A REOPOSED DESCENDED DRAINAGE SCHEME

70%

BALGROK - THONBURI



by

#### Tasana Singhsilarak

. Eng., Chulalongkorn University, 1962

211 - NA

hesis

Bub moted in partial fulfillment of the requirements for the Degree of Ester of Engineering

1n

Ope Shulalongio.n University Graduate School Department of Societry Ungineering April, 1966 (3.2. 2509) Accepted by the Graduate School, Chulalongkorn University in partial fulfillment of the requirements for the Degree of Master of Engineering.

Dean of the Graduate School

Sand's Dhailent . . . . . . . . . . . . . . .

Thesis Supervisor Arow Sorathing

Date 39. Apr. 1966

#### ABJTRACT

The problem on severage and Drainage of Bangkok and Cheaburi is dealt through out this study. Informations and illustrations are collected and presented in this thesis. The topography, geology and elimate of Bangkok-Thonburi are chated. Ristorical information such as mosquite problem, flooding etc. are included. The economic development and population forecast of metropolitan area which influence the coverage and drainage works are also given. The information of existing underground main line, characteristics of sewage and the policy of keysi Irrigation Department are presented out the bolicy of keysi Irrigation of design. Separated coverage and drainage system in the area of 33 km<sup>2</sup>. Is amounted to be concepted 445 million baht. The results and recommendation are finally concluded at the end of the thesis.

III

#### ACLIG./LEDGEMENTS

The writer is indebted to his adviser Professor Aroon Soratheon, Head of Department of Sanitary Engineering for his guidance and advice in the preparation of this theods. He wiches to express his sincere thank and gratitude to Hr. Vichai Pakdeedindan, Head of Engineering division, Department of Town and Country Planning. Mr. Vichai has indeed, shared the burden of making this thesis possible.

The writer wishes also to express his appreciation to persons whose name are mentioned at the end of this thesis for providing him valuable datas.

# LIST OF TABLES

.

.

		Page
Pablo		
1	. Climatological Data For the peroid 1951-1960	10
2	. Bangkok-Thonburi Employment Statistics	28
3	. Chemical Quality of Raw Water	32
4	. Summary-Future Land Area Requirements and	
	Population 2533	34
5.	. Population in Metropoliten Area (Bengkok -	
	Thonburi Municipality) 1943-1965	37
6.	. Rate of Live Birthe and Deaths in Netropoli-	
	tan Area (Bangkok-Thonburi Municipality)	
	1947–1964	40
7.	, Jatural Increase and Migration in Metropoli-	
	tan Area (Bangkok-Thonburi Municipality)	
	1947-1964	43
8.	Gradient of '.C. and Asbestos Cement Sewers	
	in Reighek 1964	54
9-10.	Concentration of Salinity	64-65
11.	Composition of Waste Water in Klong Lod at	
	Snistry of interior	73
12.	composition of waste Water in Klong Lod at	
	Royal Botel	74
13.	Composition of Waste Water in Klong Lod at	
	Pakklongtalat	75

VI

## Page

î.4 •	General Characteristic of Sludge (Night	
	Soil Sludge)	76
15.	General Characteristic of Sludge (Septic	
	Tank sladge)	77
16-18.	Illustrative Computations for Forced Mains	92-94
19-27.	Illustrative Computations for a System of	
	Sanitary Sewers	98 <b>-106</b>
28-40.	Illustrative Computations for a System	
	of Storm Decins	118-130

.

## LIST OF ILLUS MATIONS

Figure	Page
1. Map of Theiland	1
2. Hap of Hetropolitan Area	3
3. Well Secord (Bangkok)	7
4. Well Record (Thonburi)	8
5. Intensity and Duration in Bangkok	13
6. Land Use of Greater Bangkok Plan 2533	35
7. Age and Sex Composition in Metropolitan Are	9 <b>8</b>
1960	41
8. Population in Metropolitan Area 1990	50
9. Existing Sewers in Bangkok 1965	53
13. Various Klongs in Bangkok-Thonburi must be	
kept for Open Channel	60
11. Water Supply Pipes in Bangkok 1964	62
12. Telephone Maine Line in Bangkok 1965	62
13. Location of Various Cross-sectional Area of	•
Chao Fhraya River	67
14-16. Crossectional Area at Various Points of Cha	10
Phraya River	68-70
17. Area Under Consideration For Sewerage and	
Drainego System in Bangkok	84
18, Location of Various Pumps and Forced Main	
Severs	•• 85
19. Selected Area of Sample Calculations for	
Severage in Bangkok-Thonburi	88

VIII

## Page

20,	Layout and Direction of Flow of Samitary	
	Şewers	97
21.	Section and Length of Sanitary Severs	107
22,	Adopted Section and Length of Sanitary Severs	108
23.	Location of Various Main Klong, Lock Gatas	
	and Pumpa	111
24.	Crossectional Area of Main Klonge	112
25.	Layout and Direction of Flow of Storm Severe	115
26.	Section and Length of Storm Severs	131

.

ι

,

#### INTRODUCTION

Sewerage and Drainage works are public utilities and the government realised and agree that the existing means of treatment are not quite adequate. The government has therefore decided to have a suitable design for sewerage and drainage system in Metropolitan area. Foreign experts have been hired to lay out a comprehensive plan and proposal the solution. Since the author is now studying the sanitary engineering and it feels that it must be a good opportunity to review the facts, to collect datas and to discuss widely the problem of sewerage and drainage works. This project would coat the government many hundred million baht. It would therefore be proper for any sanitary engineer to express his idea, knowledge in order to minimize the cost and to check the cost which will be proposed by any consulting firm.

For people who are not engineers seem to be of little to them and they can endure certain muisance. However, to social life of the public are very much affected and the present problems are unpleasant smell, unsighting appearance in klongs and lower areas, mesquite problem and a manace to public health. Some solution must be applied to the severage and drainage problems otherwise it would be major obstacle to continue growth and development of the entire metropolitan community.

п

### 12011 C2 CONTEXTS

.

x	Page
ABSTRACT	III
ACKN MULEFGEMERYS	IV
LIST OF TALLESS	v
LIST OF ILLUCIACE XS	VII
INTRODUCTION	IX
Chayter	
1. Physical Grography	2
Scention and Limit of the Metropolitan Area	L
20⊵6 <sub>6</sub> ∠≈ph <b>y</b>	
Aligneto -	
2. HICCOLY OF SEWERAGE AND DEALNAGE IN BANGKOK-	1
THEADURI	15
Environmental and Economic Effects of	
Sewerage and Drainage Deficiencies	
Programme of Sewage and Waste Disposal	
Litchfield's Report	
Husband's Report	
Tholin's Report	
3. BOLLENSC DEVALOPSENT	24
Land and Water use	
Residential Development	
Industrial Development	

Existing Sewers Dye-Law of Sanitation Underground Water Supply Pipes Telephone line page

÷

	-
6. POLYCY OF ROYAL IRRIGATION DEPARTMENT	63
Control of Saline Water	
Fload Control	
Cross-sectional Area of Chao Phrayo River	
7. SEWAGE CHARACTERISCICS	71
Sewage Volume	
Sewage Strength and Composition	
8. PRINCIPLES AND FUNCTIONS OF SEWERAGE AND	
DRA INAGE	78
Public health Aspect of Sewerage	
Water Pollution	
Separated versus combined Collection Systems	
9. DESIGN AND CALCULATION	83
Sanitary Sewers	
Site of Treatment Plant	
Design of Forced Main	
Determine the Designed Domestic Sewage	
How to select the area for calculation	
Example of Calculations for Force Mains	
Example of Calculation in Seclected Area	
Storm Sewere	
The capacity of First storm	
The Volume of Main Klongs	
Sample of Calculation for Storm Sawers	

.

Page

#### Page

•

10.	COST ESTIMATION	132
	Cost of Senitary Severs in Selected Area	
	Cost of Forced Main of Sanitary Severs	
	Cost of Various Pumps	
	Cost of Storm Sewer	
11.	CONCLUSION AND DISCUSSION	138
12.	RECOMMENDATION	144
13.	ACKNOWLEDGEMENTS	146
14,	REFERENCES	147

.

.

٦

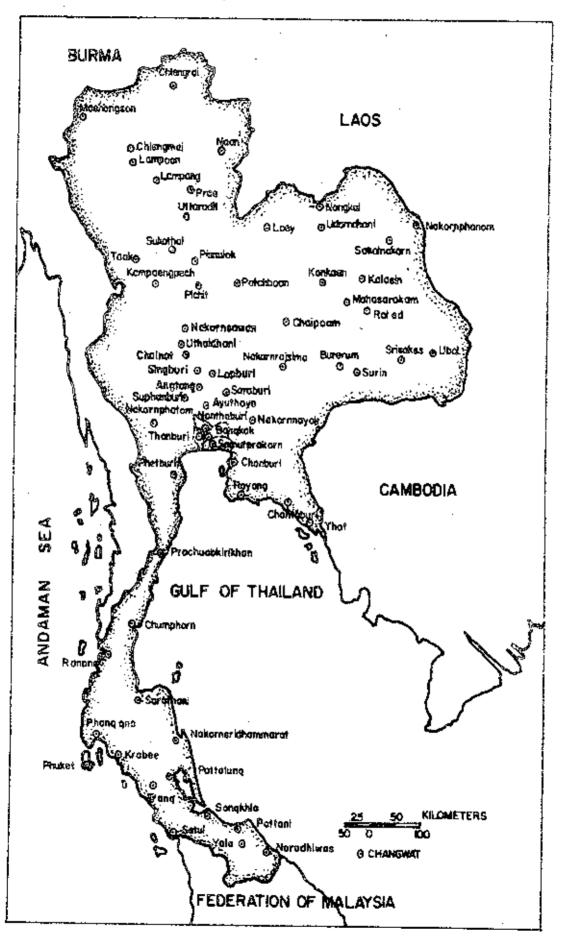


FIGURE I