

10. PRELIMINARY DESIGN

(1) Upper Reservoir

The upper reservoir is a pool type regulating pondage with $340 \times 10^3 \text{ m}^2$ of reservoir area and $10,300 \times 10^3 \text{ m}^3$ of reservoir capacity made by digging and partially embanking a gently sloped plateau at about 640 m above the sea level on the right side shore about 6.5 km upstream from Lam Ta Khong dam. The maximum output is 1,000 MW and the power can be generated for 8 hours.

The inner surfaces of pool are covered with the asphalt concrete. The embankment is made by using some of the muck. The upper reservoir is large scale pool type reservoir with an all-over asphalt facing fill-type dam.

For the location of upper reservoir, the most advantageous area was selected by taking into consideration the topography, geology, extension of waterway, dam construction cost, etc. The watershed classification area 1A designated by the National Environmental Board was avoided, thus preserving proper environmental condition (see DWG. 10-5).

The geologic condition of upper reservoir is such that the surface stratum contains 3 - 4 m of weathered residual soil and under this surface stratum, about 5 - 15 m thick claystone and 10 - 35 m thick coarse-grained sandstone layer are alternately distributed. Therefore, the foundation of dam is the claystone and coarse-grained sandstone layer.

The following table shows the specification for upper reservoir.

Specification for Upper Reservoir

Item	Specification
Type of dam	Asphalt facing fill-type dam
Height of dam	60 m
Width of dam crest	10 m
Length of dam crest	2,210 m
Elevation of dam crest	E.L 662.50 m
Slope of dam alignment surface	(Both back and inner side) 1 : 2.5
Total excavated amount	6,960 x 10 ³ m ³
Total embankment amount	6,190 x 10 ³ m ³
Asphalt facing area	(Sloped surface) 220 x 10 ³ m ² (Bottom surface) 140 x 10 ³ m ²

(2) Waterway

The route of waterway is designed in such a way that the length of waterway on the gradual mountain ridge is kept shortest. Since the waterway is installed across watershed classification area 1A, it is installed underground to meet the environmental control.

The following table shows specifications for waterway.

Specification for Waterway

Item		Specification
Power intake	Type Inner dia. x height x No. of ways	Morning-glory shape reinforced concrete D(18.00-5.80)m x 51m x 2 ways
Penstock	Type Inner dia. x Length x No. of way	Underground laid type D(5.80-2.60)m x 690m x (2-4) ways
Tailrace tunnel	type Inner dia. x Length x No. of way	Circular pressure tunnel D(4.90-6.60)m x 1,470m x (4-2) ways
Surge chamber	Type (Shaft) Inner dia. x Height x No. of way (Upper water chamber) Width x height x Length x No. of way	Simple, upper water chamber type D8.90 x 107.00 x 2 ways 10.00m x 10.00mm x 35.00m x 2 ways
Tailrace outlet	Type Width x height x Length x No. of way	Reinforced concrete 4 series box culvert type (6.60-30.00)m x (6.60-10)m x 55.00m x 2 ways

The foundation for the power intake is set on the hard and coarse-grained sandstone.

The bedrock of penstock and tailrace consists of mainly siltstone and fine-grained sandstone with coarse-grained sandstone being partially distributed. Since these strata are kept nearly horizontal.

Since the upper reservoir is pool type regulating poundage, it is made in the morning-glory shape, because the power intake has to be installed on the bottom of reservoir.

The penstock is underground laid type steel pipe with total length of about 690 m x 4 - 2 ways, which connects with the upper, middle and lower horizontal sections and the upper and lower inclined tunnels (51°). The inner diameter of the penstock varies from 5.80 to 2.60 m. 2 way is provided from the upper horizontal part of to the lower inclined tunnel. For the sections lower than the lower horizontal tunnel, 4 ways are provided.

The maximum design head including the water-hammer pressure for the steel penstock is about 600 m. The steel pipe withstand the total hydraulic pressure. Total weight of steel pipe is about 7,580 t.

The tailrace is circular pressure tunnel with a total length of 1,470 m x 4 - 2 ways.

Since the tailrace tunnel is considerably long, the surge chamber is required against load built-up and load rejection.

The outlet is designed in such a way that it is continuously widened from the circular pressure tunnel and changes to the 4-series box culvert, thus ensuring that the water flow velocity is smoothly reduced and water is smoothly diffused while generating power and that the water flow is stabilized without containing air while pumping.

Installed at the tailrace tunnel are 4 draft gates (Bonnet type; ϕ 4.90 m) and 2 tailrace gate (Roller gate; width 5.20 m height 6.60 m) which are used for the maintenance and inspection of turbines and tunnels. A screen is also installed at the outlet.

(3) Powerhouse

Just as in the case of the waterway, the powerhouse is constructed underground. Furthermore, we avoided watershed classification areas 1A and 2A by minimizing the entrance of access tunnel of powerhouse and the switchyard area (see DWG. 10-5).

The powerhouse in a large scale underground cavern (width 22 m x height 45.7 m x length 117 m) constructed about 300 m under the ground is equipped with pump turbine, 250 MW x 4 units, power generator and other accessories. In the transformer room, a large cavern (width 20 m x height 25.5 m x length 108m) is provided about 70 m apart from the center of turbine, in order to install 4 units of transformer and GMCS. The excavated amount of the powerhouse and the transformer room is about 168,000 m³.

The geologic condition near the underground powerhouse and transformer room is such that the upper part of arch consists of siltstone and fine-grained sandstone and the area under the arch is made up of sandy siltstone and fine-grained sandstone. Both of them are kept horizontal as in the case of the waterway.

The cross-section of underground powerhouse and transformer room is in the "mushroom shape" which satisfies a wide range of geologic requirements and improves the economic aspect with the minimized cross-sectional shape.

The underground powerhouse and the outside on the surface are connected by the access tunnel for powerhouse (total length; about 1,210 m) and the power cable tunnel (total length; about 710 m).

The access tunnel for powerhouse passes from the National Highway at a gradient of about 14%, through the transformer room and reaches the erection bay of the powerhouse.

(4) Electrical and mechanical equipment

Electrical and mechanical facilities of the plant consist mainly of four pumping-generating units with a nominal unit capacity of 250 MW and transformers installed in underground caverns, GIS type outdoor switchyard equipment, control facilities and various auxiliary equipment. The plant is designed to operate being controlled both remotely from the EGAT's dispatching center and locally by one-man-control at the power station. Outlines of main units are as follows:

Pump-turbine

Type: Vertical shaft Francis type reversible pump-turbine

No. of units: 4

Ratings:

- Generating	Nor. effective head	357 m
	Max. output	255 MW
	Max. discharge	82.5 m ³ /s
	Revolving speed	375 rpm
- Pumping	Max. total head	409.2 m
	Max. pump discharge	71.4 m ³ /s
	Max. pump input	277 MW
	Revolving speed	375 rpm

Generator-motor

Type: 3 phase AC synchronous generator-motor

No. of units: 4

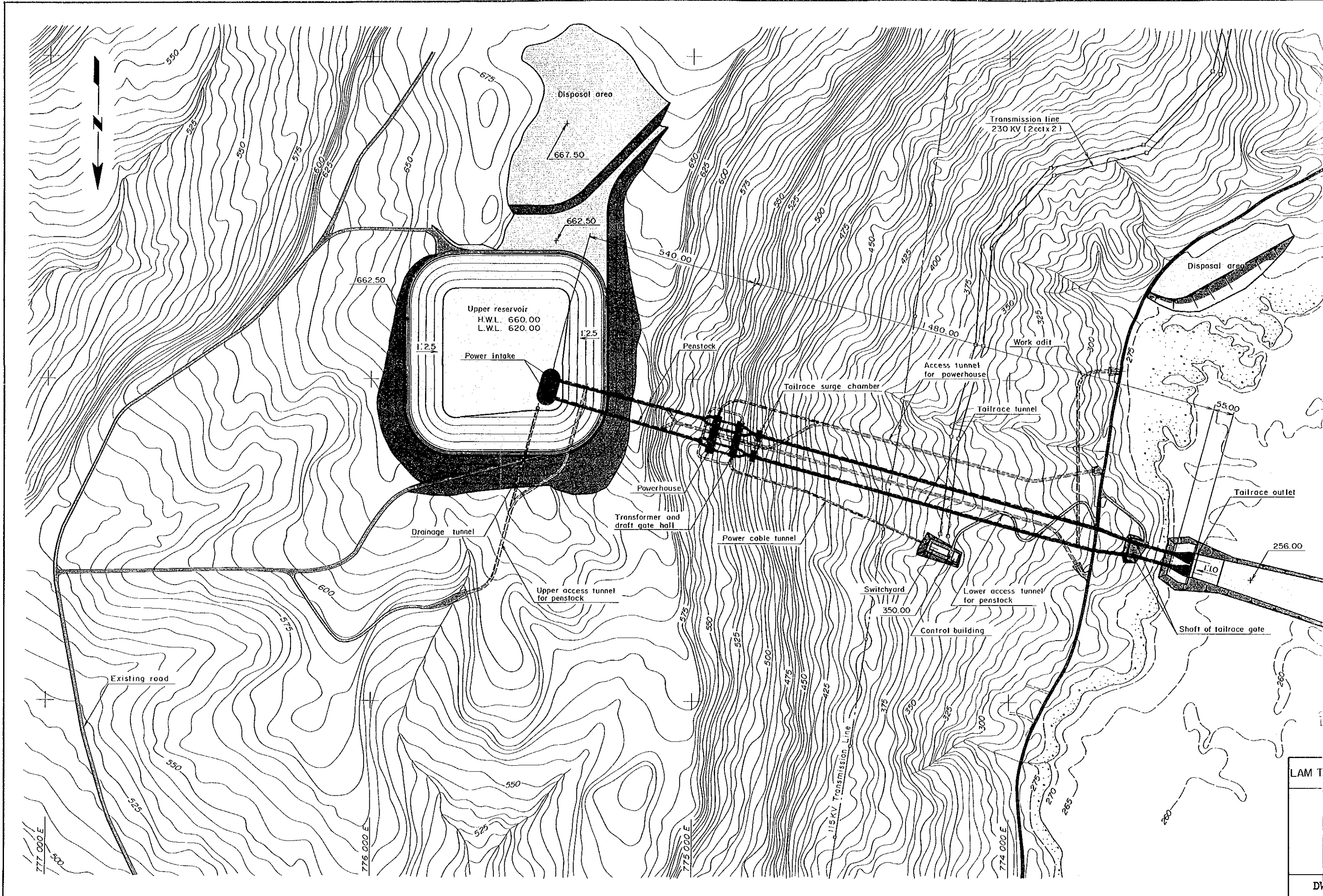
Ratings: Output	278 MVA (Gen.)/277 MW (Mot.)
Voltage	16.5 kV
Frequency	50 Hz

(5) Transmission Lines

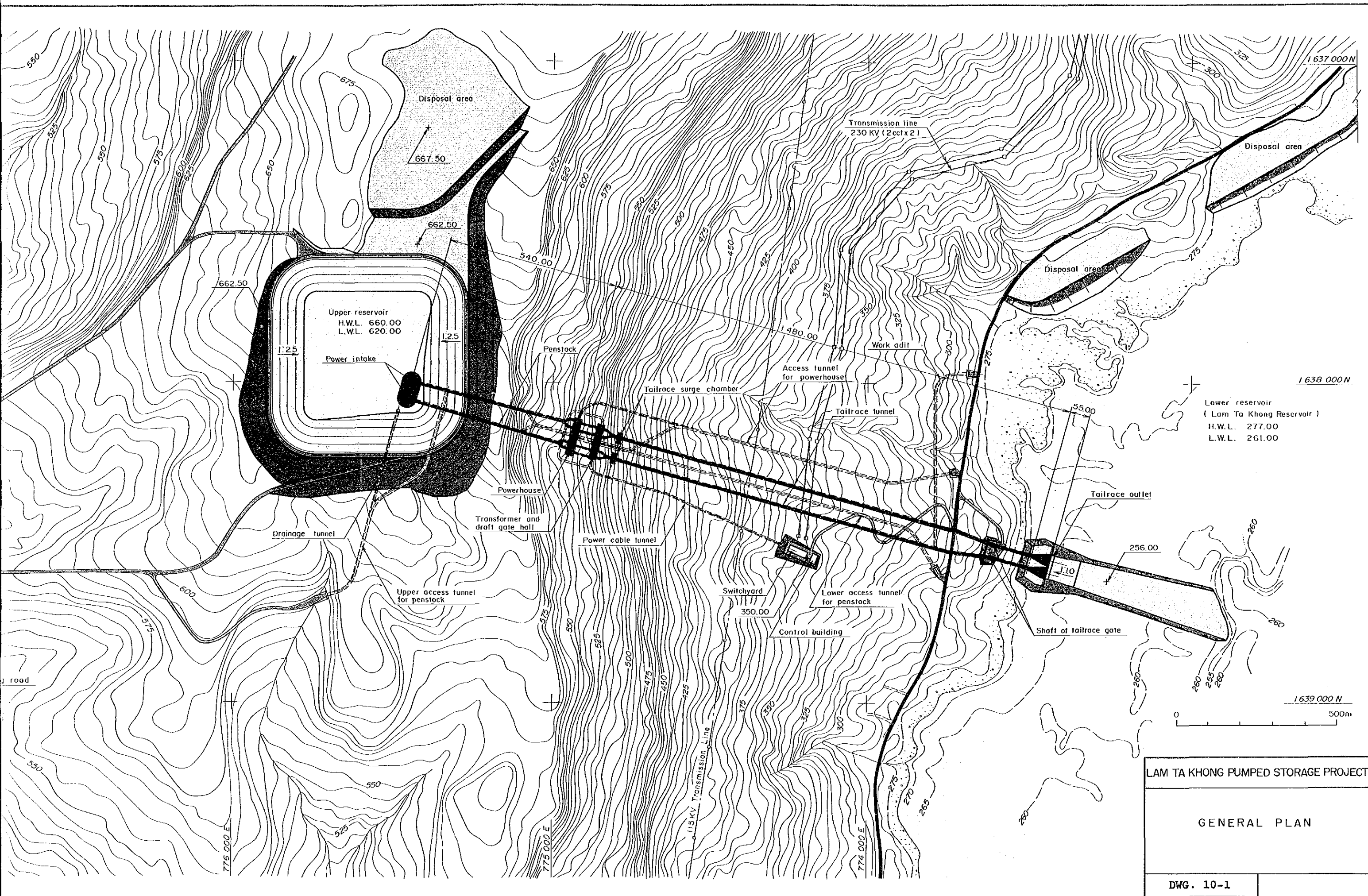
The Lam Ta Khong power plant shall be connected with EGAT's power system by means of four circuits of 230 kV transmission lines, two circuits of which with Thalan 3 substation and the others with one of existing two 230 kV transmission lines between Saraburi 2 and Nakhon Ratchasima 2 substations by π branch.

Therefore, two routes of double-circuit transmission lines i.e. from the Lam Ta Khong power plant to Thalan 3 substation and from the plant to the connecting point with the existing transmission line are to be constructed.

The length of the transmission lines to be newly constructed for connection with Thalan 3 substation and the existing transmission line are approximately 95 km and 15 km respectively.



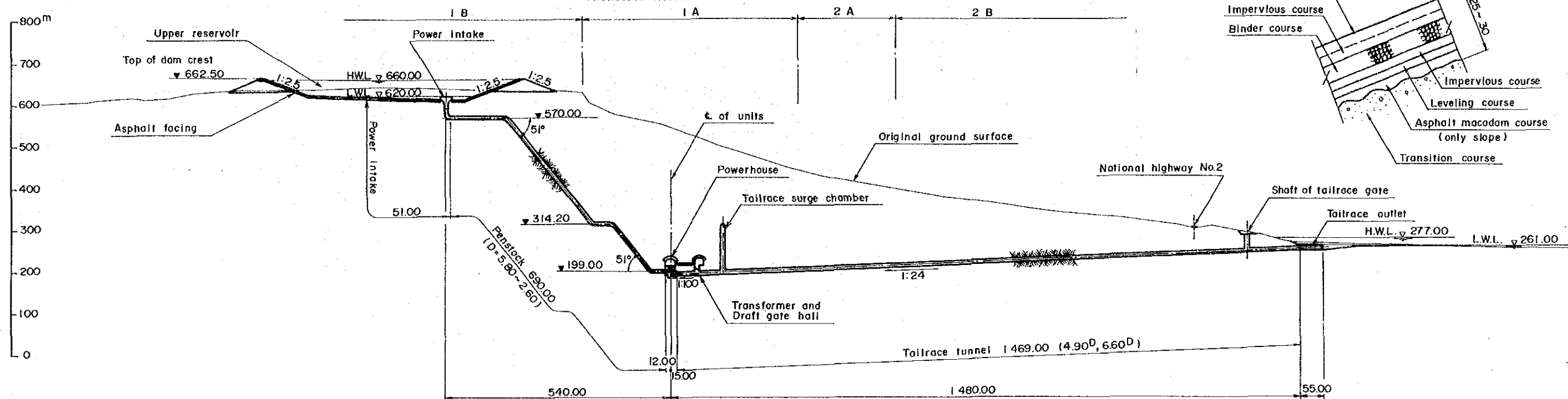
LAM T
D.V.



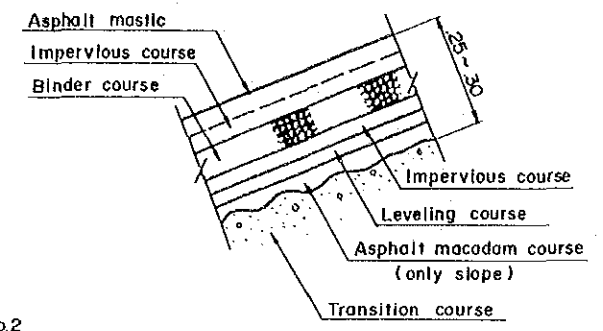
LAM TA KHONG PUMPED STORAGE PROJECT
 GENERAL PLAN
 DWG. 10-1

PROFILE OF WATER WAY

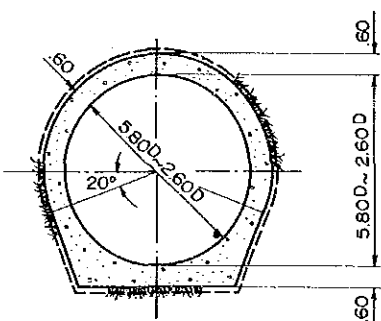
(Watershed classification)



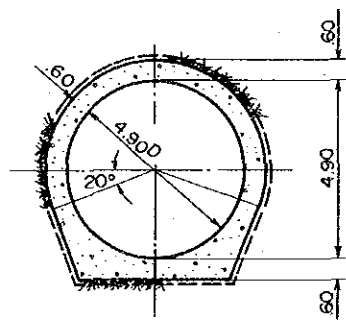
Composition of asphalt facing



PENSTOCK TUNNEL

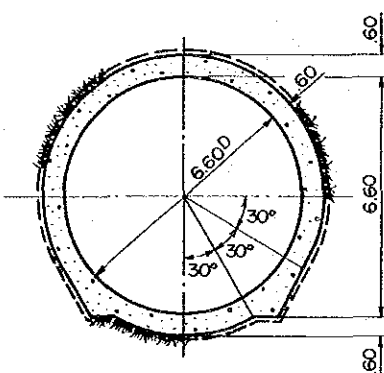


TAILRACE TUNNEL (4.90D)

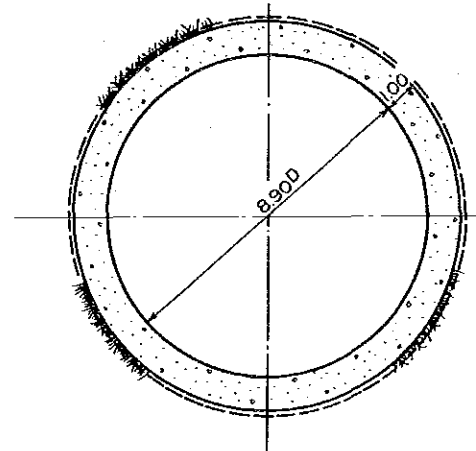


TYPICAL CROSS SECTION

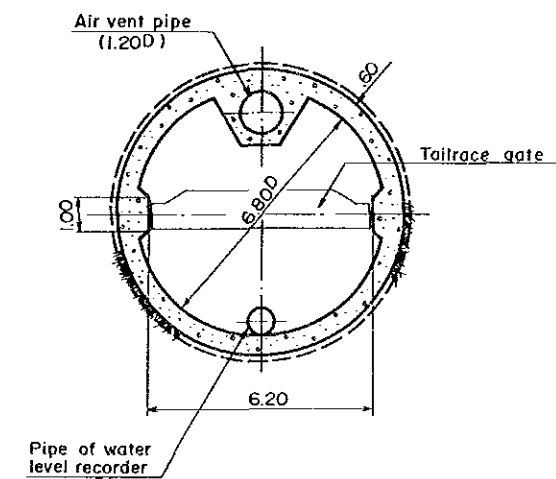
TAILRACE TUNNEL (6.60D)



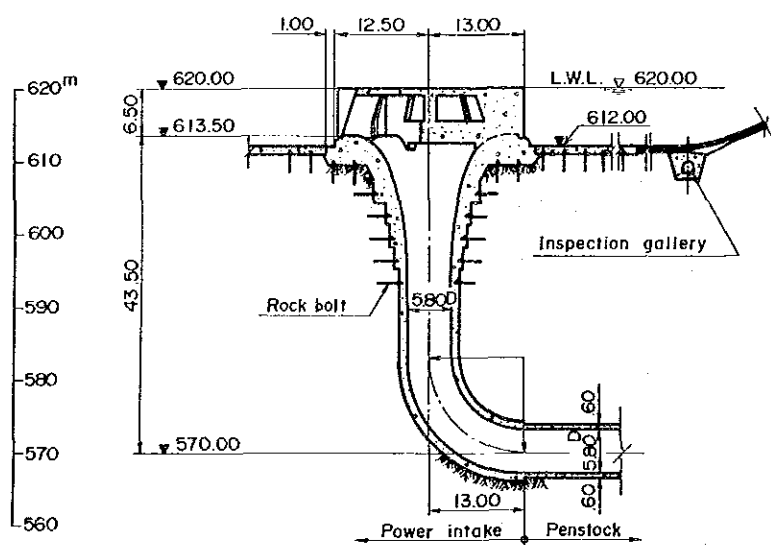
SHAFT OF TAILRACE SURGE CHAMBER



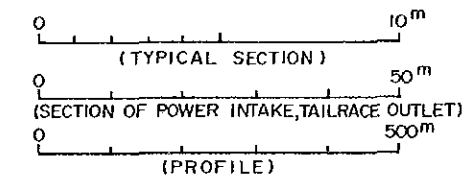
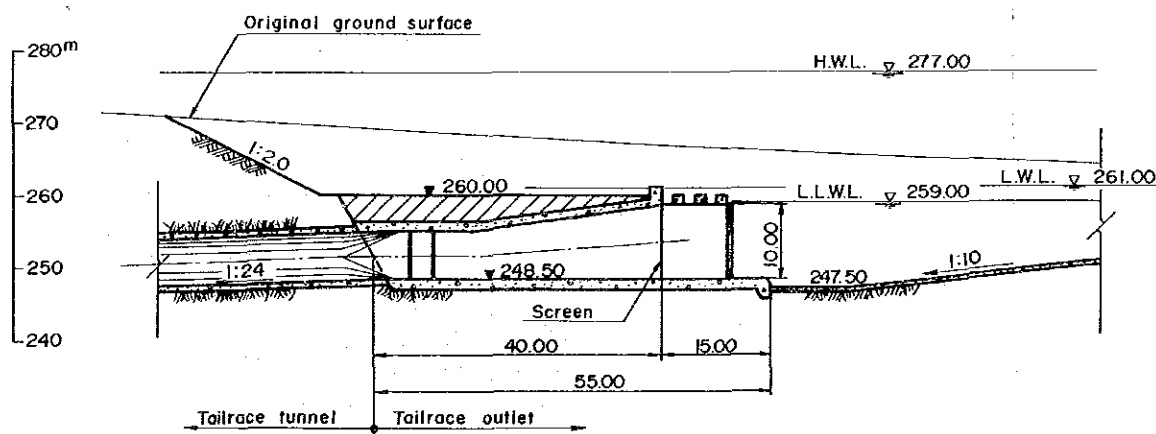
SHAFT OF TAILRACE GATE



SECTION OF POWER INTAKE



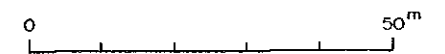
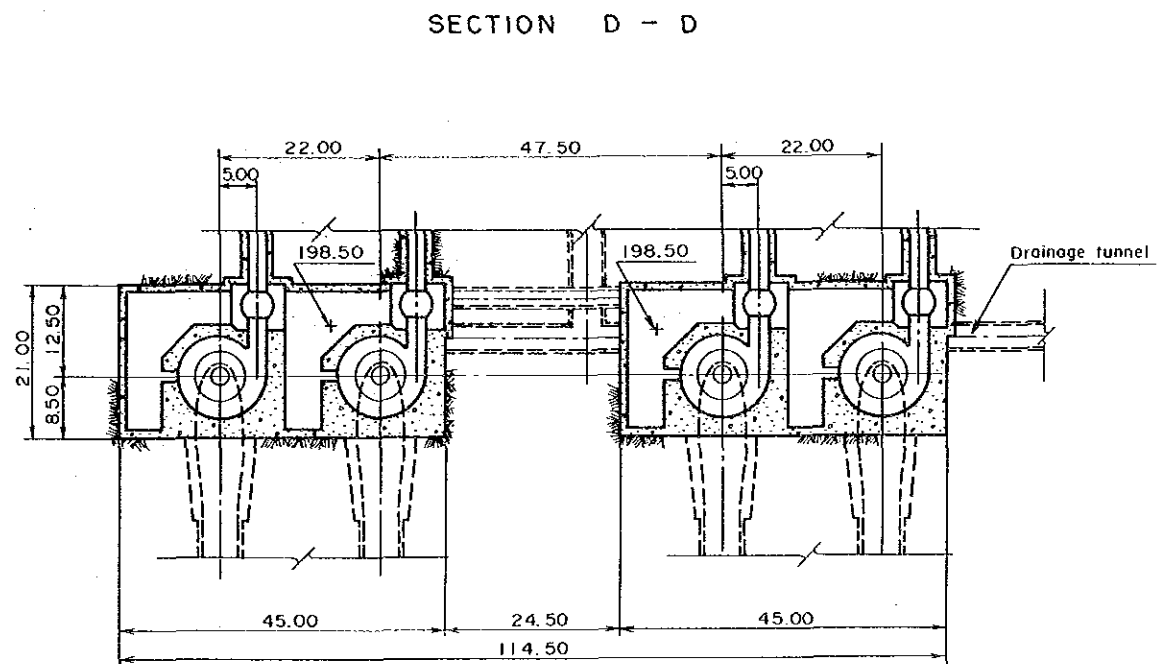
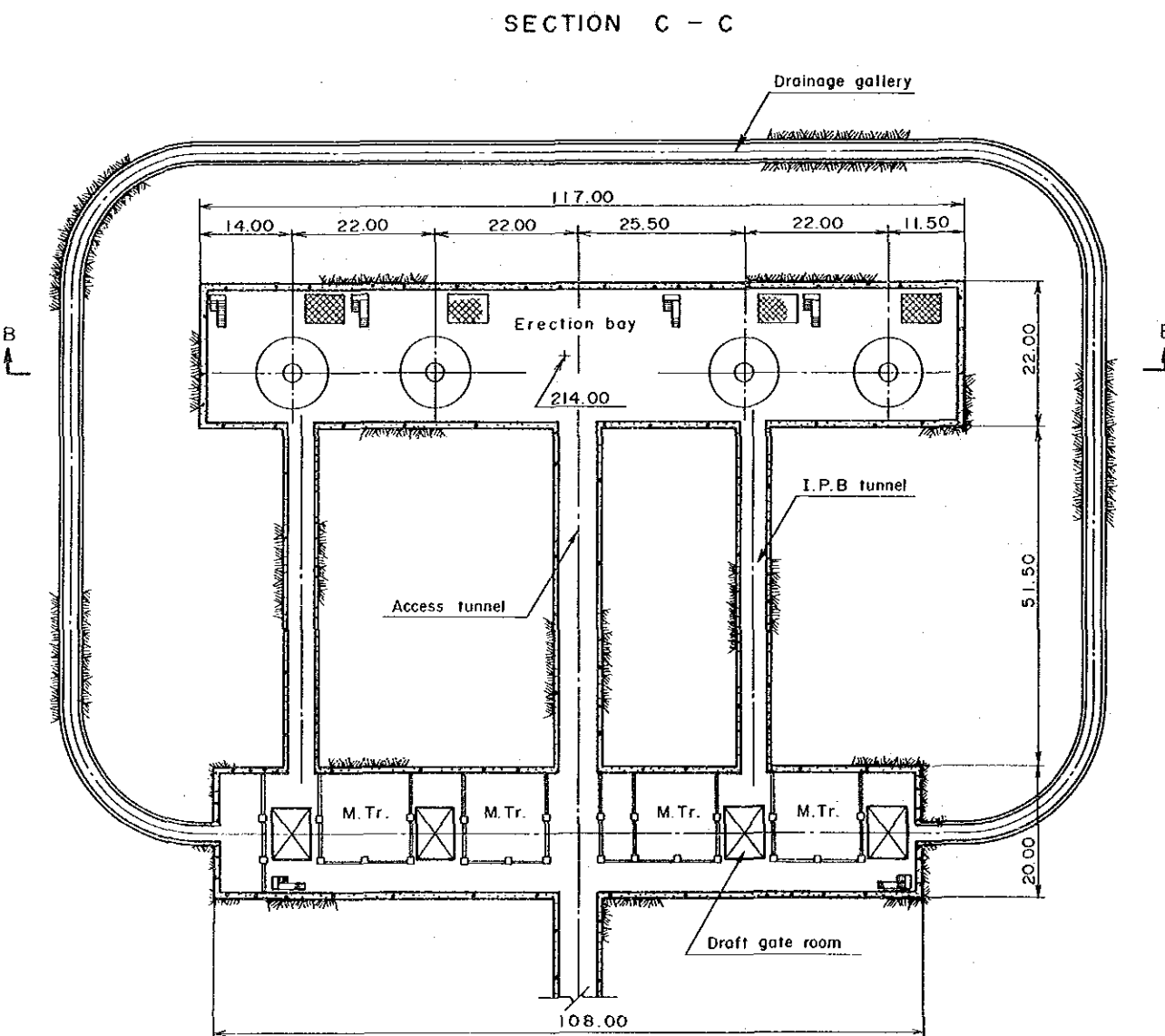
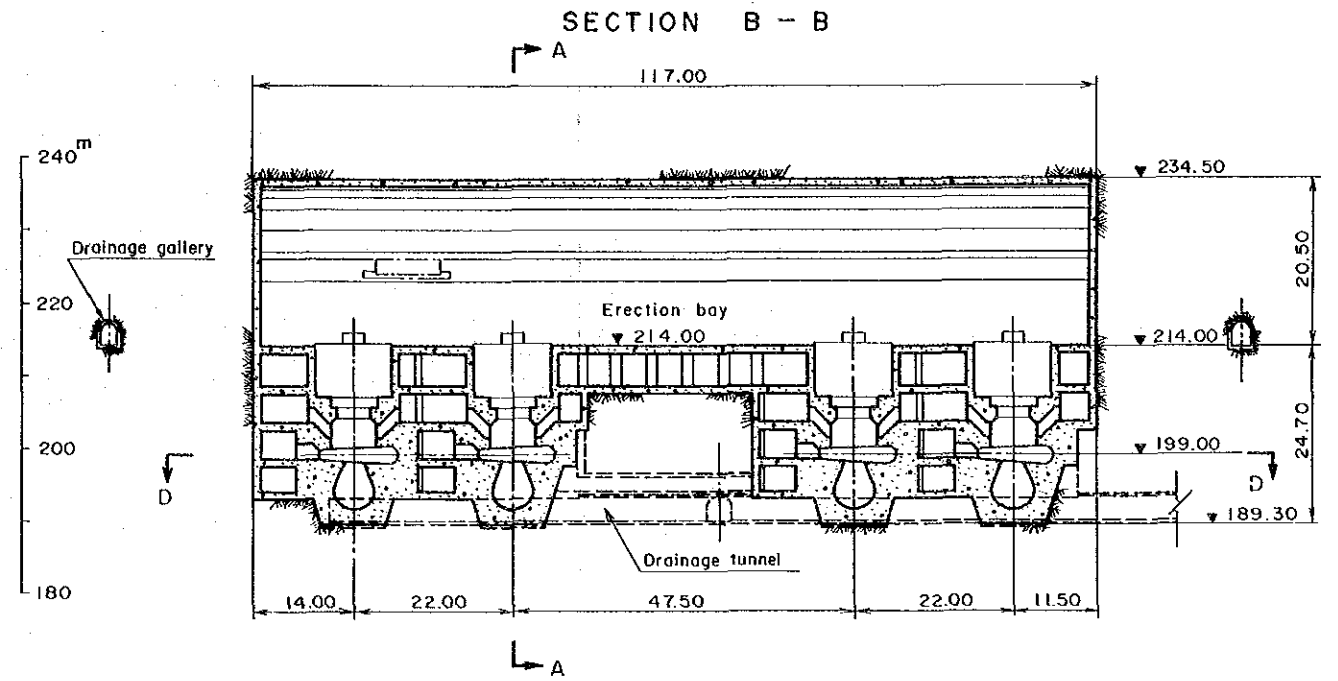
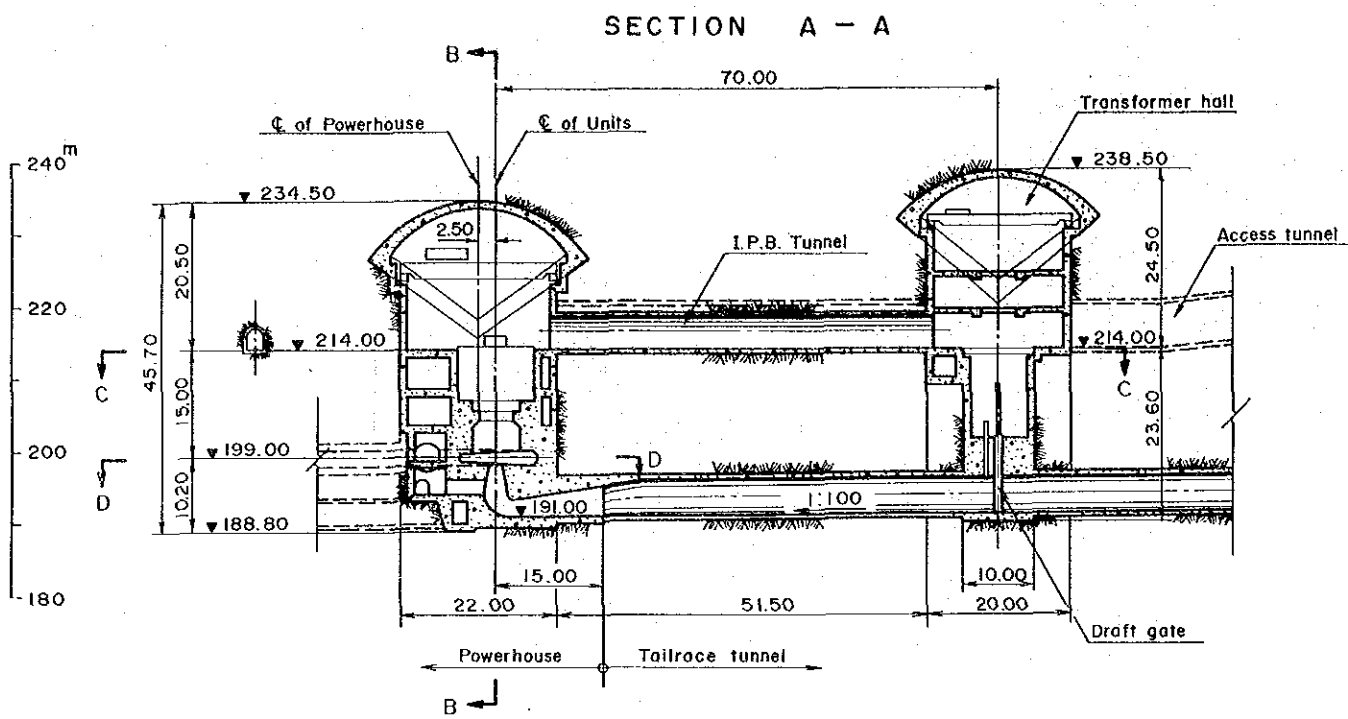
SECTION OF TAILRACE OUTLET



LAM TA KHONG PUMPED STORAGE PROJECT

WATER WAY
PROFILE AND SECTION

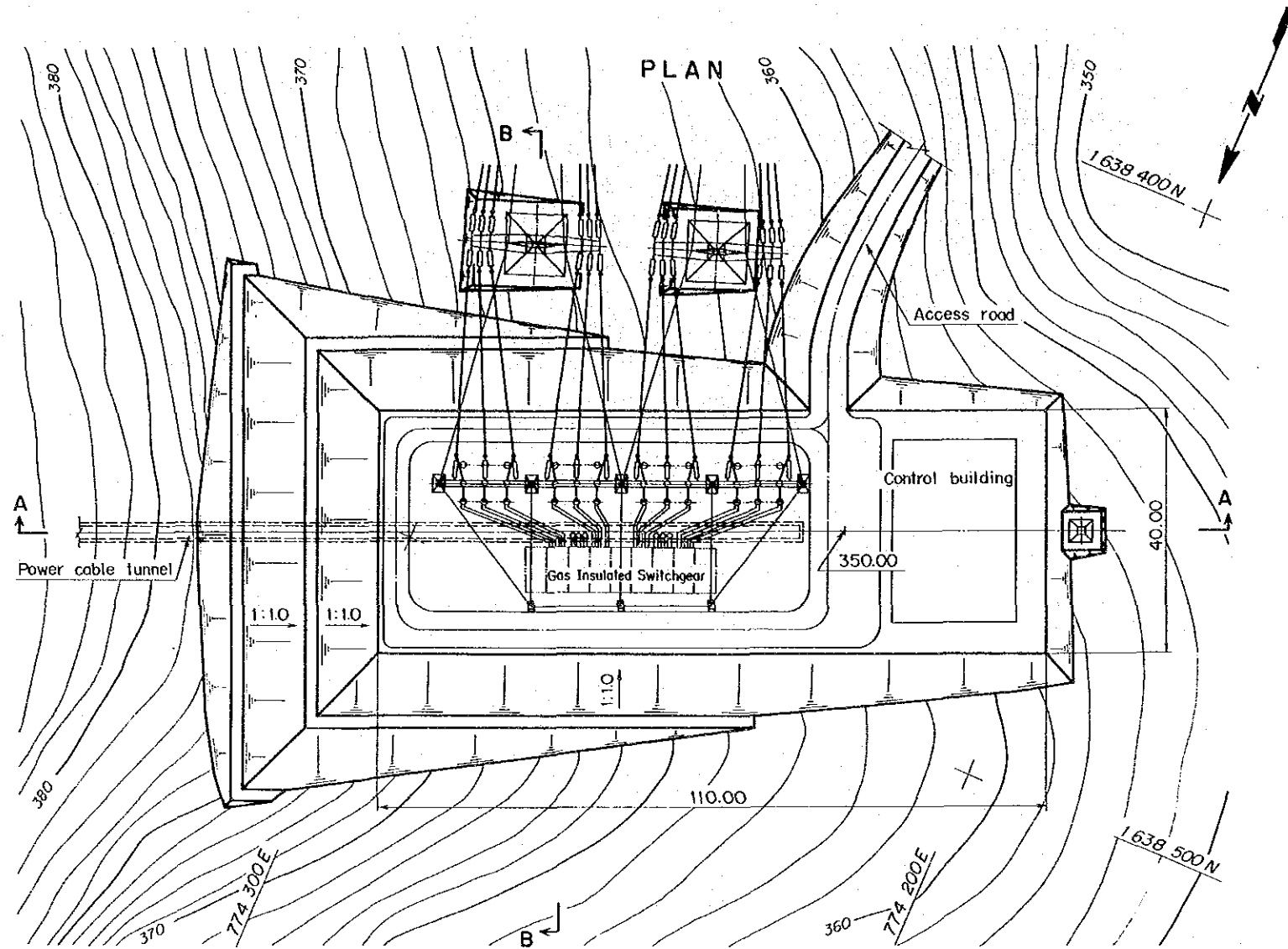
DWG. 10-2



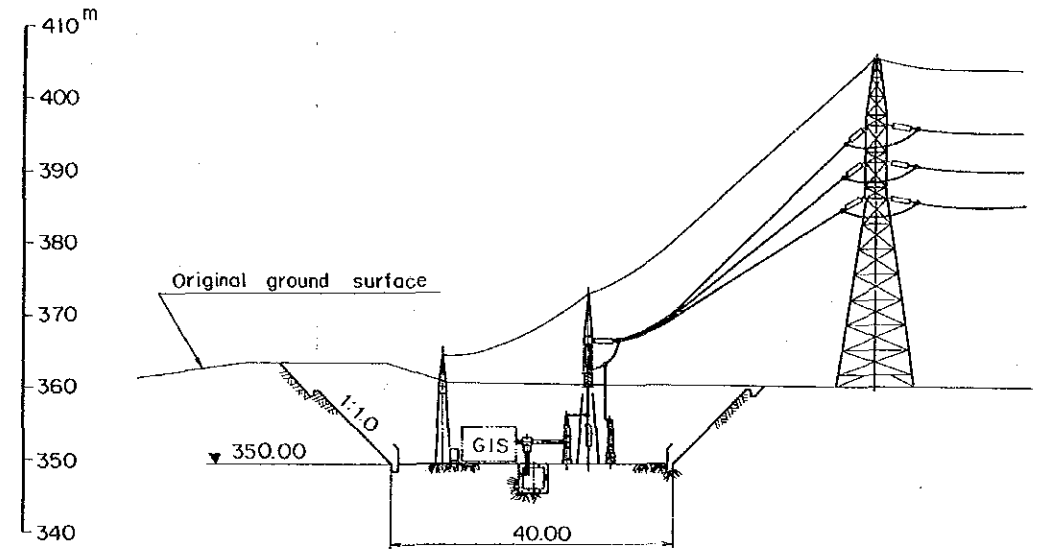
LAM TA KHONG PUMPED STORAGE PROJECT

POWERHOUSE
SECTION

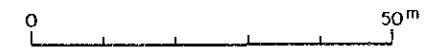
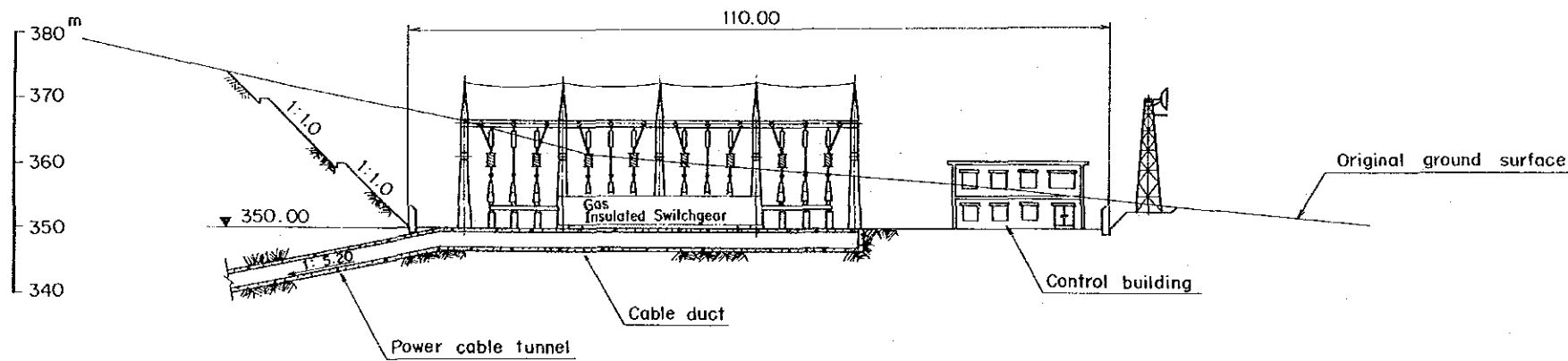
DWG. 10-3



SECTION B - B



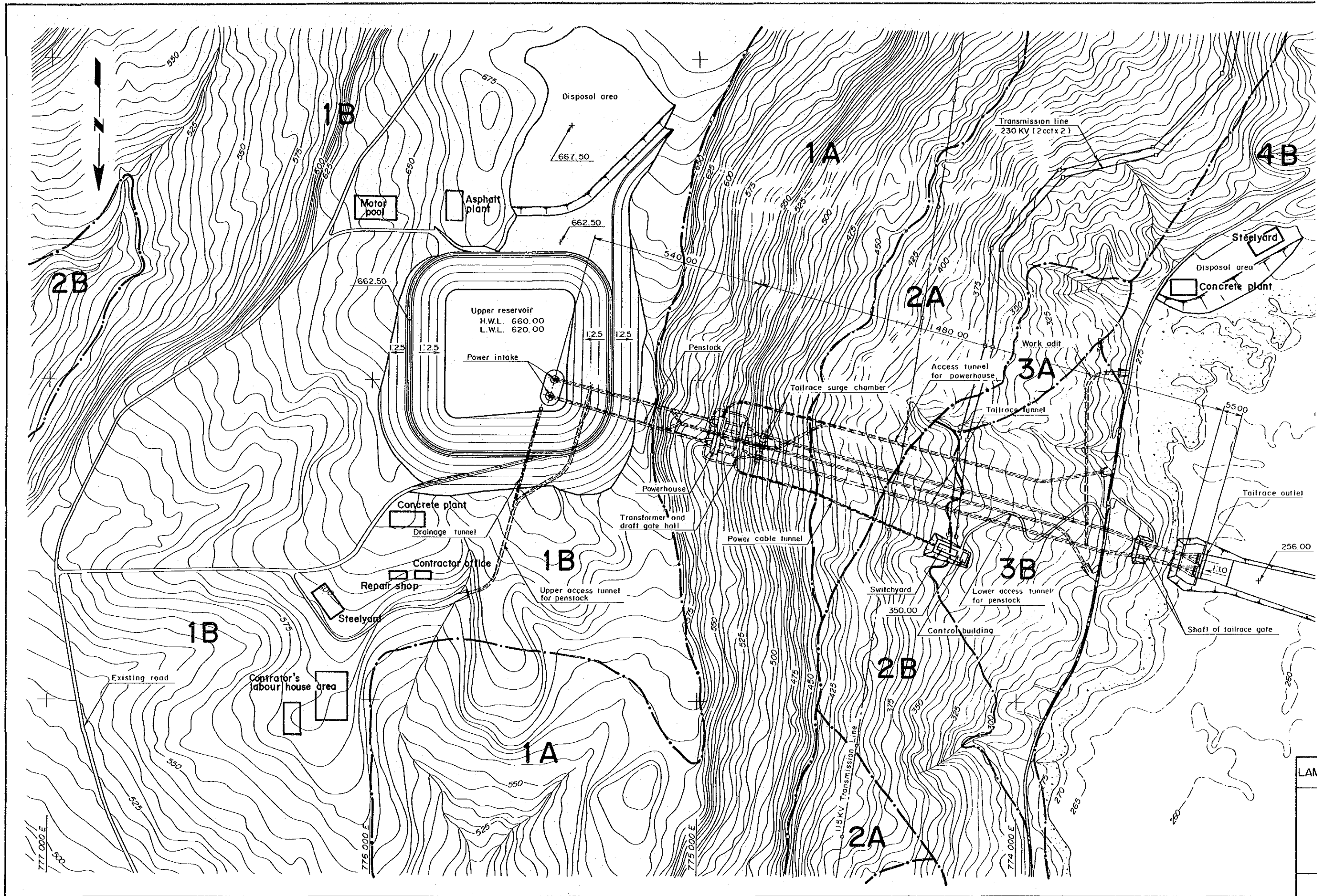
SECTION A - A



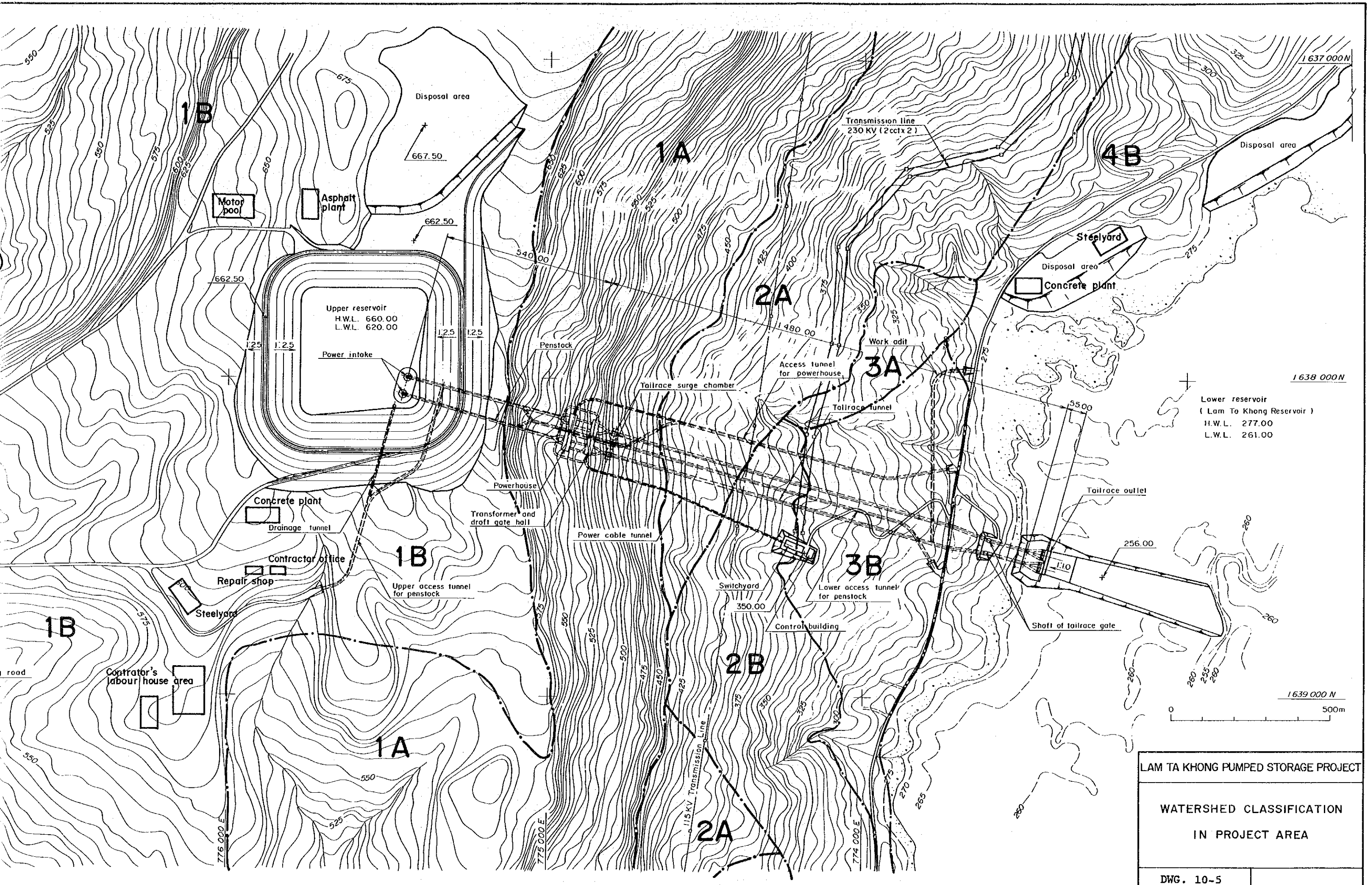
LAM TA KHONG PUMPED STORAGE PROJECT

**SWITCHYARD
PLAN AND SECTION**

DWG. 10-4



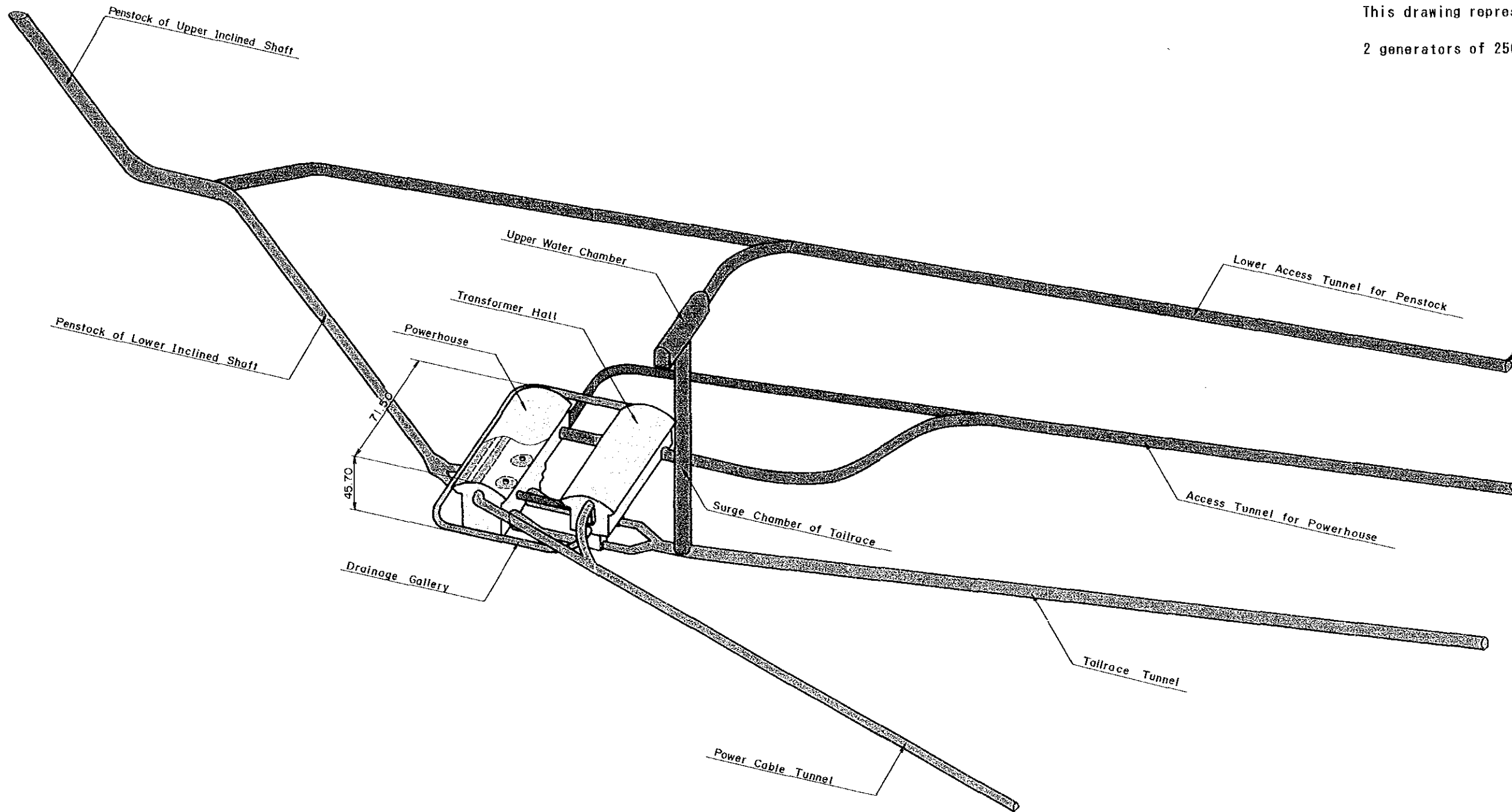
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LAM TA KHONG PUMPED STORAGE PROJECT	
WATERSHED CLASSIFICATION IN PROJECT AREA	
DWG. 10-5	

Note.

This drawing represents
2 generators of 250 MW.



LAM TA KHONG PUMPED STORAGE PROJECT

POWERHOUSE
BIRD'S-EYE VIEW

DWG. 10-6

11. CONSTRUCTION PLANNING AND COST ESTIMATE

(1) Construction Planning

The construction schedule of the Lam Ta Khong Project is shown in Fig. 11-1. The schedule is prepared taking into consideration the works quantity and natural conditions such as meteorological condition, road condition, etc., assuming that the project is to be commissioned in the year 1997.

It takes approximately five years from the start of the preliminary works to the commencement of the operation.

(2) Cost Estimate

(a) Price Level and Currency Exchange Rate

Price Level : January 1991

Currency Exchange Rate: 1 US\$ = 26 Baht

(b) Condition for Cost Estimate

- Preliminary Works

5% of civil works are estimated as the cost of the preliminary works.

- Environmental Mitigation

Considering the project's condition, 2% of the sum of civil works, hydraulic equipment, electro-mechanical equipment, transmission line, EGAT's administration and engineering service are estimated as the environmental mitigation cost.

- Civil Works

The cost of civil works is estimated in accordance with the drawings of the feasibility-grade design and unit costs. The unit costs are derived from the planned construction schedule and methods, the site conditions and the availability of construction materials.

- Hydraulic Equipment and Electro-mechanical Equipment

The costs of hydraulic and electro-mechanical equipments are based on budget prices quoted by manufacturers and on contract or bid prices of recent similar projects, updated January 1991 price. These equipments are imported from foreign countries.

- Transmission Line

The costs of the new 230 kV transmission line ($l = 110$ km, 2 cct) and of the line equipment for 230 kV (2 cct) are included in the project cost.

- Import Duties

Import duties are estimated by considering the foreign currency component; hydraulic equipment (11.40%), turbine, generator and transformers (11.40%), electro-mechanical accessories (11.40%), switchyard equipments (11.40%), transmission lines (21.86%).

- EGAT's Administration and Engineering Service

The costs of EGAT's administration and engineering service are separately estimated at 3% respectively, of above costs from the preliminary works to the transmission line.

- Physical Contingency

The physical contingency of 10% for all of the costs from the preliminary works to the hydraulic equipments and 7% from the electro-mechanical equipments to the transmission line is added to cover the cost of unforeseen physical conditions except price escalation.

- Price Contingency

The price contingency for all of the costs from the preliminary works to the transmission line is estimated on the basis of the escalation rates as follows.

Escalation Rate

Year	1991	1992	1993	1994	1995	1996 and onward
Rate (F.C., %)	4.4	4.4	4.4	4.4	4.4	4.4
Rate (L.C., %)	4.0	4.0	4.0	4.0	4.0	4.0

(Source: IBRD Bangkok, Oct. 1989)

- Interest During Construction

The interests during construction are estimated to be an 8% of annual interest rate on the foreign currency portion and 11% on 50% of the local currency portion. Further, the commitment fee of 0.75% on the foreign currency is considered.

(3) Project Cost

The project cost was estimated on the basis of the above cited conditions.

Project Cost 16,674 Million Baht (US\$ 641 Million).

The detailed project cost is shown in Table 11-1.

(4) Economic Cost

The economic cost excluding the import duties, price contingency and interest during construction are as follows:

Economic Cost 11,254 Million Baht (US\$ 433 Million)

The detailed economic cost is shown in Table 11-2.

The annual expenditure of the project cost and the economic cost is shown in Table 11-3 (1) ~ Table 11-3 (5).

Table 11-1 Project Cost of Development Plan

(Million Baht)

Description	Lam Ta Khong Project		
	F. C.	L. C.	Total
1. Preliminary Works	0.00	183.12	183.12
2. Environmental Mitigation	0.00	248.73	248.73
3. Civil Works	1,894.61	2,181.79	4,076.40
4. Hydraulic Equipment	1,076.32	703.84	1,780.16
5. Electro-mechanical Equipment	4,625.98	729.47	5,355.45
6. Transmission System	639.23	269.24	908.46
7. EGAT Administration	0.00	373.35	373.35
8. Engineering Service	261.27	107.21	368.48
9. Import Duties and Taxes	0.00	776.48	776.48
10. Interest During Construction	0.00	2,603.20	2,603.20
TOTAL PROJECT COST	8,497.39	8,176.43	16,673.83

Table 11-2 Economic Cost of Development Plan

(Million Baht)

Description	Lam Ta Khong Project		
	F. C.	L. C.	Total
1. Preliminary Works	0.00	171.38	171.38
2. Environmental Mitigation	0.00	220.00	220.00
3. Civil Works	1,657.37	1,900.25	3,557.62
4. Hydraulic Equipment	895.62	599.50	1,495.12
5. Electro-mechanical Equipment	3,811.56	611.62	4,423.16
6. Transmission System	524.30	224.70	749.00
7. EGAT Administration	0.00	319.00	319.00
8. Engineering Service	225.50	93.50	319.00
TOTAL ECONOMIC COST	7,114.34	4,139.94	11,254.29

Table 11-3-(1) Annual Expenditure

(UNIT: MILLION BAHT)

DESCRIPTION	BASE COST (1991 PRICE)													
	TOTAL		1992		1993		1994		1995		1996		1997	
	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C
1. PRELIMINARY WORKS	0.00	155.80	0.00	50.00	0.00	105.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2. ENVIRONMENTAL MITIGATION	0.00	200.00	0.00	20.00	0.00	40.00	0.00	60.00	0.00	0.00	0.00	20.00	0.00	0.00
3. CIVIL WORKS	1,506.70	1,727.50	0.00	0.00	412.84	228.03	653.91	587.35	332.98	725.55	106.98	186.57	0.00	0.00
4. HYDRAULIC EQUIPMENT	814.20	545.00	0.00	0.00	0.00	0.00	97.70	76.30	407.10	348.80	309.40	119.90	0.00	0.00
5. ELECTRO-MECHANICAL EQUIP.														
-TURBINE GENERATOR & OTHERS	3,331.50	546.10	0.00	0.00	299.84	49.15	0.00	0.00	1,232.66	202.06	1,499.18	245.75	299.84	49.15
-MAIN TRANSFORMER	230.70	25.50	0.00	0.00	0.00	0.00	0.00	0.00	23.07	2.55	207.63	22.95	0.00	0.00
6. TRANSMISSION SYSTEM	490.00	210.00	0.00	0.00	0.00	0.00	0.00	0.00	196.00	84.00	294.00	126.00	0.00	0.00
7. EGAT ADMINISTRATION	0.00	290.00	0.00	2.10	0.00	34.07	0.00	0.00	0.00	108.44	0.00	94.15	0.00	6.98
8. ENGINEERING SERVICE														
-D/D AND TENDER PREPARATION	30.00	10.00	24.00	8.00	6.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-CONSTRUCTION SUPERVISION	175.00	75.00	0.00	0.00	26.25	11.25	52.50	22.50	43.75	18.75	43.75	18.75	8.75	3.75
9. IMPORT DUTIES & TAXES	0.00	606.02	0.00	0.00	0.00	34.18	0.00	11.14	0.00	232.41	0.00	294.12	0.00	34.18
SUM OF BASE COST	6,578.10	4,390.92	24.00	80.10	744.92	504.48	804.11	801.55	2,235.56	1,782.56	2,460.93	1,128.18	308.59	94.06

Table 11-3-(2) Annual Expenditure

(UNIT: MILLION BAHT)

DESCRIPTION	PHYSICAL CONTINGENCY													
	TOTAL		1992		1993		1994		1995		1996		1997	
	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C
1. PRELIMINARY WORKS	0.00	15.58	0.00	5.00	0.00	10.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2. ENVIRONMENTAL MITIGATION	0.00	20.00	0.00	2.00	0.00	4.00	0.00	6.00	0.00	6.00	0.00	2.00	0.00	0.00
3. CIVIL WORKS	150.67	172.75	0.00	0.00	41.28	22.80	65.39	58.74	33.30	72.56	10.70	18.66	0.00	0.00
4. HYDRAULIC EQUIPMENT	81.42	54.50	0.00	0.00	0.00	0.00	9.77	7.63	40.71	34.88	30.94	11.99	0.00	0.00
5. ELECTRO-MECHANICAL EQUIP.														
-TURBINE GENERATOR & OTHERS	233.21	38.23	0.00	0.00	20.99	3.44	0.00	0.00	86.29	14.14	104.94	17.20	20.99	3.44
-MAIN TRANSFORMER	16.15	1.79	0.00	0.00	0.00	0.00	0.00	0.00	1.61	0.18	14.53	1.61	0.00	0.00
6. TRANSMISSION SYSTEM	34.30	14.70	0.00	0.00	0.00	0.00	0.00	0.00	13.72	5.88	20.58	8.82	0.00	0.00
7. EGAT ADMINISTRATION	0.00	29.00	0.00	0.21	0.00	3.09	0.00	4.43	0.00	8.28	0.00	7.26	0.00	4.73
8. ENGINEERING SERVICE														
-D/D AND TENDER PREPARATION	3.00	1.00	2.40	0.80	0.60	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-CONSTRUCTION SUPERVISION	17.50	7.50	0.00	0.00	2.63	1.13	5.25	2.25	4.38	1.88	4.38	1.88	0.88	0.38
9. IMPORT DUTIES & TAXES	0.00	45.21	0.00	0.00	0.00	2.39	0.00	1.11	0.00	17.66	0.00	21.65	0.00	2.39
SUM OF PHYSICAL CONTINGENCY	536.24	400.25	2.40	8.01	65.50	47.63	80.41	80.15	180.00	162.45	186.07	91.06	21.86	10.94

Table 11-3-(3) Annual Expenditure

DESCRIPTION	PRICE CONTINGENCY (UNIT: MILLION BAHT)													
	TOTAL		1992		1993		1994		1995		1996		1997	
	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C
1. PRELIMINARY WORKS	0.00	11.74	0.00	2.20	0.00	9.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2. ENVIRONMENTAL MITIGATION	0.00	28.73	0.00	0.88	0.00	3.61	0.00	8.25	0.00	11.22	0.00	4.77	0.00	0.00
3. CIVIL WORKS	237.24	281.54	0.00	0.00	40.87	20.57	99.26	80.76	68.86	135.68	28.24	44.53	0.00	0.00
4. HYDRAULIC EQUIPMENT	180.70	104.34	0.00	0.00	0.00	0.00	14.83	10.48	84.19	65.23	81.68	28.62	0.00	0.00
5. ELECTRO-MECHANICAL EQUIP. -TURBINE, GENERATOR & OTHERS	756.47	112.06	0.00	0.00	28.87	4.31	0.00	0.00	247.96	36.75	384.99	57.06	94.64	13.94
-MAIN TRANSFORMER	57.96	5.79	0.00	0.00	0.00	0.00	0.00	0.00	4.64	0.46	53.32	5.33	0.00	0.00
6. TRANSMISSION SYSTEM	114.93	44.54	0.00	0.00	0.00	0.00	0.00	0.00	39.43	15.28	75.50	29.26	0.00	0.00
7. EGAT ADMINISTRATION	0.00	54.35	0.00	0.09	0.00	3.05	0.00	6.09	0.00	20.01	0.00	22.01	0.00	3.19
8. ENGINEERING SERVICE -D/D AND TENDER PREPARATION	1.76	0.53	1.16	0.35	0.59	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-CONSTRUCTION SUPERVISION	34.01	13.18	0.00	0.00	2.60	1.01	7.97	3.09	9.05	3.51	11.55	4.48	2.84	1.09
9. IMPORT DUTIES & TAXES	0.00	125.25	0.00	0.00	0.00	3.00	0.00	1.53	0.00	42.51	0.00	68.52	0.00	9.59
SUM OF PRICE CONTINGENCY	1383.05	782.06	1.16	3.52	72.94	45.27	122.06	110.21	454.13	330.65	635.28	264.57	97.48	27.83

Table 11-3-(4) Annual Expenditure

DESCRIPTION	BASE COST INCLUDE PHYSICAL CONTINGENCIES (UNIT: MILLION BAHT)													
	TOTAL		1992		1993		1994		1995		1996		1997	
	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C
1. PRELIMINARY WORKS	0.00	171.38	0.00	55.00	0.00	116.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2. ENVIRONMENTAL MITIGATION	0.00	220.00	0.00	22.00	0.00	44.00	0.00	66.00	0.00	66.00	0.00	22.00	0.00	0.00
3. CIVIL WORKS	1657.37	1900.25	0.00	0.00	454.12	250.83	719.30	646.09	366.28	798.11	117.67	205.23	0.00	0.00
4. HYDRAULIC EQUIPMENT	895.62	599.50	0.00	0.00	0.00	0.00	107.47	83.93	447.81	383.68	340.34	131.89	0.00	0.00
5. ELECTRO-MECHANICAL EQUIP. -TURBINE, GENERATOR & OTHERS	3564.71	584.33	0.00	0.00	320.82	52.59	0.00	0.00	1318.94	216.20	1604.12	262.95	320.82	52.59
-MAIN TRANSFORMER	246.85	27.29	0.00	0.00	0.00	0.00	0.00	0.00	24.58	2.73	222.16	24.56	0.00	0.00
6. TRANSMISSION SYSTEM	524.30	224.70	0.00	0.00	0.00	0.00	0.00	0.00	209.72	89.88	314.58	134.82	0.00	0.00
7. EGAT ADMINISTRATION	0.00	319.00	0.00	2.31	0.00	37.16	0.00	48.68	0.00	117.72	0.00	101.41	0.00	11.71
8. ENGINEERING SERVICE -D/D AND TENDER PREPARATION	33.00	11.00	26.40	8.80	5.60	2.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
-CONSTRUCTION SUPERVISION	192.50	82.50	0.00	0.00	28.88	12.38	57.75	24.75	48.13	20.63	48.13	20.63	9.63	4.13
9. IMPORT DUTIES & TAXES	0.00	651.23	0.00	0.00	0.00	36.57	0.00	12.25	0.00	250.07	0.00	315.76	0.00	36.57
T O T A L	7114.34	4791.17	26.40	88.11	810.42	552.11	884.52	861.70	2415.56	1945.01	2647.00	1219.24	330.45	105.00
ECONOMIC COST	7114.34	4139.94	26.40	88.11	810.42	515.54	884.52	869.45	2415.56	1694.94	2647.00	903.47	330.45	68.43

Table 11-3-(5) Annual Expenditure

TOTAL PROJECT COST (BASE COST INCLUDE PHYSICAL & PRICE CONTINGENCIES)

(UNIT: MILLION BAHT)

DESCRIPTION	TOTAL		1992		1993		1994		1995		1996		1997	
	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C	F.C	L.C
1. PRELIMINARY WORKS	0.00	183.12	0.00	57.20	0.00	125.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2. ENVIRONMENTAL MITIGATION	0.00	248.73	0.00	22.88	0.00	47.61	0.00	74.25	0.00	77.22	0.00	26.77	0.00	0.00
3. CIVIL WORKS	1894.61	2181.79	4076.40	0.00	494.98	271.40	818.56	726.85	435.14	933.78	145.91	249.76	0.00	0.00
4. HYDRAULIC EQUIPMENT	1076.32	703.84	1780.16	0.00	0.00	0.00	122.31	94.42	532.00	448.91	422.02	160.51	0.00	0.00
5. ELECTRO-MECHANICAL EQUIP.	4321.17	696.39	5017.56	0.00	348.70	56.80	0.00	0.00	1566.80	252.96	1989.11	320.01	415.47	66.53
-TURBINE GENERATOR & OTHERS	304.81	33.98	337.89	0.00	0.00	0.00	0.00	0.00	28.33	3.19	275.48	28.83	0.00	0.00
-MAIN TRANSFORMER	639.23	269.24	908.46	0.00	0.00	0.00	0.00	0.00	249.15	105.16	390.08	154.08	0.00	0.00
6. TRANSMISSION SYSTEM	0.00	373.35	373.35	0.00	0.00	40.21	0.00	54.77	0.00	137.73	0.00	123.42	0.00	14.82
7. EGAT ADMINISTRATION	34.76	11.53	46.29	27.56	7.19	2.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8. ENGINEERING SERVICE	226.51	95.68	322.19	0.00	31.47	13.39	65.72	27.84	57.17	24.13	59.68	25.10	12.46	5.22
-D/O AND TENDER PREPARATION	0.00	776.48	776.48	0.00	0.00	39.57	0.00	13.78	0.00	292.58	0.00	384.28	0.00	46.27
-CONSTRUCTION SUPERVISION	8497.39	5573.23	14070.63	27.56	883.36	597.39	1006.59	891.91	2869.68	2275.66	3282.27	1483.81	427.93	132.83
9. IMPORT DUTIES & TAXES	0.00	2603.20	2603.20	0.00	0.00	115.91	0.00	227.66	0.00	451.04	0.00	775.90	0.00	965.54
TOTAL (W/O IDC)	8497.39	8176.43	16673.83	27.56	883.36	713.30	1006.59	1219.57	2869.68	2726.70	3282.27	2259.71	427.93	1088.37
INDC														
TOTAL PROJECT COST														

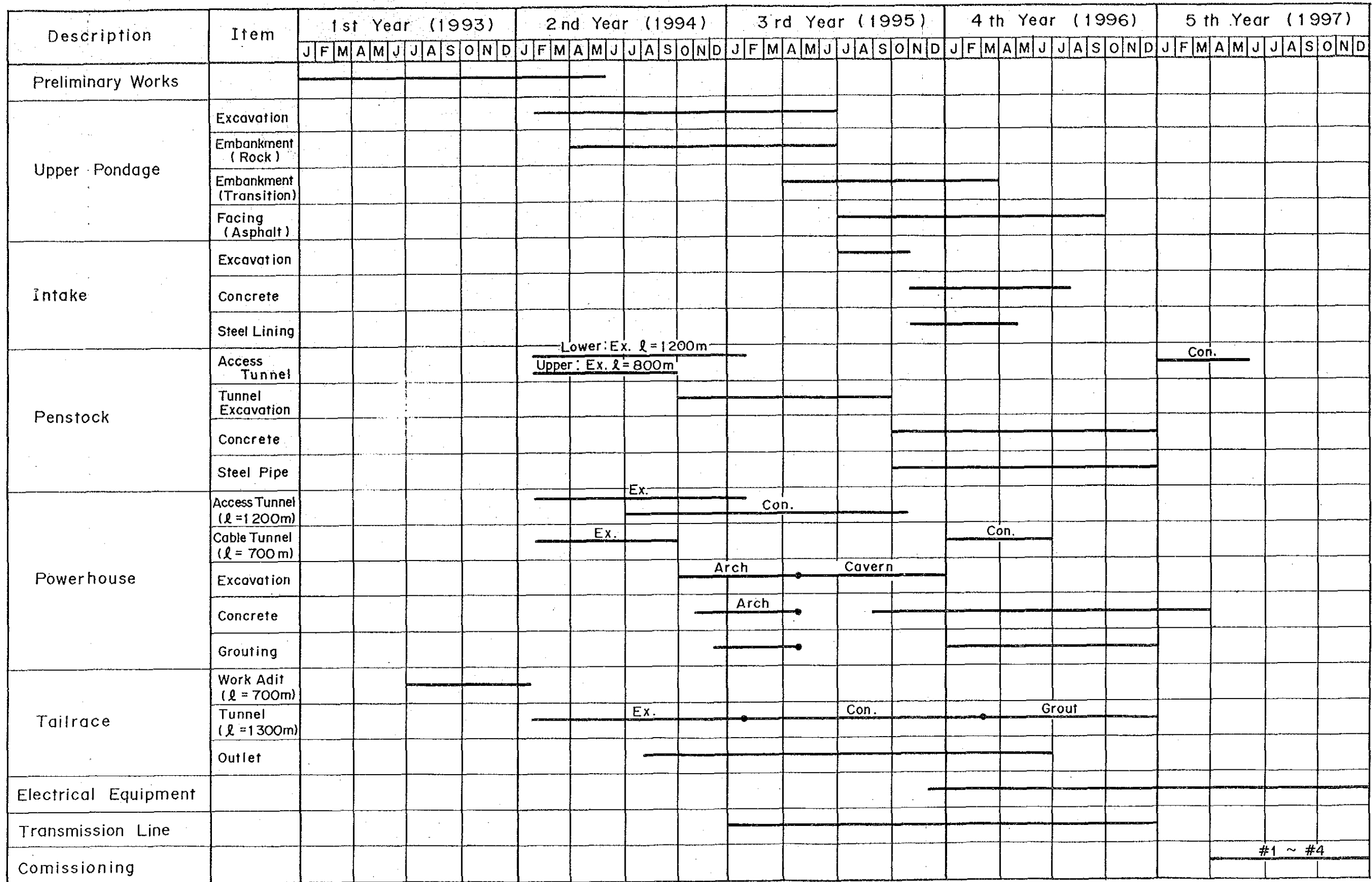


Fig. 11-1 Construction Schedule of Lam Ta Khong Project

12. ECONOMIC EVALUATION AND FINANCIAL ANALYSIS

(1) Economic Evaluation

(a) Methodology and Basic Conditions

As the method of the economic evaluation of this project, an alternative plant approach is employed to measure and evaluate economic costs of the proposed project and the alternative project.

The basic conditions for confirming the economic justification of this project are as follows:

- Alternative Thermal Power Plant: Gas turbine power plant
- Overall Efficiency Between Pumping Energy and Generating Energy: 68.9%.
- Discount rate: 12%

(b) Economic Analysis

The benefit flow and the cost flow of the adopted development plan based on the above-mentioned basic conditions and the economic cost in "11. CONSTRUCTION PLANNING AND COST ESTIMATE" are shown on Table 12-1, and the results of evaluation of B-C, B/C and EDR (EIRR) are as follows:

B-C: 1,504 Million Baht

B/C: 1.16

EDR: 17.4%

As indicated by indices of B-C and B/C, the costs of construction and operation of this project is smaller than those of an alternative thermal power plant which can provide equivalent service, and it can be also concluded that the

project can continue to maintain its superiority as long as the discount rate which reflects the capital opportunity cost does not exceed 17.4%.

The one stage development plan with a maximum output of 1,000 MW (250 MW x 4 units) is the most economical plan, however, study on a deadline of installation of Units 3 and 4 (250 MW x 2 units) which can keep feasibility of the project is also carried out on the assumption that the actual project development will be divided into two stages and Units 3 and 4 will be installed later than the year of 1997.

As presented in Fig. 12-1, it can be concluded that Units 3 and 4 shall be installed by the year of 2002 and that the sooner they are installed, the better feasibility of the project from the economic points of view is.

(c) Sensitivity Analysis

The sensitivity analysis of the project was implemented for the cases based on conditions "Increase of Construction Cost", "fluctuation of Fuel Prices", "Fluctuation of Annual Generating Hours" and "In the case of 1,000 MW Pumping and 1,000 MW Generating". The result of the sensitivity analysis on the increase of the construction cost is shown on Fig. 12-2, and it can be concluded that the project is feasible and superior to the alternative thermal power plant as long as the ratio of the increase of the construction cost does not exceed 19%.

The results of the sensitivity analysis on the fluctuation of fuel prices (50% ~ 200%) and the annual generating hours (750 hrs ~ 250 hrs) show approximately from 17% to 18% EDR in every cases, the project is feasible regardless of those fluctuation.

In addition, the cost flow and benefit flow in the case of 1,000 MW pumping and 1,000 MW generating is shown on Table 12-2, and the result of evaluation of EDR is 18.6%.

(2) Financial Analysis

(a) Methodology and Basic Conditions

For the financial analysis of this project, two cases, "Financial Evaluation from Viewpoint of Total Investment - Calculation of the financial internal rate of return (FIRR)" and "Financial Analysis from Viewpoint of Project Equity - Calculation of the debt service ratio", were analyzed and judgement was made for evaluation.

The basic conditions for implementing the financial evaluation of this project are as follows:

- Financing Conditions

- Foreign Currency Portion
Interest : 8%
Commitment fee:0.75%

The repayment period shall be 20 years from the commencement of operation and repayment is in the form of regular installments.

- Local Currency Portion
Interest : 11% on 50% of the local currency portion

The repayment period shall be 10 years from the commencement of operation and repayment is in the form of regular installments.

- Electric Sales Revenue

The electric sales revenue will be estimated using the EGAT tariff for "Large Manufacturing & Mining".

(b) Financial Analysis

The cost flow and the flow of the revenue considering the escalation are presented on Table 12-3 based on the above conditions, and FIRR is evaluated as 11.2%.

Although this FIRR is slightly less than the social discount rate (12%), it can be concluded that this project has no big problem from the financial point of view.

The repayment schedule of the debt based on the financing conditions, the statement of profit and loss, the cash flow and the result of calculation of the debt service ratio are shown on Table 12-4 through Table 12-7. Average debt service ratio for 20 years is 2.09, and it can be concluded that the Project is sound from the viewpoint of profitability.

Table 12-1 Cost Flow and Benefit Flow of the Adopted Development Plan

(Unit: Million B)

Serial No. after Completion Number	Investment Cost		Cost		Total (N.P.V.)	Investment Cost	Benefit		Total (N.P.V.)	B - C
	Investment Cost	Cost	D&M Cost	Fuel Cost For Pumping			D&M Cost	Fuel Cost		
0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	114.5	132.2	182.9	237.1	114.5	0.0	332.9	0.0	0.0	-114.5
2	1325.0	1037.0	182.9	237.1	1325.0	0.0	332.9	0.0	0.0	-1325.0
3	1754.0	1248.4	182.9	237.1	1754.0	0.0	332.9	0.0	0.0	-1754.0
4	4110.5	2612.3	182.9	237.1	4110.5	0.0	332.9	0.0	0.0	-4110.5
5	3550.5	2014.5	182.9	237.1	3550.5	2634.9	332.9	1495.1	1495.1	-915.5
6	338.9	282.1	182.9	237.1	338.9	10539.7	332.9	5829.7	5829.7	10140.8
7	420.0	180.0	182.9	237.1	420.0	0.0	332.9	329.4	329.4	308.1
8	420.0	169.6	182.9	237.1	420.0	0.0	332.9	294.1	294.1	308.1
9	420.0	151.4	182.9	237.1	420.0	0.0	332.9	262.6	262.6	308.1
10	420.0	135.2	182.9	237.1	420.0	0.0	332.9	234.4	234.4	308.1
11	420.0	120.7	182.9	237.1	420.0	0.0	332.9	209.3	209.3	308.1
12	420.0	107.8	182.9	237.1	420.0	0.0	332.9	186.9	186.9	308.1
13	420.0	96.2	182.9	237.1	420.0	0.0	332.9	166.9	166.9	308.1
14	420.0	85.9	182.9	237.1	420.0	0.0	332.9	149.0	149.0	308.1
15	420.0	76.7	182.9	237.1	420.0	0.0	332.9	133.0	133.0	308.1
16	420.0	68.5	182.9	237.1	420.0	0.0	332.9	118.8	118.8	308.1
17	420.0	61.2	182.9	237.1	420.0	0.0	332.9	106.0	106.0	308.1
18	420.0	54.6	182.9	237.1	420.0	0.0	332.9	94.7	94.7	308.1
19	420.0	48.8	182.9	237.1	420.0	0.0	332.9	84.5	84.5	308.1
20	420.0	43.5	182.9	237.1	420.0	0.0	332.9	75.5	75.5	308.1
21	420.0	38.9	182.9	237.1	420.0	0.0	332.9	67.4	67.4	308.1
22	420.0	34.7	182.9	237.1	420.0	0.0	332.9	60.2	60.2	308.1
23	420.0	31.0	182.9	237.1	420.0	0.0	332.9	53.7	53.7	308.1
24	420.0	27.7	182.9	237.1	420.0	0.0	332.9	48.0	48.0	308.1
25	420.0	24.7	182.9	237.1	420.0	2634.9	332.9	197.8	294.1	294.1
26	420.0	22.1	182.9	237.1	420.0	10539.7	332.9	591.8	10647.8	10647.8
27	395.8	237.1	182.9	237.1	395.8	0.0	332.9	34.1	34.1	-37.7
28	0.0	237.1	182.9	237.1	0.0	0.0	332.9	30.5	30.5	308.1
29	1656.3	2076.3	182.9	237.1	1656.3	0.0	332.9	27.2	27.2	-1348.2
30	2240.6	2650.6	182.9	237.1	2240.6	0.0	332.9	24.3	24.3	-1932.5
31	335.8	815.8	182.9	237.1	335.8	0.0	332.9	21.7	21.7	-37.7
32	420.0	11.2	182.9	237.1	420.0	0.0	332.9	19.4	19.4	308.1
33	420.0	10.0	182.9	237.1	420.0	0.0	332.9	17.3	17.3	308.1
34	420.0	8.9	182.9	237.1	420.0	0.0	332.9	15.4	15.4	308.1
35	420.0	8.0	182.9	237.1	420.0	0.0	332.9	13.8	13.8	308.1
36	420.0	7.1	182.9	237.1	420.0	0.0	332.9	12.3	12.3	308.1
37	420.0	6.3	182.9	237.1	420.0	0.0	332.9	11.0	11.0	308.1
38	420.0	5.7	182.9	237.1	420.0	0.0	332.9	9.8	9.8	308.1
39	420.0	5.1	182.9	237.1	420.0	0.0	332.9	8.8	8.8	308.1
40	420.0	4.5	182.9	237.1	420.0	0.0	332.9	7.8	7.8	308.1
41	420.0	4.0	182.9	237.1	420.0	0.0	332.9	7.0	7.0	308.1
42	420.0	3.6	182.9	237.1	420.0	0.0	332.9	6.2	6.2	308.1
43	420.0	3.2	182.9	237.1	420.0	0.0	332.9	5.6	5.6	308.1
44	317.6	5.0	182.9	237.1	317.6	0.0	332.9	5.0	5.0	-3.4
45	476.4	896.3	182.9	237.1	476.4	2634.9	332.9	3693.0	20.5	2465.7
46	420.0	2.3	182.9	237.1	420.0	10539.7	332.9	11367.8	61.9	10847.8
47	420.0	2.0	182.9	237.1	420.0	0.0	332.9	3.5	3.5	308.1
48	420.0	1.8	182.9	237.1	420.0	0.0	332.9	3.2	3.2	308.1
49	420.0	1.6	182.9	237.1	420.0	0.0	332.9	2.8	2.8	308.1
50	420.0	1.5	182.9	237.1	420.0	0.0	332.9	2.5	2.5	308.1
51	420.0	1.2	182.9	237.1	420.0	0.0	332.9	2.2	2.2	308.1
52	420.0	1.2	182.9	237.1	420.0	0.0	332.9	2.0	2.0	308.1
53	420.0	1.0	182.9	237.1	420.0	0.0	332.9	1.8	1.8	308.1
54	420.0	0.9	182.9	237.1	420.0	0.0	332.9	1.6	1.6	308.1
55	420.0	0.8	182.9	237.1	420.0	0.0	332.9	1.4	1.4	308.1
56	420.0	0.7	182.9	237.1	420.0	0.0	332.9	1.3	1.3	308.1
B - C										
15736.8 9143.6 11854.9 87735.2 9175.8 39522.8 18761.9 16544.0 75929.8 10890.3 88194.6										
B / C										
1504.4661										
1.1693598										
E D R										
0.1744519										

Table 12-3

Cost Flow and Flow of Revenue of Adopted Development Plan

(Unit: Million B)

Serial Number	Year	Cost			Revenue	R - C	
		Investment Cost	O&M Cost	Fuel Cost for Pump.			Total
0	1991	0.0			0.0	0.0	
1	1992	119.2			119.2	-119.2	
2	1993	1480.8			1480.8	-1480.8	
3	1994	1998.5			1998.5	-1998.5	
4	1995	5145.3			5145.3	-5145.3	
5	1996	4766.1			4766.1	-4766.1	
6	1997	560.8			560.8	-560.8	
7	1998		235.6	283.2	518.8	2533.6	
8	1999		235.6	283.2	518.8	2533.6	
9	2000		235.6	283.2	518.8	2533.6	
10	2001		235.6	283.2	518.8	2533.6	
11	2002		235.6	283.2	518.8	2533.6	
12	2003		235.6	283.2	518.8	2533.6	
13	2004		235.6	283.2	518.8	2533.6	
14	2005		235.6	283.2	518.8	2533.6	
15	2006		235.6	283.2	518.8	2533.6	
16	2007		235.6	283.2	518.8	2533.6	
17	2008		235.6	283.2	518.8	2533.6	
18	2009		235.6	283.2	518.8	2533.6	
19	2010		235.6	283.2	518.8	2533.6	
20	2011		235.6	283.2	518.8	2533.6	
21	2012		235.6	283.2	518.8	2533.6	
22	2013		235.6	283.2	518.8	2533.6	
23	2014		235.6	283.2	518.8	2533.6	
24	2015		235.6	283.2	518.8	2533.6	
25	2016		235.6	283.2	518.8	2533.6	
26	2017		235.6	283.2	518.8	2533.6	
27	2018	477.3	235.6	283.2	996.1	2533.6	
28	2019	0.0	235.6	283.2	518.8	2533.6	
29	2020	2174.7	235.6	283.2	2693.5	2533.6	
30	2021	3069.4	235.6	283.2	3588.2	2533.6	
31	2022	565.9	235.6	283.2	1084.6	2533.6	
32	2023		235.6	283.2	518.8	2533.6	
33	2024		235.6	283.2	518.8	2533.6	
34	2025		235.6	283.2	518.8	2533.6	
35	2026		235.6	283.2	518.8	2533.6	
36	2027		235.6	283.2	518.8	2533.6	
37	2028		235.6	283.2	518.8	2533.6	
38	2029		235.6	283.2	518.8	2533.6	
39	2030		235.6	283.2	518.8	2533.6	
40	2031		235.6	283.2	518.8	2533.6	
41	2032		235.6	283.2	518.8	2533.6	
42	2033		235.6	283.2	518.8	2533.6	
43	2034		235.6	283.2	518.8	2533.6	
44	2035	453.0	235.6	283.2	971.8	2533.6	
45	2036	708.5	235.6	283.2	1227.3	2533.6	
46	2037		235.6	283.2	518.8	2533.6	
47	2038		235.6	283.2	518.8	2533.6	
48	2039		235.6	283.2	518.8	2533.6	
49	2040		235.6	283.2	518.8	2533.6	
50	2041		235.6	283.2	518.8	2533.6	
51	2042		235.6	283.2	518.8	2533.6	
52	2043		235.6	283.2	518.8	2533.6	
53	2044		235.6	283.2	518.8	2533.6	
54	2045		235.6	283.2	518.8	2533.6	
55	2046		235.6	283.2	518.8	2533.6	
56	2047		235.6	283.2	518.8	2533.6	
		21519.5	11780.0	14157.9	47457.4	126680.0	79222.6

Table 12-4 Repayment Schedule of Debt

.No.	Year	Const ruction		Cost		Repayment of F. C.			Repayment of L. C.			
		F. C.	L. C.	Total	Interest	Principal	Total	Balance	Interest	Principal	Total	Balance
	1992	27.56	91.63	119.19	679.79	185.69	865.48	8311.70	306.53	166.64	473.17	2786.62
	1993	883.36	597.39	1480.75	664.94	200.54	865.48	8111.16	288.20	184.97	473.17	2619.97
	1994	1006.59	991.91	1998.5	648.89	216.59	865.48	7894.58	267.85	205.32	473.17	2435.00
	1995	2869.68	2275.66	5145.34	631.57	233.91	865.48	7560.66	245.26	227.91	473.17	2001.77
	1996	3282.27	1483.81	4766.08	612.85	252.62	865.48	7408.04	220.19	252.98	473.17	1748.79
	1997	427.93	132.83	560.76	592.64	272.83	865.48	7135.21	192.37	280.80	473.17	1467.99
1	1998				570.82	294.66	865.48	6840.54	161.48	311.69	473.17	1156.30
2	1999				547.24	318.23	865.48	6522.31	127.19	345.98	473.17	810.32
3	2000				521.78	343.69	865.48	6178.62	89.13	384.04	473.17	426.28
4	2001				494.29	371.19	865.48	5807.43	46.89	426.28	473.17	0.00
5	2002				464.59	400.88	865.48	5406.54				
6	2003				432.52	432.95	865.48	4973.59				
7	2004				397.89	467.59	865.48	4506.00				
8	2005				360.48	505.00	865.48	4001.00				
9	2006				320.08	545.40	865.48	3455.60				
10	2007				276.45	589.03	865.48	2866.57				
11	2008				229.33	636.15	865.48	2230.42				
12	2009				178.43	687.04	865.48	1543.98				
13	2010				123.47	742.01	865.48	801.37				
14	2011				64.11	801.37	865.48	0.00				
15	2012											
16	2013											
17	2014											
18	2015											
19	2016											
20	2017											
	Total	8497.39	5573.23	14070.62	8812.17	8497.39	17309.56		1945.10	2786.62	4731.71	

(Unit: Million B)

Table 12-5 Statement of Profit and Loss

No.	Year	Revenue	Business Expenses		Business Profit	Financial I.D.C.	Cost Interest	Net Profit
			O&M Cost	Depreciation				
	1992					67.15		-67.15
	1993					115.91		-115.91
	1994					227.66		-227.66
	1995					451.04		-451.04
	1996					775.90		-775.90
	1997					965.54		-965.54
1	1998	2533.60	235.60	484.40	720.00	1813.60	986.32	827.28
2	1999	2533.60	235.60	484.40	720.00	1813.60	953.13	860.47
3	2000	2533.60	235.60	484.40	720.00	1813.60	916.74	896.86
4	2001	2533.60	235.60	484.40	720.00	1813.60	876.83	936.77
5	2002	2533.60	235.60	484.40	720.00	1813.60	833.05	980.55
6	2003	2533.60	235.60	484.40	720.00	1813.60	785.01	1028.59
7	2004	2533.60	235.60	484.40	720.00	1813.60	732.30	1081.30
8	2005	2533.60	235.60	484.40	720.00	1813.60	674.44	1139.16
9	2006	2533.60	235.60	484.40	720.00	1813.60	610.92	1202.68
10	2007	2533.60	235.60	484.40	720.00	1813.60	541.18	1272.42
11	2008	2533.60	235.60	484.40	720.00	1813.60	454.59	1349.01
12	2009	2533.60	235.60	484.40	720.00	1813.60	432.52	1381.08
13	2010	2533.60	235.60	484.40	720.00	1813.60	397.89	1415.71
14	2011	2533.60	235.60	484.40	720.00	1813.60	360.48	1453.12
15	2012	2533.60	235.60	484.40	720.00	1813.60	320.08	1493.52
16	2013	2533.60	235.60	484.40	720.00	1813.60	276.45	1537.15
17	2014	2533.60	235.60	484.40	720.00	1813.60	229.33	1584.27
18	2015	2533.60	235.60	484.40	720.00	1813.60	178.43	1635.17
19	2016	2533.60	235.60	484.40	720.00	1813.60	123.47	1690.13
20	2017	2533.60	235.60	484.40	720.00	1813.60	64.11	1749.49
	Total	50672.00	4712.00	9688.00	14400.00	36272.00	10757.27	22911.53

Table 12-6 Cash Flow

No.	Year	Cash		Inflow Depreci- ation	Total	Cash		Total	Balance	
		Financing	Net Profit			Investment	Repayment of Princpl.		Year	Accumulated
	1992	119.19	-67.15		52.04	119.19		119.19	-67.15	-67.15
	1993	1480.75	-115.91		1364.84	1480.75		1480.75	-115.91	-183.06
	1994	1998.50	-227.66		1770.84	1998.50		1998.50	-227.66	-410.72
	1995	5145.34	-451.04		4694.30	5145.34		5145.34	-451.04	-861.76
	1996	4766.08	-775.90		3990.18	4766.08		4766.08	-775.90	-1637.66
	1997	560.76	-965.54		-404.78	560.76		560.76	-965.54	-2603.20
1	1998		827.28	484.40	1311.68		352.33	352.33	959.35	-1643.85
2	1999		860.47	484.40	1344.87		385.52	385.52	959.35	-684.50
3	2000		896.86	484.40	1381.26		421.91	421.91	959.35	-274.85
4	2001		936.77	484.40	1421.17		461.82	461.82	959.35	1234.20
5	2002		980.55	484.40	1464.95		505.60	505.60	959.35	2193.55
6	2003		1028.59	484.40	1512.99		553.64	553.64	959.35	3152.91
7	2004		1081.30	484.40	1565.70		606.35	606.35	959.35	4112.26
8	2005		1139.16	484.40	1623.56		664.21	664.21	959.35	5071.61
9	2006		1202.68	484.40	1687.08		727.73	727.73	959.35	6030.96
10	2007		1272.42	484.40	1756.82		797.47	797.47	959.35	6990.31
11	2008		1349.01	484.40	1833.41		800.88	400.88	1432.52	8422.83
12	2009		1381.08	484.40	1865.48		432.95	432.95	1432.52	9855.35
13	2010		1415.71	484.40	1900.11		467.59	467.59	1432.52	11287.87
14	2011		1453.12	484.40	1937.52		505.00	505.00	1432.52	12720.40
15	2012		1493.52	484.40	1977.92		545.40	545.40	1432.52	14152.92
16	2013		1537.15	484.40	2021.55		589.03	589.03	1432.52	15585.44
17	2014		1584.27	484.40	2068.67		636.15	636.15	1432.52	17017.96
18	2015		1635.17	484.40	2119.57		687.04	687.04	1432.52	18450.49
19	2016		1690.13	484.40	2174.53		742.01	742.01	1432.52	19883.01
20	2017		1749.49	484.40	2233.89		801.37	801.37	1432.52	21315.53
	Total	14070.62	23911.53	9688.00	46670.15	14070.62	11284.01	25354.63	21315.53	

(Unit: Million B)

Table 12-7 Calculation of Debt Service Ratio

No.	Year	Internal			Fund		Procured		Repayment of Debt			(Unit: Million B)	
		Business Profit	Depreciation	Total	Accumulated (A)	Interest	Principal	Total	Accumulated (B)	Debt Service Ratio (A)/(B)			
	1992												
	1993												
	1994												
	1995												
	1996												
	1997												
1	1998	1813.60	484.40	2298.00	2298.00	985.32	352.33	1338.65	1338.65				
2	1999	1813.60	484.40	2298.00	4596.00	953.13	385.52	1338.65	2677.30				
3	2000	1813.60	484.40	2298.00	6894.00	916.74	421.91	1338.65	4015.95				
4	2001	1813.60	484.40	2298.00	9192.00	876.83	461.82	1338.65	5354.60				
5	2002	1813.60	484.40	2298.00	11490.00	833.05	505.60	1338.65	6693.25				1.72
6	2003	1813.60	484.40	2298.00	13788.00	785.01	553.64	1338.65	8031.89				
7	2004	1813.60	484.40	2298.00	16086.00	732.30	606.35	1338.65	9370.54				
8	2005	1813.60	484.40	2298.00	18384.00	674.44	664.21	1338.65	10709.19				
9	2006	1813.60	484.40	2298.00	20682.00	610.92	727.73	1338.65	12047.84				
10	2007	1813.60	484.40	2298.00	22980.00	541.18	797.47	1338.65	13386.49				1.72
11	2008	1813.60	484.40	2298.00	25278.00	464.59	400.88	865.48	14251.97				
12	2009	1813.60	484.40	2298.00	27576.00	432.52	432.95	865.48	15117.45				
13	2010	1813.60	484.40	2298.00	29874.00	397.89	467.59	865.48	15982.93				
14	2011	1813.60	484.40	2298.00	32172.00	360.48	505.00	865.48	16848.40				
15	2012	1813.60	484.40	2298.00	34470.00	320.08	545.40	865.48	17713.88				1.95
16	2013	1813.60	484.40	2298.00	36768.00	276.45	589.03	865.48	18579.36				
17	2014	1813.60	484.40	2298.00	39066.00	229.33	636.15	865.48	19444.84				
18	2015	1813.60	484.40	2298.00	41364.00	178.43	687.04	865.48	20310.31				
19	2016	1813.60	484.40	2298.00	43662.00	123.47	742.01	865.48	21175.79				
20	2017	1813.60	484.40	2298.00	45960.00	64.11	801.37	865.48	22041.27				2.09
	Total	1125580.4	248997.10	1352821.5	833497.17	445754.23	779251.40						

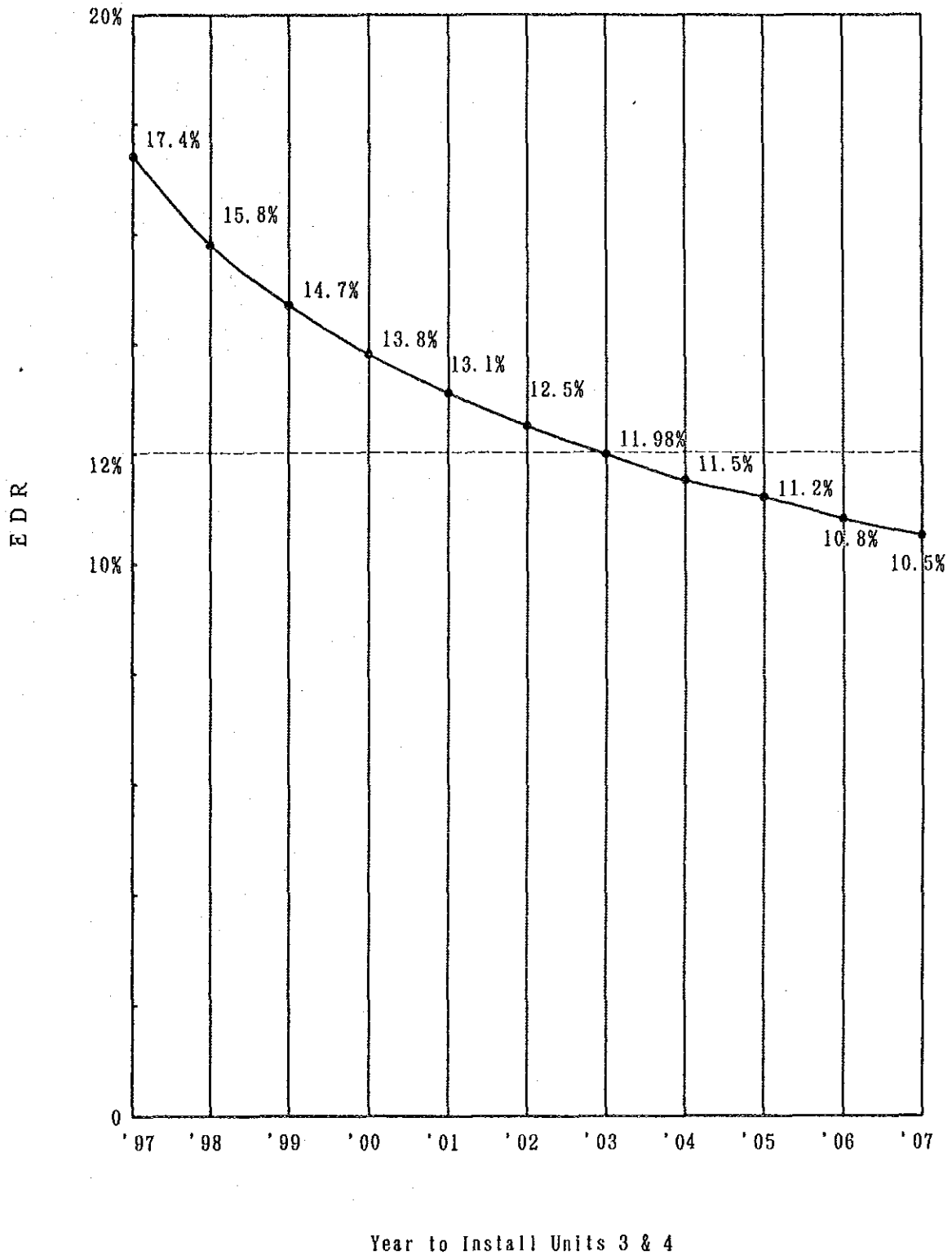


Fig.12-1 Sensitivit Analysis on Istallation of Units 3 and 4

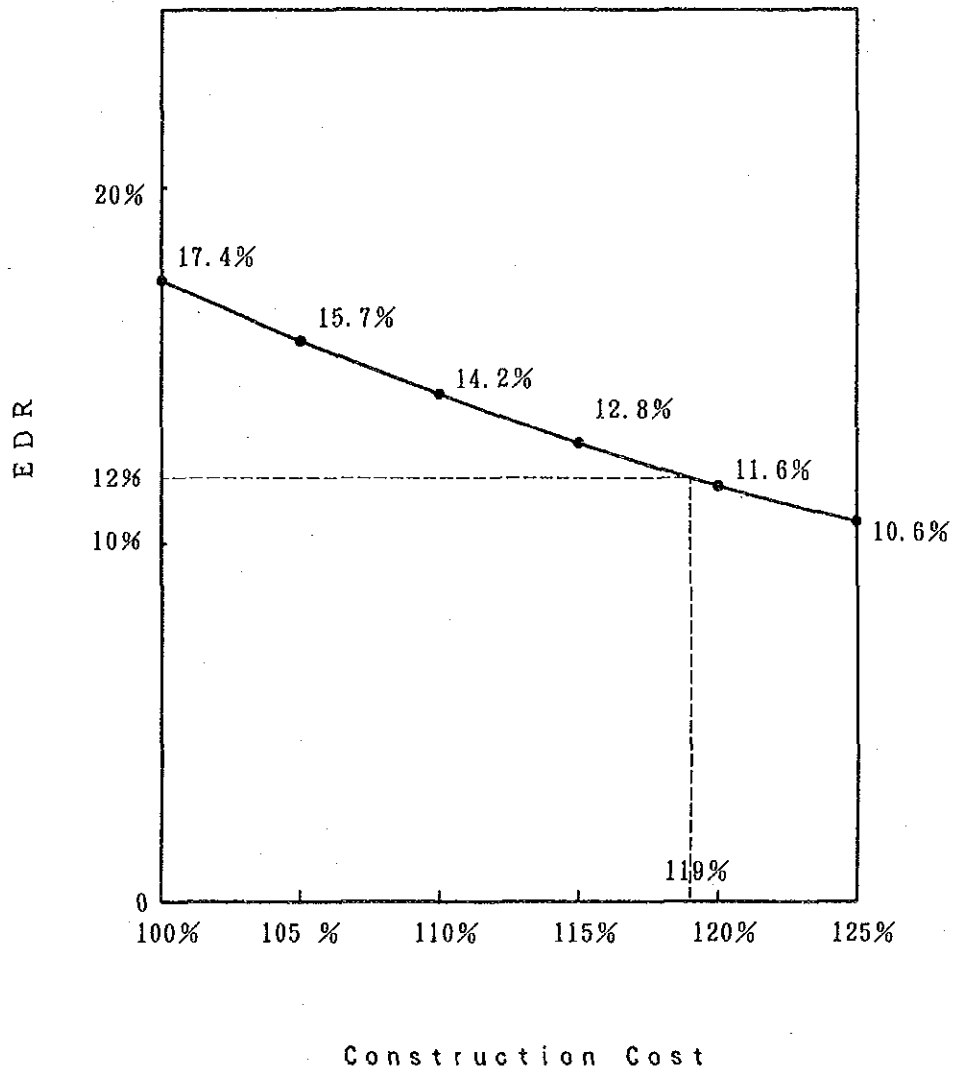


Fig.12-2 Sensitivity Analysis (Construction Cost)

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