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J.1.

SIMULATED STREAMFLOW AT THE NGOAJANE/HOLOLO ABSTRACTION SITE

SIMULATED RUNOFF AT THE NGOAJANE/HOLOLO ABSTRACTION SITE

CATCHMENT AREA = 211.SQ.KM

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL	ACCUMULATED
1935/36	0.18	0.26	0.45	0.54	0.96	5.13	2.41	1.22	1.33	0.80	0.36	0.14	13.78	13.78
1936/37	0.33	22.37	8.53	19.32	19.11	11.05	3.03	0.58	0.27	0.16	0.10	0.05	84.90	98.68
1937/38	0.20	0.25	0.20	3.84	16.37	5.59	0.96	1.23	7.06	3.43	6.09	2.96	48.18	146.86
1938/39	1.57	1.07	0.53	0.81	15.69	5.96	0.72	0.98	1.17	1.04	1.14	1.02	31.70	178.56
1939/40	3.60	15.25	5.38	0.86	1.14	5.26	10.36	9.58	3.29	0.88	0.42	0.42	56.44	235.00
1940/41	0.37	0.69	7.21	3.39	8.86	3.79	4.01	2.10	0.67	0.46	0.36	0.31	32.22	267.22
1941/42	2.11	1.08	0.17	6.32	5.36	13.66	7.72	2.39	1.20	0.69	0.71	0.75	42.16	309.38
1942/43	1.18	2.03	17.40	14.43	3.67	5.28	10.28	9.35	3.16	7.94	3.77	1.02	79.51	388.89
1943/44	11.80	18.36	17.48	13.43	13.74	4.84	1.08	0.58	1.16	1.42	0.78	1.03	85.70	474.59
1944/45	2.60	4.39	1.60	0.22	0.59	21.87	8.28	1.08	0.70	0.39	0.21	0.08	42.01	516.60
1945/46	0.03	0.00	0.05	0.48	1.24	1.70	1.57	1.81	1.60	0.89	0.43	0.17	9.97	526.57
1946/47	8.73	8.46	2.43	0.69	6.50	9.28	8.16	2.80	0.70	0.42	0.27	0.36	48.80	575.37
1947/48	2.20	7.50	7.55	2.79	1.13	23.02	14.87	3.67	1.14	0.59	0.29	0.14	64.89	640.26
1948/49	0.21	0.17	0.04	0.34	0.70	7.11	6.31	2.28	0.83	0.52	0.31	0.16	18.98	659.24
1949/50	0.18	0.32	0.48	0.80	3.67	12.49	12.92	10.03	3.36	1.01	1.21	1.04	47.51	706.75
1950/51	0.62	0.36	4.37	8.17	3.48	1.54	2.97	2.43	1.67	0.99	0.56	0.39	27.55	734.30
1951/52	15.10	5.54	0.40	0.48	11.60	4.98	1.34	0.95	0.60	0.74	0.86	0.60	43.19	777.49
1952/53	0.43	0.52	0.73	0.52	8.50	3.75	1.43	1.39	0.91	0.49	0.28	0.16	19.11	796.60
1953/54	0.41	0.69	2.03	7.07	3.17	2.04	1.38	0.90	0.74	0.51	0.28	0.17	19.39	815.99
1954/55	0.11	0.36	0.50	13.25	25.31	8.12	1.66	1.95	1.61	0.95	0.48	0.20	54.50	870.49
1955/56	0.32	10.45	7.72	1.77	3.22	2.23	1.53	1.91	1.55	0.84	0.42	0.20	32.16	902.65
1956/57	2.19	11.62	25.36	10.71	2.11	10.34	4.41	0.93	0.69	0.86	1.08	23.82	94.12	996.77
1957/58	32.08	10.82	1.70	8.74	3.39	0.58	1.20	1.80	1.45	0.81	0.39	0.39	63.35	1060.12
1958/59	0.58	0.97	1.37	1.10	0.65	0.46	4.34	19.90	7.37	1.69	1.31	0.55	40.29	1100.41
1959/60	1.50	1.76	11.67	4.69	5.31	14.03	8.04	2.43	1.05	0.70	0.79	0.91	52.88	1153.29
1960/61	1.29	5.34	6.74	11.34	3.84	0.95	7.63	9.14	4.07	2.03	1.29	0.79	54.45	1207.74
1961/62	0.39	6.74	2.99	0.75	8.87	6.24	4.34	1.98	0.70	0.35	0.22	0.14	33.71	1241.45
1962/63	0.12	0.40	0.38	10.55	4.44	6.38	9.46	3.76	1.55	1.46	1.05	0.46	40.01	1281.46
1963/64	0.30	0.89	1.17	2.56	1.76	13.94	5.65	1.06	0.94	0.87	0.69	0.52	30.35	1311.81
1964/65	9.28	3.86	1.08	3.64	1.64	0.38	1.00	1.24	0.80	0.66	0.58	0.39	24.55	1336.36
1965/66	0.28	0.66	0.54	13.06	5.34	0.84	0.40	0.26	0.23	0.17	0.13	0.07	21.98	1358.34
1966/67	0.12	0.25	0.62	29.56	22.00	9.45	6.32	4.31	1.90	0.78	0.41	0.26	75.98	1434.32
1967/68	0.35	0.88	1.06	0.56	0.27	3.53	2.63	7.36	3.31	0.91	0.61	0.35	21.82	1456.14
1968/69	0.28	0.38	0.48	0.47	0.46	2.12	2.04	5.15	2.62	0.90	0.48	0.26	15.64	1471.78
1969/70	0.83	1.06	4.48	2.50	1.21	0.80	0.52	0.37	0.37	0.59	0.73	0.84	14.30	1486.08
1970/71	0.99	0.74	7.44	11.20	4.19	4.80	4.73	7.47	3.13	0.96	0.62	0.30	46.57	1532.65
1971/72	0.21	0.36	0.46	3.48	9.54	11.45	3.83	1.13	0.93	0.62	0.37	0.20	32.58	1565.23
1972/73	0.26	0.79	0.49	0.22	1.19	1.47	1.51	1.22	0.69	0.41	0.99	1.43	10.67	1575.90
1973/74	0.95	0.83	1.26	12.55	5.22	5.57	2.74	1.00	0.77	0.58	0.39	0.23	32.09	1607.99
1974/75	0.18	20.23	7.38	2.70	11.91	9.64	3.00	0.99	0.63	0.45	0.36	0.71	58.18	1666.17
1975/76	1.13	15.65	7.51	5.26	9.32	32.12	13.35	2.35	1.30	0.87	0.47	0.47	89.80	1755.97
1976/77	9.38	17.90	5.69	6.29	2.72	12.47	5.09	0.95	0.56	0.31	0.17	0.25	61.78	1817.75
1977/78	5.05	2.20	0.57	11.53	4.70	9.94	7.34	2.25	0.72	0.43	0.36	0.64	45.73	1863.48
1978/79	1.01	0.65	6.34	2.70	1.13	1.28	0.84	0.70	0.70	0.89	12.72	5.49	34.45	1897.93
1979/80	7.82	9.14	3.42	1.23	5.03	2.56	0.90	0.51	0.32	0.20	0.13	0.56	31.82	1929.75
1980/81	0.66	2.47	1.65	23.43	17.94	8.76	3.16	1.37	0.94	0.73	0.88	0.75	62.74	1992.49
1981/82	0.34	0.44	1.02	1.26	0.77	0.47	9.18	4.02	0.88	0.68	0.49	0.30	19.85	2012.34
1982/83	3.79	2.25	0.66	0.24	0.31	0.74	0.91	0.84	0.81	0.88	0.69	0.36	12.48	2024.82
1983/84	0.55	8.16	5.12	2.11	0.99	2.69	1.59	0.75	0.55	0.38	0.44	0.42	23.75	2048.57
1984/85	0.62	0.65	0.53	0.45	3.47	2.03	0.85	0.46	0.24	0.14	0.09	0.04	9.57	2058.14
1985/86	0.46	3.17	20.03	6.97	0.78	0.78	2.98	1.75	0.88	0.73	0.75	0.63	39.91	2098.05
1986/87	1.11	3.69	1.66	0.40	0.51	0.80	1.36	1.25	0.67	0.35	0.55	17.17	29.52	2127.57
1987/88	6.54	1.11	1.34	5.34	9.97	21.89	7.66	1.49	1.10	0.84	0.57	0.42	58.27	2185.84
1988/89	0.91	1.29	9.73	4.10	8.38	3.93	1.33	1.11	1.43	1.37	0.80	0.33	34.71	2220.55
1989/90	0.16	1.66	0.97	0.24	0.63	6.43	15.01	5.25	0.80	0.57	0.51	0.30	32.53	2253.08
1990/91	0.16	0.08	0.06	16.13	18.30	13.22	3.64	0.46	0.25	0.21	0.14	0.19	52.84	2305.92
1991/92	7.10	2.95	0.49	0.24	0.19	0.47	0.54	0.33	0.17	0.10	0.42	0.53	13.53	2319.45
1992/93	0.61	10.91	4.14	0.48	0.74	1.14	1.45	1.16	0.64	0.34	0.27	0.22	22.10	2341.55
1993/94	6.72	3.31	3.31	8.44	5.90	8.66	9.18	3.08	0.62	0.34	0.23	0.13	49.92	2391.47
1994/95	0.07	0.05	0.06	0.19	0.33	0.90	1.31	1.13	0.73	0.42	0.24	0.12	5.55	2397.02
1995/96	0.48	6.19	3.69	4.90	12.20	4.86	1.35	1.14	0.89	0.71	0.75	0.61	37.77	2434.79
1996/97	0.68	10.56	3.96	0.64	0.87	19.91	12.22	9.12	3.72	1.39	0.92	0.51	64.50	2499.29
1997/98	0.38	0.60	0.37	7.78	11.93	7.00	2.10	0.67	0.36	0.26	0.19	0.13	31.77	2531.06
1998/99	0.25	12.26	4.62	0.38	0.33	0.46	0.44	0.47	0.46	0.34	0.20	0.10	20.31	2551.37
1999/00	0.25	0.32	8.35	12.07	14.93	17.26	5.42	1.09	0.82	0.52	0.28	0.21	61.52	2612.89
% TOTAL	6.15	10.96	9.84	13.50	14.53	16.93	10.94	6.67	3.39	2.10	2.11	2.87	100.00	

MAR = 40.20 MIL.CU.M STANDARD DEVIATION = 21.46 MIL.CU.M COEF.VARIATION = 0.53

J.2.

SIMULATED STREAMFLOW AT THE NGOAJANE DAM SITE

SIMULATED RUNOFF AT THE NGOAJANE DAM SITE

CATCHMENT AREA = 150.SQ.KM

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL	ACCUMULATED
1935/36	1.14	1.22	1.51	1.62	2.24	4.53	2.89	2.70	2.47	1.41	0.76	0.43	22.92	22.92
1936/37	1.16	16.99	7.66	14.30	13.95	8.45	3.30	1.23	0.69	0.53	0.45	0.37	69.08	92.00
1937/38	1.01	1.11	0.94	4.28	12.41	4.89	2.05	2.33	5.27	3.61	4.57	3.27	45.74	137.74
1938/39	2.81	1.96	1.32	1.98	11.91	5.42	1.53	2.01	2.11	1.81	1.97	1.82	36.65	174.39
1939/40	3.27	11.29	4.93	1.99	2.38	4.52	8.20	7.56	3.64	1.56	0.83	1.10	51.27	225.66
1940/41	1.09	1.82	6.27	3.98	7.10	4.00	3.55	2.61	1.32	1.02	0.86	0.95	34.57	260.23
1941/42	2.70	1.70	0.58	6.26	5.00	10.21	6.04	3.13	2.04	1.22	1.43	1.57	41.88	302.11
1942/43	2.34	3.09	13.32	11.05	3.87	4.68	8.19	7.39	3.48	5.90	3.91	1.84	69.06	371.17
1943/44	9.62	13.66	12.89	10.28	10.34	4.99	1.96	1.21	2.22	2.35	1.32	1.99	72.83	444.00
1944/45	3.18	4.24	2.06	0.77	1.75	16.43	7.25	1.98	1.32	0.83	0.55	0.35	40.71	484.71
1945/46	0.33	0.39	0.67	1.67	2.74	3.05	2.63	2.87	2.36	1.37	0.78	0.50	19.36	504.07
1946/47	7.69	7.03	2.83	1.70	5.74	7.36	6.38	3.15	1.38	0.92	0.70	1.10	45.98	550.05
1947/48	2.74	6.20	6.22	3.51	2.26	16.83	11.23	4.10	1.94	1.06	0.66	0.48	57.23	607.28
1948/49	0.90	0.81	0.39	1.35	1.99	6.16	5.17	2.85	1.57	1.03	0.74	0.56	23.52	630.80
1949/50	0.85	1.23	1.54	2.03	3.68	9.40	9.52	7.73	3.68	1.77	2.10	1.83	45.36	676.16
1950/51	1.34	1.04	4.49	6.85	4.12	2.73	3.12	3.65	2.87	1.66	1.08	0.94	33.89	710.05
1951/52	11.56	4.94	1.14	1.50	9.24	5.10	2.41	1.72	1.18	1.51	1.65	1.27	43.22	753.27
1952/53	1.16	1.47	1.87	1.41	7.37	4.23	2.61	2.33	1.54	0.94	0.69	0.55	26.17	779.44
1953/54	1.35	1.84	2.67	5.98	3.75	3.04	2.47	1.83	1.48	1.06	0.68	0.59	26.74	806.18
1954/55	0.63	1.32	1.56	10.48	18.52	7.17	2.85	3.01	2.35	1.45	0.86	0.51	50.71	856.89
1955/56	1.10	8.78	6.51	2.13	3.63	3.33	2.66	3.06	2.50	1.43	0.81	0.62	36.56	893.45
1956/57	2.87	8.98	18.44	8.40	2.96	8.50	4.59	1.73	1.39	1.68	1.95	17.02	78.51	971.96
1957/58	22.88	8.38	2.53	7.27	3.49	1.47	2.46	3.02	2.23	1.30	0.74	1.05	56.82	1028.78
1958/59	1.56	2.20	2.70	2.21	1.49	1.27	4.17	14.53	6.51	2.66	1.99	0.96	42.25	1071.03
1959/60	2.14	3.00	8.85	4.62	4.68	10.41	6.26	3.10	1.83	1.28	1.57	1.79	49.53	1120.56
1960/61	2.45	4.53	5.56	9.33	3.99	2.06	6.13	7.12	4.62	3.11	2.00	1.42	52.32	1172.88
1961/62	0.88	6.15	3.65	1.75	7.41	5.27	3.74	2.60	1.37	0.78	0.63	0.60	34.83	1207.71
1962/63	0.69	1.41	1.26	9.05	4.79	5.33	7.51	4.23	2.50	2.24	1.64	0.85	41.50	1249.21
1963/64	0.93	2.15	2.46	2.86	2.74	10.38	5.30	1.92	1.75	1.58	1.34	1.15	34.56	1283.77
1964/65	7.65	4.11	2.26	3.60	2.20	1.07	2.23	2.33	1.50	1.31	1.21	0.98	30.45	1314.22
1965/66	0.92	1.79	1.46	10.78	5.48	1.71	1.01	0.85	0.78	0.66	0.56	0.44	26.44	1340.66
1966/67	0.77	1.12	1.83	21.91	16.11	7.33	5.09	4.10	2.78	1.48	0.89	0.77	64.18	1404.84
1967/68	1.17	2.16	2.31	1.35	0.93	3.89	3.80	5.36	3.33	1.64	1.18	0.83	27.95	1432.79
1968/69	0.94	1.26	1.51	1.42	1.39	2.70	3.19	3.96	2.94	1.59	0.97	0.68	22.55	1455.34
1969/70	1.97	2.30	4.26	3.37	2.34	1.67	1.27	1.03	1.06	1.44	1.60	1.77	24.08	1479.42
1970/71	2.02	1.62	6.46	8.91	4.66	4.04	3.88	5.76	3.42	1.72	1.16	0.72	44.37	1523.79
1971/72	0.78	1.29	1.47	3.80	7.70	9.14	4.11	2.10	1.70	1.15	0.82	0.61	34.67	1558.46
1972/73	0.98	2.04	1.25	0.86	2.37	2.79	2.68	2.06	1.22	0.85	1.98	2.57	21.65	1580.11
1973/74	1.77	1.81	2.56	9.54	5.14	4.66	3.21	1.87	1.47	1.16	0.89	0.70	34.78	1614.89
1974/75	0.79	15.55	6.56	3.10	9.11	7.48	3.50	1.86	1.22	0.99	0.90	1.69	52.75	1667.64
1975/76	2.34	11.66	6.10	4.66	7.43	23.25	9.99	3.09	2.20	1.45	0.92	1.19	74.28	1741.92
1976/77	7.66	13.27	5.22	5.56	3.18	9.53	4.92	1.79	1.10	0.73	0.53	0.94	54.43	1796.35
1977/78	4.87	2.75	1.51	9.47	4.85	8.24	5.91	2.77	1.42	0.93	0.91	1.58	45.21	1841.56
1978/79	2.16	1.46	5.81	3.25	2.38	2.47	1.65	1.51	1.48	1.74	9.16	5.24	38.31	1879.87
1979/80	6.09	7.07	4.04	2.38	4.44	3.20	1.77	1.13	0.82	0.63	0.51	1.59	33.67	1913.54
1980/81	1.68	2.96	2.69	17.30	13.17	6.85	3.85	2.28	1.65	1.33	1.68	1.48	56.92	1970.46
1981/82	0.86	1.36	2.37	2.58	1.63	1.25	7.62	4.24	1.62	1.31	1.02	0.83	26.69	1997.15
1982/83	3.90	3.21	1.47	0.87	1.18	1.97	2.01	1.75	1.62	1.67	1.32	0.85	21.82	2018.97
1983/84	1.49	6.91	4.61	3.11	2.16	3.03	2.38	1.58	1.20	0.89	1.16	1.11	29.63	2048.60
1984/85	1.61	1.64	1.48	1.37	3.74	2.94	1.75	1.05	0.65	0.51	0.42	0.33	17.49	2066.09
1985/86	1.54	3.61	14.90	6.02	1.82	1.81	2.99	2.41	1.71	1.38	1.49	1.35	41.03	2107.12
1986/87	2.28	3.50	2.20	1.15	1.52	1.98	2.64	2.18	1.21	0.78	1.32	12.75	33.51	2140.63
1987/88	5.81	2.25	2.62	4.68	7.82	16.00	6.89	2.48	1.82	1.45	1.10	1.03	53.95	2194.58
1988/89	2.05	2.55	7.79	4.33	6.81	4.35	2.37	1.98	2.38	2.11	1.30	0.69	38.71	2233.29
1989/90	0.67	2.62	1.86	0.76	1.80	5.69	11.12	4.86	1.51	1.17	1.14	0.79	33.99	2267.28
1990/91	0.68	0.51	0.61	12.95	13.77	10.31	3.75	1.04	0.74	0.70	0.53	0.84	46.43	2313.71
1991/92	6.44	3.39	1.30	0.90	0.88	1.52	1.51	0.94	0.58	0.47	1.47	1.54	20.94	2334.65
1992/93	1.64	8.62	4.00	1.35	1.88	2.41	2.64	2.00	1.17	0.76	0.76	0.76	27.99	2362.64
1993/94	6.17	4.09	3.32	6.83	5.05	6.87	7.09	3.30	1.25	0.77	0.66	0.54	45.94	2408.58
1994/95	0.51	0.53	0.67	1.06	1.31	2.20	2.56	2.05	1.35	0.86	0.65	0.50	14.25	2422.83
1995/96	1.49	5.65	4.10	4.89	9.37	5.00	2.37	2.01	1.58	1.34	1.48	1.33	40.61	2463.44
1996/97	1.60	8.51	3.86	1.66	2.06	14.78	9.15	7.15	4.12	2.24	1.52	1.02	57.67	2521.11
1997/98	1.07	1.64	1.05	7.15	9.88	5.83	2.70	1.41	0.86	0.71	0.62	0.63	33.55	2554.66
1998/99	1.08	9.39	4.31	1.09	1.17	1.46	1.29	1.31	1.20	0.88	0.63	0.42	24.23	2578.89
1999/ 0	1.07	1.21	7.47	9.62	11.17	12.66	5.10	2.03	1.52	1.03	0.67	0.74	54.29	2633.18
% TOTAL	6.79	10.42	9.65	12.31	13.04	14.56	10.49	7.46	4.85	3.45	3.20	3.77	100.00	
MAR =	40.51 MIL.CU.M			STANDARD DEVIATION =				14.92 MIL.CU.M			COEF.VARIATION = 0.37			

J.3.

SIMULATED STREAMFLOW AT MUELA DAM

SIMULATED RUNOFF AT MUELA DAM													CATCHMENT AREA = 31.SQ.KM	
*****													*****	
YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL	ACCUMULATED
1935/36	0.06	0.07	0.09	0.11	0.15	0.71	0.35	0.27	0.22	0.12	0.07	0.03	2.25	2.25
1936/37	0.07	3.22	1.23	2.82	2.79	1.61	0.45	0.10	0.06	0.04	0.03	0.02	12.44	14.69
1937/38	0.06	0.07	0.06	0.51	2.37	0.83	0.15	0.19	1.00	0.49	0.89	0.44	7.06	21.75
1938/39	0.26	0.17	0.10	0.13	2.26	0.87	0.12	0.15	0.17	0.16	0.17	0.16	4.72	26.47
1939/40	0.51	2.23	0.80	0.15	0.18	0.74	1.55	1.45	0.49	0.14	0.07	0.08	8.39	34.86
1940/41	0.08	0.12	1.01	0.48	1.28	0.56	0.58	0.31	0.11	0.08	0.07	0.07	4.75	39.61
1941/42	0.27	0.15	0.04	0.87	0.76	2.00	1.13	0.35	0.18	0.11	0.12	0.13	6.11	45.72
1942/43	0.18	0.34	2.58	2.11	0.55	0.76	1.54	1.41	0.47	1.15	0.55	0.16	11.80	57.52
1943/44	1.78	2.70	2.56	1.93	2.00	0.71	0.17	0.10	0.17	0.20	0.12	0.16	12.60	70.12
1944/45	0.41	0.67	0.25	0.05	0.11	3.15	1.20	0.17	0.11	0.07	0.04	0.03	6.26	76.38
1945/46	0.02	0.02	0.03	0.10	0.19	0.24	0.22	0.27	0.22	0.13	0.07	0.04	1.55	77.93
1946/47	1.22	1.21	0.37	0.12	0.92	1.34	1.19	0.42	0.12	0.08	0.06	0.07	7.12	85.05
1947/48	0.28	1.07	1.10	0.41	0.18	3.35	2.21	0.55	0.17	0.10	0.06	0.04	9.52	94.57
1948/49	0.05	0.05	0.02	0.07	0.13	0.99	0.90	0.34	0.13	0.09	0.06	0.04	2.87	97.44
1949/50	0.05	0.08	0.10	0.14	0.50	1.81	1.89	1.50	0.50	0.15	0.18	0.16	7.06	104.50
1950/51	0.11	0.08	0.60	1.17	0.51	0.22	0.47	0.48	0.28	0.15	0.10	0.07	4.24	108.74
1951/52	2.17	0.81	0.08	0.10	1.66	0.71	0.20	0.15	0.10	0.12	0.13	0.10	6.33	115.07
1952/53	0.09	0.10	0.13	0.10	1.20	0.54	0.21	0.20	0.14	0.09	0.06	0.04	2.90	117.97
1953/54	0.08	0.12	0.26	1.01	0.47	0.36	0.23	0.15	0.12	0.09	0.06	0.04	2.99	120.96
1954/55	0.04	0.08	0.10	1.91	3.69	1.19	0.24	0.27	0.22	0.14	0.08	0.04	8.00	128.96
1955/56	0.07	1.47	1.10	0.28	0.44	0.32	0.22	0.40	0.26	0.13	0.07	0.05	4.81	133.77
1956/57	0.27	1.68	3.71	1.56	0.32	1.56	0.66	0.15	0.12	0.14	0.16	3.46	13.79	147.56
1957/58	4.69	1.59	0.26	1.26	0.50	0.11	0.18	0.25	0.20	0.12	0.07	0.08	9.31	156.87
1958/59	0.11	0.16	0.20	0.17	0.11	0.09	0.59	2.90	1.08	0.23	0.19	0.09	5.92	162.79
1959/60	0.20	0.24	1.71	0.70	0.77	2.05	1.18	0.36	0.16	0.11	0.13	0.14	7.75	170.54
1960/61	0.19	0.77	0.97	1.71	0.59	0.15	1.09	1.35	0.71	0.31	0.18	0.12	8.14	178.68
1961/62	0.07	0.95	0.44	0.13	1.26	0.90	0.63	0.29	0.12	0.07	0.05	0.04	4.95	183.63
1962/63	0.04	0.09	0.08	1.49	0.63	0.92	1.41	0.56	0.22	0.21	0.16	0.08	5.89	189.52
1963/64	0.07	0.15	0.18	0.35	0.26	2.03	0.83	0.16	0.15	0.14	0.11	0.09	4.52	194.04
1964/65	1.32	0.56	0.17	0.51	0.25	0.08	0.16	0.18	0.13	0.11	0.10	0.08	3.65	197.69
1965/66	0.06	0.12	0.10	1.86	0.77	0.14	0.08	0.06	0.05	0.05	0.04	0.03	3.36	201.05
1966/67	0.04	0.06	0.12	4.28	3.20	1.38	0.92	0.67	0.30	0.13	0.08	0.06	11.24	212.29
1967/68	0.08	0.15	0.17	0.10	0.06	0.47	0.39	0.98	0.45	0.14	0.10	0.07	3.16	215.45
1968/69	0.06	0.08	0.10	0.09	0.09	0.26	0.28	0.75	0.39	0.14	0.09	0.05	2.38	217.83
1969/70	0.13	0.17	0.63	0.36	0.18	0.13	0.10	0.08	0.08	0.10	0.12	0.13	2.21	220.04
1970/71	0.15	0.12	1.05	1.62	0.64	0.62	0.66	1.07	0.46	0.15	0.10	0.06	6.70	226.74
1971/72	0.05	0.08	0.09	0.47	1.37	1.72	0.58	0.17	0.15	0.10	0.07	0.05	4.90	231.64
1972/73	0.06	0.13	0.09	0.05	0.15	0.22	0.23	0.18	0.11	0.07	0.15	0.21	1.65	233.29
1973/74	0.15	0.14	0.19	1.82	0.76	0.81	0.40	0.16	0.12	0.10	0.07	0.05	4.77	238.06
1974/75	0.05	2.90	1.07	0.38	1.73	1.41	0.44	0.16	0.10	0.08	0.07	0.12	8.51	246.57
1975/76	0.17	2.26	1.09	0.76	1.35	4.70	1.95	0.35	0.19	0.13	0.08	0.09	13.12	259.69
1976/77	1.33	2.61	0.85	0.90	0.40	1.81	0.74	0.15	0.09	0.06	0.04	0.06	9.04	268.73
1977/78	0.68	0.32	0.11	1.64	0.68	1.50	1.08	0.34	0.12	0.08	0.07	0.11	6.73	275.46
1978/79	0.16	0.11	0.89	0.40	0.18	0.19	0.13	0.12	0.12	0.14	1.83	0.79	5.06	280.52
1979/80	1.14	1.33	0.51	0.19	0.69	0.37	0.14	0.09	0.06	0.05	0.04	0.10	4.71	285.23
1980/81	0.12	0.32	0.24	3.42	2.62	1.28	0.45	0.20	0.15	0.12	0.14	0.12	9.18	294.41
1981/82	0.07	0.09	0.16	0.19	0.13	0.09	1.29	0.57	0.14	0.11	0.09	0.06	2.99	297.40
1982/83	0.51	0.32	0.12	0.06	0.07	0.13	0.15	0.14	0.13	0.14	0.11	0.07	1.95	299.35
1983/84	0.10	1.15	0.73	0.35	0.18	0.38	0.24	0.13	0.10	0.07	0.09	0.08	3.60	302.95
1984/85	0.11	0.12	0.10	0.09	0.46	0.29	0.14	0.09	0.05	0.04	0.03	0.02	1.54	304.49
1985/86	0.09	0.41	2.91	1.03	0.13	0.13	0.40	0.25	0.14	0.12	0.12	0.11	5.84	310.33
1986/87	0.17	0.52	0.25	0.08	0.10	0.14	0.20	0.18	0.11	0.07	0.10	2.47	4.39	314.72
1987/88	0.95	0.17	0.20	0.76	1.44	3.20	1.12	0.21	0.17	0.13	0.10	0.08	8.53	323.25
1988/89	0.15	0.19	1.39	0.60	1.21	0.57	0.20	0.17	0.20	0.19	0.12	0.06	5.05	328.30
1989/90	0.05	0.20	0.14	0.05	0.11	0.89	2.18	0.77	0.13	0.10	0.09	0.06	4.77	333.07
1990/91	0.05	0.03	0.03	2.29	2.65	1.98	0.56	0.08	0.06	0.05	0.04	0.05	7.87	340.94
1991/92	0.97	0.42	0.09	0.06	0.05	0.09	0.10	0.07	0.04	0.03	0.09	0.10	2.11	343.05
1992/93	0.11	1.56	0.61	0.10	0.13	0.18	0.21	0.17	0.10	0.07	0.06	0.05	3.35	346.40
1993/94	0.93	0.47	0.48	1.22	0.86	1.26	1.34	0.45	0.11	0.06	0.05	0.04	7.27	353.67
1994/95	0.03	0.03	0.04	0.06	0.08	0.15	0.19	0.17	0.12	0.07	0.05	0.04	1.03	354.70
1995/96	0.09	0.86	0.56	0.75	1.79	0.71	0.20	0.17	0.14	0.12	0.12	0.11	5.62	360.32
1996/97	0.12	1.50	0.58	0.12	0.15	2.88	1.77	1.37	0.55	0.20	0.14	0.09	9.47	369.79
1997/98	0.08	0.11	0.07	1.09	1.77	1.04	0.32	0.12	0.07	0.05	0.04	0.04	4.80	374.59
1998/99	0.07	1.66	0.65	0.08	0.08	0.10	0.09	0.09	0.09	0.07	0.05	0.03	3.06	377.65
1999/ 0	0.06	0.07	1.16	1.71	2.17	2.53	0.80	0.17	0.13	0.09	0.06	0.05	9.00	386.65
% TOTAL	6.20	10.81	9.80	13.31	14.34	16.72	10.87	6.81	3.53	2.25	2.29	3.07	100.00	
MAR =	5.95 MIL.CU.M		STANDARD DEVIATION =				3.11 MIL.CU.M		COEF.VARIATION = 0.52					

J.4.

SIMULATED STREAMFLOW AT THE HLOTSE ABSTRACTION SITE

SIMULATED RUNOFF AT THE HLOTSE ABSTRACTION SITE

CATCHMENT AREA = 367.SQ.KM

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL	ACCUMULATED
1935/36	0.57	0.57	1.02	1.44	0.95	3.83	1.42	1.82	1.53	0.76	0.39	0.18	14.48	14.48
1936/37	2.16	55.72	10.49	29.46	36.16	11.78	1.89	0.57	0.34	0.31	0.25	0.25	149.38	163.86
1937/38	0.43	0.52	1.00	20.62	40.97	5.08	2.08	1.80	1.82	1.53	1.42	0.96	78.23	242.09
1938/39	1.41	0.81	5.45	41.02	36.18	4.68	0.80	1.20	1.07	1.03	1.37	0.97	95.99	338.08
1939/40	1.65	15.91	2.74	0.76	15.20	3.32	11.95	3.78	1.70	0.90	0.48	5.08	63.47	401.55
1940/41	1.43	1.24	9.31	14.28	24.05	3.54	1.77	1.25	0.52	0.43	0.36	0.91	59.09	460.64
1941/42	18.21	2.48	0.09	14.65	14.39	21.08	9.03	2.35	1.22	0.72	1.44	1.29	86.95	547.59
1942/43	5.22	18.75	19.27	21.46	3.21	7.56	14.77	18.14	3.34	11.77	14.38	2.41	140.28	687.87
1943/44	29.14	44.32	40.62	5.09	23.41	5.66	1.20	0.89	4.77	1.93	0.65	1.23	158.91	846.78
1944/45	5.80	8.59	1.23	0.34	19.54	28.04	4.70	1.65	0.95	0.48	0.28	0.15	71.75	918.53
1945/46	0.39	0.49	0.27	3.25	1.66	8.79	2.32	2.06	1.52	0.70	0.35	0.23	22.03	940.56
1946/47	7.71	2.52	1.04	0.79	1.16	1.53	14.79	2.82	0.85	0.70	0.45	0.79	35.15	975.71
1947/48	4.21	2.06	30.20	4.81	13.47	41.30	6.42	1.32	0.60	0.44	0.33	0.16	105.32	1081.03
1948/49	0.58	0.63	0.20	15.09	3.39	7.45	2.17	1.25	0.87	0.54	0.32	0.42	32.91	1113.94
1949/50	1.83	16.30	24.89	13.37	2.94	40.78	25.40	6.19	1.79	1.44	15.45	2.90	153.28	1267.22
1950/51	0.91	0.75	14.21	3.21	14.51	10.09	2.62	1.53	1.05	0.64	0.69	0.57	50.78	1318.00
1951/52	17.49	2.65	0.49	1.31	27.40	5.00	1.84	1.13	0.65	0.85	1.01	0.79	60.61	1378.61
1952/53	0.56	1.36	2.67	0.86	21.85	3.92	1.33	1.02	0.65	0.40	0.36	0.30	35.28	1413.89
1953/54	5.70	2.67	1.73	1.91	11.21	17.89	3.10	1.50	1.30	0.75	0.37	0.27	48.40	1462.29
1954/55	0.32	0.70	0.78	34.15	47.66	6.45	6.42	2.79	1.74	0.98	0.47	0.21	102.67	1564.96
1955/56	0.56	4.11	13.00	7.36	19.04	16.61	3.29	4.69	1.79	0.74	0.41	0.35	71.95	1636.91
1956/57	1.49	24.88	65.14	32.22	15.49	14.28	7.61	1.94	1.11	1.33	1.67	35.28	202.44	1839.35
1957/58	56.25	14.92	2.64	3.99	4.96	4.39	15.23	11.42	2.59	1.02	0.62	0.77	118.80	1958.15
1958/59	1.17	1.61	7.17	2.21	1.19	0.98	9.48	34.83	5.38	2.09	1.46	0.51	68.08	2026.23
1959/60	3.41	11.81	17.07	4.48	41.51	25.43	13.78	2.81	0.96	0.58	0.61	1.15	123.60	2149.83
1960/61	1.94	21.41	19.64	16.58	5.04	18.32	21.85	7.29	2.83	1.86	1.07	0.80	118.63	2268.46
1961/62	0.44	4.16	2.03	5.34	30.57	15.32	7.58	2.14	0.86	0.45	0.36	0.30	69.55	2338.01
1962/63	0.53	1.46	0.90	26.01	13.88	14.43	17.35	3.44	1.31	1.15	0.77	0.37	81.60	2419.61
1963/64	0.80	5.07	2.16	4.33	1.51	17.94	3.65	1.19	0.99	0.77	0.58	0.80	39.79	2459.40
1964/65	20.40	3.10	1.08	8.53	1.79	0.44	1.47	1.24	0.83	0.99	0.89	0.52	41.28	2500.68
1965/66	0.61	1.15	0.59	17.62	3.59	1.45	1.02	0.87	0.76	0.53	0.36	0.26	28.81	2529.49
1966/67	0.34	0.66	0.86	53.14	34.81	11.29	11.99	3.25	1.62	0.97	0.59	0.36	119.88	2649.37
1967/68	0.77	1.06	3.12	0.83	0.32	8.57	3.90	10.59	2.59	1.13	0.84	0.42	34.14	2683.51
1968/69	0.59	0.45	0.70	0.46	0.82	11.51	3.38	17.00	3.31	0.97	0.59	0.31	40.09	2723.60
1969/70	7.07	1.53	3.36	1.50	0.84	0.65	0.55	0.45	0.63	0.84	0.88	1.09	19.39	2742.99
1970/71	1.12	0.79	4.20	13.36	5.36	7.91	5.28	4.06	1.70	0.85	0.49	0.25	45.37	2788.36
1971/72	0.57	0.73	0.65	8.63	24.79	20.04	3.31	1.04	0.74	0.50	0.35	0.61	61.96	2850.32
1972/73	1.14	12.30	1.81	0.44	23.47	4.25	1.88	1.23	0.59	0.47	1.26	1.23	50.07	2900.39
1973/74	0.60	13.81	2.76	42.25	8.01	8.34	2.72	1.42	1.01	0.71	0.64	0.52	82.79	2983.18
1974/75	0.70	39.94	6.04	12.98	16.09	17.27	3.30	1.14	0.68	0.72	0.68	18.40	117.94	3101.12
1975/76	3.70	21.93	7.76	5.69	27.37	42.17	11.21	2.37	1.45	0.94	0.46	4.32	129.37	3230.49
1976/77	22.92	13.37	1.75	19.23	5.38	41.26	5.56	0.60	0.43	0.32	0.23	1.06	112.11	3342.60
1977/78	18.24	3.12	6.42	20.38	3.56	12.58	22.68	3.56	0.77	0.56	0.63	1.30	93.80	3436.40
1978/79	1.72	1.20	29.63	4.29	0.97	0.92	0.70	0.81	0.77	6.17	12.52	2.97	62.67	3499.07
1979/80	20.52	10.07	7.28	1.58	4.80	1.67	0.76	0.50	0.37	0.28	0.24	7.75	55.82	3554.89
1980/81	1.79	15.44	2.55	50.85	7.25	11.50	3.27	1.62	1.55	1.17	1.32	0.91	99.22	3654.11
1981/82	0.43	1.21	1.13	0.60	0.50	0.77	22.00	3.62	0.93	0.87	0.52	0.25	32.83	3686.94
1982/83	8.03	2.19	0.71	0.19	0.56	1.09	1.11	0.74	0.44	0.42	0.34	0.21	16.03	3702.97
1983/84	0.51	9.43	2.42	1.37	0.65	0.77	0.93	1.78	1.47	0.71	0.78	0.52	21.34	3724.31
1984/85	0.66	1.20	0.66	0.25	0.87	0.84	0.48	0.28	0.20	0.19	0.16	0.10	5.89	3730.20
1985/86	0.80	1.39	5.47	1.44	1.35	1.23	1.28	0.83	1.44	1.41	1.72	1.15	19.51	3749.71
1986/87	21.25	3.98	0.76	0.38	0.80	11.02	15.63	2.66	0.50	0.39	0.90	48.02	106.29	3856.00
1987/88	6.93	9.21	2.90	11.90	36.72	47.11	16.36	3.36	1.90	1.22	0.62	0.88	139.11	3995.11
1988/89	1.33	1.74	3.01	2.05	30.61	5.58	1.66	2.42	3.00	1.74	0.73	0.27	54.14	4049.25
1989/90	0.38	7.08	1.31	0.35	1.43	9.13	28.14	4.43	1.37	1.52	1.35	0.59	57.08	4106.33
1990/91	0.33	0.20	0.49	21.53	9.04	12.47	2.08	0.34	0.33	0.34	0.23	0.63	48.01	4154.34
1991/92	24.63	3.70	0.50	0.18	0.65	1.45	1.03	0.47	0.27	0.22	1.15	0.87	35.12	4189.46
1992/93	1.08	14.25	2.17	0.55	10.54	2.64	7.45	2.06	0.87	0.57	0.48	0.37	43.03	4232.49
1993/94	31.32	4.66	1.42	18.63	11.42	2.90	5.75	1.64	0.50	0.39	0.32	0.20	79.15	4311.64
1994/95	0.21	0.49	0.50	0.73	1.03	1.64	1.42	1.61	1.19	0.59	0.35	0.25	10.01	4321.65
1995/96	10.39	16.40	13.03	11.26	20.26	4.69	1.84	1.59	1.21	1.32	1.32	0.87	84.18	4405.83
1996/97	2.79	11.34	23.57	15.41	4.10	21.78	9.24	13.20	2.90	1.21	0.69	0.29	106.52	4512.35
1997/98	0.48	0.87	0.49	5.50	12.21	18.46	2.94	0.69	0.55	0.44	0.31	1.01	43.95	4556.30
1998/99	1.56	37.17	4.91	0.78	3.49	2.39	1.42	1.22	0.88	0.56	0.82	0.76	55.96	4612.26
1999/00	0.98	33.67	16.35	59.20	7.87	57.63	11.64	2.01	1.07	1.09	0.73	0.50	192.74	4805.00
% TOTAL	8.10	11.85	9.57	15.49	16.98	16.04	8.97	4.61	1.81	1.47	1.77	3.34	100.00	

MAR = 73.92 MIL.CU.M STANDARD DEVIATION = 44.82 MIL.CU.M COEF.VARIATION = 0.61

J.5.

SIMULATED STREAMFLOW AT THE HLOTSE DAM SITE

SIMULATED RUNOFF AT THE HLOTSE DAM SITE													CATCHMENT AREA = 359.SQ.KM	
*****													*****	
YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL	ACCUMULATED
1935/36	0.57	0.56	1.01	1.41	0.93	3.75	1.39	1.78	1.49	0.74	0.39	0.17	14.19	14.19
1936/37	2.11	54.56	10.27	28.85	35.42	11.54	1.85	0.56	0.33	0.30	0.25	0.25	146.29	160.48
1937/38	0.42	0.51	0.97	20.20	40.11	4.98	2.04	1.77	1.77	1.51	1.39	0.94	76.61	237.09
1938/39	1.39	0.79	5.34	40.18	35.42	4.59	0.78	1.17	1.05	1.01	1.33	0.95	94.00	331.09
1939/40	1.61	15.58	2.69	0.74	14.88	3.25	11.71	3.70	1.66	0.89	0.47	4.97	62.15	393.24
1940/41	1.41	1.22	9.11	13.99	23.54	3.46	1.72	1.22	0.51	0.43	0.35	0.89	57.85	451.09
1941/42	17.84	2.42	0.09	14.35	14.09	20.65	8.84	2.30	1.19	0.71	1.42	1.27	85.17	536.26
1942/43	5.10	18.37	18.87	21.01	3.15	7.41	14.47	17.76	3.27	11.53	14.08	2.35	137.37	673.63
1943/44	28.53	43.40	39.77	4.98	22.92	5.54	1.17	0.87	4.67	1.89	0.63	1.20	155.57	829.20
1944/45	5.68	8.42	1.20	0.32	19.13	27.46	4.60	1.62	0.93	0.48	0.27	0.15	70.26	899.46
1945/46	0.38	0.47	0.27	3.18	1.62	8.61	2.27	2.01	1.49	0.68	0.34	0.22	21.54	921.00
1946/47	7.54	2.47	1.02	0.77	1.14	1.51	14.49	2.76	0.83	0.69	0.44	0.77	34.43	955.43
1947/48	4.12	2.02	29.57	4.70	13.19	40.44	6.28	1.29	0.58	0.43	0.33	0.16	103.11	1058.54
1948/49	0.56	0.62	0.21	14.78	3.32	7.30	2.12	1.23	0.86	0.53	0.32	0.41	32.26	1090.80
1949/50	1.80	15.96	24.38	13.10	2.89	39.93	24.87	6.05	1.76	1.41	15.13	2.84	150.12	1240.92
1950/51	0.90	0.74	13.91	3.14	14.22	9.88	2.57	1.51	1.03	0.62	0.67	0.56	49.75	1290.67
1951/52	17.13	2.60	0.49	1.28	26.83	4.90	1.80	1.11	0.63	0.84	0.98	0.77	59.36	1350.03
1952/53	0.55	1.34	2.62	0.85	21.40	3.83	1.31	0.99	0.64	0.39	0.35	0.30	34.57	1384.60
1953/54	5.59	2.61	1.69	1.86	10.97	17.53	3.04	1.47	1.27	0.73	0.36	0.27	47.39	1431.99
1954/55	0.31	0.69	0.75	33.45	46.68	6.31	6.29	2.73	1.70	0.96	0.45	0.20	100.52	1532.51
1955/56	0.55	4.02	12.74	7.20	18.65	16.27	3.22	4.60	1.75	0.72	0.40	0.34	70.46	1602.97
1956/57	1.46	24.36	63.80	31.55	15.18	13.98	7.45	1.89	1.09	1.30	1.64	34.56	198.26	1801.23
1957/58	55.08	14.61	2.58	3.91	4.86	4.31	14.92	11.18	2.53	1.00	0.61	0.76	116.35	1917.58
1958/59	1.15	1.58	7.01	2.17	1.16	0.96	9.29	34.11	5.26	2.06	1.44	0.49	66.68	1984.26
1959/60	3.33	11.57	16.71	4.39	40.65	24.91	13.50	2.75	0.95	0.56	0.59	1.13	121.04	2105.30
1960/61	1.89	20.98	19.24	16.23	4.93	17.94	21.39	7.14	2.76	1.83	1.05	0.79	116.17	2221.47
1961/62	0.43	4.07	1.99	5.23	29.93	15.00	7.43	2.10	0.85	0.43	0.34	0.29	68.09	2289.56
1962/63	0.52	1.42	0.89	25.47	13.60	14.12	16.98	3.36	1.29	1.14	0.75	0.35	79.89	2369.45
1963/64	0.78	4.96	2.11	4.23	1.48	17.58	3.58	1.17	0.97	0.74	0.56	0.79	38.95	2408.40
1964/65	19.98	3.04	1.06	8.36	1.76	0.42	1.44	1.22	0.82	0.97	0.88	0.52	40.47	2448.87
1965/66	0.59	1.12	0.57	17.26	3.51	1.41	1.00	0.85	0.74	0.52	0.36	0.25	28.18	2477.05
1966/67	0.33	0.64	0.84	52.03	34.09	11.06	11.75	3.18	1.58	0.96	0.57	0.34	117.37	2594.42
1967/68	0.75	1.04	3.06	0.81	0.30	8.39	3.82	10.37	2.54	1.10	0.83	0.42	33.43	2627.85
1968/69	0.58	0.43	0.69	0.44	0.79	11.28	3.30	16.65	3.24	0.95	0.57	0.30	39.22	2667.07
1969/70	6.92	1.50	3.28	1.46	0.82	0.63	0.53	0.45	0.61	0.82	0.86	1.07	18.95	2686.02
1970/71	1.10	0.78	4.11	13.08	5.24	7.75	5.18	3.98	1.67	0.83	0.48	0.24	44.44	2730.46
1971/72	0.55	0.71	0.64	8.45	24.28	19.62	3.23	1.02	0.72	0.49	0.34	0.60	60.65	2791.11
1972/73	1.11	12.04	1.78	0.44	22.99	4.17	1.85	1.20	0.58	0.45	1.24	1.21	49.06	2840.17
1973/74	0.58	13.52	2.71	41.37	7.84	8.16	2.67	1.38	0.98	0.69	0.62	0.50	81.02	2921.19
1974/75	0.68	39.12	5.91	12.71	15.77	16.92	3.23	1.13	0.66	0.70	0.67	18.01	115.51	3036.70
1975/76	3.62	21.47	7.61	5.58	26.81	41.29	10.97	2.31	1.42	0.92	0.46	4.23	126.69	3163.39
1976/77	22.44	13.10	1.72	18.83	5.27	40.40	5.45	0.59	0.42	0.31	0.23	1.03	109.79	3273.18
1977/78	17.85	3.06	6.29	19.96	3.48	12.31	22.21	3.49	0.76	0.55	0.63	1.28	91.87	3365.05
1978/79	1.69	1.18	29.01	4.21	0.95	0.90	0.69	0.80	0.74	6.03	12.26	2.92	61.38	3426.43
1979/80	20.09	9.86	7.13	1.54	4.71	1.64	0.75	0.50	0.36	0.28	0.23	7.59	54.68	3481.11
1980/81	1.76	15.13	2.51	49.81	7.09	11.27	3.21	1.59	1.53	1.15	1.30	0.89	97.24	3578.35
1981/82	0.41	1.18	1.11	0.58	0.48	0.75	21.55	3.55	0.92	0.85	0.50	0.24	32.12	3610.47
1982/83	7.87	2.15	0.69	0.20	0.54	1.06	1.09	0.73	0.42	0.41	0.33	0.20	15.69	3626.16
1983/84	0.51	9.23	2.37	1.35	0.64	0.75	0.92	1.74	1.44	0.70	0.76	0.51	20.92	3647.08
1984/85	0.65	1.17	0.64	0.24	0.86	0.83	0.48	0.28	0.20	0.18	0.16	0.11	5.80	3652.88
1985/86	0.78	1.37	5.36	1.40	1.32	1.21	1.25	0.80	1.42	1.38	1.68	1.13	19.10	3671.98
1986/87	20.81	3.89	0.74	0.37	0.78	10.80	15.31	2.60	0.50	0.38	0.89	47.03	104.10	3776.08
1987/88	6.79	9.02	2.84	11.66	35.96	46.13	16.03	3.30	1.87	1.20	0.61	0.86	136.27	3912.35
1988/89	1.30	1.69	2.95	2.02	29.98	5.47	1.63	2.36	2.94	1.70	0.71	0.27	53.02	3965.37
1989/90	0.37	6.93	1.28	0.34	1.39	8.94	27.55	4.33	1.35	1.48	1.31	0.58	55.85	4021.22
1990/91	0.32	0.20	0.48	21.09	8.86	12.22	2.05	0.33	0.32	0.33	0.23	0.62	47.05	4068.27
1991/92	24.11	3.62	0.49	0.18	0.63	1.41	1.01	0.47	0.26	0.21	1.13	0.86	34.38	4102.65
1992/93	1.05	13.96	2.13	0.54	10.32	2.59	7.29	2.02	0.85	0.57	0.46	0.37	42.15	4144.80
1993/94	30.68	4.56	1.38	18.25	11.19	2.84	5.62	1.61	0.50	0.39	0.30	0.19	77.51	4222.31
1994/95	0.21	0.48	0.50	0.71	1.00	1.61	1.38	1.58	1.17	0.57	0.35	0.24	9.80	4232.11
1995/96	10.17	16.05	12.76	11.02	19.85	4.59	1.81	1.55	1.18	1.28	1.29	0.85	82.40	4314.51
1996/97	2.73	11.10	23.08	15.09	4.01	21.32	9.04	12.94	2.85	1.18	0.67	0.28	104.29	4418.80
1997/98	0.48	0.84	0.49	5.38	11.95	18.08	2.88	0.69	0.55	0.44	0.29	0.99	43.06	4461.86
1998/99	1.53	36.39	4.80	0.76	3.42	2.34	1.39	1.19	0.85	0.55	0.80	0.74	54.76	4516.62
1999/ 0	0.96	32.97	16.02	57.98	7.70	56.44	11.41	1.96	1.04	1.06	0.72	0.49	188.75	4705.37
% TOTAL	8.10	11.85	9.57	15.49	16.98	16.04	8.98	4.61	1.81	1.47	1.77	3.34	100.00	
MAR =	72.39 MIL.CU.M			STANDARD DEVIATION =				43.90 MIL.CU.M			COEF.VARIATION = 0.61			

J.6.

SIMULATED STREAMFLOW AT THE MAKHALENG ABSTRACTION SITE

SIMULATED RUNOFF AT THE MAKHALENG ABSTRACTION SITE

CATCHMENT AREA = 1628.SQ.KM

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL	ACCUMULATED
1935/36	12.49	22.22	25.26	16.24	36.67	32.30	12.16	16.63	11.14	6.28	3.77	2.36	197.52	197.52
1936/37	33.21	119.18	45.28	111.37	173.77	66.21	11.93	7.28	5.34	5.74	4.34	2.79	586.44	783.96
1937/38	2.99	2.84	14.30	23.70	117.38	41.09	95.41	38.70	14.43	11.03	10.36	5.89	378.12	1162.08
1938/39	34.12	19.22	17.74	69.99	131.57	44.89	9.74	20.26	12.26	13.29	27.45	14.07	414.60	1576.68
1939/40	57.54	40.77	10.78	3.00	15.99	49.68	60.18	43.82	15.72	5.45	3.76	46.42	353.11	1929.79
1940/41	19.04	5.54	30.87	17.13	115.24	47.35	29.73	13.72	3.69	7.12	5.69	10.02	305.14	2234.93
1941/42	24.28	8.71	0.68	15.65	47.47	60.91	36.70	12.63	5.36	3.88	12.04	11.56	239.87	2474.80
1942/43	25.40	32.31	76.61	36.52	12.78	31.05	146.49	139.37	37.80	11.40	25.55	12.01	587.29	3062.09
1943/44	21.73	80.76	65.35	19.00	54.27	35.14	11.42	15.98	24.18	12.95	4.22	10.86	355.86	3417.95
1944/45	9.97	20.22	6.94	7.29	19.24	71.81	26.06	19.63	11.93	5.00	3.05	1.66	202.80	3620.75
1945/46	1.97	5.50	7.77	49.85	25.02	52.14	55.62	34.42	15.28	6.19	3.07	3.10	259.93	3880.68
1946/47	19.72	10.94	10.68	11.68	23.37	9.89	12.72	16.17	9.83	6.11	4.12	31.17	166.40	4047.08
1947/48	33.35	13.31	50.29	26.23	14.52	143.44	61.87	14.52	7.01	3.97	3.25	1.85	373.61	4420.69
1948/49	8.25	4.28	1.41	8.80	12.30	27.92	14.01	12.38	9.62	8.10	4.87	3.45	115.39	4536.08
1949/50	8.38	21.56	20.30	15.93	37.93	174.17	199.06	79.19	18.34	22.58	62.54	25.04	685.02	5221.10
1950/51	4.69	5.54	43.45	58.75	40.08	33.96	29.91	12.98	7.17	10.07	7.70	10.89	265.19	5486.29
1951/52	72.74	24.97	1.01	12.53	46.20	26.17	16.13	9.18	9.25	48.64	27.72	19.29	313.83	5800.12
1952/53	12.73	16.50	11.66	5.46	77.86	43.33	39.40	18.03	5.72	3.62	6.38	5.70	246.39	6046.51
1953/54	29.89	23.28	25.89	12.35	41.77	171.07	60.91	17.71	14.08	10.26	5.44	2.69	414.34	6461.85
1954/55	1.76	5.64	12.96	156.99	169.39	51.82	24.78	16.79	9.54	8.28	5.11	2.16	465.22	6927.07
1955/56	9.16	31.85	45.86	17.03	165.51	138.06	50.70	23.36	10.75	5.35	3.31	3.21	504.15	7431.22
1956/57	15.62	22.66	105.67	44.17	20.18	42.34	24.39	8.51	8.12	10.53	25.20	99.23	426.62	7857.84
1957/58	120.43	46.67	11.66	111.45	47.56	18.76	37.62	55.91	21.56	4.89	2.69	3.46	482.66	8340.50
1958/59	9.00	47.83	52.01	26.06	28.23	52.25	75.40	43.42	14.07	43.14	19.57	3.04	414.02	8745.52
1959/60	7.43	13.45	105.96	43.93	41.76	89.23	53.85	19.84	11.54	10.47	22.00	14.12	433.58	9188.10
1960/61	24.24	29.27	21.38	17.36	8.08	90.53	72.19	40.55	56.92	26.99	10.31	4.15	401.97	9590.07
1961/62	1.13	101.79	47.56	10.88	143.47	87.03	35.69	13.30	4.51	2.72	2.31	1.87	452.26	10042.33
1962/63	3.06	80.89	30.12	57.21	34.95	80.86	113.18	41.01	15.37	21.46	12.99	4.13	495.23	10537.56
1963/64	14.54	84.48	43.93	10.35	14.57	144.29	61.10	11.12	13.97	9.27	4.79	4.13	416.54	10954.10
1964/65	97.10	35.80	15.14	18.86	8.85	7.25	64.66	25.70	11.69	13.00	13.87	7.09	319.01	11273.11
1965/66	4.83	9.94	4.46	185.67	105.55	21.89	12.02	9.39	8.20	5.64	3.95	2.14	373.68	11646.79
1966/67	4.20	17.90	15.81	177.59	76.60	33.45	106.11	63.11	22.03	9.67	8.17	4.46	539.10	12185.89
1967/68	18.40	20.96	8.77	2.36	1.89	31.63	53.00	60.56	24.09	12.57	8.22	5.24	247.69	12433.58
1968/69	12.37	9.59	46.61	17.80	42.85	134.80	84.61	32.92	12.27	5.37	8.37	5.43	412.99	12846.57
1969/70	60.33	22.10	4.18	8.27	6.54	3.87	3.73	5.06	7.64	8.51	12.01	21.36	163.60	13010.17
1970/71	23.28	11.92	44.16	38.71	47.98	33.77	49.60	26.59	8.56	8.10	6.00	2.62	301.29	13311.46
1971/72	7.65	5.18	8.49	68.60	131.87	109.79	35.26	11.95	11.40	7.22	3.93	2.54	403.88	13715.34
1972/73	13.17	7.71	4.62	3.88	79.66	45.29	24.02	11.78	4.95	4.87	22.09	14.44	236.48	13951.82
1973/74	4.67	5.75	6.39	130.59	174.66	62.90	12.16	6.10	4.88	3.81	9.59	5.62	427.12	14378.94
1974/75	4.41	52.24	25.28	19.94	47.77	78.46	37.13	10.56	9.92	17.78	10.39	22.93	336.81	14715.75
1975/76	13.39	60.01	43.56	148.22	108.20	113.43	70.64	26.92	20.34	11.35	4.34	38.58	658.98	15374.73
1976/77	122.41	39.67	3.40	46.69	58.52	109.45	41.34	11.37	7.37	4.33	2.98	45.81	493.34	15868.07
1977/78	59.02	20.42	13.99	52.35	23.37	95.54	79.03	20.89	4.74	4.23	6.30	15.79	395.67	16263.74
1978/79	9.00	4.49	45.16	19.01	52.02	22.74	10.03	21.17	13.98	28.44	56.07	23.40	305.51	16569.25
1979/80	48.87	30.31	15.56	7.43	12.44	8.49	5.39	4.72	4.46	3.93	4.38	14.20	160.18	16729.43
1980/81	6.16	18.59	7.79	128.95	93.31	39.45	20.69	20.10	18.54	9.66	29.35	13.07	405.66	17135.09
1981/82	4.81	23.30	23.26	12.29	17.13	18.73	135.28	49.97	12.66	16.03	8.57	5.60	327.63	17462.72
1982/83	70.98	36.52	5.48	6.97	6.33	18.17	19.70	19.08	18.20	41.30	18.26	5.11	266.10	17728.82
1983/84	11.97	61.20	39.07	20.19	7.33	18.25	13.97	33.02	18.16	6.25	21.78	11.73	262.92	17991.74
1984/85	18.38	14.58	7.37	18.85	42.62	25.39	17.22	8.35	12.73	9.47	4.02	2.02	181.00	18172.74
1985/86	63.35	36.15	51.97	35.45	19.19	26.25	19.26	7.30	29.05	16.68	24.18	18.18	347.01	18519.75
1986/87	91.60	91.97	23.00	0.95	22.80	20.63	37.86	16.00	6.56	9.13	42.93	105.86	469.29	18989.04
1987/88	43.50	51.96	26.45	7.38	172.98	140.18	101.24	39.28	13.51	14.52	11.80	30.96	653.76	19642.80
1988/89	79.87	36.91	47.47	33.99	166.86	73.78	29.56	31.51	21.75	11.65	7.01	4.12	544.48	20187.28
1989/90	13.76	74.66	26.84	57.10	39.12	102.95	114.39	34.41	22.38	16.89	11.44	5.05	518.99	20706.27
1990/91	4.11	2.18	4.66	162.77	149.18	113.74	31.80	4.11	8.58	7.27	3.65	20.89	512.94	21219.21
1991/92	149.63	57.96	19.17	7.20	9.24	14.76	10.50	4.75	2.47	1.86	14.34	8.01	299.89	21519.10
1992/93	17.59	28.21	8.98	11.87	45.02	33.46	32.49	15.77	6.08	3.84	6.93	4.50	214.74	21733.84
1993/94	93.53	53.10	37.56	123.64	86.83	39.05	21.10	8.59	4.02	5.77	4.55	2.47	480.21	22214.05
1994/95	1.80	2.37	2.18	17.37	11.26	39.40	17.67	11.11	7.87	4.44	4.07	4.69	124.23	22338.28
1995/96	42.74	27.37	33.18	45.04	60.14	52.70	32.02	17.69	13.63	18.85	15.53	9.34	368.23	22706.51
1996/97	22.35	18.47	12.34	8.74	13.68	118.93	56.17	17.89	15.21	13.69	8.79	3.72	309.98	23016.49
1997/98	3.66	15.15	15.44	32.07	56.20	67.14	23.42	8.61	5.67	7.68	6.63	4.37	246.04	23262.53
1998/99	20.48	42.81	21.10	23.18	17.89	15.84	11.63	9.77	7.24	4.96	3.59	2.16	180.65	23443.18
1999/00	7.88	4.08	81.42	37.41	15.52	78.85	37.72	16.42	10.60	6.33	3.65	14.97	314.85	23758.03
% TOTAL	8.04	8.39	7.34	11.59	15.78	16.53	12.42	6.48	3.52	3.03	3.22	3.66	100.00	

MAR = 365.51 MIL.CU.M

STANDARD DEVIATION = 133.96 MIL.CU.M

COEF.VARIATION = 0.37

J.7.

SIMULATED STREAMFLOW AT THE MAKHALENG DAM SITE

SIMULATED RUNOFF AT THE MAKHALENG DAM SITE

CATCHMENT AREA = 535.SQ.KM

YEAR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL	ACCUMULATED
1935/36	11.67	13.23	21.01	10.01	16.08	15.08	5.38	7.07	3.87	1.70	1.16	0.82	107.08	107.08
1936/37	16.01	66.16	29.45	60.31	56.73	33.55	10.00	3.71	2.47	3.42	2.19	1.89	285.89	392.97
1937/38	2.10	6.92	14.58	13.61	31.39	10.56	19.82	9.36	7.56	5.24	4.55	2.73	128.42	521.39
1938/39	17.06	9.40	11.09	23.39	32.95	11.93	2.13	8.01	4.47	4.81	12.55	9.22	147.01	668.40
1939/40	30.23	21.31	5.25	0.79	4.58	17.46	32.19	20.12	5.79	3.23	1.94	29.47	172.36	840.76
1940/41	11.09	9.65	22.01	11.95	44.41	19.58	24.64	9.74	1.66	2.99	2.04	2.35	162.11	1002.87
1941/42	18.53	6.30	0.43	21.78	22.73	32.93	24.22	7.93	2.14	1.07	10.57	5.97	154.60	1157.47
1942/43	27.13	23.41	18.69	12.86	4.39	8.38	45.36	36.23	9.31	12.02	18.40	6.10	222.28	1379.75
1943/44	13.81	52.95	23.36	4.92	31.59	13.83	4.89	6.98	12.32	5.67	1.49	2.49	174.30	1554.05
1944/45	3.81	5.06	1.87	4.79	4.77	32.28	12.20	10.24	5.30	1.51	0.82	0.52	83.17	1637.22
1945/46	1.27	4.17	6.85	16.86	12.09	19.22	9.38	2.27	5.28	3.60	1.44	1.48	83.91	1721.13
1946/47	8.22	3.76	10.03	4.39	12.99	5.57	1.70	3.87	3.18	2.35	1.43	8.46	65.95	1787.08
1947/48	16.30	6.09	19.69	12.84	6.66	48.93	22.76	7.27	3.15	1.66	1.19	0.64	147.18	1934.26
1948/49	1.16	2.06	0.90	15.19	18.92	18.58	7.04	5.52	4.13	3.12	1.74	1.85	80.21	2014.47
1949/50	8.18	16.40	20.56	12.83	40.03	53.72	70.59	35.42	8.97	11.25	31.73	12.00	321.68	2336.15
1950/51	2.12	4.60	21.18	47.31	27.26	20.59	15.97	6.63	4.46	3.02	2.27	1.81	157.22	2493.37
1951/52	42.42	14.61	1.64	8.91	29.83	22.05	5.57	2.25	2.90	13.77	8.41	4.99	157.35	2650.72
1952/53	3.13	15.41	8.57	5.02	36.10	32.19	25.03	10.23	3.55	1.88	2.95	1.81	145.87	2796.59
1953/54	16.37	27.35	21.67	6.23	16.98	28.21	11.37	6.97	6.75	3.50	1.44	0.87	147.71	2944.30
1954/55	0.83	3.94	4.78	67.97	63.21	21.24	12.97	7.15	2.52	2.56	1.79	0.95	189.91	3134.21
1955/56	6.50	11.26	27.93	10.86	56.25	50.32	18.47	13.00	5.35	1.44	0.81	1.00	203.19	3337.40
1956/57	16.55	7.70	51.36	25.09	7.75	11.31	13.84	5.35	4.59	4.98	8.88	4.21	161.61	3499.01
1957/58	40.48	24.12	8.28	23.65	12.41	11.08	19.15	20.34	7.06	1.58	0.88	3.20	172.23	3671.24
1958/59	4.76	15.79	15.41	8.82	17.81	18.77	38.19	22.19	5.70	11.31	5.35	1.00	165.10	3836.34
1959/60	6.19	11.80	42.71	14.30	20.52	26.00	15.59	6.66	4.34	4.60	6.78	3.74	163.23	3999.57
1960/61	13.37	14.52	6.83	16.10	6.54	34.95	15.81	7.61	19.64	10.26	4.55	1.78	151.96	4151.53
1961/62	0.45	56.03	25.56	5.81	47.47	30.44	18.06	6.10	1.39	0.81	0.63	0.74	193.49	4345.02
1962/63	2.50	30.30	11.80	28.09	18.98	35.39	40.65	15.27	5.08	8.85	5.46	1.69	204.06	4549.08
1963/64	8.22	31.66	24.60	11.57	10.25	63.58	27.40	4.60	6.22	3.62	2.00	2.38	196.10	4745.18
1964/65	46.73	18.51	14.12	14.51	5.00	3.10	34.25	12.74	6.29	6.20	6.54	3.23	171.22	4916.40
1965/66	3.88	8.26	3.45	70.87	38.67	9.43	7.25	5.56	3.69	2.08	2.07	1.13	156.34	5072.74
1966/67	3.71	9.76	10.47	81.57	36.06	18.98	43.64	24.14	8.21	3.73	4.27	2.19	246.73	5319.47
1967/68	11.61	10.99	8.10	3.49	3.08	15.76	21.22	27.12	10.10	5.94	4.04	2.42	123.87	5443.34
1968/69	8.18	6.44	16.00	6.77	14.40	66.23	39.91	19.61	7.15	2.46	4.53	2.54	194.22	5637.56
1969/70	27.52	10.53	3.52	7.80	6.75	4.06	2.77	2.31	4.09	4.92	6.97	11.71	92.95	5730.51
1970/71	10.95	5.91	25.87	27.29	21.84	17.28	18.36	10.87	3.79	4.90	3.18	1.24	151.48	5881.99
1971/72	6.56	3.72	3.77	33.98	48.71	36.94	12.66	5.02	3.97	2.37	1.56	1.38	160.64	6042.63
1972/73	7.87	6.03	8.36	6.21	30.74	21.75	11.51	4.33	1.71	2.25	12.35	6.18	119.29	6161.92
1973/74	1.47	1.79	2.28	53.81	60.01	22.22	4.91	2.07	1.70	1.40	2.47	1.67	155.80	6317.72
1974/75	1.63	27.47	16.18	10.95	26.31	39.72	16.47	4.07	3.83	7.04	3.85	10.38	167.90	6485.62
1975/76	7.63	34.06	21.09	52.48	46.64	49.60	29.29	12.32	11.95	5.51	1.68	16.69	288.94	6774.56
1976/77	49.10	16.36	2.60	23.88	36.60	44.96	16.68	4.46	2.53	1.53	1.09	16.76	216.55	6991.11
1977/78	23.50	9.08	12.40	47.96	18.08	38.44	34.50	8.95	1.65	1.54	2.50	9.30	207.90	7199.01
1978/79	5.32	4.39	22.54	9.44	28.80	11.23	5.19	12.21	6.78	12.36	13.48	4.84	136.58	7335.59
1979/80	18.41	10.63	8.90	4.83	2.21	2.13	2.18	2.06	1.89	1.52	1.71	8.10	64.57	7400.16
1980/81	3.22	8.31	3.63	68.98	43.51	24.55	11.24	6.38	6.10	3.28	9.19	4.13	192.52	7592.68
1981/82	2.57	16.15	15.28	8.35	13.12	9.13	47.19	17.75	4.44	4.31	2.20	3.32	143.81	7736.49
1982/83	37.55	21.31	3.44	4.55	4.01	8.61	8.00	8.62	7.54	12.99	5.65	2.14	124.41	7860.90
1983/84	6.53	30.82	19.71	10.89	4.32	9.17	6.65	20.18	8.85	2.16	10.09	5.30	134.67	7995.57
1984/85	10.76	7.94	5.62	9.65	17.18	12.29	9.24	3.71	3.18	2.58	1.37	0.87	84.39	8079.96
1985/86	25.35	16.04	26.78	12.01	5.00	8.92	9.69	3.69	15.10	7.26	13.59	8.47	151.90	8231.86
1986/87	41.42	52.85	13.98	0.58	21.53	14.84	17.70	6.56	1.58	3.18	10.90	44.83	229.95	8461.81
1987/88	20.76	24.95	18.47	6.65	62.99	48.17	40.02	19.40	6.57	9.30	7.49	9.48	274.25	8736.06
1988/89	35.90	17.96	18.08	16.88	68.16	37.33	18.37	19.88	9.67	4.41	3.58	1.73	251.95	8988.01
1989/90	9.58	24.34	8.66	29.61	24.01	42.87	48.22	14.37	11.62	7.16	4.96	2.00	227.40	9215.41
1990/91	0.74	0.56	3.74	69.25	65.01	61.40	17.25	1.18	2.75	2.56	1.39	8.15	233.98	9449.39
1991/92	40.45	17.56	8.60	3.09	3.78	7.44	5.09	1.98	0.94	0.68	9.24	4.18	103.03	9552.42
1992/93	9.35	17.24	6.20	6.18	26.25	19.78	20.64	8.37	2.41	1.48	3.79	1.94	123.63	9676.05
1993/94	48.08	24.50	17.12	67.25	49.44	22.28	12.12	4.28	1.66	2.32	1.64	0.76	251.45	9927.50
1994/95	0.66	1.08	2.47	10.78	5.29	15.26	7.67	5.40	3.19	1.73	1.41	1.73	56.67	9984.17
1995/96	30.32	20.36	17.91	29.34	35.42	29.94	18.83	9.24	6.66	10.26	7.74	4.53	220.55	10204.72
1996/97	22.85	12.38	9.79	14.55	9.77	30.72	21.58	10.04	5.14	4.90	5.04	2.56	149.32	10354.04
1997/98	1.44	7.70	12.66	18.00	44.74	79.14	25.26	4.06	2.30	5.08	4.69	3.97	209.04	10563.08
1998/99	14.08	14.08	13.43	17.54	17.02	14.76	5.95	5.19	4.20	2.53	1.79	1.08	111.65	10674.73
1999/ 0	11.59	4.56	31.02	20.35	7.09	39.21	21.49	9.78	4.64	2.42	1.41	16.87	170.43	10845.16
% TOTAL	8.83	9.59	8.43	12.79	15.34	15.54	11.46	5.96	3.20	2.69	3.00	3.17	100.00	

MAR = 166.85 MIL.CU.M

STANDARD DEVIATION = 56.99 MIL.CU.M

COEF.VARIATION = 0.34