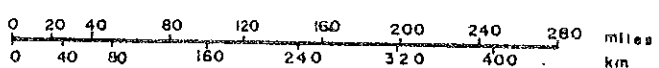
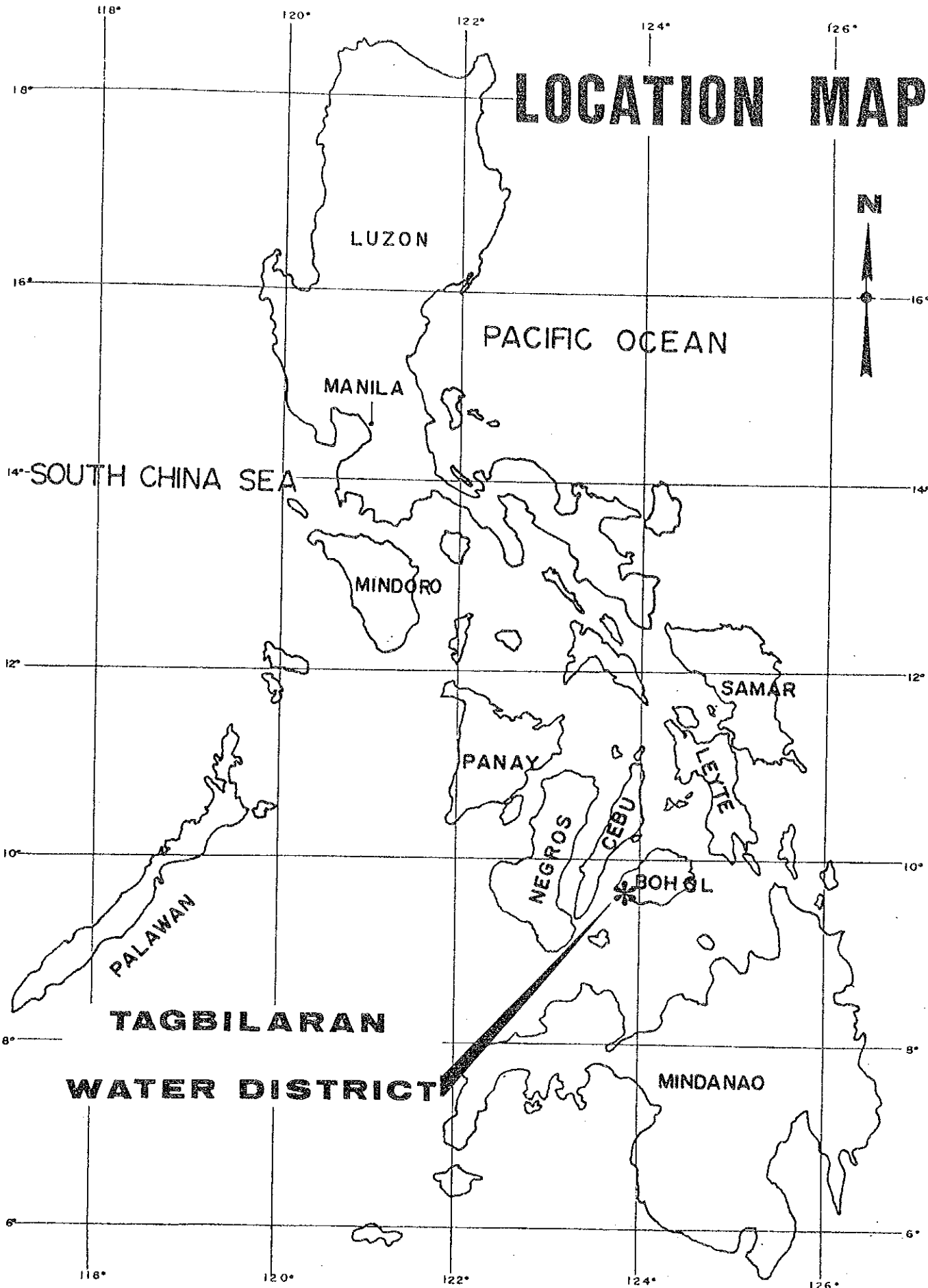


TABGILARAN WATER SUPPLY SYSTEM

LOCATION MAP



SUMMARY

I. General

1.1 Physical and Socioeconomic Conditions

The Project Area consists of the whole of Tagbilaran City and the poblacion of Dauis Municipality. Tagbilaran City lies on the southwestern end of Bohol Island, and Dauis poblacion is located on another island opposite to the City. Most soil formations in the area are composed of limestone. Major features of the Area are as follows.

- (1) Location: Southwestern end of the Bohol Island in the Philippines
- (2) Topography: Limestone-rocky tableland with elevation of 20 - 50 m above sea level
- (3) Climate: No pronounced dry/wet seasons
Rainfall = 1,600 mm/year
Not much variable temperature throughout the day and the year
- (3) Population: 42,275 in 1980, with 2.5% of annual growth rate
- (4) Socio-Economic Conditions: Identified as a commercial, trading center and educational center
Dialect: Cebuano (99%)
Religion: Roman Catholic (98%)
Road Condition: Ample in length and width, though not yet satisfactory in pavement
Public Water Supply: Existing, however poorly supplying
Sewerage System: Not existing
Electricity: 48.7% in electrification
Transportation: Accessible to various points in the island by roads and to neighboring provinces by water and air

1.2 Existing Water Supply

The existing water supply is operated by Bohol Provincial Waterworks System, covering two poblacions of Tagbilaran and Dauis. Water sources are all groundwater, being taken by means of deep well. As the area consists of porous limestone formations, withdrawal of groundwater is apt to cause seawater intrusion and some deep wells suffer from salinization of water, with some wells already abandoned. Generally the pipelines are deteriorated, with leaks, and supply conditions are very poor. Main features of the water supply are as follows.

- (1) System: Started in 1924 with a deep well. Currently owned and operated by the Bohol Provincial Waterworks System.
- (2) Water Source: Groundwater by 8 deep wells
- (3) Distribution System: Storage facilities and a distribution network: Two reservoirs and 37,640 m of distribution mains with diameters of 150 - 38 mm
- (4) Present Water Use: Maximum amount of supply = 4,700 cu m/day from 8 deep wells
Served Population = 15,000
Service Connections = Total 2,556 including 2,130 domestic connections (715 of functioning meters)
- (5) Water Rate: Peso 11.96 per month for domestic (Minimum charge for the first 14 cu m)

II. Master Plan

A period from the present up to the year 2010 was taken for the design period of the master plan of the Tagbilaran water supply system. Served population was planned to gradually increase from the present served population 15,000 (35% of the total population) to 68,085 (88%) at the end of the design period. Based on the served population, future water demand was projected.

Potential water sources to meet the projected water requirement were investigated in and around the project area, including groundwater and surface water, and groundwater was selected for future water supply use.

The whole master plan period was divided into three Phases I, II and III. Phase I covers a period up to the year 1987, and plans to increase the supply capacity by rehabilitation of the existing facilities and addition of reservoirs and pipelines. Phase II covers a period up to the year 1993 after Phase I, and increases the supply capacity by addition of new facilities. The rest period is Phase III.

Major figures and work items are tabulated below.

(1) Target Year:	Phase I	=	1987
	Phase II	=	1993
	Phase III	=	2010
(2) Service Area:	Present	:	480 ha
	1987	:	720 ha
	1993	:	1,980 ha
	2010	:	2,450 ha
(3) Population Projection:	Present	:	42,275
	1987	:	49,910
	1993	:	56,870
	2010	:	77,020

- (4) Served Population: Present : 15,000 (35%)
 1987 : 24,840 (50%)
 1993 : 39,440 (69%)
 2010 : 68,085 (88%)
- (5) Water Demand: Present : 4,700 cu m/day
 1987 : 7,090 cu m/day
 1993 : 9,800 cu m/day
 2010 : 18,430 cu m/day
- (6) Water Sources: Present : 8 deep wells
 1987 : 9 deep wells
 1993 : 11 deep wells
 2010 : 16 deep wells

(7) Facilities to be Constructed: See page 6.

(8) Project Cost:

	<u>Phase I</u>	<u>Phase II</u>	<u>Phase III</u>
Foreign	\$1.26 M	\$ 1.82 M	\$ 3.86 M
Local	\$0.78 M	\$ 1.18 M	\$ 2.46 M
Total	\$2.04 M	\$ 3.00 M	\$ 6.32 M

(Costs as of July 1981; Not including price escalation)



Facilities to be Constructed

Facilities	Phase I 1987	Phase II 1993	Phase III 2010
Deep Well	---	1 x (Ø 250mm x 60m) 1 x (Ø 250mm x 50m)	5 x (Ø 300mm x 80m)
Deep Well Pump Station	---	14.5 l/s, 29 Kw 11.6 l/s, 29 Kw	5 x (19.7 l/s, 29 Kw)
Elevated Tank	1 x 100 m ³	1 x 100 m ³ 1 x 350 m ³	---
Ground Reservoir	1 x 1350 m ³	1 x 800 m ³	1 x 710 m ³ 2 x 1450 m ³
Pump Station	1 x (H=30 m, Q=62.9 l/s)	1 x (H=30 m, Q=39.1 l/s)	1 x (H=70 m, Q=98.7 l/s)
Transmission	Ø 200, L=3100 m	Ø 200mm, L= 1900m Ø 150mm, L= 100m	Ø 200mm, L=10000m Ø 350mm, L= 4000m
Distribution	Ø 250mm, L=3500m Ø 150mm, L=9600m Ø 100mm, L=5300m	Ø 200mm, L= 2500m Ø 150mm, L= 3500m Ø 100mm, L=16000m	Ø 350mm, L= 3000m Ø 200mm, L= 5000m Ø 150mm, L=20000m
Pump for No. 8 Well	1 x (H=70 m, Q=14.5 l/s)	---	---
Water Meter	1813 x Ø 13	---	---
Water Meter & Connection	2057 x Ø 13	3900 x Ø 13	6717 x Ø 13
Bulk Meter	13 x (Ø 250, Ø 200, Ø 150)	12 x (Ø 200mm, Ø150mm)	8 x (Ø 350mm, Ø200mm)
Chlorinator	2	2	2
Fire Hydrant	87	40	187
Valve	65 x (Ø 250, Ø 200, Ø150, Ø 100)	75 x (Ø 200, Ø 150, Ø 100)	101 x (Ø 350, Ø 200, Ø 150)
Pressure Gauge	10	---	---
Vehicle	2	1	1
Service Pipe	---	Ø50mm, L=39,000m	Ø50mm, L=67,000m

III. Feasibility Study

Feasibility study was carried out for two potential cases: Case 1 study was made on the Phase I project, and Case 2 study on the combined projects of Phases I and II. Phase I aims to increase the supply capacity by improvement of facilities adding reservoirs and pipelines. Phase II is to increase the capacity by constructing deep wells and some distribution facilities.

The results of the above study indicate that both projects are feasible. The only difference is that the Case 2 project is to given a government subsidy of 25% of the total investment cost.

(1) Implementation

Schedule: Phase I : 1982 - 1984
Phase I + II : 1982 - 1988

(2) Project Costs:

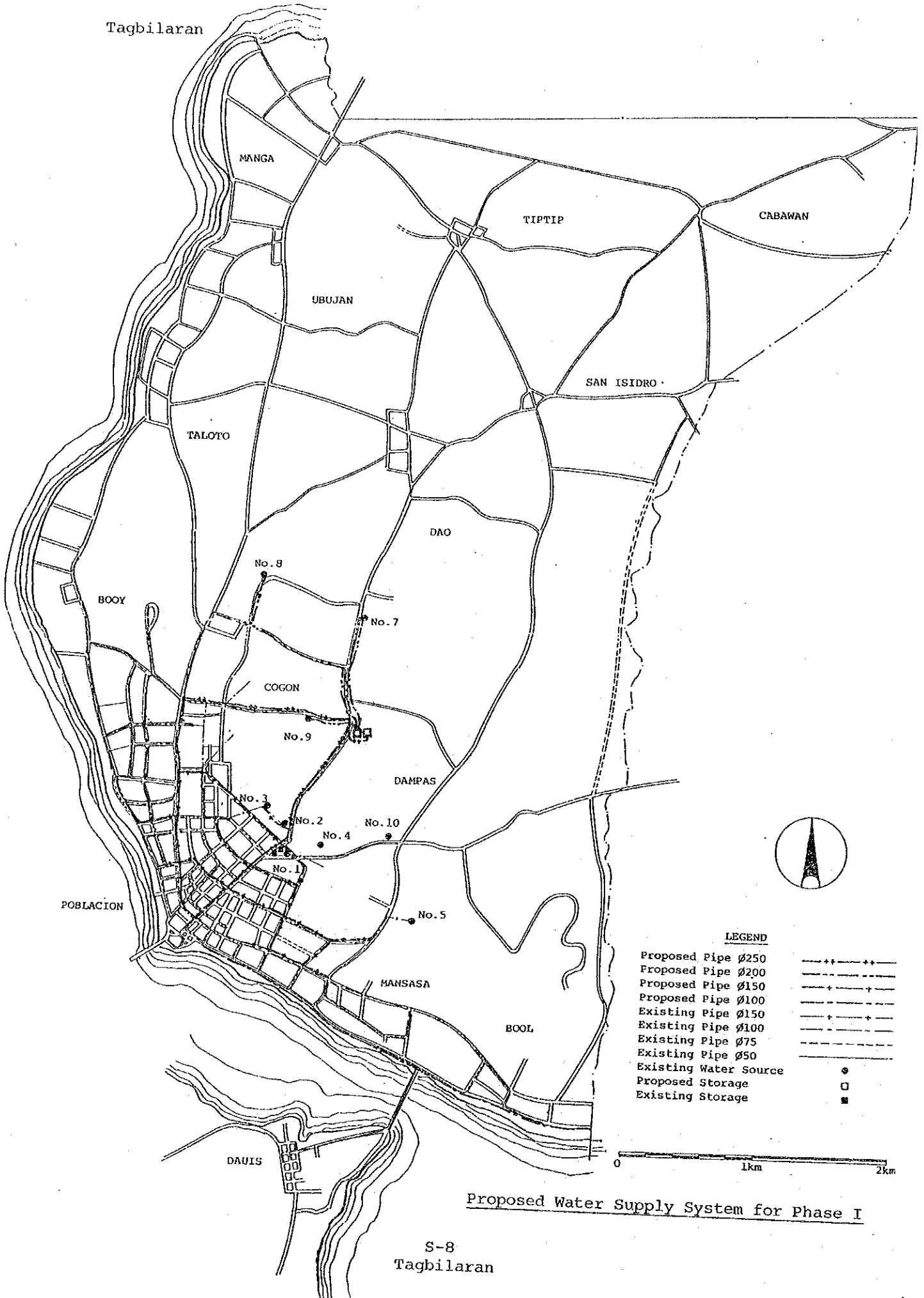
	<u>Phase I</u>	<u>Phase I + II</u>
Foreign	\$1.89 M	\$4.05 M
Local	\$1.17 M	\$2.51 M
Total	\$3.06 M	\$6.56 M

(Costs including price escalation according to implementation schedule)

(3) Financial

Feasibility: Phase I : Feasible
Phase I + II : Feasible with government subsidy of 25% of total investment cost

Tagbilaran



Proposed Water Supply System for Phase I

S-8
Tagbilaran

Construction Schedule for Phase I

(Target Year: 1987)

Work Item	Year							
	'82	'83	'84	'85	'86	'87	'88	'89
<u>(Appraisal & Loan Procedure)</u>	■							
<u>Engineering Services</u>		DD ■	SV ■					
<u>Procurement</u>								
-Transmission & distribution pipes, pumps, water meters, etc.		T ■	M ■					
<u>Civil Work</u>								
-Group I Works		T ■	C ■					
-Group II Works		T ■	C ■					
-Meters, Valves and Other Appurtenances		T ■	C ■					

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

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)

Water Rate Schedule

(Phase I)

DOMESTIC AND GOVERNMENTAL SERVICE CONNECTIONS, 1/2"

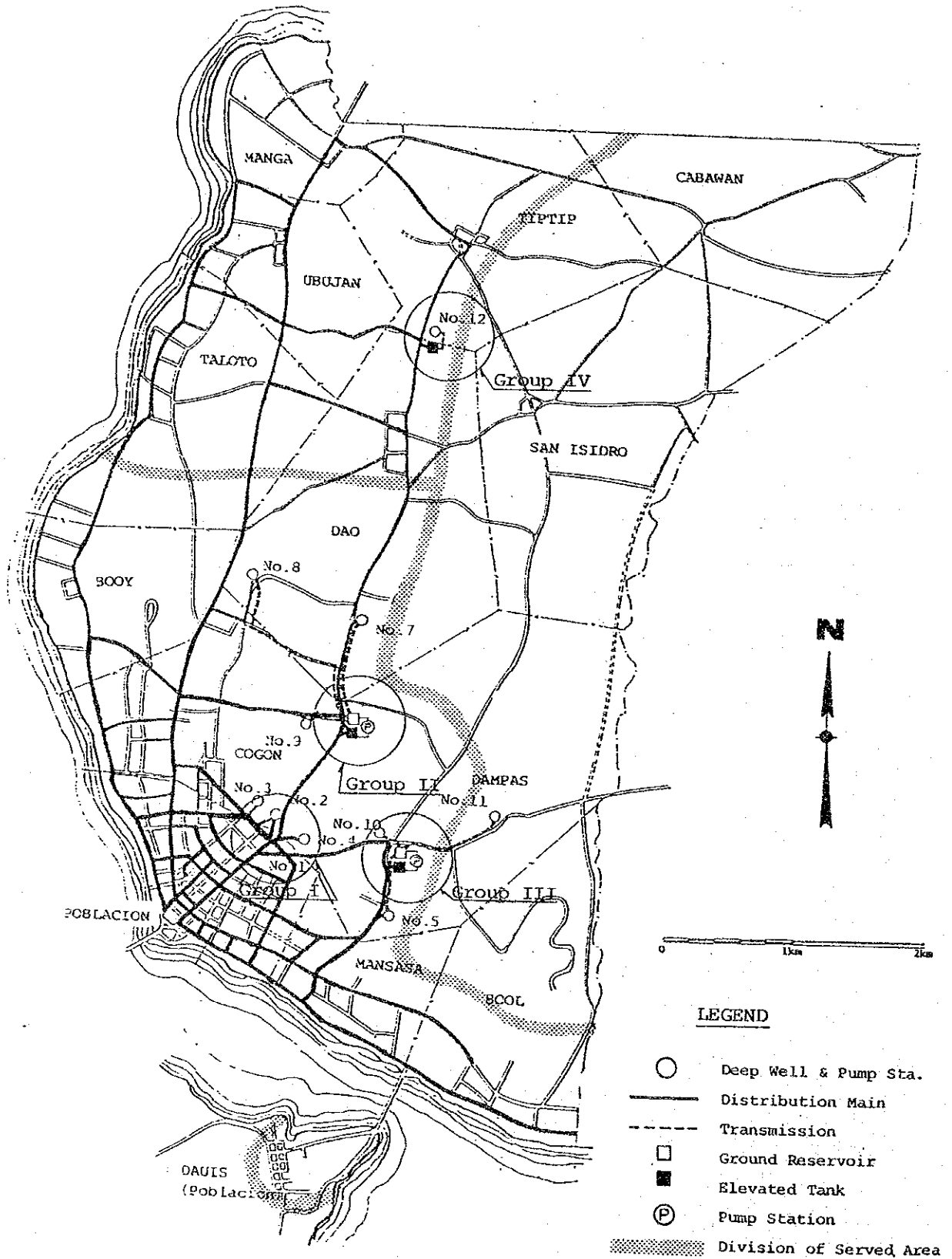
Year	First 10 m ³ <u>1/</u>	Charge for Each Added m ³ <u>2/</u>			Charge <u>3/</u> per Revenue Unit
		11-20	21-45	over 45	
1981	10.75	0.52	0.60	0.73	0.43
1982	10.75	0.52	0.60	0.73	0.43
1983	16.75	0.80	0.94	1.14	0.67
1984	27.50	1.32	1.54	1.87	1.10
1985	44.00	2.11	2.46	2.99	1.76
1986	55.75	2.68	3.12	3.79	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 m³ for the first 10 m³ 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"
 Commercial: 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 m³, multiply R.U. charges shown in 3/ by the following block factors.

Domestic : 1.2 for 11-20 m³; 1.4 for 21-45 m³; 1.7 for over 45 m³
 Commercial: 2.4 for 21-45 m³; 2.8 for 45-100 m³; 2.4 for over 100 m³



Proposed Water Supply System for Year 1993

(Phase I + II)

Construction Schedule for Phase I + II

(Target Year: 1993)

Work Item	Year							
	'82	'83	'84	'85	'86	'87	'88	'89
(Appraisal & Loan Procedure)	■							
<u>Engineering Services</u>		DD			SV			
<u>Procurement</u>								
- Transmission & distribution pipes, pumps, water meters, etc.		T		M				
<u>Civil Work</u>								
- Group I Works			T		C		T	C
- Group II Works			T	C				
- Group III Works					T	C		
- Group IV Works					T		C	
- Meters, valves and other apparatus			T			C		

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

Tagbilaran Project Cost for Phase I + II (Target Year: 1993)

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	4,457	2,987	1,470
B. Group II Works	5,425	2,817	2,608
C. Group III Works	4,090	1,968	2,122
D. Group IV Works	2,645	1,645	1,000
E. Meters, Valves and Other Appurtenances	6,370	4,742	1,628
Sub Total	22,987	14,159	8,828
Detailed Design Cost (10.5%)	2,414	1,448	966
Supervision Cost (3.5 %)	805	483	322
Land Cost	71	-	71
Total	26,277	16,090	10,187
Physical Contingency (10%)	2,628	1,609	1,019
Total	28,905	17,699	11,206
Price Contingency	22,286	13,887	8,399
Grand Total (Project Cost)	51,191	31,586	19,605
	(Equivalent to US\$6.56 M)	(Equivalent to US\$4.05M)	(Equivalent to US\$2.51 M)

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