E-4. Project Implementation Program

E-4.1. Construction Management

The Executive Agency for the Project would be Ministry of Water Resources (MWR). The MWR would be responsible for the planning, design, bidding and supervision of the project works, and keep close coordination with the agencies concerned on the project approval, finance and project implementation. The Project would be implemented under the present organization of the MWR and required to be of great importance in the coordination of activities among the departments and institutes concerned. Prior to the start of project works, the Project Manager would be appointed under the Construction Department, MWR, who would rest with the day-to-day works. Under him, aiming at the smooth implementation, Administration section, Planning & Engineering section, Construction section, Mechanics & Material section and Right-of-way Coordination section. Administration section would serve the works in charge of office operation, personnel, finance and others not concerned to the other sections. Planning & Engineering section would have the works for planning and monitoring of construction works, design of force account works and engineering support to the construction, etc. Construction section would supervise the contract works and execute the force account works. Mechanics & Material section would be responsible for procurement and management of equipment and materials for the force account works, every material tests with regard to the construction quality control and management of office equipment. Right-of-way & Coordination section would deal with Land acquisition, education/training to farmers, management of claim during the construction. For this project office set-up, the number of project engineers and staffs would be increased.

E-4.2. Construction Mode and Method

The procurement of mechanical and electrical equipment, construction of pumping station and major irrigation and/or drainage canals and structures as well as construction of fish ponds would be executed by the contract work. the open international competitive bidding would be conducted in case of the project with financial assistance from international institution. The procedures of pre-qualification and bidding for the contract

works have not been authorized. According to the draft procedure, The Awarding Committee chaired by a leader of the ministry would be created under the MWR. Every matters would be dealt with by the department concerned under the present organization and approved by the committee, through administrative arrangement of Construction Department or Planning Department.

The construction of small irrigation and drainage canals have depended on the farmers concerned. In case of leaving those construction works to the farmers, it is so often seen that the canals have been untouched and/or have not coincided with the plan. Consequently, effects of such project might not be expected. Therefore, it is suggested for the small irrigation and drainage canals to be implemented by the force account works under the Project.

E-4.3. Construction Schedule

Upon the project approved, the detailed design as well as bidding documents, specifications and others documents/drawings necessary for the approval and implementation of the project works should be commenced and at the same time the selection of consultants would be carried out. The consultants would be selected first by the technical proposal. After approval of the selection, the contract conditions would be concluded. The prequalification documents would be reviewed by the consultants upon the commencement of consulting services and advertised after the Approval. The procurement of construction equipment for the force account works would be bidden in the early stage of the project schedule so as not to delay the schedule of the force account works. The contract works would be bidden upon the approval of detailed design and construction drawings and started in the construction. The bidding for the procurement of mechanical and electrical parts of the pumping station would be completed at least 18 months before the completion of the building of the station. The arrangement of all right-of-way should be accomplished before the construction with every efforts. These preconstruction activities are estimated to take about one year and little more.

The construction would be implemented by the approved construction schedule, according to the specifications and construction drawings. In principal, the construction of irrigation

canals would be carried out from the upstream and the drainage canals would be constructed starting from the downstream. In the rainy season, specially in July to September, the construction would be controlled in a certain parts of the works, to prevent damages due to heavy rain. The deep foundation of the pumping station and fish ponds would be constructed in the dry season. These construction would be supervised by the staff of Construction section according to the construction supervision manuals. The project would be completed by six to seven years, while the construction works are expected to be accomplished within five years.

APPENDIX F

AGRICULTURAL INFRASTRUCTURE

APPENDIX F

PROJECT FACILITIES AND COST

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F-1 ROADS AND TRANSPORTATION

F-1.1 Existing Road Net Work

The existing road net work of the Project area is shown in the Figure F-1.1 Plan of Road Net Work which shows the existing net work and the improvement of roads. The total length of roads are 405.5 km including village roads in Tien Son district. There are a National road, 5 provincial roads, 11 district roads, 16 commune roads, village roads and 3 Special roads. Length of different type of roads in Tien Son and the project area are summarized as below, and Table F-1.1 show the road net work in the Tien Son district.

Length of Different types of Roads

	Tien Son District	Project Area
National Road	11 km;	5 km;
Provincial Roads	41 km;	22 km;
District Roads	67.5 km;	45 km;
Commune Roads	38.5 km;	1.8 km;
Village Roads	243 km;	95 km;
Special Roads	3.5 km;	1 km;
Bridges	15 bridges;	6 bridges;
Culverts	627 pls;	247 pls;

F-1.2 Present Transportation

There are regular services of a railway and buses between Hanoi City and the area. Small regular buses and irregular omnibus links major communes and towns. There are only four services of

the railway a day. According the Plan for the rural transport and transportation development of Tien Son district in Phase 1994-2000, there some conflict in the development though the requirement of a quick development of transport means;

- The State run transport means are much declined;
- The individual transport means are much increased, the individuals quickly catch up market demands and expanse their extent.

Table F-1.1 Road network in Tien Son District
(Existing situation)

No	Nam of road	Length (m)	Width (m)	Surface type	Road class
1	2	3	4	5	6
I	**National Roads**				
1	National road No1A	11,000	8-10	Asphalt	5
II	**Provincial Roads**	**41,000**			
1	Road No 288				
	- Bac Ninh - Ho	10,000	5-7	Asphalt	6
2	Road No 295				
	- Tu Son - Cau Net	4,800	6-7	sandgravel	6
	- Tu Son - Cau Chat	5,300	6-7	,,	6
3	Road No 270				
	- Lim - Cau Sop	7,000	5-6	,,	6
	- Lim - An Phu	6,000	3-5	,,	no class
4	Road No 271				
	- Tu Son - Van Ho	5,000	6-7	Asphalt	6
5	Road No 298				
	- Phu Khe - Cau to	3,000	5-6	Asphalt+ sandgravel	6
III	**District Roads**	**67,500**			
1	Chua Dan - Da Hoi	3,000	3-5	sandgravel	no class
2	Tuong Giang-Cau Cho	5,300	,,	,,	,,
3	Trinh Xa - Dong Ky	3,000	,,	,,	,,
4	Phu Khe - Mai Dong	2,200	,,	,,	,,
5	Cam Thu - Phat Tich	8,000	,,	,,	,,

6	Phu Chan-Tri Phuong	5,750	,,	,,	,,
7	Phu Chan-Hap Linh	12,000	,,	,,	,,
8	Noi Due - Phat Tich	6,200	,,	,,	,,
9	Bach Mon-So Dong	8,000	,,	,,	,,
10	Cho Son-Minh Dao	4,000	,,	,,	,,
11	Dong Nguyen-Tam Son	2,000	2-4	,,	,,
IV	**Commune Roads**	**38,500**			
1	Phu Khe-Nghia Lap	1,500	2-3	sandgravel	no class
1	Me - Mai Dong	2,200	,,	,,	,,
3	Tu Son - Trang Liet	1,500	,,	,,	,,
4	Tu Son - Xom Nieu	2,700	,,	,,	,,
5	Duong Loi - Huc	2,000	,,	,,	,,
6	Dong Phu - Vinh Phuc	1,750	,,	,,	
7	Tam Tao - Ha Giang	1,750	,,	,,	,,
8	Cong Ba - Dong Khu	2,500	,,	,,	,,
9	Dinh Bang - Phu Luu	1,700	,,	,,	,,
10	Vieng - Le Xuyen	1,000	,,	,,	,,
11	Bue - Lung Son	3,200	,,	,,	,,
12	Va - Ba Duyen	6,000	,,	,,	,,
13	Cho Son - Doc Coc	2,400	,,	,,	,,
14	Dong So - Dong Co	3,500	,,	,,	,,
15	Cau Sop - Ren	2,000	,,	,,	,,
16	Huc - Dai Trung	2,800	,,	,,	,,
					,,
V	**Village Roads**	**243,000**	about 70% paved with bricks		
VI	**Special Roads**	**3,500**			
1	Tan Lap - Den Rong	1,500			
2	Road to Tu Son market	1,000			
3	Doi Lim	1,000			

TOTAL :

- National Roads :	11 km	- Bridges	15 pieces
- Provincial Roads:	41 km	L =	8-32 m
- District Roads :	67.5 km	- Culverts	627 pieces
- Commune Roads:	38.5 km	with diameter of 40-300	
- Village roads :	243 km		

Source; Tien Son District Office

The development of transport means

(1990 - 1992)

Type of means	Unit	1990	1991	1992
1- Vehicles				
- Sedan	piece	5	6	7
- Bus	,,	7	19	35
- Truck of 2-5 T	,,	6	10	27
2- Carts				
Ox cart + horse carriage		132	86	70
3- Small Vehicles			68	
- Cong Nong		47	32	110
- Xe Lam		15		40

Source; Tien Son district

-Number of transport means is getting higher, but these means are not strictly controlled. Regulations of specific branches are not seriously applied. Transport means are being operated but without:

- Registration permission;
- License for running;
- License for transportation business;
- Transport fees and insurance;
- Paying taxes.

Because the management of transportation is not well controlled, many vehicles break transport & transportation regulations. Accidents caused by vehicles increase.

In addition, due to the uncontrolled management, the State losses a great amount from taxes and fees. The State also finances investment in reparation, maintenance of roads and on-road structures which are damaged by transport means.

Transportation management is a very complicated work. It requests all efforts of all institutions, all people.

Under these situation the Tien Son district plans to the year of 2000 for the transportation means as follows.

- Resuming to develop forces of the individual transport means.

- Increasing number of transportation, but not encourage high load vehicles that should be suitable with rural roads.

- Simple transport means (ox carts, horse carriages, bamboo boats) are still employed.

- Good management for the individual transport means in accordance with transport laws, regulations.

- At a certain time and at any place if it is reasonable, individual establishments under companies Ltd. or enterprises for transport & transportation should be founded.

F-1.3 Farm Road Improvement

The district office has a development for improvement in the whole area of the Tien Son in the period of 1944 - 2000. The objectives of the improvement are resuming to improve quality of road system in order to allow trucks to be able to move on all village roads with following demands.

- Main roads' width is 6.0 m;
- Some roads are improved using a grain distributed measure.
- Repairing and improving bridge, culvert system that ensures load higher H-8 to be able to move on.
- Finding every financial source to improve and asphalt some important district roads and roads serving places within high economic potentials.
- Maintaining movement of village road construction taken through people's contribution in order to change face of rural areas.

The table F-1.3 show the development plan.

F-1.4 Improvement of Main Farm Roads

According to the Plan for the transport and transportation of Tien Son district, Most of Main farm road will be improved up to the year of 2000 by the other projects, so that improvement of main farm roads is limited, to improve the dike or levee of the irrigation and drainage canals and their crossing structures for the project.

Table F-1.3 General on project development

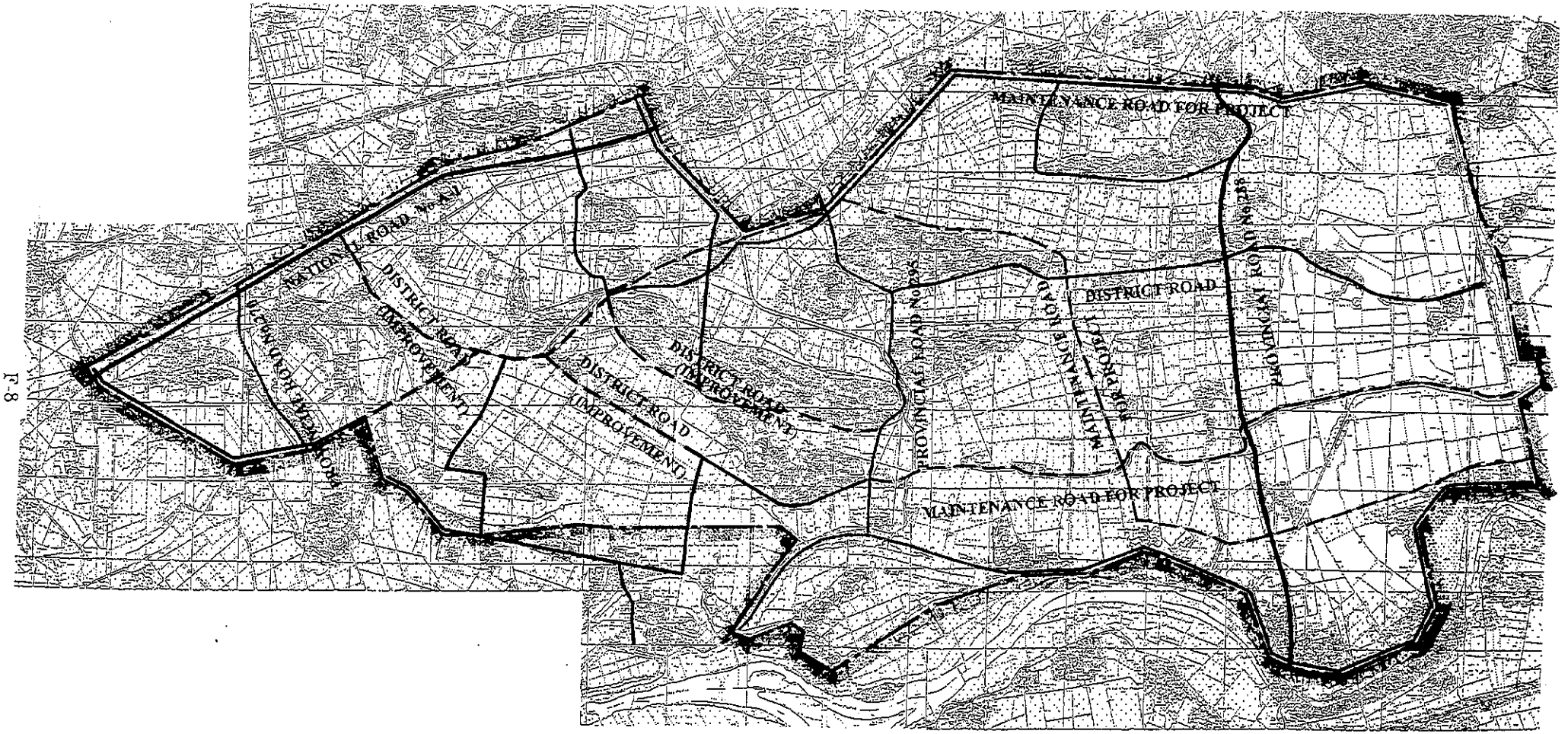
No	NAM OF ROAD	Length (m)	1993 - 1995		1996-2000	
			Class	Surface type	Class	Surface type
I	**Provincial Roads**	**23,000**				
1	Lim - Cau Sop	7,000	6	Asphalt		
2	Lim - Phu Lam ※	6,000	6	Sandgraval		Asphalt
3	Tu Son - Cau Chat	5,000	6			Asphalt
4	Tu Son - Cau Net ※	5,000	6	Asphalt		
II	**District Roads**	**46,000**				
1	Bach Mon - Lac Ve ※	5,000	6	Sandgravel		
2	Cam Thu - Phat Tich	8,000			6	Asphalt
3	Chua Dan - Da Hoi	5,000	6			Asphalt
4	Chua Dan - Hap Linh	15,000			6	Sandgravel
5	Tuong Giang - Cho ※	5,300	6	Asphalt		
6	Phu Chan - Tri Phuong	5,700			6	Sandgravel
7	Dong Nguyen-Tam Son ※	2,000	6	Sandgravel		
III	**Commune Roads**					
1	Dinh Bang - Phu Luu ※	2,000			6	Sandgravel
2	Cho Son - Doc Coc	2,400			6	Sandgravel
IV	**Village Roads**					
	Village Roads	Paved with bricks, concrete of 90%				
V	**Special Roads**					
	- Lim area	2,000	6	Asphalt		
	- Tu Son market area	1,000	6	Asphalt		
VI	**Bridges, Culverts Construction**					
	- Bridges	80 m	Le Xuyen, Tan Trao, Cau Tieu, Cau Noi			
	- Culverts	120 pieces	Different types, ϕ 40-300 m			

SOURCE; TIENSON DISTRICT OFFICE

※ ; OUT OF F.S.Area

Figure F-1.1 **PLAN OF ROAD NET WORK**

SCALE ; 1/50,000



F-2 PROPOSED FACILITIES

F-2.1 Scope of Facility Plan

The scope of facility plan is to plan, pre-design, establish of the construction method and estimate the project costs for the project facilities.

The project facilities are composed of a drainage pumping station, the drainage & irrigation canals with their related facilities, and fish ponds. The road facilities planing is excluded except the maintenance roads for the drainage and irrigation canals.

F-2.2 Pumping Station

The two pumping stations are planed for two alternative areas in accordance with the drainage system analysis. One is planed to construct at the side of existing Tan Chi pumping Station to drain the Tan Chi area, and Other is planed at Han Quang area to drain the excess water of Han Quang area and Tan Chi area. Both of them covers whole areas of two alternatives with existing pumping Tan Chi station.

The existing Tan Chi pumping station covers 6,420 ha. of the drainage area with 68 units of pumps which are installed in the year of 1975, maximum 54 pumps of which are operated due to rotation operating method. All pumps are maintained in good conditions by the technicians in spite of financial shortage.

The capacity of pumps are reportedly estimated by the B.D.I.E. as approximately 80% of the manufacturer's discharge which are nearly equaled to the discharge test of 10 pump units at the sluice

gate by using current meter. These poor discharge comes due to the long time operation so that renovation of pumps seems to be required in order to reduce the maintenance and repairing cost as well as improve the discharge capacity.

The pump type and numbers are decided from the tables of comparison of Table 2-2.-1 and Table 2-2-2.

Determination of total head and motor output.

Basic Conditions

		Tan Chi	Han Quang
• Total pump station capacity		= 16 m3/s	= 2.6 m3/s
• Nos of pump unit		= 4	= 6
• Pump capacity per unit		= 4.0 m3/s	= 4.33 m3/s
• Water level condition			
Suction side	LWL	▽ + 2.0	▽ + 1.5
Discharge side	HWL	▽ + 9.13	▽ + 9.13
	HHWL	▽ + 10.51	▽ + 10.51

Determination of the total head

• Static head Ha = 7.63 = 7.63

HWL ▽+9.63 - LWL ▽+2.0 HWL ▽9.13 - LWL▽+1.5

• Total head HT = 7.63 + 0.58 = 8.21 ≒ 8.5 m

(Loss head Hf = Screen loss Hf1 + Straight pipe loss Hf2 +Butterfly valve H3 + Enlarge pipe loss Hf4 + Flap Valve loss Hf5 + Residual loss Hf6)

= 0.58 m

Table 2-2-1 Comparison on pump type (Pump capacity : 4m3/s)

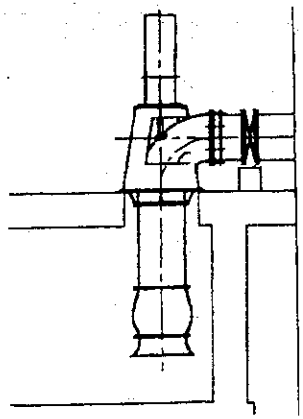
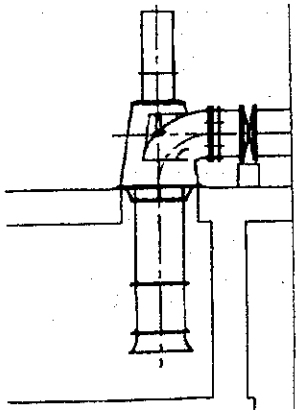
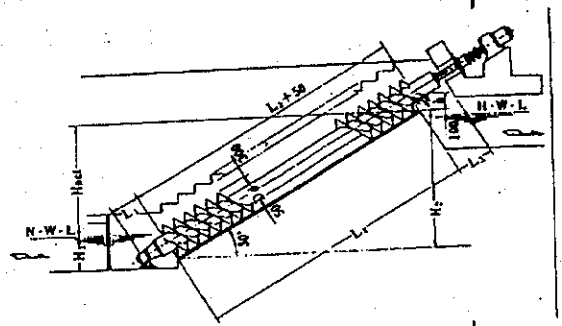
Pump type	Vertical mixed flow pump	Vertical axial flow pump	Screw pump
Application	Usually, this type is used for drainage and irrigation. Maximum total head is approx. 30m.	This type is also used for drainage and irrigation. Maximum total head is limited to 5m to 8m.	Screw pump is usually used for sewage water since screw pump does not have a problem for clogging. Maximum total head is approx. 8m.
Construction			
Pump efficiency	83.5%	Since pump total head is 8.5m (above 8m), axial flow pump is not suitable. High efficiency as mixed flow pump will not be anticipated.	75%

Table 2-2-2(2) Comparison on pump type (Pump capacity : 4m3/s)

Pump type	Vertical mixed flow pump	Vertical axial flow pump	Screw pump
Required motor output (gear efficiency : 97%)	410.5kw	N.A.	484.0kw
Pump dia.	1350mm	1350mm	3500mm
Station space (excluding switchgear room)	390m2	390m2	550m2
Operation	Easy Cavitation and / or air voltex phenomena should be checked.	Easy	Easier Cavitation and air voltex problem can be ignored.
Maintenance	Easy	Easy	Easier Nos of parts of the pump are less than others.
For Environment	Good	Good	Not so good Since usually screw pump is installed outside, cover / protection for the pump is required to prevent odour and / or noise.

Table 2-2-2(1) Comparison on pump nos. (Type : Vertial mixed flow pump)

Pump nos.	Three (3)	Four (4)	Five (5)
Capacity per pump	5.4m3/s	4m3/s	3.2m3/s
Pump dia.	1500mm	1350mm	1200mm
Pump total head	8.5m	8.5m	8.5m
Pump efficiency	84%	83.5%	83%
Required motor output (Gear efficiency : 97%)	550.9kw	410.5kw	330.4kw
Total required motor output as station	550.9kw x 3 =1652.7kw ○	410.5kw x 4 =1642kw ◎	330.4kw x 5 =1652kw ○
Station space (excluding switchgear room)	26m x 14m=364m2 ◎	30m x 13m=390m2 ○	33m x 12m=396m2 △
Safetyness for drainage (Station capacity in case of one pump breakdown)	5.4m3/s x 2 / 16m3/s =67% △	4m3/s x 3 / 16m3/s =75% ○	3.2m3/s x 4 / 16m3/s =80% ◎
Maintenance	Since nos of pump are less than others, time for maintenance is less. ◎	○	△

• Determination of the motor output

$$L = 0.163 \times \frac{1 \times Q \times H}{\eta p \times \eta q} \times 1.1$$

$$= 0.163 \times \frac{1 \times 240 \times 8.5}{0.835 \times 0.97} \times 1.15 = 472.1\text{kw Say } 500\text{kw}$$

The type of prime mover will be determined in accordance with the electric supply and operating conditions calculating water power and shaft power. Generally a electric motor type is selected in a place to obtain easy electricity and to operate ordinary, and a diesel engine type might be selected in a place far from electric source and of rare operation of the pumps. The detail comparison will be made to select suitable type of prime mover from a economical view points taking operation & maintenance cost and equipment cost into account.

The Han Quang pump station might obtain the electric supply from the transformer station (2 x 1000 kw 35/0.4) of tributary transmission line of No. 372 (35KV) in vicinity of the Tan Chi pump station with 3 km of extended distance or from the transformer station (35/0.4) of other tributary transmission line of N. 372 in vicinity of Thai Hoa pumping station with 6 km of extended distance.

Plan of TANCHI PUMP STATION

Mixed Flow pump D＝1350mm 4台

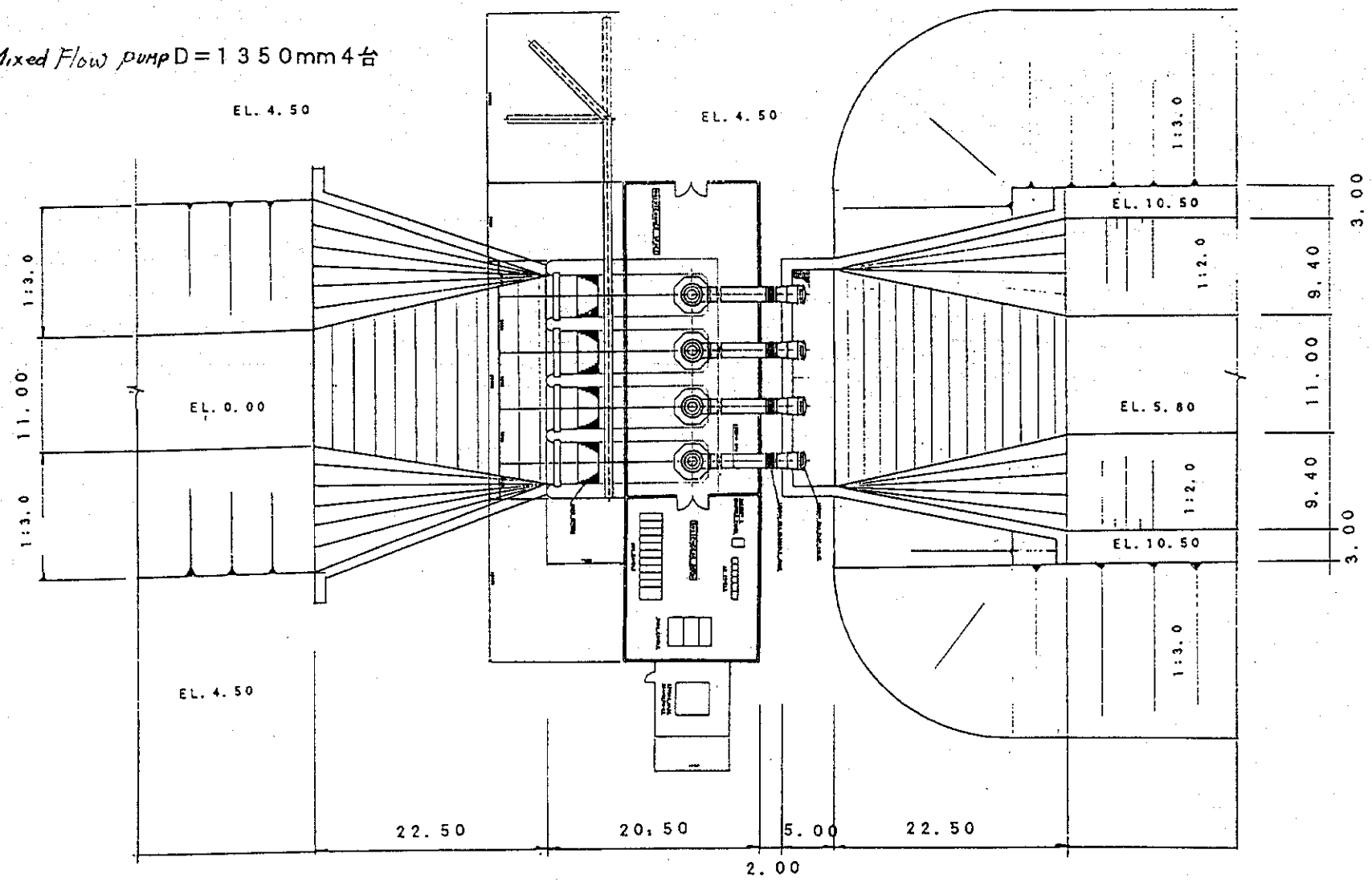
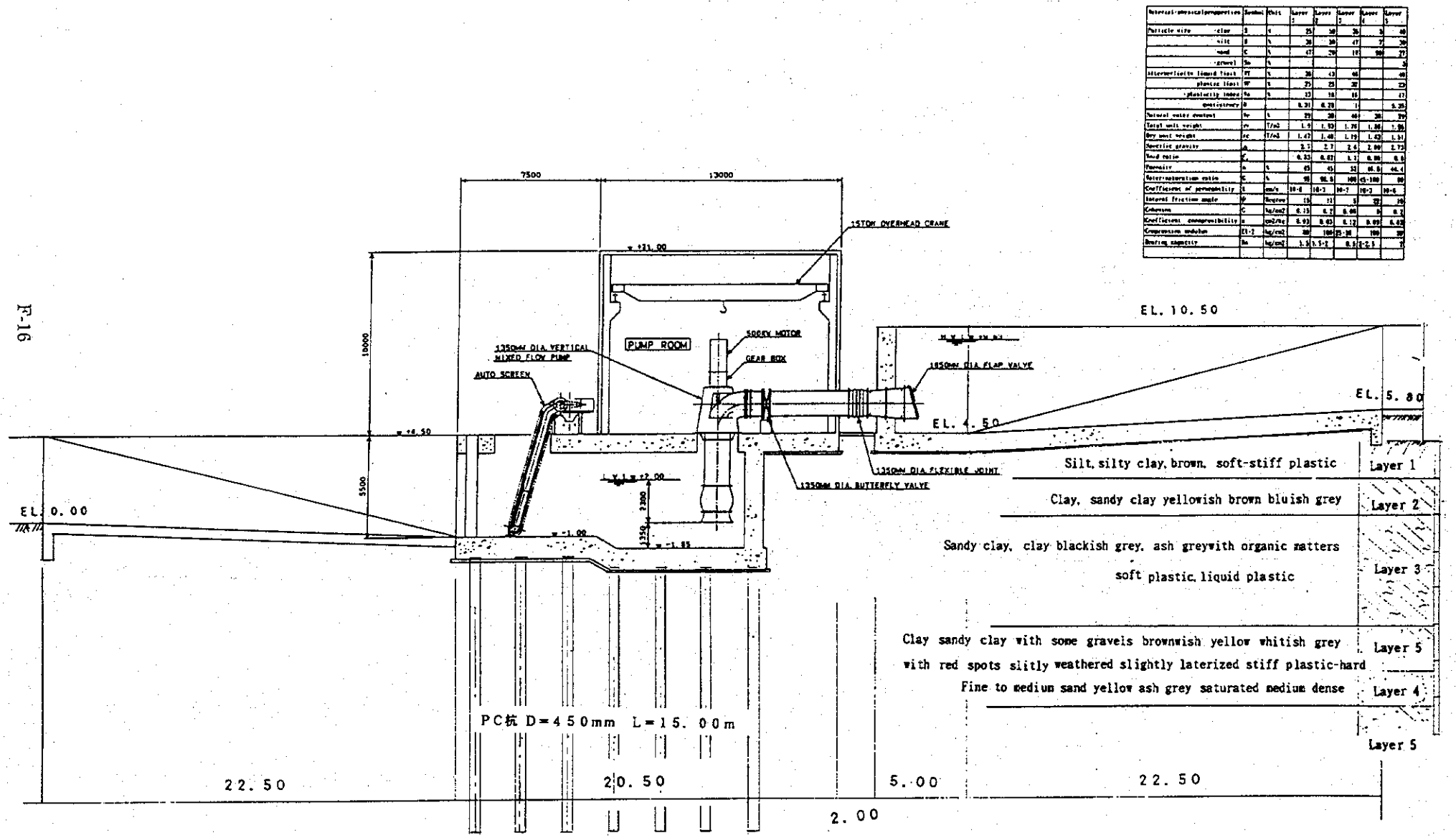
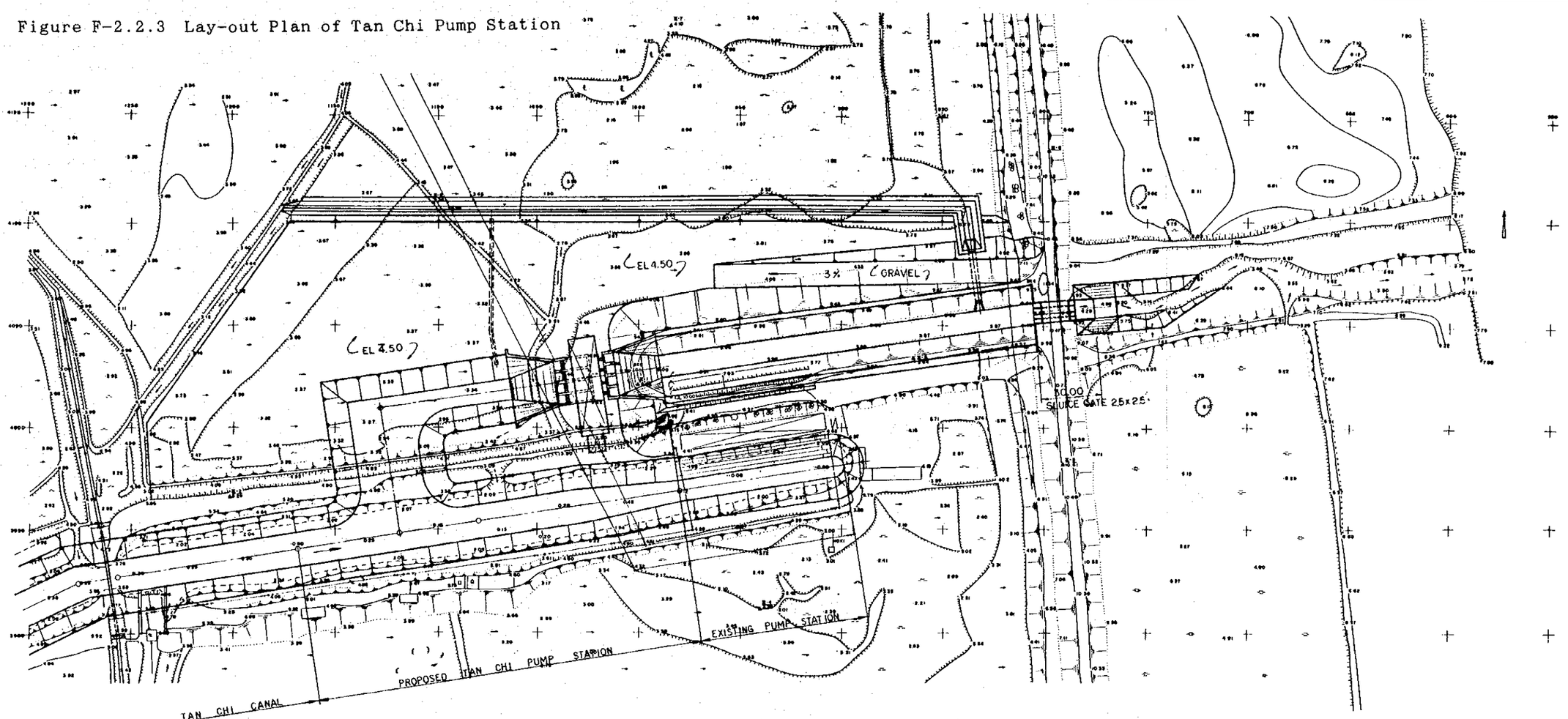


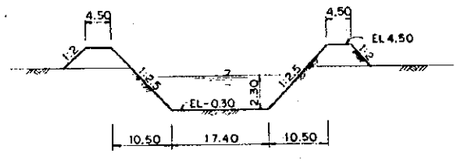
Figure F-2.2-2 LONGITUDINAL SECTION OF TANCH



Material-mechanical properties	Symbol	Unit	Layer 1	Layer 2	Layer 3	Layer 4	Layer 5
Particle size · clay	S	%	25	50	36	3	40
· silt	S	%	30	30	47	7	30
· sand	C	%	47	20	17	90	27
· gravel	Sa	%					3
Atterberg's limit liquid limit	WL	%	35	43	66		48
plastic limit	WP	%	21	25	30		23
· plasticity index	Ip	%	13	18	35		17
consistency	B		0.31	0.28	1		0.35
Natural water content	Wn	%	29	30	46	30	29
Total unit weight	γt	T/m3	1.9	1.93	1.76	1.86	1.95
Dry unit weight	γd	T/m3	1.47	1.48	1.19	1.42	1.51
Specific gravity	Δ		2.7	2.7	2.6	2.69	2.72
Void ratio	e		0.83	0.82	1.2	0.89	0.8
Porosity	n	%	45	45	55	46.8	44.4
Water saturation ratio	Sr	%	95	96.5	100	95-100	100
Coefficient of permeability	k	cm/s	10-6	10-7	10-7	10-2	10-6
Internal friction angle	Φ	Degree	15	21	5	32	20
Cohesion	C	kg/cm2	0.15	0.2	0.06	0	0.2
Coefficient compressibility	a	cm2/kg	0.03	0.03	0.12	0.009	0.03
Compression modulus	E(1-2)	kg/cm2	80	100	25-30	100	80
Bearing capacity	Ra	kg/cm2	1.3	1.5-2	0.5	2-2.5	2

Figure F-2.2.3 Lay-out Plan of Tan Chi Pump Station





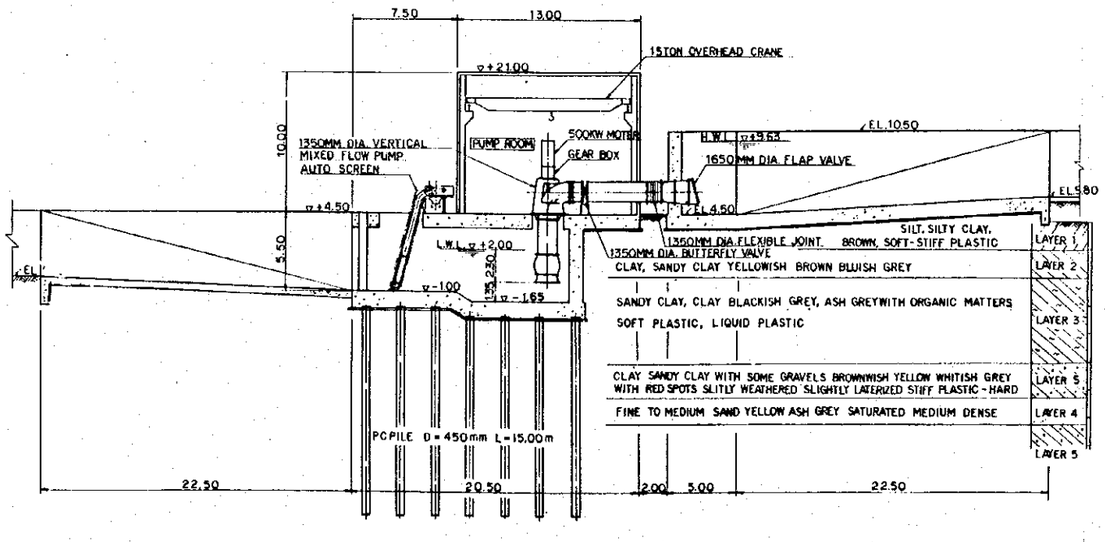


Table F-2.2-3

I.1.2 - Bơm hướng trục đứng và nghiêng
Vertical and inclined axial flow pumps

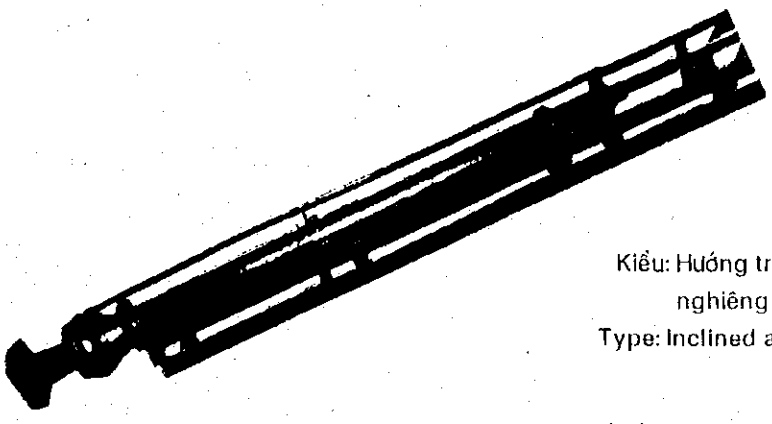
HTĐ 3600 - 4,5

Kiểu: Hướng trục đứng
Type: Vertical Axial flow

H = 4,5m

Q = 3600m³/h

Kí hiệu Type	Thông số kĩ thuật và kích thước cơ bản Specifications						Công dụng Uses
	Q (m^3/h)	H (m)	n (v/p) (Rpm)	Nđ.cơ motor (Kw)	D_h (mm)	D_x (mm)	
HTĐ 1100-3	1000-1100	3,5-3	1460	20	300	360	Dùng cấp tiêu nước trong nông nghiệp, khu dân cư... Suplying and draining water in agricuture population's area...
HTĐ 1100-2	1100	2	1460	14	300	360	
HTĐ 1900-4,5	1800-2100	4,5-3,5	970	37	430	500	
HTĐ 2100-3,5	2100-2500	3,5-2,2	970	37	430	500	
HTĐ 2300-7	2300	7	735	75	500	600	
HTĐ 3600-4,5	3600-4000	4,5-2,5	735	75	600	600	
HTĐ 8400-5,2	7600-9000	6,5-4	585	200	750	1000	
HTĐ 8000-5,6	7800-8600	6,8-4	585	200	750	1000	
HTĐ 8000-9	8000-10000	9,5-6	585	320	750	1000	
HTN 80-1,7	40-120	2,1-1,1	2900	4Hp	100	100	Có công dụng như trên. Đặc điểm: dễ di chuyển, thích ứng với nơi có mực nước daođộng hoặc trạm di động. Uses: Like HTĐ. Easy to move, suitable the place where water level can oscilate, or to the mobile station.
HTN 800-2,5	800	2,5	1960	20	300	300	
HTN 800-7	800	7	980	33	350	400	
HTN 800-7x2	800	14	980	75	350	400	
HTN 1800-2,3	1800	2,3	980	33	400	400	
HTN 4000-4,7	4000	4,7	730	75	700	580	



HTN 800 - 25

Kiểu: Hướng trục nghiêng
Type: Inclined axial

H = 2,5m

Q = 800m³/h

The sluice gates at the levee of the Duong River are determined as follows.

		Tan Chi	Han Quang
• Discharge Capacity Q (m3/s)	=	31.11	26.0
• Nos of Sluice gate (pcs)	=	4	3
• Size of gate H x W (m)	=	2.0 x 2.0	2.0 x 2.0
• Velocity of flow (m/s)	=	2.0 m/s	2.0 m/s
• Head Loss (m)	=	0.40	0.40

The Figure F-2.2-1 and F-2.2-2 show the plan and section of Tan Chi pumping station. The Figure F-2.2-3 shows a lay out plan of Tan Chi pumping station. Table F-2.2-1 shows a list of the vertical and inclined axial flow pumps manufactured by Hai Duong pump manufacturing plant.

F-2.3. Irrigation Canal and Related Facilities

A cross section of irrigation canal is planned as an unlined trapezoid type from an economical viewpoint, when the existing canal capacity is enough for the proposed design discharge.

The longitudinal bed slope of a canal is selected considering the maximum and minimum allowable velocities in the canal and the present topographic conditions as well as the existing canal's slopes.

The maximum allowable velocity is to be 0.6 m/sec considering the soil characteristics of this area, and the minimum, 0.3 m/sec, as a non-silting and a non-weed velocity. The Manning's formula is used as a mean velocity formula to plan canals, as presented

below:

$$V = 1/n \cdot R2/3 \cdot I\ 1/2$$

$$Q = A \cdot V$$

where, V; Mean velocity (m/sec)

n; Coefficient of roughness = 0.03 (earth), 0.015 (brick)

R; Hydraulic mean radius (m)

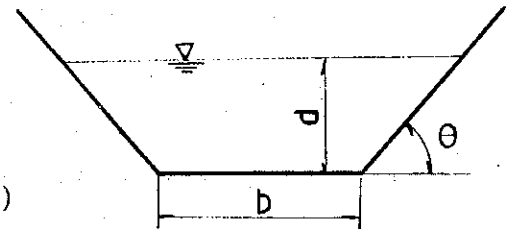
I; Canal slope

A; Cross sectional area (m2)

Q; Design canal discharge (m3/sec)

The following empirical formula is used obtain the optimal water depth to a bed width.

$$d = b/(2 \tan \theta/2)$$



where, d; Water depth (m)

b; Canal bed width (m)

θ; Angle between side slope and horizontal line

Keeping the optimal relation between the bed width and water depth obtained by the above formula, the optimal water depth to each discharge was studied. And then it was revised considering such economic aspects as the earth work cost, and the land acquisition cost considering the brick lining to reduce coefficient of roughness.

As a result, the side slopes of the canals are planned as shown in the following table:

Embankment height (m)	Side slope (inside)	(outside)
less than 2.5 /	1 : 1.5 /	1 : 2.0
2.5 ~ 3.0	1 : 2.0	1 : 2.0
3.0 ~ 3.5	1 : 2.5	1 : 2.0
3.5 ~ 4.0	1 : 3.0	1 : 3.0
above 4.0	above 3.5	above 3.5

The side slopes of the cutting embankments of the canals are planned as 1 : 1.5. The bank top width for one side of the main canals is to be 4.5 m as an inspection road, and that for the other side, 3.0 m.

As for the standard canal cross sections, which are satisfied with the above-mentioned criteria and of least cost, the following canal types are proposed for the main canals and the secondary canals as shown in Figure F-2.3-1 and Table F-2.3-1 and F-2.3-2.

Figure F-2.3-1 Typical Cross Section of Irrigation Canals

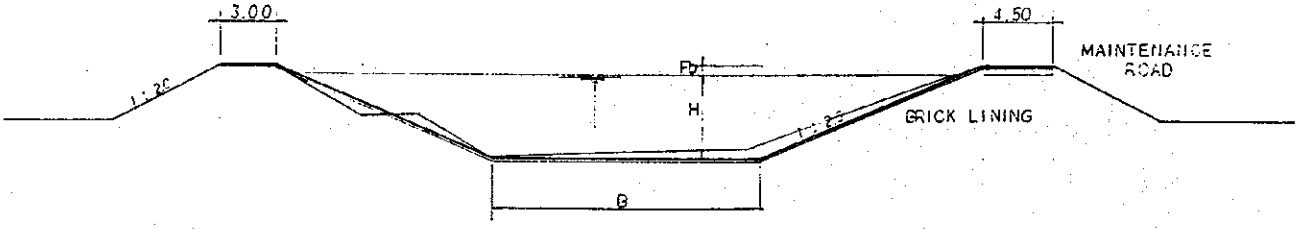


Table F-2.3-1 Dimensions of South Irrigation Canal

Canals	Q (m3/s)	B (m)	H (m)	Fb (m)	H' (m)	I	Pavement	Length (m)
M-1	21.52	5.0	2.9	0.3	3.2	1/25,000	Brick	1,560
M-2	17.62	3.3	2.9	0.3	3.2	1/25,000	''	4,028
M-3	15.33	2.2	2.9	0.3	3.2	1/25,000	''	6,935
M-4	10.04	4.4	2.9	0.3	3.2	1/25,000	Earth	1,131
M-5	8.54	3.0	2.9	0.3	3.2	1/25,000	''	3,866
M-6	7.03	1.6	2.9	0.3	3.2	1/25,000	''	2,980

Table F-2.3-2 Dimensions of Secondary Irrigation Canals

Canals	Q (m3/s)	B (m)	H (m)	Fb (m)	H' (m)	I	Pavement	Length
N11	0.35	0.6	0.8	0.3	1.1	1/10,000	Brick	1,000
Noi Loc	0.04	0.3	0.4	''	0.7	''	Earth	700
N4	1.42	0.8	1.1	''	1.4	''	Earth	5,500
N5	0.38	0.7	0.7	''	1.0	''	Brick	2,430
N13	0.26	0.6	0.7	''	1.0	''	Brick	3,000
Cau Ngatu	0.13	0.5	0.5	''	0.8	''	Earth	1,400
N15	0.42	0.7	0.8	''	1.1	''	Brick	2,000
Ban Thong	0.06	0.3	0.5	''	0.8	''	Earth	700
Nam Nui Che	0.36	0.6	0.8	''	1.1	''	Brick	4,650
Bac Nui Che	0.22	0.6	0.7	''	1.0	''	Earth	4,000
Nghia Trung	0.07	0.3	0.5	''	0.8	''	''	480
Che Doc	0.03	0.3	0.4	''	0.7	''	''	450
K10 Van Tuong	0.35	0.6	0.9	''	1.2	''	''	3,200
Thuong Lam	0.67	0.5	0.5	''	0.8	''	''	900
Benh Vien	0.07	0.4	0.5	''	0.8	''	''	1,000
Hoai Trang	0.07	0.4	0.5	''	0.8	''	''	350
N6	2.40	1.8	1.8	''	2.1	''	''	13,000
Hoai Thi	0.10	0.5	0.5	''	0.8	''	''	1,080
Lang Tuong	0.07	0.4	0.5	''	0.8	''	''	500
M22	0.14	0.6	0.7	''	1.0	''	''	327
M25	0.10	0.3	0.6	''	0.9	''	''	1,600
M24	0.31	0.4	0.5	''	0.8	''	''	400
N8	0.82	0.8	1.1	''	1.4	''	Brick	5,200
N35	0.21	0.4	0.7	''	1.0	''	Earth	1,600

Table F-2.3-3 and F-2.3-4 show the hydraulic conditions of the south irrigation and secondary canals. Figure F-2.3-2 and F-2.3-3 show the plan of irrigation canals and the longitudinal section of South irrigation canal.

There are 35 places of existing turn-out structures on the Irrigation Canal from beginning point to 17k+520 (Crossing provincial road) with 25 type and/or size of culverts. Most of gates are too old to operate precisely so that all of these turn-out facilities are proposed to replace as show below.

Turn-outs

Size of Gate	Φ400	Φ600	Φ800	Φ1000	0.9x0.9	1.0x1.0	1.5x1.8
Flow Area	0.07	0.12	0.50	0.78	0.81	1.00	2.70
Gate No.	7	10	11	4	1	1	2

There are existing 3 check gates on the irrigation canal to regulate the water surface, which are also too old and too heavy to operate the gates timely and frequently. These are proposed to replace with new gates with electric movers.

Check-Gate

	K4+725		K11+840		K17+520	
	W	H	W	H	W	H
Size of Gate	1.50x4.00		1.60x3.00		2.00x2.70	
Number of Gates	3		2		1	

The 14km length and 5m width of maintenance roads are proposed along the right side of the irrigation canal with asphalt pavement as well as 15 number of 5m width of farm bridges.

Table F-2.3-3 HYDRAULIC CONDITION FOR SOUTH IRRIGATION CANAL

STATION	DISTANCE ACUM. (m)	DISTANCE INTVL. (m)	EXISTING CONDITIONS BED EL. (m)	EXISTING CONDITIONS DIKE EL. (m)	EXISTING CONDITIONS BED WIDTH (m)	EXISTING CONDITIONS CANAL WIDTH (m)	DESIGNED CONDITIONS Qd (m3/s)	DESIGNED CONDITIONS BED EL. (m)	DESIGNED CONDITIONS W.S. EL. (m)	DESIGNED CONDITIONS SLOPE I
K+			3.20	7.33	10.50	20.10	21.52	4.100	7.000	0.00004
1 K+	1000	1000	4.10	7.44	10.50	21.80		4.060	6.960	
1 K+ 510	1510	510	3.54	7.14	11.00	23.40	17.62	4.040	6.940	D2X4
1 K+ 560	1560	50	3.60					4.038	6.938	1.65X3.75X
2 K+	2000	440	4.00	7.43	12.40	25.00		4.020	6.920	
3 K+	3000	1000	4.00	7.23	12.60	23.00		3.980	6.880	
3 K+ 780	3780	780			9.6	23.10		3.949	6.849	
4 K+	4000	220	3.90	7.20	10.20	21.90		3.940	6.840	
4 K+ 725	4725	725	4.00	6.91	7.40	22.00		3.911	6.811	1.5X3.98X4
5 K+	5000	275	4.00	7.21	8.40	24.60		3.900	6.800	
5 K+ 588	5588	588		7.21	11.30	23.80	15.33	3.801	6.701	0.00004
6 K+	6000	412	4.00	7.26	13.20	24.50		3.785	6.685	
7 K+	7000	1000	3.95	6.61	10.80	17.60		3.745	6.645	
8 K+	8000	1000	4.00	6.74	9.60	17.60		3.705	6.605	
9 K+	9000	1000	3.72	6.92	9.40	18.00		3.665	6.565	
10 K+	10000	1000	3.73	6.60	9.30	18.00		3.625	6.525	
11 K+	11000	1000	3.70	6.39	6.90	17.60		3.585	6.485	
11 K+ 840	11840	840	3.10	6.15	7.00	17.10		3.551	6.451	1.6X3.0X2
12 K+	12000	160	3.68	6.09	7.00	16.80		3.545	6.445	
12 K+ 523	12523	523	3.50	6.10	7.10	16.90	10.04	3.449	6.349	0.00004
13 K+	13000	477	3.55	6.02	7.30	18.20		3.430	6.330	
13 K+ 654	13654	654	3.60	5.86	7.00	17.00	8.54	3.329	6.229	0.00004
14 K+	14000	346	3.60	5.77	7.10	17.00		3.315	6.215	
15 K+	15000	1000	3.53	6.15	8.10	17.00		3.275	6.175	
16 K+	16000	1000	3.40	5.97	6.30	16.30		3.235	6.135	
16 K+ 767	16767	767	3.40	5.94	4.90	14.20		3.204	6.104	
17 K+	17000	233	3.45	5.92	5.00	14.20		3.195	6.095	
17 K+ 520	17520	520	3.40	5.96	5.20	15.20	7.03	3.099	5.999	0.00004
20 K+ 500	20500	2980	3.40	5.96	5.20	15.20		2.980	5.880	

STATION	I	H (m)	B (m)	S	A (m2)	P (m)	R (m)	R^2/3	n	V (m/s)	Q (m3/s)	Fb(m) CALC.	Fb(m) MINM.
K+	0.00004	2.90	5.00	2.50	35.53	20.62	1.723	1.437	0.015	0.61	21.53	0.21	0.30
1 K+ 510	0.00004	2.90	3.30	2.50	30.60	18.92	1.617	1.378	0.015	0.58	17.77	0.21	0.30
5 K+ 588	0.00004	2.90	2.20	2.50	27.41	17.82	1.538	1.332	0.015	0.56	15.40	0.21	0.30
12 K+ 523	0.00004	2.90	4.40	2.50	33.79	20.02	1.688	1.418	0.030	0.30	10.10	0.20	0.30
13 K+ 654	0.00004	2.90	3.00	2.50	29.73	18.62	1.597	1.366	0.030	0.29	8.56	0.20	0.30
17 K+ 520	0.00004	2.90	1.60	2.50	25.67	17.22	1.491	1.305	0.030	0.28	7.06	0.20	0.30

TABLE F-2.3.4 (1) Hydraulic Conditions of Secondary Canals

STATION	NAME OF SECONDARY CANAL	CANAL LENGTH (m)	DIMENSION WIDTH B(m)	HEIGHT H(m)	BED EL (m)	W.S. (m)	LOCA-TION	IRRGBL AREA (ha)	WATER REQRMNT (m3/s)	FLOW AREA A(m2)	WETTED PRMTR P(m)	HYDRLC MN DPTH R(m)	R^(2/3)	SURFACE SLOPE I	VLCTY V(m/s)	DSCHRG Q(m3/s)	COEFFCNT ROUGHNSS N
K+110			0.50	0.40	5.73	7.00	RIGHT										
K+300	B2 CANAL	10000	1.50	1.80	4.25	6.99	LEFT	3640	4.732	7.560	7.991	0.946	0.964	0.0001	0.642	4.857	0.015
K+510	B1 CANAL	1450	0.80	1.50	4.08	6.98	RIGHT	205	0.267	4.575	6.209	0.737	0.816	0.0001	0.272	1.244	0.030
K+533	TRINE NGUYEN TA	600	0.60	1.20	4.08	6.98	LEFT	60	0.078	2.880	4.927	0.585	0.699	0.0001	0.233	0.671	0.030
K+520					4.08	6.98	LEFT										
K+660					4.07	6.97	RIGHT										
1 K+ 50			0.80	0.80	4.06	6.96	RIGHT										
1 K+ 65	B2' CANAL	1140	0.70	1.00	5.55	6.96	LEFT	60	0.078	2.200	4.306	0.511	0.639	0.0001	0.213	0.469	0.030
1 K+400					4.04	6.94	LEFT										
1 K+775	DAY GANG	852	0.70	1.70	4.22	6.93	LEFT	18	0.023	5.525	6.830	0.809	0.868	0.0001	0.289	1.599	0.030
2 K+170	DONG BONG	1060	0.70	1.50	5.14	6.91	LEFT	26	0.034	4.425	6.109	0.724	0.807	0.0001	0.269	1.190	0.030
2 K+365			0.50	0.75	5.78	6.91	RIGHT										
2 K+470					4.00	6.90											
2 K+480					4.00	6.90	RIGHT										
2 K+535			1.00		4.00	6.90	RIGHT										
2 K+555			0.80		4.00	6.90	RIGHT										
3 K+401	DAU DOT	1650	0.70	1.20	5.72	6.86	RIGHT	58	0.075	3.000	5.027	0.597	0.709	0.0001	0.236	0.709	0.030
2 K+480					4.00	6.90											
3 K+690			0.65	0.95	3.95	6.85	LEFT										
3 K+780	CONG THON	4700	3.00	2.50	3.95	6.85	RIGHT	1260	1.638	16.875	12.015	1.404	1.254	0.0001	0.418	7.055	0.030
4 K+ 64	N3A CANAL	3500	0.80	1.10	5.23	6.84	RIGHT	170	0.221	2.695	4.767	0.565	0.684	0.0001	0.228	0.614	0.030
4 K+ 90	N3B CANAL	1960	0.80	1.40	5.22	6.84	LEFT	134	0.174	4.060	5.848	0.694	0.784	0.0001	0.261	1.061	0.030
4 K+145			0.40	0.45	3.93	6.83	LEFT			0.484	2.023	0.239	0.385	0.0001	0.128	0.062	0.030
4 K+718			0.50	0.80	3.91	6.81	LEFT			1.360	3.385	0.402	0.545	0.0001	0.182	0.247	0.030
5 K+145	N11 CANAL	1000	0.60	0.80	6.20	6.79	LEFT	265	0.345	1.440	3.485	0.413	0.555	0.0001	0.370	0.533	0.015
5 K+145	NOI LOC	700	0.30	0.40	6.20	6.79	RIGHT	28	0.036	0.360	1.742	0.207	0.349	0.0001	0.116	0.042	0.030
5 K+148					3.89	6.79	LEFT										
5 K+583	N4 CANAL	5500	0.80	1.10	4.55	6.78	RIGHT	1091	1.418	2.695	4.767	0.565	0.684	0.0001	0.456	1.228	0.015
5 K+585			0.50	0.50	3.88	6.70	LEFT			0.625	2.303	0.271	0.419	0.0001	0.140	0.087	0.030
6 K+ 10			0.30		3.86	6.68	LEFT										
6 K+ 69			0.40		3.86	6.68	RIGHT										
6 K+299	N5 CANAL	2430	0.70	0.70	4.57	6.67	RIGHT	292	0.380	1.225	3.224	0.380	0.525	0.0001	0.350	0.428	0.015
6 K+912	N13 CANAL	3000	0.60	0.70	4.50	6.65	LEFT	203	0.264	1.155	3.124	0.370	0.515	0.0001	0.343	0.397	0.015
7 K+270	CAU NGATU	1400	0.50	0.50	4.95	6.63	RIGHT	100	0.130	0.625	2.303	0.271	0.419	0.0001	0.140	0.087	0.030
7 K+972			0.35	0.45	3.78	6.61	RIGHT			0.461	1.973	0.234	0.380	0.0001	0.127	0.058	0.030
8 K+			0.40		3.78	6.61	LEFT										
8 K+ 73	N15 CANAL	2000	0.70	0.80	4.29	6.60	LEFT	321	0.417	1.520	3.585	0.424	0.564	0.0001	0.188	0.286	0.030
8 K+925	BAN THONG	700	0.50	0.40	5.02	6.57	LEFT	43	0.056	0.440	1.942	0.227	0.372	0.0001	0.124	0.055	0.030
9 K+ 85	NAM NUI CHE	4650	0.60	0.80	4.72	6.56	RIGHT	280	0.364	1.440	3.485	0.413	0.555	0.0001	0.370	0.533	0.015
9 K+454	BAC NUI CHE	4000	0.80	1.00	4.77	6.55	RIGHT	166	0.216	2.300	4.406	0.522	0.648	0.0001	0.216	0.497	0.030
9 K+570	NGHIA TRANG	480	0.30	0.50	4.75	6.54	LEFT	50	0.065	0.525	2.103	0.250	0.396	0.0001	0.132	0.069	0.030
9 K+928			0.40		3.70	6.53	LEFT										
10 K+161			0.40	0.50	3.69	6.52	LEFT										

TABLE F-2.3.4 (2) Hydraulic Conditions of Secondary Canals

STATION	NAME OF SECONDARY CANAL	CANAL LENGTH (m)	DIMENSION WIDTH B(m)	HEIGHT H(m)	BED EL (m)	W.S. (m)	BED LOCA-TION	IRRGBL AREA (ha)	WATER REQREMNT (m3/s)	FLOW AREA A(m2)	WETTED PRMTR P(m)	HYDRLC MN DPTH R(m)	R^(2/3)	SURFACE SLOPE I	VLCTY V(m/s)	DSCHRG Q(m3/s)	COEFFCNT ROUGHNSS N
10 K+350	CHE DOC	450	0.30	0.40		6.51	RIGHT	24	0.031	0.360	1.742	0.207	0.349	0.0001	0.116	0.042	0.030
10 K+900	KIOYAN TUONG	3200	0.70	0.90	4.79	6.49	LEFT	271	0.352	1.845	3.945	0.468	0.602	0.0001	0.201	0.371	0.030
11 K+370	THUON LAM	900	0.40	0.50	4.19	6.47	RIGHT	512	0.666	0.575	2.203	0.261	0.408	0.0001	0.136	0.078	0.030
11 K+400	BENH VIEN	1000	0.40	0.50	4.23	6.47	LEFT	53	0.069	0.575	2.203	0.261	0.408	0.0001	0.136	0.078	0.030
11 K+810			0.40	0.50	4.20	6.45	LEFT			0.575							
12 K+ 25	HOAI TRUNG	350	0.40	0.50	4.35	6.44	LEFT	50	0.065	0.575	2.203	0.261	0.408	0.0001	0.136	0.078	0.030
12 K+ 70	N6 CANAL	13800	1.70	1.80	3.35	6.44	RIGHT	1847	2.401	7.920	8.191	0.967	0.978	0.0001	0.326	2.581	0.030
12 K+653	HOAI TBI	1080	0.50	0.50	4.45	6.34	RIGHT	76	0.099	0.625	2.303	0.271	0.419	0.0001	0.140	0.087	0.030
13 K+150	LANG TUONG	500	0.40	0.50	4.20	6.32	LEFT	50	0.065	0.575	2.203	0.261	0.408	0.0001	0.136	0.078	0.030
14 K+100	N1 CANAL	8500	0.80	1.20	4.20	6.21	LEFT	1097	1.426	3.120	5.127	0.609	0.718	0.0001	0.479	1.494	0.015
14 K+930	N22 CANAL	327	0.60	0.70	4.57	6.18	RIGHT	109	0.142	1.155	3.124	0.370	0.515	0.0001	0.172	0.198	0.030
15 K+543	N25 CANAL	1600	0.30	0.60	4.01	6.15	LEFT	80	0.104	0.720	2.464	0.292	0.440	0.0001	0.147	0.106	0.030
16 K+ 70	N24 CANAL	400	0.40	0.50	3.93	6.13	RIGHT	235	0.306	0.575	2.203	0.261	0.408	0.0001	0.136	0.078	0.030
16 K+ 70	N27 CANAL	1160	0.50	0.80	3.90	6.13	LEFT	337	0.438	1.360	3.385	0.402	0.545	0.0001	0.363	0.494	0.015
16 K+480			0.30		4.74	6.12	RIGHT										
16 K+766			0.30		4.49	6.10	RIGHT										
16 K+766			0.40	0.65	4.50	6.10	LEFT			0.894							
17 K+460	N9 CANAL	300	0.30	0.30	4.50	6.08	LEFT	28	0.036	0.225	1.382	0.163	0.298	0.0001	0.199	0.045	0.015
17 K+461	N8 CANAL	5200	0.80	1.10	4.20	6.08	RIGHT	631	0.820	2.695	4.767	0.565	0.684	0.0001	0.342	0.921	0.020
19 K+550	N35 CANAL	1600	0.40	0.70	4.20	5.92	RIGHT	161	0.209	1.015	2.924	0.347	0.494	0.0001	0.165	0.167	0.030
21 K+300	N34 CANAL	3800	0.80	1.00	4.95	5.92	LEFT	500	0.650	2.300	4.406	0.522	0.648	0.0001	0.432	0.994	0.015
21 K+500	N23 CANAL	2000	0.80	1.00		5.92	RIGHT	351	0.456	2.300	4.406	0.522	0.648	0.0001	0.216	0.497	0.030
23 K+200	N23' CANAL	2700	0.80	1.00	5.36	5.85	RIGHT	673	0.875	2.300	4.406	0.522	0.648	0.0001	0.432	0.994	0.015
23 K+300	N36 CANAL	4000	1.00	1.20	4.29	5.84	LEFT	1135	1.476	3.360	5.327	0.631	0.735	0.0001	0.490	1.647	0.015
24 K+900	THAI HOA	3500	8.00	2.40	4.29	5.70	RIGHT	1137	1.478	27.840	16.654	1.672	1.409	0.0001	0.470	13.071	0.030
24 K+900	K1N DOI	9200	2.00	2.20		5.70	LEFT	3218	4.183	11.660	9.933	1.174	1.113	0.0001	0.371	4.325	0.030
25 K+700	N42 CANAL	2500	0.70	0.90	5.02	5.67	RIGHT	134	0.174	1.845	3.945	0.468	0.602	0.0001	0.201	0.371	0.030
25 K+700	N43 CANAL	800	0.60	0.80		5.67	LEFT	90	0.117	1.440	3.485	0.413	0.555	0.0001	0.185	0.266	0.030
26 K+200	N44 CANAL	800	0.60	0.80	4.72	5.65	LEFT	40	0.052	1.440	3.485	0.413	0.555	0.0001	0.185	0.266	0.030
30 K+400	N49 CANAL	1750	0.70	0.90		5.48	RIGHT	496	0.645	1.845	3.945	0.468	0.602	0.0001	0.402	0.741	0.015
30 K+400	N48 CANAL	1000	0.60	0.90	4.77	5.48	LEFT	159	0.207	1.440	3.485	0.413	0.555	0.0001	0.185	0.266	0.030
31 K+200	N51 CANAL	2300	0.70	0.90	4.75	5.45	RIGHT	98	0.127	1.845	3.945	0.468	0.602	0.0001	0.201	0.371	0.030
31 K+200	N50 CANAL	1000	0.60	0.80	4.80	5.45	LEFT	50	0.065	1.440	3.485	0.413	0.555	0.0001	0.185	0.266	0.030
31 K+800	N52	800	0.60	0.80	4.80	5.43	LEFT	20	0.026	1.440	3.485	0.413	0.555	0.0001	0.185	0.266	0.030
32 K+200	N53 CANAL	1400	0.60	0.80		5.41	RIGHT	70	0.091	1.440	3.485	0.413	0.555	0.0001	0.185	0.266	0.030
33 K+800	N54 CANAL	2000	0.70	0.90		5.35	LEFT	228	0.296	1.845	3.945	0.468	0.602	0.0001	0.201	0.371	0.030
35 K+300	N56 CANAL	2000	0.70	0.90		5.29	RIGHT	231	0.300	1.845	3.945	0.468	0.602	0.0001	0.201	0.371	0.030

Figure F-2.3.2 **PLAN OF IRRIGATION FACILITIES**

SCALE ; 1/50,000

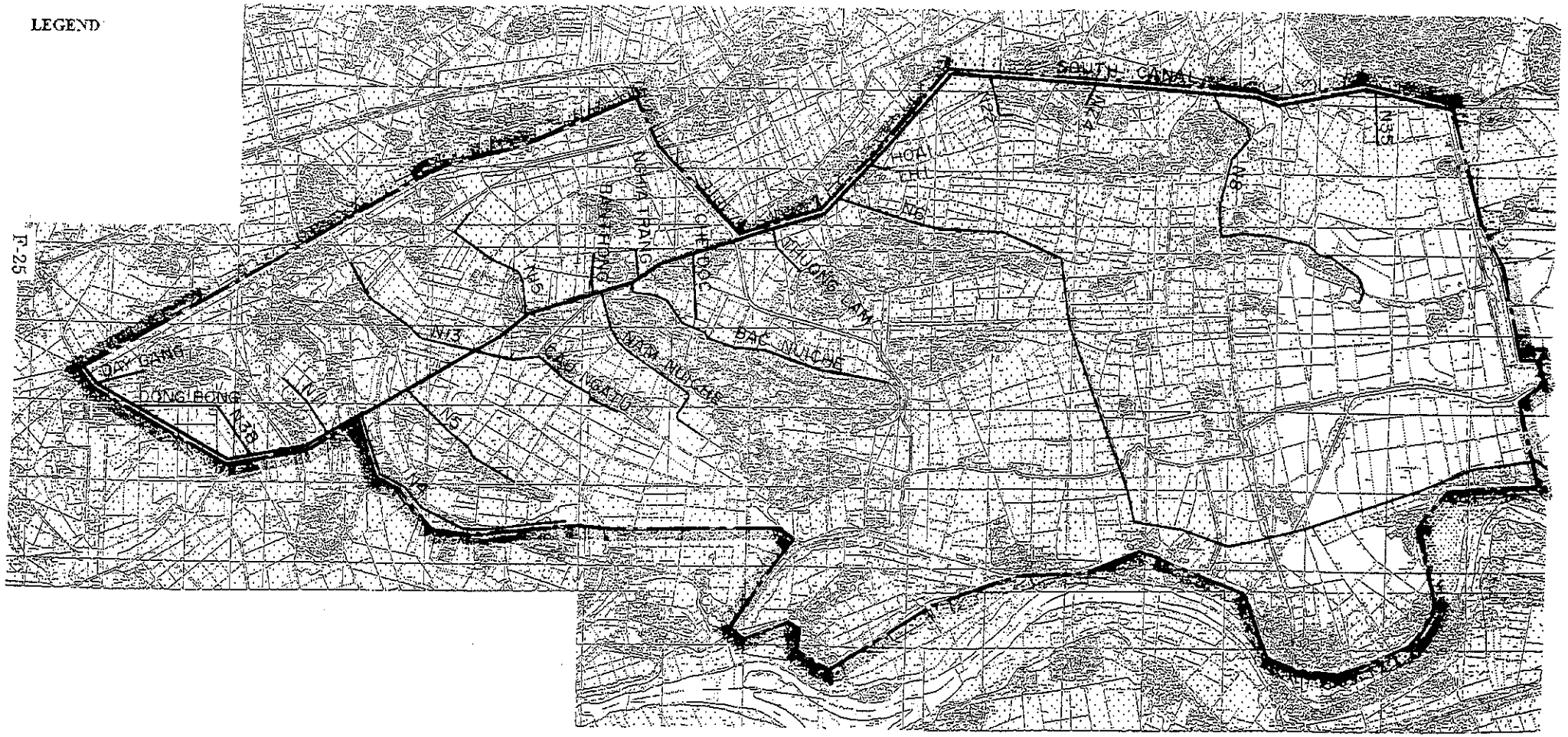
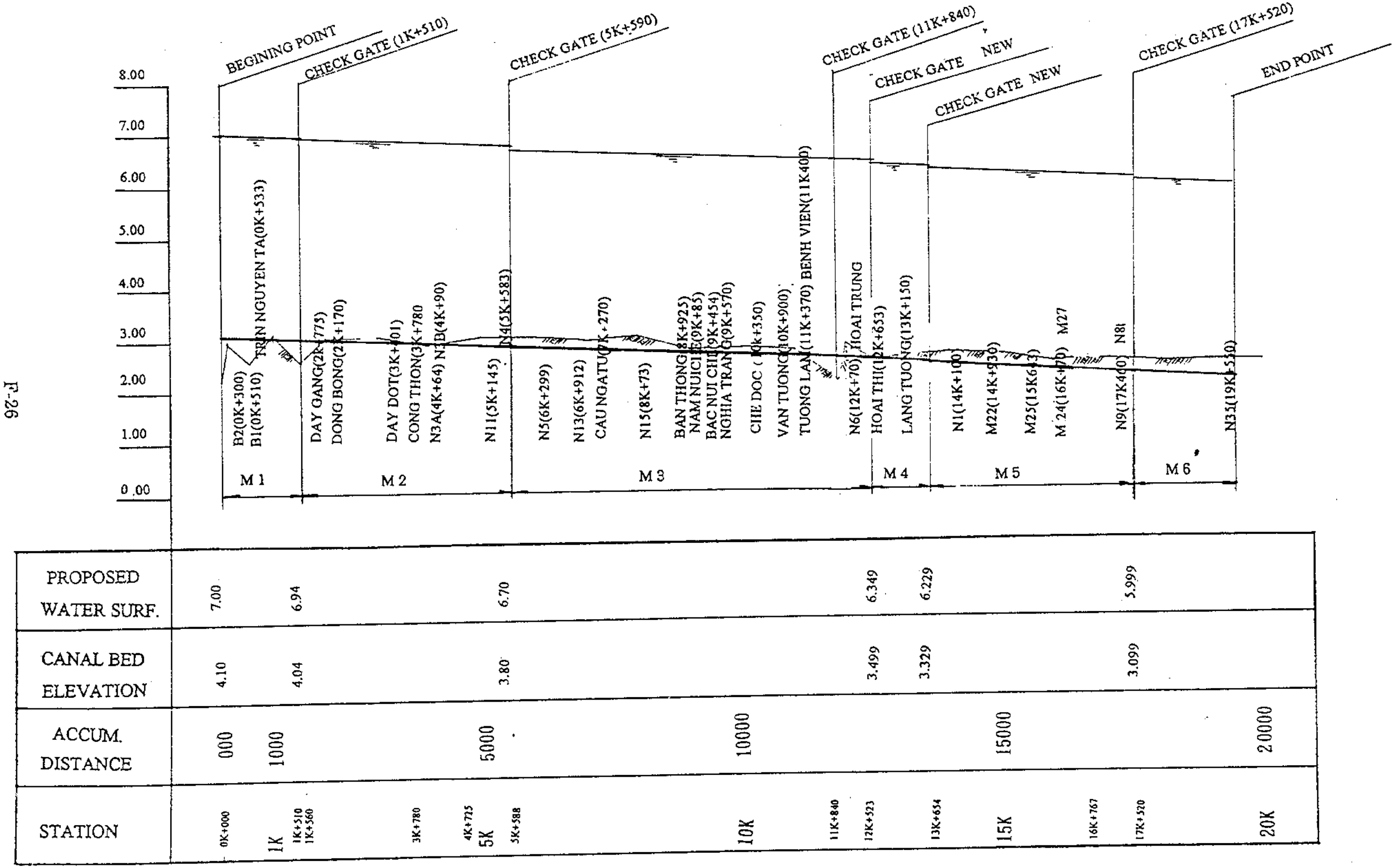


Figure F-2.3.3 Longitudinal Section for South Irrigation Canal



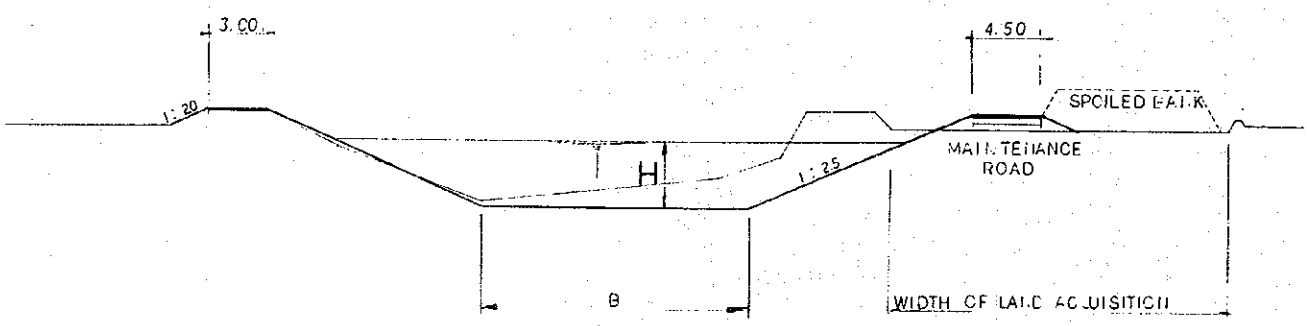
F-2.4 Drainage Canals and Related structures

Natural channels;Tao Khe creek,will be improved by dredging so as to be constituted main drainage canal.Main drainage canal is designed under the conditions of non-lined canal with inverted trapezoid shape of 1:2.50 side slopes,0.6m/sec of allowable flow velocity in maximum,0.3m/sec of minimum velocity and applying Manning's formula with 0.03 of roughness coefficient.

Where the existing cross sections of drainage canals are smaller than the designed canal flow area,the existing canal will be dredged to fit with it.Where the existing canals' crossing area are more than the designed area,then no treatment is required.The designed dimensions of drainage canals are sown as Figure F-2.4.1 and Table F-2.4.1

The maintenance roads with 4.5m of width are proposed on the left side of Tao Khe creek and Secondary canals accessing to the district roads with Gravel paving,Additional 10 farm bridges with 5.0m of width are proposed on Tao Khe Creek.

FIGURE F-2.4.1 TYPICAL CROSS SECTION OF DRAINAGE CANALS



Results of hydraulic calculations are shown in the Table F-2.4.2 and Figure 2-4.2 shows the longitudinal section of Tao Khe creek.

Table F-2.4.1 Dimensions of Drainage Canals

Canals	Q(m3/s)	B(m)	H(m)	I	Length(m)
Tan Chi Area					
Tao khe Creek	23.45	20.5	2.00	1/10,000	8,900
KT Trinh XA	10.64	16.0	1.76	1/20,000	6,440
KT 6 XA	6.63	6.7	1.99	1/20,000	6,500
KT Phat Tich	4.32	4.5	1.84	1/20,000	4,200
KT 4 XA	7.61	13.1	1.61	1/20,000	1,400
KT Cau Nau	7.25	10.2	1.76	1/20,000	4,300
KT Cau Nau-1	2.64	4.5	1.44	1/20,000	3,200
KT Cau Nau-2	2.74	4.5	1.54	1/20,000	3,300
KT Tan Chi	31.11	17.4	2.30	1/ 7,000	1,500
Han Quang Area					
Tao khe Creek	23.29	20.5	2.00	1/10,000	12,750
Con Ten Creek	3.85	6.3	1.54	1/20,000	3,050
KT Han Quang	26.00	22.8	2.00	1/10,000	1,100
KT Tan Chi	15.11	10.1	1.97	1/ 7,000	1,500

TABLE F-2.4.2 (1) HYDRAULIC CONDITION FOR TAO KHE CREEK 4.846 ℓ/sec/ha

STATION	DISTANCE ACUM. (m)	DISTANCE INTVL. (m)	EXISTING CONDITIONS BED EL. (m)	EXISTING CONDITIONS W.S. EL. (m)	EXISTING CONDITIONS BED WIDTH (m)	EXISTING CONDITIONS W.S. WIDTH (m)	DESIGNED CONDITIONS Qd (m3/s)	DESIGNED CONDITIONS BED EL. (m)	DESIGNED CONDITIONS W.S. EL. (m)	DESIGNED CONDITIONS SLOPE I
13 K+ 650	0	0						0.200	1.664	0.0001
14 K+ 0	350	350	1.11	2.20	56.10	67.00	6.40	0.235	1.699	
15 K+ 0	1350	1000	1.05	2.25	32.00	39.00		0.335	1.799	
15 K+ 500	1850	500						0.385	1.849	
16 K+ 0	2350	500	0.97	2.27	21.00	28.00		0.435	1.899	
17 K+ 0	3350	1000	1.04	2.24	11.00	15.00		0.535	1.999	
17 K+ 5[illegible]	3850	500					23.45	0.125	2.124	0.0001
18 K+ 0	4350	500	1.33	2.33	13.00	19.00		0.175	2.174	
18 K+ 400	4750	400						0.215	2.214	
19 K+ 0	5350	600	1.38	2.38	12.00	18.00		0.275	2.274	
19 K+ 750	6100	750					21.14	0.425	2.424	0.0001
20 K+ 0	6350	250	0.86	2.46	12.00	15.00		0.450	2.449	
21 K+ 0	7350	1000	1.50	2.48	0.00	6.00		0.550	2.549	
22 K+ 0	8350	1000	2.04	2.50	0.00	15.00		0.650	2.649	
22 K+ 300	8650	300					7.25	0.755	2.754	0.0001
23 K+ 0	9350	700	1.96	2.56	0.00	34.00		0.825	2.824	
24 K+ 400	10750	1400	2.66	3.11	6.00	14.00	5.35	1.040	3.039	0.0001
25 K+ 0	11350	600	2.61	3.11	7.00	34.00		1.100	3.099	
26 K+ 0	12350	1000	2.14	3.74	6.20	12.90		1.200	3.199	
26 K+ 400	12750	400	2.22					1.240	3.239	

STATION	I	H (m)	B (m)	S	A (m2)	P (m)	R (m)	R^2/3	n	V (m/s)	Q (m3/s)
13 K+ 650	0.0001	1.46	8.80	2.50	18.24	16.68	1.093	1.061	0.030	0.35	6.45
17 K+ 750	0.0001	2.00	20.50	2.50	50.97	31.26	1.630	1.385	0.030	0.46	23.53
19 K+ 750	0.0001	2.00	18.20	2.50	46.37	28.96	1.601	1.369	0.030	0.46	21.15
22 K+ 300	0.0001	2.00	4.50	2.50	18.99	15.26	1.244	1.157	0.030	0.39	7.32
24 K+ 400	0.0001	2.00	2.50	2.50	14.99	13.26	1.130	1.085	0.030	0.36	5.42

TABLE F-2.4.2 (2) HYDRAULIC CONDITION FOR KT TRINH XA

STATION	DISTANCE ACUM. (m)	DISTANCE INTVL. (m)	EXISTING CONDITIONS BED EL. (m)	EXISTING CONDITIONS W.S. EL. (m)	EXISTING CONDITIONS BED WIDTH (m)	EXISTING CONDITIONS W.S. WIDTH (m)	DESIGNED CONDITIONS Qd (m3/s)	DESIGNED CONDITIONS BED EL. (m)	DESIGNED CONDITIONS W.S. EL. (m)	DESIGNED CONDITIONS SLOPE I
0 K+ 0	0	0	2.12	2.72	3.00	10.00	10.71	0.830	2.829	0.00005
1 K+ 0	1000	1000	1.80	2.48	3.00	13.00		0.880	2.879	
1 K+ 300	1300	300					9.86	0.970	2.969	0.00005
2 K+ 0	2000	700	1.60	2.31	5.00	15.00		1.005	3.004	
3 K+ 0	3000	1000	1.24	2.20	6.00	19.00		1.055	3.054	
4 K+ 0	4000	1000	1.26	2.18	4.00	15.00		1.105	3.104	
5 K+ 0	5000	1000	1.58	2.20	15.00	25.00		1.155	3.154	
5 K+ 500	5500	500					7.40	1.255	3.254	0.00005
6 K+ 0	6000	500	0.90	2.2	6.60	13.00		1.280	3.279	
6 K+ 440	6440	440						1.302	3.301	

STATION	I	H (m)	B (m)	S	A (m2)	P (m)	R (m)	R^2/3	n	V (m/s)	Q (m3/s)
0 K+ 0	0.00005	2.00	9.70	2.50	29.38	20.46	1.436	1.273	0.030	0.30	8.81
1 K+ 300	0.00005	2.00	7.90	2.50	25.78	18.66	1.381	1.240	0.030	0.29	7.54
5 K+ 0	0.00005	2.00	4.50	2.50	18.99	15.26	1.244	1.157	0.030	0.27	5.18

TABLE F-2.4.2 (3) HYDRAULIC CONDITION FOR KT 6 XA

STATION	DISTANCE ACUM. (m)	DISTANCE INTVL. (m)	EXISTING CONDITIONS BED EL. (m)	EXISTING CONDITIONS W.S. EL. (m)	EXISTING CONDITIONS BED WIDTH (m)	EXISTING CONDITIONS W.S. WIDTH (m)	DESIGNED CONDITIONS Qd (m3/s)	DESIGNED CONDITIONS BED EL. (m)	DESIGNED CONDITIONS W.S. EL. (m)	DESIGNED CONDITIONS SLOPE I
0 K+ 0	0	0	1.95	2.49	3.00	5.00	6.67	1.330	3.329	0.00005
1 K+ 0	1000	1000	2.20	2.54	3.00	7.50		1.380	3.379	
2 K+ 0	2000	1000	2.29	3.40	4.00	7.00		1.430	3.429	
2 K+ 600	2600	600					4.75	1.535	3.534	0.00005
3 K+ 0	3000	400	2.51	3.65	3.00	9.00		1.555	3.554	
3 K+ 800	3800	800					3.30	1.670	3.669	0.00005
4 K+ 0	4000	200	3.05	3.67	4.00	3.00		1.680	3.679	
5 K+ 0	5000	1000						1.730	3.729	
6 K+ 0	6000	1000						1.780	3.779	
6 K+ 500	6500	500						1.805	3.804	

STATION	I	H (m)	B (m)	S	A (m2)	P (m)	R (m)	R^2/3	n	V (m/s)	Q (m3/s)
0 K+ 0	0.00005	2.00	6.70	2.50	23.38	17.46	1.339	1.215	0.030	0.29	6.70
2 K+ 0	0.00005	2.00	3.90	2.50	17.79	14.66	1.213	1.137	0.030	0.27	4.77
4 K+ 0	0.00005	2.00	1.70	2.50	13.39	12.46	1.074	1.049	0.030	0.25	3.31

TABLE F-2.4.2 (4) HYDRAULIC CONDITION FOR KT PHAT TICH

STATION	DISTANCE ACUM. (m)	DISTANCE INTVL. (m)	EXISTING CONDITIONS BED EL. (m)	EXISTING CONDITIONS W.S. EL. (m)	EXISTING CONDITIONS BED WIDTH (m)	EXISTING CONDITIONS W.S. WIDTH (m)	DESIGNED CONDITIONS Qd (m3/s)	DESIGNED CONDITIONS BED EL. (m)	DESIGNED CONDITIONS W.S. EL. (m)	DESIGNED CONDITIONS SLOPE I
0 K+ 0	0	0					4.35	1.110	3.114	0.00005
1 K+ 0	1000	1000						1.160	3.164	
2 K+ 0	2000	1000						1.210	3.214	
3 K+ 0	3000	1000						1.260	3.264	
3 K+ 200	3200	200					3.52	1.345	3.349	0.00005
4 K+ 0	4000	800						1.385	3.389	
4 K+ 200	4200	200					1.06	1.975	3.474	0.00005

STATION	I	H (m)	B (m)	S	A (m2)	P (m)	R (m)	R^2/3	n	V (m/s)	Q (m3/s)
0 K+ 0	0.00005	2.00	4.50	2.50	19.06	15.29	1.246	1.158	0.030	0.27	5.20
2 K+ 0	0.00005	2.00	3.00	2.50	16.05	13.79	1.164	1.106	0.030	0.26	4.19
4 K+ 200	0.00005	1.50	0.00	2.50	5.62	8.07	0.696	0.785	0.030	0.19	1.04

TABLE F-2.4.2 (5) HYDRAULIC CONDITION FOR KT 4 XA

STATION	DISTANCE ACUM. (m)	DISTANCE INTVL. (m)	EXISTING CONDITIONS BED EL. (m)	EXISTING CONDITIONS W.S. EL. (m)	EXISTING CONDITIONS BED WIDTH (m)	EXISTING CONDITIONS W.S. WIDTH (m)	DESIGNED CONDITIONS Qd (m3/s)	DESIGNED CONDITIONS BED EL. (m)	DESIGNED CONDITIONS W.S. EL. (m)	DESIGNED CONDITIONS SLOPE I
0 K+ 0	0	0					7.66	0.200	2.199	0.00005
1 K+ 0	1000	1000						0.250	2.249	
1 K+ 400	1400	400						0.345	2.344	0.00005

STATION	I	H (m)	B (m)	S	A (m2)	P (m)	R (m)	R^2/3	n	V (m/s)	Q (m3/s)
0 K+ 0	0.00005	2.00	13.20	2.50	36.38	23.96	1.518	1.321	0.030	0.31	11.32
1 K+ 400	0.00005	2.00	0.00	2.50	9.99	10.76	0.928	0.951	0.030	0.22	2.24

TABLE F-2.4.2 (6) HYDRAULIC CONDITION FOR KT CAU NAU

STATION	DISTANCE ACUM. (m)	DISTANCE INTVL. (m)	EXISTING CONDITIONS BED EL. (m)	EXISTING CONDITIONS W.S. EL. (m)	EXISTING CONDITIONS BED WIDTH (m)	EXISTING CONDITIONS W.S. WIDTH (m)	DESIGNED CONDITIONS Qd (m3/s)	DESIGNED CONDITIONS BED EL. (m)	DESIGNED CONDITIONS W.S. EL. (m)	DESIGNED CONDITIONS SLOPE I
0 K+ 0	0	0					7.30	0.420	2.419	0.00005
0 K+ 800	800	800					4.64	0.535	2.534	0.00005
1 K+ 0	1000	200						0.545	2.544	
2 K+ 0	2000	1000						0.595	2.594	
2 K+ 500	2500	500					1.24	1.195	2.694	0.00005
3 K+ 0	3000	500						1.220	2.719	
4 K+ 0	4000	1000						1.270	2.769	
4 K+ 300	4300	300						1.285	2.784	

STATION	I	H (m)	B (m)	S	A (m2)	P (m)	R (m)	R^2/3	n	V (m/s)	Q (m3/s)
0 K+ 0	0.00005	2.00	7.60	2.50	25.18	18.36	1.371	1.234	0.030	0.29	7.33
0 K+ 800	0.00005	2.00	3.80	2.50	17.59	14.56	1.207	1.134	0.030	0.27	4.70
2 K+ 500	0.00005	1.50	0.60	2.50	6.52	8.67	0.751	0.827	0.030	0.19	1.27

TABLE F-2.4.2 (7) HYDRAULIC CONDITION FOR KT CAU NAU-1

STATION	DISTANCE ACUM. (m)	DISTANCE INTVL. (m)	EXISTING CONDITIONS BED EL. (m)	EXISTING CONDITIONS W.S. EL. (m)	EXISTING CONDITIONS BED WIDTH (m)	EXISTING CONDITIONS W.S. WIDTH (m)	DESIGNED CONDITIONS Qd (m3/s)	DESIGNED CONDITIONS BED EL. (m)	DESIGNED CONDITIONS W.S. EL. (m)	DESIGNED CONDITIONS SLOPE I
0 K+ 0	0	0					2.66	0.985	2.609	0.00005
1 K+ 0	1000	1000						1.035	2.659	
1 K+ 700	1700	700					0.97	1.370	2.769	0.00005
2 K+ 0	2000	300						1.385	2.784	
2 K+ 200	2200	200						1.395	2.794	
3 K+ 0	3000	800						1.435	2.834	
3 K+ 200	3200	200						1.445	2.844	0.00005

STATION	I	H (m)	B (m)	S	A (m2)	P (m)	R (m)	R^2/3	n	V (m/s)	Q (m3/s)
0 K+ 0	0.00005	1.62	3.00	2.50	11.47	11.75	0.976	0.984	0.030	0.23	2.66
1 K+ 700	0.00005	1.40	0.30	2.50	5.31	7.83	0.678	0.772	0.030	0.18	0.97
3 K+ 200	0.00005	1.40	0.00	2.50	4.89	7.53	0.649	0.750	0.030	0.18	0.86

TABLE F-2.4.2 (8) HYDRAULIC CONDITION FOR KT CAU NAU-2

STATION	DISTANCE ACUM. (m)	DISTANCE INTVL. (m)	EXISTING CONDITIONS BED EL. (m)	EXISTING CONDITIONS W.S. EL. (m)	EXISTING CONDITIONS BED WIDTH (m)	EXISTING CONDITIONS W.S. WIDTH (m)	DESIGNED CONDITIONS Qd (m3/s)	DESIGNED CONDITIONS BED EL. (m)	DESIGNED CONDITIONS W.S. EL. (m)	DESIGNED CONDITIONS SLOPE I
0 K+ 0	0	0					2.76	1.270	2.769	0.00005
1 K+ 0	1000	1000						1.320	2.819	
2 K+ 0	2000	1000						1.370	2.869	
3 K+ 0	3000	1000						1.420	2.919	
3 K+ 300	3300	300					1.07	1.510	3.009	0.00005

STATION	I	H (m)	B (m)	S	A (m2)	P (m)	R (m)	R^2/3	n	V (m/s)	Q (m3/s)
0 K+ 0	0.00005	1.50	4.20	2.50	11.91	12.27	0.971	0.980	0.030	0.23	2.75
3 K+ 300	0.00005	1.50	0.10	2.50	5.77	8.17	0.706	0.793	0.030	0.19	1.08

TABLE F-2.4.2 (9) HYDRAULIC CONDITION FOR TAN CHI CANAL

STATION	DISTANCE ACUM. (m)	DISTANCE INTVL. (m)	EXISTING CONDITIONS BED EL. (m)	EXISTING CONDITIONS W.S. EL. (m)	EXISTING CONDITIONS BED WIDTH (m)	EXISTING CONDITIONS W.S. WIDTH (m)	DESIGNED CONDITIONS Qd (m3/s)	DESIGNED CONDITIONS BED EL. (m)	DESIGNED CONDITIONS W.S. EL. (m)	DESIGNED CONDITIONS SLOPE I
0 K+ 0	0	0					31.11	-0.30	2.000	0.0001429
1 K+ 0	1000	1000						-0.16	2.143	
1 K+ 500	1500	500					31.11	-0.09	2.214	0.0001429

STATION	I	H (m)	B (m)	S	A (m2)	P (m)	R (m)	R^2/3	n	V (m/s)	Q (m3/s)
0 K+ 0	0.0001429	2.30	17.40	2.50	53.22	29.78	1.787	1.473	0.030	0.59	31.22

TABLE F-2.4.2 (10) HYDRAULIC CONDITION FOR KON TEN CREEK

STATION	DISTANCE		EXISTING CONDITIONS				DESIGNED CONDITIONS			
	ACUM. (m)	INTVL. (m)	BED EL. (m)	W.S. EL. (m)	BED WIDTH (m)	W.S. WIDTH (m)	Qd (m3/s)	BED EL. (m)	W.S. EL. (m)	SLOPE I
0 K+ 0	0	0					3.87	0.275	1.739	0.00005
1 K+ 0	1000	1000						0.325	1.789	
1 K+ 950	1950	950					3.42	0.448	1.912	0.00005
2 K+ 0	2000	50						0.450	1.914	
3 K+ 0	3000	1000						0.500	1.964	
3 K+ 50	3050	50					0.45	0.578	2.042	0.00005

STATION	I	H (m)	B (m)	S	A (m2)	P (m)	R (m)	R^2/3	n	V (m/s)	Q (m3/s)
0 K+ 0	0.00005	1.46	7.20	2.50	15.90	15.08	1.054	1.036	0.030	0.24	3.88
1 K+ 950	0.00005	1.46	6.20	2.50	14.44	14.08	1.025	1.017	0.030	0.24	3.46
3 K+ 50	0.00005	1.464	0.00	2.50	5.36	7.88	0.680	0.773	0.030	0.18	0.98

TABLE F-2.4.2 (11) STRUCTURES AT TAO KHE CREEK

STATION	NAME OF STRUCTURES	EXISTING CONDITIONS					PROPOSED DIMENSIONS				
		WIDTH φB(m)	HEIGHT H(m)	NUMBER N(pcs)	LENGTH L(m)	LOCATE	DISCH. Q(m3)	WIDTH φB(m)	HEIGHT H(m)	NUMBER N(pcs)	LENGTH L(m)
K17+500	TRAM BRIDGE	2.4	2.6	2	20	CLVRT.	0.00	2.4	2.6	3	20
K17+500	KT 4 XA SLUICE	1.0		2	10	LEFT	7.61	3.8	2.5	1	20
K18+300	SLUICE(PIPE)	1.5		1	20	LEFT		1.0		1	20
K18+300	SLUICE(PIPE)	1.5		1	20	RIGHT		1.0		1	20
K19+150	KT TKV1 SLUICE	NEW		1		RIGHT	1.12	1.1	1.1	1	20
K19+300	SLUICE(PIPE)	1.4		1	18	LEFT		1.0		1	20
K19+300	SLUICE(PIPE)	1.4		1	18	RIGHT		1.0		1	20
K19+700	N6 ELEVATED FLUME	1.5	1.0	1	30	CLVRT.	21.00	3.5	2.5	3	20
K19+750	KT TKV2	NEW				LEFT	0.71	1.0		1	20
K20+100	SLUICE(PIPE)	1.4		1	15	LEFT		1.0		1	20
K20+100	MINH DAO SLUICE	1.4		1	15	RIGHT	1.10	1.1	1.1	1	20
K21+ 50	SLUICE(PIPE)	1.3		1	10	LEFT		1.0		1	20
K21+300	LIEN AP SLUICE	NEW		1		LEFT	0.61	1.0		1	20
K21+300	LIEN AP BRIDGE	5.0	3.1	1	10.9	CLVRT.	21.00	3.5	2.5	3	20
K22+ 0	SLUICE(PIPE)	1.2		1	12	LEFT		1.0		1	20
K22+ 0	TAN HUNG SLUICE	1.2		1	12	RIGHT	0.75	1.0		1	20
K22+300	KT TRINH XA SLUICE	2.0	1.7	2		LEFT	10.64	2.7	2.5	2	20
K22+300	SLUICE(PIPE)	1.1		1	10	LEFT		1.0		1	20
K23+200	CANH HUNG SLUICE	NEW				RIGHT	1.31	1.2	1.1	1	20
K23+500	SLUICE(PIPE)	1.4		1	10	LEFT		1.0		1	20
K23+500	SLUICE(PIPE)	1.4		1	10	RIGHIT		1.0		1	20
K23+600	DONG MAI BRIDGE	10.9	3.1	1		CLVRT.	7.21	3.6	2.5	1	20
K23+850	SLUICE(PIPE)	1.1		1	15	RIGHT		1.0		1	20
K24+400	SLUICE(PIPE)	NEW				LEFT	1.01	1.0	1.0	1	20
K24+400	KT PHAT TICH SLUICE	10.9	3.1	1	15	LEFT	4.32	2.2	2.5	1	20
K24+500	BRIDGE(CULVERT)	1.2		1	10	CLOSED					

TABLE F-2.4.2 (12) STRUCTURES AT KT TRINH XA

STATION	NAME OF STRUCTURES	EXISTING CONDITIONS					PROPOSED DIMENSIONS				
		WIDTH φB(m)	HEIGHT H(m)	NUMBER N(pcs)	LENGTH L(m)	LOCATE	DISCH. Q(m3)	WIDTH φB(m)	HEIGHT H(m)	NUMBER N(pcs)	LENGTH L(m)
K0+700	NGO THAI SLUICE	1.1			10	RIGHT	0.85	1.0		1	20
K1+300	PHUC NGHIEM BRIDGE	1.5		4	10	CLVRT.	9.79	2.5	2.5	2	20
K1+300	PHUC NGHIEM SLUICE	1.5		1	20	RIGHT		1.3	1.2	1	20
K1+800	THUC PHAM SLUICE	1.5		1	20	RIGHT		1.0		1	20
K2+200	VIET DOAN BRDIGE	10.3	3.6	1		BRIDGE	9.79	2.5	2.5	2	20
K3+ 50	DAI TAO BRIDGE	2.0	1.5	3	18	CLVRT.	9.79	2.5	2.5	2	20
K3+ 60	DAI TAO RIGHT SLUICE	1.4		1	18	RIGHT		1.0		1	20
K3+200	DAI TAO LEFT SLUICE	1.4		1		LEFT		1.0		1	20
K4+250	NAM TRINH XA SYPHON	2.0	1.5	3	50	CLVRT.	9.79	2.0	1.5	3	50
K4+500	DUONG MONG SLUICE	1.4		1	15	RIGHT	0.73	1.0		1	20
K5+ 0	SLUICE(PIPE)	1.4	1.4	1	15	LEFT		1.4	1.4	1	20
K5+ 0	SLUICE(PIPE)	0.9		2	10	RIGHT		0.9		1	20
K5+500	KT 6 XA SLUICE	1.0	1.3	2	10	RIGHT	6.63	1.5	1.5	3	20

TABLE F-2.4.2 (13) STRUCTURES AT KT 6 XA

STATION	NAME OF STRUCTURES	EXISTING CONDITIONS				LOCATED	PROPOSED DIMENSIONS				
		WIDTH φ B(m)	HEIGHT H(m)	NUMBER N(pcs)	LENGTH L(m)		DISCH. Q(m3)	WIDTH φ B(m)	HEIGHT H(m)	NUMBER N(pcs)	LENGTH L(m)
K0+ 50	SLUICE(PIPE)	0.6		1	13	LEFT		0.6		1	20
K0+300	SLUICE(PIPE)	0.4		1	9	RIGHT		0.6		1	20
K0+400	BRIDGE(CULVERT)	5.0		1	15	CLVRT.	6.63	3.0	2.5	1	20
K1+100	DUONG MONG BRIDGE	5.0		1	5	CLVRT.	6.63	3.0	2.5	1	20
K1+150	SLUICE(PIPE)	1.3		1	11	RIGHT		1.3		1	20
K1+750	BRIDGE(CULVERT)	4.0		1	2	CLVRT.	6.63	3.0	2.5	1	20
K1+850	SLUICE(PIPE)	1.5		1	10	RIGHT		1		1	20
K1+900	BRIDGE(CULVERT)	5.0		1	2	RIGHT	6.63	3.0	2.5	1	20
K2+700	SLUICE(PIPE)	2.5		1	10	RIGHT		1.0		1	50
K3+300	SLUICE(PIPE)	1.5		1	6	RIGHT		1.0		1	20
K3+600	KAU SAT SLUICE	1.4	1.4	2	15	CLVRT.	3.27	1.3	1.3	2	20

TABLE F-2.4.2 (14) STRUCTURES AT KT PHAT TICH

STATION	NAME OF STRUCTURES	EXISTING CONDITIONS				LOCATED	PROPOSED DIMENSIONS				
		WIDTH φ B(m)	HEIGHT H(m)	NUMBER N(pcs)	LENGTH L(m)		DISCH. Q(m3)	WIDTH φ B(m)	HEIGHT H(m)	NUMBER N(pcs)	LENGTH L(m)
K1+300	SLUICE(PIPE)	1.4		1	16	RIGHT		1.0		1	20
K1+600	BRIDGE(CULVERT)	NEW		1		CLVRT.	4.32	2.5	2.5	1	20
K2+150	BRIDGE(CULVERT)	NEW		1		CLVRT.	4.32	2.5	2.5	1	20
K1+100	DUONG MONG BRIDGE	5.0		1	5	CLVRT.	6.63	3.0	2.5	1	20
K1+400	SLUICE(PIPE)	1.5		1	15	RIGHT		1.0		1	20

TABLE F-2.4.2 (15) STRUCTURES AT KT 4 XA

STATION	NAME OF STRUCTURES	EXISTING CONDITIONS				LOCATED	PROPOSED DIMENSIONS				
		WIDTH φ B(m)	HEIGHT H(m)	NUMBER N(pcs)	LENGTH L(m)		DISCH. Q(m3)	WIDTH φ B(m)	HEIGHT H(m)	NUMBER N(pcs)	LENGTH L(m)
K0+800	BRIDGE(CULVERT)	1.0		3		CLVRT.	7.61	3.8	2.5	1	20
K0+900	SLUICE(PIPE)	1.4		1	9	RIGHT		1.0		1	20
K1+150	BRIDGE(CULVERT)	1.0		3		CLVRT.	7.61	3.8	2.5	1	20
K1+300	SLUICE(PIPE)	1.4		1	13	CLVRT.		1.0		1	20
K1+400	KT CAU NAU	NEW				RIGHT	7.61	3.8	2.5	1	20

TABLE F-2.4.2 (16) STRUCTURES AT KT CAU NAU

STATION	NAME OF STRUCTURES	EXISTING CONDITIONS				LOCATED	PROPOSED DIMENSIONS				
		WIDTH φ B(m)	HEIGHT H(m)	NUMBER N(pcs)	LENGTH L(m)		DISCH. Q(m3)	WIDTH φ B(m)	HEIGHT H(m)	NUMBER N(pcs)	LENGTH L(m)
K0+500	SLUICE(PIPE)	1.0		1	10	LEFT		1.0		1	20
K0+800	KT KAU NAU-1 SLUICE	NEW		1		LEFT	2.64	1.7	2.0	1	20
K1+300	SLUICE(PIPE)	1.0		1	9	LEFT		1.0		1	20
K1+300	SLUICE(PIPE)	1.0		1	9	RIGHT		1.0		1	20
K2+ 0	N6 IRRIGATION SYPHON	1.0		3	20	CLVRT.	4.64	2.9	2.0	1	20
K2+500	KT KAU NAU-2 SLUICE	NEW				LEFT	2.76	1.7	2	1	20
K2+800	SLUICE(PIPE)	1.1		1	5	RIGHT		1.0		1	20

TABLE F-2.4.2 (17) STRUCTURES AT KT TAN CHI

STATION	NAME OF STRUCTURES	EXISTING CONDITIONS				LOCATED	PROPOSED DIMENSIONS				
		WIDTH φ B(m)	HEIGHT H(m)	NUMBER N(pcs)	LENGTH L(m)		DISCH. Q(m3)	WIDTH φ B(m)	HEIGHT H(m)	NUMBER N(pcs)	LENGTH L(m)
K0+600	N6 ELEVATED FLUME	1.5	1.0	1	25	CLVRT.	31.11	3.9	2.5	4	40

Figure F-2.4.2 Longutudinal Section of Tao Khe Creek

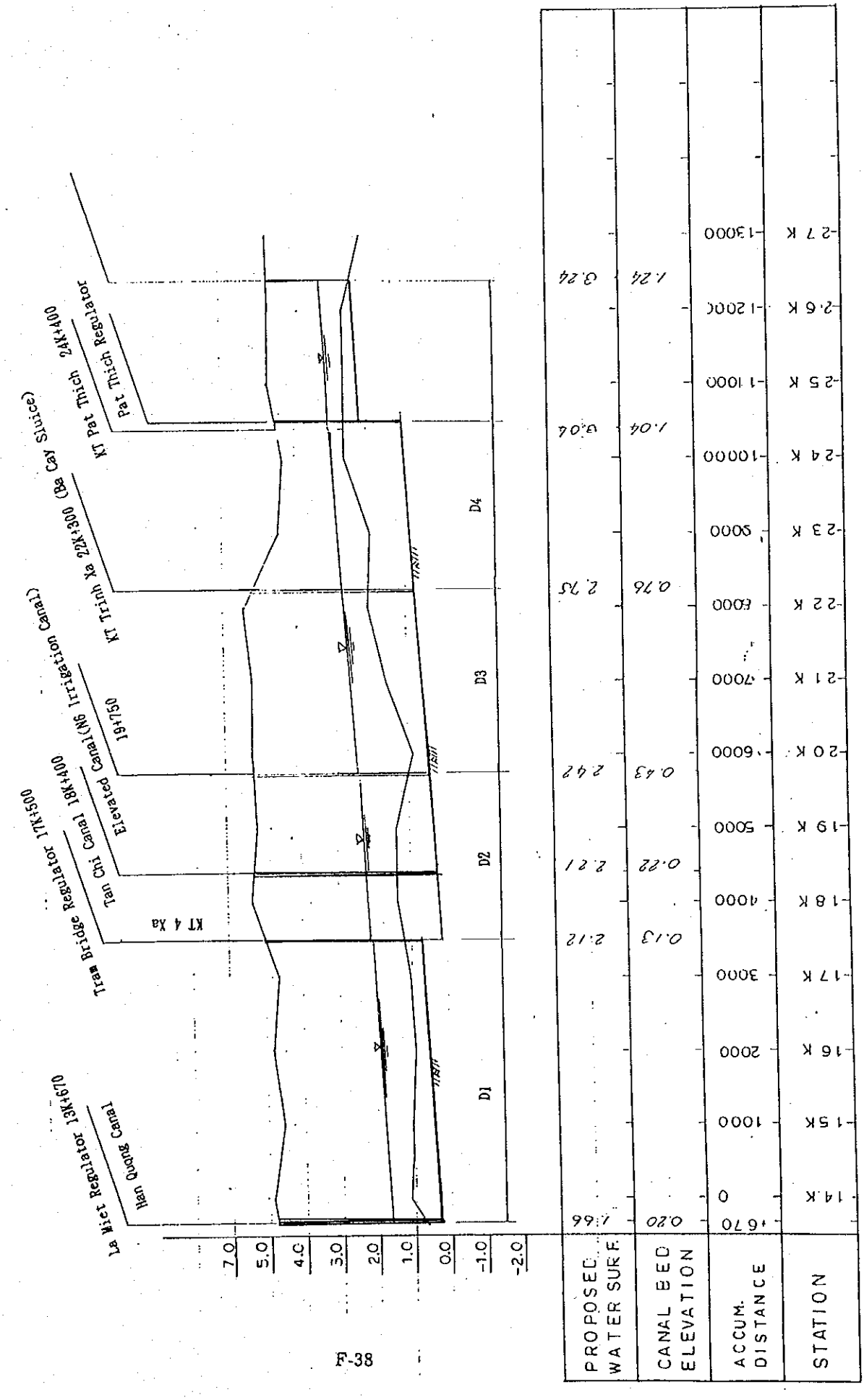
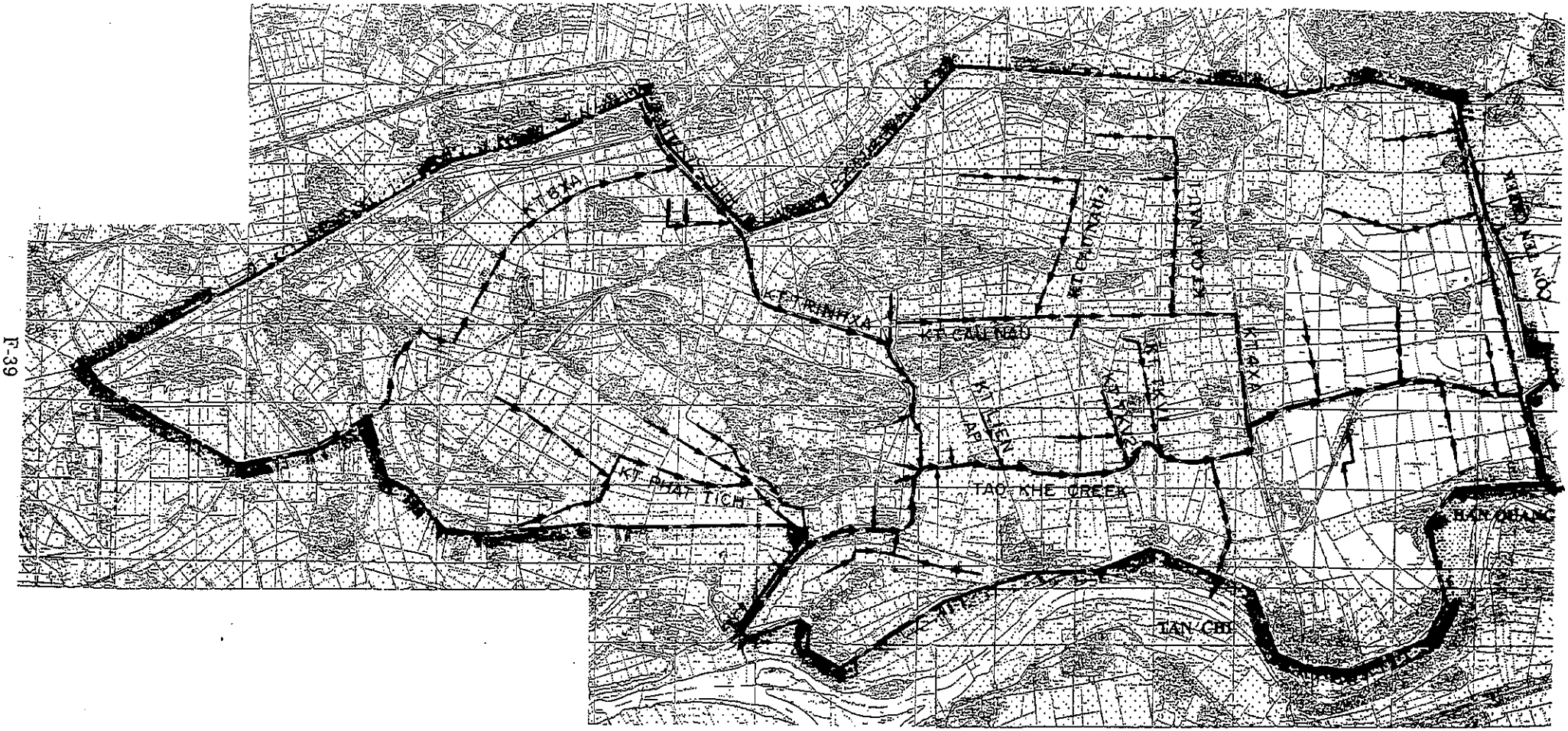


Figure F-2.4.3 **PLAN OF DRAINAGE FACILITIES**

SCALE ; 1/50,000



F-3 PROJECT COST

F-3.1 Method of Cost Estimates

The construction cost in Vietnam will be estimated in accordance with the guideline issued by the People's Committee of Ha Bac province on June 15th, 1994 based on the controlling price of construction materials, equipment in civil works issued by Interministry of Finance-Pricing Board of Government. Cost estimatin method is summarized as below.

a) Direct cost includes; (A) material costs. $a_1 + Cv_1 = A$

where, a_1 ; Listed cost

Cv_1; Difference between actual and estimated cost

(B) labour cost, $B_1 \times Factor = B$

where, B_1 ; Listed cost

Factoris; Adjsting factor of groups

(C) construction cost, $C_1 \times C = M$

where, C_1; Listed cost construction equipment

C ; Adjustinf factor

(T) Sub-total of, $(A + B + M) = T$

(T_1) other cost, $T \times n = T_1$

where, n; percentage of direct cost(T)

for wall painting, land leveling	0.5%
for comon works	0.7%
for special works	0.4%
for industrial works	0.2%

(T_2) Cost for electricity. Lightning protection, water drainage & supply

$T \times v\% = T_2$

b) General expenditures; $(C) = T \times p$

where, p; regulated ratio

Sub-total of $(T+T_1+T_2+C)$

c) Regulating profit; $(L) = (T+T_1+T_2+C) \times m$

where, m ; regulated profit

d) Construction cost; $(Gxl) = T+T_1+T_2+C+L$

e) Cost of equipment; (Gtb)..... including installation cost

f) Others : (Gkt)..... including costs as shown below

Survey & design cost

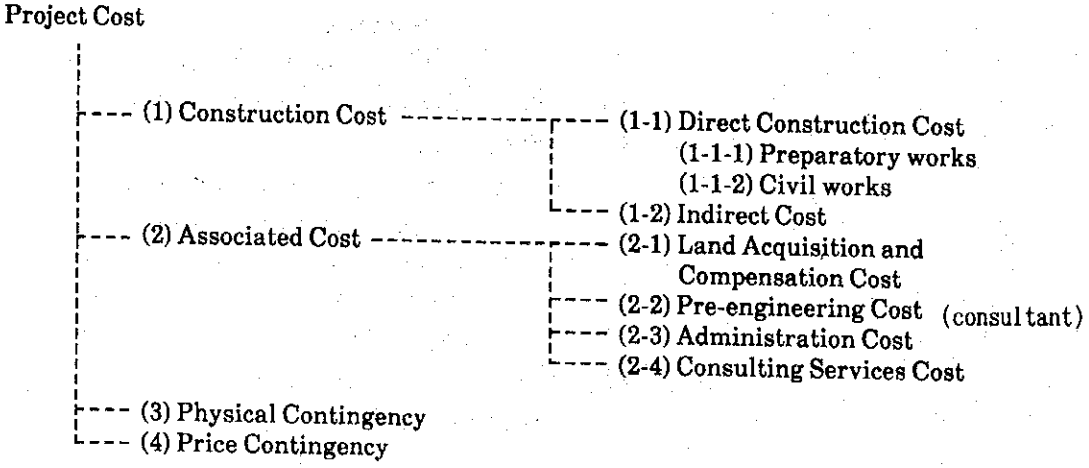
Managing cost

Land, crops compensation

g) Reserve stocks; (contingency) $(Gdp) = (gkl+Gtb+Gkt) \times 10\%$

Total cost of civil works; $Gxl+Gtb+Gkt+Gdp = Gtdt$

The project cost is estimated with the following components;



According to the Ha Bac regulations for the construction cost,some unit prices are estimated as shown below applying the material price in the list issued by the Ha Bac People Committee.

UNIT;VIETNUM,DONG

No.	Name of Works	Unit	General Unit Price	Remarks
1	Concrete M200	m^3	600,000.00	Beam
2	Concrete M200	m^3	760,899.29	Sluice
3	Plaster 2cm	m^2	10,402.29	Concrete M100
4	Ash coal concrete	m^3	104,825.30	
5	Brick Masony M50	m^3	273,902.50	
6	wall plaster	m^2	11,825.49	
7	Paving Floor tile	m^2	81,347.52	
8	Reinforcing bar	kg	5,347.47	
9	foundation earth excavation	m^3	12,160.24	by Manual,class2 distance=50m
10	Rock Masony M100	m^3	249,345.70	
11	Demolish Rock Masony	m^3	33,325.56	
12	Concrete fishing	m^2	7,100.78	
13	Steel Work	kg	7,642.49	
14	PVC-KN92 Joints	m	154,515.40	
15	Earth Fill class 2	m^3	17,012.16	by Manual,class2 distance=50m
16	Earth Fill	m^3	3,030.78	by Buldozer,class2 distance=50m
17	Demolishing old concrete	m^3	103,045.20	by Manual
18	Gravel	m^3	76,388.43	
19	Filling Eath road	m^3	3,030.78	by Buldozer,class2 distance=50m
20	Placing & Grading t=10cm	m^3	6,444.54	
21	Pumping water	day	121,988.50	
22	Demolishing Earth road by Buldozer	m^3	3,803.00	
23	Filling Eath Coffer dam	m^3	17,012.16	by Manual

Foreign and local currency portion on major construction materials are separated as follows:

Materials	Foreign (%)	Local (%)
Aggregate	80	20
Lumber	40	60
Reinforcing bar/ Nail/ Hardware	90	10
Cement	80	20
Asphalt/ Bituminous	80	20
Fuel	80	20
R.C. products	70	30
Steel plate/ Angle/ Pipe	90	10
Equipment	80	20

The exchange rate employed for the cost estimate is US$1.00=D10,996=¥100.00.

TABLE F-3.1.1 List of Unit Cost Construction Works

Works	Description	Unit	Unit Cost (US $)	Remarks	Unit Cost F/C	Unit Cost L/C	Rate(%) F/C	Rate(%) L/C
Earth Works	Dreadging	cu.m	2.37	PS200 Dredger	1.73	0.64	73	27
	Strct. Ex.(mannl)	cu.m	1.83	W/Dewatering	0.12	1.70	7	93
	Strct. Ex.(mech)	cu.m	2.40	Back Hoe	1.86	0.54	78	22
	Strct.Fil(mannl)	cu.m	2.92	L=50m	0.24	2.68	8	92
	Canal Ex.(mannl)	cu.m	1.22		0.00	1.22	0	100
	Canal.Fil(mech)	cu.m	0.30	Bull L=50m	0.24	0.06	80	20
	Canal Fil(mannl)	cu.m	1.70	L=50	0.00	1.70	0	100
	Plcng. Gravel	cu.m	7.86		0.00	7.10	0	100
Concrete Works	RFC. (Pump St.)	cu.m	165.26	M300	103.55	308.52	63	37
	RFC. (Canal St.)	cu.m	127.81	M250	77.73	250.40	61	39
	Lean Conc.	cu.m	52.40	M100	35.52	84.40	68	32
Other Works	Brick Work	cu.m	30.20	M75	1.68	142.61	6	94
	Mortar	cu.m	67.61		44.63	22.99	66	34
	Rock Masonry	cu.m	32.41		3.24	29.17	10	90
	Demolish Conc.	cu.m	13.40		1.34	12.06	10	90
	Steel Works	kg	0.99		0.79	0.20	80	20
	Conc. Finishing	sq.m	9.23		0.92	8.31	10	90
	Dmlsh Earthfill	cu.m	4.94		3.96	0.99	80	20
Pipe Works	RCP. D=1000mm	m	58.69		27.71	30.98	47	53
	RCP. D=600mm	m	45.41		18.34	27.07	40	60
	RCP. D=450mm	m	31.28		12.69	18.58	41	59
Pile	P.C.Pile D=450mm	pcs	1014.60	L=15m	909.40	105.20	90	10

TABLE F-3.1.2 (1) LIST OF UNIT COST

Descfiption		Qunt.	Unit	Rase Prc.	Total	Unit Cost (US $) F/C	L/C	Rate F/C	L/C
(1) Class M300 Concreet/Pumping Station									
Material	Cement	9.00	bag	4.30	38.70	30.96	38.70	80	20
	Gravel	0.90	cum.	7.60	6.84	5.47	6.84	80	20
	Sand	0.45	cum.	5.00	2.25	1.80	2.25	80	20
	RSB	80	kg	0.60	48.00	43.20	24.00	90	10
	Tie Wire	0.44	kg	1.80	0.79	0.71	0.40	90	10
	F.Lumber	0.05	cum.	140.00	7.00	2.80	21.00	40	60
	CWN	1.75	kg	1.30	2.28	2.05	1.14	90	10
	Plywood	0.18	cum.	230.00	41.40	16.56	124.20	40	60
Labor		1.00	LS	8.00	8.00	0.00	40.00	0	100
		1.00	LS	10.00	10.00	0.00	50.00	0	100
Equip.Spare P.Fuel			LS	4.20	0.00	0.00	0.00	80	20
Total					165.26	103.55	308.52	63	37
(2) Class M250 Concreet/Canal Structure									
Material	Cement	9.00	bag	4.30	38.70	30.96	38.70	80	20
	Gravel	0.90	cum.	7.60	6.84	5.47	6.84	80	20
	Sand	0.45	cum.	5.00	2.25	1.80	2.25	80	20
	RSB	40	kg	0.60	24.00	21.60	12.00	90	10
	Tie Wire	0.40	kg	1.80	0.72	0.65	0.36	90	10
	F.Lumber	0.03	cum.	140.00	4.20	1.68	12.60	40	60
	CWN	1.00	kg	1.30	1.30	1.17	0.65	90	10
	Plywood	0.12	cum.	230.00	27.60	11.04	82.80	40	60
Labor		1.00	LS	8.00	8.00	0.00	40.00	0	100
		1.00	LS	10.00	10.00	0.00	50.00	0	100
Equip.Spare P.Fuel		1.00	LS	4.20	4.20	3.36	4.20	80	20
Total					127.81	77.73	250.40	61	39
(3) Class M100 Concreet/Lean Concreet									
Material	Cement	7.00	bag	4.30	30.10	24.08	30.10	80	20
	Gravel	1.00	cum.	7.60	7.60	6.08	7.60	80	20
	Sand	0.50	cum.	5.00	2.50	2.00	2.50	80	20
Labor		1.00	LS	8.00	8.00	0.00	40.00	0	100
Equip.Spare P.Fuel		1.00	LS	4.20	4.20	3.36	4.20	80	20
	1								
Total					52.40	35.52	84.40	68	32
(4) Wetted Brick Riprap									
Material	Brick	0.98	cum.	9.90	9.72	0.00	48.62	0	100
	Mortar	0.05	cum.	52.01	2.48	1.68	3.99	68	32
Labour		1.00	LS	8.00	8.00	0.00	40.00	0	100
		1.00	LS	10.00	10.00	0.00	50.00	0	100
Total					30.20	1.68	142.61	6	94

TABLE F-3.1.2 (2) LIST OF UNIT COST

Descfiption		Qunt.	UnitRase	Prc.	Total	Unit Cost (US $) F/C	L/C	Rate F/C	L/C
(5) Dreadging (200PS dreadger Pump Vessel without rentar charge)40m3/h									
Material	Electric	4.67	kwh	0.04	0.19	0.04	0.15	20	80
	Consumer	1.00	LS	0.05	0.05	0.04	0.01	80	20
	Maint.	1.00	LS	0.18	0.18	0.14	0.04	80	20
	Miscel.	1.00	LS	0.01	0.01	0.01	0.00	80	20
	Otherboats	1.00	LS	1.88	1.88	1.50	0.38	80	20
Labour	H.R.sailor	1.00	LS	0.01	0.01	0.00	0.01	0	100
	Sailor	3.00	LS	0.02	0.05	0.00	0.05	0	100
Total					2.37	1.73	0.64	73	27
(6) Structure Excavation With Dewatering (Mannual)									
Labour		1.00	LS	1.22	1.22	0.00	1.22	0	100
Pumping Water		1.00	LS	0.61	0.61	0.12	0.49	20	80
Total					1.83	0.12	1.70	7	93
(7) Structure Excavation (Machine)									
Labour	Operator	1.00	LS	0.07	0.07	0.00	0.07	0	100
Equip.Spare P.Fuel		1.00	LS	2.32	2.32	1.86	0.46	80	20
Total					2.40	1.86	0.54	78	22
(8) Structure Backfill (Mannual)									
Labour		1.00	LS	1.70	1.70	0.00	1.70	0	100
Pumping Water		1.00	LS	1.22	1.22	0.24	0.98	20	80
Total					2.92	0.24	2.68	8	92
(9) Canal Fill (Buldozer)									
Equip.Spare P.Fuel		1.00	LS	0.30	0.30	0.24	0.06	80	20
Total					0.30	0.24	0.06	80	20
(10) Canal Fill (Mannual)									
Labour		1.00	LS	1.70	1.70	0.00	1.70	0	100
Total					1.70	0.00	1.70	0	100
(11) Placing Gravel t=10									
Material	Gravel	1.03	cum.	7.34	7.56	0.76	6.80	10	90
Laabour		1.00	LS	0.30	0.30	0.00	0.30	0	100
Total					7.86	0.00	7.10	0	100

TABLE F-3.1.2 (3) LIST OF UNIT COST

Descfiption		Qunt.	Unit	Rase Prc.	Total	Unit Cost (US $) F/C	L/C	Rate F/C	L/C
(12) RCP D=1000mm									
Material	Cement	2.71	bag	4.30	11.65	9.32	2.33	80	20
	Gravel	0.22	cu.m	7.60	1.67	0.33	1.34	20	80
	Sand	0.11	cu.m	5.00	0.55	0.11	0.44	20	80
	RSB	14.85	kg	0.60	8.91	7.13	1.78	80	20
	Tie Wire	0.10	kg	1.80	0.18	0.14	0.04	80	20
Labour		1.00	LS	1.24	1.24	0.00	1.24	0	100
Equip.Spare P.Fuel		1.00	LS	1.25	1.25	1.00	0.25	80	20
Sub-total					25.46	18.04	7.42	71	29
Installation									
Material	Cement	1.00	bag	4.30	4.30	3.44	0.86	80	20
	Gravel	0.08	cu.m	7.60	0.61	0.12	0.49	20	80
	Sand	0.04	cu.m	5.00	0.20	0.04	0.16	20	80
	RSB	7.30	kg	0.60	4.38	3.50	0.88	80	20
	Tie Wire	0.06	kg	1.80	0.11	0.09	0.02	80	20
	F.Lumber	3.20	LS	3.29	10.53	2.11	8.42	20	80
Labour		1.00	LS	12.64	12.64	0.00	12.64	0	100
Equip.Spare P.Fuel		1.00	LS	0.46	0.46	0.37	0.09	80	20
					33.23	9.67	23.56	29	71
Total					58.69	27.71	30.98	47	53
(13) RCP D=600mm									
Material	Cement	1.82	bag	4.30	7.83	6.26	1.57	80	20
	Gravel	0.15	cu.m	7.60	1.14	0.23	0.91	20	80
	Sand	0.08	cu.m	5.00	0.38	0.08	0.30	20	80
	RSB	9.77	kg	0.60	5.86	4.69	1.17	80	20
	Tie Wire	0.08	kg	1.80	0.14	0.12	0.03	80	20
Labour		1.00	LS	8.67	8.67	0.00	8.67	0	100
Equip.Spare P.Fuel		1.00	LS	0.84	0.84	0.67	0.17	80	20
Sub-total					24.86	12.04	12.82	48	52
Installation									
Material	Cement	0.72	bag	4.30	3.10	2.48	0.62	80	20
	Gravel	0.06	cu.m	7.60	0.46	0.09	0.36	20	80
	Sand	0.03	cu.m	5.00	0.15	0.03	0.12	20	80
	RSB	4.52	kg	0.60	2.71	2.17	0.54	80	20
	Tie Wire	0.05	kg	1.80	0.09	0.07	0.02	80	20
	F.Lumber	1.88	LS	3.29	6.19	1.24	4.95	20	80
Labour		1.00	LS	7.59	7.59	0.00	7.59	0	100
Equip.Spare P.Fuel		1.00	LS	0.28	0.28	0.22	0.06	80	20
					20.55	6.30	14.25	31	69
Total					45.41	18.34	27.07	40	60

TABLE F-3.1.2 (4) LIST OF UNIT COST

Descfiption		Qunt.	Unit	Rase Prc.	Total	Unit Cost (US $) F/C	L/C	Rate F/C	L/C
(14) RCP D=450mm									
Material	Cement	1.22	bag	4.30	5.25	4.20	1.05	80	20
	Gravel	0.10	cu.m	7.60	0.76	0.15	0.61	20	80
	Sand	0.05	cu.m	5.00	0.25	0.05	0.20	20	80
	RSB	7.72	kg	0.60	4.63	3.71	0.93	80	20
	Tie Wire	0.08	kg	1.80	0.14	0.12	0.03	80	20
Labour		1.00	LS	7.09	7.09	0.00	7.09	0	100
Equip.Spare P.Fuel		1.00	LS	0.56	0.56	0.45	0.11	80	20
Sub-total					18.69	8.67	10.02	46	54
Installation									
Material	Cement	0.45	bag	4.30	1.94	1.55	0.39	80	20
	Gravel	0.04	cu.m	7.60	0.30	0.06	0.24	20	80
	Sand	0.02	cu.m	5.00	0.10	0.02	0.08	20	80
	RSB	3.65	kg	0.60	2.19	1.75	0.44	80	20
	Tie Wire	0.04	kg	1.80	0.07	0.06	0.01	80	20
	F.Lumber	1.41	LS	1.48	2.09	0.42	1.67	20	80
Labour		1.00	LS	5.69	5.69	0.00	5.69	0	100
Equip.Spare P.Fuel		1.00	LS	0.21	0.21	0.17	0.04	80	20
					12.59	4.02	8.56	32	68
Total					31.28	12.69	18.58	41	59
(15) Prestress Concrete Pile D=450mm L=15m									
Material	P.C. Pile	1	pcs	1010.00	1010.00	909.00	101.00	90	10
Inst.	Labour	1	LS	2.60	2.60	0.00	2.60	0	100
Equi.Spare P.Fuel		1	LS	2.00	2.00	0.40	1.60	20	80
					1014.6	909.4	105.2	90	10