8-1-9 Transmission Main

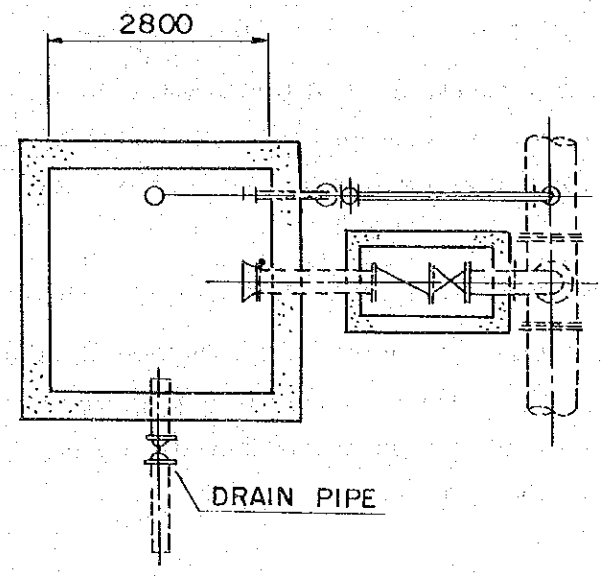
The length of the transmission main is 36 kms. A comparison of single and dual pipelines showed the advantage of using a ϕ 700 mm. diameter single pipeline. Ductile cast iron and steel pipes are best suited in terms of the size of these pipes.

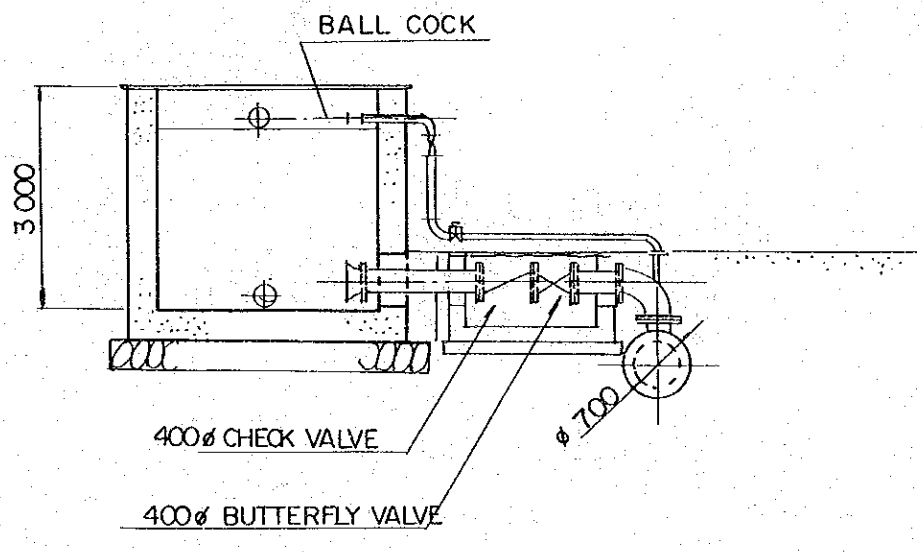
To counteract the occurrence of water hammer, installation of both flywheels and one-way surge tanks are recommended. This study shows that one-way surge tanks need to be constructed in three locations.

Figure 8-5 shows a diagram of a one-way surge tank.

Figures 8-6 (a) (Scheme 1) and 8-6 (b) (Scheme 2) show the specifications. In addition, graphs of water hammer pressure curve for cases with and without flywheels and one way surge tanks are shown in Figures 8-7 (a and b).

Fig-8·5;One Way Surge Tank





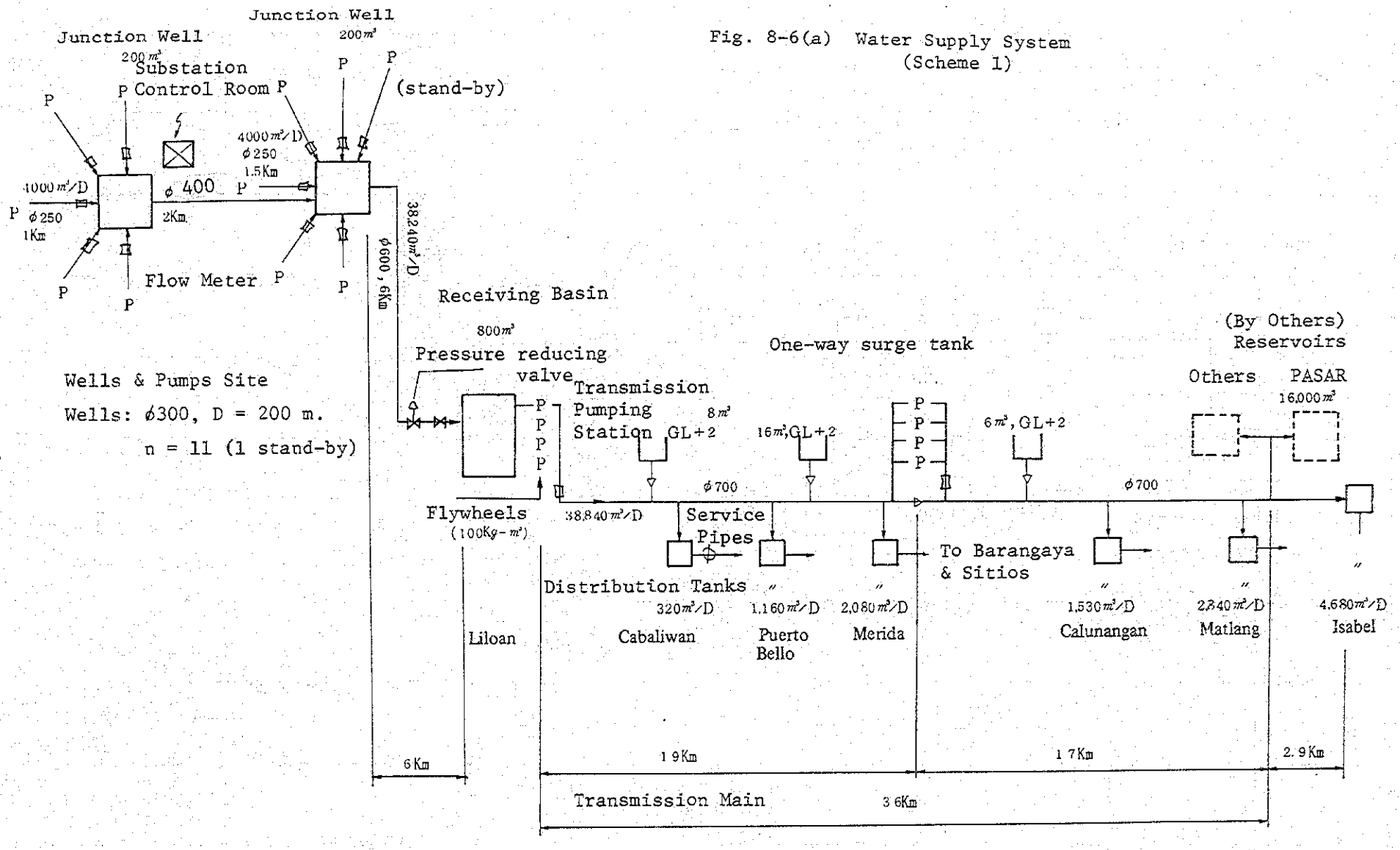


Fig. 8-6(a) Water Supply System
(Scheme 1)

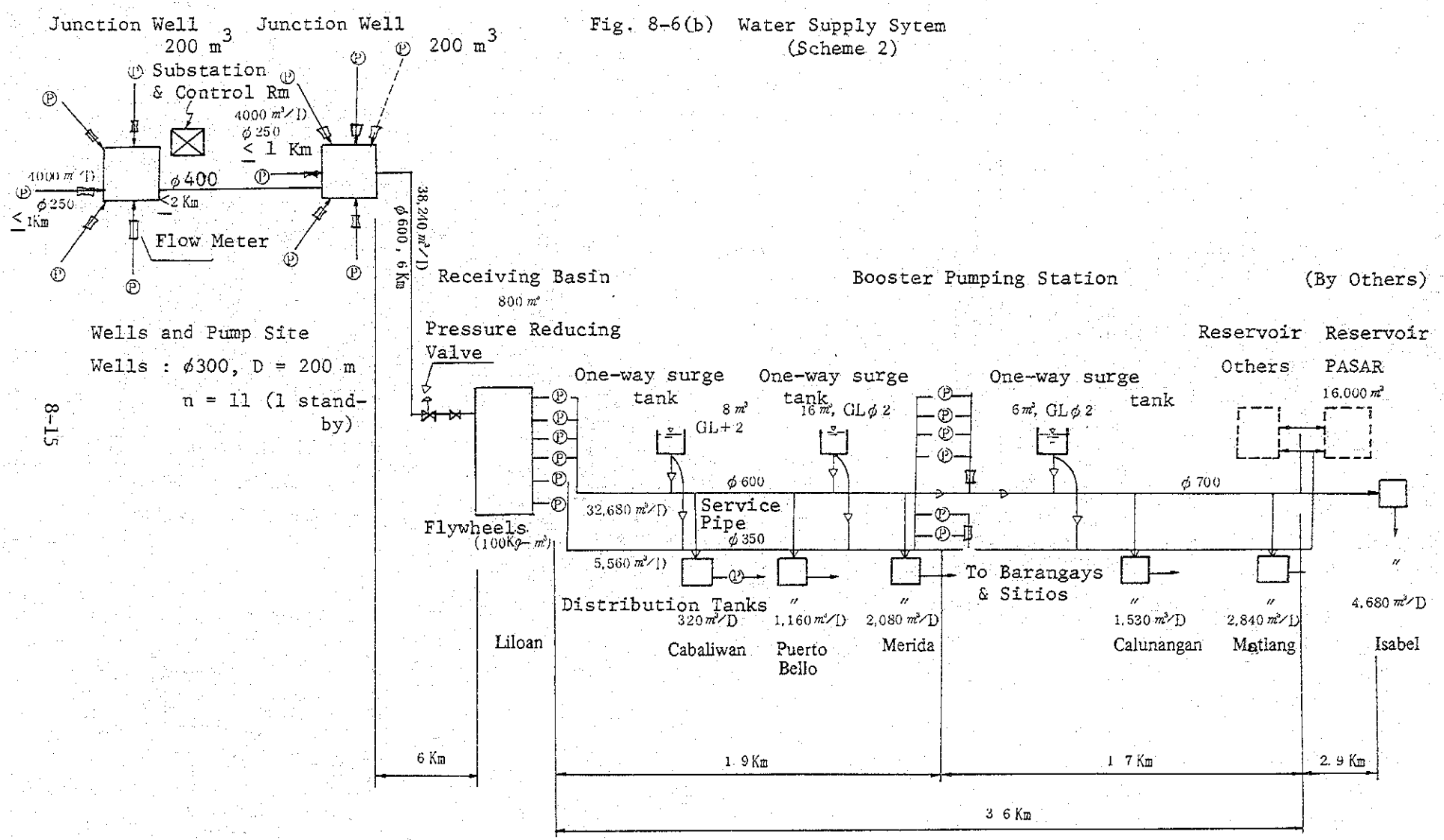


Fig. 8-6(b) Water Supply Sytem (Scheme 2)

Fig. 8-7(a) Water Hammer Pressure Curve (case with flywheels and one-way surge tanks)

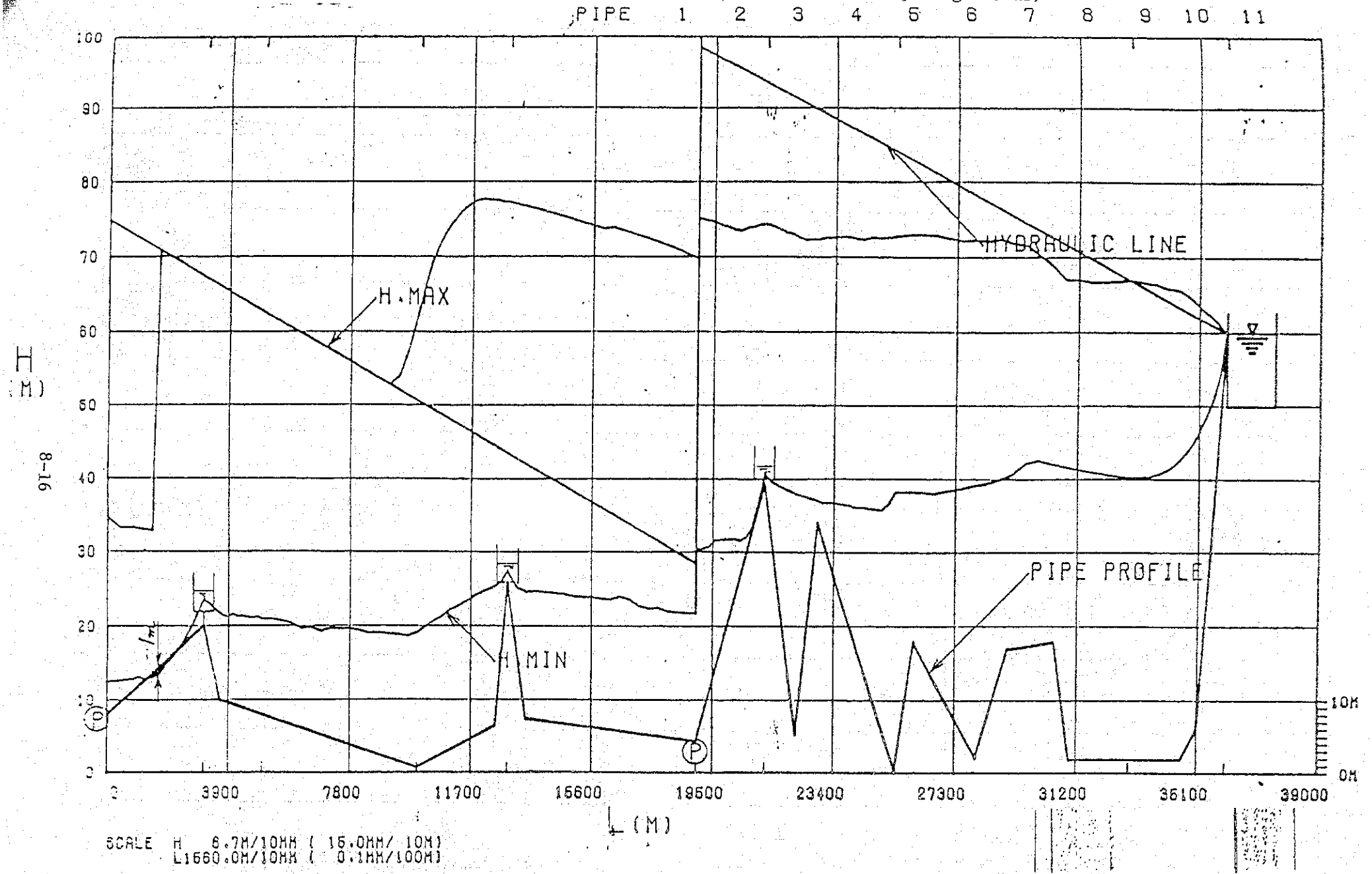
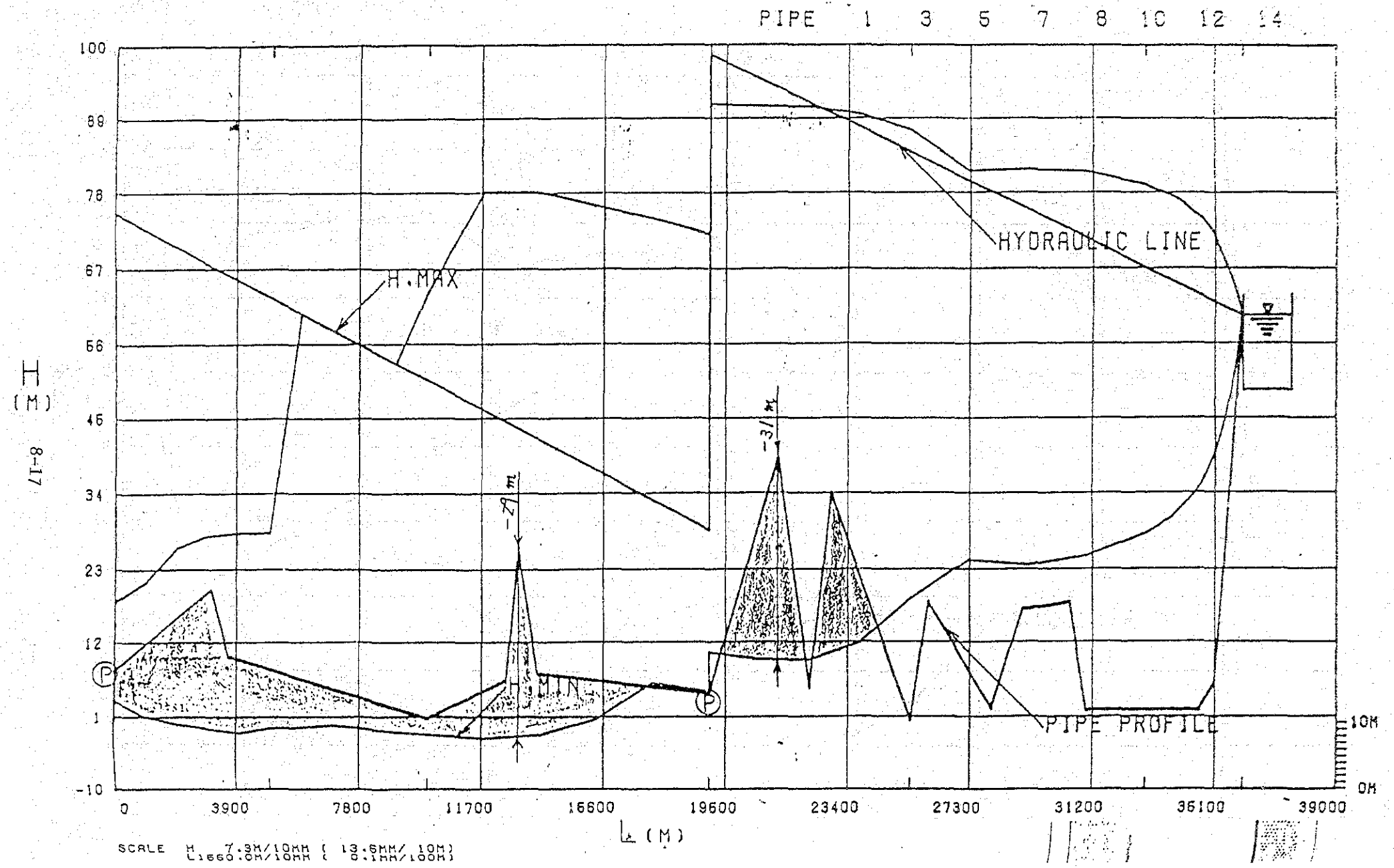
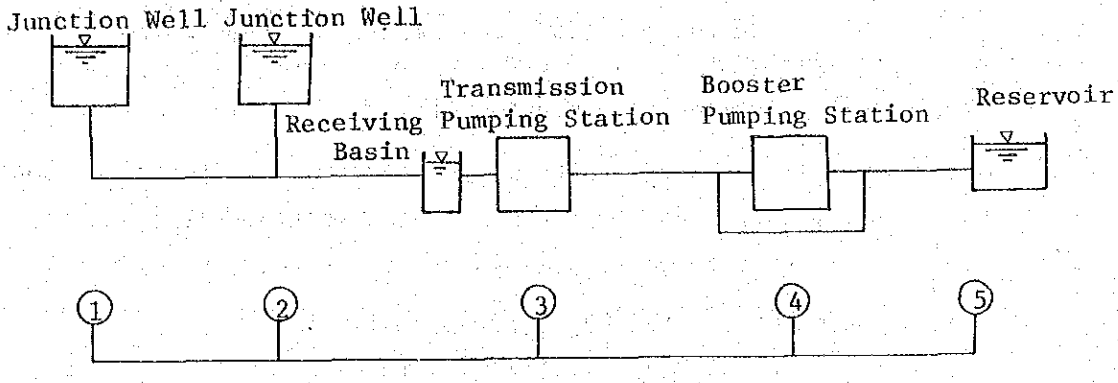


Fig. 8-7(b) Water Hammer Pressure Curve (case without flywheels and one-way surge tanks)



8-1-10 Control System

(1) Pipeline System



Telephone System

Fig. 8-8 Control System

(2) Pump Operation and Supervision

(i) A Supervisor shall be assigned to (1) ∿ (5) who shall then supervise the transmission of water via telephone.

(ii) The submersible pumps are run automatically depending on the junction well's water level. When the water level suddenly falls beyond the minimum level, the submersible pump automatically stops. During electric power black-outs, the submersible pumps are automatically switched to the generators.

(iii) The operation and supervision of transmission pumps and booster pumps are carried out via telephone.

(iv) When the water in the receiving basin drops below the stipulated water level, a warning signal is sent out to the transmission pumps and a further decline in the water level brings the pumps to a halt. Moreover, when the discharge pipe exhibits an unusually high pressure (for example, during breakdown of booster pumps), warnings are automatically sent out.

(v) An abnormal rise in the water level of the receiving

basin sends out warnings to the transmission pumps. During normal operating hours, automatic adjustments are made to keep the water within the prescribed level.

(vi) The booster pumps immediately stop once the pressure from the suction pipes becomes extremely low.

(3) Establishment of Operation Office

(i) For the smooth transfer of water from the water source to the reservoir (PASAR & Other Industries) it is necessary to set up one operation office for (1) ∿ (5). One operator shall be appointed to supervise the operation office.

(ii) The transmission pumping station (3) is found to be best suited for this purpose and is thus assigned as the operation office.

All communications from (1), (2), (4) & (5) shall be channelled to (3) which shall then directly inform and give orders to the office concerned (all contacts via telephone).

(4) Suspension of Entire Transmission System

(i) If the water level of the reservoir rises above the stipulated level, (5) shall call (3) and request for the suspension of one pump.

(ii) (3) shall contact (4) and give instructions for the suspension of one booster pump. After verifying the implementation of the order, one of the transmission pumps shall suspend operation.

(iii) If the reservoir's water level continues to rise, steps (i) & (ii) shall be repeated and additional pumps shall be shut off.

(In reality, the complete suspension of the transmission system is not likely to happen).

(iv) When the water level of the receiving basin rises the control valve shall automatically close.

(v) When the water level of the two junction wells [(1) & (2)] rise, the submersible pumps shall be stopped.

(5) Resumption of Operation of the Transmission System

(i) The transmission pumping station (3) and the reservoir (5) shall make contact to resume operation of transmission pumps.

(ii) After confirming the restart of the transmission pump's operation, (3) shall contact (4) for the resumption of the operation of the booster pumps.

(iii) When the water level of the receiving basin drops, the control valve automatically reopens.

(iv) When the junction wells' water level start dropping, the submersible pumps start running again.

8-1-11 Planning of the Distribution System

The distribution system shall consist of the reservoir, disinfection facilities, distribution main, fire hydrants, public faucets, etc. The scale of these facilities shall be based on the water requirements in the final year of the design period (2005), except in the case of the public faucets which shall be designed according to 1985 requirements since this year projects the maximum use of the public faucets during the entire design period. The following diagram indicates the standard facilities for each water district.

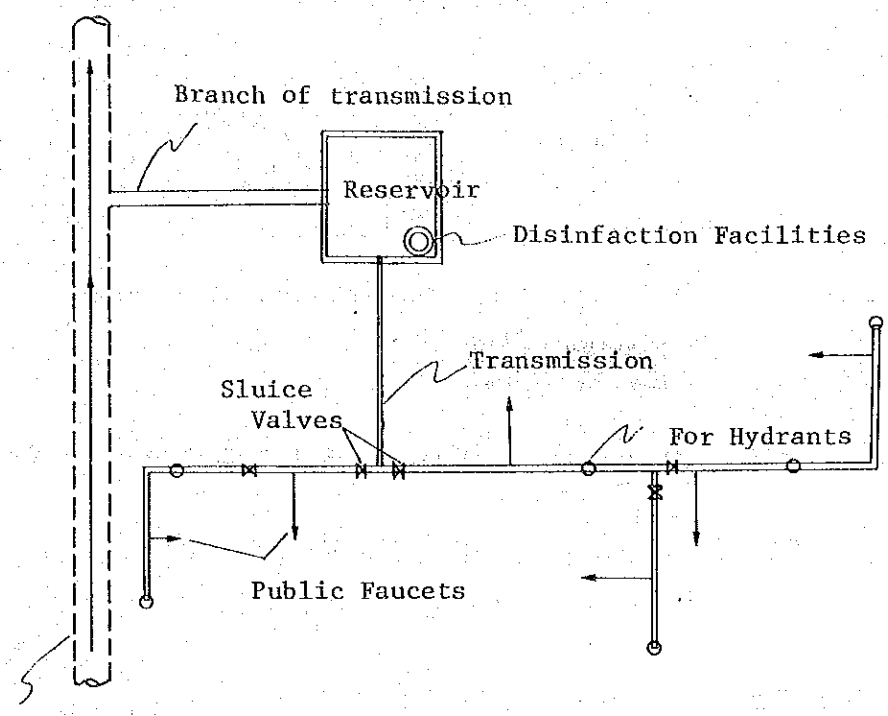


Fig. 8-9 Water Supply Facilities

(A) Planning of Reservoir

(a) Capacity of the Reservoir

The capacity of the reservoir is determined from the following factors:

(1) operational storage
(2) emergency storage
(3) fire-fighting storage

The proposed water district is divided into rural and urban districts. Because of the sparse population in the rural district, only operational storage was used in gauging the size of the reservoir. On the other hand, for the urban district which is expected to develop rapidly as a result of the LIE project, the reservoir's capacity was gauged by operational storage and fire-fighting storage. The storage capacity for the reservoirs is discussed below.

* Operational Storage

LWUA stipulates that it should equal to 15 - 30% of the maximum water supply per day. Therefore for this project, it was set at 25% which is equivalent to 6 hours' water supply.

* Fire-fighting Storage

LWUA T.S.M. prescribes 320 cu.m. of water for a population of 100,000 and below, while the LWUA M.M. recommends that the fire-fighting water capacity should be equivalent to two hours' share of the maximum demand per day. Economic considerations dictate that the latter be adopted for this project in satisfying the fire-fighting requirements.

Table 8-4 Storage Capacity of Distribution Tanks for Each Water District

Item / Water District	Operational Storage			Fire-Fighting Storage			Total
	Maximum Water Supply Per Day (LPS)	Hours	Storage (CH)	Maximum Water Supply Per Day (LPS)	Hours	Storage (CH)	
CABALIWAN	3,703	6	80	–	–	–	80
PUERTO BELLO	13,426	6	290	–	–	–	290
MERIDA	24,074	6	520	24,074	2	173	693
CALUNANGAN	17,708	6	382	–	–	–	382
MATLANG	34,870	6	753	34,870	2	251	1,004
ISABEL	54,167	6	1,170	54,167	2	390	1,560

Maximum Amount of Water consumed per day was based on the Final Year Period's (Years2005) Water consumption capacity.

Table 8-5 Planned Size of Reservoirs for Each Water District

Water District	Capacity	Size (Measurements) of Reservoir			Total Capacity
		Width	Length	Height	
CABALIWAN	80 Cm	5.5	5.5	3.1	94 Cm
PUERTO BELLO	290	10.0	10.0	3.4	340
MERIDA	700	14.0	14.0	4.1	804
CALUNANGAN	390	11.0	11.0	3.7	448
MATLANG	1,010	16.0	16.0	4.5	1,152
ISABEL	1,560	20.0	20.0	4.5	1,800

(b) Location and Structure of Reservoir

Considering the water pressure from the transmission pipes, it would be more profitable to construct the reservoir on elevated ground so that the gravity flow system may be used for distribution purposes. It should be noted that in determining the location of the reservoir, two minimum requirements must be met: (1) a static head of below 70 m. (2) a minimum dynamic head of 7 meters.

However, in the case of Cabaliwan, an area situated 80 m. above sea level, water pressure is not enough to distribute water in its area. Therefore, a booster pump shall be installed to transmit water.

The reservoir should be made of concrete and built at ground level.

(B) Planned Disinfection Facilities

According to the LWUA Methodology Manual, chlorination is currently used in the Philippines for disinfection purposes. The chlorination methods used are dry feed basis and solution-feed basis. In the case of the latter, several types of compounds may be used, one of which is calcium hypochlorite.

LWUA also stipulates that the free residual chlorine dosage should be between 0.2 $\sim$ 0.4 mg/ℓ. Water should be stored for at least 15 minutes after the injection of chlorine. The chlorine administered is in the form of a powder, thus, easily handled and poses no danger. However, a re-examination of this method is recommended for the detailed design phase.

(C) Planned Distribution Pipes

(a) Distribution Pipes

The size of the distribution pipes should be based on the planned amount of water supply for each water district as projected in the final year of the design period. The Hazen-Williams formula should be used in deciding the size of the pipes.

(b) Fire Hydrants

Dual outlet fire hydrants should be installed at an interval of 180 meters. (L.T.S.M.)

(c) Public Faucets

There should be one public faucet for every one hundred persons. A meter should be attached to each public faucet. Its diameter should be ϕ 13 mm.

Table 8-6 Population by Barangay & No. of Public Faucets

Water District	Barangay	Population Using Public Faucets		No. of Public Faucets	
		1985	2000	1985	2000
CABALIWAN	CABALIWAN	980	370	10	4
PUERTO BELLO	PUERTO BELLO	3,614	1,364	36	14
	CASILDA				
	CAN-UNZO				
MERIDA	LIBAS	3,263	2,080	33	21
	LAMANOC				
	BRGY				
CALUNANGAN	MACARIO	2,910	1,731	30	18
	MAHALIT				
	LIBJO				
	CALUNANGAN				
	BENABAYE				
MATLANG	APALE	3,790	2,846	38	29
	TOLINGON				
	TUBOD				
	BILWANG				
	MATLANG				
ISABEL	LIBERTAD	6,238	4,685	63	47
	STA. CRUZ				
	STO. ROSARIO				
	SAN ROQUE				
	MAHAYAG				
	MARVEL				
	STO. NIÑO				
TOTAL		20,795	13,076	210	133

* One Public Faucet for every 100 persons.

Table 8-7 Distribution of the Planned Amount of Water Supply

Water District	Planned Amount of Water Supply by District	Barangay	Percentage of Water Supply Each Barangang Within for Water District	Planned Maximum Water Supply by Barangay
CABALIWAN [1]	4,711 LPS	CABALIWAN	100 %	4,711
PUERTO BELLO [1]	17,361	PUERTO BELLO	44.3	7,691
		CASILDA	32.5	5,642
		CAN-UNZO	23.2	4,028
MERIDA [2]	24,074	LIBAS	20.0	4,815+22.0=26,815
		LAMANOC	17.8	4,285+22.0=26,285
		BRGY	62.2	14,974+22.0=36,974
CALUNANGAN [1]	22,951	MACARIO	12.0	2,754
		MAHALIT	19.1	4,384
		LIBJO	19.9	4,567
		CALUNANGAN	29.8	6,839
		BENABAYE	19.2	4,407
MATLANG [2]	32,870	APALE	14.1	4,635+22.0=26,635
		TOLINGON	11.0	3,616+22.0=25,616
		TUBOD	5.6	1,841+22.0=23,841
		BILWANG	27.4	9,006+22.0=31,006
		MATLANG	41.9	13,772+22.0=35,772
ISABEL [2]	54,167	LIBERTAD	19.6	10,617+22.0=32,617
		STA. CRUZ	24.0	13,000+22.0=35,000
		STO. ROSARIO		
		SAN ROQUE		
		MAHAYAG	13.9	7,529+22.0=29,529
		MARVEL	20.4	11,050+22.0=33,050
		STO. NINO	22.1	11,971+22.0=33,971

1) For CABALIWAN, PUERTO BELLO & CALUNANGAN, the amount of water supply was based on the hourly maximum water supply.

2) For MERIDA, MATLANG, ISABEL, the amount of water supply was based on the daily maximum water supply and fighting water requirement. (water for fire-fighting - 22 lps.)

Table 8-8 Length of Fipelines for Each Water District

(Unit: meters (m))

Water District	ϕ50	ϕ75	ϕ100	ϕ150	ϕ200	ϕ250	ϕ300
CABALIWAN	1,450	700					
PUERTO BELLO	200	2,050	350	2,050			
MERIDA					7,000		
CALUNANGAN	500	800	900	3,200	1,400		
MATLANG				700	6,750	500	
ISABEL					7,150	1,900	200
TOTAL	2,150	3,550	1,250	5,950	22,300	2,400	200

Table 8-9 Number of Sluice Valves and Fire Hydrants for Each Water District

Water District	ϕ50	ϕ75	ϕ100	ϕ150	ϕ200	ϕ250	ϕ300	No. of Fire Hydrants
CABALIWAN	2	3						
PUERTO BELLO	2	3	4	2				
MERIDA					14			39
CALUNANGAN	1	1	1	6				
MATLANG					15			41
ISABEL					11	4		50
TOTAL	5	7	5	8	40	4		130

8-2 Proposed Construction Schedule

The start of the operations is set for the year 1985. The Construction schedules for Scheme I and Scheme II are shown in Figures 8-9 and 8-9 and 8-10 respectively.

Figure 8-9 Construction Schedule (Scheme I)

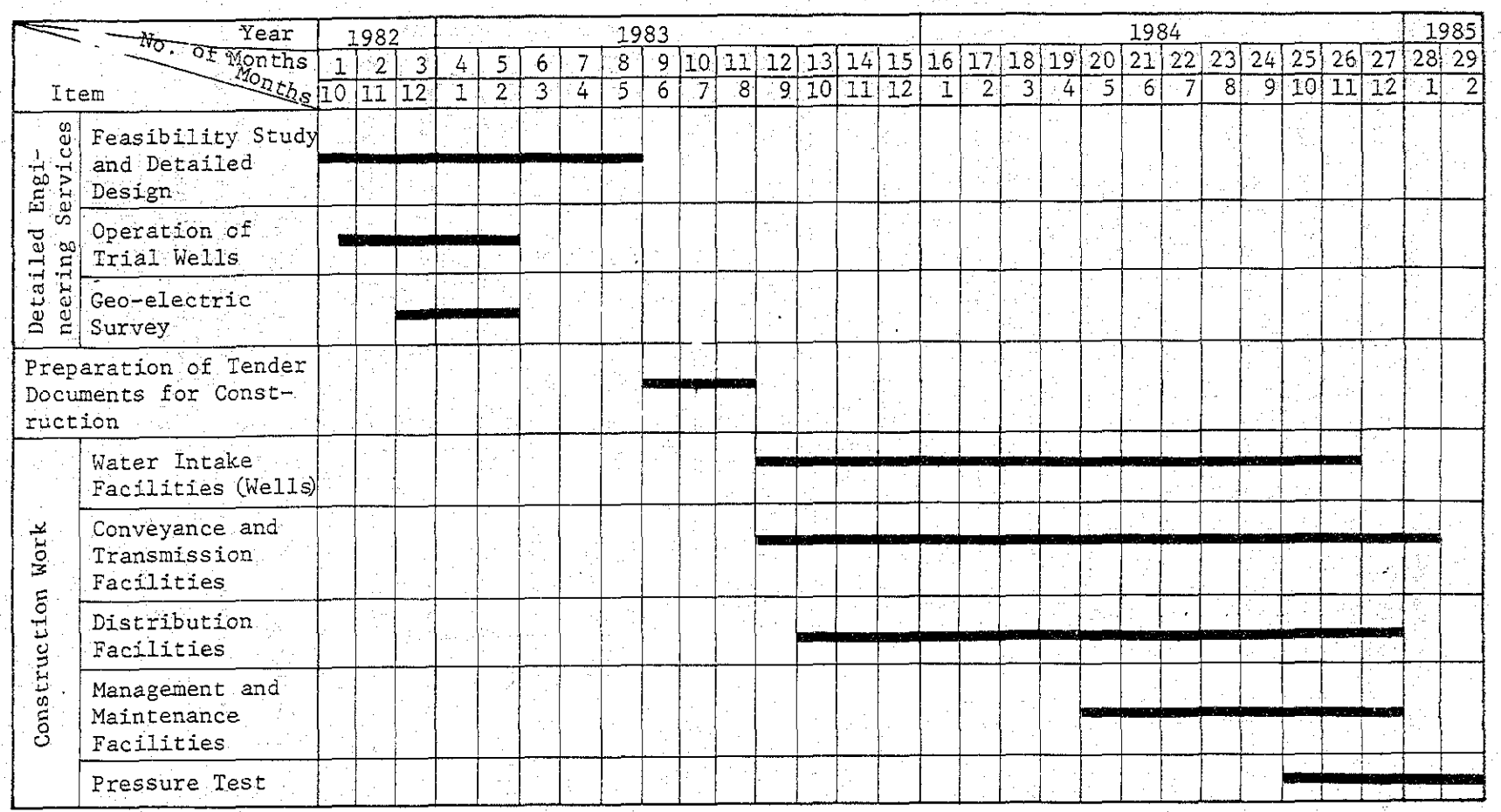
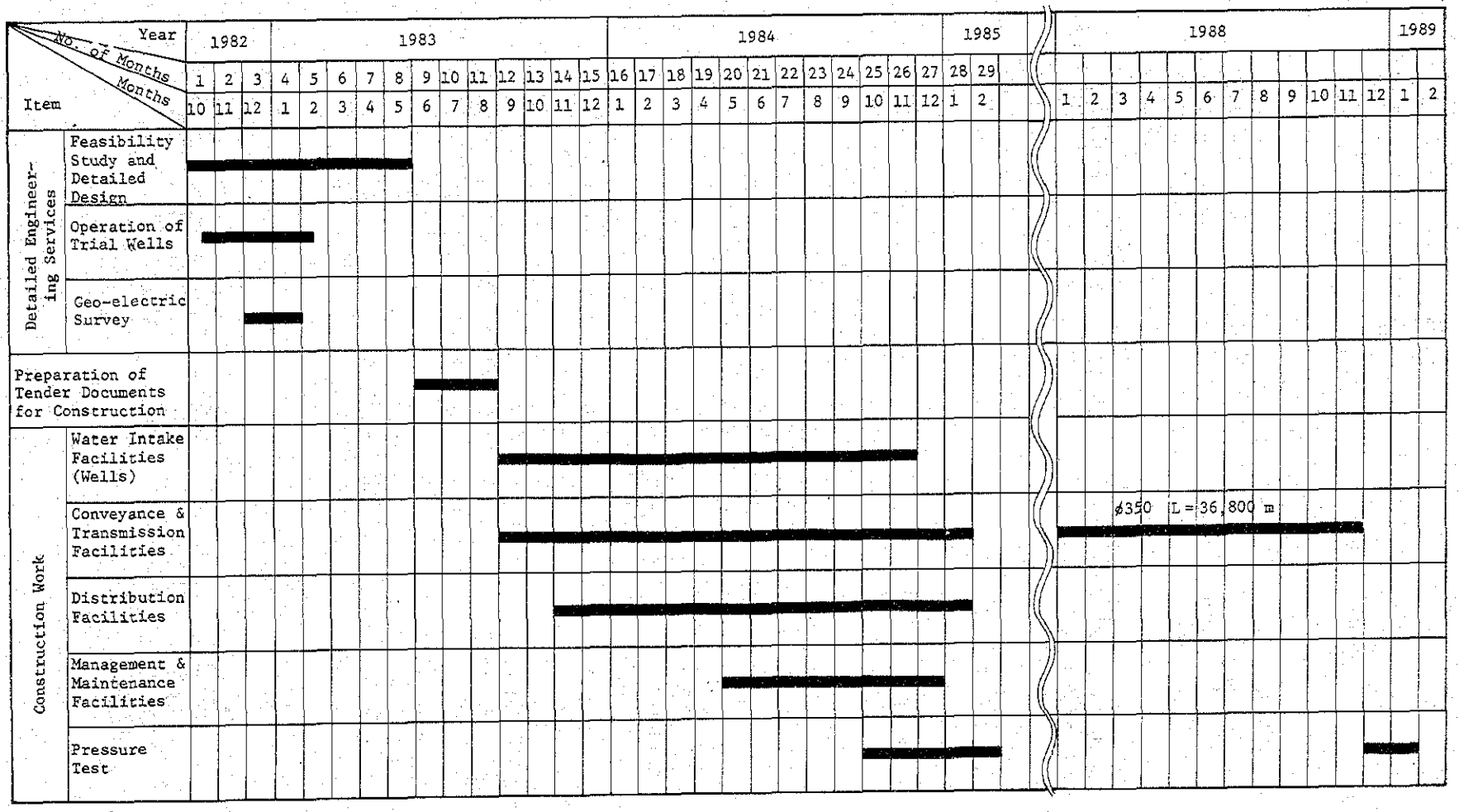


Figure 8-10 Construction Schedule (Scheme II)



CHAPTER 9 CONSTRUCTION, MANAGEMENT AND MAINTENANCE COSTS

Chapter 9 CONSTRUCTION COSTS; MANAGEMENT AND MAINTENANCE EXPENSES

9–1 Construction Costs

This section summarizes the estimated construction costs for Scheme I and Scheme II as described in the previous chapter. The estimated construction costs include the breakdown of costs for the following items:

(1) wells
(2) transmission facilities
(3) distribution facilities
(4) administration building
(5) operational center
(6) vehicles

Engineering fees and contingencies were added to the construction costs.

The unit price of materials and the main civil works are based on the standards set by LWUA as stated in its Methodology Manual - Water Supply Feasibility Study of Twelve Provincial Areas. The price of imported materials such as pumps, generators, electric devices, instrumentation and large pipes were based on the 1982 CIF prices in the Japanese market.

Since the prices listed in LMM were still 1979 prices, they were converted to 1982 prices through escalation rates stated in the said manual.

The cost of contingencies is equivalent to 5% of the sum of the basic construction costs and the engineering fee.

9–2 Total Cost of Construction and Maintenance Expenses

Tables 9-1 to 9-16 show the breakdown of the construction costs and maintenance expenses per year for Scheme I and Scheme II.

Table 9-1 Construction Costs (Scheme 1)

(Unit: pesos)

Item		Construction Cost	Remarks
Basic Construction Cost	Well	23,419,622	
	Transmission	107,911.248	
	Distribution	16,915,067	
	Administration Building	635,000	
	Operational Center	500,000	
Sub-total		149,380,937	
Engineering Fee		11,950,475	
Total		161,331,412	(1)
Contingencies		8,066,571	5% of (1) 161,331,412 x 0.05(2)
Land		1,000,000	(3)
Grand Total		170,397,983	(1)+(2)+(3)

Further breakdown shown in Table 9-3 to 9-6

Table 9-2 Construction Costs (Scheme 2)

(Unit: pesos)

Item		Construction Cost	Remarks
Basic Construction Cost	Well	23,419,622	
	Transmission	129,735,167	
	Distribution	16,915,067	
	Administration Building	635,000	
	Operational Center	500,000	
Sub-total		171,204,856	
Engineering Fee		13,696,388	
Total		184,901,244	(1)
Contingencies		9,245,062	5% of (1) 184,901,244 x 0.05(2)
Land		1,000,000	(3)
Grand-Total		195,146,306	(1)+(2)+(3)

Further breakdown shown in Tables 9-10 to 9-13.

Table 9-3 **CONSTRUCTION COST (1)**

(Unit: pesos)

ITEM	BREAKDOWN	1983				1984				1985			
		LOCAL		FEC	AMOUNT	LOCAL		FEC	AMOUNT	LOCAL		FEC	AMOUNT
		Materials	Labor			Materials	Labor			Materials	Labor		
WELLS	EQUIPMENT	1,159,368	–	565,654	4,083,975	2,318,735	–	12,299,006	19,335,647				
	CIVIL WORKS	961,739	696,267	700,947		1,923,475	1,392,534	1,401,897					
TRANSMISSION	EQUIPMENT	9,004,863	–	19,776,957	43,292,025	18,009,724	–	17,589,087	64,619,223				
	CIVIL WORKS	5,491,154	3,930,526	5,088,525		10,982,309	7,861,053	10,177,050					
DISTRIBUTION	EQUIPMENT	1,260,630	–	1,310,841	5,638,357	2,521,257	–	2,621,681	11,276,710				
	CIVIL WORKS	1,443,422	699,908	923,556		2,886,844	1,399,815	1,847,111					
ADMINISTRATION BUILDING	EQUIPMENT					146,000	–	79,000	635,000				
	CIVIL WORKS					277,000	81,000	52,000					
OPERATIONAL CENTER	EQUIPMENT					84,000	–	153,000	500,000				
	CIVIL WORKS												
VEHICLES	EQUIPMENT												
	CIVIL WORKS												
TOTAL	EQUIPMENT	11,424,861	–	21,653,452	53,014,357	23,079,718	–	32,741,774	96,366,580	0	0	0	0
	CIVIL WORKS	7,896,315	5,326,701	6,713,028		16,217,628	10,813,402	13,514,058		0	0	0	

Table 9-4 CONSTRUCTION COST (2)

(Unit: pesos)

ITEM	BREAKDOWN	1986				1987				1988			
		LOCAL		FEC	AMOUNT	LOCAL		FEC	AMOUNT	LOCAL		FEC	AMOUNT
		Materials	Labor			Materials	Labor			Materials	Labor		
WELLS	EQUIPMENT												
	CIVIL WORKS												
TRANSMISSION	EQUIPMENT												
	CIVIL WORKS												
DISTRIBUTION	EQUIPMENT												
	CIVIL WORKS												
ADMINISTRA-TION BUILDING	EQUIPMENT												
	CIVIL WORKS												
OPERATIONAL CENTER	EQUIPMENT												
	CIVIL WORKS												
VEHICLES	EQUIPMENT												
	CIVIL WORKS												
TOTAL	EQUIPMENT	0	0	0	0	0	0	0	0	0	0	0	0
	CIVIL WORKS	0	0	0		0	0	0		0	0	0	

Table 9-5 **CONSTRUCTION COST (3)**

(Unit: pesos)

ITEM	BREAKDOWN	1989				1990				1997			
		LOCAL		FEC	AMOUNT	LOCAL		FEC	AMOUNT	LOCAL		FEC	AMOUNT
		Materials	Labor			Materials	Labor			Materials	Labor		
WELL	EQUIPMENT												
	CIVIL WORKS												
TRANSMISSION	EQUIPMENT												
	CIVIL WORKS												
DISTRIBUTION	EQUIPMENT												
	CIVIL WORKS												
ADMINISTRATION BUILDING	EQUIPMENT												
	CIVIL WORKS												
OPERATIONAL CENTER	EQUIPMENT												
	CIVIL WORKS												
VEHICLES	EQUIPMENT					64,000	–	66,000	130,000	96,000	–	99,000	195,000
	CIVIL WORKS					–	–	–		–	–	–	
TOTAL	EQUIPMENT	0	0	0		64,000	–	66,000	130,000	96,000	–	99,000	195,000
	CIVIL WORKS	0	0	0		–	–	–		–	–	–	

Table 9-6 **CONSTRUCTION COST (4)**

(Unit: pesos)

ITEM	BREAKDOWN	2000				2004				2005			
		LOCAL		FEC	AMOUNT	LOCAL		FEC	AMOUNT	LOCAL		FEC	AMOUNT
		Materials	Labor			Materials	Labor			Materials	Labor		
WELL	EQUIPMENT	-	-	1,057,100									
	CIVIL WORKS	26,428	26,427	52,855	1,162,810								
TRANSMISSION	EQUIPMENT												
	CIVIL WORKS												
DISTRIBUTION	EQUIPMENT	102,540	-	220,020									
	CIVIL WORKS	59,340	38,220	12,360	432,480								
ADMINISTRA-TION BUILDING	EQUIPMENT												
	CIVIL WORKS												
OPERATIONAL CENTER	EQUIPMENT	84,000	-	153,000									
	CIVIL WORKS	148,000	79,000	36,000	500,000								
VEHICLES	EQUIPMENT					96,000	-	99,000					
	CIVIL WORKS					-	-	-	195,000				
TOTAL	EQUIPMENT	186,540	-	1,430,120		96,000	-	99,000		0	0	0	
	CIVIL WORKS	233,768	143,647	101,215	2,095,290	-	-	-	195,000	0	0	0	

Table 9-7 ADMINSTRATION, OPERATION & MAINTENANCE (1)

(Unit: pesos)

ITEM	BREAKDOWN	1985				1986				1987			
		LOCAL		FEC	AMOUNT	LOCAL		FEC	AMOUNT	LOCAL		FEC	AMOUNT
		Materials	Labor			Materials	Labor			Materials	Labor		
STORED MATERIALS	EQUIPMENT	17,458		63,620	81,078	23,0 0		83,885	106,905	25,857		94,225	120,082
	CIVIL WORKS												
PERSONNEL COST	EQUIPMENT				138,600				184,800				211,200
	CIVIL WORKS		138,600				184,800				211,200		
ELECTRIC ENERGY	EQUIPMENT	2,017,587		520,668	2,538,255	2,388,674		616,431	3,005,105			640,827	3,124,034
	CIVIL WORKS												
CHEMICAL COST	EQUIPMENT	56,546		24,234	80,780	61,607		26,403	88,010	62,860		26,940	89,800
	CIVIL WORKS												
MATERIALS FOR MAINTENANCE AND OTHER EXPENSES	EQUIPMENT	27,576		18,384	45,960	36,360		24,240	60,600	40,842		27,228	68,070
	CIVIL WORKS												
FUEL COST	EQUIPMENT	9,072		13,608	22,680	9,072		13,608	22,680	9,072		13,608	22,680
	CIVIL WORKS												
TOTAL	EQUIPMENT	2,128,239		640,514	2,907,353	2,518,733		764,567	3,468,100	2,621,838		684,363	3,635,866
	CIVIL WORKS		138,600				184,800				211,200		

Table 9-8 ADMINISTRATION, OPERATION & MAINTENANCE (2)

(Unit: pesos)

ITEM	BREAKDOWN	1988				1989				1990			
		LOCAL		FEC	AMOUNT	LOCAL		FEC	AMOUNT	LOCAL		FEC	AMOUNT
		Materials	Labor			Materials	Labor			Materials	Labor		
STORED MATERIALS	EQUIPMENT	28,855		105,146	134,001	34,416		125,412	159,828	37,652		137,206	174,858
	CIVIL WORKS												
PERSONNEL COST	EQUIPMENT				231,000				257,400				283,800
	CIVIL WORKS		231,000				257,400				283,800		
ELECTRIC ENERGY	EQUIPMENT	2,787,904		719,460	3,507,364	3,092,30		798,013	3,890,314	3,134,474		772,896	3,907,370
	CIVIL WORKS												
CHEMICAL COST	EQUIPMENT	64,358		27,582	91,940	68,607		29,403	98,010	69,944		29,976	99,920
	CIVIL WORKS												
MATERIALS FOR MAINTENANCE AND OTHER EXPENSES	EQUIPMENT	45,576		30,384	75,960	54,360			90,600			39,648	99,120
	CIVIL WORKS												
FUEL COST	EQUIPMENT	9,072		13,608	22,680	9,072		13,608	22,680	9,072		13,608	22,680
	CIVIL WORKS												
TOTAL	EQUIPMENT	2,935,765		896,180	4,062,945	3,258,756			4,518,832	3,310,614		993,334	4,587,748
	CIVIL WORKS		231,000				257,400				283,800		

Table 9-9 **ADMINSTRATION, OPERATION & MAINTENANCE (3)**

(Unit: pesos)

ITEM	BREAKDOWN	1995				2000				2005			
		LOCAL		FEC	AMOUNT	LOCAL		FEC	AMOUNT	LOCAL		FEC	AMOUNT
		Materials	Labor			Materials	Labor			Materials	Labor		
STORED MATERIALS	EQUIPMENT	52,410		190,984	243,394	70,339		256,316	326,655	87,673		319,479	407,152
	CIVIL WORKS												
PERSONNEL COST	EQUIPMENT				382,800				475,200				567,600
	CIVIL WORKS		382,800				475,200				567,600		
ELECTRIC ENERGY	EQUIPMENT	3,276,055		845,433	4,121,488	3,439,220		887,541	4,326,761	3,612,496		932,258	4,544,754
	CIVIL WORKS												
CHEMICAL COST	EQUIPMENT	78,351		33,579	111,930	87,920		37,680	125,600	98,063		42,027	140,090
	CIVIL WORKS												
MATERIALS FOR MAINTENANCE AND OTHER EXPENSES	EQUIPMENT	86,562		57,708	144,270	118,134		78,756	196,890	154,638		103,092	257,730
	CIVIL WORKS												
FUEL COST	EQUIPMENT	9,072		13,608	22,680	15,876		23,814	39,690	15,876		23,814	39,690
	CIVIL WORKS												
TOTAL	EQUIPMENT	3,502,450		1,141,312	5,026,562	3,731,489		1,284,107	5,490,796	3,968,746		1,420,670	5,957,016
	CIVIL WORKS		382,800				475,200				567,600		

Table 9-10 **CONSTRUCTION COST (1)**

(Unit: pesos)

ITEM	BREAKDOWN	1983				1984				1985			
		LOCAL		FEC	AMOUNT	LOCAL		FEC	AMOUNT	LOCAL		FEC	AMOUNT
		Materials	Labor			Materials	Labor			Materials	Labor		
WELLS	EQUIPMENT	973,671	–	3,737,574	6,706,681	1,947,342	–	7,475,149	13,413,363				
	CIVIL WORKS	809,525	588,543	597,368		1,619,050	1,177,085	1,194,737					
TRANSMISSION	EQUIPMENT	7,523,257	–	11,308,411	31,010,779	15,046,515	–	22,616,821	62,021,558				
	CIVIL WORKS	4,598,428	3,342,627	4,238,056		9,196,857	6,685,254	8,476,111					
DISTRIBUTION	EQUIPMENT	1,260,630	–	1,310,841	5,638,357	2,521,259	–	2,621,681	11,276,710				
	CIVIL WORKS	1,443,422	699,908	923,556		2,886,844	1,399,815	1,847,111					
ADMINISTRATION BUILDING	EQUIPMENT					146,000	–	79,000	635,000				
	CIVIL WORKS					277,000	81,000	52,000					
OPERATIONAL CENTER	EQUIPMENT					84,000	–	153,000	500,000				
	CIVIL WORKS					148,000	79,000	36,000					
VEHICLES	EQUIPMENT												
	CIVIL WORKS												
TOTAL	EQUIPMENT	9,757,558	–	16,356,826	43,355,817	19,745,116	–	32,945,651	87,846,631	0	0	0	0
	CIVIL WORKS	6,851,375	4,631,078	5,758,980		14,127,751	9,422,154	11,605,959		0	0	0	

Table 9-11 **CONSTRUCTION COST (2)**

(Unit: pesos)

ITEM	BREAKDOWN	1986				1987				1988			
		LOCAL		FEC	AMOUNT	LOCAL		FEC	AMOUNT	LOCAL		FEC	AMOUNT
		Materials	Labor			Materials	Labor			Materials	Labor		
WELLS	EQUIPMENT												
	CIVIL WORKS												
TRANSMISSION	EQUIPMENT												
	CIVIL WORKS												
DISTRIBUTION	EQUIPMENT												
	CIVIL WORKS												
ADMINISTRA-TION BUILDING	EQUIPMENT												
	CIVIL WORKS												
OPERATIONAL CENTER	EQUIPMENT												
	CIVIL WORKS												
VEHICLES	EQUIPMENT												
	CIVIL WORKS												
TOTAL	EQUIPMENT	0	0	0	0	0	0	0	0	0	0	0	0
	CIVIL WORKS	0	0	0		0	0	0		0	0	0	

Table 9-12. **CONSTRUCTION COST (3)**

(Unit: pesos)

ITEM	BREAKDOWN	1989				1990				1997			
		LOCAL		FEC	AMOUNT	LOCAL		FEC	AMOUNT	LOCAL		FEC	AMOUNT
		Materials	Labor			Materials	Labor			Materials	Labor		
WELL	EQUIPMENT	557,088	–										
	CIVIL WORKS		323,178	310,732									
TRANSMISSION	EQUIPMENT	9,865,077	–	11,132,017									
	CIVIL WORKS	5,896,536	4,065,136	5,744,064	36,702,830								
DISTRIBUTION	EQUIPMENT												
	CIVIL WORKS												
ADMINISTRA-TION BUILDING	EQUIPMENT												
	CIVIL WORKS												
OPERATIONAL CENTER	EQUIPMENT												
	CIVIL WORKS												
VEHICLES	EQUIPMENT					64,000	–	66,000	130,000	64,000	–	66,000	130,000
	CIVIL WORKS					–	–	–		–	–	–	
TOTAL	EQUIPMENT	10,422,165	–			64,000	–	66,000	130,000	64,000	–	66,000	130,000
	CIVIL WORKS	6,353,174	4,388,314	6,054,796		–	–	–		–	–	–	

Table 9-13 **CONSTRUCTION COST (4)**

(Unit: pesos)

ITEM	BREAKDOWN	2000				2004				2005			
		LOCAL		FEC	AMOUNT	LOCAL		FEC	AMOUNT	LOCAL		FEC	AMOUNT
		Materials	Labor			Materials	Labor			Materials	Labor		
WELLS	EQUIPMENT	–	–	761,112	951,391								
	CIVIL WORKS	47,570	47,570	95,139									
TRANSMISSION	EQUIPMENT												
	CIVIL WORKS												
DISTRIBUTION	EQUIPMENT	105,333	–	278,806	523,452								
	CIVIL WORKS	72,773	51,919	14,621									
ADMINISTRA-TION BUILDING	EQUIPMENT												
	CIVIL WORKS												
OPERATIONAL CENTER	EQUIPMENT	84,000	–	153,000	500,000								
	CIVIL WORKS	148,000	79,000	36,000									
VEHICLES	EQUIPMENT					96,000	–	99,000	195,000				
	CIVIL WORKS					–	–	–					
TOTAL	EQUIPMENT	189,333	–	1,192,918	1,974,843	96,000	–	99,000	195,000				
	CIVIL WORKS	268,343	178,489	145,760		–	–	–					

Table 9-14 **ADMINISTRATION, OPERATION & MAINTENANCE (1)**

(Unit: pesos)

ITEM	BREAKDOWN	1985				1986				1987			
		LOCAL		FEC	AMOUNT	LOCAL		FEC	AMOUNT	LOCAL		FEC	AMOUNT
		Materials	Labor			Materials	Labor			Materials	Labor		
STORED MATERIALS	EQUIPMENT	17,458		63,620	81,078	23,020		83,885	106,905	25,857		94,225	120,082
	CIVIL WORKS												
PERSONNEL COST	EQUIPMENT								184,800				211,200
	CIVIL WORKS		138,600				184,800				211,200		
ELECTRIC ENERGY	EQUIPMENT	2,470,697		637,599	3,108,296	2,925,788		755,042	3,680,830	3,041,511		784,907	3,826,418
	CIVIL WORKS												
CHEMICAL COST	EQUIPMENT	56,546		24,234	80,780	61,607		26,403	88,010	62,860		26,940	89,800
	CIVIL WORKS												
MATERIALS FOR MAINTENANCE AND OTHER EXPENSES	EQUIPMENT	27,576		18,384	45,960	36,360		24,240	60,600	40,842		27,228	68,070
	CIVIL WORKS												
FUEL COST	EQUIPMENT	9,072		13,608	22,680	9,072		13,608	22,680	9,072		13,608	22,680
	CIVIL WORKS												
TOTAL	EQUIPMENT	2,581,349			3,477,394	3,055,847		903,178	4,143,825	3,180,142		946,908	4,338,250
	CIVIL WORKS		138,600				184,800				211,200		

Table 9-15 ADMINISTRATION, OPERATION & MAINTENANCE (2)

(Unit: pesos)

ITEM	BREAKDOWN	1988				1989				1990			
		LOCAL		FEC	AMOUNT	LOCAL		FEC	AMOUNT	LOCAL		FEC	AMOUNT
		Materials	Labor			Materials	Labor			Materials	Labor		
STORED MATERIALS	EQUIPMENT	28,855		105,146	134,001	34,416		125,412	159,828	37,652		137,206	174,858
	CIVIL WORKS												
PERSONNEL COST	EQUIPMENT				231,000				257,400				283,800
	CIVIL WORKS		231,000				257,400				283,800		
ELECTRIC ENERGY	EQUIPMENT	3,415,295		881,367	4,296,662	3,788,344		977,637	4,765,981	3,828,444		987,985	4,816,429
	CIVIL WORKS												
CHEMICAL COST	EQUIPMENT	64,358		27,582	91,940	68,607		29,403	98,010	69,944		29,976	99,920
	CIVIL WORKS												
MATERIALS FOR MAINTENANCE AND OTHER EXPENSES	EQUIPMENT	45,576		30,384	75,960	54,360		36,240	90,600	59,472		39,648	99,120
	CIVIL WORKS												
FUEL COST	EQUIPMENT	9,072		13,608	22,680	9,072		13,608	22,680	9,072		13,608	22,680
	CIVIL WORKS												
TOTAL	EQUIPMENT	3,563,156		1,058,087	4,852,243	3,954,799		1,182,300	5,394,499	4,004,584		1,208,423	5,496,807
	CIVIL WORKS		231,000				257,400				283,800		

Table 9-16 ADMINISTRATION, OPERATION & MAINTENANCE (3)

(Unit: pesos)

ITEM	BREAKDOWN	1995				2000				2005			
		LOCAL		FEC	AMOUNT	LOCAL		FEC	AMOUNT	LOCAL		FEC	AMOUNT
		Materials	Labor			Materials	Labor			Materials	Labor		
STORED MATERIALS	EQUIPMENT	52,410		190,984	243,394	70,339		256,316	326,655	87,673		319,479	407,152
	CIVIL WORKS												
PERSONNEL COST	EQUIPMENT				382,800				475,200				567,600
	CIVIL WORKS		382,800				475,200				567,600		
ELECTRIC ENERGY	EQUIPMENT	3,961,929		1,022,433	4,984,362	4,116,158		1,062,234	5,178,392	4,279,719		1,104,444	5,384,163
	CIVIL WORKS												
CHEMICAL COST	EQUIPMENT	78,351		33,579	111,930	87,920		37,680	125,600	98,063		42,027	140,090
	CIVIL WORKS												
MATERIALS FOR MAINTENANCE AND OTHER EXPENSES	EQUIPMENT	86,562		57,708	144,270	118,134		78,756	196,890	154,638		103,092	257,730
	CIVIL WORKS												
FUEL COST	EQUIPMENT	9,072		13,608	22,680	15,876		23,814	39,690	15,876		23,814	39,690
	CIVIL WORKS												
TOTAL	EQUIPMENT	4,188,324		1,318,312	5,889,436	4,408,427		1,458,800	6,342,427	4,635,969		1,592,856	6,796,425
	CIVIL WORKS		382,800				475,200				567,600		

CHAPTER 10 FINANCIAL ANALYSIS

Chapter 10 FINANCIAL ANALYSIS

To evaluate the effectiveness of the supply of industrial and domestic water, it is necessary to look in terms of financial viability and contribution to the national economy. In order to determine financial viability, two issues must be addressed.

The first issue is to determine the type of entity m st suitable to perform the supply of water. In this regard, the Philippine national policy on the supply of water and the intention of PASAR which is in charge of fund raising and construction of the water supply facilities must be taken into consideration.

The second issue is to determine the kind of water rate system. The concept which is adopted in this study for a newly constructed system, is basically the same as that of LWUA.

In this chapter, the two above-mentioned issues are resolved and then the financial analysis on the operational entity is performed, using several costs cases estimated on the basis of the plans for facility construction, operation and maintenance of the facilities and the revenues from the sale of water. Moreover, the interest rates used in this study are only assumptions and do not bind all parties concerned.

10-1 Operating Entity

10-1-1 Alternative Future Operating Entities

The following three alternative operating entities are considered the most likely ones to choose from.

Alternative 1 : PASAR management.
PASAR constructs the water supply facilities and maintains them.

Alternative 2 : Public management.
A public entity, such as a water district, purchases the facilities from PASAR and then manages and maintains them.

Alternative 3 : Joint PASAR and Public entity management.
PASAR manages and maintains the facilities relating to the supply of industrial water and the

public entity manages the supply of water for domestic use.

10-1-2 Evaluation of the Three Alternatives

(1) Evaluation of alternative 3

Both the industrial and domestic supplies will use the same water sources and main pipelines. Moreover, the proportions of industrial water and domestic water supply will change year by year because of changing demand for the two kinds of the water. Since the distribution of costs between the two entities will be a difficult problem to resolve alternative 3 is considered too troublesome to be adopted.

(2) Evaluation of alternatives 1 and 2

In general, water resources in the Philippines are regulated as follows:

a. All waters existing in the territory of the Philippines belong to the State (Water Code Art. 3 a).

b. The utilization, exploitation, development, conservation and protection of water resources is subject to the control and regulation of the government through the National Water Resources Council (Water Code Art. 3 d).

c. Between two or more appropriators of water from the same source of supply, the first shall be given priority except in times of emergency when the use of water for domestic and municipal purposes shall have priority over all other uses (Water Code Art. 22).

d. Two active organizations relating to item b. above are the following:

i. Metropolitan Waterworks and Sewerage System (MWSS)

ii. Local Water Utilities Administration (LWUA)

e. The main functions of LWUA are:

i. to control and regulate the Water Districts

ii. to finance the Water Districts

iii. to participate in the determination of water rates in the Water Districts

f. In 1979, 42 percent of the population enjoyed the benefits of government-provided or assisted water service facilities. The government plans to increase the service to 83 percent in 1987.

From the above-mentioned points, it can be seen that in all cases, even that of industrial water, the operating entity is subject to control by the state.

Consequently, alternative 1 is judged to involve too many difficulties to be adopted, leaving only alternative 2 as worthy to be recommended.

There are two other reasons for the recommendation of alternative 2 (Public entity managing and maintaining the facilities).

Firstly, a private entity will have difficulty to collect the water fees from the general public, since distribution is only planned in the feasibility study up to the public faucet, not up to individual house connections.

Secondly, by adopting alternative 2, PASAR and the public entity will enjoy the following benefits.

1. Benefits for PASAR

   a. Released from obligation to supply and manage the industrial and domestic water supplies.

   b. Accordingly, PASAR will be able to make a more reliable plan of amortization of the funds for the construction of the facilities mainly due to a reduction of uncertain factors (e.g. ability to collect water fees for water supplied through public faucets) in estimation of revenues.

c. PASAR will also be released from necessity to expand its public service to meet growth in demand and from an increase of its public obligations.

In alternative 2, PASAR will only have a contractual obligation to construct the facilities and set up the water rate system.

2. Benefits for the newly created public entity

a. It will be released from obligation to construct the facilities.

b. It will be able to expand public service activities in line with national policy by means of expansion of house connections, construction of a sewerage system in the area, and so on.

10-1-3 Range of the Financial Analysis

In case of alternative 2, the public operating entity is expected to develop a plan for installation of house connections in line with the national policy and not stopping with the supply of water through public faucets which is the basis of this feasibility study.

Therefore, the financial analysis should include the installation of house connections.

10-1-4 Amortization of Construction Funds in Alternative 2

For alternative 2, PASAR will have the role to raise the funds and construct the facilities, and then the operating entity will purchase the facilities from PASAR.

Since it seems to be impossible for the operating entity to pay PASAR in one lump sum for the facilities, the operating entity will amortize payment in annual installments over twenty one years.

10-2 Financial Costs

10-2-1 Construction and Replacement Costs

(1) The initial construction costs (to be disbursed in 1983 and 1984) are estimated in 1982 to be ₱170.4 million and replacement costs (to be disbursed from 1985 to 2005) ₱2.6 million. Transmission facility costs will occupy 63 % of the initial construction costs.

(2) The initial construction costs at current prices are estimated to be P198.9 million or 16 % larger than that in 1982 prices.

On the other hand, the replacement costs in current prices will be ₱10.5 million or about four times that in 1982 prices.

Construction costs and replacement costs are summarized in Table 10-1 with breakdowns in Tables 10-2 (in 1982 prices and 10-3 (at current prices).

The escalation rates by facility which are used to estimate values at current prices come from LWUA Methodology Mannual - Water Supply Feasibility Study of 12 Provincial Areas.

Table 10-1 Summary of Construction and Replacement Costs

(Unit: thousand pesos, %)

	Facility	1983, 1984	%	1985~2005 Cumulative Total	%	1983~2005 Cumulative Total	%
1982 Prices	Wells	23,419.8	13.7	1,162.8	44.5	24,582.4	14.2
	Transmission Facilities	107,911.2	53.3			107,911.2	62.4
	Distribution Facilities	16,915.1	9.9	432.5	16.5	17,347.6	10.0
	Administration Bldg.	635.0	0.4			635.0	0.4
	Operational Center	500.0	0.3	500.0	19.1	1,000.0	0.6
	Vehicles			520.0	19.9	520.0	0.3
	Engineering Fees	11,950.5	7.0			11,950.5	6.9
	Contingencies	8,066.6	4.7			8,066.6	4.7
	Land	1,000.0	0.6			1,000	0.6
	Grand Total	170,398.0	100.0	2,615.3	100.0	173,013.3	100.0
Current Prices	Wells	27,699.9	13.9	4,886.9	46.4	32.586.5	15.6
	Transmission Facilities	124,608.2	62.6			124,608.2	59.5
	Distribution Facilities	19,616.1	9.9	1,723.2	16.4	21,339.3	10.2
	Administration Bldg.	751.9	0.4			751.9	0.4
	Operational Center	595.7	0.3	1,999.9	19.0	2,595.6	1.2
	Vehicles			1,916.1	18.2	1,916.1	0.9
	Engineering Fees	14,703.8	7.4			14,703.8	7.0
	Contingencies	9,925.1	5.0			9,925.1	4.7
	Land	1,000.0	0.5			1,000.0	0.5
	Grand Total	198,900.7	100.0	10,526.1	100.0	209,426.8	100.0

Table 10-2 Construction and Replacement Costs by Facilities in 1982 Prices

(Unit: pesos)

Year / Facilities and Others	1983~2005 Cumulative Total	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Wells	24,582.4	4,084.0	19,335.8									
Equipment	17,505.8	1,725.1	14,617.7									
Civil Works	7,076.8	2,338.9	4,717.9									
Transmission Facilities	107,911.2	43,292.9	64,619.2									
Distribution Facilities	17,347.6	5,638.4	11,276.7									
Disinfection Equipment	865.0	144.2	288.3									
Fire Hydrant Equipment	545.2	181.7	363.5									
Others	15,937.4	5,312.5	10,624.9									
Administration Building	635.0		635.0									
Operational Center	1,000.0		500.0									
Equipment	1,000.0		500.0									
Civil Works												
Vehicles	520.0								130.0			
Engineering Fees	11,950.5	5,975.2	5,975.3									
Contingencies	8,066.6		8,066.6									
Land	1,000.0	1,000.0										
Grand Total	173,013.3	59,989.6	110,408.4						130.0			

(cont'd)

Year / Facilities and Others	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Wells												
Equipment							1,162.8					
Civil Works							1,162.8					
Transmission Facilities												
Distribution Facilities							432.5					
Disinfection Equipment							432.5					
Fire Hydrant Equipmet												
Others												
Administration Building												
Operational Center							500.0					
Equipment							500.0					
Civil Works												
Vehicles				195.0							195.0	
Engineering Fees												
Contingencies												
Land												
Grand Total				195.0			2,095.3				195.0	

Table 10-3 Construction and Replacement Costs by Facilities in Current Prices

(Unit: pesos)

Year / Facilities and Others	1983~2005 Cumulative Total	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Wells	32,586.8	4,457.5	23,342.4									
Equipment	24,409.3	1,885.9	17,636.5									
Civil Works	8,177.5	2,571.6	5,605.9									
Transmission Facilities	124,608.2	47,399.3	77,209.9									
Distribution Facilities	21,330.3	6,159.6	13,456.5									
Disinfection Equipment	2,226.0	157.7	345.1									
Fire Hydrant Equipment	638.2	199.6	438.6									
Others	18,475.1	5,802.3	12,672.8									
Administration Building	751.9		751.9									
Operational Center	2,595.6		595.7									
Equipment	2,595.6		595.7									
Civil Works									237.0			
Vehicles	1,916.1											
Engineering Fees	14,703.8	7,351.9	7,351.9									
Contingencies	9,925.1		9,925.1									
Land	1,000.0	1,000.0										
Grand Total	209,426.8	66,368.3	132,532.4						257.0			

Year Facilities and Others	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Wells							4,886.9					
Equipment							4,886.9					
Civil Works												
Transmission Facilities												
Distribution Facilities												
Disinfection Equipment							1,723.2					
Fire Hydrant Equipmet-							1,723.2					
Others												
Administration Building												
Operational Center							1,999.9					
Equipment							1,999.9					
Civil Works												
Vehicles				629.9							1,029.2	
Engineering Fees												
Contingencies												
Land												
Grand Total				629.9			8,610.0				1,029.2	

10-2-2 Maintenance Costs

(1) The maintenance costs are estimated to be P102.7 million in 1982 prices and P374.5 million at current prices. These correspond to 60 % and 179 % of total of construction and replacement costs respectively.

(2) Electric energy cost will occupy more than 80 % of the total maintenance costs both in 1982 prices and at current prices. The future tendency of energy costs will have a great effect on the financial balance.

Maintenance costs are summarized in Table 10-4 and with breakdowns in Table 10-5 (in 1982 prices) and Table 10-6 (at current prices).

Table 10-4 Maintenance Costs - Summary - Cumulative Costs from 1985 to 2005 -

(Unit ₱1000, %)

Cost Items	In 1982 Prices	%	At Current Prices	%
Personnel	7,840.9	7.6	36,065.6	9.6
Electric energy	83,650.2	81.4	299,536.4	80.0
Fuel	629.7	0.6	2,504.0	0.7
Chemical	2,354.2	2.3	7,030.1	1.9
Materials for maintenance	3,098.0	3.0	10,516.0	2.8
Stored material	5,173.5	5.0	18,875.3	5.0
Total	102,746.5	100.0	374,527.4	100.0

Table 10-5 Maintenance Cost - in 1982 Prices -

(Unit: ₱1000)

Cost Items / Sub-Item / Year	Personnel	Electric Energy	Fuel	Chemicals	Materials For Maintenance	Stored Materials	Total
	Labor			Materials	Materials	Materials	
1985	138.6	2,538.3	22.7	80.8	46.0	81.1	2,907.5
86	184.8	3,005.1	22.7	88.0	60.6	106.9	3,468.1
87	211.2	3,124.0	22.7	89.8	68.1	120.1	3,635.8
88	231.0	3,507.4	22.7	91.9	76.0	134.0	4,063.0
89	257.4	3,890.3	22.7	98.1	90.6	159.8	4,518.9
1990	283.8	3,907.4	22.7	99.9	99.1	174.9	4,587.8
91	301.3	3,949.3	22.7	102.2	106.8	186.9	4,669.2
92	319.9	3,991.7	22.7	104.5	115.2	199.7	4,753.7
93	339.6	4,034.5	22.7	106.9	124.2	213.3	4,841.2
94	360.6	4,077.8	22.7	109.4	133.9	227.9	4,932.3
1995	382.8	4,121.5	22.7	111.9	144.3	243.5	5,026.7
96	399.7	4,161.8	22.7	114.5	153.6	258.2	5,110.5
97	417.4	4,202.4	39.7	117.2	163.4	273.9	5,214.0
98	435.8	4,243.5	39.7	119.9	173.9	290.5	5,303.3
99	455.1	4,284.9	39.7	122.7	185.0	308.0	5,395.4
2000	475.2	4,326.8	39.7	125.6	196.9	326.7	5,490.9
1	492.4	4,369.5	39.7	128.4	207.8	341.4	5,579.2
2	510.2	4,412.7	39.7	131.2	219.3	356.8	5,669.9
3	528.7	4,456.3	39.7	134.1	231.4	372.9	5,763.1
4	547.8	4,500.3	39.7	137.1	244.2	389.7	5,858.8
2005	567.6	4,544.8	39.7	140.1	257.7	407.2	5,957.1
1985 ~ 2005 Cumulative Total	7,840.9	83,650.2	629.7	2,354.2	3,098.0	5,173.5	102,746.5

Table 10-6 Maintenance Cost - at Current Prices -

(Unit ₱1000)

Cost Items / Sub-item / Year	Personnel	Electric Energy	Fuel	Chemicals	Materials For Maintenance	Stored Materials	Total
	Labor			Materials	Materials	Materials	
1985	184.5	3,398.8	30.7	104.1	59.4	107.3	3,884.8
86	265.7	4,393.5	33.7	122.2	84.5	153.9	5,053.5
87	332.4	4,935.9	36.9	134.9	102.9	188.1	5,700.1
88	398.2	6,116.9	40.5	148.3	123.3	228.3	7,055.5
89	486.0	7,407.1	44.3	170.7	159.1	296.3	8,563.5
1990	586.6	8,127.4	48.6	187.9	187.3	352.8	9,490.1
91	685.2	8,878.0	52.6	204.7	216.1	404.8	10,441.4
92	800.1	9,703.8	57.0	223.5	249.5	464.7	11,498.6
93	934.2	10,602.7	61.7	244.3	288.0	532.8	12,663.7
94	1,091.2	11,585.0	66.9	267.0	332.5	611.5	13,954.1
1995	1,274.3	12,657.1	72.4	291.9	383.8	701.8	15,381.3
96	1,463.7	13,817.2	78.5	319.1	437.6	799.1	16,915.2
97	1,681.3	15,086.6	148.5	349.1	498.9	910.4	18,674.9
98	1,931.0	16,469.0	160.9	381.8	568.8	1,037.1	20,548.6
99	2,218.2	17,974.4	174.4	417.5	648.2	1,180.9	22,618.6
2000	2,547.5	19,626.9	188.8	456.9	739.6	1,345.4	24,904.6
1	2,903.7	21,428.0	204.5	499.5	836.6	1,510.0	27,382.3
2	3,309.7	23,396.1	221.6	545.8	946.5	1,695.2	30,114.9
3	3,771.7	25,543.5	240.0	596.5	1,070.7	1,902.5	33,124.9
4	4,299.7	27,888.4	259.9	652.3	1,211.7	2,135.6	36,447.6
2005	4,900.7	30,445.6	281.5	713.1	1,371.5	2,396.8	40,109.2
Cumulative Total	36,065.6	299.536.4	2,504.0	7,030.1	10,516.0	18,875.3	374,527.4

10-2-3 Depreciation

Depreciation on the initially constructed facilities and the replaced facilities is based on assumptions as summarized in Table 10-8.

Since the total amount of the initial construction cost and the replacement costs for 23 years between 1983 and 2005 will be ₱294.3 million (book value). The total depreciation for 21 years between 1985 and 2005 will be ₱96.7 million. Thus, 76.2 % of the total investment will be depreciated at the end of year 2005.

Table 10-7 Summary of Depreciation Rates

(1) Depreciation method :

Straight line method

(2) Depreciation period (No. of years)[1/]

Well	equipment	15
	civil work	30
Transmission		50
Distribution		
Disinfection	equipment	15
Hydrant	equipment	30
Others		50
Administration Building		50
Operational Center	equipment	15
	civil work	50
Vehicles		7
Engineering Fee		50[2/]
Contingencies		50[2/]

(3) First year of depreciation

For the initial constructed facilities : 1985

For the replaced facilities :

The year when the facilities are replaced

1/ The same as in the LWUA reports.

2/ The same as for facilities with the longest period of depreciation

Table 10-8 Depreciation; Residual Value

(Unit: ₱1000, in 1982 price)

Year / Facilities and Others	1983~2000 Cumulative Total	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
Wells	21,757.6			969.6	969.6	969.6	969.6	969.6	969.6	969.6	969.6	969.6	969.6
Equipment	16,033.2			697.0	697.0	679.0	697.0	697.0	697.0	697.0	697.0	697.0	697.0
Civil Works	5,724.6			272.6	272.6	272.6	272.6	272.6	272.6	272.6	272.6	272.6	272.6
Transmission Facilities	52,336.2			2,492.2	2,492.2	2,492.2	2,492.2	2,492.2	2,492.2	2,492.2	2,492.2	2,492.2	2,492.2
Distribution Facilities	9,398.7			424.3	424.3	424.3	424.3	424.3	424.3	424.3	424.3	424.3	424.3
Distribution Equipment	1,191.9			33.5	33.5	33.5	33.5	33.5	33.5	33.5	33.5	33.5	33.5
Fire Hydrant Equipment	447.3			21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3
Others	7,759.5			369.5	369.5	369.5	369.5	369.5	369.5	369.5	369.5	369.5	369.5
Administration Building	315.0			15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Operational Center	1,395.3			39.7	39.7	39.7	39.7	39.7	39.7	39.7	39.7	39.7	39.7
Equipment	1,395.3			39.7	39.7	39.7	39.7	39.7	39.7	39.7	39.7	39.7	39.7
Civil Works													
Vehicles	1,180.9								36.7	36.7	36.7	36.7	36.7
Engineering Fees	6,176.1			294.1	294.1	294.1	294.1	294.1	294.1	294.1	294.1	294.1	294.1
Contingencies	4,168.5			198.5	198.5	198.5	198.5	198.5	198.5	198.5	198.5	198.5	198.5
Land													
Total	96,728.5			4,433.4	4,433.4	4,433.4	4,433.4	4,433.4	4,470.1	4,470.1	4,470.1	4,470.1	4,470.1

(Continued)

Facilities and Others \ Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	Cumulative Total of Construction Costs	Depreciated Value in End of Year 2000
Wells	969.6	969.6	969.6	969.6	969.6	1,202.3	1,202.3	1,202.3	1,202.3	1,202.3	1,202.3	32,586.8	10,829.0
Equipment	697.0	697.0	697.0	697.0	697.0	929.7	929.7	929.7	929.7	929.7	929.7	24,409.3	8,376.1
Civil Works	272.6	272.6	272.6	272.6	272.6	272.6	272.6	272.6	272.6	272.6	272.6	8,177.5	2,452.9
Transmission Facilities	2,492.2	2,492.2	2,492.2	2,492.2	2,492.2	2,492.2	2,492.2	2,492.2	2,492.2	2,492.2	2,492.2	124,608.2	72,272.0
Distribution Facilities	424.3	424.3	424.3	424.3	424.3	505.7	505.7	505.7	505.7	505.7	505.7	21,339.3	11,940.6
Distribution Equipment	33.5	33.5	33.5	33.5	33.5	114.9	114.9	114.9	114.9	114.9	114.9	2,226.0	1,034.1
Fire Hydrant Equipment	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	21.3	638.2	190.9
Others	369.5	369.5	369.5	369.5	369.5	369.5	369.5	369.5	369.5	369.5	369.5	18,475.1	10,715.6
Administration Building	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	751.9	436.9
Operational Center	39.7	39.7	39.7	39.7	39.7	133.3	133.3	133.3	133.3	133.3	133.3	2,595.6	1,206.3
Equipment	39.7	39.7	39.7	39.7	39.7	133.3	133.3	133.3	133.3	133.3	133.3	2,595.6	1,206.3
Civil Works													
Vehicles	36.7	36.7	90.0	90.0	90.0	90.0	90.0	90.0	90.0	147.0	147.0	1,916.1	735.2
Engineering Fees	294.1	294.1	294.1	294.1	294.1	294.1	294.1	294.1	294.1	294.1	294.1	14,703.8	8,527.7
Contingencies	198.5	198.5	198.5	198.5	198.5	198.5	198.5	198.5	198.5	198.5	198.5	9,925.1	5,758.7
Land												1,000.0	1,000.0
Total	4,470.1	4,470.1	4,523.4	4,523.4	4,523.4	4,931.1	4,931.1	4,931.1	4,931.1	4,988.1	4,988.1	209,426.8	112,698.3

10-2-4 Amortization Plan for the Initial Construction Funding

(1) Preconditions

(a) The operating entity should assign some internal funds for replacement of the facilities (₱10.5 million at current prices). Funds for initial construction will be raised from foreign sources (the Japaense market) in the amount of ₱198.9 million.

(b) The funds for the initial construction will be divided into two parts as follows according to the financing rate of interest:

Funding Type	Annual Rate of Interest	Amount of Funding (P1000)	
Part 1	3.5 %	139,230.5	(70 %)
Part 2 1/	8.0%	59,670.2	(30 %)
	Total	198,900.7	(100 %)

(c) Financial conditions in detail and method of the amortization

Funding Type	Financial conditions		Method of amortization		
	Annual interest rate (%)	Loan term (years)	Annual amount of amortization	First year of amortization	Time of Repayment
Part 1	3.5	20	Fixed	1985	end of year
Part 2 1/	8.0	20			

1/ When actually raising the funds, the financial conditions will be as follows:

a. Annual interest rate ... around 9 %
b. Term of financing ..... about 10 years

(2) Calculation of annual amortization

The annual amount of amortization was calculated as shown below based on the amounts of funding, the interest rates, and the methods of amortization described above.

Funding Type	Annual amount of amortization (P1000)
Part 1	9,796.4
Part 2	6,077.5
Total	15,873.9

Thus the yearly repayment to PASAR will be ₱15,873,900 for 20 years between 1985 and 2004.

10-3 Expansion Plan for House Connections

The operating entity is expected to develop a plan for installation of house connections in line with the national policy, regardless of the supply of water through public faucets which this feasible study is taking into consideration.

A probable plan of expansion of house connections is outlined below.

10-3-1 Outline of Probable Expansion Plan for House Connections

(1) At present (in 1982), it is estimated that about 10 % of the households in the area have installed house connections. However, in the feasibility study it is assumed that even these houses will replace the existing house connections and install new ones because of the obsolescence of the existing ones.

(2) The expansion schedule is shown below.

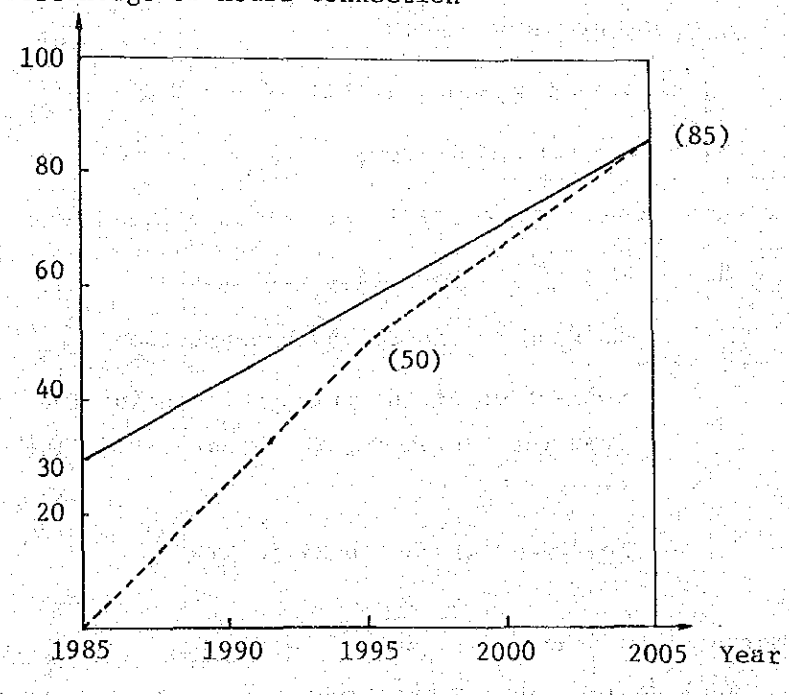


Fig. 10-1 The Expansion Schedule of House Connections

In 1985, the first year of operation, 30 % of households in the poblacions and its neighborhood will have their house connections, and in the year 2005, 80%. Other barangays will have no house connections (because the existing ones are not counted) in 1985, on the other hand, they will have 50% in 1995 and 85 % or as high as the ones in the poblacions and its neighborhood in the year 2005.

The households which have no plan of installing a house connection will receive water supplied through public faucets in the same period.

(3) The above data shows expansion in every year. However, this study will suppose a fifth period of expansion year and raising the funds and completion of the installation in the year before the year of beginning the services through the pipelines.

(4) Conditions for fund raising from LWUA and method of repayment are as follows:

a. Assumed annual interest rate : 9 %

b. Loan term : 30 years

c. Annual amount of amortization : Fixed

d. Roles of the operating entities :

. Raising the funds and construction

. Collection of the charges including the interest from the households which have installed connections.

. Repayment of the funds to LWUA

10-3-2 Numbers of households which want house connections, funds for the construction, and Annual amount of amortization per household

(1) Number of households which want house connections

The number of households to which house connections will be installed every fifth year will be estimated as follows.

Table 10-9 Number of Households which Want House Connections and the Year of Installations in Five-Year Intervals

Year of Installation	No. of Households
1984	1,322
1989	1,772
1994	1,505
1999	1,831
2004	2,028

Table 10-10 No. of Households Served By House Connections and Public Faucets

Year	Total	Water Supply Through House Connections			Water Supply Through Faucet		
		Sub-Total	Poblacion and its neighbor-hood	Other Barangays	Sub-Total	Poblacion and its neighbor-hood	Other Barangays
1980	4,167						
1981							
1982							
1983	5,260						
1984	5,975						
1985	6,146	1,322	1,322		4,824	3,083	1,741
1986	,129	1,810	1,716	94	5,319	3,525	1,794
1987	7,159	2,059	1,870	189	5,100	3,399	1,701
1988	7,222	2,322	2,037	285	9,900	3,288	1,612
1989	7,874	2,810	2,411	399	5,064	3,469	1,595
1990	7,929	3,094	2,594	500	4,835	3,334	1,501
1991							
1992							
1993							
1994							
1995	8,264	9,599	3,575	1,024	3,655	2,642	1,023
1996							
1997							
1998							
1999							
2000	9,140	6,430	4,940	1,490	2,710	1,993	717
2001							
2002							
2003							
2004							
2005	9,950	8,458	6,446	2,012	1,492	1,137	355

(2) Funds for the construction

Construction cost of a house connection is estimated to be ₱633 in 1982, and the cost at current prices after 1985 is estimated as follows.

Year of installation	Construction cost per house connection
	(Unit : Pesos, at current prices)
(1982)	(633)
1984	762
1989	1,162
1994	1,673
1999	2,380
2004	4,485

Using the above unit cost and number of households which want house connections for every 5-year period, the funds needed for the construction are estimated as follows.

Table 10-11 Funds Required for Construction

(Unit ₱1000)

Year of installation	At current prices	In 1982 prices
1984	1,007.4	837
1989	2,059.1	1,122
1994	2,517.9	953
1999	4,357.8	1,159
2004	6,864.8	1,284

(3) Annual amortization per household

Based on the conditions of funds raised, and according to the repayment method, the annual amount of amortization per household is estimated as follows.

Table 10-12 Annual Amount of Amortization Per Household

(Unit ₱/year, at current prices)

Year of installation	Annual amount of amortization per household
1984	74.1
1989	113.1
1994	162.9
1999	231.7
2004	329.5

Table 10-13 Amortization of Construction Cost of House Connection Network

(Unit: ₱1000 current prices)

Construction Period (Year)	1984		1989		1994		1999		2004		Total	
	Balance	Interest	Balance	Interest	Balance	Interest	Balance	Interest	Balance	Interest	Balance	Interest
Amount of Loan	1,007.4		2,059.1		2,517.9		4,357.8		6,864.8		16,807.0	
Year	98.0		200.4		245.1		424.2		668.2		1,635.9	
1985	999.7	90.6									999.7	90.6
1986	991.7	90.0									991.7	90.0
1987	983.0	89.3									983.0	89.3
1988	973.4	88.5									973.4	88.5
1989	963.0	87.6									963.0	87.6
1990	951.7	86.7	2,044.0	185.3							2,995.7	272.0
1991	939.4	85.7	2,027.6	184.0							2,967.0	269.7
1992	925.9	84.5	2,009.7	182.5							2,935.6	267.0
1993	911.3	83.3	1,990.1	180.9							2,901.4	264.2
1994	895.3	82.0	1,968.8	179.1							2,869.1	261.1
1995	877.8	80.6	1,945.6	177.2	2,499.4	226.6					5,322.8	484.4
1996	858.8	79.0	1,920.3	175.1	2,479.3	224.9					5,258.4	479.0
1997	838.1	77.3	1,892.8	172.8	2,457.3	223.1					5,188.2	473.2
1998	815.6	75.4	1,862.7	170.4	2,433.3	221.2					5,111.6	467.0
1999	791.0	73.4	1,830.0	167.0	2,407.2	219.0					5,028.2	460.0
2000	764.2	71.2	1,794.3	164.7	2,378.8	216.6	4,325.8	392.2			9,263.1	844.7
2001	734.9	68.8	1,755.4	161.5	2,347.8	214.1	4,390.9	389.3			9,229.0	833.7
2002	703.1	66.1	1,712.9	158.0	2,314.0	211.3	4,252.9	395.2			8,982.9	830.6
2003	668.4	63.3	1,666.7	154.2	2,277.2	208.3	4,211.5	382.8			8,823.8	808.6
2004	630.5	60.2	1,516.3	150.0	2,237.0	204.9	4,166.3	379.0			8,650.1	794.1
2005	589.3	56.7	1,561.4	145.5	2,193.2	201.3	4,117.1	37 0	6,814.4	617.8	15,275.4	1,396.3

10-4 Water Rate System of Industrial and Domestic Water Supply

10-4-1 Basic Policy on Water Unit Price and Water Rate

(1) Basic criteria which are taken into account for determination of water unit price and water rate.

(a) Efficiency : The water must be efficiently used, avoiding abuse.

(b) Equality : The users must pay for water corresponding to the quantities used.

(c) Partial profit-making : The water supply costs of industrial water and commercially used water can be recovered through the sales of the final products or services, so these kinds of water are classified as profit-making water although water supply is essential to life and essentially a non-profit-making business.

(d) Redistribution of income : Users who have ample ability to pay have to bear a relatively larger part of the production cost of water than those of users who are unable to bear such costs. Through this process, redistribution of income which is one of the most important national policies in developing countries, can be aided.

(e) Balance between operating revenues and expenses: It is desirable to maintain a balance between the operating revenues and expenses. This is also a Philippine national

policy. When considering the maintenance of such a balance, funds for the future expansion of the business must be taken into account.

(f) User's Ability to Pay the Water Fee : The water rate must be within the limits of users to pay, especially of the users in the area. Extension of water supply which is a Philippine national policy will be promoted with the water rate where the people's ability to pay is taken into account.

(2) The water rate system in this study

The water rate system based on the criteria described above is proposed as follows:

(a) As to the water supply, a gradual increase in water unit price corresponding to the level of the quantity used should be introduced to avoid abuse of water by users.

(b) Introduction of a meter rate system to maintain equality between users.

(c) Unit water rates should be set based on the ability to pay the production cost of water. In other words, the unit price for industrial water should be set higher than that of domestic water supply.

Of course, the revenues which are calculated according to the above water rate system must also maintain equilibrium between the operating revenues and the expenses of the operating entity.

10-4-2 Estimation of Industrial and Domestic Water Supply Unit Prices

The method of estimating the unit prices of industrial water and domestic water supply which the new operating entity will supply

are as follows:

A. The unit prices of industrial and domestic water supply in the first phase

For the unit prices during the first phase, all criteria except ability to pay the water rate are taken into consideration. The ability to pay is considered, during the final phase of setting of the unit prices.

(1) Quantity used per month and per household

The quantity used per month and per household during the operating period considered in this study is estimated as shown in Table 10-16.

Distribution method	Quantity (m^3)
House connection	17.84 ∿ 24.05
Public faucet	14.61 ∿ 18.11

The water quantity used would be classified as "Normal Use" in the LWUA report.

(2) The total water quantity for collecting water fees

The total water quantity for collecting water fees for twenty-one years are estimated as follows.

Total water quantity used for 21 years

	Q'ty (1000 tons)	%
Industrial Water	187,698.6	80.5
Domestic Water	45,568.4	19.5
through House connection	30,494.5	13.1
through Public faucet	15,073.9	6.4
Total	233,267.0	100.0

Table 10-16 The Water Quantity Used Per Month Per Household

(Unit: m^3)

Year	Quantity used Through House connection	Quantity used Through Public faucet
1985	17.84	14.61
1986	18.27	14.75
1987	18.74	15.05
1988	19.09	15.35
1989	19.58	15.66
1990	20.07	15.83
1995	22.31	17.24
2000	23.18	17.68
2005	24.05	18.11

Table 10-17 The Total Annual Water Demand
(Base for Collecting Water Fees)

(Unit: 1000 ton/annual)

Year	Industrial Water			Domestic and Commercial Water Supply					Total
					House Connection				
		PASAR	Others			Domestic Water	Commercial Water	Domestic Water	
1985	5,971.4	2,387.1	2,584.3	1,202.8	345.1	296.9	58.2	857.7	7,174.2
1986	7,048.2	2,182.8	3,865.4	1,434.5	980.9	403.1	77.1	953.6	8,482.7
1987	7,325.6	3,182.8	4,142.8	1,489.5	565.7	469.7	86.0	933.6	8,814.9
1988	8,398.7	3,383.6	5,015.3	1,552.9	637.9	539.8	98.1	915.0	9,951.6
1989	9,274.7	4,179.3	5,095.4	1,749.4	784.6	669.2	115.4	964.8	11,024.1
1990	9,355.0	4,179.3	5,175.7	1,818.2	879.4	750.0	123.4	938.8	11,173.2
1991	9,355.0	4,179.3	5,175.7	1,873.1	974.3	839.1	135.2	898.8	11,228.1
1992	9,355.0	4,179.3	5,175.7	1,933.5	1,073.0	931.2	141.8	960.5	11,288.5
1993	9,355.0	4,179.3	5,175.7	2,005.8	1,175.0	1,026.4	148.6	830.8	11,360.8
1994	9,355.0	4,179.3	5,176.7	2,082.1	1,286.7	1,131.4	155.3	795.4	11,437.1
1995	9,355.0	4,179.3	5,175.7	2,177.0	1,409.0	1,247.0	162.0	768.0	11,532.0
1996	9,355.0	4,179.3	5,175.7	2,244.9	1,515.8	1,342.6	173.2	729.1	11,599.9
1997	9,355.0	4,179.3	5,175.7	2,317.1	1,630.7	1,445.9	185.3	685.4	11,672.1
1998	9,355.0	4,179.3	5,175.7	2,396.0	1,744.4	1,556.1	188.3	651.6	11,751.0
1999	9,355.0	4,179.3	5,175.7	2,500.6	1,117.2	1,685.7	201.4	613.4	11,855.6
2000	9,355.0	4,179.3	5,175.7	2,601.0	2,018.7	1,814.5	204.1	582.3	11,956.0
2001	9,355.0	4,179.3	5,175.7	2,665.3	2,144.2	1,928.6	215.6	521.1	12,020.3
2002	9,355.0	4,179.3	5,175.7	2,740.2	2,277.6	2,049.8	227.8	462.6	12,095.2
2003	9,355.0	4,179.3	5,175.7	2,919.7	2,405.7	2,178.5	227.2	414.0	12,174.7
2004	9,355.0	4,179.3	5,175.7	2,922.6	2,555.1	2,315.1	240.0	367.5	12,277.6
2005	9,335.0	4,179.3	5,175.7	3,042.7	2,713.8	2,475.2	238.6	328.9	12,397.7
1985 ∿ 2005 Cumulative Total	187,698.6	83,184.4	104,514.2	45,568.4	30,494.5	27,091.3	3,403.2	15,073.9	233,367.0

(3) Allocation of construction cost of the common facilities between industrial and domestic water supply

(a) The quantity of industrial water accounts for 80 % of total demand and a large-scale facility will be needed to handle it.

(b) A profit can be made on the industrial water.

(c) We must consider the redistribution of income

Judging from the above reasons, it is desirable that all of the construction cost of the common facilities will be allocated to the industrial water.

(4) Allocation of other costs

(a) The following facilities are peculiar to the water supply, therefore, all construction costs must be charged to the water supply.

(Unit P1000, in 1982 price)

	Facility use charge for 21 years	Interest for 21 years (in 1982 prices)	Total
Public Faucet	60.4	34.2	94.6
Disinfection	605.5	205.9	811.4
Hydrant	497.2	195.3	692.5

(b) Considering the type of maintenance costs, their allocation between the industrial and domestic water supply and between the water through the house connection and through the public faucet is as follows.

Type of Maintenance Cost	Allocation between Industrial and Domestic Water supply	Allocation between Water through House Connections and Public Faucet
Personnel	All cost to Domestic supply	Allocation by ratio 2/
Electric Energy	Allocation by ratio 1/	Ditto
Fuel	All cost to Domestic Water supply	Ditto
Chemical	Ditto	Ditto
Materials for maintenance	20 % to Industrial Water 80 % to Domestic Water supply	80 % to Water through House Connection 20 % to Public Faucet
Stored Materials	Ditto	Ditto

1/ Ratio: The quantity of industrial or domestic water supply used for 21 years ÷ Total quantity of industrial and domestic water supply used for 21 years.

2/ Ratio: The quantity of water through house connection or public faucet used for 21 years ÷ The total quantity of water through house connection and public faucet for 21 years.

(5) Summary of the allocation of costs by kind of water

Table 10-18 Breakdown of Construction, Replacement and Maintenance Costs for Different

(Unit: ₱1000, in 1982 price)

	Cost Items	Industrial Water	Domestic Water		
				House Connection	Public Faucet
Construction and Replacement Costs	Common Facilities	141,741.3			
	Public Faucet		94.5		94.5
	Distribution Facilities		811.4	542.8	268.6
	Fire Hydrant		692.5	462.3	229.2
Maintenance Costs	Personnel		7,840.9	5,245.6	2,595.3
	Electric Energy	67,338.4	16,311.8	10,912.6	5,399.2
	Fuel Cost		629.7	421.3	208.4
	Chemicals		2,354.2	1,575.0	779.2
	Materials for Maintenance	619.6	2,478.4	1,982.7	495.7
	Stored Materials	1,034.7	4,138.8	3,311.0	827.8
Total		210,734.0	35,352.3	25,454.3	10,898.0

(6) Unit water prices in the first phase

Unit water prices in the first phase which are calculated on the basis of costs described above,are, are as follows.

(Unit ₱/m^3, in 1982 prices)

	Unit Price
Average	1.055
Industrial Water	1.123
Average Domestic Water Supply	0.776
Through House Connection	0.802
Through Public Faucet	0.723

B. Unit water prices at current prices

(1) The above unit prices are expressed in terms of constant prices in 1982. However; in terms of the ability of users to pay, nominal unit prices (that is, unit prices at current prices) need to be estimated on the basis of the above unit prices. Since the purpose of estimating nominal prices is only to check the ability of users to pay and not for the purpose of maintaining a balance between the operating revenues and the expenses, the escalation rate of electric energy forecast by LWUF was used.

(2) Nominal unit prices will be revised every three years, if at all.

Table 10-19 Nominal Unit Prices

(Unit: ₱/m^3)

Item / Year	Industrial water unit price	Domestic Water unit price through house connection	Domestic Water unit price through public faucet	Escalation Index
1982	1.123	0.802	0.723	1.000
1895 ∿ 1937	1.504	1.074	0.968	1.339 *
2003 ∿ 2005	6.437	4.567	4.144	5.732**

* 1985
** 2003

C. Evaluation of user's ability to pay the water rate

(1) Industrial water

PASAR has estimated the industrial unit water price at 1.2 ∿ 1.5 pesos per cubic meter and has indicated that P1.0 ∿ 5.0 m^3 should be suitable for this analyses.

The above nominal industrial water unit price in 1982 and in 1985 ∿ 1987 will be in the range which PASAR has indicated is desirable.

(2) Domestic water supply

Assuming that the user's ability to pay the water rate is 1 % of their household income, the limit of user's ability to pay is estimated as follows:

Table 10-20 User's Ability to pay the Water Rate in Marida and Isabel Areas

(Unit: ₱/household, at current prices)

	1975	1980	1985	1990	2000	2005
Merida	61	142	275	507	1,748	3,216
Isabel	68	159	308	565	1,936	3,582

The domestic water rates which is calculated on the of the unit water price described in Table 10-19 are as follows.

	Annual water rate per household (₱/yr.)	(A) User's ability to pay limit (%)
1985	230	84
2005	1,378	41

Thus, the water rate both in 1985 and in 2005 will be within the user's ability to pay.

D. The final industrial water and domestic water supply unit prices

As shown in para. C above, the nominal unit water prices

estimated with the real ones and forecast escalation rate of electric energy should be within the limits of user's ability to pay.

The final unit water prices at current prices to be used for evaluating the balance between operating revenues and expenses of the operating entity in addition to the user's ability to pay the domestic water fee are estimated as follows:

During the first three years of operation from 1985 to 1987, the industrial water unit price will be ₱1.5/m^3 and the domestic water unit price around ₱1.0/m^3 which seem to be relatively low. However, during the next ten years from 1988 to 1991, the operating entity will have to raise the unit water prices by 10 % each year due to the large amount of interest on the outside loans which cover the initial construction of the facilities and the initial shortage of the operating funds. Fortunately, after the year 2000, the burden of interest will be reduced and operation will be possible with relatively low increases in the unit water prices.

Table 10-21 The Final Unit Water Prices at Current Prices

(Unit: ₱/m^3, at current prices)

Item / Year	Industrial Water Unit Price	Average Domestic Water Supply Unit Price	Domestic Water Unit Price Through House Connection	Domestic Water Unit Price Through House Connection	Growth Index (% Annual Growth Rate)
1982	1.123	0.776	0.802	0.723	1.0
1983~1987	1.504	1.039	1.074	0.968	1.339 (10.2)
1988~1990	2.001	1.383	1.429	1.288	1.782 (10.0)
1991~1993	2.664	1.841	1.902	1.715	2.372 (10.0)
1994~1996	3.545	2.450	2.532	2.283	3.157 (10.0)
1997~1999	4.719	3.261	3.370	3.038	4.202 (10.0)
2000~2002	5.780	3.994	4.128	3.721	5.147 (7.0)
2003~2005	5.780	3.994	4.128	3.221	5.147 (0.0)

10-5 Revenues from Industrial and Domestic Water Supply Rates

The operating entity will receive income from the users in the area to cover the annual repayment of construction cost of house connections to the government. Thus, it is better not to include the funds for annual repayment in the revenues of the operating entity.

The Revenues of the operating entity are estimated as follows.

(1) The revenues will amount to ₱10.2 million in 1985, ₱38.5 million in 1995 (ie, the average annual growth rate between 1985 and 1995 ; 14.2 %) and ₱66.5 million in 2005 (5.6 %).

(2) The revenue percentage by kind of water is forecast as follows.

(Unit: Percent)

Year	Composition of Water Revenue		
	Industrial Water revenue	Domestic Water revenue	Commercial Water revenue
1985	88.2	11.2	0.6
1990	88.4	10.8	0.8
1995	86.2	12.8	1.1
2000	83.7	15.0	1.3
2005	81.3	17.2	1.5

Industrial water revenue will produce more than 80 % of the total revenues; however, the percentage of revenue from water for domestic living will increase significantly with time.

Table 10-22 Expected Revenues From Industrial and Domestic Water

(UnitP P1000, current price)

Year	Expected Revenues From Industrial and Domestic Water						Remarks
		Insutrial Water	Domestic Water				Amortization of Construction Costs of House Connection Network
				House Connection	Public Faucet	Commercial Water	
1985	10,181.9	8,981.0	1,138.4	308.1	830.3	62.5	98.5
1986	12,039.9	10,600.5	1,356.0	432.8	923.1	83.4	98.0
1987	12,518.3	11,017.7	1,408.2	504.5	903.7	92.4	98.0
1988	18,895.9	16,805.8	1,949.9	771.4	1,178.5	140.2	98.0
1989	20,922.6	18,558.7	2,199.0	956.3	1,242.7	164.9	98.0
1990	21,185.2	18,719.4	2,289.5	1,080.3	1,209.2	176.3	298.4
1991	26,316.3	24,921.7	3,137.4	1,596.0	1,541.4	257.2	298.4
1992	28,438.3	24,921.7	3,246.9	1,771.1	1,475.8	269.7	298.4
1993	28,581.3	24,921.7	3,377.0	1,952.2	1,424.8	282.6	298.4
1994	38,237.3	33,163.5	4,680.6	2,864.7	1,815.9	393.2	298.4
1995	38,484.4	33,163.5	4,910.7	3,157.4	1,753.3	410.2	543.5
1996	38,666.0	33,163.5	5,064.0	3,399.5	1,664.5	438.5	543.5
1997	51,727.0	44,146.2	6,956.3	4,871.0	2,085.3	624.5	543.5
1998	52,004.5	44,146.2	7,223.7	5,244.1	1,979.6	634.6	543.5
1999	52,369.2	44,146.2	7,544.3	5,680.8	1,163.5	678.7	543.5
2000	64,571.4	54,071.9	9,657.0	7,490.3	2,166.7	842.5	967.7
2001	64,862.2	54,071.9	8,900.3	7,961.3	1,939.0	890.0	967.7
2002	65,195.2	54,071.9	10,182.9	8,461.6	1,721.3	940.4	967.7
2003	65,543.1	54,071.9	10,533.3	8,992.8	1,540.5	937.9	967.7
2004	65,986.8	54,071.9	10,924.2	9,556.7	1,367.5	990.7	967.7
2005	66,498.2	54,071.9	11,441.4	10,217.6	1,223.8	984.9	1,635.9