

Table A.4.1-21 (12) WATER BALANCE OF KAFENG KHROI PROJECT

	(1) CHATNAY - PASAK CANAL			(2) RAPNIPAT CANAL			(3) KAFENG KHROI			(4) 1976 YEAR TOTAL			(5) PASAK RIVER	(6) MANOROM REGULATORY	(7) (5)+(6)+ SIDE FLOW	(8) (7)-(4)
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		
1	1	48.87	47.01	8.77	8.77	8.77	99.17	15.95	32.10	48.05	-51.07					
2	2	48.83	42.01	8.27	8.27	8.27	99.12	12.41	29.60	42.01	-57.11					
3	3	57.56	49.54	9.75	9.75	9.75	116.84	11.51	45.64	57.15	-59.69					
4	2	51.74	44.52	8.77	8.77	8.77	105.02	13.29	35.78	49.07	-55.95					
5	1	25.89	22.28	4.39	4.39	4.39	52.56	16.20	80.30	96.50	43.94					
6	2	42.98	36.98	7.28	7.28	7.28	87.25	11.99	110.50	122.39	35.14					
7	3	51.79	44.56	8.78	8.78	8.78	105.12	9.02	98.00	107.07	1.90					
8	1	40.22	34.61	6.82	6.82	6.82	81.65	12.37	96.27	108.64	26.99					
9	2	66.14	56.91	11.21	11.21	11.21	134.26	11.74	173.60	135.34	1.08					
10	3	66.14	56.91	11.21	11.21	11.21	134.26	18.90	147.10	166.00	31.74					
11	1	66.14	56.91	11.21	11.21	11.21	134.26	19.55	55.00	74.55	-59.71					
12	2	64.36	55.78	10.91	10.91	10.91	134.26	16.73	108.57	125.30	-8.96					
13	3	53.41	45.96	9.05	9.05	9.05	108.43	20.90	151.40	172.30	41.65					
14	1	32.18	27.69	5.45	5.45	5.45	65.33	16.47	150.70	167.17	58.74					
15	2	49.99	43.01	8.47	8.47	8.47	101.47	18.32	159.00	177.32	111.99					
16	3	7.92	6.81	1.34	1.34	1.34	16.07	24.93	117.40	137.33	171.26					
17	1	0.0	0.0	0.0	0.0	0.0	0.0	14.58	58.60	73.18	73.18					
18	2	0.0	0.0	0.0	0.0	0.0	0.0	31.45	157.27	188.73	188.73					
19	3	2.64	2.27	0.45	0.45	0.45	5.36	23.65	109.42	133.09	127.72					
20	1	0.0	0.0	0.0	0.0	0.0	0.0	71.50	168.10	195.78	195.78					
21	2	6.23	0.0	0.0	0.0	0.0	6.23	18.50	186.60	208.39	202.17					
22	3	24.17	0.0	0.0	0.0	0.0	24.17	22.70	237.84	237.84	213.67					
23	1	10.13	0.0	0.0	0.0	0.0	10.13	21.57	188.60	214.01	203.87					
24	2	20.10	0.0	0.0	0.0	0.0	20.10	19.51	190.10	211.90	191.81					
25	3	68.06	14.00	21.00	21.00	21.00	103.07	14.26	185.90	202.70	99.63					
26	1	0.0	11.39	0.0	0.0	0.0	11.39	34.73	197.36	238.27	226.88					
27	2	29.39	8.47	7.00	7.00	7.00	44.85	22.50	191.12	217.63	172.77					
28	3	0.0	0.0	0.0	0.0	0.0	0.0	76.00	200.70	243.11	243.11					
29	1	0.0	0.0	0.0	0.0	0.0	0.0	73.30	212.80	299.15	209.76					
30	2	0.0	89.39	0.0	0.0	0.0	89.39	179.18	119.64	330.71	330.71					
31	3	0.0	0.0	0.0	0.0	0.0	0.0	95.16	177.71	290.99	261.10					
32	1	0.0	29.80	0.0	0.0	0.0	29.80	272.60	175.50	456.62	447.60					
33	2	0.0	9.02	0.0	0.0	0.0	9.02	342.00	218.40	621.28	475.27					
34	3	36.00	91.77	18.23	18.23	18.23	146.01	343.10	220.10	624.27	562.00					
35	1	59.49	0.0	2.78	2.78	2.78	62.27	319.23	191.33	567.39	494.96					
36	2	31.83	33.60	7.00	7.00	7.00	72.43	478.50	238.90	755.45	601.99					
37	3	100.68	43.18	10.01	10.01	10.01	153.87	510.10	236.80	877.70	669.69					
38	1	54.19	113.31	0.50	0.50	0.50	168.00	328.73	249.45	636.69	613.34					
39	2	0.0	23.35	0.0	0.0	0.0	23.35	475.78	241.72	747.28	628.21					
40	3	51.62	59.95	3.50	3.50	3.50	116.07	264.70	533.52	771.57	771.57					
41	1	76.45	71.83	13.68	13.68	13.68	161.95	158.30	191.70	378.19	211.98					
42	2	81.87	70.45	13.87	13.87	13.87	166.20	59.40	159.90	229.87	188.32					
43	3	20.47	17.61	3.47	3.47	3.47	41.55	160.80	191.10	380.52	257.29					
44	1	59.60	53.30	10.34	10.34	10.34	123.23	37.30	72.60	109.90	63.85					
45	2	22.69	19.52	3.84	3.84	3.84	46.05	27.70	53.90	81.60	81.60					
46	3	0.0	0.0	0.0	0.0	0.0	0.0	70.77	79.27	79.27	79.27					
47	1	0.0	0.0	0.0	0.0	0.0	0.0	20.00	61.92	74.91	74.91					
48	2	7.56	6.51	1.28	1.28	1.28	15.35	28.37	61.92	74.91	74.91					

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		WATER BALANCE OF KAENG KHOT PROJECT											1977 YEAR				
		(11)		(12)		(13)		(14)		(15)		(16)		(17)		(18)	
		CHARMAT - PASAK-CANAL		PAPHPAT - PASAK-CANAL		KAFNG KHOT		TOTAL		PASAK RIVER		MANDROM REGULATOR		SIDE FLOW		(19)	
		48-83		42-01		8-27		99-12		17-80		157-70		175-50		76-38	
1		48-83		42-01		8-27		99-12		17-80		157-70		175-50		76-38	
2		57-56		49-53		9-75		116-84		10-30		156-90		159-41		70-08	
3		51-74		44-52		8-77		105-02		15-76		153-79		169-04		53-01	
2		25-89		27-28		4-39		52-55		7-24		70-30		87-95		35-39	
3		42-98		36-98		7-28		87-25		8-65		126-60		133-84		46-59	
1		40-22		44-56		8-78		105-12		6-47		101-00		107-67		2-35	
2		66-14		38-61		6-82		81-65		7-45		102-30		109-75		22-11	
3		56-14		56-91		11-21		134-26		6-04		130-50		136-54		2-28	
3		66-14		56-91		11-21		134-26		6-01		130-30		136-31		2-05	
4		66-14		56-91		11-21		134-26		6-51		146-64		151-15		16-89	
1		64-36		55-38		10-91		130-65		7-84		119-30		127-14		-3-51	
2		53-41		45-96		9-05		108-43		6-55		122-40		129-95		20-52	
3		32-18		27-69		5-45		65-33		8-46		169-80		177-36		112-03	
5		49-99		43-01		8-47		101-47		7-62		136-87		144-48		43-01	
1		7-92		6-81		1-34		16-07		25-60		168-70		193-80		177-73	
2		0-0		0-0		0-0		0-0		17-90		172-00		189-90		189-90	
3		0-0		0-0		0-0		0-0		18-77		165-09		183-36		183-36	
6		2-64		2-27		0-45		5-36		20-59		169-43		199-02		183-66	
1		0-0		0-0		0-0		0-0		19-80		147-70		171-02		171-02	
2		0-0		0-0		0-0		0-0		14-00		160-90		177-39		177-39	
3		54-87		54-53		0-0		109-40		9-11		124-80		135-63		26-23	
7		18-29		18-18		0-0		36-47		14-30		154-50		161-35		124-88	
1		99-07		0-0		0-0		99-07		6-57		149-60		157-29		58-22	
2		156-11		124-29		18-09		288-49		5-17		160-10		166-19		-122-39	
3		67-67		22-82		1-93		87-47		6-55		150-09		157-80		70-39	
A		102-62		49-04		6-67		159-33		6-08		153-26		160-43		2-10	
1		0-0		0-0		0-34		0-34		6-67		134-50		142-36		142-01	
2		82-24		32-98		7-29		127-52		5-88		133-20		141-30		13-79	
3		1-91		70-94		8-56		81-40		45-64		168-64		222-40		140-99	
9		28-05		36-31		5-60		69-76		19-73		145-45		168-69		99-83	
1		49-69		60-26		3-31		113-27		85-60		180-70		281-27		169-27	
2		0-0		0-0		0-0		0-0		188-70		224-60		446-69		446-69	
3		0-0		0-0		0-0		0-0		498-10		240-80		427-56		427-56	
10		16-56		20-09		1-10		37-76		257-47		215-20		518-60		480-84	
1		117-51		93-95		13-68		224-91		383-10		211-50		662-79		437-84	
2		68-80		49-19		16-30		134-29		92-90		205-10		315-14		180-86	
3		29-32		61-83		4-31		95-47		40-55		185-64		233-40		137-40	
11		71-88		68-32		11-36		151-55		172-18		200-95		403-78		252-22	
1		102-34		85-67		17-34		205-36		17-40		194-90		215-40		-10-04	
2		81-82		70-45		13-87		146-20		13-19		-145-90		161-34		-4-86	
3		11-27		17-61		2-18		31-02		9-08		164-60		155-30		126-29	
12		65-14		57-91		11-13		134-19		13-27		109-10		177-34		43-15	
1		22-69		19-52		3-84		46-05		8-24		39-29		117-34		71-29	
2		0-0		0-0		0-0		0-0		8-36		47-56		50-63		50-63	
3		0-0		0-0		0-0		0-0		8-35		50-63		50-63		50-63	
		7-56		6-51		1-28		15-35		8-65		63-19		71-84		56-49	

Table A.4.1-2I (14) WATER BALANCE OF KAFNG KHOT PROJECT

	1978 YEAR		(13) KAFNG KHOI	KAFNG KHOT PROJECT		(14) TOTAL	(15) PASAK RIVER	(16) MANDRAM REGULATOR	(17) (5)+(6)+ SIDE FLOW	(18) (17)-(14)
	(1) CHAINAY- PASAK CANAL	(2) RAPHIPAT CANAL		(3) KAFNG KHOI	(4) TOTAL					
1	48.93	67.01	8.27	8.27	99.17	8.11	28.90	37.01	-67.11	
2	48.83	42.01	8.27	8.27	99.12	7.15	36.60	43.75	-55.37	
3	57.56	49.53	8.75	8.75	116.84	5.12	31.55	36.66	-80.17	
4	51.74	44.52	8.77	8.77	105.02	6.79	32.35	39.14	-65.89	
5	25.89	22.28	4.39	4.39	52.56	4.38	47.80	48.18	-4.38	
6	42.08	36.98	7.28	7.28	81.25	3.68	96.90	100.58	-13.33	
7	51.79	44.56	8.78	8.78	105.17	3.82	47.80	51.70	-53.42	
8	40.22	34.61	6.82	6.82	81.65	3.96	62.86	66.92	-14.83	
9	66.14	56.91	11.21	11.21	134.26	3.38	73.00	76.38	-57.88	
10	66.14	56.91	11.21	11.21	134.26	2.76	82.70	85.44	-48.80	
11	66.14	56.91	11.21	11.21	134.26	2.76	78.55	81.31	-52.85	
12	66.14	56.91	11.21	11.21	134.26	2.97	78.08	81.05	-53.21	
13	64.36	55.38	10.91	10.91	130.65	2.90	78.70	81.60	-40.85	
14	53.41	45.96	9.05	9.05	108.43	6.88	94.20	101.08	-7.35	
15	32.18	27.64	5.45	5.45	65.33	11.24	87.60	98.84	-33.51	
16	49.99	43.01	8.47	8.47	101.47	7.01	86.83	93.84	-7.63	
17	7.97	6.81	1.34	1.34	16.07	7.45	75.50	82.95	66.88	
18	0.0	0.0	0.0	0.0	0.0	13.98	48.90	61.98	61.98	
19	0.0	0.0	0.0	0.0	0.0	21.55	28.18	49.73	49.73	
20	2.64	2.27	0.45	0.45	5.36	14.33	50.56	64.89	50.53	
21	0.0	0.0	0.0	0.0	0.0	15.20	36.40	54.31	54.31	
22	0.0	0.0	0.0	0.0	0.0	14.50	57.70	74.78	74.78	
23	0.0	0.0	0.0	0.0	0.0	26.50	81.30	112.57	112.57	
24	0.0	0.0	0.0	0.0	0.0	18.73	58.47	80.53	80.53	
25	40.26	14.75	0.0	0.0	55.01	29.00	76.80	110.96	55.96	
26	75.65	41.38	2.32	2.32	119.34	165.20	108.20	278.25	159.80	
27	0.0	5.60	7.33	7.33	7.93	299.45	48.18	400.94	393.01	
28	38.63	20.58	1.55	1.55	60.76	157.88	77.73	263.72	202.05	
29	34.77	25.14	0.0	0.0	59.97	327.80	82.40	468.55	408.63	
30	0.0	49.76	0.0	0.0	49.88	246.50	160.60	450.98	401.09	
31	106.66	94.23	16.11	16.11	217.00	336.44	177.45	571.66	354.66	
32	47.18	56.38	5.37	5.37	108.93	302.98	140.15	497.06	388.13	
33	70.59	56.44	0.0	0.0	127.03	311.80	223.50	590.80	463.77	
34	0.0	25.09	0.0	0.0	25.09	239.50	226.20	508.13	483.24	
35	0.0	0.0	0.0	0.0	0.0	585.10	74.50	764.75	764.75	
36	23.53	21.18	0.0	0.0	50.71	378.80	175.07	621.29	570.58	
37	125.09	0.0	20.79	20.79	145.88	2159.70	0.0	2544.13	2398.24	
38	131.69	91.03	0.0	0.0	222.72	714.70	23.50	865.42	642.70	
39	107.00	92.94	17.08	17.08	217.02	201.64	13.82	351.35	134.32	
40	121.26	61.32	12.62	12.62	195.21	1025.35	45.77	1253.63	1058.42	
41	102.34	88.96	17.09	17.09	207.49	55.30	220.90	286.04	78.55	
42	81.87	70.45	13.87	13.87	166.20	34.80	215.10	256.98	89.90	
43	20.47	17.61	3.47	3.47	41.55	30.10	180.60	216.06	174.51	
44	68.23	58.71	11.48	11.48	138.41	49.07	205.53	252.73	114.32	
45	22.69	19.52	3.84	3.84	46.05	29.80	100.50	130.30	84.25	
46	0.0	0.0	0.0	0.0	0.0	26.10	34.80	60.90	60.90	
47	0.0	0.0	0.0	0.0	0.0	22.36	101.55	123.91	123.91	
48	7.56	6.51	1.28	1.28	15.35	26.09	78.95	105.06	89.68	

Table A.4.1-21 (15) WATER BALANCE OF KAENG KHUJ PROJECT

	1979 YEAR										(17)	(17)-(14)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)		
	CHAINAT- BASAK-CANAL	RAPHIPAT CANAL	KAENG KHUJ	TOTAL	PASSY RIVER	MANDROW REGULATOR	(15)+(16)+ SIDE FLOW					
1	48.83	42.01	8.27	99.12	18.90	72.70	91.50					-7.62
2	48.83	42.01	8.27	99.12	16.50	91.20	107.70					8.58
3	51.56	49.53	9.75	110.84	12.27	72.55	84.82					-32.02
2	51.74	44.52	8.77	105.02	15.86	79.82	94.67					-10.35
	25.89	27.28	4.39	57.56	19.90	69.90	80.70					28.14
3	42.88	36.98	7.28	87.25	9.85	97.70	107.55					20.30
	51.79	44.56	8.78	105.12	9.11	125.50	134.61					29.40
3	40.22	34.61	6.82	81.65	9.95	97.67	107.62					25.97
	66.14	56.91	11.21	134.26	9.27	116.80	126.07					8.19
2	66.14	56.91	11.21	134.26	8.46	142.10	150.56					16.30
3	66.14	56.91	11.21	134.26	9.33	147.82	157.15					22.89
4	66.14	56.91	11.21	134.26	9.02	135.57	144.59					10.33
	64.36	55.88	10.91	130.65	4.71	158.00	162.71					32.06
2	53.41	45.96	9.05	108.43	5.33	164.90	170.23					61.80
3	32.18	27.60	5.45	65.33	6.73	141.30	148.03					82.70
5	49.99	43.01	8.47	101.47	5.59	154.73	160.32					58.85
	7.92	6.81	1.34	16.07	14.19	147.40	156.59					140.52
2	0.00	0.00	0.00	0.00	14.19	132.30	147.09					147.09
3	0.00	0.00	0.00	0.00	64.15	88.45	142.61					142.61
6	2.64	2.27	0.45	5.36	26.04	122.72	148.76					143.41
	0.00	0.00	0.00	0.00	17.19	123.90	144.15					144.15
2	15.84	19.84	2.37	38.06	26.75	134.50	164.83					126.78
3	58.01	53.58	0.00	111.59	29.78	140.50	175.58					63.99
7	24.62	24.47	0.79	49.88	24.24	132.97	161.52					111.64
	152.34	131.56	15.88	299.78	69.20	187.00	287.92					46.86
2	110.60	0.00	4.14	114.74	27.71	156.40	189.04					74.30
3	15.91	28.32	8.31	52.56	20.37	155.82	179.87					177.26
8	92.96	53.29	9.44	155.69	36.09	164.74	207.26					51.57
	41.53	20.53	2.10	64.15	14.61	136.30	153.51					89.36
2	73.28	0.00	8.26	81.55	40.90	164.70	212.88					125.33
3	80.26	0.00	0.00	80.26	59.06	152.00	221.58					141.32
9	66.99	6.84	3.49	77.32	38.19	155.99	195.99					118.67
	51.36	108.76	4.63	165.74	71.67	155.70	240.13					74.30
2	0.00	0.00	0.00	0.00	50.14	176.90	235.86					235.86
3	0.00	0.00	0.00	0.00	127.16	116.70	266.49					266.49
10	17.12	36.59	1.54	55.25	82.99	149.73	247.59					192.25
	143.77	93.60	24.36	261.74	237.63	164.40	454.33					192.25
2	131.59	113.31	22.32	267.31	89.87	158.30	266.17					3.15
3	108.01	51.71	12.09	171.81	17.39	172.91	153.40					-18.42
11	127.82	82.87	19.59	230.29	114.96	151.87	287.30					57.01
	102.34	88.06	17.34	207.74	10.94	152.40	165.29					-42.66
2	81.87	70.45	13.87	166.20	9.55	150.80	162.05					-4.15
3	20.47	17.61	3.47	41.55	8.59	127.10	137.22					95.67
12	68.23	58.71	11.56	138.50	9.69	163.43	154.85					16.36
	22.64	19.52	3.84	46.05	7.61	103.51	103.51					57.46
2	0.00	0.00	0.00	0.00	5.96	43.90	49.76					49.76
3	0.00	0.00	0.00	0.00	5.80	53.18	58.98					58.98
3	7.54	6.51	1.28	15.35	6.46	64.39	70.75					55.60

Table A.4.1-21 (16)

	WATER BALANCE OF KAFNG KHOT PROJECT				1980 YEAR		(15) PASAK RIVER	(16) MANDROM REGULATOR	(17) (5)+(6)+ SIDE FLOW	(18) (7)-(14)
	(1) CHATNAT- BASAK CANAL	(2) RAPHIPAT CANAL	(3) KAFNG KHOT	(4) TOTAL	(5) TOTAL	(6) MANDROM REGULATOR				
1	48.83	47.01	8.27	99.12	5.26	46.90	52.16	-46.96		
2	48.83	47.01	8.27	99.12	4.55	37.70	79.75	-61.87		
3	57.56	49.53	9.75	116.84	3.67	75.45	79.07	-37.76		
	51.74	44.52	8.77	105.02	4.48	51.68	56.16	-48.86		
7	75.89	77.28	4.39	157.56	3.06	76.70	27.76	-24.80		
	42.98	36.98	7.28	87.25	2.56	31.50	34.96	-53.19		
3	51.79	44.56	8.78	105.12	2.91	4.56	7.47	-97.66		
	40.22	34.61	6.82	81.65	2.84	20.25	23.10	-59.55		
3	66.14	56.91	11.21	134.26	2.76	28.50	39.76	-103.50		
2	66.14	56.91	11.21	134.26	2.46	37.80	40.26	-96.00		
3	66.14	56.91	11.21	134.26	3.04	41.64	44.67	-89.59		
	64.36	55.38	10.91	130.65	6.48	39.20	45.68	-84.97		
2	53.41	45.96	9.05	108.43	4.07	34.80	38.87	-60.61		
3	37.18	27.69	5.45	65.33	5.31	30.10	35.41	-70.92		
	49.99	43.91	8.47	101.47	5.27	34.70	39.87	-61.50		
5	7.92	6.81	1.34	16.07	5.67	36.90	42.57	76.50		
2	0.0	0.0	0.0	0.0	7.74	64.10	71.84	71.84		
3	0.0	0.0	0.0	0.0	6.87	156.18	163.05	163.05		
	2.64	2.27	0.45	5.36	5.76	85.73	92.49	47.13		
1	0.0	0.0	0.0	0.0	20.93	175.70	200.24	200.24		
2	0.0	0.0	0.0	0.0	37.34	153.00	196.99	196.99		
3	0.0	0.0	0.0	0.0	20.94	115.80	162.85	160.79		
	0.0	0.0	0.0	0.0	32.70	148.17	186.69	186.00		
1	99.63	118.83	16.88	235.34	117.56	181.10	319.59	84.25		
2	0.0	115.22	0.0	115.22	16.85	148.90	251.91	135.09		
3	18.45	0.0	3.18	21.63	44.21	168.73	220.81	199.17		
	39.36	78.02	6.69	124.05	82.87	166.24	263.87	139.80		
1	0.0	0.0	0.0	0.0	175.48	216.40	364.22	364.22		
2	0.0	9.18	0.0	9.18	154.61	174.50	356.63	367.45		
3	21.07	0.0	0.0	21.07	56.89	154.00	271.02	190.94		
	7.02	3.06	0.0	10.08	112.33	181.63	313.95	303.87		
1	0.0	0.0	0.0	0.0	134.35	155.60	313.86	313.86		
2	75.58	0.0	15.32	90.90	226.88	124.10	391.76	300.46		
3	0.0	0.0	5.79	5.79	449.44	229.60	659.04	653.25		
	25.19	0.0	7.03	32.23	270.22	136.43	454.76	422.53		
1	20.78	0.0	5.34	26.12	771.61	82.90	991.76	965.64		
2	71.02	0.0	0.0	71.02	527.10	246.90	967.72	796.70		
3	69.00	23.64	9.81	102.46	274.60	97.91	362.59	260.14		
	53.60	7.88	5.05	66.53	507.80	142.50	740.69	674.16		
1	23.55	88.04	17.34	128.95	79.58	182.20	275.95	144.09		
2	78.17	70.45	13.87	162.50	43.88	200.40	252.09	89.59		
3	20.47	17.61	3.47	41.55	30.70	181.40	214.98	175.43		
	40.73	58.71	11.56	111.00	51.22	189.00	248.34	137.34		
1	22.60	19.57	3.84	46.05	23.52	80.00	103.52	57.47		
2	0.0	0.0	0.0	0.0	19.52	39.30	58.82	58.82		
3	0.0	0.0	0.0	0.0	16.04	38.09	54.13	54.13		
	7.56	6.51	1.28	15.35	19.69	57.46	72.16	56.80		

Fig. A.4.1-1 Pasak River Discharge at S2 Gauging Station
 First Decade (1st-10th) of July

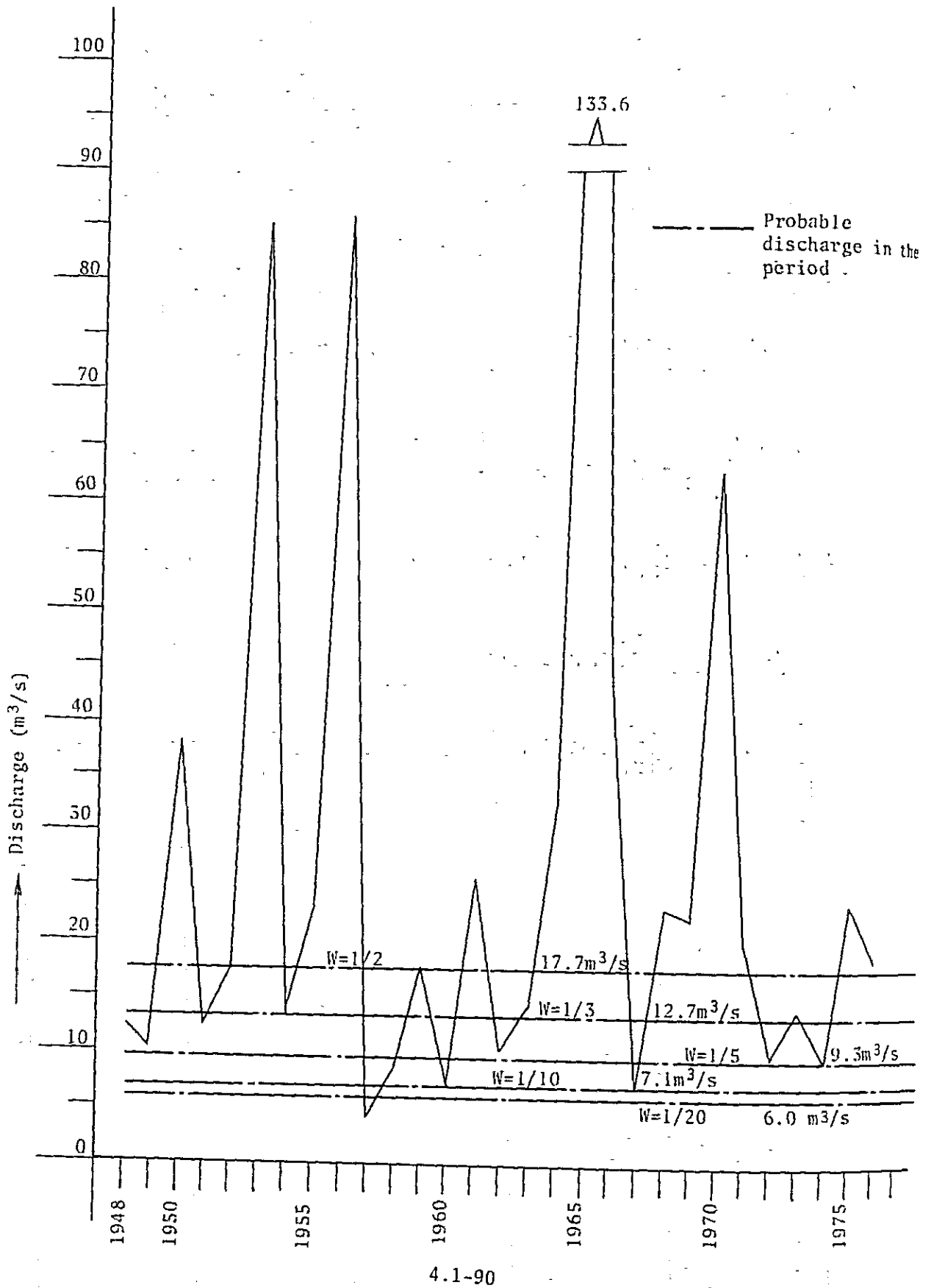


Fig. A.4.1-2 Pasak River Discharge at S2 Gauging Station
Second Decade (11th - 20th) of July

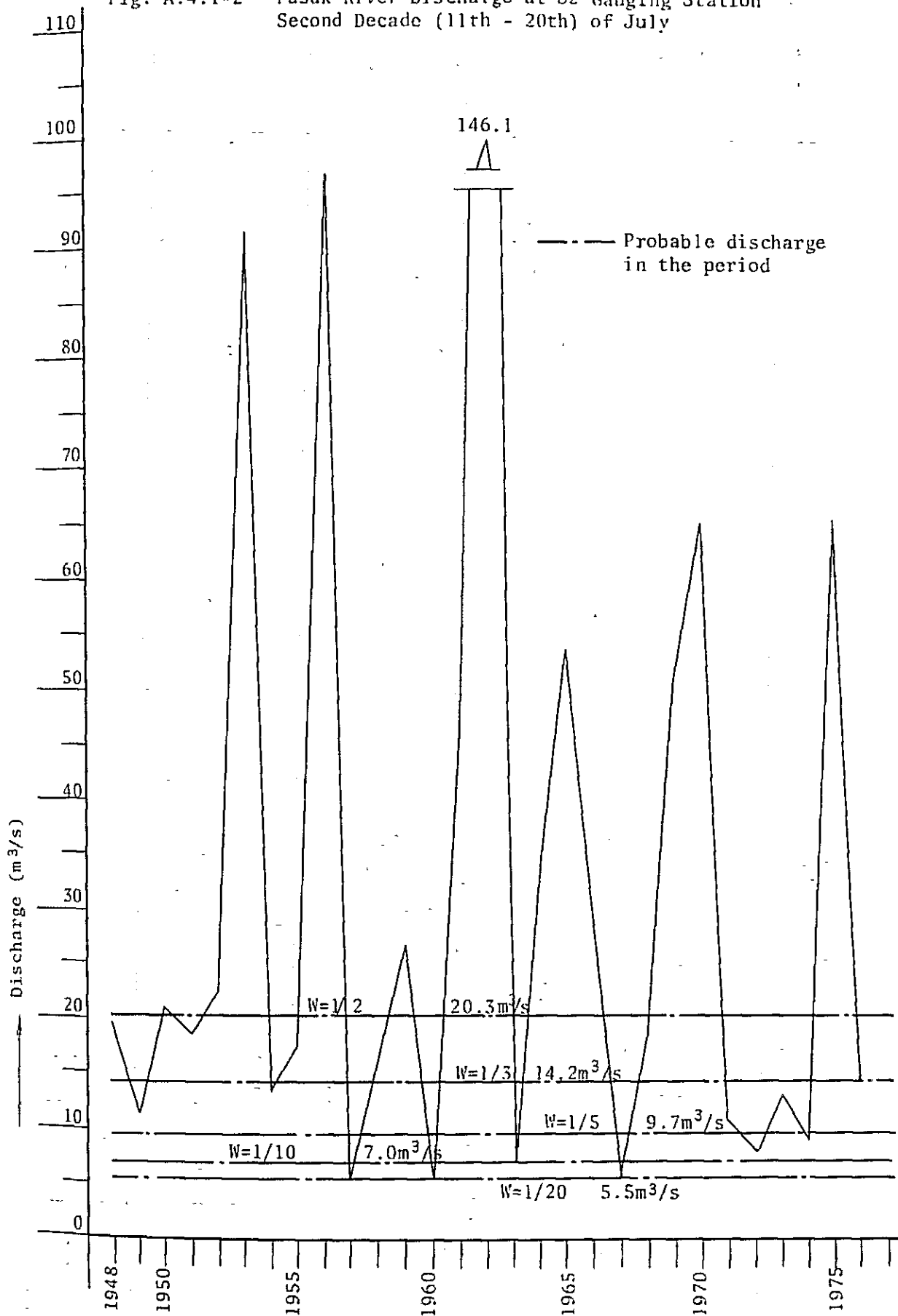


Fig. A.4.1-3 Pasak River Discharge at S2 Gauging Station
Third Decade (21th - 31th) of July

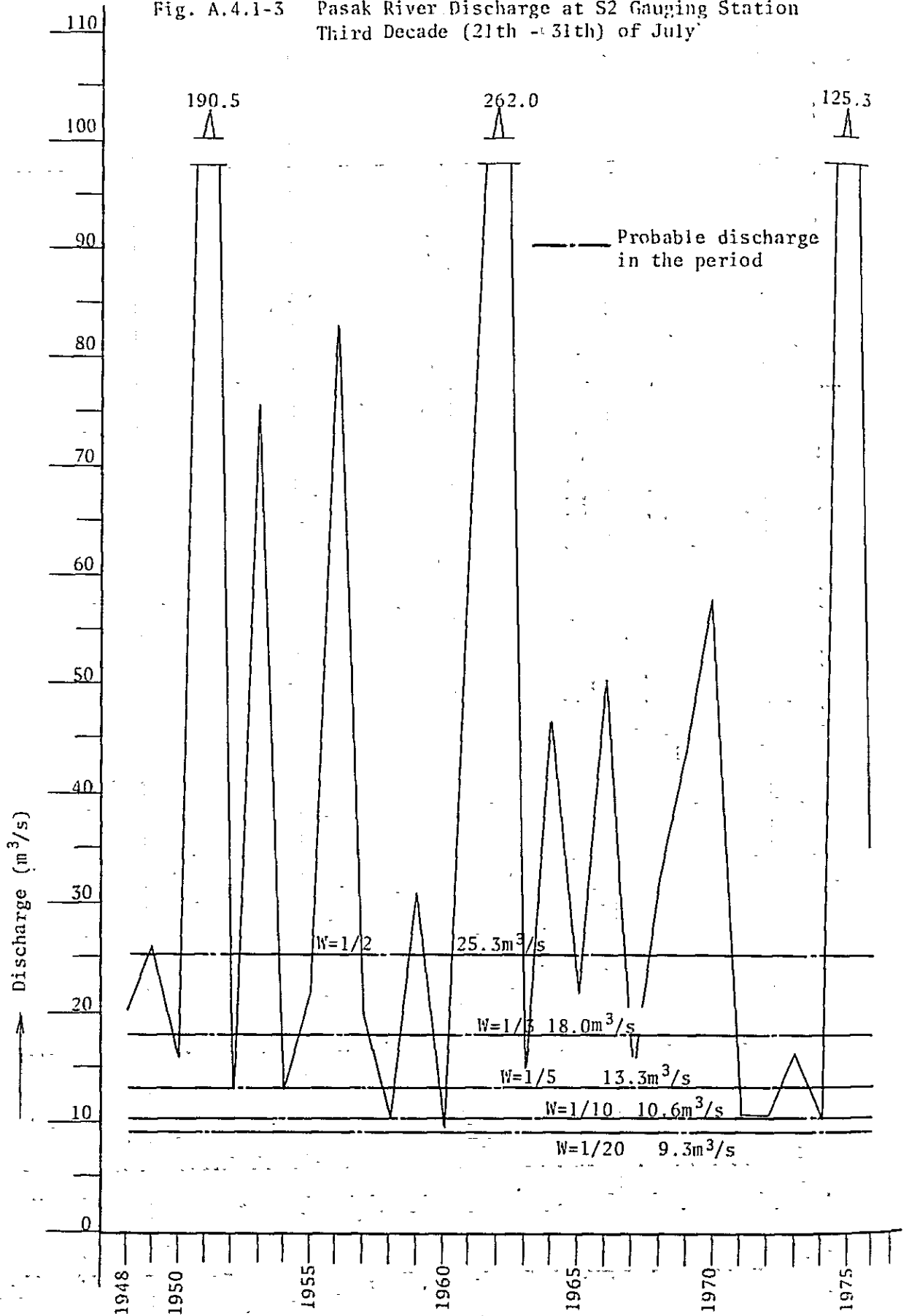


Fig. A.4.1-4 Probable Discharge of Pasak River
at S2 Gauging Station

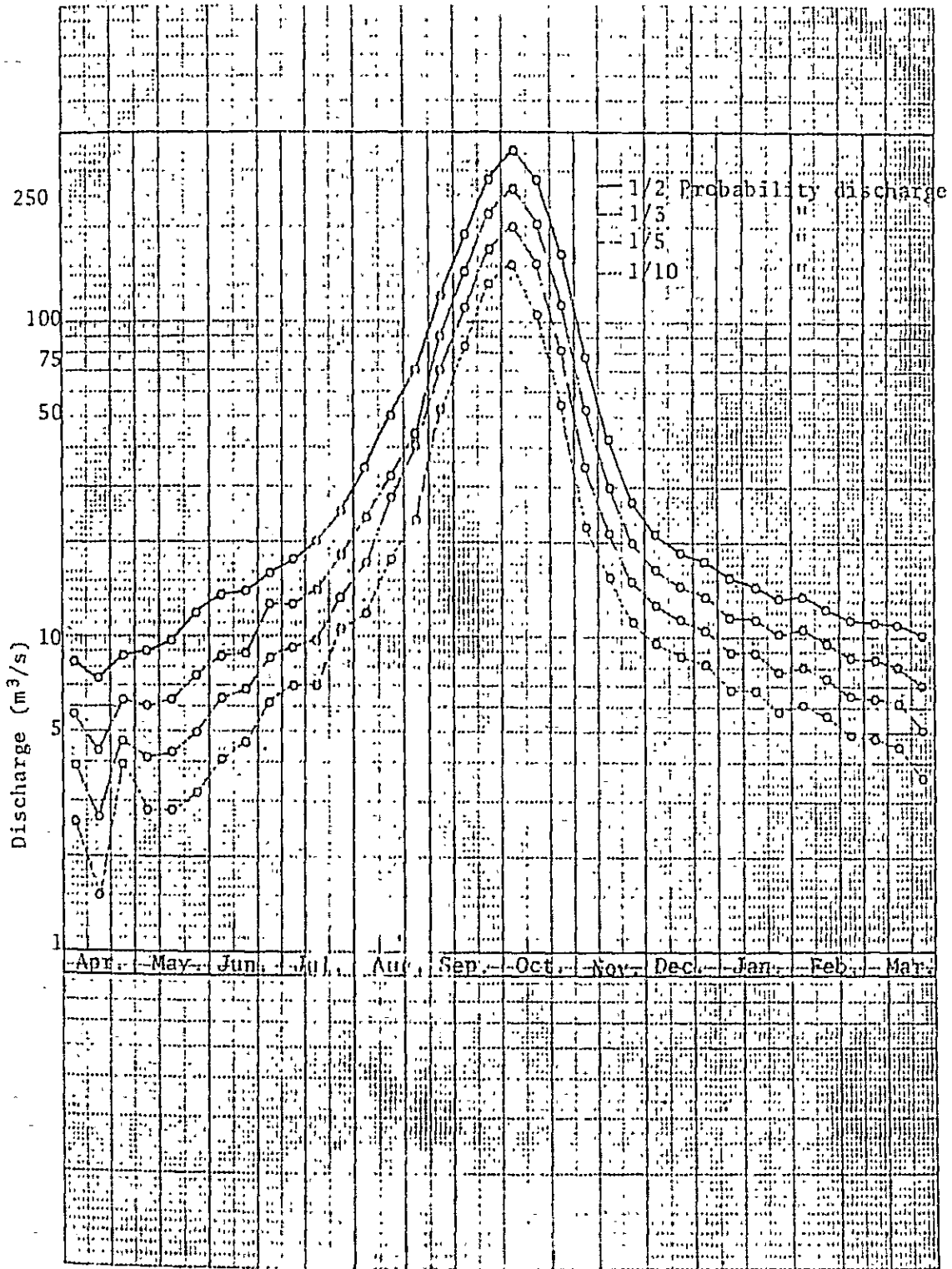
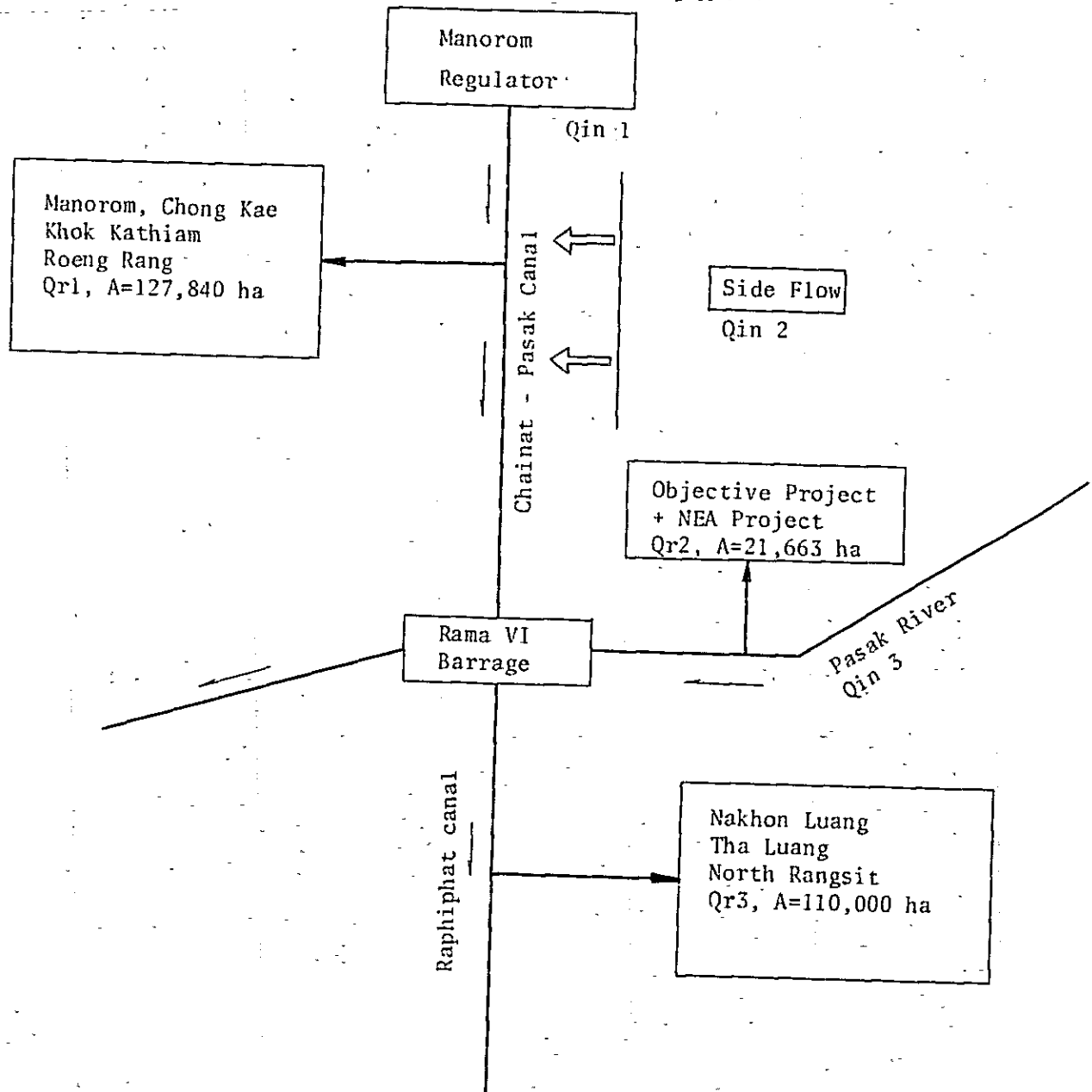


Fig. A.4.1-5 Flow Chart on Water Balance Computation



$$\Delta Q = Q_{in 1} + Q_{in 2} + Q_{in 3} - Q_{r1} - Q_{r2} - Q_{r3}$$

ΔQ : Shortage or surplus of discharge

Q_{in} : Inflow from related water resources

Q_r : Water requirement

FIG. A.4 I-6 WATER BALANCE SIMULATION - CASE. I
 (WHOLE AREA CASE, CROPPING INTENSITY 115%)



FIG. A.4 1-7 WATER BALANCE SIMULATION - CASE. II
 (WHOLE AREA CASE, CROPPING INTENSITY 120%)



FIG. A.4.1-8 WATER BALANCE SIMULATION - CASE. III
 (WHOLE AREA CASE, CROPPING INTENSITY 130%)



FIG. A.4 1-9 WATER BALANCE SIMULATION - CASE. IV
(PASAK RIVER CASE, CROPPING INTENSITY 115%)

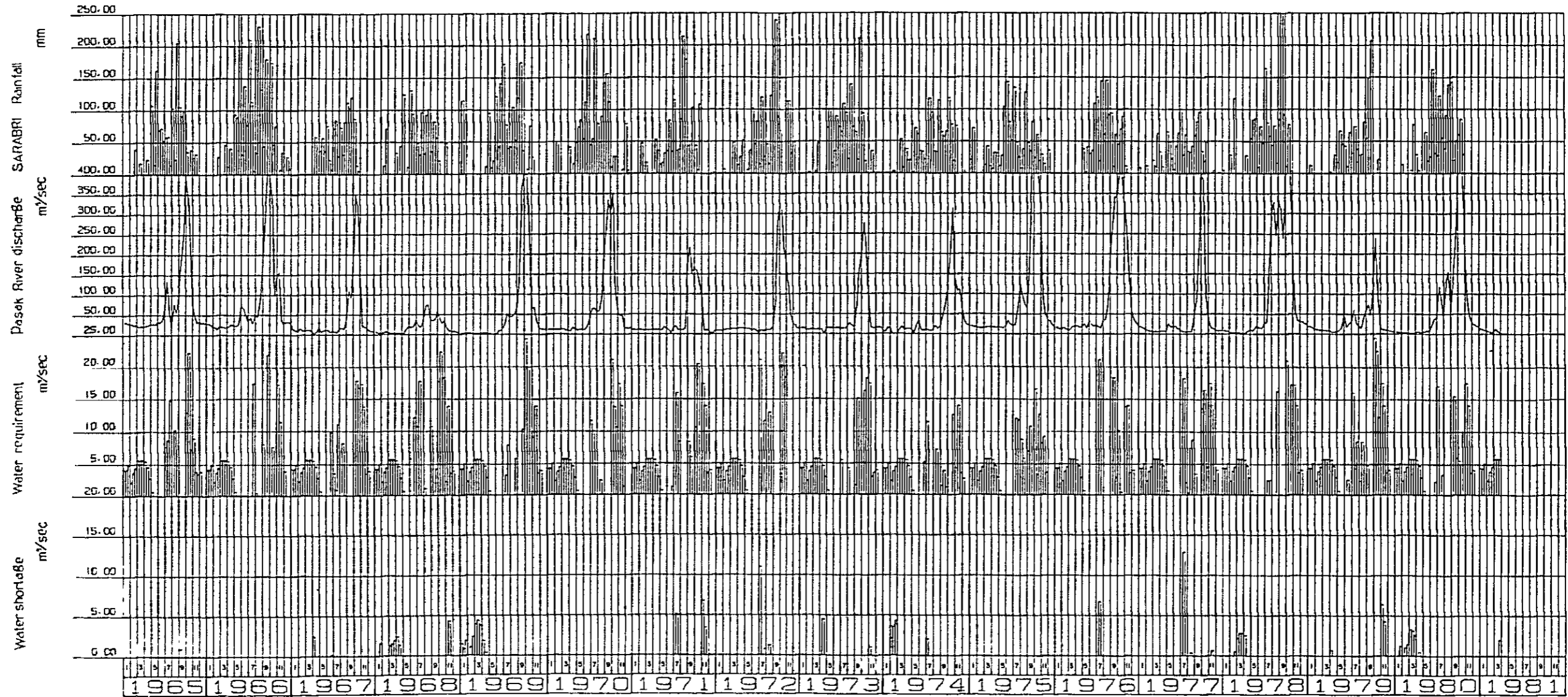


FIG.A.4 1-10 WATER BALANCE SIMULATION - CASE. V
(PASAK RIVER CASE, CROPPING INTENSITY 120%)

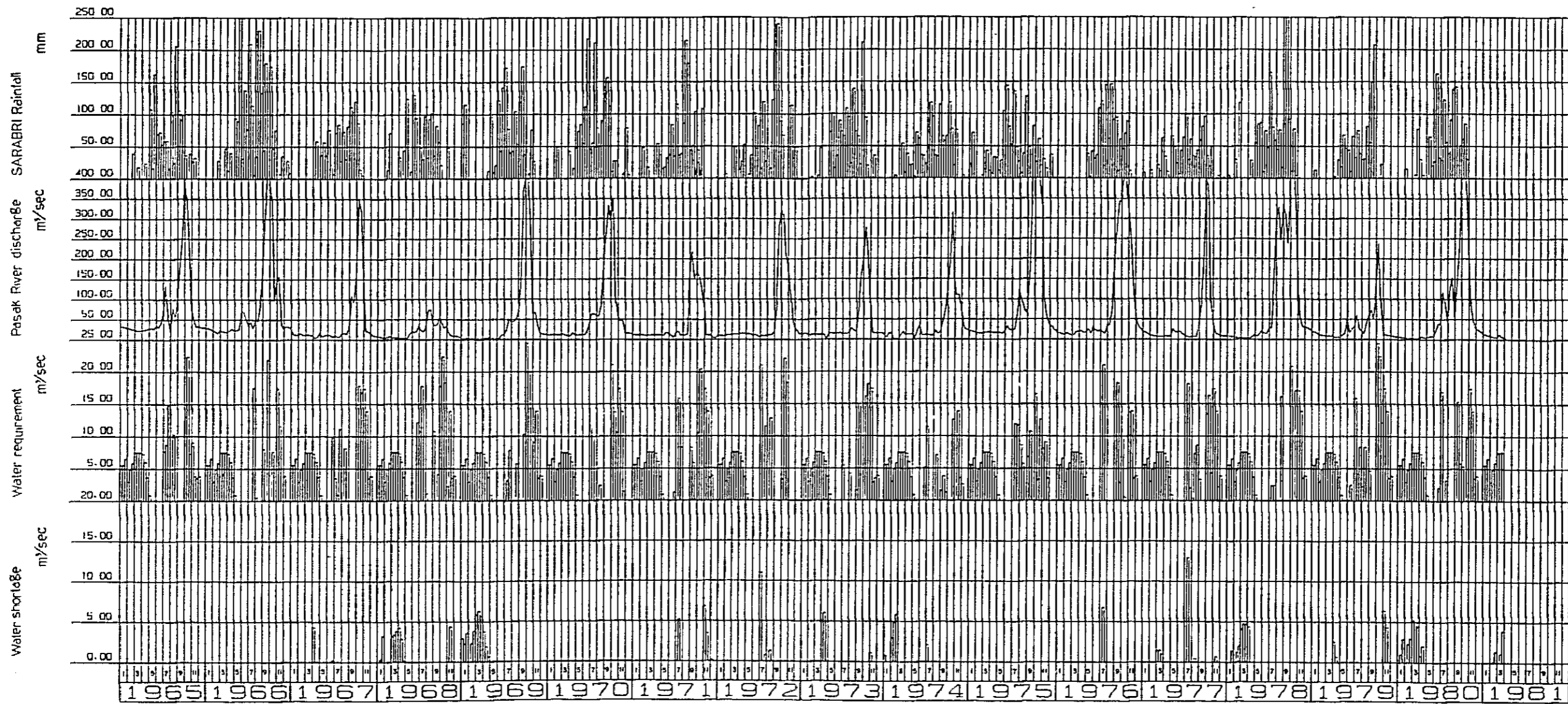


FIG.A.4.1-II ANNUAL RAINFALL AND DISCHARGE

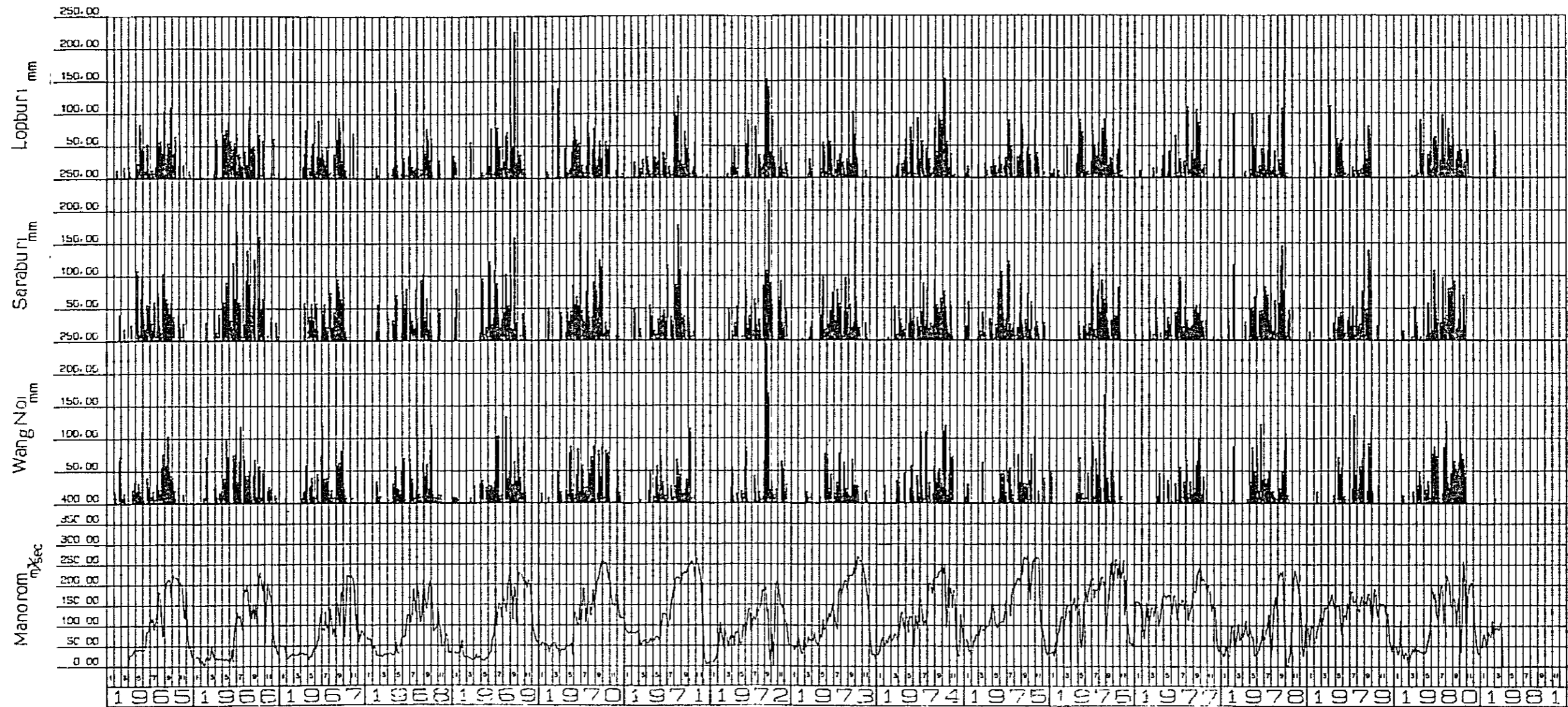


Fig. A.4.1-12 Water Balance in July
(Whole area case)

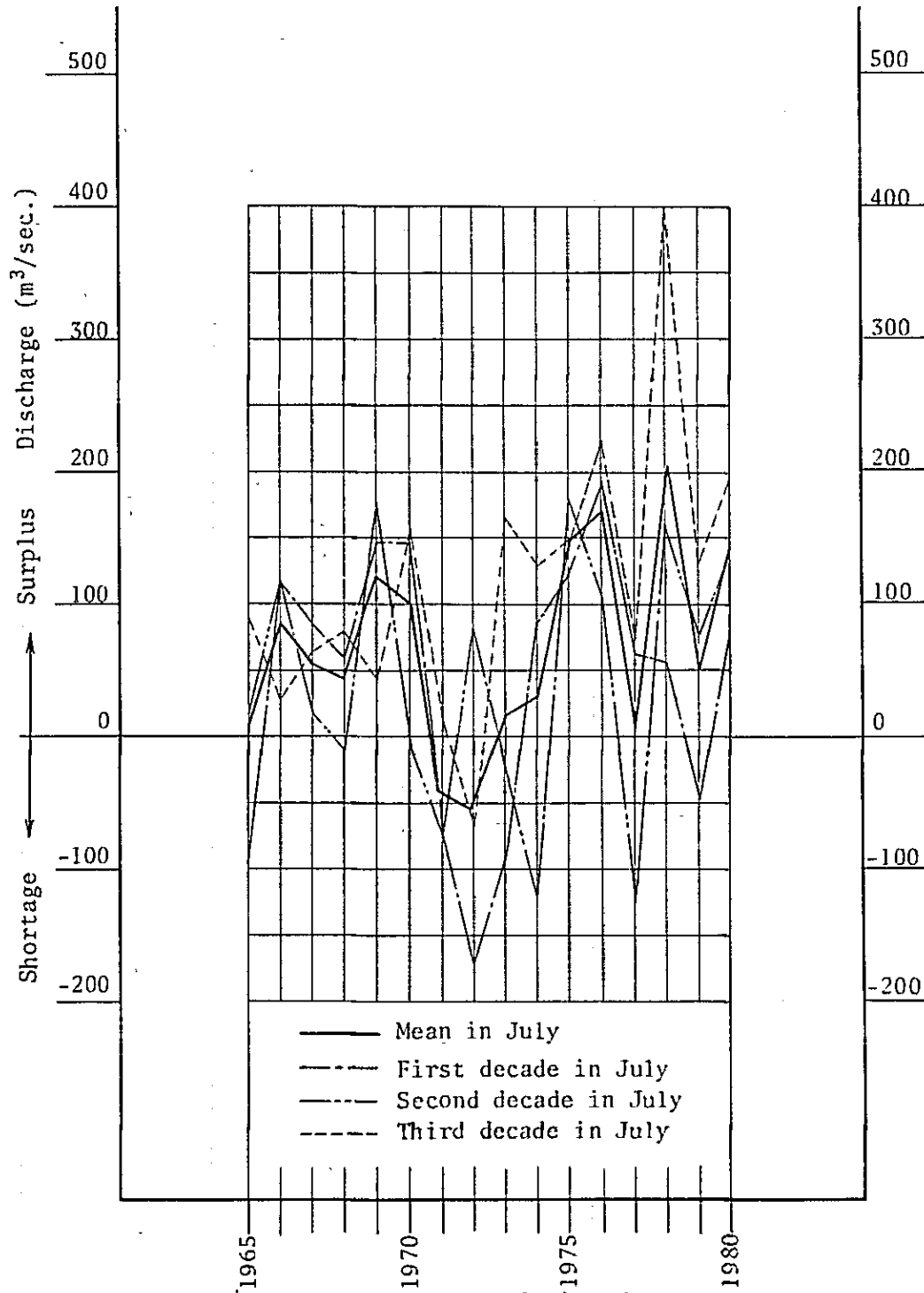
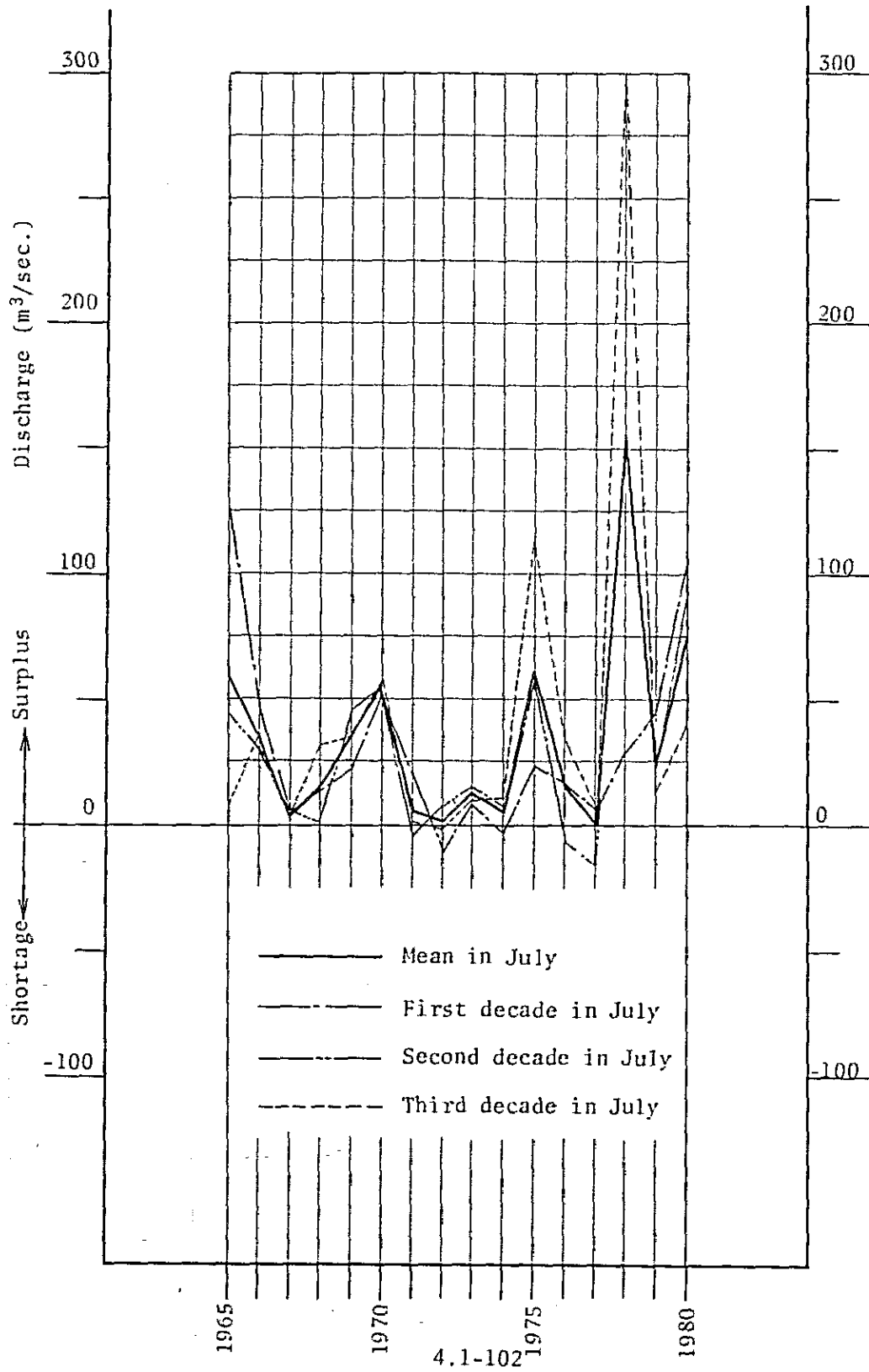


Fig. A.4.1-13 Water Balance in July
(Pasak river case)



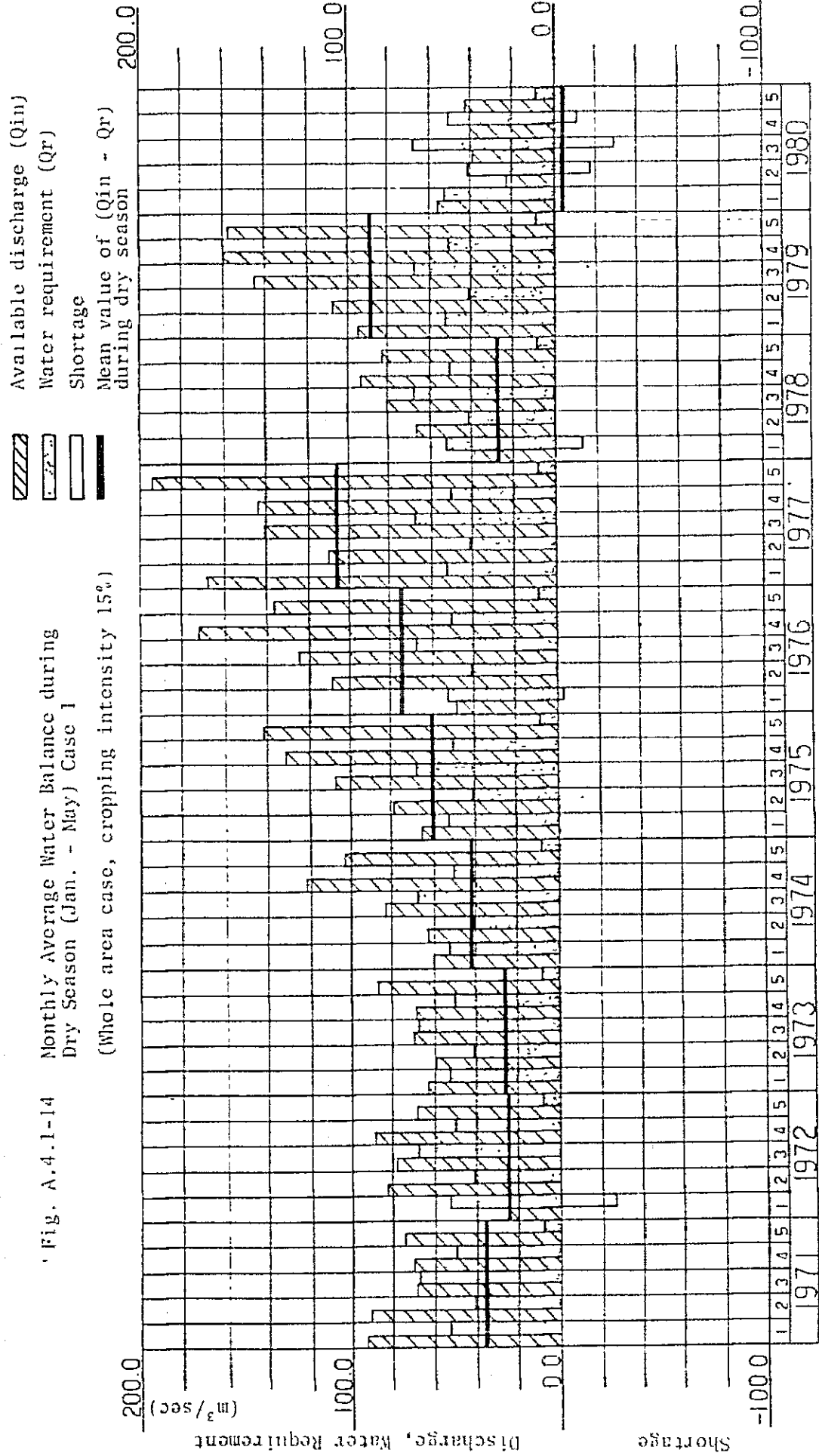
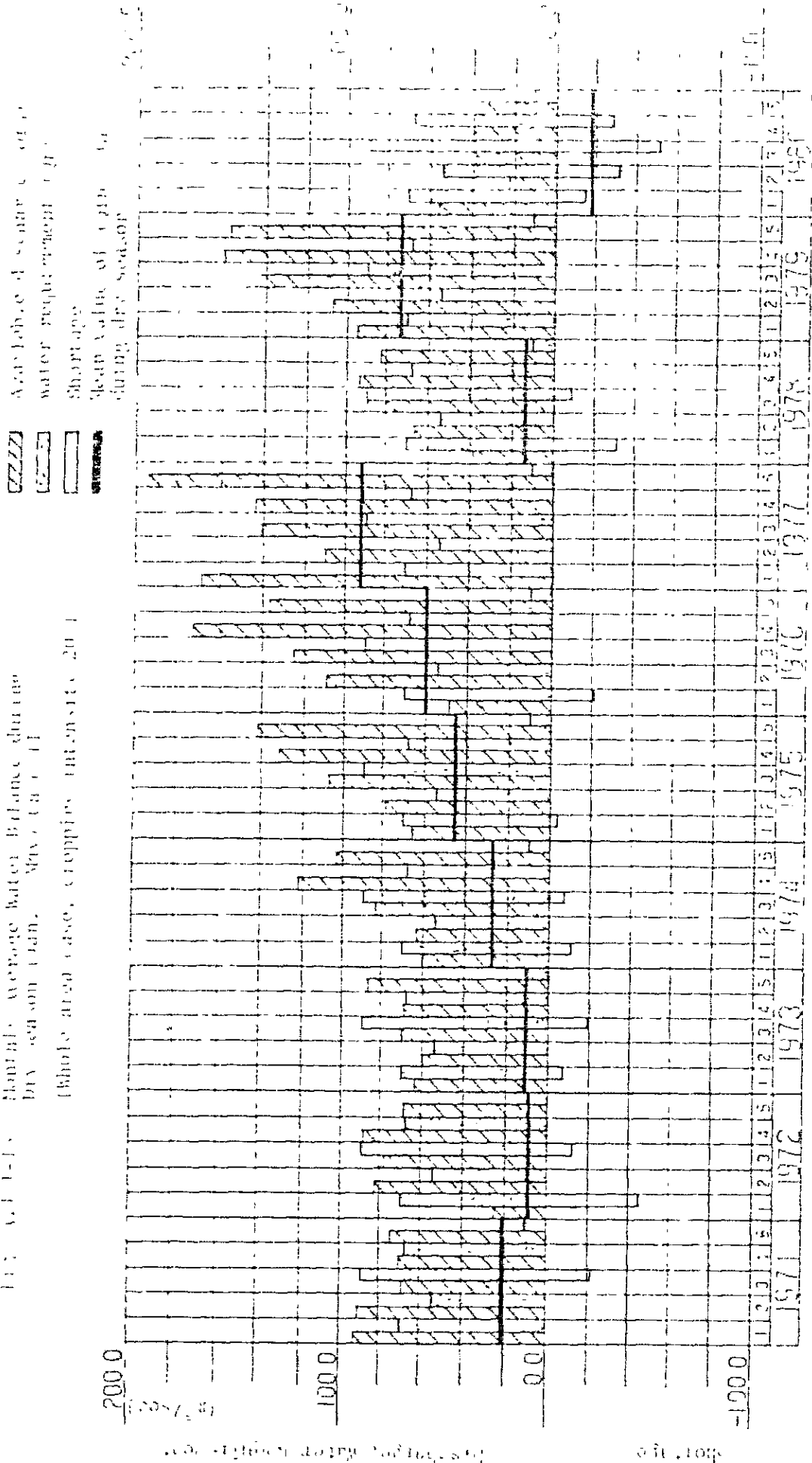


Fig. A.4.1-14

Fig. 1.1-1. Monthly average water balance during
 dry season (Jan. - May) at T-11
 (Whole area case, cropping intensity 2.0)



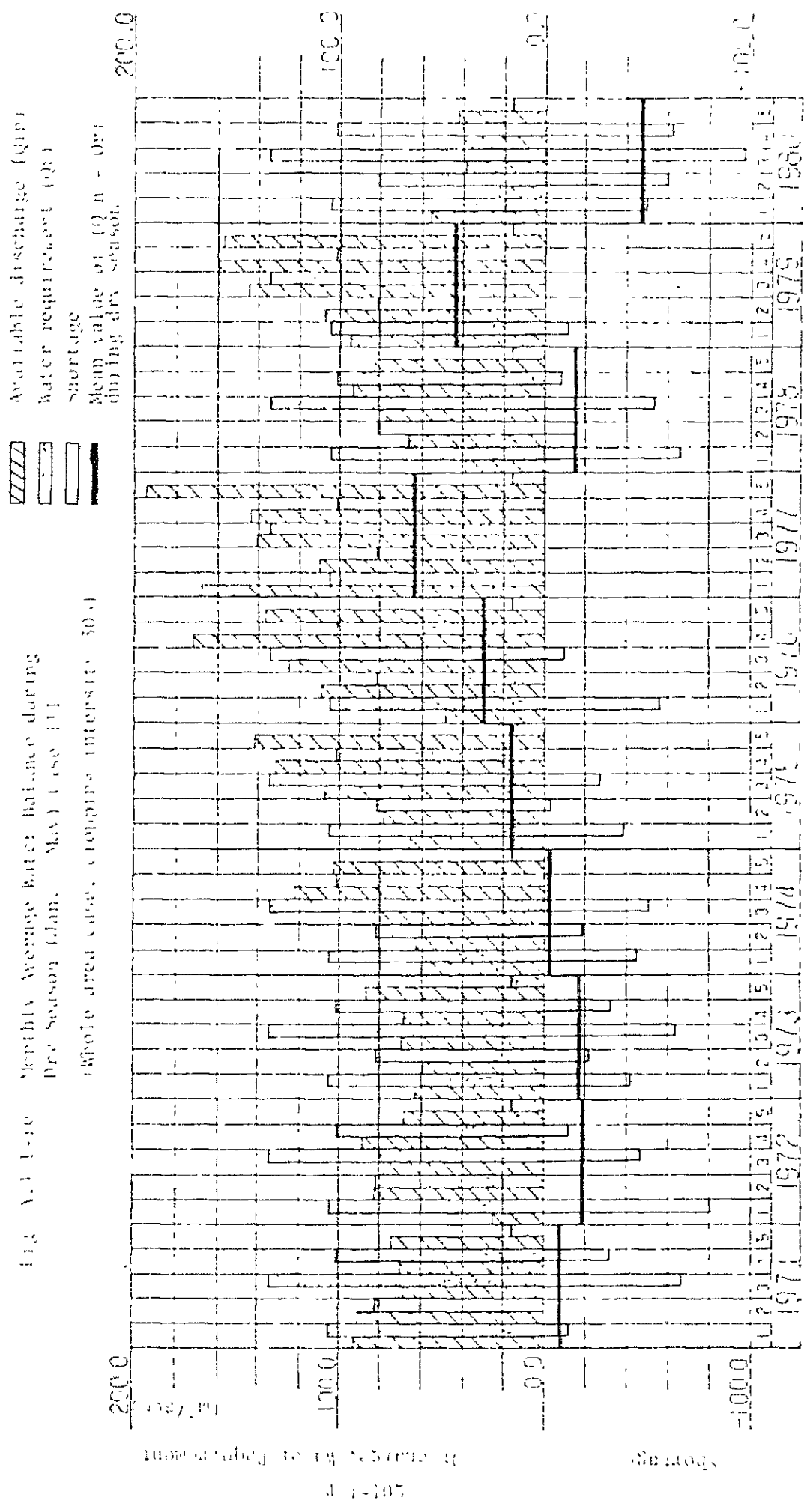
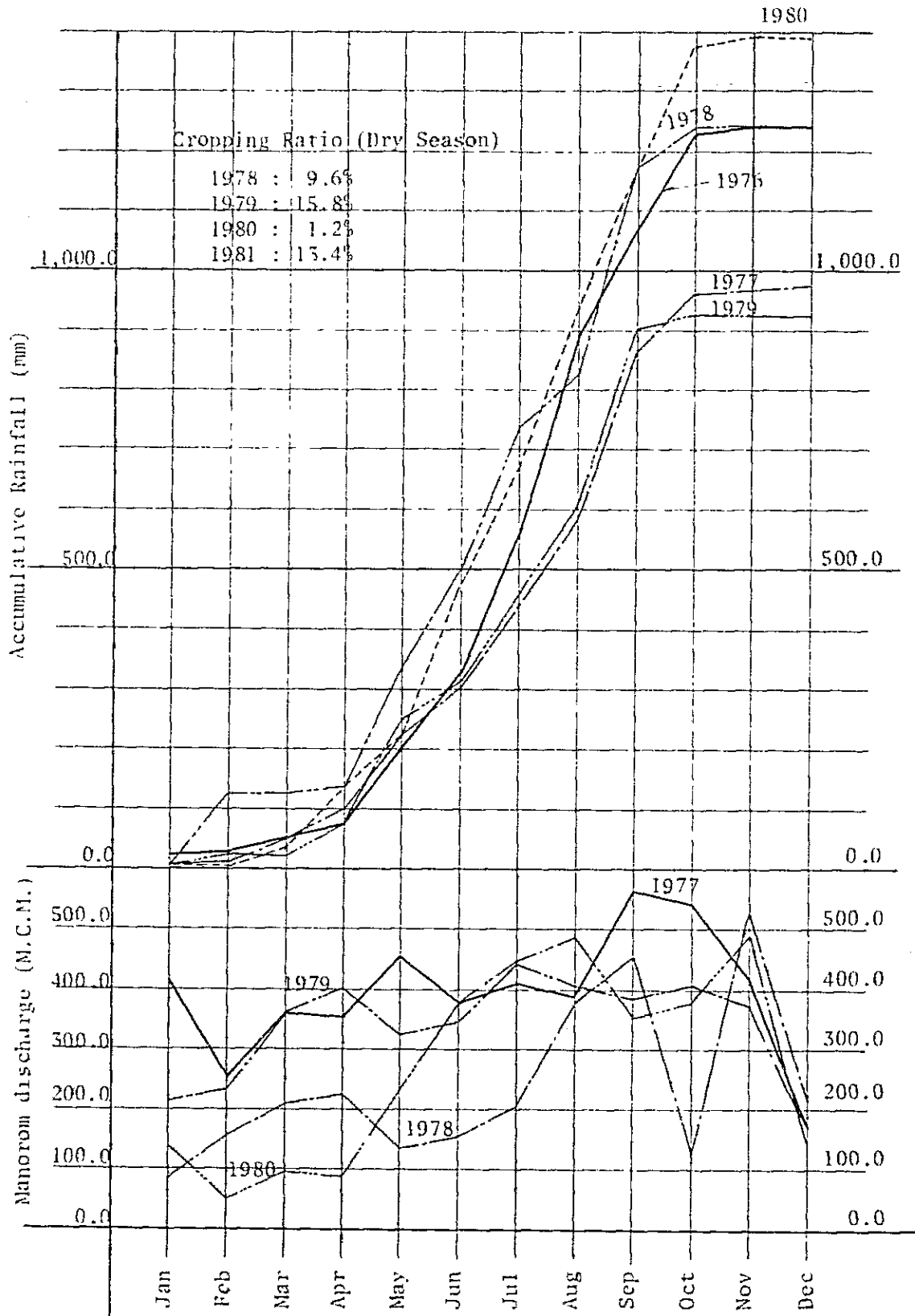


Fig. A.1.1-10 Monthly Average Water Balance during Dry Season (Jan. - May) Case III
 (Spole area case, climate interest = 50%)

Fig. A.1.1-10 Monthly Average Water Balance during Dry Season (Jan. - May) Case III (Spole area case, climate interest = 50%)

Fig. A.4.1-17 Relationship between Accumulative Rainfall and Manorom Intake Discharge



4.2. Study on Optimum Irrigation System

4.2. Study on Optimum Irrigation System

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Table A.4.2-1 Specifications and Cost of Pumping Plant for each Cases

Alter-native	Specification of Pump										Cost (1,000 Baht)			Pro-portion %	
	Q (m ³ /sec)	Ha (m)	Ht (m)	Delivery pipe (1,550mm)	Pump Dia (mm)	Motor (kw)	Unit	q per unit (m ³ /sec)	Housing space (m ²)	Pump plant	Suction pit	Housing	Delivery pipe		Total (per ha)
1 - 1	17.50	15.16	15.65	-	1,000	550	7	2.50	350	51,000	24,500	2,750	-	(฿5,525) 78,230	100
(1)	12.25	15.16	15.65	-	900	450	6	2.05	260						
1 - 2	2.85	13.27	29.00	6,500x1 =6,500m	750	610	2	1.45	160	61,500	29,120	3,280	94,000	(฿15,256) 187,700	240
(3)	2.40	8.27	8.80	-	700	165	2	1.20							
2	(1)	9.00	16.50	26.00	900	825	4	2.25	350	57,000	25,600	2,750	142,000	(฿15,915) 225,550	288
(2)	8.50	11.00	11.50	-	900	360	4	2.13							
3 - 1	16.70	13.16	13.65	-	1,000	460	7	2.59	350	50,000	24,500	2,750	-	(฿ 5,746) 77,250	104
3 - 2	13.70	13.16	15.65	-	900	440	6	2.29	260	52,000	25,060	2,810	31,500	(฿ 8,286) 111,570	150
	3.00	11.27	17.00	2,000x1 =2,000m	750	410	2	1.50	100						

Table A.4.2-2 Construction Cost of Main and Lateral Canals and Land Acquisition

(Unit : Thousand Baht)

Alternative	Quantity Cost	Q>15m ³ /sec	15>Q>10	10>Q>6	6>Q>3	3>Q>1	1>Q	Sub-total	Land Acquisition	Total
1 - 1	Q'ty	10,200 m	5,700 m	6,350 m	7,600 m	46,550 m	66,100 m	140,500 m		
	Cost	58,260	12,520	19,750	19,740	80,010	93,010	263,290	14,720	278,010
1 - 2	Q'ty	-	3,700 m	10,200 m	7,600 m	40,300 m	91,400 m	153,200 m		
	Cost	-	12,510	31,700	19,730	69,210	128,500	261,650	15,700	277,350
2	Q'ty	-	-	2,600 m	21,750 m	39,100 m	78,950 m	142,400 m		
	Cost	-	-	7,900	55,200	65,660	108,540	257,300	14,640	251,940
3 - 1	Q'ty	4,000 m	11,500 m	7,450 m	8,800 m	45,800 m	79,100 m	156,650 m		
	Cost	14,810	58,410	22,880	22,570	77,710	109,880	286,260	16,390	302,650
3 - 2	Q'ty	-	10,500 m	4,650 m	13,450 m	39,200 m	88,500 m	156,300 m		
	Cost	-	35,260	14,360	34,680	66,880	123,610	274,790	16,180	290,970

Table A.4.2-3 Breakdown Table on Construction Cost of Canal Networks

Description	Case I - 1			Case I - 2			Case II			Case III - 1			Case III - 2				
	Canal Type	Unit Cost (\$/m)	Length (m)	Cost (₹)	Length (m)	Cost (₹)	Length (m)	Cost (₹)	Length (m)	Cost (₹)	Length (m)	Cost (₹)	Length (m)	Cost (₹)	Length (m)	Cost (₹)	
A (P > 15cms)	2.702	10,200	22,460,400	-	-	-	4,000	8,808,000	-	-	-	-	-	-	-	-	
B (15 > O > 10)	1.986	3,700	7,348,200	3,700	7,348,200	-	-	11,500	22,839,000	10,500	20,853,000	-	-	-	-	-	
C (10 > O > 6)	1.826	6,350	11,595,100	10,200	18,625,200	2,600	4,747,600	7,450	13,603,700	4,650	8,490,900	-	-	-	-	-	
D (6 > O > 3)	1.525	7,600	11,590,000	7,600	11,590,000	21,750	33,168,750	8,800	13,420,000	13,450	20,511,250	-	-	-	-	-	
E (3 > O > 1)	1.009	46,550	46,968,950	40,300	40,662,700	39,100	39,451,900	45,800	46,212,200	39,200	39,552,800	-	-	-	-	-	
F (O < 1)	826	66,100	54,598,600	91,400	75,496,400	78,950	65,212,700	79,100	65,336,600	88,500	73,101,000	-	-	-	-	-	
1 Sub-total		140,500	154,561,250	153,200	153,722,500	142,400	142,580,950	156,650	170,219,500	156,300	162,508,950	-	-	-	-	-	
2 Canal Structure			29,565,000		29,245,000		25,700,000		29,960,000		29,660,000	-	-	-	-	-	
3 Others 1 + 2 x 0.1			18,412,625		18,296,750		14,260,665		20,017,950		19,216,895	-	-	-	-	-	
4 Sub-total			202,538,875		201,264,250		182,541,615		270,197,450		211,385,845	-	-	-	-	-	
5 Overhead (4 x 0.3)			60,761,662		60,379,275		54,762,484		66,059,235		63,415,753	-	-	-	-	-	
			263,100,537		261,643,525		237,304,099		286,256,685		274,801,598	-	-	-	-	-	
6 Total 4 + 5			263,300,000		261,640,000		237,300,000		286,260,000		274,800,000	-	-	-	-	-	
Land Acquisition																	
Canal Type	Unit Cost (\$/m)	Length (m)	Cost (₹)	Length (m)	Cost (₹)	Length (m)	Cost (₹)	Length (m)	Cost (₹)	Length (m)	Cost (₹)	Length (m)	Cost (₹)	Length (m)	Cost (₹)	Length (m)	Cost (₹)
A	134	10,200	1,366,800	-	-	-	-	4,000	536,000	-	-	-	-	-	-	-	-
B	131	3,700	484,700	3,700	484,700	-	-	11,500	1,506,500	10,500	1,375,500	-	-	-	-	-	-
C	134	6,350	850,900	10,200	1,366,800	2,600	348,400	7,450	998,300	4,650	623,100	-	-	-	-	-	-
D	125	7,600	950,000	7,600	950,000	21,750	2,718,750	8,800	1,100,000	13,450	1,681,250	-	-	-	-	-	-
E	100	46,550	4,655,000	40,300	4,030,000	39,100	3,910,000	45,800	4,580,000	39,200	3,920,000	-	-	-	-	-	-
F	87	66,100	6,411,700	91,400	8,865,800	78,950	7,658,150	79,100	7,672,700	88,500	8,584,500	-	-	-	-	-	-
7 Sub-total			14,719,100		15,697,300		14,635,300		16,393,500		16,184,350	-	-	-	-	-	-
			14,720,000		15,700,000		14,640,000		16,390,000		16,180,000	-	-	-	-	-	-
Total Amount 6 + 7			278,620,000		277,340,000		251,940,000		302,650,000		290,980,000	-	-	-	-	-	-

Table A.4.2-4 Operation and Maintenance Cost for Pumping Plant and Canal

Alternative	Total Output (KW)	Annual Operation Hours (HR)	Electricity Charge (B) (1)	No. of Station	Operator Wage (B) (2)	Canal Leng. Q > 3.0 Q < 3.0	Unit Cost per KM (B) **	Total canal O.M Cost (B) (3)		Total (4)=(1)+(2)+(3)	Remarks (per ha)
								(B)	(B)		
1-1	3,600	1,500	5,570,000	1	100,000	27,850m 112,650m 140,500m	12,000 6,000	334,000 676,000 1,100,000	6,770,000	478	
1-2	3,970	1,500	6,150,000	2	150,000	21,500m 131,700m 153,200m	12,000 6,000	258,000 790,000 1,048,000	7,348,000	519	
2	4,430	1,500	6,860,000	1	100,000	24,350m 118,050m 142,400m	12,000 6,000	292,000 708,000 1,000,000	7,960,000	562	
3-1	3,010	1,500	4,660,000	1	100,000	31,750m 124,900m 156,650m	12,000 6,000	381,000 749,000 1,130,000	5,890,000	438	
3-2	3,240	1,500	5,000,000	2	150,000	28,600m 127,700m 156,300m	12,000 6,000	343,000 767,000 1,110,000	6,260,000	466	

* Unit Charge per KWH is 1.19 Baht

** Unit Cost per KM : Q > 3.0 m³/s, 1.0 MMx6 Month x 2,00 B/M ÷ 12,000B/KM
Q < 3.0 m³/s, 0.5 MMx6 Month x 2,000B/M ÷ 6,000 "

Table A.4.2-5 Cost Comparison by Alternative

(Unit : \$1,000)

Project Year	1 - 1		1 - 2		2		3 - 1		3 - 2	
	Initial	O & M	Initial	O & M	Initial	O & M	Initial	O & M	Initial	O & M
1	35,624	-	46,505	-	47,727	-	37,988	-	40,234	-
2	71,248	-	93,010	-	95,454	-	75,976	-	80,468	-
3	89,060	1,693	116,262	1,837	119,317	1,990	94,970	1,473	100,585	1,565
4	89,060	3,885	116,263	3,674	119,318	3,980	94,970	2,945	100,585	3,130
5	71,248	5,078	93,010	5,511	95,454	5,970	75,976	4,418	80,468	4,695
6		6,770		7,348		7,960		5,890		6,260
7		"		"		"		"		"
8		"		"		"		"		"
9		"		"		"		"		"
10		"		"		"		"		"
11		"		"		"		"		"
12		"		"		"		"		"
13		"		"		"		"		"
14		"		"		"		"		"
15		"		"		"		"		"
16		"		"		"		"		"
17		"		"		"		"		"
18		"		"		"		"		"
19		"		"		"		"		"
20		"		"		"		"		"
21		"		"		"		"		"
22		"		"		"		"		"

Table A.4.2-6 Present Worth Value of Cost by Alternative

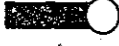



(Unit : K 1,000)

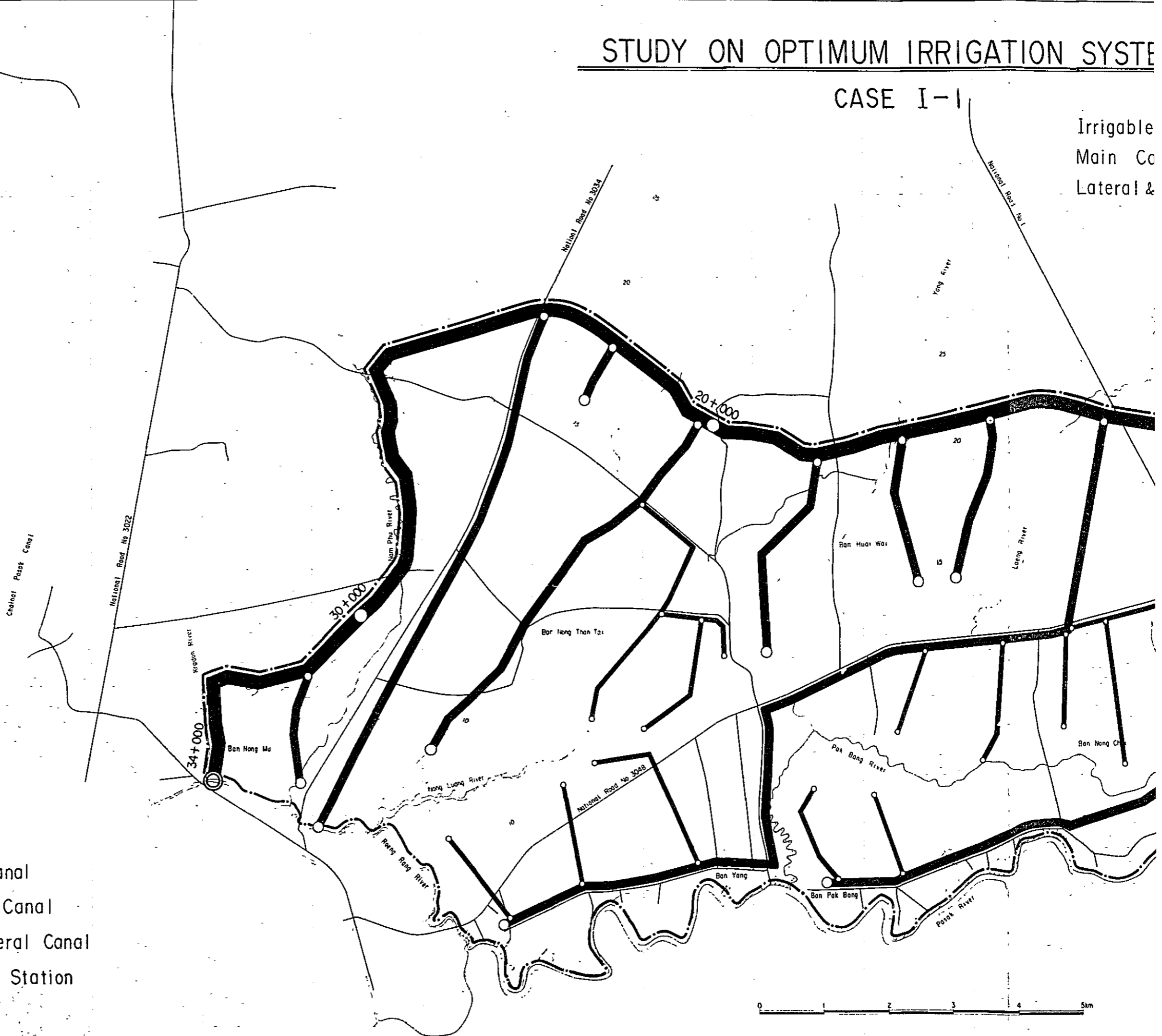
Project Year	Discount Rate : 10 %				
	1-1	1-2	2	3-1	3-2
1	32,386	42,278	43,389	34,535	36,577
2	58,879	76,863	78,883	62,787	66,499
3	68,183	88,728	91,138	72,458	76,745
4	63,481	81,917	84,213	66,876	70,837
5	47,391	61,172	62,974	49,917	52,878
6-22	33,371	36,599	39,647	29,337	31,180
<u>Total</u>	<u>303,691</u>	<u>387,557</u>	<u>400,244</u>	<u>315,910</u>	<u>334,716</u>
Irrigable Area (ha)	14,160	14 160	14,160	13,440	13,440
PWV/ha	21,447	27,370	28,266	23,505	24,904
Proportion	100	128	132	110	116

STUDY ON OPTIMUM IRRIGATION SYSTEM

CASE I-1

Irrigable
Main Ca
Lateral &

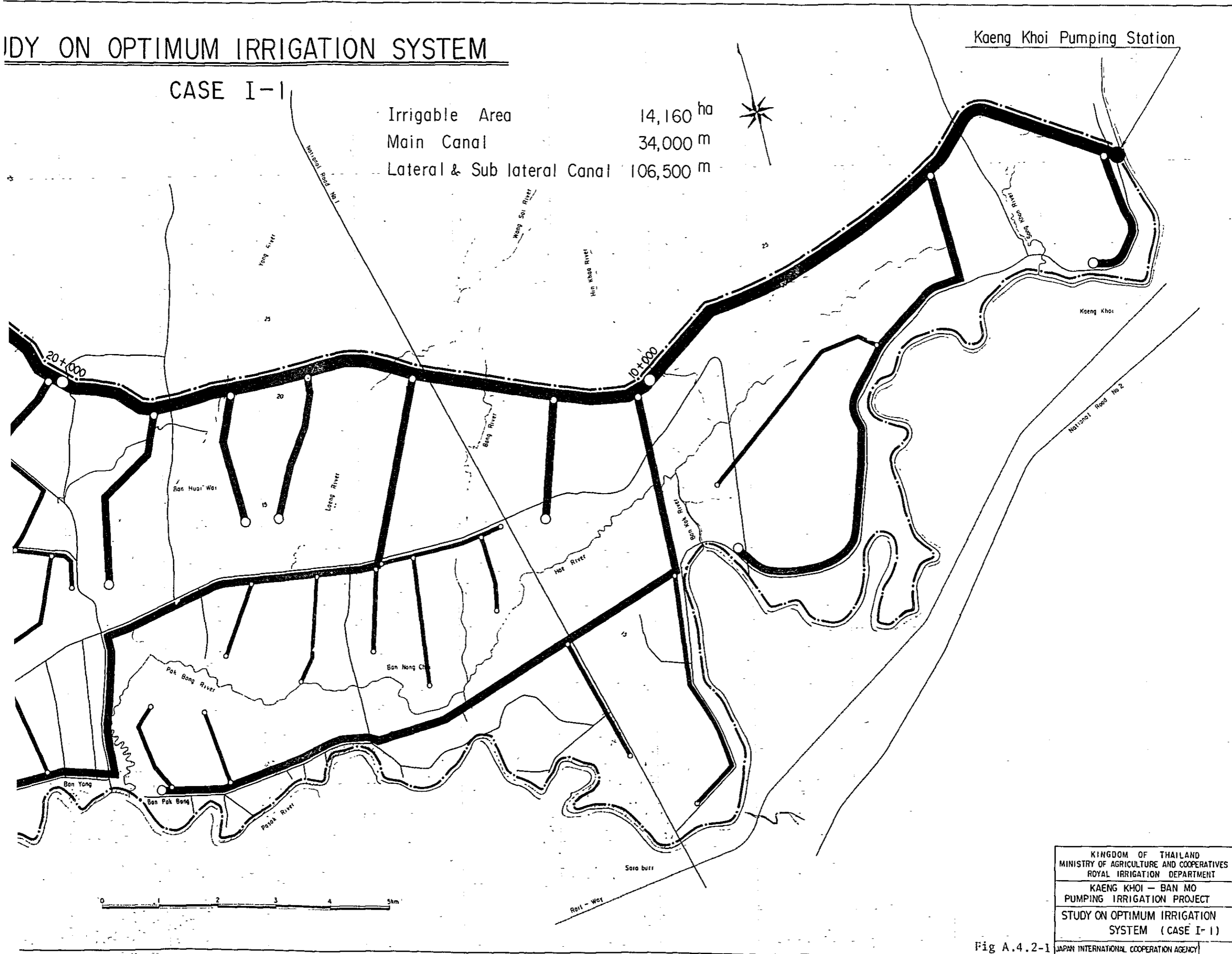
- Legend**
-  Main Canal
 -  Lateral Canal
 -  Sub Lateral Canal
 -  Pumping Station



STUDY ON OPTIMUM IRRIGATION SYSTEM

CASE I-1

Irrigable Area 14,160 ha
 Main Canal 34,000 m
 Lateral & Sub lateral Canal 106,500 m



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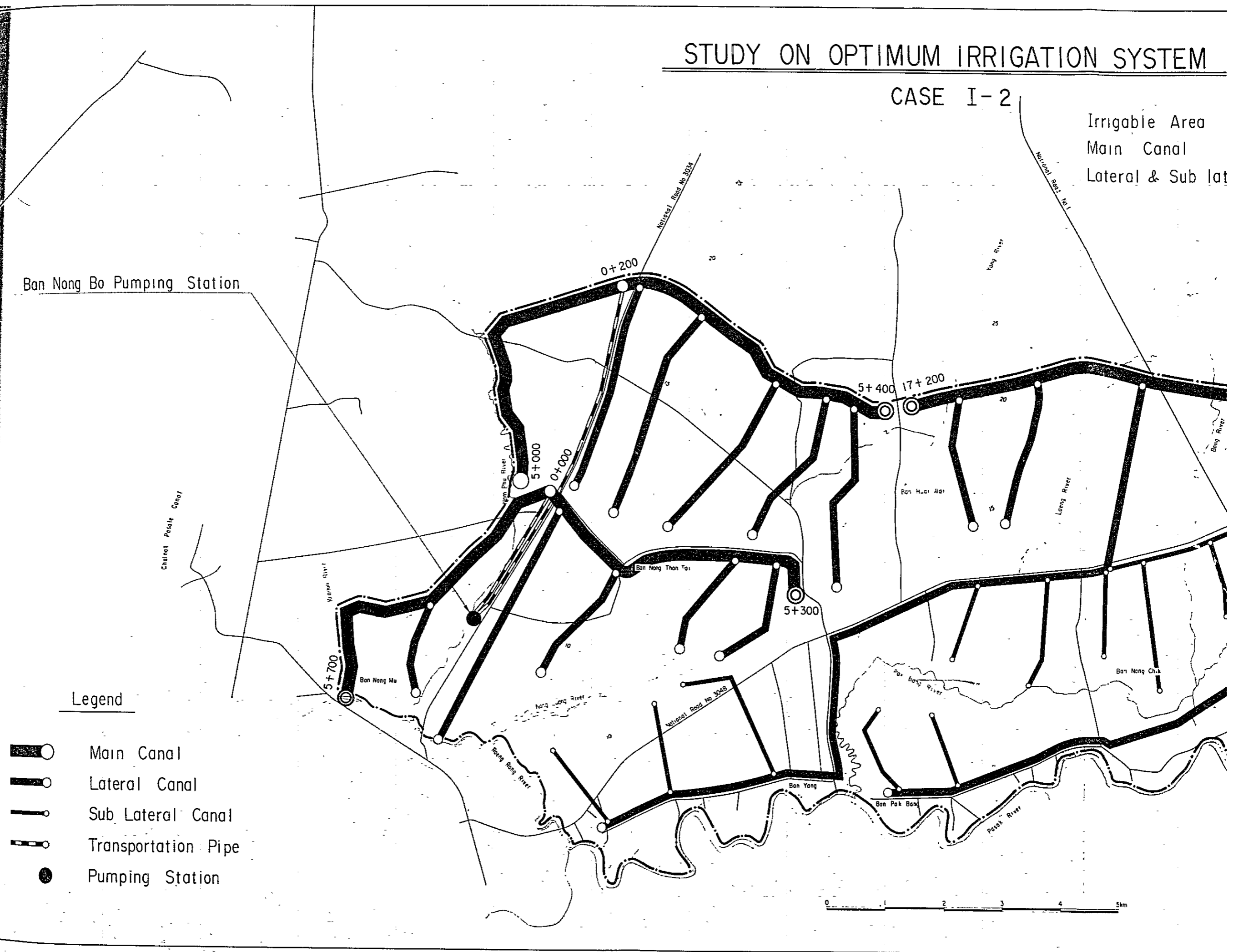
Fig A.4.2-1

STUDY ON OPTIMUM IRRIGATION SYSTEM






CASE I-2

Irrigable Area
Main Canal
Lateral & Sub lat

Ban Nong Bo Pumping Station



Legend

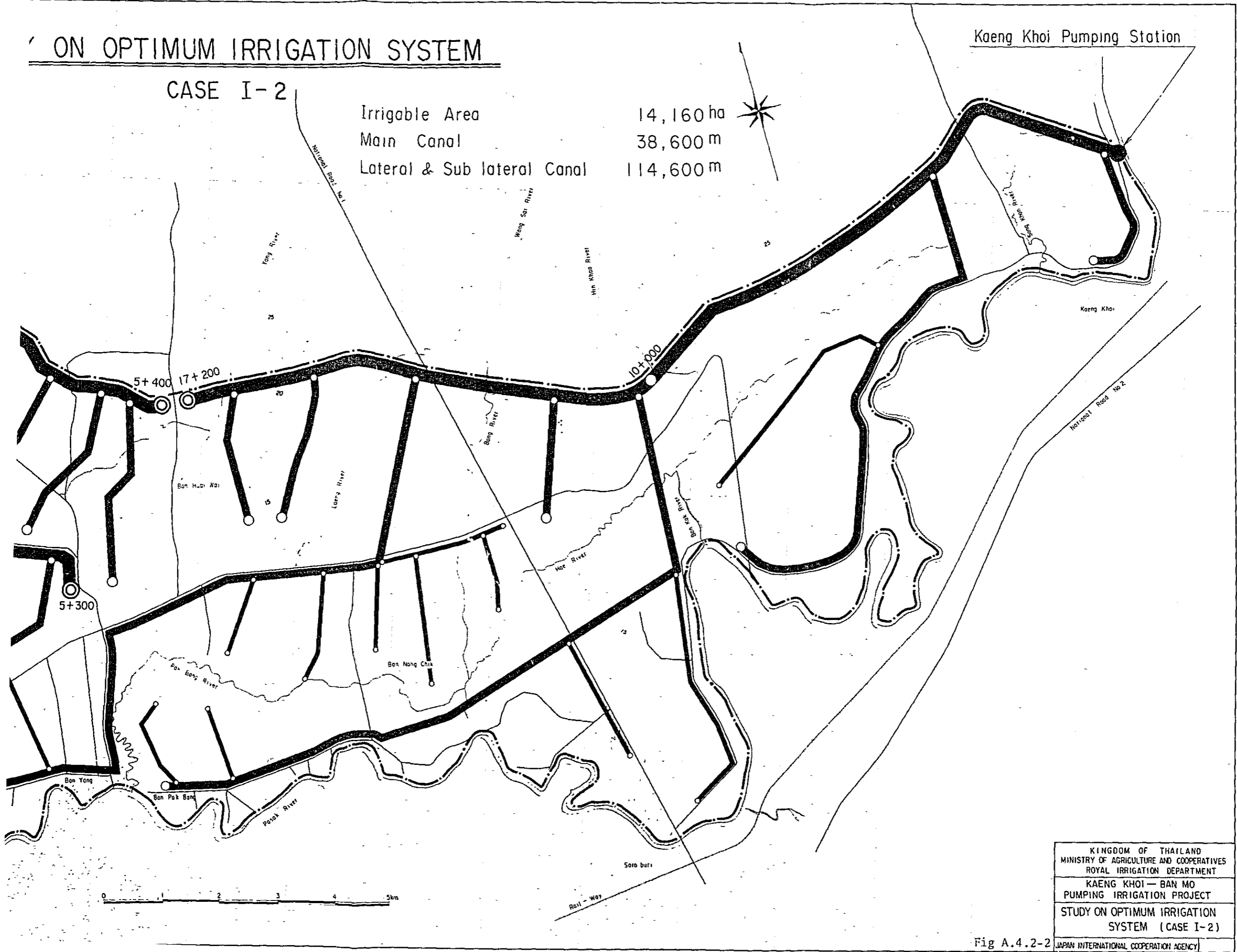
-  Main Canal
-  Lateral Canal
-  Sub Lateral Canal
-  Transportation Pipe
-  Pumping Station

ON OPTIMUM IRRIGATION SYSTEM

CASE I-2

Irrigable Area 14,160 ha
 Main Canal 38,600 m
 Lateral & Sub lateral Canal 114,600 m

Kaeng Khoi Pumping Station



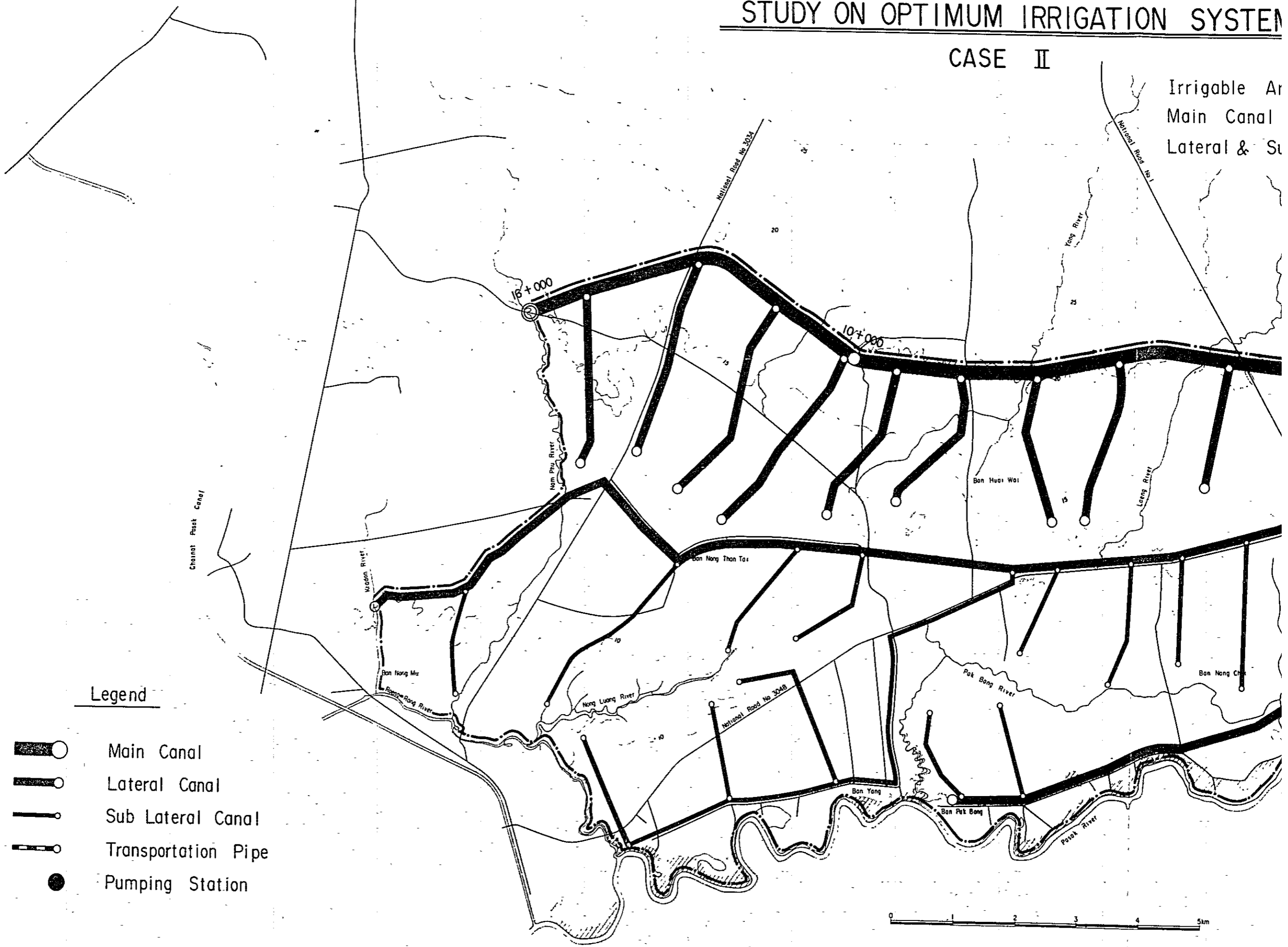
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Fig A.4.2-2


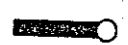



STUDY ON OPTIMUM IRRIGATION SYSTEM

CASE II

Irrigable Area
Main Canal
Lateral & Sub Lateral



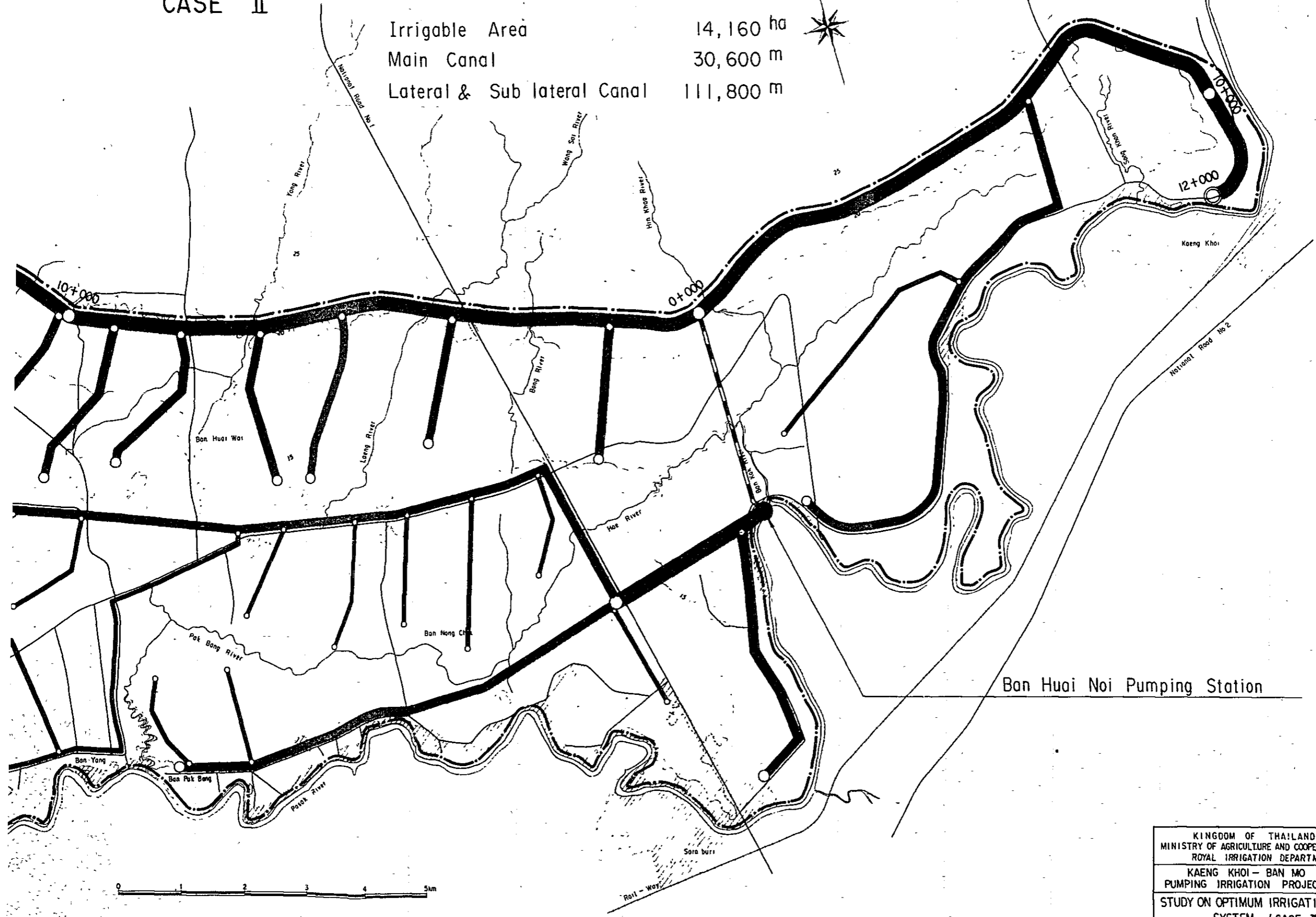
Legend

-  Main Canal
-  Lateral Canal
-  Sub Lateral Canal
-  Transportation Pipe
-  Pumping Station

ON OPTIMUM IRRIGATION SYSTEM

CASE II

Irrigable Area 14,160 ha
 Main Canal 30,600 m
 Lateral & Sub lateral Canal 111,800 m



Ban Hui Noi Pumping Station

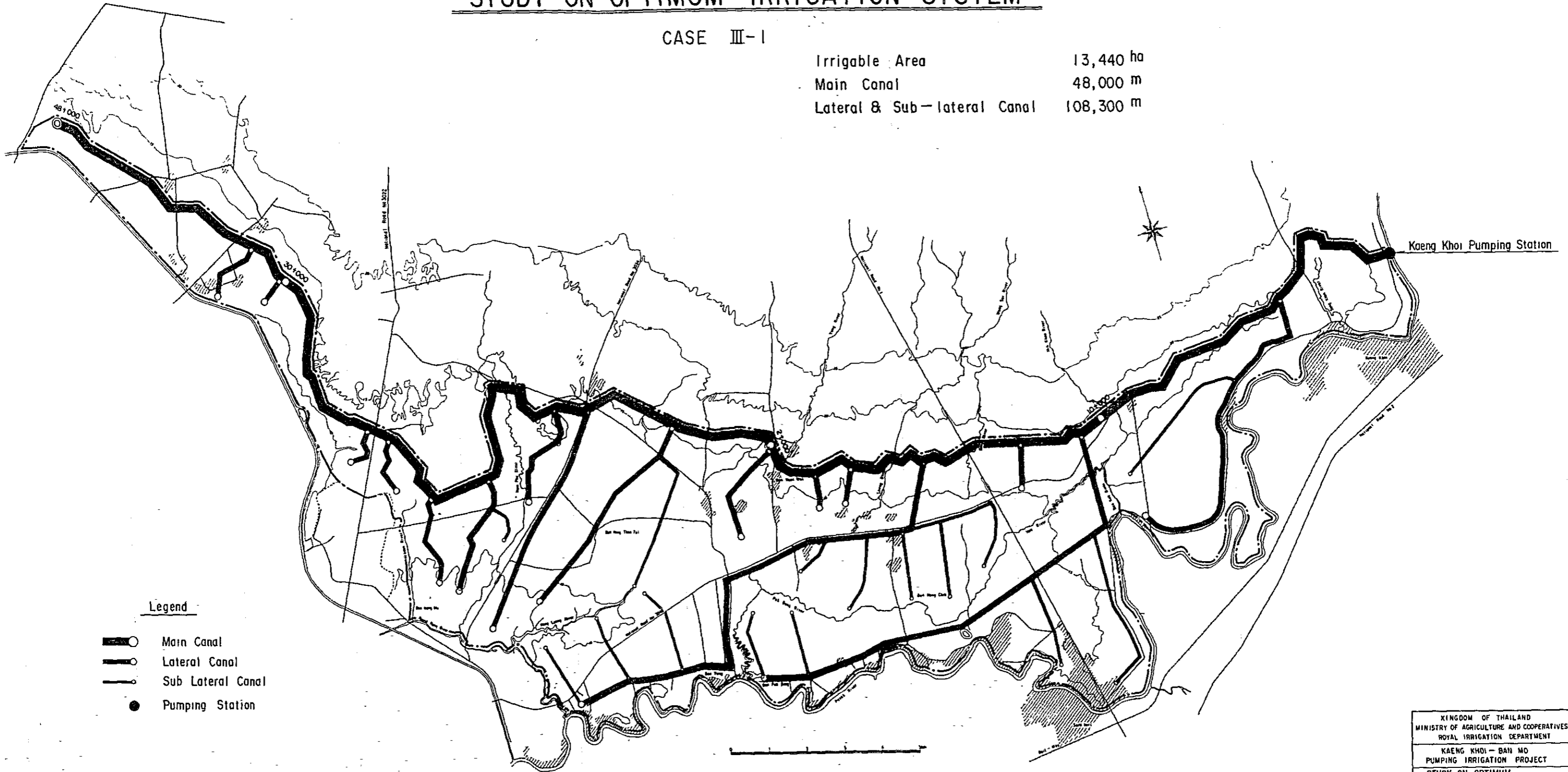
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Fig A.4.2-3





STUDY ON OPTIMUM IRRIGATION SYSTEM

CASE III-1

Irrigable Area	13,440 ha
Main Canal	48,000 m
Lateral & Sub-lateral Canal	108,300 m



Legend

-  Main Canal
-  Lateral Canal
-  Sub Lateral Canal
-  Pumping Station

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STUDY ON OPTIMUM IRRIGATION SYSTEM CASE III-1
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Fig A.4.2-4

STUDY ON OPTIMUM IRRIGATION SYSTEM

CASE III-2

Irrigable Area	13,440 ha
Main Canal	48,000 m
Lateral & Sub-lateral Canal	108,300 m

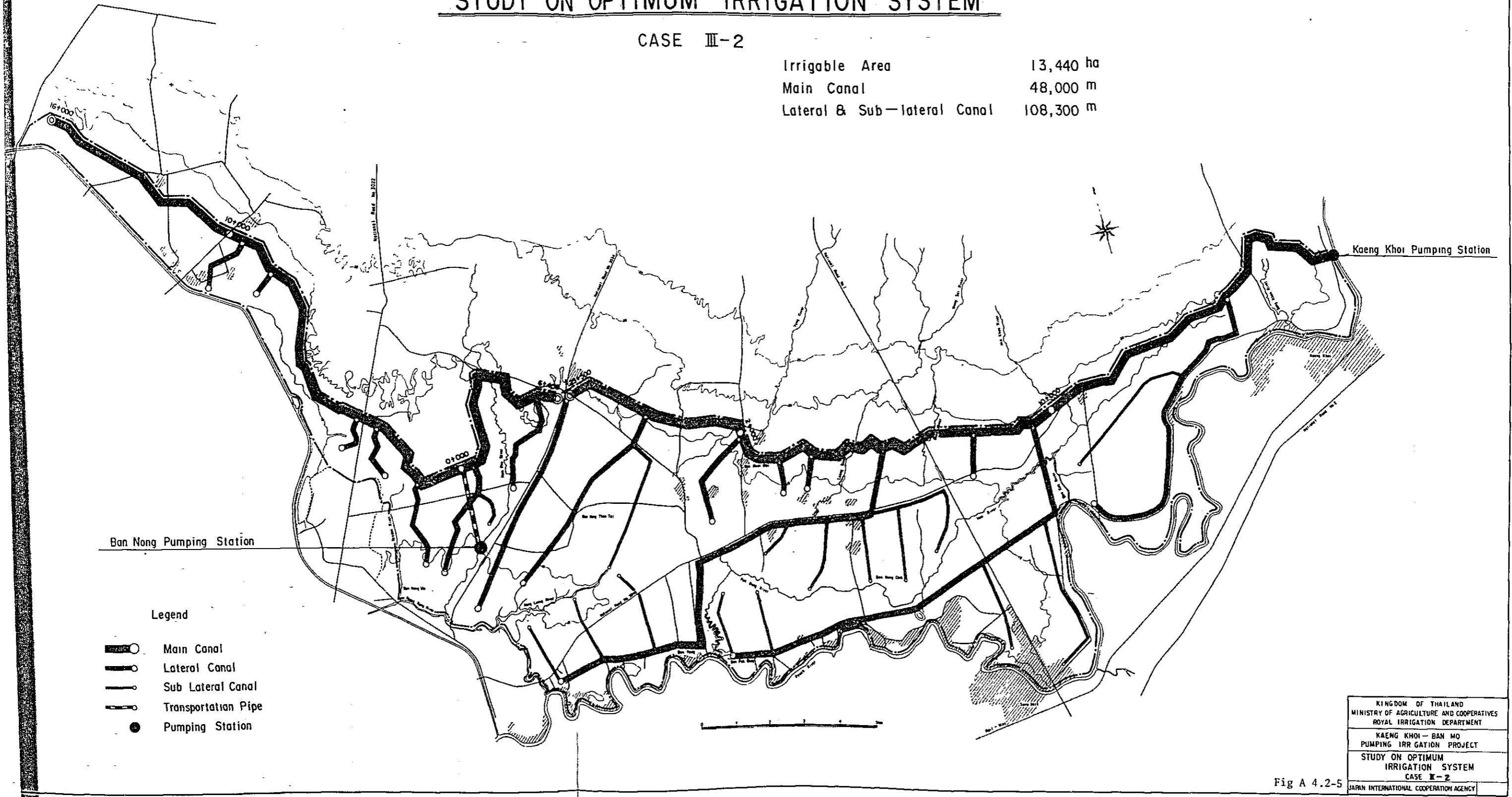


Fig A 4.2-5

4.3. Assessment of Existing Pumping Project

4.3. Assessment of Existing Pumping Project

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4.3. Assessment of Existing Pumping Projects

A. Assessment of NEA Existing Pumping Projects

A.1. Economic Comparison

Three pumping irrigation projects are under implementation by NEA of which service area of about 1,500 ha in total is included in the Project Area. Under the situations, the following two cases are taken into consideration in formulating the Project facilities plan:

Case 1. To dismantle partially the NEA project facilities placed in the service area of about 1,500 ha, and integrate the other facilities in the area as the Project facilities; and

Case 2. To maintain the NEA project facilities separately or independently from the Project after the implementation of the Project.

Case 2 is further sub-divided into the three cases as follows;

Case 2-1. To irrigate service areas of NEA project excluding 553 ha included in the Project through NEA facilities, and to irrigate 553 ha which belong both to NEA project and the Project by Kaeng Khoi pumping station and its main canal.

Case 2-2. To irrigate service areas of NEA project through NEA project facilities as mentioned in Case 2-1, and to irrigate the farm lands of 553 ha covered by the Project but excluded from NEA project areas by an additional pumping station, and its irrigation system that will be installed separately from the Project.

Case 2-3. To irrigate service area of NEA project through NEA project facilities as made in Case 2-1, and to install new pumping facilities at the same site of Ban Tao Pum pumping station of NEA for irrigation of the farm lands mentioned in Case 2-2 for which canal sections under the NEA project will be enlarged to meet the increased irrigation requirement.

Results of an economic comparison of the above-mentioned four cases are tabulated below; (Refer to Tables A.4.3-1 to A.4.3-3)

(Unit: 1,000 Baht)

<u>Item</u>	<u>Case-1</u>	<u>Case-2-1</u>	<u>Case-2-2</u>	<u>Case-2-3</u>
Construction Cost	409,899	412,059	410,645	410,203
O & M Cost	13,015	13,955	14,059	14,059
EIRR (%)	18.2	18.0	18.1	18.1

The above table suggests the following;

- 1) The construction costs in the four cases are hardly different each other;
- 2) The operation & maintenance costs in them differ by about one million Baht;
- 3) It seems that the difference in the operation & maintenance costs affects the internal rate of returns in the four cases;
- 4) Under the current regulations of the Government of Thailand, all operation & maintenance cost of RID project facilities is borne by the government whereas, in case of NEA project facilities, the electric charge out of the operation & maintenance cost are borne by farmers. The yearly operation & maintenance cost of facilities for latter amounts to about 1.6 million Baht, or about

1,090 Baht per hectare, or 174 Baht per rai.

- 5) Even if NEA facilities are placed under the direct control of RID in future; the national assistance for operation & maintenance of such facilities is unavoidably made in case of the separation plan of pumping facilities.

As a result, the case of dismantling NEA pumping facilities and lifting irrigation water only by Kaeng Khoi pumping station is slightly economical than the others.

A.2. Technical Comparison

- 1) Needless to say, the more are the units of water source facilities, the more complicate is the water management. Ban Ta Toom area, one of the NEA pumping irrigation projects areas, is 1,280 ha in total out of which about 257 ha situated at the southern most are included in the Project Area; therefore, this acreage should be excluded from the NEA project area.
- 2) Pumping facilities being installed in NEA projects are mostly of the floating type that are moved when river water levels fluctuate, and are difficult, in maintenance and management, to be utilized for a long time as permanent facilities.
- 3) The irrigation criteria of NEA premise to provide the standard irrigation block of 500 to 600 ha in scale with one unit of pump with 400 mm dia for general use. The pumps do not meet the water requirement everywhere in their service areas, and some additional pump units are required in some blocks, accordingly, three to four units in some cases.
- 4) In determining service area of NEA projects, areas for which stabilized water sources are difficult to be made avail of are partially excluded from the service areas, resulting in com-

plicated irrigation systems in the excluded areas. It is desirable to integrate the irrigation systems in and out of NEA pumping irrigation project areas since unforeseeable problems might occur, with such irrigation systems, in water management even if the responsibility to manage all of facilities is entrusted to RID in future.

- 5) Pumping facilities of this kind in Thailand is 900 to 1,000 mm in the maximum bore diameter. It has been proposed to equip Kaeng Khoi pumping station with seven units of pump with 1,000 mm dia. in consideration of easiness in mutual exchange of spare-parts among pumping stations.
- 6) The integration plan will inevitably result in an uneconomical investment amounting to about 3.3 million Baht since, out of the facilities financed by NEA, only irrigation canals are utilized in the Project and the other facilities are used only for four-year period, however, the separation plan also requires more or less the improvements of facilities having been already constructed.

A.3. Conclusion

As a result of both economic and technical comparison, it might be the most reasonable way that the existing facilities in the NEA pumping irrigation project area on the right bank of the Pasak river, which is adjacent to the Project Area, will be integrated in the Project as much as possible to be utilized in the Project to the maximum extent so that irrigation water will be lifted only by the integrated Kaeng Khoi pumping station to irrigate the entire Project Area inclusive of this area and so that the operation & maintenance of all facilities will be placed under the direct control of RID.

Table A.4.5-1 Comparison of Construction Cost For Each Cases on NEA Project Concerned
(Unit: ₱1,000)

Item	Case-1	Case 2-1	Case 2-2	Case 2-3	Remark
<u>1. KKBM Pumping Project</u>					
No.1 Pumping station	92,249	86,949	84,949	84,949	
No.2 " "	-	-	5,911	5,911	
Main canal	115,241	112,811	112,811	112,811	
Lateral and sub-lateral (1L, 2L and 3L)	30,437	18,095	12,770	6,312	
" (4L - 12L)	164,447	164,447	164,447	164,447	
Invested by NEA Project	4,960	-	-	2,146	
Sub-total	<u>405,529</u>	<u>582,502</u>	<u>580,888</u>	<u>576,576</u>	
<u>2. NEA Pumping Project</u>					
Existing pumping station	-	4,022	4,022	4,022	
Additionally " "	-	2,521	2,521	2,521	
Main canal	-	16,995	16,995	18,256	
Lateral and Sub-total canal	-	6,419	6,419	6,419	
Sub-total	-	<u>29,757</u>	<u>29,757</u>	<u>30,998</u>	
Total (1) + (2)	<u>405,529</u>	<u>412,059</u>	<u>410,645</u>	<u>407,574</u>	
<u>3. Reconstruction, Depreciation</u>					
Depreciation cost for NEA pump	6,543x4/20=1,269	-	-	-	
Reconstruction NEA canals	3,501	-	-	2,629	
Total	<u>4,570</u>	-	-	<u>2,629</u>	
4. Grand Total	<u>409,899</u>	<u>412,059</u>	<u>410,645</u>	<u>410,203</u>	
%	<u>100.0</u>	<u>100.5</u>	<u>100.2</u>	<u>100.1</u>	

Table A.4.3-2 Breakdown of O & M Cost on NEA Project Concerned

(Unit: ₱1,000)

<u>Item</u>	<u>Case 1</u>	<u>Case 2-1</u>	<u>Case 2-2</u>	<u>Case 2-3</u>
1. Salaries and wages				
Officer	420	420	420	420
Permanent employee	1,476	1,634	1,706	1,706
Temporary employee	1,494	1,494	1,494	1,494
<u>Sub-total</u>	<u>3,590</u>	<u>3,548</u>	<u>3,620</u>	<u>3,620</u>
2. Materials supply	<u>500</u>	<u>300</u>	<u>300</u>	<u>300</u>
3. Maintenance cost				
Pumping station	540	600	600	600
Canal systems	420	420	420	420
<u>Sub-total</u>	<u>960</u>	<u>1,020</u>	<u>1,020</u>	<u>1,020</u>
4. Operation cost (Electricity Charge)				
4.1 Consumptive power energy (KWH)				
(a) Wet season				
Contracted load capacity (KW)	3,665	3,982	3,996	3,996
Operation hour (hr)	1,306	1,306	1,306	1,306
Power energy (1,000 KWH)	4,786	5,200	5,219	5,219
(b) Dry season				
Contracted load capacity KW)	1,047	1,138	1,141	1,141
Operation hour (hr)	2,142	2,142	2,142	2,142
Power energy (1,000 KWH)	2,243	2,438	2,444	2,444
<u>sub-total (1,000 KWH)</u>	<u>7,029</u>	<u>7,636</u>	<u>7,663</u>	<u>7,663</u>
4.2 Unit Cost (₱/KWH)	1.19	1.19	1.19	1.19
4.3 Electricity Charge (₱1,000)	<u>8,365</u>	<u>9,087</u>	<u>9,119</u>	<u>9,119</u>
<u>Total (1 - 4)</u>	<u>13,015</u>	<u>13,955</u>	<u>14,059</u>	<u>14,059</u>
%	(100.0)	(107.2)	(108.0)	(108.0)

Table A.4.3-3 Loading Capacity of Pump Plants on NEA Project Concerned

<u>Item</u>	<u>Case 1</u>	<u>Case 2-1</u>	<u>Case2-2</u>	<u>Case 2-3</u>
1. KKBM pumping station				
No.1 pumping station	560 x 7 =3,920KW	500 x 7 =3,500KW	480 x 7 =3,360KW	480 x 7 =3,360KW
No.2 " "	-	-	75x2=150KW	75x2=150KW
<u>Sub-total (KW)</u>	<u>3,920</u>	<u>3,500</u>	<u>3,510</u>	<u>3,510</u>
2. NEA pumping station				
2.1 Existing pumping station				
Ban Tao Pun	-	105x2=210	210	210
Ban Song Khon	-	115x2=230	230	230
Ban Ta Toom	-	$105 \times 3 \times \frac{257}{1,280} = 63$	63	63
<u>Sub-total</u>	<u>-</u>	<u>503</u>	<u>503</u>	<u>503</u>
2.2 Additionally pumping station				
Ban Tao Pun	-	135	135	135
Ban Song Khon	-	55	55	55
Ban Ta Toom	-	$110 \times 3 \times \frac{257}{1,280} = 66$	66	66
<u>Sub-total (KW)</u>	<u>-</u>	<u>256</u>	<u>256</u>	<u>256</u>
<u>Total (KW)</u>	<u>3,920</u>	<u>4,259</u>	<u>4,269</u>	<u>4,269</u>
3. Contracted load capacity (KW)				
3.1 Wet season				
Load capacity (1)	3,920	4,259	4,269	4,269
<u>Contracted load capacity (2)</u>	<u>3,665</u>	<u>3,982</u>	<u>3,996</u>	<u>3,996</u>
3.2 Dry season				
Load capacity (1)	1,120	1,217	1,220	1,220
<u>Contracted load capacity (2)</u>	<u>1,047</u>	<u>1,138</u>	<u>1,141</u>	<u>1,141</u>
(2)=(1)÷1.15÷0.93				

Table A.4.3-4 Cost Comparison on Irrigation Facilities
of Cooperatives' Project

(Unit: ¥1,000)

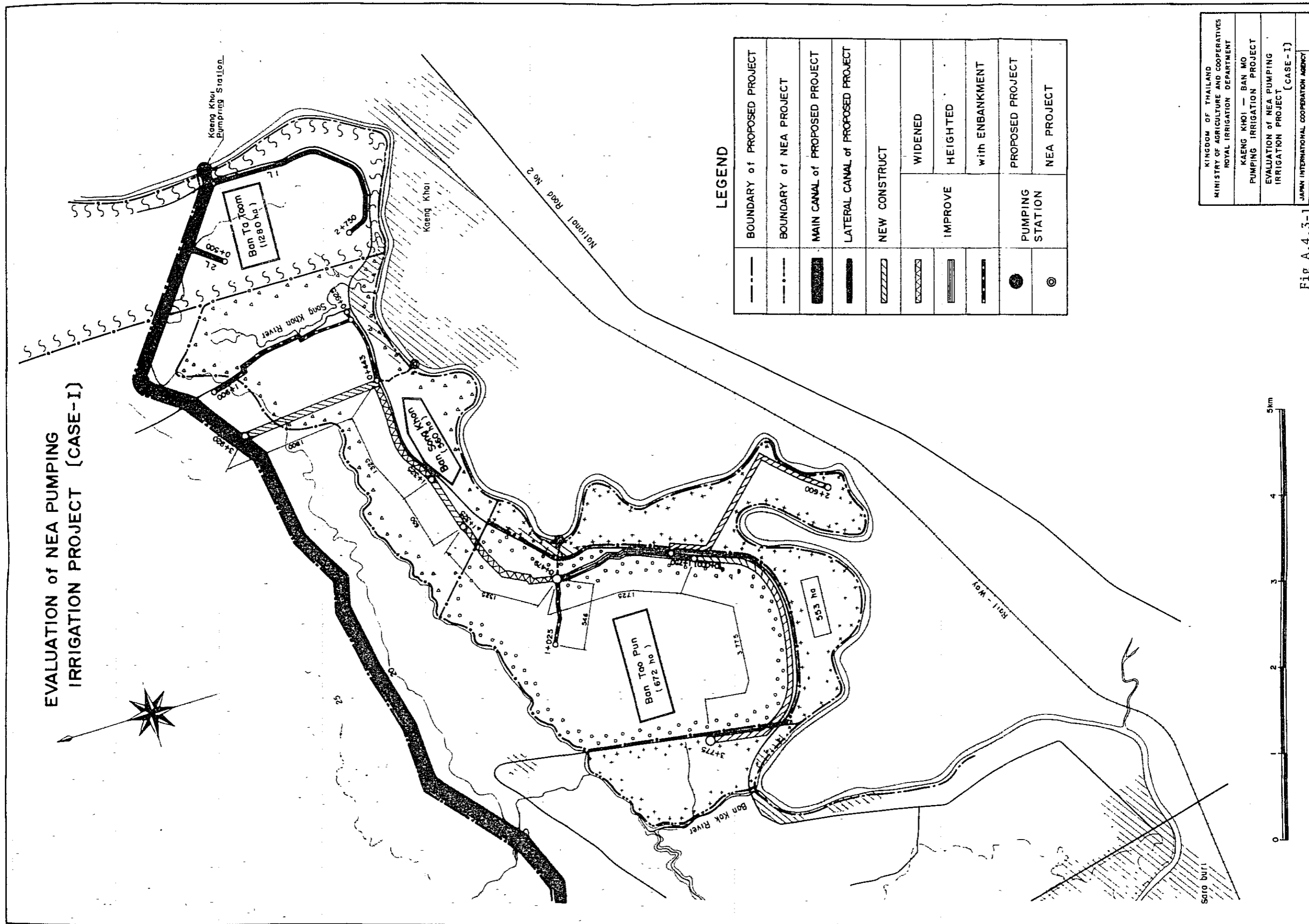
Project Name	Description of works	Construction cost	
		Integrated	Separated case
A. KKBM	1. Pumping station	27,949	27,949
	Pump plant	61,090	60,135
	Housing	3,210	3,210
	<u>Sub-total</u>	<u>92,249</u>	<u>91,294</u>
	2. Main canal (KM0-KM14+750)	48,182	44,522
	" (KM14+750-KM35+350)	37,865	37,865
	Structures	27,194	27,194
	<u>Sub-total</u>	<u>113,241</u>	<u>109,581</u>
	3. Lateral, sub-lateral canals		
	4L and sub-lateral	43,024	43,024
	6L and sub-lateral	63,411	53,059
Other lateral, sub-lateral	95,244	95,244	
<u>Sub-total</u>	<u>201,679</u>	<u>191,327</u>	
	<u>Total</u>	<u>406,057</u>	<u>392,202</u>
B. Cooperatives			
	1. Pumping station	-	1,910
	Pump plant (5/20)	1,338*	5,350
	Housing	-	200
	<u>Sub-total</u>	<u>1,338</u>	<u>7,460</u>
	2. Main and lateral canal	-	12,510
	3. Dead cost		
	Canal (15/20)	1,691	-
	Pumping station (15/20)	1,583	-
	<u>Sub-total</u>	<u>3,274</u>	<u>-</u>
	<u>Total</u>	<u>4,612</u>	<u>19,970</u>
		<u>Grand Total</u>	<u>410,649</u>

Note: * The figure indicates depreciation cost of existing pumping plants during operating period of five years up to 1987.

Table A.4.3-5 Breakdown of O & M Cost on Cooperatives' Project

<u>Item</u>	<u>Integrated case</u>	<u>Separated case</u>
1. Wages		
Officer	420	420
Permanent Employee	1,476	1,548
Temporary Employee	1,494	1,494
<u>Sub-total</u>	<u>3,390</u>	<u>3,462</u>
2. Material	300	300
3. Maintenance & repair cost		
Pump	540	600
Canal	420	420
<u>Sub-total</u>	<u>960</u>	<u>1,020</u>
4. Pump operation cost		
4.1 Consumptive power (KWH)		
(Wet season)		
Contracted load (KW)	3,665	5,590
Operation hour (hr)	1,306	1,306
Power energy (1,000 KWH)	4,786	4,689
(Dry season)		
Contracted load (KW)	1,047	1,047
Operation hour (hr)	2,142	2,142
Power energy (1,000 KWH)	2,243	2,243
Amount consumptive power (1,000 KWH)	7,029	6,932
4.2 Unit cost (฿/KWH)	1.19	1.19
4.3 Electricity charge (1,000฿)	8,364	8,249
<u>Total (1 - 4)</u>	<u>13,014</u>	<u>13,031</u>
%	100.0	100.1

EVALUATION of NEA PUMPING IRRIGATION PROJECT (CASE-I)



LEGEND

---	BOUNDARY of PROPOSED PROJECT		
- - -	BOUNDARY of NEA PROJECT		
▬	MAIN CANAL of PROPOSED PROJECT		
▬	LATERAL CANAL of PROPOSED PROJECT		
▨	NEW CONSTRUCT		
▧	WIDENED		
▩	IMPROVE		
▪	HEIGHTED		
▫	with ENBANKMENT		
●	PUMPING STATION		
◎	NEA PROJECT		

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Fig A.4.3-1

EVALUATION of NEA PUMPING
IRRIGATION PROJECT (CASE II-1)

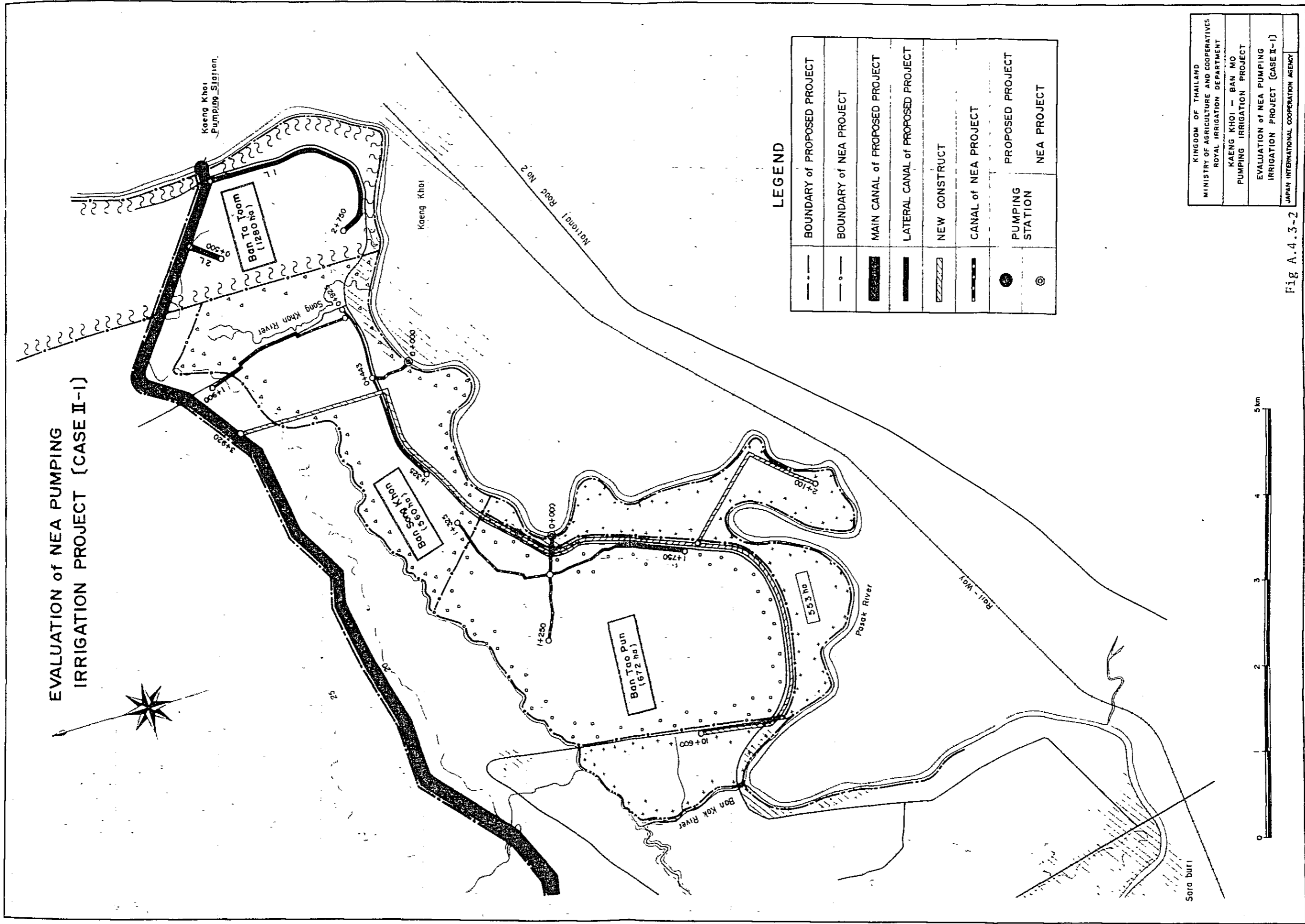
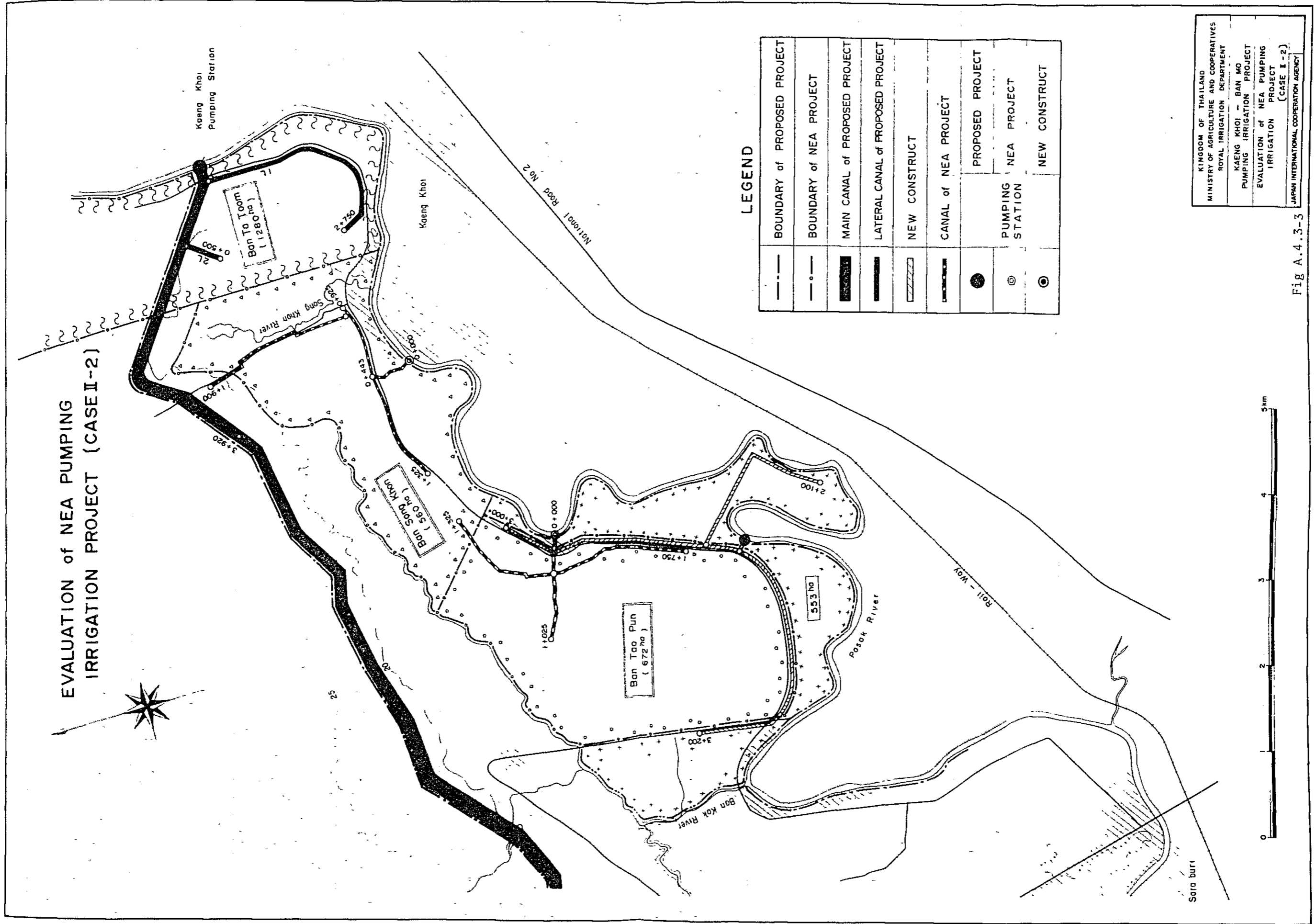


Fig A.4.3-2

EVALUATION of NEA PUMPING
IRRIGATION PROJECT (CASE II-2)



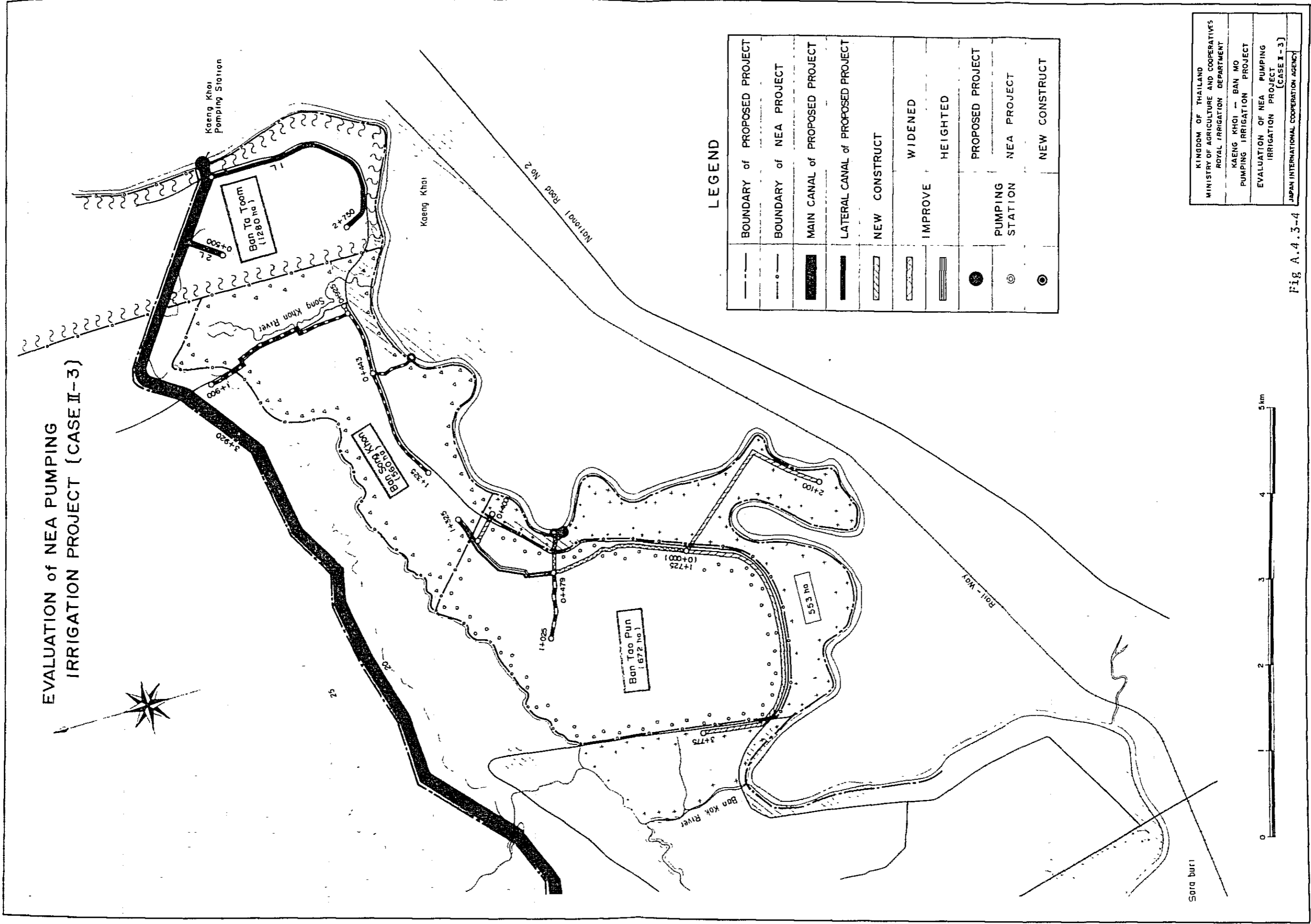
LEGEND

---	BOUNDARY of PROPOSED PROJECT
-o-	BOUNDARY of NEA PROJECT
█	MAIN CANAL of PROPOSED PROJECT
▬	LATERAL CANAL of PROPOSED PROJECT
▨	NEW CONSTRUCT
▬	CANAL of NEA PROJECT
●	PROPOSED PROJECT
⊙	PUMPING NEA PROJECT STATION
⊙	NEW CONSTRUCT

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IRRIGATION PROJECT
(CASE II-2)
JAPAN INTERNATIONAL COOPERATION AGENCY

Fig A.4.3-3

EVALUATION of NEA PUMPING
IRRIGATION PROJECT (CASE II-3)



LEGEND

	BOUNDARY of PROPOSED PROJECT
	BOUNDARY of NEA PROJECT
	MAIN CANAL of PROPOSED PROJECT
	LATERAL CANAL of PROPOSED PROJECT
	NEW CONSTRUCT
	IMPROVE
	WIDENED
	HEIGHTED
	PROPOSED PROJECT PUMPING STATION
	NEA PROJECT PUMPING STATION
	NEW CONSTRUCT PUMPING STATION

KINGDOM OF THAILAND
MINISTRY OF AGRICULTURE AND COOPERATIVES
ROYAL IRRIGATION DEPARTMENT
KAENG KHOI - BAN MO
PUMPING IRRIGATION PROJECT
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Fig A.4.3-4

