Table 7.5.2 Water Quality Analysis Results

Indices	Unit	Class "A" Water Quality Criteria for Fresh Surface Water	River		Remarks
			Magat	Matuno	
Color	units	50	10.00	10.00	within standard
Turbidity	units	-	148.00	120.00	
Conductivity	us/cm	-	300.00	290.00	
pH		6.5-8.5	7.90	5.50	Matuno is acidic
Alkalinity	mg/L	-	124.00	122.00	
Total Hardness as $CaCO_3$	mg/L	400	120.00	113.00	within standard
Sulfate (SO_4)	mg/L	200	28.00	24.00	within standard
Chloride (Cl)	mg/L	200	4.40	7.10	within standard
Iron (Fe)	mg/L	1.0	8.50	7.20	excessive
Manganese (Mn)	mg/L	0.5	0.24	0.20	within standard
Ammonia-Nitrogen	mg/L	-	2.80	0.88	
BOD	mg/L	5	57.70	53.85	excessive

Generally, the river water in the province contain high iron concentration. This is attributed to the the iron-rich rocks which forms part of the drainage system, paticularly the older formations. Likewise, the equivalent Biochemical Oxygen Demand (BOD: assumed conversion rate is BOD/COD =1/2) of the rivers exceeds the criteria for Class "A" fresh surface water. The excessive contents of BOD and turbidity are assumed to be caused by presence of organic suspended solids, such as plants, trees and eroded surface soil. The water from Matuno river is slightly acidic. This is possibly caused by oxidation of base metal sulfides deposits in its basin.

7.6 Future Development Potential of Water Sources

The questionnaires collected from each municipality show that there are 16,221 wells existing in the province, while 179 wells are recorded in the inventory made by NWRB (See Tables 7.11 and 7.3.1, Data Report). Despite the smaller number of wells in NWRB data, they were used in the analysis since technical information are provided. Of the total 179 wells, 73 have complete information; depth, static water level and specific capacity; and are summarized in Table 7.6.1.

Considering the well information, the most productive wells are those with depth ranging from 8 to 40 m. Wells drilled deeper than 40m are notably having low specific capacities. These wells have static water level ranging from 1 to 12 mbgl and specific capacity of 0.5 to 6.2 l/sec/m of drawdown.

Table 7.6.1 Well Sources Information*

Municipality	Type	Number	Depth (m)		SWL (m)		Sp. Cap. (l/sec/m)	
			Ave.	Range	Ave.	Range	Ave.	Range
Alfonso Castaneda	SW	** 1	18.00	18.00 - 18.00	0.00	0.00 - 0.00	0.64	0.64 - 0.64
	DW	** 2	25.00	24.00 - 27.00	0.00	0.00 - 0.00	0.64	0.32 - 0.96
Ambaguio	SW	***						
	DW	***						
Aritao	SW	13	14.28	7.60 - 19.82	5.79	1.22 - 10.37	1.43	0.05 - 5.27
	DW	3	32.30	20.42 - 55.79	9.55	6.10 - 13.40	0.08	0.07 - 0.11
Bagabag	SW	11	14.09	7.32 - 19.20	4.60	2.13 - 6.71	1.34	0.26 - 4.20
	DW	3	29.13	21.03 - 41.77	11.27	8.23 - 15.20	0.88	0.21 - 2.07
Bambang	SW	8	13.84	7.60 - 19.21	4.11	1.83 - 7.62	0.52	0.09 - 2.07
	DW	5	31.63	21.90 - 51.22	5.61	3.05 - 9.76	0.82	0.03 - 2.07
Bayombong	SW	** 5	13.30	10.75 - 15.00	0.00	0.00 - 0.00	0.98	0.42 - 1.28
	DW	2	60.02	48.70 - 71.34	10.67	0.00 - 21.34	0.10	0.10 - 0.10
Diadi	SW	1	17.30	17.30 - 17.30	7.62	7.62 - 7.62	0.41	0.41 - 0.41
	DW	1	25.91	25.91 - 25.91	7.01	7.01 - 7.01	3.17	3.17 - 3.17
Dupax del Norte	SW	5	14.85	12.10 - 19.50	6.04	3.05 - 10.10	0.66	0.06 - 2.07
	DW	6	29.96	24.70 - 36.58	7.74	1.26 - 11.59	0.23	0.09 - 0.41
Dupax del Sur	SW	** 3	17.00	15.00 - 18.00	0.00	0.00 - 0.00	0.85	0.64 - 0.96
	DW	** 6	25.33	22.00 - 30.00	0.00	0.00 - 0.00	0.81	0.64 - 0.96
Kasibu	SW	** 1	18.30	18.30 - 18.30	0.00	0.00 - 0.00	0.96	0.96 - 0.96
	DW	** 1	24.40	24.40 - 24.40	0.00	0.00 - 0.00	0.96	0.96 - 0.96
Kayapa	SW	2	7.32	6.10 - 8.54	5.03	2.44 - 7.62	0.44	0.35 - 0.52
	DW	***						
Quezon	SW	***						
	DW	***						
Santa Fe	SW	1	10.90	10.90 - 10.90	1.52	1.52 - 1.52	0.41	0.41 - 0.41
	DW	***						
Solano	SW	7	12.15	8.20 - 17.00	4.31	0.61 - 8.54	2.37	0.30 - 6.20
	DW	3	48.48	23.18 - 82.32	3.86	0.91 - 6.10	0.73	0.04 - 2.07
Villaverde	SW	** 4	14.25	9.00 - 18.00	0.00	0.00 - 0.00	0.66	0.32 - 0.96
	DW	2	33.88	20.49 - 47.26	5.94	3.96 - 7.92	0.80	0.03 - 1.56
Provincial Total	SW	48	13.61	6.10 - 19.82	4.97	0.61 - 10.37	1.23	0.05 - 6.20
	DW	25	35.25	20.42 - 82.32	7.55	0.91 - 21.34	0.62	0.03 - 3.17

Source: NWRB Well Inventory Database.
Notes:
*Based on the data from Feasibility Study of WDs, LWUA and DPWH (Questionable data were disregarded).
**Estimated figures from the hydrogeological continuity of the aquifer.
***No related technical information available.
Legend: SWL=Static Water Level Sp. Cap.=Specific Capacity Ave.=Average
SW=Shallow Well DW=Deep Well

Based on the hydraulic characteristics and distribution of wells in Nueva Vizcaya, the good yielding aquifers occur in the Recent deposits that extensively occupy the broad Magat valley and it's tributaries. The aquifers in the Plio-Pleistocene rocks in Bayombong, Solano and Villaverde, which are also tapped by some of the wells, are expected to have good to moderate yields. Moderate yielding aquifers are anticipated in the Miocene limestone and the upper fractured portions of the older formations.

As indicated in various data obtained, no water quality problem has been reported in the province. However, high salinity is possible in the aquifer occurring in the Miocene and older formations. These formations contained trapped sea water since they were deposited

under shallow marine environments. Likewise, areas with high iron and manganese concentration are probable in the Kasibu, Quezon, where copper and gold deposits are occurring. In the municipalities of Ambaguio, Kasibu, Bayombong and Villaverde where limestone predominates, hard water is expected.

As alternative to wells, the untapped springs identified can be developed. These are also the most reliable sources of water supply in the areas considered as difficult for well development, particularly in the southern half section of the province. The major faults dissecting the province provide interconnected fractures in the various rock units favorable for spring occurrences.

The detailed hydrogeological characteristics of each municipality are summarized in Table 7.6.2, while individual well locations with technical information are shown in Figure 7.6.1, Data Report. For water supply planning purposes, standard well specifications for each municipality are presented in Table 7.6.3. The specifications made in this study are intended for planning purposes. The design of wells for implementation will be based on the results of detailed investigations that must be made prior to construction.

The depth, static water level and specific capacity specified in Table 7.6.3 are established using the well information from NWRB, pertinent studies from other agencies and the hydrogeological assessment presented in Table7.6.2. The depth of wells in each municipality is estimated based on the inferred depth of potential aquifers approximated from the available data on existing wells. The static water level and specific capacity are the averages of existing wells employed in the analysis. For municipalities without any well data, the well parameters are made similar to adjoining towns, provided they have similar hydrogeologic features. It should be noted that for municipalities categorized as deep well areas, specifications for shallow wells are indicated since such type of well is still possible for the locality.

Table 7.6.2 Hydrogeological Description by Municipality

MUNICIPALITY	EXISTING CONDITIONS																DATA INTERPRETATION					
	TOPOGRAPHY	GEOLOGIC UNITS (%)					WELL INFORMATION						SPRINGS				GROUNDWATER AVAILABILITY (%)			AQUIFER FORMATION	ESTIMATED AQUIFER DEPTH	OTHERS
							DEPTH (m)		AVE. SWL(mbgl)		RANGE/(AVE.) SP. CAP.(l/s/m)		TAPPED		UNTAPPED							
		R	N3	N2	N1	O	SW	DW	SW	DW	SW	DW	NO.	AVE. Q (l/s)	NO.	AVE. Q (l/s)	SW	DW	DF		RANGE (mbgl)	
Alfonso Castaneda	mountainous	3	2	0	30	65	18	24-27	-	-	0.64-0.64 (0.64)	0.32-0.96 (0.64)	12	0.1	0	0	0	35	65	Alluvium/ Plio-Pleisto-cene/ Miocene sediments	6-40	Potential aquifer occurs in the valley flat of Marikit Digoliat and Casecnan river with estimated capacity of 1.0 l/s/m and SWL of about 5 mbgl as in other similar area. No water quality information.
Ambaguio	mountainous	0	0	0	100	0	-	-	-	-	-	-	31	1.5	0	0	0	100	0	Miocene limestone/s and-stone	5-40	No well is reported in the area. Aquifers are expected to have Sp. Cap. of 0.5-1.0 l/s/m. Springs are the principal sources of water supply.
Antao	mountainous w/ flat portions along floodplain	15	0	0	0	85	8-20	20-56	6	10	0.05-5.27 (1.43)	0.07 (.08)	26	1	0	0	0	15	85	Alluvium	6-40	Potential aquifers occur in the valley flat of Sta. Fe and Marang rivers with estimated capacity of 1.0-2.5 l/s/m. Groundwater is generally good as reported in past studies.
Bagabag	flat to mountainous	30	5	10	30	25	8-20	21-42	5	11	0.26-4.2 (1.34)	0.03-2.07 (.88)	7	1	3	1.5	0	75	25	Alluvium/ Plio-Pleistocene rocks	5-80	Potential aquifers occur in the valley flat of Magat river with estimated capacity of 1.0-2.5 l/s/m. Groundwater is generally good as reported in past studies.
Bambang	flat to mountainous	25	0	0	25	50	8-20	22-51	4	6	0.09-2.07 (0.52)	0.03-2.07 (0.82)	11	1	0	0	0	50	50	Alluvium	4-80	Potential aquifers occur in the valley flat of Magat river with estimated capacity of 1.0-2.5 l/s/m. Groundwater is generally good in term of drinking purpose as reported in past studies.
Bayombong	flat to mountainous	25	5	0	25	45	11-15	49-71	-	11	0.42-1.28 (0.98)	0.10-0.10 (0.10)	17	0.6	0	0	0	55	45	Alluvium/ Plio-Pleistocene rocks	4-80	Potential aquifer occurs in the broad alluvial plain and in the Plio-Pleistocene hills with estimated capacity of 1.0-2.5 l/s/m. Groundwater is generally good in term of drinking purpose as reported in past studies.
Diadi	undulating to mountainous	15	0	0	40	45	17.3	26	8	7	0.41 (0.41)	3.17-3.17 (3.17)	20	3.3	16	3.34	0	55	45	Alluvium/ Plio-Pleistocene rocks	7-40	Potential aquifer occurs in the valley flat of Magat river and in the Plio-Pleistocene hills with estimated capacity of 1.0-2.5 l/s/m. Groundwater quality is within the standard as reported in past studies.

Table 7.6.2 Hydrogeological Description by Municipality (Cont'd.)

MUNICIPALITY	EXISTING CONDITIONS																	DATA INTERPRETATION			
	TOPOGRAPHY	GEOLOGIC UNITS (%)					WELL INFORMATION						SPRINGS				GROUNDWATER AVAILABILITY (%)			AQUIFER FORMATION	ESTIMATED AQUIFER DEPTH RANGE (mbgl)	OTHERS
							DEPTH (m)		AVE. SWL(mbgl)		RANGE/(AVE.) SP. CAP.(l/s/m)		TAPPED		UNTAPPED							
		R	N3	N2	N1	O	SW	DW	SW	DW	SW	DW	NO.	AVE. Q (l/s)	NO.	AVE. Q (l/s)	SW	DW	DF			
Dupax del Norte	undulating to mountainous	5	0	0	20	75	12-20	25-37	6	8	0.06-2.07 (0.66)	0.09-0.41 (0.23)	38	1	14	0.5	0	25	75	Alluvium	6-40	Potential aquifer is localized in the narrow valley of Sta. Fe and Manga rivers and in the limestone plateau in SE section with estimated capacity of 1.0-2.5 l/s/m. No water quality information.
Dupax del Sur	undulating to mountainous	5	0	0	20	75	18	22-30	-	-	0.64-0.96 (0.85)	0.64-0.96 (0.81)	28	0.4	0	0	0	25	75	Alluvium	6-40	Potential aquifers are localized in the narrow valley of Sta. Fe and Manga rivers with estimated capacity of 1.0-2.5 l/s/m. No water quality information.
Kasibu	undulating to mountainous	5	0	0	30	65	18	24	-	-	0.96-0.96 (0.96)	0.96-0.96 (0.96)	61	0.6	1	-	0	35	65	Alluvium/ Miocene limestone and sandstone	5-40	Potential aquifers occur in the Kangkong Valley and and other structurally enclosed valleys in Malabing and Papaya and pos-sibly in the limestone terrain occurring in the southern part of the town. Estimated capacity of the aquifer is 1.0-1.5 l/s/m with approximate static water level of 5.0 mbgl. No water quality information.
Kayapa	mountainous	0	0	0	40	60	6-8	-	-	5	0.35-0.52 (0.44)	-	86	1	0	0	0	40	60	Miocene sediments	5-40	Potential aquifers can be found in the Sta. Cruz river valley with expected Sp. Cap. of 0.5-1.0 l/s/m. Major source of water supply comes from springs that abound in the area. No water quality information.
Quezon	undulating to mountainous	10	0	0	0	90	-	-	-	-	-	-	17	0.2	10	3	0	10	90	Alluvium	6-40	Potential aquifer occurs in the the major river valleys with estimated capacity of 0.5-2.5 l/s/m and SWL of 5.0 mbgl. No water quality information.

Table 7.6.2 Hydrogeological Description by Municipality (Cont'd.)

MUNICIPALITY	EXISTING CONDITIONS																DATA INTERPRETATION					
	TOPOGRAPHY	GEOLOGIC UNITS (%)					WELL INFORMATION						SPRINGS				GROUNDWATER AVAILABILITY (%)			AQUIFER FORMATION	ESTIMATED AQUIFER DEPTH	OTHERS
							DEPTH (m)		AVE. SWL(mbgl)		RANGE/(AVE.) SP. CAP.(l/s/m)		TAPPED		UNTAPPED							
													NO.	AVE. Q (l/s)	NO.	AVE. Q (l/s)						
		R	N3	N2	N1	O	SW	DW	SW	DW	SW	DW					SW	DW	DF		RANGE (mbgl)	
Santa Fe	undulating to mountainous	2	0	0	0	98	11	-	2	-	0.41 (0.41)	-	47	1	0	0	0	2	98	Alluvium/ Fractured	2-40	Potential aquifer occurs in the valley flat of Magat river and in the Plio-Pleistocene hills with estimated capacity of 1.0-2.5 l/s/m. Groundwater is generally good in term of drinking purpose as standard as reported in past studies.
Solano	flat to hilly	70	10	0	20	0	8-17	23-82	4	4	0.03-6.2 (2.37)	0.04-2.07 (0.73)	10	-	0	0	0	100	0	Alluvium/ Plio-Pleistocene rocks	4-80	Potential aquifer occurs in the broad alluvial plain and in the low relief hills with estimated capacity of 1.5-2.5 l/s/m. Ground-water is generally good in term of drinking purpose as reported in past studies.
Villaverde	flat to hilly	40	15	0	45	0	9-18	20-47	-	6	0.32-0.96 (0.66)	0.03-1.56 (0.80)	14	1.5	1	4.5	0	100	0	Alluvium/ Plio-Pleistocene rocks	4-80	Good aquifer occurs under the broad alluvial plain and the low relief hills with estimated capa- city of 1.5-2.5 l/s/m. No water quality information.

Note :

R = Recent Deposits

N_3 = Plio-Pleistocene Rocks

N_2 = Late Miocene Rocks

N_1 = Early Miocene Rocks

O = Rocks Older than Miocene

SW = Shallow Well Area

DW = Deep Well

DF = Difficult Area

Q = Discharge/Flow Rate

mbgl = meter below ground level

SWL = Static Water Level

l/s/m = liter/second/meter (draw-down)

SP. CAP. = Specific Capacity

Table 7.6.3 Standard Specification of Wells by Municipality*

Municipality		Type	Proportion** (%)	Standard Specification			Remarks
				Depth Range (m)	SWL (m)	Specific Capacity (l/sec/m)	
Alfonso Castaneda	Rural	SW	0	10< D <20	10	1.0	
		DW	40	20< D <40	10	1.0	
	Urban	SW	-	-	-	-	
		DW	-	-	-	-	
Ambaguio	Rural	SW	0	10< D <20	5	0.5	
		DW	100	20< D <40	2	0.5	
	Urban	SW	0	10< D <20	5	1.0	
		DW	100	20< D <40	10	1.0	
Aritao	Rural	SW	0	10< D <20	5	1.0	
		DW	10	20< D <40	10	1.0	
	Urban	SW	0	10< D <20	5	2.5	
		DW	40	20< D <40	5	2.5	
Bagabag	Rural	SW	0	10< D <20	5	1.0	
		DW	70	20< D <80	10	1.0	
	Urban	SW	0	10< D <20	10	2.5	
		DW	100	20< D <80	5	2.5	
Bambang	Rural	SW	0	10< D <20	5	1.0	
		DW	50	20< D <80	5	1.0	
	Urban	SW	0	10< D <20	5	2.5	
		DW	50	20< D <80	5	2.5	
Bayombong	Rural	SW	0	10< D <20	5	1.0	
		DW	60	20< D <80	2	1.0	
	Urban	SW	0	10< D <20	5	2.5	
		DW	95	20< D <80	10	2.5	
Diadi	Rural	SW	0	10< D <20	10	1.0	4 untapped springs with potential discharges of 3.0 l/s each
		DW	50	20< D <40	10	1.0	
	Urban	SW	0	10< D <20	10	2.5	
		DW	90	20< D <40	10	2.5	
Dupax del Norte	Rural	SW	0	10< D <20	5	1.0	2 untapped springs with potential discharges of 0.5 and 1.0 l/s
		DW	50	20< D <40	10	1.0	
	Urban	SW	0	10< D <20	10	2.5	
		DW	60	20< D <40	10	2.5	
Dupax del Sur	Rural	SW	0	10< D <20	5	1.0	
		DW	40	20< D <40	10	1.0	
	Urban	SW	0	10< D <20	10	2.5	
		DW	50	20< D <40	10	2.5	
Kasibu	Rural	SW	0	10< D <20	5	1.0	
		DW	50	20< D <40	10	1.0	
	Urban	SW	0	10< D <20	5	1.5	
		DW	40	20< D <40	10	1.5	
Kayapa	Rural	SW	0	10< D <20	5	0.5	
		DW	80	20< D <40	2	0.5	
	Urban	SW	0	10< D <20	10	1.0	
		DW	10	20< D <40	10	1.0	
Quezon	Rural	SW	0	10< D <20	5	1.0	
		DW	10	20< D <40	10	1.0	
	Urban	SW	0	10< D <20	5	2.5	
		DW	50	20< D <40	10	2.5	
Santa Fe	Rural	SW	0	10< D <20	5	1.0	
		DW	10	20< D <40	10	1.0	
	Urban	SW	0	10< D <40	5	2.5	
		DW	0	20< D <40	5	2.5	
Solano	Rural	SW	0	10< D <20	5	1.5	
		DW	100	20< D <80	5	1.5	
	Urban	SW	0	10< D <20	5	2.5	
		DW	100	20< D <80	5	2.5	
Villaverde	Rural	SW	0	10< D <20	5	1.5	
		DW	100	20< D <80	5	1.5	
	Urban	SW	0	10< D <20	5	2.5	
		DW	100	20< D <80	5	2.5	

B. FUTURE REQUIREMENTS AND DEVELOPMENT PLAN

B. FUTURE REQUIREMENTS AND DEVELOPMENT PLAN

8. FUTURE REQUIREMENTS IN WATER SUPPLY AND SANITATION IMPROVEMENT

8.2 Targets of Provincial Sector Plan

Table 8.2.1 Estimation of Base Year Service Coverage of Water Supply

Municipality	Type	Population (1995)	Population Served by 1995 Facilities				Pop. Served by Planned/On-going Projects				Pop. Served in the Base Year (1995)				
			Level III	Level II	Level I	Total	Level III	Level II	Level I	Total	Level III	Level II	Level I	Total	% Coverage
Alfonso Castaneda	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	4,344	0	1,890	593	2,483	0	0	0	0	0	1,890	593	2,483	57
	Total	4,344	0	1,890	593	2,483	0	0	0	0	0	1,890	593	2,483	57
Ambaguio	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	9,923	0	603	717	1,320	0	388	0	388	0	991	717	1,708	17
	Total	9,923	0	603	717	1,320	0	388	0	388	0	991	717	1,708	17
Aritao	Urban	11,204	1,626	0	7,872	9,498	0	0	478	478	1,626	0	8,350	9,976	89
	Rural	16,964	708	2,633	6,959	10,300	0	1,550	271	1,821	708	4,183	7,230	12,121	71
	Total	28,168	2,334	2,633	14,831	19,798	0	1,550	749	2,299	2,334	4,183	15,580	22,097	78
Bagabag	Urban	14,942	2,035	0	11,015	13,050	0	0	0	0	2,035	0	11,015	13,050	87
	Rural	14,310	0	954	10,433	11,387	0	0	0	0	0	954	10,433	11,387	80
	Total	29,252	2,035	954	21,448	24,437	0	0	0	0	2,035	954	21,448	24,437	84
Bambang	Urban	13,190	0	0	10,934	10,934	0	0	0	0	0	0	10,934	10,934	83
	Rural	24,974	0	1,258	18,375	19,633	0	0	0	0	0	1,258	18,375	19,633	79
	Total	38,164	0	1,258	29,309	30,567	0	0	0	0	0	1,258	29,309	30,567	80
Bayombong (Capital)	Urban	25,140	6,599	275	15,143	22,017	0	0	0	0	6,599	275	15,143	22,017	88
	Rural	19,643	2,268	0	13,413	15,681	0	103	1,185	1,288	2,268	103	14,598	16,969	86
	Total	44,783	8,867	275	28,556	37,698	0	103	1,185	1,288	8,867	378	29,741	38,986	87
Diadi	Urban	1,931	0	0	1,718	1,718	0	0	0	0	0	0	1,718	1,718	89
	Rural	11,107	0	450	5,858	6,308	0	0	0	0	0	450	5,858	6,308	57
	Total	13,038	0	450	7,576	8,026	0	0	0	0	0	450	7,576	8,026	62
Dupax del Norte	Urban	6,084	0	1,250	3,596	4,846	0	0	0	0	0	1,250	3,596	4,846	80
	Rural	17,316	0	2,996	4,406	7,402	0	0	0	0	0	2,996	4,406	7,402	43
	Total	23,400	0	4,246	8,002	12,248	0	0	0	0	0	4,246	8,002	12,248	52
Dupax del Sur	Urban	3,423	0	0	2,897	2,897	0	0	0	0	0	0	2,897	2,897	85
	Rural	10,505	0	1,407	2,177	3,584	0	0	0	0	0	1,407	2,177	3,584	34
	Total	13,928	0	1,407	5,074	6,481	0	0	0	0	0	1,407	5,074	6,481	47
Kasibu	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	25,581	0	1,377	3,414	4,791	0	0	0	0	0	1,377	3,414	4,791	19
	Total	25,581	0	1,377	3,414	4,791	0	0	0	0	0	1,377	3,414	4,791	19
Kayapa	Urban	744	0	667	0	667	0	0	0	0	0	667	0	667	90
	Rural	20,119	0	4,586	4,667	9,253	0	2,733	78	2,811	0	7,319	4,745	12,064	60
	Total	20,863	0	5,253	4,667	9,920	0	2,733	78	2,811	0	7,986	4,745	12,731	61
Quezon	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	13,681	0	92	5,024	5,116	0	0	0	0	0	92	5,024	5,116	37
	Total	13,681	0	92	5,024	5,116	0	0	0	0	0	92	5,024	5,116	37
Santa Fe	Urban	1,366	0	0	1,040	1,040	0	0	0	0	0	0	1,040	1,040	76
	Rural	11,216	0	3,527	1,072	4,599	0	708	129	837	0	4,235	1,201	5,436	48
	Total	12,582	0	3,527	2,112	5,639	0	708	129	837	0	4,235	2,241	6,476	51
Solano	Urban	27,494	4,970	100	18,598	23,668	0	0	0	0	4,970	100	18,598	23,668	86
	Rural	21,282	0	558	16,343	16,901	0	0	0	0	0	558	16,343	16,901	79
	Total	48,776	4,970	658	34,941	40,569	0	0	0	0	4,970	658	34,941	40,569	83
Villaverde	Urban	4,300	0	0	3,556	3,556	0	0	0	0	0	0	3,556	3,556	83
	Rural	11,064	0	239	8,143	8,382	0	0	0	0	0	239	8,143	8,382	76
	Total	15,364	0	239	11,699	11,938	0	0	0	0	0	239	11,699	11,938	78
Provincial Total	Urban	109,818	15,230	2,292	76,369	93,891	0	0	478	478	15,230	2,292	76,847	94,369	86
	Rural	232,029	2,976	22,570	101,594	127,140	0	5,482	1,663	7,145	2,976	28,052	103,257	134,285	58
	Total	341,847	18,206	24,862	177,963	221,031	0	5,482	2,141	7,623	18,206	30,344	180,104	228,654	67

Table 8.2.2 Population Coverage in Phase I Provided by Served Population in the Base Year (Water Supply)

Municipality	Type	Population Served by Existing Facilities				1995		2000	
		Level III	Level II	Level I	Total	Total Population	% Coverage	Total Population	% Coverage
Alfonso Castaneda	Urban	0	0	0	0	0	0	0	0
	Rural	0	1,890	593	2,483	4,344	57	4,759	52
	Total	0	1,890	593	2,483	4,344	57	4,759	52
Ambaguio	Urban	0	0	0	0	0	0	0	0
	Rural	0	991	717	1,708	9,923	17	10,870	16
	Total	0	991	717	1,708	9,923	17	10,870	16
Aritao	Urban	1,626	0	8,350	9,976	11,204	89	12,274	81
	Rural	708	4,183	7,230	12,121	16,964	71	18,583	65
	Total	2,334	4,183	15,580	22,097	28,168	78	30,857	72
Bagabag	Urban	2,035	0	11,015	13,050	14,942	87	16,368	80
	Rural	0	954	10,433	11,387	14,310	80	15,676	73
	Total	2,035	954	21,448	24,437	29,252	84	32,044	76
Bambang	Urban	0	0	10,934	10,934	13,190	83	14,449	76
	Rural	0	1,258	18,375	19,633	24,974	79	27,358	72
	Total	0	1,258	29,309	30,567	38,164	80	41,807	73
Bayombong (Capital)	Urban	6,599	275	15,143	22,017	25,140	88	27,540	80
	Rural	2,268	103	14,598	16,969	19,643	86	21,518	79
	Total	8,867	378	29,741	38,986	44,783	87	49,058	79
Diadi	Urban	0	0	1,718	1,718	1,931	89	2,115	81
	Rural	0	450	5,858	6,308	11,107	57	12,167	52
	Total	0	450	7,576	8,026	13,038	62	14,282	56
Dupax del Norte	Urban	0	1,250	3,596	4,846	6,084	80	6,665	73
	Rural	0	2,996	4,406	7,402	17,316	43	18,968	39
	Total	0	4,246	8,002	12,248	23,400	52	25,633	48
Dupax del Sur	Urban	0	0	2,897	2,897	3,423	85	3,750	77
	Rural	0	1,407	2,177	3,584	10,505	34	11,507	31
	Total	0	1,407	5,074	6,481	13,928	47	15,257	42
Kasibu	Urban	0	0	0	0	0	0	0	0
	Rural	0	1,377	3,414	4,791	25,581	19	28,023	17
	Total	0	1,377	3,414	4,791	25,581	19	28,023	17
Kayapa	Urban	0	667	0	667	744	90	815	82
	Rural	0	7,319	4,745	12,064	20,119	60	22,039	55
	Total	0	7,986	4,745	12,731	20,863	61	22,854	56
Quezon	Urban	0	0	0	0	0	0	0	0
	Rural	0	92	5,024	5,116	13,681	37	14,987	34
	Total	0	92	5,024	5,116	13,681	37	14,987	34
Santa Fe	Urban	0	0	1,040	1,040	1,366	76	1,496	70
	Rural	0	4,235	1,201	5,436	11,216	48	12,287	44
	Total	0	4,235	2,241	6,476	12,582	51	13,783	47
Solano	Urban	4,970	100	18,598	23,668	27,494	86	30,118	79
	Rural	0	558	16,343	16,901	21,282	79	23,314	72
	Total	4,970	658	34,941	40,569	48,776	83	53,432	76
Villaverde	Urban	0	0	3,556	3,556	4,300	83	4,710	75
	Rural	0	239	8,143	8,382	11,064	76	12,120	69
	Total	0	239	11,699	11,938	15,364	78	16,830	71
Provincial Total	Urban	15,230	2,292	76,847	94,369	109,818	86	120,300	78
	Rural	2,976	28,052	103,257	134,285	232,029	58	254,176	53
	Total	18,206	30,344	180,104	228,654	341,847	67	374,476	61

Table 8.2.3 Number of Households Served by Sanitary Toilets in the Base Year (1995)

Municipality	Area	1995		Households Using Sanitary Toilets in 1995				Recipient HHs of Planned/On-going Projects				Households Using Sanitary Toilets in Base Year (1995)							
												Number				Coverage (%)			
		Population	HHs	Flush	Pour Flush	VIP	Total	Flush	Pour Flush	VIP	Total	Flush	Pour Flush	VIP	Total	Flush	Pour Flush	VIP	Total
Alfonso Castaneda	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	4,344	822	0	341	137	478	0	20	0	20	0	361	137	498	0	44	17	61
	Total	4,344	822	0	341	137	478	0	20	0	20	0	361	137	498	0	44	17	61
Ambaguio	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	9,923	1,773	0	164	541	705	0	63	0	63	0	227	541	768	0	13	31	43
	Total	9,923	1,773	0	164	541	705	0	63	0	63	0	227	541	768	0	13	31	43
Aritao	Urban	11,204	2,164	50	1,678	0	1,728	0	0	0	0	50	1,678	0	1,728	2	78	0	80
	Rural	16,964	3,287	5	2,210	0	2,215	0	40	0	40	5	2,250	0	2,255	0	68	0	69
	Total	28,168	5,451	55	3,888	0	3,943	0	40	0	40	55	3,928	0	3,983	1	72	0	73
Bagabag	Urban	14,942	2,799	58	2,249	264	2,571	0	0	0	0	58	2,249	264	2,571	2	80	9	92
	Rural	14,310	2,816	0	1,964	192	2,156	0	21	0	21	0	1,985	192	2,177	0	70	7	77
	Total	29,252	5,615	58	4,213	456	4,727	0	21	0	21	58	4,234	456	4,748	1	75	8	85
Bambang	Urban	13,190	2,623	58	2,129	0	2,187	0	0	0	0	58	2,129	0	2,187	2	81	0	83
	Rural	24,974	4,944	14	3,354	358	3,726	0	70	0	70	14	3,424	358	3,796	0	69	7	77
	Total	38,164	7,567	72	5,483	358	5,913	0	70	0	70	72	5,553	358	5,983	1	73	5	79
Bayombong (Capital)	Urban	25,140	4,522	153	3,812	24	3,989	0	20	0	20	153	3,832	24	4,009	3	85	1	89
	Rural	19,643	4,511	26	2,526	143	2,695	0	90	0	90	26	2,616	143	2,785	1	58	3	62
	Total	44,783	9,033	179	6,338	167	6,684	0	110	0	110	179	6,448	167	6,794	2	71	2	75
Diadi	Urban	1,931	366	0	124	117	241	0	20	0	20	0	144	117	261	0	39	32	71
	Rural	11,107	2,144	0	817	333	1,150	0	20	0	20	0	837	333	1,170	0	39	16	55
	Total	13,038	2,510	0	941	450	1,391	0	40	0	40	0	981	450	1,431	0	39	18	57
Dupax del Norte	Urban	6,084	1,184	0	1,097	0	1,097	0	0	0	0	0	1,097	0	1,097	0	93	0	93
	Rural	17,316	3,374	0	2,960	0	2,960	0	90	0	90	0	3,050	0	3,050	0	90	0	90
	Total	23,400	4,558	0	4,057	0	4,057	0	90	0	90	0	4,147	0	4,147	0	91	0	91
Dupax del Sur	Urban	3,423	632	6	622	0	628	0	0	0	0	6	622	0	628	1	98	0	99
	Rural	10,505	1,942	0	802	85	887	0	90	0	90	0	892	85	977	0	46	4	50
	Total	13,928	2,574	6	1,424	85	1,515	0	90	0	90	6	1,514	85	1,605	0	59	3	62
Kasibu	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	25,581	4,956	0	2,104	663	2,767	0	157	0	157	0	2,261	663	2,924	0	46	13	59
	Total	25,581	4,956	0	2,104	663	2,767	0	157	0	157	0	2,261	663	2,924	0	46	13	59
Kayapa	Urban	744	139	4	135	0	139	0	0	0	0	4	135	0	139	3	97	0	100
	Rural	20,119	3,757	2	1,315	387	1,704	0	20	0	20	2	1,335	387	1,724	0	36	10	46
	Total	20,863	3,896	6	1,450	387	1,843	0	20	0	20	6	1,470	387	1,863	0	38	10	48
Quezon	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	13,681	2,699	0	1,268	707	1,975	0	40	0	40	0	1,308	707	2,015	0	48	26	75
	Total	13,681	2,699	0	1,268	707	1,975	0	40	0	40	0	1,308	707	2,015	0	48	26	75
Santa Fe	Urban	1,366	239	25	155	8	188	0	0	0	0	25	155	8	188	10	65	3	79
	Rural	11,216	2,161	0	888	190	1,078	0	49	0	49	0	937	190	1,127	0	43	9	52
	Total	12,582	2,400	25	1,043	198	1,266	0	49	0	49	25	1,092	198	1,315	1	46	8	55
Solano	Urban	27,494	5,539	358	3,838	646	4,842	0	0	0	0	358	3,838	6461	4,842	6	69	12	87
	Rural	21,282	4,240	7	3,396	364	3,767	0	20	0	20	7	3,416	364	3,787	0	81	9	89
	Total	48,776	9,779	365	7,234	1,010	8,609	0	20	0	20	365	7,254	1,010	8,629	4	74	10	88
Villaverde	Urban	4,300	778	25	650	0	675	0	0	0	0	25	650	0	675	3	84	0	87
	Rural	11,064	2,080	14	939	480	1,433	0	40	0	40	14	979	480	1,473	1	47	23	71
	Total	15,364	2,858	39	1,589	480	2,108	0	40	0	40	39	1,629	480	2,148	1	57	17	75
Provincial Total	Urban	109,818	20,985	737	16,489	1,059	18,285	0	40	0	40	737	16,529	1,059	18,325	4	79	5	87
	Rural	232,029	45,506	68	25,048	4,580	29,696	0	830	0	830	68	25,878	4,580	30,526	0	57	10	67
	Total	341,847	66,491	805	41,537	5,639	47,981	0	870	0	870	805	42,407	5,639	48,851	1	64	8	73

Table 8.2.4 Number of Public School Students Served by School Toilets in Base Year (1995)

Municipality	1995 Total No. of Public School Students	Std. No. of Students that can be Served by 1995 Toilets	No. of Students to be Served by Planned/On-going Projects	Std. No. of Students that can be Served by Toilets in Base Year (1995)	Coverage (%)
Alfonso Castaneda	1,003	550	0	550	55
Ambaguio	994	0	0	0	0
Aritao	4,460	3,750	0	3,750	84
Bagabag	4,728	4,728	0	4,728	100
Bambang	8,625	6,200	0	6,200	72
Bayombong (Capital)	8,970	3,950	0	3,950	44
Diadi	3,598	2,400	0	2,400	67
Dupax del Norte	4,899	1,400	0	1,400	29
Dupax del Sur	2,351	600	0	600	26
Kasibu	4,757	500	0	500	11
Kayapa	3,599	1,950	0	1,950	54
Quezon	2,868	2,500	0	2,500	87
Santa Fe	2,511	1,300	0	1,300	52
Solano	8,692	4,150	0	4,150	48
Villaverde	3,242	1,800	0	1,800	56
Provincial Total	65,297	35,778	0	35,778	55

Table 8.2.5 Number of Public Utilities with Sanitary Toilets in the Base Year (1995)

Municipality	Type	No. of PU in 1995	No. of PU with Sanitary Toilets in 1995	No. of PU in Planned/On-going Project	No. of PU with Sanitary Toilets in Planned/On-going Projects	No. of PU in Base Year 1995	No. of PU with Sanitary Toilets in Base year 1995	Coverage (%)
Alfonso Castaneda	Public Market	1	1	0	0	1	1	100
	Bus/Jeep Terminal	0	0	0	0	0	0	0
	Total	1	1	0	0	1	1	100
Ambaguio	Public Market	1	0	0	0	1	0	0
	Bus/Jeep Terminal	0	0	0	0	0	0	0
	Total	1	0	0	0	1	0	0
Aritao	Public Market	1	1	0	0	1	1	100
	Bus/Jeep Terminal	0	0	0	0	0	0	0
	Total	1	1	0	0	1	1	100
Bagabag	Public Market	1	1	0	0	1	1	100
	Bus/Jeep Terminal	1	1	0	0	1	1	100
	Total	2	2	0	0	2	2	100
Bambang	Public Market	2	1	0	0	2	1	50
	Bus/Jeep Terminal	0	0	0	0	0	0	0
	Total	2	1	0	0	2	1	50
Bayombong (Capital)	Public Market	2	1	0	0	2	1	50
	Bus/Jeep Terminal	0	0	0	0	0	0	0
	Total	2	1	0	0	2	1	50
Diadi	Public Market	1	1	0	0	1	1	100
	Bus/Jeep Terminal	0	0	0	0	0	0	0
	Total	1	1	0	0	1	1	100
Dupax del Norte	Public Market	3	1	0	0	3	1	33
	Bus/Jeep Terminal	0	0	0	0	0	0	0
	Total	3	1	0	0	3	1	33
Dupax del Sur	Public Market	1	1	0	0	1	1	100
	Bus/Jeep Terminal	0	0	0	0	0	0	0
	Total	1	1	0	0	1	1	100
Kasibu	Public Market	1	1	0	0	1	1	100
	Bus/Jeep Terminal	0	0	0	0	0	0	0
	Total	1	1	0	0	1	1	100
Kayapa	Public Market	4	1	0	0	4	1	25
	Bus/Jeep Terminal	0	0	0	0	0	0	0
	Total	4	1	0	0	4	1	25
Quezon	Public Market	0	0	0	0	0	0	0
	Bus/Jeep Terminal	0	0	0	0	0	0	0
	Total	0	0	0	0	0	0	0
Santa Fe	Public Market	5	1	0	0	5	1	20
	Bus/Jeep Terminal	0	0	0	0	0	0	0
	Total	5	1	0	0	5	1	20
Solano	Public Market	1	1	0	0	1	1	100
	Bus/Jeep Terminal	1	1	0	0	1	1	100
	Total	2	2	0	0	2	2	100
Villaverde	Public Market	1	0	0	0	1	0	0
	Bus/Jeep Terminal	0	0	0	0	0	0	0
	Total	1	0	0	0	1	0	0
Provincial Total	Public Market	25	12	0	0	25	12	48
	Bus/Jeep Terminal	2	2	0	0	2	2	100
	Total	27	14	0	0	27	14	52

Note: PU - Public Utilities

Table 8.2.6 Household Coverage in Phase I Provided by Existing Facilities in the Base Year (Household Toilets)

Municipality	Area	No. of Household Served by Existing Facilities				Coverage in 1995							Coverage in 2000				
							Served Households				Served Population			Served Households			
							%							%			
		Flush	Pour Flush	VIP Latrine	Total	No. of HHs	Flush	Pour Flush	VIP Latrine	Total	Number	%	No. of HHs	Flush	Pour Flush	VIP Latrine	Total
Alfonso Castaneda	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	0	361	137	498	822	0	44	17	61	2,650	61	898	0	40	15	55
	Total	0	361	137	498	822	0	44	17	61	2,650	61	898	0	40	15	55
Ambaguio	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	0	227	541	768	1,773	0	13	31	43	4,267	43	1,941	0	12	28	40
	Total	0	227	541	768	1,773	0	13	31	43	4,267	43	1,941	0	12	28	40
Aritao	Urban	50	1,678	0	1,728	2,164	2	78	0	80	8,963	80	2,360	2	71	0	73
	Rural	5	2,250	0	2,255	3,287	0	68	0	69	11,705	69	3,574	0	63	0	63
	Total	55	3,928	0	3,983	5,451	1	72	0	73	20,668	73	5,934	1	66	0	67
Bagabag	Urban	58	2,249	244	2,571	2,799	2	80	9	92	13,747	92	3,088	2	73	9	83
	Rural	0	1,985	192	2,177	2,816	0	70	7	77	11,019	77	3,074	0	65	6	71
	Total	58	4,234	456	4,748	5,615	1	75	8	85	24,766	85	6,162	1	69	7	77
Bambang	Urban	58	2,129	0	2,187	2,623	2	81	0	83	10,948	83	2,890	2	74	0	76
	Rural	14	3,426	358	3,796	4,944	0	69	7	77	19,230	77	5,364	0	64	7	71
	Total	72	5,553	358	5,983	7,567	1	73	5	79	30,178	79	8,254	1	67	4	72
Bayombong (Capital)	Urban	153	3,832	24	4,009	4,522	3	85	1	89	22,375	89	4,918	3	78	0	82
	Rural	26	2,616	143	2,785	4,511	1	58	3	62	12,179	62	4,890	1	53	3	57
	Total	179	6,448	167	6,794	9,033	2	71	2	75	34,554	75	9,808	2	66	2	69
Diadi	Urban	0	144	117	261	366	0	39	32	71	1,371	71	399	0	36	29	65
	Rural	0	837	333	1,170	2,144	0	39	16	55	6,109	55	2,340	0	36	14	50
	Total	0	981	450	1,431	2,510	0	39	18	57	7,480	57	2,739	0	36	16	52
Dupax del Norte	Urban	0	1,097	0	1,097	1,184	0	93	0	93	5,658	93	1,307	0	84	0	84
	Rural	0	3,050	0	3,050	3,374	0	90	0	90	15,584	90	3,719	0	82	0	82
	Total	0	4,147	0	4,147	4,558	0	91	0	91	21,242	91	5,026	0	83	0	83
Dupax del Sur	Urban	6	622	0	628	632	1	98	0	99	3,389	99	694	1	90	0	90
	Rural	0	892	85	977	1,942	0	46	4	50	5,253	50	2,131	0	42	4	46
	Total	6	1,514	85	1,605	2,574	0	59	3	62	8,642	62	2,825	0	54	3	57
Kasibu	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	0	2,261	663	2,924	4,956	0	46	13	59	15,093	59	5,389	0	42	12	54
	Total	0	2,261	663	2,924	4,956	0	46	13	59	15,093	59	5,389	0	42	12	54
Kayapa	Urban	4	135	0	139	139	3	97	0	100	744	100	154	3	88	0	90
	Rural	2	1,335	387	1,724	3,757	0	36	10	46	9,255	46	4,081	0	33	9	42
	Total	6	1,470	387	1,863	3,896	0	38	10	48	9,999	48	4,235	0	35	9	44
Quezan	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	0	1,308	707	2,015	2,669	0	48	26	75	10,261	75	2,939	0	45	24	69
	Total	0	1,308	707	2,015	2,669	0	48	26	75	10,261	75	2,939	0	45	24	69
Santa Fe	Urban	25	155	8	188	239	10	65	3	79	1,079	79	262	10	59	3	72
	Rural	0	937	190	1,127	2,161	0	43	9	52	5,832	52	2,363	0	40	8	48
	Total	25	1,092	198	1,315	2,400	1	46	8	55	6,911	55	2,625	1	42	8	50
Solano	Urban	358	3,838	646	4,842	5,539	6	69	12	87	23,920	87	6,024	6	64	11	80
	Rural	7	3,416	364	3,787	4,240	0	81	9	89	18,941	89	4,663	0	73	8	81
	Total	365	7,254	1,010	8,629	9,779	4	74	10	88	42,861	88	10,687	3	68	9	81
Villaverde	Urban	25	650	0	675	778	3	84	0	87	3,741	87	856	3	26	0	29
	Rural	14	979	480	1,473	2,080	1	47	23	71	7,855	71	2,287	1	43	21	64
	Total	39	1,629	480	2,148	2,858	1	57	17	75	11,596	75	3,143	1	52	15	68
Provincial Total	Urban	737	16,529	1,059	18,325	20,985	4	79	5	87	95,935	87	22,952	3	72	5	80
	Rural	68	25,878	4,580	30,526	45,506	0	57	10	67	155,233	67	49,653	0	52	9	61
	Total	805	42,407	5,639	48,851	66,491	1	64	8	73	251,168	73	72,605	1	58	8	67

Table 8.2.7 Public School Students and Public Utilities Coverage in Phase I Provided by Existing Facilities in the Base Year

Municipality	Public Schools Toilets					Public Toilets					
	Std. No. of Students that can be Served by Base Year (1995)	Coverage in 1995		Coverage in 2000		Coverage in 1995			Coverage in 2000		
		Total No. of Public School Students	%	Total No. of Public School Students	%	No. of PU in Base Year	No. of PU with Sanitary Toilets in Base Year (1995)	%	No. of PU	No. of PU with Sanitary Toilets	%
Alfonso Castaneda	550	1,003	55	1,046	53	1	1	100	1	1	100
Ambaguio	0	994	0	878	0	1	0	0	1	0	0
Aritao	3,750	4,460	84	4,963	76	1	1	100	1	1	100
Bagabag	4,728	4,728	100	5,092	93	2	2	100	2	2	100
Bambang	6,200	8,625	72	9,204	67	2	1	50	2	1	50
Bayombong (Capital)	3,950	8,970	44	9,615	41	2	1	50	2	1	50
Diadi	2,400	3,598	67	3,779	64	1	1	100	1	1	100
Dupax del Norte	1,400	4,899	29	5,290	26	3	1	33	3	1	33
Dupax del Sur	600	2,351	26	2,498	24	1	1	100	1	1	100
Kasibu	500	4,757	11	4,846	10	1	1	100	1	1	100
Kayapa	1,950	3,599	54	3,903	50	4	1	25	4	1	25
Quezon	2,500	2,868	87	3,088	81	0	0	0	0	0	0
Santa Fe	1,300	2,511	52	2,401	54	5	1	20	5	1	20
Solano	4,150	8,692	48	9,515	44	2	2	100	3	2	67
Villaverde	1,800	3,242	56	3,476	52	1	0	0	1	0	0
Provincial Total	35,778	65,297	55	69,594	51	27	14	52	28	14	50

Note: PU - Public Utilities

8.3 Projection of Frame Values

8.3.1 Review of Past Population Development and Population Projection

(1) Review of past population development

1) Characteristics of past population development

Major statistical data of past population development are shown in Table 8.3.1 in which urban and rural population are adjusted by PPDO to reflect present conditions. Provinces presently belonging to CAR are excluded from the regional population.

Table 8.3.1 Past Population Development

Area	Description	Total		Urban		Rural	
		1980	1990	1980	1990	1980	1990
Region II	Population	1,919,121	2,340,545	363,231	588,065	1,555,890	1,752,480
	Growth Rate	2.0%		4.9%		1.2%	
Nueva Vizcaya	Population	241,720	301,179	80,955	100,776	160,765	200,403
	Growth Rate	2.2%		2.2%		2.2%	
	Percentage 1/	12.6%	12.9%	22.3%	17.1%	10.3%	11.4%

Note: 1/ Provincial population percentage to regional population

During the census decade from 1980 to 1990, the following population development was observed:

- The province recorded 2.2% of average annual growth rate which was almost equivalent to that of the region at 2.0%.
- Percentage of provincial population to the regional population slightly increased from 12.6% in 1980 to 12.9% in 1990 caused by the increase of rural population, but its population percentage in urban area adversely decreased.

The region is classified as an out-migration group in the country. However, higher growth rate of rural population in the province than that of the region revealed that the migration was brought from neighboring mountainous provinces such as Ifugao, Kalinga and Apayao. While, lower growth rate of urban population in the province compared to that of the region coincides with the conservative economic activities in the province as discussed in Chapter 3.

2) 1990 population distribution in urban and rural areas

The 1990 population census results conducted by NSO were reviewed in terms of population distribution to urban and rural areas. In application of revised classifica-

tion of barangays in urban and rural category to reflect present conditions, the population by municipality was adjusted as shown in Table 8.3.2.

Table 8.3.2 Population Distribution in Urban and Rural Areas

Municipality	Total Population	1990 Census Data		Adjusted Population	
		Urban	Rural	Urban	Rural
Alfonso Castañeda	3,751	0	3,751	0	3,751
Ambaguio	7,241	0	7,241	0	7,241
Aritao	25,942	4,102	21,840	10,303	15,639
Bagabag	26,028	6,251	1,777	12,470	13,558
Bambang	33,663	11,833	21,830	11,833	21,830
Bayombong	39,886	13,573	26,313	23,721	16,165
Diadi	11,351	1,648	9,703	1,648	9,703
Dupax del Norte	20,904	2,841	18,063	5,749	15,155
Dupac del Sur	12,297	3,234	9,063	3,234	9,063
Kasibu	21,425	0	21,425	0	21,425
Kayapa	18,685	667	18,018	667	18,018
Quezon	12,206	0	12,206	0	12,206
Santa Fe	9,960	1,298	8,662	1,298	8,662
Solano	44,246	22,997	21,249	26,096	18,150
Villaverde	13,594	3,757	9,837	3,757	9,837
Provincial Total	301,179	72,201	228,978	100,776	200,403

(2) Review of NSO regional population projection mainly on growth rates and the demographic conditions presented in the 1992 Philippine Yearbook

NSO projected population at regional level for the year 1995 and target years based on the 1990 population census considering some factors. In the study, annual growth rates on the projected population by the NSO with ten years interval were calculated in application of a simple compounded formula as described below:

$$Pn = Po \times (1 + r)^n$$

where, Pn: Population in n-th year
Po: Population in the base year
r: Annual population growth rate
n: Growth period in year

Through the review of future regional population, it was learned that NSO projection coincides with the gradually declining annual growth rates; 1.66% from 1990 to 2000 and 1.13% from 2000 to 2010, while the last census decade from 1980 to 1990 recorded 2.01% (refer to Table 8.3.3). Thus, approximately 0.5% of the growth rate was discounted to every decade.

Review of "1992 Philippine Yearbook" delineated the following demographic characteristics of the region and province:

- The inter-regional migration pattern will continue as a major population development factor, however the migration rate will gradually decline through the future.
- The international migration, on the other hand, is insignificant to the population development.
- Fertility and mortality, another key factors of population growth, will moderately decline through the future, and the national family planning target set forth the family size to arrive at 4 persons/household by the year 2010.
- Population of the region and province belongs to low growth group in the country.

When the regional and provincial demographic characteristics are taken into account, the future provincial population is considered to remain under similar conditions as experienced in the last census decade, unless specific development takes place in the province.

(3) Estimation of the present population (1995)

The present population in 1995 was estimated applying 1980-1990 average annual growth rate of respective municipalities (broken down to urban and rural areas) assuming that the trend of past population development prevailed up to the present. Household size in 1995 is also assumed to be the same as that in 1990.

(4) Projection of provincial population by target year

Provincial population was projected by target year as shown in Table 8.3.3 in application of declining percentages of growth rates referring to the discounted growth rate of regional population projection as follows:

- Population in 2000 was projected from the base year 1995 applying the rate of 1.82% (17.4% discount to the growth rate of the province observed during the last census decade, 1980 to 1990).
- Population in 2010 with the base year of 2000 was projected applying the rate of 1.24% (31.9% discount to the growth rate of the province adopted for the years 1996 to 2000).
- Present profile of population distribution both in urban and rural areas is assumed to prevail through the future.
- Household size in the year 2000 is assumed to be the same as the 1990 population census results, while that in the year 2010 was assumed to be 4 persons/household for the whole province in accordance with the target of the national family planning.

Table 8.3.3 Growth Rates and Population Projection for Target Years: Region and Province

	Growth Rate (%)				Population and Provincial Share in the Region		
	1980 - 1990	1991 - 1995	1996 - 2000	2000 - 2010	1990	2000	2010
Region II	2.01	1.66 (17.4)		1.13 (31.9)	2,340,545	2,822,000	3,159,000
Nueva Vizcaya	2.20	2.20	1.82	1.24	301,179 12.9%	374,476 13.3%	424,008 13.4%

Note: ( ) shows percentage of growth rate decline from the previous period.

Table 8.3.4 shows provincial population by urban and rural area for the target years and the year 1995. Table 8.3.5 presents projected number of households for the target years.

Table 8.3.4 Provincial Population for Target Years

Area	Population/ Composition	1990	1995	2000	2010
Total	Population	301,179	341,847	374,476	424,008
Urban Area	Population	100,776	109,818	120,300	136,212
	Composition (%)	33	32	32	32
Rural Area	Population	200,403	232,029	254,176	287,796
	Composition (%)	67	68	68	68

Table 8.3.5 Projected Number of Households by Urban and Rural Area by Municipality by Target Year

Municipality	Household Size			Number of Households											
	1990			1990			1995			2000			2010		
	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Alfonso Castaneda	0.0	5.3	5.3	0	710	710	0	822	822	0	898	898	0	1,347	1,347
Ambaguio	0.0	5.6	5.6	0	1,294	1,294	0	1,773	1,773	0	1,941	1,941	0	3,077	3,077
Aritao	5.2	5.2	5.2	1,990	3,030	5,020	2,164	3,287	5,451	2,360	3,574	5,934	3,474	5,260	8,734
Bagabag	5.3	5.1	5.2	2,336	2,668	5,004	2,799	2,816	5,615	3,088	3,074	6,162	4,633	4,437	9,070
Bambang	5.0	5.1	5.0	2,353	4,322	6,675	2,623	4,944	7,567	2,890	5,364	8,254	4,090	7,744	11,834
Bayombong (Capital)	5.6	4.4	5.0	4,267	3,712	7,979	4,522	4,511	9,033	4,918	4,890	9,808	7,796	6,091	13,887
Diadi	5.3	5.2	5.2	312	1,873	2,185	366	2,144	2,510	399	2,340	2,739	599	3,444	4,043
Dupax del Norte	5.1	5.1	5.1	1,119	2,953	4,072	1,184	3,374	4,558	1,307	3,719	5,026	1,887	5,369	7,256
Dupax del Sur	5.4	5.4	5.4	597	1,675	2,272	632	1,942	2,574	694	2,131	2,825	1,062	3,257	4,319
Kasibu	0.0	5.2	5.2	0	4,151	4,151	0	4,956	4,956	0	5,389	5,389	0	7,933	7,933
Kayapa	5.3	5.4	5.4	125	3,365	3,490	139	3,757	3,896	154	4,081	4,235	231	6,239	6,470
Quezon	0.0	5.1	5.1	0	2,408	2,408	0	2,699	2,699	0	2,939	2,939	0	4,242	4,242
Santa Fe	5.7	5.2	5.3	227	1,669	1,896	239	2,161	2,400	262	2,363	2,625	424	3,478	3,902
Solano	5.0	5.0	5.0	5,257	3,616	8,873	5,539	4,240	9,779	6,024	4,663	10,687	8,525	6,600	15,125
Villaverde	5.5	5.3	5.4	680	1,849	2,529	778	2,080	2,858	856	2,287	3,143	1,333	3,431	4,764
Provincial Total	5.2	5.1	5.1	19,263	39,295	58,558	20,985	45,506	66,491	22,952	49,653	72,605	34,054	71,949	106,003

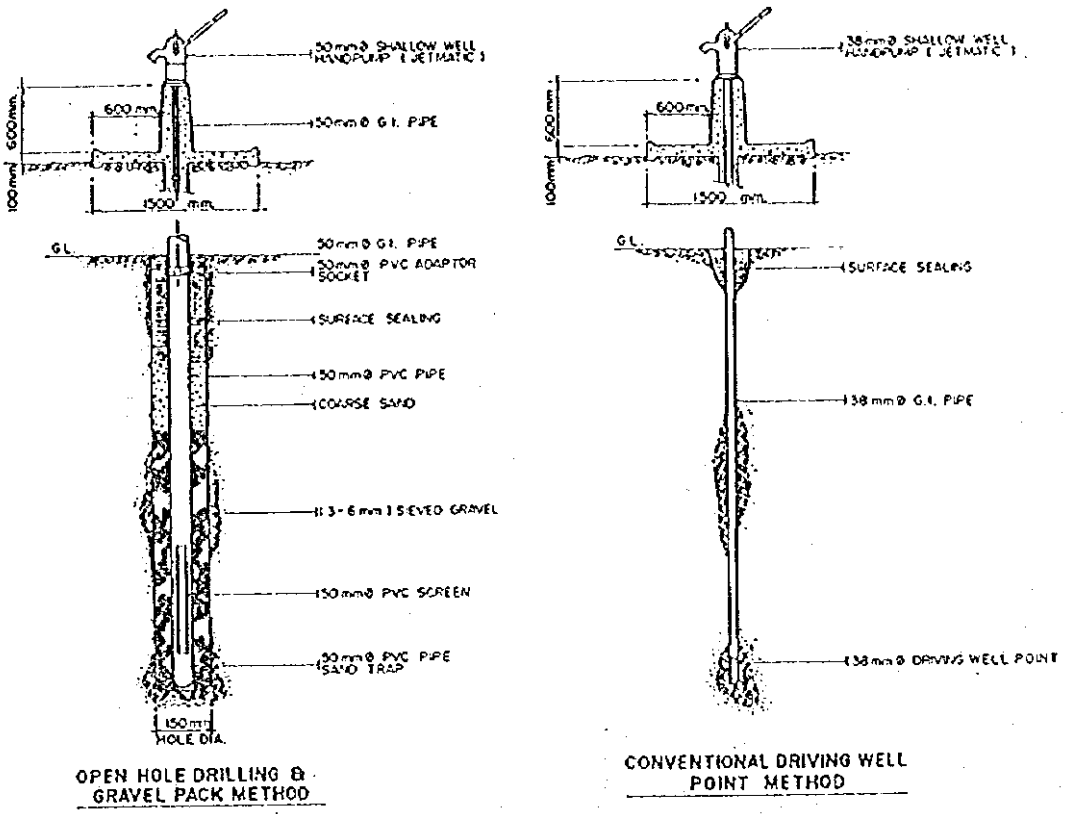
Table 8.3.6 Projected School Enrollment by Municipality by Target Year

Municipality	1995					2000					2010				
	School Age Population	Total Enrollment		Public School Enrollment		School Age Population	Total Enrollment		Public School Enrollment		School Age Population	Total Enrollment		Public School Enrollment	
		Number	Participation Rate	Number	Participation Rate		Number	Participation Rate	Number	Participation Rate		Number	Participation Rate	Number	Participation Rate
Alfonso Castaneda	1,193	1,003	84	1,003	84	1,307	1,163	89	1,046	80	1,432	1,203	84	1,203	84
Ambaguio	3,081	994	32	994	32	3,375	878	26	878	26	3,697	850	23	850	23
Aritao	7,679	6,855	89	4,460	58	8,412	7,655	91	4,963	59	9,215	9,399	102	6,082	66
Bagabag	8,015	6,004	75	4,728	59	8,780	6,409	73	5,092	58	9,618	7,598	79	5,963	62
Bambang	10,123	10,358	102	8,625	85	11,089	11,089	100	9,204	83	12,148	12,998	107	10,812	89
Bayombong (Capital)	11,703	10,051	86	8,970	77	12,820	10,769	84	9,615	75	14,044	12,780	91	11,376	81
Diadi	3,709	3,598	97	3,598	97	4,063	3,779	93	3,779	93	4,451	3,872	87	3,872	87
Dupax del Norte	6,355	4,899	77	4,899	77	6,961	5,290	76	5,290	76	7,625	6,329	83	6,329	83
Dupax del Sur	3,800	2,985	79	2,351	62	4,163	3,164	76	2,498	60	4,560	3,739	82	2,964	65
Kasibu	7,498	4,757	63	4,757	63	8,214	4,846	59	4,846	59	8,998	5,399	60	5,399	60
Kayapa	5,938	3,599	61	3,599	61	6,505	3,903	60	3,903	60	7,126	4,632	65	4,632	65
Quezon	3,915	2,868	73	2,868	73	4,289	3,088	72	3,088	72	4,698	3,664	78	3,289	70
Santa Fe	3,479	2,749	79	2,511	72	3,811	2,668	70	2,401	63	4,175	2,756	66	2,505	60
Solano	12,964	11,228	87	8,692	67	14,202	12,214	86	9,515	67	15,558	14,780	95	11,513	74
Villaverde	4,230	3,687	87	3,242	77	4,634	3,939	85	3,476	75	5,076	4,670	92	4,112	81
Provincial Total	93,682	75,635	81	65,297	70	102,625	80,854	79	69,594	68	112,421	94,669	84	80,901	72

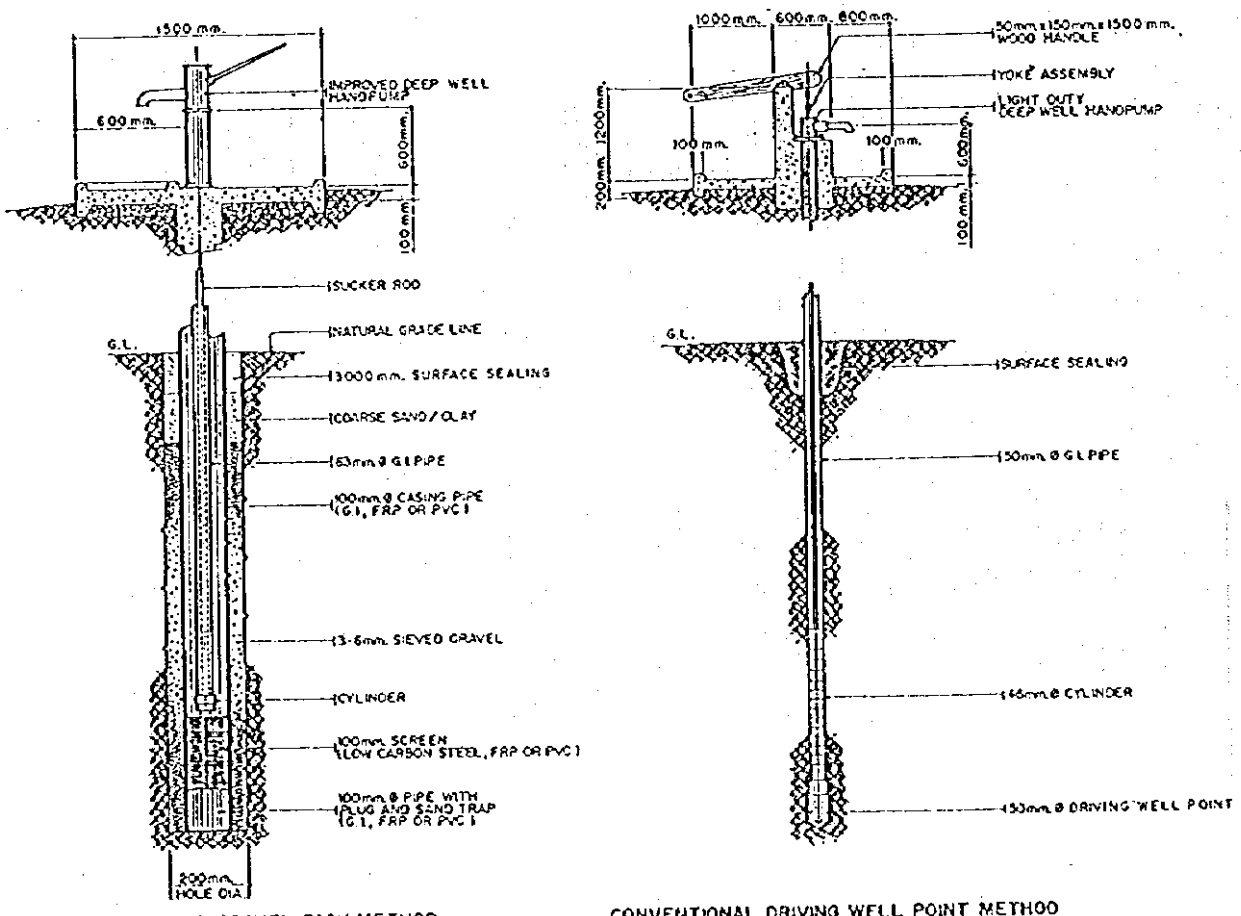
8.3.3 Projection of the Number of Public Utilities

Table 8.3.7 Projected Number of Public Utilities by Municipality by Target Year

Municipality	Type	1995	2000		2010	
		No. of Public Utilities	Proposed Construction	Total	Proposed Construction	Total
Alfonso Castaneda	Public Markets	1	0	1	0	1
	Bus/Jeep Term.	0	0	0	1	1
	Total	1	0	1	1	2
Ambaguio	Public Markets	1	0	1	0	1
	Bus/Jeep Term.	0	0	0	0	0
	Total	1	0	1	0	1
Aritao	Public Markets	1	0	1	0	1
	Bus/Jeep Term.	0	0	0	0	0
	Total	1	0	1	0	1
Bagabag	Public Markets	1	0	1	0	1
	Bus/Jeep Term.	1	0	1	0	1
	Total	2	0	2	0	2
Bambang	Public Markets	2	0	2	0	2
	Bus/Jeep Term.	0	0	0	1	1
	Total	2	0	2	1	3
Bayombong (Capital)	Public Markets	2	0	2	0	2
	Bus/Jeep Term.	0	0	0	1	1
	Total	2	0	2	1	3
Diadi	Public Markets	1	0	1	0	1
	Bus/Jeep Term.	0	0	0	0	0
	Total	1	0	1	0	1
Dupax del Norte	Public Markets	3	0	3	0	3
	Bus/Jeep Term.	0	0	0	0	0
	Total	3	0	3	0	3
Dupax del Sur	Public Markets	1	0	1	0	1
	Bus/Jeep Term.	0	0	0	0	0
	Total	1	0	1	0	1
Kasibu	Public Markets	1	0	1	0	1
	Bus/Jeep Term.	0	0	0	1	1
	Total	1	0	1	1	2
Kayapa	Public Markets	4	0	4	0	4
	Bus/Jeep Term.	0	0	0	1	1
	Total	4	0	4	1	5
Quezon	Public Markets	0	0	0	1	1
	Bus/Jeep Term.	0	0	0	0	0
	Total	0	0	0	1	1
Santa Fe	Public Markets	5	0	5	0	5
	Bus/Jeep Term.	0	0	0	0	0
	Total	5	0	5	0	5
Solano	Public Markets	1	0	1	1	2
	Bus/Jeep Term.	1	1	2	2	4
	Total	2	1	3	3	6
Villaverde	Public Markets	1	0	1	0	1
	Bus/Jeep Term.	0	0	0	0	0
	Total	1	0	1	0	1
Provincial Total	Public Markets	25	0	25	2	27
	Bus/Jeep Term.	2	1	3	7	10
	Total	27	1	28	9	37



SHALLOW WELLS



DEEP WELLS

FIGURE 8.4.1
STANDARD STRUCTURE OF LEVEL I WELLS

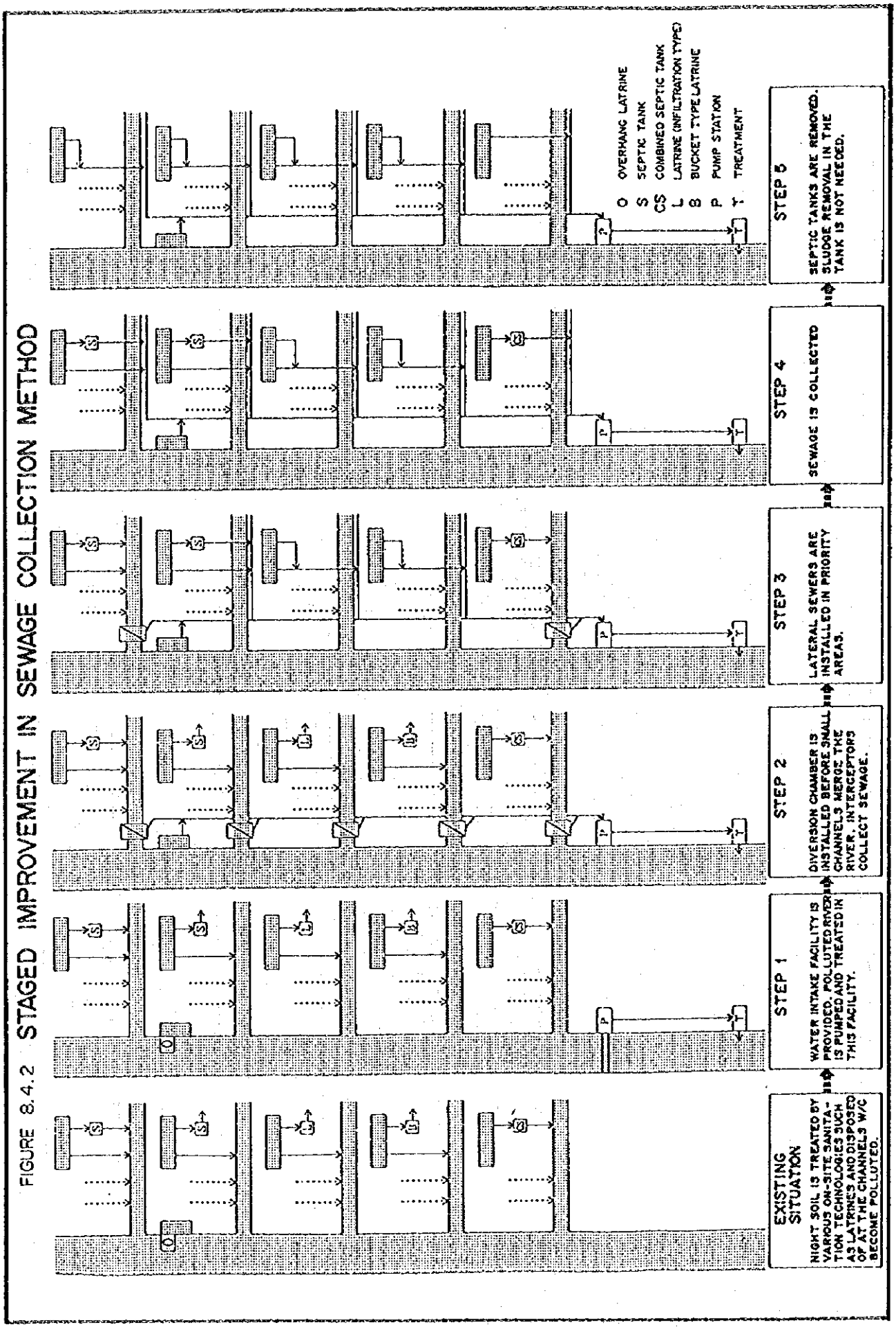


FIGURE 8.4.2 STAGED IMPROVEMENT IN SEWAGE COLLECTION METHOD
EXISTING SITUATION
NIGHT SOIL IS TREATED BY VARIOUS ON-SITE SANITATION TECHNOLOGIES SUCH AS LATRINES AND DISPOSED OF AT THE CHANNELS W/C BECOME POLLUTED.
STEP 1
WATER INTAKE FACILITY IS PROVIDED. POLLUTED RIVER IS PUMPED AND TREATED IN THIS FACILITY.
STEP 2
DIVERSION CHAMBER IS INSTALLED BEFORE SMALL CHANNELS MERGE THE RIVER. INTERCEPTORS COLLECT SEWAGE.
STEP 3
LATERAL SEWERS ARE INSTALLED IN PRIORITY AREAS.
STEP 4
SEWAGE IS COLLECTED
STEP 5
SEPTIC TANKS ARE REMOVED. SLUDGE REMOVAL IN THE TANK IS NOT NEEDED.
O OVERHANG LATRINE
S SEPTIC TANK
CS COMBINED SEPTIC TANK
L LATRINE (INFILTRATION TYPE)
B BUCKET TYPE LATRINE
P PUMP STATION
T TREATMENT

8.5 Service Coverage by Target Year

8.5.1 Water Supply

(1) Population to be served by Level II system in Phase I

Six (6) untapped spring sources were confirmed to be suitable for Level II systems in rural water supply by the time of PW4SP preparation as shown in Table 8.5.1. Conditions and assumptions applied for this estimate are as follows:

Table 8.5.1 Potential Population to be Served by Level II System in Phase I

Municipality	Number of Untapped Spring	Number of Barangay to be Served	Potential Number of Households to be Served	Population to be Served
Alfonso Castaneda	0	0	0	0
Ambaguio	0	0	0	0
Aritao	0	0	0	0
Bagabag	0	0	0	0
Bambang	0	0	0	0
Bayombong (Capital)	0	0	0	0
Diadi	4	4	400	2,080
Dupax del Norte	2	2	200	1,020
Dupax del Sur	0	0	0	0
Kasibu	0	0	0	0
Kayapa	0	0	0	0
Quezon	0	0	0	0
Santa Fe	0	0	0	0
Solano	0	0	0	0
Villaverde	0	0	0	0
Provincial Total	6	6	600	3,100

Source capacity:

The average source capacity of untapped spring was assumed to meet the need of 100 households based on the review of existing Level II systems with spring sources.

Number of system:

Six (6) untapped springs were considered to serve six (6) Level II systems in six (6) rural barangays of 2 municipalities.

(2) Population to be served by target year

Phase I

For urban area, the additional service coverage was estimated to be served by Level III service. For rural area, the population to be served by Level II systems with untapped springs was first calculated and the rest of additional service coverage was estimated to be served by Level I facilities.

Phase II

For urban area, the population served by Level I and II facilities in base year was considered to be absorbed by Level III service aside from the additional service coverage to be estimated by the sector target. For rural area, all existing facilities in Phase I was assumed to be utilized through the future.

The population to be served by target year is exhibited in Table 8.5.2 and Table 8.5.3.

Table 8.5.2 Population to be Served in Phase I (Water Supply)

Municipalities	Type	Population Served in the Base Year				Phase I Coverage (2000)								
						Total Population	Service Coverage				Additional Population to be Served			
		Level III	Level II	Level I	Total		Total	Level III	Level II	Level I	Level III	Level II	Level I	Total
Alfonso Castaneda	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	0	1,890	593	2,483	4,759	4,045	0	1,890	2,155	0	0	1,562	1,562
	Total	0	1,890	593	2,483	4,759	4,045	0	1,890	2,155	0	0	1,562	1,562
Ambaguio	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	0	991	717	1,708	10,870	9,240	0	991	8,249	0	0	7,532	7,532
	Total	0	991	717	1,708	10,870	9,240	0	991	8,249	0	0	7,532	7,532
Aritao	Urban	1,626	0	8,350	9,976	12,274	11,047	2,697	0	8,350	1,071	0	0	1,071
	Rural	708	4,183	7,230	12,121	18,583	15,796	708	4,183	10,905	0	0	3,675	3,675
	Total	2,334	4,183	15,580	22,097	30,857	26,843	3,405	4,183	19,255	1,071	0	3,675	4,746
Bagabag	Urban	2,035	0	11,015	13,050	16,368	14,731	3,716	0	11,015	1,681	0	0	1,681
	Rural	0	954	10,433	11,387	15,676	13,325	0	954	12,371	0	0	1,938	1,938
	Total	2,035	954	21,448	24,437	32,044	28,056	3,716	954	23,386	1,681	0	1,938	3,619
Bambang	Urban	0	0	10,934	10,934	14,449	13,004	2,070	0	10,934	2,070	0	0	2,070
	Rural	0	1,258	18,375	19,633	27,358	23,254	0	1,258	21,996	0	0	3,621	3,621
	Total	0	1,258	29,309	30,567	41,807	36,258	2,070	1,258	32,930	2,070	0	3,621	5,691
Bayombong (Capital)	Urban	6,599	275	15,143	22,017	27,540	24,786	9,368	275	15,143	2,769	0	0	2,769
	Rural	2,268	103	14,598	16,969	21,518	18,290	2,268	103	15,919	0	0	1,321	1,321
	Total	8,867	378	29,741	38,986	49,058	43,076	11,636	378	31,062	2,769	0	1,321	4,090
Diadi	Urban	0	0	1,718	1,718	2,115	1,904	186	0	1,718	186	0	0	186
	Rural	0	450	5,858	6,308	12,167	10,342	0	2,530	7,812	0	2,080	1,954	4,034
	Total	0	450	7,576	8,026	14,282	12,246	186	2,530	9,530	186	2,080	1,954	4,220
Dupax del Norte	Urban	0	1,250	3,596	4,846	6,665	5,999	1,153	1,250	3,596	1,153	0	0	1,153
	Rural	0	2,996	4,406	7,402	18,968	16,123	0	4,016	12,107	0	1,020	7,701	8,721
	Total	0	4,246	8,002	12,248	25,633	22,122	1,153	5,266	15,703	1,153	1,020	7,701	9,874
Dupax del Sur	Urban	0	0	2,897	2,897	3,750	3,375	478	0	2,897	478	0	0	478
	Rural	0	1,407	2,177	3,584	11,507	9,781	0	1,407	8,374	0	0	6,197	6,197
	Total	0	1,407	5,074	6,481	15,257	13,156	478	1,407	11,271	478	0	6,197	6,675
Kasibu	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	0	1,377	3,414	4,791	28,023	23,820	0	1,377	22,443	0	0	19,029	19,029
	Total	0	1,377	3,414	4,791	28,023	23,820	0	1,377	22,443	0	0	19,029	19,029
Kayapa	Urban	0	667	0	667	815	734	67	667	0	67	0	0	67
	Rural	0	7,319	4,745	12,064	22,039	18,733	0	7,319	11,414	0	0	6,669	6,669
	Total	0	7,986	4,745	12,731	22,854	19,467	67	7,986	11,414	67	0	6,669	6,736
Quezon	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	0	92	5,024	5,116	14,987	12,739	0	92	12,647	0	0	7,623	7,623
	Total	0	92	5,024	5,116	14,987	12,739	0	92	12,647	0	0	7,623	7,623
Santa Fe	Urban	0	0	1,040	1,040	1,496	1,346	306	0	1,040	306	0	0	306
	Rural	0	4,235	1,201	5,436	12,287	10,444	0	4,235	6,209	0	0	5,008	5,008
	Total	0	4,235	2,241	6,476	13,783	11,790	306	4,235	7,249	306	0	5,008	5,314
Solano	Urban	4,970	100	18,598	23,668	30,118	27,106	8,408	100	18,598	3,438	0	0	3,438
	Rural	0	558	16,343	16,901	23,314	19,817	0	558	19,259	0	0	2,916	2,916
	Total	4,970	658	34,941	40,569	53,432	46,923	8,408	658	37,857	3,438	0	2,916	6,354
Villaverde	Urban	0	0	3,556	3,556	4,710	4,239	683	0	3,556	683	0	0	683
	Rural	0	239	8,143	8,382	12,120	10,302	0	239	10,063	0	0	1,920	1,920
	Total	0	239	11,699	11,938	16,830	14,541	683	239	13,619	683	0	1,920	2,603
Provincial Total	Urban	15,230	2,292	76,847	94,369	120,300	108,271	29,132	2,292	76,847	13,902	0	0	13,902
	Rural	2,976	28,052	103,257	134,285	254,176	216,051	2,976	31,152	181,923	0	3,100	78,666	81,766
	Total	18,206	30,344	180,104	228,654	374,476	324,322	32,108	33,444	258,770	13,902	3,100	78,666	95,668

Table 8.5.3 Population to be Served in Phase II (Water Supply)

Municipalities	Type	Population Served in 2000				Total Population	Phase II Coverage (2010)							
							Service Coverage				Additional Population to be Served			
		Level III	Level II	Level I	Total		Total	Level III	Level II	Level I	Level III	Level II	Level I	Total
Alfonso Castaneda	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	0	1,890	2,155	4,045	5,388	5,119	0	1,890	3,229	0	0	1,074	1,074
	Total	0	1,890	2,155	4,045	5,388	5,119	0	1,890	3,229	0	0	1,074	1,074
Ambaguio	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	0	991	8,249	9,240	12,308	11,693	0	991	10,702	0	0	2,453	2,453
	Total	0	991	8,249	9,240	12,308	11,693	0	991	10,702	0	0	2,453	2,453
Antao	Urban	2,697	0	8,350	11,047	13,897	13,202	13,202	0	0	10,505	0	0	10,505
	Rural	708	4,183	10,905	15,796	21,041	19,989	708	4,183	15,098	0	0	4,193	4,193
	Total	3,405	4,183	19,255	26,843	34,938	33,191	13,910	4,183	15,098	10,505	0	4,193	14,698
Bagabag	Urban	3,716	0	11,015	14,731	18,533	17,606	17,606	0	0	13,890	0	0	13,890
	Rural	0	954	12,371	13,325	17,749	16,862	0	954	15,908	0	0	3,537	3,537
	Total	3,716	954	23,386	28,056	36,282	34,468	17,606	954	15,908	13,890	0	3,537	17,427
Bambang	Urban	2,070	0	10,934	13,004	16,360	15,542	15,542	0	0	13,472	0	0	13,472
	Rural	0	1,258	21,996	23,254	30,977	29,428	0	1,258	28,170	0	0	6,174	6,174
	Total	2,070	1,258	32,930	36,258	47,337	44,970	15,542	1,258	28,170	13,472	0	6,174	19,646
Bayombong (Capital)	Urban	9,368	275	15,143	24,786	31,184	29,625	29,625	0	0	20,257	0	0	20,257
	Rural	2,268	103	15,919	18,290	24,365	23,147	2,268	103	20,776	0	0	4,857	4,857
	Total	11,636	378	31,062	43,076	55,549	52,772	31,893	103	20,776	20,257	0	4,857	25,114
Diadi	Urban	186	0	1,718	1,904	2,395	2,275	2,275	0	0	2,089	0	0	2,089
	Rural	0	2,530	7,812	10,342	13,776	13,087	0	2,530	10,557	0	0	2,745	2,745
	Total	186	2,530	9,530	12,246	16,171	15,362	2,275	2,530	10,557	2,089	0	2,745	4,834
Dupax del Norte	Urban	1,153	1,250	3,596	5,999	7,546	7,169	7,169	0	0	6,016	0	0	6,016
	Rural	0	4,016	12,107	16,123	21,477	20,403	0	4,016	16,387	0	0	4,280	4,280
	Total	1,153	5,266	15,703	22,122	29,023	27,572	7,169	4,016	16,387	6,016	0	4,280	10,296
Dupax del Sur	Urban	478	0	2,897	3,375	4,246	4,034	4,034	0	0	3,556	0	0	3,556
	Rural	0	1,407	8,374	9,781	13,029	12,378	0	1,407	10,971	0	0	2,597	2,597
	Total	478	1,407	11,271	13,156	17,275	16,412	4,034	1,407	10,971	3,556	0	2,597	6,153
Kasibu	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	0	1,377	22,443	23,820	31,730	30,144	0	1,377	28,767	0	0	6,324	6,324
	Total	0	1,377	22,443	23,820	31,730	30,144	0	1,377	28,767	0	0	6,324	6,324
Kayapa	Urban	67	667	0	734	923	877	877	0	0	810	0	0	810
	Rural	0	7,319	11,414	18,733	24,954	23,706	0	7,319	16,387	0	0	4,973	4,973
	Total	67	7,986	11,414	19,467	25,877	24,583	877	7,319	16,387	810	0	4,973	5,783
Quezon	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	0	92	12,647	12,739	16,969	16,121	0	92	16,029	0	0	3,382	3,382
	Total	0	92	12,647	12,739	16,969	16,121	0	92	16,029	0	0	3,382	3,382
Santa Fe	Urban	306	0	1,040	1,346	1,694	1,609	1,609	0	0	1,303	0	0	1,303
	Rural	0	4,235	6,209	10,444	13,912	13,216	0	4,235	8,981	0	0	2,772	2,772
	Total	306	4,235	7,249	11,790	15,606	14,825	1,609	4,235	8,981	1,303	0	2,772	4,075
Solano	Urban	8,408	100	18,598	27,106	34,101	32,396	32,396	0	0	23,988	0	0	23,988
	Rural	0	558	19,259	19,817	26,398	25,078	0	558	24,520	0	0	5,261	5,261
	Total	8,408	658	37,857	46,923	60,499	57,474	32,396	558	24,520	23,988	0	5,261	29,249
Villaverde	Urban	683	0	3,556	4,239	5,333	5,066	5,066	0	0	4,383	0	0	4,383
	Rural	0	239	10,063	10,302	13,723	13,037	0	239	12,798	0	0	2,735	2,735
	Total	683	239	13,619	14,541	19,056	18,103	5,066	239	12,798	4,383	0	2,735	7,118
Provincial Total	Urban	29,132	2,292	76,847	108,271	136,212	129,401	129,401	0	0	100,269	0	0	100,269
	Rural	2,976	31,152	181,923	216,051	287,796	273,408	2,976	31,152	239,280	0	0	57,357	57,357
	Total	32,108	33,444	258,770	324,322	424,008	402,809	132,377	31,152	239,280	100,269	0	57,357	157,626

Table 8.5.4 Additional Number of Households to be Served in Phase I (Household Toilets)

Municipality	Area	No. of Households Served in the Base Year				No. of Households in 2000	Phase I Coverage (2000)							
							Household Coverage				Additional No. of Households to be Served			
		Flush	Pour Flush	VIP Latrine	Total		Flush	Pour Flush	VIP Latrine	Total	Flush	Pour Flush	VIP Latrine	Total
Alfonso Castaneda	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	0	361	137	498	898	0	703	78	781	0	342	0	342
	Total	0	361	137	498	898	0	703	78	781	0	342	0	342
Ambaguio	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	0	227	541	768	1,941	0	1,520	169	1,689	0	1,293	0	1,293
	Total	0	227	541	768	1,941	0	1,520	169	1,689	0	1,293	0	1,293
Aritao	Urban	50	1,678	0	1,728	2,360	205	1,848	0	2,053	155	170	0	325
	Rural	5	2,250	0	2,255	3,574	136	2,662	311	3,109	131	412	311	854
	Total	55	3,928	0	3,983	5,934	341	4,510	311	5,162	286	582	311	1,179
Bagabag	Urban	58	2,249	264	2,571	3,088	269	2,418	0	2,687	211	169	0	380
	Rural	0	1,985	192	2,177	3,074	0	2,407	267	2,674	0	422	75	497
	Total	58	4,234	456	4,748	6,162	269	4,825	267	5,361	211	591	75	877
Bambang	Urban	58	2,129	0	2,187	2,890	251	2,263	0	2,514	193	134	0	327
	Rural	14	3,424	358	3,796	5,364	14	4,186	467	4,667	0	762	109	871
	Total	72	5,553	358	5,983	8,254	265	6,449	467	7,181	193	896	109	1,198
Bayombong (Capital)	Urban	153	3,832	24	4,009	4,918	428	3,851	0	4,279	275	191	0	294
	Rural	26	2,616	143	2,785	4,890	213	3,616	425	4,254	187	1,000	282	1,469
	Total	179	6,448	167	6,794	9,808	641	7,467	425	8,533	462	1,019	282	1,763
Diadi	Urban	0	144	117	261	399	35	312	0	347	35	168	0	203
	Rural	0	837	333	1,170	2,340	0	1,832	204	2,036	0	995	0	995
	Total	0	981	450	1,431	2,739	35	2,144	204	2,383	35	1,163	0	1,198
Dupax del Norte	Urban	0	1,097	0	1,097	1,307	114	1,023	0	1,137	114	0	0	114
	Rural	0	3,050	0	3,050	3,719	0	2,912	324	3,236	0	0	324	324
	Total	0	4,147	0	4,147	5,026	114	3,935	324	4,373	114	0	324	438
Dupax del Sur	Urban	6	622	0	628	694	60	544	0	604	54	0	0	54
	Rural	0	892	85	977	2,131	0	1,669	185	1,854	0	777	100	877
	Total	6	1,514	85	1,605	2,825	60	2,213	185	2,458	54	777	100	931
Kasibu	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	0	2,261	663	2,924	5,389	0	4,219	469	4,688	0	1,958	0	1,958
	Total	0	2,261	663	2,924	5,389	0	4,219	469	4,688	0	1,958	0	1,958
Kayapa	Urban	4	135	0	139	154	13	121	0	134	9	0	0	9
	Rural	2	1,335	387	1,724	4,081	2	3,193	355	3,550	0	1,858	0	1,858
	Total	6	1,470	387	1,863	4,235	15	3,314	355	3,684	9	1,858	0	1,867
Quezon	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	0	1,308	707	2,015	2,939	0	2,301	256	2,557	0	993	0	993
	Total	0	1,308	707	2,015	2,939	0	2,301	256	2,557	0	993	0	993
Santa Fe	Urban	25	155	8	188	262	25	203	0	228	0	48	0	48
	Rural	0	937	190	1,127	2,363	0	1,850	206	2,056	0	913	16	929
	Total	25	1,092	198	1,315	2,625	25	2,053	206	2,284	0	961	16	977
Solano	Urban	358	3,838	646	4,842	6,024	524	4,717	0	5,241	166	879	0	1,045
	Rural	7	3,416	364	3,787	4,663	7	3,643	406	4,057	0	228	42	270
	Total	365	7,254	1,010	8,629	10,687	531	8,361	406	9,298	166	1,107	42	1,315
Villaverde	Urban	25	650	0	675	856	74	671	0	745	49	21	0	70
	Rural	14	979	480	1,473	2,287	14	1,777	199	1,990	0	798	0	798
	Total	39	1,629	480	2,148	3,143	88	2,448	199	2,735	49	819	0	868
Provincial Total	Urban	737	16,529	1,059	18,325	22,952	1,998	17,971	0	19,969	1,261	1,608	0	2,869
	Rural	68	25,878	4,580	40,526	49,653	386	38,491	4,321	43,198	318	12,751	1,259	14,328
	Total	805	42,407	5,639	58,851	72,605	2,384	56,462	4,321	63,167	1,579	14,359	1,259	17,197

Table 8.5.5 Additional Number of Households to be Served in Phase II (Household Toilets)

Municipality	Area	No. of Households Served in 2000				No. of Households in 2010	Phase II Coverage (2010)							
							Households Coverage				Add'l No. of Households to be Served			
		Flush	Pour Flush	VIP Latrine	Total		Flush	Pour Flush	VIP Flush	Total	Flush	Pour Flush	VIP Flush	Total
Alfonso Castaneda	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	0	703	78	781	1,347	0	1,266	0	1,266	0	563	0	563
	Total	0	703	78	781	1,347	0	1,266	0	1,266	0	563	0	563
Ambaguio	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	0	1,520	169	1,689	3,077	0	2,892	0	2,892	0	1,372	0	1,372
	Total	0	1,520	169	1,689	3,077	0	2,892	0	2,892	0	1,372	0	1,372
Aritao	Urban	205	1,848	0	2,053	3,474	1,633	1,633	0	3,266	1,428	0	0	1,428
	Rural	136	2,662	311	3,109	5,260	177	4,767	0	4,944	41	2,105	0	2,146
	Total	341	4,510	311	5,162	8,734	1,810	6,400	0	8,210	1,469	2,105	0	3,574
Bagabag	Urban	269	2,418	0	2,687	4,633	2,178	2,177	0	4,355	1,909	0	0	1,909
	Rural	0	2,407	267	2,674	4,437	0	4,171	0	4,171	0	1,764	0	1,764
	Total	269	4,825	267	5,361	9,070	2,178	6,348	0	8,526	1,909	1,764	0	3,673
Bambang	Urban	251	2,263	0	2,514	4,090	1,922	1,923	0	3,845	1,671	0	0	1,671
	Rural	14	4,186	467	4,667	7,744	14	7,265	0	7,279	0	4,079	0	4,079
	Total	265	6,449	467	7,181	11,834	1,936	9,188	0	11,124	1,671	3,079	0	4,750
Bayombong (Capital)	Urban	428	3,851	0	4,279	7,796	3,664	3,664	0	7,328	3,236	0	0	3,236
	Rural	213	3,616	425	4,254	6,091	567	5,159	0	5,726	354	1,543	0	1,897
	Total	641	7,467	425	8,533	13,887	4,231	8,823	0	13,054	3,590	1,543	0	5,133
Diadi	Urban	35	312	0	347	599	282	281	0	563	247	0	0	247
	Rural	0	1,832	204	2,036	3,444	0	3,237	0	3,237	0	1,405	0	1,405
	Total	35	2,144	204	2,383	4,043	282	3,518	0	3,800	247	1,405	0	1,652
Dupax del Norte	Urban	114	1,023	0	1,137	1,887	887	887	0	1,774	773	0	0	773
	Rural	0	2,912	324	3,236	5,369	0	5,047	0	5,047	0	2,135	0	2,135
	Total	114	3,935	324	4,373	7,256	887	5,934	0	6,821	773	2,135	0	2,908
Dupax del Sur	Urban	60	544	0	604	1,062	499	499	0	998	439	0	0	439
	Rural	0	1,669	185	1,854	3,257	0	3,062	0	3,062	0	1,393	0	1,393
	Total	60	2,213	185	2,458	4,319	499	3,561	0	4,060	439	1,393	0	1,832
Kasibu	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	0	4,219	469	4,688	7,933	0	7,457	0	7,457	0	3,238	0	3,238
	Total	0	4,219	469	4,688	7,933	0	7,457	0	7,457	0	3,238	0	3,238
Kayapa	Urban	13	121	0	134	241	109	108	0	217	96	0	0	96
	Rural	2	3,193	355	3,550	6,239	2	5,863	0	5,865	0	2,670	0	2,670
	Total	15	3,314	355	3,684	6,470	111	5,971	0	6,082	96	2,670	0	2,766
Quezon	Urban	0	0	0	0	0	0	0	0	0	0	0	0	0
	Rural	0	2,301	256	2,557	4,242	0	3,987	0	3,987	0	1,686	0	1,686
	Total	0	2,301	256	2,557	4,242	0	3,987	0	3,987	0	1,686	0	1,686
Santa Fe	Urban	25	203	0	228	424	199	200	0	399	174	0	0	174
	Rural	0	1,850	206	2,056	3,478	0	3,269	0	3,269	0	1,419	0	1,419
	Total	25	2,053	206	2,284	3,902	199	3,469	0	3,668	174	1,419	0	1,593
Solano	Urban	524	4,717	0	5,241	8,525	4,007	4,007	0	8,014	3,483	0	0	3,483
	Rural	7	3,644	406	4,057	6,600	7	6,197	0	6,204	0	2,553	0	2,553
	Total	531	8,361	406	9,298	15,125	4,014	10,204	0	14,218	3,483	2,553	0	6,036
Villaverde	Urban	74	671	0	745	1,333	627	626	0	1,253	553	0	0	553
	Rural	14	1,777	199	1,990	3,431	14	3,211	0	3,225	0	1,434	0	1,434
	Total	88	2,448	199	2,735	4,764	641	3,837	0	4,478	553	1,434	0	1,987
Provincial Total	Urban	1,998	17,971	0	19,969	34,054	16,007	16,005	0	32,012	14,009	0	0	14,009
	Rural	386	38,491	4,321	43,198	71,949	781	66,850	0	67,631	395	28,359	0	28,754
	Total	2,384	56,462	4,321	63,167	106,003	16,788	82,855	0	99,643	14,404	28,359	0	42,763

Table 8.5.6 Additional Number of Public School Students to be Served in Phases I and II (School Toilets)

Municipality	Std. No. of Public School Student that can be Served in the Base Year	Projected No. of Public School Students in 2000	Phase I Coverage (2000)		Std. No. of Public School Students that can be Served in 2000	Projected No. of Public School Students in 2010	Phase II Coverage (2010)	
			Public School Students Coverage	Add'l No. of Public School Students to be Served			Public School Students Coverage	Add'l No. of Public School Students to be Served
Alfonso Castaneda	550	1,046	732	182	732	1,203	1,083	351
Ambaguio	0	878	615	615	615	850	765	150
Aritao	3,750	4,963	3,474	0	3,474	6,082	5,474	2,000
Bagabag	4,728	5,092	3,564	0	3,564	5,963	5,367	1,803
Bambang	6,200	9,204	6,443	243	6,443	10,812	9,731	3,288
Bayombong (Capital)	3,950	9,615	6,731	2,781	6,731	11,376	10,238	3,507
Diadi	2,400	3,779	2,645	245	2,645	3,872	3,485	840
Dupax del Norte	1,400	5,290	3,703	2,303	3,703	6,329	5,696	1,993
Dupax del Sur	600	2,498	1,749	1,149	1,749	2,964	2,668	919
Kasibu	500	4,846	3,392	2,892	3,392	5,399	4,859	1,467
Kayapa	1,950	3,903	2,732	782	2,732	4,632	4,169	1,437
Quezon	2,500	3,088	2,162	0	2,162	3,289	2,960	798
Santa Fe	1,300	2,401	1,681	381	1,681	2,505	2,255	574
Solano	4,150	9,515	6,661	2,511	6,661	11,513	10,362	3,701
Villaverde	1,800	3,476	2,433	633	2,433	4,112	3,701	1,268
Provincial Total	35,778	69,594	48,717	14,717	48,717	80,901	72,813	24,096

Table 8.5.7 Number of Public Utilities with Sanitary Toilets in Phases I and II

Municipality	Type	Coverage in 1995		Phase I Coverage (2000)			No. of PU with Sanitary Toilets in 2000	Phase II Coverage (2010)		
		No. of PU	No. of PU with Sanitary Toilet	No. of PU	Add'l No. of Public Utilities with Sanitary Toilet	No. of PU with Sanitary Toilet		No. of PU	Add'l No. of Public Utilities with Sanitary Toilet	No. of PU with Sanitary Toilet
Alfonso Castaneda	Public Market	1	1	1	0	1	1	1	0	1
	Bus/Jeep Term.	0	0	0	0	0	0	1	1	1
	Total	1	1	1	0	1	1	2	1	2
Ambaguio	Public Market	1	0	1	1	1	1	1	0	1
	Bus/Jeep Term.	0	0	0	0	0	0	0	0	0
	Total	1	0	1	1	1	1	1	0	1
Aritao	Public Market	1	1	1	0	1	1	1	0	1
	Bus/Jeep Term.	0	0	0	0	0	0	0	0	0
	Total	1	1	1	0	1	1	1	0	1
Bagabag	Public Market	1	1	1	0	1	1	1	0	1
	Bus/Jeep Term.	1	1	1	0	1	1	1	0	1
	Total	2	2	2	0	2	2	2	0	2
Bambang	Public Market	2	1	2	1	2	2	2	0	2
	Bus/Jeep Term.	0	0	0	0	0	0	1	1	1
	Total	2	1	2	1	2	2	3	1	3
Bayombong (Capital)	Public Market	2	1	2	1	2	2	2	0	2
	Bus/Jeep Term.	0	0	0	0	0	0	1	1	1
	Total	2	1	2	1	2	2	3	1	3
Diadi	Public Market	1	1	1	0	1	1	1	0	1
	Bus/Jeep Term.	0	0	0	0	0	0	0	0	0
	Total	1	1	1	0	1	1	1	0	1
Dupax del Norte	Public Market	3	1	3	2	3	3	3	0	3
	Bus/Jeep Term.	0	0	0	0	0	0	0	0	0
	Total	3	1	3	2	3	3	3	0	3
Dupax del Sur	Public Market	1	1	1	0	1	1	1	0	1
	Bus/Jeep Term.	0	0	0	0	0	0	0	0	0
	Total	1	1	1	0	1	1	1	0	1
Kasibu	Public Market	1	1	1	0	1	1	1	0	1
	Bus/Jeep Term.	0	0	0	0	0	0	1	1	1
	Total	1	1	1	0	1	1	2	1	2
Kayapa	Public Market	4	1	4	2	3	3	4	1	4
	Bus/Jeep Term.	0	0	0	0	0	0	1	1	1
	Total	4	1	4	2	3	3	5	2	5
Quezon	Public Market	0	0	0	0	0	0	1	1	1
	Bus/Jeep Term.	0	0	0	0	0	0	0	0	0
	Total	0	0	0	0	0	0	1	1	1
Santa Fe	Public Market	5	1	5	3	4	4	5	1	5
	Bus/Jeep Term.	0	0	0	0	0	0	0	0	0
	Total	5	1	5	3	4	4	5	1	5
Solano	Public Market	1	1	1	0	1	1	2	1	2
	Bus/Jeep Term.	1	1	2	1	2	2	4	2	4
	Total	2	2	3	1	3	3	6	3	6
Villaverde	Public Market	1	0	1	1	1	1	1	0	1
	Bus/Jeep Term.	0	0	0	0	0	0	0	0	0
	Total	1	0	1	1	1	1	1	0	1
Provincial Total	Public Market	25	12	25	11	23	23	27	4	27
	Bus/Jeep Term.	2	2	3	1	3	3	10	7	10
	Total	27	14	28	12	26	26	37	11	37

Note: PU - Public Utilities

8.6 Facilities, Equipment and Rehabilitation Required to Meet the Target Services

8.6.1 Water Supply

(1) Required water supply facilities

Urban water supply:

Urban water supply facilities required by target year shown in Table 8.6.1 were estimated as the required number of house connections based on the additional service coverage.

As reference, the following requirements were also estimated:

- daily average water demand at 100 lpcd consumption rate, and
- number of deep wells to meet the daily maximum water demand based on the groundwater productivity.
  (daily maximum water demand = 1.3 x daily average water demand)

Information pertaining to the expansion plan of Level III systems was arranged to be indicated in Table 8.6.1 and details in Table 8.6.2, however, no information was available during this PW4SP preparation.

Rural water supply:

Rural water supply facilities required by target year shown in Table 8.6.3 were estimated as the number of Level II systems with number of communal faucets and the number of Level I wells broken-down to deep and shallow wells. Six (6) untapped springs suitable for Level II system were confirmed during this PW4SP preparation.

(2) Required well drilling and rehabilitation equipment

Presently, only one unit of truck-mounted percussion drilling rig is available at DPWH-DEO in the province.

Taking into account the maximum utilization of existing equipment, additional number of required equipment is estimated as described below.

Applicable type of well drilling equipment is determined considering the geological formation of the province that 50% of target area is medium to hard formation suitable to percussion type and the rest is soft to medium formation suitable to rotary type. Idling time for equipment overhauling/maintenance and rest days of workers are considered at 25% of the year.

Table 8.6.1 Urban Water Supply Facilities Required by Target Year

Municipality	Reference on Expansion of Existing Level III System						Phase I (2000) Requirements				Phase II (2010) Requirements			
	Name of Sytem (Operating Body)	Type	Coverage in 1995		Type of Water Sources[1]	Plan for Expansions[2]	Additional Population to be Served	Number of House Connections	Daily Average Water Demand (cu. m/day)	Number of Deep Well	Additional Population to be Served	Number of House Connections	Daily Average Water Demand (cu. m/day)	Number of Deep Well
			No. of Brgy.	Served Population										
Alfonso Castaneda	None	Urban	N.A.	N.A.	N.A.	None	0	0	0	0	0	0	0	0
		Rural	N.A.	N.A.										
		Total	N.A.	N.A.										
Ambaguio	None	Urban	N.A.	N.A.	N.A.	None	0	0	0	0	0	0	0	0
		Rural	N.A.	N.A.										
		Total	N.A.	N.A.										
Aritao	Arwasa, Inc.	Urban	1	1,626	SP	None	1,071	206	107	1	10,505	2,626	1,051	1
		Rural	2	708										
		Total	3	2,334										
Bagabag	Bagabag Water System	Urban	4	1,818	DW	None	1,681	317	168	1	13,890	3,473	1,389	2
		Rural	0	0										
		Total	4	1,818										
Bambang	None	Urban	N.A.	N.A.	N.A.	None	2,070	414	207	1	13,472	3,368	1,347	2
		Rural	N.A.	N.A.										
		Total	N.A.	N.A.										
Bayombong (Capital)	Prov. Water System	Urban	7	3,836	SP	None	2,769	494	277	1	20,257	5,064	2,026	2
		Rural	3	990										
		Total	10	4,826										
Diadi	None	Urban	N.A.	N.A.	N.A.	None	186	35	19	1	2,089	522	209	1
		Rural	N.A.	N.A.										
		Total	N.A.	N.A.										
Dupax del Norte	None	Urban	N.A.	N.A.	N.A.	None	1,153	226	115	1	6,016	1,504	602	1
		Rural	N.A.	N.A.										
		Total	N.A.	N.A.										
Dupax del Sur	None	Urban	N.A.	N.A.	N.A.	None	478	89	48	1	3,556	889	356	1
		Rural	N.A.	N.A.										
		Total	N.A.	N.A.										
Kasibu	None	Urban	N.A.	N.A.	N.A.	None	0	0	0	0	0	0	0	0
		Rural	N.A.	N.A.										
		Total	N.A.	N.A.										
Kayapa	None	Urban	N.A.	N.A.	N.A.	None	67	13	7	1	810	203	81	1
		Rural	N.A.	N.A.										
		Total	N.A.	N.A.										
Quezon	None	Urban	N.A.	N.A.	N.A.	None	0	0	0	0	0	0	0	0
		Rural	N.A.	N.A.										
		Total	N.A.	N.A.										
Santa Fe	None	Urban	N.A.	N.A.	N.A.	None	306	54	31	1	1,303	326	130	1
		Rural	N.A.	N.A.										
		Total	N.A.	N.A.										

Table 8.6.1 Urban Water Supply Facilities Required by Target Year (Cont'd.)

Municipality	Reference on Expansion of Existing Level III System						Phase I (2000) Requirements				Phase II (2010) Requirements			
	Name of Sytem (Operating Body)	Type	Coverage in 1995		Type of Water Sources[1]	Plan for Expansions[2]	Additional Population to be Served	Number of House Connections	Daily Average Water Demand (cu. m/day)	Number of Deep Well	Additional Population to be Served	Number of House Connections	Daily Average Water Demand (cu. m/day)	Number of Deep Well
			No. of Brgy.	Served Population										
Solano	Prov. Water System	Urban	7	3,836	SP	None	3,438	688	344	1	23,988	5,997	2,399	3
		Rural	3	990										
		Total	10	4,826										
Villaverde	None	Urban	N.A.	N.A.	N.A.	None	683	124	68	1	4,383	1,096	438	1
		Rural	N.A.	N.A.										
		Total	N.A.	N.A.										
Provincial Total		Urban	19	11,116			13,902	2,660	1,391	11	100,269	25,068	10,028	16
		Rural	8	2,688										
		Total	27	13,804										

Note: 1. *DW* - Deep Well, *SP* - Spring, *DgW* - Dug Well, and *Surf* - Surface Water.
2. Refer to supporting Table 8.6.3 for details.

Table 8.6.2 Plan for Expansion of Existing Level III System

Municipality	Name of Operating Body	Additional Areas Barangay to be Covered	Additional Population to be Served	Additional Water Sources	
				Type[1]	Capacity (cu. m/day)
Aritao	Arwasa, Inc.	N.A.	N.A.	N.A.	N.A.
Bagabag	Bagabag Water System	N.A.	N.A.	N.A.	N.A.
Bayombong (Capital)	Prov. Water System	N.A.	N.A.	N.A.	N.A.
Solano	Prov. Water System	N.A.	N.A.	N.A.	N.A.
Provincial Total		N.A.	N.A.		N.A.

Note: 1. *DW* - Deep Well, *SP* - Spring, *DgW* - Dug Well, and *Surf* - Surface Water Intake.

Table 8.6.3 Rural Water Supply Facilities Required by Target Year

Municipality	Phase I (2000) Requirements								Phase II (2010) Requirements					
	Level II		Level I						Level I					
	Number of System	No. of Communal Faucets	Number of Deep Wells				Number of Shallow Wells	Total	Number of Deep Wells				Number of Shallow Wells	Total
			30 m	50 m	70 m	Sub-total			30 m	50 m	70 m	Sub-total		
Alfonso Castaneda	0	0	20	0	0	20	0	20	14	0	0	14	0	14
Ambaguio	0	0	0	90	0	90	0	90	0	29	0	29	0	29
Aritao	0	0	47	0	0	47	0	47	54	0	0	54	0	54
Bagabag	0	0	25	0	0	25	0	25	46	0	0	46	0	46
Bambang	0	0	47	0	0	47	0	47	81	0	0	81	0	81
Bayombong (Capital)	0	0	0	20	0	20	0	20	0	74	0	74	0	74
Diadi	4	80	25	0	0	25	0	25	35	0	0	35	0	35
Dupax del Norte	2	40	101	0	0	101	0	101	56	0	0	56	0	56
Dupax del Sur	0	0	77	0	0	77	0	77	32	0	0	32	0	32
Kasibu	0	0	244	0	0	244	0	244	81	0	0	81	0	81
Kayapa	0	0	82	0	0	82	0	82	61	0	0	61	0	61
Quezon	0	0	100	0	0	100	0	100	44	0	0	44	0	44
Santa Fe	0	0	64	0	0	64	0	64	36	0	0	36	0	36
Solano	0	0	0	0	39	39	0	39	0	0	70	70	0	70
Villaverde	0	0	24	0	0	24	0	24	34	0	0	34	0	34
Provincial Total	6	120	856	110	39	1,005	0	1,005	574	103	70	747	0	747

Medium size rotary drilling rig (truck-mounted top-head drive type for deep well):

Average performance

- 1 well/20 days (10 m/day of drilling rate with finishing work)

Annual accomplishment

- 13 wells/year (365 days/year ÷ 20 days/well x 0.75)

Required number

- 8 sets for 50% of the total 1,005 deep wells

Medium size percussion drilling rig (truck-mounted type for deep well):

Average performance

- 1 well/30 days (5 m/day of drilling rate with finishing work)

Annual accomplishment

- 9 wells/year (365 days/year ÷30 days/well x 0.75)

Required number

- 12 sets for 50% of the total 1,005 deep wells

Well rehabilitation equipment:

Average performance

- 1 well/7 days (well redevelopment and finishing work

Annual accomplishment

- 39 wells/year (365 days/year ÷7 days/well x 0.75)

Required number

- 3 sets for 10% of 1,005 Level I deep wells

Support vehicle:

Type - pick-up truck with winch, double cab

Required number

- 3 units for well rehabilitation

Considering the utilization of existing percussion drilling rig, the following equipment shall be mobilized/procured either by private sector or LGUs to accomplish the physical targets:

- 8 sets of medium size rotary rig for 50% of deep wells,
- 11 sets of medium size percussion rig for 50% of deep wells
- 3 sets of well rehabilitation equipment for 10% of deep wells (at least 1 set shall be held by the provincial government), and
- 3 unit of support vehicle for well rehabilitation.

In addition to the above, service trucks equipped with crane are required for each unit of medium size rotary and percussion rigs for hauling drilling tools and water.

Table 8.6.4 Urban Household Toilets Required by Target Year

Municipality	Phase I (2000) Requirements								Phase II (2010) Requirements							
	Add'l HHs to be Served				No.of HHs Toilets				Add'l HHs to be Served				No.of HHs Toilets			
	Flush	Pour Flush	VIP Latrine	Total	Flush	Pour Flush	VIP Latrine	Total	Flush	Pour Flush	VIP Latrine	Total	Flush	Pour Flush	VIP Latrine	Total
Alfonso Castaneda	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ambaguio	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aritao	155	170	0	325	155	170	0	325	1,428	0	0	1,428	1,428	0	0	1,428
Bagabag	211	169	0	380	211	169	0	380	1,909	0	0	1,909	1,909	0	0	1,909
Bambang	193	134	0	327	193	134	0	327	1,671	0	0	1,671	1,671	0	0	1,671
Bayombong (Capital)	275	19	0	294	275	19	0	294	3,236	0	0	3,236	3,236	0	0	3,236
Diadi	35	168	0	203	35	168	0	203	247	0	0	247	247	0	0	247
Dupax del Norte	114	0	0	114	114	0	0	114	773	0	0	773	773	0	0	773
Dupax del Sur	54	0	0	54	54	0	0	54	439	0	0	439	439	0	0	439
Kasibu	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kayapa	9	0	0	9	9	0	0	9	96	0	0	96	96	0	0	96
Quezon	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Santa Fe	0	48	0	48	0	48	0	48	174	0	0	174	174	0	0	174
Solano	166	879	0	1,045	166	879	0	1,045	3,483	0	0	3,483	3,483	0	0	3,483
Villaverde	49	21	0	70	49	21	0	70	553	0	0	553	553	0	0	553
Provincial Total	1,261	1,608	0	2,869	1,261	1,608	0	2,869	14,009	0	0	14,009	14,009	0	0	14,009

Table 8.6.5 Rural Household Toilets Required by Target Year

Municipality	Phase I (2000) Requirements								Phase II (2010) Requirements							
	Add'l HHs to be Served				No.of HHs Toilets				Add'l HHs to be Served				No.of HHs Toilets			
	Flush	Pour Flush	VIP Latrine	Total	Flush	Pour Flush	VIP Latrine	Total	Flush	Pour Flush	VIP Latrine	Total	Flush	Pour Flush	VIP Latrine	Total
Alfonso Castaneda	0	342	0	342	0	342	0	342	0	563	0	563	0	563	0	563
Ambaguio	0	1,293	0	1,293	0	1,293	0	1,293	0	1,372	0	1,372	0	1,372	0	1,372
Aritao	131	412	311	854	131	412	311	854	41	2,105	0	2,146	41	2,105	0	2,146
Bagabag	0	422	75	497	0	422	75	497	0	1,764	0	1,764	0	1,764	0	1,764
Bambang	0	762	109	871	0	762	109	871	0	3,079	0	3,079	0	3,079	0	3,079
Bayombong (Capital)	187	1,000	282	1,469	187	1,000	282	1,469	354	1,543	0	1,897	354	1,543	0	1,897
Diadi	0	995	0	995	0	995	0	995	0	1,405	0	1,405	0	1,405	0	1,405
Dupax del Norte	0	0	324	324	0	0	324	324	0	2,135	0	2,135	0	2,135	0	2,135
Dupax del Sur	0	777	100	877	0	777	100	877	0	1,393	0	1,393	0	1,393	0	1,393
Kasibu	0	1,958	0	1,958	0	1,958	0	1,958	0	3,238	0	3,238	0	3,238	0	3,238
Kayapa	0	1,858	0	1,858	0	1,858	0	1,858	0	2,670	0	2,670	0	2,670	0	2,670
Quezon	0	993	0	993	0	993	0	993	0	1,686	0	1,686	0	1,686	0	1,686
Santa Fe	0	913	16	929	0	913	16	929	0	1,419	0	1,419	0	1,419	0	1,419
Solano	0	228	42	270	0	228	42	270	0	2,553	0	2,553	0	2,553	0	2,553
Villaverde	0	798	0	798	0	798	0	798	0	1,434	0	1,434	0	1,434	0	1,434
Provincial Total	318	12,751	1,259	14,328	318	12,751	1,259	14,328	395	28,359	0	28,754	395	28,359	0	28,754

Table 8.6.6 Public School Toilets Required by Target Year

Municipality	Phase I (2000) Requirements			Phase II (2010) Requirements		
	Add'l Public School Students to be Served	No. of Toilets Units	No. of Toilet Facilities	Add'l Public School Students to be Served	No. of Toilets Units	No. of Toilet Facilities
Alfonso Castaneda	182	4	1	351	7	1
Ambaguio	615	12	2	150	3	1
Aritao	0	0	0	2,000	40	8
Bagabag	0	0	0	1,803	36	7
Bambang	243	5	1	3,288	66	13
Bayombong (Capital)	2,781	56	11	3,507	70	14
Diadi	245	5	1	840	17	3
Dupax del Norte	2,303	46	9	1,993	40	8
Dupax del Sur	1,149	23	5	919	18	4
Kasibu	2,892	58	12	1,467	29	6
Kayapa	782	16	3	1,437	29	6
Quezon	0	0	0	798	16	3
Santa Fe	381	8	2	574	11	2
Solano	2,511	50	10	3,701	74	15
Villaverde	633	13	3	1,268	25	5
Provincial Total	14,717	296	60	24,096	481	96

Table 8.6.7 Public Toilets Required by Target Year

Municipality	Type	Phase I (2000) Requirements	Phase II (2010) Requirements
		Number of Public Toilets	Number of Public Toilets
Alfonso Castaneda	Public Market	0	0
	Bus/Jeepney Term.	0	1
	Total	0	1
Ambaguio	Public Market	1	0
	Bus/Jeepney Term.	0	0
	Total	1	0
Aritao	Public Market	0	0
	Bus/Jeepney Term.	0	0
	Total	0	0
Bagabag	Public Market	0	0
	Bus/Jeepney Term.	0	0
	Total	0	0
Bambang	Public Market	1	0
	Bus/Jeepney Term.	0	1
	Total	1	1
Bayombong (Capital)	Public Market	1	0
	Bus/Jeepney Term.	0	1
	Total	1	1
Diadi	Public Market	0	0
	Bus/Jeepney Term.	0	0
	Total	0	0
Dupax del Norte	Public Market	2	0
	Bus/Jeepney Term.	0	0
	Total	2	0
Dupax del Sur	Public Market	0	0
	Bus/Jeepney Term.	0	0
	Total	0	0
Kasibu	Public Market	0	0
	Bus/Jeepney Term.	0	1
	Total	0	1
Kayapa	Public Market	2	1
	Bus/Jeepney Term.	0	1
	Total	2	2
Quezon	Public Market	0	1
	Bus/Jeepney Term.	0	0
	Total	0	1
Santa Fe	Public Market	3	1
	Bus/Jeepney Term.	0	0
	Total	3	1
Solano	Public Market	0	1
	Bus/Jeepney Term.	1	2
	Total	1	3
Villaverde	Public Market	1	0
	Bus/Jeepney Term.	0	0
	Total	1	0
Provincial Total	Public Market	11	4
	Bus/Jeepney Term.	1	7
	Total	12	11

C. SECTOR IMPLEMENTATION ARRANGEMENTS

C. SECTOR IMPLEMENTATION ARRANGEMENTS

9. SECTOR MANAGEMENT PLAN

9.4 Project Management Arrangements

Table 9.4.1 Format for Level I Project Data

Form _____

PROPOSED LEVEL I PROJECT DATA

Notice : This form shall be accomplished upon instruction on PST/PWSD

LOCATION

1.1 Barangay/Sitio	1.3 Province
1.2 Municipality	1.4 Region

POP. DATA

2.1 Total Community/Barangay Population	2.3 Proposed Population to be Served
2.2 Total Number of Households	2.4 Proposed Number of Households to be Served

INFORMATION ON THE WELL SITE

3.1 Ownership : ☐ Public ☐ Private	3.3 Location:
3.2 Description :	3.4 Donor (If Private Lot):

DESCRIPTION OF EXISTING NEARBY SOURCE(S) (Use separate sheets if necessary)

4.1 Type of Point Source:

- ☐ Deep Well
- ☐ Shallow Well
- ☐ Spring
- ☐ Others (dug well pond)

4.2 Ownership :

- ☐ Public
- ☐ Private

4.3 For wells :

Casing diameter_____ in. or_____m.
Casing depth _____ ft. or_____m.
Water level Well _____ ft. or_____m.
Well capacity/yield _____ gpm. or_____m.

4.4 For Springs : Capacity/yield _____ gpm. or_____lps.

Approx. elevation above or below
Service Area _____ ft. or _____ m

Location

- ☐ Inside of service area
- ☐ Outside of service area

Approximate distance from center
of service area _____km.

Prepared by :

_____ _____
Municipal Liason Staff Date

Table 9.4.2 Format for Level II Feasibility Study

Form _____

FEASIBILITY STUDY (Level II) Notice : This form shall be accomplished upon instruction of the PST/PWSO.	Barangay	Municipality
	Province	Region

PROJECT SUMMARY

POPULATION DATA

1. Present Population	2. Design Population	3. Number of Households
		6. Number of Faucets

TECHNICAL DATA

4. Type of Source ☐ Spring ☐ Well ☐ Surface Water	5. Type of System ☐ Gravity ☐ Pumped	
	7. Pump Horsepower _____ HP	8. Pumping Time _____ Hours per Day
9. Total Average Daily Demand _____ Liters	10. Storage Tank Capacity _____ Liters	11. Pump Discharge Capacity _____ LPS

FINANCIAL DATA

12. Total System Cost ₱ _____	13. Maximum Loan Amount ₱ _____	14. Interest Rate _____
15. Local Equity ₱ _____	16. Funding Cost per Household ₱ _____	17. Repayment Period (months) _____

18. Type of Local Equity ☐ Cash ☐ Labor ☐ Materials ☐ Others, _____

19. Total Monthly Expense ₱ _____	20. Monthly Fee Per Household ₱ _____

ANNEXES

☐ 1 Survey Form	☐ 5 Design of Pipe Lines	☐ 9A Fittings Schedule (G.I. Pipes)	☐ 12 Financial Analysis
☐ 2 Map of the Project Area	☐ 6 Design of Reservoir and Pump	☐ 9B Fittings Schedule	☐ 13 Availability of Local Equity
☐ 3 Design Criteria and Basic Design Data	☐ 7 Detailed Design Plan	☐ 10 Bill of Materials	
☐ 4 Schematic Diagram of the System	☐ 8 Pipes Schedule	☐ 11 Cost Summary	

Prepared by :	Endorsed by :
_____ Municipal Liason Staff	_____ PST/PWSO Coordinator
_____ Date	_____ Date

Annex 1

SURVEY FORM
_____ Rural Water Supply Project

A. LOCATION

Barangay : _____ Province : _____
Municipality : _____ Region Number : _____

B. GENERAL INFORMATION

1. Population _____
2. Number of households _____
3. Distance from poblacion _____ kilometers
4. Availability of electricity Yes ☐ No ☐
5. Distance form electric line _____ kilometers
6. Power cost per kilowatt hour P _____
7. Availability of public transportation _____
8. Main livelihood of residents
   - ☐ Land transport
   - ☐ Water transport
   - ☐ Farming
   - ☐ Industry ☐ Others
   - ☐ Fishing

C. TECHNICAL INFORMATION

1. Are there reliable sources of potable water?
   ☐ Yes ☐ No

a) For Wells
   Well capacity : _____ lps
   Casing diameter : _____
   Casing depth : _____
   Water level from top of well : _____
   Location : ☐ Within service area
   ☐ Outside _____M. from service area

b) For Springs
   Average dry season flow : _____ ☐ GPM ☐ LPS
   Relative elevation of spring
   a. _____ ☐ ft. ☐ m. above service area
   b. _____ ☐ ft. ☐ m. below service area
   Location : ☐ Within service area
   ☐ Outside _____ m. from service area

2. Are there water supply system materials and equipment (pumps, pipes, fittings) which can be donated for this project from other source?

☐ Yes ☐ No

For pumps : Type : _____ Power : _____ HP

For pipes : ☐ Galvanized Iron ☐ PVC
☐ Others, specify _____

3. Is there an existing water tank that can be used? ☐ Yes ☐ No

Type : ☐ Steel ☐ Reinforced Concrete

Capacity : _____ ☐ Gallons ☐ Cubic Meters

Location: (Please indicate in the map of the project area)

Relative elevation with respect to service area ____ ☐ ft. ____ ☐ m.

4. Are there other sites where water tanks may be erected? ☐ Yes ☐ No

Location : (please indicate in the map of the project area)

Relative elevation with respect to service area ____ ☐ ft. ____ ☐ m.

5. Does the barrio have skilled personnel? ☐ Yes ☐ No

If yes, how many? Estimated Number

Plumbers : _____
Masons : _____
Carpenters : _____
Others : _____

If no, are there competent contractors near the area?

Plumbing contractor : ☐ Yes ☐ No
Tank fabricator : ☐ Yes ☐ No

Are there suppliers of materials (pumps, pipes, fittings) in the municipality?

☐ Yes ☐ No

D. FINANCIAL INFORMATION

1. What can the barangay provide as local equity?

Cash :	P_____		
Labor :	_____	man-days	
Materials :	Sand	: _____	cu. m.
	Gravel	: _____	cu. m.
	Cement	: _____	bags
	Others, specify :	_____	

2. Have the people been informed of the current financing policies for Level II systems, particularly the monthly fees required to repay loan & provide for O & M?

☐ Yes ☐ No

3. How much are the people willing to pay per household per month as a water fee?

Below	P 6.00	☐	P 10.00 - 15.00	☐	Others ☐
P 6.00 -	10.00	☐	15.00 - 20.00	☐	Specify : _____

4. Average income per household P _____ per month

E. INSTITUTIONAL INFORMATION

1. Is there an existing association who is ready, willing and able to manage the system

☐ Yes ☐ No

If yes, please specify. _____

2. Are people willing to join a water association to operate and manage a water supply system? ☐ Yes ☐ No

3. How many households are willing to be members? _____ households.

4. Name at least three (3) leaders of the community who can act as officers of the association, if required.

Name	Address
_____	_____
_____	_____
_____	_____
_____	_____

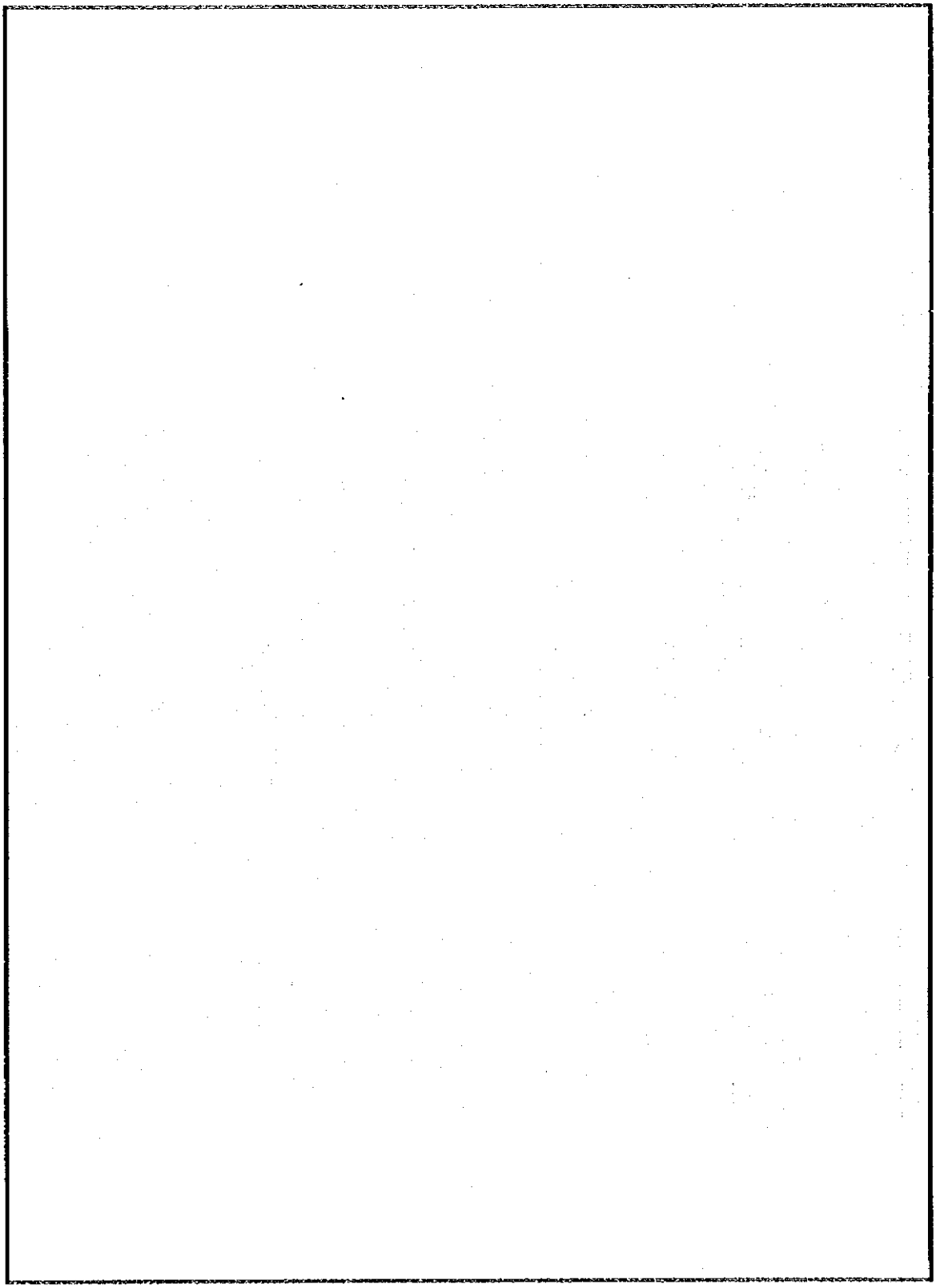
F. MAP OF THE AREA

Please attach map of the area proposed to be served. Indicate location of houses, buildings and other structures to be served including roads, the water source(s) and possible locations of storage tanks. The map should preferably be drawn to scale.

Important : If map cannot be drawn to scale, indicate distance measurements between important points along roads, or possible routes of distribution pipes with households properly indicated. For rolling terrain, indicate elevation differences between measurement points.

G. REMARKS :

Annex 2
MAP OF THE PROJECT AREA
_____ Rural Water Supply Project



Annex 3

DESIGN CRITERIA AND BASIC DESIGN DATA
_____ Rural Water Supply Project

I. Design Criteria

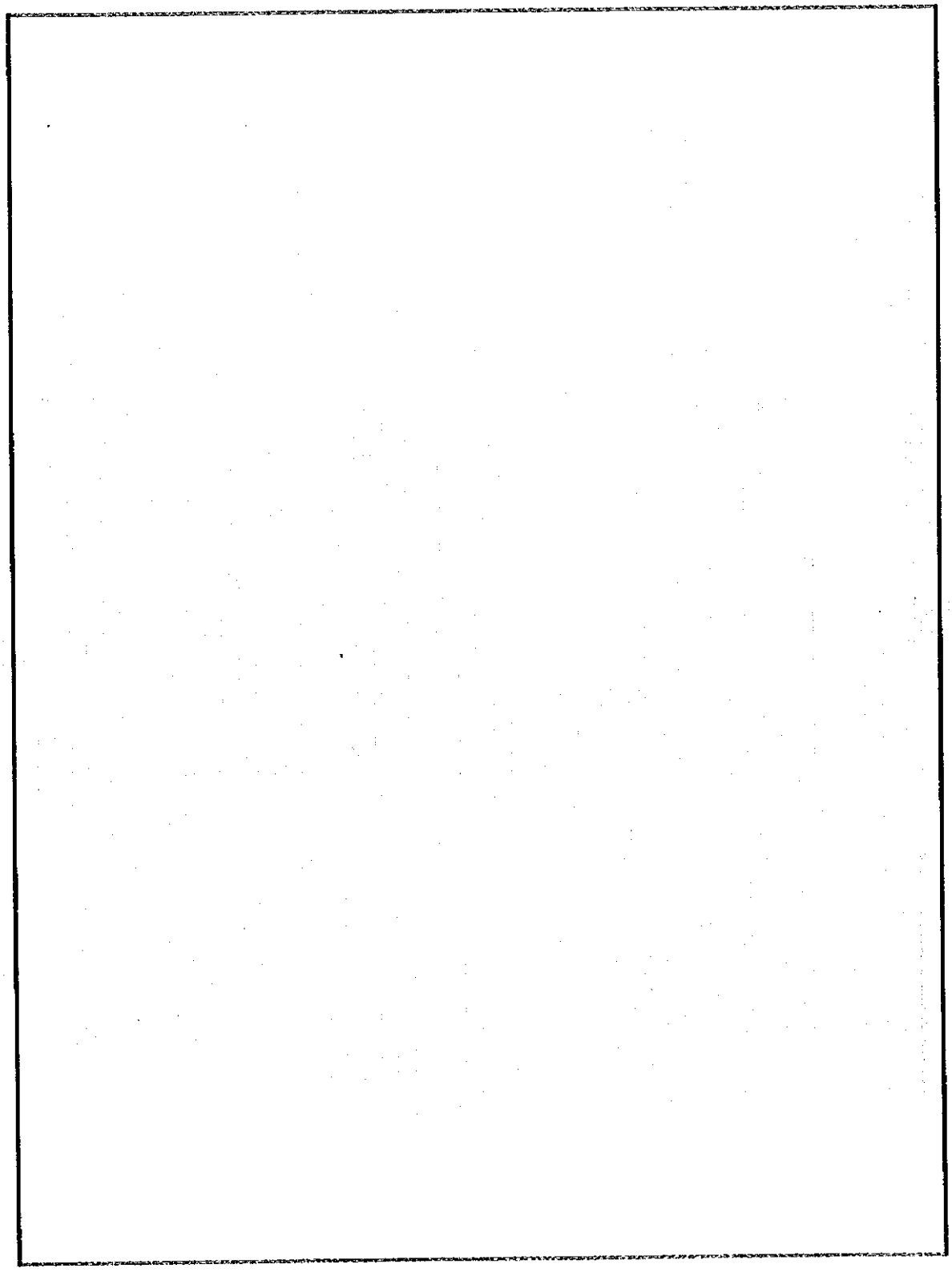
1. Design Period : 5 years
2. Population
   - Annual Growth : 3%
   - Average Household Size : 6 persons/HH
   - Design Population : Present Population x 1.16
3. Per Capita Water Consumption
   - Level II : 60 lpcd
   - Level II with garden : 75 lpcd
   - Level III : 100 lpcd
4. Water Demand
   - Average Day Demand : Design Population X Per Capita Consumption
   - Maximum Day Demand : 1.3 X Average Day Demand
   - Maximum Hour Demand : 2.5 X Average Day Demand
5. Pump Operation
   - Pumping Hours : 8 -15 hours
   - Pumping Rate : Maximum Day Demand/PumpingHrs. = _____
6. Storage Capacity : 1/4 of Average Day Demand
7. System Pressure : 5 - 10 psi at faucet
8. Households Served Per Faucet : 4 - 6 HH

II. Basic Design Data

1. Present Population : _____
2. Design Population (Present Population X 1.16) : _____
3. Average Day Demand: _____ X _____ : _____
   (Per Capita Consumption) (Design Pop.)
4. Maximum Day Demand: 1.3 X _____ : _____
   (Average Day Demand)

Annex 4

SCHEMATIC DIAGRAM OF THE SYSTEM
_____ Rural Water Supply Project



Annex 5

DESIGN OF PIPE LINES

_____ Rural Water Supply Project

SECTION (1)	NODES From (2)	NODES To (3)	SECTION LENGTH(M) (4)	HOUSEHOLD SERVED (5)	PEAKFLOW (LPS) (6)	PIPE DIA (MM) (7)	HEAD LOSS PER 100M (8)	ACTUAL HEADLOSS (9)	REMARK (10)

Annex 6

DESIGN OF RESERVOIR AND PUMP

_____ Rural Water Supply Project

A. DESIGN

1. Determine Capacity of Reservoir, (C_r)

   C_r = 1/4 x Average Day Demand

   C_r = 1/4 x D_a (LPD)

   C_r = _____ liters

2. Determine Minimum Water Elevation, (WL_m)

   WL_m = total head loss + Minimum Pressure in Main (Meters)

   For Barangay System, Min. Pressure = 5 psi (use 3M.)

   For Poblacion System, Min. Pressure = 10 psi (use 7M.)

   WL_m = _____ M.

   Note : The bottom of the storage tank should be higher than this elevation.

B. DESIGN OF PUMP

1. Determine Pump Capacity, Q_p (LPS)

   Q_p = Max. Day Demand (LPD)/ Operating Time (Sec.)

   Q_p = $78 P_d/T$ where: P_d = Design Population

   T = Operating Time in Seconds

   Q_p = _____ LPS

2. Calculate Total Dynamic Head, TDH (Meters)

   TDH = Depth of Pumping Level + by Maximum Reservoir Elevation + friction loss

   TDH = _____ m

3. Calculate Brake Horsepower Requirement :

$$\text{Brake Horsepower} = \frac{Q_p \times TDH}{75 \times \text{Efficiency}}$$

Brake Horsepower = _____ Hp

Where :

Efficiency for Centrifugal Pump, 30-60 %

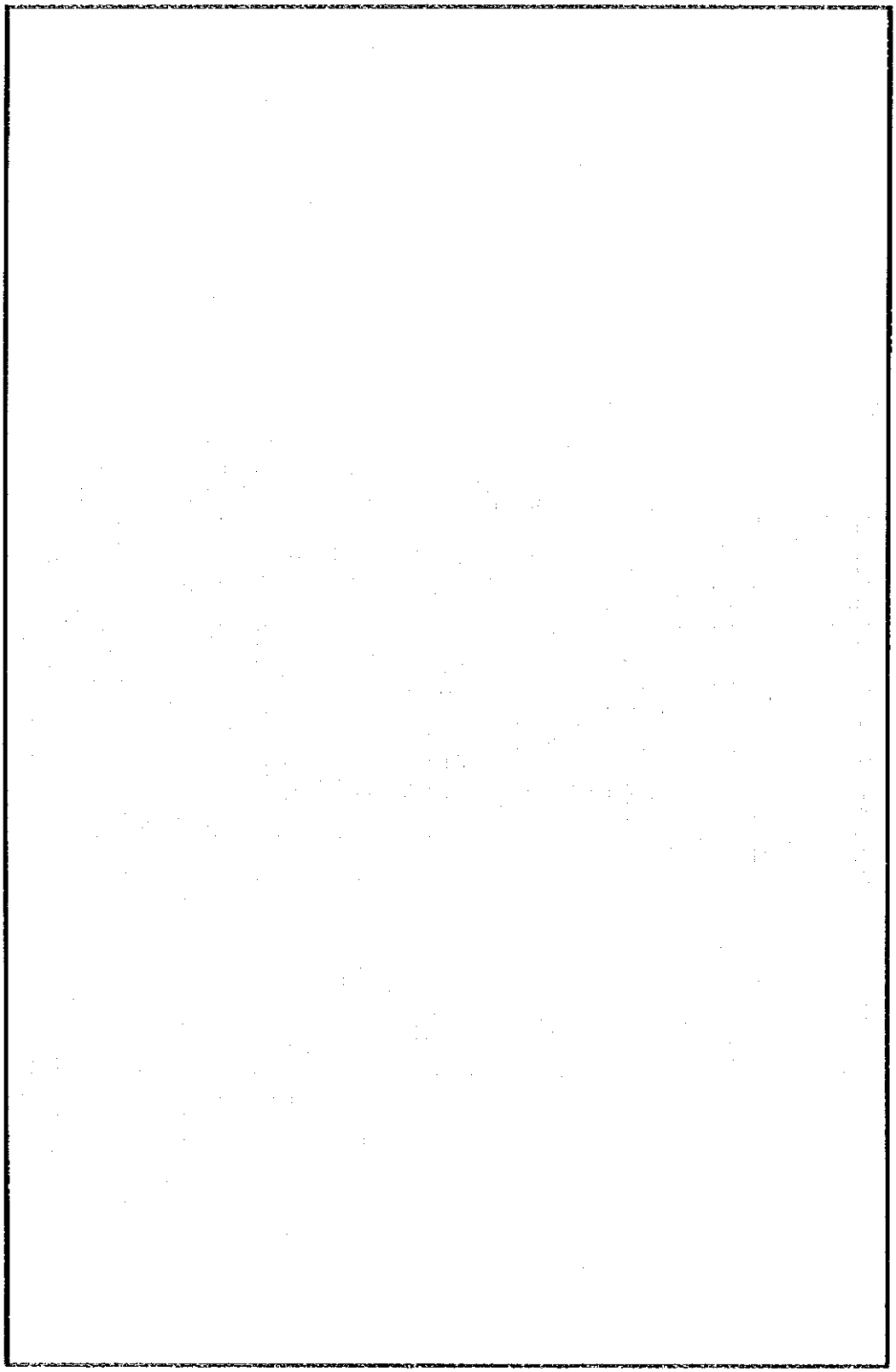
Efficiency for Submersible Pump, 50-60 %

Efficiency for Jetmatic Pump, 20-30 %

Annex 7

DETAILED DESIGN PLAN

_____ Rural Water Supply Project



Annex 8

PIPES SCHEDULE

_____ Rural Water Supply Project

PIPE DIAMETER (1) mm	SECTION LENGTH (2) m	REQUIRED PIPES (3)	ACTUAL NO. OF PIPES (4)	ADDITIONAL PIPES (5)

Annex 9A

FITTINGS SCHEDULE (G.I. PIPES)

_____ Rural Water Supply Project

NODES / SECT LENGTH	COUPLING	UNION PATENTE		TEE STD.	TEE REDUCER	BUSHING REDUCER	ELBOW STD / ELBOW REDUCER	COUPLING REDUCER	FAUCET	NIPPLE	VALVES
	Qtv.	Size	Qty.								

Annex 9B

FITTINGS SCHEDULE (PVC PIPES)

_____ Rural Water Supply Project

NODES / SECT LENGTH	SOCKET		STD. ELBOW REDUCER	STD. TEE REDUCER	SOCKET ADAPTOR	SOCKET REDUCER	G. I FITTINGS			OTHERS
	Qty.	Size					VALVES	FAUCET	ELBOW	

Annex 10

BILL OF MATERIALS

_____ Rural Water Supply Project

QUANTITY	UNIT	DESCRIPTION	UNIT COST	TOTAL COST

Annex 11

COST SUMMARY

_____ **Rural Water Supply Project**

I. ESTIMATED COST OF THE SYSTEM

1. a) Cost of Pipes	₱ _____		
b) Cost of Fittings	_____		
Total Cost of Pipes and Fittings		₱	_____
2. Cost of Reservoir			_____
3. Cost of Pump			_____
4. Labor Cost			_____
a) 10% of Pipes & Fittings (For G.I. Pipes)			
b) 25% of Pipes & Fittings (For PVC Pipes)			
5. Cost of Freight and Handling			_____
6. Contingencies 5% (Pipes & Fittings - Labor)			_____
Total Cost of the System		₱	_____

For gravity system, omit cost of pump.

II. FINANCIAL DATA

1. Total Cost of the System	₱ _____
2. Local Equity	_____
3. Amount of Loan	_____

Annex 12

FINANCIAL ANALYSIS

_____ Rural Water Supply Project

A. RELEVANT DATA

1. Pumping Hours : _____ hrs.
2. Pump Horsepower : _____ HP
3. Cost/KWH : ₱_____
4. Pump Cost : ₱_____
5. Amount of Loan : ₱_____
6. Loan Terms : _____ % (interest per annum)
   : _____ years (Repayment Period)
7. Number of Households : _____

B. COMPUTATION OF MONTHLY EXPENSES (Omit non-applicable items)

1. Operations
   a. Salaries _____ x _____ = P _____
   b. Office Supplies _____ x _____ = P _____
   c. Power _____ x _____ = P _____
   d. Chemical _____ x _____ = P _____
   e. Miscellaneous _____ x _____ = P _____

2. Asset Replacement
   a. Pump _____ / _____ = P _____
   Life (mos.)
   b. Pipelines _____ / _____ = P _____
   Life (mos.)
   c. Tank _____ / _____ = P _____
   Life (mos.)
   d. Others _____ / _____ = P _____
   Life (mos.)

3. Amortization _____ x _____ = P _____
   (CRF) (Loan Amt.)

4. Maintenance (2% of Capital Equipt.costs annually)
   .02 X _____ /12 = P _____

6. Total Monthly Expenses = P _____

C. COMPUTATION OF WATER FEE

Monthly Water Fee Per Household :

_____ / _____ = P _____
(Total Monthly Expenses) (No. of HH)

Annex 13

AVAILABILITY OF LOCAL EQUITY

Item	Amount
I. Cash	₱ _____

II. Labor

Type of Labor	No. of Workers	No. of Days	Rate Per Day	
_____	_____	_____	_____	
_____	_____	_____	_____	
_____	_____	_____	_____	
_____	_____	_____	_____	
_____	_____	_____	_____	_____

III. Materials

Type of Materials	Quantity	Unit Cost	
_____	_____	_____	
_____	_____	_____	
_____	_____	_____	
_____	_____	_____	
_____	_____	_____	_____

TOTAL ₱ _____

I certify that the items listed above represent the local share of the project cost. _____ _____ Association President Date	Noted by : _____ _____ Municipal Sector Liason Date

9.5 Community Development Model

COMMUNITY DEVELOPMENT MODEL STUDY (LEVEL I)
MODEL SITE : POBLACION, DIADI, NUEVA VIZCAYA

1. Socio - Economic Profile of the Model Site

Barangay Poblacion is the only urban area in the municipality of Diadi. It is 65km north of Bayombong and is accessible through a 45-minute ride from the capital town through the national road. The model site is situated at the southern portion of the poblacion and is adjacent to the Diadi National High School. It is also near the town's public market and a walking distance from the municipal building. The topography of the area depicts a rolling to hilly land type with a slope ranging from 8% - 30% and an elevation between 350 - 400 meters above sea level.

The proposed model site has a population of 93 and 16 households. But since the model site is right beside Diadi National High School, it is expected the school will be served by the water facility to be installed in the area. Many of the water users are students who are boarding in nearby houses. Most of the residents are engaged in agricultural productivity as their source of income. The average annual income is about ₱4,000 - ₱5,000 per household.

Plan International, a non-governmental organization, operates in the area. There are other local organizations such as the 4-H Club, Abot-Palad and Bayanihan ni Cristo.

2. Present Water Supply and Sanitation Situation

The only existing water source in the area is one (1) deep well that provides drinking water to the residents and high school population. This condition puts water supply very scarce in the area as other sources are located hundred meters away. The situation is aggravated during the morning as most of the water users, mostly students rushing up for school, queue for water.

As for sanitation, four (4) of the 16 households have unsanitary toilets while the rest have sanitary toilet facilities.

3. Institutional Analysis

There has been no prior attempt to develop new water source to augment the services of the existing well. The NGOs in the area have also not been able to mobilize the people. Lately, however, the Rural Health Unit (RHU) took cognizance of the need to supplement the present service and conducted consultation with the residents. The residents, on the other hand, expressed interest in undertaking a project to improve the water supply situation in the area.

4. Future Development Needs

4.1 Potential Source and Service Level

An additional deep well could augment the water supply in the area. Water quality analysis of the existing deep well in the area must be carried out and the intake sections of the wells must be located through geo-electric logging and must be screened to have greater intake area.

4.2 Formation of BWSA

The barangay council shall initiate the formation of a Barangay Waterworks and Sanitation Association (BWSA) The Municipal Sector Liaison (MSL), in coordination with the Provincial Sector Team (PST), shall provide assistance in forming BWSA and in developing its capability. The officers for the BWSA shall be elected as the first step led by the barangay council. They shall oversee the construction work as well as the operation and maintenance of the system.

5. Capital and O&M Funds

5.1. Water Source Facility and Sanitary Toilet

Capital cost required to construct a deep well facility is estimated at about ₱125,000. The MSL shall assist the community in securing the needed amount.

Capital cost of household toilets shall be shouldered by the owners. If a family is not able to put up the initial capital cost, the Association shall make arrangements for the extension of loan from the Provincial/Municipal Government or other sources (rural bank, cooperatives, etc.). Policies on interest rates and repayment scheme adopted by the source shall prevail.

5.2. Operation and Maintenance

The community should initially raise an amount equivalent to 1% of the capital cost of the water system (about ₱1,250), which shall be set aside for the operation and maintenance of

the water facilities. Operation and maintenance of household toilets shall be done by the owners. A monthly fee of ₱5.00 shall be collected from the beneficiaries to finance recurrent cost of maintaining the facilities.

6. Community Involvement

6.1. Pre-Construction (Project Preparation and Planning)

(1) The Barangay Council of Poblacion, in coordination with MSL, shall initiate a meeting among the residents to discuss water and sanitation problems and the opportunities in the sector and possible implementation of water and sanitation projects in the study area.

(2) The residents shall organize themselves into BWSA. The association shall discuss the construction of Level I water system and provision of sanitary toilets to the residents.

(3) The group shall determine the monthly contribution to cover all monthly operation, maintenance and administration costs, as well as to establish a reserve fund.

(4) The BWSA shall submit a formal request to the municipal and provincial governments for technical and financial assistance in undertaking Level I project in the area. The request is supplemented by a commitments sheet signed by the association indicating willingness to participate in the project and their responsibility for the operation and maintenance. An initial reserve fund representing the membership fees of beneficiaries will be collected.

(5) Upon approval of such a request, the association will mobilize its project team to assist in project implementation and in undertaking the following:

1) Conduct of community study (barangay diagnostics)
2) Identification of alternative sites for deep well
3) Negotiation for right of way

(6) Monitoring Activities: During this stage, the association will submit a progress report to MSL indicating the status of project planning and preparation. The report will include such information as the composition and membership of the BWSA, scope of project to be implemented, project specifications, work plan and schedule, and financial arrangement.

6.2. Construction Phase (Project Implementation)

(1) During construction of facilities, the BWSA will assign team/s which shall coordinate and monitor the implementation of the project.

(2) Beneficiaries could provide labor during well construction, pump installation and preparation of drains and soak way pits.

(3) The community may be asked to contribute materials which are locally available. These may take in the form of gravel and sand, roofing sheets, timber or tools for excavation.

(4) The residents shall provide information which may be necessary to expedite the construction of the facility.

(5) Monitoring Activities: The BWSA will have discussions with the MSL on the status of the project.

6.3. Post Construction (Operation and Maintenance)

(1) BWSA shall monitor proper disinfecting of the wells immediately after their completion and shall request PHO or the Rural Health Unit (RHU) to conduct periodic water quality surveillance and disinfecting wells, as required.

(2) BWSA shall monitor whether the facilities are properly maintained or not.

(3) Beneficiaries should be involved directly in the maintenance of the facilities. They shall keep the premises of the water facility clean. Breakdown should be reported immediately to the BWSA and necessary repair work must be undertaken at once.

(4) Operation and maintenance and other recurrent costs will be shouldered by the beneficiaries. The association shall regularly collect monthly contribution.

(5) The member-beneficiaries should provide labor in the repair of the facilities.

(6) Maintenance of household toilets should be the responsibility of the owners.

(7) Monitoring Activities: The BWSA is required to submit annual report to MSL. The first post-construction report should indicate well log data, number of sanitary toilets constructed, overall cost, any project modification, and maintenance activities. Succeeding reports will indicate breakdowns and repairs, expenses, problems encountered in operating the system and, if possible, recommendations, and other relevant data.

7. Project Elements

7.1. Health and Hygiene Education

Health and hygiene education should be launched as early as the initial planning of the project. It would be a good entry point in discussing existing water and sanitation issues in the community prior to the formation of BWSA. The MSL should conduct a continuous health education campaign in the barangay. Special presentations can also be done by the

RHU midwife during meetings of the group. New facilities to be established would provide significant opportunities to discuss hygiene practices and identify areas for improvement. The barangay primary/elementary school shall adopt DECS' Teacher-Child-Parent Approach which involves the family members in teaching practical lessons in hygiene education.

These efforts can be reinforced by multi-media campaign being organized by the DOH and the Philippine Information Agency.

7.2. Human Resources Development and Training

The members of the BWSA will be trained on basic hand pump operation and maintenance. Workshops and on-the-job training will be conducted by the MSL. Qualified members will be enrolled at the National Manpower and Youth Council which conducts regular training course on Plumbing. Internship of graduates can be arranged with appropriate institutions. Special training programs are to be implemented for women to provide them with basic skills in undertaking minor repairs.

7.3. Women's Involvement

Women must be involved from the start of the project and on the operation and maintenance of the facilities. They should therefore be included in training programs conducted for the members. The women sector must likewise spearhead in health and hygiene education

COMMUNITY DEVELOPMENT MODEL STUDY (LEVEL II)
MODEL SITE : BARANGAY SAWMILL, VILLAVERDE, NUEVA VIZCAYA

1. Socio - Economic Profile of the Model Site

Barangay Sawmill is one of the nine (9) barangays in the municipality of Villaverde. It is located at the slope of the Cordillera Mountain, about 18 km north of Bayombong. The area is accessible by any type of vehicle through the provincial road. The terrain of the barangay can be characterized as rolling to mountainous with some relatively flat portions. Its slope ranges from 3% - 50% and an elevation of 250 - 300 meters above sea level.

The area has a population of 1,064 and 213 households. The barangay is primarily an agricultural-based area. Average annual income per household is estimated to be ₱4,000 - ₱5,000. The barangay has a rich source of labor for construction and agricultural productivity but most of them have migrated to other areas in search for better livelihood opportunities. Infrastructures in the area include a barangay hall, a health center and an elementary school.

2. Present Water Supply and Sanitation Situation

Majority of the residents obtain their water for drinking and other purposes mainly from shallow wells. There are about 105 shallow wells (95 private and 6 public) in the area serving 189 households. A deep well was constructed within the premises of the elementary school but it has broken down and is now abandoned. Some of the residents get their water supply from springs located at the barangay's hilly portion. About 25 families directly tap spring water using long plastic hoses.

While it seems that the water requirements of the residents are being provided by existing systems (shallow wells and springs), the quality of water that they get is doubtful. This explains the prevalence of water-related illnesses in the area. The shallow wells are likely tapping near surface aquifers that are prone to contamination. In addition, no sanitary protections are provided for the water sources, especially the spring.

Almost all households have sanitary toilets as a result of DOH's toilet bowls distribution program conducted in 1988.

3. Institutional Analysis

Two national-based NGOs operate in the area- the Philippine Rural Reconstruction Movement (PRRM) and the Plan International. These NGOs focus on community organizations and capacity building. Local organizations actively operating in the area are Bayanihan ni Cristo. Rural Improvement Club and 4-H Club. These are active in the livelihood activities, especially the youth club which is presently undertaking infrastructure projects with labor as their equity and the fund being provided by the barangay.

The Plan International has attempted to construct a Level II system but it was discontinued and only the spring box was completed. The reason was the reluctance of the people to participate in that project especially in contributing for the installation of communal faucets and for the eventual operation and maintenance of the system.

Lately however, the residents have expressed willingness to participate in the project. The barangay council has become active in discussing with the people the proposal to develop a Level II system. The municipal government, meanwhile, has committed its technical and financial assistance to pursue the project.

4. Future Development Needs

4.1 Potential Source and Level of Service

Level II water system is appropriate for Barangay Sawmill. Judging from its topography and present vegetation, the area may be rich in spring water sources. For the proposed Level II project, the spring developed by Plan International could be utilized. The spring is located at about ten meters above the service area. A thorough study shall be done to determine the maximum capacity of the springs and appropriate development program to be implemented in the area.

Families shall be encouraged to construct individual household toilets.

4.2. Formation of RWSA

Prior to the implementation of the proposed project, the barangay council, in coordination with the Municipal Sector Liaison (MSL) and the Plan International, shall conduct a series of people's consultations and value formation activities to re-orient attitude of the residents

towards the importance of safe water and the responsibilities of individuals to obtain safe drinking water. The MSL, as well as the residents, must determine which organization is appropriate to take the lead in implementing the project and in managing the system. The residents must be mobilized to decide which organization is most acceptable to them to operate the system.

Since no NGO is active in the sector, the residents shall organize a Rural Waterworks and Sanitation Association (RWSA). The MSL, in coordination with the Provincial Sector Team (PST), shall initiate the formation of the RWSA. The NGOs can assist in the actual organization of the association and in conducting value formation workshops.

5. Capital and O&M Funds

5.1. Water Supply System

The capital cost required to develop the Level II water system for Barangay Sawmill is estimated at about P615,000. The fund for this shall be secured by the RWSA with the assistance of MSL and PST. The Provincial Trust Fund may be a potential source.

5.2. Household Sanitary Toilets

Capital cost of individual household toilets (pour flush type) shall be shouldered by the home owners. Should a family is not be able to put up the initial capital cost, the RWSA can make arrangements for the extension of loan from various institutions. Policies on interest rates and repayment scheme adopted by the institutions shall be followed.

5. 3. Operation and Maintenance

As mentioned earlier, the water charges to be collected by the association from the water consumers will cover costs of operation and maintenance. A membership contribution shall be collected monthly for the recurrent cost of maintaining the system.

6. Community Involvement

6.1. Pre-Construction (Project Preparation and Planning)

(1) The Barangay Council, in coordination with the MSL, shall conduct meetings among the residents to discuss water and sanitation problems and needs.

(2) The residents shall organize the RWSA to oversee the proposed project including sourcing of the funds.

(3) The association determines the scope of project and commit full support to such undertaking.

(4) The RWSA submits a formal request to the municipal and/or provincial sector team for technical and financial assistance. The request is supplemented by a commitment sheet signed by the association indicating their willingness to participate in the project and their responsibility for the operation and maintenance. A reserve fund representing the initial contribution of beneficiaries shall be collected.

(5) Upon approval of such request, the association will mobilize its team to assist for the following:

1) preparation of a work plan including time frame and budget
2) undertaking community study (barangay diagnostics)
3) detailed planning as a baseline for evaluation
4) negotiation for the right of way
5) short listing of local contractor/s for the conduct of bidding

(6) RWSA shall meet with the beneficiaries to set water rates which will be used for the system's loan repayment and for operation and maintenance.

(7) Monitoring Activities: During this stage, the association will submit a progress report to the MSL indicating the status of project planning and preparation. The report will include such information as the composition and membership of RWSA, scope of project to be implemented, project specifications, work plan and schedule, and financial arrangement.

6.2. Construction Phase (Project Implementation)

(1) The beneficiaries shall provide self-help labor in the following activities:

1) clearing of the spring premises
2) construction of intake box
3) construction of chlorination facilities
4) pipe laying
5) installation of communal faucets
6) preparation of drains and soak way pits
7) excavation of pits and construction of latrine structures

(2) Granting of right of way for pipe laying, construction of pump house and for installation of other necessary facilities.

(3) Dissemination of information on the on-going construction.

(4) Provision of the access road for contractor/s

(5) Monitoring Activities: The RWSA will coordinate with MSL on the construction activities. It shall submit a report containing information such as modifications, project team composition, people's contributions (cash, materials and labor), etc.

6.3. Post Construction (Facility Operations)

(1) The RWSA should monitor the practices of the users to ensure proper handling of the water and sanitation facilities as well as prudent use of water. Every member-consumer should also cooperate with RWSA to protect the communal faucets (with meters) from loss or damage.

(2) The association should assign person/s to regularly monitor the performance of the water source facilities and public faucets. Water samples should be collected periodically in cooperation with Provincial Health Office (PHO) staff.

(3) The members should pay their membership dues/water consumption charges regularly in order to maintain good service of the water system.

(4) Maintenance of individual household toilets shall be the responsibility of the owners.

(5) Monitoring Activities: The association is required to submit quarterly reports to MSL. The first post-construction report indicate scope of work (water system) such as: scope of spring development undertaken, number of communal faucets installed, length and diameter of pipes laid, sanitary toilets constructed, modifications (if any), overall cost (both for water system and toilets), and timetable of maintenance activities. Succeeding reports will indicate breakdowns and repairs, expenses, problems encountered in operating the system and, if possible, recommendations, and other relevant data.

7. Project Elements

7.1. Health and Hygiene Education

The RWSA, assisted by the MSL and the RHU, shall conduct hygiene education in the project area. This could be the entry point for the improvement of water and sanitation systems in the area. Moreover, these new facilities provide more opportunities to discuss hygiene practices and identify areas for improvement. The barangay elementary school also

adopts DECS' Teacher-Child-Parent Approach which involves parents and other members of the family in teaching practical lessons in hygiene education.

These efforts shall be reinforced by multi-media campaign being implemented by other government institutions such as the DOH and the Philippine Information Agency.

7.2. Human Resources Development and Training

Qualified members of the RWSA will be trained on basic utility operation and maintenance. Workshops and on-the-job training will be conducted by appropriate institutions. Qualified members will be enrolled at the National Manpower and Youth Council which conducts regular training course on Plumbing. Internship of graduates can be arranged with appropriate institutions.

7.3. Women's Involvement

Women must be involved from the start of the project and on the operation and maintenance of the facilities. They should be included in training programs conducted for the members. The women sector must likewise spearhead in health and hygiene education program of RWSA.

COMMUNITY DEVELOPMENT MODEL STUDY (LEVEL III)
MODEL SITE : DUPAX DEL SUR, NUEVA VIZCAYA

1. Socio-Economic Profile of the Model Site

The proposed model site covers four (4) barangays in the town of Dupax del Sur. These are Dopaj, Bagumbayan, Domang and Balzain. The barangays are located at the slope of Sierra Madre Mountain with an elevation of about 400 meters above sea level. Barangays Dopaj, Domang and Bagumbayan are considered urban, while Balzain is classified rural. These barangays could be easily reached by a 30-minute drive from Bayombong through a 30 km stretch of concrete secondary road. The study area has flat to hilly ground. Its hilly section is chiefly underlain by Cretaceous to Oligocene volcanic rocks while the relatively flat area is covered with alluvial deposits of Benay River, a tributary of Sta. Fe River.

The four barangays have an aggregate population of 4,063 and 740 households. The residents are engaged on farming as a major source of income followed by construction and other services. Average annual income is about ₱5,000 per household. Since the study area is located in the town center, the presence of government buildings like the municipal hall, schools, health centers and other infrastructures are evident. Its road network in the center is cemented while some of the outlying road systems within the area are gravel-packed. The oldest church in the province, which is more than 100 years old, is located at the town center.

There are at present various non-government organizations in the area. These are Philippine Rural Reconstruction Movement (PRRM), Plan International, Senior Citizens, Abot-Palad, Parish Council and the United Church of Christ in the Philippines. These NGOs deliver different services to the whole community.

2. Present Water Supply and Sanitation Condition

The residents presently get their water supply from various sources. About 330 families obtain their drinking water from shallow wells. On the other hand, some 403 families are being serviced by Level II water system being operated by the municipality which collects a fee of ₱10.00 per month from the consumers for maintenance purposes. The existing water source of this Level II system comes from a river situated on top of the mountain, overlaying the whole poblacion core. This river is flowing perennially at a rate more than the demand of the study area (5 lps). From the river, water is stored in a concrete reservoir that was constructed at the DENR nursery site in Dopaj. From the reservoir, water is distributed to

communal faucets by gravity. Since no treatment is being done, water is not used for drinking. During rainy period, the river water is turbid. Meanwhile, the shallow wells do not provide good quality water for drinking since these are prone to contamination.

On the sanitation aspects, almost all households have toilet facilities. Only six (6) have unsanitary toilet facilities.

3. Institutional Analysis

The residents are willing to participate in the development of Level III water system in the area. They have indicated readiness to mobilize their resources and form a users' association to facilitate the development of the system. The municipal government has likewise shown concern in upgrading the existing water facilities into a Level III system. Recently, it has constructed a water reservoir to store more volume of water. It invested about P500,000 for the project. The municipal government is willing to provide the initial capital costs of the project or to assist the community group in sourcing out funds for the completion of the system.

4. Future Development Needs

4.1. Potential Source and Service Level

In upgrading the existing water facility into Level III ssystem, the spring/s that support the base flow of the river being tapped for the existing Level II system must be located. A survey shall be done to determine the maximum capacity of the spring/s. Other components of the proposed project shall be determined after the feasibility study.

4.2. Identification of Community Organization

As a pre-requisite to the development of the water and sanitation facilities in the area, a community organization should be appointed or organized by the residents to oversee the project as well as operate and maintain the Level III system. In Dupax del Sur, there are NGOs which are quite active in pursuing water supply improvement projects. However, the more active ones are national-based and therefore could not assume the roles of Rural Waterworks and Sanitation Association (RWSA).

Since the residents themselves expressed willingness to participate in the project, they can get together and organize themselves into RWSA. The Municipal Sector Liaison (MSL), in coordination with the PST, shall assist in the formation of the RWSA.

5. Capital and O&M Funds

5.1. Water System

Capital cost required to construct the Level III system shall be determined after the conduct of feasibility study and detailed design. The capital cost will be shouldered by the association through a loan from either the municipal government, the Provincial Trust Fund or other sources. Water charges will be collected from the consumers to cover the cost of operation and maintenance, and for loan amortization.

5.2. Individual Sanitary Toilets

Capital cost of constructing household toilets shall be shouldered by the homeowners. If a family could not put up the initial capital cost, the association shall extend loan with the terms of payment to be decided by the cooperative.

6. Community Involvement

6.1. Pre-Construction (Project Planning and Preparation)

(1) The MSL, in coordination with the PST, shall facilitate the holding of a meeting among the residents/concessionaires. The people shall discuss the water and sanitation problems and needs in the community and decide among themselves the action that will be taken to solve the present problems.

(2) The people shall organize the RWSA to assume the management, operation and maintenance of the water supply system. The association shall elect its officers and appoint committees which shall be responsible for all its undertakings.

(3) The members shall pay their initial membership dues .

(4) The association shall request the municipal/provincial government or other sector agencies to provide assistance in determining the scope of water and sanitation project they shall undertake. The MSL and PST shall present to the residents alternative schemes in developing a Level III water system for the four barangays.

(5) The association submits a formal request to the municipal and/or provincial government for the necessary financial loan in undertaking the project. The request is supplemented

by a commitment sheet signed by the association indicating their willingness to participate in the project and their responsibility for the operation and maintenance. A reserve fund representing the initial contribution/membership fee of beneficiaries will be collected.

(6) Upon approval of the loan, the association will mobilize teams for the following:
   1) conducting feasibility study
   2) negotiation for the acquisition of the right of way
   3) design of the system
   4) project bidding
   5) project mobilization

(7) The members shall also attend all briefings and presentations related to the project

(8) Monitoring: During this stage, the association shall submit a progress report to the MSL indicating the status of project planning and preparation. The report will include, among others, the composition and membership of RWSA, scope of project to be implemented, project specifications, work plan and schedule, delineation of responsibilities, and financial arrangements.

6.2. Construction (Project Implementation)

(1) Since the construction of the water system will be undertaken by a qualified contractor, the direct involvement of the residents shall be limited to the following:
   1) Granting of right of way for pipe laying
   2) Dissemination of information on the construction activities
   3) Compliance with new road traffic routes
   4) Provision of access road for contractor/s
   5) Monitoring of inconveniences caused by the construction
   6) Early application for water connection

(2) Monitoring: The contractor will submit to the association progress reports on the status of the construction project. The report shall include any modification, problems being encountered, and possible solutions. The association will in turn submits progress report to the MSL.

6.3. Post Construction (Operation and Maintenance)

(1) The facilities shall be operated and maintained by highly-trained personnel and technicians to be assigned by the RWSA. However, the users should participate in the operation and maintenance of the systems through the following:

1) Paying of water bills on time
2) Reporting of water leaks, illegal connections and tampering of water meters
3) Giving access to meter readers
4) Conservation of water
5) Campaign for more service connections
6) Monitoring of water quality
7) Attending at association meetings and other activities
8) Safe disposal of waste water
9) Dissemination of health and hygiene information

(2) Maintenance of household toilets shall be the responsibility of the owners.

(3) Monitoring Activities: The association shall submit quarterly reports to the MSL. The first post-construction report should be submitted immediately upon the completion of the project. It should indicate scope of work (water system), sanitary toilets constructed, modifications (if any), overall cost, and maintenance activities. Succeeding reports will indicate number of connections, breakdowns and repairs, expenses, problems encountered in operating the system and, if possible, recommendations, and other relevant data.

7. Project Elements

7.1. Health and Hygiene Education

Health and hygiene education should be launched as early as the initial planning of the project. It would be a good entry point in discussing existing water and sanitation issues in the community prior to the formation of the association. The MSL, together with the RHU shall conduct a continuous health education campaign in the municipality. Special presentations can also be done by the RHU staff during meetings of the group. New facilities would provide more opportunities to discuss hygiene practices and identify areas for improvement. The primary schools in the municipality shall adopt DECS' Teacher-Child-Parent Approach which involves parents and other members of the family in teaching practical lessons on hygiene education.

These efforts shall be reinforced by multi-media campaign being organized by government institutions such as the DOH and the Philippine Information Agency.

7.2. Human Resources Development and Training

Training and human resource development programs shall be directed to those who would manage, operate and maintain the water systems. The officers and management staff of the association shall be sent to the provincial government/other relevant central government agencies to attend basic and advanced training programs such as policy making, financial management, systems design, construction supervision, among others.

Qualified RWSA members will also be enrolled at the National Manpower and Youth Council which conducts water system-related courses. Internship of graduates can be arranged with the municipal/provincial government.

7.3. Women's Involvement

The association should campaign for female members and give them equal opportunity in the board and in the management of the system. They (the women) must be involved from the start of the project up to the operation and maintenance of the facilities. They should therefore be included in training programs conducted for the members. The women sector must likewise spearhead in health and hygiene education campaign in the community.

10. COST ESTIMATES FOR FUTURE SECTOR DEVELOPMENT

10.2 Assumptions for Cost Estimates

10.2.1 Unit Construction Cost

Table 10.2.1 Unit Cost of Level I (Deep Well - 30m Depth)

(Cost: Peso)

Description	Quantity	Unit	Unit Cost	Cost
A. Mobilization/Demobilization		L.S.		3,300
B. Drilling of Well & Installation of Steel Casing/Screen				
1. Materials				
(1) 100mm x 3m Steel Casing with coupling	7	pcs.	2,625	18,375
(2) 100mm x 3m Steel Casing with one end closed	1	pc.	2,719	2,719
(3) 100mm x 3m Low Carbon Steel Screen	2	pcs.	4,313	8,626
2. Labor, Fuel, Lubricant and others				
Well Drilling for 30 m depth at 200mm borehole	30	m	1,100	33,000
3. Freight Cost (7% of Materials)		L.S.		2,080
Sub-Total of B				**64,800**
C. Well Development		L.S.		5,000
D. Gravel Packing, Installation of Handpump and Construction of Platform				
1. Materials				
(1) Improved Deep Well Cylinder Pump (Malawi Type)	1	set	9,000	9,000
(2) 63mm x 6m GI Pipe with coupling	4	pcs.	1,706	6,824
(3) #10 Sieved Gravel	0.53	cu.m	870	461
(4) Coarse Sand	1	cu.m	304	228
(5) Cement for Sanitary Seal	3	bags	117	351
(6) Pump Base and Platform				
1) Cement	4	bags	117	468
2) Gravel	2	cu.m	385	770
3) Sand	1	cu.m	304	304
4) Plywood (1,200mm x 2,400mm x 6mm)	1	pc.	250	250
5) Form Lumber (50mm x 75mm x 1,800mm)	6	pcs.	45	270
6) Nail	1	kg.	32	32
Sub-Total of D-1				18,958
2. Labor (40% of D-1.)		L.S.		7,583
3. Freight Cost (7% of Materials)		L.S.		1,327
Sub-Total of D				**27,868**
E. Indirect Cost				
Profit (10% of A, B, C & D)		L.S.		10,097
VAT (14% of Profit & Labor)		L.S.		7,095
Sub-Total of E				**17,192**
Total of Construction Cost (A+B+C+D+E)				**118,160**
F. Estimated Government Expenses				
1. Preliminary & Detailed Engineering Cost		L.S.		3,000
2. Construction Supervision		L.S.		2,000
3. Water Quality Analysis		L.S.		1,088
Sub-Total of F				**6,088**
GRAND TOTAL				**124,248**
SAY				**124,200**

Note: L.S. - Lump Sum
Source: DPWH standard price in 1994
Unit Cost: Adjusted to 1995 Price Level

Table 10.2.2 Unit Cost of Level I (Deep Well - 50m Depth)

(Cost: Peso)

Description	Quantity	Unit	Unit Cost	Cost
A. Mobilization/Demobilization		**L.S.**		**3,300**
B. Drilling of Well & Installation of Steel Casing/Screen				
1. Materials				
(1) 100mm x 3m Steel Casing with coupling	14	pcs.	2,625	36,750
(2) 100mm x 3m Steel Casing with one end closed	1	pc.	2,719	2,719
(3) 100mm x 3m Low Carbon Steel Screen	2	pcs.	4,313	8,626
2. Labor, Fuel, Lubricant and others				
Well Drilling for 50 m depth at 200mm borehole	50	m	1,100	55,000
3. Freight Cost (7% of Materials)		L.S.		3,367
Sub-Total of B				**106,462**
C. Well Development		**L.S.**		**5,000**
D. Gravel Packing, Installation of Handpump and Construction of Platform				
1. Materials				
(1) Improved Deep Well Cylinder Pump (Malawi Type)	1	set	9,000	9,000
(2) 63mm x 6m GI Pipe with coupling	6	pcs.	1,706	10,236
(3) #10 Sieved Gravel	1.0	cu.m	870	870
(4) Coarse Sand	1	cu.m	304	192
(5) Cement for Sanitary Seal	3	bags	117	351
(6) Pump Base and Platform				
1) Cement	4	bags	117	468
2) Gravel	2	cu.m	385	770
3) Sand	1	cu.m	304	304
4) Plywood (1,200mm x 2,400mm x 6mm)	1	pc.	250	250
5) Form Lumber (50mm x 75mm x 1,800mm)	6	pcs.	45	270
6) Nail	1	kg.	32	32
Sub-Total of D-1				22,743
2. Labor (40% of D-1.)		L.S.		9,097
3. Freight Cost (7% of Materials)		L.S.		1,592
Sub-Total of D				**33,432**
E. Indirect Cost				
Profit (10% of A, B, C and D)		L.S.		14,819
VAT (14% of Profit & Labor)		L.S.		11,048
Sub-Total of E				**25,867**
Total of Construction Cost (A+B+C+D+E)				**174,061**
F. Estimated Government Expenses				
1. Preliminary & Detailed Engineering Cost		L.S.		3,000
2. Construction Supervision		L.S.		2,000
3. Water Quality Analysis		L.S.		1,088
Sub-Total of F				**6,088**
GRAND TOTAL				**180,149**
SAY				**180,100**

Note: L.S. - Lump Sum

Source: DPWH standard price in 1994

Unit Cost Adjusted to 1995 Price Level

Table 10.2.3 Unit Cost of Level I (Deep Well - 70m Depth)

(Cost: Peso)

Description	Quantity	Unit	Unit Cost	Cost
A. Mobilization/Demobilization		L.S.		3,300
B. Drilling of Well & Installation of Steel Casing/Screen				
1. Materials				
(1) 100mm x 3m Steel Casing with coupling	21	pcs.	2,625	55,125
(2) 100mm x 3m Steel Casing with one end closed	1	pc.	2,719	2,719
(3) 100mm x 3m Low Carbon Steel Screen	2	pcs.	4,313	8,626
2. Labor, Fuel, Lubricant and others				
Well Drilling for 70 m depth at 200mm borehole	70	m	1,100	77,000
3. Freight Cost (7% of Materials)		L.S.		4,653
Sub-Total of B				**148,123**
C. Well Development		L.S.		5,000
D. Gravel Packing, Installation of Handpump and Construction of Platform				
1. Materials				
(1) Improved Deep Well Cylinder Pump (Malawi Type)	1	set	9,000	9,000
(2) 63mm x 6m GI Pipe with coupling	9	pcs.	1,706	15,354
(3) #10 Sieved Gravel	1.5	cu.m	870	1,305
(4) Coarse Sand	1	cu.m	385	231
(5) Cement for Sanitary Seal	3	bags	117	351
(6) Pump Base and Platform				
1) Cement	4	bags	117	468
2) Gravel	2	cu.m	385	770
3) Sand	1	cu.m	304	304
4) Plywood (1,200mm x 2,400mm x 6mm)	1	pc.	250	250
5) Form Lumber (50mm x 75mm x 1,800mm)	6	pcs.	45	270
6) Nail	1	kg.	32	32
Sub-Total of D-1				28,335
2. Labor (40% of D-1.)		L.S.		11,334
3. Freight Cost (7% of Materials)		L.S.		1,983
Sub-Total of D				**41,652**
E. Indirect Cost				
Profit (10% of A, B, C and D)		L.S.		19,808
VAT (14% of Profit & Labor)		L.S.		15,140
Sub-Total of E				**34,948**
Total of Construction Cost (A+B+C+D+E)				**233,023**
F. Estimated Government Expenses				
1. Preliminary & Detailed Engineering Cost		L.S.		3,000
2. Construction Supervision		L.S.		2,000
3. Water Quality Analysis		L.S.		1,088
Sub-Total of F				**6,088**
GRAND TOTAL				**239,111**
SAY				**239,100**

Note: L.S. - Lump Sum

Source: DPWH standard price in 1994

Unit Cost: Adjusted to 1995 Price Level

Table 10.2.4 Unit Cost of Level I (Deep Well Rehabilitation)

(Cost: Peso)

Description	Quantity	Unit	Unit Cost	Cost
A. Mobilization/Demobilization		**L.S.**		**3,300**
B. Well Rehabilitation				
1. Materials				
(1) Cylinder Pump Set	1	set	9,000	9,000
(2) Cement for Surface Sealing	4	bags	117	468
(3) Pump Base and Platform				
1) Cement	4	bags	117	468
2) Gravel	2	cu.m	385	770
3) Sand	1	cu.m	304	304
4) Plywood (4' x 8' x 1/4")	1	pc.	250	250
5) Form Lumber (2" x 3" x 6")	6	pcs.	45	270
6) Nail	1	kg.	32	32
Sub-Total of B-1				11,562
2. Labor (40% of B-1)		L.S.		4,625
3. Freight Cost (7% of Materials)		L.S.		809
Sub-Total of B				**16,996**
C. Well Development		**L.S.**		**6,500**
D. Indirect Cost				
Profit (10% of A, B & C)		L.S.		2,680
VAT (14% of Profit & Labor)		L.S.		1,933
Sub-Total of D				**4,613**
Total of Construction Cost (A+B+C+D)				**31,409**
E. Estimated Government Expenses				
1. Preliminary & Detailed Engineering Cost		L.S.		1,100
2. Supervision		L.S.		650
3. Water Quality Analysis		L.S.		1,088
Sub-Total of E				**2,838**
GRAND TOTAL				**34,247**
SAY				**34,200**

Note: L.S. - Lump Sum

Source: DPWH standard price in 1994

Unit Cost: Adjusted to 1995 Price Level

Table 10.2.5 Unit Cost of Level I (Shallow Well - 18m Depth)

(Cost: Peso)

Description	Quantity	Unit	Unit Cost	Cost
A. Mobilization/Demobilization		**L.S.**		**1,100**
B. Drilling of Well & Installation of Steel Casing/Screen				
1. Materials				
(1) 50mm x 6m PVC Pipe with socket	2	pcs.	813	1,626
(2)50mm x 3m PVC Pipe with plug	1	pc.	410	410
(3) 50mm PVC Socket	1	pc.	90	90
(4) 50mm x 3m PVC Screen	1	pc.	1,300	1,300
2. Labor, Fuel, Lubricant and others				
Well Drilling for 18 m depth at 150mm borehole	18	m	520	9,360
3. Freight Cost (7% of Materials)		L.S.		240
Sub-Total of B				**13,026**
C. Well Development		**L.S.**		**500**
D. Gravel Packing, Installation of Handpump and Construction of Platform				
1. Materials				
(1) 50mm Jetmatic Handpump	1	set	2,380	2,380
(2) 50mm x 1m GI Pipe (Sch. 40)	1	pc.	75	75
(3) #10 Sieved Gravel	0.1	cu.m	870	87
(4) Coarse Sand	0.07	cu.m	304	21
(5) Cement for Sanitary Seal	1	bag	117	117
(6) Pump Base and Platform				
1) Cement	4	bags	117	468
2) Gravel	1	cu.m	385	385
3) Sand	1	cu.m	304	304
4) Plywood (1,200mm x 2,400mm x 6mm)	1	pc.	250	250
5) Form Lumber (50mm x 75mm x 1,800 mm)	1	pc.	45	45
6) Nail	1	kg.	32	32
Sub-Total of D-1				4,164
2. Labor (40% of D-1.)		L.S.		1,666
3. Freight Cost (7% of Materials)		L.S.		291
Sub-Total of D				**6,121**
E. Indirect Cost				
Profit (10% of A, B, C & D)		L.S.		2,075
VAT (14% of Profit & Labor)		L.S.		1,834
Sub-Total of E				**3,909**
Total of Construction Cost (A+B+C+D+E)				**24,656**
F. Estimated Government Expenses				
1. Preliminary & Detailed Engineering Cost		L.S.		2,000
2. Construction Supervision		L.S.		1,500
3. Water Quality Analysis		L.S.		1,088
Sub-Total of F				**4,588**
GRAND TOTAL				**29,244**
SAY				**29,200**

Note: L.S. - Lump Sum

Source: DPWH standard price in 1994

Unit Cost: Adjusted to 1995 Price Level

Table 10.2.6 Unit Cost of Level II (600 Service Population)

Sheet-1 (Cost: Peso)

Description	Quantity	Unit	Unit Cost	Cost
A. Mobilization/Demobilization		L.S.		3,000
B. Construction of Spring Box				
1. Materials		L.S.		36,300
2. Labor (30% of 1.)		L.S.		10,890
3. Freight Cost (7% of Materials)		L.S.		2,541
Sub-Total of B				**49,731**
C. Installation of Pipelines & Fittings				
1. Transmission Main				
(1) Materials				
1) 63mm dia. PVC Pipe (Class 12.5 with pusher type socket)	330	pcs.	813	268,290
2) 63mm dia. Tee	1	no.	88	88
3) Solvent Cement	26	cans	46	1,196
4) 63mm dia. x 150mm Nipple	3	nos.	136	408
5) 63mm dia. Union Patente	1	pc.	173	173
6) 63mm dia. x 50mm dia. Reducing Socket	2	pcs.	105	210
7) 63mm dia. Elbow (90 deg.)	1	pc.	76	76
8) 63mm dia. Elbow (45 deg.)	1	pc.	75	75
9) 63mm dia. Gate Valve	3	pcs.	763	2,289
Sub-Total of Materials				272,805
(2) Labor (30% of Material Cost)		L.S.		81,842
(3) Freight Cost (7% of Materials)		L.S.		19,096
Sub-Total of Transmission Main				373,743
2. Distribution Pipeline				
(1) Materials				
1) 50mm dia. PVC Pipe (Class 12.5 with pusher type socket)	20	pcs.	450	9,000
2) 38mm dia. PVC Pipe (Class 12.5 with pusher type socket)	30	pcs.	300	9,000
3) 20mm dia. PVC Pipe (Class 40 with pusher type socket)	10	pcs.	100	1,000
4) 13mm dia. x 1 m Stand Pipe	10	pcs.	94	940
5) Solvent Cement	4	cans	46	184
6) Fittings				
a. 50mm dia. x 150mm PVC Nipple	3	pcs.	125	375
b. 32mm dia. x 150mm PVC Nipple	3	pcs.	76	228
c. 13mm dia. x 150mm GI Nipple	40	pcs.	25	1,000
d. 50mm dia. Union Patente	1	pcs.	163	163
e. 32mm dia. Union Patente	2	pcs.	71	142
f. 13mm dia. Union Patente	10	pcs.	25	250
g. 50mm dia. x 32mm dia. Reducing Socket	6	pcs.	90	540
h. 32mm dia. x 20mm dia. Reducing Socket	10	pcs.	70	700
i. 20mm dia. x 13mm dia. Reducing Socket	10	pcs.	55	550
j. 50mm dia. PVC Elbow (90 deg.)	2	pcs.	68	136
k. 13mm dia. GI Elbow (90 deg.)	20	pcs.	13	260
l. 20mm dia. x 13mm dia. Socket Adaptor	10	pcs.	41	410
m. 50mm dia. GI Gate Valve	2	pcs.	671	1,342
n. 32mm dia. GI Gate Valve	2	pcs.	380	760
o. 13mm dia. GI Gate Valve	24	pcs.	230	5,520
p. 13mm dia. Brass Faucet	24	pcs.	41	984
q. 50mm dia. Tee	4	pcs.	130	520
r. 32mm dia. Tee	6	pcs.	110	660
s. Water Meter	24	pcs.	750	18,000
t. Water Meter Box	24	pcs.	1,100	26,400
Sub-Total of Materials				79,064
(2) Labor (30% of Material Cost)		L.S.		23,719
(3) Freight Cost (7% of Materials)		L.S.		5,534
Sub-Total of Distribution Pipeline				108,317
Sub-Total of C				**482,060**

Table 10.2.6 Unit Cost of Level II (600 Service Population)

Sheet-2 (Cost: Peso)

Description	Quantity	Unit	Unit Cost	Cost
D. Indirect Cost				
1. Transmission Main				
(1) Profit (10% of C-1)		L.S.		37,374
(2) VAT (10% of Profit and Labor)		L.S.		11,922
2. Source Facilities and Distribution Pipeline				
(1) Profit (10% of A, B, C-2)		L.S.		16,105
(2) VAT (14% of Profit and Labor)		L.S.		7,100
Sub-Total of D				**72,501**
Total Construction Cost (A+B+C+D)				607,292
E. Estimated Government Expenses				
1. Preliminary & Detailed Engineering and RWSA Formation		L.S.		2,000
2. Supervision		L.S.		12,000
3. Water Quality Analysis		L.S.		1,088
Sub-Total of E				**15,088**
Total Estimated Cost				622,380
Unit Cost per Person Served				1,037
			Say	**1,000**

Note: L.S. - Lump Sum
Source: DPWH standard price in 1994
Unit Cost: Adjusted to 1995 Price Level

Table 10.2.7 Unit Cost of Level III (5,000 Service Population)

(Cost: Peso)

Description	Quantity	Unit	Unit Cost	Cost
A. Mobilization/Demobilization		**L.S.**		**300,000**
B. Source Development and Storage				
1. Deep Well	1	No.	1,540,000	1,540,000
2. Deep Well Pump	1	No.	550,000	550,000
3. Chlorinator House & Equipment	1	L.S.		440,000
4. Storage Tank (250 cu.m)	1	No.	1,100,000	1,100,000
Sub-Total of B				**3,630,000**
C. Transmission Main				
1. 160mm dia.	500	L.M.	1,120	560,000
Sub-Total of C				**560,000**
D. Distribution Main				
1. 160mm dia.	1,000	L.M.	1,120	1,120,000
2. 110mm dia.	3,000	L.M.	925	2,775,000
3. 90mm dia.	3,000	L.M.	580	1,740,000
4. 75mm dia.	5,000	L.M.	540	2,700,000
Sub-Total of D				**8,335,000**
E. Service Connections	**1,000**	**Nos.**	**1,940**	**1,940,000**
F. Miscellaneous				
1. Vehicle	1	No.	550,000	550,000
2. Office & Workshop Bldg.	1	No.	550,000	550,000
3. Office Equipment		L.S.		100,000
4. Tools and Spare Parts		L.S.		100,000
Sub-Total of F				**1,300,000**
Total Direct Cost (A+B+C+D+E+F)				**16,065,000**
G. Indirect Cost (25% of Direct Cost)		**L.S.**		**4,016,250**
Total Estimated Cost				**20,081,250**
Unit Cost per Person Served				
For New Construction				**4,016**
			Say	**4,000**
For Expansion of Existing System (Exclude F.)				**3,691**
			Say	**3,700**

Note: L.S. - Lump Sum
Source: LWUA standard price in 1994
Unit Cost: Adjusted to 1995 Price Level

Table 10.2.8 Unit Cost of Level III (10,000 Service Population)

(Cost: Peso)

Description	Quantity	Unit	Unit Cost	Cost
A. Mobilization/Demobilization		L.S.		300,000
B. Source Development and Storage				
1. Deep Well	1	No.	1,540,000	1,540,000
2. Deep Well Pump	1	No.	550,000	550,000
3. Chlorinator House & Equipment	1	L.S.		440,000
4. Storage Tank (250 cu.m)	1	No.	1,100,000	1,100,000
Sub-Total of B				**3,630,000**
C. Transmission Main				
1. 160mm dia.	500	L.M.	1,120	560,000
Sub-Total of C				**560,000**
D. Distribution Main				
1. 160mm dia.	2,000	L.M.	1,120	2,240,000
2. 110mm dia.	5,000	L.M.	925	4,625,000
3. 90mm dia.	6,000	L.M.	580	3,480,000
4. 75mm dia.	8,000	L.M.	540	4,320,000
Sub-Total of D				**14,665,000**
E. Service Connections	2,000	Nos.	1,940	3,880,000
F. Miscellaneous				
1. Vehicle	1	No.	550,000	550,000
2. Office & Workshop Bldg.	1	No.	550,000	550,000
3. Office Equipment		L.S.		100,000
4. Tools and Spare Parts		L.S.		100,000
Sub-Total of F				**1,300,000**
Total Direct Cost (A+B+C+D+E+F)				**24,335,000**
G. Indirect Cost (25% of Direct Cost)		L.S.		**6,083,750**
Total Estimated Cost				**30,418,750**
Unit Cost per Person Served				
For New Construction				3,042
			Say	3,000
For Expansion of Existing System (Exclude F.)				2,879
			Say	2,900

Note: L.S. - Lump Sum
Source: LWUA standard price in 1994
Unit Cost: Adjusted to 1995 Price Level

Table 10.2.9 Unit Cost of Level III (15,000 Service Population)

(Cost: Peso)

Description	Quantity	Unit	Unit Cost	Cost
A. Mobilization/Demobilization		L.S.		300,000
B. Source Development and Storage				
1. Deep Well	2	No.	1,540,000	3,080,000
2. Deep Well Pump	2	No.	550,000	1,100,000
3. Chlorinator House & Equipment	2	L.S.		440,000
4. Storage Tank (250 cu.m)	2	No.	1,100,000	2,200,000
Sub-Total of B				6,820,000
C. Transmission Main				
1. 160mm dia.	1,000	L.M.	1,120	1,120,000
Sub-Total of C				1,120,000
D. Distribution Main				
1. 160mm dia.	3,000	L.M.	1,120	3,360,000
2. 110mm dia.	7,000	L.M.	925	6,475,000
3. 90mm dia.	9,000	L.M.	580	5,220,000
4. 75mm dia.	11,000	L.M.	540	5,940,000
Sub-Total of D				20,995,000
E. Service Connections	3,000	Nos.	1,940	5,820,000
F. Miscellaneous				
1. Vehicle	1	No.	550,000	550,000
2. Office & Workshop Bldg.	1	No.	550,000	550,000
3. Office Equipment		L.S.		100,000
4. Tools and Spare Parts		L.S.		100,000
Sub-Total of F				1,300,000
Total Direct Cost (A+B+C+D+E+F)				36,355,000
G. Indirect Cost (25% of Direct Cost)		L.S.		9,088,750
Total Estimated Cost				45,443,750
Unit Cost per Person Served				
For New Construction				3,030
			Say	3,000
For Expansion of Existing System (Exclude F.)				2,921
			Say	2,900

Note: L.S. - Lump Sum
Source: LWUA standard price in 1994
Unit Cost: Adjusted to 1995 Price Level

Table 10.2.10 Unit Cost of Flush Water Sealed with Septic Tank Toilet

Sheet 1 (Cost: Peso)

Description	Quantity	Unit	Unit Cost	Cost
A. Demolition		L.S.		1,000
B. Earthwork				
1. Materials				
(1) Gravel Fill	1	cu.m.	385	385
Sub-Total of B-1				385
2. Labor				
(1) Excavation	6	cu.m.	119	714
(2) Backfill	2	cu.m.	108	216
(3) Gravel Fill	1	cu.m	141	141
Sub-Total of B-2				1,071
Sub-Total of B				**1,456**
C. Walls & Posts				
1. Materials				
(1) 0.15 x 0.20 x 0.40 Ord. CHB	180	pcs.	6	1,080
(2) Cement	17	bags	117	1,989
(3) Sand	2	cu.m	304	608
(4) Rebars: 12 mm dia. x 6.0 m	5	pcs.	68	340
10 mm dia. x 6.0 m	2	pcs.	49	98
(5) #16 Tie Wire	1	kg.	49	49
(6) Scaffolding:				
10-2" x 4" x 8" (Ord. Lumber)	53	bf.	32	1,696
Sub-Total of C-1				5,860
2. Labor (30% of C-1)		L.S.		1,758
Sub-Total of C				**7,618**
D. Roofing Work				
1. Materials				
(1) GA #26 Corr. GI (L=3.0 m)	3	bd.ft.	274	822
(2) GA #26 Plain GI Flushing	1	pc.	264	264
(3) GA # 24 Plain GI Gutter	1	pc.	264	264
(4) Roof Nails	2	kgs.	44	88
(5) Rafter - 2" x 5 x 10', 4 pcs.	33.33	bd.ft	32	1,067
(6) Purlins - 2" x 2" x 12', 3 pcs.	12	bd.ft	32	384
(7) Wood Cleats - 2" x 2" x 12', 1 pc.	3.33	bd.ft	32	107
(8) Nailers - 2" x 2" x 12', 5 pcs.	20	bd.ft	32	640
2" x 2" x 10', 5 pcs.	20	bd.ft	32	640
(9) Fascia Board - 1" x 12" x 18', 2 pcs.	36	bd.ft	32	1,152
(10) Common Wire Nails (Assorted)	3	kgs.	29	87
(11) Downspout (PVC)				
75 mm dia. x 3.0 m	2	pcs.	81	162
(12) Elbow (PVC) - 75 mm dia.	2	pcs.	15	30
(13) Coupling (PVC) - 75 mm dia.	1	pc.	14	14
Sub-Total of D-1				5,721
2. Labor (30% of D-1)		L.S.		1,716
Sub-Total of D				**7,437**

Table 10.2.10 Unit Cost of Flush Water Sealed with Septic Tank Toilet

Sheet 2 (Cost: Peso)

Description	Quantity	Unit	Unit Cost	Cost
E. Plumbing				
1. Materials				
(1) Water Closet	1	set	2,000	2,000
(2) Water line and sanitary fixtures with septic tank		L.S.		6,192
Sub-Total of E-1				8,192
2. Labor (30% of E-1)		L.S.		2,458
Sub-Total of E				**10,650**
F. Carpentry Work				
1. Materials				
(1) Flush Type Door w/Lower Jambs	1	pc.	1,428	1,428
(2) Windows (wooden jalousy) w/Jambs	2	sets	298	596
Sub-Total of F-1				2,024
2. Labor (30% of E-1)		L.S.		607
Sub-Total of F				**2,631**
G. Freight Cost (7% of Materials for B-F excluding indigenous materials)		**L.S.**		**1,225**
H. Indirect Cost				
Profit (10% of A - G)		L.S.		3,202
VAT (14% of Profit & Labor)		L.S.		1,514
Sub-Total of H				**4,716**
Total of Construction Cost (A+B+C+D+E+F+G+H)			**Say**	**36,733** **36,700**

Source: DOH standard price in1993.

Unit Cost: Adjusted to 1995 Price Level

Table 10.2.11 Unit Cost of Pour Flush with Double Pit Latrine

(Cost: Peso)

Description	Quantity	Unit	Unit Cost	Cost
A. Earthwork				
1. Materials				
(1) Gravel Fill	1	cu.m.	385	385
Sub-Total of A-1				385
2 Labor				
(1) Excavation	6	cu.m.	119	714
(2) Backfill	2	cu.m.	108	216
(3) Gravel Fill	1	cu.m.	141	141
Sub-Total of A-2				1,071
Sub-Total of A				**1,456**
B. Concrete Work				
1. Materials				
Slab on wood planks				
(1) 16 - 2" x 8" x 6' Coco Lumber	128	bd.ft.	8	1,024
(2) 10mm dia x 6.0m Rebar	3	pcs.	49	147
(3) #16 Tie Wire	0.5	kg.	49	25
(4) Cement	10	bags	117	1,170
(5) Sand	1.5	cu.m.	304	456
(6) Gravel	2	cu.m.	385	770
(7) Stone Lining with Mortar		L.S.	1,014	1,014
Sub-Total of B-1				4,606
2. Labor (25% of B-1)		L.S.		1,152
Sub-Total of B				**5,758**
C. Walls & Posts				
1. Materials				
(1) 4 - 4" x 4" x 10' Coco Lumber	53.33	bd.ft.	8	427
(2) 6 - 2" x 3" x 10' Coco Lumber	30	bd.ft.	8	240
(3) 8 - 2" x 3" x 8' Coco Lumber	32	bd.ft.	8	256
(4) 2.0 m x 5.0 m Sawali	2	rolls	357	714
(5) Assorted Nails	6	kgs.	29	174
(6) Bamboo Clips		L.S.	119	119
Sub-Total of C-1				1,930
2. Labor (25% of C-1)		L.S.		483
Sub-Total of C				**2,413**
D. Roofing Work				
1. Materials				
Rafters				
(1) 4 - 2" x 4" x 6' Coco Lumber	16	bd.ft.	8	128
(2) Bamboo Purlins		L.S.	119	119
(3) Nipa Roofing	2	100	238	476
Sub-Total of D-1		pcs./bandle		723
2. Labor (25% of D-1)		L.S.		181
Sub-Total of D				**904**
E. Plumbing				
1. Material				
(1) Toilet Bowl-Squat Type	1	pc.	547	547
(1) 75mm dia x 6.0m PVC Pipe	1	pc.	129	129
Sub-Total of E-1				676
2. Labor (25% of E-1)		L.S.		169
Sub-Total of E				**845**
F. Freight Cost (7% of Materials for B - E excluding indigenous materials)		**L.S.**		**153**
G. Indirect Cost				
Profit (10% of A - F)		L.S.		1,153
VAT (14% of Profit & Labor)		L.S.		589
Sub-Total of G				**1,742**
Total Construction Cost (A+B+C+D+E+F+G)			**Say**	**13,271** **13,300**

Note: L.S. - Lump Sum

Source: DOH standard price in 1993.

Unit Cost: Adjusted to 1995 Price Level

Table 10.2.12 Unit Cost of Ventilated Improved Pit Latrine (VIP)

(Cost: Peso)

Description	Quantity	Unit	Unit Cost	Cost
A. Earthwork				
1. Materials				
(1) Gravel Fill	0.5	cu.m	385	193
Sub-Total of A-1				193
2. Labor				
(1) Excavation	3	cu.m	119	357
(2) Backfill	1	cu.m	108	108
(3) Gravel Fill	0.5	cu.m	141	71
Sub-Total of A-2				536
Sub-Total of A				729
B. Concrete Work				
1. Materials				
Slab on wood planks				
(1) 8 - 2" x 8" x 6' Coco Lumber	64	bd.ft.	8	512
(2) 10mm dia x 6.0m Rebar	2	pcs.	49	98
(3) #16 Tie Wire	0.5	kg.	49	25
(4) Cement	4	bags	117	468
(5) Sand	0.5	cu.m	304	152
(6) Gravel	0.5	cu.m	385	193
(7) Stone Lining with Mortar		L.S.	1,014	1,014
Sub-total of B-1				2,462
2. Labor (25% of B-1)		L.S.		616
Sub-Total of B				3,078
C. Walls & Posts				
1. Materials				
(1) 4 - 4" x 4" x 10' Coco Lumber	53.33	bd.ft.	8	427
(2) 6 - 2" x 3" x 10' Coco Lumber	30	bd.ft.	8	240
(3) 8 - 2" x 3" x 8' Coco Lumber	32	bd.ft.	8	256
(4) 2.0 m x 5.0 m Sawali	2	rolls	357	714
(5) Assorted Nails	6	kgs.	29	174
(6) Bamboo Clips		L.S.	119	119
Sub-Total of C-1				1,930
2. Labor (25% of C-1)		L.S.		483
Sub-Total of C				2,413
D. Roofing Work				
1. Materials				
Rafters				
(1) 4 - 2" x 4" x 6' Coco Lumber	16	bd.ft.	8	128
(2) Bamboo Purlins		L.S.	119	119
(3) Nipa Roofing	2	100	238	476
Sub-Total of D-1		pcs./bundle		723
2. Labor (25% of D-1)		L.S.		181
Sub-Total of D				904
E. Plumbing				
1. Materials				
(1) 50mm dia PVC Pipe	1	pc.	65	65
(2) Fly Screen		L.S.	50	50
Sub-Total of E-1				115
2. Labor (25% of E-1)		L.S.		29
Sub-Total of E				144
F. Freight Cost (7% of Materials for B-E excluding sand and gravel)		**L.S.**		62
G. Indirect Cost				
Profit (10% of A - F)		L.S.		733
VAT (14% of Profit & Labor)		L.S.		286
Sub-Total of G				1,019
Total of Construction Cost (A+B+C+D+E+F+G)			**Say**	8,349 8,300

Note: L.S. - Lump Sum

Source: DOH standard price in 1993.

Unit Cost: Adjusted to 1995 Price Level

Table 10.2.13 Unit Cost of School Toilet

Sheet-1 (Cost: Peso)

Description	Quantity	Unit	Unit Cost	Cost
A. Mobilization and Demobilization		**L.S.**		**5,300**
B. Earthwork				
1. Materials				
(1) Gravel Fill	3.00	cu.m	385	1,155
Sub-Total of B-1				1,155
2. Labor				
(1) Excavation	15.88	cu.m	119	1,890
(2) Backfill	4.97	cu.m	108	537
(3) Gravel Fill	3.00	cu.m	141	423
Sub-Total of B-2				2,850
Sub-Total of B				**4,005**
C. Concrete Work				
1. Materials				
(1) Cement	61.00	bags	117	7,137
(2) Sand	4.00	cu.m	304	1,216
(3) Gravel	8.00	cu.m	385	3,080
(4) Rebars: 12mm dia x 6m	38.00	pcs.	68	2,584
10mm dia x 6m	57.00	pcs.	49	2,793
(5) #16 Tie Wire	8.00	kgs.	49	392
(6) Formworks:				
1/4" Plywood	6.00	pcs.	405	2,430
2"x2"x10" (Coco Lumber)	200.00	bd.ft.	8	1,600
Sub-Total of C-1				21,232
2. Labor (30% of C-1)		L.S.		6,370
Sub-Total of C				**27,602**
D. Masonry Work				
1. Materials				
(1) 6" CHB	800.00	pcs.	6	4,800
(2) 4" CHB	260.00	pcs.	5	1,300
(3) Cement	97.00	bags	117	11,349
(5) Sand	10.00	cu.m	304	3,040
(6) Rebars: 12mm dia x 6m	30.00	pcs.	68	2,040
10mm dia x 6m	11.00	pcs.	49	539
(7) #16 Tie Wire	4.00	kgs.	49	196
(8) Scaffolding:				
2"x4"x8" = 10 pcs. (Coco Lumber)	53.33	bf.	8	427
Sub-Total of D-1				23,691
2. Labor (30% of D-1)		L.S.		7,107
Sub-Total of D				**30,798**
E. Roofing Work				
1. Materials				
(1) GA #26 Corr. GI (1 = 10')	20.00	pcs.	274	5,480
(2) GA #24 Pln. GI Flashing	3.00	pcs.	264	792
(3) GA #24 Pln. GI Gutter (Pre-Fab)	9.00	pcs.	264	2,376
(4) Umbrella Nails 2 - 1/2"	12.00	kgs.	44	528
(5) Rafter - 2"x5"x18' = 5 pcs.	75.00	bf.	32	2,400
(6) Purlins - 2"x2"x12' = 18 pcs.	72.00	bf.	32	2,304
(7) WD Cleats - 2"x2"x10" = 6 pcs.	20.00	bf.	32	640

Table 10.2.13 Unit Cost of School Toilet

Sheet-2 (Cost: Peso)

Description	Quantity	Unit	Unit Cost	Cost
(8) Nailers - 2"x2"x1012' = 30 pcs.	120.00	bf.	32	3,840
- 2"x2"x10' = 36 pcs.	120.00	bf.	32	3,840
(9) Fascia Board				
1"x12"x12' = 4 pcs.	48.00	bf.	32	1,536
1"x12"x18' = 2 pcs.	36.00	bf.	32	1,152
(10) Wood Plate				
2"x4"x20' = 2 pcs.	26.66	bf.	32	853
(11) 1/4" Thk. Mar. Plywood 4'x8'	14.00	pcs.	29	406
(12) C.W.N. Assorted	15.00	kgs.	29	435
(13) 3" dia x 3m Downspout (PVC)	3.00	pcs.	81	242
(14) 3" dia Elbow (PVC)	2.00	pcs.	15	30
(15) 3"dia Coupling (PVC)	1.00	pcs.	14	14
(16) Ceiling Vent				
1"x1"x8' = 4 pcs.	2.67	bf.	26	69
(17) Screen (1/8"x1/8")	1.00	yd.	81	81
Sub-Total of E-1				27,018
2. Labor (30% of E-1)		L.S.		8,105
Sub-Total of E				**35,123**
F. Carpentry Work				
1. Materials				
(1) D - 1 Hollow Core Tanguile				
Flush Type Door w/ Louver (.80x2.20)	2.00	sets	1,428	2,856
(2) D - 2 Hollow Core Tanguile				
Flush Type Door (.60x2.10)	1.00	sets	1,071	1,071
(3) D - 3 Louver Door (.60x1.40)	5.00	sets	893	4,465
(4) Door Jambs (Apitong)				
2"x6"x14" = 1 pc.	14.00	bf.	32	448
2"x6"x10" = 2 pcs.	20.00	bf.	32	640
2"x6"x10" = 1 pc.	18.00	bf.	32	576
2"x4"x12" = 5 pcs.	40.00	bf.	32	1,280
(7) Wooden Jalousie Window				
With 5 Blades (.40x.50)	14.00	set	298	4,172
(8) Window Jambs (Apitong)				
2"x6"x16" = 5 pcs.	80.00	bf.	32	2,560
2"x6"x14" = 1 pc.	14.00	bf.	32	448
2"x6"x10" = 1 pc.	10.00	bf.	32	320
(9) Cabinet				
3/4"x4'x8' = 1 pc. (plyboard)	1.00	pc.	774	774
Sub-Total of F-1				19,610
2. Labor (30% of F-1)		L.S.		5,883
Sub-Total of F				**25,493**
G. Tile Work				
1. Materials				
(1) 4 - 1/4"x4 - 1/4" Glazed Tiles	1,950.00	pcs.	4	7,800
(2) 0.10x0.20m Floor Tiles	900.00	pcs.	7	6,300
(3) Cement	4.00	bags	117	468
(4) White Cement	1.00	bag	629	629
Sub-Total of G-1				15,197

Table 10.2.13 Unit Cost of School Toilet

Sheet-3 (Cost: Peso)

Description	Quantity	Unit	Unit Cost	Cost
2. Labor (30% of G-1)		L.S.		4,559
Sub-Total of G				**19,756**
II. Plumbing Work				
1. Materials				
(1) Toilet Bowl - Squat Type	3.00	sets	596	1,788
(2) Toilet Bowl-Sit Type	2.00	sets	596	1,192
(3) Lavatory	2.00	sets	845	1,690
(4) 4" dia x 3m PVC San. Pipe	4.00	pcs.	149	596
(5) 3" dia x 3m PVC San. Pipe	7.00	pcs.	84	588
(6) 1 1/ 2" dia x 3m PVC San. Pipe	4.00	pcs.	53	212
(7) 2" dia. x 3m PVC San. Pipe	2.00	pcs.	50	100
(8) 6" x 4" Floor Drain	5.00	pcs.	84	420
(9) 2" dia. Elbow PVC	4.00	pcs.	7	28
(10) 4" dia WYB PVC	2.00	pcs.	25	50
(11) 4" dia. x 3" dia. WYB PVC	12.00	pcs.	30	360
(12) 4" dia. x 2" dia. TEE PVC	2.00	pcs.	31	62
(13) 4" dia. TEE PVC	3.00	pcs.	31	93
(14) 1 1/2" dia. WYB PVC	1.00	pcs.	12	12
(15) 4" dia. Clean Out PVC	3.00	pcs.	35	105
(16) 3" dia. Clean Out PVC	1.00	pcs.	28	28
(17) Faucet	3.00	pcs.	50	150
(18) 3" dia. x 2" dia. WYB PVC	2.00	pcs.	25	50
(19) 1 1/2" dia. Elbow PVC	6.00	pcs.	13	78
(20) PVC Cement	1.00	can	121	121
(21) 2" dia. PVC San. Pipe x 3m	2.00	pcs.	79	158
(22) 4" dia. x 2" dia. TEE	2.00	pcs.	21	42
(23) Check Valve 1 1/2"	1.00	pcs.	182	182
(24) 4" P-Trap	5.00	pcs.	66	330
Sub-Total of H-1				8,435
2. Labor (30% of H-1)		L.S.		2,531
Sub-Total of H				**10,966**
I. Painting				
1. Materials				
(1) Acrylic, Semi Gloss	8.00	gals.	261	2,088
(2) Concrete Sealer	4.00	gals.	206	824
(3) Acri Color: Wood	4.00	gals.	80	320
(4) Enamel, QDE	6.00	gals.	266	1,596
(5) Wood Putty	1.00	gals.	302	302
(6) Paint Thinner	1.00	gals.	60	60
(7) Tinting Color	4.00	pint	40	160
(8) Sand Paper (Assorted)	15.00	pcs.	7	105
(9) Misecellaneous		L.S.	1,000	0
(10) Roof Paint (green, ready-mix)	2.00	gals.	281	562
Sub-Total of I-1				6,017
2. Labor (30% of I-1)		L.S.		1,805
Sub-Total of I				**7,822**

Table 10.2.13 Unit Cost of School Toilet

Sheet-4 (Cost: Peso)

Description	Quantity	Unit	Unit Cost	Cost
J. Electrical Work				
1. Materials				
(1) 40 Watts Flourescent Lamp	2.00	sets	255	510
(2) Elect. Wire TW #12	24.00	M	7	168
(3) Elect. Conduit - 1/2" dia x 10"	4.00	pcs.	78	312
(4) Entrance Cap. 1/2" dia	1.00	pc.	29	29
(5) Switch Outlet, Flush Type	2.00	pcs.	39	78
(6) Utility Box 2"x3"	2.00	pcs.	7	14
(7) Porcelain Receptacle 2" dia	2.00	pcs.	7	14
(8) Safety Switch 60A, 250V	1.00	set	490	490
(9) Electrical Tape	1.00	roll	22	22
Sub-Total of J-1				1,637
2. Labor (30% of J-1)		L.S.		491
Sub-Total of J				**2,128**
K. Hardware				
1. Materials				
(1) 3"x3" Butt Hinges (Loose Pin)	10.00	pcs.	15	150
(2) 4"x4" Butt Hinges (Loose Pin)	12.00	pcs.	18	216
(3) Door Lockset (Schlage US)	3.00	pcs.	454	1,362
(4) Barrel Bolt (4")	5.00	pcs.	40	200
(5) Cabinet Pull (4")	5.00	pcs.	7	35
(6) Water Storage Cover				
Checkered Plate 1/4" thick				
1.44x0.645 w/ L bar & flat bar	1.00	set	984	984
0.645x0.633 w/ L bar & flat bar	2.00	set	555	1,110
(7) Padlock	1.00	pcs.	378	378
Sub-Total of K-1				4,435
2. Labor (30% of K-1)		L.S.		1,331
Sub-Total of K				5,766
L. Septic Tank and Sewage Basin				
1. Materials				
(1) 4" CHB	180.00	pcs.	5	900
(2) Cement	18.00	bags	117	2,106
(3) Sand	1.50	cu.m	304	456
(4) Gravel	1.00	cu.m	385	385
(5) Rebars: 10mm dia x 6m	29.00	pcs.	68	1,972
(6) #16 Tire Wire	2.00	kgs.	49	98
(7) Formworks: Coco Lumber				
2"x3"x10' = 12 pcs.	60.00	bf.	8	480
1/4" plywood ord. 4'x8'	2.00	pcs.	405	810
C.W.N. (Assorted)	2.00	kgs.	29	58
Sub-Total of L-1				7,265
2. Labor (30% of L-1)		L.S.		2,180
Sub-Total of L				9,445

Sheet-5 (Cost: Peso)

Description	Quantity	Unit	Unit Cost	Cost
M. Shallow Well (18 depth)				
a. Drilling of Well & Installation of Steel Casing/Screen				
1. Materials				
(1) 63mm x 6m PVC Pipe with socket	2.00	pcs.	813	1,626
(2) 63mm x 3m PVC Pipe with plug	1.00	pc.	410	410
(3) 63mm PVC Socket	1.00	pc.	90	90
(4) 63mm x 3m PVC Screen	1.00	pc.	1,300	1,300
Sub-Total of M-a-1				3,426
2. Labor, Fuel, Lubricant and others				
Well Drilling for 18m depth at 150mm borehole	18.00	m	520	9,360
Sub-Total of M-a				12,786
b. Well Development		L.S.		500
c. Gravel Packing, Installation of Hand-Pump and Construction of Platform				
1. Materials				
(1) 50mm Jetmatic Handpump	1.00	set	2,380	2,380
(2) 50mm x 1m GI Pipe (Sch. 40)	1.00	pc.	75	75
(3) #10 Sieved Gravel	0.10	cu.m	870	87
(4) Coarse Sand	0.07	cu.m	430	30
(5) Cement for Sanitary Seal	1.00	bag	117	117
(6) Pump Base and Platform				
1) Cement	4.00	bags	117	468
2) Gravel	1.00	cu.m	385	385
3) Sand	1.00	cu.m	304	304
4) Plywood (1,200mm x 2,400mm x 6mm)	1.00	pc.	405	405
5) Form Lumber (50mmx75mmx1,800mm)	1.00	pc.	45	45
6) Nail	1.00	kg.	29	29
Sub-Total of M-c-1				33,823
2. Labor (40% of M-c-1)		L.S.		13,529
Sub-Total of M-c				47,352
Sub-Total of M				60,638
N. Freight Cost (7% of Materials for A - M excluding sand and gravel)		**L.S.**		**11,396**
O. Indirect Cost				
Profit (10% of A - N)		L.S.		25,624
VAT (14% of Profit & Labor)		L.S.		11,531
Sub-Total of O				37,155
Total of Construction Cost (A to O)				293,393
P. Estimated Government Expenses				
1. Preliminary & Detailed Engineering Cost		L.S.		2,000
2. Construction Supervision		L.S.		1,500
Sub-Total of P				3,500
GRAND TOTAL			Say	296,893 296,900

Source: DOH standard price in 1993.
Unit Cost: Adjusted to 1995 Price Level

Table 10.2.14 Unit Cost of Public Toilet

Sheet-1 (Cost: Peso)

Description	Quantity	Unit	Unit Cost	Cost
A. Mobilization and Demobilization (2.4% of B - M)		L.S.		**6,400**
B. Earthwork				
1. Materials				
(1) Gravel Fill	3.00	cu.m	385	1,155
Sub-Total of B-1				1,155
2. Labor				
(1) Excavation	15.88	cu.m	119	1,890
(2) Backfill	4.97	cu.m	108	537
(3) Gravel Fill	3.00	cu.m	141	423
Sub-Total of B-2				2,850
Sub-Total of B				**4,005**
C. Concrete Work				
1. Materials				
(1) Cement	61.00	bags	117	7,137
(2) Sand	4.00	cu.m	304	1,216
(3) Gravel	8.00	cu.m	385	3,080
(4) Rebars: 12mm dia x 6m	38.00	pcs.	68	2,584
10mm dia x 6m	57.00	pcs.	48	2,736
(5) #16 Tie Wire	8.00	kgs.	48	384
(6) Formworks:				
1/4" Plywood	6.00	pcs.	405	2,430
2"x2"x10" (Coco Lumber)	200.00	bd.ft.	8	1,600
Sub-Total of C-1				21,167
2. Labor (30% of C-1)		L.S.		6,350
Sub-Total of C				**27,517**
D. Masonry Work				
1. Materials				
(1) 6" CHB	800.00	pcs.	6	4,800
(2) 4" CHB	260.00	pcs.	5	1,300
(3) Cement	97.00	bags	117	11,349
(5) Sand	10.00	cu.m	304	3,040
(6) Rebars: 12mm dia x 6m	30.00	pcs.	68	2,040
10mm dia x 6m	11.00	pcs.	49	539
(7) #16 Tie Wire	4.00	kgs.	49	196
(8) Scaffolding:				
2"x4"x8" = 10 pcs. (Coco Lumber)	53.33	bf.	8	427
Sub-Total of D-1				23,691
2. Labor (30% of D-1)		L.S.		7,107
Sub-Total of D				**30,798**
E. Roofing Work				
1. Materials				
(1) GA #26 Corr. GI (1 = 10')	20.00	pcs.	274	5,480
(2) GA #24 Pln. GI Flashing	3.00	pcs.	264	792
(3) GA #24 Pln. GI Gutter (Pre-Fab)	9.00	pcs.	264	2,376
(4) Umbrella Nails 2 - 1/2"	12.00	kgs.	44	528
(5) Rafter - 2"x5"x18' = 5 pcs.	75.00	bf.	32	2,400

Table 10.2.14 Unit Cost of Public Toilet

Sheet-2 (Cost: Peso)

Description	Quantity	Unit	Unit Cost	Cost
(6) Purlins - 2"x2"x12' = 18 pcs.	72.00	bf.	32	2,304
(7) WD Cleats - 2"x2"x10" = 6 pcs.	20.00	bf.	32	640
(8) Nailers - 2"x2"x1012' = 30 pcs.	120.00	bf.	32	3,840
- 2"x2"x10' = 36 pcs.	120.00	bf.	32	3,840
(9) Fascia Board				
1"x12"x12' = 4 pcs.	48.00	bf.	32	1,536
1"x12"x18' = 2 pcs.	36.00	bf.	32	1,152
(10) Wood Plate				
2"x4"x20' = 2 pcs.	26.66	bf.	32	853
(11) 1/4" Thk. Mar. Plywood 4'x8'	14.00	pcs.	452	6,328
(12) C.W.N. Assorted	15.00	kgs.	29	435
(13) 3" dia x 3m Downspout (PVC)	3.00	pcs.	81	243
(14) 3" dia Elbow (PVC)	2.00	pcs.	15	30
(15) 3"dia Coupling (PVC)	1.00	pcs.	14	14
(16) Ceiling Vent, 1"x1"x8', 4 pcs.	2.67	bf.	26	69
(17) Screen (1/8"x1/8")	1.00	yd.	81	81
Sub-Total of E-1				32,941
2. Labor (30% of E-1)		L.S.		9,882
Sub-Total of E				**42,823**
F. Carpentry Work				
1. Materials				
(1) D - 1 Hollow Core Tanguile				
Flush Type Door w/ Louver (.80x2.20)	2.00	sets	1,428	2,856
(2) D - 2 Hollow Core Tanguile				
Flush Type Door (.60x2.10)	1.00	sets	1,071	1,071
(3) D - 3 Louver Door (.60x1.40)	5.00	sets	893	4,465
(4) Door Jambs (Apitong)				
2"x6"x14" = 1 pc.	14.00	bf.	32	448
2"x6"x10" = 2 pcs.	20.00	bf.	32	640
2"x6"x10" = 1 pc.	18.00	bf.	32	576
2"x4"x12" = 5 pcs.	40.00	bf.	32	1,280
(7) Wooden Jalousie Window				
With 5 Blades (.40x.50)	14.00	set	298	4,172
(8) Window Jambs (Apitong)				
2"x6"x16" = 5 pcs.	80.00	bf.	32	2,560
2"x6"x14" = 1 pc.	14.00	bf.	32	448
2"x6"x10" = 1 pc.	10.00	bf.	32	320
(9) Cabinet				
3/4"x4'x8' = 1 pc. (plyboard)	1.00	pc.	774	774
Sub-Total of F-1				19,610
2. Labor (30% of F-1)		L.S.		5,883
Sub-Total of F				**25,493**
G. Tile Work				
1. Materials				
(1) 4 - 1/4"x4 - 1/4" Glazed Tiles	1,950.00	pcs.	4	7,800
(2) 0.10x0.20m Floor Tiles	900.00	pcs.	7	6,300
(3) Cement	4.00	bags	117	468

Table 10.2.14 Unit Cost of Public Toilet

Sheet-3 (Cost: Peso)

Description	Quantity	Unit	Unit Cost	Cost
(4) White Cement	1.00	bag	629	629
(5) Tiles Fittings		L.S.	4,790	4,790
Sub-Total of G-1				19,987
2. Labor (30% of G-1)		L.S.		5,996
Sub-Total of G				**25,983**
II. Plumbing Work				
1. Materials				
(1) Urinal	3.00	sets	1,063	3,189
(2) Toilet Bowl - Squat Type	6.00	sets	596	3,576
(3) 4" dia x 3m PVC San. Pipe	6.00	pcs.	149	894
(4) 3" dia x 3m PVC San. Pipe	4.00	pcs.	84	336
(5) 2" dia x 3m PVC San. Pipe	3.00	pcs.	50	150
(6) 3/4" dia x 6m G.I. Pipe Sch. 40	5.00	pcs.	244	1,220
(7) 1/2" dia x 6m G.I. Pipe Sch. 40	1.00	pcs.	179	179
(8) 4"x4" WYE PVC	1.00	pcs.	25	25
(9) 3" dia Elbow PVC	10.00	pcs.	30	300
(10) 3" dia 45 degrees Bend PVC	2.00	pcs.	25	50
(11) 2" dia Elbow PVC	6.00	pcs.	7	42
(12) 2" dia 45 degrees Bend PVC	2.00	pcs.	20	40
(13) 1/2" dia Elbow G.I.	5.00	pcs.	10	50
(14) 4" dia 3" dia WYE PVC	8.00	pcs.	40	320
(15) 3/4" dia TEE G.I.	7.00	pcs.	40	280
(16) 1/2" dia TEE G.I.	5.00	pcs.	20	100
(17) 4" dia x 2" dia TEE PVC	6.00	pcs.	40	240
(18) 4" dia Clean Out PVC	3.00	pcs.	35	105
(19) 2" dia Clean Out PVC	1.00	pcs.	25	25
(20) Faucet	10.00	pcs.	50	500
(21) 3" dia x 2" dia Elbow Reducer PVC	1.00	pcs.	28	28
(22) 3" dia x 2" dia WYE PVC	3.00	pcs.	25	75
(23) 2" dia x 2" dia WYE PVC	3.00	pcs.	15	45
(24) PVC Cement	1.00	can	121	121
(25) 4" dia x 2" dia WYE PVC	2.00	pcs.	40	80
(26) Gate Valve 3/4" dia	1.00	pcs.	121	121
(27) Gate Valve 1/2" dia	1.00	pcs.	96	96
(28) Water Meter 3/4" dia	1.00	pcs.	1,261	1,261
(29) 3/4"dia x1/2"dia Elbow Reducer G.I.	1.00	pcs.	14	14
Sub-Total of H-1				13,462
2. Labor (30% of H-1)		L.S.		4,039
Sub-Total of H				**17,501**
I. Painting				
1. Materials				
(1) Acrylic, Semi Gloss	8.00	gals.	261	2,088
(2) Concrete Sealer	4.00	gals.	206	824
(3) Acri Color: Wood	4.00	gals.	80	320
(4) Enamel, QDE	6.00	gals.	266	1,596
(5) Wood Putty	1.00	gals.	302	302
(6) Paint Thinner	1.00	gals.	60	60

Table 10.2.14 Unit Cost of Public Toilet

Sheet-4 (Cost: Peso)

Description	Quantity	Unit	Unit Cost	Cost
(7) Tinting Color	4.00	pint	40	160
(8) Sand Paper (Assorted)	15.00	pcs.	7	105
(9) Misecellaneous		L.S.	1,005	0
(10) Roof Paint (green, ready-mix)	2.00	gals.	281	562
Sub-Total of I-1				6,017
2. Labor (30% of I-1)		L.S.		1,805
Sub-Total of I				**7,822**
J. Electrical Work				
1. Materials				
(1) 40 Watts Flourescent Lamp	2.00	sets	255	510
(2) Elect. Wire TW #12	24.00	M	7	168
(3) Elect. Conduit - 1/2" dia x 10"	4.00	pcs.	78	312
(4) Entrance Cap. 1/2" dia	1.00	pc.	29	29
(5) Switch Outlet, Flush Type	2.00	pcs.	39	78
(6) Utility Box 2"x3"	2.00	pcs.	7	14
(7) Porcelain Receptacle 2" dia	2.00	pcs.	7	14
(8) Safety Switch 60A, 250V	1.00	set	490	490
(9) Electrical Tape	1.00	roll	22	22
Sub-Total of J-1				1,637
2. Labor (30% of J-1)		L.S.		491
Sub-Total of J				**2,128**
K. Hardware				
1. Materials				
(1) 3"x3" Butt Hinges (Loose Pin)	10.00	pcs.	15	150
(2) 4"x4" Butt Hinges (Loose Pin)	12.00	pcs.	18	216
(3) Door Lockset (Schlage US)	3.00	pcs.	454	1,362
(4) Barrel Bolt (4")	5.00	pcs.	40	200
(5) Cabinet Pull (4")	5.00	pcs.	7	35
(6) Water Storage Cover				
Checkered Plate 1/4" thick				
1.44x0.633 w/ L bar & flat bar	1.00	set	984	984
(7) 0.645x0.633 w/ L bar & flat bar	2.00	set	555	1,110
(8) Padlock	1.00	pcs.	378	378
Sub-Total of K-1				4,435
2. Labor (30% of K-1)		L.S.		1,331
Sub-Total of K				**5,766**
L. Septic Tank and Sewage Basin				
1. Materials				
(1) 4" CHB	180.00	pcs.	5	900
(2) Cement	18.00	bags	117	2,106
(3) Sand	1.50	cu.m	304	456
(4) Gravel	1.00	cu.m	385	385
(5) Rebars: 10mm dia x 6m	29.00	pcs.	68	1,972
(6) #16 Tire Wire	2.00	kgs.	49	98

Table 10.2.14 Unit Cost of Public Toilet

Sheet-5 (Cost: Peso)

Description	Quantity	Unit	Unit Cost	Cost
(7) Formworks: Coco Lumber				
2"x3"x10' = 12 pcs.	60.00	bf.	8	480
1/4" plywood ord. 4'x8'	2.00	pcs.	405	810
C.W.N. (Assorted)	2.00	kgs.	29	58
Sub-Total of L-1				7,265
2. Labor (30% of L-1)		L.S.		2,180
Sub-Total of L				**9,445**
M. Concrete Water Tank (Elevated)				
1. Earth Work				
(1) Materials				
1) Gravel Fill	1.00	cu.m	385	385
Sub-Total of M-1 (1)				385
(2) Labor				
1) Excavation	14.70	cu.m	119	1,749
2) Backfill	13.08	cu.m	108	1,413
3) Gravel Fill	1.00	cu.m	141	141
Sub-Total of M-1 (2)				3,303
Sub-Total of M-1				3,688
2. Materials				
(1) Cement	62.00	bags	117	7,254
(2) Sand	4.50	cu.m	304	1,368
(3) Gravel	8.00	cu.m	385	3,080
(4) Rebars: 12mm dia x 6m	160.00	pcs.	49	7,840
(5) #16 Tie Wire	4.00	kgs.	49	196
(6) Formworks:				
1/4" plywood	12.00	pcs.	405	4,860
2"x3"x16' = 60 pcs.	480.00	bf.	8	3,840
(7) C.W.N. (Assorted)	5.00	kgs.	29	145
Sub-Total of M-2				39,647
3. Labor (30% of M-2)		L.S.		11,894
Sub-Total of M				**55,229**
N. Freight Cost (7% of Materials for A - M excluding sand and gravel)		**L.S.**		**12,406**
O. Indirect Cost				
Profit (10% of A - M)		L.S.		27,332
VAT (14% of Profit & Labor)		L.S.		12,662
Sub-Total of O				**39,994**
Total of Construction Cost (A to O)				**313,310**
P. Estimated Government Expenses				
1. Preliminary & Detailed Engineering Cost		L.S.		2,000
2. Construction Supervision		L.S.		1,500
Sub-Total of P				**3,500**
GRAND TOTAL				**316,810**
			Say	**316,800**

Source: DOH standard price in 1993.
Unit Cost: Adjusted to 1995 Price Level

10.2.2 Unit Cost of Equipment

Unit cost (CIF Manila) of equipment was referred to the standard cost estimates of DPWH as follows.

(1) Medium size rotary drilling rig

Type:

Truck-mounted top head drive mud circulation type

Rated drilling capacity:

150 m depth for ϕ250 mm bore hole

Equipment composition:

One unit of truck-mounted drilling rig

Each one set of operating accessories, drilling tools, casing tools and fishing tools

One set of spare parts (equivalent to 10% of above equipment/tool cost)

Unit cost:

Peso 17,370,000 per set

(2) Medium size percussion drilling equipment

Type:

Truck-mounted cable percussion type

Rated drilling capacity:

150 m depth for ϕ250 mm bore hole

Equipment composition:

One unit of truck-mounted drilling rig

Each one set of operating accessories, drilling tools, pipe handling tools and fishing tools

One set of spare parts (equivalent to 10% of above equipment/tool cost)

Unit cost:

Peso 10,280,000 per set

(3) Well rehabilitation equipment

Equipment composition:

One unit of diesel engine driven air compressor (7.5 kg/sq.cm, 500 liter/min.)

One set of air hose and hose fittings

Unit cost:

Peso 138,000 per set

(4) Service truck

Type:

Diesel engine driven 4 tons truck equipped with crane

Unit cost:

Peso 1,175,000 per unit

(5) Support vehicle

Type:

Diesel engine driven pick-up truck with electric winch

Unit cost:

Peso 500,000 per unit

(6) Refuse collection truck

Type:

Closed type compactor truck with 5 cu.m of payload capacity

Unit cost:

Peso 1,380,000 per unit including spare parts