

## CHAPTER 11

CONCLUSION AND DISCUSSIONPhysical Geography

Physical Geography defined by location and limit of the metropolitan area, topography, geology, climate influences in many ways the design, construction, cost and operation of sewerage and drainage works. The location and limit of the metropolitan area followed the Land Use of City Planning which was prepared by Litchfield Whiting Bowne and Associates. The topography of Bangkok-Thonburi is extremely flat. Most of the soil in Bangkok-Thonburi is clay, but about 15 metres below the ground level, it is always different kinds of clay. The water table is about 1.5 metre from ground elevation. The rainy season is continuous about 6 months.

History of Sewerage and Drainage in Bangkok-Thonburi

In these subject stated its history the environmental effects caused by sewage and drainage deficiencies. Most of problems that people have encountered are nuisances, the hazard to public health and damage to property. The Programme of sewage and waste disposal are prepared by the government are Sewage Disposal, Rain Water Disposal and Flood Control. Experts have been hired to propose the general plan for disposal waste water and stormwater, namely Litchfield Whiting Bowne and Associates, Husband Co. and with the help of some experts, Tholin gave recommendation to Bangkok Municipality.

This report will give an idea to make a decision on the sewerage and drainage works which will soon arrive.

### Economic Development

Economic Development indicates the existing and progressive conditions of the environment in the metropolitan both at present and in the future. That is very useful to forecast the population and was brought into consideration to find out the finance. It includes land and water use, residential development, industrial development, Fisheries, Agricultures, transportation, power, water supply and Land Use. The Land Use is rather affected to the population distribution. The major portion of the metropolitan area is residential use. From Land Use the industrial development is outside of Bangkok-Thonburi, Fisheries, agricultures do not influence the living of people in the city. In the future electricity can supply enough to utilize in these sewerage and drainage works and its cost is rather cheap. Land Use of Greater Bangkok or the metropolitan area would be referred or followed because this is the first time to do the Land Use for Bangkok-Thonburi.

### Population

Population is directly affected to sewerage works, such as the capacity of sewers, pumps and the treatment works. The general population trends in the metropolitan area is rather high. The birth rate gradually decreased from 1957 up to the present but the death rate increased. The high Age

composition is in the range 29-30 years old and the number of men is equally to women. Populations try to distribute to the outskirts of Bangkok-Thonburi. Future population density has to stop at any point. The population which is calculated by Least-square method is approximately 6,320,000 persons and the graphical method indicated that about 6,000,000 persons, but it would be followed the forecast of city planning stating that the population has to hold 4.5 million people.

#### Existing Sewers, Drains, Klongs, Underground Water Supply and Telephone Line

Some facts, Bye-law of Sanitation about the existing drainage are stated in this chapter. Underground main lines which are shown are required to help in selecting the location of main sewers both sewerage and drainages works for not being trouble with other works. The name of reserved Klongs being incorporated in design of drainage system, will reduce the cost of constructing main sewers.

#### Sewage Characteristics

Field and office studies about sewage characteristics in Bangkok are not undertaken before. Some datas which try to collect in this chapter has done by Tam Baramee and Suchint Phanapavudhikul. Many requirement datas of sewage characteristics have not been done before. If the government drafts a plan for sewerage and drainage works. The programme of survey for sewage characteristics would be started at present.

### Policy of Royal Irrigation Department

The Royal Irrigation Department is responsible for Control of saline water and Flood Control in the Chao Phraya River. The salinity in the year 1965 at Prakanong and Bangkok Bridge will be available because the policy of this department will be controlled in this range. The various sections of ChaoPhraya River near Treatment Plant are presented to help in finding the degree of Treatment.

### Principles and Functions ofsewerage and Drainage

Sewerage and Drainage are one of the most vital of public services. Their importance are divided into 2 aspects. The first aspect in public health is toxic and nuisance and is the carrier of the water borne diseases. Water pollution is the second. There is no the Pollution Control Commission. In this subject summarized the minimum requirement for discharged waste controlled by Pollution Control Council, Pacific Northwest Area. This scheme recommended a separate system.

### Design and Calculation

A separated system is used in this scheme. The selected site for treatment plant would be at the end of Klong Chong Nonsi near Chao Phraya River. It is estimated that the area under consideration for sewerage and drainage works is about 33 km<sup>2</sup>.

The principle concept for sewerage system is required to convey the waste to pumps by gravity flow which will conti-

nually send it to treatment plant.

Drainage system has still used existing system and the rational method is applied in this scheme. Storm water is drained to the nearest main klongs. The capacity of main klongs was calculated whether they can receive the storm water or not. Lock gates and pumps are installed at the ends of main klongs.

Results get from design is a lot of value for preliminary calculation. Due to lacking to time, some part of works have not been designed but the conclusion can be summarized as follows:-

1. The selection of sewer size has to be considered wisely. If using small sewers, the gradient has to be high and followed by high cost of excavation.

2. Due to the developing of Bangkok, it is very difficult to forecast population intensity.

3. Some facts are concluded in the chapter concerning about recommendation.

### Cost Estimation

The total cost of sewerage and drainage system is about 445 million baht in the area of 33 km<sup>2</sup> of average cost per capita is about 764 baht. The cost of sewerage works is estimated of 372 baht per capita and about 325 baht for drainage works. According to there is no preceeding sewerage system so this estimated cost may be in the wide range. However the construction cost has to be in the program of preliminary

survey for the sewerage and drainage in the future. The budget for these works is the policy of the council of ministers to make a decision from where to bring money.