method. For the calculation, the growth rate 2.2% described in the foregoing section was employed.

Regarding the use of this method, while there are other plural methods in wide use, it is acceptable and adequate for the present project of Enrekang from the following reason. The geometric method is usually suitable for the case of small and medium sized towns which are developing and may develop fairly rapidly. Enrekang is supposed to belong to such a category of towns, for it is a local center of administration and land transportation.

Further, with regard to the growth rate 2.2% employed by the Report, it is considered adequate because the past rate was pretty constant, and no significant change in the growth rate is anticipated at the present stage. Table 2-3-2 shows the result of the population projection thus made quoted from the Report.

Table 2-3-2 Projected Population

| Year | Population | Population Increase ( / 5 years) |
|---|---|---|
| 1980 | 14,699 | - |
| 1985 | 16,287 | 1,588 |
| 1990 | 18,048 | 1,761 |
| 1995 | 19,995 | 1,947 |
| 2000 | 22,154 | 2,159 |
| 2005 | 24,547 | 2,393 |

Source: the existing Report

## 2-4 Population Served and Water Demand

Water demand is the basis for planning the water supply system,

and the water demand is obtainable mainly from the two chief factors, population served and the unit consumption for domestic use and additionally with considerations on the present water use and other water requirements than domestic use. Hence, in the following paragraphs, starting with the present water use, all the above mentioned factors will be reviewed.

### 2-4-1 Present Water Use

In order to obtain some basic data, based on which 1) to estimate population to be served by the present project, and 2) to calculate the present unit consumption by the existing water supply system, the Study Team has sought for useful information available from the Report and by the field reconnaissance.

As already described in the section 2-2 Existing Water Supply, the present population served is 235 persons, 2.2 % of the total population, which is only a small portion of the total population. The water source of the system is Galonta spring, of which the yield is 4 l/sec. This yield is not used effectively, because there is a sizable amount of overflow at the intake and the reservoir. From the above, the true value of present consumption per capita per day was not ascertained by the field survey.

On the other hand, the majority of the population in the kota area have no access to good water. They are inevitably using unsanitary water from shallow wells, streams and rivers. From this condition of present water use, the public and the local government as well are very eager for a complete water supply system to cover the built-up kota.

### 2-4-2 Population Served

The estimation of population served by the Report is made as a product of the projected total population and an assumed percentage. Table 2-4-1 shows the estimation of population served. The employed percentages are 60 % for 1985, in line with the guidelines of Cipta Karya, and 100 % for 1995 and onward.

Regarding the percentage 60 % for 1985, it is considered reasonable, because most of population in Enrekang concentrate in a rather small built-up area. Therefore, once the water supply system is constructed in this area, the target of 60 % will be attained without much difficulty. Further, as regards the high percentage assumed for 1995, it may not necessarily be unattainable target, although it appears very high. The grounds for this supposition are that 1) the urbanization of Enrekang is confined in a small basin surrounded by mountains, 2) majority of the population inhabit in this area, and besides 3) no good water is available from other sources than the water supply.

Table 2-4-1 Projection of Population Served

(quoted from the Report)

| Year | Population | Percentage | Population Served |
|---|---|---|---|
| 1985 | 16,287 | 60 | 9,772 |
| 1990 | 18,048 | 70 | 12,634 |
| 1995 | 19,995 | 100 | 19,995 |
| 2000 | 22,154 | 100 | 22,154 |
| 2005 | 24,547 | 100 | 24,547 |

2-4-3 Water Requirements

From all the foregoing discussions and considerations, the existing Report has concluded the future water requirements as shown in Table 2-4-2. The outline of the process and result of the estimation, together with the comments by the present study, is briefed below.

The estimation of water requirements for 1985 by the existing Report is made as a product of population served and per capita consumption for each classification of use, such as domestic, commercial, industrial and so forth. And for the later years, that is, after the target year of the

Table 2-4-2 (a) Water Requirements

For 1985

| Item and Unit | | Requirement | Item and Unit | | Requirement |
|---|---|---|---|---|---|
| Domestic Use | (1) | 60 | Medical Facilities | (2) | 27 |
| | (2) | 586 | Schools | (2) | 74 |
| Institutions | (2) | 30 | Dormitories | (2) | 12 |
| Hotels, Shops & Markets | (2) | 19 | Religious Institutions | (2) | 29 |
| | | | Total | (1) | 80 |
| | | | | (2) | 777 |

Table 2-4-2 (b) Water Requirements

| Item and Unit | | 1985 | 1990 | 1995 | 2000 | 2005 |
|---|---|---|---|---|---|---|
| a. Water Consumption | (1) | 80 | 104 | 104 | 104 | 104 |
| | (2) | 777 | 1,314 | 2,079 | 2,304 | 2,553 |
| | (3) | 9 | 15 | 24 | 27 | 30 |
| b. Unaccounted-for Water b = a x 0.15 | (2) | 117 | 202 | 320 | 354 | 393 |
| c. Average Day c = a + b | (1) | 91 | 120 | 120 | 120 | 120 |
| | (2) | 894 | 1,516 | 2,399 | 2,658 | 2,946 |
| | (3) | 10 | 18 | 28 | 31 | 34 |
| d. Maximum Day d = c x 1.25 | (1) | 114 | 150 | 150 | 150 | 150 |
| | (2) | 1,118 | 1,894 | 2,994 | 3,323 | 3,682 |
| | (3) | 13 | 22 | 35 | 38 | 43 |

Note : (1) = liter per capita per day
(2) = cubic meter per day
(3) = liter per second

present project, an gross per-capita-day consumption which includes altogether domestic use and other uses, and the population served in the preceding section have been employed for rough estimation of total demand, all the above is considered adequate for the stage of feasibility study.

As for the per-capita-day consumptions assumed and employed in the present project, the values are virtually same as those employed for planning the rural water supply systems for other towns in the country, and at the present stage these are considered acceptable in view of examples of small water supply in foreign countries. Nevertheless, it is recommendable to review the figures comparing with the actual consumption in the stage of normal operation after the project is completed.

## 2-5 Water Source

The existing Report has mentioned the following water sources, namely, 1) surface water, Sa'dan and Mata Allo rivers, and 2) springs Lewaja and Galonta, and proposed the Lewaja spring for the present project. In order to confirm, therefore, its suitability and identify other appropriate water sources for the Enrekang water supply, the Study Team made a field reconnaissance in late June 1980. The findings of the reconnaissance and the results of the review are summarized as follows.

### 2-5-1 Alternative Water Sources

1) Lewaja Spring

This spring, proposed by the Report, is located 6 km away from the populated area and at an elevation about 150 m above the same, and has a yield of minimum 17.8 l/sec. As for the transmission route, an existing road is available, which facilitates the execution of the

transmission pipeline. In addition, water distribution can be made by gravity. Further, as regards the water quality, it does not require any treatment, as is clear in the Table 2-5-1. Table 2-5-2 Water Quality Standard is attached for reference purpose. The spring, therefore, is considered suitable for the water source of the present project.

2) Mata Allo River

This river runs through the town with a minimum discharge of 2.5 cu m/sec. The river water has high values of turbidity and color by the rainfall in the wet season, as stated in the Report and observed during the field reconnaissance. The river is more or less contaminated by waste water, as it flows through inhabited areas.

3) Sa'dan River

This river flows down near the populated area of Enrekang with a minimum discharge of 2.5 cu m/sec and joins the Mata Allo river at the lower reaches south of the area. The river water quality is generally better than that of the Mata Allo river.

4) Galonta Spring

The spring has not been proposed by the Report for the present project, for the yield is fairly less than the present water requirements. The spring is near the served area, the water quality is good, and water distribution is possible by gravity, as mentioned earlier in the section 2-2 Existing Water Supply. From the above, the spring yield should be utilized as much as practicable in the future as well.

### 2-5-2 Recommended Water Sources

On the basis of the features of each water source as described above, the Lewaja spring is considered most suitable for the present project, and its whole yield should be utilized.

Table 2-5-1 Analytical Results of Water Quality

| Item | Unit | Sources | | |
|---|---|---|---|---|
| | | Galonta Spring | Lewaja Spring | Mata Allo River |
| Date, Time | | 23-6-80 11:30 | 23-6-80 15:30 | 24-6-80 10:00 |
| Weather | | fine | fine | fine |
| Atmospheric Temperature | °C | 25.5 | 26.5 | 27.0 |
| Water Temperature | °C | 26.0 | 25.0 | 27.0 |
| Color as Pt.Co. | unit | 0 | 0 | 300 |
| Turbidity | FTU | 2 | 3 | 600 |
| pH | | 8.1 | 7.5 | 7.8 |
| Alkalinity as CaCO3 | mg/l | 250 | 200 | 130 |
| Total Hardness as CaCO3 | mg/l | 40 | 180 | 70 |
| Chloride as C12 | mg/l | 5.0 | 7.0 | 20 |
| Total Iron as Fe | mg/l | less than 0.1 | less than 0.1 | 0.8 |
| Coliform Groups | /100 ml | negative | negative | 6,000 |
| Total Bacteria | /ml | 10 | 60 | 130 |
| Ammonia-N as NH4 | mg/l | less than 0.2 | less than 0.2 | 0.3 |

Table 2-5-2 Water Quality Standard

(WHO and Indonesian Standards for Drinking Water)

| Item | Unit | WHO Standards | | Indonesian Standards | |
|---|---|---|---|---|---|
| | | Recommended Limit | Acceptable Limit | Permissible Value | Maximum Permissible Value |
| Color as Pt.Co. | unit | 5 | 50 | 5 | 50 |
| Turbidity | FTU | 5 | 25 | 5 | 25 |
| Total Solids | mg/l | 500 | 1500 | 500 | 1500 |
| pH | | 7 - 8.5 | 6.5 - 9.2 | - | 6.5 - 9.2 |
| Detergents | mg/l | 0.2 | 1.0 | - | - |
| Mineral Oil | mg/l | 0.01 | 0.3 | - | - |
| Phenol | mg/l | 0.001 | 0.002 | - | - |
| Total Hardness (as CaCO3) | mg/l | 100 | 500 | - | 5 - 10 (1) |
| Calcium as Ca | mg/l | 75 | 200 | 75 | 200 |
| Magnesium as Mg | mg/l | 30 | 150 | 30 | 150 |
| Chloride as Cl2 | mg/l | 200 | 600 | 200 | 600 |
| Copper as Cu | mg/l | 0.05 | 1.5 | 0.05 | 1.5 |
| Total Iron as Fe | mg/l | 0.1 | 1.0 | 0.1 | 1.0 |
| Manganese as Mn | mg/l | 0.05 | 0.5 | 0.05 | 0.5 |
| Sulfates as SO4 | mg/l | 200 | 400 | 250 | - |
| Zinc as Zn | mg/l | 5 | 15 | 5 | 15 |
| Coliform Groups | /100 ml | negative | - | negative | - |
| Total Bacteria | /100 ml | 10 | - | 100,000 | - |

Note : (1) German System of Degrees of Hardness ($^{o}$D)

Source : Indonesian Standard from Departemen Kesehatan R.I.

The Galonta spring also should be used together with the Lewaja spring for the present project, taking advantage of the merits as stated above, and its whole yield should be taken.

## 2-6 Water Treatment

The existing Report has not proposed any treatment for the spring water of Lewaja. The present study does neither propose any treatment for the spring waters of Lewaja and Galonta,only except for chlorination which is required to ensure the safety of water.

The concern for preserving the good water quality is that the watersheds of the two springs should be protected not to be contaminated. For this matter, a recommendation is prepared in 7-2 Recommendations.

## 2-7 Future Water Supply System

The future water source mentioned by the existing Report is the Mata Allo river. This river has a confluence with the Sa'dan river at the southern end of the built-up area of Enrekang. Both rivers have abundant perennial flows. The Report also mentioned a treatment method for the Mata Allo river water, namely, a direct filtration method. As a result of the field reconnaissance of the rivers, the Study Team recommends the following regarding the determination and planning of the future water source.

1) First of all, possibility of the riverbed water should be investigated. From the observation in the field, the Sa'dan river seems to have possibility of riverbed water.

2) If no possibility of riverbed water found, the intake of the Sa'dan river surface water should preferably be studied, because the turbidity of this river appeared less than that of the Mata Allo river under the same weather condition.

3) When the water demand increases in the future, the treatment plant and the service reservoir are better to be located in the area between the two rivers Mata Allo and Sa'dan to serve the said area, and the Galonta and Lewaja systems would supply to the area on the left bank of the Mata Allo river.

4) Per capita consumption and other unit consumptions to be used for the planning of the future water supply should be determined on the basis of actual consumptions after the completion of the present project.

## III. REVIEW OF DESIGN CRITERIA AND PRELIMINARY DESIGNS

### 3-1 General

Design criteria prepared by the existing Report are expressed in dimensions, not in words. The Report has preliminary designs of pipelines, but does not have any drawings for necessary structures, such as the intake or reservoirs. Therefore, the present study completes all design criteria and preliminary designs supplementing the insufficiencies.

### 3-2 Design Criteria

The following is the design criteria contained in the existing Report. After rearrangement, they are reproduced as shown below:

a. Lewaja spring shall be used as the water source for the project up to 1985. Out of the yield 17.8 l/sec, 13.0 l/sec shall be taken in.

b. The intake structure shall have a capacity 36 cu m.

c. The transmission pipeline shall be of diameter 200 mm and of ductile iron pipe or steel pipe.

d. Between the intake and the distribution system, two pressure release facilities by two steps shall be installed.

e. The lower pressure release facility shall be designed as a service reservoir at an elevation 135 m, and its capacity shall be 20 % of production = 346 cu m.

f. Distribution pipelines : Ø 150 mm, 3,000 m
Ø 100 mm, 4,400 m
Ø 80 mm, 1,400 m
Ø 50 mm, 3,850 m

g. Population to be served with service connections will be 50 % of the population served, and each connection serve 6 persons.

h. Population to be served with public hydrants will be 50 % of the population served, and each hydrant serve 200 persons.

The above design criteria are generally acceptable, except for the following revisions:

a. In addition to Lewaja spring, the existing water source, Galonta spring, shall be continuously used. The intake quantity shall be 17 l/sec for Lewaja and 3 l/sec for Galonta.

e. The reservoir for Lewaja system shall be capacitated for 300 cu m, and the existing reservoir for Galonta system shall be utilized with necessary improvements, such as provision of the roof, an overflow, etc. and fencing around the reservoir.

## 3-3 Preliminary Designs

Dimensions, structural features, etc. of the major facilities are proposed in accordance with the above design criteria. Figs 3-3-1 and 3-3-2 show the plan and profile of the proposed water supply system for the target year of 1985.

1) Collection Chamber
   Made of reinforced concrete as shown in Fig 3-3-3.
   Dimension : B 4.0 m x L 3.0 m x D 2.0 m - 1 basin

2) Transmission Pipeline A - Lewaja
   From the collection chamber to the break pressure chamber.
   Material : DCIP or GSP
   Length : Ø 100 x 400 m

3) Break Pressure Chamber
   Made of reinforced concrete as shown in Fig 3-3-4.
   Dimension : B 2.0 m x L 2.0 m x D 2.0 m - 1 basin

4) Transmission Pipeline B - Lewaja
   From the break pressure chamber to the service reservoir.
   Material : DCIP or GSP
   Length : Ø 200 x 5,000 m

5) Transmission Pipeline - Galonta

Material : DCIP or GSP

Length : Ø 100 x 500 m (to replace the upperstream span 500 m of the existing transmission pipeline to increase the capacity)

6) Service Reservoir

Made of reinforced concrete as shown in Fig 3-3-5.

Total Capacity : 300 cu m

Number of basin : 2 basins

Dimension : B 5.0 m x L 10.0 m x D 3.0 m

7) Solution Tank of Calcium Hypochlorite

Material : Fiberglass

Number of sets : 2 sets, one for Lewaja and one for Galonta

Component of set : 2 solution tanks with capacity of 100 liters each together with a feeding device.

8) Distribution Pipeline

Material : DCIP/PVC/ACP

Length : Ø 200 x 700 m

Ø 150 x 2,250 m

Ø 100 x 3,750 m

Ø 75 x 1,100 m

9) House Connection and Public Hydrant

Fig 3-3-6 shows a sketch of typical public hydrant

Number of house connection : 815 units

Number of public hydrant : 25 units

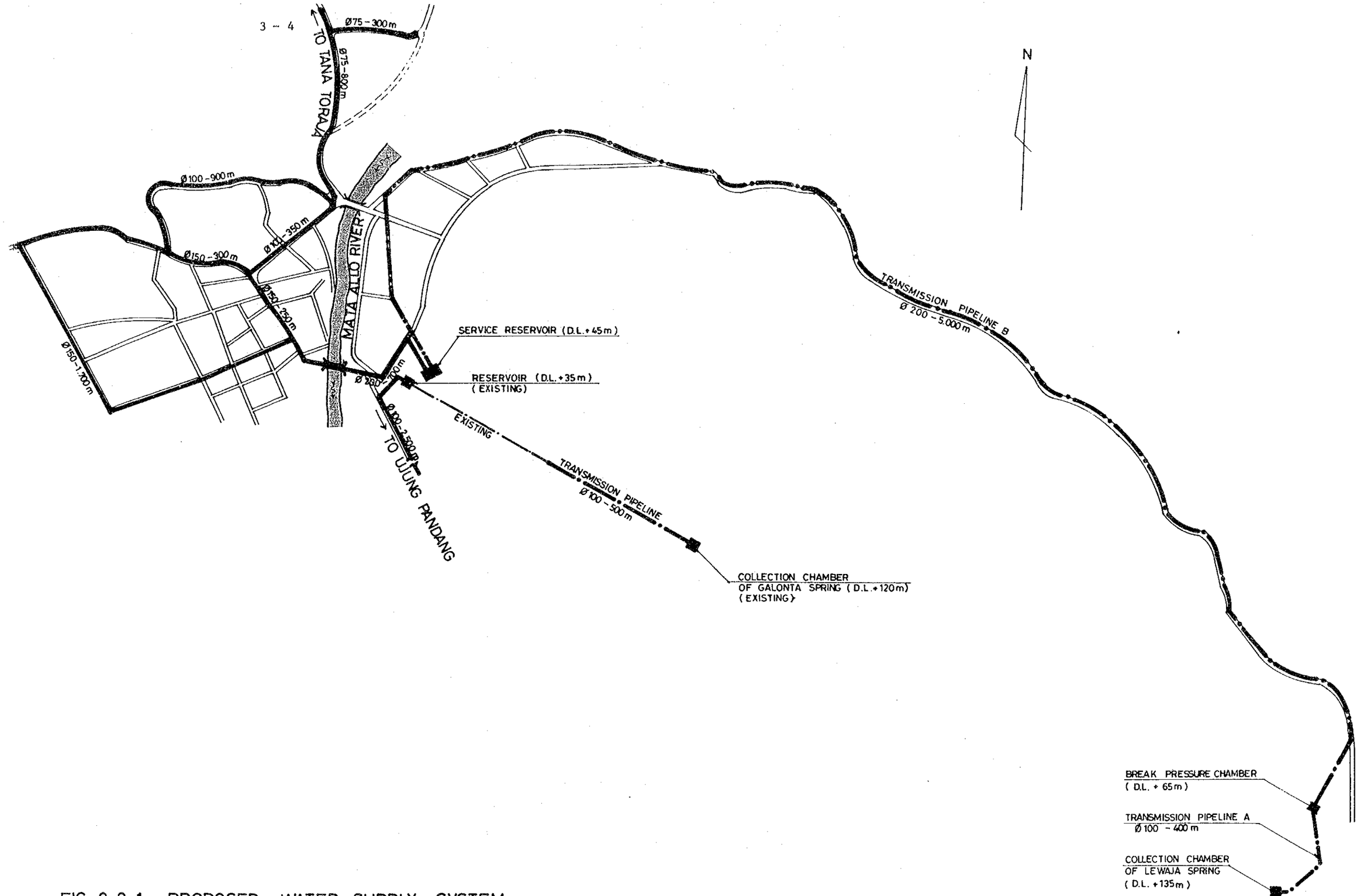



FIG. 3-3-1 PROPOSED WATER SUPPLY SYSTEM 1 : 10.000

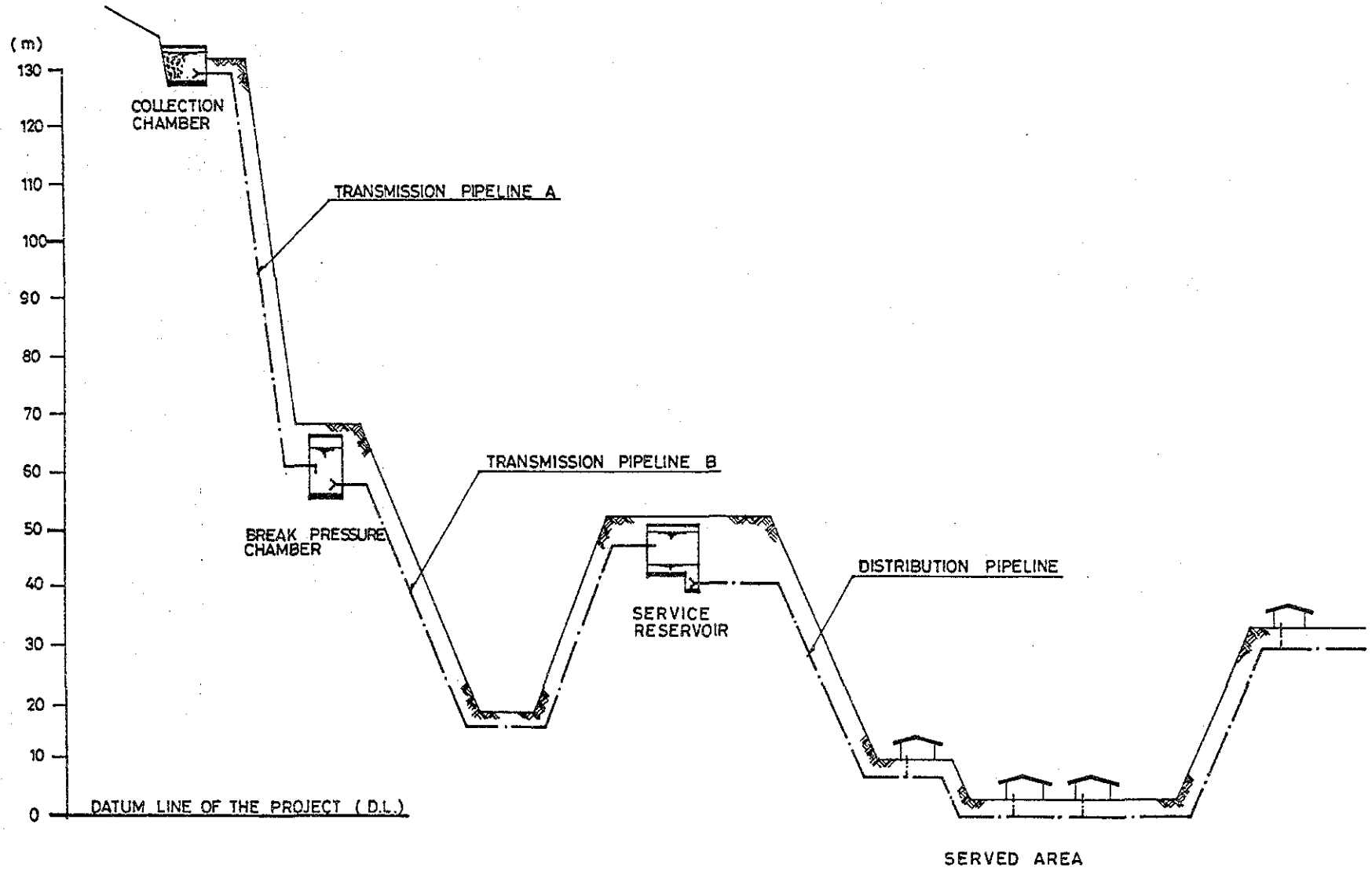



FIG. 3-3-2 PROPOSED PROFILE OF WATER SUPPLY SYSTEM H = NO SCALE V = 1 : 1000

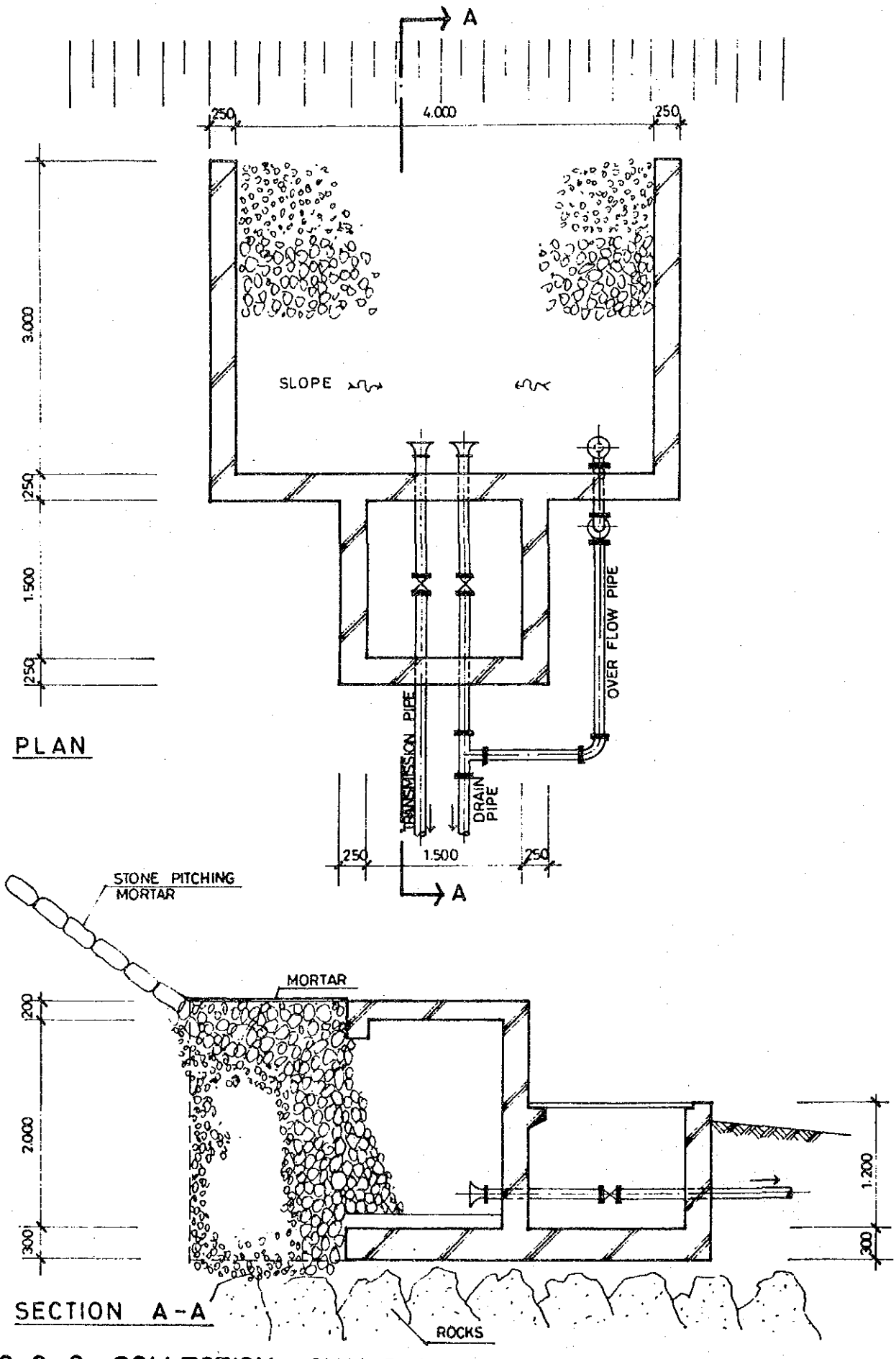
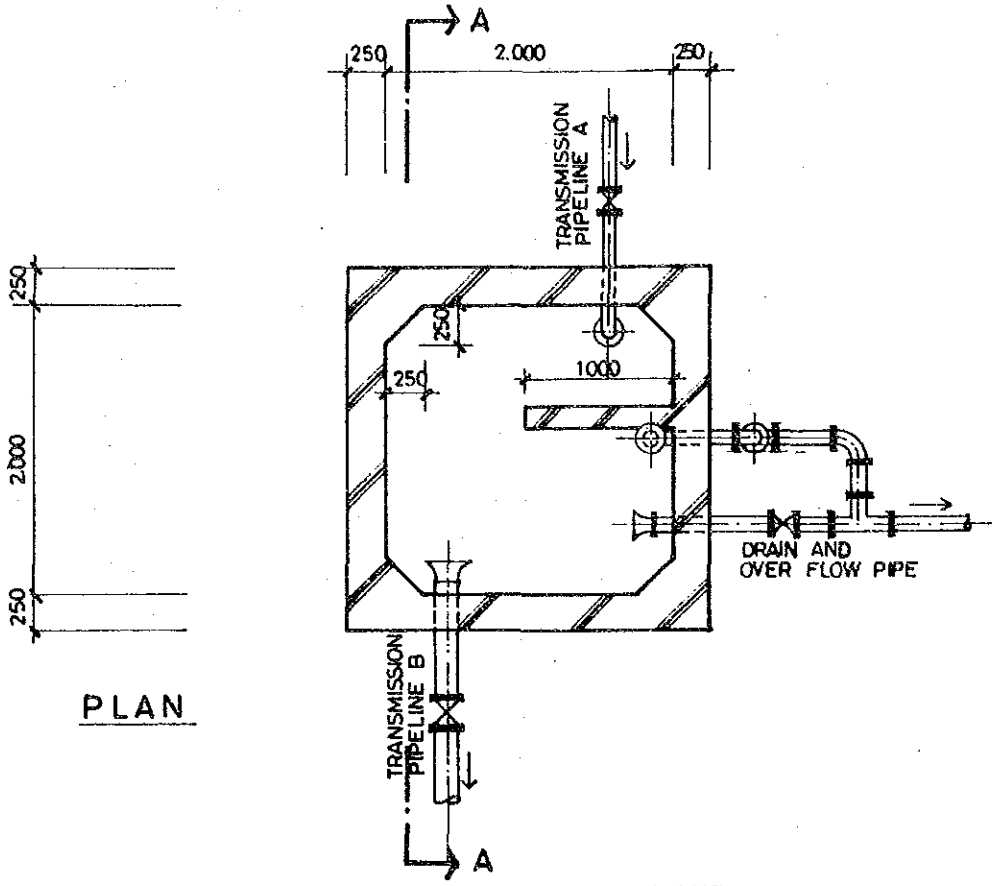
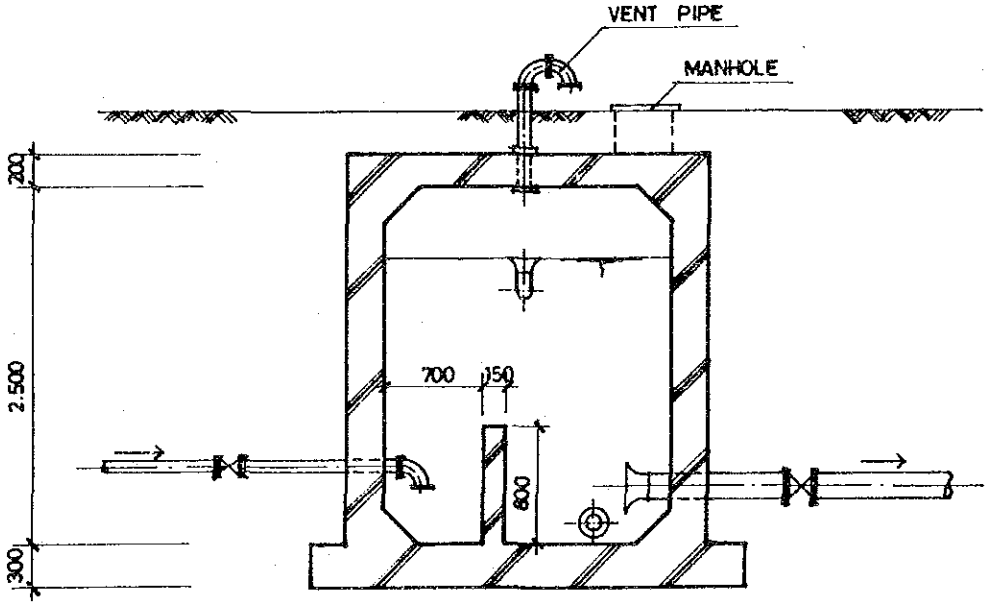



FIG. 3-3-3 COLLECTION CHAMBER OF LEWAJA SPRING 1:50

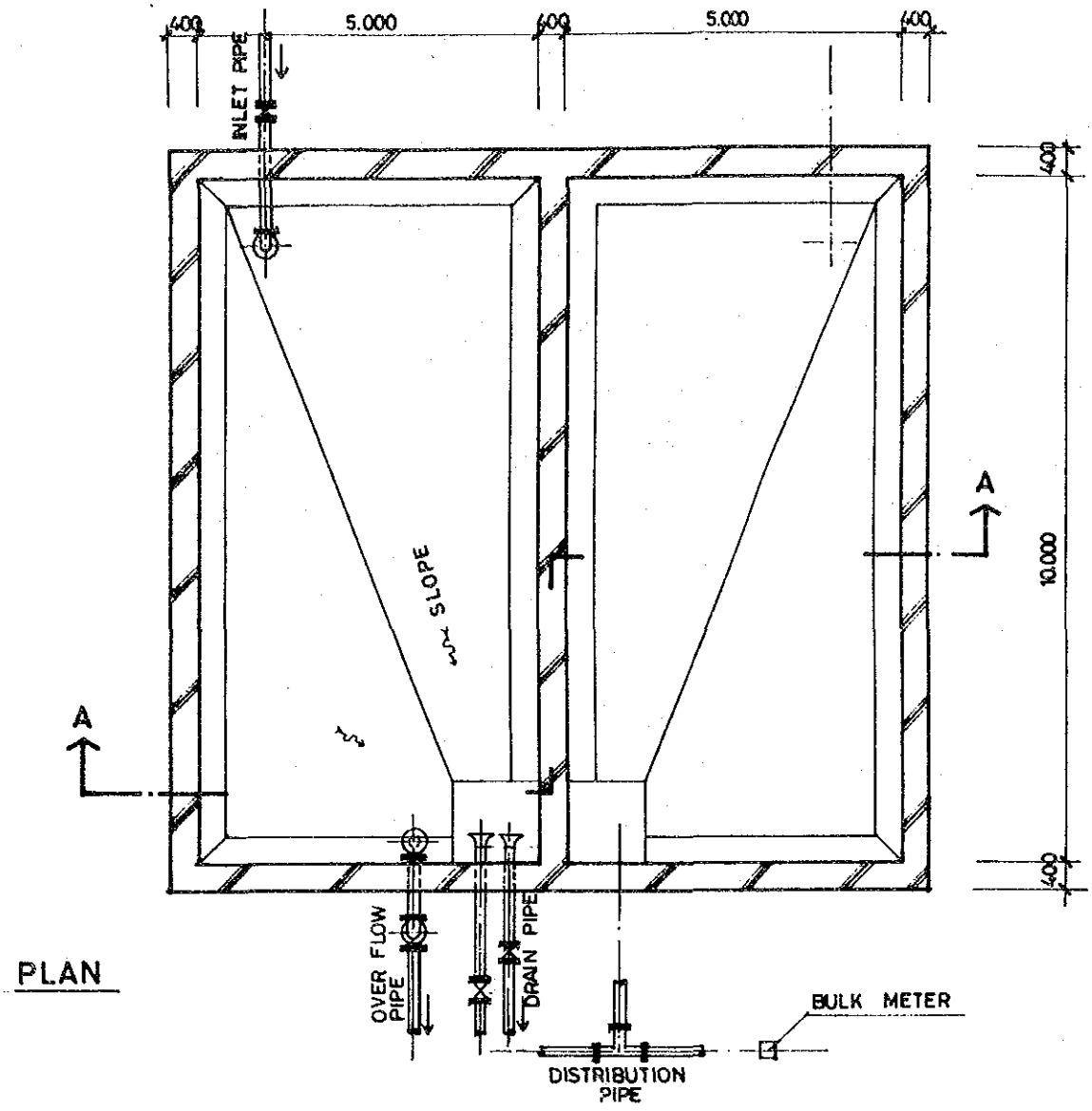



PLAN




SECTION A-A

FIG. 3-3-4 BREAK PRESSURE CHAMBER 1 : 50

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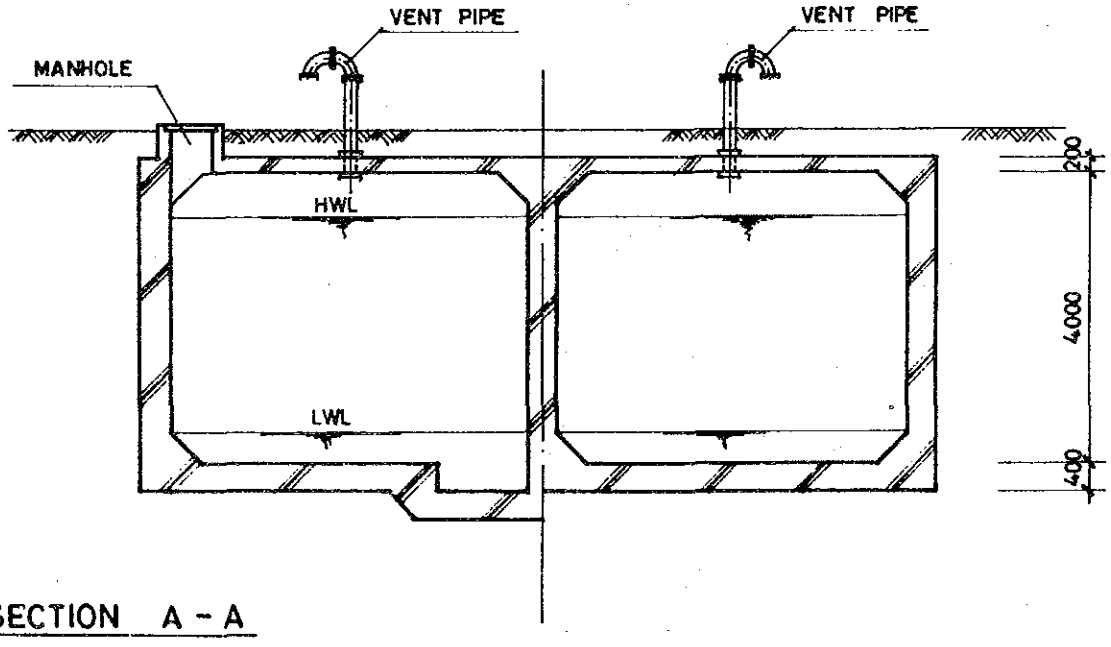
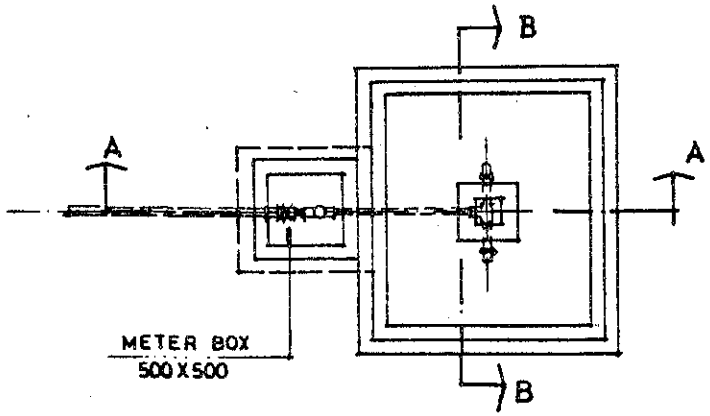
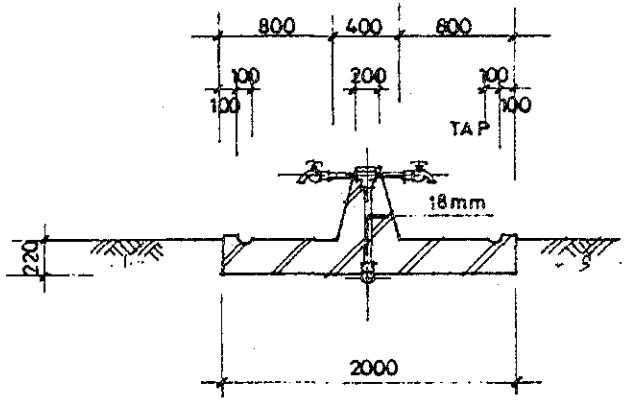



SECTION A - A

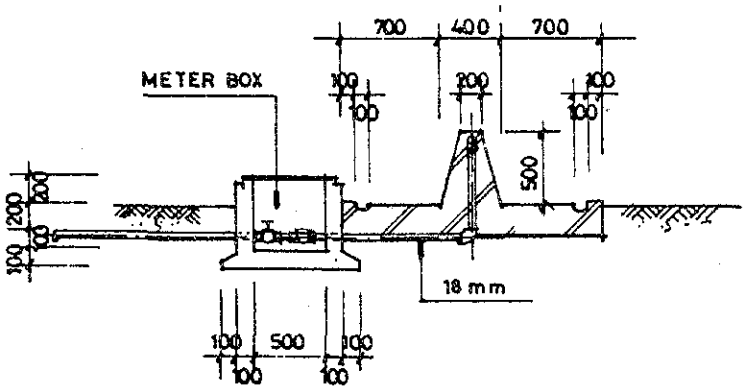
FIG. 3-3-5 SERVICE RESERVOIR 1 : 100




PLAN




SECTION B-B




SECTION A-A

FIG. 3-3-6 TYPICAL PUBLIC HYDRANT 1 : 50

## IV. REVIEW OF COST ESTIMATE AND IMPLEMENTATION SCHEDULE

### 4-1 General

As no cost estimate nor implementation schedule has been prepared by the existing Report, the Study Team will make newly a cost estimate and prepare an implementation schedule, as described in the following paragraphs.

### 4-2 Considerations on Labor, Materials, etc.

Enrekang is an inland town situated at the southern end of the central mountainous district of Sulawesi. Its only door is Ujung Pandang, 230 km away southward from the town. Due to this situation, the town is still in the underdeveloped condition and construction works are rather inactive.

1) Contractors and Suppliers

A list of contractors and suppliers has been prepared by the central and local governments to readily be used for the public works. The list classifies the contractors and suppliers according to their specialities and abilities, and includes leading contractors in Jawa and local contractors. Therefore, suitable contractors and suppliers can be selected with ease.

2) Materials

Gravels and sand are easily available in the area, and cement can be transported from Ujung Pandang where is the cement manufacturing factory. All pipe materials, local and imported, are also shipped to Ujung Pandang and then transported on land to the construction site.

3) Labor

Unskilled labor is locally available, and skilled labor can be furnished by the contractor from other major cities.

## 4-3 Construction Costs

Table 4-3-1 shows the estimated construction costs (Refer to Appendix A Breakdown of Estimated Construction Costs). All the unit costs employed for the estimation are those as of May 1980, which are obtained from projects similar to the present project and now under way in the country. For the cost in 1982 when the project is planned to be executed, an escalation 15% per annum and a contingency 20% are allowed. In addition to the above, an engineering cost for detailed design including some incidental surveys, construction supervision, etc. is provided with an allowance 8% of the construction costs, escalation and contingency. Table 4-3-2 shows the estimated project costs including all the above.

## 4-4 Implementation Schedule

Fig 4-4-1 illustrates the implementation schedule of the project prepared giving due consideration to the target of project completion set by Cipta Karya, whose desire is to commission the project within the year of 1982. In preparing the schedule, all the requirements for time and procedures in financing, tendering, construction, etc. are carefully considered.

It should, however, be noted that the implementation schedule has been prepared assuming that the financing for the project would be decided within this calendar year. Therefore, if not, the implementation schedule is subject to change, at a later date, according to the decision of financing by the agencies concerned.

Table 4-3-1 Estimated Construction Costs

Rupiahs 1,000

| Item | Foreign Exchange | Local Currency | Total |
|---|---|---|---|
| 1. Collection Chamber | lump sum 350 | lump sum 3,830 | 4,180 |
| 2. Transmission Pipeline A (Lewaja) | | | |
| Ø 100 x 400 m | Rp 11.3/m 4,520 | Rp 9.1/m 3,640 | 8,160 |
| 3. Transmission Pipeline B (Lewaja) | | | |
| Ø 200 x 5,000 m | Rp 21.0/m 105,000 | Rp 8.4/m 42,000 | 147,000 |
| 4. Transmission Pipeline (Galonta) | | | |
| Ø 100 x 500 m | Rp 11.1/m 5,550 | Rp 8.7/m 4,350 | 9,900 |
| 5. Break Pressure Chamber | lump sum 700 | lump sum 2,200 | 2,900 |
| 6. Service Reservoir | lump sum 1,250 | lump sum 30,135 | 31,385 |
| 7. Distribution Pipeline | | | |
| Ø 200 x 700 m | Rp 28.7/m 20,090 | Rp 13.9/m 9,730 | 29,820 |
| Ø 150 x 2,250 m | Rp 12.3/m 27,675 | Rp 6.9/m 15,525 | 43,200 |
| Ø 100 x 3,750 m | Rp 6.8/m 25,500 | Rp 6.0/m 22,500 | 48,000 |
| Ø 75 x 1,100 m | Rp 6.6/m 7,260 | Rp 6.8/m 7,480 | 14,740 |
| 8. Bulk Meter | | | |
| Ø 200 x 1 piece<br>Ø 100 x 1 piece | lump sum 1,500 | lump sum 650 | 2,150 |
| 9. Water Meter | | | |
| Ø 13 x 815 pieces | Rp 17.0/piece 13,855 | Rp 1.7/piece 1,385 | 15,240 |
| 10. Public Hydrant | | | |
| Ø 18 x 25 pieces | Rp 30.0/piece 750 | Rp 303.0/piece 7,575 | 8,325 |
| Total Cost | 214,000 | 151,000 | 365,000 |

Table 4-3-2 Estimated Project Costs

(1)

Rupiahs 1,000,000
U.S. Dollars 1,000

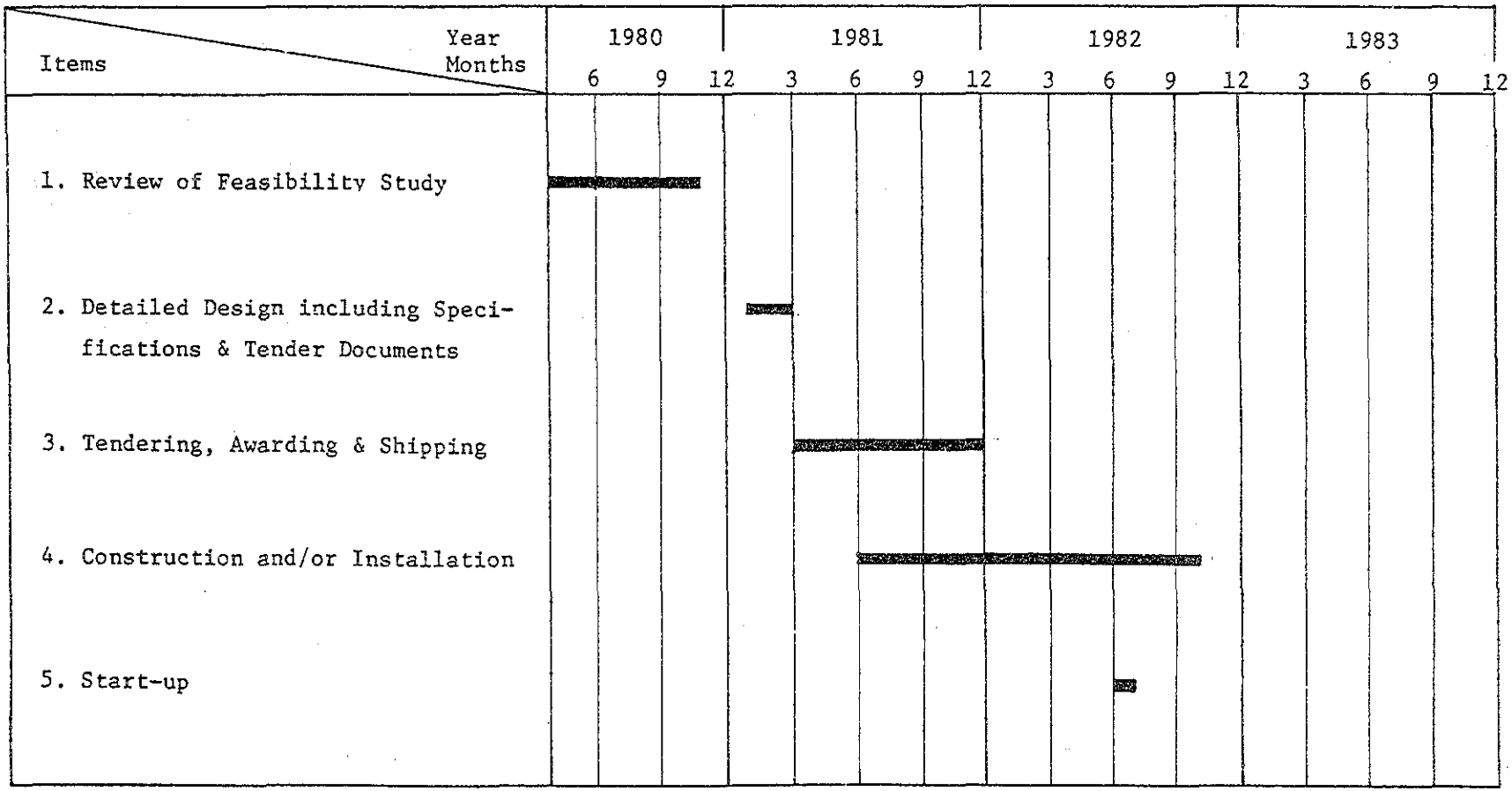
| Item | Foreign Exchange | Local Currency | Total Cost |
|---|---|---|---|
| a. Construction Cost (2) | 214<br>340 | 151<br>340 | 365<br>580 |
| b. Escalation (3)<br>(a x 32.25%) | 69<br>110 | 49<br>78 | 118<br>188 |
| c. Sub-total | 283<br>450 | 200<br>318 | 483<br>768 |
| d. Contigencies<br>(c x 20 %) | 57<br>91 | 40<br>64 | 97<br>155 |
| e. Sub-total | 340<br>541 | 240<br>382 | 580<br>923 |
| f. Engineering Cost | 11<br>17 | 35<br>56 | 46<br>73 |
| Total Cost of Project | 351<br>558 | 275<br>438 | 626<br>996 |

Note : (1) Currency equivalent : US.$ 1 = Rp. 629

(2) Construction cost is calculated based on the prices as of May 1980.

(3) The escalation is considered as 15 % annually each for years of 1981 and 1982.

Fig 4-4-1 Implementation Schedule



# V. REVIEW OF FINANCIAL STUDY

## 5-1 General

The existing Report has not made any financial study. The Study Team, therefore, will study the financial feasibility of the present project based on the engineering plan and the cost estimate so far prepared and described in the preceding sections.

With regard to the financial feasibility of the project, it should be noted that the capital cost required is to be provided by the central government in the form of a grant. Therefore, the examination of the feasibility of the project must be made from a standpoint a little different from the usual public enterprise, as detailed in the following sections.

In the meantime, the government of Indonesia is now carrying out PELITA III, in which the construction of small and medium sized water supply systems throughout the country is one of the most important social welfare policies, and the government has the intention of providing all the capital cost for such construction in grant in consideration of the financial weakness of such small scale water supply enterprises.

## 5-2 Funding Requirement

Funds required for construction of water supply facilities in Enrekang, are summarized in Table 4-3-1 Estimated Project Costs. Total cost, necessary to implement the project, is about Rp. 626 million or US$1.0 million, based on the prices as of May 1980. As construction of the facilities is proposed to be initiated in 1981, escalation of 15% is assumed for the years of 1981 and 1982. For contingencies, 20% is assumed. It should be noted that unit costs provided with allowances for local transportation are employed for calculation of capital cost, taking duly local condition of Enrekang into consideration.

## 5-3 Sources of Financing

As a source of financing for the present project, the Government of the Republic of Indonesia is considering to obtain a loan from external sources to cover the foreign components of the capital cost. The Government, however, intends to construct the facilities on a full grant basis in accordance with the policies envisaged in PELITA III. This means that all construction costs will be borne by the Government, and after construction, the facilities will be turned over to the local government.

For operation and maintenance, the costs will also be met by the grant from the Government, for the first 2-year operation of the facilities, in case the enterprise cannot afford to pay.

## 5-4 Financial Feasibility

The financial projection is worked out to check business conditions of the enterprise, i.e., whether the Enterprise can pay costs of operation and maintenance by their own fund or not, and for that purpose, comparison of costs and revenues was made.

Table 5-4-1 shows projected Income Statement and Table 5-4-2 shows projected Cash Flow. Those statements indicate the business condition of the Water Enterprise from 1983, the year of expected operation of the facilities, and six years thereafter. The revenue of water sales projected from the yearly water quantity of water sales times the proposed water rate which is worked out considering the costs of production and consumers ability as well, as described in section 5-6. The cost of operation covers costs of personnel salary, maintenance and operation, chemical and office operation. In case of Enrekang, due to the financial weakness of the Water Enterprise depreciation is not considered as cost items.

As can be seen in the table the revenue is bigger than cost and the Water Enterprise can generate income. Total accumulate income for six years amount to Rp. 11.5 million. From this it can be said that the Enterprise can afford to pay the cost of operation within their revenue.

Table 5-4-1 Income Statement

(Rp 1 million)

| | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 |
|---|---|---|---|---|---|---|
| Water Production ($m^3$/year) | 235,983 | 281,605 | 326,146 | 371,227 | 416,308 | 461,389 |
| Water Sales ($m^3$/year) | 205,203 | 244,404 | 283,605 | 322,806 | 362,007 | 401,208 |
| Percentage Sales to Production (%) | 87 | 87 | 87 | 87 | 87 | 87 |
| Revenue Water Sales (1) | 10.7 | 13.0 | 15.3 | 17.6 | 19.8 | 22.1 |
| Other Fees | 2.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Total Billing | 12.9 | 13.1 | 15.4 | 17.7 | 19.9 | 22.2 |
| Less Provision for Bad Debt | 0.2 | 0.2 | 0.3 | 0.3 | 0.4 | 0.4 |
| Total Revenue | 12.7 | 12.9 | 15.1 | 17.4 | 19.5 | 21.8 |
| Operating Cost | 12.9 | 13.6 | 14.2 | 15.0 | 15.7 | 16.5 |
| Net income (Deficit) | (0.2) | (0.7) | 0.9 | 2.4 | 3.8 | 5.3 |

Note : (1) Revenue water sales are based on water rate structure

Table 5-4-2 Cash Flow

(Rp. 1 million)

| | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 |
|---|---|---|---|---|---|---|
| Sources of cash | | | | | | |
| Net Income | (0.2) | (0.7) | 0.9 | 2.4 | 3.8 | 5.3 |
| Government Grant | 626 | | | | | |
| Total | 625.8 | (0.7) | 0.9 | 2.4 | 3.8 | 5.3 |
| Application of cash | | | | | | |
| Capital expenditure | 626 | - | - | - | - | - |
| Total | 626 | - | - | - | - | - |
| Net cash inflow (out flow) | (0.2) | (0.7) | 0.9 | 2.4 | 3.8 | 5.3 |
| Cash at beginning | | (0.2) | (0.9) | 0.0 | 2.4 | 6.2 |
| Cash at end | (0.2) | (0.9) | 0.0 | 2.4 | 6.2 | 11.5 |

## 5-5 Water Rates

The proposed water rate to be applied to Enrekang is worked out considering production cost and consumers' ability to pay. Moreover, Cipta Karya's guidelines on water rate setting is also taken into consideration.

Table 5-5-1 shows the rates for different consumers in accordance with uses of water. Detail description about design of proposed water rate is given in Attachment I) of Appendix B.

Table 5-5-1 Water Rate

| | Residential Rp | Commercial Rp | Industrial Rp | Social Rp | Public Hydrant Rp |
|---|---|---|---|---|---|
| 0 - 15 cu m/m | 50 | 100 | 150 | 40 | 40 |
| 15 - 30 cu m/m | 75 | 100 | 150 | 60 | 40 |
| 30 - cu m/m | 150 | 200 | 250 | 90 | 40 |

## 5-6 Ability of the Consumers to Pay for Water

The average income of consumers who are expected to receive water by the present project is checked to know the ability of consumers to pay for water. According to the survey, the average monthly income is about Rp. 33,000.

According to the policy of the Central Government, water rate is recommended to be arranged under 4% of the average monthly income of consumers. As mentioned in the above, the average monthly income of consumers is found to be Rp. 33,000, so it will be within their paying ability if the monthly payment is below Rp. 1,320. In accordance with the proposed water rate, the average monthly water charge to be borne by consumers will be Rp. 750, in case they use 15 cu m of water in a month, the charge will be less than Rp. 1,320 and falls within 4%.

# VI. REVIEW OF ORGANIZATION

## 6-1 General

The existing Report does not discuss anything about an organization which will cope with the proposed water supply system to be established in Enrekang. To review the current operation of the existing water supply system together with organization therefor, a survey was carried out by the Study Team, and on the basis of such review, an organization most adequate to the town was studied.

The existing water supply has been operated by the public works section of Enrekang Regency. The public works section is staffed with 30 personnel and is conducting general civil works in the regency. Out of 30 personnel three staff are in charge of water supply operation and maintenance. The function of three staff is 1) collection 2) operation/ maintenance, and 3) administration. During the survey it was observed that the existing system was not necessarily maintained well due to lack of personnel and appropriate organization. Along with the implementation of the project, an independent organization should be set up equipped with satisfactory level of function for system operation and maintenance.

## 6-2 Recommended Organization

The recommended organization for the Enrekang Water Enterprise is presented in Fig 6-2-1. The structure of organization is prepared in accordance with the guidelines of Cipta Karya with some modifications reflecting the local condition of Enrekang.

The Enrekang Water Enterprise will be supervised and controlled by a Board of Management, which should be composed of Indonesian citizens appointed by the head of local government. The enterprise should be managed by a full time Manager experienced with water works operations. As shown in the Fig, the organization is structured into two major groups. One group will be responsible for financial and administrative matters and the other for technical operation and maintenance.

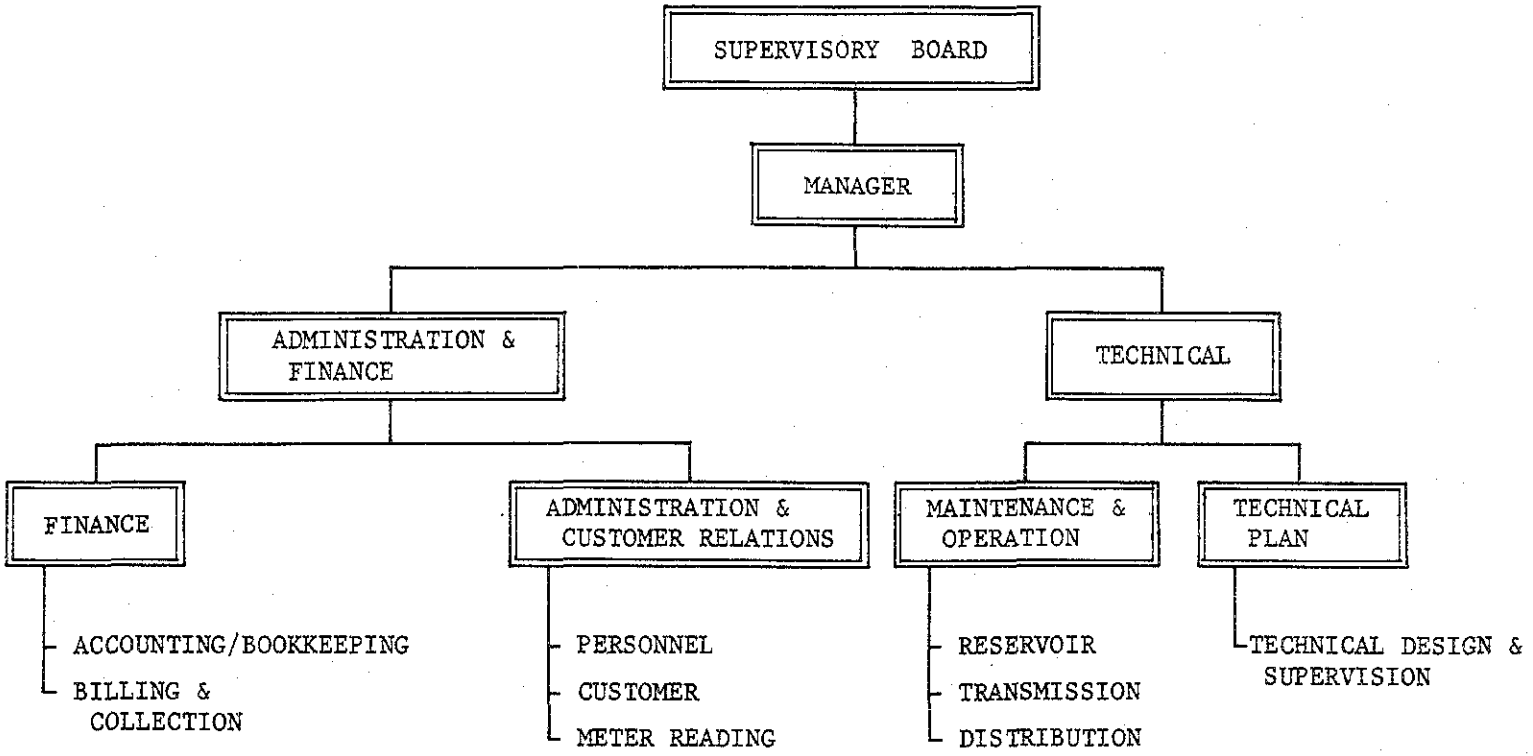



Fig 6-2-1 Proposed Organization Chart
for Enrekang Water Enterprise

## 6-3 Staffing Schedule

Necessary number of personnel required for conducting water supply activities is studied considering the scale of Enrekang water supply and target year of the present project. The staffing schedule is shown in Table 6-3-1. The number of personnel is kept minimum to the extent possible. This schedule can be utilized as a guideline for recruiting the staff.

Table 6-3-1 Staffing Schedule

| Description | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 |
|---|---|---|---|---|---|---|
| Manager | - | 1 | 1 | 1 | 1 | 1 |
| Secretary/Typist | - | 1 | 1 | 1 | 1 | 1 |
| Sub-total | - | 2 | 2 | 2 | 2 | 2 |
| Technical | | | | | | |
| Head | - | 1 | 1 | 1 | 1 | 1 |
| Maintenance & Operation | - | - | 2 | 2 | 2 | 2 |
| Foreman | - | - | 3 | 3 | 3 | 3 |
| Design | - | 1 | 1 | 1 | 1 | 1 |
| Sub-total | - | 2 | 7 | 7 | 7 | 7 |
| Administration & Finance | | | | | | |
| Head | - | 1 | 1 | 1 | 1 | 1 |
| Accounting/Bookkeeping | - | - | 1 | 1 | 1 | 1 |
| Billing & Collection | - | - | 1 | 1 | 1 | 1 |
| Meter Reading | - | - | 1 | 1 | 1 | 1 |
| Sub-total | - | 1 | 4 | 4 | 4 | 4 |
| Total | - | 5 | 13 | 13 | 13 | 13 |

As can be seen in the Table, total number of staff will be 13 at the time of full operation of the water supply system.

## 6-4 Transient Measures in the Initial Stage of Operation

In the initial period of the project operation, it is advisable for Cipta Karya to provide some experienced personnel under appropriate organization for the purpose of breaking-in of all staff and personnel of the new organization. Along with this, Cipta Karya is also recommended to assist in employing such manpower, if possible, experienced persons for the new organization.

# VII. EVALUATION OF THE PROJECT AND RECOMMENDATIONS

## 7-1 Evaluation of Merits of the Project

Enrekang has an important position as the capital city of Kabupaten (Regency) of Enrekang and a center of local commerce and transportation. But its development has been retarded by the insufficiency of drinking water. There is a river flowing through the built-up area, but it is not usable because of its turbidity; there are springs but their yields are too small except one that is inconvenience for use because of its distance. Most of the population and establishments are obliged to use unsafe shallow well water or the turbid river water. The present project, therefore, will give the following benefits.

1) Safe Water to be Secured for the Public
   Presently used shallow well water is contaminated by infiltration of waste water, and the river water gets highly turbid during and after rains and besides waste water is discharged into the river at upstream. These conditions of daily use water are surely to be improved by the construction of the present project.

2) Improvement of Living Environment
   Construction of the public water supply system rarely fails to become a motivation for improvement of the living environment, as experienced elsewhere. The improvement starts with the kitchen of the water users, and proceeds to disposal of their waste water, and it spreads to all the living environment. This welcome spontaneous movement of the public should not simply be expected, but the authority concerned should encourage and direct such activities of the public.

3) Improvement of Tourist Accomodation
   All tourists and travellers from south to the northern part, which is well known as Tana Toraja, pass through Enrekang, but they will not stay overnight in Enrekang due to the lack of restaurants and hotels

equipped with safe and abundant water supply. Even visitors to this capital city are hesitant to stay in Enrekang. When the present project is completed, all these inconveniences will be removed to lead to a sound development of the capital city.

4) Increase of Employment Opportunity and General Earning
One of the most important industries in Enrekang is stock farming, but owing to lack of water supply a factory for processing the product cannnt be built. In the future, however, when the present water project has been completed, such facility can be established. This and the above said tourist industry will made possible a rise of employment opportunity and general earning in the whole community.

## 7-2 Recommendations

To successfully operate the completed water supply system, the following must be observed.

1) Adoption of Pipe Plumbing System
Presently "open channel" system is employed for the plumbing system as well as all the piping system from the intake to the distribution pipelines. By this system, loss of water is excessive and furthermore the water is always exposed to the danger of contamination. When the present project is undertaken, this system should be changed to the pipe plumbing system for conservation of water, maintaining of water pressure and protection of water from contamination.

2) Metering
Metering of all connections is essential for preventing water wastage and charging on a fair basis. The presently available water resources are not necessarily abundant for the future water requirements in Enrekang when it develops. Therefore, it is very important to prevent water wastage.

3) Organization

In order to operate the completed facilities on a technically and financially sound basis, a most efficient organization staffed with appropriate personnel is indispensable. As already recommended earlier in this report, the organization should be established as early as possible.

4) Protection of the Water Source and Reservoirs

The existing and to-be-constructed water intakes and reservoirs should be strictly protected against contamination by building a fence not to allow entrance of people or animals. Further the forests which cover the watersheds of the springs should be protected from felling to maintain the yield.

5) Regular Observation of Spring Yields

The proposed two water sources, Galonta and Lewaja, are located rather on a high elevation, and the watersheds are not necessarily wide. Therefore the yields may be influenced by the climatic condition. If the least yields in the dry season should be found to be less, or more, than expected in the present study, and appropriate measure should be accordingly taken.

# APPENDIX A

## BREAKDOWN OF

## ESTIMATED CONSTRUCTION COST

Note:

Foreign Portion : CIF of pipe and fitting, meter, valve and pump. PVC and ACP, although locally available, are included in Foreign Portion, considering that the manufacturing capacity and experience in use are still not sufficient.

Local Portion : Cement, steel bar, gravel, sand, civil work and local transportation.

ESTIMATED CONSTRUCTION COST FOR ENREKANG (in Rp.)

| Items | Foreign Exchange | | Local Currency | | Remarks |
|---|---|---|---|---|---|
| 1. Collection Chamber | 1)* yard pipe - Ø 100 @ 8,891/m x 20 m | = 177,820 | 1) earthwork | = 200,000 | 1)* Includes all drain and overflow pipes |
| | 2) fitting 177,820 x 20 % | = 35,564 | 2) concrete @ 200,000/cu m x 16 cu m | = 3,200,000 | |
| | 3) valve | 120,074 | 3) gravel @ 20,000/cu m x 20 cu m | = 400,000 | |
| | Total | 333,458 ≒ 350,000 | 4)* local transportation | 30,000 | 4)* In case of Enrekang, costs of materials x 10 % |
| | | | Total | 3,830,000 | |
| 2. Transmission Pipeline A (Lewaja) Ø 100 x 400 m DCIP | 1) pipe @ 8,891/m x 400 m | = 3,556,400 | 1) pipe @ 4,000/m x 400 m | = 1,600,000 | |
| | 2) fitting 3,556,400 x 20 % | = 711,280 | 2) protection | 600,000 | |
| | 3) valve @ 120,074/pcs x 2 pcs | = 240,148 | 3) valve box @ 500,000/pcs x 2 pcs | = 1,000,000 | |
| | Total | 4,507,828 @ 11,300/m | 4) local transportation | 450,000 | |
| | | | Total | 3,650,000 @ 9,100/m | |
| 3. Transmission Pipeline B (Lewaja) Ø 200 x 5,000 m DCIP | 1) pipe @ 17,395/m x 5,000 m | = 86,975,000 | 1) pipe @ 6,000/m x 5,000 m | = 30,000,000 | |
| | 2) fitting 86,975,000 x 20 % | = 17,395,000 | 2) valve box @ 500,000/pcs x 3 pcs | = 1,500,000 | |
| | 3) valve @ 327,148/pcs x 3 pcs | = 981,444 | 3) local transportation | 10,500,000 | |
| | Total | 105,351,444 @ 21,000/m | Total | 42,000,000 @ 8,400/m | |

| Items | Foreign Exchange | | Local Currency | | Remarks |
|---|---|---|---|---|---|
| 4. Transmission Pipeline (Galonta) | 1) pipe @ 8,891/m x 500 m | = 4,445,500 | 1) pipe @ 4,000/m x 500 m | = 2,000,000 | |
| | 2) fitting 4,445,500 x 20 % | = 889,100 | 2) protection | 800,000 | |
| | 3) valve @ 120,074/pcs x 2 pcs | = 240,148 | 3) valve box @ 500,000/pcs x 2 pcs | = 1,000,000 | |
| | Total | 5,574,748 @ 11,100/m | 4) local transportation | 560,000 | |
| | | | Total | 4,360,000 @ 8,700/m | |
| 5. Break Pressure Chamber | 1)* yard pipe - Ø 100 @ 8,891/m x 50 m | = 444,550 | 1) earth work (200 cu m) | 400,000 | 1)* Includes all drain and overflow pipes |
| | 2) fitting 444,550 x 20 % | = 88,910 | 2) concrete @ 200,000/cu m x 8.5 cu m | = 1,700,000 | |
| | 3) valve | = 120,074 | 3) local transportation | 70,000 | |
| | Total | 653,543≒ | Total | 2,170,000≒ | |
| | | 700,000 | | 2,200,000 | |
| 6. Service Reservoir | 1)* yard pipe - Ø 100 @ 8,891/m x 60 m | = 533,460 | 1) earthwork (1,900 cu m) | 3,800,000 | 1)* Includes all drain and overflow pipes |
| | 2) fitting 533,460 x 20 % | = 116,170 | 2) concrete @ 200,000/cu m x 130 cu m | = 26,000,000 | |
| | 3) valve @ 120,074/pcs x 5 pcs | = 600,370 | 3) manhole, etc. | 200,000 | |
| | Total | 1,250,000 | 4) local transportation | 135,000 | |
| | | | Total | 30,135,000 | |

| Items | Foreign Exchange | Local Currency | Remarks |
|---|---|---|---|
| 7. Distribution Pipeline | | | |
| - Ø 200 x 700 m DCIP | 1) pipe @ 17,395/m x 700 m = 12,176,500<br>2) fitting 12,176,500 x 20 % = 2,435,300<br>3) valve @ 327,148/pcs x 3 pcs = 981,444<br>4) river crossing @ 90,000/m x 50 m = 4,500,000<br>Total 20,093,244 @ 28,700/m | 1) pipe @ 6,000/m x 700 m = 4,200,000<br>2) valve box @ 500,000/pcs x 3 pcs = 1,500,000<br>3) thrust block @ 50,000/pcs x 5 pcs = 250,000<br>4) river crossing @ 35,000/m x 50 m = 1,750,000<br>5) local transportation 2,000,000<br>Total 9,700,000 @ 13,900/m | |
| - Ø 150 x 2,250 m PVC | 1) pipe @ 9,340/m x 2,250 m = 21,015,000<br>2) fitting 21,015,000 x 20 % = 4,203,000<br>3) valve @ 217,525/pcs x 5 pcs = 1,087,625<br>4) river crossing @ 90,000/m x 15 m = 1,350,000<br>Total 27,655,625 @ 12,300/m | 1) pipe @ 4,000/m x 2,250 m = 9,000,000<br>2) valve box @ 500,000/pcs x 5 pcs = 2,500,000<br>3) thrust block @ 50,000/pcs x 15 pcs = 750,000<br>4) river crossing @ 35,000/m x 15 m = 525,000<br>5) local transportation 2,800,000<br>Total 15,575,000 @ 6,900/m | |

| Items | Foreign Exchange | | Local Currency | | Remarks |
|---|---|---|---|---|---|
| - Ø 100 x 3,750 m PVC | 1) pipe @ 4,913/m x 3,750 m | = 18,423,750 | 1) pipe @ 4,000/m x 3,750 m | = 15,000,000 | |
| | 2) fitting 18,423,750 x 20 % | = 3,684,750 | 2) valve box @ 500,000/pcs x 6 pcs | = 3,000,000 | |
| | 3) valve @ 120,074/pcs x 6 pcs | = 720,444 | 3) thrust block @ 50,000/pcs x 20 pcs | = 1,000,000 | |
| | 4) river crossing @ 90,000/m x 30 m | = 2,700,000 | 4) river crossing @ 35,000/m x 30 m | = 1,050,000 | |
| | Total | 25,528,944 @ 6,800/m | 5) local transportation | 2,600,000 | |
| | | | Total | 22,650,000 @ 6,000/m | |
| - Ø 75 x 1,100 m PVC | 1) pipe @ 3,130/m x 1,100 m | = 3,443,000 | 1) pipe @ 3,500/m x 1,100 m | = 3,850,000 | |
| | 2) fitting 3,443,000 x 20 % | = 688,000 | 2) valve box @ 300,000/pcs x 5 pcs | = 1,500,000 | |
| | 3) valve @ 92,750/pcs x 5 pcs | = 463,750 | 3) thrust block @ 40,000/pcs x 10 pcs | = 400,000 | |
| | 4) river crossing @ 90,000/m x 30 m | = 2,700,000 | 4) river crossing @ 35,000/m x 30 m | = 1,050,000 | |
| | Total | 7,295,350 @ 6,600/m | 5) local transportation | 730,000 | |
| | | | Total | 7,530,000 @ 6,800/m | |
| 8. Bulk Meter ø100 - 1 piece ø200 - 1 piece | 1) bulk meter | 1,500,000 | 1) meter box | 500,000 | |
| | | | 2) local transportation | 150,000 | |
| | | | Total | 650,000 | |

| Items | Foreign Exchange | Local Currency | Remarks |
|---|---|---|---|
| 9. Water Meter<br>Ø 13 | 1) water meter<br>@ 17,000/pcs x 815 pcs = 13,855,000 | 1) local transportation<br>1,385,500<br>@ 1,700/pcs | |
| 10. Public Hydrant | 1) meter - Ø 18<br>@ 30,000/pcs x 25 pcs = 750,000 | 1) concrete<br>@ 300,000/pcs x 25 pcs = 7,500,000<br>2) local transportation 75,000<br>Total 7,575,000<br>@ 303,000/pcs | |

# APPENDIX B

## ASSUMPTIONS FOR FINANCIAL PROJECTIONS

Financial projections are prepared on the basis of following assumptions.

1. The accounts in the financial statements conform with the generally accepted chart of accounts for water utilities. The financial statement and projections are based on an accrual system of accounting.

2. Revenues are expected from water sales and other income for installing and reconnecting service connections. Volumes of water sold are consistent with the engineering estimates of total water consumption. Other income for installing and reconnecting service connections is a service payment. Other income consists of revenues from reconnection fees and labor costs billed for installing new connections. Customers are assumed to pay for the meters, pipes and other materials used in installing the service connections.

3. The water rate, payable by the consumers, are determined, employing guidelines for setting water rates prepared by Cipta Karya, on the basis of production cost. Water rates are assumed to be minimum to generate return of the operation and maintenance cost. Depreciation for assets newly constructed is not considered in the item of operation and maintenance cost, since the provision of such expense will affect the water rate to be high. Details of water rates calculation are shown in Attachment I) Assumption for Calculation of Water Rate.

4. Two per cent of annual billings are written off as bad debts in line with assumptions of increasing water rates and number of customers.

5. Operating expense are assumed at substantially increasing levels considered necessary to operate and maintain the water supply system adequately and to provide for expanding operations. Details are given in Attachment II) Projection of Operation and Maintenance Cost.

6. Personnel costs are based on staffing requirements for the implementation of the project and on equitable salaries, and 5% increase annually. Details are given in Attachment III) Projection of Personnel Cost.

7. Annual costs of materials for repairs and maintenance cost is estimated at 0.6% of the gross value of fixed assets (project cost) in the service at 1983 and will increase 5% annually.

8. Annual office supplies expense is assumed to amount to about Rp.200 for every customer.

9. Chemical expenses are based on the chemical requirements for the volume of water to be treated and increase 5% annually. Chemical price is assumed to be Rp.1,170/kg in 1980. Details are given in Attachment IV) Projection of Chemical Cost.

10. Other operating expenses include expenditures for communications, reproduction, personnel training, board meeting, and miscellaneous items. This is estimated at 5% of total of other cash operating expenses such as personnel cost, office operating cost, and chemical cost.

Attachment I)

Assumption for Calculation of Water Rate

A. Percentage of Water Structure Classification*

| Item | Percentage of Usage of Water | | |
|---|---|---|---|
| | 0 - 15 $m^3/m$ | 15 - 30 $m^3/m$ | more than 30 $m^3/m$ |
| Domestic Use | 87.70 | 12.30 | - |
| Office | 47.00 | 51.81 | 1.19 |
| Commercial | 80.51 | 19.49 | - |
| Industrial | - | - | 100 |
| Social | 36.09 | 61.29 | 2.62 |
| Hospital | 54.7 | 4.01 | 41.29 |

Note: Residential/Government tariff includes domestic use, office, and medical facilities.
Commercial tariff includes hotel, markets.
Industrial tariff includes industrial.
Social tariff includes religious, school and domitories.
Public tariff includes public taps and public parks.
Port tariff includes harbor.

* .... Water structure classification is based on the data of monthly water consumption in Donggala.

B. Classification of Water Consumption

ENREKANG

1985

| $m^3$/day | Residential | | | | | Social | | |
|---|---|---|---|---|---|---|---|---|
| Class of Water Consumption | Domestic | Institutional | Medical | Commercial | Industrial | Religious | Public | Harbor |
| | 586 | 30 | 27 | 19 | - | 115 | - | - |
| 0 - 15 $m^3$/m | 514 | 14 | 15 | 15 | - | 41 | - | - |
| 15 - 30 $m^3$/m | 72 | 15 | 2 | 4 | - | 70 | - | - |
| more than 30 $m^3$/m | - | 1 | 10 | - | - | 4 | - | - |

1990

| $m^3$/day | Residential | | | | | Social | | |
|---|---|---|---|---|---|---|---|---|
| Class of Water Consumption | Domestic | Institutional | Medical | Commercial | Industrial | Religious | Public | Harbor |
| | 1,025 | 52 | 47 | 33 | - | 201 | - | - |
| 0 - 15 $m^3$/m | 899 | 24 | 26 | 26 | - | 72 | - | - |
| 15 - 30 $m^3$/m | 126 | 26 | 7 | 7 | - | 123 | - | - |
| more than 30 $m^3$/m | - | 2 | - | - | - | 6 | - | - |

C. Water Sales

| Item \ Year | 1985 | 1990 |
|---|---|---|
| Residential | 676.5A | 1,180A |
| Commercial | 38A | 66A |
| Industrial | - | - |
| Social | 123.2A | 214.8A |
| Harbor | - | - |
| Total | 837.7A | 1,460.8A |

Note: Figures in each classification show sales of water in Rupiah per cubic meter per day x "A" factor.

D. Water Sales

| Water Sales \ Year | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 |
|---|---|---|---|---|---|---|---|---|
| | 214,802A | | 305,760A | | 396,718A | | 487,676A | |
| | | 260,281A | | 351,239A | | 442,197A | | 533,155A |

Note: Figures show sales of water in Rupiah per year x "A" factor.

E. "A" Factor based on Water Sales

| | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 |
|---|---|---|---|---|---|---|---|---|
| "A" Factor | 58.82 | 52.13 | 46.60 | 42.60 | 39.60 | 37.31 | 35.53 | 34.11 |

Note: "A" Factor = $\frac{\text{Total Cost of Operation and Maintenance}}{\text{Water Sales}}$

"A" factor is determined to be Rp.50.

F. Proposed National Standard Water Rate Structure

| Blocks | Residential/ Government | Commercial | Industrial | Social | Public Bath-house & Standpipes | Ports |
|---|---|---|---|---|---|---|
| 0 - 15 $m^3$ | 1.0A | 2.0A | 3.0A | 0.8A | 0.8A | 5.0A |
| 15 - 30 $m^3$ | 1.5A | 2.0A | 3.0A | 1.2A | 0.8A | 5.0A |
| more than 30 $m^3$ | 3.0A | 4.0A | 5.0A | 1.6A | 0.8A | 5.0A |

Attachment II)

Projection of Operation and Maintenance Cost

ENREKANG

Operation and Maintenance Cost

(Rp. 1,000)

| I t e m | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 |
|---|---|---|---|---|---|---|
| I. Personnel Cost | 7,239 | 7,601 | 7,981 | 8,379 | 8,798 | 9,238 |
| II. Operation/Maintenance | | | | | | |
| 1. Maintenance | 3,756 | 3,944 | 4,141 | 4,348 | 4,565 | 4,794 |
| 2. Office Operation | 148 | 158 | 168 | 178 | 188 | 197 |
| 3. Chemical Cost | 749 | 786 | 826 | 867 | 910 | 956 |
| (Total I & II 1,2,3) | 11,892 | 12,489 | 13,116 | 13,772 | 14,461 | 15,185 |
| 4. Other Expenses | 1,014 | 1,079 | 1,132 | 1,189 | 1,249 | 1,311 |
| Total | 12,906 | 13,568 | 14,248 | 14,961 | 15,710 | 16,496 |
| Water Cosumption ($m^3$/year) | 205,203 | 244,404 | 283,605 | 322,806 | 362,007 | 401,208 |
| Production Cost (Rp./$m^3$) | 62.89 | 55.51 | 50.23 | 46.34 | 43.39 | 41.11 |

Attachment III)

Projection of Personnel Cost

Monthly salary of personnel according to the qualification is assumed based on information obtained from D.S.E., Cipta Karya:

| | Position | Rp./month |
|---|---|---|
| i. | Manager | 100,000.- |
| ii. | Head | 65,000.- |
| iii. | Accounting Staff | 50,000.- |
| iv. | Maintenance & Operation Staff | 45,000.- |
| v. | Bookkeeping Staff | 45,000.- |
| vi. | Staff of Billing & Collection | 40,000.- |
| vii. | Meter reader | 20,000.- |
| viii. | Secretary cum Typist | 45,000.- |
| ix. | Foreman | 15,000.- |

Note : 

| Position | Qualification |
|---|---|
| Manager | Technical I |
| Head | Technical II |
| Technical Plan | Technical III |
| Maintenance & Operation Staff | Technical IV |
| Accounting Staff | Administration II |
| Staff of Billing & Collection | Administration III |
| Meter reader | Administration IV |
| Secretary cum Typist | Administration II |

ENREKANG

Personnel Cost

(Rp. 1,000)

| Description | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 |
|---|---|---|---|---|---|---|---|---|
| Manager | 1,200 | 1,260 | 1,323 | 1,389 | 1,459 | 1,531 | 1,608 | 1,688 |
| Secretary/Typist | 540 | 567 | 595 | 625 | 656 | 689 | 723 | 760 |
| Technical | | | | | | | | |
| Head | 780 | 819 | 860 | 903 | 948 | 995 | 1,045 | 1,097 |
| Maintenance & Operation | - | - | 1,080 | 1,134 | 1,191 | 1,250 | 1,313 | 1,378 |
| Technical Planning | 600 | 630 | 661 | 694 | 729 | 766 | 804 | 844 |
| Foreman | - | - | 540 | 567 | 595 | 625 | 656 | 689 |
| Administration & Finance | | | | | | | | |
| Head | 780 | 819 | 860 | 903 | 948 | 995 | 1,045 | 1,097 |
| Accounting/Bookkeeping | - | - | 600 | 630 | 661 | 694 | 729 | 766 |
| Billing & Collection | - | - | 480 | 504 | 529 | 556 | 583 | 613 |
| Meter reading | - | - | 240 | 252 | 265 | 278 | 292 | 306 |
| Total | 3,900 | 4,095 | 7,239 | 7,601 | 7,981 | 8,379 | 8,798 | 9,238 |

Attachment IV)

Projection of Chemical Cost

A. Projection of Chemical Cost

i. Unit Price: Rp.1,170/kg as of 1980
(annual escalation of 5% considered)

ii. Amount of calcium hypochlorite to be used.

| Items | Enrekang |
|---|---|
| Water Production (Average day l/sec) | 10.6 |
| Dosage of Chlorite (ppm) | 1.0 |
| Period of Dosage | Daily |
| Use of Chlorite per Year (kg/y) | 550 |

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