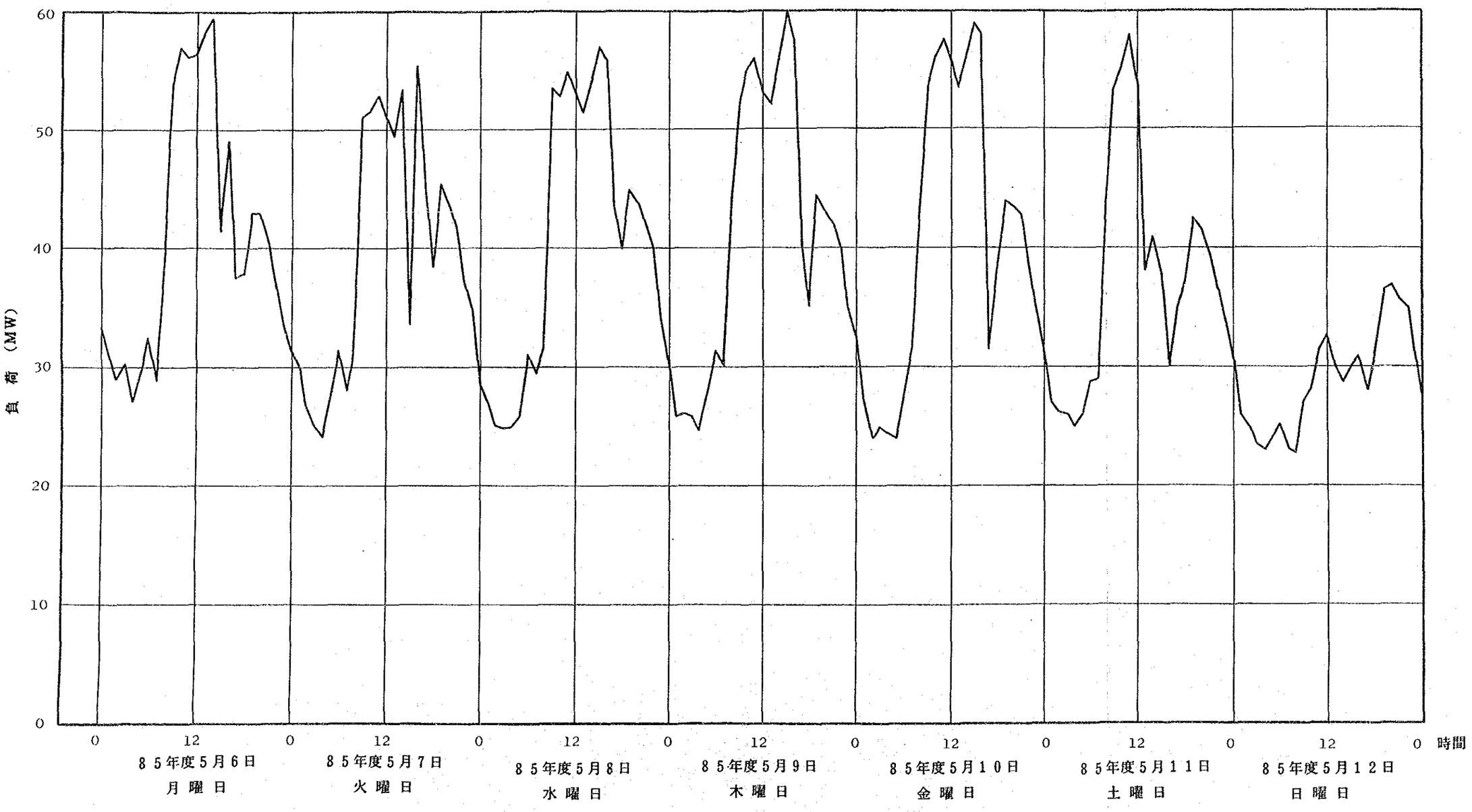
付 図　A－3．37　週負荷曲線（１９８５年度　5月6日－5月１２日）

（ コタキナバル ）



A－3．2　スーク貯水地周辺地域の電化

既存の11kv送電線を延長し、計画中のスーク発電所から新しく送電線を敷設することで、スーク貯水地周辺の村落の電化が可能になる。（Fig. A-3.37 参照）

現在、スーク貯水地周辺の村落は、ケニンガウからの11kv送電線により、送電されている。この11kv送電系統のうち、ひとつは、計画中のスーク発電所へ続く道路沿いにアンシップまで施設されており、もうひとつは、ケニンガウ・ペンシアンガ道路沿いに、教員養成大学まで施設されている。

スーク貯水地の建設により、水没する地域には、バツエンパットピア、ピアテンガ、スリラリアン、リウォンドンアンシップ、ピアラウト、メンプロット、クアラプンティ、マンプレ、クアラティガサ、スアン、トトゴップ、バランサノン、バイタならびにランカティガンピアの14の村落が現存する。水没地域の家屋総数は　約330戸で、約 2,200人の住民が住んでいる。これらの住民の大半の移転先は、スーク貯水地周辺に予定されている。

スーク貯水地周辺の村落への電力供給の方法として、次のような方法が考えられる。

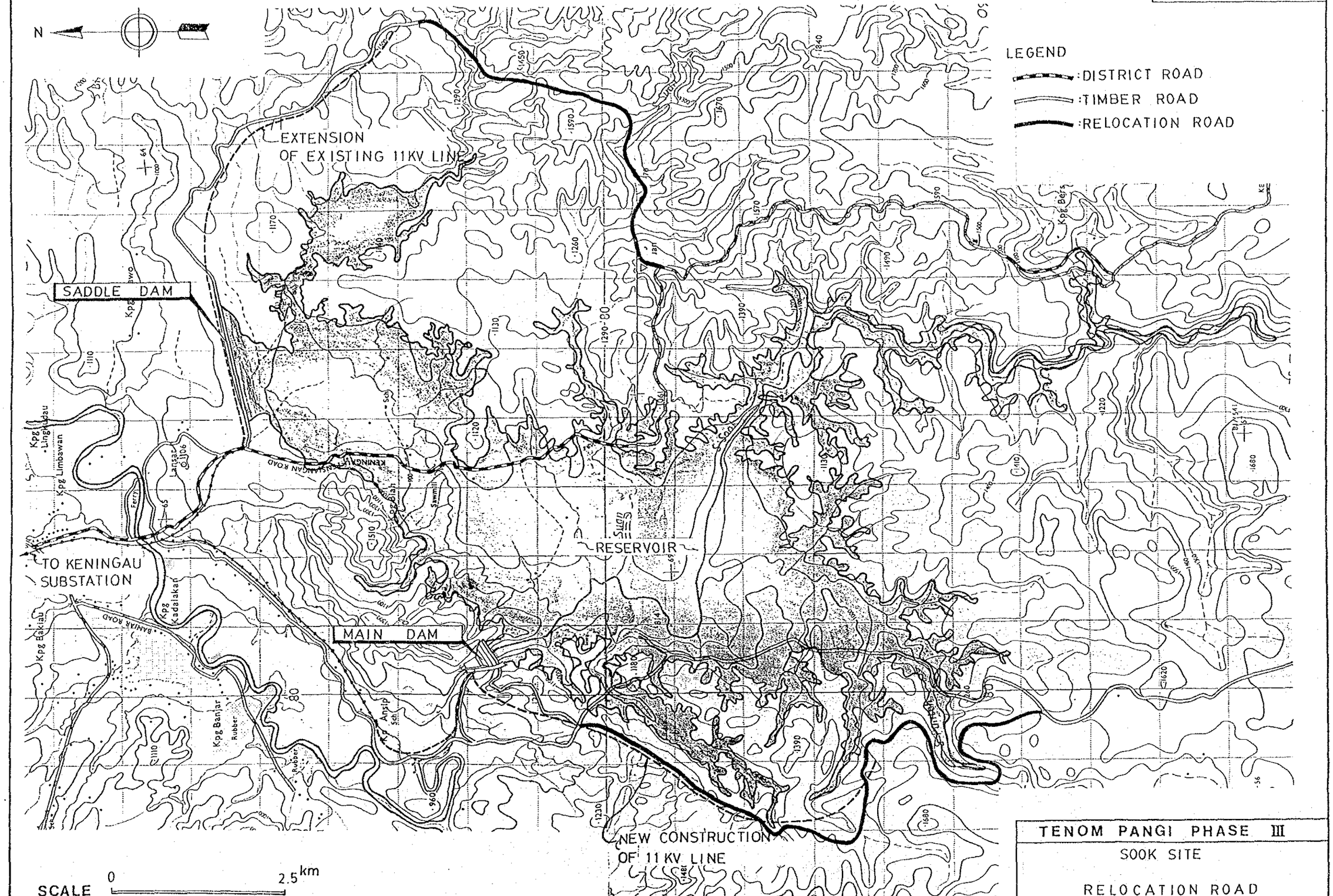
(a) 既存のケニンガウ・アンシップ間の送電線を延長し、ケニンガウ変電所あるいは、計画中のスーク発電所から送電する。

(b) スーク貯水地の左岸沿いの付替え道路に新しく11kv送電線を建設する。

(c) ケニンガウとペンシアンガンを結ぶ貯水地右岸の付替え道路沿いの既存の11kv送電線を教員養成大学以遠に延長する。

上記の(b),(c),案は、最終的な移転計画が、まとめられたあとで、計画されるべきである。新しく建設される11kv送電線は総延長で約20kmであり、これにより、500戸から 600戸が新たに、電力を供給されることになる。 1戸あたりの電力消費量は年1000kwh で、年負荷率を約40% とした場合のピーク電力需要は約150kw になると見込まれる。

FIGURE NO.A-3.38



TENOM PANGI PHASE III
SOOK SITE
RELOCATION ROAD
SEB / JICA

表　A－4．1　既存のテノムパンギプロジェクト（第1期，第2期）の検討

Item	Installed capacity (MW)				
	44	66	88	110	132
		(Existing)			
95% dependable power (MW)	44	45.0	45.0	45.0	45.0
Firm energy (GWh/yr)	225.8	331.6	428.6	516.2	595.3
Dump energy (GWh/yr)	139.0	184.6	214.2	224.5	209.5
Total energy (GWh/yr)	364.8	516.2	642.8	740.7	804.8
Power benefit (10^3US$) 1/	10,430	10,670	10,670	10,670	10,670
Energy benefit (10^3US$)	7,680	11,020	13,930	16,340	18,200
Total benefit (10^3US$)	18,110	21,690	24,600	27,010	28,870
Installation cost (10^3US$)	104,500	133,100	168,400	205,700	243,900
Annual cost (10^3US$) 2/	12,110	15,430	19,520	23,840	28,270
Annual net benefit (10^3US$)	6,000	6,260	5,080	3,170	600

1/: Unit power benefit (1985/86 price):

Capacity value = 237.0 US$/kW

Energy value = 10.026 US$/kWh

2/: 50 years project life, 10% discount rate and 1.5 per cent OMR costs.

表　A－4．2　建設費用（既存のテノムパンギプロジェクト）

(Unit: 10^6US$-1985/86 price)

	Item	Installed capacity (MW)				
		44	66	88	110	132
1.	Preparatory work	6.0	6.1	8.9	11.6	14.4
2.	Diversion work	4.8	4.8	4.8	4.8	4.8
3.	Intake weir	6.7	6.7	6.7	6.7	6.7
4.	Intake structure	9.0	9.2	9.5	9.8	10.7
5.	Waterway/Surge tank	22.2	33.4	44.5	57.3	70.0
6.	Penstock	2.6	3.2	4.2	5.2	6.0
7.	Powerhouse/tailrace	5.3	7.9	10.0	12.2	14.7
8.	Switch yard	0.4	0.4	0.4	0.4	0.4
9.	Gate and penstock	7.9	8.7	12.1	15.5	18.9
10.	Generating equipment	12.0	18.0	24.0	30.0	36.0
11.	Transmission line	9.3	9.3	9.3	9.3	9.3
12.	Substation	9.7	14.6	17.6	20.6	23.6
	Subtotal:	95.9	122.3	152.0	183.4	215.5
13.	Engineering	8.6	5.9	13.2	15.7	18.3
14.	Administration		4.9			
15.	Physical contingency	-	-	3.2	6.6	10.1
	Total:	104.5	133.1	168.4	205.7	243.9

表　A－4．3　スーク・テノムパンギ発電系統の比較検討

Case	Sook reservoir HWL (El.-m)	Sook reservoir Storage capacity (10^6m^3)	Installed capacity (MW) Sook	Installed capacity (MW) Pangi ext.	Installed capacity (MW) Total	Dependable power (MW)	Energy output (GWh) Firm	Energy output (GWh) Dump	Energy output (GWh) Total	Power benefit (10^6US$) Capacity	Power benefit (10^6US$) Energy	Power benefit (10^6US$) Total	Construction cost (10^6US$) Sook	Construction cost (10^6US$) Pangi ext.	Construction cost (10^6US$) Total	Annual cost (10^6US$)	Annual net benefit (10^6US$)
17-a	310	400	10	22	32	50.7	175.3	27.1	202.4	12.0	4.9	16.9	92.7	39.8	132.5	15.4	1.5
18-a	310	400	20	22	42	57.5	226.0	11.8	237.8	13.6	6.0	19.6	100.5	39.8	140.3	16.3	3.3
19-a	310	400	30	22	52	63.9	262.1	0	262.1	15.1	6.8	21.9	106.5	39.8	146.3	17.0	4.9
20-a	310	400	40	22	62	45.6	282.2	0	282.2	10.8	7.3	18.1	112.8	39.8	152.6	17.7	0.4
21-a	310	500	10	22	32	50.3	177.4	26.6	204.0	11.9	5.0	16.9	93.2	39.8	133.0	15.4	1.5
22-a	310	500	20	22	42	57.0	228.5	10.7	239.2	13.5	6.1	19.6	101.0	39.8	140.8	16.3	3.3
23-a	310	500	30	22	52	60.6	265.0	0	265.0	14.4	6.9	21.3	107.4	39.8	147.2	17.1	4.2
24-a	310	500	40	22	62	57.6	284.5	0	284.5	13.7	7.4	21.1	113.4	39.8	153.2	17.8	3.3
25-a	310	550	10	22	32	49.7	178.5	26.4	204.9	11.8	5.0	16.8	93.5	39.8	133.3	15.4	1.4
26-a	310	550	20	22	42	56.6	229.2	10.5	239.7	13.4	6.1	19.5	101.5	39.8	141.3	16.4	3.1
27-a	310	550	30	22	52	59.7	265.9	0	265.9	14.1	6.9	21.0	107.9	39.8	147.7	17.1	3.9
28-a	310	550	40	22	62	61.6	285.5	0	285.5	14.6	7.4	22.0	114.4	39.8	154.2	17.9	4.1
33-a	315	600	10	22	32	50.5	179.2	26.7	205.9	12.0	5.0	17.0	116.6	39.8	156.4	18.1	-1.1
34-a	315	600	20	22	42	58.6	230.5	13.4	243.9	13.9	6.2	20.1	123.9	39.8	163.7	19.0	1.1
35-a	315	600	30	22	52	64.7	271.2	0	271.2	15.3	7.1	22.4	129.9	39.8	169.7	19.7	2.7
36-a	315	600	40	22	62	67.4	293.9	0	293.9	16.0	7.6	23.6	136.0	39.8	175.8	20.4	3.2
37-a	315	700	10	22	32	50.8	180.2	26.6	206.8	12.0	5.0	17.0	116.6	39.8	156.4	18.1	-1.1
38-b	315	700	20	22	42	59.1	231.7	13.1	244.8	14.0	6.2	20.2	124.1	39.8	163.9	19.0	1.2
39-c	315	700	30	22	52	65.0	272.2	0	272.2	15.4	7.1	22.5	130.0	39.8	169.8	19.7	2.8
40-d	315	700	40	22	62	64.2	296.0	0	296.0	15.2	7.7	22.9	136.3	39.8	176.1	20.4	2.5

表　A－4．4　スーク・テノムパンギ発電系統の比較検討

Case	Sook reservoir HWL (El.-m)	Sook reservoir Storage capacity (10^6m^3)	Installed capacity (MW) Sook	Pangi ext.	Total	Dependable power (MW)	Energy output (GWh) Firm	Dump	Total	Power benefit (10^6US$) Capacity	Energy	Total	Construction cost (10^6US$) Sook	Pangi ext.	Total	Annual cost (10^6US$)	Annual net benefit (10^6US$)
17-b	310	400	10	66	76	42.6	359.9	0	359.9	10.1	9.4	19.5	92.7	110.8	203.5	23.6	-4.1
18-b	310	400	20	66	86	45.6	398.2	0	398.2	10.8	10.4	21.2	100.5	110.8	211.3	24.5	-3.3
19-b	310	400	30	66	96	48.1	425.5	0	425.5	11.4	11.1	22.5	106.5	110.8	217.3	25.2	-2.7
20-b	310	400	40	66	106	49.4	444.4	0	444.4	11.7	11.6	23.3	112.8	110.8	223.6	25.9	-2.6
21-b	310	500	10	66	76	42.3.	363.2	0	363.2	10.0	9.4	19.4	93.2	110.8	204.0	23.6	-4.2
22-b	310	500	20	66	86	45.4	401.4	0	401.4	10.8	10.4	21.2	101.0	110.8	211.8	24.5	-3.3
23-b	310	500	30	66	96	48.1	428.8	0	428.8	11.4	11.1	22.5	107.4	110.8	218.2	25.3	-2.8
24-b	310	500	40	66	106	50.9	447.6	0	447.6	12.1	11.6	23.7	113.4	110.8	224.2	26.0	-2.6
25-b	310	550	10	66	76	42.1	364.8	0	364.8	10.0	9.5	19.5	93.5	110.8	204.3	23.7	-4.2
26-b	310	550	20	66	86	45.1	402.6	0	402.6	10.7	10.5	21.2	101.5	110.8	212.3	24.6	-3.4
27-b	310	550	30	66	96	48.0	429.7	0	429.7	11.4	11.2	22.6	107.9	110.8	218.7	25.3	-2.7
28-b	310	550	40	66	106	50.8	447.9	0	447.9	12.0	11.6	23.6	114.4	110.8	225.2	26.1	-2.5
33-b	315	600	10	66	76	42.6	367.1	0	367.1	10.1	9.5	19.6	116.6	110.8	227.4	26.4	-6.7
34-b	315	600	20	66	86	48.9	407.3	0	407.3	11.6	10.6	22.2	123.9	110.8	234.7	27.2	-5.0
35-b	315	600	30	66	96	48.5	437.7	0	437.7	11.5	11.4	22.9	129.9	110.8	240.7	27.9	-5.0
36-b	315	600	40	66	106	50.9	457.9	0	457.9	12.1	11.9	24.0	136.0	110.8	246.8	28.6	-4.6
37-b	315	700	10	66	76	49.0	369.4	0	369.4	11.6	9.6	21.2	116.6	110.8	227.4	26.4	-5.2
38-b	315	700	20	66	86	48.0	409.7	0	409.7	11.4	10.7	22.1	124.1	110.8	234.9	27.2	-5.1
39-b	315	700	30	66	96	48.2	440.3	0	440.3	11.4	11.4	22.8	130.0	110.8	240.8	27.9	-5.1
40-b	315	700	40	66	106	51.1	459.9	0	459.9	12.1	12.0	24.1	136.3	110.8	247.1	28.6	-4.5

表 A－4．5 建設費用（テノムパンギプロジェクトの拡張分）

(Unit: 10^6US$-1985/86 price)

Item	Installed capacity (MW)		
	22	44	66
1. Preparatory work	2.8	5.5	8.3
2. Diversion work	0	0	0
3. Intake weir	0	0	0
4. Intake structure	0.3	0.6	1.5
5. Waterway/surge tank	14.9	23.9	36.6
6. Penstock	1.0	2.0	2.8
7. Powerhouse/tailrace	2.1	4.3	6.8
8. Switch yard	0	0	0
9. Gate and penstock	3.4	6.8	10.2
10. Generating equipment	6.0	12.0	18.0
11. Transmission line	0	0	0
12. Substation	3.0	6.0	9.0
Subtotal:	33.5	61.1	93.2
13. Engineering and administration	2.7	4.9	7.5
14. Physical contingency	3.6	6.6	10.1
Total:	39.8	72.6	110.8

表 A－4．6(1) 建設費用（スーク ダム ならびにスーク発電所）

(Case 1 - HWL: El. 290 m, V: MCM, P: - MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.0
2.	Diversion work	8.0
3.	Main dam	17.4
4.	Saddle dam	0
5.	Spillway	7.3
6.	River outlet work	0.4
7.	Intake structure	-
8.	Waterway and surge tank	-
9.	Penstock	-
10.	Powerhouse and tailrace	-
11.	Switch yard	-
12.	Hydromechanical work	2.5
13.	Generating equipment	-
14.	Transmission line	-
	Sub-total	38.6
15.	Engineering and administration	3.1
16.	Compensation	10.5
17.	Physical contingency	5.2
	Total	57.4
18.	Price contingency	
	Grand total	

表 A－4．6(2) 建設費用（スーク ダム ならびにスーク発電所）

(Case 2 - HWL: El. 300 m, V: MCM, P: - MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.2
2.	Diversion work	8.0
3.	Main dam	19.8
4.	Saddle dam	0.2
5.	Spillway	7.8
6.	River outlet work	0.4
7.	Intake structure	-
8.	Waterway and surge tank	-
9.	Penstock	-
10.	Powerhouse and tailrace	-
11.	Switch yard	-
12.	Hydromechanical work	2.6
13.	Generating equipment	-
14.	Transmission line	-
	Sub-total	42.0
15.	Engineering and administration	3.4
16.	Compensation	14.4
17.	Physical contingency	6.0
	Total	65.8
18.	Price contingency	
	Grand total	

表 A－4．6(3) 建設費用（スーク ダム ならびにスーク発電所）

(Case 3 - HWL: El. 310 m, V: 632 MCM, P: - MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.4
2.	Diversion work	8.0
3.	Main dam	23.8
4.	Saddle dam	3.8
5.	Spillway	8.1
6.	River outlet work	0.4
7.	Intake structure	-
8.	Waterway and surge tank	-
9.	Penstock	-
10.	Powerhouse and tailrace	-
11.	Switch yard	-
12.	Hydromechanical work	2.7
13.	Generating equipment	-
14.	Transmission line	-
	Sub-total	50.2
15.	Engineering and administration	4.0
16.	Compensation	18.4
17.	Physical contingency	7.3
	Total	79.9
18.	Price contingency	
	Grand total	

表 A－4．6(4) 建設費用（スーク ダム ならびにスーク発電所）

(Case 4 - HWL: El. 315 m, V: MCM, P: - MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.5
2.	Diversion work	8.0
3.	Main dam	31.6
4.	Saddle dam	10.5
5.	Spillway	8.6
6.	River outlet work	0.4
7.	Intake structure	-
8.	Waterway and surge tank	-
9.	Penstock	-
10.	Powerhouse and tailrace	-
11.	Switch yard	-
12.	Hydromechanical work	2.8
13.	Generating equipment	-
14.	Transmission line	-
	Sub-total	65.4
15.	Engineering and administration	5.2
16.	Compensation	21.1
17.	Physical contingency	9.2
	Total	100.9
18.	Price contingency	
	Grand total	

表　A－4．6(5) 建設費用（スーク　ダム　ならびにスーク発電所）

(Case 5　- HWL:　El.　300 m,　V:　300 MCM,　P:　10 MW)

(Unit:　10^6 US$)

	Item	Amount
1.	Preparatory work	3.2
2.	Diversion work	8.0
3.	Main dam	19.8
4.	Saddle dam	0.2
5.	Spillway	7.8
6.	River outlet work	0.4
7.	Intake structure	0.4
8.	Waterway and surge tank	1.8
9.	Penstock	0.8
10.	Powerhouse and tailrace	1.3
11.	Switch yard	0.1
12.	Hydromechanical work	4.0
13.	Generating equipment	5.2
14.	Transmission line	1.0
	Sub-total	54.0
15.	Engineering and administration	4.3
16.	Compensation	14.4
17.	Physical contingency	7.3
	Total	80.0
18.	Price contingency	
	Grand total	

表 A－4．6(6) 建設費用（スーク ダム ならびにスーク発電所）

(Case 6 - HWL: El: 300 m, V: 300 MCM, P: 20 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.2
2.	Diversion work	8.0
3.	Main dam	19.8
4.	Saddle dam	0.2
5.	Spillway	7.8
6.	River outlet work	0.4
7.	Intake structure	0.6
8.	Waterway and surge tank	3.0
9.	Penstock	1.0
10.	Powerhouse and tailrace	2.8
11.	Switch yard	0.1
12.	Hydromechanical work	5.4
13.	Generating equipment	7.9
14.	Transmission line	1.0
	Sub-total	61.2
15.	Engineering and administration	4.9
16.	Compensation	14.4
17.	Physical contingency	8.1
	Total	88.6
18.	Price contingency	
	Grand total	

表 A－4．6(7) 建設費用（スーク ダム ならびにスーク発電所）

(Case 7 - HWL: El. 300 m, V: 300 MCM, P: 30 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.2
2.	Diversion work	8.0
3.	Main dam	19.8
4.	Saddle dam	0.2
5.	Spillway	7.8
6.	River outlet work	0.4
7.	Intake structure	0.8
8.	Waterway and surge tank	4.0
9.	Penstock	1.1
10.	Powerhouse and tailrace	4.0
11.	Switch yard	0.1
12.	Hydromechanical work	6.4
13.	Generating equipment	9.7
14.	Transmission line	1.0
	Sub-total	66.5
15.	Engineering and administration	5.3
16.	Compensation	14.4
17.	Physical contingency	8.6
	Total	94.8
18.	Price contingency	
	Grand total	

表 A－4．6(8) 建設費用（スーク ダム ならびにスーク発電所）

(Case 8 － HWL: E1. 300 m, V: 300 MCM, P: 40 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.2
2.	Diversion work	8.0
3.	Main dam	19.8
4.	Saddle dam	0.2
5.	Spillway	7.8
6.	River outlet work	0.4
7.	Intake structure	0.9
8.	Waterway and surge tank	5.1
9.	Penstock	1.2
10.	Powerhouse and tailrace	5.1
11.	Switch yard	0.1
12.	Hydromechanical work	7.4
13.	Generating equipment	12.0
14.	Transmission line	1.0
	Sub-total	72.2
15.	Engineering and administration	5.8
16.	Compensation	14.4
17.	Physical contingency	9.2
	Total	101.6
18.	Price contingency	
	Grand total	

表 A－4．6(9) 建設費用（スーク ダム ならびにスーク発電所）

(Case 9 - HWL: El. 305 m, V: 300 MCM, P: 10 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.3
2.	Diversion work	8.0
3.	Main dam	21.4
4.	Saddle dam	1.4
5.	Spillway	8.0
6.	River outlet work	0.4
7.	Intake structure	0.4
8.	Waterway and surge tank	1.7
9.	Penstock	0.9
10.	Powerhouse and tailrace	1.2
11.	Switch yard	0.1
12.	Hydromechanical work	3.8
13.	Generating equipment	5.0
14.	Transmission line	1.0
	Sub-total	56.6
15.	Engineering and administration	4.5
16.	Compensation	16.4
17.	Physical contingency	7.8
	Total	85.3
18.	Price contingency	
	Grand total	

表 A－4．6(10)建設費用（スーク ダム ならびにスーク発電所）

(Case 10 - HWL: El. 305 m, V: 300 MCM, P: 20 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.3
2.	Diversion work	8.0
3.	Main dam	21.4
4.	Saddle dam	1.4
5.	Spillway	8.0
6.	River outlet work	0.4
7.	Intake structure	0.5
8.	Waterway and surge tank	2.8
9.	Penstock	1.0
10.	Powerhouse and tailrace	2.6
11.	Switch yard	0.1
12.	Hydromechanical work	5.1
13.	Generating equipment	7.5
14.	Transmission line	1.0
	Sub-total	63.1
15.	Engineering and administration	5.0
16.	Compensation	16.4
17.	Physical contingency	8.5
	Total	93.0
18.	Price contingency	
	Grand total	

表 A－4．6(11)建設費用（スーク ダム ならびにスーク発電所）

(Case 11 - HWL: El. 305 m, V: 300 MCM, P: 30 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.3
2.	Diversion work	8.0
3.	Main dam	21.4
4.	Saddle dam	1.4
5.	Spillway	8.0
6.	River outlet work	0.4
7.	Intake structure	0.7
8.	Waterway and surge tank	3.8
9.	Penstock	1.2
10.	Powerhouse and tailrace	3.8
11.	Switch yard	0.1
12.	Hydromechanical work	6.2
13.	Generating equipment	9.3
14.	Transmission line	1.0
	Sub-total	68.6
15.	Engineering and administration	5.5
16.	Compensation	16.4
17.	Physical contingency	9.1
	Total	99.6
18.	Price contingency	
	Grand total	

表 A－4．6(12)建設費用（スーク ダム ならびにスーク発電所）

(Case 12 - HWL: El. 305 m, V: 300 MCM, P: 40 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.3
2.	Diversion work	8.0
3.	Main dam	21.4
4.	Saddle dam	1.4
5.	Spillway	8.0
6.	River outlet work	0.4
7.	Intake structure	0.8
8.	Waterway and surge tank	4.8
9.	Penstock	1.3
10.	Powerhouse and tailrace	4.9
11.	Switch yard	0.1
12.	Hydromechanical work	7.2
13.	Generating equipment	11.5
14.	Transmission line	1.0
	Sub-total	74.1
15.	Engineering and administration	5.9
16.	Compensation	16.4
17.	Physical contingency	9.6
	Total	106.0
18.	Price contingency	
	Grand total	

表 A－4. 6 (13)建設費用（スーク ダム ならびにスーク発電所）

(Case 13 - HWL: El. 305 m, V: 400 MCM, P: 10 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.3
2.	Diversion work	8.0
3.	Main dam	21.4
4.	Saddle dam	1.4
5.	Spillway	8.0
6.	River outlet work	0.4
7.	Intake structure	0.4
8.	Waterway and surge tank	1.7
9.	Penstock	0.8
10.	Powerhouse and tailrace	1.3
11.	Switch yard	0.1
12.	Hydromechanical work	3.9
13.	Generating equipment	5.0
14.	Transmission line	1.0
	Sub-total	56.7
15.	Engineering and administration	4.5
16.	Compensation	16.4
17.	Physical contingency	7.8
	Total	85.4
18.	Price contingency	
	Grand total	

表　A－4．6(14)建設費用（スーク　ダム　ならびにスーク発電所）

(Case 14 – HWL: El. 305 m, V: 400 MCM, P: 20 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.3
2.	Diversion work	8.0
3.	Main dam	21.4
4.	Saddle dam	1.4
5.	Spillway	8.0
6.	River outlet work	0.4
7.	Intake structure	0.6
8.	Waterway and surge tank	2.9
9.	Penstock	1.0
10.	Powerhouse and tailrace	2.7
11.	Switch yard	0.1
12.	Hydromechanical work	5.1
13.	Generating equipment	7.6
14.	Transmission line	1.0
	Sub-total	63.5
15.	Engineering and administration	5.1
16.	Compensation	16.4
17.	Physical contingency	8.5
	Total	93.5
18.	Price contingency	
	Grand total	

表 A－4．6(15)建設費用（スーク ダム ならびにスーク発電所）

(Case 15 - HWL: El. 305 m, V: 400 MCM, P: 30 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.3
2.	Diversion work	8.0
3.	Main dam	21.4
4.	Saddle dam	1.4
5.	Spillway	8.0
6.	River outlet work	0.4
7.	Intake structure	0.7
8.	Waterway and surge tank	3.8
9.	Penstock	1.1
10.	Powerhouse and tailrace	3.9
11.	Switch yard	0.1
12.	Hydromechanical work	6.2
13.	Generating equipment	9.4
14.	Transmission line	1.0
	Sub-total	68.7
15.	Engineering and administration	5.5
16.	Compensation	16.4
17.	Physical contingency	9.1
	Total	99.7
18.	Price contingency	
	Grand total	

表 A－4．6(16)建設費用（スーク ダム ならびにスーク発電所）

(Case 16 - HWL: El. 305 m, V: 400 MCM, P: 40 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.3
2.	Diversion work	8.0
3.	Main dam	21.4
4.	Saddle dam	1.4
5.	Spillway	8.0
6.	River outlet work	0.4
7.	Intake structure	0.9
8.	Waterway and surge tank	4.9
9.	Penstock	1.2
10.	Powerhouse and tailrace	4.9
11.	Switch yard	0.1
12.	Hydromechanical work	7.2
13.	Generating equipment	11.6
14.	Transmission line	1.0
	Sub-total	74.3
15.	Engineering and administration	5.9
16.	Compensation	16.4
17.	Physical contingency	9.7
	Total	106.3
18.	Price contingency	
	Grand total	

表　A－4．6(17)建設費用（スーク　ダム　ならびにスーク発電所）

(Case 17　- HWL:　El.　310 m,　V:　400 MCM,　P:　10 MW)

(Unit:　10^6 US$)

	Item	Amount
1.	Preparatory work	3.4
2.	Diversion work	8.0
3.	Main dam	23.8
4.	Saddle dam	3.8
5.	Spillway	8.1
6.	River outlet work	0.4
7.	Intake structure	0.3
8.	Waterway and surge tank	1.6
9.	Penstock	0.9
10.	Powerhouse and tailrace	1.2
11.	Switch yard	0.1
12.	Hydromechanical work	3.7
13.	Generating equipment	4.7
14.	Transmission line	1.0
	Sub-total	61.0
15.	Engineering and administration	4.9
16.	Compensation	18.4
17.	Physical contingency	8.4
	Total	92.7
18.	Price contingency	
	Grand total	

表　A－4．6(18)建設費用（スーク　ダム　ならびにスーク発電所）

(Case 18　- HWL:　El.　310 m,　V:　400 MCM,　P:　20 MW)

(Unit:　10^6 US$)

	Item	Amount
1.	Preparatory work	3.4
2.	Diversion work	8.0
3.	Main dam	23.8
4.	Saddle dam	3.8
5.	Spillway	8.1
6.	River outlet work	0.4
7.	Intake structure	0.5
8.	Waterway and surge tank	2.7
9.	Penstock	1.1
10.	Powerhouse and tailrace	2.6
11.	Switch yard	0.1
12.	Hydromechanical work	5.0
13.	Generating equipment	7.1
14.	Transmission line	1.0
	Sub-total	67.6
15.	Engineering and administration	5.4
16.	Compensation	18.4
17.	Physical contingency	9.1
	Total	100.5
18.	Price contingency	
	Grand total	

表 A－4．6(19)建設費用（スーク ダム ならびにスーク発電所）

(Case 19 - HWL: El. 310 m, V: 400 MCM, P: 30 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.4
2.	Diversion work	8.0
3.	Main dam	23.8
4.	Saddle dam	3.8
5.	Spillway	8.1
6.	River outlet work	0.4
7.	Intake structure	0.6
8.	Waterway and surge tank	3.6
9.	Penstock	1.2
10.	Powerhouse and tailrace	3.7
11.	Switch yard	0.1
12.	Hydromechanical work	6.1
13.	Generating equipment	8.8
14.	Transmission line	1.0
	Sub-total.	72.6
15.	Engineering and administration	5.8
16.	Compensation	18.4
17.	Physical contingency	9.7
	Total	106.5
18.	Price contingency	
	Grand total	

表　A－4．6(20)建設費用（スーク　ダム　ならびにスーク発電所）

(Case 20　- HWL:　El.　310 m,　V:　400 MCM,　P:　40 MW)

(Unit:　10^6 US$)

	Item	Amount
1.	Preparatory work	3.4
2.	Diversion work	8.0
3.	Main dam	23.8
4.	Saddle dam	3.8
5.	Spillway	8.1
6.	River outlet work	0.4
7.	Intake structure	0.7
8.	Waterway and surge tank	4.7
9.	Penstock	1.3
10.	Powerhouse and tailrace	4.7
11.	Switch yard	0.1
12.	Hydromechanical work	7.0
13.	Generating equipment	10.9
14.	Transmission line	1.0
	Sub-total	77.9
15.	Engineering and administration	6.2
16.	Compensation	18.4
17.	Physical contingency	10.3
	Total	112.8
18.	Price contingency	
	Grand total	

表 A－4．6(21)建設費用（スーク ダム ならびにスーク発電所）

(Case 21 - HWL: El. 310 m, V: 500 MCM, P: 10 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.4
2.	Diversion work	8.0
3.	Main dam	23.8
4.	Saddle dam	3.8
5.	Spillway	8.1
6.	River outlet work	0.4
7.	Intake structure	0.5
8.	Waterway and surge tank	1.6
9.	Penstock	0.9
10.	Powerhouse and tailrace	1.2
11.	Switch yard	0.1
12.	Hydromechanical work	3.8
13.	Generating equipment	4.8
14.	Transmission line	1.0
	Sub-total	61.4
15.	Engineering and administration	4.9
16.	Compensation	18.4
17.	Physical contingency	8.5
	Total	93.2
18.	Price contingency	
	Grand total	

表 A－4．6(22)建設費用（スーク ダム ならびにスーク発電所）

(Case 22 - HWL: El. 310 m, V: 500 MCM, P: 20 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.4
2.	Diversion work	8.0
3.	Main dam	23.8
4.	Saddle dam	3.8
5.	Spillway	8.1
6.	River outlet work	0.4
7.	Intake structure	0.7
8.	Waterway and surge tank	2.8
9.	Penstock	1.1
10.	Powerhouse and tailrace	2.6
11.	Switch yard	0.1
12.	Hydromechanical work	5.0
13.	Generating equipment	7.2
14.	Transmission line	1.0
	Sub-total	68.0
15.	Engineering and administration	5.4
16.	Compensation	18.4
17.	Physical contingency	9.2
	Total	101.0
18.	Price contingency	
	Grand total	

表 A－4．6(23)建設費用（スーク ダム ならびにスーク発電所）

(Case 23 - HWL: El. 310 m, V: 500 MCM, P: 30 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.4
2.	Diversion work	8.0
3.	Main dam	23.8
4.	Saddle dam	3.8
5.	Spillway	8.1
6.	River outlet work	0.4
7.	Intake structure	0.9
8.	Waterway and surge tank	3.7
9.	Penstock	1.2
10.	Powerhouse and tailrace	3.8
11.	Switch yard	0.1
12.	Hydromechanical work	6.1
13.	Generating equipment	9.0
14.	Transmission line	1.0
	Sub-total	73.3
15.	Engineering and administration	5.9
16.	Compensation	18.4
17.	Physical contingency	9.8
	Total	107.4
18.	Price contingency	
	Grand total	

表 A－4．6(24)建設費用（スーク ダム ならびにスーク発電所）

(Case 24 - HWL: El. 310 m, V: 500 MCM, P: 40 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.4
2.	Diversion work	8.0
3.	Main dam	23.8
4.	Saddle dam	3.8
5.	Spillway	8.1
6.	River outlet work	0.4
7.	Intake structure	0.9
8.	Waterway and surge tank	4.7
9.	Penstock	1.3
10.	Powerhouse and tailrace	4.9
11.	Switch yard	0.1
12.	Hydromechanical work	7.0
13.	Generating equipment	11.0
14.	Transmission line	1.0
	Sub-total	78.4
15.	Engineering and administration	6.3
16.	Compensation	18.4
17.	Physical contingency	10.3
	Total	113.4
18.	Price contingency	
	Grand total	

表 A－4．6(25)建設費用（スーク ダム ならびにスーク発電所）

(Case 25 - HWL: El. 310 m, V: 550 MCM, P: 10 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.4
2.	Diversion work	8.0
3.	Main dam	23.8
4.	Saddle dam	3.8
5.	Spillway	8.1
6.	River outlet work	0.4
7.	Intake structure	0.5
8.	Waterway and surge tank	1.7
9.	Penstock	0.8
10.	Powerhouse and tailrace	1.3
11.	Switch yard	0.1
12.	Hydromechanical work	3.8
13.	Generating equipment	5.0
14.	Transmission line	1.0
	Sub-total	61.7
15.	Engineering and administration	4.9
16.	Compensation	18.4
17.	Physical contingency	8.5
	Total	93.5
18.	Price contingency	
	Grand total	

表 A－4．6(26)建設費用（スーク ダム ならびにスーク発電所）

(Case 26 － HWL: El. 310 m, V: 550 MCM, P: 20 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.4
2.	Diversion work	8.0
3.	Main dam	23.8
4.	Saddle dam	3.8
5.	Spillway	8.1
6.	River outlet work	0.4
7.	Intake structure	0.6
8.	Waterway and surge tank	2.9
9.	Penstock	1.0
10.	Powerhouse and tailrace	2.7
11.	Switch yard	0.1
12.	Hydromechanical work	5.1
13.	Generating equipment	7.5
14.	Transmission line	1.0
	Sub-total	68.4
15.	Engineering and administration	5.5
16.	Compensation	18.4
17.	Physical contingency	9.2
	Total	101.5
18.	Price contingency	
	Grand total	

表 A－4．6(27)建設費用（スーク ダム ならびにスーク発電所）

(Case 27 - HWL: El. 310 m, V: 550 MCM, P: 30 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.4
2.	Diversion work	8.0
3.	Main dam	23.8
4.	Saddle dam	3.8
5.	Spillway	8.1
6.	River outlet work	0.4
7.	Intake structure	0.8
8.	Waterway and surge tank	3.8
9.	Penstock	1.1
10.	Powerhouse and tailrace	3.8
11.	Switch yard	0.1
12.	Hydromechanical work	6.4
13.	Generating equipment	9.3
14.	Transmission line	1.0
	Sub-total	73.8
15.	Engineering and administration	5.9
16.	Compensation	18.4
17.	Physical contingency	9.8
	Total	107.9
18.	Price contingency	
	Grand total	

表　A－4．6(28)建設費用（スーク　ダム　ならびにスーク発電所）

(Case 28　- HWL:　El.　300 m,　V:　550 MCM,　P:　40 MW)

(Unit:　10^6 US$)

	Item	Amount
1.	Preparatory work	3.4
2.	Diversion work	8.0
3.	Main dam	23.8
4.	Saddle dam	3.8
5.	Spillway	8.1
6.	River outlet work	0.4
7.	Intake structure	1.0
8.	Waterway and surge tank	4.9
9.	Penstock	1.2
10.	Powerhouse and tailrace	4.9
11.	Switch yard	0.1
12.	Hydromechanical work	7.2
13.	Generating equipment	11.5
14.	Transmission line	1.0
	Sub-total	79.3
15.	Engineering and administration	6.3
16.	Compensation	18.4
17.	Physical contingency	10.4
	Total	114.4
18.	Price contingency	
	Grand total	

表 A－4．6(29)建設費用（スーク ダム ならびにスーク発電所）

(Case 29 - HWL: El. 315 m, V: 500 MCM, P: 10 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.5
2.	Diversion work	8.0
3.	Main dam	31.6
4.	Saddle dam	13.0
5.	Spillway	8.6
6.	River outlet work	0.4
7.	Intake structure	0.3
8.	Waterway and surge tank	1.6
9.	Penstock	0.9
10.	Powerhouse and tailrace	1.2
11.	Switch yard	0.1
12.	Hydromechanical work	3.7
13.	Generating equipment	4.5
14.	Transmission line	1.0
	Sub-total	78.4
15.	Engineering and administration	6.3
16.	Compensation	21.1
17.	Physical contingency	10.6
	Total	116.4
18.	Price contingency	
	Grand total	

表　A－4．6(30)建設費用（スーク　ダム　ならびにスーク発電所）

(Case 30 - HWL: El. 315 m, V: 500 MCM, P: 20 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.5
2.	Diversion work	8.0
3.	Main dam	31.6
4.	Saddle dam	13.0
5.	Spillway	8.6
6.	River outlet work	0.4
7.	Intake structure	0.5
8.	Waterway and surge tank	2.7
9.	Penstock	1.1
10.	Powerhouse and tailrace	2.5
11.	Switch yard	0.1
12.	Hydromechanical work	4.9
13.	Generating equipment	6.8
14.	Transmission line	1.0
	Sub-total	84.7
15.	Engineering and administration	6.8
16.	Compensation	21.1
17.	Physical contingency	11.3
	Total	123.9
18.	Price contingency	
	Grand total	

表 A－4．6(31)建設費用（スーク ダム ならびにスーク発電所）

(Case 31 - HWL: El. 315 m, V: 500 MCM, P: 30 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.5
2.	Diversion work	8.0
3.	Main dam	31.6
4.	Saddle dam	13.0
5.	Spillway	8.6
6.	River outlet work	0.4
7.	Intake structure	0.6
8.	Waterway and surge tank	3.5
9.	Penstock	1.3
10.	Powerhouse and tailrace	3.6
11.	Switch yard	0.1
12.	Hydromechanical work	6.0
13.	Generating equipment	8.4
14.	Transmission line	1.0
	Sub-total	89.6
15.	Engineering and administration	7.2
16.	Compensation	21.1
17.	Physical contingency	11.8
	Total	129.7
18.	Price contingency	
	Grand total	

表 A－4．6(32)建設費用（スーク ダム ならびにスーク発電所）

(Case 32 - HWL: El. 315 m, V: 500 MCM, P: 40 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.5
2.	Diversion work	8.0
3.	Main dam	31.6
4.	Saddle dam	13.0
5.	Spillway	8.6
6.	River outlet work	0.4
7.	Intake structure	0.7
8.	Waterway and surge tank	4.5
9.	Penstock	1.4
10.	Powerhouse and tailrace	4.6
11.	Switch yard	0.1
12.	Hydromechanical work	6.9
13.	Generating equipment	10.4
14.	Transmission line	1.0
	Sub-total	94.7
15.	Engineering and administration	7.6
16.	Compensation	21.1
17.	Physical contingency	12.3
	Total	135.7
18.	Price contingency	
	Grand total	

表 A－4．6(33)建設費用（スーク ダム ならびにスーク発電所）

(Case 33 - HWL: El. 315 m, V: 600 MCM, P: 10 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.5
2.	Diversion work	8.0
3.	Main dam	31.6
4.	Saddle dam	13.0
5.	Spillway	8.6
6.	River outlet work	0.4
7.	Intake structure	0.4
8.	Waterway and surge tank	1.6
9.	Penstock	0.9
10.	Powerhouse and tailrace	1.2
11.	Switch yard	0.1
12.	Hydromechanical work	3.7
13.	Generating equipment	4.6
14.	Transmission line	1.0
	Sub-total	78.6
15.	Engineering and administration	6.3
16.	Compensation	21.1
17.	Physical contingency	10.6
	Total	116.6
18.	Price contingency	
	Grand total	

表 A－4．6(34)建設費用（スーク ダム ならびにスーク発電所）

(Case 34 - HWL: EI. 315 m, V: 600 MCM, P: 20 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.5
2.	Diversion work	8.0
3.	Main dam	31.6
4.	Saddle dam	13.0
5.	Spillway	8.6
6.	River outlet work	0.4
7.	Intake structure	0.5
8.	Waterway and surge tank	2.7
9.	Penstock	1.1
10.	Powerhouse and tailrace	2.5
11.	Switch yard	0.1
12.	Hydromechanical work	4.9
13.	Generating equipment	6.8
14.	Transmission line	1.0
	Sub-total	84.7
15.	Engineering and administration	6.8
16.	Compensation	21.1
17.	Physical contingency	11.3
	Total	123.9
18.	Price contingency	
	Grand total	

表 A－4．6(35)建設費用（スーク ダム ならびにスーク発電所）

(Case 35 - HWL: El. 315 m, V: 500 MCM, P: 30 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.5
2.	Diversion work	8.0
3.	Main dam	31.6
4.	Saddle dam	13.0
5.	Spillway	8.6
6.	River outlet work	0.4
7.	Intake structure	0.7
8.	Waterway and surge tank	3.5
9.	Penstock	1.3
10.	Powerhouse and tailrace	3.6
11.	Switch yard	0.1
12.	Hydromechanical work	6.0
13.	Generating equipment	8.5
14.	Transmission line	1.0
	Sub-total	89.8
15.	Engineering and administration	7.2
16.	Compensation	21.1
17.	Physical contingency	11.8
	Total	129.9
18.	Price contingency	
	Grand total	

表 A－4．6(86)建設費用（スーク ダム ならびにスーク発電所）

(Case 36 - HWL: El. 315 m, V: 600 MCM, P: 40 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.5
2.	Diversion work	8.0
3.	Main dam	31.6
4.	Saddle dam	13.0
5.	Spillway	8.6
6.	River outlet work	0.4
7.	Intake structure	0.8
8.	Waterway and surge tank	4.5
9.	Penstock	1.4
10.	Powerhouse and tailrace	4.6
11.	Switch yard	0.1
12.	Hydromechanical work	6.9
13.	Generating equipment	10.5
14.	Transmission line	1.0
	Sub-total	94.9
15.	Engineering and administration	7.6
16.	Compensation	21.1
17.	Physical contingency	12.6
	Total	136.2
18.	Price contingency	
	Grand total	

表 A－4．6(37)建設費用（スーク ダム ならびにスーク発電所）

(Case 37 - HWL: El. 315 m, V: 700 MCM, P: 10 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.5
2.	Diversion work	8.0
3.	Main dam	31.6
4.	Saddle dam	13.0
5.	Spillway	8.6
6.	River outlet work	0.4
7.	Intake structure	0.4
8.	Waterway and surge tank	1.6
9.	Penstock	0.9
10.	Powerhouse and tailrace	1.2
11.	Switch yard	0.1
12.	Hydromechanical work	3.7
13.	Generating equipment	4.6
14.	Transmission line	1.0
	Sub-total	78.6
15.	Engineering and administration	6.3
16.	Compensation	21.1
17.	Physical contingency	10.6
	Total	116.6
18.	Price contingency	
	Grand total	

表 A－4．6(38)建設費用（スーク ダム ならびにスーク発電所）

(Case 38 - HWL: El. 315 m, V: 700 MCM, P: 20 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.5
2.	Diversion work	8.0
3.	Main dam	31.6
4.	Saddle dam	13.0
5.	Spillway	8.6
6.	River outlet work	0.4
7.	Intake structure	0.6
8.	Waterway and surge tank	2.7
9.	Penstock	1.1
10.	Powerhouse and tailrace	2.5
11.	Switch yard	0.1
12.	Hydromechanical work	4.9
13.	Generating equipment	6.9
14.	Transmission line	1.0
	Sub-total	84.9
15.	Engineering and administration	6.8
16.	Compensation	21.1
17.	Physical contingency	11.3
	Total	124.1
18.	Price contingency	
	Grand total	

表　A－4．6(39)建設費用（スーク　ダム　ならびにスーク発電所）

(Case 39 - HWL: El. 315 m, V: 700 MCM, P: 30 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.5
2.	Diversion work	8.0
3.	Main dam	31.6
4.	Saddle dam	13.0
5.	Spillway	8.6
6.	River outlet work	0.4
7.	Intake structure	0.7
8.	Waterway and surge tank	3.6
9.	Penstock	1.2
10.	Powerhouse and tailrace	3.6
11.	Switch yard	0.1
12.	Hydromechanical work	6.0
13.	Generating equipment	8.6
14.	Transmission line	1.0
	Sub-total	89.9
15.	Engineering and administration	7.2
16.	Compensation	21.1
17.	Physical contingency	11.8
	Total	130.0
18.	Price contingency	
	Grand total	

表　A－4．6(40)建設費用（スーク　ダム　ならびにスーク発電所）

(Case 40 - HWL: El. 315 m, V: 700 MCM, P: 40 MW)

(Unit: 10^6 US$)

	Item	Amount
1.	Preparatory work	3.5
2.	Diversion work	8.0
3.	Main dam	31.6
4.	Saddle dam	13.0
5.	Spillway	8.6
6.	River outlet work	0.4
7.	Intake structure	0.9
8.	Waterway and surge tank	4.6
9.	Penstock	1.4
10.	Powerhouse and tailrace	4.6
11.	Switch yard	0.1
12.	Hydromechanical work	6.9
13.	Generating equipment	10.6
14.	Transmission line	1.0
	Sub-total	95.2
15.	Engineering and administration	7.6
16.	Compensation	21.1
17.	Physical contingency	12.4
	Total	136.3
18.	Price contingency	
	Grand total	

表A－4．7(1) 発 電 計 画（ケース1）

	Item	Diesel	Oil-fired thermal	Total
1.	Allocation	Peak load	Base load	--
2.	Nos. of unit x capacity	2 x 10 MW	2 x 55 MW	
3.	Power generation (MW)	20	110	130
4.	Construction period (yr)	2	4	--
5.	Installation cost, adjusted (10^3 US$)	13,760	114,620	128,380
6.	Annual capital cost (10^3 US$)	1,720	12,630	14,350
7.	Energy output (GWh/year)	16.9	666.4	683.3
8.	Fuel cost, adjusted (US$/kWh)	0.051	0.058	--
9.	Annual fuel cost (10^3 US$)	860	38,650	39,510
10.	Annual OMR costs in % of installation cost	4.0	2.5	--
11.	Annual OMR costs (10^3 US$)	550	2,870	3,420
12.	Total annual cost (10^3 US$)	3,130	54,150	57,280
13.	Unit cost of energy output (US$/kWh)	--	--	0.084

表A－4．7(2) 発 電 計 画（ケース2）

	Item	Gas turbine	Oil-fired thermal	Total
1.	Allocation	Peak load	Base load	--
2.	Nos. of unit x capacity	2 x 10 MW	2 x 55 MW	
3.	Power generation (MW)	20	110	130
4.	Construction period (yr)	2	4	--
5.	Installation cost, adjusted (10^3 US$)	7,320	114,620	121,940
6.	Annual capital cost (10^3 US$)	860	12,630	13,490
7.	Energy output (GWh/year)	16.9	666.4	683.3
8.	Fuel cost, adjusted (US$/kWh)	0.122	0.058	--
9.	Annual fuel cost (10^3 US$)	2,060	38,650	40,710
10.	Annual OMR costs in % of installation cost	2.0	2.5	--
11.	Annual OMR costs (10^3 US$)	150	2,870	3,020
12.	Total annual cost (10^3 US$)	3,070	54,150	57,220
13.	Unit cost of energy output (US$/kWh)	--	--	0.084

表A－4．7(3) 発 電 計 画（ケース3）

	Item	Diesel	Coal-fired thermal	Total
1.	Allocation	Peak load	Base load	--
2.	Nos. of unit x capacity	2 x 10 MW	2 x 55 MW	
3.	Power generation (MW)	20	110	130
4.	Construction period (yr)	2	4	--
5.	Installation cost, adjusted (10^3 US$)	13,760	185,900	199,660
6.	Annual capital cost (10^3 US$)	1,720	20,490	22,210
7.	Energy output (GWh/year)	16.9	666.4	683.3
8.	Fuel cost, adjusted (US$/kWh)	0.051	0.025	--
9.	Annual fuel cost (10^3 US$)	860	16,660	17,520
10.	Annual OMR costs in % of installation cost	4.0	3.0	--
11.	Annual OMR costs (10^3 US$)	550	5,580	6,130
12.	Total annual cost (10^3 US$)	3,130	42,730	45,860
13.	Unit cost of energy output (US$/kWh)	--	--	0.067

表A－4．7(4) 発 電 計 画（ケース4）

	Item	Gas turbine	Coal-fired thermal	Total
1.	Allocation	Peak load	Base load	--
2.	Nos. of unit x capacity	2 x 10 MW	2 x 55 MW	
3.	Power generation (MW)	20	110	140
4.	Construction period (yr)	2	4	--
5.	Installation cost, adjusted (10^3 US$)	7,320	185,900	193,220
6.	Annual capital cost (10^3 US$)	860	20,490	21,350
7.	Energy output (GWh/year)	16.9	666.4	683.3
8.	Fuel cost, adjusted (US$/kWh)	0.122	0.025	--
9.	Annual fuel cost (10^3 US$)	2,060	16,660	18,720
10.	Annual OMR costs in % of installation cost	2.0	3.0	--
11.	Annual OMR costs (10^3 US$)	150	5,580	5,730
12.	Total annual cost (10^3 US$)	3,070	42,730	45,800
13.	Unit cost of energy output (US$/kWh)	--	--	0.067

表A－4．7(5) 発 電 計 画（ケース5）

	Item	Diesel	Hydro	Gas turbine	Total
1.	Allocation	Peak load	Base load	Backup	--
2.	Nos. of unit x capacity	2x10MW	2x55MW	1x6MW	--
3.	Power generation (MW)	20	106	(6)	130
4.	Construction period (yr)	2	5	2	--
5.	Installation cost, adjusted (10^3 US$)	13,760	283,100	2,200	299,060
6.	Annual capital cost (10^3 US$)	1,720	28,560	260	30,540
7.	Energy output (GWh/year)	16.9	615.3	51.1	683.3
8.	Fuel cost, adjusted (US$/kWh)	0.051	0	0.122	--
9.	Annual fuel cost (10^3 US$)	860	0	6,230	7,090
10.	Annual OMR costs in % of installation cost	4.0	1.5	2.0	--
11.	Annual OMR costs (10^3 US$)	550	4,250	40	4,840
12.	Total annual cost (10^3 US$)	3,130	32,810	6,530	42,470
13.	Unit cost of energy output (US$/kWh)	--	--	--	0.062

表A－4．7(6) 発 電 計 画（ケース6）

	Item	Gas turbine	Hydro	Gas turbine	Total
1.	Allocation	Peak load	Base load	Backup	--
2.	Nos. of unit x capacity	2x10MW	2x55MW	1x6MW	--
3.	Power generation (MW)	20	106	(6)	130
4.	Construction period (yr)	2	5	2	--
5.	Installation cost, adjusted (10^3 US$)	7,320	283,100	2,200	292,620
6.	Annual capital cost (10^3 US$)	860	28,560	260	29,680
7.	Energy output (GWh/year)	16.9	615.3	51.1	683.3
8.	Fuel cost, adjusted (US$/kWh)	0.122	0	0.122	--
9.	Annual fuel cost (10^3 US$)	2,060	0	6,230	8,290
10.	Annual OMR costs in % of installation cost	2.0	1.5	2.0	--
11.	Annual OMR costs (10^3 US$)	150	4,250	40	4,440
12.	Total annual cost (10^3 US$)	3,070	32,810	6,530	42,410
13.	Unit cost of energy output (US$/kWh)	--	--	--	0.062

表A－4．7(7) 発 電 計 画（ケース7）

	Item	Hydro	Oil-fired thermal	Total
1.	Allocation	Peak load	Base load	--
2.	Nos. of unit x capacity	2 x 10 MW	2 x 55 MW	
3.	Power generation (MW)	20	110	130
4.	Construction period (yr)	5	4	--
5.	Installation cost, adjusted (10^3 US$)	101,500	114,620	216,120
6.	Annual capital cost (10^3 US$)	10,240	12,630	22,870
7.	Energy output (GWh/year)	16.9	666.4	683.3
8.	Fuel cost, adjusted (US$/kWh)	0	0.058	--
9.	Annual fuel cost (10^3 US$)	0	38,650	38,650
10.	Annual OMR costs in % of installation cost	1.5	2.5	--
11.	Annual OMR costs (10^3 US$)	1,520	2,870	4,390
12.	Total annual cost (10^3 US$)	11,760	54,150	65,910
13.	Unit cost of energy output (US$/kWh)	--	--	0.096

表A－4．7(8) 発 電 計 画 (ケース8)

	Item	Hydro	Coal-fired thermal	Total
1.	Allocation	Peak load	Base load	--
2.	Nos. of unit x capacity	2 x 10 MW	2 x 55 MW	
3.	Power generation (MW)	20	110	130
4.	Construction period (yr)	5	4	--
5.	Installation cost, adjusted (10^3 US$)	101,500	185,900	287,400
6.	Annual capital cost (10^3 US$)	10,240	20,490	30,730
7.	Energy output (GWh/year)	16.9	666.4	683.3
8.	Fuel cost, adjusted (US$/kWh)	0	0.025	--
9.	Annual fuel cost (10^3 US$)	0	16,660	16,660
10.	Annual OMR costs in % of installation cost	1.5	3.0	--
11.	Annual OMR costs (10^3 US$)	1,520	5,580	7,100
12.	Total annual cost (10^3 US$)	11,760	42,730	54,490
13.	Unit cost of energy output (US$/kWh)	--	--	0.080

表A－4．7(9) 発 電 計 画（ケース9）

	Item	Hydro	Hydro	Gas turbine	Total
1.	Allocation	Peak load	Base load	Backup	--
2.	Nos. of unit x capacity	2x10MW	2x55MW	1x14MW	--
3.	Power generation (MW)	10	106	(14)	130
4.	Construction period (yr)	5	5	2	--
5.	Installation cost, adjusted (10^3 US$)	101,500	203,200	5,120	309,820
6.	Annual capital cost (10^3 US$)	10,240	20,500	600	31,340
7.	Energy output (GWh/year)	14.3	646.5	22.5	683.3
8.	Fuel cost, adjusted (US$/kWh)	0	0	0.122	--
9.	Annual fuel cost (10^3 US$)	0	0	2,750	2,750
10.	Annual OMR costs in % of installation cost	1.5	1.5	2.0	--
11.	Annual OMR costs (10^3 US$)	1,520	3,050	100	4,670
12.	Total annual cost (10^3 US$)	11,760	23,550	3,450	38,760
13.	Unit cost of energy output (US$/kWh)	--	--	--	0.057

表A－7．1(1) スークダムならびに発電所の建設費用

Work Item	Unit	Quantity	Unit Price (US$)	Amount (US$)	Remarks
1. Preparatory Work					
1) Access and haul roads	L.S.			1,000,000	
2) Office, workshop, quarters, etc.	L.S.			1,000,000	
3) Water supply system	L.S.			100,000	
4) Power supply system	L.S.			1,000,000	
5) Telecommunication	L.S.			100,000	
6) Miscellaneous	L.S.			160,000	5% of 1) to 5)
Sub-total				3,360,000	
2. River Diversion Work					
1) Excavation in common	m^3	55,000	4.0	220,000	
2) " in weathered rock	m^3	4,000	8.0	32,000	
3) " in rock	m^3	1,000	12.0	12,000	
4) " in tunnel	m^3	45,000	70.0	3,150,000	
5) Concrete in open	m^3	1,800	120.0	216,000	
6) " in tunnel	m^3	17,000	160.0	2,720,000	
7) Reinforcement bars	ton	480	750.0	360,000	
8) Grouting, consolidation	ton	1,000	700.0	700,000	
9) Care of river	L.S.			200,000	
10) Miscellaneous works	L.S.			381,000	5% of 1) to 9)
Sub-total				7,991,000	

表A－7．1(2) スークダムならびに発電所の建設費用

Work Item	Unit	Quantity	Unit Price (US$)	Amount (US$)	Remarks
3.Main Dam					
1) Excavation in common	m^3	580,000	4.0	2,320,000	
2) " in weathered rock	m^3	32,000	8.0	256,000	
3) " in in rock	m^3	30,000	12.0	360,000	
4) Embankment in impervious core	m^3	240,000	8.0	1,920,000	
5) " in filter	m^3	190,000	13.0	2,280,000	
6) " in rock	m^3	1,300,000	8.0	10,400,000	
7) Concrete in open	m^3	6,800	120.0	816,000	
8) Reinforcement bars	ton	410	750.0	308,000	
9) Grouting, curtain	m	26,000	110.0	2,860,000	
10) " ,blanket	m	8,000	110.0	880,000	
11) Shotcrete	m^2	6,000	45.0	270,000	
12) Miscellaneous works	L.S.			1,134,000	5% of 1) to 11)
Sub-total				23,804,000	
4.Saddle Dam					
1) Excavation in common	m^3	90,000	4.0	360,000	
2) Embankment in impervious core	m^3	220,000	8.0	1,760,000	
3) " in filter	m^3	35,000	13.0	455,000	
4) " in rock	m^3	115,000	8.0	920,000	
5) Miscellaneous works	L.S.			300,000	5% of 1) to 4)
Sub-total				3,795,000	

表A－7．1(3) スークダムならびに発電所の建設費用

Work Item	Unit	Quantity	Unit Price (US$)	Amount (US$)	Remarks
5.Spillway					
1) Excavation in common	m^3	250,000	4.0	1,000,000	
2) " in weathered rock	m^3	80,000	8.0	640,000	
3) " in rock	m^3	50,000	12.0	600,000	
4) Concrete in open	m^3	35,000	120.0	4,200,000	
5) Reinforcement bars	ton	1,400	750.0	1,050,000	
6) Shotcrete	m^2	6,000	45.0	270,000	
7) Miscellaneous works	L.S.			350,000	5% of 1) to 6)
Sub-total				8,110,000	
6.River Outlet Work					
1) Excavation in tunnel	m^3	300	70.0	20,000	
2) Concrete in tunnel	m^3	2,000	120.0	240,000	
3) Reinforcement bar	ton	80	750.0	60,000	
4) Metal work	ton	50	2,000.0	100,000	
5) Miscellaneous works	L.S.			21,000	5% of 1) to 4)
Sub-total				441,000	
7.Intake Structure					
1) Excavation in common	m^3	35,000	4.0	140,000	
2) " in weathered rock	m^3	13,000	8.0	104,000	
3) " in rock	m^3	5,000	12.0	60,000	
4) Concrete in open	m^3	2,000	120.0	240,000	

表A－7．1(4) スークダムならびに発電所の建設費用

	Work Item	Unit	Quantity	Unit Price (US$)	Amount (US$)	Remarks
5)	Reinforcement bars	ton	100	750.0	75,000	
6)	Miscellaneous works	L.S.			30,000	5% of 1) to 5)
	Sub-total				649,000	
8.	Waterway and Surge Tank					
1)	Excavation in common	m^3	40,000	4.0	160,000	
2)	" in weathered rock	m^3	2,000	8.0	16,000	
3)	" in tunnel	m^3	12,000	70.0	840,000	
4)	" in shaft	m^3	8,500	85.0	723,000	
5)	Concrete in tunnel	m^3	3,500	160.0	560,000	
6)	" in shaft	m^3	1,000	160.0	160,000	
7)	Reinforcement bars	ton	320	750.0	240,000	
8)	Grouting, consolidation	ton	70	700.0	49,000	
9)	Miscellaneous works	L.S.			137,000	5% of 1) to 8)
	Sub-total				2,885,000	
					2,885,000	
9.	Penstock Line					
1)	Excavation in common	m^3	15,000	4.0	90,000	
2)	" in weathered rock	m^3	12,000	8.0	96,000	
3)	" in rock	m^3	20,000	12.0	240,000	
4)	" in tunnel	m^3	1,000	70.0	70,000	
5)	Concrete in open	m^3	2,000	120.0	240,000	
6)	" in tunnel	m^3	400	160.0	64,000	

表A－7．1(5) スークダムならびに発電所の建設費用

	Work Item	Unit	Quantity	Unit Price (US$)	Amount (US$)	Remarks
7)	Reinforcement	ton	240	750.0	180,000	
8)	Miscellaneous work	L.S.			49,000	5% of 1) to 8)
	Sub-total				1,029,000	
10.	Powerhouse and Tailrace					
1)	Excavation in common	m^3	4,000	4.0	16,000	
2)	" in weathered rock	m^3	6,000	8.0	48,000	
3)	" in rock	m^3	23,000	12.0	276,000	
4)	Concrete in open	m^3	8,500	120.0	1,020,000	
5)	Reinforcement bars	ton	450	750.0	338,000	
6)	Powerhouse superstructure	L.S.			850,000	
7)	Miscellaneous works	L.S.			127,000	5% of 1) to 6)
	Sub-total				2,675,000	
11.	Switch Yard					
1)	Excavation in common	m^3	1,000	4.0	4 000	
2)	Embankment in earth materials	m^3	1,000	8.0	8,000	
3)	Concrete in open	m^3	500	120.0	60,000	
4)	Reinforcement bars	ton	20	750.0	15,000	
5)	Miscellaneous works	L.S.			4,000	5% of 1) to 4)
	Sub-total				91,000	

表A－7．1(6) スークダムならびに発電所の建設費用

Work Item	Unit	Quantity	Unit Price (US$)	Amount (US$)	Remarks
12.Hydro-mechanical Works					
1) Diversion gate	ton	60	3,800	228,000	
2) Spillway gate	ton	180	7,000	1,260,000	
3) River outlet facilities	ton	70	8,000	560,000	
4) Trash rack for river outlet	ton	30	3,500	105,000	
5) Intake gate	ton	100	7,000	700,000	
6) Intake trash rack	ton	60	3,500	210,000	
7) Intake mechanical race	L.S.			300,000	
8) Steel penstock	ton	240	3,600	864,000	
9) Tailrace gate	ton	60	6,500	390,000	
10) Floating trash removing facilities	L.S.			500,000	
Sub-total				5,117,000	
13.Generating Equipment	L.S.			7,500,000	10 MW x 2 sets
14.Transmission Line	Km	10	100,000	1,000,000	Sook - Keningau
15.Total of Items 1. to 14.				68,447,000	
16.Engineering and Administration	L.S.			5,476,000	8% of Item 15.
17.Compensation	L.S.			18,400,000	
18.Physical Contingency	L.S.			9,232,000	10% of Items 15. to 17.

表A－7．1(7) スークダムならびに発電所の建設費用

Work Item	Unit	Quantity	Unit Price (US$)	Amount (US$)	Remarks
19.Total of Items 1. to 18.				101,555,000	
20.Price Contingency				40,645,000	
21.Grand Total				142,200,000	

表A－7．2(1) テノムパンギ発電所の拡張に伴う建設費用

Work Item	Unit	Quantity	Unit Price (US$)	Amount (US$)	Remarks
1.Preparatory Work					
1) Office, workshop, quarters, etc.	L.S.			1,000,000	
2) Water supply system	L.S.			100,000	
3) Power supply system	L.S.			4,000,000	
4) Telecommunication system	L.S.			100,000	
5) Miscellaneous	L.S.			260,000	5% of 1) to 5)
Sub-total				5,460,000	
2.Intake Structure					
1) Care of river	L.S.			300,000	
2) Miscellaneous works	L.S.			300,000	
Sub-total				600,000	
3.Waterway and Surge Tank					
1) Excavation in tunnel	m^3	145,000	70.0	10,150,000	
2) " in shaft	m^3	19,000	85.0	1,615,000	
3) Concrete in tunnel	m^3	45,000	160.0	7,200,000	
4) " in shaft	m^3	5,000	160.0	800,000	
5) Reinforcement bars	ton	2,000	750.0	1,500,000	
6) Grouting, consolidation	ton	2,100	700.0	1,470,000	
7) Miscellaneous works				1,137,000	5% of 1 to 6)
Sub-total				23,872,000	

表A－7．2(2) テノムパンギ発電所の拡張に伴う建設費用

Work Item	Unit	Quantity	Unit Price (US$)	Amount (US$)	Remarks
4. Penstock Line					
1) Excavation in tunnel	m^3	13,000	70.0	910,000	
2) Concrete in tunnel	m^3	5,000	160.0	800,000	
3) Reinforcing bars	ton	200	750.0	150,000	
4) Grouting, consolidation	ton	60	700.0	42,000	
5) Miscellaneous works				95,000	5% of 1) to 4)
Sub-total				1,997,000	
5. Powerhouse and Tailrace					
1) Excavation in common	m^3	70,000	4.0	280,000	
2) " in weathered rock	m^3	20,000	8.0	160,000	
3) " in rock	m^3	10,000	12.0	120,000	
4) Concrete in open	m^3	15,000	120.0	1,800,000	
5) Reinforcement bars	m^3	900	750.0	675,000	
6) Powerhouse superstructure	L.S.			1,100,000	
7) Miscellaneous works				207,000	5% of 1) to 6)
Sub-total				4,342,000	

表A－7．2(3) テノムパンギ発電所の拡張に伴う建設費用

Work Item	Unit	Quantity	Unit Price (US$)	Amount (US$)	Remarks
6.Hydro-mechanical Works					
1) Intake trash rack	ton	34	3,800	171,000	
2) Intake gate	ton	150	7,000	1,050,000	
3) Floating trash deflector	ton	200	5,000	1,000,000	
4) Mechanical rake	L.S.			1,500,000	
5) Steel penstock	ton	700	3,600	2,520,000	
6) Tailrace gate	ton	40	6,500	260,000	
7) Miscellaneous works				325,000	5% of 1) to 6)
Sub-total				6,826,000	
7.Generating Equipment	L.S.			12,000,000	22 MW x 2 units
8.Substation Equipment	L.S.			6,000,000	
9.Total of Items 1. to 8.				61,097,000	
10.Engineering and Administration	L.S.			4,888,000	8% of Item 9.
11.Compensation				-	
12.Physical Contingency	L.S.			6,599,000	10% of Items 9. to 11.
13.Total of Items 9. to 12.				72,584,000	
14.Price Contingency				29,016,000	
15.Grand Total				101,600,000	

表A-8.1　経済費用の支出計画

（スーク・ダムと発電所及びテノムパンギ発電所，第３期計画単独）

(Unit: 10^3 US$)

Item	Total Amount	1989	1990	1991	1992	1993
I. Total economic cost						
1. Sook dam and power station	76,185	5,154	15,134	13,205	24,420	18,272
2. Tenom Pangi extension	68,875	2,151	6,449	11,854	27,079	21,342
3. Total	145,060	7,305	21,583	25,059	51,499	39,614
II. Foreign currency portion						
1. Sook dam and power station	47,127	2,841	8,559	7,301	15,141	13,285
2. Tenom Pangi extension	49,071	1,760	2,278	8,066	20,373	16,594
3. Total	96,198	4,601	10,837	15,367	35,514	29,879
III. Local currency portion						
1. Sook dam and power station	29,058	2,313	6,575	5,304	9,279	4,987
2. Tenom Pangi extension	19,804	391	4,171	3,788	6,706	4,748
3. Total	48,862	2,704	10,746	9,692	15,985	9,735

表A-8.2(1)　スーク・ダムと発電所の全経済費用の支出計画

（スーク・ダムと発電所及びテノムパンギ発電所，第３期計画単独）

(Unit: 10^3US$)

	Work Item	Total Amount	1988	1989	1990	1991	1992	1993
1.	Preparatory Work	2,927	-	1,755	1,172	-	-	-
2.	River Diversion Work	7,514	-	417	4,591	834	-	1,672
3.	Main Dam	21,923	-	-	3,372	5,901	10,118	2,532
4.	Saddle Dam	3,509	-	218	2,631	660	-	-
5.	Spillway	7,341	-	-	1,375	2,752	2,752	462
6.	River Outlet Work	410	-	-	-	204	-	206
7.	Intake Structure	590	-	-	-	196	394	-
8.	Waterway and Surge Tank	2,701	-	-	-	-	1,413	1,288
9.	Penstock Line	939	-	-	-	520	419	-
10.	Powerhouse and Tailrace	2,404	-	-	-	73	1,108	1,223
11.	Switch Yard	82	-	-	-	-	-	82
12.	Hydro-mechanical Works	4,953	-	-	-	-	2,567	2,386
13.	Generating Equipment	7,380	-	-	-	388	2,329	4,663
14.	Transmission Line	976	-	-	-	-	-	976
15.	Sub-total	63,649	-	2,390	13,141	11,528	21,100	15,490
16.	Engineering and Administration	5,356	-	2,296	618	478	1,101	863
17.	Compensation	-	-	-	-	-	-	-
18.	Physical Contingency	7,180	-	468	1,375	1,199	2,219	1,919
19.	Total	76,185	-	5,154	15,134	13,205	24,420	18,272

表A-8.2(2) スーク・ダムと発電所の経済費用（外貨部分）の支出計画

（スーク・ダムと発電所及びテノムパンギ発電所，第３期計画単独）

(Unit: 10^3US$)

	Work Item	Total Amount	1988	1989	1990	1991	1992	1993
1.	Preparatory Work	651	-	390	261	-	-	-
2.	River Diversion Work	5,010	-	278	3,061	556	-	1,115
3.	Main Dam	12,049	-	-	1,853	3,243	5,561	1,392
4.	Saddle Dam	2,009	-	125	1,506	378	-	-
5.	Spillway	3,305	-	-	619	1,239	1,239	208
6.	River Outlet Work	249	-	-	-	124	-	125
7.	Intake Structure	277	-	-	-	92	185	-
8.	Waterway and Surge Tank	1,737	-	-	-	-	909	828
9.	Penstock Line	464	-	-	-	257	207	-
10.	Powerhouse and Tailrace	983	-	-	-	30	453	500
11.	Switch Yard	34	-	-	-	-	-	34
12.	Hydro-mechanical Works	4,094	-	-	-	-	2,122	1,972
13.	Generating Equipment	6,750	-	-	-	355	2,131	4,264
14.	Transmission Line	850	-	-	-	-	-	850
15.	Sub-total	38,462	-	793	7,300	6,274	12,807	11,288
16.	Engineering and Administration	4,381	-	1,790	481	364	958	788
17.	Compensation	-	-	-	-	-	-	-
18.	Physical Contingency	4,284	-	258	778	663	1,376	1,209
19.	Total	47,127	-	2,841	8,559	7,301	15,141	13,285

表A-8.2(3) スーク・ダムと発電所の経済費用（内貨部分）の支出計画

（スーク・ダムと発電所及びテノムパンギ発電所，第3期計画単独）

(Unit: 10^3US$)

	Work Item	Total Amount	1988	1989	1990	1991	1992	1993
1.	Preparatory Work	2,276	-	1,365	911	-	-	-
2.	River Diversion Work	2,504	-	139	1,530	278	-	557
3.	Main Dam	9,874	-	-	1,519	2,658	4,557	1,140
4.	Saddle Dam	1,500	-	93	1,125	282	-	-
5.	Spillway	4,036	-	-	756	1,513	1,513	254
6.	River Outlet Work	161	-	-	-	80	-	81
7.	Intake Structure	313	-	-	-	104	209	-
8.	Waterway and Surge Tank	964	-	-	-	-	504	460
9.	Penstock Line	475	-	-	-	263	212	-
10.	Powerhouse and Tailrace	1,421	-	-	-	43	655	723
11.	Switch Yard	48	-	-	-	-	-	48
12.	Hydro-mechanical Works	859	-	-	-	-	445	414
13.	Generating Equipment	630	-	-	-	33	198	399
14.	Transmission Line	126	-	-	-	-	-	126
15.	Sub-total	25,187	-	1,597	5,841	5,254	8,293	4,202
16.	Engineering and Administration	975	-	506	137	114	143	75
17.	Compensation	-	-	-	-	-	-	-
18.	Physical Contingency	2,896	-	210	597	536	843	710
19.	Total	29,058	-	2,313	6,575	5,904	9,279	4,987

表A-8.3(1)　テノムパンギ増設にかかる全経済費用の支出計画
（スーク・ダムと発電所及びテノムパンギ発電所，第３期計画単独）

(Unit: 10^3 US$)

	Work Item	Total Amount	1988	1989	1990	1991	1992	1993
1.	Preparatory Work	4,808			4,808			
2.	Intake Structures	538				179	179	180
3.	Waterway & Surge Tank	22,534			866	5,488	10,110	6,070
4.	Penstock Line	1,886				664	664	558
5.	Powerhouse & Tailrace	3,893				1,668	1,389	836
6.	Hydro-Mechanical Works	6,608				600	3,603	2,405
7.	Generating Equipment	11,712				557	4,461	6,694
8.	Substation Equipment	5,856				1,171	2,928	1,757
9.	Sub-Total	57,835	0	0	5,674	10,327	23,334	18,500
10.	Engineering & Administration	4,779	0	1,956	189	450	1,284	900
11.	Compensation	0	0	0	0	0	0	0
12.	Physical Contingency	6,261	0	195	586	1,077	2,461	1,942
13.	Total	68,875	0	2,151	6,449	11,854	27,079	21,342

表A-8.3(2) テノムパンギ増設にかかる経済費用（外貨部分）の支出計画
（スーク・ダムと発電所及びテノムパンギ発電所，第3期計画単独）

(Unit: 10^3 US$)

	Work Item	Total Amount	1988	1989	1990	1991	1992	1993
1.	Preparatory Work	1,386			1,386			
2.	Intake Structures	210				70	70	70
3.	Waterway & Surge Tank	15,513			596	3,778	6,960	4,179
4.	Penstock Line	1,306				460	460	386
5.	Powerhouse & Tailrace	1,534				657	547	330
6.	Hydro-Mechanical Works	5,461				496	2,978	1,987
7.	Generating Equipment	10,200				485	3,885	5,830
8.	Substation Equipment	5,100				1,020	2,550	1,530
9.	Sub-Total	40,710	0	0	1,982	6,966	17,450	14,312
10.	Engineering & Administration	3,900	0	1,600	89	367	1,071	773
11.	Compensation	0	0	0	0	0	0	0
12.	Physical Contingency	4,461	0	160	207	733	1,852	1,509
13.	Total	49,071	0	1,760	2,278	8,066	20,373	16,594

表A-8.3(3) テノムパンギ増設にかかる経済費用（内貨部分）の支出計画
（スーク・ダムと発電所及びテノムパンギ発電所，第3期計画単独）

(Unit: 10^3 US$)

	Work Item	Total Amount	1988	1989	1990	1991	1992	1993
1.	Preparatory Work	3,422			3,422			
2.	Intake Structures	328				109	109	109
3.	Waterway & Surge Tank	7,021			270	1,710	3,150	1,891
4.	Penstock Line	580				204	204	172
5.	Powerhouse & Tailrace	2,359				1,011	842	506
6.	Hydro-Mechanical Works	1,147				104	625	418
7.	Generating Equipment	1,512				72	576	864
8.	Substation Equipment	756				151	378	227
9.	Sub-Total	17,125	0	0	3,692	3,361	5,884	4,187
10.	Engineering & Administration	879	0	356	100	83	213	127
11.	Compensation	0	0	0	0	0	0	0
12.	Physical Contingency	1,800	0	35	379	344	609	433
13.	Total	19,804	0	391	4,171	3,788	6,706	4,747

表A-8.4　　電力便益計画（第３期計画のみ）

No.	Year	Power generated (MW)	Energy output (GWh)			Power benefit (10^6 US$)			Present worth factor	Present worth (10^6 US$)
			Firm	Dump	Total	Capacity	Energy	Total		
1	1989								0.9091	
2	1990								0.8264	
3	1991								0.7513	
4	1992								0.6830	
5	1993								0.6209	
6	1994	41.0	329.3	6.3	335.6	9.7	8.6	18.3	0.5645	10.3
7	1995	61.0	329.3	6.3	335.6	14.5	8.6	23.1	0.5132	11.9
8	1996	71.0	329.3	6.3	335.6	16.8	8.6	25.4	0.4665	11.8
9	1997	71.0	329.3	6.3	335.6	16.8	8.6	25.4		
.	.									
.	.									
.	.									
.	.									
.	.		25.4 x 9.8969 x 0.5132 = 129.0							
.	.									
.	.									
.	.									
.	.									
55	2043	71.0	329.3	6.3	335.6	16.8	8.6	25.4	0.0053	0.1
Total:										163.0

Annual equivalent benefit:　163.0 x 0.1009 = 16.4 x 10^6 US$

表A-8.5　　電力便益計画（第１，２及び３期計画）

No.	Year	Power generated (MW)			Energy output (GWh)									Power benefit (10^6 US$)			Present worth factor	Present worth (10^6 US$)
					Phase I, II			Phase III			Grand total							
		Phase I, II	Phase III	Total	Firm	Dump	Total	Firm	Dump	Total	Firm	Dump	Total	Capacity	Energy	Total		
-4	1985	6.0	-	-	325.9	0	325.9	-	-	-	325.9	0	325.9	1.4	8.5	9.9	1.3310	13.2
-3	1986	15.0	-	-	331.6	51.6	383.2	-	-	-	331.6	51.6	383.2	3.6	9.3	12.9	1.2100	15.6
-2	1987	25.0	-	-	331.6	146.2	477.8	-	-	-	331.6	146.2	477.8	5.9	10.5	16.4	1.1000	18.0
-1	1988	36.0	-	-	331.6	184.6	516.2	-	-	-	331.6	184.6	516.2	8.5	11.0	19.5	1.0000	19.5
1	1989	45.0	-	-	331.6	184.6	516.2	-	-	-	331.6	184.6	516.2	10.7	11.0	21.7	0.9091	19.7
2	1990	45.0	-	-	331.6	184.6	516.2	-	-	-	331.6	184.6	516.2	10.7	11.0	21.7	0.8264	17.9
3	1991	45.0	-	-	331.6	184.6	516.2	-	-	-	331.6	184.6	516.2	10.7	11.0	21.7	0.7513	16.3
4	1992	45.0	-	-	331.6	184.6	516.2	-	-	-	331.6	184.6	516.2	10.7	11.0	21.7	0.6830	14.8
5	1993	45.0	-	-	331.6	184.6	516.2	-	-	-	331.6	184.6	516.2	10.7	11.0	21.7	0.6209	13.5
6	1994	45.0	41.0	86.0	331.6	184.6	516.2	329.3	6.3	335.6	660.9	190.9	851.8	20.4	19.7	40.1	0.5645	22.6
7	1995	45.0	61.0	106.0	331.6	184.6	516.2	329.3	6.3	335.6	660.9	190.9	851.8	25.1	19.7	44.8	0.5132	23.0
8	1996	45.0	71.0	116.0	331.6	184.6	516.2	329.3	6.3	335.6	660.9	190.9	851.8	27.5	19.7	47.2	0.4665	
9	1997	45.0	71.0	116.0	331.6	184.6	516.2	329.3	6.3	335.6	660.9	190.9	851.8	27.5	19.7	47.2		
.	.																	
.	.																	
.	.																	
.	.																	
.	.				(47.2 x 9.7570 x 0.5132 = 236.3)													
.	.																	
.	.																	
.	.																	
.	.																	
46	2034	45.0	71.0	116.0	331.6	184.6	516.2	329.3	6.3	335.6	660.9	190.9	851.8	27.5	19.7	47.2	0.0124	
47	2035	-	71.0	71.0	-	-	-	329.3	6.3	335.6	329.3	6.3	335.6	16.8	8.6	25.4	0.0113	
.	.																	
.	.																	
.	.																	
.	.																	
.	.				(25.4 x 5.7590 x 0.5124 = 1.8)													
.	.																	
.	.																	
.	.																	
.	.																	
55	2043	-	71.0	71.0	-	-	-	329.3	6.3	335.6	329.3	6.3	335.6					
Total:																		432.2

Annual equivalent benefit = 432.2 x 0.1009 = 43.6 x 10^6 US$

Table A-8.6 DISBURSEMENT SCHEDULE OF FINANCIAL COST (SOOK DAM AND POWER STATION + TENOM PANGI EXTENSION - PHASE III ONLY)

Item	Total amount	1980	1990	1991	1992	1993
I. Total financial cost						
1. Sook dam and power station	101,555	6,722	17,649	15,600	34,537	27,047
2. Tenom Pangi extension	72,584	2,200	7,235	12,569	28,340	22,240
3. Total	174,139	8,922	24,884	28,169	62,877	49,287
II. Foreign currency portion						
1. Sook dam and power station	47,127	2,841	8,669	7,411	15,141	13,065
2. Tenom Pangi extension	49,071	1,760	2,278	8,066	20,373	16,594
3. Total	96,198	4,601	10,947	15,477	35,514	29,659
III. Local currency portion						
1. Sook dam and power station	54,428	3,879	8,977	8,188	19,392	13,992
2. Tenom Pangi extension	23,513	440	4,957	4,503	7,967	5,646
3. Total	77,941	4,319	13,934	12,691	27,359	19,638

Table A-8.7(1) DISBURSEMENT SCHEDULE OF FINANCIAL COST (TOTAL) OF SOOK DAM AND POWER STATION

(Unit: 10^3US$)

	Work Item	Total Amount	1988	1989	1990	1991	1992	1993
1.	Preparatory Work	3,360	-	2,016	1,344	-	-	-
2.	River Diversion Work	7,991	-	443	4,883	887	-	1,778
3.	Main Dam	23,804	-	-	3,662	6,408	10,986	2,740
4.	Saddle Dam	3,795	-	237	2,846	712	-	-
5.	Spillway	8,110	-	-	1,520	3,041	3,041	508
6.	River Outlet Work	441	-	-	-	220	-	221
7.	Intake Structure	649	-	-	-	216	433	-
8.	Waterway and Surge Tank	2,885	-	-	-	-	1,511	1,374
9.	Penstock Line	1,029	-	-	-	571	458	-
10.	Powerhouse and Tailrace	2,675	-	-	-	81	1,234	1,360
11.	Switch Yard	91	-	-	-	-	-	91
12.	Hydro-mechanical Works	5,117	-	-	-	-	2,653	2,164
13.	Generating Equipment	7,500	-	-	-	394	2,368	2,738
14.	Transmission Line	1,000	-	-	-	-	-	1,000
15.	Sub-total	68,447	-	2,696	14,255	12,530	22,684	16,282
16.	Engineering and Administration	5,476	-	2,415	790	652	1,014	605
17.	Compensation	18,400	-	1,000	1,000	1,000	7,700	7,700
18.	Physical Contingency	9,232	-	611	1,604	1,416	3,139	2,460
19.	Total	101,555	-	6,722	17,649	15,600	34,537	27,047

Table A-8.7(2) DISBURSEMENT SCHEDULE OF FINANCIAL COST (FOREIGN CURRENCY PORTION) OF SOOK DAM AND POWER STATION

(Unit: 10^3US$)

	Work Item	Total Amount	1988	1989	1990	1991	1992	1993
1.	Preparatory Work	651	-	390	261	-	-	-
2.	River Diversion Work	5,010	-	278	3,061	556	-	1,115
3.	Main Dam	12,049	-	-	1,853	3,243	5,561	1,392
4.	Saddle Dam	2,009	-	125	1,506	378	-	-
5.	Spillway	3,305	-	-	619	1,239	1,239	208
6.	River Outlet Work	249	-	-	-	124	-	125
7.	Intake Structure	277	-	-	-	92	185	-
8.	Waterway and Surge Tank	1,737	-	-	-	-	909	828
9.	Penstock Line	464	-	-	-	257	207	-
10.	Powerhouse and Tailrace	983	-	-	-	30	453	500
11.	Switch Yard	34	-	-	-	-	-	34
12.	Hydro-mechanical Works	4,094	-	-	-	-	2,122	1,972
13.	Generating Equipment	6,750	-	-	-	355	2,131	4,264
14.	Transmission Line	850	-	-	-	-	-	850
15.	Sub-total	38,462	-	795	7,300	6,274	12,807	11,288
16.	Engineering and Administration	4,381	-	1,790	581	464	958	588
17.	Compensation	-	-	-	-	-	-	-
18.	Physical Contingency	4,284	-	258	788	673	1,376	1,189
19.	Total	47,127	-	2,841	8,669	7,411	15,141	13,065

Table A-8.7 (3) DISBURSEMENT SCHEDULE OF FINANCIAL COST (LOCAL CURRENCY PORTION) OF SOOK DAM AND POWER STATION

(Unit: 10^3US$)

	Work Item	Total Amount	1988	1989	1990	1991	1992	1993
1.	Preparatory Work	2,709	-	1,625	1,084	-	-	-
2.	River Diversion Work	2,981	-	165	1,821	331	-	664
3.	Main Dam	11,755	-	-	1,808	3,164	5,425	1,358
4.	Saddle Dam	1,786	-	111	1,339	336	-	-
5.	Spillway	4,805	-	-	900	1,801	1,801	303
6.	River Outlet Work	192	-	-	-	96	-	96
7.	Intake Structure	372	-	-	-	124	248	-
8.	Waterway and Surge Tank	1,148	-	-	-	-	601	547
9.	Penstock Line	565	-	-	-	313	252	-
10.	Powerhouse and Tailrace	1,692	-	-	-	51	780	861
11.	Switch Yard	57	-	-	-	-	-	57
12.	Hydro-mechanical Works	1,023	-	-	-	-	530	493
13.	Generating Equipment	750	-	-	-	39	236	475
14.	Transmission Line	150	-	-	-	-	-	150
15.	Sub-total	29,985	-	1,901	6,852	6,255	5,873	5,004
16.	Engineering and Administration	1,095	-	625	209	188	56	17
17.	Compensation	18,400	-	1,000	1,000	1,000	7,700	7,700
18.	Physical Contingency	4,948	-	353	816	745	1,763	1,271
19.	Total	54,428	-	3,879	8,977	8,188	19,392	13,992

Table A-8.8 (1) DISBURSEMENT SCHEDULE OF FINANCIAL COST (TOTAL) OF EXTENSION OF TENOM PANGI

(Unit: 10^3 US$)

	Work Item	Total Amount	1988	1989	1990	1991	1992	1993
1.	Preparatory Work	5,460			5,460			
2.	Intake Structures	600				200	200	200
3.	Waterway & Surge Tank	23,872			917	5,814	10,710	6,431
4.	Penstock Line	1,997				703	703	591
5.	Powerhouse & Tailrace	4,342				1,860	1,549	933
6.	Hydro-Mechanical Works	6,826				620	3,722	2,484
7.	Generating Equipment	12,000				570	4,570	6,860
8.	Substation Equipment	6,000				1,200	3,000	1,800
9.	Sub-Total	61,097	0	0	6,377	10,967	24,454	19,299
10.	Engineering & Administration	4,888	0	2,000	201	460	1,310	917
11.	Compensation	0	0	0	0	0	0	0
12.	Physical Contingency	6,599	0	200	657	1,142	2,576	2,024
13.	Total	72,584	0	2,200	7,235	12,569	28,340	22,240

Note: Engineering Cost for detail design is capitalyed to 1989.
Its amount is 2,000 x 10^3 US$

Table A-8.8 (2) DISBURSEMENT SCHEDULE OF FINANCIAL COST (FOREIGN CURRENCY PORTION) OF EXTENSION OF TENOM PANGI

(Unit: 10^3 US$)

	Work Item	Total Amount	1988	1989	1990	1991	1992	1993
1.	Preparatory Work	1,386			1,386			
2.	Intake Structures	210				70	70	70
3.	Waterway & Surge Tank	15,513			596	3,778	6,960	4,179
4.	Penstock Line	1,306				460	460	386
5.	Powerhouse & Tailrace	1,534				657	547	330
6.	Hydro-Mechanical Works	5,461				496	2,978	1,987
7.	Generating Equipment	10,200				485	3,885	5,830
8.	Substation Equipment	5,100				1,020	2,550	1,530
9.	Sub-Total	40,710	0	0	1,982	6,966	17,450	14,312
10.	Engineering & Administration	3,900	0	1,600	89	367	1,071	773
11.	Compensation	0	0	0	0	0	0	0
12.	Physical Contingency	4,461	0	160	207	733	1,852	1,509
13.	Total	49,071	0	1,760	2,278	8,066	20,373	16,594

Table A-8.8 (3) DISBURSEMENT SCHEDULE OF FINANCIAL COST (LOCAL CURRENCY PORTION) OF EXTENSION OF TENOM PANGI

(Unit: 10^3 US$)

	Work Item	Total Amount	1988	1989	1990	1991	1992	1993
1.	Preparatory Work	4,074			4,074			
2.	Intake Structures	390				130	130	130
3.	Waterway & Surge Tank	8,359			321	2,036	3,750	2,252
4.	Penstock Line	691				243	243	205
5.	Powerhouse & Tailrace	2,808				1,203	1,002	603
6.	Hydro-Mechanical Works	1,365				124	744	497
7.	Generating Equipment	1,800				85	685	1,030
8.	Substation Equipment	900				180	450	270
9.	Sub-Total	20,387	0	0	4,395	4,001	7,004	4,987
10.	Engineering & Administration	988	0	400	112	93	239	144
11.	Compensation	0	0	0	0	0	0	0
12.	Physical Contingency	2,138	0	40	450	409	724	515
13.	Total	23,513	0	440	4,957	4,503	7,967	5,646

A－8．1　社会環境詳細調査に関する環境庁の提言

1．環境庁の提言

環境庁からの以下の提言は、次段階で行なわれるべき社会環境面における詳細調査に有用である。

1)　環境影響評価には、以下の項目を含んでいなければならない。

i)　代替案を含めたプロジェクトの記述

ii)　環境の現況を明確に記述すること。

iii)　環境への影響の性質と範囲を予測すること。
当該プロジェクトが及ぼす不可避的な環境への影響と考えられ得るその結果

iv)　関係者の懸念する事項を確認すること。

v)　影響の重大さを評価すること。

vi)　プロジェクトの計画にくみ入れ影響を軽減ないし減少するのに適当な方法を提言すること。

vii)　プロジェクトが地域社会に及ぼす正負の便益を確認すること。

viii)　当該プロジェクトを断念するとして、現在の環境がどれほど長く維持され得るか。

2)　調査範囲への提言

i)　貯水池汀線の浸食を含む流域内の土砂浸食

ii)　水質変化が河川の生態や漁業におよぼす影響
当該プロジェクト上流域での農業活動の影響にも着目する必要がある。農業活動の形態は明確に述べる必要がある。

iii)　生息地が失われることによる、プロジェクトの野生生物におよぼす影響

iv) 水中に生息する病原菌に起因する病気が増加する可能性はどうか。
住血吸虫病は最近マレーシアでは発生していないが、貯水池の条件によっては住血吸虫が寄生するかたつむりが繁殖するかもしれない。

v) 貯水による考古学や自然および文化領域における損失

vi) プロジェクトの影響を受ける住民の社会経済的状況を評価する調査や、移住問題を解決するための対策を含む社会経済的影響。この問題は新しい生活基盤の整備や住民の移転の要する費用を含め詳細に検討すべきである。
社会経済調査はプロジェクトに関係しない中立的機関により行なわれるべきである。

vii) 農耕地、社会基盤設備およびその他の建造物の損失費用。

viii) 移住計画の実施時期。移住先の用地及び宗教的文化的要因に関し問題がないかどうか、住民の雇用あるいは労働形態、土壌の適性地域社会の交流等々。

2. 環境影響報告書とその形式

上記の諸提言に加え、社会環境影響評価報告書とその形式に関する以下の基本的なガイドラインも有益である。これもまた環境庁により作成されたものである。

1) プロジェクトの表題

プロジェクトの表題は、プロジェクトの形式やその位置を正しく表現すべきである。また当該プロジェクトが総合計画の一部であるなら、そのことを示唆するものでなければならない。

表題に続いて参照には以下を含むべきである。

(a) 予備的評価報告書、提出日及び承認機関名

(b) 評価のための項目説明書を含む詳細評価の概要

2) プロジェクトの施主

プロジェクトを実施する主体が公的機関なのか私企業なのか、責任の所在を明確に述べる必要がある。もし詳細な評価が、実施主体自身により行なわれない場合には、詳細な評価を行なうよう任命されたコンサルタントあるいは機関の名前を記載すべきである。また質問の宛先となる機関や個人を明確にしておくべきである。

3) プロジェクトの必要性

プロジェクトの必要性としてその背景および提案されている理由の概要を記述すること。それには、プロジェクトの社会的、経済的あるいはその他の必要性を含め、プロジェクトの目的を明確にし、結論づけねばならない。

4) プロジェクトの記述

プロジェクトの最終的計画を記述する必要がある。記述は以下の諸点を含むべきである。

(a) プロジェクトの概念をあたえるような記述
プロジェクトの産物、原材料、エネルギ消費量、土地、水、労働力、輸送、資金、市場及びインフラストラクチュア等に関して、プロジェクトの規模を示唆するような記述
(b) 地図や図表（写真も表現上有用である）
(c) プロジェクトに本質的な技術的、経済的、環境的諸元

5) 環境の現況

環境の現況を適切に記述しなければならない。

(a) プロジェクト実施以前の物理化学的、生態学的、社会的環境条件を定性的ならびに定量的に記述する。

(b) 環境を検討している空間的な境界

(c) 特別なあるいは特殊な科学的、社会経済的あるいは文化的価値に環境的に敏感な地域

6) プロジェクトの代替案

プロジェクトの目的、広域経済的、技術的および環境的制約条件の範囲内で、規模、技術、原材料、エネルギー源あるいは産物に関してさえも、通常いくつかの代替案が検討されている。それらの代替案の主要諸元を記述すると同時に各代替案の経済的、技術的、環境的長所および短所を述べ評価すること。この場合"プロジェクトを実施しない"という代替案も含まれるべきである。これはプロジェクトからもたらされ、もしプロジェクトが断念されるなら地域社会に与えることができなくなる社会的、経済的、環境的便益に光を当てる機会となる。もしプロジェクトに関して、1 ヶ所以上の代替案があるなら、それらは全て比較検討されるべきである。

7) 予備評価の結果

参考のためにレベル2のマトリックスを使用し、予備評価報告書から、発生すると予測されるが、その重大さについては未知の影響とか説明のつかない悪影響を要約せねばならない。また予測される累加的な、あるいは共に作用する、あるいは相いれない環境的影響を記述すること。

(a) 環境的影響の性質（例えば、大気の質的変化）

(b) 影響の原因（例えば、石油燃焼溶鉱炉の煙突からの放出）

(c) 影響の性質（例えば、健康、見た目の美しさ）

(d) 影響を軽減するために予備評価期間中に採用された対策

8) 影響の詳細評価

前章において列記された影響の各々につき、環境あるいはプロジェクトの追加情報に照らして、影響をさらに軽減あるいは減少する対策を検討すべきである。

適用された方法論も記述すべきである。事前評価ならびに詳細評価期間中に考慮された影響軽減ないし減少法の評価を、それらが適用されたかどうかにかかわらず、含んでいるべきである。

9) プロジェクトの評価

この章では、最終的なプロジェクトの計画から予測される環境と開発との相互関係を定量化するよう努めねばならない。

10) 結論の要約

報告書の各章において、その結論が述べられるが、それらを参照して、一連の要約文で結論を要約すれば便利である。

11) 資料の出典、協議会および公的関与

詳細評価報告書の各章における結論を根拠ずけるために、協議した個人や機関、予備評価と詳細評価中に収集した環境に関する資料を引用し、この章に全て記述されるべきである。専門家との協議をまとめた文章には、個人名、彼が代表する機関名、コミュニケーションの形態および日付を含むべきである。専門家から受けとった文章による意見は、添付すべきである。予備評価及び詳細評価機関中の公的関与の形態、範囲および結果を十分に報告すべきである。

12) 参考文献

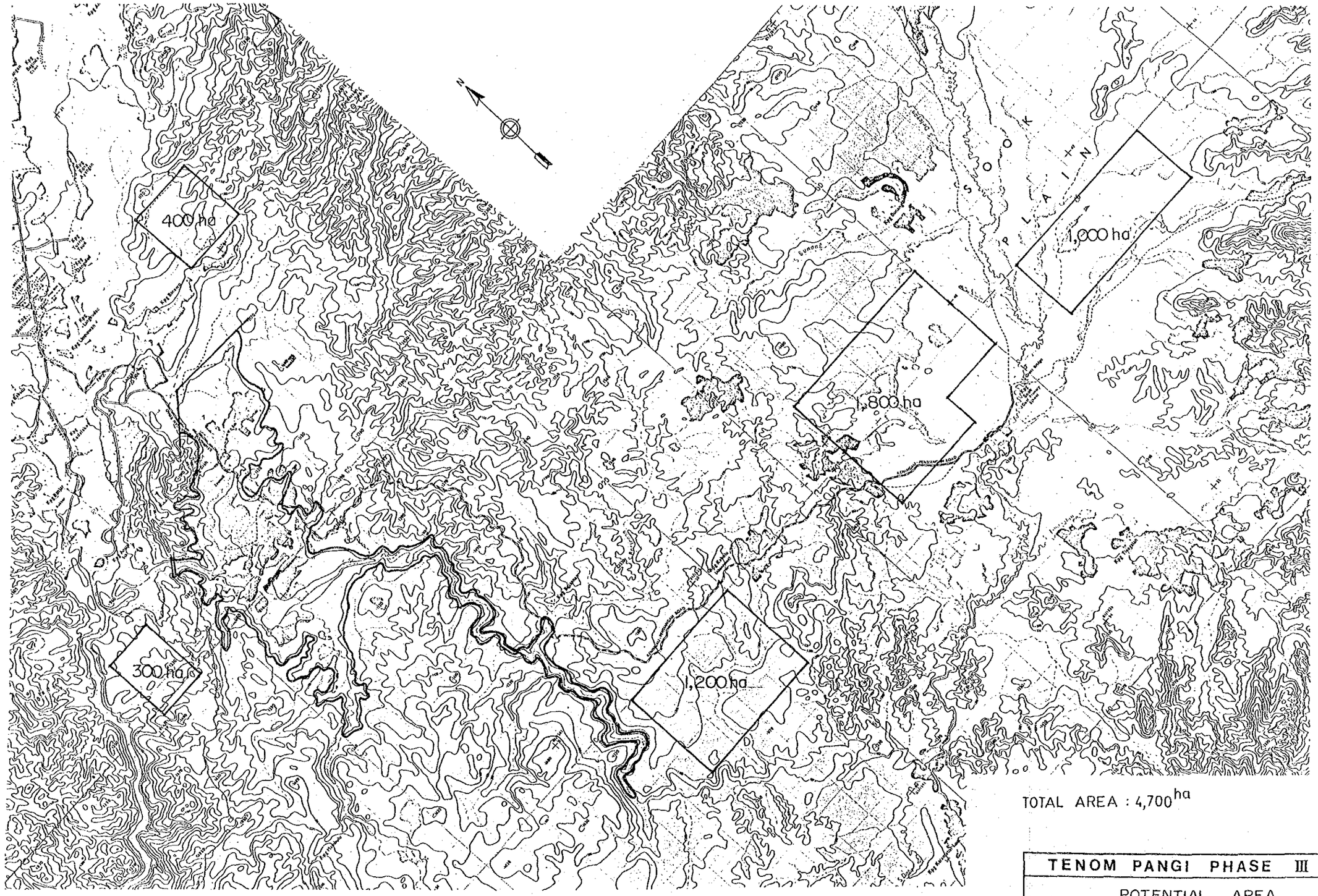
報告書に使用もしくは引用された科学および技術参考文献のリストを添付すべきである。

3. 詳細な社会・環境調査のための提言

1) 社会・経済調査は、プロジェクトに直接にも間接にも関係のない中立的機関によって実施されるべきであると環境庁は提言している。このの提言は社会・経済調査ばかりでなく、全ての社会・環境調査にも適用できる。

それ故、詳細な社会・環境調査は、大学とか環境庁のような中立的機関が、もし必要ならコンサルタントを使って、実施すべきであるという点を強く提言する。

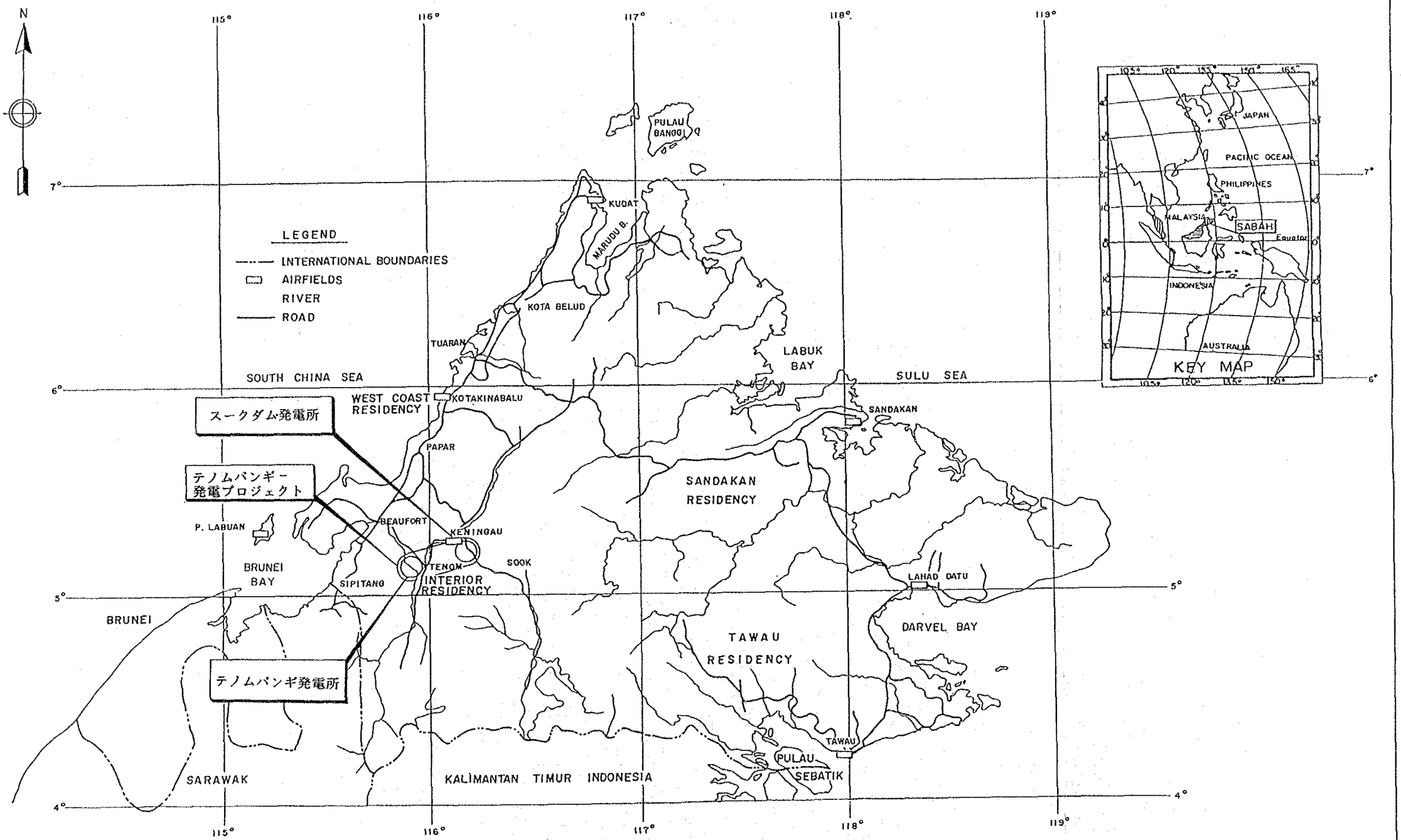
2) また移住計画の立案、検討に責任を負う政府機関をただちに設置するよう提案する。



TOTAL AREA : 4,700 ha

SCALE 0 5km
(1 100,000)

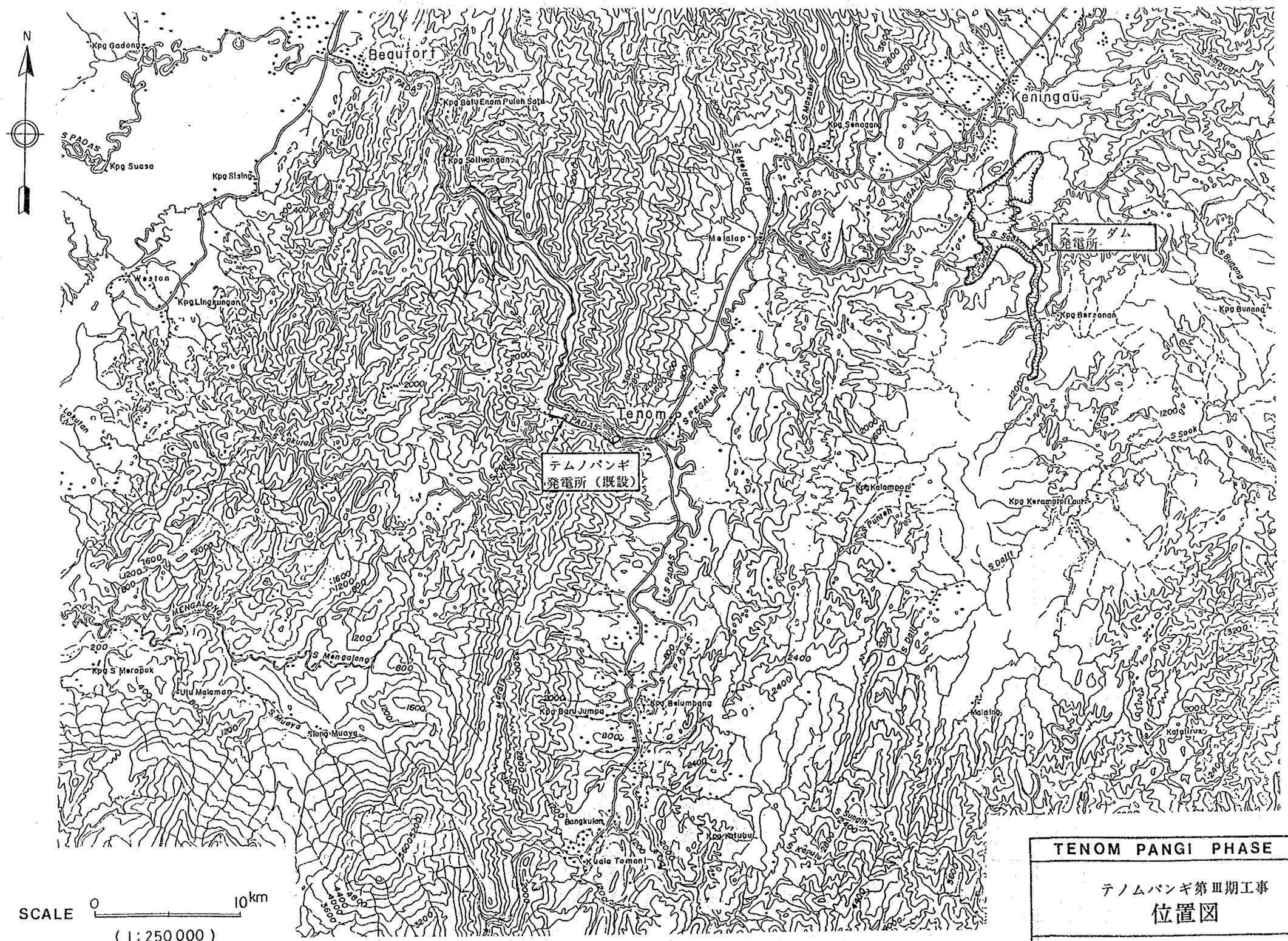
TENOM PANGI PHASE III
POTENTIAL AREA FOR RELOCATING VILLAGE
SEB / JICA



TENOM PANGI PHASE Ⅲ

位置図

SEB / JICA

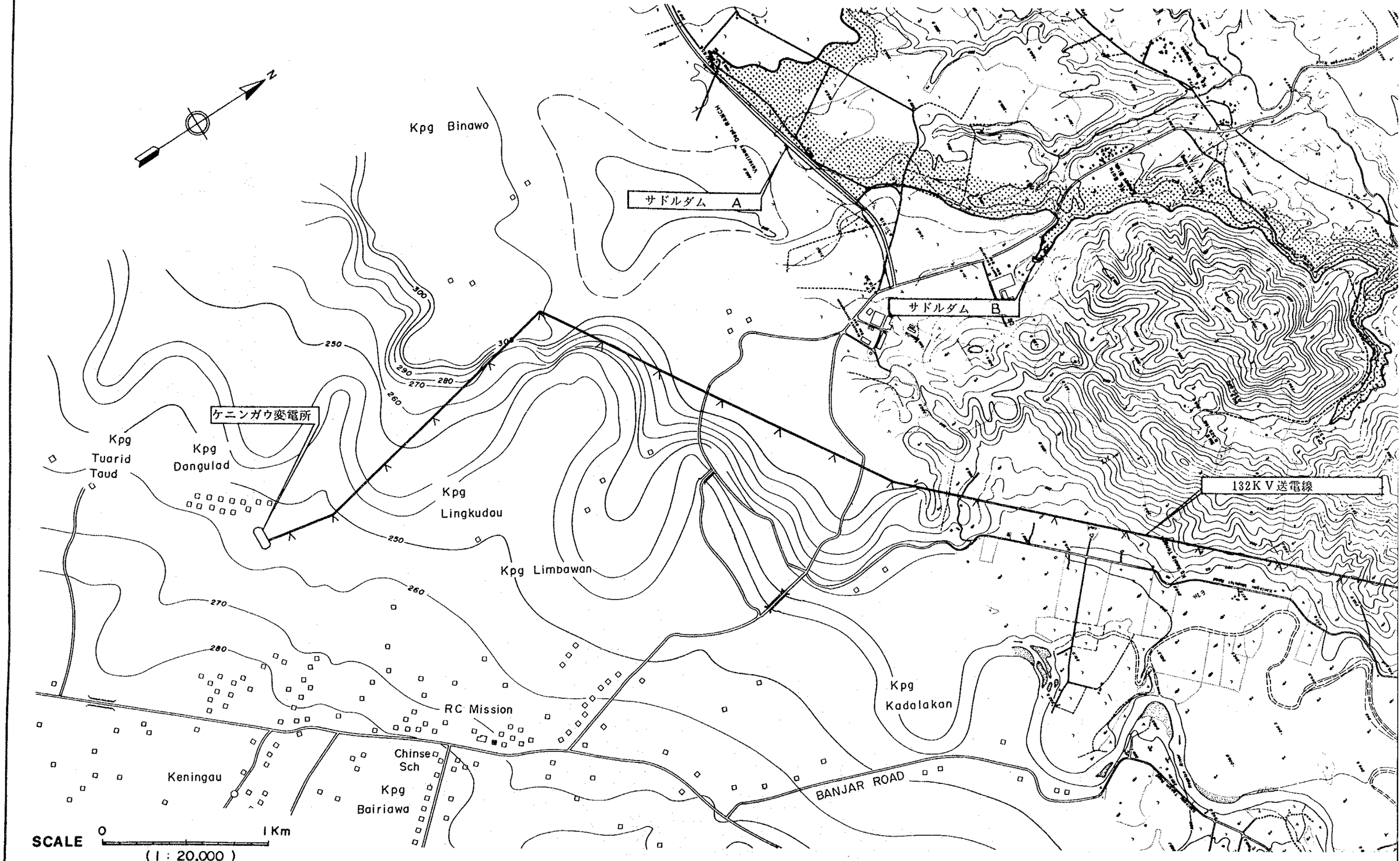


TENOM PANGI PHASE Ⅲ

テノムパンギ第Ⅲ期工事

位置図

SEB / JICA


N
Kpg Binawo
サドルダム A
サドルダム B
132K V送電線
ケニンガウ変電所
Kpg Tuarid Taud
Kpg Dangulad
Kpg Lingkudau
Kpg Limbawan
Kpg Kadalakan
RC Mission
Chinse Sch
Kpg Bairiawa
Keningau
BANJAR ROAD
250
260
270
280
290
300
SCALE 0 1 Km
(1 : 20,000)

図面　：3

サドルダム　A

サドルダム　B

スーク主ダム

132K V 送電線

取付道路

Kpg
Kadalakan

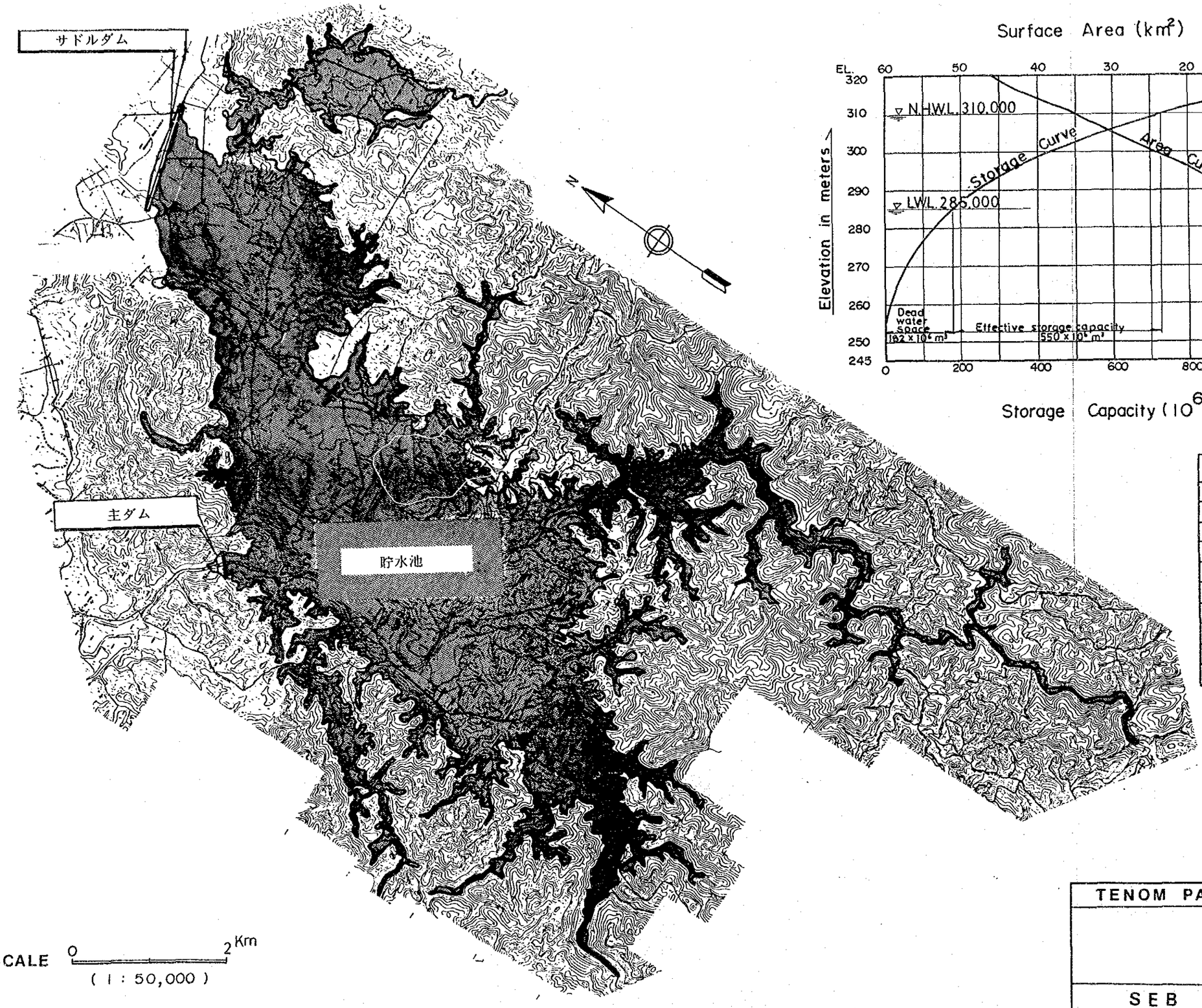
BANJAR ROAD

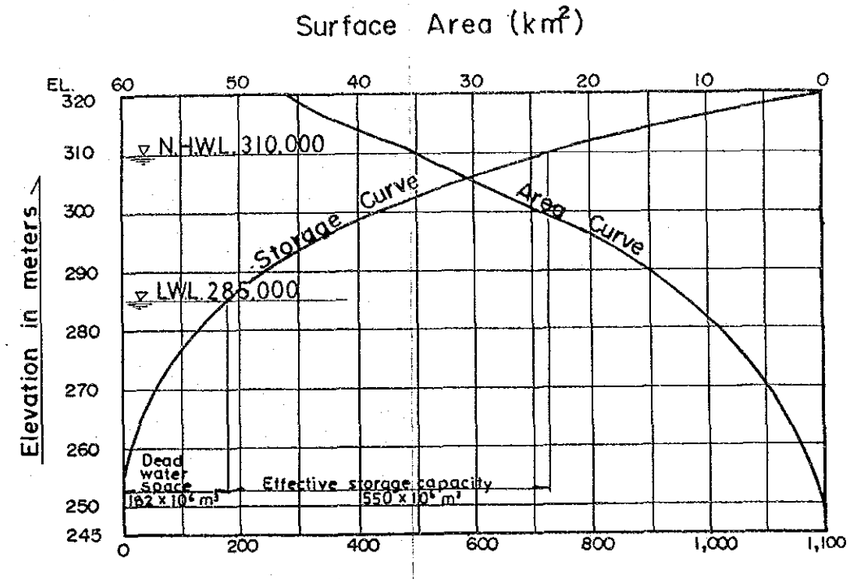
TENOM PANGI PHASE Ⅲ

スークダム

一般配置図

SEB / JICA





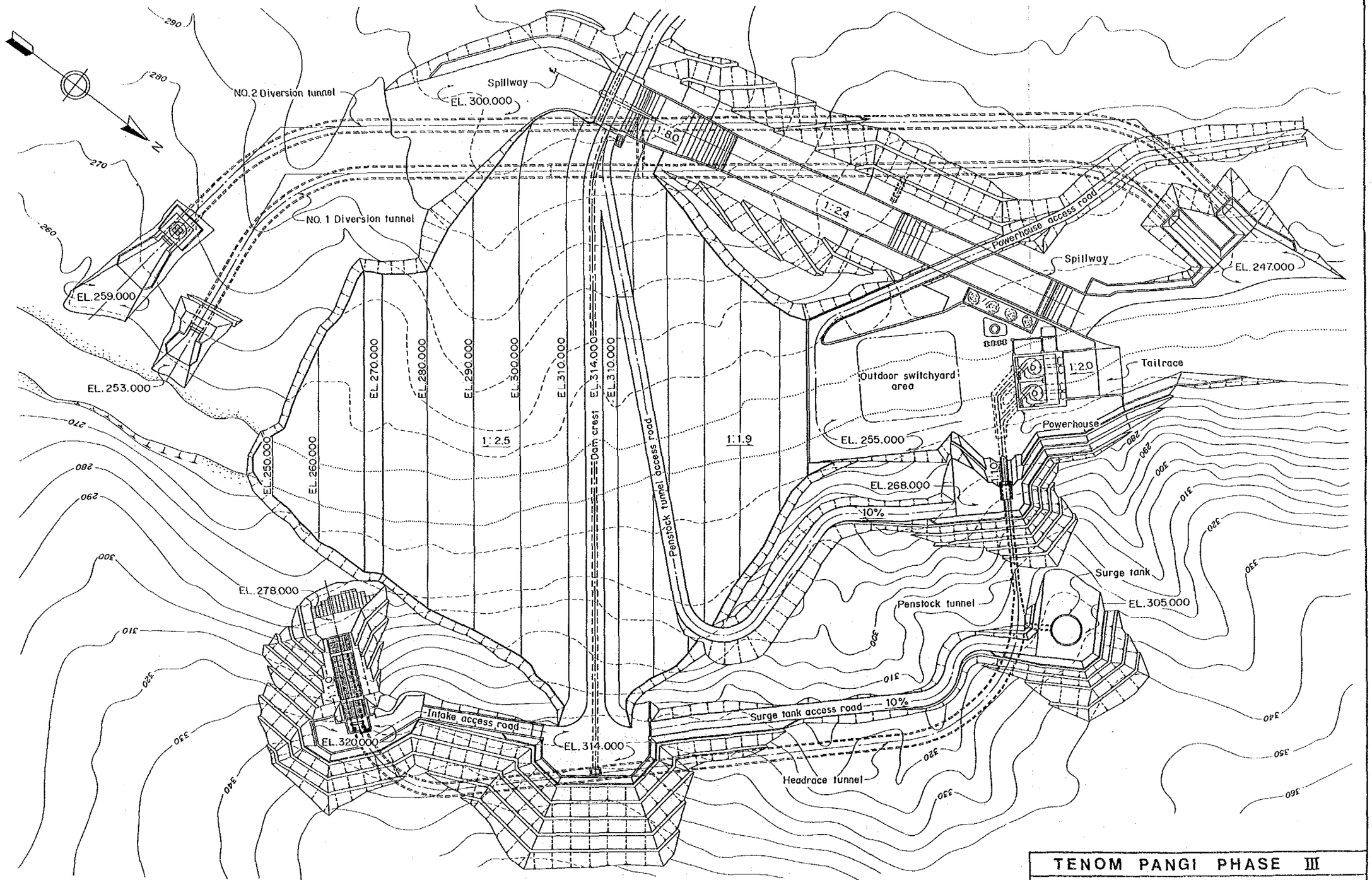
Stage (E.L.)	Area (Km2)	Storage (MCM)
245.0	0	0
250.0	0.03	0.16
260.0	2.71	13.87
270.0	5.23	53.57
280.0	9.32	126.31
285.0	11.54	188.89
290.0	14.75	241.47
300.0	24.26	436.52
310.0	34.81	731.87
320.0	45.90	1,135.44

TENOM PANGI PHASE III

スークダム

貯水池

SEB / JICA



SCALE 0 100m (1:2,000)

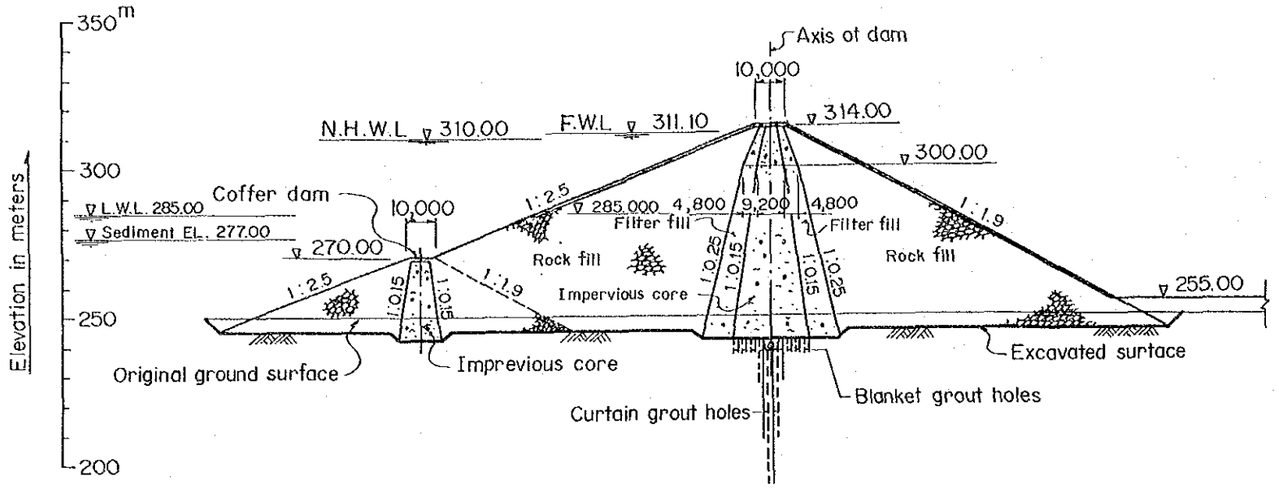
PLAN

TENOM PANGI PHASE Ⅲ

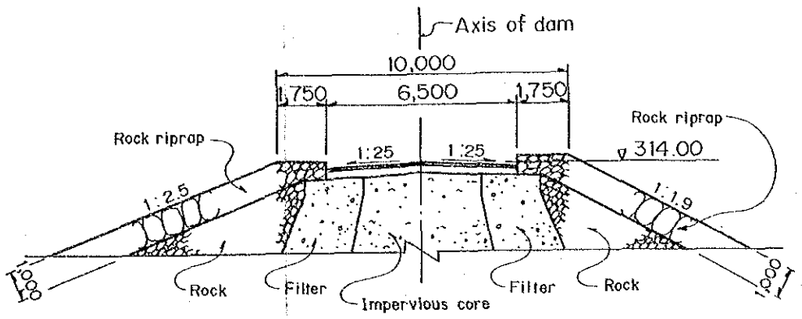
スークダム

一般平面図

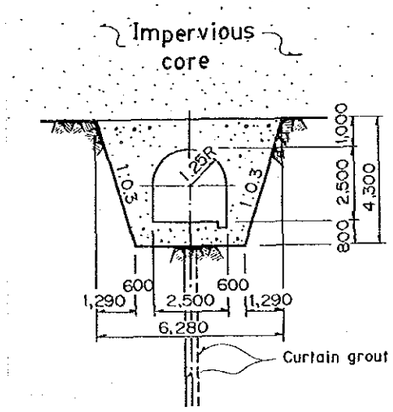
SEB / JICA



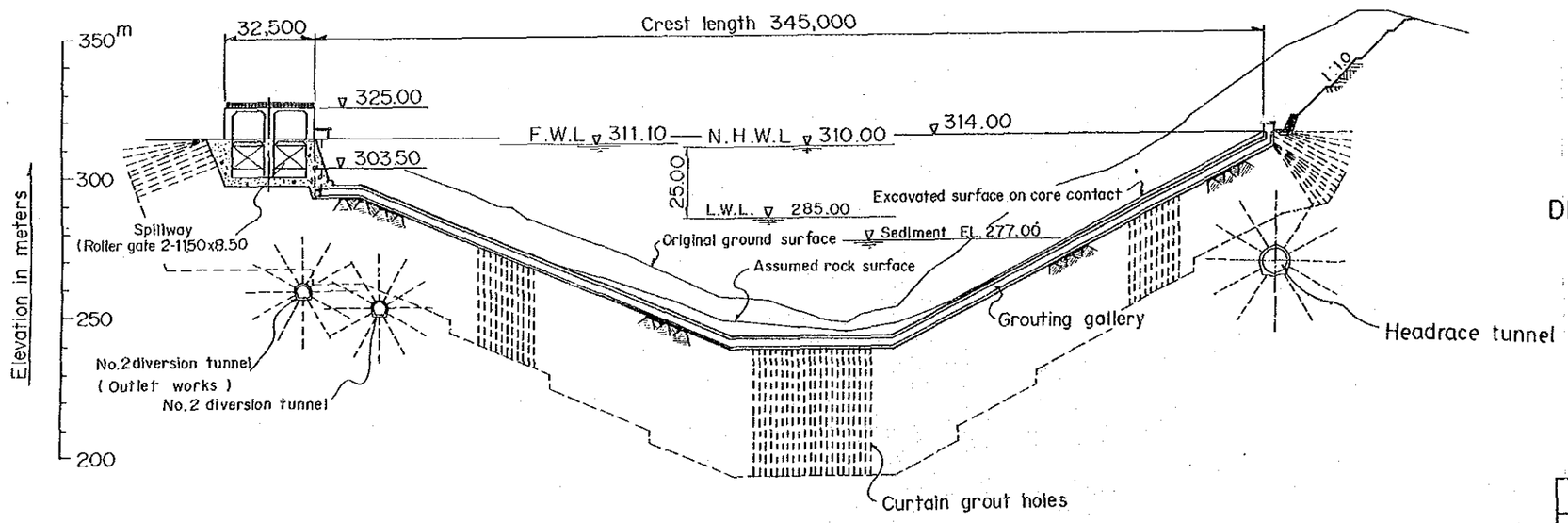
TYPICAL SECTION SCALE A



CREST DETAIL SCALE B



DETAIL OF GALLERY SCALE B



PROFILE SCALE A

SCALE A 0 100m (1:2,000)

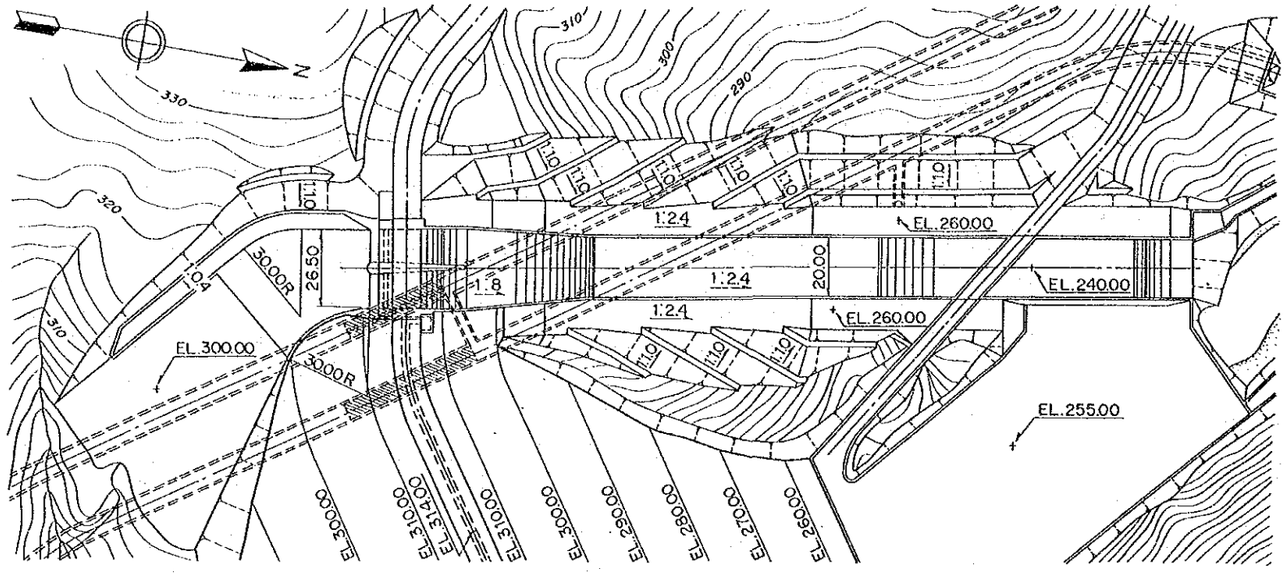
SCALE B 0 10m (1:200)

TENOM PANGI PHASE III

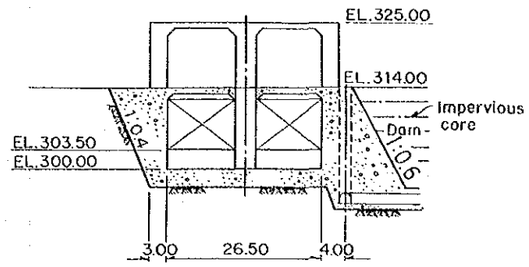
スークダム

側面図, 標準断面図, 詳細図

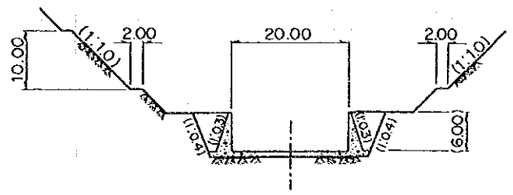
SEB / JICA



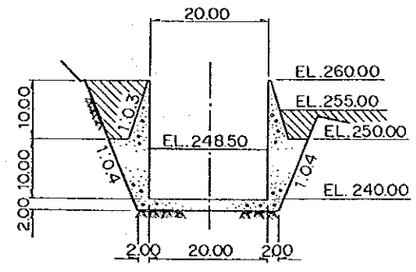
PLAN SCALE A



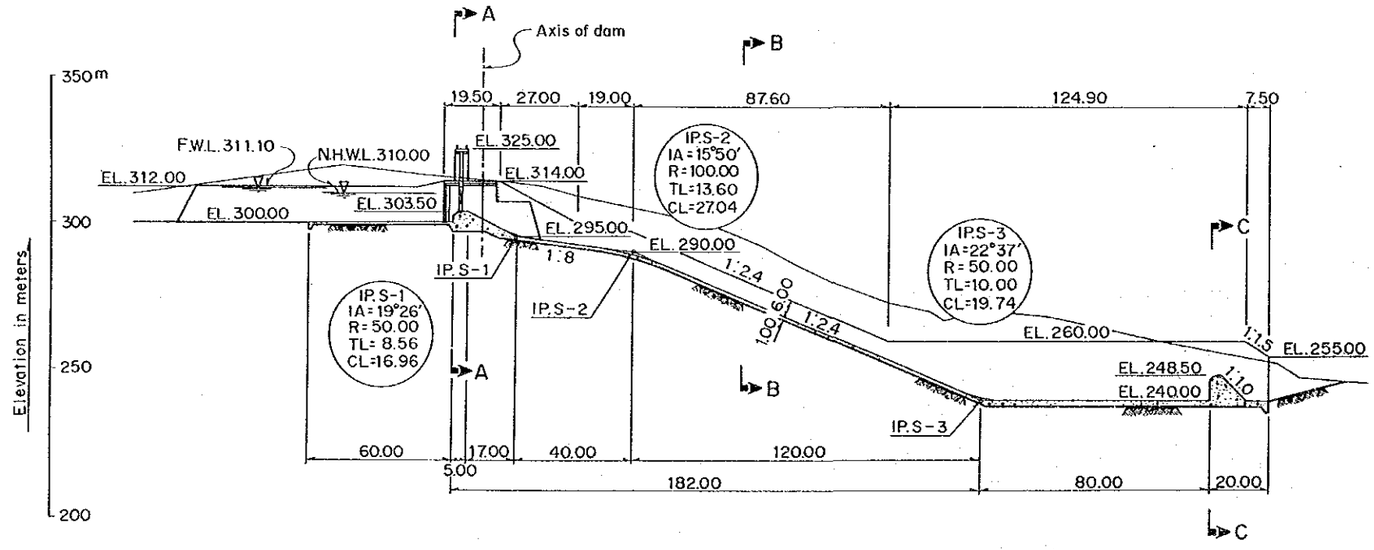
SECTION A — A SCALE B



SECTION B — B SCALE B



SECTION C — C SCALE B



Station	-1	0	1	2	3	4	5	6	7
Distance	60.00	0	14.34	16.15	18.02	26.04	98.22	19.23	90.00
Total distance	60.00	0	14.34	30.49	48.51	74.55	172.77	192.00	282.00
Formation height	300.00	303.50	298.83	293.94	291.69	284.77	243.85	240.00	240.00

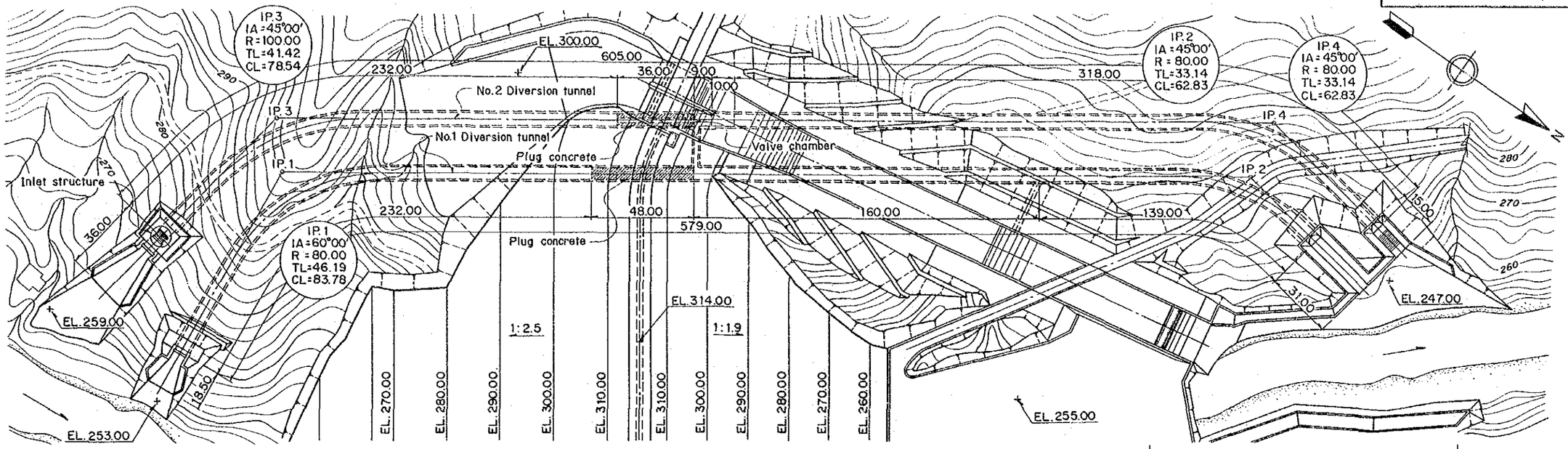
PROFILE SCALE A

SCALE A 0 100m
SCALE B 0 (1 : 2,000) 50m
(1 : 1,000)

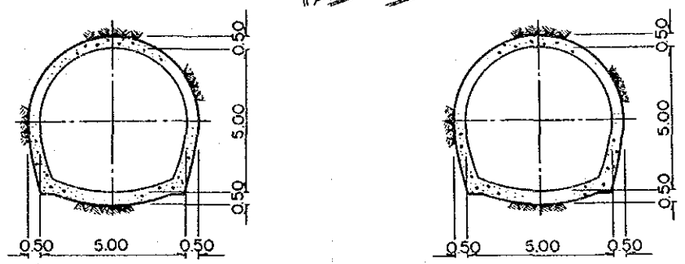
TENOM PANGI PHASE Ⅲ

スークダム
洪水吐
平面図, 側面図, 断面図

SEB / JICA

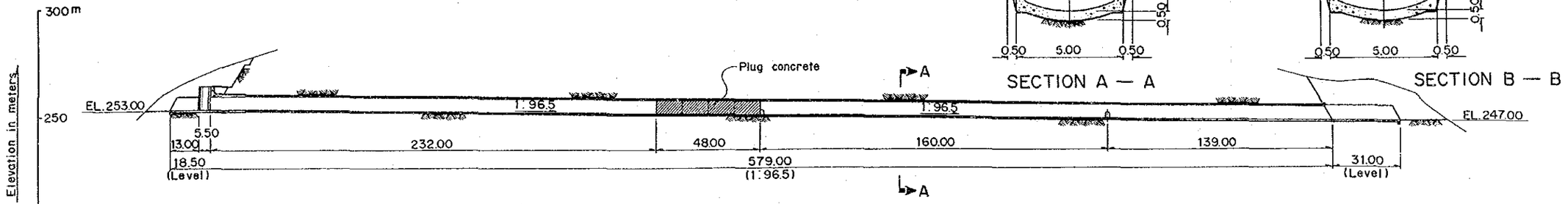


PLAN

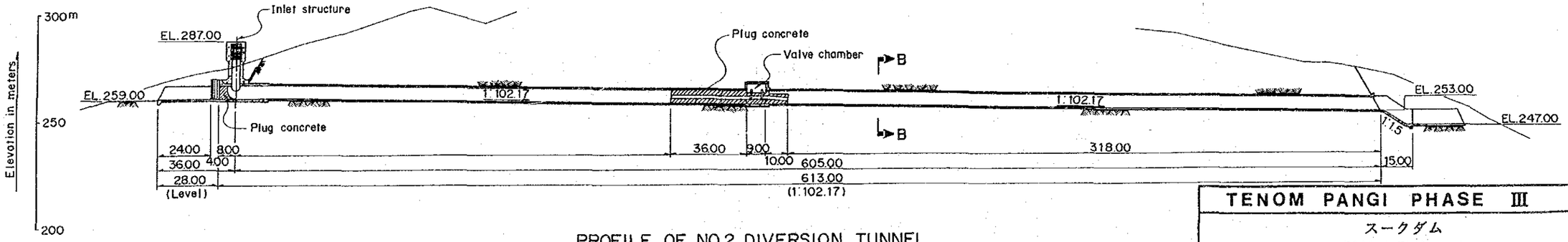


SECTION A — A

SECTION B — B



PROFILE OF NO.1 DIVERSION TUNNEL



PROFILE OF NO.2 DIVERSION TUNNEL

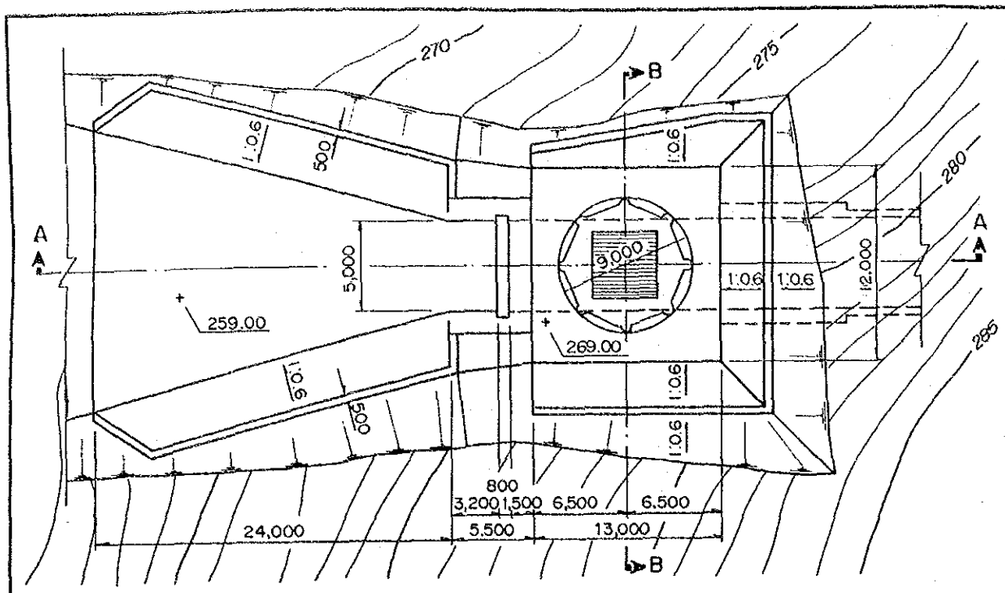
SCALE 0 100m
(1 : 2,000)

TENOM PANGI PHASE Ⅲ

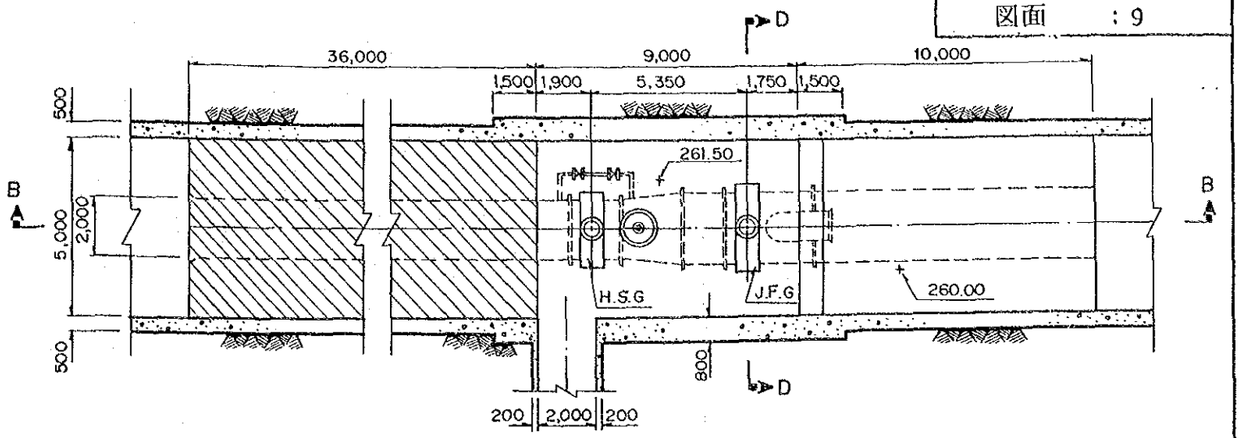
スークダム
仮排水路トンネル

平面図,側面図,断面図

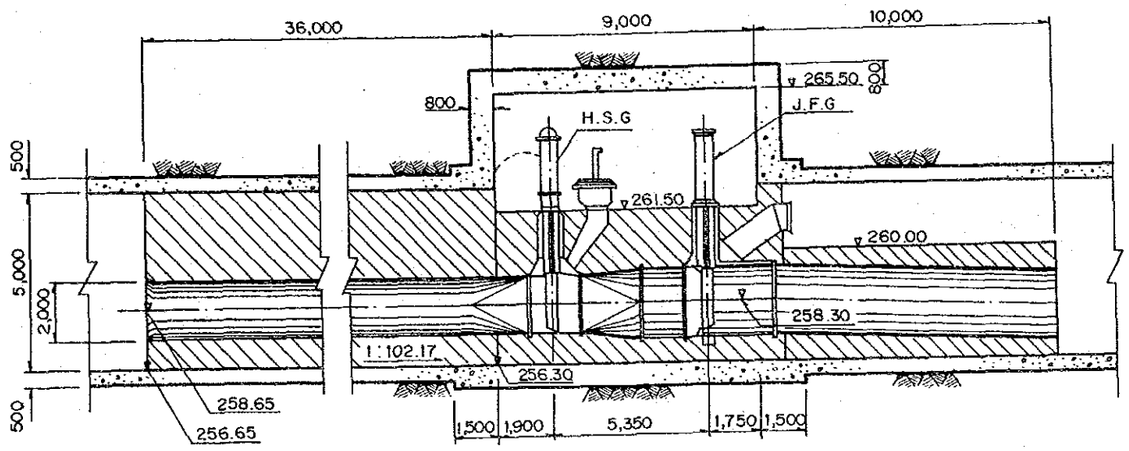
SEB / JICA



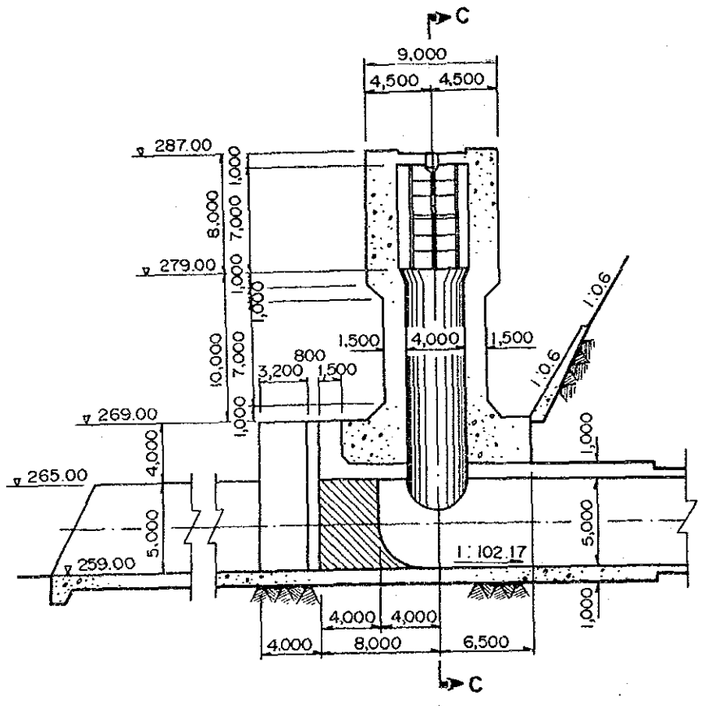
PLAN SCALE A



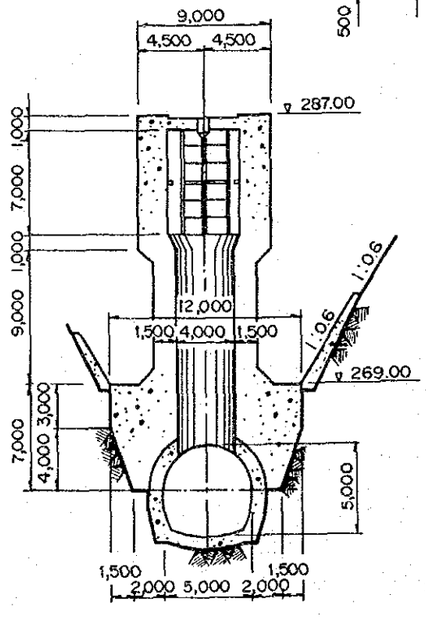
PLAN SCALE B



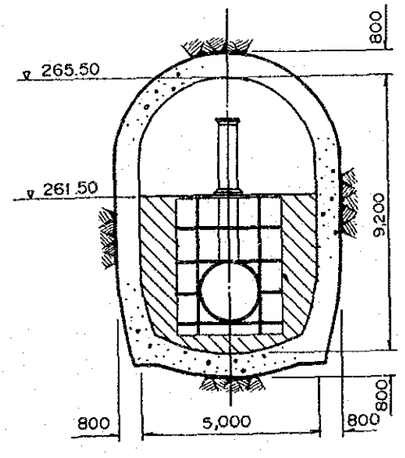
SECTION B-B SCALE B



SECTION A-A SCALE A



SECTION C-C SCALE A



SECTION D-D

SCALE A 0 20m
(1:400)
SCALE B
(1:200)

TENOM PANGI PHASE Ⅲ

スークダム
バルブ操作室

平面図,側面図,断面図

SEB / JICA