Joint Department Order delimits its responsibilities up to the turnover of the facilities to the beneficiaries, there is a possibility that the committee may be involved in the post-construction stage in the blanket clause, "perform other related activities as may be needed".

Institutional linkages and functions focusing on the RWSAs/BWSAs are shown in Figure 4.1. In addition, relevant organizational and functional charts of the DPWH, PMO-RWS, LWUA and DOH are attached in Appendix A.2.

4.3.2 Project Components and Physical Targets

The contents of water supply facility and the school toilet components including the respective service population and number of pupils in each province are shown in Table 4.5. These comprise, for both Region I and Region VI, of 78 Level I water supply systems 16 Level II water supply systems and toilets for 159 schools totaling 217 units. The water supply systems and school toilets are expected to benefit 42,107 people and 82,423 pupils, respectively. Physical targets for equipment and service vehicles remain as per request listed in Table 2.3.

Under the planned two-stage construction scheme, the first stage shall be made up of Ilocos Sur and Pangasinan in Region I and Iloilo and Antique in Region VI, and the second stage shall comprise of Ilocos Norte and La Union in Region I and Aklan and Capiz in Region VI. The priority scheduling provides equal opportunity to the two regions to avail of the Project benefits, derived from the fact that the degree of urgency of need is practically the same in the site/community levels. Furthermore, the provinces for the stage I project are selected based on a synthetic study of some factors including rural population size and percentage to the total, degree of investments made as of the present time in the provinces caused by locational and historical factors, and urgency of needs for the Project. Effects on the total construction cost is also minimal under the recommended arrangement, in comparison with a stage implementation involving regional grouping, since this Project is charac-

FIGURE 4.1 INSTITUTIONAL DEVELOPMENT FLOW CHART

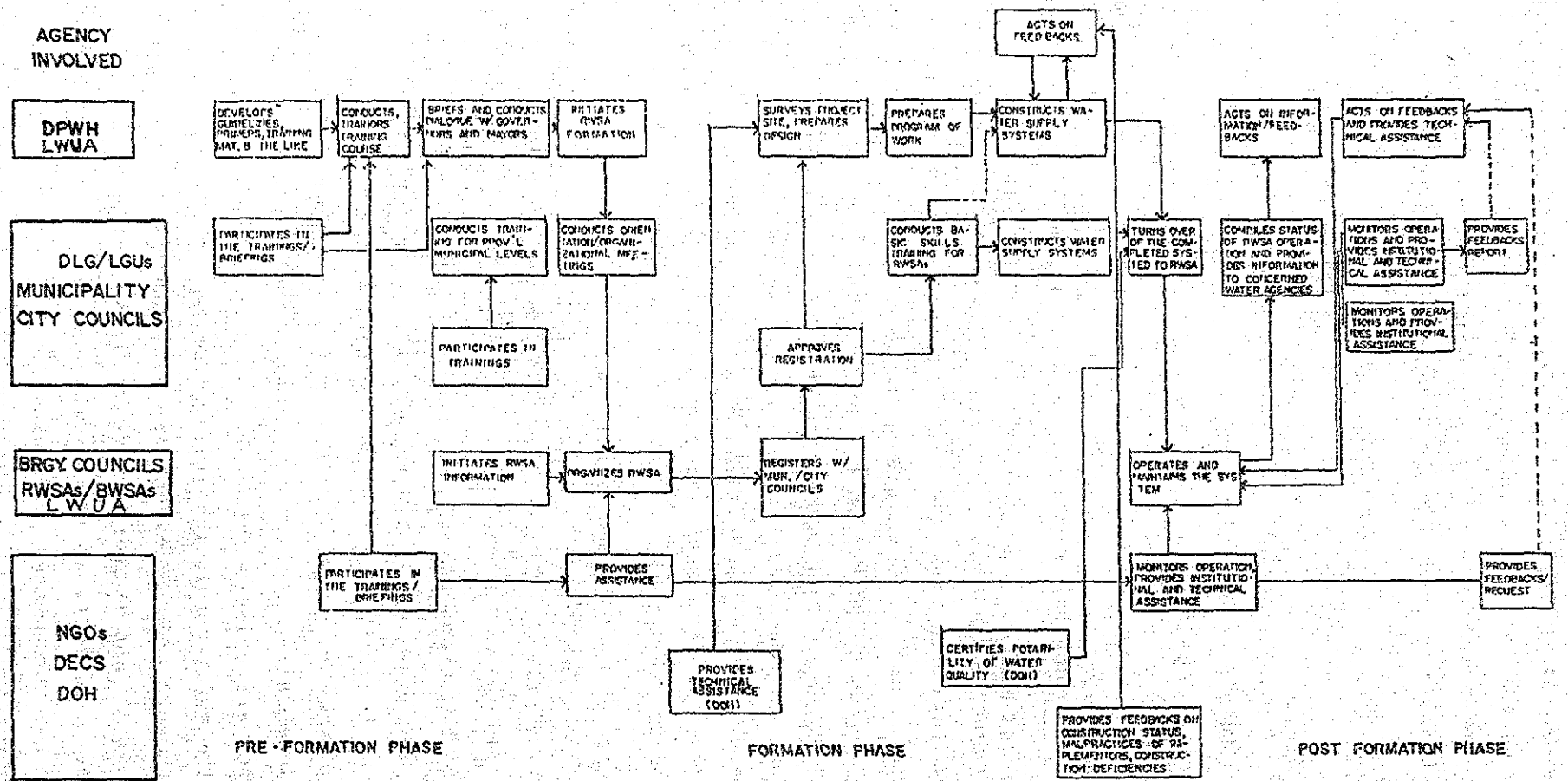


TABLE 4.5 SUMMARY OF PHYSICAL TARGETS AND POPULATION/ PUPILS TO BE SERVED BY FACILITY

Stage	Region/ Province	Water Supply Facilities								School Toilet	
		Level I				Level II		Total			
		Deep Well		Spring							
		No.	Service Pop.	No.	Service Pop.	No.	Service Pop.	No.	Service Pop.	No. of Sch.	Pupils
I	I Ilocos Sur	7	1,821	3	1,318	2	1,670	12	4,809	15	3,426
	I Panga-sinan	12	3,354	0	0	2	3,600	14	6,954	30	24,500
	VI Iloilo	9	3,267	1	300	2	1,630	12	5,197	24	15,704
	VI Antique	6	1,633	3	1,961	2	2,915	11	6,509	20	6,894
	Sub-Total	34	10,075	7	3,579	7	9,815	49	23,469	89	50,524
II	I Ilocos Norte	4	832	2	648	2	1,815	8	3,295	15	5,352
	I La Union	11	3,725	0	0	2	2,070	13	5,795	19	8,816
	VI Aklan	8	2,355	0	0	2	1,228	10	3,583	16	8,925
	VI Capiz	12	3,652	0	0	2	2,313	14	5,965	20	8,806
	Sub-Total	35	10,564	2	648	8	7,426	45	18,638	70	31,899
	Total	69	20,639	9	4,227	16	17,241	94	42,107	159	82,423

terized by distributed project sites with almost the same number of sub-projects allotted to each province, and materials and equipment will be stored in each DEO during construction.

Targets by stage and benefits expected are also summarized in Table 4.5.

4.3.3 Locations and Background Information of the Project Sites

(1) Water Supply Facilities

A complete list of rural barangays to be provided with water supply facilities is presented in Table 4.6. The list also provides pertinent information on the project site like service level, proposed type of water sources, and planned population to be served by respective water supply facilities, while their corresponding locations are pin-pointed in Appendix A.3.

Principal sources of livelihood of people in these barangays are agriculture, fishery and other self-employment in small scale cottage industries. Income level of households in those areas ranges from ₱800 to ₱1,800 per month.

Planned population to be served by the level I water supply systems ranges from 100 to 1,100 persons per system the average being 320 persons per system. On the other hand, the proposed Level II systems are estimated to serve 530 to 2,200 persons per system, with an average of 1,080 persons per system.

In the provinces of Ilocos Norte, Ilocos Sur and Antique, springs are potential water sources owing to their mountainous topographic conditions. Deep well is predominant in Pangasinan and Iloilo due to the limited availability of groundwater at shallow depth.

Information on the coverage of water supply facilities by municipality and barangay as well as the population served by the systems for every province are summarized in Table 4.7.

TABLE 4.6 PROJECT LOCATION AND SERVICE LEVEL WITH POPULATION TO BE SERVED

REGION AND PROVINCE	MUNICIPALITY	BARANGAY/ SCHOOL NAME	WATER SUPPLY			SCHOOL TOILET	
			SERVICE LEVEL	WATER SOURCE	POPULATION SERVED	TOILET TYPE	NO. OF PUPIL
REGION I							
ILOCOS NORTE	1) Pagudpud	Subec Proper - I	I	DW	132		
	2) Pagudpud	Subec Proper - II	I	DW	211		
	3) Bangui	Malasin (Sitio Saturn)	I	DW	181		
	4) Piddig	Sta. Maria	I	DW	308		
	5) Pagudpud	Burayoc	I	SP	450		
	6) Bangui	Barnyea (Sitio Suakan)	I	SP	198		
	1) Nueva Era	Poblacion	II	SP	935		
	2) Burgos	Poblacion	II	SP	880		
	1) Adams	Poblacion, Adams E/S				B	188
	2) Pagudpud	Poblacion Pagudpud E/S				C x 2	997
	3) Pagudpud	Luzong Luzong E/S				B	240
	4) Pagudpud	Burayoc Burayoc E/S				B	190
	5) Dumalneg	Poblacion Dumalneg E/S				B	158
	6) Burgos	Poblacion Burgos E/S				C	304
	7) Burgos	Ablan Barat E/S				B	172
	8) Burgos	Saoit Saoit E/S				B	282
	9) Burgos	Bubon Bubon E/S				B	282
	10) Nueva Era	Poblacion Nueva C/S				C	328
	11) Espiritu	Brgy - 4 Espiritu C/S				C	467
	12) Espiritu	Catagtogues Catagtogues E/S				B	203
	13) Paoay	Poblacion Paoay Central E/S				D	683
	14) Vintar	Brgy 4 F. Canaguin E/S				B x 2	552
	15) Nueva Era	Poblacion Nueva Era E/S & H/S				C	306

Legend: I, II - Service Level
DW - Deep Wells
SP - Spring
P/S - Primary School
E/S - Elementary School
C/S - Central School
H/S - High School

REGION AND PROVINCE	MUNICIPALITY	BARANGAY/ SCHOOL NAME	WATER SUPPLY			SCHOOL TOILET	
			SERVICE LEVEL	WATER SOURCE	POPULATION SERVED	TOILET TYPE	NO. OF PUPIL
REGION I	1st DEO						
ILOCOS SUR	1) Sinait	Cadanglaan	I	DW	110		
	2) Magsingal	Kabanayan Barbarit	I	DW	165		
	3) Magsingal	Caraisan	I	DW	83		
	4) Bantay	Banawang	I	SP	660		
	2nd DEO						
	5) Narvacan	Ambulogan	I	DW	264		
	6) Sta. Maria	Ag-agrao	I	DW	899		
	7) San Esteban	San Nicolas	I	DW	154		
	8) Sta. Cruz	Bugbuga	I	DW	146		
	9) Candon	Anquid	I	SP	394		
	10) Suyo	Kinapaganiban	I	SP	264		
	1st DEO						
	1) Sto. Domingo	Lusoc	II	SP	880		
	2nd DEO						
	2) Candon	Nugnay	II	SP	790		
	1st DEO						
	1) Caoayan	Poblacion				B	528
		Caoayan C/S					
	2) Magsingal	Patong				B	271
		Patong E/S					
	3) Magsingal	Macalcalud				A	57
		Macalcalud E/S					
	4) Magsingal	Barbarit				B	201
		Barbarit E/S					
	5) Sto. Domingo	Flora				B	260
		Flora Comm. School					
	6) Magsingal	Miraaar				B	163
		Miraaar E/S					
	7) Sto. Domingo	Lagatit				B	201
		Lagatit E/S					
	2nd DEO						
	8) Narvacan	Cagayungan				B	169
		Cagayungan E/S					
	9) Narvacan	San Antonio				C	359
		San Antonio E/S					
	10) Nagbukel	Bantugo				B	165
		Bantugo E/S					
	11) San Esteban	Apatot				B	216
		Apatot Comm. School					
	12) Santiago	Poblacion				B	181
		Santigao North C/S					
	13) Santiago	Poblacion				C	353
		Santigao South C/S					
	14) Sta. Lucia	Bao-As, Bao-As &				B	130
		Nangalisan P/S					
	15) Banayoyo	Montero, Montero E/S				B	172

REGION AND PROVINCE	MUNICIPALITY	BARANGAY/ SCHOOL NAME	WATER SUPPLY			SCHOOL TOILET	
			SERVICE LEVEL	WATER SOURCE	POPULATION SERVED	TOILET TYPE	NO. OF PUPIL
REGION I							
LA UNION	1) Burgos	Old Poblacion	I	DW	351		
	2) Santol	Corooy	I	DW	210		
	3) Sto. Tomas	Mamonitan	I	DW	770		
	4) Aringay	San Benito Norte	I	DW	94		
	5) Agoo	Balawarte	I	DW	559		
	6) Pugo	Cares	I	DW	470		
	7) Bangar	Agdeppa	I	DW	405		
	8) Sudipen	Turod	I	DW	340		
	9) Bacnotan	Ortega	I	DW	97		
	10) Pugo	Tabora	I	DW	244		
	11) Pugo	Duplas	I	DW	185		
	1) Sto. Tomas	Raois	II	DW	870		
	2) Balaoan	Paraoir	II	DW	1,200		
	1) Santol	Poblacion				B	204
		Santol E/S					
	2) Bangar	Poblacion				C x 2	824
		Bangar C/S					
	3) Santol	Paagan				B	198
		Paagan E/S					
	4) Bangar	Rissing				B	183
		Rissing E/S					
	5) Santol	Corooy				C	380
		Corooy E/S					
	6) San Gabriel	Poblacion				B & C	747
		San Gabriel Cos./S					
	7) San Gabriel	Bumbuneg				B	266
		Bumbuneg E/S					
	8) Sto. Tomas	Damortis				C x 2	992
		Damortis E/S					
	9) Pugo	Poblacion				C	448
		Pugo Central E/S					
	10) Pugo	Tabora				B	144
		Tabora E/S					
	11) Aringay	San Benito				B	204
		San Benito E/S					
	12) Sto. Tomas	Poblacion, Sto. Tomas				B & C	782
		Central E/S					
	13) Bangar	Nagsabaran				B	186
		Ag-na E/S					
	14) San Fernando	Tanqui, San Fernando				B & C	698
		North C/S					
	15) Sudipen	Old Poblacion				C	324
		Old Sudipen E/S					
	16) Sudipen	Castro				B	181
		Castro E/S					

REGION AND PROVINCE	MUNICIPALITY	BARANGAY/ SCHOOL NAME	WATER SUPPLY			SCHOOL TOILET	
			SERVICE LEVEL	WATER SOURCE	POPULATION SERVED	TOILET TYPE	NO. OF PUPIL
LA UNION (Cont'd)	17) Bacnotan	Sta. Cruz					
		Sta. Cruz E/S				B	526
	18) Bacnotan	Poblacion					
		Bacnotan C/S				C x 2	955
	19) Agoo	San Nicolas West					
		San Nicolas E/S				B	580
	1st DEO						
REGION I	1) Balinao	Sampaloc	I	DW	220		
PANGASINAN	2) Bugallon	Asinan	I	DW	474		
	3) Sual	Paitan West	I	DW	184		
	4) Labrador	Bungalon	I	DW	110		
	5) Alaminos	San Antonio	I	DW	66		
	2nd DEO						
	6) Calasiao	Doyong	I	DW	198		
	7) Malasiqui	Maliampuec	I	DW	220		
	8) Basista	Duapay	I	DW	264		
	9) Malasiqui	Taloy	I	DW	247		
	10) Mangaldan	Guesang	I	DW	377		
	11) Manaoag	Babasit	I	DW	366		
	12) Sison	Cabaritan	I	DW	628		
	2nd DEO						
	1) Asingan	Taboy	II	DW	2,100		
	2) Lingayen	Naguelguel	II	DW	1,500		
	1st DEO						
	1) Alaminos	Lucap				B	677
		Lucap E/S					
	2) Alaminos	Palamis				C	351
		Palamis E/S					
	3) Bani	Banog Norte				B	273
		Banog Norte E/S					
	4) Bani	Quinaoayanan				C	312
		Quinaoayanan E/S					
	5) Bugallon	Unanday				B & C	721
		Unanday C/S					
	6) Bugallon	Poblacion				C x 2	856
		Bugallon C/S					
	7) Labrador	Poblacion				B	636
		Labrador C/S					
	8) Sual	Poblacion				B & C	729
		Sual C/S					
	9) Sual	Paitan				C	458
		Paitan E/S					
	2nd DEO						
	10) Lingayen	Poblacion				B x 2	1,249
		Lingayen I C/S					

REGION AND PROVINCE	MUNICIPALITY	BARANGAY/ SCHOOL NAME	WATER SUPPLY			SCHOOL TOILET	
			SERVICE LEVEL	WATER SOURCE	POPULATION SERVED	TOILET TYPE	NO. OF PUPIL
PANGASINAN (Cont'd)	11) Lingayen	Poblacion				C	426
		Lingayen II C/S					
	12) Lingayen	Poblacion				C x 2	974
		Lingayen III C/S					
	13) Binmaley	Poblacion				C x 2	942
		Binmaley C/S					
	14) Binmaley	Canaley				C	411
		Canaley C/S					
	15) Calasiao	Poblacion				C x 2,D	1,552
		Calasiao C/S					
	16) Sta. Barbara	Poblacion				C & D	1,204
		Sta. Barbara C/S					
	17) Urdaneta	Poblacion				D x 4,B	3,062
		Urdaneta I C/S					
	18) Sta. Maria	Poblacion				D	681
		Sta. Maria East C/S					
	19) Sta. Maria	Poblacion				C	365
		Sta. Maria West C/S					
	20) Villasis I	Poblacion				C x 2	926
		Villasis I C/S					
	21) Rosales	Poblacion				C & D	1,058
		Rosales South C/S					
	22) Binalonan	Poblacion				C & D	1,129
		Binalonan North C/S					
	23) Balungao	Poblacion				C	506
		Balungao C/S					
	24) Malasiqui	Poblacion				D x 2,C	1,758
		Malasiqui I C/S					
	25) Bayambang	Poblacion				D x 3	2,019
		Bayambang C/S					
	26) Pozurrubio	Poblacion				C x 2,D	1,656
		Pozurrubio C/S					
	27) Mangaldan	Poblacion				D x 3,C	2,518
		Mangaldan Central I E/S					
	28) San Jacinto	Poblacion				B & C	783
		West C/S					
	29) Manaoag	Poblacion				D x 3	2,018
		Manaoag C/S					
	30) San Fabian	Poblacion				C x 2	1,008
		West C/S					

REGION AND PROVINCE	MUNICIPALITY	BARANGAY/ SCHOOL NAME	WATER SUPPLY			SCHOOL TOILET	
			SERVICE LEVEL	WATER SOURCE	POPULATION SERVED	TOILET TYPE	NO. OF PUPIL
REGION VI							
AKLAN	1) Banga	Tabayon	I	DW	145		
	2) Banga	Maaboq	I	DW	198		
	3) Banga	Nuguing	I	DW	432		
	4) Banga	San Isidro	I	DW	165		
	5) New Washington	Jalas	I	DW	220		
	6) New Washington	Guinbaluwan	I	DW	103		
	7) New Washington	Lawa-an	I	DW	429		
	8) New Washington	Jugas	I	DW	663		
	1) Banga	Paqsanjan	II	DW	528		
	2) Makato	Castillo, Tina & Buaga	II	SP	700		
	1) Banga	Nuguing				B	568
		Linabuan E/S					
	2) Numancia	Badio				B	104
		Badio P/S					
	3) Numancia	Poblacion				C & D	1,123
		Numancia C/S					
	4) Numancia	Bungos West				C	366
		Bungon E/S					
	5) Numancia	Albasan				C	338
		Albasan E/S					
	6) Kalibo	Malook				C & D	1,150
		Malook E/S					
	7) New Washington	Poblacion				C x 2	946
		New Washington C/S					
	8) New Washington	Polo				C	452
		Polo E/S					
	9) New Washington	Cawayan				C	391
		Cawayan E/S					
	10) New Washington	Puis				B	239
		Puis E/S					
	11) New Washington	Nalaphao				B	246
		Basilio Refundo M/S					
	12) New Washington	Candelaria				D x 2	1,284
		Candelaria E/S					
	13) New Washington	Lawa-an				B	183
		Lawa-an E/S					
	14) New Washington	Jugas				B	193
		Jugas E/S					
	15) Makato	Tina				C	311
		Tina E/S					
	16) Makato	Poblacion				C & D	1,031
		Makato C/S					

REGION AND PROVINCE	MUNICIPALITY	BARANGAY/ SCHOOL NAME	WATER SUPPLY			SCHOOL TOILET	
			SERVICE LEVEL	WATER SOURCE	POPULATION SERVED	TOILET TYPE	NO. OF PUPIL
REGION VI							
CAPIZ	1) Panitan	Capagao	I	DW	761		
	2) Panitan	Cala-an	I	DW	352		
	3) Panitan	Intanpilan	I	DW	154		
	4) Panitan	Salocon	I	DW	803		
	5) Dao	Ilas Norte	I	DW	101		
	6) Dao	Malonoy	I	DW	64		
	7) Dao	Nasunogan	I	DW	478		
	8) Dao	Manhoy	I	DW	221		
	9) Sigma	Acbo	I	DW	138		
	10) Sigma	Mianay	I	DW	272		
	11) Sigma	Dayhagon	I	DW	198		
	12) Sigma	Anana	I	DW	110		
	1) Panitan	Cogon	II	DW	813		
	2) Sigma	Poblacion Sur	II	DW	1,500		
	1) Panay	Tanza Norte				C	337
		Tanza Norte E/S					
	2) Panay	Poblacion Ilawod				D x 2	1,228
		Panay C/S					
	3) Panay	Calitan				B	208
		Calitan E/S					
	4) Panay	Anhawon				B	121
		Anhawon P/S					
	5) Panay	Calapawan				C	382
		Calapawan E/S					
	6) Panay	Agbalo				B & C	659
		Filomeno Legaspi M/S					
	7) Panitan	Cogon				C	395
		Cogon E/S					
	8) Panitan	Poblacion				B x 2	602
		Panitan C/S					
	9) Panitan	Capagao				C	480
		Capagao E/S					
	10) Panitan	Cala-an				A	64
		Cala-an Sur P/S					
	11) Panitan	Intanpilan				B	190
		Intanpilan E/S					
	12) Panitan	Salocon				B	194
		Salocon E/S					
	13) Dao	Ilas Norte				C	392
		Ilas Norte E/S					
	14) Dao	Ilas Sur				A	76
		Ilas Sur P/S					
	15) Dao	Manhoy				C	430
		Manhoy E/S					
	16) Dao	Poblacion Ilawod				D x 2	1,327
		Dao C/S					

REGION AND PROVINCE	MUNICIPALITY	BARANGAY/ SCHOOL NAME	WATER SUPPLY			SCHOOL TOILET	
			SERVICE LEVEL	WATER SOURCE	POPULATION SERVED	TOILET TYPE	NO. OF PUPIL
CAPIZ (Cont'd)	17) Sigma	Poblacion Norte Sigma C/S				C & D	1,084
	18) Sigma	Acbo Acbo E/S				B	177
	19) Sigma	Mianay Mianay E/S				C	348
	20) Sigma	Pagbunitan Pagbunitan E/S				B	112
REGION VI	1st DEO						
ILOILO	1) Igbaras	Brgy. No. 2	I	DW	528		
	2) Sta. Barbara	Lupa	I	DW	231		
	3) Janiuay	Dabong	I	DW	297		
	4) San Miguel	Igtambo	I	DW	396		
	5) Tubungan	Poblacion	I	SP	300		
	2nd DEO						
	6) Dumangas	Lub-Lub Guinsampanan	I	DW	330		
	7) Estancia	Estancia C/S	I	DW	336		
	8) Duenas	Calaca-an	I	DW	528		
	9) Sara	Devera	I	DW	330		
	10) Ajuy	Sitio Karityan, Tanduyan	I	DW	297		
	1st DEO						
	1) San Joaquin	Crossing Dapuyan	II	SP	530		
	2nd DEO						
	2) Duenas	Poblacion	II	DW	1,100		
	1st DEO						
	1) San Joaquin	Tiolas Tiolas E/S				C	315
	2) Legares	Lapayan Lapayan E/S				B	284
	3) Legares	Poblacion Legares C/S				C & D	922
	4) San Miguel	Poblacion San Miguel C/S				C & D	1,206
	5) Sta. Barbara	Nanbuyo Nanbuyo E/S				B	149
	6) Badiangan	Poblacion Badiangan C/S				C	361
	7) Maasin	Nandog Nandog E/S				C	325
	8) Igbaras	Poblacion Igbaras C/S				C & D	1,052
	9) Guimbal	Camangahan Camangahan E/S				C x 2	1,020
	10) Janiuay	Patong-Patong Patong-Patong E/S				B	246

REGION AND PROVINCE	MUNICIPALITY	BARANGAY/ SCHOOL NAME	WATER SUPPLY			SCHOOL TOILET	
			SERVICE LEVEL	WATER SOURCE	POPULATION SERVED	TOILET TYPE	NO. OF PUPIL
ILOILO (Cont'd)	11) Miag-ao	Poblacion				C x 2	
		Miag-ao C/S				D x 2	1,888
	2nd DEO						
	12) Ajuy	Agcadarao				C	329
		Agcadarao E/S					
	13) Conception	Tanis-ac				B	135
		Tanis-ac E/S					
	14) San Dionisio	Poblacion				C & D	1,048
		San Dionisio C/S					
	15) Batad	Poblacion				D	704
		Batad C/S					
	16) Barotac Viejo	Poblacion				D	1,255
		Raul O. Causing M/S #1					
	17) Barotac Viejo	Poblacion				D	1,255
		Raul O. Causing M/S #2					
	18) Lemery	Espanton				B	231
		Espanton E/S					
	19) Duenas	Poblacion				C x 2	982
		Duenas C/S					
	20) Carles	Bancal				D	564
		Bancal E/S					
	21) Balasan	Lawis				B	224
		Lawis E/S					
	22) Bingawan	Poblacion				D	613
		Bingawan C/S					
	23) Sara	Ilaya				C & D	1,056
		Ilaya E/S					
	24) Sara	Devera				B & C	795
		Devera E/S					
REGION VI							
ANTIQUE	1) San Jose	Pantao	I	DW	198		
	2) San Jose (F.N.)	Bugarot	I	DW	132		
	3) San Jose	Inabasan	I	DW	552		
	4) Tanini-y	Masulic	I	DUGW	275		
	5) Sibalom	Biga-a	I	DW	239		
	6) Hantic	Buhang	I	DW	237		
	7) Sibalom	Cabariuhan	I	SP	594		
	8) Tobias Fornier	Lindero	I	SP	264		
	9) Hantic	Tina	I	SP	1,103		
	1) Hantic	Malandog	II	DW	2,200		
	2) Belison	Boroc-Boroc	II	SP	715		
	1) Libertad	Union				C	500
		Union E/S					

REGION AND PROVINCE	MUNICIPALITY	BARANGAY/ SCHOOL NAME	WATER SUPPLY			SCHOOL TOILET	
			SERVICE LEVEL	WATER SOURCE	POPULATION SERVED	TOILET TYPE	NO. OF PUPIL
ANTIQUE (Cont'd)							
	2) Pandan	Tingib				A	75
		Tingib P/S					
	3) Sebaste	Idio				C	342
		Idio E/S					
	4) Culasi	Malacanang				B	215
		Malacanang E/S					
	5) Tibiao	Sta. Justa				C	447
		Sta. Justa E/S					
	6) Barbaza	Jinalinan				D	709
		Jinalinan-Ipil E/S					
	7) Laua-an	Oloc				C	500
		Oloc P/S					
	8) Bugasong	Cubay				C	419
		Cubay E/S					
	9) Patnongon	Carit-an				C	418
		Carit-an E/S					
	10) Belison	Boroc-Boroc				C	500
		Boroc-Boroc E/S					
	11) Sibalom	Pis-Anan				B & C	672
		Pis-Anan E/S					
	12) Sibalom	Odiong				A	49
		Odiong P/S					
	13) Sibalom	Sido-San Juan				C	373
		Sido-San Juan E/S					
	14) San Remigio	Calag-itan				C	449
		Calag-itan E/S					
	15) San Jose	Bansing-Cardena				A	34
		Bansing-Cardena E/S					
	16) San Jose	San Fernando				B	244
		San Fernando E/S					
	17) San Jose	Funda-Dalipe				B	270
		Funda-Dalipe Salador E/S					
	18) Hamtic	Caridad				A	54
		Caridad P/S					
	19) Tobias Fornier	Abaca				B	274
		Abaca E/S					
	20) Yanini-y	Casay				C	350
		Casay E/S					

TABLE 4.7 COVERAGE OF WATER SUPPLY FACILITIES

Region/Province	No. of Municipality	No. of Barangay	Population to be Served
Region I			
Ilocos Norte	5	8	3,295
Ilocos Sur	10	12	4,809
La Union	10	13	5,795
Pangasinan	13	14	6,954
Sub Total	38	47	20,853
Region VI			
Aklan	3	12	3,583
Capiz	3	14	5,965
Iloilo	11	13	5,197
Antique	7	11	6,509
Sub Total	24	50	21,254
Total	62	97	42,107

(2) School Toilets

A complete list of elementary/primary schools to be provided with school toilets is presented in Table 4.6. This list also includes information on the location, required type and number of toilet facilities and school population. Location of these schools are shown on the maps by province in Appendix A.3.

School population (pupils and teachers/staffs) vary from 34 to 3,060 with an average of 519 (255 boys, 246 girls and 18 teachers/staffs). Required number and type of toilet facilities are determined considering the size of school population. Big schools with more than 500 school population are found mainly in the provinces of Pangasinan and Iloilo where the provincial population exceeds one million persons, which is double or triple the size of other provinces.

Information on the coverage of school toilets by municipality including the required number of toilet units and school population are summarized in the Table 4.8.

TABLE 4.8 COVERAGE OF SCHOOL TOILETS

Region/Province	No. of Municipality	No. of Barangay	Required No. of Toilets Units	Population to be Served
Region I				
Ilocos Norte	8	15	17	5,352
Ilocos Sur	9	15	15	3,426
La Union	10	19	25	8,816
Pangasinan	22	30	59	24,500
Sub Total	49	79	116	42,094
Region VI				
Aklan	5	16	21	8,925
Capiz	4	20	25	8,806
Iloilo	21	24	34	15,704
Antique	16	20	21	6,894
Sub Total	46	80	101	40,329
Total	95	159	217	82,423

4.3.4 Plan for Operation and Maintenance

Specific institutional responsibilities and areas of cooperation between and among agencies/entities with respect to the operation, maintenance and performance monitoring of facilities are described comprehensively in Sub-section 4.2.2 and Sub-section 4.3.1. Recommended plan for these activities basically follows existing practices and are summarized in the ensuing paragraphs.

(1) Water Supply Facilities

(a) Level I system (point source)

Operation and maintenance of a Level I system shall be handled by the beneficiaries through the BWSA and with technical assistance from the DPWH.

Running the system itself generally entails simple procedures except when an electric/generator driven pump is involved. In essence, operation in this instance means proper handling of handpump; safe-

guarding from damage of the facilities like the handpump, transmission pipes, and spring box and appurtenances; preventing wastage of water; and keeping clean and well-drained the water source surroundings or fetching points.

For shallow and deep wells, periodic check-up regimen to be carried out to determine required maintenance works are:

- Monthly observation of the condition of concrete well platform, water turbidity and sand content, taste and odor of water, and well surroundings.

- Bi-annual conduct of bacteriological examination to determine the level of chlorination required (routine chlorination every 6 months is mandatory), water level measurement, total depth measurement and analysis of water levels to determine the need for rehabilitation.

Records of all these observations/activities shall be kept in a maintenance data sheet for future reference.

For a dug well source, the required observation/maintenance works are:

- Replacement of chlorine/bleaching powder in the chlorinator every 2 or 3 weeks.

- Monthly checking of the conditions of well platform, water level and surroundings, and conduct of bacteriological examination.

- Disinfection of the well every 6 months.

Handpump maintenance activities shall consist of:

- Monthly check-up of parts that are easily wearable and detached like certain bolts, nuts, pins and bearings, and corrosion of metal parts.

- Annual check-up of all bolts, nuts, washers, and other major parts like drop pipe and sucker rod, cylinder assembly, leather cup, handle and crank plate bearing, and handle shake.

- Application of oil, retightening of loose screws, and replacement of damaged/missing parts, if necessary, after the check-up.

Schedule of maintenance of spring intake facilities is as follows:

- Conduct of bacteriological examination, as required by the presence of potential contaminating agents upslope of the spring source.

- On a daily basis, cleaning of spring intake box area, ensuring safety of source from intruders, and checking/cleaning of drain ditch.

- On a monthly basis, checking/repair of intake box structure, and checking/replacement of damaged intake box appurtenances.

- On an annual basis, checking/repainting of metal parts of protective fence.

(b) Level II system (communal faucet system)

The beneficiaries through their RWSA and with technical assistance by the LWUA shall be in charge of the operation and maintenance of a Level II system.

Although it shares the same objectives as those of a Level I system, the operation and maintenance of a communal faucet system involves a more complicated process as it entails the use of electric/generator driven pump in case the source is a well and other facilities not attendant to the former. Additionally, proper valve operation based on initial trial runs to effect equitable distribution to users and collection of water charges to finance expenses for operation and maintenance are required for Level II systems. However, procedures for the operation and maintenance of spring intake box and well for both Level I and Level II systems are essentially the same.

During the daily operation of the submersible pump, it is advisable as steps for preventive maintenance to:

- o Read and record the pump operating amperage, voltage and pressure.
- o Observe and record vibration of pump and its accessories, pump and motor noises, and unusual heating of motor.

Monthly preventive maintenance program that must be carried out for submersible pumps to determine the need for well rehabilitation and/or pump overhaul consists of the following activities:

- o Measurement and recording of static water level, pumping water level, discharge and insulation resistance.
- o Checking/cleaning of well water level contacts and tank water level contacts.

Maintenance schedule for concrete ground level reservoir and elevated water tank consists of:

- o Routine procedures like keeping the structure and its surrounding clean, making sure that the reservoir is tightly covered, checking/repairing loose ladder rungs and railings, and checking the plumbing system.
- o On a monthly basis, flushing out collected silt, flushing out overflow pipe, and checking structure including plumbing and values for leaks.
- o On an annual basis, removal of accumulated silt and sand.
- o Periodically, testing for leaks in reservoir and differential settlement of water tank.

Routine maintenance of pipeline and appurtenances shall include:

- o Regular dialogue with the beneficiaries to gather information regarding the system.

- o Checking wet spots along the pipeline route at least once a week as these wet spots may indicate leaks.

- o Checking faucet, valve, and water meter for leaks.

- o Inspection and removal of accumulated debris inside valve and water meter boxes.

- o Checking/cleaning communal faucet concrete pedestal and its surroundings including drainage ditch.

(2) School Toilet Facilities

For school toilet facilities, operation and maintenance shall be taken care of initially, up to the completion of performance monitoring, by the DOH. Beyond the said period, the responsibility of such task will be turned over to the DECS. As a parallel activity to performance monitoring, information dissemination/training on the operation and maintenance of toilet facilities will be conducted by relevant DOH personnel for concerned school principals, head teachers, teachers, other involved school staff, and members of Parent-Teacher's Association (PTA). Proper use of toilet facilities and hygienic practice are instilled in the pupils through the joint health education program of the DOH and DECS, and through their parents.

Maintenance of toilet facilities may consist of keeping the toilet area and water source clean, and well drained; observation of rise in groundwater level and/or flood level, and undertaking required counter-measures to prevent waste from surfacing; and excavation of septic tank every 6 months.

Operation and maintenance procedures of shallow/dug well water supply facilities for toilets are as described in the ensuing paragraphs.

(3) Monitoring System

Monitoring and evaluation of the performance of the facilities constructed under the Project shall be carried out to determine the extent to which the Project objectives have been attained. If found warranted by the results of said undertakings, ways and means shall be formulated to optimize benefits which could possibly be in the form of improved operation and maintenance practices, increased participation of beneficiaries, and more intensive information dissemination to beneficiaries. Moreover, performance monitoring and evaluation outputs can help identify and rectify deficiencies in implementation procedures as well as to provide guidance for future planning, programming and budgeting activities.

(a) Water supply facilities

Under current practice, the DPWH and LWUA, within their respective service level jurisdiction, are responsible for monitoring and evaluating the performance of rural water supply projects. The DLG, LGUs, provincial/municipal councils, DOH, DECS and NGOs provide within their capacity the necessary assistance and inputs as may be required.

A Project Benefit Monitoring and Evaluation (PBME) program has been developed by the PMO-RWS for the purpose of carrying out the above tasks. This program, including the accompanying questionnaire form, was found to be essentially adequate. The following are its features and description of activities.

- Conduct of bench mark surveys on conditions in the proposed project sites during the pre-construction stage concerning relevant socio-economic (main source of livelihood, family structure and income, number of users and habits), technical (water supply and sanitation conditions before construction, and plan for proposed system), and institutional/management (willingness of beneficiaries to establish BWSA/RWSA, to pay for operation and maintenance of facilities, and to assist during construction) aspects. Data requirement on this activity has been covered in the field survey of the Study Team.

- o Collection of data information during the construction stage including technical (well log; problems encountered and countermeasures taken; and the facilities constructed, actual well yield, and actual construction schedule in comparison with those planned) and institutional (status of establishment of BWSA/RWSA) aspects.

- o Gathering of data/information during the operation and maintenance stage upon completion of facilities, and then 3 months, 6 months, 1 year and 3 years (in dry and wet seasons) thereafter. Data shall include socio-economic (family structure and income, increase in economic activities, improvement in public health and hygiene, and improvement in living standard), technical (source data, service population, distance and time spent for fetching, problems in water adequacy , problems in operation and maintenance, water consumption, and data on repairs), and institutional/management (status of BWSA/RWSA, water fee collection, and propagation of sanitation improvement) aspects.

- o Results of monitoring shall be evaluated with reference to the bench mark survey and the monitoring activity immediately preceding it, as a basis for determining required improvement for the following monitoring period.

- o Final evaluation shall be made 5 years in both dry and wet seasons after completion of the projects, the results of which will serve as reference for similar projects in the future.

(b) School toilet facilities

Performance monitoring and evaluation of school toilets are undertaken by the DOH before these facilities are finally turned over to the DECS. School authorities, other concerned school staff and parents may provide input required for these activities.

Procedures for survey and evaluation, frequency, and period of monitoring shall be basically the same as that for water supply facilities. Data/information to be gathered shall, however, be limited to those concerning the sanitation facilities and their corresponding water sources. In this connection, the monitoring manual prepared

for Phase I Project shall be reviewed and amended, if necessary.

4.4 Technical Cooperation for Implementation of the Project

Based on an assessment of the potential problems and needs of the Project, the following are recommended as areas for technical cooperation:

- Local engineers/technicians shall be involved in the construction work, especially in water source development, so that appropriate knowledge in open-hole drilling and gravel packing, which would ensure long well life and reliable design yield, is effectively transferred.

- Each community/barangay to be provided with water supply system shall be given a copy of the simplified illustrated operation and maintenance manual which was developed by the DPWH covering all types of Level I and Level II facilities, and the relevant barangay personnel shall be made to undergo training in this activities in reference to the said manual.

- The guideline for the standard practices in O&M of school toilets shall be developed and distributed to each school.

It is also desirable to assist DLG on a continuing and sustained training of relevant people in the barangays in operation and maintenance of the facilities.

CHAPTER 5

BASIC DESIGN OF THE FACILITIES AND SPECIFICATION OF EQUIPMENT AND SERVICE VEHICLE

CHAPTER 5 BASIC DESIGN OF THE FACILITIES AND SPECIFICATION OF EQUIPMENT AND SERVICE VEHICLE

5.1 Primary Consideration for Planning and Design

(1) Natural conditions

The subject areas are generally characterized by the occurrence of dry and rainy seasons and are subject to frequent inundation. Earthquake is also a common phenomenon in the area. Countermeasures shall be provided to prevent the pollution of water sources during flood as well as protection of school toilets.

Construction plan shall also be formulated in consideration of the duration of the rainy season and prevailing rainfall intensity.

(2) Socio-economic conditions

With the income level in the subject areas, it is neither practical to construct nor affordable for the beneficiaries to operate and maintain costly facilities/equipment. Plan and design of the facilities/ systems therefore shall be simple, durable, and shall entail spare parts that are easy to procure to ensure easy operation and maintenance at low cost.

The provision of a guideline for the operation and maintenance of facilities, and minimum tool/implement requirements for the same shall be considered to help BWSAs/RWSAs promote the management of the systems. Arrangements to be required by the related agencies for the sustained and continuing training of association members shall also be ensured.

(3) Conditions in the construction sector

Capability and efficiency of engineers and labor force which may be affected by local conditions, customs and climate shall be fully taken into account. Expatriate staff in well drilling shall be considered throughout the construction period to transfer technology to complete the specific requirements for open hole gravel pack

wells, which is still unfamiliar to well constructors especially in the rural areas. Indigenous materials will be used to as much extent as possible, such as locally available hand pumps for easy acquisition of spare parts. However, cement may be procured from a third country due to shortage of the material and expected construction boom in the country in the future.

(4) Extent and grade to be provided for the facilities, equipment and vehicle

1) Facilities

- Basically, existing plan/design of facilities both for water supply and toilet shall be employed with some modifications as required.

- Facilities are to be in such level as to suit the local environment and at the same time ensure long life especially of the well structure, required functions, and low cost in operation and maintenance.

2) Well drilling rig

The type and required capacity of the rig shall be designed based on the technical requirements for this Project and substrata conditions as well as existing type of the rig in the DPWH.

3) Service vehicle

Assistance and training/dissemination of information to the associations for the operation and maintenance of the facilities will entail the transport of materials and equipment. Pick-up is convenient for the purpose of transporting people, materials, supplies, etc.

4) Pumping test equipment and others associated to well development

The type and specifications shall be same as those being used in the DEOs.

(5) Conditions on the construction method and period

A common construction method shall be employed for construction of facilities. However, a simple suspension bridge may be used in river crossing to meet specific conditions in the area. Required protection of transmission lines in the mountaneous area shall be provided. All pipes shall be embedded in general.

Two-stage construction will be carried out to complete the Project within the framework of Grant-Aid Program.

5.2 Fundamentals for Planning and Design

Design criteria for planning and design of facilities and standardization of facilities shall, in principle, follow those employed in the Phase I Project. The following are fundamentals for planning purpose.

5.2.1 Water Supply Facilities

(1) Basic considerations

- A generator set shall be provided for sub-projects where electric supply (three phase) voltage is fluctuating or extension line requirement from the existing source is very long and/or difficult to install. However, no generation set shall be provided for Level I deep well facility. In case power is needed engine drive bore hole type turbine pump shall be used for easy operation and maintenance.

- A simple treatment process shall be provided to remove iron and manganese in groundwater in areas where said problem exist.

- For Level II systems, a water meter shall be installed at each faucet to ensure collection of water charges and effective distribution or control of water for equitable delivery to each household within the limited total supply. In addition, device for disinfection of water source shall be provided for all Level II systems and for those Level I systems using water source exposed to pollution.

(2) Fundamentals

a) Water source

Groundwater extracted through wells is widely used as a source of water supply for the rural areas. The types of wells include shallow, dug and deep wells. A spring source is also used and is most advantageous economically if the quality and quantity are adequate for drinking purpose and its distance is not so remote from the service area.

b) Water supply system

Level I (point source)

The system consists of either a simple well with a handpump or spring collection box with/without a transmission line to serve inhabitants within 250 m from the supply point. Number of recipient households ranges from 40 to 100 depending on the source capacity and population density in the service area.

Level II (communal faucet system)

The system comprises transmission and distribution facilities including reservoir and communal faucets. Each faucet is designed to serve 4 to 6 households in average within a distance of about 25 m.

A typical schematic diagram for Level II system is presented in Appendix A.4, which includes three cases according to service population group (500-1000, 1500-1000 and 1500-2000) by either spring or well source.

c) Water demand

- Design year : Five (5) year period following current practice in the Philippines
- Design population : 10 percent increase of present population using average annual increase rate of 2 percent

o Water consumption rate	:	30 to 40 l/c.d for level I and 40-60 l/c.d (daily average) for Level II
o Average day demand	:	Design population x water consumption rate
o Maximum day demand	:	1.3 x Average Day Demand
o Maximum hour demand	:	$\frac{2.5 \times \text{Average day demand}}{24}$
o Hydraulic pressure	:	5 psi (3.5m) at end-faucet
d) **Facilities**	:	ISO standards, currently used in the Philippines, are adopted
o Pressure reducing tank	:	Installed to ensure static water pressure less than 70 m (2 cu.m tank)
o Reservoir (Ground or Elevated Tank)	:	1/4 of maximum day demand
o Pipes	:	GI or PE pipe is used for transmission line. Gi pipe is also used for river/road crossing in distrubuion line. PE or PVC pipe is used under normal conditions of distribution line. Well casing is either GI, PVC, FRP or Steel depending on well depth and substrata conditions.
o Pump Type and its Operation Period	:	Either submersible, centrifugal pump, and engine driven borehole turbine pump is used and operation of the pump is between 8 to 10 hours/day.

5.2.2 School Toilet Facilities

(1) Basic consideration

- The provision of water for flushing and hand washing purposes is a requisite. Rainwater and groundwater by means of dug/shallow wells shall be used at all project sites.

- Cistern to store water for flushing at the toilet shall be installed inside the toilet building with an access from both male and female areas.

- All toilet facilities shall be of the water sealed type with a septic tank. Furthermore, majority of toilet bowls shall be squat- type with a few sit-type for female.

(2) Fundamentals

Basically conforming to the DOH standards, the following are considered:

- Number of toilet bowls : 20 percent of pupils use the toilet to defecate and 50 percent to urinate

- Water requirement : 2 liter/capita for flushing of water sealed toilet and 0.5 liter/capita for hand washing

- Facilities :
  - Urinals and wash basins in all facilities
  - Toilet and urinal for every 50 males
  - Toilet for every 30 females
  - Appropriate number of windows at least 0.50 m x 0.50 m in size to allow sufficient ventilation and light particularly in each cubicle
  - Non-slip floor with cement tile and provision of drain with appropriate slope in both floor and surrounding area of toilet bowl
  - Provision of the roof above the sink/cistern

5.3 Basic Plan and Design

5.3.1 Water Supply Facilities

Standardization of facilities from intake to distribution is made, most of which are currently used in the Philippines.

(1) Water source facilities

Typical spring intake box and small intake dam are illustrated in Figure 5.1 and Figure 5.2, respectively. Several types of standard well designs both for Level I and II are developed taking into account actual field conditions, construction method (open hole gravel pack), and well structure applicable in the rural area. Figure 5.3 and Figure 5.4 show the standard design of Level I and Level II, respectively. Standard specification of wells in terms of well drilling depth is presented in Table 5.1 and summary of number of wells by province in two stages is given in Table 5.2.

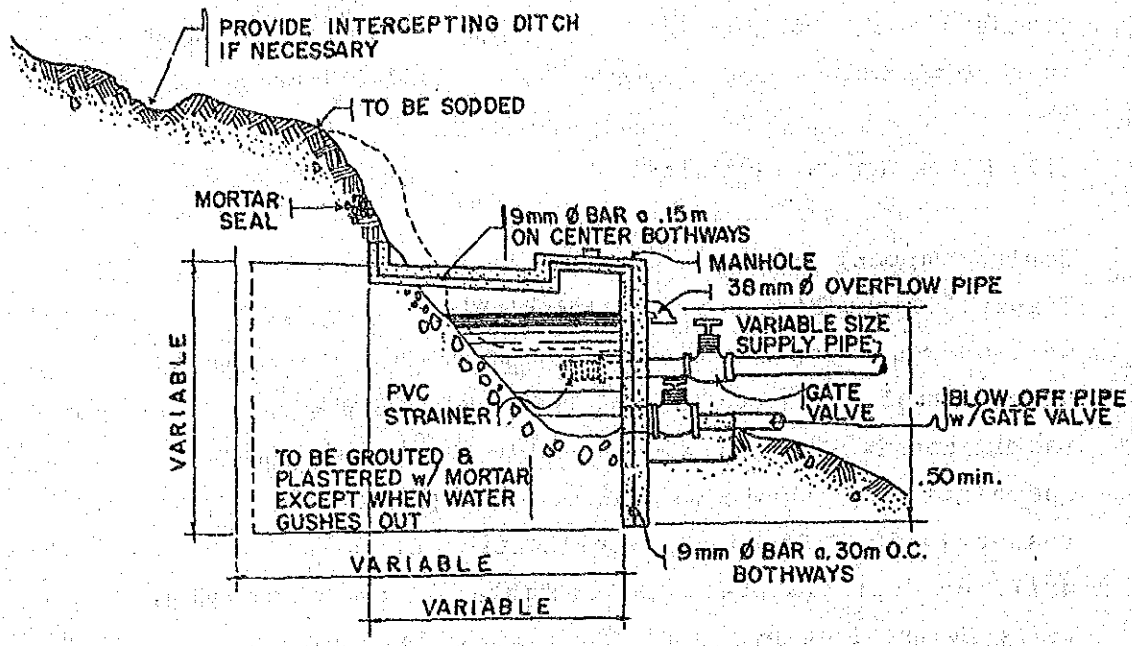
(2) Transmission and distribution facilities for Level II system

From the water source, water is transmitted and distributed to the consumers through the pipeline system and other facilities consisting of sump tank, elevated water tank or ground level reservoir, river crossing and public faucets. Standard design of these facilities are attached in Appendix A.5 including the following.

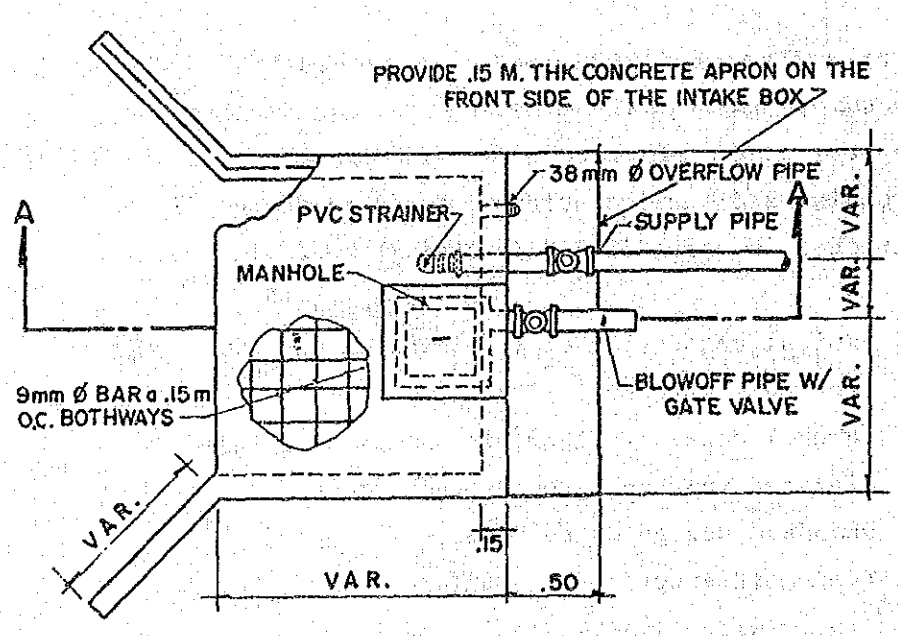
- o Typical connection of transmission pipe and sumptank
- o Deep well with centrifugal pump
- o Several cases of river crossing
- o Elevated tank and ground Level reservoir
- o Standard design of pump house
- o Types of faucet

5.3.2 School Toilet Facilities

Four standard types of toilet unit are developed in consideration of number of pupils (see Table 5.3) and illustrated in Appendix A.6. A combination of the units may be made for schools with more than 700



SECTION A-A



PLAN

NOTE : Drawn not to scale

FIGURE 5.1 **TYPICAL SPRING INTAKE BOX**

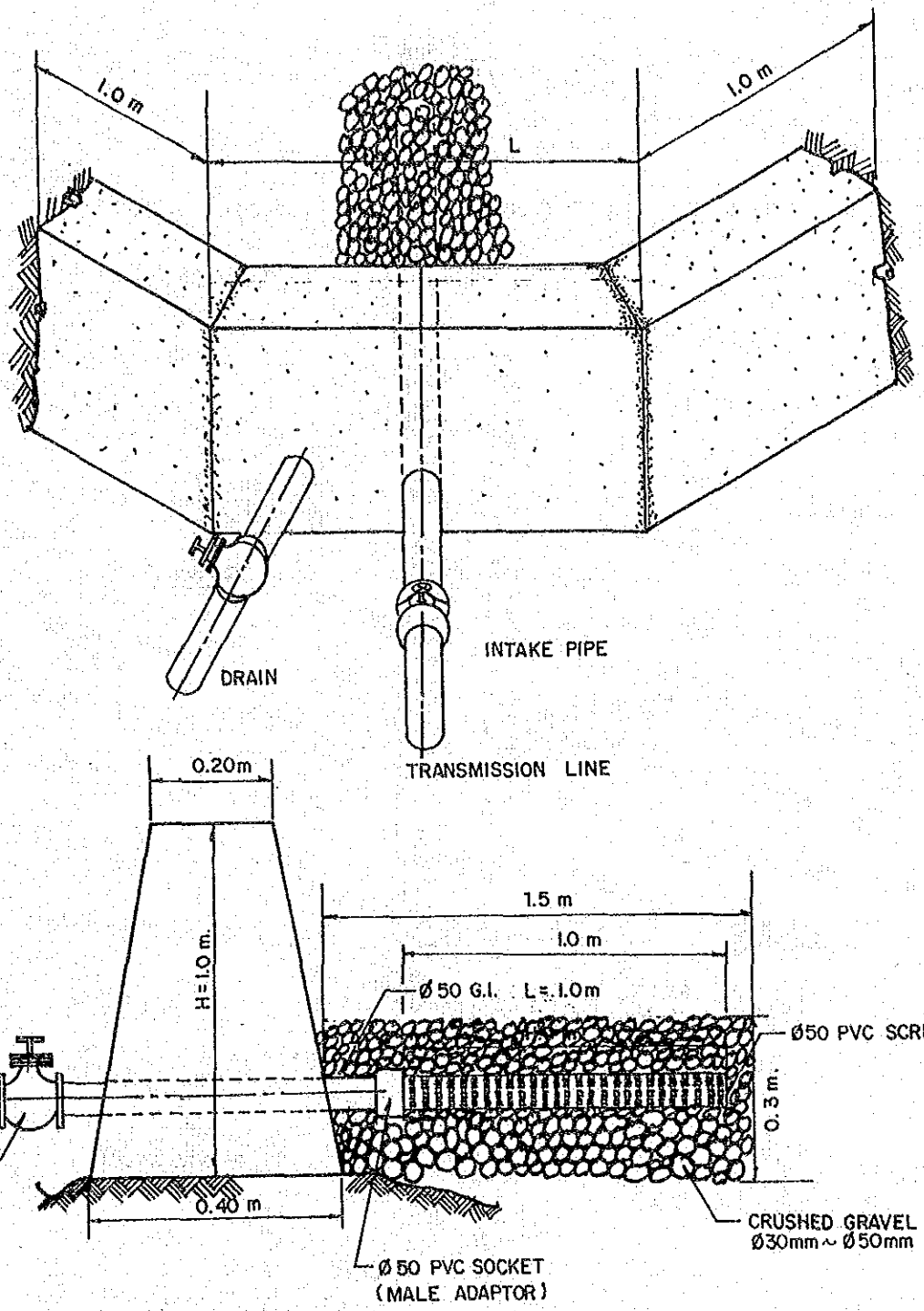


FIGURE 5.2 TYPICAL DESIGN OF SMALL INTAKE DAM

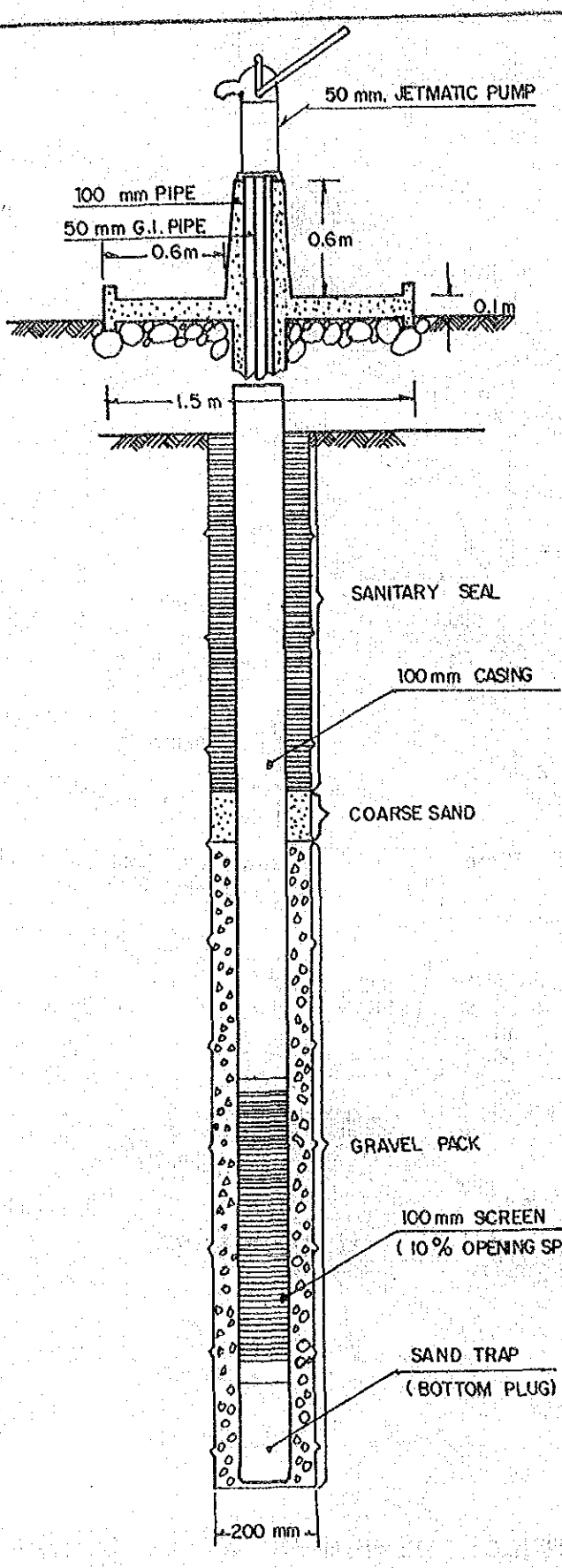


FIGURE 5.3a **STANDARD DESIGN FOR LEVEL I DEEPWELL (JETMATIC PUMP)**

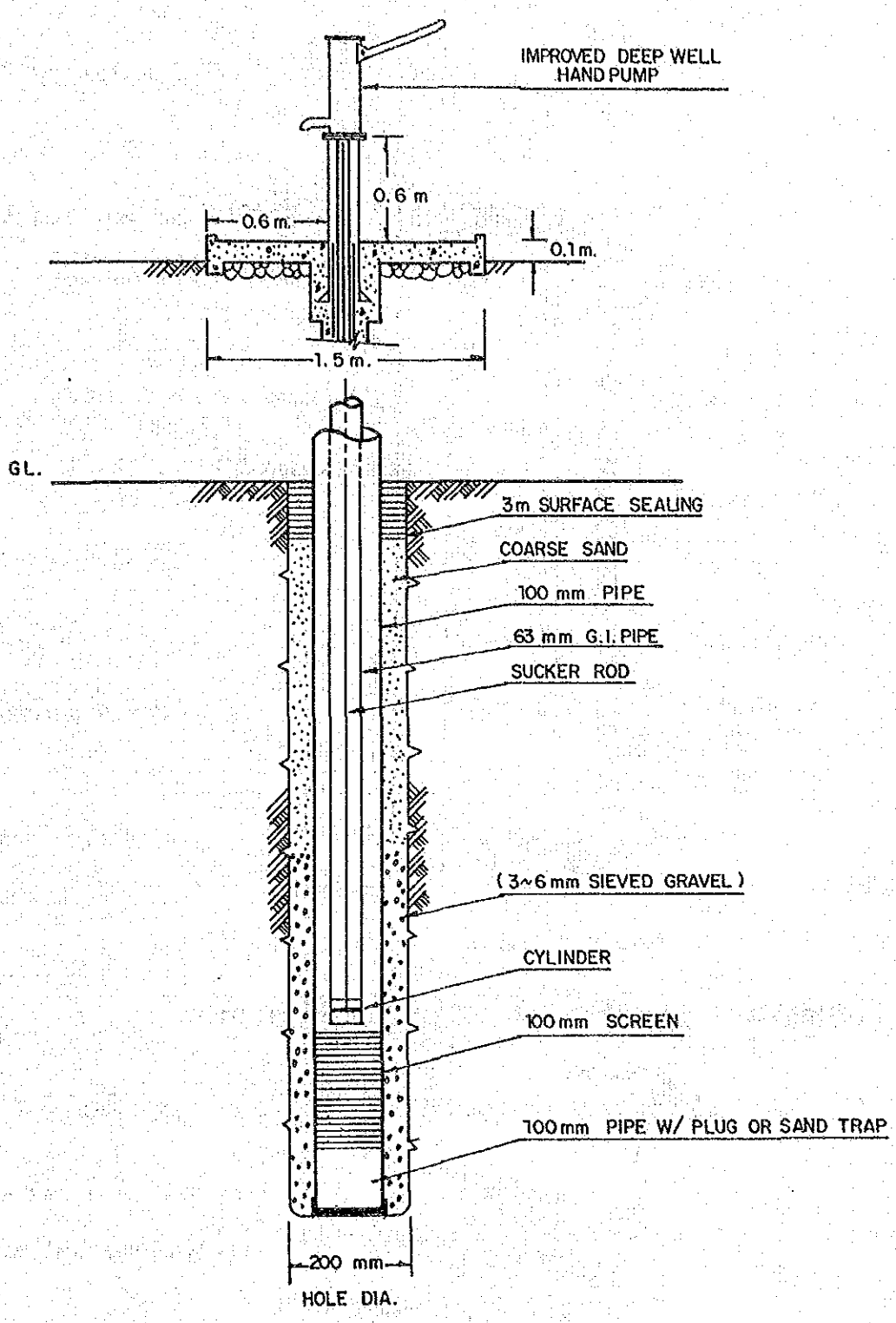
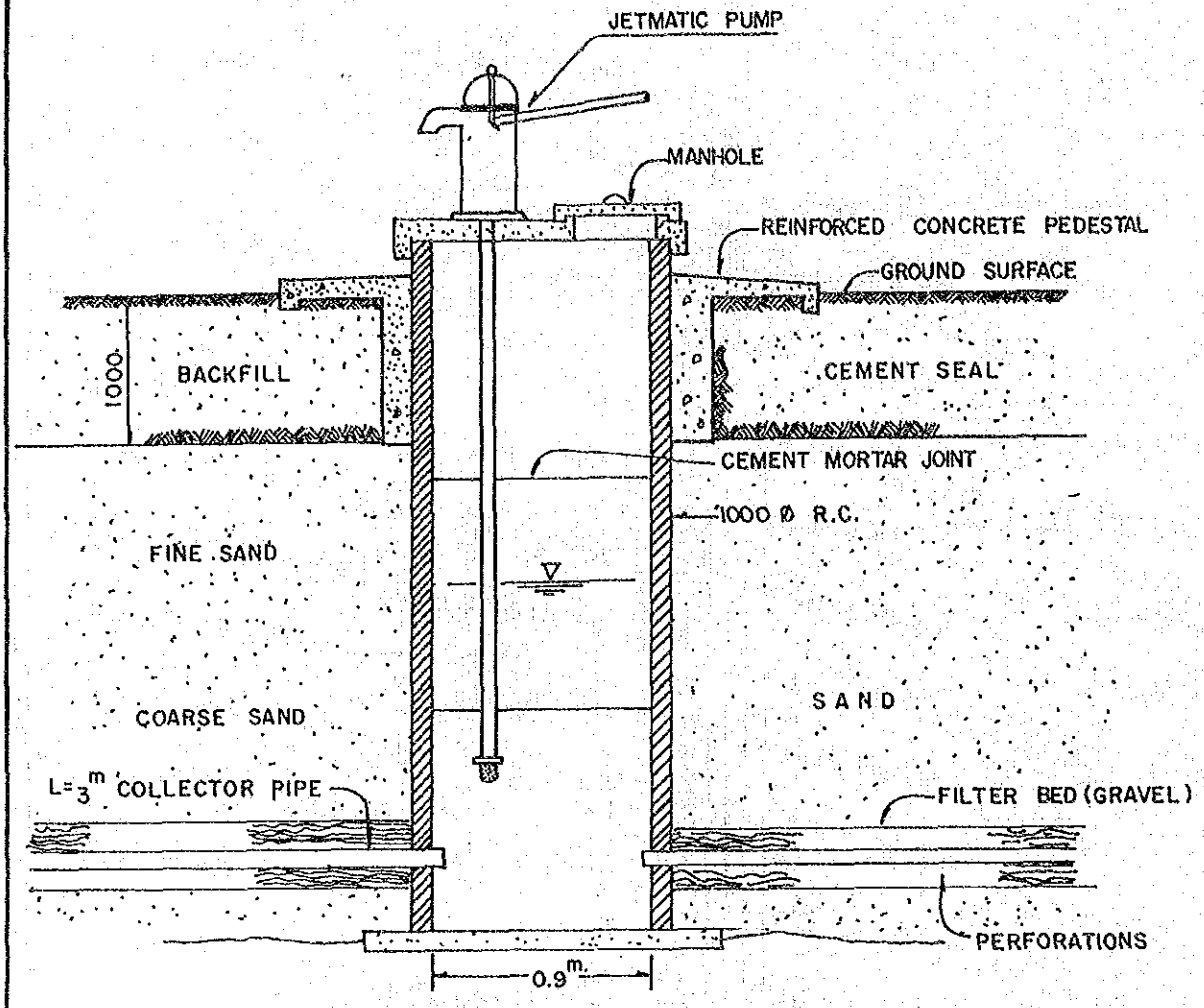
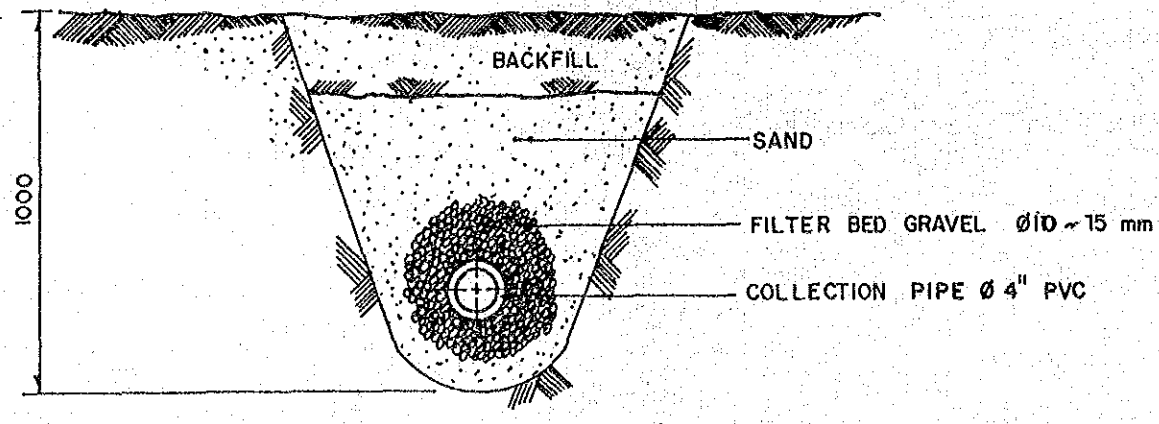


FIGURE 5.3.b **STANDARD DESIGN FOR LEVEL I DEEPWELL**
(IMPROVED DEEPWELL HANDPUMP)





DETAIL OF COLLECTION PIPE

FIGURE 5.3.c **STANDARD DESIGN FOR LEVEL I DUG WELL**

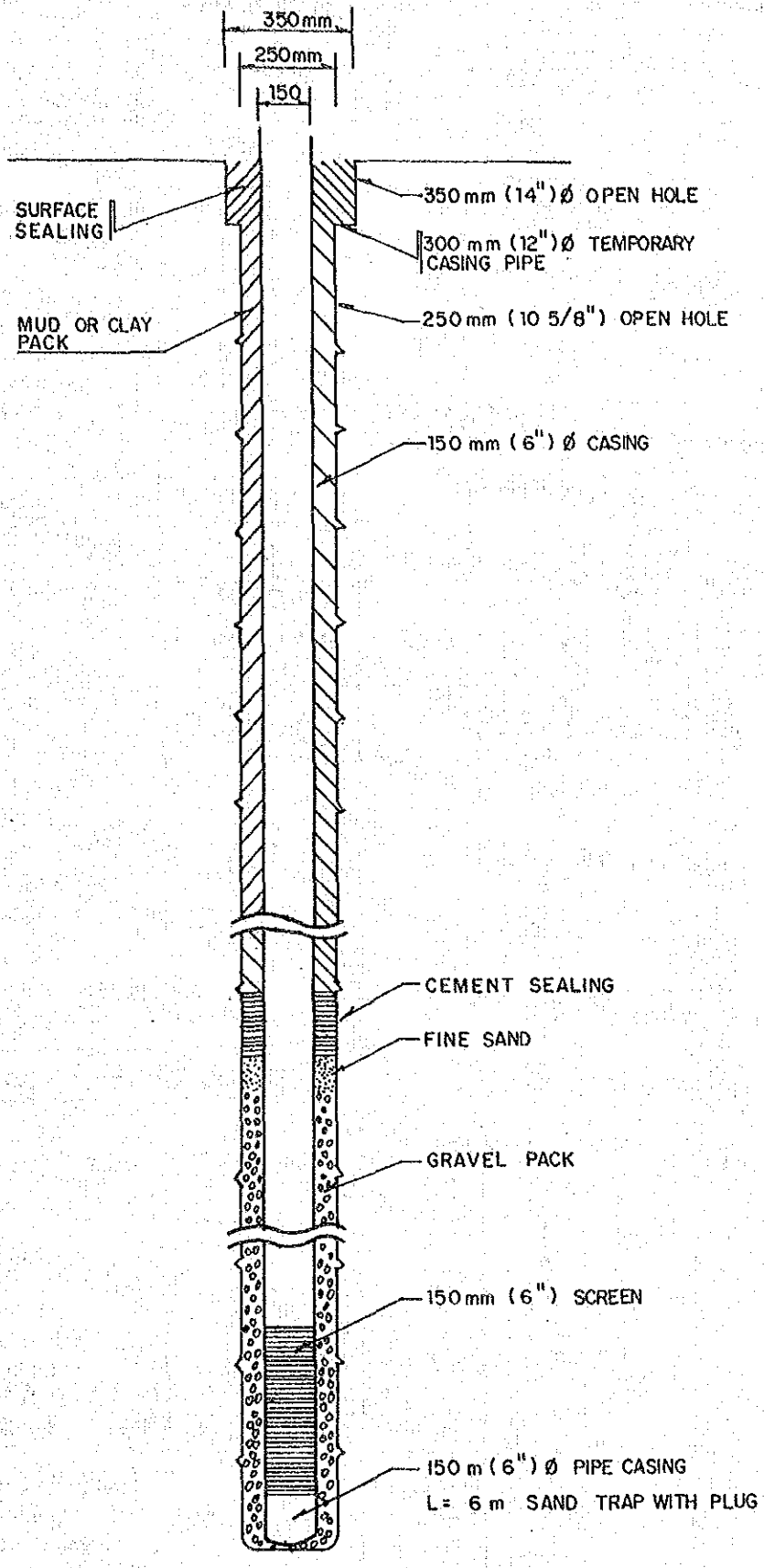
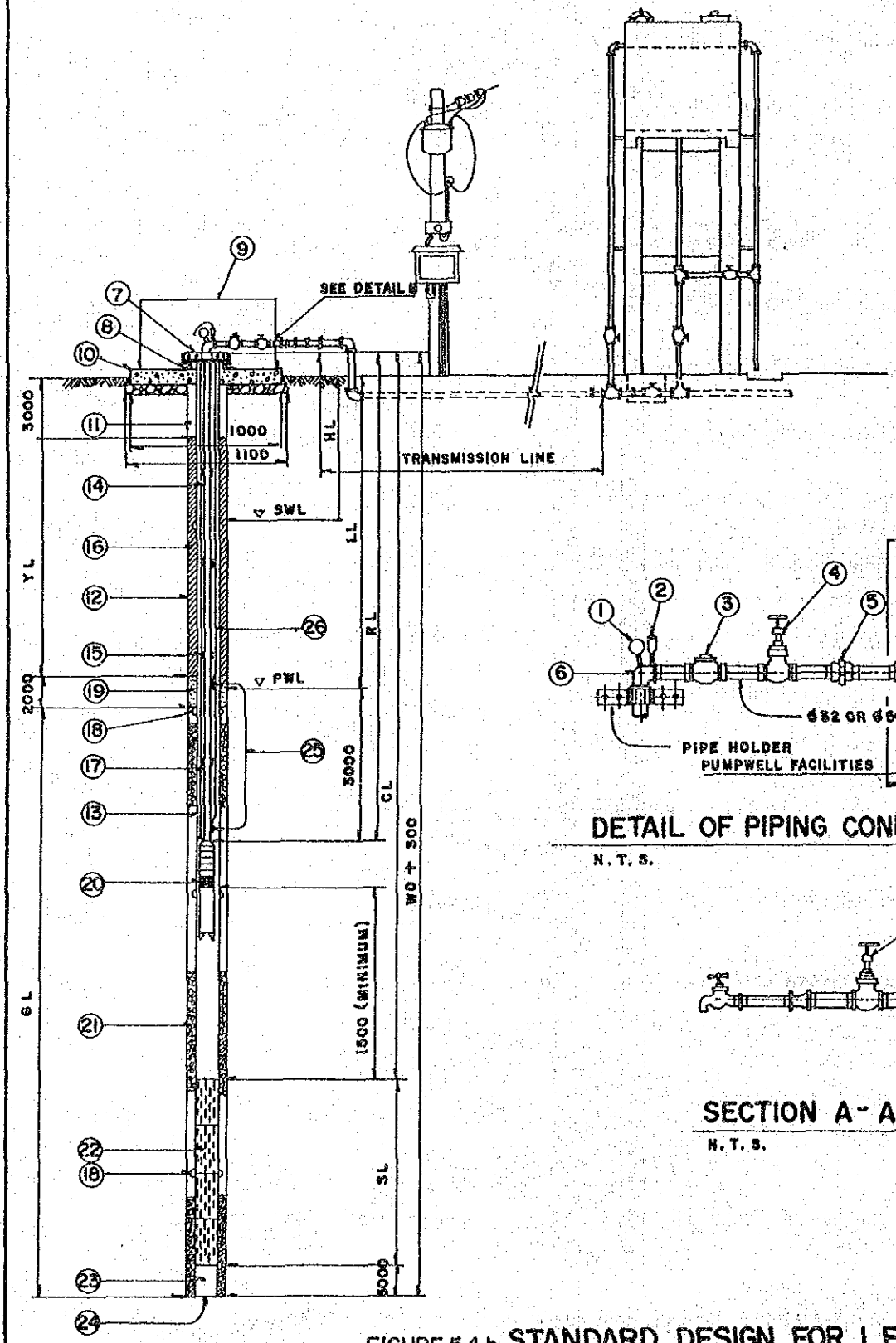


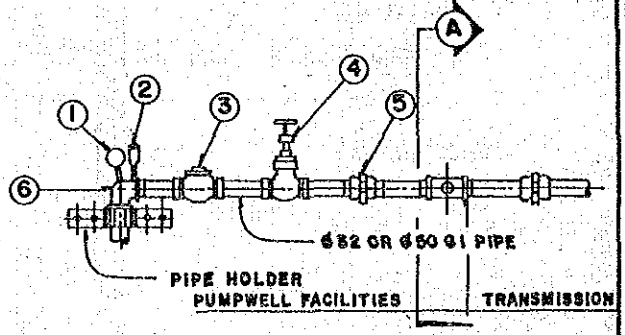
FIGURE 54.a **STANDARD DESIGN FOR LEVEL II DEEPWELL**

NAME OF PARTS			
① PRESSURE GAUGE	⑦ RISER PIPE HOLDER	⑬ WELL CASING	⑲ FINE SAND
② AIR VENT VALVE	⑧ WELL COVER	⑭ RISER PIPE	⑳ SUBMERSABLE PUMP
③ CHECK VALVE	⑨ WELL BOX COVER	⑮ COUPLING	㉑ GRAVEL PACKING
④ GATE VALVE	⑩ PLATFORM	⑯ CLAY FILL	㉒ SCREEN
⑤ UNION PATENTE	⑪ SURFACE SEALING	⑰ SUBMERSIBLE CABLE	㉓ BOTTOM PIPE
⑥ 90° BEND	⑫ DRILL HOLE	⑱ CENTRALIZER	㉔ BOTTOM PLUG
			㉕ RELAY SENSOR
			㉖ RELAY CABLE



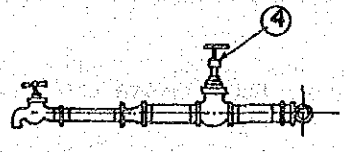
ELEVATION

N. T. S.



DETAIL OF PIPING CONNECTION

N. T. S.



SECTION A-A

N. T. S.

FIGURE 5.4.b STANDARD DESIGN FOR LEVEL II WATER SOURCE FACILITIES

TABLE 5.1 STANDARD SPECIFICATION OF LEVEL I WELL CONSTRUCTION

Well Depth (m)	30P	40G	50 G	60 G	80 F	100 F
1. WELL DRILLING						
1) Borehole Dia. (mm)	200	200	200	200	200	200
2) Total Depth (m)	30	40	50	60	80	100
2. CASING						
1) Material	PVC	GI	GI	GI	FRP	FRP
2) Diameter (mm)	100	100	100	100	100	100
3) Joint Type	Sleeve	Thread Coupling	Thread Coupling	Thread Coupling	Thread Coupling	Thread Coupling
4) Unit Length (m)	6.0	5.5	5.5	5.5	6 + 3	6.0
5) Required No. (pcs.)	4	6	7	9	10 + 1	13
6) Total Length (m)	24.0	33.0	38.5	49.5	63.0	78.0
3. SCREEN (8-12 % opening)						
1) Material	PVC	Low Carbon steel	Low Carbon steel	Low Carbon steel	FRP	FRP
2) Diameter (mm)	100	100	100	100	100	100
3) Joint Type	Sleeve	Thread Coupling	Thread Coupling	Thread Coupling	Thread Coupling	Thread Coupling
4) Unit Length (m)	3	3	3	3	3	3
5) Required No. (pcs.)	2	3	4	4	6	8
6) Total Length (m)	6	9	12	12	18	24
4. GRAVEL PACK						
1) Depth (m)	20	25	30	30	30	30
2) #5 Gravel Volume (cu.m)	0.51	0.63	0.76	0.76	0.82	0.82
5. SAND SEAL						
1) Depth (m)	4	9	10	10	20	20
2) Coarse Sand Volume (cu.m)	0.11	0.23	0.26	0.26	0.55	0.55
6. CEMENT SEAL						
1) Depth (m)	6	6	6	6	10	10
2) Cement (kg)	117	117	117	116	210	210
3) Sand (cu.m)	0.05	0.05	0.05	0.05	0.08	0.08
7. TYPE OF PUMP						
1) Shallow/Deep Well Hand Pump	S	S	D	D	D	D
2) Suction Pipe (GI Φ 50 mm, 5.5 mm/pc)	5	6	7	9	10	12

TABLE 5.1 STANDARD SPECIFICATION OF LEVEL II
WELL CONSTRUCTION (CONTINUATION)

Well Depth	50 S	50 F	100 F
1. WELL DRILLING			
1) Borehole Dia. (mm)	250	250	250
2) Total Depth (m)	50	50	100
2. CASING			
1) Material	Stainless Steel	FRP	FRP
2) Diameter (mm)	150	150	150
3) Joint Type	Welding	Thread Coupling	Thread Coupling
4) Unit Length (m)	6	6	6
5) Required No. (pcs.)	6	6	12
6) Total Length (m)	36	36	72
3. SCREEN (opening)	(20%)	(12%)	(12%)
1) Material	Stainless Steel	FRP	FRP
2) Diameter (mm)	150	150	150
3) Joint Type	Welding	Thread Coupling	Thread Coupling
4) Unit Length (m)	5	6	6
5) Required No. (pcs.)	3	2.5	5
6) Total Length (m)	15	15	30
4. GRAVEL PACK			
1) Depth (m)	30	30	60
2) #5 Gravel Volume (cu.m)	1.01	1.01	2.02
5. SAND SEAL			
1) Depth (m)	10	10	30
2) Coarse Sand Volume (cu.m)	0.34	0.34	1.02
6. CEMENT SEAL			
1) Depth (m)	10	10	10
2) Cement (kg)	270	270	270
3) Sand (cu.m)	0.11	0.11	0.11

TABLE 5.2 SUMMARY OF NUMBER OF WELLS BY PROVINCES

Service Level	Level I							Level II			
Well Depth (m)	30P	40G	50G	60G	80F	100F	Total	50S	50F	100F	Total
Stage I											
ILOCOS SUR											
1st DEO	3						3				0
2nd DEO	2	1	1				4				0
Sub-Total	5	1	1				7				0
PANGASINAN											
1st DEO		1			1	3	5				
2nd DEO		1		4	2		7	1			1
Sub-Total		2		4	3	3	12	1			1
ILOILO											
1st DEO					2	2	4				
2nd DEO	2		2			1	5			1	1
Sub-Total	2		2		2	3	9			1	1
ANTIQUE		3	2				5	1			1
Total for Stage I	7	6	5	4	5	6	33	2		1	3
Stage II											
ILOCOS NORTE	3	1					4				0
LA UNION	3	3	3		1		10		1	1	2
AKLAN	4	4					8	1			1
CAPIZ	5	6	1				12		1	1	2
Total for Stage II	15	14	4		1		34	1	2	2	5
GRAND TOTAL	22	20	9	4	6	6	67	3	2	3	8

The following are not included in the Table.

1) Dug well : Antique
2) Existing deep well : Pangasinan

pupils. Location of the building should be determined with reference to that of classrooms in convenience of pupils during rainy day. For the design of the unit, floor is provided with concrete and local made tile, and walls shall be made of concrete hollow block with plaster and paint finish. The building is tin-roofed and arrangement on the wall is made to ensure light and ventilation. The design of septic tank conforms with the Philippine standard and countermeasures required during rainy season in the occurrence of flood will be made.

The summary of school toilets by province and number of schools by size are presented in Table 5.4 and Table 5.5, respectively.

TABLE 5.3 TYPES OF TOILET UNIT

Type		A	B	C	D
Number of Pupils		~ 100	101 ~ 300	301 ~ 500	501 ~ 700
Boy	Urinal	1	2	3	4
	Squat Type	1	1	2	3
Girl	Squat Type	1	2	4	5
	Sit Type	1	1	1	2

5.3.3 Equipment and Service Vehicle Specification

Major specifications of the equipment and vehicles are given below.

(1) Drilling rig

o Type and number of units : truckmounted rotary drilling rig, 2 units

o Performance : nominal (rated) drilling capacity of 150 m for a bore hole diameter of 250 mm

o Other requirements : mud pump, common accessories, drilling and fishing tools, and spare and wearing parts

(2) Pumping test equipment : 8 units

TABLE 5.4 SUMMARY OF SCHOOL TOILETS

	No. of Schools	Pupils				Toilet Type					Water Source		
		Boy	Girl	Staff	Total	A	B	C	D	Total	S.W.	Dug	Total
Stage I													
Ilocos Sur													
1st DEO	7	829	775	77	1,681	1	5		1	7	7		7
2nd DEO	8	856	824	65	1,745		6	2		8	7	1	8
Sub-Total	15	1,685	1,599	142	3,426	1	11	2	1	15	14	1	15
Pangasinan													
1st DEO	9	2,399	2,441	173	5,013		3	7	2	12	8	4	12
2nd DEO	21	9,658	9,215	614	19,487		2	22	23	47	46	1	47
Sub-Total	30	12,057	11,656	787	24,500		5	29	25	59	54	5	59
Iloilo													
1st DEO	11	3,784	3,694	290	7,768		3	9	5	17	10	7	17
2nd DEO	13	3,942	3,741	253	7,936		4	6	7	17	11	6	17
Sub-Total	24	7,726	7,435	543	15,704		7	15	12	34	21	13	34
Antique	20	3,282	3,366	246	6,894	4	5	11	1	21	9	12	21
Total for Stage I	89	24,750	24,056	1,718	50,524	5	28	57	39	129	98	31	129
Stage II													
Ilocos Norte	15	2,643	2,515	194	5,352		10	6	1	17	17		17
La Union	19	4,493	4,018	305	8,816		11	12	2	25	22	3	25
Aklan	16	4,323	4,301	301	8,925		5	10	6	21	6	15	21
Capiz	20	4,312	4,163	331	8,806	2	9	9	5	25	18	7	25
Total for Stage II	70	15,771	14,997	1,131	31,899	2	35	37	14	88	63	25	88
Grand Total	159	40,521	39,053	2,849	82,423	7	63	94	53	217	161	56	217

TABLE 5.5 NUMBER OF SCHOOLS BY PUPIL DISTRIBUTION

	" 100	101 " 300	301 " 500	501 " 700	701 " 1000	1001 " 1,500	1501 " 2000	2001 " 2500	2500 " "	Total
Stage I										
Ilocos Sur										
1st DEO	1	5		1						7
2nd DEO		6	2							8
Sub Total	1	11	2	1						15
Pangasinan										
1st DEO		1	3	2	3					9
2nd DEO			3	2	4	5	3	2	2	21
Sub Total		1	6	4	7	5	3	2	2	30
Iloilo										
1st DEO		3	3		1	3	1			11
2nd DEO		3	1	2	3	4				13
Sub-Total		6	4	2	4	7	1			24
Antique	4	4	10	2						20
Total for Stage I	5	22	22	9	11	12	4	2	2	89
Stage II										
Ilocos Norte		8	5	2						15
La Union		8	3	3	5					19
Aklan		5	5	1	1	4				16
Capiz	2	6	7	2	3					20
Total for Stage II	2	27	20	8	9	4				70
Grand Total	7	49	42	17	20	16	4	2	2	159

(3) Water level indicator

o Type and number of units : portable electric water level measurement type, 11 units

o Performance : depth of measurement is approximately 100 m with marking on cable at each one meter interval

(4) Water quality analysis kit : 11 units

(5) Service vehicles

Type and number of units: pick-up 4 x 4 (1-1/2 tons), 10 units (6 for DPWH and 4 for DOH)

5.4 Project Implementation Plan

5.4.1 Present Situation of Relevant Fields of Construction in the Philippines

(1) Water Supply Facilities

Well drilling is the most critical field of construction involved in the Project. The current situation in this particular construction sector, which is discussed lengthily in Sub-section 4.2.5, indicates a general shortage of drilling rig and competent crew especially in the provinces, considering the huge number of wells to be constructed under the existing plans and programs. This problem exists both in the government and private construction sectors.

Project facilities will be constructed under adverse locational conditions mainly brought about by widely dispersed project sites and other constraints like a tight time frame for completion and limited equipment/manpower resources. Because of this, it would be difficult to maintain a consistently high level of construction quality control. This is particularly true in well drilling/source development where it is very important to be able to construct sources that could deliver

the planned amount of water within a reasonably long period.

To offset the above drawbacks, it is recommended that the GOJ should provide totally all the requirements of the Project including materials/equipment procurement, and construction surveillance, management and control.

Most of the required construction materials are easily available, and can be procured locally except for some well casing and screen that meet international standards, and cement which is considered for importation from a third country.

(2) School Toilet Facilities

As part of the program, most of the construction work for the facilities is done by contractors based on the design prepared by the DPWH in accordance with DOH standards. The toilet housing can be constructed by local contractors, but based on observations made of Phase I project there is a need for a higher degree of workmanship to ensure the drainage of water used in the cleaning of toilet floor and bowl.

The major concern of this Project is to promote motivation in the improvement of sanitation practices, hence, an arrangement should be made for the GOJ to cover not only provision of materials and equipment for the required facilities, but also construction work as well.

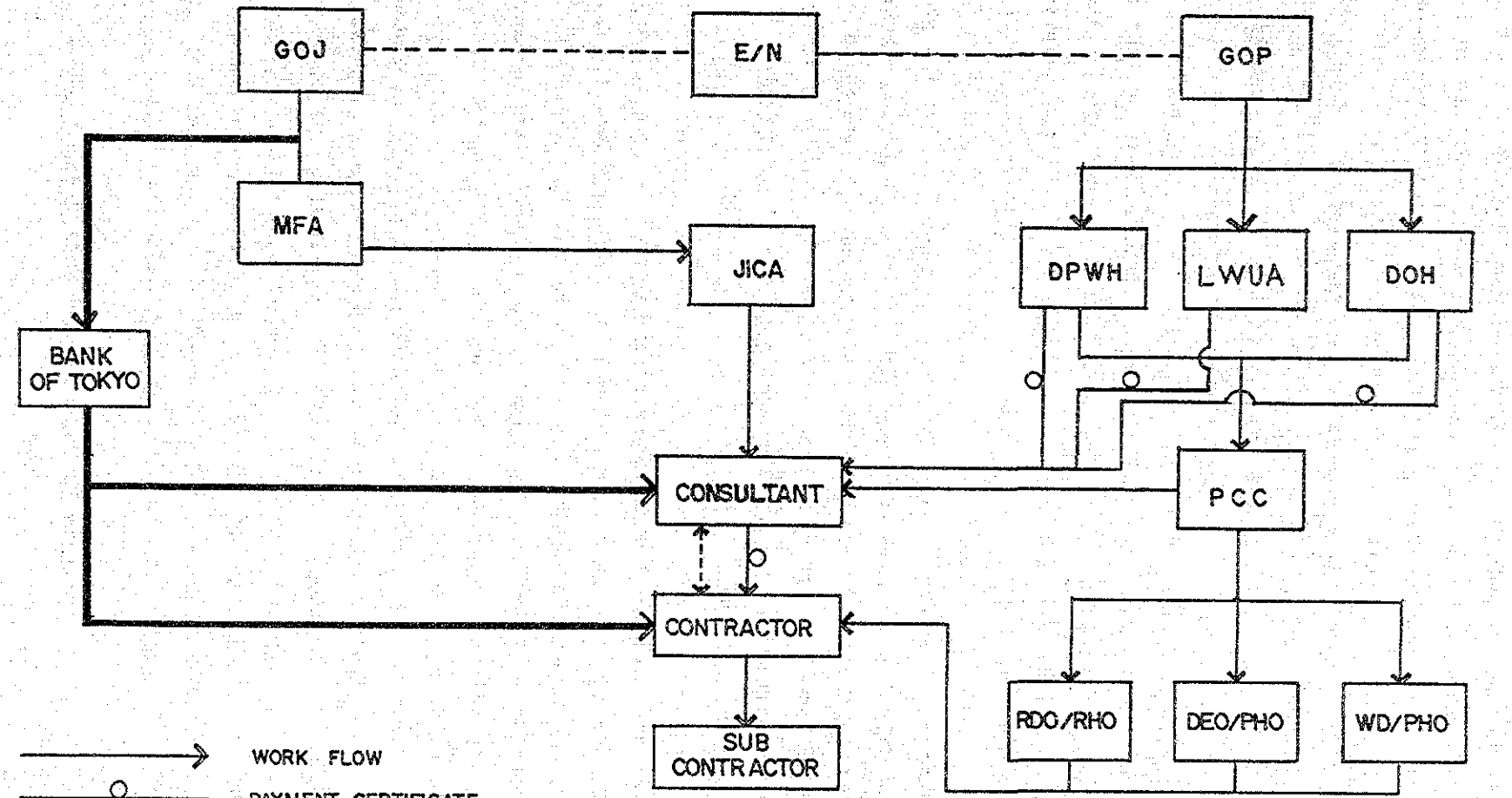
Most of materials except for cement are easily available in the country.

5.4.2 Implementation Method

The Project organization and work/fund flows chart based principally on existing and proposed implementation arrangements of the GOP are shown in Figure 5.5.

Construction work for all required water supply and school toilet facilities shall be contracted out to a qualified Japanese Contractor. The said principal Contractor has the option to engage the services of local contractors which will render actual construction

FIGURE 5.5 PROJECT ORGANIZATION AND WORK / FUND FLOW CHART



LEGEND:

MFA- MINISTRY OF FOREIGN AFFAIRS
PCC- PROJECT COORDINATING COMMITTEE
RDO- REGIONAL DIRECTOR'S OFFICE
DEO- DISTRICT ENGINEERING OFFICE
WD- WATER DISTRICT
RHO- REGIONAL HEALTH OFFICE
PHO- PROVINCIAL HEALTH OFFICE

work and supply labor. The recommended office set-up for construction is the establishment of one office each in Region I and Region IV. Minimum expatriate staff requirements of one office shall consist of a Project Engineer, an Assistant Project Engineer, a Well Engineer, and an Administrative Officer. One of the Project Engineers, shall concurrently act as Project Manager.

Construction supervision, activities will be the responsibility of a Japanese Consultant. A Project Manager, who is a professional civil engineer, a Sr. Well Engineer, and a Sr. Civil Engineer shall comprise the expatriate Consultant staff, in consideration of the nature of construction work called for under the Project. The services to be performed by the Consultant shall principally be spot supervision of construction.

Assistance and cooperation in the coordination of activities shall be provided by the DEO/PHO/WD, specifically in the storage/safekeeping of construction materials, supplies and equipment. Laws and regulations pertinent to the construction work shall be adhered to strictly by the Contractor, who shall secure necessary permits with the help of local authorities.

Most of the material requirements of the Project are easily available locally except for some types of well casings and well screens, and cement which is presently very scarce in the local market. These commodities will be imported together with drilling equipment, vehicles, and miscellaneous equipment for well construction/rehabilitation/monitoring. Cement would probably come from Malaysia while the rest of the imported good will be shipped from Japan. Depending upon the availability of adequate storage space, procured materials, and equipment may be stocked temporarily at the DEOs concerned or transported directly to provincial offices preparatory to delivery to individual project sites. As before mentioned, procurement of both local and foreign goods shall be taken care of by the assigned GOJ entity with the assistance of relevant local agencies.

5.4.3 Major Undertakings by Japanese and Philippine Governments

Responsibilities in the implementation of the Project, most of which

are outlined in the Minutes of Discussion (Appendix B.2), are augmented and more clearly delineated in the following paragraphs.

(1) Responsibilities of the GOJ

The GOJ, directly or through the assigned Consultant and Contractor will be responsible for the complete delivery of Project components including detailed engineering design, procurement of materials/equipment, funding of construction, supervision/management of construction, and training of GOP field personnel in well construction.

(2) Responsibilities of the GOP

The obligations of the GOP, which shall be discharged through the DPWH, LWUA and DOH, are to:

- Provide liaison between GOJ nationals and other GOP agencies/entities involved in the Project.

- Ensure the acquisition of required land for the construction of facilities like water intakes, storage reservoirs, etc., and right- of-access along pipeline routes and other facility sites during construction sufficiently ahead of the scheduled implementation to avoid delays.

- Provide all data/information necessary for the design of facilities.

- Arrange for the exemption of GOJ nationals from customs duties, local taxes and other forms of fiscal levies which may be imposed in the Philippines with respect to the supply of products and services related to the Project.

- Facilitate the entry and assure the tenure for the duration of their work in the Philippines of GOJ nationals whose services may be required in connection with the supply of products and services for the Project.

- Expedite the unloading, tax exemption, customs clearance at ports

of disembarkation in the Philippines, and local transport to points of destination of products purchased under the Grant-Aid Program.

- o Operate and maintain properly and effectively the completed facilities and the equipment procured under the Project and in this connection, carry out a training program for beneficiaries/operators of the facilities.

- o Coordinate training activities to be conducted by GOJ nationals for concerned GOP field personnel.

5.4.4 Implementation Schedule

The Project will be implemented in 2 stages, each stage covering 4 provinces as described and rationalized in Sub-section 4.3.2. Figure 5.6 shows that for each stage, the Detailed Design phase will entail 4 months and the Procurement/Construction phase will cover a 12-month period.

Since the construction period will cover an entire year rainy season is unavoidable, it would be advisable to undertake well drilling activities especially in flood prone areas and concreting for reservoirs/tanks as much as possible during the dry season.

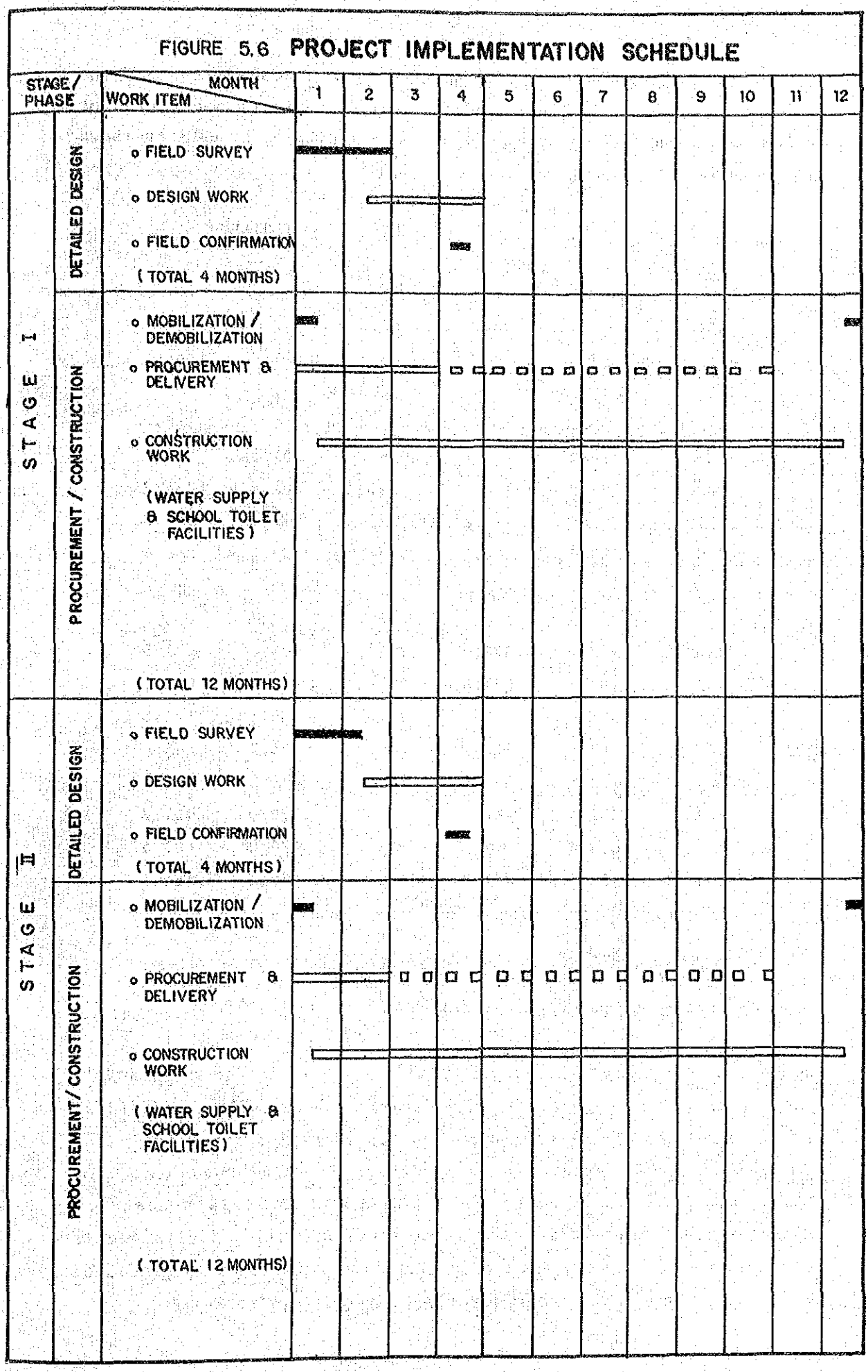
5.4.5 Cost Estimates

(1) Construction Cost

Project cost is taken as the sum of equipment and service vehicle procurement cost, consulting fee for detailed design and construction supervision, and direct and indirect costs for construction of facilities. Construction cost is estimated as the sum of the direct cost which includes materials, labor and equipment depreciation, and indirect cost which includes contractor's profit, overhead contingency and tax. Required construction cost for the GOP in fulfillment of its responsibility is land acquisition cost/donation.

As reference in future price adjustment the official exchange rate of Philippine Peso to the U.S. Dollar has slightly increased from

FIGURE 5.6 PROJECT IMPLEMENTATION SCHEDULE



₱21.56 in May 1989 to ₱21.89 in October 1989, or an average devaluation rate of about 1.5 percent in 6 months. Price escalation of principal construction materials has been monitored by NEDA as shown in the following table:

TABLE 5.6 PRICE INDEX OF CONSTRUCTION MATERIALS
(100 in 1978)

Period	Diesel Oil	Cement	Steel Bar	Steel Material	Timber
1985	607.7	328.6	315.2	301.6	231.0
1986	492.7	347.8	327.9	301.4	234.7
1987	427.5	382.6	327.9	322.2	342.3
1988	459.0	384.8	337.1	393.1	383.4
1989					
Jan	382.6	399.0	364.1	401.6	411.5
Feb	382.6	435.8	364.1	401.6	411.5
Mar	382.6	459.0	375.0	435.8	426.3
Apr	382.6	465.7	385.9	435.8	445.0
May	382.6	480.4	385.9	444.3	463.1
Jun	382.6	480.4	406.5	470.0	481.2
Jul	382.6	509.2	423.4	470.0	485.5
Aug	382.6	513.8	429.0	478.5	485.5

(2) Operation and Maintenance Cost

Operation and maintenance costs considered are those for water supply facilities (Level I and Level II systems), school toilet facilities, and monitoring. Total estimated monthly operation and maintenance cost for Level I systems is ₱ 126,360 or ₱ 2.54/household. For Level II systems the total is ₱ 333,665 or ₱ 10.34/household. Annual costs for operation and maintenance of toilet facilities is ₱77,252, while that for monitoring training activities is placed at ₱ 316,992. Details of these costs are given in Appendix A.7.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS ON THE PROJECT

CHAPTER 6 CONCLUSION AND RECOMMENDATIONS ON THE PROJECT

The Rural Environmental Sanitation Project Phase II, like its predecessor pilot project, is expected to bring the following benefits to recipient communities/schools in particular and the rural water supply and sanitation sector in general:

- Delivery of at least the minimum requirement for potable water of every beneficiary household member. Planned water consumption rates are 30-40 lpcd for Level I system and 40-60 lpcd for Level II system.

- Distance for fetching water is generally shortened, resulting to convenience of users and savings in man-hours which could otherwise be devoted to other productive activities.

- Provision of alternative sources of water like a distant spring or deep aquifer well to areas where water of adequate quantity and quality is difficult to obtain.

- Prevention of the deterioration of the living environment which can invariably be caused by improper disposal of human waste and protection of water sources especially in flood prone areas like the plains of Pangasinan.

- Motivation of beneficiaries, particularly school pupils, to adopt proper sanitation and hygienic practices.

- Reduction of the incidence of waterborne and water-related diseases which have, for the period 1977-1984, ranked among the top 3 causes of morbidity and second in infant mortality.

- Extension of the benefits of the pilot project to other areas that urgently need such improvement.

- Transfer of technology in proper well construction by the use of open-hole gravel pack method to relevant GOP field personnel through demonstration during the construction stage.

Once completed, the water supply and school toilet facilities will directly benefit 42,107 people and 82,423 pupils, respectively, in 8 provinces of 2 regions. Recipients of water supply facilities are 97 barangays in 62 municipalities, while 159 barangays in 95 municipalities are beneficiaries of school toilet facilities. Additionally, residents of neighboring barangays and other people living in communities where water supply systems and school toilets are located may likely be influenced by favorable results of the Project and ultimately follow suit.

The Project is regarded as appropriate for implementation through a Grant-Aid Program because of the following reasons:

- The Project is in the category of non-profit, socially-oriented infrastructure designed to cater to basic human needs. Facilities will be operated and maintained through user cooperatives, which are purely non-profit organizations. Whatever water fees collected by these cooperatives accrue to funds to be exclusively used for payment of electric power bills, repair/maintenance of facilities, and salary of operators.

- Prospective Project beneficiaries are civilian residents numbering nearly 125,000 of rural communities who generally constitute the lower stratum of society, and whose welfare continues to be a major concern of the GOP.

- The Project is in line with the GOP Master Plan for the water supply and sanitation sector, and the Accelerated Water Supply Program which provides for the construction of 100,000 units of Level I systems to cover all barangays in the country.

- The Project will involve the education and training of people in well construction, and operation and maintenance of water supply and school toilet facilities, which in some way will contribute to improved living standards. Since it covers rural areas where agriculture is the predominant source of livelihood, the Project would also indirectly influence promotion of agricultural production and cottage industry with the more time that can be devoted to these endeavors and a healthier labor force.

- The Project will contribute remarkably to the improvement of the living standard of beneficiaries. However, the communities cannot afford the cost for the construction of required facilities, hence there is a need to extend aid in consideration of the GOP's status as a developing country.

- The facilities are urgent to sustain life and serve the basic human needs of the people, who are endangered by the alarming prevalence of waterborne and water-related diseases.

- Existing arrangements indicate the capability of GOP institutions to operate and maintain the facilities through its own financial and technological resources.

In view of its expected considerable effects in terms of the improvement of living standard associated with basic human needs over a large area and number of people, it is strongly recommended that the Project be implemented through the Grant-Aid Program. Furthermore, the implementation arrangements of the GOP, including institutional set-up, organizational and financial aspects seem to be adequate.

However, more efficient and effective implementation could be ensured by the following measures that should be instituted by the GOP.

- Assurance at the earliest practicable time of the acquisition of land and right-of-access for the construction of facilities to preclude delays.

- Commencement of activities for BWSA/RWSA formation immediately upon signing of the Exchange of Notes.

- Adequate training of relevant personnel to assure an efficient mechanism for operation and maintenance.

- Priority should be given to communities covered by the Project where Sanitation-related government projects like distribution of individual house toilet bowls is involved.

- Assurance of the effectiveness of the PCC through the creation of a working group within the committee to oversee the Project for some time after the turnover of facilities.