THE KINGDOM OF THAILAND
FEASIBILITY STUDY
FOR
SAMUT SAKHON INDUSTRIAL ESTATE PROJECT
FINAL REPORT (SUMMARY)

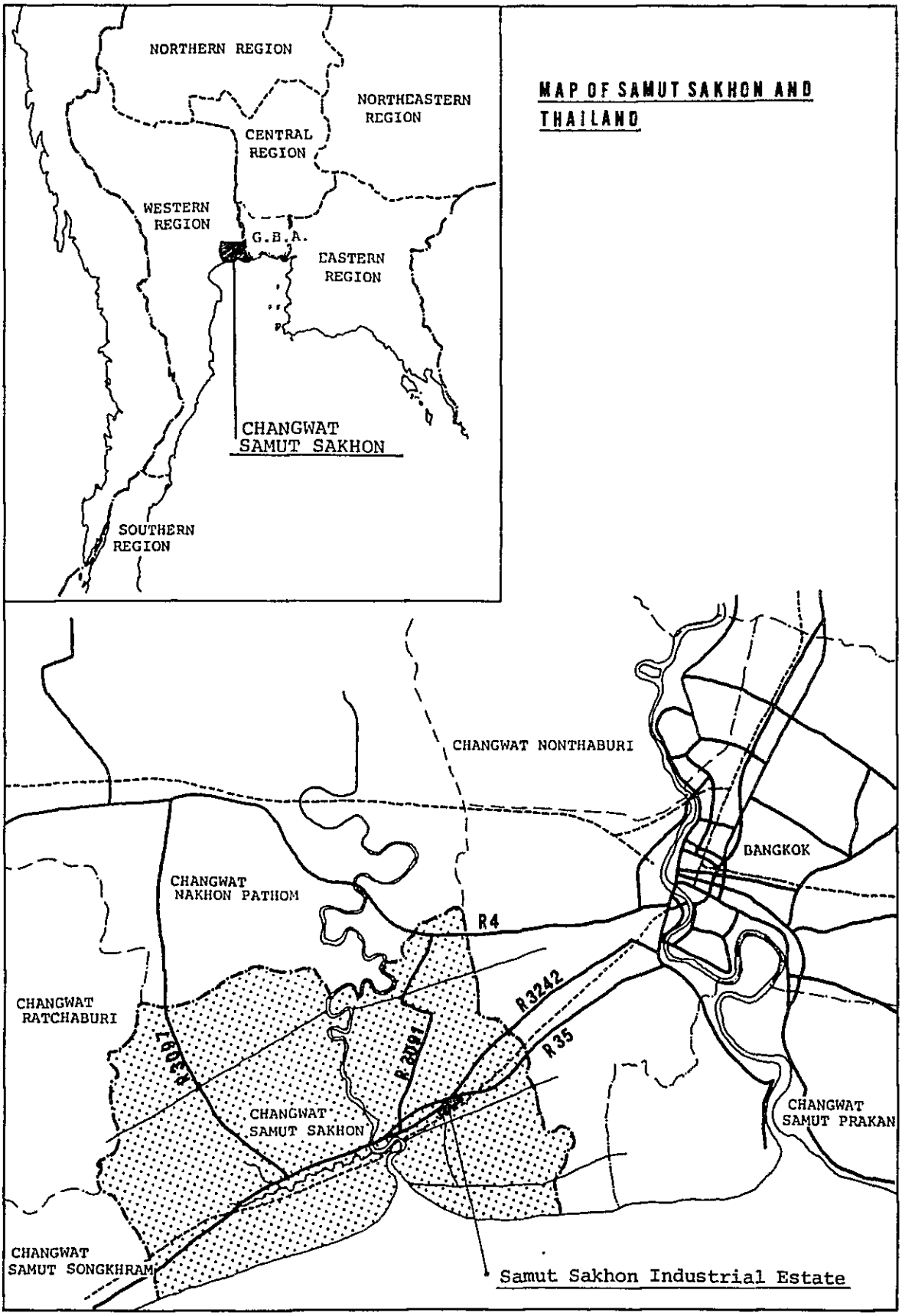
September 1980

Japan International Cooperation Agency

THE KINGDOM OF THAILAND
FEASIBILITY STUDY
FOR
SAMUT SAKHON INDUSTRIAL ESTATE PROJECT
FINAL REPORT (SUMMARY)

September 1 9 8 0

Japan International Cooperation Agency


MAP OF SAMUT SAKHON AND THAILAND
NORTHERN REGION
NORTHEASTERN REGION
CENTRAL REGION
WESTERN REGION
G.B.A.
EASTERN REGION
CHANGWAT SAMUT SAKHON
SOUTHERN REGION
CHANGWAT NONTHABURI
BANGKOK
CHANGWAT NAKHON PATHOM
R4
R3242
R35
R2081
R3097
CHANGWAT RATCHABURI
CHANGWAT SAMUT SAKHON
CHANGWAT SAMUT PRAKAN
CHANGWAT SAMUT SONGKHRAM
Samut Sakhon Industrial Estate

ABBREVIATIONS

AIT	Asian Institute of Technology
BMA	Bangkok Metropolitan Area
BOD	Biochemical Oxygen Demand
BOI	Board of Investment
CMD	Cubic Meters per Day
COD	Chemical Oxygen Demand
DC	Department of Customers (MOF)
DF	Department of Fisheries (MOAC)
DH	Department of Health
DMR	Department of Mineral Resources (MOI)
DTCP	Department of Town and Country Planning (MOINT)
DTEC	Department of Technical and Economic Cooperation
ECFA	Engineering Consulting Firms Association, Japan
EGAT	Electricity Generating Authority of Thailand
EIRR	Economic Internal Rate of Return
ESCAP	Economic and Social Commission for Asia and the Pacific
GBA	Greater Bangkok Area
HD	Highway Department (MOINT)
IE	Industrial Estate
IEAT	Industrial Estate Authority of Thailand
IRR	Internal Rate of Return
JETRO	Japan External Trade Organization
JICA	Japan International Cooperation Agency
LD	Land Department (MOINT)
LTD	Land Transport Department (MOC)
MOAC	Ministry of Agriculture and Cooperatives
MOC	Ministry of Communications
MOF	Ministry of Finance
MOI	Ministry of Industry
MOINT	Ministry of Interior
MWWA	Metropolitan Water Works Authority
NEB	National Environmental Board
NESDB	National Economic and Social Development Board
NESDP	National Economic and Social Development Plan
NHA	National Housing Authority
NRC	National Research Council
OECF	Overseas Economic Cooperation Fund
OPP	Office of Policy and Planning (MOINT)
PBX	Private Branch Exchange
PEA	Provincial Electricity Authority
PWD	Public Works Department (MOINT)
PWWA	Provincial Water Works Authority
RID	Royal Irrigation Department (MOINT)
RIE	Regional Industrial Estate Program
RPD	Regional Planning Division (NESDB)
RSRT	The Royal State Railway of Thailand
RTN	Royal Thai Navy
SIE	Samut Sakhon Industrial Estate
SMO	Samut Sakhon Municipal Office
SPG	Samut Sakhon Provincial Government
SS	Suspended Solids
SZIE	Satellite Zone Industrial Estate Program
TOT	Telephone Organization of Thailand
UAIE	Urban Area Industrial Estate Program

EQUIVALENTS

US $ 1	= Baht 20.0
Baht 1	= US $ 0.05
1 Rai = 400.0 Wa^2	= 1,600 sq.m
1 Wa^2	= 4.0 sq.m
1 ha	= 6.25 Rai

C O N T E N T S

PREFACE

In August 1979, the Government of the Kingdom of Thailand made presentation to the Japanese Government of its request in writing for feasibility study on the development project of the Samut Sakhon Industrial Estate under planning since years ago. To comply with this request, the Japan International Cooperation Agency organized the 'Survey Team on the Samut Sakhon Industrial Estate Project', consisting of Mr. Eiji Nishita and 9 other members, which was dispatched to the project site to conduct survey for the period from February 4 to March 5, 1980. The survey team obtained, immediately after entry into Thailand, the full consent from the authority concerned as to the scope of work, continued its survey activities by observation of the candidate sites and by interview with industries and governmental agencies concerned and submitted on March 4, immediately before the scheduled date of return to Japan, the interim report containing the team's proposal for the preferred type of industries to be introduced, the optimum size of the development project and the suitable site for construction. After that, the team entered into further details of analysis by due reference to the IEAT's statement of views and comments, dated April 16, 1980, on the interim report and then compiled the draft report after deliberation jointly with 3 trainees who were then in Japan from the IEAT. On July 3, 1980 the team was again in Thailand for observation of the candidate site condition in the rainy season in particular as well as for presentation of the draft report to the IEAT authority. This report has been revised and finalized in accordance with the IEAT's statement of comments, dated July 25, on the draft report submitted by the team and the latest result of the site observation, containing the following items.

(1) Background of the Samut Sakhon Industrial Estate
(2) Current Situations of Samut Sakhon Area
(3) Concept of Regional Development
(4) Types of Industries and Size of Industrial Land
(5) Selection and Evaluation of Sites
(6) Land Use Plan
(7) Basic Design
(8) Construction Program and Cost Estimate
(9) Organization and Management
(10) Financial Analysis
(11) Economic Analysis
(12) Environmental Impact Statement

A. OUTLINE OF THE PROJECT AND THE CONCLUSION

a. Outline of the SIE Project

1.	NAME	: SAMUT SAKHON INDUSTRIAL ESTATE PROJECT
2.	SPONSOR	: INDUSTRIAL ESTATE AUTHORITY OF THAILAND (IEAT)
3.	TYPE	: A. Motivation - Dispersal & Promotional B. Location - Semi Urban C. Scale - Nucleus for Satellite City D. Industrial Activities - Composite
4.	SCALE OF DEVELOPMENT	: A. Industrial Area 1,819.7 Rai B. Residential Area 265.0 Rai C. Total 2,084.7 Rai
5.	LOCATION	: Amphoe Muang Samut Sakhon Has easy access to R-35, R-3242, railway and Khlong Maha Chai
6.	TYPE OF THE CANDIDATE INDUSTRIES	: A. Textile and Apparel B. Metal & Machinery C. Foods D. Chemicals E. Rubber F. Wood & Furniture G. Non Metals (Ceramic) H. Paper (Secondary) I. Others (Trans. equipment, Electrical, etc.)
7.	EMPLOYMENT	: Direct workers - approx. 16,500
8.	PLANNED POPULATION AT RESIDENTIAL AREA	: 18,150
9.	REQUIRED WATER SUPPLY	: A. Industrial - 18,000 CMD B. Domestic - 3,700 " C. Total 21,700 "
10.	SOURCE WATER	: Ground water - 8 deep wells
11.	REQUIRED ELECTRICITY	: 64 MW supply by EGAT
12.	TELEPHONE	: PBX 500 circuits
13.	WASTE WATER TREATMENT	: ACTIVATED SLUDGE SYSTEM (Common Facility) Level : BOD & SS - 20 PPM Toxic substance and heavy pollutants shall be pretreated by the individual factories prior to discharge into sewer system
14.	FLOOD CONTROL	: Dike & Pump System
15.	CONSTRUCTION PERIOD	: Approx. 4 years
16.	INAUGURATION	: 1985
17.	TOTAL INVESTMENT REQUIRED	: Baht 699 Million (1980 price)
18.	PLANNED LAND PRICE	: 420,000 Baht/Rai (1980 price)
19.	FINANCIAL ANALYSIS	: IRR - 10.3%
20.	ECONOMIC ANALYSIS	: IRR - 23.2%

b. Conclusion

This project is one of those six (6) industrial estate development projects now being proposed under the 4th National Economic and Social Development Plan. It aims at mitigation of pollution and dense-population problems becoming conspicuous in Bangkok in the recent years, promotion of the nationwide industrialization and encouragement of regional development (by construction of new satellite towns).

Initially, the Government of Thailand had intended to characterize this project as an industrial estate for pollution industries, which might be capable of receiving the existing pollution industries within the BMA for relocation. However, in view of the facts that the project area of Samut Sakhon is neighbored to the BMA, with the capacity of natural environment not superior to that of the BMA and that the image as a new industrial estate may be damaged if it is allotted solely to those pollution industries, it was mutually agreed that those incoming industries would not necessarily be limited to the pollution industries, after consultation with the IEAT officials.

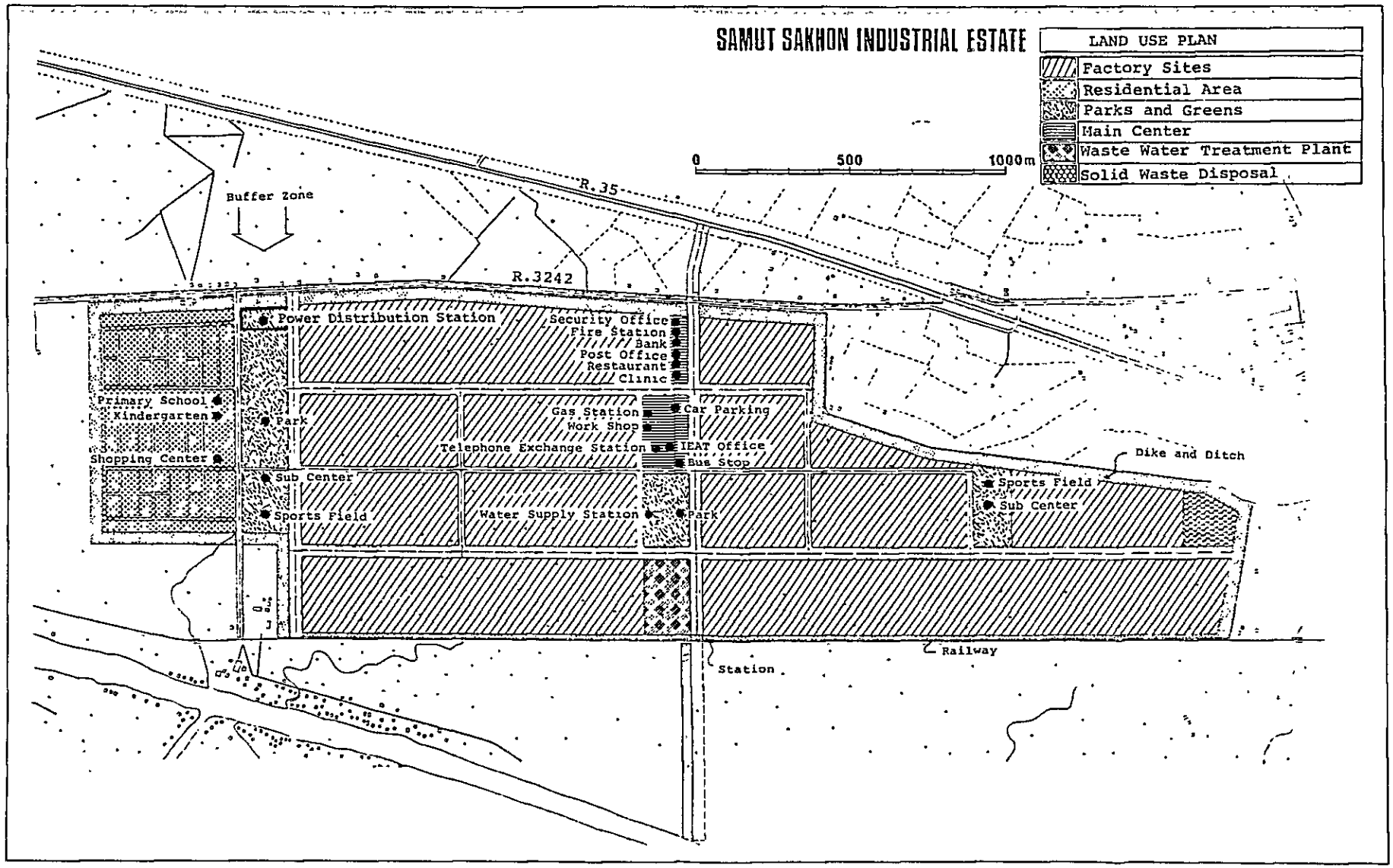
Needless to mention, however, it is most probable that the greater majority of industrial activities may be accompanied, more or less, by pollution problems though such pollution may be varied by type or density. Here is one of significant meanings involved in development of the industrial estate which is designed to concentrate such industrial activities into the space properly arranged with the pollution control facilities engineered at a high level and allow utilization of these facilities with less economic burden by cost sharing among all industries within the estate and effectuate better pollution control under a closed circuit monitoring system.

It is fully assured as the result of this survey that the proposed project is of great significance for the nation's socio-economic development and is feasible financially as well as technically. Although it may be physically impossible that the industrial estate will be completed within the predetermined period of 1977 - 1981 under the current Plan, it is recommended that the Government of Thailand will follow its procedural steps toward final decision to implement this project for earlier realization.

B. BACKGROUND OF THE SAMUT SAKHON INDUSTRIAL ESTATE

Since the early 1960's, the Thai Economy has grown at a remarkably rapid pace. The role of a "locomotive" in such a rapid economic advance was played by the agriculture and the manufacturing industries. Looking ahead, however, one cannot help seeing a looming spector overshadowing the future of agriculture and so it will be more and more necessary to shift industrial structure to the secondary and tertiary industries.

The Thai government has been promoting industrialization and economic development through the execution of Fourth National, Economic and Social Development Plans (NESDP). It amply demonstrates the high industrial potentiality of Thailand that the economy grew 11% in real terms in 1978-79 despite of the worldwide stagnation caused by crude price hikes and of the high domestic prime rate.


SAMUT SAKHON INDUSTRIAL ESTATE
LAND USE PLAN
Factory Sites
Residential Area
Parks and Greens
Main Center
Waste Water Treatment Plant
Solid Waste Disposal
0
500
1000m
R.35
R.3242
Buffer Zone
Power Distribution Station
Security Office
Fire Station
Bank
Post Office
Restaurant
Clinic
Primary School
Kindergarten
Park
Shopping Center
Sub Center
Sports Field
Gas Station
Work Shop
Car Parking
Telephone Exchange Station
IEAT Office
Bus Stop
Water Supply Station
Park
Dike and Ditch
Sports Field
Sub Center
Railway
Station

Because of excess zeal for the efficiency of investment and economic rationality, however, too many industrial activities have become concentrated in Bangkok and have aggravated environmental pollution, traffic congestion, rises in land prices and other evils that eroded the living standard in Bangkok.

With a view to accelerate industrial and demographic dispersion from Bangkok, the Department of Twon and Country Planning (MOINT) has been advocating the development of secondary and statellite cities. In keeping with this proposal, IEAT came up with a plan for the consturction of Regional Industrial Estates (RIE) and Satellite-Zone Industrial Estates (SZIE) to accommodate the relocating factories and of Urban Area Industrial Estates (UAIE) to provide land and facilities to small and medium size factories which cannot leave Bangkok because of their locational characteristics and financial capabilities.

The role to be played by the Samut Sakhon Industrial Estate, which is characterized both as a regional industrial estate and a satellite-zone industrial estate, obviously is not only to contribute to economic development of Thailand but also to accelerate local development in the Samut Sakhon area. The most important is, however, its role in lessening the various burden currently borne by Bangkok, e.g., environmental problems, traffic congestion, increasing price of land, etc. In addition, since there are substantial sprawls caused by the past development in the Samut Sakhon area, the industrial estate is anticipated to be a trigger to implement rational landuse controls and to assist the construction of a satellite city in the area.

C. CURRENT SITUATIONS OF SAMUT SAKHON AREA

Changwat Samut Sakhon has a littoral area of 839.9 km^2 and is adjacent to BMA. The Changwat is divided into three Amphoes, and its population is 258,633 persons (as of 1979).

Samut Sakhon is connected with Bangkok by the trunk roads of R-4 and R-35, Mae Klong railway and the 3 Khlongs.

Changwat Samut Sakhon is a plain Changwat with the altitude of around 1 - 2 m above sea level, and Tha Chin River of the width of 200 - 300 m runs in north to south across the center of the Changwat. The area close to the coastline is mainly used for salt farms and shrimp farms. The area from the center through northern part of the Changwat is used for paddy fields and fields for vegetables, fruit trees and horticulture (57% of the area of the Changwat). The area between them is the area where seawater and fresh water are mixed, and is used for plantation of coconuts or is thicket of assorted trees or wasteland.

The place of largest accumulation of population is Samut Sakhon City about 30 km apart from Bangkok, which is inhabited by 46,380 persons (as of 1980).

Samut Sakhon is a base for both deep sea and offshore fishery, and the amount of fish catch landed at Samut Sakhon is the largest in Thailand, and the share of fisheries in gross production of the Changwat is as high as 33.1% (as of 1978).

The share of industry in gross production of the Changwat is 8.9% (as of 1978), but locations of factories to the areas along R-4 and R-3091 are conspicuous in the recent years.

Because of remarkable water pollution on the upstream of the Tha Chin River, the River Conservation Board was established to study how to mitigate the polluting load on that river.

Piped water in Samut Sakhon is supplied by Municipal waterworks, PWWA and PWD and has a good quality, but their sources entirely rely on the underground water. The surface water is supplied within BMA by MWWA, but in Samut Sakhon, they will not be supplied within a forseenable future.

Electricity can be supplied to SIE from the new substation Samut Sakhon-2 which is planned to be constructed by EGAT by Oct. in 1982 around Samut Sakhon. There are 1,000 telephone lines between Bangkok and Samut Sakhon which are planned for further expansion to 2,000 by 1981 and 4,000 by 1984.

D. CONCEPT OF REGIONAL DEVELOPMENT

Land use and facilities plan of Samut Sakhon City, fairway and port improvement plan, construction of dike and canals to protect the land from penetration of seawater, brackish water farm plan and so forth are currently in progress in Changwat Samut Sakhon, and it is possible to point out the following three points as for positioning of Samut Sakhon area.

i) Base for supplying fresh food to BMA
ii) A satellite city of capital city Bangkok
iii) Gateway to western region from Bangkok

Furthermore, the following four points can be raised as the functions to be strengthened in Samut Sakhon area.

i) Strengthening of distribution and processing function with fishing as the nucleus

- To introduce industries related to fish processing and distribution to SIE -

ii) Strengthening of farm product distribution and processing function

- To introduce industries related to farm products to SIE -

iii) Strengthening of industrial cargo distribution function and manpower development function

- To introduce an intermodal transport terminal of railway, truck and water transportation in the vicinity of SIE -

iv) Strengthening of industrial tourism function

It is considered that linear type (urban corridor) along R-35 is desirable as for the direction of development of the town area of Samut Sakhon including development of SIE, due to the relationship with linkage with Bangkok, current situation of traffic network, water-way, land use and productivity of land.

In connection with the above, active aid and support by the concerned governmental authorities will be required in the future for orderly inducement of the increasing population by the SIE into the new planned urban area, earliest realization of the MWWA's surface water supply plan, prompt construction of the Samut Sakhon sewage treatment plant as well as other necessary public service facilities.

E. TYPES OF INDUSTRIES AND SIZE OF INDUSTRIAL LAND

Screening of industries is conducted in the following four steps.

i) Selecting the types of industries that have substantial future growth potentiality in Thailand.

ii) From this industrial group, selecting those which have better locational potentiality in Bangkok and its surrounding areas.

iii) From such industry group, selecting those which have particularly high locational potentiality in the Samut Sakhon area.

iv) Making the final selection of industries considering the locational characteristics of candidate sites and industrial linkage among the types of industries selected through the foregoing three steps.

The types of industries thus selected and the proposed land allocation among them are summarized as follows:

Textiles and apparels	30%
Metals and machinery	20
Foods	15
Chemical products	10
Non-metal products	7
Rubber and rubber products	5
Wood and furniture	5
Paper products	3
Others	5
Total	100%

The land demand for the Samut Sakhon Industrial Estate is estimated in two different ways:

i) Allocation model : Estimates are made from the perspective of nationwide land requirements based on a macro-economic projection, and they are regionally allocated.

ii) Accumulation model : Estimates are made on the basis of land requirements of entrepreneurs achieved through our interview survey.

The analysis on demand side indicate that 1,020 Rai of industrial land is at least necessary from whichever approach to satisfy the potential demand for the Samut Sakhon Industrial Estate and that 1,785 Rai of industrial land may be necessary according to future circumstances.

However, in view of the evaluation that the area to be required at minimum for achievement of the purpose as a satellite city would be estimated at 1,000 to 1,400 Rai, it has been proposed, after due consideration to the local environmental conditions, that the optimum size of development for the SIE project should be limited to an area of 1,000 to 1,500 Rai. In the meantime, since the SIE project is purposed for easement of the burden upon Bangkok, it is considered most appropriate from the demand side analysis that the total project site should be allocated into new and relocated industries at a ratio of fifty to fifty.

F. SELECTION AND EVALUATION OF SITES

The first step taken in this survey was to make review of the result from site selection and evaluation at the preliminary survey conducted by the ECFA. Then, for final screening of the remaining seven candidate sites, it was decided to select the land of approximately 2,000 Rai as the site for SIE at each candidate site and then to make selection of these lands by means of scoring evaluation method. The main items of evaluations are

i) environmental acceptability,
ii) infrastructure and utility services availability,
iii) land acquisition possibility and development cost, and
iv) compatibility with regional development policy.

Analysis was made on alternative four cases by weight distribution to these items varied.

As the result, the prospective candidate sites were reduced only to Site 5 and Site 9, out of which Site 5 was recommended finally as the suitable site for the SIE project after re-evaluation to a further depth of details. Since Site 5 provides the most favorable site conditions. it is observed as a general tendency that the land is going to be developed haphazardly by private developers. Such being the circumstance, the IEAT should take the following actions.

i) survey of land ownership,

ii) boring survey related to quality and quantity of ground water, and

iii) deliberation with RSRT (the Royal State Railway of Thailand) regarding provision of new railway station(s) and a spur line.

G. LAND USE PLAN

The land use plan of SIE shall be planned with the following basic thoughts in order to construct the industrial estate attractive to the executing agency investors, laborers and inhabitants.

i) To create pleasant working environment

ii) To consider influence to peripheral existing villages and farming

iii) To make double assurance as for countermeasures against disasters

iv) To provide residences close to the place of work

v) Unitization of wastewater treatment system

vi) To enable entry of relevant minor industries

vii) To make subdivision capable of coping with the changes in economic environment

viii) To reduce development cost and to eliminate restricting conditions for sales of land

As for the factory lot plan, standard lots were established so that it is possible to cope with the demand for various size of lots desired by the diversified types of industry. The minimum lot is of 3,000 m^2 (50 m x 60 m) and standard building is proposed to be built to meet the needs of the small enterprises.

Otehr major facilities and land utilization items are planned as follows:

Facilities at Estate Center:

① Administrative center facilities
IEAT office, office of businesses in the industrial estate, assembly hall, exhibition room, training room, library, parking area, security office, stores and workshops

② Public service facilities
Post office, bus stop and fire station

③ Commercial facilities
Bank, restaurants and gas filling station

④ Medical facility
Clinic

Facilities at sub-Center (2):

Stores, restaurant, small meeting rooms

COMPOSITION OF LAND USE

1. Industrial estate area	Total 291.15 ha	1,819.7 Rai
Factories sites	200.62	1,253.8 (68.9%)
Roads	39.95	249.7 (13.7%)
Parks and Greens	11.80	73.8 (4.1%)
Dike	24.70	154.4 (8.5%)
Utilities	10.78	67.4 (3.7%)
Administration	3.30	20.6 (1.1%)
2. Residential area	Total 42.39 ha	265.0 Rai
Housing (including road)	25.88	161.8 (61.1%)
Roads (Main)	2.31	14.4 (5.4%)
Greens/Recreations	4.78	29.9 (11.3%)
Dike	6.72	42.0 (15.8%)
Shopping center	1.00	6.3 (2.4%)
Primary school/ Kindergarten	1.70	10.6 (4.0%)
3. Total	333.54 ha	2,084.7 Rai

H. BASIC DESIGN

(1) Flood Control System

The pump/dike system has been adopted in view of the economy with due consideration to the technical safety to be required.

(2) Traffic

The generated traffic by SIE is estimated at about 4,000 veh/day for both directions, and R-35 will provide the connection to BMA. In coping with this traffic demand, the acceleration of the improvement of R-35, the construction of outer belt, the review of Mae Klong Railway and the improvement of inland waterway and unloading facilities are required. Within SIE the asphalt paved roads with the right-of-ways of 40 m, 20 m and 10 m were planned.

(3) Water Supply

Water demand in SIE is estimated at 21,700 CMD. Since the existing surface water supply system is not available to SIE, underground water supply system from eight deep wells with the depth of 150 m from Nakhon Luang Aquifer via reservoir and elevated water tanks to each enterprise was planned.

(4) Wastewater Treatment

The industrial wastewater will be discharged to the central treatment plant by keeping the allowable effluent standard which follows the trade effluent standard of MOI under the responsibility of each factory. The quantity of 19,000 CMD and the quality of 250 ppm for BOD, 200 ppm for COD and 250 ppm for SS are estimated. The central treatment plant is planned to have the secondary treatment system by the activated sludge process with consideration given to the quality of discharge, construction cost, and the situation in Thailand. The quality of discharge water has 20 ppm for BOD and SS by eliminating the rate of 92%.

IEAT should manage this central treatment plant and highly advanced staff for wastewater treatment, being familiar with the detailed production processes of factories, pretreatment systems and the effect to the production should be arranged. The industrial wastewater, pretreatment facilities, influent, effluent and the water in the waterway need to be inspected regularly.

(5) Power Supply

The total power demand in SIE is estimated at 64 MW. This demand is greater than that of Samut Sakhon. Samut Sakhon-2 substation planned by EGAT has a great possibility to be constructed within SIE. IEAT should contact EGAT promptly in connection with Samut Sakhon-2 substation which is planned to be constructed in 1982. Overhead wiring system of 22 KV are planned for SIE.

(6) Telecommunication

PBX with 500 circuits will be provided for SIE to connect with Samut Sakhon exchange station by cable. Accordingly to the future demand, an exchange station shall be built within SIE to link with BMA directly.

(7) Solid Waste Disposal

Solid waste from SIE is estimated to be about 323,800 ton/year, and is disposed of for sanitary landfill in SIE. Each factory should transport solid waste to the disposal area, and in the residential area NHA should desirably collect in cooperation with Samut Sakhon Municipality.

(8) Landscaping

The facility installation standard shall be provided to keep unity and beauty of the estate, such as the building restrictions for the factories inducing into SIE. The common facilities should be planned emphasizing discrimination from factories in the estate.

I. COST ESTIMATE AND CONSTRUCTION PROGRAM

Among the development cost of SIE, IEAT and PEA will each bear 50% of the cost for the electricity supply facilities, and also IEAT and TOT each will bear 50% of the cost for the telecommunication system. The cost for major utility facilities in the residential area will be borne by IEAT, while NHA will develop buildings and their appurtenant works independently. The work relating to facilities and infrastructures outside the estate will be carried out,by the relevant agencies.

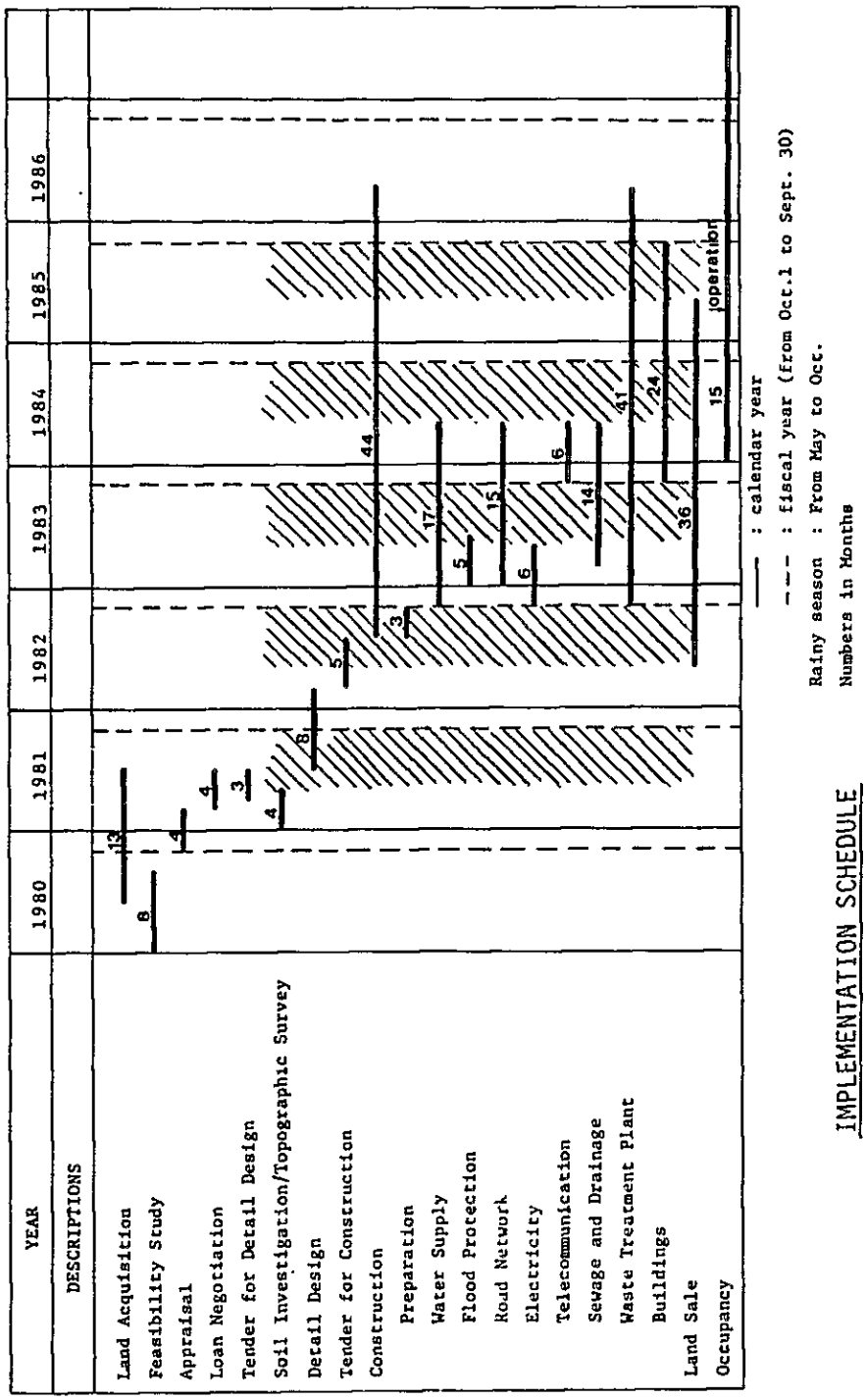
The total construction cost is estimated as shown in the following table on a 1980 basis. The total cost is Baht 665.470 million and the foreign portion is 41.6% or Baht 276.588 million. The additional costs by the residential area is 11.3% of the total cost.

COST PROJECTION TOTAL

Baht 1,000

	1980	1981	1982	1983	1984	1985	1986	TOTAL
LAND AQUISITION	43115	0	0	0	0	0	0	43115
LAND DEVELOPMENT			19789	176782	98036	9837	6737	311181
SITE PREPARATION	0	0	2611	0	0	0	0	2611
ROAD	0	0	3872	65037	48271	0	0	117180
DRAINAGE	0	0	0	6201	24228	0	0	30429
WATER SUPPLY	0	0	13306	17684	3782	0	0	34772
POWER SUPPLY	0	0	0	3385	0	0	0	3385
SEWAGE DISPOSAL	0	0	0	31576	19424	9837	6737	67574
TELECOMMUNICATION	0	0	0	990	2331	0	0	3321
FLOOD CONTROL	0	0	0	51909	0	0	0	51909
OTHERS	0	0	0	0	0	0	0	0
BUILDING	0	0	0	24317	38115	23464	0	85896
STANDARD FACTORY BUILDING	0	0	0	21033	30217	10401	0	61651
ADMINISTRATIVE BUILDING	0	0	0	3284	6248	9517	0	19049
COMMERCIAL, ETC.	0	0	0	0	1650	3546	0	5196
ENGINEERING & ARCH. SERVICE	0	20250	8528	2332	2332	550	0	33992
OTHERS	0	0	23920	0	0	0	0	23920
BASE COST	43115	20250	52237	203431	138483	33851	6737	498104
CONTINGENCIES	4311	3473	13001	66929	58235	17413	4003	167366
PHYSICAL	4311	2025	5224	20343	13848	3385	674	49810
PRICE	0	1448	7778	46586	44387	14027	3329	117556
TOTAL FINANCING	47426	23723	65238	270360	196718	51264	10740	665470

The construction time schedule has been set up as shown below after consultation with the IETA.



IMPLEMENTATION SCHEDULE

J. ORGANIZATION AND MANAGEMENT

In formulating management and administrative organization of SIE, the following points are to be noted.

i) To fully utilize management knowhows accumulated by IEAT

ii) Operations conducted by IEAT headquarters are not to be included in the SIE organization

iii) Surveillance and measuring organization concerning wastewater treatment is to be strengthened.

In the management and administration of SIE, the following points are to be noted.

i) In selling industrial sites, firms located in SIE are to be selected so that an industrial composition and the ratio of relocated firms will be adequate.

ii) Financial assistance is to be provided to the relocated firms.

iii) To establish a business information center.

K. FINANCIAL ANALYSIS

Construction cost of the SIE amounts to Baht 666 million, adjusted for price increases, with 1980 as the base year. Taking account of the interest payments of Baht 33 million during the construction period, the total amount of funds necessary for this project reaches Baht 699 million. Of the total, the foreign portion accounts for 44.3% and the domestic portion 55.7%.

The Baht 699 million will be raised with a long-term foreign loan of Baht 310 million (44.3%), the Thai government's contribution of Baht 60 million (8.6%), and internally-generated Baht 329 million (47.1%). It was assumed that the foreign loans should be repaid in 15 years with a 5-year grace at the four different rates of annual interest of 3.5%, 5%, 6.5% and 8%. Revenue Sources are assumed as follows:

Revenve Sources are assumed as follows:

Revenue Source		Unit Price	Volume
Factory Lots	Cash Sale Installment Sale Lease	420,000 Baht/Rai 400,000 " 37,700 Baht/Rai·Year	548 Rai 581 " 110 "
Housing Lots	Sale to NHA	420,000 Baht/Rai	179 "
Lease of Buildings	Standard Factory Commercial Buildings	1,280 Baht/m^2·Year 3,510 "	12,000 m^2 1,200 m^2
Maintenance and Administration		2,700 Baht/Rai·Year	1,433 Rai
Water Supply and Sewerage		7.6 Baht/m^3	6.75 Mill·CUM/Year

According to a trial calculation of earnings of this project, sizable profits after tax will be posted for four years from 1982 to 1985 during which factory and housing sites will be sold. Then, the balance will dip into the red, but from 1996 onward, it will resume posting a surplus.

The internal rate of return (IRR) of this project in the 1980 real prices will reach 10.3%, considerably exceeding 8%, a level commonly regarded as the bottom of the IRR for industrial development projects. The cost-benefit ratio and the net present value at a discount rate of 8% will stand at 1.025 and Baht 13,032,000 respectively.

According to the results of the sensitivity analysis, a 5% decline in the selling prices of factory and housing lots or a 5% rise in the construction costs is the tolerance limit, and a further rise or drop is undesirable.

Since the financial analysis of this project from all angles shows favorable results, the project can be regarded as worthy of carrying out.

L. ECONOMIC ANALYSIS

The economic cost (direct) of the Project is composed of Baht 497 million for construction of SIE (plant site), Baht 54 million per year (for a 100 percent operation) for operation of SIE, and Baht 2,547 million for plant construction by the enterprises in SIE.

The economic benefit (direct) of the Project consists of Baht 65 million of benefit resulting from the construction of SIE, Baht 388 million from the plant constructions in SIE, and Baht 1,112 million per year (for a 100 percent operation) from production by the plants in SIE.

Economic Cost and Economic Benefit of the SIE Project

Economic Cost	Unit: Baht 1,000	Economic Benefit	Unit: Baht 1,000
Construction Cost of Factory Lots	497,226	Economic Benefit from the Construction of SIE	64,674
Plant Construction Cost by the Enterprises	2,547,050	Economic Benefit from the Plant Construction in SIE	310,400
Annual Operation Cost of SIE	54,278	Annual Production Benefit by the Plants in SIE	1,111,800
Total Amount of Cost from 1980 to 1999	3,747,103	Total Amount of Benefit from 1980 to 1999	14,272,574

In consideration of these economic cost and benefits, the economic internal rate of return (EIRR) for the 20 years from the base year of 1980 to 1999 is estimated at 23.2 percent. Therefore the Project is highly favorable from the viewpoint of economic analysis, too. It is fully worth executing from the standpoint of national interests of Thailand.

The indirect economic benefit of the Project comprises a saving of foreign currencies, an improvement in the infrastructure of the Samut Sakhon area, including roads, water supply, sewerage, power supply, telephone system and transportation facilities, and a sharp rise in employment opportunity for unskilled workers, thanks to construction works for the infrastructure improvement. With the completion of SIE, the population of the city of Samut Sakhon is expected to increase by nearly 40,000 to attain a two-fold gain. As a result, business opportunities will increase largely in construction, transportation, commerce, financial business and other industries in the city. About half of the enterprises locating themselves in SIE will be those moving from GBA. So, the urban environment of GBA will be improved, though very locally.

TEAM COMPOSITION AND ITINERARY OF THE FIELD SURVEY

a. Composition of the Survey Team

Members of the First Survey Team :

Chief	1/	Eiji NISHITA	President Regional Planning International
Member	1/	Yutaka NAKAO	Nomura Research Institute
Member		Shoichi KOBAYASHI	Nomura Research Institute
Member		Kazuhiro KATAYAMA	Regional Planning International
Member		Toshio SATO	Regional Planning International
Member		Iwao NAKAJIMA	Yachiyo Engineering Co., Ltd.
Member	1/	Tetsuo KAWAMURA	Yachiyo Engineering Co., Ltd.
Member		Hiroshi SUMIKAWA	Mitsui Consultants Co., Ltd.
Member		Tsuneyasu FUKASE	Mitsui Consultants Co., Ltd.
Member	1/	Yukio NAKAJIMA	Industry Division Mining & Industrial Planning and Survey Department Japan International Cooperation Agency

Note : 1/ Members of the Second Survey Team

b. Itinerary of the Field Survey

(1) Itinerary of the First Survey (From Feb. 4 to Mar. 5, 1980)

FEB. 4	(MON.)	TG 601 Narita → Bangkok (Traveling. Mr. Nishita, Katayama, Kobayashi, Kawamura, Y. Nakajima)
FEB. 5	(TUE.)	Japanese Embassy, JICA, DTEC, IEAT (Greeting and Meeting)
FEB. 6	(WED.)	Japanese Embassy, JICA, IEAT (Team Meeting) CX 501, CX 713 Narita → Bangkok (Traveling. Mr. Nakao, Sato, I. Nakajima, Sumikawa, Fukase)
FEB. 7	(THR.)	Japanese Embassy, JICA, IEAT (Greeting and Meeting)
FEB. 8	(FRI.)	SPG, Candidate Sites Survey (Samut Sakhon)
FEB. 9, 10	(SAT., SUN.)	Hotel (Team Meeting, Collection Data Investigation)

FEB. 11	(MON.)	Bang Chan IE, Lat Krabang IE and Bang Poo IE
FEB. 12	(TUE.)	IEAT, Japanese Embassy, DTCP-MOINT, RPD-NESDB, MOI, PWD, RID, TOT, Thai Textile Industry Association (Hearing and Data Collection)
FEB. 13	(WED.)	IEAT, BOI, MOI, ESCAP, NEB, PEA, MWWA, PWWA, HD-MOINT
FEB. 14	(THU.)	IEAT, NESDB, OPP-MOINT, MOAC, NRC, DMR-MOI EGAT
FEB. 15	(FRI.)	IEAT, MOI, NHA, AIT, MWWA
FEB. 16, 17	(SAT., SUN.)	HOTEL (Team Meeting and Work Report Preparation)
FEB. 18	(MON.)	IEAT, Sunny Industry Co., Ltd. (Team Meeting)
FEB. 19	(TUE.)	SPG, SMO, HD (Thon Buri Branch Office), PEA (Samut Sakhon Office), RID (Krathum Baen Station), Tha Chin River Field Work
FEB. 20	(WED.)	IEAT, DF-MOAC, DTCP-MOINT, LTD-MOC, RID Field Work-Tha Chin River and Khlongs
FEB. 21	(THU.)	IEAT, JICA, SPG, SMO, Thai Ohbayashi Co., Ltd. PWWA (Samut Sakhon Office), Industrial Survey (Samut Sakhon Area), Field Work-Tha Chin River and Khongs
FEB. 22	(FRI.)	IEAT, Air Line, DF-MOAC, RID, PWD, JICA Office Japanese Embassy, Industrial Survey-Bangkok Area
FEB. 23, 24	(SAT., SUN.)	IEAT (Office Work)
FEB. 25	(MON.)	IEAT (Team Meeting), Industrial Survey-Bangkok Area
FEB. 26	(TUE.)	IEAT, DH, HD-MOINT, JETRO, Industrial Survey-Bangkok Area
FEB. 27	(WED.)	IEAT, RTN, LD-MOINT, MOI, Industrial Survey-Bangkok Area
FEB. 28	(THU.)	IEAT, NEB, DC-MOF, Nomura Trading Co., Ltd., Thai Japan Construction Co., Ltd.
FEB. 29	(FRI.)	IEAT, RTN, Japanese Embassy, JICA Office (Interim Report Preparation)
MAR. 1, 2, 3	(SAT., SUN., MON.)	IEAT (Office Work-Interim Report Preparation)

MAR. 4	(TUE.)	IEAT (Presentation, JICA Office, Japanese Embassy JAL 462 Bangkok → Narita (Traveling. Mr. Nakao, Nakajima, Kawamura, Katayama, Sumikawa, Fukase)
MAR. 5	(WED.)	JAL 718 Bangkok → Narita (Traveling. Mr. Nishita, Sato, Kobayashi)

(2) Itinerary of the Second Survey (From June 30 to July 6, 1980)

JUN. 30	(MON.)	AZ 775 Narita → Bangkok (Traveling. Mr. Nishita, Nakao, Kawamura, Nakajima)
JUL. 1	(TUE.)	IEAT, DTEC, Japanese Embassy, JICA Office (Greeting)
JUL. 2	(WED.)	IEAT (Team Meeting)
JUL. 3	(THU.)	IEAT, OECF (Presentation)
JUL. 4	(FRI.)	Site Survey, Japanese Embassy, JICA Office
JUL. 5	(SAT.)	Laem Chabang
JUL. 6	(SUN.)	JAL 718 Bangkok → Narita (Traveling)

JICA