.8	*14.3	2083.1	0.1	645.4
1965	*2.3	*6.6	*24.0	*54.7	*69.0	*517.2	*510.2	*504.4	*120.7	*92.2	*63.1	*0.0	1964.4	0.0	517.2
1966	*55.2	*59.7	*0.7	*11.5	*121.9	*239.3	*585.7	*645.4	*63.6	13.2	0.1	2.0	1798.3	0.1	645.4
1967	0.0	0.0	63.0	61.7	33.2	267.1	508.2	411.1	*210.5	*0.0	*8.6	*0.0	1563.4	0.0	508.2
1968	*47.2	*13.3	*71.2	*40.0	*172.7	169.0	330.8	298.2	133.6	219.0	0.0	0.0	1495.0	0.0	330.8
1969	13.2	3.6	76.4	26.8	81.8	192.2	245.8	338.4	202.4	8.4	0.0	0.0	1189.0	0.0	338.4
1970	34.8	28.8	40.4	53.6	188.8	231.2	427.4	371.8	200.8	12.0	0.0	0.0	1589.6	0.0	427.4
1971	6.4	6.4	18.4	191.6	208.4	618.6	276.8	296.2	46.4	138.8	0.0	0.0	1811.0	0.0	618.6
1972	0.0	38.4	65.6	19.2	63.6	318.0	729.2	195.6	266.0	131.2	24.8	0.0	1851.6	0.0	729.2
1973	34.4	65.2	67.2	29.2	140.0	542.4	495.4	409.6	611.4	224.4	13.6	0.0	2632.8	0.0	611.4
1974	30.6	8.8	42.4	68.8	297.6	115.2	546.6	549.8	488.4	44.4	0.0	14.0	2206.6	0.0	549.8
1975	32.4	28.4	4.4	52.4	165.6	174.8	732.8	458.2	401.6	41.2	0.0	0.0	2091.8	0.0	732.8
1976	40.2	5.0	0.0	100.6	285.6	780.8	457.0	516.2	423.8	34.0	0.0	0.0	2643.2	0.0	780.8
1977	24.0	20.0	34.0	163.2	213.2	334.2	578.6	670.6	100.6	92.0	0.0	57.2	2287.6	0.0	670.6
1978	0.0	27.0	125.6	190.4	208.9	394.2	656.9	541.8	542.1	230.5	0.0	3.7	2911.1	0.0	656.9
1979	12.0	34.7	0.0	142.6	73.0	471.5	701.1	885.6	136.9	41.8	41.0	100.8	2641.0	0.0	885.6
1980	0.0	13.9	67.5	15.7	73.3	263.5	590.3	654.0	405.2	123.3	0.0	9.6	2216.3	0.0	654.0
1981	21.3	0.0	60.9	152.6	113.0	125.5	371.6	202.2	261.7	0.0	34.0	0.9	1343.7	0.0	371.6
1982	21.7	33.0	42.5	73.6	25.9	58.5	123.1	267.6	221.7	14.3	36.5	0.0	918.4	0.0	267.6
1983	30.3	5.5	23.8	75.5	138.3	94.0	485.6	287.9	340.1	43.2	0.0	39.7	1563.9	0.0	485.6
1984	19.3	21.4	20.5	51.9	103.5	292.7	692.6	254.5	453.7	30.6	0.0	8.1	1948.8	0.0	692.6
1985	8.5	0.0	0.0	59.8	165.5	180.3	586.4	679.6	622.5	253.1	0.0	80.8	2636.5	0.0	679.6
1986	0.0	58.5	16.2	104.7	180.3	487.9	636.5	477.6	422.1	60.3	0.0	55.6	2499.7	0.0	636.5
Mean	22.9	25.3	38.9	85.9	146.2	329.8	558.6	530.7	285.0	75.2	8.6	9.7	2116.8	0.2	641.9
Min.	0.0	0.0	0.0	6.0	25.9	58.5	123.1	195.6	44.9	0.0	0.0	0.0	918.4	0.0	267.6
Max.	105.1	100.3	125.6	222.3	346.9	780.8	937.1	969.1	622.5	282.0	72.0	100.8	3140.7	5.0	969.1

Remarks * : Calculated based on the correlation analysis because no record observed throughout month
+ : Filled-in data based on the correlation analysis at the missing data

Table C-3.5 MONTHLY RAINFALL (9/11)

BHAKTAPUR Unit : mm

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual	Min.	Max.
1940	--	--	--	--	--	*263.4	*672.7	*600.1	*105.5	*0.0	*0.0	*0.0	---	0.0	672.7
1941	*9.4	*0.0	*0.0	*43.8	*123.5	*576.4	*386.3	*490.6	*151.9	*50.4	*9.2	*0.0	1841.5	0.0	576.4
1942	*0.0	*0.0	*0.0	*142.0	*23.0	*272.2	*512.0	*736.1	*351.5	*4.9	*0.0	*0.0	2041.7	0.0	736.1
1943	*11.4	*53.8	*15.3	*105.1	*124.6	*284.9	*612.4	*698.5	*305.1	*16.5	*0.0	*0.0	2227.6	0.0	698.5
1944	*33.4	*41.9	*71.1	*72.0	*59.8	*192.4	*429.5	*517.2	*332.6	*28.4	*0.0	*0.0	1778.3	0.0	517.2
1945	*79.8	*8.2	*7.3	*106.6	*114.8	*261.8	*365.2	*723.9	*366.3	*120.0	*0.6	*0.0	2154.5	0.0	723.9
1946	*0.0	*53.5	*8.7	*169.0	*135.5	*302.6	*712.3	*538.4	*271.9	*182.7	*11.5	*0.0	2386.1	0.0	712.3
1947	*10.5	*8.6	*5.1	*152.4	*239.2	*146.7	*702.7	*276.7	*240.2	*7.8	*0.0	*1.4	1791.3	0.0	702.7
1948	*0.0	*21.9	*1.4	*103.5	*244.7	*289.0	*480.8	*450.2	*280.3	*81.5	*54.7	*0.0	2008.0	0.0	480.8
1949	*0.0	*49.7	*4.4	*126.2	*167.7	*141.5	*337.0	*464.6	*138.7	*103.5	*0.0	*5.8	1539.1	0.0	464.6
1950	*20.5	*25.3	*49.2	*23.9	*119.4	*381.3	*569.4	*474.9	*49.5	*8.7	*0.0	*7.4	1729.5	0.0	569.4
1951	*16.7	*31.2	*29.0	*15.2	*63.1	*270.3	*357.7	*467.6	*106.2	*17.1	*4.3	*0.0	1378.4	0.0	467.6
1952	*3.3	*10.3	*77.8	*80.0	*116.3	*170.7	*351.3	*366.7	*247.5	*0.0	*7.4	*0.0	1431.3	0.0	366.7
1953	*21.4	*0.0	*48.8	*18.1	*54.0	*218.9	*659.0	*219.6	*281.6	*4.8	*0.0	*0.0	1526.2	0.0	659.0
1954	*5.9	*17.4	*1.0	*4.5	*101.7	*297.9	*624.0	*583.7	*134.6	*14.6	*0.0	*0.0	1785.3	0.0	624.0
1955	*9.9	*3.1	*28.6	*46.3	*38.7	*186.7	*386.5	*340.6	*189.5	*30.3	*0.0	*2.1	1262.3	0.0	386.5
1956	*23.3	*29.4	*52.3	*64.2	*263.4	*373.0	*474.1	*406.7	*199.9	*72.4	*25.8	*3.6	1988.1	3.6	474.1
1957	*67.9	*0.2	*17.3	*11.1	*94.4	*136.0	*307.6	*405.0	*33.9	*32.0	*0.0	*11.9	1117.3	0.0	405.0
1958	*16.3	*0.2	*18.2	*41.9	*92.1	*133.4	*274.6	*400.5	*228.5	*60.9	*0.0	*0.0	1266.6	0.0	400.5
1959	*47.9	*1.1	*23.5	*23.9	*104.7	*200.7	*268.0	*345.7	*239.8	*101.2	*0.0	*0.0	1356.5	0.0	345.7
1960	*0.0	*8.5	*84.8	*19.0	*140.4	*232.6	*409.8	*245.7	*173.4	*51.1	*0.0	*0.0	1365.3	0.0	409.8
1961	*9.3	*76.1	*23.9	*23.7	*54.8	*333.4	*444.1	*589.7	*145.1	*214.2	*1.8	*14.4	1930.5	1.8	589.7
1962	*68.4	*74.5	*49.7	*122.2	*105.4	*350.6	*210.9	*351.0	*93.4	*1.1	*0.0	*4.4	1431.6	0.0	351.0
1963	*14.6	*1.9	*73.2	*75.3	*81.1	*232.5	*340.8	*371.6	*203.6	*50.6	*21.2	*3.0	1469.4	1.9	371.6
1964	*0.1	*1.8	*10.3	*84.8	*73.1	*314.0	*490.0	*343.3	*227.7	*23.7	*2.1	*10.9	1581.8	0.1	490.0
1965	*1.8	*5.1	*18.2	*41.4	*52.4	*392.8	*387.7	*383.0	*91.6	*70.0	*47.8	*0.0	1491.8	0.0	392.8
1966	*41.9	*45.4	*0.6	*8.6	*92.7	*181.7	*444.7	*490.4	*48.2	*10.1	*1.3	*3.6	1369.2	0.6	490.4
1967	*0.0	*1.3	*56.7	*68.0	*12.6	*274.7	*534.8	*395.7	*159.8	*0.0	*6.6	*0.0	1510.2	0.0	534.8
1968	*35.8	*10.1	*54.1	*30.2	*131.1	*365.7	*454.4	*272.7	*103.7	*192.3	*0.0	*0.0	1650.1	0.0	454.4
1969	*10.3	*1.6	*57.0	*32.7	*104.5	*198.5	*358.7	*387.7	*209.4	*48.2	*2.4	*0.0	1411.0	0.0	387.7
1970	*34.8	*32.8	*31.8	*41.1	*111.9	*231.6	*592.2	*274.6	*196.1	*69.7	*13.3	*0.0	1629.9	0.0	592.2
1971	*3.6	*7.5	*34.0	*216.0	*131.1	657.8	309.4	376.0	57.6	*97.1	0.0	0.0	1890.1	0.0	657.8
1972	6.2	16.0	65.4	31.2	93.2	233.2	420.2	222.0	260.8	97.2	20.8	0.0	1466.2	0.0	420.2
1973	22.8	48.4	66.8	33.2	106.2	468.9	332.4	398.7	313.9	*142.7	0.0	0.0	1934.0	0.0	468.9
1974	11.0	10.8	26.9	33.1	174.8	*89.1	454.6	335.4	215.3	46.8	0.0	11.6	1409.4	0.0	454.6
1975	29.3	28.4	8.8	40.0	91.2	174.0	339.6	310.4	375.6	47.2	0.0	0.0	1444.5	0.0	375.6
1976	25.2	19.2	0.0	65.6	145.6	308.2	277.8	471.2	199.0	24.8	0.0	0.0	1536.6	0.0	471.2
1977	13.2	14.0	22.4	66.4	105.2	289.6	268.0	291.8	104.0	53.5	11.1	42.4	1281.6	11.1	291.8
1978	4.4	18.8	88.6	66.0	212.3	306.9	498.9	416.8	180.1	116.8	1.1	1.9	1912.6	1.1	498.9
1979	6.9	40.7	0.1	27.7	75.2	276.2	378.6	270.9	58.4	36.9	6.3	33.2	1211.1	0.1	378.6
1980	0.0	12.9	18.8	6.7	147.5	263.0	335.5	278.2	121.2	86.8	0.0	4.2	1274.8	0.0	335.5
1981	4.9	0.1	33.4	92.3	179.9	163.0	316.7	237.5	230.3	0.0	0.0	0.0	1258.1	0.0	316.7
1982	10.5	10.7	68.4	41.8	39.3	111.7	256.6	377.5	122.1	41.1	1.5	0.6	1081.8	0.6	377.5
1983	12.6	11.2	20.3	183.5	171.9	105.3	973.3	475.8	267.7	141.8	0.0	17.2	2380.6	0.0	973.3
1984	30.0	25.5	25.7	121.8	212.6	285.4	464.8	315.8	285.1	20.1	0.0	6.1	1792.9	0.0	464.8
1985	17.0	16.7	0.0	34.1	179.9	318.2	498.6	454.0	339.6	189.9	0.0	59.1	2107.1	0.0	498.6
1986	0.0	34.9	12.1	44.0	178.2	426.7	372.7	400.8	294.0	48.7	6.3	62.1	1880.5	0.0	426.7
Mean	17.2	20.2	30.7	65.2	119.2	269.9	439.3	409.5	198.5	60.9	5.5	6.5	1642.7	0.4	499.1
Min.	0.0	0.0	0.0	4.5	12.6	89.1	210.9	219.6	33.9	0.0	0.0	0.0	1081.8	0.0	291.8
Max.	79.8	76.1	88.6	216.0	263.4	657.8	973.3	736.1	375.6	214.2	54.7	62.1	2386.1	11.1	973.3

Remarks * : Calculated based on the correlation analysis because no record observed throughout month
+ : Filled-in data based on the correlation analysis at the missing data

Table C-3.5 MONTHLY RAINFALL (10/11)

KHUMALTAR Unit : mm

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual	Min.	Max.
1940	--	--	--	--	--	*197.3	*503.9	*449.6	*79.0	*0.0	*0.0	*0.0	---	0.0	503.9
1941	*7.1	*0.0	*0.0	*32.9	*92.2	*431.7	*289.3	*367.6	*114.0	*37.9	*6.8	*0.0	1379.5	0.0	431.7
1942	*0.0	*0.0	*0.0	*106.2	*17.2	*203.7	*383.3	*551.7	*263.3	*3.6	*0.0	*0.0	1529.0	0.0	551.7
1943	*8.5	*40.2	*11.3	*78.6	*93.3	*213.1	*458.7	*523.4	*228.1	*12.3	*0.0	*0.0	1667.5	0.0	523.4
1944	*24.9	*31.4	*53.2	*53.8	*44.5	*143.9	*321.6	*387.4	*249.2	*21.3	*0.0	*0.0	1331.2	0.0	387.4
1945	*59.9	*6.2	*5.4	*79.7	*85.8	*196.2	*273.3	*542.6	*274.3	*89.9	*0.4	*0.0	1613.7	0.0	542.6
1946	*0.0	*39.9	*6.5	*126.3	*101.3	*226.6	*533.6	*403.3	*203.3	*136.8	*8.6	*0.0	1786.2	0.0	533.6
1947	*7.8	*6.4	*3.8	*114.2	*179.1	*109.7	*526.8	*207.4	*179.9	*5.8	*0.0	*1.0	1341.9	0.0	526.8
1948	*0.0	*16.2	*1.0	*77.3	*183.1	*216.4	*360.4	*337.0	*210.0	*61.1	*41.0	*0.0	1503.5	0.0	360.4
1949	*0.0	*37.3	*3.3	*94.5	*125.3	*105.9	*252.5	*347.9	*103.9	*77.6	*0.0	*4.4	1152.6	0.0	347.9
1950	*15.3	*18.9	*36.8	*18.0	*89.5	*285.6	*426.7	*355.8	*37.1	*6.5	*0.0	*5.5	1295.7	0.0	426.7
1951	*12.6	*23.4	*21.6	*11.3	*47.3	*202.4	*268.3	*350.0	*79.5	*12.8	*3.3	*0.0	1032.5	0.0	350.0
1952	*2.4	*7.8	*58.2	*59.6	*86.9	*127.8	*263.0	*274.8	*185.1	*0.0	*5.5	*0.0	1071.1	0.0	274.8
1953	*15.9	*0.0	*36.6	*13.5	*40.3	*163.7	*493.9	*164.5	*210.9	*3.6	*0.0	*0.0	1142.9	0.0	493.9
1954	*4.4	*13.1	*0.8	*3.4	*76.0	*222.9	*467.7	*437.4	*100.8	*11.0	*0.0	*0.0	1337.5	0.0	467.7
1955	*7.3	*2.3	*21.3	*34.6	*29.0	*139.6	*289.6	*255.0	*142.0	*22.6	*0.0	*1.6	944.9	0.0	289.6
1956	*17.5	*21.9	*39.1	*48.0	*197.2	*279.5	*355.1	*304.8	*149.7	*54.3	*19.3	*2.8	1489.2	2.8	355.1
1957	*50.8	*0.1	*13.1	*8.3	*70.6	*101.9	*230.1	*303.3	*25.3	*23.9	*0.0	*8.9	836.3	0.0	303.3
1958	*12.2	*0.1	*13.6	*31.4	*69.1	*99.7	*205.6	*300.3	*171.0	*45.6	*0.0	*0.0	948.6	0.0	300.3
1959	*35.9	*0.7	*17.5	*17.8	*78.4	*150.4	*200.4	*258.7	*179.3	*75.8	*0.0	*0.0	1014.9	0.0	258.7
1960	*0.0	*6.3	*63.3	*14.2	*105.1	*173.9	*306.9	*184.0	*129.8	*38.3	*0.0	*0.0	1021.8	0.0	306.9
1961	*6.9	*57.1	*17.9	*17.8	*40.9	*249.6	*332.7	*442.1	*108.3	*160.4	*1.3	*10.8	1445.8	1.3	442.1
1962	*51.2	*55.7	*37.2	*91.5	*79.0	*262.5	*157.7	*262.5	*69.7	*0.7	*0.0	*3.3	1071.0	0.0	262.5
1963	*10.9	*1.4	*54.9	*56.5	*60.6	*174.3	*255.4	*278.0	*152.6	*37.9	*15.9	*2.2	1100.6	1.4	278.0
1964	*0.0	*1.3	*7.7	*63.3	*54.6	*235.1	*367.1	*257.3	*170.3	*17.8	*1.6	*8.1	1184.2	0.0	367.1
1965	*1.3	*3.8	*13.7	*31.0	*39.0	*294.0	*290.2	*287.1	*68.6	*52.3	*35.8	*0.0	1116.8	0.0	294.0
1966	*31.3	*34.0	*0.4	*6.5	*69.1	*136.1	*333.0	*367.1	*35.9	*7.6	*0.9	*2.7	1024.6	0.4	367.1
1967	*0.0	*0.9	*42.5	*51.0	*30.0	153.5	+276.9	264.7	169.1	7.4	1.8	0.2	998.0	0.0	276.9
1968	20.6	7.0	14.0	24.3	64.4	291.0	428.4	270.3	72.0	141.8	0.0	1.0	1334.8	0.0	428.4
1969	12.0	1.0	59.7	33.4	64.9	88.8	248.3	241.0	153.5	8.0	11.0	0.0	921.6	0.0	248.3
1970	31.5	39.5	24.5	54.0	75.7	204.5	403.4	264.5	109.5	25.5	0.0	0.0	1232.6	0.0	403.4
1971	5.0	7.0	16.0	179.5	177.5	462.0	248.0	138.0	46.0	84.5	0.0	0.0	1363.5	0.0	462.0
1972	0.0	29.8	43.0	19.0	51.8	182.7	429.7	143.0	203.7	84.2	10.1	0.0	1197.0	0.0	429.7
1973	25.8	30.8	38.2	13.0	72.9	263.1	320.9	+239.6	276.4	141.0	7.0	*0.0	1428.7	0.0	320.9
1974	*15.1	*5.1	*20.8	*27.4	*96.8	*66.6	*304.2	*326.7	*183.2	*40.8	*0.0	*10.1	1096.8	0.0	326.7
1975	30.0	35.1	6.1	53.2	101.8	150.3	438.4	337.7	249.3	26.1	0.0	0.0	1428.0	0.0	438.4
1976	39.0	8.2	0.0	48.2	96.3	288.1	245.7	233.7	117.6	12.1	0.0	0.0	1088.9	0.0	288.1
1977	13.0	12.0	8.6	103.9	88.8	226.6	281.9	259.7	53.6	35.4	8.2	52.0	1143.7	8.2	281.9
1978	1.1	20.7	73.9	27.5	152.5	288.8	512.2	295.5	215.3	107.4	1.5	1.3	1697.7	1.1	512.2
1979	1.0	39.5	0.0	47.0	12.4	176.3	299.4	252.8	36.4	21.6	5.5	67.9	959.8	0.0	299.4
1980	0.9	7.0	30.4	7.5	105.7	246.1	286.6	143.9	117.5	14.8	0.0	9.5	969.9	0.0	286.6
1981	6.9	0.0	40.0	101.5	102.0	136.5	259.5	242.2	251.2	0.0	19.0	0.0	1158.8	0.0	259.5
1982	12.6	10.1	36.4	111.4	94.9	131.1	234.7	347.1	141.2	22.4	15.3	2.5	1159.7	2.5	347.1
1983	17.0	4.0	6.5	72.1	147.5	55.2	409.0	235.5	201.4	146.3	0.0	14.0	1308.5	0.0	409.0
1984	13.3	14.5	14.5	45.4	95.5	246.9	277.0	292.0	306.3	16.0	0.0	7.9	1329.3	0.0	306.3
1985	9.0	0.5	4.0	35.4	121.5	136.6	356.3	292.8	327.0	182.5	0.0	67.5	1533.1	0.0	356.3
1986	0.0	30.5	19.3	105.5	106.7	266.5	303.4	234.8	203.5	44.7	0.0	49.7	1364.6	0.0	303.4
Mean	13.9	15.8	22.5	53.3	87.3	200.1	334.3	303.3	156.5	46.4	4.7	7.1	1245.1	0.4	373.0
Min.	0.0	0.0	0.0	3.4	12.4	55.2	157.7	138.0	25.3	0.0	0.0	0.0	836.3	0.0	248.3
Max.	59.9	57.1	73.9	179.5	197.2	462.0	533.6	551.7	327.0	182.5	41.0	67.9	1786.2	8.2	551.7

Remarks * : Calculated based on the correlation analysis because no record observed throughout month
+ : Filled-in data based on the correlation analysis at the missing data

Table C-3.5 MONTHLY RAINFALL (11/11)

GODAWARI Unit : mm

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual	Min.	Max.
1940	--	--	--	--	--	*322.7	*823.4	*735.3	*129.2	*0.0	*0.0	*0.0	---	0.0	823.4
1941	*11.6	*0.0	*0.0	*53.7	*151.1	*706.1	*473.2	*601.3	*186.5	*62.0	*11.3	*0.0	2256.8	0.0	706.1
1942	*0.0	*0.0	*0.0	*173.7	*28.2	*333.2	*627.0	*901.7	*430.5	*5.9	*0.0	*0.0	2500.2	0.0	901.7
1943	*14.0	*66.0	*18.7	*128.7	*152.7	*348.6	*749.8	*855.8	*373.5	*20.2	*0.0	*0.0	2728.0	0.0	855.8
1944	*40.8	*51.3	*87.1	*88.4	*73.2	*235.6	*526.0	*633.6	*407.6	*34.8	*0.0	*0.0	2178.4	0.0	633.6
1945	*97.8	*10.1	*9.0	*130.5	*140.4	*320.7	*447.4	*886.8	*448.9	*146.9	*0.7	*0.0	2639.2	0.0	886.8
1946	*0.0	*65.4	*10.7	*206.9	*165.9	*370.8	*872.5	*659.4	*332.8	*224.2	*14.1	*0.0	2922.7	0.0	872.5
1947	*12.9	*10.5	*6.2	*186.7	*292.9	*179.7	*861.5	*339.2	*294.7	*9.6	*0.0	*1.7	2195.6	0.0	861.5
1948	*0.0	*26.7	*1.7	*126.6	*299.9	*353.9	*589.1	*551.4	*343.5	*100.0	*67.0	*0.0	2459.8	0.0	589.1
1949	*0.0	*60.9	*5.4	*154.8	*205.3	*173.5	*412.9	*568.9	*170.3	*126.9	*0.0	*7.2	1886.1	0.0	568.9
1950	*25.1	*31.0	*60.2	*29.4	*146.5	*467.4	*697.4	*581.8	*60.7	*10.7	*0.0	*9.1	2119.3	0.0	697.4
1951	*20.6	*38.2	*35.4	*18.6	*77.3	*331.2	*438.6	*572.6	*130.3	*21.0	*5.4	*0.0	1689.2	0.0	572.6
1952	*4.0	*12.7	*95.4	*98.1	*142.5	*209.2	*430.5	*449.0	*302.9	*0.0	*9.1	*0.0	1753.4	0.0	449.0
1953	34.1	0.0	68.9	26.6	72.1	231.8	726.8	297.5	294.4	12.2	0.0	0.0	1764.4	0.0	726.8
1954	11.3	20.2	9.6	7.0	144.8	307.0	614.1	693.3	248.1	28.2	0.0	0.0	2083.6	0.0	693.3
1955	7.2	0.0	52.4	46.4	89.3	265.4	612.1	609.2	348.0	33.9	0.0	0.0	2063.9	0.0	612.1
1956	29.2	19.4	41.7	20.9	311.0	618.7	489.6	486.4	208.9	154.2	11.0	2.9	2393.9	2.9	618.7
1957	86.2	0.0	21.4	8.4	42.5	230.3	452.1	450.2	103.1	3.7	0.0	0.0	1397.9	0.0	452.1
1958	29.9	0.0	14.5	44.3	83.6	213.1	337.4	460.9	175.4	96.4	0.0	0.2	1455.7	0.0	460.9
1959	50.7	0.7	28.7	17.4	61.3	234.3	448.1	481.2	210.4	100.2	0.0	0.0	1633.0	0.0	481.2
1960	0.0	0.0	62.8	29.7	146.1	310.1	486.7	478.6	192.9	57.6	1.7	0.0	1766.2	0.0	486.7
1961	9.5	87.0	16.4	31.6	*67.2	*408.3	*543.8	*722.4	*177.5	*262.2	*2.2	*17.7	2345.8	2.2	722.4
1962	88.2	39.7	53.4	71.0	111.1	507.8	367.5	642.4	403.8	18.7	0.0	+33.6	2337.2	0.0	642.4
1963	*17.9	*2.3	45.2	189.1	66.0	168.8	315.6	509.6	234.7	48.2	6.2	*3.6	1607.2	2.3	509.6
1964	*0.1	*2.2	3.8	79.3	118.6	240.9	413.2	295.9	232.8	40.5	*2.6	*13.3	1443.2	0.1	413.2
1965	*2.2	*6.2	*22.4	*50.8	*64.2	*481.2	*474.4	*469.3	*112.3	119.8	12.0	*0.0	1814.8	0.0	481.2
1966	41.9	31.7	*0.7	23.0	118.9	190.3	364.8	574.0	84.0	*12.5	*1.6	*4.5	1447.9	0.7	574.0
1967	*0.0	*1.6	77.0	69.0	9.8	199.0	580.4	480.2	118.0	12.0	*8.0	1.2	1556.2	0.0	580.4
1968	57.1	10.6	*66.2	*37.0	*160.6	*448.1	*556.5	*334.1	*127.0	*235.4	*0.0	*0.0	2032.6	0.0	556.5
1969	*12.5	*1.9	*69.6	*40.1	*127.9	*242.8	*439.3	*475.1	*256.2	*59.0	*2.9	*0.0	1727.3	0.0	475.1
1970	*42.5	*40.2	*39.0	*50.3	*137.0	*283.4	*725.1	433.8	165.0	68.4	0.6	0.0	1985.3	0.0	725.1
1971	4.0	31.3	13.2	136.6	166.2	697.9	349.0	409.0	90.2	95.4	0.0	0.0	1992.8	0.0	697.9
1972	0.0	28.9	38.3	51.9	55.4	298.8	728.9	250.7	351.9	99.5	22.9	0.0	1927.2	0.0	728.9
1973	33.0	44.7	68.7	15.9	105.7	531.9	447.4	445.9	464.0	266.8	6.4	0.0	2430.4	0.0	531.9
1974	13.2	+9.3	65.2	49.0	+136.1	180.3	664.5	553.6	376.1	34.1	0.0	12.5	2093.9	0.0	664.5
1975	32.1	14.8	+7.5	54.7	+163.4	319.5	+704.5	+434.1	+398.2	+26.8	+0.0	0.0	2155.6	0.0	704.5
1976	34.5	+12.0	+0.0	+97.0	116.7	+540.6	+509.7	+354.4	+419.3	+12.0	+0.0	0.0	2096.2	0.0	540.6
1977	+12.1	+18.2	+11.2	104.3	135.0	194.2	655.5	299.3	90.3	+49.6	+7.2	+61.4	1638.3	7.2	655.5
1978	2.5	25.0	78.1	65.6	127.7	367.8	414.4	625.5	373.3	124.4	0.6	4.7	2209.6	0.6	625.5
1979	6.2	51.8	1.1	47.5	63.7	329.8	548.3	345.1	70.5	34.1	6.7	79.3	1584.1	1.1	548.3
1980	0.0	11.7	25.2	19.2	111.2	440.0	474.6	389.7	256.8	32.3	0.0	5.5	1766.2	0.0	474.6
1981	30.2	0.4	45.2	96.3	137.7	185.7	419.6	349.5	412.8	0.1	20.4	0.0	1697.9	0.0	419.6
1982	14.8	16.3	55.2	43.5	79.7	303.8	374.8	522.7	228.8	11.2	17.7	1.8	1670.3	1.8	522.7
1983	20.5	8.3	6.8	59.0	213.8	90.8	586.7	454.6	298.1	164.4	0.0	14.3	1917.3	0.0	586.7
1984	25.7	19.6	12.0	65.2	157.7	416.8	448.5	489.5	537.9	27.5	0.0	11.3	2211.7	0.0	537.9
1985	20.0	0.0	0.0	27.1	140.2	226.3	846.5	483.6	455.2	274.1	0.0	79.8	2552.8	0.0	846.5
1986	0.0	24.0	25.8	85.3	133.4	460.5	432.1	315.8	313.6	55.8	2.5	60.0	1908.8	0.0	460.5
Mean	21.7	20.7	32.1	70.8	127.2	330.2	542.6	509.7	264.7	73.1	5.1	9.1	2006.8	0.4	620.8
Min.	0.0	0.0	0.0	7.0	9.8	90.8	315.6	250.7	60.7	0.0	0.0	0.0	1397.9	0.0	413.2
Max.	97.8	87.0	95.4	206.9	311.0	706.1	872.5	901.7	537.9	274.1	67.0	79.8	2922.7	7.2	901.7

Remarks * : Calculated based on the correlation analysis because no record observed throughout month
+ : Filled-in data based on the correlation analysis at the missing data

Table C-3.6 SUMMARY OF METEOROLOGICAL CONDITIONS AT RESPECTIVE STATIONS

Mean Monthly Temperature — Unit: oC

Station	Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Indian Embassy	1960-1975	10.1	12.1	16.0	19.7	22.4	24.0	23.9	23.8	22.9	19.7	15.0	11.1	18.4
Kathmandu Airport	1968-1986	9.4	11.4	15.6	19.2	21.5	23.4	23.7	23.7	22.3	19.1	14.7	10.8	17.9
Nagarkot	1976-1986	7.1	8.9	13.0	16.0	17.3	18.8	18.8	18.9	17.6	15.2	11.8	8.6	14.3
Khumaltar	1967-73,75-86	9.0	10.7	14.8	18.3	20.9	23.1	23.4	23.4	22.0	18.4	13.5	10.0	17.3
Godavari	1953-61,63-64,70-86	8.2	10.6	15.4	19.0	19.5	21.5	21.1	21.2	19.8	17.2	12.7	9.2	16.3

Mean Monthly Maximum Temperature — Unit: oC

Station	Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Indian Embassy	1960-1975	18.5	20.9	24.7	28.3	29.6	28.9	27.7	27.8	27.4	26.5	23.1	20.0	25.3
Kathmandu Airport	1968-1986	17.0	19.4	23.9	26.7	27.7	28.1	27.4	27.6	26.5	25.0	21.8	18.7	24.1
Nagarkot	1976-1986	11.8	13.8	18.3	21.3	22.2	22.8	22.3	22.6	21.3	19.7	16.4	13.3	18.8
Khumaltar	1967-73,75-86	16.7	18.6	23.3	26.1	27.1	27.6	26.8	27.1	26.0	24.3	21.0	18.2	23.6
Godavari	1953-61,63-64,70-86	13.6	16.7	21.9	24.5	25.1	25.7	24.2	24.6	23.6	21.9	17.9	14.9	21.2

Mean Monthly Minimum Temperature — Unit: oC

Station	Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Indian Embassy	1960-1975	2.0	3.5	7.0	11.1	15.0	19.1	20.1	19.9	18.3	13.0	6.8	2.2	11.5
Kathmandu Airport	1968-1986	2.0	3.6	7.2	11.5	15.5	18.8	20.0	19.7	18.1	13.0	7.4	2.7	11.6
Nagarkot	1976-1986	2.4	4.0	7.5	10.5	12.3	14.6	15.3	15.2	13.9	10.7	7.2	4.0	9.8
Khumaltar	1967-73,75-86	1.6	2.9	6.3	10.6	15.0	18.5	19.8	19.6	18.0	12.2	6.4	2.1	11.1
Godavari	1953-61,63-64,70-86	3.1	4.6	8.6	13.0	13.8	17.5	18.0	17.7	16.0	12.4	7.3	3.6	11.3

Mean Monthly Relative Humidity — Unit: %

Station	Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Kathmandu Airport	1976-1986	81	75	63	63	67	74	83	82	83	82	84	84	77
Nagarkot	1976-1986	77	74	61	66	77	88	96	95	95	87	85	78	81
Khumaltar	1976-1986	73	70	60	55	67	73	81	80	81	77	73	75	72
Godavari	1976-1986	80	78	74	71	77	84	93	91	88	84	83	82	82

Mean Monthly Sunshine Hour — Unit: hours

Station	Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Kathmandu Airport	1968-1986	6.9	7.8	8.4	7.9	7.8	5.8	4.4	5.5	5.0	7.2	7.6	7.3	6.8
Khumaltar	1967-73,75-77	6.6	7.8	7.6	6.2	6.0	5.1	4.3	4.8	4.6	6.6	7.7	7.8	6.3

Mean Monthly Wind Speed — Unit:m/sec

Staion	Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Kathmandu Airport	1985-1986	0.6	0.9	1.2	1.3	1.3	1.0	-	-	0.8	-	0.3	0.3	-
Nagarkot	1976-1986	3.0	3.5	4.0	4.1	3.8	3.2	2.9	2.7	3.0	2.7	2.6	2.5	3.2
Khumaltar	1980-1986	1.1	1.5	1.6	1.6	1.6	1.6	1.5	1.4	1.1	1.1	1.0	1.0	1.3

Mean Monthly Air Pressure — Unit: mb

Staion	Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
Kathmandu Airport	1968-1981	867.1	865.5	865.4	863.7	861.5	858.5	858.1	859.6	862.6	866.7	868.0	868.2	863.7

Table C-4.1 MONTHLY RUNOFF AT COBIIAR

Unit : mm

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual	Min.	Max.
1965	2.20	1.27	1.33	2.23	0.98	8.87	36.54	51.55	17.66	10.59	9.57	4.27	12.37	0.98	51.55
1966	3.79	2.28	0.96	0.33	1.28	2.89	29.74	66.26	23.30	7.90	4.84	3.50	12.39	0.33	66.26
1967	2.27	1.61	2.24	2.20	1.25	5.30	38.21	46.03	27.39	8.20	5.07	3.39	12.03	1.25	46.03
1968	2.70	2.10	1.24	0.77	1.34	9.68	53.17	49.24	18.84	26.59	6.54	3.46	14.77	0.77	53.17
1969	2.54	1.49	2.01	1.21	2.06	1.32	17.92	46.87	22.95	8.04	3.64	1.68	9.40	1.21	46.87
1970	1.11	1.05	0.77	0.60	0.85	7.34	57.64	58.78	43.05	19.78	8.31	3.49	17.05	0.60	58.78
1971	1.72	1.38	1.28	5.61	5.06	72.87	44.25	45.89	22.12	14.36	7.08	3.00	18.77	1.28	72.87
1972	1.53	2.05	2.46	1.68	0.73	7.88	94.52	35.99	38.83	16.38	9.67	4.74	18.17	0.73	94.52
1973	2.08	1.47	3.34	0.52	1.58	19.11	49.21	55.48	62.15	39.19	9.27	3.75	20.73	0.52	62.15
1974	1.60	0.72	0.71	1.14	4.26	2.28	47.30	79.84	61.56	15.09	7.18	4.91	19.04	0.71	79.84
1975	3.63	3.25	1.19	1.54	2.59	6.80	64.96	62.44	92.04	25.89	8.74	5.12	23.30	1.19	92.04
1976	3.41	3.17	0.88	2.70	5.76	37.60	40.77	56.31	34.01	14.24	6.57	3.50	17.46	0.88	56.31
1977	2.74	2.32	0.70	2.14	3.52	22.30	45.50	34.98	19.51	10.83	6.33	5.39	13.11	0.70	45.50
1978	3.24	1.36	1.38	2.61	5.28	23.86	61.47	80.08	39.40	31.70	9.60	4.72	22.26	1.36	80.08
1979	2.75	3.66	1.21	1.88	1.47	3.54	34.26	46.92	19.36	9.63	5.22	4.84	11.33	1.21	46.92
1980	2.39	1.13	1.32	0.51	1.78	16.43	41.28	45.32	24.08	9.34	4.36	2.38	12.60	0.51	45.32
Mean	2.48	1.89	1.44	1.73	2.49	15.50	47.30	53.87	35.39	16.73	7.00	3.88	15.81	0.89	62.39
Min.	1.11	0.72	0.70	0.33	0.73	1.32	17.92	34.98	17.66	7.90	3.64	1.68	9.40	0.33	45.32
Max.	3.79	3.66	3.34	5.61	5.76	72.87	94.52	80.08	92.04	39.19	9.67	5.39	23.30	1.36	94.52

Table C-4.2 SYNTHESIZED RUNOFF OF THE BAGMATI RIVER AT SUNDARIJAL

Year	Rainfall (mm)	Discharge (mm)	Evaporation (mm)	Runoff Ration (%)	Minimum Discharge (cumec)
1940	2935.9	2139.4	796.5	72.9	0.097
1941	3207.0	2235.3	971.7	69.7	0.142
1942	3567.4	2657.9	909.5	74.5	0.138
1943	3822.8	2807.2	1015.6	73.4	0.172
1944	3080.0	2084.4	995.6	67.7	0.169
1945	3694.9	2564.6	1130.3	69.4	0.151
1946	4140.2	3016.4	1123.8	72.9	0.216
1947	3315.9	2457.3	858.6	74.1	0.222
1948	3969.7	2809.6	1160.1	70.8	0.194
1949	3147.4	2165.4	982.0	68.8	0.218
1950	1828.1	1239.0	589.1	67.8	0.159
1951	2149.3	1276.4	872.9	59.4	0.090
1952	2924.1	1933.1	991.0	66.1	0.087
1953	2825.7	1930.6	895.1	68.3	0.126
1954	3242.8	2318.2	924.6	71.5	0.127
1955	3294.1	2319.9	974.2	70.4	0.137
1956	2932.6	1995.9	936.7	68.1	0.160
1957	1920.8	1281.6	639.2	66.7	0.126
1958	1933.4	1082.1	851.3	56.0	0.085
1959	2533.1	1601.0	932.1	63.2	0.082
1960	2148.5	1263.6	884.9	58.8	0.100
1961	2473.2	1520.3	952.9	61.5	0.090
1962	3005.8	1950.5	1055.3	64.9	0.094
1963	2874.2	1923.4	950.8	66.9	0.117
1964	2418.3	1567.4	850.9	64.8	0.128
1965	2094.7	1369.0	725.7	65.4	0.104
1966	2195.7	1413.8	781.9	64.4	0.100
1967	2618.4	1764.7	853.7	67.4	0.097
1968	3105.3	2189.2	916.1	70.5	0.121
1969	2449.8	1599.3	850.5	65.3	0.127
1970	2880.1	1791.7	1088.4	62.2	0.118
1971	3025.7	2093.6	932.1	69.2	0.129
1972	2259.6	1386.7	872.9	61.4	0.127
1973	3474.1	2326.8	1147.3	67.0	0.110
1974	2549.1	1651.3	897.8	64.8	0.157
1975	3226.8	2230.8	996.0	69.1	0.117
1976	2962.9	2131.6	831.3	71.9	0.162
1977	2413.0	1484.8	928.2	61.5	0.139
1978	3802.3	2533.0	1269.3	66.6	0.127
1979	2407.1	1509.8	897.3	62.7	0.148
1980	2532.6	1617.4	915.2	63.9	0.115
1981	2501.1	1458.8	1042.3	58.3	0.131
1982	2150.2	1108.8	1041.4	51.6	0.091
1983	3937.6	2725.3	1212.3	69.2	0.077
1984	3112.3	2294.2	818.1	73.7	0.174
1985	3241.7	2252.0	989.7	69.5	0.142
1986	2639.3	1791.1	848.2	67.9	0.150
Average	2871.6	1933.3	938.3	66.6	0.132
Maximum	1828.1	1082.1	589.1	51.6	0.077
Minimum	4140.2	3016.4	1269.3	74.5	0.222

Table C-4.3 ESTIMATED NATURAL RUNOFF AT SUNDARIJAL

Unit : mm

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Annual	Min.	Max.
1940	0.19	0.15	0.14	0.12	0.12	0.68	3.48	4.34	1.90	0.69	0.38	0.25	1.04	0.12	4.34
1941	0.21	0.19	0.17	0.17	0.37	2.70	2.64	3.37	1.69	0.82	0.44	0.29	1.09	0.17	3.37
1942	0.23	0.21	0.18	0.37	0.15	0.86	2.71	5.10	3.52	1.22	0.58	0.38	1.30	0.15	5.10
1943	0.28	0.26	0.23	0.31	0.47	1.48	3.16	4.84	3.15	1.24	0.59	0.40	1.38	0.23	4.84
1944	0.30	0.29	0.25	0.30	0.21	0.55	2.28	3.33	2.82	1.03	0.48	0.32	1.02	0.21	3.33
1945	0.41	0.24	0.20	0.29	0.29	0.73	1.95	4.65	3.50	1.57	0.72	0.44	1.26	0.20	4.65
1946	0.31	0.31	0.24	0.48	0.57	1.11	4.33	4.14	2.91	1.78	0.90	0.52	1.48	0.24	4.33
1947	0.38	0.31	0.27	0.76	0.95	0.77	3.44	2.76	2.63	1.20	0.53	0.36	1.20	0.27	3.44
1948	0.27	0.24	0.22	0.31	0.67	1.24	2.94	3.93	3.76	1.63	0.72	0.47	1.37	0.22	3.93
1949	0.34	0.32	0.25	0.26	0.60	0.70	2.54	3.69	2.06	0.99	0.53	0.35	1.06	0.25	3.69
1950	0.26	0.23	0.21	0.18	0.22	0.83	1.69	1.59	1.18	0.40	0.24	0.19	0.60	0.18	1.69
1951	0.16	0.15	0.13	0.11	0.10	0.20	1.39	2.65	1.58	0.50	0.27	0.18	0.62	0.10	2.65
1952	0.15	0.14	0.12	0.11	0.10	0.41	2.28	3.72	2.63	0.91	0.43	0.27	0.94	0.10	3.72
1953	0.21	0.19	0.20	0.15	0.13	1.45	2.99	2.77	1.83	0.73	0.37	0.24	0.94	0.13	2.99
1954	0.21	0.18	0.16	0.14	0.20	0.87	3.27	3.88	2.77	1.02	0.49	0.32	1.13	0.14	3.88
1955	0.24	0.22	0.19	0.17	0.22	0.79	2.25	4.94	2.63	1.04	0.50	0.32	1.14	0.17	4.94
1956	0.25	0.22	0.19	0.17	0.65	2.17	1.94	2.61	1.66	1.03	0.46	0.30	0.97	0.17	2.61
1957	0.30	0.21	0.19	0.17	0.15	0.24	1.39	2.56	1.44	0.41	0.23	0.17	0.63	0.15	2.56
1958	0.15	0.13	0.12	0.11	0.09	0.25	0.77	2.26	1.23	0.76	0.24	0.15	0.53	0.09	2.26
1959	0.13	0.12	0.10	0.09	0.25	0.32	0.80	3.38	2.64	0.88	0.38	0.23	0.78	0.09	3.38
1960	0.18	0.16	0.15	0.12	0.12	0.43	1.65	2.26	1.36	0.50	0.24	0.17	0.61	0.12	2.26
1961	0.15	0.14	0.44	0.10	0.18	0.29	1.98	3.00	1.65	0.47	0.26	0.18	0.74	0.10	3.00
1962	0.19	0.14	0.13	0.31	0.16	1.55	2.30	2.74	2.45	0.79	0.40	0.26	0.95	0.13	2.74
1963	0.21	0.18	0.16	0.14	0.13	0.69	1.79	3.47	2.51	1.09	0.51	0.32	0.94	0.13	3.47
1964	0.23	0.20	0.18	0.17	0.23	0.68	1.20	2.96	1.99	0.72	0.36	0.23	0.76	0.17	2.96
1965	0.19	0.17	0.15	0.13	0.11	0.59	1.91	2.24	1.30	0.57	0.40	0.22	0.67	0.11	2.24
1966	0.18	0.16	0.14	0.12	0.12	0.63	1.48	2.73	1.68	0.52	0.28	0.19	0.69	0.12	2.73
1967	0.16	0.14	0.13	0.25	0.12	0.87	2.39	2.76	2.07	0.74	0.39	0.26	0.86	0.12	2.76
1968	0.20	0.18	0.18	0.16	0.16	1.05	3.66	3.65	1.59	1.15	0.45	0.29	1.07	0.16	3.66
1969	0.24	0.21	0.20	0.16	0.15	0.19	1.63	2.66	2.25	0.95	0.41	0.26	0.78	0.15	2.66
1970	0.21	0.18	0.16	0.18	0.37	0.76	2.10	2.91	1.92	0.94	0.43	0.27	0.88	0.16	2.91
1971	0.21	0.19	0.17	0.24	0.16	2.64	2.31	3.17	1.68	0.79	0.42	0.28	1.02	0.16	3.17
1972	0.23	0.20	0.29	0.16	0.14	0.31	2.31	1.66	1.43	0.55	0.51	0.28	0.68	0.14	2.31
1973	0.18	0.16	0.19	0.13	0.44	1.20	2.08	2.99	3.39	1.78	0.66	0.40	1.14	0.13	3.39
1974	0.28	0.23	0.21	0.19	0.52	0.82	1.42	2.20	2.32	0.83	0.38	0.25	0.81	0.19	2.32
1975	0.20	0.18	0.16	0.27	0.21	0.57	2.52	3.49	3.13	1.38	0.55	0.35	1.09	0.16	3.49
1976	0.26	0.22	0.20	0.19	0.89	1.70	2.39	2.93	1.97	0.94	0.45	0.30	1.04	0.19	2.93
1977	0.24	0.22	0.19	0.17	0.28	0.96	2.51	1.97	1.14	0.44	0.28	0.25	0.73	0.17	2.51
1978	0.19	0.16	0.38	0.21	0.75	1.66	3.48	3.79	1.83	1.46	0.51	0.34	1.24	0.16	3.79
1979	0.26	0.25	0.20	0.18	0.22	1.26	2.24	2.28	0.96	0.41	0.25	0.29	0.74	0.18	2.28
1980	0.17	0.15	0.14	0.12	0.40	1.38	1.80	2.41	1.37	0.86	0.38	0.24	0.79	0.12	2.41
1981	0.19	0.17	0.15	0.39	0.56	0.66	1.75	1.91	1.67	0.59	0.27	0.19	0.71	0.15	1.91
1982	0.16	0.15	0.19	0.12	0.11	0.20	1.09	2.29	1.28	0.47	0.23	0.15	0.54	0.11	2.29
1983	0.13	0.12	0.10	0.10	0.25	0.42	3.75	3.76	3.70	2.34	0.76	0.46	1.34	0.10	3.76
1984	0.34	0.26	0.23	0.20	0.55	0.85	2.90	3.51	2.89	0.87	0.47	0.32	1.12	0.20	3.51
1985	0.25	0.22	0.20	0.18	0.47	0.44	2.89	3.42	2.55	1.45	0.59	0.46	1.10	0.18	3.42
1986	0.32	0.24	0.21	0.27	0.19	1.02	2.25	1.77	2.36	1.10	0.44	0.30	0.88	0.19	2.36
Mean	0.23	0.20	0.19	0.21	0.31	0.90	2.30	3.09	2.17	0.95	0.44	0.29	0.94	0.16	3.17
Min.	0.13	0.12	0.10	0.09	0.09	0.19	0.77	1.59	0.96	0.40	0.23	0.15	0.53	0.09	1.69
Max.	0.41	0.32	0.44	0.76	0.95	2.70	4.33	5.10	3.76	2.34	0.90	0.52	1.48	0.27	5.10

Table C-4.4 5-DAY DISCHARGE AT SUNDARIJAL (1/8)

Year: 1940 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.22	0.16	0.14	0.13	0.11	0.20	2.42	4.38	2.67	1.00	0.46	0.29
6 - 10	0.20	0.16	0.14	0.12	0.11	0.10	3.23	4.08	2.32	0.80	0.42	0.27
11 - 15	0.19	0.15	0.14	0.12	0.11	0.09	1.79	4.74	1.96	0.67	0.39	0.26
16 - 20	0.18	0.15	0.13	0.12	0.10	0.72	3.69	5.19	1.62	0.62	0.36	0.24
21 - 25	0.17	0.15	0.13	0.12	0.18	1.71	3.79	4.22	1.53	0.56	0.34	0.23
26 - End	0.16	0.15	0.13	0.11	0.11	1.27	5.55	3.59	1.28	0.50	0.31	0.23

Year: 1941 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.22	0.20	0.17	0.15	0.65	1.01	2.56	4.30	2.56	1.20	0.52	0.34
6 - 10	0.22	0.19	0.17	0.15	0.44	1.74	2.25	3.83	1.80	0.94	0.49	0.32
11 - 15	0.21	0.19	0.17	0.15	0.48	4.60	2.94	4.76	1.55	0.82	0.45	0.30
16 - 20	0.21	0.18	0.16	0.14	0.33	1.57	3.60	2.76	1.37	0.79	0.42	0.28
21 - 25	0.20	0.18	0.16	0.14	0.23	2.96	1.98	2.13	1.60	0.67	0.39	0.27
26 - End	0.20	0.18	0.16	0.27	0.16	4.33	2.52	2.59	1.27	0.56	0.36	0.25

Year: 1942 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.25	0.22	0.19	0.20	0.16	0.15	1.42	5.36	3.13	1.92	0.70	0.45
6 - 10	0.24	0.21	0.19	0.73	0.15	0.14	2.34	3.60	4.53	1.55	0.65	0.42
11 - 15	0.24	0.21	0.19	0.47	0.15	1.44	1.14	7.49	4.87	1.26	0.60	0.39
16 - 20	0.23	0.21	0.18	0.33	0.15	0.70	3.43	6.16	3.63	1.04	0.55	0.37
21 - 25	0.23	0.20	0.18	0.18	0.14	1.02	3.49	4.88	2.67	0.89	0.51	0.35
26 - End	0.22	0.20	0.18	0.29	0.14	1.71	4.17	3.42	2.31	0.77	0.48	0.33

Year: 1943 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.31	0.26	0.28	0.20	0.20	0.63	0.98	6.36	3.09	1.95	0.71	0.46
6 - 10	0.29	0.25	0.23	0.20	0.18	3.37	4.43	4.48	3.33	1.59	0.65	0.43
11 - 15	0.28	0.27	0.22	0.23	0.18	2.04	1.86	6.44	4.67	1.29	0.61	0.41
16 - 20	0.27	0.25	0.22	0.44	0.17	1.14	4.30	3.78	2.80	1.05	0.56	0.38
21 - 25	0.27	0.28	0.21	0.44	0.17	0.93	3.12	3.80	2.70	0.87	0.52	0.36
26 - End	0.26	0.27	0.21	0.32	1.66	0.76	4.09	4.31	2.29	0.78	0.49	0.34

Year: 1944 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.32	0.27	0.25	0.46	0.20	0.44	1.67	2.83	2.12	1.54	0.58	0.37
6 - 10	0.31	0.27	0.24	0.40	0.19	0.38	1.59	4.40	4.67	1.39	0.53	0.35
11 - 15	0.30	0.26	0.24	0.32	0.19	0.24	3.14	4.75	3.19	1.10	0.49	0.32
16 - 20	0.29	0.37	0.23	0.23	0.18	0.39	2.56	3.01	2.44	0.88	0.46	0.31
21 - 25	0.31	0.30	0.25	0.20	0.20	0.54	2.92	2.19	2.68	0.71	0.42	0.29
26 - End	0.28	0.28	0.29	0.20	0.26	1.32	1.89	2.87	1.85	0.63	0.39	0.27

Year: 1945 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.28	0.28	0.21	0.19	0.41	0.17	1.22	5.78	4.13	2.44	0.98	0.52
6 - 10	0.69	0.26	0.21	0.19	0.23	0.54	1.82	4.20	4.70	1.71	0.82	0.48
11 - 15	0.51	0.24	0.21	0.18	0.17	0.23	1.25	4.95	4.43	1.41	0.70	0.45
16 - 20	0.40	0.22	0.20	0.19	0.16	0.46	1.85	3.88	2.99	1.16	0.64	0.42
21 - 25	0.31	0.22	0.20	0.44	0.36	0.46	2.23	5.33	2.59	1.52	0.60	0.40
26 - End	0.28	0.22	0.19	0.53	0.41	2.52	3.08	3.91	2.16	1.23	0.56	0.37

Table C-4.4 5-DAY DISCHARGE AT SUNDARIJAL (2/8)

Year: 1946 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.35	0.27	0.32	0.22	0.51	0.35	4.72	4.01	4.78	2.68	1.26	0.61
6 - 10	0.33	0.27	0.24	0.30	0.38	0.37	3.72	4.18	2.95	1.76	1.08	0.57
11 - 15	0.31	0.26	0.23	0.31	0.97	0.48	3.85	4.30	2.47	1.59	0.91	0.54
16 - 20	0.30	0.26	0.23	0.36	0.71	0.95	4.80	4.33	2.85	1.54	0.77	0.51
21 - 25	0.28	0.44	0.23	0.84	0.47	1.72	3.90	4.10	2.13	1.60	0.70	0.48
26 - End	0.28	0.43	0.22	0.87	0.39	2.80	4.86	3.98	2.27	1.55	0.66	0.45

Year: 1947 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.42	0.32	0.29	0.25	0.39	0.81	1.87	2.94	1.59	1.95	0.64	0.41
6 - 10	0.41	0.31	0.28	0.25	0.26	0.86	3.84	3.65	3.31	1.57	0.59	0.39
11 - 15	0.39	0.31	0.28	0.24	0.22	0.80	2.73	2.29	2.55	1.26	0.55	0.37
16 - 20	0.37	0.30	0.27	2.36	1.84	0.63	2.80	2.03	2.71	1.01	0.51	0.35
21 - 25	0.35	0.30	0.26	0.97	2.00	0.50	4.41	3.79	2.88	0.81	0.47	0.33
26 - End	0.34	0.29	0.26	0.51	0.96	1.01	4.71	1.99	2.76	0.69	0.44	0.31

Year: 1948 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.29	0.26	0.23	0.35	0.61	0.34	2.43	3.04	3.27	2.17	0.93	0.55
6 - 10	0.28	0.25	0.22	0.29	0.59	0.26	1.74	4.53	6.08	1.88	0.79	0.52
11 - 15	0.28	0.25	0.22	0.20	0.71	1.44	2.73	3.64	4.50	1.74	0.72	0.49
16 - 20	0.27	0.24	0.21	0.41	0.85	2.68	2.98	2.37	3.42	1.59	0.68	0.46
21 - 25	0.27	0.24	0.21	0.31	0.67	0.96	2.88	3.71	2.87	1.38	0.63	0.43
26 - End	0.26	0.23	0.23	0.27	0.60	1.76	4.57	5.92	2.42	1.12	0.58	0.40

Year: 1949 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.38	0.29	0.27	0.23	0.40	0.34	2.07	3.41	2.77	1.14	0.68	0.40
6 - 10	0.36	0.45	0.26	0.26	0.55	0.34	2.72	2.92	2.31	1.32	0.58	0.38
11 - 15	0.34	0.34	0.26	0.25	0.66	1.28	1.95	4.65	2.28	1.09	0.53	0.35
16 - 20	0.32	0.28	0.25	0.23	0.79	0.61	2.01	5.16	2.01	0.89	0.50	0.33
21 - 25	0.31	0.27	0.24	0.22	0.68	0.98	3.47	3.29	1.61	0.71	0.46	0.32
26 - End	0.30	0.27	0.24	0.37	0.54	0.66	2.91	2.89	1.35	0.80	0.43	0.30

Year: 1950 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.28	0.25	0.22	0.19	0.17	0.27	1.70	1.52	1.63	0.51	0.29	0.20
6 - 10	0.27	0.24	0.21	0.19	0.17	0.21	1.43	2.06	1.54	0.46	0.26	0.19
11 - 15	0.27	0.24	0.21	0.19	0.16	0.47	2.48	1.42	1.32	0.42	0.24	0.19
16 - 20	0.26	0.23	0.21	0.18	0.18	0.88	1.61	1.58	1.11	0.38	0.23	0.19
21 - 25	0.26	0.23	0.20	0.18	0.16	1.12	1.41	1.58	0.87	0.34	0.21	0.18
26 - End	0.25	0.22	0.20	0.17	0.45	2.00	1.51	1.41	0.64	0.31	0.20	0.18

Year: 1951 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.17	0.15	0.14	0.12	0.11	0.15	1.33	2.20	2.14	0.71	0.33	0.20
6 - 10	0.17	0.15	0.13	0.12	0.10	0.13	1.03	2.31	2.12	0.58	0.30	0.19
11 - 15	0.17	0.15	0.13	0.11	0.10	0.26	2.35	2.81	1.66	0.50	0.28	0.17
16 - 20	0.16	0.14	0.13	0.11	0.10	0.21	1.08	3.09	1.49	0.45	0.26	0.17
21 - 25	0.16	0.14	0.13	0.11	0.10	0.10	1.35	3.58	1.16	0.41	0.24	0.17
26 - End	0.16	0.14	0.12	0.11	0.10	0.36	1.23	2.02	0.93	0.37	0.22	0.16

Table C-4.4 5-DAY DISCHARGE AT SUNDARIJAL (3/8)

Year: 1952 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.16	0.14	0.14	0.11	0.10	0.09	2.15	3.36	2.72	1.47	0.52	0.32
6 - 10	0.16	0.14	0.12	0.11	0.10	0.13	1.89	4.60	2.16	1.16	0.48	0.30
11 - 15	0.15	0.14	0.12	0.11	0.09	0.11	1.65	2.46	3.97	0.92	0.44	0.28
16 - 20	0.15	0.13	0.13	0.10	0.10	0.29	1.42	3.24	2.67	0.73	0.40	0.26
21 - 25	0.15	0.13	0.12	0.11	0.09	0.99	2.14	4.59	2.37	0.64	0.37	0.25
26 - End	0.14	0.13	0.11	0.10	0.09	0.88	4.07	4.01	1.86	0.57	0.34	0.23

Year: 1953 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.22	0.20	0.18	0.15	0.14	3.84	5.15	2.67	1.74	1.17	0.44	0.28
6 - 10	0.21	0.19	0.34	0.15	0.13	1.26	3.21	3.50	2.37	0.92	0.41	0.26
11 - 15	0.21	0.19	0.23	0.15	0.13	0.71	2.91	2.43	2.31	0.72	0.38	0.25
16 - 20	0.21	0.18	0.17	0.15	0.13	0.55	2.38	3.21	1.72	0.59	0.35	0.23
21 - 25	0.21	0.18	0.16	0.14	0.13	1.03	2.16	2.68	1.49	0.54	0.32	0.22
26 - End	0.20	0.18	0.16	0.14	0.12	1.34	2.24	2.26	1.35	0.49	0.30	0.22

Year: 1954 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.22	0.19	0.17	0.15	0.13	0.29	3.33	3.45	2.84	1.62	0.59	0.37
6 - 10	0.21	0.19	0.17	0.15	0.13	0.21	3.19	2.40	3.10	1.30	0.54	0.35
11 - 15	0.21	0.18	0.16	0.14	0.13	0.45	1.46	4.39	2.94	1.04	0.50	0.33
16 - 20	0.20	0.18	0.16	0.14	0.12	1.31	1.50	4.30	3.30	0.84	0.46	0.31
21 - 25	0.20	0.18	0.16	0.14	0.44	1.20	1.84	5.65	2.43	0.71	0.43	0.29
26 - End	0.20	0.17	0.15	0.14	0.25	1.79	7.46	3.24	2.04	0.65	0.40	0.27

Year: 1955 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.26	0.23	0.20	0.18	0.17	0.17	2.48	1.68	3.70	1.60	0.60	0.38
6 - 10	0.25	0.22	0.22	0.17	0.15	0.20	1.24	5.49	2.53	1.36	0.55	0.35
11 - 15	0.24	0.22	0.19	0.17	0.15	0.37	2.40	8.06	2.96	1.09	0.51	0.33
16 - 20	0.24	0.21	0.19	0.17	0.15	1.06	2.45	4.86	2.57	0.88	0.47	0.31
21 - 25	0.24	0.21	0.19	0.16	0.58	1.37	2.25	5.04	2.19	0.73	0.44	0.30
26 - End	0.23	0.21	0.18	0.16	0.14	1.56	2.63	4.60	1.85	0.66	0.41	0.28

Year: 1956 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.26	0.23	0.20	0.18	0.18	0.50	2.05	2.87	2.05	1.27	0.56	0.35
6 - 10	0.25	0.22	0.20	0.18	0.48	1.70	1.54	2.38	1.76	1.65	0.51	0.33
11 - 15	0.25	0.22	0.20	0.17	1.53	1.86	1.63	1.91	1.78	1.11	0.48	0.31
16 - 20	0.24	0.22	0.19	0.17	0.40	3.47	2.35	2.78	1.45	0.90	0.44	0.29
21 - 25	0.24	0.21	0.19	0.17	0.28	3.49	2.31	2.74	1.51	0.72	0.41	0.28
26 - End	0.23	0.21	0.18	0.16	0.99	1.98	1.80	2.90	1.43	0.60	0.38	0.26

Year: 1957 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.25	0.22	0.20	0.18	0.19	0.44	0.66	1.33	2.03	0.53	0.28	0.18
6 - 10	0.51	0.22	0.19	0.17	0.15	0.14	1.77	3.49	2.02	0.48	0.26	0.17
11 - 15	0.32	0.21	0.19	0.17	0.15	0.49	1.66	2.81	1.68	0.43	0.24	0.17
16 - 20	0.25	0.21	0.19	0.16	0.15	0.14	1.13	2.10	1.25	0.39	0.22	0.17
21 - 25	0.23	0.21	0.18	0.16	0.14	0.13	1.68	1.60	0.94	0.35	0.20	0.17
26 - End	0.23	0.20	0.18	0.16	0.14	0.12	1.41	3.80	0.69	0.31	0.18	0.16

Table C-4.4 5-DAY DISCHARGE AT SUNDARIJAL (4/8)

Year: 1958 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.16	0.14	0.12	0.11	0.10	0.08	0.59	3.27	1.24	1.87	0.30	0.17
6 - 10	0.16	0.14	0.12	0.11	0.09	0.08	0.37	2.75	2.17	0.90	0.28	0.16
11 - 15	0.15	0.13	0.12	0.10	0.09	0.08	0.80	2.10	1.18	0.67	0.25	0.15
16 - 20	0.15	0.13	0.12	0.14	0.09	0.44	1.21	2.36	0.87	0.49	0.23	0.15
21 - 25	0.15	0.13	0.11	0.11	0.09	0.37	0.84	1.68	1.19	0.38	0.21	0.15
26 - End	0.14	0.13	0.12	0.10	0.09	0.42	0.81	1.55	0.75	0.34	0.19	0.14

Year: 1959 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.14	0.12	0.11	0.10	0.08	0.26	0.13	1.43	2.97	1.43	0.47	0.28
6 - 10	0.14	0.12	0.11	0.09	0.08	0.49	0.09	3.80	5.22	1.16	0.43	0.26
11 - 15	0.13	0.12	0.11	0.09	0.08	0.47	0.43	6.55	2.26	0.92	0.39	0.24
16 - 20	0.13	0.12	0.10	0.10	0.08	0.25	0.25	2.67	1.89	0.74	0.36	0.22
21 - 25	0.13	0.11	0.10	0.09	0.08	0.22	1.21	3.19	1.97	0.60	0.33	0.21
26 - End	0.13	0.11	0.10	0.09	0.98	0.24	2.39	2.75	1.50	0.52	0.30	0.20

Year: 1960 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.18	0.18	0.15	0.13	0.11	0.47	1.01	2.39	2.39	0.80	0.30	0.18
6 - 10	0.18	0.16	0.18	0.13	0.11	0.33	1.11	2.21	1.78	0.63	0.28	0.17
11 - 15	0.18	0.16	0.14	0.12	0.11	0.14	1.41	1.73	1.34	0.48	0.25	0.17
16 - 20	0.18	0.16	0.14	0.12	0.11	0.14	2.57	3.15	1.09	0.42	0.23	0.17
21 - 25	0.17	0.15	0.16	0.12	0.11	0.53	1.61	2.50	0.85	0.38	0.21	0.16
26 - End	0.17	0.15	0.13	0.12	0.16	0.96	2.11	1.71	0.67	0.34	0.19	0.16

Year: 1961 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.16	0.16	0.12	0.11	0.10	0.53	0.60	2.67	2.90	0.64	0.32	0.19
6 - 10	0.15	0.13	0.12	0.11	0.61	0.28	1.09	2.21	2.04	0.54	0.29	0.18
11 - 15	0.15	0.13	0.12	0.11	0.11	0.27	1.74	4.06	1.68	0.49	0.27	0.18
16 - 20	0.15	0.13	1.99	0.10	0.09	0.16	2.53	2.58	1.29	0.44	0.24	0.17
21 - 25	0.14	0.13	0.25	0.10	0.09	0.27	3.59	4.11	1.12	0.40	0.22	0.17
26 - End	0.16	0.12	0.12	0.10	0.09	0.25	2.28	2.47	0.85	0.35	0.21	0.17

Year: 1962 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.16	0.15	0.13	0.11	0.39	0.12	2.26	1.69	2.82	1.16	0.48	0.30
6 - 10	0.16	0.14	0.15	0.11	0.16	1.54	2.62	2.82	4.02	0.96	0.44	0.28
11 - 15	0.16	0.14	0.12	0.11	0.10	1.93	2.19	2.83	2.40	0.84	0.41	0.26
16 - 20	0.15	0.14	0.12	0.11	0.10	0.67	1.47	3.05	2.06	0.67	0.38	0.25
21 - 25	0.15	0.13	0.12	0.44	0.10	2.53	2.36	3.06	1.96	0.59	0.35	0.23
26 - End	0.31	0.13	0.12	1.00	0.11	2.50	2.78	2.97	1.47	0.54	0.32	0.22

Year: 1963 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.22	0.19	0.17	0.15	0.17	0.19	1.04	3.33	3.98	1.95	0.67	0.37
6 - 10	0.21	0.19	0.17	0.15	0.13	0.16	0.95	3.12	2.44	1.41	0.59	0.35
11 - 15	0.22	0.18	0.16	0.14	0.13	0.14	1.55	2.37	2.53	1.11	0.50	0.33
16 - 20	0.20	0.18	0.16	0.14	0.13	0.88	1.11	3.31	2.26	0.88	0.47	0.30
21 - 25	0.20	0.18	0.16	0.14	0.12	0.51	2.32	3.39	1.66	0.69	0.44	0.29
26 - End	0.20	0.17	0.15	0.14	0.12	2.29	3.45	4.98	2.23	0.60	0.40	0.27

Table C-4.4 5-DAY DISCHARGE AT SUNDARIJAL (5/8)

Year: 1964 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.25	0.21	0.19	0.16	0.57	0.13	0.57	1.19	2.63	1.05	0.43	0.27
6 - 10	0.23	0.21	0.18	0.16	0.26	0.13	0.42	2.78	2.41	0.93	0.40	0.25
11 - 15	0.23	0.20	0.18	0.16	0.16	0.17	2.26	4.16	2.56	0.77	0.37	0.23
16 - 20	0.22	0.20	0.18	0.15	0.14	0.67	0.87	4.45	1.74	0.60	0.34	0.22
21 - 25	0.22	0.19	0.17	0.20	0.14	2.11	1.80	2.62	1.40	0.52	0.31	0.21
26 - End	0.21	0.19	0.17	0.19	0.13	0.87	1.24	2.61	1.22	0.47	0.29	0.20

Year: 1965 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.19	0.17	0.15	0.14	0.12	0.11	1.35	1.99	1.65	0.74	0.56	0.26
6 - 10	0.19	0.17	0.15	0.13	0.12	0.11	3.45	2.07	1.38	0.66	0.51	0.24
11 - 15	0.19	0.17	0.15	0.13	0.11	0.10	1.78	2.94	1.25	0.57	0.39	0.23
16 - 20	0.18	0.16	0.14	0.13	0.11	1.87	1.18	2.64	1.44	0.50	0.33	0.21
21 - 25	0.18	0.16	0.14	0.12	0.11	0.53	1.66	1.94	1.16	0.43	0.31	0.20
26 - End	0.18	0.16	0.14	0.12	0.11	0.84	2.00	1.91	0.94	0.53	0.28	0.18

Year: 1966 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.22	0.16	0.14	0.13	0.11	0.14	1.83	2.55	2.70	0.73	0.34	0.21
6 - 10	0.21	0.16	0.14	0.12	0.13	0.10	1.02	2.23	1.92	0.64	0.31	0.19
11 - 15	0.17	0.20	0.14	0.12	0.11	0.16	0.88	2.64	1.56	0.52	0.29	0.18
16 - 20	0.17	0.16	0.14	0.12	0.11	0.73	1.44	2.01	1.81	0.47	0.26	0.18
21 - 25	0.17	0.15	0.13	0.12	0.10	0.35	1.86	4.35	1.18	0.43	0.24	0.18
26 - End	0.16	0.15	0.13	0.11	0.15	2.33	1.82	2.63	0.89	0.38	0.22	0.18

Year: 1967 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.17	0.15	0.13	0.12	0.23	0.09	1.27	2.28	2.88	1.17	0.47	0.31
6 - 10	0.17	0.15	0.13	0.12	0.10	0.81	2.93	2.22	2.29	0.92	0.43	0.29
11 - 15	0.16	0.14	0.13	0.11	0.10	1.69	1.99	2.71	2.08	0.72	0.40	0.27
16 - 20	0.16	0.14	0.13	0.30	0.10	1.12	2.13	2.85	1.86	0.61	0.38	0.25
21 - 25	0.16	0.14	0.13	0.45	0.10	0.73	3.08	3.74	1.81	0.56	0.35	0.23
26 - End	0.15	0.14	0.12	0.38	0.10	0.78	2.87	2.76	1.50	0.50	0.33	0.22

Year: 1968 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.21	0.19	0.17	0.15	0.20	0.39	3.30	2.56	2.07	2.44	0.54	0.34
6 - 10	0.21	0.19	0.16	0.15	0.13	0.48	2.84	4.95	1.75	1.36	0.50	0.32
11 - 15	0.20	0.18	0.16	0.14	0.28	0.57	3.70	4.45	1.52	1.07	0.46	0.30
16 - 20	0.20	0.18	0.24	0.14	0.12	1.14	5.35	4.26	1.57	0.85	0.42	0.28
21 - 25	0.20	0.18	0.21	0.14	0.12	0.89	3.34	3.54	1.34	0.68	0.39	0.27
26 - End	0.20	0.17	0.15	0.22	0.12	2.84	3.47	2.42	1.31	0.59	0.37	0.25

Year: 1969 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.24	0.22	0.20	0.17	0.16	0.16	1.32	2.94	2.18	1.33	0.50	0.31
6 - 10	0.24	0.21	0.19	0.17	0.16	0.27	1.41	3.43	1.85	1.33	0.46	0.29
11 - 15	0.25	0.21	0.19	0.17	0.16	0.22	0.83	2.97	3.05	1.03	0.43	0.27
16 - 20	0.24	0.21	0.24	0.16	0.14	0.20	0.94	3.08	2.85	0.81	0.39	0.25
21 - 25	0.23	0.20	0.20	0.16	0.14	0.14	2.47	2.12	1.94	0.70	0.36	0.24
26 - End	0.22	0.20	0.18	0.16	0.17	0.12	2.63	1.63	1.65	0.58	0.33	0.22

Table C-4.4 5-DAY DISCHARGE AT SUNDARIJAL (6/8)

Year: 1970 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.21	0.19	0.17	0.15	0.13	0.23	1.53	2.53	2.31	1.41	0.52	0.32
6 - 10	0.20	0.18	0.16	0.14	0.15	0.17	0.96	3.12	1.88	1.21	0.48	0.30
11 - 15	0.20	0.18	0.16	0.17	0.12	0.26	2.44	2.55	1.97	0.99	0.44	0.28
16 - 20	0.20	0.18	0.16	0.34	0.12	1.49	2.70	3.87	1.64	0.87	0.41	0.26
21 - 25	0.24	0.18	0.15	0.15	1.53	0.68	1.46	2.30	2.10	0.68	0.37	0.25
26 - End	0.20	0.17	0.15	0.13	0.21	1.76	3.27	3.07	1.65	0.56	0.35	0.23

Year: 1971 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.22	0.20	0.17	0.15	0.24	0.21	2.40	2.07	2.30	0.88	0.51	0.32
6 - 10	0.22	0.19	0.17	0.15	0.18	1.26	1.97	4.19	2.05	0.76	0.47	0.30
11 - 15	0.21	0.19	0.17	0.15	0.14	6.44	3.16	2.19	1.96	0.97	0.44	0.29
16 - 20	0.21	0.18	0.16	0.15	0.14	2.09	1.89	2.60	1.54	0.81	0.40	0.27
21 - 25	0.20	0.18	0.16	0.55	0.13	2.63	2.32	4.16	1.24	0.76	0.37	0.25
26 - End	0.20	0.18	0.16	0.30	0.13	3.20	2.14	3.67	0.99	0.58	0.35	0.24

Year: 1972 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.24	0.21	0.19	0.19	0.15	0.13	2.05	1.77	2.02	0.75	0.37	0.42
6 - 10	0.23	0.21	0.24	0.16	0.14	0.13	1.85	1.59	1.69	0.65	0.33	0.32
11 - 15	0.23	0.20	0.18	0.16	0.14	0.12	1.20	1.49	1.65	0.54	0.31	0.26
16 - 20	0.22	0.20	0.18	0.16	0.14	0.21	3.23	1.26	1.21	0.45	0.29	0.24
21 - 25	0.22	0.19	0.17	0.15	0.13	0.42	1.78	2.28	1.04	0.41	0.26	0.23
26 - End	0.21	0.19	0.71	0.15	0.13	0.82	3.50	1.58	0.99	0.53	1.47	0.21

Year: 1973 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.19	0.16	0.15	0.13	1.60	0.11	1.60	2.72	3.65	2.93	0.87	0.47
6 - 10	0.18	0.16	0.40	0.13	0.47	0.13	1.94	2.90	3.94	1.94	0.76	0.44
11 - 15	0.18	0.16	0.21	0.13	0.26	0.48	2.43	3.82	4.63	2.20	0.65	0.41
16 - 20	0.17	0.16	0.14	0.12	0.15	3.07	2.76	2.56	3.13	1.54	0.60	0.39
21 - 25	0.17	0.15	0.14	0.12	0.11	1.50	2.18	3.90	2.34	1.23	0.55	0.36
26 - End	0.17	0.20	0.13	0.14	0.11	1.93	1.65	2.21	2.64	1.00	0.51	0.34

Year: 1974 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.32	0.24	0.22	0.19	0.18	0.66	1.40	1.67	4.05	1.20	0.47	0.29
6 - 10	0.30	0.24	0.21	0.19	0.17	0.55	0.90	2.27	1.86	1.14	0.43	0.27
11 - 15	0.28	0.23	0.21	0.20	0.17	0.53	1.48	1.73	2.39	0.91	0.40	0.25
16 - 20	0.27	0.23	0.20	0.18	0.19	1.17	1.39	1.82	2.25	0.70	0.36	0.25
21 - 25	0.26	0.23	0.20	0.18	0.16	1.37	1.69	3.04	1.81	0.57	0.34	0.24
26 - End	0.25	0.22	0.20	0.17	1.94	0.64	1.63	2.59	1.53	0.51	0.31	0.23

Year: 1975 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.21	0.19	0.17	0.15	0.17	0.27	2.92	4.54	4.97	2.09	0.67	0.42
6 - 10	0.21	0.19	0.17	0.15	0.13	0.13	2.83	2.47	3.78	1.78	0.62	0.39
11 - 15	0.21	0.18	0.16	0.14	0.14	0.12	3.33	4.41	2.50	1.51	0.57	0.36
16 - 20	0.20	0.18	0.16	0.14	0.13	0.11	1.72	3.03	2.19	1.24	0.52	0.34
21 - 25	0.20	0.18	0.16	0.69	0.14	0.78	1.51	2.67	2.26	1.01	0.48	0.32
26 - End	0.20	0.17	0.15	0.34	0.50	1.99	2.77	3.76	3.07	0.79	0.45	0.30

Table C-4.4 5-DAY DISCHARGE AT SUNDARIJAL (7/8)

Year: 1976 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.28	0.23	0.21	0.18	0.21	2.38	2.14	2.49	2.37	1.32	0.54	0.35
6 - 10	0.26	0.23	0.20	0.18	0.16	2.72	1.44	2.65	1.85	1.26	0.50	0.33
11 - 15	0.25	0.22	0.20	0.18	1.60	1.43	3.50	4.59	2.11	1.03	0.46	0.31
16 - 20	0.27	0.22	0.19	0.17	0.48	1.22	2.44	3.03	1.90	0.82	0.43	0.29
21 - 25	0.25	0.21	0.19	0.21	2.32	0.91	2.97	2.85	1.63	0.66	0.40	0.28
26 - End	0.24	0.21	0.19	0.25	0.61	1.57	1.95	2.14	1.93	0.59	0.37	0.26

Year: 1977 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.25	0.23	0.20	0.19	0.18	0.14	1.64	1.90	1.39	0.58	0.32	0.22
6 - 10	0.25	0.22	0.20	0.17	0.49	0.16	1.94	2.35	1.58	0.50	0.30	0.20
11 - 15	0.24	0.22	0.19	0.17	0.40	0.36	3.12	1.67	1.28	0.46	0.29	0.20
16 - 20	0.24	0.21	0.19	0.18	0.25	0.87	3.38	1.55	1.00	0.42	0.27	0.20
21 - 25	0.24	0.21	0.19	0.16	0.22	2.57	2.76	2.70	0.85	0.38	0.25	0.19
26 - End	0.23	0.20	0.19	0.16	0.16	1.64	2.28	1.69	0.71	0.34	0.23	0.43

Year: 1978 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.26	0.17	0.15	0.13	0.56	0.54	4.99	3.59	1.77	1.26	0.61	0.40
6 - 10	0.20	0.17	0.15	0.13	0.99	2.28	3.51	5.41	1.58	3.72	0.57	0.37
11 - 15	0.18	0.16	1.28	0.45	1.06	2.59	2.07	5.26	3.01	1.33	0.53	0.35
16 - 20	0.18	0.16	0.37	0.15	0.66	1.40	3.92	4.00	1.78	1.06	0.49	0.33
21 - 25	0.17	0.15	0.22	0.22	0.70	1.19	3.18	2.62	1.51	0.86	0.45	0.31
26 - End	0.17	0.15	0.15	0.16	0.56	1.98	3.23	2.15	1.32	0.70	0.42	0.29

Year: 1979 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.27	0.24	0.21	0.19	0.17	0.15	1.10	3.42	1.51	0.48	0.30	0.69
6 - 10	0.26	0.28	0.21	0.18	0.16	0.15	1.56	1.87	1.19	0.43	0.28	0.26
11 - 15	0.26	0.25	0.20	0.19	0.44	3.05	2.88	2.11	0.99	0.49	0.25	0.21
16 - 20	0.25	0.25	0.20	0.18	0.20	0.81	1.41	1.65	0.87	0.39	0.23	0.20
21 - 25	0.25	0.23	0.20	0.17	0.21	0.66	3.25	3.16	0.67	0.36	0.22	0.19
26 - End	0.24	0.22	0.19	0.17	0.16	2.73	3.09	1.59	0.53	0.32	0.20	0.18

Year: 1980 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.18	0.16	0.15	0.12	0.61	0.28	0.93	2.33	1.64	0.94	0.47	0.29
6 - 10	0.18	0.16	0.14	0.12	0.17	3.09	1.33	2.61	1.52	0.82	0.43	0.27
11 - 15	0.17	0.15	0.14	0.12	1.00	0.99	2.13	1.92	1.30	1.17	0.39	0.25
16 - 20	0.17	0.15	0.13	0.12	0.26	1.49	1.66	2.10	1.29	0.92	0.36	0.23
21 - 25	0.17	0.15	0.13	0.12	0.21	1.34	1.86	3.77	1.05	0.76	0.33	0.22
26 - End	0.16	0.14	0.13	0.11	0.18	1.12	2.69	1.83	1.41	0.61	0.31	0.21

Year: 1981 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.20	0.18	0.16	0.14	0.16	0.79	1.76	2.18	1.69	1.01	0.33	0.20
6 - 10	0.20	0.18	0.16	0.14	0.21	0.43	1.00	3.40	2.61	0.77	0.30	0.19
11 - 15	0.19	0.17	0.15	0.15	0.34	0.30	2.12	1.60	1.25	0.58	0.28	0.19
16 - 20	0.19	0.17	0.15	1.47	1.09	0.51	1.66	1.92	1.01	0.45	0.26	0.18
21 - 25	0.19	0.16	0.15	0.28	0.47	0.23	2.13	1.32	0.94	0.41	0.24	0.18
26 - End	0.18	0.16	0.14	0.16	0.99	1.71	1.83	1.18	2.50	0.37	0.22	0.18

Table C-4.4 5-DAY DISCHARGE AT SUNDARIJAL (8/8)

Year: 1982 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.17	0.15	0.17	0.12	0.11	0.10	1.37	1.56	1.44	0.57	0.29	0.17
6 - 10	0.17	0.15	0.42	0.12	0.10	0.13	1.87	2.75	1.32	0.44	0.26	0.16
11 - 15	0.17	0.15	0.17	0.12	0.10	0.58	0.93	2.91	1.82	0.72	0.24	0.15
16 - 20	0.16	0.14	0.13	0.16	0.10	0.16	0.86	3.42	1.24	0.42	0.22	0.15
21 - 25	0.16	0.14	0.14	0.11	0.12	0.09	0.76	1.64	1.07	0.36	0.20	0.15
26 - End	0.16	0.14	0.12	0.12	0.10	0.14	0.81	1.62	0.78	0.32	0.18	0.14

Year: 1983 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.14	0.12	0.11	0.10	0.10	0.08	4.80	5.66	6.04	2.62	1.05	0.54
6 - 10	0.14	0.12	0.11	0.10	0.08	0.08	1.83	2.89	3.20	2.36	0.87	0.50
11 - 15	0.14	0.12	0.11	0.09	0.52	0.08	1.51	3.92	2.56	4.26	0.74	0.47
16 - 20	0.13	0.12	0.10	0.09	0.42	0.07	2.78	2.92	4.02	2.03	0.68	0.44
21 - 25	0.13	0.11	0.10	0.09	0.20	0.43	5.19	2.75	4.03	1.65	0.63	0.41
26 - End	0.13	0.11	0.10	0.15	0.17	1.77	5.94	4.31	2.32	1.32	0.58	0.43

Year: 1984 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.38	0.28	0.24	0.21	0.19	0.23	1.57	2.20	2.84	1.32	0.56	0.36
6 - 10	0.36	0.26	0.23	0.21	1.16	0.63	3.63	4.23	4.80	1.06	0.52	0.34
11 - 15	0.34	0.25	0.23	0.20	1.02	1.25	4.07	4.42	2.70	0.88	0.48	0.32
16 - 20	0.37	0.26	0.22	0.20	0.54	0.78	2.01	4.38	3.19	0.74	0.45	0.31
21 - 25	0.32	0.25	0.22	0.19	0.30	0.60	2.61	2.49	2.11	0.68	0.42	0.29
26 - End	0.30	0.24	0.21	0.21	0.19	1.58	3.42	3.35	1.66	0.61	0.39	0.28

Year: 1985 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.26	0.24	0.21	0.19	1.80	0.35	2.00	3.69	3.12	1.57	0.78	0.44
6 - 10	0.26	0.23	0.21	0.18	0.29	0.24	4.15	3.43	3.05	1.29	0.66	0.41
11 - 15	0.26	0.23	0.20	0.18	0.31	0.14	2.12	3.91	2.23	1.54	0.59	0.38
16 - 20	0.25	0.22	0.20	0.17	0.17	0.14	2.98	2.53	2.93	2.12	0.55	0.36
21 - 25	0.25	0.22	0.19	0.17	0.18	0.30	3.05	2.51	2.02	1.27	0.51	0.34
26 - End	0.24	0.21	0.19	0.20	0.15	1.43	3.00	4.28	1.93	0.99	0.47	0.78

Year: 1986 Unit:m3/sec

Period	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 - 5	0.43	0.25	0.22	0.22	0.18	0.47	1.56	3.24	2.47	1.62	0.53	0.33
6 - 10	0.35	0.27	0.22	0.19	0.17	0.22	1.25	1.92	2.01	1.47	0.49	0.31
11 - 15	0.31	0.24	0.21	0.19	0.21	0.17	1.03	1.67	3.98	1.24	0.45	0.29
16 - 20	0.30	0.23	0.21	0.18	0.29	0.91	4.47	1.64	1.89	0.99	0.42	0.31
21 - 25	0.28	0.23	0.21	0.18	0.16	1.65	1.77	1.20	1.77	0.77	0.38	0.28
26 - End	0.27	0.23	0.20	0.65	0.16	2.68	3.25	1.08	2.05	0.59	0.36	0.26

Table C-5.1 PEAK DISCHARGE OF ANNUAL MAXIMUM FLOOD AT RESPECTIVE STATIONS

Year	505 Sundarijal (C.A=16.0km2)		507 Mahankal (C.A=13.7km2)		510 Shyamdado (C.A=3.34km2)		530 Guari Ghat (C.A=67.8km2)		536.2 Burhanilkantha (C.A=4.43km2)		540 Tika Bhairab (C.A=42.5km2)		550 Cobhar (C.A=585km2)	
	Discharge (m3/sec)	Date	Discharge (m3/sec)	Date	Discharge (m3/sec)	Date	Discharge (m3/sec)	Date	Discharge (m3/sec)	Date	Discharge (m3/sec)	Date	Discharge (m3/sec)	Date
1962													287	8 Aug.
1963	17.30	31 Aug.	16.30	18 Aug.	4.19	31 Aug.					27.9	29 Sep.	206	1 Sep.
1964	7.86	30 Aug.	9.50	15 Aug.	4.19	29 Jul.					20.7	3 Sep.	251	3 Sep.
1965	16.00	26 Jul.	17.50	26 Jul.	9.97	26 Jul.	119.0	19 Aug.			75.5	8 Jul.	395	9 Jul.
1966	33.10	4 Sep.	52.00	24 Aug.	10.80	4 Sep.	214.0	24 Aug.			181.0	24 Aug.	634	24 Aug.
1967	31.10	10 Jul.	19.20	10 Jul.	19.50	10 Jul.	236.0	10 Jul.			35.0	10 Jul.	680	10 Jul.
1968	26.00	27 Jun.	25.80	27 Jun.	6.73	16 Aug.	73.8	15 Aug.	3.35	7 Aug.	26.6	5 Oct.	497	4 Oct.
1969	6.00	27 Jul.	10.00	22 Jul.	3.73	3 Aug.	51.3	11 Aug.	1.95	12 Aug.	38.6	21 Aug.	431	19 Aug.
1970	41.00	19 Jul.	19.60	28 Jul.	13.20	1 Jun.	125.0	20 Jul.	7.30	19 Aug.	48.7	16 Jul.	582	16 Jul.
1971	9.52	14 Jul.	10.00	10 Jun.	7.54	15 Aug.	90.4	12 Jun.	3.40	12 Oct.	63.2	12 Jun.	617	12 Jun.
1972	7.28	28 Jul.							4.00	28 Jul.	28.0	28 Jul.	876	28 Jul.
1973	- No Record								4.30	11 Aug.	42.4	26 Sep.	335	25 Jul.
1974	3.76	2 Sep.							2.60	25 Jul.	70.8	30 Aug.	350	30 Aug.
1975	18.20	2 Sep.							2.80	9 Jul.	52.0	28 Jul.	591	3 Aug.
1976	31.20	8 Jun.							3.61	3 Aug.	20.8	2 Jul.	245	30 Jun.
1977	16.20	9 Jul.							2.50	24 Jun.	8.7	13 Aug.	299	20 Jun.
1978	53.20	25 Aug.							2.70	18 Aug.	30.8	14 Sep.	407	16 Jul.
1979	3.26	23 Aug.							2.60	2 Sep.	75.6	24 Jul.	416	21 Aug.
1980	11.00	22 Aug.							1.55	3 Aug.	16.8	19 Jun.	254	31 Jul.
1981	16.20	2 Sep.							2.02	15 Aug.				
1982	6.16	28 Aug.							2.75	11 Aug.				
1983	20.80	1 Aug.							2.50	2 Aug.				
1984	4.76	26 Aug.							3.00	5 Jul.				
1985	7.00	26 Jun.							2.45	5 Aug.				
1986														
Max.	53.20		52.00		19.50		236.0		7.30		181.00		876	

Source: 1962 - 1971 : Surface Water Records of Nepal (Ref.4)
1972 - 1985 : Data obtained from Department of Meteorology and Hydrology

Table C-5.2 PROBABLE FLOOD AT EXISTING GAUGING STATIONS

(1) Sundarijal (505) CA=16km2 Unit:m3/sec

Return Period	Iwai	Hazen	Gunbel	Pearson
2	13.39	14.76	15.64	13.20
5	25.90	26.90	29.42	25.91
10	36.44	35.52	38.54	36.84
20	48.23	44.13	47.29	48.94
50	66.01	56.10	58.62	68.34
100	81.33	65.09	67.10	84.96
200	98.40	74.64	75.56	103.78
1000	145.69	98.54	95.15	156.59

(2) Tika Bhairab (540) CA=42.5km2 Unit:m3/sec

Return Period	Iwai	Hazen	Gunbel	Pearson
2	38.95	34.22	42.41	37.47
5	68.05	61.60	83.37	67.63
10	90.35	94.75	110.49	92.81
20	113.83	127.89	136.51	120.35
50	147.20	203.30	170.18	163.94
100	174.49	260.21	195.41	201.20
200	203.73	361.32	220.55	243.27
1000	280.00	597.93	278.70	367.00

(3) Cobhar (550) CA=585km2 Unit:m3/sec

Return Period	Iwai	Hazen	Gunbel	Pearson
2	403.35	412.18	413.67	403.48
5	571.87	578.18	603.20	571.01
10	688.83	681.38	728.69	687.58
20	804.34	784.57	849.06	800.69
50	958.70	914.30	1004.86	959.54
100	1078.31	1011.50	1121.60	1081.63
200	1201.22	1106.77	1237.92	1208.58
1000	1502.45	1335.48	1507.42	1535.49

Table C-5.3 PROBABLE FLOOD AT EACH PROMISSING DANSITE

Unit:m3/sec

Return Period (Year)	C-Value	Balkhu kh. (CA=37km2)	Sundarijal (CA=30km2)	Kodkhu kh. (CA=16km2)	Lele kh. (CA=15km2)	Nakhu kh. (CA=43km2)
2	16	167 (4.52)	145 (4.83)	92 (5.75)	88 (5.85)	185 (4.31)
5	24	251 (6.78)	217 (7.24)	138 (8.63)	132 (8.77)	278 (6.46)
10	30	314 (8.48)	271 (9.05)	173 (10.78)	164 (10.96)	347 (8.08)
20	35	366 (9.89)	317 (10.56)	201 (12.58)	192 (12.79)	405 (9.43)
50	43	450 (12.16)	389 (12.97)	247 (15.46)	236 (15.71)	498 (11.58)
100	49	512 (13.85)	443 (14.78)	282 (17.61)	269 (17.90)	568 (13.20)
200	54	565 (15.27)	489 (16.29)	311 (19.41)	296 (19.73)	625 (14.54)
1000	67	701 (18.94)	606 (20.20)	385 (24.08)	367 (24.48)	776 (18.05)

Remark: Figures in parenthesis show the specific discharge
CA : Catchment Area

Table C-7.1 LAND USE IN THE STUDY AREA

Unit: km2

Category	Kathmandu	Bhaktapur	Lalitpur	Total	%
Agricurtural Land	224.9	98.6	98.3	421.8	64.3
Lowland in Net	(102.6)	(53.7)	(66.3)	(222.6)	(33.9)
Upland in Net	(51.3)	(19.5)	(20.2)	(91.0)	(13.9)
Forest	86.9	12.6	34.8	134.3	20.5
Shurub	36.9	7.2	24.8	68.9	10.5
Sand,Gravel,Boulders	2.4	1.1	1.1	4.6	0.7
Urban	20.0	2.6	3.8	26.4	4.0
Total	370.8	121.9	162.8	656.0	100.0

Table C-7.2 IRRIGATION SYSTEM IN THE STUDY AREA (1/3)

River Basin	Sys. No.	Model No.	Name of Irrigation System	Type*1	Commanding Area (ha)
Bisunumati Kh.	1	I101	Jitpurphedi	F	60
	2	I102	Kabherethali	F	60
	3	I103	-	F	8
	4	I104	-	F	30
	5	I105	Chuni	F	25
	6	I106	Tokha	G	147
	7	I107	Bhudanilkantha	G	123
	8	I108	-	F	60
	9	I109	-	F	30
	10	I110	Icahdol	G	55
	11	I110	Balaju	G	52
			(Sub Total)		(650)
Dhobi Kh.	12	I201	-	F	40
	13	I202	-	F	100
	14	I203	-	F	70
			(Sub Total)		(210)
Bagmati Kh.	15	I301	-	F	35
	16	I302	-	F	100
	17	I303	Gokarna	G	152
	18	I304	Pasupati	G	20
			(Sub Total)		(307)
Manohara Kh.	19	I401	-	F	6
	20	I402	Sali Nadi	G	80
	21	I403	Bisambhara	G	82
	22	I404	Indrayani	G	100
	23	I405	-	F	50
	24	I405	Majh Kuno	F	64
	25	I405	-	F	15
	26	I405	Kumajol ko Kulo	F	8
	27	I405	Pakho ko Kulo	F	47
	28	I405	-	F	7
	29	I405	Barha Bise Kulo	F	35
	30	I406	-	F	17
			(Sub Total)		(511)
Hanumante	31	I501	Dhungedhara	G	80
	32	I501	Terso Kulo	F	10
	33	I502	Kuthudhal	G	100
	34	I503	Hanumante	G	60
	35	I504	Bidol	F	48
	36	I504	Rato Pati Ko Kulo	F	4
	37	I504	-	F	2
	38	I505	Thali Ko Kulo	F	10
	39	I505	Thulo Khola Ko Kulo	F	27
	40	I505	-	F	46
	41	I505	Kalimati Kulo	F	88
	42	I505	-	F	10
	43	I505	-	F	5
	44	I505	-	F	4
	45	I505	Daha Ko Kulo	F	6
	46	I505	Chalise Khola Ko Kulo	F	28
	47	I505	-	F	13
	48	I505	Saat Talle Kulo	F	34
	49	I505	Hanumante Chado ko Kul	F	11
	50	I506	Debre Kuol	F	33

Remarks: *1 G:Government Irrigation System
F:Farmers' Irrigation System

Table C-7.2 IRRIGATION SYSTEM IN THE STUDY AREA (2/3)

River Basin	Sys. No.	Model No.	Name of Irrigation System	Type	Commanding Area (ha)
	51	I506	Dahine Kulo	F	9
	52	I506	Manabu Kulo	F	13
	53	I506	Gatte Kulo	F	93
	54	I506	Chakhu	G	57
	55	I506	-	F	12
	56	I506	Jagate Kulo	F	26
	57	I506a	Nalinchol ko Kulo	F	21
	58	I506a	Balauta ko Mathlo Kulo	F	9
	59	I506a	Tallo Kulo	F	5
	60	I506a	Malinchok Ko	F	7
	61	I506a	Terso Kulo	F	8
	62	I507	-	F	93
	63	I507	Suryabineyaka	F	28
	64	I507	-	F	19
	65	I508	Balkhu	G	104
	66	I508	-	F	3
	67	I509	Dhungakhani Ko Kulo	F	4
	68	I509	Bhairabthan Ko Kulo	F	11
	69	I509	Banjh Kulo	F	45
	70	I509	Mahadev	G	210
	71	I509	Dundur Ko Kulo	F	11
	72	I509	-	F	14
	73	I509	-	F	26
	74	I510	Reekhedol Ko Kulo	F	9
	75	I510	Lapsetar Kulo	F	8
	76	I510	Katunje	G	30
	77	I510	Eedol Ko Kulo	F	6
	78	I510	Chakhu Kulo	G	23
	79	I511	Milli Kulo	F	46
	80	I511	Besi Pikhel Kulo	F	19
	81	I511	Wadaha dovan	F	11
	82	I511	-	F	5
	83	I511	Wadaha Kulo	F	17
	84	I511	-	F	17
	85	I511	-	F	5
			(Sub Total)		(1,643)
Godavari Khola	86	I513	Raj Kulo	F	200
	87	I514	Naya Kulo	F	60
	88	I514	Kaule Kulo	F	75
	89	I514	-	F	200
	90	I514	Tapyo Kulo	F	300
	91	I515	Dhamile Khola Kulo	F	10
	92	I515	Chalise Tarko	F	10
	93	I515	Lubhu Raj Kulo	G	185
	94	I516	Moti Kulo	F	100
	95	I517	Charkhande Kulo	F	1
	96	I517	Choharpur dol Ko Kulo	F	37
	97	I517	Dhungre Kulo	F	47
			(Sub Total)		(1,225)
Kodkhu Khola	98	I601	Kande Pani Kulo	F	75
	99	I602	Kodkhu	G	275
	100	I603	Aphal Kulo	F	30
	101	I604	Khunathali Kulo Muhan	F	200
			(Sub Total)		(580)
Nakhu Khola	102	I701	Jor Chate Kulo	F	8

Table C-7.2 IRRIGATION SYSTEM IN THE STUDY AREA (3/3)

River Basin	Sys. No.	Model No.	Name of Irrigation System	Type	Commanding Area (ha)
	103	I701	Tar kulo	F	3
	104	I701	Makal Kulo	F	11
	105	I701	Kula Tore Kholcha Kulo	F	2
	106	I703	Bhutmul Kulo	F	30
	107	I703	Barah-Bishe Kulo	F	10
	108	I703	Kami ko Dhara Kulo	F	4
	109	I703	Dhara ko Muhan Kulo	F	15
	110	I703	Kailash Kulo	F	4
	111	I703	1 No. Raj Kulo	F	80
	112	I703	Murali Kulo	F	125
	113	I703	Jamura Kulo	F	8
	114	I703	11 No.Raj Kulo	F	25
	115	I703	3 Nos. Dungkhel Kulo	F	15
	116	I703	Bhaise Kulo	F	13
	117	I704	Tika Bhairab No.1	G	400
	118	I705	Bungamati Kulo	F	100
	119	I706	Tika Bhairab No.2	G	200
	120	I707	3 No. Rani Kulo	F	350
	121	I707	Makal Kulo	F	225
	122	I707	Sano Kulo	F	25
	123	I707	4 No. Chatte Kulo	F	-
	124	I707	5 No. Chatte Kulo	F	-
	125	I707	Khokana Kulo	F	150
	126	I707	Jhingati Kulo	F	150
	127	I707	Bhakhal Kulo	F	-
	128	I707	Sera Kulo	F	25
			(Sub Total)		(1,978)
Balkhu Kh.	129	I801	-	F	260
	130	I802	-	F	50
			(Sub Total)		(310)
Bosan Kh.	131	I901	Bosan	G	100
Mai Kh.	132	I902	Parphin	G	30
	133	I902	Dakshinkali	G	70
	134	I902	Chaite	G	11
			(Sub Total)		(211)
			TOTAL		(7,625)

Table C-7.3 SUMMARY OF THE GOVERNMENT AIDED IRRIGATION SYSTEMS

District	Name of Irrigation Project	Source	Commanding Area (ha)	Main Canal Length (km)	Main Canal Design Dis.(l/s)
Kathmandu	Dakshinkali	Kharpa khola	70	7.0	140
	Pharping	Kharpa khola	30	3.2	113
	Chaitye kulo	Spring	11	2.1	140
	Bosan	Bosan khola	100	8.5	710
	Kuthuli Kulo	Spring	11	0.9	85
	Ichadol	Manamati khola	55	3.2	140
	Gokarna	Bagmati river	152	4.8	430
	Pashupati	Bagmati river	20	3.0	170
	Bisambhara	Gaderi khola	82	5.0	340
	Bhudanilkanta	Bisnumati river	123	4.8	198
	Balaju	Spring	52	1.2	113
	Tokha	Thulo khola	147	2.4	198
	Indrayani	Ghatte khola	100	1.0	283
	Shali Nadi	Shali Nadi	80	N.A	N.A
Lalitpur	Lubhu	Sisheri khola	185	4.0	283
	Godavari	Naudhara & Godavari	200	7.0	425
	Kodkhu	Kodkhu khola	275	5.0	340
	Tika Bhairab No.1	Naldu & Lele khola	400	22.5	1000
	Tika Bhairab No.2	Nakhu khola	200	7.5	340
Baktapur	Katunje	Katunje khola	30	2.3	140
	Mavadev khola	Mahadev khola	210	12.9	113
	Hanumante	Hanumante river	60	1.0	340
	Dhungedhara	Ghatte khola	80	N.A	198
	Kuthudhal	Ghatte khola	100	4.0	85
	Chakhu	Chakhu khola	57	3.4	170
	Balkhu	Balkhu khola	104	2.0	140
	Bidol	Bidol khola	48	5.0	140

Table C-7.4 ESTIMATED IRRIGATION WATER REQUIREMENT (1/6)

(1) Irrigation Systems in Bisunumati Kh. and Dobhi Kh. basin Unit:l/sec

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1940	0.4	0.7	1.1	1.0	0.8	1.1	0.8	1.1	1.3	1.1	0.3	0.4
1941	0.4	0.7	1.1	0.8	0.6	0.9	0.8	1.0	1.1	1.0	0.3	0.4
1942	0.4	0.7	1.1	0.3	0.2	1.1	0.8	0.5	0.1	1.1	0.3	0.4
1943	0.4	0.4	1.0	0.6	0.5	1.1	0.8	0.6	0.4	1.1	0.3	0.4
1944	0.3	0.5	0.8	0.7	0.6	1.3	0.8	0.5	0.2	1.1	0.3	0.4
1945	0.1	0.6	1.1	0.5	0.4	1.1	0.9	0.5	0.1	0.8	0.3	0.4
1946	0.4	0.4	1.1	0.3	0.2	1.0	0.8	0.7	0.5	0.6	0.3	0.4
1947	0.4	0.6	1.1	0.3	0.2	1.3	0.8	0.8	0.7	1.1	0.3	0.4
1948	0.4	0.6	1.1	0.5	0.4	1.1	0.8	0.7	0.5	0.9	0.3	0.4
1949	0.4	0.5	1.1	0.4	0.3	1.3	1.1	1.1	1.1	0.8	0.3	0.3
1950	0.3	0.6	0.8	0.9	0.7	1.0	0.8	1.2	1.6	1.1	0.3	0.3
1951	0.4	0.6	0.9	1.0	0.8	1.1	1.0	1.2	1.3	1.1	0.3	0.4
1952	0.4	0.6	0.7	0.6	0.5	1.3	1.0	0.8	0.6	1.1	0.3	0.4
1953	0.3	0.7	0.8	0.9	0.7	1.1	0.8	0.7	0.5	1.1	0.3	0.4
1954	0.4	0.6	1.1	1.0	0.8	1.0	0.8	1.0	1.2	1.1	0.3	0.4
1955	0.4	0.7	0.9	0.8	0.6	1.3	0.9	0.9	0.9	1.1	0.3	0.3
1956	0.3	0.5	0.8	0.7	0.6	1.0	0.8	0.9	0.9	1.0	0.3	0.3
1957	0.2	0.7	1.0	1.0	0.8	1.3	1.2	1.4	1.6	1.1	0.3	0.3
1958	0.4	0.7	1.0	0.8	0.6	1.3	1.4	1.1	0.7	1.0	0.3	0.4
1959	0.3	0.7	1.0	0.9	0.7	1.3	1.4	1.1	0.7	0.9	0.3	0.4
1960	0.4	0.6	0.8	0.9	0.7	1.1	0.8	0.9	1.0	1.0	0.3	0.4
1961	0.4	0.3	1.0	0.9	0.7	1.0	0.8	1.0	1.1	0.5	0.3	0.3
1962	0.2	0.3	0.8	0.4	0.3	1.0	1.7	1.5	1.3	1.1	0.3	0.3
1963	0.4	0.7	0.7	0.7	0.6	1.1	1.1	1.0	0.8	1.0	0.3	0.3
1964	0.4	0.7	1.1	0.6	0.5	1.0	0.8	0.8	0.7	1.1	0.3	0.4
1965	0.4	0.6	1.0	0.8	0.6	0.9	0.9	1.2	1.4	1.0	0.3	0.4
1966	0.3	0.5	1.1	1.0	0.8	1.3	0.8	1.2	1.6	1.1	0.3	0.3
1967	0.4	0.7	0.8	0.7	0.6	1.1	0.8	0.9	1.0	1.1	0.3	0.4
1968	0.3	0.6	0.8	0.9	0.7	1.0	0.8	1.1	1.4	0.7	0.3	0.4
1969	0.4	0.7	0.8	0.9	0.7	1.3	1.0	1.0	1.0	1.0	0.3	0.4
1970	0.3	0.6	1.0	0.8	0.6	1.1	0.8	0.8	0.8	1.1	0.3	0.4
1971	0.4	0.6	1.0	0.1	0.1	0.9	1.5	1.5	1.5	0.9	0.3	0.4
1972	0.4	0.5	0.6	0.8	0.6	1.1	0.8	0.8	0.7	0.8	0.3	0.4
1973	0.3	0.5	0.8	0.9	0.7	0.9	0.8	0.4	0.0	0.7	0.3	0.4
1974	0.4	0.6	1.0	0.8	0.6	1.4	1.0	0.9	0.7	1.1	0.3	0.3
1975	0.3	0.6	1.1	0.7	0.6	1.3	0.8	0.6	0.3	1.0	0.3	0.4
1976	0.3	0.6	1.1	0.6	0.5	0.9	0.8	0.8	0.8	1.1	0.3	0.4
1977	0.4	0.6	1.0	0.4	0.3	1.0	0.8	1.1	1.3	1.1	0.3	0.3
1978	0.4	0.6	0.7	0.8	0.6	1.0	0.8	0.9	0.9	0.7	0.3	0.3
1979	0.4	0.5	1.1	0.8	0.6	1.0	0.8	1.0	1.2	1.1	0.3	0.1
1980	0.4	0.6	0.8	1.0	0.8	0.9	1.0	0.9	0.8	0.9	0.3	0.3
1981	0.4	0.7	0.7	0.4	0.3	1.3	0.9	0.7	0.5	1.1	0.3	0.4
1982	0.4	0.5	0.9	0.7	0.6	1.1	1.3	1.1	0.9	1.1	0.3	0.3
1983	0.3	0.7	0.9	0.6	0.5	1.4	0.8	0.5	0.2	0.7	0.3	0.3
1984	0.4	0.6	1.0	0.7	0.6	1.0	1.2	0.8	0.3	1.1	0.3	0.3
1985	0.4	0.7	1.1	0.9	0.7	1.3	0.8	0.4	0.0	0.5	0.3	0.1
1986	0.4	0.5	1.0	0.5	0.4	0.9	0.8	0.7	0.5	0.9	0.3	0.2
Ave.	0.4	0.6	0.9	0.7	0.6	1.1	0.9	0.9	0.8	1.0	0.3	0.3

Table C-7.4 ESTIMATEED IRRIGATION WATER REQUIREMENT (2/6)

(2) Irrigation Systens in Bagmati Kh. Basin Unit:l/sec

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1940	0.4	0.7	1.1	1.0	0.8	1.1	0.8	1.1	1.3	1.1	0.3	0.4
1941	0.4	0.7	1.1	0.8	0.6	0.9	1.0	1.1	1.1	1.0	0.3	0.4
1942	0.4	0.7	1.1	0.4	0.3	1.1	0.8	0.6	0.3	1.1	0.3	0.4
1943	0.4	0.4	1.0	0.6	0.5	1.1	0.8	0.7	0.5	1.1	0.3	0.4
1944	0.3	0.5	0.8	0.7	0.6	1.3	0.8	0.6	0.3	1.1	0.3	0.4
1945	0.1	0.6	1.1	0.5	0.4	1.1	1.1	0.7	0.2	0.8	0.3	0.4
1946	0.4	0.4	1.1	0.3	0.2	1.1	0.8	0.7	0.6	0.6	0.3	0.4
1947	0.4	0.6	1.1	0.3	0.2	1.3	0.8	0.8	0.7	1.1	0.3	0.4
1948	0.4	0.6	1.1	0.6	0.5	1.1	0.8	0.7	0.6	0.9	0.3	0.4
1949	0.4	0.5	1.1	0.5	0.4	1.3	1.2	1.2	1.2	0.9	0.3	0.3
1950	0.4	0.6	0.9	0.9	0.7	1.0	0.8	1.2	1.6	1.1	0.3	0.3
1951	0.4	0.5	1.0	1.0	0.8	1.1	1.1	1.2	1.3	1.1	0.3	0.4
1952	0.4	0.6	0.7	0.7	0.6	1.3	1.1	0.9	0.7	1.1	0.3	0.4
1953	0.4	0.7	0.9	1.0	0.8	1.3	0.8	0.7	0.6	1.1	0.3	0.4
1954	0.4	0.6	1.1	1.0	0.8	1.1	0.8	1.0	1.2	1.1	0.3	0.4
1955	0.4	0.7	1.0	0.8	0.6	1.3	1.0	1.0	1.0	1.1	0.3	0.3
1956	0.3	0.5	0.8	0.7	0.6	1.0	0.8	0.9	0.9	1.0	0.3	0.3
1957	0.2	0.7	1.0	1.0	0.8	1.3	1.3	1.5	1.6	1.1	0.3	0.3
1958	0.4	0.7	1.0	0.8	0.6	1.3	1.5	1.2	0.8	1.0	0.3	0.4
1959	0.3	0.7	1.0	0.9	0.7	1.3	1.5	1.1	0.7	0.9	0.3	0.4
1960	0.4	0.6	0.7	0.9	0.7	1.1	0.9	1.0	1.0	1.0	0.3	0.4
1961	0.4	0.4	1.0	0.9	0.7	1.0	0.8	1.0	1.2	0.5	0.3	0.3
1962	0.2	0.4	0.9	0.5	0.4	1.0	1.7	1.6	1.4	1.1	0.3	0.3
1963	0.4	0.7	0.8	0.7	0.6	1.1	1.2	1.1	0.9	1.0	0.3	0.3
1964	0.4	0.7	1.1	0.6	0.5	1.1	0.8	0.8	0.8	1.1	0.3	0.3
1965	0.4	0.7	1.0	0.8	0.6	1.0	1.0	1.2	1.4	1.0	0.3	0.4
1966	0.3	0.5	1.1	1.0	0.8	1.3	0.8	1.2	1.6	1.1	0.3	0.3
1967	0.4	0.7	0.8	0.7	0.6	1.1	0.8	1.0	1.1	1.1	0.3	0.4
1968	0.3	0.6	0.8	0.9	0.7	1.0	0.8	1.1	1.3	0.6	0.3	0.4
1969	0.4	0.7	0.8	0.9	0.7	1.3	1.1	1.0	0.9	1.0	0.3	0.4
1970	0.3	0.5	0.9	0.8	0.6	1.1	0.8	0.9	0.9	1.0	0.3	0.4
1971	0.4	0.6	0.9	0.1	0.1	0.9	1.6	1.6	1.6	0.9	0.3	0.4
1972	0.4	0.5	0.6	0.9	0.7	1.3	0.8	0.9	0.9	0.9	0.3	0.4
1973	0.3	0.5	0.8	0.9	0.7	1.0	0.8	0.5	0.1	0.7	0.3	0.4
1974	0.4	0.6	1.0	0.9	0.7	1.4	0.9	0.8	0.7	1.0	0.3	0.3
1975	0.3	0.5	1.1	0.8	0.6	1.3	0.8	0.6	0.4	1.1	0.3	0.4
1976	0.3	0.6	1.1	0.7	0.6	0.9	0.9	0.9	0.9	1.1	0.3	0.4
1977	0.4	0.6	1.0	0.5	0.4	1.0	1.0	1.2	1.4	1.1	0.3	0.3
1978	0.4	0.6	0.7	0.8	0.6	1.0	1.0	1.0	1.0	0.8	0.3	0.3
1979	0.4	0.5	1.1	0.8	0.6	1.1	0.8	1.1	1.3	1.1	0.3	0.1
1980	0.4	0.6	0.8	1.0	0.8	0.9	1.1	1.0	0.8	0.9	0.3	0.3
1981	0.4	0.7	0.8	0.5	0.4	1.3	1.1	0.9	0.6	1.1	0.3	0.4
1982	0.4	0.6	0.9	0.8	0.6	1.1	1.4	1.2	1.0	1.1	0.3	0.3
1983	0.4	0.7	0.9	0.6	0.5	1.4	0.8	0.6	0.3	0.7	0.3	0.3
1984	0.4	0.6	1.0	0.7	0.6	1.0	1.4	0.9	0.4	1.1	0.3	0.3
1985	0.4	0.7	1.1	0.9	0.7	1.3	0.8	0.4	0.0	0.6	0.3	0.1
1986	0.4	0.6	1.0	0.5	0.4	1.0	0.8	0.7	0.6	0.9	0.3	0.2
Ave.	0.4	0.6	0.9	0.7	0.6	1.1	1.0	0.9	0.9	1.0	0.3	0.3

Table C-7.4 ESTIMATED IRRIGATION WATER REQUIREMENT (3/6)

(3) Irrigation Systems in Manohara Kh. Basin Unit:l/sec

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1940	0.4	0.7	1.1	1.0	0.8	1.0	0.8	1.0	1.1	1.1	0.3	0.4
1941	0.4	0.7	1.1	0.7	0.6	0.9	0.8	0.8	0.8	1.0	0.3	0.4
1942	0.4	0.7	1.1	0.1	0.1	1.0	0.8	0.4	0.0	1.1	0.3	0.4
1943	0.4	0.4	1.0	0.4	0.3	1.0	0.8	0.4	0.0	1.1	0.3	0.4
1944	0.3	0.4	0.7	0.6	0.5	1.1	0.8	0.4	0.0	1.1	0.3	0.4
1945	0.0	0.6	1.1	0.3	0.2	1.0	0.8	0.4	0.0	0.7	0.3	0.4
1946	0.4	0.4	1.0	0.0	0.0	0.9	0.8	0.5	0.1	0.4	0.3	0.4
1947	0.4	0.6	1.1	0.1	0.1	1.3	0.8	0.4	0.0	1.1	0.3	0.4
1948	0.4	0.6	1.0	0.3	0.2	0.9	0.8	0.4	0.0	0.7	0.3	0.4
1949	0.4	0.4	1.0	0.4	0.3	1.1	0.8	0.8	0.8	0.8	0.3	0.4
1950	0.4	0.6	1.0	1.0	0.8	1.0	0.9	1.0	1.1	1.1	0.3	0.3
1951	0.4	0.6	1.0	0.9	0.7	1.3	0.8	0.8	0.8	1.1	0.3	0.4
1952	0.4	0.6	0.9	0.8	0.6	1.1	0.8	0.5	0.1	1.1	0.3	0.4
1953	0.3	0.6	0.7	0.9	0.7	0.9	0.8	0.7	0.5	1.1	0.3	0.4
1954	0.4	0.6	1.1	1.0	0.8	0.9	0.8	0.4	0.0	1.1	0.3	0.4
1955	0.4	0.7	0.9	0.9	0.7	1.0	0.8	0.6	0.3	1.1	0.3	0.4
1956	0.4	0.7	1.1	1.0	0.8	0.9	0.8	0.8	0.7	0.8	0.3	0.4
1957	0.3	0.7	1.0	1.0	0.8	1.3	0.8	1.0	1.2	1.1	0.3	0.4
1958	0.3	0.7	1.0	0.7	0.6	1.3	1.2	1.1	0.9	0.8	0.3	0.4
1959	0.4	0.7	1.1	0.8	0.6	1.3	1.0	0.5	0.0	1.0	0.3	0.4
1960	0.4	0.6	0.8	1.0	0.8	1.1	0.8	0.9	1.0	1.0	0.3	0.4
1961	0.3	0.7	0.5	1.0	0.8	1.1	0.8	0.9	1.0	1.1	0.3	0.4
1962	0.3	0.7	1.0	0.3	0.2	0.9	0.8	0.5	0.2	1.1	0.3	0.4
1963	0.4	0.6	1.1	0.9	0.7	1.0	0.8	0.6	0.3	1.0	0.3	0.4
1964	0.4	0.7	1.1	0.7	0.6	1.1	1.0	0.8	0.5	1.0	0.3	0.4
1965	0.4	0.6	1.1	1.0	0.8	1.1	0.8	1.0	1.1	0.8	0.3	0.4
1966	0.3	0.5	1.1	1.0	0.8	1.0	0.8	0.9	1.0	1.1	0.3	0.4
1967	0.4	0.7	1.0	0.5	0.4	1.0	0.8	0.7	0.5	1.1	0.3	0.4
1968	0.3	0.6	0.8	0.8	0.6	0.9	0.8	0.9	0.9	0.8	0.3	0.4
1969	0.3	0.7	0.9	0.9	0.7	1.4	0.8	0.4	0.0	0.9	0.3	0.4
1970	0.3	0.5	1.0	0.7	0.6	1.0	0.8	0.7	0.5	1.0	0.3	0.4
1971	0.4	0.6	0.8	0.5	0.4	0.9	0.8	0.8	0.8	0.5	0.3	0.4
1972	0.4	0.5	0.5	0.9	0.7	0.9	0.8	0.5	0.1	0.9	0.3	0.4
1973	0.3	0.5	0.7	0.8	0.6	0.9	0.8	0.4	0.0	0.6	0.3	0.4
1974	0.4	0.6	0.9	0.8	0.6	1.1	0.8	0.6	0.3	1.1	0.3	0.3
1975	0.3	0.5	1.1	0.4	0.3	1.0	0.8	0.4	0.0	0.7	0.3	0.4
1976	0.3	0.6	1.1	0.6	0.5	0.9	0.8	0.5	0.1	1.1	0.3	0.4
1977	0.4	0.6	1.0	0.6	0.5	1.0	0.8	1.1	1.3	0.9	0.3	0.2
1978	0.4	0.6	0.5	0.9	0.7	0.9	0.8	0.4	0.0	0.9	0.3	0.3
1979	0.4	0.3	1.1	0.6	0.5	1.0	0.8	0.9	1.0	1.0	0.3	0.3
1980	0.4	0.6	1.0	1.0	0.8	0.9	0.8	1.1	1.3	1.1	0.3	0.4
1981	0.4	0.7	1.0	0.6	0.5	1.4	1.1	1.4	1.6	1.1	0.3	0.4
1982	0.4	0.0	1.0	0.8	0.6	1.1	0.8	0.4	0.0	1.1	0.3	0.4
1983	0.4	0.6	1.0	0.7	0.6	1.3	0.8	0.4	0.0	0.3	0.3	0.3
1984	0.3	0.6	1.1	0.9	0.7	1.0	0.8	0.4	0.0	1.1	0.3	0.3
1985	0.4	0.7	1.1	0.8	0.6	1.1	0.8	0.5	0.1	0.7	0.3	0.2
1986	0.4	0.6	1.1	0.6	0.5	0.9	0.8	0.4	0.0	1.0	0.3	0.3
Ave.	0.4	0.6	1.0	0.7	0.6	1.0	0.8	0.6	0.5	0.9	0.3	0.3

Table C-7.4 ESTIMATED IRRIGATION WATER REQUIREMENT (4/6)

(4) Irrigation Systems in Hanumante Kh. Basin Unit:l/sec

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1940	0.4	0.7	1.1	1.0	0.8	1.1	0.8	1.0	1.2	1.1	0.3	0.4
1941	0.4	0.7	1.1	0.8	0.6	0.9	0.8	0.9	1.0	1.0	0.3	0.4
1942	0.4	0.7	1.1	0.2	0.2	1.0	0.8	0.4	0.0	1.1	0.3	0.4
1943	0.4	0.4	1.0	0.4	0.3	1.0	0.8	0.5	0.2	1.1	0.3	0.4
1944	0.3	0.5	0.7	0.6	0.5	1.1	0.8	0.5	0.1	1.1	0.3	0.4
1945	0.1	0.6	1.1	0.4	0.3	1.1	0.8	0.4	0.0	0.7	0.3	0.4
1946	0.4	0.4	1.1	0.1	0.1	1.0	0.8	0.6	0.4	0.5	0.3	0.4
1947	0.4	0.6	1.1	0.2	0.2	1.3	0.8	0.7	0.5	1.1	0.3	0.4
1948	0.4	0.6	1.1	0.4	0.3	1.0	0.8	0.6	0.3	0.9	0.2	0.4
1949	0.4	0.4	1.1	0.3	0.2	1.3	0.9	1.0	1.1	0.8	0.3	0.3
1950	0.3	0.5	0.8	0.9	0.7	0.9	0.8	1.2	1.5	1.1	0.3	0.3
1951	0.4	0.5	0.9	0.9	0.7	1.0	0.8	1.0	1.2	1.1	0.3	0.4
1952	0.4	0.6	0.7	0.6	0.5	1.3	0.8	0.7	0.5	1.1	0.3	0.4
1953	0.3	0.7	0.8	0.9	0.7	1.1	0.8	0.6	0.3	1.1	0.3	0.4
1954	0.4	0.6	1.1	1.0	0.8	1.0	0.8	1.0	1.1	1.1	0.3	0.4
1955	0.4	0.7	0.9	0.8	0.6	1.1	0.8	0.8	0.8	1.1	0.3	0.4
1956	0.3	0.5	0.8	0.7	0.6	0.9	0.8	0.8	0.7	0.9	0.2	0.4
1957	0.1	0.7	1.0	1.0	0.8	1.3	1.1	1.4	1.6	1.1	0.3	0.3
1958	0.4	0.7	1.0	0.8	0.6	1.3	1.2	0.9	0.6	1.0	0.3	0.4
1959	0.2	0.7	1.0	0.9	0.7	1.1	1.3	0.9	0.5	0.8	0.3	0.4
1960	0.4	0.6	0.6	0.9	0.7	1.1	0.8	0.9	0.9	1.0	0.3	0.4
1961	0.4	0.3	1.0	0.9	0.7	1.0	0.8	0.9	1.0	0.4	0.3	0.3
1962	0.1	0.3	0.8	0.3	0.2	0.9	1.6	1.5	1.3	1.1	0.3	0.4
1963	0.4	0.7	0.7	0.6	0.5	1.1	0.9	0.8	0.7	1.0	0.3	0.4
1964	0.4	0.7	1.1	0.5	0.4	1.0	0.8	0.7	0.6	1.1	0.3	0.3
1965	0.4	0.6	1.0	0.8	0.6	0.9	0.8	1.1	1.3	0.9	0.2	0.4
1966	0.3	0.4	1.1	1.0	0.8	1.3	0.8	1.2	1.5	1.1	0.3	0.4
1967	0.4	0.7	0.8	0.6	0.5	1.0	0.8	0.9	1.0	1.1	0.3	0.4
1968	0.3	0.6	0.8	0.8	0.6	0.9	0.8	1.0	1.2	0.5	0.3	0.4
1969	0.4	0.7	0.8	0.8	0.6	1.1	0.8	0.8	0.7	1.0	0.3	0.4
1970	0.3	0.5	0.9	0.8	0.6	1.1	0.8	0.8	0.8	0.9	0.3	0.4
1971	0.4	0.6	0.9	0.0	0.0	0.9	1.1	1.3	1.5	0.8	0.3	0.4
1972	0.4	0.6	0.7	0.8	0.6	1.1	0.8	0.6	0.4	0.8	0.3	0.4
1973	0.3	0.4	0.7	0.8	0.6	0.9	0.9	0.6	0.2	0.6	0.3	0.4
1974	0.4	0.6	1.0	0.8	0.6	1.4	0.8	0.8	0.7	1.0	0.3	0.3
1975	0.3	0.5	1.1	0.8	0.6	1.3	0.9	0.5	0.0	1.0	0.3	0.4
1976	0.3	0.6	1.1	0.6	0.5	1.0	1.2	1.0	0.8	1.1	0.3	0.4
1977	0.4	0.6	1.0	0.6	0.5	1.0	1.3	1.3	1.2	1.0	0.3	0.2
1978	0.4	0.6	0.6	0.6	0.5	1.0	0.8	0.9	0.9	0.8	0.3	0.4
1979	0.4	0.5	1.1	0.9	0.7	1.0	0.8	1.2	1.5	1.1	0.3	0.2
1980	0.4	0.6	1.0	1.0	0.8	1.1	0.9	1.1	1.2	0.9	0.3	0.4
1981	0.4	0.7	0.9	0.5	0.4	1.3	1.0	0.8	0.6	1.1	0.3	0.4
1982	0.4	0.6	0.7	0.8	0.6	1.3	1.3	1.3	1.2	1.0	0.3	0.4
1983	0.4	0.6	1.0	0.0	0.0	1.4	0.8	0.6	0.4	0.7	0.3	0.3
1984	0.3	0.5	1.0	0.3	0.2	1.0	0.8	0.6	0.3	1.1	0.3	0.3
1985	0.4	0.6	1.1	0.8	0.6	1.0	0.8	0.4	0.0	0.5	0.3	0.1
1986	0.4	0.5	1.0	0.8	0.6	0.9	0.8	0.6	0.3	1.0	0.3	0.1
Ave.	0.4	0.6	0.9	0.7	0.5	1.1	0.9	0.8	0.8	0.9	0.3	0.3

Table C-7.4 ESTIMATED IRRIGATION WATER REQUIREMENT (5/6)

(5) Irrigation Systems in Godavari and Nakhu Kh. Basin Unit:l/sec

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1940	0.5	0.6	1.1	1.1	0.9	1.1	0.8	1.1	1.4	1.1	0.3	0.3
1941	0.4	0.6	1.1	0.9	0.7	0.9	1.2	1.2	1.2	1.1	0.3	0.3
1942	0.5	0.6	1.1	0.5	0.4	1.1	0.8	0.6	0.4	1.1	0.3	0.3
1943	0.4	0.4	1.0	0.6	0.5	1.1	0.8	0.7	0.6	1.1	0.3	0.3
1944	0.4	0.5	0.8	0.7	0.6	1.3	1.0	0.8	0.5	1.1	0.3	0.3
1945	0.2	0.6	1.1	0.6	0.5	1.1	1.2	0.8	0.4	0.9	0.3	0.3
1946	0.5	0.4	1.1	0.4	0.3	1.1	0.8	0.8	0.7	0.7	0.3	0.3
1947	0.4	0.6	1.1	0.4	0.3	1.3	0.8	0.9	0.9	1.1	0.3	0.3
1948	0.5	0.5	1.1	0.6	0.5	1.1	0.8	0.8	0.7	1.0	0.2	0.3
1949	0.5	0.4	1.1	0.5	0.4	1.4	1.3	1.3	1.2	0.9	0.3	0.3
1950	0.4	0.5	0.9	0.9	0.7	1.0	0.8	1.2	1.6	1.1	0.3	0.3
1951	0.4	0.5	1.0	1.0	0.8	1.1	1.3	1.4	1.4	1.1	0.3	0.3
1952	0.5	0.6	0.8	0.7	0.6	1.3	1.3	1.1	0.8	1.1	0.3	0.3
1953	0.4	0.6	0.9	1.0	0.8	1.3	0.8	0.8	0.7	1.1	0.3	0.3
1954	0.5	0.6	1.1	1.0	0.8	1.1	0.8	1.1	1.3	1.1	0.3	0.3
1955	0.4	0.6	1.0	0.9	0.7	1.3	1.2	1.1	1.0	1.1	0.3	0.3
1956	0.4	0.5	0.9	0.8	0.6	1.0	0.8	0.9	1.0	1.0	0.2	0.3
1957	0.2	0.6	1.0	1.0	0.8	1.4	1.5	1.6	1.7	1.1	0.3	0.3
1958	0.4	0.6	1.0	0.9	0.7	1.4	1.6	1.3	0.9	1.0	0.3	0.3
1959	0.3	0.6	1.0	0.9	0.7	1.3	1.6	1.3	0.9	0.9	0.3	0.3
1960	0.5	0.6	0.7	1.0	0.8	1.3	1.1	1.1	1.1	1.1	0.3	0.3
1961	0.4	0.4	1.0	0.9	0.7	1.1	0.9	1.1	1.2	0.6	0.3	0.3
1962	0.2	0.4	0.9	0.5	0.4	1.1	1.8	1.6	1.4	1.1	0.3	0.3
1963	0.4	0.6	0.8	0.7	0.6	1.3	1.3	1.2	1.0	1.1	0.2	0.3
1964	0.5	0.6	1.0	0.7	0.6	1.1	0.8	0.9	0.9	1.1	0.3	0.3
1965	0.5	0.6	1.0	0.9	0.7	1.0	1.2	1.3	1.4	1.0	0.2	0.3
1966	0.3	0.5	1.1	1.0	0.8	1.3	0.9	1.3	1.6	1.1	0.3	0.3
1967	0.5	0.6	0.8	0.8	0.6	1.3	1.2	1.1	0.9	1.1	0.3	0.3
1968	0.4	0.6	1.0	0.9	0.7	1.0	0.8	1.1	1.4	0.7	0.3	0.3
1969	0.4	0.6	0.8	0.9	0.7	1.4	1.4	1.2	1.0	1.1	0.3	0.3
1970	0.3	0.4	0.9	0.7	0.6	1.1	0.8	1.0	1.2	1.1	0.3	0.3
1971	0.5	0.6	1.0	0.1	0.1	0.9	1.4	1.5	1.5	0.9	0.3	0.3
1972	0.5	0.5	0.8	0.9	0.7	1.3	0.8	0.8	0.7	0.9	0.3	0.3
1973	0.4	0.5	0.9	1.0	0.8	1.1	1.0	0.7	0.4	0.7	0.3	0.3
1974	0.4	0.6	1.0	0.9	0.7	1.4	1.1	1.0	0.8	1.0	0.3	0.3
1975	0.3	0.5	1.1	0.8	0.6	1.3	0.8	0.7	0.5	1.1	0.3	0.3
1976	0.3	0.6	1.1	0.8	0.6	1.0	1.4	1.3	1.2	1.1	0.3	0.3
1977	0.4	0.6	1.0	0.5	0.4	1.1	1.2	1.4	1.5	1.1	0.3	0.1
1978	0.5	0.5	0.7	0.9	0.7	1.0	0.8	0.8	0.7	0.8	0.3	0.3
1979	0.5	0.4	1.1	0.8	0.6	1.3	1.1	1.4	1.6	1.1	0.3	0.1
1980	0.5	0.6	0.9	1.0	0.8	1.1	1.2	1.2	1.2	1.1	0.3	0.3
1981	0.4	0.6	0.9	0.5	0.4	1.3	1.3	0.9	0.5	1.1	0.2	0.3
1982	0.4	0.6	0.9	0.4	0.3	1.3	1.4	1.3	1.1	1.1	0.2	0.3
1983	0.4	0.6	1.1	0.6	0.5	1.4	0.8	0.8	0.7	0.6	0.3	0.3
1984	0.4	0.6	1.0	0.8	0.6	1.1	1.2	0.7	0.2	1.1	0.3	0.3
1985	0.4	0.6	1.1	0.9	0.7	1.3	0.8	0.5	0.1	0.5	0.3	0.1
1986	0.5	0.5	1.0	0.5	0.4	1.0	1.1	0.9	0.7	1.0	0.3	0.1
Ave.	0.4	0.6	1.0	0.8	0.6	1.2	1.1	1.0	1.0	1.0	0.3	0.3

Table C-7.4 ESTIMATED IRRIGATION WATER REQUIREMENT (6/6)

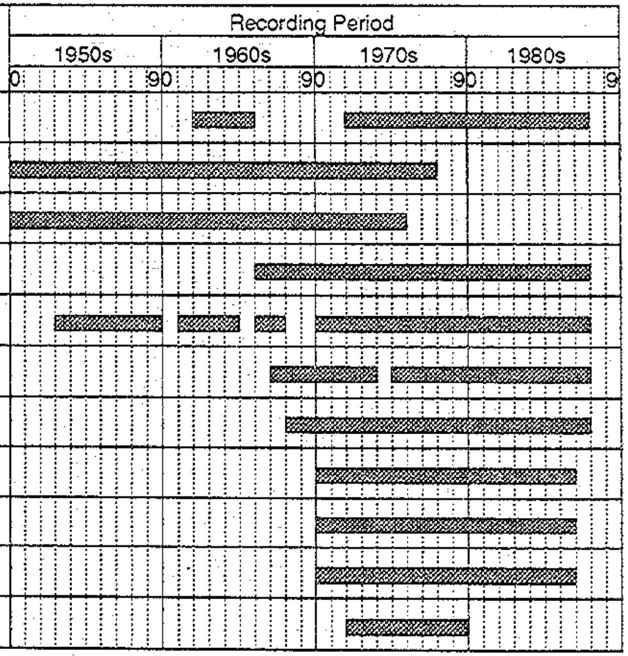
(6) Irrigation Systems in Balkhu Kh. Basin Unit:l/sec

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1940	0.4	0.7	1.1	1.0	0.8	1.1	0.8	1.1	1.4	1.1	0.3	0.4
1941	0.4	0.7	1.1	0.9	0.7	0.9	1.2	1.2	1.2	1.1	0.3	0.4
1942	0.4	0.7	1.1	0.5	0.4	1.1	0.8	0.6	0.4	1.1	0.3	0.4
1943	0.4	0.5	1.0	0.6	0.5	1.1	0.8	0.7	0.6	1.1	0.3	0.4
1944	0.3	0.5	0.8	0.7	0.6	1.3	1.0	0.8	0.5	1.1	0.3	0.4
1945	0.2	0.6	1.1	0.6	0.5	1.1	1.2	0.8	0.4	0.9	0.3	0.4
1946	0.4	0.5	1.1	0.3	0.2	1.1	0.8	0.8	0.7	0.7	0.3	0.4
1947	0.4	0.6	1.1	0.4	0.3	1.3	0.8	0.9	0.9	1.1	0.3	0.4
1948	0.4	0.6	1.1	0.6	0.5	1.1	0.8	0.8	0.7	1.0	0.3	0.4
1949	0.4	0.5	1.1	0.5	0.4	1.4	1.3	1.3	1.2	0.9	0.3	0.3
1950	0.4	0.6	0.9	0.9	0.7	1.0	0.8	1.2	1.6	1.1	0.3	0.3
1951	0.4	0.6	1.0	1.0	0.8	1.1	1.3	1.4	1.4	1.1	0.3	0.4
1952	0.4	0.6	0.8	0.7	0.6	1.3	1.3	1.1	0.8	1.1	0.3	0.4
1953	0.4	0.7	0.9	1.0	0.8	1.3	0.8	0.8	0.7	1.1	0.3	0.4
1954	0.4	0.6	1.1	1.0	0.8	1.1	0.8	1.1	1.3	1.1	0.3	0.4
1955	0.4	0.7	1.0	0.8	0.6	1.3	1.2	1.1	1.0	1.1	0.3	0.3
1956	0.4	0.6	0.9	0.8	0.6	1.0	0.8	0.9	1.0	1.0	0.3	0.3
1957	0.2	0.7	1.0	1.0	0.8	1.4	1.5	1.6	1.7	1.1	0.3	0.3
1958	0.4	0.7	1.0	0.9	0.7	1.4	1.6	1.3	0.9	1.0	0.3	0.4
1959	0.3	0.7	1.0	0.9	0.7	1.3	1.6	1.3	0.9	0.9	0.3	0.4
1960	0.4	0.6	0.7	1.0	0.8	1.3	1.1	1.1	1.1	1.1	0.3	0.4
1961	0.4	0.4	1.0	0.9	0.7	1.1	0.9	1.1	1.2	0.6	0.3	0.3
1962	0.2	0.4	0.9	0.5	0.4	1.1	1.8	1.6	1.4	1.1	0.3	0.3
1963	0.4	0.7	0.8	0.7	0.6	1.3	1.3	1.2	1.0	1.1	0.3	0.3
1964	0.4	0.7	1.1	0.7	0.6	1.1	0.8	0.9	0.9	1.1	0.3	0.3
1965	0.4	0.7	1.0	0.9	0.7	1.0	1.2	1.3	1.4	1.0	0.3	0.4
1966	0.3	0.5	1.1	1.0	0.8	1.3	0.9	1.3	1.6	1.1	0.3	0.3
1967	0.4	0.7	0.9	0.8	0.6	1.3	1.2	1.1	0.9	1.1	0.3	0.4
1968	0.3	0.6	1.0	0.9	0.7	1.0	0.8	1.1	1.4	0.7	0.3	0.4
1969	0.4	0.7	0.8	0.9	0.7	1.4	1.4	1.2	1.0	1.1	0.3	0.4
1970	0.3	0.5	1.0	0.7	0.6	1.1	0.8	1.0	1.2	1.1	0.3	0.4
1971	0.4	0.6	1.0	0.1	0.1	0.9	1.4	1.5	1.5	0.9	0.3	0.4
1972	0.4	0.5	0.9	0.9	0.7	1.3	0.8	0.8	0.7	0.9	0.3	0.4
1973	0.3	0.5	0.9	1.0	0.8	1.1	1.0	0.7	0.4	0.7	0.3	0.4
1974	0.4	0.6	1.0	0.9	0.7	1.4	1.1	1.0	0.8	1.0	0.3	0.3
1975	0.3	0.5	1.1	0.7	0.6	1.3	0.8	0.7	0.5	1.1	0.3	0.4
1976	0.3	0.6	1.1	0.8	0.6	1.0	1.4	1.3	1.2	1.1	0.3	0.4
1977	0.4	0.6	1.1	0.5	0.4	1.1	1.2	1.4	1.5	1.1	0.3	0.2
1978	0.4	0.6	0.7	0.9	0.7	1.0	0.8	0.8	0.7	0.8	0.3	0.4
1979	0.4	0.5	1.1	0.8	0.6	1.3	1.1	1.4	1.6	1.1	0.3	0.1
1980	0.4	0.6	0.9	1.0	0.8	1.1	1.2	1.2	1.2	1.1	0.3	0.3
1981	0.4	0.7	0.9	0.5	0.4	1.3	1.3	0.9	0.5	1.1	0.3	0.4
1982	0.4	0.6	0.9	0.4	0.3	1.3	1.4	1.3	1.1	1.1	0.3	0.3
1983	0.4	0.7	1.1	0.6	0.5	1.4	0.8	0.8	0.7	0.6	0.3	0.3
1984	0.4	0.6	1.0	0.8	0.6	1.1	1.2	0.7	0.2	1.1	0.3	0.3
1985	0.4	0.7	1.1	0.8	0.6	1.3	0.8	0.5	0.1	0.5	0.3	0.1
1986	0.4	0.5	1.0	0.5	0.4	1.0	1.1	0.9	0.7	1.0	0.3	0.2
Ave.	0.4	0.6	1.0	0.7	0.6	1.2	1.1	1.0	1.0	1.0	0.3	0.3

FIGURES

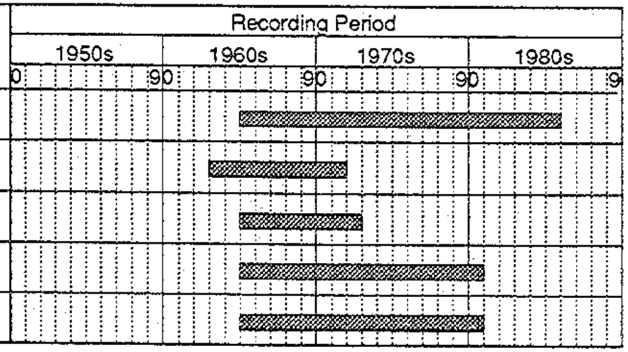
1. Daily Rainfall

Stn. No.	Station Name	Latitude	Longitude	Artitude (m)	
21007	Kakani	27°48'	85°15'	2,064	
21013	Sundarijal Water Res.	27°47'	85°26'	1,576	from 1939
21014	Indian Embassy	27°44'	85°20'	1,324	from 1946
21015	Thankot	27°41'	85°12'	1,630	
21022	Godavari	27°35'	85°24'	1,400	
21029	Khumaltar	27°40'	85°20'	1,350	
21030	Kathmandu Airport	27°42'	85°22'	1,336	
21035	Sankhu	27°44'	85°28'	1,463	
21043	Nakarkot	27°42'	85°31'	2,150	
21052	Bhaktapur	27°44'	85°25'	1,330	
21056	Tokha	27°48'	85°26'	1,790	



2. Daily Discharge

Stn. No.	Station Name	Latitude	Longitude	Artitude (m)	Catchment Area (km^2)
505	Sundarijal	27°46'30"	85°25'40"	Bagmati	16.0
507	Mahankal	27°46'20"	85°26'10"	Nagmati	13.7
530	Gauri Ghat	27°42'30"	85°21'00"	Bagmati	67.8
540	Tika Bhairab	27°34'30"	85°18'50"	Nakhu	42.5
550	Cobhar	27°39'40"	85°15'50"	Bagmati	585.0

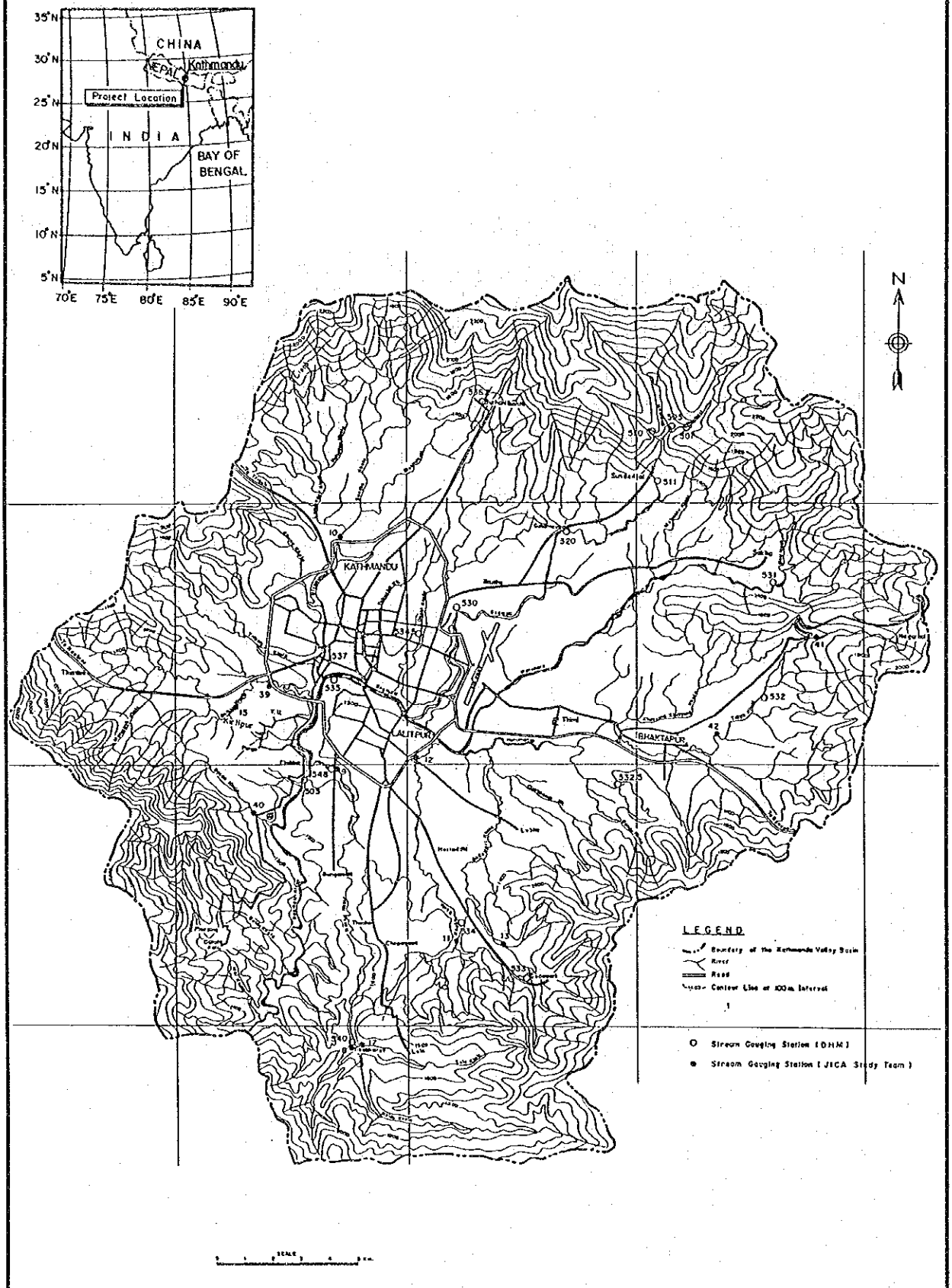


HIS MAJESTY'S GOVERNMENT OF NEPAL
GROUND WATER MANAGEMENT PROJECT
IN THE KATHMANDU VALLEY

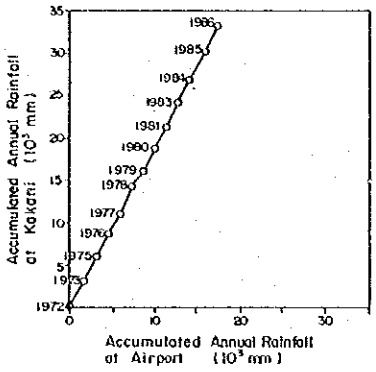
JAPAN INTERNATIONAL COOPERATION AGENCY

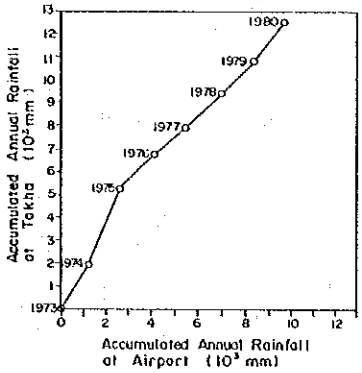
Fig. C-2.1

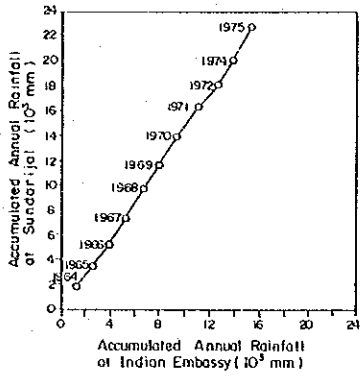
DURATION OF RECORDS AT RAINFALL AND STREAM FLOW GAUGING STATIONS

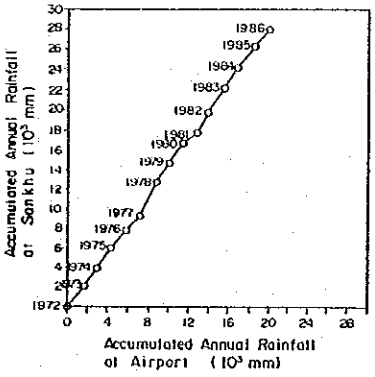


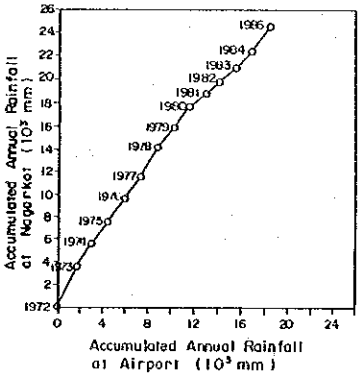
HIS MAJESTY'S GOVERNMENT OF NEPAL GROUND WATER MANAGEMENT PROJECT IN THE KATHMANDU VALLEY JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. C-2.2	LOCATION MAP OF STREAM FLOW GAUGING STATIONS

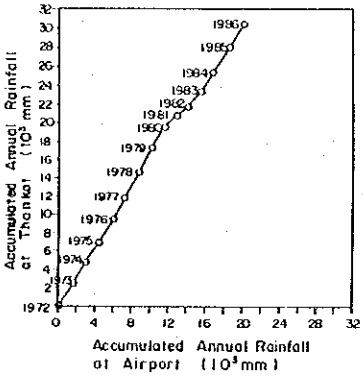


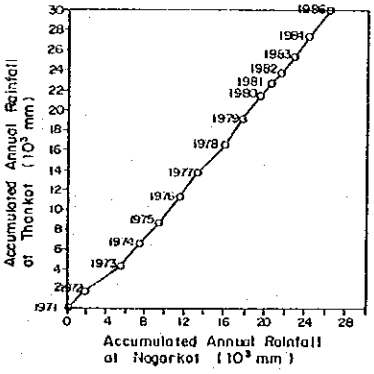


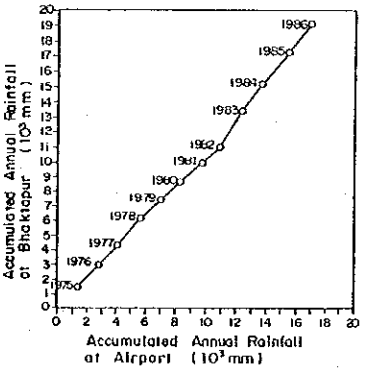


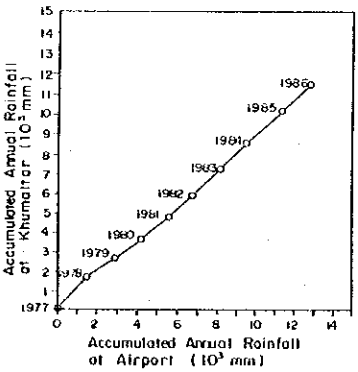


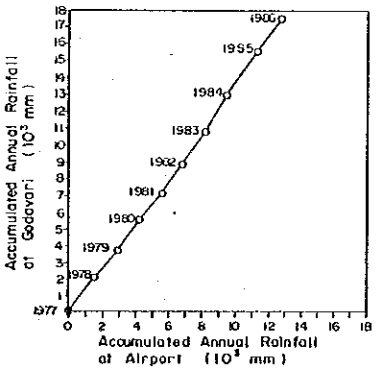




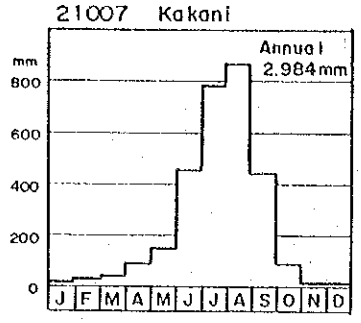


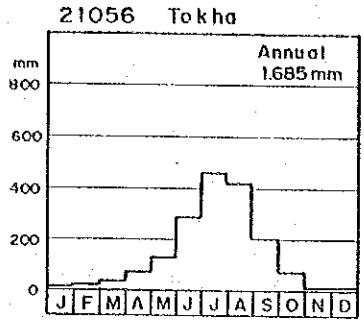


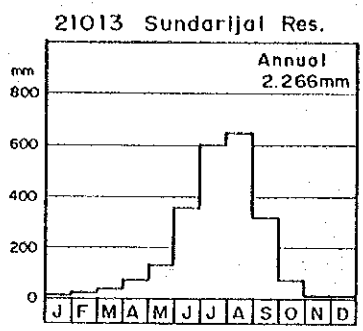


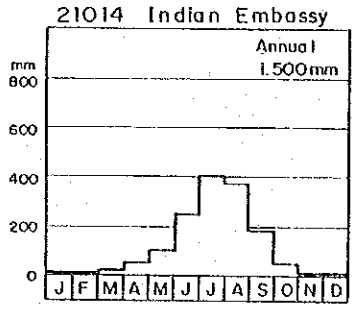


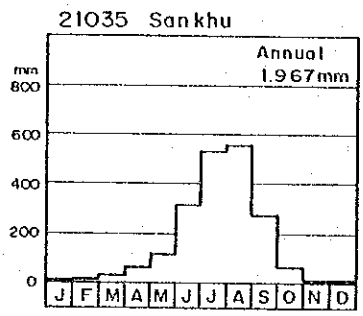
HIS MAJESTY'S GOVERNMENT OF NEPAL GROUND WATER MANAGEMENT PROJECT IN THE KATHMANDU VALLEY JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. C-3.1	DOUBLE MASS CURVE FOR RAINFALL RECORDS

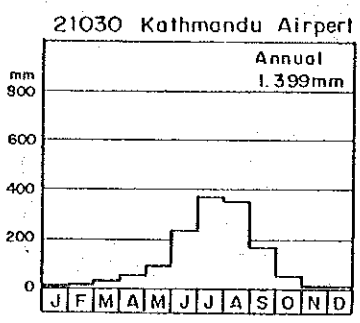


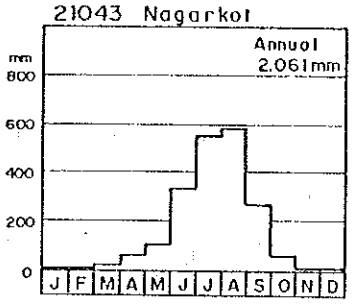


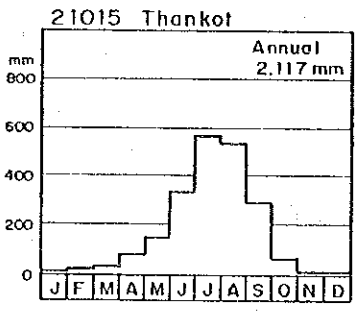


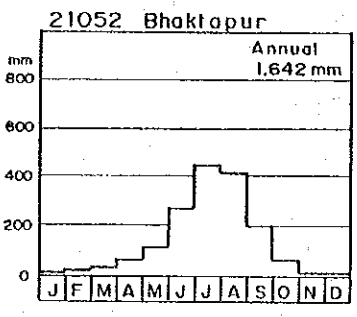


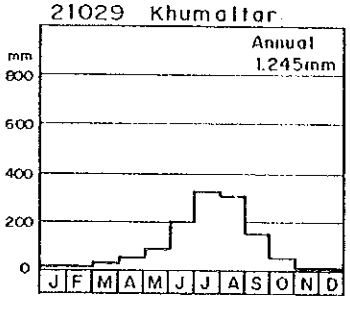


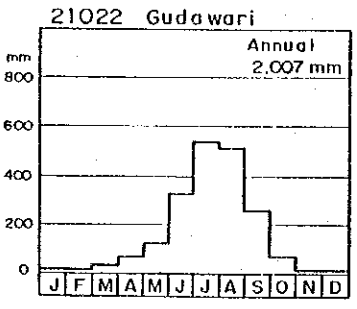




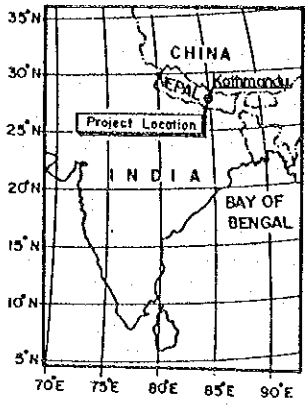


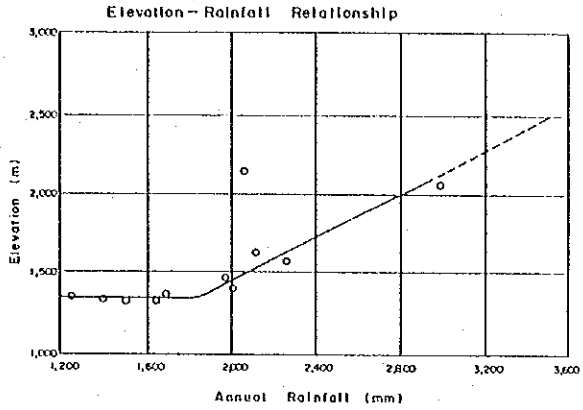


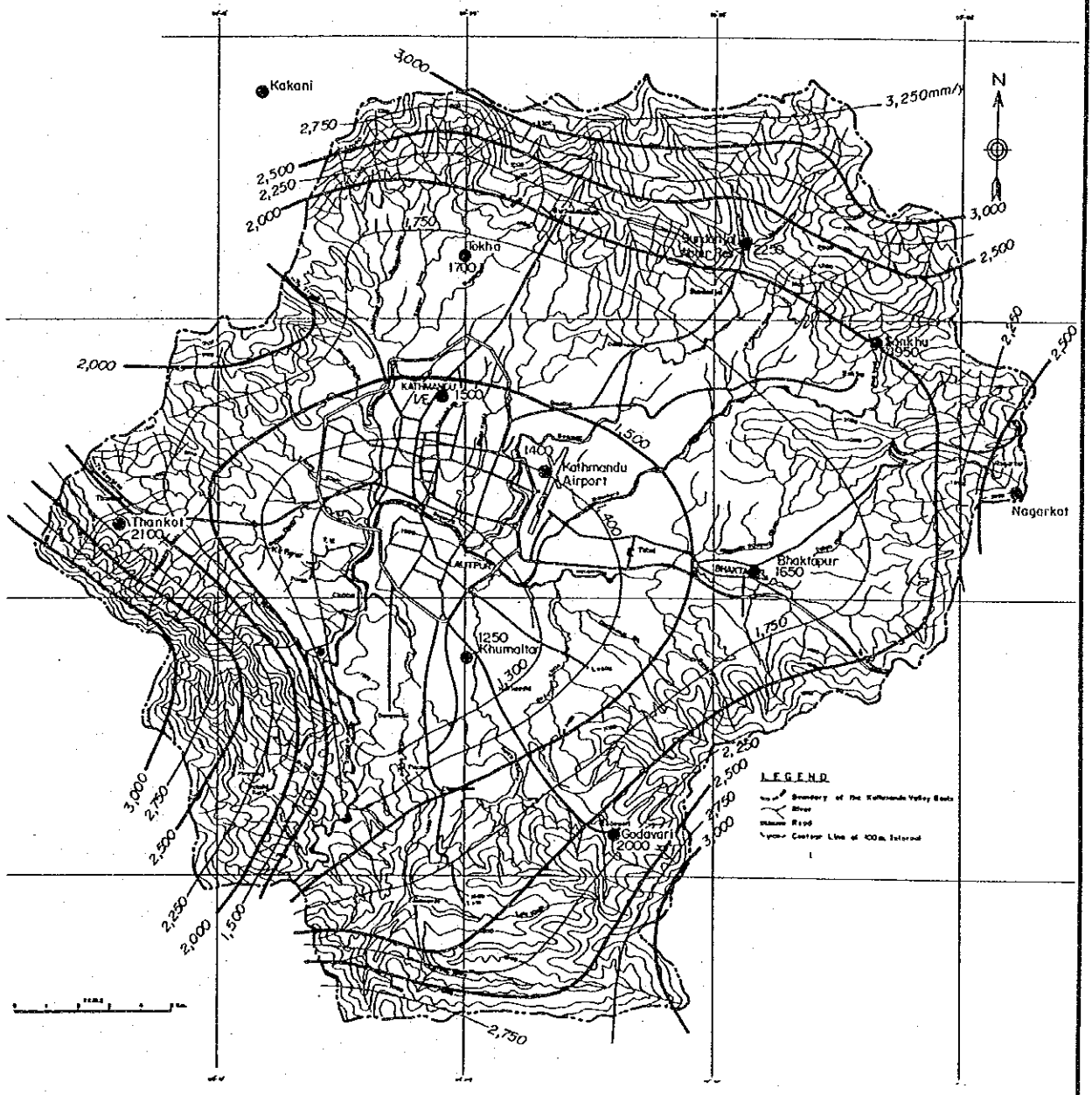




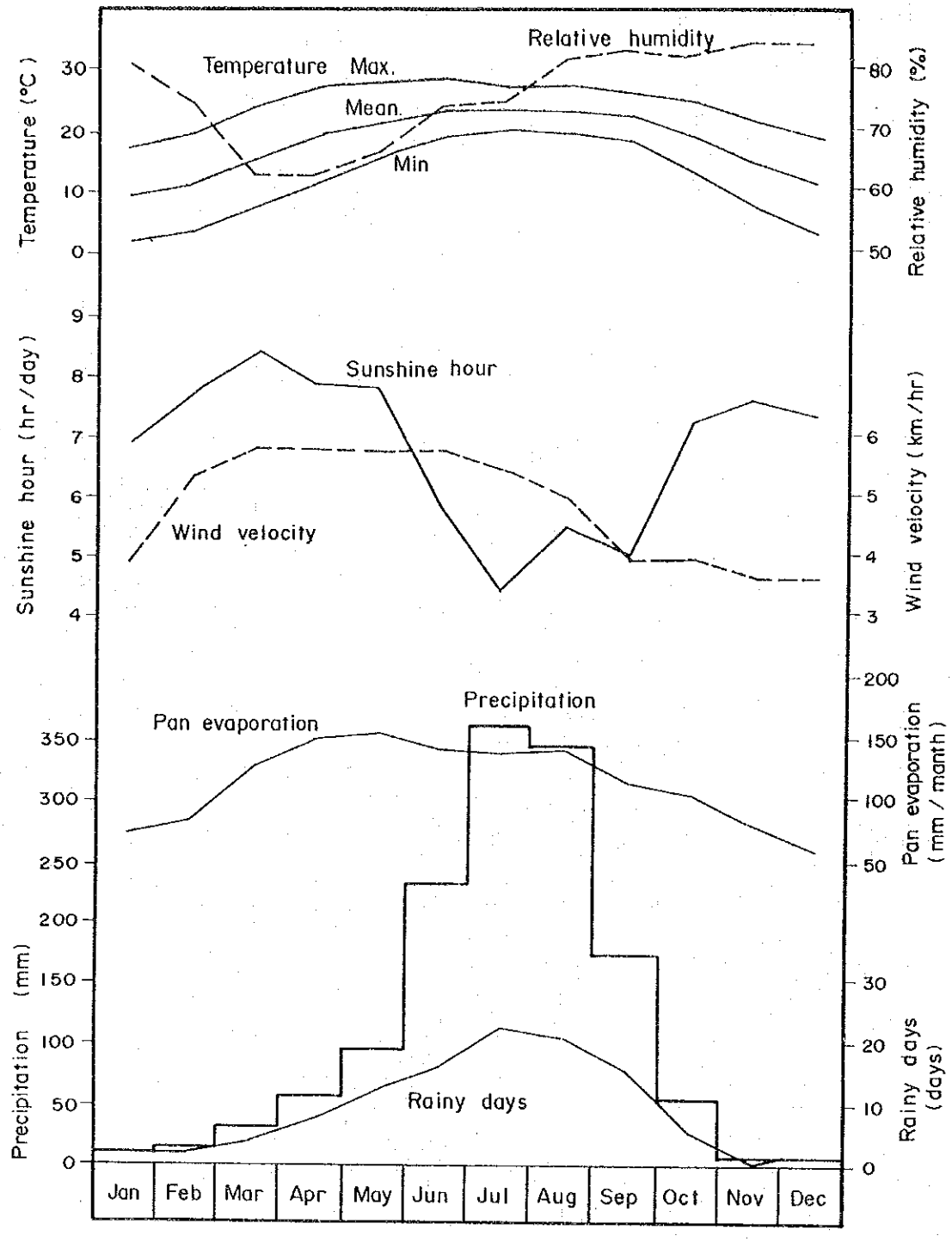
HIS MAJESTY'S GOVERNMENT OF NEPAL GROUND WATER MANAGEMENT PROJECT IN THE KATHMANDU VALLEY JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. C-3.2	MONTHLY RAINFALL DISTRIBUTION



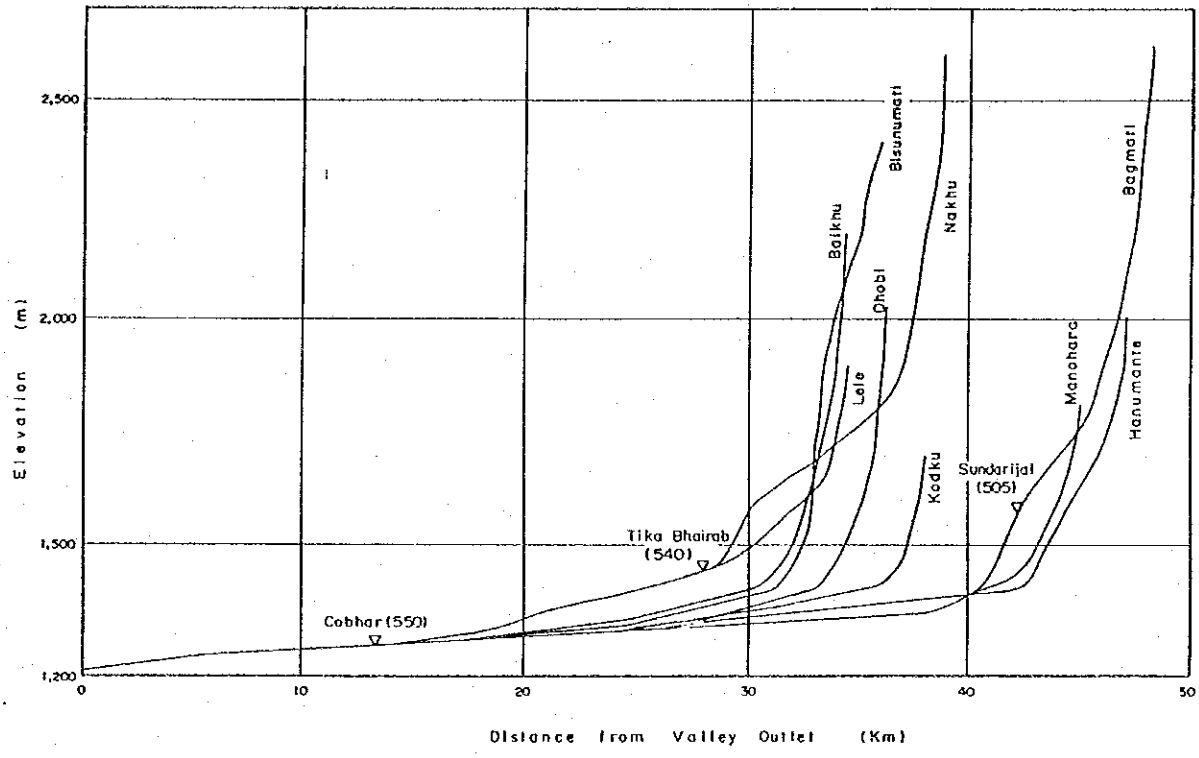


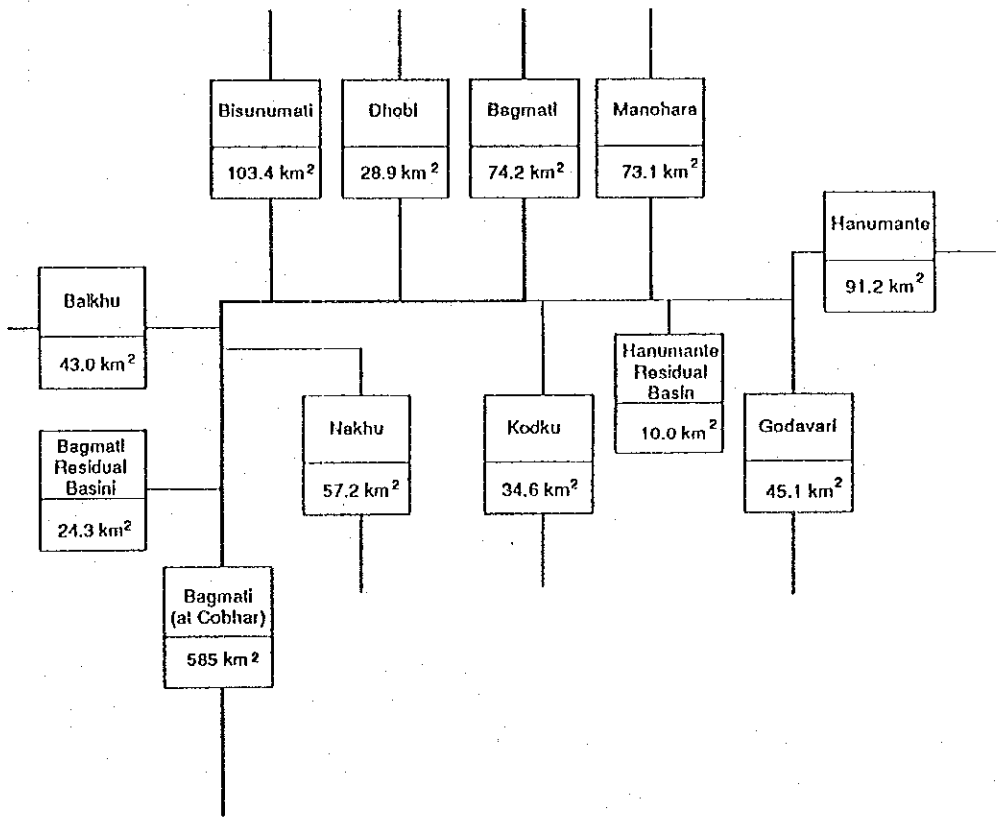


HIS MAJESTY'S GOVERNMENT OF NEPAL GROUND WATER MANAGEMENT PROJECT IN THE KATHMANDU VALLEY JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. C-3.3	ANNUAL ISOHYET AND RAINFALL GAUGING STATIONS

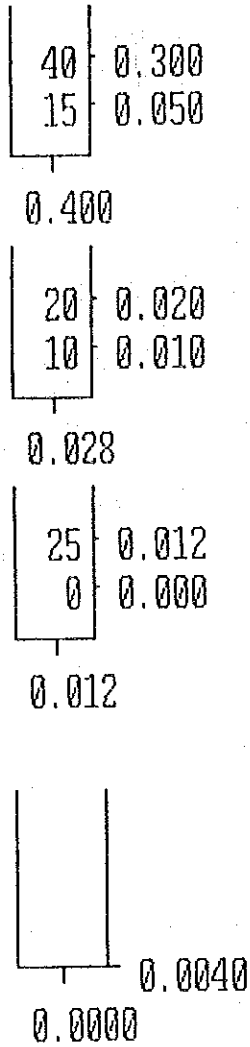


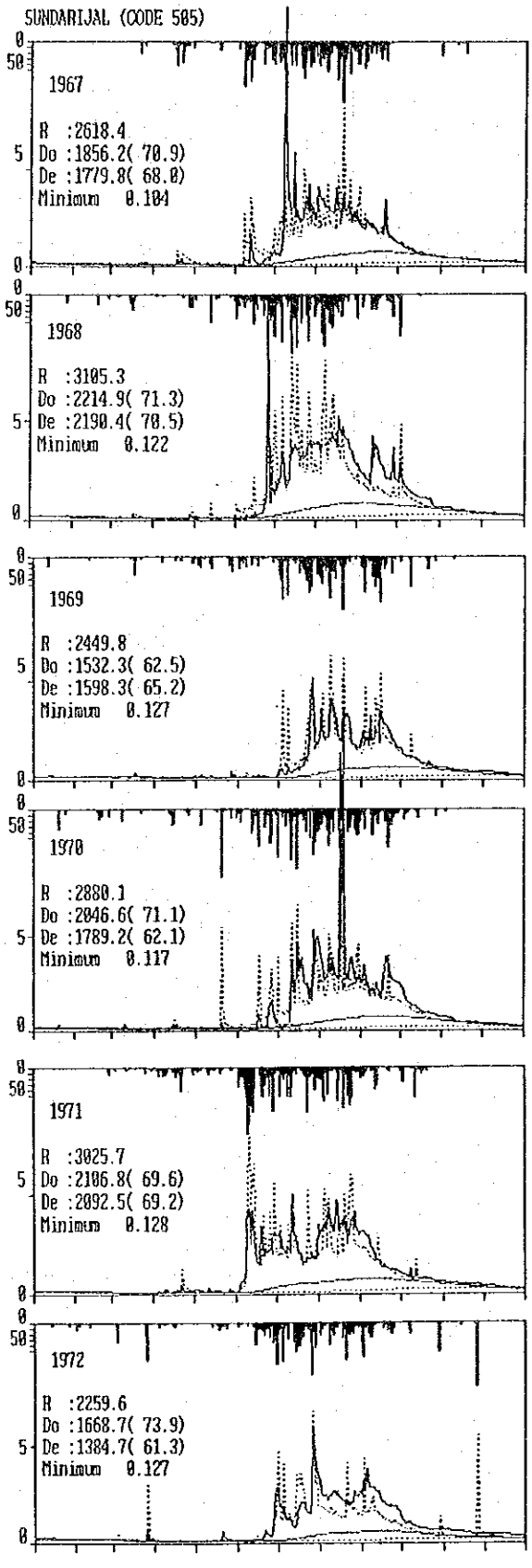
HIS MAJESTY'S GOVERNMENT OF NEPAL GROUND WATER MANAGEMENT PROJECT IN THE KATHMANDU VALLEY JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. C-3.4	METEOROLOGICAL FEATURES AT KATHMANDU AIRPORT





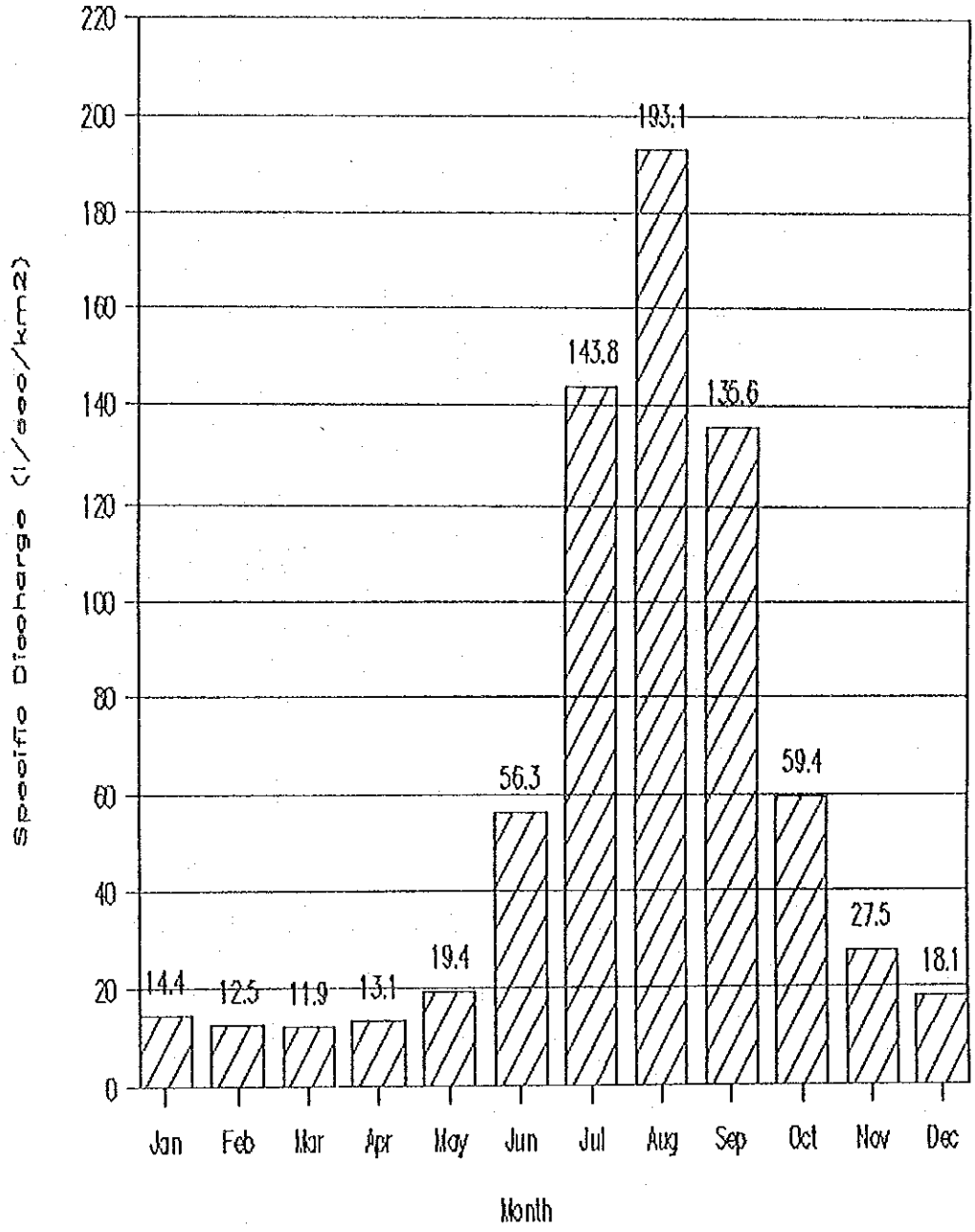
HIS MAJESTY'S GOVERNMENT OF NEPAL GROUND WATER MANAGEMENT PROJECT IN THE KATHMANDU VALLEY JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. C-4.1	RIVER PROFILE AND SCHEMATIC DIAGRAM OF DRAINAGE AREA



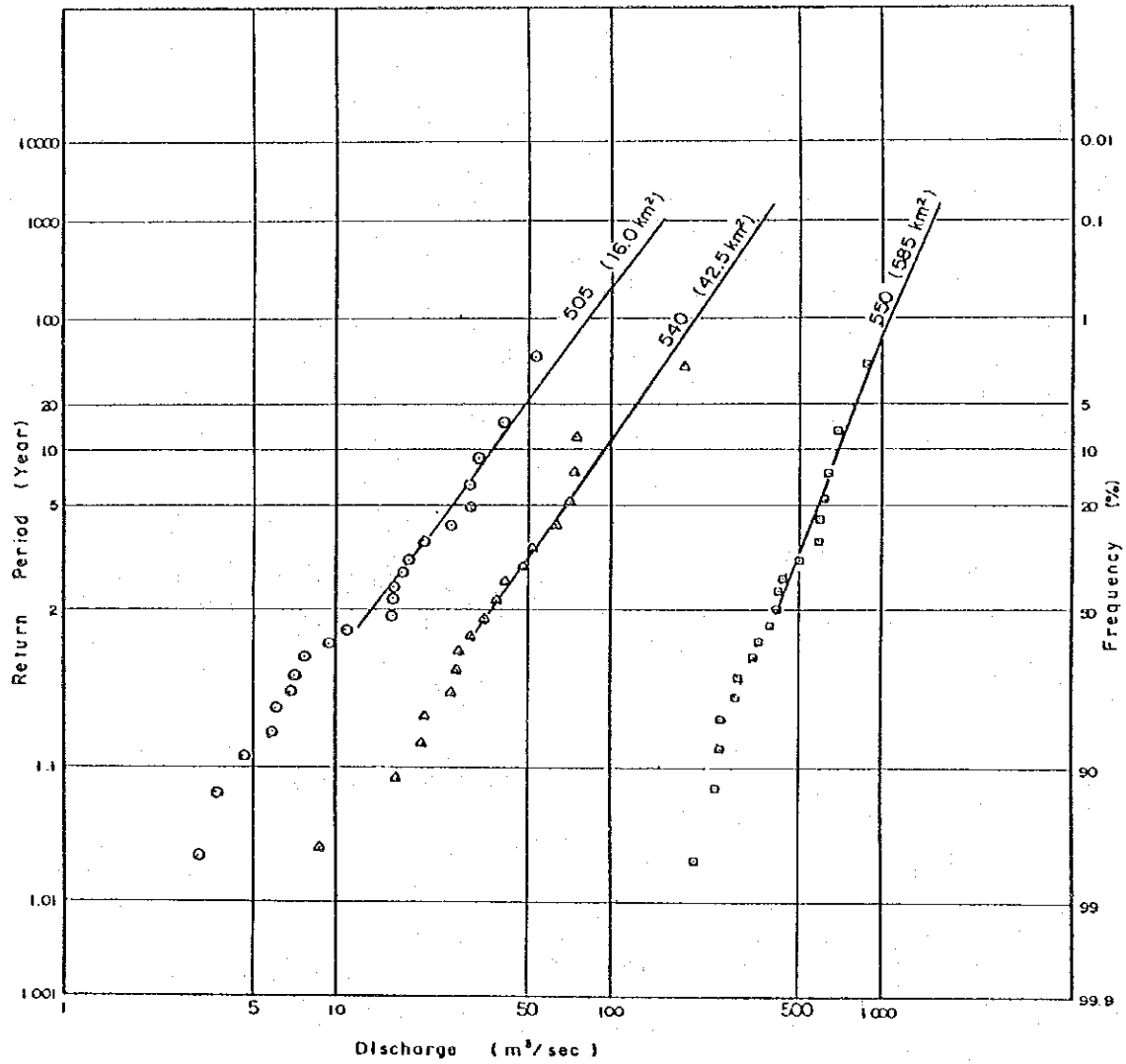


Observed
Simulated

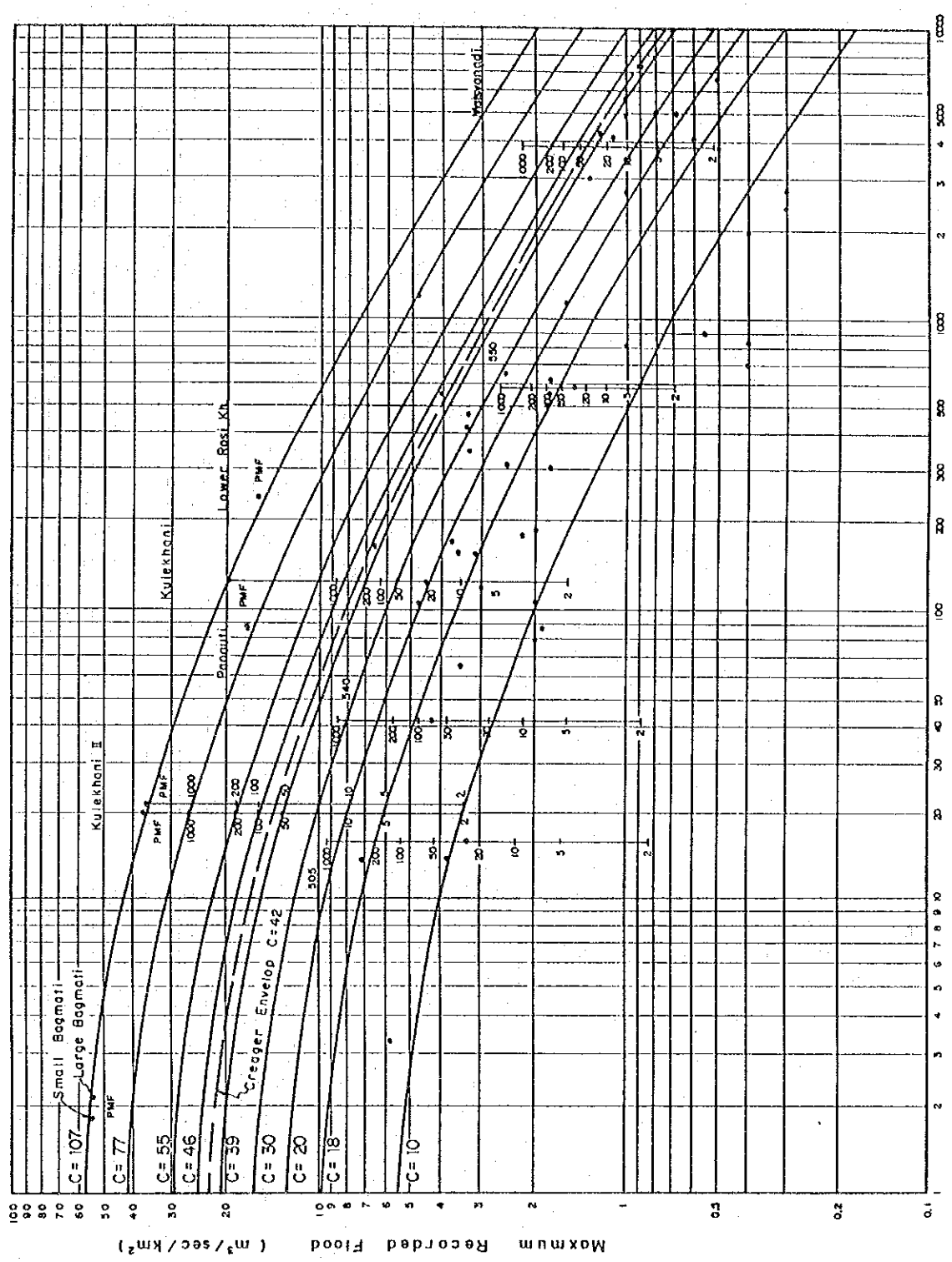
HIS MAJESTY'S GOVERNMENT OF NEPAL GROUND WATER MANAGEMENT PROJECT IN THE KATHMANDU VALLEY JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. C-4.2	TANK MODEL SIMULATION



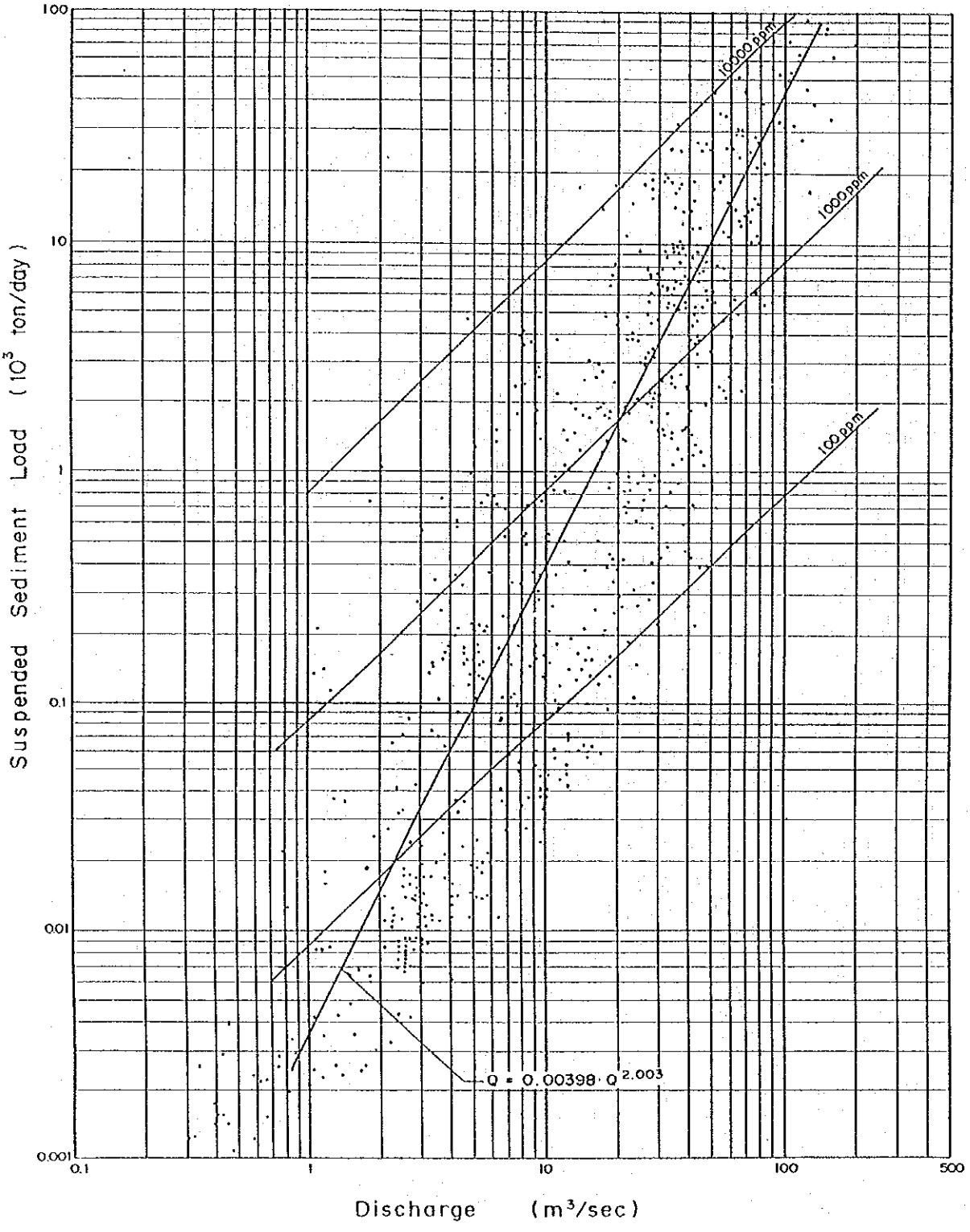
HIS MAJESTY'S GOVERNMENT OF NEPAL GROUND WATER MANAGEMENT PROJECT IN THE KATHMANDU VALLEY JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. C-4.3	MONTHLY DISCHARGE AT SUNDARIJAL



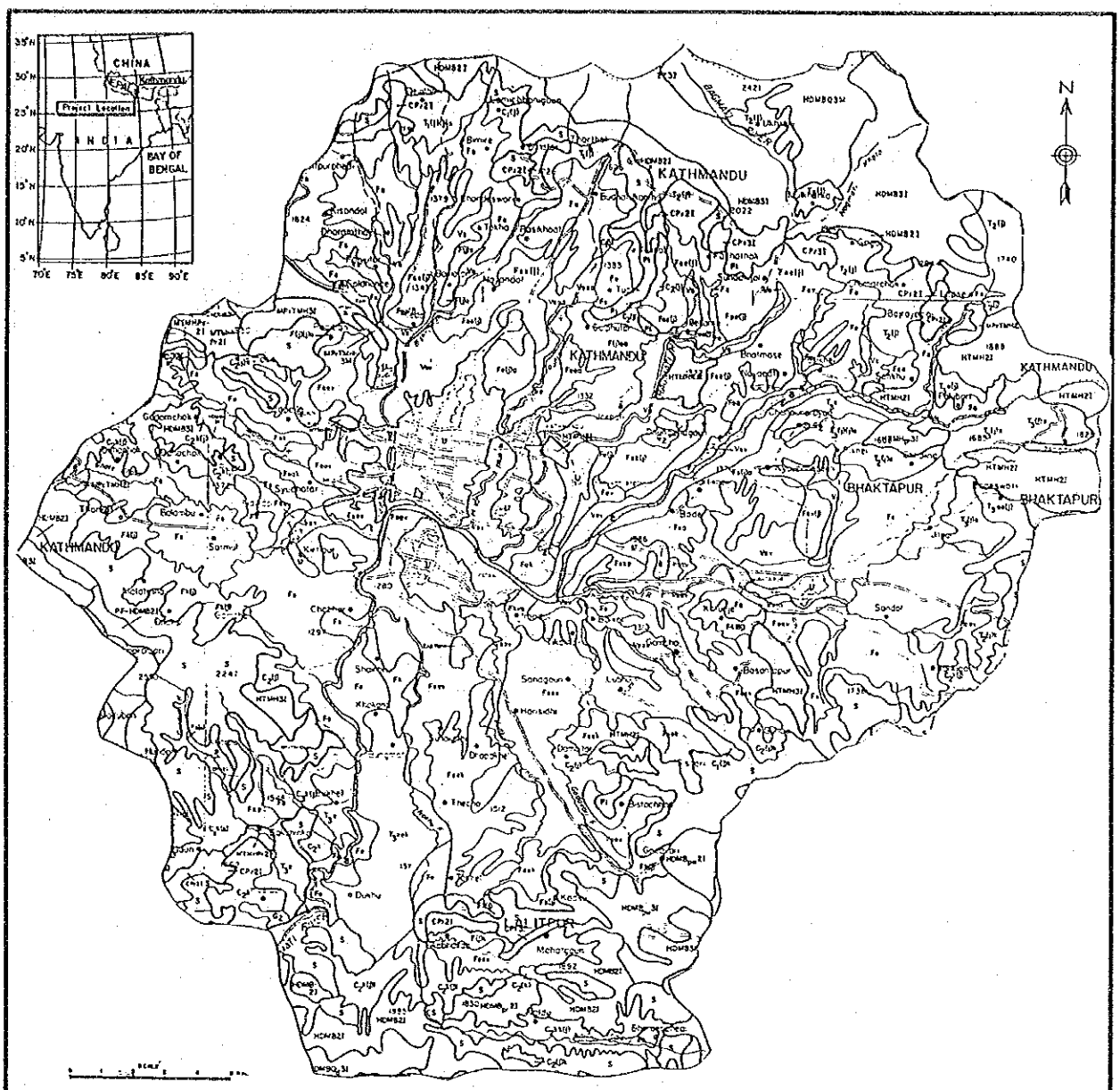
HIS MAJESTY'S GOVERNMENT OF NEPAL GROUND WATER MANAGEMENT PROJECT IN THE KATHMANDU VALLEY JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. C-5.1	FLOOD FREQUENCY CURVE AT RESPECTIVE STATIONS



HIS MAJESTY'S GOVERNMENT OF NEPAL GROUND WATER MANAGEMENT PROJECT IN THE KATHMANDU VALLEY JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. C-5.2	RECORDED MAXIMUM FLOOD AND PROBABLE FLOOD



HIS MAJESTY'S GOVERNMENT OF NEPAL GROUND WATER MANAGEMENT PROJECT IN THE KATHMANDU VALLEY JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. C-6.1	SEDIMENT LOAD RATING CURVE



LEGEND

TERAI CULTIVATION

HILLSLOPE CULTIVATION

GRAZING LANDS

VALLEY CULTIVATION

NON AGRICULTURAL LANDS

DOMINANT CROPPING PATTERNS

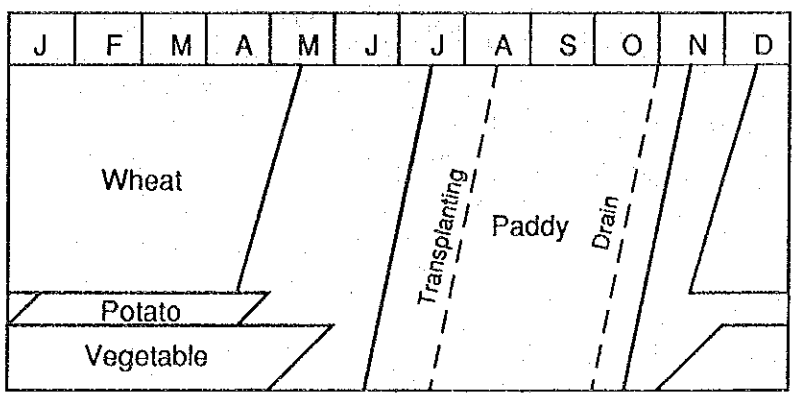
MONSOON SEASON	WINTER/DRY SEASON	MONSOON SEASON	WINTER/DRY SEASON
Rice	Fallow	Rice	Tobacco
Rice	Wheat	Corn — Fallow	Potato — Fallow
Rice	Mixed Winter Crop	Millet — Rice	Mixed Winter Crop
Rice	Potato	Tobacco	Fallow
Rice	Corn	Millet — Rice	Potato
Jute — Rice	Fallow	Millet	Fallow
Jute — Rice	Mixed Winter Crop	Millet	Potato
Rice Nursery	Mixed Winter Crop	Millet + Pulses	Mixed Winter Crop
Rice Seedlings	Mustard	Pulses	Fallow
Maize or Millet	Fallow	Wheat	
Millet	Mustard	Mustard	
Maize	Corn	Sugar Cane	
Corn	Fallow	Other	

TYPE LEGEND SAMPLE

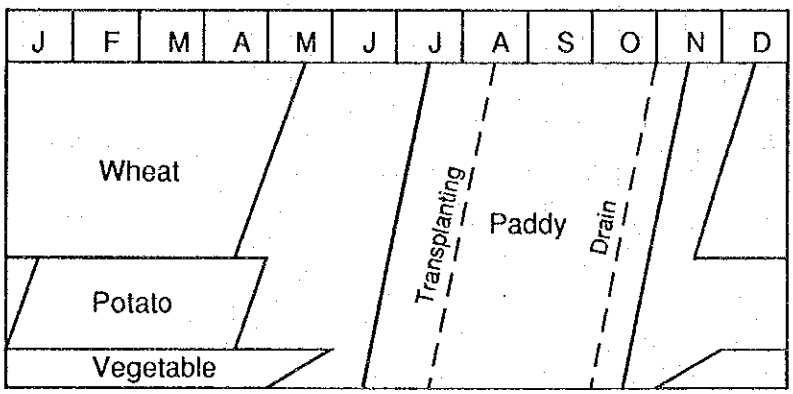
Source: Land Resources Mapping Project (Ref.16)

HIS MAJESTY'S GOVERNMENT OF NEPAL GROUND WATER MANAGEMENT PROJECT IN THE KATHMANDU VALLEY	Fig. C-7.1	LAND USE MAP
JAPAN INTERNATIONAL COOPERATION AGENCY		

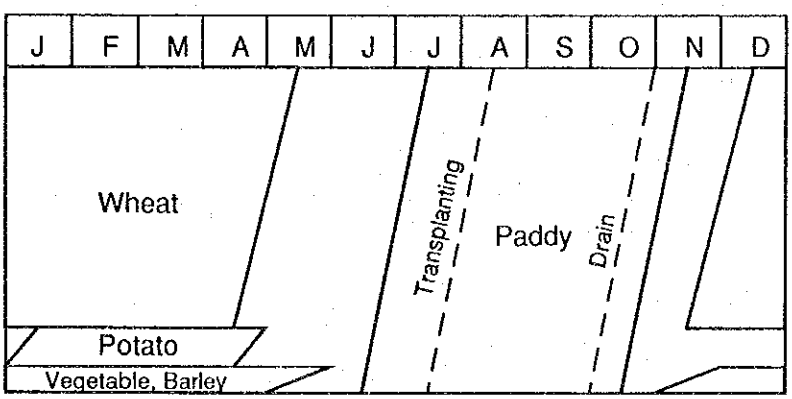
Kathmandu District



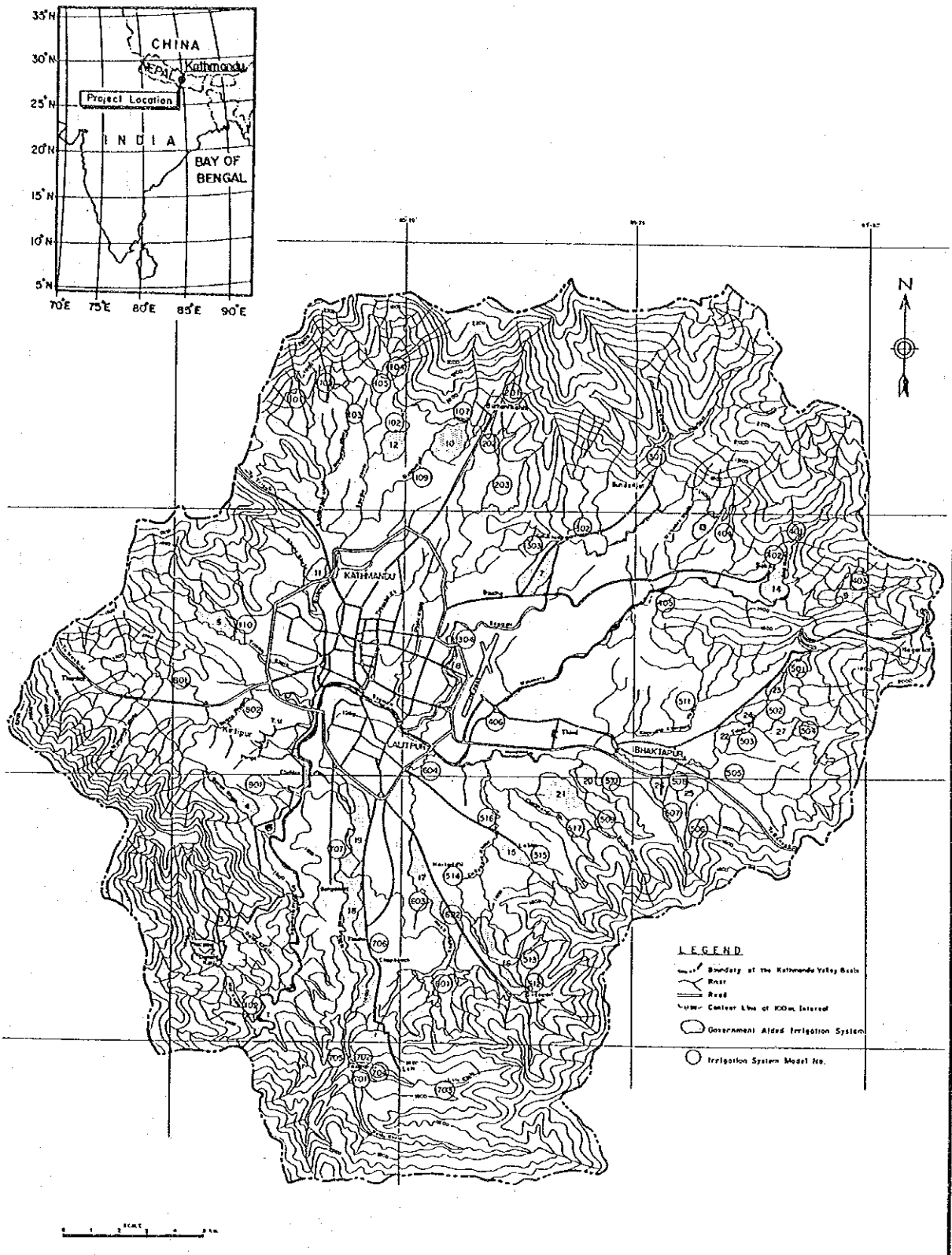
Lalitpur District



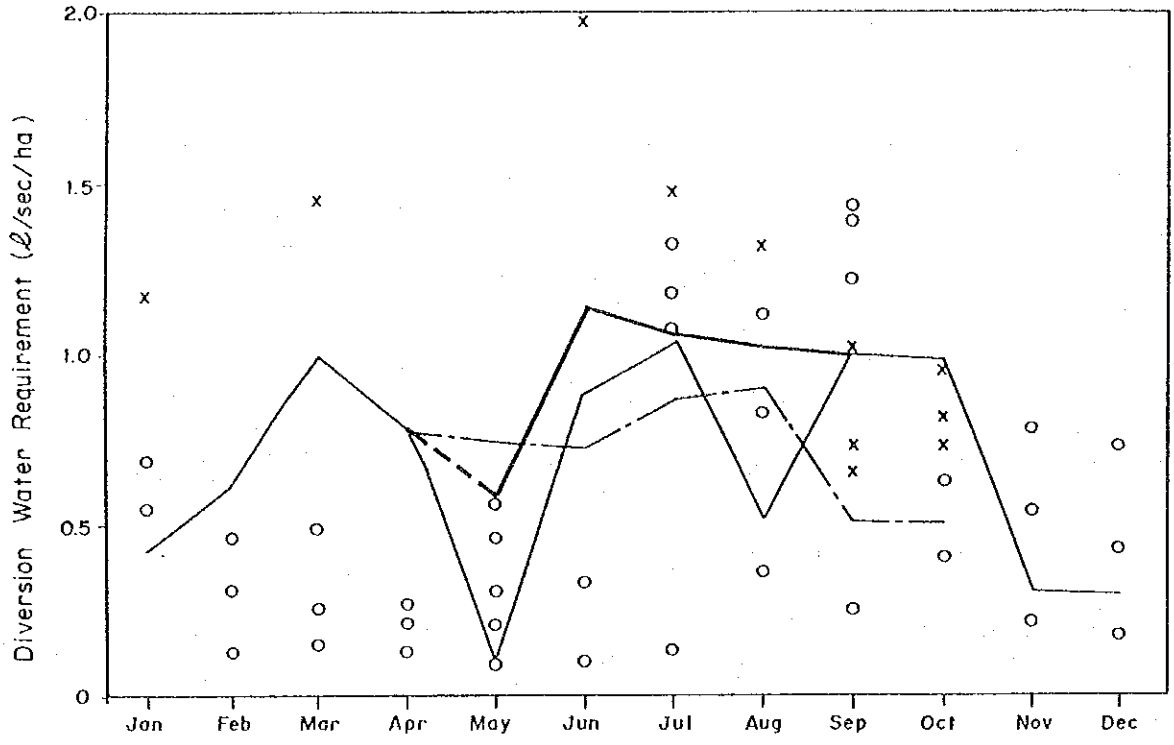
Bhaktapur District



HIS MAJESTY'S GOVERNMENT OF NEPAL GROUND WATER MANAGEMENT PROJECT IN THE KATHMANDU VALLEY JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. C-7.2	TYPICAL CROPPING PASTERN



HIS MAJESTY'S GOVERNMENT OF NEPAL GROUND WATER MANAGEMENT PROJECT IN THE KATHMANDU VALLEY JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. C-7.3	LOCATION MAP OF IRRIGATION SYSTEMS



——— Calculated Irrigation Requirement

——— Estimated Irrigation Water Abstruction

——— - ——— Discharge Record at Tika Bhairab No. 1 Irrigation System by JICA Team (1989)

o Discharge Measurement at Tika Bhairab No. 1 Irrigation System by DIHM (1962 - 1976)

x Discharge Measurement at Other Irrigation System

HIS MAJESTY'S GOVERNMENT OF NEPAL GROUND WATER MANAGEMENT PROJECT IN THE KATHMANDU VALLEY JAPAN INTERNATIONAL COOPERATION AGENCY	Fig. C-7.4	COMPARISON OF ESTIMATED IRRIGATION WATER REQUIREMENT AND ACTUAL IRRIGATION WATER ABSTRACTION

APPENDIX D
HYDROGEOLOGY

APPENDIX D
HYDROGEOLOGY

LIST OF TABLES

LIST OF FIGURES

1. GROUNDWATER USE

1.1 Trend of Abstraction from Tube Wells in the Study Area.

As a result of the hydrogeological data collected and field survey, well inventory of existing wells were prepared and attached in the Data Book C (C-2 Inventory of wells). In total 87 wells were confirmed which consists of 38 NWSC production wells, 4 NWSC observation wells, 37 private wells and 8 gas wells. The location of these wells are showing Fig.D-1.1

About 60 tube wells are operated out of the above mentioned 87 wells in the Kathmandu Valley at end of 1989 with the estimated annual groundwater abstractions amounting to around 14 million cubic meters. However, in 1972 no confined aquifer had been developed. Figure D-1.2 is shows the trend of abstractions from tube wells in the Kathmandu Valley from 1972 until 1989. In 1980, NWSC had just started groundwater development by using old WHO wells. The total abstractions from tube wells of this year is estimated about one million cubic meters.

Total estimated groundwater abstractions are grew remarkably in 1988, because almost of NWSC wells are prepared into operation conditions. Among 60 operation wells 28 wells are belong to NWSC ,but production amounts of NWSC wells are occupied over 80 % of the total estimated abstractions from all tube wells in the Kathmandu Valley.

The yield of private wells range which generally lower than abstracted amounts of NWSC wells in the northern area. Because, the ability of water bearing formation of these area is very small compared with northern area. Then,the total pumpage rate from private wells and gas wells are enormously smaller than the NWSC wells . The trend of groundwater abstraction volume of private wells and gas wells are almost constant during the last several years, only the production value of NWSC wells is increasing greatly.

According to the General Groundwater Location Map (Fig.D-1.1), these NWSC wells are almost located at northern part of the Kathmandu valley, because this area has a best aquifer conditions for groundwater development compared with other area in the Kathmandu Valley.

While on the other hand, the location of the most of private wells are concentrated in the central part of the Valley where the Greater Kathmandu is located. However,the groundwater in this area has contain very high ammonia and nitrogen content. So that, pumping water from private wells which are belongs to the international hotels in the Greater Kathmandu area, are used mainly for bathing, toilet, and landry, after several treatment procedures.

The 8 "gas" wells belongs to the Kathmandu gas project of Department of Mines and Geology (DMG) and are located on the right side of the Bagmati river between Kalimati and Thapathali. All the gas wells are self flowing with

discharge rates ranging from 0.41 to 8.47 l/s. Among the 8 gas wells, only 3 wells are supplied the gas to the government quarter experimentally.

1.2 Monthly abstraction from NWSC wells in 1989

As a result of the collected operation record of NWSC well from January to December 1989, and field survey, estimated groundwater abstraction from NWSC well fields are shown on Table D-1.1. The total monthly amount of groundwater abstraction from NWSC well field might be estimated that 0.66 to 1.24 million cubic meters per month during these months. The most developed well field is Bansbari well field which abstracted more than 40 % of total abstract amount of NWSC wells.

The estimated monthly abstraction rate has increased from February to June. The reason why trend of increasing is not only demand situation also several stand by wells were converted into production wells from April to May 1989 such as BB5, MH4, MH5, GK1, MH3 and MH4. And also the broken main pipes from BB7 and Balaju well to Balaju reservoir was repaired on April. The total estimated MLD in October 1989 from NWSC wells was around 36.9 MLD and 24 wells were operated which amounts is about 140 % of estimated NWSC well abstracted of 1987 by IBRD report (1988).

However these amount of abstraction may be reach to maximum amount of abstraction rate. For example in Gokarna well filed, there are five productive wells. Among five wells, three wells were operated on March 1989. However after three months since the fourth well (GK1) pumped, two wells (GK2 and GK4) were could not pumping because of too much draw down by interference of pumping of GK1. Therefore, total pumpage from Gokarna well field is limited about 3.5 MLD by decline in groundwater level

1.3 Spout

Groundwater from the spout is used mainly for domestic use for peoples since long time ago, when there were no water supply system in the Kathmandu Valley, people were using theses spouts as a source of water supply. The spout is constructed of the horizontal brick channel which is tapped into the shallow water bearing formation. Groundwater is discharged naturally by gravity from shallow aquifer through the brick channel and tap to the pit of the spout.

Accordingly, the feasibility study report of waste water from spouts by NWSC (1989), about 50 spouts were selected for utilization of wastage water from spouts in the night time in the Kathmandu and Lalitpur area. Among 50 spouts, 19 spouts are rejected for this study because of too small discharge for utilization.

Consequently, yield, electric conductivity (EC) and temperature of 31 spouts were surveyed in dry season at March 1989 by the study team. The yield

of spouts usually fluctuate seasonally, so that the rainy season survey of spout is carried out the rainy season in the second stage for compared with dry season. Survey results are shown in Table D-1.2. And also location of surveyed spouts are shown in Fig.D-1.3.

The discharge of spouts in the rainy season in Kathmandu City is almost same as the dry season, however in Lalitpur area is generally very large compared with the dry season. The some spouts in Lalitpur area yield range between 5 to 15 l/s in the rainy season which is equivalent to 3 to 5 times of the dry season yield. This shows the difference in hydrogeological conditions between Kathmandu and Lalitpur. Lalitpur is underlain by permeable terrace deposits ,whereas no permeable terrace deposits are found in the Kathmandu area.

The EC value of spouts range in MS/cm from 180 to 920 and in the rainy season is generally higher than in the dry season. According to chemical analysis by the study team , the spout water has bacteria and bacteria coli range from 50 to 250 numbers per ml, and also that water has a much more high chloride ion than water from deep wells.

Existence of bacteria, bacteria coli and high chlorides are sign of water quality contamination. Spout water is derived from a shallow aquifer which is situated not many meters below the surface of the urban area of the Greater Kathmandu. Consequently, pollution the source of spout water is seepage water from the domestic waste water of urban area in Greater Kathmandu. So that, from the viewpoints quantity and quality, spouts are not recommendable as water resources for a main water supply system.

2. ELECTRICAL PROSPECTING

2.1 Introduction

Electrical prospecting was carried out to investigate subsurface geological structures in the Kathmandu Valley by the study team in cooperation with NWSC counterpart. Vertical electrical sounding is usually employed to clarify the electrical resistivity distribution of subsurface layers, and Schlumberger electrode array method was used for this purpose at fifty sites. These sites are shown in the location map (Fig.D-2.1).

Maximum interval between the current and potential electrodes for the Schlumberger array was 1000 m, and high quality data regarding the resistivity distribution in the Quaternary sediments as well as basement topography information were obtained. Field work was carried out in the first field stage. Detail analysis and interpretation was carried out in Japan after the first field stage.

The Kathmandu Valley is filled with the Quaternary lacustrine and fluvial sediments which comprise gravel, sand, silt and clay with lignite

seams. They are all more or less unconsolidated. These sediments lie uncomfortably on the Paleozoic and Precambrian rocks.

Some geophysical work had been carried out in the Kathmandu Valley in the past. Resistivity survey was made in 1971 and provided general information regarding the sediments of the Valley (Binnie and Partners, 1973). As a result of this survey, areas where the strata are predominantly clay, and predominantly sand and gravel were delineated.

In 1980, basement topography of the Valley was calculated by using gravity anomaly data (Moribayashi and Maruo, 1980).
In the central part of Valley, the Quaternary sediments including thick clay of low electrical resistivity are distributed, and the maximum depth of the basement was estimated to be more than 600 m from the surface.

2.2 Analysis and Interpretation

Vertical electrical sounding curve (VES) is drawn with taking apparent resistivity as ordinate and electrode spacing as abscissa in the full-logarithmic section. The theory of analysis assumes horizontally stratified layers of uniform thickness. For analyses of VES curves, curve matching method using two layer standard curve and auxiliary curve was the standard procedure in the past, but recently in particular, personal computer is often used.

There are methods of analyses by personal computer, one is forward program which can calculate apparent resistivity curve from horizontally stratified layers model, and another is and inversion program which can construct horizontally stratified layers model from measured apparent resistivity. In the analyses work of the present project, initial model parameters (number of layers, resistivity and depth of each layer) were determined first by curve matching method, and secondly more accurate parameters were determined by using initial model parameters with personal computer.

The analyzed results of VES curves by using initial model parameters with personal computer are shown in the attached DATA BOOK C (C-1 VES curve). However, some analyses results of standard curve method is showing more good correlation with existing geological log than personal computer method. Therefore some points are accompanied by the results of standard curve analysis method.

Most of VES curves were analyzed in the range of 3-5 layers. The resistivity of the deepest layer, is mostly high (more than 500 ohm-m) and it is considered to be an indication of the basement. Generally good correlation is recognizable between the analyzed resistivity and geology of a nearby borehole, and the resistivity of sediments and basement rock are generally classified as follows.

Resistivity (ohm-m)	Lithology
less than 15	clay & silt
15-50	sandy clay
50-100	clayey sand
100-500	sand & gravel
greater than 500	basement rock

According to the wells drilled in the Valley, aquifers are generally found in coarse sediments (sand & gravel, clayey sand), and the resistivity of these sediments are estimates to be in the range of 50-500 ohm-m. On the other hand, clay & silt with resistivity less than 15 ohm-m and basement rock are generally impermeable layers.

Resistivity map, and structural basement iso-depth map, are made by the analyzed results of VES data and are presented in Fig.D-2.2 and D-2.3, Quaternary sediments with resistivity 50-500 ohm-m, which are expected to be aquifers, are found mostly in northern and north-eastern apart of the Valley. Most of the Quaternary sediments with resistivity less than 15 ohm-m, are distributed in central and southern part of the Valley.

Basement topography is shown in Fig.D-2.4. Basement depth is estimated more than 400 m in the central part and north-eastern part of the Valley.

3.OBSERVATION WELL DRILLING AND PUMPING TEST

3.1 Observation well drilling

The well drilling campaign was programmed, with total depth of 950 meters for four observation wells to investigate the groundwater level and hydrogeological condition of the study area. The drilling campaign was commenced on 23rd March, 1989 in the study area, however drilling work is suspended around 3 months from end of March due to the fuel crisis all over Nepal.

The drilling work has been progressed generally well after restarted, then four observation wells namely JW1, JW2, JW3 and JW4, were completed at end of November 1989, as shown in the drilling progress chart (See Fig.D-3.1). The results of these wells are shown from Fig.D-3.2 to Fig.D-3.5. respectively.

The following tests were carried out in the observation wells;
a.Electrical logging, b.Step drawdown test, c.Time drawdown test and recovery observation, d.Chemical analysis of groundwater.

3.1.1 Location and quantity

The location of four observation wells are shown on general groundwater location map (Fig.D-1.1.). The coordinate of wells execution period are

as follows:

Well No.	Coordinate		Execution Period	
	Latitude	Longitude	Beginning	Completed
JW1	27°43'45"N	85°19'30"E	Aug.28'89	Sep.28'89
JW2	27°44'35"N	85°20'40"E	Jul.31'89	Aug.27'89
JW3	27°40'30"N	85°17'40"E	Sep.29'89	Nov.26'89
JW4	27°40'35"N	85°21'25"E	Jun.28'89	Jul.27'89

The drilling depth, casing depth and elevation of well location are summarized as follows:

Elevation of G.L.(m)	Drilling Depth (m)	Casing Diameter (inch)	Casing Depth (m)	Screen Position (m)	Well No. (m)
JW1	1326.52	246	6	0-65	
			4	65-246	138-168,234-240
JW2	1364.62	230	6	0-65	
			4	65-230	122-140,170-176
					182-191,221-224
JW3	1275.22	284.3	6	0-65	
			4	65-284.3	234-246,252-258
					268-280
JW4	1293.55	230	6	0-60	
			4	60-230	200-212,215-227
Total		990.3			

3.1.2 Method and Procedure

The drilling operation was performed with direct rotary drilling rig (Model TBM 70) which are described in the following sentence.
Drilling Rig : Model TBM-70 Rotary type with diesel engine,
Mud Pump : Model MG-25 W, 400 l/min. 30HP

The progress of drilling operation is shown in Table D-3.1. The normal procedure of drilling work is summarized as follows:
Drilled with 10 $^{5}/_{8}$ inches tricone bits to the depth of depth of 70 to 75 meters with bentonite mud water for circulation without temporary casing pipes. When the drilling operations encountered above mentioned depth, the drilling diameter was reduced to 8 $^{1}/_{2}$ inches and drilling was continued to the designated depth.

3.1.3 Electrical logging

The purpose of electrical logging is to observed the lithological condition and also to determine exactly depth of aquifer. Electrical logging, which consists of resistivity and SP logging, was performed with Yokogawa type 3244 and SP instrument. The results of electrical logging as shown on Figure D-3.2 to D-3.5.

3.1.4 Casing and Screen

As the casing for the observation wells, steel pipes with diameter of 6 and 4 inches were used. As the screen for the observation wells , slotted steel pipes with 4 inches were installed at the aquifer portion. Screens were installed at the aquifer portions which were determined by lithology and electrical logging.

The assembly of casing pipes and slotted pipes for observation wells were fitted with electric welding. The pipes and screens of the observation wells were supported by centralizer. The materials of casing pipe, slotted pipe and reducer are summarized as follows:

Casing pipe	Unit Length (m)	Outside Diameter (mm)	Thickness of well (mm)	Installed (m)
6" N.D Steel pipe	6 or 3	214	5.4	255
4" N.D Steel Pipe	6 or 3	163	5.4	608.78
4" N.D Slotted steel pipe	6 or 3	163	5.4	126
6" x 4" Reducer	0.13	214/163	5.4	4 pcs.

3.1.5 Gravel packing

Natural gravel was used for filled annular space around casing pipes and slotted pipes of observation well. They were collected locally from Terai plain. The collected gravels were composed of rounded gavel of quartz and was sieved into 2 to 10 mm diameter. The gravel was placed into the annular space between the borehole and casing pipes from the ground using a bucket. In the annular space above the top of gravel pack was filled with mortar up to the ground surface. The volume of gravel packing of each drilling package is summarized as follows:

Well No.	Volume of gravel(m^3)	Total depth of gravel packing(m)
JW-1	13.5	5.0-246
JW-2	12.5	5.0-230
JW-3	15	5.0-284.3
JW-4	12	5.0-230

3.1.6 Development of observation wells

Two stage of development were done in each observation wells. Preliminary well development was executed with surge bailer method. Before surging, adding a small amounts of Sodium Polyphoshate to drilling mud in the well. These dispersing agent makes the mud more easily moved by surging. The operation hour of this method was regulated for 60 hours to each well, until little sand can be pulled into the well.

Final development of observation well was executed using air lift system, it was continue until water change to clear or 60 hours, however water of JW3 could not get completely clear water due to too small permeability.

3.2 Pumping Test

3.2.1 General

The purpose of the pumping test is to determine the hydraulic characteristics of the aquifer systems, and also the yield of the well. The tests were performed with the step drawdown test, the continuous pumping test and recovery test which were carried out in four observation wells by using submergible pump and air lift system.

Observation well of JW1 was drilled around 83 meters away from the B12 existing WHO observation well in order to observation of drawdown in aquifer. During step drawdown test or continuous pumping test, discharge rate measurement was made by V-notch. The results of the pumping tests are shown in Fig.D-3.2 to D-3.5 and Fig.D-3.6 and are tabulated in Table D-3.2.

3.2.2 Step drawdown test

The step drawdown tests were executed in order to determine the aquifer behavior in a different discharge rate and to estimate the well loss at each well. One step of the test was continued normally for two hours and there were four steps each test. During the step drawdown test, the water level attained to the equilibrium condition at the end of each step. The specific capacities of the observation wells are calculated by the step drawdown data to estimate the well characteristics (Table D-3.3).

3.2.3 Continuous pumping test and recovery observation

The continuous pumping test to for 72 hours were performed at each observation well to determine by the hydraulic characteristics of aquifers. The continuous pumping test data are interpreted by the nonequlibrium equation suggested by Jacob and Hantush. The results of the pumping tests analysis are shown in Table D-3.4. The recovery test measure the water level rise after the pumping stopped. The measurement was normally continued until water level recovered up to almost 100 % of original water level or for a period of twenty four (24) hours at JW1, JW2, JW3 and JW4.

4. HYDROGEOLOGICAL STRUCTURE

4.1. Groundwater Recharge and Discharge

The Kathmandu valley which is surrounded by high relief mountains consists of Precambrian and Paleozoic rocks, namely augen gneiss, crystalline limestone, phyllite and sandstone. The lower flat part of valley is underlain by a thick deposit of Quaternary unconsolidated sediments comprising mainly lacustrine deposits, such as sand, silt, clay, gravel having a total thickness of over 400 meters at Tripureswar in Kathmandu.

Subsequent faulting and uplift has given rise to the present day topography of the study area. The valley is drained by the Bagmati river which flows from north-east to south.

Groundwater occurs in pore spaces of these sediments. The area for most favorable recharge of sandy formations is located at mainly northern part of study area, where the recharge area is enough to receive much amount of annual precipitation. But, the precipitation is less effective in groundwater recharge. Because, the lacustrine aquifers of recharge area have no great capacity and the mean annual precipitation is about 1,700 mm of which 70% falls during the monsoon seasons (only three months), so the water runs off quickly and stream flow is not well sustained during dry season. Then, probably streams of study area receives some amounts of groundwater from the shallow aquifer after the monsoon seasons.

Availability of groundwater recharge in Kathmandu valley is complicated by at least two main conditions the most serious is the widespread distribution of lacustrine layer interbeded impermeable black clay which of prevent easy access to the recharge groundwater. In many areas the argillaceous lacustrine deposits begin from shallow depth below the surface and extends to great deposits.

Recharge sources may occur above the impermeable argillaceous lacustrine deposits. These also may be absent near the mountains to be north. In the central part of the valley argillaceous lacustrine deposits are virtually continuous from the surface to 200 m or more.

The second problem is the poor quality of groundwater in the central part of valley which is caused by an excessive accumulation of decayed organic matter. The Kathmandu valley has a large scale natural gas well field with potentially good economic prospects. This would appear to be the source of ammonia and nitrogen which is found in groundwater in the valley.

The groundwater quality survey and dating analysis indicate that the confined aquifer in this valley is stagnant. Thus, the possibility of developing the confined aquifer will be limited to artificial pumpage.

4.2 Groundwater Resources of Study Area

Based on the physical and chemical properties of ground water and geological structures, the Kathmandu valley is divided into three groundwater district. Figure D-1.1 shows the boundary of three groundwater district, area of NWSC well field and location of wells, bore holes and schematic geologic cross section. The well logs and bore hole logs are shown in the DATA BOOK C. The schematic geologic cross section and hydrogeological formation are shown on Fig.D-4.1. Fig.D-4.2 shows the groundwater potentially and chemical properties od aquifer.

4.2.1 Hydrogeological formation

The hydrogeological formation of the study area has been classified into 6 types of formation according to the hydrogeological condition of study area (See Figure D-4.1).

Formation A ; This formation consists of river deposits, talus deposits, fan deposits and top soil . This formation sometimes forms a shallow aquifer and is found all over the flat plain of the Valley. The deposits to the north are sandy, but those to the south is predominant clay and silty clay.

Formation B ; This formation consists of arenaceous deposits or intermediate types of arenaceous and argillaceous deposits. This formation is mainly distributed in the northern part of the valley and forms the main aquifer of the northern part of the Kathmandu Valley.

Formation C ; This formation consists of stiff black clay called Kalimati clay which is categorized as argillaceous lacustrine deposits. These impermeable clay formation deposits in the center and south of the valley from are about 200 m in thickness from ground level.

Formation D ; This formation consists of an intermediate type of arenaceous and argillaceous deposits of lacustrine deposits which underlie Formation C and form the deep central aquifer.

Formation E ; This formation consists of weathered basement rock which overlies basement rock. This formation sometimes has a very small capacity as an aquifer, but usually forms an aquifuge.

Formation F ; This formation consist of basement rock, and usually forms an aquifuge (hydrogeological basement).

4.2.2 Groundwater district

Northern groundwater district ;

The northern groundwater district, which include the Bansbari, Dhobi Khola, Manohara, Bakutapur and Gokarna well field are the principal water sources for water supply to greater Kathmandu by NWSC. The most precipitation of fall on the rechargeable area of this district which recharge aquifers through out the most part of Kathmandu valley.

The upper part of deposits in the northern Basnbari ,Dhobi Khola , Gokarna and Manohara area are composed of unconsolidated high permeable materials consisting of micaceous quartz sand and gravel. The unconsolidated coarse sediments is as much as 60 m thick can yield large quantities (up to 40 l/s) of water during the first pumping test after well completed.

However, these coarse sediments interbeded several impermeable fine sediments. Groundwater stored in these aquifers overdrafts have become each well filed due to unfavorable recharge condition especially in Dhobi Khola well field.

Water quality of these groundwater is characterized low electrical conductivity such as 100 to 200 micro-simens/cm. The transmissivities of the aquifers in the range of from 83 to 1963 m_2/day. The southern boundary of this groundwater area bounded with central groundwater district.

Central groundwater district ;

The central groundwater district includes Greater Kathmandu. The upper part of deposits are composed of impermeable very thick (as much as 200 m) stiff black clay accompanied some lignite. Unconsolidated of coarse sediments of low permeability underlie of thick black clay.

Groundwater stored in these aquifers is includes marsh methane gas all over the area. Water quality of these groundwater is characterized by very high electrical conductivity such as 1,000 micro-simens/cm in some wells located near Tripueswar.

The transmissivities of aquifers are range from 32 to 960 m_2/day. The water head pressure of this district is generally high, the all deep gas wells in particular being self flowing. The existence of soluble methane gas may indicate stagnate aquifer conditions.

Southern groundwater district ;

The southern groundwater district is located between the southern mountains and a geological structural line from Kirtipur to Godawari.
This area is characterized by thick impermeable clay formation and low permeable basal gravel. Aquifer is not well developed only recognized along the Bagmati river between Cobhar and Pharphing

5. HYDRAULICS CONSTANTS

5.1. Aquifer Constants of JICA Observation Wells

The results of aquifer constants analysis of observation well are tabulated in Table D-3.4. The transmissivities are interpreted using the Jacob's modification of the non-equilibrium formula. The storage coefficient of aquifer is interpreted using Jacob and Hantush standard curve methods using of data from B12 well as observation well of JW1.

According to the Table D-3.4, JW1 and JW4 wells are showing high to medium transmissivities (536 - 402 m^2/d), the other hand JW3 well shown very small transmissivity (7 m^2/d). The storage coefficient of B12 is 1.85^{-3}. This value belongs to a range of confined aquifer.

5.2 Well Loss of JICA Observation Wells

This describe a general evaluation of the observation wells. It is reasonably understand that the drawdown of water level by pumping includes the two components, namely the drawdown of an aquifer loss in accordance with the Darcy's law and the drawdown of a well loss caused by flow through the well screen and flow inside the well to the pump intake.

The well loss is associated with turbulent flow and is expressed as,

$$Sw = BQ + CQ^2 \qquad \text{or} \qquad Sw/Q = B + CQ$$

where

Sw = Drawdown
Q = Discharge rate
$B = \dfrac{\ln (ro/rw)}{2\ tu\ T}$ (Constant of aquifer loss)
C = Constant governed by the radius, construction and condition of a well.

Therefore, the total drawdown Sw consists of the aquifer loss BQ and the well loss of CQ_2. The evaluation of well condition is expressed in Table D-3.3. However, well loss at JW2 and JW3 could not estimated due to unreasonable data. Well loss of JW1 (68.3 % as 4.6 l/s) and JW4 (40.5% as 5.0 l/s) are seems to be rather large because of small well diameter and small opening ratio of screen.

5.3 Pumping Test of Existing NWSC Wells by JICA Study Team

In order to confirm the permeability of existing NWSC wells,four existing wells are selected at each well fields respectively. Table D-5.1 shows the transmissivity and specific capacity obtained from pumping test of these existing NWSC wells in the northern groundwater district by the study team.

As shown in this table, the transmissibility of aquifers in the north valley varies in arrange from 86.2 to 1295 m^2/d. The results suggest that the general trend of permeability in the northern groundwater district is probably shallow part aquifer has higher permeability compared with deeper aquifer.

5.4 Transmissivity of Kathmandu Valley

The transmissivity indicates the potential for groundwater development. Transmissivity is measured in m^2/day and can be measured by pumping tests in the field. The distribution of transmissivity in Kathmandu valley is shown in the transmissivity map based on pumping tests (See, Figure D-4.2). These data obtained from pumping test data of existing tube wells and JICA observation wells. The transmissivity of each well is shown in the inventory of wells of Data Book C (C-2 Well inventory).

The study area is divided into five groups with value of transmissivity. First grade area, the aquifer of the sandy formation shows highest transmissivity ($T > 500$ m^2/d),which are expected most high potential development of groundwater in the study area. Second grade area, the aquifer of the sandy formation shows medium to high transmissivity ($T=500-300$ m^2/d), which are produced medium scale of groundwater by tube well.

Third grade area, the aquifer of sandy with silt formation shows medium transmissivity($T=300-100$ m^2/d), which are produced medium scale groundwater with much drawdown. Fourth grade area, the aquifer of the silty sand formation shows low transmissivity ($T=100-10$ m^2/d) which can not get enough water for water supply by tube well. Fifth grade area,clayey sand formation shows very low transmissivity ($T < 10$ m^2/d) which can not expect groundwater development by tube well.

According to Figure D-4.2 middle reach of Manohara river at east side of Kathmandu air port is most highly potential area for ground water development. The other hand southern area is not expected any large scale groundwater development. The northern NWSC well fields are located at the high to medium transmissivity area.

6. GROUNDWATER LEVEL TREND

6.1 Static Water Level Trend in the Study Area

As a results of static water level trends in the study area (See Table D-6.1), static water level in the study area goes down after commencement of the development of NWSC wells in the third project (Fig.D-1.2). Such groundwater development resulted in a progressive increase about 15 meters of lowering of the water level during the past 4 years in each NWSC well field. In order to the judge of the Fluctuation of groundwater level in the study area, periodical monitoring just start from end of February at six existing

NWSC wells.

6.2 Simultaneous observation of groundwater level survey

In order to, seasonal fluctuation of groundwater level, simultaneous observation of groundwater level survey are performed using existing wells. The results of simultaneous survey on March and August 1989 are shown in Table D-6.2. As a result of simultaneous observation of groundwater level in dry and rainy seasons, generally rainy season water level is lower than dry season water level.It is probably shown that the range of groundwater level decline is bigger than seasonal fluctuation . So that daily groundwater level monitoring is more important this area.

6.3 Groundwater Level Monitoring

6.3.1 Monitoring of existing wells

The daily water level measurement of existing wells are performed on the selected five standby NWSC wells since February 1989, and these location are illustrated in Figure D-1.1. However,BB5 and BH4 were converted into production wells since April 1989, then only three wells have been remained the position of real observation well.

Well hydrograph of these wells are shown in Figure D-6.1. The trend of a decline in water level is still serious as shown in these well hydrographs. At the Gokarna well field, water level of GK5 shown about 4 meters of lowering, about one month half since GK1 pump started, then GK2 and GK4 wells stopped the pumping, due to water level influence from GK1. But, water level of GK5 is not recovery.

And also, similar phenomena happened at Manohara well field, MH6 well shown about 8 meters of lowing of the water level during the period from February to December 1989. The phenomena of both well fields shown the effects of radius of influence of a well cone of depression.

6.3.2 Installation of automatic water level recorder

Four automatic water level recorders were fitted on JW1, JW2, JW4 and DK1 during the study period to record the annual fluctuation of ground water levels. Three float type model automatic water level recorders were installed at JW1, JW2 and JW4 observation well.

One pressure type of automatic water level recorder was installed at DK1 well. However, JW3 well was installed water pressure gauge instead of automatic water level recorder, because water level of JW3 was showing above ground level. The value of water pressure gauge shows 1.2 kg/cm^3 on March 1990. Monitoring of JICA wells are performed since each well completed, except JW3.

6.3.3 Monitoring of JICA observation wells

According to the automatic water level measurement of JICA observation wells which are performed on the JW1, and JW4 wells since October 1989, the trend of a decline in water level is still serious as shown in these well hydrographs (See Fig.D-6.1).

The location of both wells are illustrated in Figure D-1.1. JW1 is typical monitoring well of northern groundwater district, and JW4 is typical monitoring well of central groundwater district. The water level of JW1 is goes up around 1 meter during the period from October 1989 to January 1990, but decline about 2.1 meters from middle of January to March 1990.

On the other hand, well hydrograph of JW4 shows about 0.8 meters decline in water level trend. However, both wells are not yet recorded full year, in order to the judge of fluctuation of groundwater level each groundwater district area, automatic water level monitoring should be continued. Well hydrograph of JW1 may be influenced by the pumping of existing wells.

7. DATING ANALYSIS

7.1 Introduction

The transit time or age of groundwater data helps in determining the recharge and discharge system of aquifer. Several radioactive isotopes originate in the atmosphere is an effective medium for the determination of age of groundwater. Tritium and carbon-14 are the two isotopes that have been used to determine the age of groundwater.

Concentrations of tritium and Carbon-14 in the groundwater samples from Kathmandu valley have been measured by Science faculty of Gakushuuin University in Tokyo.

7.2 Tritium

Tritium with a half-life of 12.3 years is formed continually in the upper atmosphere by cosmic rays. Age or transit time of groundwater can be determined by assuming simple exponential decay from the time of the entry of meteoric waters into the ground. Concentrations are measured in tritium units (T.U.), one T.U. being defined as one atom 3H to 10 18 atoms 1H. The accuracy of analyses is ±1 T.U.. Tritium concentrations in rainfall of recent period is about 10 to 50 T.U. The results of tritium measurement are summarized as follows:

Sample Number	Concentration of Tritium
PH-1	Less than 0.38 T.U.
SP-1	9.7 ± 0.2 T.U.
GK-3	Less than 0.38 T.U.
DK-5	4.3 ± 0.2 T.U.
BB-7	1.7 ± 0.1 T.U.

T.U.(1 T.U.= $^{3}H / ^{1}H = 10^{-18}$)

According to the above results, probably, PH-1 and GK-3 do not include recent precipitation. SP-1 (spout water at Kathmandu) has been including recent water. If recent precipitation including 20 T.U. of tritium, spout water may be contents about 50% of recent precipitation waters. Aquifer of GK-3 is not expect any recharge from recent precipitation.

7.3 Carbon 14

The radioactive isotope of carbon, carbon-14, with atomic weight 14, is also produced consecutively by cosmic rays in the atmosphere. When meteoric waters entered ground, carbon-14 is no longer maintained and C-14 atoms decay at a rate such that their concentration is reduced to one half of its initial value in about 5600 years(5700±30). Therefore by measuring the residual activity, the time C-14 detection is from 200 years to 35000 years Before Present. The results of carbon-14 measurement are summarized as follows:

Code Number	Sample Number	B.P.age (Before A.D.1950)
Gak-14562	JW-1	9170 ± 270 7220 B.C.
Gak-14563	DMG-4	28890 ± 1370 26970 B.C.

According to the above results, both samples are entered to the ground about 9000 to 28000 years before A.D.1950. It is mean confined groundwater of central part of the Kathmandu Valley is probably defined as non rechargeable stagnant groundwater.

8. CHEMICAL PROPERTIES OF WATER

8.1. Electrical Conductivity

Electric conductivity (EC) value of the groundwater in the Kathmandu Valley shows a range from 84 to 1400 micro-simens/cm .

Iso-electric conductivity contour shows conductance of water and the trend of groundwater flow (See Fig.D-4.2). EC value is easily measured and given results that are convenient as a general indication of water quality of aquifers. Because electric conductance generally related to total dissolved.

Generally the EC value of surface water in the surrounding mountain area is quite low (less than 100 MS/cm). EC of the groundwater shows about 200 MS/cm or less in the northern part of the valley, meanwhile EC value of private wells in center and southern part shows high electric conductivity (more than 500 MS/cm). And also, electrical conductivity contour formed concentric circle at gas well filed between Kathmandu and Lalitpur along the Bagmati river. It seems that, groundwater in the deep aquifer in the center and south is remote from the recharge area and is no possibility of natural discharge from the Kathmandu Valley.

8.2 Chemical Analysis

Chemical analysis for the hydrogeological study was carried out in Japan on 31 water samples taken during the first field stage from existing NWSC wells, private wells, spouts, springs and the main river courses, and 4 samples taken during the second field stage from JICA observation wells. The location of sampling points is shown in Fig.D-8.1. The results of analysis are shown in Table D-8.1.

8.3 Classification Analysis

Accordingly to the results of classification analysis by trilinear diagram as shown in Fig.D-8.2 most of water samples were categorized as carbonate hardness type ($Ca(HCO_3)_2$) or carbonate alkali type ($NaHCO_3$).

Water samples from the southern mountain and sample No.10 are typical of the carbonate hardness type as low salinity and low sodium hazard water which is generally found in shallow and good quality aquifer in carbonaceous rock area. Water samples from rivers in the northern area are carbonate alkali type being low carbonaceous. The sample of JW2 is categorized into carbonate hardness type, but other three samples from JICA observation wells are categorized into carbonate alkali type.

Stiff's hexa-diagram is shown in Fig.D-8.1 to further illustrate the pattern of water quality. The carbonate alkali type with a very small amount of total ion density which is located in the northern groundwater district. The carbonated hardness and carbonate alkali type with very large amount of total ion density are located in the central area deep aquifer. The carbonated hardness type with a medium amount of total ion density is located in the southern area.

These three kind of groundwater quality pattern are reflected by the lithological and structural condition of aquifers. The samples of JW1 and JW2 are categorized into A type (the carbonate alkali type with a very small amount of total ion density), on the other hand the samples of JW3 and JW4 are categorized into B type (the carbonate hardness and carbonate alkali types with very large amounts of total ion density) of Stiff's hexa-diagram.

8.4 Chemical Quality of Groundwater

High concentrations of ammonium(NH_4+)ion, nitrogen(N) and potassium permanganate ($KMnO_4$ Cons.) were recognized in central area of the Kathmandu Valley as shown in Stiff's hexa-diagram. These area relatively high concentrations of these ions in sample No.12 at gas well DMG5 and sample No.13 at Himalaya Hotel. In these samples, the NH_4+ content is 78 - 100 mg/l, the Kjeldahl N content 58 - 62 mg/l, and $KMnO_4$ Cons. content 46-51 mg/l.

The deposits in the Kathmandu valley has originated from the Quaternary fluvio-lacustrine deposits. It means high ammonia from deep well not derived from human pollution. However, ammonia ion should be removal from water well because they are absorbed much chloride compared with surface water in the valley.

According to the report of "Natural gas resources in Kathmandu valley" May 1`80 JICA, these ions contents are higher than observed in groundwater from ordinary Quaternary gas reservoirs in Japan. This fact reflects the rapid or strong disintegration of organic matter in the sediments.

TABLES

Table D-1.1 ESTIMATED GROUNDWATER ABSTRACTIONS FROM NWSC WELL FIELD (1989)

WELL FIELD	BANSBARI	DHOBIKHOLA	GOKARNA	MANOHARA	BAKUTAPUR	PHARPHING	TOTAL
JANUARY	318073	92501	48036	228005	89497	0	776112
FEBRUARY	260144	78344	34190	203747	81561	0	657986
MARCH	383323	91390	46272	213380	95786	0	830151
APRIL	411156	93617	76000	198260	94885	48771	922689
MAY	436881	88848	96309	235705	86854	52760	997357
JUNE	466499	90187	126897	329160	98184	47193	1158120
JULY	447059	94300	116332	376630	109363	0	1143684
AUGUST	506253	95343	119461	309428	104592	0	1135077
SEMPTEMBER	502814	85346	101722	344106	201348	0	1235336
OCTOBER	503300	101531	110250	326103	101479	0	1142663
NOVEMBER	442994	89909	73162	264685	117151	0	987901
DECEMBER	414986	80858	37590	256393	124892	0	914719
TOTAL	5093482	1082174	986221	3285602	1305592	148724	11901795
AVERAGE	423550	91141	87547	276452	106355	14872	999918

UNIT IN CUBIC METER

Table D-1.2 RESULTS OF SPOUTS SURVEY(1/2)
(KATHMANDU)

No.	Name & Location	Type	No.of Tap	Discharge rate* (L/s) Mar.'89	Aug.'89	EC (MS/cm) Aug.'89	Temperature (°C) Aug.'89
1.	Bang Gang Baneswore	B	2	0.68	1.48	540	20.5
2.	Dhungedhara Batisputali	B	1	0.32	0.29	340	21
3.	Dhungedhara Chabhill	B	3	0.48	1.22	420	19.5
4.	Dhungedhara Bhatbhatini	A	1	1.00	1.17	360	19.5
5.	Gauridhara Tangel	A	1	0.37	0.29	550	20
6.	Nandakeshari Naksal	A	3	**	0.73	660	20
7.	Pipalbat Dillibazar	A	1	0.17	0.45	560	19.5
8.	Sundhara Sundhara	A	5	0.35	0.77	920	19.5
9.	Kohiti Kohiti tole	A	1	0.31	0.40	850	18.5
10.	Bhimsen hiti Bhimsenthan	A	1	0.19	0.21	840	19
11.	Maruhiti Marutole	A	4	1.34	1.90	360	19.5
12.	Banjahiti Dhokatole	B	3	0.30	0.43	780	20
13.	Dallundhara Dallu	B	1	0.13	0.64	500	19.5
14.	Dhimabazardhara Dallu	B	1	0.02	0.02	800	21.5
15.	Kinadoledhara Swayanbhu	B	1	0.09	0.23	810	20.5
16.	Kapoordhara Lainchour	B	2	0.63	0.53	180	20.5
17.	Dillibazardara Dillibazar	A	1	0.01	0.10	680	21.5

Note; Type A: Tap located on the wall in the pit,Type B:Tap located on the slope of cliff with open drain *:Total tap discharge rate, **:Submergence, due to closed drainage system since January 1989.

Table D-1.2 RESULTS OF SPOUTS SURVEY(2/2)
(LALITPUR)

No.	Name & Location	Type	No.of Tap	Discharge rate* (L/s) Mar.'89	Aug.'89	EC (MS/cm) Aug.'89	Temperature (^{0}C) Aug.'89
1.	Jawalakheldara Jawalakhel	A	1+2**	0.12	0.39	540	21
2.	Dhobidhara1 Dhobigat	B	5+1**	4.72	8.55	380	19.5
3.	Dhobidhara2 Dhobigat	B	3	1.38	1.73	320	19.5
4.	Pulchokhiti Pulchok	A	1	0.15	0.48	870	20
5.	Natolehiti Natole	A	2	0.11	0.40	780	19.5
6.	Chhabahalhiti Chhabahal	A	1+1**	0.22	0.30	780	19.5
7.	Tapahiti Tapahiti	A	1	1.87	2.84	620	19.5
8.	Alukodhara Ekhachhen	A	5	3.06	5.07	590	19.5
9.	Nagbahalhiti Nagbahal	A	1+2**	0.06	5.19	670	19.5
10.	Gahhiti Kumbherswar	A	7+5**	3.64	10.62	510	19.5
11.	Manghadhara Manganbazar	A	3	0.79	1.46	500	19.5
12.	Chyasalhiti Chyasal	A	2+3**	3.41	15.30	660	19.5
13.	Sundhara Sundhara	B	3+1**	0.33	0.02	490	21
14.	Thapahiti Nadon	A	3	0.51	1.78	380	20

Note; Type A: Tap located on the wall in the pit,Type B:Tap located o the slope of cliff with open drain. *: Total tap discharge rate, **:Th number of no working (dried up)tap.

Table D-3.1 OPERATION TIME OF WELL DRILLING

Well Number Drilling Depth (m)	JW1 246	JW2 230	JW3 284	JW4 230	Total Days	Total %
Site preparation, transportation, assembly and disassembly of rig	4	3	3	9	19	7.9
Drilling operations	10	12	9	8	39	16.3
Electrical logging	2	2	1	1	6	2.5
Installation of permanent casing and screen, gravel packing and cementing	2	1	3	2	8	3.3
Development	7	9	11	8	35	14.6
Pumping test	6	5	7	6	24	10.0
Recovery work of accident	0	0	0	0	0	0.0
Mechanical trouble	0	0	0	3	3	1.3
Administration trouble*1	0	0	0	91	91	38.1
No activity, etc.*2	0	0	14	0	14	5.9
Total days	31	32	48	128	239	100.0

Note:*1,Including 88 days working suspention due to fuel shortage
*2,Dasain holiday

Table D-3.2 RESULTS OF PUMPING TEST ON JICA OBSERVATION WELLS

Well No.	Test type	Static water level (m)	Quantity (l/s)	Drawdown (m)	Specific yeild (l/s/m)	s/Q (m/l/s)
JW1	C	37.84	8.5	4.91	1.73	0.5776
	S-1	37.82	2.3	0.63	3.65	0.2739
	S-2		4.6	1.61	2.86	0.3500
	S-3		7.0	3.27	2.14	0.4671
	S-4		9.3	5.53	1.68	0.5946
JW2	C	77.50	1.8	2.36	0.76	1.3111
	S-1		0.8	1.20	0.67	1.5000
	S-2		1.3	1.78	0.73	1.3692
	S-3		1.8	2.21	0.81	1.2278
JW3	C	+5.88	1.7	43.08	0.04	25.3412
	S-1	+5.88	1.0	23.83	0.04	23.8300
	S-2		1.5	30.08	0.05	20.0533
	S-3		2.1	34.28	0.06	16.3238
	S-4		3.0	53.03	0.06	17.6767
JW4	C	1.90	10.2	4.55	2.24	0.4461
	S-1	1.90	2.5	1.10	2.27	0.4400
	S-2		5.0	2.25	2.22	0.4500
	S-3		7.5	4.06	1.85	0.5413
	S-4		10.2	4.57	2.23	0.4480

NOTE;C: Time drawdown test
S: Step drawdown test

Table D-3.3 ESTIMATED WELL LOSS AND AQUIFER LOSS ON JICA OBSERVATION WELLS

Well No.	Discharge rate (l/s)	Aquifer loss (m)	Well loss (m)	Total drawdown (m)	Well efficiency (%)
JW1	2.3	0.2553	0.2751	0.5304	48.1
	4.6	0.5106	1.1003	1.6109	31.7
	7.0	0.7770	4.4975	5.5298	23.4
	9.3	1.0323	4.4975	5.5298	18.7
JW2	0.8	-	-	-	-
	1.3	-	-	-	-
	1.8	-	-	-	-
JW3	1.0	-	-	-	-
	1.5	-	-	-	-
	2.1	-	-	-	-
	3.0	-	-	-	-
JW4	2.5	0.669	0.2281	0.8971	74.6
	5.0	1.338	0.9125	2.2505	59.5
	7.5	2.007	2.0531	4.0601	49.4
	10.2	2.730	3.7975	6.5275	41.8

Note; Well loss and aquifer loss of JW2 &JW3 could not estimated due to unreasonable data.

Table D-3.4 RESULTS OF PUMPING TEST ANALYSIS ON JICA OBSERVATION WELLS

Well No.	JW1	B12	JW2	JW3	JW4
Sreen thickness(m)	36	36	30	30	24
1).TRANSMISSIVITY AND PERMEABILITY					
Jacob/Time DD					
T(m2/day)	536	462	83	7	402
k(cm/s)	1.79E-02	1.54E-02	3.32E-03	2.70E-04	2.01E-02
Jacob/Recovery					
T(m2/day)	394	357	116	3.3	460
k(cm/s)	1.31E-02	1.19E-02	4.64E-03	1.27E-04	2.30E-02
Hantush/Jacob					
T(m2/day)	146	431	63	6	257
k(cm/s)	4.87E-03	1.44E-02	2.52E-03	2.31E-04	1.29E-02
2).STORAGE COEFICIENT					
Jacob/Time DD					
S(-)	-	0.00065	-	-	-
Hantush/Jacob					
S(-)	-	0.00185	-	-	-