# 7. WATER SOURCE DEVELOPMENT

## 7.3 Groundwater Sources

### 7.3.2 Groundwater Availability in the Province

(1) Major Information and References

The Groundwater Availability Map was prepared using the following information and reference (detailed list of reference is presented in Table 7.1.2, Data Report):

- Administrative and Topographical Maps of the Province published by NAMRIA with scales of 1:250,000 and 1:50,000, respectively.
- Geological Map of the Philippines published by BMGS with a scale of 1:1,000,000.
- Water Resource Investigation conducted by NWRB, 1986.
- Well Inventory Database prepared by NWRB, LWUA and DPWH.
- Well Inventory Database in the province.
- General information on groundwater condition by DPWH-DEO and PPDO.
- Well Log Data by DPWH-DEO and PEO.
- Water source information by Water Districts.

(2) Approach and Methodology

The procedure in preparing the Groundwater Availability Map is explained below with workflow depicted in Figure 7.3.1.

1) Prepare a base map with an approximate scale of 1:450,000 (fit to the A4 map size). The topographical map of NAMRIA (1:250,000) was used as a reference map. Basic information including rivers and provincial and municipal boundaries are indicated in the prepared base map.

2) The groundwater potential areas, based on the geology of the province, are delineated on the base map. The Recent alluvial and/or beach deposits, Pliocene-Quaternary sedimentary formation (clay, silt, sand and gravel) and Pliocene-Quaternary volcanic rock units (pyroclastics, debris flow and tuff) are regarded as possible aquifers considering their high porosity and permeability.

Boundaries between groundwater development potential area and difficult area were defined and delineated as presented in Figure 7.3.1, Main Report.

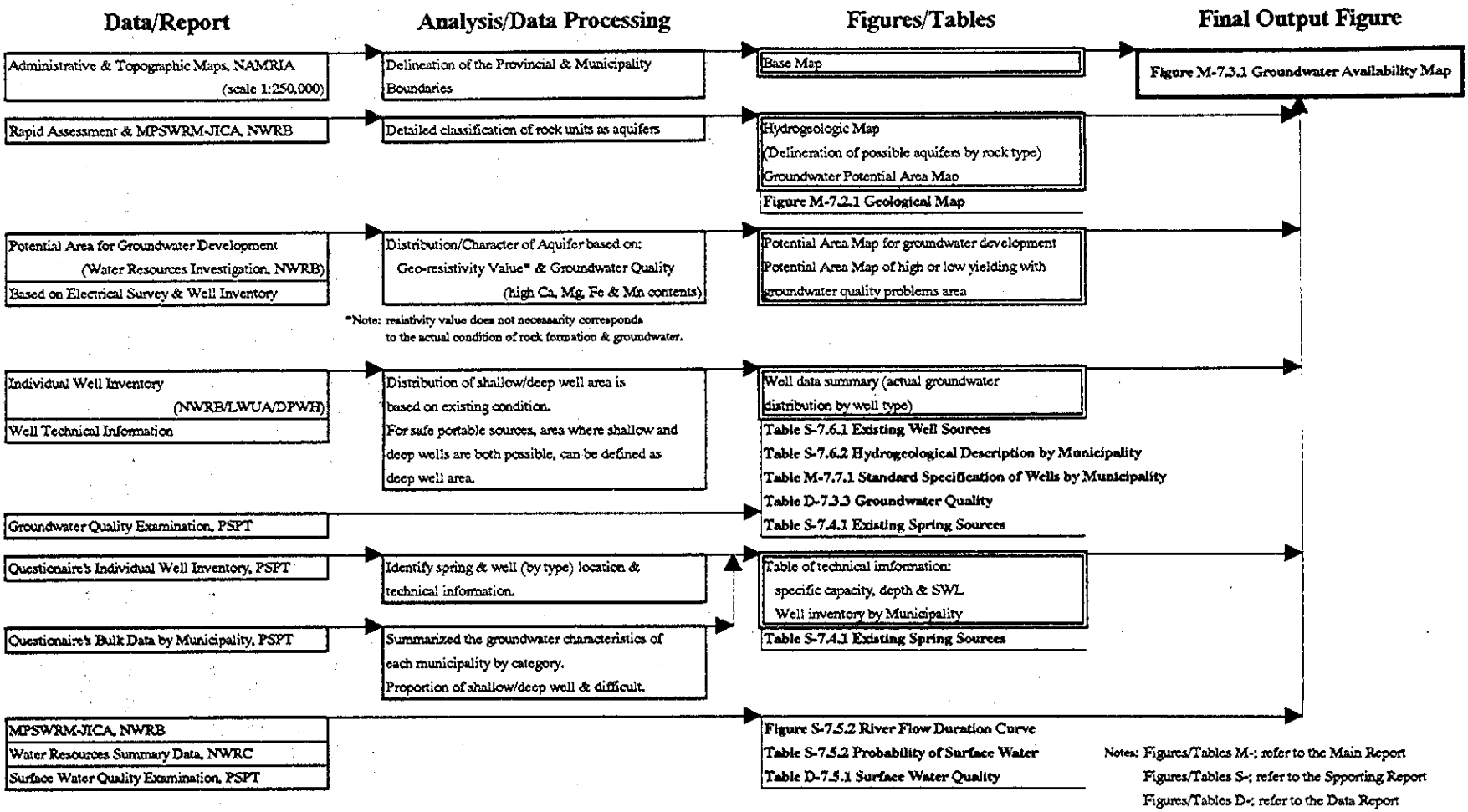



**Figure 7.3.1 Workflow of Groundwater Availability Map**

3) Areas with potential high yielding aquifer in the Water Resources Investigation of NWRB, are reflected in the defined groundwater potential areas.

Based on the results of electric resistivity survey of the above investigation, resistivity values from 20 to 210 ohm-meter indicate a potential high yielding formation. Values less than 10 ohm-meter suggest clayey layer. Figure 7.3.1, Main Report, shows the boundaries of areas with high and low yielding aquifers.

4) Delineate shallow and deep well areas based on well database of NWRB and DPWH central office, well inventory of DPWH-DEO and rock distribution. Figure 7.3.2 presents the categorization in terms of groundwater utilization.

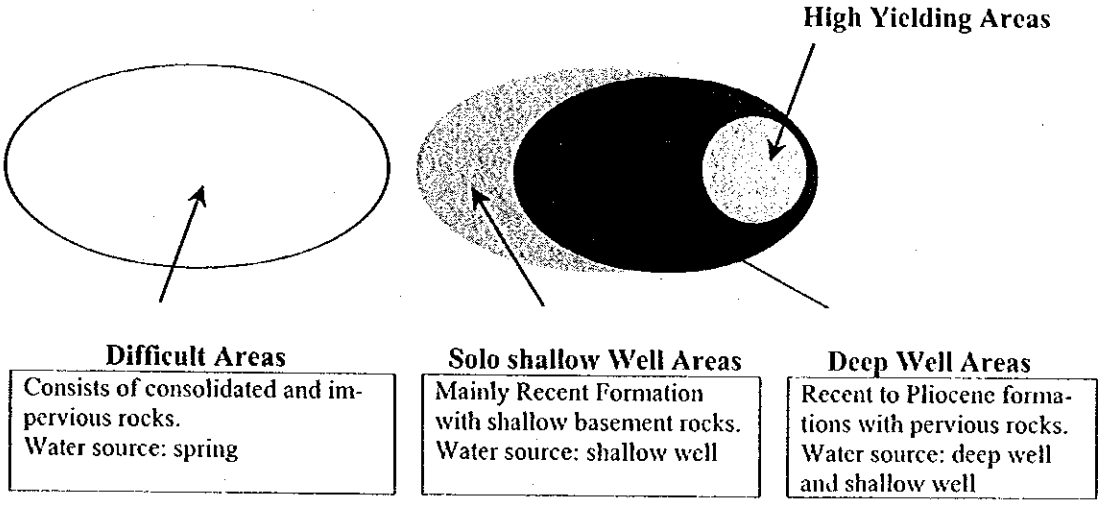



**Figure 7.3.2 Area Category by Groundwater Utilization**

Solo shallow well areas are defined on the following basis:

(a) Predominance of serviceable shallow wells and presence of deep wells with water quality problem and/or low yielding aquifers.

(b) Occurrence of impervious rocks beneath the Recent formation at shallow depth.

5) Based on the information provided by NWRB's well inventory and the data obtained through the questionnaires, well specification for each municipality is established as shown in the map. These specifications are used as references in evaluating the groundwater availability in each locality. Individual well locations with technical information are presented in Figure 7.6.1, Data Report.

(3) Future Updating and Utilization of the Map

For future updating of the map, the following procedure shall be employed.

1) Referring to the results of any supplementary water sources investigation by various agencies, re-define the potential area for groundwater development by applying the aforementioned procedures.

2) Update the provincial database using the questionnaire made for the study to make necessary revision of the delineated boundaries of groundwater categories.

## 7.4 Spring Sources

The numbers and discharge of developed and untapped springs by municipality are shown in Table 7.4.1. It is noted in the column of untapped spring that only range of discharge rates is shown, due to limited data available. The data are derived from the questionnaires and Table 7.1.1 Water Source Information, Data Report.

**Table 7.4.1 Existing Spring Sources**

| Municipality/City | No. of Developed Spring | | | Untapped Spring | | |
|---|---|---|---|---|---|---|
| | Q: NA | Data Available | | Q: NA | Data Available | |
| | | Q<2 lps | Q>2 lps | | No. | Range lps |
| Altavas | 3 | 1 | 3 | 0 | 4 | 0.5 ~ 3.0 |
| Balete | 1 | 3 | 0 | 0 | 2 | 0.6 ~ 1.0 |
| Banga | 0 | 5 | 0 | 0 | 8 | 0.1 ~ 0.2 |
| Batan | 0 | 4 | 0 | 0 | 0 | - ~ - |
| Buruanga | 18 | 0 | 0 | 14 | 0 | - ~ - |
| Ibajay | 58 | 0 | 9 | 0 | 9 | 2.0 ~ 4.5 |
| Kalibo | 0 | 0 | 0 | 0 | 0 | - ~ - |
| Lezo | 0 | 0 | 0 | 0 | 0 | - ~ - |
| Libacao | 49 | 5 | 0 | 0 | 0 | - ~ - |
| Madalag | 14 | 0 | 3 | 0 | 0 | - ~ - |
| Makato | 6 | 2 | 1 | 0 | 0 | - ~ - |
| Malay | 6 | 0 | 6 | 0 | 2 | 5.0 ~ 5.0 |
| Malinao | 6 | 6 | 0 | 0 | 3 | 1.0 ~ 1.5 |
| Nabas | 21 | 0 | 5 | 0 | 0 | - ~ - |
| New Washington | 0 | 0 | 0 | 0 | 0 | - ~ - |
| Numancia | 0 | 0 | 0 | 0 | 0 | - ~ - |
| Tangalan | 9 | 6 | 0 | 0 | 0 | - ~ - |

Note: Q: NA; number of springs with no discharge rate data available at present,
lps; liter/second, Range; minimum and maximum discharge rates among springs with available data

## 7.5 Surface Water Sources

The major rivers in the province were selected to evaluate their potential as water supply sources to meet the future water needs of the province. The following criteria were adopted for the selection:

- rivers currently utilized for domestic water supply,
- rivers which have gauging stations and
- rivers with watershed of 100 $km^2$ or more.

Based on the above criteria, the selected major rivers are Malay, Ibajay, Tangalan, Aklan and Hal-o Rivers. Malinao, Kinalanga, Timbaban, Dumalaylay and Dit-ana Rivers are tributaries of the major rivers as shown in Figure 7.5.1 River Network Map.

The gauging stations in the province are located at Tangalan and Aklan Rivers, which are shown in Figure 7.5.1. The runoff records are obtained from the "Philippine Water Resources Summary Data" prepared by the NWRC in 1980. The information on the gauging stations and the present uses (water rights) of the major rivers in the province is summarized in Table 7.5.1.

(1) Surface Water Utilization/Water Rights

As seen in Table 7.5.1, the present water uses in the watershed of the major rivers total to 17.6 $m^3$/sec. The diversions for major flume, which are operated by NIA, are located at Ibajay, the Ibajay River; and at Banga, the Aklan River, respectively. Mining sites are located in the mountainous area. Most of them are located in Nabas and Tangalan as shown in the Figure 7.5.1.

(2) River Flow Analysis

The flow duration curves, derived from the available runoff records, are shown in Figure 7.5.2. The river flow, maintenance flow, diversion flow and return flow are usually used to estimate the exploitable surface water potential. In this study, the river flow was considered as the flow potential for domestic use and the diversion flow value was treated as the equivalent to the discharge of water rights registration in surface water use. No detailed study on the return flow has been performed yet due to the difficulties in investigating the irrigation, evapotranspiration and recharge value to groundwater, etc. within the entire watersheds in the province. Therefore, the return flow was not considered for the estimation of exploitable potential.

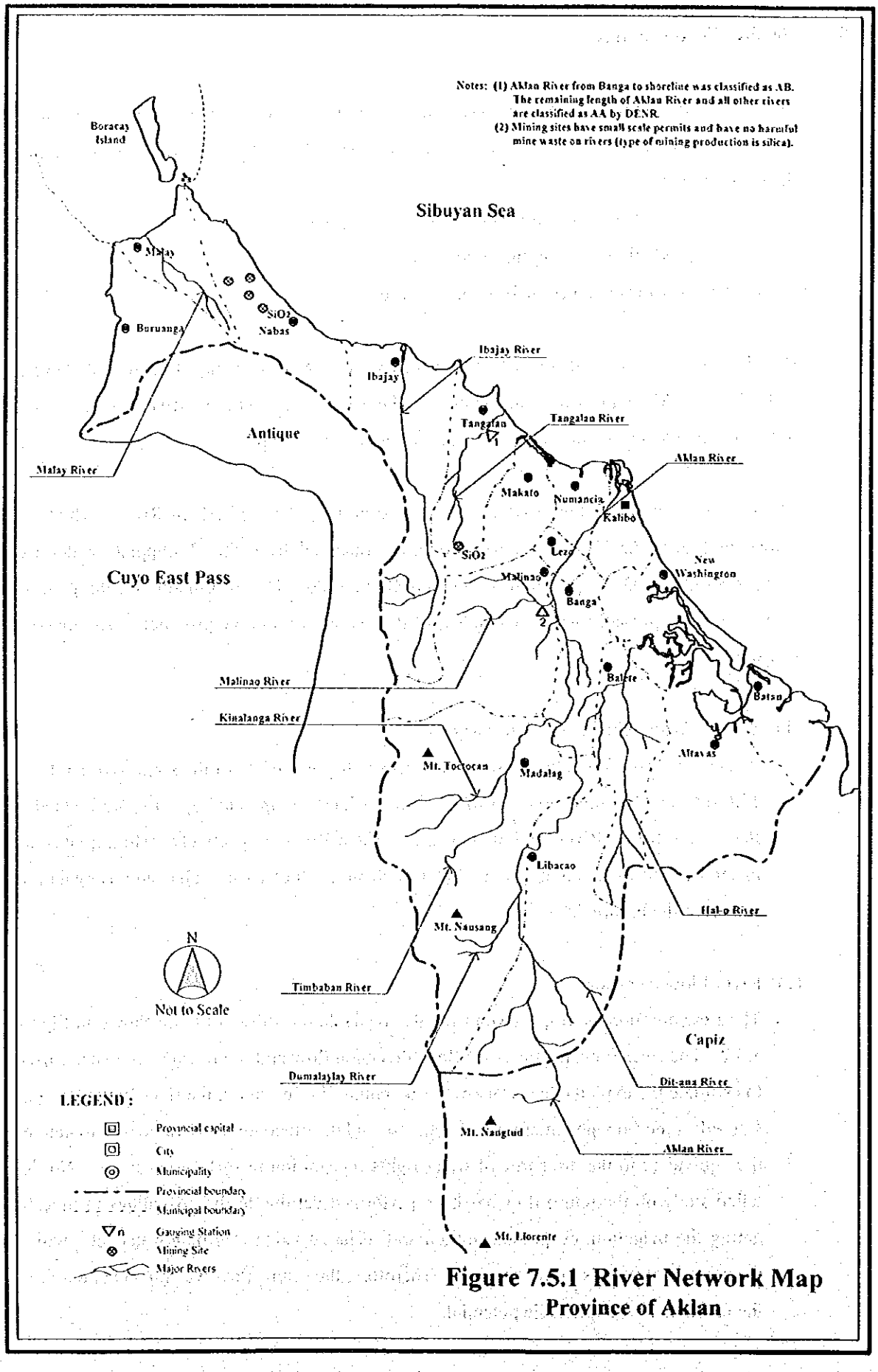



**Figure 7.5.1 River Network Map**
**Province of Aklan**

## Table 7.5.1 Gauging Station & River Water Use by Major River Basins

| River Basin | | Information from Gauging Station | | | | | | Surface Water Use (Water Rights) in Watershed | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Major River | Stream & Main Systems | Drainage*1 sq.km | Location No. in Figure 7.5.1 | River Flow Rate (Q: cum/sec) Peak $Q_p$ | Max. $Q_{dx}$ | Min. $Q_{dn}$ | Data Period | Municipality in watershed | Domestic cum/sec | Industrial cum/sec | Irrigation cum/sec | Others*3 cum/sec |
| Malay | | Gauging station is not existed in watershed. | | | | | | Malay | 0.12 | - | 0.08 | 0.01 |
| Ibajay | | Gauging station is not existed in watershed. | | | | | | Ibajay | - | - | 2.45 | 0.01 |
| Tangalan | | 38 | (1); Panayakan | 510.4 | 218.9 | 0.1 | 1958-70 | Tangalan | - | - | 0.52 | 0.02 |
| Aklan | Dit-ana | Gauging station is not existed in watershed. | | | | | | Libacao | - | - | - | - |
| | Dumalaylay | Gauging station is not existed in watershed. | | | | | | Madalag | - | - | - | - |
| | Kinalanga | Gauging station is not existed in watershed. | | | | | | Madalag | - | - | - | - |
| | | | | | | | | Banga | - | - | - | - |
| | Malinao | 705 | (2); Rosario | 4,104.0 | 1,503.0 | 9.2 | 1950-70 | Malinao | - | - | 0.43 | - |
| | | | | | | | | Banga | - | - | - | - |
| | Main | Gauging station is not existed in watershed. | | | | | | (Province of Capiz)*5 | - | - | - | - |
| | | | | | | | | Libacao | - | - | 0.15 | - |
| | | | | | | | | Madalag | - | - | 0.15 | - |
| | | | | | | | | Banga | - | - | 11.61 | - |
| | | | | | | | | Lezo | NR*4 | NR*4 | NR*4 | NR*4 |
| | | | | | | | | Numancia | - | - | - | 0.02 |
| | | | | | | | | Kalibo | NR*4 | NR*4 | NR*4 | NR*4 |
| Hal-o | | Gauging station is not existed in watershed. | | | | | | Libacao | - | - | - | - |
| | | | | | | | | Banga | - | - | - | - |
| | | | | | | | | Balete | - | - | 0.52 | - |
| | | | | | | | | Altavas | - | - | 0.11 | 0.02 |

Source; Philippine Water Resources Summary Data, established January 1980 by NWRC

Notes; Drainage*1 : Watershed Area at Gauging Station
NA*2 : Recorded River Gauge Hight only
Others*3 : Including Livestock, Recreation & Fisheries
NR*4 : Surface water utilization was not registered in NWRB Database, as of March 1997.
(Province)*5 : Out of Applicable Area

$Q_p$ : Peak Discharge of Daily Maximum Discharge
$Q_{dx}$ : Maximum Daily Discharge of Weighted Daily Discharge
$Q_{dn}$ : Minimum Daily Discharge of Weighted Daily Discharge

| Percent of Time (%) (No. in Figure 7.5.1) | Specific Discharge (cum/sec/100sq.km) | |
|---|---|---|
| | Tangalan 1 | Aklan 2 |
| 10% | 16.54 | 24.98 |
| 20% | 9.05 | 18.37 |
| 30% | 5.95 | 15.95 |
| 40% | 4.26 | 13.42 |
| 50% | 3.71 | 11.77 |
| 60% | 2.79 | 10.21 |
| 70% | 1.97 | 8.57 |
| 80% | 1.23 | 7.02 |
| 90% | 0.76 | 5.08 |
| 100% | 0.32 | 1.39 |
| Data Period | 1958-'70 | 1950-'70 |

Source; Philippine Water Resources Summary Data, as of Jan. 1980 by NWRC
Interim Report, Master Plan Study on Water Resources Management, as of Oct. 1997 by NWRB

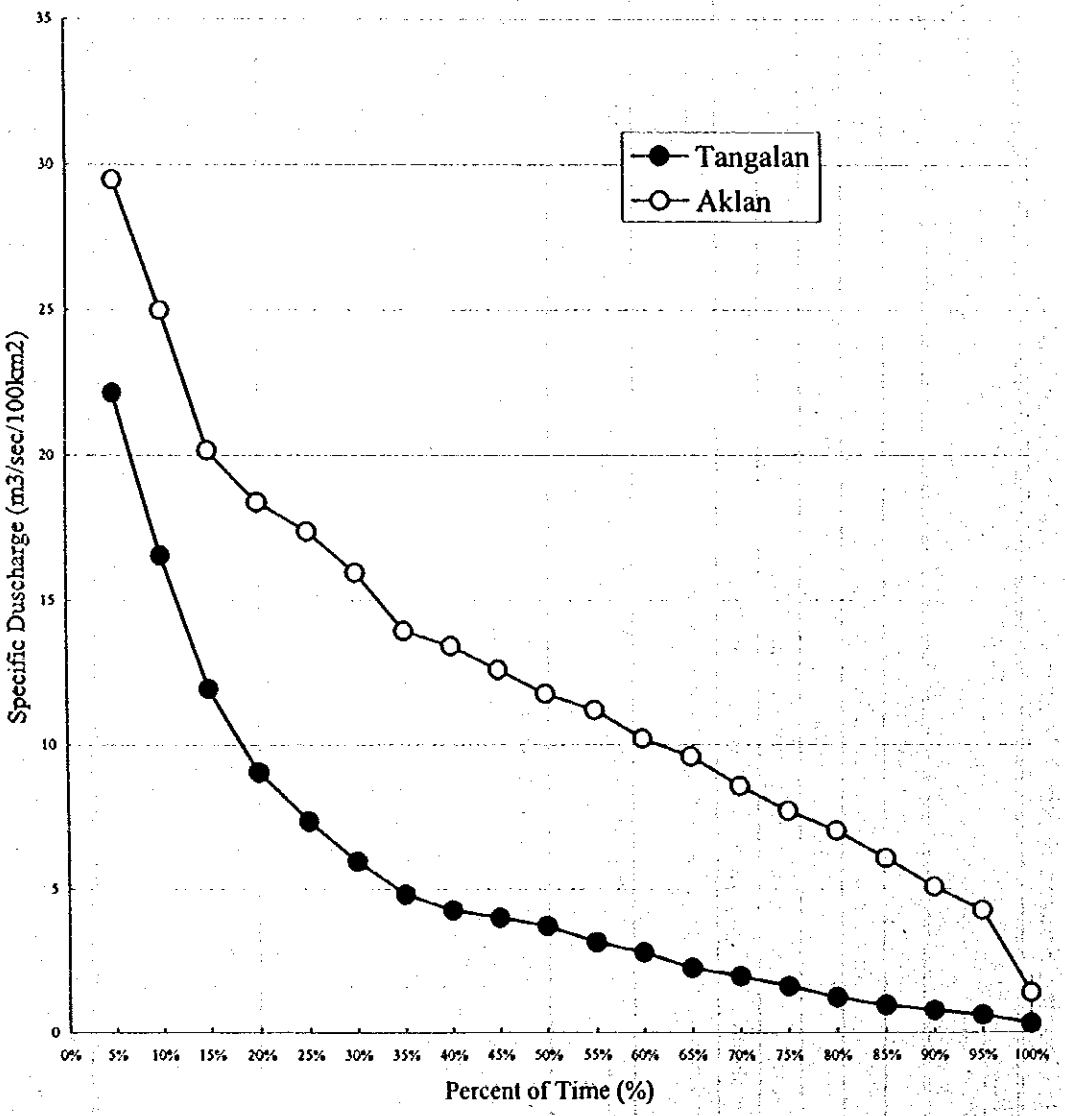



**Figure 7.5.2 River Flow Duration Curve**

It is generally accepted that to secure the required volume for water supply, each water use sector adopts the different return periods. Usually, the dependability of domestic water supply is taken to be 90% or higher (10-year or longer return-period) of the whole hydrological period.

In determining the river maintenance flow, such factors as runoff characteristics, navigation, fishing, picturesque scenery, salt water intrusion, clogging of river mouth, riparian structures, groundwater table, flora and fauna, and river water quality shall be considered to maintain the normal function of the river. In the Philippines, 10% of the dependable flow of the river is required as minimum maintenance flow. Therefore, the maintenance flow was calculated as the dependable flow for irrigation, which equals to 80% (5-year return-period) of the whole hydrological period.

Finally, the exploitable potential of surface water in the province was studied in the case of inflow to and outflow from the respective municipalities. The results are summarized in Table 7.5.2.

(3) Surface Water Quality

Mining sites are located in upstream area of the Tangalan River and in watershed of Molada River at eastern neighboring of Malay River, locations of which are shown in Figure 7.5.1. Major mining product is silica (silica minerals: $SiO_2$ and $SiO_4$ for silica glass) and it is necessary to use hydrogen fluoride for the processing of silica glass. However, their activities are minimal and these operations cause no discharge of harmful mine waste to the rivers, according to the hearing information obtained from the Regional DENR and the PEO's officials.

The results of water quality analysis are summarized in Table 7.5.1, Data Report. The sampling locations were selected upstream of the respective municipalities. In the said table, Class AA and Class A of the DENR "Water Quality Criteria for Fresh Water" are shown as reference for raw water evaluation. The PNSDW-1994 is also used to evaluate water quality with reference to turbidity and trace elements. The water quality of the selected rivers falls on the Class "AA" standard, although the parameters tested are limited. According to the river water classification conducted by the Regional DENR, Aklan River from Banga to shoreline is classified as the Class "AB", while the remaining span of Aklan River and other all rivers are regarded as the Class "AA".

## Table 7.5.2 Probability of Surface Water

| Surface Water Sources | | Related Data | | | | | | Probability of Surface Water (10-year returen-period) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Watershed Area in | | Sp. D (return-period) | | Inlet Flow to Municipality | | | | Outlet Flow from Municipality | | | |
| Major River Water | System & Main | Location Municipality & other Province | River Connection | Location (1) | Upstream (2) | 10-year (3) | 5-year (4) | S/Flow (5) (2)x(3)/100 | M/Flow (6) (2)x(4)/100x10% | Use (7) | Potential (8) (5)-(6)-(7) | S/Flow (9) (5)+(1)x(3)/100 | M/Flow (10) (8)+(1)x(4)/100x10% | Use (11) | Potential (12) (9)-(10)-(11) |
| | | upstream to down | outlet/inlet | sq.km | sq.km | Q | Q | cu.m/sec | cu.m/sec | cu.m/sec | cu.m/sec | cu.m/sec | cu.m/sec | cu.m/sec | cu.m/sec |
| Malay | | Malay | | 64.97 | 0.00 | 0.76 | 1.23 | 0.00 | 0.00 | 0.00 | **0.00** | 0.50 | 0.08 | 0.20 | **0.22** |
| Ibajay | | Ibajay | | 105.48 | 0.00 | 0.76 | 1.23 | 0.00 | 0.00 | 0.00 | **0.00** | 0.80 | 0.13 | 0.63 | **0.05** |
| Tangalan | | Tangalan | | 70.02 | 0.00 | 0.76 | 1.23 | 0.00 | 0.00 | 0.00 | **0.00** | 0.53 | 0.09 | 0.25 | **0.20** |
| Aklan | Dit-ana | Libacao | to Main | 94.08 | 0.00 | 5.08 | 7.02 | 0.00 | 0.00 | 0.00 | **0.00** | 4.77 | 0.66 | 0.00 | **4.11** |
| | Dumalaylay | Madalag | to Main | 35.16 | 0.00 | 5.08 | 7.02 | 0.00 | 0.00 | 0.00 | **0.00** | 1.78 | 0.25 | 0.00 | **1.54** |
| | Kinalanga | Madalag | | 164.08 | 0.00 | 5.08 | 7.02 | 0.00 | 0.00 | 0.00 | **0.00** | 8.33 | 1.15 | 0.00 | **7.18** |
| | | Banga | to Main | 1.61 | 164.08 | 5.08 | 7.02 | 8.33 | 1.15 | 0.00 | **7.18** | 8.41 | 1.16 | 0.00 | **7.25** |
| | Malinao | Malinao | | 68.36 | 0.00 | 5.08 | 7.02 | 0.00 | 0.00 | 0.00 | **0.00** | 3.47 | 0.48 | 0.43 | **2.56** |
| | | Banga | to Main | 1.61 | 68.36 | 5.08 | 7.02 | 3.47 | 0.48 | 0.43 | **2.56** | 3.55 | 0.49 | 0.43 | **2.63** |
| | Main | Libacao | from Dit-ana | 188.16 | 76.49 | 5.08 | 7.02 | 3.88 | 0.54 | 0.00 | **3.35** | 13.43 | 1.86 | 0.00 | **11.57** |
| | | Madalag | from Dumalaylay | 23.44 | 358.73 | 5.08 | 7.02 | 18.21 | 2.52 | 0.00 | **15.69** | 19.40 | 2.68 | 0.15 | **16.56** |
| | | Banga | from Kinalanga & Malinao | 62.95 | 417.33 | 5.08 | 7.02 | 21.18 | 2.93 | 0.15 | **18.10** | 24.38 | 3.37 | 0.30 | **20.70** |
| | | Lezo | | 23.40 | 715.94 | 5.08 | 7.02 | 36.34 | 5.02 | 0.73 | **30.58** | 37.52 | 5.19 | 12.34 | **19.99** |
| | | Numancia | | 10.40 | 739.34 | 5.08 | 7.02 | 37.52 | 5.19 | 12.34 | **19.99** | 38.05 | 5.26 | 12.34 | **20.45** |
| | | Kalibo | | 13.86 | 749.74 | 5.08 | 7.02 | 38.05 | 5.26 | 12.34 | **20.45** | 38.75 | 5.36 | 12.34 | **21.06** |
| Hal-o | | Libacao | | 31.36 | 0.00 | 5.08 | 7.02 | 0.00 | 0.00 | 0.00 | **0.00** | 1.59 | 0.22 | 0.00 | **1.37** |
| | | Banga | | 1.45 | 31.36 | 5.08 | 7.02 | 1.59 | 0.22 | 0.00 | **1.37** | 1.67 | 0.23 | 0.00 | **1.43** |
| | | Balete | | 127.60 | 32.81 | 5.08 | 7.02 | 1.67 | 0.23 | 0.00 | **1.43** | 8.14 | 1.13 | 0.52 | **6.50** |
| | | Altavas | | 3.28 | 160.41 | 5.08 | 7.02 | 8.14 | 1.13 | 0.52 | **6.50** | 8.31 | 1.15 | 0.65 | **6.51** |

Notes; Sp. D (Specific Discharge) was analyzed by montly mean flow records from gauging station.
S/Flow (Stream Flow) was estimated specific diacharge (10-year return-period) multilied by upstream area.
M/Flow (Maintenance Flow) was estimated 10% of river flow in case of 5-year return-period.
Sp.D (10-year or 5-year return-period) without gauging station was adopted by the other analysis result from near gauging station.
Inlet & outlet "Use" (Water Rights) are summed up by NWRB Database, as of March 1997.
Unit Q for Specific Discharge is cu.m/sec/100 sq.km.
S/Flow, M/Flow & Use in final outlet flow of each stream system was added to respective inlet flows' of main system.

## 7.6 Future Development Potential of Water Sources

### (1) Groundwater

A well inventory covering all the municipalities shows that there are 15,377 existing wells in the province, while 297 wells are recorded in the inventory prepared by PSPT (See Table 7.1.1 and 7.3.1, Data Report). Despite the smaller number of wells included in the PSPT data, these were used in the analysis in provision of technical information. Of the total 297 wells, 283 wells have complete information: depth, static water level and specific capacity. Data are summarized in Table 7.6.1 Existing Well Sources.

**Table 7.6.1 Existing Well Sources**

| Municipality/ City | Type | No. | Depth (m) | | SWL (mbgs) | | Sp. Cap. (lpsm) | |
|---|---|---|---|---|---|---|---|---|
| | | | Ave | Range | Ave | Range | Ave | Range |
| Altavas | DW | 2 | 26.5 | 20.0 - 33.0 | 15.0 | 15.0 - 15.0 | 0.20 | 0.20 - 0.20 |
| | SW | 11 | 10.4 | 6.0 - 18.0 | 8.0 | 4.0 - 13.0 | 0.20 | 0.20 - 0.20 |
| Balete | DW | 0 | | - | | - | | - |
| | SW | 6 | 11.1 | 9.1 - 12.0 | - | - - - | 0.29 | 0.20 - 0.75 |
| Banga | DW | 0 | | - | | - | | - |
| | SW | 30 | 6.0 | 5.0 - 7.3 | 3.0 | 3.0 - 3.0 | 0.22 | 0.20 - 0.72 |
| Batan | DW | 2 | 20.0 | 20.0 - 20.0 | 1.0 | 1.0 - 1.0 | 0.20 | 0.20 - 0.20 |
| | SW | 18 | 8.6 | 5.5 - 15.0 | 1.3 | 1.0 - 5.0 | 0.20 | 0.20 - 0.20 |
| Buruanga | DW | 0 | | - | | - | | - |
| | SW | 13 | 8.1 | 3.0 - 15.0 | 4.1 | 1.5 - 14.0 | 0.20 | 0.20 - 0.20 |
| Ibajay | DW | 0 | | - | | - | | - |
| | SW | 29 | 9.1 | 5.4 - 18.3 | 3.0 | 1.2 - 8.8 | 1.17 | 0.20 - 28.24 |
| Kalibo | DW | 0 | | - | | - | | - |
| | SW | 16 | 6.4 | 6.0 - 9.0 | 4.1 | 3.0 - 5.0 | 0.20 | 0.20 - 0.20 |
| Lezo | DW | 0 | | - | | - | | - |
| | SW | 12 | 8.8 | 3.0 - 12.0 | 6.9 | 2.5 - 10.0 | 0.20 | 0.20 - 0.20 |
| Libacao | DW | 0 | | - | | - | | - |
| | SW | 16 | 11.5 | 6.7 - 18.0 | 3.6 | 2.5 - 5.4 | 0.20 | 0.20 - 0.20 |
| Madalag | DW | 5 | 35.4 | 20.0 - 56.1 | 18.0 | 18.0 - 18.0 | 0.12 | 0.06 - 0.22 |
| | SW | 19 | 10.9 | 6.1 - 18.3 | 9.9 | 4.9 - 16.5 | 0.09 | 0.06 - 0.17 |
| Makato | DW | 0 | | - | | - | | - |
| | SW | 18 | 8.3 | 4.0 - 18.0 | 3.6 | 2.0 - 6.0 | 0.20 | 0.20 - 0.20 |
| Malay | DW | 0 | | - | | - | | - |
| | SW | 15 | 6.0 | 6.0 - 6.0 | 4.9 | 3.0 - 5.0 | 0.20 | 0.20 - 0.20 |

**Table 7.6.1 Existing Well Sources**

(cont'd)

| Municipality/ City | Type | No. | Depth (m) | | SWL (mbgs) | | Sp. Cap. (lpsm) | |
|---|---|---|---|---|---|---|---|---|
| | | | Ave | Range | Ave | Range | Ave | Range |
| Malinao | DW | 1 | 20.0 | 20.0 - 20.0 | 10.0 | 10.0 - 10.0 | 0.20 | 0.20 - 0.20 |
| | SW | 18 | 12.5 | 5.5 - 18.0 | 5.6 | 3.0 - 12.0 | 0.20 | 0.20 - 0.20 |
| Navas | DW | 0 | | - | | - | | - |
| | SW | 18 | 12.7 | 10.0 - 16.0 | 10.3 | 8.0 - 12.0 | 0.20 | 0.20 - 0.20 |
| New Washington | DW | 4 | 20.0 | 20.0 - 20.0 | 11.0 | 10.0 - 12.0 | 0.20 | 0.20 - 0.20 |
| | SW | 12 | 17.2 | 4.0 - 9.0 | 1.0 | 1.0 - 1.2 | 0.20 | 0.20 - 0.20 |
| Numancia | DW | 0 | | - | | - | | - |
| | SW | 17 | 6.5 | 5.2 - 9.1 | 4.9 | 3.0 - 6.0 | 0.24 | 0.20 - 0.90 |
| Tangalan | DW | 6 | 20.8 | 20.0 - 25.0 | 13.3 | 10.0 - 15.0 | 0.20 | 0.20 - 0.20 |
| | SW | 9 | 15.0 | 15.0 - 15.0 | 10.0 | 10.0 - 10.0 | 0.49 | 0.20 - 2.78 |

Notes; The values of "Ave. depth, SWL and Sp.Cap." by municipality are estimated using the weighted average based on 1995 census population in respective barangays at well location.
SWL=static water level, Sp.Cap.=specific capacity, Ave.=average, SW=shallow well, DW=deep well

Considering the well information, the most productive wells are those with the depth ranging from 5m to 15m and from 30m to 56m. The good yielding wells have static water level varying from about 3m to 6mbgs and specific capacity of about 3 lpsm to 9 lpsm.

Based on the hydrogeologic characteristics and location of wells in Aklan, aquifers are widely distributed along Aklan and Ibajay Rivers that originate from the western Cordillera and flow to Sibuyan Sea. Solo shallow well areas are distributed only in the northwestern coastal area in Malay facing Tablas Strait and in the inland basin along Aklan River of Madalag. The Miocene and older rock units are widely distributed in the southwestern part of the province and in the mountainside of Buruanga Peninsula that are classified as difficult area for groundwater development.

As indicated in Figure 7.3.1 Main Report, the fluvial terraces along Aklan and Ibajay Rivers are high yielding potential areas covering the northeast coastal part of the province. Water levels in unconfined aquifers are shallow in these areas, while the static water levels of confined aquifers in the terrace formation have various ranges from 1.0 mbgs to 20.0 mbgs or deeper probably depending on the distance from the river mouth. On the other hand, the low-hill areas just behind of the coastal plain and surroundings of the fluvial terraces fall on low yielding areas, because such areas are made up of conglomerate calcareous mudstone to siltstone and shale limestone.

In the low-hill areas of Lezo, Banga, Balete and Altavas, existence of high iron contents in groundwater is confirmed. Saline water intrusion is reported along the northeastern coast including Boracay Island. Especially in the municipalities of New Washington and Batan, where extensive swampland is distributed, saline water intrusion including brackish water with high color can be found even at shallow wells. According to the water quality examination results, groundwater in the municipality of Batan shows slightly low pH value (acidic groundwater) ranging from 6.4 to 6.8.

As an alternative water source, the untapped spring can be developed for future use. This is the most reliable source for rural water supply in the province because groundwater quality has a serious problem in terms of ironic groundwater and saline water intrusion. Existing spring sources (250 springs) are utilized for water supply and most of them originate from the Cordillera and Buruanga Peninsula in the southwestern and western parts of the province. The untapped springs (42 springs) are proposed as future water sources in the subject areas.

The detailed hydrogeological characteristics of each municipality are summarized in Table 7.6.2, while individual well locations with technical information are shown in Figure 7.6.1 Individual Well Location and Specification Map, Data Report.

Additional wells shall be designed employing "gravel packed well" with a gravel thickness of about 50mm or more depending on the grain sizes of aquifers and pumping capacity. While, natural gravel packed well may be adopted within the areas where well-sorted natural gravel formation is distributed at the expected aquifer. Such areas are usually the upstream areas of alluvial fans or plains in the province. The application of such method for Level-I well is also justifiable, since inflow velocity of groundwater through the screen is very low because of minimal pumping rate by means of hand-pump operation.

Generally, shallower well has a higher possibility to be constructed applying the natural gravel packed method than the deeper one in areas formed by recent deposits. This is because the layers at different depths of alluvial plain or fan deposits had been formed by different situations of transportation and sedimentation between varied grain sizes. The adaptability of the natural gravel packed well is experimentally assumed referring to the limited information such as topography, geology, static water levels, etc., as shown in Table 7.6.3.

## Table 7.6.2 Hydrogeological Descriptions by Municipality

| Municipality | Ground Information | | | | | | | | Well Information | | | | | | Groundwater Information | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Topography | | | Geology | | | | | Depth | | SWL | | Sp.Cap. | L-III | Availability | | | Potential | | Quality | |
| | Area Proportion (%) | | | | Stratigraphy of Geological Age* | | | | m | | mbgs | | lpsm | | Area Proportion (%) | | | Comparative | | Area Feature | |
| | Plain-Plateau | Hilly-Piedmont | Mountain | Lithofacies (Major Aquifers) | Q | Tertiary | | C | mini. | max. | mini. | max. | ave. | well | SW | DW | Diff. | Wells | Springs | Problem | Pollutants |
| | | | | | | Neo. | Paleo. | | | | | | | | | | | | | | |
| Altavas | 76% | 14% | 10% | recent deposits & limestone | x | x | x | x | 20 | 50 | 5.0 | 15.0 | 0.2 | 1 | 0% | 88% | 12% | fair | few | ironic & acid | |
| Balete | 58% | 27% | 15% | recent deposits & limestone | x | x | x | x | 40 | 40 | 5.0 | 5.0 | 0.2 | 0 | 0% | 92% | 8% | fair | few | ironic | |
| Banga | 60% | 36% | 4% | recent deposits & limestone | x | x | x | x | 40 | 40 | 5.0 | 5.0 | 0.2 | 0 | 0% | 97% | 3% | fair | poor | ironic | |
| Batan | 89% | 11% | 0% | recent deposits & limestone | x | x | | | 20 | 50 | 1.0 | 1.0 | 0.3 | 1 | 0% | 100% | 0% | fair | poor | ironic & acid | |
| Buruanga | 4% | 5% | 91% | metamorphic (fissure water) | | | x | x | - | - | - | - | - | 0 | 0% | 0% | 100% | risky | few | | |
| Ibajay | 18% | 53% | 29% | recent deposits & limestone | x | x | x | x | 40 | 40 | 5.0 | 5.0 | 0.8 | 2 | 0% | 64% | 36% | good | few | saline | |
| Kalibo | 100% | 0% | 0% | recent deposits | x | | | | 40 | 40 | 3.0 | 3.0 | 1.0 | 3 | 0% | 100% | 0% | good | poor | saline | |
| Lezo | 100% | 0% | 0% | recent deposits | x | | | | 40 | 40 | 5.0 | 5.0 | 1.0 | 1 | 0% | 100% | 0% | good | poor | ironic | |
| Libacao | 2% | 47% | 51% | limestone | | x | x | x | 40 | 40 | 20.0 | 20.0 | 0.1 | 1 | 0% | 28% | 72% | risky | few | ironic | |
| Madalag | 3% | 14% | 83% | recent deposits & limestone | x | x | x | x | 6 | 56 | 9.0 | 15.0 | 0.1 | 1 | 2% | 6% | 92% | poor | few | ironic | |
| Makato | 78% | 19% | 3% | recent deposits & limestone | x | x | x | | 40 | 40 | 3.0 | 3.0 | 0.7 | 1 | 0% | 97% | 3% | good | poor | ironic & saline | |
| Malay | 9% | 4% | 87% | recent deposits | x | x | x | x | 6 | 40 | 3.0 | 5.0 | 0.2 | 0 | 8% | 0% | 92% | fair | few | | |
| Malinao | 34% | 42% | 24% | recent deposits & limestone | x | x | x | x | 20 | 50 | 5.0 | 10.0 | 0.6 | 1 | 0% | 87% | 13% | good | poor | ironic | |
| Nabas | 3% | 9% | 88% | recent deposits & limestone | x | x | x | x | 40 | 40 | 3.0 | 5.0 | 0.3 | 0 | 0% | 46% | 54% | fair | few | saline | mining |
| New Washington | 100% | 0% | 0% | recent deposits | x | | | | 20 | 50 | 3.0 | 3.0 | 0.4 | 0 | 0% | 100% | 0% | fair | poor | saline | |
| Numancia | 100% | 0% | 0% | recent deposits | x | | | | 40 | 40 | 3.0 | 3.0 | 1.0 | 2 | 0% | 100% | 0% | good | poor | ironic | |
| Tangalan | 9% | 87% | 4% | recent deposits & limestone | x | x | x | | 20 | 50 | 5.0 | 10.0 | 0.2 | 0 | 0% | 79% | 21% | fair | poor | saline | mining |

Legend: Geological Age, Q=Quaternary, Neo.=Neogene, Paleo.=Paleogene, C=Cretaceous
Well Information, SWL=static water level, Sp.Cap.=specific capacity, L-III=wells operated for L-III service
Groundwater Information, SW=solo shallow well area, DW=deep well area, Diff.=difficult area

Table 7.6.3 Proportion of Gravel Packed and Natural Gravel Packed Wells

| Municipality (only potential area) | Proposed Well Depth | Proportion (%) of Level-I Deep Wells | |
|---|---|---|---|
| | | Gravel Packed | Natural Gravel Packed |
| Banga | 40 m | 90 % | 10 % |
| Ibajay | 40 m | 80 % | 20 % |
| Lezo | 40 m | 70 % | 30 % |
| Madalag | 40 m | 90 % | 10 % |
| Malinao | 40 m | 90 % | 10 % |

Examination on the effective grain sizes and uniformity coefficient by sieve analysis at the influential aquifers (composed of coarse sand and/or fine gravel) should be conducted during the implementation period. Such analysis and actual well construction results are very helpful in application of the natural gravel packed method in future planning.

In the municipalities of Banga, Balete, Altavas and Batan, it is reported by DPWH/DEO that numerous deep wells present high Fe contents (PNSDW; Fe<1.0ppm). The results of groundwater quality examination, conducted by the PSPT, show their characteristics with slightly higher Fe and acidic water. Ironic water pumped from deep wells is caused by groundwater itself, well materials eluded in acid water, or combination of groundwater and well materials. There are four cases on water quality problem in terms of Fe and pH value as shown below.

(1) Iron concentration is less than the PNSDW (1 ppm) and the pH value of groundwater indicates neutral or alkaline. There is a low possibility of iron contamination through the future.

(2) Although iron concentration is within the PNSDW, groundwater shows an acid pH value. There is a possibility of iron contamination from steel materials.

(3) Iron concentration exceeds the PNSDW and the groundwater shows neutral or alkaline. There is iron contamination caused by groundwater itself.

(4) Iron concentration exceeds the PNSDW and groundwater shows acid pH side. There is a possibility of iron contamination caused by groundwater and/or well materials.

Where groundwater has high Fe contents, the Iron Removal Facility shall be additionally installed. Such countermeasures are recommended especially for the municipalities of Numancia, Makato, Lezo, Malinao, Banga, Balete, Altavas and Batan. The ratio of deep wells equipped with Iron Removal Facility to the total requirements of the province is assumed at about 30%.

Where the parameter of groundwater indicates acid pH side, the well casing pipe and screen shall be designed to use anti-corrosive materials, such as anti-metallic (polyvinyl chloride; PVC) or anti-corrosive metal (stainless steel; SUS) materials. Generally, shallower well presents water quality with alkalinity parameter. This is because the shallow wells are usually constructed in alluvial plain or fan deposits. The well materials of the said anti-corrosive shall be used for deep wells. The development of deep wells using anti-corrosive materials in the province is experimentally assumed referring to the limited information such as results of water quality examination, geology, etc., as shown in Table 7.6.4.

Water quality examination on Fe and pH parameters should be conducted during the implementation period. Such groundwater quality analysis is very helpful to design well materials in future planning.

**Table 7.6.4 Proportion of Wells to be Constructed by Different Materials**

| Municipality (only potential area) | Proposed Well Depth | Proportion (%) of Level-I Deep Wells | |
|---|---|---|---|
| | | GI Casing Pipes | PVC Casing Pipes |
| Altavas | 40 m | 60 % | 40 % |
| Batan | 40 m | 0 % | 100 % |

(2) Spring

Untapped spring sources identified are shown in Table 7.6.5. These data were collected and tabulated using the questionnaire sheet-untapped spring information format, Data Report. Data also include the parameters of barangay name, owner, discharge, transmission pipeline length and relative elevation.

**Table 7.6.5 Untapped Spring Sources Identified**

| Location | | Untapped Spring | | | |
|---|---|---|---|---|---|
| Municipality/City | Barangay | Owner | Discharge (lps) | T.L.L.* (km) | Relative Elevation (m) |
| Altavas | Catmon | UK | 3.0 | NA | NA |
| | Lupo | UK | 1.0 | 0.8 | NA |
| | Man-up | UK | 1.0 | 3.0 | NA |
| | Talon | UK | 0.5 | 0.1 | NA |
| Balete | Arcangel | Private | 0.6 | 2.5 | NA |
| | Morales | Private | 1.0 | 2.3 | NA |
| Banga | Badiangan | UK | 0.1 | NA | NA |
| | Cupang | UK | 0.2 | NA | NA |

## Table 7.6.5 Untapped Spring Sources Identified

(cont'd)

| Location | | Untapped Spring | | | |
|---|---|---|---|---|---|
| Municipality/City | Barangay | Owner | Discharge (lps) | T.L.L.* (km) | Relative Elevation (m) |
| Banga | Mangan | UK | 0.2 | NA | NA |
| | Polo | UK | 0.1 | NA | NA |
| | Polocate | UK | 0.2 | NA | NA |
| | Sibalew | UK | 0.2 | NA | NA |
| | Sigcay | UK | 0.2 | NA | NA |
| | Torralba | UK | 0.1 | NA | NA |
| Buruanga | Alegria | UK | NA | 0.5 | NA |
| | Bagongbayan | UK | NA | 1.5 | NA |
| | Balusbos | UK | NA | 0.5 | NA |
| | Bel-is | UK | NA | 1.0 | NA |
| | Cabugan | UK | NA | 1.5 | NA |
| | El Progreso | UK | NA | 3.0 | NA |
| | Habana | UK | NA | 1.0 | NA |
| | Katipunan | UK | NA | 1.5 | NA |
| | Mayapay | UK | NA | 1.5 | NA |
| | Nazareth | UK | NA | 1.5 | NA |
| | Panilongan | UK | NA | 2.0 | NA |
| | Santander | UK | NA | 1.5 | NA |
| | Tag-osip | UK | NA | 1.5 | NA |
| | Tigum | UK | NA | 1.0 | NA |
| Ibajay | Aparicio | UK | 3.0 | 3.5 | NA |
| | Cabugao | UK | 4.5 | 1.2 | NA |
| | Malindog | UK | 3.5 | 4.1 | NA |
| | Mina-a | UK | 4.0 | 2.5 | NA |
| | Monlaque | UK | 3.0 | 2.0 | NA |
| | Rivera | UK | 4.5 | 2.8 | NA |
| | San Jose | UK | 2.0 | 1.5 | NA |
| | Tul-ang | UK | 3.0 | NA | NA |
| | Yawan | UK | 3.5 | 3.5 | NA |
| Malay | Dumlog | UK | 5.0 | 0.5 | NA |
| | Poblacion | UK | 5.0 | 1.0 | NA |
| Malinao | Dangcalan | UK | 1.5 | 0.5 | NA |
| | Rosario | UK | 1.0 | 0.5 | NA |
| | San Roque | UK | 1.0 | 1.2 | NA |

Notes: T.L.L.; Transmission line length, NA; Data not available and UK; Unknown Data

## 7.7 Water Source Development for Medium-Term Development Plan

### 7.7.1 Detailed Groundwater Investigation Required

(1) Water quality examination required in the hills and Buruanga Peninsula

The province encountered groundwater quality problems such as ironic, salinity, acidic, etc., while spring sources may have high mineral contents due to geologic condition in its watersheds.

Water quality examination was conducted by the PSPT for this PW4SP using instruments procured by JICA. However, water quality parameters are limited and numbers of water samples are not sufficient for future project implementation. Additional water quality examination shall be conducted before and during the implementation periods. Required examination includes following parameters.

1) Well Source

a) Study Area

Seven (7) municipalities to cover Malay, Makato, Numancia, Banga, Balete, Altavas and Batan.

b) Examination Parameters

Deep Well; Fe, Mn, Cl, pH, Color, Turbidity

Shallow Well; Fe, Mn, Cl, pH, Color, Turbidity, Bacteria and Coliform

2) Spring Source

a) Study Area

Four (4) municipalities to cover Malay, Banga, Balete and Altavas.

b) Examination Parameters

Developed Spring; Fe, Mn, Cl, pH, Color, Turbidity

Untapped Spring; Fe, Mn, Cl, pH, Color, Turbidity, Bacteria and Coliform

(2) Prospecting & Test Well required in the mangrove coast

There are numerous shallow wells in the municipality of New Washington. Most of shallow wells extract groundwater through shallow well from alluvial deposits with the depth of less than 10m. Major aquifers in this area is made up of estuarine and delta deposits of Recent time. Salinity and/or brackish groundwater are found in most of this area.

Groundwater quality problems are very serious, although some wells have potable water.

In this connection, it is required for Level-I water supply to study on the distributive condition of potential aquifers available prior to the site selection and well designing. This groundwater investigation shall involve:

1) Groundwater Database

a) Study Area

Municipality of New Washington

b) Database Parameters

well log (geology and physical logging), well structures (depth, diameter and screen positions), water level, operational condition (expected production with operation time), water quality, completion year, present utilization (service level), type of pump facility, ownership, etc.

2) Physical Prospecting

a) Field

same area in item 1)

b) Method

Type of Prospecting; electric resistivity

Alignment; Schlumberger or Wenner

Sounding depth; 70m

Sounding points; 100 points

c) Study

Hydrogeologic section with information of quality and permeability shall be described for the test well construction.

3) Test Deep Wells

a) Construction Site

Sites shall be pointed out after the study on groundwater database and geologic survey.

b) Specification of Test Deep Well

Number; at least 4 test wells

Well design; well depth of 30m to 50m (expected target aquifers) with well diameter of 100mm and well screen (SUS) length of 10m

c) Installed Tests

Geophysical Logging; Resistivity (short & long) and Spontaneous Potential

Pumping Test; Time draw-down by maximum discharge of 20 lpm with 4 hours or more and Recovery test

Water Quality Examination; to include Fe, Mn, Cl, pH, Color, Turbidity, Bacteria, Coliform, etc.

If aquifers with potable groundwater can not be found through the above investigation, the improved rainwater collector facility shall be promoted with due consideration on roof materials, reservoir with sand filtration and chlorination system.

### 7.7.2 Spacing Allocation for Level II and III Wells

The pumping rates required for Level I facilities are fairly lower than that for Level II and III systems. The well interference in Level I facilities need not to be studied in terms of spacing of wells and production rate, since most formations in shallow and deep well areas generally have enough groundwater development potential. As Level II and III wells are usually expected to produce larger discharge to meet the water demand, the spacing of wells to avoid well interference has to be considered. Spacing allocation for Level II and III wells was examined considering specific capacity, pumping rate, and assumed drawdown of 1cm at the interference radius for a pumping duration of 16 hours.

(1) Specific Capacity

According to the existing well source information, specific capacity was considered with ranges from 0.5 lpsm to 6.5 lpsm. To simplify the calculation, an average value in each range is adopted in the calculation of interference radius.

(2) Pumping Rate

The pumping rate was estimated by assuming a drawdown of 10m with the average value of specific capacity and pump operation of 16 hours/day. The formula used to determine proper well spacing is the Jacob modified equation. Drawdown at the interference boundary is assumed at 1cm after a pumping duration of 16 hours.

Table 7.7.1 presents the estimated spacing requirements and number of wells to be constructed within a well field of one $km^2$. The spacing interval between adjacent wells to avoid well interference is planned to be more than twice the distances of the calculated interference radius.

**Table 7.7.1 Spacing Arrangements for Planned Wells**

| Range of Specific Capacity (lpsm) | Estimated Pumping Rate ($m^3$/day) | Estimated Interference Radius (m) | Estimated Number of Wells/$km^2$ |
|---|---|---|---|
| 0.5 - 1.5 | 500 | 80 | 45 |
| 1.5 - 3.0 | 1,000 | 120 | 20 |
| 3.0 - 4.5 | 2,000 | 160 | 11 |
| 4.5 - 6.0 | 2,500 | 200 | 7 |
| > 6.0 | >2,500 | >200 | >7 |

# FUTURE REQUIREMENTS AND DEVELOPMENT PLAN

B

# 8. FUTURE REQUIREMENTS IN WATER SUPPLY AND SANITATION IMPROVEMENT

## 8.2 Targets of Provincial Sector Plan

Table 8.2.1 Estimation of Base Year Service Coverage of Water Supply

| Name of Municipality | Area | Population (1998) | Population Served by 1998 Facilities | | | | Population Served by Planned/On-going Projects | | | | Population Served in the Base Year (1998) | | | | Percentage Coverage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Level III | Level II | Level I | Total | Level III | Level II | Level I | Total | Level III | Level II | Level I | Total | |
| Altavas | Urban | 2,829 | 200 | 25 | 1,480 | 1,705 | | | | | 200 | 25 | 1,480 | 1,705 | 60 |
| | Rural | 19,311 | | 750 | 8,464 | 9,214 | | | | | | 750 | 8,464 | 9,214 | 48 |
| | Total | 22,140 | 200 | 775 | 9,944 | 10,919 | | | | | 200 | 775 | 9,944 | 10,919 | 49 |
| Balete | Urban | 1,727 | | 75 | 852 | 927 | | | | | | 75 | 852 | 927 | 54 |
| | Rural | 18,392 | | 375 | 1,066 | 1,441 | | | | | | 375 | 1,066 | 1,441 | 8 |
| | Total | 20,119 | | 450 | 1,918 | 2,368 | | | | | | 450 | 1,918 | 2,368 | 12 |
| Banga | Urban | 2,155 | | | 2,044 | 2,044 | | | | | | | 2,044 | 2,044 | 95 |
| | Rural | 28,914 | | 1,850 | 14,159 | 16,009 | | | | | | 1,850 | 14,159 | 16,009 | 55 |
| | Total | 31,069 | | 1,850 | 16,203 | 18,053 | | | | | | 1,850 | 16,203 | 18,053 | 58 |
| Batan | Urban | 1,569 | 1,225 | | 5 | 1,230 | | | | | 1,225 | | 5 | 1,230 | 78 |
| | Rural | 25,377 | 510 | 225 | 8,059 | 8,794 | | | | | 510 | 225 | 8,059 | 8,794 | 35 |
| | Total | 26,946 | 1,735 | 225 | 8,064 | 10,024 | | | | | 1,735 | 225 | 8,064 | 10,024 | 37 |
| Buruanga | Urban | 1,181 | | 250 | 536 | 786 | | | | | | 250 | 536 | 786 | 67 |
| | Rural | 11,535 | | 2,725 | 4,753 | 7,478 | | | | | | 2,725 | 4,753 | 7,478 | 65 |
| | Total | 12,716 | | 2,975 | 5,289 | 8,264 | | | | | | 2,975 | 5,289 | 8,264 | 65 |
| Ibajay | Urban | 2,738 | | | 2,147 | 2,147 | | | | | | | 2,147 | 2,147 | 78 |
| | Rural | 33,926 | 8,108 | 1,200 | 15,956 | 25,264 | | | | | 8,108 | 1,200 | 15,956 | 25,264 | 74 |
| | Total | 36,664 | 8,108 | 1,200 | 18,103 | 27,411 | | | | | 8,108 | 1,200 | 18,103 | 27,411 | 75 |
| Kalibo (Capital) | Urban | 62,774 | 30,205 | | 18,614 | 48,819 | | | | | 30,205 | | 18,614 | 48,819 | 78 |
| | Rural | | | | | | | | | | | | | | |
| | Total | 62,774 | 30,205 | | 18,614 | 48,819 | | | | | 30,205 | | 18,614 | 48,819 | 78 |
| Lezo | Urban | 1,969 | 1,295 | | 351 | 1,646 | | | | | 1,295 | | 351 | 1,646 | 84 |
| | Rural | 10,393 | 829 | | 5,576 | 6,405 | | | | | 829 | | 5,576 | 6,405 | 62 |
| | Total | 12,362 | 2,124 | | 5,927 | 8,051 | | | | | 2,124 | | 5,927 | 8,051 | 65 |

Table 8.2.1 Estimation of Base Year Service Coverage of Water Supply (contd)

| Name of Municipality | Area | Population (1998) | Population Served by 1998 Facilities | | | | Population Served by Planned/On-going Projects | | | | Population Served in the Base Year (1998) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Level III | Level II | Level I | Total | Level III | Level II | Level I | Total | Level III | Level II | Level I | Total | Percentage Coverage |
| Libacao | Urban | 2,808 | | | 2,231 | 2,231 | | | | | | | 2,231 | 2,231 | 79 |
| | Rural | 20,959 | 2,695 | 1,150 | 10,213 | 14,058 | | | | | 2,695 | 1,150 | 10,213 | 14,058 | 67 |
| | Total | 23,767 | 2,695 | 1,150 | 12,444 | 16,289 | | | | | 2,695 | 1,150 | 12,444 | 16,289 | 69 |
| Madalag | Urban | 1,657 | 696 | 100 | 227 | 1,023 | | | | | 696 | 100 | 227 | 1,023 | 62 |
| | Rural | 16,032 | | 600 | 2,828 | 3,428 | | | | | | 600 | 2,828 | 3,428 | 21 |
| | Total | 17,689 | 696 | 700 | 3,055 | 4,451 | | | | | 696 | 700 | 3,055 | 4,451 | 25 |
| Makato | Urban | 2,928 | 1,506 | | 800 | 2,306 | | | | | 1,506 | | 800 | 2,306 | 79 |
| | Rural | 20,926 | 612 | 2,475 | 10,139 | 13,226 | | | | | 612 | 2,475 | 10,139 | 13,226 | 63 |
| | Total | 23,854 | 2,118 | 2,475 | 10,939 | 15,532 | | | | | 2,118 | 2,475 | 10,939 | 15,532 | 65 |
| Malay | Urban | 6,484 | | | 2,933 | 2,933 | | | | | | | 2,933 | 2,933 | 45 |
| | Rural | 17,000 | | 2,400 | 5,967 | 8,367 | | | | | | 2,400 | 5,967 | 8,367 | 49 |
| | Total | 23,484 | | 2,400 | 8,900 | 11,300 | | | | | | 2,400 | 8,900 | 11,300 | 48 |
| Malinao | Urban | 1,544 | 1,500 | | 44 | 1,544 | | | | | 1,500 | | 44 | 1,544 | 100 |
| | Rural | 20,893 | 684 | 825 | 12,017 | 13,526 | | | | | 684 | 825 | 12,017 | 13,526 | 65 |
| | Total | 22,437 | 2,184 | 825 | 12,061 | 15,070 | | | | | 2,184 | 825 | 12,061 | 15,070 | 67 |
| Nabas | Urban | 3,899 | | | 2,331 | 2,331 | | | | | | | 2,331 | 2,331 | 60 |
| | Rural | 18,098 | | 3,900 | 8,934 | 12,834 | | | | | | 3,900 | 8,934 | 12,834 | 71 |
| | Total | 21,997 | | 3,900 | 11,265 | 15,165 | | | | | | 3,900 | 11,265 | 15,165 | 69 |
| New Washington | Urban | 5,139 | | | 4,759 | 4,759 | | | | | | | 4,759 | 4,759 | 93 |
| | Rural | 28,002 | | | 24,549 | 24,549 | | | | | | | 24,549 | 24,549 | 88 |
| | Total | 33,141 | | | 29,308 | 29,308 | | | | | | | 29,308 | 29,308 | 88 |
| Numancia | Urban | 3,154 | 780 | | 1,829 | 2,609 | | | | | 780 | | 1,829 | 2,609 | 83 |
| | Rural | 20,910 | 6,381 | | 11,816 | 18,197 | | | | | 6,381 | | 11,816 | 18,197 | 87 |
| | Total | 24,064 | 7,161 | | 13,645 | 20,806 | | | | | 7,161 | | 13,645 | 20,806 | 86 |
| Tangalan | Urban | 2,834 | | | 1,658 | 1,658 | | | | | | | 1,658 | 1,658 | 59 |
| | Rural | 14,301 | | 1,225 | 7,299 | 8,524 | | | | | | 1,225 | 7,299 | 8,524 | 60 |
| | Total | 17,135 | | 1,225 | 8,957 | 10,182 | | | | | | 1,225 | 8,957 | 10,182 | 59 |
| **Provincial Total** | Urban | 107,389 | 37,407 | 450 | 42,841 | 80,698 | | | | | 37,407 | 450 | 42,841 | 80,698 | 75 |
| | Rural | 324,969 | 19,819 | 19,700 | 151,795 | 191,314 | | | | | 19,819 | 19,700 | 151,795 | 191,314 | 59 |
| | Total | 432,358 | 57,226 | 20,150 | 194,636 | 272,012 | | | | | 57,226 | 20,150 | 194,636 | 272,012 | 63 |

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

| Name of Municipality | Area | Population Served by 1998 Facilities | | | | 1998 | | 2005 | |
|---|---|---|---|---|---|---|---|---|---|
| | | Level III | Level II | Level I | Total | Total Population | Coverage (%) | Total Population | Coverage (%) |
| Altavas | Urban | 200 | 25 | 1,480 | 1,705 | 2,829 | 60 | 3,017 | 57 |
| | Rural | | 750 | 8,464 | 9,214 | 19,311 | 48 | 20,593 | 45 |
| | Total | 200 | 775 | 9,944 | 10,919 | 22,140 | 49 | 23,610 | 46 |
| Balete | Urban | | 75 | 852 | 927 | 1,727 | 54 | 1,744 | 53 |
| | Rural | | 375 | 1,066 | 1,441 | 18,392 | 8 | 18,579 | 8 |
| | Total | | 450 | 1,918 | 2,368 | 20,119 | 12 | 20,323 | 12 |
| Banga | Urban | | | 2,044 | 2,044 | 2,155 | 95 | 2,310 | 88 |
| | Rural | | 1,850 | 14,159 | 16,009 | 28,914 | 55 | 30,986 | 52 |
| | Total | | 1,850 | 16,203 | 18,053 | 31,069 | 58 | 33,296 | 54 |
| Batan | Urban | 1,225 | | 5 | 1,230 | 1,569 | 78 | 1,632 | 75 |
| | Rural | 510 | 225 | 8,059 | 8,794 | 25,377 | 35 | 26,400 | 33 |
| | Total | 1,735 | 225 | 8,064 | 10,024 | 26,946 | 37 | 28,032 | 36 |
| Buruanga | Urban | | 250 | 536 | 786 | 1,181 | 67 | 1,184 | 66 |
| | Rural | | 2,725 | 4,753 | 7,478 | 11,535 | 65 | 11,563 | 65 |
| | Total | | 2,975 | 5,289 | 8,264 | 12,716 | 65 | 12,747 | 65 |
| Ibajay | Urban | | | 2,147 | 2,147 | 2,738 | 78 | 2,804 | 77 |
| | Rural | 8,108 | 1,200 | 15,956 | 25,264 | 33,926 | 74 | 34,745 | 73 |
| | Total | 8,108 | 1,200 | 18,103 | 27,411 | 36,664 | 75 | 37,549 | 73 |
| Kalibo (Capital) | Urban | 30,205 | | 18,614 | 48,819 | 62,774 | 78 | 74,782 | 65 |
| | Rural | | | | | | | | |
| | Total | 30,205 | | 18,614 | 48,819 | 62,774 | 78 | 74,782 | 65 |
| Lezo | Urban | 1,295 | | 351 | 1,646 | 1,969 | 84 | 2,297 | 72 |
| | Rural | 829 | | 5,576 | 6,405 | 10,393 | 62 | 12,131 | 53 |
| | Total | 2,124 | | 5,927 | 8,051 | 12,362 | 65 | 14,428 | 56 |
| Libacao | Urban | | | 2,231 | 2,231 | 2,808 | 79 | 3,069 | 73 |
| | Rural | 2,695 | 1,150 | 10,213 | 14,058 | 20,959 | 67 | 22,906 | 61 |
| | Total | 2,695 | 1,150 | 12,444 | 16,289 | 23,767 | 69 | 25,975 | 63 |
| Madalag | Urban | 696 | 100 | 227 | 1,023 | 1,657 | 62 | 1,893 | 54 |
| | Rural | | 600 | 2,828 | 3,428 | 16,032 | 21 | 18,311 | 19 |
| | Total | 696 | 700 | 3,055 | 4,451 | 17,689 | 25 | 20,204 | 22 |
| Makato | Urban | 1,506 | | 800 | 2,306 | 2,928 | 79 | 3,529 | 65 |
| | Rural | 612 | 2,475 | 10,139 | 13,226 | 20,926 | 63 | 25,221 | 52 |
| | Total | 2,118 | 2,475 | 10,939 | 15,532 | 23,854 | 65 | 28,750 | 54 |
| Malay | Urban | | | 2,933 | 2,933 | 6,484 | 45 | 10,049 | 29 |
| | Rural | | 2,400 | 5,967 | 8,367 | 17,000 | 49 | 26,348 | 32 |
| | Total | | 2,400 | 8,900 | 11,300 | 23,484 | 48 | 36,397 | 31 |
| Malinao | Urban | 1,500 | | 44 | 1,544 | 1,544 | 100 | 1,692 | 91 |
| | Rural | 684 | 825 | 12,017 | 13,526 | 20,893 | 65 | 22,897 | 59 |
| | Total | 2,184 | 825 | 12,061 | 15,070 | 22,437 | 67 | 24,589 | 61 |
| Nabas | Urban | | | 2,331 | 2,331 | 3,899 | 60 | 4,134 | 56 |
| | Rural | | 3,900 | 8,934 | 12,834 | 18,098 | 71 | 19,184 | 67 |
| | Total | | 3,900 | 11,265 | 15,165 | 21,997 | 69 | 23,318 | 65 |
| New Washington | Urban | | | 4,759 | 4,759 | 5,139 | 93 | 5,581 | 85 |
| | Rural | | | 24,549 | 24,549 | 28,002 | 88 | 30,409 | 81 |
| | Total | | | 29,308 | 29,308 | 33,141 | 88 | 35,990 | 81 |
| Numancia | Urban | 780 | | 1,829 | 2,609 | 3,154 | 83 | 3,720 | 70 |
| | Rural | 6,381 | | 11,816 | 18,197 | 20,910 | 87 | 24,656 | 74 |
| | Total | 7,161 | | 13,645 | 20,806 | 24,064 | 86 | 28,376 | 73 |
| Tangalan | Urban | | | 1,658 | 1,658 | 2,834 | 59 | 3,221 | 51 |
| | Rural | | 1,225 | 7,299 | 8,524 | 14,301 | 60 | 16,254 | 52 |
| | Total | | 1,225 | 8,957 | 10,182 | 17,135 | 59 | 19,475 | 52 |
| **Provincial Total** | Urban | 37,407 | 450 | 42,841 | 80,698 | 107,389 | 75 | 126,658 | 64 |
| | Rural | 19,819 | 19,700 | 151,795 | 191,314 | 324,969 | 59 | 361,183 | 53 |
| | Total | 57,226 | 20,150 | 194,636 | 272,012 | 432,358 | 63 | 487,841 | 56 |

Table 8.2.3 Number of Households Served by Sanitary Toilets in the Base Year (1998)

| Name of Municipality | Area | Population (1998) | Number of Households (1998) | Households Using Sanitary Toilets in 1998 | | | | Recipient HHs of Planned/On-going Projects | | | | Households Using Sanitary Toilets in the Base Year (1998) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | Number | | | | Coverage (%) | | | |
| | | | | Flush Toilets | Pour Flush | VIP/Dry | Total | Flush | Pour Flush | VIP/Dry | Total | Flush | Pour Flush | VIP/Dry | Total | Flush | Pour Flush | VIP/Dry | Total |
| Altavas | Urban | 2,829 | 521 | 41 | 255 | 100 | 396 | | | | | 41 | 255 | 100 | 396 | 8 | 49 | 19 | 76 |
| | Rural | 19,311 | 3,699 | 9 | 2,136 | | 2,145 | | | | | 9 | 2,136 | | 2,145 | | 58 | | 58 |
| | Total | 22,140 | 4,220 | 50 | 2,391 | 100 | 2,541 | | | | | 50 | 2,391 | 100 | 2,541 | 1 | 57 | 2 | 60 |
| Balete | Urban | 1,727 | 343 | | 33 | 311 | 344 | | | | | | 33 | 311 | 344 | | 10 | 91 | 100 |
| | Rural | 18,392 | 3,642 | | | 1,433 | 1,433 | | | | | | | 1,433 | 1,433 | | | 39 | 39 |
| | Total | 20,119 | 3,985 | | 33 | 1,744 | 1,777 | | | | | | 33 | 1,744 | 1,777 | | 1 | 44 | 45 |
| Banga | Urban | 2,155 | 422 | 295 | 94 | 11 | 400 | | | | | 295 | 94 | 11 | 400 | 70 | 22 | 3 | 95 |
| | Rural | 28,914 | 5,658 | 197 | 2,899 | 988 | 4,084 | | | | | 197 | 2,899 | 988 | 4,084 | 3 | 51 | 17 | 72 |
| | Total | 31,069 | 6,080 | 492 | 2,993 | 999 | 4,484 | | | | | 492 | 2,993 | 999 | 4,484 | 8 | 49 | 16 | 74 |
| Batan | Urban | 1,569 | 346 | 23 | 303 | 3 | 329 | | | | | 23 | 303 | 3 | 329 | 7 | 88 | 1 | 95 |
| | Rural | 25,377 | 5,106 | 10 | 2,886 | 14 | 2,910 | | | | | 10 | 2,886 | 14 | 2,910 | | 57 | | 57 |
| | Total | 26,946 | 5,452 | 33 | 3,189 | 17 | 3,239 | | | | | 33 | 3,189 | 17 | 3,239 | 1 | 58 | | 59 |
| Buruanga | Urban | 1,181 | 224 | 125 | 62 | 17 | 204 | | | | | 125 | 62 | 17 | 204 | 56 | 28 | 8 | 91 |
| | Rural | 11,535 | 2,321 | 16 | 850 | | 866 | | | | | 16 | 850 | | 866 | 1 | 37 | | 37 |
| | Total | 12,716 | 2,545 | 141 | 912 | 17 | 1,070 | | | | | 141 | 912 | 17 | 1,070 | 6 | 36 | 1 | 42 |
| Ibajay | Urban | 2,738 | 530 | 109 | 251 | | 360 | | | | | 109 | 251 | | 360 | 21 | 47 | | 68 |
| | Rural | 33,926 | 6,952 | 89 | 4,311 | | 4,400 | | | | | 89 | 4,311 | | 4,400 | 1 | 62 | | 63 |
| | Total | 36,664 | 7,482 | 198 | 4,562 | | 4,760 | | | | | 198 | 4,562 | | 4,760 | 3 | 61 | | 64 |
| Kalibo (Capital) | Urban | 62,774 | 12,189 | 7,073 | 2,813 | 609 | 10,495 | | | | | 7,073 | 2,813 | 609 | 10,495 | 58 | 23 | 5 | 86 |
| | Rural | | | | | | | | | | | | | | | | | | |
| | Total | 62,774 | 12,189 | 7,073 | 2,813 | 609 | 10,495 | | | | | 7,073 | 2,813 | 609 | 10,495 | 58 | 23 | 5 | 86 |
| Lezo | Urban | 1,969 | 416 | 43 | 241 | 107 | 391 | | | | | 43 | 241 | 107 | 391 | 10 | 58 | 26 | 94 |
| | Rural | 10,393 | 2,083 | 146 | 1,018 | 536 | 1,700 | | | | | 146 | 1,018 | 536 | 1,700 | 7 | 49 | 26 | 82 |
| | Total | 12,362 | 2,499 | 189 | 1,259 | 643 | 2,091 | | | | | 189 | 1,259 | 643 | 2,091 | 8 | 50 | 26 | 84 |
| Libacao | Urban | 2,808 | 529 | 205 | 153 | 65 | 423 | | | | | 205 | 153 | 65 | 423 | 39 | 29 | 12 | 80 |
| | Rural | 20,959 | 3,783 | 87 | 1,076 | 1,033 | 2,196 | | | | | 87 | 1,076 | 1,033 | 2,196 | 2 | 28 | 27 | 58 |
| | Total | 23,767 | 4,312 | 292 | 1,229 | 1,098 | 2,619 | | | | | 292 | 1,229 | 1,098 | 2,619 | 7 | 29 | 25 | 61 |
| Madalag | Urban | 1,657 | 286 | 9 | 153 | 56 | 218 | | | | | 9 | 153 | 56 | 218 | 3 | 53 | 20 | 76 |
| | Rural | 16,032 | 2,759 | 7 | 852 | 498 | 1,357 | | | | | 7 | 852 | 498 | 1,357 | | 31 | 18 | 49 |
| | Total | 17,689 | 3,045 | 16 | 1,005 | 554 | 1,575 | | | | | 16 | 1,005 | 554 | 1,575 | 1 | 33 | 18 | 52 |
| Makato | Urban | 2,928 | 559 | 20 | 436 | 93 | 549 | | | | | 20 | 436 | 93 | 549 | 4 | 78 | 17 | 98 |
| | Rural | 20,926 | 3,840 | 26 | 2,300 | 905 | 3,231 | | | | | 26 | 2,300 | 905 | 3,231 | 1 | 60 | 24 | 84 |
| | Total | 23,854 | 4,399 | 46 | 2,736 | 998 | 3,780 | | | | | 46 | 2,736 | 998 | 3,780 | 1 | 62 | 23 | 86 |
| Malay | Urban | 6,484 | 1,188 | 824 | 264 | | 1,088 | | | | | 824 | 264 | | 1,088 | 69 | 22 | | 92 |
| | Rural | 17,000 | 3,238 | 159 | 2,085 | | 2,244 | | | | | 159 | 2,085 | | 2,244 | 5 | 64 | | 69 |
| | Total | 23,484 | 4,426 | 983 | 2,349 | | 3,332 | | | | | 983 | 2,349 | | 3,332 | 22 | 53 | | 75 |
| Malinao | Urban | 1,544 | 316 | 25 | 235 | 18 | 278 | | | | | 25 | 235 | 18 | 278 | 8 | 74 | 6 | 88 |
| | Rural | 20,893 | 3,957 | 17 | 1,784 | 1,167 | 2,968 | | | | | 17 | 1,784 | 1,167 | 2,968 | | 45 | 29 | 75 |
| | Total | 22,437 | 4,273 | 42 | 2,019 | 1,185 | 3,246 | | | | | 42 | 2,019 | 1,185 | 3,246 | 1 | 47 | 28 | 76 |
| Nabas | Urban | 3,899 | 778 | 340 | 356 | 42 | 738 | | | | | 340 | 356 | 42 | 738 | 44 | 46 | 5 | 95 |
| | Rural | 18,098 | 3,542 | 250 | 2,493 | 154 | 2,897 | | | | | 250 | 2,493 | 154 | 2,897 | 7 | 70 | 4 | 82 |
| | Total | 21,997 | 4,320 | 590 | 2,849 | 196 | 3,635 | | | | | 590 | 2,849 | 196 | 3,635 | 14 | 66 | 5 | 84 |
| New Washington | Urban | 5,139 | 968 | 16 | 742 | 57 | 815 | | | | | 16 | 742 | 57 | 815 | 2 | 77 | 6 | 84 |
| | Rural | 28,002 | 5,364 | 34 | 3,292 | 603 | 3,929 | | | | | 34 | 3,292 | 603 | 3,929 | 1 | 61 | 11 | 73 |
| | Total | 33,141 | 6,332 | 50 | 4,034 | 660 | 4,744 | | | | | 50 | 4,034 | 660 | 4,744 | 1 | 64 | 10 | 75 |
| Numancia | Urban | 3,154 | 580 | 236 | 265 | | 501 | | | | | 236 | 265 | | 501 | 41 | 46 | | 86 |
| | Rural | 20,910 | 4,006 | 354 | 1,990 | 382 | 2,726 | | | | | 354 | 1,990 | 382 | 2,726 | 9 | 50 | 10 | 68 |
| | Total | 24,064 | 4,586 | 590 | 2,255 | 382 | 3,227 | | | | | 590 | 2,255 | 382 | 3,227 | 13 | 49 | 8 | 70 |
| Tangalan | Urban | 2,834 | 522 | 23 | 347 | 26 | 396 | | | | | 23 | 347 | 26 | 396 | 4 | 66 | 5 | 76 |
| | Rural | 14,301 | 2,605 | 47 | 983 | 665 | 1,695 | | | | | 47 | 983 | 665 | 1,695 | 2 | 38 | 26 | 65 |
| | Total | 17,135 | 3,127 | 70 | 1,330 | 691 | 2,091 | | | | | 70 | 1,330 | 691 | 2,091 | 2 | 43 | 22 | 67 |
| Provincial Total | Urban | 107,389 | 20,717 | 9,407 | 7,003 | 1,515 | 17,925 | | | | | 9,407 | 7,003 | 1,515 | 17,925 | 45 | 34 | 7 | 87 |
| | Rural | 324,969 | 62,555 | 1,448 | 30,955 | 8,378 | 40,781 | | | | | 1,448 | 30,955 | 8,378 | 40,781 | 2 | 49 | 13 | 65 |
| | Total | 432,358 | 83,272 | 10,855 | 37,958 | 9,893 | 58,706 | | | | | 10,855 | 37,958 | 9,893 | 58,706 | 13 | 46 | 12 | 70 |

**Table 8.2.4 Number of Public School Student Served by School Toilets in Base Year (1998)**

| Name of Municipality | 1998 Total Number of Public School Student | Standard No. of Student that can be Served by 1998 | No. of Student to be Served by Planned /On-going Projects | Standard No. of Students that can be Served by Toilets in Base Year (1998) | Coverage (%) |
|---|---|---|---|---|---|
| Altavas | 6,636 | 2,960 | | 2,960 | 45 |
| Balete | 5,012 | 3,240 | | 3,240 | 65 |
| Banga | 4,373 | 4,373 | | 4,373 | 100 |
| Batan | 7,278 | 1,840 | | 1,840 | 25 |
| Buruanga | 3,545 | 840 | | 840 | 24 |
| Ibajay | 3,929 | 2,200 | | 2,200 | 56 |
| Kalibo (Capital) | 13,792 | 11,480 | | 11,480 | 83 |
| Lezo | 3,110 | 2,320 | | 2,320 | 75 |
| Libacao | 5,705 | 3,320 | | 3,320 | 58 |
| Madalag | 5,861 | 2,320 | | 2,320 | 40 |
| Makato | 5,362 | 2,640 | | 2,640 | 49 |
| Malay | 4,989 | 2,720 | | 2,720 | 55 |
| Malinao | 5,700 | 3,840 | | 3,840 | 67 |
| Nabas | 6,655 | 3,200 | | 3,200 | 48 |
| New Washington | 6,444 | 2,800 | | 2,800 | 43 |
| Numancia | 4,402 | 1,040 | | 1,040 | 24 |
| Tangalan | 4,402 | 4,360 | | 4,360 | 99 |
| **Provincial Total** | 97,195 | 55,493 | | 55,493 | 57 |

Table 8.2.5 Number of Public Utilities with Sanitary Toilets in the Base Year (1998)

| Name of Municipality | Type | No. of PU with Toilets in 1998 | No. of PU with Sanitary Toilets in 1998 | No. of PU with Toilets in Planned/On-going Project | No. of PU with Sanitary Toilets in Planned/On-going Projects | No. of PU with Toilets in Base Year 1998 | No. of PU with Sanitary Toilets in Base year 1998 | Coverage (%) |
|---|---|---|---|---|---|---|---|---|
| Altavas | Public Market | 4 | 4 | | | 4 | 4 | 100 |
| | Bus/Jeepney Terminal | | | | | | | |
| | Parks/Playground | | | | | | | |
| | Total | 4 | 4 | | | 4 | 4 | 100 |
| Balete | Public Market | 2 | 2 | | | 2 | 2 | 100 |
| | Bus/Jeepney Terminal | | | | | | | |
| | Parks/Playground | | | | | | | |
| | Total | 2 | 2 | | | 2 | 2 | 100 |
| Banga | Public Market | 4 | 4 | | | 4 | 4 | 100 |
| | Bus/Jeepney Terminal | | | | | | | |
| | Parks/Playground | | | | | | | |
| | Total | 4 | 4 | | | 4 | 4 | 100 |
| Batan | Public Market | 2 | 2 | | | 2 | 2 | 100 |
| | Bus/Jeepney Terminal | 2 | 2 | | | 2 | 2 | 100 |
| | Parks/Playground | 2 | 2 | | | 2 | 2 | 100 |
| | Total | 6 | 6 | | | 6 | 6 | 100 |
| Buruanga | Public Market | 2 | 2 | | | 2 | 2 | 100 |
| | Bus/Jeepney Terminal | | | | | | | |
| | Parks/Playground | | | | | | | |
| | Total | 2 | 2 | | | 2 | 2 | 100 |
| Ibajay | Public Market | 2 | 2 | | | 2 | 2 | 100 |
| | Bus/Jeepney Terminal | 2 | 2 | | | 2 | 2 | 100 |
| | Parks/Playground | | | | | | | |
| | Total | 4 | 4 | | | 4 | 4 | 100 |
| Kalibo (Capital) | Public Market | 9 | 9 | | | 9 | 9 | 100 |
| | Bus/Jeepney Terminal | 6 | 6 | | | 6 | 6 | 100 |
| | Parks/Playground | 5 | 5 | | | 5 | 5 | 100 |
| | Total | 20 | 20 | | | 20 | 20 | 100 |
| Lezo | Public Market | 2 | 2 | | | 2 | 2 | 100 |
| | Bus/Jeepney Terminal | 2 | 2 | | | 2 | 2 | 100 |
| | Parks/Playground | | | | | | | |
| | Total | 4 | 4 | | | 4 | 4 | 100 |
| Libacao | Public Market | 2 | 2 | | | 2 | 2 | 100 |
| | Bus/Jeepney Terminal | | | | | | | |
| | Parks/Playground | | | | | | | |
| | Total | 2 | 2 | | | 2 | 2 | 100 |
| Madalag | Public Market | 2 | 2 | | | 2 | 2 | 100 |
| | Bus/Jeepney Terminal | 2 | 2 | | | 2 | 2 | 100 |
| | Parks/Playground | | | | | | | |
| | Total | 4 | 4 | | | 4 | 4 | 100 |
| Makato | Public Market | 2 | 2 | | | 2 | 2 | 100 |
| | Bus/Jeepney Terminal | | | | | | | |
| | Parks/Playground | | | | | | | |
| | Total | 2 | 2 | | | 2 | 2 | 100 |
| Malay | Public Market | 4 | 2 | | | 4 | 2 | 50 |
| | Bus/Jeepney Terminal | | | | | | | |
| | Parks/Playground | 2 | 2 | | | 2 | 2 | 100 |
| | Total | 6 | 4 | | | 6 | 4 | 67 |
| Malinao | Public Market | 2 | 2 | | | 2 | 2 | 100 |
| | Bus/Jeepney Terminal | | | | | | | |
| | Parks/Playground | | | | | | | |
| | Total | 2 | 2 | | | 2 | 2 | 100 |
| Nabas | Public Market | 8 | 8 | | | 8 | 8 | 100 |
| | Bus/Jeepney Terminal | | | | | | | |
| | Parks/Playground | | | | | | | |
| | Total | 8 | 8 | | | 8 | 8 | 100 |
| New Washington | Public Market | 4 | 4 | | | 4 | 4 | 100 |
| | Bus/Jeepney Terminal | 2 | 2 | | | 2 | 2 | 100 |
| | Parks/Playground | | | | | | | |
| | Total | 6 | 6 | | | 6 | 6 | 100 |
| Numancia | Public Market | 2 | 2 | | | 2 | 2 | 100 |
| | Bus/Jeepney Terminal | 4 | 4 | | | 4 | 4 | 100 |
| | Parks/Playground | | | | | | | |
| | Total | 6 | 6 | | | 6 | 6 | 100 |
| Tangalan | Public Market | 4 | 4 | | | 4 | 4 | 100 |
| | Bus/Jeepney Terminal | | | | | | | |
| | Parks/Playground | | | | | | | |
| | Total | 4 | 4 | | | 4 | 4 | 100 |
| Provincial Total | Public Market | 57 | 55 | | | 57 | 55 | 96 |
| | Bus/Jeepney Terminal | 20 | 20 | | | 20 | 20 | 100 |
| | Parks/Playground | 9 | 9 | | | 9 | 9 | 100 |
| | Total | 86 | 84 | | | 86 | 84 | 98 |

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

| Name of Municipality | Area | No. of Household Served by Existing Facilities | | | | Coverage in 1998 | | | | | | | Coverage in 2005 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Flush | Pour Flush | VIP/Dry | Total | No. of HHs | Percentage of Served Households | | | | Served Population | | No. of HHs | Percentage of Served Households | | | | Served Population | |
| | | | | | | | Flush | Pour Flush | VIP/ Dry | Total | Number | % | | Flush | Pour Flush | VIP/ Dry | Total | Number | % |
| Altavas | Urban | 41 | 255 | 100 | 396 | 521 | 8 | 49 | 19 | 76 | 2,150 | 76 | 556 | 7 | 46 | 18 | 71 | 2,325 | 71 |
| | Rural | 9 | 2,136 | | 2,145 | 3,699 | | 58 | | 58 | 1,641 | 58 | 3,945 | | 54 | | 54 | 11,896 | 54 |
| | Total | 50 | 2,391 | 100 | 2,541 | 4,220 | 1 | 57 | 2 | 60 | 3,791 | 60 | 4,501 | 1 | 53 | 2 | 56 | 14,221 | 56 |
| Balete | Urban | | 33 | 311 | 344 | 343 | | 10 | 91 | 100 | 1,727 | 100 | 347 | | 10 | 90 | 99 | 2,015 | 99 |
| | Rural | | | 1,433 | 1,433 | 3,642 | | | 39 | 39 | 674 | 39 | 3,679 | | | 39 | 39 | 7,521 | 39 |
| | Total | | 33 | 1,744 | 1,777 | 3,985 | | 1 | 44 | 45 | 2,401 | 45 | 4,026 | | 1 | 43 | 44 | 9,536 | 44 |
| Banga | Urban | 295 | 94 | 11 | 400 | 422 | 70 | 22 | 3 | 95 | 2,047 | 95 | 452 | 65 | 21 | 2 | 88 | 2,104 | 88 |
| | Rural | 197 | 2,899 | 988 | 4,084 | 5,658 | 3 | 51 | 17 | 72 | 1,552 | 72 | 6,064 | 3 | 48 | 16 | 67 | 22,112 | 67 |
| | Total | 492 | 2,993 | 999 | 4,484 | 6,080 | 8 | 49 | 16 | 74 | 3,599 | 74 | 6,516 | 8 | 46 | 15 | 69 | 24,216 | 69 |
| Batan | Urban | 23 | 303 | 3 | 329 | 346 | 7 | 88 | 1 | 95 | 1,491 | 95 | 359 | 6 | 84 | 1 | 92 | 1,501 | 92 |
| | Rural | 10 | 2,886 | 14 | 2,910 | 5,106 | | 57 | | 57 | 894 | 57 | 5,312 | | 54 | | 55 | 15,157 | 55 |
| | Total | 33 | 3,189 | 17 | 3,239 | 5,452 | 1 | 58 | | 59 | 2,385 | 59 | 5,671 | 1 | 56 | | 57 | 16,658 | 57 |
| Buruanga | Urban | 125 | 62 | 17 | 204 | 224 | 56 | 28 | 8 | 91 | 1,075 | 91 | 225 | 56 | 28 | 8 | 91 | 1,169 | 91 |
| | Rural | 16 | 850 | | 866 | 2,321 | 1 | 37 | | 37 | 437 | 37 | 2,327 | 1 | 37 | | 37 | 4,504 | 37 |
| | Total | 141 | 912 | 17 | 1,070 | 2,545 | 6 | 36 | 1 | 42 | 1,512 | 42 | 2,552 | 6 | 36 | 1 | 42 | 5,673 | 42 |
| Ibajay | Urban | 109 | 251 | | 360 | 530 | 21 | 47 | | 68 | 1,862 | 68 | 542 | 20 | 46 | | 66 | 1,954 | 66 |
| | Rural | 89 | 4,311 | | 4,400 | 6,952 | 1 | 62 | | 63 | 1,725 | 63 | 7,120 | 1 | 61 | | 62 | 22,621 | 62 |
| | Total | 198 | 4,562 | | 4,760 | 7,482 | 3 | 61 | | 64 | 3,587 | 64 | 7,662 | 3 | 60 | | 62 | 24,575 | 62 |
| Kalibo (Capital) | Urban | 7,073 | 2,813 | 609 | 10,495 | 12,189 | 58 | 23 | 5 | 86 | 53,986 | 86 | 14,521 | 49 | 19 | 4 | 72 | 61,019 | 72 |
| | Rural | | | | | | | | | | | | | | | | | | |
| | Total | 7,073 | 2,813 | 609 | 10,495 | 12,189 | 58 | 23 | 5 | 86 | 53,986 | 86 | 14,521 | 49 | 19 | 4 | 72 | 61,019 | 72 |
| Lezo | Urban | 43 | 241 | 107 | 391 | 416 | 10 | 58 | 26 | 94 | 1,851 | 94 | 486 | 9 | 50 | 22 | 80 | 1,907 | 80 |
| | Rural | 146 | 1,018 | 536 | 1,700 | 2,083 | 7 | 49 | 26 | 82 | 1,615 | 82 | 2,431 | 6 | 42 | 22 | 70 | 9,059 | 70 |
| | Total | 189 | 1,259 | 643 | 2,091 | 2,499 | 8 | 50 | 26 | 84 | 3,466 | 84 | 2,917 | 6 | 43 | 22 | 72 | 10,966 | 72 |
| Libacao | Urban | 205 | 153 | 65 | 423 | 529 | 39 | 29 | 12 | 80 | 2,246 | 80 | 578 | 35 | 26 | 11 | 73 | 2,527 | 73 |
| | Rural | 87 | 1,076 | 1,033 | 2,196 | 3,783 | 2 | 28 | 27 | 58 | 1,629 | 58 | 4,135 | 2 | 26 | 25 | 53 | 12,167 | 53 |
| | Total | 292 | 1,229 | 1,098 | 2,619 | 4,312 | 7 | 29 | 25 | 61 | 3,875 | 61 | 4,713 | 6 | 26 | 23 | 56 | 14,694 | 56 |

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

| Name of Municipality | Area | No. of Household Served by Existing Facilities | | | | Coverage in 1998 | | | | | | | Coverage in 2005 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Flush | Pour Flush | VIP/Dry | Total | No. of HHs | Percentage of Served Households | | | | Served Population | | No. of HHs | Percentage of Served Households | | | | Served Population | |
| | | | | | | | Flush | Pour Flush | VIP/ Dry | Total | Number | % | | Flush | Pour Flush | VIP/ Dry | Total | Number | % |
| Madalag | Urban | 9 | 153 | 56 | 218 | 286 | 3 | 53 | 20 | 76 | 1,259 | 76 | 326 | 3 | 47 | 17 | 67 | 1,454 | 67 |
| | Rural | 7 | 852 | 498 | 1,357 | 2,759 | | 31 | 18 | 49 | 812 | 49 | 3,152 | | 27 | 16 | 43 | 8,245 | 43 |
| | Total | 16 | 1,005 | 554 | 1,575 | 3,045 | 1 | 33 | 18 | 52 | 2,071 | 52 | 3,478 | | 29 | 16 | 45 | 9,699 | 45 |
| Makato | Urban | 20 | 436 | 93 | 549 | 559 | 4 | 78 | 17 | 98 | 2,869 | 98 | 673 | 3 | 65 | 14 | 82 | 3,168 | 82 |
| | Rural | 26 | 2,300 | 905 | 3,231 | 3,840 | 1 | 60 | 24 | 84 | 2,460 | 84 | 4,628 | 1 | 50 | 20 | 70 | 19,328 | 70 |
| | Total | 46 | 2,736 | 998 | 3,780 | 4,399 | 1 | 62 | 23 | 86 | 5,329 | 86 | 5,301 | 1 | 52 | 19 | 71 | 22,496 | 71 |
| Malay | Urban | 824 | 264 | | 1,088 | 1,188 | 69 | 22 | | 92 | 5,965 | 92 | 1,840 | 45 | 14 | | 59 | 7,626 | 59 |
| | Rural | 159 | 2,085 | | 2,244 | 3,238 | 5 | 64 | | 69 | 4,474 | 69 | 5,019 | 3 | 42 | | 45 | 15,250 | 45 |
| | Total | 983 | 2,349 | | 3,332 | 4,426 | 22 | 53 | | 75 | 10,439 | 75 | 6,859 | 14 | 34 | | 49 | 22,876 | 49 |
| Malinao | Urban | 25 | 235 | 18 | 278 | 316 | 8 | 74 | 6 | 88 | 1,359 | 88 | 347 | 7 | 68 | 5 | 80 | 1,440 | 80 |
| | Rural | 17 | 1,784 | 1,167 | 2,968 | 3,957 | | 45 | 29 | 75 | 1,158 | 75 | 4,337 | | 41 | 27 | 68 | 16,480 | 68 |
| | Total | 42 | 2,019 | 1,185 | 3,246 | 4,273 | 1 | 47 | 28 | 76 | 2,517 | 76 | 4,684 | 1 | 43 | 25 | 69 | 17,920 | 69 |
| Nabas | Urban | 340 | 356 | 42 | 738 | 778 | 44 | 46 | 5 | 95 | 3,704 | 95 | 825 | 41 | 43 | 5 | 89 | 4,003 | 89 |
| | Rural | 250 | 2,493 | 154 | 2,897 | 3,542 | 7 | 70 | 4 | 82 | 3,197 | 82 | 3,754 | 7 | 66 | 4 | 77 | 16,072 | 77 |
| | Total | 590 | 2,849 | 196 | 3,635 | 4,320 | 14 | 66 | 5 | 84 | 6,901 | 84 | 4,579 | 13 | 62 | 4 | 79 | 20,075 | 79 |
| New Washington | Urban | 16 | 742 | 57 | 815 | 968 | 2 | 77 | 6 | 84 | 4,317 | 84 | 1,051 | 2 | 71 | 5 | 78 | 4,654 | 78 |
| | Rural | 34 | 3,292 | 603 | 3,929 | 5,364 | 1 | 61 | 11 | 73 | 3,751 | 73 | 5,825 | 1 | 57 | 10 | 67 | 21,776 | 67 |
| | Total | 50 | 4,034 | 660 | 4,744 | 6,332 | 1 | 64 | 10 | 75 | 8,068 | 75 | 6,876 | 1 | 59 | 10 | 69 | 26,430 | 69 |
| Numancia | Urban | 236 | 265 | | 501 | 580 | 41 | 46 | | 86 | 2,712 | 86 | 684 | 35 | 39 | | 73 | 3,361 | 73 |
| | Rural | 354 | 1,990 | 382 | 2,726 | 4,006 | 9 | 50 | 10 | 68 | 2,145 | 68 | 4,723 | 7 | 42 | 8 | 58 | 15,647 | 58 |
| | Total | 590 | 2,255 | 382 | 3,227 | 4,586 | 13 | 49 | 8 | 70 | 4,857 | 70 | 5,407 | 11 | 42 | 7 | 60 | 19,008 | 60 |
| Tangalan | Urban | 23 | 347 | 26 | 396 | 522 | 4 | 66 | 5 | 76 | 2,154 | 76 | 593 | 4 | 59 | 4 | 67 | 2,441 | 67 |
| | Rural | 47 | 983 | 665 | 1,695 | 2,605 | 2 | 38 | 26 | 65 | 1,842 | 65 | 2,961 | 2 | 33 | 22 | 57 | 10,480 | 57 |
| | Total | 70 | 1,330 | 691 | 2,091 | 3,127 | 2 | 43 | 22 | 67 | 3,996 | 67 | 3,554 | 2 | 37 | 19 | 59 | 12,921 | 59 |
| Provincial Total | Urban | 9,407 | 7,003 | 1,515 | 17,925 | 20,717 | 45 | 34 | 7 | 87 | 92,774 | 87 | 24,405 | 39 | 29 | 6 | 73 | 104,668 | 73 |
| | Rural | 1,448 | 30,955 | 8,378 | 40,781 | 62,555 | 2 | 49 | 13 | 65 | 30,006 | 65 | 69,412 | 2 | 45 | 12 | 59 | 228,315 | 59 |
| | Total | 10,855 | 37,958 | 9,893 | 58,706 | 83,272 | 13 | 46 | 12 | 70 | 122,780 | 70 | 93,817 | 12 | 40 | 11 | 63 | 332,983 | 63 |

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

| Name of Municipalities | Public School Toilets | | | | | Public Toilets | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Std. No. of Student that can be Served by Base Year | Coverage in 1998 | | Coverage in 2005 | | Coverage in 1998 | | | Coverage in 2005 | | |
| | | Total No. of Public School Students | % | Total No. of Public School Student | % | No. of PU with Toilets in Base Year | No. of PU with Sanitary Toilets in Base Year | % | No. of PU with Toilets | No. of PU with Sanitary Toilets in Base Year | % |
| Altavas | 2,960 | 6,636 | 45 | 6,245 | 47 | 4 | 4 | 100 | 4 | 4 | 100 |
| Balete | 3,240 | 5,012 | 65 | 4,725 | 69 | 2 | 2 | 100 | 4 | 2 | 50 |
| Banga | 4,373 | 4,373 | 100 | 4,966 | 88 | 4 | 4 | 100 | 3 | 4 | 133 |
| Batan | 1,840 | 7,278 | 25 | 7,046 | 26 | 6 | 6 | 100 | 5 | 6 | 120 |
| Buruanga | 840 | 3,545 | 24 | 3,310 | 25 | 2 | 2 | 100 | 3 | 2 | 67 |
| Ibajay | 2,200 | 3,929 | 56 | 4,279 | 51 | 4 | 4 | 100 | 4 | 4 | 100 |
| Kalibo (Capital) | 11,480 | 13,792 | 83 | 17,969 | 64 | 20 | 20 | 100 | 11 | 20 | 182 |
| Lezo | 2,320 | 3,110 | 75 | 3,436 | 68 | 4 | 4 | 100 | 3 | 4 | 133 |
| Libacao | 3,320 | 5,705 | 58 | 6,310 | 53 | 2 | 2 | 100 | 3 | 2 | 67 |
| Madalag | 2,320 | 5,861 | 40 | 5,197 | 45 | 4 | 4 | 100 | 4 | 4 | 100 |
| Makato | 2,640 | 5,362 | 49 | 6,667 | 40 | 2 | 2 | 100 | 3 | 2 | 67 |
| Malay | 2,720 | 4,989 | 55 | 7,678 | 35 | 6 | 4 | 67 | 5 | 4 | 80 |
| Malinao | 3,840 | 5,700 | 67 | 6,053 | 63 | 2 | 2 | 100 | 3 | 2 | 67 |
| Nabas | 3,200 | 6,655 | 48 | 6,332 | 51 | 8 | 8 | 100 | 3 | 8 | 267 |
| New Washington | 2,800 | 6,444 | 43 | 7,084 | 40 | 6 | 6 | 100 | 4 | 6 | 150 |
| Numancia | 1,040 | 4,402 | 24 | 5,537 | 19 | 6 | 6 | 100 | 5 | 6 | 120 |
| Tangalan | 4,360 | 4,402 | 99 | 4,999 | 87 | 4 | 4 | 100 | 4 | 4 | 100 |
| **Provincial Total** | 55,493 | 97,195 | 57 | 107,833 | 51 | 86 | 84 | 98 | 71 | 84 | 118 |

## 8.3 Projection of Frame Values

### 8.3.1 Review of Past Population Development and Population Projection

The future population of the region and the province has been recently projected by the NSO. However, the NSO does not prepare municipal population. With regard to this, the municipal population for the years 1998 (planning base year), 2005 (medium-term target year) and 2010 (long-term target year) was projected in this study. Available information for the study at present is as follows:

- NSO population census results from 1980 to 1995
- 1995 Census-based Regional and Provincial Population Projection prepared by the NSO
- Provincial Physical Framework Plan/Comprehensive Provincial Land Use Plan (1993-2003) prepared by the Provincial Office (hereafter referred to as "the Land Use Plan")

(1) 1995 Census-Based Regional and Provincial Population Projections: NSO

The NSO conducted regional and provincial projections for the period 1995-2020. The assumptions take into account future trends in the demographic processes of fertility, mortality and migration required by the cohort-component method for projecting population. The 1995 Population Census was used as the basis for the projection.

In the regional population projection, the subject region for this study; Region VI is classified as the medium-sized region (at least 5 million but less than 10 million by year 2000). The following are the result of projection for the region and the province of Aklan in 2000, 2005 and 2010.

**Table 8.3.1 Regional and Provincial Population Projection by NSO**

| Year | | 1980 | 1990 | 1995 | 2000 | 2005 | 2010 |
|---|---|---|---|---|---|---|---|
| Region VI | Population | 4,525,615 | 5,393,333 | 5,756,623 | 6,328,671 | 6,890,447 | 7,428,329 |
| | Growth Rate | - | 1.77% | 1.31% | 1.91% | 1.72% | 1.51% |
| Aklan | Population | 324,563 | 380,497 | 408,949 | 447,974 | 487,839 | 528,072 |
| | Growth Rate | - | 1.60% | 1.45% | 1.84% | 1.72% | 1.60% |

Note: Average annual growth rates: geometric growth rate
Population of the province in 1995 as of September 1, 1995 was 410,539 (1995 Census)

In the past development, annual growth rates of the region between 1990 and 1995 decreased compared with those of previous census period. Likewise, the growth rates for the province slightly decreased within census period (1980-1995). For the projection, however, the NSO adopted the almost same growth rates for the region and province considering previous development (up to 1990) of the regional population. Thus, the growth rates of the region with 5-year interval between 1995 and 2010 are

assumed at 1.91%, 1.72% and 1.51%, respectively. Likewise, those of the province are assumed at 1.84%, 1.71% and 1.60%.

(2) The Land Use Plan: Province of Aklan (Planning period 1993-2002)

The population projection on the provincial total and component municipalities was made with a base year 1990. The population for the year 2002 was projected using a uniform growth rate between 1990 and 2002 referring to the experience from 1980 to 1990 (census years). The regional and provincial growth rate between 1980 and 1990 were 1.77% and 1.59%, respectively.

The following are comparison of the projected population for year 2002 between the Land Use Plan and NSO.

| | Land Use Plan | NSO | Comparison |
|---|---|---|---|
| Regional Population | Not Available | 6,890,447 | |
| Provincial Population | 450,483 | 463,912 | 3.0% lower than NSO |

In comparison between Land Use Plan and NSO's projection for year 2002, there is no significant difference in provincial population.

While Table 8.3.2 shows past population developments in census years (1980-1995) and projections for the years 1995 and 2002 by municipality as a base year 1990 in application of assumed annual growth rates for the period 1990 to 2002 in the said Land Use Plan.

In comparison of 1995 municipal population between the projected and census results, the projected population of ten (10) out of 17 municipalities is lower than the census results with a range of -1% to 14%, while that of remaining seven (7) municipalities is higher with a range of 3% to 8%.

Thus, future projection for the municipalities shall be made using 1995 census results as a base year. While, the regional and provincial population projected by the NSO may be adopted in this PW4SP, since the differences between population projected for the medium-term by Land Use Plan and by the NSO is less than 3%.

(3) Population Projection of the Province

The following conditions are considered in the population projection.

Regional and Provincial Population

For the regional and provincial population in the study, the projection conducted by NSO shall be adopted. Table 8.3.3 shows the projected population of the region VI and component provinces.

**Table 8.3.2 Census Population and Projected Population in Land Use Plan**

| Municipality | Census Population | | | | | Land Use Plan | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1980 | 1990 | Growth Rate (1980-1990) | 1995 | Growth Rate (1990-1995) | 1995 | Compariso w/ Census (%) | 2002 | Growth Rate (1980-2005) |
| Altavas | 17,443 | 20,526 | 1.64% | 21,475 | 0.91% | 18,565 | -13.55% | 16,130 | -1.99% |
| Balete | 17,300 | 19,842 | 1.38% | 19,972 | 0.13% | 20,964 | 4.97% | 22,642 | 1.11% |
| Banga | 25,034 | 28,640 | 1.35% | 30,071 | 0.98% | 31,302 | 4.09% | 35,449 | 1.79% |
| Batan | 23,393 | 25,698 | 0.94% | 26,415 | 0.55% | 28,487 | 7.84% | 32,908 | 2.08% |
| Buruanga | 10,764 | 12,652 | 1.63% | 12,665 | 0.02% | 13,602 | 7.40% | 15,053 | 1.46% |
| Ibajay | 31,214 | 35,598 | 1.32% | 36,184 | 0.33% | 39,045 | 7.91% | 44,439 | 1.87% |
| Kalibo (capital) | 39,894 | 51,277 | 2.54% | 58,065 | 2.52% | 56,305 | -3.03% | 64,184 | 1.89% |
| Lezo | 9,625 | 10,338 | 0.72% | 11,536 | 2.22% | 11,426 | -0.96% | 13,143 | 2.02% |
| Libacao | 21,683 | 21,425 | -0.12% | 22,812 | 1.26% | 22,238 | -2.51% | 23,429 | 0.75% |
| Madalag | 14,128 | 15,160 | 0.71% | 16,659 | 1.90% | 15,810 | -5.10% | 16,766 | 0.84% |
| Makato | 16,732 | 19,228 | 1.40% | 21,955 | 2.69% | 19,880 | -9.45% | 20,830 | 0.67% |
| Malay | 9,120 | 14,201 | 4.53% | 19,406 | 6.44% | 16,905 | -12.89% | 21,576 | 3.55% |
| Malinao | 18,117 | 20,161 | 1.07% | 21,509 | 1.30% | 20,903 | -2.82% | 21,988 | 0.73% |
| Nabas | 16,607 | 20,533 | 2.14% | 21,391 | 0.82% | 21,964 | 2.68% | 24,137 | 1.36% |
| New washington | 26,119 | 30,093 | 1.43% | 31,896 | 1.17% | 33,650 | 5.50% | 39,346 | 2.26% |
| Numancia | 16,216 | 19,887 | 2.06% | 22,356 | 2.37% | 20,619 | -7.77% | 21,690 | 0.73% |
| Tangalan | 11,174 | 14,769 | 2.83% | 16,172 | 1.83% | 15,573 | -3.70% | 16,773 | 1.07% |
| Province | 324,563 | 380,028 | 1.59% | 410,539 | 1.56% | 407,93 | -0.63% | 450,483 | 1.43% |

Note: * Population in 1995 was estimated using average annual growth rate (1990-2002) employed in Land Use Plan

**Table 8.3.3 Projected Population by the NSO**

| Province | Census Population | Projected Population/Growth Rate | | | | | |
|---|---|---|---|---|---|---|---|
| | | Population | | | Average Annual Growth Rate | | |
| | 1995 | 1998 | 2005 | 2010 | 1995-2000 | 2000-2005 | 2005-2010 |
| Aklan | 408,949 | 432,359 | 487,839 | 528,072 | 1.84% | 1.72% | 1.60% |
| Antique | 430,363 | 455,051 | 512,755 | 554,797 | 1.84% | 1.69% | 1.59% |
| Capiz | 622,034 | 657,975 | 742,312 | 801,742 | 1.86% | 1.71% | 1.55% |
| Guimaras | 126,034 | 133,422 | 150,680 | 162,774 | 1.88% | 1.72% | 1.56% |
| Iloilo | 1,743,302 | 1,847,328 | 2,086,833 | 2,249,494 | 1.91% | 1.72% | 1.51% |
| Negros Occidental | 2,425,941 | 2,573,658 | 2,910,028 | 3,131,450 | 1.95% | 1.72% | 1.48% |
| Region VI | 5,756,623 | 6,099,793 | 6,890,447 | 7,428,329 | 1.91% | 1.72% | 1.51% |

Source NSO
Note: Population of Aklan in 1995 as of Sep. 1, 1995 was 410,539 (1995 Census)

Municipal Population

1) The total population of the province in 1998, 2005 and 2010 was fixed.
2) Municipal population for short/medium-term target years (1998 and 2005) is estimated using the recorded growth rates between 1990 and 1995. The municipal population estimated initially is adjusted in proportion to the population size of each municipality to the total provincial population, to meet the above mentioned provincial population fixed for the years 1998 and 2005.

For the year 2010 in the long-term, it is assumed that the tendency of population growth of respective municipalities between 1980 and 1995 will not change drastically in the future. Thus, recorded growth rate between 1980 and 1995 by municipality is firstly applied to project 2010 population from the year 2005. Then, the municipal population estimated initially is adjusted in the same manner mentioned above.

Table 8.3.4 presents census results (1980, 1990 and 1995) and projected population of the municipalities.

**Table 8.3.4 Census results and Projected Population of Municipalities**

| Municipality | Census Result | | | | | Projected Population/Growth Rate | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | GR | | 1998 | | | 2005 | | | 2010 | | |
| | 1980 | 1990 | 1995 | 1990-1995 | 1980-1995 | Population | | GR | Population | | GR | Population | | GR |
| | | | | | | Initia | Adju | | Initia | Adju | | Initia | Adju | |
| Altavas | 17,443 | 20,526 | 21,475 | 0.91% | 1.40% | 22,065 | 22,140 | 1.02% | 23,507 | 23,610 | 0.95% | 25,304 | 25,036 | 1.18% |
| Balete | 17,300 | 19,842 | 19,972 | 0.13% | 0.96% | 20,050 | 20,119 | 0.24% | 20,235 | 20,323 | 0.17% | 21,320 | 21,094 | 0.75% |
| Banga | 25,034 | 28,640 | 30,071 | 0.98% | 1.23% | 30,964 | 31,069 | 1.09% | 33,151 | 33,296 | 1.02% | 35,394 | 35,020 | 1.01% |
| Batan | 23,393 | 25,698 | 26,415 | 0.55% | 0.81% | 26,855 | 26,946 | 0.67% | 27,910 | 28,032 | 0.60% | 29,190 | 28,881 | 0.60% |
| Buruanga | 10,764 | 12,652 | 12,665 | 0.02% | 1.09% | 12,673 | 12,716 | 0.13% | 12,691 | 12,747 | 0.06% | 13,457 | 13,314 | 0.85% |
| Ibajay | 31,214 | 35,598 | 36,184 | 0.33% | 0.99% | 36,540 | 36,664 | 0.44% | 37,385 | 37,549 | 0.37% | 39,445 | 39,027 | 0.78% |
| Kalibo (capital) | 39,894 | 51,277 | 58,065 | 2.52% | 2.53% | 62,562 | 62,774 | 2.63% | 74,456 | 74,782 | 2.56% | 84,749 | 83,851 | 2.32% |
| Lezo | 9,625 | 10,338 | 11,536 | 2.22% | 1.21% | 12,320 | 12,362 | 2.33% | 14,365 | 14,428 | 2.26% | 15,325 | 15,163 | 1.00% |
| Libacao | 21,683 | 21,425 | 22,812 | 1.26% | 0.34% | 23,687 | 23,767 | 1.38% | 25,861 | 25,975 | 1.31% | 26,418 | 26,138 | 0.13% |
| Madalag | 14,128 | 15,160 | 16,659 | 1.99% | 1.10% | 17,629 | 17,689 | 2.02% | 20,116 | 20,204 | 1.95% | 21,345 | 21,119 | 0.89% |
| Makato | 16,732 | 19,228 | 21,955 | 2.69% | 1.83% | 23,773 | 23,854 | 2.80% | 28,624 | 28,750 | 2.73% | 31,475 | 31,141 | 1.61% |
| Malay | 9,120 | 14,201 | 19,406 | 6.44% | 5.16% | 23,405 | 23,484 | 6.56% | 36,239 | 36,397 | 6.49% | 46,815 | 46,319 | 4.94% |
| Malinao | 18,117 | 20,161 | 21,509 | 1.30% | 1.15% | 22,361 | 22,437 | 1.42% | 24,481 | 24,589 | 1.35% | 26,036 | 25,761 | 0.94% |
| Nabas | 16,607 | 20,533 | 21,391 | 0.82% | 1.70% | 21,923 | 21,997 | 0.94% | 23,216 | 23,318 | 0.87% | 25,371 | 25,102 | 1.49% |
| New washington | 26,119 | 30,093 | 31,896 | 1.17% | 1.34% | 33,029 | 33,141 | 1.28% | 35,833 | 35,990 | 1.21% | 38,468 | 38,061 | 1.13% |
| Numancia | 16,216 | 19,887 | 22,356 | 2.37% | 2.16% | 23,982 | 24,064 | 2.48% | 28,252 | 28,375 | 2.41% | 31,581 | 31,247 | 1.95% |
| Tangalan | 11,174 | 14,769 | 16,172 | 1.83% | 2.50% | 17,077 | 17,135 | 1.95% | 19,391 | 19,475 | 1.88% | 22,030 | 21,796 | 2.28% |
| province | 324,56 | 389,02 | 410,53 | 1.56% | 1.58% | 430,89 | 432,35 | 1.74% | 485,71 | 487,83 | 1.74% | 533,72 | 528,07 | 1.60% |

Note: Growth rates in 1998, 2005 and 2010 were calculated using geometric formula.

Population by Urban and Rural Area

1) Past population development

Table 8.3.5 shows the urban and rural population with growth rates in census years (1980-1995) by municipality. With regards to the ratio of the urban population of the province to the total population, the provincial averages in 1980 and 1990 were 12.1% and 24.3%, respectively. While it maintained same ratio in 1995. The provincial growth rate of 8.88% between 1980 and 1990 decreased to 1.62% in 1995. With regard to the rural population, growth rates as the provincial average were 0.09% (1980 - 1990) and 1.54% (1990 - 1995), respectively.

2) Projection of urban and rural population for the years 1998, 2005 and 2010

Urban population by municipality for the target years was at first projected and rural population was calculated to meet aforementioned total population fixing the urban

population.

**Table 8.3.5 Past Population Development by Urban and Rural Area**

| | Municipality | 1980 | | | 1990 | | | | 1995 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Total | Urban / Rural | Share (%) | Total | Urban/ Rural | G.R. 1980-1990 (%) | Share (%) | Total | Urban/ Rural | G.R. 1990-1995 (%) | G.R. 1980-1995 (%) | Share (%) |
| Urban Area | Altavas | 17,443 | 2,146 | 12.3% | 20,526 | 2,621 | 2.02% | 12.8 | 21,47 | 2,744 | 0.92% | 1.65% | 12.8% |
| | Balete | 17,300 | 1,079 | 6.2% | 19,842 | 1,515 | 3.45% | 7.6% | 19,97 | 1,714 | 2.50% | 3.13% | 8.6% |
| | Banga | 25,034 | 1,881 | 7.5% | 28,640 | 2,040 | 0.81% | 7.1% | 30,07 | 2,086 | 0.45% | 0.69% | 6.9% |
| | Batan | 23,393 | 1,546 | 6.6% | 25,698 | 1,543 | -0.02% | 6.0% | 26,41 | 1,538 | -0.06% | -0.03% | 5.8% |
| | Buruanga | 10,764 | 918 | 8.5% | 12,652 | 1,044 | 1.29% | 8.3% | 12,66 | 1,176 | 2.41% | 1.66% | 9.3% |
| | Ibajay | 31,214 | 2,297 | 7.4% | 35,598 | 3,985 | 5.66% | 11.2 | 36,18 | 2,702 | -7.48% | 1.09% | 7.5% |
| | Kalibo | 39,894 | 15,823 | 39.7% | 51,277 | 51,277 | 12.48% | 100.0 | 58,06 | 58,065 | 2.52% | 9.05% | 100.0% |
| | Lezo | 9,625 | 1,645 | 17.1% | 10,338 | 1,736 | 0.54% | 16.8 | 11,53 | 1,837 | 1.14% | 0.74% | 15.9% |
| | Libacao | 21,683 | 1,877 | 8.7% | 21,425 | 2,811 | 4.12% | 13.1 | 22,81 | 2,695 | -0.84% | 2.44% | 11.8% |
| | Madalag | 14,128 | 1,036 | 7.3% | 15,160 | 1,542 | 4.06% | 10.2 | 16,65 | 1,561 | 0.25% | 2.77% | 9.4% |
| | Makato | 16,732 | 0 | 0.0% | 19,228 | 2,621 | - | 13.6 | 21,95 | 2,695 | 0.56% | - | 12.3% |
| | Malay | 9,120 | 709 | 7.8% | 14,201 | 832 | 1.61% | 5.9% | 19,40 | 5,358 | 45.14% | 14.43% | 27.6% |
| | Malinao | 18,117 | 1,230 | 6.8% | 20,161 | 1,517 | 2.12% | 7.5% | 21,50 | 1,480 | -0.49% | 1.24% | 6.9% |
| | Nabas | 16,607 | 1,646 | 9.9% | 20,533 | 7,869 | 16.94% | 38.3 | 21,39 | 3,792 | - | 5.72% | 17.7% |
| | New Washington | 26,119 | 4,047 | 15.5% | 30,093 | 4,510 | 1.09% | 15.0 | 31,89 | 4,946 | 1.86% | 1.35% | 15.5% |
| | Numancia | 16,216 | 1,544 | 9.5% | 19,887 | 3,642 | 8.96% | 18.3 | 22,35 | 2,930 | -4.26% | 4.36% | 13.1% |
| | Tangalan | 11,174 | 0 | 0.0% | 14,769 | 1,168 | #DIV/0 | 7.9% | 16,17 | 2,675 | 18.03% | #DIV/0 | 16.5% |
| | **Province** | **324,56** | **39,424** | **12.1%** | **380,02** | **92,273** | **8.88%** | **24.3** | **410,5** | **99,994** | **1.62%** | **6.40%** | **24.4%** |
| Rural Area | Altavas | 17,443 | 15,297 | 87.7% | 20,526 | 17,905 | 1.59% | 87.2 | 21,47 | 18,731 | 0.91% | 1.36% | 87.2% |
| | Balete | 17,300 | 16,221 | 93.8% | 19,842 | 18,327 | 1.23% | 92.4 | 19,97 | 18,258 | -0.08% | 0.79% | 91.4% |
| | Banga | 25,034 | 23,153 | 92.5% | 28,640 | 26,600 | 1.40% | 92.9 | 30,07 | 27,985 | 1.02% | 1.27% | 93.1% |
| | Batan | 23,393 | 21,847 | 93.4% | 25,698 | 24,155 | 1.01% | 94.0 | 26,41 | 24,877 | 0.59% | 0.87% | 94.2% |
| | Buruanga | 10,764 | 9,846 | 91.5% | 12,652 | 11,608 | 1.66% | 91.7 | 12,66 | 11,489 | -0.21% | 1.03% | 90.7% |
| | Ibajay | 31,214 | 28,917 | 92.6% | 35,598 | 31,613 | 0.90% | 88.8 | 36,18 | 33,482 | 1.16% | 0.98% | 92.5% |
| | Kalibo | 39,894 | 24,071 | 60.3% | 51,277 | 0 | -100.00% | 0.0% | 58,06 | 0 | - | - | 0.0% |
| | Lezo | 9,625 | 7,980 | 82.9% | 10,338 | 8,602 | 0.75% | 83.2 | 11,53 | 9,699 | 2.43% | 1.31% | 84.1% |
| | Libacao | 21,683 | 19,806 | 91.3% | 21,425 | 18,614 | -0.62% | 86.9 | 22,81 | 20,117 | 1.57% | 0.10% | 88.2% |
| | Madalag | 14,128 | 13,092 | 92.7% | 15,160 | 13,618 | 0.39% | 89.8 | 16,65 | 15,098 | 2.08% | 0.95% | 90.6% |
| | Makato | 16,732 | 16,732 | 100.0% | 19,228 | 16,607 | -0.07% | 86.4 | 21,95 | 19,260 | 3.01% | 0.94% | 87.7% |
| | Malay | 9,120 | 8,411 | 92.2% | 14,201 | 13,369 | 4.74% | 94.1 | 19,40 | 14,048 | 1.00% | 3.48% | 72.4% |
| | Malinao | 18,117 | 16,887 | 93.2% | 20,161 | 18,644 | 0.99% | 92.5 | 21,50 | 20,029 | 1.44% | 1.14% | 93.1% |
| | Nabas | 16,607 | 14,961 | 90.1% | 20,533 | 12,664 | -1.65% | 61.7 | 21,39 | 17,599 | - | 1.09% | 82.3% |
| | New Washington | 26,119 | 22,072 | 84.5% | 30,093 | 25,583 | 1.49% | 85.0 | 31,89 | 26,950 | 1.05% | 1.34% | 84.5% |
| | Numancia | 16,216 | 14,672 | 90.5% | 19,887 | 16,245 | 1.02% | 81.7 | 22,35 | 19,426 | 3.64% | 1.89% | 86.9% |
| | Tangalan | 11,174 | 11,174 | 100.0% | 14,769 | 13,601 | 1.98% | 92.1 | 16,17 | 13,497 | -0.15% | 1.27% | 83.5% |
| | **Province** | **324,56** | **285,139** | **87.9%** | **380,02** | **287,75** | **0.09%** | **75.7** | **410,5** | **310,54** | **1.54%** | **0.57%** | **75.6%** |

In the projection of municipal urban population, the following are assumed by short/medium-term and long-term.

Short/Medium-term target: 1998 and 2004

The share of urban population in 1995 in terms of the profile of urban population to total population by municipality were basically adopted, assuming that the latest profile will not change drastically in short/medium-term period.

Long-term target: 2010

For the long-term projection, the recorded growth rates of urban population between 1980 and 1995 may be applied for the municipal population in 2010, assuming that the tendency of urban population in the long-term period will be stable reflecting past longer term results.

However, for the municipality of Batan, the urban population in 2005 was fixed to avoid negative growth of the population in 2010.

In addition, some modifications were made as follows:

- Malay and Nabas; Shares of the urban population in 2005 were applied, since the growth rates of urban population between 1980 and 1995 were considerably high (more than 5%).
- Makato and Tangalan; Ratios of urban population in 2005 were applied, since the growth rates (1980-1995) were not available due to non existence of urban barangays in 1980 census time.

Under the above assumptions, provincial average share of urban population for the year 2010 arrived at 26.9%, slightly higher than the figure in 1995 (24.4%). Table 8.3.6 presents projected urban and rural population. The growth rates and shares on rural population are calculated using estimated rural population.

**Table 8.3.6 Population Projection by Urban and Rural Area:1998, 2005 and 2010**

| | Municipality | 1998 | | 2005 | | | 2010 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Total | Urban/ Rural | Total | Urban/ Rural | Share (%) | Total | Urban/ Rural | G.R. (%) | Share (%) |
| Urban Area | Altavas | 22,140 | 2,829 | 23,610 | 3,017 | 12.8% | 25,304 | 3,274 | 1.65% | 12.9% |
| | Balete | 20,119 | 1,727 | 20,323 | 1,744 | 8.6% | 21,320 | 2,035 | 3.13% | 9.5% |
| | Banga | 31,069 | 2,155 | 33,296 | 2,310 | 6.9% | 35,394 | 2,391 | 0.69% | 6.8% |
| | Batan | 26,946 | 1,569 | 28,032 | 1,632 | 5.8% | 29,190 | 1,632 | 0.00% | 5.6% |
| | Buruanga | 12,716 | 1,181 | 12,747 | 1,184 | 9.3% | 13,457 | 1,285 | 1.66% | 9.6% |
| | Ibajay | 36,664 | 2,738 | 37,549 | 2,804 | 7.5% | 39,445 | 2,960 | 1.09% | 7.5% |
| | Kalibo | 62,774 | 62,774 | 74,782 | 74,782 | 100.0% | 84,749 | 84,749 | 2.53% | 100.0% |
| | Lezo | 12,362 | 1,969 | 14,428 | 2,297 | 15.9% | 15,325 | 2,384 | 0.74% | 15.6% |
| | Libacao | 23,767 | 2,808 | 25,975 | 3,069 | 11.8% | 26,418 | 3,462 | 2.44% | 13.1% |
| | Madalag | 17,689 | 1,657 | 20,204 | 1,893 | 9.4% | 21,345 | 2,170 | 2.77% | 10.2% |
| | Makato | 23,854 | 2,928 | 28,750 | 3,529 | 12.3% | 31,475 | 3,864 | 1.83% | 12.3% |
| | Malay | 23,484 | 6,484 | 36,397 | 10,049 | 27.6% | 46,815 | 12,926 | 5.16% | 27.6% |
| | Malinao | 22,437 | 1,544 | 24,589 | 1,692 | 6.9% | 26,036 | 1,800 | 1.24% | 6.9% |
| | Nabas | 21,997 | 3,899 | 23,318 | 4,134 | 17.7% | 25,371 | 4,498 | 1.70% | 17.7% |
| | New | 33,141 | 5,139 | 35,990 | 5,581 | 15.5% | 38,468 | 5,967 | 1.35% | 15.5% |
| | Numancia | 24,064 | 3,154 | 28,375 | 3,719 | 13.1% | 31,581 | 4,604 | 4.36% | 14.6% |
| | Tangalan | 17,135 | 2,834 | 19,475 | 3,221 | 16.5% | 22,030 | 3,644 | 2.50% | 16.5% |
| | **Province** | **432,359** | **107,389** | **487,839** | **126,656** | **26.0%** | **533,723** | **143,643** | **2.55%** | **26.9%** |
| Rural Area | Altavas | 22,140 | 19,311 | 23,610 | 20,593 | 87.2% | 25,304 | 22,030 | 1.36% | 87.1% |
| | Balete | 20,119 | 18,392 | 20,323 | 18,579 | 91.4% | 21,320 | 19,285 | 0.75% | 90.5% |
| | Banga | 31,069 | 28,914 | 33,296 | 30,987 | 93.1% | 35,394 | 33,001 | 1.27% | 93.2% |
| | Batan | 26,946 | 25,377 | 28,032 | 26,400 | 94.2% | 29,190 | 27,558 | 0.86% | 94.4% |
| | Buruanga | 12,716 | 11,535 | 12,747 | 11,563 | 90.7% | 13,457 | 12,171 | 1.03% | 90.4% |
| | Ibajay | 36,664 | 33,926 | 37,549 | 34,745 | 92.5% | 39,445 | 36,485 | 0.98% | 92.5% |
| | Kalibo | 62,774 | 0 | 74,782 | 0 | 0.0% | 84,749 | 0 | - | 0.0% |
| | Lezo | 12,362 | 10,394 | 14,428 | 12,130 | 84.1% | 15,325 | 12,942 | 1.30% | 84.4% |
| | Libacao | 23,767 | 20,960 | 25,975 | 22,906 | 88.2% | 26,418 | 22,956 | 0.04% | 86.9% |
| | Madalag | 17,689 | 16,031 | 20,204 | 18,311 | 90.6% | 21,345 | 19,175 | 0.93% | 89.8% |
| | Makato | 23,854 | 20,926 | 28,750 | 25,221 | 87.7% | 31,475 | 27,611 | 1.83% | 87.7% |
| | Malay | 23,484 | 17,000 | 36,397 | 26,348 | 72.4% | 46,815 | 33,889 | 5.16% | 72.4% |
| | Malinao | 22,437 | 20,893 | 24,589 | 22,897 | 93.1% | 26,036 | 24,237 | 1.14% | 93.1% |
| | Nabas | 21,997 | 18,098 | 23,318 | 19,184 | 82.3% | 25,371 | 20,873 | 1.70% | 82.3% |
| | New | 33,141 | 28,002 | 35,990 | 30,409 | 84.5% | 38,468 | 32,502 | 1.34% | 84.5% |
| | Numancia | 24,064 | 20,910 | 28,375 | 24,657 | 86.9% | 31,581 | 26,977 | 1.81% | 85.4% |
| | Tangalan | 17,135 | 14,301 | 19,475 | 16,254 | 83.5% | 22,030 | 18,386 | 2.50% | 83.5% |
| | **Province** | **432,359** | **324,970** | **487,839** | **361,183** | **74.0%** | **533,723** | **390,080** | **1.55%** | **73.1%** |

## Table 8.3.9 Projected Number of Households by Urban and Rural Area by Municipality by Target Year

| Name of Municipality | Household Size | | | Number of Households | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1995 | | | 1995 | | | 1998 | | | 2005 | | | 2010 | | |
| | Urban | Rural | Total | Urban | Rural | Total | Urban | Rural | Total | Urban | Rural | Total | Urban | Rural | Total |
| Altavas | 5.43 | 5.22 | 5.25 | 505 | 3,588 | 4,093 | 521 | 3,699 | 4,220 | 556 | 3,945 | 4,501 | 819 | 5,508 | 6,327 |
| Balete | 5.03 | 5.05 | 5.05 | 341 | 3,613 | 3,954 | 343 | 3,642 | 3,985 | 347 | 3,679 | 4,026 | 509 | 4,821 | 5,330 |
| Banga | 5.11 | 5.11 | 5.11 | 408 | 5,480 | 5,888 | 422 | 5,658 | 6,080 | 452 | 6,064 | 6,516 | 598 | 8,251 | 8,849 |
| Batan | 4.54 | 4.97 | 4.94 | 339 | 5,006 | 5,345 | 346 | 5,106 | 5,452 | 359 | 5,312 | 5,671 | 408 | 6,890 | 7,298 |
| Buruanga | 5.27 | 4.97 | 5.00 | 223 | 2,311 | 2,534 | 224 | 2,321 | 2,545 | 225 | 2,327 | 2,552 | 321 | 3,043 | 3,364 |
| Ibajay | 5.17 | 4.88 | 4.90 | 523 | 6,856 | 7,379 | 530 | 6,952 | 7,482 | 542 | 7,120 | 7,662 | 740 | 9,121 | 9,861 |
| Kalibo (Capital) | 5.15 | | 5.15 | 11,281 | | 11,281 | 12,189 | | 12,189 | 14,521 | | 14,521 | 21,187 | | 21,187 |
| Lezo | 4.73 | 4.99 | 4.95 | 388 | 1,944 | 2,332 | 416 | 2,083 | 2,499 | 486 | 2,431 | 2,917 | 596 | 3,235 | 3,831 |
| Libacao | 5.31 | 5.54 | 5.51 | 508 | 3,634 | 4,142 | 529 | 3,783 | 4,312 | 578 | 4,135 | 4,713 | 866 | 5,739 | 6,605 |
| Madalag | 5.80 | 5.81 | 5.81 | 269 | 2,598 | 2,867 | 286 | 2,759 | 3,045 | 326 | 3,152 | 3,478 | 543 | 4,794 | 5,337 |
| Makato | 5.24 | 5.45 | 5.42 | 514 | 3,536 | 4,050 | 559 | 3,840 | 4,399 | 673 | 4,628 | 5,301 | 966 | 6,903 | 7,869 |
| Malay | 5.46 | 5.25 | 5.31 | 982 | 2,676 | 3,658 | 1,188 | 3,238 | 4,426 | 1,840 | 5,019 | 6,859 | 3,232 | 8,472 | 11,704 |
| Malinao | 4.88 | 5.28 | 5.25 | 303 | 3,791 | 4,094 | 316 | 3,957 | 4,273 | 347 | 4,337 | 4,684 | 450 | 6,059 | 6,509 |
| Nabas | 5.01 | 5.11 | 5.10 | 757 | 3,441 | 4,198 | 778 | 3,542 | 4,320 | 825 | 3,754 | 4,579 | 1,125 | 5,218 | 6,343 |
| New Washington | 5.31 | 5.22 | 5.23 | 931 | 5,167 | 6,098 | 968 | 5,364 | 6,332 | 1,051 | 5,825 | 6,876 | 1,492 | 8,125 | 9,617 |
| Numancia | 5.44 | 5.22 | 5.24 | 539 | 3,725 | 4,264 | 580 | 4,006 | 4,586 | 684 | 4,723 | 5,407 | 1,151 | 6,745 | 7,896 |
| Tangalan | 5.43 | 5.49 | 5.48 | 493 | 2,458 | 2,951 | 522 | 2,605 | 3,127 | 593 | 2,961 | 3,554 | 911 | 4,597 | 5,508 |
| **Provincial Total** | **5.18** | **5.19** | **5.19** | **19,304** | **59,824** | **79,128** | **20,717** | **62,555** | **83,272** | **24,405** | **69,412** | **93,817** | **35,914** | **97,521** | **133,435** |

### 8.3.2 School Enrollment Projection

Table 8.3.10 Projected School Enrollment by Municipality by Target Year

| Name of Municipality | 1998 | | | | 2005 | | | | | 2010 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | School Age Population | Total Enrollment | | Public Sch. Enrollment | School Age Population | Total Enrollment | | Public Sch. Enrollment | | School Age Population | Total Enrollment | | Public Sch. Enrollment |
| | | Number | Participation Rate | Number | Participation Rate | | Number | Participation Rate | Number | Participation Rate | | Number | Participation Rate |
| Altavas | 6,165 | 6,813 | 111 | 6,636 | 108 | 6,574 | 6,574 | 100 | 6,245 | 95 | 7,046 | 7,046 | 100 | 6,694 | 95 |
| Balete | 5,503 | 5,497 | 100 | 5,012 | 91 | 5,559 | 5,281 | 95 | 4,725 | 85 | 5,832 | 5,540 | 95 | 5,540 | 95 |
| Banga | 6,178 | 4,727 | 77 | 4,373 | 71 | 6,621 | 5,297 | 80 | 4,966 | 75 | 7,038 | 5,982 | 85 | 5,630 | 80 |
| Batan | 7,526 | 7,493 | 100 | 7,278 | 97 | 7,829 | 7,438 | 95 | 7,046 | 90 | 8,152 | 7,989 | 98 | 7,744 | 95 |
| Buruanga | 3,476 | 3,668 | 106 | 3,545 | 102 | 3,484 | 3,484 | 100 | 3,310 | 95 | 3,678 | 3,494 | 95 | 3,310 | 90 |
| Ibajay | 10,446 | 5,041 | 48 | 3,929 | 38 | 10,698 | 5,349 | 50 | 4,279 | 40 | 11,238 | 6,743 | 60 | 5,619 | 50 |
| Kalibo (Capital) | 15,878 | 21,071 | 133 | 13,792 | 87 | 18,915 | 18,915 | 100 | 17,969 | 95 | 21,436 | 20,364 | 95 | 19,292 | 90 |
| Lezo | 3,271 | 3,366 | 103 | 3,110 | 95 | 3,818 | 3,627 | 95 | 3,436 | 90 | 4,055 | 3,852 | 95 | 3,650 | 90 |
| Libacao | 6,793 | 5,705 | 84 | 5,705 | 84 | 7,424 | 6,310 | 85 | 6,310 | 85 | 7,551 | 6,796 | 90 | 6,796 | 90 |
| Madalag | 4,790 | 6,317 | 132 | 5,861 | 122 | 5,471 | 5,471 | 100 | 5,197 | 95 | 5,780 | 5,780 | 100 | 5,491 | 95 |
| Makato | 6,508 | 5,765 | 89 | 5,362 | 82 | 7,844 | 7,060 | 90 | 6,667 | 85 | 8,587 | 8,158 | 95 | 7,728 | 90 |
| Malay | 5,828 | 5,056 | 87 | 4,989 | 86 | 9,033 | 8,130 | 90 | 7,678 | 85 | 11,619 | 11,038 | 95 | 10,457 | 90 |
| Malinao | 6,137 | 6,029 | 98 | 5,700 | 93 | 6,726 | 6,390 | 95 | 6,053 | 90 | 7,122 | 6,766 | 95 | 6,410 | 90 |
| Nabas | 6,287 | 7,207 | 115 | 6,655 | 106 | 6,665 | 6,665 | 100 | 6,332 | 95 | 7,252 | 7,252 | 100 | 6,889 | 95 |
| New Washington | 9,319 | 6,444 | 69 | 6,444 | 69 | 10,120 | 7,084 | 70 | 7,084 | 70 | 10,817 | 8,654 | 80 | 8,654 | 80 |
| Numancia | 6,260 | 4,874 | 78 | 4,402 | 70 | 7,382 | 5,906 | 80 | 5,537 | 75 | 8,216 | 6,573 | 80 | 6,162 | 75 |
| Tangalan | 4,630 | 4,402 | 95 | 4,402 | 95 | 5,262 | 4,999 | 95 | 4,999 | 95 | 5,952 | 5,654 | 95 | 5,654 | 95 |
| Provincial Total | 114,995 | 109,475 | 95 | 97,195 | 85 | 129,425 | 113,980 | 88 | 107,833 | 83 | 141,371 | 127,681 | 90 | 121,720 | 86 |

**Table 8.3.11Projected Number of Public Utilities by Municipality by Target Year**

| Name of Municipality | Type | 1998 | 2005 | | 2010 | |
|---|---|---|---|---|---|---|
| | | No. of Public Utilities | Proposed Construction | Total | Proposed Construction | Total |
| Altavas | Public Market | 2 | 1 | 3 | 1 | 4 |
| | Bus/Jeepney Terminal | | | | | |
| | Parks/Playground | | 1 | 1 | 1 | 2 |
| | Total | 2 | 2 | 4 | 2 | 6 |
| Balete | Public Market | 2 | 1 | 3 | 1 | 4 |
| | Bus/Jeepney Terminal | | | | | |
| | Parks/Playground | | 1 | 1 | 1 | 2 |
| | Total | 2 | 2 | 4 | 2 | 6 |
| Banga | Public Market | 1 | 1 | 2 | 1 | 3 |
| | Bus/Jeepney Terminal | | | | | |
| | Parks/Playground | | 1 | 1 | 1 | 2 |
| | Total | 1 | 2 | 3 | 2 | 5 |
| Batan | Public Market | 1 | 1 | 2 | 1 | 3 |
| | Bus/Jeepney Terminal | 1 | 1 | 2 | 1 | 3 |
| | Parks/Playground | 1 | | 1 | 1 | 2 |
| | Total | 3 | 2 | 5 | 3 | 8 |
| Buruanga | Public Market | 1 | 1 | 2 | 1 | 3 |
| | Bus/Jeepney Terminal | | 1 | 1 | 1 | 2 |
| | Parks/Playground | | | | | |
| | Total | 1 | 2 | 3 | 2 | 5 |
| Ibajay | Public Market | 1 | 1 | 2 | 1 | 3 |
| | Bus/Jeepney Terminal | 1 | | 1 | | 1 |
| | Parks/Playground | | 1 | 1 | 1 | 2 |
| | Total | 2 | 2 | 4 | 2 | 6 |

**Table 8.3.11Projected Number of Public Utilities by Municipality by Target Year (Cont'd)**

| Name of Municipality | Type | 1998 | 2005 | | 2010 | |
|---|---|---|---|---|---|---|
| | | No. of Public Utilities | Proposed Construction | Total | Proposed Construction | Total |
| Kalibo (Capital) | Public Market | 2 | 1 | 3 | 1 | 4 |
| | Bus/Jeepney Terminal | 3 | 1 | 4 | 1 | 5 |
| | Parks/Playground | 3 | 1 | 4 | 1 | 5 |
| | Total | 8 | 3 | 11 | 3 | 14 |
| Lezo | Public Market | 1 | 1 | 2 | 1 | 3 |
| | Bus/Jeepney Terminal | 1 | | 1 | | 1 |
| | Parks/Playground | | | | 1 | 1 |
| | Total | 2 | 1 | 3 | 2 | 5 |
| Libacao | Public Market | 1 | 1 | 2 | 1 | 3 |
| | Bus/Jeepney Terminal | | 1 | 1 | 1 | 2 |
| | Parks/Playground | | | | | |
| | Total | 1 | 2 | 3 | 2 | 5 |
| Madalag | Public Market | 1 | 1 | 2 | 1 | 3 |
| | Bus/Jeepney Terminal | 1 | 1 | 2 | 1 | 3 |
| | Parks/Playground | | | | | |
| | Total | 2 | 2 | 4 | 2 | 6 |
| Makato | Public Market | 1 | 1 | 2 | 1 | 3 |
| | Bus/Jeepney Terminal | | | | | |
| | Parks/Playground | | 1 | 1 | 1 | 2 |
| | Total | 1 | 2 | 3 | 2 | 5 |
| Malay | Public Market | 1 | 1 | 2 | 1 | 3 |
| | Bus/Jeepney Terminal | | 1 | 1 | | 1 |
| | Parks/Playground | 1 | 1 | 2 | 1 | 3 |
| | Total | 2 | 3 | 5 | 2 | 7 |

**Table 8.3.11Projected Number of Public Utilities by Municipality by Target Year (Cont'd)**

| Name of Municipality | Type | 1998 | 2005 | | 2010 | |
|---|---|---|---|---|---|---|
| | | No. of Public Utilities | Proposed Construction | Total | Proposed Construction | Total |
| Malinao | Public Market | 1 | 1 | 2 | 1 | 3 |
| | Bus/Jeepney Terminal | | | | | |
| | Parks/Playground | | 1 | 1 | 1 | 2 |
| | Total | 1 | 2 | 3 | 2 | 5 |
| Nabas | Public Market | 1 | 1 | 2 | 1 | 3 |
| | Bus/Jeepney Terminal | | | | | |
| | Parks/Playground | | 1 | 1 | 1 | 2 |
| | Total | 1 | 2 | 3 | 2 | 5 |
| New Washington | Public Market | 1 | | 1 | | 1 |
| | Bus/Jeepney Terminal | 1 | 1 | 2 | 1 | 3 |
| | Parks/Playground | | 1 | 1 | 1 | 2 |
| | Total | 2 | 2 | 4 | 2 | 6 |
| Numancia | Public Market | 1 | 1 | 2 | | 2 |
| | Bus/Jeepney Terminal | 2 | | 2 | 1 | 3 |
| | Parks/Playground | | 1 | 1 | 1 | 2 |
| | Total | 3 | 2 | 5 | 2 | 7 |
| Tangalan | Public Market | 1 | 1 | 2 | | 2 |
| | Bus/Jeepney Terminal | 1 | | 1 | 1 | 2 |
| | Parks/Playground | | 1 | 1 | 1 | 2 |
| | Total | 2 | 2 | 4 | 2 | 6 |
| **Provincial Total** | Public Market | 20 | 16 | 36 | 14 | 50 |
| | Bus/Jeepney Terminal | 11 | 7 | 18 | 8 | 26 |
| | Parks/Playground | 5 | 12 | 17 | 14 | 31 |
| | Total | 36 | 35 | 71 | 36 | 107 |

## 8.4 Types of Facilities and Implementation Criteria

### 8.4.1 Water Supply

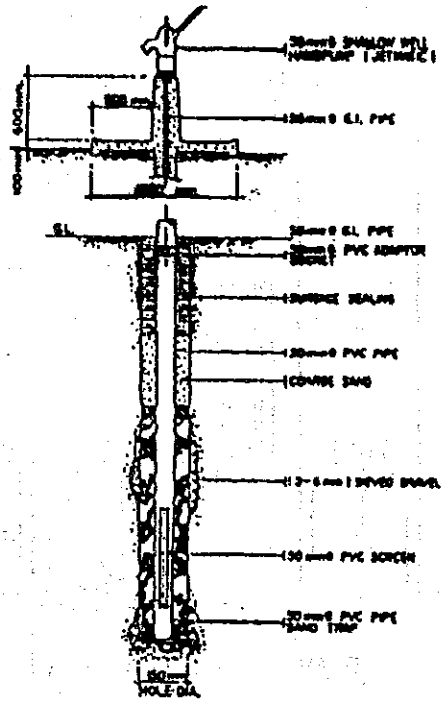
(1) Urban water supply

With regard to development/expansion of urban water supply by municipality, existing conditions, future requirements and planned/on-going projects were reviewed in preparation of this PW4SP. Potential water source for future development was also evaluated in Chapter 7, taking into account the possibility to utilize untapped spring sources. Location of urban area of respective municipalities/city was referred to Figure 3.4.1 in Chapter 3. Table 8.4.1 presents basic figures on existing service coverage, water sources and future requirements.

## Table 8.4.1 Existing Condition and Future Requirements of Urban Water Supply by Municipality

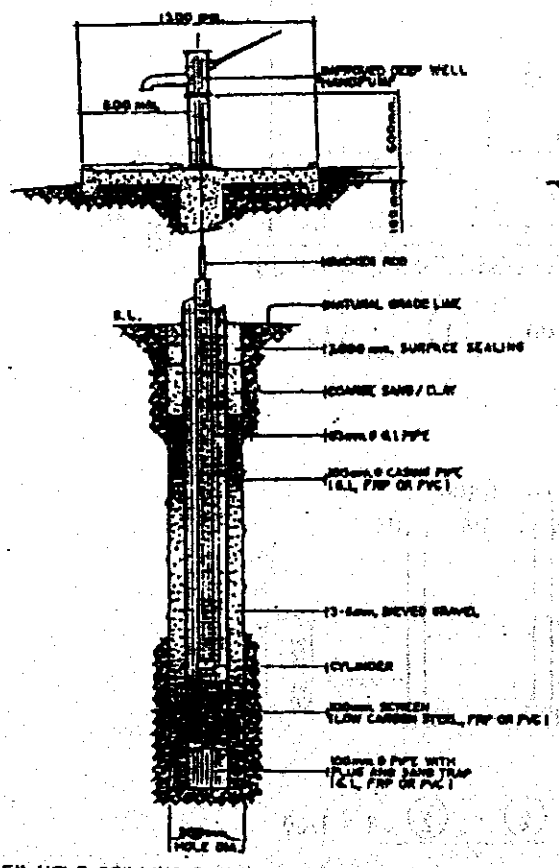
| Name of Municipality | Existing Condition (1998) | | | | | | | | | Phase I (2005) | | | | | | | | Phase II (2010) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Urban Population (1998) | Existing Level III System and Others | | | | | L-III Water Source | | | Urban Population (2005) | Pop. Served by Level III and Others | | | | | Newly Developed/Additional Water Source | Total Water Source Required (m3/d) | Urban Population (2010) | Pop. Served by Level-III | | | Newly developed/ Additional water source | Total Water Source Required (m3/d) |
| | | No. of Level-III and Operating Body | Pop. Served by Level-III | % | Pop. Served by Level-I/II | Total Pop. Served | Total (%) | Type | Production (m3/d) | | Additional Pop. Served by L-III | Total Pop. Served by Level-III | % | Additional Pop. Served by Level-I/II | Total Pop. Served | % | | | Additional Pop. Served | Total | % | | |
| Alfuvus | 2,829 | 1(Mun) | 200 | 7% | 1,515 | 1,715 | 61% | DW | n.a. | 3,017 | 371 | 571 | 19% | None | 2,086 | 69% | 100 | 100 | 3,274 | 2,539 | 3,110 | 95% | 400 | 500 |
| Buletc | 1,727 | | | | 1,005 | 1,005 | 58% | | | 1,744 | 214 | 214 | 12% | None | 1,219 | 70% | 100 | 100 | 2,055 | 1,719 | 1,933 | 95% | 200 | 300 |
| Banga | 2,155 | | | | 2,047 | 2,047 | 95% | | | 2,310 | 284 | 284 | 12% | None | 2,310 | 100% | 100 | 100 | 2,391 | 1,987 | 2,271 | 95% | 300 | 400 |
| Batan | 1,569 | 1(Asc) | 1,225 | 78% | 5 | 1,230 | 78% | DW | 48 | 1,632 | 201 | 1,426 | 87% | None | 1,431 | 88% | 100 | 200 | 1,632 | 124 | 1,550 | 95% | | 200 |
| Buruanga | 1,181 | | | | 817 | 817 | 69% | | | 1,184 | 145 | 145 | 12% | None | 962 | 81% | 100 | 100 | 1,285 | 1,076 | 1,221 | 95% | 200 | 300 |
| Ibajay | 2,738 | | | | 2,149 | 2,149 | 78% | | | 2,804 | 345 | 345 | 12% | None | 2,494 | 89% | 100 | 100 | 2,960 | 2,467 | 2,812 | 95% | 400 | 500 |
| Kalibo (Capital) | 62,774 | 1(WD) | 30,205 | 48% | 18,652 | 48,857 | 78% | DW | 7,670 | 74,782 | 9,188 | 39,393 | 53% | None | 58,045 | 78% | 1,200 | 5,200 | 84,749 | 41,119 | 80,512 | 95% | 5,400 | 10,600 |
| Lezo | 1,969 | 1(WD) | 1,295 | 66% | 357 | 1,652 | 84% | DW | 225 | 2,297 | 282 | 1,577 | 69% | None | 1,934 | 84% | 100 | 300 | 2,384 | 688 | 2,265 | 95% | | 300 |
| Libacao | 2,808 | | | | 2,230 | 2,230 | 79% | | | 3,069 | 377 | 377 | 12% | None | 2,607 | 85% | 100 | 100 | 3,462 | 2,912 | 3,289 | 95% | 400 | 500 |
| Madalag | 1,657 | 1(Asc) | 696 | 42% | 335 | 1,031 | 62% | DW | 518 | 1,893 | 233 | 929 | 49% | None | 1,264 | 67% | 100 | 200 | 2,170 | 1,133 | 2,062 | 95% | 200 | 400 |
| Makato | 2,928 | 1(WD) | 1,506 | 51% | 787 | 2,293 | 78% | DW | 720 | 3,529 | 434 | 1,940 | 55% | None | 2,727 | 77% | 100 | 300 | 3,864 | 1,731 | 3,671 | 95% | 300 | 600 |
| Malay | 6,484 | | | | 2,975 | 2,975 | 46% | | | 10,049 | 1,235 | 1,235 | 12% | None | 4,210 | 42% | 200 | 200 | 12,926 | 11,045 | 12,280 | 95% | 1,500 | 1,700 |
| Malinao | 1,544 | 1(Mun) | 1,500 | 97% | 44 | 1,544 | 100% | DW | 216 | 1,692 | 148 | 1,648 | 97% | None | 1,692 | 100% | 100 | 300 | 1,800 | 62 | 1,710 | 95% | 100 | 400 |
| Nabas | 3,899 | | | | 2,336 | 2,336 | 60% | | | 4,134 | 508 | 508 | 12% | None | 2,844 | 69% | 100 | 100 | 4,498 | 3,765 | 4,273 | 95% | 500 | 600 |
| New Washington | 5,139 | | | | 4,792 | 4,792 | 93% | | | 5,581 | 686 | 686 | 12% | None | 5,478 | 98% | 100 | 100 | 5,967 | 4,983 | 5,669 | 95% | 700 | 800 |
| Numancia | 3,154 | 1(WD) | 780 | 25% | 1,806 | 2,586 | 82% | DW | 1,440 | 3,719 | 457 | 1,237 | 33% | None | 3,043 | 82% | 100 | 200 | 4,604 | 3,157 | 4,374 | 95% | 500 | 700 |
| Tangalan | 2,834 | | | | 1,648 | 1,648 | 58% | | | 3,221 | 396 | 396 | 12% | None | 2,044 | 63% | 100 | 100 | 3,644 | 3,066 | 3,462 | 95% | 400 | 500 |
| Provincial Total | 107,389 | | 37,407 | 35% | 43,500 | 80,907 | 75% | | 10,837 | 126,657 | 15,504 | 52,911 | 42% | | 96,390 | 76% | 2,900 | 7,800 | 143,645 | 83,552 | 136,463 | 95% | 11,500 | 19,300 |

(Note) WD: Water District, Prov: Province, Mun: Municipality, Asc: Association
Unit consumption: 100 lpcd
Additional population served in 2010 includes the served population that will be absorbed by Level III system.

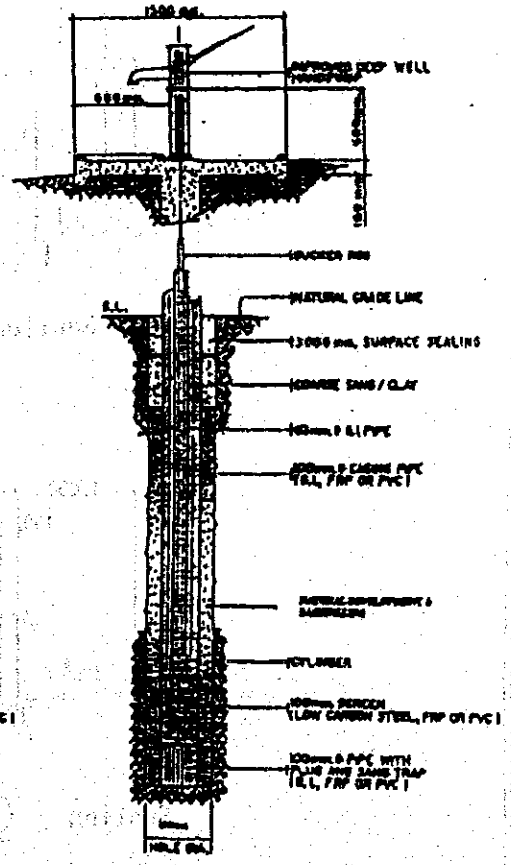


OPEN HOLE DRILLING & GRAVEL PACK METHOD

SHALLOW WELLS



OPEN HOLE DRILLING & GRAVEL PACK METHOD

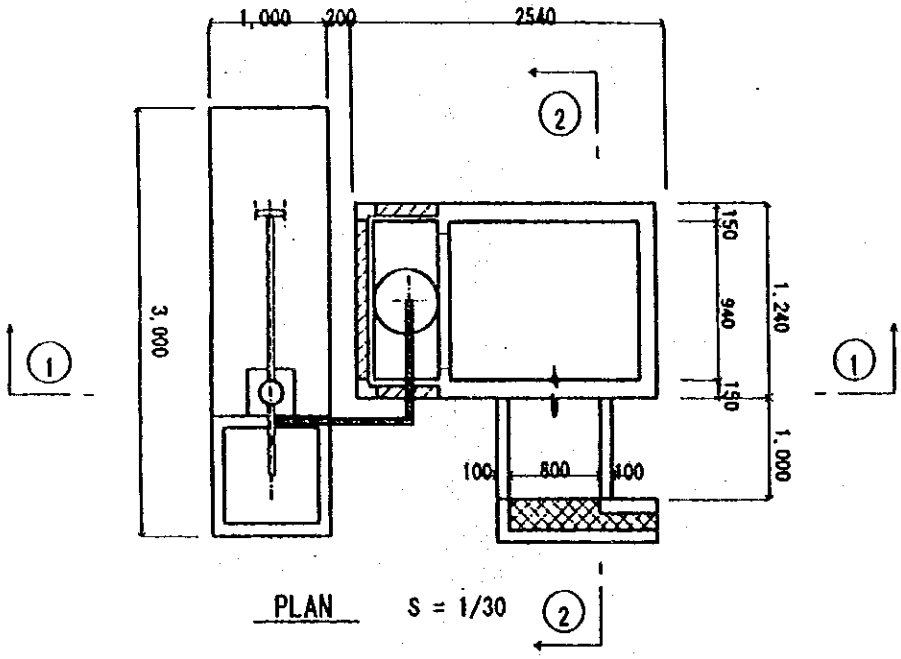


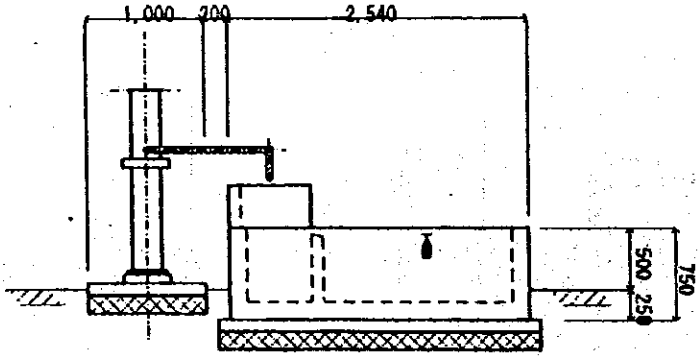
OPEN HOLE DRILLING & NATURAL GRAVEL PACK METHOD

DEEP WELLS

FIGURE 8.4.1

TYPICAL STRUCTURE OF LEVEL I WELL FACILITY



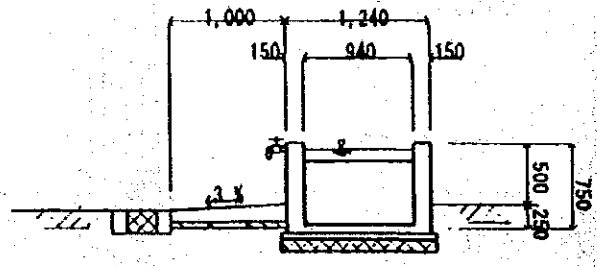
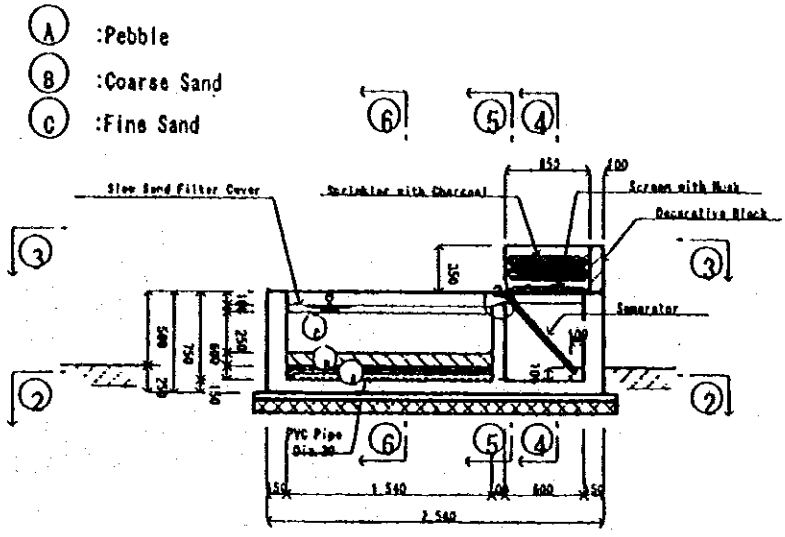
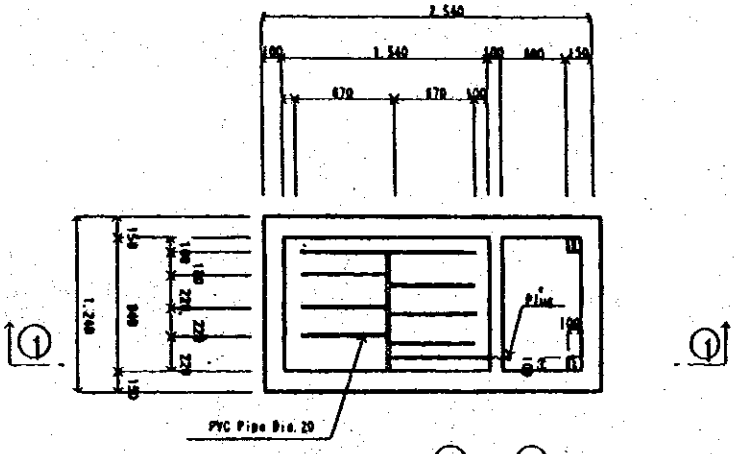



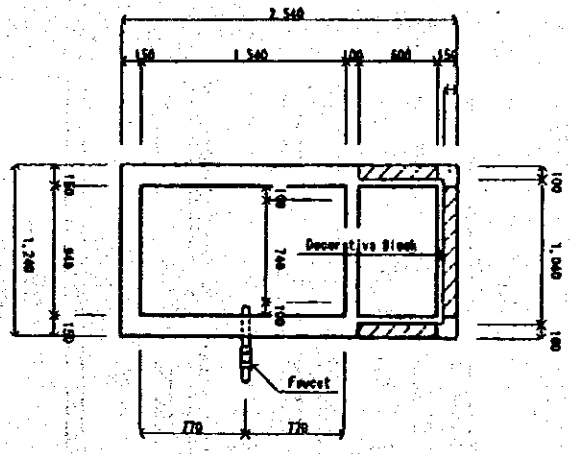

**Figure 8.4.2(a) Iron Removal Facility**




Section ① - ① S = 1/20




Section ② - ② S = 1/20




Section ③ - ③ S = 1/20

**Figure 8.4.2(b) Iron Removal Facility**

### 8.4.3 Urban Sewerage

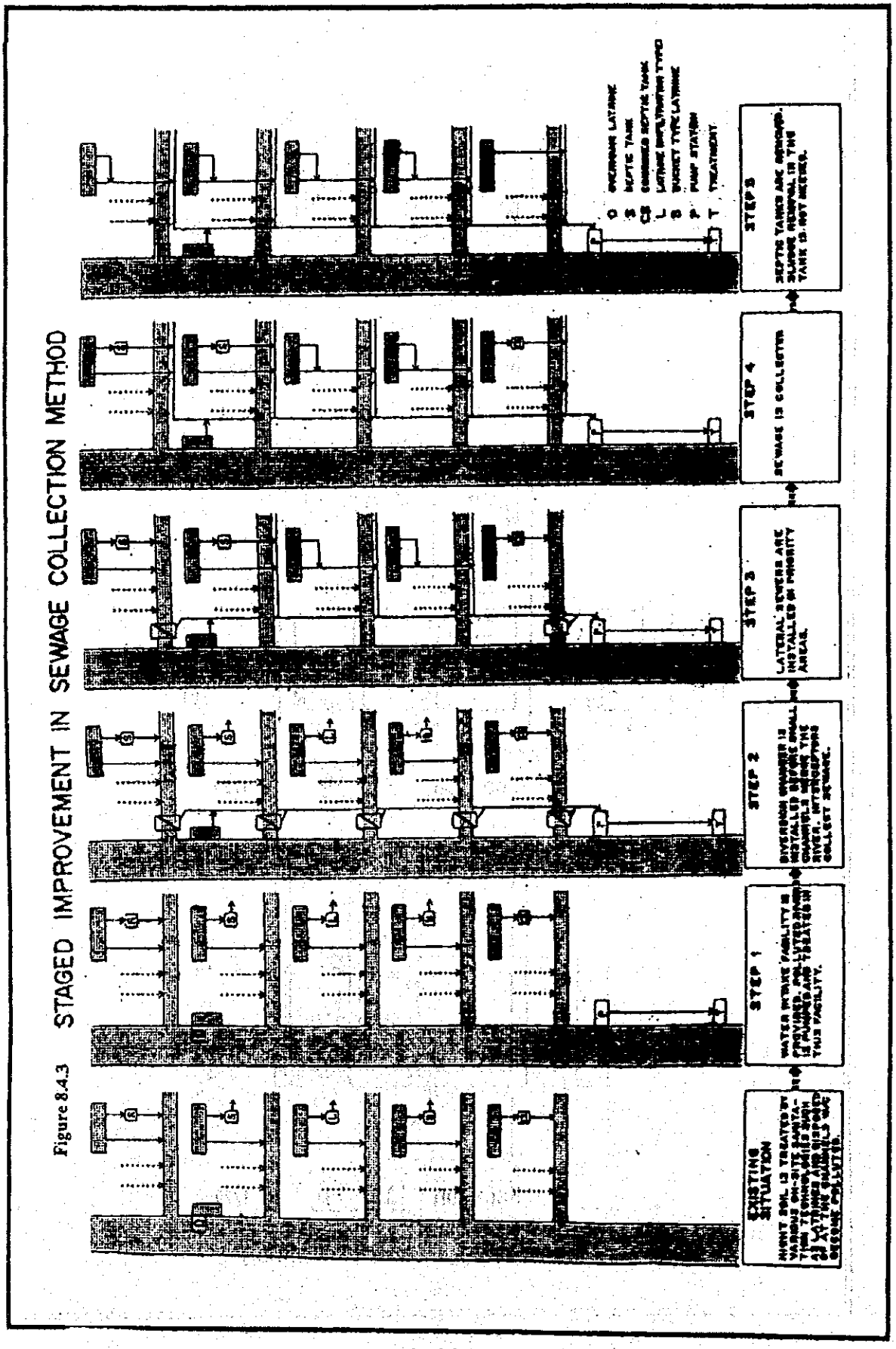



Figure 8.4.3