2.8. Balance of Water Availability and Demand

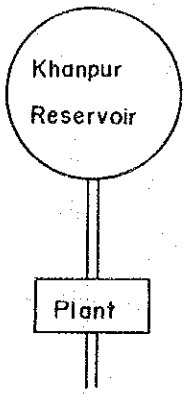
The existing and proposed yields from surface water and groundwater are listed in Table A.II-43. As previously discussed, firm yield from surface waters of stream was estimated on the basis of the actual achievement of water production under the assumption that the lowest value observed in the past five years would correspond to the safe yield of order to 5-year return period. Firm yields from the storage reservoirs have been evaluated in detail through water balance computations. Production of groundwater was estimated from the individual well data and possible developments in future, and the safe yield was obtained multiplying average production by 80% taking into account the reduction of production during dry summer period.

The water demand is defined as the quantity of water to be supplied and consists of water consumption and losses. For both Islamabad and Rawalpindi, water demands have already been computed on the basis of unit water consumption, service population and estimated rate of leakage and wastage. Thus, mass water balance of average per day production and demand was studied as presented in Table A.II-44.

Taking into account the phasing plans of water resources development, which are discussed in detail in 4.3 of the main text, firm yields and demands by year are compared as shown in Figures A.II-27 and A.II-28 for Islamabad and Rawalpindi, respectively.

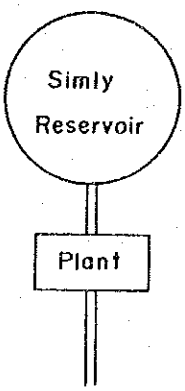
FIGURE A.II-26 AVAILABILITY OF RESERVOIR WATER : AFTER TREATED, IN A DRY YEAR WITH 5-YEAR PROBABILITY

(1) KHANPUR



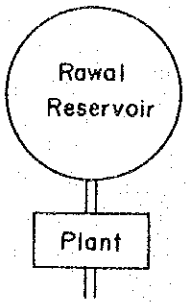
Losses	Safe Yield in 5-Year Dry Year (MGD)	Remarks
	76.8 (96.0)	(33.0+69.37)x75%=76.8MGD 76.8x125%(Peak)=96.0
Conveyance 5%	73.0 (91.2)	
Treatment 5%	69.3 (86.6)	
	69.3 (86.6)	Water Available
→ Islamabad		22.3 (27.9)
→ Rawalpindi		47.0 (58.7)

(2) SIMLY



	30.7 (38.4)	(Peak) 24.0MGDx160%=38.4MGD 38.4/1.25=30.7 (Average)
Treatment 5%	29.2 (36.5)	
Conveyance 2%	28.6 (35.8)	
	28.6 (35.8)	
→ For Islamabad		

(3) RAWAL



	40.3 (50.4)	(Peak) 28.0x180%=50.4MGD 50.4/1.25=40.3 (Average)
Treatment 5%	38.3 (47.9)	
	38.3 (47.9)	
→ For Rawalpindi		

FIGURE A.II-27 BALANCE OF AVAILABILITY AND DEMAND OF WATER

(ISLAMABAD)

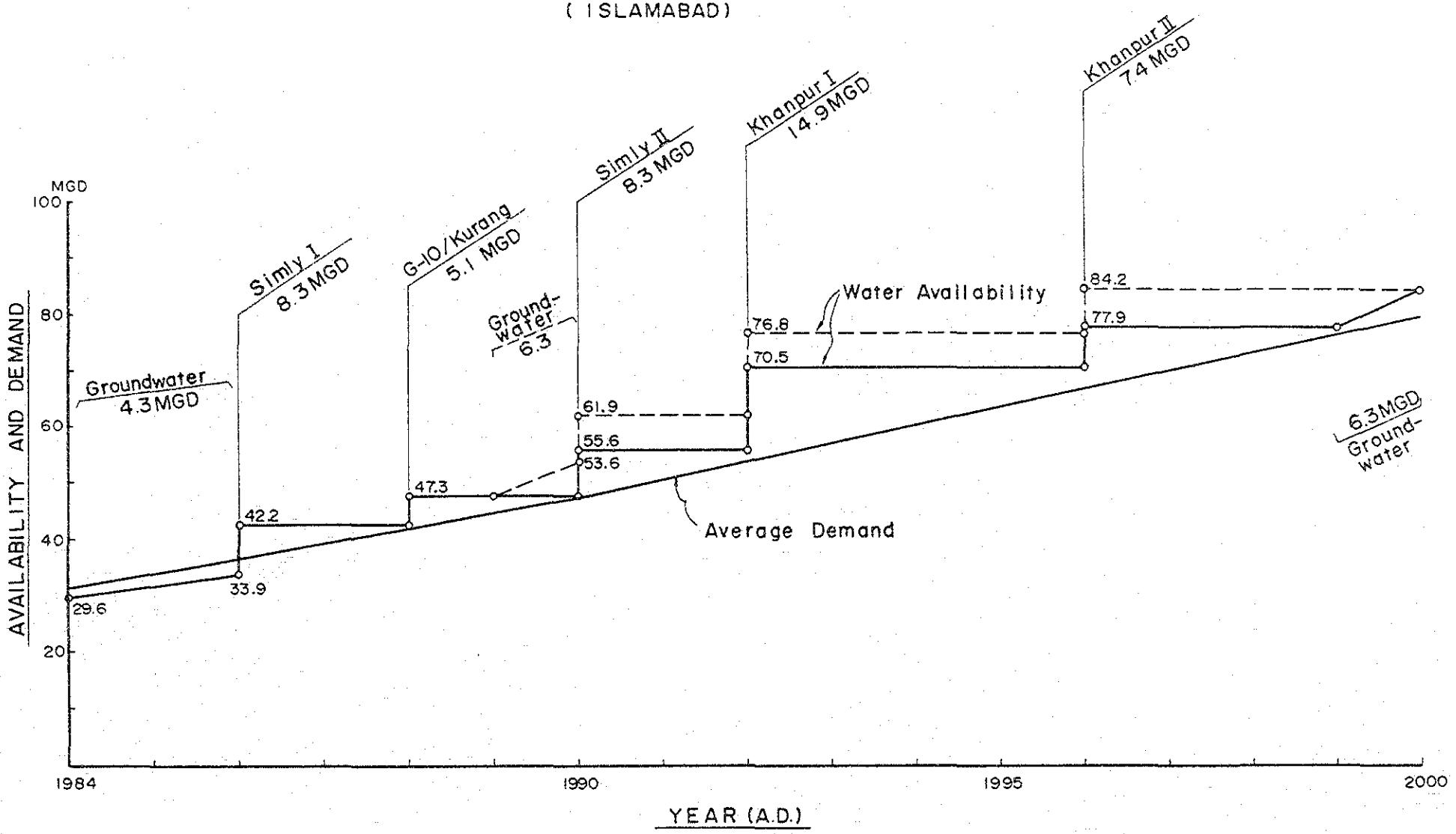


FIGURE A.II-28 BALANCE OF AVAILABILITY AND DEMAND OF WATER
(RAWALPINDI)

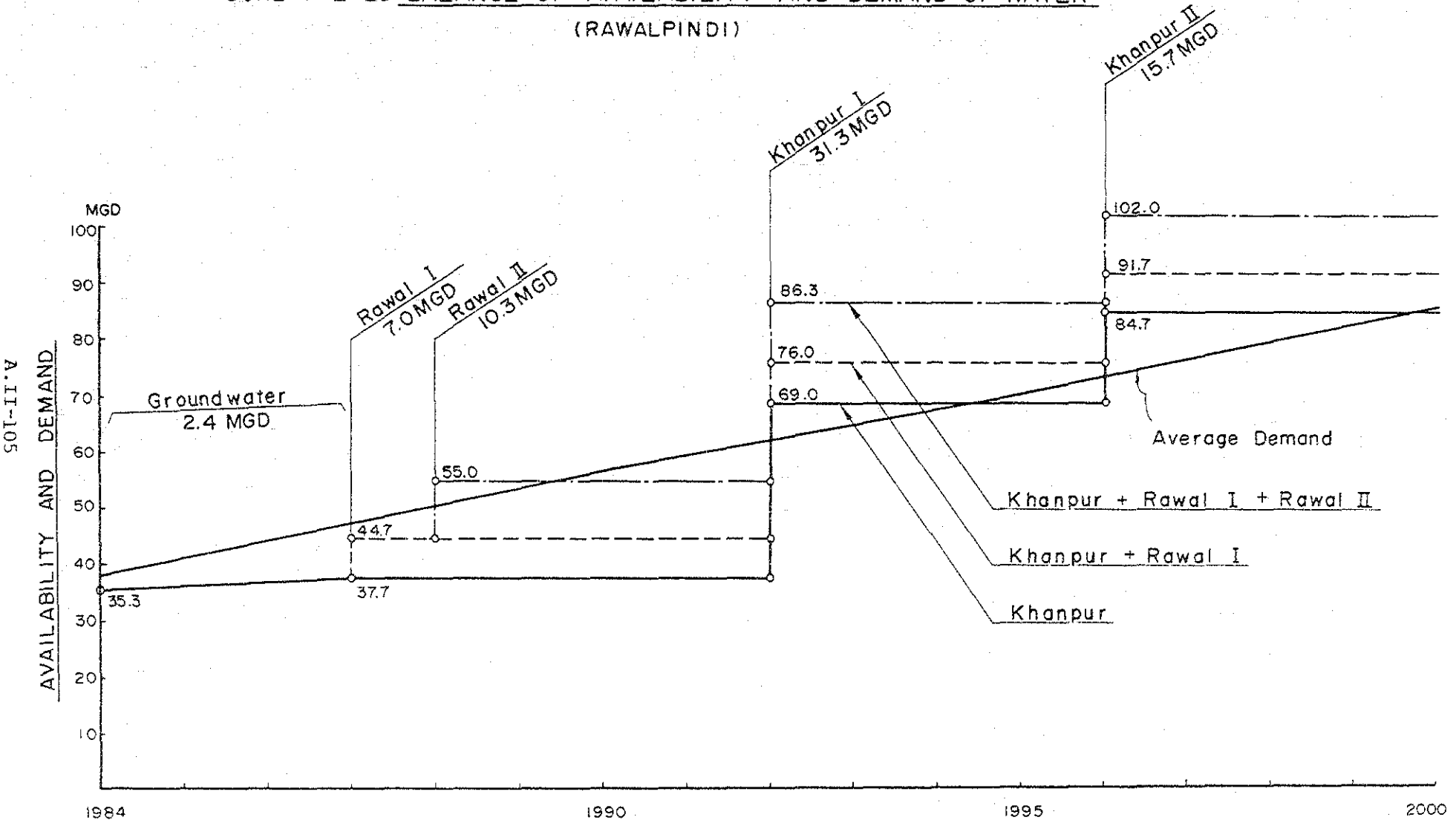


TABLE A.II-43 EXISTING AND PROPOSED YIELD OF WATER
(Average per day)

Water Source	Present[2/]	2000 A.D	Remarks
Islamabad			
Shahdara H.W[4/]	1.4	1.4	
Nurpur H.W	0.5	0.5	
Saidpur H.W	0.6	0.6	
Golf Course (Old)	2.1	2.1	
- do - (New)	1.7	1.7	
G-10 H.W	1.9	3.8	by the end of 1986
Kurang H.W.	-	3.2	by the end of 1986
Tube Wells in National Park Area	6.4	10.4	
Tube Wells in Sectoral Area	3.0	9.0	
Sub-total	17.6	32.7	
Rawalpindi			
Sohan Camp T.W[5/]	2.8	2.8	
PHED T.W	3.6	3.6	
RMC T.W	4.8	4.8	
CB T.W	2.0	4.4	in a few years
MES (Army) T.W	0.6	0.6	
MES (PAF T.W	0.5	0.5	
Sub-total	14.3	16.7	
Total	30.7	50.0	

Notes:
1/ Unit in MGD.
2/ As of July, 1984.
3/ Production of water from storage dams are excluded.
4/ H.W.: Head works
5/ T.W.: Tube wells
6/ Firm yield from surface water is estimated based on the actual achievement of water production, taking the lowest value observed in the past 5 years.
7/ Firm yield from groundwater is taken as 80% of average production, taking into account the reduction of production in dry summer period.

TABLE A.II-44 BALANCE OF AVAILABILITY AND DEMAND OF URBAN WATER

(In 5-year dry year)

Water Source	Islamabad		Rawalpindi	
	Present (1984) (MGD)	2000 A.D. (MGD)	Present (1984) (MGD)	2000 A.D. (MGD)
Surface Water				
Khanpur	-	22.3	-	47.0
Simly	12.0	28.6	-	-
Rawal	-	-	21.0	38.3
Streams	8.2	13.3	-	-
Sub-total	20.2	64.3	21.0	85.3
Groung Water				
Sectoral Area	3.0	9.0	-	-
National Park Area	6.4	10.4	-	-
PHED, RMC and MES	-	-	14.3	16.7
Sub-total	9.4	19.4	14.3	16.7
Total	29.6	83.7	35.3	102.0
Demand				
Up to Sector 10		54.3		
Sector 11 - 15		25.4		
Total		79.7		84.6
Surplus		4.0		15.2

TABLE A.II-45 DISCHARGE FROM TUBE WELLS

(Discharge in 1,000 Gallon)

No.	Operating Agency and Well Name	Year Completed	Hourly Discharge			Daily Pumping Time (hr)	Daily Discharge				Remarks
			Designed	Present Estimated	Present Measured		Designed 2/	Present Estimated 3/	Present Measured	Maximum 4/	
	CDA 1/										
1.	National Park Area TW 1	1971	18-20	20	-	22	440	440	-	480	
2.	- do - 2	"	25	8.7	-	22	550	191	-	600	
3.	- do - 3	"	25	22.5	-	20	500	450	-	600	
4.	- do - 4	"	39.4	24.8	-	22	867	546	-	946	
5.	- do - 5	"	-	-	-	-	-	-	-	-	Turbine damaged.
6.	- do - 6	"	39.4	38.3	-	22	867	843	-	946	
7.	- do - 7	"	22.5	10.9	-	-	-	-	-	-	Turbine damaged.
8.	- do - 8	-	-	-	-	-	-	-	-	-	Not installed.
9.	- do - 9	1971	39.4	37.0	-	Not in Operation since the last week of July 84 due to fault in motor.					
10.	- do - 10	"	-	-	-	Not in Operation for the last five years.					
11.	- do - 11	"	-	-	-	Not in Operation for the last five years.					
12.	- do - 12	"	22.5	8.7	-	Not in Operation for more than six months due to fault in motor.					
13.	- do - 13	"	36	30.4	-	21	756	638	-	864	
14.	- do - 14	"	22.5	(17.6) 7/	-	22	495	(388)	-	540	
15.	- do - 15	"	39.4	39.4	-	22	867	867	-	946	
16.	- do - 16	1977	22.5	23.5	-	20	450	470	-	540	
17.	- do - 17	"	39.4	23.5	-	20	788	470	-	946	
18.	- do - 18	1971	22.5	23.5	-	Not in operation for the last two months.					
19.	- do - 19	1977	22.5	(17.6) 7/	-	22	495	(388)	-	540	
20.	- do - 20	1980	-	-	-	Abandoned due to low discharge.					
21.	- do - 21	"	15	(11.7) 7/	-	22	330	(257)	-	360	

Contd.-

TABLE A.II-45 DISCHARGE FROM TUBE WELLS

(Discharge in 1,000 Gallon)

No.	Operating Agency and Well Name	Year Completed	Hourly Discharge			Daily Pumping Time (hr)	Daily Discharge				Remarks
			Designed	Present Estimated	Measured		Designed[2]	Present Estimated[3]	Measured	Maximum[4]	
	CDA[1] (Contd.)										
22.	National Park Area TW 22	-	-	-	-	-	-	-	-	-	Site amended.
23.	- do - 23	1980	29.3	28.5	-	22	645	627	-	703	
24.	- do - 24	-	-	-	-	Abandoned due to low discharge.					
25.	- do - W-I	1971	16	11.3	-	22	352	249	-	384	
26.	- do - W-II	"	-	-	-	-	-	-	-	-	Not in operation.
27.	- do - W-III	"	25	12.2	-	21	525	256	-	600	
	Sub-total (National Park Area)		av.29.0 (av.27.5)[11] (100%)	av.22.7[10] (78%)		av.21.5	8,927 = 8.9MGD	7,080 = 7.1MGD = 6.5MGD[5]		9,995 = 10.0MGD	
28.	Golf Course Area No.1	1970	11.3	(7.9)[8]	-	20	226	(158)	-	271	
29.	(New) No.2	"	11.3	(7.9)[8]	-	20	226	(158)	-	271	
30.	No.3	"	33.8	(23.7)[8]	-	22	744	(521)	-	811	
	Sub-total (New Golf Course)		av.18.8 (100%)	- (70%)		av.207	1,196 = 1.2MGD	837 = 0.8MGD		1,353 = 1.3MGD	
31.	Golf Course Area No.4	1970	22.5	(15.8)[8]	-	22	495	(347)	-	540	
32.	(Old) No.5	"	11.3	(7.9)[8]	-	20	226	(158)	-	271	
33.	No.6	1978	16.9	(11.8)[8]	-	20	338	(237)	-	406	
34.	No.7	"	-	-	-	-	-	-	-	-	Abandoned due to choke
	Sub-total (Old Golf Course)		av.20.2 (100%)	- (70%)		av.20.7	1,059 = 1.1MGD	742 = 0.7MGD		1,217 = 1.2MGD	
35.	Gowal Colony	1983	15	11.3	-	12	180	136	-	360	Not located in Sectoral Area.
36.	No. 36 F-8	1966	21	13	-	20	420	260	-	504	
37.	No. 37 G-5/2	1968	6.8	4.4	-	2	14	9	-	163	

Contd.-

TABLE A.II-45 DISCHARGE FROM TUBE WELLS

(Discharge in 1,000 Gallon)

No.	Operating Agency and Well Name	Year Completed	Hourly Discharge			Daily Pumping Time (hr)	Daily Discharge				Remarks
			Designed	Present Estimated	Measured		Designed [2]	Present Estimated [3]	Measured	Maximum [4]	
	CDA [1] (Contd.)										
38.	No. 38 G-7	1964	7.2	4.3	-	20	144	86	-	173	
39.	No. 39 G-7/2	1964-5	-	4.3	-	- [6]	(144)	(86)	-	173	
40.	No. 40 G-8/1	1980	14.6	10.9	-	20	292	218	-	350	
41.	No. 41 G-9/3	1978	15	13	-	21	315	273	-	360	
42.	No. 42 G-9/4	"	16.9	13	-	Not in operation due to damage in turbine on the first week of Aug. '84.					
43.	No. 43 Markaz G-9	1980	13.2	6.5	-	20	264	130	-	317	
44.	No. 44 G-9/4	"	14.6	6.5	-	20	292	130	-	350	
45.	No. 45 H-8	1981	18	(11.3) [9]	-	22	396	(249)	-	432	
46.	No. 46 H-9/3	1979	16.9	(10.6) [9]	-	Turbine pulled out since 12.3.1984.					
47.	No. 47 H-9	1980	17	(10.7) [9]	-	- [6]	-	-	-	-	Turbine pulled out.
48.	No. 48 H-9/1	"	15	(9.5) [9]	-	22	330	(209)	-	360	
49.	No. 49 H-9/2	"	15	(9.5)	-	2	30	(19)	-	360	
50.	No. 50 I-8/1	"	15	(9.5) [9]	-	20	300	(190)	-	360	
51.	No. 51 I-8/2	-	13	(8.2) [9]	-	Not in operation. Civil work in progress.					
52.	No. 52 I-9/1	1970	22.5	4.4	-	- [6]	(450)	(88)	-	540	
53.	No. 53 I-9/3	"	16.9	13	-	20	338	260	-	406	
54.	No. 54 I-9/4	"	11.3	6.6	-	20	226	132	-	271	
55.	No. 55 I-9/2	1980	17	8.7	-	Not in operation due to electric faults.					
56.	No. 56 I-9/4	"	16.8	13	-	- [6]	(336)	(260)	-	403	
57.	No. 57 I-10/1	1976	22.5	13	-	6	135	78	-	703	
58.	No. 58 I-10/2	-	-	-	-	Abandoned due to being filled with debris.					
59.	No. 59 I-11/1	1979	29.3	8.7	-	20	586	174	-	703	

Contd.-

TABLE A.II-45 DISCHARGE FROM TUBE WELLS

(Discharge in 1,000 Gallon)

No.	Operating Agency and Well Name	Year Completed	Hourly Discharge			Daily Pumping Time (hr)	Daily Discharge				Remarks
			Designed	Present Estimated	Measured		Designed[2]	Present Estimated[3]	Measured	Maximum[4]	
	CDA [1] (Contd.)										
60.	No. 60 I-11/2	1979	29.3	13	-	2	59	26	-	703	
61.	No. 61 7/3-2	1981	28	22	-	20	560	440	-	672	
62.	No. 62 G-8/1	"	16.5	12	-	- [6]	(330)	240	-	396	
63.	No. 63 G-8/4	"	18	14	-	22	396	308	-	432	
64.	No. 64 F-8/1	"	22.5	10.8	-	20	450	216	-	540	
65.	No. 65 F-8/4	"	22.5	9.5	-	20	450	190	-	540	
66.	No. 66 G-9/3	"	8	6	-	[6]	160	(120)	-	192	
67.	No. 67 H-8/2	-	-	-	-	Abandoned due to being filled with debris.					
68.	No. 68 H-8/4	1982	30	30	-	22	660	660	-	720	
69.	No. 69 F-10/3	1980	32	24	-	Not in operation due to water lines choked.					
70.	No. 70 F-9/4	1982	11.3	(7.1) [9]	-	22	249	(156)	-	271	
71.	No. 71 I-10/4	-	-	-	-	Not in operation. Civil work in progress.					
72.	No. 72 G-9/1	1981	22.5	(14.2) [9]	-	22	495	(312)	-	540	
73.	No. 73 G-10/3	1982	22.5	-	-	Not in operation since 6-8-84 due to burning of motor.					
74.	No. G-10/4	-	-	-	-	-	-	-	-	-	Turbine not yet installed.
	Sub-total (Sectoral Area)		av.18.7 (av.18.1) (100%)	av.11.7 [11] (av.11.4) [12] (63%)		av.17.4	8,821 = 8.8MGD	5,519 = 5.5MGD = 3.8MGD [5] = 5.5MGD (From another source of CDA.		11,771 = 11.8MGD	Excluding Gowala Colony Well.

Contd.-

TABLE A.II-45 DISCHARGE FROM TUBE WELLS

(Discharge in 1,000 Gallon)

No.	Operating Agency and Well Name	Year Completed	Hourly Discharge			Daily Pumping Time (hr)	Daily Discharge				Remarks
			Designed	Present Estimated	Present Measured		Designed 2/	Present Estimated 3/	Present Measured	Maximum 4/	
	CDA 1/ (Contd.)										
75.	No. 75 New Golf Course	-	8	-	-	-	-	-	-	-	Experimentally running.
76.	No. 76 Old Golf Course	-	18	-	-	-	-	-	-	-	- do -
77.	Model village Humak Sharki	1982	11.3	-	-	4	45	-	-	-	For local water supply only.
78.	Model village Humak Kharbi	"	11.3	-	-	-	-	-	-	-	- do -
	Total (No.1 ~ No.74)										
	National Park Area						9.4	7.1MGD (6.5) 5/		10.0MGD	
	Old Golf Course						1.2	0.8		1.3	
	New Golf Course						1.1	0.7		1.2	
	Sectoral Area						8.8	5.5 (3.8) 5/		11.8	

Notes:
1/ Data given by CDA.
2/ Designed Hourly discharge multiplied by daily pumping time.
3/ Estimated hourly discharge multiplied by daily pumping time.
4/ Designed hourly discharge multiplied by 24 hours.
5/ Really supplied amount in 1984.
6/ 20 hours assumed.
7/ 78% of designed discharge assumed based on average estimated/designed discharge ratio in National Park Area.
8/ 70% of designed discharge assumed.
9/ 63% of designed discharge assumed based on the similar data to 7/.
10/ Average of data of which both designed and estimated discharge are known.
11/ Average of all known discharge.

Contd.-

TABLE A.II-45 DISCHARGE FROM TUBE WELLS

(Discharge in 1,000 Gallon)

No.	Operating Agency and Well Name	Year Completed	Hourly Discharge			Daily Pumping Time(hr)	Daily Discharge				Remarks
			Designed	Present Estimated	Present Measured		Designed	Present Estimated	Present Measured	Maximum 2/	
	PHED 1/				June '84				June '84		
1-6	6 Sohan Camp TW	1975-77	22.5 -28.1		(1 x 21.4 1 x 22.0	22		3,500		4,000	
	Sub-total							3,500 = 3.5MGD		4,000 = 4.0MGD	
7.	TW No.1 (Ashgar Mall)	1983	33.8	-	-	16 ~ (20)	-	4,500	-	811	
8.	2 (Dhok Khakka)	"	11.3	-	-		-		-	271	
9.	3 (Dhok Ratta)	"	16.9	-	-		-		-	406	
10.	4 (Dhok Kala Khan)	"	28.1	-	-		-		-	674	
11.	5 (D-Block, S/Town)	"	28.1	-	-		-		-	674	
12.	6 (A.Block, S/Town)	"	22.5	-	-		-		-	540	
13.	7 (R.M.C. Store)	"	16.9	-	-		-		-	406	
14.	8 (B.Block, S/Town)	"	33.8	-	-		-		-	811	
15.	9 (Pindora, Saidpur R)	"	22.5	-	-		-		-	540	
16.	10 (Mohin Pura)	1984	16.9	-	-		-		-	406	
17.	11 (Pir Vadhi)	"	22.5	-	-		-		-	540	
	Sub-total		av.20.5					4,500 = 4.5MGD		6,079 = 6.1MGD	
	Total							8,000 = 8.0MGD		9,679 = 9.7MGD	

Notes: 1/ Data given by PHED.

2/ Discharge for 24 hours running by designed capacity.

Contd.-

TABLE A.II-45 DISCHARGE FROM TUBE WELLS

(Discharge in 1,000 Gallon)

No.	Operating Agency and Well Name	Year Completed	Hourly Discharge			Daily Pumping Time(hr)	Daily Discharge				Remarks
			Designed	Present Estimated	Present Measured		Designed	Present Estimated	Present Measured	Maximum 4/	
	R.M.C.				June '84				June '84		
1.	A.R.P. Plant (H/W/W)	1926	14 1/	15 2/	- 3/	20 2/	280	300	-	336	
2.	- do -	"	14	15	-	20	280	300	-	336	
3.	- do -	"	12	12	-	20	240	240	-	288	
4.	Hailey W/works	1981	(9.1)	8	-	20	(182)	160	-	(218)	
5.	Percolation Well(H/W/W)	1978	(17)	15	-	20	(340)	300	-	(408)	
6.	New Katarian	1971	(9.1)	8	-	8	(73)	64	-	(218)	
7.	New Katarian Market	1978	(4.5)	4	5.2	8	(36)	32	42	(108)	
8.	F-Block	1982	(6.8)	6	-	8	(54)	48	-	(163)	
9.	Dhok Des Raj	1968	6	4	35.5(?)	8	48	32	-	144	
10.	7th Road	1955	5	3.5	-	12	60	42	-	120	
11.	6th Road	1956	(10.2)	9	3.4	12	(122)	108	41	(245)	
12.	D-Block	1970	(5.7)	5	-	12	(68)	60	-	(137)	
13.	Children Park	1958	(6.8)	6	0.2	15	(102)	90	3	(163)	
14.	Commercial Centre	1960	(8)	7	-	15	(120)	105	-	(192)	
15.	Fire Brigade S/Town	1971	(4.5)	4	-	15	(68)	60	-	(108)	
16.	Fire Brigade B-Block	1972	(1.7)	1.5	-	8	(14)	12	-	(41)	
17.	Afandi Colony	1978	(5.7)	5	1.8	12	(68)	60	22	(137)	
18.	Asghar Mall Scheme	1975	(9.1)	8	3.3	8	(73)	64	26	(218)	
19.	Saidpur Scheme No.1	1977	5	4	49.6(?)	8	40	32	-	120	
20.	- do - 2	1978	4	4	2.4	8	32	32	19	96	
21.	Dhok Hukamdad	1968	(17)	12	-	12	204	144	-	408	
22.	Millat Colony	"	6	5	0.6	8	48	40	-	144	

Contd.-

TABLE A.II-45 DISCHARGE FROM TUBE WELLS

(Discharge in 1,000 Gallon)

No.	Operating Agency and Well Name	Year Completed	Hourly Discharge			Daily Pumping Time (hr)	Daily Discharge				Remarks
			Designed	Present Estimated	Present Measured		Designed 2/	Present Estimated 3/	Present Measured	Maximum 4/	
	R.M.C. (Contd.)										
23.	Sher Pao No.1	1972	5	8	One of two	8	40	64	-	120	
24.	- do - No.2	1980	(9.1)	8	3.2	8	(73)	64	26	(218)	
25.	Chahchi Park	1968	7	6	-	22	154	132	-	168	
26.	Purana Qilah	1977	9	6	3.2	22	198	132	70	216	
27.	Ghazni Colony	1978	8	6	-	10	80	60	-	192	
28.	G.Bus Stand	1976	8	6	1.1	12	96	72	13	192	
29.	Mahau Pura	1971	4	3.5	3.4	22	88	77	75	96	
30.	Liaqat Bagh No.1	1954	18	15		10	180	150	-	432	
31.	- do - No.2	1956	4	3	One of three 0.5	10	40	30	5	96	
32.	- do - No.3	1983	(31)	27		10	(310)	270	-	(744)	
33.	Civil Line	1968	4.5	4	3.5	22	99	88	77	108	
34.	Dhok Ratta School	"	1.7	1	-	6	10	6	-	41	
35.	Bag Saradaran	1982	(9.1)	8	2.3	12	(109)	96	28	(218)	
36.	Dhok Dial	1983	(9.1)	8	-	18	(164)	144	-	(218)	
37.	New W/Works	1981	(9.1)	6	-	20	(182)	120	-	(218)	
38.	G.Bus Stand No.2	1983	(9.1)	8	-	12	(109)	96	-	(218)	
	Total		av.8.0 (100%)	av.7.0 6/ (av.7.5) 7/ (88%)		av.13.2	4,484 = 4.4MGD	3,926 = 3.9MGD = 6.0MGD 5/		7,843 = 7.8MGD	

Notes:
1/ Data from WAPDA Report (1982). Figures in parenthesis estimated.
2/ Data from R.M.C. Hourly discharge by R.M.C. seems to be 70-90% of the designed capacity.
3/ Data from P.H.E.D.
4/ Designed discharge for 24 running.
5/ Data given by PHED. Difference between figures by RMC and by PHED may be caused by different estimation of daily pumping time.
6/ Average of data of which both designed and estimated discharge are known.
7/ Average of all known discharge.

Contd.-

TABLE A.II-45 DISCHARGE FROM TUBE WELLS

(Discharge in 1,000 Gallon)

No.	Operating Agency and Well Name	Year Completed [1]	Hourly Discharge			Daily Pumping Time (hr) [1]	Daily Discharge				Remarks
			Designed [1]	Present Estimated	Present Measured		Designed	Present Estimated	Present Measured	Maximum [2]	
	C.B.										
1.	No. I Gawal Mandi	1958	22.5			20	450			540	
2.	II - do -	1959	22.5			20	450			540	
3.	III - do -	1961	33.8			20	676		2,500 [1]	811	
4.	IV - do -	1970	22.5			20	450			540	
5.	V Children Park	1980	11.3			20	226			271	
6.	Shiham Village	1981	22.5			20	450			540	
7.	Jhanda Chichi	1984	22.5			15	338			540	
	Total		av.22.5			av.19.3	3,040 = 3.0MGD		2,500 = 2.5MGD	3,782 = 3.8MGD	
	M.E.S.(ARMY) [3]										
1-3	3 TW.								700 [1]		
	Total								700 = 0.7MGD		
	M.E.S.(PAF) [3]										
1-3	3 TW.								700 [1]		
	Total								700 = 0.7MGD		

Notes: 1/ Data given by C.B.

2/ Designed discharge for 24 hours pumping.

3/ Detailed data not given because of military ristriction.

TABLE A.II-46 DIMENSIONS OF WELLS (1)

No.	Operating Agency and Well Name	Year Completed	Depth (ft.)	Top Casing			Strainer (Screen)					
				Diameter (in.)	Length (ft.)	Wall Thickness (in.)	Diameter (in.)	Total Length (ft.)	Uppermost Depth (ft.)	Type	Material	Slit Width (in.)
	CDA											
1.	National Park Area TW 1	1971	179	12	102	-	8	73	-	Vertically Slotted	Brass	-
2.	- do - 2	"	200	10	92	-	8	80	90	- do -	- do -	-
3.	- do - 3	"	228	10	98	-	8	76	138	- do -	- do -	-
4.	- do - 4	"	204	10	90	-	8	76	114	- do -	- do -	-
5.	- do - 5	"	231	10	63	-	8	124	62	- do -	- do -	-
6.	- do - 6	"	214	10	99	-	8	60	118	- do -	- do -	-
7.	- do - 7	"	228	10	100.5	-	8	60	113	- do -	- do -	-
8.	- do - 8	Not installed	-	-	-		-	-	-	-	-	-
9.	- do - 9	1971	208	10	99.5	-	8	40	142	Vertically Slotted	Brass	-
10.	- do - 10	"	250	10	99	-	8	72	150	- do -	- do -	-
11.	- do - 11	"	250	10	116	-	8	96	142	- do -	- do -	-
12.	- do - 12	"	174	10	101	-	8	32	116	- do -	- do -	-
13.	- do - 13	"	256	10	101	-	8	61	164	- do -	- do -	-
14.	- do - 14	"	168	10	89	-	8	64	98	- do -	- do -	-
15.	- do - 15	"	234	10	100	-	8	72	132	- do -	- do -	-
16.	- do - 16	1977	273	10	106	-	8	68	106	- do -	- do -	-
17.	- do - 17	"	250	-	103	-	8	72	102	- do -	- do -	-
18.	- do - 18	1971	207	10	100	-	8	72	130	- do -	- do -	-
19.	- do - 19	1977	271	10	108	-	8	40	129	- do -	- do -	-
20.	- do - 20	1980	249	10	111	-	8	36	71	- do -	- do -	-
21.	- do - 21	1980	229	10	116	-	8	44	117	- do -	- do -	-
22.	- do - 22	Site amended	-	-	-	-	-	-	-	-	-	-
23.	- do - 23	1980	204	10	131	-	8,10	80	83	Vertically Slotted	Brass	-
24.	- do - 24	Abandoned	270	12	122	-	8	44	147	- do -	- do -	-

Contd.-

TABLE A.II-46 DIMENSIONS OF WELLS (1)

No.	Operating Agency and Well Name	Year Completed	Depth (ft.)	Top Casing			Strainer (Screen)					
				Diameter (in.)	Length (ft.)	Wall Thickness (in.)	Diameter (in.)	Total Length (ft.)	Uppermost Depth (ft.)	Type	Material	Slit Width (in.)
	CDA (Contd.)											
25.	National Park Area W-I	1971	250	-	-	-	-	-	-	Vertically Slotted	Brass	-
26.	- do - W-II	"	250	-	-	-	-	-	-	- do -	- do -	-
27.	- do - W-III	"	250	-	-	-	-	-	-	- do -	- do -	-
28.	Golf Course Area No.1	1970	147.7	-	-	-	-	47	-	- do -	- do -	-
29.	- do - 2	"	115.4	-	-	-	-	21.4	-	- do -	- do -	-
30.	- do - 3	"	111	-	-	-	-	16.6	-	- do -	- do -	-
31.	- do - 4	"	101.4	-	-	-	-	27.4	-	- do -	- do -	-
32.	- do - 5	"	111	-	-	-	-	16.6	-	- do -	- do -	-
33.	- do - 6	1978	102	-	-	-	-	40	-	- do -	- do -	-
34.	- do - 7	Abandoned	131	-	-	-	-	76	-	- do -	- do -	-
35.	Gowal Colony	1983	265	-	-	-	-	132	-	- do -	- do -	-
36.	No. 36 F-8	1966	600	-	-	-	-	-	-	- do -	- do -	-
37.	No. 37 G-5/2	1968	120	-	-	-	-	35	-	- do -	- do -	-
38.	No. 38 G-7	1964	-	-	-	-	-	-	-	- do -	- do -	-
39.	No. 39 G-7/2	1964-5	-	-	-	-	-	-	-	- do -	- do -	-
40.	No. 40 G-8/1	1980	148	-	-	-	-	40	46	- do -	- do -	-
41.	No. 41 G-9/3	1978	264	-	-	-	-	72	-	- do -	- do -	-
42.	No. 42 G-9/4	"	400	-	-	-	-	100	-	- do -	- do -	-
43.	No. 43 Markaz G-9	1980	285	-	-	-	-	100	-	- do -	- do -	-
44.	No. 44 G-9/4	"	300	-	-	-	-	66	208	- do -	- do -	-
45.	No. 45 H-8	1981	375	-	-	-	-	-	-	- do -	- do -	-
46.	No. 46 H-9/3	1979	270	-	-	-	-	66	-	- do -	- do -	-
47.	No. 47 H-9	1980	340	10	125	3/16	8	76	173	- do -	- do -	-
48.	No. 48 H-9/1	"	360	10	142	-	8	75	144	- do -	- do -	-
49.	No. 49 H-9/2	"	390	10	110	3/16	8	96	112	- do -	- do -	-
50.	No. 50 I-8/1	"	195	10	128	1/8	-	53	130	- do -	- do -	-
51.	No. 51 I-8/2	-	298	10	100	3/16	8	104	102	- do -	- do -	-

Contd.-

TABLE A.II-46 DIMENSIONS OF WELLS (1)

No.	Operating Agency and Well Name	Year Completed	Depth (ft.)	Top Casing			Strainer (Screen)					
				Diameter (in.)	Length (ft.)	Wall Thickness (in.)	Diameter (in.)	Total Length (ft.)	Uppermost Depth (ft.)	Type	Material	Slit Width (in.)
	CDA (Contd.)											
52.	No. 52 I-9/1	1970	387	-	-	-	-	75	-	Vertically Slotted	Brass	-
53.	No. 53 I-9/3	"	261	-	-	-	-	72	-	- do -	- do -	-
54.	No. 54 I-9/4	"	259	-	-	-	-	60	-	- do -	- do -	-
55.	No. 55 I-9/2	1980	300	10	118	3/16	8	64	120	- do -	- do -	-
56.	No. 56 I-9/4	"	240	10	116	3/16	8	75	118	- do -	- do -	-
57.	No. 57 I-10/1	1976	285	-	-	-	-	75	-	- do -	- do -	-
58.	No. 58 I-10/2	Abandoned	-	-	-	-	-	-	-	-	-	-
59.	No. 59 I-11/1	1979	270	-	-	-	-	60	-	Vertically Slotted	Brass	-
60.	No. 60 I-11/2	"	272	-	-	-	-	72	-	- do -	- do -	-
61.	No. 61 G-7/3-2	1981	445	10	156	3/16	8	100	85	- do -	- do -	1/16
62.	No. 62 G-8/1	"	243	12	-	-	10	64	48	- do -	- do -	1/16
63.	No. 63 G-8/4	"	148	10	-	3/16	10	48	42	- do -	- do -	1/16
64.	No. 64 F-8/1	"	293	10	107	-	8	88	112	- do -	- do -	-
65.	No. 65 F-8/4	"	310	12	150	3/16	10	72	165	- do -	- do -	1/16
66.	No. 66 G-9/3	"	168	10	-	-	8	48	70	- do -	- do -	-
67.	No. 67 H-8/2	Abandoned	233	-	-	-	-	60	-	-	-	-
68.	No. 68 H-8/4	1982	304	14	160	3/16	12	132	168	Vertically Slotted	Brass	1/20
69.	No. 69 F-10/3	1980	175	10	120	3/16	8	64	86	- do -	- do -	1/16
70.	No. 70 F-9/4	1982	290	12	119	-	8	100	56	- do -	- do -	-
71.	No. 71 I-10/4	-	400	12	164	3/16	8	96	166	- do -	- do -	-
72.	No. 72 G-9/1	1981	300	12	136	3/16	8	80	138	- do -	- do -	-
73.	No. 73 G-10/3	1982	255	10	126	-	8	80	125	- do -	- do -	-
74.	No. 74 G-10/4	-	219	12	123	3/16	10	56	54	- do -	- do -	-
75.	No. 75 New Golf Course	-	202	10	-	-	10	72	50	- do -	- do -	-
76.	No. 76 Old Golf Course	-	198	12	100	-	10	58.6	101.5	- do -	- do -	1/25 1/30

Contd.-

TABLE A.II-46 DIMENSIONS OF WELLS (1)

No.	Operating Agency and Well Name	Year Completed	Depth (ft.)	Top Casing			Strainer (Screen)					
				Dia-meter (in.)	Length (ft.)	Wall Thick-ness (in.)	Dia-meter (in.)	Total Length (ft.)	Upper most Depth (ft.)	Type	Material	Slit Width (in.)
	CDA (Contd.)											
77.	Model Village Humak Sharki	1982	-	-	-	-	-	-	-	Vertically Slotted	Brass	-
78.	Model Village Humak Kharbi	"	-	-	-	-	-	-	-	- do -	- do -	-
	RMC											
1.	A.R.P. Plant (H/W/W)	1926	-	-	-	-	-	-	-	Vertically Slotted	Brass	-
2.	- do -	"	-	-	-	-	-	-	-	- do -	- do -	-
3.	- do -	"	-	-	-	-	-	-	-	- do -	- do -	-
4.	Hailey W/Works	1981	450	12	-	1/4	10	-	-	- do -	- do -	1/16
5.	Percolation Well (H/W/W)	1978	-	-	-	-	-	-	-	Dug Well	-	-
6.	New Katarian	1971	-	-	-	-	-	-	-	Vertically Slotted	Brass	-
7.	New Katarian Market	1978	-	8	-	1/4	6	-	-	- do -	- do -	-
8.	F-Block	1982	450	12	-	3/16	10	-	140	- do -	- do -	1/16
9.	Dhok Des Raj	1968	-	6	-	1/4	6	-	-	- do -	- do -	1/16
10.	7th Road	1955	-	-	-	-	-	-	-	- do -	- do -	-
11.	6th Road	1956	-	8	-	1/4	6	-	-	- do -	- do -	1/16
12.	D-Block	1970	-	-	-	-	-	-	-	- do -	- do -	-
13.	Children Park	1958	-	10	-	1/4	8	-	-	- do -	- do -	1/16
14.	Commercial Centre	1960	-	-	-	-	-	-	-	- do -	- do -	-
15.	Fire Brigade S/Town	1971	-	-	-	-	-	-	-	- do -	- do -	-
16.	Fire Brigade B-Block	1972	-	-	-	-	-	-	-	- do -	- do -	-
17.	Afandi Colony	1978	-	6	-	1/4	6	-	-	- do -	- do -	1/16
18.	Asghar Mall Scheme	1975	-	10	-	1/4	8	-	-	- do -	- do -	1/16
19.	Saidpur Scheme No.1	1977	-	8	-	1/4	6	-	-	- do -	- do -	1/16
20.	- do - No.2	1978	-	10	-	1/4	8	-	-	- do -	- do -	1/16
21.	Dhok Hukamdad	1968	-	10	-	1/4	8	-	-	- do -	- do -	1/16

Contd.-

TABLE A.II-46 DIMENSIONS OF WELLS (1)

No.	Operating Agency and Well Name	Year Completed	Depth (ft.)	Top Casing			Strainer (Screen)					
				Dia-meter (in.)	Length (ft.)	Wall Thick-ness (in.)	Dia-meter (in.)	Total Length (ft.)	Upper most Depth (ft.)	Type	Material	Slit Width (in.)
	RMC (Contd.)											
22.	Millat Colony	1968	-	8	-	1/4	6	-	-	Vertically Slotted	Brass	1/16
23.	Sher Pao No.1	1972	348	10	-	1/4	8	-	-	- do -	- do -	1/16
24.	-do- No.2	1980	-	10	-	1/4	8	-	-	- do -	- do -	1/16
25.	Chahchi Park	1968	-	-	-	-	-	-	-	- do -	- do -	-
26.	Purana Qilah	1977	-	10	-	1/4	8	-	-	- do -	- do -	-
27.	Ghazni Colony	1978	-	-	-	-	-	-	-	- do -	- do -	-
28.	G. Bus Stand	1976	-	8	-	1/4	6	-	-	- do -	- do -	-
29.	Mahau Pura	1971	-	6	-	1/4	6	-	-	- do -	- do -	-
30.	Liaqat Bagh No.1	1954	-	-	-	-	-	-	-	- do -	- do -	-
31.	- do - No.2	1956	400	12	-	1/4	10	-	-	- do -	- do -	-
32.	- do - No.3	1983	-	6	-	1/4	6	-	-	- do -	- do -	-
33.	Civil Line	1968	-	10	-	1/4	8	-	-	- do -	- do -	-
34.	Dhok Ratta School	1968	-	-	-	-	-	-	-	- do -	- do -	-
35.	Bag Saradaran	1982	-	10	-	1/4	8	-	-	- do -	- do -	-
36.	Dhok Dial	1983	445	12	-	1/4	10	-	-	- do -	- do -	-
37.	New W/Works	1981	450	12	-	1/4	10	-	-	- do -	- do -	-
38.	G. Bus Stand No.2	1983	-	-	-	-	-	-	-	- do -	- do -	-
	PHED											
1~6	Sohan Camp TW	1975-77	-	-	-	-	-	-	-	-	-	-
7.	TW No.1 (Ashgar Mall)	1983	401	12	200	3/16	8	97	200	Vertically Slotted	Brass	-
8.	-do- 2 (Dhok Khakka)	"	519	12	200	3/16	8	92	227	- do -	- do -	-
9.	-do- 3 (Dhok Ratta)	"	409	12	190	3/16	10	80.7	190	- do -	- do -	-
10.	-do- 4 (Dhok Kala Khan)	"	354	12	177	3/16	8	92	177	- do -	- do -	-
11.	-do- 5 (D-Block, S/Ton)	"	310	12	144.3	3/16	8	112	150	- do -	- do -	-

Contd.-

TABLE A.II-46 DIMENSIONS OF WELLS (1)

No.	Operating Agency and Well Name	Year Completed	Depth (ft.)	Casing Pipe: Dia-meter (in.)	Casing Pipe: Length (ft.)	Casing Pipe: Wall Thick-ness (in.)	Strainer (Screen): Dia-meter (in.)	Strainer (Screen): Total Length (ft.)	Strainer (Screen): Upper most Depth (ft.)	Strainer (Screen): Type	Strainer (Screen): Material	Strainer (Screen): Slit Width (in.)
	PHED (Contd.)											
12.	TW No.6 (A-Block, S/TowNO	1983	346.8	12	169.5	3/16	8	108	193	Vertically Slotted	Brass	-
13.	-do- 7 (RMC Store)	"	448.6	12	159.2	3/16	8	128	161	- do -	- do -	-
14.	-do- 8 (B-Block, S/Town)	"	382	12	160	3/16	8	88.5	202	- do -	- do -	-
15.	-do- 9 (Pindora, Said Pur R.)	"	328	12	168	3/16	8	148	170	- do -	- do -	-
16.	-do- 10 (Mohin Pura)	1984	296.5	12	169	3/16	8	104	187	- do -	- do -	-
17.	-do- 11 (Pir Vadhi)	"	357	12	144	3/16	8	112	155	- do -	- do -	-
	CB											
1.	No. I Gawal Mandi	1958	300	16	220	3/16	10	-	-	Vertically Slotted	Brass	1/32
2.	No.II - do -	1959	300	16	220	3/16	10	-	-	- do -	- do -	1/32
3.	No.III - do -	1961	260	15	180	3/16	10	-	-	- do -	- do -	1/32
4.	No.IV - do -	1970	300	16	220	3/16	10	-	-	- do -	- do -	1/32
5.	No. V Children Park	1980	244	10	194	3/16	10	-	-	- do -	- do -	1/32
6.	Shiham Village	1981	228	10	148	3/16	10	-	-	- do -	- do -	1/32
7.	Jhanda Chichi	1984	338	10	253	3/16	10	-	-	- do -	- do -	1/32

TABLE A.II-47 DIMENSIONS OF WELLS (2)

No.	Pump						Motor		Water Level			Specific Capacity		Remarks
	Nominal Capacity (1000 GPH)	Actual Capacity (1000 GPH)	Total Head (ft.)	Suction Pipe Dia. (in.)	Delivery Pipe Dia. (in.)	Year Manufac-tured	Hourse Power (Hp)	Year Manufac-tured	Static (ft.)	Drawdown (ft.)	Date observed	(1000 GPD/ft.)	(cub.m /D/m)	
CDA														
1.	20	20	150	8	5	1971	35	1971	17.4	26.0	6-8-84	18	280	
2.	25	8.7	150	-	5	1971	30	1971	15.0	7.3	8-8-84	29	430	
3.	25	22.5	150	-	5	1971	40	1971	-	-	-	-	-	
4.	39.4	24.8	150	-	5	1971	40	1971	0	10.16	6-8-84	59	870	
5.	-	-	-	-	-	-	-	-	Flowing	-	-	-	-	
6.	39.4	38.3	150	-	5	1971	50	1970	0	14.16	8-8-84	65	970	
7.	-	-	-	-	5	-	-	-	-	-	-	-	-	
8.	-	-	-	-	-	-	-	-	-	-	-	-	-	
9.	-	-	-	-	5	1971	-	-	-	-	-	-	-	Not installed.
10.	-	-	-	-	-	-	-	-	-	-	-	-	-	
11.	-	-	-	-	-	-	-	-	0	-	5-6-84	-	-	
12.	-	-	-	-	-	1971	-	-	Flowing	-	4-6-84	-	-	
13.	36	39.4	200	-	5	1980	50	1971	(No hole to measure)		8-8-84	-	-	
14.	22.5	-	250	-	5	1984	50	1983	9.75	-	7-8-84	-	-	
15.	39.4	39.8	150	-	6	1971	50	1968	(No hole to measure)		6-8-84	-	-	
16.	22.5	23.5	250	-	5	1975	40	-	(do)		7-8-84	-	-	
17.	39.4	23.5	-	-	5	-	40	-	(do)		7-8-84	-	-	
18.	-	23.5	-	-	-	-	40	-	-	-	-	-	-	
19.	22.5	-	250	-	5	1975	40	-	0	10.26	8-8-84	(53)	(790)	
20.	-	-	-	-	5	-	-	-	0	-	2-6-84	-	-	
21.	15	-	250	-	5	1982	50	-	11.8	9.55	8-8-84	(38)	(560)	
22.	-	-	-	-	-	-	-	-	-	-	-	-	-	Site amended.
23.	29.3	28.5	140-150	-	5	1977	50	1977	18.36	17.42	6-8-84	39	590	
24.	-	22	-	-	-	-	-	-	-	-	-	-	-	Abandoned.
25.	24	11.3	180	-	5	1971	60	1957	(No hole to measure)		8-8-84	-	-	
26.	-	-	-	-	-	-	-	-	-	-	-	-	-	

Contd.-

TABLE A.II-47 DIMENSIONS OF WELLS (2)

No.	Pump: Nominal Capacity (1000 GPH)	Pump: Actual Capacity (1000 GPH)	Pump: Total Head (ft.)	Pump: Suction Pipe Dia. (in.)	Pump: Delivery Pipe Dia. (in.)	Pump: Year Manufactured	Motor: Hourse Power (Hp)	Motor: Year Manufactured	Water Level: Static (ft.)	Water Level: Drawdown (ft.)	Water Level: Date observed	Specific Capacity: (1000 GPD/ft.)	Specific Capacity: (cub.m/D/m)	Remarks
CDA (Contd.)														
27.	25	12.2	150	-	5	1971	40	-	0	20.23	7-8-84	14	220	
28.	11.3	-	130	-	5	-	20	-	(No hole to measure)		4-8-84	-	-	
29.	11.3	-	130	-	5	-	20	-	71.09	8.61	4-8-84	(31)	(470)	
30.	33.8	-	155	-	5	-	50	-	71.34	7.97	4-8-84	(102)	(1,520)	
31.	22.5	-	130	-	5	1969	30	-	46.57	9.25	5-8-84	(58)	(870)	
32.	11.3	-	75	-	3	1969	15	1969	(No hole to measure)		5-8-84	-	-	
33.	16.9	-	250	-	5	-	30	-	(do)		29-5-84	-	-	
34.	-	-	-	-	-	-	-	-	-	-	-	-	-	Abandoned.
35.	15	11.3	260	-	5	1983	-	1969	78.3	7.70	5-8-84	35	530	
36.	21	13	300	-	5	1980	50	1977	82.38	25.02	26-6-84	12	190	
37.	6.8	4.4	270	-	5	-	-	-	-	-	-	-	-	
38.	7.2	4.3	130	-	5	1964	10	1969	-	-	16-8-84	-	-	
39.	-	4.3	-	-	-	-	-	-	-	-	-	-	-	
40.	14.6	10.9	250	-	5	1980	30	1980	(No hole to measure)		9-7-84	-	-	
41.	15	13.0	250	-	5	1982	40	-	40.9	31.91	24-6-84	10	150	
42.	16.9	13.0	-	-	-	-	50	-	44.77	-	16-8-84	-	-	
43.	13.2	6.5	250	-	5	1980	30	1979	(No hole to measure)		24-6-84	-	-	
44.	14.6	6.5	250	-	5	1980	30	1979	35	22.48	24-6-84	7	100	
45.	18	-	250	-	5	-	30	-	36	37.70	11-6-84	(11)	(170)	
46.	16.9	-	-	-	-	-	-	-	21.25	-	24-5-84	-	-	
47.	17	-	-	5	5	-	-	-	54.42	-	24-5-84	-	-	
48.	15	-	250	-	-	-	30	-	38	57.57	10-6-84	(6)	(90)	
49.	15	-	250	-	5	-	30	-	57.46	41.43	14-5-84	(9)	(130)	
50.	15	-	250	-	-	-	30	-	(No hole to measure)		28-5-84	-	-	
51.	13	-	250	-	5	-	30	-	-	-	-	-	-	
52.	22.5	4.4	250	-	-	-	40	-	40.75	10.35	13-6-84	10	150	

Contd.-

TABLE A.II-47 DIMENSIONS OF WELLS (2)

No.	Pump: Nominal Capacity (1000 GPH)	Pump: Actual Capacity (1000 GPH)	Pump: Total Head (ft.)	Pump: Suection Pipe Dia. (in.)	Pump: Delivery Pipe Dia. (in.)	Pump: Year Manufac-tured	Motor: Hourse Power (Hp)	Motor: Year Manufac-tured	Water Level: Static (ft.)	Water Level: Drawdown (ft.)	Water Level: Date observed	Specific Capacity: (1000 GPD/ft.)	Specific Capacity: (cub.m /D/m)	Remarks
CDA (Contd.)														
53.	16.9	13	175	-	5	-	20	-	38.25	18.10	13-6-84	17	260	
54.	-	6.6	300	-	-	-	60	-	-	-	-	-	-	
55.	-	8.7	250	-	5	-	30	-	-	-	-	-	-	
56.	-	13	250	-	5	-	30	-	-	-	-	-	-	
57.	-	13	250	-	-	-	30	-	-	-	-	-	-	
58.	-	-	-	-	-	-	-	-	-	-	-	-	-	Abandoned.
59.	-	8.7	-	-	-	-	60	-	-	-	-	-	-	
60.	-	13	-	-	-	-	60	-	-	-	-	-	-	
61.	37.8	22	250	-	5	1981	60	1980	15.5	50.03	16-8-84	11	160	
62.	-	12	250	-	-	-	40	-	-	-	-	-	-	
63.	18	14	250	-	5	-	30	-	24.92	19.36	9-7-84	17	260	
64.	22.5	10.8	250	-	5	1981	40	1980	-	-	-	-	-	
65.	22.5	9.5	250	-	5	1981	40	1980	-	-	-	-	-	
66.	8	6	250	-	-	-	50	-	31.50	64.27	25-6-84	2	30	
67.	-	-	-	-	-	-	-	-	-	-	-	-	-	Abandoned.
68.	30	30	250	-	6	-	60	-	62.05	14.86	10-6-84	48	720	
69.	32	24	-	-	5	-	-	-	12.5	-	27-5-84	-	-	
70.	11.3	8	175	-	5	1983	20	1982	12.13	58.55	25-6-84	3	50	
71.	-	-	200	-	5	-	30	-	-	-	-	-	-	
72.	22.5	-	250	-	-	1981	50	1981	51.62	13.91	24-6-84	(39)	(580)	
73.	22.5	4.2	250	-	5	1981	50	1981	14.00	40.28	9-7-84	3	40	
74.	-	-	-	-	-	-	-	-	-	-	24-5-84	-	-	
75.	-	-	-	-	-	-	-	-	-	-	-	-	-	
76.	-	-	-	-	-	-	-	-	-	-	-	-	-	
77.	11.3	-	250	-	5	1982	30	1982	30.67	19.33	8-8-84	(14)	210	
78.	-	-	-	-	5	-	30	-	(No hole to measure)		8-8-84	-	-	

Contd.-

TABLE A.II-47 DIMENSIONS OF WELLS (2)

No.	Pump						Motor		Water Level			Specific Capacity		Remarks
	Nominal Capacity (1000 GPH)	Actual Capacity (1000 GPH)	Total Head (ft.)	Suction Pipe Dia. (in.)	Delivery Pipe Dia. (in.)	Year Manufac-tured	Hourse Power (Hp)	Year Manufac-tured	Static (ft.)	Drawdown (ft.)	Date observed	(1000 GPD/ft.)	(cub.m./D/m)	
RMC														
1.	14	15	200	5	5	-	25	-	-	-	-	-	-	
2.	14	15	200	5	5	-	25	-	-	-	-	-	-	
3.	12	12	200	6	6	-	25	-	-	-	-	-	-	
4.	-	8	200	5	5	-	25	-	60	12.33	-	16	230	
5.	-	15	200	7	7	-	30	-	-	-	-	-	-	
6.	-	8	200	5	5	-	40	-	-	-	-	-	-	
7.	-	4	200	4	4	-	15	-	65.58	12	-	8	120	
8.	-	6	200	5	5	-	25	-	60.75	18.75	-	8	110	
9.	6	4	200	4	4	-	15	-	110	15.50	-	6	90	
10.	5	3.5	200	5	5	-	17	-	-	-	-	-	-	
11.	-	9	200	5	5	-	25	-	87.42	20.75	-	10	160	
12.	-	5	200	3	3	-	15	-	-	-	-	-	-	
13.	-	6	200	5	5	-	17	-	55.58	18.0	-	8	120	
14.	-	7	200	5	5	-	16	-	-	-	-	-	-	
15.	-	4	200	3	3	-	10	-	-	-	-	-	-	
16.	-	1.5	200	3	3	-	10	-	-	-	-	-	-	
17.	-	5	200	4	4	-	15	-	80.42	19.0	-	6	90	
18.	-	8	200	5	5	-	20	-	60.42	15.58	-	12	180	
19.	5	4	200	4	4	-	15	-	58.92	13.25	-	7	110	
20.	4	4	200	5	5	-	20	-	15.50	13.33	-	7	110	
21.	17	12	200	5	5	-	25	-	80.25	13.33	-	22	320	
22.	6	5	200	5	5	-	20	-	59.75	21.33	-	6	80	
23.	5	8	200	4	4	-	20	-	13.25	13.25	-	15	220	
24.	-	8	200	5	5	-	20	-	20.0	20.0	-	10	140	
25.	7	6	200	6	6	-	25	-	-	-	-	-	-	
26.	9	6	200	6	6	-	25	-	86.33	20.0	-	7	110	

Contd.-

TABLE A.II-47 DIMENSIONS OF WELLS (2)

No.	Pump: Nominal Capacity (1000 GPH)	Pump: Actual Capacity (1000 GPH)	Pump: Total Head (ft.)	Pump: Suction Pipe Dia. (in.)	Pump: Delivery Pipe Dia. (in.)	Pump: Year Manufactured	Motor: Hourse Power (Hp)	Motor: Year Manufactured	Water Level: Static (ft.)	Water Level: Drawdown (ft.)	Water Level: Date observed	Specific Capacity: (1000 GPD/ft.)	Specific Capacity: (cub.m /D/m)	Remarks
RMC (Contd.)														
27	8	6	200	5	5	-	10	-	-	-	-	-	-	
28.	8	6	200	5	5	-	30	-	75.66	14.17	-	10	150	
29.	4	3.5	200	4	4	-	15	-	65.0	22.0	-	4	60	
30.	18	15	200	6	6	-	38.5	-	-	-	-	-	-	
31.	4	27	200	6	6	-	40	-	-	-	-	-	-	
32.	-	3	200	3	3	-	10	-	140.0	30.33	-	2	40	
33.	4.5	4	200	5	5	-	10	-	60.0	15.33	-	6	90	
34.	1.7	1	200	3	6	-	15	-	-	-	-	-	-	
35.	-	8	200	6	6	-	25	-	75.0	15.0	-	13	190	
36.	-	8	200	6	6	-	25	-	-	-	-	-	-	
37.	-	6	200	5	5	-	20	-	70.33	15.25	-	9	140	
38.	-	8	200	5	5	-	25	-	-	-	-	-	-	
PHED														
1^6	-	-	-	-	-	-	-	-	-	-	-	-	-	
7.	33.8	-	200	6	6	1983	60	1983	53.12	13.44	-	60	900	
8.	11.3	-	220	6	6	1983	25	1983	32.92	86.0	-	3	50	
9.	16.9	-	200	6	6	1983	30	1983	26.0	54.0	-	8	110	
10.	28.1	-	200	6	6	1983	50	1983	71.8	16.6	-	41	610	
11.	28.1	-	200	6	6	1983	50	1983	40.0	21.0	-	32	480	
12.	22.5	-	200	6	6	1983	40	1983	65.0	7.0	-	77	1,150	
13.	16.9	-	250	6	6	1983	35	1983	45.0	40.0	-	10	150	
14.	33.8	-	200	6	6	1983	60	1983	55.0	23.0	-	35	530	
15.	22.5	-	200	6	6	1983	40	1983	40.0	8.0	-	68	1,010	
16.	16.9	-	200	6	6	1984	30	1984	45.0	31.0	-	13	200	
17.	22.5	-	200	6	6	1984	40	1984	45(61)	23(20)	-	23	350	

Contd.-

TABLE A.II-47 DIMENSIONS OF WELLS (2)

No.	Pump: Nominal Capacity (1000 GPH)	Pump: Actual Capacity (1000 GPH)	Pump: Total Head (ft.)	Pump: Suction Pipe Dia. (in.)	Pump: Delivery Pipe Dia. (in.)	Pump: Year Manufac-tured	Motor: Hourse Power (Hp)	Motor: Year Manufac-tured	Water Level: Static (ft.)	Water Level: Drawdown (ft.)	Water Level: Date observed	Specific Capacity: (1000 GPD/ft)	Specific Capacity: (cub.m /D/m)	Remarks
CB														
1.	22.5	-	150	6	5	1958	40	1958	50	30	-	(18)	(270)	
2.	22.5	-	150	6	5	1959	40	-	50	30	-	(18)	(270)	
3.	33.8	-	200	6	-	1961	40	1958	50	30	-	(27)	(400)	
4.	22.5	-	150	6	5	1970	40	-	50	30	-	(18)	(270)	
5.	11.3	-	150	5	-	1980	40	1980	50	30	-	(9)	(130)	
6.	22.5	-	150	6	-	1981	40	1981	50	30	-	(18)	(270)	
7.	22.5	-	100	6	-	1984	40	1984	50	30	-	(18)	(270)	

TABLE A.II-48(1) ANNUAL SUMMARY OF KHANPUR RESERVOIR OPERATION STUDY

SUMMARY OF KHANPUR RESERVOIR OPERATION CASE = 1

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	--INDUSTRIAL-- WAH	TAXILA	--AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	RESERVOIR LEVEL	RESERVOIR VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1960	249.138	54.907	115.420	24.958	22.462	58.855	35.349	311.950	24.914				0.0	0.0
1961	433.160	54.779	115.152	24.889	22.400	49.134	29.511	295.865	43.316				43.632	11.860
1962	210.633	54.779	115.152	24.889	22.400	55.617	33.284	305.922	21.063				0.0	35.792
1963	233.917	54.779	115.152	24.889	22.400	55.370	33.256	305.847	23.392				0.0	100.109
1964	260.719	54.907	115.420	24.958	22.462	65.812	39.528	323.086	26.072				0.0	83.652
1965	402.425	54.779	115.152	24.889	22.400	53.133	31.912	302.266	40.243				44.828	18.711
1966	261.736	54.779	115.152	24.889	22.400	53.569	32.174	302.964	26.174				0.0	53.603
1967	342.702	54.779	115.152	24.889	22.400	53.410	32.079	302.709	34.270				0.0	23.202
1968	286.557	54.907	115.420	24.958	22.462	50.697	30.449	298.892	28.656				0.0	12.067
1969	164.154	54.779	115.152	24.889	22.400	58.699	35.255	311.175	16.415				0.0	163.437
1970	323.927	54.779	115.152	24.889	22.400	53.525	32.148	302.894	32.393				21.880	98.869
1971	383.446	54.779	115.152	24.889	22.400	60.508	36.342	314.071	38.345				90.586	37.739
1972	203.369	54.907	115.420	24.958	22.462	51.255	30.784	299.785	20.337				0.0	72.941
1973	459.627	54.779	115.152	24.889	22.400	53.787	32.305	303.314	45.963				59.076	12.415
1974	126.891	54.779	115.152	24.889	22.400	67.603	40.603	325.427	12.689				0.0	147.536
1975	222.791	54.779	115.152	24.889	22.400	59.291	35.611	312.124	22.279				0.0	111.612
1976	629.396	54.907	115.420	24.958	22.462	46.626	28.004	292.376	62.940				213.986	12.300
1977	484.248	54.779	115.152	24.889	22.400	59.188	35.549	311.957	48.425				120.728	9.884
1978	569.414	54.779	115.152	24.889	22.400	50.350	30.241	297.811	56.941				219.664	0.0
1979	312.879	54.779	115.152	24.889	22.400	52.388	31.465	301.073	31.288				48.260	0.0
1980	304.569	54.907	115.420	24.958	22.462	48.934	29.390	296.070	30.457				0.0	34.494
MEAN	326.937	54.815	115.229	24.909	22.418	55.121	33.107	305.598	32.694				41.078	47.630
RATE1		17.937	37.706	8.151	7.336	18.037	10.833	100.000					13.442	15.586
RATE2		100.000	100.000	100.000	100.000	100.000	100.000	100.000					100.000	100.000

SUMMARY OF KHANPUR RESERVOIR OPERATION CASE = 2

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	--INDUSTRIAL-- WAH	TAXILA	--AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	RESERVOIR LEVEL	RESERVOIR VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1960	249.138	52.161	109.649	23.710	21.339	55.912	33.582	296.353	24.914				0.0	0.0
1961	433.160	52.040	109.395	23.645	21.280	46.677	28.035	281.072	43.316				58.882	0.0
1962	210.633	52.040	109.395	23.645	21.280	52.646	31.620	290.626	21.063				0.0	17.215
1963	233.917	52.040	109.395	23.645	21.280	52.502	31.593	290.555	23.392				0.0	91.236
1964	260.719	52.161	109.649	23.710	21.339	62.522	37.551	306.931	26.072				0.0	61.079
1965	402.425	52.040	109.395	23.645	21.280	50.476	30.317	287.153	40.243				52.936	17.292
1966	261.736	52.040	109.395	23.645	21.280	50.891	30.566	287.816	26.174				0.0	15.978
1967	342.702	52.040	109.395	23.645	21.280	50.739	30.475	287.573	34.270				0.0	18.596
1968	286.557	52.161	109.649	23.710	21.339	48.162	28.927	283.948	28.656				0.0	0.0
1969	164.154	52.040	109.395	23.645	21.280	55.764	33.493	295.616	16.415				0.0	131.362
1970	323.927	52.040	109.395	23.645	21.280	50.849	30.540	287.749	32.393				24.294	89.576
1971	383.446	52.040	109.395	23.645	21.280	57.483	34.525	298.367	38.345				94.520	27.268
1972	203.369	52.161	109.649	23.710	21.339	48.692	29.245	284.796	20.337				0.0	53.216
1973	459.627	52.040	109.395	23.645	21.280	51.098	30.690	288.148	45.963				68.855	10.524
1974	126.891	52.040	109.395	23.645	21.280	64.223	38.573	309.156	12.689				0.0	127.769
1975	222.791	52.040	109.395	23.645	21.280	56.327	33.831	296.517	22.279				0.0	96.005
1976	629.396	52.161	109.649	23.710	21.339	44.294	26.604	277.757	62.940				223.860	11.061
1977	484.248	52.040	109.395	23.645	21.280	56.228	33.771	296.359	48.425				127.968	0.0
1978	569.414	52.040	109.395	23.645	21.280	47.832	28.729	282.920	56.941				233.436	0.0
1979	312.879	52.040	109.395	23.645	21.280	49.768	29.892	286.020	31.288				55.515	0.0
1980	304.569	52.161	109.649	23.710	21.339	46.487	27.921	281.266	30.457				0.0	0.0
MEAN	326.937	52.075	109.467	23.683	21.297	52.365	31.451	290.318	32.694				44.774	36.580
RATE1		17.937	37.706	8.151	7.336	18.037	10.833	100.000					15.423	12.600
RATE2		95.000	95.000	95.000	95.000	95.000	95.000	95.000					108.999	76.800

SUMMARY OF KHANPUR RESERVOIR OPERATION CASE = 3

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	--INDUSTRIAL-- WAH	TAXILA	--AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	RESERVOIR LEVEL	RESERVOIR VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1960	249.138	49.416	103.878	22.462	20.216	52.969	31.814	280.755	24.914				0.0	0.0
1961	433.160	49.301	103.637	22.400	20.160	44.220	26.559	266.279	43.316				85.993	0.0
1962	210.633	49.301	103.637	22.400	20.160	49.875	29.956	275.330	21.063				0.0	0.0
1963	233.917	49.301	103.637	22.400	20.160	49.833	29.931	275.262	23.392				0.0	81.001
1964	260.719	49.416	103.878	22.462	20.216	59.231	35.575	290.777	26.072				0.0	38.506
1965	402.425	49.301	103.637	22.400	20.160	47.820	28.721	272.040	40.243				61.041	15.873
1966	261.736	49.301	103.637	22.400	20.160	48.212	28.957	272.668	26.174				0.0	2.022
1967	342.702	49.301	103.637	22.400	20.160	48.069	28.871	272.438	34.270				0.0	10.317
1968	286.557	49.416	103.878	22.462	20.216	45.627	27.404	269.003	28.656				0.0	0.0
1969	164.154	49.301	103.637	22.400	20.160	52.829	31.730	280.058	16.415				0.0	87.220
1970	323.927	49.301	103.637	22.400	20.160	48.173	28.933	272.604	32.393				26.708	80.283
1971	383.446	49.301	103.637	22.400	20.160	54.457	32.708	282.664	38.345				98.454	16.796
1972	203.369	49.416	103.878	22.462	20.216	46.129	27.706	269.806	20.337				0.0	33.491
1973	459.627	49.301	103.637	22.400	20.160	48.409	29.075	272.982	45.963				78.634	8.533
1974	126.891	49.301	103.637	22.400	20.160	60.843	36.543	292.885	12.689				0.0	108.002
1975	222.791	49.301	103.637	22.400	20.160	53.362	32.050	280.911	22.279				0.0	85.109
1976	629.396	49.416	103.878	22.462	20.216	41.963	25.204	263.138	62.940				233.796	5.112
1977	484.248	49.301	103.637	22.400	20.160	53.269	31.994	280.761	48.425				145.032	0.0
1978	569.414	49.301	103.637	22.400	20.160	45.315	27.217	268.030	56.941				247.207	0.0
1979	312.879	49.301	103.637	22.400	20.160	47.149	28.318	270.966	31.288				62.770	0.0
1980	304.569	49.416	103.878	22.462	20.216	44.040	26.451	266.463	30.457				0.0	0.0
MEAN	326.937	49.334	103.706	22.418	20.176	49.609	29.796	275.038	32.694				49.506	27.255
RATE1		17.937	37.706	8.151	7.336	18.037	10.833	100.000					18.000	9.910
RATE2		90.000	90.000	90.000	90.000	90.000	90.000	90.000					120.518	97.224

TABLE A.II-48(2) ANNUAL SUMMARY OF KHANPUR RESERVOIR OPERATION STUDY

SUMMARY OF KHANPUR RESERVOIR OPERATION CASE = 4

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	-INDUSTRIAL- WAH	TAXILA	-AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	-RESERVOIR- LEVEL	VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1960	249.138	46.671	98.107	21.214	19.092	50.027	30.047	265.157	24.914				1.936	0.0
1961	433.160	46.562	97.879	21.156	19.040	41.764	25.084	251.486	43.316				111.167	0.0
1962	210.633	46.562	97.879	21.156	19.040	47.104	28.292	260.034	21.063				0.0	0.0
1963	233.917	46.562	97.879	21.156	19.040	47.065	28.268	259.970	23.392				0.0	53.551
1964	260.719	46.671	98.107	21.214	19.092	55.940	33.599	274.623	26.072				0.0	15.933
1965	402.425	46.562	97.879	21.156	19.040	45.163	27.126	256.926	40.243				69.147	14.454
1966	261.736	46.562	97.879	21.156	19.040	45.534	27.348	257.520	26.174				0.0	0.0
1967	342.702	46.562	97.879	21.156	19.040	45.398	27.267	257.303	34.270				1.487	0.0
1968	286.557	46.671	98.107	21.214	19.092	43.092	25.882	254.059	28.656				24.278	0.0
1969	164.154	46.562	97.879	21.156	19.040	49.894	29.967	264.499	16.415				0.0	58.959
1970	323.927	46.562	97.879	21.156	19.040	45.496	27.326	257.460	32.393				29.197	70.990
1971	383.446	46.562	97.879	21.156	19.040	51.432	30.891	266.960	38.345				102.388	6.400
1972	203.369	46.671	98.107	21.214	19.092	43.566	26.167	254.817	20.337				0.0	13.767
1973	459.627	46.562	97.879	21.156	19.040	45.719	27.460	257.817	45.963				88.414	6.742
1974	126.891	46.562	97.879	21.156	19.040	57.463	34.513	276.613	12.689				0.0	88.235
1975	222.791	46.562	97.879	21.156	19.040	50.398	30.270	265.305	22.279				0.0	76.841
1976	629.396	46.671	98.107	21.214	19.092	39.632	23.803	248.520	62.940				247.630	0.0
1977	484.248	46.562	97.879	21.156	19.040	50.309	30.217	265.164	48.425				161.661	0.0
1978	569.414	46.562	97.879	21.156	19.040	42.797	25.705	253.140	56.941				260.979	0.0
1979	312.879	46.562	97.879	21.156	19.040	44.530	26.745	255.913	31.288				79.102	0.0
1980	304.569	46.671	98.107	21.214	19.092	41.594	24.982	251.660	30.457				2.474	0.0
MEAN	326.937	46.593	97.964	21.172	19.055	46.853	28.141	259.758	32.694				55.755	19.327
RATE1		17.937	37.706	8.151	7.336	18.037	10.833	100.000					21.464	7.440
RATE2		85.000	85.000	85.000	85.000	85.000	85.000	85.000					135.730	40.577

SUMMARY OF KHANPUR RESERVOIR OPERATION CASE = 5

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	-INDUSTRIAL- WAH	TAXILA	-AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	-RESERVOIR- LEVEL	VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1960	249.138	43.925	92.336	19.966	17.969	47.084	28.279	249.560	24.914				15.433	0.0
1961	433.160	43.823	92.122	19.911	17.920	39.307	23.608	236.692	43.316				127.183	0.0
1962	210.633	43.823	92.122	19.911	17.920	44.334	26.627	244.738	21.063				0.0	0.0
1963	233.917	43.823	92.122	19.911	17.920	44.296	26.605	244.678	23.392				0.0	26.502
1964	260.719	43.925	92.336	19.966	17.969	52.650	31.622	258.469	26.072				0.0	0.0
1965	402.425	43.823	92.122	19.911	17.920	42.506	25.530	241.813	40.243				77.720	6.395
1966	261.736	43.823	92.122	19.911	17.920	42.855	25.740	242.372	26.174				0.0	0.0
1967	342.702	43.823	92.122	19.911	17.920	42.728	25.663	242.167	34.270				33.073	0.0
1968	286.557	43.925	92.336	19.966	17.969	40.558	24.360	239.114	28.656				37.868	0.0
1969	164.154	43.823	92.122	19.911	17.920	46.959	28.204	248.940	16.415				0.0	38.216
1970	323.927	43.823	92.122	19.911	17.920	42.820	25.718	242.315	32.393				32.138	61.697
1971	383.446	43.823	92.122	19.911	17.920	48.406	29.074	251.257	38.345				109.867	0.0
1972	203.369	43.925	92.336	19.966	17.969	41.004	24.627	239.828	20.337				0.0	0.0
1973	459.627	43.823	92.122	19.911	17.920	43.030	25.844	242.651	45.963				99.300	0.0
1974	126.891	43.823	92.122	19.911	17.920	54.082	32.485	260.342	12.689				0.0	68.468
1975	222.791	43.823	92.122	19.911	17.920	47.433	28.489	249.699	22.279				0.0	68.574
1976	629.396	43.925	92.336	19.966	17.969	37.301	22.403	233.901	62.940				266.527	0.0
1977	484.248	43.823	92.122	19.911	17.920	47.350	28.439	249.566	48.425				178.290	0.0
1978	569.414	43.823	92.122	19.911	17.920	40.280	24.193	238.249	56.941				274.991	0.0
1979	312.879	43.823	92.122	19.911	17.920	41.910	25.172	240.859	31.288				80.388	0.0
1980	304.569	43.925	92.336	19.966	17.969	39.147	23.512	236.856	30.457				20.554	0.0
MEAN	326.937	43.852	92.183	19.927	17.934	44.097	26.485	244.479	32.694				64.352	12.850
RATE1		17.937	37.706	8.151	7.336	18.037	10.833	100.000					26.322	5.256
RATE2		80.000	80.000	80.000	80.000	80.000	80.000	80.000					156.657	26.979

SUMMARY OF KHANPUR RESERVOIR OPERATION CASE = 6

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	-INDUSTRIAL- WAH	TAXILA	-AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	-RESERVOIR- LEVEL	VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1960	249.138	41.180	86.565	18.718	16.846	44.141	26.512	233.963	24.914				24.929	0.0
1961	433.160	41.084	86.364	18.667	16.800	36.850	22.133	221.899	43.316				143.288	0.0
1962	210.633	41.084	86.364	18.667	16.800	41.563	24.963	229.442	21.063				0.0	0.0
1963	233.917	41.084	86.364	18.667	16.800	41.528	24.942	229.386	23.392				0.0	0.0
1964	260.719	41.180	86.565	18.718	16.846	49.359	29.646	242.315	26.072				0.0	0.0
1965	402.425	41.084	86.364	18.667	16.800	39.850	23.934	226.700	40.243				104.397	0.0
1966	261.736	41.084	86.364	18.667	16.800	40.177	24.131	227.223	26.174				0.0	0.0
1967	342.702	41.084	86.364	18.667	16.800	40.057	24.059	227.032	34.270				64.609	0.0
1968	286.557	41.180	86.565	18.718	16.846	38.023	22.837	224.169	28.656				51.458	0.0
1969	164.154	41.084	86.364	18.667	16.800	44.024	26.442	233.382	16.415				0.0	17.483
1970	323.927	41.084	86.364	18.667	16.800	40.144	24.111	227.170	32.393				35.244	52.568
1971	383.446	41.084	86.364	18.667	16.800	45.381	27.257	235.553	38.345				123.746	0.0
1972	203.369	41.180	86.565	18.718	16.846	38.441	23.088	224.839	20.337				0.0	0.0
1973	459.627	41.084	86.364	18.667	16.800	40.341	24.229	227.485	45.963				130.694	0.0
1974	126.893	41.084	86.364	18.667	16.800	50.702	30.453	244.071	12.689				0.0	48.701
1975	222.791	41.084	86.364	18.667	16.800	44.469	26.708	234.093	22.279				0.0	60.306
1976	629.396	41.180	86.565	18.718	16.846	34.969	21.003	219.282	62.940				285.868	0.0
1977	484.248	41.084	86.364	18.667	16.800	44.391	26.662	233.968	48.425				194.576	0.0
1978	569.414	41.084	86.364	18.667	16.800	37.762	22.681	223.359	56.941				290.004	0.0
1979	312.879	41.084	86.364	18.667	16.800	39.291	23.599	225.805	31.288				92.112	0.0
1980	304.569	41.180	86.565	18.718	16.846	36.700	22.043	222.053	30.457				36.340	0.0
MEAN	326.937	41.112	86.421	18.682	16.813	41.341	24.830	229.199	32.694				75.108	8.527
RATE1		17.937	37.706	8.151	7.336	18.037	10.833	100.000					32.770	3.720
RATE2		75.000	75.000	75.000	75.000	75.000	75.000	75.000					182.842	17.902

TABLE A.II-48(3) ANNUAL SUMMARY OF KHANPUR RESERVOIR OPERATION STUDY

SUMMARY OF KHANPUR RESERVOIR OPERATION CASE = 7

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	-INDUSTRIAL- WAH	TAXILA	-AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	-RESERVOIR- LEVEL	VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1960	249.138	38.435	80.794	17.470	15.723	41.198	24.744	218.365	24.914				36.426	0.0
1961	433.160	38.345	80.606	17.423	15.680	34.594	20.657	207.106	43.316				159.649	0.0
1962	210.633	38.345	80.606	17.423	15.680	38.792	23.299	214.146	21.063				0.0	0.0
1963	233.917	38.345	80.606	17.423	15.680	38.759	23.279	214.093	23.392				0.0	0.0
1964	260.719	38.435	80.794	17.470	15.723	46.068	27.669	226.160	26.072				6.295	0.0
1965	402.425	38.345	80.606	17.423	15.680	37.193	22.339	211.586	40.243				159.423	0.0
1966	261.736	38.345	80.606	17.423	15.680	37.498	22.522	212.075	26.174				1.163	0.0
1967	342.702	38.345	80.606	17.423	15.680	37.387	22.455	211.896	34.270				94.982	0.0
1968	286.557	38.435	80.794	17.470	15.723	35.488	21.315	209.225	28.656				65.047	0.0
1969	164.154	38.345	80.606	17.423	15.680	41.089	24.679	217.823	16.415				0.0	0.0
1970	323.927	38.345	80.606	17.423	15.680	37.467	22.504	212.026	32.393				38.492	40.333
1971	383.446	38.345	80.606	17.423	15.680	42.356	25.439	219.850	38.345				137.625	0.0
1972	203.369	38.435	80.794	17.470	15.723	35.878	21.549	209.850	20.337				0.0	0.0
1973	459.627	38.345	80.606	17.423	15.680	37.651	22.614	212.320	45.963				162.161	0.0
1974	126.891	38.345	80.606	17.423	15.680	47.322	28.422	227.799	12.689				0.0	29.005
1975	222.791	38.345	80.606	17.423	15.680	41.504	24.928	218.487	22.279				0.0	52.038
1976	629.396	38.435	80.794	17.470	15.723	32.638	19.603	204.663	62.940				305.266	0.0
1977	484.248	38.345	80.606	17.423	15.680	41.431	24.884	218.370	48.425				210.755	0.0
1978	569.414	38.345	80.606	17.423	15.680	35.245	21.168	208.468	56.941				305.155	0.0
1979	312.879	38.345	80.606	17.423	15.680	36.671	22.025	210.751	31.288				103.698	0.0
1980	304.569	38.435	80.794	17.470	15.723	34.294	20.573	207.249	30.457				52.435	0.0
MEAN	326.937	38.371	80.660	17.436	15.693	38.585	23.175	213.919	32.694				87.456	5.780
RATE1		17.937	37.706	8.151	7.336	18.037	10.833	100.000					40.883	2.702
RATE2		70.000	70.000	70.000	70.000	70.000	70.000	70.000					212.901	12.135

SUMMARY OF KHANPUR RESERVOIR OPERATION CASE = 8

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	-INDUSTRIAL- WAH	TAXILA	-AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	-RESERVOIR- LEVEL	VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1960	249.138	35.689	75.023	16.222	14.600	38.256	22.977	202.768	24.914				47.986	0.0
1961	433.160	35.606	74.849	16.178	14.560	31.937	19.182	192.312	43.316				177.205	0.0
1962	210.633	35.606	74.849	16.178	14.560	36.021	21.635	198.849	21.063				8.749	0.0
1963	233.917	35.606	74.849	16.178	14.560	35.991	21.617	198.801	23.392				8.374	0.0
1964	260.719	35.689	75.023	16.222	14.600	42.778	25.693	210.006	26.072				30.995	0.0
1965	402.425	35.606	74.849	16.178	14.560	34.536	20.743	196.473	40.243				173.657	0.0
1966	261.736	35.606	74.849	16.178	14.560	34.820	20.913	196.927	26.174				18.944	0.0
1967	342.702	35.606	74.849	16.178	14.560	34.716	20.851	196.761	34.270				108.736	0.0
1968	286.557	35.689	75.023	16.222	14.600	32.953	19.792	194.280	28.656				78.637	0.0
1969	164.154	35.606	74.849	16.178	14.560	38.154	22.916	202.264	16.415				0.0	0.0
1970	323.927	35.606	74.849	16.178	14.560	34.791	20.896	196.881	32.393				42.141	10.615
1971	383.446	35.606	74.849	16.178	14.560	39.330	23.622	204.146	38.345				151.300	0.0
1972	203.369	35.689	75.023	16.222	14.600	33.316	20.010	194.860	20.337				0.0	0.0
1973	459.627	35.606	74.849	16.178	14.560	34.962	20.999	197.154	45.963				193.839	0.0
1974	126.891	35.606	74.849	16.178	14.560	43.942	26.392	211.528	12.689				0.0	9.218
1975	222.791	35.606	74.849	16.178	14.560	38.539	23.147	202.880	22.279				0.0	43.771
1976	629.396	35.689	75.023	16.222	14.600	30.307	18.203	190.044	62.940				324.663	0.0
1977	484.248	35.606	74.849	16.178	14.560	38.472	23.107	202.772	48.425				226.934	0.0
1978	569.414	35.606	74.849	16.178	14.560	32.727	19.656	193.577	56.941				323.547	0.0
1979	312.879	35.606	74.849	16.178	14.560	34.052	20.452	195.698	31.288				115.043	0.0
1980	304.569	35.689	75.023	16.222	14.600	31.807	19.104	192.446	30.457				68.529	0.0
MEAN	326.937	35.630	74.898	16.191	14.572	35.829	21.519	198.639	32.694				99.825	3.053
RATE1		17.937	37.706	8.151	7.336	18.037	10.833	100.000					50.253	1.537
RATE2		65.000	65.000	65.000	65.000	65.000	65.000	65.000					243.008	5.409

SUMMARY OF KHANPUR RESERVOIR OPERATION CASE = 9

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	-INDUSTRIAL- WAH	TAXILA	-AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	-RESERVOIR- LEVEL	VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1960	249.138	32.944	69.252	14.975	13.477	35.313	21.209	187.170	24.914				59.954	0.0
1961	433.160	32.867	69.091	14.934	13.440	29.480	17.706	177.519	43.316				194.429	0.0
1962	210.633	32.867	69.091	14.934	13.440	33.250	19.971	183.553	21.063				21.404	0.0
1963	233.917	32.867	69.091	14.934	13.440	33.222	19.954	183.508	23.392				23.773	0.0
1964	260.719	32.944	69.252	14.975	13.477	39.487	23.717	193.852	26.072				46.691	0.0
1965	402.425	32.867	69.091	14.934	13.440	31.880	19.147	181.360	40.243				187.891	0.0
1966	261.736	32.867	69.091	14.934	13.440	32.141	19.305	181.779	26.174				36.725	0.0
1967	342.702	32.867	69.091	14.934	13.440	32.046	19.247	181.626	34.270				122.490	0.0
1968	286.557	32.944	69.252	14.975	13.477	30.418	18.270	179.336	28.656				92.227	0.0
1969	164.154	32.867	69.091	14.934	13.440	35.219	21.153	186.705	16.415				0.0	0.0
1970	323.927	32.867	69.091	14.934	13.440	32.115	19.289	181.736	32.393				64.915	0.0
1971	383.446	32.867	69.091	14.934	13.440	36.305	21.805	188.443	38.345				165.341	0.0
1972	203.369	32.944	69.252	14.975	13.477	30.753	18.471	179.871	20.337				0.0	0.0
1973	459.627	32.867	69.091	14.934	13.440	32.272	19.383	181.988	45.963				225.129	0.0
1974	126.891	32.867	69.091	14.934	13.440	40.562	24.362	195.256	12.689				0.0	0.0
1975	222.791	32.867	69.091	14.934	13.440	35.575	21.367	187.274	22.279				0.0	25.736
1976	629.396	32.944	69.252	14.975	13.477	27.975	16.802	175.426	62.940				344.061	0.0
1977	484.248	32.867	69.091	14.934	13.440	35.513	21.329	187.174	48.425				243.112	0.0
1978	569.414	32.867	69.091	14.934	13.440	30.210	18.144	178.687	56.941				335.939	0.0
1979	312.879	32.867	69.091	14.934	13.440	31.433	18.879	180.644	31.288				127.141	0.0
1980	304.569	32.944	69.252	14.975	13.477	29.360	17.634	177.642	30.457				93.871	0.0
MEAN	326.937	32.889	69.137	14.945	13.451	33.073	19.864	183.359	32.694				113.100	1.235
RATE1		17.937	37.706	8.151	7.336	18.037	10.833	100.000					61.682	0.673
RATE2		60.000	60.000	60.000	60.000	60.000	60.000	60.000					275.329	2.593

TABLE A.II-48(4) ANNUAL SUMMARY OF KHANPUR RESERVOIR OPERATION STUDY

SUMMARY OF KHANPUR RESERVOIR OPERATION CASE = 10

PERIOD	INFLOW	WATER DEMAND: WATER SUPPLY- ISLAMA	WATER SUPPLY- RAWALP	INDUSTRIAL- WAH	INDUSTRIAL- TAXILA	AGRICULTURE- RIGHT	AGRICULTURE- LEFT	TOTAL	LOSS	DIFFER	RESERVOIR- LEVEL	RESERVOIR- VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1960	249.138	30.199	63.481	13.727	12.354	32.370	19.442	171.573	24.914				71.922	0.0
1961	433.160	30.128	63.334	13.689	12.320	27.024	16.231	162.726	43.316				211.653	0.0
1962	210.633	30.128	63.334	13.689	12.320	30.479	18.306	168.257	21.063				34.058	0.0
1963	233.917	30.128	63.334	13.689	12.320	30.454	18.291	168.216	23.392				39.172	0.0
1964	260.719	30.199	63.481	13.727	12.354	36.197	21.740	177.697	26.072				62.397	0.0
1965	402.425	30.128	63.334	13.689	12.320	29.223	17.552	166.246	40.243				202.117	0.0
1966	261.736	30.128	63.334	13.689	12.320	29.463	17.696	166.630	26.174				54.506	0.0
1967	342.702	30.128	63.334	13.689	12.320	29.375	17.643	166.490	34.270				136.244	0.0
1968	286.557	30.199	63.481	13.727	12.354	27.883	16.747	164.391	28.656				105.816	0.0
1969	166.154	30.128	63.334	13.689	12.320	32.285	19.391	171.147	16.615				0.0	0.0
1970	323.927	30.128	63.334	13.689	12.320	29.439	17.681	166.592	32.393				98.304	0.0
1971	383.446	30.128	63.334	13.689	12.320	33.279	19.988	172.739	38.345				179.381	0.0
1972	203.369	30.199	63.481	13.727	12.354	28.190	16.931	164.882	20.337				7.017	0.0
1973	459.627	30.128	63.334	13.689	12.320	29.583	17.768	166.823	45.963				249.403	0.0
1974	126.891	30.128	63.334	13.689	12.320	37.182	22.332	178.985	12.689				0.0	0.0
1975	222.791	30.128	63.334	13.689	12.320	32.610	19.586	171.668	22.279				0.0	0.0
1976	629.396	30.199	63.481	13.727	12.354	25.644	15.402	160.807	62.940				365.257	0.0
1977	484.248	30.128	63.334	13.689	12.320	32.553	19.552	171.577	48.425				259.440	0.0
1978	569.414	30.128	63.334	13.689	12.320	27.692	16.632	163.796	56.941				351.006	0.0
1979	312.879	30.128	63.334	13.689	12.320	28.813	17.306	165.590	31.288				139.435	0.0
1980	304.569	30.199	63.481	13.727	12.354	26.914	16.165	162.839	30.457				99.016	0.0
MEAN	326.937	30.168	63.376	13.700	12.330	30.317	18.209	168.079	32.694				126.959	0.0
RATE1		17.937	37.706	8.151	7.336	18.037	10.833	100.000					75.535	0.0
RATE2		55.000	55.000	55.000	55.000	55.000	55.000	55.000					309.068	0.0

TABLE A.II-49(1) ANNUAL SUMMARY OF SIMLY RESERVOIR OPERATION STUDY

SUMMARY OF SIMLY RESERVOIR OPERATION CASE = 1

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	-INDUSTRIAL- WAH	TAXILA	-AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	RESERVOIR LEVEL	RESERVOIR VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1961	108.747	33.465	0.0	0.0	0.0	0.0	0.0	33.465	10.875				67.638	0.0
1962	39.556	33.465	0.0	0.0	0.0	0.0	0.0	33.465	3.956				5.767	0.0
1963	53.350	33.465	0.0	0.0	0.0	0.0	0.0	33.465	5.335				14.928	0.0
1964	66.665	33.543	0.0	0.0	0.0	0.0	0.0	33.543	6.666				25.140	0.0
1965	62.737	33.465	0.0	0.0	0.0	0.0	0.0	33.465	6.274				25.893	0.0
1966	53.357	33.465	0.0	0.0	0.0	0.0	0.0	33.465	5.336				11.960	0.0
1967	80.813	33.465	0.0	0.0	0.0	0.0	0.0	33.465	8.081				34.729	0.0
1968	60.230	33.543	0.0	0.0	0.0	0.0	0.0	33.543	6.023				26.330	0.0
1969	26.850	33.465	0.0	0.0	0.0	0.0	0.0	33.465	2.685				0.0	0.0
1970	117.535	33.465	0.0	0.0	0.0	0.0	0.0	33.465	11.754				58.608	0.0
1971	117.865	33.465	0.0	0.0	0.0	0.0	0.0	33.465	11.786				75.129	0.0
1972	54.643	33.543	0.0	0.0	0.0	0.0	0.0	33.543	5.464				12.794	0.0
1973	88.142	33.465	0.0	0.0	0.0	0.0	0.0	33.465	8.814				48.036	0.0
1974	39.767	33.465	0.0	0.0	0.0	0.0	0.0	33.465	3.977				5.510	0.0
1975	113.582	33.465	0.0	0.0	0.0	0.0	0.0	33.465	11.358				65.738	0.0
1976	175.584	33.543	0.0	0.0	0.0	0.0	0.0	33.543	17.558				123.167	0.0
1977	158.099	33.465	0.0	0.0	0.0	0.0	0.0	33.465	15.810				106.899	0.0
1978	148.166	33.465	0.0	0.0	0.0	0.0	0.0	33.465	14.817				100.734	0.0
1979	88.312	33.465	0.0	0.0	0.0	0.0	0.0	33.465	8.831				49.994	0.0
MEAN	87.052	33.481	0.0	0.0	0.0	0.0	0.0	33.481	8.705				45.200	0.0
RATE1		100.000	0.0	0.0	0.0	0.0	0.0	100.000					135.000	0.0
RATE2		100.000	0.0	0.0	0.0	0.0	0.0	100.000					100.000	0.0

SUMMARY OF SIMLY RESERVOIR OPERATION CASE = 2

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	-INDUSTRIAL- WAH	TAXILA	-AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	RESERVOIR LEVEL	RESERVOIR VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1961	108.747	41.814	0.0	0.0	0.0	0.0	0.0	41.814	10.875				61.355	0.0
1962	39.556	41.814	0.0	0.0	0.0	0.0	0.0	41.814	3.956				0.0	0.0
1963	53.350	41.814	0.0	0.0	0.0	0.0	0.0	41.814	5.335				4.583	0.219
1964	66.665	41.929	0.0	0.0	0.0	0.0	0.0	41.929	6.666				16.571	0.0
1965	62.737	41.814	0.0	0.0	0.0	0.0	0.0	41.814	6.274				18.093	0.0
1966	53.357	41.814	0.0	0.0	0.0	0.0	0.0	41.814	5.336				3.245	0.0
1967	80.813	41.814	0.0	0.0	0.0	0.0	0.0	41.814	8.081				26.196	0.0
1968	60.230	41.929	0.0	0.0	0.0	0.0	0.0	41.929	6.023				18.311	0.0
1969	26.850	41.814	0.0	0.0	0.0	0.0	0.0	41.814	2.685				0.0	2.085
1970	117.535	41.814	0.0	0.0	0.0	0.0	0.0	41.814	11.754				54.551	11.491
1971	117.865	41.814	0.0	0.0	0.0	0.0	0.0	41.814	11.786				67.531	0.0
1972	54.643	41.929	0.0	0.0	0.0	0.0	0.0	41.929	5.464				4.399	0.0
1973	88.142	41.814	0.0	0.0	0.0	0.0	0.0	41.814	8.814				39.512	0.0
1974	39.767	41.814	0.0	0.0	0.0	0.0	0.0	41.814	3.977				0.0	0.0
1975	113.582	41.814	0.0	0.0	0.0	0.0	0.0	41.814	11.358				56.674	2.335
1976	175.584	41.929	0.0	0.0	0.0	0.0	0.0	41.929	17.558				114.610	0.0
1977	158.099	41.814	0.0	0.0	0.0	0.0	0.0	41.814	15.810				97.936	0.0
1978	148.166	41.814	0.0	0.0	0.0	0.0	0.0	41.814	14.817				92.385	0.0
1979	88.312	41.814	0.0	0.0	0.0	0.0	0.0	41.814	8.831				42.626	0.0
MEAN	87.052	41.838	0.0	0.0	0.0	0.0	0.0	41.838	8.705				37.820	0.849
RATE1		100.000	0.0	0.0	0.0	0.0	0.0	100.000					90.396	2.029
RATE2		124.960	0.0	0.0	0.0	0.0	0.0	124.960					83.673	0.0

SUMMARY OF SIMLY RESERVOIR OPERATION CASE = 3

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	-INDUSTRIAL- WAH	TAXILA	-AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	RESERVOIR LEVEL	RESERVOIR VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1961	108.747	36.811	0.0	0.0	0.0	0.0	0.0	36.811	10.875				65.024	0.0
1962	39.556	36.811	0.0	0.0	0.0	0.0	0.0	36.811	3.956				2.710	0.0
1963	53.350	36.811	0.0	0.0	0.0	0.0	0.0	36.811	5.335				11.485	0.0
1964	66.665	36.897	0.0	0.0	0.0	0.0	0.0	36.897	6.666				21.690	0.0
1965	62.737	36.811	0.0	0.0	0.0	0.0	0.0	36.811	6.274				22.835	0.0
1966	53.357	36.811	0.0	0.0	0.0	0.0	0.0	36.811	5.336				8.421	0.0
1967	80.813	36.811	0.0	0.0	0.0	0.0	0.0	36.811	8.081				31.286	0.0
1968	60.230	36.897	0.0	0.0	0.0	0.0	0.0	36.897	6.023				23.168	0.0
1969	26.850	36.811	0.0	0.0	0.0	0.0	0.0	36.811	2.685				0.0	0.0
1970	117.535	36.811	0.0	0.0	0.0	0.0	0.0	36.811	11.754				55.778	4.354
1971	117.865	36.811	0.0	0.0	0.0	0.0	0.0	36.811	11.786				72.177	0.0
1972	54.643	36.897	0.0	0.0	0.0	0.0	0.0	36.897	5.464				9.430	0.0
1973	88.142	36.811	0.0	0.0	0.0	0.0	0.0	36.811	8.814				44.602	0.0
1974	39.767	36.811	0.0	0.0	0.0	0.0	0.0	36.811	3.977				2.156	0.0
1975	113.582	36.811	0.0	0.0	0.0	0.0	0.0	36.811	11.358				62.188	0.0
1976	175.584	36.897	0.0	0.0	0.0	0.0	0.0	36.897	17.558				119.729	0.0
1977	158.099	36.811	0.0	0.0	0.0	0.0	0.0	36.811	15.810				103.258	0.0
1978	148.166	36.811	0.0	0.0	0.0	0.0	0.0	36.811	14.817				97.387	0.0
1979	88.312	36.811	0.0	0.0	0.0	0.0	0.0	36.811	8.831				47.134	0.0
MEAN	87.052	36.829	0.0	0.0	0.0	0.0	0.0	36.829	8.705				42.129	0.229
RATE1		100.000	0.0	0.0	0.0	0.0	0.0	100.000					114.390	0.622
RATE2		110.000	0.0	0.0	0.0	0.0	0.0	110.000					93.207	0.0

TABLE A.II-49(2) ANNUAL SUMMARY OF SIMLY RESERVOIR OPERATION STUDY

SUMMARY OF SIMLY RESERVOIR OPERATION CASE = 4

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	--INDUSTRIAL-- WAH	TAXILA	--AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	---RESERVOIR-- LEVEL	VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1961	108.747	40.158	0.0	0.0	0.0	0.0	0.0	40.158	10.875				62.410	0.0
1962	39.556	40.158	0.0	0.0	0.0	0.0	0.0	40.158	3.956				0.0	0.0
1963	53.350	40.158	0.0	0.0	0.0	0.0	0.0	40.158	5.335				7.695	0.0
1964	66.665	40.251	0.0	0.0	0.0	0.0	0.0	40.251	6.666				18.239	0.0
1965	62.737	40.158	0.0	0.0	0.0	0.0	0.0	40.158	6.274				19.777	0.0
1966	53.357	40.158	0.0	0.0	0.0	0.0	0.0	40.158	5.336				4.883	0.0
1967	80.813	40.158	0.0	0.0	0.0	0.0	0.0	40.158	8.081				27.863	0.0
1968	60.230	40.251	0.0	0.0	0.0	0.0	0.0	40.251	6.023				20.007	0.0
1969	26.850	40.158	0.0	0.0	0.0	0.0	0.0	40.158	2.685				0.0	0.0
1970	117.535	40.158	0.0	0.0	0.0	0.0	0.0	40.158	11.754				54.609	10.369
1971	117.865	40.158	0.0	0.0	0.0	0.0	0.0	40.158	11.786				69.225	0.0
1972	54.643	40.251	0.0	0.0	0.0	0.0	0.0	40.251	5.464				6.076	0.0
1973	88.142	40.158	0.0	0.0	0.0	0.0	0.0	40.158	8.814				41.159	0.0
1974	39.767	40.158	0.0	0.0	0.0	0.0	0.0	40.158	3.977				0.0	0.0
1975	113.582	40.158	0.0	0.0	0.0	0.0	0.0	40.158	11.358				57.651	0.0
1976	175.584	40.251	0.0	0.0	0.0	0.0	0.0	40.251	17.558				116.278	0.0
1977	158.099	40.158	0.0	0.0	0.0	0.0	0.0	40.158	15.810				99.618	0.0
1978	148.166	40.158	0.0	0.0	0.0	0.0	0.0	40.158	14.817				94.041	0.0
1979	88.312	40.158	0.0	0.0	0.0	0.0	0.0	40.158	8.831				44.274	0.0
MEAN	87.052	40.178	0.0	0.0	0.0	0.0	0.0	40.178	8.705				39.146	0.546
RATE1		100.000	0.0	0.0	0.0	0.0	0.0	100.000					97.434	1.358
RATE2		120.000	0.0	0.0	0.0	0.0	0.0	120.000					86.608	0.0

SUMMARY OF SIMLY RESERVOIR OPERATION CASE = 5

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	--INDUSTRIAL-- WAH	TAXILA	--AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	---RESERVOIR-- LEVEL	VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1961	108.747	43.504	0.0	0.0	0.0	0.0	0.0	43.504	10.875				59.796	0.0
1962	39.556	43.504	0.0	0.0	0.0	0.0	0.0	43.504	3.956				0.0	0.0
1963	53.350	43.504	0.0	0.0	0.0	0.0	0.0	43.504	5.335				4.122	2.906
1964	66.665	43.606	0.0	0.0	0.0	0.0	0.0	43.606	6.666				14.767	0.0
1965	62.737	43.504	0.0	0.0	0.0	0.0	0.0	43.504	6.274				16.719	0.0
1966	53.357	43.504	0.0	0.0	0.0	0.0	0.0	43.504	5.336				1.344	0.0
1967	80.813	43.504	0.0	0.0	0.0	0.0	0.0	43.504	8.081				24.400	0.0
1968	60.230	43.606	0.0	0.0	0.0	0.0	0.0	43.606	6.023				16.942	0.0
1969	26.850	43.504	0.0	0.0	0.0	0.0	0.0	43.504	2.685				0.0	4.320
1970	117.535	43.504	0.0	0.0	0.0	0.0	0.0	43.504	11.754				53.484	12.159
1971	117.865	43.504	0.0	0.0	0.0	0.0	0.0	43.504	11.786				66.229	0.0
1972	54.643	43.606	0.0	0.0	0.0	0.0	0.0	43.606	5.464				2.722	0.0
1973	88.142	43.504	0.0	0.0	0.0	0.0	0.0	43.504	8.814				37.717	0.0
1974	39.767	43.504	0.0	0.0	0.0	0.0	0.0	43.504	3.977				0.0	0.0
1975	113.582	43.504	0.0	0.0	0.0	0.0	0.0	43.504	11.358				56.034	5.036
1976	175.584	43.606	0.0	0.0	0.0	0.0	0.0	43.606	17.558				112.788	0.0
1977	158.099	43.504	0.0	0.0	0.0	0.0	0.0	43.504	15.810				95.978	0.0
1978	148.166	43.504	0.0	0.0	0.0	0.0	0.0	43.504	14.817				90.859	0.0
1979	88.312	43.504	0.0	0.0	0.0	0.0	0.0	43.504	8.831				41.249	0.0
MEAN	87.052	43.526	0.0	0.0	0.0	0.0	0.0	43.526	8.705				36.587	1.285
RATE1		100.000	0.0	0.0	0.0	0.0	0.0	100.000					84.058	2.953
RATE2		130.000	0.0	0.0	0.0	0.0	0.0	130.000					80.945	0.0

SUMMARY OF SIMLY RESERVOIR OPERATION CASE = 6

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	--INDUSTRIAL-- WAH	TAXILA	--AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	---RESERVOIR-- LEVEL	VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1961	108.747	46.851	0.0	0.0	0.0	0.0	0.0	46.851	10.875				57.183	0.0
1962	39.556	46.851	0.0	0.0	0.0	0.0	0.0	46.851	3.956				0.0	0.0
1963	53.350	46.851	0.0	0.0	0.0	0.0	0.0	46.851	5.335				3.636	8.824
1964	66.665	46.960	0.0	0.0	0.0	0.0	0.0	46.960	6.666				11.220	0.0
1965	62.737	46.851	0.0	0.0	0.0	0.0	0.0	46.851	6.274				13.661	0.0
1966	53.357	46.851	0.0	0.0	0.0	0.0	0.0	46.851	5.336				0.0	0.899
1967	80.813	46.851	0.0	0.0	0.0	0.0	0.0	46.851	8.081				19.661	0.0
1968	60.230	46.960	0.0	0.0	0.0	0.0	0.0	46.960	6.023				13.876	0.0
1969	26.850	46.851	0.0	0.0	0.0	0.0	0.0	46.851	2.685				0.0	8.784
1970	117.535	46.851	0.0	0.0	0.0	0.0	0.0	46.851	11.754				52.517	13.806
1971	117.865	46.851	0.0	0.0	0.0	0.0	0.0	46.851	11.786				63.075	0.0
1972	54.643	46.960	0.0	0.0	0.0	0.0	0.0	46.960	5.464				0.0	0.0
1973	88.142	46.851	0.0	0.0	0.0	0.0	0.0	46.851	8.814				33.641	0.0
1974	39.767	46.851	0.0	0.0	0.0	0.0	0.0	46.851	3.977				0.0	1.525
1975	113.582	46.851	0.0	0.0	0.0	0.0	0.0	46.851	11.358				55.355	9.430
1976	175.584	46.960	0.0	0.0	0.0	0.0	0.0	46.960	17.558				109.241	0.0
1977	158.099	46.851	0.0	0.0	0.0	0.0	0.0	46.851	15.810				92.338	0.0
1978	148.166	46.851	0.0	0.0	0.0	0.0	0.0	46.851	14.817				87.806	0.0
1979	88.312	46.851	0.0	0.0	0.0	0.0	0.0	46.851	8.831				38.095	0.0
MEAN	87.052	46.874	0.0	0.0	0.0	0.0	0.0	46.874	8.705				34.279	2.277
RATE1		100.000	0.0	0.0	0.0	0.0	0.0	100.000					73.131	4.858
RATE2		140.000	0.0	0.0	0.0	0.0	0.0	140.000					75.839	0.0

TABLE A.II-49(3) ANNUAL SUMMARY OF SIMLY RESERVOIR OPERATION STUDY

SUMMARY OF SIMLY RESERVOIR OPERATION CASE = 7

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	--INDUSTRIAL-- WAH	TAXILA	--AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	RESERVOIR LEVEL	RESERVOIR VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1961	108.747	50.197	0.0	0.0	0.0	0.0	0.0	50.197	10.875				54.569	0.0
1962	39.556	50.197	0.0	0.0	0.0	0.0	0.0	50.197	3.956				0.0	2.007
1963	53.350	50.197	0.0	0.0	0.0	0.0	0.0	50.197	5.335				3.149	12.735
1964	66.665	50.314	0.0	0.0	0.0	0.0	0.0	50.314	6.666				7.882	0.170
1965	62.737	50.197	0.0	0.0	0.0	0.0	0.0	50.197	6.274				10.564	0.0
1966	53.357	50.197	0.0	0.0	0.0	0.0	0.0	50.197	5.336				0.0	3.855
1967	80.813	50.197	0.0	0.0	0.0	0.0	0.0	50.197	8.081				15.636	0.0
1968	60.230	50.314	0.0	0.0	0.0	0.0	0.0	50.314	6.023				10.810	0.0
1969	26.850	50.197	0.0	0.0	0.0	0.0	0.0	50.197	2.685				0.0	13.249
1970	117.535	50.197	0.0	0.0	0.0	0.0	0.0	50.197	11.754				51.549	15.452
1971	117.865	50.197	0.0	0.0	0.0	0.0	0.0	50.197	11.786				60.005	0.0
1972	54.643	50.314	0.0	0.0	0.0	0.0	0.0	50.314	5.464				0.0	0.0
1973	88.142	50.197	0.0	0.0	0.0	0.0	0.0	50.197	8.814				26.822	0.0
1974	39.767	50.197	0.0	0.0	0.0	0.0	0.0	50.197	3.977				0.0	4.156
1975	113.582	50.197	0.0	0.0	0.0	0.0	0.0	50.197	11.358				54.677	12.776
1976	175.584	50.314	0.0	0.0	0.0	0.0	0.0	50.314	17.558				105.696	0.0
1977	158.099	50.197	0.0	0.0	0.0	0.0	0.0	50.197	15.810				88.698	0.0
1978	148.166	50.197	0.0	0.0	0.0	0.0	0.0	50.197	14.817				84.753	0.0
1979	88.312	50.197	0.0	0.0	0.0	0.0	0.0	50.197	8.831				35.222	0.0
MEAN	87.052	50.222	0.0	0.0	0.0	0.0	0.0	50.222	8.705				32.107	5.390
RATE1		100.000	0.0	0.0	0.0	0.0	0.0	100.000					63.930	6.749
RATE2		150.000	0.0	0.0	0.0	0.0	0.0	150.000					71.033	0.0

SUMMARY OF SIMLY RESERVOIR OPERATION CASE = 8

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	--INDUSTRIAL-- WAH	TAXILA	--AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	RESERVOIR LEVEL	RESERVOIR VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1961	108.747	53.544	0.0	0.0	0.0	0.0	0.0	53.544	10.875				51.955	0.0
1962	39.556	53.544	0.0	0.0	0.0	0.0	0.0	53.544	3.956				0.0	4.578
1963	53.350	53.544	0.0	0.0	0.0	0.0	0.0	53.544	5.335				2.663	16.082
1964	66.665	53.669	0.0	0.0	0.0	0.0	0.0	53.669	6.666				7.107	2.845
1965	62.737	53.544	0.0	0.0	0.0	0.0	0.0	53.544	6.274				7.410	0.0
1966	53.357	53.544	0.0	0.0	0.0	0.0	0.0	53.544	5.336				0.0	5.512
1967	80.813	53.544	0.0	0.0	0.0	0.0	0.0	53.544	8.081				11.611	0.0
1968	60.230	53.669	0.0	0.0	0.0	0.0	0.0	53.669	6.023				7.745	0.0
1969	26.850	53.544	0.0	0.0	0.0	0.0	0.0	53.544	2.685				0.0	17.713
1970	117.535	53.544	0.0	0.0	0.0	0.0	0.0	53.544	11.754				50.582	17.398
1971	117.865	53.544	0.0	0.0	0.0	0.0	0.0	53.544	11.786				56.947	0.0
1972	54.643	53.669	0.0	0.0	0.0	0.0	0.0	53.669	5.464				0.0	0.0
1973	88.142	53.544	0.0	0.0	0.0	0.0	0.0	53.544	8.814				20.025	0.0
1974	39.767	53.544	0.0	0.0	0.0	0.0	0.0	53.544	3.977				0.0	6.826
1975	113.582	53.544	0.0	0.0	0.0	0.0	0.0	53.544	11.358				53.998	16.125
1976	175.584	53.669	0.0	0.0	0.0	0.0	0.0	53.669	17.558				102.148	0.0
1977	158.099	53.544	0.0	0.0	0.0	0.0	0.0	53.544	15.810				85.057	0.0
1978	148.166	53.544	0.0	0.0	0.0	0.0	0.0	53.544	14.817				81.712	0.0
1979	88.312	53.544	0.0	0.0	0.0	0.0	0.0	53.544	8.831				32.350	0.0
MEAN	87.052	53.570	0.0	0.0	0.0	0.0	0.0	53.570	8.705				30.069	4.836
RATE1		100.000	0.0	0.0	0.0	0.0	0.0	100.000					56.130	8.655
RATE2		160.000	0.0	0.0	0.0	0.0	0.0	160.000					66.525	0.0

TABLE A.II-49(4) ANNUAL SUMMARY OF SIMLY RESERVOIR OPERATION STUDY

SUMMARY OF SIMLY RESERVOIR OPERATION CASE = 1

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	--INDUSTRIAL-- WAH	TAXILA	--AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	RESERVOIR LEVEL	RESERVOIR VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1961	108.747	33.465	0.0	0.0	0.0	0.0	0.0	33.465	10.875				67.638	0.0
1962	39.556	33.465	0.0	0.0	0.0	0.0	0.0	33.465	3.956				5.767	0.0
1963	53.350	33.465	0.0	0.0	0.0	0.0	0.0	33.465	5.335				14.928	0.0
1964	66.665	33.543	0.0	0.0	0.0	0.0	0.0	33.543	6.666				25.140	0.0
1965	62.737	33.465	0.0	0.0	0.0	0.0	0.0	33.465	6.274				25.895	0.0
1966	53.357	33.465	0.0	0.0	0.0	0.0	0.0	33.465	5.336				11.960	0.0
1967	80.813	33.465	0.0	0.0	0.0	0.0	0.0	33.465	8.081				34.729	0.0
1968	60.230	33.543	0.0	0.0	0.0	0.0	0.0	33.543	6.023				26.330	0.0
1969	26.850	33.465	0.0	0.0	0.0	0.0	0.0	33.465	2.685				0.0	0.0
1970	117.535	33.465	0.0	0.0	0.0	0.0	0.0	33.465	11.754				58.608	0.0
1971	117.865	33.465	0.0	0.0	0.0	0.0	0.0	33.465	11.786				75.129	0.0
1972	54.643	33.543	0.0	0.0	0.0	0.0	0.0	33.543	5.464				12.796	0.0
1973	88.142	33.465	0.0	0.0	0.0	0.0	0.0	33.465	8.814				48.036	0.0
1974	39.767	33.465	0.0	0.0	0.0	0.0	0.0	33.465	3.977				5.310	0.0
1975	113.582	33.465	0.0	0.0	0.0	0.0	0.0	33.465	11.358				65.738	0.0
1976	175.584	33.543	0.0	0.0	0.0	0.0	0.0	33.543	17.558				123.167	0.0
1977	158.099	33.465	0.0	0.0	0.0	0.0	0.0	33.465	15.810				106.899	0.0
1978	148.166	33.465	0.0	0.0	0.0	0.0	0.0	33.465	14.817				100.734	0.0
1979	88.312	33.465	0.0	0.0	0.0	0.0	0.0	33.465	8.831				69.994	0.0
MEAN	87.052	33.481	0.0	0.0	0.0	0.0	0.0	33.481	8.705				45.200	0.0
RATE1		100.000	0.0	0.0	0.0	0.0	0.0	100.000					135.000	0.0
RATE2		100.000	0.0	0.0	0.0	0.0	0.0	100.000					100.000	0.0

SUMMARY OF SIMLY RESERVOIR OPERATION CASE = 2

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	--INDUSTRIAL-- WAH	TAXILA	--AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	RESERVOIR LEVEL	RESERVOIR VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1961	108.747	41.814	0.0	0.0	0.0	0.0	0.0	41.814	10.875				61.355	0.0
1962	39.556	41.814	0.0	0.0	0.0	0.0	0.0	41.814	3.956				0.0	0.0
1963	53.350	41.814	0.0	0.0	0.0	0.0	0.0	41.814	5.335				4.364	0.0
1964	66.665	41.929	0.0	0.0	0.0	0.0	0.0	41.929	6.666				16.571	0.0
1965	62.737	41.814	0.0	0.0	0.0	0.0	0.0	41.814	6.274				18.093	0.0
1966	53.357	41.814	0.0	0.0	0.0	0.0	0.0	41.814	5.336				3.245	0.0
1967	80.813	41.814	0.0	0.0	0.0	0.0	0.0	41.814	8.081				26.196	0.0
1968	60.230	41.929	0.0	0.0	0.0	0.0	0.0	41.929	6.023				18.311	0.0
1969	26.850	41.814	0.0	0.0	0.0	0.0	0.0	41.814	2.685				0.0	0.0
1970	117.535	41.814	0.0	0.0	0.0	0.0	0.0	41.814	11.754				42.730	1.734
1971	117.865	41.814	0.0	0.0	0.0	0.0	0.0	41.814	11.786				67.531	0.0
1972	54.643	41.929	0.0	0.0	0.0	0.0	0.0	41.929	5.464				4.399	0.0
1973	88.142	41.814	0.0	0.0	0.0	0.0	0.0	41.814	8.814				39.512	0.0
1974	39.767	41.814	0.0	0.0	0.0	0.0	0.0	41.814	3.977				0.0	0.0
1975	113.582	41.814	0.0	0.0	0.0	0.0	0.0	41.814	11.358				54.338	0.0
1976	175.584	41.929	0.0	0.0	0.0	0.0	0.0	41.929	17.558				114.610	0.0
1977	158.099	41.814	0.0	0.0	0.0	0.0	0.0	41.814	15.810				97.936	0.0
1978	148.166	41.814	0.0	0.0	0.0	0.0	0.0	41.814	14.817				92.385	0.0
1979	88.312	41.814	0.0	0.0	0.0	0.0	0.0	41.814	8.831				42.626	0.0
MEAN	87.052	41.838	0.0	0.0	0.0	0.0	0.0	41.838	8.705				37.062	0.091
RATE1		100.000	0.0	0.0	0.0	0.0	0.0	100.000					88.585	0.218
RATE2		124.960	0.0	0.0	0.0	0.0	0.0	124.960					81.997	0.0

SUMMARY OF SIMLY RESERVOIR OPERATION CASE = 3

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	--INDUSTRIAL-- WAH	TAXILA	--AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	RESERVOIR LEVEL	RESERVOIR VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1961	108.747	36.811	0.0	0.0	0.0	0.0	0.0	36.811	10.875				65.024	0.0
1962	39.556	36.811	0.0	0.0	0.0	0.0	0.0	36.811	3.956				2.710	0.0
1963	53.350	36.811	0.0	0.0	0.0	0.0	0.0	36.811	5.335				11.485	0.0
1964	66.665	36.897	0.0	0.0	0.0	0.0	0.0	36.897	6.666				21.690	0.0
1965	62.737	36.811	0.0	0.0	0.0	0.0	0.0	36.811	6.274				22.835	0.0
1966	53.357	36.811	0.0	0.0	0.0	0.0	0.0	36.811	5.336				8.421	0.0
1967	80.813	36.811	0.0	0.0	0.0	0.0	0.0	36.811	8.081				31.286	0.0
1968	60.230	36.897	0.0	0.0	0.0	0.0	0.0	36.897	6.023				23.168	0.0
1969	26.850	36.811	0.0	0.0	0.0	0.0	0.0	36.811	2.685				0.0	0.0
1970	117.535	36.811	0.0	0.0	0.0	0.0	0.0	36.811	11.754				51.425	0.0
1971	117.865	36.811	0.0	0.0	0.0	0.0	0.0	36.811	11.786				72.177	0.0
1972	54.643	36.897	0.0	0.0	0.0	0.0	0.0	36.897	5.464				9.430	0.0
1973	88.142	36.811	0.0	0.0	0.0	0.0	0.0	36.811	8.814				44.602	0.0
1974	39.767	36.811	0.0	0.0	0.0	0.0	0.0	36.811	3.977				2.156	0.0
1975	113.582	36.811	0.0	0.0	0.0	0.0	0.0	36.811	11.358				62.188	0.0
1976	175.584	36.897	0.0	0.0	0.0	0.0	0.0	36.897	17.558				119.729	0.0
1977	158.099	36.811	0.0	0.0	0.0	0.0	0.0	36.811	15.810				103.258	0.0
1978	148.166	36.811	0.0	0.0	0.0	0.0	0.0	36.811	14.817				97.387	0.0
1979	88.312	36.811	0.0	0.0	0.0	0.0	0.0	36.811	8.831				47.134	0.0
MEAN	87.052	36.829	0.0	0.0	0.0	0.0	0.0	36.829	8.705				41.900	0.0
RATE1		100.000	0.0	0.0	0.0	0.0	0.0	100.000					113.768	0.0
RATE2		110.000	0.0	0.0	0.0	0.0	0.0	110.000					92.700	0.0

TABLE A.II-49(5) ANNUAL SUMMARY OF SIMLY RESERVOIR OPERATION STUDY

SUMMARY OF SIMLY RESERVOIR OPERATION CASE = 4

PERIOD	INFLOW	WATER DEMAND: WATER SUPPLY ISLAMA	WATER SUPPLY RAWALP	INDUSTRIAL WAH	INDUSTRIAL TAXILA	AGRICULTURE RIGHT	AGRICULTURE LEFT	TOTAL	LOSS	DIFFER	RESERVOIR LEVEL	RESERVOIR VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1961	108.747	40.158	0.0	0.0	0.0	0.0	0.0	40.158	10.875				62.410	0.0
1962	39.556	40.158	0.0	0.0	0.0	0.0	0.0	40.158	3.956				0.0	0.0
1963	53.350	40.158	0.0	0.0	0.0	0.0	0.0	40.158	5.335				7.694	0.0
1964	66.665	40.251	0.0	0.0	0.0	0.0	0.0	40.251	6.666				18.239	0.0
1965	62.737	40.158	0.0	0.0	0.0	0.0	0.0	40.158	6.274				19.777	0.0
1966	53.357	40.158	0.0	0.0	0.0	0.0	0.0	40.158	5.336				4.882	0.0
1967	80.813	40.158	0.0	0.0	0.0	0.0	0.0	40.158	8.081				27.843	0.0
1968	60.230	40.251	0.0	0.0	0.0	0.0	0.0	40.251	6.023				20.007	0.0
1969	26.850	40.158	0.0	0.0	0.0	0.0	0.0	40.158	2.685				0.0	0.0
1970	117.535	40.158	0.0	0.0	0.0	0.0	0.0	40.158	11.754				44.240	0.0
1971	117.865	40.158	0.0	0.0	0.0	0.0	0.0	40.158	11.786				69.225	0.0
1972	54.643	40.251	0.0	0.0	0.0	0.0	0.0	40.251	5.464				6.076	0.0
1973	88.142	40.158	0.0	0.0	0.0	0.0	0.0	40.158	8.814				41.159	0.0
1974	39.767	40.158	0.0	0.0	0.0	0.0	0.0	40.158	3.977				0.0	0.0
1975	113.582	40.158	0.0	0.0	0.0	0.0	0.0	40.158	11.358				57.656	0.0
1976	175.584	40.251	0.0	0.0	0.0	0.0	0.0	40.251	17.558				116.278	0.0
1977	158.099	40.158	0.0	0.0	0.0	0.0	0.0	40.158	15.810				99.618	0.0
1978	148.166	40.158	0.0	0.0	0.0	0.0	0.0	40.158	14.817				94.041	0.0
1979	88.312	40.158	0.0	0.0	0.0	0.0	0.0	40.158	8.831				44.274	0.0
MEAN	87.052	40.178	0.0	0.0	0.0	0.0	0.0	40.178	8.705				38.601	0.0
RATE1		100.000	0.0	0.0	0.0	0.0	0.0	100.000					98.075	0.0
RATE2		120.000	0.0	0.0	0.0	0.0	0.0	120.000					85.401	0.0

SUMMARY OF SIMLY RESERVOIR OPERATION CASE = 5

PERIOD	INFLOW	WATER DEMAND: WATER SUPPLY ISLAMA	WATER SUPPLY RAWALP	INDUSTRIAL WAH	INDUSTRIAL TAXILA	AGRICULTURE RIGHT	AGRICULTURE LEFT	TOTAL	LOSS	DIFFER	RESERVOIR LEVEL	RESERVOIR VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1961	108.747	43.504	0.0	0.0	0.0	0.0	0.0	43.504	10.875				59.798	0.0
1962	39.556	43.504	0.0	0.0	0.0	0.0	0.0	43.504	3.956				0.0	0.0
1963	53.350	43.504	0.0	0.0	0.0	0.0	0.0	43.504	5.335				1.216	0.0
1964	66.665	43.606	0.0	0.0	0.0	0.0	0.0	43.606	6.666				14.767	0.0
1965	62.737	43.504	0.0	0.0	0.0	0.0	0.0	43.504	6.274				16.719	0.0
1966	53.357	43.504	0.0	0.0	0.0	0.0	0.0	43.504	5.336				1.343	0.0
1967	80.813	43.504	0.0	0.0	0.0	0.0	0.0	43.504	8.081				24.400	0.0
1968	60.230	43.606	0.0	0.0	0.0	0.0	0.0	43.606	6.023				16.942	0.0
1969	26.850	43.504	0.0	0.0	0.0	0.0	0.0	43.504	2.685				0.0	0.0
1970	117.535	43.504	0.0	0.0	0.0	0.0	0.0	43.504	11.754				41.642	4.638
1971	117.865	43.504	0.0	0.0	0.0	0.0	0.0	43.504	11.786				66.229	0.0
1972	54.643	43.606	0.0	0.0	0.0	0.0	0.0	43.606	5.464				2.722	0.0
1973	88.142	43.504	0.0	0.0	0.0	0.0	0.0	43.504	8.814				37.717	0.0
1974	39.767	43.504	0.0	0.0	0.0	0.0	0.0	43.504	3.977				0.0	0.0
1975	113.582	43.504	0.0	0.0	0.0	0.0	0.0	43.504	11.358				50.997	0.0
1976	175.584	43.606	0.0	0.0	0.0	0.0	0.0	43.606	17.558				112.788	0.0
1977	158.099	43.504	0.0	0.0	0.0	0.0	0.0	43.504	15.810				93.978	0.0
1978	148.166	43.504	0.0	0.0	0.0	0.0	0.0	43.504	14.817				90.859	0.0
1979	88.312	43.504	0.0	0.0	0.0	0.0	0.0	43.504	8.831				41.249	0.0
MEAN	87.052	43.526	0.0	0.0	0.0	0.0	0.0	43.526	8.705				35.545	0.244
RATE1		100.000	0.0	0.0	0.0	0.0	0.0	100.000					81.665	0.561
RATE2		130.000	0.0	0.0	0.0	0.0	0.0	130.000					78.641	0.0

SUMMARY OF SIMLY RESERVOIR OPERATION CASE = 6

PERIOD	INFLOW	WATER DEMAND: WATER SUPPLY ISLAMA	WATER SUPPLY RAWALP	INDUSTRIAL WAH	INDUSTRIAL TAXILA	AGRICULTURE RIGHT	AGRICULTURE LEFT	TOTAL	LOSS	DIFFER	RESERVOIR LEVEL	RESERVOIR VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1961	108.747	46.851	0.0	0.0	0.0	0.0	0.0	46.851	10.875				57.183	0.0
1962	39.556	46.851	0.0	0.0	0.0	0.0	0.0	46.851	3.956				0.0	0.0
1963	53.350	46.851	0.0	0.0	0.0	0.0	0.0	46.851	5.335				0.0	0.0
1964	66.665	46.960	0.0	0.0	0.0	0.0	0.0	46.960	6.666				6.032	0.0
1965	62.737	46.851	0.0	0.0	0.0	0.0	0.0	46.851	6.274				13.661	0.0
1966	53.357	46.851	0.0	0.0	0.0	0.0	0.0	46.851	5.336				0.0	0.0
1967	80.813	46.851	0.0	0.0	0.0	0.0	0.0	46.851	8.081				18.762	0.0
1968	60.230	46.960	0.0	0.0	0.0	0.0	0.0	46.960	6.023				13.876	0.0
1969	26.850	46.851	0.0	0.0	0.0	0.0	0.0	46.851	2.685				0.0	0.0
1970	117.535	46.851	0.0	0.0	0.0	0.0	0.0	46.851	11.754				40.675	10.749
1971	117.865	46.851	0.0	0.0	0.0	0.0	0.0	46.851	11.786				63.075	0.0
1972	54.643	46.960	0.0	0.0	0.0	0.0	0.0	46.960	5.464				0.0	0.0
1973	88.142	46.851	0.0	0.0	0.0	0.0	0.0	46.851	8.814				33.661	0.0
1974	39.767	46.851	0.0	0.0	0.0	0.0	0.0	46.851	3.977				0.0	0.0
1975	113.582	46.851	0.0	0.0	0.0	0.0	0.0	46.851	11.358				44.401	0.0
1976	175.584	46.960	0.0	0.0	0.0	0.0	0.0	46.960	17.558				109.241	0.0
1977	158.099	46.851	0.0	0.0	0.0	0.0	0.0	46.851	15.810				92.338	0.0
1978	148.166	46.851	0.0	0.0	0.0	0.0	0.0	46.851	14.817				87.806	0.0
1979	88.312	46.851	0.0	0.0	0.0	0.0	0.0	46.851	8.831				38.095	0.0
MEAN	87.052	46.874	0.0	0.0	0.0	0.0	0.0	46.874	8.705				32.568	0.566
RATE1		100.000	0.0	0.0	0.0	0.0	0.0	100.000					69.479	1.207
RATE2		140.000	0.0	0.0	0.0	0.0	0.0	140.000					72.053	0.0

TABLE A.II-49(6) ANNUAL SUMMARY OF SIMLY RESERVOIR OPERATION STUDY

SUMMARY OF SIMLY RESERVOIR OPERATION CASE = 7

PERIOD	INFLOW	WATER DEMAND: WATER SUPPLY- ISLAMA	RAWALP	INDUSTRIAL- WAH	TAXILA	AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	RESERVOIR LEVEL	RESERVOIR VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1961	108.747	50.197	0.0	0.0	0.0	0.0	0.0	50.197	10.875				54.569	0.0
1962	39.556	50.197	0.0	0.0	0.0	0.0	0.0	50.197	3.956				0.0	0.0
1963	53.350	50.197	0.0	0.0	0.0	0.0	0.0	50.197	5.335				0.0	2.900
1964	66.665	50.314	0.0	0.0	0.0	0.0	0.0	50.314	6.666				0.0	0.0
1965	62.737	50.197	0.0	0.0	0.0	0.0	0.0	50.197	6.274				9.584	0.0
1966	53.357	50.197	0.0	0.0	0.0	0.0	0.0	50.197	5.336				0.0	0.0
1967	80.813	50.197	0.0	0.0	0.0	0.0	0.0	50.197	8.081				11.780	0.0
1968	60.230	50.314	0.0	0.0	0.0	0.0	0.0	50.314	6.023				10.810	0.0
1969	26.850	50.197	0.0	0.0	0.0	0.0	0.0	50.197	2.685				0.0	1.407
1970	117.535	50.197	0.0	0.0	0.0	0.0	0.0	50.197	11.754				39.708	15.452
1971	117.865	50.197	0.0	0.0	0.0	0.0	0.0	50.197	11.786				60.005	0.0
1972	54.643	50.314	0.0	0.0	0.0	0.0	0.0	50.314	5.464				0.0	0.0
1973	88.142	50.197	0.0	0.0	0.0	0.0	0.0	50.197	8.814				26.822	0.0
1974	39.767	50.197	0.0	0.0	0.0	0.0	0.0	50.197	3.977				0.0	0.0
1975	113.582	50.197	0.0	0.0	0.0	0.0	0.0	50.197	11.358				42.835	5.093
1976	175.584	50.314	0.0	0.0	0.0	0.0	0.0	50.314	17.558				105.694	0.0
1977	158.099	50.197	0.0	0.0	0.0	0.0	0.0	50.197	15.810				88.698	0.0
1978	148.166	50.197	0.0	0.0	0.0	0.0	0.0	50.197	14.817				84.753	0.0
1979	88.312	50.197	0.0	0.0	0.0	0.0	0.0	50.197	8.831				35.222	0.0
MEAN	87.052	50.222	0.0	0.0	0.0	0.0	0.0	50.222	8.705				30.025	1.308
RATE1		100.000	0.0	0.0	0.0	0.0	0.0	100.000					59.785	2.605
RATE2		150.000	0.0	0.0	0.0	0.0	0.0	150.000					66.428	0.0

SUMMARY OF SIMLY RESERVOIR OPERATION CASE = 8

PERIOD	INFLOW	WATER DEMAND: WATER SUPPLY- ISLAMA	RAWALP	INDUSTRIAL- WAH	TAXILA	AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	RESERVOIR LEVEL	RESERVOIR VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1961	108.747	53.544	0.0	0.0	0.0	0.0	0.0	53.544	10.875				51.955	0.0
1962	39.556	53.544	0.0	0.0	0.0	0.0	0.0	53.544	3.956				0.0	0.0
1963	53.350	53.544	0.0	0.0	0.0	0.0	0.0	53.544	5.335				0.0	8.818
1964	66.665	53.669	0.0	0.0	0.0	0.0	0.0	53.669	6.666				0.0	0.182
1965	62.737	53.544	0.0	0.0	0.0	0.0	0.0	53.544	6.274				2.676	0.0
1966	53.357	53.544	0.0	0.0	0.0	0.0	0.0	53.544	5.336				0.0	0.0
1967	80.813	53.544	0.0	0.0	0.0	0.0	0.0	53.544	8.081				4.799	0.0
1968	60.230	53.669	0.0	0.0	0.0	0.0	0.0	53.669	6.023				7.745	0.0
1969	26.850	53.544	0.0	0.0	0.0	0.0	0.0	53.544	2.685				0.0	5.871
1970	117.535	53.544	0.0	0.0	0.0	0.0	0.0	53.544	11.754				38.740	17.098
1971	117.865	53.544	0.0	0.0	0.0	0.0	0.0	53.544	11.786				56.947	0.0
1972	54.643	53.669	0.0	0.0	0.0	0.0	0.0	53.669	5.464				0.0	0.0
1973	88.142	53.544	0.0	0.0	0.0	0.0	0.0	53.544	8.814				20.025	0.0
1974	39.767	53.544	0.0	0.0	0.0	0.0	0.0	53.544	3.977				0.0	0.0
1975	113.582	53.544	0.0	0.0	0.0	0.0	0.0	53.544	11.358				42.156	11.108
1976	175.584	53.669	0.0	0.0	0.0	0.0	0.0	53.669	17.558				102.148	0.0
1977	158.099	53.544	0.0	0.0	0.0	0.0	0.0	53.544	15.810				85.057	0.0
1978	148.166	53.544	0.0	0.0	0.0	0.0	0.0	53.544	14.817				81.712	0.0
1979	88.312	53.544	0.0	0.0	0.0	0.0	0.0	53.544	8.831				32.350	0.0
MEAN	87.052	53.570	0.0	0.0	0.0	0.0	0.0	53.570	8.705				27.700	2.267
RATE1		100.000	0.0	0.0	0.0	0.0	0.0	100.000					51.709	4.232
RATE2		160.000	0.0	0.0	0.0	0.0	0.0	160.000					61.285	0.0

SUMMARY OF SIMLY RESERVOIR OPERATION CASE = 9

PERIOD	INFLOW	WATER DEMAND: WATER SUPPLY- ISLAMA	RAWALP	INDUSTRIAL- WAH	TAXILA	AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	RESERVOIR LEVEL	RESERVOIR VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1961	108.747	56.890	0.0	0.0	0.0	0.0	0.0	56.890	10.875				49.341	0.0
1962	39.556	56.890	0.0	0.0	0.0	0.0	0.0	56.890	3.956				0.0	0.0
1963	53.350	56.890	0.0	0.0	0.0	0.0	0.0	56.890	5.335				0.0	14.737
1964	66.665	57.023	0.0	0.0	0.0	0.0	0.0	57.023	6.666				0.0	3.344
1965	62.737	56.890	0.0	0.0	0.0	0.0	0.0	56.890	6.274				0.0	0.0
1966	53.357	56.890	0.0	0.0	0.0	0.0	0.0	56.890	5.336				0.0	0.0
1967	80.813	56.890	0.0	0.0	0.0	0.0	0.0	56.890	8.081				0.0	0.0
1968	60.230	57.023	0.0	0.0	0.0	0.0	0.0	57.023	6.023				1.243	0.0
1969	26.850	56.890	0.0	0.0	0.0	0.0	0.0	56.890	2.685				0.0	10.335
1970	117.535	56.890	0.0	0.0	0.0	0.0	0.0	56.890	11.754				37.773	18.745
1971	117.865	56.890	0.0	0.0	0.0	0.0	0.0	56.890	11.786				53.889	0.0
1972	54.643	57.023	0.0	0.0	0.0	0.0	0.0	57.023	5.464				0.0	0.0
1973	88.142	56.890	0.0	0.0	0.0	0.0	0.0	56.890	8.814				13.228	0.0
1974	39.767	56.890	0.0	0.0	0.0	0.0	0.0	56.890	3.977				0.0	0.0
1975	113.582	56.890	0.0	0.0	0.0	0.0	0.0	56.890	11.358				41.478	17.122
1976	175.584	57.023	0.0	0.0	0.0	0.0	0.0	57.023	17.558				98.601	0.0
1977	158.099	56.890	0.0	0.0	0.0	0.0	0.0	56.890	15.810				81.417	0.0
1978	148.166	56.890	0.0	0.0	0.0	0.0	0.0	56.890	14.817				78.756	0.0
1979	88.312	56.890	0.0	0.0	0.0	0.0	0.0	56.890	8.831				29.393	0.0
MEAN	87.052	56.918	0.0	0.0	0.0	0.0	0.0	56.918	8.705				25.533	3.383
RATE1		100.000	0.0	0.0	0.0	0.0	0.0	100.000					44.858	5.944
RATE2		170.000	0.0	0.0	0.0	0.0	0.0	170.000					56.488	0.0

TABLE A.II-49(7) ANNUAL SUMMARY OF SIMLY RESERVOIR OPERATION STUDY

SUMMARY OF SIMLY RESERVOIR OPERATION CASE = 10

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	-INDUSTRIAL- WAH	TAXILA	-AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	-RESERVOIR- LEVEL	VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1961	108.747	60.237	0.0	0.0	0.0	0.0	0.0	60.237	10.875				46.727	0.0
1962	39.556	60.237	0.0	0.0	0.0	0.0	0.0	60.237	3.956				0.0	0.0
1963	53.350	60.237	0.0	0.0	0.0	0.0	0.0	60.237	5.335				0.0	20.655
1964	66.665	60.377	0.0	0.0	0.0	0.0	0.0	60.377	6.666				0.0	6.506
1965	62.737	60.237	0.0	0.0	0.0	0.0	0.0	60.237	6.274				0.0	0.0
1966	53.357	60.237	0.0	0.0	0.0	0.0	0.0	60.237	5.336				0.0	6.065
1967	80.813	60.237	0.0	0.0	0.0	0.0	0.0	60.237	8.081				0.0	0.0
1968	60.230	60.377	0.0	0.0	0.0	0.0	0.0	60.377	6.023				0.0	0.0
1969	26.850	60.237	0.0	0.0	0.0	0.0	0.0	60.237	2.685				0.0	21.467
1970	117.535	60.237	0.0	0.0	0.0	0.0	0.0	60.237	11.754				36.855	20.391
1971	117.865	60.237	0.0	0.0	0.0	0.0	0.0	60.237	11.786				50.782	0.0
1972	54.643	60.377	0.0	0.0	0.0	0.0	0.0	60.377	5.464				0.0	0.0
1973	88.142	60.237	0.0	0.0	0.0	0.0	0.0	60.237	8.814				6.431	0.0
1974	39.767	60.237	0.0	0.0	0.0	0.0	0.0	60.237	3.977				0.0	0.320
1975	113.582	60.237	0.0	0.0	0.0	0.0	0.0	60.237	11.358				40.799	22.816
1976	175.584	60.377	0.0	0.0	0.0	0.0	0.0	60.377	17.558				95.054	0.0
1977	158.099	60.237	0.0	0.0	0.0	0.0	0.0	60.237	15.810				77.777	0.0
1978	148.166	60.237	0.0	0.0	0.0	0.0	0.0	60.237	14.817				75.799	0.0
1979	88.312	60.237	0.0	0.0	0.0	0.0	0.0	60.237	8.831				26.435	0.0
MEAN	87.052	60.266	0.0	0.0	0.0	0.0	0.0	60.266	8.705				24.035	5.170
RATE1		100.000	0.0	0.0	0.0	0.0	0.0	100.000					39.881	8.578
RATE2		180.000	0.0	0.0	0.0	0.0	0.0	180.000					53.175	0.0

SUMMARY OF SIMLY RESERVOIR OPERATION CASE = 11

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	-INDUSTRIAL- WAH	TAXILA	-AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	-RESERVOIR- LEVEL	VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1961	108.747	63.583	0.0	0.0	0.0	0.0	0.0	63.583	10.875				44.114	0.0
1962	39.556	63.583	0.0	0.0	0.0	0.0	0.0	63.583	3.956				0.0	0.452
1963	53.350	63.583	0.0	0.0	0.0	0.0	0.0	63.583	5.335				0.0	26.121
1964	66.665	63.731	0.0	0.0	0.0	0.0	0.0	63.731	6.666				0.0	9.668
1965	62.737	63.583	0.0	0.0	0.0	0.0	0.0	63.583	6.274				0.0	0.0
1966	53.357	63.583	0.0	0.0	0.0	0.0	0.0	63.583	5.336				0.0	12.951
1967	80.813	63.583	0.0	0.0	0.0	0.0	0.0	63.583	8.081				0.0	0.0
1968	60.230	63.731	0.0	0.0	0.0	0.0	0.0	63.731	6.023				0.0	0.0
1969	26.850	63.583	0.0	0.0	0.0	0.0	0.0	63.583	2.685				0.0	33.022
1970	117.535	63.583	0.0	0.0	0.0	0.0	0.0	63.583	11.754				35.984	22.038
1971	117.865	63.583	0.0	0.0	0.0	0.0	0.0	63.583	11.786				47.628	0.0
1972	54.643	63.731	0.0	0.0	0.0	0.0	0.0	63.731	5.464				0.0	0.0
1973	88.142	63.583	0.0	0.0	0.0	0.0	0.0	63.583	8.814				0.0	0.0
1974	39.767	63.583	0.0	0.0	0.0	0.0	0.0	63.583	3.977				0.0	3.484
1975	113.582	63.583	0.0	0.0	0.0	0.0	0.0	63.583	11.358				40.120	26.035
1976	175.584	63.731	0.0	0.0	0.0	0.0	0.0	63.731	17.558				91.507	0.0
1977	158.099	63.583	0.0	0.0	0.0	0.0	0.0	63.583	15.810				74.137	0.0
1978	148.166	63.583	0.0	0.0	0.0	0.0	0.0	63.583	14.817				72.843	0.0
1979	88.312	63.583	0.0	0.0	0.0	0.0	0.0	63.583	8.831				23.679	0.0
MEAN	87.052	63.614	0.0	0.0	0.0	0.0	0.0	63.614	8.705				22.622	7.040
RATE1		100.000	0.0	0.0	0.0	0.0	0.0	100.000					35.560	11.067
RATE2		190.000	0.0	0.0	0.0	0.0	0.0	190.000					50.048	0.0

SUMMARY OF SIMLY RESERVOIR OPERATION CASE = 12

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	-INDUSTRIAL- WAH	TAXILA	-AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	-RESERVOIR- LEVEL	VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1961	108.747	66.930	0.0	0.0	0.0	0.0	0.0	66.930	10.875				41.500	0.0
1962	39.556	66.930	0.0	0.0	0.0	0.0	0.0	66.930	3.956				0.0	4.513
1963	53.350	66.930	0.0	0.0	0.0	0.0	0.0	66.930	5.335				0.0	27.978
1964	66.665	67.086	0.0	0.0	0.0	0.0	0.0	67.086	6.666				0.0	12.829
1965	62.737	66.930	0.0	0.0	0.0	0.0	0.0	66.930	6.274				0.0	0.0
1966	53.357	66.930	0.0	0.0	0.0	0.0	0.0	66.930	5.336				0.0	19.836
1967	80.813	66.930	0.0	0.0	0.0	0.0	0.0	66.930	8.081				0.0	1.813
1968	60.230	67.086	0.0	0.0	0.0	0.0	0.0	67.086	6.023				0.0	1.382
1969	26.850	66.930	0.0	0.0	0.0	0.0	0.0	66.930	2.685				0.0	39.382
1970	117.535	66.930	0.0	0.0	0.0	0.0	0.0	66.930	11.754				35.113	23.684
1971	117.865	66.930	0.0	0.0	0.0	0.0	0.0	66.930	11.786				44.174	0.0
1972	54.643	67.086	0.0	0.0	0.0	0.0	0.0	67.086	5.464				0.0	0.0
1973	88.142	66.930	0.0	0.0	0.0	0.0	0.0	66.930	8.814				0.0	0.058
1974	39.767	66.930	0.0	0.0	0.0	0.0	0.0	66.930	3.977				0.0	16.494
1975	113.582	66.930	0.0	0.0	0.0	0.0	0.0	66.930	11.358				39.442	27.775
1976	175.584	67.086	0.0	0.0	0.0	0.0	0.0	67.086	17.558				87.961	0.0
1977	158.099	66.930	0.0	0.0	0.0	0.0	0.0	66.930	15.810				70.496	0.0
1978	148.166	66.930	0.0	0.0	0.0	0.0	0.0	66.930	14.817				69.886	0.0
1979	88.312	66.930	0.0	0.0	0.0	0.0	0.0	66.930	8.831				20.891	0.0
MEAN	87.052	66.963	0.0	0.0	0.0	0.0	0.0	66.963	8.705				21.566	9.250
RATE1		100.000	0.0	0.0	0.0	0.0	0.0	100.000					32.207	13.813
RATE2		200.000	0.0	0.0	0.0	0.0	0.0	200.000					47.714	0.0

TABLE A.II-50(1) ANNUAL SUMMARY OF RAWAL RESERVOIR OPERATION STUDY

SUMMARY OF RAWAL RESERVOIR OPERATION CASE = 1

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	--INDUSTRIAL-- WAH	TAXILA	--AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	RESERVOIR LEVEL	RESERVOIR VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1960	70.423	0.0	39.133	0.0	0.0	0.0	0.0	39.133	7.042				26.958	0.0
1961	122.440	0.0	39.042	0.0	0.0	0.0	0.0	39.042	12.244				68.775	0.0
1962	59.539	0.0	39.042	0.0	0.0	0.0	0.0	39.042	5.954				17.121	0.0
1963	66.121	0.0	39.042	0.0	0.0	0.0	0.0	39.042	6.612				19.707	0.0
1964	73.697	0.0	39.133	0.0	0.0	0.0	0.0	39.133	7.370				27.602	0.0
1965	113.753	0.0	39.042	0.0	0.0	0.0	0.0	39.042	11.375				64.386	0.0
1966	73.984	0.0	39.042	0.0	0.0	0.0	0.0	39.042	7.398				25.543	0.0
1967	96.871	0.0	39.042	0.0	0.0	0.0	0.0	39.042	9.687				46.530	0.0
1968	81.000	0.0	39.133	0.0	0.0	0.0	0.0	39.133	8.100				36.880	0.0
1969	46.401	0.0	39.042	0.0	0.0	0.0	0.0	39.042	4.640				3.102	0.0
1970	91.563	0.0	39.042	0.0	0.0	0.0	0.0	39.042	9.156				42.275	0.0
1971	108.388	0.0	39.042	0.0	0.0	0.0	0.0	39.042	10.839				59.541	0.0
1972	57.486	0.0	39.133	0.0	0.0	0.0	0.0	39.133	5.749				11.021	0.0
1973	129.922	0.0	39.042	0.0	0.0	0.0	0.0	39.042	12.992				77.678	0.0
1974	35.868	0.0	39.042	0.0	0.0	0.0	0.0	39.042	3.587				0.169	0.0
1975	62.976	0.0	39.042	0.0	0.0	0.0	0.0	39.042	6.298				12.445	0.0
1976	177.909	0.0	39.133	0.0	0.0	0.0	0.0	39.133	17.791				118.535	0.0
1977	136.881	0.0	39.042	0.0	0.0	0.0	0.0	39.042	13.688				83.543	0.0
1978	160.955	0.0	39.042	0.0	0.0	0.0	0.0	39.042	16.095				106.497	0.0
1979	88.441	0.0	39.042	0.0	0.0	0.0	0.0	39.042	8.844				45.341	0.0
1980	86.092	0.0	39.133	0.0	0.0	0.0	0.0	39.133	8.609				35.320	0.0
MEAN	92.414	0.0	39.068	0.0	0.0	0.0	0.0	39.068	9.241				44.236	0.0
RATE1		0.0	100.000	0.0	0.0	0.0	0.0	100.000					113.228	0.0
RATE2		0.0	100.000	0.0	0.0	0.0	0.0	100.000					100.000	0.0

SUMMARY OF RAWAL RESERVOIR OPERATION CASE = 2

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	--INDUSTRIAL-- WAH	TAXILA	--AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	RESERVOIR LEVEL	RESERVOIR VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1960	70.423	0.0	48.917	0.0	0.0	0.0	0.0	48.917	7.042				19.586	0.0
1961	122.440	0.0	48.783	0.0	0.0	0.0	0.0	48.783	12.244				57.892	0.0
1962	59.539	0.0	48.783	0.0	0.0	0.0	0.0	48.783	5.954				8.352	0.0
1963	66.121	0.0	48.783	0.0	0.0	0.0	0.0	48.783	6.612				10.135	0.0
1964	73.697	0.0	48.917	0.0	0.0	0.0	0.0	48.917	7.370				17.720	0.0
1965	113.753	0.0	48.783	0.0	0.0	0.0	0.0	48.783	11.375				55.056	0.0
1966	73.984	0.0	48.783	0.0	0.0	0.0	0.0	48.783	7.398				15.041	0.0
1967	96.871	0.0	48.783	0.0	0.0	0.0	0.0	48.783	9.687				36.813	0.0
1968	81.000	0.0	48.917	0.0	0.0	0.0	0.0	48.917	8.100				27.523	0.0
1969	46.401	0.0	48.783	0.0	0.0	0.0	0.0	48.783	4.640				0.0	0.0
1970	91.563	0.0	48.783	0.0	0.0	0.0	0.0	48.783	9.156				25.447	0.0
1971	108.388	0.0	48.783	0.0	0.0	0.0	0.0	48.783	10.839				50.036	0.0
1972	57.486	0.0	48.917	0.0	0.0	0.0	0.0	48.917	5.749				1.666	0.0
1973	129.922	0.0	48.783	0.0	0.0	0.0	0.0	48.783	12.992				67.421	0.0
1974	35.868	0.0	48.783	0.0	0.0	0.0	0.0	48.783	3.587				0.0	0.0
1975	62.976	0.0	48.783	0.0	0.0	0.0	0.0	48.783	6.298				0.0	0.0
1976	177.909	0.0	48.917	0.0	0.0	0.0	0.0	48.917	17.791				101.365	0.0
1977	136.881	0.0	48.783	0.0	0.0	0.0	0.0	48.783	13.688				73.422	0.0
1978	160.955	0.0	48.783	0.0	0.0	0.0	0.0	48.783	16.095				97.119	0.0
1979	88.441	0.0	48.783	0.0	0.0	0.0	0.0	48.783	8.844				36.868	0.0
1980	86.092	0.0	48.917	0.0	0.0	0.0	0.0	48.917	8.609				24.999	0.0
MEAN	92.414	0.0	48.821	0.0	0.0	0.0	0.0	48.821	9.241				34.593	0.0
RATE1		0.0	100.000	0.0	0.0	0.0	0.0	100.000					70.857	0.0
RATE2		0.0	124.963	0.0	0.0	0.0	0.0	124.963					78.201	0.0

SUMMARY OF RAWAL RESERVOIR OPERATION CASE = 3

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	--INDUSTRIAL-- WAH	TAXILA	--AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	RESERVOIR LEVEL	RESERVOIR VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1960	70.423	0.0	70.440	0.0	0.0	0.0	0.0	70.440	7.042				2.760	0.0
1961	122.440	0.0	70.276	0.0	0.0	0.0	0.0	70.276	12.244				34.669	0.0
1962	59.539	0.0	70.276	0.0	0.0	0.0	0.0	70.276	5.954				0.0	0.0
1963	66.121	0.0	70.276	0.0	0.0	0.0	0.0	70.276	6.612				0.0	0.0
1964	73.697	0.0	70.440	0.0	0.0	0.0	0.0	70.440	7.370				0.0	0.0
1965	113.753	0.0	70.276	0.0	0.0	0.0	0.0	70.276	11.375				8.918	0.0
1966	73.984	0.0	70.276	0.0	0.0	0.0	0.0	70.276	7.398				0.0	0.0
1967	96.871	0.0	70.276	0.0	0.0	0.0	0.0	70.276	9.687				7.378	0.0
1968	81.000	0.0	70.440	0.0	0.0	0.0	0.0	70.440	8.100				7.788	0.0
1969	46.401	0.0	70.276	0.0	0.0	0.0	0.0	70.276	4.640				0.0	0.0
1970	91.563	0.0	70.276	0.0	0.0	0.0	0.0	70.276	9.156				0.0	11.536
1971	108.388	0.0	70.276	0.0	0.0	0.0	0.0	70.276	10.839				20.710	0.0
1972	57.486	0.0	70.440	0.0	0.0	0.0	0.0	70.440	5.749				0.0	0.0
1973	129.922	0.0	70.276	0.0	0.0	0.0	0.0	70.276	12.992				25.119	0.0
1974	35.868	0.0	70.276	0.0	0.0	0.0	0.0	70.276	3.587				0.0	0.0
1975	62.976	0.0	70.276	0.0	0.0	0.0	0.0	70.276	6.298				0.0	16.934
1976	177.909	0.0	70.440	0.0	0.0	0.0	0.0	70.440	17.791				53.021	0.0
1977	136.881	0.0	70.276	0.0	0.0	0.0	0.0	70.276	13.688				51.179	0.0
1978	160.955	0.0	70.276	0.0	0.0	0.0	0.0	70.276	16.095				76.118	0.0
1979	88.441	0.0	70.276	0.0	0.0	0.0	0.0	70.276	8.844				20.954	0.0
1980	86.092	0.0	70.440	0.0	0.0	0.0	0.0	70.440	8.609				0.071	0.0
MEAN	92.414	0.0	70.323	0.0	0.0	0.0	0.0	70.323	9.241				14.690	1.361
RATE1		0.0	100.000	0.0	0.0	0.0	0.0	100.000					20.889	1.935
RATE2		0.0	180.000	0.0	0.0	0.0	0.0	180.000					33.207	0.0

TABLE A.II-50(2) ANNUAL SUMMARY OF RAWAL RESERVOIR OPERATION STUDY

SUMMARY OF RAWAL RESERVOIR OPERATION CASE = 4

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	--INDUSTRIAL-- WAH	TAXILA	--AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	--RESERVOIR-- LEVEL	VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1960	70.423	0.0	74.353	0.0	0.0	0.0	0.0	74.353	7.042				0.0	0.0
1961	122.440	0.0	74.181	0.0	0.0	0.0	0.0	74.181	12.244				30.154	0.0
1962	59.539	0.0	74.181	0.0	0.0	0.0	0.0	74.181	5.954				0.0	0.0
1963	66.121	0.0	74.181	0.0	0.0	0.0	0.0	74.181	6.612				0.0	0.0
1964	73.697	0.0	74.353	0.0	0.0	0.0	0.0	74.353	7.370				0.0	2.684
1965	113.753	0.0	74.181	0.0	0.0	0.0	0.0	74.181	11.375				0.0	2.450
1966	73.984	0.0	74.181	0.0	0.0	0.0	0.0	74.181	7.398				0.0	0.0
1967	96.871	0.0	74.181	0.0	0.0	0.0	0.0	74.181	9.687				0.0	0.0
1968	81.000	0.0	74.353	0.0	0.0	0.0	0.0	74.353	8.100				2.451	0.0
1969	46.401	0.0	74.181	0.0	0.0	0.0	0.0	74.181	4.640				0.0	0.0
1970	91.563	0.0	74.181	0.0	0.0	0.0	0.0	74.181	9.156				0.0	19.220
1971	108.388	0.0	74.181	0.0	0.0	0.0	0.0	74.181	10.839				16.245	0.0
1972	57.486	0.0	74.353	0.0	0.0	0.0	0.0	74.353	5.749				0.0	0.0
1973	129.922	0.0	74.181	0.0	0.0	0.0	0.0	74.181	12.992				17.190	0.0
1974	35.868	0.0	74.181	0.0	0.0	0.0	0.0	74.181	3.587				0.0	3.058
1975	62.976	0.0	74.181	0.0	0.0	0.0	0.0	74.181	6.298				0.0	20.905
1976	177.909	0.0	74.353	0.0	0.0	0.0	0.0	74.353	17.791				48.215	0.0
1977	136.881	0.0	74.181	0.0	0.0	0.0	0.0	74.181	13.688				47.059	0.0
1978	160.955	0.0	74.181	0.0	0.0	0.0	0.0	74.181	16.095				72.430	0.0
1979	88.441	0.0	74.181	0.0	0.0	0.0	0.0	74.181	8.844				19.073	0.0
1980	86.092	0.0	74.353	0.0	0.0	0.0	0.0	74.353	8.609				0.0	0.0
MEAN	92.414	0.0	74.230	0.0	0.0	0.0	0.0	74.230	9.241				12.038	2.301
RATE1		0.0	100.000	0.0	0.0	0.0	0.0	100.000					16.217	3.100
RATE2		0.0	190.000	0.0	0.0	0.0	0.0	190.000					27.213	0.0

SUMMARY OF RAWAL RESERVOIR OPERATION CASE = 5

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	--INDUSTRIAL-- WAH	TAXILA	--AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	--RESERVOIR-- LEVEL	VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1960	70.423	0.0	78.267	0.0	0.0	0.0	0.0	78.267	7.042				0.0	0.0
1961	122.440	0.0	78.085	0.0	0.0	0.0	0.0	78.085	12.244				23.079	0.0
1962	59.539	0.0	78.085	0.0	0.0	0.0	0.0	78.085	5.954				0.0	0.0
1963	66.121	0.0	78.085	0.0	0.0	0.0	0.0	78.085	6.612				0.0	4.089
1964	73.697	0.0	78.267	0.0	0.0	0.0	0.0	78.267	7.370				0.0	9.478
1965	113.753	0.0	78.085	0.0	0.0	0.0	0.0	78.085	11.375				0.0	4.388
1966	73.984	0.0	78.085	0.0	0.0	0.0	0.0	78.085	7.398				0.0	0.0
1967	96.871	0.0	78.085	0.0	0.0	0.0	0.0	78.085	9.687				0.0	0.0
1968	81.000	0.0	78.267	0.0	0.0	0.0	0.0	78.267	8.100				0.0	0.0
1969	46.401	0.0	78.085	0.0	0.0	0.0	0.0	78.085	4.640				0.0	15.413
1970	91.563	0.0	78.085	0.0	0.0	0.0	0.0	78.085	9.156				0.0	22.926
1971	108.388	0.0	78.085	0.0	0.0	0.0	0.0	78.085	10.839				11.825	0.0
1972	57.486	0.0	78.267	0.0	0.0	0.0	0.0	78.267	5.749				0.0	0.0
1973	129.922	0.0	78.085	0.0	0.0	0.0	0.0	78.085	12.992				9.214	0.0
1974	35.868	0.0	78.085	0.0	0.0	0.0	0.0	78.085	3.587				0.0	7.817
1975	62.976	0.0	78.085	0.0	0.0	0.0	0.0	78.085	6.298				0.0	23.173
1976	177.909	0.0	78.267	0.0	0.0	0.0	0.0	78.267	17.791				45.233	1.825
1977	136.881	0.0	78.085	0.0	0.0	0.0	0.0	78.085	13.688				43.031	0.0
1978	160.955	0.0	78.085	0.0	0.0	0.0	0.0	78.085	16.095				68.649	0.0
1979	88.441	0.0	78.085	0.0	0.0	0.0	0.0	78.085	8.844				17.192	0.0
1980	86.092	0.0	78.267	0.0	0.0	0.0	0.0	78.267	8.609				0.0	0.0
MEAN	92.414	0.0	78.137	0.0	0.0	0.0	0.0	78.137	9.241				10.592	4.243
RATE1		0.0	100.000	0.0	0.0	0.0	0.0	100.000					13.299	5.431
RATE2		0.0	200.000	0.0	0.0	0.0	0.0	200.000					23.491	0.0

SUMMARY OF RAWAL RESERVOIR OPERATION CASE = 6

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	--INDUSTRIAL-- WAH	TAXILA	--AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	--RESERVOIR-- LEVEL	VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1960	70.423	0.0	82.180	0.0	0.0	0.0	0.0	82.180	7.042				0.0	0.0
1961	122.440	0.0	81.989	0.0	0.0	0.0	0.0	81.989	12.244				16.028	0.0
1962	59.539	0.0	81.989	0.0	0.0	0.0	0.0	81.989	5.954				0.0	0.0
1963	66.121	0.0	81.989	0.0	0.0	0.0	0.0	81.989	6.612				0.0	10.905
1964	73.697	0.0	82.180	0.0	0.0	0.0	0.0	82.180	7.370				0.0	15.150
1965	113.753	0.0	81.989	0.0	0.0	0.0	0.0	81.989	11.375				0.0	4.744
1966	73.984	0.0	81.989	0.0	0.0	0.0	0.0	81.989	7.398				0.0	0.0
1967	96.871	0.0	81.989	0.0	0.0	0.0	0.0	81.989	9.687				0.0	0.0
1968	81.000	0.0	82.180	0.0	0.0	0.0	0.0	82.180	8.100				0.0	0.0
1969	46.401	0.0	81.989	0.0	0.0	0.0	0.0	81.989	4.640				0.0	34.587
1970	91.563	0.0	81.989	0.0	0.0	0.0	0.0	81.989	9.156				0.0	25.302
1971	108.388	0.0	81.989	0.0	0.0	0.0	0.0	81.989	10.839				7.471	0.0
1972	57.486	0.0	82.180	0.0	0.0	0.0	0.0	82.180	5.749				0.0	0.0
1973	129.922	0.0	81.989	0.0	0.0	0.0	0.0	81.989	12.992				3.172	0.0
1974	35.868	0.0	81.989	0.0	0.0	0.0	0.0	81.989	3.587				0.0	12.576
1975	62.976	0.0	81.989	0.0	0.0	0.0	0.0	81.989	6.298				0.0	25.442
1976	177.909	0.0	82.180	0.0	0.0	0.0	0.0	82.180	17.791				42.419	3.816
1977	136.881	0.0	81.989	0.0	0.0	0.0	0.0	81.989	13.688				39.003	0.0
1978	160.955	0.0	81.989	0.0	0.0	0.0	0.0	81.989	16.095				64.926	0.0
1979	88.441	0.0	81.989	0.0	0.0	0.0	0.0	81.989	8.844				15.253	0.0
1980	86.092	0.0	82.180	0.0	0.0	0.0	0.0	82.180	8.609				0.0	0.0
MEAN	92.414	0.0	82.044	0.0	0.0	0.0	0.0	82.044	9.241				8.870	6.311
RATE1		0.0	100.000	0.0	0.0	0.0	0.0	100.000					10.811	7.692
RATE2		0.0	210.000	0.0	0.0	0.0	0.0	210.000					20.051	0.0

TABLE A.II-50(3) ANNUAL SUMMARY OF RAWAL RESERVOIR OPERATION STUDY

SUMMARY OF RAWAL RESERVOIR OPERATION CASE = 7

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	--INDUSTREIAL-- WAH	TAXILA	--AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	RESERVOIR LEVEL	RESERVOIR VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1960	70.423	0.0	86.093	0.0	0.0	0.0	0.0	86.093	7.042				0.0	0.0
1961	122.440	0.0	85.894	0.0	0.0	0.0	0.0	85.894	12.244				9.065	0.0
1962	59.539	0.0	85.894	0.0	0.0	0.0	0.0	85.894	5.954				0.0	0.0
1963	66.121	0.0	85.894	0.0	0.0	0.0	0.0	85.894	6.612				0.0	18.865
1964	73.697	0.0	86.093	0.0	0.0	0.0	0.0	86.093	7.370				0.0	19.766
1965	113.753	0.0	85.894	0.0	0.0	0.0	0.0	85.894	11.375				0.0	5.100
1966	73.984	0.0	85.894	0.0	0.0	0.0	0.0	85.894	7.398				0.0	0.0
1967	96.871	0.0	85.894	0.0	0.0	0.0	0.0	85.894	9.687				0.0	3.656
1968	81.000	0.0	86.093	0.0	0.0	0.0	0.0	86.093	8.100				0.0	5.972
1969	46.401	0.0	85.894	0.0	0.0	0.0	0.0	85.894	4.640				0.0	44.133
1970	91.563	0.0	85.894	0.0	0.0	0.0	0.0	85.894	9.156				0.0	27.678
1971	108.388	0.0	85.894	0.0	0.0	0.0	0.0	85.894	10.839				4.758	1.640
1972	57.486	0.0	86.093	0.0	0.0	0.0	0.0	86.093	5.749				0.0	1.628
1973	129.922	0.0	85.894	0.0	0.0	0.0	0.0	85.894	12.992				0.0	2.652
1974	35.868	0.0	85.894	0.0	0.0	0.0	0.0	85.894	3.587				0.0	19.925
1975	62.976	0.0	85.894	0.0	0.0	0.0	0.0	85.894	6.298				0.0	29.215
1976	177.909	0.0	86.093	0.0	0.0	0.0	0.0	86.093	17.791				39.604	4.303
1977	136.881	0.0	85.894	0.0	0.0	0.0	0.0	85.894	13.688				34.975	0.0
1978	160.955	0.0	85.894	0.0	0.0	0.0	0.0	85.894	16.095				61.258	0.0
1979	88.441	0.0	85.894	0.0	0.0	0.0	0.0	85.894	8.844				13.259	0.0
1980	86.092	0.0	86.093	0.0	0.0	0.0	0.0	86.093	8.609				0.0	0.0
MEAN	92.414	0.0	85.950	0.0	0.0	0.0	0.0	85.950	9.241				7.758	8.787
RATE1		0.0	100.000	0.0	0.0	0.0	0.0	100.000					9.026	10.224
RATE2		0.0	220.000	0.0	0.0	0.0	0.0	220.000					17.538	0.0

TABLE A.II-50(4) ANNUAL SUMMARY OF RAWAL RESERVOIR OPERATION STUDY

SUMMARY OF RAWAL RESERVOIR OPERATION CASE = 1

PERIOD	INFLOW	WATER DEMAND: WATER SUPPLY- ISLAMA	RAWALP	INDUSTRIAL- WAH	TAXILA	AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	RESERVOIR- LEVEL	VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1960	70.423	0.0	39.133	0.0	0.0	0.0	0.0	39.133	7.042				26.958	0.0
1961	122.440	0.0	39.042	0.0	0.0	0.0	0.0	39.042	12.244				68.773	0.0
1962	59.539	0.0	39.042	0.0	0.0	0.0	0.0	39.042	5.954				17.121	0.0
1963	66.121	0.0	39.042	0.0	0.0	0.0	0.0	39.042	6.612				19.707	0.0
1964	73.697	0.0	39.133	0.0	0.0	0.0	0.0	39.133	7.370				27.602	0.0
1965	113.753	0.0	39.042	0.0	0.0	0.0	0.0	39.042	11.375				64.386	0.0
1966	73.984	0.0	39.042	0.0	0.0	0.0	0.0	39.042	7.398				25.543	0.0
1967	96.871	0.0	39.042	0.0	0.0	0.0	0.0	39.042	9.687				48.530	0.0
1968	81.000	0.0	39.133	0.0	0.0	0.0	0.0	39.133	8.100				36.880	0.0
1969	46.401	0.0	39.042	0.0	0.0	0.0	0.0	39.042	4.640				3.102	0.0
1970	91.563	0.0	39.042	0.0	0.0	0.0	0.0	39.042	9.156				42.275	0.0
1971	108.388	0.0	39.042	0.0	0.0	0.0	0.0	39.042	10.839				59.541	0.0
1972	57.486	0.0	39.133	0.0	0.0	0.0	0.0	39.133	5.749				11.021	0.0
1973	129.922	0.0	39.042	0.0	0.0	0.0	0.0	39.042	12.992				77.678	0.0
1974	35.868	0.0	39.042	0.0	0.0	0.0	0.0	39.042	3.587				0.169	0.0
1975	62.976	0.0	39.042	0.0	0.0	0.0	0.0	39.042	6.298				12.445	0.0
1976	177.909	0.0	39.133	0.0	0.0	0.0	0.0	39.133	17.791				118.535	0.0
1977	136.881	0.0	39.042	0.0	0.0	0.0	0.0	39.042	13.688				83.543	0.0
1978	160.955	0.0	39.042	0.0	0.0	0.0	0.0	39.042	16.095				106.497	0.0
1979	88.441	0.0	39.042	0.0	0.0	0.0	0.0	39.042	8.844				45.343	0.0
1980	86.092	0.0	39.133	0.0	0.0	0.0	0.0	39.133	8.609				35.320	0.0
MEAN	92.414	0.0	39.068	0.0	0.0	0.0	0.0	39.068	9.241				44.236	0.0
RATE1		0.0	100.000	0.0	0.0	0.0	0.0	100.000					113.228	0.0
RATE2		0.0	100.000	0.0	0.0	0.0	0.0	100.000					100.000	0.0

SUMMARY OF RAWAL RESERVOIR OPERATION CASE = 2

PERIOD	INFLOW	WATER DEMAND: WATER SUPPLY- ISLAMA	RAWALP	INDUSTRIAL- WAH	TAXILA	AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	RESERVOIR- LEVEL	VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1960	70.423	0.0	48.917	0.0	0.0	0.0	0.0	48.917	7.042				19.586	0.0
1961	122.440	0.0	48.783	0.0	0.0	0.0	0.0	48.783	12.244				57.892	0.0
1962	59.539	0.0	48.783	0.0	0.0	0.0	0.0	48.783	5.954				8.352	0.0
1963	66.121	0.0	48.783	0.0	0.0	0.0	0.0	48.783	6.612				10.135	0.0
1964	73.697	0.0	48.917	0.0	0.0	0.0	0.0	48.917	7.370				17.720	0.0
1965	113.753	0.0	48.783	0.0	0.0	0.0	0.0	48.783	11.375				55.056	0.0
1966	73.984	0.0	48.783	0.0	0.0	0.0	0.0	48.783	7.398				15.041	0.0
1967	96.871	0.0	48.783	0.0	0.0	0.0	0.0	48.783	9.687				36.813	0.0
1968	81.000	0.0	48.917	0.0	0.0	0.0	0.0	48.917	8.100				27.523	0.0
1969	46.401	0.0	48.783	0.0	0.0	0.0	0.0	48.783	4.640				0.0	0.0
1970	91.563	0.0	48.783	0.0	0.0	0.0	0.0	48.783	9.156				25.447	0.0
1971	108.388	0.0	48.783	0.0	0.0	0.0	0.0	48.783	10.839				50.036	0.0
1972	57.486	0.0	48.917	0.0	0.0	0.0	0.0	48.917	5.749				1.666	0.0
1973	129.922	0.0	48.783	0.0	0.0	0.0	0.0	48.783	12.992				67.421	0.0
1974	35.868	0.0	48.783	0.0	0.0	0.0	0.0	48.783	3.587				0.0	0.0
1975	62.976	0.0	48.783	0.0	0.0	0.0	0.0	48.783	6.298				0.0	0.0
1976	177.909	0.0	48.917	0.0	0.0	0.0	0.0	48.917	17.791				101.365	0.0
1977	136.881	0.0	48.783	0.0	0.0	0.0	0.0	48.783	13.688				73.422	0.0
1978	160.955	0.0	48.783	0.0	0.0	0.0	0.0	48.783	16.095				97.119	0.0
1979	88.441	0.0	48.783	0.0	0.0	0.0	0.0	48.783	8.844				36.868	0.0
1980	86.092	0.0	48.917	0.0	0.0	0.0	0.0	48.917	8.609				24.999	0.0
MEAN	92.414	0.0	48.821	0.0	0.0	0.0	0.0	48.821	9.241				34.593	0.0
RATE1		0.0	100.000	0.0	0.0	0.0	0.0	100.000					70.857	0.0
RATE2		0.0	124.963	0.0	0.0	0.0	0.0	124.963					78.201	0.0

SUMMARY OF RAWAL RESERVOIR OPERATION CASE = 3

PERIOD	INFLOW	WATER DEMAND: WATER SUPPLY- ISLAMA	RAWALP	INDUSTRIAL- WAH	TAXILA	AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	RESERVOIR- LEVEL	VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1960	70.423	0.0	43.047	0.0	0.0	0.0	0.0	43.047	7.042				23.900	0.0
1961	122.440	0.0	42.947	0.0	0.0	0.0	0.0	42.947	12.244				64.312	0.0
1962	59.539	0.0	42.947	0.0	0.0	0.0	0.0	42.947	5.954				13.661	0.0
1963	66.121	0.0	42.947	0.0	0.0	0.0	0.0	42.947	6.612				15.915	0.0
1964	73.697	0.0	43.047	0.0	0.0	0.0	0.0	43.047	7.370				23.590	0.0
1965	113.753	0.0	42.947	0.0	0.0	0.0	0.0	42.947	11.375				60.689	0.0
1966	73.984	0.0	42.947	0.0	0.0	0.0	0.0	42.947	7.398				21.294	0.0
1967	96.871	0.0	42.947	0.0	0.0	0.0	0.0	42.947	9.687				42.436	0.0
1968	81.000	0.0	43.047	0.0	0.0	0.0	0.0	43.047	8.100				33.393	0.0
1969	46.401	0.0	42.947	0.0	0.0	0.0	0.0	42.947	4.640				0.0	0.0
1970	91.563	0.0	42.947	0.0	0.0	0.0	0.0	42.947	9.156				37.333	0.0
1971	108.388	0.0	42.947	0.0	0.0	0.0	0.0	42.947	10.839				55.760	0.0
1972	57.486	0.0	43.047	0.0	0.0	0.0	0.0	43.047	5.749				7.333	0.0
1973	129.922	0.0	42.947	0.0	0.0	0.0	0.0	42.947	12.992				73.460	0.0
1974	35.868	0.0	42.947	0.0	0.0	0.0	0.0	42.947	3.587				0.0	0.0
1975	62.976	0.0	42.947	0.0	0.0	0.0	0.0	42.947	6.298				5.104	0.0
1976	177.909	0.0	43.047	0.0	0.0	0.0	0.0	43.047	17.791				114.076	0.0
1977	136.881	0.0	42.947	0.0	0.0	0.0	0.0	42.947	13.688				79.490	0.0
1978	160.955	0.0	42.947	0.0	0.0	0.0	0.0	42.947	16.095				102.740	0.0
1979	88.441	0.0	42.947	0.0	0.0	0.0	0.0	42.947	8.844				42.111	0.0
1980	86.092	0.0	43.047	0.0	0.0	0.0	0.0	43.047	8.609				31.072	0.0
MEAN	92.414	0.0	42.975	0.0	0.0	0.0	0.0	42.975	9.241				40.365	0.0
RATE1		0.0	100.000	0.0	0.0	0.0	0.0	100.000					93.927	0.0
RATE2		0.0	110.000	0.0	0.0	0.0	0.0	110.000					91.248	0.0

TABLE A.II-50(5) ANNUAL SUMMARY OF RAWAL RESERVOIR OPERATION STUDY

SUMMARY OF RAWAL RESERVOIR OPERATION CASE = 4

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	--INDUSTRIAL-- WAH	TAXILA	--AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	RESERVOIR LEVEL	RESERVOIR VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1960	70.423	0.0	46.960	0.0	0.0	0.0	0.0	46.960	7.042				20.841	0.0
1961	122.440	0.0	46.851	0.0	0.0	0.0	0.0	46.851	12.244				59.909	0.0
1962	59.539	0.0	46.851	0.0	0.0	0.0	0.0	46.851	5.954				10.199	0.0
1963	66.121	0.0	46.851	0.0	0.0	0.0	0.0	46.851	6.612				12.067	0.0
1964	73.697	0.0	46.960	0.0	0.0	0.0	0.0	46.960	7.370				19.676	0.0
1965	113.753	0.0	46.851	0.0	0.0	0.0	0.0	46.851	11.375				57.010	0.0
1966	73.984	0.0	46.851	0.0	0.0	0.0	0.0	46.851	7.398				16.930	0.0
1967	96.871	0.0	46.851	0.0	0.0	0.0	0.0	46.851	9.687				38.767	0.0
1968	81.000	0.0	46.960	0.0	0.0	0.0	0.0	46.960	8.100				29.480	0.0
1969	46.401	0.0	46.851	0.0	0.0	0.0	0.0	46.851	4.640				0.0	0.0
1970	91.563	0.0	46.851	0.0	0.0	0.0	0.0	46.851	9.156				29.288	0.0
1971	108.388	0.0	46.851	0.0	0.0	0.0	0.0	46.851	10.839				51.980	0.0
1972	57.486	0.0	46.960	0.0	0.0	0.0	0.0	46.960	5.749				3.644	0.0
1973	129.922	0.0	46.851	0.0	0.0	0.0	0.0	46.851	12.992				69.331	0.0
1974	35.868	0.0	46.851	0.0	0.0	0.0	0.0	46.851	3.587				0.0	0.0
1975	62.976	0.0	46.851	0.0	0.0	0.0	0.0	46.851	6.298				0.0	0.0
1976	177.909	0.0	46.960	0.0	0.0	0.0	0.0	46.960	17.791				107.227	0.0
1977	136.881	0.0	46.851	0.0	0.0	0.0	0.0	46.851	13.688				75.607	0.0
1978	160.955	0.0	46.851	0.0	0.0	0.0	0.0	46.851	16.095				98.998	0.0
1979	88.441	0.0	46.851	0.0	0.0	0.0	0.0	46.851	8.844				38.791	0.0
1980	86.092	0.0	46.960	0.0	0.0	0.0	0.0	46.960	8.609				26.934	0.0
MEAN	92.414	0.0	46.882	0.0	0.0	0.0	0.0	46.882	9.241				36.499	0.0
RATE1		0.0	100.000	0.0	0.0	0.0	0.0	100.000					77.853	0.0
RATE2		0.0	120.000	0.0	0.0	0.0	0.0	120.000					82.509	0.0

SUMMARY OF RAWAL RESERVOIR OPERATION CASE = 5

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	--INDUSTRIAL-- WAH	TAXILA	--AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	RESERVOIR LEVEL	RESERVOIR VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1960	70.423	0.0	50.873	0.0	0.0	0.0	0.0	50.873	7.042				17.782	0.0
1961	122.440	0.0	50.755	0.0	0.0	0.0	0.0	50.755	12.244				55.555	0.0
1962	59.539	0.0	50.755	0.0	0.0	0.0	0.0	50.755	5.954				6.749	0.0
1963	66.121	0.0	50.755	0.0	0.0	0.0	0.0	50.755	6.612				8.197	0.0
1964	73.697	0.0	50.873	0.0	0.0	0.0	0.0	50.873	7.370				15.724	0.0
1965	113.753	0.0	50.755	0.0	0.0	0.0	0.0	50.755	11.375				53.399	0.0
1966	73.984	0.0	50.755	0.0	0.0	0.0	0.0	50.755	7.398				12.496	0.0
1967	96.871	0.0	50.755	0.0	0.0	0.0	0.0	50.755	9.687				35.099	0.0
1968	81.000	0.0	50.873	0.0	0.0	0.0	0.0	50.873	8.100				25.650	0.0
1969	46.401	0.0	50.755	0.0	0.0	0.0	0.0	50.755	4.640				0.0	0.0
1970	91.563	0.0	50.755	0.0	0.0	0.0	0.0	50.755	9.156				21.161	0.0
1971	108.388	0.0	50.755	0.0	0.0	0.0	0.0	50.755	10.839				48.228	0.0
1972	57.486	0.0	50.873	0.0	0.0	0.0	0.0	50.873	5.749				0.409	0.0
1973	129.922	0.0	50.755	0.0	0.0	0.0	0.0	50.755	12.992				64.720	0.0
1974	35.868	0.0	50.755	0.0	0.0	0.0	0.0	50.755	3.587				0.0	0.0
1975	62.976	0.0	50.755	0.0	0.0	0.0	0.0	50.755	6.298				0.0	0.0
1976	177.909	0.0	50.873	0.0	0.0	0.0	0.0	50.873	17.791				95.275	0.0
1977	136.881	0.0	50.755	0.0	0.0	0.0	0.0	50.755	13.688				71.396	0.0
1978	160.955	0.0	50.755	0.0	0.0	0.0	0.0	50.755	16.095				95.201	0.0
1979	88.441	0.0	50.755	0.0	0.0	0.0	0.0	50.755	8.844				35.454	0.0
1980	86.092	0.0	50.873	0.0	0.0	0.0	0.0	50.873	8.609				22.796	0.0
MEAN	92.414	0.0	50.789	0.0	0.0	0.0	0.0	50.789	9.241				32.633	0.0
RATE1		0.0	100.000	0.0	0.0	0.0	0.0	100.000					64.252	0.0
RATE2		0.0	130.000	0.0	0.0	0.0	0.0	130.000					73.769	0.0

SUMMARY OF RAWAL RESERVOIR OPERATION CASE = 6

PERIOD	INFLOW	WATER DEMAND -WATER SUPPLY- ISLAMA	RAWALP	--INDUSTRIAL-- WAH	TAXILA	--AGRICULTURE- RIGHT	LEFT	TOTAL	LOSS	DIFFER	RESERVOIR LEVEL	RESERVOIR VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1960	70.423	0.0	54.787	0.0	0.0	0.0	0.0	54.787	7.042				14.724	0.0
1961	122.440	0.0	54.659	0.0	0.0	0.0	0.0	54.659	12.244				51.201	0.0
1962	59.539	0.0	54.659	0.0	0.0	0.0	0.0	54.659	5.954				3.407	0.0
1963	66.121	0.0	54.659	0.0	0.0	0.0	0.0	54.659	6.612				4.293	0.0
1964	73.697	0.0	54.787	0.0	0.0	0.0	0.0	54.787	7.370				11.699	0.0
1965	113.753	0.0	54.659	0.0	0.0	0.0	0.0	54.659	11.375				49.832	0.0
1966	73.984	0.0	54.659	0.0	0.0	0.0	0.0	54.659	7.398				8.019	0.0
1967	96.871	0.0	54.659	0.0	0.0	0.0	0.0	54.659	9.687				31.491	0.0
1968	81.000	0.0	54.787	0.0	0.0	0.0	0.0	54.787	8.100				22.094	0.0
1969	46.401	0.0	54.659	0.0	0.0	0.0	0.0	54.659	4.640				0.0	0.0
1970	91.563	0.0	54.659	0.0	0.0	0.0	0.0	54.659	9.156				12.763	0.0
1971	108.388	0.0	54.659	0.0	0.0	0.0	0.0	54.659	10.839				44.509	0.0
1972	57.486	0.0	54.787	0.0	0.0	0.0	0.0	54.787	5.749				0.0	0.0
1973	129.922	0.0	54.659	0.0	0.0	0.0	0.0	54.659	12.992				57.184	0.0
1974	35.868	0.0	54.659	0.0	0.0	0.0	0.0	54.659	3.587				0.0	0.0
1975	62.976	0.0	54.659	0.0	0.0	0.0	0.0	54.659	6.298				0.0	0.110
1976	177.909	0.0	54.787	0.0	0.0	0.0	0.0	54.787	17.791				83.463	0.0
1977	136.881	0.0	54.659	0.0	0.0	0.0	0.0	54.659	13.688				67.442	0.0
1978	160.955	0.0	54.659	0.0	0.0	0.0	0.0	54.659	16.095				91.316	0.0
1979	88.441	0.0	54.659	0.0	0.0	0.0	0.0	54.659	8.844				32.117	0.0
1980	86.092	0.0	54.787	0.0	0.0	0.0	0.0	54.787	8.609				18.720	0.0
MEAN	92.414	0.0	54.696	0.0	0.0	0.0	0.0	54.696	9.241				28.775	0.005
RATE1		0.0	100.000	0.0	0.0	0.0	0.0	100.000					52.609	0.010
RATE2		0.0	140.000	0.0	0.0	0.0	0.0	140.000					65.048	0.0

TABLE A.II-50(6) ANNUAL SUMMARY OF RAWAL RESERVOIR OPERATION STUDY

SUMMARY OF RAWAL RESERVOIR OPERATION CASE = 7

PERIOD	INFLOW	WATER DEMAND: WATER SUPPLY- ISLAMA	WATER SUPPLY- RAWALP	INDUSTRIAL- WAH	INDUSTRIAL- TAXILA	AGRICULTURE- RIGHT	AGRICULTURE- LEFT	TOTAL	LOSS	DIFFER	RESERVOIR- LEVEL	RESERVOIR- VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1960	70.423	0.0	58.700	0.0	0.0	0.0	0.0	58.700	7.042				11.656	0.0
1961	122.440	0.0	58.564	0.0	0.0	0.0	0.0	58.564	12.244				46.895	0.0
1962	59.539	0.0	58.564	0.0	0.0	0.0	0.0	58.564	5.954				0.017	0.0
1963	66.121	0.0	58.564	0.0	0.0	0.0	0.0	58.564	6.612				0.389	0.0
1964	73.697	0.0	58.700	0.0	0.0	0.0	0.0	58.700	7.370				7.739	0.0
1965	113.753	0.0	58.564	0.0	0.0	0.0	0.0	58.564	11.375				46.198	0.0
1966	73.984	0.0	58.564	0.0	0.0	0.0	0.0	58.564	7.398				3.566	0.0
1967	96.871	0.0	58.564	0.0	0.0	0.0	0.0	58.564	9.687				27.911	0.0
1968	81.000	0.0	58.700	0.0	0.0	0.0	0.0	58.700	8.100				18.517	0.0
1969	46.401	0.0	58.564	0.0	0.0	0.0	0.0	58.564	4.640				0.0	0.0
1970	91.563	0.0	58.564	0.0	0.0	0.0	0.0	58.564	9.156				4.293	0.0
1971	108.388	0.0	58.564	0.0	0.0	0.0	0.0	58.564	10.839				40.830	0.0
1972	57.486	0.0	58.700	0.0	0.0	0.0	0.0	58.700	5.749				0.0	0.0
1973	129.922	0.0	58.564	0.0	0.0	0.0	0.0	58.564	12.992				49.142	0.0
1974	35.868	0.0	58.564	0.0	0.0	0.0	0.0	58.564	3.587				0.0	0.0
1975	62.976	0.0	58.564	0.0	0.0	0.0	0.0	58.564	6.298				0.0	6.790
1976	177.909	0.0	58.700	0.0	0.0	0.0	0.0	58.700	17.791				78.295	0.0
1977	136.881	0.0	58.564	0.0	0.0	0.0	0.0	58.564	13.688				63.431	0.0
1978	160.955	0.0	58.564	0.0	0.0	0.0	0.0	58.564	16.095				87.411	0.0
1979	88.441	0.0	58.564	0.0	0.0	0.0	0.0	58.564	8.844				28.780	0.0
1980	86.092	0.0	58.700	0.0	0.0	0.0	0.0	58.700	8.609				14.695	0.0
MEAN	92.414	0.0	58.603	0.0	0.0	0.0	0.0	58.603	9.241				25.232	0.323
RATE1		0.0	100.000	0.0	0.0	0.0	0.0	100.000					43.056	0.552
RATE2		0.0	150.000	0.0	0.0	0.0	0.0	150.000					57.039	0.0

SUMMARY OF RAWAL RESERVOIR OPERATION CASE = 8

PERIOD	INFLOW	WATER DEMAND: WATER SUPPLY- ISLAMA	WATER SUPPLY- RAWALP	INDUSTRIAL- WAH	INDUSTRIAL- TAXILA	AGRICULTURE- RIGHT	AGRICULTURE- LEFT	TOTAL	LOSS	DIFFER	RESERVOIR- LEVEL	RESERVOIR- VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1960	70.423	0.0	62.613	0.0	0.0	0.0	0.0	62.613	7.042				8.652	0.0
1961	122.440	0.0	62.468	0.0	0.0	0.0	0.0	62.468	12.244				42.727	0.0
1962	59.539	0.0	62.468	0.0	0.0	0.0	0.0	62.468	5.954				0.0	0.0
1963	66.121	0.0	62.468	0.0	0.0	0.0	0.0	62.468	6.612				0.0	0.0
1964	73.697	0.0	62.613	0.0	0.0	0.0	0.0	62.613	7.370				0.0	0.0
1965	113.753	0.0	62.468	0.0	0.0	0.0	0.0	62.468	11.375				39.272	0.0
1966	73.984	0.0	62.468	0.0	0.0	0.0	0.0	62.468	7.398				0.0	0.0
1967	96.871	0.0	62.468	0.0	0.0	0.0	0.0	62.468	9.687				23.444	0.0
1968	81.000	0.0	62.613	0.0	0.0	0.0	0.0	62.613	8.100				14.941	0.0
1969	46.401	0.0	62.468	0.0	0.0	0.0	0.0	62.468	4.640				0.0	0.0
1970	91.563	0.0	62.468	0.0	0.0	0.0	0.0	62.468	9.156				2.538	6.515
1971	108.388	0.0	62.468	0.0	0.0	0.0	0.0	62.468	10.839				37.150	0.0
1972	57.486	0.0	62.613	0.0	0.0	0.0	0.0	62.613	5.749				0.0	0.0
1973	129.922	0.0	62.468	0.0	0.0	0.0	0.0	62.468	12.992				41.100	0.0
1974	35.868	0.0	62.468	0.0	0.0	0.0	0.0	62.468	3.587				0.0	0.0
1975	62.976	0.0	62.468	0.0	0.0	0.0	0.0	62.468	6.298				0.0	13.470
1976	177.909	0.0	62.613	0.0	0.0	0.0	0.0	62.613	17.791				73.133	0.0
1977	136.881	0.0	62.468	0.0	0.0	0.0	0.0	62.468	13.688				59.420	0.0
1978	160.955	0.0	62.468	0.0	0.0	0.0	0.0	62.468	16.095				83.507	0.0
1979	88.441	0.0	62.468	0.0	0.0	0.0	0.0	62.468	8.844				25.601	0.0
1980	86.092	0.0	62.613	0.0	0.0	0.0	0.0	62.613	8.609				10.511	0.0
MEAN	92.414	0.0	62.509	0.0	0.0	0.0	0.0	62.509	9.241				22.000	0.952
RATE1		0.0	100.000	0.0	0.0	0.0	0.0	100.000					35.194	1.522
RATE2		0.0	160.000	0.0	0.0	0.0	0.0	160.000					49.932	0.0

SUMMARY OF RAWAL RESERVOIR OPERATION CASE = 9

PERIOD	INFLOW	WATER DEMAND: WATER SUPPLY- ISLAMA	WATER SUPPLY- RAWALP	INDUSTRIAL- WAH	INDUSTRIAL- TAXILA	AGRICULTURE- RIGHT	AGRICULTURE- LEFT	TOTAL	LOSS	DIFFER	RESERVOIR- LEVEL	RESERVOIR- VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1960	70.423	0.0	66.527	0.0	0.0	0.0	0.0	66.527	7.042				5.706	0.0
1961	122.440	0.0	66.372	0.0	0.0	0.0	0.0	66.372	12.244				38.598	0.0
1962	59.539	0.0	66.372	0.0	0.0	0.0	0.0	66.372	5.954				0.0	0.0
1963	66.121	0.0	66.372	0.0	0.0	0.0	0.0	66.372	6.612				0.0	0.0
1964	73.697	0.0	66.527	0.0	0.0	0.0	0.0	66.527	7.370				0.0	0.0
1965	113.753	0.0	66.372	0.0	0.0	0.0	0.0	66.372	11.375				24.095	0.0
1966	73.984	0.0	66.372	0.0	0.0	0.0	0.0	66.372	7.398				0.0	0.0
1967	96.871	0.0	66.372	0.0	0.0	0.0	0.0	66.372	9.687				15.411	0.0
1968	81.000	0.0	66.527	0.0	0.0	0.0	0.0	66.527	8.100				11.364	0.0
1969	46.401	0.0	66.372	0.0	0.0	0.0	0.0	66.372	4.640				0.0	0.0
1970	91.563	0.0	66.372	0.0	0.0	0.0	0.0	66.372	9.156				1.752	14.099
1971	108.388	0.0	66.372	0.0	0.0	0.0	0.0	66.372	10.839				33.470	0.0
1972	57.486	0.0	66.527	0.0	0.0	0.0	0.0	66.527	5.749				0.0	0.0
1973	129.922	0.0	66.372	0.0	0.0	0.0	0.0	66.372	12.992				33.058	0.0
1974	35.868	0.0	66.372	0.0	0.0	0.0	0.0	66.372	3.587				0.0	3.595
1975	62.976	0.0	66.372	0.0	0.0	0.0	0.0	66.372	6.298				0.0	16.555
1976	177.909	0.0	66.527	0.0	0.0	0.0	0.0	66.527	17.791				68.062	0.0
1977	136.881	0.0	66.372	0.0	0.0	0.0	0.0	66.372	13.688				55.314	0.0
1978	160.955	0.0	66.372	0.0	0.0	0.0	0.0	66.372	16.095				79.791	0.0
1979	88.441	0.0	66.372	0.0	0.0	0.0	0.0	66.372	8.844				22.835	0.0
1980	86.092	0.0	66.527	0.0	0.0	0.0	0.0	66.527	8.609				5.725	0.0
MEAN	92.414	0.0	66.416	0.0	0.0	0.0	0.0	66.416	9.241				18.818	1.631
RATE1		0.0	100.000	0.0	0.0	0.0	0.0	100.000					28.334	2.456
RATE2		0.0	170.000	0.0	0.0	0.0	0.0	170.000					42.540	0.0

TABLE A.II-50(7) ANNUAL SUMMARY OF RAWAL RESERVOIR OPERATION STUDY

SUMMARY OF RAWAL RESERVOIR OPERATION CASE = 12

PERIOD	INFLOW	WATER DEMAND: WATER SUPPLY- ISLAMA	WATER SUPPLY- RAWALP	INDUSTRIAL- WAH	INDUSTRIAL- TAXILA	AGRICULTURE- RIGHT	AGRICULTURE- LEFT	TOTAL	LOSS	DIFFER	RESERVOIR- LEVEL	RESERVOIR- VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1960	70.423	0.0	78.267	0.0	0.0	0.0	0.0	78.267	7.042				0.0	0.0
1961	122.440	0.0	78.085	0.0	0.0	0.0	0.0	78.085	12.244				23.079	0.0
1962	59.539	0.0	78.085	0.0	0.0	0.0	0.0	78.085	5.954				0.0	0.0
1963	66.121	0.0	78.085	0.0	0.0	0.0	0.0	78.085	6.612				0.0	14.136
1964	73.697	0.0	78.267	0.0	0.0	0.0	0.0	78.267	7.370				0.0	9.478
1965	113.753	0.0	78.085	0.0	0.0	0.0	0.0	78.085	11.375				6.565	4.388
1966	73.984	0.0	78.085	0.0	0.0	0.0	0.0	78.085	7.398				0.0	0.0
1967	96.871	0.0	78.085	0.0	0.0	0.0	0.0	78.085	9.687				0.0	0.0
1968	81.000	0.0	78.267	0.0	0.0	0.0	0.0	78.267	8.100				0.0	0.0
1969	46.401	0.0	78.085	0.0	0.0	0.0	0.0	78.085	4.640				0.0	21.979
1970	91.563	0.0	78.085	0.0	0.0	0.0	0.0	78.085	9.156				0.0	22.926
1971	108.388	0.0	78.085	0.0	0.0	0.0	0.0	78.085	10.839				21.872	0.0
1972	57.486	0.0	78.267	0.0	0.0	0.0	0.0	78.267	5.749				0.0	1.690
1973	129.922	0.0	78.085	0.0	0.0	0.0	0.0	78.085	12.992				12.662	1.758
1974	35.868	0.0	78.085	0.0	0.0	0.0	0.0	78.085	3.587				0.0	17.864
1975	62.976	0.0	78.085	0.0	0.0	0.0	0.0	78.085	6.298				0.0	23.174
1976	177.909	0.0	78.267	0.0	0.0	0.0	0.0	78.267	17.791				55.280	1.825
1977	136.881	0.0	78.085	0.0	0.0	0.0	0.0	78.085	13.688				43.031	0.0
1978	160.955	0.0	78.085	0.0	0.0	0.0	0.0	78.085	16.095				68.649	0.0
1979	88.441	0.0	78.085	0.0	0.0	0.0	0.0	78.085	8.844				17.192	0.0
1980	86.092	0.0	78.267	0.0	0.0	0.0	0.0	78.267	8.609				0.0	0.0
MEAN	92.414	0.0	78.137	0.0	0.0	0.0	0.0	78.137	9.241				11.825	5.677
RATE1		0.0	100.000	0.0	0.0	0.0	0.0	100.000					15.134	7.265
RATE2		0.0	200.000	0.0	0.0	0.0	0.0	200.000					26.732	0.0

SUMMARY OF RAWAL RESERVOIR OPERATION CASE = 11

PERIOD	INFLOW	WATER DEMAND: WATER SUPPLY- ISLAMA	WATER SUPPLY- RAWALP	INDUSTRIAL- WAH	INDUSTRIAL- TAXILA	AGRICULTURE- RIGHT	AGRICULTURE- LEFT	TOTAL	LOSS	DIFFER	RESERVOIR- LEVEL	RESERVOIR- VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1960	70.423	0.0	74.353	0.0	0.0	0.0	0.0	74.353	7.042				0.0	0.0
1961	122.440	0.0	74.181	0.0	0.0	0.0	0.0	74.181	12.244				30.154	0.0
1962	59.539	0.0	74.181	0.0	0.0	0.0	0.0	74.181	5.954				0.0	0.0
1963	66.121	0.0	74.181	0.0	0.0	0.0	0.0	74.181	6.612				0.0	7.344
1964	73.697	0.0	74.353	0.0	0.0	0.0	0.0	74.353	7.370				0.0	5.387
1965	113.753	0.0	74.181	0.0	0.0	0.0	0.0	74.181	11.375				8.922	2.450
1966	73.984	0.0	74.181	0.0	0.0	0.0	0.0	74.181	7.398				0.0	0.0
1967	96.871	0.0	74.181	0.0	0.0	0.0	0.0	74.181	9.687				0.0	0.0
1968	81.000	0.0	74.353	0.0	0.0	0.0	0.0	74.353	8.100				3.556	0.0
1969	46.401	0.0	74.181	0.0	0.0	0.0	0.0	74.181	4.640				0.0	8.717
1970	91.563	0.0	74.181	0.0	0.0	0.0	0.0	74.181	9.156				0.181	20.551
1971	108.388	0.0	74.181	0.0	0.0	0.0	0.0	74.181	10.839				26.111	0.0
1972	57.486	0.0	74.353	0.0	0.0	0.0	0.0	74.353	5.749				0.0	0.0
1973	129.922	0.0	74.181	0.0	0.0	0.0	0.0	74.181	12.992				17.190	0.0
1974	35.868	0.0	74.181	0.0	0.0	0.0	0.0	74.181	3.587				0.0	13.195
1975	62.976	0.0	74.181	0.0	0.0	0.0	0.0	74.181	6.298				0.0	20.905
1976	177.909	0.0	74.353	0.0	0.0	0.0	0.0	74.353	17.793				58.262	0.0
1977	136.881	0.0	74.181	0.0	0.0	0.0	0.0	74.181	13.688				47.059	0.0
1978	160.955	0.0	74.181	0.0	0.0	0.0	0.0	74.181	16.095				72.430	0.0
1979	88.441	0.0	74.181	0.0	0.0	0.0	0.0	74.181	8.844				19.073	0.0
1980	86.092	0.0	74.353	0.0	0.0	0.0	0.0	74.353	8.609				0.0	0.0
MEAN	92.414	0.0	74.230	0.0	0.0	0.0	0.0	74.230	9.241				13.473	3.736
RATE1		0.0	100.000	0.0	0.0	0.0	0.0	100.000					18.151	5.033
RATE2		0.0	190.000	0.0	0.0	0.0	0.0	190.000					30.457	0.0

SUMMARY OF RAWAL RESERVOIR OPERATION CASE = 10

PERIOD	INFLOW	WATER DEMAND: WATER SUPPLY- ISLAMA	WATER SUPPLY- RAWALP	INDUSTRIAL- WAH	INDUSTRIAL- TAXILA	AGRICULTURE- RIGHT	AGRICULTURE- LEFT	TOTAL	LOSS	DIFFER	RESERVOIR- LEVEL	RESERVOIR- VOL.	SPILL	SHORT
	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(MCM)	(FT)	(MCM)	(MCM)	(MCM)
1960	70.423	0.0	70.440	0.0	0.0	0.0	0.0	70.440	7.042				2.760	0.0
1961	122.440	0.0	70.276	0.0	0.0	0.0	0.0	70.276	12.244				34.469	0.0
1962	59.539	0.0	70.276	0.0	0.0	0.0	0.0	70.276	5.954				0.0	0.0
1963	66.121	0.0	70.276	0.0	0.0	0.0	0.0	70.276	6.612				0.0	0.551
1964	73.697	0.0	70.440	0.0	0.0	0.0	0.0	70.440	7.370				0.0	1.458
1965	113.753	0.0	70.276	0.0	0.0	0.0	0.0	70.276	11.375				11.279	0.351
1966	73.984	0.0	70.276	0.0	0.0	0.0	0.0	70.276	7.398				0.0	0.0
1967	96.871	0.0	70.276	0.0	0.0	0.0	0.0	70.276	9.687				7.378	0.0
1968	81.000	0.0	70.440	0.0	0.0	0.0	0.0	70.440	8.100				7.788	0.0
1969	46.401	0.0	70.276	0.0	0.0	0.0	0.0	70.276	4.640				0.0	3.509
1970	91.563	0.0	70.276	0.0	0.0	0.0	0.0	70.276	9.156				0.967	18.175
1971	108.388	0.0	70.276	0.0	0.0	0.0	0.0	70.276	10.839				29.791	0.0
1972	57.486	0.0	70.440	0.0	0.0	0.0	0.0	70.440	5.749				0.0	0.0
1973	129.922	0.0	70.276	0.0	0.0	0.0	0.0	70.276	12.992				25.119	0.0
1974	35.868	0.0	70.276	0.0	0.0	0.0	0.0	70.276	3.587				0.0	8.345
1975	62.976	0.0	70.276	0.0	0.0	0.0	0.0	70.276	6.298				0.0	18.636
1976	177.909	0.0	70.440	0.0	0.0	0.0	0.0	70.440	17.791				63.068	0.0
1977	136.881	0.0	70.276	0.0	0.0	0.0	0.0	70.276	13.688				51.179	0.0
1978	160.955	0.0	70.276	0.0	0.0	0.0	0.0	70.276	16.095				76.118	0.0
1979	88.441	0.0	70.276	0.0	0.0	0.0	0.0	70.276	8.844				20.954	0.0
1980	86.092	0.0	70.440	0.0	0.0	0.0	0.0	70.440	8.609				0.071	0.0
MEAN	92.414	0.0	70.323	0.0	0.0	0.0	0.0	70.323	9.241				15.759	2.430
RATE1		0.0	100.000	0.0	0.0	0.0	0.0	100.000					22.409	3.455
RATE2		0.0	180.000	0.0	0.0	0.0	0.0	180.000					35.624	0.0

APPENDIX -- B

APPENDIX - B

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CHAPTER I. REVIEW OF EXISTING STUDY

CHAPTER I. REVIEW OF EXISTING STUDY

1.1. General

Previous study reports on the Khanpur water conveyance project have been issued by various agencies for the conveyance of water to Islamabad only, Rawalpindi only or Islamabad/Rawalpindi combined. This chapter deals with the results of review on the previous representative reports which are NESPAK and AESL Report.

There is no comprehensive study report on the Khanpur water conveyance from reservoir to twin cities of Islamabad and Rawalpindi as a combined or joint project. Besides, scopes of work in respective existing studies are quite different.

Summarized description and focus of the report are given as below:

- NESPAK Report: In June 1980, National Engineering Services (Pakistan) Ltd. submitted to the CDA a preliminary design and feasibility report on supply of the Khanpur water to Islamabad. The NESPAK examined various alternatives to divert the Khanpur water directly from the reservoir or through the already completed Left Bank Canal with a proposed least cost solution. Focus of the report is selection of least cost conveyance canal route for mostly Islamabad area.

- AESL Report: Associated Engineering Service Ltd. (AESL) of Canada under the technical assistance of the Asian Development Bank submitted draft final report on Rawalpindi Water Supply and Sewerage Project in May 1980. The AESL

examined the problem of water supply and sewerage for Rawalpindi and Islamabad collectively, placing their focus mainly upon groundwater development. The AESL also carried out comprehensive studies of water supply needs for Rawalpindi and Islamabad combined, in which various alternatives on water supply from Khanpur were indicated on preliminary planning basis with the best solution for a combined supply to twin cities.

1.2. Review and Assessment of the Reports

1.2.1. NESPAK Report

The following are the summary, including scope of work and problem areas, of the report.

- Scope of Work: The NESPAK has worked out water conveyance systems from Kanpur reservoir to Islamabad area. The study items were selection of least cost water conveyance system excluding detailed study on water demand projection and water balance study for Khanpur reservoir.

- Water Requirement: The average demand in winter and summer would be 70 and 120 percent of yearly average. The peak summer day demand is 150% of average summer day demand, or equivalent to 1.8 times of the annual average. Design capacity of Islamabad and Rawalpindi is about 60 and 125 MGD respectively. The discharges mentioned above, however, are rather over estimate compared to optimum values.

- Service Area: The beneficial areas of Islamabad by the Khanpur are mainly sectors 10 to 12 series, whereas for Rawalpindi they are not specified due to supplementary water supply scheme.

- Survey and Investigation: Topographical and geological surveys have been made based on terms of reference on a preliminary basis.

- Alternative Plans: The NESPAK has studied five possible alternative plans on the conduction system from Khanpur reservoir including existing Left Bank Canal to service area, three of which have a tunnel plan and remainder are without tunnel construction works.

- Engineering Consideration: There are no indications of major thrust zones near Khurram Gujar and Tarmakki in their geological profile. The rock classification along tunnel route of alternative - 2 has some discrepancy between drawings and result of field survey. "Massive Limestone" shall be alternate layer of not only limestones but also shale and marl. Stilling basin would be required at the outlet of intake tunnel. The structures of the basin should be designed with gate or valve type in order to reduce size of basin for energy dissipation.

  Reinforcement of typical cross section of tunnel for free flow type can be eliminated from view point of structural design.

- Evaluation: The economic and technical analysis shows that for supply of Khanpur water to islamabad the most feasible solution lies in obtaining the water directly from the Khanpur reservoir and fully utilizing the available head in the reservoir. Recommendable alternative plan is Alternate 2B Khanpur-Shah Allah Ditta route.

- Assessment of the Report: The report has been prepared mainly concentrating on selection of least cost water supply system for Islamabad area. The several data and information, such as topographic and geological maps as well as conveyance route, are very useful for further study and project implementation. Design concepts, however, would need some modification or changes to meet the project requirements.

1.2.2. AESL Report

The summary of the report are described as under.

- Scope of Work: The AESL has carried out the study on water supply and sewerage plans for Rawalpindi and Islamabad. The study items of water supply scheme include projection of population and water demand, survey and evaluation of water resources for water supply, selection of least cost water conveyance systems, economic and financial analysis of the project etc.

- Population Projection: Service area of twin cities falls within their administrative boundary. Proposed population of Islamabad and Rawalpindi in the year of 2000 are expected to be about 0.575 and 1.400 million respectively.

- Water Requirement: Average water demands per day per capita are prospected to be about 46 gal. for Rawalpindi and 116 gal. for Islamabad taking into account living standard, service level of water supply and consumption trend in service area. The water demands are decided considering leakage and wastage losses reduction scheme from 60% of consumption total to 25% of it.

- Water Resources Availability: The AESL pointed out that available water of Khanpur reservoir is about 116 MGD on an average instead of 186 MGD suggested by WAPDA. Based on the above suggetions, apportionments of Khanpur available water are revised to 40.5 MGD for both the Rawalpindi and Islamabad, and 35.0 MGD for right bank area irrigation, and others are neglected from water supply during drought period. Besides, the AESL recommended that extremely large volumes of groundwater can be developed totaling about 232 MGD against the existing capacity of 68 MGD. This recommendation seems to be difficult to realize full development.

- Alternative Plan: The AESL has basically worked out four possible alternate plans on the water conveyance from Khanpur to twin beneficiary cities. Two alternatives from outlet of Margala tunnel and another two from Khanpur reservoir are set up. Each alternative has a plan with combined system for twin cities and separate system individually.

- Evaluation of the Alternative: Recommendable scheme is to utilize the existing Left Bank Canal and construct a tunnel to convey water to Margala treatment plant, from which it is pumped to Shah Allh Ditta reservoir for the higher zone of Islamabad and to Tirnaul and Tomar reservoirs for Rawalpindi and the lower Islamabad zone. When groundwater is considered as suitable combined water sources, the first priority of development plan is to develop groundwater to its maximum potential prior to Khanpur for the area as a whole, including Islamabad.

- Assessment of the Report: The report has been compiled with overall study on the water supply as well as sewerage schemes. The aspects on the water supply plan are very useful for the future study and project implementation. Selection of least cost water supply system, however, will need some modification due to the use of different water apportionment.

CHAPTER II. INVESTIGATION

CHAPTER II. INVESTIGATION

2.1. Geological Survey

The following geological survey has been conducted with close cooperation of CDA in order to clarify geology of foundation for raw water reservoir/water treatment plant and qualitative and quantitative embankment material of raw water reservoir.

Water Treatment Plant Site

	Location	Item	Quantity
(1)	Sang Jani	Drilling	1 hole, 60 ft
		Standard penetration test	3 times
(2)	Shah Allah Ditta		
		Drilling	1 hole, 18 ft
		Test pit excavation	1 pit
(3)	Golra		
		Drilling	1 hole, 60 ft
		Standard penetration test	8 times
		Test pit excavation	1 pit

Raw Water Reservoir

(1)	Sang Jani		
		Test pit excavation	2 pits
		Hand auger drilling	5 holes
		Soil test*1	6 samples
(2)	Khurram Paracha		
		Test pit excavation	2 pits
		Hand auger drilling	5 holes
		Soil test	6 samples
	Total Quantity		
		Drilling	3 holes
		Standard penetration test	11 times
		Test pit excavation	7 pits
		Hand auger drilling	10 holes
		Soil test	12 samples

Note: *1 Test items include grain size analysis, liquid and plastic limits test, and specific gravity test.

Location map of the sites is illustrated in Figure B.II-1 and B.II-2. Each geologic log of drill hole, test pit and auger hole are also indicated in Figure B.II-3, B.II-4 and B.II-5, respectively.

Besides, results of soil test and analysis are shown in Table B.II-1 and Figure B.II-6 and B.II-7. The evaluation of survey and some consideration are discussed in Chapter III and V of this Appendix.

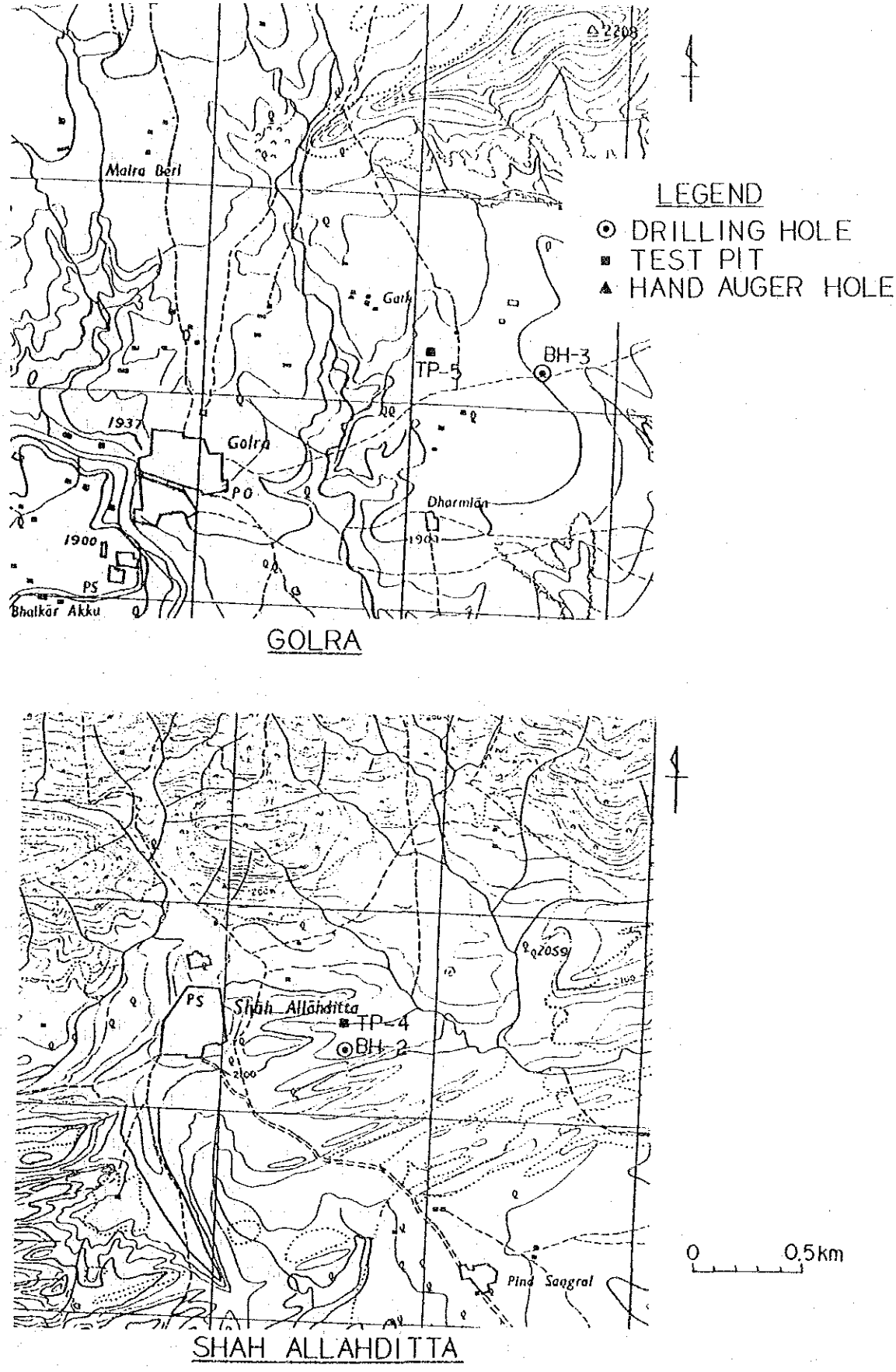
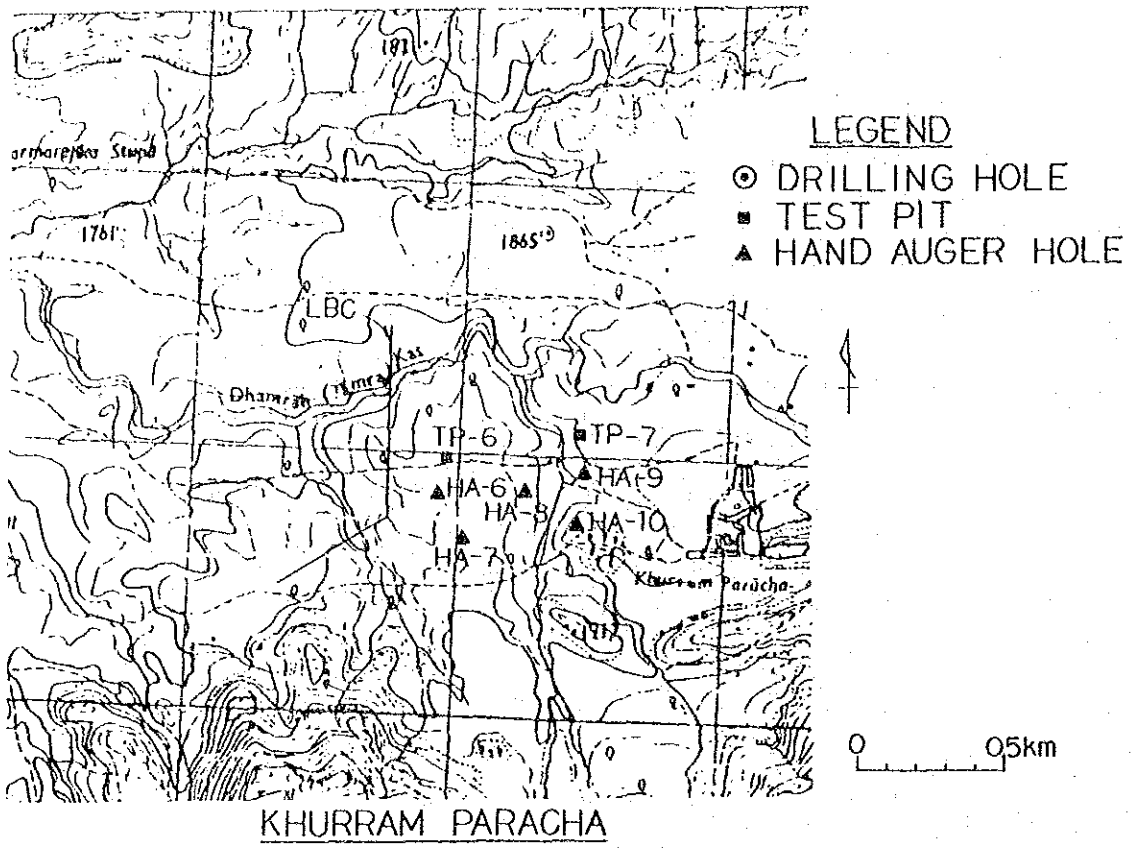
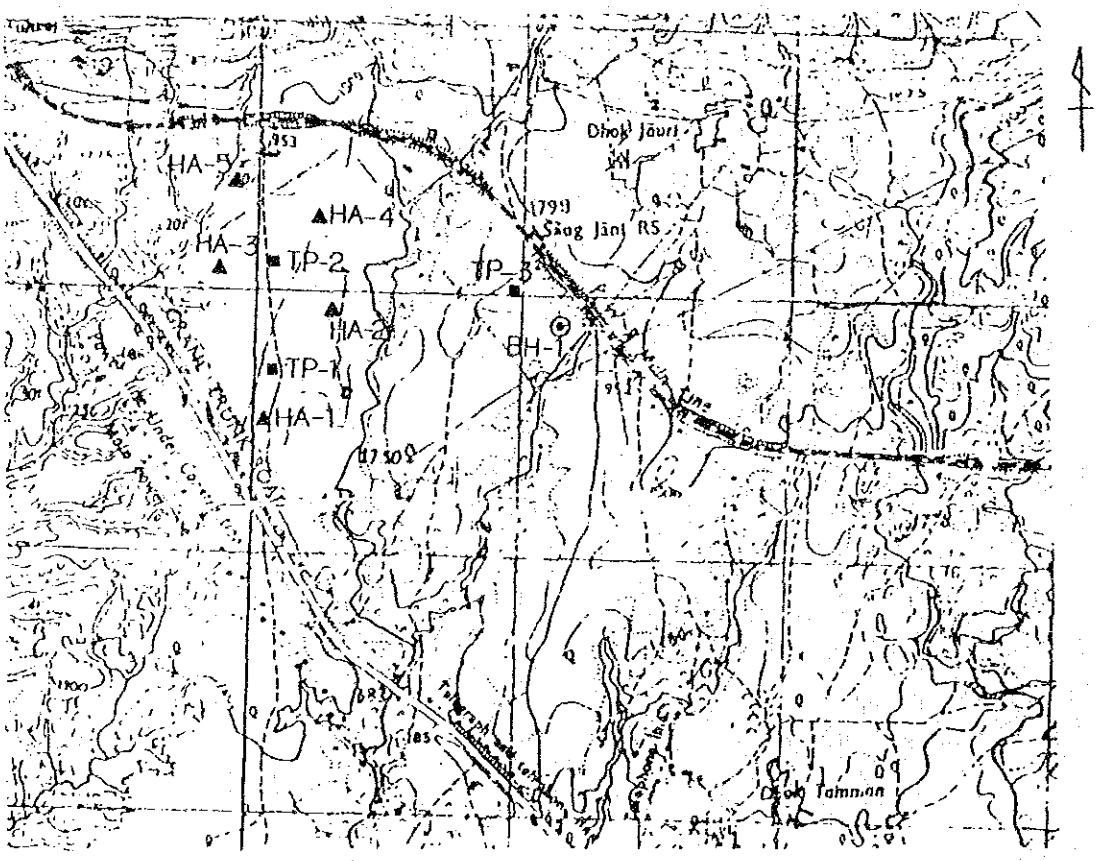


FIGURE B.II-1 LOCATION MAP OF GEOLOGICAL SURVEY (1)



KHURRAM PARACHA



SANG JANI

FIGURE B.II-2 LOCATION MAP OF GEOLOGICAL SURVEY (2)

FIGURE B.II-3 GEOLOGIC LOG OF DRILL HOLE(1)

Project _____

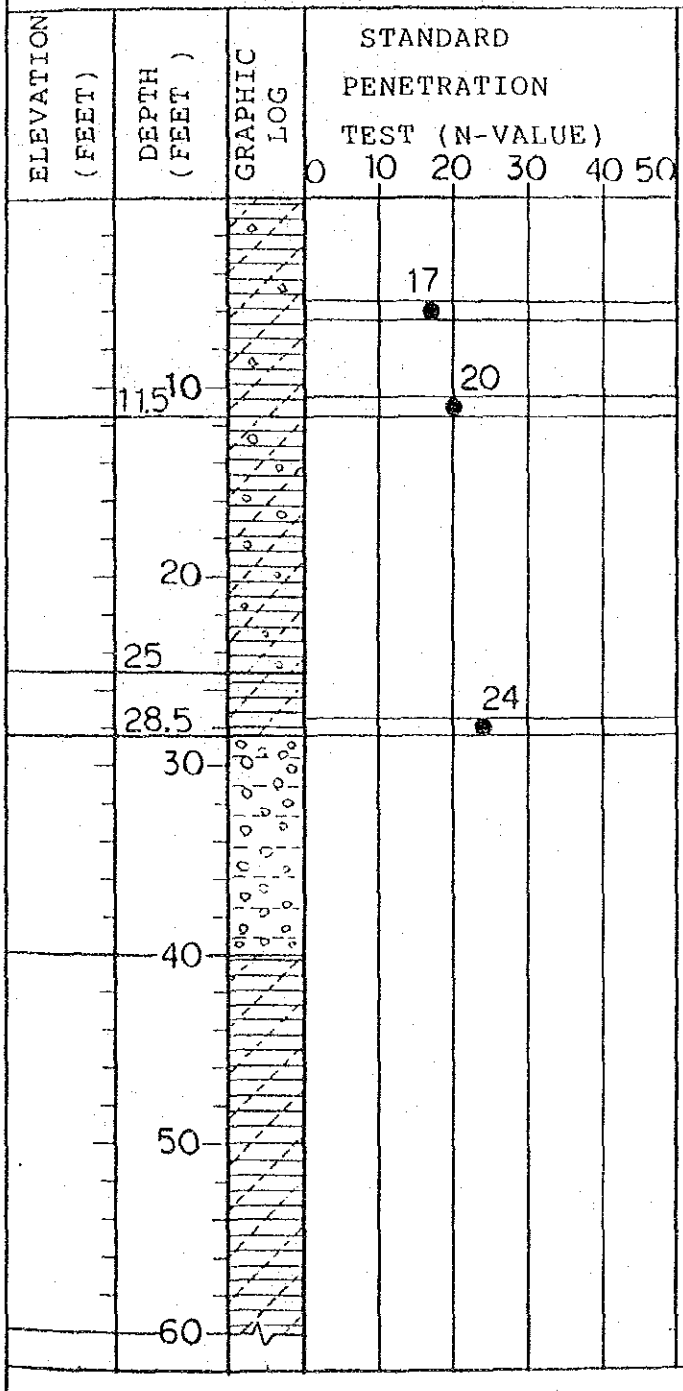
Area Designation Treatment Plant

Hole No. BH-1 Total Depth 60' Dip Vertical

Location Sang Jani Ground Elev. (1765')

Begun 26-9-1984 Finished 30-9-84 Depth to W.L. More than 13'

Logged by M.A.M. AZAM Log Revised by S. SUGIYAMA



CLASSIFICATION AND PHYSICAL CONDITION

0'-11.5' Silty CLAY with trace of concretion; light brown.

11.5-25' Silty CLAY with GRAVEL; light brown.

25'-28.5' Silty CLAY; light brown.

28.5'-40' GRAVEL with brown Silty CLAY.

40'-60' Silty CLAY with GRAVEL; cobble & pebble dia.

REMARKS:

FIGURE B.II-3 GEOLOGIC LOG OF DRILL HOLE (2)

Project _____

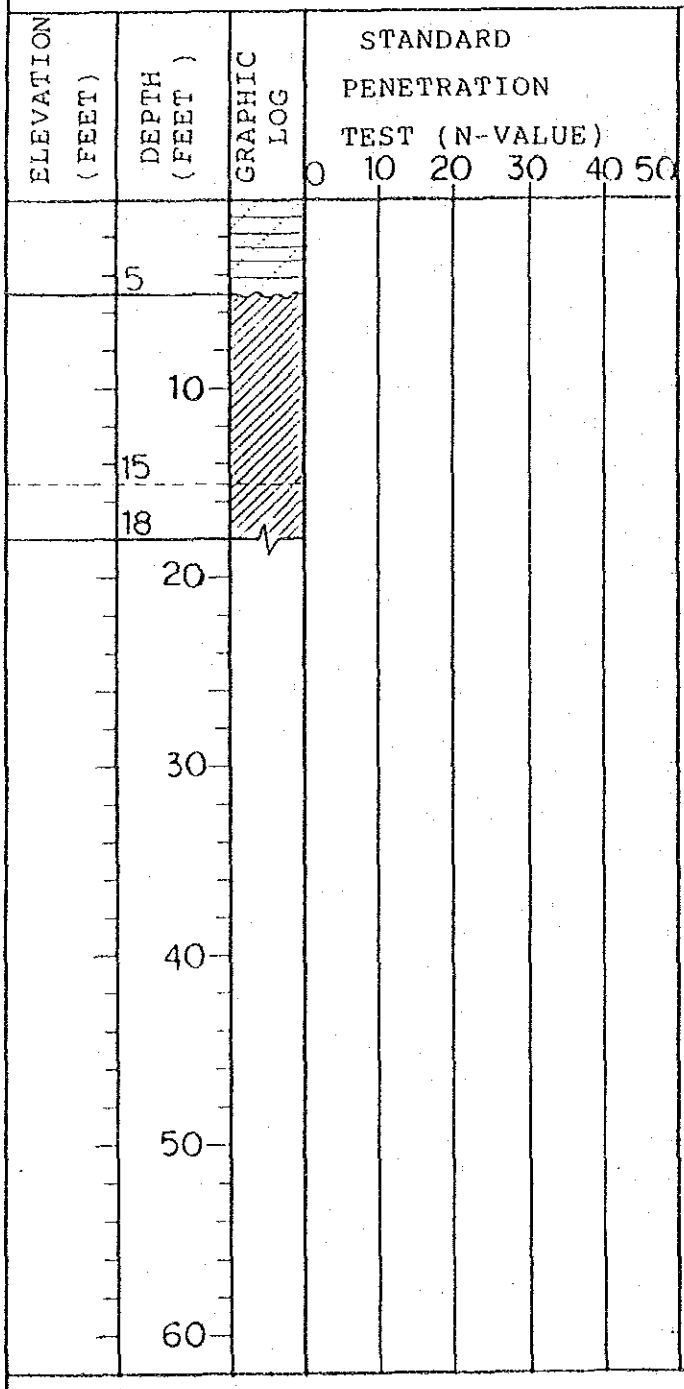
Area Designation Treatment Plant

Hole No. BH-2 Total Depth 18' Dip Vertical

Location Shah Allahditta Ground Elev. (2095')

Begun 1-10-1984 Finished 2-10-1984 Depth to W.L. —

Logged by M.A.M. AZAM Log Revised by S. SUGIYAMA



CLASSIFICATION AND PHYSICAL CONDITION

0'-5' Sandy CLAY; loose; reddish brown, overburden.

5'-15' Weathered MUDSTONE; reddish brown; sandy; with pebble; slicken Side present;

Murree Formation.

15'-18' Mudstone; reddish brown; sandy; calsite vein intercalated; rather hard; Murree Formation.

REMARKS:

FIGURE B.II-3 GEOLOGIC LOG OF DRILL HOLE(3)

Project

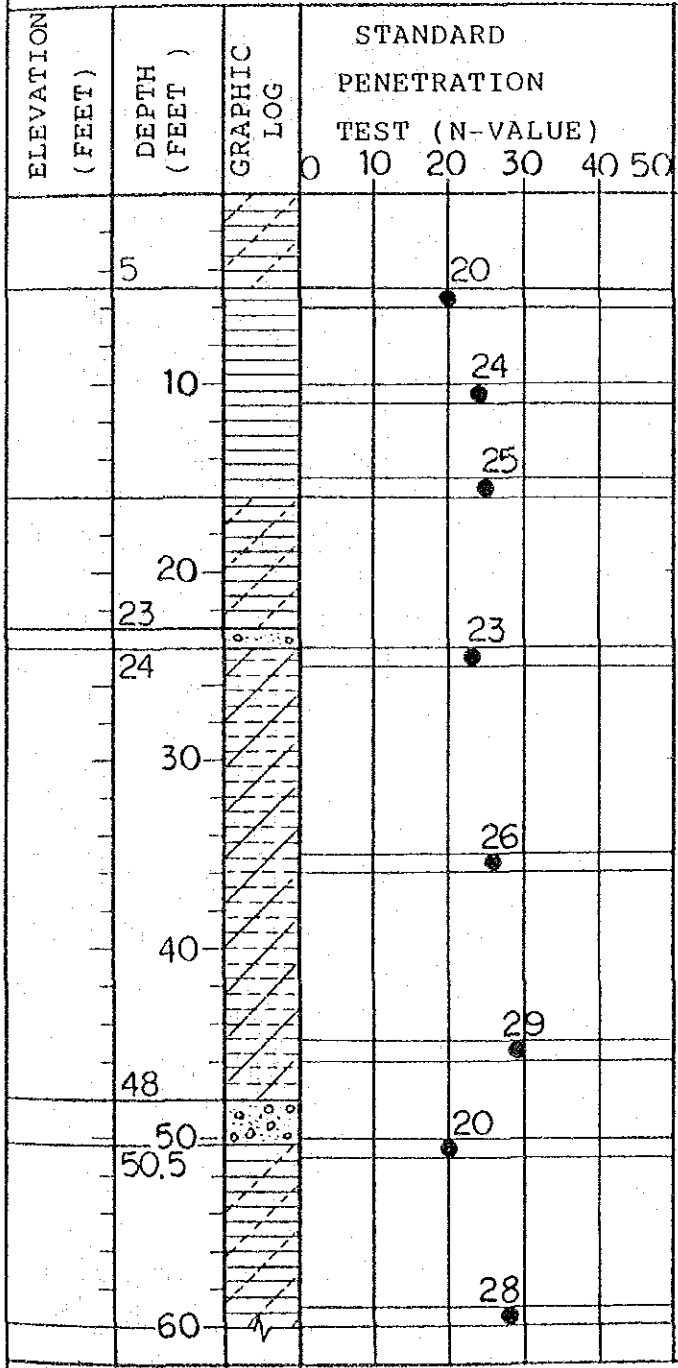
Area Designation Treatment Plant

Hole No. BH-3 Total Depth 60' Dip Vertical

Location Golra Ground Elev. (187O') More than

Begun 3-10-1984 Finished 4.10.1984 Depth to W.L. 18'

Logged by M.A.M. AZAM Log Revised by S. SUGIYAMA



CLASSIFICATION AND PHYSICAL CONDITION

0'-5' Silty CLAY with traces of concretion; light brown.

5'-16' CLAY with trace of concretion; brown

16'-23' Silty CLAY: compact; brown.

23'-24' SAND with little gravel; medium to coarse grained; limestone pebble; gray.

24'-48' Clayey SILT; brown.

48'-50.5' SAND with gravel; medium to coarse grained; limestone pebble; gray.

50.5'-60' Silty CLAY; brown.

REMARKS:

FIGURE B.II-4 LOG OF TEST PIT ~~OR AUGER HOLE~~ (1)

Project _____ Hole No. TP-1

Location ~~Sang-Jani~~ _____ Ground Elev. (1765')

Area Designation Raw Water Reservoir & borrow Area.

Approx. Dimension 4'x10'x10'

Depth to Water Level Not reached

Method of Excavation Hand dug pit

Date October 1, 1984 Logged by S. Sugiyama

CLASSIFICATION SYMBOL LETTER	CLASSIFICATION SYMBOL GRAPHIC	DEPTH (FEET)	SAMPLE	CLASSIFICATION AND DESCRIPTION OF MATERIAL
CL				0'-3' Silty CLAY, trace of concretion; roots scattered especially at 0'-1'; brown;dry;compact; loess.
			3 lb.	3'-8' Silty CLAY;a considerable amount of concretion with about 1-inch dia. ; brown ; dry; compact; loess.
CL		5		
				8'-10' Silt ; trace of concretion; uniform grains; brown ; dry; compact; loess.
ML		10		

REMARKS:

FIGURE B.II-4 LOG OF TEST PIT ~~OR AUGER HOLE~~ (2)

Project _____ Hole No. TP-2

Location SangJani Ground Elev. (1775')

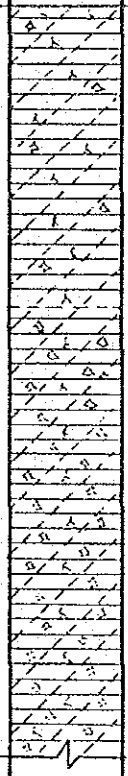
Area Designation Raw Water Reservoir & Borrow Area

Approx. Dimension 4' x 10' x 10'

Depth to Water Level Not reached

Method of Excavation Hand dug pit

Date September 27, 1984 Logged by S. SUGIYAMA

CLASSIFICATION SYMBOL LETTER	CLASSIFICATION SYMBOL GRAPHIC	DEPTH (FEET)	SAMPLE	CLASSIFICATION AND DESCRIPTION OF MATERIAL
CL		5	3 lb.	0'-4' Silty CLAY; trace of concretion; brown; dry; compact; loess 4'-10' Silty CLAY; considerable amount of concretion with 1-½ inch max. dia.; brown; a little dry; compact; loess. Roots scattered 0'-10'. No coarse grains except for concretion.
CL		10		

REMARKS:

FIGURE B.II-4 LOG OF TEST PIT ~~OR AUGER HOLE~~ (3)

Project _____ Hole No. TP-3

Location Sang Jani Ground Elev. (1778')

Area Designation Treatment Plant

Approx. Dimension 4' x10'x10'

Depth to Water Level Not reached

Method of Excavation Hand dug pit

Date ~~October 1, 1984~~ Logged by S. SUGIYAMA

CLASSIFICATION SYMBOL LETTER	CLASSIFICATION SYMBOL GRAPHIC	DEPTH (FEET)	SAMPLE	CLASSIFICATION AND DESCRIPTION OF MATERIAL
CL		5 10	3 lb.	0'-10' Silty CLAY; trace of concretion; compact; massive; a little dry; low plasticity; brown; loess. 0'-3' Abundant roots; dry. 8'-10' Trace of limeston pebble

REMARKS:

FIGURE B.II-4 LOG OF TEST PIT ~~OR AUGER HOLE~~ (4)

Project _____ Hole No. TP-4

Location Shah Allahditta Ground Elev. (2075')

Area Designation Treatment Pant

Approx. Dimension 4' x 10' x 7'

Depth to Water Level Not reached

Method of Excavation Hand dug pit

Date October 4, 1984 Logged by S.SUGIYAMA

CLASSIFICATION SYMBOL LETTER	CLASSIFICATION SYMBOL GRAPHIC	DEPTH (FEET)	SAMPLE	CLASSIFICATION AND DESCRIPTION OF MATERIAL
SC				0'-1' Clavey Sand; dry; hard; abundant roots, top soil.
SC		5		1'-7' Clavey Sand with rubble; massive; compact; moist; brown with yellowish sandy patch; abundant roots upto 3' and trace of roots upto 7'; Overburden. Rubble consists of hard greenish sand stone with 4" max.-dia. 1'x2" cave at 5' depth.
Bedrock				7'- Sandy MUDSTONE to Clayey SAND STONE; reddish brown to purple; massive; soft; Murree Formation, bedrock.
		10		

REMARKS:

FIGURE B.II-4 LOG OF TEST PIT ~~OR AUGER HOLE~~ (5)

Project _____ Hole No. TP-5

Location Golra Ground Elev. (1885')

Area Designation Treatment Plant

Approx. Dimension 4'x10'x10'

Depth to Water Level Not reached

Method of Excavation Hand dug pit

Date October 4, 1984 Logged by S.SUGIYAMA

CLASSIFICATION SYMBOL LETTER	CLASSIFICATION SYMBOL GRAPHIC	DEPTH (FEET)	SAMPLE	CLASSIFICATION AND DESCRIPTION OF MATERIAL
CL				0'-1' Silty CLAY with limestone pebble; abundant roots; brown; dry; top soil.
CL		5		1'-10' Silty CLAY; trace of concretion; massive; compact; trace of roots; many small holes of 1mm dia. scattered; brown with yellowish patch; dry; loess.
		10		

REMARKS:

FIGURE B.II-4 LOG OF TEST PIT ~~OR AUGER HOLE~~ (6)

Project _____ Hole No. TP-6

Location Khurram Parucha Ground Elev. _____

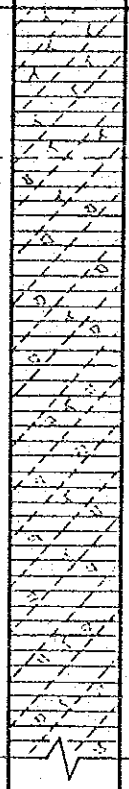
Area Designation Raw Water Reservoir & Borrow Area

Approx. Dimension 4'x10'x10'

Depth to Water Level Not reached

Method of Excavation Hand dug pit

Date October 8, 1984 Logged by S.SUGIYAMA

CLASSIFICATION SYMBOL LETTER	CLASSIFICATION SYMBOL GRAPHIC	DEPTH (FEET)	SAMPLE	CLASSIFICATION AND DESCRIPTION OF MATERIAL
CL		0 5 10	4 lb.	0'-2' Silty CLAY; abundant roots; soft; brown; dry; loess. 2'-10' Silty CLAY; compact; massive; a little roots; a considerable amount of concretion; porous; an ant cave with 5"ϕ; ant pits scattered; brown; a little dry; loess.
CL				

REMARKS:

FIGURE B-II-4 LOG OF TEST PIT ~~OR AUGER HOLE~~ (7)

Project _____ Hole No. TP-7

Location Khurram Parucha Ground Elev. _____

Area Designation Raw Water Reservoir & Borrow Area

Approx. Dimension 4'x10'x10'

Depth to Water Level Not reached

Method of Excavation Hand dug pit

Date October 8, 1984 Logged by S. SUGIYAMA

CLASSIFICATION SYMBOL LETTER	CLASSIFICATION SYMBOL GRAPHIC	DEPTH (FEET)	SAMPLE	CLASSIFICATION AND DESCRIPTION OF MATERIAL
CL				0'-1' Sandy CLAY with gravel; abundant roots; gray; dry; top soil.
CL				1'-3' Silty CLAY; porous; moderately compact; a considerable amount of roots; trace of concretion; brown with gray patch; moist; reworked loess.
			4 lb.	
CL		5		3'-10' Silty CLAY; massive; very compact hard; abundant concretion; trace of roots; brown; moist; loess.
		10		

REMARKS:

FIGURE B.II-5 LOG OF ~~TEST PIT OR~~ AUGER HOLE (1)

Project _____ Hole No. HA-1

Location Sang Jani Ground Elev. (1750')

Area Designation Raw Water Reservoir & Borrow Area

Approx. Dimension 3-inch-dia

Depth to Water Level Not reached

Method of Excavation Hand auger hole

Date September 24, 1984 Logged by S. Sugiyama

CLASSIFICATION SYMBOL LETTER	CLASSIFICATION SYMBOL GRAPHIC	DEPTH (FEET)	SAMPLE	CLASSIFICATION AND DESCRIPTION OF MATERIAL
CL				0'-5' Silty CLAY; slightly organic with plant roots; no coarse grains except for trace of concretion; medium plasticity; dark brown; moist; easy to be compacted; loess.
		5	2 lb.	5'-8' Silty CLAY-Clayey SILT; small amount of concretion with 1-inch max. dia; brown; moist to a little dry; Loess.
CL S ML				STOPPED DUE TO MUCH CONCRETION.
		10		

REMARKS:

FIGURE B.II-5 LOG OF ~~TEST PIT OR~~ AUGER HOLE (2)

Project _____ Hole No. HA-2

Location Sang Jani Ground Elev. (1750')

Area Designation Raw Water Reservoir & Borrow Area

Approx. Dimension 3-inch-dia.

Depth to Water Level Not reached

Method of Excavation Hand Auger Hole

Date September 24, 1984 Logged by S. SUGIYAMA

CLASSIFICATION SYMBOL LETTER	CLASSIFICATION SYMBOL GRAPHIC	DEPTH (FEET)	SAMPLE	CLASSIFICATION AND DESCRIPTION OF MATERIAL
CL		5		0'-6' Silty CLAY; medium plasticity; trace of concretion; brown; moist; reworked loess. 6'-7' Sily SAND medium grains; a little amount of limestone pebble; brown moist; alluvial deposit.
SM		10		STOPPED BECAUSE OF GRAVEL ENCOUNTERED

REMARKS:

FIGURE B.II-5 LOG OF ~~TEST PIT OR~~ AUGER HOLE (3)

Project _____ Hole No. HA-3

Location Sang Jani Ground Elev. (1775')

Area Designation Raw Water Reservoir & Borrow Area

Approx. Dimension 3-inch-dia.

Depth to Water Level Not reached

Method of Excavation Hand auger hole

Date September 24, 1984 Logged by S. SUGIYAMA

CLASSIFICATION SYMBOL LETTER	CLASSIFICATION SYMBOL GRAPHIC	DEPTH (FEET)	SAMPLE	CLASSIFICATION AND DESCRIPTION OF MATERIAL
				0'-1' Silty CLAY slightly organic; medium plasticity; dark brown; moist; top soil.
			2 lb.	1'-10' Silty CLAY; a little amount of concretion; medium plasticity; brown; moist avobe 6'; a little dry from 6'; loess.
CL		5		
		10		

REMARKS:

FIGURE B.II-5 LOG OF ~~TEST PIT OR~~ AUGER HOLE (4)

Project _____ Hole No. HA-4

Location Sarg Jani Ground Elev. (1772')

Area Designation Raw Water Reservoir & Borrow Area

Approx. Dimension 3-inch-dia.

Depth to Water Level Not reached

Method of Excavation Hand auger hole

Date September 25, 1984 Logged by S. SUGIYAMA

CLASSIFICATION SYMBOL LETTER	CLASSIFICATION SYMBOL GRAPHIC	DEPTH (FEET)	SAMPLE	CLASSIFICATION AND DESCRIPTION OF MATERIAL
				0'-1' Silty CLAY ; slightly organic; medium plasticity; brown; a little wet; top soil.
CL				1'-8' Silty CLAY; medium plasticity; a little amount of concretion with a hald inch max. dia; brown; a little wet; loess.
		5		
CL				8'-9' Silty CLAY; a considerable amount of concretion.
CL				STOPPED BY MUCH CONCRETION.
		10		

REMARKS:

FIGURE B.II-5 LOG OF ~~TEST PIT OR~~ AUGER HOLE (5)

Project _____ Hole No. HA-5

Location Sang Jani Ground Elev. (1785')

Area Designation Raw Water Reservoir & Borrow Area

Approx. Dimension 3-inch-dia.

Depth to Water Level Not reached

Method of Excavation Hand auger hole

Date September 25, 1984 Logged by S. SUGIYAMA

CLASSIFICATION SYMBOL LETTER	CLASSIFICATION SYMBOL GRAPHIC	DEPTH (FEET)	SAMPLE	CLASSIFICATION AND DESCRIPTION OF MATERIAL
CL		5 10	2 lb.	0'-10' Silty CLAY; a small amount of concretion with 1-inch max. dia.; light brown; dry; loess.

REMARKS:

FIGURE B.II-5 LOG OF ~~TEST PIT OR~~ AUGER HOLE (6)

Project _____ Hole No. HA-6

Location Khurrum Parucha Ground Elev. _____

Area Designation Raw Water Reservoir & Borrow Area

Approx. Dimension 3-inch-dia.

Depth to Water Level Not reached

Method of Excavation Hand auger hole

Date September 26, 1984 Logged by S.SUGIYAMA

CLASSIFICATION SYMBOL LETTER	CLASSIFICATION SYMBOL GRAPHIC	DEPTH (FEET)	SAMPLE	CLASSIFICATION AND DESCRIPTION OF MATERIAL
CL		5	2 lb	0'-10' Silty CLAY; moderate plasticity; trace of concretion below 1'; brown; a little dry -moist; loess.
		10		

REMARKS:

FIGURE B.II-5 LOG OF ~~TEST PIT OR~~ AUGER HOLE (7)

Project _____ Hole No. HA-7

Location ~~Khurrum Parucha~~ Ground Elev. _____

Area Designation Raw Water Reservoir & Borrow Area

Approx. Dimension 3 inch-dia.

Depth to Water Level Not reached

Method of Excavation Hand auger hole

Date September 26, 1984 Logged by S.SUGIYAMA

CLASSIFICATION SYMBOL LETTER	CLASSIFICATION SYMBOL GRAPHIC	DEPTH (FEET)	SAMPLE	CLASSIFICATION AND DESCRIPTION OF MATERIAL
CL			2 lb.	0'-3' Silty CLAY with trace of brick fragment and concretion; slightly organic; dark brown; moist-wet; top soil; reworked loess.
				3'-10' Silty CLAY; trace of concretion; trace of roots; light brown; loose; wet; loess.
CL		5		
		10		

REMARKS:

FIGURE B.II-5 LOG OF ~~TEST PIT OR~~ AUGER HOLE (8)

Project _____ Hole No. HA-8

Location Khurrum Paruda Ground Elev. _____

Area Designation Raw Water Reservoir

Approx. Dimension 3-inch-dia

Depth to Water Level _____

Method of Excavation Hand auger hole

Date September 27, 1984 Logged by S.SUGIYAMA

CLASSIFICATION SYMBOL LETTER	CLASSIFICATION SYMBOL GRAPHIC	DEPTH (FEET)	SAMPLE	CLASSIFICATION AND DESCRIPTION OF MATERIAL
CL~CH				0'-2' Silty CLAY;slightly organic; a little sandy; some roots; dark brown; rather soft; moist; top soil
CL~CH		5	2 lb.	2'-6' Silty CLAY; a little organic; a little amount of concretion; brown with black & light brown patch;compact; moist; reworked loess.
ML				6'-8' Clavey Silt; a little amount of concretion with 0.5-inch-dia.; light brown; a little dry; loess.
ML				8'-9.5' Silt ;no concretion; uniform grains; light gray; a little dry; loess.
		10		

REMARKS: Stopped dur to gravel encountered.

FIGURE B.II-5 LOG OF ~~TEST PIT OR~~ AUGER HOLE (9)

Project _____ Hole No. HA-9

Location Khurrum Paracha Ground Elev. _____

Area Designation Raw Water Reservoir & Borrow Area

Approx. Dimension 3-inch-dia

Depth to Water Level 6'

Method of Excavation Hand auger hole

Date September 27, 1984 Logged by S. SUGIYAMA

CLASSIFICATION SYMBOL LETTER	CLASSIFICATION SYMBOL GRAPHIC	DEPTH (FEET)	SAMPLE	CLASSIFICATION AND DESCRIPTION OF MATERIAL
CL		0		0'-3' Silty CLAY; a little organic; a little concretion; brown with darker patch; moist; reworked loess.
CL		5		3'-6' Silty CLAY; no coarse grains except for a little amount of concretion; light brown; moist.
CL				6'-9' Silty CLAY; almost saturated; soft; light brown.
		10		

REMARKS:

FIGURE B.II-5 LOG OF ~~TEST PIT OR~~ AUGER HOLE (10)

Project _____ Hole No. HA-10

Location Khurrum Parucha Ground Elev. _____

Area Designation Raw Water Reservoir & Borrow Area

Approx. Dimension 3-inch-dia.

Depth to Water Level 6'

Method of Excavation Hand auger hole

Date September 27, 1984 Logged by S. SUGIYAMA

CLASSIFICATION SYMBOL LETTER	CLASSIFICATION SYMBOL GRAPHIC	DEPTH (FEET)	SAMPLE	CLASSIFICATION AND DESCRIPTION OF MATERIAL
CL				0'-5' Silty CLAY; a little amount of concretion; brown with darke: & lighter patch; moist; reworked loess.
				5-6' Ditto.; wet.
CL		5	2 lb.	6-10' Silty Clay; soft; almost saturated; light brown.
CL				
		10		

REMARKS:

FIGURE B.II-6

GRAIN-SIZE ANALYSIS (1)

Project _____ Date of Testing _____

Location of Project SANGJANI Remarks ;

Sample NO. 1, 2, 3, 8, 9, 10

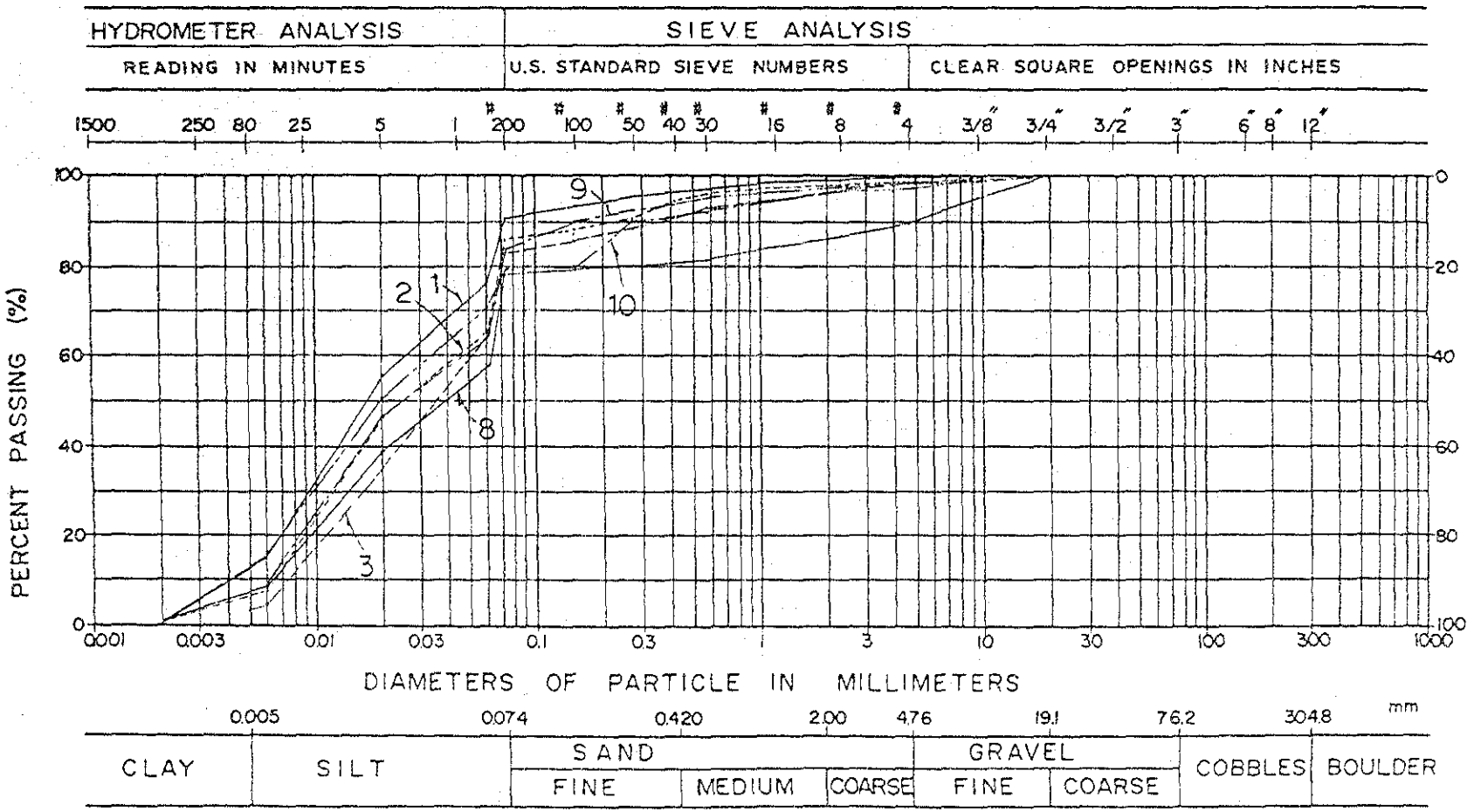


FIGURE B.II-6

GRAIN-SIZE ANALYSIS (2)

Project _____ Date of Testing _____

Location of Project KHURAM PARACHA Remarks ;

Sample NO. 4 5 6, 7, 11, 12

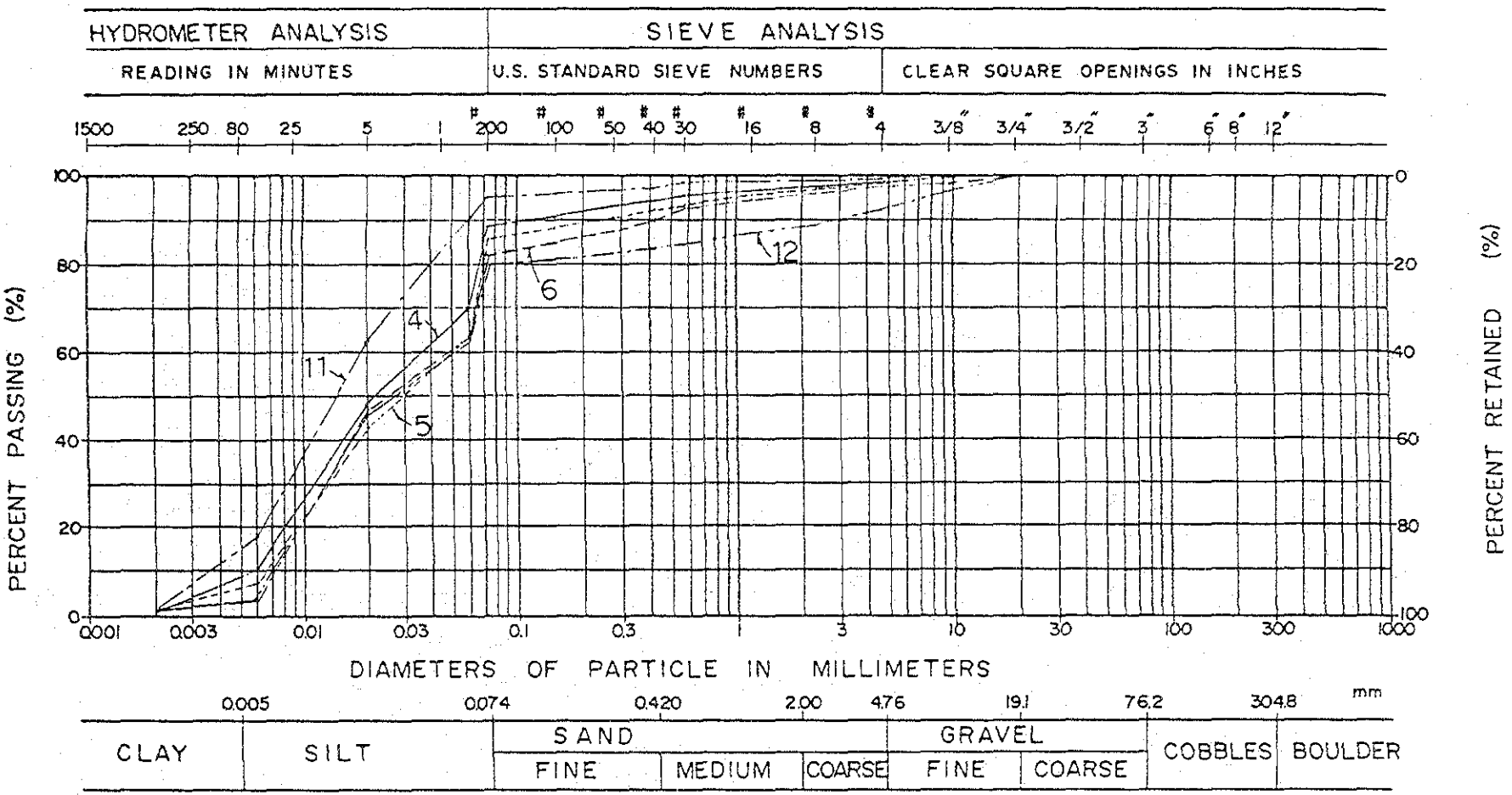


FIGURE B.II-7

PLASTICITY CHART(1)

Project _____

Location of Project Khurram Paracha

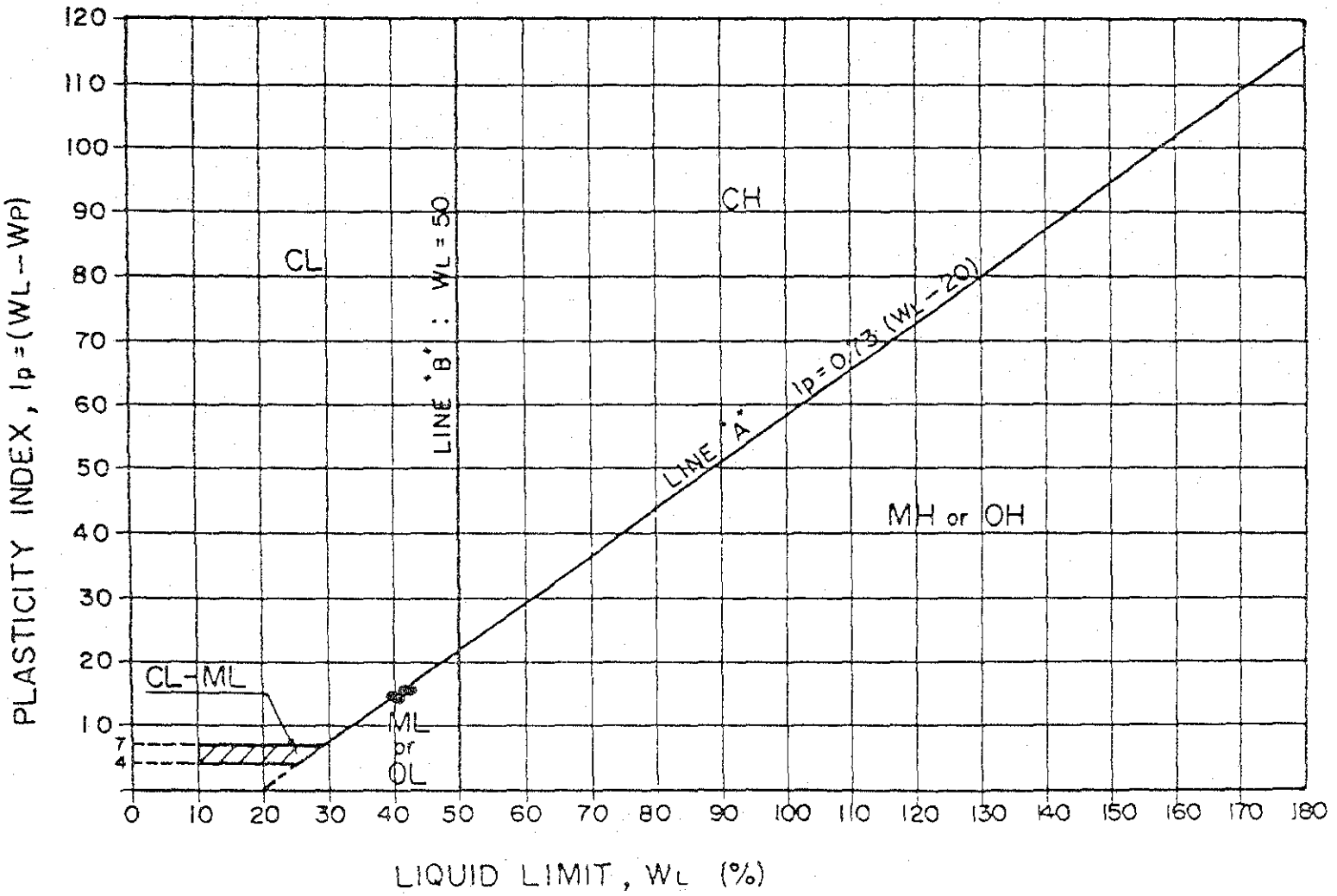


FIGURE B.II-7 PLASTICITY CHART(2)

Project _____

Location of Project Sang Jani

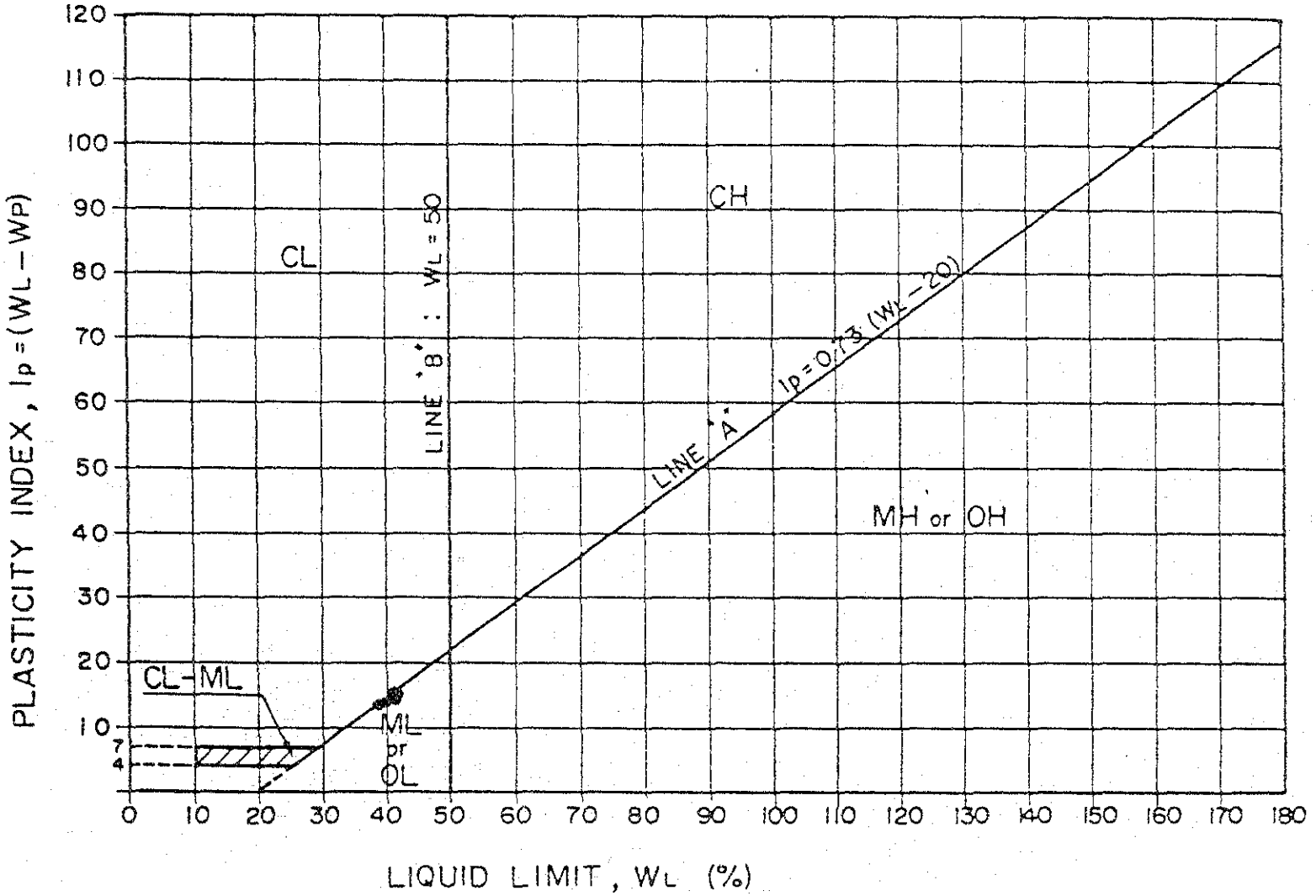


TABLE B.II-1 RESULTS OF SOIL TEST (1)

Sample No.	Hole/Prt No.	Depth (ft)	Location	Atterberg's Limits L.L.	P.L.	P.I.	Specific Gravity	Unified Soil Classification
1	HA-1	5-6	Sang Jani	41.0	25.2	15.8	2.51	CL
2	HA-3	3-4	-do-	41.5	26.5	15.0	2.52	ML
3	HA-5	3-6	-do-	38.6	24.6	14.0	2.54	CL
4	HA-6	3-6	Khurram Paracha	41.3	25.8	15.5	2.53	ML
5	HA-7	3-4	-do-	39.7	25.2	14.5	2.53	CL
6	HA-8	6-9	-do-	40.2	25.7	14.5	2.55	ML
7	HA-10	6-8	-do-	41.6	26.2	15.4	2.57	ML
8	TP-1	3-6	Sang jani	39.7	25.9	13.8	2.59	ML
9	TP-2	3-6	-do-	41.1	26.4	14.7	2.51	ML
10	TP-3	3-6	-do-	41.1	26.0	15.1	2.55	ML
11	TP-6	3-7	Khurram Paracha	42.5	27.1	15.4	2.54	ML
12	TP-7	3-7	-do-	40.6	26.4	14.2	2.58	ML

L.L.: Liquid Limit

P.L.: Plastic Limit

P.I.: Plastic Index

TABLE B.II-1 RESULTS OF SOIL TEST (2)

Sample No.	Grain Size 3/4"	3/8"	Analysis % Passing (U.S.S.S.) No.4	No.8	No. 16	No.30	No.40	No.50	No. 100	No. 200	Hydrometer Test % Passing (Dra.in milimeter) .06	.02	.006	.002
1	-	100	99.7	99.2	98.7	97.1	96.4	95.4	93.2	90.7	76.0	55.3	15.0	1.0
2	100	99.3	98.7	98.1	92.2	96.1	94.4	90.7	88.6	85.9	65.2	46.1	7.5	1.0
3	100	99.0	98.5	97.0	95.1	93.1	90.5	88.3	85.7	82.9	64.3	35.2	4.3	-
4	100	99.6	98.7	97.3	96.1	95.4	94.1	93.3	90.9	88.2	70.0	48.4	10.2	1.0
5	100	98.9	98.3	97.0	95.6	93.6	92.2	90.6	88.2	85.4	63.2	42.4	7.2	1.5
6	100	98.1	97.5	96.5	94.7	92.9	90.0	87.4	84.9	81.8	62.5	46.2	3.2	1.0
7	100	99.4	98.3	97.8	96.6	95.2	94.1	93.0	90.2	88.1	62.5	46.2	3.2	-
8	100	95.2	89.9	86.8	84.3	81.2	80.4	80.0	79.3	78.1	57.2	38.5	8.3	1.2
9	100	99.3	98.4	97.6	96.6	95.2	93.7	92.1	90.0	83.8	64.3	46.2	8.9	1.2
10	100	98.8	97.2	96.3	94.8	92.6	91.1	90.6	79.8	79.0	70.4	50.3	15.2	1.3
11	-	100	99.3	99.0	98.8	98.3	97.2	96.8	96.1	94.9	90.5	62.2	17.3	1.2
12	100	96.7	92.3	88.8	87.0	84.5	83.3	82.1	81.3	80.0	62.5	46.3	3.8	1.3

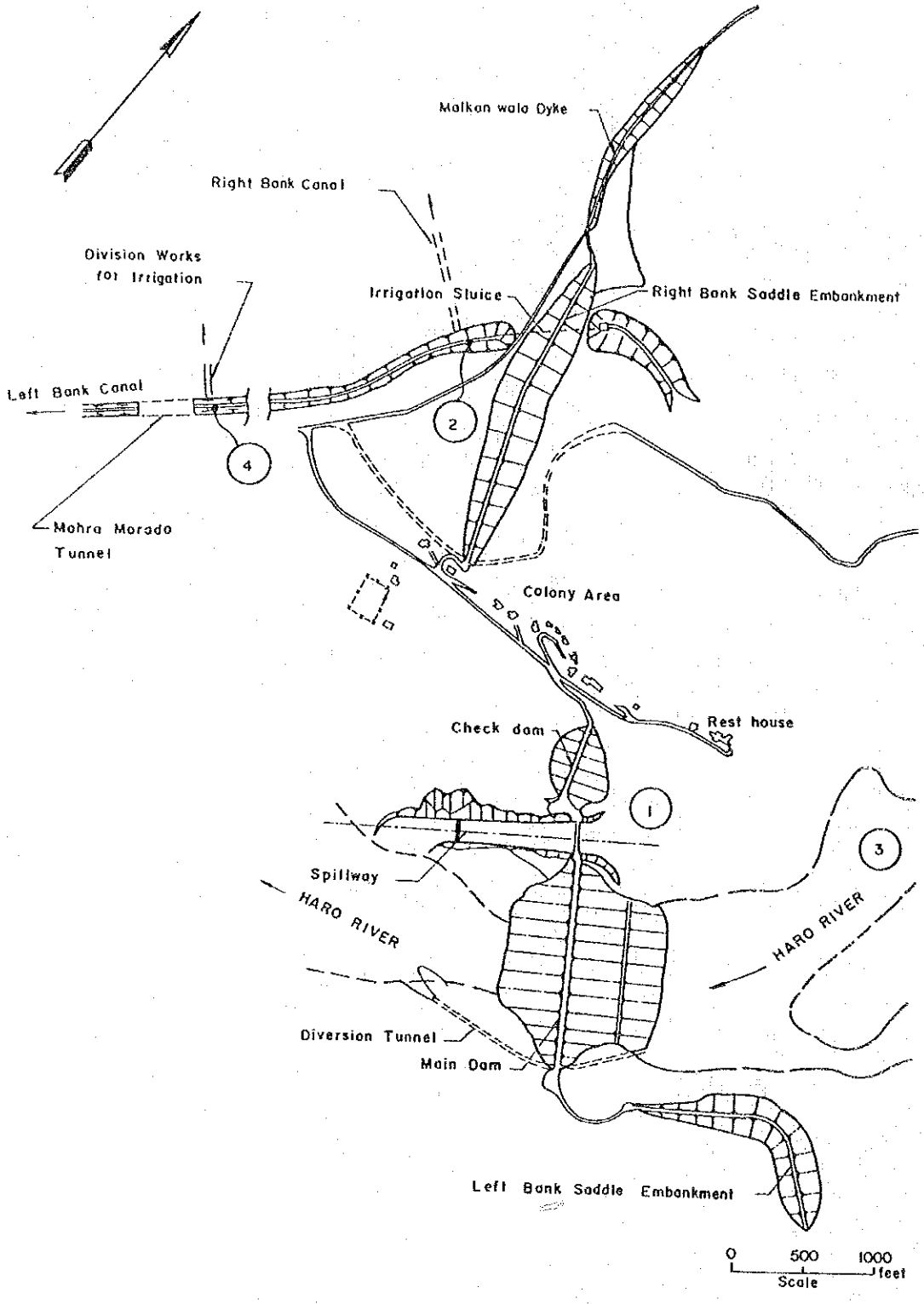
U.S.S.S. : U.S. Standard Series.

2.2. Water Quality Sampling and Analysis

During field survey in Pakistan, water quality sampling and analysis has been carried out at appropriate sites as indicated in Figure B.II-8.

Results of analysis for raw water quality and algae content are shown in Table B.II-2 and B.II-3. Assessment of analysis is discussed in Chapter III of Appendix B.

Figure B.II-8 LOCATION OF WATER SAMPLING POINTS



(1) : Surface water of the Khanpur Reservoir

(2) : Canal water at the branch to the Right Bank Canal

(3) : Haro River water at about 1 km upstream of the dam

(4) : Canal water at the division works for Irrigation

Table B.II-2 Raw Water Quality (1)

Items \ Sampling Points		1	2	3	4
Sampling date (1984)		Aug 6	Aug 6	Aug 6	Aug 6
Weather		Clear	Clear	Clear	Clear
Atom. Temperature	(°C)	35	33	35	35
Water temperature	(°C)	30	28	30	31
Discoloration	(Unit)	5	5	5	6
Odours		Unobjec-tionable	Unobjec-tionable	Unobjec-tionable	Unobjec-tionable
Tastes		do	do	do	do
Turbidity	(Unit)	10	16	18	16
Total Solids	(mg/l)	250	252	252	251
pH range		8.1	7.9	8.0	8.0
Total hardness	(mg/l)	125	120	135	130
Calcium	(mg/l)	80	80	85	80
Chlorides	(mg/l)	16	15	17	18
Copper	(mg/l)	Nil	Nil	Nil	Nil
Iron	(mg/l)	Nil	Nil	Nil	Nil
Magnesium	(mg/l)	45	40	50	50
Manganese	(mg/l)	Nil	Nil	Nil	Nil
Sulphate	(mg/l)	49	45	50	55
Zinc	(mg/l)	0.025	0.025	0.025	0.025
Ammonia nitrogen	(mg/l)	Nil	Nil	Nil	Nil
Nitrate nitrogen	(mg/l)	0.5	0.5	0.5	0.5
Nitrite nitrogen	(mg/l)	-	-	-	-
Alkalinity	(mg/l)	90	110	105	110
Conductivity	(″″/cm)	354	360	357	356
Coliform group	(nos/ml)	Nil	10	6	Nil
Total colonies	(nos/ml)	15	80	30	110
Dissolved oxygen	(mg/l)	-	-	-	-

Table B.II-2 Raw Water Quality (2)

Items	Sampling Points	1	2	3	4
Sampling date (1984)		Sep 13	Sep 13	Sep 13	Sep 13
Weather		Clear	Clear	Clear	Clear
Atom. Temperature	(°C)	33	34	33	32
Water temperature	(°C)	26	24	26	26
Discoloration	(Unit)	5	5	5	5
Odours		Unobjec-tionable	Unobjec-tionable	Unobjec-tionable	Unobjec-tionable
Tastes		do	do	do	do
Turbidity	(Unit)	8	12	8	16
Total Solids	(mg/l)	259	281	257	256
pH range		8.1	8.0	8.1	8.1
Total hardness	(mg/l)	120	112	112	110
Calcium	(mg/l)	70	60	63	58
Chlorides	(mg/l)	20	18	16	19
Copper	(mg/l)	Nil	Nil	Nil	Nil
Iron	(mg/l)	Nil	Nil	Nil	Nil
Magnesium	(mg/l)	50	52	59	52
Manganese	(mg/l)	Nil	Nil	Nil	Nil
Sulphate	(mg/l)	45	35	34	30
Zinc	(mg/l)	0.02	0.025	0.01	0.02
Ammonia nitrogen	(mg/l)	Nil	Nil	Nil	Nil
Nitrate nitrogen	(mg/l)	0.55	0.5	0.45	0.5
Nitrite nitrogen	(mg/l)	0.05	0.04	0.06	0.065
Alkalinity	(mg/l)	105	108	102	100
Conductivity	(μmho/cm)	370	388	367	365
Coliform group	(nos/ml)	3	80	6	120
Total colonies	(nos/ml)	7	120	11	50
Dissolved oxygen	(mg/l)	7.5	8.0	7.25	8.75

Water Level of Khanpur Reservoir : 1948 ft

Table B.II-2 Raw Water Quality (3)

Items		Sampling Points 1	2	3	4
Sampling date (1984)		Oct 17	Oct 17	Oct 17	Oct 17
Weather		Clear	Clear	Clear	Clear
Atom. Temperature	(°C)	26	28	26	29
Water temperature	(°C)	21	22	21	22
Discoloration	(Unit)	0	0	0	0
Odours		Unobjec-tionable	Unobjec-tionable	Unobjec-tionable	Unobjec-tionable
Tastes		do	do	do	do
Turbidity	(Unit)	5	6	6	8
Total Solids	(mg/l)	282	308	295	290
pH range		8.3	8.3	8.2	8.2
Total hardness	(mg/l)	140	144	135	130
Calcium	(mg/l)	80	92	90	85
Chlorides	(mg/l)	20	22	21	18
Copper	(mg/l)	Nil	Nil	Nil	Nil
Iron	(mg/l)	Nil	Nil	Nil	Nil
Magnesium	(mg/l)	60	52	45	45
Manganese	(mg/l)	Nil	Nil	Nil	Nil
Zinc	(mg/l)	40	49	38	35
Ammonia nitrogen	(mg/l)	Nil	Nil	Nil	Nil
Nitrate nitrogen	(mg/l)	0.4	0.5	0.45	0.4
Nitrite nitrogen	(mg/l)	-	-	-	-
Alkalinity	(mg/l)	106	112	110	108
Conductivity	(μmho/cm)	412	440	422	413
Coliform group	(nos/ml)	1	40	-	55
Total colonies	(nos/ml)	15	90	-	50
Dissolved oxygen	(mg/l)	6.0	7.75	7.5	9.5

Water Level of Khanpur Reservoir : 1955 ft

Table B.II-3 Analysis of Algae

Algae	Species	No./ml point 1	No./ml point 2
Diatom	Melosira	1	-
	Nitzschia	4	13
	Synedra	2	9
	Diatoma	4	43
	Achnanthes	-	6
	Navicula	-	2
Green Algae	Ankistrodesmus	1	-
Flagellum Algae	Dinobryon	13	14
Total		25	87

CHAPTER III. DESIGN CRITERIA

CHAPTER III. DESIGN CRITERIA

3.1. Hydraulic Design

Of a number of mean velocity formula prepared for open channel, tunnel and pipe line etc., the most suitable formula is to be applied in consideration of flow conditions. In the study, the Manning's Formula is applied for open channel and tunnel where the Reynolds number and roughness coefficient are considered to be relatively large, while the Hazen-Williams Formula is selected for pipeline where flows of transitional region between smooth and rough are expected.

3.1.1. Manning's Formula

$$V = \frac{1}{n} R^{2/3} S^{1/2}$$

where V = flow velocity in m/s
S = slope of energy gradient in m/m
R = hydrulic radius
= flow area/wetted perimeter
n = coefficient of roughness

A. Coefficient of Roughness (n)

Lining Material	n
Concrete (Steel Form)	0.014
- do - (Wooden Form)	0.015
Concrete Block	0.017
Earth	0.025

B. Allowable Velocity (meter per second)

	Maximum	Minimum
Open Canal (Concrete)	1.80	0.60
Concrete Conduit & Syphon	2.50	1.00
Tunnel with Lining	2.50	1.00

3.1.2. Hazen-Williams Formula

$$V = 0.35464\ CD^{0.63}\ I^{0.54}$$
$$Q = 0.27853\ CD^{2.63}\ I^{0.54}$$

where V = flow velocity in m/s

Q = discharge in cu.m/s

I = hydraulic gradient

C = coefficient

D = inner diameter of pipe in m

A. Coefficient of Roughness (C)

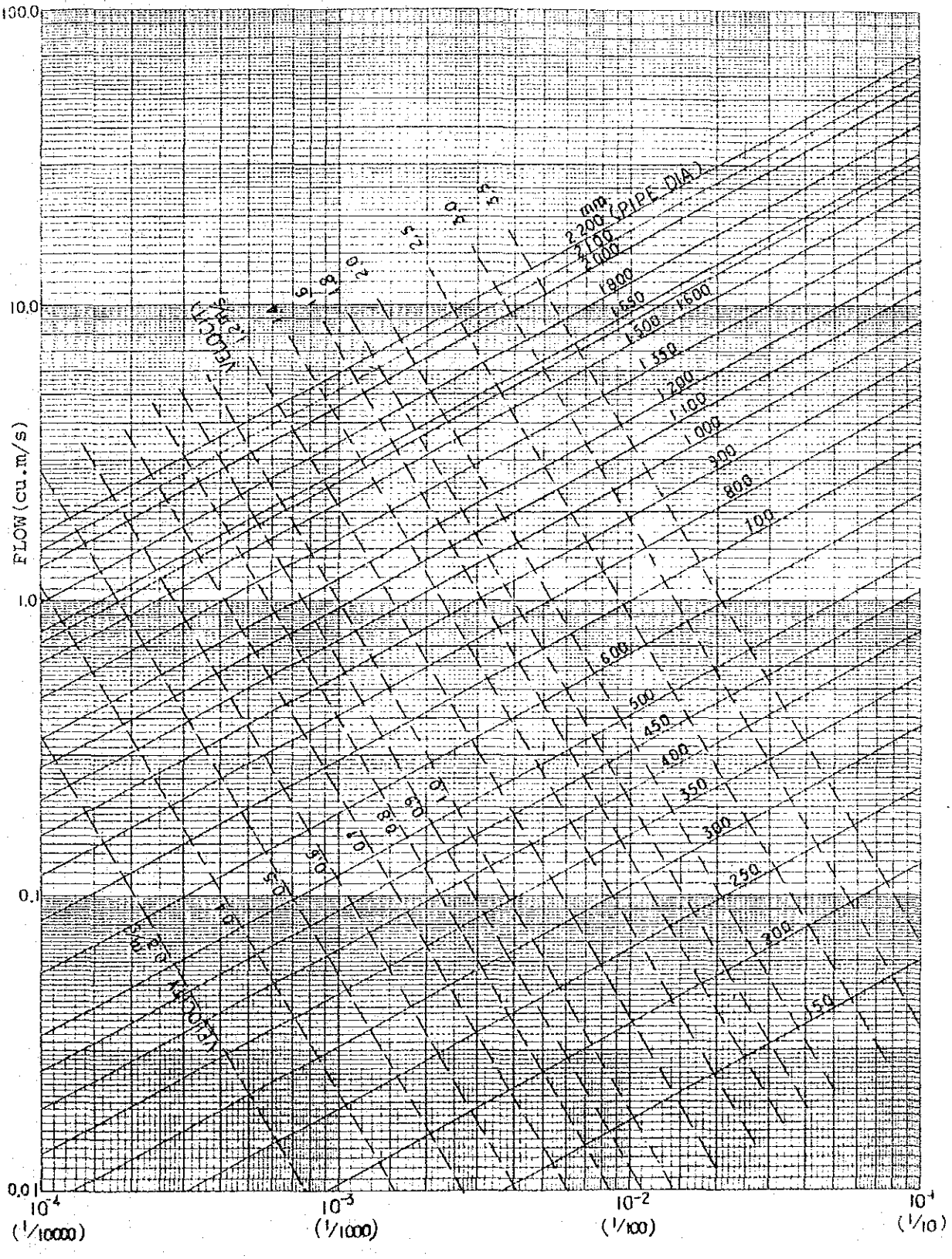
In addition to friction loss, other losses such as bend loss are also considered to determine the value of "C" at 110. Figure B.III-1 presents a hydraulic nomogram with parameters of Q, I and C.

B. Diameter and Standard Design Velocity

In consideration of safe and easy operation and maintenance of a pipeline as well as appurtenant structure and equipment, standard design velocity is determined empirically as below:

Pipe Diameter (mm)	Design Velocity (m/s)
75 - 150	0.7 - 1.0
200 - 400	0.9 - 1.6
450 - 800	1.2 - 1.8
900 - 1,500	1.3 - 2.0
1,600 - 3,000	1.4 - 2.5

FIGURE B.III-1 NOMOGRAM OF HAZEN-WILLIAMS FOUMULA (C = 110)



3.2. Conduction Main and Tunnel Geology

3.2.1. Water Head Allocation and Canal Alignment

To propose alignment of the conduction main, the followings were taken fully into consideration:

A. Since the conduction main conveys domestic water, closed combined systems with pipelines, tunnels and syphons are proposed. If the conduction main contains open channels, sediment inflows during heavy rains would be deposited on the sill of structure causing serious difficulty in operation and maintenance works.

B. To expect economic merits the conduction main is designed so as to minimize the total length and construction cost by means of allotting a large share to such structures that need less construction costs.

C. It is so designed as to simplify construction works.

D. Tunnel is aligned to be straight as much as possible.

E. To minimize construction period, vertical or inclined shafts are proposed to be constructed for a tunnel of which length exceeds 2 km.

As a basic conception of water head allocation, it is required for a water conduction system that an overall construction cost is to be minimized, by means of allocating more head (available water head) to such structures that need high construction costs (steep) and allotting less head to the structures that require low costs (gentle). The Khanpur water conduction main systems involve tunnel, pipeline and syphon as the major structures. Among these structures, difference of per unit length construction cost is

relatively small and lifting of water by pumps is inevitably be necessary for each alternative plan. Considering that the total length of conduction main by alternative plan varies with a range from 6.5 km to 12.5 km with required lifting head from 70 m to 105 m, it is clear that the merit of decreasing the construction cost in terms of allocating additional several meters of available head to the conduction main is much bigger than the demerit of increasing the construction cost of pumping stations with additional lifting head of several meters. As a consequence, design velocity for each structure is determined as under, as acceptable from stand point of operation & maintenance within the limit of the maximum allowable velocity:

DESIGN VELOCITY

Structure	Dimension	Velocity (m/s)	Energy Gradient
Pipeline	ø1,650 mm x 2	1.58	1:800
Pressure Pipe	ø1,500	1.91	1:500
Syphon	ø2,000	2.15	1:600
Tunnel 1/	Horse Shoe D=2,100	1.84	1:650
-do- 2/	- do - D=2,400	1.48	1:1,500

Notes: 1/ For length(ℓ) <3 km
2/ For ℓ >5 km

3.2.2. Tunnel

The cross-section of the tunnel is determined as standard horse shoe type due to its superior workability, although from structural point of view strength is to some extent inferior as compared with circular type. For mechanical construction, the minimum cross-section, in terms of a diameter, is 2.0 m. For the Project in consideration of velocity of flow, a diameter of 2.10 m is given for ordinary type of tunnel. For a long tunnel with a length exceeding 3 km, it is often necessary to construct lining concrete immediately after excavation, because that steel supports are deformed due to