fairly complex, where various formation and structures are exposed. The basement rocks of the province are composed of faulted and folded Cretaceous schists and slates and thrusted ultramafics bodies. Various intrusives are existed on the southwestern portion of the province, they are usually grouped between intermediate to acid and basic to ultrabasic rocks.

Late Oligocene-Middle Miocene formation of marine sandstone, shale, reefal limestone, conglomerate, coal measure, marine pyroclastics, and lava can be found nearby the boundary of this province to Lanao del Norte Province. Covering the northern part of this formation is the Upper Miocene formation of marine clastics, reef limestone, and andesitic-basaltic pyroclastics and lava. Pliocene-Pleistocene formation of both marine and terrestrial sediments including limestone and pyroclastics was deposited later. It also can be found on the eastern part of the province and the coastal area of the western part.

The Pliocene-Pleistocene and Recent volcanic deposits are the most extensive formation in the province. They cover most of the central and northern part of the province. They are typically comprised of andesites and basalts with associated dacites and rhyodacites. The Quaternary alluvial only covers the narrow coastal plain nearby Cagayan de Oro City and Gingoog City.

The geological map of Misamis Oriental is shown on Figure 2.3.15. Figure 2.3.12 shows the stratigraphy of Misamis Oriental.

(3) Hydrogeology and Groundwater

In hydrogeology, the geological formations or strata are classified into aquifer, aquitard and aquiclude, depending on the hydraulic property such as transmissivity. The aquifers to be developed must be the water-bearing strata with good yield. For water supply projects the availability of water throughout the year is also essential whether it is springwater or groundwater. The potential aquifers are judged on their areal extent of water-bearing strata and recharge area and the continuity from the recharge area to the water-bearing strata which depend on the geological structure, the geomorphology. The quantity of recharge in the area and the yield required are important factors for considering safe yield of the wells.

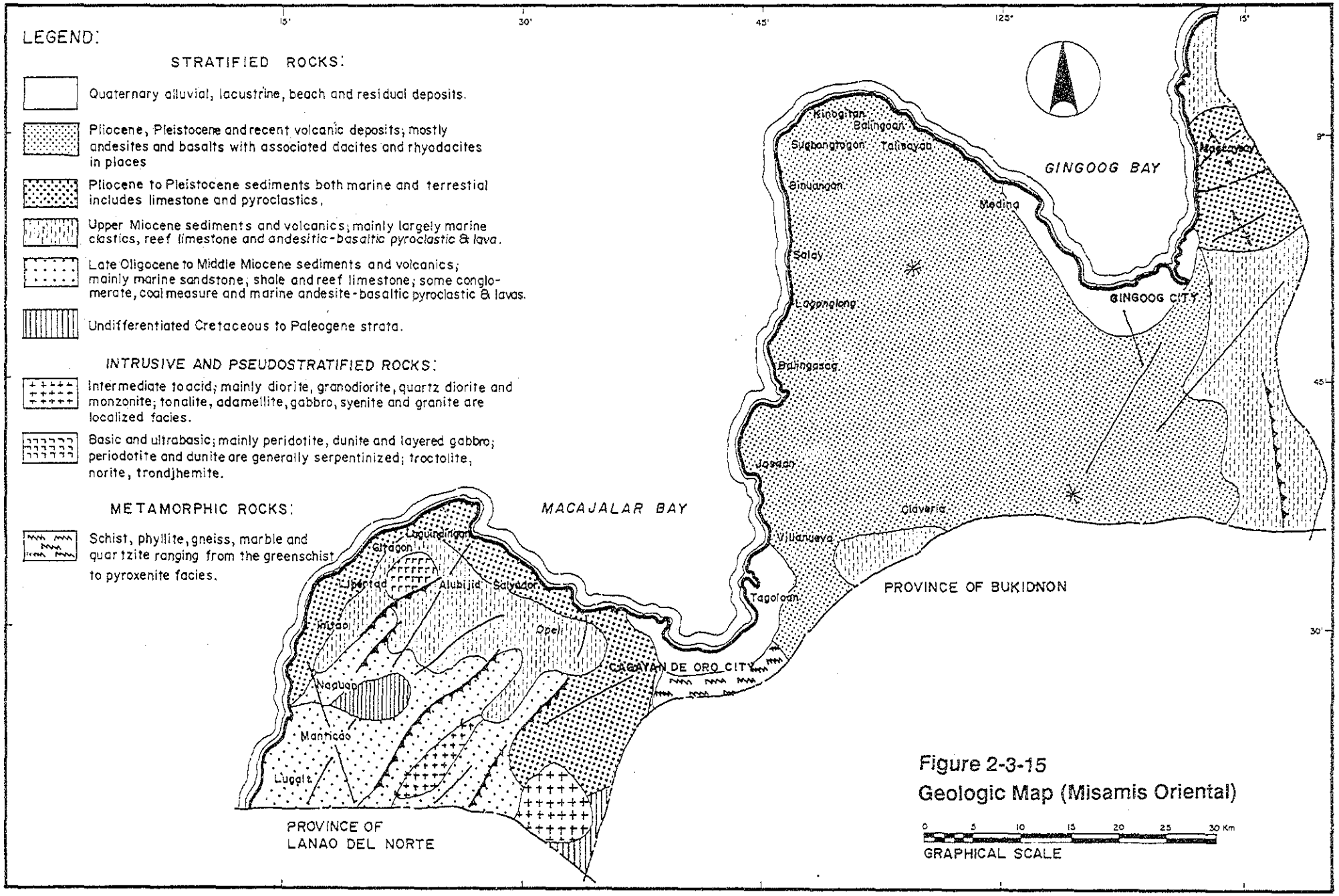


Figure 2-3-15
Geologic Map (Misamis Oriental)

The following explanation and groundwater maps for the Project Area inform the area of high-yielding wells, probable salt intrusion area, groundwater table, and groundwater flow directions of the provinces. The selected well logs show the geological strata and target aquifers for the project sites. Most of the information, such as the general SWL, specific yield, average discharge of the wells in the provinces, and related information, are taken from Rapid Assessment of Water Supply Sources (RAWSS), 1982, published by National Water Resources Council (NWRC) of the Philippines. Then, field work observation were incorporated to get the complete report.

Specific capacity data is described in order to know the drawdown of the wells since the transmissivity data is not available. Respective permeability and infiltration capacity of the respective lithology is shown on Table 2.3.8. For this project, aquifers of sand and gravel, gravels and loose boulders are selected as the target aquifer in the alluvial areas. Aquifers of pyroclastics and basalts are selected in the volcanic rock areas. Although aquifers of sedimentary and metamorphic rocks are well fractured they are not selected for the groundwater development because most of them do not have sufficiently large recharge areas.

Generally speaking the water quality in the Project Area is fair. Iron-rich water is found around and in the downstream of the plutonic rock and hypabyssal rock areas. Saltwater intrusion caused by over pumping is found at few and limited places along the coast.

A. Rizal

For the province of Rizal, the most important hydrogeologic units where major groundwater is confined are the Pleistocene-Recent pyroclastic rocks and the unconsolidated sediments underlying the coastal area of Laguna Lake and the plains of San Mateo and Montalban which is corresponding to the area of high-yielding wells (Figure 2-3-16). Their primary permeabilities, of pyroclastic rocks, are probably not very high but their great thicknesses and secondary permeabilities developed by the associated tectonics give rise to favorable conditions for groundwater development. Figure 2-3-16 is the groundwater map of Rizal. As shown in this figure, the water level contours reflect more or less the general topographic conditions of the province. The groundwater moves toward the discharge areas at Laguna de Bay and Manila Bay.

Table 2-3-8 Permeability and Infiltration Capacity by Lithology

Lithology	permeability	Infiltration Capacity	Remarks
Boulder	very high	very high	
Gravel	very high	very high	
Gravel with Boulder	very high	very high	
Sand and Gravel	high	high	
Sand	medium – high	medium – high	
Silt	low	low	
Clay	absent	absent	saturated with water
Clay with Gravel	absent	absent	– do –
Clay with Gravel	absent	absent	– do –
Tuffaceous clay	absent	absent	locally called adobe
Sandstone	low – medium	low	
Limestone	low – high	very low – low	permeability is high if solution cavities exist
Tuff	low	low	
Lava	very high	very high	
Basalt	low – medium	low	
Andesite	absent	absent	
Metamorphic rocks	absent	absent	

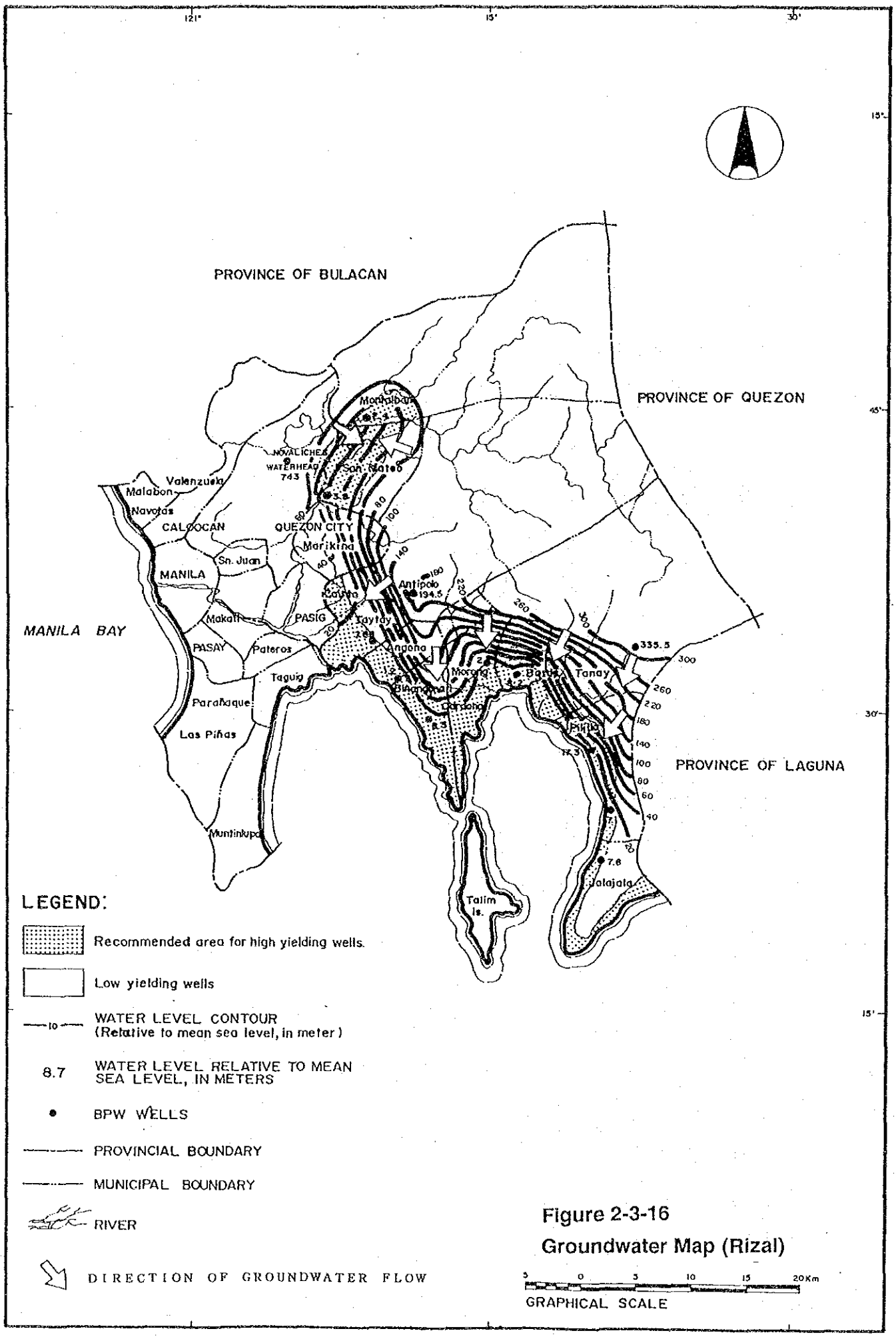


Figure 2-3-16
Groundwater Map (Rizal)

According to the RAWSS (1982), the province of Rizal has a total number of 193 deep wells with an average depth ranging from 23-153 m. Its municipal average SWL ranges from 2.89-38.65 m below ground surface. Wells in Montalban has the maximum SWL of 38.65 mbgs. Teresa and Morong rank second with an average of 18.29 mbgs and 18.14 mbgs respectively. These munucipalities are found on the western part of Rizal. Shallower SWLs are found along the coastal portion of Pililla and Jala Jala with an average SWL of 3.89 mbgs. The municipality of Baras has the minimum average of 2.89 mbgs.

Deep and shallow wells could be tapped in all areas of the different rock types except in the highly elevated terrain of the older rocks. Shallow well areas are mostly found in the recent formations composed of consolidated and unconsolidated sand, gravel and beach deposits. These areas are situated on the western part of the province particularly in the municipalities of San Mateo, Taytay, Cainta, and portions of Angono. Deep well areas are scattered all over the province, majority of which are concentrated on the eastern portion of the province encompassing portions of the municipalities of Montalban, Antipolo and Tanay. Of the total 164 developed and operational water resources in the province as registered by DPWH, 1.2% were springs, 51.2% were shallow wells and 47.6% were deep wells.

Specific capacity of Rizal Province has an average ranging from 0.21-1.37 lps/m. The municipality of Binangonan has the maximum average specific capacity of 1.37 lps/m. Averages of 1.02 and 1.20 lps/m are found in Tanay and San Mateo, respectively. Wells in the municipalities of Antipolo and San Mateo have the maximum discharge of 4.25 lps. Morong and Taytay wells have an average of 3.65 and 3.64 lps respectively. The minimum discharge ranging from 0.59-0.98 lps prevail in most parts of the province particularly Baras, Montalban, Teresa, Angono, Jala Jala, Pililla, Binangonan, Tanay and Cardona.

B. Laguna

The most extensive and potential aquifer in the province are the Quaternary volcano-clastic sediments locally known as Laguna Tuff and the recent alluvial deposits. Little amount of groundwater is known to

exist in the dense basalt and andesite flows. The Quaternary sediments, which are essentially pyroclastic rocks (tuff volcanic breccia and volcanic agglomerate), are inherently less permeable compared to recent alluviums. However, their thickness and areal extent make them important groundwater basins.

Hydrogeologically, the province may be divided into two sub-areas. The boundary of the sub-areas is defined by the extent of recent alluvial deposits near Laguna de Bay. The groundwater level contours in Figure 2-3-17 shows that the hydraulic gradient is steep under mountainous area and becomes flat toward the plain. Based on the figure, the groundwater recharge originates from higher elevation and flows toward Laguna de Bay.

According to the RAWSS (1982), the SWL of Laguna Province ranges from 0.3-120.43 m below ground surface, with well depths ranging from 10-293 m. Wells in the municipality of Calamba with average depth of 72 m has the maximum average SWL of 44.57 mbgs while the municipality of Pila with an average well depth of 34 m has the minimum average SWL of 1.29 mbgs.

In terms of specific capacity, the municipality of Siniloan has the maximum of 5.29 lps/m while the municipality of Pila exhibits the lowest of 0.40 lps/m. The province of Laguna has an average well discharge ranging from 0.53-1.95 lps. Wells in the municipality of Siniloan has the maximum discharge capacity of 1.95 lps while the minimum discharge of 0.53 lps is found in the municipality of Nagcarlan. Majority of the municipalities in the province have an average discharge capacity ranging from 0.53-0.87 lps.

Shallow well areas are confined within the recent alluvial deposits particularly in well-sorted sediments that includes layers of sand, occasional lenses of gravel and considerable silt and clay derived from the weathering of volcanic and pyroclastic rock upland. These areas are found along the southern shores of Laguna de Bay, from the coastal plains of Famy, Siniloan, Pangil, Pakil, Paete, Kalayaan, Lumban, Sta. Cruz, Pila, Victoria, Bay, Calamba, Cabuyao, Sta. Rosa to Biñan. Beyond those coastal plains the area of high-yielding wells falls under difficult area category. This area usually comprising of

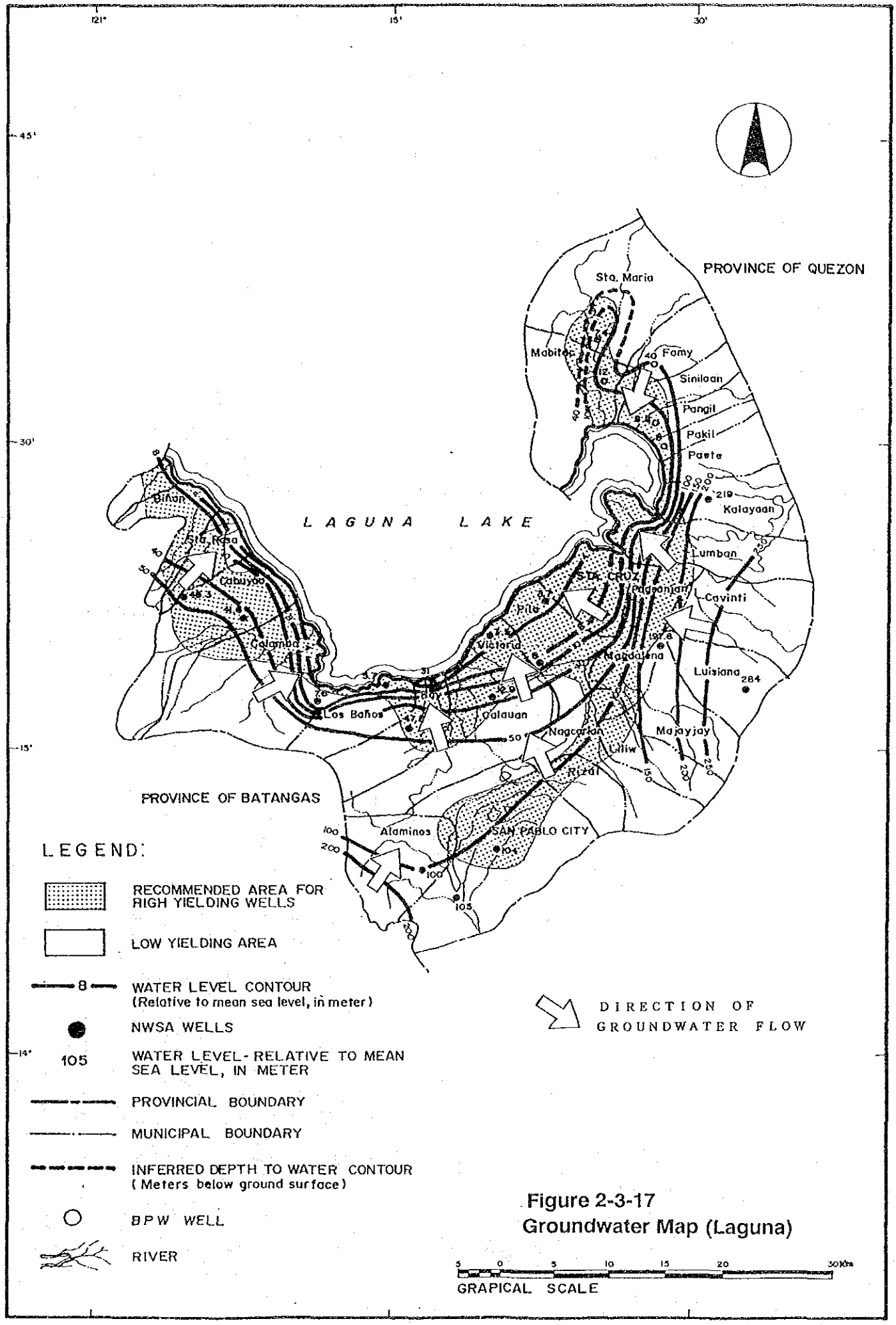


Figure 2-3-17
Groundwater Map (Laguna)

basaltic to andesitic flows with intercalated pyroclastics and minor sedimentary rocks. Groundwater discharges by springs and seepages along these flows, which serve as the aquifer for this difficult area. Of the total 587 developed and operational water sources as registered by DPWH, 7.2% were springs, 8.3% were shallow wells and 84.5% were deep wells.

C. Quezon

In addition to recent alluvial deposits, potential good aquifers in the province are the late Miocene-recent pyroclastics and sedimentary rocks in areas surrounding Mt. Banahaw covering the municipalities of Mauban, Lucban, Tayabas, Candelaria, Sariaya, portions of Tiaong and Lucena City. The primary permeability of these rocks are low, nevertheless, their thickness make them significant groundwater aquifer. Shown in Figure 2-3-18 is the groundwater map of the province showing potential areas for groundwater development. Generally, groundwater recharge in the province comes from the north-south trending mountain ranges and moves towards the Tayabas Bay, Lamon Bay, Dingalan Bay. Saltwater intrusion areas exist in limited area along the Tayabas Bay from Pitogo to near Gen. Luna and the peninsula facing Alabat island from Calauag to Lopez.

According to the RAWSS (1982), the province of Quezon has a total of 581 wells with depths ranging from 6.81-50.23 m. Its municipal average SWL ranges from 0.61-17.23 mbgs. Wells in the municipality of Tiaong have the maximum SWL of 17.23 mbgs. Candelaria and San Antonio rank second with an average SWL of 16.91 and 16.19 mbgs, respectively. These municipalities are located in the southwestern part of Quezon. The central area of Southern Quezon has a shallower SWL ranging from 2.44-6.25 mbgs. This area includes municipalities of Agdañgan, Unisan, Pitogo, Macalelon, Gumaca, Plaridel, Atimonan, and Padre Burgos. Similar SWL ranges of 2.44-6.25 mbgs are obtained in areas located in northern Quezon and in the island of Polilio. The eastern and southeastern portions of southern Quezon has an average SWL of 6.09-10.68 mbgs. The minimum SWL of 0.61 mbgs is found in the coastal municipality of Real, situated in northern Quezon.

The average specific capacity of Quezon Province ranges from 0.11-2.07

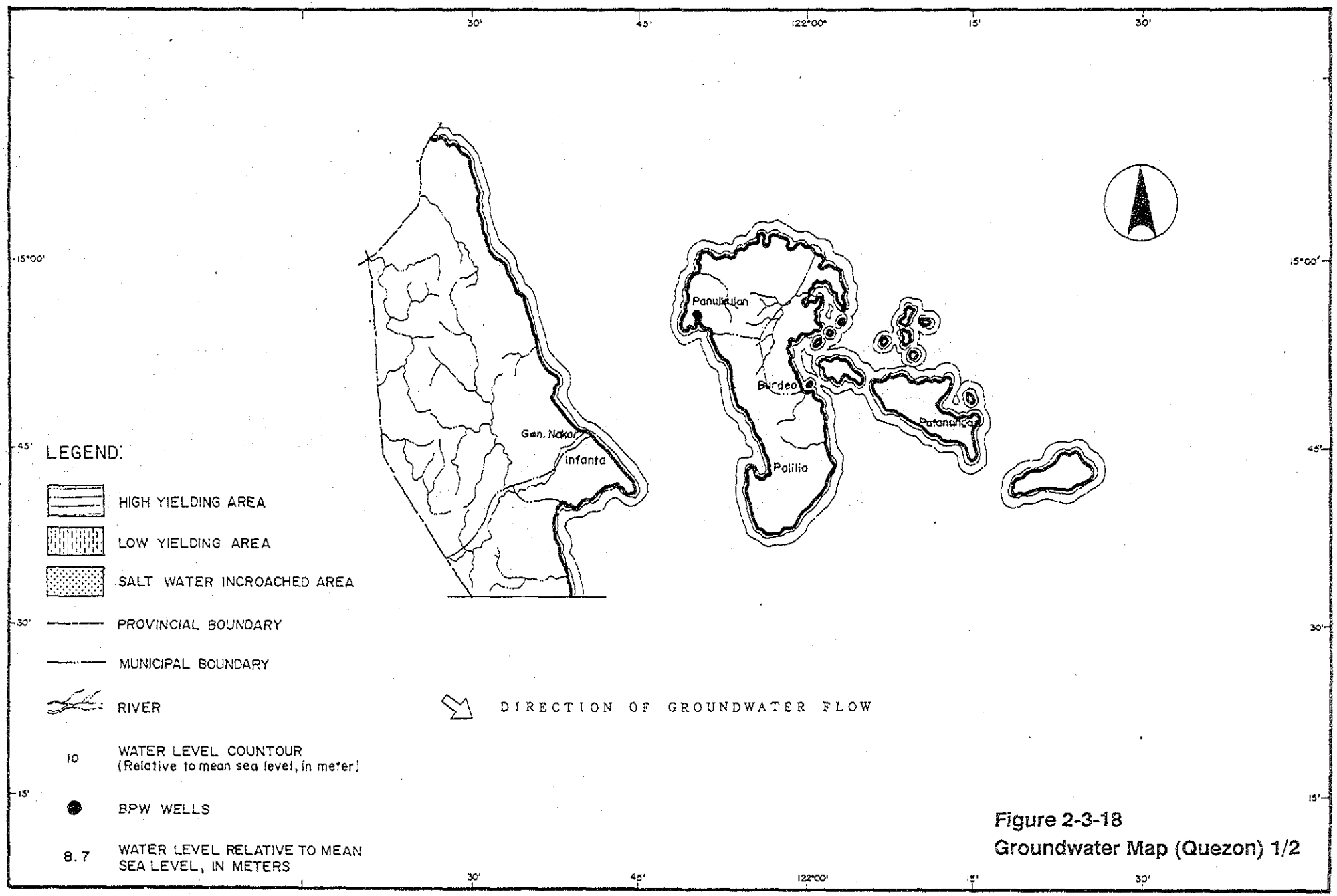


Figure 2-3-18
Groundwater Map (Quezon) 1/2

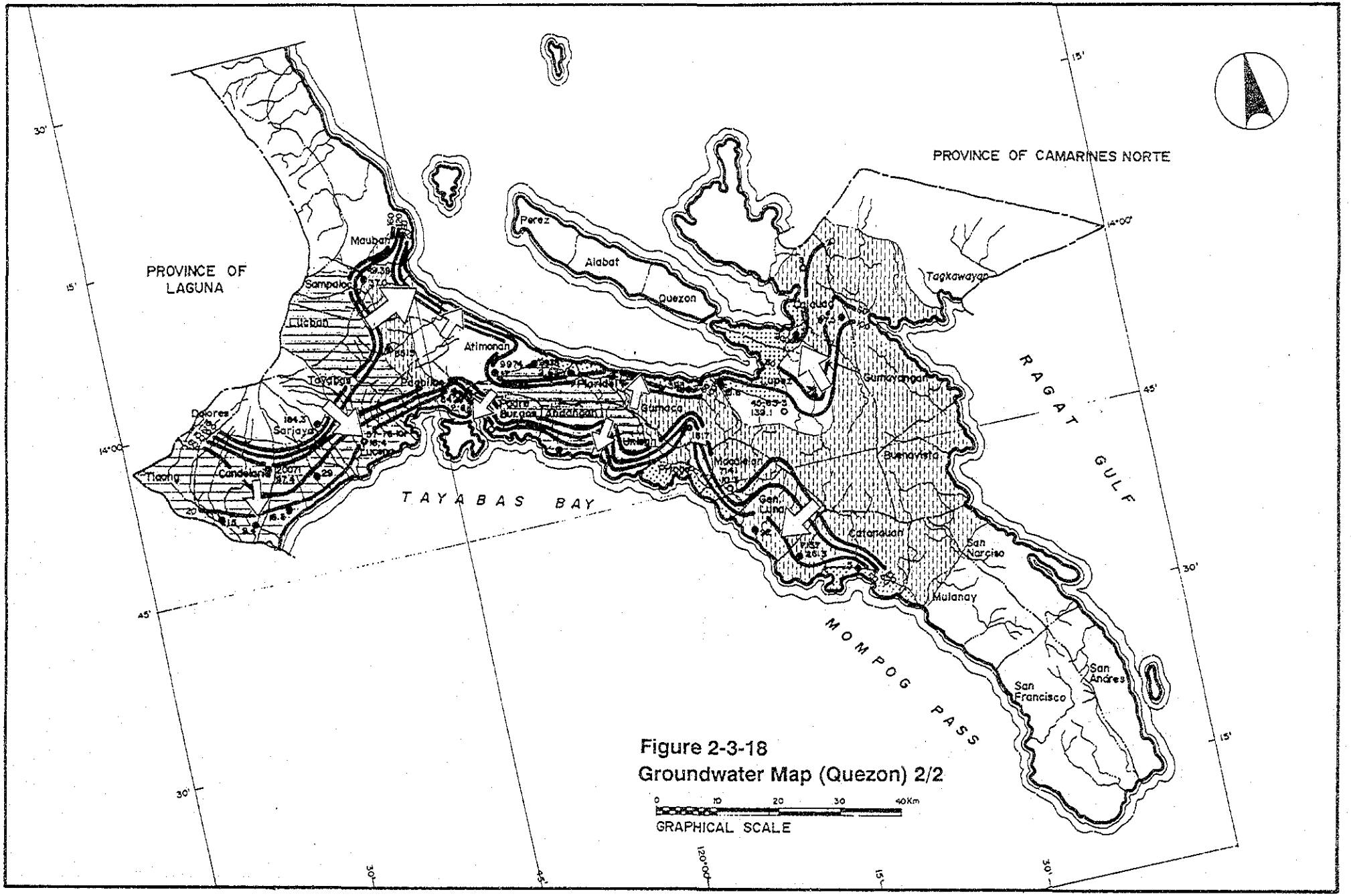


Figure 2-3-18
Groundwater Map (Quezon) 2/2

lps/m. The municipality of Real in northern Quezon has the maximum specific capacity of 2.07 lps/m, while the municipality of Panukulan in the island of Polilio has the minimum average of 0.11 lps/m. In terms of discharge capacities, the province has an average of 0.80 lps. Wells in the municipality of Sariaya in southern Quezon has the maximum discharge of 5.04 lps. The minimum discharge of 0.32 lps is found in the municipality of General Nakar in northern Quezon.

As seen in the provided geological map, it is clear that this province is pretty much dissected by faults of NW-SE trend. The surface delineation of geological formation also follows this elongation. As the result, the generalization only can be made for case per case condition. Shallow-well area occupies most of the municipalities in the central parts of southern Quezon particularly in the coastal areas of Pagbilao, Padre Burgos, Agdañgan, Unisan, Pitogo, Gumaca, Plaridel, Atimonan and on the eastern portion of southern Quezon in Lopez, Calauag and Quezon. This area is most likely composed of the recent alluvial deposits of unconsolidated sand, gravel, and clay as well as marine clastic deposits of Upper Miocence to Pliocene. Deep-well area occupies the eastern part of southern Quezon, particularly in the municipalities of Catanauan, Mulanay, San Francisco, San Andres, San Narciso, Buenavista, Guinayangan, Tagkawayan, Perez, Alabat, and a portion of Quezon, the western part of southern Quezon, namely the municipalities of Plaridel, Atimonan, portions of Pagbilao, Tayabas, and Mauban, and in northern Quezon where it can be found sporadically on the western part of the municipality of Real and General Nakar. This area usually has the lithologic units of pyroclastic rocks dominantly bedded tuffaceous sandstones, coralline limestones, marls, and other unmapped rocks. Areas underlain by ultramafic and mafic plutonic rocks, diorite, metamorphosed shale with intermediate flows and pyroclastics are fallen under difficult area category. These areas are predominant in northern Quezon, the western portions of southern Quezon, namely Lucban, Dolores, Tiaong, San Antonio, and Candelaria, and the eastern portions of southern Quezon Atimonan, Quezon and Tagkawayan. Of the total 487 developed and operational water sources as registered by DPWH, 1% were springs, 17% were shallow wells and 82% were deep wells.

D. Camarines Norte

The primary water-bearing aquifers in the province of Camarines Norte are the Late Miocene-Pliocene sandstone, conglomerate, pyroclastics belonging to Sta. Elena, Viñas and Macogon Formations and unconsolidated sand and gravel of Quaternary alluvium. The alluvium occupies most of the shallow well areas located in the municipalities of Mercedes, Talisay, Daet, Basud, and along the coast in Sta. Elena. The aquifers also underlie areas considered as deep well area situated in the central part of Camarines Norte. Dense rocks of older formations underlain difficult areas which situated in the northern portions of the province. The areas of Labo volcanics and Labo volcano fall in the difficult area because of its deep ground water table. Generally, the groundwater flow in the province is radial towards the Philippine Sea (Figure 2-3-19).

According to the RAWSS, the municipal average SWL ranges from 0.61 to 19.82 mbgs, while the provincial average SWL is 4.03 mbgs. The municipalities along the shoreline namely Sta. Elena, Jose Panganiban, Paracale, Vinzons, Talisay, Daet, Mercedes, Basud and Labo have a low average SWL ranging from 2.49-5.05 mbgs. The municipalities of Imelda and San Mateo has a SWL of 6.16 and 6.13 mbgs, respectively.

The specific capacity of the province ranges from 0.04 lps/m as minimum in the municipality of Paracale and 6.33 lps/m as maximum in the municipality of Vinzons. The average discharge capacity per well in this province is 0.54 lps. The wells in the municipalities of Jose Panganiban has the maximum average discharge of 0.64 lps, while the minimum average discharge of 0.42 lps is found in the municipalityies of Daet and Sta. Elena. As shown in the groundwater map (Fig.2-3-19), the high yielding well areas are located in the eastern alluvial plain and the surrounding area with Labo volcano and the area of Sta. Elena formation in Sta. Elena. The remaining area is designated as low yielding well area. Of the total 247 developed and operational water sources as resistared by DPWH, 7% were springs, 23% were shallow wells and 70% were deep wells.

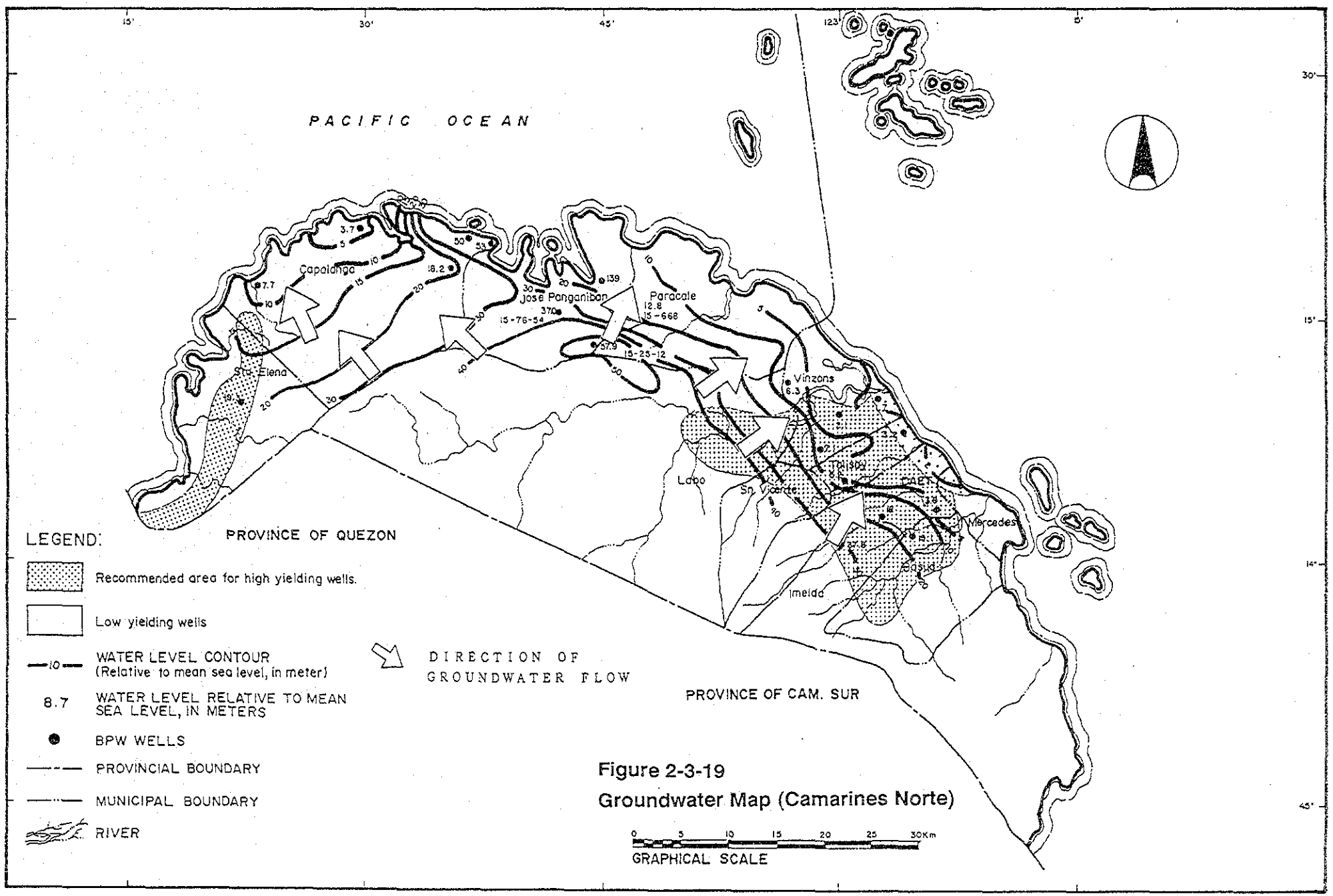


Figure 2-3-19
Groundwater Map (Camarines Norte)

E. Camarines Sur

The areas of high-yielding wells are indicated in two formations, namely the alluvium of the valley floors, and the pyroclastics forming the foothills of Mt. Isaraog and Mt. Iriga which is the most widespread, and the coastal plain along Lagonoy Bay. These area are found in the municipalities of Casureo, Togaon, Minalabas, Magaroa, Pamplona, Naga, San Jose, Pili, Baao, portions of Iriga and Nabua. These areas also the place where shallow-well areas can be found. The groundwater map (Figure 2-3-20) shows the groundwater flow in the province which reflects more or less its general topography. The areal extent of saltwater intrusion can be found near the coastal shores of Cabusao to Calabangan which facing San Miguel Bay, and small areal extent near Pasacao which facing Ragay Gulf.

According to the RAWSS (1982), the province has SWL ranging from 0.30 mbgs with a well of Sagnay to 51.83 mbgs with a well of Buhi, while the provincial SWL averages at 5.1 mbgs. SWL of less than 6 mbgs is the characteristic of most of the municipalities in the lowland of Bicol Valley, except the municipalities of Buhi, Iriga City, Pili, Baao, Magarao, San Fernando and Sipocot.

The specific capacity ranges from 0.02 to 3.17 lps/m. The minimum and maximum specific yield were recorded in the municipality of Calabanga and Nabua, respectively. The average discharge per well in the province of Camarines Sur is 0.57 lps. The wells in the city of Naga has the maximum average discharge of 1.31 lps. The minimum average discharge of 0.32 lps is found in the municipality of Magarao. There are about 78 wells in Buhi, Bula Libmanan, Pamplona and Iriga City which exhibit discharges ranging from 0.32-0.95 lps.

F. Albay

The areas of high-yielding wells are situated around the foothills of Mt. Mayon which is comprising of recent alluvium, Pliocene-Pleistocene clastic sediments, and Quaternary pyroclastics. The alluvium vastly underlain the shallow well areas located in the municipalities of Libon, Oas, Ligao, Tiwi, Malinao, northern part of Tabaco, south of Polangui, part of Camalig, central part of Guinobatan and part of

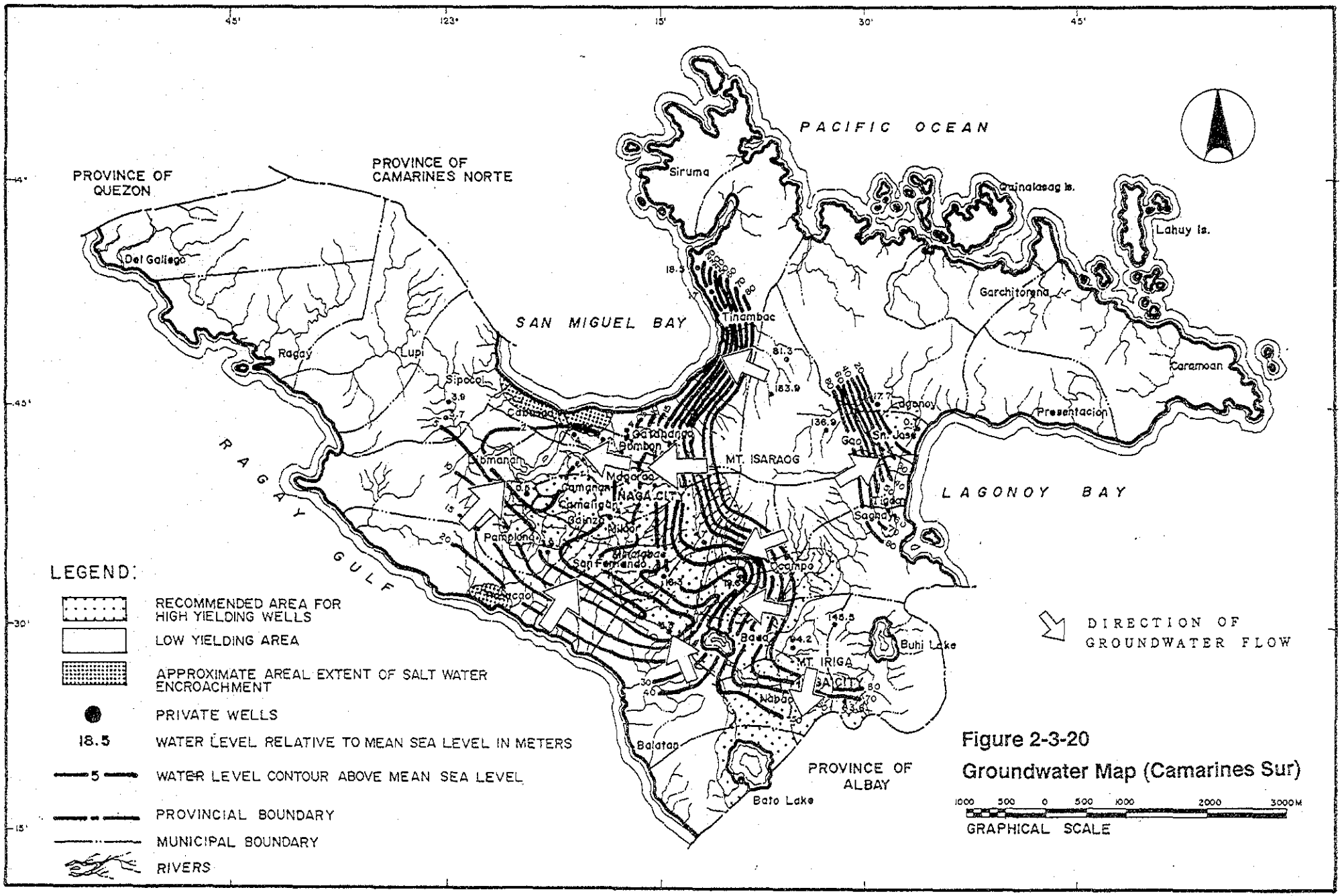


Figure 2-3-20
Groundwater Map (Camarines Sur)

Pioduran which account for 12% of the provincial area. The sedimentary rocks predominate in the southern, western part and eastern islands of the province which are considered as deep well areas. The groundwater generally flows radially from Mt. Mayon towards the sea following the trend of topography. Shown in Figure 2-3-21 is the groundwater map of Albay, depicting groundwater contour and potential area for groundwater development. The contour pattern in the western part of the province reflects the geologic structure. On the other hand, the abrupt flattening of the water table contours at intervals 100 to 140 m on the central part of the basin is due to flat topography of the land surface and increase in the transmissivity of the aquifer.

According to the RAWSS (1982), the province has SWL ranging from 0.30 mbgs with a well of Liban and Tabaco to 25.91 mbgs with a well in the city of Legaspi, while the average provincial SWL is 4.31 mbgs. In addition, the specific capacity ranges from 0.01-4.20 lps/m both recorded in the municipality of Camalig. The average discharge per well in the Albay Province is 0.69 lps. The wells in the municipality of Libon has the maximum average discharge of 1.51 lps. The minimum average discharge of 0.38 lps is found in the municipality of Jovellar. Bacacay is next with an average discharge of 0.46 lps. There are about 44 wells in the municipalities of Camalig and Guinobatan which exhibits discharges from 0.32-1.26 lps.

G. Sorsogon

The province of Sorsogon has more or less similar geologic setting as Albay province. For this reason, the most potential aquifers are the Pliocene-recent marine and terrestrial clastic sediments, Quaternary pyroclastics, and alluvium. Geologically, 18% of the province fall under shallow-well area category covering the municipalities of Donsol, Sorsogon, Magallanes, Bulusan, Gubat, Juban, Casiguran, Prieto Diaz, and Bocon. The municipality of Barcelona and the western part of the province are considered deep well areas accounting for 36% of the provincial land area. The remaining is regarded as difficult area covering the northern and southern mountains of the province.

Potential area for groundwater development in the province is shown in

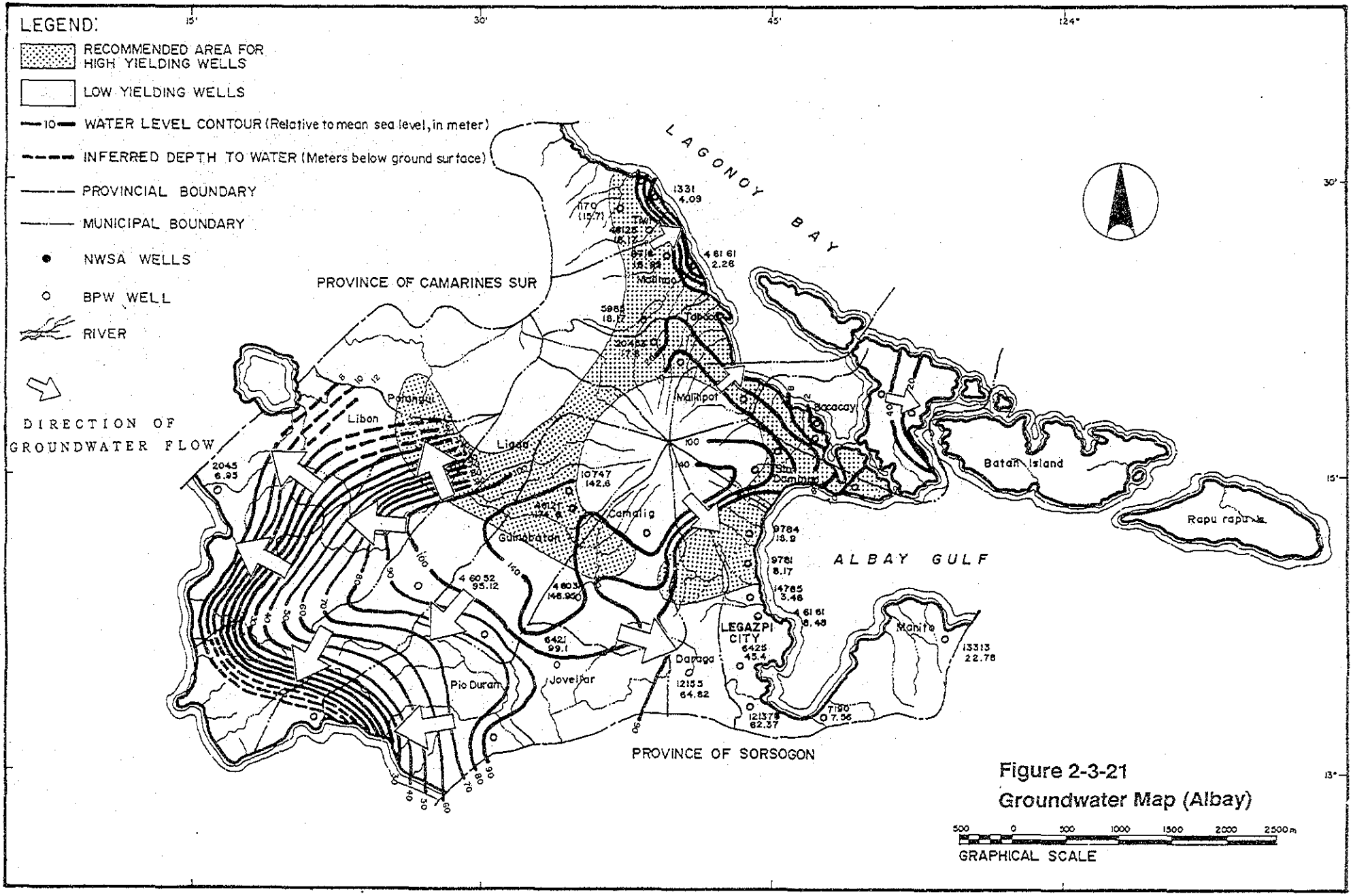


Figure 2-3-21
Groundwater Map (Albay)

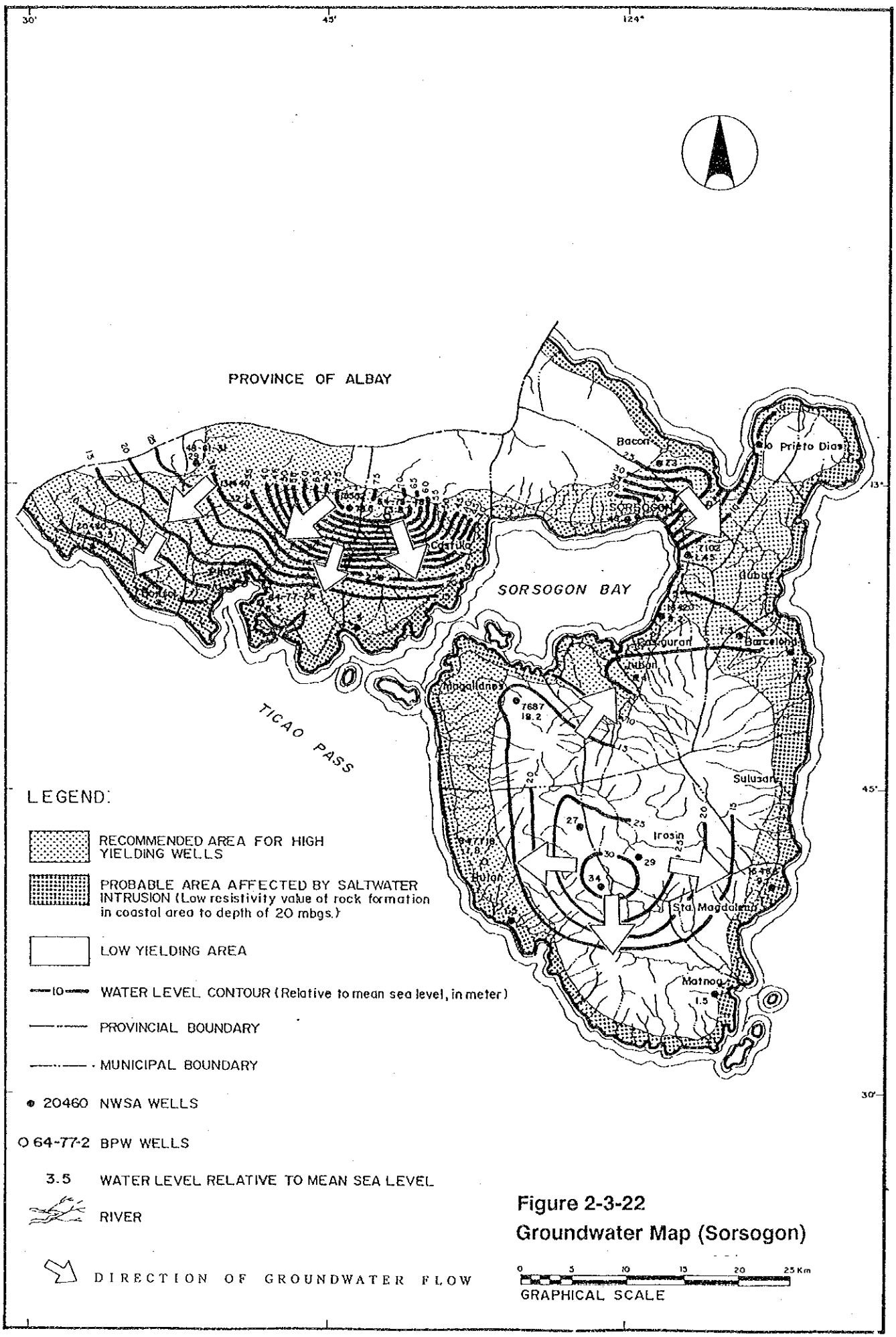


Figure 2-3-22
Groundwater Map (Sorsogon)

Figure 2-3-22. Also depicted from the figure is the groundwater level contour. The steep hydraulic gradient is determined from the contour spacing in the western part of the province, around Castilla to Pilar. There the groundwater mostly flows in the south direction. This closely contour spacing also can be found in the isthmus of peninsula which connecting Bacon to Sorsogon. A radial flow characterizes the southern part (peninsula) of the province which is mainly covered by the Quaternary volcanics and volcanic plains. Saltwater intrusion probably covers an extensive area along the coast of this province, and they are largely exist in the shallow-well area.

According to the RAWSS (1982), the province of Sorsogon has SWL ranging from 0.30-50.30 mbgs with the provincial average at 5.50 mbgs. The provincial specific capacity ranges from 0.02-4.14 lps/m. The average discharge per well in the province of Sorsogon is 0.52 lps. The wells in the municipality of Donsol has the maximum average discharge of 0.77 lps, while the minimum average discharge of 0.32 lps is found in the municipality of Barcelona. There are about 55 wells in the municipalities of Bacon, Castilla and Prieto Diaz which exhibit discharges ranging from 0.32-0.95 lps.

H. Agusan del Norte

The aquifers in the province belong to the recent alluvial deposits, Pliocene-Pleistocene and late Miocene-Pliocene sediments. Substantial discharges from these formations were observed. Free flowing wells were encountered from recent deposits in Butuan City and Cabadbaran. In Pliocene-Pleistocene sediments, waterworks well in Bonbon, Butuan City yields about 54.44 m3/hour for more or less 10 meters drawdown or a specific yield of 1.24 to 1.45 lps/m. The late Miocene-Pliocene sediments yield about 22.73 m3/hour for 9.15 meters of water drawdown to waterworks well in Butuan City. However, in Butuan City, saline water has been reported to intrude the aquifers as a result of groundwater mining.

Based on the distribution of the aforementioned geologic units, majority of the land area of Agusan del Norte, about 55%, is classified as deep well area. The shallow well areas cover 21% of the provincial territory and the remaining mountainous areas account for difficult

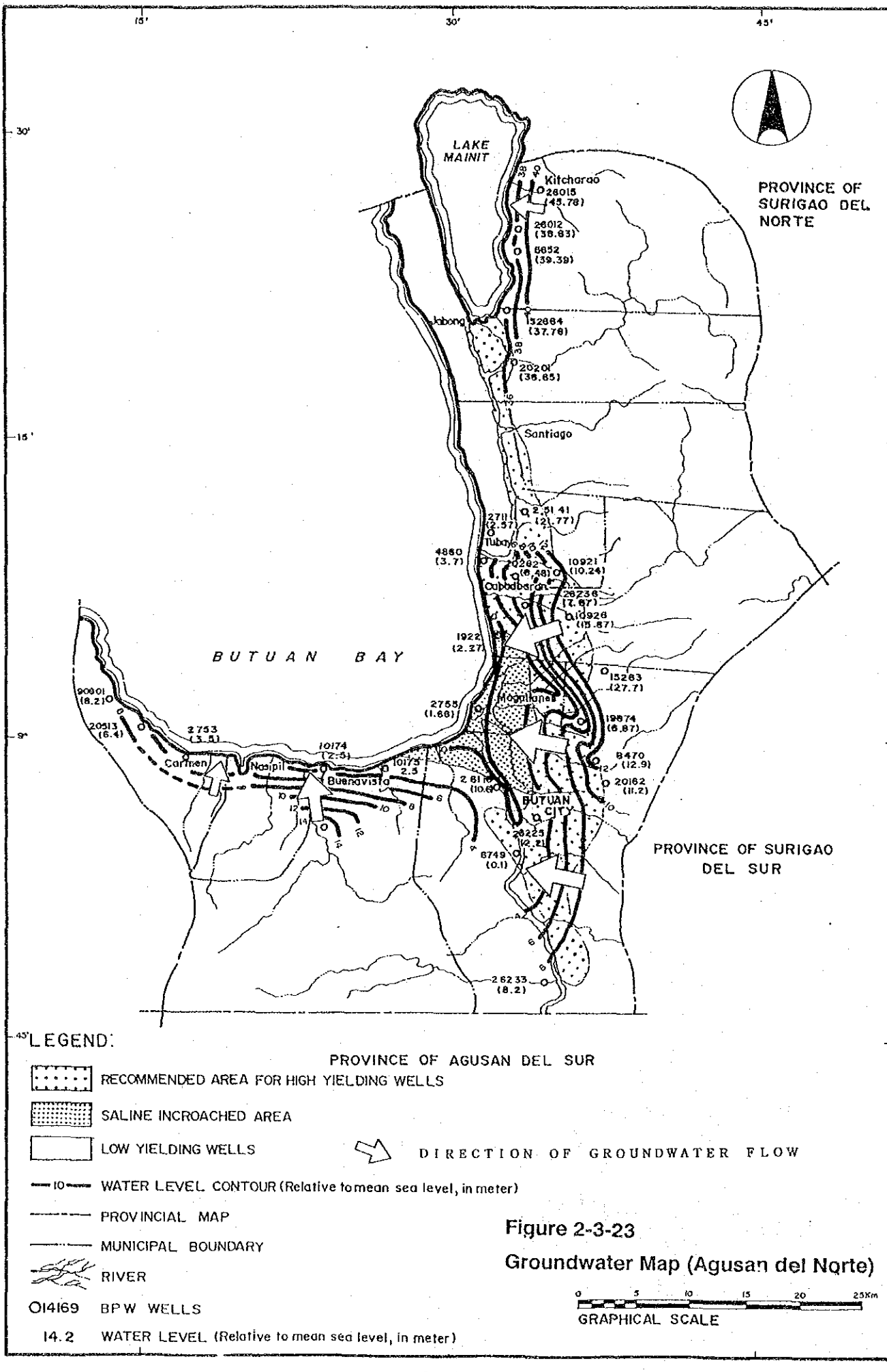


Figure 2-3-23

Groundwater Map (Agusan del Norte)

areas. Figure 2-3-23 presents the areas potential for groundwater development. This figure shows the extension of saltwater intrusion around and nearby Butuan City which facing Butuan Bay.

According to the RAWSS (1982), the SWL in the province ranges from the ground level in the city of Butuan to 29.78 mbgs in the municipality of Cabadbaran, with provincial average of 4.06 mbgs. The municipalities of Las Nieves, Carmen, Cabadbaran and Tubay have average SWLs deeper than the provincial average while the municipalities of Buenavista, Jabonga, Magallanes, Nasipit and Butuan City have average SWL shallower than the provincial average.

The specific capacity of the province ranges from 0.047-4.13 lps/m and the depth of well ranges from 6 to 190 m. The average discharge of the province is 1.18 lps. The largest well discharge, which is 9.45 lps with a well depth of 55.49 m exists in Butuan City. The minimum discharge of 0.0063 lps is found in Cabadbaran. The municipalities of Cabadbaran, Magallanes, Nasipit and Butuan City have average discharges greater than the provincial average while the municipalities of Buenavista, Carmen, Jabonga, Las Nieves and Tubay have average discharges lower than the provincial average. In terms of well depth the municipality of Jabongan has an average depth of 19.15 m which is the lowest among the municipalities in the province. All the other municipalities including Butuan City has an average deeper than 20 m.

Shallow-well areas cover the municipalities of Nasipit, Buenavista, Cabadbaran, Butuan City, Magallanes, eastern side of Tubay River, extending northward to lake Mainit. Deep-well areas cover the northern portion of the province which includes Kitcharao, Jabonga; the south and western portions of the province; the municipalities of Carmen, a greater part of Nasipit and Buenavista including the southeastern side of Butuan City. The difficult areas are usually found on the eastern portion along the Agusan-Surigao boundary, eastern part of Cabadbaran and Santiago, and the western coast of Tubay and Jabonga. Of the 466 developed and operational water sources as registered by DPWH, 3% were springs and 97% were deep wells.

I. Camiguin

The potential aquifers in the island of Camiguin are related to alluvial deposits, less consolidated pyroclastics and vesicular lava flows. These deposits underlie the gently sloping areas mostly along the northern and eastern coast.

Almost all the sources for the water supply are springs situated at the mountainous areas. Based on the geology of the island, only 4% of the total land area of the province are classified as shallow well areas. The areal extent of this shallow-well area is coincided with the high-yielding well area along the coast, namely nearby Sagay on the southern coast and from nearby Mahinog to Mambajao along the southeastern to northern coast of the island. With the exception of the area near Mambajao on the northern coast where the high-yielding well area goes beyond the Quaternary alluvial, beach and residual deposits. In the shallow well areas, wells may be developed privately since the SWL in these areas are generally within 6 mbgs.

The groundwater in the province is largely recharged in the central range, gushes along the valleys and moves radially towards the coast by gravity (Figure 2-3-24). The depth to water varies from 3-20 mbgs throughout the peripheral rim close to the coastal area while the SWL is between 3-80 m relative to sea level.

J. Misamis Oriental

The most important aquifers in the province belong to Quaternary alluvial, beach, and residual deposits and the Pliocene-Pleistocene sedimentary units. Shallow aquifer usually is found in the Quaternary allumium with boulders and covers the northern area near Gingoog City which facing Gingoog Bay and the nearby area of Cagayan de Oro City which facing Macajalar Bay. In the absence of this Quaternary alluvial, the Pliocene-Pleistocene sedimentary units act as shallow aquifer as well as deeper aquifer under confined or unconfined condition. This kind of aquifer usually comprised of sand, gravel, conglomerate, and pyroclastics with their clayey and moderately consolidated one. In the southwestern part of the province aquifer can be found in various geological formation such as the Pliocene-Pleistocene sedi-

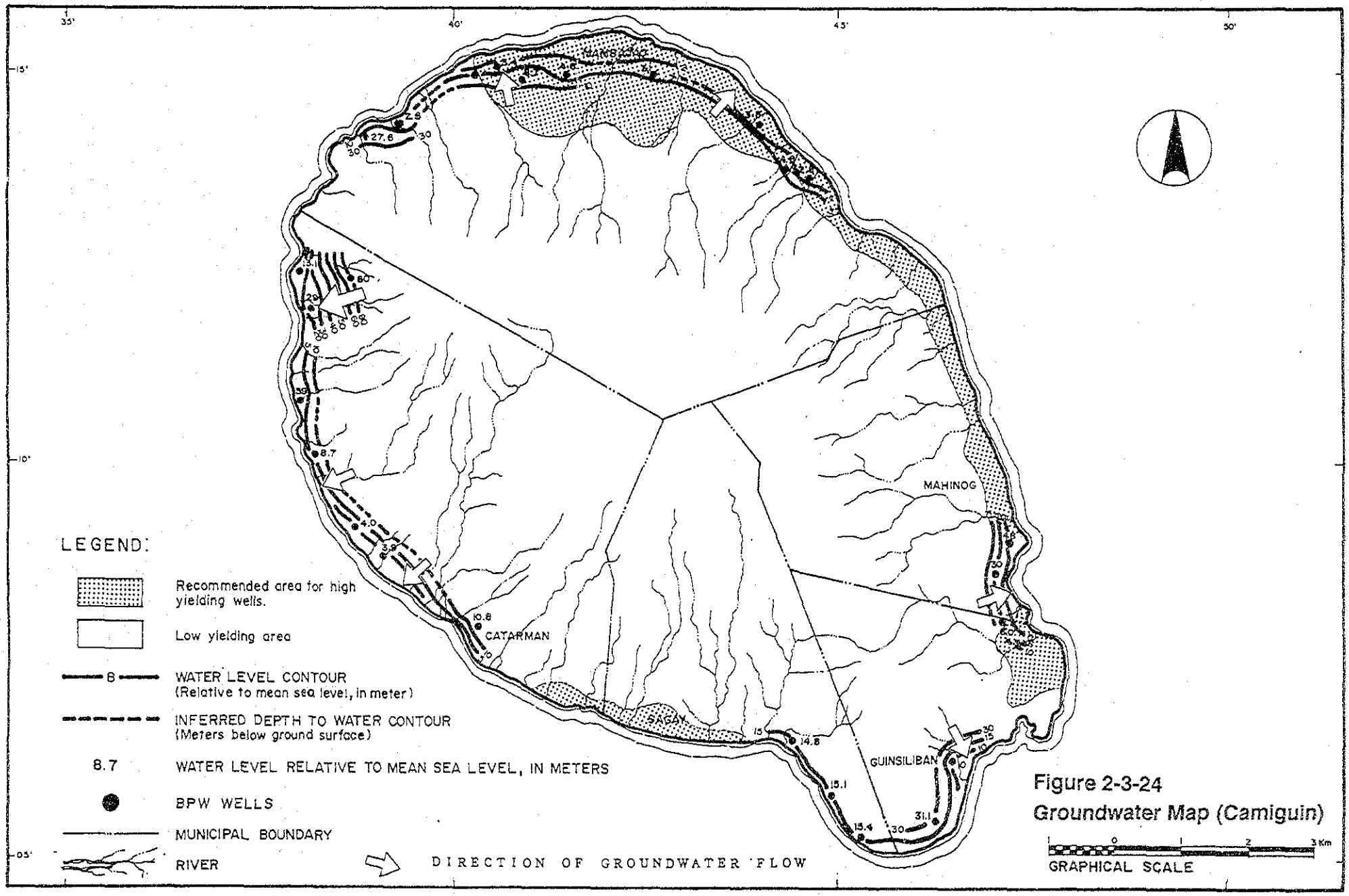


Figure 2-3-24
Groundwater Map (Camiguin)

ments of both marine and terrestrial including limestone and pyroclastic, the Upper Miocene sediments and pyroclastics, and the weathered zones and fractures of bedrock (metamorphic rocks).

Figure 2-3-25 shows the groundwater map of this province. The groundwater flows to the Gingoog Bay and Macajalar Bay, reflecting the trend of topography.

According to the RAWSS (1982), shallow well areas occupy 12% of the provincial area. These cover the municipalities of Balingasag, Logonglong, Medina, Alubijo, Opol, El Salvador, Tagoloan, cities of Gingoog and Cagayan de Oro, and some parts of Naawan and Manticao. Most of these areas coincides with the high-yielding well areas. The municipalities of Lugait, Initao, Libertad, Gitagum, Luguidingan and the coast side of Magsaysay fall under deep well areas which account for 36% of total provincial area. The difficult areas comprising 52% of the total provincial area and cover the municipalities of Balingoan, Sugnongcogon, Jasaan, Villanueva and Claveria. In Barangay Molugan, west coast of El Salvador, saline water was encountered at depth of 92.4 meters and also near the municipality of Opol. The SWL of the province ranges from ground level to 150 mbgs with an average of 12.2 mbgs. Deeper SWL predominates in the western coastal municipalities particularly the municipalities of Libertad, Alubijo, Gitagum, and El Salvador. Towns of Claveria, Talisayan and Kinogitan have SWLs deeper than the provincial average.

The discharge from wells ranges from 0.06-28.35 lps with provincial average at 1.2 lps. The wells in Cagayan de Oro City have the maximum discharge, an average of 5.1 lps and aquifer depths ranging from 13.72-219.5 m. The wells in the municipality of Libertad and Gitagum have an average discharge of 0.315 lps, whereas Lagonglong, Manticao, Tagoloan, Initao, Balingoan have an average discharge capacity of more than 1 lps. Gingoog City has also an average of 2 lps with well depths ranging from 6-85 m. The municipality of Lagonglong has aquifer depths range from 46-53 m and the discharges ranging from 0.63-1.575 lps.

The average specific capacity is 0.99 lps/m. In the west, the range is from 0.014 lps/m recorded in the municipality of Alubijo to 6.20 lps/m in the municipality of Manticao.

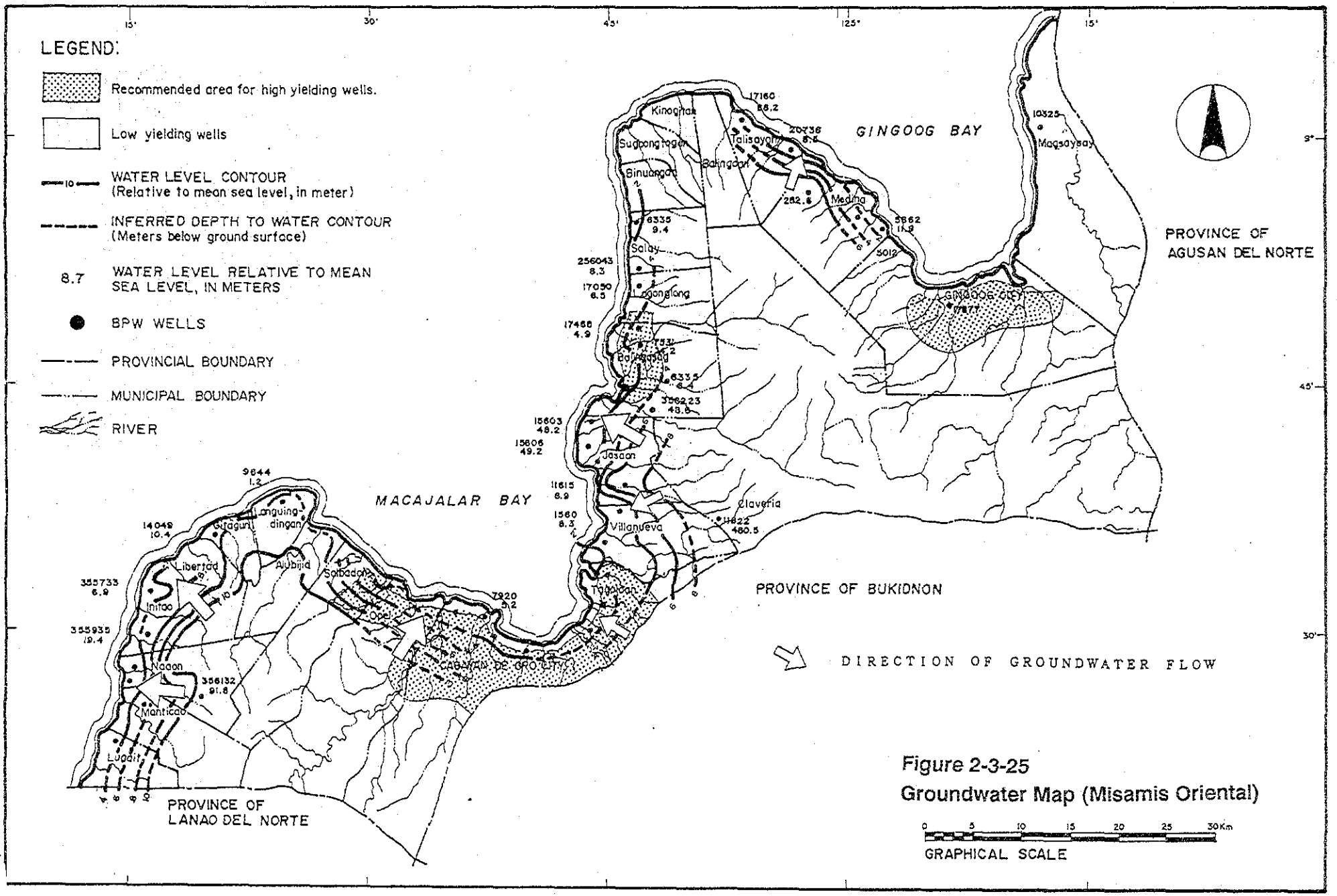


Figure 2-3-25
Groundwater Map (Misamis Oriental)

2-3-5 Socio Economic Conditions Including Basic Infrastructures

Basic infrastructures and socio-economic conditions represented by population composition, land area and number of municipalities are shown in Table 2-3-9.

Table 2-3-9 Population Composition, Land Area and No. of Municipality in Project Area

Region/Province	Population and Composition			Land Area	No. of Municipality
	Urban Area (persons) (%)	Rural Area (persons) (%)	Total (persons) (%)	(ha)	
Region IV					
Laguna	1,012,499 (74)	357,733 (26)	1,370,232 (100)	175,970	30
Rizal	879,739 (90)	97,749 (10)	977,488 (100)	130,800	14
Quezon	919,495 (67)	452,886 (33)	1,372,381 (100)	870,660	41
Region V					
Camarines del Norte	132,934 (34)	258,048 (66)	390,982 (100)	211,249	12
Camarines del Sur	457,072 (35)	848,847 (65)	1,305,919 (100)	526,680	37
Albay	280,174 (31)	623,611 (69)	903,785 (100)	255,260	18
Sorsogon	141,199 (27)	381,761 (73)	522,960 (100)	214,140	16
Region X					
Agusan del Norte	218,765 (47)	246,693 (53)	465,458 (100)	259,030	12
Camiguin	21,843 (33)	42,404 (67)	64,247 (100)	29,187	5
Misamis Oriental	570,933 (66)	294,118 (34)	865,051 (100)	357,010	18

As shown by the population composition of each province in the Project Area, those provinces in Region IV (Rizal, Laguna and Quezon) which are adjacent to Metro Manila and Misamis Oriental (wherein Cagayan de Oro City as regional center of Region X), have urban populations exceeding two-thirds of the provincial population. The remaining provinces, on the other hand, have the rural population as a majority.

Some socio-economic indicators as background of locality are shown in Table 2-3-10 and summarized as follows:

(1) The provinces of Rizal and Misamis Oriental show an improved barangay road network of more than 60% to the total length. Provinces of Laguna and Albay have, on the other hand, only 30 to 40% of such a road network.

(2) Electricity is supplied to all municipalities in the Project Area (excluding Quezon Province wherein only 56% of municipalities are provided with electricity). At the barangay level, it varies from 56%

Table 2-3-10 Socio-Economic Indicators

ITEM	UNIT	REGION IV			REGION V				REGION X		
		RIZAL	LAGUNA	QUEZON	CAMARINES N.	CAMARINES S.	ALBAY	SORSOGON	AGUSAN	MISAMIS OR.	CAMIGUIN
(1) ROADS											
a) Total Lenghts	Km.	1238	1641	3426	824	–	1506	1522	981	2216	345
b) Barangay Roads	Percent	63%	34	58	48	–	40	56	49	68	46
(2) ELECTRICITY AVAILABILITY AT											
a) Municipal Level	Percent	100	100	56	100	–	100	100	100	100	100
b) Barangay Level	Percent		66	56	67	–	71	76	81	89	94
c) Household Level	Percent	52	89	56	46	–	64	53	53	52	41
(3) TELECOMMUNICATION											
a) Availability at Municipal Level	Percent	100	100	35	–	–	100	31	8	8	40
b) Telegraph Station	Number	15	32	44	5	–	18	9			2
c) Telephone Exchange	Number	–	–	–	–	–	–	–			–
(4) POSTAL SERVICES											
a) Post Office/Postal Station	Number	16	41	47	35	–	40	20	11	25	5
(5) TRANSPORTATION		Bus, Public Jeep	Bus, Public Jeep	Bus Line, Jeep Seaports	Bus Line, Jeep Seaports, Airport	Bus Line, Jeep Seaports, Airport	Bus Line, Jeep Seaports, Airport	Bus Line, Jeep Seaports	Bus Line, Jeep Seaports	Bus Line, Jeep Seaports, Airport	Bus Line, Jeep Airport
(6) BANKING FACILITIES		About 69 Commercial & Rural Banks		About 68 Commercial & Rural Banks	19 Gov. and Private Banks	23 Comm., Sevings, Agri. & Credit Dev. Banks	4 Gov. and 15 Private Banks	–	5 Comm., 3 Gov. and 5 Rural Banks	–	4 Commercial & Rural Banks
(7) INDUSTRIAL/BUSINESS/ COMMERCIAL ESTABLISHMENT	Number	9145	2546	10472	2479	–	–	–		102	146
(8) TOURISM FACILITIES (Hotel, Resort, Lodging House, Restaurant Recreation Facilities)	Number	281	60	24	5	–	20	7	61	24	20
(9) SCHOOLS											
a) Primary Level	Number	241	558	745	–	780	–	477	160	346	53
b) Secondary Level	Number	49	199	91	35	–	–	69	29	45	13
c) Tertiary Level	Number	7	–	16	11	–	–	18	–	36	3
(10) HEALTH FACILITIES											
a) Hospital/Clinics	Number	25	46	47	12		53	17	11	10	6
b) Main Health Centers/ Rural Health Units/ Barangay Health Centers/Barangay Health Station, Etc.	Number	200	272	202	15	41	–	129	73	136	19
(11) LABOR											
a) Labor Force Participation Rate	Percent	59	63	63	42	66	62	54	58	53	63
b) Employment Rate	Percent	95	93	94	98	98	68	82	91	95	92
(12) AVE. FAMILY INCOME AND EXPENDITURE											
a) Monthly Income	P/mo.	3,178	4,389	–	–	2,560	2,216	–	–	–	–
b) Monthly Expenditures	P/mo.	–	3,824	–	–	2,170	1,927	–	–	–	–

Source : 1989–1994 Socio–Economic Profile, Provincial Planning and Development Office, Respective Province
– No Data

in Quezon Province to 94% of Camiguin Province. At the household level, it further varies from 41% in Camiguin Province to 89% in Laguna Province.

(3) Telecommunication service by the government is available in all provinces of the Project Area and is supplemented by private companies. In the provinces of Rizal, Laguna and Albay, all municipalities have access to such telecommunication services.

(4) Postal service is also available in all provinces and almost all municipalities have post offices in the Project Area. Also available is a private parcel delivery service in the major cities where regular passenger flights are operated.

(5) Major land transportation means are buses and jeepneys (small size passenger buses). Regular passenger flights are operated between Manila/Cebu and Naga in Camarines Sur, Legaspi in Albay, Butuan in Agusan del Norte, and Cagayan de Oro in Misamis Oriental. Camiguin, the island province, is connected to Mindanao by a ferry service.

(6) The employment ratio is between 82% in Albay Province to 98% in Camarines Sur, and the majority of the labor force is employed in agriculture.

Owing the above-mentioned infrastructure conditions, there are considerable differences in economic activities among provinces/municipalities.

Aside from rice planting, cash income can be obtained by producing vegetables and other crops. However, due to insufficient transportation and poor road conditions, the majority of these cash crops are not delivered to major markets, such as Metro Manila, and therefore are consumed within the local markets. In Camiguin Province, major foods, including rice are brought from the mainland of Mindanao due to the limited land available for food production. The major agricultural product in this particular province is limited to copra (dried coconut meat).

2-3-6 Present Situation of the Related Sectors

(1) Water Service Situation

The public water supply situation in the project area, compiled by the DOH as of 1991, is shown in Table 2-3-11.

Table 2-3-11 Service Coverage of Public Water Supply

REGION/ PROVINCE	* TOTAL POPULATION	POPULATION SERVED BY PUBLIC FACILITIES		POPULATION UNSERVED BY PUBLIC FACILITIES	
		NUMBER	PERCENT	NUMBER	PERCENT
REGION IV					
RIZAL	980,194	614,171	63	366,023	37
LAGUNA	1,370,232	561,870	41	808,362	59
QUEZON	1,372,381	794,312	58	578,069	42
REGION V					
CAMARINES NORTE	390,982	287,121	73	103,861	27
CAMARINES SUR	1,305,919	457,860	35	848,059	65
ALBAY	903,023	765,720	85	137,303	15
SORSOGON	522,960	461,232	88	61,728	12
REGION X					
AGUSAN DEL NORTE	465,458	235,279	50	235,279	50
MISAMIS ORIENTAL	865,051	379,804	44	485,247	56
CAMIGUIN	64,247	56,600	88	7,647	12

Source: 1991 ANNUAL REPORT DEPARTMENT OF HEALTH

* AS OF 1990

Significant differences in service coverage of the public water supply are observed among the provinces in the Project Area.

- Camiguin, being classified as a depressed and poverty-stricken island province, enjoys an advantageous service coverage for public water supply. It owes this to the presence of abundant spring sources in its well-wooded mountain area and most barangays have Level II or Level III systems.

- Laguna Province, on the other hand, has the poorest public water supply coverage, although it is well-situated with regards water sources and economic activities in comparison to other remote provinces. This fact may stem from the fact that a considerable number of households located along the Laguna de Bay have privately constructed shallow wells owing to their hydrogeological advantageous position. However, such shallow wells are commonly exposed to water pollution by seepage of surface water if appropriate construction methods are not applied and/or if there is any significant pollution source in the vicinity of household. Theses are considered to be one of causes of a high incidence of diarrhea in the province.

(2) Health and Sanitation Conditions

Health statistics of the DOH as reported by the respective Provincial Health Offices (PHOs) in 1991 is presented in Table 2-3-12. A high incidence of diarrhea is observed throughout the project area. Even in Rizal and Laguna, which are neighboring provinces of Metro Manila, both mortality and morbidity due to diarrhea show remarkable ratios of high incidence in comparison to other provinces.

Infectious hepatis, Malaria and Schistosomiasis are also observed in Regions V an X. Typhoid is concentrated in Region V, especially in Camarines Sur.

Another survey of the DOH was conducted regarding the provision of sanitary toilet of households and was incorporated in 1991 Annual Report as shown in Table 2-3-13. This survey shows that approximately one-third of the households in Region V did not have sanitary toilets and more than half of such households have no toilet.

Table 2-3-12 Reported Cases and Deaths of Notifiable Waterborne and Water Related Diseases

REGION/ PROVINCE	CHOLERA				TYPHOID				DIARRHEA				MALARIA				INFECTIOUS HEPATITIS				SCHISTOSOMIASIS				POLIOMYLITIS				H-FEVER			
	MORBIDITY		MORTALITY		MORBIDITY		MORTALITY		MORBIDITY		MORTALITY		MORBIDITY		MORTALITY		MORBIDITY		MORTALITY		MORBIDITY		MORTALITY		MORBIDITY		MORTALITY		MORBIDITY		MORTALITY	
	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R	C	R
REGION IV																																
RIZAL (1993)	-	-	-	-	-	-	-	-	19,855	654	84	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LAGUNA (1993)	-	-	-	-	-	-	-	-	7,579	501	32	2	-	-	-	-	-	-	55	4	-	-	-	-	-	-	-	-	-	-	-	-
QUEZON (1992)	-	-	-	-	-	-	-	-	10,460	823	128	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
REGION V																																
CAMARINES NORTE (1992)	-	-	-	-	-	-	-	-	3,631	886	80	10	-	-	3,651	890	-	-	46	11	-	-	-	-	-	-	-	-	-	-	-	-
CAMARINES SUR (1993)	-	-	-	-	340	29	-	-	21,124	1,797	66	68	219	19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ALBAY (1988)	0	0	0	0	58	5	19	2	13,309	1,587	163	19	9	1	1	0	151	18	4	1	3	0	1	0	-	-	-	-	-	-	-	-
SORSOGON (1988)	0	0	0	0	20	3	9	2	10,312	1,672	175	28	19	3	0	0	79	13	5	1	373	61	2	0	-	-	-	-	-	-	-	-
REGION X																																
AGUSAN DEL NORTE (1989)	-	-	-	-	-	-	-	-	5,830	1,263	74	16	2,504	538	36	8	-	-	-	-	1924	413	-	-	-	-	-	-	-	-	-	-
MISAMIS ORIENTAL (1991)	-	-	-	-	-	-	-	-	7,036	1,309	62	12	-	-	-	-	165	31	77	14	-	-	-	-	-	-	-	-	-	-	-	-
CAMIGUIN	-	-	-	-	-	-	-	-	161	251	16	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Source: Provincial Health Office, Respective Provinces
- No Record

Note: C = No. of Cases
R = Rate/100,000

Table 2-3-13 Status of Sanitation Facilities

REGION/ PROVINCE	TOTAL NUMBER OF HOUSEHOLD	HOUSEHOLDS WITH SANITARY TOILET		HOUSEHOLDS WITH INSANITARY TOILET		HOUSEHOLDS WITHOUT TOILET	
		NUMBER	PERCENT	NUMBER	PERCENT	NUMBER	PERCENT
REGION IV							
Rizal	132,005	91,841	70	19,378	14.68	20,786	16
Laguna	220,991	177,275	80	21,810	9.87	21,826	10
Quezon	200,474	109,072	54	42,212	21	48,190	25
REGION V							
Camarines Norte	72,490	44,573	61.49	10,213	1409	17,704	24.42
Camarines Sur	196,565	124,887	63.53	19,747	10.05	51,931	26.42
Albay	141,128	92,547	65.58	28,701	20.34	19,880	14.08
Sorsogon	91,203	51,510	56.48	6,012	6.59	33,681	36.93
REGION X							
Agusan Del Norte	45,071	37,600	83.42	6,693	14.85	778	1.73
Misamis Oriental	63,913	48,558	64.13	1,307	1.73	14,048	18.55
Camiguin	10,653	8,584	80.58	1,155	10.84	914	8.58

SOURCE : 1991 ANNUAL REPORT – DEPARTMENT OF HEALTH

For an overall uplift of the living environment, the improvement of the surrounding environment is essential condition. However, introduction of sanitary toilets as well as the improvement of the existing unsanitary toilets are the most important and urgent measures.

2-3-7 Operation and Maintenance Plan

(1) Water Supply Facility

1) Preparatory Works toward Project Implementation

Operation and maintenance of water supply facilities is to be shouldered by BWSA/RWSAs, which will be formed by the beneficiaries in their respective barangays, in accordance with the regulations of the Philippine Government. In this connection, the DEO officials of the DPWH through cooperation with the municipal governments, will visit respective barangays to formulate the said BWSA/RWSAs (BWSA for Level I at every barangay and RWSA for Level II by the direct beneficiaries) and to provide seminars/training for institutional development including collection of monthly water charges.

With regard to the construction of the water supply facilities, land acquisition and right-of-way are prerequisites for smooth implementation. The DPWH shall, in cooperation with the BWSA/RWSAs and local governments, secure concurrence from concerned land owners. This shall be performed along with the Consultant's topographic survey during the detailed design of the Project.

2) Operation and Maintenance

Institutional activities of the BWSA/RWSA, including collection of monthly water charges shall be guided and advised by local government units as delineated by the new Local Government Code.

The technical assistance for operation and maintenance shall be provided by the respective DEOs. Such works requiring equipment and tools (i.e. well redevelopment) shall be undertaken by DEOs under the financial arrangement by the BWSA/RWSAs. In some cases, the repair/rehabilitation work itself will be directly performed by the association.

Major operation and maintenance work is described below:

Routine Activities

The DEO staff will provide OJT to the BWSA/RWSA members and the following routine work shall be performed by the BWSA/RWSAs themselves.

- Periodical inspection of water source facility,
- Periodical inspection of transmission/distribution pipelines including check-up of leakage,
- Periodical inspection and cleaning of elevated tank/ground reservoir and disinfection facility,
- Periodical inspection and operation of electric motor pump and its control panel,
- Periodical inspection and operation of air relief/blow-off valves to be installed at public faucets and transmission/distribution pipeline.

To ease the above-mentioned routine work of the BWSA/RWSAs, an operation and maintenance manual of Level I/II facilities has been developed during the Phase II Project. In the Phase III Project, this manual will be reprinted and distributed to the respective BWSA/RWSAs.

Safety of supplied water will be bacteriologically examined by PHOs at least once a year.

Well Redevelopment/Rehabilitation

The discharge of sand from deep well water source and/or descent of discharge volume/pumping water level may occur owing to several reasons. Not only for well redevelopment at least once a year, but also for well rehabilitation of any problem deep well sources shall be assisted by the DEOs lending necessary equipment and giving technical guidance.

Conservation of Watershed Area

Not only the appropriate manner of spring development, but also that of watershed conservation is indispensable to enjoy safe and potable drinking water supply.

Restriction and/or control of timber logging, land development and agriculture production are primary concern of watershed management to maintain necessary discharge amount and to protect water source against possible pollution.

For this particular purpose, the DEOs shall assist and guide the BWSA/RWSAs and local government units in their periodical inspection.

Operation and Maintenance Cost

The BWSA shall collect approximately 5 to 10 Pesos per month from every household for the operation and maintenance of a Level I water supply facility. The purchase of packing of handpump is a major requirement.

The RWSA shall collect 30 to 50 Pesos per month per household and utilize it for the payment of electricity (if a electric motor pump is utilized), disinfectant and the salary of a caretaker. The RWSA shall save the balance for forthcoming repair work (leakage, replacement of valve, faucet, etc.). With regard to the service life and depreciation of the equipment, the electric motor pump is a major concern as the most expensive item. Although the actual service life varies depending on the accumulated operating hours and operating conditions, it is commonly considered to be approximately 10 years.

(2) School Toilet Facility

1) Preparatory Work toward Project Implementation

Joint Campaign

Daily care of the toilet facilities is obliged to respective elementary schools. To promote awareness of the objective of the Project by

school teachers and to improve their mentality and behavior regarding unsanitary toilets and their usage, the DOH in cooperation with DECS will implement a campaign in the Project Area.

Prior to the campaign, the DOH will prepare an operation and maintenance manual for toilet facilities, including shallow well sources with the hand pump.

Development of Education Program on Public Hygiene

DECS is currently implementing a community education program on public hygiene at selected elementary schools. This program intends to spread knowledge and practices of public hygiene from school teachers to families via the pupils. DECS, with the assistance of the DOH, will further develop the current program focusing on pupils and prepare an institutional set-up to implement the program to the target schools of the Project. DECS will then conduct seminars/workshops at regional, provincial and municipal levels for its local personnel. (Refer to Appendix 6).

2) Operation and Maintenance

The major activity of operation and maintenance is the daily cleaning to be performed by the pupils themselves with proper instruction/guidance by the school teachers. Pupils will be organized into several groups so as to share cleaning practices in their school. Those which included in the cleaning work will be, but are not limited to the following:

- General cleaning in the morning and after school hours,
- Removal of sand and mud inside the toilet building, especially along the floor drain,
- Water storage by operating the handpump during the dry season,
- Cleaning the surrounding area of the toilet building.

Responsibility of the school teachers entails:

- Maintenance of the hand pump,
- Removal of fallen leaves on the roof and roof drain to ensure

smooth collection of rain water,
- Locking of the door to the toilet building during off-times and times when the school is closed, and
- Repainting of walls, etc. as needed.

In addition to the above, removal and disposal of sludge from the septic tank will be indispensable for long term operation. The DOH and DECS shall secure appropriate equipment, i.e., a vacuum truck, and land for final disposal or a composting facility to process septic sludge into organic fertilizer.

3) Operation and Maintenance Cost

Handpumps will be used the frequently requiring replacement of wearing parts, such as rubber packing, within a year. The current cost of such spare part is only 20 to 30 Pesos and even thorough replacement of pump costs approximately 1,000 Pesos. DECS is encouraging PTA to introduce a self-help improvement of education facility at the respective elementary schools and the PTA is collecting annual membership fee of 10 to 20 Pesos per from every pupil. Likewise, the annual budget of PTA is considered to afford the replacement of a hand pump, if needed.

(3) Monitoring System

The DOH has a plan to conduct an epidemiological survey on waterborne and water-related diseases to determine the expected effect of implementation of the Project. This survey will cover such schools/barangays not included in the Project, for comparison purposes. It will be conducted before implementation of the Project to collect baseline data and be repeat upon completion of the Project.

2-4 Technical Cooperation

The request for technical cooperation in relation to this Project has not been made to the GOJ by the GOP.

Technology transfer has been carried out in respective locality during the implementation of past projects. In the implementation of this Project, further transfer of technology will be provided in the field of well engineering and O&M of facilities with the use of manual.

Counterpart training in Japan was also provided for DPWH and DOH personnel under the Phase II Project. It is recommended to extend the same training on planning and construction supervision of rural water supply works for DPWH and on public health promotion and relevant school education in rural area for DOH, respectively.

CHAPTER 3
BASIC DESIGN

CHAPTER 3 BASIC DESIGN

3-1 Primary Consideration for Planning and Design

(1) Natural Condition

The Project Area is generally characterized by the occurrence of dry and rainy seasons and is subject to frequent inundation. Earthquake is also a common phenomenon in the Project Area. Countermeasures shall be provided against the flood to prevent the pollution of water sources as well as to protect school toilets and elevated tank/ground reservoir.

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 Project Area, 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 shall therefore 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 the operation and maintenance manual of facilities and minimum tool/equipment 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 BWSA/RWSA 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 for overall management of well engineering and to transfer appropriate technology to complete specific requirements for the open-hole drilling and gravel-pack method of well construction.

Indigenous materials will be used to as much extent as possible, such as locally available hand pumps for easy acquisition of spare parts.

(4) Measures to Cope with Operation and Maintenance Capability of Implementing Agency

Both DPWH and DOH are establishing firm implementation set-up of their organization, manpower and budget based on the experience acquired in the Phase II Project. It includes inter-agency agreement on project coordination and cooperation between DPWH and DOH as well as between DOH and DECS. This arrangement is intended to attain the sustainability and continuity of operation and maintenance of facilities to be undertaken by BWSAs/RWSAs and schools.

With regard to utilization and maintenance of equipment to be procured under the Project, the Consultants will extend OJT to DPWH personnel during the course of construction work.

(5) Extent and Grade to be Provided for the Facilities and Equipment

1) Facilities

Number of water supply and toilet facilities shall be of proposed sites as confirmed during the field survey.

Grade of facilities shall be basically the existing standard of plan and design of the Philippine Government. However, some modifications will be considered especially based on the experience acquired through the implementation of the Phase II Project.

2) Equipment

Type and performance of equipment will be determined considering technical requirements in the Project, hydrogeological conditions and existing equipment of DPWH and DOH.

(6) Implementation Period

The current method/practice in the Philippines is, in principle, applicable for construction work of the Project. However, the Japanese expatriate for well engineering shall be dispatched in consideration of capability of local drilling company, restriction on implementation period under the Japan's Grant Aid Program as well as the importance of overall quality control of well construction and the necessity of technology transfer.

In view of number of project sites, Level II water supply facilities and school toilets have increased, while deepwell water sources of Level I have decreased when compared to the Phase II Project. As a whole, the magnitude of the Project is most likely same as that of the Phase II Project, and it is therefore deemed appropriate to implement the Project by two stages.

3-2 Fundamentals for Planning and Design

Design criteria for planning and design of facilities and standardization of facilities shall, in principle, follow those which adopted in the Phase II Project.

The following are fundamentals for planning purpose.

3-2-1 Water Supply Facilities

(1) Basic Considerations

Level I Facility

- Application of open-hole drilling and gravel-pack method of well construction
- Application of simplified iron removal facility for deep well source

Level II Facility

- Application of open-hole drilling and gravel-pack method of well construction
- Application of centrifugal pump for deep well source
- Installation of water meters to public faucet

(2) Fundamentals

- Design year :

  1999-five (5) year period following current practice in the Philippines

- Design population :

  10% increase of present population using average annual increase rate of 2%.

- Water consumption rate :

  30 to 40 lpcd for Level I

  40 to 60 lpcd for Level II (daily average)

- Average day demand :

  (Design population) x (Water consumption rate)

- Maximum day demand :

  1.3 x (Average day demand)

- Maximum hour demand :

  2.5 x (Average day demand)/24

- Hydraulic pressure :

  5 psi (3.5 m) at end-faucet

- Pressure reducing tank :

  To be installed to ensure static water pressure at less than 140 psi (70 m) (2 cu.m capacity)

- Reservoir (ground or elevated) :

  1/4 x (Maximum day demand)

- Pipe :

  GI or PE pipe is used for transmission line.

  GI pipe is also used for river/road crossing of transmission/distribution line.

  GI, PE or PVC pipe is used under normal conditions of distribution line.

Well casing/screen is either GI, PVC or FRP depending on well depth and geological conditions.

- Pump type and its operation period :
  Centrifugal pump is used and operation of the pump is between 8 to 10 hours/day.

3-2-2 School Toilet Facilities

(1) Basic Considerations

- Both shallow dug well and rainwater are used as water source for flushing and cleaning.
- Water-sealed toilet bowl (squat type) and urinal are used in prinple and sit type will be considered for girls.
- Hand washing space and faucet shall be provided.
- Septic tank shall be provided with the minimum distance of 20 m from drinking water sources.
- Experience acquired in the Phase II Project will be reflected to the Project:
  - Separation of floor drain and sanitary sewer.
  - Cistern will be located inside the toilet building and its height will be lowered for easy access of pupils.
  - Hand pump will be placed at shallow well.
  - Soak pipe/pit will be considered for smooth infiltration of treated wastewater where the groundwater level is high.
  - Overflow outlet will be applied to rainwater collector.

(2) Fundamentals

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

- Number of toilet bowls/urinals :

  20 % of pupils use the toilets to defecate and 50 % to urinate.
  For boys, each one unit of toilet bowl and urinal for every 50 pupils.
  For girls, one unit of toilet bowl for every 30 pupils.

- Water requirement :

  2 l/capita for flushing water sealed toilet and 0.5 l/capita for hand washing.

- Appropriate number of windows at least 0.5 m x 0.5 m in size to maintain sufficient ventilation and light particularly in each cubicle.

3-3 Basic Plan and Design

3-3-1 Water Supply Facilities

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

(1) Water Source Facilities

Spring

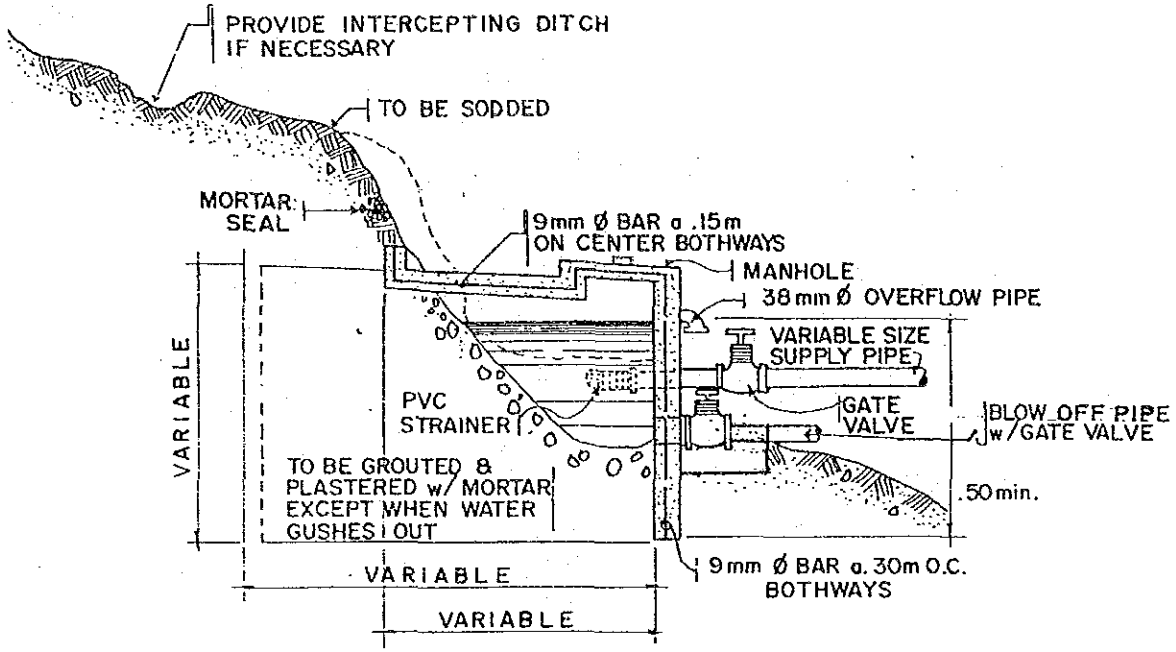
Typical spring intake box and small intake dam are illustrated in Figures 3-3-1 and 3-3-2, respectively.

Deep Well

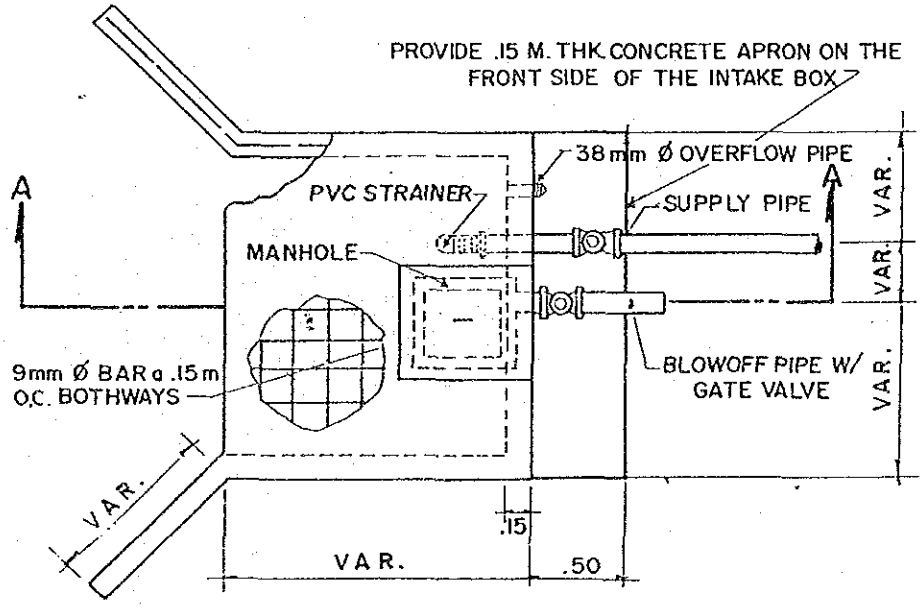
Several types of standard well designs both for Level I and Level II are developed taking into account actual field conditions, construction method (open-hole/gravel-pack), and well structure applicable in the rural area.

Figures 3-3-3 and 3-3-4 show the standard design of Level I and Level II, respectively.

Standard specifications of wells in terms of well depth is presented in Tables 3-3-1 and 3-3-2. A summary of number of wells by province in two stages in given Table 3-3-3.



SECTION A-A



PLAN

NOTE : Drawn not to scale

Figure 3-3-1 **TYPICAL SPRING INTAKE BOX**

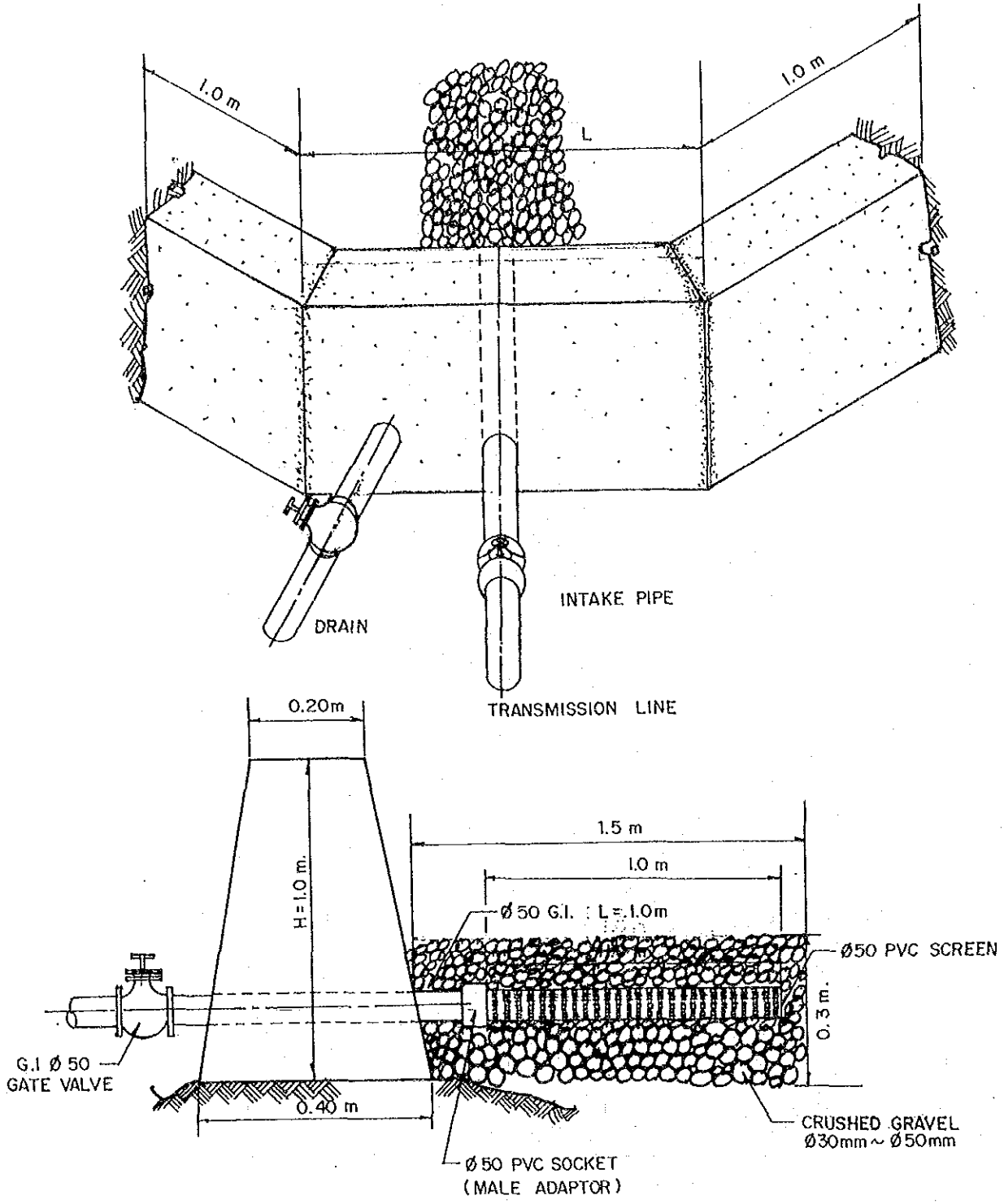


Figure 3-3-2 **TYPICAL DESIGN OF SMALL INTAKE DAM**

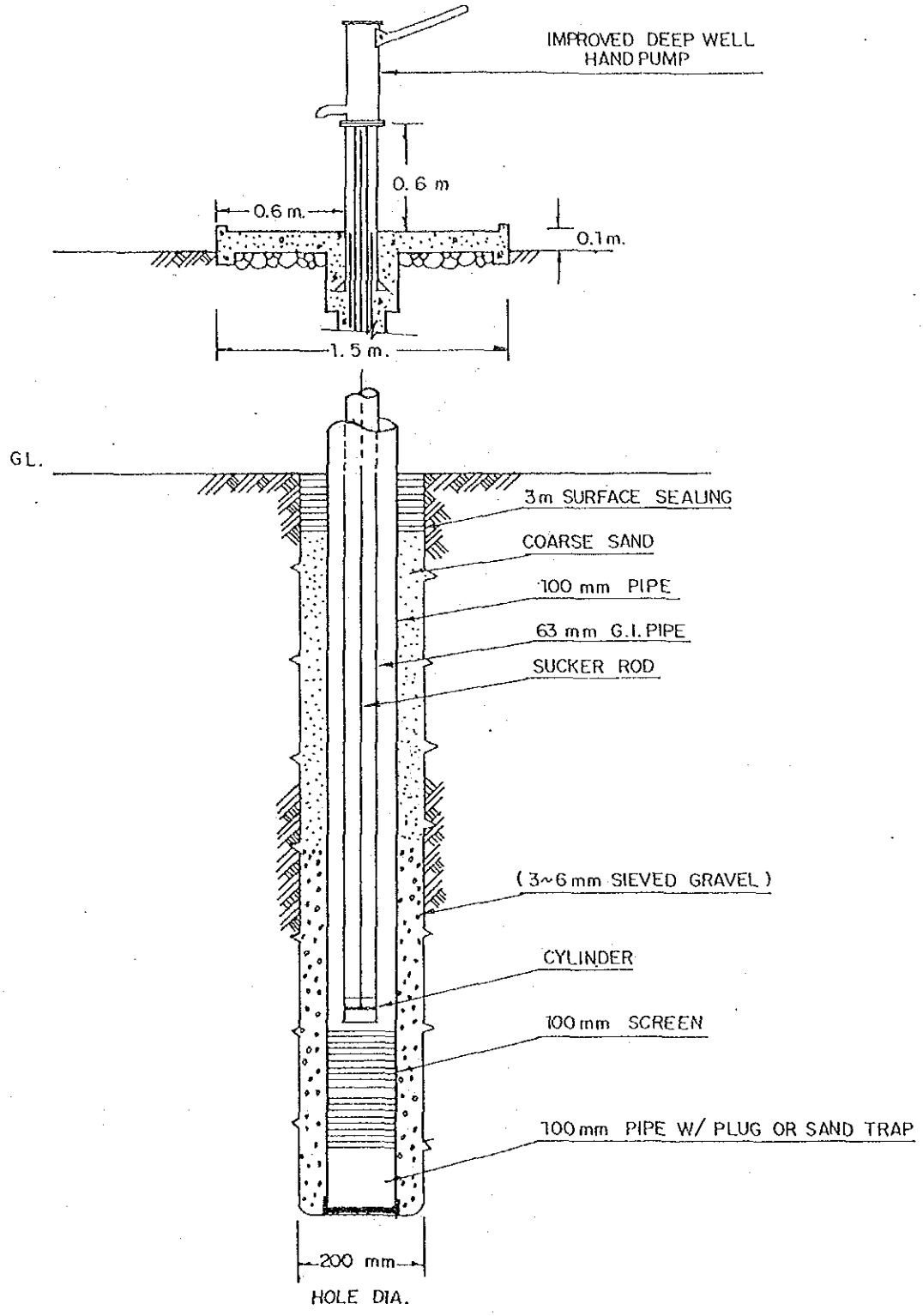


Figure 3-3-3 **STANDARD DESIGN FOR LEVEL I DEEPWELL**
(IMPROVED DEEPWELL HANDPUMP)

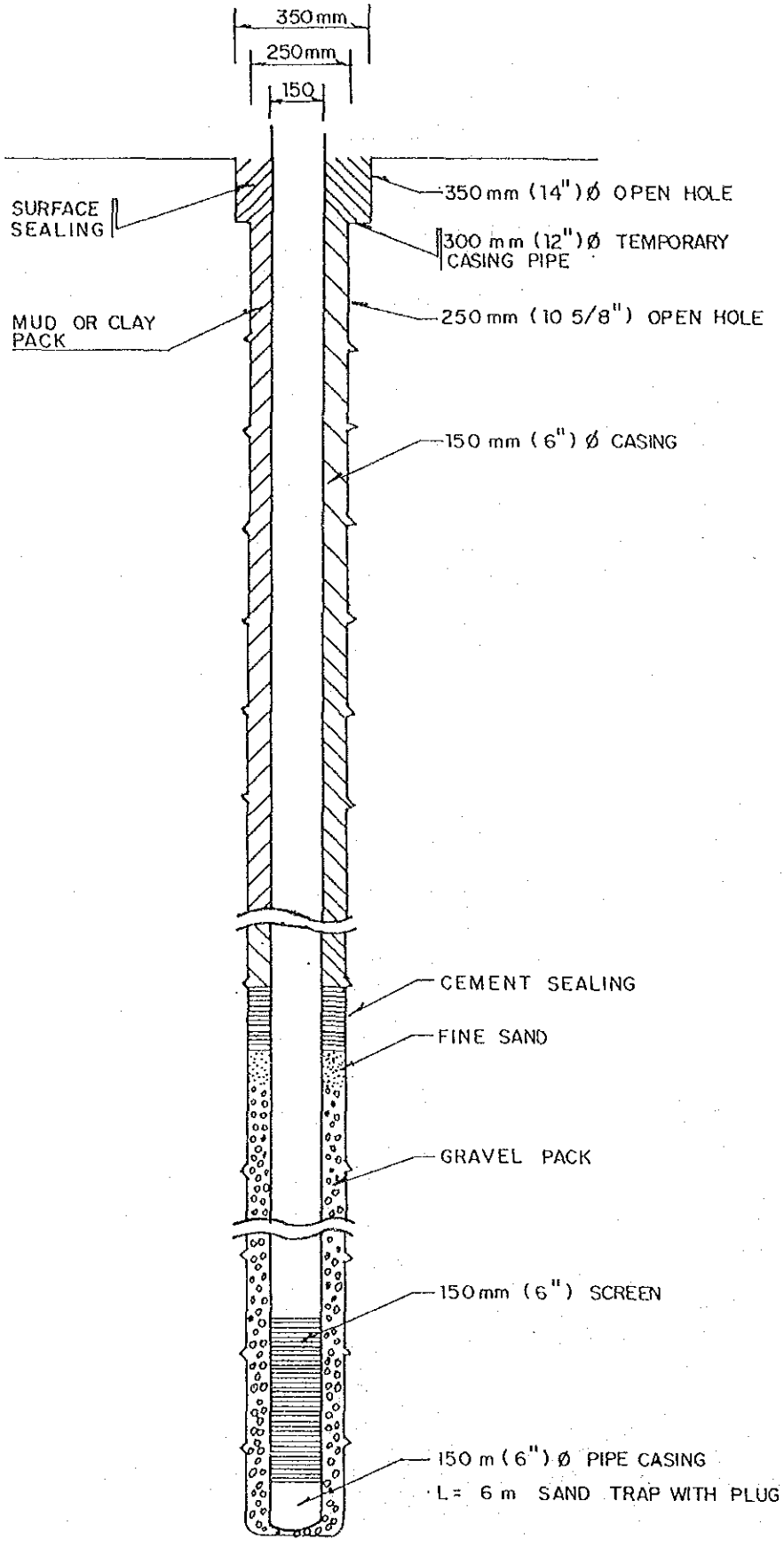


Figure 3-3-4 STANDARD DESIGN FOR LEVEL II DEEPWELL

Table 3-3-1 Standard Specification of Level I Well Construction

Well Depth (m)	30 P	40 G	50 G	60 G	80 F	100F	150G
1. Well Drilling							
1) Borehole Dia. (mm)	200	200	200	200	200	200	200
2) Total Depth (m)	30	40	50	60	80	100	150
2. Casing							
1) Material	PVC	GI	GI	GI	FRP	FRP	GI
2) Diameter (mm)	100	100	100	100	100	100	100
3) Joint Type	Sleeve	Thread Coup-ling	Thread Coup-ling	Thread Coup-ling	Thread Coup-ling	Thread Coup-ling	Thread Coup-ling
4) Unit Length	6.0	5.5	5.5	5.5	6+3	6.0	5.5
5) Required Number (pcs.)	4	6	7	9	10+1	13	23
6) Total Length (m)	24.0	33.0	38.5	49.5	63.0	78.0	126.5
3. Screen (8 - 12% opening)							
1) Material	PVC	Low Carbon Steel	Low Carbon Steel	Low Carbon Steel	FRP	FRP	Low Carbon Steel
2) Diameter (mm)	100	100	100	100	100	100	100
3) Joint Type	Sleeve	Thread Coup-ling	Thread Coup-ling	Thread Coup-ling	Thread Coup-ling	Thread Coup-ling	Thread Coup-ling
4) Unit Length	3.0	3.0	3.0	3.0	3.0	3.0	3.0
5) Required Number (pcs.)	2	3	4	4	6	8	8
6) Total Length (m)	6.0	9.0	12.0	12.0	18.0	24.0	24.0
4. Gravel-Pack							
1) Depth (m)	20	25	30	30	30	30	30
2) #5 Gravel Volume (cu.m)	0.51	0.63	0.76	0.76	0.82	0.82	0.82
5. Sand Seal							
1) Depth (m)	4	9	10	10	20	20	20
2) Coarse Sand Vol. (cu.m)	0.11	0.23	0.26	0.26	0.55	0.55	0.55
6. Cement Seal							
1) Depth (m)	6	6	6	6	10	10	10
2) Cement (kg)	117	117	117	117	210	210	210
3) Sand (cu.m)	0.05	0.05	0.05	0.05	0.08	0.08	0.08
7. Type of Pump							
1) Shallow/Deep Well Hand Pump	S	S	D	D	D	D	D
2) Suction Pipe (GI, ϕ 50mm, 5.5m/pc)	5	6	7	9	10	12	16

Table 3-3-2 Standard Specification of Level II Well Construction

Well Depth	50 G	50 F	80 F	100F
1. Well Drilling				
1) Borehole Dia. (mm)	250	250	250	250
2) Depth (m)	50	50	80	100
2. Casing				
1) Material	Stainless Steel	FRP	FRP	FRP
2) Diameter (mm)	150	150	150	150
3) Joint Type	Welding	Thread Coupling	Thread Coupling	Thread Coupling
4) Unit Length (m)	6.0	6.0	6+3	6.0
5) Required No. (pcs.)	6	6	9+1	12
6) Total Length (m)	36.0	36.0	57.0	72.0
3. Screen (opening)	(20%)	(12%)	(12%)	(12%)
1) Material	Stainless Steel	FRP	FRP	FRP
2) Diameter (mm)	150	150	150	150
3) Joint Type	Welding	Thread Coupling	Thread Coupling	Thread Coupling
4) Unit Length (m)	5.0	6.0	6.0	6.0
5) Required No. (pcs.)	3	2.5	4	5
6) Total Length (m)	15.0	15.0	24.0	30.0
4. Gravel-Pack				
1) Depth (m)	30	30	60	60
2) #5 Gravel Vol. (cu.m)	1.01	1.01	2.02	2.02
5. Sand Seal				
1) Depth (m)	10	10	10	30
2) Coarse Sand Vol.(cu.m)	0.34	0.34	0.34	1.02
6. Cement Seal				
1) Depth (m)	10	10	10	10
2) Cement (kg)	270	270	270	270
3) Sand (cu.m)	0.11	0.11	0.11	0.11

Table 3-3-3 Summary of Number of Wells by Provinces

Level	Level I								Level II				
Well Depth (m)	30 P	40 G	50 G	60 G	80 F	100F	150G	Total	50 G	50 F	80 P	100F	Total
Stage I													
Region V													
Camarines Norte	—	—	—	—	1	2	—	3					
Camarines Sur													
1st DEO	—	—	—	1	—	—	—	1	—	—	—	—	0
2nd DEO	—	1	1	1	—	—	—	3	—	—	—	—	0
Albay	—	—	1	2	—	1	—	4	—	—	—	—	0
Sorsogon	—	—	1	—	2	—	—	3	—	—	—	—	0
Total	0	1	3	4	3	3	0	14	0	0	0	0	0
Stage II													
Region IV													
Rizal	—	—	—	3	—	2	1	6	1	—	1	—	2
Laguna	—	2	—	3	—	1	—	6	1	—	—	—	1
Quezon													
1st DEO	3	—	—	—	—	—	—	3	—	—	—	—	0
2nd DEO	—	1	1	2	—	—	—	4	—	—	—	—	0
Region X													
Agusan del Norte	—	—	—	1	—	—	—	1	—	—	1	—	1
Misamis Oriental	—	—	1	1	—	—	—	2	—	1	—	—	1
Total	3	3	2	10	0	3	1	22	2	1	2	0	5
Grand Total	3	4	5	14	3	6	1	36	2	1	2	0	5

(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 tank/ground reservoir, river crossing and public faucets.

Standard design of these facilities are presented in Figures 3-3-5 to 3-3-8 including:

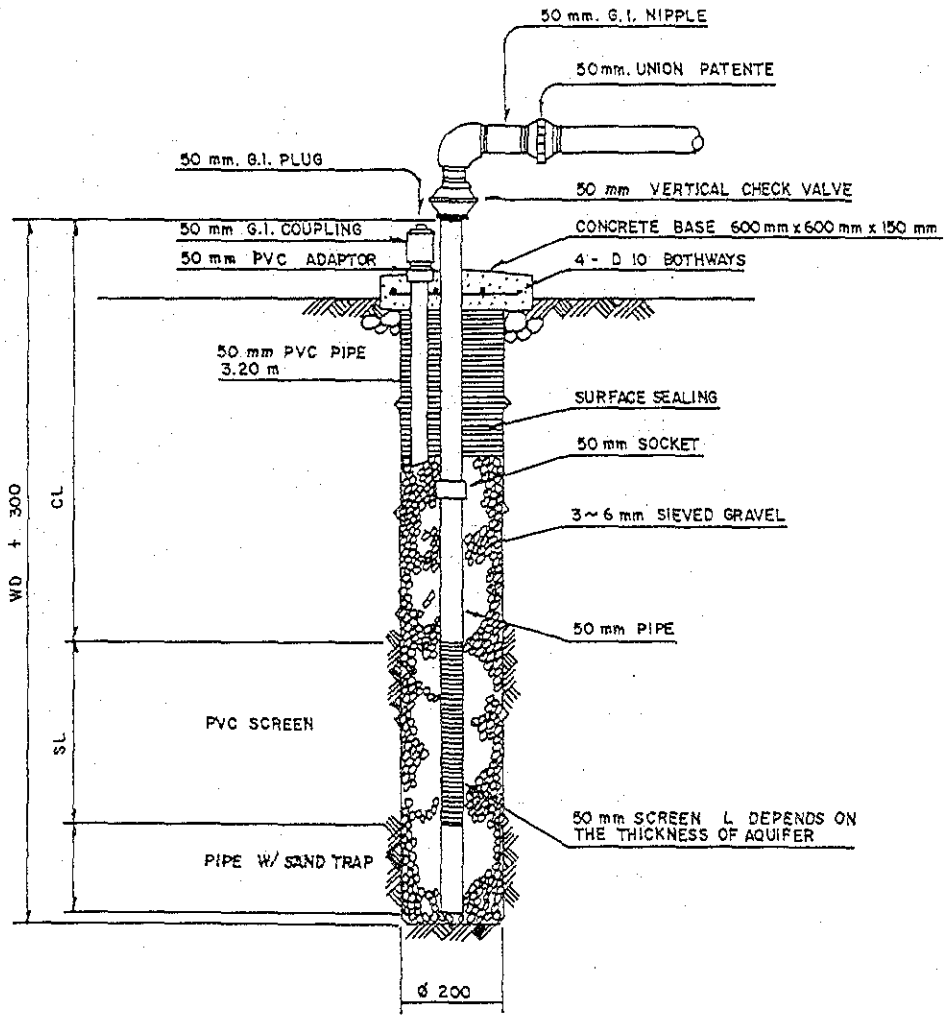
- Deep well with centrifugal pump,
- Several cases of river crossing,
- Elevated tank and ground reservoir,
- Pump house,
- Public faucet.

3-3-2 School Toilet Facilities

Four (4) standard type of toilet building are developed in consideration of number of pupils (refer to Table 3-3-4) and illustrated in Figures 3-3-9 to 3-3-14.

For the design of toilet facility, floor is provided with concrete and locally made tile, and walls shall be made of concrete hollow block with plaster and paint finish. The building is roofed with paint finished corrugated GI sheet 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 is considered by elevating structures.

The summary of school toilets by province and number of schools by size are presented in Tables 3-3-5 and 3-3-6, respectively.



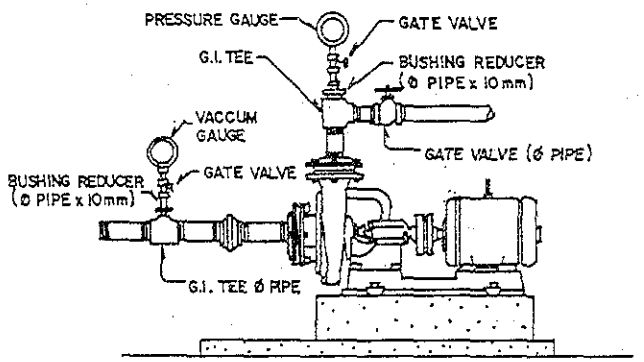
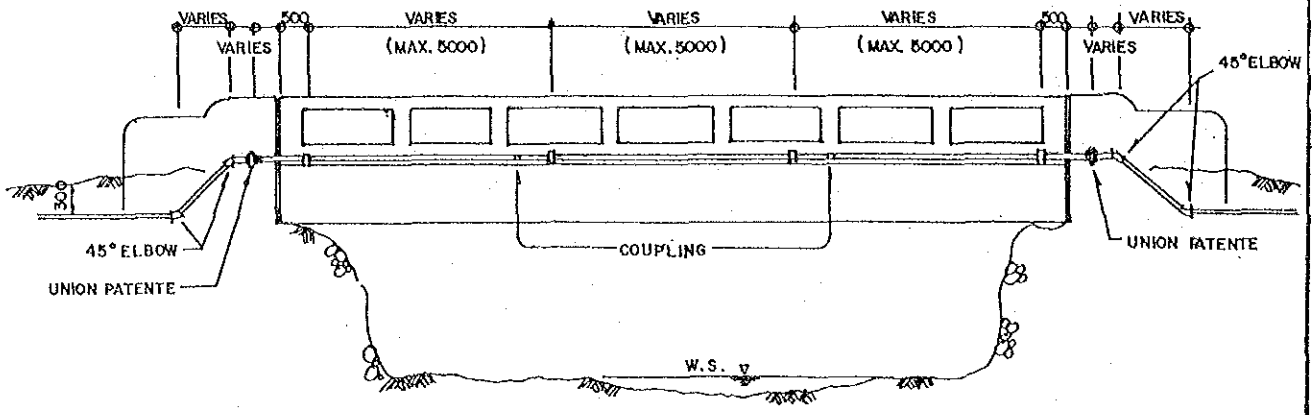


Figure 3-3-5 DEEP WELL W/ CENTRIFUGAL PUMP



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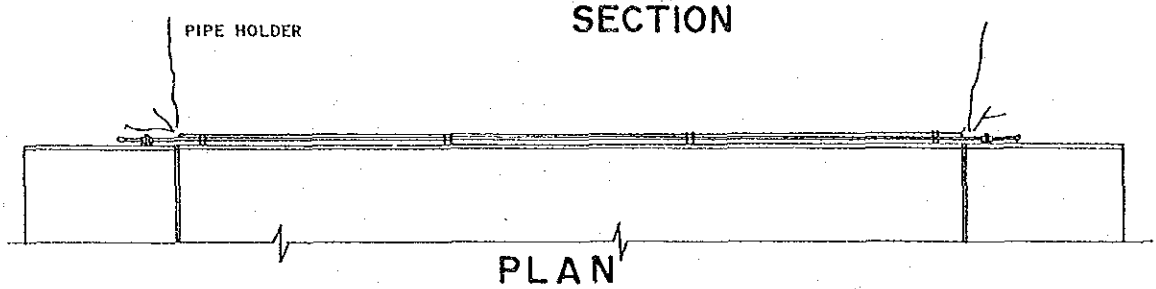


PLAN

TYPICAL CONCRETE BRIDGE

NOT TO SCALE

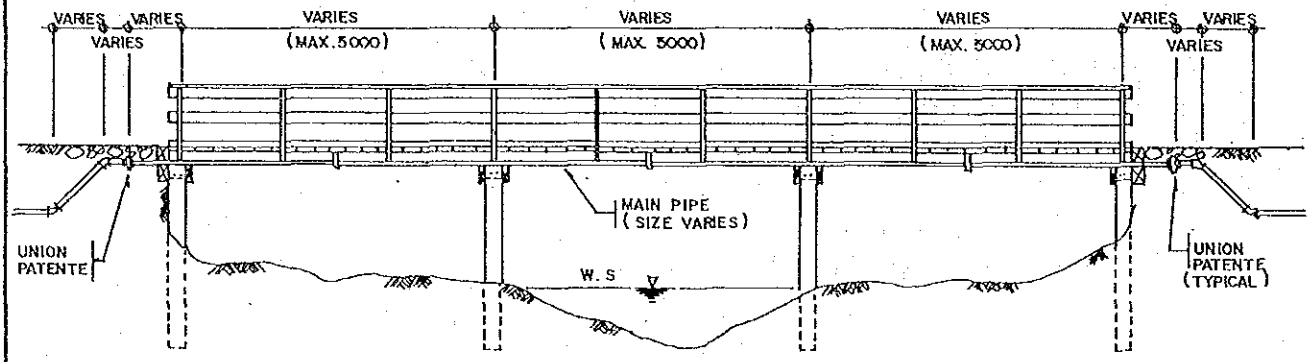
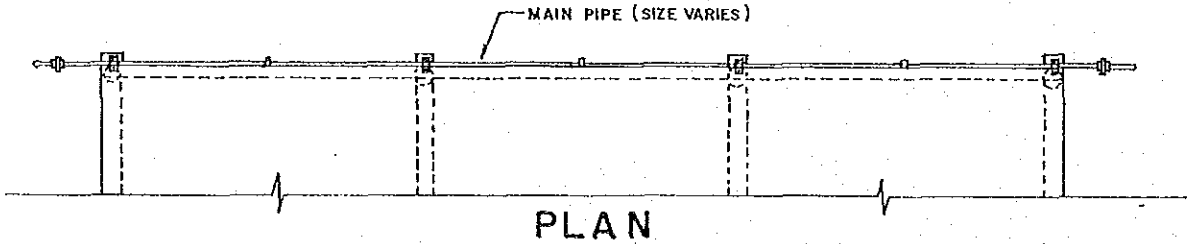


Figure 3–3–6

Several Cases of River Crossing (1)

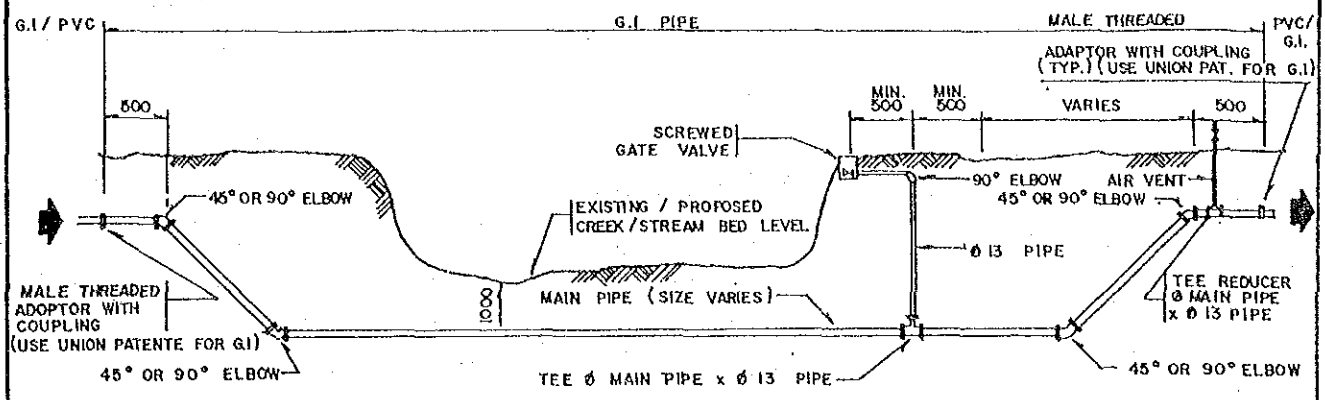
SECTION



PLAN

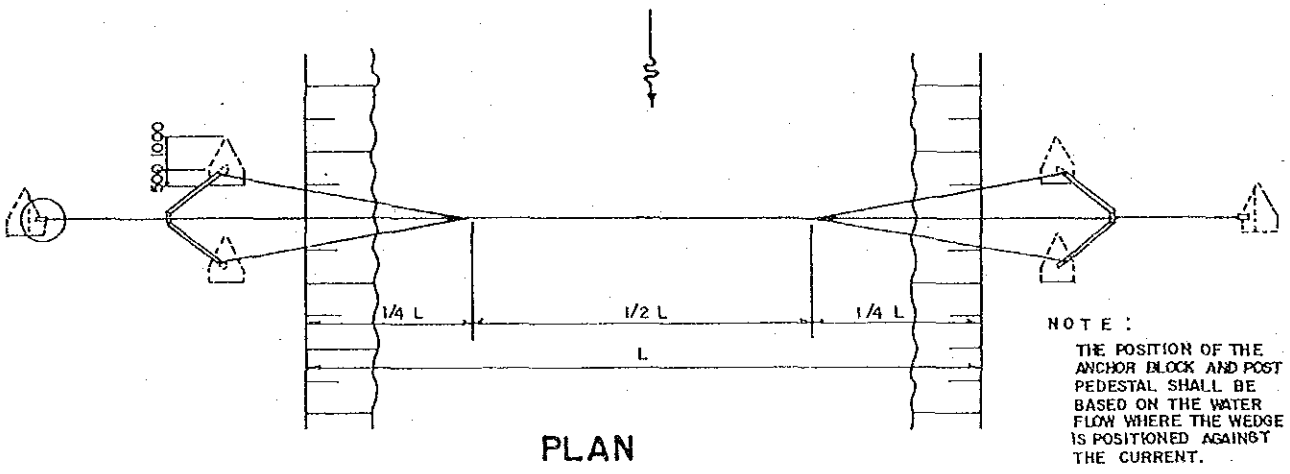
TYPICAL TIMBER / BAILEY BRIDGE

NOT TO SCALE

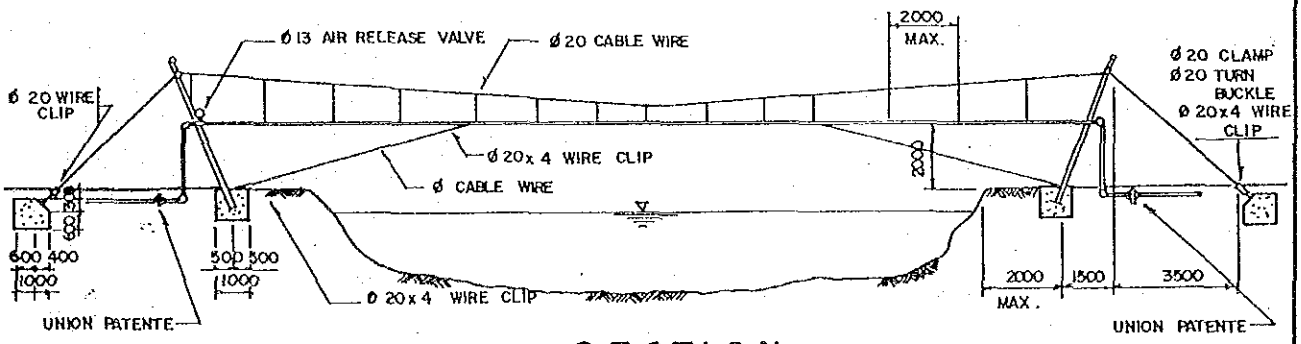


ORDINARY SOIL BEDDING

NOT TO SCALE



PLAN

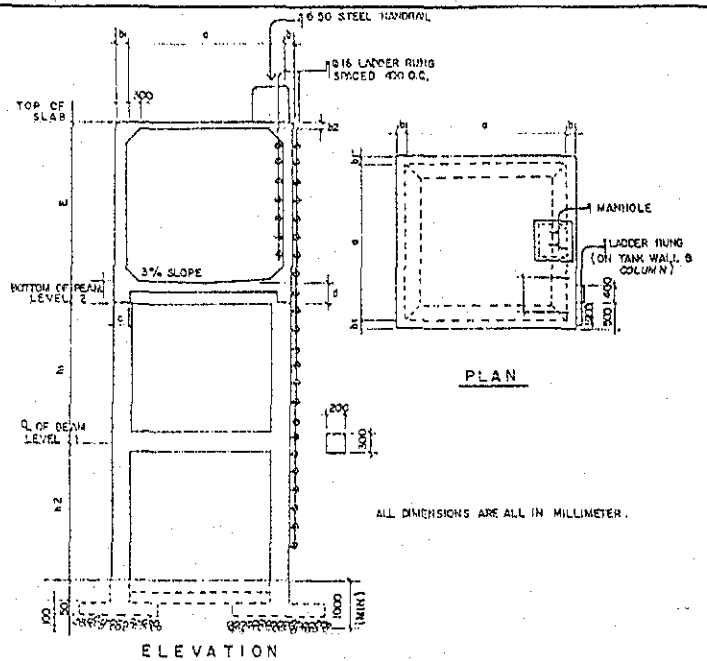


SECTION

SUSPENSION BRIDGE

NOT TO SCALE

Figure 3–3–7 Several Cases of River Crossing (2)



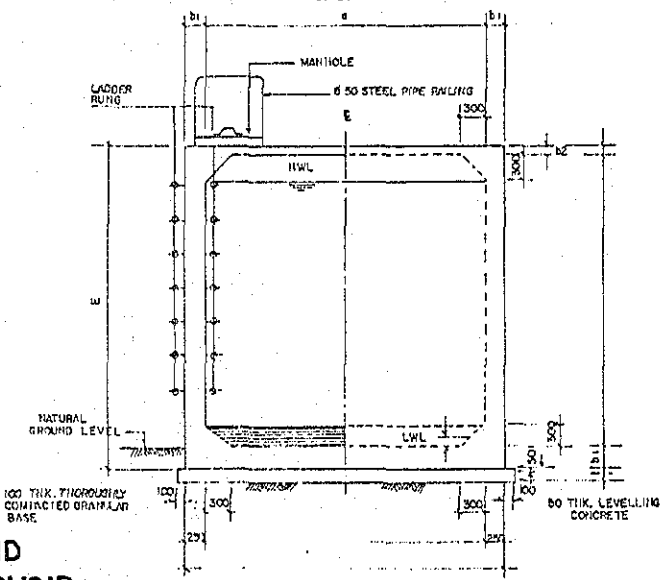
ELEVATED WATER TANK

TABLE OF ELEVATED TANK CAPACITY AND DIMENSION
(DIMENSION ARE ALL IN MM)

V (cu m)	TANK DIMENSION						COLUMN			FOOTING							
										SBP 120 KPa		SBP 144 KPa		SBP 168 KPa		SBP 192 KPa	
	a	b1	b2	C	d	E	h1	h2	SECTION	SECTION	t	SECTION	t	SECTION	t	SECTION	t
2	1400	150	150	200	300	1850	2500	2500	250x250	830x830	200	760x760	200	700x700	200	660x660	200
5	1850	150	150	200	300	2300	3000	4000	250x250	1110x1110	200	1010x1010	250	940x940	250	880x880	250
7	2050	150	150	200	300	2550	3000	4000	300x300	1190x1190	250	1090x1090	250	1010x1010	250	940x940	250
10	2300	150	150	200	400	2850	3000	4000	300x300	1300x1300	250	1180x1180	250	1100x1100	250	1030x1030	250
15	2600	150	150	200	400	3150	3000	4000	300x300	1400x1400	250	1280x1280	250	1190x1190	300	1110x1110	300
20	2850	200	150	200	600	3600	3000	4000	300x300	1520x1520	300	1390x1390	300	1280x1280	300	1200x1200	300
25	3050	200	150	250	600	3800	3000	4000	300x300	1600x1600	300	1460x1460	300	1350x1350	300	1270x1270	300
30	3250	200	150	250	600	4000	3000	4000	300x300	1700x1700	300	1560x1560	300	1440x1440	350	1350x1350	350
35	3400	250	150	300	600	4150	3000	4000	400x400	1870x1870	300	1700x1700	300	1580 1580	350	1470x1470	350
40	3550	250	150	300	600	4300	3000	4000	400x400	1950x1950	300	1780x1780	350	1650x1650	350	1540x1540	350
45	3700	250	150	300	600	4450	3000	4000	400x400	2030x2030	350	1850x1850	350	1720x1720	350	1610x1610	400
50	3800	250	150	400	600	4550	3000	4000	400x400	2100x2100	350	1920x1920	350	1780x1780	350	1660x1660	400
55	3950	300	150	400	600	4700	3000	4000	400x400	2240x2240	350	2040x2040	350	1890x1890	400	1770x1770	400
60	4050	300	150	400	600	4800	3000	4000	400x400	2290x2290	400	2080x2080	400	1930x1930	400	1810x1810	400
65	4150	300	150	400	600	4900	3000	4000	400x400	2340x2340	400	2130x2130	400	1970x1970	400	1850x1850	400
70	4250	350	150	400	600	5000	3000	4000	450x450	2510x2510	400	2280x2280	400	2120x2120	450	1980x1980	450
75	4350	350	150	400	600	5100	3000	4000	500x500	2570x2570	400	2350x2350	400	2170x2170	450	2030x2030	450

TABLE OF GROUND LEVEL RESERVOIR
(DIMENSION ARE ALL IN MM)

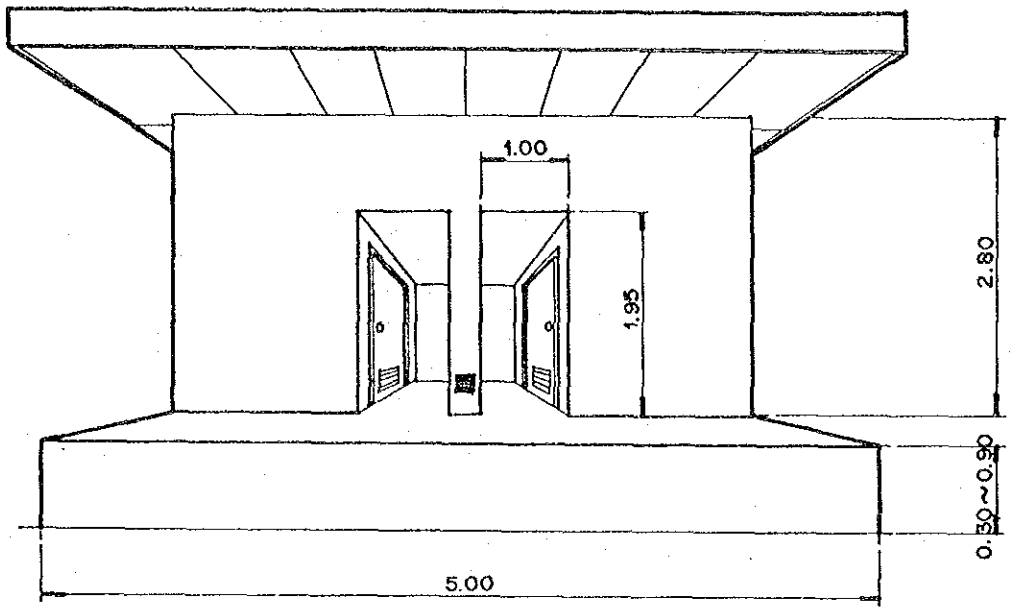
CAPACITY V (cu m)	TANK DIMENSION			
	a	b1	b2	E
2	1400	150	150	1700
5	1850	150	150	2150
7	2050	150	150	2350
10	2300	150	150	2600
15	2600	200	150	2950
20	2850	200	150	3200
25	3050	200	150	3400
30	3250	200	150	3600
35	3400	250	150	3800
40	3550	250	150	3950
45	3700	250	150	4100
50	3800	250	150	4200
55	3950	250	150	4350
60	4050	250	150	4450
65	4150	250	150	4550
70	4250	350	150	4750
75	4350	350	150	4850



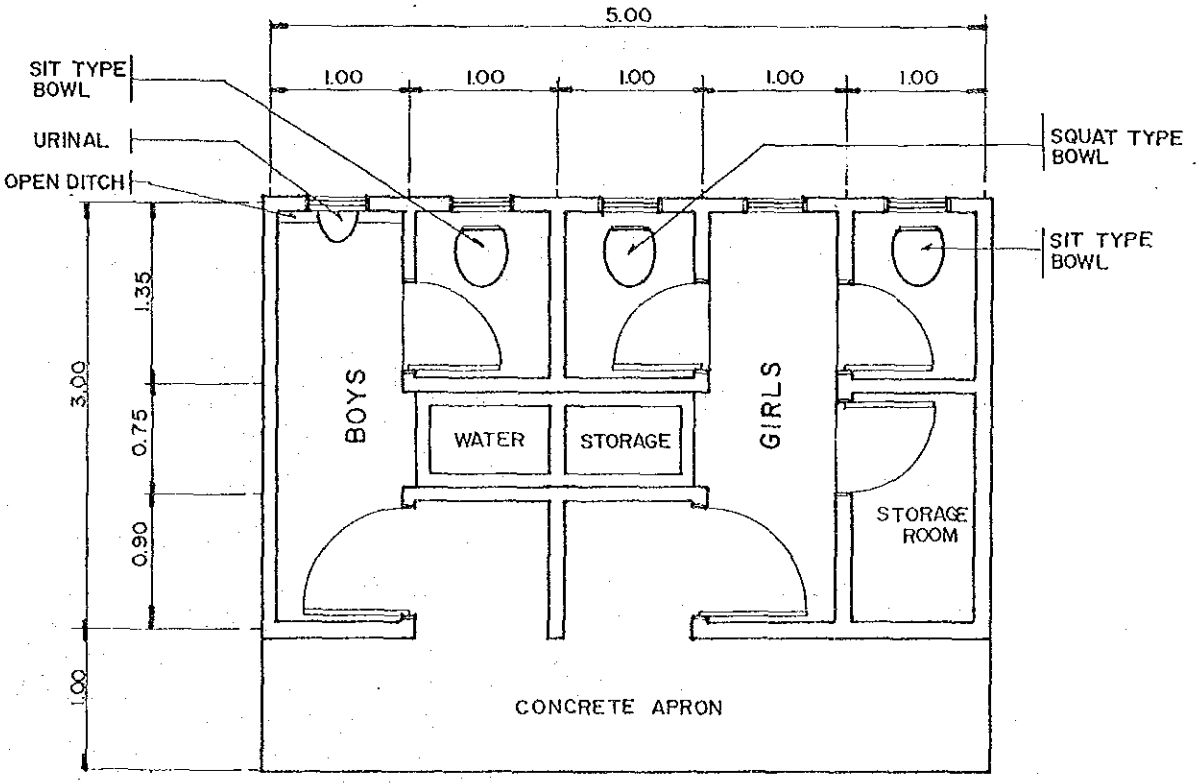
PROPOSED GROUND RESERVOIR

Figure 3–3–8

STANDARD DESIGN OF ELEVATED TANK AND GROUND LEVEL RESERVOIR



PERSPECTIVE

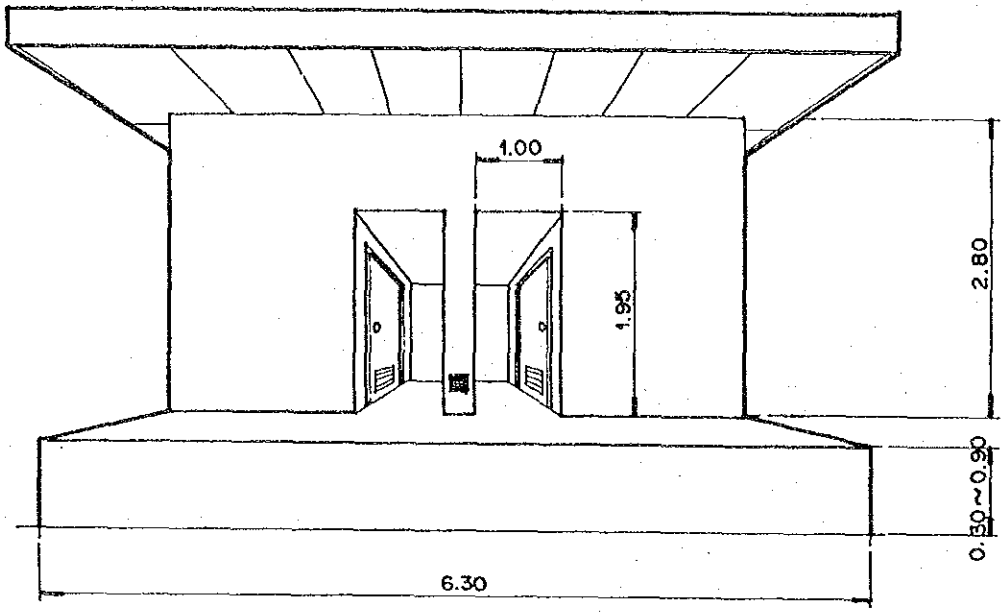


FLOOR PLAN

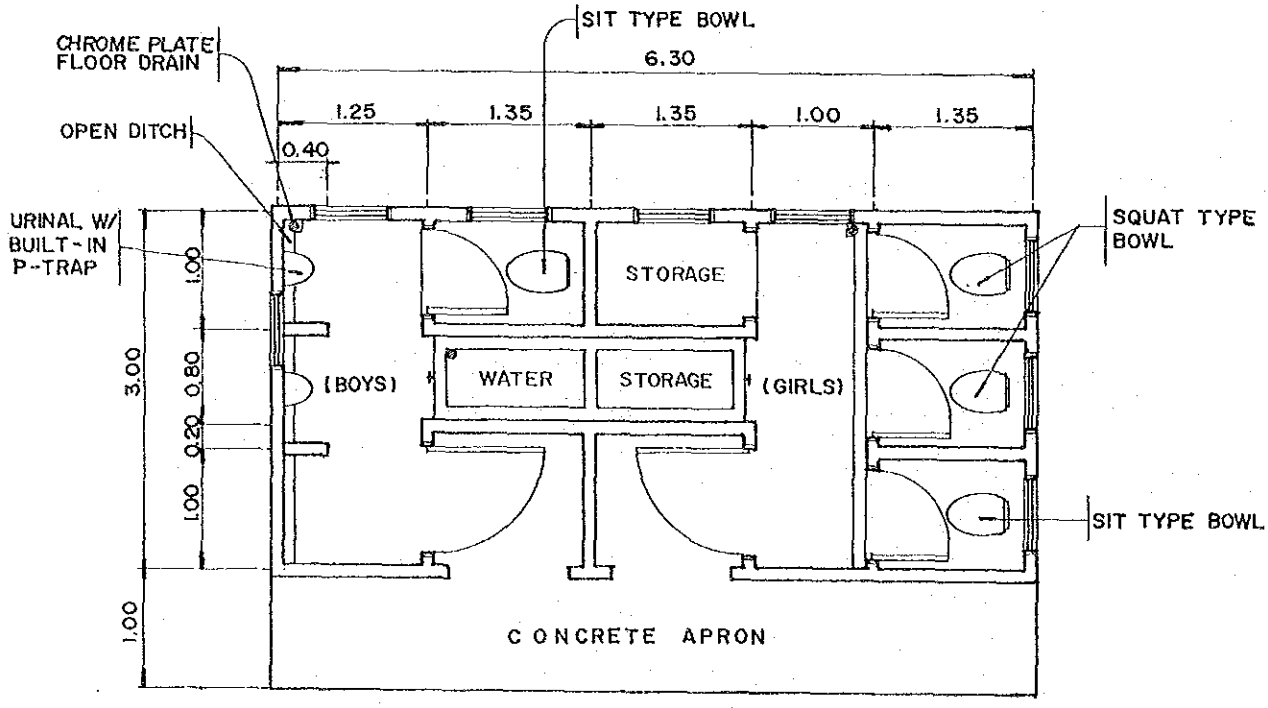
Figure 3-3-9

(TOILET BUILDING)

TYPE A



PERSPECTIVE

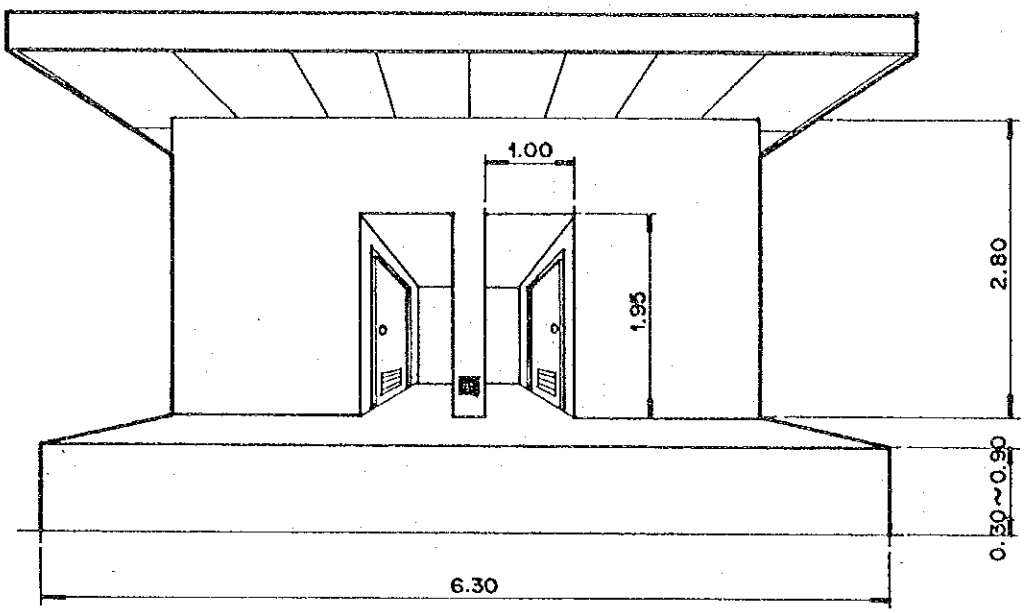


FLOOR PLAN

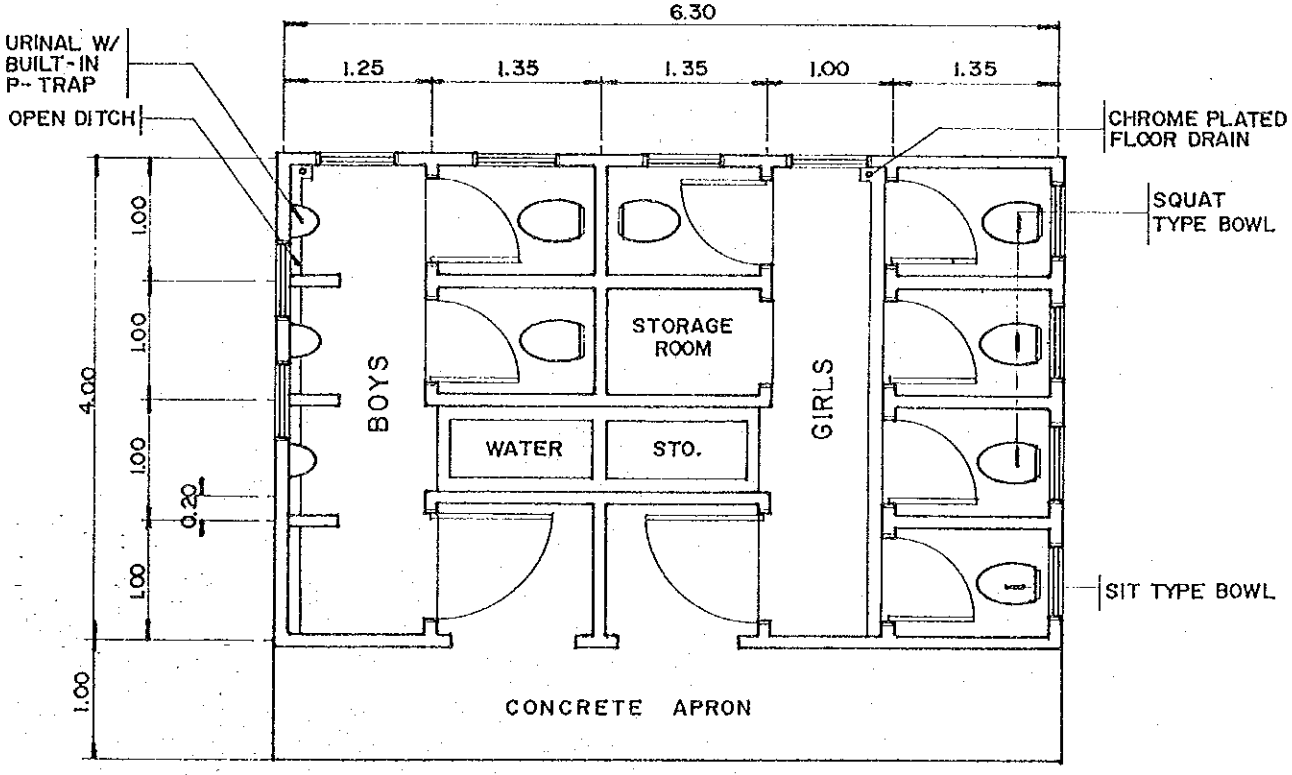
Figure 3-3-10

(TOILET BUILDING)

TYPE B



PERSPECTIVE

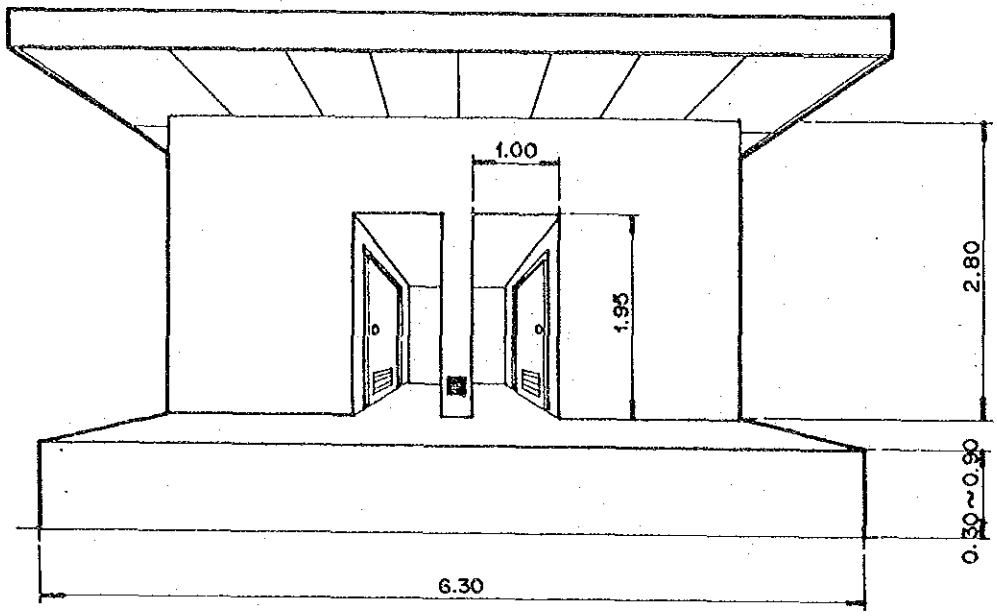


FLOOR PLAN

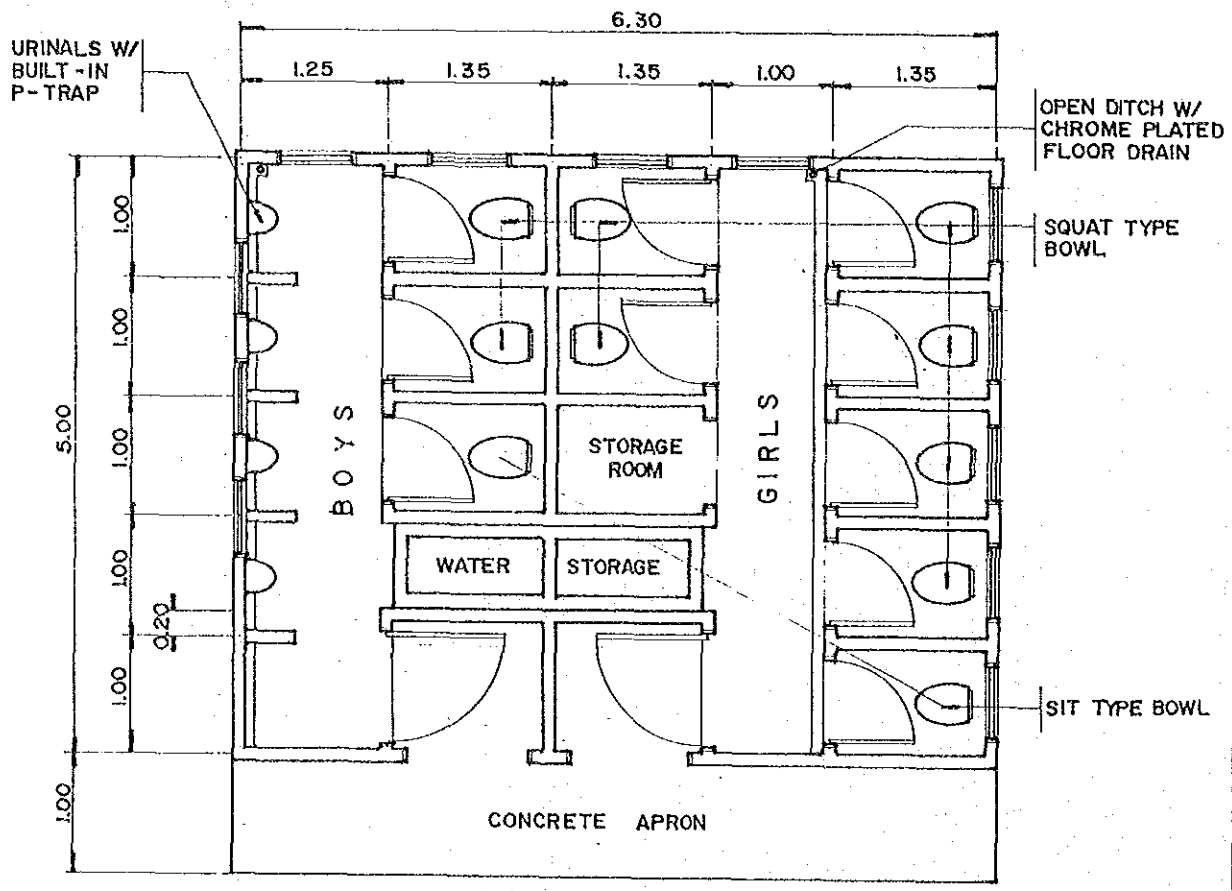
Figure 3-3-11

(TOILET BUILDING)

TYPE C



PERSPECTIVE



FLOOR PLAN

Figure 3-3-12

(TOILET BUILDING)

TYPE D

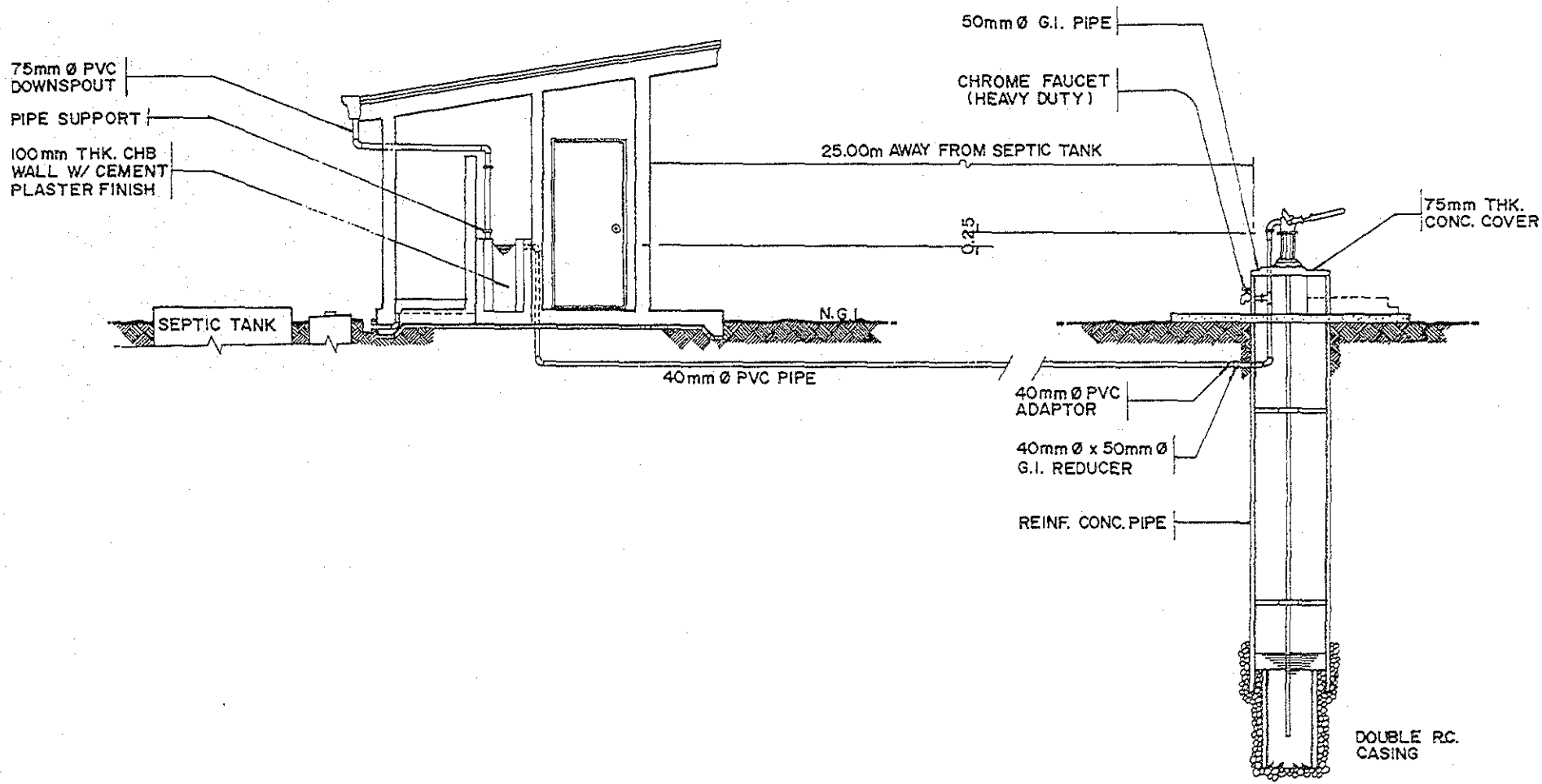
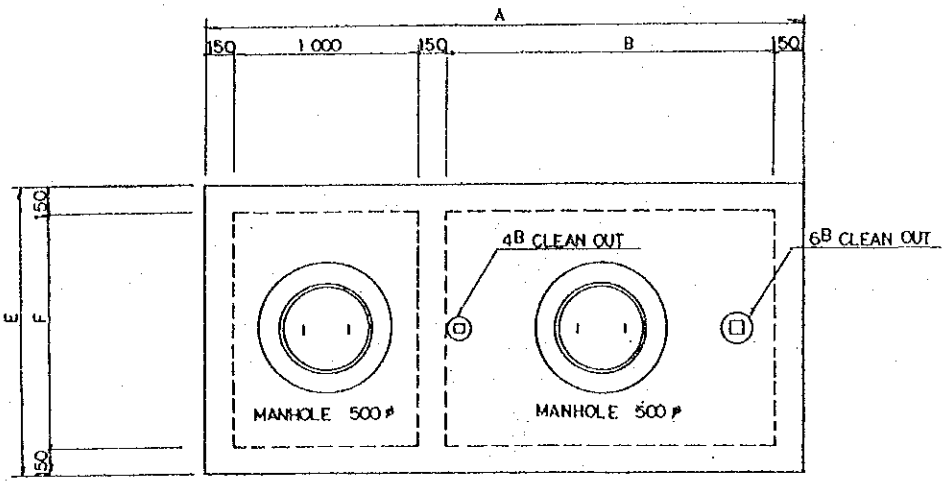
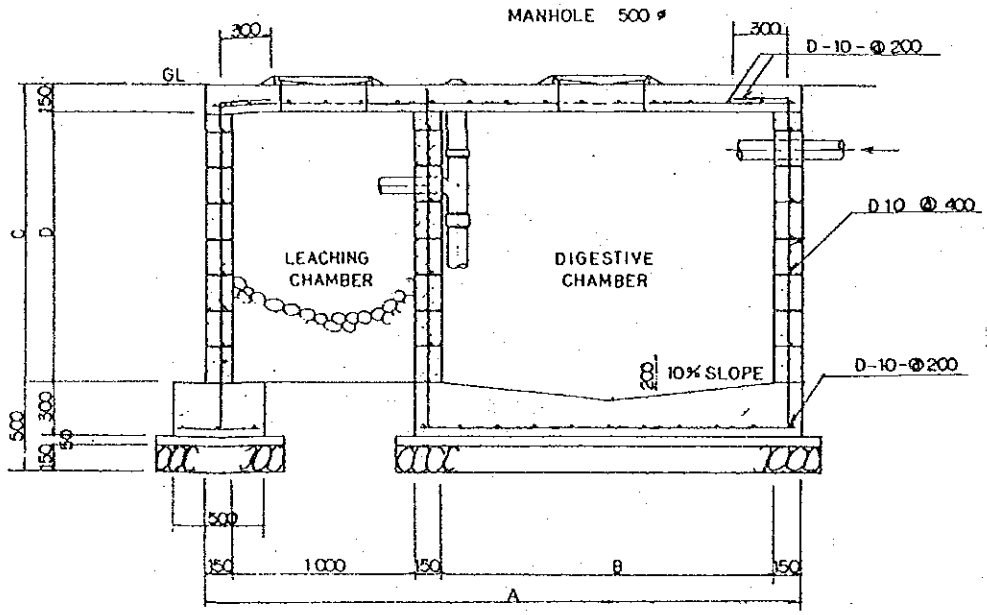


Figure 3–3–13

TYPICAL CONNECTION OF SCHOOL TOILET AND WATER SOURCE



TYPICAL ROOF PLAN



TYPICAL SECTION

SCHEDULE FOR SEPTIC TANK						
TOILET TYPE	A	B	C	D	E	F
TYPE – A	3,250	1,800	1,650	1,500	1,600	1,300
TYPE – B	3,250	1,800	1,650	1,500	1,600	1,300
TYPE – C	3,550	2,100	1,650	1,500	1,800	1,500
TYPE – D	4,450	3,000	1,750	1,600	2,200	1,900

Figure 3–3–14 **STANDARD DESIGN OF SEPTIC TANK**

Table 3-3-4 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

Table 3-3-5 Summary of School Toilets

	Number of School/ Toilet	Number of Pupils	Toilet Type				
			A	B	C	D	Total
Stage I							
Region V							
Camarines Norte	17	6,424		10	6	1	17
Camarines Sur	42	18,460	1	16	17	8	42
Albay	24	10,833		12	8	4	24
Sorsogon	36	11,421	2	27	6	1	36
Total	119	47,138	3	65	37	14	119
Stage II							
Region IV							
Rizal	5	2,917		1	2	2	5
Laguna	26	8,240	5	12	8	1	26
Quezon	35	8,663	7	24	3	1	35
Sub-Total	66	19,820	12	37	13	4	66
Region X							
Agusan del Norte	15	5,461		10	4	1	15
Misamis Oriental	18	5,937	1	10	6	1	18
Camiguin	10	1,960	2	8			10
Sub-Total	43	13,358	3	28	10	2	43
Total	109	33,178	15	65	23	6	109
Grand Total	228	80,316	18	130	60	20	228

Table 3-3-6 Number of Schools by Pupil Distribution

	below 100	101 ~ 300	301 ~ 500	501 ~ 700	701 ~ 1,000	Total
Stage I						
Region V						
Camarines Norte		6	8	3		17
Camarines Sur		13	14	11	4	42
Albay		4	12	5	3	24
Sorsogon		21	11	3	1	36
Total		44	45	22	8	119
Stage II						
Region IV						
Rizal		1	2		2	5
Laguna	2	14	5	4	1	26
Quezon	3	23	7	2		35
Sub-Total	5	38	14	6	3	66
Region X						
Agusan del Norte		5	8	2		15
Misamis Oriental	1	9	7		1	18
Camiguin		9	1			10
Sub-Total	1	23	16	2	1	43
Total	6	61	30	8	4	109
Grand Total	6	105	75	30	12	228

3-3-3 Equipment Specifications

Major specifications of the equipment are given below.

(1) Pumping Test Equipment

- Type and number of units :

  Diesel engine driven portable air compressor, 3 units

- Performance :

  Free air delivery - more than 500 l/min.

  Pressure - 100 psi (7 kg/sq.cm)

  Pumping capacity - more than 100 l/min.

- Other requirements :

  Air hose, riser pipe, air pipe, and spare and wearing parts.

(2) Water Level Indicator

- Type and number of units
  Portable water level indicator, 3 units

- Performance
  Minimum measurement - 1 cm
  Maximum measurement - 100 m
  Dry battery powered water level indication

(3) Water Quality Analysis Equipment

- Type and number of units :
  Portable type water equality analysis kit, 3 units

- Performance :
  Capable to analyze physical and chemical water quality indices as required by the National Standard for Drinking Water of the Philippines.

  Portable type photometer for calorimetric method
  Portable type pH and conductivity meters
- Other requirements :
  Carrying case, chemical reagents, glassware, and spare and wearing parts

3-4 Project Implementation Plan

3-4-1 Present Situation of Relevant Field 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 indicates a general shortage of drilling rigs and competent crews, especially in the provinces, in consideration the huge number of wells to be constructed under the existing program. This problem exists both in the government and private construction sectors.

Project facilities will be constructed under adverse locational conditions mainly brought about by the widely dispersed project sites and other constraints such as 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 can deliver the planned amount of water within a reasonably long period.

Most of the required construction materials are easily available, and can be procured locally except for well casings and screens that meet international standards.

(2) School Toilet Facilities

School toilet facilities can be constructed with the use of all local materials by local contractors. However, the prevailing practices of construction quality control and workmanship at local the contractors are below the requirements of the Project. To offset this problem, appropriate technology transfer and construction management shall be instituted by the Japanese contractor.

3-4-2 Implementation Method

The project organization chart, including work flow, is shown in Figure 3-4-1. The Project will be implemented as a joint effort by the DPWH and the DOH, and the DPWH will play the role of leading agency, while the DOH will act as co-executing agency. Both Departments will establish an inter-agency agreement for smooth and effective implementation of the Project and will form the PCC (Project Coordination Committee) to be headed by the Undersecretary of each Department, who will take charge of overall coordination of the execution of the Project.

Under the PCC, PMO-RWS of DPWH and EHS of DOH will be directly involved for actual implementation for water supply component and sanitation (school toilet) component, respectively and will form the Project Team by their own staffs exclusively for this Project. Local offices of each Department will be then directed by this Project Team. The Project Team will work for the following major activities:

1) Contact office of DPWH and DOH on this Project.
2) Coordination/communication within both Departments and with agencies/authorities concerned.
3) Execution of obligation to be shouldered by the Philippine Government, such as budget, land acquisition, training on operation and maintenance of the facilities.
4) Cooperation and execution of detailed design, bidding and construction supervision as counterpart to the Consultants.

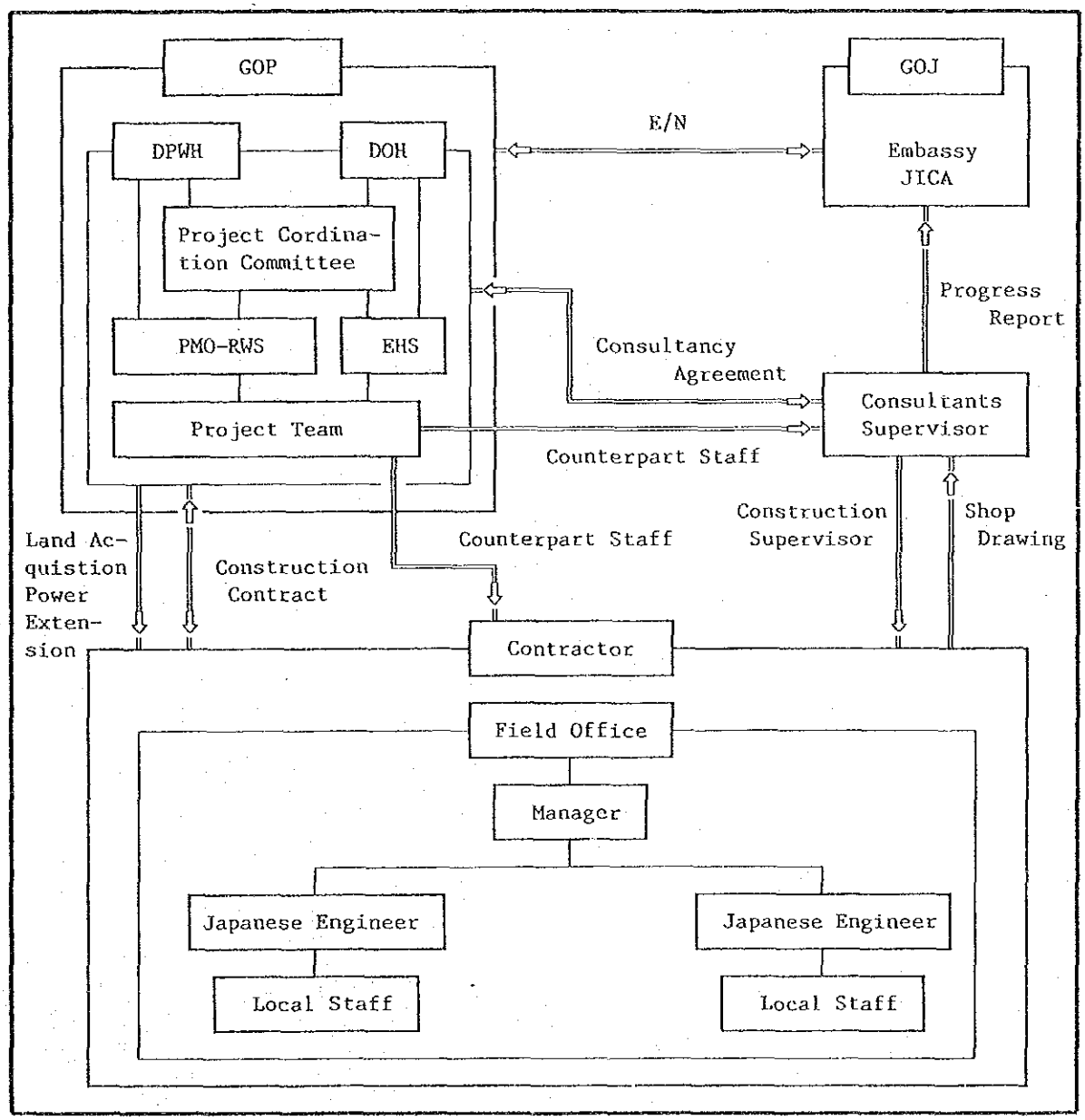


Figure 3-4-1 Project Organization Chart

The Japanese Consultants will control the work schedule and quality as appropriate for smooth execution of the Project through his services to detailed design, bidding and construction supervision, and accomplish the Project within the designated period. To achieve this goal, the Consultants will dispatch his supervisory staffs to the Philippines and intermittently supervise the Project on behalf of the Philippine Government.

Construction work for all required water supply and school toilet facilities shall be contracted but to a qualified Japanese contractor. The said principal Contractor has the option to engage the services of local contractors which will perform the actual construction work and supply laborers. Laws and regulations pertaining to construction work shall be strictly complied with by the Contractor, who shall secure the necessary permits with the help of local authorities.

Most material requirements of the Project will be procured in the Philippines, except for some types of well casings/screens, etc. which will be imported from Japan.

3-4-3 Major Undertakings by Japanese and Philippine Governments

Responsibilities in the implementation of the Project, most of which are outlined in the Minutes of Discussion, are augmented and more clearly delineated in the following paragraphs.

(1) Responsibilities of the Government of Japan

The GOJ, directly or through the assigned Consultants 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 Government of the Philippines

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

- *Provide liaison between Japanese 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-way 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 Japanese 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 Japanese nationals whose service 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.

- 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.

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

3-4-4 Implementation Schedule

The Project will be implemented in 2 stages, Stage-1 for Region V covering the provinces of Camarines Norte, Camarines Sur, Albay and Sorsogon, while Stage-2 for Region IV (the provinces of Rizal, Laguna and Quezon) and Region X (the provinces of Agusan del Nolte, Misamis Oriental and Camiguin).

Figure 3-4-2 shows the implementation schedule for each stage; the detailed design work will entail 4 months, and the procurement/construction work cover a 12 month period.

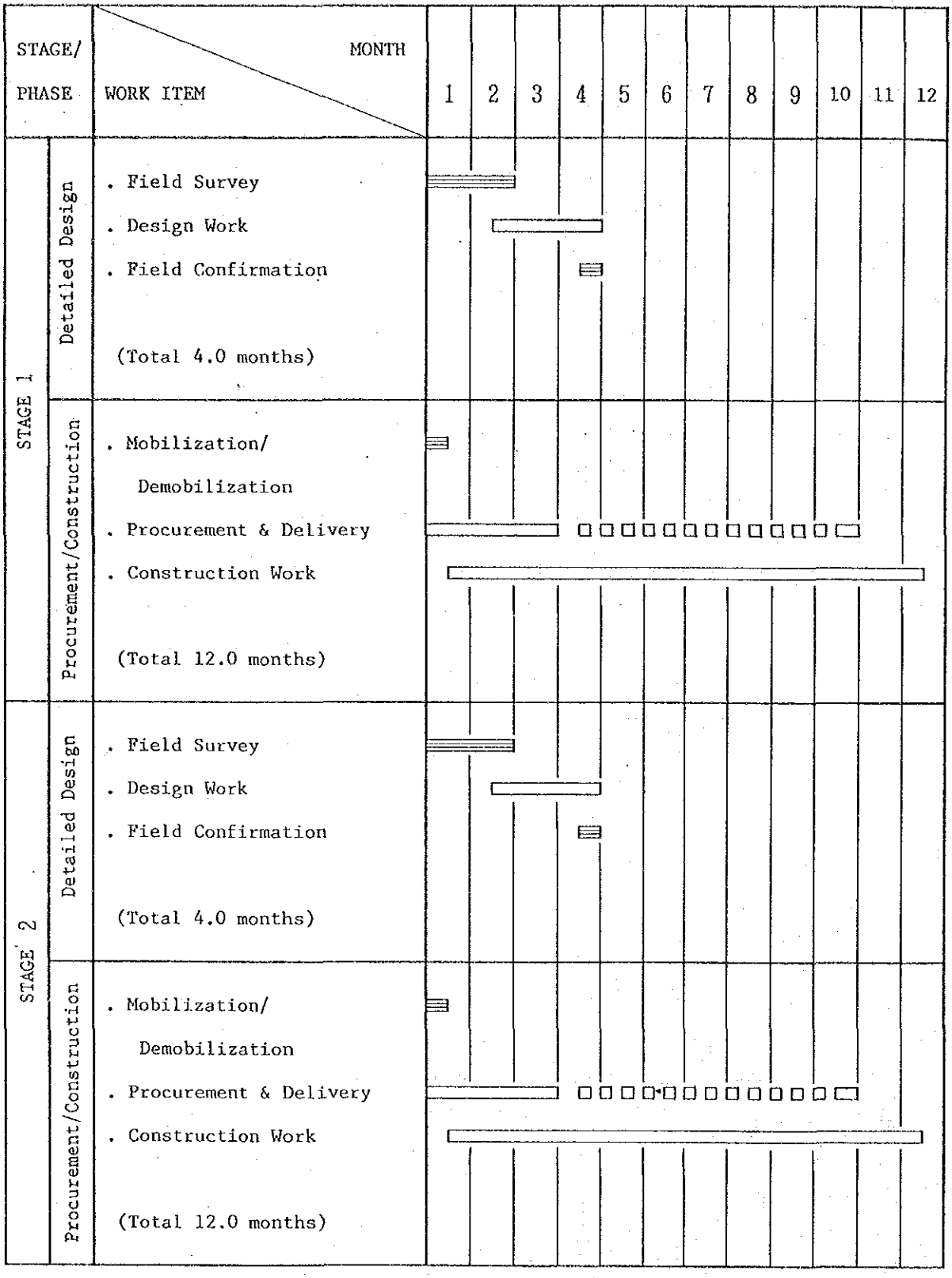


Figure 3-4-2 Project Implementation Schedule

3-4-5 Scope of Work to Be Undertaken by Each Government

The scope of work to be undertaken by each Government necessary for the implementation of the Project is shown in Table 3-4-1.

Table 3-4-1 Scope of Work to be undertaken by Each Government

Item No.	Description	To be Covered by the GOP	To be Covered by the GOJ
1.	Land acquisition (donation)	x	
2.	Procurement of project equipment/materials		x
3.	Transportation of 3.		x
4.	Construction of facilities		x
5.	Construction supervision		x
6.	Training of beneficiaries for operation & maintenance	x	
7.	Operation & maintenance of equipment and facilities	x	

CHAPTER 4
PROJECT EVALUATION AND CONCLUSION

CHAPTER 4 PROJECT EVALUATION AND CONCLUSION

4-1 Effects

The Project will have the following direct benefits to rural residents/pupils:

- Approximately 67,000 persons residing in 82 rural barangays will have access to a safe and potable drinking water supply,
- Approximately 80,300 pupils in 228 elementary schools will gain the use of sanitary toilets with septic tanks as well as water sources for maintenance.

In addition to the above, a health and education campaign for school pupils, to be carried out by the DOH and DECS, is expected to contribute to the improvement of knowledge and practice of public hygiene and to reduce incidence of water-borne/water-related diseases.

Through enrollment and graduation, approximately one-sixth of children in elementary schools will have an opportunity to enjoy the above-mentioned benefits every year.

4-2 Conclusion

As mentioned in the previous section, the Project is expected to benefit large numbers of rural residents/pupils with access to safe and potable drinking water supply and sanitary toilets, and therefore to contribute to improve BHN (basic human needs).

In view of the above, the Project is deemed suitable for Japan's Grant Aid and is recommended for implementation under the scheme of Japan's Grant Aid Program.

However, it is indispensable for the Philippine Government to fulfill the recommendations presented hereafter to ensure smooth and effective implementation of the Project as well as the maximization of the expected benefits.

4-3 Recommendation

It is recommended that the Philippine Government implements the following measures to maximize the Project's effects and benefits:

(1) Before Implementation of the Project

- Inter-agency cooperation agreements between the DPWH and the DOH as well as the DOH and DECS shall be established.
- The implementation plan of requirements to be carried out by implementing agencies shall be prepared and necessary arrangements covering institutional set-up, manpower, equipment and budget shall be carried out.
- Appropriate cooperation and coordination among the implementing agencies, the DILG, and local government units shall be established.
- Preparatory work to carry out the requirements by the Philippine side shall be performed.

(2) During the Project Implementation

- Implementing agencies shall carry out seminars/workshops for their local officials to make sure the officials clearly understand the objectives and implementation methods of the Project.
- Construction site and right-of-way shall be secured for construction of facilities in the course of topographic survey to be undertaken by the Consultants.
- A informational campaign and other necessary activities such as the formation/registration of the BWSAs/RWSAs and training on operation and maintenance shall be carried out for the beneficiary barangays/schools.

(3) After Completion of the Project

- The DPWH shall support operation and maintenance of the facilities to be undertaken by the BWSAs/RWSAs and shall inspect/monitor the facilities periodically.
- The DOH, in cooperation with DECS, shall support operation and maintenance of the facilities to be undertaken by elementary schools and shall inspect/monitor facilities periodically.

- The DPWH and the DOH shall execute monitoring program and evaluate the project effects/benefits.
- The DOH and DECS shall take up necessary measures including budget, equipment (vacuum truck) and land for removal, treatment and disposal of septic sludge.

APPENDIX

1. MEMBER LIST OF SURVEY TEAM

APPENDIX – 1 List of Members of the Study Team

1. Field Survey Team

Assignment	Name	Position
1. Leader	Mr. Sen–ichi Kimura	Deputy Director, 2nd Basic Design Study Div., Grant Aid Study and Design Dep., JICA
2. Coordinator	Mr. Yoshitaro Watanabe	Director, Planning & Development Div., General Affiars Dep., Japan International Cooperation System
3. Chief Consultant/ Water Supply Planner	Mr. Masatoshi Momose	Manager, Engineering Div., Overseas Dep., Nippon Jogesuido Sekkei Co., Ltd.
4. Hydrogeologist/ Well Engineer	Mr. Seimi Mochizuki	Director, Wacos Japan Co., Ltd.
5. Hydrogeologist/ Well Engineer	Mr. Mitsuo Tsutsumi	Senior Advisor, Fukuoka Branch, Nippon Jogesuido Sekkei Co., Ltd.
6. Sanitary Engineer	Mr. Masuomi Hiroyama	Senior Environmental Engineer, Engineering Div., Overseas Dep., Nippon Jogesuido Sekkei Co., Ltd.

2. Draft Report Explanation Team

Assignment	Name	Position
1. Leader	Mr. Kei Jinnai	1st Basic Design Study Div., Grant Aid Study and Design Dep., JICA
2. Chief Consultant/ Water Supply Planner	Mr. Masatoshi Momose	Manager, Engineering Div., OVerseas Dep., Nippon Jogesuido Sekkei Co., Ltd.
3. Sanitary Engineer	Mr. Masuomi Hiroyama	Senior Environmental Engineer Engineering Div., Overseas Dep., Nippon Jogesuido Sekkei Co., Ltd.

2. FIELD SURVEY SCHEDULE

Appendix-2 Field Survey Schedule

Date	Activities
February	
24 (Thu)	Arrival of the Study Team Meeting at JICA Philippine Office
28 (Mon)	Kick-off Meeting with DPWH & DOH Meeting at Region IV
March	
2 (Wed)	Site Inspection of Phase II Project
3 (Thu)	– ditto –
4 (Fri)	Signing of Minutes of Discussions
April	
7 (Thu)	Final Meeting with DPWH & DOH
8 (Fri)	Meeting at JICA Philippine Office
9 (Sat)	Leave for Tokyo
Unless otherwise mentioned, the Study Team conducted field Survey, data collection and series of meetings with DPWH/DOH throughout the course of the Survey period.	

3. MEMBER LIST OF PARTY CONCERNED IN THE RECIPIENT COUNTRY

LOCAL AGENCIES AND OFFICIALS MET WITH

CENTRAL/ LOCAL OFFICE	AGENCY	NAME	POSITION
CENTRAL OFFICE	DPWH	Teodoro T. Encarnacion Rogelio A. Flores Hellen G. Marvilla Virgilio Gacusana Elpidio Aquino	Undersecretary Director, PMO-RWS PM-II,PMO-RWS Engr. V, PMO-RWS Engr. III, PMO-RWS
	DOH	Dr. Manuel Roxas Dr. Wilfredo Asoy Dr. Mario Villaverde	Undersecretary Director , EHS Project Coordinator
	DECS	Dr. Adelfo Trinidad	Director
REGION 4-A	DPWH DOH	Alfredo Torres Justina Bernardo Fidel Junatas	Regional Director Regional Director Reg. Sanitary Eng'r.
RIZAL	DEO	Nestor Agustin Dominador Fabian Jr.	District Engineer Water Supply Eng'r.
	IPAO	Efren Soriano Ricardo de Arroz	Provincial Health Office Sanitary Eng'r.
LAGUNA	DEO	Federico Gaspar Carlo Guan	District Eng'r. Water Supply Eng'r.
	IPAO	Cirila Jorvina Virginia Fabros	Prov. Health Officer Sanitary Eng'r.
QUEZON	DEO 1st	Ricardo Lusterio Abdel Torres	District Engineer Water Supply Eng'r.
	DEO 2nd	Reynaldo Calayan Ronnel Tan	District Engineer Water Supply Eng'r.
	IPHO	Manuel Salazar Daniel Urguelles	Prov. Health Officer Sanitary Engineer

CENTRAL/ LOCAL OFFICE	AGENCY	NAME	POSITION
REGION 5	DPWH	Rafael Abundo	Regional Director
	DOH	Antonio Lopez	Regional Director
CAMARINES NORTE	DEO	Sofio Juria Victorio Corporal	District Engineer Water Supply Engineer
	IPHO	Jesus Dyquianco Milane Schneider	Prov. Health Officer Sanitary Engineer
CAMARINES SUR	DEO 1st	Nestor Tria Valeriano Fausto	District Engineer Water Supply Engineer
	DEO 2nd	Manuel Quimson Nilo Salazar	District Engineer Water Supply Engineer
	IPHO	Leny Reyes Ulyses Belen	Prov. Health Officer Sanitary Engineer
ALBAY	DEO	Orlando Roces Wilfredo Bigol	District Engineer Water Supply Engineer
	IPHO	Lea Bootan Paz Alain Mape	Prov. Health Officer Sanitary Engineer
SORSOGON	DEO	Jose Gigantone Mamerto Legaspi	District Engineer Water Supply Engineer
REGION 10	DPWH	Julio Luspo Edmundo Quipanes	Regional Director Reg. Water Supply Eng'r.
	DOH	Avelino Gorospe	Regional Director
MIS. ORIENTAL	DEO	Nazario Lerias Paquito Palamine	District Engineer Water Supply Eng'r.
	IPHO	Hurley Galindo Carmela Roa	Prov. Health Officer Sanitary Engineer
CAMIGUIN	DEO	Ruperto Guanco Cordino Tarongoy	District Engineer Water Supply Engineer
	IPHO	Quitilianito Babarin Elpidio Lagura	Prov. Health Officer Sanitary Engineer
AGUSAN DEL NORTE	DEO	Daniel Arquisola Alpidio Grana	District Engineer Water Supply Engineer
	IPHO	Brenda Lopez Patricio Bael	Prov. Health Officer Sanitary Engineer

4. MINUTES OF DISCUSSION

MINUTES OF DISCUSSIONS

BASIC DESIGN STUDY FOR

RURAL ENVIRONMENTAL SANITATION PROJECT (PHASE-III) IN

THE REPUBLIC OF THE PHILIPPINES

In response to a request from the Government of the Republic of the Philippines, the Government of Japan decided to conduct a Basic Design Study for Rural Environmental Sanitation Project (Phase III) (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to the Philippines a study team, which is headed by Mr. Sen-ichi Kimura, Deputy Director, Second Basic Design Study Division, Grant Aid Study and Design Department, JICA and is scheduled to stay in the country from February 24 to April 9, 1994.

The team held discussions with the officials concerned of the Government of the Philippines and conducted a field survey at the study area.

In the course of discussions and field survey, both parties have confirmed the main items described on the attached sheets. The team will proceed to further works and prepare the Basic Design Study report.

Manila, March 4, 1994

MR. SEN-ICHI KIMURA
Leader
Basic Design Study Team
JICA

MR. TEODORO T. ENCARNACION
Undersecretary
Department of Public Works
and Highways

DR. MANUEL ROXAS
Undersecretary
Department of Health

ATTACHMENT

1. Objective

The objective of the Project is to improve and promote rural environmental sanitation conditions in selected areas through the provision of water supply facilities (Level I and II) and sanitation facilities for elementary schools.

2. Project Sites

(1) Site Selection

The Project Sites are located in Regions IV, V and X. Ten provinces in the regions are to be covered in consideration of location and socio-economic conditions to realize the grant aid concept of the Project as well as accessibility to proposed areas for construction of the facilities.

(2) Area Coverage

The provinces to be covered by the Project are as follows:

Region IV - Laguna, Rizal and Quezon
Region V - Camarines Norte, Camarines Sur, Albay and Sorsogon
Region X - Agusan del Norte, Misamis Oriental and Camiguin

Regarding the sites of elementary school, those included in the Education Facilities Improvement Project (Phase II) implemented by the Department of Education, Culture and Sports (DECS) are to be excluded from the Project.

(3) Number of Project Sites

The number of sub-projects by component as indicated in Annex I, as agreed by both sides, is tentative. However, it is subject to change based on the result of the Study and is to be determined within the scheme of Grant Aid Program of Japan.

3. Executing Agency

Department of Public Works and Highways as lead agency and Department of Health as co-executing agency are responsible for the administration and execution of the Project, in coordination with DECS.

4. Items Requested by the Republic of the Philippines

After discussions with the Basic Design Study Team, the following items were requested by the Philippine side.

1) Construction of water supply facilities (Level I and II)
2) Construction of sanitation facilities for elementary schools
3) Provision of equipment and spare parts for well construction, water quality monitoring and maintenance activities.
4) Provision of services for the implementation of the Project.

The final components of the Project will be decided and incorporated into the Basic Design Study Report.

5. Japan's Grant Aid System

(1) The Government of the Republic of the Philippines has understood the system of Japanese Grant Aid explained by the team.

(2) The Government of the Republic of the Philippines will take necessary measures, described in Annex II for smooth implementation of the Project, on condition that the Grant Aid Assistance by the Government of Japan is extended to the Project.

6. Schedule of the Study

In accordance with the schedule indicated in the Inception Report;

(1) The Consultants will proceed with the studies in the Philippines from February 24 to April 9, 1994.

(2) JICA will dispatch a team to the Philippines for explanation of the Draft Final Report by July, 1994.

(3) JICA will complete the Final Report and send it to the Government of the Republic of the Philippines by August, 1994.

Annex-I Number of Project Sites being Considered as Start-line of the Study

Region/Province	Water Supply				Sanitation	TOTAL
	Level I		Level II			
	D.W.	SP	D.W./SP	Sub-Total	School Toilet	
Region IV						
Laguna	6	2	3	11	26	37
Quezon	9	-	4	13	32	45
Rizal	7	1	3	11	3	14
-Sub-Total	22	3	10	35	61	96
Region V						
Camarines Norte	1	5	3	9	15	24
Camarines Sur	3	4	4	11	38	49
Albay	6	3	3	12	21	33
Sorsogon	4	2	4	10	32	42
Sub-Total	14	14	14	42	106	148
Region X						
Agusan del Norte	4	1	3	8	13	21
Camiguin	-	5	2	7	8	15
Misamis Oriental	2	3	3	8	16	24
Sub-Total	6	9	8	23	37	60
TOTAL	**42**	**26**	**32**	**100**	**204**	**304**

Annex-II Necessary Measures To Be Taken By the Government of the Republic of the Philippines in Case Japan's Grant Aid is Executed

1. To secure the right-of-way for pipeline construction, land area for the facilities and prospective water sources.

2. To clear, level and reclaim the site prior to commencement of the construction.

3. To undertake incidental outdoor works such as fencing and gates in and around the site.

4. To construct the access road to the site, if necessary, prior to commencement of the construction.

5. To provide facilities for distribution of electricity, drainage and other incidental facilities to the Project site.
   1) Electricity distributing line to the site
   2) Drainage main to the site

6. To bear commissions to the Japanese foreign exchange bank for the banking services based upon Banking Arrangement (B/A).

7. To exempt taxes and to take necessary measures for customs clearance of the equipment and materials brought for the Project at the port of disembarkation.

8. To accord Japanese nationals whose services may be required in connection with the supply of products and the services under the verified contract such facilities as may be necessary for their entry into the Philippines and stay therein for the performance of their work.

9. To maintain and use properly and effectively the facilities constructed and equipment purchased under the Grant.

10. To bear all the expenses other than those to be covered by the Grant Aid, necessary for the execution of the Project.

Minutes of Discussions:
Basic Design Study for
Rural Environmental Sanitation Project (Phase III)
in the Republic of the Philippines
(Consultation on Draft Report)

In February 1994, the Japan International Cooperation Agency (JICA) dispatched a Basic Design Study Team on Rural Environmental Sanitation Project (Phase III) (hereinafter referred to as "the Project") to the Republic of the Philippines, and through discussions, field surveys and technical examinations of the results in Japan, has prepared the draft report of the study.

In order to explain and to consult the Philippine side on the components of the draft report, JICA sent to the Philippines a study team, which is headed by Mr. Kei Jinnai, First Basic Design Study Division, Grant Aid Study and Design Department, JICA, from July 11 to 15, 1994.

As a result of discussions, both parties confirmed the main items described on the attached ANNEXES A and B.

Manila, July 15, 1994

Mr. Kei Jinnai
Leader,
Draft Report Explanation Team,
JICA

Mr. Teodoro T. Encarnacion
Undersecretary,
Department of Public Works and Highways

Dr. Manuel G. Roxas
Undersecretary,
Department of Health

ANNEX-A: Main Items Confirmed by the GOP and the Draft Report Explanation Team

1. Components of Draft Report

The Government of the Philippines has agreed and accepted in principle the components of the Draft Report prepared by the Basic Design Study Team.

2. Japan's Grant Aid System

(1) The Government of the Philippines has understood the system of Japanese Grant Aid.

(2) The Government of the Philippines will take the necessary measures, described in Annex-B, for smooth implementation of the Project on condition that the Grant Aid assistance by the Government of Japan is extended to the Project.

3. Further Schedule

The Basic Design Study Team will prepare the final report in accordance with the confirmed items, and send it to the Government of the Philippines by the end of August, 1994.

K. J.

ANNEX-B: Necessary Measures to be Taken by the Government of the Philippines in Case Japan's Grant Aid is Executed

1. To secure the right-of-way for pipeline construction, land area for the facilities and prospective water sources.

2. To clear, level and reclaim the site prior to commencement of the construction.

3. To construct the access road to the site, if necessary, prior to commencement of the construction.

4. To bear commissions to the Japanese foreign exchange bank for the banking services based upon the Banking Arrangement.

5. To exempt taxes and to take necessary measures for custom clearance of the equipment and materials brought for the Project at the port of disembarkation.

6. To accord Japanese nationals whose services may be required in connection with the supply of products and the services under the verified contract such facilities as may be necessary for their entry into the Philippines and stay therein for the performance of their work.

7. To maintain and use properly and effectively the facilities constructed and equipment purchased under the Grant.

8. To bear all the expenses other than those to be born by the Grant, necessary for the execution of the Project.

9. To secure approval from the Investment Coordinating Committee (ICC) whenever necessary as required under the GOP internal policy.

5. JOINT DEPARTMENT ORDER CREATING PROJECT COORDINATION COMMITTEE BY DPWH AND DOH AND COOPERATION AGREEMENT BY DOH AND DECS

Republic of the Philippines
Department of Public Works and Highways
PROJECT MANAGEMENT OFFICE FOR RURAL WATER SUPPLY

7 April 1994

MR. SENICHI KIMURA
Deputy Director
Second Basic Design Study Division
Grand Aid Study and Design Department
Japan International Cooperation Agency
P.O. Box No. 216, 45th floor
Shinjuku Mitsui Bldg.
1-1, Nishi-shinjuku 2-Chome
Shinjuku-ku, Tokyo, 163-04
Japan

SUBJECT: Rural Environmental Sanitation and Sanitation Project, Phase III

S i r :

This refers to the implementation of the proposed Rural Environmental and Sanitation Project (RESP III), please be informed of the following:

1. As in the previous project, RESP II, a joint Department Order was issued duly signed by the Secretaries of the two implementing agenices, DOH and DPWH, to ensure effective and efficient implementation of the said project. Under the proposed project, similar Joint Department Order will be issued after the signing of the Exchange of Notes between the Government of Japan and the Government of the Philippines.

2. GOP counterpart funds will be provided for administrative expenses; construction supervision, formation of BWSA and Skills Training.

3. Procurement of Materials, Equipment and Vehicles

   Our original proposal we intend that only 3 vehicles are proposed to be procured, 2 units for DPWH and 1 for DOH. During the Regional Consultation Meeting, the DPWH and DOH Regional Offices reiterated and expressed the dire need of service vehicle for use in the conduct of inspection during construction and periodic monitoring after completion of the project, in order to attain and improved the sustainability of the completed facilities. Hence, we would like to request for reconsideration that our original proposal from 3 units service vehicle be increase to 6 units, 3 for DOH and 3 for DPWH, per region.

Very truly yours,

ROGELIO A. FLORES
Project Director

6.18/VGG/ajb

OFFICE OF THE SECRETARY

OFFICE OF THE SECRETARY

Pmo #398
Pg. 31b

25 September 1989

JOINT DEPARTMENT ORDER)
NO: 02 - PW/H-cH)
Series of 1989)

SUBJECT: CREATION OF RURAL ENVIRONMENTAL SANITATION PROJECT COORDINATING COMMITTEE FOR THE IMPLEMENTATION OF THE RURAL ENVIRONMENTAL SANITATION PROJECT, PHASE II

x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x-x

To ensure effective and efficient implementation of the Rural Environmental Sanitation Project, Phase II (RESP II) financed under the grant-aid program of Japan International Cooperation Agency (JICA), a Rural Environmental Sanitation Project Coordinating Committee is hereby created.

The Committee shall be composed of the following:

DPWH, PMO-RWS, Project Director	-	Chairman
DOH, EHS Chief	-	Co-chairman
LWUA Representative (By Invitation)	-	Member
DLG Representative (By Invitation)	-	Member

RECEIVED BY: ... SERVICE
Date: OCT 13 1989
Time:

The Committee shall be responsible for the following:

a) Have over-all coordination with the JICA's representatives, consultants and contractors towards the implementation of the projects.

b) Formulate and exercise over-all direction in the planning and execution of the projects and the transfer of responsibilities to the beneficiaries upon completion of the same.

c) Perform other related activities as may be needed.

ALFREDO R. A. BENGZON
Secretary

FLORELLO R. ESTUAR
Secretary

17 January 1994

JOINT DEPARTMENT ORDER
NO. _____
Series of 1994

SUBJECT: CREATION OF RURAL ENVIRONMENTAL SANITATION PROJECT COORDINATING COMMITTEE FOR THE IMPLEMENTATION OF THE RURAL ENVIRONMENTAL SANITATION PROJECT, PHASE III

To ensure effective and efficient implementation of the Rural Environmental Sanitation Project, Phase III (RESP III) financed under the grant-aid program of Japan International Cooperation Agency (JICA), a Rural Environmental Sanitation Project Coordinating Committee is hereby created.

The committee shall be composed of the following:

DPWH, PMO-RWS, Project Director — Chairman

DOH, EHS (Director) — Co-Chairman

LWUA Representative (By Invitation) — Member

DILG Representative (By Invitation) — Member

The committee shall be responsible for the following:

a) Have over-all coordination with the JICA's representatives, consultants and contractors towards the implementation of the projects;

b) Formulate and exercise over-all direction in the planning and execution of the projects and the transfer of responsibilities to the beneficiaries upon completion of the same;

c) Perform other related activities as may be needed.

JUAN M. FLAVIER
Secretary
Department of Health

GREGORIO R. VIGILAR
Secretary
Department of Public Works & Highways

FD: DIR. ROGELIO FLORES
DFWIT
DRAFT

MEMORANDUM OF AGREEMENT

KNOW ALL MEN BY THESE PRESENTS:

This Memorandum of Agreement is entered into by and between: The DEPARTMENT OF HEALTH, a government agency duly organized and operating under Philippines Laws, with principal offices at San Lazaro Compound, Rizal Avenue, Sta. Cruz, Manila, represented by its Regional Health Offices, Dr. _____ hereinafter referred to as DOH: and the DEPARTMENT OF EDUCATION, CULTURE AND SPORTS, also a government agency organized and operating under Philippine Laws, with principal office at University of Life Complex, MERALCO Avenue, Pasig Metro Manila, represented by its District Superintendent, Mr/Mrs. _____ Division of _____ hereinafter referred to as DECS.

WITHNESSETH

WHEREAS, the Philippine Government has received a grant from the Japan International Coordinating Agency (hereinafter referred to as JICA), under the Rural Environmental Sanitation Project (Phase III) (hereinafter referred to as project).

WHEREAS, the DOH is the government agency principally tasked to implement the Sanitation Component of the project, through the Project Management Office at the Central and Field Operating Levels.

WHEREAS, the Project would provide the construction of _____ school toilet facilities in the province of _____.

WHEREAS, in the implementation of the JICA assisted project, the DOH, being the implementing agency for the construction of school toilet facilities must enter into agreement with the DECS for the joint health education campaign and training activity in the sanitation aspect of the project.

WHEREAS, the coordinative effort between the DOH and DECS is needed to effectively carry out the smooth transition of responsibilitie in the proper utilization and maintenance of school toilet facilities.

NOW THEREFORE, for and in consideration with the foregoing premises, the parties hereby agreed as follows:

TO: DIR. PEDELIO FLORES
DPWH

I. Responsibilities of the DOH

a. Provide assistance in the implementation of the project.

b. Provide orientation and to coordinate with DECS for the joint information campaign on health education and training activity in the proper utilization and maintenance of school toilet facilities.

c. Provide technical assistance to DECS needed in the repair and maintenance of school toilet facilities for the smooth operation of the system and provide reference materials (module) to DECS in the health education activity.

d. Monitor and evaluate the construction, installation, operation and maintenance and performance of school toilet facilities.

e. Advise the DECS on the selection of suitable sites for the construction of shcool toilet facilities.

II. Responsibilities of the DECS

a. The school authority shall allocate 60 sq. m. of lot within the school compound for the construction of RESP School Toilet.

b. As recipient of the project, the shcool shall operate, maintain and repair any defect caused by negligence/vandalism within a period of one week from the date the defect was observed.

c. In coordination with the DOH, the school will conduct health education activities to school children with emphasis on basic toilet habits, maintenance of clean toilet and personal hygiene practices.

d. The school shall initiate raising of funds for the operation and maintenance of RESP III School Toilet.

IN WITNESS WHEREOF, the parties have hereunto set their hands on this day of _____, _____.

DOH by: DECS by:

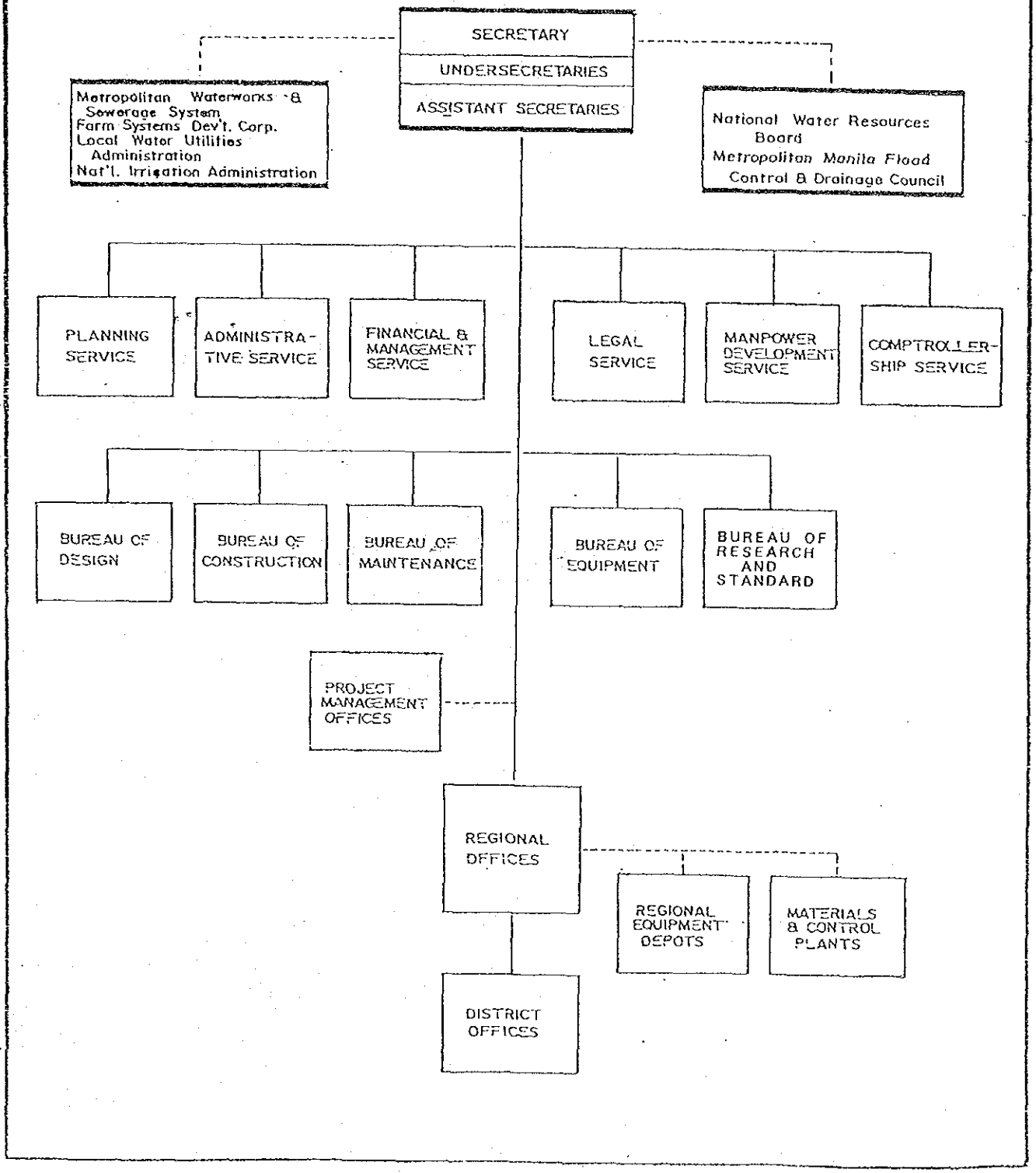
_____ _____

Signed in the presence of:

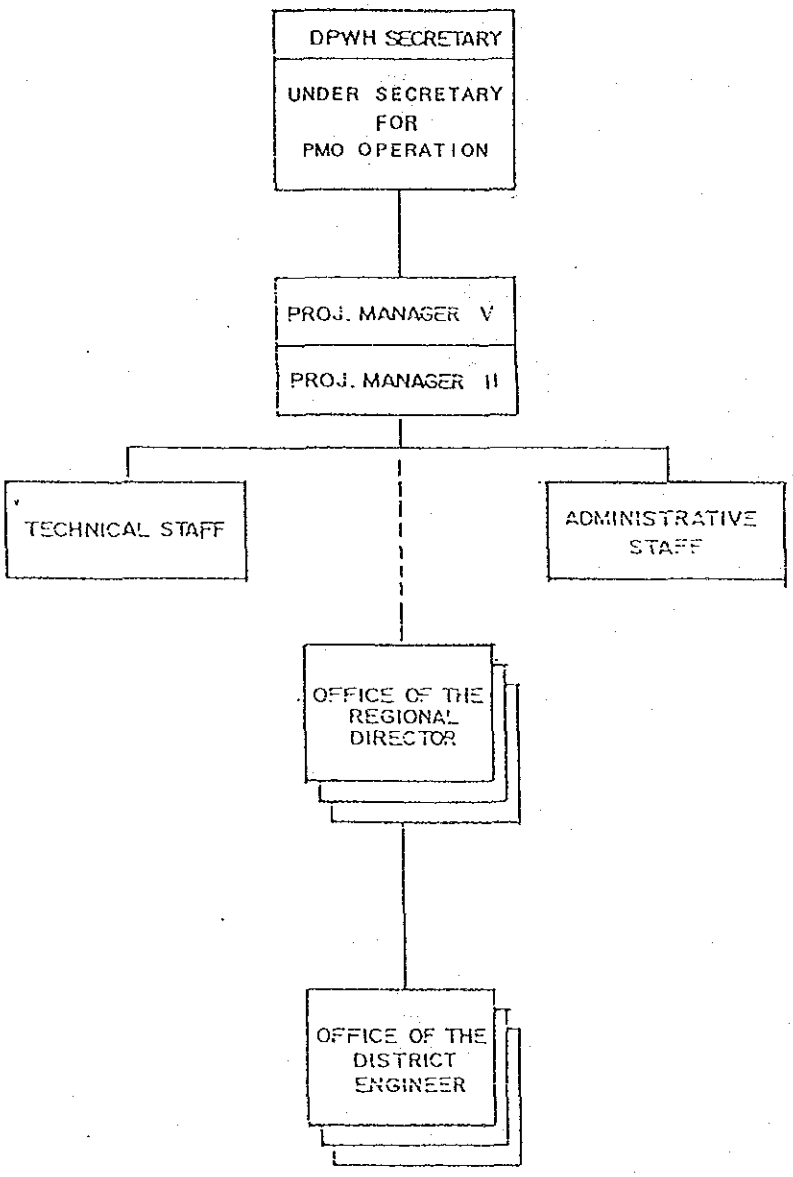
_____ _____

6. ORGANIZATION AND FUNCTIONAL CHARTS OF IMPLEMENTATION AGENCIES FOR THE PROJECT

DEPARTMENT OF PUBLIC WORKS AND HIGHWAYS
ORGANIZATIONAL CHART



PROJECT MANAGEMENT OFFICE FOR RURAL WATER SUPPLY ORGANIZATIONAL CHART



PROJECT MANAGEMENT OFFICE
FOR
RURAL WATER SUPPLY

FUNCTIONAL CHART

OFFICE OF THE PROJECT MANAGER

1. Exercise day-to-day planning and control of the execution of the Project.
2. Direct and supervise the preparation, review and execution of annual programs, budgets, plans, specifications, estimates, progress of work, tender documents, procurement of materials and equipment, construction works, contract payments, variation orders, and related matters concerning the Project; work for the approval thereof by the Office of the President, the Office of the Minister/Deputy Minister, the PHO-RWS, or the Regional and field offices, as the case may be, within the limits of their approving powers as provided by law and/or delegated by higher authorities.
3. Supervise for the Minister/Deputy Minister for Construction and Quality Control, field operations pertaining to the Project, thru the Regional, District, Provincial and other offices concerned.
4. Recommend or take remedial action to resolve problem areas in the implementation of the Project.
5. Assist in the negotiation of loans and grants for the Project.
6. Participate as member of the NPCB-Prequalifications, Bids and Awards Committee (PBAC) and provide technical assistance thereto, insofar as contracts pertaining to the Project are concerned.
7. Procure equipment, materials and supplies required for the Project and distribute them to the Regional and field offices, as authorized by the Minister.
8. Submit physical and financial progress and status reports on the Project to the Minister thru the Deputy Minister for Construction and Quality Control, and the financing institutions concerned.
9. Manage the disbursement of Project funds, including payments and loan/grant drawdowns, to suppliers/contractors as authorized by the Minister.
10. Recommend, for approval of the Minister/Deputy Minister for Construction and Quality Control, the hiring of personnel for the PHO-RWS.
11. Exercise such other functions as may be assigned by the Minister.

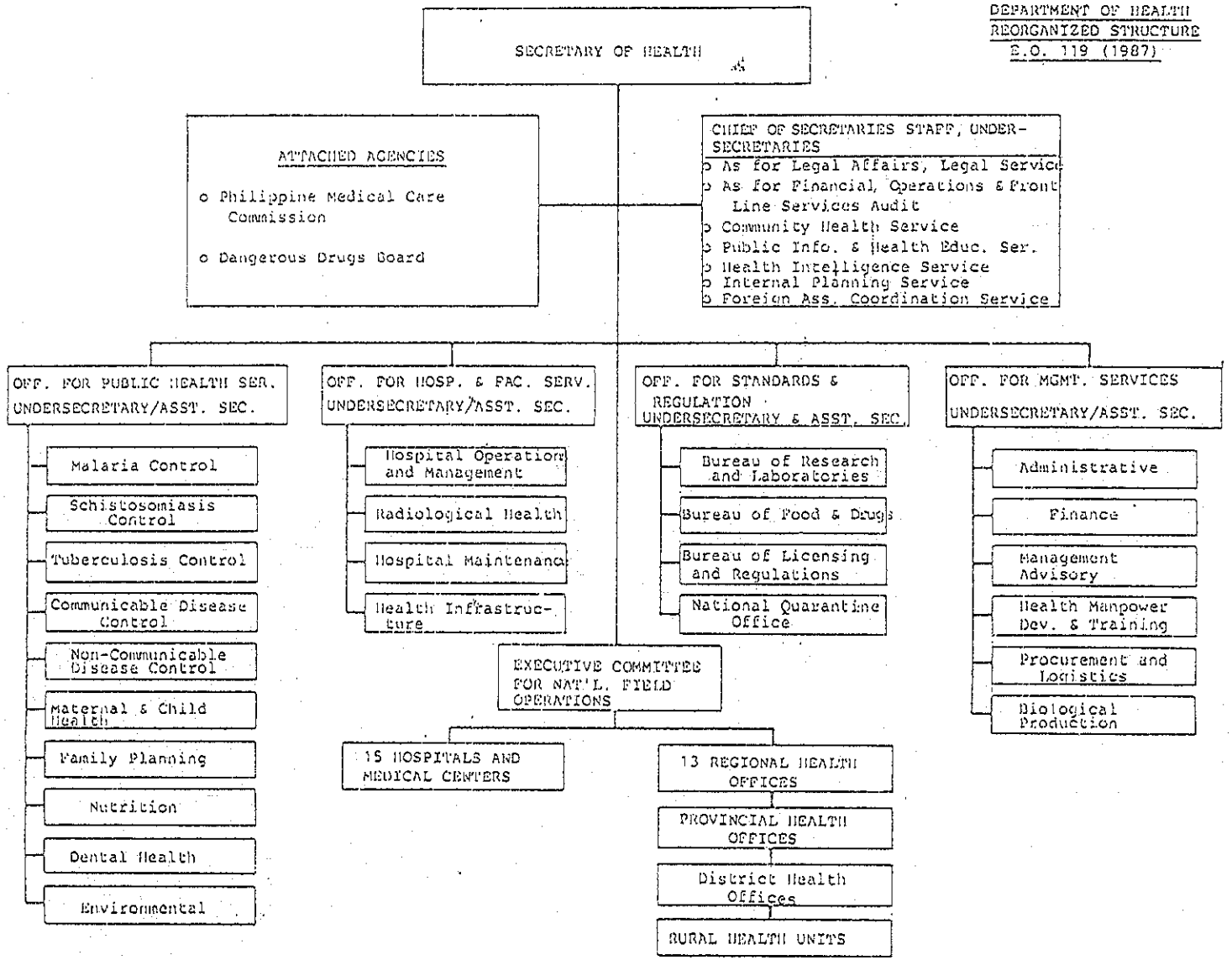
TECHNICAL STAFF

1. Develop standards and guidelines for planning, prioritizing, designing and programming facilities under the Project.
2. Identify, prioritize, initiate and coordinate the planning and development of facilities under the Project.
3. Undertake, initiate, coordinate and supervise surveys and preparation of plans, programs, specifications, estimates, and tender documents for the implementation of facilities under the Project.
4. Monitor and evaluate the progress of work under the Project.
5. Process, review and supervise requests for variation orders, contract time extension and suspension, claims for payments, and related matters concerning the Project.
6. Exercise technical supervision over the utilization and maintenance of drilling rigs and related equipment under the Project.
7. Undertake, coordinate and review materials testing and control activities for the Project.
8. Provide technical assistance in tendering and contract documentation.
9. Develop standards, specifications, criteria and guidelines for the construction of facilities under the Project.
10. Prepare, initiate, coordinate and review programs of work, contract documents, implementation schedules, procurement programs and related matters pertaining to the Project.
11. Supervise construction activities relative to the Project to ensure compliance with plans, specifications, estimates, programs of work and schedules.
12. Develop standards, specifications, criteria and guidelines for the operation, maintenance and repair of water supply systems completed under the Project.
13. Provide technical support in the operation, maintenance and repair of water supply systems under the Project.
14. Consolidate and analyze statistics on operation, maintenance, and repair of water supply systems.
15. Undertake, assist, coordinate, and supervise in water quality tests and analyses.
16. Conduct inspection of completed water supply systems to determine actual conditions and recommend appropriate measures pertinent to system management and operations.
17. Perform such other related functions as may be assigned by the Project Manager.

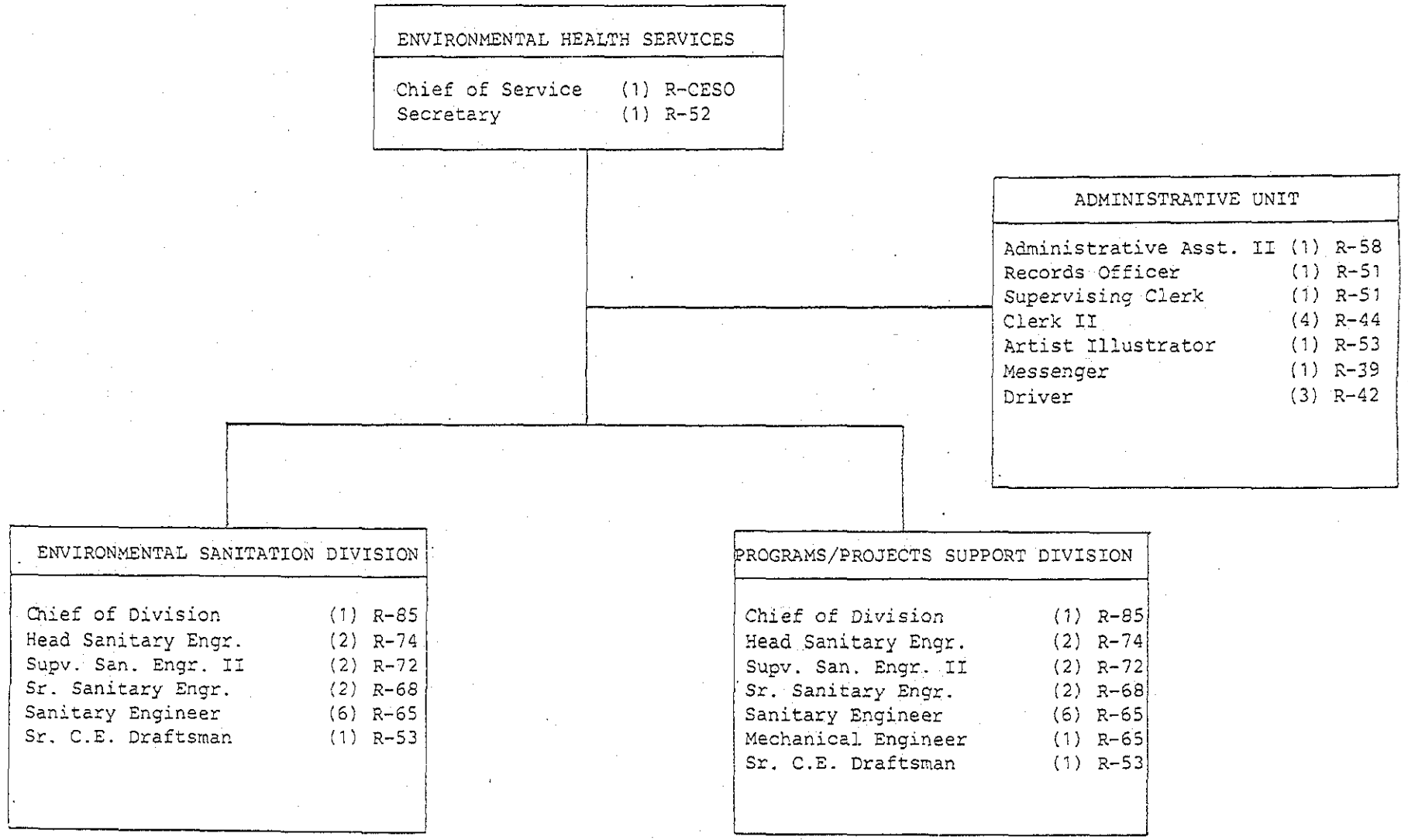
ADMINISTRATIVE STAFF

The Finance and Administrative Staff shall perform staff functions relative to personnel, property, supply, budget, accounting, cashiering and general services for the Project.

ORGANIZATION CHART OF DOH



STAFFING PATTERN OF ENVIRONMENTAL HEALTH SERVICES,DOH



RESPONSIBILITY OF ENVIRONMENTAL HEALTH SERVICES, DOH

FUNCTIONS OF THE ENVIRONMENTAL HEALTH SERVICES

The Environmental Health Services is charged with formulation of plans, programs, policies, operating standards and techniques for Environmental Health and Sanitation; it also provides consultative and advisory services and training to implementing agencies; monitors and evaluates E.H. programs and projects and develops/conducts researches and special projects in environmental health.

ENVIRONMENTAL SANITATION DIVISION

I. Plans/Programs Development:

1. Develop long term, medium terms and annual national plans and programs for Environmental Sanitation on the following areas of concern: -

   a. Water Supply Sanitation
   b. Excreta & Sewage Collection & Disposal
   c. Food Sanitation
   d. Solid Waste Management
   e. Insect and Rodent Control
   f. Slaughterhouses and Market Sanitation
   g. Public Places Sanitation

      - Public Land Transports and Terminals
      - Swimming and Bathing Places
      - Hotels and Lodging Places
      - Recreational Establishments
      - Tensorial and Beauty Establishments
      - Funeral Parlors & Embalming Establishments

   h. School Sanitation
   i. Housing Sanitation

2. Provide technical, consultative and advisory services to upper and lower level units and agencies relative to Environmental Sanitation Services.

PROGRAMS/PROJECTS SUPPORT DIVISION

1. Project development related to Environmental Health.
2. Conduct studies of existing condition of the environment and develop relevant projects to improve such conditions.
3. Formulate policies, standards, guidelines for effective implementation of Environmental Sanitation program.
4. Formulate implementing rules and regulations based on the Sanitation Code of the Philippines.
5. Promote and strengthen the enforcement mechanisms of the rules and regulations.
6. Monitor and evaluate progress implementation of programs and projects.
7. Develop training programs of environmental health personnel at all levels.
8. Develop IEC materials on E.H. for dissemination at all levels.
9. Establish intra and inter coordination and cooperation with related government agencies and NGOs.
10. Recommend projects for funding and logistic support from international, bilateral agencies and GOP.