TABLE D-3-(1) IRRIGATION WATER REQUIRMENT IN EVERY A THIRD MONTH IN ACCORDANCE WITH PROPOSED CROPPING PATTERN

SWAT

UNIT: mm

CROP		MAIZE	RICE	WHEAT	FODDERS	VEGETABLES	FRUITS	ONION	TOTAL CONSUMPTION	EFFECTIVE RAIN	WATER REQUIREMENT NET	WATER REQUIREMENT GROSS	WATER REQUIREMENT MONTH
AREAL RATE		30 %	30 %	30 %	10 %	20 %	20 %	20 %					
MONTH	DAYS												
JAN.	I 10			3.7	1.0	9/12 2.8	3.1	2.3	12.9	19.3	0.0	0	
	II 10			4.2	1.2	7/12 2.2	3.1	2.7	13.4	0.0	13.4	22	
	III 11			5.0	1.4	5/12 1.6	3.4	3.3	14.7	32.5	0.0	0	22
FEB.	I 10			6.6	2.0	3/12 1.0	4.3	4.3	18.2	0.0	18.2	30	
	II 10			6.8	2.2	1/12 0.2	4.3	5.3	18.8	0.0	18.8	31	
	III 8			5.8	2.0		3.4	4.2	15.4	0.0	15.4	26	87
MAR.	I 10			11.0	3.8		6.3	7.8	28.9	9.1	19.8	33	
	II 10			11.3	3.9		6.3	7.8	29.3	26.5	2.8	5	
	III 11			12.3	4.1		6.9	8.5	31.8	31.5	0.3	1	39
APR.	I 10			16.2	5.1		10.5	10.1	41.9	32.5	9.4	16	
	II 10			12.9	4.4		10.5	8.8	36.6	20.3	16.3	27	
	III 10			8.9	3.7		10.5	8.8	31.9	52.9	0.0	0	43
MAY	I 10			5/6 6.8	5/6 3.9	1/10 0.6	15.5	5/6 9.9	36.7	33.0	3.7	6	
	II 10			1/2 3.9	1/2 2.2	1/10 1.8	15.5	1/2 5.9	29.3	11.2	18.1	30	
	III 11			1/6 1.3	1/6 0.8	1/2 16.0	17.1	1/6 2.2	37.4	6.1	31.3	52	88
JUN.	I 10	1/6 1.7	1/6 4.6			2/10 7.8	19.3		33.4	0.0	33.4	56	
	II 10	1/2 5.1	1/2 13.9			5/10 12.8	19.3		51.1	10.2	40.9	68	
	III 10	5/6 9.3	5/6 11.6			16.4	19.3		56.6	6.1	50.5	84	208
JUL.	I 10	10.1	22.1			13.8	15.4		61.4	21.4	40.0	67	
	II 10	11.9	22.1			12.4	15.4		61.8	15.2	46.6	78	
	III 11	15.0	20.4			15.4	17.0		67.8	44.3	23.5	39	184
AUG.	I 10	13.1	18.8			10.6	13.1		55.6	13.2	42.4	71	
	II 10	14.0	18.8			9.2	13.1		55.1	0.0	55.1	92	
	III 11	16.4	23.5			7/8 8.8	14.4		63.1	48.8	14.3	24	187
SEP.	I 10	13.4	18.8			5/8 5.0	11.0		48.2	4.1	44.1	74	
	II 10	13.4	17.7			3/8 3.0	11.0		45.1	0.0	45.1	75	
	III 10	13.1	15.9			1/4 0.4	11.0		40.4	0.0	40.4	67	216
OCT.	I 10	5/6 8.0	5/6 9.5			3/8 1.2	6.8		25.5	6.1	19.4	32	
	II 10	1/2 4.8	1/2 5.7			5/8 2.4	6.8		19.7	9.1	10.6	18	
	III 11	1/6 1.7	1/6 2.1	1/6 0.8		7/8 4.2	7.5	1/6 0.4	16.7	5.7	11.0	18	68
NOV.	I 10			1/2 1.4	1/6 1.0	1 3.2	4.1	1/2 0.8	10.5	0.0	10.5	18	
	II 10			5/6 2.5	1/2 0.4	4.0	4.1	5/6 1.4	12.4	5.0	7.4	12	
	III 10			1 3.1	5/6 0.8	4.6	4.1	1.9	14.5	0.0	14.5	24	54
DEC.	I 10			2.4	0.7	3.4	2.7	1.5	10.7	0.0	10.7	18	
	II 10			2.6	0.8	1 2.4	2.7	1.6	10.1	0.0	10.1	17	
	III 11			3.2	0.9	11/12 2.2	3.0	2.1	11.4	0.0	11.4	19	54
TOTAL	(36) 365	151.0	225.5	132.7	46.3	169.4	341.8	101.6	1,168.3	464.1	749.4	1,250	1,250

TABLE D-3-(2) IRRIGATION WATER REQUIREMENT IN EVERY A THIRD MONTH IN ACCORDANCE WITH THE PROPOSED CROPPING PATTERN

SHANGLA PAR

UNIT: mm

CROP		MAIZE	RICE	WHEAT	FODDERS	VEGETABLES	FRUITS	ONION	TOTAL CONSUMPTION	EFFECTIVE RAIN	WATER REQUIREMENT NET	WATER REQUIREMENT GROSS	MONTH
AREAL RATE		20 %	50 %	40 %	10 %	10 %	20 %	20 %					
MONTH	DAYS												
JAN.	I 10			4.9	1.0	1/12 1.4	3.1	2.3	12.7	0.0	12.7	21	
	II 10			5.6	1.2	2/12 1.1	3.1	2.7	13.7	0.0	13.7	23	
	III 11			6.6	1.4	2/12 0.8	3.4	3.3	15.5	76.5	0	0	44
FEB.	I 10			8.8	2.0	3/12 0.5	4.3	4.3	19.9	0.0	19.9	33	
	II 10			9.1	2.2	1/12 0.1	4.3	5.3	21.0	0.0	21.0	35	
	III 8			7.7	2.0		3.4	4.2	17.3	81.3	0	0	68
MAR.	I 10			14.6	3.8		6.3	7.8	32.5	18.3	14.2	24	
	II 10			15.1	3.9		6.3	7.8	33.1	77.3	0	0	
	III 11			16.4	4.1		6.9	8.5	35.9	13.0	22.9	38	62
APR.	I 10			21.6	5.1		10.5	10.1	47.3	0.0	47.3	79	
	II 10			17.2	4.4		10.5	8.8	40.9	23.6	17.3	29	
	III 10			11.9	3.7		10.5	8.8	34.9	10.6	24.3	41	149
MAY	I 10			1/6 9.1	1/6 3.9	1/10 0.3	15.5	5/6 9.9	38.7	14.8	23.9	40	
	II 10			1/2 5.2	1/2 2.2	1/10 0.9	15.5	1/2 5.9	29.7	0.0	29.7	50	
	III 11			1/6 1.7	1/6 0.8	9/? 8.0	17.1	1/6 2.2	29.8	15.2	14.6	24	114
JUN.	I 10	1/6 1.1	1/6 7.7			2/10 3.9	19.3		32.0	0.0	32.0	53	
	II 10	1/? 3.4	1/2 23.1			4/10 6.4	19.3		52.2	17.3	34.9	58	
	III 10	2/6 6.2	5/6 19.3			8.2	19.3		53.0	9.2	43.8	73	184
JUL.	I 10	6.7	36.9				6.9	15.4	65.9	19.3	46.6	78	
	II 10	7.9	36.9				6.2	15.4	66.4	11.2	55.2	92	
	III 11	10.0	40.6				7.7	17.0	75.3	30.8	44.5	74	244
AUG.	I 10	8.7	31.4				5.3	13.1	58.5	0.0	58.5	98	
	II 10	9.3	31.4				4.6	13.1	58.4	10.2	48.2	80	
	III 11	10.9	39.2			2/6	4.4	14.4	68.9	39.6	29.3	49	227
SEP.	I 10	8.9	31.3			5/8	2.5	11.0	53.7	17.3	36.4	61	
	II 10	8.9	29.5			3/8	1.5	11.0	50.9	52.4	0	0	
	III 10	8.7	26.5			1/6	0.2	11.0	46.4	0.0	46.4	77	138
OCT.	I 10	2/6 5.3	5/6 15.8			1/6	0.6	6.8	28.5	43.3	0	0	
	II 10	1/? 3.2	1/2 9.5			2/6	1.2	6.8	20.7	0.0	20.7	35	
	III 11	1/6 1.1	1/6 3.5	1/6 1.0		2/8	2.1	7.5	15.6	33.9	0	0	35
NOV.	I 10			1/2 1.8	1/6 1.0		1.6	4.1	1/2 0.8	9.3	0.0	9.3	15
	II 10			2/6 3.3	1/? 0.4		2.0	4.1	5/6 1.4	11.2	0.0	11.2	19
	III 10			4.1	2/6 0.8		2.3	4.1	1.9	13.2	0.0	13.2	22	56
DEC.	I 10			3.2	0.7		1.7	2.7	1.5	9.8	0.0	9.8	16	
	II 10			3.5	0.8		1.2	2.7	1.6	9.8	32.9	0	0	
	III 11			4.3	0.9	1/12	1.1	3.0	2.1	11.4	0.0	11.4	19	35
TOTAL	(36) 365	100.3	382.6	176.7	46.3		84.7	341.8	101.6	1,234.0	648.0	813.0	1,356	1,356

TABLE D-3-(3) IRRIGATION WATER REQUIREMENT IN EVERY A THIRD MONTH IN ACCORDANCE WITH THE PROPOSED CROPPING PATTERN

BUNER

UNIT: mm

CROP		MAIZE	WHEAT	FODDERS	VEGETABLES	FRUITS	SUGAR-CANE	TOTAL CONSUMPTION	EFFECTIVE RAIN	WATER REQUIREMENT		
AREAL RATE		40 %	30 %	10 %	20 %	20 %	20 %			NET	GROSS	MONTH
MONTH	DAYS											
JAN.	I 10		3.7	1.0	9/12 2.8	3.1	4.5	15.1	0.0	15.1	25	
	II 10		4.2	1.2	7/12 2.2	3.1	4.5	15.2	0.0	15.2	25	
	III 11		5.0	1.4	5/12 1.6	3.4	5.0	16.4	56.0	0.0	0	50
FEB.	I 10		6.6	2.0	3/12 1.0	4.3	4.8	18.7	0.0	18.7	31	
	II 10		6.8	2.2	1/12 0.2	4.3	4.8	18.3	0.0	18.3	31	
	III 8		5.8	2.0		3.4	3.8	15.0	46.4	0.0	0	62
MAR.	I 10		11.0	3.8		6.3	5.2	26.3	10.2	16.1	27	
	II 10		11.3	3.9		6.3	5.2	26.7	43.3	0.0	0	
	III 11		12.3	4.1		6.9	5.7	29.0	7.3	21.7	36	63
APR.	I 10		16.2	5.1		10.5	4.4	36.2	0.0	36.2	60	
	II 10		12.9	4.4		10.5	4.4	32.2	34.2	0.0	0	
	III 10		8.9	3.7		10.5	4.4	27.5	15.4	12.1	20	80
MAY	I 10		5/6 6.8	5/6 3.9	1/10 0.6	15.5	11.1	37.9	13.8	24.1	40	
	II 10		1/2 3.9	1/2 2.2	3/10 1.8	15.5	11.1	34.5	0.0	34.5	58	
	III 11		1/6 1.3	1/6 0.8	1/2 16.0	17.1	12.2	47.4	14.2	33.2	55	153
JUN.	I 10	1/6 2.2			7/10 7.8	19.3	16.0	45.3	0.0	45.3	76	
	II 10	1/2 6.8			9/10 12.8	19.3	16.0	54.9	17.2	37.7	63	
	III 10	5/6 12.4			16.4	19.3	16.0	64.1	9.2	54.9	92	231
JUL.	I 10	1 13.4			13.8	15.4	14.7	57.3	26.2	31.1	52	
	II 10	15.8			12.4	15.4	14.7	58.3	15.2	43.1	72	
	III 11	20.0			15.4	17.0	16.2	68.6	41.8	26.8	45	169
AUG.	I 10	17.4			10.6	13.1	14.3	55.4	0.0	55.4	92	
	II 10	18.6			9.2	13.1	14.3	55.2	15.6	39.6	66	
	III 11	21.8			7/8 8.8	14.4	15.7	60.7	60.4	0.3	1	159
SEP.	I 10	17.8			5/8 5.0	11.0	12.5	46.3	12.9	33.4	56	
	II 10	17.8			3/8 3.0	11.0	12.5	44.3	39.1	5.2	9	
	III 10	17.4			1/8 0.4	11.0	12.5	41.3	0.0	41.3	69	134
OCT.	I 10	5/6 10.6			3/8 1.2	6.8	9.5	28.1	14.8	13.3	22	
	II 10	1/2 6.4			5/8 2.4	6.8	9.5	25.1	0.0	25.1	42	
	III 11	1/6 2.2	1/6 0.8		7/8 4.2	7.5	10.5	25.2	11.6	13.6	23	87
NOV.	I 10		1/2 1.4	1/6 1.0	1 3.2	4.1	6.0	15.7	0.0	15.7	26	
	II 10		5/6 2.5	1/2 0.4	4.0	4.1	6.0	17.0	8.8	8.2	14	
	III 10		1 3.1	5/6 0.8	4.6	4.1	6.0	18.6	8.8	9.8	16	56
DEC.	I 10		2.4	0.7	3.4	2.7	4.0	13.2	0.0	13.2	22	
	II 10		2.6	0.8	1 2.4	2.7	4.0	12.5	25.6	0.0	0	
	III 11		3.2	0.9	1 1/12 2.2	3.0	4.0	13.3	0.0	13.3	22	44
TOTAL	(36) 365	200.6	132.7	46.3	169.4	341.8	326.0	1,216.8	548.0	771.5	1,288	1,288

TABLE D-4 IRRIGATION WATER REQUIREMENT AT IMPROVED TRADITIONAL IRRIGATION SYSTEM AREA IN SWAT, SHANGLA PAR & BUNER

UNIT: mm

CROP		WHEAT	RICE	TOTAL CONSUMP-TION	SWAT				SHANGLA PAR				BUNER			
					EFFEC-TIVE	WATER REQUIREMENT			EFFEC-TIVE	WATER REQUIREMENT			EFFEC-TIVE	WATER REQUIREMENT		
AREAL RATE		100 %	100 %		RAIN	NET	GROSS	MONTH	RAIN	NET	GROSS	MONTH	RAIN	NET	GROSS	MONTH
MONTH	DAYS															
JAN.	I 10	12.3		12.3	19.3	0.0	0		0.0	12.3	21		0.0	12.3	21	
	II 10	14.0		14.0	0.0	14.0	23		0.0	14.0	23		0.0	14.0	23	
	III 11	16.5		16.5	32.5	0.0	0	23	76.5	0.0	0	44	56.0	0.0	0	44
FEB.	I 10	22.0		22.0	0.0	22.0	37		0.0	22.0	37		0.0	22.0	37	
	II 10	22.8		22.8	0.0	22.8	38		0.0	22.8	38		0.0	22.8	38	
	III 8	19.3		19.3	0.0	19.3	32	107	81.3	0.0	0	75	46.4	0.0	0	75
MAR.	I 10	36.5		36.5	9.1	27.4	46		18.3	18.2	30		10.2	26.3	44	
	II 10	37.8		37.8	26.5	11.3	19		77.3	0.0	0		43.3	0.0	0	
	III 11	41.0		41.0	31.5	9.5	16	81	13.0	28.0	47	77	7.3	33.7	56	100
APR.	I 10	54.0		54.0	32.5	21.5	36		0.0	54.0	90		0.0	54.0	90	
	II 10	43.0		43.0	20.3	22.7	38		23.6	19.4	32		34.2	8.8	15	
	III 10	29.8		29.8	52.9	0.0	0	74	10.6	19.2	32	154	15.4	14.4	24	129
MAY	I 10	22.8		22.8	33.0	0.0	0		14.8	8.0	13		13.8	9.0	15	
	II 10	13.0		13.0	11.2	1.8	3		0.0	13.0	22		0.0	13.0	22	
	III 11	4.3		4.3	6.1	0.0	0	3	15.2	0.0	0	35	14.2	0.0	0	37
JUN.	I 10		15.4	15.4	0.0	15.4	26		0.0	15.4	26		0.0	15.4	26	
	II 10		46.2	46.2	10.2	36.0	60		17.3	28.9	48		17.2	29.0	48	
	III 10		38.6	38.6	6.1	32.5	54	140	9.2	29.4	49	123	9.2	29.4	49	123
JUL.	I 10		73.8	73.8	21.4	52.4	87		19.3	54.5	91		26.2	47.6	79	
	II 10		73.8	73.8	15.2	58.6	98		11.2	62.6	104		15.2	58.6	98	
	III 11		81.2	81.2	44.3	36.9	62	247	30.8	50.4	84	279	41.8	39.4	66	243
AUG.	I 10		62.8	62.8	13.2	49.6	83		0.0	62.8	105		0.0	62.8	105	
	II 10		62.8	62.8	0.0	62.8	105		10.2	52.6	88		15.6	47.2	79	
	III 11		78.4	78.4	48.8	29.6	49	237	39.6	38.8	65	258	60.4	18.0	30	214
SEP.	I 10		62.6	62.6	4.1	58.5	98		17.3	45.3	76		12.9	49.7	83	
	II 10		59.0	59.0	0.0	59.0	98		52.4	6.6	11		39.1	19.9	33	
	III 10		53.0	53.0	0.0	53.0	88	284	0.0	53.0	88	175	0.0	53.0	88	204
OCT.	I 10		31.6	31.6	6.1	25.5	43		43.3	0.0	0		14.8	16.8	28	
	II 10		19.0	19.0	9.1	9.9	17		0.0	19.0	32		0.0	19.0	32	
	III 11	2.5	7.0	9.5	5.7	3.8	6	66	33.9	0.0	0	32	11.6	0.0	0	60
NOV.	I 10	4.5		4.5	0.0	4.5	8		0.0	4.5	8		0.0	4.5	8	
	II 10	8.3		8.3	5.0	3.3	6		0.0	8.3	14		8.8	0.0	0	
	III 10	10.3		10.3	0.0	10.3	17	31	0.0	10.3	17	39	8.8	1.5	3	11
DEC.	I 10	8.0		8.0	0.0	8.0	13		0.0	8.0	13		0.0	8.0	13	
	II 10	8.8		8.8	0.0	8.8	15		32.9	0.0	0		25.6	0.0	0	
	III 11	10.8		10.8	0.0	10.8	18	46	0.0	10.8	18	31	0.0	10.8	18	31
TOTAL	(36) 365	442.3	765.2	1,207.5	464.1	801.5	1,339	1,339	648.0	792.1	1,322	1,322	548.0	760.9	1,271	1,271

Case Study on Irrigation and Hydel Power Schemes in Priority Project Area (SIRDP)

(1) The following three schemes have been examined on pre-feasibility study level whether dom construction plans are feasible or not for irrigation and hydel power generation.

- Sandai-Aloch Irrigation & Hydel Power Scheme
- Choga Irrigation & Hydel Power Scheme
- Chakesar Irrigation & Hydel Power Scheme

(2) The Year of 1970 (with annual rainfall: 828mm) has been selected for the hydrological design year in Shangla Par area since that year approximately corresponds to 1/5 year drought according to the probability analysis based on the 22 years' rainfall data (1963-1984) observed at Karora raingauge station. The run-off hydro-pattern of Barandu river is adopted in the respective Khwars in the SIRDP area since no thaw influences upon the river discharge in this area. The data are shown in Table A-3, A-4 and A-5 in Annex A.

(3) At Sandai, Choga and Chakesar proposed dam sites, the cross section survey has been carried out by 100m intervals in order to estimate the reservoir capacity and dam size on each site. Then, the H-V and H-A CURVES and dam sizes have been delineated according to the survey result on each site. The curves are shown in Figure D-2-(1) to D-2-(3), respectively.

(4) The planning of these dams for irrigation purpose has been made taking into account the points described in 6.2.1. Agricultural Infrastructure Plan of the Main Report.

(5) The reservoir's behavior trials have been examined in the following four cases in the above-mentioned 3 dam plans.

(Case-1) Dam plan with optimal reservoir capacity to carry out the irrigated double crop forming according to the proposed cropping pattern in the maximum irrigable area.

(Case-2) The same as Case-1 but in the suitable irrigable area.

(Case-3) The same as Case-1 but in the existing irrigable area.

(Case-4) No dam plan but improvement of the existing off-take and canal to carry out the irrigated faming in the existing irrigable area with the proposed cropping pattern for improved traditional irrigation system area. The results of the reservoir's behavior trials are shown in Table D-6-(1) to D-6-(12), and the Case-2 in Sandai-Aloch Scheme is illustrated in Figure D-3 for example.

(6) The relatively large size dam is required for the small irrigable area (small C.C.A.) due to the steep gradient (8% to 3%) of the river profile and a large quantity of sediments (400~700 cu.m/sq.km/year) which are the characteristic of the Khwars running down the bald watersheds.

(7) Since the turbines of micro hydel power are planned to be installed in the discharge conduit(s) of irrigation water in Case-1, 2 and 3, the power is generated corresponding to the discharge from dam to meet the irrigation demand which changes every 10 days through the year.

(8) In Case-4, the diverted water at the planned head regulator is conveyed to the hydel plant through feeder canal for power generation, and released to the river for irrigation through the hydel power plant.

(9) The result of case study on Irrigation and Hydel Power Scheme is shown in Table D-5.

(10) The plans in Case-4 have been selected as the most suitable plans in each scheme taking into account the project evaluation.

TABLE D-5 RESULT OF CASE STUDY ON IRRIGATION AND HYDEL POWER SCHEME

IRRIGATION & HYDEL POWER SCHEME			SANDAI - ALOCH				CHOGA				CHAKESAR			
CASE - STUDY			CASE-1	CASE-2	CASE-3	CASE-4	CASE-1	CASE-2	CASE-3	CASE-4	CASE-1	CASE-2	CASE-3	CASE-4
			(Existing)			(Existing)			(Existing)					(Existing)
Irrigable Area (ha)			352	315	285	352	340	270	170	170	550	420	300	110
Dam: Effective Storage		(MCM)	1.0	0.75	0.50	0.001	0.50	0.30	0.15	0.001	2.5	2.0	1.0	0.001
Height of Dam		(m)	45	43	40	-	46.5	44.5	43.0	-	40.5	39.0	35.0	-
Top Width		(m)	6	6	6	-	6	6	6	-	6	6	6	-
Length	Top	(m)	375	344	334	40	190	180	175	40	180	175	165	40
	Bottom	(m)	20	20	20	40	40	40	40	40	60	60	60	40
Slope	Up		3.0	3.0	3.0	-	3.0	3.0	3.0	-	3.0	3.0	3.0	-
	Down		2.5	2.5	2.5	-	2.5	2.5	2.5	-	2.5	2.5	2.5	-
Enbankment Volume		(1,000 m3)	824	698	591	-	567	501	460	-	480	439	344	-
Head Regulator: (L=40m, H=1.5m)		(PC.)	-	-	-	3	-	-	-	1	-	-	-	1
Hydel Plant:														
Generated output		(Kw)	60	60	45	-	60	45	30	-	99	79	49	7
Firm output		(Kw)	-	-	-	-	-	-	-	-	13	10	7.6	1.2
Annual Possible Power Gen.		(Mwh)	289	263	233	-	284	225	150	-	393	319	204	-
Available 130 days		(Mwh)	-	-	-	28	-	-	-	11	-	-	-	18
Canal:														
Construction of New canal		(km)	-	-	-	1.5	4	3	-	0.5	8	6	4	0.5
Improvement of Exist. off-take		(PC.)	35	32	29	35	17	17	17	17	11	11	11	11
Improvement of Exist. canal		(ha)	352	315	285	352	170	170	170	170	110	110	110	110
Land Acquisition for Dam & Reservoir		(ha)	15	14	13	-	11	10.3	10	-	23	22	17	-
Land Compensation for Canal		(km)	-	-	-	1.5	4	3	-	0.5	8	6	4	0.5
Relocation of Existing road		(km)	0.5	0.5	0.5	-	1	1	1	-	2.0	1.9	1.8	-

FIGURE D-2-(1) SANDAI DAM

H – V , H – A CURVES

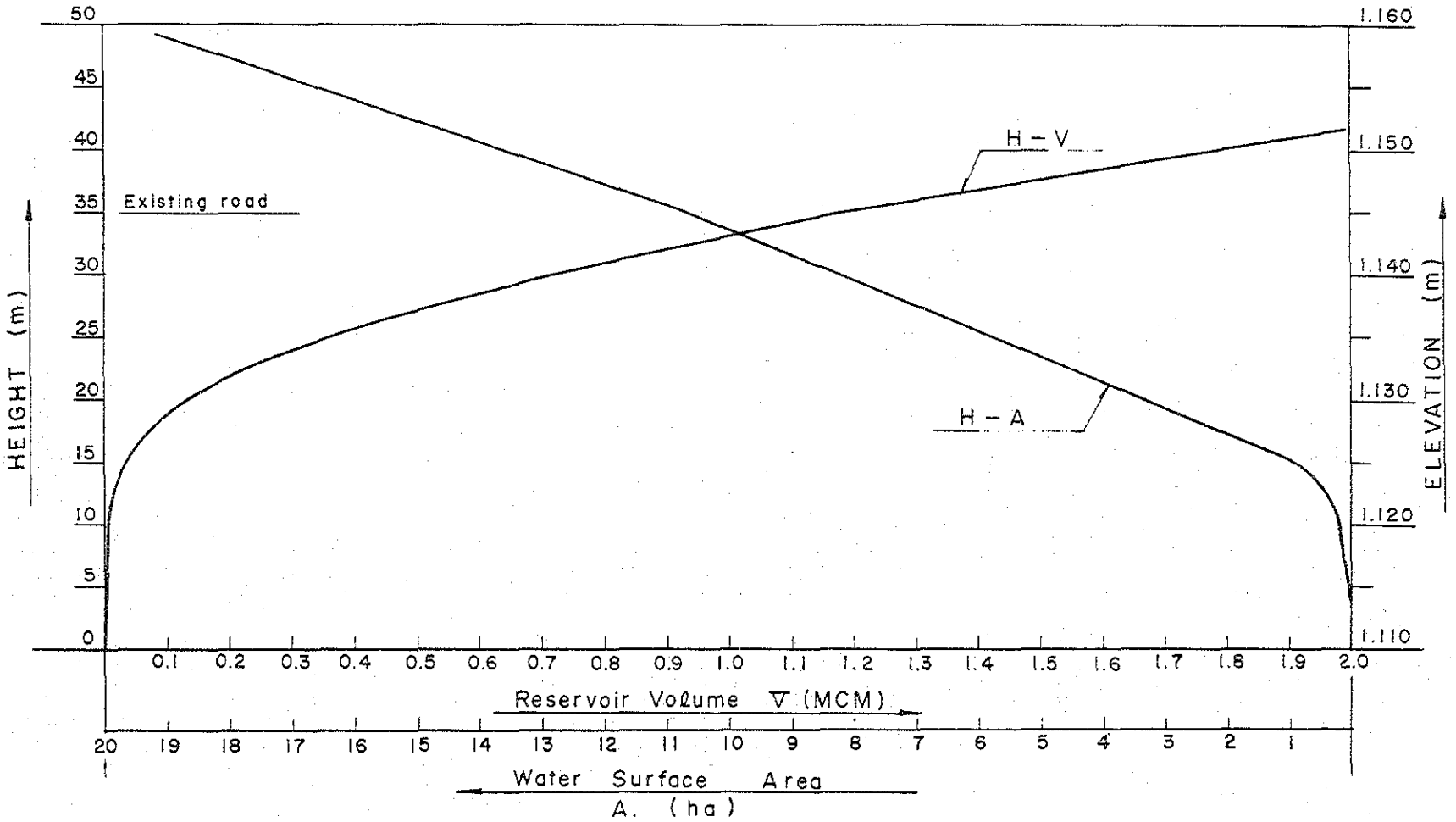

FIGURE D-2-(2) CHOGA DAM

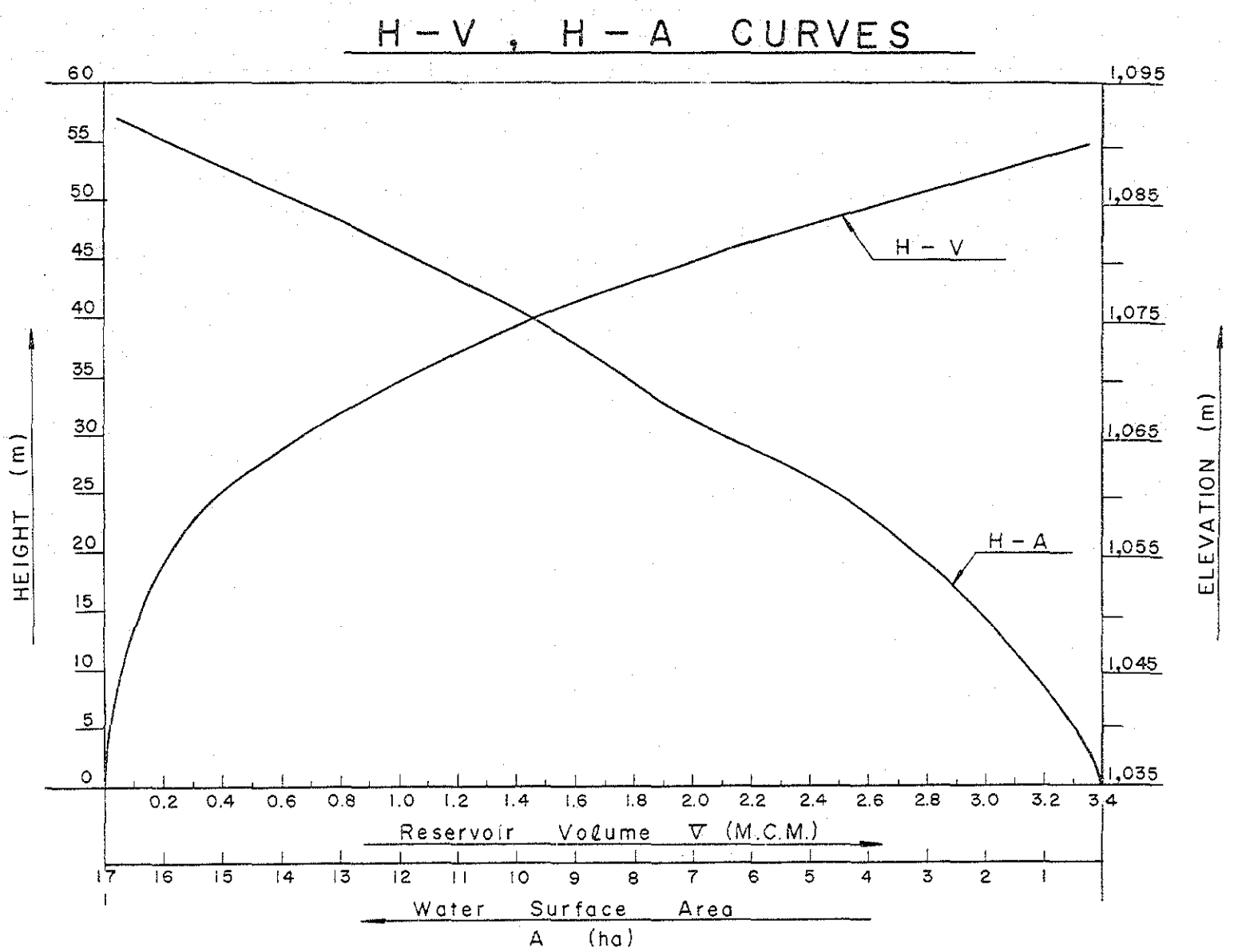

FIGURE D-2-(3) CHAKESAR DAM

H – V , H – A CURVES

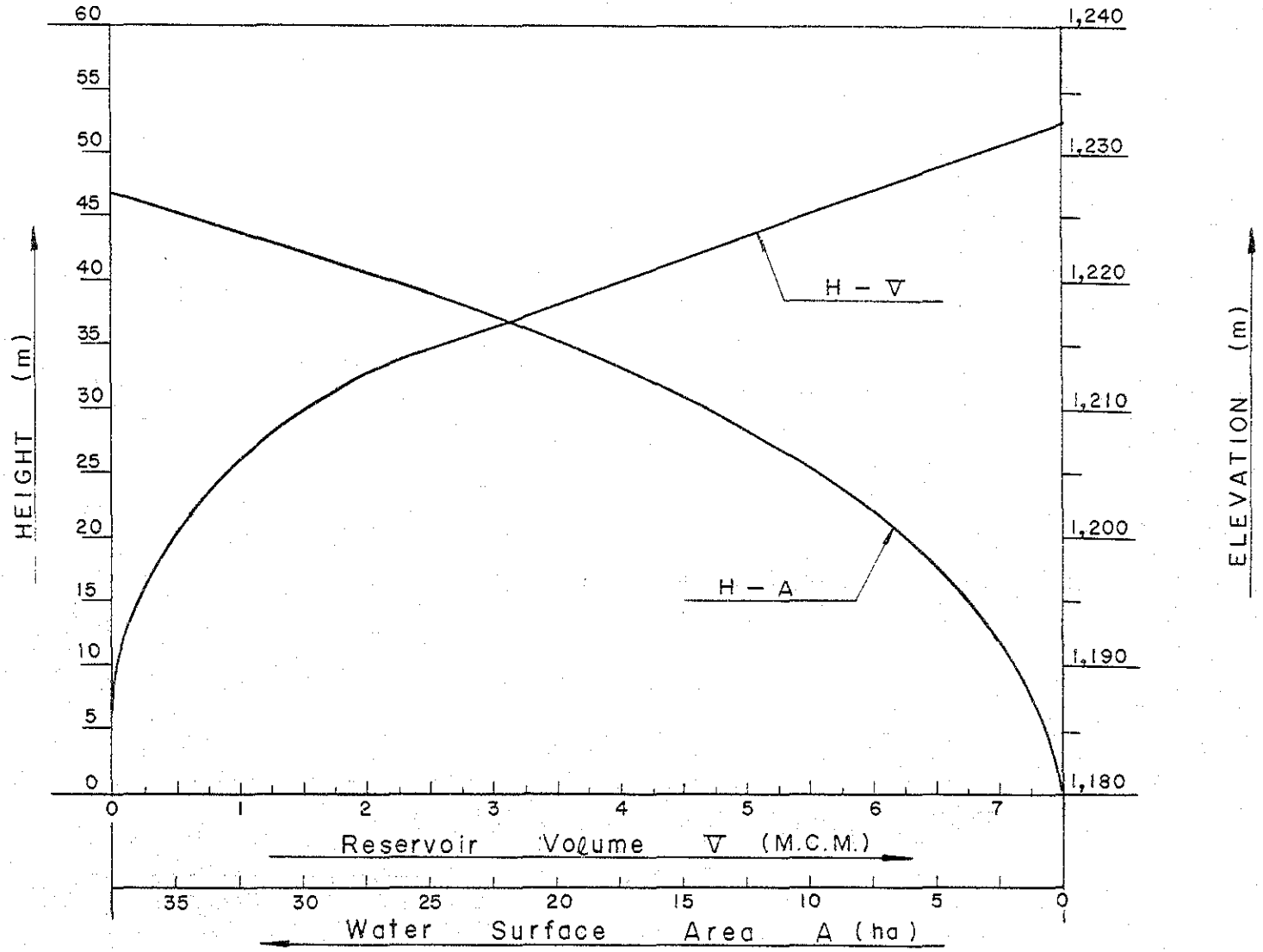

FIGURE D-3

BEHAVIOUR TRIAL AT SANDAI DAM

Case-2

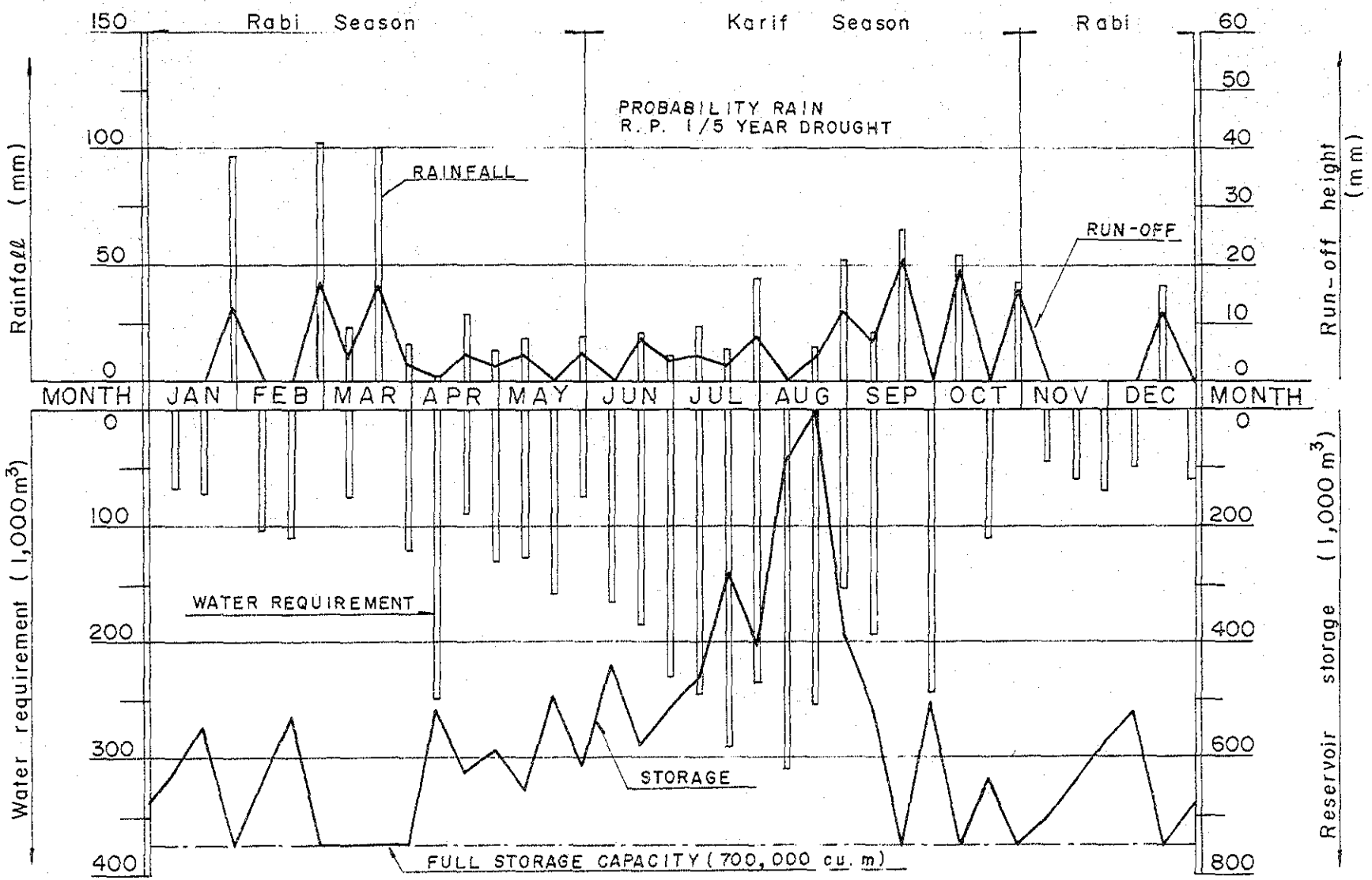

TABLE D-6-(1) SANDAI-ALOCH : Case - 1

RESERVOIR'S BEHAVIOUR TRIAL

PROJECT :SANDAI-1
E-STORAGE :1000.(TM3)
NWS-AREA :15.(HA)
WATERSHED :45.5(KM2)
IRRI-AREA :352.(HA)

Dam Height	: 45.0M	Full Capacity	: 2.08	MCM
Full Water Surface	: 42.0M	Effective Capacity	: 1.00	MCM
Sediment Height(50years)	: 35.5M	Irrigable Area	: 352	Ha

MON	TERM	RAIN	RUNOF	DEMAND	INTAK	STRAG	SPILL
		(MM)	(MM)	(ALL UNITS IN 1000M3)			
1	1	0.0	0.0	73	73	857	0
1	2	0.0	0.0	80	80	775	0
1	3	96.6	12.6	0	0	1000	362
SUB-T		96.6	12.6	154	154		362
2	1	0.0	0.0	116	116	882	0
2	2	0.0	0.0	123	123	757	0
2	3	101.6	17.3	0	0	1000	559
SUB-T		101.6	17.3	239	239		559
3	1	22.9	3.9	84	84	1000	93
3	2	100.6	17.1	0	0	1000	790
3	3	16.3	2.8	133	133	993	0
SUB-T		139.8	23.8	218	218		884
4	1	2.5	0.4	278	278	736	0
4	2	29.5	4.4	102	102	834	0
4	3	13.2	2.0	144	144	779	0
SUB-T		45.2	6.8	524	524		0
5	1	18.5	4.3	140	140	833	0
5	2	0.0	0.0	176	176	653	0
5	3	19.0	4.4	84	84	768	0
SUB-T		37.5	8.7	401	401		0
6	1	0.0	0.0	186	186	575	0
6	2	21.6	7.1	204	204	691	0
6	3	11.4	3.8	256	256	602	0
SUB-T		33.0	10.9	647	647		0
7	1	24.1	4.3	274	274	520	0
7	2	14.0	2.5	323	323	305	0
7	3	43.7	7.9	260	260	404	0
SUB-T		81.8	14.7	858	858		0
8	1	0.0	0.0	344	344	53	0
8	2	15.2	3.5	281	215	0	0
8	3	52.5	12.1	172	172	380	0
SUB-T		67.7	15.6	799	732		0
9	1	21.6	6.9	214	214	478	0
9	2	65.5	21.0	0	0	1000	439
9	3	0.0	0.0	271	271	724	0
SUB-T		87.1	27.9	485	485		439
10	1	54.1	19.5	0	0	1000	617
10	2	0.0	0.0	123	123	873	0
10	3	42.4	15.3	0	0	1000	572
SUB-T		96.5	34.8	123	123		1189
11	1	0.0	0.0	52	52	945	0
11	2	0.0	0.0	66	66	876	0
11	3	0.0	0.0	77	77	797	0
SUB-T		0.0	0.0	197	197		0
12	1	0.0	0.0	56	56	740	0
12	2	41.1	11.5	0	0	1000	268
12	3	0.0	0.0	66	66	932	0
SUB-T		41.1	11.5	123	123		268
TOTAL		827.9	184.6	4773	4706		3703

TABLE D-6-(2) SANDAI-ALOCH : Case - 2

RESERVOIR'S BEHAVIOUR TRIAL

PROJECT :SANDAI-2
E-STORAGE :750.(TM3)
NWS-AREA :14.(HA)
WATERSHED :45.4(KM2)
IRRI-AREA :515.(HA)

Dam Height	:	43.0	M	Full Capacity	:	1.83 MCM
Full Water Surface	:	40.0	M	Effective Capacity	:	0.75 MCM
Sediment Height(50years)	:	35.5	M	Irrigable Area	:	315 Ha

MON	TERM	RAIN	RUNOF	DEMAND	INTAK	STRAG	SPILL
		(MM)	(MM)	(ALL UNITS IN 1000M3)			
1	1	0.0	0.0	66	66	622	0
1	2	0.0	0.0	72	72	548	0
1	3	96.6	12.6	0	0	750	383
SUB-T		96.6	12.6	138	138		383
2	1	0.0	0.0	103	103	644	0
2	2	0.0	0.0	110	110	533	0
2	3	101.6	17.3	0	0	750	581
SUB-T		101.6	17.3	214	214		581
3	1	22.9	3.9	75	75	750	102
3	2	100.6	17.1	0	0	750	738
3	3	16.3	2.8	119	119	750	7
SUB-T		139.8	23.8	195	195		897
4	1	2.5	0.4	248	248	515	0
4	2	29.5	4.4	91	91	624	0
4	3	13.2	2.0	129	129	584	0
SUB-T		45.2	6.8	469	469		0
5	1	18.5	4.3	126	126	652	0
5	2	0.0	0.0	157	157	491	0
5	3	19.0	4.4	75	75	614	0
SUB-T		37.5	8.7	359	359		0
6	1	0.0	0.0	166	166	441	0
6	2	21.6	7.1	182	182	578	0
6	3	11.4	3.8	229	229	516	0
SUB-T		33.0	10.9	579	579		0
7	1	24.1	4.3	245	245	463	0
7	2	14.0	2.5	289	289	282	0
7	3	43.7	7.9	233	233	407	0
SUB-T		81.8	14.7	768	768		0
8	1	0.0	0.0	308	308	94	0
8	2	15.2	3.5	252	252	0	0
8	3	52.5	12.1	154	154	396	0
SUB-T		67.7	15.6	715	715		0
9	1	21.6	6.9	192	192	517	0
9	2	65.5	21.0	0	0	750	726
9	3	0.0	0.0	242	242	503	0
SUB-T		87.1	27.9	434	434		726
10	1	54.1	19.5	0	0	750	643
10	2	0.0	0.0	110	110	636	0
10	3	42.4	15.3	0	0	750	583
SUB-T		96.5	34.8	110	110		1227
11	1	0.0	0.0	47	47	701	0
11	2	0.0	0.0	59	59	639	0
11	3	0.0	0.0	69	69	568	0
SUB-T		0.0	0.0	176	176		0
12	1	0.0	0.0	50	50	517	0
12	2	41.1	11.5	0	0	750	294
12	3	0.0	0.0	59	59	689	0
SUB-T		41.1	11.5	110	110		294
TOTAL		827.9	184.6	4271	4271		4110

TABLE D-6-(3) SANDAI-ALOCH : Case - 3

RESERVOIR'S BEHAVIOUR TRIAL

PROJECT :SANDAI-3
E-STORAGE :500.(TM3)
NWS-AREA :13.(HA)
WATERSHED :45.4(KM2)
IRRI-AREA :285.(HA)

Dam Height	:	40.0	M	Full Capacity	:	1.58	MCM
Full Water Surface	:	37.0	M	Effective Capacity	:	0.50	MCM
Sediment Height(50years)	:	35.5	M	Irrigable Area	:	285	Ha

MON	TERM	RAIN	RUNOF	DEMAND	INTAK	STRAG	SPILL
		(MM)	(MM)	(ALL UNITS IN 1000M3)			
1	1	0.0	0.0	59	59	384	0
1	2	0.0	0.0	65	65	317	0
1	3	96.6	12.6	0	0	500	401
SUB-T		96.6	12.6	125	125		401
2	1	0.0	0.0	94	94	404	0
2	2	0.0	0.0	99	99	303	0
2	3	101.6	17.3	0	0	500	601
SUB-T		101.6	17.3	193	193		601
3	1	22.9	5.9	68	68	500	109
3	2	100.6	17.1	0	0	500	787
3	3	16.3	2.8	108	108	500	18
SUB-T		139.8	23.8	176	176		914
4	1	2.5	0.4	225	225	289	0
4	2	29.5	4.4	82	82	407	0
4	3	13.2	2.0	116	116	379	0
SUB-T		45.2	6.8	424	424		0
5	1	16.5	4.3	114	114	459	0
5	2	0.0	0.0	142	142	314	0
5	3	19.0	4.4	68	68	444	0
SUB-T		37.5	8.7	324	324		0
6	1	0.0	0.0	151	151	287	0
6	2	21.6	7.1	165	165	442	0
6	3	11.4	3.8	208	208	402	0
SUB-T		33.0	10.9	524	524		0
7	1	24.1	4.3	222	222	372	0
7	2	14.0	2.5	262	262	228	0
7	3	43.7	7.9	210	210	367	0
SUB-T		81.8	14.7	695	695		0
8	1	0.0	0.0	279	279	83	0
8	2	15.2	3.5	228	228	11	0
8	3	52.5	12.1	139	139	422	0
SUB-T		67.7	15.6	646	646		0
9	1	21.6	6.9	173	173	500	61
9	2	65.5	21.0	0	0	500	958
9	3	0.0	0.0	219	219	277	0
SUB-T		87.1	27.9	393	393		1019
10	1	54.1	19.5	0	0	500	666
10	2	0.0	0.0	99	99	397	0
10	3	42.4	15.3	0	0	500	594
SUB-T		96.5	34.8	99	99		1261
11	1	0.0	0.0	42	42	455	0
11	2	0.0	0.0	54	54	400	0
11	3	0.0	0.0	62	62	335	0
SUB-T		0.0	0.0	159	159		0
12	1	0.0	0.0	45	45	289	0
12	2	41.1	11.5	0	0	500	316
12	3	0.0	0.0	54	54	444	0
SUB-T		41.1	11.5	99	99		316
TOTAL		827.9	184.6	3864	3864		4514

TABLE D-6-(4) **SANDAI-ALOCH : Case - 4**

RESERVOIR'S BEHAVIOUR TRIAL

PROJECT :SANDAI-4
E-STORAGE :1.(TM3)
NWS-AREA :1.(HA)
WATERSHED :45.4(KM2)
IRRI-AREA :352.(HA)

Head Regulator
Weir Length : 40.0 M
Weir Height : 1.5 M

Irrigable Area : 352 Ha

MON	TERM	RAIN	RUNOF	DEMAND	INTAK	STRAG	SPILL
		(MM)	(MM)	(ALL UNITS IN 1000M3)			
1	1	0.0	0.0	73	0	0	0
1	2	0.0	0.0	80	0	0	0
1	3	96.6	12.6	0	0	1	571
SUB-T		96.6	12.6	154	0		571
2	1	0.0	0.0	116	1	0	0
2	2	0.0	0.0	123	0	0	0
2	3	101.6	17.3	0	0	1	785
SUB-T		101.6	17.3	239	1		785
3	1	22.9	3.9	84	84	1	92
3	2	100.6	17.1	0	0	1	777
3	3	16.3	2.8	133	128	0	0
SUB-T		139.8	23.8	218	212		869
4	1	2.5	0.4	278	19	0	0
4	2	29.5	4.4	102	102	1	96
4	3	13.2	2.0	144	91	0	0
SUB-T		45.2	6.8	524	213		96
5	1	18.5	4.3	140	140	1	53
5	2	0.0	0.0	176	1	0	0
5	3	19.0	4.4	84	84	1	114
SUB-T		37.5	8.7	401	226		167
6	1	0.0	0.0	186	1	0	0
6	2	21.6	7.1	204	204	1	117
6	3	11.4	3.8	256	173	0	0
SUB-T		33.0	10.9	647	378		117
7	1	24.1	4.3	274	195	0	0
7	2	14.0	2.5	323	113	0	0
7	3	43.7	7.9	260	260	1	97
SUB-T		81.8	14.7	858	569		97
8	1	0.0	0.0	344	1	0	0
8	2	15.2	3.5	281	159	0	0
8	3	52.5	12.1	172	172	1	376
SUB-T		67.7	15.6	799	332		376
9	1	21.6	6.9	214	214	1	98
9	2	65.5	21.0	0	0	1	953
9	3	0.0	0.0	271	1	0	0
SUB-T		87.1	27.9	485	215		1052
10	1	54.1	19.5	0	0	1	884
10	2	0.0	0.0	123	1	0	0
10	3	42.4	15.3	0	0	1	693
SUB-T		96.5	34.8	123	1		1578
11	1	0.0	0.0	52	1	0	0
11	2	0.0	0.0	66	0	0	0
11	3	0.0	0.0	77	0	0	0
SUB-T		0.0	0.0	197	1		0
12	1	0.0	0.0	56	0	0	0
12	2	41.1	11.5	0	0	1	521
12	3	0.0	0.0	66	1	0	0
SUB-T		41.1	11.5	123	1		521
TOTAL		927.9	184.6	4775	2152		6233

TABLE D-6-(5)

CHOGA : Case - 1

RESERVOIR'S BEHAVIOUR TRIAL

PROJECT :CHOGA-1
E-STORAGE :500.(TM3)
NWS-AREA :11.(HA)
WATERSHED :55.8(KM2)
IRRI-AREA :340.(HA)

Dam Height	: 46.5 M	Full Capacity	:	1.83	MCM
Full Water Surface	: 43.5 M	Effective Capacity	:	0.50	MCM
Sediment Height(50years)	: 38.5 M	Irrigable Area	:	340	Ha

MON	TERM	RAIN	RUNOF	DEMAND	INTAK	STRAG	SPILL
		(MM)	(MM)	(ALL UNITS IN 1000M3)			
1	1	0.0	0.0	71	71	362	0
1	2	0.0	0.0	78	78	283	0
1	3	96.6	12.6	0	0	500	496
SUB-T		96.6	12.6	149	149		496
2	1	0.0	0.0	112	112	386	0
2	2	0.0	0.0	119	119	266	0
2	3	101.6	17.3	0	0	500	742
SUB-T		101.6	17.3	231	231		742
3	1	22.9	3.9	81	81	500	136
3	2	100.6	17.1	0	0	500	963
3	3	16.3	2.8	129	129	500	26
SUB-T		139.8	23.8	210	210		1126
4	1	2.5	0.4	268	268	250	0
4	2	29.5	4.4	98	98	398	0
4	3	13.2	2.0	139	139	368	0
SUB-T		45.2	6.8	506	506		0
5	1	18.5	4.3	136	136	472	0
5	2	0.0	0.0	170	170	299	0
5	3	19.0	4.4	81	81	462	0
SUB-T		37.5	8.7	387	387		0
6	1	0.0	0.0	180	180	277	0
6	2	21.6	7.1	197	197	474	0
6	3	11.4	3.8	248	248	434	0
SUB-T		33.0	10.9	625	625		0
7	1	24.1	4.3	265	265	407	0
7	2	14.0	2.5	312	312	230	0
7	3	43.7	7.9	251	251	419	0
SUB-T		81.8	14.7	829	829		0
8	1	0.0	0.0	333	333	82	0
8	2	15.2	3.5	272	272	2	0
8	3	52.5	12.1	166	166	500	13
SUB-T		67.7	15.6	771	771		13
9	1	21.6	6.9	207	207	500	177
9	2	65.5	21.0	0	0	500	1176
9	3	0.0	0.0	261	261	235	0
SUB-T		87.1	27.9	469	469		1353
10	1	54.1	19.5	0	0	500	826
10	2	0.0	0.0	119	119	378	0
10	3	42.4	15.3	0	0	500	734
SUB-T		96.5	34.8	119	119		1561
11	1	0.0	0.0	51	51	447	0
11	2	0.0	0.0	64	64	381	0
11	3	0.0	0.0	74	74	385	0
SUB-T		0.0	0.0	190	190		0
12	1	0.0	0.0	54	54	250	0
12	2	41.1	11.5	0	0	500	396
12	3	0.0	0.0	64	64	434	0
SUB-T		41.1	11.5	119	119		396
TOTAL		827.9	184.6	4610	4610		5689

TABLE D-6-(6)

CHOGA : Case - 2

RESERVOIR'S BEHAVIOUR TRIAL

PROJECT :CHOGA-2
E-STORAGE :300.(TM3)
NWB-AREA :10.3(HA)
WATERSHED :55.8(KM2)
IRRI-AREA :270.(HA)

Dam Height	:	44.5	M	Full Capacity	:	1.63	MCM
Full Water Surface	:	41.5	M	Effective Capacity	:	0.30	MCM
Sediment Height(50years)	:	38.5	M	Irrigable Area	:	270	Ha

MON	TERM	RAIN	RUNOF	DEMAND	INTAK	STRAG	SPILL
		(MM)	(MM)	(ALL UNITS IN 1000M3)			
1	1	0.0	0.0	56	56	190	0
1	2	0.0	0.0	62	62	127	0
1	3	96.6	12.6	0	0	300	540
SUB-T		96.6	12.6	118	118		540
2	1	0.0	0.0	89	89	209	0
2	2	0.0	0.0	94	94	114	0
2	3	101.6	17.3	0	0	300	789
SUB-T		101.6	17.3	183	183		789
3	1	22.9	3.9	64	64	300	153
3	2	100.6	17.1	0	0	300	962
3	3	16.3	2.8	102	102	300	53
SUB-T		139.8	23.8	167	167		1169
4	1	2.5	0.4	213	213	106	0
4	2	29.5	4.4	78	78	273	0
4	3	13.2	2.0	110	110	273	0
SUB-T		45.2	6.8	402	402		0
5	1	18.5	4.3	108	108	300	104
5	2	0.0	0.0	135	135	162	0
5	3	19.0	4.4	64	64	300	42
SUB-T		37.5	8.7	307	307		147
6	1	0.0	0.0	143	143	152	0
6	2	21.6	7.1	156	156	300	89
6	3	11.4	3.8	197	197	300	11
SUB-T		33.0	10.9	496	496		101
7	1	24.1	4.5	210	210	300	27
7	2	14.0	2.5	248	248	187	0
7	3	43.7	7.9	199	199	300	128
SUB-T		81.8	14.7	658	658		155
8	1	0.0	0.0	264	264	31	0
8	2	15.2	3.5	216	216	0	0
8	3	52.5	12.1	132	132	300	252
SUB-T		67.7	15.6	612	612		252
9	1	21.6	6.9	164	164	300	219
9	2	65.5	21.0	0	0	300	1175
9	3	0.0	0.0	207	207	89	0
SUB-T		87.1	27.9	372	372		1395
10	1	54.1	19.5	0	0	300	880
10	2	0.0	0.0	94	94	206	0
10	3	42.4	15.3	0	0	300	758
SUB-T		96.5	34.8	94	94		1639
11	1	0.0	0.0	40	40	258	0
11	2	0.0	0.0	51	51	205	0
11	3	0.0	0.0	59	59	145	0
SUB-T		0.0	0.0	151	151		0
12	1	0.0	0.0	43	43	101	0
12	2	41.1	11.5	0	0	300	446
12	3	0.0	0.0	51	51	247	0
SUB-T		41.1	11.5	94	94		446
TOTAL		827.9	184.6	3661	3661		6638

TABLE D-6-(7)

CHOGA : Case - 3

RESERVOIR'S BEHAVIOUR TRIAL

PROJECT :CHOGA-3
E-STORAGE :150.(TM3)
NWS-AREA :10.(HA)
WATERSHED :55.8(KM2)
IRRI-AREA :170.(HA)

Dam Height	:	43.0	M	Full Capacity	:	1.48	MCM
Full Water Surface	:	40.0	M	Effective Capacity	:	0.15	MCM
Sediment Height(50years)	:	38.5	M	Irrigable Area	:	170	Ha

MON	TERM	RAIN	RUNOF	DEMAND	INTAK	STRAG	SPILL
		(MM)	(MM)	(ALL UNITS IN 1000M3)			
1	1	0.0	0.0	35	35	80	0
1	2	0.0	0.0	39	39	40	0
1	3	96.6	12.6	0	0	150	602
SUB-T		96.6	12.6	74	74		602
2	1	0.0	0.0	56	56	92	0
2	2	0.0	0.0	59	59	32	0
2	3	101.6	17.3	0	0	150	857
SUB-T		101.6	17.3	115	115		857
3	1	22.9	3.9	40	40	150	177
3	2	100.6	17.1	0	0	150	962
3	3	16.3	2.8	64	64	150	91
SUB-T		139.8	23.8	105	105		1231
4	1	2.5	0.4	134	134	35	0
4	2	29.5	4.4	49	49	150	81
4	3	13.2	2.0	69	69	150	40
SUB-T		45.2	6.8	253	253		122
5	1	18.5	4.3	68	68	150	171
5	2	0.0	0.0	85	85	62	0
5	3	19.0	4.4	40	40	150	116
SUB-T		37.5	8.7	193	193		288
6	1	0.0	0.0	90	90	55	0
6	2	21.6	7.1	98	98	150	201
6	3	11.4	3.8	124	124	150	84
SUB-T		33.0	10.9	312	312		285
7	1	24.1	4.3	132	132	150	105
7	2	14.0	2.5	156	156	130	0
7	3	43.7	7.9	125	125	150	294
SUB-T		81.8	14.7	414	414		400
8	1	0.0	0.0	166	150	0	0
8	2	15.2	3.5	136	136	57	0
8	3	52.5	12.1	83	83	150	500
SUB-T		67.7	15.6	385	369		500
9	1	21.6	6.9	103	103	150	280
9	2	65.5	21.0	0	0	150	1175
9	3	0.0	0.0	130	130	16	0
SUB-T		87.1	27.9	234	234		1456
10	1	54.1	19.5	0	0	150	957
10	2	0.0	0.0	59	59	88	0
10	3	42.4	15.3	0	0	150	793
SUB-T		96.5	34.8	59	59		1751
11	1	0.0	0.0	25	25	123	0
11	2	0.0	0.0	32	32	89	0
11	3	0.0	0.0	37	37	51	0
SUB-T		0.0	0.0	95	95		0
12	1	0.0	0.0	27	27	23	0
12	2	41.1	11.5	0	0	150	518
12	3	0.0	0.0	32	32	117	0
SUB-T		41.1	11.5	59	59		518
TOTAL		827.9	184.6	2305	2288		8014

TABLE D-6-(8)

CHOGA : Case - 4

RESERVOIR'S BEHAVIOUR TRIAL

PROJECT :CHOGA-4
E-STORAGE :1.(TM3)
NWS-AREA :1.(HA)
WATERSHED :55.8(KM2)
IRRI-AREA :170.(HA)

Head Regulator
Weir Length : 40.0 M
Weir Height : 1.5 M

Irrigable Area : 170 Ha

MON	TERM	RAIN	RUNOF	DEMAND	INTAK	STRAG	SPILL
		(MM)	(MM)	(ALL UNITS IN 1000M3)			
1	1	0.0	0.0	35	0	0	0
1	2	0.0	0.0	39	0	0	0
1	3	96.6	12.6	0	0	1	703
SUB-T		96.6	12.6	74	0		703
2	1	0.0	0.0	56	1	0	0
2	2	0.0	0.0	59	0	0	0
2	3	101.6	17.3	0	0	1	965
SUB-T		101.6	17.3	115	1		965
3	1	22.9	3.9	40	40	1	176
3	2	100.6	17.1	0	0	1	955
3	3	16.3	2.8	64	64	1	91
SUB-T		139.8	23.8	105	105		1223
4	1	2.5	0.4	134	23	0	0
4	2	29.5	4.4	49	49	1	195
4	3	13.2	2.0	69	69	1	41
SUB-T		45.2	6.8	253	142		237
5	1	18.5	4.3	68	68	1	171
5	2	0.0	0.0	85	1	0	0
5	3	19.0	4.4	40	40	1	203
SUB-T		37.5	8.7	193	109		375
6	1	0.0	0.0	90	1	0	0
6	2	21.6	7.1	98	98	1	296
6	3	11.4	3.8	124	124	1	87
SUB-T		33.0	10.9	312	223		384
7	1	24.1	4.3	132	132	1	107
7	2	14.0	2.5	156	140	0	0
7	3	43.7	7.9	125	125	1	314
SUB-T		81.8	14.7	414	399		421
8	1	0.0	0.0	166	1	0	0
8	2	15.2	3.5	136	136	1	58
8	3	52.5	12.1	83	83	1	592
SUB-T		67.7	15.6	385	220		650
9	1	21.6	6.9	103	103	1	281
9	2	65.5	21.0	0	0	1	1172
9	3	0.0	0.0	130	1	0	0
SUB-T		87.1	27.9	234	104		1453
10	1	54.1	19.5	0	0	1	1087
10	2	0.0	0.0	59	1	0	0
10	3	42.4	15.3	0	0	1	852
SUB-T		96.5	34.8	59	1		1940
11	1	0.0	0.0	25	1	0	0
11	2	0.0	0.0	32	0	0	0
11	3	0.0	0.0	37	0	0	0
SUB-T		0.0	0.0	95	1		0
12	1	0.0	0.0	27	0	0	0
12	2	41.1	11.5	0	0	1	641
12	3	0.0	0.0	32	1	0	0
SUB-T		41.1	11.5	59	1		641
TOTAL		827.9	184.6	2305	1309		8994

TABLE D-6-(9)

CHAKESAR : Case - 1

RESERVOIR'S BEHAVIOUR TRIAL

PROJECT :CHAK-1
E-STORAGE :2500.(TM3)
NWS-AREA :23.(HA)
WATERSHED :36.5(KM2)
IRRI-AREA :550.(HA)

Dam Height	:	40.5	M	Full Capacity	:	3.4	MCM
Full Water Surface	:	37.5	M	Effective Capacity	:	2.5	MCM
Sediment Height(50years)	:	24.5	M	Irrigable Area	:	550	Ha

MON	TERM	RAIN	RUNOF	DEMAND	INTAK	STRAG	SPILL
		(MM)	(MM)	(ALL UNITS IN 1000M3)			
1	1	0.0	0.0	115	115	1319	0
1	2	0.0	0.0	126	126	1191	0
1	3	96.6	12.6	0	0	1672	0
SUB-T		96.6	12.6	242	242		0
2	1	0.0	0.0	181	181	1488	0
2	2	0.0	0.0	192	192	1293	0
2	3	101.6	17.3	0	0	1946	0
SUB-T		101.6	17.3	374	374		0
3	1	22.9	3.9	132	132	1958	0
3	2	100.6	17.1	0	0	2500	101
3	3	16.3	2.8	209	209	2392	0
SUB-T		139.8	23.8	341	341		101
4	1	2.5	0.4	434	434	2074	0
4	2	29.5	4.4	159	159	2075	0
4	3	13.2	2.0	225	225	1920	0
SUB-T		45.2	6.8	819	819		0
5	1	18.5	4.3	220	220	1855	0
5	2	0.0	0.0	275	275	1575	0
5	3	19.0	4.4	132	132	1602	0
SUB-T		37.5	8.7	627	627		0
6	1	0.0	0.0	291	291	1300	0
6	2	21.6	7.1	319	319	1236	0
6	3	11.4	3.8	401	401	966	0
SUB-T		33.0	10.9	1012	1012		0
7	1	24.1	4.3	429	429	689	0
7	2	14.0	2.5	506	506	267	0
7	3	43.7	7.9	407	407	148	0
SUB-T		81.8	14.7	1342	1342		0
8	1	0.0	0.0	539	148	0	0
8	2	15.2	3.5	440	131	0	0
8	3	52.5	12.1	269	269	175	0
SUB-T		67.7	15.6	1248	548		0
9	1	21.6	6.9	335	335	90	0
9	2	65.5	21.0	0	0	865	0
9	3	0.0	0.0	423	423	436	0
SUB-T		87.1	27.9	759	759		0
10	1	54.1	19.5	0	0	1155	0
10	2	0.0	0.0	192	192	957	0
10	3	42.4	15.3	0	0	1520	0
SUB-T		96.5	34.8	192	192		0
11	1	0.0	0.0	82	82	1435	0
11	2	0.0	0.0	104	104	1328	0
11	3	0.0	0.0	121	121	1204	0
SUB-T		0.0	0.0	308	308		0
12	1	0.0	0.0	88	88	1115	0
12	2	41.1	11.5	0	0	1542	0
12	3	0.0	0.0	104	104	1436	0
SUB-T		41.1	11.5	192	192		0
TOTAL		827.9	184.6	7458	6758		101

TABLE D-6-(10) **CHAKESAR : Case - 2**

RESERVOIR'S BEHAVIOUR TRIAL

PROJECT :CHAK-2
E-STORAGE :2000.(TM3)
NWS-AREA :22.(HA)
WATERSHED :36.5(KM2)
IRRI-AREA :420.(HA)

Dam Height	:	39.0	M	Full Capacity	:	2.9	MCM
Full Water Surface	:	36.0	M	Effective Capacity	:	2.0	MCM
Sediment Height(50years)	:	24.5	M	Irrigable Area	:	420	Ha

MON	TERM	RAIN	RUNOF	DEMAND	INTAK	STRAG	SPILL
		(MM)	(MM)	(ALL UNITS IN 1000M3)			
1	1	0.0	0.0	88	88	1753	0
1	2	0.0	0.0	96	96	1655	0
1	3	96.6	12.6	0	0	2000	135
SUB-T		96.6	12.6	184	184		135
2	1	0.0	0.0	138	138	1859	0
2	2	0.0	0.0	147	147	1710	0
2	3	101.6	17.3	0	0	2000	362
SUB-T		101.6	17.3	285	285		362
3	1	22.9	3.9	100	100	2000	42
3	2	100.6	17.1	0	0	2000	642
3	3	16.3	2.8	159	159	1942	0
SUB-T		139.8	23.8	260	260		685
4	1	2.5	0.4	331	331	1677	0
4	2	29.5	4.4	121	121	1716	0
4	3	13.2	2.0	172	172	1614	0
SUB-T		45.2	6.8	625	625		0
5	1	18.5	4.3	168	168	1601	0
5	2	0.0	0.0	210	210	1386	0
5	3	19.0	4.4	100	100	1444	0
SUB-T		37.5	8.7	478	478		0
6	1	0.0	0.0	222	222	1212	0
6	2	21.6	7.1	243	243	1223	0
6	3	11.4	3.8	306	306	1049	0
SUB-T		33.0	10.9	772	772		0
7	1	24.1	4.3	327	327	873	0
7	2	14.0	2.5	386	386	571	0
7	3	43.7	7.9	310	310	548	0
SUB-T		81.8	14.7	1024	1024		0
8	1	0.0	0.0	411	411	128	0
8	2	15.2	3.5	336	260	0	0
8	3	52.5	12.1	205	205	238	0
SUB-T		67.7	15.6	953	877		0
9	1	21.6	6.9	256	256	233	0
9	2	65.5	21.0	0	0	1008	0
9	3	0.0	0.0	323	323	678	0
SUB-T		87.1	27.9	579	579		0
10	1	54.1	19.5	0	0	1397	0
10	2	0.0	0.0	147	147	1245	0
10	3	42.4	15.3	0	0	1308	0
SUB-T		96.5	34.8	147	147		0
11	1	0.0	0.0	63	63	1743	0
11	2	0.0	0.0	79	79	1660	0
11	3	0.0	0.0	92	92	1565	0
SUB-T		0.0	0.0	235	235		0
12	1	0.0	0.0	67	67	1497	0
12	2	41.1	11.5	0	0	1924	0
12	3	0.0	0.0	79	79	1843	0
SUB-T		41.1	11.5	147	147		0
TOTAL		827.9	184.6	5695	5619		1182

TABLE D-6-(11) CHAKESAR : Case - 3

RESERVOIR'S BEHAVIOUR TRIAL

PROJECT :CHAK-3
E-STORAGE :1000.(TM3)
NWS-AREA :17.(HA)
WATERSHED :36.5(KM2)
IRRI-AREA :300.(HA)

Dam Height	:	35.0	M	Full Capacity	:	1.9 MCM
Full Water Surface	:	32.0	M	Effective Capacity	:	1.0 MCM
Sediment Height(50years)	:	24.5	M	Irrigable Area	:	300 Ha

MON	TERM	RAIN	RUNOF	DEMAND	INTAK	STRAG	SPILL
		(MM)	(MM)	(ALL UNITS IN 1000M3)			
1	1	0.0	0.0	63	63	877	0
1	2	0.0	0.0	69	69	807	0
1	3	96.6	12.6	0	0	1000	282
SUB-T		96.6	12.6	132	132		282
2	1	0.0	0.0	99	99	899	0
2	2	0.0	0.0	105	105	792	0
2	3	101.6	17.3	0	0	1000	440
SUB-T		101.6	17.3	204	204		440
3	1	22.9	3.9	72	72	1000	71
3	2	100.6	17.1	0	0	1000	638
3	3	16.3	2.8	114	114	987	0
SUB-T		139.8	23.8	186	186		709
4	1	2.5	0.4	237	237	773	0
4	2	29.5	4.4	87	87	847	0
4	3	13.2	2.0	123	123	794	0
SUB-T		45.2	6.8	447	447		0
5	1	18.5	4.3	120	120	830	0
5	2	0.0	0.0	150	150	676	0
5	3	19.0	4.4	72	72	764	0
SUB-T		37.5	8.7	342	342		0
6	1	0.0	0.0	159	159	597	0
6	2	21.6	7.1	174	174	679	0
6	3	11.4	3.8	219	219	593	0
SUB-T		33.0	10.9	552	552		0
7	1	24.1	4.3	234	234	513	0
7	2	14.0	2.5	276	276	323	0
7	3	43.7	7.9	222	222	389	0
SUB-T		81.8	14.7	732	732		0
8	1	0.0	0.0	294	294	88	0
8	2	15.2	3.5	240	219	0	0
8	3	52.5	12.1	147	147	296	0
SUB-T		67.7	15.6	681	660		0
9	1	21.6	6.9	183	183	364	0
9	2	65.5	21.0	0	0	1000	137
9	3	0.0	0.0	231	231	764	0
SUB-T		87.1	27.9	414	414		137
10	1	54.1	19.5	0	0	1000	481
10	2	0.0	0.0	105	105	891	0
10	3	42.4	15.3	0	0	1000	452
SUB-T		96.5	34.8	105	105		934
11	1	0.0	0.0	45	45	953	0
11	2	0.0	0.0	57	57	894	0
11	3	0.0	0.0	66	66	826	0
SUB-T		0.0	0.0	168	168		0
12	1	0.0	0.0	48	48	777	0
12	2	41.1	11.5	0	0	1000	202
12	3	0.0	0.0	57	57	941	0
SUB-T		41.1	11.5	105	105		202
TOTAL		827.9	184.6	4068	4047		2707

TABLE D-6-(12) CHAKESAR : Case - 4

RESERVOIR'S BEHAVIOUR TRIAL

PROJECT :CHAK-4
E-STORAGE :1.(TM3)
NWS-AREA :1.(HA)
WATERSHED :36.5(KM2)
IRRI-AREA :110.(HA)

Head Regulator
Weir Length : 40.0 M
Weir Height : 1.5 M

Irrigable Area : 110 Ha

MON	TERM	RAIN	RUNOF	DEMAND	INTAK	STRAG	SPILL
		(MM)	(MM)	(ALL UNITS IN 1000M3)			
1	1	0.0	0.0	23	0	0	0
1	2	0.0	0.0	25	0	0	0
1	3	96.6	12.6	0	0	1	459
SUB-T		96.6	12.6	48	0		459
2	1	0.0	0.0	36	1	0	0
2	2	0.0	0.0	38	0	0	0
2	3	101.6	17.3	0	0	1	631
SUB-T		101.6	17.3	74	1		631
3	1	22.9	3.9	26	26	1	116
3	2	100.6	17.1	0	0	1	625
3	3	16.3	2.8	41	41	1	60
SUB-T		139.8	23.8	68	68		801
4	1	2.5	0.4	86	15	0	0
4	2	29.5	4.4	31	31	1	127
4	3	13.2	2.0	45	45	1	27
SUB-T		45.2	6.8	163	92		155
5	1	18.5	4.3	44	44	1	112
5	2	0.0	0.0	55	1	0	0
5	3	19.0	4.4	26	26	1	133
SUB-T		37.5	8.7	125	71		246
6	1	0.0	0.0	58	1	0	0
6	2	21.6	7.1	63	63	1	194
6	3	11.4	3.8	80	80	1	58
SUB-T		33.0	10.9	202	145		252
7	1	24.1	4.3	85	85	1	70
7	2	14.0	2.5	101	92	0	0
7	3	43.7	7.9	81	81	1	205
SUB-T		81.8	14.7	268	259		276
8	1	0.0	0.0	107	1	0	0
8	2	15.2	3.5	88	88	1	38
8	3	52.5	12.1	53	53	1	387
SUB-T		67.7	15.6	249	142		426
9	1	21.6	6.9	67	67	1	184
9	2	65.5	21.0	0	0	1	766
9	3	0.0	0.0	84	1	0	0
SUB-T		87.1	27.9	151	68		951
10	1	54.1	19.5	0	0	1	711
10	2	0.0	0.0	38	1	0	0
10	3	42.4	15.3	0	0	1	557
SUB-T		96.5	34.8	38	1		1268
11	1	0.0	0.0	16	1	0	0
11	2	0.0	0.0	20	0	0	0
11	3	0.0	0.0	24	0	0	0
SUB-T		0.0	0.0	61	1		0
12	1	0.0	0.0	17	0	0	0
12	2	41.1	11.5	0	0	1	419
12	3	0.0	0.0	20	1	0	0
SUB-T		41.1	11.5	38	1		419
TOTAL		827.9	184.6	1491	851		5888

TABLE D-7 AGRICULTURAL INFRASTRUCTURE : FACILITY PLAN

Program	Aim of Development	Development Scheme	Execution Period			Description of Scheme
			Short-Term	Middle-Term	Long-Term	(NOTE) 1. MARK "△" shows the term of F/S, D/D and Fund Arrangement. 2. NIS means the National Irrigation Scheme.
1) Irrigation & Multi-purpose Water Resources Utilization Plan	To steal out of Barani and Improvement of Farming Circumstances (On-Going Schemes)	Ushoran Irrigation Scheme (Swat S.D.)	○			NIS (CCA : 120 ha) by the Palogn Gol water source in conformity with 7th 5yr. National Plan. To harvest and diffuse highland vegetables, cash crops and seeds.
		Construction of Irrigation Channel at Higher Level from Butial (Shangla Par S.D.)	○			NIS by the Indus water source (lift irrigation) in conformity with 7th 5yr. National Plan
		Budal Irrigation Scheme (Buner S.D.)	○			NIS in Budar by the Chargarz water source in conformity with 7th 5yr. National Plan
		Kar Shalizara Irrigation Scheme (Buner S.D.)	○			NIS (CCA : 42 ha) in Ziarat village by the Barandu water source.
		Ghur Ghushto Lift Irrigation Scheme (Buner S.D.)	○			NIS (CCA : 50 ha) in Gurghushto village, lift irrigation by the Badri water source
	To steal out of Barani Farming and Improvement of Farming Circumstances (New Schemes)	Project for Improvement of Existing Irrigation Facilities (Swat S.D.)	○	○	○	Improvement of existing government, civil and private irri. facilities, and construction of crossings, conduits and farm roads etc.
		Extension Scheme of Nipki Kher Canal beyond Aligram Village (Swat S.D.)	△○	○		Expansion of CCA from 645 ha to 1,120 ha with extension of Nipki Khel Irrigation Canal beyond Aligram village. Tunnel construction (about 300 m long) may be required.
		Barwai Khwar Irrigation Scheme (Swat S.D.)	○	○		Irrigation (CCA : 4,000 ha) and farmland consolidation in Shokorai and Darmai areas by improvement of existing irri. system, construction of permanent off-takes, reinforcement and lining of canals and protction from flood
		Harnoi Khwar Water Utilization Scheme (Swat S.D.)	○	○		Irrigation (CCA : 7,000 ha) and farmland consolidation in Sijban-Golai and Tukai areas by the same means as the above.
		Deolai Khwar Irrigation Scheme (Swat S.D.)	○	○		Irrigation (CCA : 3,200 ha) and farmland consolidation in Kabbal area by the same means as the above.
		Kabulgram Water Utilization Scheme (Shangla Par S.D.)		△	○	Irrigation (CCA : 320 ha), electric and water supply by dam construction upstream from Kuz Kaburgram in Itai Khwar
		Jambal Derai Water Utilization Scheme (Shangla Par S.D.)	△○			Irrigation, electric and water supply hydel power plant in Itai Khwar.
		Kana Khwar Water Utilization Scheme (Shangla Par S.D.)	○	○	○	Irrigation (CCA : 1,650 ha), electric and water supply by dam construction upstream from Damorai.
		Irrigation & Hydel Power Sheme (Shangla Par S.D.)	○	○		Irrigation, electric and water supply by construction of head regulator, feeder canal and hydel power plant
		Chagarzai Irrigation Scheme (Buner S.D.)	△	○		Irrigation (CCA : 2,000 ha) and farmland consolidation of the area along the Barandu river by dam construction at Shulah in Budar (Chargaruz) Khwar.
	To steal out of Barani Farming by Effective Use of Intermittent Surface Flows in Small Rivers (New Schemes)	South Swat Small Scale Irrigation Schemes (Swat S.D.)	○	○	○	SSIS(s) by small dams to be constructed in Ugnd, Jambil, Saidu and Karkara Khwar etc. Implementation of model work, proof of the effect and escalation of the schemes.
		SIRDP Small Scale Irrigation Scheme (Shangla Par S.D.)	○	○	○	SSIS (CCA : 390 ha) by farm pond, and proof of the effect.
		Kot Kai Small Scale Irrigation Scheme (Shangla Par S.D.)	○			SSIS (CCA : 150 ha) in Bar Kotkai village by small dam to be constructed at Bazarkot, and proof of the effect
		Barandu Basin Small Scale Irrigation Scheme (Buner S.D.)	○	○	○	SSIS(s) by small dams to be constructed in Chulano, Wuch and Loei Khwar etc. Implementation of model work, proof of the effect and escalation of the schemes.
	Effective Utilization of Water Resources by Discharge Control of Swat River	Swat River Basin Irrigated Agriculture Development Project (Swat S.D.)	△	△	○	Stage 1 : To observe and grasp the basic situation of flow, aspect, shape and water use etc. Feasibility Study (F/S) of the development scheme, establishment of project office etc. for long term project operation, improvement of existing irri. system Stage 2 : Detailed Design (D/D) of the development scheme mainly comosed of the dam construction, and fund arrangement for the implementation of the scheme. Improvement of existing irri. system Stage 3 : Construction of main dam and the related facilities
	To secure Irrigation and Domestic Water by Mountainous Springs	Spring Water-Tank Program (Mountainous villages in Three S.D.)	○	○		Implementation of model work, and proof of the effect. Escalation of the schemes.
	Promotion of High Income & Living Standard by Ground-water Use	Chamla Basin Ground-water Development Scheme (Buner S.D.)	○	○		Irrigation and water supply drawing up the groundwater by tube wells. Implementation of model work, and proofing of the effect. Escalation of the schemes.
		Badri Basin Ground-water Development Scheme (Buner S.D.)	○	○		
2) Barani Farmland Consolidation Plan	Elevation of Labour and Land Productivities in Barani Farming	Project for Establishment of ATTD for Barani Farming Fundamental Research (Swat S.D.)	○			Establishment of the ATTD Farm in Mingora (Swat) to conduct experiments, studies, exhibitions, training, diffusion related to land consolidation and optimal varieties etc. including technology transfer, Establishment of the Branch Farms in Shangla Par and Buner for promotion of training and diffuion of the new technology.
		Shamozai-aba Khel Barani Farmland Consolidation Scheme (Swat S.D.)		○	○	Implementation of large scale schemes : Land levelling and terrace works to reduce erosion and evaporation and increase water holding capacity of field. Land plot arrangement, farm roads and drainage works to improve farming activities.
		Usmanzai-Khudo Khel Barani Farmland Consolidation Scheme (Buner S.D.)		○	○	The same as above
3) Flood Control & River Protection Plan	Protection and Conservation of Farmland, Irrigation and Public Facilities against Flood in Swat River Basin	Flood Control and River Protection Scheme in Swat River Basin	○	○	○	On-going short-term sheme (urgent protection works in 3 zones) : (ie. Bagh Derai-Khwazakhela, Khawazakhela-Fazagat, Fazagat-Shamozai) Escalation of middle-and long-term schemes following the above. 1st stage : Restoration of damaged places 2nd stage : Protection works along Swat main river 3rd stage : Protection works along tributaries.

List of Existing Irrigation Channels

The existing irrigation channels located at the proposed project sites of "Irrigation and Hyedel Power Scheme " in SIRDP Area are as listed below.

These channels are to be reinforced and improved for better use as one of the key components of the Irrigation and Hydel Power Schemes.

TABLE D-8 List of Existing Irrigation Cannels

AREA	No.	NAME OF CHANNEL	LENGTH	COVERED AREA
1.Chakesar I&HP Scheme	1	Tranwar cannal	(m) 200	(acre) 2
	2	Bajkatta	80	2
	3	Tangi	170	5
	4	Tangi	170	3
	5	Trawar	200	1
	6	Dand	1300	14
	7	Jalac	400	20
	8	Prot Paw	100	4
	9	Bara Nira	150	2
	10	Koza Nira	80	4
	11	Kwarey	250	4
2.Sandai-Aloch I&HP Scheme	1	Wand Manz Lakhtai	1,000	11
	2	Qawanj Chan Cha-Nako Lakhtai	2,000	15
	3	Kas Lakhtai	2,000	16
	4	Shagai Lakhtai	200	6
	5	Serai Lakhtai	400	
	6	Sanam Lakhtai	1,000	25
	7	Kanba Lakhtai	2,000	20
	8	Chalkot Lakhtai	100	1/2
	9	Kanser Wala	3,000	40
	10	Belai Lakhtai	1,500	3
	11	Tong Lakhtai	400	3
	12	Jaba Lakhtai	1,000	10
	13	Awazai Wand Band	1,500	8
	14	Batarai Wand Lakhtai	2,500	10
	15	Kolalai Band	1,000	5

AREA	No.	NAME OF CHANNEL	LENGTH	COVERED AREA
			(m)	(acre)
	16	Soor Patee Wand Walah	1,500	18
	17	Tarnaw Walah	2,000	10
	18	Serai Walah	2,500	14
	19	Tar-Serai Walah	1,500	12
	20	Kohi Walah	1,000	8
	21	Mahmood Serai Walah	750	8
	22	Beli Walah	1,000	6
	23	Kawar Banda Walah	1,000	6
	24	Shami Dand Walah	200	1
	25	Hindo Wand	2,000	10
3.Choga I&HP Schme	1	Kano Manz Alan Khan	500	20
	2	Jala Serai	2,000	40
	3	Chorlangi Walah	1,250	40
	4	Koza-Berara	1,000	10
	5	Serai Wahlah	1,000	25
	6	Sanora Walah	500	25
	7	Charman	1,000	40
	8	Badishai	1,000	70
	9	Taraera Kas	1,000	55
	10	Kalu Serai	2,000	9
	11	Kalu Serai	300	2
	12	Adil Saidan	1,500	23
4.Martung Area	1	Sairy Cannol	1,400	11
	2	Cham Cannol	120	(4mills)
	3	Kozdab Cannol	270	1
	4	Kari Cannol	200	1+(3mills)
	5	Shahttot Cannol	320	1+(4mills)
	6	Berdab Cannol	200	1+(4mills)

ANNEX E. RURAL INFRASTRUCTURE

ANNEX E. RURAL INFRASTRUCTURE

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CHAPTER I. INQUIRING SURVEY ON RURAL INFRASTRUCTURE

1.1 Inquiring Survey on Rural Infrastructure

In order to understand the present conditions of rural infrastructure in Swat District, during the Phase I Study, 1988 the inquiring survey for Union Council (UC) level was carried out by JICA Study Team. The questionnaires have been distributed to all 69 UCs in Swat District through LG & RD, and the study team got answers from 66 UCs.

The objective of the inquiring survey was to identify the following subjects;

- Road conditions	:pavement, density, etc.
- Communication Facilities	:kinds, location and Nos.
- Education Facilities	:kinds, level, location, sex and Nos.
- Water Supply Facilities	:kinds and No. of houses
- Rural Electrification	:kinds and No. of houses
- Health Facilities	:kinds, location and No. of doctor
- Sanitation Facilities	:kinds and No. of houses
- Others	:kinds of public facilities, etc.

1.2 Results of the Inquiring Survey

The answer of the questionnaire has been analyzed dividing into the following nine zones. They are;

Swat Sub-Division:	Zone I	Kalam and Bahrain
	Zone II	Matta, Khawazakhela and Charbagh
	Zone III	Kanju, Kabal, Barikot and Mingora
Shangla Par Sub-Division:	Zone IV	Alpuri
	Zone V	Chakesar, Puran and Martung
	Zone VI	Besham
Buner Sub-Division:	Zone VII	Daggar, Gadezai, Gagra and Chagarzai
	Zone VIII	Chamla/Amazai
	Zone IX	Khudukhel

The results of the inquiring survey are shown in Figure E-1(1 to 4) by population coverage or other indices. Shangla Par Sub-division(Zone IV, V and VI) shows the low development of rural infrastructure, especially rural electrification and girls education.

CHAPTER II. PRESENT CONDITIONS OF RURAL INFRASTRUCTURE

2.1 Road and Communication

Road development works in NWFP are mainly carried out by Communication and Works Department. The department is in charge of construction and maintenance of trunk and important branch roads. Table E-1 shows district wise roads conditions in NWFP which are maintained by C & W Department.

In addition to the road development by C & W Department, LG & RD Department is conducting construction and/or maintenance of community roads by local people. However, those community roads are not constructed properly due to the shortage of technical staff and budget and it is difficult to keep safe traffic of those roads.

2.2 Village Water Supply and Sanitation

Completed water supply schemes by PHE Department in NWFP and in Swat District are shown in Table E-2 and E-4 respectively. Table E-3 and E-5 illustrate kinds of water source of the schemes in NWFP and in Swat District respectively. In Swat District shares of surface water and ground water for completed water supply schemes are almost fifty-fifty. Quality of natural water in Swat District generally dose not have any chemical problem(see Table E-6(1) and (2)). However, bacteria are found out in some completed schemes due to the improper construction of facilities, mainly filter of intake.

An implementation office of sanitation schemes has been established in PHE Department, Peshawar recently, but its activity is very poor. Rural sewage, latrines and other sanitation facilities are not completed in rural area of Swat District. The Seventh Five Year Plan 1988-1993 of water supply and sanitation by PHE Department, NWFP is summarized in Table E-7.

Study on water supply and sanitation development by World Bank and CIDA Project has been started from January 1989 based upon agreement between the Government of Pakistan, the Government of NWFP and World Bank. A provincial team of the project is working with PHE Department, LG & RD Department and other related departments of NWFP in Peshawar. Table E-8 and E-9 show tentative targets of the projects.

Table E-10 shows types of latrines which are proposed to construct in rural area by PHE Department.

2.3 Education Facilities

Table E-11 and Figure E-2 illustrate the education system in Pakistan. Participation rates of school by level and sex in Swat District are shown in Table E-12 comparing the average of NWFP. The participation rate of girls is extremely low in Swat.

As shown in Table E-13, literacy rate in Swat District is generally low, therefore the understanding on importance of school education is not identified by local people who want children to join their works. There is another reason of low participation rate in Swat District that is shortage of number of schools. Table E-14 shows a low density of schools in Swat comparing with that of NWFP. Especially number of girls schools is very few.

2.4 Health Facilities

Present conditions of health facilities in Swat District are summarized in Table E-15. Population per one institution is estimated at about 10,000, however population per doctor is estimated at 14,500 which is bigger than the average of NWFP, 10,800(see Table E-16). Table E-17 shows major diseases in Swat District.

CHAPTER III. RURAL INFRASTRUCTURE DEVELOPMENT PLAN

3.1 Targets of Development Plan

Development targets of rural infrastructure for each sector are summarized in Table E-18. The targets of the Swat Integrated Development Plan are given for the three development phases viz. the short term, the middle term and long term, considering the present situation and future development plan of national and/or provincial level.

Ideal development targets would be very high, and it is impossible to achieve them during the project period for 15 years because of the limited budgets and staff. In order to cover the future population growth which would be estimated at 3.2 percent per year, the targets of the rural infrastructure development should be raised gradually and steadily.

The target of rural electrification would be almost same level of the WAPDA national target. However, the targets of village water supply and education sector are set up lower than those of national and/or provincial level with about 12 years delay. The targets of road development and health sector will delay for 17 to 20 years form the national targets of the Seventh Five Year Development Plan by 1993.

Amount of the rural infrastructure development works which is required to achieve the targets is estimated for each Sub-Project Area(see Table E-19(1) to (20)). The project cost of the rural infrastructure development in the Master Plan is estimated based upon above-mentioned amount of the development works.

3.2 Road and Communication Development Plan

On-going road development schemes by the Seventh Five Year Plan 1988-93 in Swat District are listed in Table E-20. New road development schemes should be planed coordination to those schemes. The proposed road improvement and construction schemes by C & W Department, Swat are shown in Table E-21 and 22 respectively. Those schemes listed will be completed year by year during the project period for 15 years.

The improvement schemes of main roads should be carried out early stage of the Master Plan, and the construction of branch roads will follow them. Figure E-3(1) and (2) show the standard design of road cross section and related structures.

3.3 Village Water Supply and Sanitation Development Plan

3.3.1 Village Water Supply Development Plan

Population coverage of water supply facilities should be raised strengthening activities of PHE Department and encouraging direct participation of local people. Amount of water supply facilities required by the development phases are as follows;

Term	Beneficiary	Coverage
Short Term(1990-1995)	59,300 houses	50 %
Middle Term(1995-2000)	70,500 houses	65 %
Long Term(2000-2005)	72,600 houses	75 %
Total	202,400 houses	

Facilities are designed basing upon the standards of PHE Department (see Figure E-4(1), (2) and (3)). However, In order to improve water quality, intake efficiency and others, proper construction management by engineering staff is required.

3.3.2 Sanitation Development Plan

In order to carry out hygiene education to local people and to encourage construction of sanitation facilities in rural area, establishment of an implementation office for sanitation schemes is needed in first place. The office should mainly carry out extension of self-construction of latrine(see Figure E-5(1) and (2)). The target of this project are as follows;

Term	Beneficiary	Coverage
Short Term(1990-1995)	13,400 houses	5 %
Middle Term(1995-2000)	18,300 houses	10 %
Long Term(2000-2005)	42,800 houses	20 %
Total	74,500 houses	

3.4 Education Facilities Development Plan

Improvement and/or upgrading of existing facilities are required in the initial stage of the development. Construction of residence for teachers and dormitory for students should be involved in the improvement and/or upgrading works. Construction of school should be carried out according to the standards of C & W Department, Building Division(see Figure E-6(1) and (2)).

Construction of new schools is required to cover the population increased in future and to raise participation rate at primary education. The large of the construction of schools is summarized as below;

	Year	1995	2000	2005
Boys	Participation Rate	60	80	90
	Population per School	2,000	1,500	1,000
	Population per Teacher	400	300	200
Girls	Participation Rate	30	50	70
	Population per School	4,000	3,000	2,000
	Population per Teacher	800	600	400

In order to fulfill a large number of teachers required, a system of assistant and/or temporary teachers from local people would be introduced. The system can encourage interest of local people in school education and present new job opportunity.

3.5 Health Facilities Development Plan

Strengthening of BHUs which consists of upgrading of dispensary into BHU and posting of doctors is required in the short term development. Following that, RHCs which are higher health institutions will be constructed in the middle and long term development. Standard designs of the health facilities by C & W Department, Building Division are shown in Figure E-7(1), (2) and (3).

In order to improve rescue medical system in the District, ambulances should be stationed at existing hospitals. The health facilities development plan is summarized as follows;

	Short	Middle	Long	Total
Improvement/Upgrading Existing Facilities	78	65	-	143
Construction of BHUs	26	32	53	111
Construction of RHCs	-	7	19	26
Residence of Doctors	52	130	220	402

Table E-1 Length of Roads Maintained by C & W Deptt:, NWFP

LENGTH OF ROADS(IN KM.) MAINTAINED BY
COMMUNICATION & WORKS DEPTT: NWFP ON 30 6.1987

DISTRICT	Area in Km^2	Population in thousand up to 1981	LENGTH OF RAODS			
			Black Topped	Shingled	Earthen	Total
PESHAWAR	4,002	2,246	783.718	158.428	—	942.146
MARDAN	3,137	1,423	483.000	38.000	—	521.000
ABBOTTABAD	3,843	1,150	485.410	228.620	—	714.030
MANSEHRA	5,732	1,055	383.140	375.460	—	758.600
KOHISTAN	4,574	465	—	164.880	—	164.880
MALAKAND	953	258	145.190	104.210	—	249.400
SWAT	11,743	1,227	593.744	427.410	—	1,021.154
DIR	5,281	769	222.150	453.910	—	676.060
CHITRAL	14,851	208	82.480	500.820	641.910	1,225.210
C&W ROADS MAINTAINED BY IRR: DEPTT: MARDAN DISTT:	—	—	110.773	—	—	110.773
TOTAL	54,116	8,801	3,289.605	2,451.738	641.910	6,383.253

SOURCES: C&W DEPARTMENT N.W.F.P., PENSHAWAR

Table E-2 Completed Water Supply Schemes by PHE Deptt:, NWFP

DISTRICT	NO. OF SCHEMES COMPLETED	EXPENDITURE IN MILLION Rs.	POPULATION UP TO JUNE 1988 (THOUSAND)	PER CAPITA COST Rs.
ABBOTTABAD	194	109.590	751.47	145.83
MANSEHRA	189	61.840	424.49	145.68
KOHISTAN	59	6.390	119.02	53.68
SWAT	143	77.046	475.72	162.20
DIR	103	49.876	218.95	227.79
MALAKAND	55	31.580	321.53	155.58
CHITRAL	44	28.224	88.86	317.62
MARDAN	102	91.046	890.46	101.77
PESHAWAR	166	132.731	1,104.30	120.20
KOHAT	78	68.720	345.43	198.94
KARAK	82	83.576	179.85	464.67
BANNU	122	144.580	605.55	189.21
D.I.KHAN	101	105.609	415.49	254.17

SOURCES : Inception Report, Strategic Provincial Investment Plan and Project Preparation for Rural Water Supply, Sanitation and Health, March, 1989.

Table E-3 Water Source of PHE Deptt: Schemes In NWFP

DISTRICT	SURFACE WATER SOURCE % (Spring, infiltration, galleries, canal)	GROUND WATER SOURCE % (Tubewells, percolation well)
ABBOTTABAD	70	30
MANSEHRA	87	13
KOHISTAN	93	7
SWAT	55	45
DIR	49	51
MALAKAND	69	31
CHITRAL	79	21
MARDAN	14	86
PESHAWAR	9	91
KOHAT	48	52
KARAK	43	57
BANNU	4	96
D.I.KHAN	25	75
NWFP Overall	47	53

SOURCES : Inception Report, Strategic Provincial Investment Plan and Project Preparation for Rural Water Supply, Sanitation and Health, March, 1989.

Table E-4 Completed Water Supply Schemes by PHE Deptt:, Swat

TOTAL POPULATION COVERAGE IN SWAT UP TO JUNE 1988

SUB-DIVISION	NO.OF SCHEMES COMPLETED	PUROJECTED POPULATION IN THOUSAND	POPULATION SERVED IN THOUSAND	EXPENDITURE INCURRED IN THOUSAND	PERCENTAGE COVERAGE
SWAT	59	780.41	241.825	39.156	30.98
BUNER	46	331.39	144.370	34.012	43.56
SHANGLA PAR	38	314.38	89.528	3.878	28.47
TOTAL	143	1,426.18	475.723	77.046	33.36

Table E-5 Water Source of PHE Deptt: Schemes in Swat

SUB-DIVISION	SPRING	I.G.	TUBE WELL	C/W	TOTAL	(PUMPING)
SWAT	14	2	26	8	50	(24)
BUNER	18	3	14	7	42	(11)
SHANGLA PAR	29	2	—	—	31	(0)
TOTAL	61	7	40	15	123	(35)

SOURCES : PHE DEPARTMENT, SWAT

Table E-6(1) Results of Chemical Examination of Water, Chakesar

GS&PD. NWFP.—1472 C.E.P.H.E. 50 P. of 100—8-3-88—(i)

PUBLIC HEALTH ENGINEERING CENTRAL LABORATORY,
KOHAT ROAD, PESHAWAR.

REPORT ON CHEMICAL EXAMINATION OF DRINKING WATER.

Name of supply..... Chakesar spring, Swat.....

Sampling point..... Union Council Chakesar.....

Sample collected by... JICA.....

Owned by.... .....

Senders reference No.. Letter No. Nil dated 2-7-89.....

Laboratory reference No. HAL/CHE/75-131.....

Date & Time of collection..... 29-6-89.....

Date of examination..... 4-7-89.....

Results of Chemical Examination.

Colour.....Nil.....

Odour.....Nil.....

Taste. Acceptable.....

Turbidity (NTU)....0.25.....

pH.....8.2.....

Substance	mg/l	Substance	mg/l
Ammonia NH3	0.001	Calcium Ca	30.4
Nitrite No 2	0.0231	Ma nesi m Mg	4.6
Nitrate No 3	4.8	Sulphate So 4	19.7
Total Alkalinity	80	Chloride Cl	13.3
Hardness	95	Total Dissolved Sol ds at 110C	150
Iron Fe	0.02	Manganese Mn	0.1

Date of Report. 6-7-89.....

Conductivity 180 um

REMARKS. The water samples meets WHO International Standards for drinking water.

S. Ghaffar Ali

Senior Research Officer,
Public Health Engineering Laboratory,
Peshawar.

Note :— Authenticity of the Sample is not gauranted.

Table E-6(2) Results of Chemical Examination of Water, Martung

GS&PD. NWFP.—1472 C.E.P H.E. 50 P. of 100—8-3-88-(')

PUBLIC HEALTH ENGINEERING CENTRAL LABORATORY,
KOHAT ROAD, PESHAWAR.

REPORT ON CHEMICAL EXAMINATION OF DRINKING WATER.

Name of supply.....Murthung Spring,Swat.....

Sampling point..... Union Council. Murthung.....

Sample collected by.....JICA.....

Owned by.....

Senders reference No. Letter No. Nil. dated 2-7-89.....

Laboratory reference No MAL/CHE/75-130.....

Date & Time of collection.....26-6-89.....

Date of examination..... 4-7-89.....

Results of Chemical Examination.

Colour.....Nil.....

Odour.....Nil.....

Taste. Acceptable.....

Turbidity (NTU)....0.2.....

pH.....7.55.....

Substance	mg/l	Substance	mg/l
Ammonia NH3	0.003	Calcium Ca	76.9
Nitrite No 2	0.013	Ma nesi m Mg	9.1
Nitrate No 3	10.1	Sulphate So 4	10.5
Total Alkallnity	250	Chloride Cl	19
Hardness	230	Total Dissolved Sol ds at 180C	315
Iron Fec	0.04	Manganese Mn	0.2

Date of Report..9-7-89..... Conductivity 350 um

REMARKS. The water samples meets WHO International Standards for drinking water.

S. Munir
Senior Research Officer,
Public Health Engineering Laboratory,
Peshawar.

Note :— Authenticity of the Sample is not gourantsd.

Table E-7 Targets of Seventh Five Year Plan, PHED in NWFP

(IN MILLION)

Sub Sector	Unit Cost Rs.	Addtl. Pop: Served	%age coverage by end of the Plan (1993)	Cost
WATER SUPPLY				
Rural	400	3.578	60	1,431.20
Urban	470	0.789	100	370.83
			Sub Total	1,802.03
SEWERAGE, DRAINAGE AND SANITATION				
Rural	200	2.536	20	507.20
Urban	600	0.540	35	324.00
			Sub Total	831.20
			G. Total	2,633.23

BENCH MARK

Sub Sector	6th Plan Target (%) 1983-1988	P.M. 5-Point Target 1988	%age coverage upto end of 6th Plan/ Bench Mark 7th Plan
WATER SUPPLY			
Rural	48	50	50
Urban	80	81	81
SEWERAGE, DRAINAGE AND SANITATION			
Rural	1.5	1.2	1.2
Urban	28	16	16

Sources : PHE Department N.W.F.P.

Table E-8 Targets of Water Supply Development Plan by World Bank Project, NWFP

TARGET POPULATION TO BE SERVED WITH WATER SUPPLY BY 1993 (THOUSAND)

DISTRICT	PROJECTED POPULATION AT JUNE 1993	70 % OF THIS POPULATION	POPULATION SERVED UP TO JUNE 1989 BY			7TH FIVE YEAR TARGET POPULATION 1989-1993
			PHED	UNICEF	LGRDD	
	(A)	(B)	(C)	(D)*	(E)**	F=B-(C+D+E)
ABBOTTABAD	1,453.94	1,017.75	819.84		8.186	194.72
MANSEHRA	1,451.03	1,015.72	444.30		7.798	563.62
KOHISTAN	672.58	470.80	129.82		4.527	336.45
SWAT	1,652.94	1,157.05	527.95		8.283	620.82
DIR	1,115.43	780.80	240.88		2.235	537.69
MALAKAND	372.65	260.85	209.25		1.207	50.40
CHITRAL	301.68	211.17	97.43	90.24	0.554	22.40
MARDAN	1,736.61	1,215.20	954.26		3.116	257.83
PESHAWAR	2,042.18	1,429.40	1,159.25		24.484	245.66
KOHAT	603.35	422.34	366.70		2.458	53.18
KARAK	287.37	201.16	189.83		0.777	10.55
BANNU	922.81	645.66	611.53	23.30	3.893	6.93
D.I.KHAN	750.38	525.27	455.19	30.50	2.065	37.24
TOTAL	13,363.31	9,353.17	6,206.23	144.04	69.583	2,937.49

* The UNICEF data does not include the population covered by UNICEF in Mansehra as no firm information is presently available.

** No data by LGRDD on the population served is availble. The indicated poulation is estimated from fund allocations using PHED per capita costs.

SOURCES : Inception Report, Starategic Provincial Investment Plan and Project Preparation for Rural Water Supply, Sanitation and Health, Inception Report, March, 1989.

Table E-9 Targets of Sanitation Development Plan by World Bank Project, NWFP

TARGET POPULATION TO BE SERVED WITH HUMAN WASTE DISPOSAL FACILITIES BY 1993 (THOUSAND)

DISTRICT	PROJECTED POPULATION	20% OF THIS POPULATION	PROJECTED POPULATION UP TO JUNE 1989	POPULATION COVERED UP TO JUNE 1989 (assumed to be 1% of June 1989 Projected Population).	
	(A)	(B)	(C)	(D)	E=(B-D)
ABBOTTABAD	1,453.94	290.79	1,292.11	12.92	277.87
MANSEHRA	1,451.03	290.20	1,289.53	12.89	277.31
KOHISTAN	672.58	134.52	597.72	5.97	128.55
SWAT	1,652.94	330.40	1,468.97	14.68	315.72
DIR	1,115.43	223.10	991.28	9.91	213.19
MALAKAND	372.65	74.53	331.18	3.31	71.22
CHITRAL	301.68	60.34	268.10	2.68	57.66
MARDAN	1,736.61	347.32	1,543.32	15.43	331.89
PESHAWAR	2,042.18	408.43	1,814.88	18.15	390.28
KOHAT	603.35	120.67	536.20	5.36	115.31
KARAK	287.37	57.47	255.71	2.56	54.91
BANNU	922.81	184.56	820.10	8.20	176.36
D.I.KHAN	750.38	150.08	666.08	6.67	143.41
TOTAL	13,363.31			118.73	2,553.68

Table E-10 Type of Latrine and Its Cost

TECHNOLOGIES FOR HUMAN WASTE DISPOSAL FACILITIES

TYPE OF LATRINE	PROPOSED FOR AREAS WHERE	TOTAL COST WITH PUCCA SUPER STRUCTURE	GOVT. SHARE OF COST	COMMUNITY SHARE OF COST
SINGLE VENTILATED PIT LATRINE	People depend on open an well water supply system. The soil is stable and does not need lining. The water table exceeds 30 feet depth.	Rs.4000/-	Rs.1000/- (25%)	Rs.3000/- (75%)
DOUBLE VENTILATED PIT LATRINE	People depend on an open well water supply. The soil is unstable and requires pit lining. The water table is shallow(10-15 feet depth).	Rs.5600/-	Rs.1500/- (27%)	Rs.4100/- (37%)
SURFACE VENTIRATED LATRINE	People depend on an open well water supply. The area is water logged and water table exceeds 10 feet depth.	Rs.7200/-	Rs.2700/- (37%)	Rs.4500/- (63%)
POUR-FLUSH LATRINE WITH SOAKAGE PIT ARRANGEMENT	People of open well depend on piped water supply, community tanks or other reliable source not liable tobe affected by seepage from soakage pits.	Rs.5767/-	Rs.1372/- (24%)	Rs.4395/- (76%)

SOURCES : Inception Report, Starategic Provincial Investment Plan and Project Preparation for Rural Water Supply, Sanitation and Health, Inception Report, March, 1989.

Table E-11 Educational Institutions in Pakistan by Kind, Level and Sex 1983

LEVEL		PRIMARY SCHOOLS	MIDDLE SCHOOLS	HIGH SCHOOLS	SECONDARY VOCATIONAL INSTITUTIONS	ARTS AND SCIENCE COLLAGES	PROFESSIONAL COLLAGES	UNIVERSITIES
TERMS(YEARS)		5	3	2	3	4	2	4
NO. OF SCHOOLS		69,858 (798)	5,979 (84)	4,837 (85)	263	500	102	20
NO. OF TEACHERS	MALE	144,400 (2,227)	39,200 (1,067)	55,200 (1,452)	2,836	9,652	4,528	3,310
	FEMALE	56,400 (529)	17,400 (108)	23,400 (88)	751	4,411	522	390
	TOTAL	200,800 (2,756)	56,600 (1,175)	78,600 (1,540)	3,587	14,063	5,050	3,700
NO. OF ENROLMENTS	MALE	4,049,000 (83,777)	1,185,000 (27,091)	780,000 (28,531)	41,000	267,000	67,860	39,721
	FEMALE	1,974,000 (18,576)	408,000 (2,862)	167,000 (1,829)	8,000	121,000	16,470	7,866
	TOTAL	6,023,000 (102,353)	1,593,000 (29,753)	947,000 (30,160)	49,000	388,000	84,330	47,587
TEACHERS PER SCHOOL		2.9 (3.5)	9.5 (14.0)	19.5 (18.1)	13.6	28.1	49.5	185.0
ENROLMENTS PER SCHOOL		87.2 (128.0)	266.4 (354.0)	234.6 (355.0)	186.3	776.0	826.8	2,379.4
ENROLMENTS PER TEACHER		30.0 (37.0)	28.1 (25.3)	12.0 (19.6)	13.7	27.6	16.7	12.9

Note: ( ) Swat District
Source: Pakistan Economic Survey 1983-84

Table E-12 Enrollment and Estimated Participation Rates of Schools in Swat 1988

MALE (unit:1,000)

Sub-Divisions		Primary *Population (5-9)	Enrolment	Rate(%)	Middle & High Population (10-19)	Enrolment	Rate(%)
Swat	Urban						
	*Rural	167.98	75.98	45	219.76	20.78	9
Shangla Par	Rural	57.45	16.37	28	72.48	3.78	5
Buner	Rural	64.26	27.71	43	77.04	6.25	8
Total		289.69	120.06	41	369.28	30.81	8
NWFP	Urban	163.82	128.68	78			
	Rural	1,052.17	877.26	83			

FEMALE

Sub-Divisions		Primary *Population (5-9)	Enrolment	Rate(%)	Middle & High Population (10-19)	Enrolment	Rate(%)
Swat	Urban						
	*Rural	170.26	10.50	6	203.66	1.98	1
Shangla Par	Rural	59.45	1.20	2	66.13	0.03	-
Buner	Rural	62.48	2.07	3	71.00	0.07	-
Total		292.19	13.77	5	340.79	2.08	
NWFP	Urban	154.92	75.76	49			
	Rural	972.18	180.45	19			

MALE & FEMALE

Sub-Divisions		Primary *Population (5-9)	Enrolment	Rate(%)	Middle & High Population (10-19)	Enrolment	Rate(%)
Swat	Urban						
	*Rural	338.24	86.48	26	423.42	22.76	5
Shangla Par	Rural	116.90	17.57	15	138.42	3.81	3
Buner	Rural	126.74	129.78	23	148.04	6.32	4
Total		581.88	133.83	23	710.07	32.89	5
NWFP	Urban	318.74	204.44	64			
	Rural	2,024.34	1,057.71	52			

Note: * Projected Population for the year 1988
Source: Statistic Data Education Office, Swat 1987-88

Table E-13 Literacy Rate In Swat 1981

	Urban			Rural			Total		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Sub-Division Swat	23.73	35.87	9.20	8.61	15.16	1.35	-	-	-
Shangla Par	-	-	-	4.82	8.64	0.55	-	-	-
Buner	-	-	-	7.77	13.90	1.35	-	-	-
District Swat	23.73	35.87	9.20	7.58	13.41	1.18	8.73	15.08	1.73
N.W.F.P	35.77	46.96	21.88	13.18	21.73	3.82	16.70	25.85	6.48

Source: National Census 1981

Table E-14 Catchment Area of Schools in Swat 1988

(Unit:km² /school)

		Sub-Divisions			Swat	
		Swat	Shangla Par	Buner	District	NWFP
Area (sq.km)		5,067	1,357	1,724	8,167	74,521
High schools	Male	112.6	98.2	86.2	103.4	104.2
	Female	1,013.4	-	1,724.0	1,361.2	496.8
Middle Schools	Male	120.6	85.9	90.7	106.1	129.4
	Female	844.5	1,375.0	862.0	907.4	564.6
Primary and other Schools	Male	11.9	6.9	9.1	10.0	8.0
	Female	41.2	36.2	33.2	38.3	24.9

Source: Statistic Data of Education Office Swat 1987-88

Table E-15 Health Institutions and Density in Swat 1988

	Population* (1,000)	Area (km²)	Institutions Units		Population /Units (persons/Unit)	Area/Units (km² /unit)
Sub-Division						
Swat	948	5,067	Hospitals	8		
			R.H.Cs	1		
			B.H.Us	35		
			Dispensaries	19		
			Total	63	15,000	80.4
Shangla Par	334	1,375	Hospitals	5		
			R.H.Cs	0		
			B.H.Us	11		
			Dispensaries	5		
			Total	21	15,900	65.5
Buner	355	1,724	Hospitals	4		
			R.H.Cs	2		
			B.H.Us	18		
			Dispensaries	10		
			Total	34	10,440	50.7
District Swat	1,637	8,167	Hospitals	17		
			R.H.Cs	3		
			B.H.Us	64		
			Dispensaries	34		
			Total	118	13,900	69.2
N.W.F.P **	15,505	54,116	Total	770	20,136	70.3

Note: * Projected Population for 1988

** from 1985 Data

Source: Statistic Data 1987-88, District Health Office, Swat

Table E-16 Population per Doctor in Swat 1988

	Population* (1,000)	No. of Doctors	Population/Doctor (person)
Sub-Division			
Swat	948	60	15,800
Shangla Par	334	24	13,900
Buner	335	29	12,200
District Swat	1,637	113	14,500
N.W.F.P **	15,505	1,440	10,800

Note: * Project Population for 1988
** Data 1986

Source: Statistic Data 1987-88, District Health Office, Swat.

Table E-17 Major Diseases in Swat

	NAME OF DISEASES
1	Dysentries/Diarrhoeas
2	Malaria
3	Tuberculosis/Pulmonary, Extra Pulmonary
4	Respiratory Treat Infection
5	Enteric Fever
6	Skin Diseases
7	Rheumatic Diseases
8	Anaermias
9	Deficiency Diseases
10	Goitre/Diabetes
11	Tranrnatic

Source : Statistic Data 1987-88, District Health Office, Swat

Table E-18 Targets of Rural Infrastructure Development in Swat District

FACILITIES INDEX	TARGET LEVEL	1983 RESULTS	6TH FIVE YEAR PLAN 1987-88 TARGET	6TH FIVE YEAR PLAN 1987-88 RESULTS	7TH FIVE YEAR PLAN 1993 TARGET	SHORT TERM 1995 TARGET	MIDDLE TERM 2000 TARGET	LONG TERM 2005 TARGET	REMARKS
ROAD	FEDERAL	0.12	*0.24	*0.16	*0.18				
ROAD DENSITY	PROVINCIAL			0.118					17 years
(km/km2)	DISTRICT			0.125				0.16	delay
RURAL WATER SUPPLY	FEDERAL	22.0	45.0	45.0	75.0				
POPULATION COVERAGE	PROVINCIAL	35.0	48.0	50.0	60.0				12 years
(%)	DISTRICT			36(21-45)		50	65	75	delay
HEALTH INSTITUTIONS	FEDERAL	12,943	9,820	*12,000	*10,700				
POPULATION/UNIT	PROVINCIAL			*20,100					10 years
(PERSONS)	DISTRICT			13,900		12,000	11,000	10,000	delay
DOCTORS	FEDERAL	4,600	2,940	*2,900	*1,800				
POPULATION/DOCTOR	PROVINCIAL			*10,800					20 years
(PERSONS)	DISTRICT			14,500		12,000	7,500	5,000	delay
SANITATION	FEDERAL	4.0	10.0	10.0					
POPULATION COVERAGE	PROVINCIAL	0.3	1.5	1.2	20.0				12 years
(%)	DISTRICT			<1.0		5	10	20	delay
BOYS PRIMARY EDUCATION	FEDERAL	63.0	90.0	79.5	88.5				
PERTICIPATION RATE	PROVINCIAL			83					12 years
(%)	DISTRICT			41(28-45)		60	80	90	delay
GIRLS PRIMARY EDUCATION	FEDERAL	32.0	60.0	45.7	70.3				
PERTICIPATION RATE	PROVINCIAL			19					12 years
(%)	DISTRICT			5(2-6)		30	50	70	delay
RURAL ELECTRIFICATION	FEDERAL	27.2	53.3	35.2	47.0				
POPULATION COVERAGE	PROVINCIAL								almost
(%)	DISTRICT			32(0-49)		45	60	75	same

Note: *: Estimated by statistic data

Table E-19(1) Rural Infrastructure Development Plan, Kalam

(1) Sub-project Area : KALAM
Nos. of UC : 2

Unit: '000

Year	1988	1995	2000	2005
Population	31.5	39.3	45.9	53.8
Houses	4.9	5.1	7.2	8.4

Section - Item	Existing Nos.	Coverage Unit	Coverage 1988	Requirment Unit	Requirment 90-95	95-00	00-05	Total	Remarks
Water Supply		%	12	Houses'000	2.5	1.6	1.6	5.7	
Sanitation									
Latrines		%	< 1	Houses'000	0.3	0.4	1.0	1.7	
Health Care									
Improve. BHU,RHC,etc.	3	P/Unit	6,300	No.	3	2		5	
Construction BHUs				No.	0	0	0	0	
Doctors	1	P/Doctor	31,500	No.	2	3	5	10	
Education									
Constr. Boys School	25	P/School	1,260	No.	0	5	23	29	
Teachers for Boys	122	P/Teach.	258	No.	0	31	116	147	
Girls School	2	P/School	15,750	No.	8	6	12	26	
Teachers for Girls	1	P/Teach.	31,500	No.	18	28	58	104	
Electricity									
1		%	12	Houses'000	0.0	1.5	1.2	5.7	

Note : % : Family Coverage
P/Unit : Population per Unit
P/Doctor : Population per Doctor
P/School : Population per School
P/Teach. : Population per Teacher

Table E-19(2) Rural Infrastructure Development Plan, Bahrain

(2) Sub-project Area : BAHRAIN
Nos. of UC : 1

Unit: '000

Year	1988	1995	2000	2005
Population	85.2	105.2	121.3	145.5
Houses	13.3	15.6	19.1	22.7

Section - Item	Existing Nos.	Coverage Unit	Coverage 1988	Requirment Unit	Requirment 90-95	95-00	00-05	Total	Remarks
Water Supply		%	28	Houses'000	4.6	4.3	4.4	13.3	
Sanitation									
Latrines		%	< 1	Houses'000	0.8	1.1	2.6	4.5	
Health Care									
Improve. BHU,RHC,etc.	12	P/Unit	7,100	No.	6	6		12	
Construction BHUs				No.	0	0	3	3	
Doctors	9	P/Doctor	9,467	No.	0	8	13	21	
Education									
Boys School	35	P/School	1,893	No.	8	30	63	101	
Teachers for Boys	332	P/Teach.	257	No.	0	82	313	395	
Girls School	8	P/School	10,650	No.	19	15	31	65	
Teachers for Girls	38	P/Teach.	2,242	No.	95	74	157	326	
Electricity									
Extent, WAPDA Supply		%	36	Houses'000	2.7	1.2	5.4	12.3	

Note : % : Family Coverage
P/Unit : Population per Unit
P/Doctor : Population per Doctor
P/School : Population per School
P/Teach. : Population per Teacher

Table E-19(3) Rural Infrastructure Development Plan, Matta

(3) Sub-project Area : MATTA
Nos. of UC : 8

Unit:'000

Year	1988	1995	2000	2005
Population	211.1	263.2	308.1	360.6
Houses	31.0	38.6	45.2	53.0

Section - Item	Existing Nos.	Coverage Unit	Coverage 1988	Requirment Unit	Requirment 90-95	95-00	00-05	Total	Remarks
Water Supply		%	28	Houses'000	10.6	10.1	10.3	31.0	
Sanitation									
Latrines		%	< 1	Houses'000	1.9	2.6	6.1	10.6	
Health Care									
Improve. BHU,RHC,etc.	20	P/Unit	10,555	No.	10	10		20	
Construction BHUs				No.	2	6	8	16	
Doctors	20	P/Doctor	10,555	No.	2	19	31	52	
Education									
Boys School	109	P/School	1,937	No.	23	74	155	252	
Teachers for Boys	618	P/Teach.	342	No.	10	369	776	1185	
Girls School	32	P/School	5,926	No.	21	37	78	139	
Teachers for Girls	153	P/Teach.	1,380	No.	176	184	388	748	
Electricity									
Extent. WAPDA Supply		%	15	Houses'000	3.1	3.8	12.5	25.8	

Note : % : Family Coverage
P/Unit : Population per Unit
P/Doctor : Population per Doctor
P/School : Population per School
P/Teach. : Population per Teacher

Table E-19(4) Rural Infrastructure Development Plan, Khawazakhela

(4) Sub-project Area : KHAWAZAKHELA
Nos. of UC : 4

Unit:'000

Year	1988	1995	2000	2005
Population	100.9	125.8	147.2	172.1
Houses	15.1	18.8	22.0	25.8

Section - Item	Existing Nos.	Coverage Unit	Coverage 1988	Requirment Unit	Requirment 90-95	95-00	00-05	Total	Remarks
Water Supply		%	59	Houses'000	0.5	4.9	5.0	10.4	
Sanitation									
Latrines		%	< 1	Houses'000	0.9	1.3	3.0	5.2	
Health Care									
Improve. BHU,RHC,etc.	9	P/Unit	11,211	No.	5	4		9	
Construction BHUs				No.	1	3	1	5	
Doctors	9	P/Doctor	11,211	No.	1	9	15	25	
Education									
Boys School	67	P/School	1,506	No.	0	31	74	105	
Teachers for Boys	240	P/Teach.	420	No.	74	176	371	621	
Girls School	27	P/School	3,737	No.	4	18	37	59	
Teachers for Girls	91	P/Teach.	1,109	No.	66	88	185	339	
Electricity									
Extent. WAPDA Supply		%	34	Houses'000	3.3	4.8	6.1	14.2	

Note : % : Family Coverage
P/Unit : Population per Unit
P/Doctor : Population per Doctor
P/School : Population per School
P/Teach. : Population per Teacher

Table E-19(5) Rural Infrastructure Development Plan, Charbagh

[5] Sub-project Area : CHARBAGH
Nos. of UC : 3

Unit:'000

Year	1988	1995	2000	2005
Population	54.0	67.3	78.8	92.2
Houses	7.7	9.6	11.2	13.2

Section - Item	Existing Nos.	Coverage Unit	Coverage 1988	Requirment Unit	Requirment 90-95	95-00	00-05	Total	Remarks
Water Supply		%	53	Houses'000	0.7	2.5	2.6	5.8	
Sanitation									
Latrines		%	< 1	Houses'000	0.5	0.6	1.5	2.5	
Health Care									
Improve. BHU,RHC,etc.	3	P/Unit	18,000	No.	2	1		3	
Construction BHUs				No.	3	2	2	7	
Doctors	2	P/Doctor	27,000	No.	1	5	8	13	
Education									
Boys School	41	P/School	1,317	No.	0	12	10	32	
Teachers for Boys	184	P/Teach.	293	No.	0	79	199	278	
Girls School	11	P/School	4,909	No.	6	9	20	35	
Teachers for Girls	34	P/Teach.	1,588	No.	50	17	99	166	
Electricity									
Extent, WAPDA Supply		%	45	Houses'000	0.9	2.1	3.1	5.1	

Note : % : Family Coverage
P/Unit : Population per Unit
P/Doctor : Population per Doctor
P/School : Population per School
P/Teach. : Population per Teacher

Table E-19(6) Rural Infrastructure Development Plan, Kanju

[6] Sub-project Area : KANJU
Nos. of UC : 3

Unit:'000

Year	1988	1995	2000	2005
Population	50.5	61.0	73.7	86.1
Houses	5.3	8.6	10.1	11.8

Section - Item	Existing Nos.	Coverage Unit	Coverage 1988	Requirment Unit	Requirment 90-95	95-00	00-05	Total	Remarks
Water Supply		%	37	Houses'000	1.7	2.2	2.3	6.2	
Sanitation									
Latrines		%	< 1	Houses'000	0.4	0.6	1.4	2.4	
Health Care									
Improve. BHU,RHC,etc.	7	P/Unit	7,214	No.	4	3		7	
Construction BHUs				No.	0	0	2	2	
Doctors	6	P/Doctor	8,417	No.	0	2	7	9	
Education									
Boys School	37	P/School	1,365	No.	0	12	37	49	
Teachers for Boys	197	P/Teach.	256	No.	0	19	186	235	
Girls School	15	P/School	3,367	No.	1	9	19	29	
Teachers for Girls	32	P/Teach.	1,578	No.	47	14	93	184	
Electricity									
Extent, WAPDA Supply		%	47	Houses'000	0.6	2.2	2.8	5.6	

Note : % : Family Coverage
P/Unit : Population per Unit
P/Doctor : Population per Doctor
P/School : Population per School
P/Teach. : Population per Teacher

Table E-19(7) Rural Infrastructure Development Plan, Kabal

[7] Sub-project Area : KABAL
Nos. of UC : 3

Unit: '000

Year	1988	1995	2000	2005
Population	136.0	169.5	198.5	232.3
Houses	18.6	23.2	27.1	31.8

Section · Item	Existing Nos.	Coverage Unit	Coverage 1988	Requirment Unit	Requirment 90-95	95-00	00-05	Total	Remarks
Water Supply		%	20	Houses'000	7.9	6.0	6.2	20.1	
Sanitation									
Latrines		%	< 1	Houses'000	1.2	1.6	3.6	6.4	
Health Care									
Improve. BHU. RHC. etc.	7	P/Unit	19,429	No.	4	3		7	
Construction BHUs				No.	7	4	5	16	
Doctors	6	P/Doctor	22,667	No.	8	12	20	40	
Education									
Boys School	50	P/School	2,720	No.	35	18	100	183	
Teachers for Boys	238	P/Teach.	571	No.	186	238	500	924	
Girls School	13	P/School	10,462	No.	29	24	50	103	
Teachers for Girls	34	P/Teach.	4,000	No.	178	119	250	547	
Electricity									
Extent. WAPDA Supply		%	36	Houses'000	3.7	5.9	7.5	17.1	

Note : % : Family Coverage
P/Unit : Population per Unit
P/Doctor : Population per Doctor
P/School : Population per School
P/Teach. : Population per Teacher

Table E-19(8) Rural Infrastructure Development Plan, Barikot

[8] Sub-project Area : BARIKOT
Nos. of UC : 3

Unit: '000

Year	1988	1995	2000	2005
Population	54.6	80.5	94.3	110.4
Houses	8.7	10.8	12.7	14.9

Section · Item	Existing Nos.	Coverage Unit	Coverage 1988	Requirment Unit	Requirment 90-95	95-00	00-05	Total	Remarks
Water Supply		%	40	Houses'000	1.9	2.8	3.9	7.6	
Sanitation									
Latrines		%	< 1	Houses'000	0.5	0.7	1.7	2.9	
Health Care									
Improve. BHU. RHC. etc.	9	P/Unit	7,178	No.	5	4		9	
Construction BHUs				No.	0	0	2	2	
Doctors	6	P/Doctor	10,767	No.	1	5	10	17	
Education									
Boys School	36	P/School	1,794	No.	1	23	48	75	
Teachers for Boys	240	P/Teach.	269	No.	0	74	238	312	
Girls School	9	P/School	7,178	No.	11	11	24	46	
Teachers for Girls	45	P/Teach.	1,436	No.	36	56	119	231	
Electricity									
Extent. WAPDA Supply		%	75	Houses'000	0.0	2.7	3.5	6.2	

Note : % : Family Coverage
P/Unit : Population per Unit
P/Doctor : Population per Doctor
P/School : Population per School
P/Teach. : Population per Teacher

Table E-19(9) Rural Infrastructure Development Plan, Mingora

(9) Sub-project Area : MINGORA
Nos. of UC : 5

Unit:'000

Year	1988	1995	2000	2005
Population	96.4	120.2	140.7	164.7
Houses	13.6	17.0	19.8	23.2

Section - Item	Existing Nos.	Coverage Unit	Coverage 1988	Requirment Unit	Requirment 90-95	95-00	00-05	Total	Remarks
Water Supply		%	41	Houses'000	2.9	4.4	4.5	11.8	
Sanitation									
Latrines		%	< 1	Houses'000	0.8	1.1	2.7	4.6	
Health Care									
Improve. BHU,RHC,etc.	12	P/Unit	8,033	No.	6	6		12	
Construction BHUs				No.	0	1	1	5	
Doctors	9	P/Doctor	10,711	No.	1	9	14	24	
Education									
Boys School	33	P/School	1,161	No.	0	11	71	82	
Teachers for Boys	328	P/Teach.	256	No.	0	93	354	447	
Girls School	16	P/School	2,096	No.	0	1	35	36	
Teachers for Girls	175	P/Teach.	551	No.	0	59	177	236	
Electricity									
Extent, #APDA Supply		%	49	Houses'000	1.0	1.3	5.5	10.8	

Note : % : Family Coverage
P/Unit : Population per Unit
P/Doctor : Population per Doctor
P/School : Population per School
P/Teach. : Population per Teacher

Table E-19(10) Rural Infrastructure Development Plan, Alpuri

(10) Sub-project Area : ALPURI
Nos. of UC : 3

Unit:'000

Year	1988	1995	2000	2005
Population	121.5	151.5	177.3	207.6
Houses	19.8	24.3	28.9	33.8

Section - Item	Existing Nos.	Coverage Unit	Coverage 1988	Requirment Unit	Requirment 90-95	95-00	00-05	Total	Remarks
Water Supply		%	22	Houses'000	8.0	6.1	6.6	21.0	
Sanitation									
Latrines		%	< 1	Houses'000	1.2	1.7	3.3	6.6	
Health Care									
Improve. BHU,RHC,etc.	3	P/Unit	13,500	No.	5	1		9	
Construction BHUs				No.	5	3	5	13	
Doctors	3	P/Doctor	40,500	No.	10	11	18	39	
Education									
Boys School	115	P/School	1,057	No.	0	3	55	32	
Teachers for Boys	145	P/Teach.	273	No.	0	146	147	593	
Girls School	21	P/School	5,786	No.	17	21	45	83	
Teachers for Girls	81	P/Teach.	1,500	No.	108	106	223	133	
Electricity									
Extent, #APDA Supply		%	5	Houses'000	19.3	6.2	8.0	21.5	

Note : % : Family Coverage
P/Unit : Population per Unit
P/Doctor : Population per Doctor
P/School : Population per School
P/Teach. : Population per Teacher

Table E-19(11) Rural Infrastructure Development Plan, Chakesar

[11] Sub-project Area : CHAKESAR
Nos. of UC : 2

Unit:'000

Year	1988	1995	2000	2005
Population	51.5	64.2	75.2	88.9
Houses	8.1	10.5	12.3	14.3

Section - Item	Existing Nos.	Coverage Unit	Coverage 1988	Requirment Unit	Requirment 90-95	95-00	00-05	Total	Remarks
Water Supply		%	17	Houses'000	3.8	2.7	2.8	9.3	
Sanitation									
Latrines		%	< 1	Houses'000	0.5	0.7	1.6	2.8	
Health Care									
Improve. BHU,RHC,etc.	3	P/Unit	17,167	No.	2	1		3	
Construction BHUs				No.	2	1	2	5	
Doctors	4	P/Doctor	12,875	No.	1	5	8	14	
Education									
Boys School	35	P/School	1,471	No.	0	15	38	53	
Teachers for Boys	161	P/Teach.	320	No.	0	90	189	279	
Girls School	2	P/School	25,750	No.	14	9	19	42	
Teachers for Girls	2	P/Teach.	25,750	No.	78	45	95	218	
Electricity									
Extent, WAPDA Supply		%	0	Houses'000	1.7	2.5	3.4	10.7	

Note : % : Family Coverage
P/Unit : Population per Unit
P/Doctor : Population per Doctor
P/School : Population per School
P/Teach. : Population per Teacher

Table E-19(12) Rural Infrastructure Development Plan, Puran

[12] Sub-project Area : PURAN
Nos. of UC : 2

Unit:'000

Year	1988	1995	2000	2005
Population	51.2	63.8	74.7	87.5
Houses	7.9	9.8	11.5	13.5

Section - Item	Existing Nos.	Coverage Unit	Coverage 1988	Requirment Unit	Requirment 90-95	95-00	00-05	Total	Remarks
Water Supply		%	22	Houses'000	3.2	2.5	2.5	8.1	
Sanitation									
Latrines		%	< 1	Houses'000	0.5	0.7	1.5	2.7	
Health Care									
Improve. BHU,RHC,etc.	3	P/Unit	17,067	No.	2	1		3	
Construction BHUs				No.	2	1	2	5	
Doctors	1	P/Doctor	51,200	No.	4	5	8	17	
Education									
Boys School	31	P/School	1,652	No.	1	18	38	57	
Teachers for Boys	140	P/Teach.	366	No.	20	89	188	297	
Girls School	12	P/School	4,267	No.	1	9	19	32	
Teachers for Girls	23	P/Teach.	2,226	No.	57	45	94	196	
Electricity									
Extent, WAPDA Supply		%	0	Houses'000	1.1	2.5	3.2	10.1	

Note : % : Family Coverage
P/Unit : Population per Unit
P/Doctor : Population per Doctor
P/School : Population per School
P/Teach. : Population per Teacher

Table E-19(13) Rural Infrastructure Development Plan, Martung

(13) Sub-project Area : MARTUNG
Nos. of UC : 2

Unit: '000

Year	1988	1995	2000	2005
Population	31.1	38.8	45.4	53.1
Houses	4.6	5.7	6.7	7.9

Section - Item	Existing Nos.	Coverage Unit	Coverage 1988	Requirment Unit	Requirment 00-05	05-00	00-05	Total	Remarks
Water Supply		%	28	Houses'000	1.6	1.5	1.5	4.6	
Sanitation									
Latrines		%	< 1	Houses'000	0.3	0.4	0.9	1.6	
Health Care									
Improve. BHU,RHC,etc.	1	P/Unit	7,275	No.	2	2		4	
Construction BHUs				No.	0	0	1	1	
Doctors	1	P/Doctor	31,100	No.	2	3	5	10	
Education									
Boys School	20	P/School	1,555	No.	0	10	23	33	
Teachers for Boys	85	P/Teach.	366	No.	12	54	114	180	
Girls School	2	P/School	15,550	No.	5	5	11	21	
Teachers for Girls	2	P/Teach.	15,550	No.	46	27	57	130	
Electricity									
Extent, MAPDA Supply		%	0	Houses'000	2.6	1.6	1.9	5.9	

Note : % : Family Coverage
P/Unit : Population per Unit
P/Doctor : Population per Doctor
P/School : Population per School
P/Teach. : Population per Teacher

Table E-19(14) Rural Infrastructure Development Plan, Besham

(14) Sub-project Area : BESHAM
Nos. of HC : 2

Unit: '000

Year	1988	1995	2000	2005
Population	18.3	58.5	58.1	80.1
Houses	2.7	9.5	11.2	13.2

Section - Item	Existing Nos.	Coverage Unit	Coverage 1988	Requirment Unit	Requirment 00-05	05-00	00-05	Total	Remarks
Water Supply		%	36	Houses'000	2.0	2.5	2.5	7.1	
Sanitation									
Latrines		%	< 1	Houses'000	0.5	0.6	1.5	2.6	
Health Care									
Improve. BHU,RHC,etc.	3	P/Unit	15,633	No.	2	1		3	
Construction BHUs				No.	2	1	2	5	
Doctors	2	P/Doctor	23,450	No.	3	4	7	14	
Education									
Boys School	22	P/School	2,132	No.	1	16	31	57	
Teachers for Boys	147	P/Teach.	319	No.	0	81	172	253	
Girls School	8	P/School	5,863	No.	7	8	17	32	
Teachers for Girls	15	P/Teach.	3,127	No.	58	41	86	185	
Electricity									
Extent, MAPDA Supply		%	6	Houses'000	1.9	2.1	3.1	7.1	

Note : % : Family Coverage
P/Unit : Population per Unit
P/Doctor : Population per Doctor
P/School : Population per School
P/Teach. : Population per Teacher

Table E-19(15) Rural Infrastructure Development Plan, Daggar

[15] Sub-project Area : DAGGAR
Nos. of UC : 4

Unit:'000

Year	1988	1995	2000	2005
Population	65.3	81.4	95.3	111.5
Houses	9.1	11.3	13.3	15.5

Section - Item	Existing Nos.	Coverage Unit	Coverage 1988	Requirment Unit	Requirment 90-95	95-00	00-05	Total	Remarks
Water Supply		%	29	Houses'000	3.0	3.0	3.0	9.0	
Sanitation									
Latrines		%	< 1	Houses'000	0.6	0.8	1.8	3.1	
Health Care									
Improve. BHU.RHC.etc.	6	P/Unit	10,883	No.	1	3		6	
Construction BHUs				No.	1	2	2	5	
Doctors	2	P/Doctor	32,650	No.	5	6	10	21	
Education									
Boys School	32	P/School	2,041	No.	9	23	18	50	
Teachers for Boys	196	P/Teach.	333	No.	8	114	240	362	
Girls School	8	P/School	10,883	No.	14	11	24	49	
Teachers for Girls	20	P/Teach.	3,265	No.	82	57	120	259	
Electricity									
Extent. HAPDA Supply		%	37	Houses'000	1.7	2.9	3.7	8.3	

Note : % : Family Coverage
P/Unit : Population per Unit
P/Doctor : Population per Doctor
P/School : Population per School
P/Teach. : Population per Teacher

Table E-19(16) Rural Infrastructure Development Plan, Gadezai

[16] Sub-project Area : GADEZAI
Nos. of UC : 3

Unit:'000

Year	1988	1995	2000	2005
Population	54.8	80.8	94.6	110.7
Houses	9.4	11.7	13.7	16.1

Section - Item	Existing Nos.	Coverage Unit	Coverage 1988	Requirment Unit	Requirment 90-95	95-00	00-05	Total	Remarks
Water Supply		%	42	Houses'000	1.9	3.1	3.1	8.1	
Sanitation									
Latrines		%	< 1	Houses'000	0.6	0.8	1.8	3.2	
Health Care									
Improve. BHU.RHC.etc.	7	P/Unit	9,257	No.	3	3		7	
Construction BHUs				No.	0	2	2	4	
Doctors	5	P/Doctor	12,960	No.	2	6	10	18	
Education									
Boys School	34	P/School	1,906	No.	5	23	18	77	
Teachers for Boys	123	P/Teach.	527	No.	79	113	204	396	
Girls School	19	P/School	3,411	No.	1	11	24	36	
Teachers for Girls	38	P/Teach.	1,705	No.	53	57	119	229	
Electricity									
Extent. HAPDA Supply		%	48	Houses'000	0.8	3.0	3.8	7.6	

Note : % : Family Coverage
P/Unit : Population per Unit
P/Doctor : Population per Doctor
P/School : Population per School
P/Teach. : Population per Teacher

Table E-19(17) Rural Infrastructure Development Plan, Gagra

(17) Sub-project Area : GAGRA
Nos. of UC : 7

Unit: '000

Year	1988	1995	2000	2005
Population	51.7	64.5	75.1	88.3
Houses	7.2	9.0	10.5	12.3

Section - Item	Existing Nos.	Coverage Unit	Coverage 1988	Requirement Unit	Requirement 90-95	95-00	00-05	Total	Remarks
Water Supply		%	59	Houses'000	0.2	2.3	2.4	4.9	
Sanitation									
Latrines		%	< 1	Houses'000	0.4	0.6	1.4	2.1	
Health Care									
Improve. BHU, RHC etc.	5	P/Unit	10,340	No.	3	2		5	
Construction BHUs				No.	0	2	2	4	
Doctors	4	P/Doctor	12,925	No.	1	5	8	14	
Education									
Boys School	34	P/School	1,521	No.	0	16	38	54	
Teachers for Boys	161	P/Teach.	321	No.	0	30	190	280	
Girls School	13	P/School	3,977	No.	3	9	19	31	
Teachers for Girls	14	P/Teach.	3,693	No.	67	15	95	207	
Electricity									
Extent, HAPDA Supply		%	57	Houses'000	0.0	2.2	2.9	5.1	

Note : % : Family Coverage
P/Unit : Population per Unit
P/Doctor : Population per Doctor
P/School : Population per School
P/Teach. : Population per Teacher

Table E-19(18) Rural Infrastructure Development Plan, Chagarzai

(18) Sub-project Area : CHAGARZAI
Nos. of UC : 4

Unit: '000

Year	1988	1995	2000	2005
Population	46.3	58.1	68.3	79.9
Houses	7.0	8.7	10.2	12.0

Section - Item	Existing Nos.	Coverage Unit	Coverage 1988	Requirement Unit	Requirement 90-95	95-00	00-05	Total	Remarks
Water Supply		%	31	Houses'000	1.5	2.3	2.3	6.1	
Sanitation									
Latrines		%	< 1	Houses'000	0.4	0.6	1.4	2.4	
Health Care									
Improve. BHU, RHC etc.	10	P/Unit	4,680	No.	5	5		10	
Construction BHUs				No.	0	0	0	0	
Doctors	7	P/Doctor	6,686	No.	0	2	7	9	
Education									
Boys School	54	P/School	867	No.	0	0	26	26	
Teachers for Boys	191	P/Teach.	245	No.	0	37	172	209	
Girls School	3	P/School	15,600	No.	12	8	17	37	
Teachers for Girls	3	P/Teach.	15,600	No.	20	41	86	197	
Electricity									
Extent, HAPDA Supply		%	0	Houses'000	3.9	2.2	2.8	8.9	

Note : % : Family Coverage
P/Unit : Population per Unit
P/Doctor : Population per Doctor
P/School : Population per School
P/Teach. : Population per Teacher

Table E-19(19) Rural Infrastructure Development Plan, Chamla

(19) Sub-project Area : CHAMLA/AMAZAI
Nos. of UC : 3

Unit: '000

Year	1988	1995	2000	2005
Population	61.3	76.4	89.5	104.7
Houses	9.3	12.3	14.4	16.9

Section - Item	Existing Nos.	Coverage Unit	Coverage 1988	Requirment Unit	Requirment 90-95	95-00	00-05	Total	Remarks
Water Supply		%	67	Houses'000	0.0	2.8	3.3	6.1	
Sanitation									
Latrines		%	< 1	Houses'000	0.8	0.8	1.9	3.3	
Health Care									
Improve. BHU,RHC,etc.	5	P/Unit	12,260	No.	3	2		5	
Construction BHUs				No.	1	2	2	5	
Doctors	3	P/Doctor	20,433	No.	3	5	9	18	
Education									
Boys School	36	P/School	1,703	No.	2	21	45	68	
Teachers for Boys	230	P/Teach.	267	No.	0	68	225	293	
Girls School	12	P/School	5,108	No.	7	11	23	41	
Teachers for Girls	15	P/Teach.	4,087	No.	81	54	113	248	
Electricity									
Extent, WAPDA Supply		%	10	Houses'000	1.6	3.1	4.0	11.7	

Note : % : Family Coverage
P/Unit : Population per Unit
P/Doctor : Population per Doctor
P/School : Population per School
P/Teach. : Population per Teacher

Table E-19(20) Rural Infrastructure Development Plan, Khudukhel

(20) Sub-project Area : KHUDUKHEL
Nos. of UC : 2

Unit: '000

Year	1988	1995	2000	2005
Population	47.2	58.8	68.9	80.6
Houses	7.7	9.6	11.2	13.2

Section - Item	Existing Nos.	Coverage Unit	Coverage 1988	Requirment Unit	Requirment 90-95	95-00	00-05	Total	Remarks
Water Supply		%	52	Houses'000	0.8	2.5	2.6	5.9	
Sanitation									
Latrines		%	< 1	Houses'000	0.5	0.8	1.5	2.6	
Health Care									
Improve. BHU,RHC,etc.	4	P/Unit	11,800	No.	2	2		4	
Construction BHUs				No.	1	1	2	4	
Doctors	3	P/Doctor	15,733	No.	2	4	7	13	
Education									
Boys School	37	P/School	1,276	No.	0	7	35	64	
Teachers for Boys	142	P/Teach.	332	No.	5	82	174	261	
Girls School	7	P/School	6,743	No.	8	8	17	33	
Teachers for Girls	20	P/Teach.	2,360	No.	54	41	87	182	
Electricity									
Extent, WAPDA Supply		%	25	Houses'000	2.1	2.4	3.1	7.9	

Note : % : Family Coverage
P/Unit : Population per Unit
P/Doctor : Population per Doctor
P/School : Population per School
P/Teach. : Population per Teacher

Table E-20 Seventh Five Year Plan of Road in Swat

NAME	NAME OF THE PROJECT	LENGTH	LEGEND
[1]	KALAM～MATILTAN	12.0km	IMPROVEMENT
[2]	SAIDU～KALAM	103.0	〃
[3]	BAGDHERI ～SAKRA	12.0	〃
[4]	MATTA～BEHA	23.0	〃
[5]	KHAWAZAKHELA ～BESHAM	67.0	〃
[6]	KOTKAI ～DHERI ～ALOCH	25.0	〃
[7]	LANDKAI～ SAIDU	40.0	RECONDITIONING
[8]	DAGGAR ～GOKAND	19.0	IMPROVEMENT
[9]	DAGGAR ～SHALBANDAI	15.5	〃
[10]	DANDAR ～GHAZICOT	16.0	CONSTRUCTION
	TOTAL	332.5	

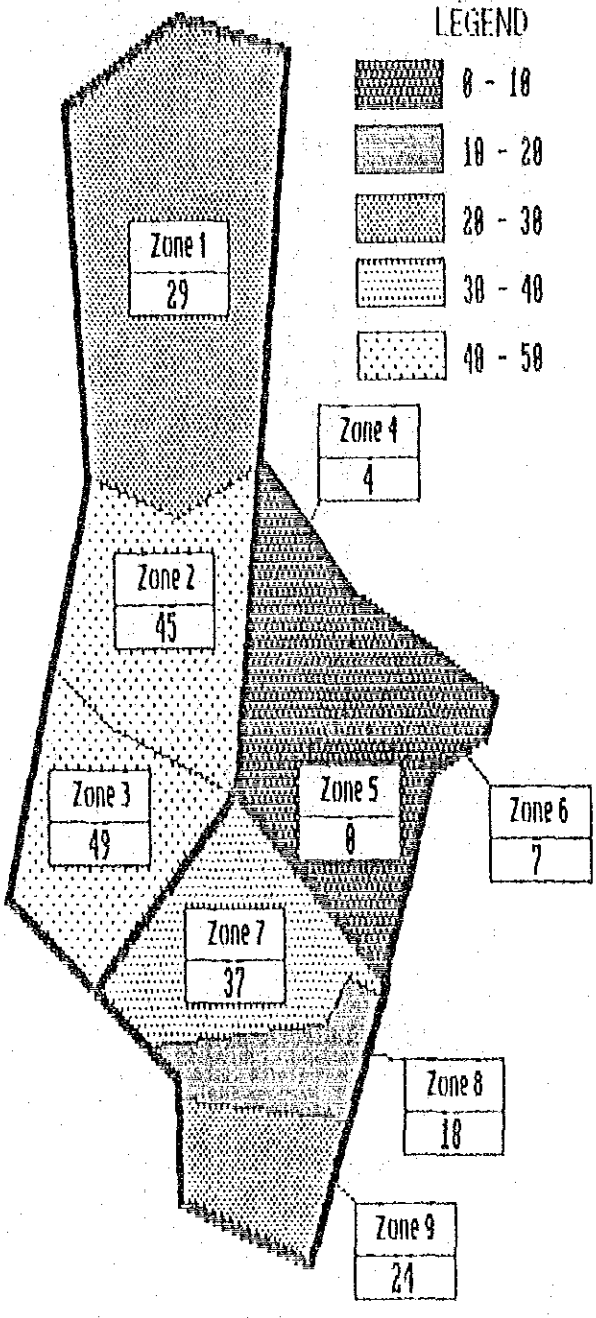
Table E-21 Proposed New Construction Roads In Swat

NAME	NAME OF THE PROJECT	LENGTH
(1)	HOOR PANDAI～TIRAT	3.0km
(2)	HANKIYAL ～BALAKOT	3.0
(3)	RAHATKOT ～SHAGRAH	9.5
(4)	BAIKANAI ～LUDER	3.5
(5)	KHAWAZAKHELA ～BESHAH TO KARAI	3.0
(6)	TELEGRAH ～BISHBAND	7.0
(7)	HALAH JABBA ROAD TO GANAJIR	5.0
(8)	LINK ROAD DERAI～BRABARAI	6.0
(9)	KATKORE～CHAKESAR ROAD	5.0
(10)	KATKOT ～HULTABANDA	5.0
(11)	DANAKUL～SAIDA	2.0
(12)	KUZ GANAGAR～DERAI	12.0
(13)	DANDAI ～OPAL	15.0
(14)	HAIRAGAI ～GOSH BANDA	6.0
(15)	CHAKESAR ～DANDAI	30.0
(16)	CHAKESAR ～HARTUNG	20.0
(17)	DEHRAI ～BEGALI	10.0
(18)	DEHRAI ～FAIZU ～BATU	8.0
(19)	ALOCH～GAHIAR	15.0
(20)	AWARI～KODONA	8.0
(21)	CHOGA～HACHKANDAI	4.0
(22)	CHOGA～KOT VIA BINA	20.0
(23)	KABALGRAH～HARTUNG	19.0
(24)	HARTUNG～PISHTAUR	6.0
(25)	TANGOLA～BAR SHAHNAI	5.0
(26)	BATARA ～KUZ SHAHNAI	5.0
(27)	BUDAL～BANGERAI	15.0
(28)	CHARORAI ～HANDO	4.0
(29)	SHADAH ～HALKA	4.0
(30)	KURTA VILLAGE	3.0
(31)	NAWAGAI～AHLOOK DANA	2.0
(32)	KANKUAI～GANJAI DERAI	3.0
(33)	HANGLAWAR～SHINGRAI	13.0
(34)	HINGORA～SANGOTA	8.0
(35)	PAROONA～GOKAND	12.0km
(36)	DUKADDA～CHOWAI	3.0
(37)	SDWARI TO REGA ROAD	1.5
(38)	AHLUKDARRA ～SARDAD	7.0
(39)	TO VILLAGE CHINDA KHAWRA	1.5
	TOTAL	312.0

Table E-22 Proposed Improvement Roads in Swat

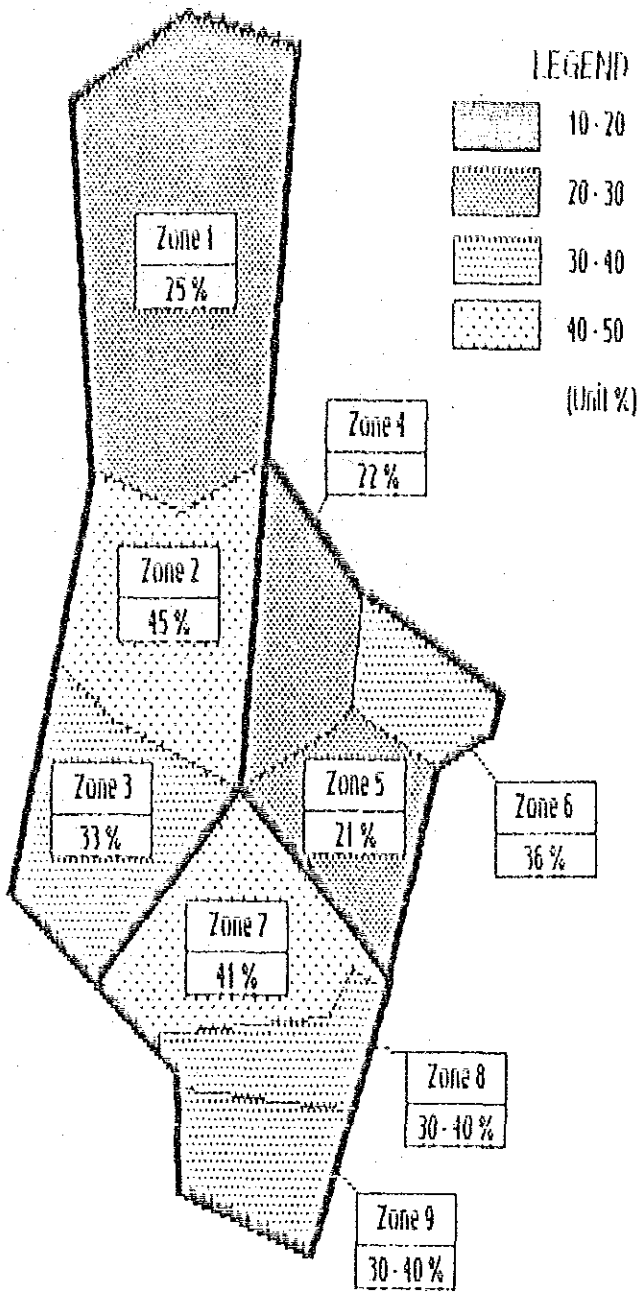
NAME	NAME OF THE PROJECT	LENGTH
1	KOHI ~BAHPEKHA	3.0km
2	CHAIL~BASHIGRAM ROAD	4.0
3	MIANDAM ROAD	3.0
4	RORINGAR ~NANDAL ROAD	6.0
5	PANTIGRAM~LABAT ROAD	3.0
6	ZINKHARAI~KOTANI	2.0
7	KANJU~MATTA ~BAGHDHERI	32.0
8	KHAWAZKHELA~SHALPIN	6.0
9	MASKONAI ROAD	2.0
10	KAS ~LELONAI ROAD	5.0
11	KARORA ~AJMIR	20.0
12	DEHRAI ~CHAKESAR~KARORA	50.5
13	SHAHDHERI~LANGAR ROAD	1.2
14	AMCOK~BANO ROAD	3.0
15	SERSENAI TO TANOBAND ROAD	4.5
16	KOZABANDAI ~SIGRAM ROAD	5.0
17	MANGLAWAR~BANJOT~LIAVANBAT	16.0
18	ZARAKHELA~RANGALA	8.0
19	VAINAI ~CHINGLAILAI	8.0
20	TANA ~NAI	4.0
21	VILLEAGE BARICOT APPROACH ROAD	2.0
22	NAJIGRAM VALLEY ROAD	1.5
23	JOWAR~GIRARAI	3.0
24	BAZARGAI ~NAWIDANO	11.0
25	BARIKOT~DAGGAR	46.0
26	MALAKPUR ~DUKADA ROAD	3.0
27	KARAPA ~NAWAKALAY	8.0
28	CHOGA~INAWAR	6.0
29	CHOGA~KUZPAN	6.0
30	ALOCH~CHOGA	6.0
31	ALOCH~MARTUNG	20.0
32	KUZANAWAGAI~CHARORAI	20.0
33	CHINGLAI ~KINGLAI	5.0
	T O T A L	323.7

Figure E-1(1) Rural Infrastructure Conditions in Swat District
Electrification, Water Supply



Electrification Coverage

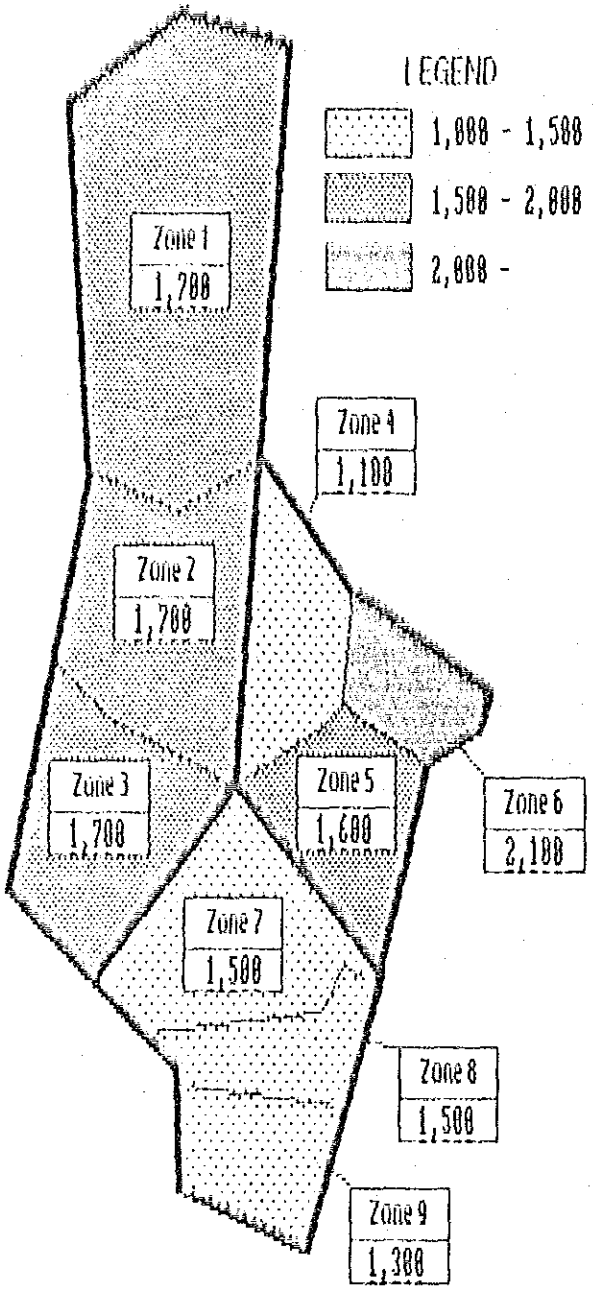
(Unit:Families %)



Water Supply System

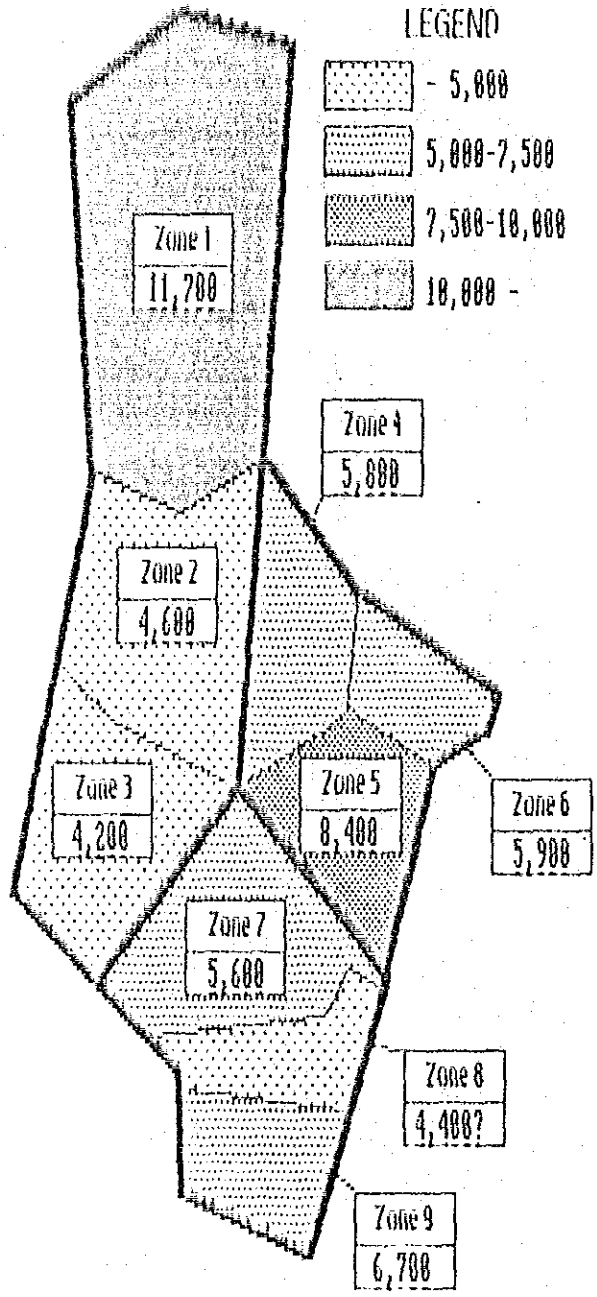
Family Coverage (%)

Figure E-1(2) Rural Infrastructure Conditions in Swat District
Boys and Girls Schools



Boys Schools

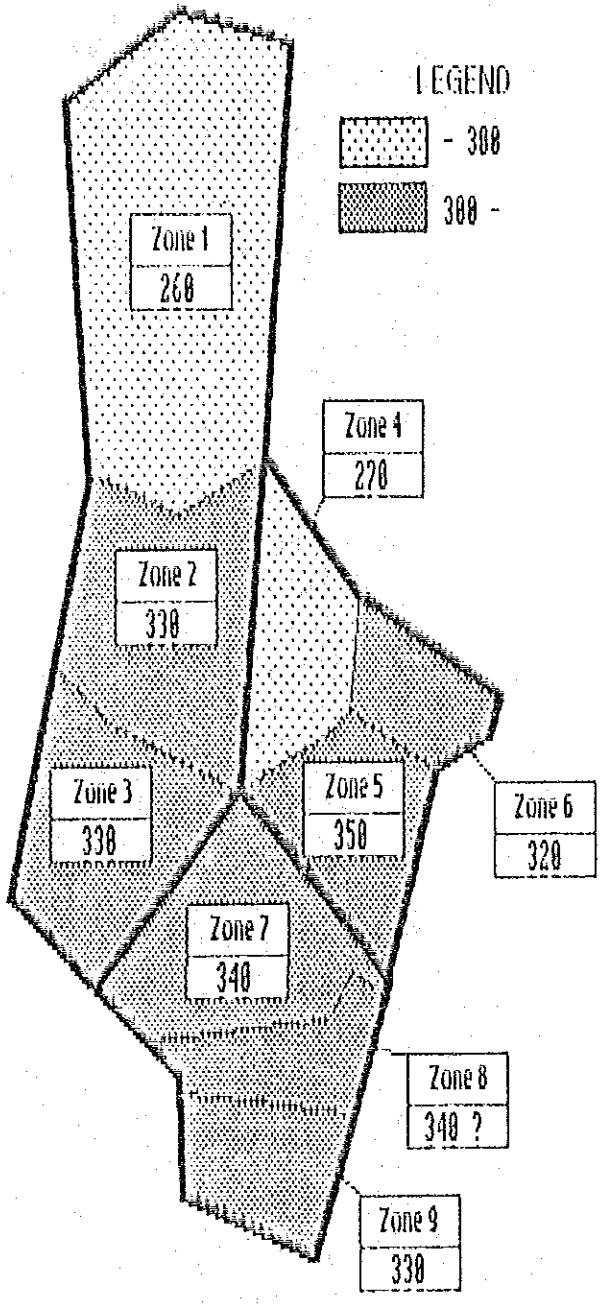
(Unit:Population per School)



Girls Schools

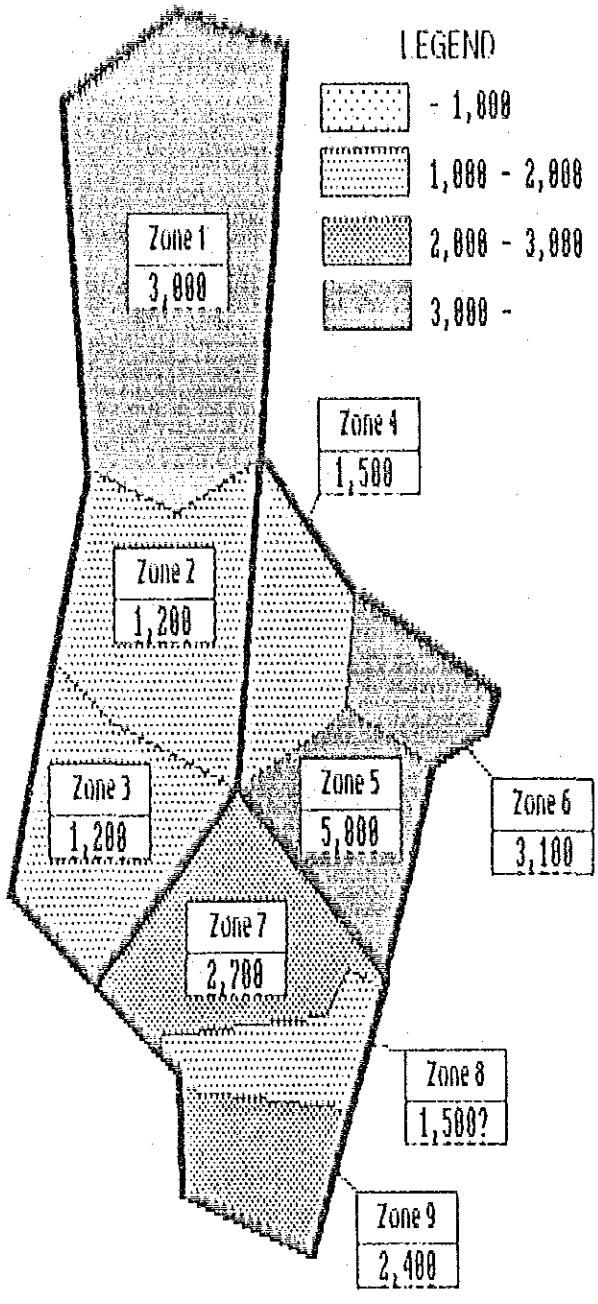
(Unit:Population per School)

Figure E-1(3) Rural Infrastructure Conditions in Swat District
Teachers of Boys and Girls Schools



Teachers of Boys Schools

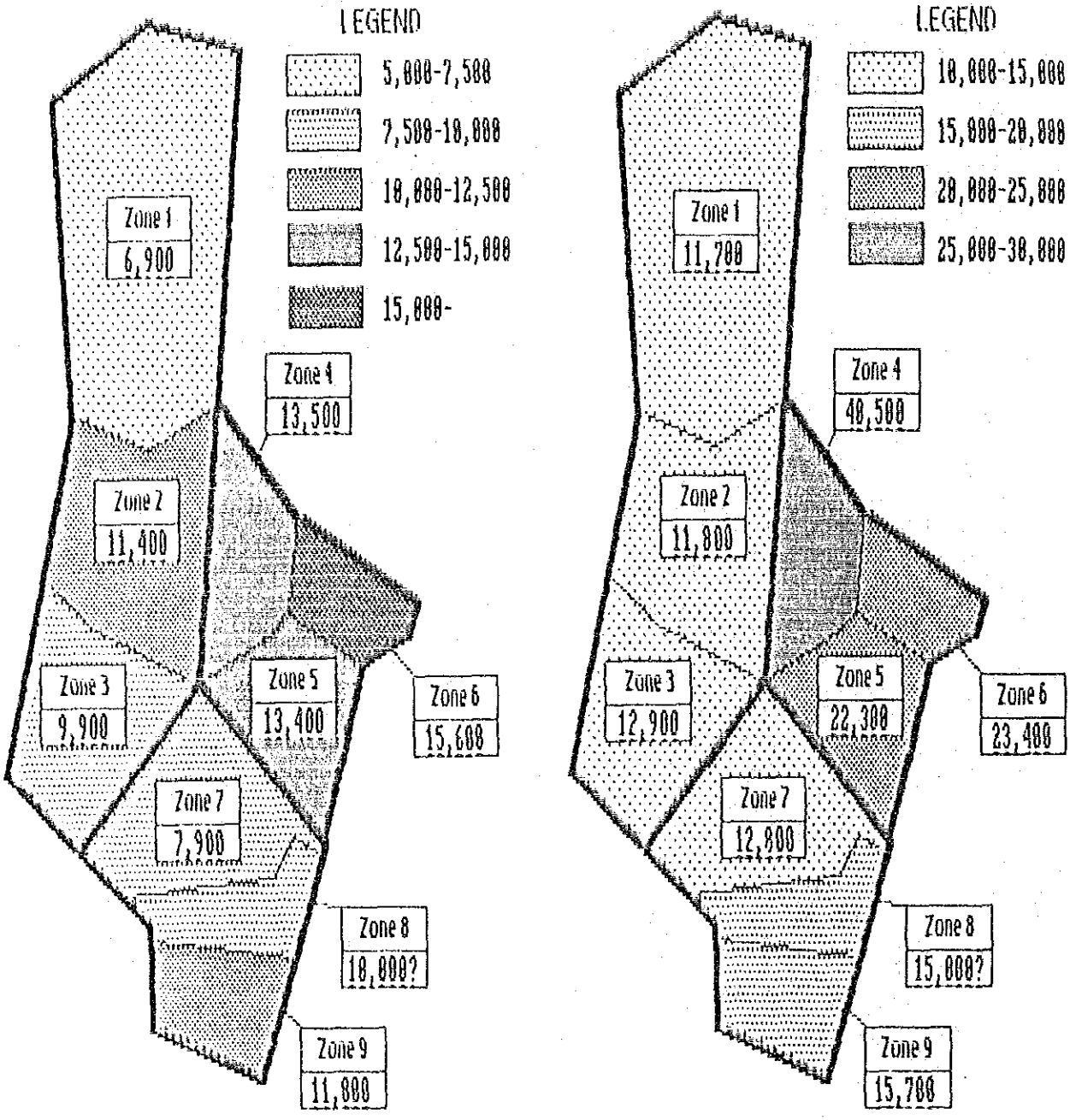
(Unit:Population per Teacher)



Teachers of Girls Schools

(Unit:Population per Teacher)

Figure E-1(4) Rural Infrastructure Conditions in Swat District
Health Facilities



Health Facilities

(Unit:Population per Unit)

Health : Doctors

(Unit:Population per Doctor)

Figure E-2 Education System in Pakistan

Grade	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Age	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Level	Primary Education (Compulsory)					Secondary Education							Collage Education				
Schools	Primary School					Middle School			High School		Inter-mediate Collage		Collage				
													University				

CHAPTER IV. DRAWINGS OF RURAL INFRASTRUCTURE

Present and proposed rural infrastructure facilities are presented in the following drawings;

Figure E-3(1) Rural and Social Infrastructure (Road Conditions and Schemes)

Figure E-3(2) Rural and Social Infrastructure (Communication)

Figure E-3(3) Rural and Social Infrastructure (Wireless Telephone)

Figure E-3(4) Rural and Social Infrastructure (Village Water Supply)

Figure E-3(5) Rural and Social Infrastructure (Education)

Figure E-3(6) Rural and Social Infrastructure (Medical and Health Services)

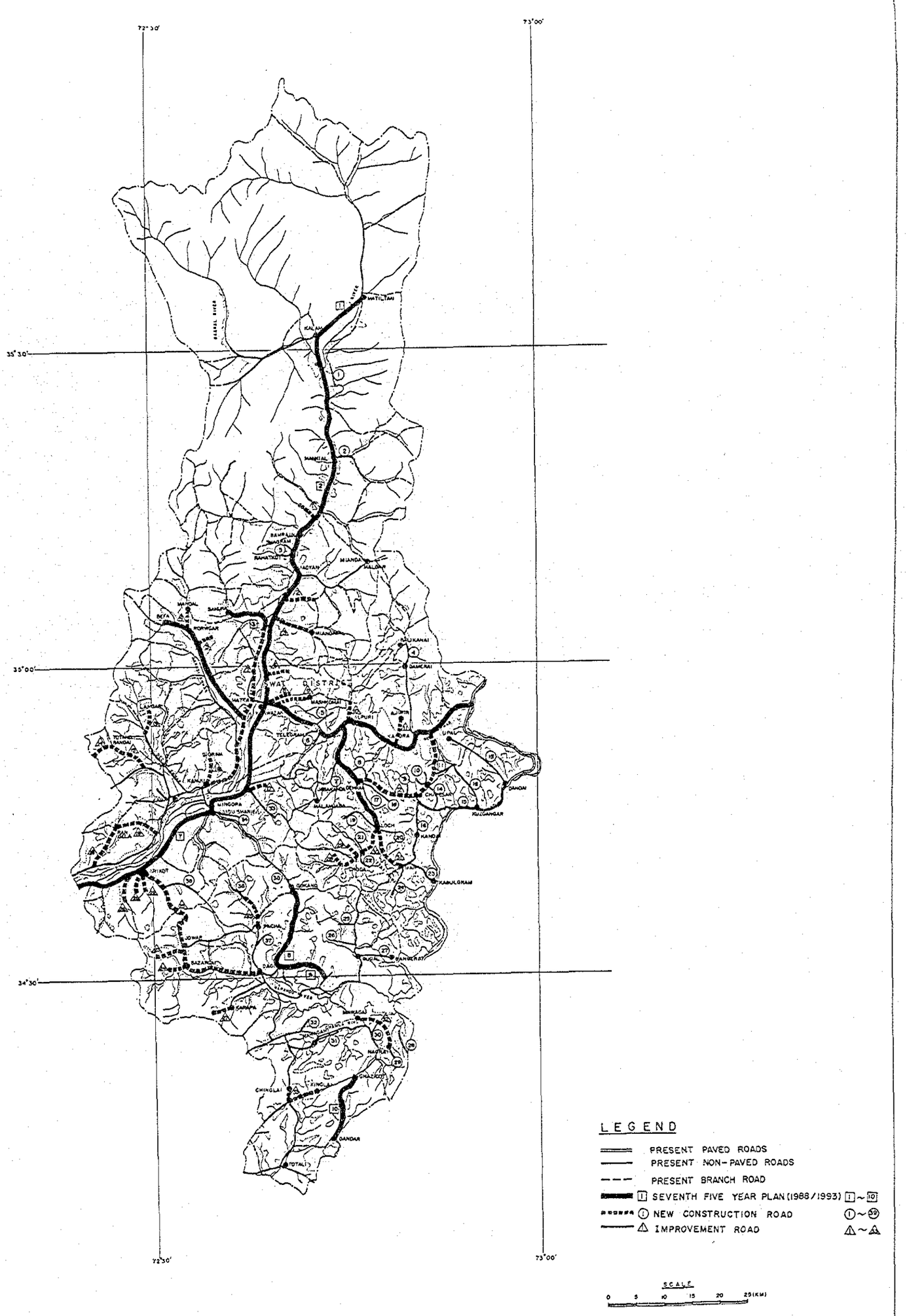


FIGURE E-3(1)
RURAL AND SOCIAL INFRASTRUCTURE (ROAD CONDITIONS AND SCHEMES)

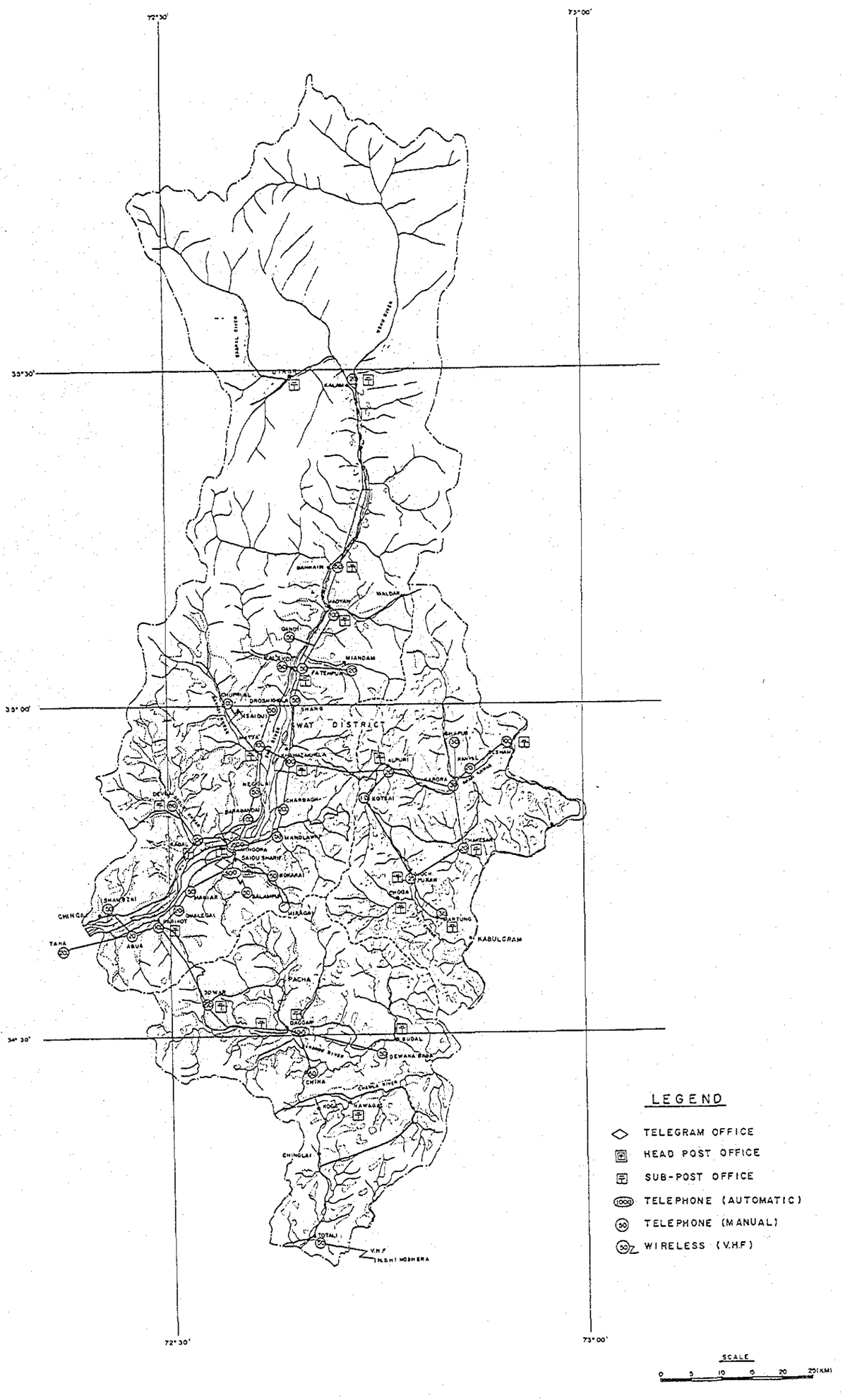


FIGURE E-3(2) RURAL AND SOCIAL INFRASTRUCTURE (COMMUNICATION)

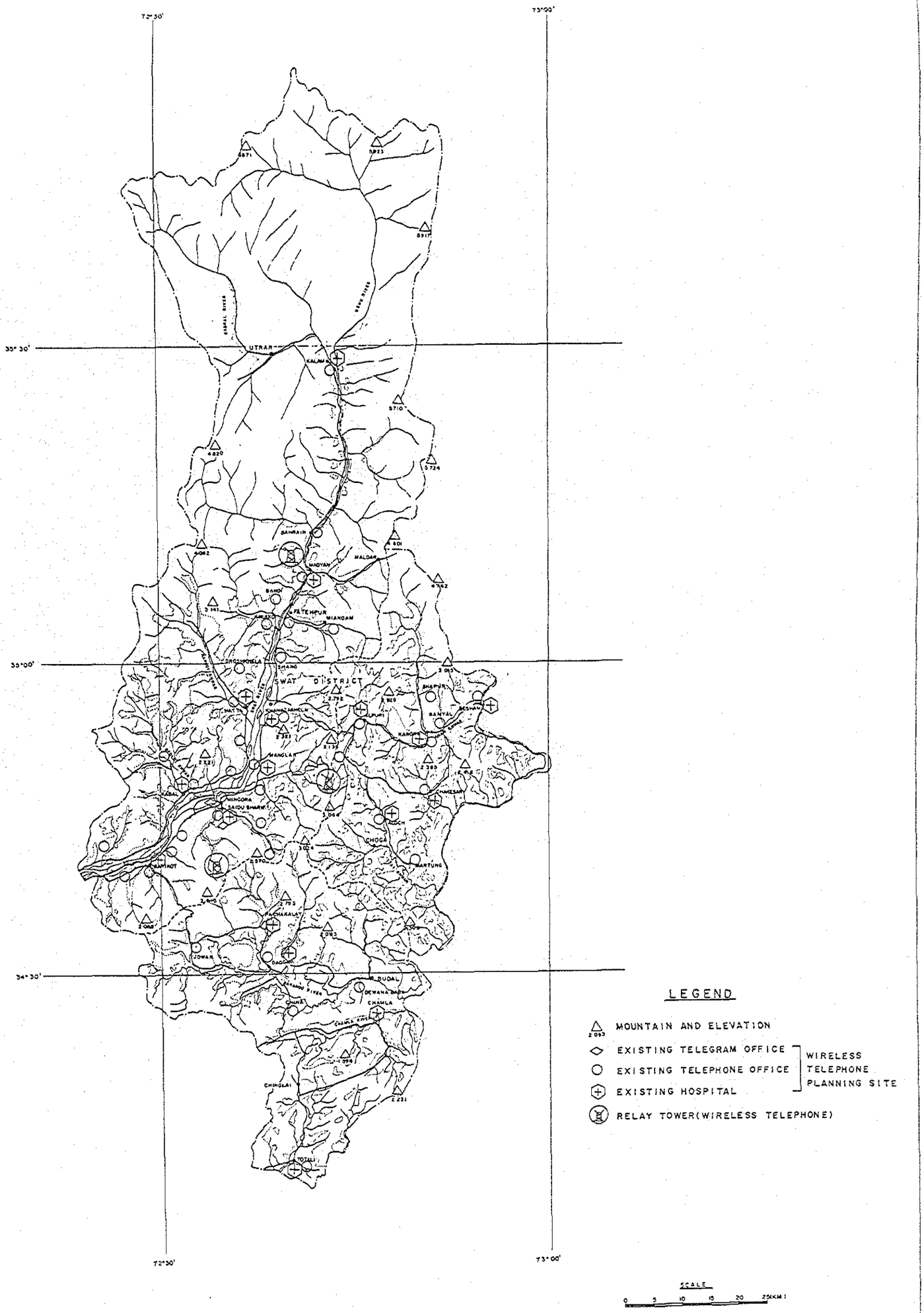


FIGURE E-3(3) RURAL AND SOCIAL INFRASTRUCTURE (WIRELESS TELEPHONE)

FIGURE E-3(4) RURAL AND SOCIAL INFRASTRUCTURE (VILLAGE WATER SUPPLY)

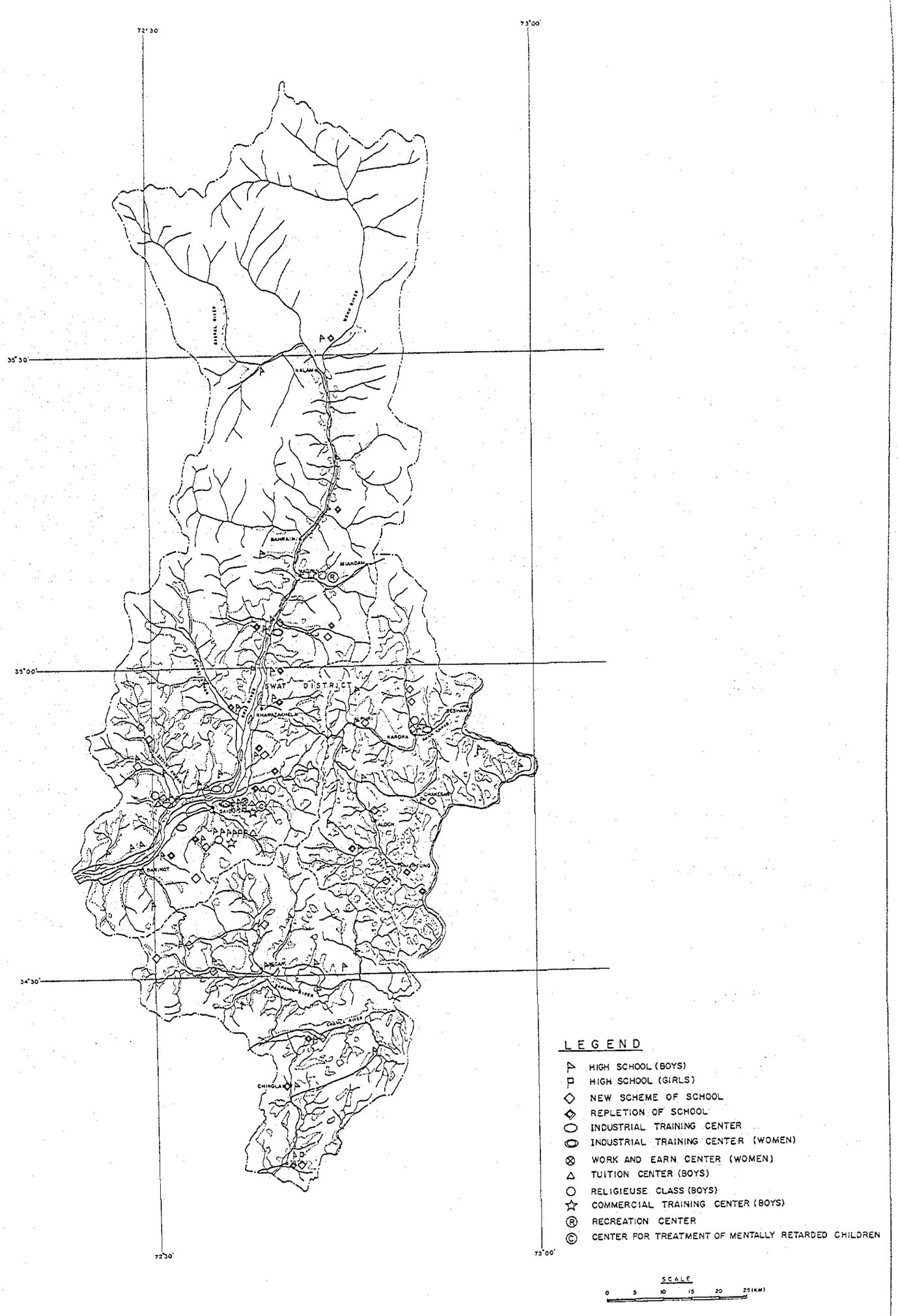


FIGURE E-3(5) RURAL AND SOCIAL INFRASTRUCTURE (EDUCATION)

FIGURE E-3 (6) RURAL AND SOCIAL INFRASTRUCTURE
(MEDICAL AND HEALTH SERVICES)

ANNEX F. RURAL ELECTRIFICATION

LIST OF TABLES

LIST OF FIGURES

F. Rural Electrification

1) The present State of WAPDA Transmission Line for Swat District

The existing transmission lines around Swat district are shown on the attached Figure F-1. The source of the electric power is from the Tarubera hydel power plant located in Indus river. The existing transmission line for Swat District has two circuits passing through Mardan Dargai and Chakdar grid stations to Saidu Sharif grid station. The voltages of the transmission lines for Swat District are 66KV and 132KV. The capacities of the existing transformer of the grid station in Saidu Sharif are; units 132/33KV 6.3 MVA one unit, and the other two units are 132/11KV 13MVA.

2) The Future Plan of WAPDA Transmission Line and Distribution Line for Swat District

The proposed extension from the existing distribution lines in Swat District are shown on the attached Figure F-2. However, the capacity of the existing distribution line is over loading. In order to augment the electric supply, WAPDA proposed to construct new grid stations and transmission lines around Swat District under "Forth secondary transmission and grid station project of WAPDA". For Swat District, the grid station will be constructed at Khwazakhela, Madyan and Martung or Chakesar, and the transmission lines will be installed from Saidu Sharif to Madyan via Khwazakhela and from Daggar to Martung or Chakesar for Shangla Par Sub-Division. And the existing grid station in Saidu Sharif will be augmented.

3) The Development of Electrification for the Priority Area

The priority area is steep, mountainous and remote from the existing WAPDA Grid and distribution line, moreover, each village is scattered. Therefore, the completion of the plan is probably delayed, Consequently, hydel power is the most reasonable means of the electrification in the area. However, the are has a low potential for the hydel power. Nevertheless, electrification for public facilities such as

health care school etc. is necessary for the enhancement of the life of the people in the locality.

Other than the hydel power, micro-hydel power is also one possible means of electrification which can used for public facilities. Some potentials for the micro-hydel power have been identified in the area. The potentials for the micro-hydel power are shown on the attached Table F-1.

The hydel-micro power schemes except in Jambal Derai will be combined with small scale irrigation schemes, in which, the existing irrigation canals will be involved. Two units of generator set should be equipped in each micro-hydel power plant to be used in case of the micro-hydel power breakdown, thus, it may take a long time to repair or to get spare parts in this area.

4) Annual Possible Power Generation

Annual possible power generation, P(Mwh)
= Maximum use discharge × 355 × Discharge utilization factor × 24 × Mean energy conversion fact of discharge

Where: Maximum use discharge = 1.42(M^3)

Discharge utilization factor = 0.42

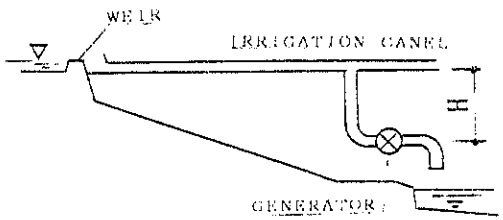
Mean energy conversion fact of discharge
= 1/2 × {(Maximum power generation/Maximum use discharge) + (Firm power generation/Firm use discharge)}
= 1/2 × {(200/1.42) + (85/0.6)}
= 141

P(Mwh) = 1.43 × 335 × 0.42 × 24 × 141
= 721(Mwh)

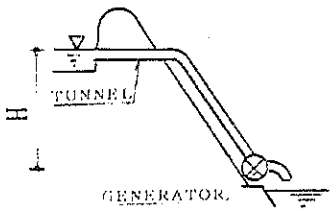
TABLE F-1 POTENTIAL FOR MICRO-HYDEL POWER GENERATION

NAME OF SCHEME	TYPE	HEAD (M)	DISCHARG (MAX.USE) (M^3/S)	POWER (MAX) (KW)	POWER (FIRM) (KW)	CATCHMENT AREA (KM^2)	ANNUAL POSSIBLE GENERATION (MWh)	ANNUAL AVAILABLE POWER SUPPLY (DAY/YERA)
SURBANAI B.	I	10	0.11	7.0	1.2	36.5	18.0	130
SANDAI	I	10	0.63	45.0	9.0	53.0	143.4	214
CHOGA	I	10	0.05	3.5	2.0	55.8	11.3	224
JAMBAL.D	II	20	1.42	200.0	85.0	227.1	721.0	355
KABULGRAM	III	20	0.72	102.0	50.8	337.0	580.0	355

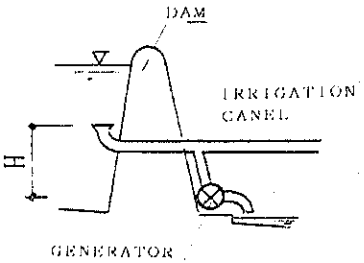
(In case of Sandai, discriptions are total of three units.



TYPE I (WEIR)



TYPE II (WEIR & TUNNEL)



TYPE III (DAM)

$P=9.8 \times H \times Q \times E$

WHERE P:POWER(KW)

H:HEAD(m)

Q:DISCHARGE(M^3/S)

E:EFFECUENCY 0.72

TABLE F-2 CALCULATION OF DISCHARGE UTILIZATION FACTOR

DISCHARGE OF FLOW DURATION					USABLE DISCHARGE		DISCHARGE UTILIZATION FACTOR
A	B	C	D	E	F	H	I
				C x D		B x 365	F/G
(DAY)	(M^3 /S)	(M^3 /S)	(DAY)	(M^3 /S)	(%)	(M^3 /S)	(%)
MINIMUM --- 365	0	0	365	0	0	0	0
DROUGHT --- 355	0.6	0.6	360	216.0	216.0	219.0	20.7
LOW --- 275	0.9	0.3	315	94.5	310.5	328.5	30.0
NORMAL --- 185	1.4	0.5	230	115.0	422.5	511.0	40.7
95-DAY --- 95	2.2	0.8	140	112.0	537.5	803.0	51.6
MAXIMUM	12.8	10.6	48	508.3	G= 1,045.8	4,672.0	100.0

Note:

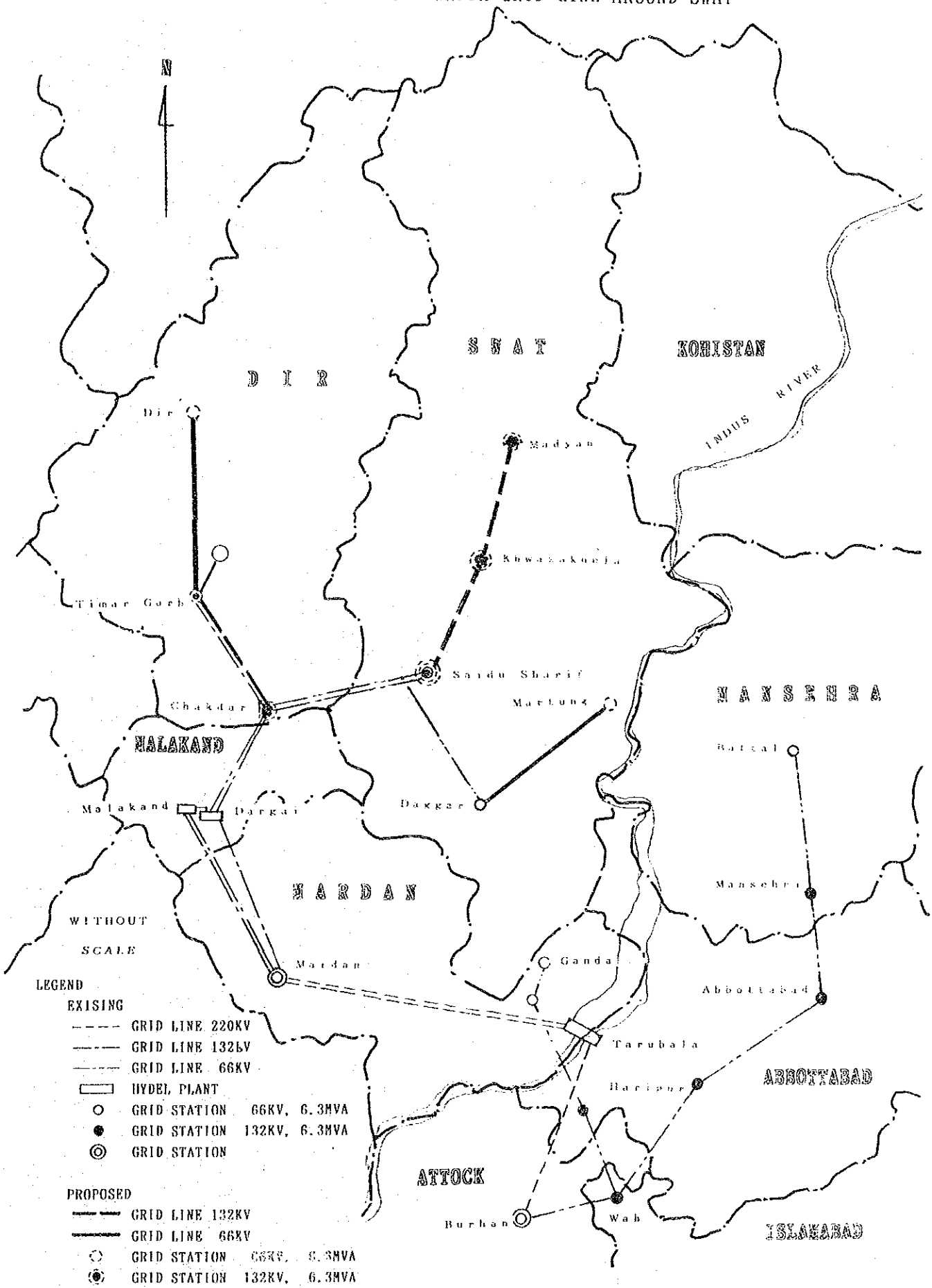
(1) B - The order of the value of the discharge (from the lesser value to the greater value).

(2) C - The difference between the value of discharge above and the value of discharge below in "B".

(3) D - The sum of the days above minus the days divided by two plus the days below in "A".

(4) F - The sum of the number above plus the number below in "E".

FIGURE F-1 WAPDA GRID LINE AROUND SWAT



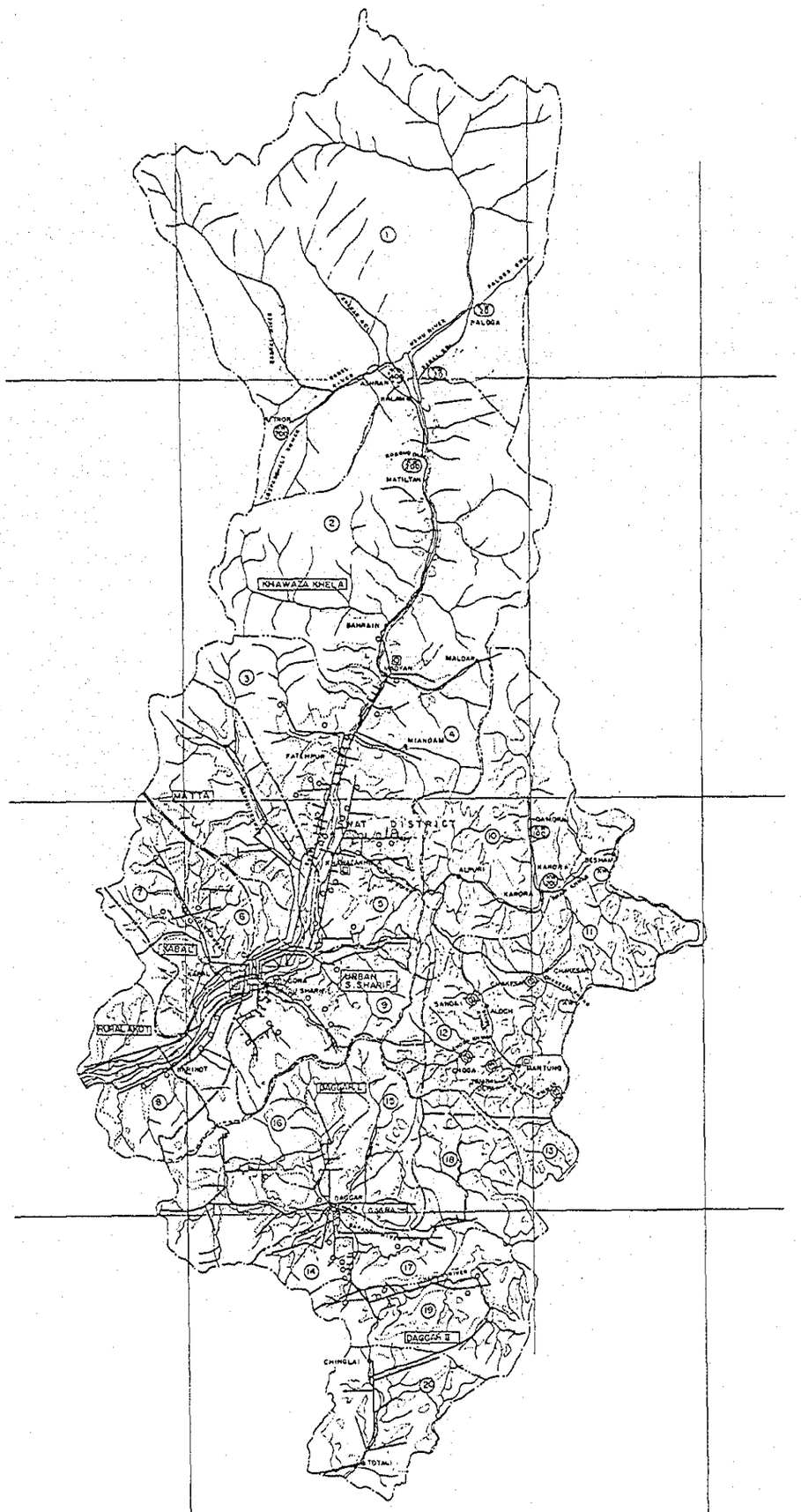


FIGURE F-2 RURAL ELECTRIFICATION MAP