6. Design Criteria, Alternative Plans and Preliminary Design

6.1 Design Criteria

Design criteria to be used for the present feasibility study are detailed in Appendix 6 Design Criteria for Planning.

6.2 Alternative Plans

To realize a most appropriate water supply system, economical in cost and reliable and easy in operation, some alternative plans of the water supply system to be constructed are discussed as follows.

(1) Composition of the Water Supply System

The poblacion of Tagbilaran is situated along the sea coast, and future development in the builtup areas is deemed to take place along the sea coast to north and southeast. The existing water supply system is in the poblacion and its adjoining areas, and the existing deep wells are rather clustered in the poblacion and its close vicinity, as shown in Fig 3.6.1. From this overall picture of the project area, two basic plans of the future water supply system can be conceived, namely, one, single water supply system which covers the whole served area of the Water District, and two, plural water supply systems which have individually a served area. These two basic plans are compared in the following.

1) Single Water Supply System for the Whole District

This conceptual water supply system may have a distribution network covering the whole served area with plural charging sources into the network. The charging sources may be deep wells, or reservoirs according to the location.

Major intent of this system is to make possible centralized control of water production and distribution, and make convenient water distribution in case of disruption of any charging sources.

This system would not function so well as intended, unless all the facilities are equipped with sophisticated instruments for measuring, communicating and controlling, and besides it requires trunk mains with larger diameters to transmit water to distant areas in case of emergency.

A system of this type, accordingly, requires more construction cost for the piping work and instrumentation, and operation of the facilities is not necessarily easy requiring higher skill and technology.

2) Plural Water Supply Systems

A most characteristic feature of the Water District is that groundwater is available everywhere, though the available quantity is limited. From this availability of water source, it is possible to establish independent water supply systems, each having a limited served area with a deep well water source, in many numbers all over the project area. This idea is an extreme case. In reality, plural numbers of such water supply system would always be grouped into several water supply systems, so as to suit the requirement of the location.

In the Water District, a few water supply systems have spontaneously emerged, or have been constructed. In the poblacion area, a water supply system which has a number of deep wells and a distribution network has been built as a Level III system, and in isolated densely-populated areas Level II systems have been provided.

A unit of water supply system, defined here as a water supply system which has a single water source/plural water sources and a served area, is usually determined by natural conditions of the area concerned, such as topography, location of supply sources and area to be served. In the District, two units of water supply system are considered natural and proper, as shown in Figs 3.6.2 and 3.6.4.

If this type of water supply system should be adopted, actually it is adopted in the present planning, most important is the device to cope with emergency, such as a case one system is put out of service due to unforeseable causes. In this planning, due consideration for such emergency will be made so as to assure continuous supply of water by linking the served areas with connecting pipelines.

6.3 Preliminary Design

Preliminary designs necessary for the feasibility study of the project are prepared, as detailed in the following, in accordance with the design criteria and the basic idea, both described in the foregoing subsections.

As for the constitution of the water supply system discussed in the above subsection, its application to the design of the water supply system of the District is further elaborated as below.

1) Grouping of Deep Wells and Served Area (Ref. Figs 3.6.2 and 3.6.4)

Group I --- Wells Nos. 1, 2, 3, and 4

All wells are existing and reservoir is also existing. Its served area cover the poblacion. No. 3 well of this Group delivers water directly into the distribution network.

The supply of this served area is being and to be strengthend by Groups II and III.

Group II --- Wells Nos. 7, 8 and 9

All wells are existent; a reservoir will be newly constructed by the project. This Group source serves mainly the developing area north of and adjoining the poblacion, and part of the production will be delivered to the poblacion.

Group III --- Wells Nos. 5, 10 and 11

Well No. 5 is existent; No. 10 is under construction and No. 11 will be sunk by this project. A new reservoir will also be constructed by the project. This Group source serves mainly the developing area east of and adjoining the poblacion, and part of the production will be delivered to the poblacion.

Group IV --- Well No. 12

The well and a reservoir will be constructed by the present project. This source will serve the far northern part of the District.

2) Composition of Network

The served area of the District will be in principle divided into two served areas according to the location of source Groups and areas to be served, namely, 1) the area consisting of the poblacion, and its adjoining areas to be served by Groups I, II and III, and 2) the area to be covered by Group IV, as shown in Figs 3.6.2 and 3.6.4. Networks of the distribution system will be composed accordingly.

In the present preliminary design, major pipelines despite the above division of the served area, will be calculated and designed in accordance with 1) Grouping of Deep Wells and Served Area considering each barrangay water demand (See Fig 3.6.5) for convenience of calculation.

Water source and network corresponding thereto are as follows:

a. Poblacion Area

Supply source	:	Group I and partial production of Groups II and III
Network	:	Within the poblacion area

b. Area North of the Poblacion

Supply source	:	Group II
Network	:	Within the area north of and adjoining the poblacion

c. Area East of the Poblacion

Supply source : Group III

Network : Within the area east of and adjoining the poblacion

d. Area in the North of the District

Supply source : Group IV

Network : Within the area as titled above

Major works for each Group are described in the following pages, and schematic diagrams of proposed water supply system for Phase I and Phase II are shown in Fig 3.6.7 and Fig 3.6.8 respectively. Further proposed water supply system of Phase I is shown in Fig 3.6.6.

Note:

Two alternatives are considered for the distribution system. One is the combination of a reservoir and an elevated tank, that is double pumping system. The other is a bigger elevated tank or single pumping system. As the result of the cost comparison, the former was adopted for Group II and Group III, the latter was taken for Group IV.

Tagbilaran

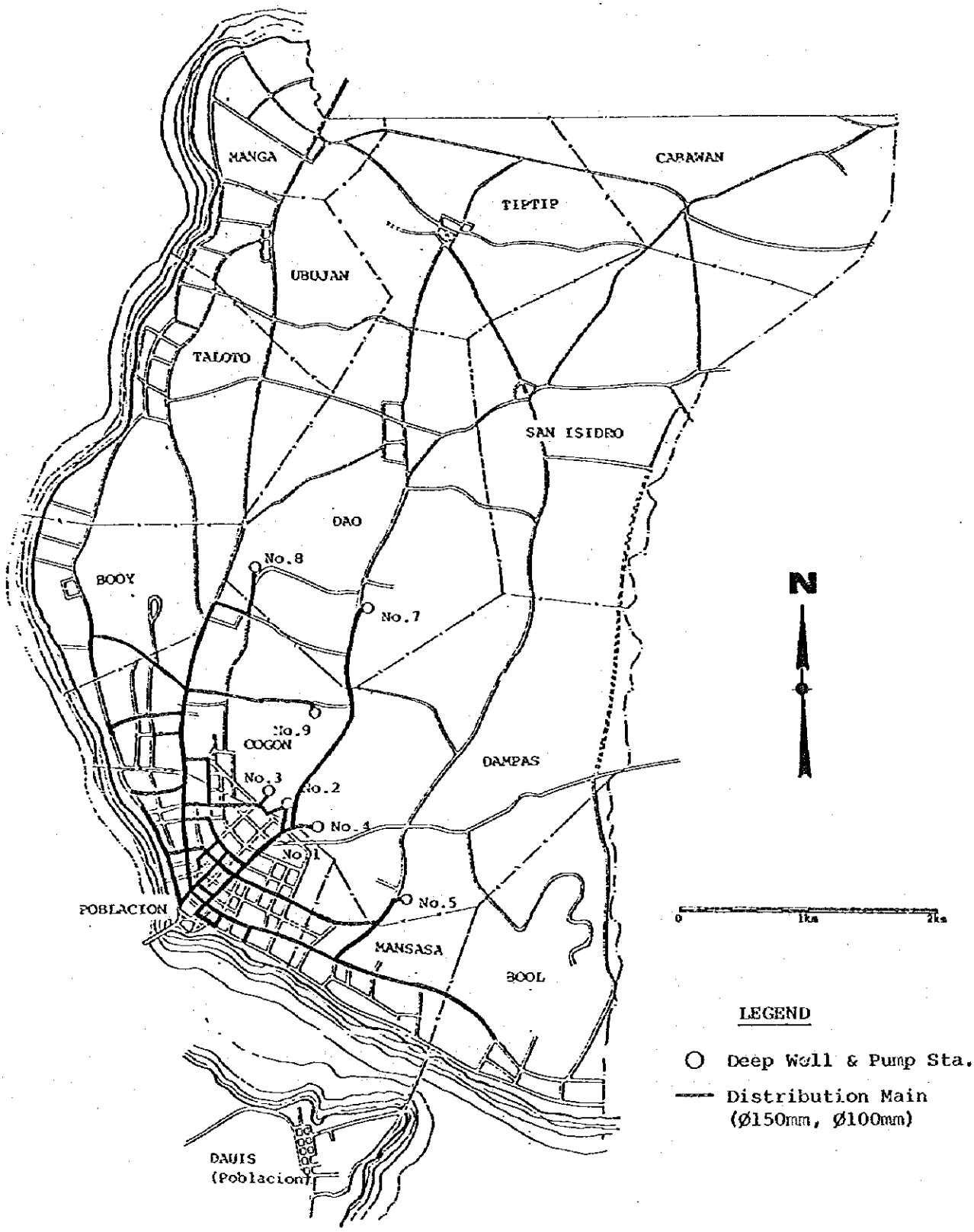


Fig 3.6.1 Present Water Supply System

Table 3.6.1 Facilities to be Constructed (Phase I & Phase II)

	Phase I		Phase II	
	Work Item	Description	Work Item	Description
Group I Works	1) Distribution	Ø250 mm, L=1000 m Ø150 mm, L=9600 m Ø100 mm, L=5300 m	1) Distribution	Ø200 mm, L=750 m
Group II Works	1) Transmission 2) Ground Reservoir 3) Pump Station 4) Elevated Tank 5) Distribution 6) Pump for No. 8 Well	Ø200 mm, L=3,100 m 1,350 m^3, HWL 45 m 62.9 l/s, H=30 m 100 m^3, HWL 65 m Ø250 mm, L=2500 m 14.5 l/s, H=70 m		
Group III Works			1) Deep Well 2) Deep Well Pump Station 3) Transmission 4) Ground Reservoir 5) Pump Station 6) Elevated Tank 7) Distribution	Ø250 mm x 60 m 14.5 l/s, 29 kW Ø200 mm, L=1900 m 800 m^3, HWL 48 m 39.1 l/s, H=30 m 100 m^3, HWL 65 m Ø200 mm, L=1750 m

(To be continued)

	Phase I		Phase II	
	Work Item	Description	Work Item	Description
Group IV Works			1) Deep Well	Ø250 mm x 50 m
			2) Deep Well Pump Station	11.6 l/s, 29 kW
			3) Transmission	Ø150 mm, L=100 m
			4) Elevated Tank	350 m^3, HWL 65 m
			5) Distribution	Ø150 mm, L=3500 m
				Ø100 mm, L=16000 m
Meters, Valves and Other Appurtenances	1) Water Meter	Ø13 mm, 1813 pcs.	1) Water Meter & Connection	Ø13 mm, 3900 pcs.
	2) Water Meter	Ø13 mm, 2057 pcs.	2) Bulk Meter	Ø200 mm, 6 pcs.
	3) Bulk Meter	Ø250 mm, 3 pcs.	3) Chlorinator	2 pcs.
		Ø200 mm, 3 pcs.		
		Ø150 mm, 7 pcs.		
	4) Chlorinator	2 pcs.	4) Fire Hydrant	50 pcs.
	5) Fire Hydrant	77 pcs.	5) Valve	Ø200 mm, 10 pcs.
				Ø150 mm, 12 pcs.
				Ø100 mm, 53 pcs.
				Ø50 mm, 130 pcs.
	6) Valve	Ø250 mm, 12 pcs.	6) Service Pipe	Ø50 mm, L=39000 m
		Ø200 mm, 3 pcs.		
		Ø150 mm, 32 pcs.		
		Ø100 mm, 18 pcs.		
	7) Pressure Gauge	10 pcs.		

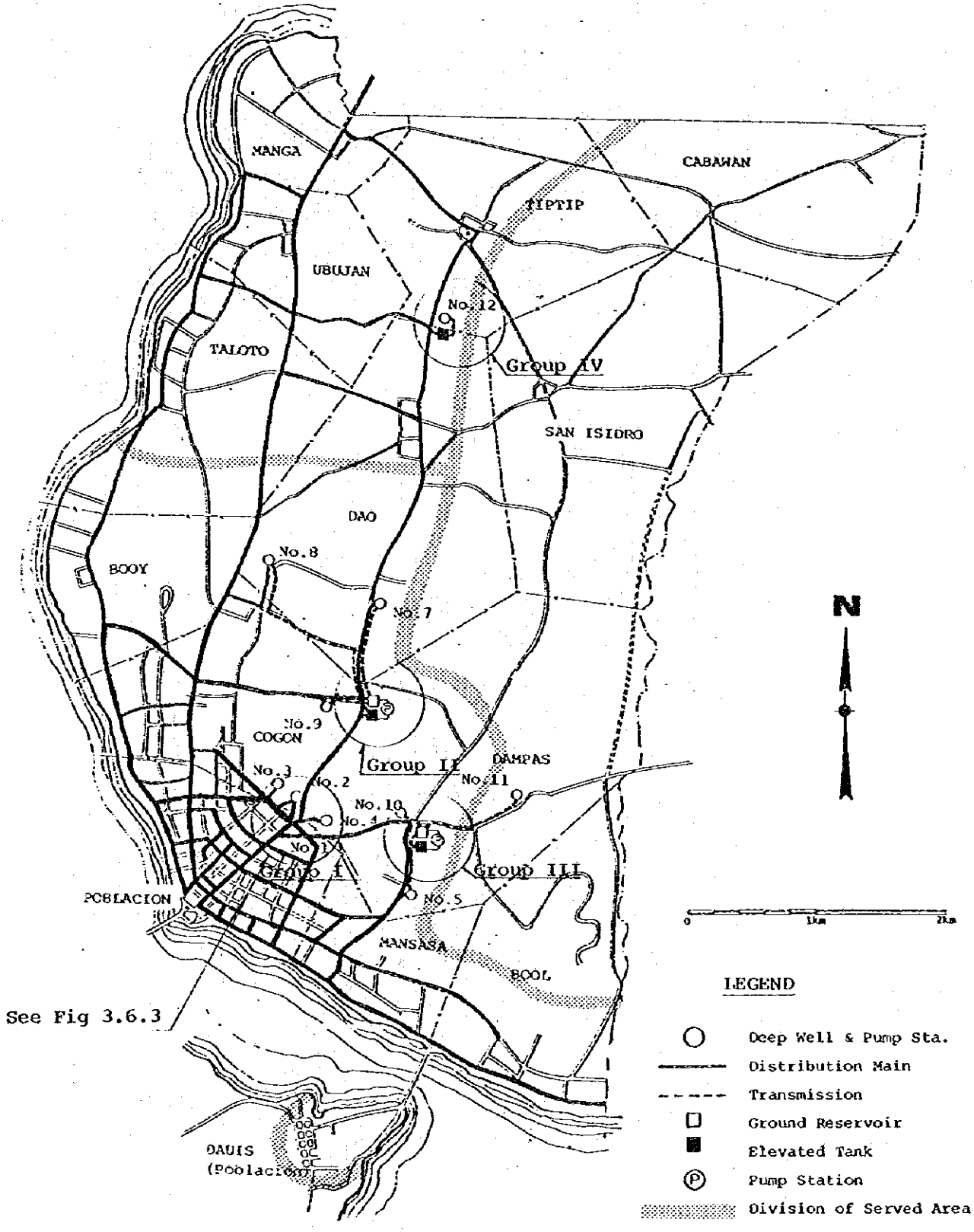


Fig 3.6.2 Proposed Water Supply System for Year 1993

Tagbilaran

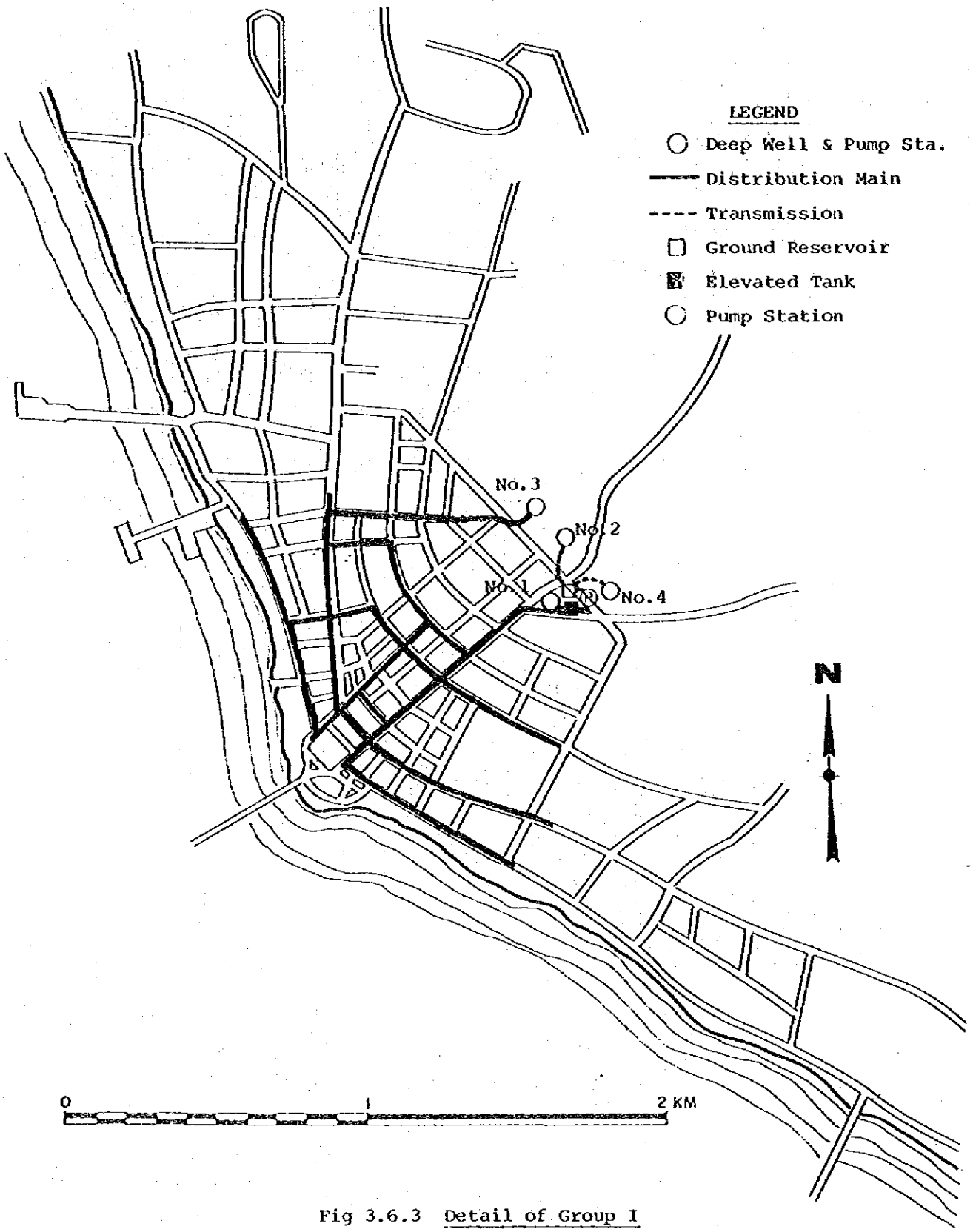


Fig 3.6.3 Detail of Group I

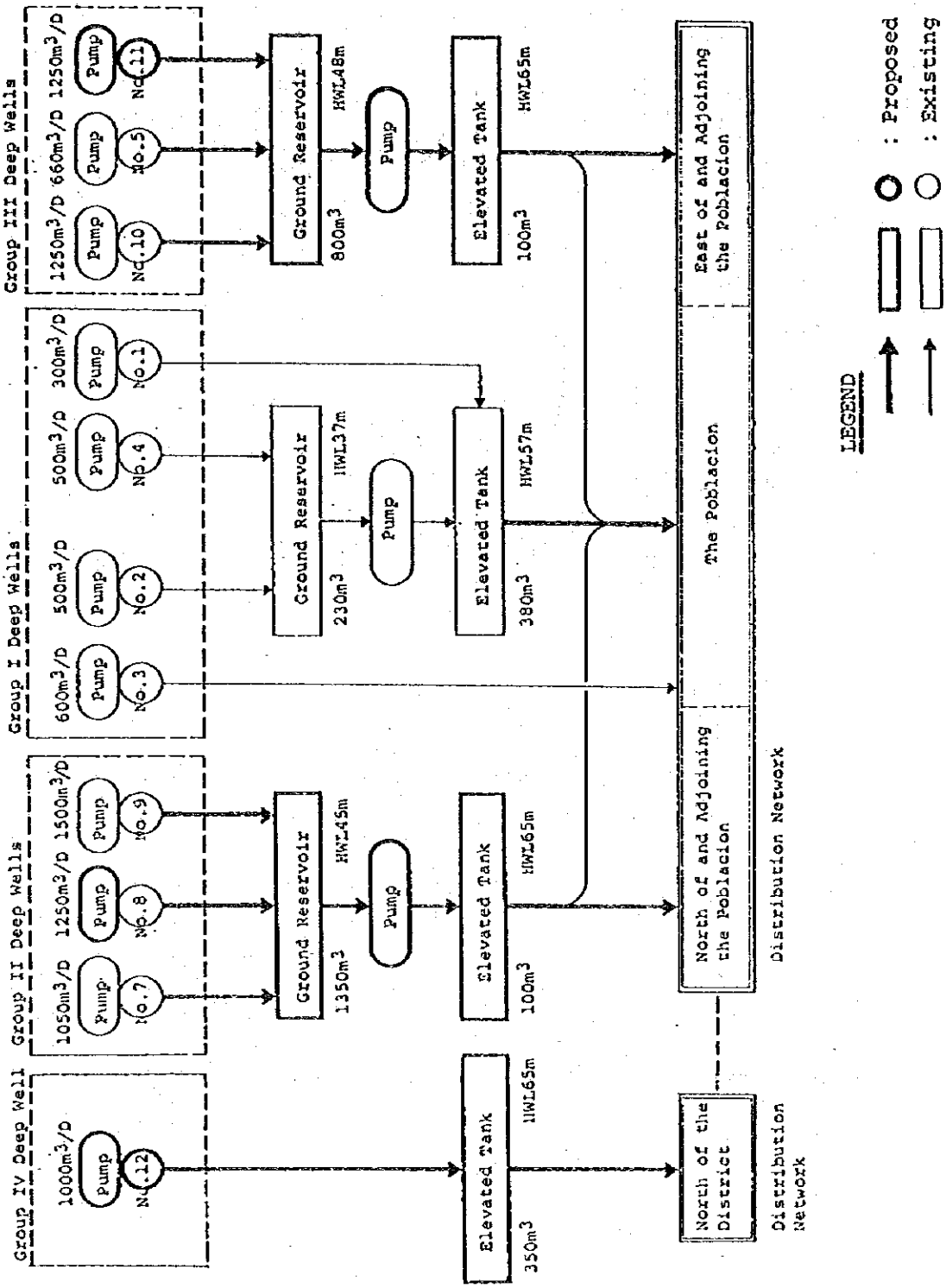


Fig 3.6.4 Schematic Diagram of Proposed Water Supply System (Phase I and Phase II)

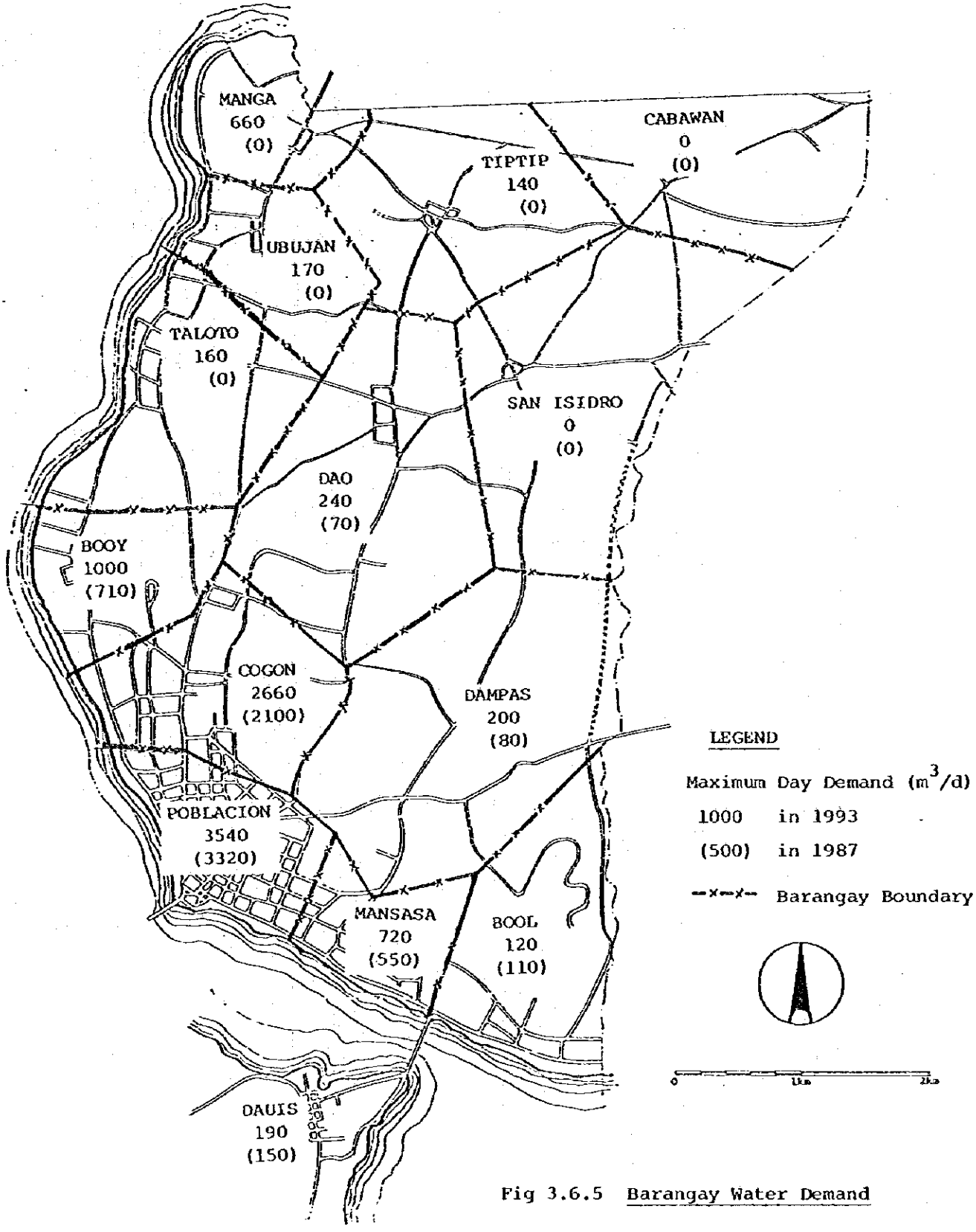


Fig 3.6.5 Barangay Water Demand

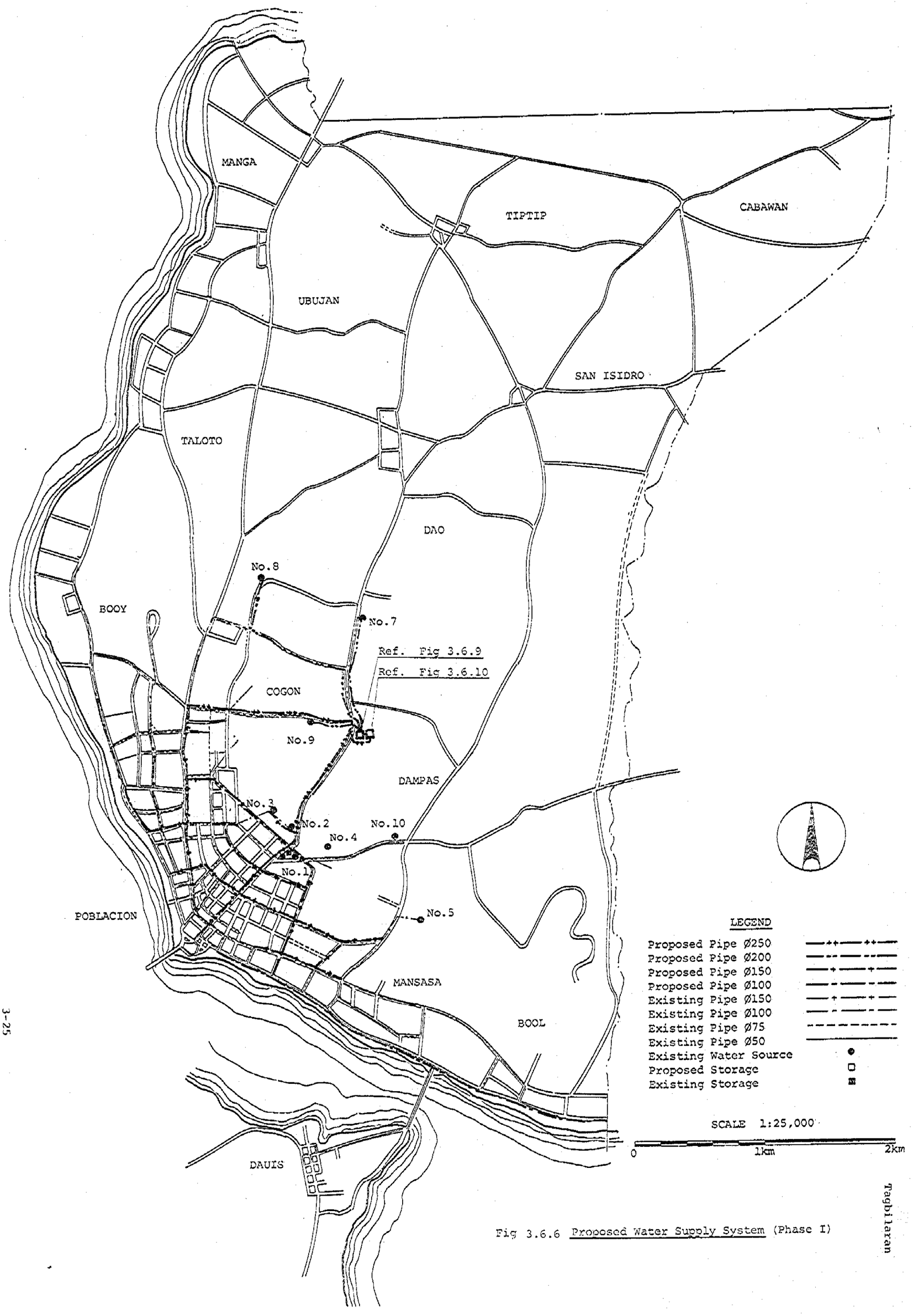


Fig 3.6.6 Proposed Water Supply System (Phase I)

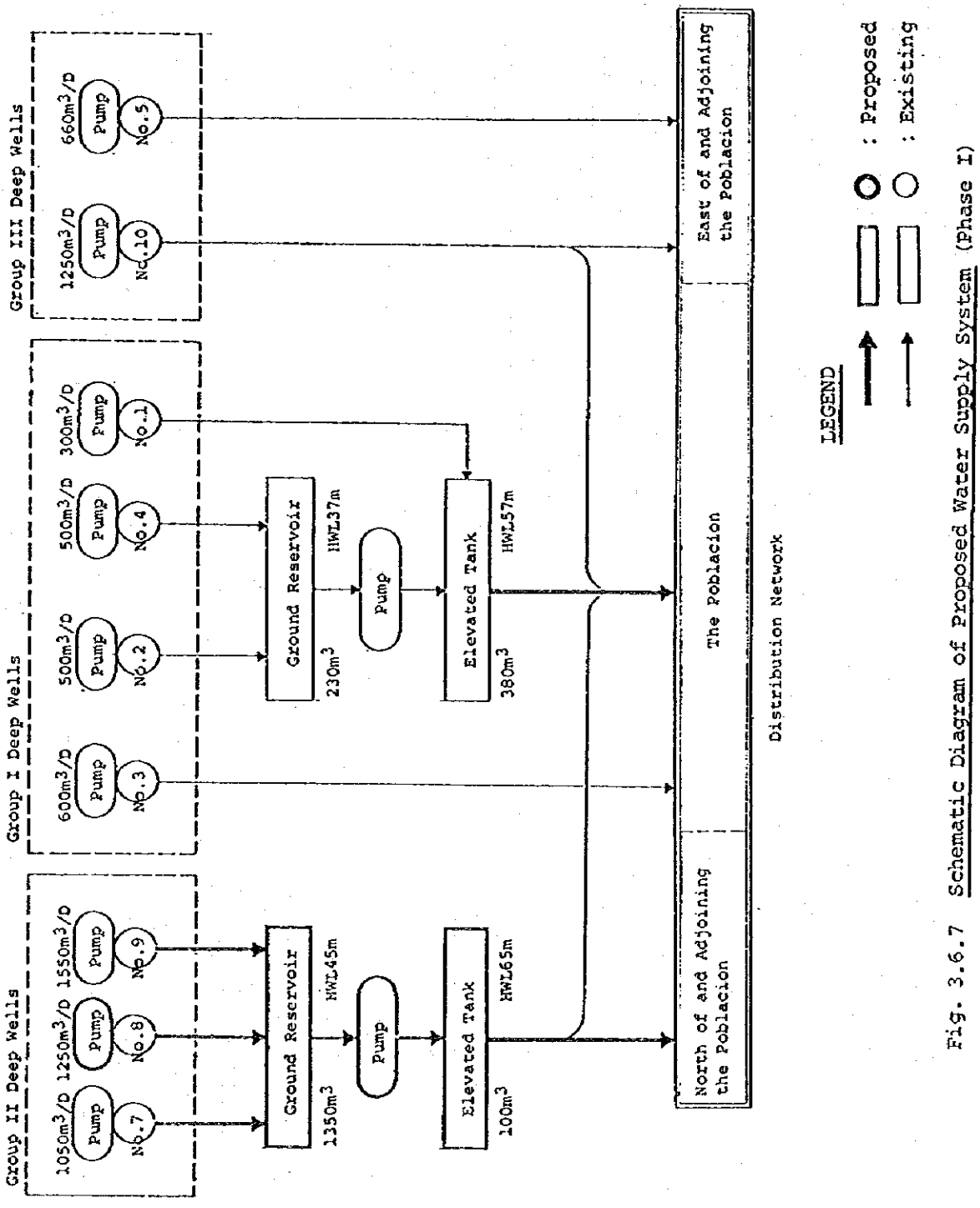


Fig. 3.6.7 Schematic Diagram of Proposed Water Supply System (Phase I)

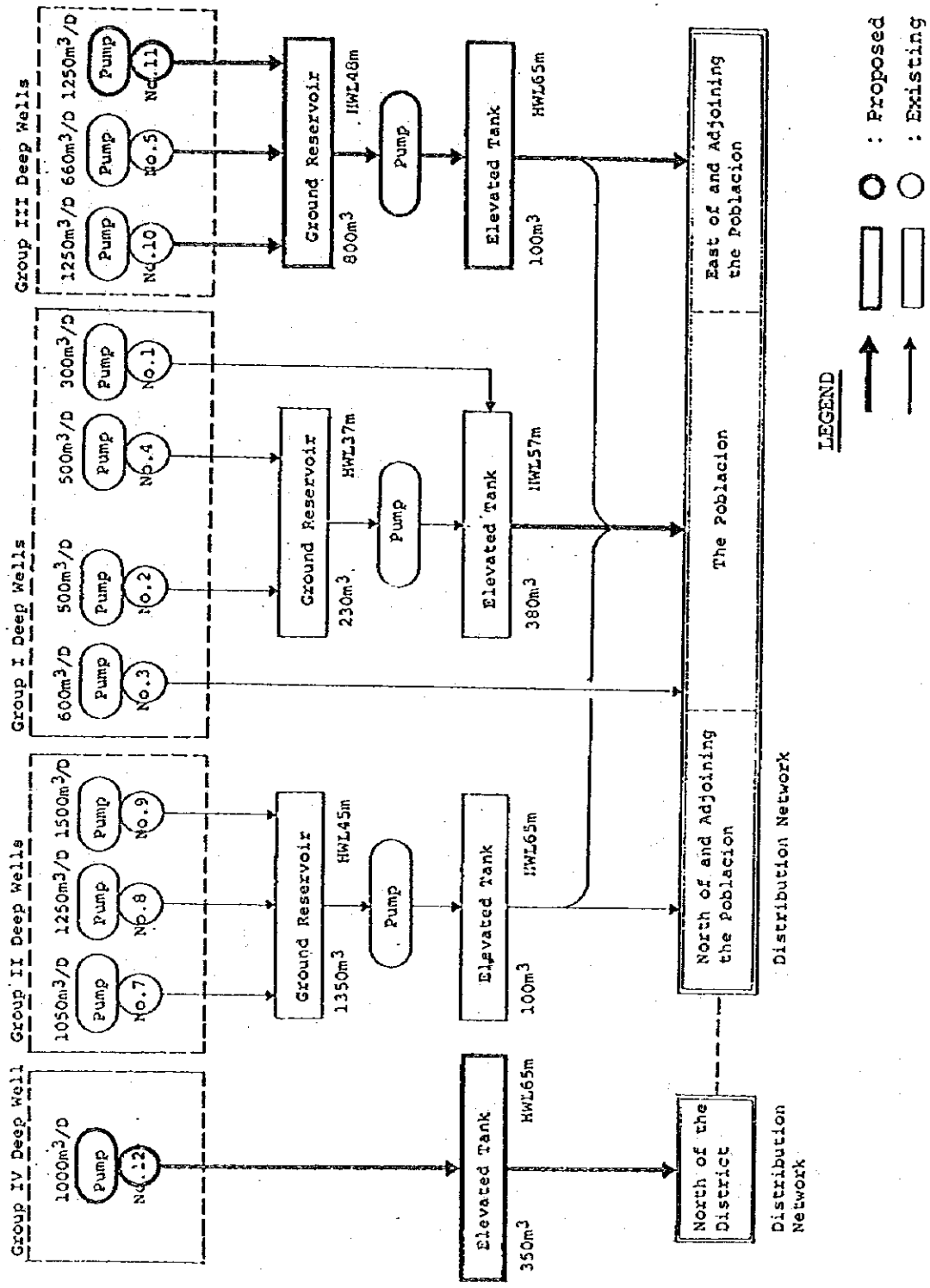


Fig. 3.6.8 Schematic Diagram of Proposed Water Supply System (Phase II)

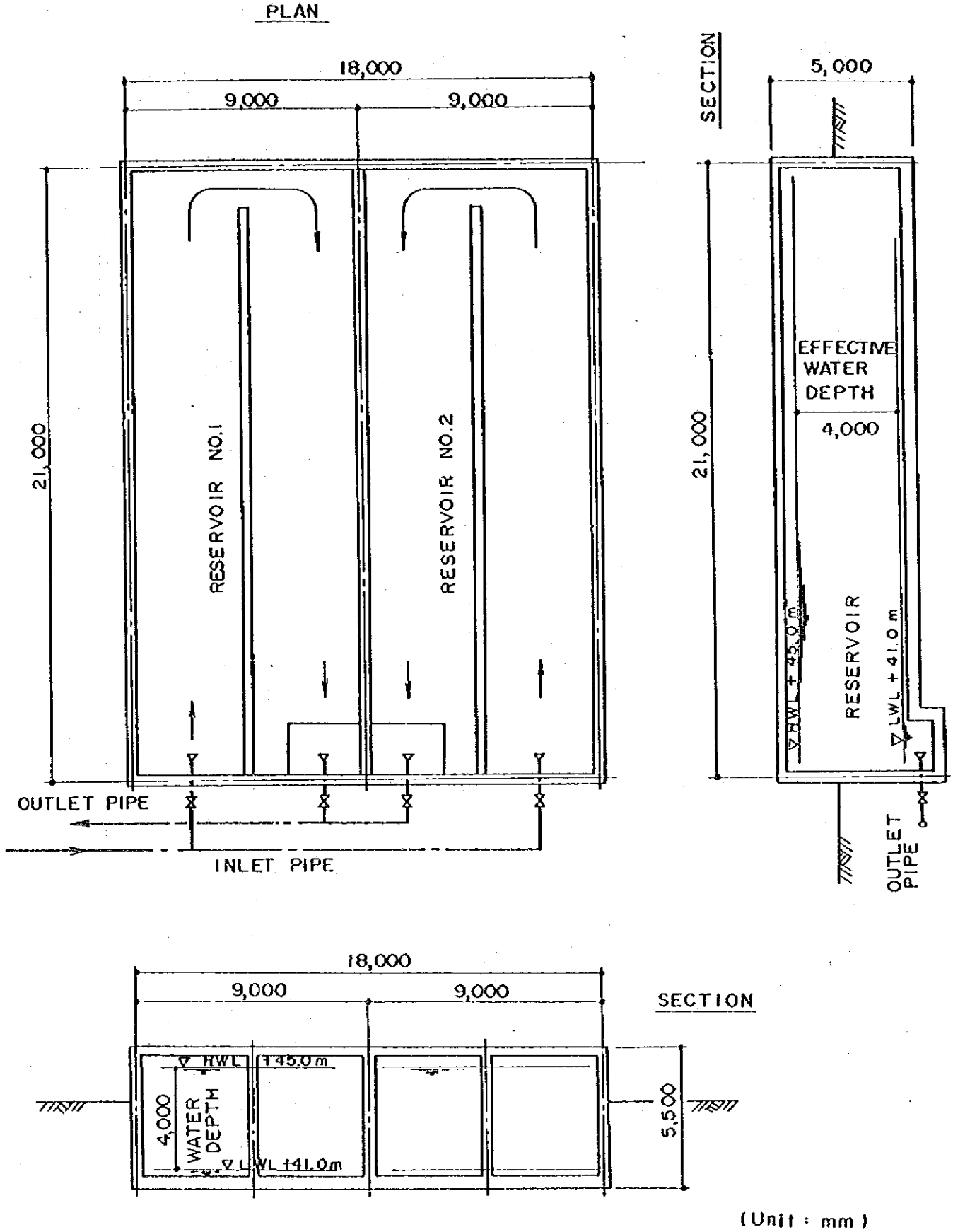
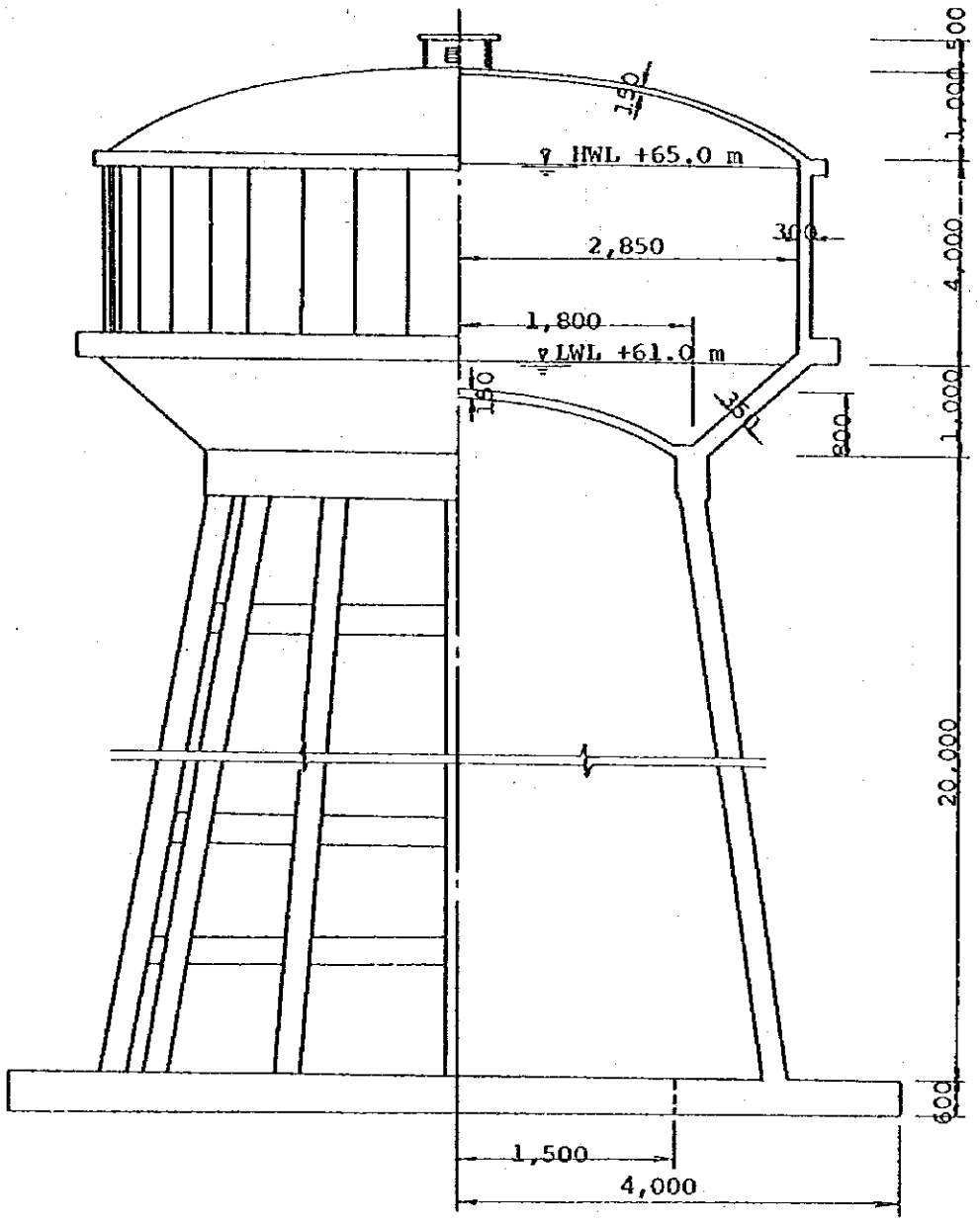


Fig 3.6.9 Ground Reservoir ($V=1,350m^3$)



(Unit : mm)

Fig 3.6.10 Elevated Tank ($V=100m^3$)

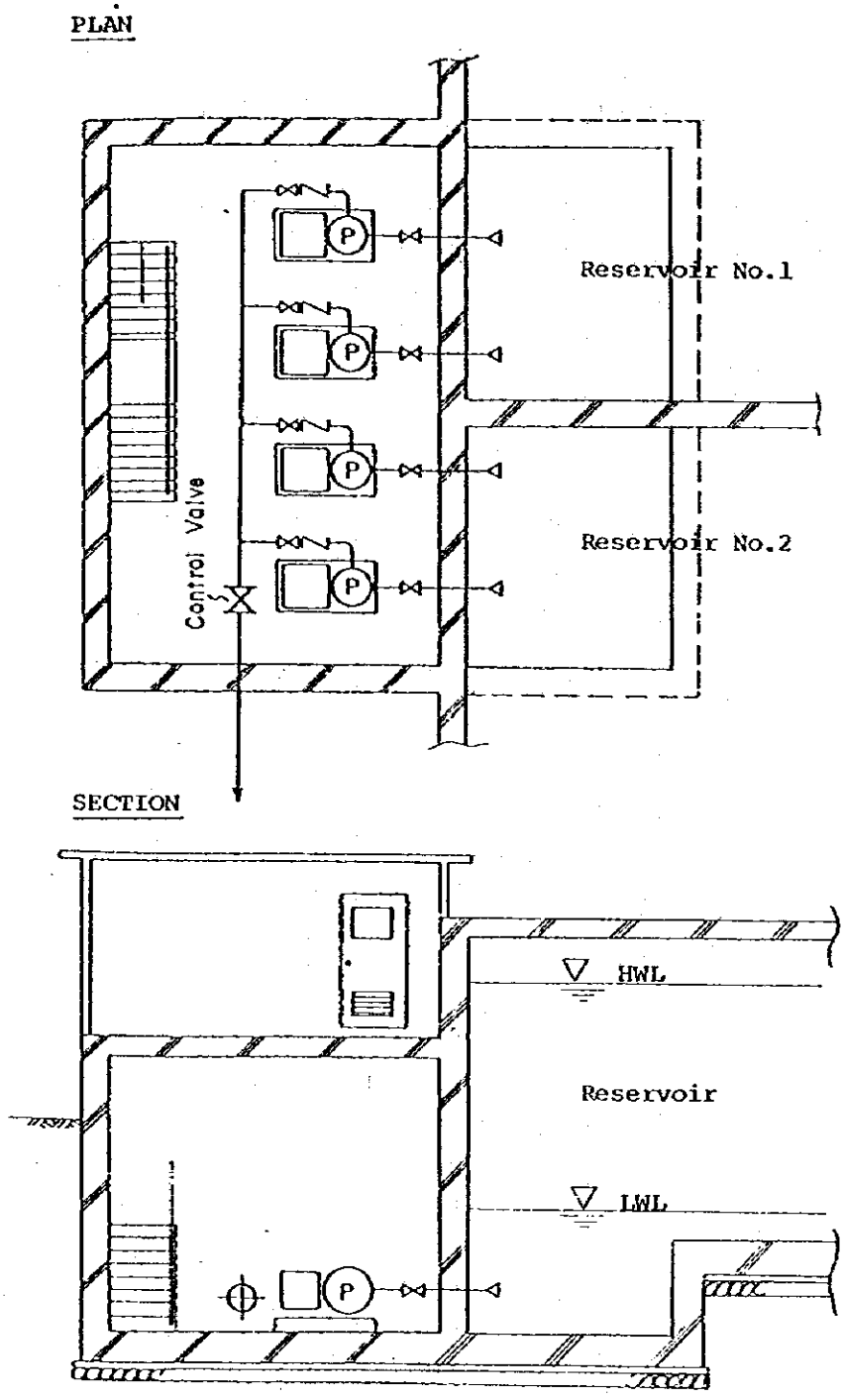


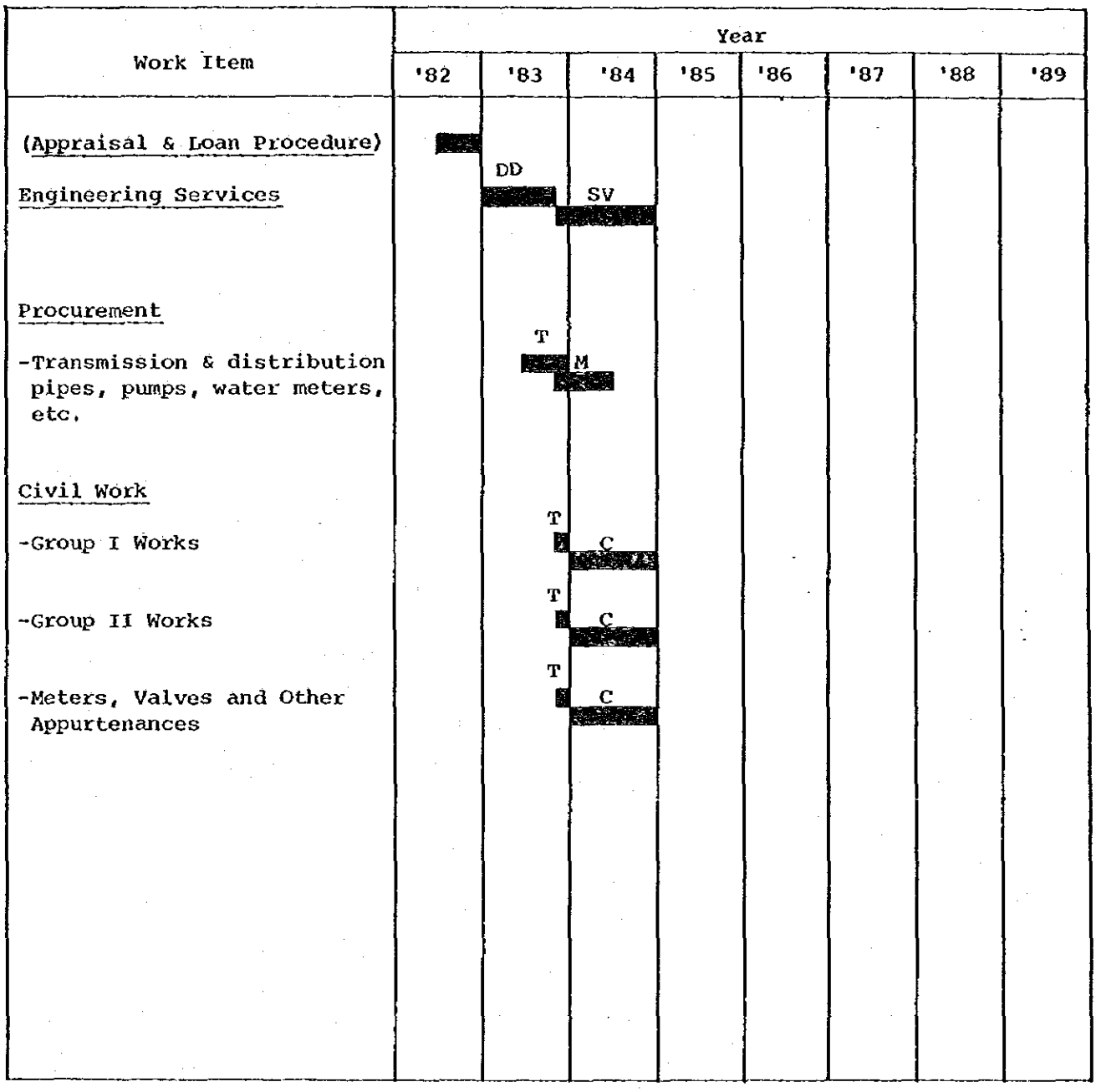
Fig 3.6.11 Pump Station

7. Construction, Operation and Maintenance Schedules

7.1 Construction Schedule

The following Fig 3.7.1 shows the construction schedule for the project. All timings of design, tendering, shipping, construction and installation are indicated in the Figure.

Fig 3.7.1 Construction Schedule



Note: DD = Detailed Design
SV = Supervision of Construction
T = Tendering Procedure (Advertisement/Tendering/Evaluation/Award)
M = Manufacturing & Shipping
C = Construction/Installation

7.2 Operation and Maintenance Schedule

Personnel of the Water District needed for operation and maintenance is scheduled, as shown in the following table.

Table 3.7.1 Staffing Schedule for Operation/ Maintenance (Phase I)

Staff \ Year	1982	1983	1984	1985	1986	1987
General Manager	1	1	1	1	1	1
Administrative Staff	6	7	7	7	8	8
Technical Staff	15	16	17	18	19	20
Commercial Staff	11	12	14	16	16	18
- Meter readers, bill collectors and inspectors	(6)	(6)	(7)	(8)	(8)	(10)
- Other employees	(5)	(6)	(7)	(8)	(8)	(8)
Total Staff	33	36	39	42	44	47
Number of Service Connections	2,818	3,101	3,404	3,738	4,111	4,585

8. Materials; Labor Force and Contractor's Ability

8.1 Materials

1) Sand and Gravel

Sand and gravel are locally available for concrete, aggregates pipe bedding, road surfacing and other works.

2) Cement

Cement is manufactured in large quantities in the Philippines. At present, there are 18 operating cement plants in the Philippines; 11 in Luzon; 2 in the Visayas and 5 in Mindanao. No serious or special problem is likely to arise with respect to cement requirements of any water supply project in the Philippines.

3) Reinforcing Steel

There are 27 steel mills in the country fabricating steel reinforcing bars. Steel manufacturing normally conforms to ASTM standards. Sizes of bars vary from 60 to 25 mm. For large sizes, bars are available in plain or deformed sections.

4) Pipe Materials

a) Asbestos Cement Pipe

Asbestos Cement Pipe is being manufactured by two manufacturers with factories in Metropolitan Manila; Eternit and Italit. The pipe is widely accepted in the Philippines and usually chosen for small diameter pipes (80 mm to 300 mm).

Pressure pipe is available in size from 80 mm to 600 mm for rated working pressure of 130 psi. Pipes are usually manufactured according to ISO R-160 specifications and supplied in 4-meters lengths. Asbestos pipe conforming the AWWA standard C-400 can be manufactured by the local plants but at higher cost than ISO pipes.

Locally produced asbestos cement are normally joined with a coupling of the same composition and strength as the pipe. Joints are sealed with double "O" rubber rings, though mechanical joints (Gibault joints) are also produced locally.

b) Steel Pipe

LWUA has accredited four steel pipe manufacturers in accordance with its standards for steel pipes and specials. Steel pipe is usually used in distribution and transmission lines as well as in plant system and usually available in different commercial sizes. Pipes can be cement lined according to AWWA standard C205.

c) Plastic Pipe

Early production of plastic pipes was in sizes below 50 mm and are used for service lines and household plumbing system.

To date, LWUA has accredited 5 local manufacturers of plastic pipes. Plastic pipe materials acceptable to LWUA are PVC, PE and PB. A tentative standards have been adopted by LWUA for the manufacture of these plastic pipes. Pipe sizes are from 10 mm to 300 mm in diameter.

d) Ductile Cast Iron Pipe, Valves and Hydrants

Ductile cast iron pipe, valves and hydrants are generally imported except gate valves of small sizes which are locally manufactured.

8.2 Labor Force

For any particular area in the Philippines, there is no immediate problem on the availability of common labor and skills in the construction work involved in water supply system development or improvement.

8.3 Contractor's Ability

Construction contractors with the competence and resource to undertake all or portions of a waterworks project are generally available in the province. In areas where local construction contractor's capabilities and expertise are not available or are deficient in some respects, several Metropolitan Manila-based firms can be utilized for any and almost all of the work required in the development and/or improvement of a water supply system. Certain work requires the use of specialized equipment not available in the locality nor owned by a particular construction contractor. In such cases, these specialized equipment may be available from government regional offices doing infrastructure projects and can be availed of by construction contractor on a rental basis.

9. Construction and Procurement Methods

The implementation of the proejct is the responsibility of the Water District under financing, supervision and guidance of LWUA. Funds necessary for the construction are to be financed through LWUA both for foreign and local currency sources. LWUA has prepared all procedures and manuals needed for construction and operation of the water supply system of the Water District and in addition keeps staff to supervise and guide works of the Districts in the field. In case external technical resources are required to assist the Water District, local and foreign consultants are available, and have been widely used for similar works.

9.1 Construction Method

Tagbilaran has a good sea port with seaway transportation connecting with major ports in the country. Within the Bohol island there are trunk roads linking all municipalities in the island. Therefore, with regard to transportation of materials and equipment, the project will have no inconvenience.

Regarding power which will be required for the construction work of the project, electricity can be supplied by the existing power system, and, if required, some civil work machines can be operated with the power of engines. Therefore, the present project will not encounter any difficulty of power supply.

For civil works construction, contractors, including general contractors and well drillers, will be selected by local competitive bidding after prequalification of bidders. Such qualified contractors with ability and construction equipment are sufficiently available in the country. The prequalifications and tendering will be carried out by the Water District under the guidance of LWUA. To assist the tendering and supervision of construction, consultants will be hired and during the period of construction, engineers of the District will be trained in construction

management and supervision of construction works. And also the engineers and operators concerned of the Water District will be given knowledge and skill in operation of the completed facilities.

9.2 Procurement Method

Procurement of materials and equipment will be carried out, in principle, on a basis of open international competitive bidding. The procedures for the above will be in accordance with the guidelines of the foreign lending agency which may finance the foreign currency component of the project cost.

Major steps of the procurement procedures are as follows:

1) Advertisement of tenders
2) Bidding
3) Evaluation of the bids with assistance of consultants
4) Award of contracts
5) Manufacturing and shipping by the suppliers and acceptance
6) Installation of equipment by the suppliers or contractors, and acceptance

Major items of materials and equipment to be imported are as follows:

1) Pipes, fittings, valves and fire hydrants
2) Pumps and motors
3) Electric equipment
4) Well casings and strainers
5) Bulk meters and service meters
6) Chlorinators
7) Vehicles

10. Cost Estimate and Disbursement Schedule

10.1 Cost Estimate

Table 3.10.1 presents summary of the project cost for the proposed program which is detailed in the table of disbursement schedule. The costs are broken down into foreign and local currency components. Cost for engineering and contingencies for physical and price escalation are allowed in addition to the construction costs.

Conditions and assumptions on which the estimation is carried out are as below, and cost data relating to the estimation are attached to the Report as Appendix 4.

1) All of costs and prices presented in the Table are as of July 1981.
2) Unit costs, as far as available, are taken from the list of costs prepared by LWUA.[1/]
3) Unit costs not included in the above list are current prices in the market.
4) Some of the unit costs of LWUA are modified so as to fit for the present project.
5) Local currency portion for the above includes costs for handling, storage and local transportation.
6) Engineering cost is assumed as 10.5 percent of the basic construction cost for the detailed design and 3.5 percent of the basic construction cost for the construction supervision.
7) Physical contingency is allowed by 10 percent of the basic construction cost and engineering cost.
8) Foreign currency exchange rate applied is: US$1.00= ₱7.80.

1/ Addendum to Methodology Manual, 1981.

Tagbilaran

Table 3.10.1 Project Cost

Note: - Unit = One Thousand Pesos = '000 Pesos
- Prices as of 1st July 1981
- Foreign Exchange Rate: US $ 1.00 = Peso 7.80

Work Items	Cost		
	Total Cost	Foreign Currency Component	Local Currency Component
A. Group I Works	4,165	2,791	1,374
B. Group II Works	5,425	2,817	2,608
C. Meters, Valves and Other Appurtenances	3,045	2,233	812
Sub Total	12,635	7,841	4,794
Detailed Design Cost (10.5%)	1,327	796	531
Supervision Cost (3.5 %)	442	265	177
Land Cost	37	-	37
Total	14,441	8,902	5,539
Physical Contingency (10 %)	1,444	890	554
Total	15,885	9,792	6,093
Price Contingency	7,085	4,927	3,058
Grand Total (Project Cost)	23,870	14,719	9,151
	(Equivalent to US$3.06 M)	(Equivalent to US$1.89 M)	(Equivalent to US$1.17 M)

10.2 Disbursement Schedule

In accordance with the projected construction schedule as mentioned in the Fig 3.7.1, the annual disbursement schedule of the construction cost of the project is prepared, and shown in Table 3.10.2. The above schedule also contains detailed cost estimates and their breakdowns for each major work.

Table 3.10.2 Disbursement Schedule

NOTE:
- F/C = Foreign Currency Component
- L/C = Local Currency Component
- Unit: One Thousand Pesos = '000 Pesos
- Prices: As of 1st July 1981
- Foreign Exchange Rate: US$1.00 = Pesos 7.80

(Thousand Pesos)

Description	Cost			Yearly Disbursement											
	Total Cost	Breakdown		1983		1984		1985		1986		1987		1988	
		F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C
A. Group I Works															
a) Distribution (ø250 mm x 1,000 m)	570	382	188			382	188								
b) (ø150 mm x 9,600 m)	2,641	1,770	871			1,770	871								
c) (ø100 mm x 5,300 m)	954	639	315			639	315								
B. Group II Works															
a) Transmission (ø200 mm x 3,100 m)	1,209	810	399			810	399								
b) Ground Reservoir (1,350 m^3)	1,372	343	1,029			343	1,029								
c) Pump Station (62.9 ℓ/s)	879	527	352			527	352								
d) Elevated Tank (100 m^3)	407	102	305			102	305								
e) Distribution (ø250 mm x 2,500 m)	1,425	955	470			955	470								
f) Pump for No. 8 Well (14.5 ℓ/s)	133	80	53			80	53								
C. Meters, Valves and Other Appurtenances															
a) Water Meter (ø13 mm x 1,813)	272	209	63			209	63								
b) Water Meter & Connection (ø13 mm x 2,057)	1,337	1,029	308			1,029	308								
c) Bulk Meter (ø250 mm x 3)	30	24	6			24	6								
d) (ø200 mm x 3)	30	24	6			24	6								
e) (ø150 mm x 7)	47	38	9			38	9								
f) Chlorinator (2 pieces)	20	18	2			18	2								

(to be continued)

NOTE: - F/C = Foreign Currency Component
- F/C = Local Currency Component
- Unit: One Thousand Pesos = '000 Pesos
- Prices: As of 1st July 1981
- Foreign Exchange Rate: US$1.00 = Pesos 7.80

NOTE: Price Escalation Rate (Price Contingency)
Present - 1984: 15% Annual both for F/C and L/C
1985 - 1989: 12% Annual both for F/C and L/C
1990 - : 10% Annual both for F/C and L/C

(Thousand Pesos)

Description	Cost			Yearly Disbursement											
	Total Cost	Breakdown		1983		1984		1985		1986		1987		1988	
		F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C	F/C	L/C
g) Fire Hydrant (87 pieces)	623	411	212			411	212								
h) Valve (ø250 mm x 12)	100	73	27			73	27								
i) (ø200 mm x 3)	18	13	5			13	5								
j) (ø150 mm x 32)	136	99	37			99	37								
k) (ø100 mm x 18)	60	44	16			44	16								
l) Pressure Gauge (10 pieces)	3	2	1			2	1								
m) Vehicles (2 cars)	140	70	70			70	70								
n) Stored Material	229	179	50			179	50								
Sub-Total	12,635	7,841	4,794			7,841	4,794								
Datailed Design Cost (10.5%)	1,327	796	531	796	531										
Supervision Cost (3.5%)	442	265	177			265	177								
Land Cost	37	0	37			0	37								
Total	14,441	8,902	5,539	796	531	8,106	5,008								
Physical Contingency (10%)	1,444	890	554	80	53	810	501								
Total	15,885	9,792	6,093	876	584	8,916	5,509								
Price Contingency	7,985	4,927	3,058	283	188	4,644	2,870								
Grand Total (Project Cost)	23,870	14,719	9,151	1,159	772	13,560	8,379								

11. Organization, Operation and Management Plan

Success of the project depends largely on how to operate the completed water supply system including the management of water supply business and operation of the facilities. From this standpoint, the following is recommended with special emphasis to be put in practice.

(1) Organization

The existing organization of the Bohol Provincial Waterworks System is fairly well organized and sufficiently staffed. However, the performance of the organization is not necessarily satisfactory. The main cause for this is considered that maintenance works, which are generally to be carried out by a technical division, are not well performed, and further the cause for this is considered to be insufficient funding for such works. Therefore, it is proposed to reinforce the present "Planning, Programming, Construction and Maintenance" division, as shown in Fig 3.11.1 together with budgetary reinforcement for the works.

(2) Operation

Most important is the control of deep well productions by taking full advantage of the reservoirs in the case of the Tagbilaran water supply. For one thing the drop of the groundwater table must be kept as small as possible and for the two the supply water pressure must be kept as uniform as possible for 24 hours a day to maintain a good supply condition in the served area. On the other hand, to prevent wasteful use and minimize leakage, all connections should be metered and leakage control activities strengthened. To attain the above, consideration has been well made in the above-mentioned organization and suggestions given in the following (3) Management Plan.

(3) Management Plan

When the present Waterworks System is reformed to a Water District, the management aspects of the water supply undergoes a radical change, namely, 1) the District must sustain itself in financial terms; 2) the burden of debt service increases to a great extent. To cope with this new situation, the District must strengthen itself financially by metering all connections and also revising the current water rate structure. Aside from the above, the District has a very serious problem of water source. In the future, very costly investments or new water sources are unavoidable. The District, therefore, has to make every effort to conserve water.

In order to realize the above purposes, it is recommended to put in force the following:

1) To strengthen the organization as shown in Fig 3.11.1.
2) To upgrade the ability of leading staff members of the organization by sending them to the training courses held by LWUA.
3) To train all the employees of the organization so as for every employee to perform his assignment efficiently and satisfactorily.

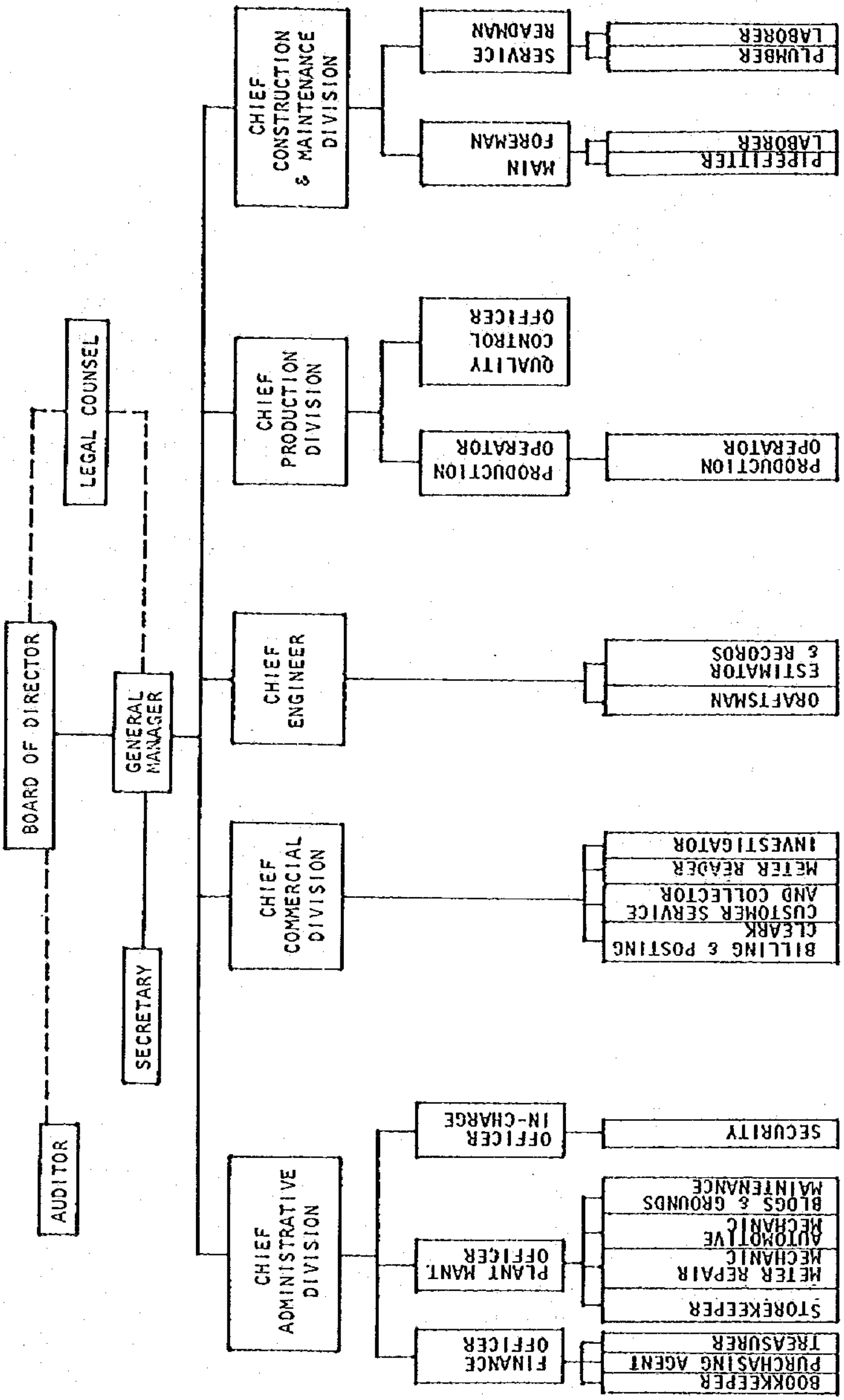


Fig 3.11.1 Proposed Organization Chart

12. Financial Feasibility Analysis

As in the case with all forecasts, many assumptions and estimates must be made concerning future financial conditions. In making these assumptions, efforts were made to comply with the methods and rules of feasibility study being practiced by the LWUA, but consideration was also paid to the practices prevailing in Japan as well as in other Asian countries.

Many of the assumptions deal with matters that can be controlled by management, and these assumptions represent guidelines for managing the project so as to achieve the predicted results.

12.1 Source of Funds and Rate of Interest on Borrowing

The length of the project period and the magnitude of the recommended capital investment program as shown in Financial Table 1 will require stable long-term borrowing.

In this financial feasibility study, forecasts are constructed on the assumption that 100% of the total capital investment is financed by government loans. Forecasts of loan disbursements and debt service are presented in Financial Table 3.

These estimates are based on the assumption that the Water District will be able to obtain loan funds through government sources (LWUA), which represent a blending of funds obtained locally and internationally.

The assumed in terest rate is 9.0 percent per annum and other assumed terms include a two-year period (construction period) of grace on principal payment, and twenty-eight year instalment repayment.

Approximately 60% of the project cost is composed of foreign currency portions and the rest composed of local currency portions. In view of the magnitude of foreign currency requirements, the government is recommended to seek loans from foreign or international sources such as the Overseas Economic Cooperation Fund, JAPAN (OECF) the World Bank and Asian Development Bank, though the effect of such borrowing will not direct the forecasts of the Water District's financial performance.

12.2 Financial Feasibility

Carefully constructed financial forecasts based on the above mentioned assumptions indicate that the Phase I project will be positively viable in financial terms.

12.3 Water Rate

In calculating revenue, water rates for domestic users were projected less than 5% of the average household income of the Water District area. Although major increases in water rates will be required, allocation of additional costs to non-domestic customers and progressive rate structuring allows the construction of cross-subsidized rates for basic household requirements. (See Financial Table 7)

One of the salient features of the project is that the revenue unit costs at 1981 constant prices of production toward the target year will be significantly lower than at present.

13. Economic Feasibility

13.1 Benefits

Major benefits, direct and indirect, of the project are as follows:

a. Increase of Served Population and Area:
Served population in the target year is estimated at 34,940, which is a gain of 41 % over the present served population. And the served area will increase from 480 hectares to 720 hectares in the target year.

b. Rise of Water Pressure and Elimination of Intermittent Supply
Present insufficient water pressure will be rectified to a normal level and "dried up" areas and intermittent supply will be all eliminated. Tanks and pumps of the plumbing system which consumers have provided will be no more required.

c. Supply of Safe Water
The existing water supply facilities are vulnerable to contamination because the pipelines are sometimes under negative pressure. When the project is completed and the water pressure is raised, consumers will be free from such contamination and the safety of water will be assured.

d. Healthy Environment
Living environment in the whole poblacion will greatly be enhanced with 24-hour continuous water supply.

e. Employment Opportunity
The civil works of the project together with accompanying connection works on the part of consumers will increase employment opportunities in the area.

f. Increase in Land Values

Other than the generation of employment, the water supply improvement project will contribute to an increase in the land value of the service area.

g. Reduction in Fire Damage

The project includes the installation of fire hydrants, which with projected increase in water pressure will result in savings due to reduced fire damage.

13.2 Internal Economic Rate of Return

An attempt was made to determine the economic viability of the recommended master plan program through the mechanism of benefit cost comparison. This mechanism considered only quantifiable benefits. It is however to be noted that the quantifiable benefits are not necessarily more important than the unquantifiable ones.

In this study, quantifiable benefits included (1) benefical value of water, (2) water quality benefits; and (3) reduction in fire damage.

In addition these three items of quantifiable benefits, " benefits to the nation " were included as benefits in making benefit-cost comparison. National interest effects for the Tagbilaran Water Supply System were estimated to be equal to 10 percent of the total of volume, quality and fire loss reduction benefits.

The calculations of internal economic rates of return have been subjected to sensitivity analyses using various adjustments as follows:

1) Cost value without conversion

Calculation was made with cost values as used in financial forecasts.

2) Cost value with Conversion A

i. Foreign costs -- raised by use of 1.25 factor (Scarcity of foreign exchange)
ii. Common labor -- lowered by 0.5 factor (Unemployment alternative)
iii. Residual local cost -- reduced by 0.95 factor (Removal of hidden taxes)

3) Cost value with Conversion B

i. Foreign cost -- cnconverted
ii. Common labor -- converted as 2), ii, above
iii. Residual local cost -- converted as 2), iii, above

4) Cost value with Conversion C

i. Foreign cost -- converted as 2), i, above
ii. Common labor -- unconverted
iii. Residual local cost -- unconverted

The internal economic rates of return thus calculated proved positive economic viability as to the recommended master plan as shown below.

1) Based on Cost Value without Conversion: 16 %
2) Based on Cost Value with Conversion A: 15 %
3) Based on Cost Value with Conversion B: 18 %
4) Based on Cost Value with Conversion C: 14 %

Tagbilaran

FINANCIAL TABLE 1

TAGBILARAN WATER SUPPLY PROJECT

PORJECT COSTS BY YEAR OF CONSTRUCTION

(₱1,000's)

I

Project Components By Major Elements	Costs as of 7-1-81 By Construction Year						
	Total	1983	1984	1985	1986	1987	1988
1. Vehicles	140	—	140				
2. Chlorinator	20	—	20				
3. Wells and Pumps	1,012	—	1,012				
4. Stored Material	229	—	229				
5. Meters & Pressure Gauges	1,719	—	1,719				
6. Distribution System	5,590	—	5,590				
7. Transmission System	1,209	—	1,209				
8. Fire Hydrants	623	—	623				
9. Valves	314	—	314				
10. Reservoir	1,372	—	1,372				
11. Elevated tank	407	—	407				
12. Engineering	1,327	1,327	—				
13. Supervision	442	—	442				
14. Land	37	—	37				
15. Physical Contingency	1,444	133	1,311				
16.							
17.							
18.							
TOTAL, 7-1-81	15,885	1,460	14,425				
ESCALATION FACTORS		1.322500	1.520875				
ESCALATED COSTS	23,870	1,931	21,939				

FINANCIAL TABLE 2

TAGBILARAN WATER SUPPLY PROJECT

OPERATION AND MAINTENANCE COSTS

(₱1,000's)

I

Year	Fixed, 7-1-81 Costs				Escalated Costs	
	Power	Chemicals	Others	Total	Factor 1/	Amount
1981	239	69	314	622	1.000000	622
1982	247	71	366	684	1.150000	787
1983	257	74	455	786	1.322500	1,040
1984	267	77	568	912	1.520875	1,387
1985	269	77	619	965	1,703380	1,644
1986	283	81	737	1,101	1.907785	2,101
1987	300	86	825	1,211	2.136719	2,588
1988	300	86	825	1,211	2.393126	2,898
1989	300	86	825	1,211	2.680301	3,246
1990	300	86	825	1,211	2.948331	3,570
1991	300	86	825	1,211	3.243164	3,928
1992	300	86	825	1,211	3.567480	4,320
1993	300	86	825	1,211	3.924228	4,752
1994	300	86	825	1,211	4,316651	5,228
1995	300	86	825	1,211	4,748316	5,750
1996	300	86	825	1,211	5.223148	6,325
1997	300	86	825	1,211	5.745463	6,958
1998	300	86	825	1,211	6.320009	7,654

1/ Escalation currently 15 percent per year to 1984 (1981 = 1.00), 12 percent per year between 1985 and 1989 and 10 percent per year in 1990 and afterwards.

FINANCIAL TABLE 3

TAGBILARAN WATER SUPPLY PROJECT
LOAN DISBURSEMENTS AND DEBT SERVICE
(₱1,000's)

Year	Disbursement 1/		Loans Outstanding		Interest Payments		Principal Payments 3/	Total Debt Service
	Grant	Loan	Beginning	Ending	First Year 2/	Later Years		
1981								
1982								
1983		1,931		2,018				
1984		21,939	2,018	25,126				
1985			25,126	25,054		2,261	72	2,333
1986			25,054	24,157		2,255	897	3,152
1987			24,157	23,260		2,174	897	3,071
1988			23,260	22,360		2,093	897	2,990
1989			22,360	21,466		2,012	897	2,909
1990			21,466	20,569		1,932	897	2,829
1991			20,569	19,672		1,851	897	2,748
1992			19,672	18,775		1,770	897	2,667
1993			18,775	17,878		1,690	897	2,587
1994			17,878	16,981		1,609	897	2,506
1995			16,981	16,084		1,528	897	2,425
1996			16,084	15,187		1,448	897	2,345
1997			15,187	14,290		1,367	897	2,264
1998			14,290	13,393		1,286	897	2,183

1/ From Financial Table 1.

2/ Disbursements assumed to be equally spread during year. Charge with 50 per cent of annual interest in first year.

3/ Principal payments made in equal yearly instalments.

4/ Interest capitalized during construction.

FINANCIAL TABLE 4

TAGBILARAN WATER SUPPLY PROJECT
CASH REQUIREMENTS PER REVENUE UNIT
(₱1,000's)

Year	Debt Service	O & M	Total Costs	Estimated Reserves 1/	Cost With Reserves	Revenue Units 2/	Cost Per Revenue Unit 3/
1981		622	622		622	1,714	0.36
1982		787	787		787	1,832	0.43
1983		1,040	1,040		1,040	1,961	0.53
1984		1,387	1,387		1,387	2,158	0.64
1985	2,333	1,644	3,977	199	4,176	2,263	1.85
1986	3,152	2,101	5,253	263	5,516	2,405	2.29
1987	3,071	2,588	5,659	566	6,225	2,571	2.42
1988	2,990	2,898	5,888	589	6,477	2,571	2.52
1989	2,909	3,246	6,155	616	6,771	2,571	2.63
1990	2,829	3,570	6,399	640	7,039	2,571	2.74
1991	2,748	3,928	6,676	668	7,344	2,571	2.86
1992	2,667	4,320	6,987	699	7,686	2,571	2.99
1993	2,587	4,752	7,339	734	8,073	2,571	3.14
1994	2,506	5,228	7,734	773	8,507	2,571	3.31
1995	2,425	5,750	8,175	818	8,993	2,571	3.50
1996	2,345	6,325	8,670	867	9,537	2,571	3.71
1997	2,264	6,958	9,222	922	10,144	2,571	3.95
1998	2,183	7,654	9,837	984	10,821	2,571	4.21

1/ Reserve estimate equal to 10 per cent of total costs. (5 per cent for the first two years)

2/ Revenue units from Tables 9A, 9B and 9C.

3/ Revenue units divided into costs with reserves.

FINANCIAL TABLE 5 - A

TABGILARAN WATER SUPPLY PROJECT

ABILITY TO PAY FOR WATER

I

1	2	3	4	5	6	7	8
Year	Ave. Monthly Family Income 1/	Available 5%	Average Family Size	Household Water Use		Revenue Units Per Month 2/	Max. Ability Per Rev. Unit
				lpcd	Cubic Meters/ Month		
1981	642.00	36.23	5.73	84	14	30	1.21
1982	833.24	41.66	5.72	84	14	30	1.39
1983	958.23	47.91	5.71	83	14	30	1.60
1984	1,101.96	55.10	5.70	82	14	30	1.84
1985	1,234.19	61.71	5.69	85	15	31	1.99
1986	1,382.29	69.11	5.68	89	15	31	2.23
1987	1,548.17	77.41	5.67	93	16	32	2.42
1988	1,733.95	86.70	5.66	94	16	32	2.71
1989	1,942.03	97.10	5.65	97	16	32	3.03
1990	2,136.23	106.81	5.64	98	17	33	3.24
1991	2,349.85	117.49	5.63	101	17	33	3.56
1992	2,584.84	129.24	5.62	102	17	33	3.92
1993	2,843.32	142.17	5.61	102	17	33	4.31

1/ Average monthly income escalated by 15 per cent per year to 1984, 12 per cent per year between 1985 and 1989, and 10 per cent in 1990 and afterwards.

2/ Assumed 1/2" service.

FINANCIAL TABLE 6 - A

TAGBILARAN WATER SUPPLY PROJECT

ILLUSTRATIVE CASH FLOW TABLE

₱1,000's EXCEPT CHARGES PER UNIT

I

Year	Revenue Units 1/	Charges Per Unit	Gross Revenues	Net Revenue 2/		Basic Costs 3/	Required Reserves 4/	Total Costs 5/	Net Income	
				%	Amount				Annual	Cumulative
1981	1,714	0.43	737	95	700	622		622	78	78
1982	1,832	0.43	788	95	749	787		787	-38	40
1983	1,961	0.67	1,314	95	1,248	1,040		1,040	208	248
1984	2,158	1.10	2,373	96	2,278	1,387		1,387	891	1,139
1985	2,263	1.76	3,983	96	3,824	3,977	199	4,176	-352	787
1986	2,405	2.23	5,363	96	5,148	5,253	268	5,521	-373	414
1987	2,571	2.40	6,170	97	5,985	5,659	617	6,276	-291	123
1988	2,571	2.70	6,942	97	6,734	5,888	694	6,582	152	275
1989	2,571	3.00	7,713	97	7,482	6,155	771	6,926	556	831
1990	2,571	3.00	7,713	98	7,559	6,399	771	7,170	389	1,220
1991	2,571	3.50	8,999	98	8,819	6,676	900	7,576	1,243	2,463
1992	2,571	3.90	10,027	98	9,826	6,987	1,003	7,990	1,836	4,299
1993	2,571	3.90	10,027	98	9,826	7,339	1,003	8,342	1,484	5,783

1/ From Tables 9A, 9B and 9C.
2/ Gross revenues from water sales reduced by bad debt allowance.
3/ Total of project debt service, operation and maintenance costs.
4/ Ten percent of gross water sales, after completion of construction. (5 percent for the first two years)
5/ Includes the costs of replacing the first complement of project components with seven years of life expectancy.

FINANCIAL TABLE 7

TAGBILARAN WATER SUPPLY PROJECT

ILLUSTRATIVE RATE SCHEDULE

DOMESTIC AND GOVERNMENTAL SERVICE CONNECTIONS, 1/2"

Year	First 10 m^3 1/	Charge for Each Added m^3 2/			Charge 3/ per Revenue Unit
		11-20	21-45	over 45	
1981	10.75	0.52	0.60	0.73	0.43
1982	10.75	0.52	0.60	0.73	0.43
1983	16.75	0.80	0.94	1.14	0.67
1984	27.50	1.32	1.54	1.87	1.10
1985	44.00	2.11	2.46	2.99	1.76
1986	55.75	2.68	3.12	3.79	2.23
1987	60.00	2.88	3.36	4.08	2.40
1988	67.50	3.24	3.78	4.59	2.70
1989	75.00	3.60	4.20	5.10	3.00
1990	75.00	3.60	4.20	5.10	3.00
1991	87.50	4.20	4.90	5.95	3.50
1992	97.50	4.68	5.46	6.63	3.90
1993	97.50	4.68	5.46	6.63	3.90

Note: 1/ To obtain charge per m^3 for the first 10 m^3 classified by connection size, multiply R.U. charge shown in 3/ above by the following connection size factors.

Domestic : 1.0 for 3/8"; 2.5 for 1/2"; 4.0 for 3/4"; 8 for 1"
Commerical: 5.0 for 1/2"; 8.0 for 3/4"; 16.0 for 1"; 40.0 for 1 1/2"

2/ To obtain charge for each added m^3, multiply R.U. charges shown in 3/ by the following block factors.

Domestic : 1.2 for 11-20 m^3; 1.4 for 21-45 m^3; 1.7 for over 45 m^3
Commercial: 2.4 for 21-45 m^3; 2.8 for 45-100 m^3; 2.4 for over 100 m^3

FINANCIAL TABLE 8

TAGBILARAN WATER SUPPLY PROJECT

GROWTH IN POPULATION, SERVICE CONNECTIONS AND IN DELIVERED AND PROCURED WATER

Year	Ave. Number Service Connections	Number For Service	Persons Served	Daily Use lpcd 1/	Annual Water Supply (1,000 M^3)		
					Delivered	% Unacct.	Produced
1981	2,528	9.7	24,600	105	944	45	1,716
1982	2,818	9.1	25,500	105	1,012	43	1,776
1983	3,255	8.6	28,050	105	1,075	40	1,792
1984	3,783	8.2	30,900	105	1,185	40	1,975
1985	4,129	7.9	32,400	110	1,242	40	2,070
1986	4,337	7.6	33,000	115	1,324	37	2,102
1987	4,585	7.3	33,640	116	1,423	34	2,156
1988	4,585	7.3	33,640	116	1,423	34	2,156
1989	4,585	7.3	33,640	116	1,423	34	2,156
1990	4,585	7.3	33,640	116	1,423	34	2,156
1991	4,585	7.3	33,640	116	1,423	34	2,156
1992	4,585	7.3	33,640	116	1,423	34	2,156
1993	4,585	7.3	33,640	116	1,423	34	2,156

1/ Liters per capita per day.

FINANCIAL TABLE 9A

TAGBILARAN WATER SUPPLY PROJECT I

CALCULATION OF REVENUE UNITS

A) AVERAGE NUMBER OF CONCESSIONAIRES

Year	Residential and Government					Commercial and Industrial					Total
	3/8"	1/2"	3/4"	1"	S-Total	1/2"	3/4"	1"	1 1/2"	S-Total	
1981	643	1,478	19	2	2,142	330	34	20	2	386	2,528
1982	729	1,676	22	2	2,429	332	35	20	2	389	2,818
1983	855	1,962	24	3	2,844	352	37	20	2	411	3,255
1984	1,010	2,324	31	3	3,368	355	37	21	2	415	3,783
1985	1,113	2,560	34	3	3,710	359	37	21	2	419	4,129
1986	1,174	2,701	35	4	3,914	363	37	21	3	423	4,337
1987	1,254	2,884	38	4	4,180	365	38	21	3	427	4,585
1988											
1989											
1990											
1991											
1992											
1993											

B) SERVICE REVENUE UNITS PER CUBIC METER

Year	Residential and Government					Commercial and Industrial					Total
	1.00	2.50	4.0	8.0	S-total	5.0	8.0	16.0	40.0	S-Total	
1981	643	3,695	76	16	4,430	1,650	272	320	80	2,322	6,752
1982	729	4,190	88	16	5,023	1,660	280	320	80	2,340	7,363
1983	855	4,905	98	24	5,882	1,760	296	320	80	2,456	8,338
1984	1,019	5,810	124	24	6,977	1,775	296	336	80	2,487	9,464
1985	1,113	6,400	136	24	7,673	1,795	296	336	80	2,507	10,180
1986	1,174	6,753	140	32	8,099	1,815	296	336	120	2,567	10,666
1987	1,254	7,210	152	32	8,648	1,825	304	336	120	2,585	11,233
1988											
1989											
1990											
1991											
1992											
1993											

FINANCIAL TABLE 9B1

TABGILARAN WATER SUPPLY PROJECT

CALCULATION OF REVENUE UNITS

I

DOMESTIC

Year	Delivered Water (x1000 cum)	Service Connections (x 0.12)	Net	11 - 20 cum		21 - 45 cum		over 45 cum		Total CRU's
				cum	x 1.2	cum	x 1.4	cum	x 1.7	
1981	840	257	583	257	308	326	456	-	-	764
1982	901	292	609	292	350	317	444	-	-	794
1983	957	341	616	341	409	275	385	-	-	794
1984	1,055	404	651	404	485	247	346	-	-	831
1985	1,105	445	660	445	534	215	301	-	-	835
1986	1,178	470	708	470	564	238	333	-	-	897
1987	1,266	502	764	502	602	262	367	-	-	969
1988	1,266	502	764	502	602	262	367	-	-	969
1989	1,266	502	764	502	602	262	367	-	-	969
1990	1,266	502	764	502	602	262	367	-	-	969
1991	1,266	502	764	502	602	262	367	-	-	969
1992	1,266	502	764	502	602	262	367	-	-	969
1993	1,266	502	764	502	602	262	367	-	-	969

FINANCIAL TABLE 9B2

TAGBILARAN WATER SUPPLY PROJECT

CALCULATION OF WATER REVENUES UNITS

COMMERCIAL

Year	Delivered Water (x1000 cum)	Service Connections (x 0.12)	Net	11 - 45 cum		46 - 100 cum		Over 100 cum		Total CRU's
				cum	x 2.4	cum	x 2.8	cum	x 3.4	
1981	104	46	58	58	139	-	-	-	-	139
1982	111	47	64	64	154	-	-	-	-	154
1983	118	49	69	69	166	-	-	-	-	166
1984	130	50	80	80	192	-	-	-	-	192
1985	136	50	86	86	206	-	-	-	-	206
1986	146	51	95	95	228	-	-	-	-	228
1987	157	51	106	106	254	-	-	-	-	254
1988	157	51	106	106	254	-	-	-	-	254
1989	157	51	106	106	254	-	-	-	-	254
1990	157	51	106	106	254	-	-	-	-	254
1991	157	51	106	106	254	-	-	-	-	254
1992	157	51	106	106	254	-	-			254
1993	157	51	106	106	254					254

FINANCIAL TABLE 9C

SUMMARY OF REVENUE UNITS

I

Year	Residential and Governmental				Commercial and Industrial				Total All
	Service			Total R & C	Service			Total C & I	
	RU/Serv. Connection	Multiplied by 0.12	Commodity Rev. Units		RU/Serv. Connection	Multiplied by 0.12	Commodity Rev. Units		
1981	4,430	532	764	1,296	2,322	279	139	418	1,714
1982	5,023	603	794	1,397	2,340	281	154	435	1,832
1983	5,882	706	794	1,500	2,456	295	166	461	1,961
1984	6,977	837	831	1,668	2,487	298	192	490	2,158
1985	7,673	921	835	1,756	2,507	301	206	507	2,263
1986	8,099	972	897	1,869	2,567	308	228	536	2,405
1987	8,648	1,038	969	2,007	2,585	310	254	564	2,571
1988	8,648	1,038	969	2,007	2,585	310	254	564	2,571
1989	8,648	1,038	969	2,007	2,585	310	254	564	2,571
1990	8,648	1,038	969	2,007	2,585	310	254	564	2,571
1991	8,648	1,038	969	2,007	2,585	310	254	564	2,571
1992	8,648	1,038	969	2,007	2,585	310	254	564	2,571
1993	8,648	1,038	969	2,007	2,585	310	254	564	2,571

ECONOMIC TABLE 1

TAGBILARAN WATER SUPPLY PROJECT

SUMMARY OF PROJECT COST

I

Costs as of July 1, 1981 in 1,000 Pesos

Components	Total Cost	Foreign Currency Portion	Local Currency Portion
1. Vehicles	140	70	70
2. Chlorinator	20	18	2
3. Wells and Pumps	1,012	607	405
4. Stored Materials	229	179	50
5. Meters & Pressure Gauge	1,719	1,326	393
6. Distribution System	5,590	3,746	1,844
7. Transmission System	1,209	810	399
8. Fire Hydrants	623	411	212
9. Valves	314	229	85
10. Reservoir	1,372	343	1,029
11. Elevated tank	407	102	305
12. Engineering	1,327	796	531
13. Supervision	442	265	177
14. Land	37	-	37
15.			
16.			
17.			

Source: From Cost Estimates

ECONOMIC TABLE 2

TAGABILARAN WATER SUPPLY PROJECT

ANNUAL DEMAND AND GROSS PRODUCTION IN 1,000 M^3

1	2	3	4	5	6	7	8	9
Year	Average Connections	Persons Per Service Connection	Population Served	Average Water Use		Net Increase in Delivered Volume	Unacounted Percentage	Annual Production
				Liters/ Capita Per Day	Water Delivered Annually			
1981	2,528	9.7	24,600	105	944		45	1,716
1982	2,818	9.1	25,500	105	1,012		43	1,776
1983	3,255	8.6	28,050	105	1,075		40	1,792
1984	3,783	8.2	30,900	105	1,185	110	40	1,975
1985	4,129	7.9	32,400	110	1,242	167	40	2,070
1986	4,337	7.6	33,000	115	1,324	249	37	2,102
1987	4,585	7.3	33,640	116	1,423	348	34	2,156
1988	4,585	7.3	33,640	116	1,423	348	34	2,156
1989	4,585	7.3	33,640	116	1,423	348	34	2,156
1990	4,585	7.3	33,640	116	1,423	348	34	2,156
1991	4,585	7.3	33,640	116	1,423	348	34	2,156
1992	4,585	7.3	33,640	116	1,423	348	34	2,156
1993	4,585	7.3	33,640	116	1,423	348	34	2,156

ECONOMIC TABLE 3-A

TAGBILARAN WATER SUPPLY PROJECT
CONVERSION OF CONSTRUCTION COST TO ECONOMIC COST
Costs as of July 1, 1981 in 1,000 Pesos

Component	Foreign Costs	Local Costs	Common Labor Costs	Residual Local Cost	Converted Value			
					Foreign x 1.25	Labor x 0.5	Residual x 0.95	Total
1. Vehicles	70	70	-	70	87.5	-	66.5	154
2. Chlorinator	18	2	0.2	1.8	22.5	0.1	1.7	24.3
3. Wells and Pumps	607	405	202.5	202.5	758.8	101.3	192.4	1,052.5
4. Stored Materials	179	50	-	50	223.8	-	47.5	271.3
5. Meters & Gauge	1,326	393	78.6	314.4	1,657.5	39.3	298.7	1,995.5
6. Distribution System	3,746	1,844	737.6	1,106.4	4,682.5	368.8	1,051.1	6,102.4
7. Transmission System	810	399	99.8	299.2	1,012.5	49.9	284.2	1,346.6
8. Fire Hydrant	411	212	84.8	127.2	513.8	42.4	120.8	677
9. Valves	229	85	34	51	286.3	17	48.5	351.8
10. Reservoir	343	1,029	668.9	360.1	428.8	334.5	342.1	1,105.4
11. Elevated tank	102	305	198.2	106.8	127.5	99.1	101.5	328.1
12. Engineering	796	531	-	531	995	-	504.5	1,499.5
13. Land	-	37	-	37	-	-	35	35
14. Supervision	265	177	-	177	331	-	168	499
15.								
16.								
17.								

ECONOMIC TABLE 3-B

TAGBILARAN WATER SUPPLY PROJECT

CONVERSION OF CONSTRUCTION COST TO ECONOMIC COST

Costs as of July 1, 1981 in 1,000 Pesos

I

Component	Foreign Costs	Local Costs	Common Labor Costs	Residual Local Cost	Converted Value			
					Foreign x 1.0	Labor x 0.5	Residual x 0.95	Total
1. Vehicles	70	70	-	70	70	-	66.5	136.5
2. Chlorinators	18	2	0.2	1.8	18	0.1	1.7	19.8
3. Wells and Pumps	607	405	202.5	202.5	607	101.3	192.4	900.7
4. Stored Materials	179	50	-	50	179	-	47.5	226.5
5. Meters & Gauge	1,326	393	78.6	314.4	1,326	39.3	298.7	1,664
6. Distribution System	3,746	1,844	737.6	1,106.4	3,746	368.8	1,051.1	5,165.9
7. Transmission System	810	399	99.8	299.2	810	49.9	284.2	1,144.1
8. Fire Hydrants	411	212	84.8	127.2	411	42.4	120.8	574.2
9. Valves	229	85	34	51	229	17	48.5	294.5
10. Reservoir	343	1,029	668.9	360.1	343	334.5	342.1	1,019.5
11. Elevated tank	102	305	198.2	106.8	102	991	101.5	302.6
12. Engineering	796	531	-	531	796	-	504.5	1,300.5
13. Land	-	37	-	37	-	-	35	35
14. Supervision	265	177	-	177	265	-	168	433
15.								
16.								
17.								

ECONOMIC TABLE 3-C

TAGBILARAN WATER SUPPLY PROJECT
CONVERSION OF CONSTRUCTION COST TO ECONOMIC COST
Costs as of July 1, 1981 in 1,000 Pesos

Component	Foreign Costs	Local Costs	Common Labor Costs	Residual Local Cost	Converted Value			
					Foreign x 1.25	Labor x 1.0	Residual x 1.0	Total
1. Vehicles	70	70	-	70	87.5	-	70	157.5
2. Chlorinators	18	2	0.2	1.8	22.5	0.2	1.8	24.5
3. Wells and Pumps	607	405	202.5	202.5	758.8	202.5	202.5	1,163.8
4. Stored Materials	179	50	-	50	223.8	-	50	273.8
5. Meters	1,326	393	78.6	314.4	1,657.5	78.6	314.4	2,050.5
6. Distribution System	3,746	1,844	737.6	1,106.4	4,682.5	737.6	1,106.4	6,526.5
7. Transmission System	810	399	99.8	299.2	1,012.5	99.8	299.2	1,411.5
8. Fire Hydrants	411	212	84.8	127.2	513.8	84.8	127.2	725.8
9. Valves	229	85	34	51	286.3	34	51	371.3
10. Reservoir	343	1,029	668.9	360.1	428.8	668.9	360.1	1,457.8
11. Elevated tank	102	305	198.2	106.8	127.5	198.2	106.8	432.5
12. Engineering	796	531	-	531	995	-	531	1,526
13. Land	-	37	-	37	-	-	37	37
14. Supervision	265	177	-	177	331	-	177	508
15.								
16.								
17.								

ECONOMIC TABLE 4-0

TAGBILARAN WATER SUPPLY PROJECT

ECONOMIC COSTS DISTRIBUTED TO YEARS

₱ x 1,000

I

Value without CONVERSION

Components	Total	1983	1984	1985	1986	1987	1988
1. Vehicles	140	-	140				
2. Chlorinators	20	-	20				
3. Wells and Pumps	1,012	-	1,012				
4. Stored Materials	229	-	229				
5. Meters & Gauges	1,719	-	1,719				
6. Distribution System	5,590	-	5,590				
7. Transmission System	1,209	-	1,209				
8. Fire Hydrants	623	-	623				
9. Valves	314	-	314				
10. Reservoir	1,372	-	1,372				
11. Elevated tank	407	-	407				
12. Engineering	1,327	1,327	-				
13. Land	37	-	37				
14. Supervision	442	-	442				
15.							
16.							
17.							
18.							
Total	14,441	1,327	13,114				

ECONOMIC TABLE 4-A

TAGBILARAN WATER SUPPLY PROJECT
ECONOMIC COSTS DISTRIBUTED TO YEARS
₱ x 1,000

I

Value with CONVERSION A

Components	Total	1983	1984	1985	1986	1987	1988
1. Vehicles	154	--	154				
2. Chlorinators	24	-	24				
3. Wells and Pumps	1,053	--	1,053				
4. Stored Materials	271	-	271				
5. Meters & Gauges	1,996	-	1,996				
6. Distribution System	6,102	-	6,102				
7. Transmission System	1,347	-	1,347				
8. Fire Hydrants	677	-	677				
9. Valves	352	-	352				
10. Reservoir	1,105	-	1,105				
11. Elevated tank	328	-	328				
12. Engineering	1,500	1,500	-				
13. Land	35	-	35				
14. Supervision	499	--	499				
15.							
16.							
17.							
18.							
Total	15,443	1,500	13,943				

ECONOMIC TABLE 4-B

TAGBILARAN WATER SUPPLY PROJECT
ECONOMIC COSTS DISTRIBUTED TO YEARS
₱ x 1,000

I

Value with CONVERSION B

Components	Total	1983	1984	1985	1986	1987	1988
1. Vehicles	137	–	137				
2. Chlorinators	20	–	20				
3. Wells and Pumps	901	–	901				
4. Stored Materials	227	–	227				
5. Meters & Gauges	1,664	–	1,664				
6. Distribution System	5,166	–	5,166				
7. Transmission System	1,144	–	1,144				
8. Fire Hydrants	574	–	574				
9. Valves	295	–	295				
10. Reservoir	1,020	–	1,020				
11. Elevated tank	303	–	303				
12. Engineering	1,301	1,301	–				
13. Land	35	–	35				
14. Supervision	433		433				
15.							
16.							
17.							
18.							
Total	13,220	1,301	11,919				

ECONOMIC TABLE 4-C

TAGBILARAN WATER SUPPLY PROJECT

ECONOMIC COSTS DISTRIBUTED TO YEARS

₱ x 1,000

I

Value with CONVERSION C

Components	Total	1983	1984	1985	1986	1987	1988
1. Vehicles	158	–	158				
2. Chlorinators	26	–	26				
3. Wells and Pumps	1,164	–	1,164				
4. Stored Materials	274	–	274				
5. Meters	2,051	–	2,051				
6. Distribution System	6,527	–	6,527				
7. Transmission System	1,412	–	1,412				
8. Fire Hydrants	726	–	726				
9. Valves	371	–	371				
10. Reservoir	1,458	–	1,458				
11. Elevated tank	433	–	433				
12. Engineering	1,526	1,526	–				
13. Land	37	–	37				
14. Supervision	508	–	508				
15.							
16.							
17.							
18.							
Total	16,671	1,526	15,145				

ECONOMIC TABLE 5

TAGBILARAN WATER SUPPLY PROJECT
OPERATION AND MAINTENANCE EXPENSES
Costs as of July 1, 1981 in 1,000 Pesos

I

Year	Power	Chemicals	Others	Total	Net Costs
1981	239	69	314	622	
1982	247	71	366	684	
1983	257	74	455	786	102
1984	267	77	568	912	228
1985	269	77	619	965	281
1986	283	81	737	1,101	417
1987	300	86	825	1,211	527
1988	300	86	825	1,211	527
1989	300	86	825	1,211	527
1990	300	86	825	1,211	527
1991	300	86	825	1,211	527
1992	300	86	825	1,211	527
1993	300	86	825	1,211	527

Base Year = 1983

ECONOMIC TABLE 6-Q

TAGBILARAN WATER SUPPLY PROJECT
LIFE EXPECTANCY AND REPLACEMENT SCHEDULES
₱ x 1,000

I

Value without CONVERSION

Components	Life Expectancy of Components				
	7 Years	15 Years	50 Years	Infinite	Total
1. Vehicles	140				140
2. Chlorinator	20				20
3. Stored Materials	229				229
4. Wells and Pumps		1,102			1,102
5. Meters & Pressure Gauges		1,719			1,719
6. Distribution System			5,590		5,590
7. Transmission System			1,209		1,209
8. Fire Hydrants			623		623
9. Valves			314		314
10. Reservoir			1,372		1,372
11. Elevated Tank			407		407
12. Land				37	37

7 Year Items	Years of Installation					Years of Replacement				
1. Vehicles	1984					1991	1998	2005	2012	
2. Chlorinator	1984					1991	1998	2005	2012	
3. Stored Materials	1984					1991	1998	2005	2012	
4.										

15 Year Items	Years of Installation					Years of Replacement				
1. Wells and Pumps	1984					1999				
2. Meters & Pressure Gauges	1984					1999				
3.										
4.										

ECONOMIC TABLE 6-A

TAGBILARAN WATER SUPPLY PROJECT
LIFE EXPECTANCY AND REPLACEMENT SCHEDULES
₱ x 1,000

I

Value with CONVERSION A

Components	Life Expectancy of Components				
	7 Years	15 Years	50 Years	Infinite	Total
1. Vehicles	154				154
2. Chlorinator	24				24
3. Stored Materials	271				271
4. Wells and Pumps		1,053			1,053
5. Meters & Pressure Gauge		1,996			1,996
6. Distribution System			6,102		6,102
7. Transmission System			1,347		1,347
8. Fire Hydrants			677		677
9. Valves			352		352
10. Reservoir			1,105		1,105
11. Elevated Tank			328		328
12. Land				35	35

7 Year Items	Years of Installation					Years of Replacement				
1. Vehicles	1984					1991	1998	2005	2012	
2. Chlorinator	1984					1991	1998	2005	2012	
3. Stored Materials	1984					1991	1998	2005	2012	
4.										

15 Year Items	Years of Installation					Years of Replacement				
1. Wells and Pumps	1984					1999				
2. Meters & Gauge	1984					1999				
3.										
4.										

Tagbilaran

ECONOMIC TABLE 6-B

TAGBILARAN WATER SUPPLY PROJECT
LIFE EXPECTANCY AND REPLACEMENT SCHEDULES
₱ x 1,000

I

Value with CONVERSION B

Components	Life Expectancy of Components				
	7 Years	15 Years	50 Years	Infinite	Total
1. Vehicles	137				137
2. Chlorinator	20				20
3. Stored Materials	227				227
4. Wells and Pumps		901			901
5. Meters & Gauge		1,664			1,664
6. Distribution System			5,166		5,166
7. Transmission System			1,144		1,144
8. Fire Hydrants			574		574
9. Valves			295		295
10. Reservoir			1,020		1,020
11. Elevated Tank			303		303
12. Land				35	35

7 Year Items	Years of Installation					Years of Replacement				
1. Vehicles	1984					1991	1998	2005	2012	
2. Chlorinator	1984					1991	1998	2005	2012	
3. Stored Materials	1984					1991	1998	2005	2012	
4.										

15 Year Items	Years of Installation					Years of Replacement				
1. Wells and Pumps	1984					1999				
2. Meters & Gauge	1984					1999				
3.										
4.										

ECONOMIC TABLE 6-C

TAGBILARAN WATER SUPPLY PROJECT
LIFE EXPECTANCY AND REPLACEMENT SCHEDULES I
₱ x 1,000

Value with CONVERSION C

Components	Life Expectancy of Components				
	7 Years	15 Years	50 Years	Infinite	Total
1. Vehicles	158				158
2. Chlorinator	26				26
3. Stored Materials	274				274
4. Wells and Pumps		1,164			1,164
5. Meters & Gauge		2,051			2,051
6. Distribution System			6,527		6,527
7. Transmission System			1,412		1,412
8. Fire Hydrants			726		726
9. Valves			371		371
10. Reservoir			1,458		1,458
11. Elevated Tank			433		433
12. Land				37	37

7 Year Items	Years of Installation					Years of Replacement				
1. Vehicles	1984					1991	1998	2005	2012	
2. Chlorinator	1984					1991	1998	2005	2012	
3. Stored Materials	1984					1991	1998	2005	2012	
4.										

15 Year Items	Years of Installation					Years of Replacement				
1. Wells and Pumps	1984					1999				
2. Meters & Gauge	1984					1999				
3.										
4.										

ECONOMIC TABLE 7-0

TAGBILARAN WATER SUPPLY PROJECT

CALCULATION OF SALVAGE VALUES

I

₱ x 1,000

Value without CONVERSION

Components	Base Year Value	Percentage of Base Year Value	31st Year Salvage Base Year Values
Infinite Life, Year Purchased			
1984	37	75%	28
50 Year Life, Year Constructed			
1 1984	9,515	42%	3,996
15 Year Life, Year of Replacement			
1 1999	2,731	7%	191
7 Year Life, Years of Final Replacement			
1 2012	389	86%	335
Total			4,550

ECONOMIC TABLE 7-A

TAGBILARAN WATER SUPPLY PROJECT

CALCULATION OF SALVAGE VALUES

₱ x 1,000

I

Value with CONVERSION A

Components	Base Year Value	Percentage of Base Year Value	31st Year Salvage Base Year Values
Infinite Life, Year Purchased			
1984	35	75%	26
50 Year Life, Year Constructed			
1 1984	9,911	42%	4,163
15 Year Life, Year of Replacement			
1 1999	3,049	7%	213
7 Year Life, Years of Final Replacement			
1 2012	449	86%	386
Total			4,788

ECONOMIC TABLE 7-B

TAGBILARAN WATER SUPPLY PROJECT
CALCULATION OF SALVAGE VALUES
₱ x 1,000

I

Value with CONVERSION B

Components	Base Year Value	Percentage of Base Year Value	31st Year Salvage Base Year Values
Infinite Life, Year Purchased			
1984	35	75%	26
50 Year Life, Year Constructed			
1 1984	8,502	42%	3,571
15 Year Life, Year of Replacement			
1 1999	2,565	7%	180
7 Year Life, Years of Final Replacement			
1 2012	384	86%	330
Total			4,107

ECONOMIC TABLE 7-C

TAGBILARAN WATER SUPPLY PROJECT

CALCULATION OF SALVAGE VALUES

I

₱ x 1,000

Value with CONVERSION C

Components	Base Year Value	Percentage of Base Year Value	31st Year Salvage Base Year Values
Infinite Life, Year Purchased			
1984	37	75%	28
50 Year Life, Year Constructed			
1 1984	10,927	42%	4,589
15 Year Life, Year of Replacement			
1 1999	3,215	7%	225
7 Year Life, Years of Final Replacement			
1 2012	458	86%	394
Total			5,236

ECONOMIC TABLE 8-0

TAGBILARAN WATER SUPPLY PROJECT

SUMMARY OF ALL PROJECT COSTS

Costs as of July 1, 1981 in 1,000 Pesos

I

Value without CONVERSION

Year	Cost of Facilities	Net O & M	Replace-ment Costs	Total	Salvage	Net Cost
1982						
1983	1,327	102		1,429		
1984	13,114	228		13,342		
1985		281		281		
1986		417		417		
1987		527		527		
1988		527		527		
1989		527		527		
1990		527		527		
1991		527	389	916		
1992		527		527		
1993		527		527		
1994		527		527		
1995		527		527		
1996		527		527		
1997		527		527		
1998		527	389	916		
1999		527	2,731	3,258		
2000		527		527		
2001		527		527		
2002		527		527		
2003		527		527		
2004		527		527		
2005		527	389	916		
2006		527		527		
2007		527		527		
2008		527		527		
2009		527		527		
2010		527		527		
2011		527		527		
2012		527	389	916		
Total	14,441	14,730	4,287	33,458	4,550	28,908

ECONOMIC TABLE 8-A

TAGBILARAN WATER SUPPLY PROJECT I

SUMMARY OF ALL PROJECT COSTS

Costs as of July 1, 1981 in 1,000 Pesos

Value with CONVERSION A

Year	Cost of Facilities	Net O & M	Replace-ment Costs	Total	Salvage	Net Cost
1982						
1983	1,500	102		1,602		
1984	13,943	228		14,171		
1985		281		281		
1986		417		417		
1987		527		527		
1988		527		527		
1989		527		527		
1990		527		527		
1991		527	449	976		
1992		527		527		
1993		527		527		
1994		527		527		
1995		527		527		
1996		527		527		
1997		527		527		
1998		527	449	976		
1999		527	3,049	3,576		
2000		527		527		
2001		527		527		
2002		527		527		
2003		527		527		
2004		527		527		
2005		527	449	976		
2006		527		527		
2007		527		527		
2008		527		527		
2009		527		527		
2010		527		527		
2011		527		527		
2012		527	449	976		
Total	15,443	14,730	4,845	35,018	(4,788)	30,230

ECONOMIC TABLE 8-B

TAGBILARAN WATER SUPPLY PROJECT I

SUMMARY OF ALL PROJECT COSTS

Costs as of July 1, 1981 in 1,000 Pesos

Value with CONVERSION B

Year	Cost of Facilities	Net O & M	Replace-ment Costs	Total	Salvage	Net Cost
1982						
1983	1,301	102		1,403		
1984	11,919	228		12,147		
1985		281		281		
1986		417		417		
1987		527		527		
1988		527		527		
1989		527		527		
1990		527		527		
1991		527	384	911		
1992		527		527		
1993		527		527		
1994		527		527		
1995		527		527		
1996		527		527		
1997		527		527		
1998		527	384	911		
1999		527	2,565	3,092		
2000		527		527		
2001		527		527		
2002		527		527		
2003		527		527		
2004		527		527		
2005		527	384	911		
2006		527		527		
2007		527		527		
2008		527		527		
2009		527		527		
2010		527		527		
2011		527		527		
2012		527	384	911		
Total	13,220	14,730	4,101	32,051	(4,107)	27,944

ECONOMIC TABLE 8-C

TAGBILARAN WATER SUPPLY PROJECT I

SUMMARY OF ALL PROJECT COSTS

Costs as of July 1, 1981 in 1,000 Pesos

Value with CONVERSION C

Year	Cost of Facilities	Net O & M	Replace-ment Costs	Total	Salvage	Net Cost
1982						
1983	1,526	102		1,628		
1984	15,145	228		15,373		
1985		281		281		
1986		417		417		
1987		527		527		
1988		527		527		
1989		527		527		
1990		527		527		
1991		527	458	985		
1992		527		527		
1993		527		527		
1994		527		527		
1995		527		527		
1996		527		527		
1997		527		527		
1998		527	458	985		
1999		527	3,215	3,742		
2000		527		527		
2001		527		527		
2002		527		527		
2003		527		527		
2004		527		527		
2005		527	458	985		
2006		527		527		
2007		527		527		
2008		527		527		
2009		527		527		
2010		527		527		
2011		527		527		
2012		527	458	985		
Total	16,671	14,730	5,047	36,448	(5,236)	31,212

ECONOMIC TABLE 9

TAGBILARAN WATER SUPPLY PROJECT I
BENEFITS AT 1981 PRICES
(₱ x 1,000)

Year	Volume	Qualitative	Fire Loss Reduction	Total	National Interest Adjustment
1982					
1983					
1984	407	398	206	1,011	1,112
1985	618	795	227	1,640	1,804
1986	921	1,193	250	2,364	2,600
1987	1,288	1,193	280	2,761	3,037
1988	1,288	1,193	280	2,761	3,037
1989	1,288	1,193	280	2,761	3,037
1990	1,288	1,193	280	2,761	3,037
1991	1,288	1,193	280	2,761	3,037
1992	1,288	1,193	280	2,761	3,037
1993	1,288	1,193	280	2,761	3,037
1994	1,288	1,193	280	2,761	3,037
1995	1,288	1,193	280	2,761	3,037
1996	1,288	1,193	280	2,761	3,037
1997	1,288	1,193	280	2,761	3,037
1998	1,288	1,193	280	2,761	3,037
1999	1,288	1,193	280	2,761	3,037
2000	1,288	1,193	280	2,761	3,037
2001	1,288	1,193	280	2,761	3,037
2002	1,288	1,193	280	2,761	3,037
2003	1,288	1,193	280	2,761	3,037
2004	1,288	1,193	280	2,761	3,037
2005	1,288	1,193	280	2,761	3,037
2006	1,288	1,193	280	2,761	3,037
2007	1,288	1,193	280	2,761	3,037
2008	1,288	1,193	280	2,761	3,037
2009	1,288	1,193	280	2,761	3,037
2010	1,288	1,193	280	2,761	3,037
2011	1,288	1,193	280	2,761	3,037
2012	1,288	1,193	280	2,761	3,037
Total	35,434	33,404	7,963	76,801	84,478

ECONOMIC TABLE 10-0

TAGBILARAN WATER SUPPLY PROJECT

INTERNAL RATE OF RETURN COMPUTATION

I

Cost Value without CONVERSION

Year	Total Cost	Total Benefit	Net Benefit	Present Net Benefit
1982				
1983	1,429	-	-1,429	-1,429
1984	13,342	1,112	-12,230	-10,540
1985	281	1,804	1,523	1,131
1986	417	2,600	2,183	1,397
1987	527	3,037	2,510	1,385
1988	527	3,037	2,510	1,193
1989	527	3,037	2,510	1,029
1990	527	3,037	2,510	886
1991	916	3,037	2,121	646
1992	527	3,037	2,510	658
1993	527	3,037	2,510	567
1994	527	3,037	2,510	489
1995	527	3,037	2,510	421
1996	527	3,037	2,510	363
1997	527	3,037	2,510	313
1998	916	3,037	2,121	228
1999	3,258	3,037	-221	-20
2000	527	3,037	2,510	200
2001	527	3,037	2,510	173
2002	527	3,037	2,510	149
2003	527	3,037	2,510	128
2004	527	3,037	2,510	111
2005	916	3,037	2,121	81
2006	527	3,037	2,510	82
2007	527	3,037	2,510	71
2008	527	3,037	2,510	61
2009	527	3,037	2,510	53
2010	527	3,037	2,510	45
2011	527	3,037	2,510	39
2012	916	3,037	6,671*	89*
Salvage(-)	4,550			
Total	28,908	84,478	55,570	-1

Rate of Return = 0.16

ECONOMIC TABLE 10-A

TAGBILARAN WATER SUPPLY PROJECT

INTERNAL RATE OF RETURN COMPUTATION

Cost Value with CONVERSION A

Year	Total Cost	Total Benefit	Net Benefit	Present Benefit
1982				
1983	1,602	-	-1,602	-1,602
1984	14,171	1,112	-13,059	-11,371
1985	281	1,804	1,523	1,155
1986	417	2,600	2,183	1,441
1987	527	3,037	2,510	1,443
1988	527	3,037	2,510	1,256
1989	527	3,037	2,510	1,094
1990	527	3,037	2,510	953
1991	976	3,037	2,061	681
1992	527	3,037	2,510	722
1993	527	3,037	2,510	629
1994	527	3,037	2,510	548
1995	527	3,037	2,510	477
1996	527	3,037	2,510	415
1997	527	3,037	2,510	362
1998	976	3,037	2,061	258
1999	3,576	3,037	-539	-59
2000	527	3,037	2,510	239
2001	527	3,037	2,510	208
2002	527	3,037	2,510	181
2003	527	3,037	2,510	158
2004	527	3,037	2,510	137
2005	976	3,037	2,061	98
2006	527	3,037	2,510	104
2007	527	3,037	2,510	91
2008	527	3,037	2,510	79
2009	527	3,037	2,510	69
2010	527	3,037	2,510	60
2011	527	3,037	2,510	52
2012	976	3,037	6,849*	124*
Salvage(-)	4,788			
Total	30,230	84,478	54,248	2

* Values include salvage.

Rate of Return = 0.15

ECONOMIC TABLE 10-B

TAGBILARAN WATER SUPPLY PROJECT

INTERNAL RATE OF RETURN COMPUTATION

I

Cost Value with CONVERSION B

Year	Total Cost	Total Benefit	Net Benefit	Present Benefit
1982				
1983	1,403	-	-1,403	-1,403
1984	12,147	1,112	-11,035	-9,385
1985	281	1,804	1,523	1,102
1986	417	2,600	2,183	1,343
1987	527	3,037	2,510	1,313
1988	527	3,037	2,510	1,117
1989	527	3,037	2,510	950
1990	527	3,037	2,510	808
1991	911	3,037	2,126	582
1992	527	3,037	2,510	584
1993	527	3,037	2,510	497
1994	527	3,037	2,510	423
1995	527	3,037	2,510	359
1996	527	3,037	2,510	306
1997	527	3,037	2,510	260
1998	911	3,037	2,126	187
1999	3,092	3,037	-55	-4
2000	527	3,037	2,510	160
2001	527	3,037	2,510	136
2002	527	3,037	2,510	116
2003	527	3,037	2,510	98
2004	527	3,037	2,510	84
2005	911	3,037	2,126	60
2006	527	3,037	2,510	61
2007	527	3,037	2,510	51
2008	527	3,037	2,510	44
2009	527	3,037	2,510	37
2010	527	3,037	2,510	32
2011	527	3,037	2,510	27
2012	911	3,037	6,233*	57*
Salvage(-)	4,107			
Total	27,944	84,478	56,534	2

* Values include salvage.

Rate of Return = 0.18

I

ECONOMIC TABLE 10-C

TAGBILARAN WATER SUPPLY PROJECT

INTERNAL RATE OF RETURN COMPUTATION

Cost Value with CONVERSION C

Year	Total Cost	Total Benefit	Net Benefit	Present Benefit
1982				
1983	1,628	-	-1,628	-1,628
1984	15,373	1,112	-14,261	-12,547
1985	281	1,804	1,523	1,179
1986	417	2,600	2,183	1,487
1987	527	3,037	2,510	1,504
1988	527	3,037	2,510	1,323
1989	527	3,037	2,510	1,164
1990	527	3,037	2,510	1,024
1991	985	3,037	2,052	737
1992	527	3,037	2,510	793
1993	527	3,037	2,510	698
1994	527	3,037	2,510	614
1995	527	3,037	2,510	540
1996	527	3,037	2,510	475
1997	527	3,037	2,510	418
1998	985	3,037	2,052	301
1999	3,742	3,037	-705	-91
2000	527	3,037	2,510	285
2001	527	3,037	2,510	250
2002	527	3,037	2,510	220
2003	527	3,037	2,510	194
2004	527	3,037	2,510	171
2005	985	3,037	2,052	123
2006	527	3,037	2,510	132
2007	527	3,037	2,510	116
2008	527	3,037	2,510	102
2009	527	3,037	2,510	90
2010	527	3,037	2,510	79
2011	527	3,037	2,510	70
2012	985	3,037	7,288*	178*
Salvage(-)	5,236			
Total	31,212	84,478	53,266	1

* Values include salvage.

Rate of Return = 0.14