

2000	4,086	41
2001	4,252	43
2002	4,426	44
2003	4,606	46
2004	4,794	48
2005	4,990	50

The existing number of employees, although deviating greatly from LWUA's Methodology Manual is deemed justified. The location and facilities of the TC-WD especially the booster pumping stations are in remote areas necessitating three(3) shifts of operators/pump tenders.

However, upon completion of the project in 1997, a reduction in the number of employees will be necessary in as much as the newly constructed pumping station is a single stage.

(2) Cost for Operation and Maintenance of the Water Supply System

A summary of operation and maintenance cost for the Tagaytay water supply system is shown in **Table 11.5-3**, and a breakdown of the expenditures is presented in **Table 11.5-4a** to **11.5-4c**.

11.5.3 Financial Analysis

(1) Financial Background

Tagaytay Water District was established in May, 1975. From 1984 to 1986, the district received the grant at the total amount of 12 million pesos from the central government to improve its water supply facilities.

(2) Development Cost

The cost estimates of the required improvements are presented in the preceding section. A breakdown of the project cost on an annual basis is shown in **Table 11.5-5**.

(3) Operating and Maintenance Costs

Operating and maintenance costs are shown in **Table 11.5-6**. Details are also shown in the preceding section (Section 11.5.2).

(4) Project Financing

100% of the total project cost is assumed to be financed by loans. The district shall be exempted from the equity contribution since it has not received major loan from LWUA. Computation of the loan is shown below.

TABLE 11.5-3
SUMMARY OF OPERATION AND MAINTENANCE COST
TAGAYTAY WATER DISTRICT

YEAR	ADMINISTRATION PERSONNEL A)	POWER B)	CHLORINE C)	MISCELLANEOUS & MAINTENANCE D)	OFFICE RENTALS E)	TOTAL
1994	2,444,000.00	11,368,945.70	133,775.71	285,000.00	0.00	14,231,721.41
1995	2,505,100.00	12,156,892.43	142,926.70	300,000.00	0.00	15,104,919.13
1996	2,566,200.00	12,982,360.44	152,891.20	315,900.00	0.00	16,017,351.64
1997	2,657,850.00	13,920,392.26	163,622.20	332,500.00	0.00	17,074,364.46
1998	2,223,000.00	11,761,476.11	207,619.30	377,400.00	0.00	14,569,495.41
1999	2,281,500.00	12,462,159.79	219,934.40	392,700.00	0.00	15,356,294.19
2000	2,398,500.00	13,212,892.31	232,964.90	408,600.00	0.00	16,252,957.21
2001	2,515,500.00	13,988,649.25	246,761.90	425,200.00	0.00	17,176,111.15
2002	2,574,000.00	14,814,455.02	261,376.50	442,600.00	0.00	18,092,431.52
2003	2,691,000.00	15,690,309.62	276,859.80	460,600.00	0.00	19,118,769.42
2004	2,808,000.00	16,616,213.06	293,262.90	479,400.00	0.00	20,196,875.96
2005	2,925,000.00	17,617,189.75	310,636.90	499,000.00	0.00	21,351,826.65

TABLE 11.5-4a Cost for Operation and Maintenance

A) PERSONNEL

The staff is expected to increase by design year to cope up with growing demand of the water supply system.

Staff = 100 per Connection

Cost = Staff * Average Salary *

13 months

YEAR	Average Salary/month	Conn	Staff	Annual Cost (P)
1994	4,000.00	2,850	47	2,444,000.00
1995	4,100.00	3,000	47	2,505,100.00
1996	4,200.00	3,159	47	2,566,200.00
1997	4,350.00	3,325	47	2,657,850.00
1998	4,500.00	3,774	38	2,223,000.00
1999	4,500.00	3,927	39	2,281,500.00
2000	4,500.00	4,086	41	2,398,500.00
2001	4,500.00	4,252	43	2,515,500.00
2002	4,500.00	4,426	44	2,574,000.00
2003	4,500.00	4,606	46	2,691,000.00
2004	4,500.00	4,794	48	2,808,000.00
2005	4,500.00	4,990	50	2,925,000.00

TABLE 11.5-4b Cost for Operation and Maintenance

B) PUMPING COST

YEAR	ADD (L/s)	HP RATING	KW RATING	SC (L/s)	Demand/ Supply	PHPD (Hr/d)	DEPD (KWH/D)	PUMPING COST (P)		
								Daily	Monthly	Annually
1994	30.30	525	391.65	42.44	0.71	17.13	7895.10	31580.40	947,412.14	11,368,945.70
1995	32.40	525	391.65	42.44	0.76	18.32	8442.29	33769.15	1,013,074.37	12,156,892.43
1996	34.60	525	391.65	42.44	0.82	19.57	9015.53	36062.11	1,081,863.37	12,982,360.44
1997	37.10	525	391.65	42.44	0.87	20.98	9666.94	38667.76	1,160,032.69	13,920,392.26
1998	47.00	795	593.07	96.36	0.49	11.71	8167.69	32670.77	980,123.01	11,761,476.11
1999	49.80	795	593.07	96.36	0.52	12.40	8654.28	34617.11	1,038,513.32	12,462,159.79
2000	52.80	795	593.07	96.36	0.55	13.15	9175.62	36702.48	1,101,074.36	13,212,892.31
2001	55.90	795	593.07	96.36	0.58	13.92	9714.34	38857.36	1,165,720.77	13,988,649.25
2002	59.20	795	593.07	96.36	0.61	14.74	10287.82	41151.26	1,234,537.92	14,814,455.02
2003	62.70	795	593.07	96.36	0.65	15.62	10896.05	43584.19	1,307,525.80	15,690,309.62
2004	66.40	795	593.07	96.36	0.69	16.54	11539.04	46156.15	1,384,684.42	16,616,213.06
2005	70.40	795	593.07	96.36	0.73	17.53	12234.16	48936.64	1,468,099.15	17,617,189.75

ADD = Average day demand

SC = Supply Capacity

HP = Pumps Rated Horsepower

Pv = Cost per KWH = 4.00

Em = Pump Efficiency = 85%

Days of Pumping/month = 30 days

PHPD = Pumping hours per day

DEPD = Daily Energy Power Demand

Computations Used:

KW Rating = Rated Hp * .746

Demand/Supply Ratio = ADD/SC

PHPD = 24 Hours * Demand/Supply Ratio

DEPD = PHPD * KW Rating / Pump Efficiency

Power Cost:

Daily = DEPD * Energy Cost

Monthly = Daily Power Cost * 30

Yearly = Monthly Power Cost * 12

TABLE 11.5-4C Cost for Operation and Maintenance
C) CHLORINATION COST

The average annual demand for chlorine is as follows:

$$A = (365 \times Q \times D) / 1000$$

Where :

A = Annual Demand of Chlorine (Kg)

Q = Average Daily Water Demand (cumd)

D = Average Chlorine Dosage = 2 mg/l

Cost of Chlorine = 70.00 /kg

YEAR	ADD (Cumd)	ADC (Kg)	COST (P)
1994	2,618	1,911	133,775.71
1995	2,797	2,042	142,926.70
1996	2,992	2,184	152,891.20
1997	3,202	2,337	163,622.20
1998	4,063	2,966	207,619.30
1999	4,304	3,142	219,934.40
2000	4,559	3,328	232,964.90
2001	4,829	3,525	246,761.90
2002	5,115	3,734	261,376.50
2003	5,418	3,955	276,859.80
2004	5,739	4,189	293,262.90
2005	6,079	4,438	310,636.90

ADD = Average day demand

ADC = Annual Demand of Chlorine

D) Maintenance and Miscellaneous Expenses
Cost per connection/year = P

100.00 /year

E) Office Rentals

YEAR	Conn	TOTAL (P)	Monthly Rentals	Yearly Rentals
1994	2,850	285,000.00	0.00	0.00
1995	3,000	300,000.00	0.00	0.00
1996	3,159	315,900.00	0.00	0.00
1997	3,325	332,500.00	0.00	0.00
1998	3,774	377,400.00	0.00	0.00
1999	3,927	392,700.00	0.00	0.00
2000	4,086	408,600.00	0.00	0.00
2001	4,252	425,200.00	0.00	0.00
2002	4,426	442,600.00	0.00	0.00
2003	4,606	460,600.00	0.00	0.00
2004	4,794	479,400.00	0.00	0.00
2005	4,990	499,000.00	0.00	0.00

TABLE 11.5-5 BREAKDOWN OF PROJECT COST - Tagaytay Water District

Unit: 1000 Pesos

	1995	1996	1997	1998	1999	TOTAL
Basic Construction Cost		11,903	35,709			47,612
Price and Physical Contingencies		1,785	5,356			7,142
Engineering Studies		4,928				4,928
Construction Supervision		548	1,643			2,190
Land Acquisition and Non-engineering Basic Cost		5363				5,363
Total Project Cost	0	24,527	42,708	0	0	67,235
Less: Paid-in Capital (WD Equity)	0	0	0	0	0	0
Soft Loan	0	0	33,618	0	0	33,618
Regular Loan Disbursements	0	24,527	9,091	0	0	33,618
Add: Capitalized Interest	0	2,902	4,385	4,933	0	12,220
Regular Loan	0	27,429	13,475	4,933	0	45,837
Total Project Loan	0	27,429	47,093	4,933	0	79,455

TABLE 11.5-6a PROJECTED OPERATION & MAINTENANCE COST (UNESCALATED) - Tagaytay Water District

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
SALARIES	950	2,505	2,566	2,638	2,223	2,282	2,399	2,516	2,574	2,691	2,808	2,925
POWER	10,103	12,157	12,982	13,920	11,761	12,462	13,213	13,989	14,814	15,680	16,616	17,617
CHEMICALS	66	143	153	164	208	220	233	277	261	277	293	311
MISC. & MAINTENANCE	2,381	300	316	333	377	393	409	425	443	461	479	499
UNESCALATED TOTAL O & M COST	13,499	15,105	16,017	17,074	14,569	15,356	16,253	17,176	18,092	19,119	20,197	21,352

TABLE 11.5-6b PROJECTED OPERATION & MAINTENANCE COST (ESCALATED) - Tagaytay Water District

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
SALARIES	950	2,806	3,162	3,602	3,314	3,741	4,326	4,991	5,618	6,461	7,416	8,497
POWER & FUEL	10,103	13,616	15,994	18,865	17,533	20,435	23,833	27,756	32,333	37,670	43,882	51,178
CHEMICALS	66	160	188	222	310	361	420	490	570	665	774	902
MISC. & MAINTENANCE	2,381	336	389	451	563	644	737	844	966	1,106	1,266	1,450
ESCALATED TOTAL O & M COST	13,499	16,918	19,733	23,139	21,719	25,181	29,317	34,080	39,488	45,901	53,338	62,027

Note: For financial analysis, operation and maintenance cost in 1994 is mainly based on the financial statements of the district although large parts are projected. Therefore, it is not necessarily equal to the costs shown in Table 11.5-3 through 11.5-4.

Total Project Cost	67.24 million pesos
Capitalized Interest	12.22 million pesos
Total Loan Amount (regular and soft loan)	79.46 million pesos

50% of the loan is assumed to be at regular loan with interest rates of 8.5%, 10.5% and 12.5% for the first 2 million pesos, the next 5 million pesos and the excess of 7 million pesos, respectively.

Remaining 50% of the loan is to be a soft loan with the terms and conditions described in Section 11.1-3.

The details of the project loan's debt service schedule is presented in **Table 11.5-7**.

(5) Projection of Financial Statements

The water district's projected income statement for the period 1994-2005, as presented in **Table 11.5-8**, shows that annual net income are positive except in 1995 and 1997. Major financial ratios derived from the income statement shows as follows;

- a) Operating ratio which measures the ability of revenues to cover operating expenses shows that the operating costs are between 66 - 74% of the operating revenues after the project completion.
- b) Return on the average fixed assets, which measures the earning power of the district's facilities, ranges from 11 to 19% after the completion of the project.

The projected cash flow statement for the same period as shown in **Table 11.5-9** indicates the sources and applications of funds. Major highlights from this table are as follows:

- a) Increase in working capital is positive throughout the study period except in 1995.
- b) Debt service coverage which shows the ability of the district's internal cash generation to meet its debt services vary between 2.0 and 3.2 in 1999 - 2005. These ratios are higher than LWUA's minimum ratio of 1.3.

The projected balance sheet are presented in **Table 11.5-10**. Major points are shown as follows;

- a) Cash balance at the end of the study period (2005) is 42.6 million pesos.
- b) A total of 44.1 million pesos is accumulated for cash reserves by the year 2005.
- c) Current ratios which measure the ability of the district to meet its short term obligations increase from 5.0 in 1998 to 8.4 in 2005.

TABLE 11.5-7 DEBT SERVICE SCHEDULE - Tagavay Water District

Unit: 1000 Pesos

REGULAR LOAN (50%)												
First 2 million												
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	
Disbursements	0	1,843	0	0								
Capitalized Interest	0	157	0	0								
Operational Interest					170	168	166	164	161	158	155	
Principal					23	25	27	30	32	35	38	
Debt Service					193	193	193	193	193	193	193	
Loan Outstanding, year-end	0	2,000	2,000	2,000	1,977	1,952	1,924	1,895	1,863	1,828	1,790	
Next 5 million												
Disbursements	0	4,525	0	0								
Capitalized Interest	0	475	0	0								
Operational Interest					525	521	516	510	504	498	490	
Principal					42	47	52	57	63	70	77	
Debt Service					567	567	567	567	567	567	567	
Loan Outstanding, year-end	0	5,000	5,000	5,000	4,958	4,911	4,859	4,802	4,739	4,669	4,592	
More than 7 million												
Disbursements	0	18,159	9,091	4,933								
Capitalized Interest	0	2,270	4,385									
Operational Interest					4,855	4,825	4,791	4,754	4,711	4,664	4,610	
Principal					238	268	302	339	382	429	483	
Debt Service					5,093	5,093	5,093	5,093	5,093	5,093	5,093	
Loan Outstanding, year-end	0	20,429	33,904	38,837	38,599	38,331	38,030	37,690	37,309	36,879	36,396	
SOFT LOAN (50%)												
Disbursements	0	0	33,618	0								
Capitalized Interest	0	0	0	0								
Operational Interest												
Principal												
Debt Service												
Loan Outstanding, year-end	0	0	33,618	33,618	33,618	33,618	33,618	33,618	33,618	33,618	33,618	
DEBT SERVICE SUMMARY												
Disbursements	0	24,527	42,708	0								
Capitalized Interest	0	2,902	4,385	4,933								
Operational Interest					5,550	5,513	5,473	5,450	5,399	5,342	5,278	
Principal					304	340	380	426	477	534	598	
Debt Service					5,853	5,853	5,853	5,853	5,853	5,853	5,853	
Loan Outstanding, year-end	0	27,429	74,522	79,455	79,151	78,811	78,431	78,005	77,528	76,994	76,397	

TABLE 11.5-8 PROJECTED INCOME STATEMENT - Taguayay Water District

Unit: 1000 Pesos

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Water Produced (000 cum)	955	1,021	1,092	1,169	1,483	1,571	1,664	1,763	1,867	1,978	2,095	2,219
Water Sold (000 cum)	755	807	863	923	1,160	1,228	1,300	1,377	1,458	1,544	1,636	1,735
Non-Revenue Water (%)	21%	21%	21%	21%	22%	22%	22%	22%	22%	22%	22%	22%
Average Water Rate (Effective Water Rate) (cum)	19.39	21.14	23.25	25.69	28.26	31.08	34.19	37.61	39.87	42.26	44.80	47.48
Operating Revenue												
Water Revenues	15,273	16,345	20,060	23,722	32,790	38,179	44,455	51,784	58,136	65,265	73,301	82,368
Other Operating Revenue	745	797	979	1,157	1,600	1,863	2,169	2,526	2,836	3,184	3,576	4,018
Total Operating Revenue	16,018	17,142	21,039	24,880	34,389	40,041	46,624	54,310	60,972	68,449	76,877	86,386
Operating Costs												
Personnel	950	2,806	3,162	3,602	3,314	3,741	4,326	4,991	5,618	6,461	7,416	8,497
Chemicals	66	160	188	222	310	361	420	490	570	665	774	902
Power and Fuel	10,103	13,616	15,994	18,865	17,533	20,435	23,833	27,756	32,333	37,670	43,882	51,178
Misc. & Maintenance	2,381	336	389	451	563	644	737	844	966	1,106	1,266	1,450
Bad Debts	153	409	502	593	820	954	1,111	1,295	1,453	1,632	1,833	2,059
Total Operating Cost	13,652	17,326	20,235	23,732	22,539	26,136	30,428	35,375	40,941	47,532	55,170	64,066
Income Before Depreciation	2,366	-184	804	1,147	11,850	13,906	16,196	18,936	20,031	20,916	21,706	22,300
Less: Depreciation	2,025	488	619	1,177	2,049	2,495	2,503	2,512	2,522	2,534	2,547	2,563
Operating Income	341	-672	185	-30	9,802	11,411	13,693	16,424	17,509	18,382	19,159	19,738
Add: Non-operating Income	719	0	0	0	0	5,550	5,513	5,473	9,450	9,399	9,342	9,278
Less: Interest on Loans	0	0	0	0	0	0	0	0	0	0	0	0
NET INCOME (LOSS)	1,060	-672	185	-30	9,802	5,861	8,180	10,951	8,059	8,984	9,817	10,460
Operating Ratio a/	85%	101%	96%	95%	66%	65%	65%	65%	67%	69%	72%	74%
Average Rate Base b/	18,970	19,537	24,764	47,077	81,956	99,797	100,109	100,467	100,878	101,350	101,888	102,507
Rate of Return c/	2%	-3%	1%	0%	12%	11%	14%	16%	17%	18%	19%	19%

a/ Total operating cost as a percentage of total revenue

b/ Average net fixed assets in operation

c/ Operating income as a percentage of the average rate base

PROJECTED WATER RATES 1/

MINIMUM CHARGE (Peso/10 cum.)	110.00	(July 1)	131.89	145.74	160.31	176.34	193.98	213.38	226.18	239.75	254.13	269.38
11 - 20 cum. (Peso/cum.)	5.80	6.32	6.95	7.68	8.45	9.30	10.23	11.25	11.93	12.64	13.40	14.20
21 - 30 cum. (Peso/cum.)	7.05	7.68	8.45	9.34	10.27	11.30	12.43	13.68	14.50	15.37	16.29	17.26
31 - 40 cum. (Peso/cum.)	9.05	9.86	10.85	11.99	13.19	14.51	15.96	17.55	18.61	19.72	20.91	22.16
41 - 50 cum. (Peso/cum.)	11.85	12.92	14.21	15.70	17.27	19.00	20.90	22.99	24.37	25.83	27.38	29.02
51 - 70 cum. (Peso/cum.)	13.55	14.77	16.25	17.95	19.75	21.72	23.89	26.28	27.86	29.53	31.30	33.18
71 - 100 cum. (Peso/cum.)	14.50	15.81	17.39	19.21	21.13	23.25	25.57	28.13	29.81	31.60	33.50	35.51
Over 100 cum. (Peso/cum.)	19.00	20.71	22.78	25.17	27.69	30.46	33.51	36.86	39.07	41.41	43.90	46.53
Average low income (Urban)	2,188	2,407	2,647	2,912	3,203	3,524	3,876	4,264	4,690	5,159	5,675	6,242
% of income allocated to water	5.03	4.98	4.98	5.00	5.00	5.00	5.00	5.00	4.82	4.65	4.48	4.32
% of increase of minimum charge	-	9%	10%	11%	10%	10%	10%	10%	6%	6%	6%	6%

1/ Projected/effective dates of implementation of the projected rates are the first day of January in each year unless otherwise specified.

TABLE 11.3-9 PROJECTED CASH FLOW TABLE (SOURCES AND USE OF FUNDS) - Tagaytay Water District

Unit: 1000 Pesos

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
SOURCES OF FUNDS												
Income Before Depreciation	2,366	-184	804	1,147	11,850	13,906	16,196	18,936	20,031	20,916	21,706	22,300
Add: Non-operating Income	719											
Internal Cash Generation	3,085	-184	804	1,147	11,850	13,906	16,196	18,936	20,031	20,916	21,706	22,300
Government Contributions	0	0	0	0	0	0	0	0	0	0	0	0
Loans	0	0	27,429	47,093	4,933	0	0	0	0	0	0	0
Project Loan (LWUA)	0	0	0	0	0	0	0	0	0	0	0	0
Other Loans	0	0	0	0	0	0	0	0	0	0	0	0
Total Sources	3,085	-184	28,233	48,240	16,783	13,906	16,196	18,936	20,031	20,916	21,706	22,300
APPLICATION OF FUNDS												
Project	0	0	24,527	42,708	0	0	0	0	0	0	0	0
Capitalized Interest	0	0	2,902	4,385	4,933	0	0	0	0	0	0	0
Other Capital Expenditures	939	195	0	0	562	291	333	382	441	502	576	661
Total Capital Expenditures	939	195	27,429	47,093	5,495	291	333	382	441	502	576	661
Debt Service												
Interest	0	0	0	0	0	5,550	5,513	5,473	9,450	9,399	9,342	9,278
Project Loan	0	0	0	0	0	0	0	0	0	0	0	0
Other Loans	0	0	0	0	0	0	0	0	0	0	0	0
Total Interest	0	0	0	0	0	5,550	5,513	5,473	9,450	9,399	9,342	9,278
Amortization												
Project Loan	0	0	0	0	0	304	340	380	426	477	534	598
Other Loans	0	0	0	0	0	0	0	0	0	0	0	0
Total Amortization	0	0	0	0	0	304	340	380	426	477	534	598
Total Debt Service	0	0	0	0	0	5,853	5,853	5,853	9,876	9,876	9,876	9,876
Increase in Working Capital	2,146	-379	804	1,147	11,288	7,761	10,010	12,700	9,715	10,539	11,255	11,764
Total Applications	3,085	-184	28,233	48,240	16,783	13,906	16,196	18,936	20,031	20,916	21,706	22,300
Self Financing Ratio a/	100%	100%	0%	0%	10%	100%	100%	100%	100%	100%	100%	100%
Average Self-Financing Ratio b/	-	52%	0%	0%	2%	2%	16%	114%	114%	114%	114%	114%
Debt Service Ratio	-	-	-	-	-	2.38	2.77	3.24	2.03	2.12	2.20	2.26

a/ annual

b/ calculated on three years average

TABLE 11.5-10 PROJECTED BALANCE SHEET - Tagaytay Water District

Unit: 1000 Pesos

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
A S S E T S												
Current Assets												
Cash	2,934	2,363	2,454	2,886	11,557	15,208	20,442	27,562	31,329	35,242	39,084	42,561
Accounts Receivable	981	2,725	3,344	3,954	5,466	6,364	7,411	8,632	9,691	10,880	12,219	13,731
Inventory	1,728	83	96	112	145	167	193	222	256	295	340	392
Cash Reserves	0	490	1,092	1,804	2,788	6,605	11,051	16,229	22,043	28,569	35,899	44,136
Other Current Assets	5,352	5,352	5,352	5,352	5,352	5,352	5,352	5,352	5,352	5,352	5,352	5,352
Total Current Assets	10,995	11,013	12,339	14,109	25,308	33,697	44,449	57,997	68,671	80,338	92,895	106,172
Fixed Assets in Operation	19,439	19,634	29,894	64,260	99,652	99,943	100,276	100,658	101,099	101,600	102,177	102,838
Accumulated Depreciation	8,573	9,062	9,681	10,858	12,906	15,401	17,904	20,416	22,938	25,471	28,019	30,581
Net Fixed Assets in Operation	10,866	10,573	20,213	53,403	86,745	84,541	82,372	80,242	78,161	76,129	74,158	72,256
Add: Work in Progress	0	0	17,169	29,896	0	0	0	0	0	0	0	0
Total Fixed Assets	10,866	10,573	37,382	83,299	86,745	84,541	82,372	80,242	78,161	76,129	74,158	72,256
TOTAL ASSETS	21,861	21,586	49,721	97,407	112,053	118,238	126,820	138,240	146,832	156,467	167,053	178,428
LIABILITIES and EQUITY												
Current Liabilities												
Accounts Payable	2,473	2,820	3,290	3,857	3,621	4,198	4,887	5,681	6,583	7,652	8,891	10,340
Customer Deposits	882	931	984	1,038	1,187	1,237	1,290	1,344	1,402	1,461	1,523	1,588
Current Maturities	0	0	0	0	304	340	380	426	477	534	598	669
Total Current Liabilities	3,355	3,751	4,273	4,896	5,111	5,775	6,557	7,451	8,461	9,647	11,012	12,597
Loans Payable - Long Term Debts	0	0	27,429	74,522	79,151	78,811	78,431	78,005	77,528	76,994	76,397	75,727
Equity												
Government Contribution	23,099	23,099	23,099	23,099	23,099	23,099	23,099	23,099	23,099	23,099	23,099	23,099
Retained Earnings	-4,592	-5,264	-5,079	-5,109	4,692	10,554	18,734	29,685	37,744	46,728	56,545	67,005
Total Equity	18,507	17,834	18,019	17,990	27,791	33,652	41,832	52,783	60,842	69,826	79,644	90,103
TOTAL LIABILITIES & EQUITY	21,861	21,586	49,721	97,407	112,053	118,238	126,820	138,240	146,832	156,467	167,053	178,428
Current Ratio ^{a/}		2.94	2.89	2.88	4.95	5.84	6.78	7.78	8.12	8.33	8.44	8.43
Debt/Equity Ratio ^{b/}	0.0%	0.0%	60.4%	80.6%	74.0%	70.1%	65.2%	59.6%	56.0%	52.4%	49.0%	45.7%

^{a/} The ratio which total current assets divided by the total current liability^{b/} Long-term debt as a percentage of the net worth (total liability and equity minus total current liability)

- d) Debt/equity ratios which indicate the percentage of the long-term debt in the net worth decrease gradually from 74% in 1998 to 46% in 2005.

(6) Financial Internal Rate of Return

As shown in Table 11.5-11, the FIRR is 23.7 percent for the base case. The derived FIRR is well above the water district's weighted average cost of capital at 12.1 percent, which is shown in Table 11.5-12.

(7) Sensitivity Analysis

A sensitivity analysis is conducted to determine the effect of variances in the assumptions to the FIRR. The derived FIRR under selected variances to the base case are as follows:

<u>Scenario</u>	<u>FIRR</u>
Base Case	23.7%
1. 20% increase in Investment Cost	20.3%
2. 20% increase in O & M Cost	18.9%
3. 20% decrease in Revenue	13.8%

The computation of the FIRR under the different scenarios is also shown in Table 11.5-11. Results of the sensitivity analysis shows that the FIRR is greatly influenced by the decrease of revenue. The derived FIRR, however, are still more than the water district's weighted average cost of capital.

(8) Recommended Water Rates

The recommended water rates are shown below. The rates are proposed to increase annually up to 2005. The details including water rates over 40 m³ are also presented in Table 11.5-8.

	<u>Minimum</u>	<u>11-20m³</u>	<u>21-30m³</u>	<u>31-40m³</u>
1994	110.00	5.80	7.05	9.05
1996	131.89	6.95	8.45	10.85
1998	160.31	8.45	10.27	13.19
2000	193.98	10.23	12.43	15.96
2002	226.18	11.93	14.50	18.61
2005	269.38	14.20	17.26	22.16

These recommended water rates are subject to the following criteria:

- Minimum charge (First 10 m³) must not exceed 5% of the average family income of the low income group
- Any increase must be limited to 60% of the prevailing rates.

TABLE 11.5-11 FINANCIAL INTERNAL RATE OF RETURN - Tagaytay Water District

YEAR	(a) Base Case				(b) Investment Cost +20%				(c) O & M Cost +20%				(d) Revenue -20%			
	INCREMENTAL REVENUES	O & M	PROJECT COSTS	Net	INCREMENTAL REVENUES	O & M	PROJECT COSTS	Net	INCREMENTAL REVENUES	O & M	PROJECT COSTS	Net	INCREMENTAL REVENUES	O & M	PROJECT COSTS	Net
1994	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	24,527	-24,527	0	0	29,433	-29,433	0	0	29,433	-29,433	0	0	24,527	-24,527
1997	3,841	3,406	42,708	-42,273	3,841	3,406	51,250	-50,815	3,841	4,087	42,708	-42,955	3,072	3,406	42,708	-43,042
1998	13,350	1,986	562	10,802	13,350	1,986	675	10,690	13,350	2,383	562	10,405	10,680	1,986	562	8,132
1999	19,002	5,448	291	13,263	19,002	5,448	349	13,205	19,002	6,537	291	12,174	15,202	5,448	291	9,463
2000	25,585	9,583	333	15,669	25,585	9,583	399	15,602	25,585	11,500	333	13,752	20,468	9,583	333	10,552
2001	33,271	14,347	382	18,542	33,271	14,347	459	18,466	33,271	17,216	382	15,673	26,617	14,347	382	11,888
2002	39,933	19,754	441	19,738	39,933	19,754	529	19,650	39,933	23,705	441	15,787	31,947	19,754	441	11,751
2003	47,410	26,167	502	20,741	47,410	26,167	602	20,640	47,410	31,401	502	15,507	37,928	26,167	502	11,259
2004	55,838	33,605	576	21,657	55,838	33,605	692	21,542	55,838	40,325	576	14,936	44,670	33,605	576	10,489
2005	65,348	42,293	661	22,393	65,348	42,293	793	22,261	65,348	50,752	661	13,934	52,278	42,293	661	9,324
2006	65,348	42,293	0	23,054	65,348	42,293	0	23,054	65,348	50,752	0	14,595	52,278	42,293	0	9,985
2007	65,348	42,293	0	23,054	65,348	42,293	0	23,054	65,348	50,752	0	14,595	52,278	42,293	0	9,985
2008	65,348	42,293	0	23,054	65,348	42,293	0	23,054	65,348	50,752	0	14,595	52,278	42,293	0	9,985
2009	65,348	42,293	0	23,054	65,348	42,293	0	23,054	65,348	50,752	0	14,595	52,278	42,293	0	9,985
2010	65,348	42,293	0	23,054	65,348	42,293	0	23,054	65,348	50,752	0	14,595	52,278	42,293	0	9,985
2011	65,348	42,293	0	23,054	65,348	42,293	0	23,054	65,348	50,752	0	14,595	52,278	42,293	0	9,985
2012	65,348	42,293	0	23,054	65,348	42,293	0	23,054	65,348	50,752	0	14,595	52,278	42,293	0	9,985
2013	65,348	42,293	0	23,054	65,348	42,293	0	23,054	65,348	50,752	0	14,595	52,278	42,293	0	9,985
2014	65,348	42,293	0	23,054	65,348	42,293	0	23,054	65,348	50,752	0	14,595	52,278	42,293	0	9,985
2015	65,348	42,293	0	23,054	65,348	42,293	0	23,054	65,348	50,752	0	14,595	52,278	42,293	0	9,985
2016	65,348	42,293	0	23,054	65,348	42,293	0	23,054	65,348	50,752	0	14,595	52,278	42,293	0	9,985
2017	65,348	42,293	0	23,054	65,348	42,293	0	23,054	65,348	50,752	0	14,595	52,278	42,293	0	9,985
2018	65,348	42,293	0	23,054	65,348	42,293	0	23,054	65,348	50,752	0	14,595	52,278	42,293	0	9,985
2019	65,348	42,293	0	23,054	65,348	42,293	0	23,054	65,348	50,752	0	14,595	52,278	42,293	0	9,985
2020	65,348	42,293	0	23,054	65,348	42,293	0	23,054	65,348	50,752	0	14,595	52,278	42,293	0	9,985
2021	65,348	42,293	0	23,054	65,348	42,293	0	23,054	65,348	50,752	0	14,595	52,278	42,293	0	9,985
2022	65,348	42,293	0	23,054	65,348	42,293	0	23,054	65,348	50,752	0	14,595	52,278	42,293	0	9,985
2023	65,348	42,293	0	23,054	65,348	42,293	0	23,054	65,348	50,752	0	14,595	52,278	42,293	0	9,985

FIRR = 23.68%

FIRR = 20.32%

FIRR = 18.85%

FIRR = 13.77%

TABLE 11.5-12 WEIGHTED AVERAGE OF CAPITAL - Tagaytay Water District

Unit: 1000 Pesos

	AMOUNT	%TOTAL PROJECT LOAN	INTEREST RATE	WEIGHTED COST OF CAPITAL
TOTAL PROJECT LOAN	79,455	100.00%		
COMPOSITION OF LOAN				
A. REGULAR LOAN	45,837	57.69%		
FIRST 2 MILLION	2,000	2.52%	8.50%	0.21%
NEXT 5 MILLION	5,000	6.29%	10.50%	0.66%
EXCESS OF 7 MILLION	38,837	48.88%	12.50%	6.11%
B. SOFT LOAN	33,618	42.31%		
FIRST 2 MILLION	2,000	2.52%	8.50%	0.21%
NEXT 5 MILLION	5,000	6.29%	10.50%	0.66%
EXCESS OF 7 MILLION	26,618	33.50%	12.50%	4.19%
PRESCRIBED DISCOUNT RATE FOR FIRR COMPUTATION				12.05%

TABLE 11.5-13 INCREASE IN CONSUMER SATISFACTION - Tagaytay Water District

Unit: 1000 Pesos

YEAR	INCREMENTAL ACCOUNTED FOR WATER	PRICE PER CUM.	ECONOMIC VALUE PER CUM.	ECONOMIC WATER REVENUE	DISCOUNT RATE AT 15%	PRESENT VALUE FACTOR	VALUE
1994	0	19.39	23.27	0	0	1.000	0
1995	0	18.87	22.64	0	0	0.870	0
1996	0	18.87	22.64	0	0	0.756	0
1997	61	18.96	22.75	1,377	0.658	0.658	906
1998	297	18.96	22.75	6,767	0.572	0.572	3,869
1999	365	18.96	22.75	8,311	0.497	0.497	4,132
2000	437	18.96	22.75	9,947	0.432	0.432	4,300
2001	514	18.96	22.75	11,690	0.376	0.376	4,395
2002	595	18.27	21.92	13,050	0.327	0.327	4,266
2003	681	17.60	21.12	14,395	0.284	0.284	4,092
2004	773	16.96	20.36	15,743	0.247	0.247	3,892
2005	872	16.35	19.62	17,100	0.215	0.215	3,675
2006	872	16.35	19.62	17,100	0.187	0.187	3,196
2007	872	16.35	19.62	17,100	0.163	0.163	2,779
2008	872	16.35	19.62	17,100	0.141	0.141	2,417
2009	872	16.35	19.62	17,100	0.123	0.123	2,101
2010	872	16.35	19.62	17,100	0.107	0.107	1,827
2011	872	16.35	19.62	17,100	0.093	0.093	1,589
2012	872	16.35	19.62	17,100	0.081	0.081	1,382
2013	872	16.35	19.62	17,100	0.070	0.070	1,202
2014	872	16.35	19.62	17,100	0.061	0.061	1,045
2015	872	16.35	19.62	17,100	0.053	0.053	909
2016	872	16.35	19.62	17,100	0.046	0.046	790
2017	872	16.35	19.62	17,100	0.040	0.040	687
2018	872	16.35	19.62	17,100	0.035	0.035	597
2019	872	16.35	19.62	17,100	0.030	0.030	519
2020	872	16.35	19.62	17,100	0.026	0.026	452
2021	872	16.35	19.62	17,100	0.023	0.023	393
2022	872	16.35	19.62	17,100	0.020	0.020	342
2023	872	16.35	19.62	17,100	0.017	0.017	297
TOTAL INCREASE IN CONSUMER SATISFACTION				406,176			56,050

1/ The 1996 volume of cum. is deducted from the water demand projections annually throughout the study period for the incremental volume.

2/ Price per cum. was based on the de-escalated average rate per cum. of water.

3/ Economic value per cum. was assumed to be 1.2 times the price per cum. of water.

As can be seen in **Table 11.5-8**, the recommended rates for the first 10 m³ do not exceed 5% of the average income of the low income group. Also, all rate increases are within the maximum limit of 60%.

(9) **Concluding Remarks of Financial Analysis**

The proposed development program for Tagaytay Water District is financially viable. However, it must be emphasized that the following conditions should be fulfilled.

- a) Water rates as discussed above should be adopted and attained.
- b) The project should be implemented in 1996 and completed by the end of 1997.
- c) The targeted number of service connections should be attained because the FIRR is the most sensitive in the revenue reduction.

Since the recommended water rates are almost 5% of the average income of the low income group continuously from 1995 to 2001, the adoption of the progressive water rates system, with an increase of rates as the consumption of water increase, may be taken into consideration more clearly. Then, the minimum charge will be in a fully affordable range of the low income group.

11.5.4 Economic Analysis

(1) **Project Benefits**

Consumer Satisfaction

Under the assumption described in Section 11.1.4, the present economic value of water at 15% discount rate is 56.1 million pesos as shown in **Table 11.5-13**.

Health Benefits

Morbidity rate of water-born disease in Tagaytay City is 917 out of 100,000 according to the Municipal Socio-economic Profile. When 125 pesos per day and 8 days per patient were lost by illness, the present economic value of health benefits at 15% discount rate is 0.35 million pesos as shown in **Table 11.5-14**.

Fire Protection

Under the assumption described in Section 11.1.4, the present economic value of fire protection at 15% discount rate is 2.3 million pesos as shown in **Table 11.5-15**.

TABLE 11.5-14 HEALTH BENEFITS - Tagaytay Water District

Unit: 1000 Pesos

YEAR	SERVED POPULATION	COST OF TIME DUE TO ILLNESS	ECONOMIC LOSS DUE TO PREMATURE DEATH	COST OF MEDICAL EXPENSES	TOTAL ECONOMIC LOSSES	20% REDUCTION DUE TO PROJECT (Benefit)	PRESENT VALUE DISCOUNT RATE AT 15%	VALUE
							FACTOR	
1994	13,270	0	0	0	0	0	0.000	0
1995	16,368	0	0	0	0	0	0.000	0
1996	17,236	0	0	0	0	0	0.756	0
1997	18,141	0	0	0	0	0	0.658	0
1998	20,590	123	0	189	312	62	0.572	36
1999	23,915	143	0	219	362	72	0.497	36
2000	24,884	148	0	228	377	75	0.432	33
2001	25,895	154	0	237	392	78	0.376	29
2002	26,954	161	0	247	408	82	0.327	27
2003	28,051	167	0	257	424	85	0.284	24
2004	29,195	174	0	268	442	88	0.247	22
2005	30,377	181	0	279	460	92	0.215	20
2006	30,377	181	0	279	460	92	0.187	17
2007	30,377	181	0	279	460	92	0.163	15
2008	30,377	181	0	279	460	92	0.141	13
2009	30,377	181	0	279	460	92	0.123	11
2010	30,377	181	0	279	460	92	0.107	10
2011	30,377	181	0	279	460	92	0.093	9
2012	30,377	181	0	279	460	92	0.081	7
2013	30,377	181	0	279	460	92	0.070	6
2014	30,377	181	0	279	460	92	0.061	6
2015	30,377	181	0	279	460	92	0.053	5
2016	30,377	181	0	279	460	92	0.046	4
2017	30,377	181	0	279	460	92	0.040	4
2018	30,377	181	0	279	460	92	0.035	3
2019	30,377	181	0	279	460	92	0.030	3
2020	30,377	181	0	279	460	92	0.026	2
2021	30,377	181	0	279	460	92	0.023	2
2022	30,377	181	0	279	460	92	0.020	2
2023	30,377	181	0	279	460	92	0.017	2
TOTAL HEALTH BENEFIT						2,290		347

1/ "Cost of Time due to Illness" was computed based on the following formula:

65% x Morbidity Rate x SERVED POP x 8 days x P125.00

2/ Economic Loss due to Premature Death" was computed based on the following formula:

65% x Mortality Rate x SERVED POP x P150,000

3/ Cost of Medical Expenses" was computed based on the following formula:

65% x Morbidity Rate x SERVED POP x P1,000

4/ Morbidity Rate (per 100,000): 917

Mortality Rate (per 100,000): Nil

Ave. Medical Expense : P 1,000.00

Weighted Ave. Wage Rate: P 125.00

% of Economic Active Population : 65%

TABLE 11.5-15 REDUCTION IN FIRE DAMAGE - Tagaytay Water District

Unit: 1000 Pesos

YEAR	POPULATION IN THE SER. AREA	NO. OF STRUC- TURES	TOTAL VALUE	OVERALL REDUCTION IN FIRE DAMAGE	PER- CENTAGE PROTEC- TION	NET REDUCTION IN FIRE DAMAGE (Benefit)	PRESENT VALUE	DISCOUNT RATE AT 15%	FACTOR	VALUE
1994	20,695	3,980	994,952	7,462	0.00%	0	0.000			0
1995	21,502	4,135	1,033,755	7,753	0.00%	0	0.000			0
1996	22,341	4,296	1,074,071	8,056	0.00%	0	0.756			0
1997	23,212	4,464	1,115,960	8,370	0.00%	0	0.658			0
1998	24,118	4,638	1,159,519	8,696	4.90%	426	0.572			244
1999	25,531	4,910	1,227,467	9,206	4.90%	451	0.497			224
2000	27,027	5,198	1,299,397	9,745	4.90%	506	0.432			206
2001	28,611	5,502	1,375,541	10,317	4.90%	535	0.376			190
2002	30,288	5,825	1,456,148	10,921	4.90%	566	0.327			175
2003	32,063	6,166	1,541,478	11,561	4.90%	600	0.284			161
2004	33,942	6,527	1,631,809	12,239	4.90%	635	0.247			148
2005	35,936	6,911	1,727,692	12,958	4.90%	635	0.215			136
2006	35,936	6,911	1,727,692	12,958	4.90%	635	0.187			119
2007	35,936	6,911	1,727,692	12,958	4.90%	635	0.163			103
2008	35,936	6,911	1,727,692	12,958	4.90%	635	0.141			90
2009	35,936	6,911	1,727,692	12,958	4.90%	635	0.123			78
2010	35,936	6,911	1,727,692	12,958	4.90%	635	0.107			68
2011	35,936	6,911	1,727,692	12,958	4.90%	635	0.093			59
2012	35,936	6,911	1,727,692	12,958	4.90%	635	0.081			51
2013	35,936	6,911	1,727,692	12,958	4.90%	635	0.070			45
2014	35,936	6,911	1,727,692	12,958	4.90%	635	0.061			39
2015	35,936	6,911	1,727,692	12,958	4.90%	635	0.053			34
2016	35,936	6,911	1,727,692	12,958	4.90%	635	0.046			29
2017	35,936	6,911	1,727,692	12,958	4.90%	635	0.040			26
2018	35,936	6,911	1,727,692	12,958	4.90%	635	0.035			22
2019	35,936	6,911	1,727,692	12,958	4.90%	635	0.030			19
2020	35,936	6,911	1,727,692	12,958	4.90%	635	0.026			17
2021	35,936	6,911	1,727,692	12,958	4.90%	635	0.023			15
2022	35,936	6,911	1,727,692	12,958	4.90%	635	0.020			13
2023	35,936	6,911	1,727,692	12,958	4.90%	635	0.017			11
TOTAL REDUCTION IN FIRE DAMAGE							15,625			2,321

- 1/ Population in the service area was derived from the Population and Demand projections.
 2/ The number of structures was estimated by dividing the service area population by the average number of persons per dwelling unit of 5.2.
 3/ The total value is estimated by multiplying the number of structures with the average replacement value of dwelling units in Tagaytay of 250,000 pesos.
 4/ Percentage fire protection was based on the area to be served by fire hydrants.

(2) Project Costs

The detail of the conversion of financial project cost to economic cost is shown in **Table 11.5-16**. Further, incremental economic operation and maintenance cost is shown in **Table 11.5-17**. The summary of economic costs including the total replacement cost of 7.5 million pesos are shown in **Table 11.5-18**.

(3) Economic Benefits and Costs Analysis

The summary of quantifiable economic benefits and economic costs for the project is shown below expressed as net present values of a 15% discount rate. Benefit cost ratio (BCR) obtained is 1.01. Salvage value is shown in **Table 11.5-20**.

Increase in Consumer Satisfaction	56.05 million pesos
Health Benefits	0.35 million pesos
Reduction in Fire Damage	2.32 million pesos
Total Benefits (Salvage value is not included.)	58.72 million pesos
Total Project Costs	58.46 million pesos
Benefit Cost ratio (BCR):	1.01

(4) Economic Internal Rate of Return

The results of EIRR are summarized below. EIRR for base case is estimated at 15.2%. Details are shown in **Table 11.5-19**. A sensitivity analysis is conducted to determine the effect of variances in the assumptions to the EIRR. The derived EIRR under selected variances to the base case are as follows:

<u>Scenario</u>	<u>EIRR</u>
Base Case	15.2%
1. 20% increase in Investment Cost	12.7%
2. 20% increase in O & M Cost	14.6%
3. 20% decrease in Revenue	11.3%

The result show all the scenario except base case can not exceed the opportunity cost of capital of 15%.

(5) Concluding Remarks of Economic Analysis

From the results of the preceding analysis, the proposed project for Tagaytay Water District is considered economically almost feasible although the results of sensitivity analysis are below the opportunity cost of capital.

TABLE 11.5-16 CONVERSION OF FINANCIAL PROJECT COST TO ECONOMIC COST - Tagaytay Water District

Unit: 1000 Pesos

	FINANCIAL PROJECT COST	FOREIGN EXCHANGE COMPONENT	DOMESTIC COMPONENT	UNSKILLED LABOR	BALANCE	TAXES (5%)	OTHERS (95%)	SHADOW PRICING				TOTAL ECONOMIC COST
								FOREX		OTHERS X 1.0	UNSKILLED LABOR X 6	
								COMPONENT X 1.2	COMPONENT X 6			
CIVIL WORKS												
BOOSTER PUMP STATION	4,146	265	3,882	618	3,264	163	3,101	318	371	3,101	3,789	
DISTRIBUTION FACILITIES	6,683	2,088	4,594	557	4,038	202	3,836	2,506	334	3,836	6,676	
TRANSMISSION FACILITIES	5,579	1,744	3,836	465	3,371	169	3,202	2,092	279	3,202	5,573	
SERVICE CONNECTIONS	146	12	134	47	88	4	83	14	28	83	125	
VALVES/HYDRANTS	590	40	550	166	384	19	365	48	100	365	513	
STORAGE FACILITIES	2,663	213	2,450	852	1,598	80	1,518	256	511	1,518	2,284	
TOTAL CIVIL WORKS	19,807	4,361	15,446	2,704	12,742	637	12,105	5,234	1,622	12,105	18,961	
EQUIPMENTS												
BOOSTER PUMP STATION	4,675	3,619	1,057	0	1,057	53	1,004	4,343	0	1,004	5,346	
DISTRIBUTION FACILITIES	7,240	3,202	4,038	0	4,038	202	3,836	3,843	0	3,836	7,678	
TRANSMISSION FACILITIES	6,044	2,673	3,371	0	3,371	169	3,202	3,208	0	3,202	6,410	
SERVICE CONNECTIONS	438	426	12	0	12	1	11	511	0	11	522	
VALVES/HYDRANTS	1,421	1,201	220	0	220	11	209	1,441	0	209	1,650	
STORAGE FACILITIES	7,988	7,775	213	0	213	11	202	9,329	0	202	9,532	
TOTAL EQUIPMENTS	27,805	18,896	8,910	0	8,910	445	8,464	22,675	0	8,464	31,139	
BASIC CONSTRUCTION COST												
BASIC CONSTRUCTION COST	47,612	23,257	24,355	2,704	21,651	1,083	20,569	27,908	1,622	20,569	50,099	
CONTINGENCY												
CONTINGENCY	7,142	3,489	3,653	406	3,248	162	3,085	4,186	243	3,085	7,515	
ENGINEERING STUDIES												
ENGINEERING STUDIES	4,928	2,407	2,521	280	2,241	112	2,129	2,889	168	2,129	5,185	
CONSTRUCTION SUPERVISION												
CONSTRUCTION SUPERVISION	2,190	1,070	1,120	124	996	50	946	1,284	75	946	2,305	
LAND ACQUISITION & OTHERS												
LAND ACQUISITION & OTHERS	5,363	3,281	2,083	38	2,044	102	1,942	3,937	23	1,942	5,902	
TOTAL PROJECT COST	67,235	33,503	33,732	3,552	30,180	1,509	28,671	40,204	2,131	28,671	71,006	

TABLE 11.5-17 INCREMENTAL ECONOMIC OPERATION AND MAINTENANCE COST - Tagaytay Water District

Unit: 1000 Pesos

YEAR	O & M COST (Unescalated)	FOREIGN EXCHANGE COMPONENT	DOMESTIC COMPONENT	TAXES (5%)	SHADOW PRICING			TOTAL ECONOMIC O & M COST	NET ECONOMIC O & M COST
					OTHERS (95%)	FOREIGN COMPONENT (X 1.2)	OTHERS (X 1.0)		
1994	13,499	2,970	10,529	526	10,003	3,564	10,003	13,566	0
1995	15,349	3,377	11,972	599	11,374	4,052	11,374	15,426	0
1996	16,201	3,564	12,637	632	12,005	4,277	12,005	16,282	0
1997	17,166	3,777	13,389	669	12,720	4,532	12,720	17,252	970
1998	14,569	3,205	11,364	568	10,796	3,846	10,796	14,642	-1,640
1999	15,356	3,378	11,978	599	11,379	4,054	11,379	15,433	-849
2000	16,253	3,576	12,677	634	12,043	4,291	12,043	16,334	52
2001	17,176	3,779	13,397	670	12,727	4,534	12,727	17,262	980
2002	18,092	3,980	14,112	706	13,406	4,776	13,406	18,182	1,900
2003	19,119	4,206	14,913	788	14,167	5,047	14,167	19,215	2,933
2004	20,197	4,443	15,754	833	14,966	5,332	14,966	20,298	4,016
2005	21,352	4,697	16,655	833	15,822	5,637	15,822	21,459	5,177
2006	21,352	4,697	16,655	833	15,822	5,637	15,822	21,459	5,177
2007	21,352	4,697	16,655	833	15,822	5,637	15,822	21,459	5,177
2008	21,352	4,697	16,655	833	15,822	5,637	15,822	21,459	5,177
2009	21,352	4,697	16,655	833	15,822	5,637	15,822	21,459	5,177
2010	21,352	4,697	16,655	833	15,822	5,637	15,822	21,459	5,177
2011	21,352	4,697	16,655	833	15,822	5,637	15,822	21,459	5,177
2012	21,352	4,697	16,655	833	15,822	5,637	15,822	21,459	5,177
2013	21,352	4,697	16,655	833	15,822	5,637	15,822	21,459	5,177
2014	21,352	4,697	16,655	833	15,822	5,637	15,822	21,459	5,177
2015	21,352	4,697	16,655	833	15,822	5,637	15,822	21,459	5,177
2016	21,352	4,697	16,655	833	15,822	5,637	15,822	21,459	5,177
2017	21,352	4,697	16,655	833	15,822	5,637	15,822	21,459	5,177
2018	21,352	4,697	16,655	833	15,822	5,637	15,822	21,459	5,177
2019	21,352	4,697	16,655	833	15,822	5,637	15,822	21,459	5,177
2020	21,352	4,697	16,655	833	15,822	5,637	15,822	21,459	5,177
2021	21,352	4,697	16,655	833	15,822	5,637	15,822	21,459	5,177
2022	21,352	4,697	16,655	833	15,822	5,637	15,822	21,459	5,177
2023	21,352	4,697	16,655	833	15,822	5,637	15,822	21,459	5,177
TOTAL ECONOMIC OPERATION AND MAINTENANCE COST									106,720

TABLE 11.5-18 SUMMARY OF ECONOMIC COSTS - Tagaytay Water District

YEAR	ECONOMIC PROJECT COST	REPLACE- MENT COST /	NET O & M COST	TOTAL ECONOMIC COST	Unit: 1000 Pesos		
					PRESENT VALUE AT 15%	FACTOR	VALUE
1994			0	0	0	0.000	0
1995			0	0	0	0.000	0
1996	11,087		0	11,087	8,383	0.756	-8,383
1997	59,919		0	60,889	40,035	0.658	-39,130
1998			-1,640	-1,640	970	0.572	5,086
1999			-849	-849	-422	0.497	4,815
2000			52	52	23	0.432	4,517
2001			980	980	368	0.376	4,246
2002			1,900	1,900	621	0.327	3,846
2003			2,933	2,933	834	0.284	3,443
2004			4,016	4,016	993	0.247	3,069
2005			5,177	5,177	1,113	0.215	2,719
2006			5,177	5,177	968	0.187	2,364
2007			5,177	5,177	841	0.163	2,056
2008			5,177	5,177	732	0.141	1,788
2009			5,177	5,177	636	0.123	1,555
2010			5,177	5,177	553	0.107	1,352
2011		1,880	5,177	7,056	656	0.093	1,001
2012		5,639	5,177	10,816	874	0.081	567
2013			5,177	5,177	364	0.070	889
2014			5,177	5,177	316	0.061	773
2015			5,177	5,177	275	0.053	672
2016			5,177	5,177	239	0.046	584
2017			5,177	5,177	208	0.040	508
2018			5,177	5,177	181	0.035	442
2019			5,177	5,177	157	0.030	384
2020			5,177	5,177	137	0.026	334
2021			5,177	5,177	119	0.023	291
2022			5,177	5,177	103	0.020	253
2023			5,177	5,177	90	0.017	679
TOTAL	71,006	7,519	106,720	185,245	58,459		719

1/ (a) Pump station: 1,337 (2011) & 4,010 (2012); (b) Service facilities: 131 (2011) & 392 (2012);
(c) Valves/hydrants: 412 (2011) & 1,237 (2012)

TABLE 11.5-19 ECONOMIC INTERNAL RATE OF RETURN - Tagaytay Water District

YEAR	TOTAL ECONOMIC BENEFITS	TOTAL ECONOMIC COSTS	NET BENEFIT	Unit: 1000 Pesos		
				PRESENT VALUE AT 15%	FACTOR	VALUE
1994	0	0	0	0	0.000	0
1995	0	0	0	0	0.000	0
1996	0	11,087	-11,087	-8,383	0.756	-8,383
1997	1,377	60,889	-59,511	-39,130	0.658	-39,130
1998	7,255	-1,640	8,895	5,086	0.572	5,086
1999	8,835	-849	9,684	4,815	0.497	4,815
2000	10,500	52	10,447	4,517	0.432	4,517
2001	12,274	980	11,294	4,246	0.376	4,246
2002	13,666	1,900	11,766	3,846	0.327	3,846
2003	15,046	2,933	12,113	3,443	0.284	3,443
2004	16,432	4,016	12,416	3,069	0.247	3,069
2005	17,827	5,177	12,650	2,719	0.215	2,719
2006	17,827	5,177	12,650	2,364	0.187	2,364
2007	17,827	5,177	12,650	2,056	0.163	2,056
2008	17,827	5,177	12,650	1,788	0.141	1,788
2009	17,827	5,177	12,650	1,555	0.123	1,555
2010	17,827	5,177	12,650	1,352	0.107	1,352
2011	17,827	7,056	10,770	1,001	0.093	1,001
2012	17,827	10,816	7,011	567	0.081	567
2013	17,827	5,177	12,650	889	0.070	889
2014	17,827	5,177	12,650	773	0.061	773
2015	17,827	5,177	12,650	672	0.053	672
2016	17,827	5,177	12,650	584	0.046	584
2017	17,827	5,177	12,650	508	0.040	508
2018	17,827	5,177	12,650	442	0.035	442
2019	17,827	5,177	12,650	384	0.030	384
2020	17,827	5,177	12,650	334	0.026	334
2021	17,827	5,177	12,650	291	0.023	291
2022	17,827	5,177	12,650	253	0.020	253
2023	44,259	5,177	39,083	679	0.017	679
TOTAL	450,523	185,245	265,279	719		719

(Salvage value is added in 2023.)

ECONOMIC INTERNAL RATE OF RETURN = 15.22%

EIRR OF OTHER CASES (SENSITIVITY ANALYSIS)

Investment Cost: 20% increase = 12.65%
O & M Cost: 20% increase = 14.59%
Revenue: 20% decrease = 11.29%

BENEFIT COST RATIO at 15% discount rate = 1.01

TABLE 11.5-20 SALVAGE VALUE IN YEAR 2023 - Tagaytay Water District

Unit: 1000 Pesos

YEAR	50 - YEAR ITEMS			30 - YEAR ITEMS			15 - YEAR ITEMS			TOTAL	
	ECONOMIC VALUE	REMAINING LIFE IN 2023	SALVAGE VALUE	ECONOMIC VALUE	REMAINING LIFE IN 2023	SALVAGE VALUE	ECONOMIC VALUE	REMAINING LIFE IN 2023	SALVAGE VALUE	SALVAGE VALUE	VALUE
1994											
1995											
1996	9,698	46.00%	4,461	947	10.00%	95				4,556	
1997		48.00%			13.33%	379				14,344	
1998	29,094	50.00%	13,965	2,842	16.67%					0	
1999		52.00%			20.00%					0	
2000		54.00%			23.33%					0	
2001		56.00%			26.67%					0	
2002		58.00%			30.00%					0	
2003		60.00%			33.33%					0	
2004		62.00%			36.67%					0	
2005		64.00%			40.00%					0	
2006		66.00%			43.33%					0	
2007		68.00%			46.67%					0	
2008		70.00%			50.00%					0	
2009		72.00%			53.33%					0	
2010		74.00%			56.67%					0	
2011		76.00%			60.00%					0	
2012		78.00%			63.33%		1,880	26.67%	501	501	
2013		80.00%			66.67%		5,639	33.33%	1,880	1,880	
2014		82.00%			70.00%			40.00%		0	
2015		84.00%			73.33%			46.67%		0	
2016		86.00%			76.67%			53.33%		0	
2017		88.00%			80.00%			60.00%		0	
2018		90.00%			83.33%			66.67%		0	
2019		92.00%			86.67%			73.33%		0	
2020		94.00%			90.00%			80.00%		0	
2021		96.00%			93.33%			86.67%		0	
2022		98.00%			96.67%			93.33%		0	
2023		100.00%			100.00%			100.00%		0	
SALVAGE VALUE			18,426	474		2,381				21,281	
ADD: LAND										5,152	
TOTAL SALVAGE VALUE										26,433	

The increase in land value as an economic benefit due to the provision of an improved water supply system was not estimated for this analysis since by NEDA it is not advisable to add the benefit in the economic feasibility study on the water supply project. This is mainly because it is difficult to isolate the benefits brought about by the improvement of the water supply system from other factors.

In Tagaytay such as other major tourism spot in the country, however, the benefit may be added with the careful market survey of the land value for commercial and tourism facilities in particular because the value seems to be large. Then, the EIRR may reach more feasible range.

11.6 PROJECT FOR TANZA

11.6.1 Estimation of the Construction Cost and Construction Period

(1) Construction Cost

The basic construction costs of the Phase I improvement for the Tanza water supply facilities totals P8.21 million, while the Phase II totals P21.16 million.

A summary of the estimated project cost is presented in **Table 11.6-1a** and **11.6-1b**, and the detailed breakdown is shown in **Table 11.6-2a** and **11.6-2b**.

(2) Construction Period

In accordance with the facility requirements as described in Section 10.6.6, the construction period is presented in **Fig. 11.6-1**.

11.6.2 Organization and Cost for Operation and Maintenance of the Water Supply System

(1) Organization

The TAN-WD presently has 6 employees headed by the general manager. However, it will be required to increase this number in 1997 after the proposed water supply system is implemented.

Based on the number of service connection described in Section 10.6.4, the number of personnel for the TAN-WD from the year 1995 up to 2005 is computed as follows:

Design year	No. of Connection	No. of Employee
1995	809	8
1996	1,365	14

TABLE 11.6-1a
COST ESTIMATES (P X 1000)
(1994 Price Level)

PHASE 1
TANZA WATER DISTRICT

FACILITIES	TOTAL COST	LOCAL COMPONENT				FOREIGN EXCHANGE COMPONENT		
		MATERIAL	LABOR		TOTAL	DIRECT	INDIRECT	TOTAL
			SKILLED	UNSKILLED				
1) PUMP STATION								
- Equipment	1,025.1	126.2	-	-	126.2	883.1	15.8	898.9
- Civil Works	552.0	236.6	141.9	78.9	457.3	-	94.6	94.6
- Total	1,577.0	362.7	141.9	78.9	583.5	883.1	110.4	993.5
2) DISTRIBUTION FACILITIES								
- Equipment	1,534.0	796.5	59.0	-	855.5	-	678.5	678.5
- Civil Works	1,416.0	649.0	206.5	118.0	973.5	-	442.5	442.5
- Total	2,950.0	1,445.5	265.5	118.0	1,829.0	-	1,121.0	1,121.0
3) TREATMENT FACILITIES								
- Equipment	26.9	8.6	-	-	8.6	16.3	1.9	18.2
- Civil Works	21.1	14.4	3.4	1.4	19.2	-	1.9	1.9
- Total	48.0	23.0	3.4	1.4	27.8	16.3	3.8	20.2
4) SERVICE CONNECTIONS								
- Equipment	760.5	20.3	-	-	20.3	719.9	20.3	740.2
- Civil Works	253.5	111.5	40.6	81.1	233.2	-	20.3	20.3
- Total	1,014.0	131.8	40.6	81.1	253.5	719.9	40.6	760.5
5) VALVES/HYDRANTS								
- Equipment	66.8	10.4	0.0	0.0	10.4	52.4	4.0	56.4
- Civil Works	33.2	13.2	7.0	11.0	31.2	0.0	2.0	2.0
- Total	100.0	23.6	7.0	11.0	41.6	52.4	6.0	58.4
6) STORAGE FACILITY								
- Equipment	1,667.3	44.5	-	-	44.5	1,578.3	44.5	1,622.8
- Civil Works	555.8	244.5	88.9	177.8	511.3	-	44.5	44.5
- Total	2,223.0	289.0	88.9	177.8	555.8	1,578.3	88.9	1,667.3
7) LAND ACQUISITION								
- Equipment	300.0	96.0	-	-	96.0	135.0	69.0	204.0
- Civil Works	-	-	-	-	-	-	-	-
- Total	300.0	96.0	-	-	96.0	135.0	69.0	204.0
=====								
TOTAL CONSTRUCTION COST								
- Equipment	5,380.6	1,102.4	59.0	0.0	1,161.4	3,385.1	833.9	4,219.0
- Civil Works	2,831.6	1,269.2	488.3	468.3	2,225.7	0.0	605.8	605.8
- Total	8,212.0	2,371.7	547.3	468.3	3,387.2	3,385.1	1,439.7	4,824.8

TABLE 11.6-1b
COST ESTIMATES (P X 1000)
(1994 Price Level)

PHASE 2
TANZA WATER DISTRICT

FACILITIES	TOTAL COST	LOCAL COMPONENT				FOREIGN EXCHANGE COMPONENT		
		MATERIAL	LABOR		TOTAL	DIRECT	INDIRECT	TOTAL
			SKILLED	UNSKILLED				
1) DEEPWELL CONSTRUCTION								
- Equipment	1,320.0	840.0	-	-	840.0	-	480.0	480.0
- Civil Works	1,680.0	810.0	270.0	210.0	1,290.0	-	390.0	390.0
- Total	3,000.0	1,650.0	270.0	210.0	2,130.0	-	870.0	870.0
2) PUMP STATION								
- Equipment	2,234.1	275.0	-	-	275.0	1,924.7	34.4	1,959.1
- Civil Works	1,203.0	515.6	309.3	171.9	996.7	-	206.2	206.2
- Total	3,437.0	790.5	309.3	171.9	1,271.7	1,924.7	240.6	2,165.3
3) PIPELINES								
- Equipment	2,468.4	1,281.7	94.9	-	1,376.6	-	1,091.8	1,091.8
- Civil Works	2,278.6	1,044.3	332.3	189.9	1,566.5	-	712.1	712.1
- Total	4,747.0	2,326.0	427.2	189.9	2,943.1	-	1,803.9	1,803.9
4) TREATMENT FACILITIES								
- Equipment	53.8	17.3	-	-	17.3	32.6	3.8	36.5
- Civil Works	42.2	28.8	8.7	2.9	38.4	-	3.8	3.8
- Total	96.0	46.1	8.7	2.9	55.7	32.6	7.7	40.3
5) SERVICE CONNECTIONS								
- Equipment	990.0	26.4	-	-	26.4	937.2	26.4	963.6
- Civil Works	330.0	145.2	52.8	105.6	303.6	-	26.4	26.4
- Total	1,320.0	171.6	52.8	105.6	330.0	937.2	52.8	990.0
6) VALVES/HYDRANTS								
- Equipment	69.4	10.8	0.0	0.0	10.8	54.4	4.2	58.6
- Civil Works	34.6	13.7	7.4	11.5	32.6	0.0	2.1	2.1
- Total	104.0	24.5	7.4	11.5	43.4	54.4	6.2	60.6
7) STORAGE FACILITIES								
- Equipment	5,889.0	157.0	-	-	157.0	5,574.9	157.0	5,732.0
- Civil Works	1,963.0	863.7	314.1	628.2	1,806.0	-	157.0	157.0
- Total	7,852.0	1,020.8	314.1	628.2	1,963.0	5,574.9	314.1	5,889.0
8) LAND ACQUISITION								
- Equipment	600.0	192.0	-	-	192.0	270.0	138.0	408.0
- Civil Works	-	-	-	-	-	-	-	-
- Total	600.0	192.0	-	-	192.0	270.0	138.0	408.0
=====								
TOTAL CONSTRUCTION COST								
- Equipment	13,624.7	2,800.2	94.9	0.0	2,895.1	8,793.9	1,935.6	10,729.5
- Civil Works	7,531.4	3,421.3	1,292.6	1,319.9	6,033.8	0.0	1,497.6	1,497.6
- Total	21,156.0	6,221.5	1,387.5	1,319.9	8,928.9	8,793.9	3,433.3	12,227.1

TABLE 11.6-2a
BREAKDOWN OF COST ESTIMATES (Phase 1)
Tanza Water District
Tanza, Cavite

A. ENGINEERING BASIC COST ITEM

					P	2,950,000.00
1.	Pipelines					
a)	2930 m.	100 mm PVC Pipes C-100 @ P	310.00 /m	908,300.00		
b)	975 m.	150 mm PVC Pipes C-100 @ P	520.00 /m	507,000.00		
c)	1030 m.	200 mm PVC Pipes C-100 @ P	1,490.00 /m	1,534,700.00		
						100,600.00
2.	Appurtenances					
a)	5 pcs.	Gate Valves (Various Sizes)	8,000.00 /pc	40,000.00		
b)	3 units	Fire Hydrant	20,200.00 /unit	60,600.00		
						1,576,788.00
3.	Pumping Station					
	20 HP	1 Submersible Pump	22,183.00 /HP	443,660.00		
	1 unit	30 KVA Stand-by Generator Set	453,128.00 /Unit	453,128.00		
		1 Pumphouse	150,000.00	150,000.00		
		Transformer/Powerlines	Lump Sum	530,000.00		
						2,223,000.00
4.	Reservoir					
	171 cum	1 Elevated Steel Tank	13,000.00 /cum	2,223,000.00		
5.	Service Connection					
	780 s.c.		1,300.00 /s.c	1,014,000.00		1,014,000.00
6.	Disinfection Facility					
	1 set	Hypochlorinator	48,000.00 /unit	48,000.00		48,000.00
Sub-Total A					P	7,912,388.00

B. NON-ENGINEERING BASIC COST ITEM

Land Acquisition	300.00 sq.m.	1,000.00 /sq.m.		300,000.00		
Sub-Total B					P	300,000.00

TOTAL PROJECT COST _____ P 8,212,388.00
 SAY P 8.21 MILLION

TABLE 11.6-2b

BREAKDOWN OF COST ESTIMATES (Phase 2)

Tanza Water District

Tanza, Cavite

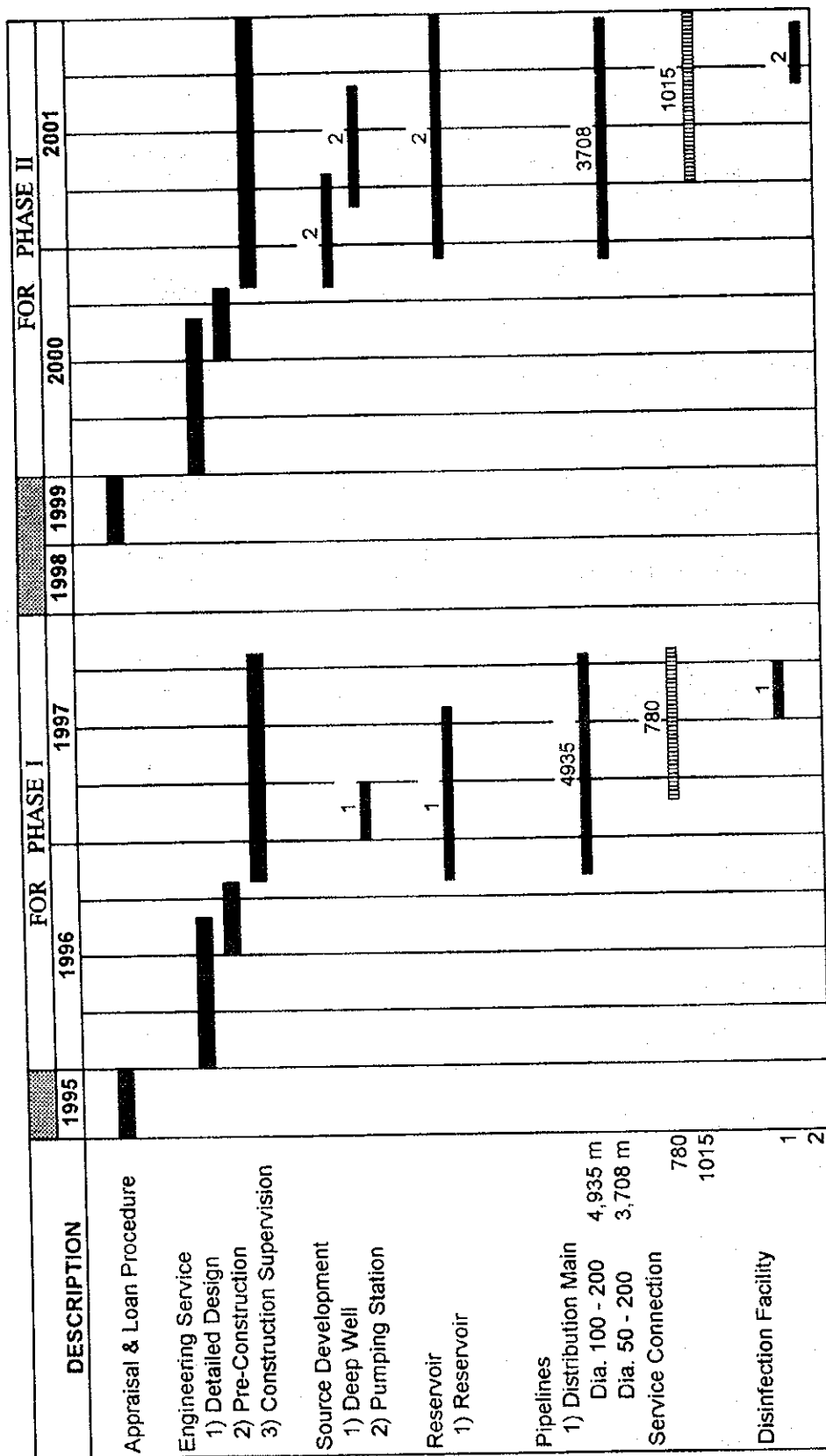
A. ENGINEERING BASIC COST ITEM

1.	Pipelines and Appurtenances				P	4,747,160.00
a)	1108 m.	150 mm PVC Pipes C-100 @ P	520.00 /m	576,160.00		
b)	2050 m.	200 mm PVC Pipes C-100 @ P	1,490.00 /m	3,054,500.00		
c)	550 m.	250 mm PVC Pipes C-100 @ P	2,030.00 /m	1,116,500.00		
2.	Appurtenances					104,400.00
a)	8 pcs.	Gate Valves (Various Sizes)	8,000.00 /pc	64,000.00		
b)	2 units	Fire Hydrant	20,200.00 /unit	40,400.00		
3.	Source Development					
	2 unit	Deepwell (150m @ P10,000/m)		3,000,000.00		3,000,000.00
4.	Pumping Station					3,437,266.00
	40 HP	1 Submersible Pump (Mulawin)	14,310.63 /HP	572,425.00		
	40 HP	1 Submersible Pump (D. Amaya)	14,310.63 /HP	572,425.00		
	2 unit	60 KVA Stand-by Generator Set	616,208.00 /Unit	1,232,416.00		
		2 Pumphouse	150,000.00	300,000.00		
		Transformer/Powerlines	Lump Sum	760,000.00		
5.	Reservoir					7,852,000.00
	292 cum	1 Elevated Steel Tank (Bgy Mulawin)	13,000.00 /cum	3,796,000.00		
	312 cum	1 Elevated Steel Tank (Bgy Daang Amaya)	13,000.00 /cum	4,056,000.00		
6.	Service Connection					
	1015 s.c		1,300.00 /s.c	1,319,500.00		1,319,500.00
7.	Disinfection Facility					
	2 set	Hypochlorinator	48,000.00 /unit	96,000.00		96,000.00
		Sub-Total A			P	20,556,326.00

B. NON-ENGINEERING BASIC COST ITEM

Land Acquisition	600.00 sq.m.	1,000.00 /sq.m.		600,000.00		
		Sub-Total B			P	600,000.00
		TOTAL PROJECT COST			P	21,156,326.00
					SAY	P 21.16 MILLION

FIG. 11.6-1 CONSTRUCTION PERIOD FOR TANZA



1997	1,920	19
1998	2,688	27
1999	2,905	29
2000	3,122	31
2001	3,399	33
2002	4,354	44
2003	4,817	48
2004	5,280	53
2005	5,743	57

(2) Cost for Operation and Maintenance of the Water Supply System

A summary of the operation and maintenance costs for the Tanza water supply system are shown in **Table 11.6-3**, and a breakdown of the expenditures is presented in **Table 11.6-4a** to **11.6-4c**.

For the financial analysis in Section 11.6.3, a summary of operation and maintenance cost and a breakdown of the expenditures for Phase I only are presented in **Table 11.6-5**, and **Table 11.6-6a** to **11.6-6c**, respectively.

11.6.3 Financial Analysis

(1) Financial Background

Tanza Water District was established in 1988. The district has implemented the approved loan of 12 million pesos from 1991 to 1994 for the development of its water system which consist of drilling of a deep well, pipe laying of transmission and distribution lines, reservoir construction and provision for disinfecting of the water served. The district was exempted from the equity contribution since the project was their initial major improvement.

(2) Development Cost

The cost estimates of the required improvements are presented in the preceding section. A breakdown of the project cost on an annual basis is shown in **Table 11.6-7**.

(3) Operating and Maintenance Costs

Operating and maintenance costs are shown in **Table 11.6-8**. Details are also shown in the preceding section (Section 11.6.2).

TABLE 11.6-3
SUMMARY OF OPERATION AND MAINTENANCE COST
TANZA WATER DISTRICT

YEAR	ADMINISTRATION PERSONNEL A)	POWER B)	CHLORINE C)	MISCELLANEOUS & MAINTENANCE D)	OFFICE RENTALS E)	TOTAL
1994	351,000.00	101,104.94	11,037.60	25,400.00	24,000.00	512,542.54
1995	468,000.00	335,668.40	36,843.10	80,900.00	24,000.00	945,411.50
1996	819,000.00	574,276.07	62,648.60	136,500.00	24,000.00	1,616,424.67
1997	1,111,500.00	808,839.53	88,454.10	192,000.00	24,000.00	2,224,793.63
1998	1,579,500.00	1,036,545.44	115,792.60	268,800.00	24,000.00	3,024,638.04
1999	1,696,500.00	1,159,190.13	129,487.40	290,500.00	24,000.00	3,299,677.53
2000	1,813,500.00	1,281,834.82	143,233.30	312,200.00	24,000.00	3,574,768.12
2001	1,930,500.00	1,408,435.79	156,928.10	333,900.00	24,000.00	3,853,763.89
2002	2,574,000.00	1,768,649.35	189,274.40	435,400.00	24,000.00	4,991,323.75
2003	2,808,000.00	2,020,135.62	216,101.90	481,700.00	24,000.00	5,549,937.52
2004	3,100,500.00	2,267,499.17	242,929.40	528,000.00	24,000.00	6,162,928.57
2005	3,334,500.00	2,518,985.44	269,808.00	574,300.00	24,000.00	6,721,593.44

TABLE 11.6-4a Cost for Operation and Maintenance
A) PERSONNEL

The staff is expected to increase by design year to cope up with growing demand of the water supply system.

Staff =		100 per Connection		
Cost = Staff * Average Salary *				13 months
YEAR	Average Salary/month	Conn	Staff	Annual Cost (P)
1994	4,500.00	254	6	351,000.00
1995	4,500.00	809	8	468,000.00
1996	4,500.00	1,365	14	819,000.00
1997	4,500.00	1,920	19	1,111,500.00
1998	4,500.00	2,688	27	1,579,500.00
1999	4,500.00	2,905	29	1,696,500.00
2000	4,500.00	3,122	31	1,813,500.00
2001	4,500.00	3,339	33	1,930,500.00
2002	4,500.00	4,354	44	2,574,000.00
2003	4,500.00	4,817	48	2,808,000.00
2004	4,500.00	5,280	53	3,100,500.00
2005	4,500.00	5,743	57	3,334,500.00

TABLE 11.6-4b Cost for Operation and Maintenance

B) PUMPING COST

YEAR	ADD (L/s)	HP RATING	KW RATING	SC (L/s)	Demand/ Supply	PHPD (Hr/d)	DEPD (KWH/D)	PUMPING COST (P)		
								Daily	Monthly	Annually
1994	2.50	40	29.84	30.00	0.08	2.00	70.21	280.85	8,425.41	101,104.94
1995	8.30	40	29.84	30.00	0.28	6.64	233.10	932.41	27,972.37	335,668.40
1996	14.20	40	29.84	30.00	0.47	11.36	398.80	1,595.21	47,856.34	574,276.07
1997	20.00	40	29.84	30.00	0.67	16.00	561.69	2,246.78	67,403.29	808,839.53
1998	26.20	60	44.76	46.00	0.57	13.67	719.82	2,879.29	86,378.79	1,036,545.44
1999	29.30	60	44.76	46.00	0.64	15.29	804.99	3,219.97	96,599.18	1,159,190.13
2000	32.40	60	44.76	46.00	0.70	16.90	890.16	3,560.65	106,819.57	1,281,834.82
2001	35.60	60	44.76	46.00	0.77	18.57	978.08	3,912.32	117,369.55	1,408,435.79
2002	42.90	140	104.44	103.00	0.42	10.00	1228.23	4,912.91	147,387.45	1,768,649.35
2003	49.00	140	104.44	103.00	0.48	11.42	1402.87	5,611.49	168,344.64	2,020,135.62
2004	55.00	140	104.44	103.00	0.53	12.82	1574.65	6,298.61	188,958.26	2,267,499.17
2005	61.10	140	104.44	103.00	0.59	14.24	1749.30	6,997.18	209,915.45	2,518,985.44

ADD = Average day demand
 SC = Supply Capacity
 HP = Pumps Rated Horsepower
 PV = Cost per KWH = 4.00
 Em = Pump Efficiency = 85%
 Days of Pumping/month = 30 days
 PHPD = Pumping hours per day
 DEPD = Daily Energy Power Demand

Computations Used:

KW Rating = Rated Hp * .746
 Demand/Supply Ratio = ADD/SC
 PHPD = 24 Hours * Demand/Supply Ratio
 DEPD = PHPD * KW Rating / Pump Efficiency

Power Cost:

Daily = DEPD * Energy Cost
 Monthly = Daily Power Cost * 30
 Yearly = Monthly Power Cost * 12

TABLE 11.6-4c. Cost for Operation and Maintenance
C) CHLORINATION COST

The average annual demand for chlorine is as follows:

$$A = (365 \cdot Q \cdot D) / 1000$$

Where :

A = Annual Demand of Chlorine (Kg)
Q = Average Daily Water Demand (cumd)
D = Average Chlorine Dosage = 2 mg/l
Cost of Chlorine = 70.00 /kg

YEAR	ADD (CumD)	ADC (Kg)	COST (P)
1994	216	158	11,037.60
1995	721	526	36,843.10
1996	1,226	895	62,648.60
1997	1,731	1,264	88,454.10
1998	2,266	1,654	115,792.60
1999	2,534	1,850	129,487.40
2000	2,803	2,046	143,233.30
2001	3,071	2,242	156,928.10
2002	3,704	2,704	189,274.40
2003	4,229	3,087	216,101.90
2004	4,754	3,470	242,929.40
2005	5,280	3,854	269,808.00

ADD = Average day demand

ADC = Annual Demand of Chlorine

D) Maintenance and Miscellaneous Expenses
Cost per connection/year = P

YEAR	Conn	TOTAL (P)	100.00 /year	E) Office Rentals	Monthly Rentals	Yearly Rentals
1994	254	25,400.00		1994	2,000.00	24,000.00
1995	809	80,900.00		1995	2,000.00	24,000.00
1996	1,365	136,500.00		1996	2,000.00	24,000.00
1997	1,920	192,000.00		1997	2,000.00	24,000.00
1998	2,688	268,800.00		1998	2,000.00	24,000.00
1999	2,905	290,500.00		1999	2,000.00	24,000.00
2000	3,122	312,200.00		2000	2,000.00	24,000.00
2001	3,339	333,900.00		2001	2,000.00	24,000.00
2002	4,354	435,400.00		2002	2,000.00	24,000.00
2003	4,817	481,700.00		2003	2,000.00	24,000.00
2004	5,280	528,000.00		2004	2,000.00	24,000.00
2005	5,743	574,300.00		2005	2,000.00	24,000.00

TABLE 11.6-5
SUMMARY OF OPERATION AND MAINTENANCE COST
TANZA WATER DISTRICT

YEAR	ADMINISTRATION PERSONNEL A)	POWER B)	CHLORINE C)	MISCELLANEOUS & MAINTENANCE D)	OFFICE RENTALS E)	TOTAL
1994	351,000.00	101,104.94	11,058.04	25,400.00	24,000.00	512,562.98
1995	468,000.00	335,668.40	36,843.10	80,900.00	24,000.00	945,411.50
1996	819,000.00	574,276.07	62,648.60	136,500.00	24,000.00	1,616,424.67
1997	1,111,500.00	808,839.53	88,454.10	192,000.00	24,000.00	2,224,793.63
1998	1,579,500.00	1,036,545.44	115,792.60	268,800.00	24,000.00	3,024,638.04
1999	1,696,500.00	1,159,190.13	129,487.40	290,500.00	24,000.00	3,299,677.53
2000	1,813,500.00	1,281,834.82	143,233.30	312,200.00	24,000.00	3,574,768.12
2001	1,930,500.00	1,408,435.79	156,979.20	333,900.00	24,000.00	3,853,814.99
2002	2,047,500.00	1,463,823.71	163,468.90	347,300.00	24,000.00	4,046,092.61
2003	2,106,000.00	1,523,167.92	170,009.70	360,700.00	24,000.00	4,183,877.62
2004	2,164,500.00	1,582,512.12	176,499.40	374,000.00	24,000.00	4,321,511.52
2005	2,281,500.00	1,641,856.33	183,091.30	387,400.00	24,000.00	4,517,847.63

TABLE 11.6-6a Cost for Operation and Maintenance
A) PERSONNEL

The staff is expected to increase by design year to cope up with growing demand of the water supply system.

Staff = 100 per Connection
Cost = Staff * Average Salary *

13 months

YEAR	Average Salary/month	Conn	Staff	Annual Cost (P)
1994	4,500.00	254	6	351,000.00
1995	4,500.00	809	8	468,000.00
1996	4,500.00	1,365	14	819,000.00
1997	4,500.00	1,920	19	1,111,500.00
1998	4,500.00	2,688	27	1,579,500.00
1999	4,500.00	2,905	29	1,696,500.00
2000	4,500.00	3,122	31	1,813,500.00
2001	4,500.00	3,339	33	1,930,500.00
2002	4,500.00	3,473	35	2,047,500.00
2003	4,500.00	3,607	36	2,106,000.00
2004	4,500.00	3,740	37	2,164,500.00
2005	4,500.00	3,874	39	2,281,500.00

TABLE 11.6-6b Cost for Operation and Maintenance

B) PUMPING COST

YEAR	ADD (L/s)	HP RATING	KW RATING	SC (L/s)	Demand/ Supply	PHPD (Hr/d)	DEPD (KWH/D)	PUMPING COST (P)		
								Daily	Monthly	Annually
1994	2.50	40	29.84	30.00	0.08	2.00	70.21	280.85	8,425.41	101,104.94
1995	8.30	40	29.84	30.00	0.28	6.64	233.10	932.41	27,972.37	335,668.40
1996	14.20	40	29.84	30.00	0.47	11.36	398.80	1,595.21	47,856.34	574,276.07
1997	20.00	40	29.84	30.00	0.67	16.00	561.69	2,246.78	67,403.29	808,839.53
1998	26.20	60	44.76	46.00	0.57	13.67	719.82	2,879.29	86,378.79	1,036,545.44
1999	29.30	60	44.76	46.00	0.64	15.29	804.99	3,219.97	96,599.18	1,159,190.13
2000	32.40	60	44.76	46.00	0.70	16.90	890.16	3,560.65	106,819.57	1,281,834.82
2001	35.60	60	44.76	46.00	0.77	18.57	978.08	3,912.32	117,369.65	1,408,435.79
2002	37.00	60	44.76	46.00	0.80	19.30	1016.54	4,066.18	121,985.31	1,463,823.71
2003	38.50	60	44.76	46.00	0.84	20.09	1057.76	4,231.02	126,930.66	1,523,167.92
2004	40.00	60	44.76	46.00	0.87	20.87	1098.97	4,395.87	131,876.01	1,582,512.12
2005	41.50	60	44.76	46.00	0.90	21.65	1140.18	4,560.71	136,821.36	1,641,856.33

Em = Pump Efficiency = 85%
 Days of Pumping/month = 30 days
 PHPD = Pumping hours per day
 DEPD = Daily Energy Power Demand

Computations Used:

KW Rating = Rated Hp * .746
 Demand/Supply Ratio = ADD/SC
 PHPD = 24 Hours * Demand/Supply Ratio
 DEPD = PHPD * KW Rating / Pump Efficiency

Power Cost:

Daily = DEPD * Energy Cost
 Monthly = Daily Power Cost * 30
 Yearly = Monthly Power Cost * 12

TABLE 11.6-6c Cost for Operation and Maintenance
C) CHLORINATION COST

The average annual demand for chlorine is as follows:

$$A = (365 \times Q \times D) / 1000$$

Where:

A = Annual Demand of Chlorine (kg)

Q = Average Daily Water Demand (cumd)

D = Average Chlorine Dosage = 2 mg/l

Cost of Chlorine = 70.00 /kg

YEAR	ADD (Cumd)	ADC (Kg)	COST (P)
1994	216	158	11,058.04
1995	721	526	36,843.10
1996	1,226	895	62,648.60
1997	1,731	1,264	88,454.10
1998	2,266	1,654	115,792.60
1999	2,534	1,850	129,487.40
2000	2,803	2,046	143,233.30
2001	3,072	2,243	156,979.20
2002	3,199	2,335	163,468.90
2003	3,327	2,429	170,009.70
2004	3,454	2,521	176,499.40
2005	3,583	2,616	183,091.30

ADD = Average day demand

ADC = Annual Demand of Chlorine

D) Maintenance and Miscellaneous Expenses
Cost per connection/year = P

100.00 /year

E) Office Rentals

YEAR	Conn	TOTAL (P)	Monthly Rentals	Yearly Rentals
1994	254	25,400.00	2,000.00	24,000.00
1995	809	80,900.00	2,000.00	24,000.00
1996	1,365	136,500.00	2,000.00	24,000.00
1997	1,920	192,000.00	2,000.00	24,000.00
1998	2,698	269,800.00	2,000.00	24,000.00
1999	2,905	290,500.00	2,000.00	24,000.00
2000	3,122	312,200.00	2,000.00	24,000.00
2001	3,339	333,900.00	2,000.00	24,000.00
2002	3,473	347,300.00	2,000.00	24,000.00
2003	3,607	360,700.00	2,000.00	24,000.00
2004	3,740	374,000.00	2,000.00	24,000.00
2005	3,874	387,400.00	2,000.00	24,000.00

TABLE 11.6-7 BREAKDOWN OF PROJECT COST - Tanza Water District

Unit: 1000 Pesos

	1995	1996	1997	1998	1999	TOTAL
Basic Construction Cost		0	7,912			7,912
Price and Physical Contingencies		0	1,187			1,187
Engineering Studies		819				819
Construction Supervision		0	364			364
Land Acquisition		345				345
Total Project Cost	0	1,164	9,463	0		10,627
Less: Paid-in Capital (W/D Equity)		0	1,063	0		1,063
Soft Loan		0	2,869	0		2,869
Regular Loan Disbursements	0	1,164	5,531	0		6,695
Add: Capitalized Interest	0	145	855	962	0	1,963
Regular Loan	0	1,309	6,386	962	0	8,658
Total Project Loan	0	1,309	9,256	962	0	11,527

TABLE 11.6-8a PROJECTED OPERATION & MAINTENANCE COST (UNESCALATED) - Tanza Water District

Unit: 1000 Pesos

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
SALARIES	146	468	819	1,112	1,580	1,697	1,814	1,931	2,048	2,106	2,165	2,282
POWER	22	336	574	809	1,037	1,159	1,282	1,408	1,464	1,523	1,583	1,642
CHEMICALS	5	37	63	88	116	129	143	157	163	170	176	183
MISC. & MAINTENANCE	116	105	161	216	293	315	336	358	371	385	398	411
UNESCALATED TOTAL O & M COST	289	945	1,616	2,225	3,025	3,300	3,575	3,854	4,046	4,184	4,322	4,518

TABLE 11.6-8b PROJECTED OPERATION & MAINTENANCE COST (ESCALATED) - Tanza Water District

Unit: 1000 Pesos

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
SALARIES	146	524	1,009	1,506	2,355	2,782	3,271	3,830	4,469	5,056	5,716	6,628
POWER & FUEL	22	376	708	1,096	1,545	1,901	2,312	2,795	3,195	3,657	4,179	4,770
CHEMICALS	5	41	77	120	173	212	258	311	357	408	466	532
MISC. & MAINTENANCE	116	117	198	293	436	516	606	710	810	924	1,051	1,195
ESCALATED TOTAL O & M COST	289	1,059	1,991	3,015	4,509	5,411	6,448	7,647	8,831	10,045	11,413	13,124

Note:

For financial analysis, operation and maintenance cost in 1994 is mainly based on the financial statements of the district although large parts are projected. Therefore, it is not necessarily equal to the costs shown in Table 11.6-3 through 11.6-6.

(4) Project Financing

90% of the total project cost is assumed to be financed by loans. It is assumed that the district will prepare 10% of the their own equity portion in the total project cost since the project is their second major improvement. Computation of the loan is shown below.

Total Project Cost (Phase 1)	10.63	million pesos
Water District Equity	1.06	million pesos
Capitalized Interest	1.96	million pesos
Total Loan Amount (regular and soft loan)	11.53	million pesos

Seventy percent (70%) of the loan is assumed to be at regular loan with the condition that interest rate of 12.5% is applied to all the amount of the regular loan.

Remaining 30% of the loan is to be a soft loan with the terms and conditions described in Section 11.1.3. The share of regular loan and soft loan is based on the experiences of the first improvement program in 1991-1994.

The details of the project loan's debt service schedule is presented in **Table 11.6-9**.

(5) Projection of Financial Statements

The water district's projected income statement for the period 1994-2005, as presented in **Table 11.6-10**, shows that annual net income are positive. Major financial ratios derived from the income statement shows the following;

- a) Operating ratio which measures the ability of revenues to cover operating expenses shows that the operating costs are between 55 - 68% of the operating revenues after the project completion.
- b) Return on the average fixed assets, which measures the earning power of the district's facilities, ranges from 13 to 20% after the completion of the project.

The projected cash flow statement for the same period as shown in **Table 11.6-11** indicates the sources and applications of funds. Major highlights from this table are as follows:

- a) Increase in working capital is positive throughout the study period except in 1995.
- b) Debt service coverage which shows the ability of the district's internal cash generation to meet its debt services varies between 1.7 and 2.3 from 1999 to 2005. These ratios are higher than LWUA's minimum ratio of 1.3.

The projected balance sheet are presented in **Table 11.6-12**. Major points are shown as follows;

TABLE 11.6-9 DEBT SERVICE SCHEDULE - Tanza Water District

Unit: 1000 Pesos

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
REGULAR LOAN (70%)											
First 2 million											
Disbursements	0	0	0	0	0	0	0	0	0	0	0
Capitalized Interest	0	0	0	0	0	0	0	0	0	0	0
Operational Interest											
Principal											
Debt Service											
Loan Outstanding, year-end	0	0	0	0	0	0	0	0	0	0	0
Next 5 million											
Disbursements	0	0	0	0	0	0	0	0	0	0	0
Capitalized Interest	0	0	0	0	0	0	0	0	0	0	0
Operational Interest											
Principal											
Debt Service											
Loan Outstanding, year-end	0	0	0	0	0	0	0	0	0	0	0
More than 7 million a/											
Disbursements	0	1,164	5,531	962	1,082	1,076	1,068	1,060	1,050	1,040	1,028
Capitalized Interest	0	145	855		53	60	67	76	85	96	108
Operational Interest					1,135	1,135	1,135	1,135	1,135	1,135	1,135
Principal					8,605	8,545	8,478	8,402	8,317	8,221	8,114
Debt Service											
Loan Outstanding, year-end	0	1,309	7,696	8,658							
SOFT LOAN (30%) a/											
Disbursements	0	0	2,869	0				301	301	301	301
Capitalized Interest	0	0	0								
Operational Interest											
Principal											
Debt Service											
Loan Outstanding, year-end	0	0	2,819	2,869	2,869	2,869	2,869	2,869	2,869	2,869	2,869
DEBT SERVICE SUMMARY											
Disbursements	0	1,164	8,401	962	1,082	1,076	1,068	1,061	1,052	1,041	1,029
Capitalized Interest	0	145	855		53	60	67	76	85	96	108
Operational Interest					1,135	1,135	1,135	1,437	1,437	1,437	1,437
Principal					11,474	11,414	11,347	11,271	11,186	11,091	10,983
Debt Service											
Loan Outstanding, year-end	0	1,309	10,565	11,527							

a/ According to the LWUA record, Tanza Water District has already received the regular loan and the soft loan at the amount of 8.1 million and 3.2 million pesos respectively.

TABLE 11.6-10 PROJECTED INCOME STATEMENT - Tanza Water District

Unit: 1000 Pesos

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Water Produced ('000 cum)	79	263	447	632	827	925	1,023	1,121	1,168	1,214	1,261	1,308
Water Sold ('000 cum)	59	197	336	474	620	694	767	841	876	911	945	980
Non-Revenue Water (%)	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%	25%
Average Water Rate (Effective Water Rate) (cum)	6.37	9.24	10.81	10.81	13.51	13.51	14.86	14.86	16.35	16.35	17.98	19.78
(July)												
Operating Revenue	175	1,541	3,627	5,121	8,378	9,372	11,402	12,494	14,315	14,885	17,000	19,390
Water Revenues	189	46	109	154	251	281	342	375	429	447	510	582
Other Operating Revenue	364	1,587	3,736	5,275	8,630	9,653	11,744	12,869	14,744	15,331	17,510	19,971
Total Operating Revenue												
Operating Costs												
Personnel	146	524	1,009	1,506	2,355	2,782	3,271	3,830	4,469	5,056	5,716	6,628
Chemicals	5	41	77	120	173	212	258	311	357	408	466	532
Power and Fuel	22	376	708	1,096	1,545	1,901	2,312	2,795	3,195	3,657	4,179	4,770
Misc. & Maintenance	116	117	198	293	436	516	606	710	810	924	1,051	1,195
Bad Debts	0	39	91	128	209	234	285	312	358	372	425	485
Total Operating Cost	289	1,097	2,082	3,143	4,718	5,645	6,733	7,959	9,189	10,417	11,838	13,609
Income Before Depreciation	75	489	1,654	2,132	3,912	4,008	5,011	4,910	5,555	4,914	5,672	6,362
Less: Depreciation	175	243	309	381	544	655	666	678	689	697	707	718
Operating Income	-100	246	1,345	1,751	3,368	3,353	4,345	4,232	4,867	4,217	4,965	5,644
Add: Non-operating Income	135											
Less: Interest on Loans	0	211	842	835	835	2,207	2,200	2,185	2,478	2,461	2,451	2,419
NET INCOME (LOSS)	35	36	502	916	2,533	1,146	2,145	2,047	2,389	1,755	2,514	3,226
Operating Ratio a/	79%	69%	56%	60%	55%	58%	57%	62%	62%	68%	68%	68%
Average Rate Base b/	6,987	9,727	12,561	15,224	21,742	26,211	26,645	27,122	27,541	27,898	28,288	28,718
Rate of Return c/	-1%	3%	11%	12%	15%	13%	16%	16%	18%	15%	18%	20%

a/ Total operating cost as a percentage of total revenue

b/ Average net fixed assets in operation

c/ Operating income as a percentage of the average rate base

PROJECTED WATER RATES 1/

	(July 1)	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
MINIMUM CHARGE (Peso/10 cum.)	60.00	101.79	101.79	127.24	127.24	139.96	139.96	139.96	153.96	169.35	186.29
11 - 20 cum. (Peso/cum.)	6.00	10.18	10.18	12.72	12.72	14.00	14.00	14.00	15.40	16.94	18.63
21 - 30 cum. (Peso/cum.)	6.20	8.99	10.52	13.15	13.15	14.46	14.46	14.46	15.91	17.50	19.25
Over 30 cum. (Peso/cum.)	6.35	9.21	10.77	13.47	13.47	14.81	14.81	14.81	16.29	17.92	19.72
Average low income (Urban)	2,188	2,407	2,647	2,912	3,203	3,524	3,876	4,264	4,690	5,159	5,675
% of income allocated to water	2.74	3.61	3.85	3.50	3.61	3.61	3.61	3.28	3.28	2.98	2.98
% of increase of minimum charge	-	45%	17%	0%	25%	0%	10%	0%	10%	10%	10%

1/ Projected effective dates of implementation of the projected rates are the first day of January in each year unless otherwise specified.

TABLE 11.6-11 PROJECTED CASH FLOW TABLE (SOURCES AND USE OF FUNDS) - Tanza Water District

Unit: 1000 Pesos

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
SOURCES OF FUNDS												
Income Before Depreciation	75	489	1,654	2,132	3,912	4,008	5,011	4,910	5,555	4,914	5,672	6,362
Add: Non-operating Income	135											
Internal Cash Generation	210	489	1,654	2,132	3,912	4,008	5,011	4,910	5,555	4,914	5,672	6,362
Paid-in Capital			0	1,063	0							
Loans												
Project Loan (LWUA)	4,758	0	1,309	9,256	962	0	0	0	0	0	0	0
Other Loan (LWUA: L.A. #3-372)		0	0	0	0	0	0	0	0	0	0	0
Total Sources	4,968	489	2,963	12,450	4,873	4,008	5,011	4,910	5,555	4,914	5,672	6,362
APPLICATION OF FUNDS												
Project	4,758	0	1,164	9,463	0	0						
Capitalized Interest	1/	0	145	835	962	0						
Other Capital Expenditures	177	722	723	0	940	413	454	500	339	373	408	452
Total Capital Expenditures	4,935	722	2,032	10,318	1,902	413	454	500	339	373	408	452
Debt Service												
Interest												
Project Loan	0	0	0	0	0	1,082	1,076	1,068	1,361	1,352	1,341	1,329
Other Loans	0	211	842	835	835	1,124	1,124	1,117	1,117	1,110	1,110	1,090
Total Interest	0	211	842	835	835	2,207	2,200	2,185	2,478	2,461	2,451	2,419
Amortization												
Project Loan	0	0	0	0	0	53	60	67	76	85	96	108
Other Loans	1	6	71	71	71	70	70	70	70	69	193	189
Total Amortization	1	6	71	71	71	123	130	137	145	154	288	297
Total Debt Service	2	216	914	906	906	2,330	2,329	2,322	2,623	2,615	2,739	2,715
Increase in Working Capital	32	-449	17	1,225	2,066	1,265	2,227	2,089	2,593	1,925	2,525	3,195
Total Applications	4,968	489	2,963	12,450	4,873	4,008	5,011	4,910	5,555	4,914	5,672	6,362
Self Financing Ratio a/	4%	100%	36%	0%	49%	100%	100%	100%	100%	100%	100%	100%
Average Self-Financing Ratio b/			28%	0%	20%	10%	49%	110%	79%	92%	109%	110%
Debt Service Ratio		2.26	1.81	2.35	4.32	1.72	2.15	2.11	2.12	1.88	2.07	2.34

1/ Capitalized interest is included in the project expenditures.

a/ annual

b/ calculated on three years average

TABLE 11.6-12 PROJECTED BALANCE SHEET - Taraza Water District

Unit: 1000 Pesos

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
A S S E T S												
Current Assets												
Cash	632	540	681	2,096	4,198	4,665	5,737	6,741	7,880	8,504	9,280	10,495
Accounts Receivable	48	257	605	854	1,397	1,562	1,901	2,083	2,386	2,481	2,834	3,232
Inventory	20	26	46	69	102	121	144	170	195	222	253	288
Cash Reserves	0	46	155	309	560	1,497	2,637	3,887	5,318	6,807	8,507	10,446
Other Current Assets	85	85	85	85	85	85	85	85	85	85	85	85
Total Current Assets	786	955	1,572	3,412	6,342	7,931	10,505	12,967	15,864	18,099	20,959	24,547
Fixed Assets in Operation	7,701	11,753	12,970	17,479	26,005	26,418	26,872	27,372	27,711	28,085	28,492	28,944
Accumulated Depreciation	175	418	727	1,107	1,651	2,306	2,972	3,650	4,339	5,036	5,744	6,462
Net Fixed Assets in Operation	7,526	11,335	12,243	16,371	24,354	24,111	23,900	23,721	23,372	23,048	22,749	22,483
Add: Work in Progress	3,331	0	815	6,624	0	0	0	0	0	0	0	0
Total Fixed Assets	10,856	11,335	13,058	22,996	24,354	24,111	23,900	23,721	23,372	23,048	22,749	22,483
TOTAL ASSETS	11,642	12,290	14,630	26,408	30,695	32,042	34,404	36,688	39,236	41,147	43,708	47,029
LIABILITIES and EQUITY												
Current Liabilities												
Accounts Payable	3	177	332	503	752	902	1,075	1,275	1,472	1,674	1,902	2,188
Customer Deposits	218	662	1,107	1,551	2,165	2,339	2,513	2,686	2,793	2,901	3,007	3,114
Current Maturities	6	71	71	71	123	130	137	145	154	288	297	307
Total Current Liabilities	227	910	1,510	2,124	3,040	3,371	3,724	4,106	4,419	4,863	5,206	5,609
Loans Payable - Long Term Debts	11,384	11,313	12,551	21,736	22,575	22,445	22,308	22,163	22,009	21,720	21,424	21,117
Equity												
Paid-in Capital	0	0	0	1,063	1,063	1,063	1,063	1,063	1,063	1,063	1,063	1,063
Retained Earnings	31	67	569	1,485	4,018	5,164	7,309	9,357	11,746	13,501	16,015	19,241
Total Equity	31	67	569	2,548	5,081	6,227	8,372	10,419	12,808	14,564	17,078	20,304
TOTAL LIABILITIES & EQUITY	11,642	12,290	14,630	26,408	30,695	32,042	34,404	36,688	39,236	41,147	43,708	47,029
Current Ratio ^{a/}	99.7%	1.05	1.04	1.61	2.09	2.35	2.82	3.16	3.59	3.72	4.03	4.38
Debt/Equity Ratio ^{b/}		99.4%	95.7%	89.5%	81.6%	78.3%	72.7%	68.0%	63.2%	59.9%	55.6%	51.0%

^{a/} The ratio which total current assets divided by the total current liability^{b/} Long-term debt as a percentage of the net worth (total liability and equity minus total current liability)

- a) Cash balance at the end of the study period (2005) is 10.5 million pesos.
- b) A total of 10.4 million pesos is accumulated for cash reserves by the year 2005.
- c) Current ratios which measure the ability of the district to meet its short term obligations increase from 2.1 to 4.4 after the project completion.
- d) Debt/equity ratios which indicate the percentage of the long-term debt in the net worth decrease from 82% in 1998 to 51% in 2005.

(6) Financial Internal Rate of Return

As shown in **Table 11.6-13**, the FIRR is 28.5 percent for the base case. The derived FIRR is well above the water district's weighted average cost of capital at 12.0 percent, which is shown in **Table 11.6-14**.

(7) Sensitivity Analysis

A sensitivity analysis is conducted to determine the effect of variances in the assumptions to the FIRR. The derived FIRR under selected variances to the base case are as follows:

<u>Scenario</u>	<u>FIRR</u>
Base Case	28.5%
1. 20% increase in Investment Cost	24.1%
2. 20% increase in O & M Cost	18.8%
3. 20% decrease in Revenue	12.3%

The computation of the FIRR under the different scenarios is also shown in **Table 11.6-13**. Results of the sensitivity analysis shows that the FIRR is greatly influenced by the decrease of revenue. The derived FIRR, however, are still more than the water district's weighted average cost of capital.

(8) Recommended Water Rates

The recommended water rates are shown below. The high increase of the rates in 1995 and 1998 are tallied with the full implementation by the Program of Work and the projected implementation in this project although almost bi-annual increase up to 2005 is also proposed. The details are also presented in **Table 11.6-10**.

	<u>Minimum</u>	<u>11-20m³</u>	<u>21-30m³</u>	<u>Over 31m³</u>
1994	60.00	6.00	6.20	6.35
1996	101.79	10.18	10.52	10.77
1998	127.24	12.72	13.15	13.47
2000	139.96	14.00	14.46	14.81
2002	153.96	15.40	15.91	16.29

TABLE 11.6-13 FINANCIAL INTERNAL RATE OF RETURN - Tanzania Water District

YEAR	(a) Base Case				(b) Investment Cost +20%				(c) O & M Cost +20%				(d) Revenue -20%			
	INCREMENTAL REVENUES	O & M	PROJECT COSTS	Net	INCREMENTAL REVENUES	O & M	PROJECT COSTS	Net	INCREMENTAL REVENUES	O & M	PROJECT COSTS	Net	INCREMENTAL REVENUES	O & M	PROJECT COSTS	Net
1994	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	-1,164	0	0	1,397	-1,397	0	0	1,164	-1,164	0	0	1,164	-1,164
1997	1,539	1,024	9,463	-8,948	1,539	1,024	11,356	-10,840	1,539	1,228	9,463	-9,153	1,231	1,024	9,463	-9,256
1998	4,894	2,517	940	1,437	4,894	2,517	1,127	1,249	4,894	3,021	940	934	3,915	2,517	940	458
1999	5,917	3,419	413	2,085	5,917	3,419	496	1,249	5,917	4,103	413	1,401	4,734	3,419	413	902
2000	8,008	4,457	454	3,097	8,008	4,457	545	2,002	8,008	5,348	454	2,206	6,407	4,457	454	1,496
2001	9,133	5,655	500	2,979	9,133	5,655	600	2,879	9,133	6,786	500	1,848	7,307	5,655	500	1,152
2002	11,008	6,839	339	3,830	11,008	6,839	407	3,762	11,008	8,207	339	2,462	8,807	6,839	339	1,628
2003	11,595	8,053	373	3,169	11,595	8,053	448	3,094	11,595	9,664	373	1,558	9,276	8,053	373	850
2004	13,774	9,421	408	3,945	13,774	9,421	489	3,863	13,774	11,305	408	2,061	11,019	9,421	408	1,190
2005	16,236	11,133	452	4,651	16,236	11,133	542	4,561	16,236	13,359	452	2,424	12,989	11,133	452	1,404
2006	16,236	11,133	0	5,103	16,236	11,133	0	5,103	16,236	13,359	0	2,876	12,989	11,133	0	1,856
2007	16,236	11,133	0	5,103	16,236	11,133	0	5,103	16,236	13,359	0	2,876	12,989	11,133	0	1,856
2008	16,236	11,133	0	5,103	16,236	11,133	0	5,103	16,236	13,359	0	2,876	12,989	11,133	0	1,856
2009	16,236	11,133	0	5,103	16,236	11,133	0	5,103	16,236	13,359	0	2,876	12,989	11,133	0	1,856
2010	16,236	11,133	0	5,103	16,236	11,133	0	5,103	16,236	13,359	0	2,876	12,989	11,133	0	1,856
2011	16,236	11,133	0	5,103	16,236	11,133	0	5,103	16,236	13,359	0	2,876	12,989	11,133	0	1,856
2012	16,236	11,133	0	5,103	16,236	11,133	0	5,103	16,236	13,359	0	2,876	12,989	11,133	0	1,856
2013	16,236	11,133	0	5,103	16,236	11,133	0	5,103	16,236	13,359	0	2,876	12,989	11,133	0	1,856
2014	16,236	11,133	0	5,103	16,236	11,133	0	5,103	16,236	13,359	0	2,876	12,989	11,133	0	1,856
2015	16,236	11,133	0	5,103	16,236	11,133	0	5,103	16,236	13,359	0	2,876	12,989	11,133	0	1,856
2016	16,236	11,133	0	5,103	16,236	11,133	0	5,103	16,236	13,359	0	2,876	12,989	11,133	0	1,856
2017	16,236	11,133	0	5,103	16,236	11,133	0	5,103	16,236	13,359	0	2,876	12,989	11,133	0	1,856
2018	16,236	11,133	0	5,103	16,236	11,133	0	5,103	16,236	13,359	0	2,876	12,989	11,133	0	1,856
2019	16,236	11,133	0	5,103	16,236	11,133	0	5,103	16,236	13,359	0	2,876	12,989	11,133	0	1,856
2020	16,236	11,133	0	5,103	16,236	11,133	0	5,103	16,236	13,359	0	2,876	12,989	11,133	0	1,856
2021	16,236	11,133	0	5,103	16,236	11,133	0	5,103	16,236	13,359	0	2,876	12,989	11,133	0	1,856
2022	16,236	11,133	0	5,103	16,236	11,133	0	5,103	16,236	13,359	0	2,876	12,989	11,133	0	1,856
2023	16,236	11,133	0	5,103	16,236	11,133	0	5,103	16,236	13,359	0	2,876	12,989	11,133	0	1,856

FIRR = 28.45%

FIRR = 24.09%

FIRR = 18.79%

FIRR = 12.28%

TABLE 11.6-14 WEIGHTED AVERAGE OF CAPITAL - Tanza Water District

Unit: 1000 Pesos

	AMOUNT	%TOTAL PROJECT LOAN	INTEREST RATE	WEIGHTED COST OF CAPITAL
TOTAL PROJECT LOAN	11,527	100.00%		
COMPOSITION OF LOAN				
A. REGULAR LOAN	8,658	75.11%		
FIRST 2 MILLION	0	0.00%	8.50%	0.00%
NEXT 5 MILLION	0	0.00%	10.50%	0.00%
EXCESS OF 7 MILLION	8,658	75.11%	12.50%	9.39%
B. SOFT LOAN	2,869	24.89%		
FIRST 2 MILLION	0	0.00%	8.50%	0.00%
NEXT 5 MILLION	2,869	24.89%	10.50%	2.61%
EXCESS OF 7 MILLION	0	0.00%	12.50%	0.00%
PREScribed DISCOUNT RATE FOR FIRR COMPUTATION				12.00%

TABLE 11.6-15 INCREASE IN CONSUMER SATISFACTION - Tanza Water District

Unit: 1000 Pesos

YEAR	INCREMENTAL ACCOUNTED FOR WATER	PRICE PER CUM.	ECONOMIC VALUE PER CUM.	ECONOMIC REVENUE	PRESENT VALUE	
					DISCOUNT RATE AT 15%	FACTOR
1994	0	6.37	7.64	0	1.000	0
1995	0	8.25	9.90	0	0.870	0
1996	0	8.77	10.53	0	0.756	0
1997	138	7.97	9.57	1,323	0.658	870
1998	285	9.06	10.87	3,095	0.572	1,770
1999	358	8.24	9.89	3,541	0.497	1,760
2000	432	8.24	9.89	4,268	0.432	1,845
2001	505	7.49	8.99	4,540	0.376	1,707
2002	540	7.49	8.99	4,854	0.327	1,587
2003	575	6.81	8.17	4,698	0.284	1,335
2004	610	6.81	8.17	4,983	0.247	1,232
2005	645	6.81	8.17	5,268	0.215	1,132
2006	645	6.81	8.17	5,268	0.187	985
2007	645	6.81	8.17	5,268	0.163	856
2008	645	6.81	8.17	5,268	0.141	744
2009	645	6.81	8.17	5,268	0.123	647
2010	645	6.81	8.17	5,268	0.107	563
2011	645	6.81	8.17	5,268	0.093	490
2012	645	6.81	8.17	5,268	0.081	426
2013	645	6.81	8.17	5,268	0.070	370
2014	645	6.81	8.17	5,268	0.061	322
2015	645	6.81	8.17	5,268	0.053	280
2016	645	6.81	8.17	5,268	0.046	243
2017	645	6.81	8.17	5,268	0.040	212
2018	645	6.81	8.17	5,268	0.035	184
2019	645	6.81	8.17	5,268	0.030	160
2020	645	6.81	8.17	5,268	0.026	139
2021	645	6.81	8.17	5,268	0.023	121
2022	645	6.81	8.17	5,268	0.020	105
2023	645	6.81	8.17	5,268	0.017	91
TOTAL INCREASE IN CONSUMER SATISFACTION				131,387		20,176

1/ The 1996 volume of cu m. is deducted from the water demand projections annually throughout the study period for the incremental volume.

2/ Price per cu.m. was based on the de-escalated average rate per cu.m. of water.

3/ Economic value per cu m. was assumed to be 1.2 times the price per cu.m. of water.

2005	186.29	18.63	19.25	19.72
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These recommended water rates are subject to the following criteria:

- a) Minimum charge (First 10 m³) must not exceed 5% of the average family income of the low income group.
- b) Any increase must be limited to 60% of the prevailing rates.

As can be seen in Table 11.6-10, the recommended rates for the first 10 m³ do not exceed 5% of the average income of the low income group. Also, all rate increases are within the maximum limit of 60%.

(9) Concluding Remarks of Financial Analysis

The proposed development program for Tanza Water District is financially viable. However, it must be emphasized that the following conditions should be fulfilled.

- a) Water rates as discussed above should be adopted and attained.
- b) The project should be implemented in 1996 and completed by the end of 1997.
- c) The targeted number of service connections should be attained because the FIRR is the most sensitive in the revenue reduction.

11.6.4 Economic Analysis

(1) Project Benefits

Consumer Satisfaction

Under the assumptions described in Section 11.1.4, the present economic value of water at 15% discount rate is 20.2 million pesos as shown in Table 11.6-15.

Health Benefits

Morbidity rate of water-born disease in Tanza is 342 out of 100,000 according to the Municipal Socio-economic Profile. When 120 pesos per day and 8 days per patient were lost by illness, the present economic value of health benefits at 15% discount rate is 0.07 million pesos as shown in Table 11.6-16.

TABLE 11.6-16 HEALTH BENEFITS - Tanza Water District

Unit: 1000 Pesos

YEAR	SERVED POPULATION	COST OF TIME DUE TO ILLNESS	ECONOMIC LOSS DUE TO PREMA- TURE DEATH	COST OF MEDICAL EXPENSES	TOTAL ECONOMIC LOSSES	20% REDUCTION DUE TO PROJECT (Benefit)	PRESENT VALUE DISCOUNT RATE AT 15%	VALUE
							FACTOR	
1994	1,315	0	0	0	0	0	0.000	0
1995	4,199	0	0	0	0	0	0.000	0
1996	7,084	0	0	0	0	0	0.756	0
1997	9,965	0	0	0	0	0	0.658	0
1998	13,958	30	0	48	78	16	0.572	9
1999	15,077	30	0	48	78	16	0.497	8
2000	16,203	30	0	48	78	16	0.432	7
2001	17,329	30	0	48	78	16	0.376	6
2002	18,025	30	0	48	78	16	0.327	5
2003	18,720	30	0	48	78	16	0.284	4
2004	19,411	30	0	48	78	16	0.247	4
2005	20,106	30	0	48	78	16	0.215	3
2006	20,106	30	0	48	78	16	0.187	3
2007	20,106	30	0	48	78	16	0.163	3
2008	20,106	30	0	48	78	16	0.141	2
2009	20,106	30	0	48	78	16	0.123	2
2010	20,106	30	0	48	78	16	0.107	2
2011	20,106	30	0	48	78	16	0.093	1
2012	20,106	30	0	48	78	16	0.081	1
2013	20,106	30	0	48	78	16	0.070	1
2014	20,106	30	0	48	78	16	0.061	1
2015	20,106	30	0	48	78	16	0.053	1
2016	20,106	30	0	48	78	16	0.046	1
2017	20,106	30	0	48	78	16	0.040	1
2018	20,106	30	0	48	78	16	0.035	1
2019	20,106	30	0	48	78	16	0.030	0
2020	20,106	30	0	48	78	16	0.026	0
2021	20,106	30	0	48	78	16	0.023	0
2022	20,106	30	0	48	78	16	0.020	0
2023	20,106	30	0	48	78	16	0.017	0
TOTAL HEALTH BENEFIT								66

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- 1/ "Cost of Time due to Illness" was computed based on the following formula:
 $65\% \times \text{Morbidity Rate} \times \text{SERVED POP.} \times 8 \text{ days} \times \text{P}120.00$
- 2/ Economic Loss due to Premature Death" was computed based on the following formula:
 $65\% \times \text{Mortality Rate} \times \text{SERVED POP.} \times \text{P}150,000$
- 3/ Cost of Medical Expenses" was computed based on the following formula:
 $65\% \times \text{Morbidity Rate} \times \text{SERVED POP.} \times \text{P}1,000$
- 4/ Morbidity Rate (per 100,000): 342 Ave. Medical Expense : P 1,000.00
Mortality Rate (per 100,000): Nil Weighted Ave. Wage Rate: P 120.00
% of Economic Active Population : 65%

Fire Protection

Under the assumption described in Section 11.1.4, the present economic value of fire protection at 15% discount rate is 8.8 million pesos as shown in **Table 11.6-17**.

(2) Project Costs

The detail of the conversion of financial project cost to economic cost is shown in **Table 11.6-18**. Further, incremental economic operation and maintenance cost is shown in **Table 11.6-19**. The summary of economic costs including the total replacement cost of 2.2 million pesos are shown in **Table 11.6-20**.

(3) Economic Benefits and Costs Analysis

The summary of quantifiable economic benefits and economic costs for the project is shown below expressed as net present values of a 15% discount rate. Benefit cost ratio (BCR) obtained is 1.58. Salvage value is shown in **Table 11.6-22**.

Increase in Consumer Satisfaction	20.18	million pesos
Health Benefits	0.07	million pesos
Reduction in Fire Damage	8.84	million pesos
Total Benefits (Salvage value is not included.)	29.09	million pesos
Total Project Costs	18.49	million pesos
Benefit Cost ratio (BCR):		1.58

(4) Economic Internal Rate of Return

The results of EIRR are summarized below. EIRR for base case is estimated at 34.4%. Details are shown in **Table 11.6-21**. A sensitivity analysis is conducted to determine the effect of variances in the assumptions to the EIRR. The derived EIRR under selected variances to the base case are as follows:

<u>Scenario</u>	<u>EIRR</u>
Base Case	34.4%
1. 20% increase in Investment Cost	29.0%
2. 20% increase in O & M Cost	31.0%
3. 20% decrease in Revenue	24.3%

For all the scenarios, the EIRR exceed the opportunity cost of capital of 15%.

TABLE 11.6-17 REDUCTION IN FIRE DAMAGE - Tanza Water District

Unit: 1000 Pesos

YEAR	POPULATION IN THE SER. AREA	NO. OF STRUC- TURES	TOTAL VALUE	OVERALL REDUCTION IN FIRE DAMAGE	PER- CENTAGE PROTEC- TION	NET REDUCTION IN FIRE DAMAGE (Benefit)	PRESENT VALUE	
							DISCOUNT RATE AT 15%	VALUE
							FACTOR	
1994	5,294	1,018	203,615	1,527	0.00%	0	0.000	0
1995	8,470	1,629	325,785	2,443	0.00%	0	0.000	0
1996	13,553	2,606	521,255	3,909	0.00%	0	0.756	0
1997	21,684	4,170	834,009	6,255	0.00%	0	0.658	0
1998	31,344	6,028	1,205,538	9,042	22.90%	2,071	0.572	1,184
1999	31,344	6,028	1,205,538	9,042	22.90%	2,071	0.497	1,029
2000	31,344	6,028	1,205,538	9,042	22.90%	2,071	0.432	895
2001	31,344	6,028	1,205,538	9,042	22.90%	2,071	0.376	778
2002	31,344	6,028	1,205,538	9,042	22.90%	2,071	0.327	677
2003	31,344	6,028	1,205,538	9,042	22.90%	2,071	0.284	589
2004	31,344	6,028	1,205,538	9,042	22.90%	2,071	0.247	512
2005	31,344	6,028	1,205,538	9,042	22.90%	2,071	0.215	445
2006	31,344	6,028	1,205,538	9,042	22.90%	2,071	0.187	387
2007	31,344	6,028	1,205,538	9,042	22.90%	2,071	0.163	337
2008	31,344	6,028	1,205,538	9,042	22.90%	2,071	0.141	293
2009	31,344	6,028	1,205,538	9,042	22.90%	2,071	0.123	254
2010	31,344	6,028	1,205,538	9,042	22.90%	2,071	0.107	221
2011	31,344	6,028	1,205,538	9,042	22.90%	2,071	0.093	192
2012	31,344	6,028	1,205,538	9,042	22.90%	2,071	0.081	167
2013	31,344	6,028	1,205,538	9,042	22.90%	2,071	0.070	145
2014	31,344	6,028	1,205,538	9,042	22.90%	2,071	0.061	127
2015	31,344	6,028	1,205,538	9,042	22.90%	2,071	0.053	110
2016	31,344	6,028	1,205,538	9,042	22.90%	2,071	0.046	96
2017	31,344	6,028	1,205,538	9,042	22.90%	2,071	0.040	83
2018	31,344	6,028	1,205,538	9,042	22.90%	2,071	0.035	72
2019	31,344	6,028	1,205,538	9,042	22.90%	2,071	0.030	63
2020	31,344	6,028	1,205,538	9,042	22.90%	2,071	0.026	55
2021	31,344	6,028	1,205,538	9,042	22.90%	2,071	0.023	48
2022	31,344	6,028	1,205,538	9,042	22.90%	2,071	0.020	41
2023	31,344	6,028	1,205,538	9,042	22.90%	2,071	0.017	36
TOTAL REDUCTION IN FIRE DAMAGE							53,833	8,836

1/ Population in the service area was derived from the Population and Demand projections.

2/ The number of structures was estimated by dividing the service area population by the average number of persons per dwelling unit of 5.2.

3/ The total value is estimated by multiplying the number of structures with the average replacement value of dwelling units in Tanza of 200,000 pesos.

4/ Percentage fire protection was based on the area to be served by fire hydrants.

TABLE 11.6-18 CONVERSION OF FINANCIAL PROJECT COST TO ECONOMIC COST - Tarza Water District

Unit: 1000 Pesos

	FINANCIAL PROJECT COST	FOREIGN EXCHANGE COMPONENT	DOMESTIC COMPONENT	UNSKILLED LABOR	BALANCE	TAXES (5%)	OTHERS (95%)	SHADOW PRICING			TOTAL ECONOMIC COST
								FOREX		UNSKILLED LABOR	
								COMPONENT	X 1.2		
CIVIL WORKS											
PUMP STATION	552	95	457	79	379	19	360	114	47	360	520
DISTRIBUTION FACILITIES	1,416	443	974	118	856	43	813	531	71	813	1,415
TREATMENT FACILITIES	21	2	19	1	18	1	17	2	1	17	20
SERVICE CONNECTIONS	254	21	233	81	152	8	144	25	49	144	218
VALVES/HYDRANTS	33	2	31	11	20	31	19	2	7	19	28
STORAGE FACILITIES	556	45	511	178	334	17	317	53	107	317	477
TOTAL CIVIL WORKS	2,832	606	2,226	468	1,757	88	1,670	727	281	1,670	2,678
EQUIPMENTS											
PUMP STATION	1,025	899	126	0	126	6	120	1,079	0	120	1,199
DISTRIBUTION FACILITIES	1,534	679	856	0	856	43	813	814	0	813	1,627
TREATMENT FACILITIES	27	18	9	0	9	0	8	22	0	8	30
SERVICE CONNECTIONS	761	740	20	0	20	1	19	888	0	19	908
VALVES/HYDRANTS	67	56	10	0	10	1	10	68	0	10	78
STORAGE FACILITIES	1,667	1,623	45	0	45	2	42	1,947	0	42	1,990
TOTAL EQUIPMENTS	5,081	4,015	1,066	0	1,066	53	1,012	4,818	0	1,012	5,830
BASIC CONSTRUCTION COST											
BASIC CONSTRUCTION COST	7,912	4,621	3,291	468	2,823	141	2,682	5,545	281	2,682	8,508
CONTINGENCY	1,187	693	494	70	423	21	402	832	42	402	1,276
ENGINEERING STUDIES	819	478	341	48	292	15	278	574	29	278	881
CONSTRUCTION SUPERVISION	364	213	151	22	130	6	123	255	13	123	391
LAND ACQUISITION	345	235	110	0	110	6	105	282	0	105	386
TOTAL PROJECT COST	10,627	6,240	4,387	608	3,779	189	3,590	7,488	365	3,590	11,443

TABLE 11.6-19 INCREMENTAL ECONOMIC OPERATION AND MAINTENANCE COST - Tanga Water District

Unit: 1000 Pesos

YEAR	O & M COST (Unescalated)	FOREIGN EXCHANGE COMPONENT	DOMESTIC COMPONENT	TAXES (.5%)	SHADOW PRICING			TOTAL ECONOMIC O & M COST	NET ECONOMIC O & M COST
					OTHERS (.95%)	FOREX COMPONENT (X.1.2)	OTHERS (X.1.0)		
1994	289	62	227	11	216	74	216	290	0
1995	945	202	743	37	706	243	706	948	0
1996	1616	346	1270	64	1207	415	1207	1622	0
1997	2225	476	1749	87	1661	571	1661	2233	611
1998	3025	647	2378	119	2259	777	2259	3036	1414
1999	3300	706	2594	130	2464	847	2464	3312	1690
2000	3575	765	2810	140	2669	918	2669	3588	1966
2001	3854	825	3029	151	2878	990	2878	3867	2246
2002	4046	866	3180	159	3021	1039	3021	4060	2439
2003	4184	895	3289	164	3124	1074	3124	4199	2577
2004	4322	925	3397	170	3227	1110	3227	4337	2715
2005	4518	967	3551	178	3374	1160	3374	4534	2912
2006	4518	967	3551	178	3374	1160	3374	4534	2912
2007	4518	967	3551	178	3374	1160	3374	4534	2912
2008	4518	967	3551	178	3374	1160	3374	4534	2912
2009	4518	967	3551	178	3374	1160	3374	4534	2912
2010	4518	967	3551	178	3374	1160	3374	4534	2912
2011	4518	967	3551	178	3374	1160	3374	4534	2912
2012	4518	967	3551	178	3374	1160	3374	4534	2912
2013	4518	967	3551	178	3374	1160	3374	4534	2912
2014	4518	967	3551	178	3374	1160	3374	4534	2912
2015	4518	967	3551	178	3374	1160	3374	4534	2912
2016	4518	967	3551	178	3374	1160	3374	4534	2912
2017	4518	967	3551	178	3374	1160	3374	4534	2912
2018	4518	967	3551	178	3374	1160	3374	4534	2912
2019	4518	967	3551	178	3374	1160	3374	4534	2912
2020	4518	967	3551	178	3374	1160	3374	4534	2912
2021	4518	967	3551	178	3374	1160	3374	4534	2912
2022	4518	967	3551	178	3374	1160	3374	4534	2912
2023	4518	967	3551	178	3374	1160	3374	4534	2912
TOTAL ECONOMIC OPERATION AND MAINTENANCE COST									70989

TABLE 11.6-20 SUMMARY OF ECONOMIC COSTS - Tanza Water District

YEAR	ECONOMIC PROJECT COST	REPLACE- MENT COST /	NET O & M COST	TOTAL ECONOMIC COST	Unit: 1000 Pesos	
					PRESENT VALUE AT 15%	VALUE
1994			0	0	0.000	0
1995			0	0	0.000	0
1996	3,811		0	3,811	0.756	2,882
1997	7,632		0	8,243	0.658	5,420
1998			611	1,414	0.572	808
1999			1,690	1,690	0.497	840
2000			1,966	1,966	0.432	850
2001			2,246	2,246	0.376	844
2002			2,439	2,439	0.327	797
2003			2,577	2,577	0.284	733
2004			2,715	2,715	0.247	671
2005			2,912	2,912	0.215	626
2006			2,912	2,912	0.187	544
2007			2,912	2,912	0.163	473
2008			2,912	2,912	0.141	412
2009			2,912	2,912	0.123	358
2010			2,912	2,912	0.107	311
2011			2,912	2,912	0.093	271
2012		2,214	2,912	5,126	0.081	414
2013			2,912	2,912	0.070	205
2014			2,912	2,912	0.061	178
2015			2,912	2,912	0.053	155
2016			2,912	2,912	0.046	135
2017			2,912	2,912	0.040	117
2018			2,912	2,912	0.035	102
2019			2,912	2,912	0.030	88
2020			2,912	2,912	0.026	77
2021			2,912	2,912	0.023	67
2022			2,912	2,912	0.020	58
2023			2,912	2,912	0.017	51
TOTAL	11,443	2,214	70,989	84,645		18,486

1/ (a) Pump station: 1,198 (2012); (b) Treatment facilities: 30 (2012); (c) Service facilities: 908 (2012); (d) Valves/hydrants: 78 (2012)

TABLE 11.6-21 ECONOMIC INTERNAL RATE OF RETURN - Tanza Water District

YEAR	TOTAL ECONOMIC BENEFITS	TOTAL ECONOMIC COSTS	NET BENEFIT	Unit: 1000 Pesos	
				PRESENT VALUE AT 15%	VALUE
1994	0	0	0	0.000	0
1995	0	0	0	0.000	0
1996	0	3,811	-3,811	0.756	-2,882
1997	1,323	8,243	-6,920	0.658	-4,550
1998	5,181	1,414	3,767	0.572	2,154
1999	5,627	1,690	3,937	0.497	1,957
2000	6,354	1,966	4,388	0.432	1,897
2001	6,626	2,246	4,381	0.376	1,647
2002	6,940	2,439	4,502	0.327	1,472
2003	7,069	2,577	4,492	0.284	1,196
2004	7,354	2,715	4,639	0.247	1,076
2005	7,354	2,912	4,442	0.215	955
2006	7,354	2,912	4,442	0.187	830
2007	7,354	2,912	4,442	0.163	722
2008	7,354	2,912	4,442	0.141	628
2009	7,354	2,912	4,442	0.123	546
2010	7,354	2,912	4,442	0.107	475
2011	7,354	2,912	4,442	0.093	413
2012	7,354	5,126	2,228	0.081	180
2013	7,354	2,912	4,442	0.070	312
2014	7,354	2,912	4,442	0.061	271
2015	7,354	2,912	4,442	0.053	236
2016	7,354	2,912	4,442	0.046	205
2017	7,354	2,912	4,442	0.040	178
2018	7,354	2,912	4,442	0.035	155
2019	7,354	2,912	4,442	0.030	135
2020	7,354	2,912	4,442	0.026	117
2021	7,354	2,912	4,442	0.023	102
2022	7,354	2,912	4,442	0.020	89
2023	11,319	2,912	8,407	0.017	146
TOTAL	189,589	84,645	104,944		10,662

ECONOMIC INTERNAL RATE OF RETURN = 34.35%

EIRR OF OTHER CASES (SENSITIVITY ANALYSIS)

Investment Cost: 20% increase = 28.97%
O & M Cost: 20% increase = 31.04%
Revenue: 20% decrease = 24.32%

BENEFIT COST RATIO at 15% discount rate = 1.58

TABLE 11.6-22 SALVAGE VALUE IN YEAR 2023 - Tanza Water District

Unit: 1000 Pesos

YEAR	50 - YEAR ITEMS			30 - YEAR ITEMS			15 - YEAR ITEMS			TOTAL
	ECONOMIC VALUE	REMAINING LIFE IN 2023	SALVAGE VALUE	ECONOMIC VALUE	REMAINING LIFE IN 2023	SALVAGE VALUE	ECONOMIC VALUE	REMAINING LIFE IN 2023	SALVAGE VALUE	
1994										
1995										
1996										
1997	5.774	48.00%	2.771	520	13.33%	69				2.841
1998		50.00%			16.67%					0
1999		52.00%			20.00%					0
2000		54.00%			23.33%					0
2001		56.00%			26.67%					0
2002		58.00%			30.00%					0
2003		60.00%			33.33%					0
2004		62.00%			36.67%					0
2005		64.00%			40.00%					0
2006		66.00%			43.33%					0
2007		68.00%			46.67%					0
2008		70.00%			50.00%					0
2009		72.00%			53.33%					0
2010		74.00%			56.67%					0
2011		76.00%			60.00%					0
2012		78.00%			63.33%					0
2013		80.00%			66.67%		2.214	33.33%	738	738
2014		82.00%			70.00%			40.00%		0
2015		84.00%			73.33%			46.67%		0
2016		86.00%			76.67%			53.33%		0
2017		88.00%			80.00%			60.00%		0
2018		90.00%			83.33%			66.67%		0
2019		92.00%			86.67%			73.33%		0
2020		94.00%			90.00%			80.00%		0
2021		96.00%			93.33%			86.67%		0
2022		98.00%			96.67%			93.33%		0
2023		100.00%			100.00%			100.00%		0
SALVAGE VALUE			2.771			69			738	3.579
ADD: LAND										386
TOTAL SALVAGE VALUE										3.965

(5) **Concluding Remarks of Economic Analysis**

From the results of the preceding analysis, the proposed project for Tanza Water District is considered economically feasible.

CHAPTER 12

ENVIRONMENTAL IMPACT ASSESSMENT OF THE WATER SUPPLY PROJECTS

CHAPTER 12

ENVIRONMENTAL IMPACT ASSESSMENT OF THE WATER SUPPLY PROJECTS

Although the advantage or positive impacts of the water supply projects are great, some adverse impacts have to be taken into consideration.

G.M.A. project would contribute to the general increase of groundwater level drawdown in the area. Therefore, groundwater monitoring and management is suggested in this Study.

Mendez project concerns not only with the groundwater condition around the proposed wells, but also with the groundwater and/or spring conditions downstream of the project site. Therefore, the spring discharges should also be monitored together with the groundwater level.

Tanza and Naic projects face the same problem of saline water intrusion. Therefore, the monitoring of water quality and groundwater level should be conducted to provide basic data for pumpage control.

Tagaytay project has no direct impacts on groundwater. However, deforestation accompanying with development as an tourism zone should be restricted and wastewater treatment facilities should be improved to prevent reduction and deterioration of groundwater in lower elevation areas.

12.1 ENVIRONMENTAL IMPACT ASSESSMENT FOR G.M.A.

G.M.A. is located in the eastern part of the Study Area, at the boundary of groundwater flowing and storage areas. Generally, groundwater development potential in such a hydrogeological condition like in G.M.A. can be considered as relatively good. However, in spite of its relatively small area, G.M.A. has the highest level of urbanization and industrialization in the Study Area. The population density of G.M.A. is as high as 70.34 persons/ha, which is about 12.5 times the average in the Study Area. G.M.A. has also the highest industrial water consumption intensity (1598 m³/y/ha), which corresponds to 26.7 times the average in the Study Area.

Therefore, out of the 5 F/S areas, G.M.A. has the highest water utility intensity and consequently shows the largest groundwater level drawdown rate (1.57 – 2.55 m/year) during the past 10 years. This means that groundwater extraction in G.M.A. has, at least partially, exceeded the groundwater development potential.

It is projected that the water demands of G.M.A. WD for the years 2000 and 2005 will be about 2.43 times and 2.96 times that of 1994. On the other hand, the water supply facility survey revealed that the future water demand will exceed the capacity of the present facilities. Therefore, new water resources have to be developed and new facilities have to be designed and constructed to meet the needs of water supply for the well-being of the population. Furthermore, the results of groundwater simulation in Chapter 5 indicated that with the projected water demand, the groundwater level would decline by one (1) to two (2) meters per year in the G.M.A. area.

As discussed in Chapter 10, no water resources other than groundwater can be used practically and economically for domestic water supply in G.M.A. at present and in the near future. The G.M.A. project of groundwater development is critical from the viewpoint of groundwater conservation, but indispensable from the viewpoint of human livelihood and health, which is the most essential factor in environmental assessment.

General items regarding the impact of groundwater development project on the environment have been discussed in Chapter 9. Thus, only items that needs particular emphasis will be discussed here.

Since G.M.A. has nearly reached and/or partially exceeded its limit for groundwater development at present, there is a serious concern that any future tapping of groundwater will cause more serious groundwater level drawdown and even groundwater depletion.

For the purpose of groundwater conservation, the following monitoring/management (M/M) plan should be formulated:

(1) Establishment of Groundwater Monitoring System

Abandoned and operational wells can be used to establish a groundwater monitoring network. Proper spatial distribution should be taken into account.

(2) Ground Water Level Observation

Ground water levels should be observed monthly as part of the operation and maintenance program of the water district. All the observation records should be made available to LWUA for arrangement and encoding to the database.

Groundwater quality should also be monitored periodically.

(3) Analysis and Evaluation

Observations encoded in the database shall be input to the groundwater flow model installed at LWUA for evaluation of the existing and future groundwater conditions.

(4) Groundwater Management Options

Results of the evaluation shall be the basis for making groundwater management policies or decisions for the water district.

In addition to the proposed Groundwater Management Committee in Chapter 9, a Technical Subcommittee should be formed, which could be composed of LWUA personnel, to do the evaluation on the existing and future groundwater conditions using the groundwater flow model. Like the MWSS for its service area, the water district then should be deputized by NWRB to investigate water rights application for groundwater exploitation in their district. In consultation

with the Technical Subcommittee, the water district sets the volume of water (and also the screen positions) that can be exploited based on the results of the evaluation.

Serious campaign to save water should be done. People should be made to understand that they have no choice but save water since no alternative source of water is available. Facts regarding groundwater usage such as records of groundwater pumpage and water levels must be disclosed to the people to enhance users awareness to save water. When the time comes that LWUA is confident on the reliability and accuracy of the groundwater model, the results and recommendations of the simulation must be publicized so that the people and the government could respond to the problem quickly.

Future land use plan of the province in general and each municipality in particular should be reviewed and revised if needed from the viewpoint of groundwater potential.

For the purpose of avoiding groundwater pollution, a safe distance should be maintained from the wells to prevent admission. Especially in G.M.A., many industrial effluent and a lot of domestic wastewater constitute a very high pollution threat to groundwater.

From ocular survey, it seems hard to meet the demand for a safe distance, as in the case of JICA test well and most G.M.A. WD wells. Therefore, measures should be taken, such as providing cement grout deep enough to avoid the infiltration of pollutants into the wells.

12.2 ENVIRONMENTAL IMPACT ASSESSMENT FOR MENDEZ

Mendez is located upland in the recharge area of the groundwater basin of the Study Area. Existing groundwater levels range from 50 m to 100 m below ground surface. The recharge area of Mendez itself is small. The groundwater development potential in Mendez is low, as shown in the Groundwater Evaluation Map. On the other hand, Mendez has the highest level of urbanization with the highest population density among the upland municipalities.

The water demands of Mendez WD for the years 2000 and 2005 are estimated to be 1.7 times and 3.3 times that of 1994. On the other hand, the water facility survey reported that the future water demand will exceed the capacity of the present facilities. On this account, new water resources have to be developed and new facilities have to be designed and constructed to meet the water needs for the well-being of the people.

Since most headwaters of springs lie in Mendez, no surface water potential can be taken into consideration. The only possible water resources at present although limited is groundwater. Thus, the Mendez project of groundwater development is indispensable from the viewpoint of people's livelihood and health.

Three (3) alternatives are discussed in Chapter 10, and alternative 1 is recommended for its cheaper cost. This alternative seems to be the best one from the viewpoint of environment conservation,

because the wells and other construction items proposed in this alternative are the fewest and, consequently, its impact will be relatively small.

The most serious impact of the Mendez project seems to be that groundwater development will cause decrease in groundwater level and perhaps in the discharge of springs located downstream of the wells.

For the purpose of groundwater conservation, the M/M plan for Mendez project should have the same content as that for G.M.A. project. Besides the Mendez WD wells, springs around the project site, especially those springs located downstream of the wells, should also be monitored.

12.3 ENVIRONMENTAL IMPACT ASSESSMENT FOR NAIC

Naic is located in the northern lowland of the Study Area, facing the Manila Bay. As part of the groundwater storage area, a relatively high groundwater development potential can be expected in Naic.

Naic is largely an agricultural area with 60 percent of its population residing in the rural area. Therefore, the water consumption intensity for domestic and industrial purpose is relatively low.

The water demands of Naic WD for the years 2000 and 2005 are projected to be about 3.5 times and 11.2 times that of 1994. On the other hand, the water supply facility survey revealed that the future water demand will exceed the capacity of the present facilities. Therefore, new water resources have to be developed, and new facilities have to be designed and constructed to meet the water needs for the well-being of the people.

Though Naic lies in the lowland area where several rivers are flowing, the surface water can hardly be used for drinking purposes, because it requires a complex and high cost water treatment system. Therefore, the proposed groundwater development project is indispensable from the viewpoint of human livelihood and health.

Naic WD uses spring water as its present water source and has no groundwater development facilities such as pumping station, storage tank and disinfection facilities, except several kilometers of transmission/distribution lines. According to the survey, another spring can not be used to increase the supply amount. Therefore, groundwater development is indispensable, and supplementary facilities such as disinfection facilities are needed.

Of the four (4) alternatives presented in Chapter 10, alternative 4 is recommended for its lower cost. This can be recommended also from the viewpoint of environment conservation. More facilities like wells and tanks are proposed in alternative 4 and this is unfavorable for groundwater quality protection. However, the most serious factor in this project is the threat of saline water intrusion.

Well No.1, which is included in all the four (4) alternatives, has the largest designed discharge and is the nearest to the coastline among the proposed wells. Therefore, a large drawdown in

groundwater level can be expected, and consequently, saline water intrusion may occur. In fact, the appearance of saline water intrusion has been released by EC observation in EIA survey.

Furthermore, the results of groundwater simulation in Chapter 5 indicated that with the projected water demand, the groundwater level would decline by 5 to 10 meters in 10 years (1995–2005) in Naic area.

However, if alternative 4 were adopted, two (2) other wells will be located at a safe distance from Well No.1. Therefore, it is possible to decrease the pumping discharge of each well, which will consequently contribute to minimize groundwater level lowering. This should be given an important consideration in the coastal area in order to prevent saline water intrusion.

For the purpose of groundwater conservation, a M/M plan similar to that of G.M.A. is necessary. Besides groundwater level, groundwater quality should be given enough attention in the monitoring, specifically, Na, K, Cl, Ca, TDS and EC.

12.4 ENVIRONMENTAL IMPACT ASSESSMENT FOR TAGAYTAY

Tagaytay City is located in the highest portion of the Study Area and is considered as a recharge area for groundwater. Since the city is famous for its mild climate and beautiful landscape, Tagaytay is planned as a tourist center.

The water demands of Tagaytay WD for the years 2000 and 2005 are forecasted to be about 1.74 times and 2.3 times that of 1994. On the other hand, the water supply facility survey revealed that the future water demand will exceed the capacity of the present facilities. Therefore, additional water resources have to be developed, and new facilities have to be designed and constructed to meet the domestic water demands.

Because of its high elevation, existing groundwater level is more than 100 m below the ground surface, and since recharge is scarce, any production well will inevitably cause a rapid and serious drawdown of groundwater water level. Accordingly, almost no groundwater can be developed practically.

The present water sources of the city water supply are three (3) springs with discharge enough to meet the water demand in the year 2005. Thus, increasing spring water utility may be the most reasonable option to adopt for the present and in near future.

Since it differs from the other projects, which are all designed for groundwater development, the Tagaytay project has no direct impact on groundwater.

The two (2) alternatives presented in chapter 10, however, show no obvious difference from the viewpoint of environment conservation.

Because the landscape is a more sensitive factor in Tagaytay City than in any other areas of the Study Area and the project involves the construction of pumping stations and about 4 kms of pipeline, these facilities must be in harmony with the landscape.

Moreover, deforestation accompanying with development as an tourism Zone should be restricted and wastewater treatment facilities should be improved to prevent reduction and deterioration of groundwater in lower elevation areas.

12.5 ENVIRONMENTAL IMPACT ASSESSMENT FOR TANZA

Tanza is also a lowland municipality located in the vicinity of Naic and exhibits the same geological and topographical characteristics of Naic.

The water demands of Tanza WD for the years 2000 and 2005 are projected to be about 12.9 times and 24.4 times that of 1994. On the other hand, the water supply facility survey showed that the future water demand will exceed the capacity of the present facilities. Therefore, new water resources have to be developed, and new facilities have to be designed and constructed to meet the domestic water demands.

Like Naic, Tanza can not use its surface water resources for domestic purposes.

Three (3) alternatives are presented in chapter 10, and alternative 1 seems to be the most environmentally suitable one, requiring relatively fewer facilities (wells and storage). Besides, all these facilities are relatively far from the coast; consequently, there will be less concern with regards to saline water intrusion. However, it is the most expensive (about 1.7 times more than alternative 2 and 1.3 times more than alternative 3). Perhaps, alternative 2 is a more reasonable option at the moment.

The results of groundwater simulation in Chapter 5 indicated that with the projected water demand, the groundwater level would decline by 10 to 40 meters in 10 years (1995–2005) in Tanza area towards Noveleta, and a groundwater level depression of 50 meters below MSL near the coast will occur in the middle and lower aquifers at its boundary with Noveleta. This depression will cause saline water intrusion especially in the area between the coastline and the center of depression. For the rest of the Tanza area, no danger of saline water intrusion is expected unless the depression moves inland.

The M/M plan for Tanza should be formulated similar to that of Naic.

CHAPTER 13

CONCLUSIONS AND RECOMMENDATIONS

CHAPTER 13

CONCLUSIONS AND RECOMMENDATIONS

As shown in Fig. 13.1, the Study Area is divided into four (4) sub-areas from the view point of groundwater potential and future water demand (year 2005).

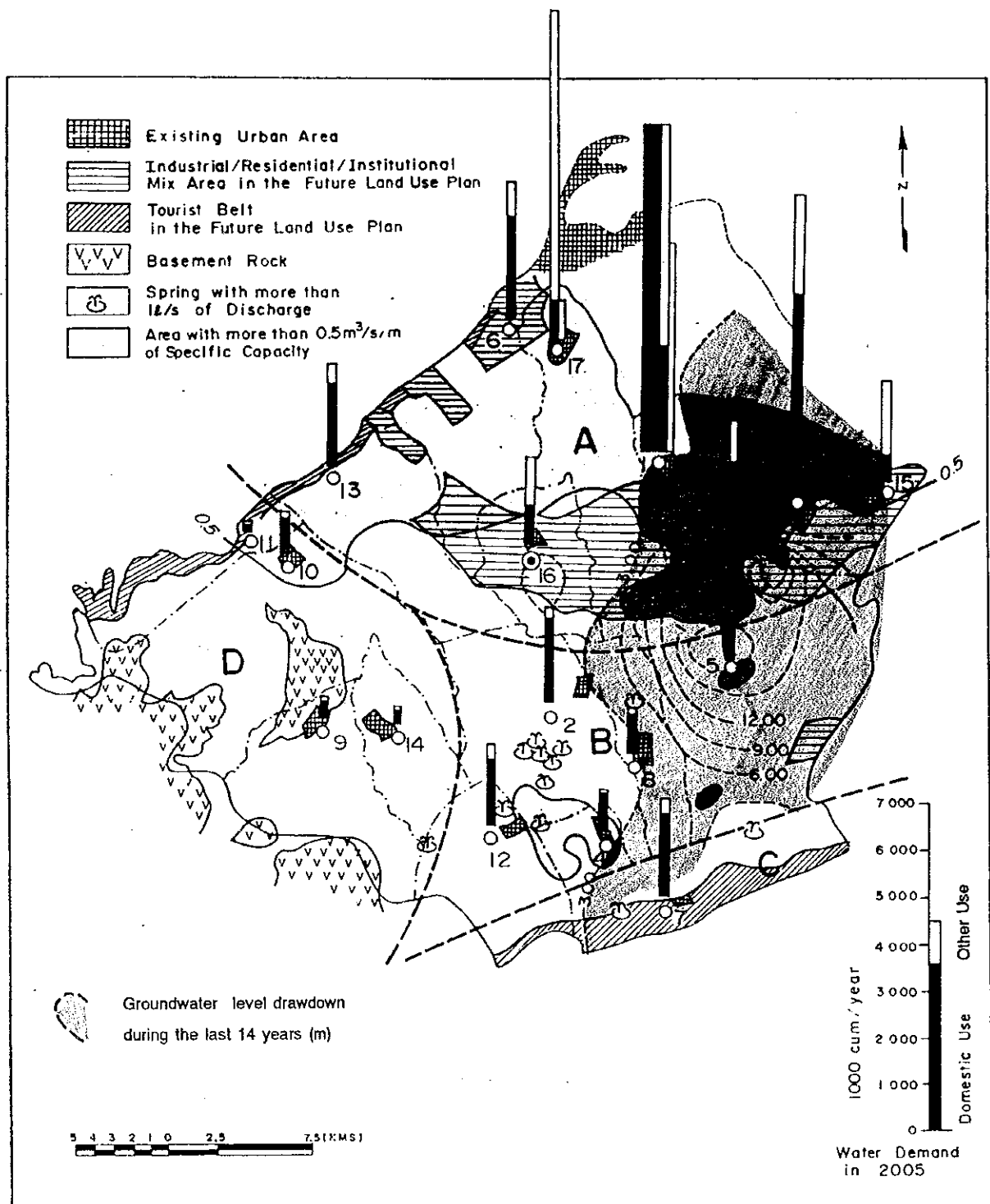
Sub-area A which comprises Dasmarinas, G.M.A., Tanza, Naic, Carmona as well as parts of Silang and Trece Martirez covers the low elevation area. Though groundwater potential is comparatively high, the projected water demand is also large since the area is rapidly developing as an Industrial/Residential/Institutional Mix Zone. As mentioned earlier, groundwater level drawdown and saline water intrusion are in progress in Sub-area A. According to the results of groundwater simulation, these phenomena shall be accelerated drastically, considering the projected water demand. Consequently, permissive yield (or permissive critical water level) should be decided for Sub-area A, and monitoring of groundwater level and water quality is vital and should be conducted. It is also necessary to re-examine the existing development plans and to establish measures to control the use of groundwater by industries and secure its use for domestic.

Sub-area B which comprises Mendez, Tagaytay, Amadeo, Alfonso as well as the southern part of Silang covers the middle to high elevation area. Though groundwater potential is low in Sub-area B, the projected water demand is not as large as that of Sub-area A since its designated land use is agri-business and tree crops zone. It is desirable therefore to maintain its present land use and use groundwater sustainably since Sub-area B is part of the recharge area of the groundwater basin and it has many springs which are at present valuable domestic water sources.

Sub-area C which comprises Tagaytay and the southern part of Alfonso covers the highest elevation area. Groundwater development is difficult in this area not only because groundwater potential is low, but also groundwater level is deep. Springs on Tagaytay cliff, however, have been utilized as domestic water sources because of its large discharge. Still they have plenty of discharge to be developed to meet future water demand if the consumers are willing to pay a high water rate equivalent to the operation and maintenance cost. When this area is developed as a tourist zone, it is necessary to preserve forest and improve wastewater treatment facilities, because Sub-area C is part of the recharge area of the groundwater basin.

Sub-area D which comprises Magallanes, Maragondon, Ternate and Gen. Aguinaldo covers the western end of the Study Area. The groundwater potential of this area is low since the basement rocks crop out widely. But the future water demand is also low because the development of this area as predicted will be left behind mainly due to insufficient road network. Thus, the groundwater development in Sub-area D has no special problem with regards to the conditions of the projected water demand.

As mentioned above, pumping control is necessary for Sub-areas A and C monitoring pumping discharge and groundwater level. Four measures recommended in Section 9.5, which are (1) Establishment of the priority of groundwater use, (2) Establishment of groundwater management



CAVITE WATER SUPPLY DEVELOPMENT STUDY

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Fig. 13-1
GROUNDWATER POTENTIAL AND
WATER DEMAND IN 2005

committee, (3) Examination of permissive pumping discharge, (4) Re-examination of regional development plan and land use plan, should be implemented for sustainable use of groundwater, which is a valuable water resource in the Study Area.

Feasibility studies of water supply projects for the urban areas of G.M.A., Mendez, Naic, Tagaytay and Tanza were conducted on the assumptions that the measures recommended would be implemented. The essence of the projects are summarized in **Table 13-1**.

Table 13-1(a) SUMMARY OF RECOMMENDED PLAN FOR GMA-WD

Description	1994	1998	2005
A. Population			
(1) Total Population	59,348	68,771	89,025
(2) Pop. in Service Area	53,404	62,461	80,104
(3) Served Population	20,504	46,151	56,892
B. Water Demand (cu.m./d)			
(1) Domestic (Daily Ave.)	3,194	5,431	7,258
(2) Commercial (Daily Ave.)	-	159	194
(3) Institutional (Daily Ave.)	-	90	120
(4) Total Water Demand			
1) Daily Average	3,194	7,098	9,462
2) Daily Maximum	4,152	9,227	12,300
3) Peak Hour	6,388	14,276	18,924
C. Number of Connection			
(1) Domestic	3,648	8,266	10,144
(2) Commercial	70	159	194
(3) Institutional	26	30	40
(4) Total	3,744	8,415	10,368
D. Water Sources			
(1) Existing Source	8 wells	8 wells	8 wells
(capacity: cu.m/d)	5,766	5,766	5,766
(2) New Source	-	1-JICA well & 3 wells	-
(capacity: cu.m/d)	-	7,705	-
(3) Pumping Facilities		Submersible	
1) Pump	8 sets	3 sets-60 HP	-
		1 set-25 HP	
2) Pumphouse	8 units	4 units	-
3) Standby Generator	-	4-Generator sets	-
E. Pipelines/Appurtenances			
(1) Pipelines	50mm-150mm	100mm-200mm	50mm-200mm
	17,800m	6,078m	3,510m
(2) Gate Valve	37 pcs	17 pcs	11 pcs
(3) Fire Hydrant	5 units	7 units	7 units
F. Storage Facilities			
(1) Reservoir	5 units	1 unit	2 units
(capacity: cu.m/d)	1,665	292	584
(2) Rehabilitation	-	3 units	2 units
G. Disinfection Facilities	-	Hypochlorinator	-
		10 units	
H. Land Acquisition	-	1,000 sq.m	600 sq.m
I. Number of Employee	23	84	104
J. Project Cost			
(1) Total Project Cost (Phase I)	-	36.70 Million Peso	-
(2) Capitalized Interest	-	6.56 Million Peso	-
(3) Total Loan Amount	-	43.26 Million Peso	-
(regular and soft loan)	-		
K. O & M Cost (P/annum)	-	12.99 Million Peso	15.72 Million Peso

Table 13-1(b) SUMMARY OF RECOMMENDED PLAN FOR MWD

Description	1994	1998	2005
A. Population			
(1) Total Population	14,891	15,914	17,908
(2) Pop. in Service Area	7,638	11,070	15,474
(3) Served Population	4,121	5,385	13,848
B. Water Demand (cu.m./d)			
(1) Domestic (Daily Ave.)	603	692	1,783
(2) Commercial (Daily Ave.)	-	13	25
(3) Institutional (Daily Ave.)	-	33	60
(4) Total Water Demand			
1) Daily Average	603	924	2,336
2) Daily Maximum	-	1,201	3,037
3) Peak Hour	-	1,848	4,672
C. Number of Connection			
(1) Domestic	783	1,110	2,639
(2) Commercial	10	13	25
(3) Institutional	8	11	20
(4) Total	801	1,134	2,684
D. Water Sources			
(1) Existing Source	1 well	1 well	1 well
(capacity: cu.m/d)	864	864	864
(2) New Source	-	1-JICA well	-
(capacity: cu.m/d)		2,160	
(3) Pumping Facilities	Submersible	Submersible	-
1) Pump	1 set	1 set-75 HP	
2) Pumphouse	1 unit	1 unit	
3) Standby Generator	1-Generator set	1-Generator set	
E. Pipelines/Appurtenances			
(1) Pipelines	50mm-150mm 6,800m	50mm-200mm 5,378m	-
(2) Gate Valve		12 pcs	-
(3) Fire Hydrant		2 units	-
F. Storage Facilities			
(1) Reservoir	1 unit	1 unit	-
(capacity: cu.m/d)	212	577	
(2) Rehabilitation	-	-	-
G. Disinfection Facilities	Hypochlorinator 1 set	Hypochlorinator 1 set	-
H. Land Acquisition	-	400 sq.m	-
I. Number of Employee	10	11	27
J. Project Cost			
(1) Total Project Cost (Phase I)	-	19.81 Million Peso	-
(2) Capitalized Interest	-	2.84 Million Peso	-
(3) Total Loan Amount (regular and soft loan)	-	22.65 Million Peso	-
K. O & M Cost (P/annum)	-	1.76 Million Peso	4.33 Million Peso

Table 13-1(c) SUMMARY OF RECOMMENDED PLAN FOR NWD

Description	1994	1998	2005
A. Population			
(1) Total Population	25,376	28,527	35,275
(2) Pop. in Service Area	6,910	14,488	28,354
(3) Served Population	2,950	7,002	23,003
B. Water Demand (cu.m./d)			
(1) Domestic (Daily Ave.)	472	721	2,931
(2) Commercial (Daily Ave.)	-	235	488
(3) Institutional (Daily Ave.)	-	43	85
(4) Total Water Demand			
1) Daily Average	472	1,333	4,673
2) Daily Maximum	613	1,733	6,075
3) Peak Hour	944	2,666	9,346
C. Number of Connection			
(1) Domestic	558	1,092	3,807
(2) Commercial	-	181	375
(3) Institutional	-	14	28
(4) Total	558	1,287	4,211
D. Water Sources			
(1) Existing Source	1 spring	-	-
(capacity: cu.m/d)	371	-	-
(2) New Source	-	1-JICA well & 1 well	2 wells
(capacity: cu.m/d)	-	4,925	3,283
(3) Pumping Facilities		Submersible/Turbine	Turbine
1) Pump	-	1 set-50 HP	2 sets-30 HP
		1 set-30 HP	
2) Pumphouse	-	2 units	2 units
3) Stanby Generator	-	1-Diesel Engine Drive	2-Diesel Engine Drive
		1-Generator set	
E. Pipelines/Appurtenances			
(1) Pipelines	38mm-200mm	50mm-250mm	100mm-200mm
	8,530m	8,378m	5,340m
(2) Gate Valve	3 pcs	31 pcs	3 pcs
(3) Fire Hydrant	-	9 units	5 units
F. Storage Facilities			
(1) Reservoir	-	1 unit	1 units
(capacity: cu.m/d)	-	292	436
(2) Rehabilitation	-	-	-
G. Disinfection Facilities	-	Hypochlorinator	Hypochlorinator
		2 sets	2 sets
H. Land Acquisition	-	500 sq.m	1,000 sq.m
I. Number of Employee	10	13	42
J. Project Cost			
(1) Total Project Cost (Phase I)	-	22.61 Million Peso	-
(2) Capitalized Interest	-	3.71 Million Peso	-
(3) Total Loan Amount	-	26.32 Million Peso	-
(regular and soft loan)	-		
K. O & M Cost (P/annum)		1.62 Million Peso	5.54 Million Peso

Table 13-1(d) SUMMARY OF RECOMMENDED PLAN FOR TC-WD

Description	1994	1998	2005
A. Population			
(1) Total Population	24,316	28,326	37,080
(2) Pop. in Service Area	20,695	24,118	35,936
(3) Served Population	13,270	20,590	30,377
B. Water Demand (cu.m./d)			
(1) Domestic (Daily Ave.)	1,948	2,646	4,094
(2) Commercial (Daily Ave.)	-	467	556
(3) Institutional (Daily Ave.)	-	66	102
(4) Total Water Demand			
1) Daily Average	1,948	4,063	6,079
2) Daily Maximum	2,532	5,282	7,903
3) Peak Hour	3,896	8,126	12,158
C. Number of Connection			
(1) Domestic	2,371	3,285	10,144
(2) Commercial	140	467	556
(3) Institutional	41	22	34
(4) Total	2,552	3,774	4,990
D. Water Sources			
(1) Existing Source	3 Springs	3 Springs	3 Springs
(capacity: cu.m/d)	3,591	-	-
(2) New Source	-	-	-
(capacity: cu.m/d)	-	8,325	-
(3) Pumping Facilities	Three Stage Booster	Single Stage Booster	-
1) Pump	Turbine/Submersible	Turbine/Centrifugal	-
	8 sets	3 sets-375 HP	-
		1 set- 7.5 HP	-
2) Pumphouse	2 units	1 unit	-
3) Standby Generator	1-Diesel Engine Drive	1-Diesel Engine Drive	-
E. Pipelines/Appurtenances			
(1) Pipelines	38mm-250mm	50mm-300mm	-
	48,980m	29,067m	-
(2) Gate Vales	68 pcs	20 pcs	-
(3) Fire Hydrant	6 units	5 units	-
F. Storage Facilities			
(1) Reservoir	1 unit	8 units	-
(capacity: cu.m/d)	950	925	-
(2) Rehabilitation	-	1 unit	-
G. Disinfection Facilities	Gas chlorinator	-	-
	1 set		
H. Land Acquisition	-	2,000 sq.m	-
I. Number of Employee	47	38	50
J. Project Cost			
(1) Total Project Cost	-	67.24 Million Peso	-
(2) Capitalized Interest	-	12.22 Million Peso	-
(3) Total Loan Amount	-	79.46 Million Peso	-
(regular and soft loan)	-		-
K. O & M Cost (P/annum)	-	14.57 Million Peso	21.35 Million Peso

Table 13-1(e) SUMMARY OF RECOMMENDED PLAN FOR TAN-WD

Description	1994	1998	2005
A. Population			
(1) Total Population	37,122	42,718	54,930
(2) Pop. in Service Area	5,294	31,344	43,952
(3) Served Population	1,315	13,958	29,829
B. Water Demand (cu.m/d.)			
(1) Domestic (Daily Ave.)	235	1,656	3,848
(2) Commercial (Daily Ave.)	-	31	45
(3) Institutional (Daily Ave.)	-	12	66
(4) Total Water Demand			
1) Daily Average	235	2,266	5,280
2) Daily Maximum	305	2,946	6,864
3) Peak Hour	470	4,532	10,560
C. Number of Connection			
(1) Domestic	210	2,653	5,676
(2) Commercial	-	31	45
(3) Institutional	-	4	66
(4) Total	210	2,688	5,743
D. Water Sources			
(1) Existing Source	1 well	1 well	1 wells
(capacity: cu.m/d)	2,592	2,592	2,592
(2) New Source	-	1-JICA well	2 wells
(capacity: cu.m/d)	-	1,382	4,925
(3) Pumping Facilities			
1) Pump	Turbine	Submersible	Submersible
	1 set	1 set-20 HP	2 sets-40 HP
2) Pumphouse	1 unit	1 unit	1 unit
3) Standby Generator	-	1-Generator set	2-Generator set
E. Pipelines/Appurtenances			
(1) Pipelines	50mm-200mm	100mm-200mm	150mm-250mm
	10,136m	4,935m	3,708m
(2) Gate Valve	30 pcs	5 pcs	8 pcs
(3) Fire Hydrant	5 units	3 units	2 units
F. Storage Facilities			
(1) Reservoir	1 unit	1 unit	2 units
(capacity: cu.m/d)	250	171	604
(2) Rehabilitation	-	-	-
G. Disinfection Facilities	Hypochlorinator	Hypochlorinator	Hypochlorinator
	1 set	1 set	2 sets
H. Land Acquisition	-	300 sq.m	600 sq.m
I. Number of Employee	6	27	57
J. Project Cost			
(1) Total Project Cost (Phase I)	-	10.63 Million Peso	-
(2) Water District Equity	-	1.06 Million Peso	-
(2) Capitalized Interest	-	1.96 Million Peso	-
(3) Total Loan Amount	-	11.53 Million Peso	-
(regular and soft loan)	-		
K. O & M Cost (P/annum)		3.02 Million Peso	6.72 Million Peso

ANNEX

<ANNEX>

EXPLANATION OF HYDROGEOLOGICAL MAP OF CAVITE PROVINCE

1. Objective of Hydrogeological Map

The "Hydrogeological Map of Cavite Province" was made based on various hydrogeological data collected in the "Cavite Water Supply Development Study".

This map is expected to be revised when new data are collected since the data used in the preparation of this map are not always accurate.

2. Climatic and Topographical Conditions (Lower left of No.1)

Isohyet lines show the average annual precipitation calculated from the observed data at five PAGASA stations in the Study Area and its vicinity. Observation period is from 1984 to 1993. Colors show the difference of elevation divided at every 200 m. It clarifies the relationship between precipitation and elevation: the higher the elevation, the more precipitation.

3. Administrative Unit Map (Upper left of No.1)

Administrative boundaries shown in this map are based on the map "PROVINCE OF CAVITE (1/50,000)" published by NAMRIA in 1990.

4. Hydrogeological Map (Center of No.1)

Various hydrogeological information as well as information on topography, survey points, administrative boundaries, watershed boundaries and road network are included in this map.

The topographical information was extracted from the topographical map published by NAMRIA in 1990 with a scale of 1/50,000, and the road network information was extracted from the map prepared by DPWH (REGION-4A).

As for the survey point information, the location of four test wells drilled during the Study, the survey lines of geophysical prospecting, the hydrological observation points, and the existing wells (registered in PGDB:105, not registered in PGDB:62) are entered.

As for the hydrogeological information, the distribution pattern of each stratigraphic formation, faults and other geostructural elements, contours of groundwater table, and top surface contours of Talisay formation are entered.

Contours of groundwater table were drawn using the data obtained from the simultaneous groundwater level measurement in twenty (20) deep wells and the static

water level of existing 167 wells. The top surface contours of Talisay formation means the top surface of Lower aquifer which is distributed over the whole Study Area, and the groundwater stored above this aquifer flows along this plane.

5. Groundwater Resource Potential Map (Upper left of No.2)

This map shows the distribution pattern of specific capacity (Sc), which were obtained from the data of existing wells and the four test wells drilled in the Study. The specific capacity shown in this map does not mean the specific capacity of the same aquifer, but it indicates the groundwater potential in the Study Area in a broader sense.

In this map, a high specific capacity zone with more than 2.0 l/s/m is around Tanza. It is known that several thick conglomerate layers are distributed in this area, forming a good aquifer.

6. Hydrogeological Cross Sections (Lower right of No.2)

Two geological cross sections in east-west and north-south directions and three sections using the data obtained from the geophysical prospecting survey are shown. The Upper, Middle and Lower aquifers can be identified in these sections.

7. Results of Water Quality Analysis (Upper right of No.2)

The results of analysis for spring water (10 samples), river water (15 samples) and deep well water (20 samples) collected in dry and wet seasons of 1994 are plotted on the key-diagram and the map. These figures tell that the water quality changes in proportion to the storing time.

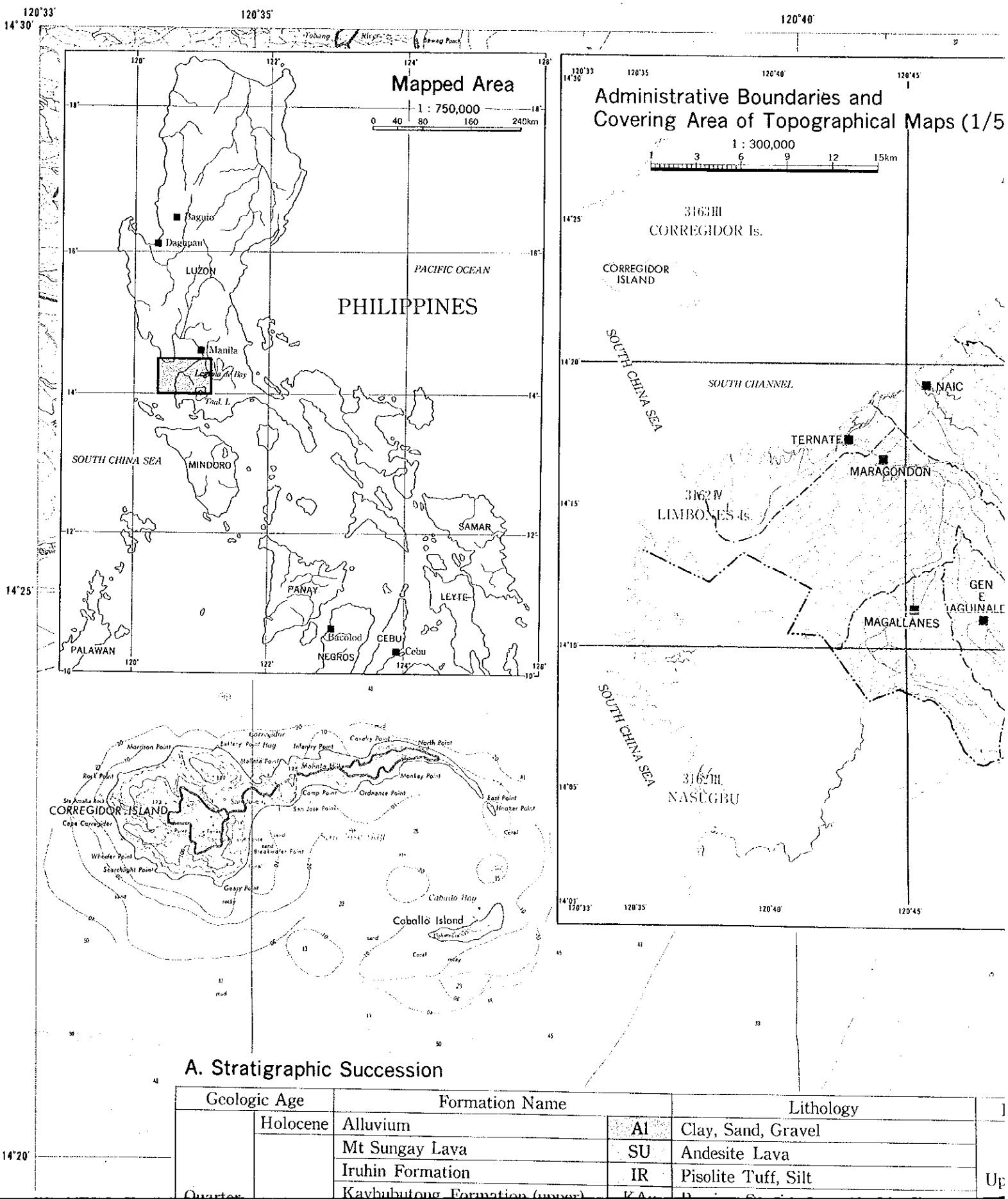
Hydrogeological Map

LEGEND

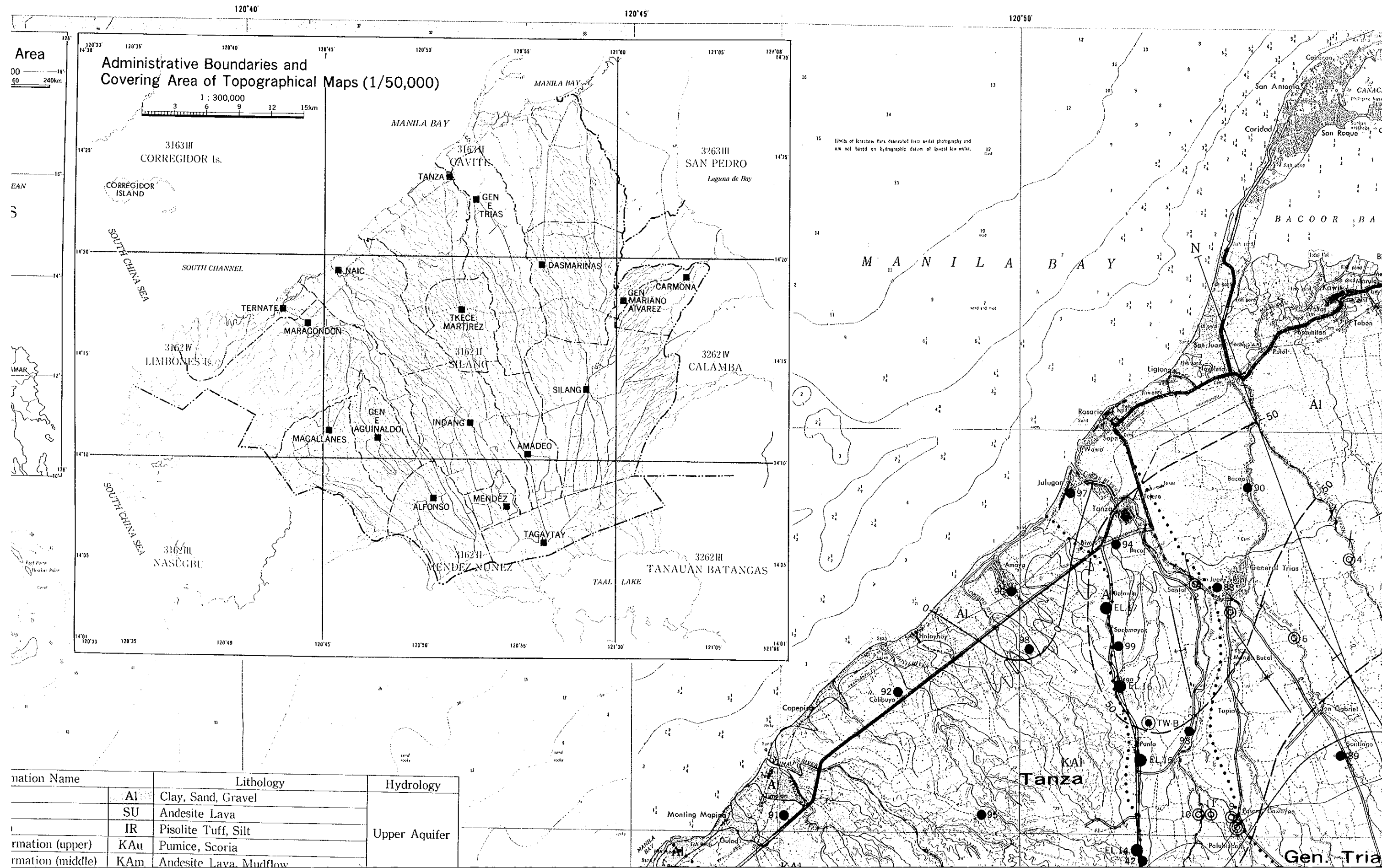
B. Survey Point

- TW-A JICA Test and Production Wells
- 10 PGDB registered Wells
- 150 Non-PGDB registered Wells
- EL.1 Electric Sounding Point
- Electro-Magnetic Survey Line
- ★ Rainfall Station
- ◎ 17 Point for River Discharge Measurement
- △ 2 Point for Spring Discharge Measurement
- △ 5 Point of Water Quality Analysis for Springs
- ◎ 3 Point of Water Quality Analysis for Rivers
- A—A' Hydrogeologic Cross Section

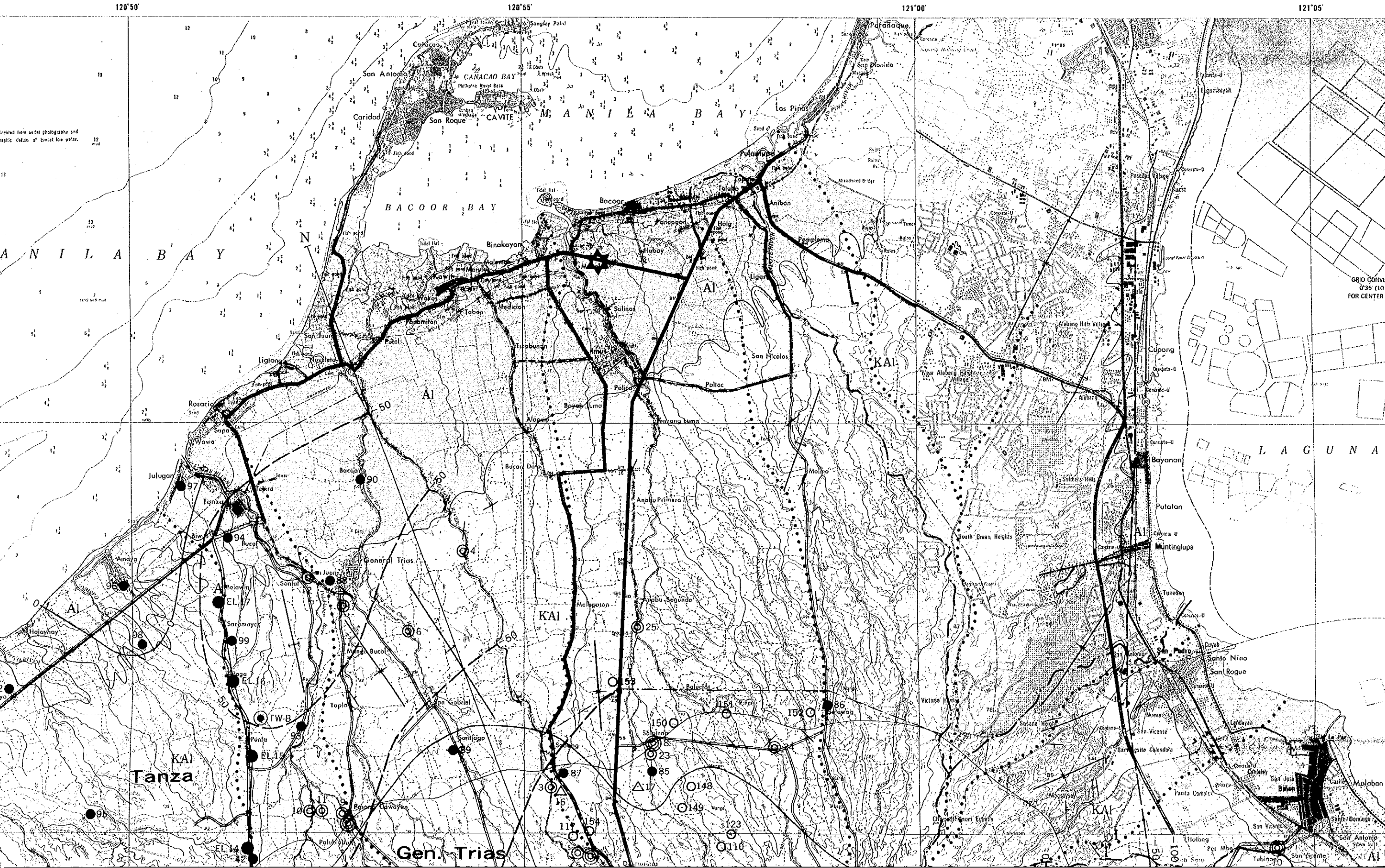
C. Geological Structure



HYDROGEOLOGICAL MAP OF CAVITE PROVINCE (1)



AVITE PROVINCE (1)



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Hydrogeological Map

LEGEND

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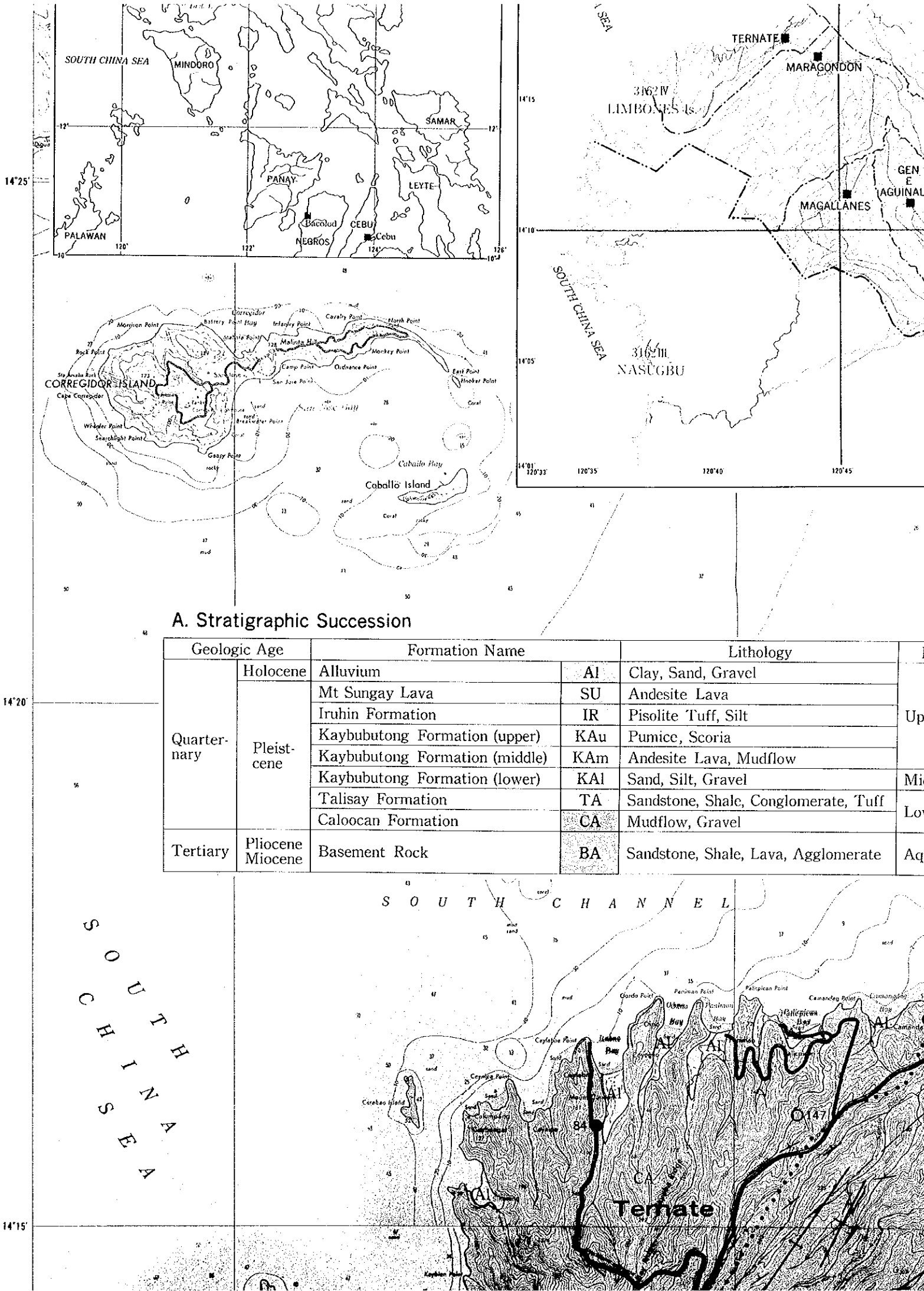
- ↗ Strike and Dip
- Fault
- ⋈ Axis of Syncline
- ⋈ Axis of Anticline
- ⌒ Volcanic Crater
- ⌒ 25 Surface Level of Talisay Formation

D. Occurrence of Surface Water

- Stream
- Lake, Sea
- ⋯ Major Surface Water Divide

E. Occurrence of Groundwater

- ⌒ 50 Contour Line of Static Groundwater Level(1994)



Hydrogeological Map

LEGEND

B. Survey Point

- JICA Test and Production Wells
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A—A' Hydrogeologic Cross Section

C. Geological Structure

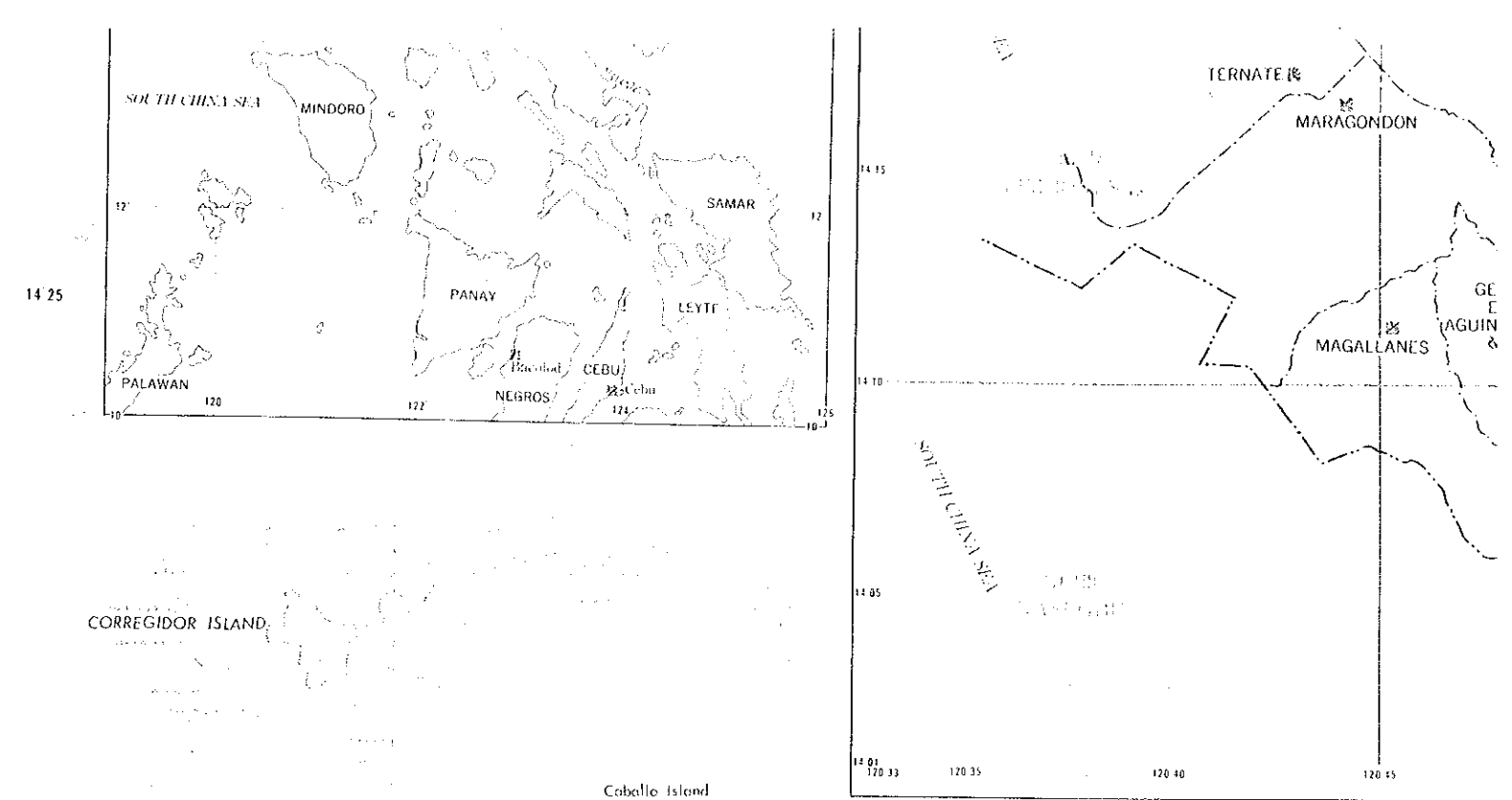
- Strike and Dip
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- Contour Line of Static Groundwater Level(1994)



A. Stratigraphic Succession

Geologic Age		Formation Name		Lithology	
Quar- ter- nary	Holocene	Alluvium	AI	Clay, Sand, Gravel	
	Pleist- cene	Mt Sungay Lava	SU	Andesite Lava	
		Iruh-in Formation	IR	Pisolite Tuff, Silt	U
		Kaybubutong Formation (upper)	KAu	Pumice, Scoria	
		Kaybubutong Formation (middle)	KAm	Andesite Lava, Mudflow	
		Kaybubutong Formation (lower)	KAl	Sand, Silt, Gravel	M
		Talisay Formation	TA	Sandstone, Shale, Conglomerate, Tuff	La
		Caloocan Formation	CA	Mudflow, Gravel	
Tertiary	Pliocene Miocene	Basement Rock	BA	Sandstone, Shale, Lava, Agglomerate	Ac

