APPENDIX G

TABLES

Table G1.1 Alternative Development Plans Studied in Preliminary Feasibility Report (1969)

Description	Unit	Plan A		Plan B			Plan C		Plan D
		Munda (High)	Kalangai	Munda (High)	Kalangai	Khazana	Munda (Low)	Ambahar	Bazargai
1. River and Basin									
River Name		Swat	Swat	Swat	Swat	Panjkora	Swat	Swat	Swat
River Mile*	mile (km)	21 (33.8)	58 (93.3)	21 (33.8)	58 (93.3)	70 (112.7)	21 (33.8)	32.5 (52.3)	25 (40.2)
2. Reservoir									
River Bed Elevation	ft (m)	1200 (365.8)	1790 (545.6)	1200 (365.8)	1790 (545.6)	2120 (646.2)	1200 (365.8)	1300 (396.2)	1260 (384.0)
Normal Pool Elevation	ft (m)	1850 (563.9)	2345 (714.8)	1850 (563.9)	2280 (694.9)	2610 (795.5)	1340 (408.4)	2200 (670.6)	2185 (666.0)
Gross Storage Capacity	MAF (MCM)	2.0 (2,460)	7.8 (9,594)	2.0 (2,460)	5.3 (6,519)	4.0 (4,920)	0.03 (37)	9.0 (11,070)	9.0 (11,070)
Live Storage Capacity	MAF (MCM)	1.5 (1,845)	6.0 (7,380)	1.5 (1,845)	3.5 (4,305)	2.5 (3,075)	0.02 (25)	7.5 (9,225)	7.5 (9,225)
Total of Live Storage	MAF (MCM)		7.5 (9,225)			7.5 (9,225)		7.52 (9,250)	7.5 (9,225)
3. Power Generation									
Effective Head	ft (m)	548 (167.0)	463 (141.1)	548 (167.0)	425 (129.5)	335 (102.1)	110 (33.5)	774 (235.9)	820 (249.9)
Installed Capacity	MW	625	750	625	675	245	125	1325	935
Total Installed Capacity	MW		1,375			1,545		1,450	935
4. Geology**									
Geology		Chlorite-mica schist, quartz mica schist, limestone and graphite schist	Gneisses and schists with minor occurrence of phyllites and quartzite	Chlorite-mica schist, quartz mica schist, limestone and graphite schist	Gneisses and schists with minor occurrence of phyllites and quartzite	Coarse grained granitic gneiss	Chlorite-mica schist, quartz mica schist, limestone and graphite schist	Similar to Bazargai	Calcareous schists with subordinate phyllites and graphitic schists
Construction Materials		Schists, limestone, river bed material,	Suitable deposits and sources available	Schists, limestone, river bed material,	Suitable deposits and sources available	Suitable deposits and sources available	Schists, limestone, river bed material,	Similar to Bazargai	Lack of suitable materials
5. Dam									
Dam Type***		ECRD	ECRD	ECRD	ECRD	ECRD	ECRD	ECRD	ECRD
Dam Height	ft (m)	700 (213.4)	575 (175.3)	700 (213.4)	510 (155.4)	510 (155.4)	150 (45.7)	920 (280.4)	945 (288.0)
6. Land and Population Affected									
Agricultural Land Affecte	acre (ha)	-	28,700 (11,615)	-	18,000 (7,285)	20,550 (8,317)	-	-	-
Population Affected	persons	-	35,000	-	16,000	35,000	-	-	-

Notes:

* measured from Swat-Kabul confluence.

** Aerial reconnaissance and photographic interpretation only except for the Munda site.

*** ECRD=Earth Core Rockfill Dam,

(Source: Lower Swat Gorge Development, Preliminary Feasibility Report, Munda Dam Project, WAPDA (P&I), August 1969)

Table G1.2 Summary of Development Scale Alternatives (1/2)

Alternatives	FSL.505			FSL.510			FSL.515			FSL.520			FSL.525			FSL.530			FSL.535			FSL.540				FSL.545			
	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c	a	b	c	d	a	b	c	d
FSL (EL.m)	505.0	505.0	505.0	510.0	510.0	510.0	515.0	515.0	515.0	520.0	520.0	520.0	525.0	525.0	525.0	530.0	530.0	530.0	535.0	535.0	535.0	540.0	540.0	540.0	540.0	545.0	545.0	545.0	545.0
MOL (EL.m)	487.0	490.0	495.0	488.0	495.0	500.0	490.0	495.0	505.0	491.0	500.0	510.0	493.0	505.0	515.0	494.0	505.0	520.0	495.0	510.0	525.0	496.0	500.0	515.0	530.0	497.0	505.0	520.0	535.0
Sediment level (EL.m)	470.0	470.0	470.0	470.0	470.0	470.0	471.0	471.0	471.0	471.0	471.0	471.0	472.0	472.0	472.0	473.0	473.0	473.0	473.0	473.0	473.0	473.0	473.0	473.0	473.0	474.0	474.0	474.0	474.0
Dam crest (EL.m)	514.0	514.0	514.0	519.0	519.0	519.0	524.0	524.0	524.0	529.0	529.0	529.0	534.0	534.0	534.0	539.0	539.0	539.0	544.0	544.0	544.0	549.0	549.0	549.0	549.0	553.0	553.0	553.0	553.0
Dam height (m)	164.0	164.0	164.0	169.0	169.0	169.0	174.0	174.0	174.0	179.0	179.0	179.0	184.0	184.0	184.0	189.0	189.0	189.0	194.0	194.0	194.0	199.0	199.0	199.0	199.0	203.0	203.0	203.0	203.0
Effective storage (Million m3)	213	171	120	260	188	137	308	257	137	366	273	137	433	293	156	521	381	176	589	401	176	667	625	420	176	772	672	467	203
Rated head (m)	124.5	125.4	127.0	127.9	130.2	131.7	131.7	133.3	136.5	134.3	138.1	141.2	137.8	142.8	146.0	141.6	146.0	150.7	145.0	150.7	155.5	148.5	149.8	155.5	160.2	152.0	154.5	159.3	165.0
Maximum discharge (m3/sec)	250	230	205	270	240	210	295	270	210	325	280	210	350	290	220	380	330	230	410	330	230	440	425	340	230	480	440	360	245
Peak power output (MW)	280	260	235	281	260	235	351	325	259	394	349	268	435	374	290	484	434	313	537	449	323	590	575	477	333	658	614	518	365
Number of unit	140 x 2	130 x 2	120 x 2	155 x 2	140 x 2	125 x 2	175 x 2	165 x 2	130 x 2	130 x 3	175 x 2	135 x 2	147 x 3	123 x 3	145 x 2	163 x 3	143 x 3	155 x 2	135 x 4	150 x 3	160 x 2	148 x 4	145 x 4	160 x 3	165 x 2	165 x 4	153 x 4	130 x 4	120 x 3
Installed capacity (MW)	280	260	240	310	280	250	350	330	260	390	350	270	440	370	290	490	430	310	540	450	320	590	570	480	330	660	610	520	360
Dependable peak output (MW) *1	250	240	220	280	260	240	300	290	250	330	310	260	370	330	280	400	380	300	430	400	310	470	460	420	320	510	500	460	350
Annual energy																													
Total (GWh)	1,270	1,212	1,144	1,375	1,289	1,193	1,499	1,454	1,240	1,620	1,527	1,286	1,753	1,610	1,370	1,875	1,771	1,446	1,992	1,846	1,492	2,093	2,090	1,937	1,538	2,222	2,170	2,053	1,660
Firm (GWh)	363	347	324	403	377	346	441	423	359	483	455	372	530	484	403	578	548	449	623	575	447	683	674	610	462	745	731	666	504
Secondary (GWh)	907	865	820	972	913	848	1,058	1,031	881	1,137	1,072	915	1,224	1,126	967	1,297	1,224	997	1,368	1,271	1,045	1,410	1,416	1,327	1,077	1,477	1,439	1,387	1,156
Plant factor	51%	53%	54%	50%	52%	54%	48%	50%	54%	47%	49%	54%	45%	49%	53%	43%	47%	53%	42%	46%	53%	40%	41%	46%	53%	38%	40%	45%	52%
Economic cost (US$ Million)	470.3	462.8	456.9	484.8	471.7	458.5	503.8	491.9	468.7	536.2	509.4	478.5	559.9	528.5	492.7	592.4	567.3	506.4	629.1	576.8	522.1	665.9	643.1	595.1	542.3	711.3	674.6	636.9	575.3
Economic analysis																													
*2 NPV(US$ Mil)	39.6	27.2	12.1	58.2	41.6	23.2	78.6	71.8	26.6	89.5	77.9	30.5	107.5	80.9	38.0	116.8	96.8	44.4	128.7	109.5	44.6	138.7	145.9	122.5	42.6	153.9	152.6	127.9	51.2
*2 B/C	1.12	1.09	1.04	1.18	1.13	1.08	1.24	1.22	1.09	1.26	1.24	1.10	1.30	1.24	1.12	1.31	1.27	1.14	1.32	1.30	1.14	1.53	1.36	1.32	1.12	1.34	1.36	1.32	1.14
IRR	11.1%	10.7%	10.3%	11.5%	11.1%	10.7%	12.0%	11.9%	10.7%	12.1%	12.0%	10.8%	12.4%	12.0%	11.0%	12.5%	12.2%	11.1%	12.6%	12.4%	11.1%	12.6%	12.8%	12.6%	11.0%	12.7%	12.8%	12.5%	11.2%

Note: *1: Peaking hour = 4 hours, Dependability of 95 %
*2: Discount rate = 10%

Table G1.2 Summary of Development Scale Alternatives (2/2)

Alternatives	FSL.550				FSL.555					FSL.560				FSL.565				FSL.570				FSL.575				FSL.580			
	a	b	c	d	a	b	c	d	e	a	b	c	d	a	b	c	d	a	b	c	d	a	b	c	d	a	b	c	d
FSL (EL.m)	550.0	550.0	550.0	550.0	555.0	555.0	555.0	555.0	555.0	560.0	560.0	560.0	560.0	565.0	565.0	565.0	565.0	570.0	570.0	570.0	570.0	575.0	575.0	575.0	575.0	580.0	580.0	580.0	580.0
MOL (EL.m)	499.0	510.0	525.0	540.0	493.0	510.0	515.0	530.0	545.0	494.0	510.0	530.0	550.0	494.0	510.0	530.0	550.0	495.0	515.0	535.0	555.0	497.0	515.0	535.0	555.0	497.0	520.0	540.0	560.0
Sediment level (EL.m)	474.0	474.0	474.0	474.0	474.0	474.0	474.0	474.0	474.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0	475.0
Dam crest (EL.m)	558.0	558.0	558.0	558.0	563.0	563.0	563.0	563.0	563.0	568.0	568.0	568.0	568.0	573.0	573.0	573.0	573.0	577.0	577.0	577.0	577.0	582.0	582.0	582.0	582.0	587.0	587.0	587.0	587.0
Dam height (m)	208.0	208.0	208.0	208.0	213.0	213.0	213.0	213.0	213.0	218.0	218.0	218.0	218.0	223.0	223.0	223.0	223.0	227.0	227.0	227.0	227.0	232.0	232.0	232.0	232.0	237.0	237.0	237.0	237.0
Effective storage (Million m3)	866	719	495	231	1,043	834	766	522	231	1,148	950	637	231	1,296	1,108	795	389	1,455	1,198	866	432	1,592	1,356	1,024	590	1,751	1,446	1,094	633
Rated head (m)	154.9	159.3	164.0	169.7	156.1	162.5	164.0	168.8	174.5	159.6	164.7	172.0	179.2	163.1	167.8	175.1	182.4	166.6	172.6	178.9	186.2	170.1	175.8	182.1	189.4	173.2	180.5	186.8	194.1
Maximum discharge (m3/sec)	520	460	370	255	580	505	475	380	255	620	545	425	255	665	605	490	330	715	635	515	345	755	685	575	405	800	710	600	425
Peak power output (MW)	727	661	548	391	816	740	702	578	401	893	810	660	412	979	916	774	543	1,075	989	832	580	1,159	1,087	945	692	1,249	1,155	1,011	744
Number of unit	183 x 4	165 x 4	138 x 4	130 x 3	205 x 4	185 x 4	175 x 4	145 x 4	133 x 3	148 x 6	203 x 4	165 x 4	133 x 3	163 x 6	153 x 6	193 x 4	135 x 4	180 x 6	165 x 6	138 x 6	145 x 4	193 x 6	182 x 6	158 x 6	173 x 4	208 x 6	193 x 6	168 x 6	185 x 4
Installed capacity (MW)	730	660	550	390	820	740	700	580	400	890	810	660	410	980	920	770	540	1,080	990	830	580	1,160	1,090	950	690	1,250	1,160	1,010	740
Dependable peak output (MW) *1	560	540	490	370	590	590	580	510	380	630	640	570	390	680	700	660	510	740	760	710	540	780	820	790	630	820	880	850	680
Annual energy																													
Total (GWh)	2,326	2,285	2,144	1,771	2,402	2,407	2,377	2,230	1,817	2,481	2,497	2,385	1,861	2,559	2,610	2,561	2,224	2,606	2,697	2,677	2,334	2,645	2,755	2,803	2,560	2,665	2,816	2,881	2,669
Firm (GWh)	808	789	706	543	859	847	842	747	558	925	928	832	573	991	1,022	954	732	1,078	1,109	1,033	780	1,140	1,194	1,149	918	1,189	1,281	1,232	987
Secondary (GWh)	1,518	1,496	1,438	1,229	1,543	1,560	1,535	1,483	1,259	1,556	1,569	1,553	1,288	1,567	1,589	1,607	1,493	1,528	1,589	1,644	1,554	1,505	1,560	1,654	1,642	1,475	1,535	1,649	1,682
Plant factor	36%	39%	44%	51%	33%	37%	38%	43%	51%	32%	35%	41%	51%	30%	32%	38%	47%	27%	31%	36%	46%	26%	29%	33%	42%	24%	27%	32%	41%
Economic cost (US$ Million)	751.0	707.4	663.5	598.7	817.6	766.9	748.6	746.4	627.5	883.3	804.8	742.1	656.5	957.9	901.9	814.7	736.1	1025.6	960.7	894.4	783.2	1098.8	1032.9	957.0	840.4	1165.3	1103.9	1016.7	889.0
Economic analysis																													
*2 NPV(US$ Mil)	169.0	167.2	135.8	64.1	168.8	175.5	169.5	107.5	56.6	156.4	183.1	155.6	44.8	164.7	188.0	184.9	105.2	161.3	185.9	171.2	104.9	127.9	163.1	172.1	123.8	92.6	126.6	143.0	106.0
*2 B/C	1.35	1.37	1.32	1.17	1.33	1.36	1.36	1.23	1.14	1.28	1.36	1.33	1.11	1.29	1.35	1.38	1.24	1.27	1.33	1.33	1.23	1.20	1.27	1.30	1.25	1.13	1.19	1.23	1.20
IRR	12.8%	13.0%	12.6%	11.4%	12.6%	12.9%	12.8%	11.9%	11.2%	12.3%	12.8%	12.6%	10.9%	12.3%	12.8%	13.0%	11.9%	12.2%	12.7%	12.6%	11.9%	11.6%	12.1%	12.4%	12.0%	11.1%	11.5%	11.8%	11.5%

Note; *1: Peaking hour = 4 hours, Dependability of 95 %
*2: Discount rate = 10%

Table G1.3 Reservoir Operation Simulation Results for Selected Scheme (1/6)

Year	Month	Reservoir WL (El.m)	Inflow volume (mill.m^3)	Spillout volume (mill.m^3)	Peak Generation			Off-peak Generation		
					Discharge (m^3/sec)	Power (MW)	Energy (GWh)	Discharge (m^3/sec)	Power (MW)	Energy (GWh)
1956	Oct.	555.0	93.4	-	505.0	740.0	91.8	-	-	-
	Nov.	549.1	38.0	-	505.0	738.6	88.6	-	-	-
	Dec.	541.2	62.8	-	505.0	700.2	86.8	-	-	-
	Jan.	532.1	68.2	-	505.0	657.3	81.5	-	-	-
	Feb.	522.9	55.7	-	505.0	611.5	70.9	-	-	-
	Mar.	512.0	98.5	-	271.4	325.7	40.4	-	-	-
	Apr.	510.0	240.0	-	505.0	581.8	69.8	-	-	-
	May	511.1	503.6	-	505.0	603.9	74.9	63.1	73.6	45.6
	June	520.3	1,275.1	-	505.0	704.8	84.6	163.6	227.4	136.4
	July	555.0	2,006.4	646.1	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	1,215.7	-	505.0	740.0	91.8	441.0	688.9	427.1
	Sept.	555.0	282.0	57.7	505.0	740.0	88.8	-	-	-
1957	Oct.	555.0	200.8	-	505.0	740.0	91.8	-	-	-
	Nov.	553.8	244.6	-	505.0	740.0	88.8	-	-	-
	Dec.	554.8	197.3	-	505.0	740.0	91.8	-	-	-
	Jan.	553.4	64.1	-	505.0	740.0	91.8	-	-	-
	Feb.	546.2	43.3	-	505.0	726.1	81.3	-	-	-
	Mar.	538.7	118.1	-	505.0	695.2	86.2	-	-	-
	Apr.	532.2	825.1	-	505.0	730.2	87.6	63.1	87.9	52.7
	May	554.1	957.6	-	505.0	740.0	91.8	314.2	489.4	303.4
	June	555.0	1,549.6	228.0	505.0	740.0	88.8	505.0	740.0	444.0
	July	555.0	2,785.3	1,425.0	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	1,350.3	-	505.0	740.0	91.8	501.3	740.0	458.8
	Sept.	555.0	669.0	-	505.0	740.0	88.8	205.9	321.2	192.7
1958	Oct.	555.0	168.8	-	505.0	740.0	91.8	-	-	-
	Nov.	552.4	77.7	-	505.0	740.0	88.8	-	-	-
	Dec.	546.1	95.9	-	505.0	730.5	90.6	-	-	-
	Jan.	540.4	72.3	-	505.0	697.4	86.5	-	-	-
	Feb.	531.6	45.7	-	505.0	654.8	73.3	-	-	-
	Mar.	522.3	122.1	-	505.0	616.4	76.4	-	-	-
	Apr.	515.0	798.9	-	505.0	660.1	79.2	63.1	80.2	48.1
	May	540.7	1,236.5	-	505.0	740.0	91.8	300.8	451.2	279.7
	June	555.0	1,689.3	367.7	505.0	740.0	88.8	505.0	740.0	444.0
	July	555.0	2,442.8	1,082.4	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	1,411.2	52.6	505.0	740.0	91.8	505.0	740.0	458.8
	Sept.	555.0	596.7	-	505.0	740.0	88.8	172.4	265.0	159.0
1959	Oct.	555.0	249.1	19.9	505.0	740.0	91.8	-	-	-
	Nov.	555.0	175.0	-	505.0	740.0	88.8	-	-	-
	Dec.	553.0	185.6	-	505.0	740.0	91.8	-	-	-
	Jan.	551.1	143.9	-	505.0	740.0	91.8	-	-	-
	Feb.	547.4	133.7	-	505.0	740.0	82.9	-	-	-
	Mar.	544.1	277.0	-	505.0	738.3	91.6	-	-	-
	Apr.	546.0	397.2	-	505.0	740.0	88.8	63.1	89.8	53.9
	May	547.5	1,020.7	-	505.0	740.0	91.8	274.4	416.6	258.3
	June	555.0	1,751.0	429.4	505.0	740.0	88.8	505.0	740.0	444.0
	July	555.0	3,002.2	1,641.9	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	1,486.9	128.3	505.0	740.0	91.8	505.0	740.0	458.8
	Sept.	555.0	441.6	-	505.0	740.0	88.8	100.6	156.8	94.1

Year	Month	Reservoir WL (El.m)	Inflow volume (mill.m^3)	Spillout volume (mill.m^3)	Peak Generation			Off-peak Generation		
					Discharge (m^3/sec)	Power (MW)	Energy (GWh)	Discharge (m^3/sec)	Power (MW)	Energy (GWh)
1960	Oct.	555.0	114.8	-	505.0	740.0	91.8	-	-	-
	Nov.	550.0	71.8	-	505.0	740.0	88.8	-	-	-
	Dec.	543.5	88.1	-	505.0	716.1	88.8	-	-	-
	Jan.	536.7	78.4	-	505.0	679.6	84.3	-	-	-
	Feb.	528.1	57.7	-	505.0	639.8	74.2	-	-	-
	Mar.	518.8	118.1	-	505.0	599.5	74.3	-	-	-
	Apr.	510.6	482.3	-	505.0	600.7	72.1	63.1	73.2	43.9
	May	519.4	839.0	-	505.0	677.7	84.0	63.1	82.3	51.0
	June	544.4	1,309.0	-	505.0	740.0	88.8	386.7	584.4	350.7
	July	555.0	1,584.4	224.1	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	940.4	-	505.0	740.0	91.8	317.6	496.0	307.5
	Sept.	555.0	443.4	-	505.0	740.0	88.8	101.4	158.2	94.9
1961	Oct.	555.0	139.9	-	505.0	740.0	91.8	-	-	-
	Nov.	551.1	91.7	-	505.0	740.0	88.8	-	-	-
	Dec.	545.5	72.5	-	505.0	723.9	89.8	-	-	-
	Jan.	538.3	60.0	-	505.0	686.8	85.2	-	-	-
	Feb.	528.7	37.7	-	505.0	640.8	71.8	-	-	-
	Mar.	518.7	84.8	-	442.9	536.9	66.6	-	-	-
	Apr.	510.0	296.8	-	505.0	590.7	70.9	-	-	-
	May	515.2	391.6	-	505.0	604.3	74.9	63.1	73.6	45.6
	June	516.4	858.6	-	505.0	670.1	80.4	63.1	81.4	48.8
	July	543.9	1,229.5	-	505.0	740.0	91.8	332.4	503.5	312.2
	Aug.	555.0	743.1	-	505.0	740.0	91.8	229.2	358.0	221.9
	Sept.	555.0	127.8	-	505.0	740.0	88.8	-	-	-
1962	Oct.	550.8	76.3	-	505.0	740.0	91.8	-	-	-
	Nov.	544.2	65.8	-	505.0	717.4	86.1	-	-	-
	Dec.	536.6	68.6	-	505.0	678.5	84.1	-	-	-
	Jan.	527.6	43.6	-	505.0	630.2	78.1	-	-	-
	Feb.	516.1	36.4	-	286.2	348.9	39.1	-	-	-
	Mar.	510.0	261.3	-	505.0	584.3	72.5	-	-	-
	Apr.	512.3	615.5	-	505.0	623.7	74.8	63.1	76.0	45.6
	May	528.4	823.7	-	505.0	713.4	88.5	63.1	86.3	53.5
	June	550.6	1,447.1	23.2	505.0	740.0	88.8	505.0	740.0	444.0
	July	555.0	1,437.2	76.9	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	827.4	-	505.0	740.0	91.8	267.0	411.6	255.2
	Sept.	555.0	170.5	-	505.0	740.0	88.8	-	-	-
1963	Oct.	552.7	87.4	-	505.0	740.0	91.8	-	-	-
	Nov.	546.5	99.6	-	505.0	733.2	88.0	-	-	-
	Dec.	541.2	53.1	-	505.0	699.4	86.7	-	-	-
	Jan.	531.6	80.5	-	505.0	656.8	81.4	-	-	-
	Feb.	523.2	75.7	-	505.0	617.0	69.1	-	-	-
	Mar.	514.3	210.3	-	505.0	594.9	73.8	-	-	-
	Apr.	512.9	536.9	-	505.0	616.4	74.0	63.1	75.1	45.1
	May	524.4	706.1	-	505.0	686.4	85.1	63.1	83.1	51.5
	June	542.4	1,177.3	-	505.0	740.0	88.8	304.1	458.0	274.8
	July	555.0	1,792.4	432.0	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	1,045.9	-	505.0	740.0	91.8	364.9	567.6	351.9
	Sept.	555.0	255.2	30.9	505.0	740.0	88.8	-	-	-

Table G1.3 Reservoir Operation Simulation Results for Selected Scheme (2/6)

Year	Month	Reservoir WL (El.m)	Inflow volume (mill.m^3)	Spillout volume (mill.m^3)	Peak Generation			Off-peak Generation		
					Discharge (m^3/sec)	Power (MW)	Energy (GWh)	Discharge (m^3/sec)	Power (MW)	Energy (GWh)
1964	Oct.	555.0	83.5	-	505.0	740.0	91.8	-	-	-
	Nov.	548.7	49.4	-	505.0	737.8	88.5	-	-	-
	Dec.	541.2	90.1	-	505.0	703.9	87.3	-	-	-
	Jan.	533.7	78.6	-	505.0	667.0	82.7	-	-	-
	Feb.	525.1	145.2	-	505.0	638.5	74.1	-	-	-
	Mar.	521.1	206.2	-	505.0	623.9	77.4	-	-	-
	Apr.	519.6	967.5	-	505.0	694.1	83.3	63.1	84.0	50.4
	May	550.8	1,078.4	-	505.0	740.0	91.8	333.8	515.5	319.6
	June	555.0	1,933.4	611.8	505.0	740.0	88.8	505.0	740.0	444.0
	July	555.0	1,971.8	611.4	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	978.1	-	505.0	740.0	91.8	334.5	522.6	324.0
	Sept.	555.0	204.1	-	505.0	740.0	88.8	-	-	-
1965	Oct.	554.1	91.5	-	505.0	740.0	91.8	-	-	-
	Nov.	548.2	91.8	-	505.0	739.5	88.7	-	-	-
	Dec.	542.5	64.0	-	505.0	708.0	87.8	-	-	-
	Jan.	534.0	54.2	-	505.0	665.0	82.5	-	-	-
	Feb.	524.0	82.3	-	505.0	622.0	69.7	-	-	-
	Mar.	515.9	321.0	-	505.0	617.7	76.6	-	-	-
	Apr.	521.9	833.4	-	505.0	690.2	82.8	63.1	83.5	50.1
	May	546.6	793.6	-	505.0	740.0	91.8	163.7	245.4	152.2
	June	555.0	1,638.0	316.4	505.0	740.0	88.8	505.0	740.0	444.0
	July	555.0	1,405.9	45.6	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	996.7	-	505.0	740.0	91.8	342.9	535.5	332.0
	Sept.	555.0	294.2	69.9	505.0	740.0	88.8	-	-	-
1966	Oct.	555.0	88.9	-	505.0	740.0	91.8	-	-	-
	Nov.	548.9	77.8	-	505.0	740.0	88.8	-	-	-
	Dec.	542.7	52.5	-	505.0	707.4	87.7	-	-	-
	Jan.	533.5	48.2	-	505.0	662.4	82.1	-	-	-
	Feb.	523.2	99.9	-	505.0	620.9	69.5	-	-	-
	Mar.	516.2	226.1	-	505.0	605.2	75.0	-	-	-
	Apr.	515.8	564.1	-	505.0	631.0	75.7	63.1	76.9	46.1
	May	528.2	633.2	-	505.0	694.1	86.1	63.1	84.0	52.1
	June	542.2	1,570.3	-	505.0	740.0	88.8	483.5	725.2	435.1
	July	555.0	2,031.2	670.9	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	973.8	-	505.0	740.0	91.8	332.6	519.7	322.2
	Sept.	555.0	253.5	29.3	505.0	740.0	88.8	-	-	-
1967	Oct.	555.0	60.7	-	505.0	740.0	91.8	-	-	-
	Nov.	547.7	68.4	-	505.0	735.3	88.2	-	-	-
	Dec.	541.1	99.5	-	505.0	704.3	87.3	-	-	-
	Jan.	534.0	85.6	-	505.0	669.2	83.0	-	-	-
	Feb.	525.9	58.8	-	505.0	627.5	70.3	-	-	-
	Mar.	516.6	206.0	-	505.0	603.8	74.9	-	-	-
	Apr.	514.8	539.2	-	505.0	623.9	74.9	63.1	76.0	45.6
	May	526.0	719.6	-	505.0	693.7	86.0	63.1	84.0	52.1
	June	544.2	1,604.9	35.2	505.0	740.0	88.8	505.0	740.0	444.0
	July	555.0	1,882.9	522.6	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	1,068.3	-	505.0	740.0	91.8	374.9	581.9	360.8
	Sept.	555.0	124.5	-	505.0	740.0	88.8	-	-	-

Year	Month	Reservoir WL (El.m)	Inflow volume (mill.m^3)	Spillout volume (mill.m^3)	Peak Generation			Off-peak Generation		
					Discharge (m^3/sec)	Power (MW)	Energy (GWh)	Discharge (m^3/sec)	Power (MW)	Energy (GWh)
1968	Oct.	550.7	79.6	-	505.0	740.0	91.8	-	-	-
	Nov.	544.2	84.8	-	505.0	719.7	86.4	-	-	-
	Dec.	537.7	133.8	-	505.0	693.4	86.0	-	-	-
	Jan.	532.3	86.8	-	505.0	662.1	82.1	-	-	-
	Feb.	524.2	118.0	-	505.0	627.7	72.8	-	-	-
	Mar.	518.3	457.1	-	505.0	626.1	77.6	63.1	76.3	47.3
	Apr.	523.5	667.6	-	505.0	678.5	81.4	63.1	82.4	49.4
	May	540.7	781.0	-	505.0	740.0	91.8	96.3	144.1	89.4
	June	555.0	1,540.2	218.6	505.0	740.0	88.8	505.0	740.0	444.0
	July	555.0	2,223.1	862.8	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	1,399.8	41.2	505.0	740.0	91.8	505.0	740.0	458.8
	Sept.	555.0	187.8	-	505.0	740.0	88.8	-	-	-
1969	Oct.	553.4	123.7	-	505.0	740.0	91.8	-	-	-
	Nov.	548.8	128.3	-	505.0	740.0	88.8	-	-	-
	Dec.	544.8	74.1	-	505.0	720.6	89.4	-	-	-
	Jan.	537.5	69.7	-	505.0	684.4	84.9	-	-	-
	Feb.	528.4	38.4	-	505.0	639.6	71.6	-	-	-
	Mar.	518.4	140.8	-	505.0	601.2	74.5	-	-	-
	Apr.	511.8	436.0	-	505.0	598.7	71.8	63.1	72.9	43.8
	May	517.2	812.4	-	505.0	667.8	82.8	63.1	81.1	50.3
	June	542.0	1,227.5	-	505.0	740.0	88.8	323.0	486.8	292.1
	July	555.0	1,073.1	-	505.0	740.0	91.8	376.3	583.9	362.0
	Aug.	555.0	911.6	-	505.0	740.0	91.8	304.7	475.2	294.6
	Sept.	555.0	425.0	-	505.0	740.0	88.8	92.9	143.9	86.4
1970	Oct.	555.0	104.3	-	505.0	740.0	91.8	-	-	-
	Nov.	549.6	58.2	-	505.0	740.0	88.8	-	-	-
	Dec.	542.5	43.4	-	505.0	704.6	87.4	-	-	-
	Jan.	532.8	46.4	-	505.0	657.5	81.5	-	-	-
	Feb.	522.3	37.6	-	505.0	607.0	68.0	-	-	-
	Mar.	510.5	83.4	-	190.7	231.1	28.7	-	-	-
	Apr.	510.0	506.2	-	505.0	601.8	72.2	63.1	73.3	44.0
	May	520.4	968.1	-	505.0	695.8	86.3	63.1	84.2	52.2
	June	550.8	1,258.3	-	505.0	740.0	88.8	430.5	665.1	399.0
	July	555.0	1,057.2	-	505.0	740.0	91.8	369.2	573.7	355.7
	Aug.	555.0	826.6	-	505.0	740.0	91.8	266.6	411.0	254.8
	Sept.	555.0	83.6	-	505.0	740.0	88.8	-	-	-
1971	Oct.	548.9	63.4	-	505.0	739.4	91.7	-	-	-
	Nov.	541.7	46.7	-	505.0	701.9	84.2	-	-	-
	Dec.	532.3	37.5	-	505.0	654.6	81.2	-	-	-
	Jan.	521.5	40.1	-	444.7	544.3	67.5	-	-	-
	Feb.	510.0	66.5	-	153.3	183.3	20.5	-	-	-
	Mar.	510.0	283.2	-	505.0	587.7	72.9	-	-	-
	Apr.	513.9	534.9	-	505.0	619.9	74.4	63.1	75.5	45.3
	May	525.1	927.8	-	505.0	710.4	88.1	63.1	85.9	53.3
	June	552.5	1,791.8	413.2	505.0	740.0	88.8	505.0	740.0	444.0
	July	555.0	1,695.1	334.7	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	975.8	-	505.0	740.0	91.8	333.5	521.0	323.0
	Sept.	555.0	270.2	46.0	505.0	740.0	88.8	-	-	-

Table G1.3 Reservoir Operation Simulation Results for Selected Scheme (3/6)

Year	Month	Reservoir WL (El.m)	Inflow volume (mill.m³)	Spillout volume (mill.m³)	Peak Generation			Off-peak Generation		
					Discharge (m³/sec)	Power (MW)	Energy (GWh)	Discharge (m³/sec)	Power (MW)	Energy (GWh)
1972	Oct.	555.0	77.0	-	505.0	740.0	91.8	-	-	-
	Nov.	548.4	107.0	-	505.0	740.0	88.8	-	-	-
	Dec.	543.4	93.2	-	505.0	716.1	88.8	-	-	-
	Jan.	536.8	100.5	-	505.0	685.2	85.0	-	-	-
	Feb.	529.5	126.0	-	505.0	654.7	75.9	-	-	-
	Mar.	524.3	329.5	-	505.0	655.7	81.3	-	-	-
	Apr.	529.9	728.7	-	505.0	711.6	85.4	63.1	86.0	51.6
	May	548.2	1,134.0	-	505.0	740.0	91.8	332.2	509.3	315.8
	June	555.0	1,746.2	424.6	505.0	740.0	88.8	505.0	740.0	444.0
	July	555.0	1,667.8	307.5	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	1,278.1	-	505.0	740.0	91.8	468.9	731.3	453.4
	Sept.	555.0	349.3	125.1	505.0	740.0	88.8	-	-	-
1973	Oct.	555.0	91.4	-	505.0	740.0	91.8	-	-	-
	Nov.	549.0	45.7	-	505.0	739.0	88.7	-	-	-
	Dec.	541.4	57.9	-	505.0	700.9	86.9	-	-	-
	Jan.	532.1	57.5	-	505.0	656.1	81.4	-	-	-
	Feb.	522.4	59.5	-	505.0	610.5	68.4	-	-	-
	Mar.	512.1	198.3	-	497.4	577.4	71.6	-	-	-
	Apr.	510.0	476.7	-	505.0	597.5	71.7	63.1	72.8	43.7
	May	518.4	561.5	-	505.0	641.6	79.6	63.1	78.0	48.4
	June	529.3	990.1	-	505.0	725.0	87.0	104.7	151.9	91.2
	July	555.0	1,232.3	-	505.0	740.0	91.8	447.6	699.4	433.6
	Aug.	555.0	698.9	-	505.0	740.0	91.8	209.4	326.9	202.7
	Sept.	555.0	77.2	-	505.0	740.0	88.8	-	-	-
1974	Oct.	548.6	69.4	-	505.0	738.7	91.6	-	-	-
	Nov.	541.7	47.2	-	505.0	701.9	84.2	-	-	-
	Dec.	532.3	46.3	-	505.0	655.7	81.3	-	-	-
	Jan.	522.0	33.5	-	449.9	551.4	68.4	-	-	-
	Feb.	510.0	39.4	-	86.1	104.9	11.8	-	-	-
	Mar.	510.0	210.1	-	459.4	537.9	66.7	-	-	-
	Apr.	510.0	720.9	-	505.0	627.9	75.3	63.1	76.5	45.9
	May	532.6	1,293.7	-	505.0	732.9	90.9	261.2	378.5	234.7
	June	555.0	1,508.8	187.2	505.0	740.0	88.8	505.0	740.0	444.0
	July	555.0	1,556.7	196.4	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	1,347.0	-	505.0	740.0	91.8	499.8	740.0	458.8
	Sept.	555.0	279.7	55.4	505.0	740.0	88.8	-	-	-
1975	Oct.	555.0	72.8	-	505.0	740.0	91.8	-	-	-
	Nov.	548.2	84.5	-	505.0	739.1	88.7	-	-	-
	Dec.	542.3	100.8	-	505.0	711.3	88.2	-	-	-
	Jan.	535.7	114.2	-	505.0	680.0	84.3	-	-	-
	Feb.	529.2	130.1	-	505.0	654.8	73.3	-	-	-
	Mar.	524.7	236.2	-	505.0	645.8	80.1	-	-	-
	Apr.	525.0	832.6	-	505.0	701.7	84.2	63.1	84.9	51.0
	May	548.9	1,042.4	-	505.0	740.0	91.8	298.7	457.9	283.9
	June	555.0	1,304.3	-	505.0	740.0	88.8	497.0	740.0	444.0
	July	555.0	1,767.9	407.6	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	1,011.0	-	505.0	740.0	91.8	349.3	544.9	337.8
	Sept.	555.0	224.3	0.0	505.0	740.0	88.8	-	-	-

Year	Month	Reservoir WL (El.m)	Inflow volume (mill.m³)	Spillout volume (mill.m³)	Peak Generation			Off-peak Generation		
					Discharge (m³/sec)	Power (MW)	Energy (GWh)	Discharge (m³/sec)	Power (MW)	Energy (GWh)
1976	Oct.	555.0	80.9	-	505.0	740.0	91.8	-	-	-
	Nov.	548.6	65.7	-	505.0	738.9	88.7	-	-	-
	Dec.	541.8	56.4	-	505.0	702.8	87.1	-	-	-
	Jan.	532.6	103.1	-	505.0	665.1	82.5	-	-	-
	Feb.	525.4	62.3	-	505.0	624.7	72.5	-	-	-
	Mar.	515.7	118.3	-	427.9	514.0	63.7	-	-	-
	Apr.	510.0	532.5	-	505.0	605.0	72.6	63.1	73.7	44.2
	May	521.9	676.1	-	505.0	671.4	83.3	63.1	81.5	50.6
	June	539.0	1,169.3	-	505.0	740.0	88.8	266.4	394.0	236.4
	July	555.0	1,408.5	48.2	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	716.3	-	505.0	740.0	91.8	217.2	339.4	210.4
	Sept.	555.0	104.2	-	505.0	740.0	88.8	-	-	-
1977	Oct.	549.8	72.8	-	505.0	740.0	91.8	-	-	-
	Nov.	543.0	100.4	-	505.0	715.8	85.9	-	-	-
	Dec.	537.1	80.4	-	505.0	684.0	84.8	-	-	-
	Jan.	528.7	75.8	-	505.0	643.4	79.8	-	-	-
	Feb.	519.9	44.9	-	434.5	529.5	59.3	-	-	-
	Mar.	510.0	385.2	-	505.0	581.7	72.1	63.1	70.9	43.9
	Apr.	511.0	648.6	-	505.0	623.0	74.8	63.1	75.9	45.5
	May	529.3	1,005.7	-	505.0	725.0	89.9	106.0	153.8	95.3
	June	555.0	1,451.2	129.6	505.0	740.0	88.8	505.0	740.0	444.0
	July	555.0	1,610.1	249.8	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	856.8	-	505.0	740.0	91.8	280.2	434.1	269.1
	Sept.	555.0	67.6	-	505.0	740.0	88.8	-	-	-
1978	Oct.	548.2	65.0	-	505.0	736.5	91.3	-	-	-
	Nov.	541.1	117.9	-	505.0	708.3	85.0	-	-	-
	Dec.	535.5	71.6	-	505.0	674.1	83.6	-	-	-
	Jan.	526.6	61.3	-	505.0	628.4	77.9	-	-	-
	Feb.	516.2	62.0	-	352.7	426.5	47.8	-	-	-
	Mar.	510.0	188.5	-	410.8	483.3	59.9	-	-	-
	Apr.	510.0	721.2	-	505.0	628.0	75.4	63.1	76.5	45.9
	May	532.7	627.3	-	505.0	711.2	88.2	63.1	86.0	53.3
	June	545.3	1,271.7	-	505.0	740.0	88.8	378.3	570.3	342.2
	July	555.0	1,678.9	318.6	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	777.1	-	505.0	740.0	91.8	244.5	380.1	235.7
	Sept.	555.0	144.5	-	505.0	740.0	88.8	-	-	-
1979	Oct.	551.5	58.7	-	505.0	740.0	91.8	-	-	-
	Nov.	544.1	72.1	-	505.0	718.0	86.2	-	-	-
	Dec.	536.9	58.9	-	505.0	678.6	84.1	-	-	-
	Jan.	527.3	73.5	-	505.0	636.4	78.9	-	-	-
	Feb.	518.0	96.7	-	498.6	590.9	66.2	-	-	-
	Mar.	510.0	424.2	-	505.0	587.8	72.9	63.1	71.6	44.4
	Apr.	513.9	757.0	-	505.0	649.8	78.0	63.1	79.0	47.4
	May	537.7	968.8	-	505.0	740.0	91.8	155.4	226.2	140.2
	June	555.0	1,425.4	103.8	505.0	740.0	88.8	505.0	740.0	444.0
	July	555.0	1,273.8	-	505.0	740.0	91.8	466.3	727.4	451.0
	Aug.	555.0	674.5	-	505.0	740.0	91.8	198.5	309.1	191.6
	Sept.	555.0	108.6	-	505.0	740.0	88.8	-	-	-

Table G1.3 Reservoir Operation Simulation Results for Selected Scheme (4/6)

Year	Month	Reservoir WL (El.m)	Inflow volume (mill.m³)	Spillout volume (mill.m³)	Peak Generation			Off-peak Generation		
					Discharge (m³/sec)	Power (MW)	Energy (GWh)	Discharge (m³/sec)	Power (MW)	Energy (GWh)
1980	Oct.	550.0	57.7	-	505.0	740.0	91.8	-	-	-
	Nov.	542.5	112.4	-	505.0	714.9	85.8	-	-	-
	Dec.	537.1	88.5	-	505.0	685.3	85.0	-	-	-
	Jan.	529.2	79.7	-	505.0	646.2	80.1	-	-	-
	Feb.	520.7	94.1	-	505.0	606.5	70.4	-	-	-
	Mar.	512.0	376.6	-	505.0	588.6	73.0	63.1	71.7	44.5
	Apr.	512.3	1,135.3	-	505.0	684.7	82.2	63.1	82.9	49.7
	May	553.7	1,411.8	19.2	505.0	740.0	91.8	505.0	740.0	458.8
	June	555.0	1,135.7	-	505.0	740.0	88.8	418.9	654.0	392.4
	July	555.0	1,523.4	163.1	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	732.2	-	505.0	740.0	91.8	224.3	350.5	217.3
	Sept.	555.0	74.2	-	505.0	740.0	88.8	-	-	-
1981	Oct.	548.5	61.5	-	505.0	737.4	91.4	-	-	-
	Nov.	541.2	62.2	-	505.0	701.4	84.2	-	-	-
	Dec.	532.5	32.0	-	505.0	655.0	81.2	-	-	-
	Jan.	521.4	50.3	-	464.7	565.8	70.2	-	-	-
	Feb.	510.0	35.4	-	76.3	92.1	10.3	-	-	-
	Mar.	510.0	154.2	-	334.2	398.1	49.4	-	-	-
	Apr.	510.0	421.6	-	505.0	588.9	70.7	63.1	71.7	43.0
	May	514.4	578.4	-	505.0	625.5	77.6	63.1	76.2	47.3
	June	527.1	608.5	-	505.0	688.6	82.6	63.1	83.4	50.0
	July	540.7	774.2	-	505.0	740.0	91.8	94.8	141.8	87.9
	Aug.	555.0	754.9	-	505.0	740.0	91.8	234.5	365.7	226.7
	Sept.	555.0	44.3	-	505.0	740.0	88.8	-	-	-
1982	Oct.	547.2	50.5	-	505.0	730.4	90.6	-	-	-
	Nov.	539.3	184.9	-	505.0	708.0	85.0	-	-	-
	Dec.	537.2	128.7	-	505.0	690.5	85.6	-	-	-
	Jan.	531.5	101.3	-	505.0	660.4	81.9	-	-	-
	Feb.	524.2	89.9	-	505.0	624.5	69.9	-	-	-
	Mar.	516.8	350.1	-	505.0	624.5	77.4	-	-	-
	Apr.	524.3	547.0	-	505.0	667.4	80.1	63.1	81.1	48.6
	May	534.8	754.7	-	505.0	732.0	90.8	63.1	88.1	54.6
	June	552.4	963.7	-	505.0	740.0	88.8	311.9	483.2	289.9
	July	555.0	1,134.0	-	505.0	740.0	91.8	403.6	629.1	390.1
	Aug.	555.0	965.8	-	505.0	740.0	91.8	329.0	514.1	318.7
	Sept.	555.0	245.4	21.1	505.0	740.0	88.8	-	-	-
1983	Oct.	555.0	75.7	-	505.0	740.0	91.8	-	-	-
	Nov.	548.3	88.5	-	505.0	740.0	88.8	-	-	-
	Dec.	542.6	99.3	-	505.0	712.6	88.4	-	-	-
	Jan.	536.0	101.2	-	505.0	679.7	84.3	-	-	-
	Feb.	528.7	74.3	-	505.0	646.1	72.4	-	-	-
	Mar.	521.1	151.8	-	505.0	615.2	76.3	-	-	-
	Apr.	515.6	366.6	-	505.0	604.2	72.5	63.1	73.6	44.2
	May	515.9	808.2	-	505.0	663.1	82.2	63.1	80.5	49.9
	June	541.1	1,752.9	111.0	505.0	740.0	88.8	505.0	740.0	444.0
	July	555.0	1,147.9	-	505.0	740.0	91.8	409.9	639.3	396.4
	Aug.	555.0	942.9	-	505.0	740.0	91.8	318.7	497.8	308.6
	Sept.	555.0	226.8	2.5	505.0	740.0	88.8	-	-	-

Year	Month	Reservoir WL (El.m)	Inflow volume (mill.m³)	Spillout volume (mill.m³)	Peak Generation			Off-peak Generation		
					Discharge (m³/sec)	Power (MW)	Energy (GWh)	Discharge (m³/sec)	Power (MW)	Energy (GWh)
1984	Oct.	555.0	63.9	-	505.0	740.0	91.8	-	-	-
	Nov.	547.8	97.9	-	505.0	738.7	88.6	-	-	-
	Dec.	542.5	94.2	-	505.0	711.4	88.2	-	-	-
	Jan.	535.6	99.2	-	505.0	677.6	84.0	-	-	-
	Feb.	528.2	55.7	-	505.0	640.0	74.2	-	-	-
	Mar.	518.8	91.8	-	463.1	559.0	69.3	-	-	-
	Apr.	510.0	294.3	-	505.0	590.3	70.8	-	-	-
	May	515.0	517.5	-	505.0	620.6	77.0	63.1	75.6	46.9
	June	524.2	848.2	-	505.0	699.8	84.0	63.1	84.7	50.8
	July	548.8	1,210.7	-	505.0	740.0	91.8	374.5	570.8	353.9
	Aug.	555.0	753.1	-	505.0	740.0	91.8	233.7	364.5	226.0
	Sept.	555.0	87.7	-	505.0	740.0	88.8	-	-	-
1985	Oct.	549.1	77.6	-	505.0	740.0	91.8	-	-	-
	Nov.	542.5	41.5	-	505.0	705.3	84.6	-	-	-
	Dec.	533.1	61.6	-	505.0	662.2	82.1	-	-	-
	Jan.	523.6	75.8	-	505.0	615.7	76.4	-	-	-
	Feb.	513.4	89.9	-	325.3	392.9	44.0	-	-	-
	Mar.	510.0	318.4	-	505.0	593.3	73.6	-	-	-
	Apr.	516.4	663.5	-	505.0	648.2	77.8	63.1	78.8	47.3
	May	534.4	729.1	-	505.0	727.2	90.2	63.1	87.9	54.5
	June	551.0	1,009.5	-	505.0	740.0	88.8	317.9	491.2	294.7
	July	555.0	1,693.7	333.4	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	991.7	-	505.0	740.0	91.8	340.6	532.2	330.0
	Sept.	555.0	83.2	-	505.0	740.0	88.8	-	-	-
1986	Oct.	548.9	85.0	-	505.0	740.0	91.8	-	-	-
	Nov.	542.6	57.5	-	505.0	708.6	85.0	-	-	-
	Dec.	534.1	94.1	-	505.0	670.8	83.2	-	-	-
	Jan.	526.5	40.1	-	505.0	624.5	77.4	-	-	-
	Feb.	514.5	42.2	-	246.0	297.9	33.4	-	-	-
	Mar.	510.0	429.2	-	505.0	588.5	73.0	63.1	71.7	44.5
	Apr.	514.2	675.3	-	505.0	641.2	76.9	63.1	78.0	46.8
	May	533.3	818.0	-	505.0	732.4	90.8	63.1	88.2	54.7
	June	554.1	1,195.7	-	505.0	740.0	88.8	436.7	680.6	408.4
	July	555.0	1,594.0	233.7	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	954.2	-	505.0	740.0	91.8	323.8	505.9	313.7
	Sept.	555.0	242.1	17.9	505.0	740.0	88.8	-	-	-
1987	Oct.	555.0	223.7	-	505.0	740.0	91.8	-	-	-
	Nov.	554.8	159.6	-	505.0	740.0	88.8	-	-	-
	Dec.	552.1	104.6	-	505.0	740.0	91.8	-	-	-
	Jan.	546.7	66.2	-	505.0	729.7	90.5	-	-	-
	Feb.	539.4	75.5	-	505.0	696.1	78.0	-	-	-
	Mar.	531.9	405.6	-	505.0	683.7	84.8	63.1	82.8	51.3
	Apr.	533.7	811.1	-	505.0	734.7	88.2	63.1	88.4	53.1
	May	554.7	1,260.0	-	505.0	740.0	91.8	455.5	710.9	440.8
	June	555.0	1,322.4	0.8	505.0	740.0	88.8	505.0	740.0	444.0
	July	555.0	1,694.2	333.9	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	820.5	-	505.0	740.0	91.8	263.9	406.4	252.0
	Sept.	555.0	103.6	-	505.0	740.0	88.8	-	-	-

Table G1.3 Reservoir Operation Simulation Results for Selected Scheme (5/6)

Year	Month	Reservoir WL (El.m)	Inflow volume (mill.m³)	Spillout volume (mill.m³)	Peak Generation			Off-peak Generation		
					Discharge (m³/sec)	Power (MW)	Energy (GWh)	Discharge (m³/sec)	Power (MW)	Energy (GWh)
1988	Oct.	549.8	74.8	-	505.0	740.0	91.8	-	-	-
	Nov.	543.1	49.7	-	505.0	709.9	85.2	-	-	-
	Dec.	534.3	51.1	-	505.0	666.1	82.6	-	-	-
	Jan.	524.2	101.4	-	505.0	622.7	77.2	-	-	-
	Feb.	516.0	43.3	-	289.0	352.3	40.9	-	-	-
	Mar.	510.0	115.7	-	247.7	294.7	36.5	-	-	-
	Apr.	510.0	254.7	-	505.0	584.1	70.1	-	-	-
	May	512.1	752.1	-	505.0	640.9	79.5	63.1	77.9	48.3
	June	535.3	1,349.4	-	505.0	738.7	88.6	319.6	472.3	283.4
	July	555.0	1,289.6	-	505.0	740.0	91.8	473.3	737.7	457.4
	Aug.	555.0	812.4	-	505.0	740.0	91.8	260.3	400.3	248.2
	Sept.	555.0	143.4	-	505.0	740.0	88.8	-	-	-
1989	Oct.	551.5	57.0	-	505.0	740.0	91.8	-	-	-
	Nov.	544.0	113.7	-	505.0	722.5	86.7	-	-	-
	Dec.	539.1	177.0	-	505.0	704.9	87.4	-	-	-
	Jan.	536.2	112.9	-	505.0	684.2	84.8	-	-	-
	Feb.	529.6	186.9	-	505.0	665.0	74.5	-	-	-
	Mar.	528.3	632.5	-	505.0	694.9	86.2	63.1	84.1	52.2
	Apr.	542.4	1,024.8	-	505.0	740.0	88.8	235.1	353.6	212.2
	May	555.0	1,658.2	294.9	505.0	740.0	91.8	505.0	740.0	458.8
	June	555.0	1,317.7	-	505.0	740.0	88.8	503.2	740.0	444.0
	July	555.0	1,400.7	40.4	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	882.5	-	505.0	740.0	91.8	291.7	453.5	281.1
	Sept.	555.0	304.6	80.3	505.0	740.0	88.8	-	-	-
1990	Oct.	555.0	128.7	-	505.0	740.0	91.8	-	-	-
	Nov.	550.6	173.9	-	505.0	740.0	88.8	-	-	-
	Dec.	548.6	169.9	-	505.0	740.0	91.8	-	-	-
	Jan.	546.0	240.1	-	505.0	740.0	91.8	-	-	-
	Feb.	546.5	414.3	-	505.0	740.0	82.9	63.1	90.5	50.7
	Mar.	549.8	808.0	-	505.0	740.0	91.8	204.7	315.0	195.3
	Apr.	555.0	1,456.0	138.0	505.0	740.0	88.8	505.0	740.0	444.0
	May	555.0	1,010.8	-	505.0	740.0	91.8	347.1	541.7	335.9
	June	555.0	1,888.6	567.0	505.0	740.0	88.8	505.0	740.0	444.0
	July	555.0	2,137.0	776.7	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	1,224.6	-	505.0	740.0	91.8	445.0	695.2	431.0
	Sept.	555.0	415.9	-	505.0	740.0	88.8	88.7	136.7	82.0
1991	Oct.	555.0	125.2	-	505.0	740.0	91.8	-	-	-
	Nov.	550.5	101.1	-	505.0	740.0	88.8	-	-	-
	Dec.	545.3	93.3	-	505.0	725.3	89.9	-	-	-
	Jan.	539.2	61.5	-	505.0	690.8	85.7	-	-	-
	Feb.	529.6	67.9	-	505.0	649.3	72.7	-	-	-
	Mar.	521.6	331.5	-	505.0	644.4	79.9	-	-	-
	Apr.	527.4	686.2	-	505.0	697.0	83.6	63.1	84.4	50.6
	May	544.4	1,047.5	-	505.0	740.0	91.8	254.2	379.9	235.5
	June	555.0	1,645.6	324.0	505.0	740.0	88.8	505.0	740.0	444.0
	July	555.0	1,762.6	402.3	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	1,013.4	-	505.0	740.0	91.8	350.3	546.5	338.8
	Sept.	555.0	224.5	0.2	505.0	740.0	88.8	-	-	-

Year	Month	Reservoir WL (El.m)	Inflow volume (mill.m³)	Spillout volume (mill.m³)	Peak Generation			Off-peak Generation		
					Discharge (m³/sec)	Power (MW)	Energy (GWh)	Discharge (m³/sec)	Power (MW)	Energy (GWh)
1992	Oct.	555.0	66.7	-	505.0	740.0	91.8	-	-	-
	Nov.	547.9	66.8	-	505.0	736.3	88.4	-	-	-
	Dec.	541.2	55.2	-	505.0	699.8	86.8	-	-	-
	Jan.	531.8	50.0	-	505.0	653.7	81.1	-	-	-
	Feb.	521.6	35.2	-	465.6	567.0	65.8	-	-	-
	Mar.	510.0	244.6	-	505.0	581.7	72.1	-	-	-
	Apr.	511.0	730.5	-	505.0	635.8	76.3	63.1	77.3	46.4
	May	534.0	931.1	-	505.0	735.8	91.2	109.3	160.8	99.7
	June	555.0	1,356.7	35.1	505.0	740.0	88.8	505.0	740.0	444.0
	July	555.0	1,519.6	159.3	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	927.9	-	505.0	740.0	91.8	312.0	486.9	301.9
	Sept.	555.0	223.7	-	505.0	740.0	88.8	-	-	-
1993	Oct.	555.0	79.2	-	505.0	740.0	91.8	-	-	-
	Nov.	548.5	86.2	-	505.0	740.0	88.8	-	-	-
	Dec.	542.6	162.2	-	505.0	720.5	89.3	-	-	-
	Jan.	539.6	111.0	-	505.0	698.7	86.6	-	-	-
	Feb.	532.9	126.9	-	505.0	671.9	75.2	-	-	-
	Mar.	528.2	316.7	-	505.0	672.3	83.4	-	-	-
	Apr.	533.1	694.7	-	505.0	720.4	86.5	63.1	87.1	52.3
	May	549.1	1,086.2	-	505.0	740.0	91.8	320.3	492.6	305.4
	June	555.0	1,657.1	335.5	505.0	740.0	88.8	505.0	740.0	444.0
	July	555.0	2,161.0	800.7	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	1,282.4	-	505.0	740.0	91.8	470.9	734.1	455.2
	Sept.	555.0	283.5	59.3	505.0	740.0	88.8	-	-	-
1994	Oct.	555.0	123.2	-	505.0	740.0	91.8	-	-	-
	Nov.	550.4	167.0	-	505.0	740.0	88.8	-	-	-
	Dec.	548.0	167.4	-	505.0	740.0	91.8	-	-	-
	Jan.	545.4	124.6	-	505.0	729.8	90.5	-	-	-
	Feb.	540.8	113.8	-	505.0	708.0	79.3	-	-	-
	Mar.	535.6	632.4	-	505.0	723.4	89.7	63.1	87.5	54.2
	Apr.	548.0	990.8	-	505.0	740.0	88.8	278.5	423.8	254.3
	May	555.0	804.7	-	505.0	740.0	91.8	254.8	391.1	242.5
	June	555.0	1,409.3	87.7	505.0	740.0	88.8	505.0	740.0	444.0
	July	555.0	2,199.8	839.5	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	1,241.0	-	505.0	740.0	91.8	452.3	706.6	438.1
	Sept.	555.0	136.0	-	505.0	740.0	88.8	-	-	-
1995	Oct.	551.2	91.7	-	505.0	740.0	91.8	-	-	-
	Nov.	545.2	90.6	-	505.0	725.6	87.1	-	-	-
	Dec.	539.4	90.4	-	505.0	695.3	86.2	-	-	-
	Jan.	531.5	52.3	-	505.0	653.0	81.0	-	-	-
	Feb.	521.5	77.4	-	505.0	609.0	68.2	-	-	-
	Mar.	512.3	265.2	-	505.0	594.8	73.7	-	-	-
	Apr.	514.8	562.8	-	505.0	627.0	75.2	63.1	76.4	45.8
	May	527.4	848.1	-	505.0	711.8	88.3	63.1	86.1	53.4
	June	550.9	1,202.4	-	505.0	740.0	88.8	405.6	625.9	375.5
	July	555.0	1,633.7	273.4	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	1,087.5	-	505.0	740.0	91.8	383.5	595.6	369.3
	Sept.	555.0	150.2	-	505.0	740.0	88.8	-	-	-

Table G1.3 Reservoir Operation Simulation Results for Selected Scheme (6/6)

Year	Month	Reservoir WL (El.m)	Inflow volume (mill.m^3)	Spillout volume (mill.m^3)	Peak Generation			Off-peak Generation		
					Discharge (m^3/sec)	Power (MW)	Energy (GWh)	Discharge (m^3/sec)	Power (MW)	Energy (GWh)
1996	Oct.	551.8	79.3	-	505.0	740.0	91.8	-	-	-
	Nov.	545.3	75.3	-	505.0	724.1	86.9	-	-	-
	Dec.	538.6	91.7	-	505.0	692.1	85.8	-	-	-
	Jan.	530.8	67.4	-	505.0	651.8	80.8	-	-	-
	Feb.	521.6	89.5	-	505.0	610.5	70.8	-	-	-
	Mar.	512.9	282.0	-	505.0	599.8	74.4	-	-	-
	Apr.	516.6	625.7	-	505.0	644.3	77.3	63.1	78.3	47.0
	May	532.4	880.4	-	505.0	732.3	90.8	73.9	105.3	65.3
	June	555.0	1,284.5	-	505.0	740.0	88.8	487.8	740.0	444.0
	July	555.0	1,639.3	279.0	505.0	740.0	91.8	505.0	740.0	458.8
	Aug.	555.0	1,051.7	-	505.0	740.0	91.8	367.5	571.3	354.2
	Sept.	555.0	197.5	-	505.0	740.0	88.8	-	-	-

Year	Month	Reservoir WL (El.m)	Inflow volume (mill.m^3)	Spillout volume (mill.m^3)	Peak Generation			Off-peak Generation		
					Discharge (m^3/sec)	Power (MW)	Energy (GWh)	Discharge (m^3/sec)	Power (MW)	Energy (GWh)

Table G1.4 Power Balance of Planting-up Study

(Unit: MW)

No.	Installation	Unit Name	Type	Installed Capacity	Year 1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
1	Existing	Tarbela		3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
2	Existing	Tarbela		478	478	478	478	478	478	478	478	478	478	478	478	478	478	478	478	478	478	478	478	478
3	Existing	Mangla		1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
4	Existing	Warsak		240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240
5	Committed	Multan		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	Existing	Faisalabad		100	100	100	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	Existing	Guddu (74)		165	165	165	165	165	165	165	165	165	165	165	0	0	0	0	0	0	0	0	0	0
8	Existing	Guddu (85)		158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158
9	Existing	Guddu (86)		158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158	158
10	Existing	Jamshoro		710	710	710	710	710	710	710	710	710	710	710	710	710	710	710	710	710	710	710	710	710
11	Existing	Muzaffargarh		1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300	1,300
12	Existing	Faisalabad		152	152	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	Existing	Guddu		360	360	360	360	360	360	360	360	360	360	360	360	360	360	0	0	0	0	0	0	0
14	Existing	Guddu		360	360	360	360	360	360	360	360	360	360	360	360	360	360	0	0	0	0	0	0	0
15	Existing	Guddu (85)		180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	0
16	Existing	Guddu (92)		243	243	243	243	243	243	243	243	243	243	243	243	243	243	243	243	243	243	243	243	243
17	Existing	Lakhra		150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
18	Existing	HUBCO		1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292	1,292
19	Existing	KONNOOR		131	131	131	131	131	131	131	131	131	131	131	131	131	131	131	131	131	131	131	131	131
20	Existing	Kot AAlu (Gas)		973	973	973	973	973	973	973	973	973	973	973	973	973	973	973	973	973	973	973	973	973
21	Existing	Kot AAlu (CC)		645	645	645	645	645	645	645	645	645	645	645	645	645	645	645	645	645	645	645	645	645
22	Existing	Kotangi (70)		125	125	125	125	125	125	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	Existing	Kotangi (77)		125	125	125	125	125	125	125	125	125	125	125	125	125	125	0	0	0	0	0	0	0
24	Existing	Bin Qasim (84)		332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332	332
25	Existing	Bin Qasim (91)		498	498	498	498	498	498	498	498	498	498	498	498	498	498	498	498	498	498	498	498	498
26	Existing	Bin Qasim (97)		166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166	166
27	Committed	Chashma		184	0	184	184	184	184	184	184	184	184	184	184	184	184	184	184	184	184	184	184	184
28	Committed	Ghazi		1,450	0	0	0	1,450	1,450	1,450	1,450	1,450	1,450	1,450	1,450	1,450	1,450	1,450	1,450	1,450	1,450	1,450	1,450	1,450
29	Existing	Steam (Coal)		1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387	1,387
30	Existing	GTPP		833	833	833	833	833	833	833	833	833	833	833	833	833	833	833	833	833	833	833	833	833
31	Existing	CCPP		555	555	555	555	555	555	555	555	555	555	555	555	555	555	555	555	555	555	555	555	555
32	Committed	Chashma (Nuclear)		325	0	325	325	325	325	325	325	325	325	325	325	325	325	325	325	325	325	325	325	325
33	2005	GTPP 100MW	GTPP	100							100	100	100	100	100	100	100	100	100	100	100	100	100	100
34	2005	GTPP 100MW	GTPP	100							100	100	100	100	100	100	100	100	100	100	100	100	100	100
35	2006	Neelum Jhelum	HYDR	963								963	963	963	963	963	963	963	963	963	963	963	963	963
36	2006	Golen Gc	HYDR	106								106	106	106	106	106	106	106	106	106	106	106	106	106
37	2006	Jinnah	HYDR	96								96	96	96	96	96	96	96	96	96	96	96	96	96
38	2007	STCF 400MW	STCF	400									400	400	400	400	400	400	400	400	400	400	400	400
39	2007	STCF 400MW	STCF	400									400	400	400	400	400	400	400	400	400	400	400	400
40	2007	STCF 400MW	STCF	400									400	400	400	400	400	400	400	400	400	400	400	400
41	2007	STCF 400MW	STCF	400									400	400	400	400	400	400	400	400	400	400	400	400
42	2008	STCF 400MW	STCF	400										400	400	400	400	400	400	400	400	400	400	400
43	2008	STCF 400MW	STCF	400										400	400	400	400	400	400	400	400	400	400	400
44	2008	STCF 400MW	STCF	400										400	400	400	400	400	400	400	400	400	400	400
45	2008	STCF 400MW	STCF	400										400	400	400	400	400	400	400	400	400	400	400
46	2009	STCF 400MW	STCF	400											400	400	400	400	400	400	400	400	400	400
47	2009	STCF 400MW	STCF	400											400	400	400	400	400	400	400	400	400	400
48	2009	STCF 400MW	STCF	400											400	400	400	400	400	400	400	400	400	400
49	2009	STCF 400MW	STCF	400											400	400	400	400	400	400	400	400	400	400
50	2010	Mangla	HYDR	740												740	740	740	740	740	740	740	740	740
51	2010	Kohala	HYDR	590												590	590	590	590	590	590	590	590	590
52	2010	STCF 400MW	STCF	400												400	400	400	400	400	400	400	400	400
53	2010	STCF 400MW	STCF	400												400	400	400	400	400	400	400	400	400
54	2011	STCF 400MW	STCF	400													400	400	400	400	400	400	400	400
55	2011	STCF 400MW	STCF	400													400	400	400	400	400	400	400	400
56	2011	STCF 400MW	STCF	400													400	400	400	400	400	400	400	400
57	2011	STCF 400MW	STCF	400													400	400	400	400	400	400	400	400
58	2011	STCF 400MW	STCF	400													400	400	400	400	400	400	400	400
59	2012	STCF 400MW	STCF	400														400	400	400	400	400	400	400
60	2012	STCF 400MW	STCF	400														400	400	400	400	400	400	400
61	2012	STCF 400MW	STCF	400														400	400	400	400	400	400	400
62	2012	STCF 400MW	STCF	400														400	400	400	400	400	400	400
63	2012	STCF 400MW	STCF	400														400	400	400	400	400	400	400
64	2012	GTPP 100MW	GTPP	100														100	100	100	100	100	100	100
65	2013	STCF 400MW	STCF	400															400	400	400	400	400	400
66	2013	STCF 400MW	STCF	400															400	400	400	400	400	400
67	2013	STCF 400MW	STCF	400															400	400	400	400	400	400
68	2013	GTPP 100MW	GTPP	100															100	100	100	100	100	100
69	2013	GTPP 100MW	GTPP	100															100	100	100	100	100	100
70	2013	GTPP 100MW	GTPP	100															100	100	100	100	100	100
71	2013	GTPP 100MW	GTPP	100															100	100	100	100	100	100
72	2013	GTPP 100MW	GTPP	100															100	100	100	100	100	100
73	2013	GTPP 100MW	GTPP	100															100	100	100	100	100	100
74	2013	GTPP 100MW	GTPP	100															100	100	100	100	100	100
75	2013	GTPP 100MW	GTPP	100															100	100	100	100	100	100
76	2013	GTPP 100MW	GTPP	100															100	100	100	100	100	100
77	2013	GTPP 100MW	GTPP	100															100	100	100	100	100	100
78	2014	STCF 400MW	STCF	400																400	400	400	400	400
79	2014	STCF 400MW	STCF	400																400	400	400	400	400
80	2014	STCF 400MW	STCF	400																400	400	400	400	400
81	2014	GTPP 100MW	GTPP	100																100	100	100	100	100
82	2014	GTPP 100MW	GTPP	100																100	100	100	100	100
83	2014	GTPP 100MW	GTPP	100																100	100	100	100	100
84	2014	GTPP 100MW	GTPP	100																100	100	100	100	100
85	2014	GTPP 100MW	GTPP	100																100	100	100	100	100
86	2014	GTPP 100MW	GTPP	100																100	100	100	100	100
87	2014	GTPP 100MW	GTPP	100																100	100	100	100	100
88	2014	GTPP 100MW	GTPP	100																100	100	100	100	100
89	2014	GTPP 100MW	GTPP	100																100	100	100	100	100
90	2014	GTPP 100MW	GTPP	100																100	100	100	100	100
91	2014	GTPP 100MW	GTPP	100																100	100	100	100	100
92	2014	GTPP 100MW	GTPP	100																100	100	100	100	100
93	2015	CCPP 600MW	CCPP	600																	600	600	600	600
94	2015	CCPP 600MW	CCPP	600																	600	600	600	600
95	2015	CCPP 600MW	CCPP	600																	600	600	600	600
96	2015	CCPP 600MW	CCPP	600																	600	600	600	600
97	2015	CCPP 600MW	CCPP	600																	600	600	600	600
98	2016	GTPP 100MW	GTPP	100																		100	100	100
99	2016	GTPP 100MW	GTPP	100																		100	100	100
100	2016	CCPP 600MW	CCPP	600																		600	600	600
101	2016	CCPP 600MW	CCPP	600																		600	600	600
102	2016	CCPP 600MW	CCPP	600																		600	600	600
103	2016	CCPP 600MW	CCPP	600																		600	600	600
104	2017	CCPP 600MW	CCPP	600																			600	600
105	2017	CCPP 600MW	CCPP	600																			600	600
106	2017	CCPP 600MW	CCPP	600																			600	600
107	2017	CCPP 600MW	CCPP	600																			600	600
108	2017	CCPP 600MW	CCPP	600																			600	600
109	2017	CCPP 600MW	CCPP	600																			600	600
110	2018	CCPP 600MW	CCPP	600																				600
111	2018	CCPP 600MW	CCPP	600																				600
112	2018	CCPP 600MW	CCPP	600																				600
113	2018	CCPP 600MW	CCPP	600																				600
114	2018	CCPP 600MW	CCPP	600																				600
Total Installed Capacity				(MW)	15,818	16,175	16,175	17,525	17,525	17,525	17,650	18,765	20,365	21,555	23,390	25,530	26,810	25,785	30,985	33,365	36,227	38,827	42,423	45,247
Forecasted Peak Load				(MW)	10,723	11,264	11,852	12,443	13,071	13,831	14,542	15,453	16,548	17,689	19,180	20,584	22,209	23,933	25,757	27,784	29,976	32,341	34,893	37,647
Reserve Percent				(%)	45.8	43.2	36.5	40.8	34.1	26.7	21.2	21.2	23.1	24.2	22.6	24.0	20.7	20.3	20.3	20.2	20.9	20.1	21.6	20.2

Notes: HYDR = Hydropower plant
GTPP = Gas turbine power plant
CCPP = Combined cycle power plant
STCF = Steam coal fire

Table G2.1 Concrete Face Rockfill Dams Classified by Rockfill Material

LIMESTONE

Name of Dam	Country	Dam Height (m)	Year Completed	Upstream Slope	Downstream Slope	
Dix River	Calif. USA	84	1925	1 - 1.2	1.4	
El Tejo	Spain	40	1974	1.3	1.4	
Neveti	Venezuela	115	1981	1.4	1.5	
Alfilorios	Spain	75	1983	1.4	1.4	
Khao Laem	Thailand	130	1984	1.4	1.4	
Alsasua	Spain	50	1985	1.5	1.4	
Bolboci	Romania	56	1985	1.3	1.3	
Xibeokou	China	95	1989	1.4	1.4	
Shushuqiao	China	78	1990	1.4	1.7	*1
U.Siah Bishe	Iran	100	1994	1.5	1.6	
L. Siah Bishe	Iran	130	1994	1.5	1.6	*2
Messochoba	Greece	135	1994	1.4	1.4	
Baiyun	China	120	1996	1.4	1.4	
Tianshengqiao I	China	178	1998	1.4	1.4	
Hon Gjiadu	China	182	U/D	1.4	1.4	*3
Pankou	China	123	U/D	1.4	1.5	
Poneasca	Romania	52	U/D	1.3	1.4	
Nam Ngum 3	Lao	220	2001	1.4	1.4	
Shui Bu Ya	China	232	U/D	1.4	1.4	
Gordes	Turkey	95	2001	1.4	1.5	
Xiaoxikou	China	68	U/C	1.4	1.3	
Antamina	Peru	115	U/D	1.3	1.3	

GRAVEL

Name of Dam	Country	Dam Height (m)	Year Completed	Upstream Slope	Downstream Slope	
Kekeya	China	42	1986	1.5	1.5	
Xiaogan Gou	China	55	1990	1.55	1.6	
Upper Guangzhou	China	68	1992	1.4	1.4	
Aguamilpa	Mexico	187	1993	1.5	1.4	
Yacambu	Venezuela	162	1996	1.5	1.6	
Wuluwati	China	135	U/C	1.6	1.6	*4
M'dez	Morocco	97	P	1.8	1.6	
Los Molles	Argentina	46	P	1.5	1.5	
La Parota	Mexico	162	P	1.5	1.4	*5
El Cajon	Mexico	189	P	1.5	1.4	*6
Quimbo	Colombia	150	P	1.5	1.6	
Corrales	Chile	70	2000	1.5	1.6	
Puclaro	Chile	100	2000	1.5	1.6	
La Regadera II	Colombia	90	2002	1.5	1.6	
Daqiao	China	68	U/C	1.5	1.7	
Sogamoso	Colombia	190	2004	1.4	1.4	
Gudongkou	China	120	U/C	1.4	1.5	*7
Heiquan	China	124	U/C	1.55	1.4	*5
West Seti	Nepal	220	P	1.5	1.6	

SHALE AND SCHIST

Name of Dam	Country	Dam Height (m)	Year Completed	Upstream Slope	Downstream Slope	
Salazar	Portugal	70	1949	1.25	1.4	
Kangaroo	Creak/Australia	50	1968	1.3	1.4	
Oasa	Romania	91	1971	1.3	1.6	
MangroveCr.	Australia	80	1981	1.5	1.6	
Wuluwadi	China	138	1998	1.6	1.6	*4
Taia	Romania	64	U/D	1.65	1.55	
Bajiaotan	China	70	P	1.4	1.4	
Dim	Turkey	135	2001	1.4	1.5	

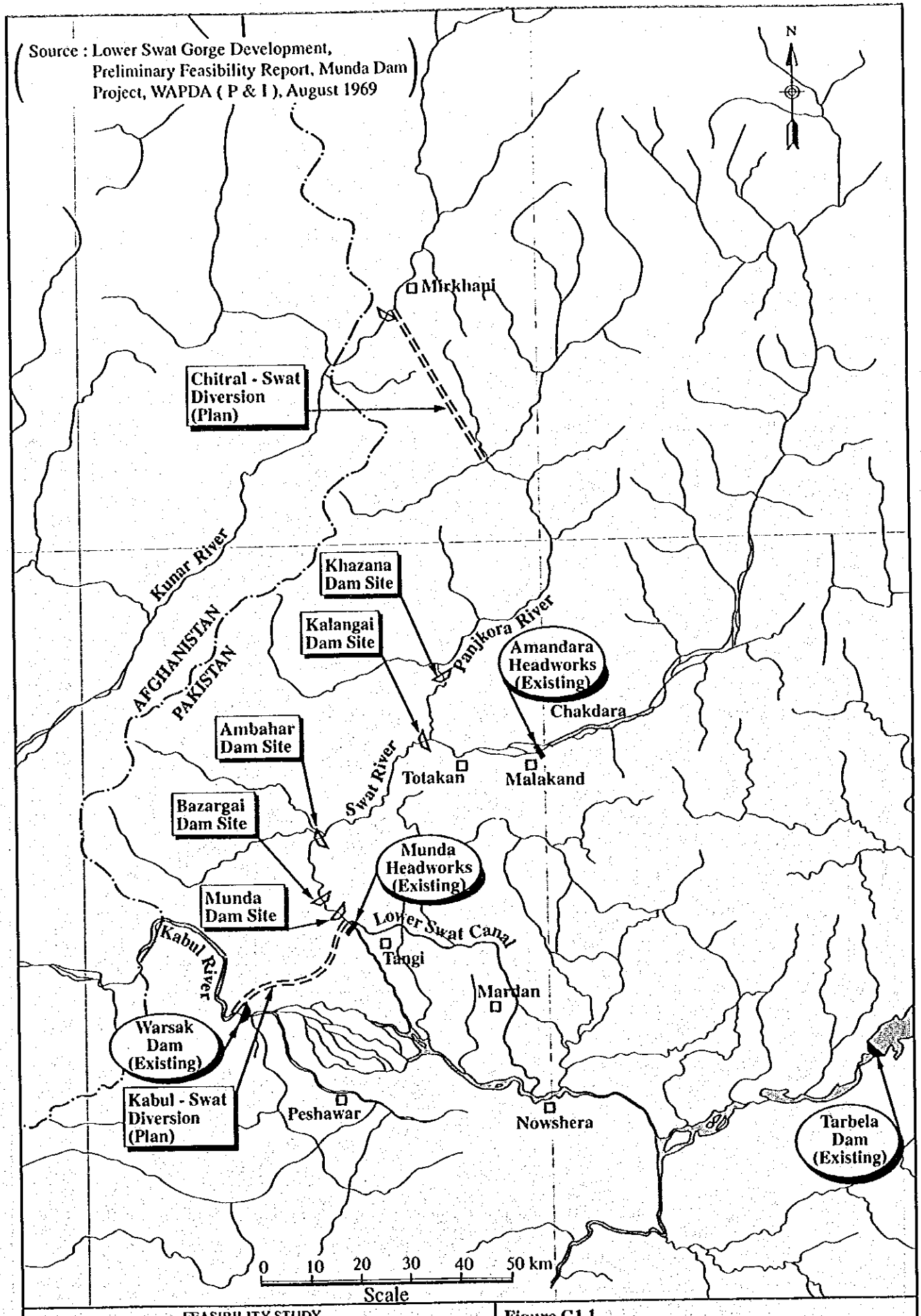
GRANITE and GNEISS

Name of Dam	Country	Dam Height (m)	Year Completed	Upstream Slope	Downstream Slope	
Morena	Calif. USA	54	1895	0.5 - 0.9	1.3	
Strawberry	Calif. USA	50	1916	1.1 - 1.2	1.3	
Salt Springs	Calif. USA	100	1931	1.1 - 1.4	1.4	
Cogswell	Calif. USA	85	1934	1.35	1.6	
L. Bear No.2	Calif. USA	50	1952	1.0	1.4	
Paradela	Portugal	112	1955	1.3	1.3	
Courtright	Calif. USA	98	1958	1.3	1.3	
Wishon	Calif. USA	82	1958	1.0 - 1.3	1.4	
Vilar	Portugal	55	1965	1.1 - 1.3	1.3	
Fades	France	70	1967	1.3	1.3	
Kootenay	Canal / Canada	37	1975	2.0	1.3	
Rouchain	France	60	1976	1.4	1.4	
Fantanele	Romania	92	1978	1.3	1.3	
Outarde no.2	Canada	55	1978	1.4	1.4	
Bejar	Spain	71	1984	1.3	1.3	
Spicer	Meadows/Calif. USA	82	1988	1.5	1.5	
Balsam	Meadows/Calif. USA	40	1988	1.4	1.4	
Xingo	Brazil	150	1994	1.4	1.3	
Wananxi	China	94	1995	1.4	1.4	
Haichaoba	China	57	1996	1.4	1.4	
Douyan	China	58	1996	1.4	1.6	
Lianhua	China	72	1997	1.4	1.4	
Runcv	Romania	90	1999	1.4	1.4	
Caruachi	Venezuela	80	1999	1.3	1.3	
Acena	Spain	65	U/D	1.3	1.3	
Merowe	Sudan	83	P	1.3	1.4	
Yang Yang	S. Korea	93	2000	1.4	1.4	
Mukorsi	Zimbabwe	89	2002	1.3	1.3	
Itatebi	Brazil	100	2003	1.3	1.3	
Qiezishan	China	107	U/C	1.4	1.4	
Gongbaixia	China	130	U/D	1.4	1.4	*8

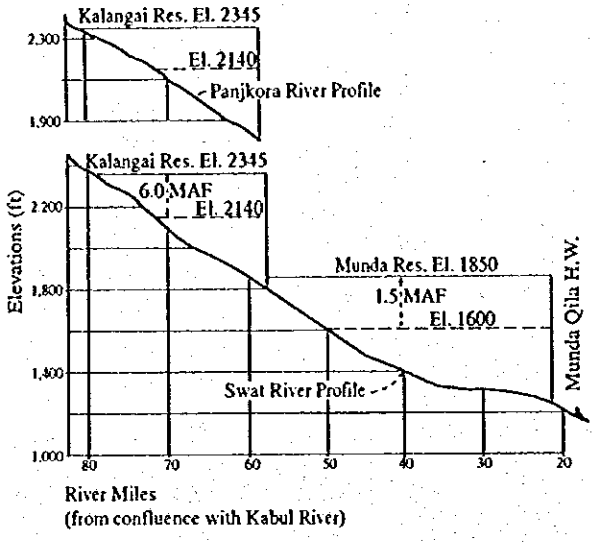
*1 Limestone & Slate
*2 Limestone & Basalt
*3 Limestone & Sndstone
*4 Gravel & Schist
*5 Gravel and Gneiss
*6 Gravel and Ignimbrite
*7 Gravel and Limestone
*8 Granite and Gravel

(Source : International Water Power and Dam Construction, Year Book 1999)

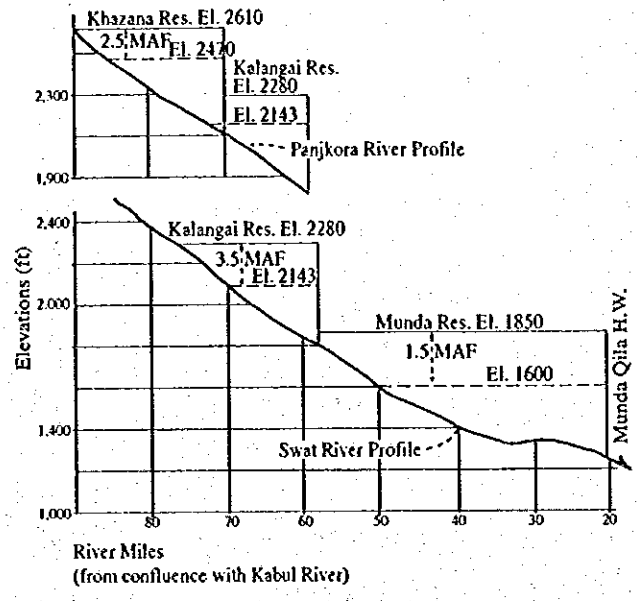
FIGURES



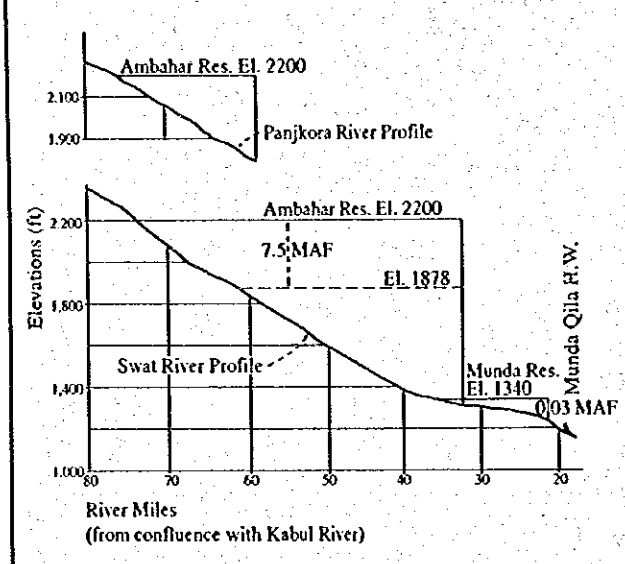
FEASIBILITY STUDY ON THE DEVELOPMENT OF MUNDA DAM MULTIPURPOSE PROJECT IN ISLAMIC REPUBLIC OF PAKISTAN JAPAN INTERNATIONAL COOPERATION AGENCY	**Figure G1.1** **Alternative Development Plans Studied in Preliminary Feasibility Report (1969)**



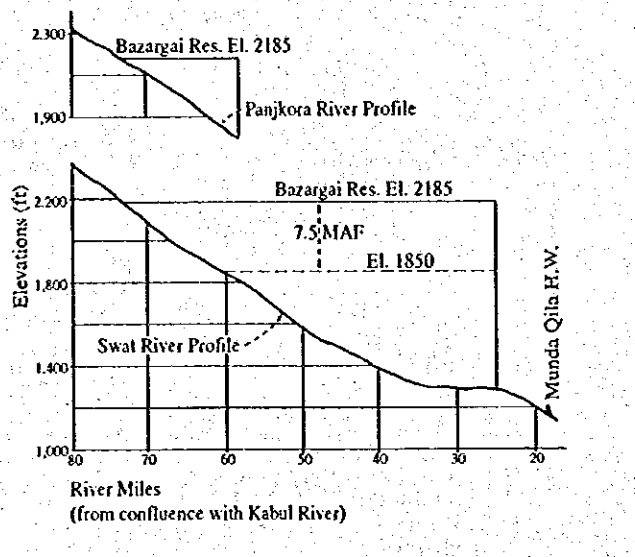
PLAN A



PLAN B



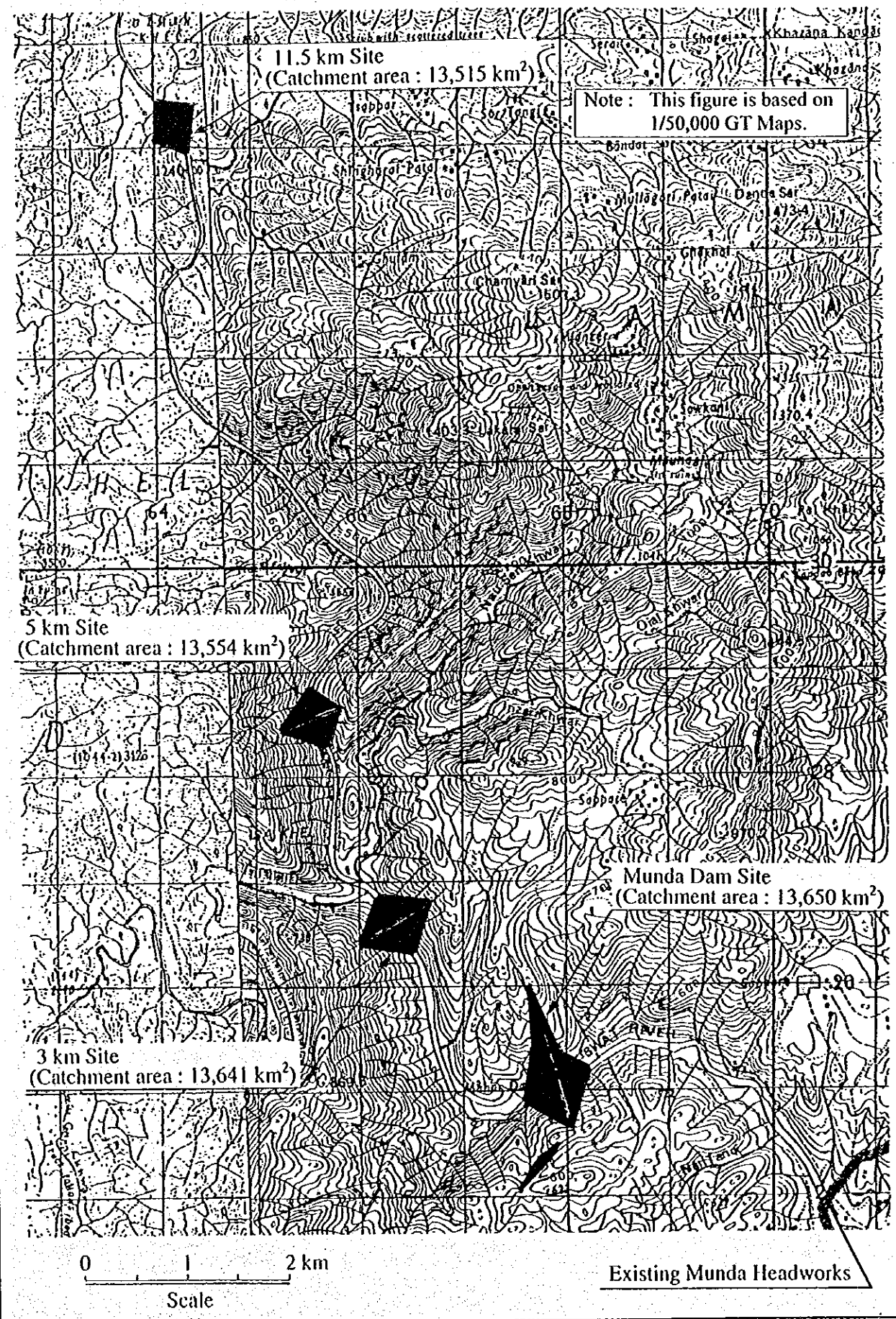
PLAN C



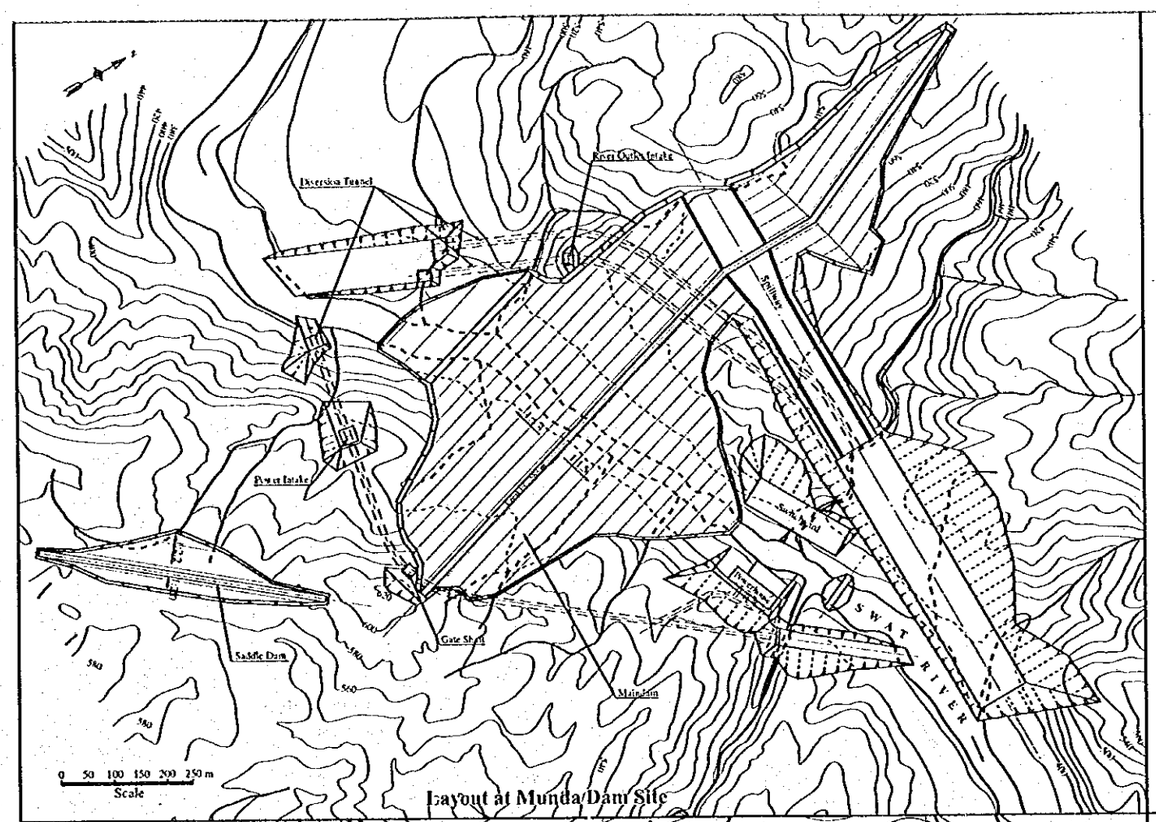
PLAN D

(Source : Lower Swat Gorge Development, Preliminary Feasibility Report, Munda Dam Project, WAPDA (P&I), August 1969)

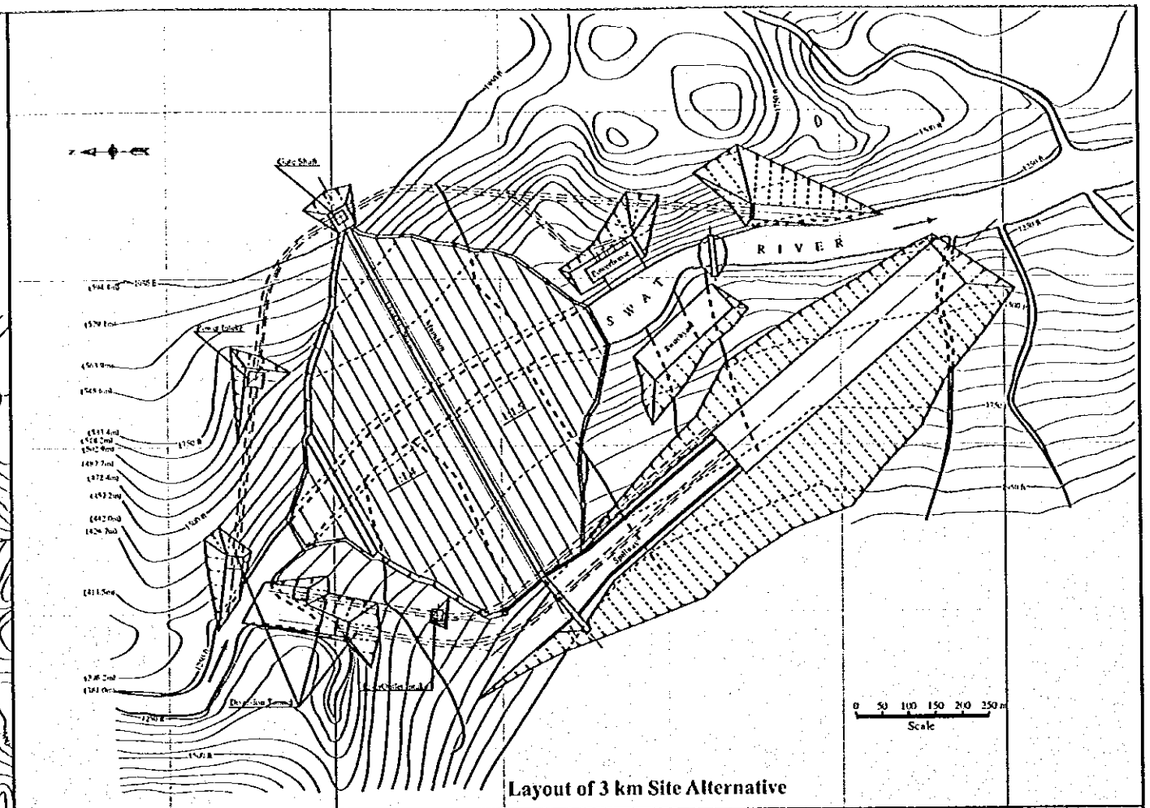
FEASIBILITY STUDY ON THE DEVELOPMENT OF MUNDA DAM MULTIPURPOSE PROJECT IN ISLAMIC REPUBLIC OF PAKISTAN JAPAN INTERNATIONAL COOPERATION AGENCY	**Figure G1.2** **River Profile of Alternative Development Plans Studied in PreliminaryFeasibility Report (1969)**



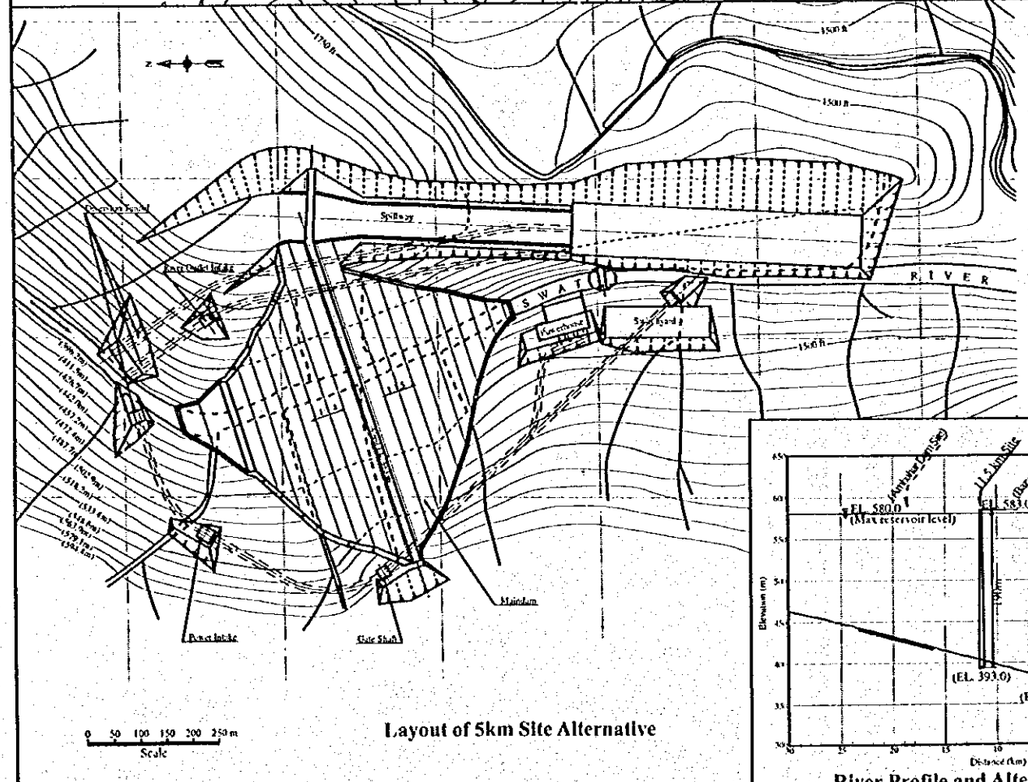
FEASIBILITY STUDY ON THE DEVELOPMENT OF MUNDA DAM MULTIPURPOSE PROJECT IN ISLAMIC REPUBLIC OF PAKISTAN JAPAN INTERNATIONAL COOPERATION AGENCY	**Figure G1.3** **Alternative Dam Sites Upstream of Munda Dam**



Layout at Munda Dam Site

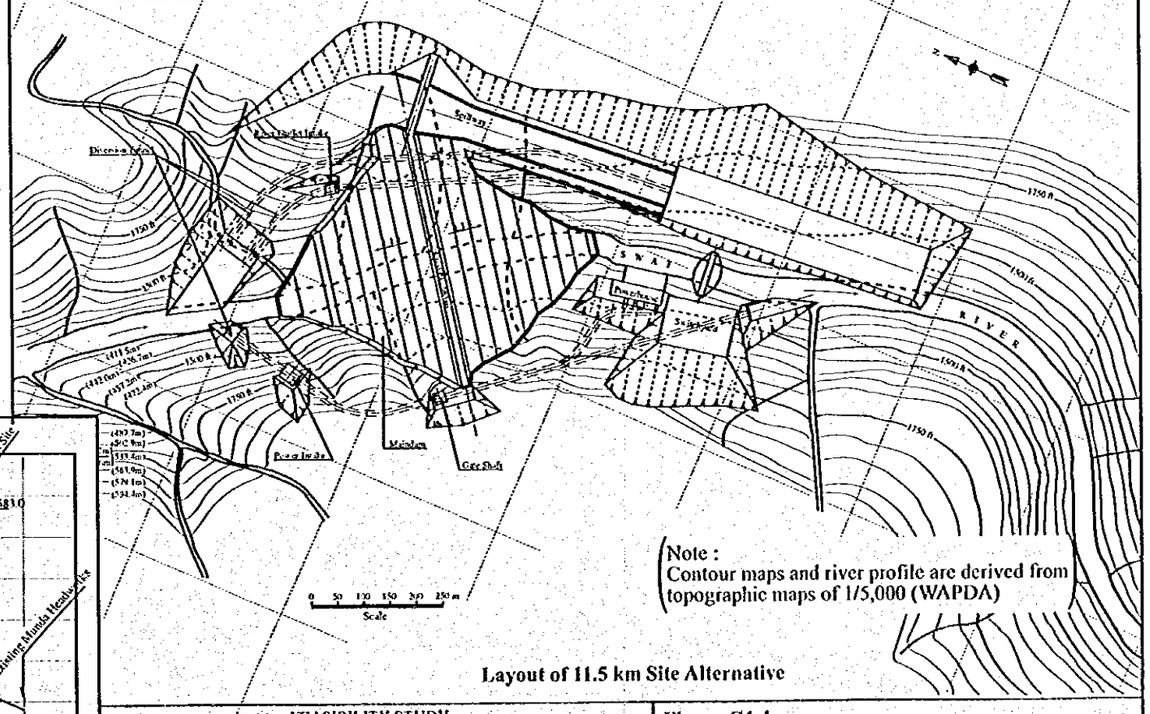


Layout of 3 km Site Alternative



Layout of 5km Site Alternative

River Profile and Alternative Dams



Layout of 11.5 km Site Alternative

Note :
Contour maps and river profile are derived from topographic maps of 1/5,000 (WAPDA)

FEASIBILITY STUDY
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Figure G1.4
Layouts at Alternative Dam Sites upstream of Munda Dam