STUDY ON ESTABLISHMENT OF KULIM HI-TECH INDUSTRIAL PARK FOR THE GOVERNMENT OF MALAYSIA

MAIN REPORT

March 1992

JAPAN INTERNATIONAL COOPERATION AGENCY

STUDY ON ESTABLISHMENT OF KULIM HI-TECH INDUSTRIAL PARK FOR THE GOVERNMENT OF MALAYSIA

MAIN REPORT

March 1992

JAPAN INTERNATIONAL COOPERATION AGENCY

Preface

In response to a request from the Government of Malaysia, the Government of Japan decided to conduct a study on establishment of High Techonology and Electronic Industrial Park in Kulim and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Malaysia a study team headed by Mr.Hideki SATO, Nippon Koei Co., Ltd., five times between March 1991 and March 1992.

The team held discussions with the officials concerned of the Government of Malaysia, and conducted field surveys at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

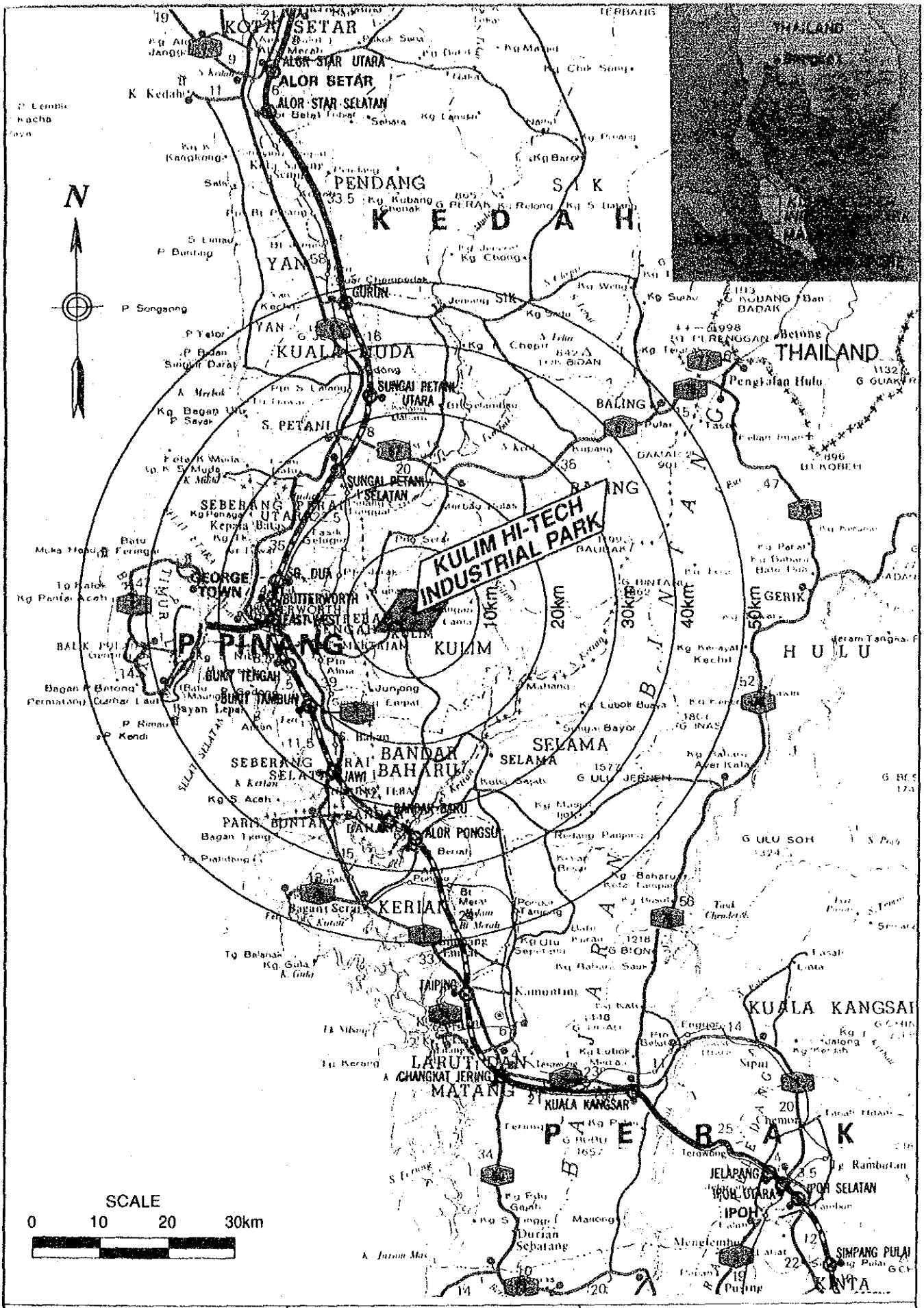
I hope that this report will contribute to the promotion of the project and the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of Malaysia for their close cooperation extended to the team.

March 1992

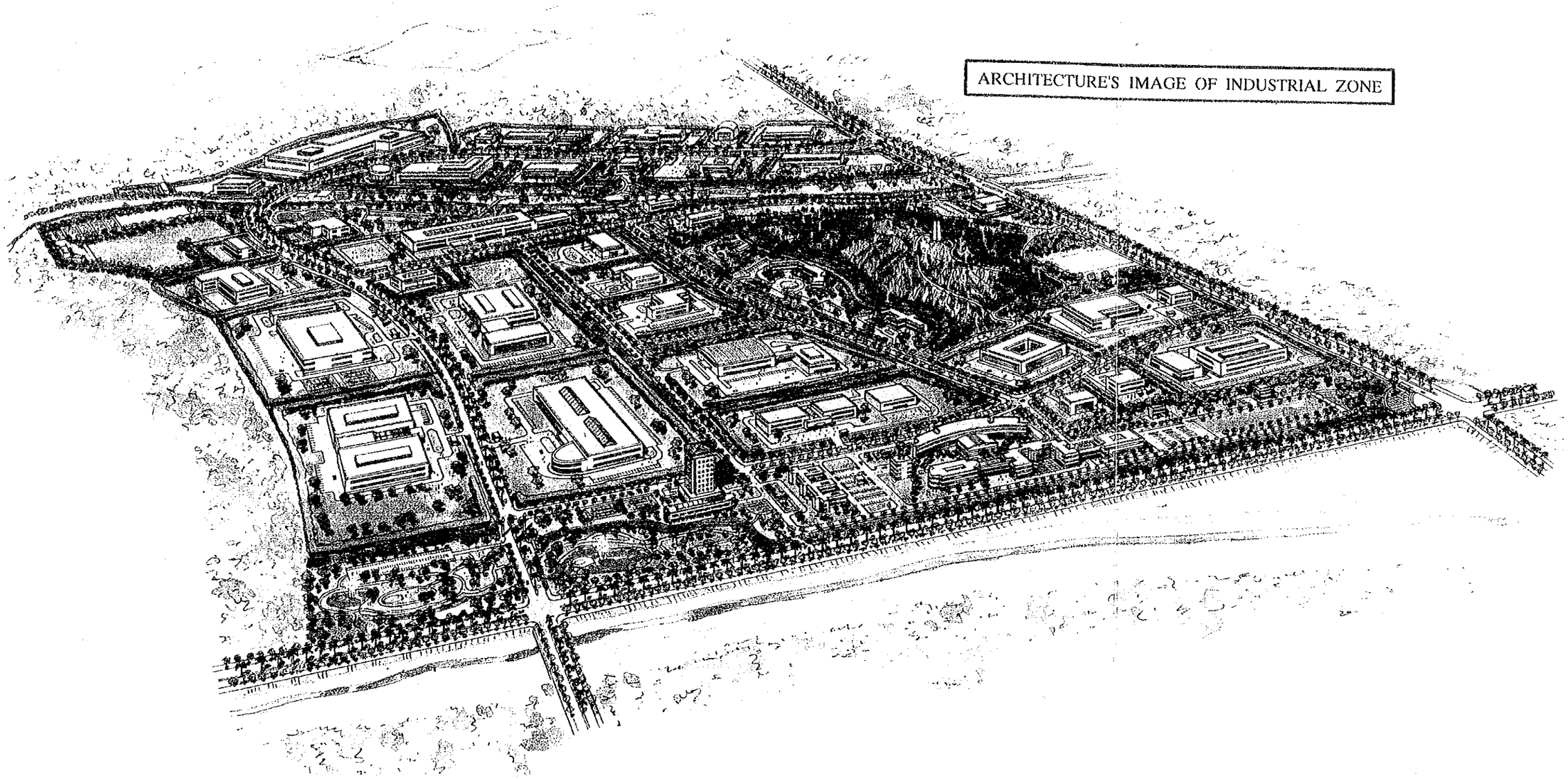
Kensuke Yanagiya

Kensuke YANAGIYA
President
Japan International Cooperation Agency



THE GOVERNMENT OF MALAYSIA ECONOMIC PLANNING UNIT	THE STUDY ON ESTABLISHMENT OF KULIM HI-TECH INDUSTRIAL PARK JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Location Map

ARCHITECTURE'S IMAGE OF INDUSTRIAL ZONE



The Study Reports of Kulim Hi-Tech Industrial Park consist of the following four (4) volumes.

Volume 1 : SUMMARY

Volume 2 : MAIN REPORT

Volume 3 : ANNEX

Volume 4 : GUIDELINE (DRAFT) FOR BASIC PLAN AND DESIGN OF HI-TECH INDUSTRIAL PARK

This is the Volume 2 : MAIN REPORT

Principal Features
of
First Phase Hi-Tech Industrial Zone

1. Project name	:	Kulim Hi-Tech Industrial Park Project
2. Administrative body	:	KSDC (Kedah State Development Corporation) / EPU (Economic Planning Unit of Prime Minister's Department)
3. Location	:	Kulim District, Kedah State 30 km from Penang, 106 km from Alor Setar
4. Development area		
1) Total area	:	1,450 ha
2) First phase industrial zone	:	250 "
3) Land use plan of 1st phase industrial zone		- Factory lot 137.0 ha (55 %) - Urban block 14.5 " (6 ") - R & D block 8.7 " (3 ") - Utilities 56.3 " (22 ") - Parks/Greenery 33.5 " (14 ") Total 250 ha (100%)
5. Targetted industry	:	First phase - Electronics and mechatronics based industries. Second phase - Bio-technology and new materials based industries
6. Population projection	:	47,000 of overall, and 19,700 of 1st phase
7. Implementation plan	:	1992 - 1994 for 1st phase
8. Topography	:	Gentle slope, less than 10 % of gradient and EL. 30 to 40 m (1st phase industrial zone)
9. Geological condition	:	Clayey silt and sandy silt, N value is more than 10 at 3 m of depth below ground
10. Related infrastructures		
1) Transportation		
- Road	:	20 minutes to Penang by car upon completion of East-West highway in 1993. Close to North-South Expressway
- Seaport	:	25 km to Penang port
- Airport	:	30 km to Penang international airport
2) Power supply	:	Transmission line of 132 kV with 2-route, 4-circuit (ring system) Substation of 132/33/11 kV and 90 MVA for 1st phase
3) Water supply	:	Supply capacity of 27,000 m^3/day
4) Telecommunication	:	Telephone 900-line in 1993, 5000-line in 1996
5) Drainage	:	20 years return period, 100 years for retention pond
6) Sewerage	:	Separate system with central treatment plant
7) Industrial solid waste	:	Temporary storage site of 10 ha with for 25 years capacity
11. Labour force	:	Skill development center, politeknik, university
12. Investment promotion	:	MIDA's international network

STUDY ON ESTABLISHMENT OF KULIM HI-TECH INDUSTRIAL PARK

TABLE OF CONTENTS

CHAPTER 5. BASIC DESIGN OF FIRST PHASE INDUSTRIAL ZONE

CHAPTER 6. IMPLEMENTATION PLAN OF FIRST PHASE INDUSTRIAL ZONE

CHAPTER 7. INSTITUTION AND MANAGEMENT ASPECT

CHAPTER 8. FINANCIAL ANALYSIS

CHAPTER 9. ENVIRONMENTAL IMPACT ASSESSMENT AND MONITORING

LIST OF TABLES

LIST OF FIGURES

Acknowledgement

The JICA Study Team appreciates the Engineering and Environmental Consultants and Ikatan Cipta Bina, who are appointed to this Project, for the preparation of figures and drawings.

ABBREVIATIONS

(1) Plan

5MP	:	Fifth Malaysia Plan
6MP	:	Sixth Malaysia Plan
NDP	:	National Development Policy
OPP2	:	Second Outline Perspective Plan

(2) Domestic Organization

DOE	:	Department of Environment
DOS	:	Department of Statistics
EPU	:	Economic Planning Unit
ICU	:	Implementation and Coordination Unit
IMR	:	Institute of Medical Research
DID (JPT)	:	Drainage and Irrigation Department
PWD (JKR)	:	Public Works Department
MARDI	:	Malaysian Agricultural Research and Development Institute
MHA (LLM)	:	Malaysia Highway Authority
MIDA	:	Malaysian Industrial Development Authority
MIMOS	:	Malaysian Institute of Microelectronics System
MITI	:	Ministry of International Trade and Industry
MLRD	:	Ministry of Land and Regional Development
MOF	:	Ministry of Finance
MOH	:	Ministry of Health
MOPI	:	Ministry of Primary Industries
MOHLG	:	Ministry of Housing and Local Government
NDPC	:	National Development Planning Committee
KSDC (PKNK)	:	Kedah State Development Corporation
PORIM	:	Palm Oil Research Institute of Malaysia
PPC	:	Penang Port Commission
RDA	:	Regional Development Corporation
RRIM	:	Rubber Research Institute of Malaysia
SEDC	:	State Economic Development Corporation
SEPU	:	State Economic Planning Unit
SIRIM	:	Standard and Industrial Research Institute
STM	:	Malaysia Telecommunication Company
TEN	:	Tenaga Nasional
TPM	:	Technology Park Malaysia
UDA	:	Urban Development Authority

(3) International or Foreign Organization

ADB	:	Asian Development Bank
IBRD	:	International Bank Reconstruction Development

ILO	:	International Labor Organization
IMF	:	International Monetary Fund
JICA	:	Japan International Cooperation Agency
MITI	:	Ministry of International Trade and Industry
MOC	:	Ministry of Construction, Japan
OECD	:	Organization of Economic Cooperation Development
OECF	:	Overseas Economic Cooperation Fund, Japan
UNIDO	:	United Nations Industrial Development Organization
UNDP	:	United Nations Development Program
WHO	:	World Health Organizations

(4) Others

B	:	Benefit
BOD	:	Biochemical oxygen demand
C	:	Cost
CIF	:	Cost, insurance and freight
COD	:	Chemical oxygen demand
D & I	:	Domestic and industrial
FIRR	:	Financial Internal Rate of Return
EL.	:	Elevation above mean sea level
Fig.	:	Figure
FOB	:	Free on Board
GDP	:	Gross Domestic Product
GNP	:	Gross National Product
HWL	:	Reservoir high water level
LWL	:	Reservoir low water level
TWL	:	Top Water Level
O & M	:	Operation and maintenance
Ref.	:	Reference
SITC	:	Standard International Trade Classification
SS	:	Suspended Solid
TEU	:	Twenty feet Equivalent Unit
ADT	:	Average Daily Traffic

ABBREVIATIONS OF MEASUREMENT

Length

mm	=	millimeter
cm	=	centimeter
m	=	meter
km	=	kilometer
ft	=	foot
yd	=	yard

Atea

cm^2	=	square centimeter
m^2	=	square meter
ha	=	hectare
km^2	=	square kilometer

Volume

cm^3	=	cubic centimeter
l	=	litre
kl	=	kilolitre
m^3	=	cubic meter
gal.	=	gallon

Weight

mg	=	milligram
g	=	gram
kg	=	kilogram
ton	=	metric ton
lb.	=	pound

Time

s	=	second
min	=	minute
h	=	hour
d	=	day
y	=	year

Electrical Measurement

V	=	Volt
A	=	Amphere
Hz	=	Hertz (cycle)
GHz	=	Gigahertz
W	=	Watt
kW	=	kilowatt
MW	=	Megawatt
GW	=	Gigawatt
pr	=	pair

Other Measures

%	=	percent
PS	=	horsepower
°	=	degree
'	=	minute
"	=	second
10^3	=	thousand
10^6	=	million
10^9	=	billion

Derived Measures

m^3/s	=	cubic meter per second
cusec	=	cubic feet per second
mgd	=	million gallon per day
kWh	=	Kilowatt hour
MWh	=	Megawatt hour
GWh	=	Gigawatt hour
kWh/y	=	kilowatt hour per year
kVA	=	kilovolt amphere
BTU	=	British thermal Unit
psi	=	pound per square inch
lcd	=	litre per capita per day
Kb/s	=	Kilobit/second
Mb/s	=	Megabit/second

Currency

M$	=	Malaysian Ringgit
US$	=	US Dollar
¥	=	Japanese Yen
	=	
	=	

CONVERSION FACTORS

	From Metric System			To Metric System		
Length	1 cm	=	0.394 inch	inch	=	2.54 cm
	1 m	=	3.281 ft	1 ft	=	30.48 cm
			1.094 yd	1 yd	=	91.44 cm
	1 km	=	0.621 mile	1 mile	=	1.609 km
Area	1 cm^2	=	0.155sq.in	1 sq.ft.	=	0.0929 m^2
	1 m^2	=	10.76 sq.ft	1 sq.yd.	=	0.835 m^2
	1 ha	=	2.471 acres	1 acre	=	0.4047 ha
	1 km^2	=	0.386 sq.miles	1 sqmile	=	2.59 km^2
Volume	1 cm^2	=	0.610 cu in	1 cu ft.	=	8.32 lit
	1 lit	=	0.220 gal (imp)	1 cu yd	=	0.765 m^3
	1 kl	=	1 kl = 6.29 barrels	1gal (imp)	=	4.55 lit
	1 m^3	=	35.3 cu.ft.	1 gal (US)	=	3.79 lit
	10^6 m^3	=	811 acre ft.	1 acre ft	=	1233.5 m^2
Weight	1 g	=	0.0353 ounce	1 ounce	=	28.35 g
	1 kg	=	2.20 lb.	1 lb.	=	0.4536 kg
	1 ton	=	0.984 long ton	1 long ton	=	1.016 ton
		=	1.102 short ton	1 shortton	=	0.907 ton
Energy	1 kWh	=	3,413 BTU	1 BTU	=	1 BTU
Temperature	℃	=	(F - 32) x 5/9	F	=	1.8 C + 32
Derived	1 m^3/s	=	35.3 cusec	1 cusec	=	0.028 m^3/s
Measures	1kg/cm^2	=	14.2 psi	1 psi	=	0.703 kg/cm^2
	1ton/ha	=	891 lb/acre	1 lb/acre	=	1.12 kg/ha
	$10^6 m^3$	=	810.7 acre ft.	1 acre ft	=	1,233.5 m^3
	1m^3/s	=	19.0 mgd	1 mgd	=	0.0526 m^3/s
Local	1 lit		0.220 gantang	1 gantang		4.55 lit
	1 kg		1.65 kati	1 kati		0.606 kg
	1 ton		16.5 pikul	1 pikul		60.6 kg

Exchange Rate (average in the month of May, 1991)

M$ 1	Y 50.065
M$ 1	US$ 0.7841

INDUSTRIAL TERMINOLOGY

ACM	Advanced Compound Material
AI	Artificial Intelligence
ATM	Asymmetric Transfer Mode
CAD	Computer Aided Design
CD	Compact Disk
CFRC	Carbon Fiber Reinforced Concrete
CFRP	Carbon Fiber Reinforced Plastic
CG	Computer Graphics
CIM	Computer Integrated Manufacturing
CISC	Compound Imperative Set Computer
CMOS	Complementary Metal-Oxide Semiconductor
DDS	Drug Delivery System
DRAM	Dynamic Random Access Memory
FRP	Fiber Reinforced Plastic
HDTV	High Definition Television
IFN	Interferon
ISDN	Integrated Services Digital Network
LAN	Local Area Network
LCD	Liquid Crystal Digital
LD	Laser Disk
LSI	Large Scale Integrated Circuit
MMC	Material of Metallic Compound
MSI	Middle Scale Integrated Circuit
NC	Numerically Controlled
PAN	Polyacrylic Nitril
PCB	Printed Circuit Board
RISC	Reduced Imperative Set Computer
ROM	Read Only Memory
SIS	Strategic Information System
SOR	Synchrotron Orbit Radiation
SRAM	Static Random Access Memory
SSI	Small Scale Integrated Circuit
SST	Super Sonic Transport
STM	Scanning Tunneling Microscope
STN	Super Twist Nematic
TFT	Thin Film Transistor
ULSI	Ultra-Large-Scale Integrated Circuit
VLSI	Very Large Scale Integrated Circuit
VTR	Video Tape Recorder

CHAPTER 1

INTRODUCTION

1. INTRODUCTION

1.1 Background of the Study

The Government of Malaysia (hereinafter called "GOM") intends to promote value-added industrialization and introducting of high-technology industry during the period of the Sixth Malaysia Plan, 1991 to 1995. Accordingly, GOM has executed the Study on Selected Industrial Product Development in Malaysia which was executed under technical assistance by Japan International Cooperation Agency (hereinafter called "JICA") for the three-year period from 1988 to 1990. Through the discussion between GOM and JICA during the above study, GOM strongly wished to promote the establishment of Kulim Hi-Tech Industrial Park as a pioneer project and requested the Government of Japan to provide the technical assistance.

The Governments of Japan and Malaysia agreed to take the following actions:

(1) GOM requested UNIDO to formulate the concept plan of the Kulim Hi-Tech Industrial Park.

(2) GOM requested the Government of Japan to carry out the study for planning and designing the physical components within the Industrial Zone based on the concept plan prepared by the UNIDO study team.

The UNIDO study team has completed the Concept Plan Report in March, 1991,and presented to GOM. Following the UNIDO Study, the Government of Japan sent the JICA Study Team to Malaysia to carry out the planning and designing the physical components within the Industrial Zone.

1.2 Objectives of the Study

The objective of the Study is to assist GOM to establish High Technology and Electronic Industrial Park in Kulim and to transfer the planning technique of the Estate through planning and designing of the physical components within the Industrial Zone of the Park in collaboration with GOM.

1.3 Scope of the Study

The JICA Study Team shall concentrate on planning and designing of the physical

components within the Industrial Zone of the Park in collaboration with GOM, while GOM shall be solely responsible for planning and design of the physical components outside the Industrial Zone.

The outline of the Study shall be the following:

(1) Review of the concept plan and conceptual layout plan available

- The basic concept of the Kulim Hi-Tech Industrial Park
- The land-use and conceptual layout plan of the Kulim Hi-Tech Industrial Park

(2) Planning and designing the physical components within the Industrial Zone

- Industrial Zone planning
- Transportation Planning
- Water supply planning
- Drainage and sewerage planning
- Industrial waste planning
- Telecommunication planning
- Electricity planning
- Landscape planning
- Environmental impact study
- Management planning
- Cost estimate
- Human resource planning
- Financial analysis

(3) Advice on the development plan of the Kulim Hi-Tech Industrial Park other than the Industrial Zone

(4) Advice on the development of related infrastructure outside of the Kulim Hi-Tech Industrial Park

The Study on Establishment of Kulim Hi-Tech Industrial Park was carried out in accordance with the above scope of work which was agreed between the Economic Planning Unit of Prime Minister's Department (hereinafter called "EPU") and JICA, on November 30, 1990 in Kuala Lumpur.

The Study was conducted by JICA Study Team in collaboration with counterpart

personnel of EPU, KSDC and other agencies concerned during March 1991 and March 1992 and the Progress Reports (1), (2), (3) and Draft Final Report containing the following major subjects were presented to GOM in March, July,,September and December 1991, respectively.

Progress Report (1)

- Results of field reconnaissance
- Review of UNIDO concept report
- Basic design conditions, standards and criteria
- Overall work schedule and procedures

Progress Report (2)

- Overall plan
- Basic layout plan of industrial zone for the first phase
- Basic plan and design of industrial zone for first phase
- Implementation plan of first phase industrial zone
- Financial analysis and institutional aspect
- Environmental assessment and monitoring

Progress Report (3)

- First phase development plan
- Basic design for industrial zone for first phase
- Financial analysis
- Institution and management
- Environmental assessment and monitoring
- Work progress of local consultants

Draft Final Report

- Overall Plan
- First Phase Development Plan
- Basic design of first phase industrial zone
- Implementation plan of first phase industrial zone
- Institution and management aspect
- Financial analysis
- Environmental Impact assessment and monitoring

However, it is noted that planning and designing for outside the industrial zone had commenced the study in October 1991 and being conducted by Malaysian side. Accordingly, a some of minor deviation appear between both study teams of JICA and GOM due to the time lag. In this final report, therefore, particular items on the study has been modified to avoid the such deviation according to the agreed minutes by GOM and JICA on the Technical and Steering Committee Meetings in January 23rd and 25th 1992 at K.L. due to the time constraint. Parameter of population projection, zoning plan and housing scheme were used the JICA's study results.

CHAPTER 2

BACKGROUND OF THE PROJECT

2. BACKGROUND OF THE PROJECT

2.1 National Development Policy

The Government of Malaysia (GOM) intends to promote and accelerate high value-added industrialization and research and development (R & D) activities as well as introduction of high technology industry during the period of the Sixth Malaysia Plan, 1991 to 1995 (hereinafter called "the Sixth Plan").

The Sixth Plan is the first phase in the implementation of the Second Outline Perspective Plan (OPP2), 1991 – 2000, under the National Development Policy (NDP). The main thrust of the Plan is to sustain the growth momentum and manages it successfully so as to achieve the objective of balanced development as enunciated in the NDP. The emphasis on 'balanced development' is based on the recognition that while there has been progress in economic growth and distribution, the quality of the growth process needs to be improved to make it more broad-based.

With the launching of the Sixth Plan, Malaysia now stands poised for another period of sustained social and economic development in the nineteen-nineties. Since independence in 1957, the country has achieved remarkable progress in transforming the economy and raising the standard of living of the people through a series of five-year development plans under the New Economic Policy (NEP). Building upon the ongoing thrust of NEP to eradicate poverty and restructure society, NDP will encompass the following principal aspects:

- promote and strengthen national integration by reducing the wide disparities in economic development between states and between urban and rural areas in the country;

- promote human resource development including creating a productive and disciplined labour force and developing the necessary skills to meet the challenges in industrial development through a culture of merit and excellence without jeopardizing the restructuring objectives;

- make science and technology an integral component of socio-economic planning and development, which entails building competence in strategic and knowledge-based technologies, and promoting a science and technology culture in the process of building a modern industrial economy; and

- ensure that in the pursuit of economic development, adequate attention will be given to the protection of the environment and ecology so as to maintain the long-term sustainability of the country's development.

The role of science and technology as an important tool for economic development has been repeatedly stressed in the Fifth Malaysia Plan, 1986 – 1990, with a view toward increasing overall productivity and developing a strong industrial foundation. In this connection, high technology and strategic hi-tech oriented programmes that are expected to expand industrial capacity and enhance the technological capability of the country were sought.

Although efforts are being made to foster and upgrade indigenous capacity and competence in scientific and technological innovation, strong linkages between the private and public sector are not fully developed. The development of a hi-tech industiral park will provide one of the necessary ingredients in achieving this objective. Thus, the development of Kulim Hi-Tech is the first step towards achieving this target.

2.2 Socio-Economy

According to the population census of 1980, the total population of Kedah is 1,118,000 which increased from 989,000 in 1970 with an annual growth rate of 1.23%. The ethnic breakdown of the population is 72.4% Malays, 18.5% Chinese, 7.5% Indians and 1.6% the others. In terms of age breakdown, approximately half of the population is below nineteen years old, while 42.7% is within the working age (20-59 years old). The population of Kedah in 1990 was presumed to be 1,620,000. The population distribution in Kedah is shown in Fig. 2.2.1.

Kedah has been an agriculture state. Its GDP (Gross Domestic Products) shows that agriculture sector accounted for 45.1% of the GDP of Kedah in 1986 and 43.6% in 1988. The manufacturing sector to which the state government has been placing importance, contributed 12.1% in 1986 and 14.9% in 1988, with an annual growth rate of 18.0%. (ref. Table 2.2.2)

The GDP of Kedah was M$2,767 million in 1986 and increased to M$3,120 million in 1988. From the national point of view, Kedah's GDP accounted for 4.8% and 4.79% of the national GDP respectively. The per capita GDP of Kedah was M$2,238 in 1986 and M$2,431 in 1988 which was far below the national average of M$3,551 and M$3,857 respectively.
(ref. Table 2.2.1)

The state government has recently launched a development strategy, which emphasized diversification of economic activities, particularly in the manufacturing sector. To

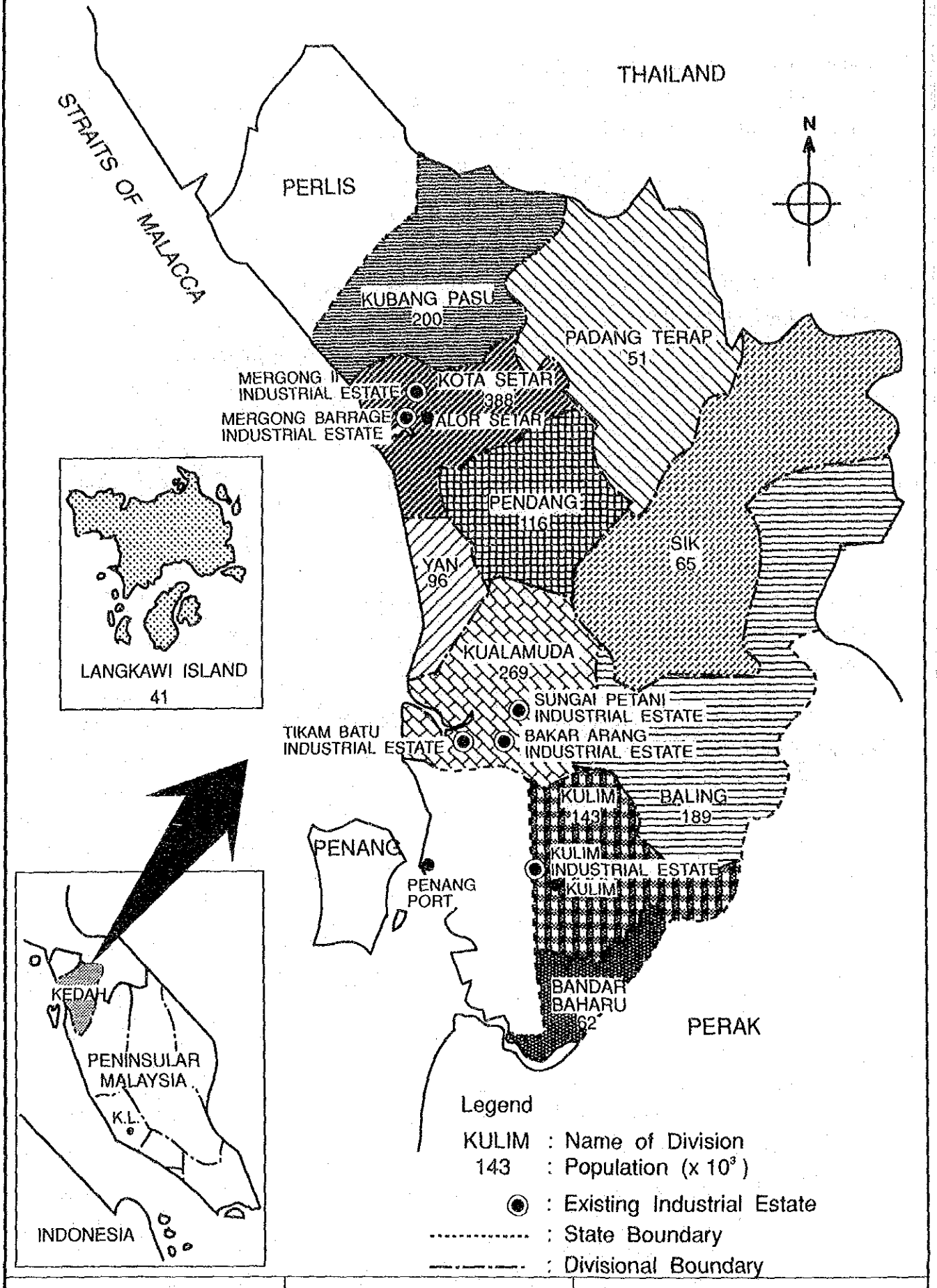
enhance the development drive of the manufacturing the industry sector, the Kedah state has striven to provide good infrastructure and established six industrial estates to accommodate foreign and local investment. The location of the above industrial estates is shown in Fig. 2.2.1. Industrial estates operating are Mergong Barrage (30 ha), Mergong II (35 ha), Bakar Arang (175 ha), Tikambatu (33 ha), Kulim (155 ha) and Sungai Petani (214 ha). (ref. Table 2.2.3 & Fig. 2.2.1)

As a growth centre in the north of the country, Kedah enjoys better industrial infrastructure such as close proximity to Penang airport and port, cheap and still abundant workforce, and competitive prices for industrial estates. This can be illustrated in the recent increase in number of investment projects approved by MIDA (Malaysian Industrial Development Authority). As far as the number of the projects is concerned, it increased from 12 in 1986 to 33 in 1989, while the amount of investment grew from M$32.8 million in 1986 to M$600 million in 1989. For 1990 the number of projects has already increased to 32 while the volume of investment amounted to M$3,705 million as of July. (ref. Table 2.2.4)

Within the industrial sector, electrical, transport equipment, textile, and rubber industries are major manufacturing activities. By country of origin, the major sources of foreign investment comes from Taiwan,Japan, UK, Singapore, and Hong Kong (ref. Table 2.2.5 & 2.2.6).

In view of strategic position of Kedah, it is expected that the growth of the state economy, especially the manufacturing sector, would continue to advance significantly.

Fig. 2.2.1



THE GOVERNMENT OF MALAYSIA ECONOMIC PLANNING UNIT	THE STUDY ON ESTABLISHMENT OF KULIM HI-TECH INDUSTRIAL PARK JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Population & Existing Industrial Estate in Kedah State

Table 2.2.1 Per Capita Gross Domestic Product by State

Unit : M$

Order	State	1986	1988
1.	F.T. K.Lumpur	6,227.2	6,698.9
2.	Trengganu	5,741.2	5,951.7
3.	Selangor	5,050.9	5,682.2
4.	P.Pinang	3,723.1	4,221.9
5.	Sabah	3,777.6	4,090.6
6.	Sarawak	3,414.3	3,552.3
7.	N.Sembilan	3,167.3	3,464.8
8.	Johor	3,109.4	3,375.8
9.	Melaka	2,780.7	3,086.6
10.	Perak	2,769.6	2,977.7
11.	Pahang	2,838.8	2,932.3
12.	Perlis	2,345.1	2,525.7
13.	Kedah	2,237.7	2,430.9
14.	Kelantan	1,475.2	1,553.2
National Mean		3,550.9	3,857.5

(Source : Mid-Term Review 1986-90, EPU)

Table 2.2.2 Gross Regional Domestic Product by Sector

Unit : M$ million in 1978 prices

Sector	1986	Share (%)	1988	Share (%)
Agriculture	1,246.6	45.1	1,359.3	43.6
Mining	15.0	0.5	15.5	0.5
Manufacturing	334.9	12.1	466.0	14.9
Construction	82.9	3.0	76.7	2.5
Electricity	34.3	1.2	39.5	1.3
Transport	131.7	4.8	156.3	5.0
Wholesale	109.8	4.0	122.5	3.9
Finance	275.1	9.9	302.4	9.7
Government	455.1	16.4	498.0	16.0
Others	81.6	2.9	84.9	2.7
Total	2,767.0	100	3,120.6	100

(Source : Mid-Term Review 1986-90, EPU)

Table 2.2.3 Industrial Estates in Kedah

1. Bakar Arang (1973 – 85)
   a. Developed Area : 558.0 acres
   b. Saleable Area : 431.7 acres
   c. Area Sold : 431.7 acres
   d. Area Still Available : 0
   e. Rate per m^2 : M$21.15
   (Remarks: Located at 61 km from Alor Setar and 34 km from Butterworth/Penang.)

2. Tikam Batu (1973 – 78)
   a. Developed Area : 89.0 acres
   b. Saleable Area : 1.1 acres
   c. Area Sold : 81.1 acres
   d. Area Still Available : 0
   e. Rate per m^2 : M$21.15
   (Remarks: Located at 70 km from Alor Setar and 23 km from Butterworth/Penang.)

3. Mergong Barrage (1979, 1987 – 91)
   a. Developed Area : 100.4 acres
   b. Saleable Area : 75.4 acres
   c. Area Sold : 65.5 acres
   d. Area Still Available : 9.9 acres
   e. Rate per m^2 : M$53.8
   (Remarks: Located at 6 km from Alor Setar and 100 km from Butterworth/Penang.)

4. Sungai Petani (1989 – 91)
   a. Developed Area : 662.0 acres
   b. Saleable Area : 529.2 acres
   c. Area Sold : 514.7 acres
   d. Area Still Available : 14.5 acres
   e. Rate per m^2 : M$21.15
   (Remarks: Located at 59 km from Alor Setar and 36 km from Butterworth/Penang.)

5 Mergong II (1976)
   a. Developed Area : 102.3 acres
   b. Saleable Area : 87.0 acres
   c. Area Sold : 75.9 acres
   d. Area Still Available : 11.1 acres
   e. Rate per m^2 :M$6.97-M$53.8
   (Remarks: Located at 6 km from Alor Setar and 100 km from Butterworth/Penang.)

6. Kulim (1977 – 83)
   a. Developed Area : 430.0 acres
   b. Saleable Area : 381.6 acres
   c. Area Sold : 381.6 acres
   d. Area Still Available : 0
   e. Rate per m^2 : M$21.15
   (Remarks: Located at 106 km from Alor Setar and 30 km from Butterworth/Penang.)

Table 2.2.4 Investment Projects Approved for Kedah (1986 - 1990)

	No.	Investment	Employment
1986	12	32.8	1,023
1987	10	90.1	2,238
1988	45	269.5	11,474
1989	33	600.2	8,569
1990 (Jan-July)	32	3,705.2	11,599

(Source: MIDA)

Table 2.2.5 Total Investment in Kedah by Industry (1986-1989)

(Unit : M$ million)

	1986	1987	1988	1989
Food	7.2	–	–	–
Textiles	0.1	4.3	49.6	0.7
Wood	–	–	6.2	4.0
Furniture	2.8	–	1.4	4.7
Paper	1.0	10.0	–	4.2
Chemicals	–	6.0	–	–
Petroleum	–	–	–	–
Rubber	6.0	61.2	144.2	43.8
Plastic	–	–	2.0	–
Non Metallic	–	–	22.6	–
Basic Mettals	–	–	–	16.0
Fabricated Met	–	–	1.9	15.0
Machine	–	–	–	–
Electrical	1.0	8.4	40.4	277.0
Transport	14.8	–	0.2	231.3
Miscellaneous	–	–	1.0	3.7
Total	32.9	89.9	269.5	600.4

(Source: MIDA)

Table 2.2.6 Foreign Investment Approved for Kedah

(Unit : M$ million)

	1986	1987	1988	1989
Taiwan	–	–	17.1	142.2
Japan	4.4	2.4	74.4	20.4
Singapore	–	4.0	0.2	6.2
Hong Kong	0.5	2.4	0.5	4.9
Sri Lanka	–	–	–	4.9
UK	5.2	2.6	43.3	–
USA	–	–	12.7	2.9
Others	2.8	60.1	16.2	10.6
Total	12.9	71.5	164.4	192.1

(Source: MIDA)

2.3 Natural Condition

(1) Site Location

The proposed site for the Kulim Hi-Tech Industrial Park, is located about 26 km east of Butterworth, 5 km northeast of Kulim city of Kedah State, and near the existing Kulim industrial estate. The site is situated in the Bukit Mertajam plantation estate (Ref. Fig. 1).

(2) Topography

The proposed site of first phase industrial zone of 250 ha is located on a gentle sloped area, having 3 to 10 per cent gradient from the hill to the east, west, and north directions. Lower flat land at EL.30.48m (100 ft) is also extends widely. About 90 % of the proposed site will occupy the gentle slope and flat land. The southern part of the hill has a relatively steep slope. The highest hill is EL.137.2 m (450 ft) in the whole Park of 1,450 ha and EL.60.96 m (200 ft) in the Hi-Tech Industrial Zone of 250 ha.

(3) Geology

According to geological investigations the subsoil in the proposed site is

composed of clayey silt and sandy silt to a depth of 10 m below ground level. Underlying this strata, stiff clay silt (highly weathered siltstone) is found in a depth of 23 m.

(4) Meteorology

Climate of the site belongs to tropical monsoon type. Mean annual meteorological values are as follows;

Temperature	(Day)	:	27°C – 30°C	(at Penang)
	(Night)	:	22°C – 24°C	
Relative Humidity		:	70% – 90%	(at Penang)
Mean Annual Rainfall		:	2686 mm	(at Bukit Mertajam Estate)

Rainfall pattern is heavy from April to May and from September to November. (ref. Table 2.3.1)

Table 2.3.1 10 years (1980 - 1989) Average of Rainfall & Rain days

(Station : Bukit Mertajam Estate)

	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual
Rainfall (mm)	62	96	192	326	270	148	183	250	380	328	304	149	2,686
Rain days	4	6	11	13	12	8	10	11	19	17	14	8	131

(5) Existing Land Use

The proposed site is utilized as rubber and palm oil plantations at present by the Bukit Mertajam plantation estate of 3,800 ha. A cemetery zone of about 5,000 m^2 exists in the southern part of the site (Simpanan Kubur Hindu).

(6) River/Drainage

Two (2) small tributaries (S. Parit Bunian & S. Ayer Merah) run in the proposed industrial zone flowing to the S. Selnang Atas. Open channel type drainage ditches of small scale maintain to drain to the small tributaries for the estate's plantation.

(7) Existing Road

Access road to the site is made available by an existing rural road connecting between Kelang Lama and Karangan which runs along southern side of proposed area for Hi-Tech industrial zone. This road is paved by asphalt and

has about 4.0 m effective width. Non-paved and narrowed roads exist in the area for the plantation works which are accessible by 4 wheel drive car.

(8) Construction Material/Equipment

Required construction materials such as cement, steel bar, aggregate for construction works are obtainable in and around the project area in Penang and Keda states. Earthmoving equipment is available in the domestic market.

(9) Others

- No cultural property exists in the proposed site.
- No residence exists in the proposed site.
- No public facility exists in the proposed site.

2.4 Present Condition of Infrastructure

2.4.1 Transportation Network

(1) Road Network

Road network concerned to the Study area including roads under planning is shown in Fig. 2.4.1. Its informations are as follows:

(A) Federal road, Route No. 1

Federal Route No. 1 runs through the west side of the Peninsular Malaysia from Johor Bahru, at the south end, to Bukit Kayu Hitam, at the north end nearby the national border to Thailand, via Kuala Lumpur and Butterworth. Road length from Kuala Lumpur to Butterworth is 369 kilometers.(Ref. Fig. 1)

(B) North – South Toll Expressway

The North – South Toll Expressway managed by MHA (Malaysia Highway Authority) is just under construction, but partially opened, will be one of the most important transport network within Peninsular Malaysia and will mostly run along Federal Route No. 1. Near the Study area, the section of this Expressway from Alor Setor, the state capital of Kedah, to Sungai Petani North, 35 km far from Butterworth, is opened

and under operation. Penang Bridge under operation, which will be an important access to Penang Airport for the proposed Hi-Tech Industrial Park, will be directly connected to the Expressway.

(C) East – West Highway

The East – West Highway is planned by PWD (Public Works Department) from Butterworth to Kota Bharu, the state capital of Kelantan. The construction of the section from Butterworth to Titi Karangan (approx. 34 km) will be completed by the end of 1993. Construction Packages consist of two, one is Butterworth to Luas (approx. 20 km) and another is Luas to Titi Karangan (approx. 14 km). It takes about 40 minutes from Kulim to Butterworth at present. After completion of this Highway construction, it is supposed to take about 20 minutes.

(D) State Roads

There is a plan to improve the alignment and intersection of the state road form Luas to Kelang Lama. This road will be an access from the East – West Highway to the proposed Hi-Tech Park. 16–hours traffic volume of this road in 1989 was 17,168 and annual growth rate of the last 10 years was 9.8% according to "Traffic Volume Malaysia 1980 – 1989" prepared by the Highway Planning Unit of PWD.

The intersection at Kelang Lama which is one of access points to the proposed Hi-Tech Park is recommended to be improved as a vertical cross, because it is expected that heavy truck traffic will be much generated form the proposed Hi-Tech Park. According to PWD Kulim, the implementation of the said intersection improvement is under process but its schedule is not fixed yet due to the problem of land acquisition.

(2) Airport

The nearest airport is Bayan Lepas International Airport, which is located in the southeast end of Penang Island and about 16 km form Georgetown. The airport has a 3,353m runway. Cargo terminal expansion of the airport is under way. Facilities of the airport will be enough for the proposed Hi-Tech Park to import materials, and equipment and to export products. At present it takes about 50 minutes by car from the airport to Kulim.

(3) Port

The nearest seaport is Penang Port, which is located in the towns of Butterworth and Georgetown. The port, strategically located on the north-west coast of Peninsular Malaysia, is one of the premier seaports in the ASEAN region. The port is administered by PPC (Penang Port Commission). The Penang Port comprises breakbulk facilities at Butterworth wharves and Penang Swettenham pier, container facilities, bulk cargo terminal, vegetable oil tanker pier and ferry terminals. Average depth alongside the berths ranges from 8.7 m to 10.0 m.

The present total handling capacity of cargo is 230,000 TEU (Twenty feet Equivalent Unit). There is a plan to construct a new container terminal with 170,000 TEU handling cargo capacity at north Butterworth. The new terminal will be operational from the beginning of 1994. Penang Port installations are shown in Fig. 2.4.2.

(4) Railway

The railway near the proposed Park runs from Singapore to Bangkok via Butterworth. The railway standard in Malaysia is 1,000 mm rail gauge and 16 tones axle load. The line has cargo handling services at Butterworth station without unloading facility. However, this line does not contribute to the proposed Hi-Tech Park, because service level, such as speed and frequency, is not so high.

2.4.2 Power Supply System

(1) Available power capacity for existing 132 KV transmission line between Bukit Tengah s/s (275 KV/132 KV) and Kulim s/s.

- As firm capacity, 149 MVA. Double circuit by using 300 sq. mm ACSR

(2) Recorded number of high speed auto reclosing per year for the 132 KV transmission line.

- Not recorded, but three phase high speed auto reclosing scheme (less than 0.5 sec) has been applied by power line carrier relaying system.

(3) Recorded number of the black-out (stoppage of power supply) due to some

troubles or failures, if occurred. (At Kulim s/s)

- None for 1989 and 1990. On, 12 February 1991, only black-out occurred during about 11 hour due to transient earth fault. Then, 33 KV circuit breakers for secondary circuit of both main transformers were tripped. Certain reason of the fault has not, however, been know.

  Note) Kulim substation was completed in June 1989.

(4) Recorded voltage regulation in 11 KV of Kulim substation

- Setting at 11.25 KV, +5%, to -10% according to TEN standard

(5) Recorded frequency fluctuation in Kulim s/s

- 50 HZ, + 0.5 HZ to -0.5 HZ

(6) Recorded or expected harmonic in the power system.

- Not available

(7) Recorded maximum demand (KVA or KW) in Kulim s/s.

- 27 MW at present. However, 54 MW is forecasted at the end of this century.

(8) Number of operator and maintenance engineer in Kulim s/s

- Kulim s/s is nobody station. Usually, a group composing of 4 engineers, 1 technical assistant and 5 technicians is standing by at the home, to do maintenance work for the system excepted 132 KV system. For 132 KV system, the stuff on Bukit Tengah s/s (275 KV/132 KV) controls and supervises.

(9) Policy for fire extinguishers system in substation

- At main intake, halon gas system has been practised. According to latest design, oil flow-out protection system is applied for large capacity oil immersed transformer.

(10) Existing Kulim Substation

- For two (2) banks of main transformer (132 KV/33 KV, 45 MVA, ONAF), no fire extinguisher system has been applied, although the

substation is nobody station.

- 33 KV switchgear is outdoor type and conventional structure type, although can be applied with the indoor use metalclad switchgear or cubicle.
- For 11 KV distribution line, paper insulation cable having low reliability has been applied still now.
- It seems that the substation has no enough space for 132 KV switchgear extension. Land acquisition of its adjacent place may be required in this project.
- Almost protective relay equipment are electromagnetic type (mechanical type)

2.4.3 Water Supply System

(1) Present water supply system

The water supply systems are managed by the PWD. The present water supply facilities for Kulim comprise mainly intake, treatment plant, service reservoir and distribution main. Existing water supply network and schematic diagram in Kulim are as shown in Figs. 2.4.3 and 2.4.4. The summary of the water supply systems is as follows:

(A) Pinang Tungal Water Treatment Plant

Source	:	Sungai Muda
Intake	:	Pinang Tungal
Treatment Plant		
– Location	:	Pinang Tungal
– Type	:	Rapid sand filtration
– Capacity	:	27.2 Mld

(B) Wang Pinang Water Treatment Plant

Source	:	Sungai Kulim
Intake	:	Wang Pinang
Treatment Plant		
– Location	:	Wang Pinang
– Type	:	Rapid sand filtration

- Capacity : 30.0 Mld

(C) Service Reservoir

Station Name	Capacity (MG)	TWL (ft)
T13	0.1	170
T14	0.1	170
T15	2.0	192
T16	0.15	175
T20	2.0	240
R1	1.0	175
R2	1.0	279
R3	0.1	192
R4	1.0	192
R5	0.2	not available

(D) Distribution Pipeline

- Material : Asbestons cement pipe, steel pipe
- Diameter : 3 – 4 – 6 – 8 – 10 – 12 – 15 – 18" and 600 – 700 – 800 mm

(2) Unaccounted for water

Unaccounted for water or non revenue water (NRW) of water supply systems in the nation wide was studied by the PWD in 1987 and NRW in the district of Kulim/Bandar Baru was estimated at a high rate of 57 % in 1987 of which 50 % was leakage. Fig. 2.4.5 shows NRW in Kedah State and reveals high rate of NRW in all districts.

(3) Water quality

Water sampling is undertaken weekly by the Chemistry Department, Ministry of Health and PWD as joint measurement in order to analyze raw water quality. Water quality of the Muda river satisfies the WHO standard of raw water as water sources for drinking water. Raw water is treated so as to meet the WHO standard.

(4) Water demand and supply balance

There has been no problem of water shortage in recent years thanks to the abundant water resources, although water leakage was at a high rate of 50 % as mentioned above. Service factor to the total population in Kulim is said at nearly 100 % at present.

According to some officers of PWD, DID approves the withdrawal of water from the Muda river at 20 mgd for water supply.

(5) Water supply for industrial estates

Water supply for industrial estates is undertaken by PWD as the same as water supply for other consumers. Water is treated so as to meet the WHO standard. It is treated again by each company if necessary to satisfy the quality for industrial use.

(6) Water tariff

Water tariff is determined by the State. The present water tariff in the State of Kedah in effect from January 1st, 1983 is as shown below.

	Metered (m^3)	Rate ($/$m^3$)	Min. rate ($/2 month)
Domestic Supplies	0 – 18.2	0.35	3.20
(residential, religious	18.3 – 45.5	0.52	do.
institutions, Government	45.6 –	0.77	do.
schools, statutories bodies)			
Commercial Supplies			
(industrial, construction,		0.96	7.80
swimming pool, shipping)			

(7) Operation and maintenance

Operation and maintenance are undertaken by PWD. Budget for O & M of water supply system in Kedah State in 1990 was M$965,000, of which 60 % was spent for the treatment plants. Staff for O & M comprises 6 operators, 7 technicians, 1 technical assistant, 1 engineer, and 17 permanent labours.

2.4.4 General Condition of Telephone Services

(1) Marginal capacity of telephone plant in Kedah state and Malaysia

Table 2.4.1 Exchange Capacity, Cable Pair and Residential and Business Subscribers (Dec., 1990)

Item		Kedah	Malaysia
Population		1,300,500	17,877,200
Exchange Capacity	(line)	90,400	2,505,500
Cable pair	(pair)	143,300	3,478,400
Residential			
Subscriber	(line)	43,700	1,136,000
Back log	(line)	6,755	71,400
Business			
Subscriber	(line)	15,800	449,800
Back log	(line)	687	10,415
Total			
Subscriber	(line)	59,500	1,535,700
Back log	(line)	7,442	81,780

From the above data, using ratio is calculated as follows:

	Kedah	Malaysia
Exchange	66%	61%
Cable pair	42%	45%

Using ratio of exchange terminal capacity is good enough in both Kedah and Malaysia. Cable pair capacity is also enough for the whole nation.

(2) Kulim Exchange Capacity Margin

Table 2.4.2 Kulim Exchange Capacity

		Unit–1	Unit–2
Type		ARF	NEX
Exchange Capacity	(line)	5,000	1,000
Cable Pair	(pair)	11,000	–
Residential			
subscriber	(line)	3,001	397
back log	(line)	792	–
Business			
subscriber	(line)	1,001	135
back log	(line)	22	0
Total			
subscriber	(line)	4,002	532
back log	(line)	816	0

(Source : STM)

In Kulim, 4,500 subscribers are provided by 6,000 exchange terminals. The using ratio of 75 % is higher as compared with 61% for the whole of Malaysia. The ratio should be around 60% taking into account allowance.

(3) Telephone Service Performance

Table 2.4.3 Telephone Service Performance in Malaysia

Unit : %

	1983	1989	1990
Answered	19	38	38
Busy	8	15	15
No Reply	18	17	16
Congestion	40	10	15
Technical Fault	12	5	5
Subscriber Fault	3	15	10

(Source : Data of 1983 & 1989 from Pamphlet prepared by Arab-Malaysia Securities
Data of 1990 from hearing at STM on Mar., 1991)

The answered ratio of 38% in 1990 indicates considerable progress compared with 19% in 1983. But in comparison with targeted international value of 75%, it is still low.

(4) New Plant Construction Plan

The following construction plan using new technology is being done by STM. These will satisfy the demand requirement from the Kulim Hi-Tech Industrial Park.

(A) FOKUS

The optical fiber long distance transmission line from Alor Setar to Johor Baharu and Kuantan, will start construction soon. It will pass the Kulim GSC (Group Switching Center). After completion of FOKUS, big and high speed digital traffic is carried to/from anywhere in Malaysia and overseas.

(B) Fiber Optics Junction

This is a short distance digital transmission line to connect telephone exchange offices. The tender of procurement of equipment for some telephone offices has been made. This system should connect the new Kulim exchange in Hi-Tech Park to Kulim GSC, and will be able to provide the extension digital demand to/from the Park.

(C) Digitalization of switch and transmission line

This technical revolution of switch and transmission method from analog to digital is on going in the world. Kulim telephone office has equipped digital switches and micro wave systems in some portions already. The initial digital demand will be supplied by this equipment.

(5) Service Statistics by STM (1987 ~ 1990)

The service statistics by STM are indicated in Table 2.4.4. Some of these are new telecommunication services, and are effective for new service demand forecasting.

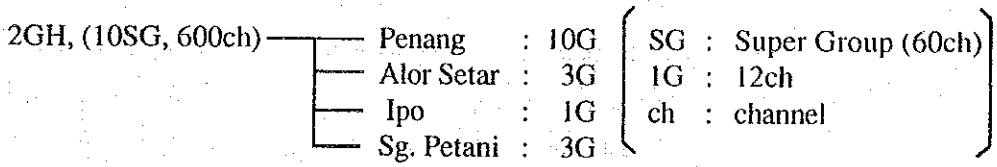
Table 2.4.4 New Service Statistics by STM

Service	1987	1988	1989	1990
Telephone	1,131,719	1,247,687	1,388,183	1,585,744
Atur 450 (Car telephone)	17,411	27,302	39,415	54,616
Public payphones *	19,007	21,456	22,853	24,591
Telex	11,228	9,980	8,821	8,872
Telefax *	4,674	13,663	24,864	40,000 **
Leased circuits	6,724	8,206	10,953	15,528
Datel *	1,208	2,687	4,235	5,580 **
Maypac	530	763	909	1,153
Maycis			301	822

Note * included in telephone ** Estimates

(6) Toll Transmission lines around Kulim

There is a microwave radio system (analog system) between Kulim Telephone office and BM (Bukit Mertajam) hill (about 10 km west from Kulim), where radio transmission lines are connected to the national network. Toll telephone lines via this microwave radio system are as follows:



A new 140MB digital microwave radio system (1800ch) is under construction.

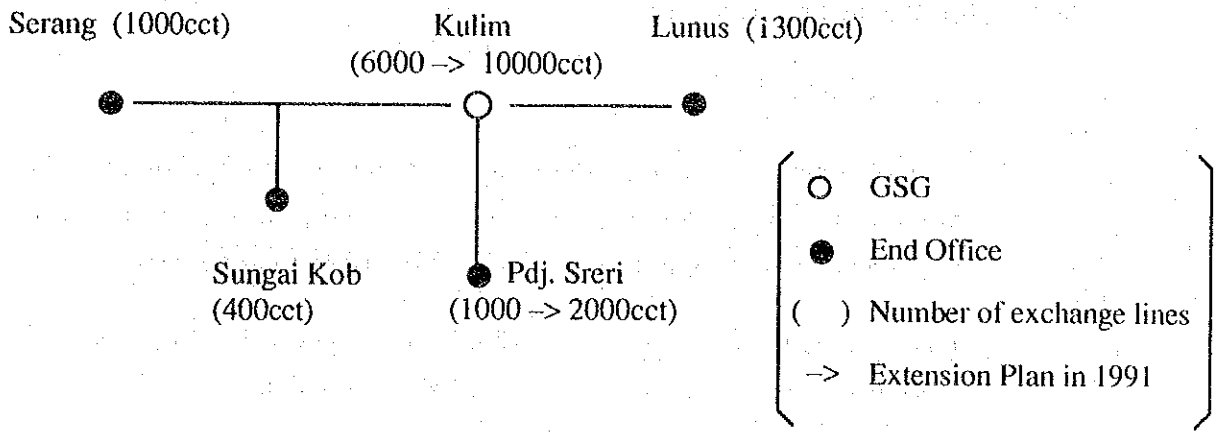
(7) Kulim GSC and End Office inside Kulim GSA

Kulim GSC (Group Switching Center) has 4 End Offices (lowest rank in telephone hierarchy which has Local Switch) in Kulim GSA (Group Switching Area, almost same as Kulim district).

Their distribution is indicated below.

The Kulim telephone office in Hi-Tech Park will be added to a new end office in Kulim GSA.

Present Condition & Extension Plan of Kulim GSC and End Office inside Kulim GSA (Hearing at Kulim GSC)



2.4.5 Drainage and Sewerage System

(1) Drainage System

- The Ayer Merah River originates in the western boundary of the site and the Parit Bunian River originates in the eastern boundary.
- The both rivers meet the Selnang Atas River about 15 km north and then flow into the Jarak River.
- The existing capacity of both rivers is not large enough for the discharge of peak flow upstream, (present return period is less than 2 years) so this area has frequently suffered floods.
- Water of the Jarak basin is utilized only for irrigation.

(2) Sewerage System

- There are not any public sewerage facilities in Kulim.
- As for industrial waste water, Individual Treatment systems are adopted in Malaysia.

- As for domestic waste water, Central Treatment systems are adopted in Malaysia.

- Domestic waste water is treated by the Oxidation Pond Process in Malaysia.

2.4.6 Industrial Waste Management

(1) Industrial Solid Waste

- Lack of facilities for centralized treatment, storage and disposal of toxic and hazardous wastes is becaming a serious social problem, for instance, the construction of a toxic waste disposal plant has been a serious issue.

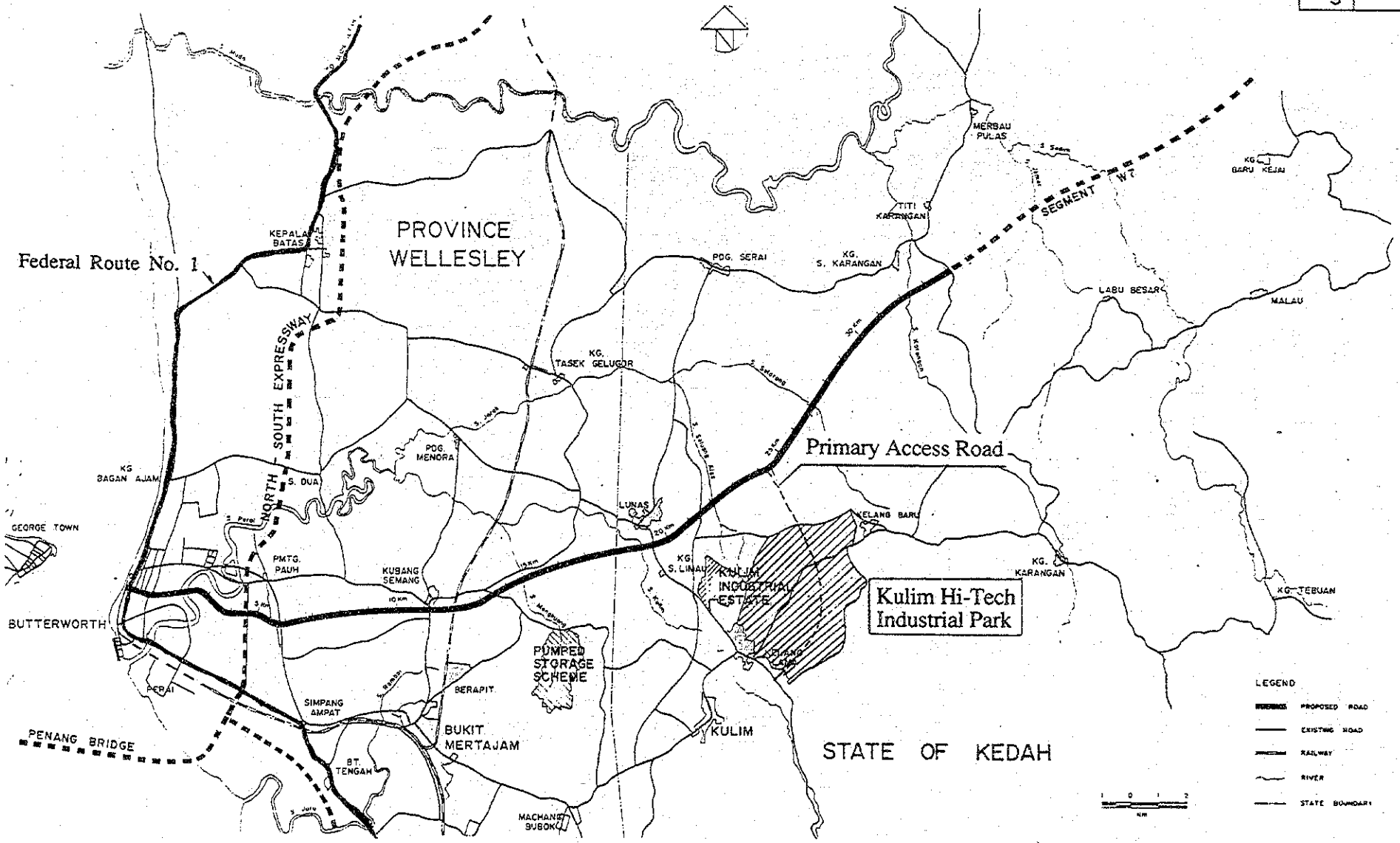
- Basically, all industrial solid wastes are kept in drums and stored at factory lots regardless of toxicity according to DOE's instruction.

(2) Municipal Solid Wastes

- Kulim Local Council is responsible for municipal solid waste disposal.

- Kulim Local Council has an open dumping site.

Fig. 2.4.1



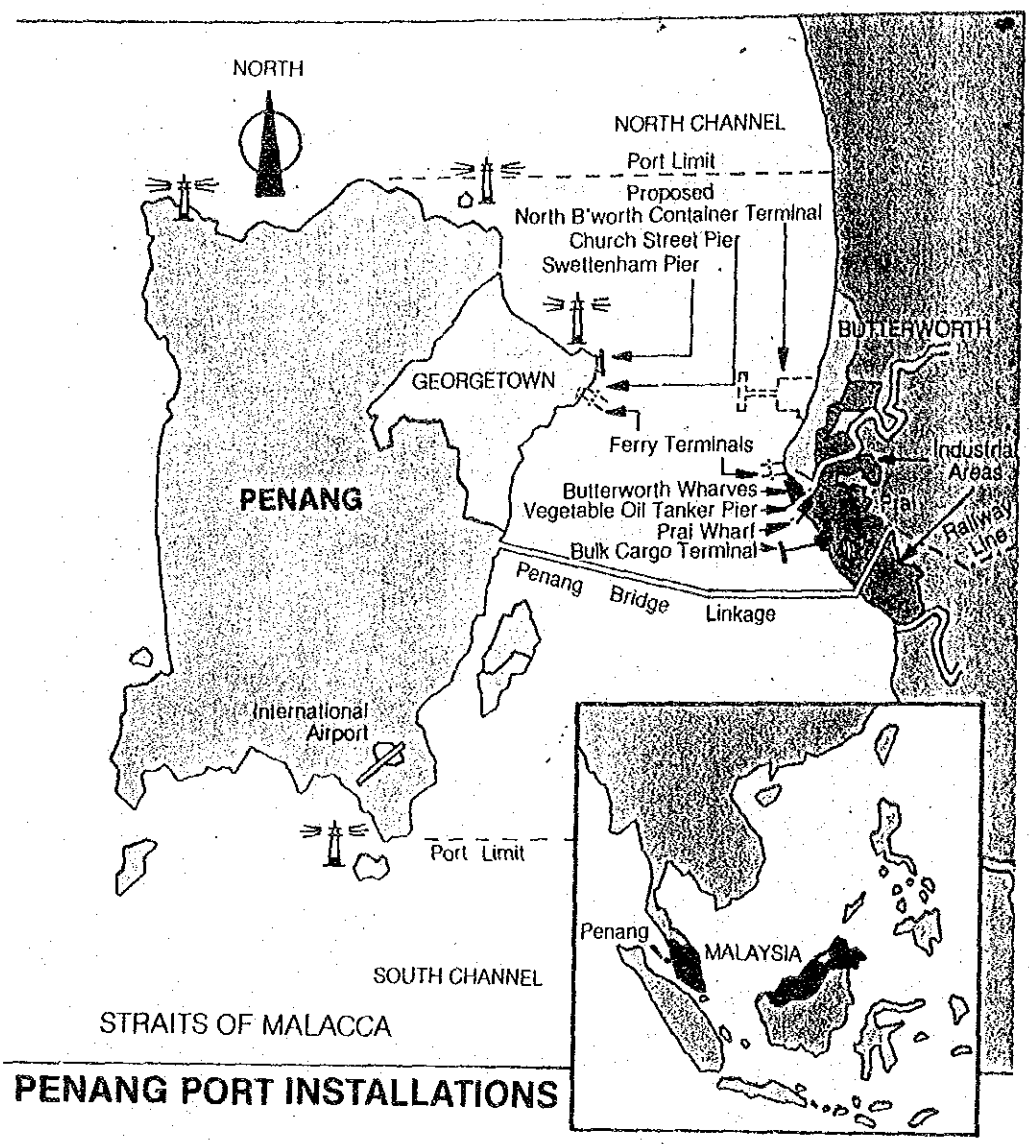
THE GOVERNMENT OF MALAYSIA ECONOMIC PLANNING UNIT	THE STUDY ON ESTABLISHMENT OF KULIM HI-TECH INDUSTRIAL PARK JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Road Network around Kulim Hi-Tech Industrial Park (Source : PPC)

Port Authority : Penang Port Commission

Position : Latitude 5°25′N; Longitude 100°21′E

Approach : Via North Channel — Depth at entrance is 10.2m A.C.D.

Via South Channel — Depth at entrance is 5.8m A.C.D. and an air draft of not more than 28m.

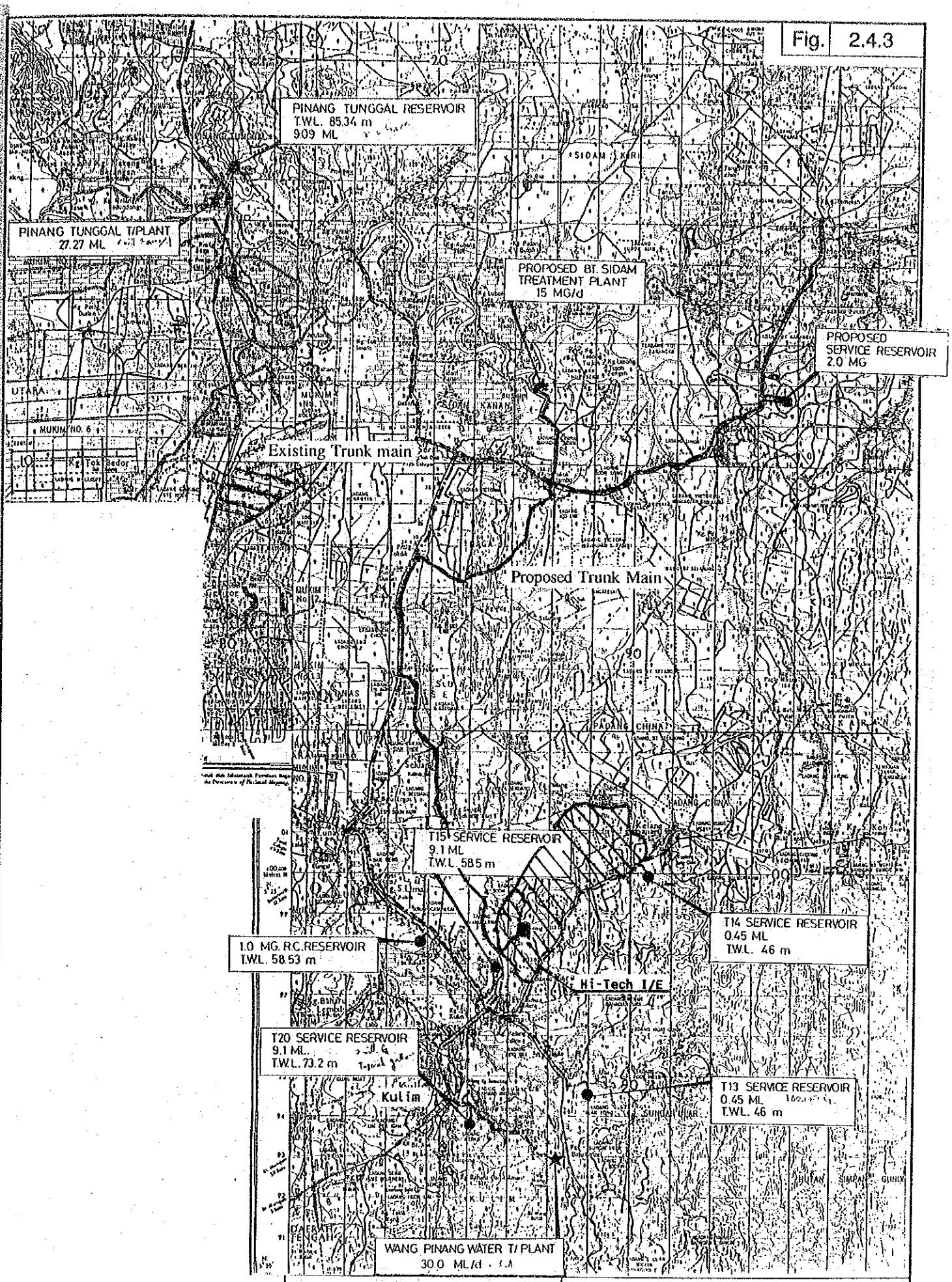


PENANG PORT INSTALLATIONS

PORT OF PENANG AND ITS LOCATION IN SOUTH-EAST ASIA

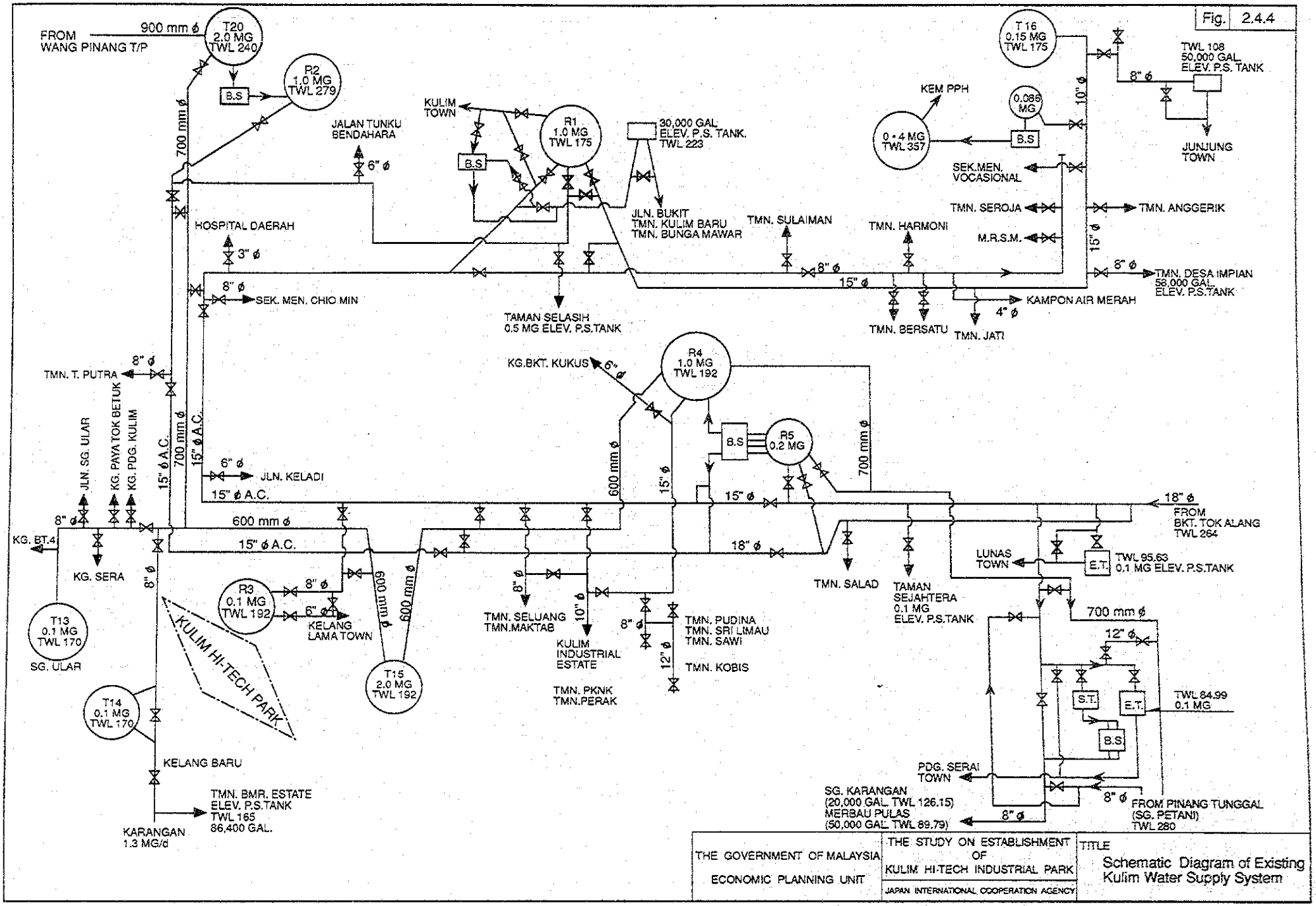
THE GOVERNMENT OF MALAYSIA ECONOMIC PLANNING UNIT	THE STUDY ON ESTABLISHMENT OF KULIM HI-TECH INDUSTRIAL PARK JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE PENANG PORT INSTALLATIONS (Source : PPC)

Fig. 2.4.3



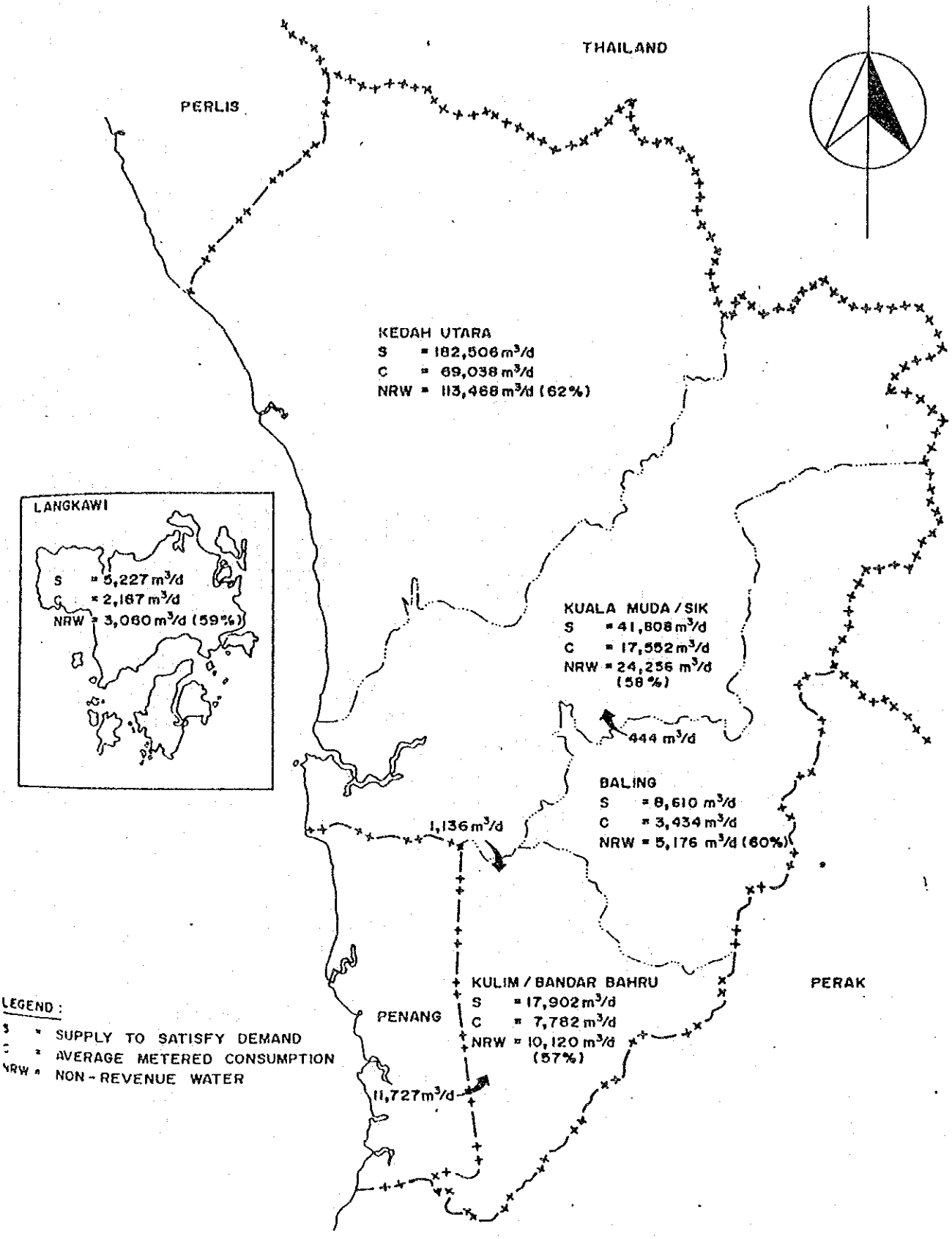
THE GOVERNMENT OF MALAYSIA ECONOMIC PLANNING UNIT	THE STUDY ON ESTABLISHMENT OF KULIM HI-TECH INDUSTRIAL PARK JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Kulim Water Supply System

Fig. 2.4.4



THE GOVERNMENT OF MALAYSIA ECONOMIC PLANNING UNIT	THE STUDY ON ESTABLISHMENT OF KULIM HI-TECH INDUSTRIAL PARK JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Schematic Diagram of Existing Kulim Water Supply System

Fig. 2.4.5



THE GOVERNMENT OF MALAYSIA ECONOMIC PLANNING UNIT	THE STUDY ON ESTABLISHMENT OF KULIM HI-TECH INDUSTRIAL PARK JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE NON REVENUE WATER IN KEDAH STATE

CHAPTER 3

OVERALL PLAN

3. OVERALL PLAN

3.1 Basic Concept of Kulim Hi-Tech Industrial Park

UNIDO Report proposed the concept plan and type of Hi-Tech Industrial Estate/Park. The JICA Study Team has accepted the concept plan of the UNIDO Report upon its review and requested the Malaysian side to prepare the Master Plan on the whole Park in parallel with the JICA Study.

Generally, a so called hi-tech park or science city is planned based on a development policy taking into consideration the following factors.

1) Infrastructures
2) Human resources
3) Industrial concentration
4) Academia and research organization
5) Urban amenity
6) Living condition
7) Natural environment, etc.

As for Kulim, there are some advantages and disadvantages on the above mentioned conditions as follows:

Advantages:

- convenient transportation network
  * East-West Highway
  * airport
  * seaport
- concentration of industries
  * existing industrial estates
  * existing electric and electronics industries in Penang

Disadvantages:

- lack of the availability of highly developed academic and research functions with facilities
- shortage of skilled manpower
- lack of high-grade amenity

Based on the above conditions, the following matrix was used to select the type of the Park:

Type \ Factors	Academy and Research	Infrastru-cture	Hi-grade Engineers	Skilled Workers	Related Industries	Hi-grade Living Condition
R&D Type	A	A	A	A	A	A
R&D/Production Type	B	A	B	B	B	B
Production Type	N	A	B	B	B	N
Kulim Hi-Tech Park	N	B	N	B	B	N

Note: "A" is highly necessary or available, "B" is necessary or available and "N" is not necessary or available.

The introduction of R&D type to Kulim might be difficult due to the lacks of conditions required by R&D type. Therefore, it is proposed that the type of Kulim Hi-Tech Park and the development strategy are as follows:

- In short-term : production oriented type

  Concentration on inducing hi-tech production factories which include the product development function

- In long-term : R & D and production combined type

  Private R & D industries will be induced.

It is necessary to take enough time for the addition of new or sophisticated functions of Hi-Tech Park in order to avoid drastic changes to the natural and social environment.

The principles of the Kulim Hi-Tech Industrial Park development should be as follows:

1) Harmonious development
   - Minimizing damage to the surrounding natural environment

2) Creation of New Industries/New Employment Opportunities
   - Prime motor of the Malaysian Economy

3) Creation of High Grade Living Standard

4) Advanced Industrial Structure

5) Environmental Measures

3.2 Basic Development Policy

The development plan for Kulim Hi-Tech Industrial Park is formulated in line with three basic development policies given below:

- To establish a growth center for advanced industrial structure

  The Kulim Hi-Tech Industrial Park is planned to be a growth core which will be a prime motor to change the industrial structure from labour intensive to hi-tech oriented. In order to function as a growth center, it is required to provide it with urban facilities and R & D facilities.

- To create new industries and new job opportunities

  Accumulation of Hi-Tech industries and both public and private R & D institutes will supply local companies with a chance to advance in their technology. The above industries and institutes will provide new kinds of job opportunities for students who will graduate from Malaysian universities and foreign universities.

- To provide a favorable environment

  Present and future development shall be harmonized with the natural environment. At the stage of land preparation, it is required to minimize cut and fill, not only for cost reduction but also for protection of the surrounding environment. At the stage of operations, it is necessary to adopt preventive measures against pollution. In order to attract the foreign hi-tech investors and researchers, the Kulim Hi-Tech Industrial Park shall provide a favourable environment for their R & D and production activities.

3.3 Target Industry

Target industries were proposed in the UNIDO Report based on the reports by the Office of Technology Assessment, USA and MITI, Japan. The selection of targetted industries in UNIDO Report was based on the following criteria.

a. to introduce and promote as core industries high technologies and higher degree of

processing,

b. to strengthen R&D function,

c. to contribute to technological refinement and overall industrial restructuring,

d. to use locally available technical background and materials,

e. to development into suitable supporting industries,

f. to encourage linkage type industries development,

g. to integrate available interface with universities and public reseach institutes

From the above consideration, UNIDO Report proposed the targetted industries as follows :

First Phase (1993 - 1995)

Electronics and mechatronics based indusries

- IC industries
- Video equipment
- Color TV tube
- Electronics components
- Plastic processing machinery
- Computer related industries
- LCD
- Audio equipment
- Metal machine tools

Supporting Industries

- Bearings
- Plastics products (Precision)
- Plating and heat treatment
- Moulds
- Metal press industries

Second Phase (1996 and onward)

Bio-technology and new materials based industries

- Pharmaceuticals
- Plant species improvement
- Agro-chemical
- Amorphous alloy
- Fine ceramics
- Photo magnetic

Above targetted industries are described as produses-based in and broad - sub-sector. In the planning stage of industrial estate, the broadness of targetted industries are agreeable, because the purposes of selection of targetted industries are mainly to consider the basic factors of infrastructure, for example, water consumption, telecommunication lines, electricity, etc. In the promotion stage, however, products - based sub-sector should be determined. The products - based sub-sectors in the promotion stage are proposed as a reference in the Annex.

3.4 Conceptual Zoning Plan

3.4.1 Major function

In order to satisfy functions as a Hi-Tech Park, the Kulim Hi-Tech Park will be composed of five zones;

1) Hi-Tech Industrial Zone
2) R & D Zone
3) Housing Zone
4) Urban Zone
5) Amenity Zone

Each zone consists of several functions. The location of each zone and components to be introduced in it are as follows:

(1) Hi-Tech Industrial Zone

- To be located north of the watershed which runs east-west, slightly to the south of the central part of project site in order to avoid effluent of industrial waste water to the southern part of the watershed where water is withdrawn for water supply.
- To use existing flat land as much as possible.

Components

1) Factory	– Foreign and Local Hi-Tech Industries – Supporting Industries
2) Urban block	– Administration Core – Police & Fire Station – Bus Terminal – Shopping Facilities – Science & Technology Exchange Plaza – Skill Development Center – Public Service Facilities
3) R & D block	– Public R & D institutes – Supporting Facilities
4) Utilities	– Road – Drainage Channel – Sewer Collector – Power Substation

- Service Reservoir/Pumping Station
- Central Waste Water Treatment Plant
- Industrial Waste Temporary Storage Yard

5) Green Belt and Parks

(2) R & D Zone

- To be located adjacent to the Hi-Tech Industrial Zone in order to ensure inter-face with Hi-Tech Industries.
- To select location to certify the appropriate atmosphere for their activities.

Components

1) R & D Institute
   - Private R & D Institutes
   - University/Innovation Center
2) Utilities
   - Road
   - Drainage Channel
   - Sewer Collector
3) Green Belt and Parks

(3) Housing Zone

- To be located on slope area.
- To ensure in conformity with the direction of existing residential development.
- To provide community and educational facilities.

Components

1) Housing
   - Bungalow Type
   - Semi-detached Type
   - Low-cost Type
2) School
   - Kindergarten
   - Primary
   - Secondary School
   - International School
3) Community
   - Supermarket
   - Restaurant
   - Clinic
   - Bank
   - Gas Station
   - Post Office
   - Police Box

- Branch Office of Public Services

4) Utilities
- Road
- Retention Pond
- Drainage Channel
- Sewer Collector
- Waste Water Treatment Plant

5) Green Belt and Parks

(4) Urban Zone

- To locate urban facilities in order to integrate with other zones.

Components

1) City Center
- Office Building
- Town Hall
- Condominium
- Shopping Centre
- Bank
- Teleport
- Bus Terminal
- Hotel
- Mosque

2) Utilities
- Road
- Drainage Channel
- Sewer Collector

3) Green Belt and Parks

(5) Amenity Zone

- To utilize highest area as a natural park.
- To locate recreational facilities in the vicinity of R & D and Housing Zone in order to preserve greenery.

Components

1) Natural park

2) Sports facilities
- Golf Club
- Football Stadium
- Gymnasium
- Tennis Court
- Swimming Pool

Amenity zone includes reserved area for future expansion.

3.4.2 Zoning Plan

Basic policies for the zoning of project area are:

1) Location of industrial zone should be in the north of the watershed

2) Type of housing should be introduced as exclusive zone for executives, medium class, and workers

3) Housing zone should be separated from the industrial zone to maintain housing and production environments

4) Urban center at a community level should be introduced

5) Landscape to create environment suitable for R & D researchers

Based on the above policy, the conceptual zoning plan of the project area is proposed as shown in Fig. 3.1. Basic framework of development for each zone is prepared based on the target industries and population. It is summarized below, while finalization of phasing and zoning should be made in the Master Plan Study.

Zone	First Phase	Overall Plan
Hi-Tech Industrial Zone	250 ha	360 ha
R & D Zone	30 ha	60 ha
Housing Zone	300 ha	710 ha
Urban Zone	10 ha	30 ha
Amenity Zone	180 ha	290 ha
Total	770 ha	1,450 ha

3.5 Population Projection

The procedure for population projection is as follows:

1) Direct Employment by the planned targeted industries for the first phase
2) Assume the family members based on the Malaysian standard, 5.8 persons per 1 family

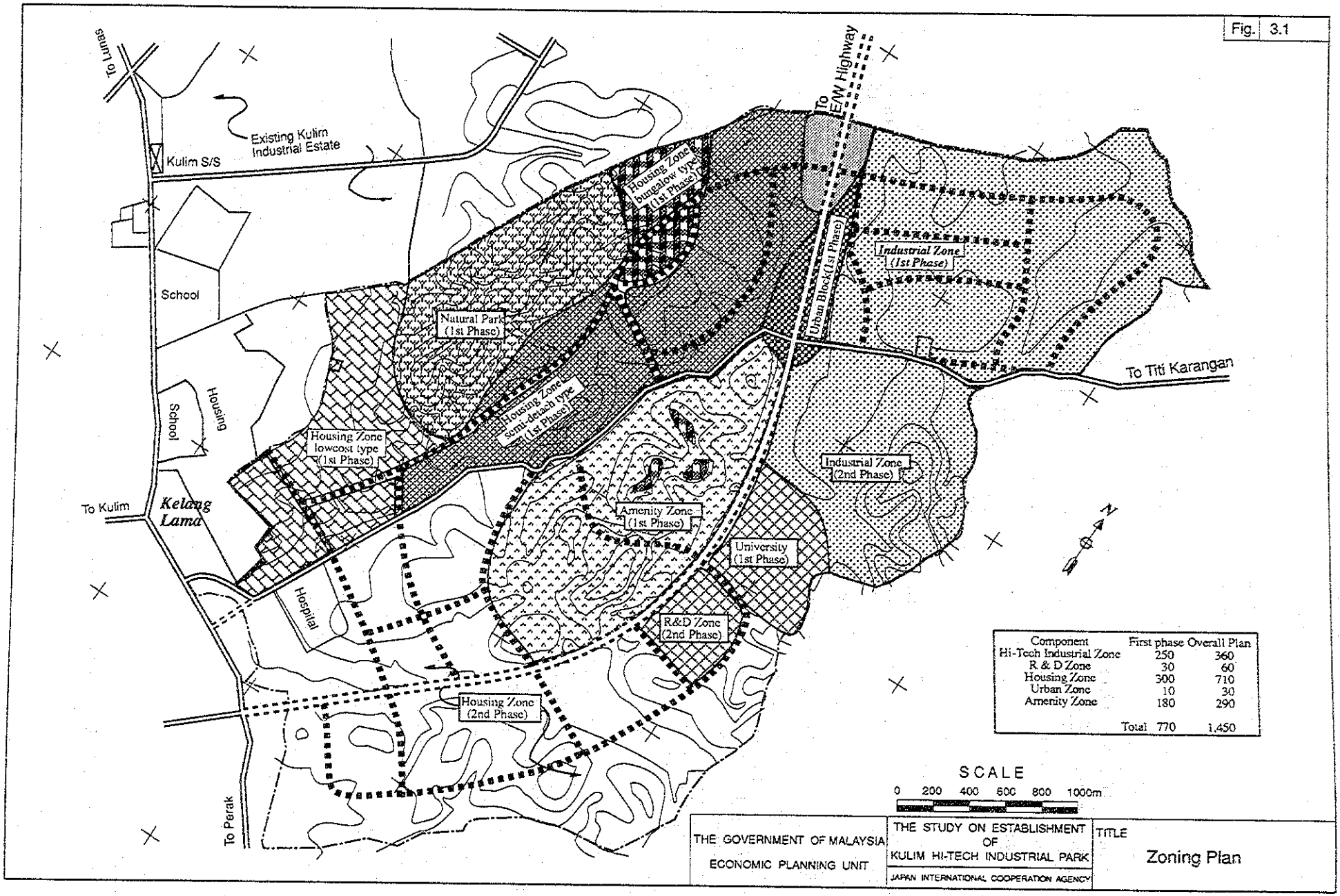
3) Assume the ratio of single - married as 40% - 60%

4) Assume population to actual reside in the area as 40%

Based on the estimated direct and indirect employment of all components described above, the population that is expected to reside in the whole area would amount to 47,000 in total. Total amount of employees in the whole Park is forecasted to be around 24,200 in the Overall Plan. The number of employees in the first phase will be around 15,070. It is required that the Malaysian side should finalize population projection in the whole Park in the Master Plan.

	Hi-Tech Industries No. of Employees	Other Components No. of Employees	Total Population Based on Employees	Actual Population living in the Housing Zone	No. of Families	Housing Area (ha)
First phase	12,540	2,530	58,700	19,700	5,050	300
Overall phase	15,540	8,660	94,600	47,000	12,060	710

Fig. 3.1



Component	First phase	Overall Plan
Hi-Tech Industrial Zone	250	360
R & D Zone	30	60
Housing Zone	300	710
Urban Zone	10	30
Amenity Zone	180	290
Total	770	1,450

THE GOVERNMENT OF MALAYSIA ECONOMIC PLANNING UNIT	THE STUDY ON ESTABLISHMENT OF KULIM HI-TECH INDUSTRIAL PARK JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Zoning Plan

CHAPTER 4

FIRST PHASE DEVELOPMENT PLAN

4. FIRST PHASE DEVELOPMENT PLAN

4.1 Targeted Industries

The targeted industries for the Kulim Hi-Tech Industrial Park are proposed as follows:

First Phase (1993 - 1995) : Electronics and mechatronics based indusries

- IC industries
- Video equipment
- Color TV tube
- Electronics components
- Computer related industries
- LCD
- Audio equipment
- Metal machine tools

Supporting Industries

- Bearings
- Plastics processing machinery
- Plating and heat treatment
- Moulds
- Plastics products
- Metal press industries

Model plants of target industries are assumed as shown in Table 4.1.

4.2 Land Use Plan

In line with the strategy and zoning concept, the first phase development area is divided into five zones as shown below.

Zone	First phase Area (ha)
Hi-Tech Industrial Zone	250
R & D Zone	30
Housing Zone	300
Urban Zone	10
Amenity Zone	180
Total	770

The land use pattern for respective zones is as follows:

Zone	Utility/facility
Hi-Tech Zone (250 ha)	– Factory lot – Temporary storage yard for industrial solid waste – Central treatment plans for waste water – Urban block – R & D block – Utility – Green belt and parks
R & D Zone (30 ha)	– University/Innovation center – Utility – Green belt and parks
Housing Zone (300 ha)	– Bungalow,semi-detached and low-cost type houses – Community center – Utility – Green belt and parks
Urban Zone (10 ha)	– City center – Utility
Amenity Zone (180 ha)	– Green belt and parks – Natural park – Sports facilities – Reserved area

4.3 Design Population

Based on the estimated direct and indirect employment from all components, the population that is expected to reside in the whole Park would amount to 19,700 in the first phase. The total amount of employees in the whole Park is forecasted to be about 15,070.

	Hi-Tech Industries No. of Employees	Other Components No. of Employees	Total Population based on Employees	Population living in the Housing Zone	No. of Families	Housing Area (ha)
First phase	12,540	2,530	58,700	19,700	5,050	300

4.4 Implementation Plan

The proposed completion time of land preparation for first phase industrial zone is June 1993. For the first phase development stepwise completion is recommended including infrastructures as follows based on the i) development scale / work scale, ii) duration of factory building construction with plant installation which will requires one (1) year approx. by investor/(s) and iii) duration of procurement procedures for construction works.

First step	:	June 1993
Second step	:	End 1993
Third and final step	:	End 1994

The following infrastructures should be completed to meet with the targetted schedule stipulated above.

1) Road network
2) Power supply system

   Ring formation power supply system should be applied by the time of factory operation which needs reliable and stable power.

3) Water supply system
4) Sewerage system
5) Telecommunication system

The JICA Study Team recommends the facilities to be introduced by priority as indicated below based on the basic concept and strategy of this Hi-Tech Industrial Park.

Zone/(Block)		Facility	Priority		
			1st priority	2nd priority	3rd priority
Hi-Tech zone (Urban block)	–	Skills development centre	*		
	–	Administration core	*		
	–	Business centre	*		
	–	Telephone office	*		
	–	Central plaza		*	
	–	Fire station		*	
	–	Police station		*	
	–	Commercial centre			*
	–	Others			*
R & D zone	–	University		*	
	–	Innovation centre		*	
	–	Others			*
Housing zone	–	Houses(low-cost,semi detached & bungalow type)	*		
	–	Community center		*	
	–	Others			*
Urban zone	–	City center		*	
	–	Hotel			*
	–	Mosque		*	
	–	Others			*
Amenity zone	–	Sports facilities	*		
	–	Others		*	

1st priority : June 1993

2nd priority : End 1993

3rd priority : End 1994

Table 4.1 Model Plant

	(1) LSI	(2) Personal Computer	(3) TV	(4) NC Machine Tool	(5) Magnetic Disc Drive	(6) Bearing	(7) Magnetic Head	(8) Printed Circuit Board	(9) Compact Disk	(10) Connector	(11) Plastic Form	(12) VTR	(13) LCD(excl. Assemble) 200x250mm	(14) TFT-LCD
	1000Pcs/M	Units/M	Units/M	Pcs/M	Pcs/M	1000Pcs/M	Pcs/day	¥1000/M	Pcs/day	Mil.Yen/M		Units/M	Pcs/M	1000Pcs/yr
1.Production	5,000	90,000	100,000	100	20,000	10,000	120,000	70,000	1,000	1,000		25,000	100,000	10,000
2.Land(m2)	200,000	100,000	200,000	50,000	150,000	100,000	15,000	3,000	10,000	100,000	3,000	100,000	5,000	30,000
Facility		20,000	80,000	10,000	15,000	25,000	5,000	750	2,500	15,500	1,000	35,000	2,300	10,000
3.Employment (persons)	2,500	700	2,000	140	600	400	400	60	160	350	70	550	150	700
4.Power Supply (kW)	16,000	4,000	5,500	700	2,300	6,000	470	150	400	2,200	600	2,500	180	30,000
(V)	6,600	6,600		400	6,000	66,000		6,600	6,600	6,000			3,300	
5.Water(m3/d)														
Supply	15,900	160	500	10	200	35	60		45	100	30	250	50	2,880
Recycle	4,100	40	100		200		70		20	90	120	50		2,880
Total	20,000	200	600	10	400	35	130		65	190	150	300	50	5,760
6.Waste Water (m3/d)	15,900	160	500	10	200	35	60		45	100	30	250	50	2,880

CHAPTER 5

BASIC DESIGN OF FIRST PHASE INDUSTRIAL ZONE

5. BASIC DESIGN OF FIRST PHASE INDUSTRIAL ZONE

5.1 Land Preparation

5.1.1 Land Use Plan

The total area of industrial zone in the first phase is planned to be 250 ha or 17% of whole Park of 1,450ha. To meet the overall development concept in the Hi-Tech Industrial Park, R & D, administration, and supporting facilities for the industries are planned to be located in the Industrial Zone and Urban Zone (Urban block) to present an attractive business environment to private enterprises from the first stage. Parks and green belts are provided for the environmental quality and scenic beauty. Factory lots are provided to meet the requirement of target Hi-Tech and supporting industries. Thus the land use of Industrial Zone is planned as shown in Fig. 5.1.1. The area occupied by each lot or blocks of Industrial Zone is as follows:

	Zoning	Area (ha)	Ratio (%)
(1)	Factory lot	137.0	55
(2)	Urban block	14.5	6
(3)	R & D block	8.7	3
(4)	Utilities w/CTP,temporary yard	56.3	22
(5)	Parks and green belts	33.5	14
	Total	250	100

The condition and breakdown of land use are summarized belows:

(1) Factory lot

The factory area is divided into four major lots; large lots of 10 ha, medium lots of 5 ha and 3 ha, and small lots of 1 ha. They are allocated so as to be combined or sub-divided in accordance with the requirement of investors. The factory lots of 33 in total are provided as shown below for both foreign and local investors according to the targeted industries to be introduced in the first phase.

– large lot	:	10 ha	*	6 lots	=	60 ha
– medium lot	:	5 "	*	7 "	=	35 "
– "	:	3 "	*	10 "	=	30 "
– small lot	:	1 "	*	10 "	=	10 "
Total				33 lots		135 ha /1

/1 : Total area is measured as 137 ha on the basis of map on a scale of 1/6,000.

The layout of factory lot is made under the following conditions.

- to locate large factory lot along arterial road and flat land comparatively.
- to set up lot for local industries adjacent to large industries and urban zone to expect inter relationship and communication.

Design elevation of factory lots is indicated in Fig. 5.1.1.

(2) Urban block

In order to provide various services for the investors, the following related facilities are proposed to be introduced in the same implementation stage of the industrial zone.

– the core (skill development centre, teleport, administration core, business centre and central plaza)	:	5 ha
– others (shopping facility, fire station, police station, hotel, etc.)	:	9.5ha
Total		14.5ha

Administration core and supporting facilities are planned to be located at urban zone (Urban block) and at boundary between industrial zone and housing zone in order to ensure convenience for both factories and inhabitant.

(3) R & D block : 8.7 ha

R & D block is provided mainly for public R & D institutes. It is important for this Hi-Tech Industrial Park that the public R & D institutes should play a role to prepare the environment in order to invite private R & D institutes well as

interface between production and research.

R & D block locates on the hill side in order to provide researches in silent natural environment and to ensure close relationship to the industries.

(4) Utilities

The occupancy area of utilities is derived from the basic design study as presented in the respective sectors.

– roads	:	20.0ha
– drainage channels and retention ponds	:	18.5ha
– sub-station	:	1.7ha
– central treatment plant	:	3.4ha
– storage yard for industrial waste	:	10.7ha
Total		56.3ha

(5) Parks and green belts : 33.5 ha

A total area of 33.5 ha is provided as the parks and green belts including the existing greenery in order to make a aesthetically pleasing environment amenities.

5.1.2 Design Condition

The design conditions/standards stipulated below and in the Annex are applied to the design of land preparation. However, these values should be reviewed after study of the soil and geological investigation survey in the further study.

(a) Factory land gradient : 0.5 to 1.0 %
(b) Cut and fill slope : 1 : 1.5 to 2.0
(c) Following swell and shrinkage factors are applied:

Material	Loose/bank	Embank/bank
Common soil	1.20	0.90
Coase,sand & gravel	1.15	1.02
Rock	1.60	1.15

(d) The following Malaysian standard/criteria are to be referred:

- Town and country planning act, 1976
- Local government act, 1976
- Uniform building by low, 1984

5.1.3 Earthwork Volume

Present geography is utilized as far as possible from the viewpoint of cost saving and landscape. Earthwork volume of Industrial Zone is calculated as follows:

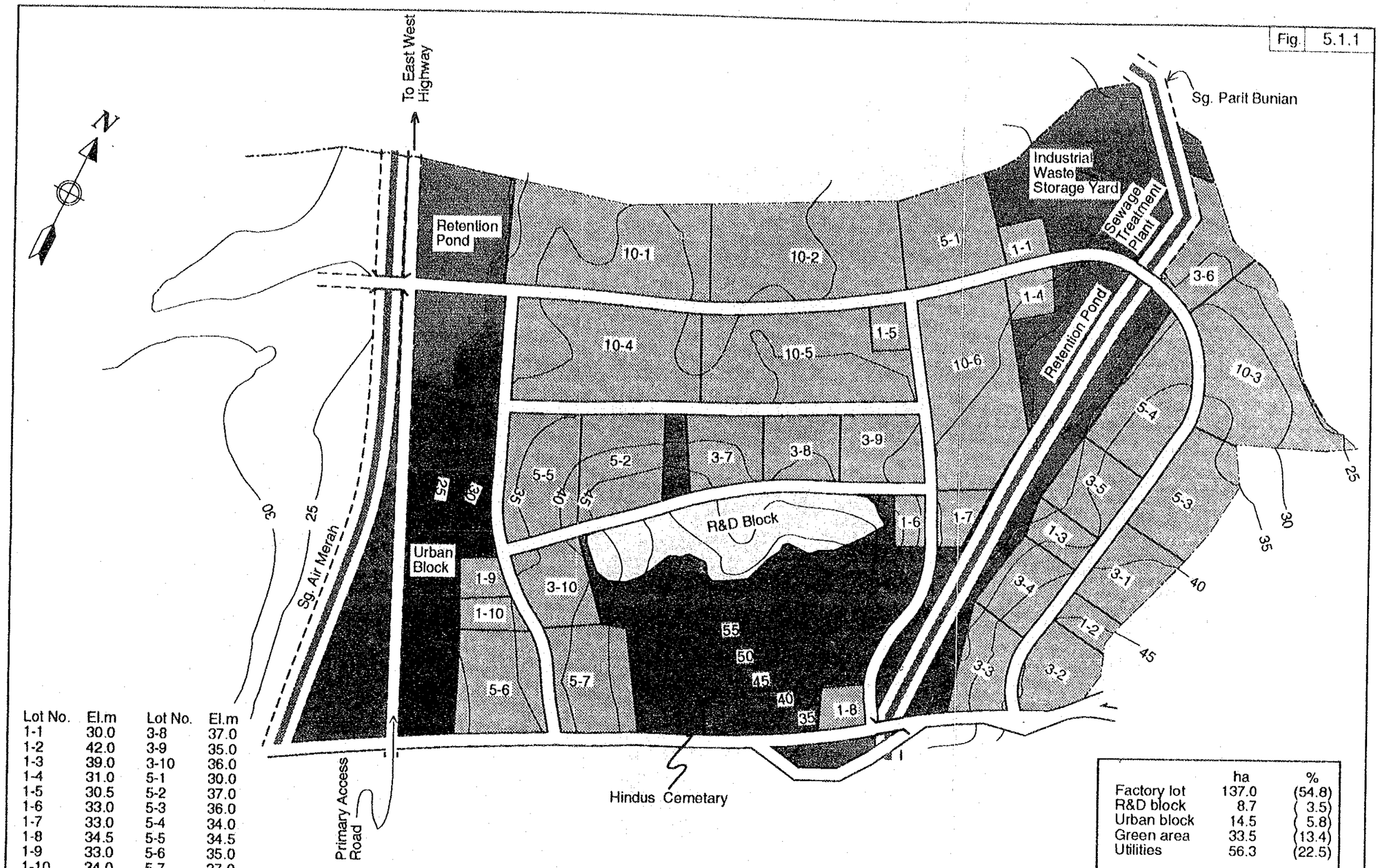
Lot/Block	Cut (m^3)	Fill (m^3)	Balance (m^3)
Factory	2,060,000	1,800,000	+260,000
Urban block	30,000	470,000	- 440,000
R & D block	250,000	35,000	+215,000
CTP,temporary yard	86,000	290,000	- 204,000
Roads	270,000	150,000	+120,000
Drainage	210,000	70,000	+140,000
Sewerage	60,000	50,000	+ 10,000
Retention ponds	210,000	0	+210,000
Total	3,176,000	2,865,000	+311,000

Fig. 5.1.2 illustrates cut and fill of earthworks. Figs. 5.1.3 (1) to (5) show typical cross sections.

5.1.4 Construction Plan and Schedule

The land preparation and construction of utilities for the Industrial Zone of 1st phase are scheduled to be commenced in April 1992 and completed in June 1993. Net workable period for the earthwork will be 10 months due to weather conditions and holidays.

Fig. 5.1.1



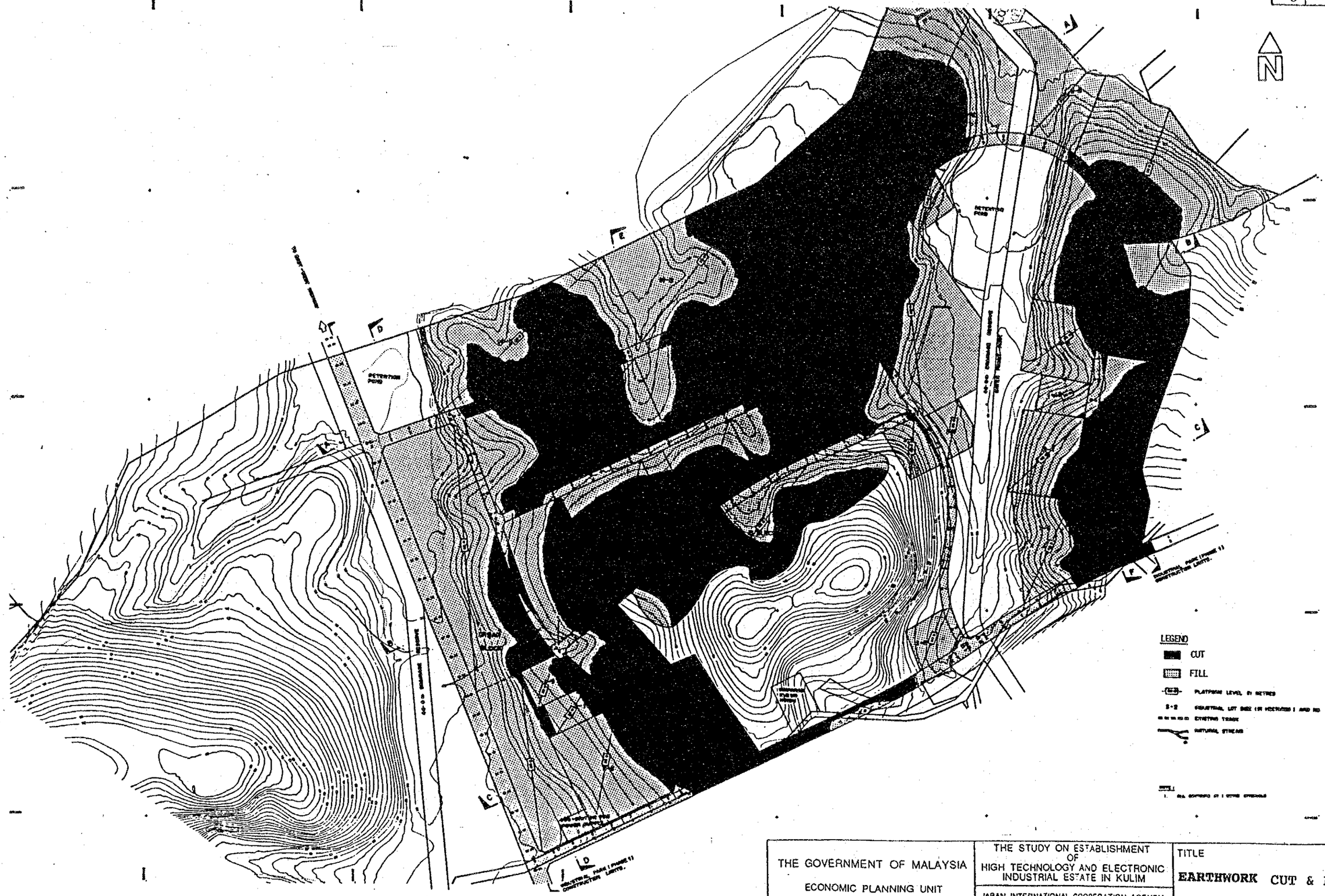
Lot No.	El.m	Lot No.	El.m
1-1	30.0	3-8	37.0
1-2	42.0	3-9	35.0
1-3	39.0	3-10	36.0
1-4	31.0	5-1	30.0
1-5	30.5	5-2	37.0
1-6	33.0	5-3	36.0
1-7	33.0	5-4	34.0
1-8	34.5	5-5	34.5
1-9	33.0	5-6	35.0
1-10	34.0	5-7	37.0
3-1	39.0	10-1	30.0
3-2	44.0	10-2	30.0
3-3	43.5	10-3	33.0
3-4	42.0	10-4	30.5
3-5	36.5	10-5	30.5
3-6	30.5	10-6	32.0
3-7	38.0		

SCALE
0 100 200 300 400 500m

	ha	%
Factory lot	137.0	(54.8)
R&D block	8.7	(3.5)
Urban block	14.5	(5.8)
Green area	33.5	(13.4)
Utilities	56.3	(22.5)
Total	250.0	

THE GOVERNMENT OF MALAYSIA ECONOMIC PLANNING UNIT	THE STUDY ON ESTABLISHMENT OF KULIM HI-TECH INDUSTRIAL PARK JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE Land Use Plan

Fig. 5.1.2



THE GOVERNMENT OF MALAYSIA ECONOMIC PLANNING UNIT	THE STUDY ON ESTABLISHMENT OF HIGH TECHNOLOGY AND ELECTRONIC INDUSTRIAL ESTATE IN KULIM JAPAN INTERNATIONAL COOPERATION AGENCY	TITLE **EARTHWORK CUT & FILL**