

INTRODUCTION TO THE SEWERAGE SYSTEM
OF
THE BANGKOK METROPOLIS

JULY 2525 (1982)

DEPARTMENT OF DRAINAGE AND SEWERAGE
BANGKOK METROPOLITAN ADMINISTRATION

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SEWERAGE SYSTEM OF THE BANGKOK METROPOLIS

1. Preface
2. Amenity of Environment and Public Health
3. What is to be Constructed (Master Plan of Sewerage System)
4. Pilot Project (First Stage Sewerage System)
 - 4.1 Sewerage System
 - 4.2 Treatment Plant
 - 4.3 Cost of the Project
 - 4.4 Tremendous Benefits

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1. PREFACE

Healthful environment is most essential to such a great city as the Bangkok Metropolis, where more than one tenth of the nation's total population concentrate and all political, commercial, educational and transportational activities gather. The Bangkok Metropolis is located in the tropical zone with abundant rainfall and variety of flora and fauna. However, such a pleasant indigenous environment is being increasingly ruined due to the concentration of human activities. One of the most important measures to remove such hazards is to install a sewerage system and treat wastewater being discharged as a result of such activities. This booklet describes a long-term vision of the sewerage system to be constructed. The immediate plan of the system to be provided in the most congested area of the Bangkok Metropolis has already been studied and planned by the technical assistances of the Japan International Cooperation Agency (JICA). This project will serve as a pilot project for the whole Metropolitan area.

2. AMENITY OF ENVIRONMENT AND PUBLIC HEALTH

As the old saying says 'A sound mind in a sound body', a sound life of the citizens can be enjoyed in a sound environment of the city. Who would like to live in a dirty and unsanitary environment? It is a natural tendency for people to move into a healthy and pleasant environment to make home and work for livelihood.

The damage of the living environment, which was once pleasant and beautiful, is in a deplorable condition. All the public waterways emit objectionable odor and are unsightly with black and dirty water. This unsanitary condition not only destroys amenity of the living environment but also causes waterborne diseases.

As a sewerage system has a function of the removal of such hazards, it is necessary to install urgently the sewerage system in the Bangkok Metropolis. Figure 1 shows the schematic view of exemplary sewerage system and Table 1 presents that the statistics of leading cities in the world clearly indicate why people prefer healthy environment.

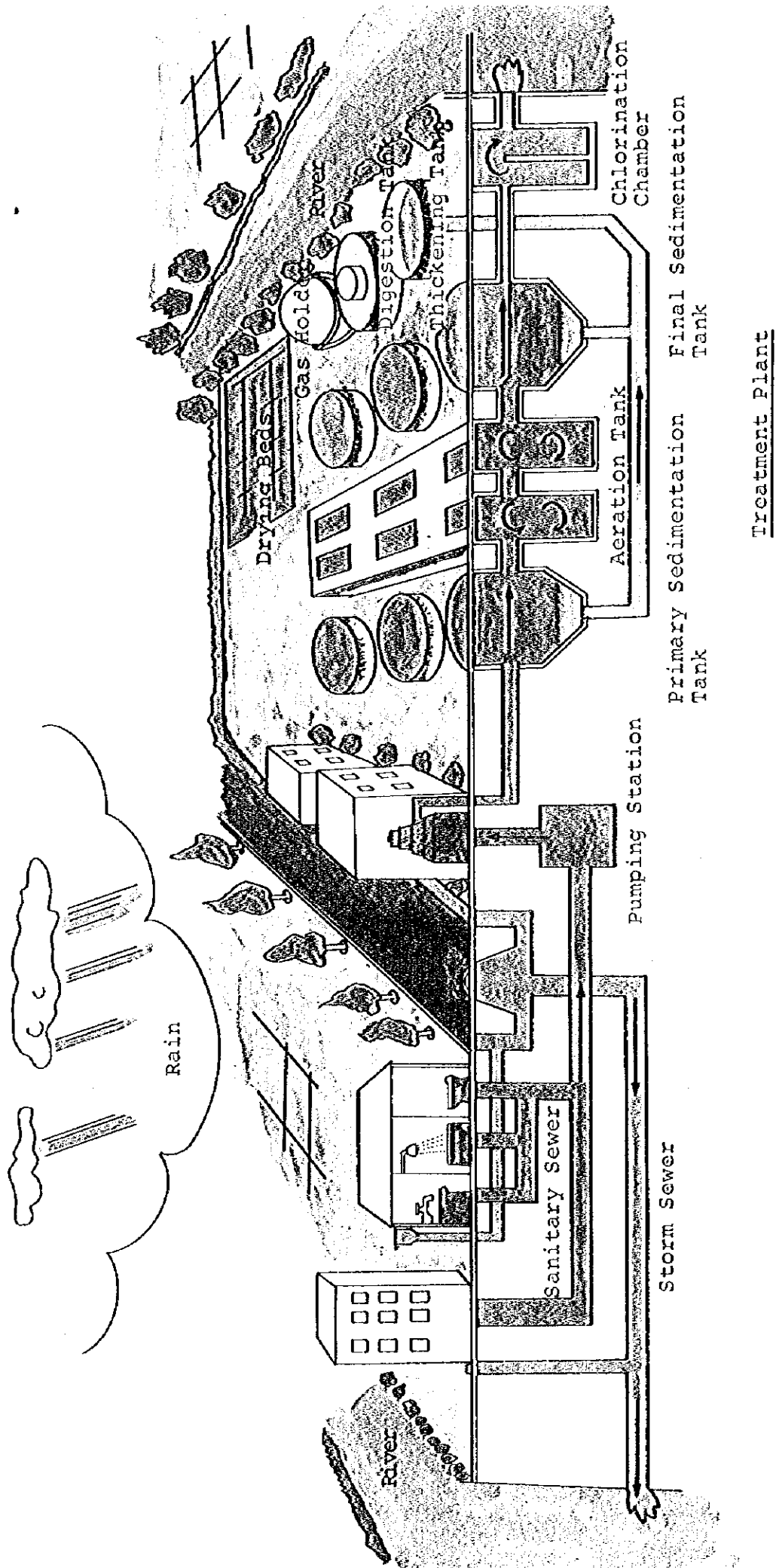


Figure 1 Outline of Sewerage System

Table 1 Development of Sewerage System in the World

City (Country)	Population (1) (Persons)	Served Popu- lation (Persons) (2)	Percentage (2)/(1) (%)	Year
Ankara (TURKEY)	2,500,000	1,800,000	72	2524 (1981)
Helsinki (FINLAND)	480,000	472,000	98	2524 (1981)
Kuala Lumpur (MALAYSIA)	1,080,000	150,000	14	2518 (1975)
London (ENGLAND)	8,000,000	8,000,000	100	2514 (1971)
Manila (PHILIPPINE)	7,000,000	1,400,000	20	2524 (1981)
Montreal (CANADA)	1,830,000	1,793,000	98	2524 (1981)
New York (U.S.A.)	7,895,000	6,475,000	82	2514 (1971)
Osaka (JAPAN)	2,648,000	2,597,000	98	2523 (1980)
Oslo (NORWAY)	445,000	429,000	96	2524 (1981)
Paris (FRANCE)	2,300,000	2,300,000	100	2524 (1981)
Sapporo (JAPAN)	1,402,000	1,205,000	86	2523 (1980)
Singapore (SINGAPORE)	2,200,000	1,335,000	67	2518 (1975)
Seoul (KOREA)	8,000,000	2,100,000	26	2524 (1981)
Sydney (AUSTRALIA)	3,191,000	2,992,000	94	2524 (1981)
Tokyo (JAPAN)	8,296,000	6,412,000	74	2523 (1980)
West-Berlin (WEST GERMANY)	1,800,000	1,750,000	97	2524 (1981)

3. WHAT IS TO BE CONSTRUCTED
(MASTER PLAN OF SEWERAGE SYSTEM)

The Bangkok Metropolis will be and have to be equipped with a complete sewerage system as early as practicable. To implement such a sewerage system in an orderly manner, the city has worked out a long-range master plan of the sewerage system, covering the whole Metropolitan area. Figure 2 shows the skeleton of the sewerage system and divisions of the area. The construction works will be carried out stagewise in accordance with the need of system construction in each division.

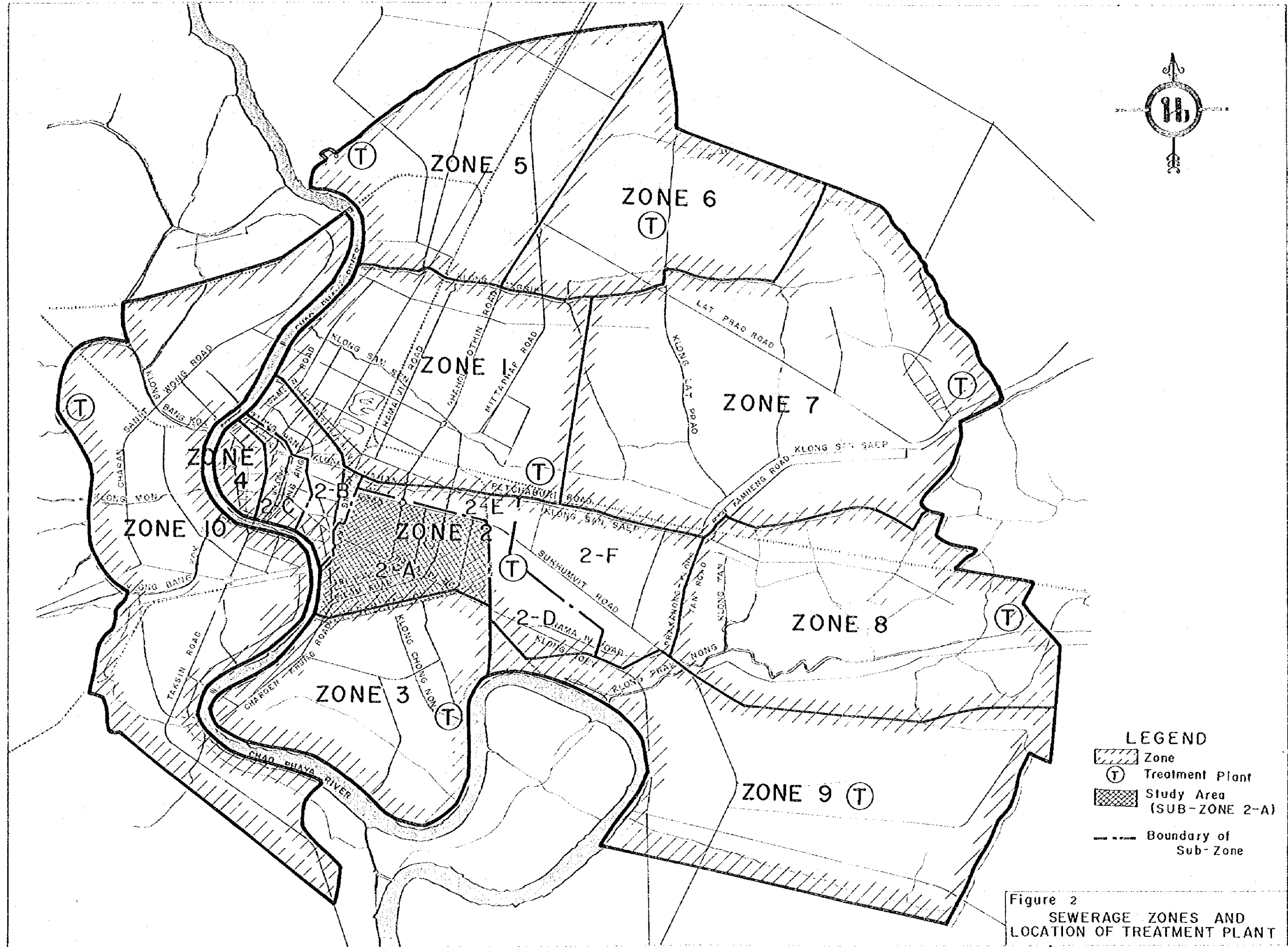


Figure 2
SEWERAGE ZONES AND
LOCATION OF TREATMENT PLANT

4. PILOT PROJECT (FIRST STAGE SEWERAGE SYSTEM)

The two Districts, Pa Thum Wan and Bang Rak, are areas requiring a sewerage system most urgently, because all klongs are severely polluted with a highest population density in the Metropolitan area, furthermore in this area, governmental and commercial buildings are clustered, so to speak forming a center of the Metropolis.

4.1 Sewerage System

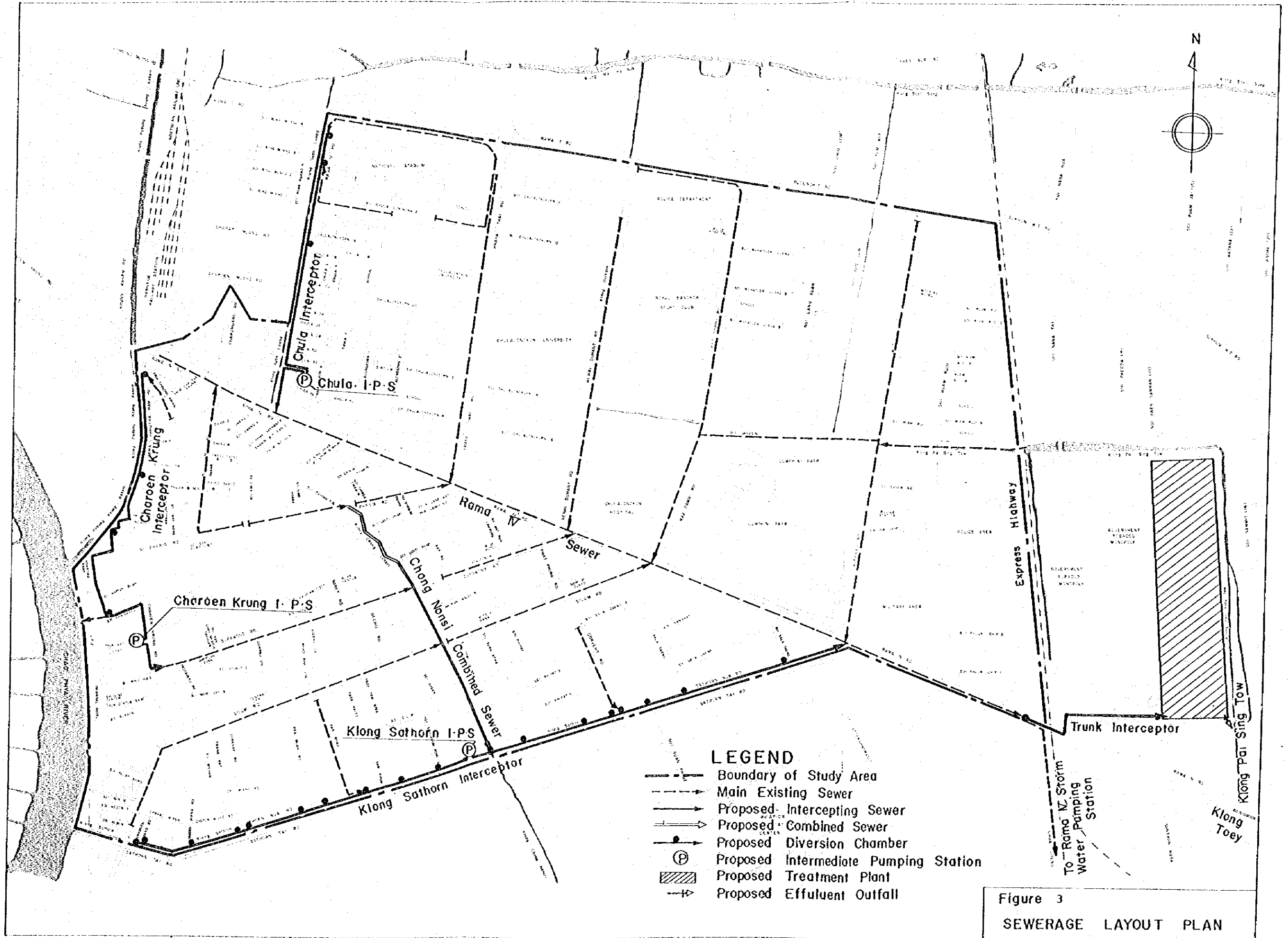
There are two systems of sewerage widely practiced in the world: one is the combined system and the other is the separate system. For the above two Districts, a system of the former type is designed. The existing storm sewers are to be used to accommodate both storm and wastewater with minimum addition of facilities to attain early effect with minimum costs.

Wastewater discharged in the area collects to Rama IV sewer extended west to east, and collected wastewater will be treated at a new treatment plant to be constructed at the pond of Thai Tobacco Monopoly. Figure 3 shows the layout plan of the first stage sewerage system.

While the existing drainage gutters and pipes will be used to transport wastewater, some other facilities will have to be constructed in addition. The new sewer and interceptors are meant to retain the wastewater effluents which are presently polluting the Chao Phya River, Klong Padung Krung Kasem and Klong Sathorn and direct them to the treatment plant. The sewerage system is planned according to Table 2.

Table 2 Implementation Schedule, Major Item and Price of the First Stage Sewerage System

		Million Baht at (Unit: 2524(1981) Price Level)					
No.	Major Item	Implementation Schedule					Total
		2527 (1984)	2528 (1985)	2529 (1986)	2530 (1987)	2531 (1988)	
1	Chula Interceptor and Pumping Station				4	9	13
2	Charoen Krung Interceptor and Pumping Station				5	9	14
3	Chong Nonsi Combined Sewer				34	33	67
4	Klong Sathorn Interceptor and Pumping Station				16	19	35
5	Trunk Interceptor				19	19	38
6	Paisingtow Treatment Center		99	101	124	96	420
7	Others	130	25	26	55	60	296
Total		130	124	127	257	245	883



4.2 Sewage Treatment Plant

Organic matters, which cause offensive odor and give unsightly color to wastewater, will be removed at the treatment plant by biological actions reinforced by addition of air. Organic matters will be decomposed to simple and stable matters, and solids will be removed as sludge which will be further treated for disposal. Effluent which contain as low organic matters as required by existing regulations will be discharged into the public waterways. This will no longer cause pollution of water of the klongs and river.

The treatment plant site is allocated for the expansion to accomodate all the wastewater which will originate in zone 2 in the future. At this first stage of implementation the capacity of the treatment plant will be about 135,000 cubic meters per day with at 160 mg BOD 5 per litre concentration. It will utilize about one third of the allocated site area.

Table 3 Major Components of the Treatment Plant

No.	Major Component	Approximate Size	Design Criteria
1.	Aeration Tank	8,500 m ³	Aeration time 1.5 hr.
2.	Sedimentation Tank	13,000 m ³	Detention time 2 hr.
3.	Chlorination Chamber	1,400 m ³	Contact time 15 min.
4.	Thickening Tank	2 x 730 m ³	Solids loading 60 kg/d/m
5.	Digestion Tank	2 x 4,200 m ³	Detention time 30 days
6.	Sludge Drying Bed	11,500 m ²	Detention time 10 days
7.	Laboratory and Office	1,200 m ²	41 persons
8.	Living Compound	11,000 m ²	28 persons

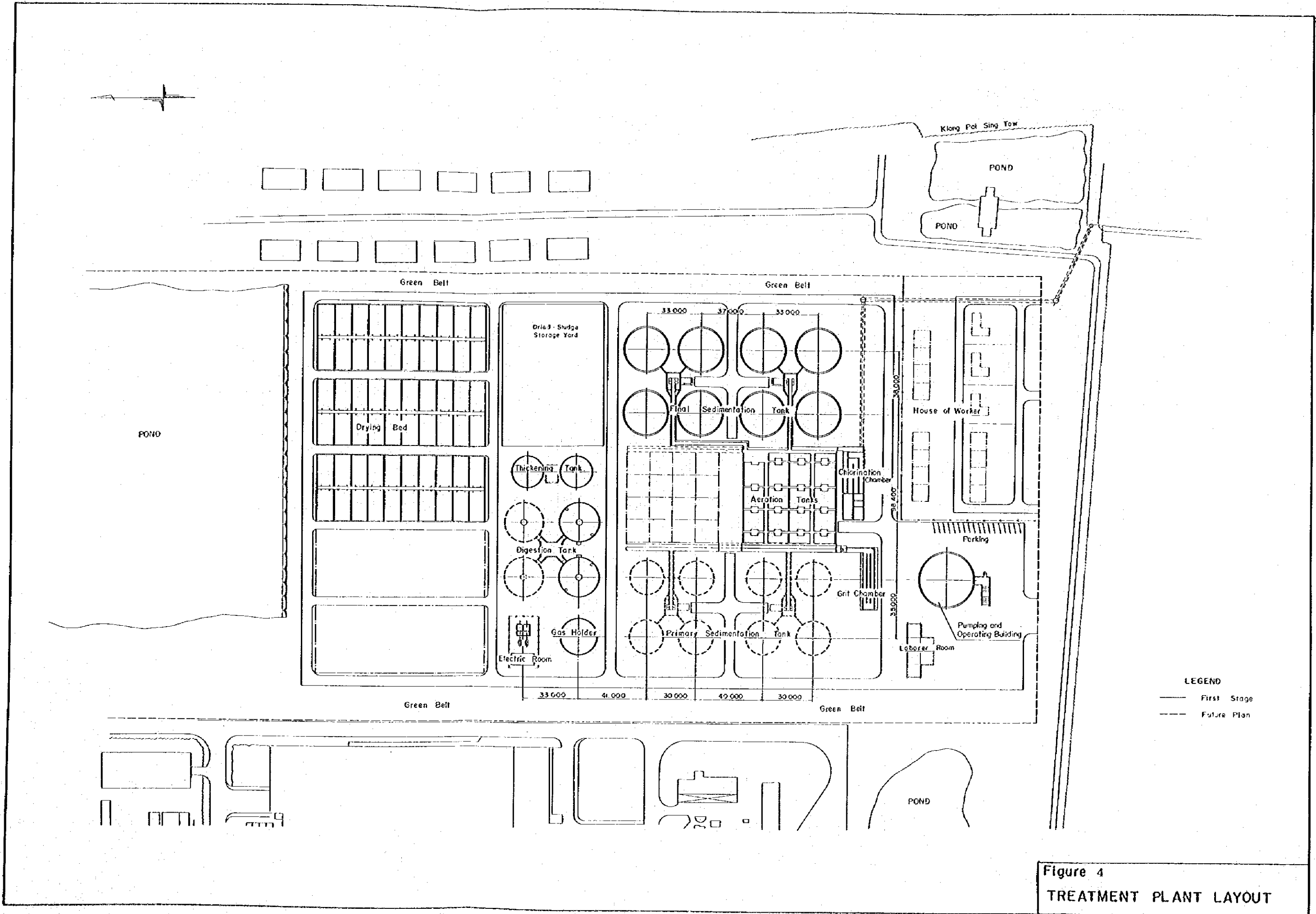


Figure 4
TREATMENT PLANT LAYOUT

4.3 Cost of the Project

The project cost estimated at 2524 (1981) price amounts to 883.11 million Baht, consisting of foreign currency portion equivalent to 250.06 million Baht required for procurement of materials and equipments of foreign origin, and remaining local currency portion of 633.05 million Baht.

The well schemed funding for the project cost is recommended with a joint financing from agencies concerned to make the project capital investment manageable while operation and maintenance cost after completion of sewerage system is to be borne by the served population.

The foreign currency portion can be financed by foreign lending agency and the local currency portion is jointly financed from the central and local government.

The project cost as estimated is based on the most economized engineering design which is equivalent to 1,600 Baht/person to be served by the sewerage system, the lowest among those in the exemplary cities as shown in Table 4.

Table 4 Sewerage Project Cost Per Person in the Exemplary Cities

City (Country)	Project Cost per Person (Baht/person)	Price Level	Sewerage System	Treatment Process
Kuala Lumpur (MALAYSIA)	2,600	2517 (1974)	Separate	Stabilization Pond and Aerated Lagoon
Alor Setar (MALAYSIA)	4,300	2522 (1979)	Separate	Stabilization Pond
Tokyo (JAPAN)	30,000	2510 (1975)	Separate and Combined	Conventional Activated Sludge
Niigata (JAPAN)	25,800	2522 (1979)	Separate	Conventional Activated Sludge
Bangkok (THAILAND)	1,600	2524 (1981)	Combined	Modified Aeration

4.4 Tremendous Benefits

The project will give tremendous benefits to the community including the central and local governments and the public. The primary objective of the sewerage system is to improve public health, the results of which are substantial in monetary terms. Other secondary effects are also tremendous. All such benefits are enumerated as follows:

- 1) It has been proved from precedents of sewerage projects that the sewerage system reduces water-borne diseases. Estimated reduction of medical care cost due to the above effect is 28.2 million Baht for twenty years after the completion of the project.
- 2) Similarly, loss of wages due to illness will be reduced by 1.2 million Baht in the same period.
- 3) Death also will be reduced; estimated wage income corresponding to such reduction is 11.4 million Baht.
- 4) Land value will be appreciated due to improvement of environment. The estimated land value increase amounts to 1,166.1 million Baht.

- 5) Employment opportunities will be given to the inhabitants for the construction works as well as operation and maintenance of the sewerage system.
- 6) The central and local governments will acquire more revenues of tax from the increased land value and more intensified land use due to the installation of the sewerage system.
- 7) The new system will also offer additional capacities of storage and drainage due to the 4 new pumping stations.
- 8) The existing storm water pumps at Rama IV will be relieved from the dry weather flow burden.
- 9) The corrosion due to septicity in the Rama IV tunnel will be minimized.

