Table 6.21 (2) Financial Analysis for Scheme K-2 by Case 3 (Industrial Use)

(Unit : Million Rp)

No.	Year	Project Cost	O & M Cost	Pumping Cost	Total Cost	Benefit	Net Benefit	Present Value	
								Cost	Benefit
1	1993	1,290			1,290		-1,290	1,290	0
2	1994	2,580			2,580		-2,580	2,304	0
3	1995	4,081			4,081		-4,081	3,254	0
4	1996	5,232			5,232		-5,232	3,724	0
5	1997	13,409			13,409		-13,409	8,522	0
6	1998	29,649			29,649		-29,649	16,824	0
7	1999	43,320			43,320		-43,320	21,947	0
8	2000		580	2,363	2,943	18,234	15,291	1,331	8,248
9	2001		580	2,363	2,943	18,234	15,291	1,189	7,364
10	2002		580	2,363	2,943	18,234	15,291	1,061	6,575
11	2003		580	2,363	2,943	18,234	15,291	948	5,871
12	2004		580	2,363	2,943	18,234	15,291	846	5,242
13	2005		580	2,363	2,943	18,234	15,291	755	4,680
14	2006		580	2,363	2,943	18,234	15,291	674	4,179
15	2007		580	2,363	2,943	18,234	15,291	602	3,731
16	2008		580	2,363	2,943	18,234	15,291	538	3,331
17	2009		580	2,363	2,943	18,234	15,291	480	2,974
18	2010		580	2,363	2,943	18,234	15,291	429	2,656
19	2011		580	2,363	2,943	18,234	15,291	383	2,371
20	2012		580	2,363	2,943	18,234	15,291	342	2,117
21	2013		580	2,363	2,943	18,234	15,291	305	1,890
22	2014		580	2,363	2,943	18,234	15,291	272	1,688
23	2015		580	2,363	2,943	18,234	15,291	243	1,507
24	2016		580	2,363	2,943	18,234	15,291	217	1,345
25	2017		580	2,363	2,943	18,234	15,291	194	1,201
26	2018		580	2,363	2,943	18,234	15,291	173	1,073
27	2019		580	2,363	2,943	18,234	15,291	155	958
							Total	69,002	69,002
								B-C	0
								B/C	1.00

Note: Water tariff for industrial use is full cost recovery basis including investment cost, O&M cost and pumping cost.

Discount Rate 12 %

Water tariff 1,098.2 Rp

Table 6.22 (1) Financial Analysis for Scheme C-3 by Case 3 (Domestic Use)

(Unit : Million Rp)

No.	Year	Project Cost	O & M Cost	Pumping Cost	Total Cost	Benefit	Net Benefit	Present Value	
								Cost	Benefit
1	1993	0			0		0	0	0
2	1994	0			0		0	0	0
3	1995	0			0		0	0	0
4	1996	0			0		0	0	0
5	1997	0			0		0	0	0
6	1998	0			0		0	0	0
7	1999	0			0		0	0	0
8	2000		277	1,004	1,281	1,281	0	579	579
9	2001		277	1,004	1,281	1,281	0	517	517
10	2002		277	1,004	1,281	1,281	0	462	462
11	2003		277	1,004	1,281	1,281	0	412	412
12	2004		277	1,004	1,281	1,281	0	368	368
13	2005		277	1,004	1,281	1,281	0	329	329
14	2006		277	1,004	1,281	1,281	0	294	294
15	2007		277	1,004	1,281	1,281	0	262	262
16	2008		277	1,004	1,281	1,281	0	234	234
17	2009		277	1,004	1,281	1,281	0	209	209
18	2010		277	1,004	1,281	1,281	0	187	187
19	2011		277	1,004	1,281	1,281	0	167	167
20	2012		277	1,004	1,281	1,281	0	149	149
21	2013		277	1,004	1,281	1,281	0	133	133
22	2014		277	1,004	1,281	1,281	0	119	119
23	2015		277	1,004	1,281	1,281	0	106	106
24	2016		277	1,004	1,281	1,281	0	95	95
25	2017		277	1,004	1,281	1,281	0	84	84
26	2018		277	1,004	1,281	1,281	0	75	75
27	2019		277	1,004	1,281	1,281	0	67	67
							Total	4,847	4,847
								B-C	0
								B/C	1.00

Note: Water tariff for domestic use is O&M cost recovery basis including O&M cost and pumping cost.

Discount Rate 12 %

Water tariff 181.1 Rp

Table 6.22 (2) Financial Analysis for Scheme C-3 by Case 3 (Industrial Use)

(Unit : Million Rp)

No.	Year	Project Cost	O & M Cost	Pumping Cost	Total Cost	Benefit	Net Benefit	Present Value	
								Cost	Benefit
1	1993	2,034			2,034		-2,034	2,034	0
2	1994	4,069			4,069		-4,069	3,633	0
3	1995	4,847			4,847		-4,847	3,864	0
4	1996	11,089			11,089		-11,089	7,893	0
5	1997	22,111			22,111		-22,111	14,052	0
6	1998	91,621			91,621		-91,621	51,988	0
7	1999	20,855			20,855		-20,855	10,566	0
8	2000		832	3,011	3,843	28,690	24,848	1,738	12,978
9	2001		832	3,011	3,843	28,690	24,848	1,552	11,588
10	2002		832	3,011	3,843	28,690	24,848	1,386	10,346
11	2003		832	3,011	3,843	28,690	24,848	1,237	9,238
12	2004		832	3,011	3,843	28,690	24,848	1,105	8,248
13	2005		832	3,011	3,843	28,690	24,848	986	7,364
14	2006		832	3,011	3,843	28,690	24,848	881	6,575
15	2007		832	3,011	3,843	28,690	24,848	786	5,871
16	2008		832	3,011	3,843	28,690	24,848	702	5,242
17	2009		832	3,011	3,843	28,690	24,848	627	4,680
18	2010		832	3,011	3,843	28,690	24,848	560	4,179
19	2011		832	3,011	3,843	28,690	24,848	500	3,731
20	2012		832	3,011	3,843	28,690	24,848	446	3,331
21	2013		832	3,011	3,843	28,690	24,848	398	2,974
22	2014		832	3,011	3,843	28,690	24,848	356	2,656
23	2015		832	3,011	3,843	28,690	24,848	318	2,371
24	2016		832	3,011	3,843	28,690	24,848	284	2,117
25	2017		832	3,011	3,843	28,690	24,848	253	1,890
26	2018		832	3,011	3,843	28,690	24,848	226	1,688
27	2019		832	3,011	3,843	28,690	24,848	202	1,507
							Total	108,572	108,572
								B-C	0
								B/C	1.00

Note: Water tariff for industrial use is full cost recovery basis including investment cost, O&M cost and pumping cost.

Discount Rate 12 %

Water tariff 1,352.3 Rp

Table 6.23 Financial Analysis for Scheme K-1 by Case 4

(Unit : Million Rp)

No.	Year	Project Cost	O & M Cost	Pumping Cost	Total Cost	Benefit		Net Benefit	Present Value	
						Domestic	Industrial		Cost	Benefit
1	1993	0			0			0	0	0
2	1994	0			0			0	0	0
3	1995	0			0			0	0	0
4	1996	0			0			0	0	0
5	1997	0			0			0	0	0
6	1998	0			0			0	0	0
7	1999	0			0			0	0	0
8	2000		747	3,267	4,014	1,003	3,010	0	1,816	1,816
9	2001		747	3,267	4,014	1,003	3,010	0	1,621	1,621
10	2002		747	3,267	4,014	1,003	3,010	0	1,447	1,447
11	2003		747	3,267	4,014	1,003	3,010	0	1,292	1,292
12	2004		747	3,267	4,014	1,003	3,010	0	1,154	1,154
13	2005		747	3,267	4,014	1,003	3,010	0	1,030	1,030
14	2006		747	3,267	4,014	1,003	3,010	0	920	920
15	2007		747	3,267	4,014	1,003	3,010	0	821	821
16	2008		747	3,267	4,014	1,003	3,010	0	733	733
17	2009		747	3,267	4,014	1,003	3,010	0	655	655
18	2010		747	3,267	4,014	1,003	3,010	0	585	585
19	2011		747	3,267	4,014	1,003	3,010	0	522	522
20	2012		747	3,267	4,014	1,003	3,010	0	466	466
21	2013		747	3,267	4,014	1,003	3,010	0	416	416
22	2014		747	3,267	4,014	1,003	3,010	0	372	372
23	2015		747	3,267	4,014	1,003	3,010	0	332	332
24	2016		747	3,267	4,014	1,003	3,010	0	296	296
25	2017		747	3,267	4,014	1,003	3,010	0	264	264
26	2018		747	3,267	4,014	1,003	3,010	0	236	236
27	2019		747	3,267	4,014	1,003	3,010	0	211	211
								Total	15,189	15,189
									B-C	0.00
									B/C	1.00

Note : Water tariff for both industrial and domestic uses is O&M cost recovery basis including O&M cost and pumping cost.

Discount Rate 12 %

Water tariff

Domestic 191.1 Rp

Industrial 191.1 Rp

Table 6.24 Financial Analysis for Scheme K-2 by Case 4

(Unit : Million Rp)

No.	Year	Project Cost	O & M Cost	Pumping Cost	Total Cost	Benefit		Net Benefit	Present Value	
						Domestic	Industrial		Cost	Benefit
1	1993	0			0			0	0	0
2	1994	0			0			0	0	0
3	1995	0			0			0	0	0
4	1996	0			0			0	0	0
5	1997	0			0			0	0	0
6	1998	0			0			0	0	0
7	1999	0			0			0	0	0
8	2000		773	3,151	3,924	981	2,943	0	1,775	1,775
9	2001		773	3,151	3,924	981	2,943	0	1,585	1,585
10	2002		773	3,151	3,924	981	2,943	0	1,415	1,415
11	2003		773	3,151	3,924	981	2,943	0	1,263	1,263
12	2004		773	3,151	3,924	981	2,943	0	1,128	1,128
13	2005		773	3,151	3,924	981	2,943	0	1,007	1,007
14	2006		773	3,151	3,924	981	2,943	0	899	899
15	2007		773	3,151	3,924	981	2,943	0	803	803
16	2008		773	3,151	3,924	981	2,943	0	717	717
17	2009		773	3,151	3,924	981	2,943	0	640	640
18	2010		773	3,151	3,924	981	2,943	0	572	572
19	2011		773	3,151	3,924	981	2,943	0	510	510
20	2012		773	3,151	3,924	981	2,943	0	456	456
21	2013		773	3,151	3,924	981	2,943	0	407	407
22	2014		773	3,151	3,924	981	2,943	0	363	363
23	2015		773	3,151	3,924	981	2,943	0	324	324
24	2016		773	3,151	3,924	981	2,943	0	290	290
25	2017		773	3,151	3,924	981	2,943	0	259	259
26	2018		773	3,151	3,924	981	2,943	0	231	231
27	2019		773	3,151	3,924	981	2,943	0	206	206
								Total	14,850	14,850
									B-C	0
									B/C	1.00

Note : Water tariff for both industrial and domestic uses is O&M cost recovery basis including O&M cost and pumping cost.

Discount Rate 12 %

Water tariff

Domestic 177.3 Rp

Industrial 177.3 Rp

Table 6.25 Financial Analysis for Scheme C-3 by Case 4

(Unit : Million Rp)

No.	Year	Project Cost	O & M Cost	Pumping Cost	Total Cost	Benefit		Net Benefit	Present Value	
						Domestic	Industrial		Cost	Benefit
1	1993	0			0			0	0	0
2	1994	0			0			0	0	0
3	1995	0			0			0	0	0
4	1996	0			0			0	0	0
5	1997	0			0			0	0	0
6	1998	0			0			0	0	0
7	1999	0			0			0	0	0
8	2000		1,110	4,014	5,124	1,281	3,843	0	2,318	2,318
9	2001		1,110	4,014	5,124	1,281	3,843	0	2,069	2,069
10	2002		1,110	4,014	5,124	1,281	3,843	0	1,848	1,848
11	2003		1,110	4,014	5,124	1,281	3,843	0	1,650	1,650
12	2004		1,110	4,014	5,124	1,281	3,843	0	1,473	1,473
13	2005		1,110	4,014	5,124	1,281	3,843	0	1,315	1,315
14	2006		1,110	4,014	5,124	1,281	3,843	0	1,174	1,174
15	2007		1,110	4,014	5,124	1,281	3,843	0	1,048	1,048
16	2008		1,110	4,014	5,124	1,281	3,843	0	936	936
17	2009		1,110	4,014	5,124	1,281	3,843	0	836	836
18	2010		1,110	4,014	5,124	1,281	3,843	0	746	746
19	2011		1,110	4,014	5,124	1,281	3,843	0	666	666
20	2012		1,110	4,014	5,124	1,281	3,843	0	595	595
21	2013		1,110	4,014	5,124	1,281	3,843	0	531	531
22	2014		1,110	4,014	5,124	1,281	3,843	0	474	474
23	2015		1,110	4,014	5,124	1,281	3,843	0	423	423
24	2016		1,110	4,014	5,124	1,281	3,843	0	378	378
25	2017		1,110	4,014	5,124	1,281	3,843	0	338	338
26	2018		1,110	4,014	5,124	1,281	3,843	0	301	301
27	2019		1,110	4,014	5,124	1,281	3,843	0	269	269
								Total	19,390	19,390
									B-C	0
									B/C	1.00

Note : Water tariff for both industrial and domestic uses is O&M cost recovery basis including O&M cost and pumping cost.

Discount Rate 12 %

Water tariff

Domestic 181.1 Rp

Industrial 181.1 Rp

Table 7.1 Evaluation Matrix between Activity Group and Environment Group in the Cibanten Basin

Environment Group \ Activity Group		Pre Construction		Construction							Operation		Score	Remark
				Preparation			Implementation							
		Survey	Land Acquisition	Mobilization of Equipment	Mobilization of Labour	Construct of Support Facilities	Dewatering	Material Mining	Material Excavation	Dam Construction	Impounding of Reservoir	Operation of Dam		
Bio Geo Physics	Soil/Rock	0	1	0	0	1	0	1	1	1	1	0	6	Score > 10
	Water	0	1	0	0	1	1	1	1	1	1	1	8	Critical Impacts
	Climate	0	1	1	1	1	1	1	1	1	1	0	9	Score >10
	Flora	1	1	1	0	1	0	1	1	1	1	0	8	Non Critical impacts
	Fauna	1	1	0	0	1	1	1	1	1	1	1	9	
Socio-culture	Land Use	1	1	0	0	1	0	1	1	1	1	0	7	
	Recreation	0	1	1	1	1	1	0	1	0	1	1	8	
	Aesthetics	0	1	1	1	1	1	1	1	1	1	1	10	
	Culture Pattern	1	1	1	1	1	1	1	1	1	1	1	11	
Socio-economics	Resettlement	1	1	1	1	1	1	1	1	1	1	1	11	
	Health	0	1	1	1	1	1	1	1	1	1	1	10	
	Economic Aspect	1	1	1	1	1	1	1	1	1	1	1	11	
Score		6	12	8	7	12	9	11	12	11	12	8		

Table 7.2 Evaluation Matrix between Activity Group and Environment Group in Krenceng, Beroeng and Downstream Cidanau Basins

Environment Group \ Activity Group		Pre Construction			Construction					Operation		Score	Remark
					Preparation			Implementation					
		Survey	Land Acquisition	Resettlement	Mobilization of Equipment & Materials	Mobilization of Labour	Construct of Support Facilities	Heightening of Dam	Construct of Gated Weir	Heightening of Reservoir Surface	Operation of Dam		
Bio Geo Physics	Soil/Rock	0	1	1	1	0	1	1	1	1	1	8	Score > 8
	Water	0	1	1	1	0	1	1	1	0	1	7	Critical Impacts
	Climate	0	0	0	0	0	1	0	0	1	1	3	Score >8
	Flora	0	1	1	1	0	1	1	0	1	0	6	Non Critical impacts
	Fauna	0	1	1	1	0	1	1	0	1	0	6	
Socio-culture	Land Use	0	1	1	0	0	1	1	0	1	1	6	
	Recreation	0	1	0	0	0	0	0	0	1	1	3	
	Aesthetics	0	1	1	0	0	1	1	0	1	1	6	
	Culture Pattern	1	1	1	0	1	0	0	0	0	1	5	
Socio-economics	Resettlement	1	1	1	0	1	1	1	0	1	1	8	
	Health	0	1	1	1	0	1	1	0	1	1	7	
	Economic Aspect	0	1	1	0	1	0	1	0	1	1	6	
	Score	2	11	10	5	3	9	9	2	10	10		

Table 7.3 (1) Results of Water Quality Measurement for Cidanau and Cibanten Rivers and Krenceng Reservoir

Dry Season

unit : mg/ℓ

		pH	DO	BOD	COD	SS	col. germs[1]	NH_4-N	NO_2-N	NO_3-N	Org-N	T-N	T-P
Cidanau	Peusar	6.9	3.6	1.7	23	34	1.7×10^5	0.24	0.005	0.13	0.19	0.57	0.10
	Kadu Peureup	7.3	6.9	1.9	23	38	–	0.21	ud	0.20	0.15	0.56	0.09
	Sindang Laya	7.3	7.3	1.4	20	38	1.7×10^5	0.21	ud	0.23	0.27	0.71	0.14
Cibanten	Serut	7.9	7.3	1.2	10	53	2.2×10^4	0.20	0.004	0.23	0.15	0.58	0.13
	Karundang	7.8	7.2	1.3	9.0	57	7.5×10^3	0.07	0.019	0.21	0.22	0.52	0.08
	Telanggaran	7.4	3.0	5.2	17	63	3.4×10^6	0.52	0.10	0.26	0.27	1.15	0.23
Rawa Danau	Perumukaan	7.0	1.7	3.6	23	23	5.8×10^5	0.31	0.010	0.11	0.21	0.64	0.11
Krenceng Reservoir													
Water quality standard[2]		5-9	6	5.0	10		2000	0.5	1.0	10			

1) Number of colitis germs 2)drinking water

Source : DPU Survey Result for 1989/Survey made by Puslitbang Air

Rainy Season

unit : mg/ℓ

		pH	DO	BOD	COD	SS	col. germs	NH_4-N	NO_2-N	NO_3-N	Org-N	T-N	T-P
Cidanau	Peusar	7.1	5.8	1.3	19	143	3.8×10^3	0.06	0.002	0.27	0.10	0.43	0.04
	Kadu Peureup	7.2	5.8	1.2	17	166	2.3×10^3	0.05	0.002	0.21	0.09	0.35	0.04
	Sindang Laya	7.1	7.2	1.4	21	90	2.9×10^3	0.07	0.011	0.12	0.10	0.30	0.06
Cibanten	Serut	7.1	7.0	1.7	18	174	1.8×10^3	0.04	0.001	0.17	0.10	0.31	0.03
	Karundang	7.2	6.9	1.4	17	199	1.8×10^3	0.05	0.002	0.25	0.09	0.39	0.04
	Telanggaran	7.1	6.4	4.1	17	279	2.7×10^3	0.06	0.006	0.44	0.12	0.63	0.06
Rawa Danau	Perumukaan	6.9	5.8	1.2	18	111	1.6×10^3	0.05	0.001	0.15	0.10	0.30	0.05
Krenceng Reservoir		7.2	6.7	1.3	18	319	1.6×10^3	0.04	0.004	0.22	0.07	0.33	0.03

Source : JICA Survey Result for 1990/Survey made by Puslitbang Air

Table 7.3 (2) Results of Water Quality Measurement for the Beroeng River

No.	Item	Unit	Location	
			S-1 [1]	S-2 [2]
	<Physics>			
1.	Electric conductivity	umho/cm	110	1130
2.	Total Dissolved Solid	mg/l	78	84
3.	Water Temperature	'C	-	-
4.	Air Temperature	'C	-	-
	<Chemistry>			
1.	Hg (Mercury)	ppm	0.000013	ud [3]
2.	NH_4 (Ammonium)	"	0.09	0.04
3.	As (Arsen)	"	0.0187	0.05
4.	Ba (Barium)	"	ud	ud
5.	Fe (Iron)	"	0.64	0.75
6.	F (Fluoride)	"	0.10	0.15
7.	Cd (Cadmium)	"	ud	ud
8.	Cl (Chloride)	"	4.8	5.5
9.	Cr^{6+} (Chromium)	"	ud	ud
10.	Mn (Manganese)	"	0.02	0.03
11.	No_3 (Nitrate)	"	0.21	0.17
12.	No_2 (Nitrate)	"	0.012	0.001
13.	Se (Selenium)	"	0.05	0.01
14.	Zn (Zinc)	"	0.01	0.01
15.	CN (Cyanide)	"	ud	ud
16.	SO_4 (Sulphate)	"	1.2	1.3
17.	Cu (Copper)	"	ud	ud
18.	Pb (Lead)	"	ud	ud
19.	B (Boron)	"	0.03	0.02
20.	Co (Cobalt)	"	ud	ud
21.	Na (Sodium)	"	ud	ud
22.	Ni (Nickel)	"	ud	ud
23.	SAR (Sodium Absorption Rstio)	"	0.86	0.91
24.	RSC (Residual Sodium Carbonatc)	"	0.32	0.39
25.	CO_3 (Carbonatc)	"	0	0
26.	Hardness	"	26	32
27.	Ca (Calcium)	"	6.5	9.0
28.	Mg (Magnesium)	"	2.4	2.3
29.	K (Potassium)	"	2.7	2.9
30.	MBAS (Dctergent)	"	0.034	0.052
31.	% Na	"	43	42
32.	Grease & Oil	"	ud	ud
33.	Aldrin & Dieldrin	ppb	0.001	ud
34.	Chlordane	"	ud	0.037
35.	DDT	"	ud	ud
36.	Endrin	"	ud	ud
37.	Heptachlor & Heptachlor epoxide	"	0.02	0.027
38.	Hexachlorobenzen Lindane	"	ud	ud
39.	Metoxychlor	"	ud	ud
40.	BHC	"	ud	ud

Note: 1) S-1 : the Beroeng River (5km upstream of the Krenceng Reservoir)
2) S-2 : the Krenceng River (5km upstream of the Krenceng Reservoir)
3) ud : under detection

Table 7.4 Present Land Use in the Catchment Area at Proposed Sites

Category \ Catchment Area	Downstream Cidanau Dam		Cidanau Gated Weir		Beroeng Diversion Tunnel		Krenceng Reservoir	
	(ha)	(%)	(ha)	(%)	(ha)	(%)	(ha)	(%)
Wet Paddy Field	7,600	37	7,600	36	140	12	120	10
Upland Crop Field	8,700	43	9,130	44	940	78	550	45
Plantation	100	0	100	0	110	9	430	35
Forest	3,800	19	3,800	18	20	2	-	0
Swamp/Reservoir	200	1	200	1	-	0	15	1
Industrial Area	-	0	-	0	-	0	105	9
Total	20,400	100	20,830	100	1,210	100	1,220	100

FIGURES

Fig. 1.1

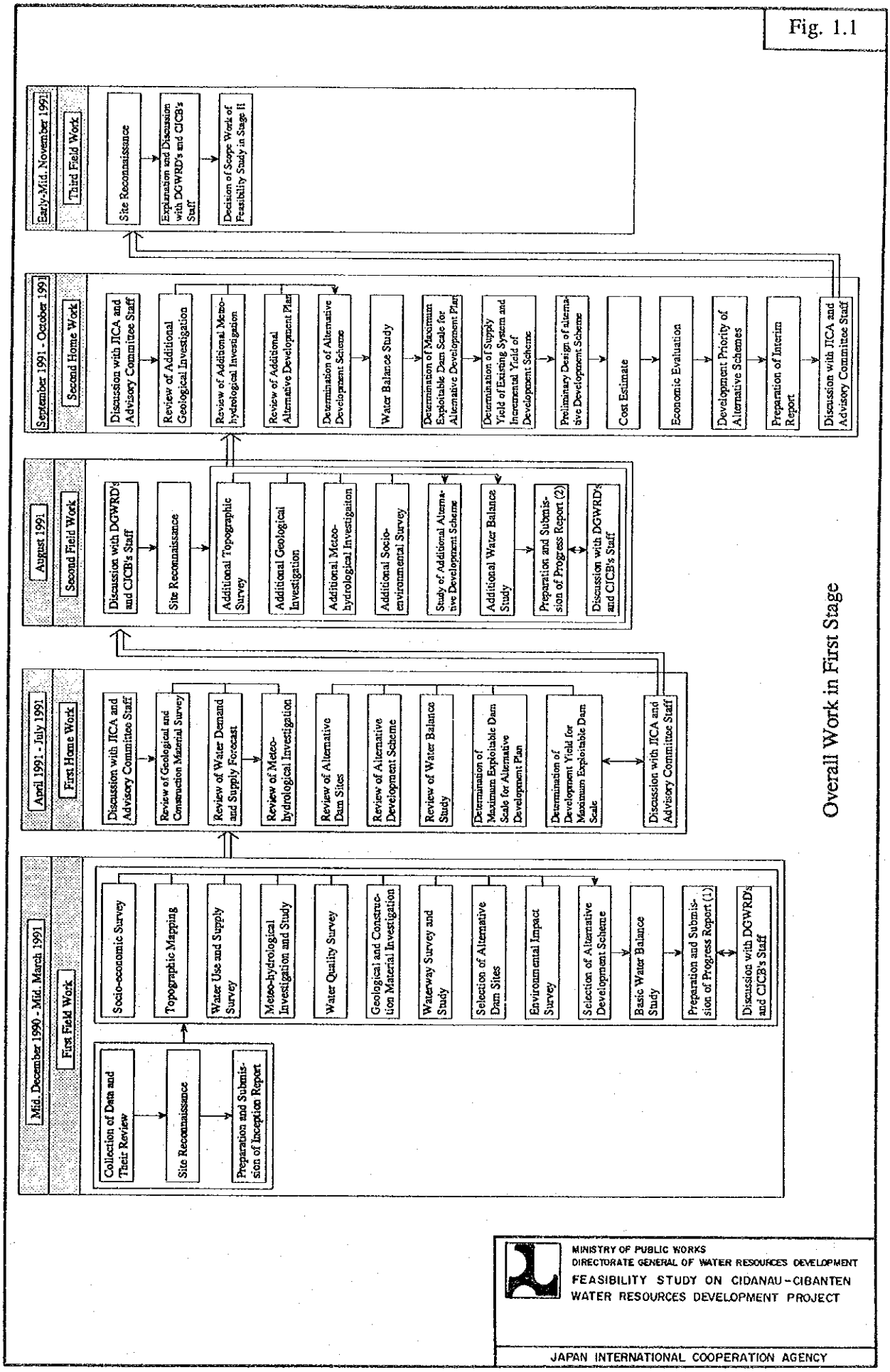
Overall Work in First Stage
Mid. December 1990 - Mid. March 1991
First Field Work
Collection of Data and Their Review
Site Reconnaissance
Preparation and Submission of Inception Report
Socio-economic Survey
Topographic Mapping
Water Use and Supply Survey
Meteo-hydrological Investigation and Study
Water Quality Survey
Geological and Construction Material Investigation
Waterway Survey and Study
Selection of Alternative Dam Sites
Environmental Impact Survey
Selection of Alternative Development Scheme
Basic Water Balance Study
Preparation and Submission of Progress Report (1)
Discussion with DGWRD's and CICB's Staff
April 1991 - July 1991
First Home Work
Discussion with JICA and Advisory Committee Staff
Review of Geological and Construction Material Survey
Review of Water Demand and Supply Forecast
Review of Meteo-hydrological Investigation
Review of Alternative Dam Sites
Review of Alternative Development Scheme
Review of Water Balance Study
Determination of Maximum Exploitable Dam Scale for Alternative Development Plan
Determination of Development Yield for Maximum Exploitable Dam Scale
Discussion with JICA and Advisory Committee Staff
August 1991
Second Field Work
Discussion with DGWRD's and CICB's Staff
Site Reconnaissance
Additional Topographic Survey
Additional Geological Investigation
Additional Meteo-hydrological Investigation
Additional Socio-environmental Survey
Study of Additional Alternative Development Scheme
Additional Water Balance Study
Preparation and Submission of Progress Report (2)
Discussion with DGWRD's and CICB's Staff
September 1991 - October 1991
Second Home Work
Discussion with JICA and Advisory Committee Staff
Review of Additional Geological Investigation
Review of Additional Meteo-hydrological Investigation
Review of Additional Alternative Development Plan
Determination of Alternative Development Scheme
Water Balance Study
Determination of Maximum Exploitable Dam Scale for Alternative Development Plan
Determination of Supply Yield of Existing System and Incremental Yield of Development Scheme
Preliminary Design of alternative Development Scheme
Cost Estimate
Economic Evaluation
Development Priority of Alternative Schemes
Preparation of Interim Report
Discussion with JICA and Advisory Committee Staff
Early-Mid. November 1991
Third Field Work
Site Reconnaissance
Explanation and Discussion with DGWRD's and CICB's Staff
Decision of Scope Work of Feasibility Study in Stage II
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Fig. 1.2

Overall Work in Second Stage

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Fig. 1.3

Work Schedule for the Feasibility Study

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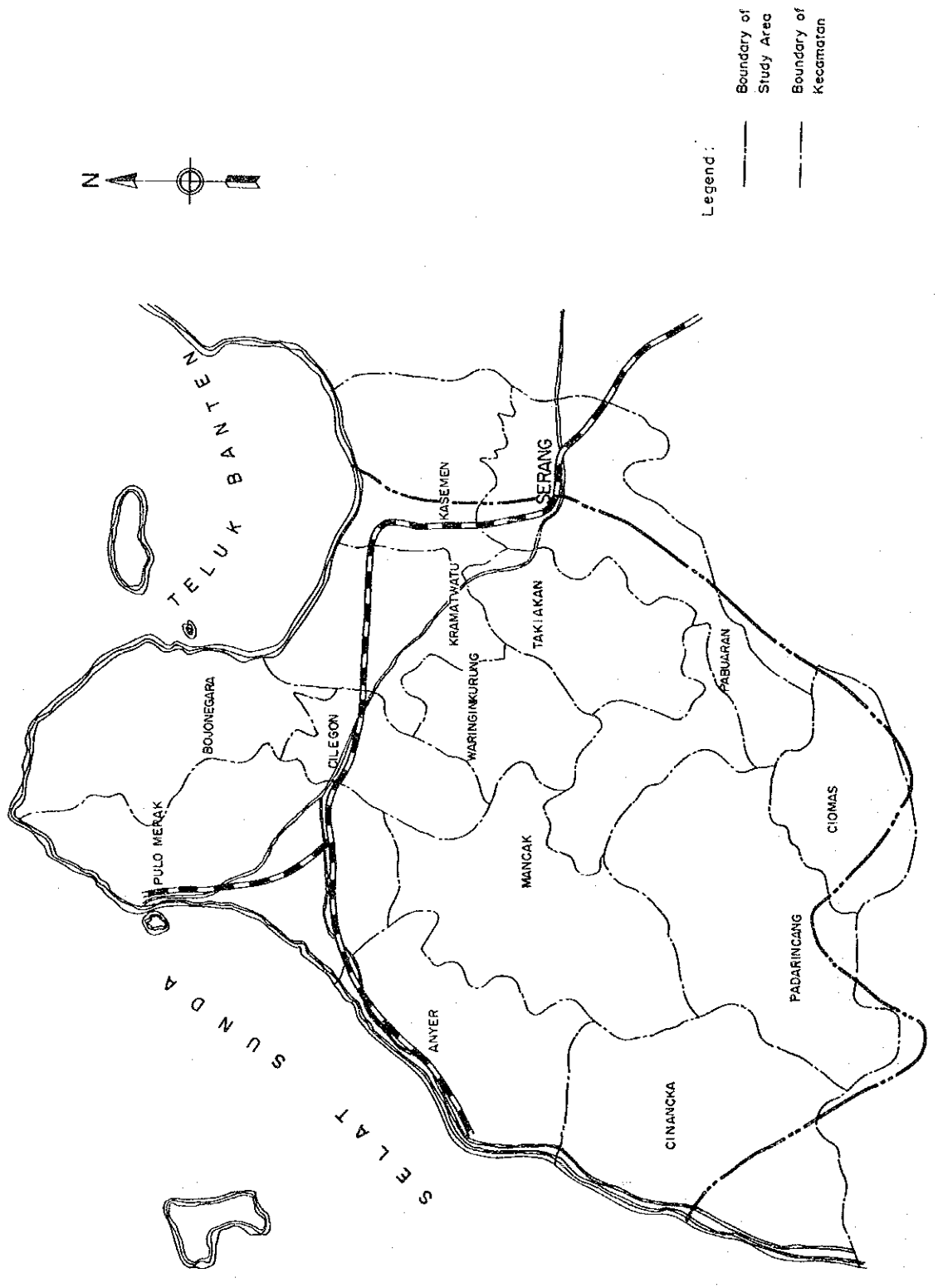
Fig. 2.1



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Kecamatans in the Study Area

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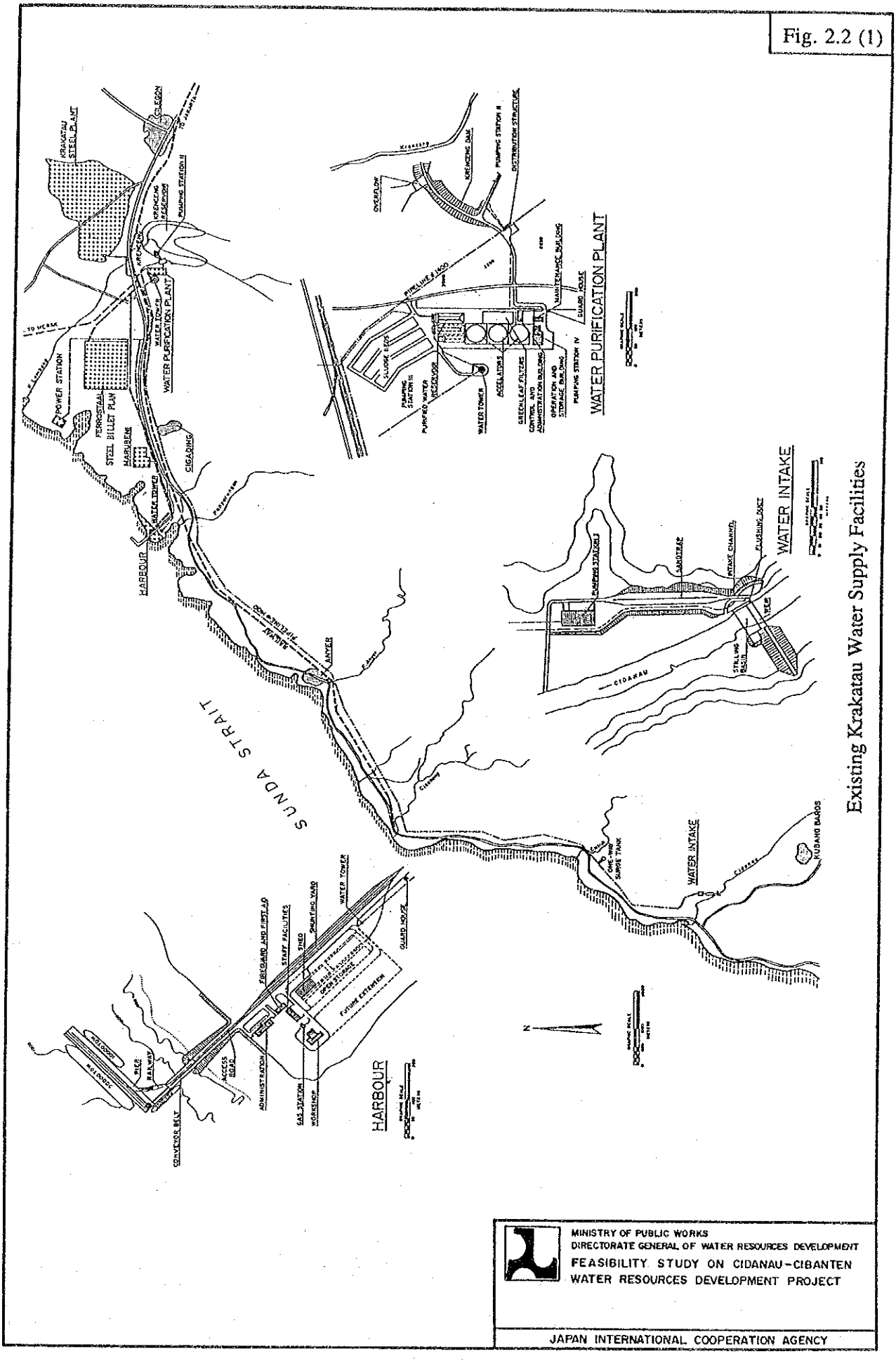
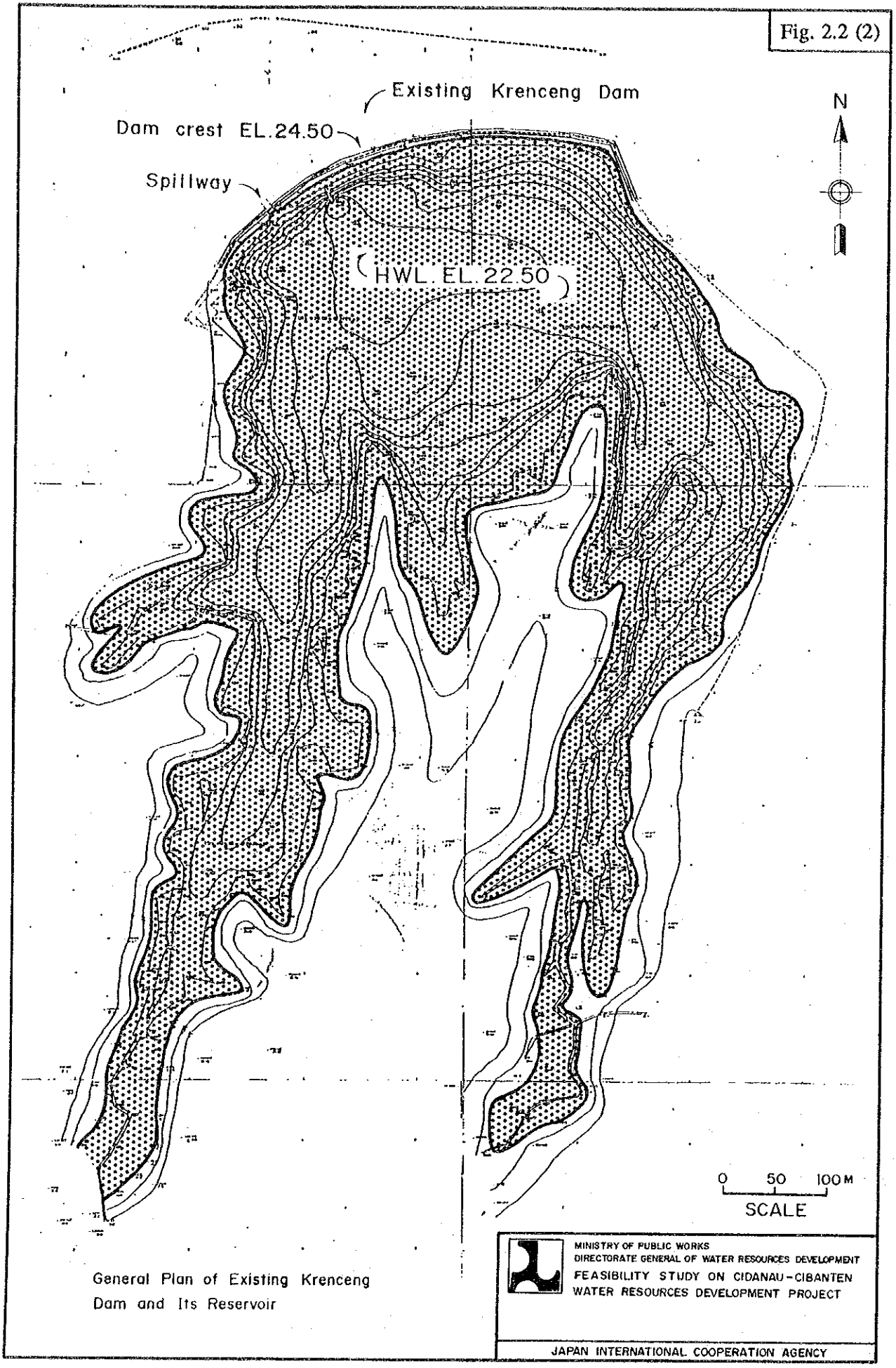
Fig. 2.2 (1)



Existing Krakatau Water Supply Facilities

Fig. 2.2 (2)



General Plan of Existing Krenceng Dam and Its Reservoir

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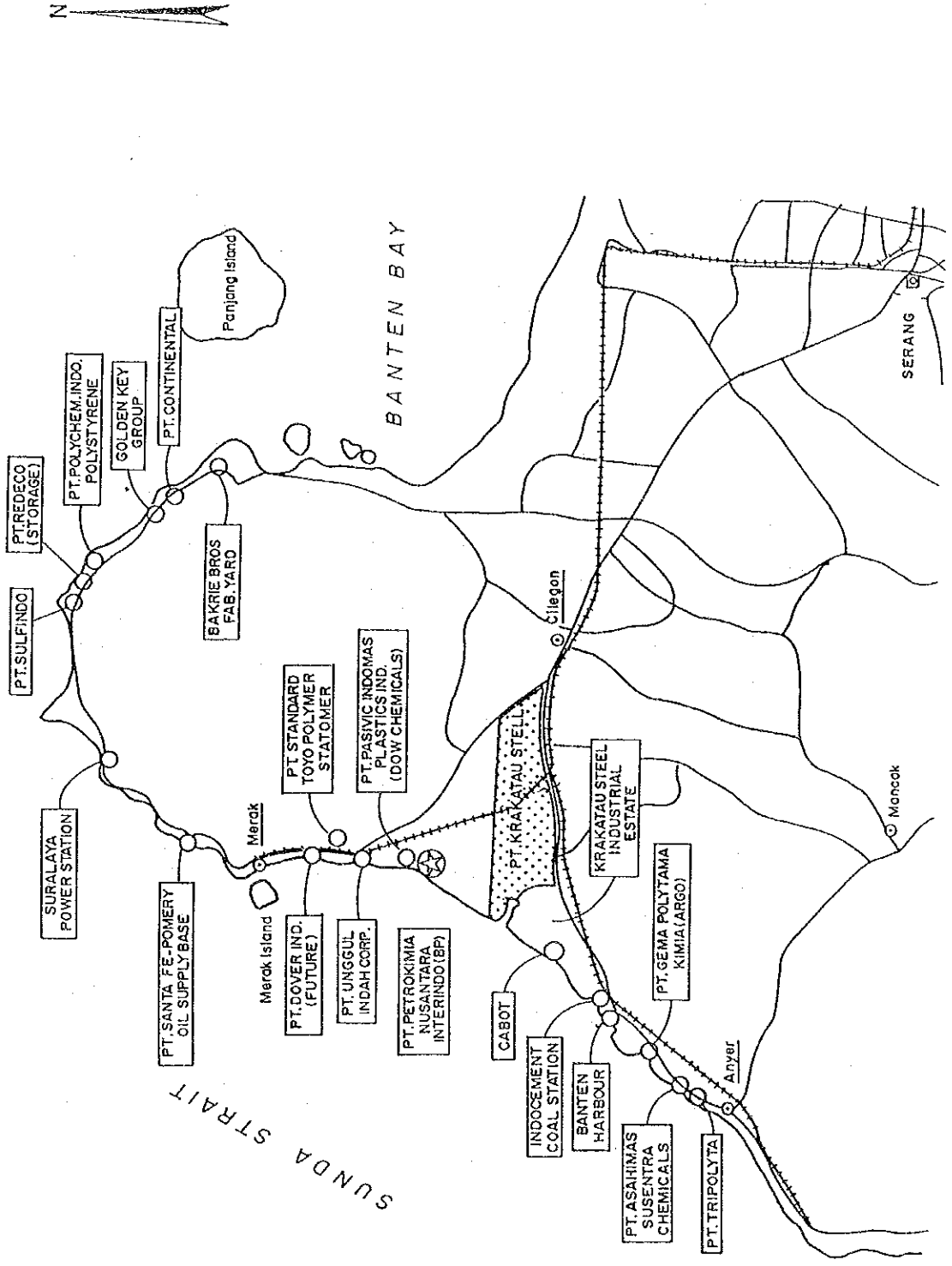
Fig. 2.3



Location Map for Industrial Area

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FEASIBILITY STUDY ON CIDANAU-CIBANTEN WATER RESOURCES DEVELOPMENT PROJECT

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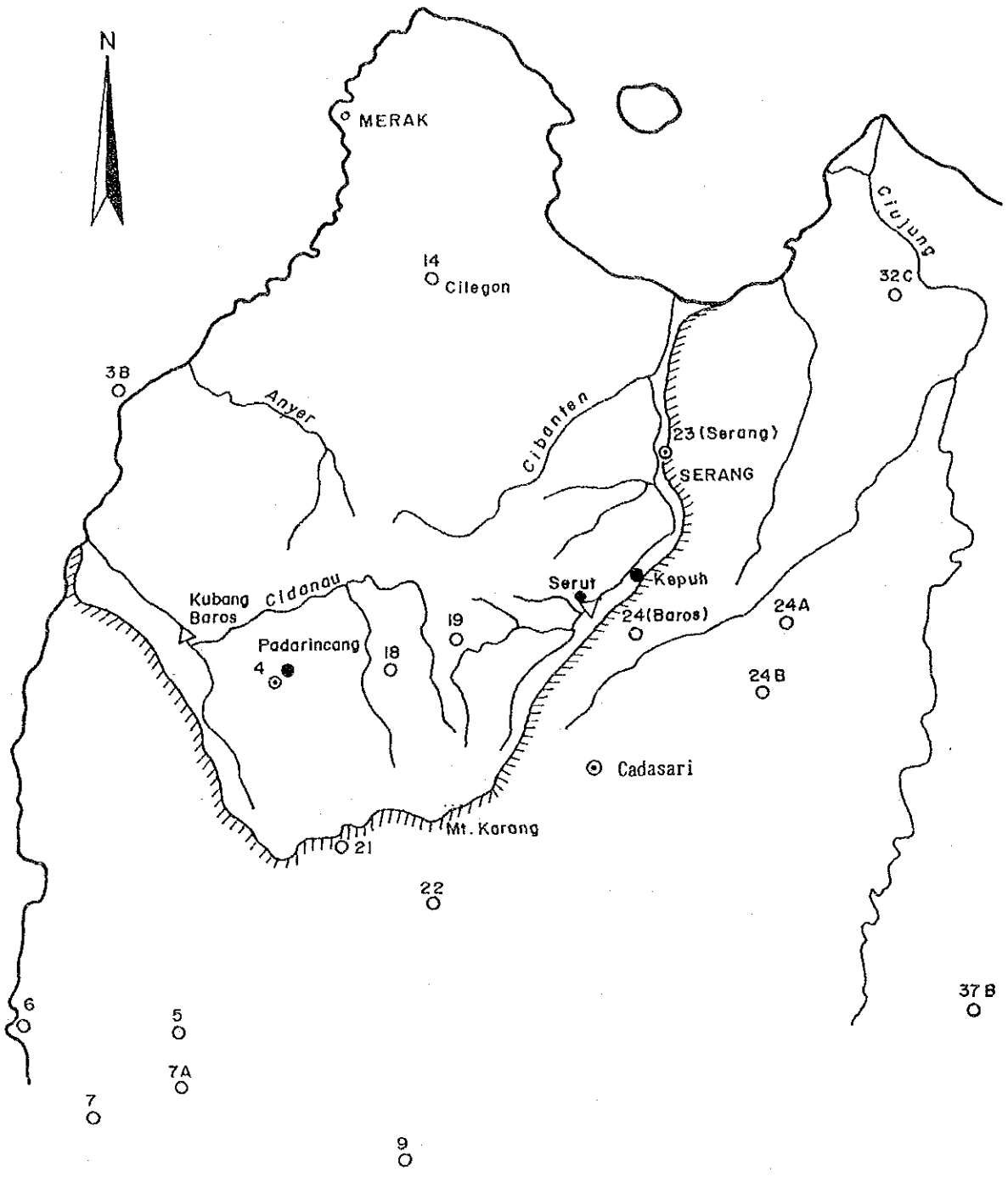
Fig. 2.4



LEGEND

● : Rain gauge (P3SA)
○ : Rain gauge (PGM)
▽ : Water level gauging station
⊙ : Meteorological Observation station

Location of Meteorological and Hydrological Station

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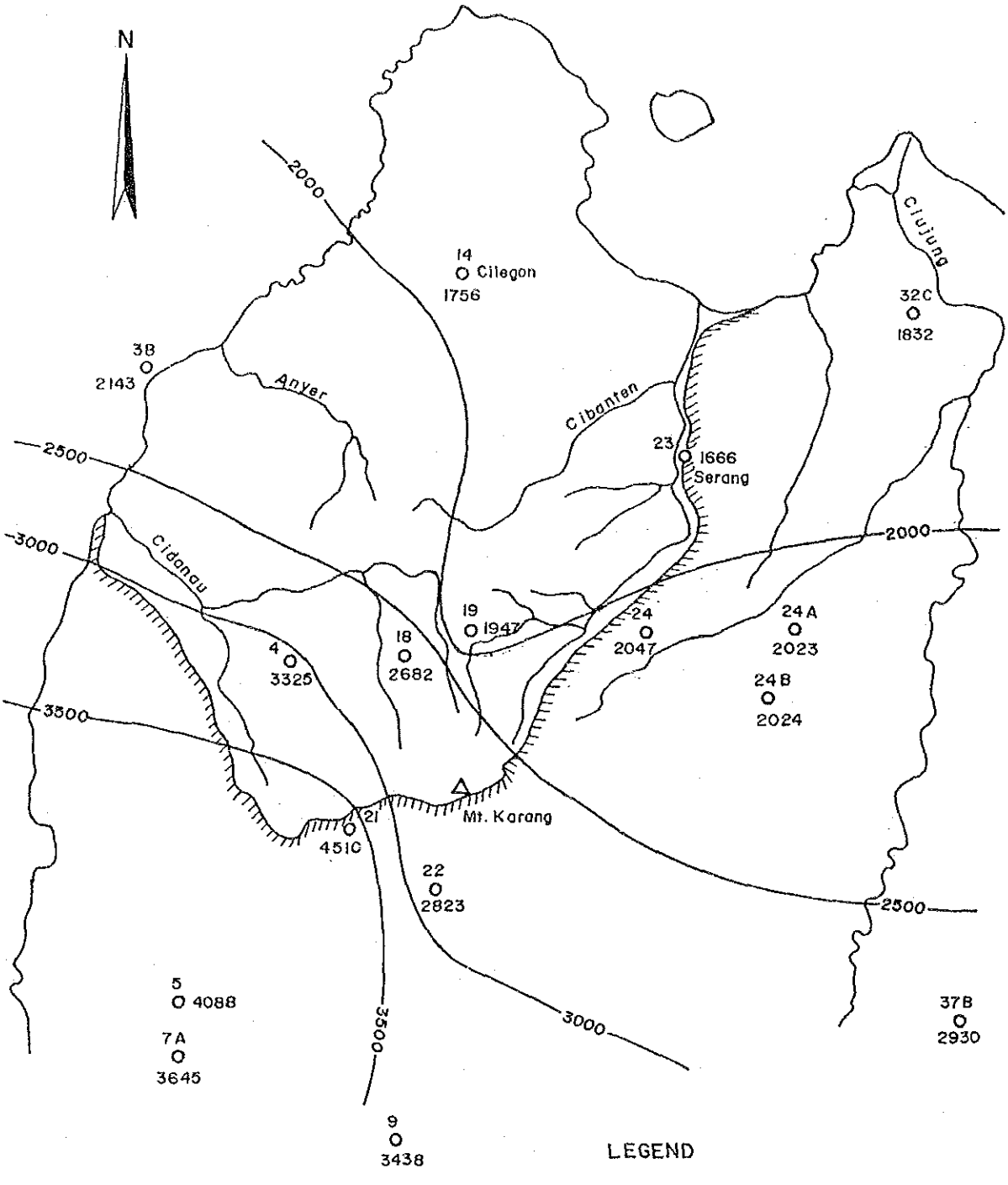
Fig. 2.5



Annual Isohyetal map

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Fig. 2.6

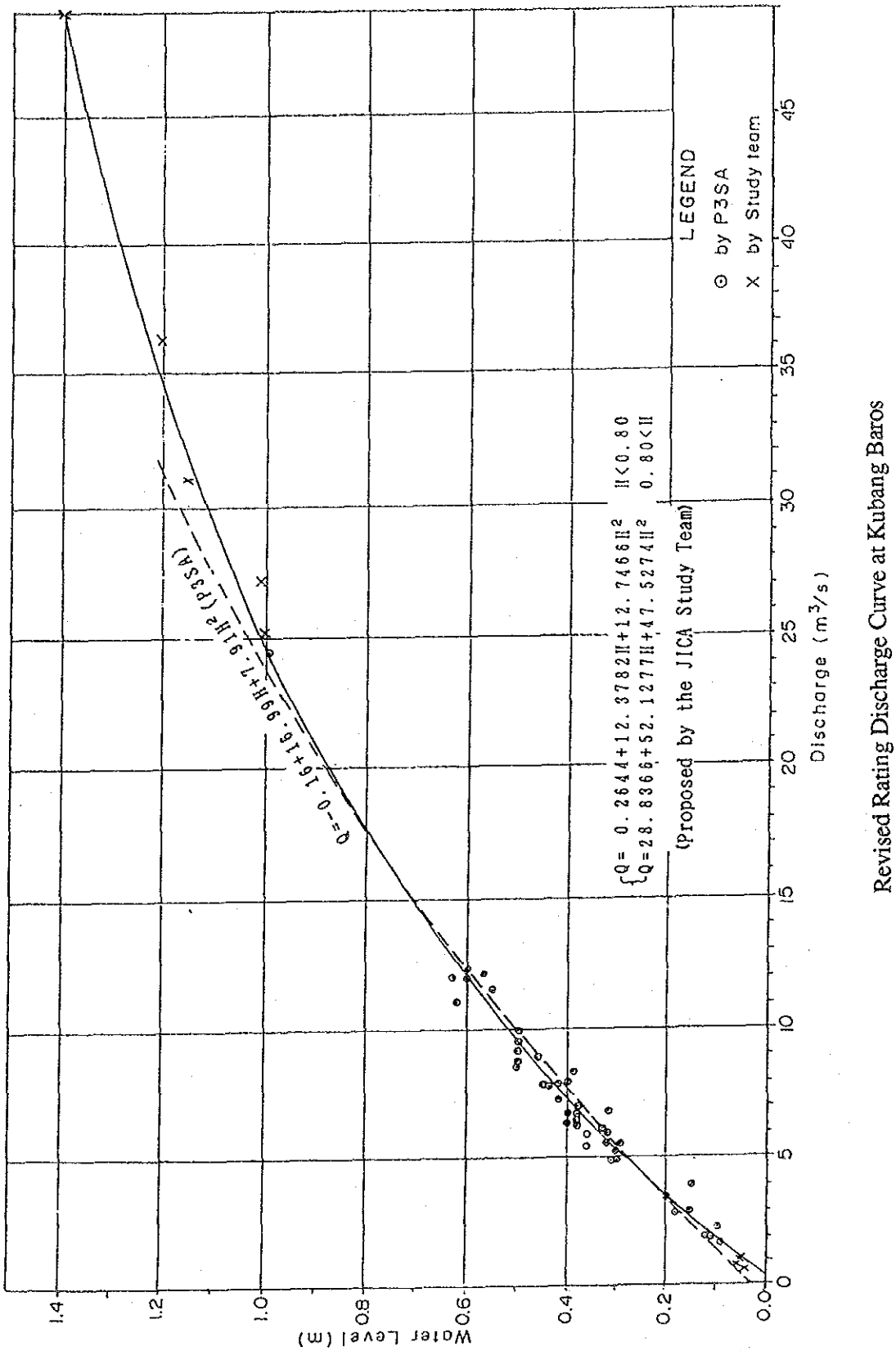

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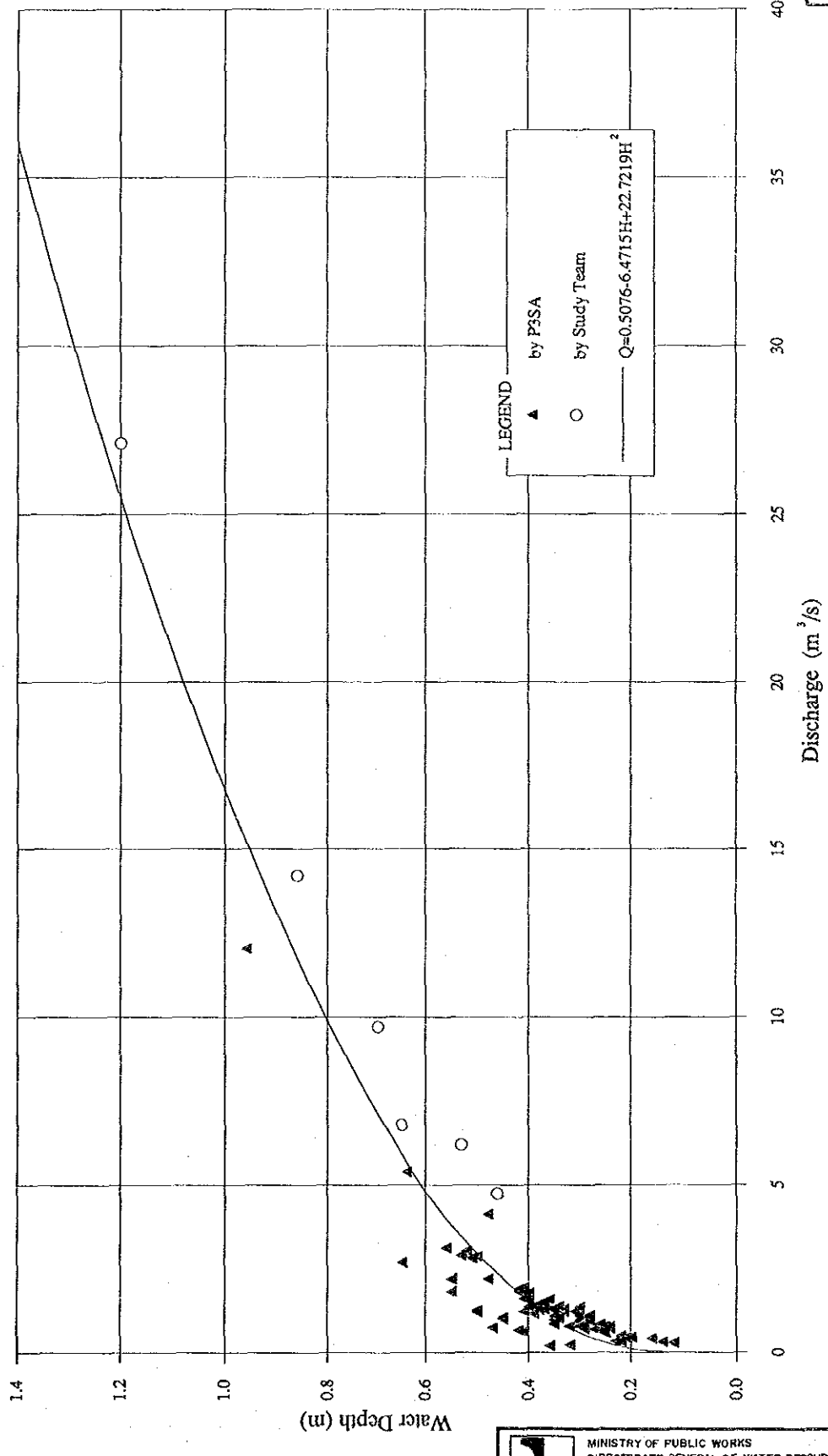
Fig. 2.7



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Revised Rating Discharge Curve at Serut

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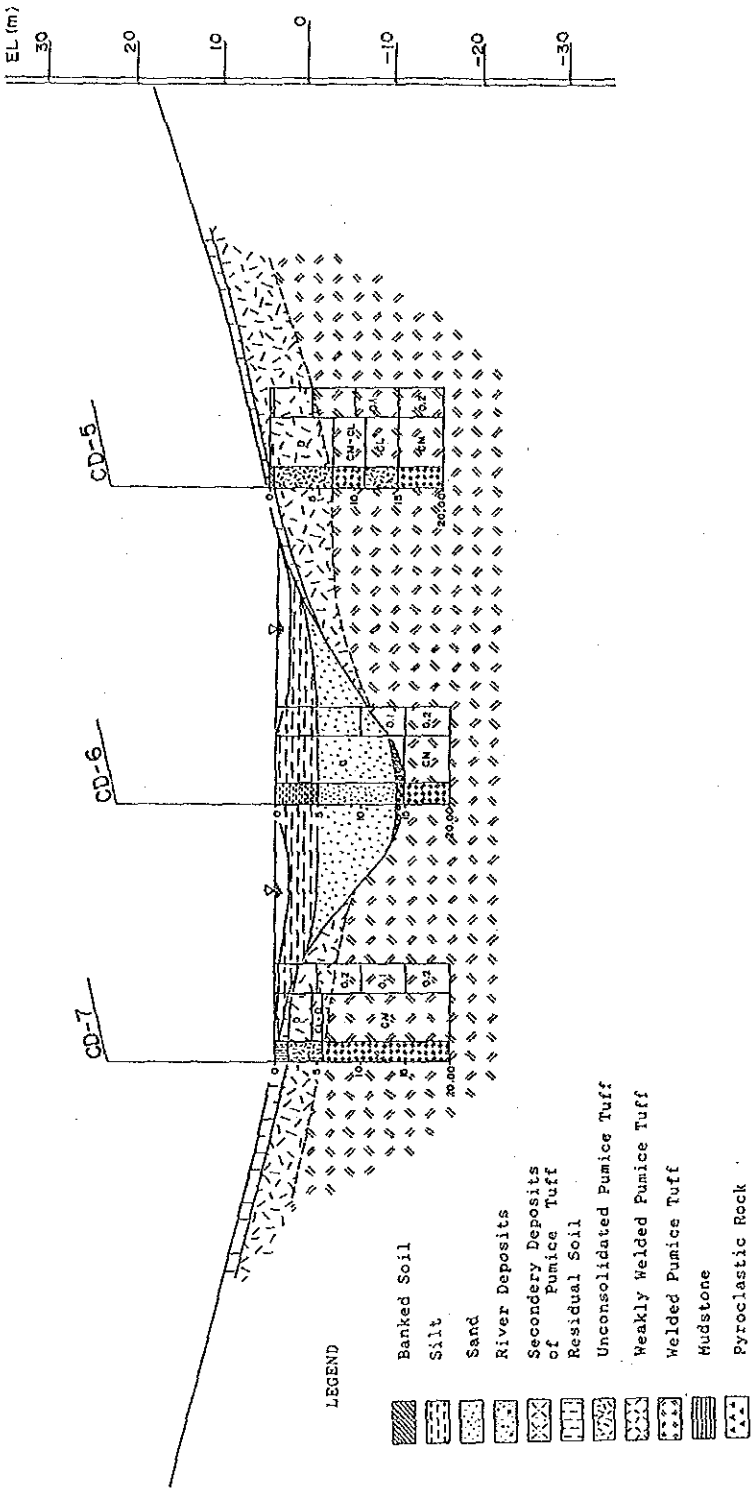
Fig. 2.8



Geological Profile of Cidanau Gated Weir Site

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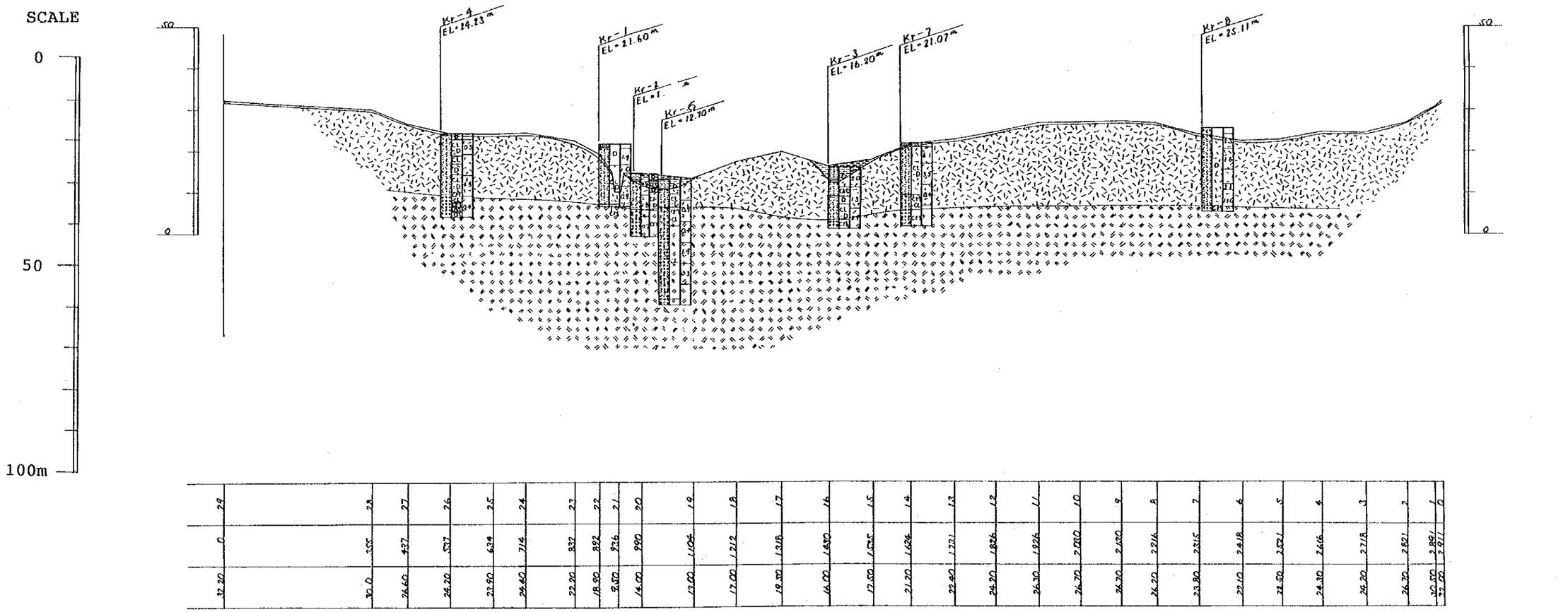
Fig. 2.9



LEGEND

- Top Soil
- River Deposits
- Unconsolidated Pumice Tuff
- Pumice Tuff

0 500m 1000m

SCALE

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WATER RESOURCES DEVELOPMENT PROJECT

Geological Profile of Krenceng Damsite

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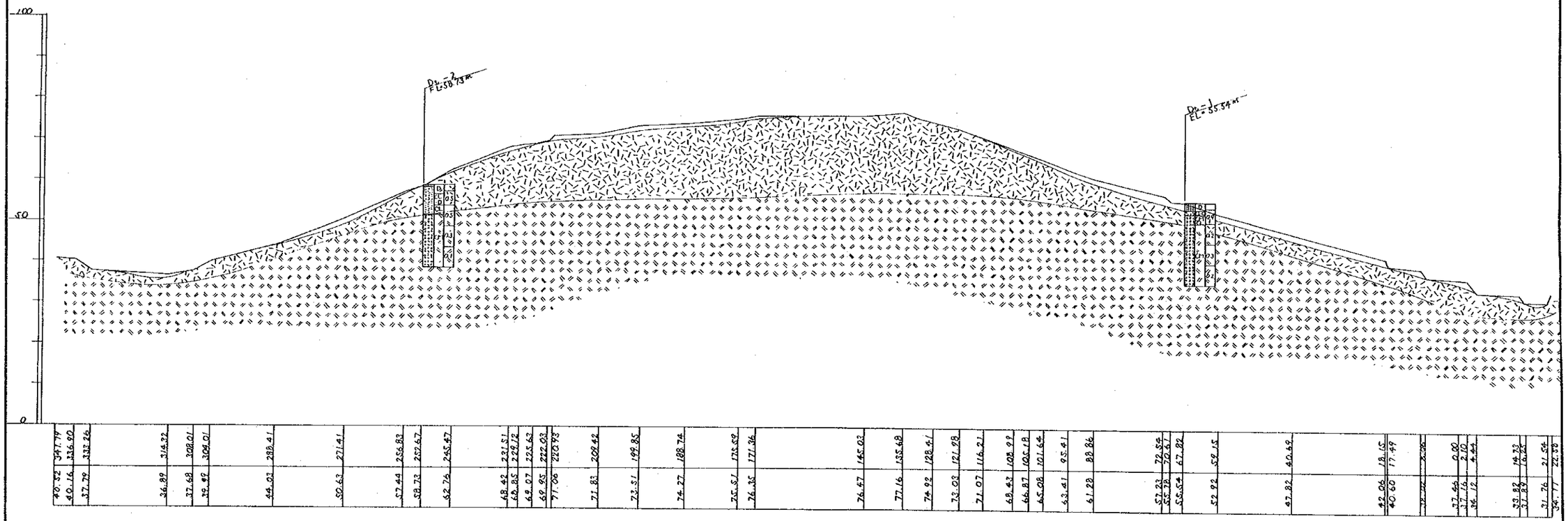
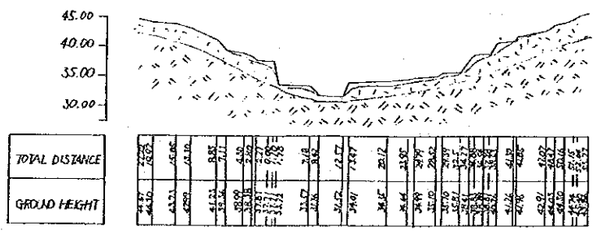
Fig. 2.10





LEGEND

- Top Soil
- Unconsolidated Pumice Tuff
- Pumice Tuff

0 50 100m

SCALE

Geological Profile of Beroeng Diversion Tunnel Site

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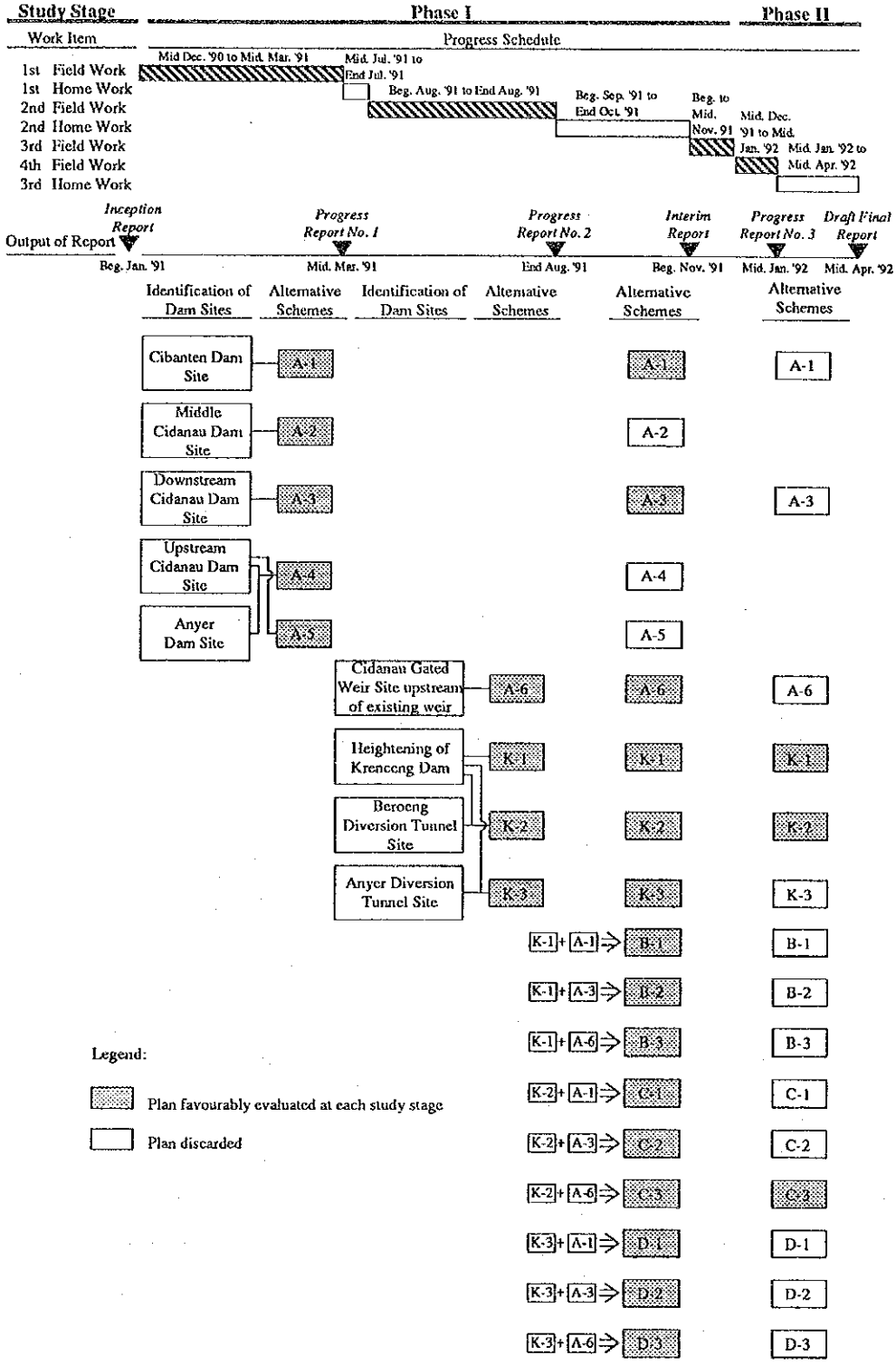
Fig. 3.1



Flow of Plan Formulation Study

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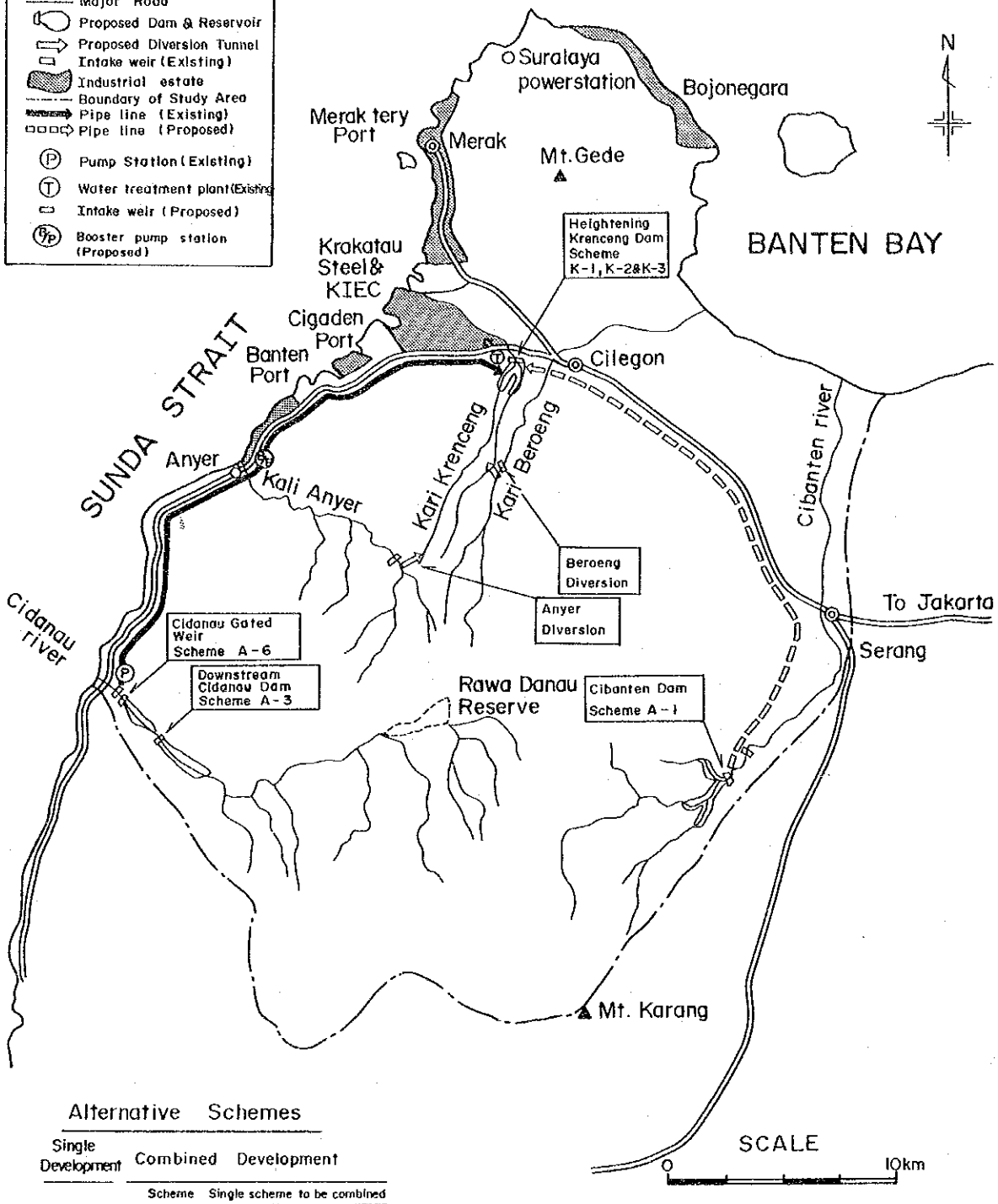
Fig. 3.2



Alternative Schemes

Single Development	Combined Development	
	Scheme	Single scheme to be combined
Scheme	B-1	K-1 plus A-1
	B-2	K-1 plus A-3
	B-3	K-1 plus A-6
A-1	C-1	K-2 plus A-1
A-3	C-2	K-2 plus A-3
A-6	C-3	K-2 plus A-6
K-1 1)	D-1	K-3 plus A-1
K-2 2)	D-2	K-3 plus A-3
K-3 3)	D-3	K-3 plus A-6

Notes :
1) Without diversion
2) With Beroeng diversion
3) With Beroeng & Anyer diversions

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Location Map of Alternatives

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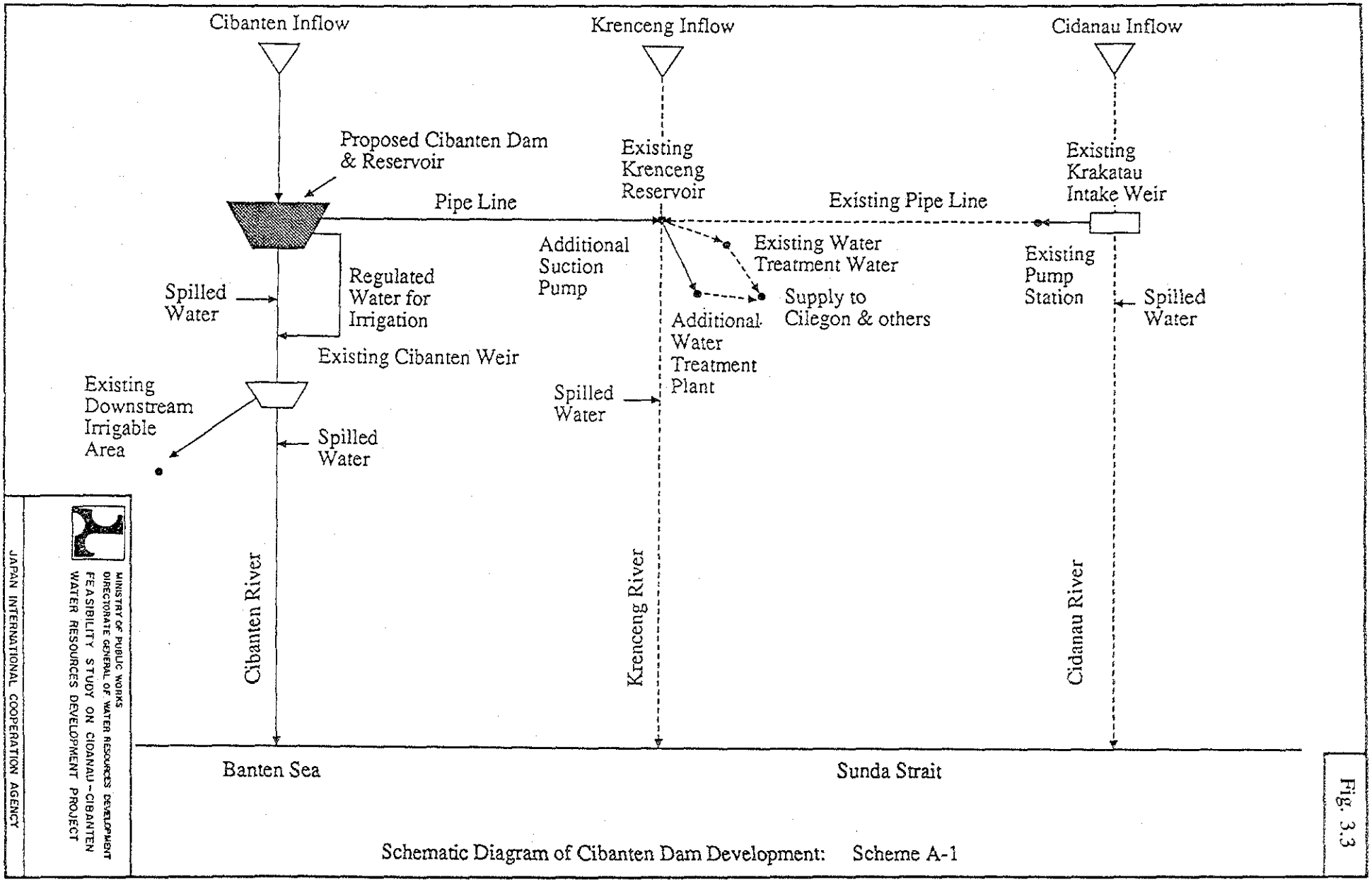
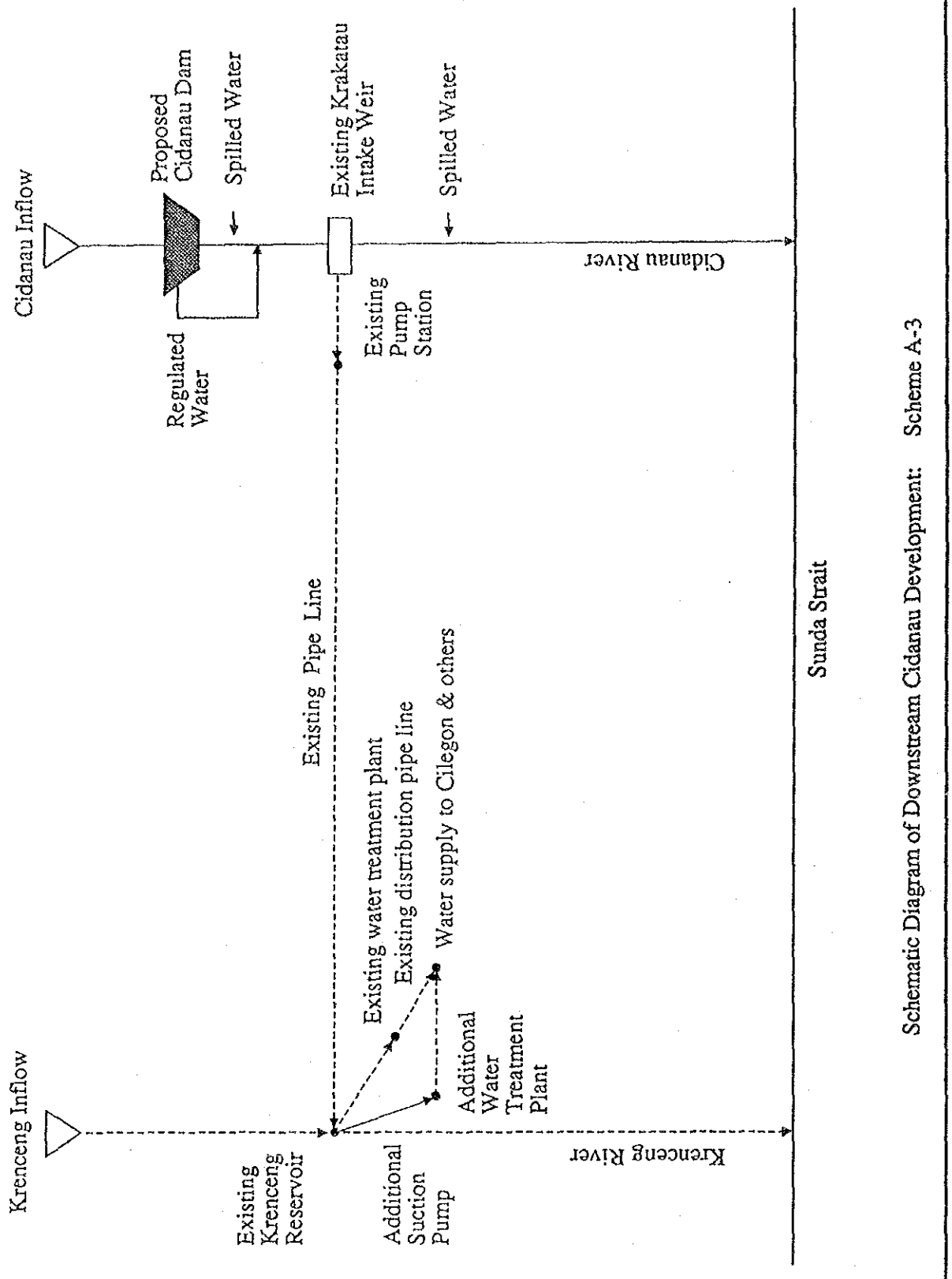


Schematic Diagram of Cibanten Dam Development: Scheme A-1

Fig. 3.3

Fig. 3.4



Schematic Diagram of Downstream Cidanau Development: Scheme A-3

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Fig. 3.5

Schematic Diagram of Cidanau Gated Weir Development: Scheme A-6

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Fig. 3.6

Schematic Diagram of Heightening of Krenceng Dam without Diversion Tunnel: Scheme K-1

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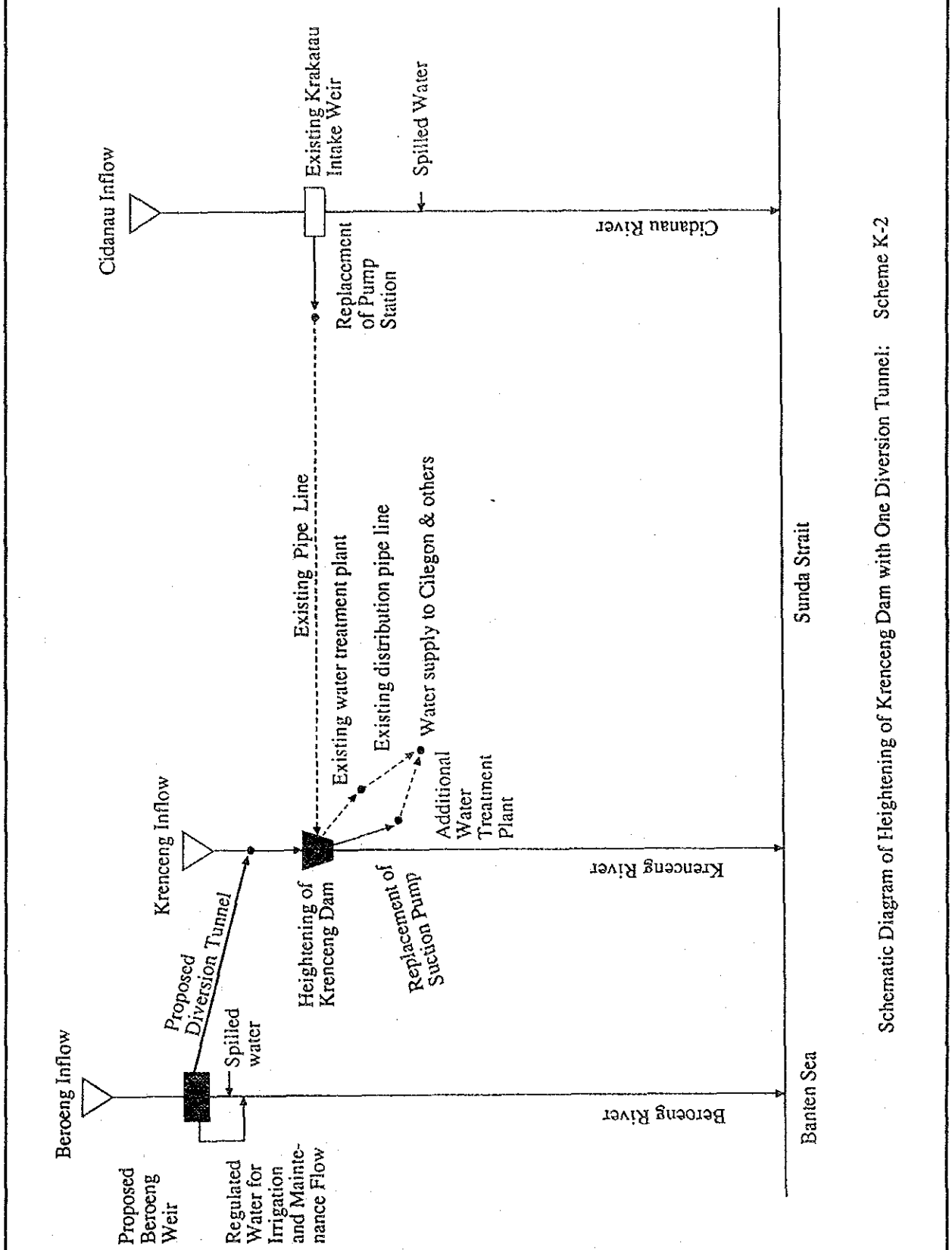
Fig. 3.7



Schematic Diagram of Heightening of Krenceng Dam with One Diversion Tunnel: Scheme K-2

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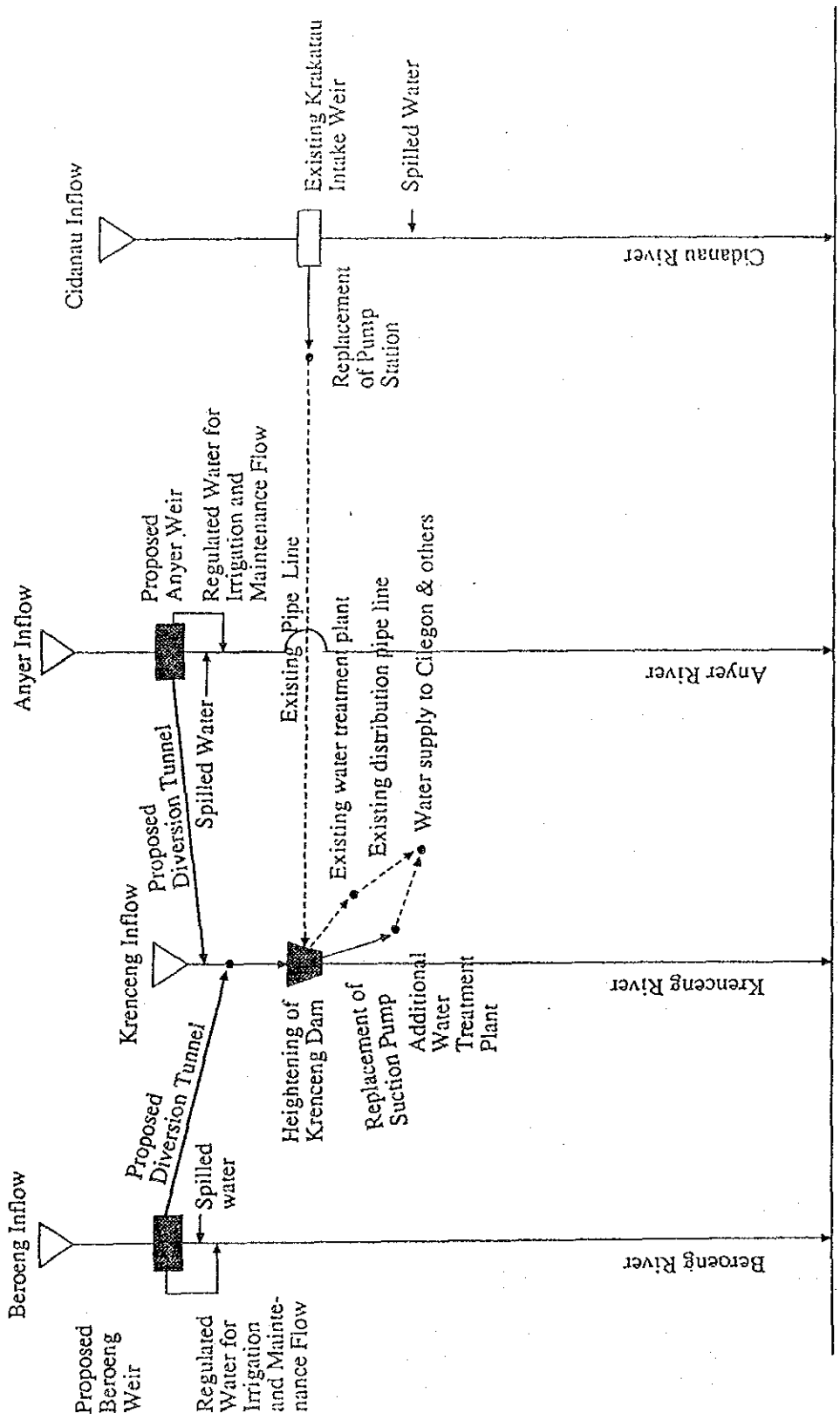
Fig. 3.8



Schematic Diagram of Heightening of Krenceng Dam Development with Two Diversion Tunnels: Scheme K-3

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Fig. 3.9

Plan, Maximum Section and Upstream View of Main Structures for Cibanten Dam

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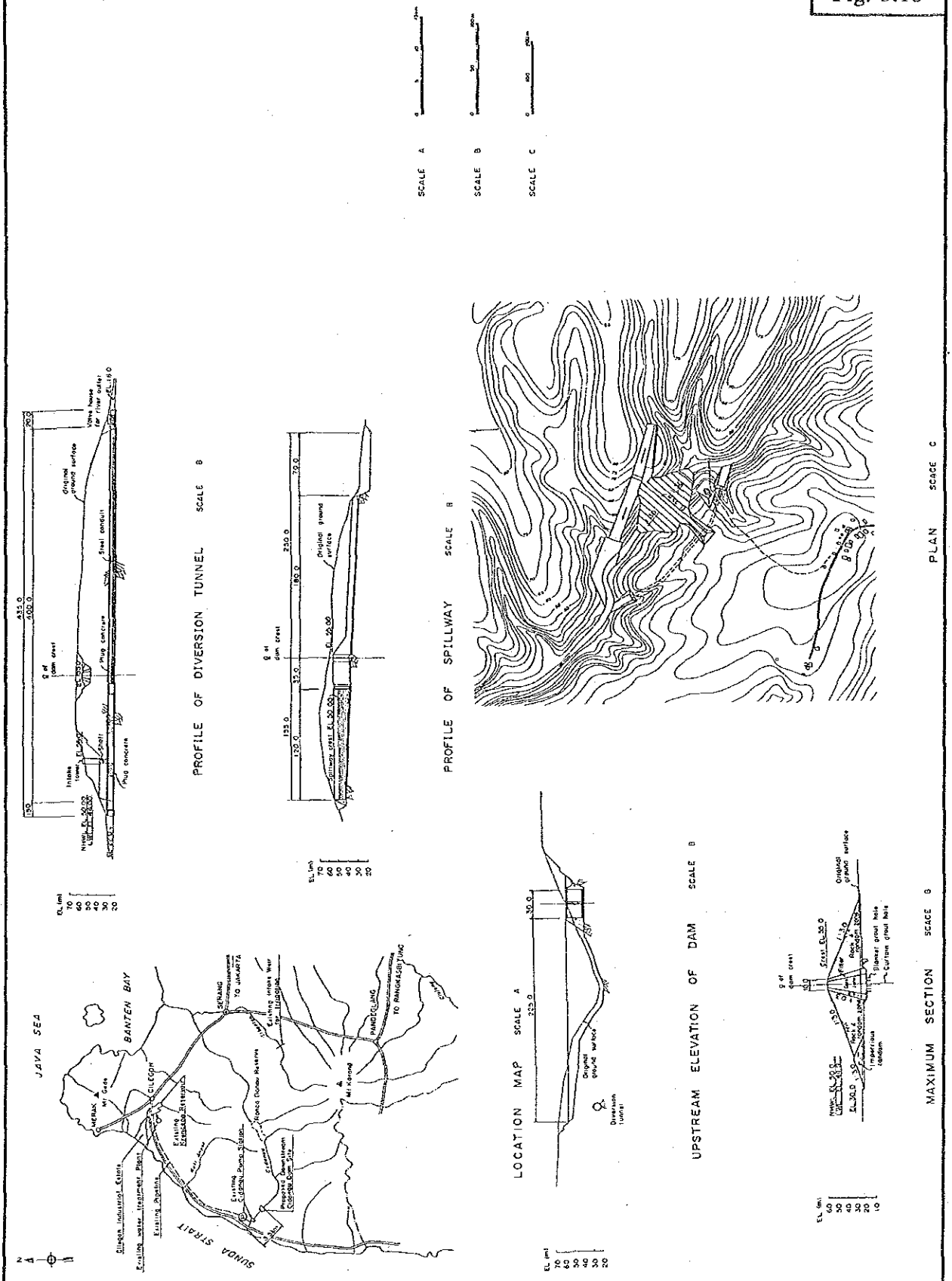
Fig. 3.10



Plan, Maximum Section and Upstream View of Main Structures for Downstream Cidanau Dam

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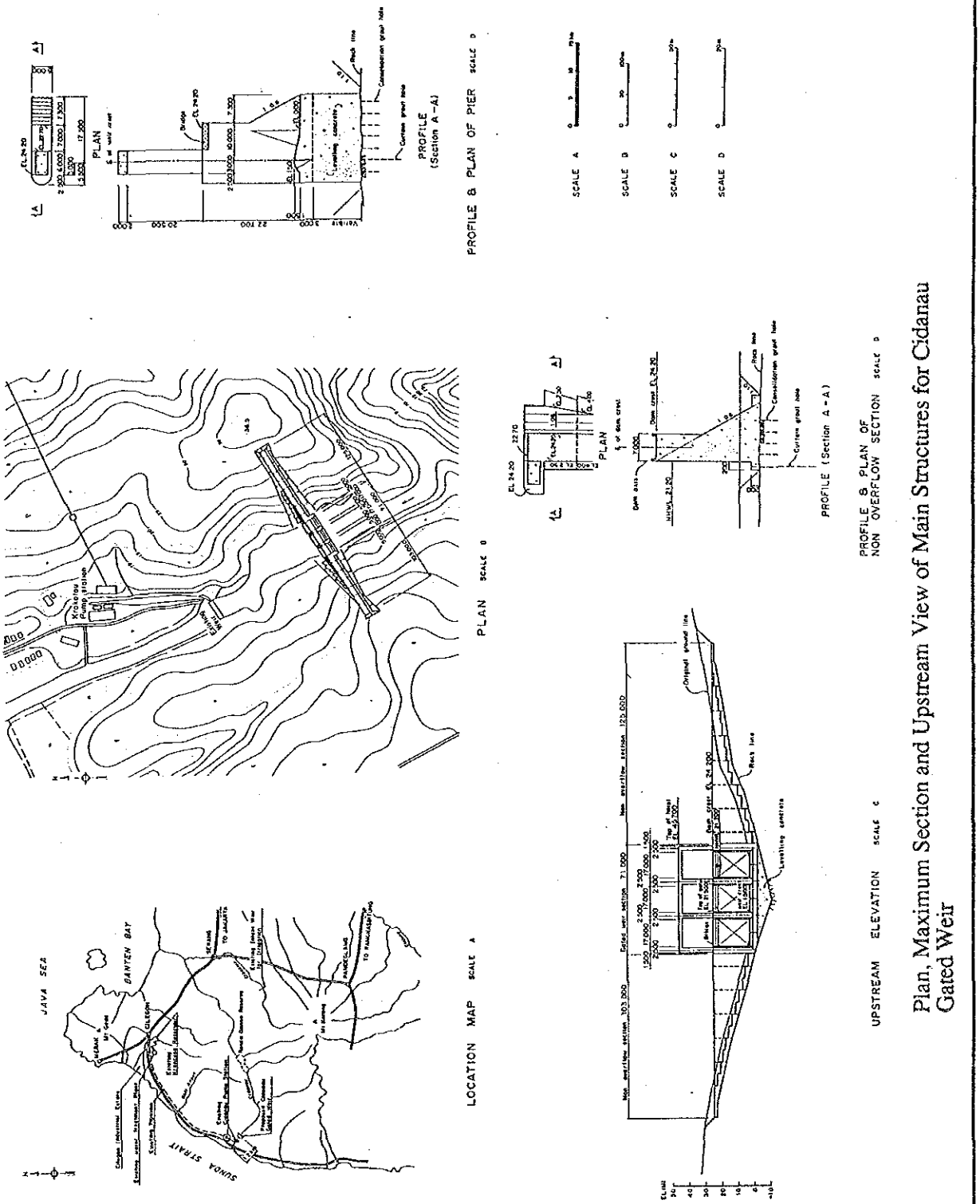
Fig. 3.11



Plan, Maximum Section and Upstream View of Main Structures for Cidanau Gated Weir

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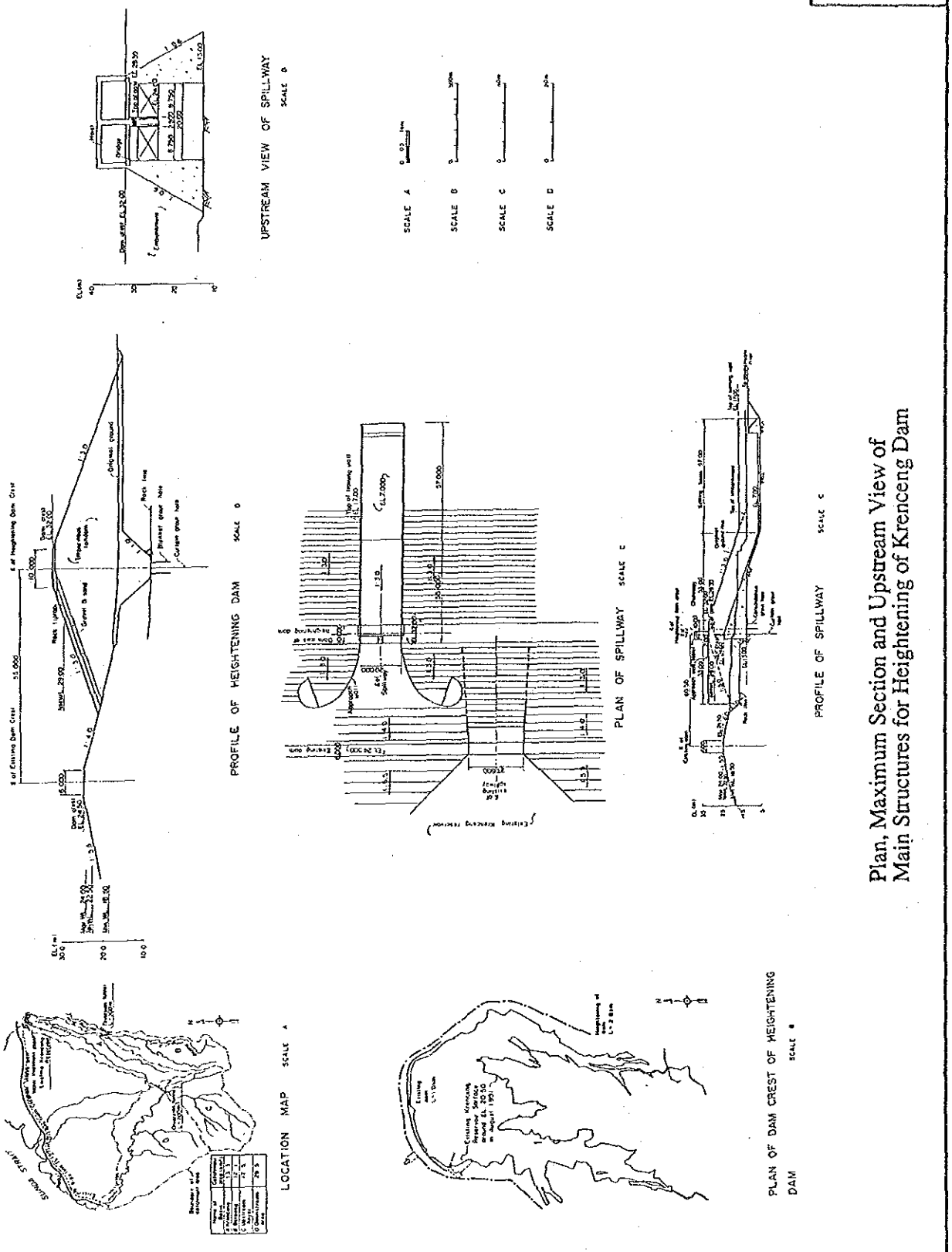
Fig. 3.12



Plan, Maximum Section and Upstream View of Main Structures for Heightening of Krenceng Dam

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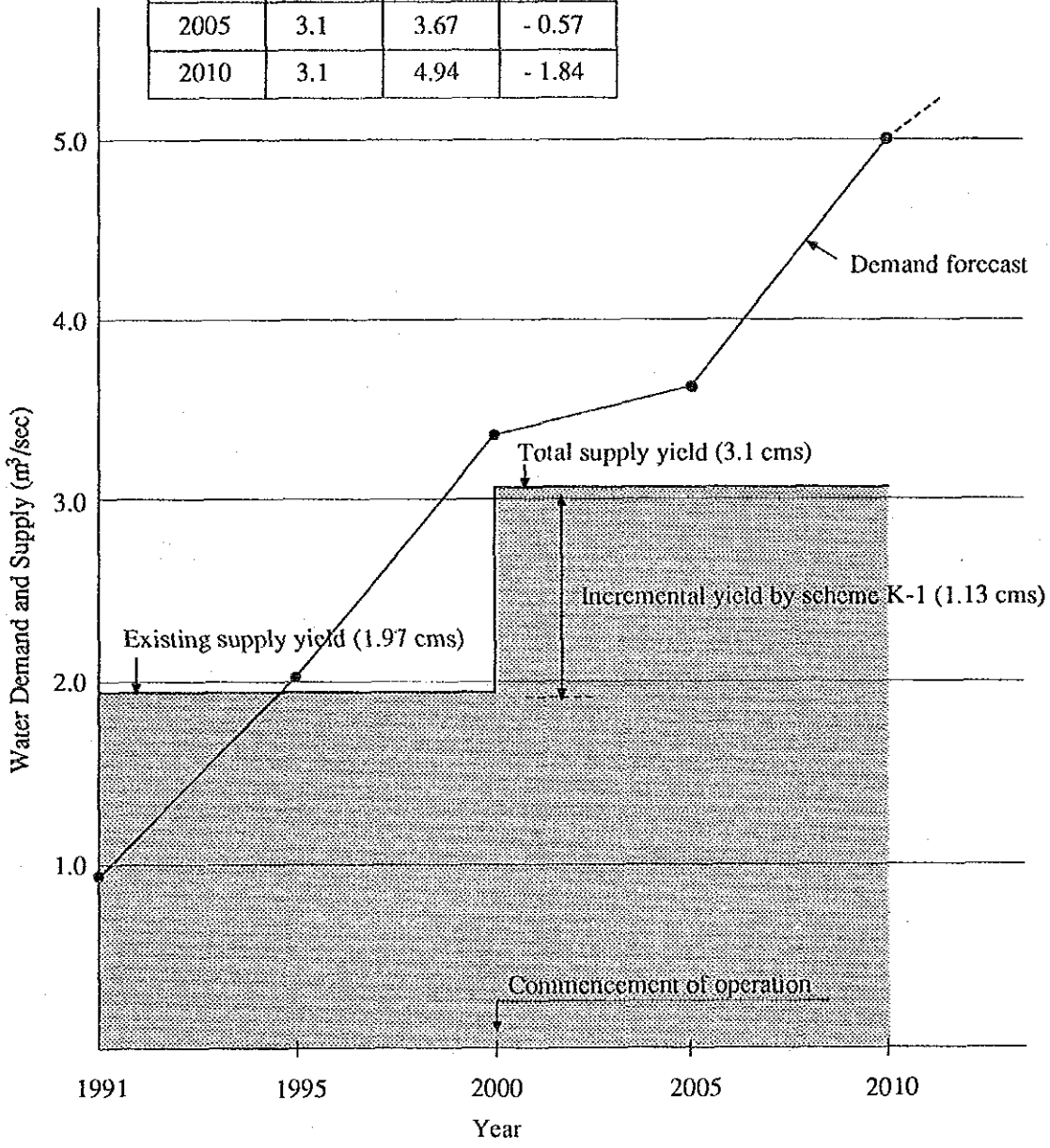
Fig. 3.13

Unit: cms)

Year	Supply	Demand	Balance
1991	1.97	0.86	+1.11
1995	1.97	2.06	- 0.09
2000	3.1	3.30	- 0.20
2005	3.1	3.67	- 0.57
2010	3.1	4.94	- 1.84



Water Demand and Supply Program by Scheme K-1

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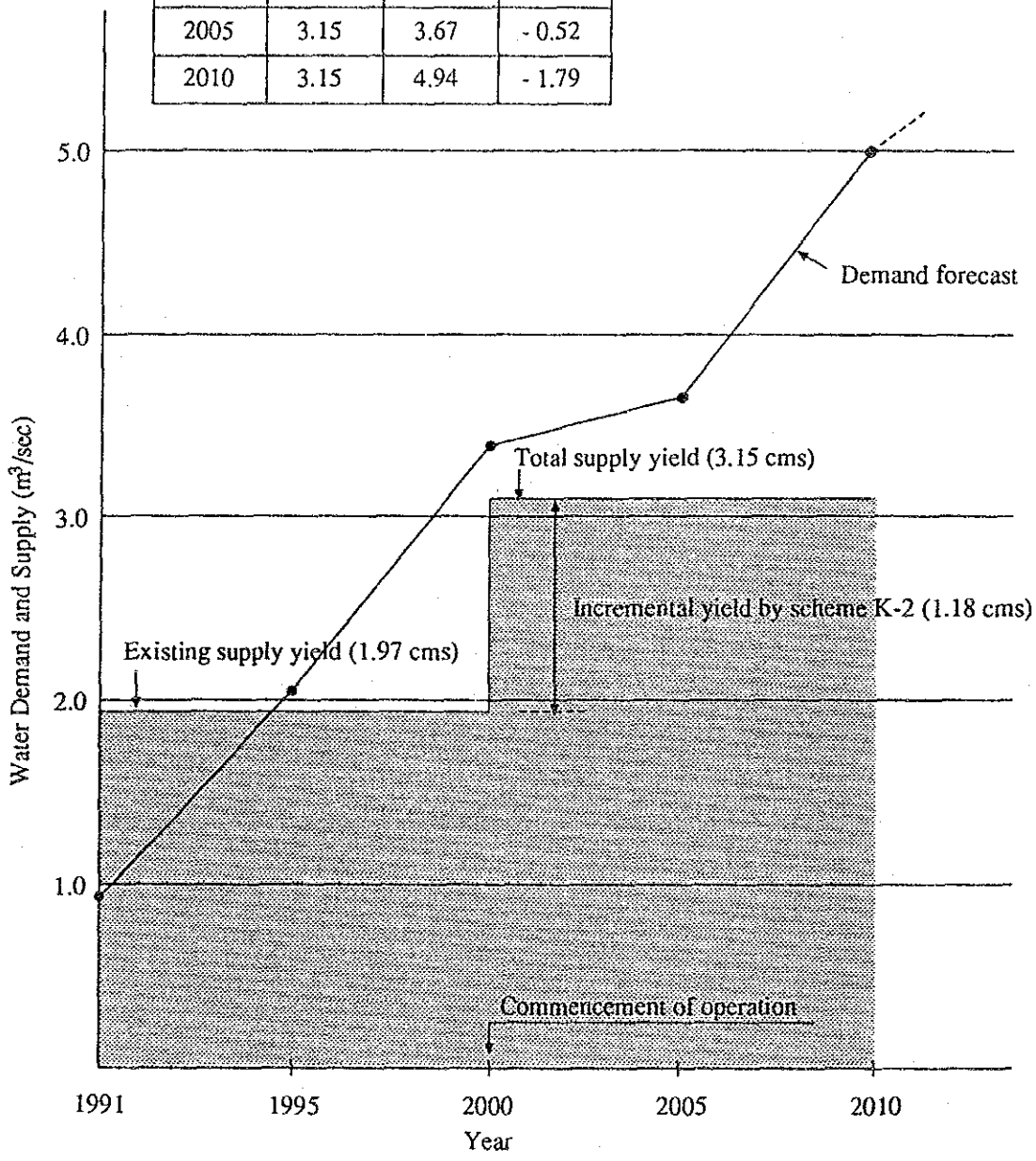
Fig. 3.14

Unit: cms)

Year	Supply	Demand	Balance
1991	1.97	0.86	+1.11
1995	1.97	2.06	- 0.09
2000	3.15	3.30	- 0.15
2005	3.15	3.67	- 0.52
2010	3.15	4.94	- 1.79



Water Demand and Supply Program by Scheme K-2

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WATER RESOURCES DEVELOPMENT PROJECT

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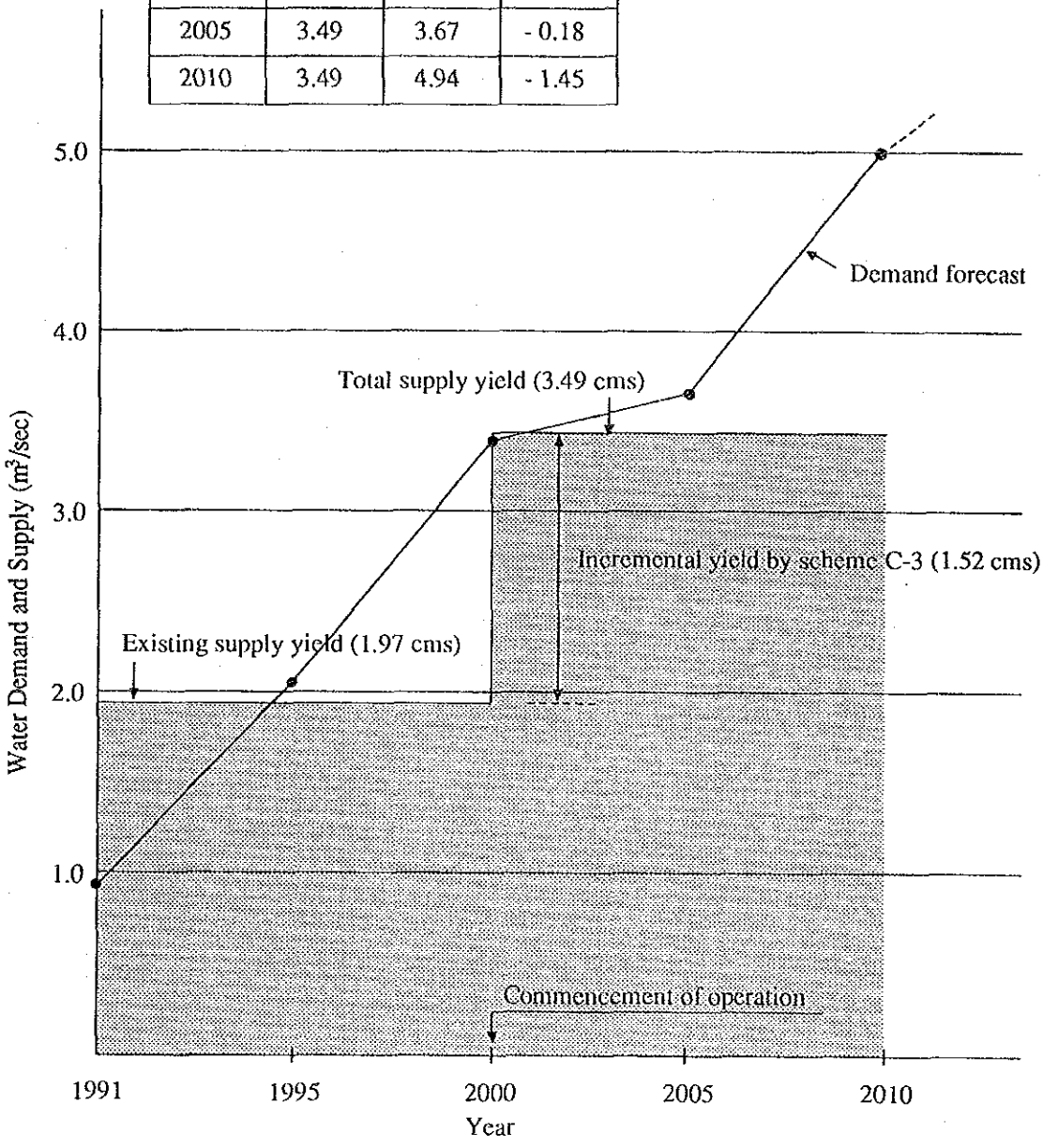
Fig. 3.15

Unit: cms)

Year	Supply	Demand	Balance
1991	1.97	0.86	+1.11
1995	1.97	2.06	- 0.09
2000	3.30	3.30	0
2005	3.49	3.67	- 0.18
2010	3.49	4.94	- 1.45



Water Demand and Supply Program by Scheme C-3

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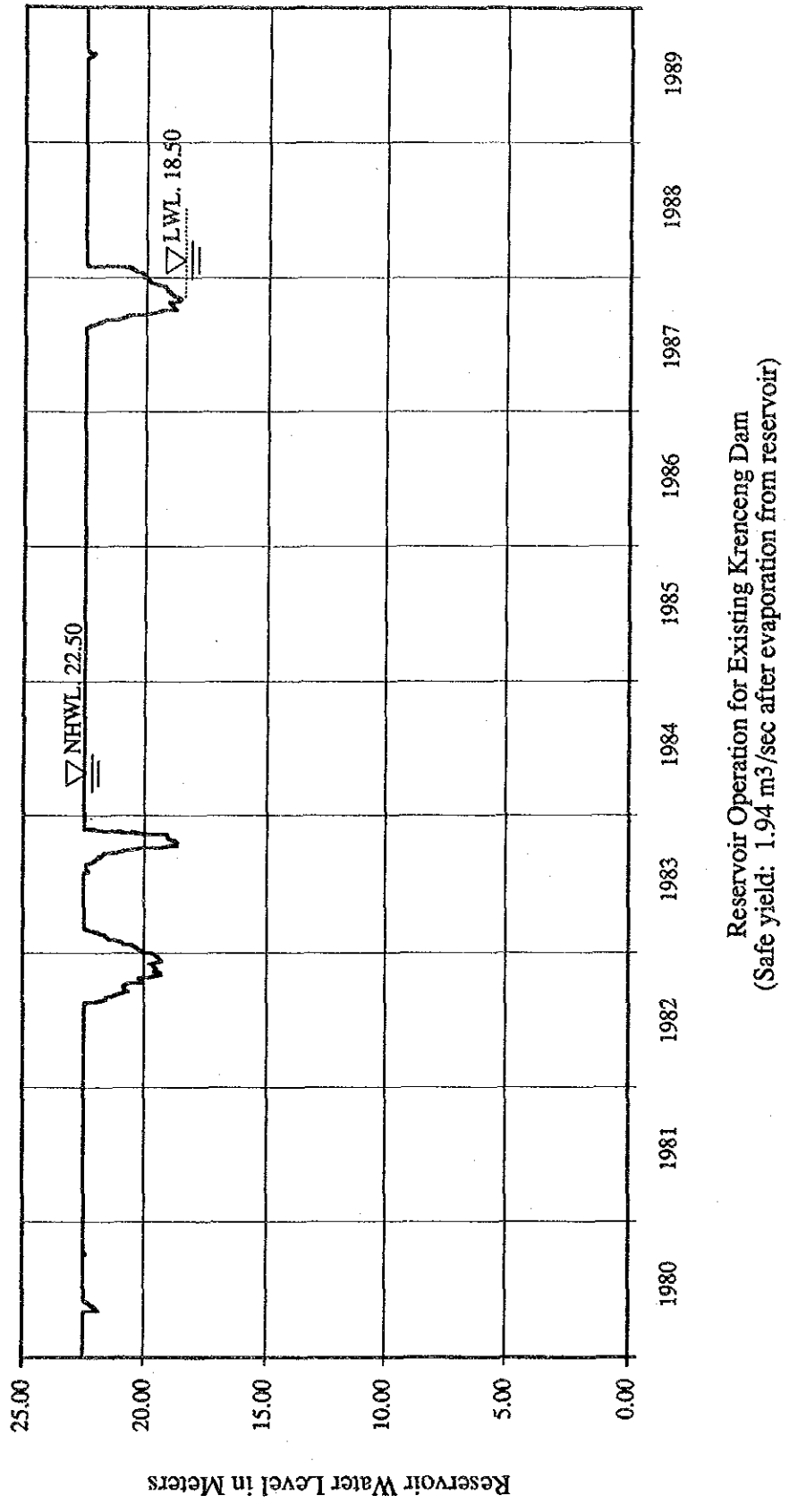
Fig. 3.16



Reservoir Operation for Existing Krenceng Dam
(Safe yield: 1.94 m3/sec after evaporation from reservoir)

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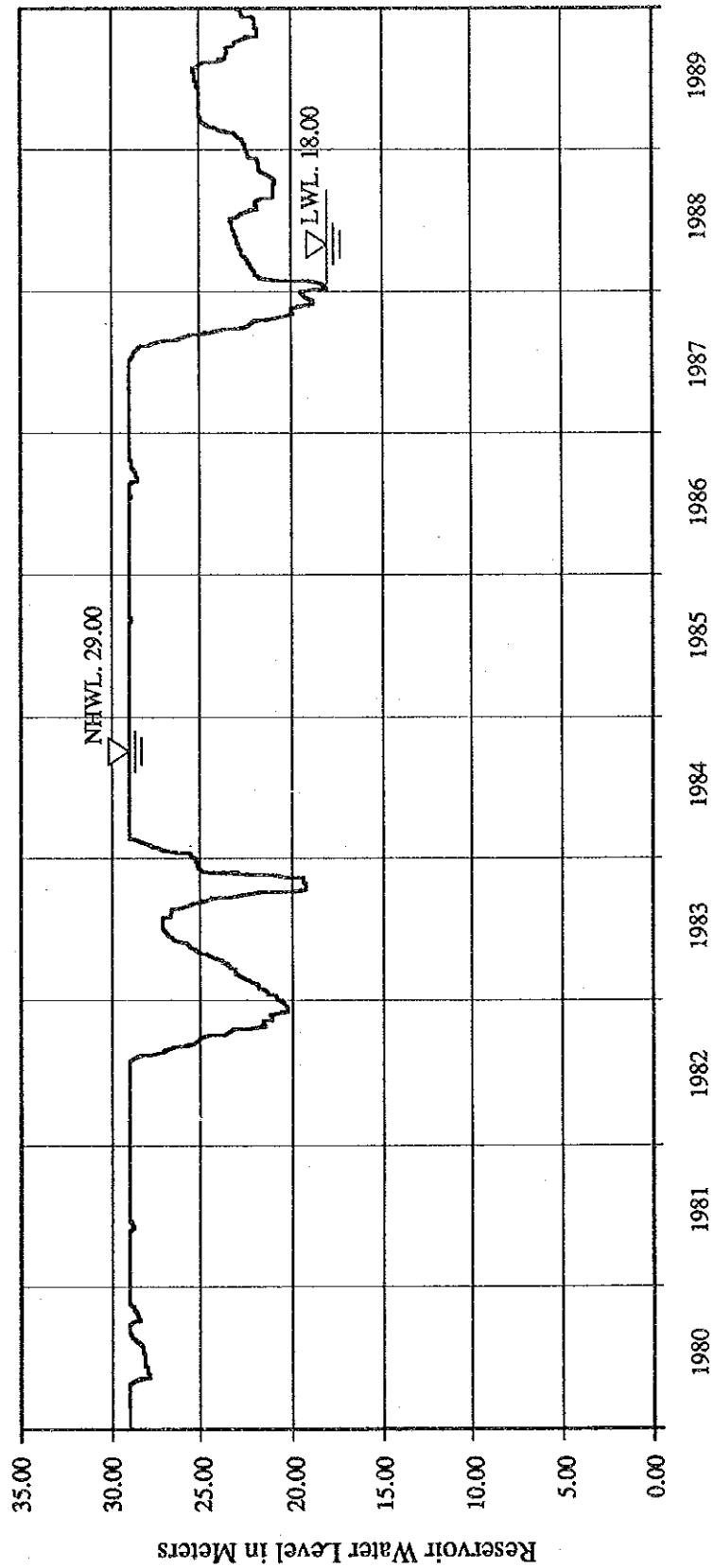
Fig. 3.17



Reservoir Operation for Heightening of Krenceng Dam (without Beroeng diversion Tunnel)
(Safe Yield: 3.05 m³/sec after evaporation from reservoir)

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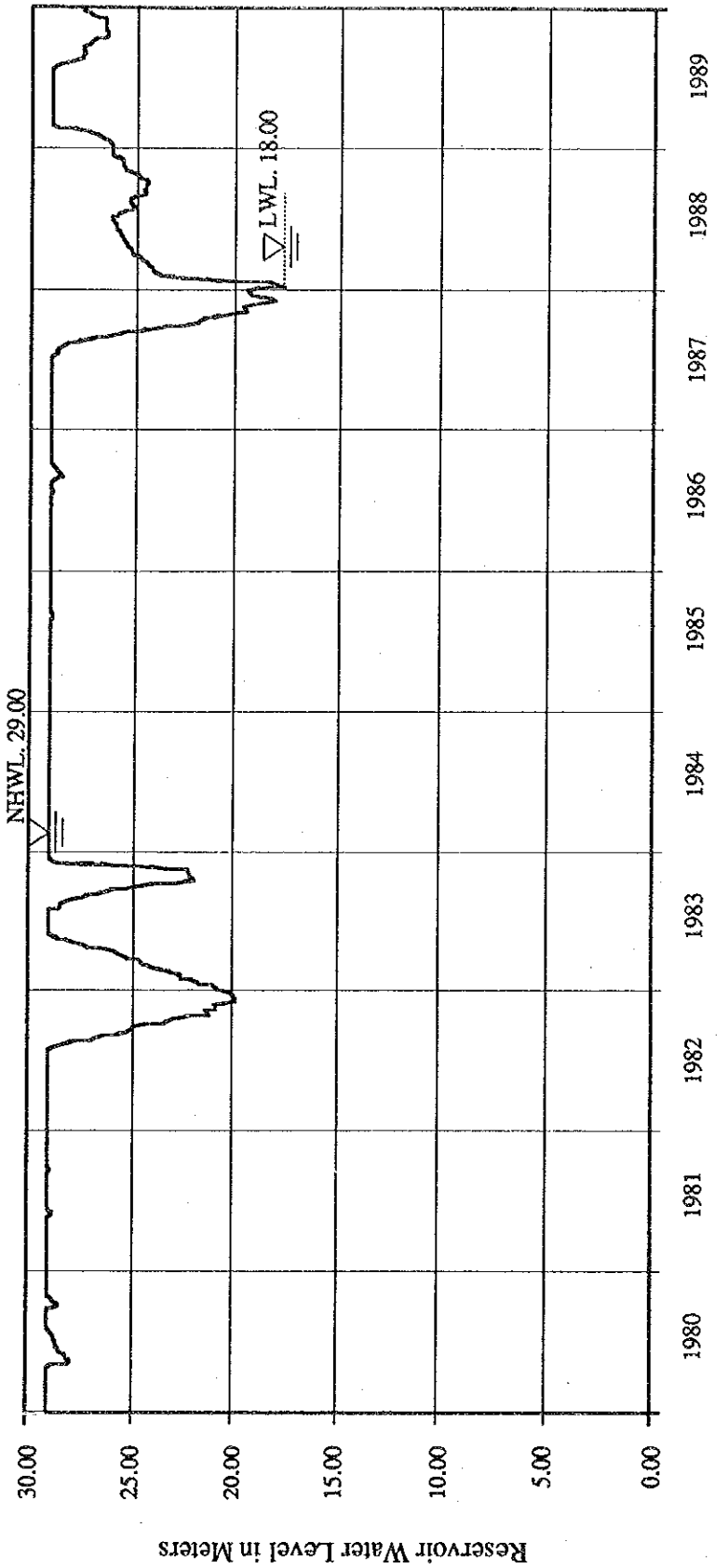
Fig. 3.18



Reservoir Operation for Heightening of Krenceng Dam with Beroeng Diversion Tunnel
(Safe Yield: 3.11 m^3/sec after evaporation from reservoir)

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Fig. 3.19

Reservoir Operation for Heightening of Krenceng Dam with Beroeng Diversion Tunnel
(Safe yield: 3.11 m³/sec after evaporation from reservoir)

Reservoir Operation for Cidanau Gated Weir
(Safe yield: 3.325m³/sec after evaporation from reservoir)

Reservoir Operation for Heightening of Krenceng Dam with Beroeng Diversion Tunnel and Cidanau Gated Weir

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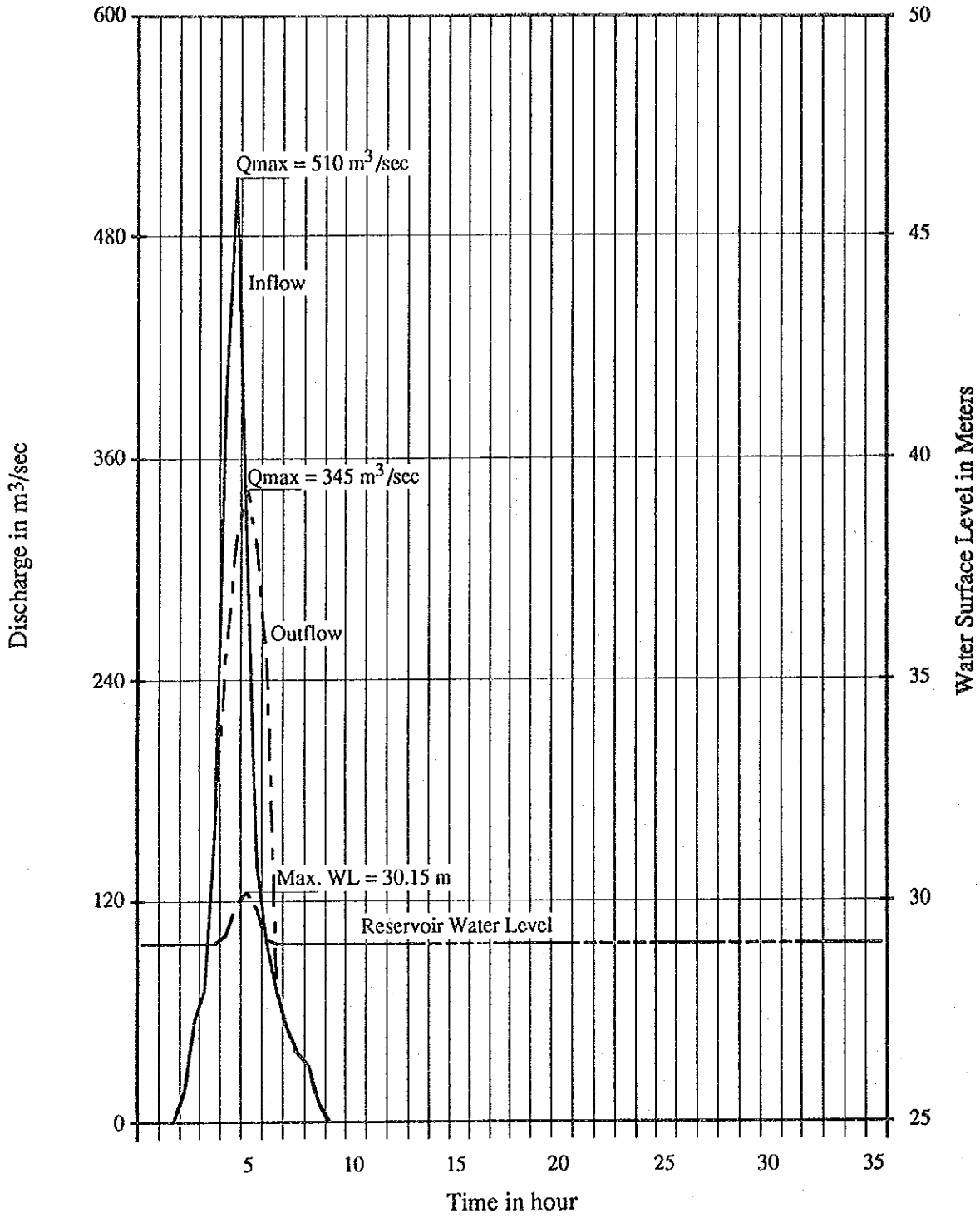
Fig. 4.1



Flood Routing by Krenceng Spillway against PMF

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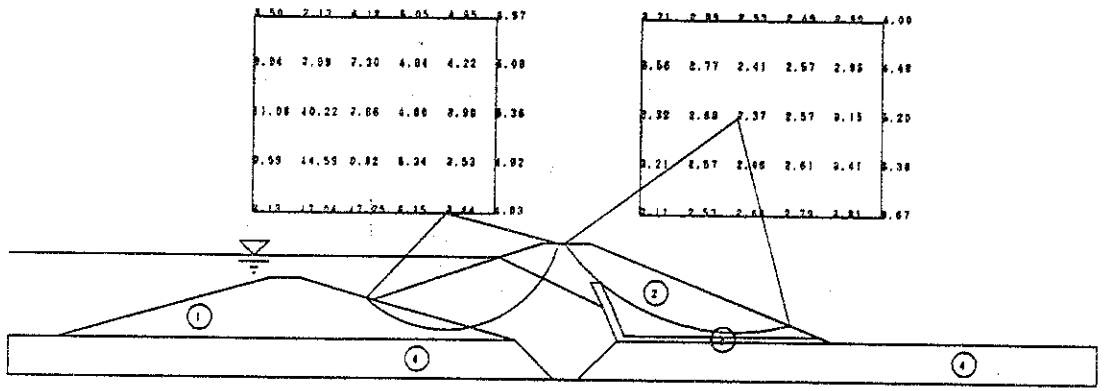

0 80.0 M

SCALE=1/1500

MATERIAL	COHESION (T/M^2)	FRICTION (DEG)	W(WET) (T/M^3)	W(SAT) (T/M^3)	W(SUB) (T/M^3)
1	2.00	20.00	1.70	1.80	0.80
2	3.00	26.00	1.73	1.86	0.86
3	0.00	33.00	1.72	2.02	1.02
4	5.00	32.00	1.70	1.80	0.80
ACCELERATION OF EARTHQUAKE				0.150	

MINIMUM SAFETY FACTOR (NORMAL)	
UP STREAM SIDE	DOWN STREAM SIDE
3.436	2.369

Stability Analysis of Heightening of Krenceng Dam at Reservoir Full
(Maximum Section, Normal Condition)

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Fig. 4.2 (1)

Fig. 4.2 (2)

MATERIAL	COHESION (T/M²)	FRICTION (DEG)	W(WET) (T/M³)	W(SAT) (T/M³)	W(SUB) (T/M³)
1	2.00	20.00	1.70	1.80	0.80
2	3.00	26.00	1.73	1.86	0.86
3	0.00	33.00	1.72	2.02	1.02
4	5.00	32.00	1.70	1.80	0.80
ACCELERATION OF EARTHQUAKE					0.150

MINIMUM SAFETY FACTOR (SEISMIC)	
UP STREAM SIDE	DOWN STREAM SIDE
1.541	1.546

Stability Analysis of Heightening of Krenceng Dam at Reservoir Full
(Maximum Section, Seismic Condition)

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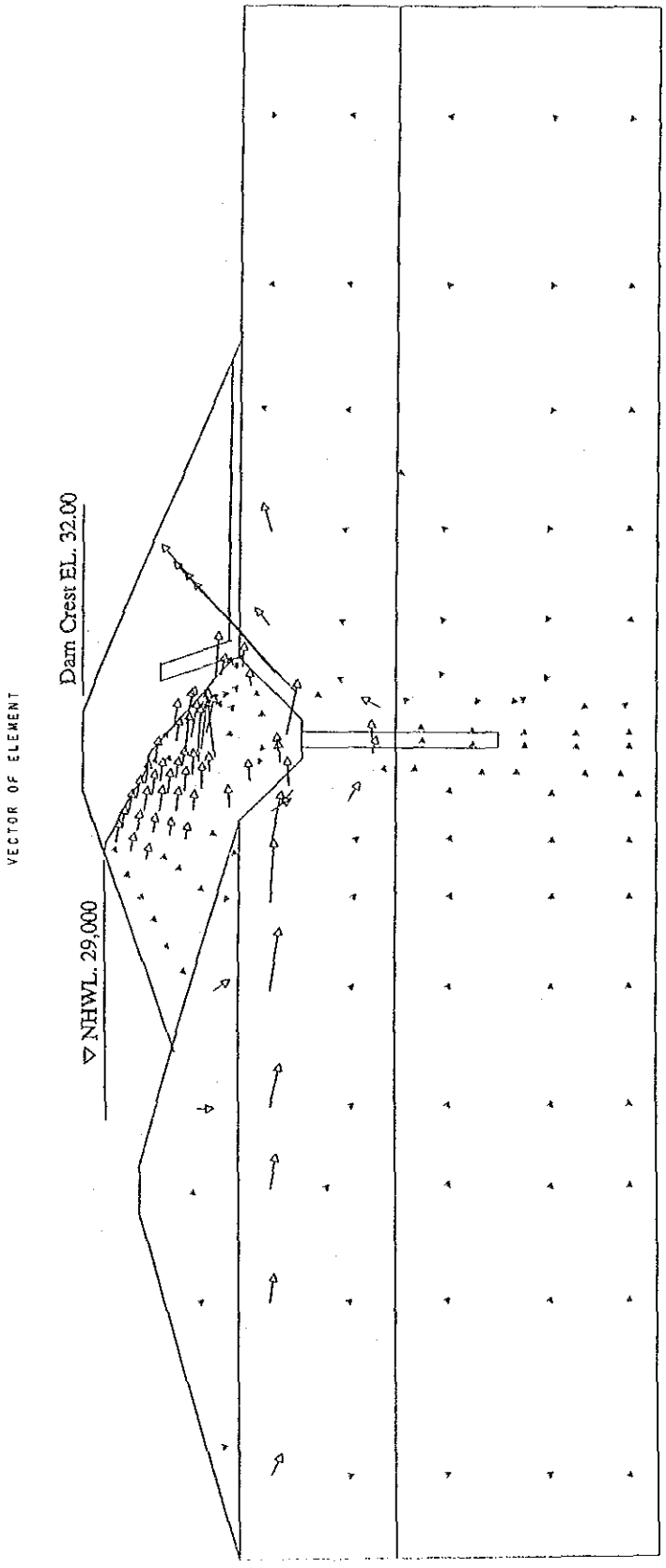
Fig. 4.3



VECTOR OF ELEMENT

0.35 ×10⁻⁶ m /sec

0

SCALE

0 10 20 30 40 50 m

Seepage Analysis of Heightening of Krenceng Dam at Reservoir Full
(Maximum Section)

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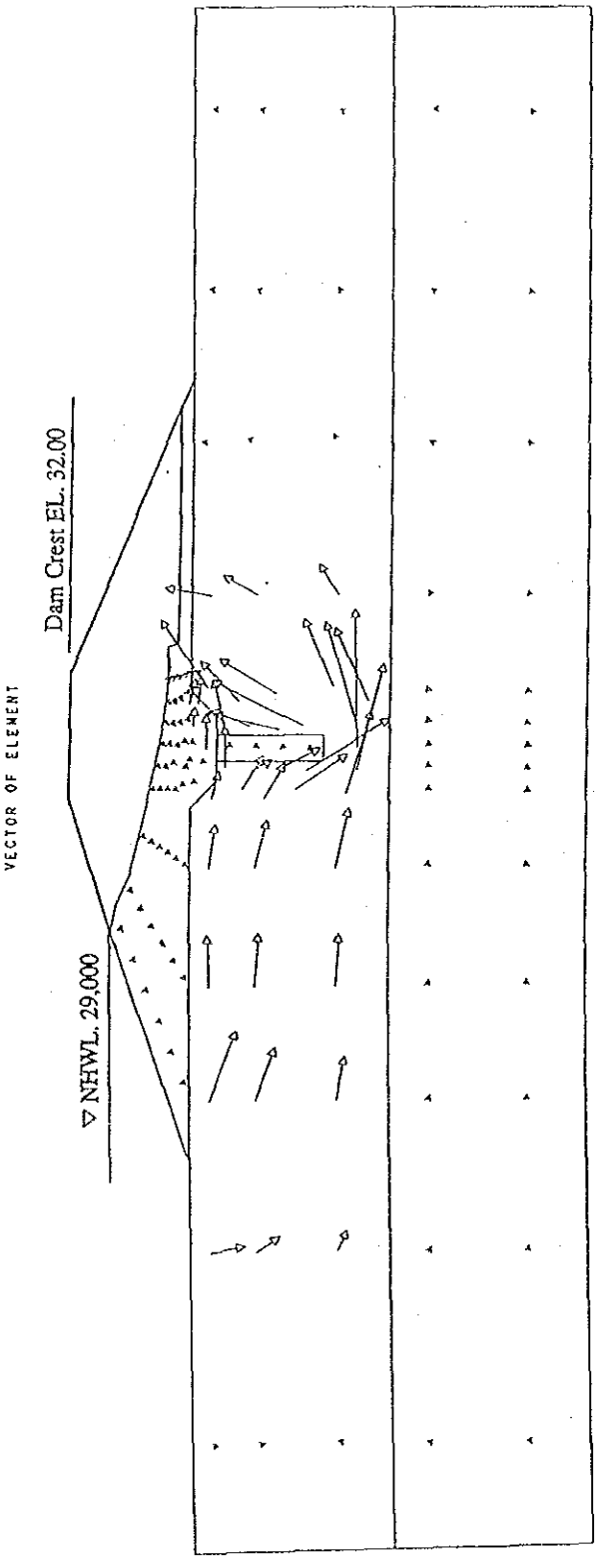
Fig. 4.4



VECTOR OF ELEMENT
0 0.1 0.2 0.3 0.4 0.5×10^{4} m /sec

SCALE
0 10 20 30 m

Seepage Analysis of Heightening of Krenceng Dam at Reservoir Full (Middle Section)

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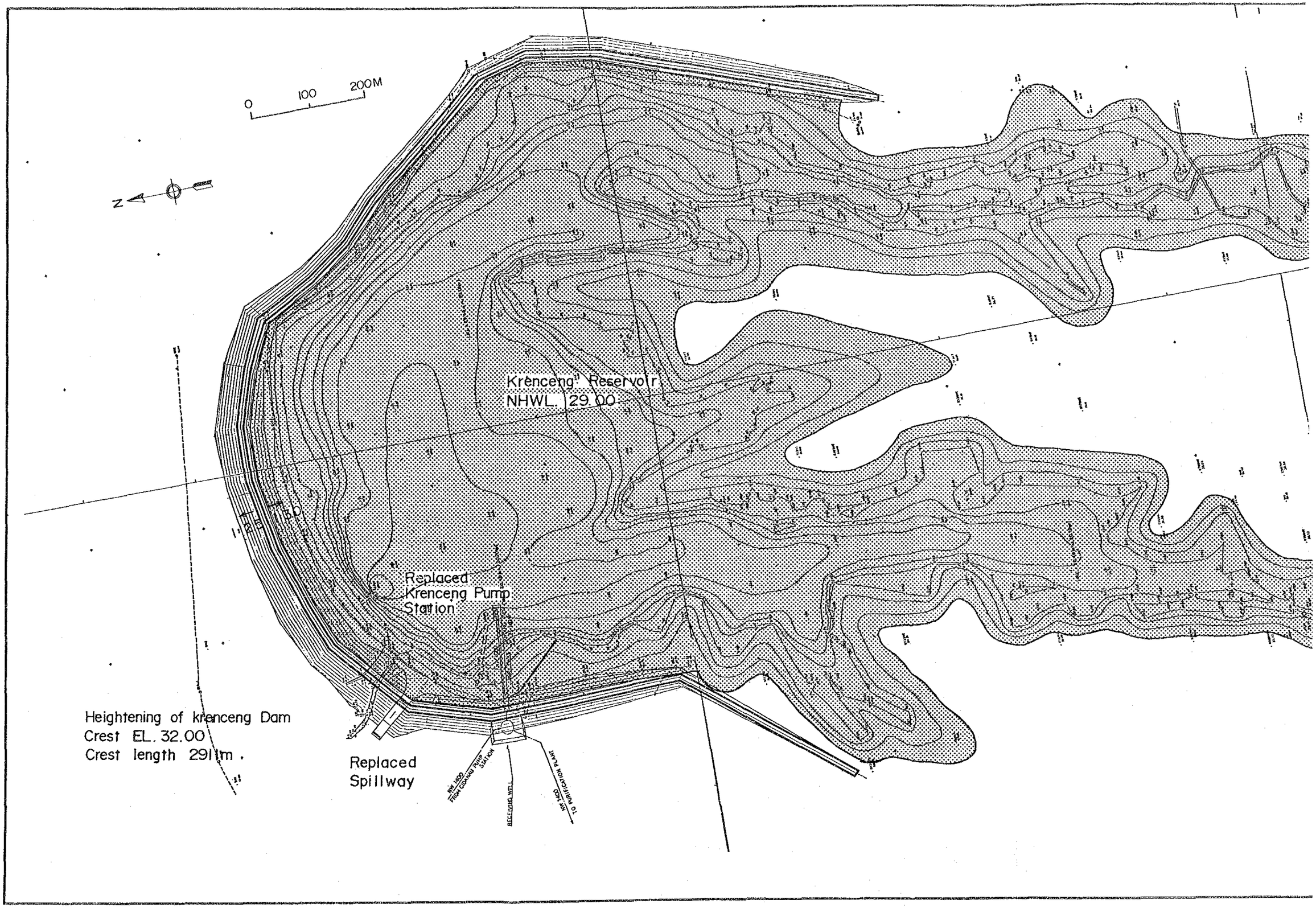
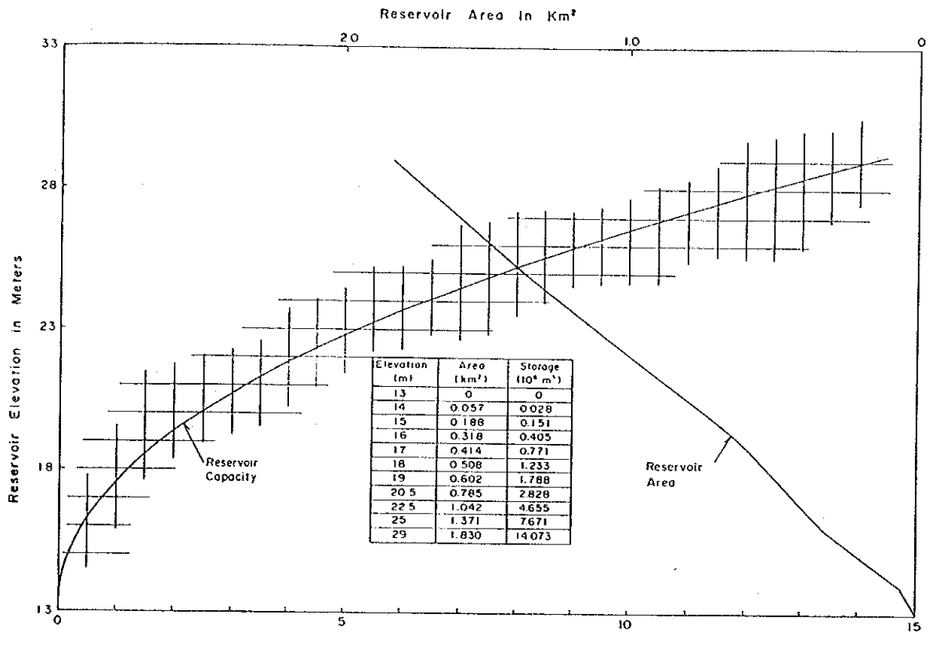

0 100 200M
N
Krenceng Reservoir
NHWL. 29.00
Replaced
Krenceng Pump
Station
Heightening of krenceng Dam
Crest EL. 32.00
Crest length 291m.
Replaced
Spillway
RAW WATER FROM CIGANJUR PUMP STATION
RECEIVING WELL
RAW WATER TO PURIFICATION PLANT

Fig. 4.5



Elevation (m)	Area (km²)	Storage (10⁶ m³)
13	0	0
14	0.057	0.028
15	0.188	0.151
16	0.318	0.405
17	0.414	0.771
18	0.508	1.233
19	0.602	1.788
20.5	0.785	2.828
22.5	1.042	4.655
25	1.371	7.671
29	1.830	14.073

Modified Area - Storage Curves for Krenceng Dam Site

General Plan of Proposed Heightening of Krenceng Dam and Its Reservoir

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WATER RESOURCES DEVELOPMENT PROJECT

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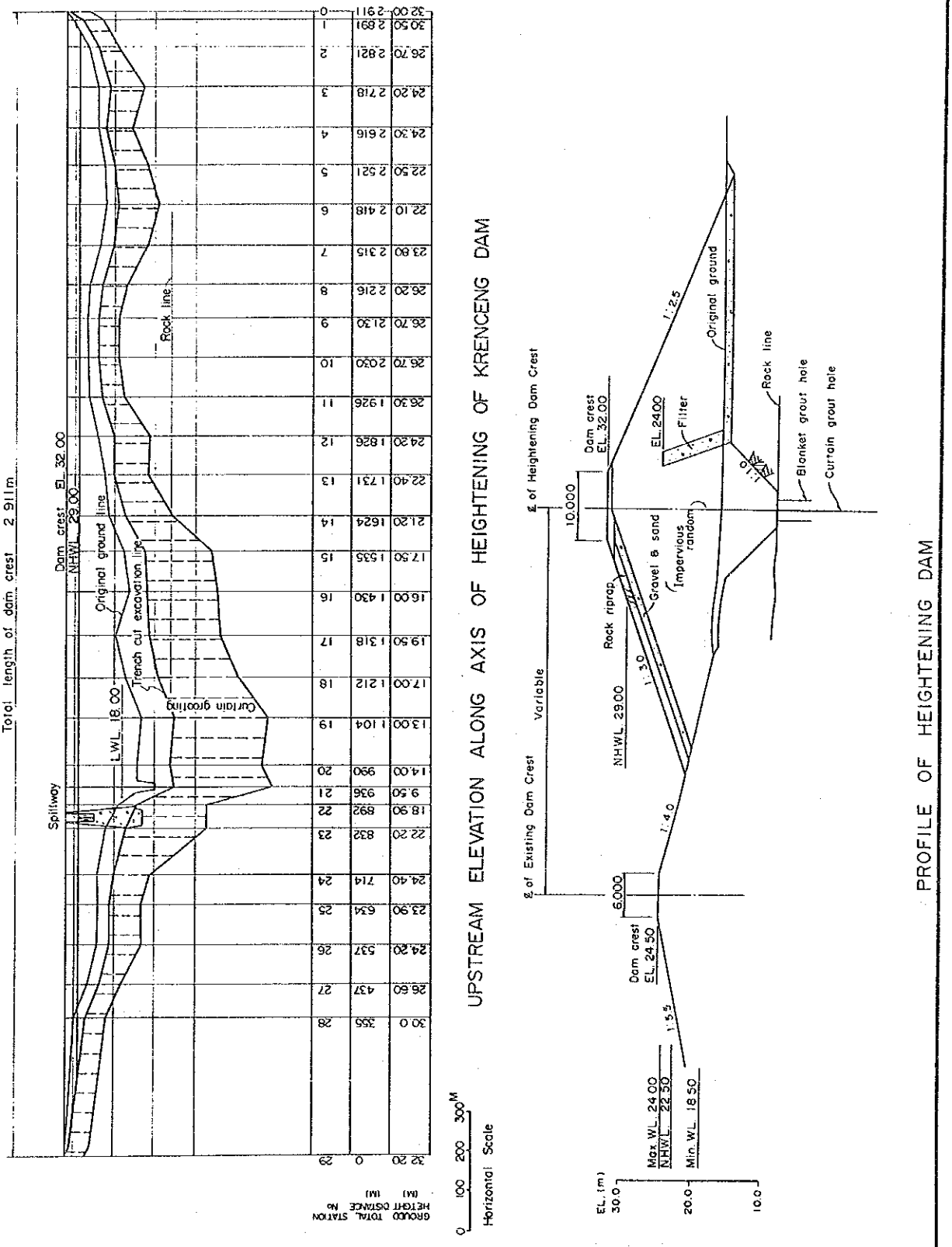
Fig. 4.6



Profile and Section of Proposed Heightening of Krenceng Dam

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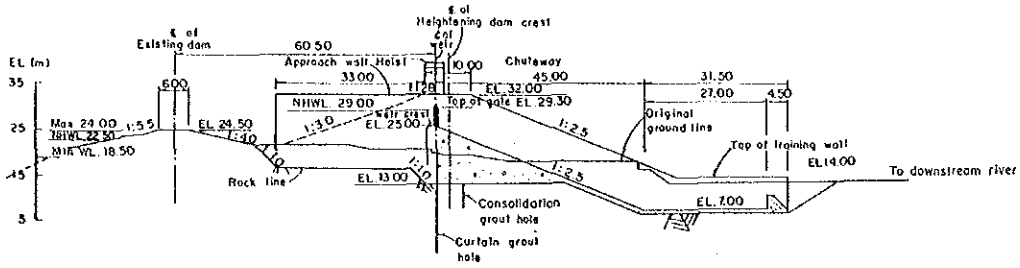
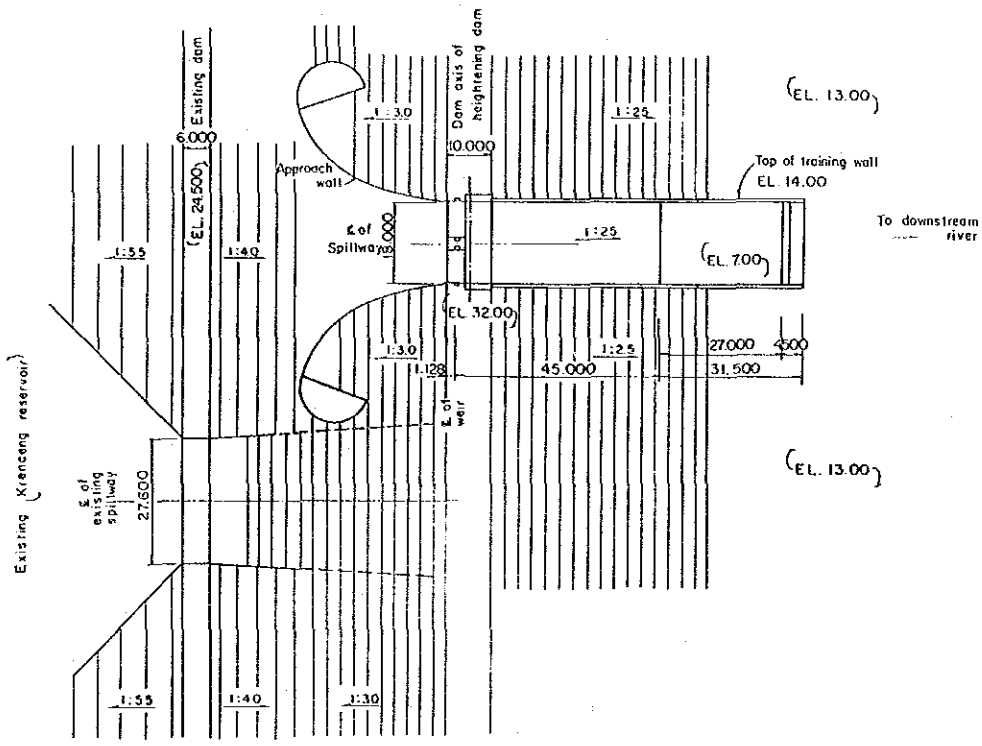
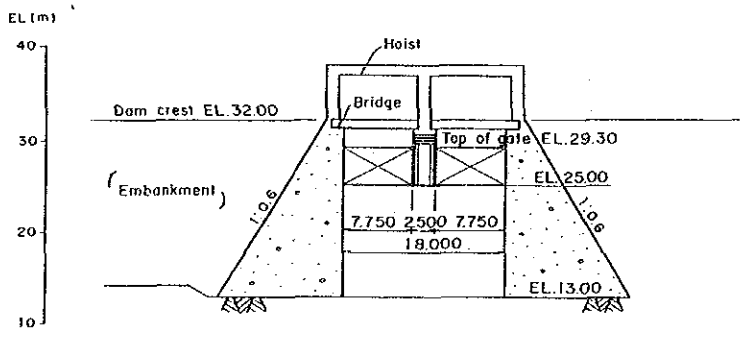


PROFILE OF SPILLWAY



PLAN OF SPILLWAY



UPSTREAM VIEW OF SPILLWAY

Plan, Profile and Section of Spillway for Proposed Heightening of Krenceng Dam

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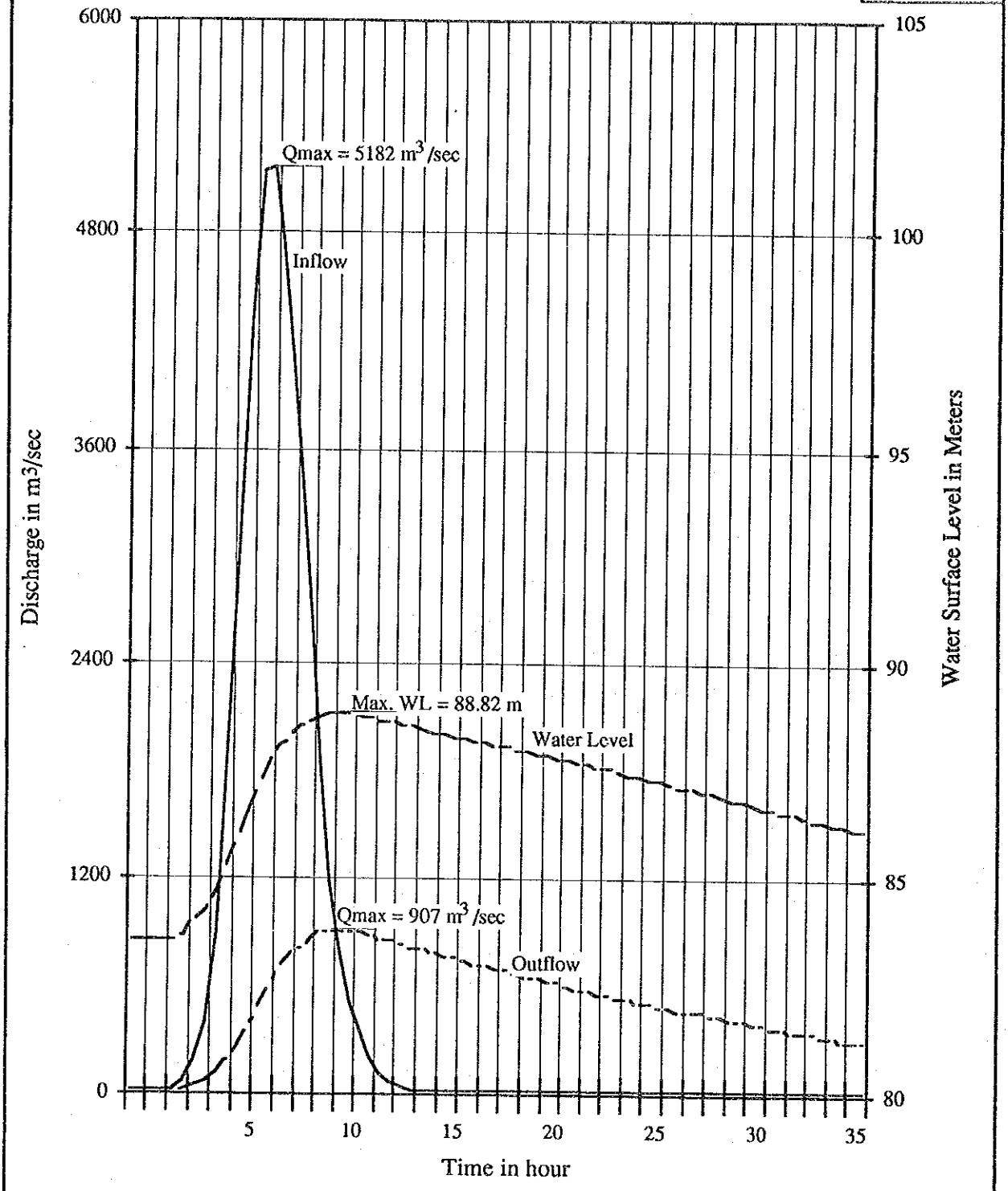
Fig. 4.8



Outflow Hydrograph for PMF at Kubang Baros

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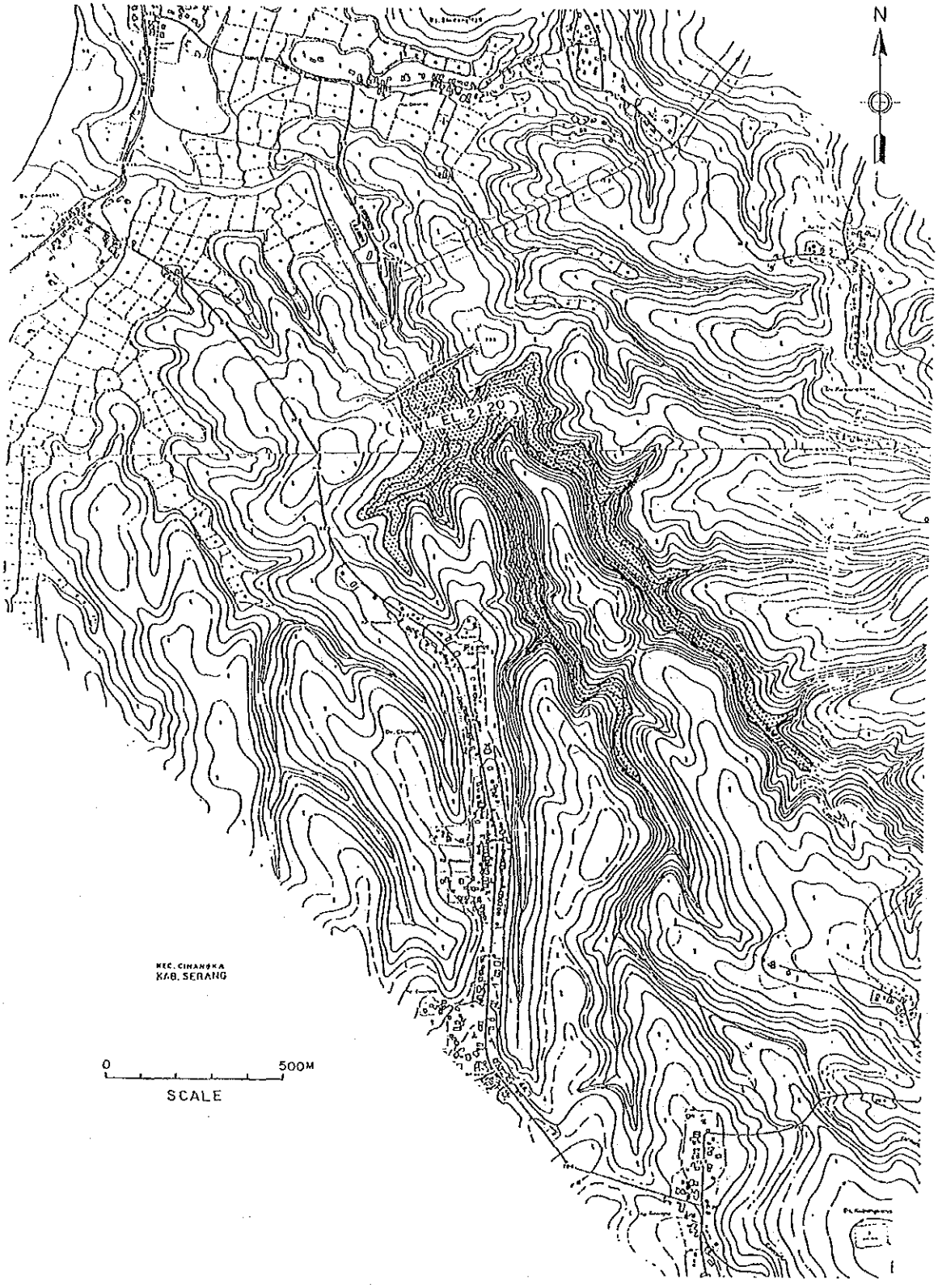
Fig. 4.9



General Plan of Cidanau Gated Weir and Its Reservoir

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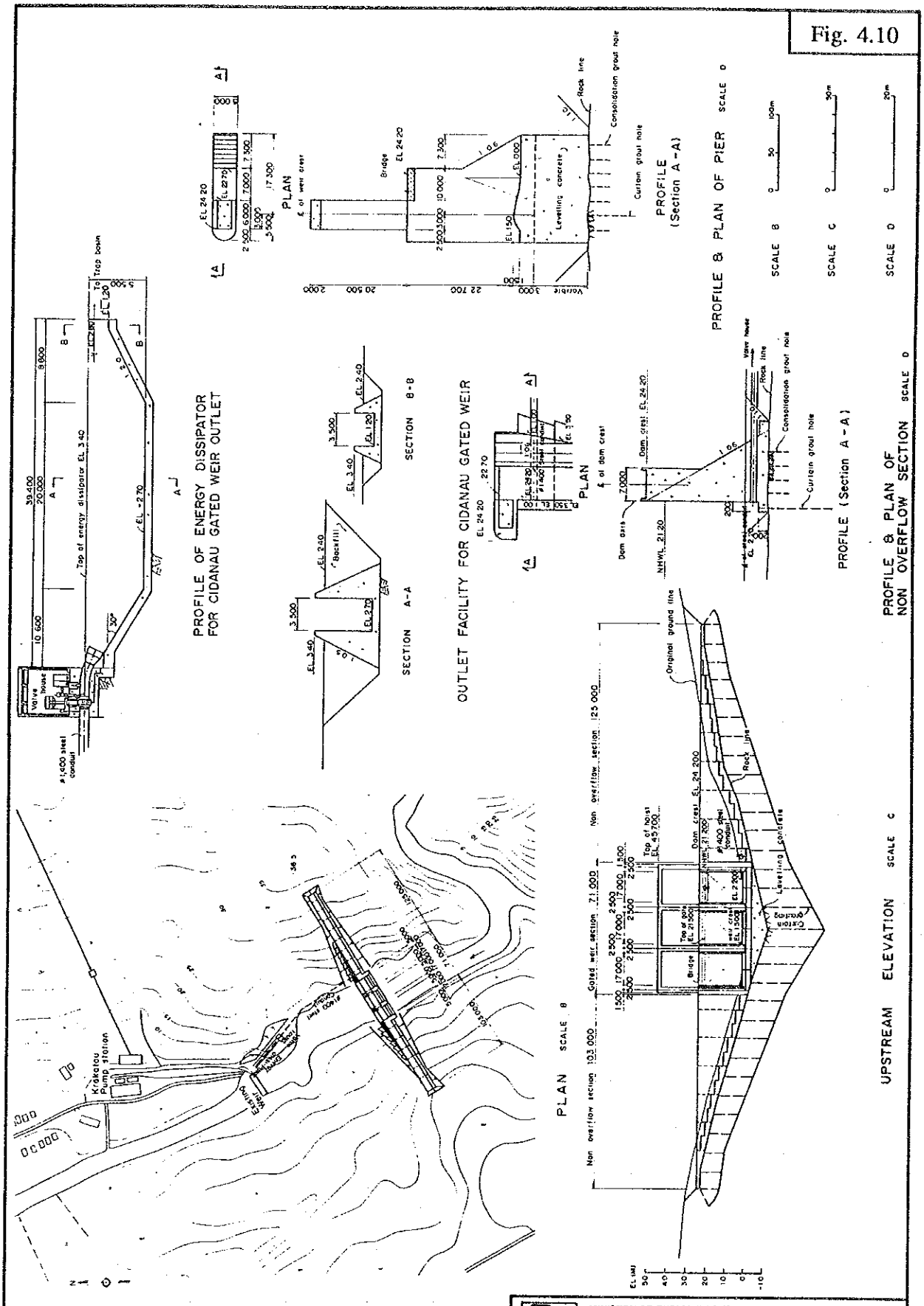
Fig. 4.10



Plan Profile and Section of Proposed Cidanau Gated Weir

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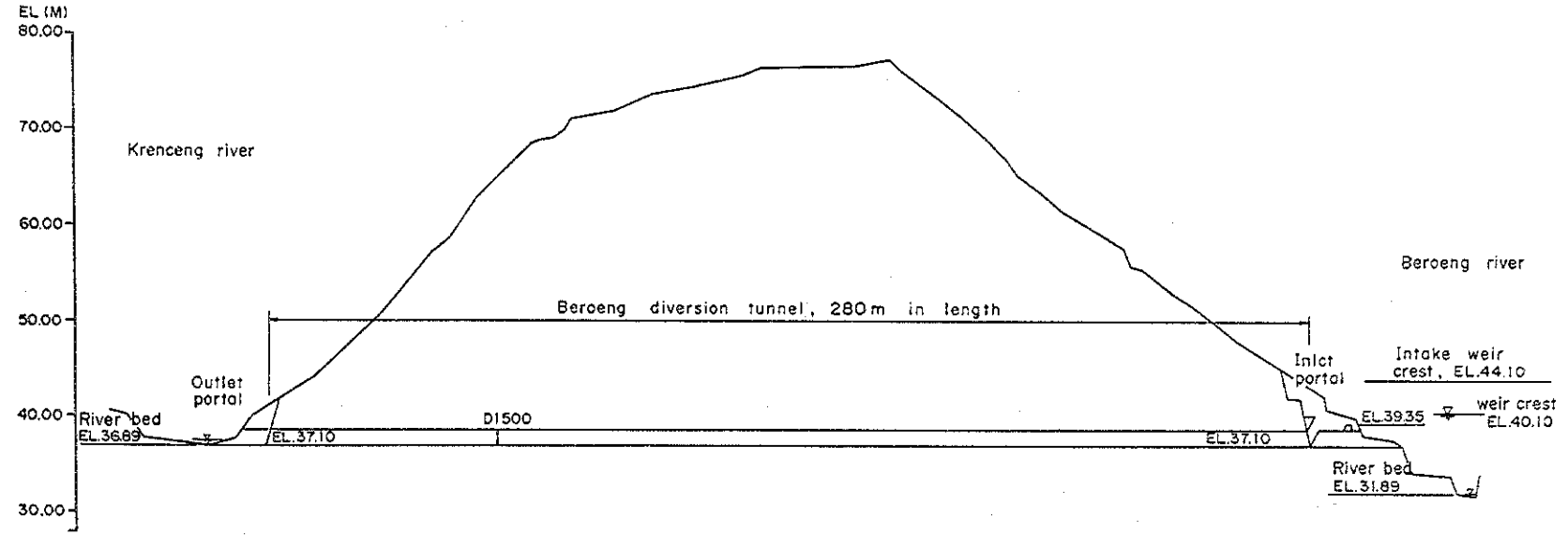
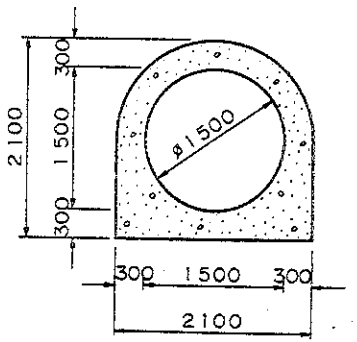


SCALE

Horizontal 0 25M

Vertical 0 10M

PROFILE OF BEROENG DIVERSION TUNNEL



SECTION OF DIVERSION TUNNEL

Profile and Section of Proposed Beroeng Diversion Tunnel

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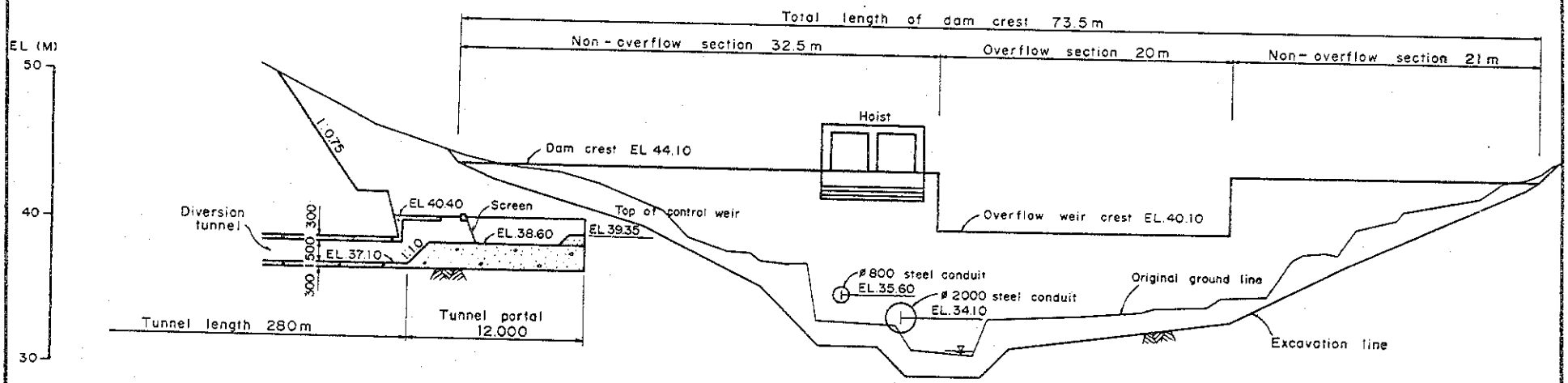
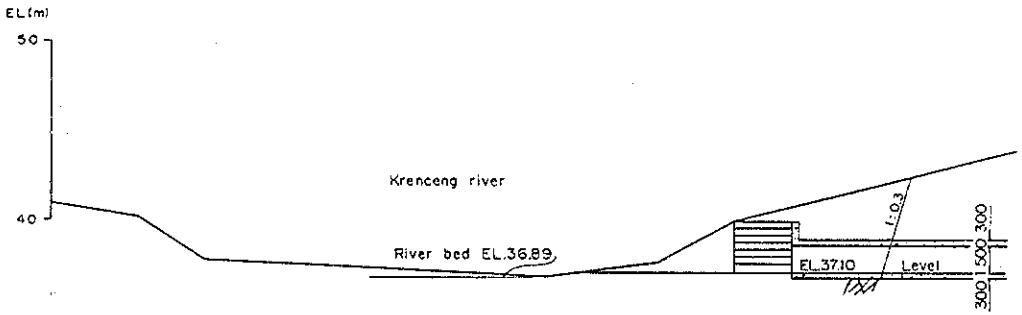
Fig. 4.11



UPSTREAM ELEVATION OF INTAKE WEIR AND TUNNEL PORTAL



OUTLET PORTAL

Upstream Elevation of Proposed Beroeng Intake Weir and Tunnel Portals

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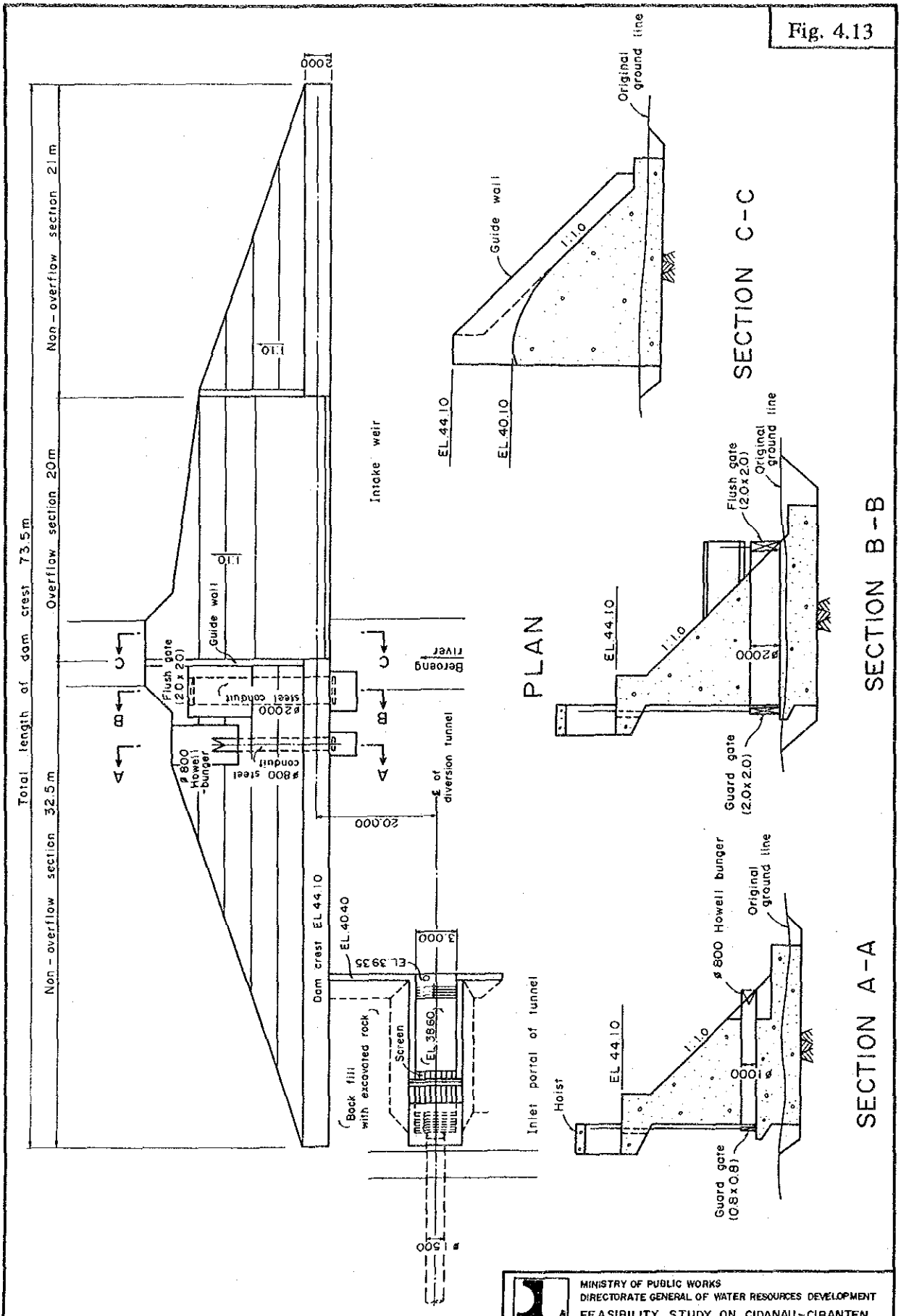
Fig. 4.12

Fig. 4.13



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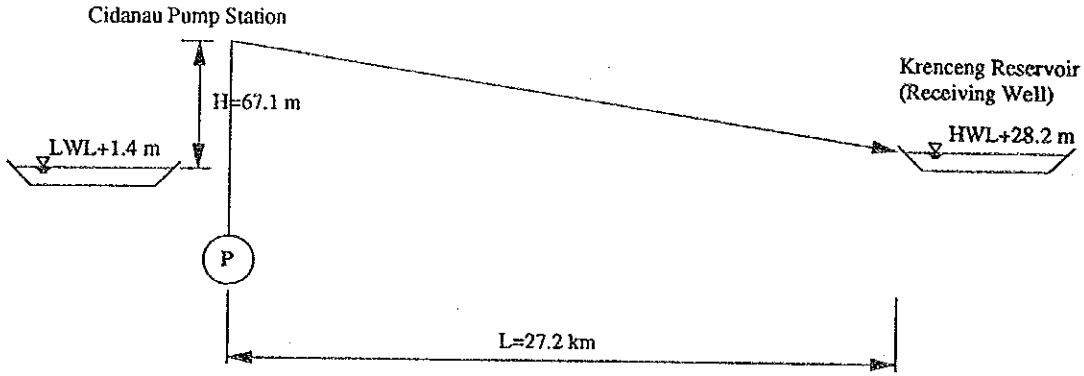
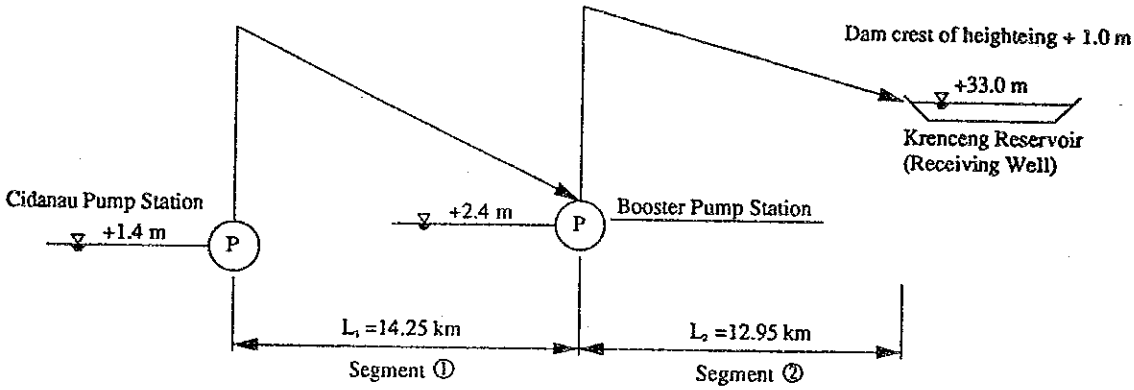
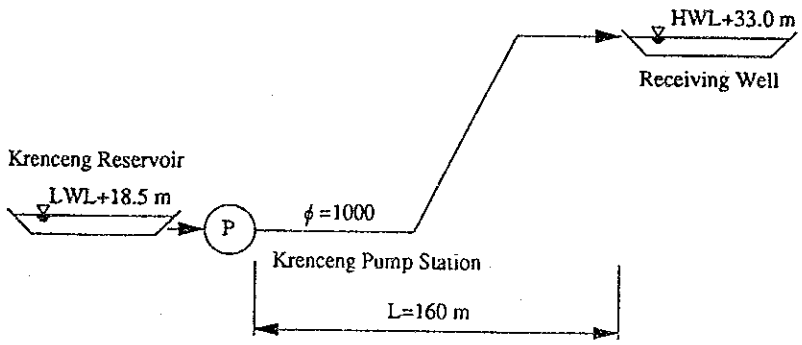
Plan and Section of Proposed Beroeng Intake Weir



Existing Water Conveyance between Cidanau Pump Station and Krenceng Reservoir



Water Conveyance between Cidanau Pump Station and Krenceng Reservoir for the Project



Water Conveyance between Krenceng Reservoir and Receiving Well for the Project

Schematic Diagram of Water Conveyance Facilities

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Fig. 4.15

Schematic Diagram of Water Conveyance and Treatment Facilities for the Project

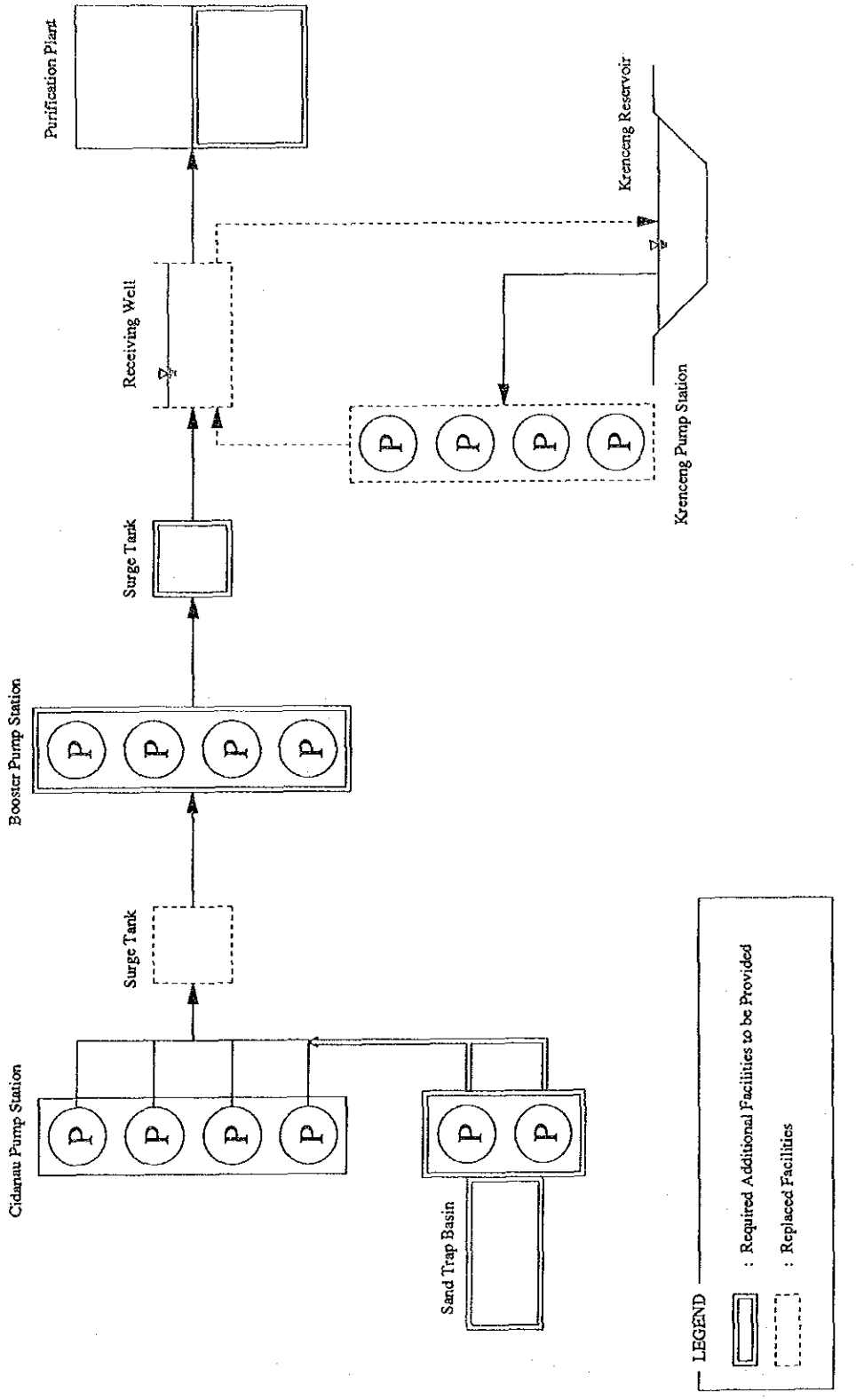

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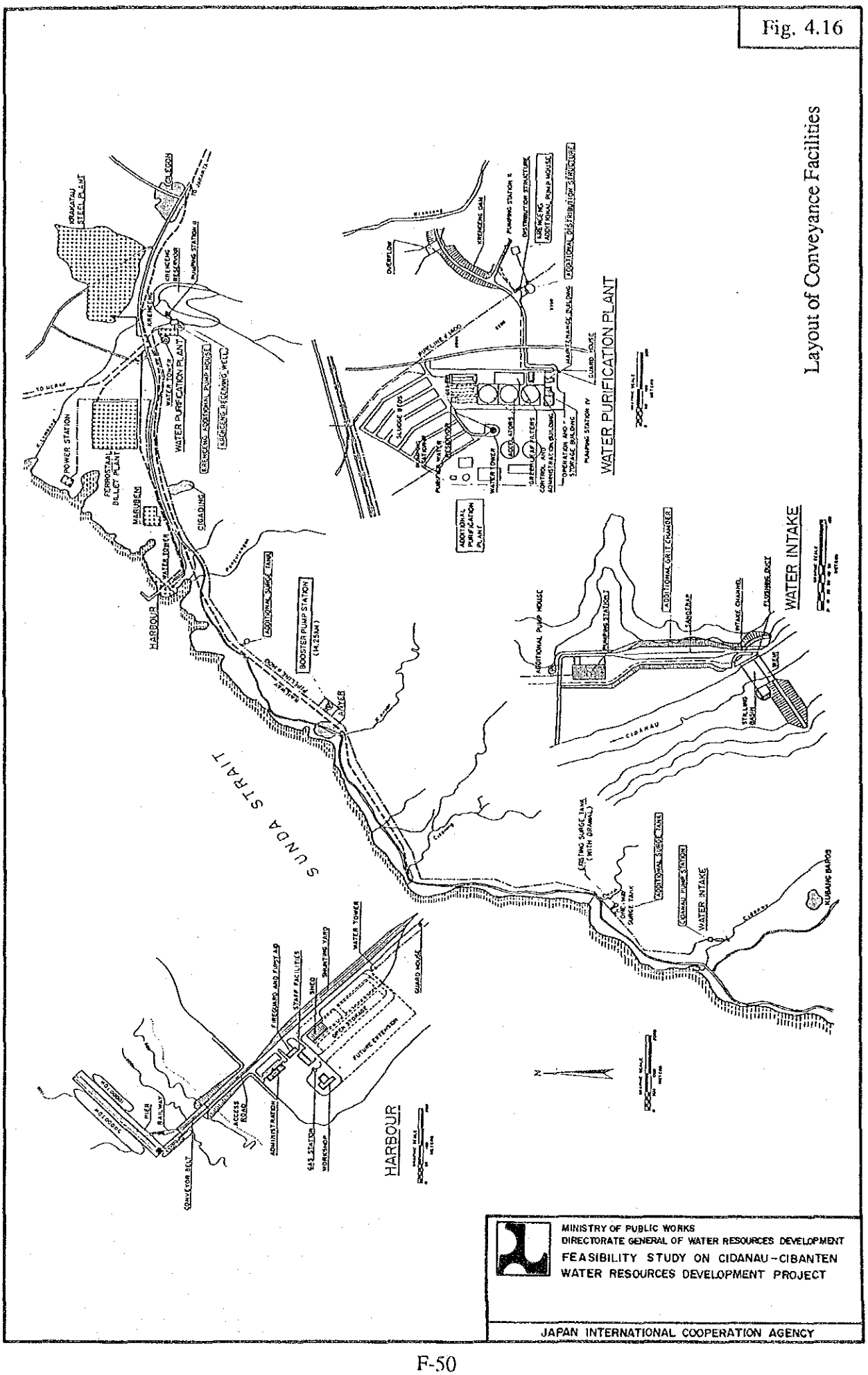
Fig. 4.16


Layout of Conveyance Facilities
WATER PURIFICATION PLANT
WATER INTAKE
HARBOUR
SUNDA STRAIT
CIDANAU
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FEASIBILITY STUDY ON CIDANAU-CIBANTEN
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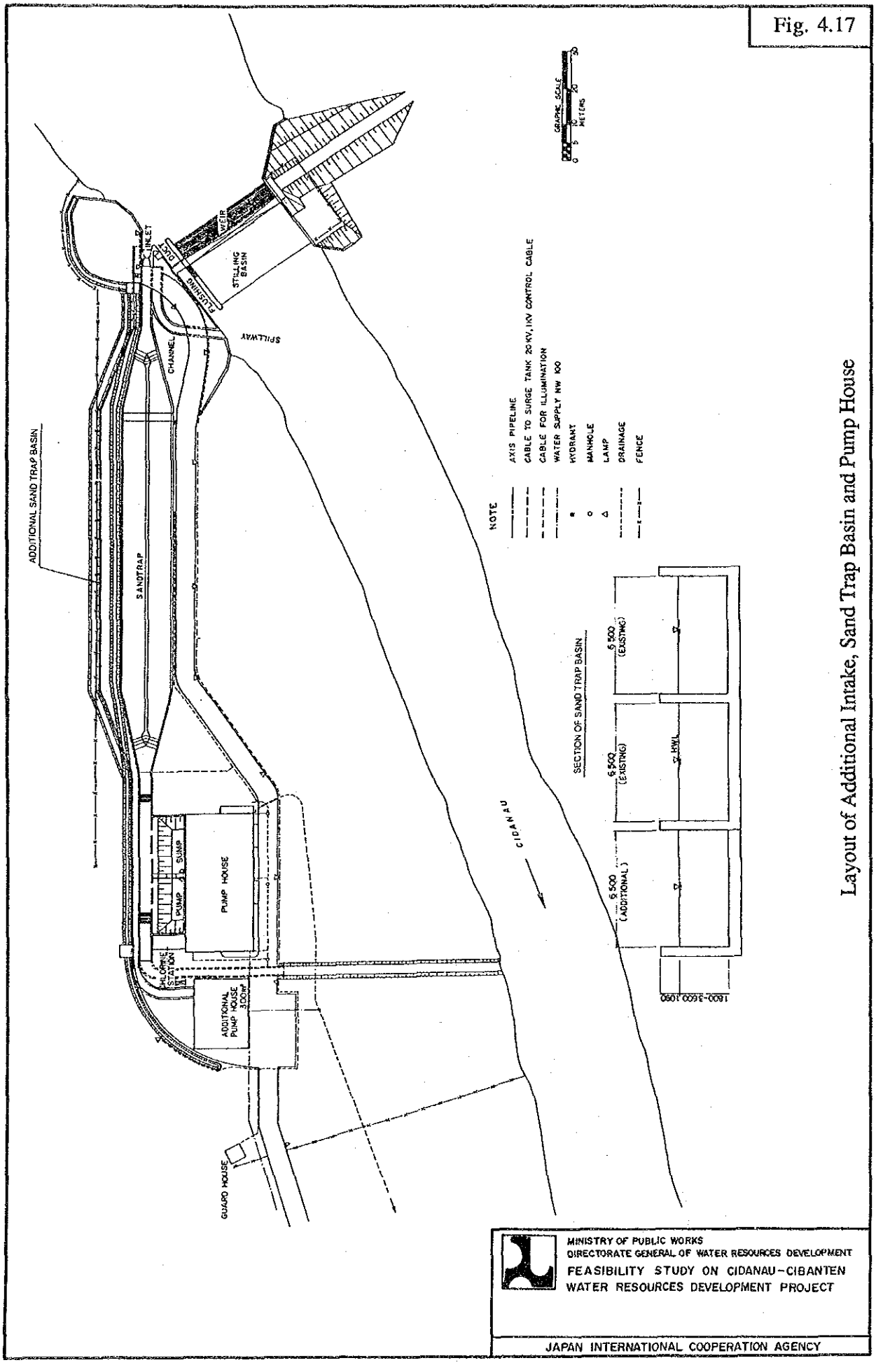
Fig. 4.17


Layout of Additional Intake, Sand Trap Basin and Pump House
ADDITIONAL SAND TRAP BASIN
SANDTRAP
CHANNEL
SPILLWAY
STILLING BASIN
WEIR
INTAKE
PUMP HOUSE
SUMP
PUMP
CHLORINE STATION
ADDITIONAL PUMP HOUSE 300m³
GUARD HOUSE
CIDANAU
NOTE
AXIS PIPELINE
CABLE TO SURGE TANK 20 KV, 1 KV CONTROL CABLE
CABLE FOR ILLUMINATION
WATER SUPPLY NW 100
HYDRANT
MANHOLE
LAMP
DRAINAGE
FENCE
SECTION OF SAND TRAP BASIN
5,500 (EXISTING)
5,500 (EXISTING)
5,500 (ADDITIONAL)
HWL
1600-3600-1050
GRAPHIC SCALE
METERS
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FEASIBILITY STUDY ON CIDANAU-CIBANTEN
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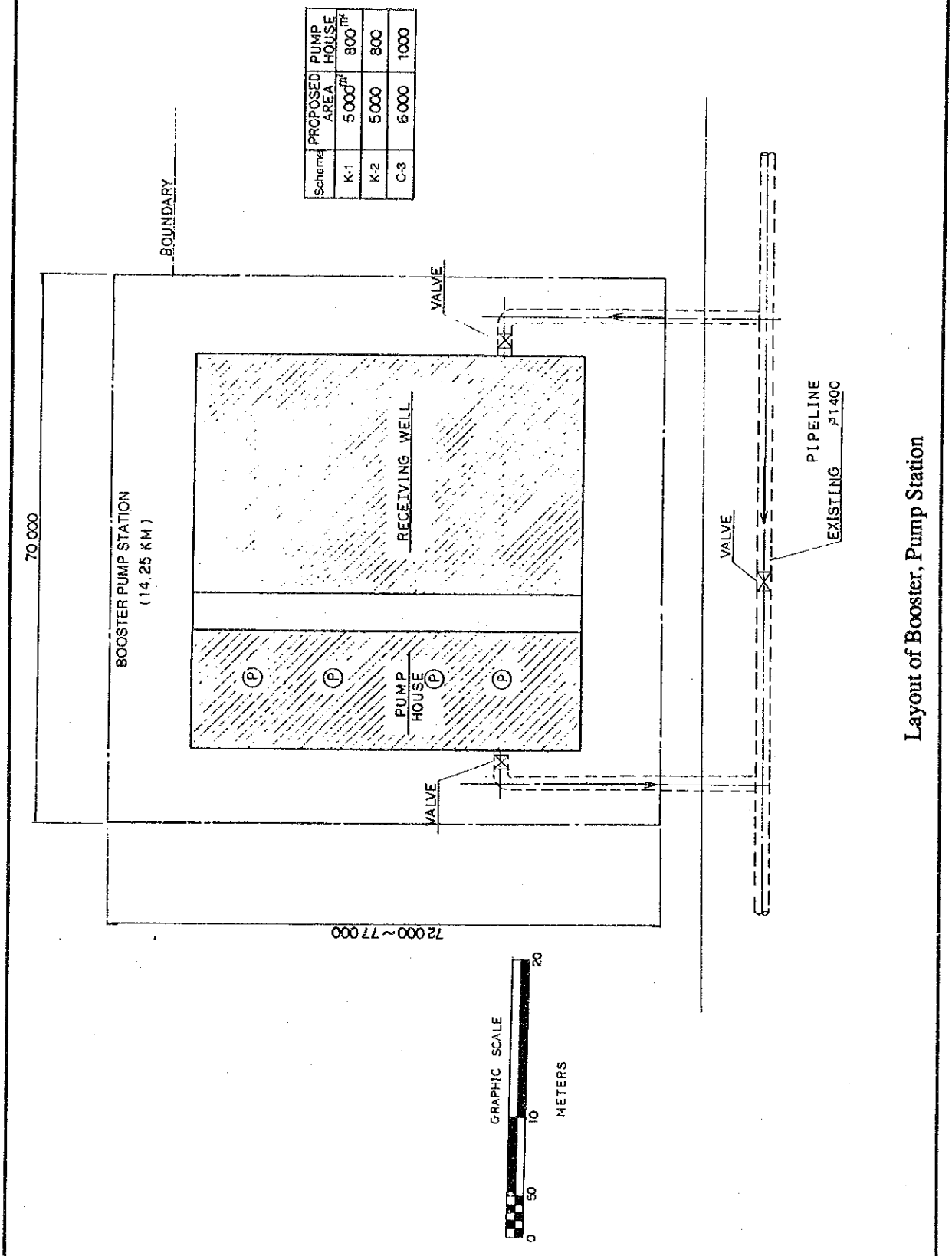
Fig. 4.18



Layout of Booster, Pump Station

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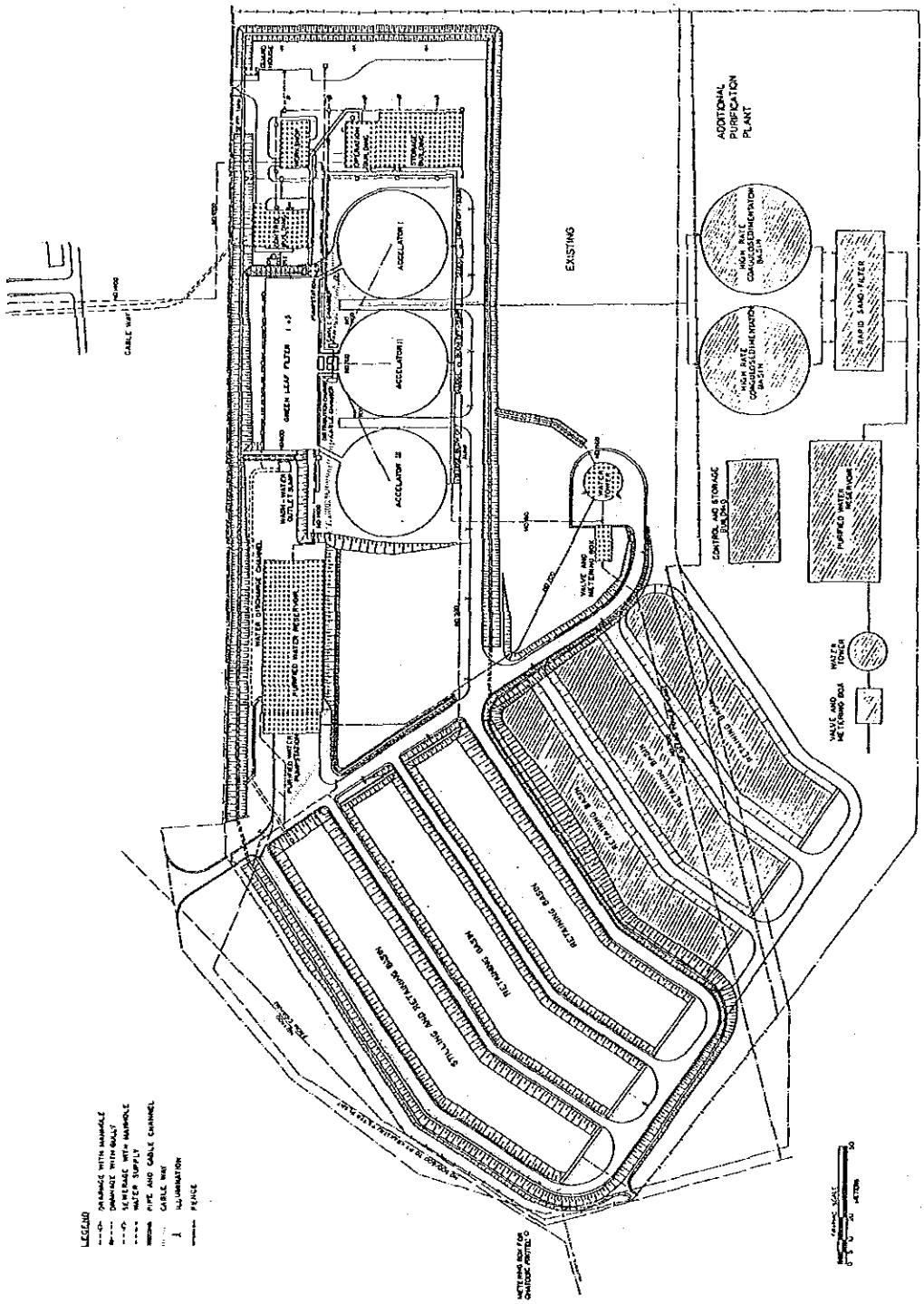
Fig. 4.19



Layout of Additional Purification Plant

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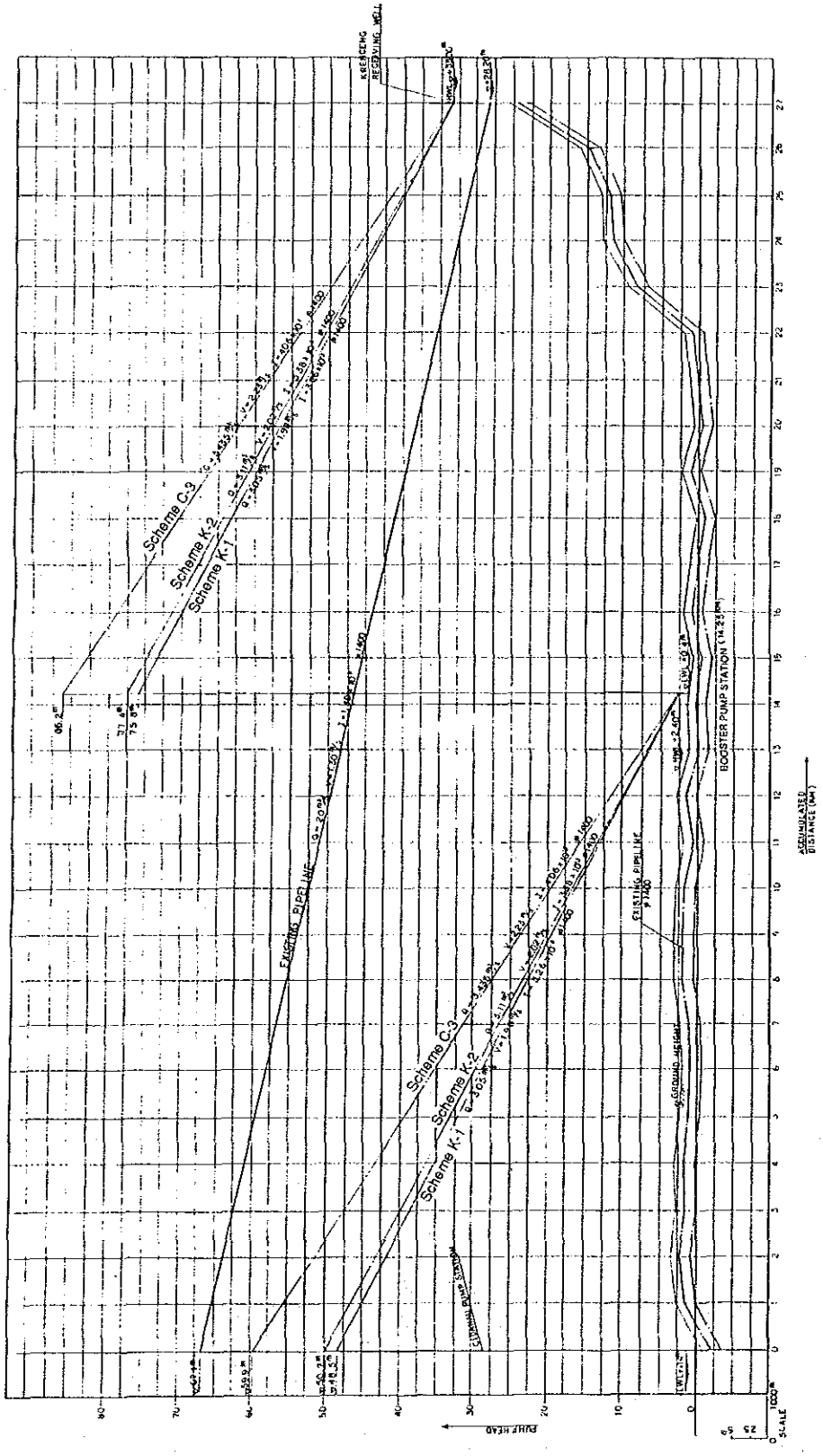
Fig. 4.20



Profile and Hydraulic Gradient of Conveyance Pipeline

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WATER RESOURCES DEVELOPMENT PROJECT

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Fig. 5.1

Description	1st Year	2nd Year	3rd Year	4th Year	5th Year	6th Year	7th Year	Remarks
1. Financial arrangement & selection of consultant								
2. Detail design & tender document preparation								
(1) Survey & investigation								
(2) Detail design								
(3) Preparation of T/D								
3. Selection of contractor								
(1) Prequalification								
(2) Tendering								
(3) Evaluation & contract								
4. Construction works								
(1) Mobilization & preparation works								
(2) Main works								

Implementation Schedule

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FEASIBILITY STUDY ON CIDANAU-CIBANTEN
WATER RESOURCES DEVELOPMENT PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. 5.2 (1)

Construction Schedule of Scheme K-1 (1/2)

Description	1st Year	2nd Year	3rd Year	4th Year	Remarks
	A M J J A S O N D J F M	A M J J A S O N D J F M	A M J J A S O N D J F M	A M J J A S O N D J F M	
I. HEIGHTENING OF KRENCENG DAM					
1. Mobilization & Preparatory Works					
2. Dam Heightening					
(1) Foundation, excavation, grout					
(2) Embankment					
3. Spillway					
(1) Excavation					
(2) Concrete					
(3) Gate					

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WATER RESOURCES DEVELOPMENT PROJECT

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Fig. 5.2 (2)

Construction Schedule of Scheme K-1 (2/2)

Description	1st Year	2nd Year	3rd Year	4th Year	Remarks
	A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M				
II. WATER CONVEYANCE AND TREATMENT FACILITIES					
1. Mobilization					
2. Cidanau Pump Station					
(1) Intake sand trap basin					
(2) Pump house					
(3) Pump installation					
3. Booster Pump Station					
(1) Pump house					
(2) Pump installation					
4. Krenceng Pump Station					
(1) Intake civil structure					
(2) Pump installation					
(3) Pipe installation					
5. Purification Plant					
(1) Operation & control building					
(2) Purification facility, Civil structure					
Equipment installation					

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FEASIBILITY STUDY ON CIDANAU-CIBANTEN
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Fig. 5.3 (1)

Construction Schedule of Scheme K-2 (1/3)

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Fig. 5.3 (2)

Construction Schedule of Scheme K-2 (2/3)

Description	1st Year	2nd Year	3rd Year	4th Year	Remarks
	A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M				
II. BEROENG DIVERSION TUNNEL					
1. Mobilization & Preparatory Works					
2. Tunnel					
(1) Portal, excavation					
, concrete					
(2) Tunnel, excavation					
, concrete					
, grout					
3. Intake Weir					
(1) Excavation					
(2) Concrete					
(3) Gates					

MINISTRY OF PUBLIC WORKS
DIRECTORATE GENERAL OF WATER RESOURCES DEVELOPMENT
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Fig. 5.3 (3)

Construction Schedule of Scheme K-2 (3/3)

Description	1st Year	2nd Year	3rd Year	4th Year	Remarks
	A M J J A S O N D J F M	A M J J A S O N D J F M	A M J J A S O N D J F M	A M J J A S O N D J F M	
III. WATER CONVEYANCE AND TREATMENT FACILITIES					
1. Mobilization					
2. Cidanau Pump Station					
(1) Intake sand trap basin					
(2) Pump house					
(3) Pump installation					
3. Booster Pump Station					
(1) Pump house					
(2) Pump installation					
4. Krenceng Pump Station					
(1) Intake civil structure					
(2) Pump installation					
(3) Pipe installation					
5. Purification Plant					
(1) Operation & control building					
(2) Purification facility, Civil structure					
Equipment installation					

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Fig. 5.4 (1)

Construction Schedule of Scheme C-3 (1/3)

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Fig. 5.4 (2)

Construction Schedule of Scheme C-3 (2/3)

Description	1st Year	2nd Year	3rd Year	4th Year	Remarks
	A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M				
3. Intake Weir					
(1) Excavation					
(2) Concrete					
(3) Gates					
III. CIDANAU GATED WEIR					
1. Mobilization & Preparatory Works					
2. River Diversion					
(1) Steel sheet driving					
(2) Removal					
3. Dam & Spillway					
(1) Foundation, excavation , grout					
(2) Concrete					
(3) Gate					
4. Outlet Works					

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Fig. 5.4 (3)

Construction Schedule of Scheme C-3 (3/3)

Description	1st Year	2nd Year	3rd Year	4th Year	Remarks
	A M J J A S O N D J F M	A M J J A S O N D J F M	A M J J A S O N D J F M	A M J J A S O N D J F M	
IV. WATER CONVEYANCE AND TREATMENT FACILITIES					
1. Mobilization					
2. Cidanau Pump Station					
(1) Intake sand trap basin					
(2) Pump house					
(3) Pump installation					
3. Booster Pump Station					
(1) Pump house					
(2) Pump installation					
4. Krenceng Pump Station					
(1) Intake civil structure					
(2) Pump installation					
(3) Pipe installation					
5. Purification Plant					
(1) Operation & control building					
(2) Purification facility, Civil structure					
Equipment installation					

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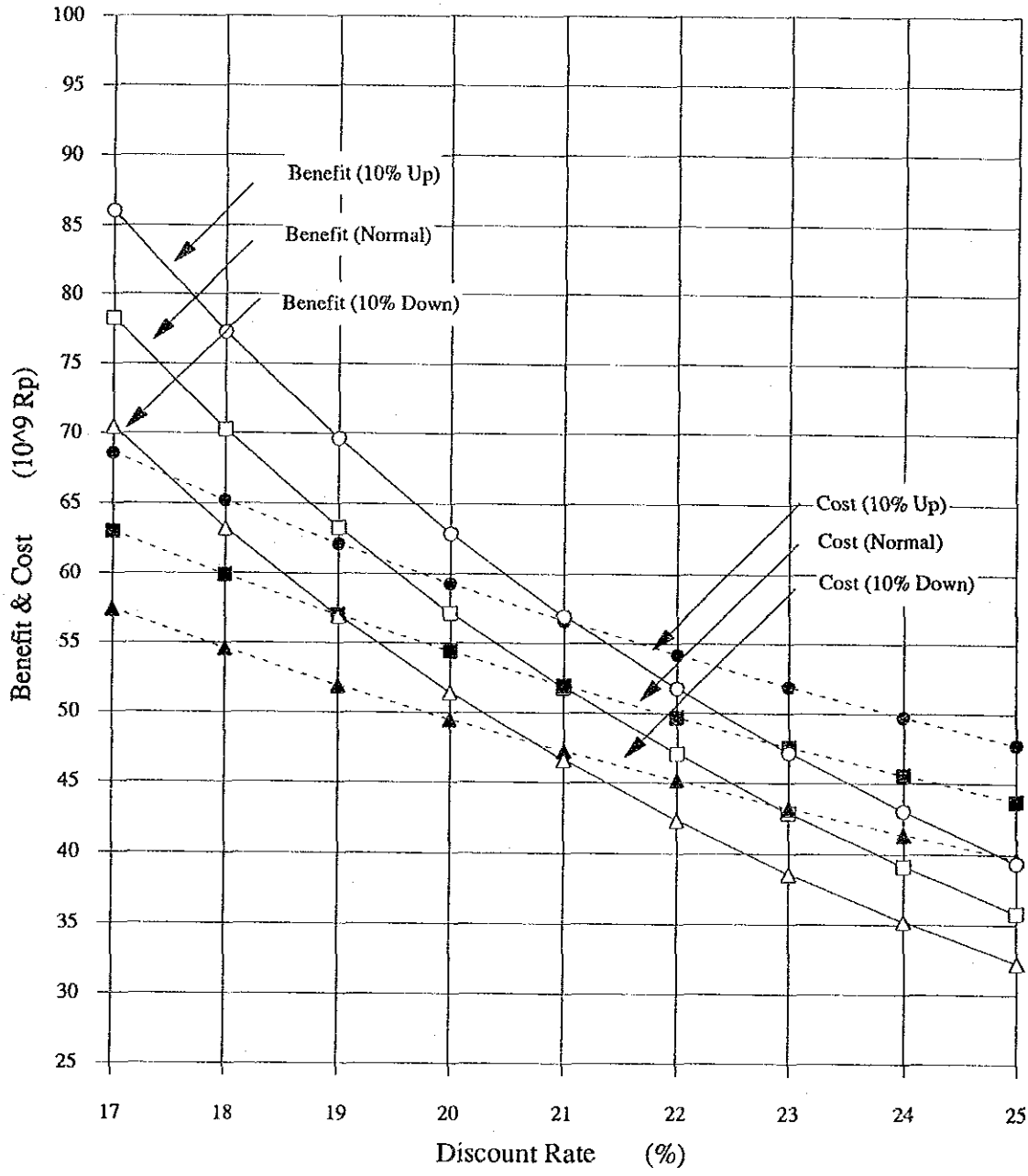
Fig. 6.1



Economical Sensitivity Analysis for K-1

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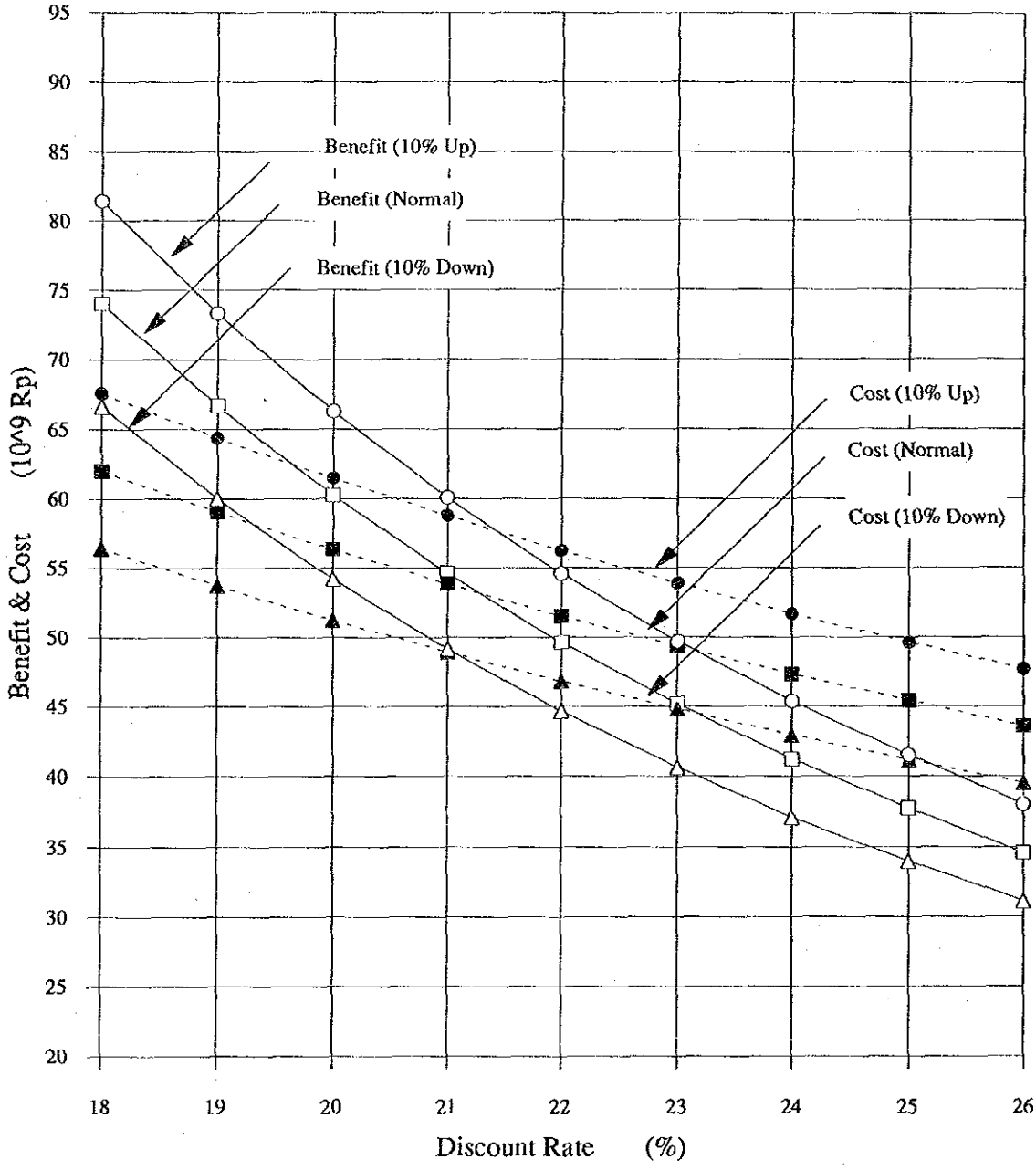

Economical Sensitivity Analysis for K-2

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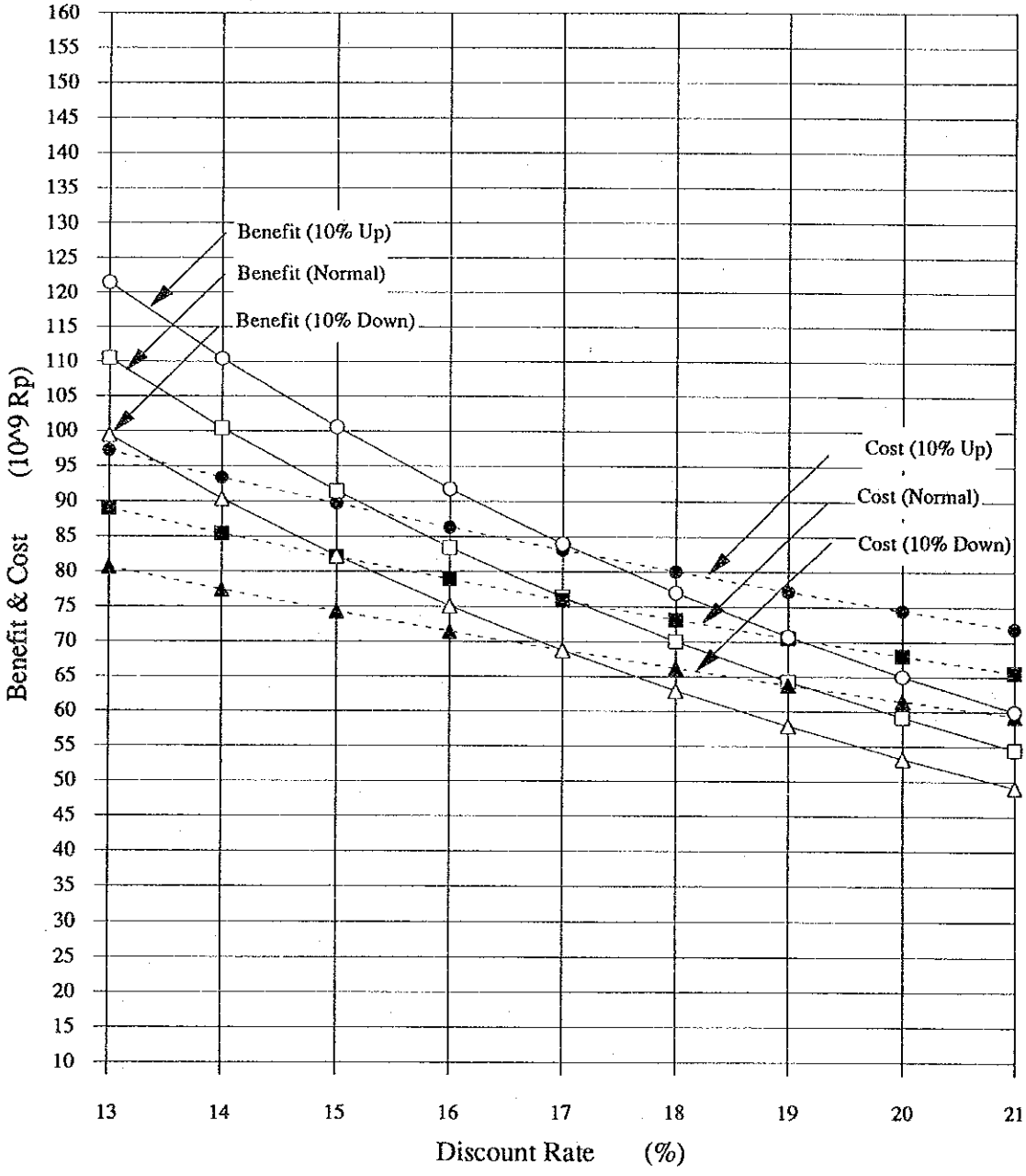
Fig. 6.3



Economical Sensitivity Analysis for C-3

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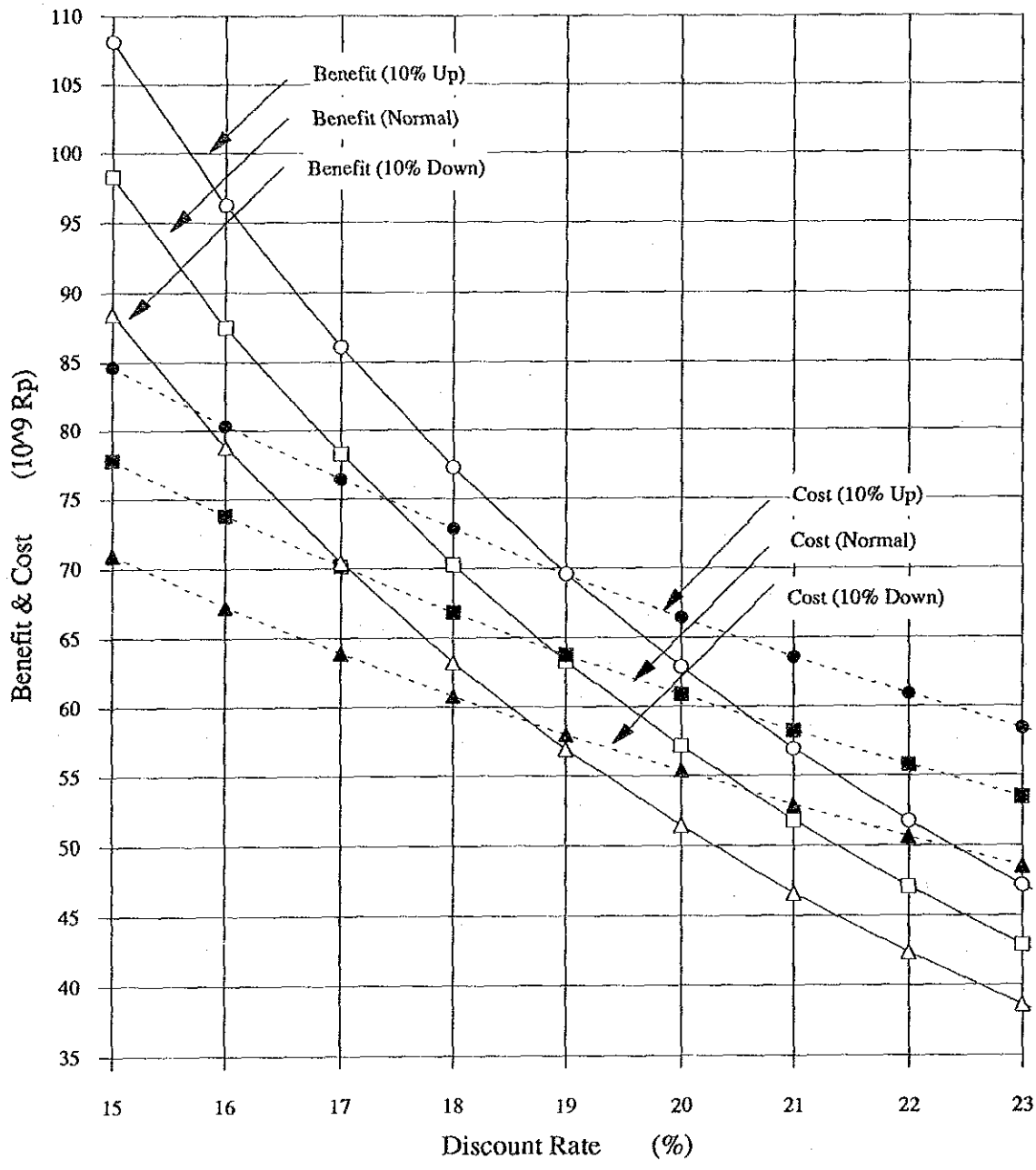

Financial Sensitivity Analysis for K-1

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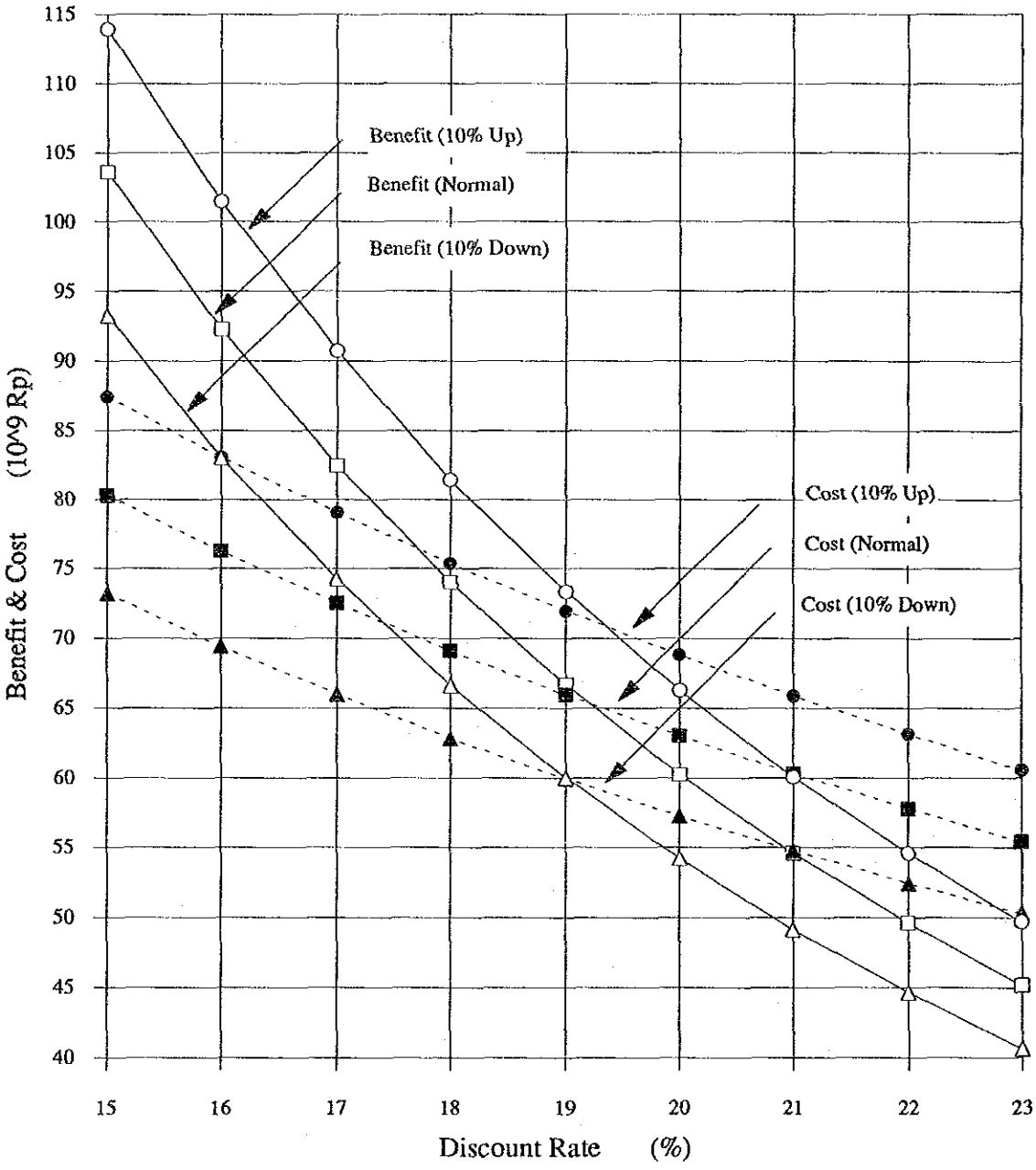
Fig. 6.5



Financial Sensitivity Analysis for K-2

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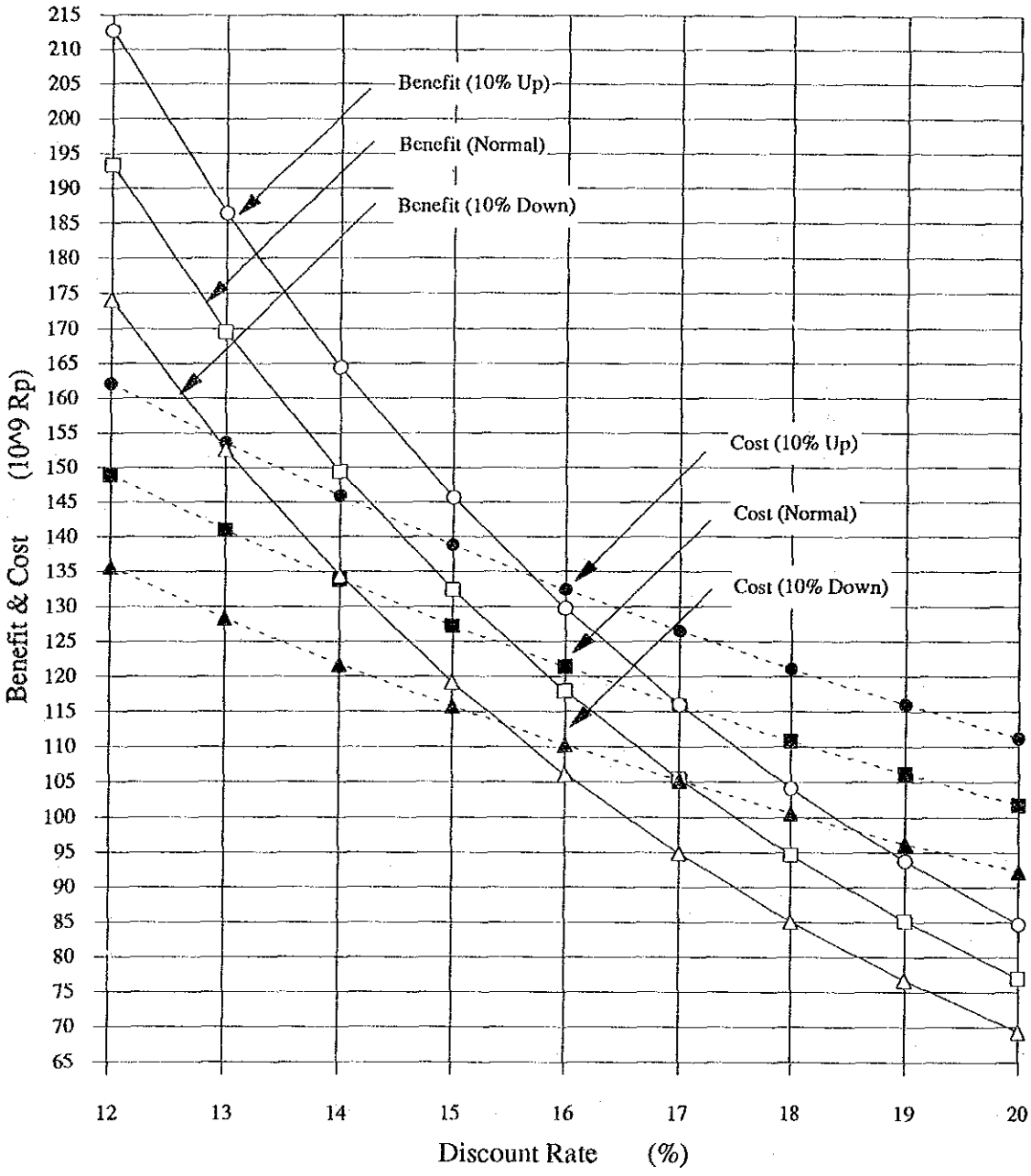

Financial Sensitivity Analysis for C-3

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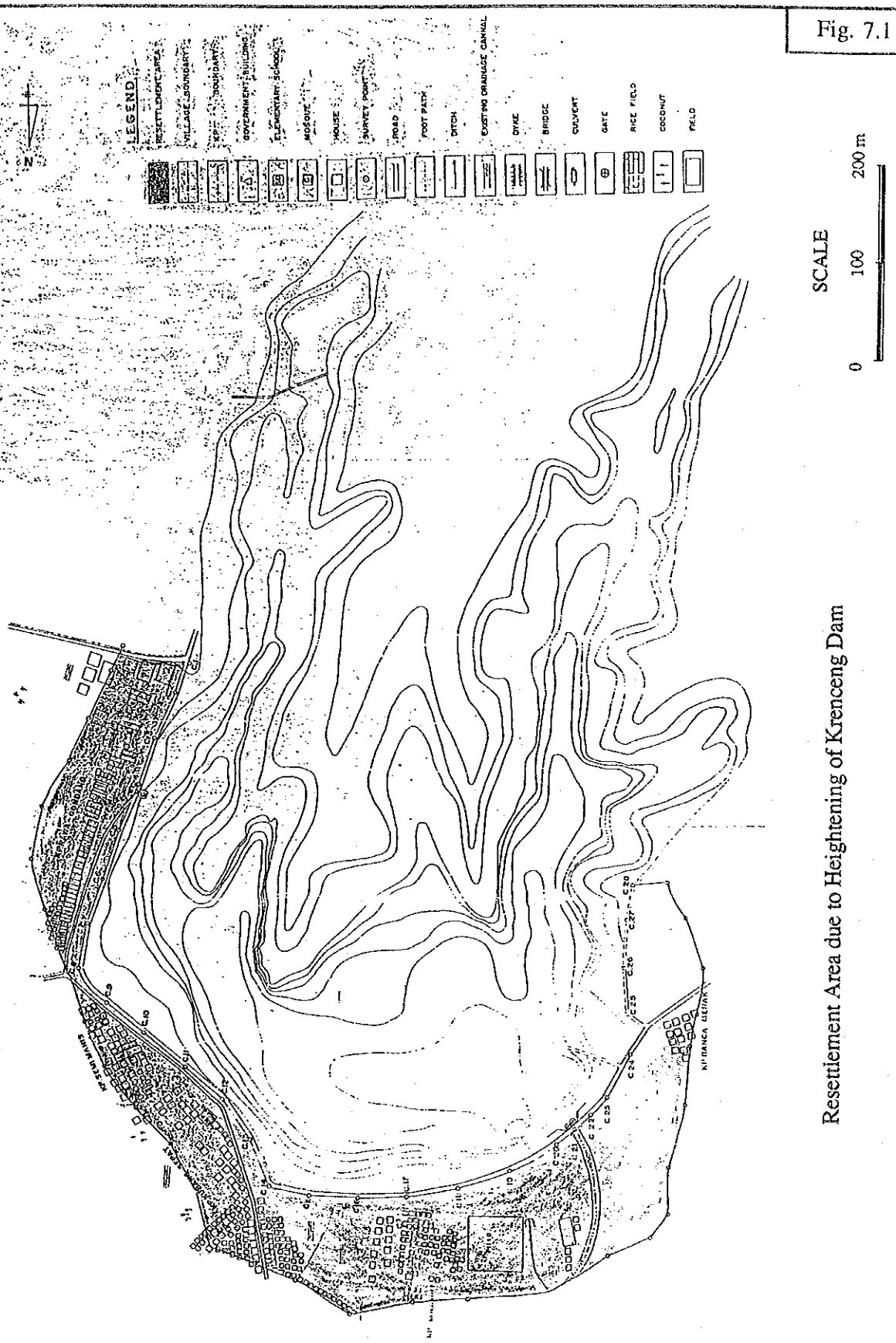
Fig. 7.1



Resettlement Area due to Heightening of Krenceng Dam

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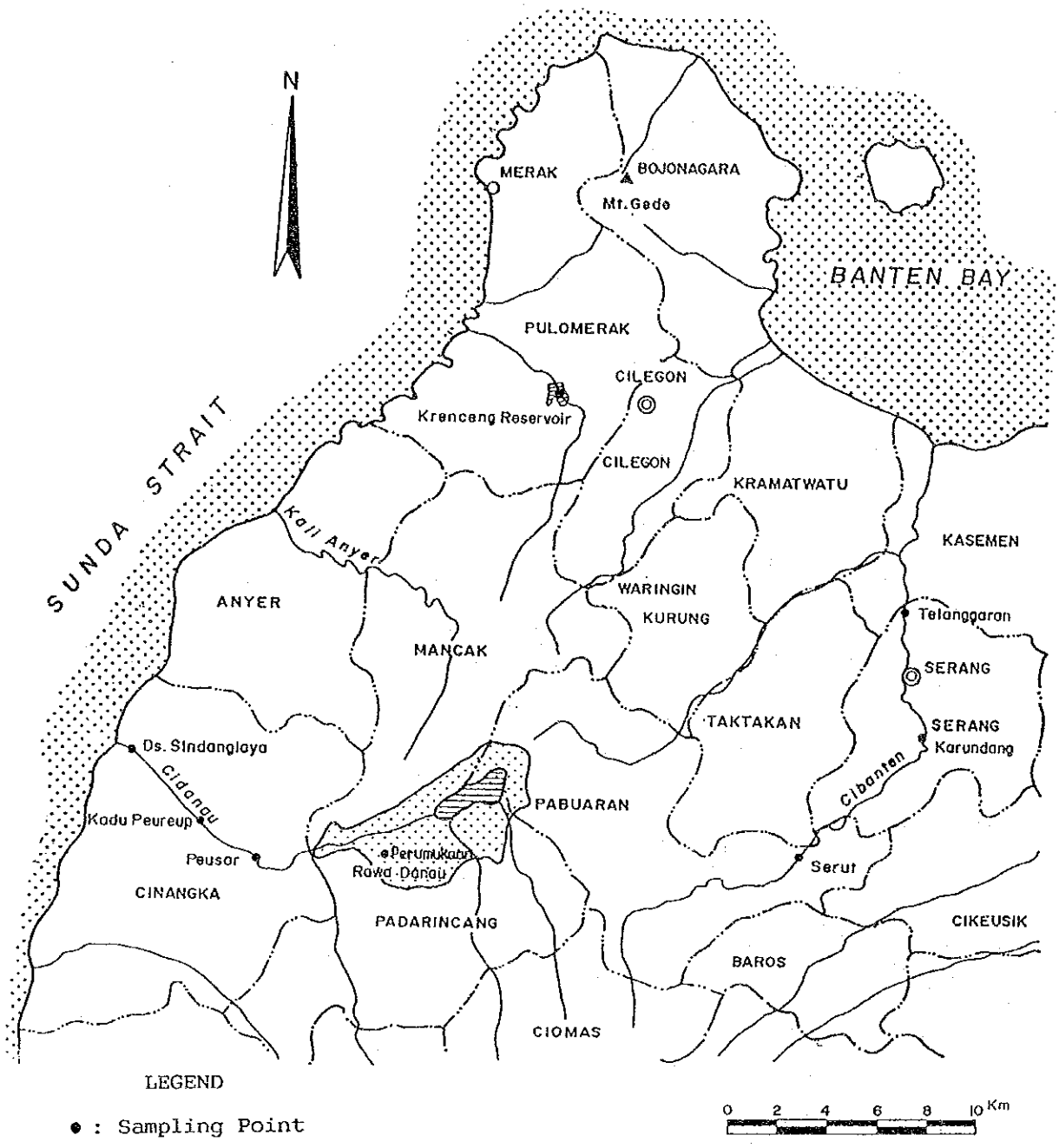
Fig. 7.2



Location Map of Sampling for Water Quality Survey

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