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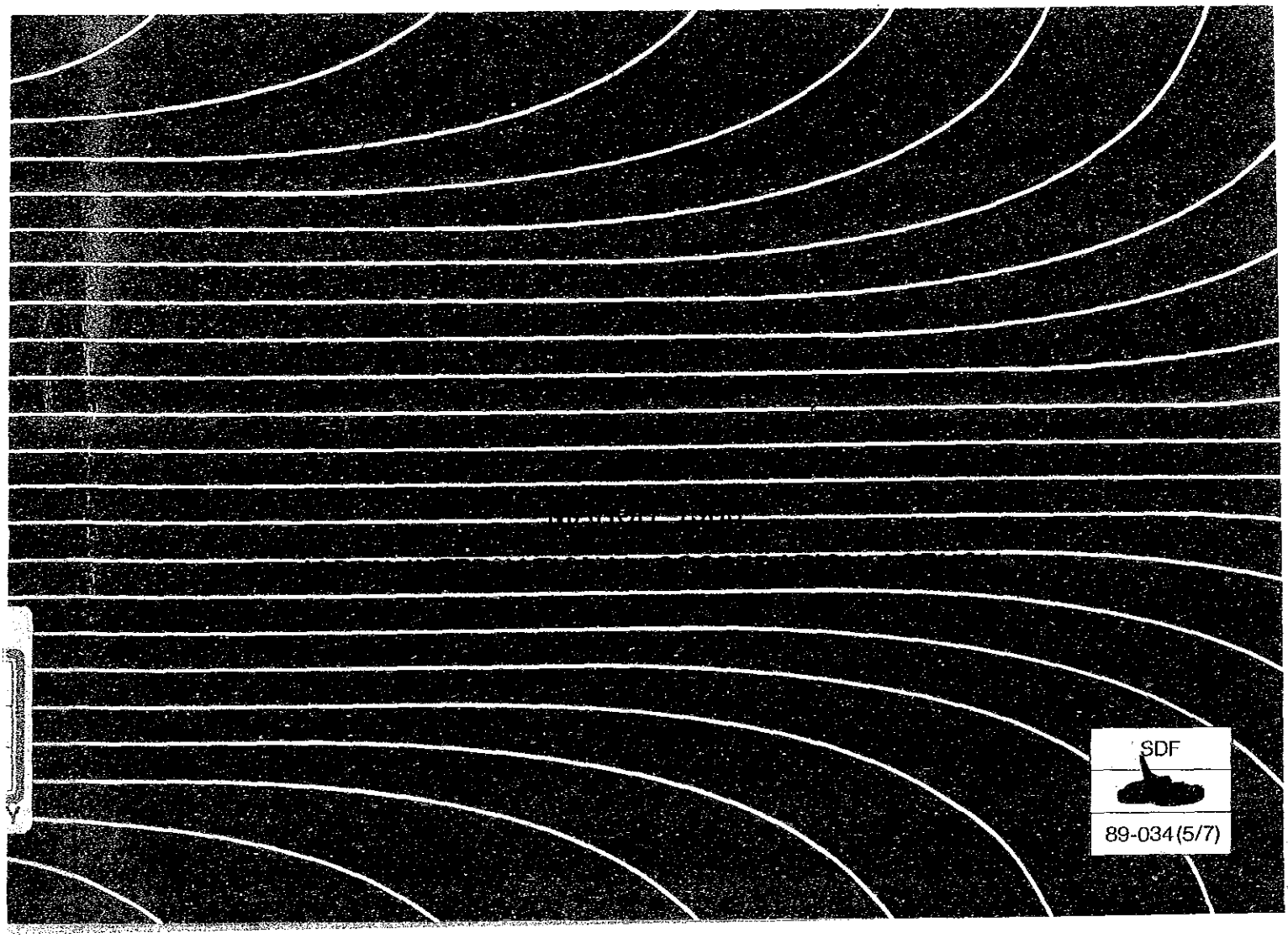
No. 02

KINGDOM OF THAILAND
MINISTRY OF TRANSPORT AND COMMUNICATIONS
DEPARTMENT OF HIGHWAYS

ROAD DEVELOPMENT STUDY IN THE CENTRAL REGION

FEASIBILITY STUDY

FINAL REPORT
MAIN TEXT
(VOLUME Ⅱ-1)



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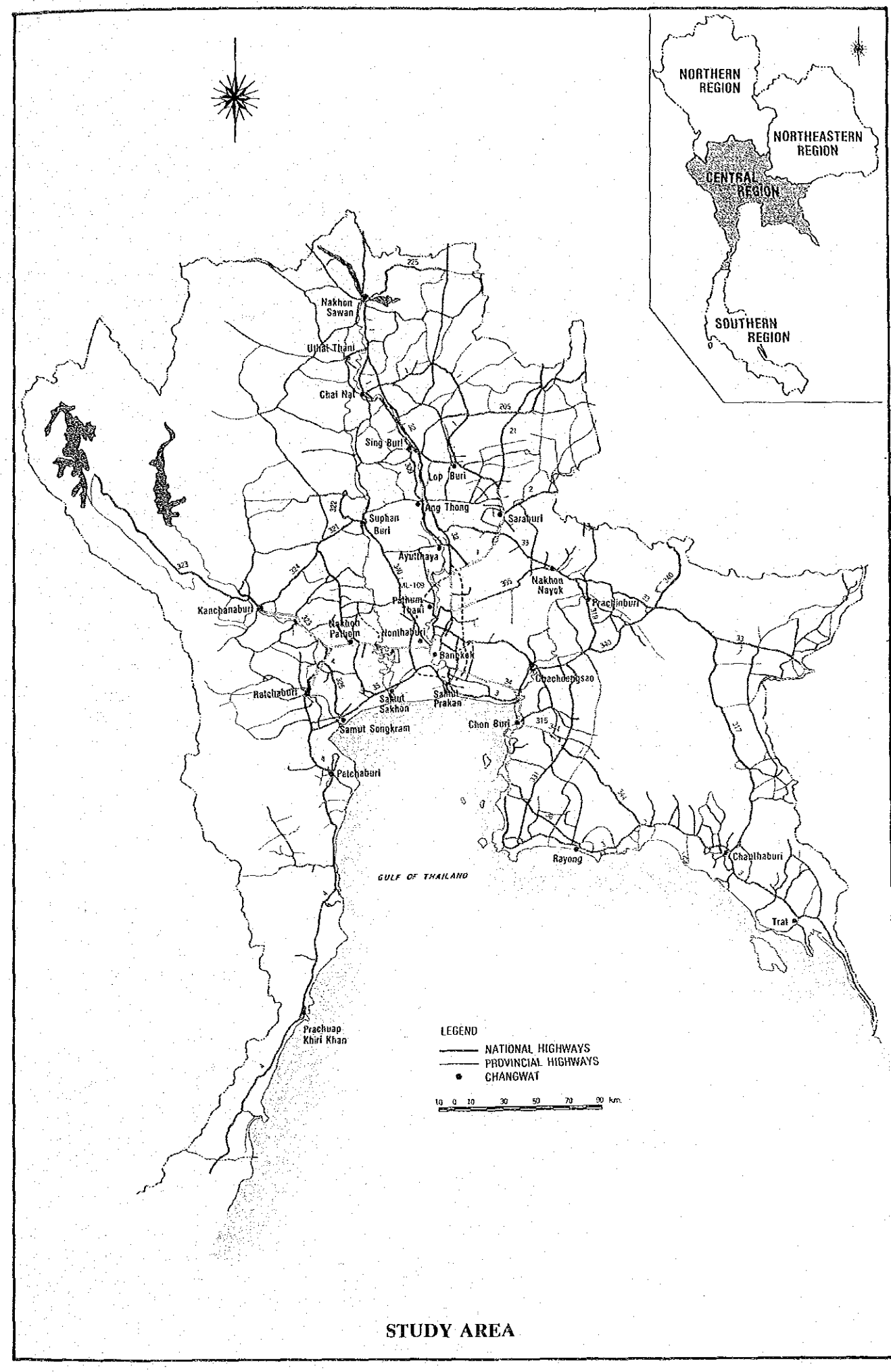
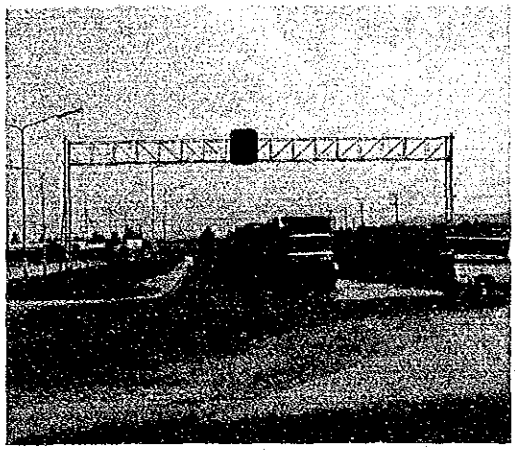
MARCH 1989

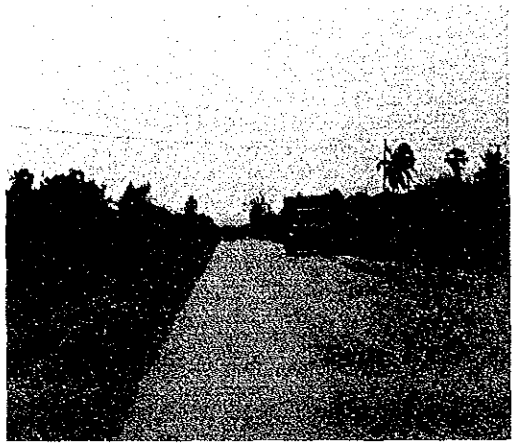
JAPAN INTERNATIONAL COOPERATION AGENCY


NORTHERN REGION
NORTHEASTERN REGION
CENTRAL REGION
SOUTHERN REGION
Nakhon Sawan
Uthai Thani
Chai Nat
Sing Buri
Lop Buri
Ang Thong
Saraburi
Suphan Buri
Ayutthaya
Nakhon Nayok
Prachinburi
Kanchanaburi
Pathum Thani
Nakhon Pathom
Nonthaburi
Bangkok
Chachoengsao
Ratchaburi
Samut Sakhon
Samut Prakan
Samut Songkram
Chon Buri
Petchaburi
Rayong
Chanthaburi
Trat
GULF OF THAILAND
Prachuap Khiri Khan
LEGEND
NATIONAL HIGHWAYS
PROVINCIAL HIGHWAYS
CHANGWAT
km.

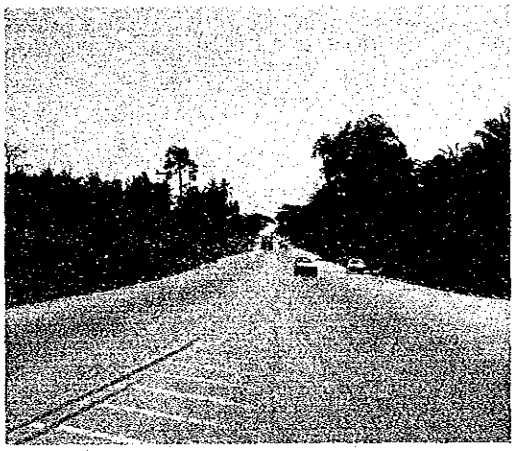
STUDY AREA



ML-1 Beginning Point (Chon Buri Bypass)

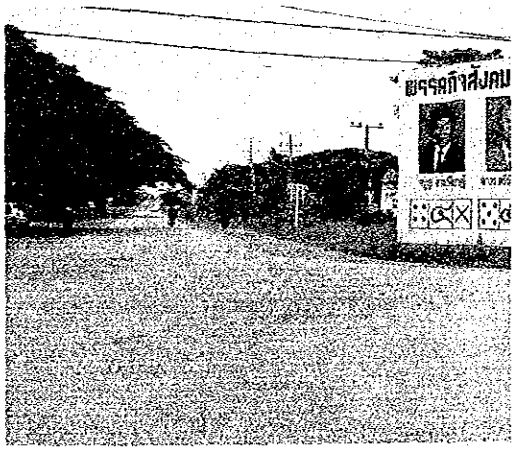


ML-1 Typical View

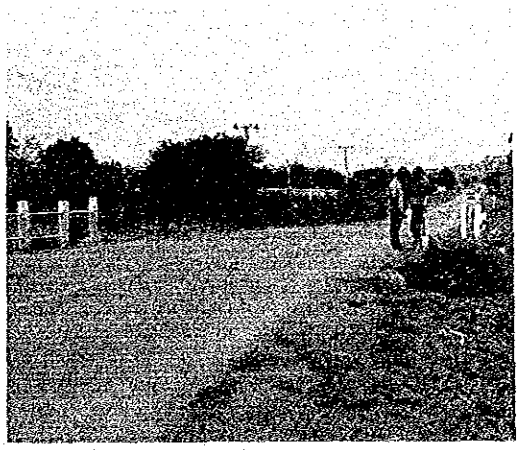


ML-2 Beginning Point

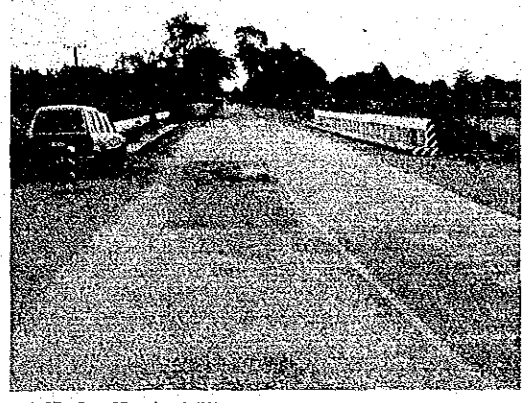
ML-2 End Point



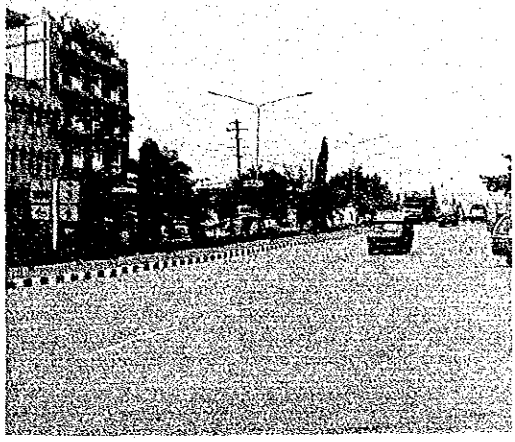
ML-3 Beginning Point (Amphoe Sattahip)



ML-3 Narrow Bridge

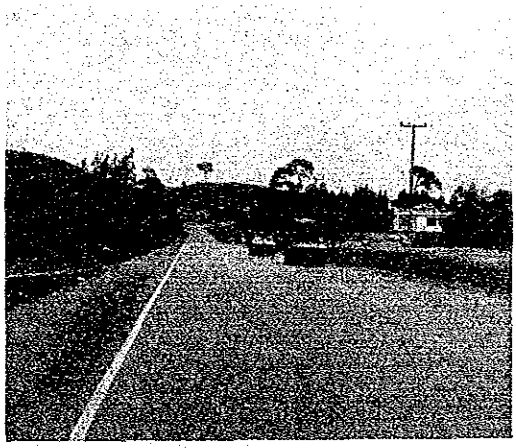


ML-3 Typical View

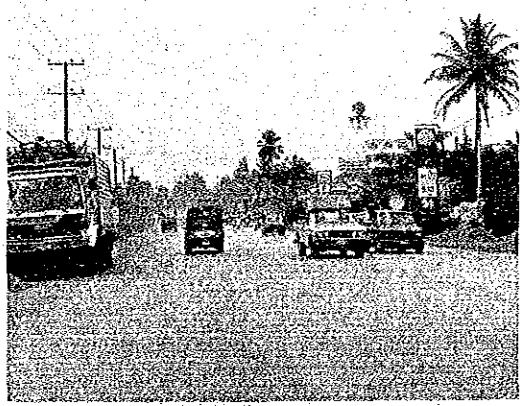


ML-3 End Point (Changwat Rayong)

ML-4 Beginning Point (Amphoe Kleang)

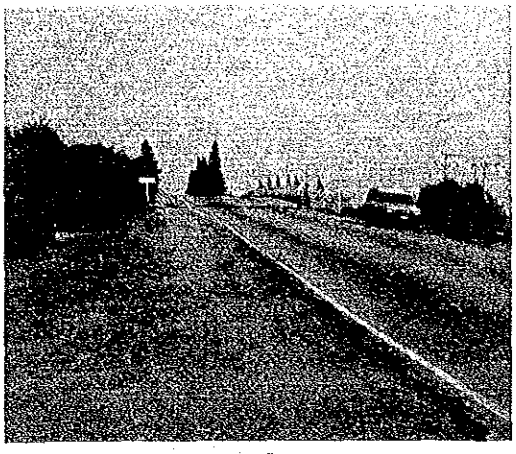


ML-4 Typical View

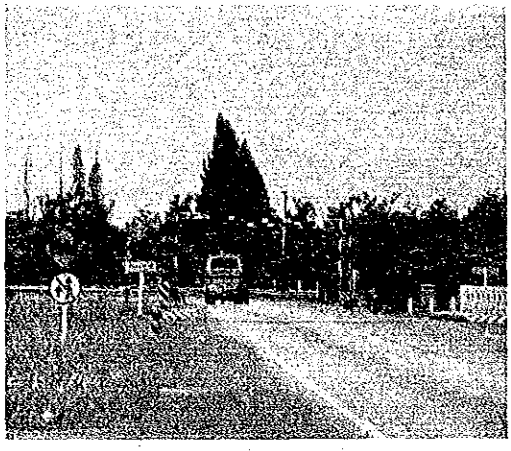


ML-4 Urban Section (Changwat Chanthaburi)

ML-7 Near Beginning Point (Amphoe Min Buri)



ML-7 Khlong Luang Phraeng Bridge



ML-7 Near End Point (Changwat Chachoengsao)

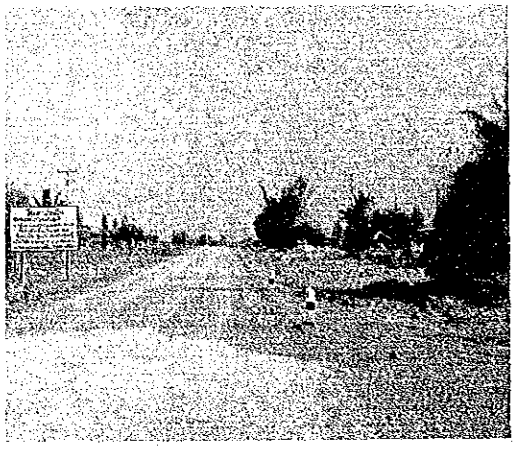
ML-9 Beginning Point (near Srinakarin Road)

ML-9 Landsat Satellite Receiver Station

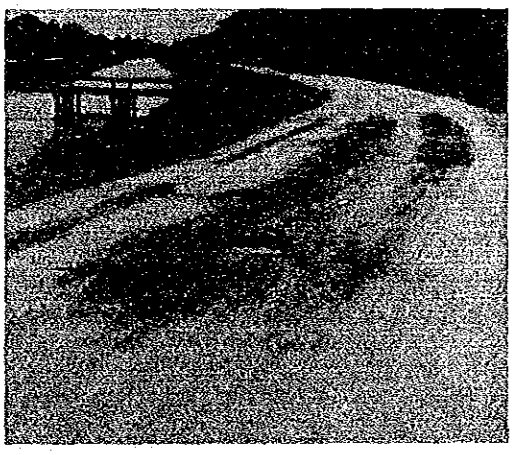
ML-9 Soft Ground Section

ML-9 Near End Point (in cassava field)

IM-1 Laterite Surface Condition in Rainy Season

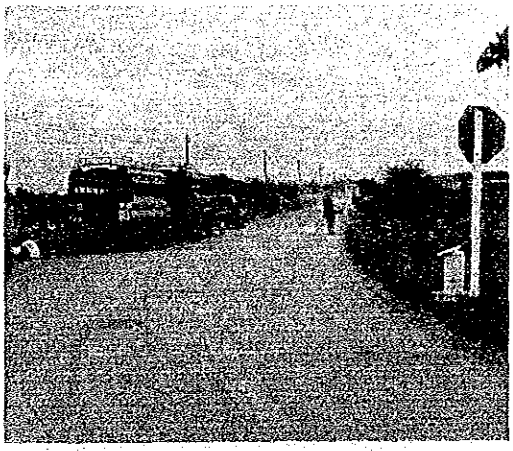


IM-2 End Point (near Amphoe Lao Khwan)



IM-11 Typical View

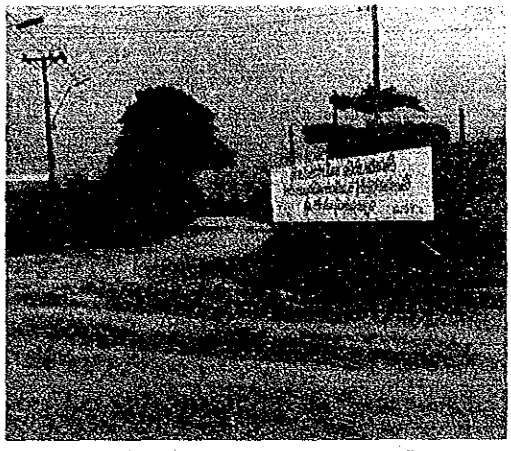
IM-12 Typical View



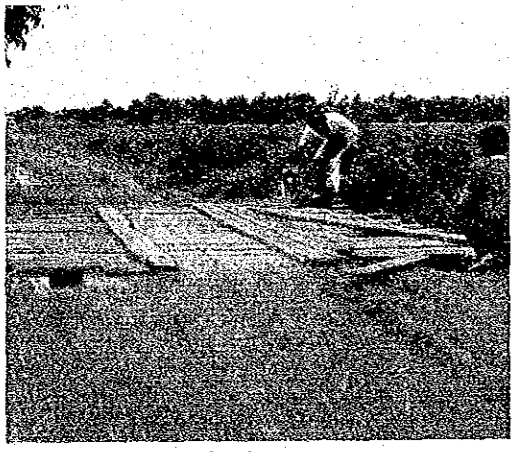
IM-13 Beginning Point (Amphoe Bang Pa-in)

IM-13 Near End Point (Changwat Ayutthaya)

IM-14 Beginning Point (Amphoe Wang Noi)

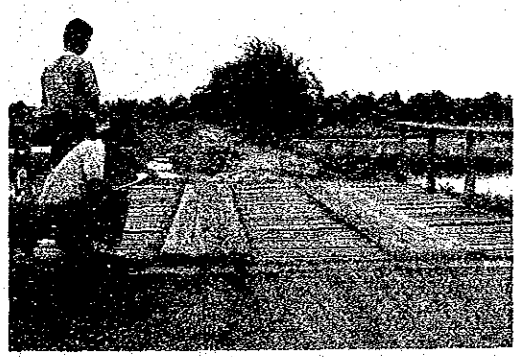


IM-15 End Point (Amphoe Min Buri)

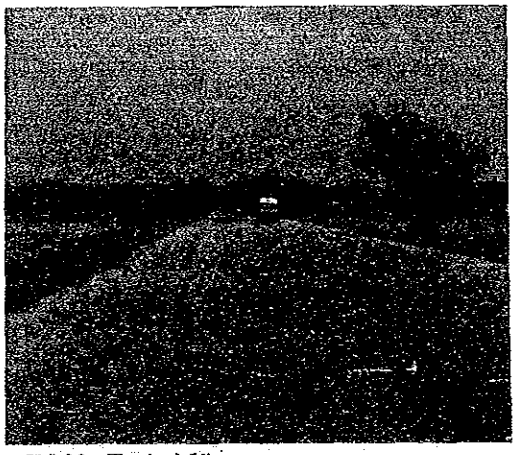


IM-16 Flooding Section

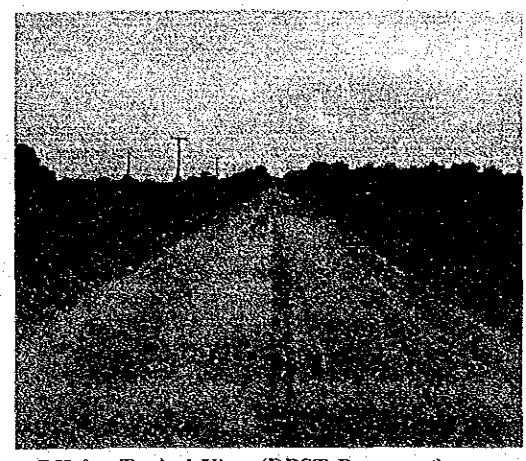
IM-17 Khlong Tup Yao Bridge



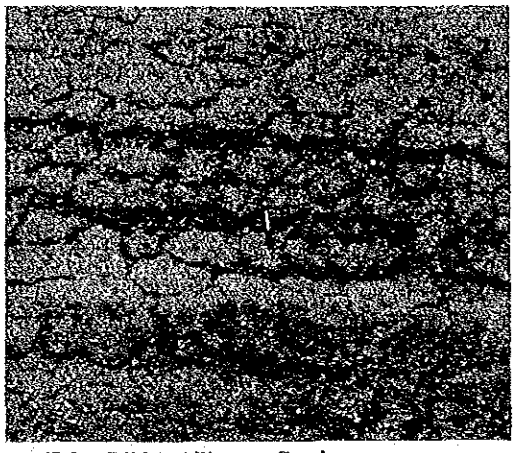
IM-22 Temporary Bridge & Typical View



IM-23 Typical View

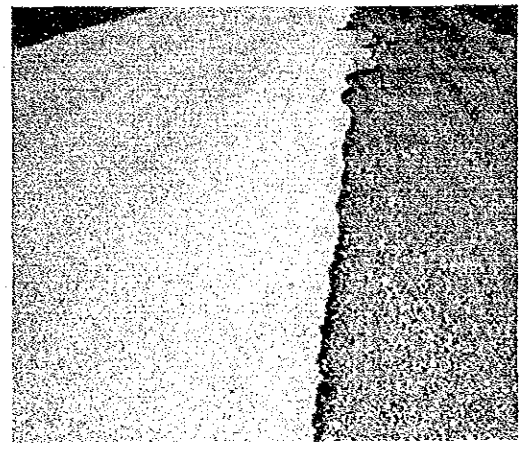


RH-2 Typical View (DBST Pavement)



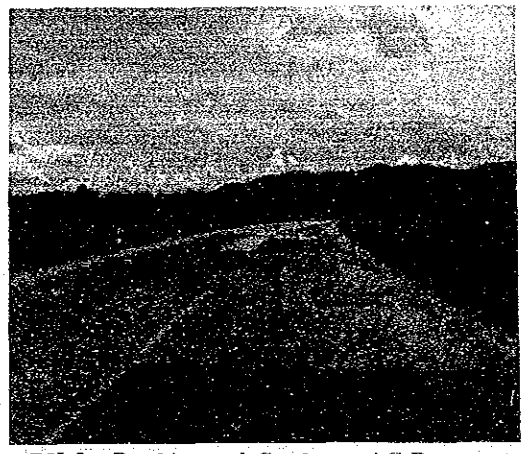
RH-2 DBST Alligator Cracks

RH-3 Typical View (DBST Pavement)



RH-3 Damage to Pavement Edge

RH-5 Typical View (AC Pavement)



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ABBREVIATIONS

AADT	:	Annual Average Daily Traffic
AASHTO	:	American Assopciation of State Highway and Transportation Officials
ADT	:	Average Daily Traffic
B/C	:	Benefit Cost ratio
BC	:	Business and Commercial
CBR	:	Californa' Bearing Ratio
DBST	:	Double Bituminous Surface Treatment
DOH	:	Department of Highway
EPZ	:	Export Processing Zone
ESA	:	Equivalent Standard Axles
ETA	:	Expressway and Rapid Transit Authority of THAILAND
FSH	:	Feasibility Study Handbook
GDP	:	Gross Domestic Product
GIA	:	General Industrial Area
GIE	:	General Industrial Estate
H/B, HB	:	Heavy Bus
H/T, HT	:	Heavy Truck
ICD	:	Inland Coantainer Depot
IM	:	Improvement Projects
IRR	:	Internal Rate of Return
JRA	:	Japan Road Association
L/B, LB	:	Light Bus
L/T, LT	:	Light Truck
M/B, MB	:	Medium Bus
MC	:	Motor Cycle
ML	:	New Four-Lanes Highway or Additional Two Lanes Projects
M/T, MT	:	Medium Truck
NSO	:	National Statistical Office
O/D	:	Origin/Destination
OESB	:	Office of the Eastern Seaboard Development Committee
P/C, PC	:	Passenger Car
PCC	:	Portland Concrete Cement
PCU	:	Passenger Car Units
PHF	:	Peak Hour Factor
P/T	:	Pick up Truck
PWD	:	Public Works aof Department
RH	:	Rehabilitation Projects
SPT	:	Standard Penetration Test
TPMS	:	Thai Pavement Maanagement System

VOC	:	Vehicle Operating Cost
4WT	:	4-Wheel Truck
6WT	:	6-Wheel Truck
10WT	:	10-Wheel Truck

CHAPTER 1
SUBJECT ROADS AND SCOPE OF WORK

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SUBJECT ROADS AND SCOPE OF WORK

The Master Plan Study reported in a separate volume resulted in a prioritized list of roads to be improved. The improvement of six roads among them was considered urgent, and their feasibility studies were commenced immediately after the Master Plan Study as the Phase I Feasibility Study. Later, more roads were selected to be the subject of the Phase II Feasibility Study. Additional study of the Bangkok-Chon Buri new Highway (ML-9) was also carried out following a request by DOH. This report describes the results of feasibility studies of 21 routes, six in Phase I and 15 in Phase II.

1.1 STUDY ROUTES

The Feasibility Study was carried out for the 21 routes with a total length of 714.2 km listed in Table 1.1.1 for Phase I and Tables 1.1.2 and 1.1.3 for Phase II (see Figure 1.1.1).

The ML Projects are those selected based on an analysis of road congestion. ML-1, ML-2, ML-3, ML-4 and ML-7 are to add two new lanes to two existing lanes, while ML-5 and ML-9 are new construction planned primarily for the Eastern Seaboard Development Program.

IM Projects are primarily for widening and paving of existing two-lane roads to upgrade, while RH Projects are for rehabilitation of deteriorated existing pavement.

TABLE 1.1.1 STUDY ROUTES (PHASE I)

Project No.	Route No.	Origin		Destination	Length (km)
ML-1	3	Chon Buri Bypass			13.6
ML-2	3	Pattaya	-	Sattahip	27.3
ML-4	3	Klaeng	-	Chanthaburi	61.9
ML-5		Chon Buri	-	Pattaya New Highway	50.3
ML-7	304	Min Buri	-	Chachoengsao	40.9
IM-23	3267	J.R. 32	-	Tha Rua	26.9
				Total	220.9

Table 1.1.2 STUDY ROUTES (PHASE II, IMPROVEMENT AND NEW CONSTRUCTION)

Project No.	Route No.	Origin		Destination	Length (km)
IM-1	PWD	A. Bang Len	-	B. Bang Noi Nai	18.7
IM-2	3306	B. Nong Pru	-	A. Lao Khwan	35.9
IM-11	RID	B. Chanasut	-	A. Pho Thong	40.7
IM-12	RID	A. Pho Thong	-	A. Sena	51.0
IM-13	PWD	A. Bang Pa-in	-	C. Ayutthaya	17.8
IM-14	RURAL	A. Wang Noi	-	A. Thanyaburi	25.6
IM-15	RURAL	B. Klong Luang	-	A. Min Buri	24.7
IM-16	3312	A. Lam Luk Ka	-	B. Khlong 16	20.8
IM-17	PWD	A. Lat Krabang	-	B. Khlong Tha Thua	19.2
IM-22	RURAL	A. Nong Chok	-	A. Bang Nam Prieo	15.9
ML-3	3	A. Sattahip	-	C. Rayong	44.6
ML-9	-	Bangkok	-	Chon Buri	81.7
				Total	396.6

Table 1.1.3 STUDY ROUTES (PHASE II, REHABILITATION)

Project No.	Route No.	Origin		Destination	Length (km)
RH-2	225	J. Route 1	-	Chumsaeng	39.5
RH-3	325	Damnoen Saduak	-	Samut Songkram	17.9
RH-5	344	Ban Bung	-	Ban Khlong Phu	39.3
				Total	96.7

1.2 STUDY ACTIVITIES

The following activities were carried out in order to achieve the objectives of the Feasibility Study:

- Review of the Master Plan Study.
- Review of the Eastern Seaboard Development Program and other related development programs.
- Traffic investigations such as traffic counts and origin/destination (O/D) surveys.
- Engineering investigations such as topographic surveys, soil investigations, construction materials investigations and hydrological investigations.

- Route location study and preliminary engineering design.
- Estimation of construction costs to an accuracy of 20%.
- Traffic projections and calculation of benefits.
- Economic evaluation by net present value (NPV), benefit cost ratio (B/C), and economic internal rate of return (IRR).
- Optimal phasing for implementation.

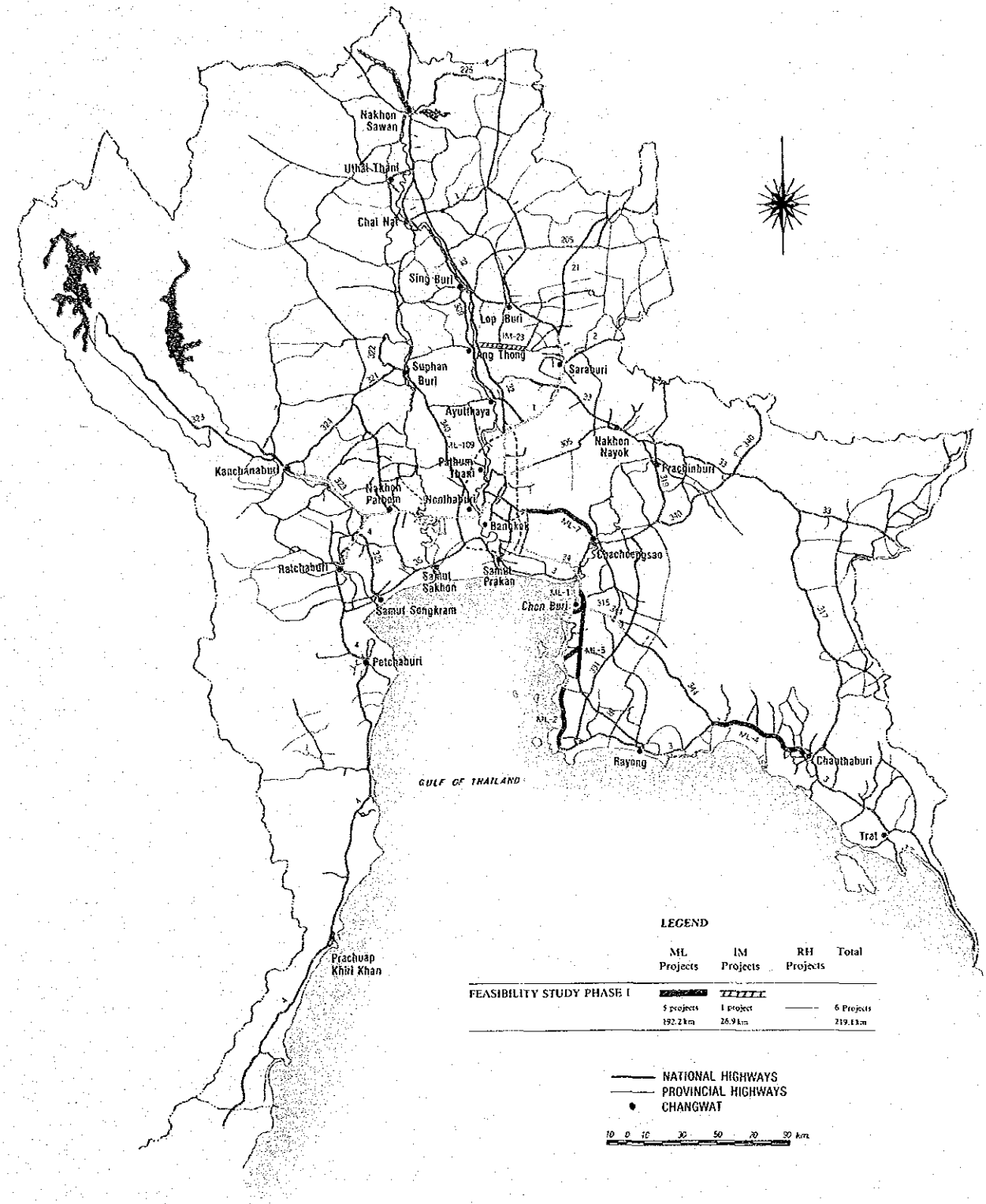


Figure 1.1.1(1) STUDY ROUTES (PHASE I)

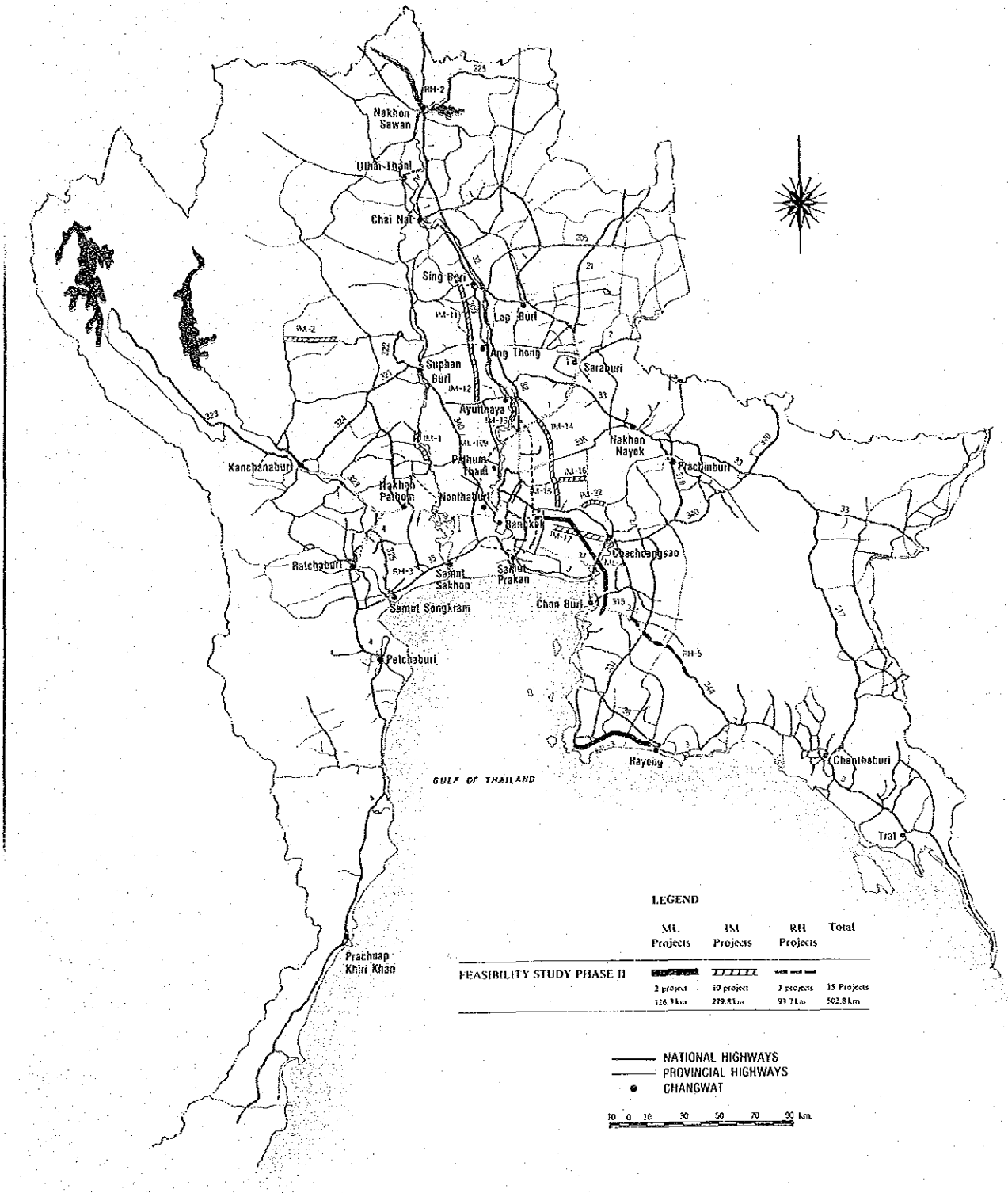


Figure 1.1.1(2) STUDY ROUTES (PHASE II)

CHAPTER 2

EFFECT OF PLANNED DEVELOPMENTS ON PROPOSED ROUTES

CHAPTER 2
EFFECT OF PLANNED DEVELOPMENTS ON PROPOSED ROUTES

Many of the projects such as ML-1, ML-3, ML-5 and ML-9 were conceived in anticipation of increased traffic that will be generated by large scale development projects planned or under implementation in the Central Region. The Eastern Seaboard Development Program is particularly important because of its size, and the Lat Krabang Industrial Estate, the Inland Container Depot and the Second Bangkok International Airport are also important projects. This chapter examines such development plans specifically in terms of their potential effect on road traffic.

2.1 EASTERN SEABOARD DEVELOPMENT PROGRAM

The latest information concerning the Eastern Seaboard Development Program was collected and the existing estimates for the generated traffic from the Laem Chabang Industrial Complex and the Map Ta Phut Industrial Complex were reviewed and updated.

2.1.1 Laem Chabang Industrial Complex

The Laem Chabang Industrial Complex will have a commercial deep-sea port, an industrial estate and an export processing zone backed up by complete urban center and essential infrastructures.

1) Generated Freight Volume

Industrial Estate

The basic land use for development of the industrial estate consists of three areas: the General Industrial Estate (GIE), the Export Processing Zone (EPZ) and the Business and Commercial Area (BC), as shown in Figure 3.3.2 in the Master Plan Study Report.

The GIE and EPZ are planned not only for such agro-industries as food processing, animal feed, leather and rubber products, but also for such other export-oriented industries as elec-

tronics, auto parts and manufactures of toy and sport good.

The BC is planned as a commercial zone to serve the industrial complex, the port and the future urban area to be developed in the vicinity.

Table 2.1.1 prepared by the Office of the Eastern Seaboard Development Committee (OESB): shows the area and number of employees in the industrial estate.

Table 2.1.1 AREA AND NUMBER OF EMPLOYEES

	1995			2001		
	Area (Rai)	(ha)	Number of Employees	Area (Rai)	(ha)	Number of Employees
GIE	1,278	204	12,270	1,752	280	16,820
EPZ	359	57	12,920	871	139	31,360
BC	146	23	13,000	146	23	21,500

Generated cargo volume by production activities in the GIE and EPZ areas were estimated based on the relationship between the number of employees and production volume.

The following relationship given by a JICA Study was considered appropriate:

For the GIE

- 4,040 workers generate an outgoing cargo volume of 500,000 tons per year and an incoming cargo volume of 570,000 tons per year.

- 15,000 workers generate an outgoing cargo volume of 1,264,000 tons per year and an incoming cargo volume of 1,432,000 tons per year.

For the EPZ

- 5,430 workers generate an outgoing cargo volume of 100,000 tons per year and an incoming cargo volume of 110,000 tons per year.

- 19,000 workers generate an outgoing cargo volume of 176,000 tons per year and an incoming cargo volume of 194,000 tons per year.

Using the above relationships, outgoing and incoming cargo volumes were estimated by interpolation or extrapolation, as shown in Table 2.1.2:

Table 2.1.2 ATTRACTED AND GENERATED CARGO VOLUMES

(Unit: tons/year)

	1995	2001
GIE Total	2,238,000	2,883,000
Outgoing	1,049,000	1,352,000
Incoming	1,189,000	1,531,000
EPZ Total	298,000	516,000
Outgoing	142,000	245,000
Incoming	156,000	271,000

Break-bulk cargo and export volumes of agricultural products were estimated on the basis of the Design Report of the Laem Chabang Port Project as shown in Tables 2.1.3. and 2.1.4:

Table 2.1.3 BREAK-BULK CARGO

(Unit: tons)

	1991	2001
Rice	200,000	230,000
Iron and Steel	100,000	120,000
Others	20,000	30,000
Total	320,000	380,000

Table 2.1.4 EXPORT VOLUMES OF AGRICULTURAL PRODUCTS

(Unit: thousand tons)

	1991	2001
Topioca	1,300	1,300
Sugar	550	550
Molasses	230	230

Commercial Port

The port will provide a new commercial gateway for containerized and break-bulk cargo to and from Thailand. It will be capable of berthing 2000-TEU vessels from the start of operation of the first stage in 1991.

Considering the high increase in the containerized cargo traffic of Thailand with a growth rate of 20% during 1982–1987, a projection of containerized cargo traffic was made on the basis of projections prepared from MOT[1], PF[2], and PAT study[3]. This is shown in Table 2.1.5:

Table 2.1.5 CONTAINERIZED FREIGHT VOLUME

(Unit: TEU)

	1991	2001
Loaded		
Imported	187,000	468,000
Exported	153,000	382,000
Empty (15% of total)	60,000	150,000
Total	400,000	1,000,000

Note: TEU: Twenty-foot equivalent unit

2) Generated Freight Traffic

Industrial Estate

The average daily numbers of trucks by type were estimated from projected freight volume by using the following formulae and assumptions:

$$M = \frac{T}{20.801 \times W}, \qquad H = \frac{T}{11.989 \times W}$$

where, M: Number of medium trucks
H: Number of heavy trucks
T: Annual cargo volume
W: Annual average number of operation days taken as 240

These formulae were made from the results of the O/D Survey on Rt. 3 conducted by the Study Team.

A part of generated freight from the GIE and EPZ will be carried by ship, which was assumed at 100,000 tons per year from each area.

Note: [1]: Ministry of Transport and Communications
[2]: Port of Felixstowe International
[3]: Detailed Engineering Report for the Laem Chabang Port Project

The estimated number of trucks is shown in Table 2.1.6:

Table 2.1.6 NUMBER OF TRUCKS FROM GIE AND EPZ

(Unit: vehicles/day)

Type of Vehicle	1995	2001
GIE - Medium Truck	428	557
Heavy Truck	743	967
EPZ - Medium Truck	40	83
Heavy Truck	69	145

Commercial Port

The freight traffic in and out of the port will be carried by road or rail. Based on the market shares of each mode of transport forecasted by the Laem Chabang Port Project and the containerized freight traffic described in the Table 2.1.5, inland container movements were estimated as shown in Table 2.1.7:

Table 2.1.7 INLAND CONTAINER MOVEMENTS

(Unit: TEU)

	1991		2001	
Import Total	187,000	(100)	468,000	(100)
Road	140,000	(75)	304,000	(65)
Rail	47,000	(25)	164,000	(35)
Export Total	153,000	(100)	382,000	(100)
Road	122,000	(80)	287,000	(75)
Rail	31,000	(20)	95,000	(25)

Note: Figures in parentheses show market shares by mode of transport in %.

Based on the above inland container movements, the average daily number of trucks was estimated by using the following assumptions:

- Heavy trucks will transport containers to Bangkok, because the Laem Chabang Port is expected to handle overflow cargoes at Bangkok (Khlong Toey) Port.

- The empty truck ratio will be 30 %.

- The annual average number of operating days was taken as 300 days.

The estimated daily number of heavy trucks is shown in Table 2.1.8:

Table 2.1.8 NUMBER OF HEAVY TRUCKS CARRYING CONTAINERIZED CARGO

(Unit: Vechicles/day)

	1991	2001
Out	607	1,317
In	529	1,244
Total	1,136	2,561

The number of trucks of break-bulk cargo was estimated based on break-bulk cargo volumes by using the same formula described in the forecast of number of trucks from the GIE and the EPZ and the following assumptions:

- Rice will be carried by rail and barges, and other commodities by trucks.
- Annual average number of operating days is taken as 300 days.

The estimated daily number of trucks of break-bulk cargo is shown in Table 2.1.9:

Table 2.1.9 NUMBER OF TRUCKS WITH BREAK-BULK CARGO

(Unit: Vehicles/day)

Type of Vehicle	1991	2001
Medium Truck	19	24
Heavy Truck	33	42

The number of trucks carrying agricultural products was not estimated for project road ML-5. Because agricultural products were assumed to be carried through the south access road in the estate and Rt. 3, because the producing areas are located close to these roads.

3) Generated Passenger Traffic

Industrial Estate

Planning of a new urban area to support the port and industrial estate has been completed.

Table 2.1.10 prepared by OESB shows the estimated number of workers and residents in the New Town:

Table 2.1.10 NUMBER OF WORKERS AND RESIDENTS IN NEW TOWN

(Unit: persons)

	1995	2001
Workers	27,600	55,600
Residents	54,800	115,900

Movements of people in the area, in particular commuting workers, were estimated by allocating commuter origins and destinations as shown in Table 2.1.11:

Table 2.1.11 COMMUTER O&D

Area	1995			2001		
	Number of Workers	Commuting from New Town	Commuting from Other Area	Number of Workers	Commuting from New Town	Commuting from Other Area
GIE	12,270	8,430	3,840	16,820	13,010	3,810
EPS	12,920	8,870	4,050	31,360	24,260	7,100
BC	13,300	8,930	4,070	21,500	16,630	4,870
Port	2,000	1,370	630	2,200	1,700	500
Total	40,190	27,600	12,590	71,880	55,600	16,280

The percentage of vehicle types used and the number of passengers by vehicle type were taken at the same values as in the Laem Chabang Industrial Complex Detailed Engineering Design Report and are shown below:

(Unit: percent)

Type of Vehicle	1995	2001
Motorcycle	7	7
Passenger Car	20	25
Bus	73	68

Type of Vehicle	Number of persons/vehicle
Motorcycle	1.21
Passenger Car	1.5
Bus	70

Table 2.1.12 shows the daily volume of passenger traffic by vehicle type, and Appendix 2.1.1 shows more detail.

Table 2.1.12 PASSENGER TRAFFIC VOLUMES

(Unit: Vehicle/day)

Type of Vehicle	1995			2001		
	Commuting from			Commuting from		
	New Town	Other Areas	Total	New Town	Other Areas	Total
Motorcycle	3,190	1,460	4,650	6,430	1,880	8,310
Passenger Car	7,360	3,360	10,720	18,530	5,430	23,960
Bus	580	260	840	1,080	320	1,400
Total	11,130	5,080	16,210	26,040	7,630	33,670

The above passenger vehicle traffic was distributed to three main access roads in the estate such as the North Access Road, T-2 Road and the South Access Road (see Figure 3.3.2 in the Master Plan Study Report), using appropriate distribution factors estimated by the Laem Chabang Industrial Complex Detailed Engineering Design Report as shown in Appendix 2.1.2.

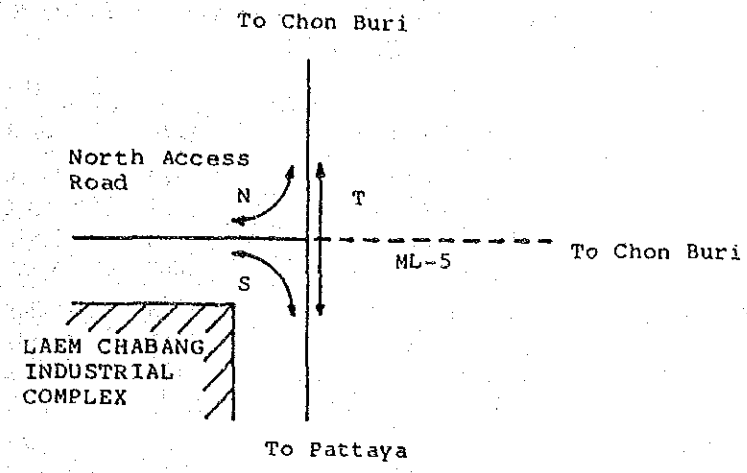
Moreover, passenger traffic commuting from other areas was estimated for the north and south directions by using the population distribution in nearby areas of the complex. It was estimated that 77% would come from the northern areas and 23% from the southern areas.

Therefore, daily passenger vehicle traffic volumes in relation to project road ML-5 were estimated as given in Table 2.1.13:

Table 2.1.13 PASSENGER TRAFFIC TO THE INDUSTRIAL ESTATE

(Unit: Vehicle/day)

Type of Vehicle	1995			2001		
	N	S	T	N	S	T
Motorcycle	294	284	737	374	412	969
Passenger Car	678	653	1,698	974	1,293	2,580
Bus	53	51	131	64	70	161
Total	1,025	988	2,566	1,412	1,775	3,710



Commercial Port

In the port area, passenger traffic will be generated by people who require close communication with offices in Bangkok. Such traffic will be related to freight traffic in volume.

The amount of passenger car traffic was estimated at 568 vehicles per day in 1991 and 1,281 vehicles per day in 2001 on the basis of a ratio of passenger car traffic to containerized cargo traffic of 0.5, which was obtained from the results of traffic surveys conducted in Japan.

4) Total Generated Traffic

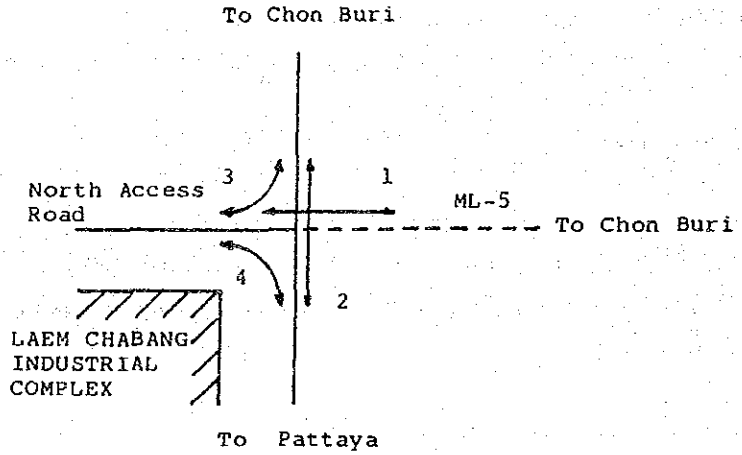
Combining the generated traffic volumes from the estate and the port, the total generated traffic due to the Laem Chabang Industrial Complex was estimated. In order to unify the difference in target years, the generated traffic in 1994, 2000 and 2008 was estimated by means of interpolation or extrapolation.

The results are shown in Table 2.1.14 and illustrated in Figure 2.1.1.

Table 2.1.14 TRAFFIC GENERATED FROM LAEM CHABANG INDUSTRIAL COMPLEX

(Unit: vehicles/day)

Direction	Type of Vehicle	1994	2000	2008
1. Complex - BKK on ML-5	Passenger Car	784	1,210	1,780
	Medium Truck	461	636	869
	Heavy Truck	2,362	3,522	5,069
	Total	3,607	5,368	7,718
2. Chon Buri - Pattaya	Motorcycle	698	930	1,240
	Passenger Car	1,551	2,433	3,609
	Heavy Bus	126	156	196
	Total	2,375	3,519	5,045
3. Complex - Chon Buri	Motorcycle	281	361	467
	Passenger Car	629	925	1,319
	Heavy Bus	51	62	77
	Total	961	1,348	1,863
4. Complex - Pattaya	Motorcycle	263	391	561
	Passenger Car	546	1,186	2,040
	Bus	48	67	92
	Total	857	1,644	2,693



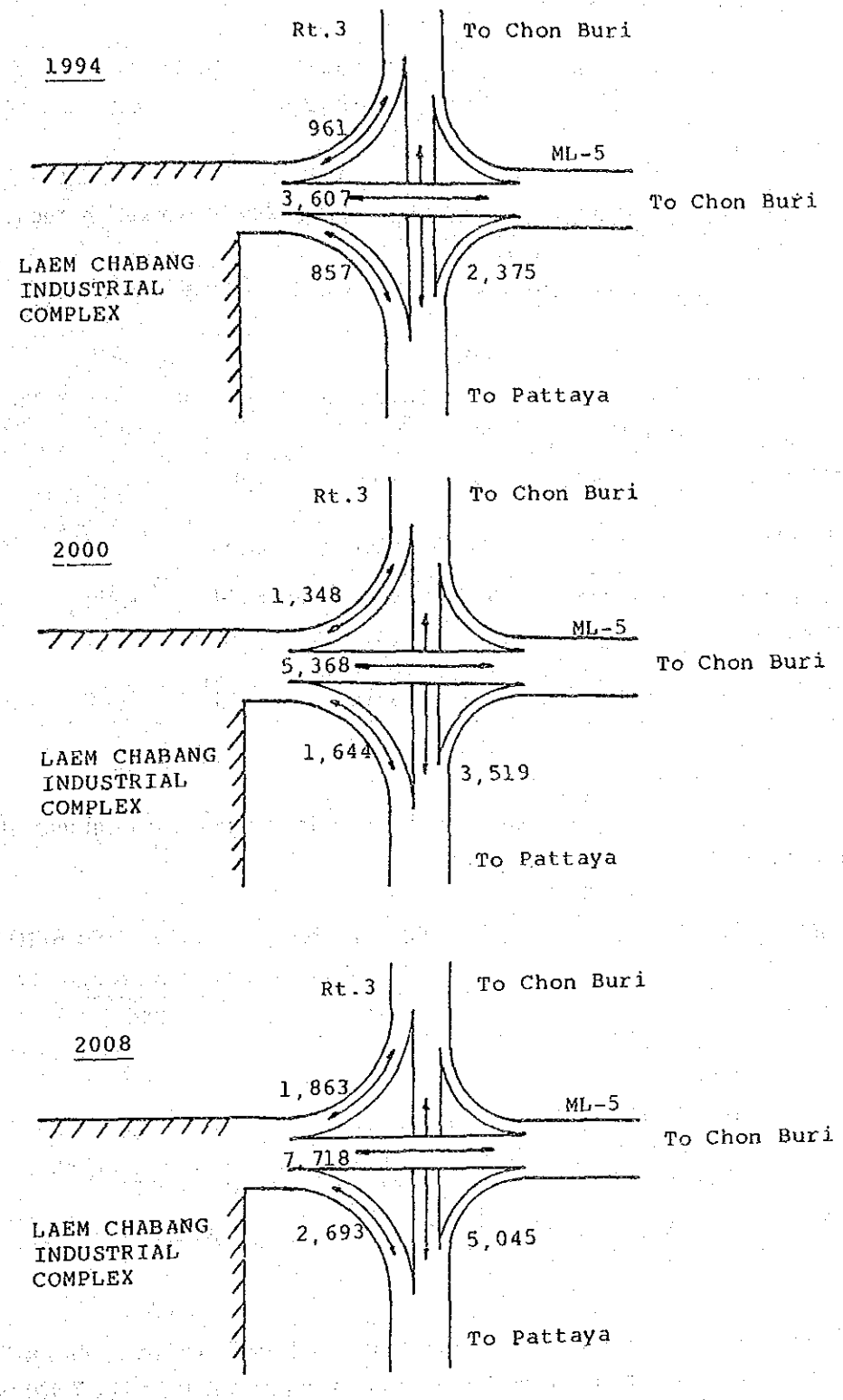


Figure 2.1.1. TRAFFIC GENERATED FROM THE LAEM CHABANG INDUSTRIAL COMPLEX (vehicles/day)

2.1.2 Map Ta Phut Industrial Complex

1) Generated Freight Volume

Industrial Estate

Table 2.1.15 prepared by OESB shows the area and number of workers in the estate:

Table 2.1.15 AREA AND NUMBER OF WORKERS

	1995			2001		
	Area (Rai)	(ha)	Number of Workers	Area (Rai)	(ha)	Number of Workers
Petrochemical Stage 1	1,088	174	1,150	1,088	174	1,150
Petrochemical Stage 2	1,750	280	1,620	6,750	1,080	6,120
Other Industry	1,554	249	2,120	6,554	1,049	8,620
Small Plot and Reserved Area	604	97	5,800	604	97	5,800
BC	23	4	9,600	23	4	19,500

Expected cargo volumes to be carried by trucks generated by petrochemical industries are shown in Table 2.1.16 as prepared by OESB:

Table 2.1.16 CARGO VOLUMES FROM PETROCHEMICAL INDUSTRIES

(Unit: thousand tons/year)

	1991	1994	2000
Petrochemical Stage I	157	157	157
Petrochemical Stage II	280	499	499
Other Chemical	190	470	470
Total	627	1,126	1,126

In addition to petrochemical industries, other general industries will be established in the estate. The number of workers engaged in other industries is expected to be 7,920 persons in 1995 and 14,420 persons in 2001. Based on the number of workers, generated cargo volumes from other industries were estimated by using the same method described in 2.1.1 at 2,116,000 tons in 1995 and 3,038,000 tons in 2001.

Industrial Deep-Sea Port

Table 2.1.17 prepared OESB shows expected cargo handling volumes. Of these, cargo volumes by trucks were also estimated by OESB as shown in Table 2.1.18:

Table 2.1.17 CARGO HANDLING VOLUMES (POTENTIAL)

(Unit: thousand tons)

	1989	1991	1994	2000
Petrochemical Stage I	144	344	344	344
Petrochemical Stage II	—	683	1,785	1,785
Fertilizer and Downstream Industries	—	2,443	18,741	32,596
Distribution Facilities	—	1,460	3,360	3,860
Total	144	4,930	24,230	38,585

Table 2.1.18 CARGO VOLUMES CARRIED BY TRUCKS

(Unit: thousand tons)

Type of Goods	1991	1994	2000
Wood Chips	—	900	900
Tapioca	760	760	760
Total	760	1,660	1,660

2) Generated Freight Traffic

Industrial Estate

The daily number of trucks was estimated from the cargo volume estimates by means of the same method described in 2.1.1 as shown in Table 2.1.19:

Table 2.1.19 NUMBER OF TRUCKS FROM PETROCHEMICAL INDUSTRIES

Type of Vehicle	1991	1994	2000
Medium Truck	126	226	226
Heavy Truck	218	391	391

The daily number of trucks from other industries was also estimated based on generated cargo volumes from other industries as shown in Table 2.1.20:

Table 2.1.20 NUMBER OF TRUCKS FROM OTHER INDUSTRIES

Type of Vehicle	1995	2001
Medium Truck	424	608
Heavy Truck	735	1,055

These trucks were assumed to take Route 3119 and ML-5, providing a shuttle service with Bangkok.

Industrial Deep-Sea Port

The daily numbers of trucks was estimated based on the cargo volume through the port. The daily number of trucks was estimated by using the same method described in 2.1.1 and is shown in Table 2.1.21. This truck traffic was divided into half on Route 3119 to Chon Buri and half on Route 3 to Rayong in accordance with cargo origin and destination.

Table 2.1.21 NUMBER OF TRUCKS FROM PORT

Type of Vehicle	1991	1994	2000
Medium Truck	121	266	266
Heavy Truck	211	462	462

3) Generated Passenger Vehicle Traffic

A planned urban area will be developed to provide housing and other facilities for the new residents.

The estimated number of workers and residents in the New Town are shown in Table 2.1.22 prepared by OESB:

Table 2.1.22 NUMBER OF WORKERS AND RESIDENTS IN NEW TOWN

	1995	2001
Workers	14,800	32,300
Number of Residents	37,000	80,000

Passenger vehicle traffic was estimated based on the number of workers and the percentage of vehicles by type and using the same method described in 2.1.1.

Table 2.1.23 shows the number of workers commuting from the New Town and other areas by land use. Table 2.1.24 shows the daily amount of passenger vehicle traffic and Appendix 2.1.3 shows more details.

Table 2.1.23 NUMBER OF WORKERS

	1995			2001		
	Number of Workers	Comuting from		Number of Workers	Comuting from	
		New Town	Other Areas		New Town	Other Areas
Petrochemical Stage I	1,150	819	331	1,150	881	269
Petrochemical Stage II	1,620	1,153	467	6,120	4,685	1,435
Other Industry	2,120	1,509	611	8,620	6,599	2,021
Small Industry	5,800	4,129	1,671	5,800	4,400	1,360
Reserved Area						
Port	500	356	144	1,000	766	234
BC	9,600	6,834	2,766	19,500	14,929	4,571
Total	20,790	14,800	5,990	42,190	32,300	9,890

Table 2.1.24 PASSENGER VEHICLE TRAFFIC

Type of Vehicle	1995			2001		
	Commuting from			Commuting from		
	New Town	Other Areas	Total	New Town	Other Areas	Total
Motorcycle	1,713	693	2,406	3,738	1,144	4,882
Passenger Car	3,946	1,597	5,543	10,767	3,297	14,064
Bus	308	126	434	627	192	819
Total	5,967	2,416	8,383	15,132	4,633	19,765

4) Total Generated Traffic

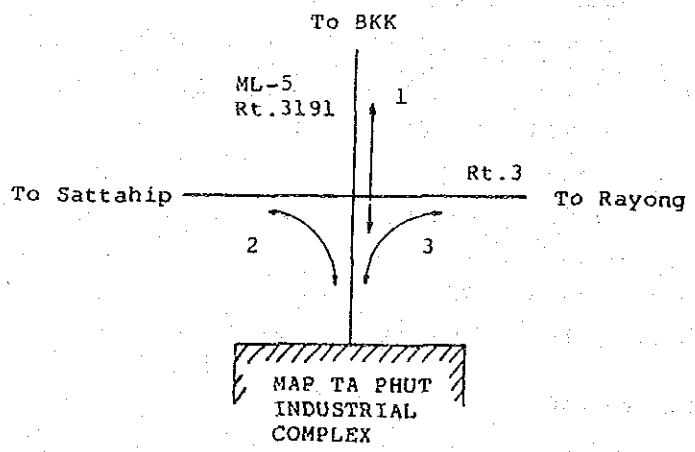
Total generated daily traffic in 1994, 2000 and 2008 was estimated by means of interpolation and extrapolation.

The results are shown in Table 2.1.25 and illustrated in Figure 2.1.2:

Table 2.1.25 TRAFFIC GENERATED FROM MAP TA PHUT INDUSTRIAL COMPLEX

(Unit: vehicles/day)

	Direction	Type of Vehicle	1994	2000	2008
1.	Complex - BKK on Rt. 3191	Medium Truck	699	936	1,182
		Heavy Truck	1,212	1,624	2,050
		Total	1,911	2,560	3,232
2.	Complex - Sattahip on Rt. 3	Motorcycle	123	231	575
		Passenger Car	315	725	1,271
		Heavy Bus	28	43	63
		Total	466	999	1,909
3.	Complex - Rayong on Rt. 3	Motorcycle	470	813	1,270
		Passenger Car	999	2,289	4,009
		Heavy Bus	88	139	207
		Medium Truck	133	133	133
		Heavy Truck	231	231	231
		Total	1,921	3,605	5,850



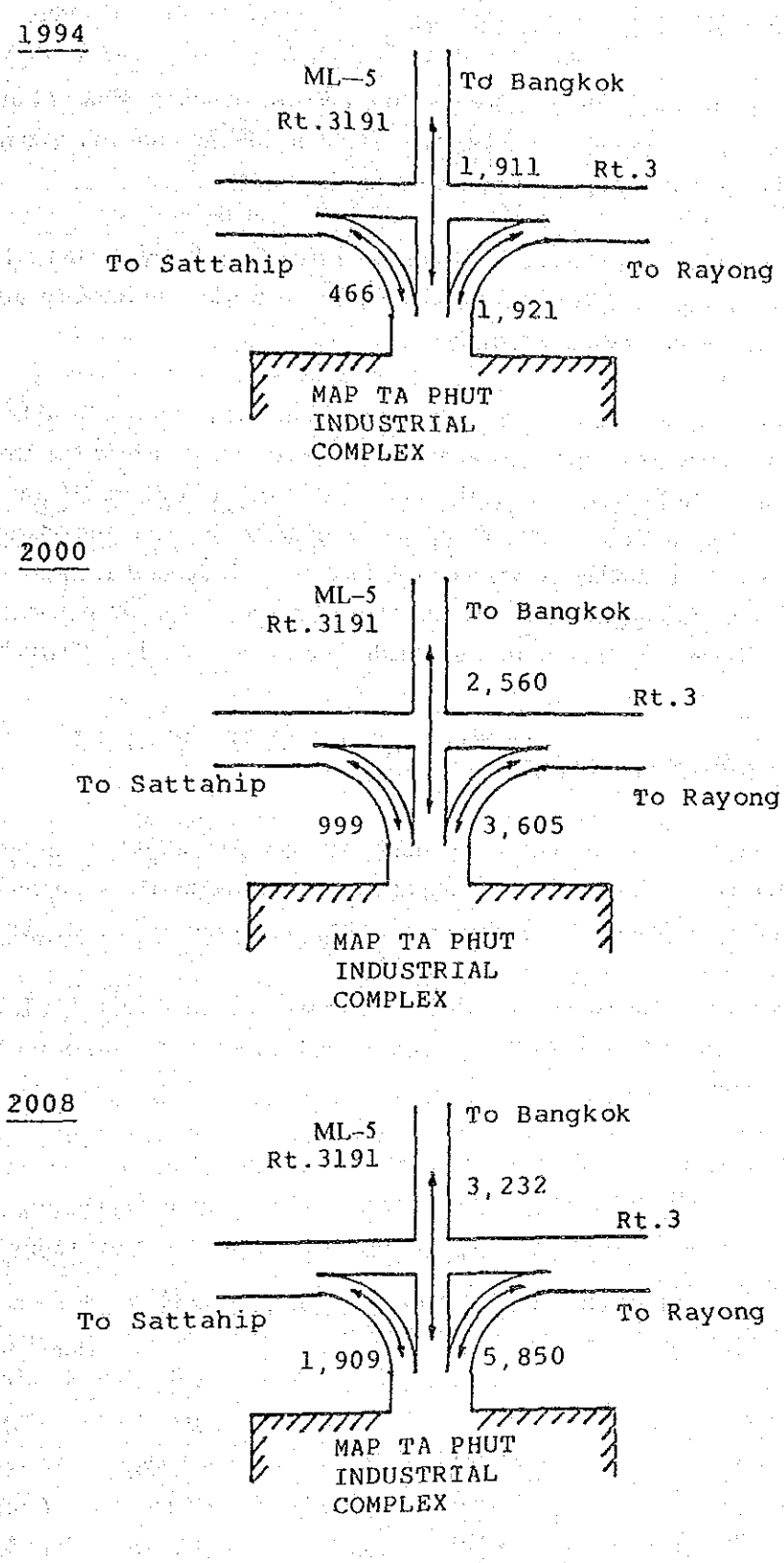


Figure 2.1.2 TRAFFIC GENERATED FROM MAP TA PHUT INDUSTRIAL COMPLEX (vehicles/day)