APPENDICES TO CHAPTER 5

APPENDIX TABLE 5-1

PASSENGER CARS BY ZONE

Zone	Class[1]	1972[2]	1982[3]	2000[3]
1	2	705	3,040	3,640
2	2	10,931	22,193	27,819
3	2	7,580	26,243	34,671
4	2	14,029	22,513	28,667
5	3	852	2,911	2,911
6	3	4,683	4,683	5,701
7	3	4,182	6,713	8,116
8	3	4,737	6,737	13,766
9	2	2,819	2,819	5,344
10	3	3,658	9,365	9,365
11	1	4,736	6,870	10,907
12	3	10,602	10,602	16,850
13	2	9,837	9,837	14,993
14	1	992	5,842	8,058
15	2	3,723	8,460	18,085
16	2	6,815	12,542	17,791
17	1	5,890	23,911	29,722
18	3	6,166	8,792	13,752
19	3	1,116	2,946	8,945
20	3	2,999	2,999	6,728
21	4	1,235	6,991	21,225
22	3	963	6,301	7,583
23	3	2,714	4,324	22,806
24	3	4,831	13,985	36,831
25	3	2,079	3,486	12,900
26	4	2,183	4,478	7,209
27	4	354	915	9,987
28	4	1,961	5,372	21,116
29	4	97	1,432	6,996
30	4	239	239	239
31	4	215	2,923	3,768
32	3	4,322	4,322	5,555
33	3	1,426	6,379	6,379
34	3	7,052	7,052	7,408
35	3	1,375	1,375	3,063
36	3	3,816	4,638	8,279
37	4	676	676	2,108
38	3	3,614	10,105	13,627
39	4	337	337	3,415
40	4	169	169	757
41	4	207	2,302	6,356
42	4	165	2,250	9,113
43	4	87	2,444	4,153
44	3	2,646	6,694	16,462
45	3	3,481	7,182	11,933

Zone	Class[1]	1972[2]	1982[3]	2000[3]
46	3	2,041	3,921	8,762
47	3	2,695	2,695	2,695
48	3	1,564	2,434	7,989
49	3	1,466	1,466	4,151
50	3	2,815	4,036	8,948
51	3	2,091	3,540	8,937
52	4	1,421	10,011	13,426
53	4	1,010	7,938	15,602
54	4	2,328	15,500	19,639
55	4	145	1,470	2,752
BKK		170,872	359,400	628,000
56	4	438	886	2,802
57	4	131	1,007	2,011
58	3	226	819	3,360
59	4	850	4,077	17,547
60	4	96	893	2,688
61	4	14	14	237
62	4	82	1,004	1,355
Samut-Prakan		1,837	8,700	30,000
63	4	94	94	94
64	4	45	45	45
65	3	1,069	4,748	15,573
66	4	235	868	3,600
67	4	533	1,444	1,444
68	4	315	5,001	11,244
Nontha-buri		2,291	12,200	32,000
Study Area		175,000	380,300	690,000

Notes : 1) Landuse classification :
1. Special
2. Core
3. Urban
4. Rural

2) 1972 from BIS

3) 1982 and 2000 by the Study Team

APPENDIX 5.1 PROFILE OF THE OUTER RING ROAD PROJECT

The feasibility study for this road was conducted in 1977/1978 to examine the economic viability of constructing a highway from Bang Bua Thong to Bang Pa-in via Thonburi, Phra Pradaeng and Samrong. The section from Bang Bua Thong to the southern railway line near Wat Mai Yair She was constructed to a 2-lane road in 1982, and for the connecting section to National Road No. 4 the construction of a 4-lane road will start in 1983 and complete in 1986, and for the section between National Road No. 4 and National Road No. 35 the construction of a 4-lane road will start in 1984.

The construction schedule of the southern and eastern sections of this Ring Road is not known, but for a substitute of the eastern section Roads No. 3202 and 3344 with 4 to 6 lane roads are available and the southern extension down to the intersection with Road No. 3268 a 2-lane road will be constructed by 1984. The First Stage Expressway System from Bang Na to Dao Khanong via Port will substitute for the southern section of the Ring Road. Thus the above road network is considered to function as the original ring road concept.

APPENDIX 5.2 DETAILS OF OTHER ROAD PROJECTS BY DOH

DOH plans the following road projects:

(1) Roads from Bangkok Noi to the intersection of Nakhorn Chaisi Highway

- National Road No. 338 from the intersection of Road 3310 with the approach road to the Phrapinklao Bridge at Bangkok Noi will be constructed to a 4-lane fully access controlled road in 1983 and the northern approach to the Krungthon Bridge at Bang Plat will be constructed to a partially access controlled road in 1983.
- Westwards from the intersection with Road No. 3310 to the Nakhorn Chaisi road, a new 4-lane road will be constructed by 1985.

(2) New Airport Road

This is an urgent road of DOH to serve the planned new international airport, which is desired to be constructed well before the completion of the new airport.

(3) National Road No. 304

From the intersection with National Road No. 1 the existing 2-lane eastern section will be widened to a 4-lane divided highway by 1985.

(4) National Road No. 306

The existing 2-lane road will be widened to 4 lanes by 1985.

APPENDIX 5.3 ROAD PROJECTS BY DPW

(1) Nonthaburi and Pathumthani Bridges Construction Project

Feasibility study and engineering design of the two bridges across the Chaophraya River at Nonthaburi and Pathumthani was conducted in 1980 to replace the existing passenger ferry services at both locations and relief the traffic congestion on the existing Rama VI Bridge, which has been a long-cherished interest.

The construction of the two bridges has started and will be completed in 1984.

(2) Nonthaburi Road

As described in 1) above, with the construction of the Nonthaburi Bridge a 4-lane road will be constructed by 1984 to connect the Outer Bangkok Ring Road in the west and National Road No. 302 in the east.

(3) New Memorial Bridge

The construction of the new Memorial Bridge across the Chaophraya River will be completed in 1984 to relief the traffic congestion on the existing Memorial Bridge.

(4) Western Extension from the Sathon Bridge

The newly constructed road from the Sathon Bridge to Tak Sin Road in Thonburi will be extended westwards to the Phet Kasem Road. The road will be divided to two sections. Detailed design for the first section from Tak Sin Road to the Middle Ring Road will start in 1983, and a detailed study for the section from the Middle Ring Road to Phet Kasem Road will be conducted to select the alignment a few years afterwards.

This project will be for a 6-lane divided highway with a 2-lane frontage road on both sides, fully access controlled, within a righ-of-way width of 60 meters.

(5) New Rama VI Bridge Construction Project

The existing Rama VI Bridge across the Chaophraya River is a highway-cum-railway bridge which accommodates a 6-m 2-lane highway and a single track rail line with a 1.5 m pedestrian walkway on both sides. This is a part of the Middle Ring Road which has a 6-lane divided highway. The State Railways of Thailand has a plan to increase their train frequencies to 54 per day on a double track while the existing gauge has the maximum capacity of 44 train frequencies per day.

The feasibility study for the new bridge was carried out in 1981/1982 by JICA with a feasible result for its implementation.

APPENDIX 5.4 ROAD PROJECTS BY BMA

BMA plans the following road projects:

(1) North Khlong Sain Sen Line

The existing 7-meter wide, one kilometer long road which was constructed temporarily from Asoke to Din Daeng Road will be widened to a 11-meter wide, 2-lane highway within the right-of-way width of 30 meters, and this road will be extended by two kilometers to join Khlong Tan Road. The budget for this project amounts to 500 million Baht. The project started in January 1977 and will be completed in 1985.

(2) Ekkamai to Ram Indra Line

The construction of a road from Sukhumvit Road Soi 63 (Ekkamai) through Lad Phrao Road (Choak Chai 4) to Ram Indra Road is proposed with a right-of-way width of 30 meters. The land use and land acquisition for the project area being studied.

(3) Portions of Middle Ring Road

a) Taksin to Ta Phra Section

This section will join the traffic between Charan Sanit Wong Road and Krungthep Bridge. The project fund has already been approved.

b) Wong Sawang to Rama VI Bridge Section

The bidding for the widening of this section will be made in 1982.

c) Wiphawadeerungsit to Wong Sawang Section

This section includes a semi-cloverleaf type interchange with Wiphawadeerungsit Road, having a 1.5 kilometers long elevated structure, which is now pending for budget approval.

(4) Phathanakarn to On-Nooch Line

The westernmost one kilometer long section is completed to a 6-lane road and the construction of the second 3.5 kilometer long section with a right-of-way width of 30 meters will be completed in early 1984. For the remaining section from the intersection with Road No. 3344 the survey has stopped due to a land acquisition problem.

(5) On-Nooch to Lad Krabang Line

This existing road will not only serve its local transportation but also be corelated with the Lad Krabang Industrial Estate Project. The westernmost section will be widened to a 4-lane undivided road in early 1984, and from the intersection with Road No. 3344 the existing 2-lane road is proposed to be widened to 6 lanes.

(6) Lad Krabang to Krungthep Kee Tra Line

This road will serve Lad Krabang National Housing Authority Project and Lad Krabang

National Industrial Estate Authority Project as well as their adjacent local areas.

The existing westernmost one kilometer long road will be widened with a right-of-way width of 30 meters, and the connecting 9.5 kilometer long section is a new 2-lane road in its first stage within a right-of-way width of 40 meters. This section is now in design stage financed by the World Bank. The easternmost section is also a new road to connect the Lad Krabang Industrial Estate Project site.

APPENDIX 5.5 DEVELOPMENT TRAFFIC FROM SAMUT SAKHON INDUSTRIAL ESTATE

(1) Cargo Traffic

a) Daily product from the estate

6,013 tons

b) Model split

Truck	76.0%
Railway	1.6%
Inland waterway	22.4%

c) Truck type composition and loading rate

4 wheel truck	35.3%	(0.9 t/veh)
6 wheel truck	46.7%	(2.6 t/veh)
10 wheel truck	18.0%	(6.2 t/veh)

d) Generated truck volume by type

4 wheel truck	609	
6 wheel truck	806	
10 wheel truck	311	
Total	4,570 t	1,726 veh. (Total of Gen. Att.)

(2) Workers Traffic

a) Number of workers 16,500 persons

b) Commute workers 50%
House Labour 50%

c) Modal split and passenger occupancy rate

Pick up/Micro bus	56%	12 persons/vehicle
Public bus	24%	42 persons/vehicle
Private car	20%	2–3 persons/vehicle

d) Generated passenger cars

	Persons	Total Gen. Att. (vehicle/day)
Pick up/Micro bus	4,620	770
Public bus	1,980	94
Private car	1,650	1,435
Total	8,250	2,299

APPENDIX 5.6 PROJECTS BY THE STATE RAILWAY OF THAILAND (SRT)

(1) Container Freight Station at Bang Sue

The station will be provided in two years and start its operation in 1986, handling freight to and from Bangkok by rail.

(2) Elevated Lines on the Existing Northern and Eastern Lines

SRT is planning to elevate the existing northern and eastern rail lines within their existing right-of-way in order to meet the future transportation demand and to reduce the conflict between the train operation and the street network.

(3) Rail Link between Chachoengsao and Sattahip

A new railway line from Chachoengsao to Sattahip Port is currently under construction, and is scheduled for completion in 1984.

The railway system has design speed of 100 kilometers per hour and a maximum gradient of one percent. Initially a single line is constructed but with provision, in the right-of-way and station designs, for a second line when required.

The link has for the first time opened up the Eastern Seaboard for rail transport and provided a spine to which additional links may in turn be added.

(4) Rail Link between Bangkok and Wong Wian Yai

SRT has a plan to extend the rail link from the Bangkok railway station to the Wong Wian Yai railway section across the Chaophraya River.

APPENDIX 5.7 FACILITIES OF OTHER SECTORS OF TRANSPORTATION

(1) Don Muang Airport Expansion Project

The expansion of the existing Don Muang Airport will be commenced in November 1982 to meet the requirements for the period 1987–1997. Major features include the provision of international passenger building, domestic passenger building, cargo handling sheds, etc.

(2) Second Bangkok International Airport

The existing international airport at Don Muang, 30 kilometers to the north of Bangkok, cannot be expanded indefinitely and the Government has proposed that a second international airport be built at Nong Nghu Hao on the eastern fringe of Bangkok, immediately to the north of National Road 34.

The Thai Government has just invited competent consultants for their proposals for the master plan on the second international airport.

(3) Bangkok Urban Truck Terminals Construction Project

The feasibility study for the above project was carried out in 1979/1980 by JICA. It aims at devising effective measures for the trucking situation and improving the present cargo transport and distribution system to have the project more effectively contribute to the economic development of the country.

The study recommends the construction of a truck terminal at four (4) locations: Rangsit, Bang Na, Bang Kae and Yannawa. The Cabinet has approved for the construction of the truck terminals.

(4) Bangkok Suburban Transportation Project

The study for the captioned project was carried in 1978/1979 by JICA to improve the inter-regional (central region and suburban area) public transportation by extending the services of the urban mass transit system into the suburbs. The study recommends that coordination and modification of the network should be made with more data and that more detailed features of the plan and analysis should be worked out in the next stage.

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APPENDICES TO CHAPTER 6

APPENDIX 6.1 ROAD DENSITY AND POPULATION DENSITY

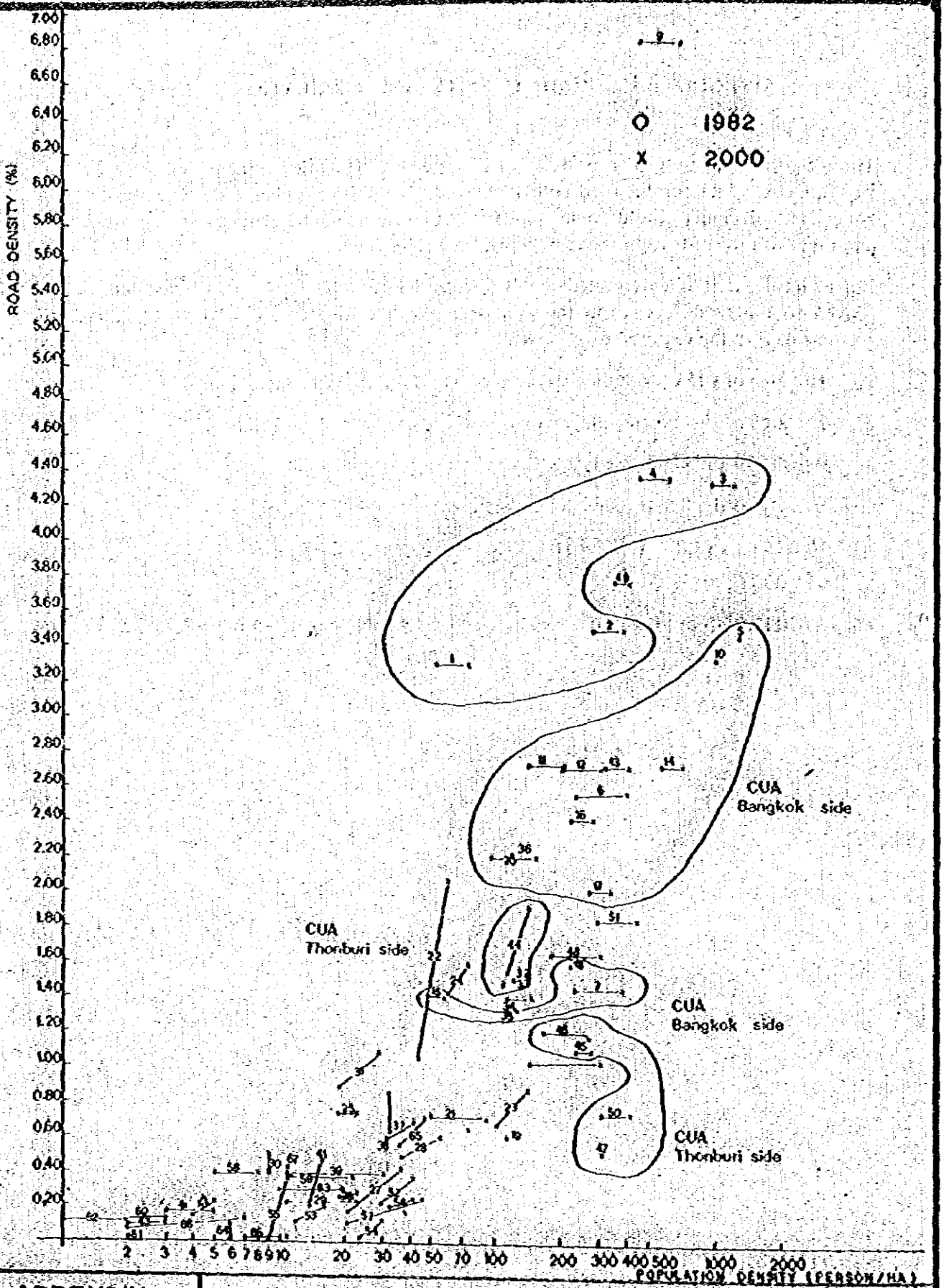
These figures (Appendix Fig. 6-1, 6-2) indicate the difficulties in increasing the road density in CUA, while current road construction and improvement plans are rather for suburban zones. The difficulty would come from the extremely high cost of the land acquisition and a number of restraints to the road network expansion.

For example, if it is determined that the road density in the zones of CUA should be improved to the same level as in the core area, the following factors have to be taken into account to find the required road length:

1. The area of CUA, excluding the core area : 10,045 ha
2. The area of the existing major roads of the above area: 190 ha
3. Density of the major roads in CUA : 1.9%
4. Density of the major roads in the core area : 3.8%

$$10{,}045 \text{ ha} \times (3.8 - 1.9)\% \times 10{,}000 \left(\frac{m^2}{ha}\right) \div (6 \text{ lanes} \times 3.5 \text{ m width}) \div 1{,}000 \left(\frac{m}{ha}\right) \fallingdotseq 90 \text{ km}$$

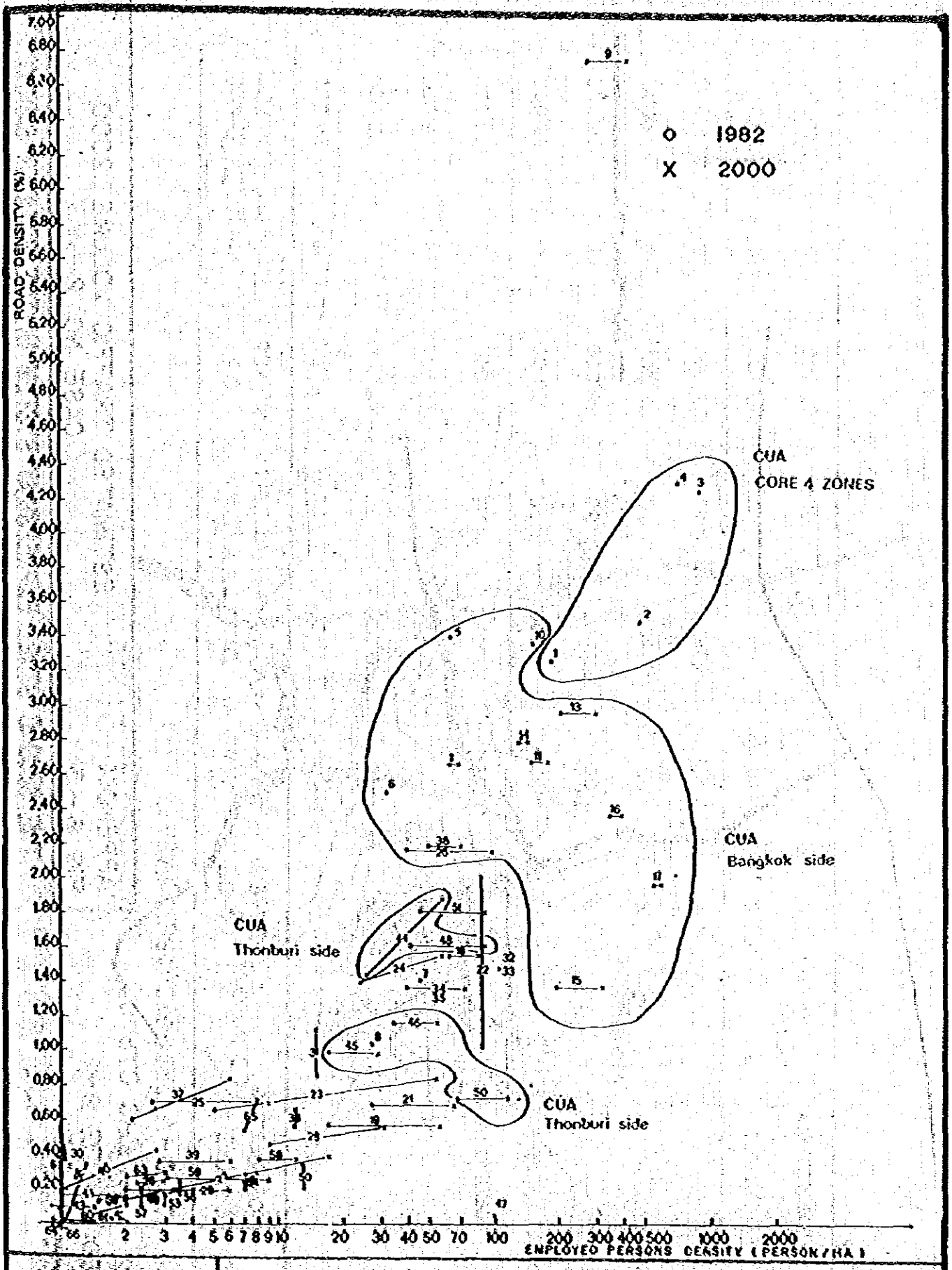
Thus a total length of 90 km of 6-lane arterial road would be required in CUA.



APPENDIX
FIG. 6-1

ROAD DENSITY VS POPULATION DENSITY

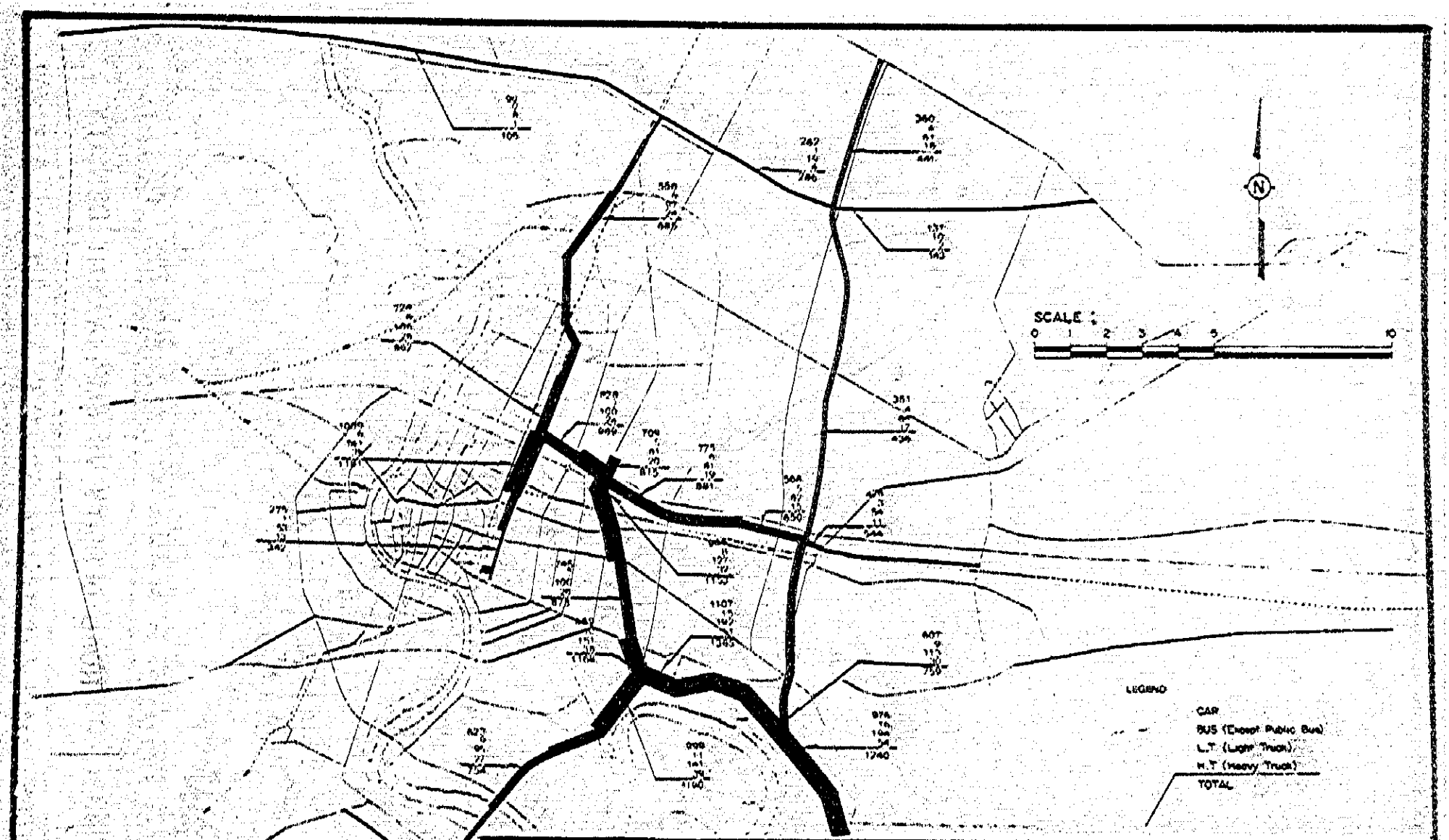
THE SECOND STAGE EXPRESSWAY SYSTEM IN THE GREATER BANGKOK



APPENDIX FIG. 6-2

ROAD DENSITY VS EMPLOYMENT DENSITY

THE SECOND STAGE EXPRESSWAY SYSTEM IN THE GREATER BANGKOK



APPENDIX
FIG. 6 – 3

ESTIMATED TRAFFIC VOLUME , 2000
CASE NO. 2

THE SECOND STAGE EXPRESSWAY SYSTEM IN THE GREATER BANGKOK

APPENDIX TABLE 6-1

TRAFFIC CAPACITY LIMITATION OF ROADS IN Q-V TRAFFIC ASSIGNMENT

MODEL NO.	TYPE OF ROAD	LOCATION	NO. OF LANES	Vmax (Km./Hr.)	Qmin (Veh./Day)	Vmid (Km./Hr.)	Qo (Veh./Day)	Vmin (Km./Hr.)	Qmax (Veh./Day)
1 , 7	ORDINARY ROAD	URBAN	2	40	6,400	20	16,000	5	24,000
2 , 8			4	50	19,200	25	48,000	5	72,000
3 , 9			6	50	28,800	25	72,000	5	108,000
13			8	50	38,400	25	96,000	5	144,000
4 , 10		SUBURBAN	2	50	6,800	25	17,000	5	25,500
5 , 11			4	60	27,200	30	68,000	5	102,000
6 , 12			6	60	40,800	30	102,000	5	153,000
14			8	60	54,400	30	136,000	5	204,000
15	(RAMP) EXPRESSWAY	URBAN	6	80	—	40	120,000	0	180,000
16			6	80	—	40	120,000	0	180,000

APPENDIX 6.2 EXPRESSWAY TRAFFIC DIVERSION SURVEY

(1) General

In the Phase I Study, a diversion model was provisionally determined by the simulation work which approximated the traffic flow on the Din Daeng-Port Expressway to the traffic counting volume in July 1982. The traffic flow was shown by using the vehicle OD matrices in 1982, and the existing conditions were incorporated in the road network system. The model formula used in the Phase I Study was not based on the findings in Bangkok, but on assumptions referring to a model used in toll expressway studies in Japan.

In January 1983, the additional Port-Bang Na section of FES was opened. It resulted in an increase of traffic volume both on the newly opened Port-Bang Na section and previously opened Din Daeng-Port section as shown in Appendix Table 6-2. Comparing with the traffic volume before the opening of Port-Bang Na section, total traffic volume of the Expressways has increased more than 150%, on the other hand, traffic volume on Din Daeng-Port section also increased about 50% by the opening of Port-Bang Na section. The toll fare revenue also has increased in response to the increase of traffic volume.

After the opening of Port-Bang Na section, substantial changes in traffic were found in the corridor along this section, diverting from the paralleled Sukhumvit Road, Rama IV Road and Na Krom Road to the Expressways. Under the circumstances, the origin destination interviewing was conducted on the roads in Bang Na area. Interviewing at Din Daeng gate and its adjacent roads were not conducted because of difficulty in stopping very heavy traffic.

(2) Field Survey

1) Origin-Destination Interview Survey

The origin-destination interview survey was conducted at three roadsides on a weekday with the details as follows. The location is shown in Appendix Fig. 6-4.

Survey date	:	February 24 (Thursday), 1983
Survey hours	:	Hours 6.00-22.00
Locations	:	1. Bang Na toll gate 2. Sukhumvit Road at Soi 103 3. Na Krom Road in front of "Thai Battery Manufacturing Authority"
Direction	:	Inbound direction
Type of Vehicles	:	Passenger cars (private cars, taxis, samlors and scelors) Light trucks (pick-ups, vans and light trucks) Medium trucks (medium trucks with 4 wheels) Heavy trucks (large trucks with 6 wheels and more) Private buses (privately used buses including micro buses, school buses and tourists buses) Public buses and motorcycles were not interviewed.

APPENDIX TABLE 6-2 VEHICLES AND REVENUE : FIRST STAGE EXPRESSWAY SECTIONS

			Din Daeng-Port Section								Bang Na-Port Section				Total Traffic Volume on FES (Veh./Day)	Total Revenue of FES (Baht per Day)
			Cross-sectional Traffic Volume at Toll Gate (Veh./Day)							Revenue (Baht/Day)	Cross-sec. Traffic Vol. (Veh./Day)			Revenue (Baht/Day)		
			Din Daeng	Petchaburi Road	Sukhumvit Road	Rama IV Road	River Side Road	Kasem Raj (Port)	Sub Total		Sof 62	Bang Na	Sub Total			
(A)	Before opening of Port-Bang Na Section	October[1] 1982	13,774	1,762	4,186	98	8,673	3,475	31,968	360,181	-	-	-	-	31,968	360,181
(B)		Dec.[2] 1982	15,870	1,929	4,812	142	9,615	3,839	36,206	407,980	-	-	-	-	36,206	407,980
(C)	After Opening	Feb.[3] 1983	22,793	5,912	5,287	7,401	14,014	3,615	59,022	661,809	3,373	17,286	20,659	229,120	79,681	890,929
Increased (B)/(A)		Ratio	1.15	1.09	1.15	1.45	1.11	1.10	1.13	1.13	-	-	-	-	1.13	1.13
		Rate (%/Day)	0.20	0.10	0.20	0.60	0.20	0.20	0.20	0.20	-	-	-	-	0.20	0.20
Increased (C)/(B)		Ratio	1.44	3.06	1.10	52.12	1.46	0.94	1.63	1.62	-	-	-	-	2.20	2.18
		Rate (%/Day)	0.50	1.60	0.10	5.60	0.50	0.10	0.70	0.70	-	-	-	-	1.10	1.10

Notes : 1) Weekly average traffic volume October 10th-16th, 1982
2) Weekly average traffic volume December 12th-18th, 1982
3) Weekly average traffic volume February 22nd-28th, 1983

Interview : At locations 2 and 3, policemen were at roadside to stop selected vehicles for interviewing. Interviewing was conducted to those stopped vehicles. At Bang Na toll gate, the interviewing was conducted to selected vehicles stopping to pay toll fare.

The interview items were origin, destination, trip purpose, etc. The interview sheet is shown in Appendix Table 6-8. The numbers of interviewed vehicles together with the counted total vehicles passing inbound are shown in Appendix Table 6-3.

2) Traffic Volume Counting Survey

The interview was conducted on sample vehicles. In order to estimate the total volume subject for the analysis, the sample data should be expanded. For this purpose the traffic counting was conducted at the same location in such ways as follows:

Counting date	:	February 24-25, 1983
Counting hours	:	24 hours from 6.00-6.00
Direction	:	Inbound and outbound, respectively
Type of Vehicles	:	Passenger cars (private cars, taxis, samlors and seelors)
		Light trucks (pick-ups, vans and light trucks)
		Medium trucks (medium trucks with 4 wheels)
		Heavy trucks (large trucks with 6 wheels and more)
		Private buses (privately used buses and tourist buses)
		Public buses (public service buses)

The sheet used for recording the traffic volume is attached as in Appendix Table 6-9. The total volume counted is shown in previous Appendix Table 6-3.

APPENDIX TABLE 6-3 TRAFFIC VOLUME, INTERVIEWED VEHICLES AND THE RATIO

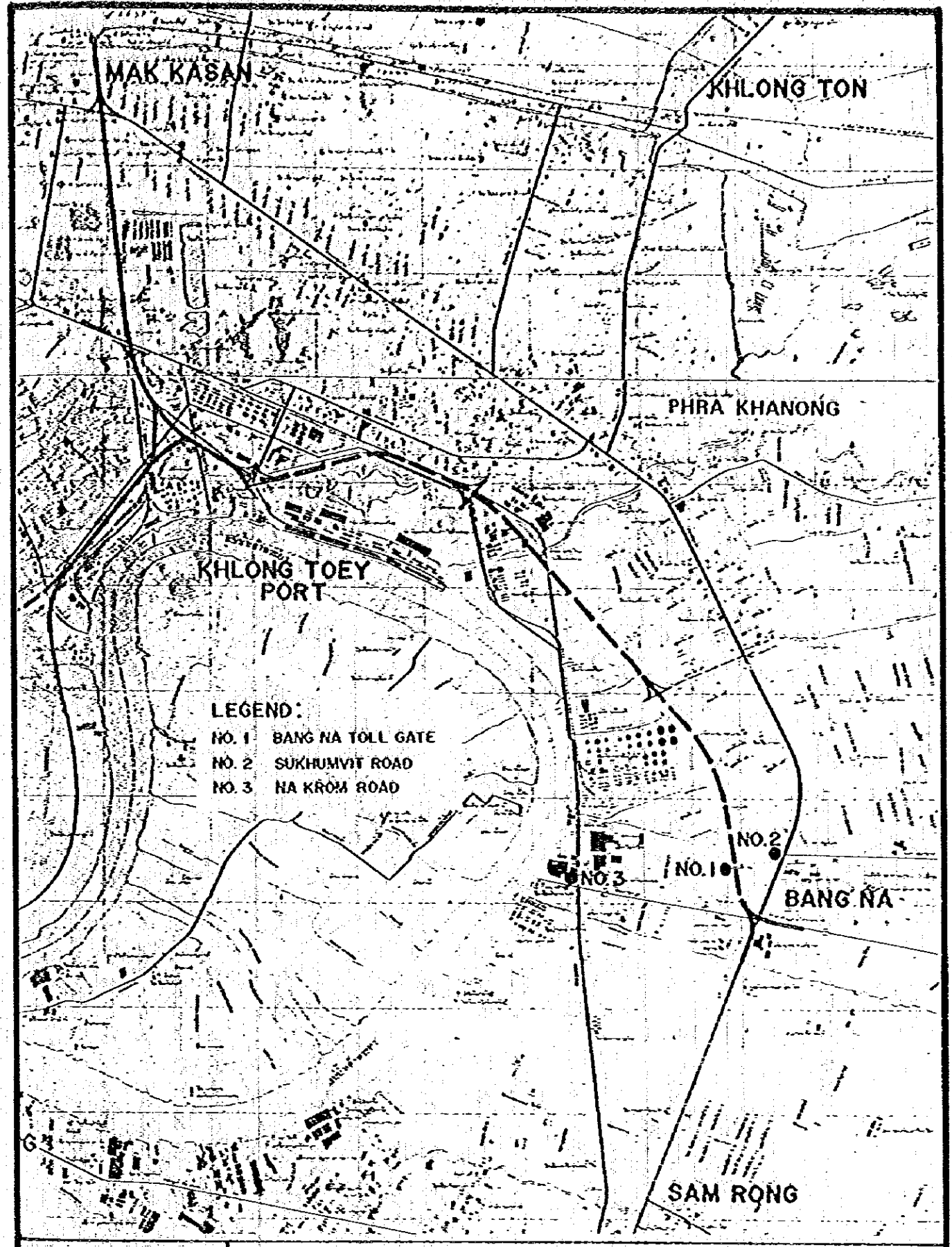
Location	Inbound Traffic 24 Hrs. 1)	Inbound Traffic 16 Hrs. 2)	Interviewed Vehicles 16 Hrs. 3)	The Ratio 3)/2) (%)
1. Bang Na-Toll Gates	16,242	15,232	5,442	(35.7)
2. Sukhumvit Road	12,797	10,679	1,585	(14.8)
3. Na Krom Road	4,246	3,965	1,919	(48.4)
TOTAL	33,285	29,876	8,946	(29.9)

Notes: 1), 2) Excluding public buses and motorcycles
3) Valid data only

(3) Survey Results

1) Cross-sectional Traffic Volume

Cross-sectional traffic volume counted at each survey station is shown in Appendix Table 6-4 and changes in the hourly traffic volume are shown in Appendix Fig. 6-5 and Appendix Table 6-10 thru 6-12.



APPENDIX FIG. 6-4

TRAFFIC SURVEY LOCATIONS

THE SECOND STAGE EXPRESSWAY SYSTEM IN THE GREATER BANGKOK

APPENDIX TABLE 6-4 TRAFFIC VOLUME AND TYPE OF VEHICLE COMPOSITION[1)]

(In vehicles and percent)

	Cars, Taxis & Samlors	Trucks[3)]				Buses (Private)			Buses (Public)			Total[2)]	Motor-cycles
		Light	Medium	Heavy	Total	Mini	Large	Total	Mini	Large	Total		
1. Bang Na	19,598	6,305	1,197	2,795	10,297	704	421	1,125	714	-	714	31,734	-
	(61.8)	(19.9)	(3.8)	(8.8)	(32.5)	(2.2)	(1.3)	(3.5)	(2.2)		(2.2)	(100.0)	
2. Sukhumvit	17,347	2,818	1,533	2,375	6,726	1,768	1,958	3,726	1,969	4,453	6,422	34,221	9,019
	(50.7)	(8.2)	(4.5)	(6.9)	(19.6)	(5.2)	(5.7)	(10.9)	(5.8)	(13.0)	(18.8)	(100.0)	
3. Na Krom	3,623	1,162	385	2,537	4,084	364	110	474	234	196	426	8,611	3,372
	(42.1)	(13.5)	(4.5)	(29.5)	(47.4)	(4.2)	(1.3)	(5.5)	(2.7)	(2.3)	(5.0)	(100.0)	
TOTAL	40,568	10,285	3,115	7,707	21,107	2,836	2,489	5,325	2,913	4,649	7,562	74,567	12,391
	(54.4)	(13.8)	(4.2)	(10.3)	(28.4)	(3.8)	(3.3)	(7.1)	(3.9)	(6.2)	(10.1)	(100.0)	

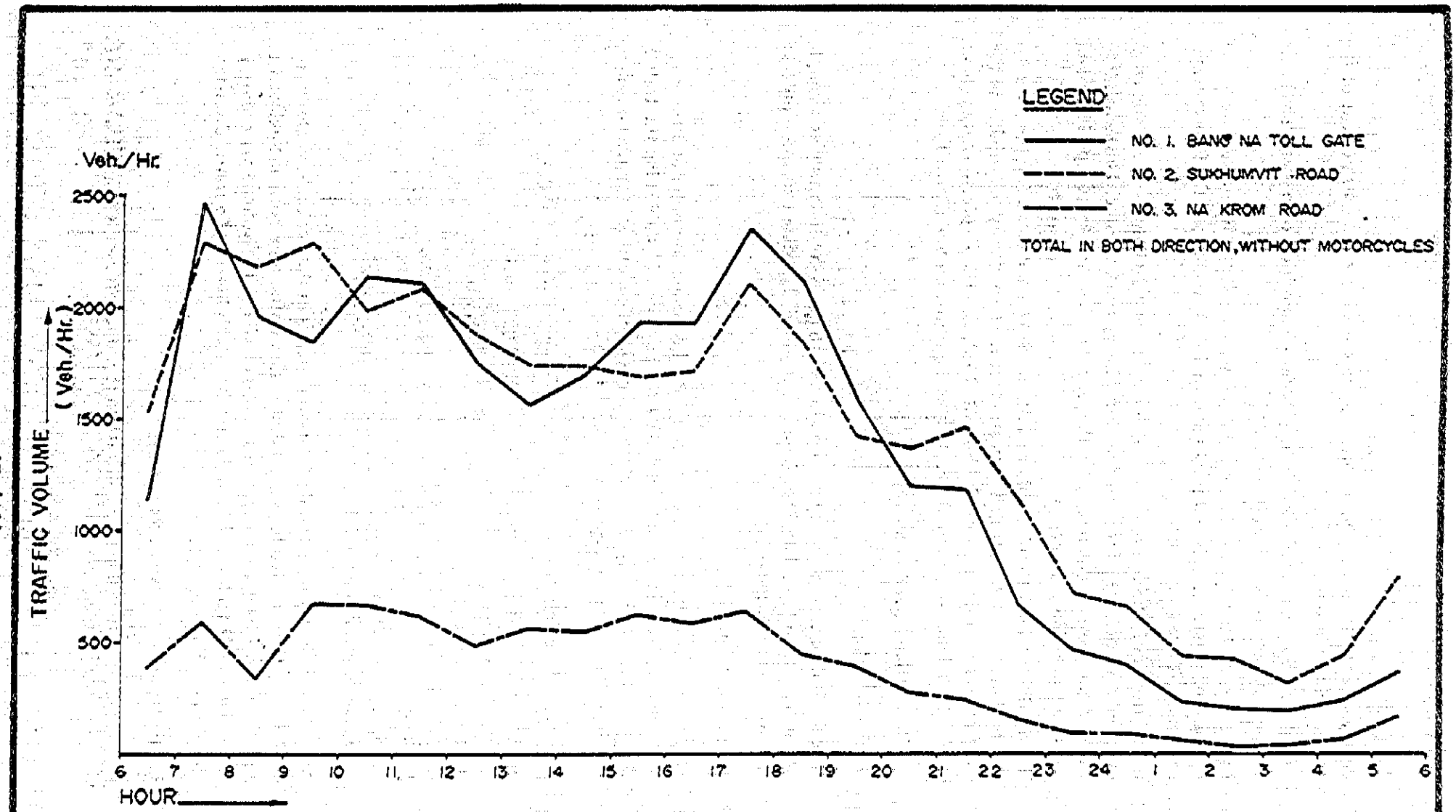
Notes : 1) February 24th-25th, 1983

2) Total in both directions, 24 hours

3) Light trucks : pick-ups, vans

Medium trucks : trucks with 4 wheels

Heavy trucks : trucks with 6 wheels and more



APPENDIX FIG. 6-5	HOURLY CHANGES IN TRAFFIC VOLUME
THE SECOND STAGE EXPRESSWAY SYSTEM IN THE GREATER BANGKOK	

- Newly opened Port-Bang Na Expressway imbibes more than 40 percent of the traffic volume in this corridor.
- Comparing with ordinary roads, the percent composition of passenger vehicles on the Expressway is high at 62 percent.
- In the private buses approximately 20% of them used the Expressway, while in the case of passenger cars and trucks almost 50% of them used the Expressways. (Appendix Table 6-4)
- Heavy trucks on the Expressway which have to pay 20 Baht as a toll fare, comprise only 30 percent of the cross-sectional heavy truck volume. This percentage seems rather low comparing with the ones of light trucks (62 percent) and medium trucks (38 percent).
- Hourly fluctuation of traffic volume both on Sukhumvit Road and the Expressway is almost similar. This fact indicates that the Expressway contributes to the relief of traffic congestion on Sukhumvit Road, and the Expressway users have the same tendency of hourly fluctuation as the traffic on Sukhumvit Road.

2) Origin-Destination Interview Survey

a) Data Expansion

The roadside interview survey was conducted 16 hours continuously as a sampling survey, therefore, data expansion was requited. The data expansion process is shown as in Appendix Fig. 6-6.

b) Origin and Destination

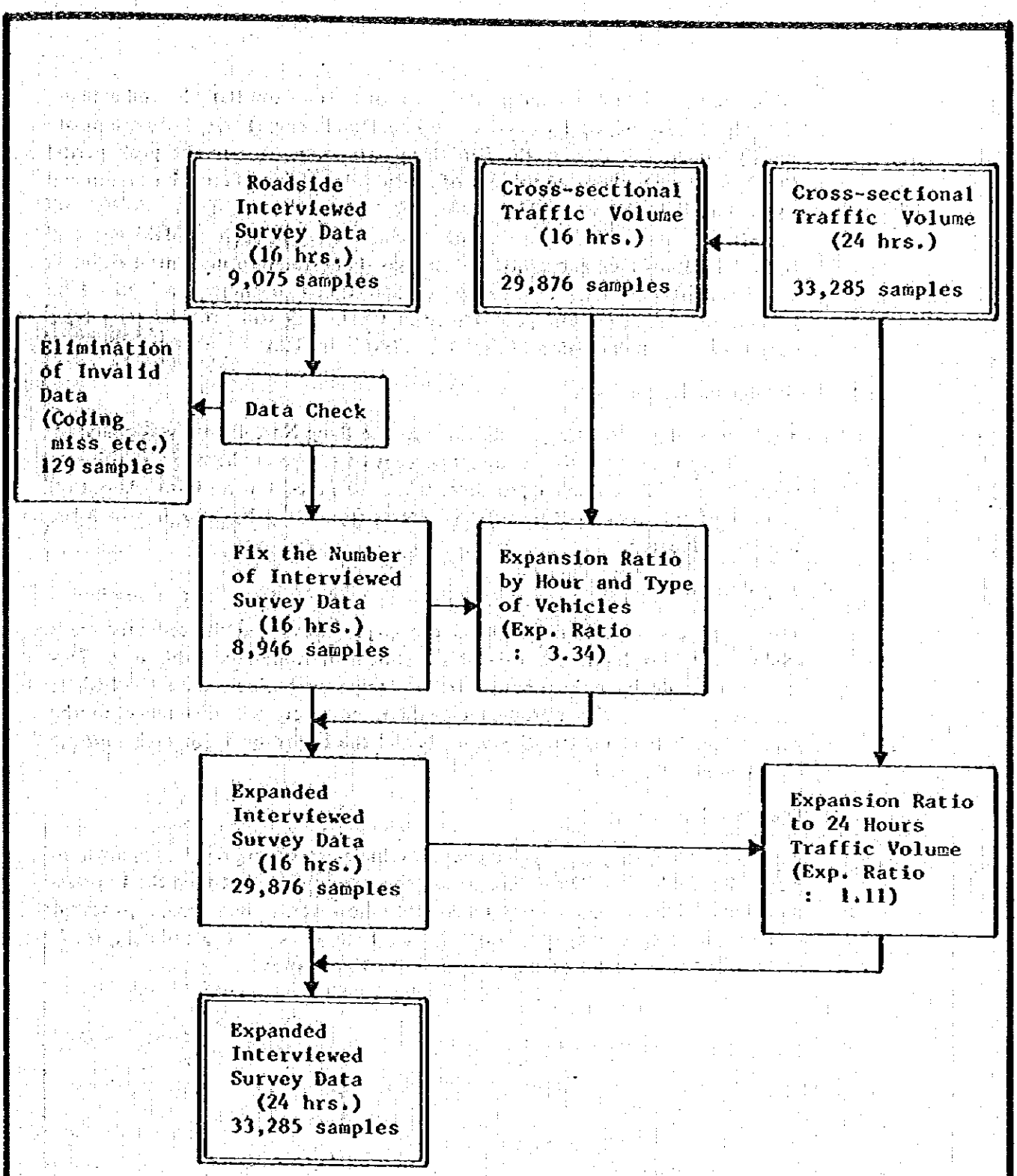
Origin and destination matrices were established using computer and these results are available in separate files. For the purpose of establishing the traffic diversion model, the types of vehicles were classified into four types, considering the toll fare of each type of vehicle, as follows:

Surveyed Vehicle Types		Combined Vehicle Types
1. Pick ups, Vans, Light trucks	———	1. Light trucks
2. Medium trucks	⟹	2. Heavy trucks
3. Heavy trucks		
4. Private cars	⟹	3. Passenger cars
5. Taxis, Samlors		
6. Small buses (Private only)	⟹	4. Buses
7. Large buses (Private only)		

At the same time, origin and destination matrices of the peak period also were established. The surveyed origin and destination traffic flow both on Sukhumvit and Na Krom Roads were combined together as a traffic volume via ordinary roads. These OD tables will be used for the establishment of a traffic diversion model to the Expressways.

c) Traffic Movement between Rampways

Traffic volume from Bang Na toll gate to the other off-ramps is summarized as in Appendix Table 6-5.



APPENDIX FIG. 6-6

DATA EXPANSION PROCESS

THE SECOND STAGE EXPRESSWAY SYSTEM IN THE GREATER BANGKOK

According to this table, almost 30 percent of traffic from Bang Na toll gate use the whole sections of Expressways up to Din Daeng. Their destinations are mostly concentrated near the Din Daeng off ramp. During the peak period (7.00--9.00 am), about 25 percent of traffic gets off from Petchaburi ramp and its peak ratio is also about 25 percent. Again, their destinations are mostly concentrated in its surrounding area of Petchaburi ramp, such as Makkasan and New Petchaburi area and a little traffic has its destination in Central Business District (CBD). If it is taken into consideration that there is a high traffic generation and attraction potentiality in CBD, FES still provides its service only for some small portion of the overall traffic in GBA.

d) Ramp-zone Relationship

The origin of the traffic passing through the Bang Na toll gate was analysed. According to the analysis, about 50 percent of traffic at the Bang Na toll gate comes from Samut Prakan province, while 40 percent form GBA. About 80 percent of the above GBA traffic generates from Bang Na area, in which the toll gate is located.

e) Trip Purpose Compsition

Trip purpose compositions both on the Expressways and the ordinary roads (Sukhumvit and Na Krom Roads) are shown in Appendix Table 6-6. This table was made by only inbound traffic. Trips on business have the highest percentage among the purposes classified, however, the difference in the percentages between the ordinary roads and the Expressway for each purpose classified is quite modest.

f) Passenger Occupancy

Passenger occupancy on each type of vehicles is summarized as shown in Appendix Table 6-7. Difference of passenger occupancy between the Expressway and ordinary roads is not remarkable, however, passenger occupancy of taxi on the Expressway is a little higher than ones on the ordinary roads because of the low ratio of empty taxi on the Expressway.

APPENDIX TABLE 6-5 TRAFFIC FLOW BETWEEN BANG NA TOLL GATE AND OTHER RAMPS

Ramps	Kasemraj (Port)	Riverside Road	Rama IV	Petcha-buri Road	Din Daeng	Total
A. Daily Volume (Veh./Day)	3,191	1,455	3,940	2,948	4,708	16,242
(%)	(19.6)	(9.0)	(24.3)	(18.2)	(28.9)	(100.0)
B. Peak Volume* (Veh./2 Hrs.)	632	179	825	731	600	2,967
(%)	(21.3)	(6.1)	(27.8)	(24.6)	(20.2)	(100.0)
C. = B)/A) (%)	(19.8)	(12.3)	(20.9)	(24.8)	(12.7)	(18.3)

* Peak Period : 7.00-9.00 am

APPENDIX TABLE 6-6 TRIP PURPOSE COMPOSITION (INBOUND TRAFFIC)

(%)

Purpose	Ordinary Roads	Expressways Bang Na
Home to Work	15.2	19.8
Home to School	3.1	4.0
On Business	32.3	33.2
Go Home	28.8	26.3
Others	20.6	16.7
TOTAL	100.0	100.0

APPENDIX TABLE 6-7

AVERAGE NO. OF OCCUPANTS PER VEHICLE

(Inbound : Persons/Vehicle)

		Expressway[1]		Ordinary Road[2]	
		Peak	Daily	Peak	Daily
Pick-ups, Vans		2.42	2.40	2.40	2.35
Trucks	Medium	2.42	2.41	2.22	2.17
	Heavy	2.12	1.85	2.36	1.98
	Average	(2.30)	(2.02)	(2.30)	(2.06)
Passenger Cars	Private Car	1.97	2.08	2.24	2.12
	Taxi	1.73	1.83	0.87	1.56
	Average	(1.95)	(2.06)	(1.98)	(2.01)
Buses (Private)	Small	6.00	6.54	3.53	3.78
	Large	25.64	15.32	15.60	21.41
	Average	(10.25)	(7.75)	(5.38)	(7.68)
GRAND AVERAGE		2.19	2.31	2.35	2.80

Notes : 1) Bang Na Toll Gate

2) Averages of Sukhumvit and Na Krom Roads

APPENDIX TABLE 6-8

ORIGIN-DESTINATION SURVEY

Sheet No (แผ่นที่)

Location No: (หมายเลข) _____ Direction From (ทิศทาง) (จาก) _____ To (ไป) _____ Survey Time (เวลาสำรวจ) _____ Interviewer's Name (ผู้สัมภาษณ์) _____

No.	ORIGIN (จุดเริ่มต้น) Soi (ซอย) _____ Road (ถนน) or nearby wellknown location (หมายเหตุที่ใกล้เคียง)	DESTINATION (จุดสิ้นสุด) Soi (ซอย) _____ Road (ถนน) or nearby wellknown location (หมายเหตุที่ใกล้เคียง)	RAMP WAY C/T (จุดขึ้นทางด่วน) Port (ท่าเรือ)	River Side Road (ถนนริมแม่น้ำ)	Rama IV (ถนนพระราม ๔)	New Petchburi (เพชรบุรีตัดใหม่)	Din Daeng (ดินแดง)	TRUCKS (รถบรรทุก) 1 Pick up ban Light-truck	2 Medium Truck	3 Heavy Truck	PASSENGER VEHICLES (รถโดยสาร) 4 Private Car	5 Taxi (taelor)	6 Bus (Private) Small bus	Large bus	TRIP PURPOSE (วัตถุประสงค์การเดินทาง) Home to-Work (เดินทางไปทำงาน)	To School (ไปโรงเรียน)	On business (ไปธุรกิจ)	To home (กลับบ้าน)	Others (อื่น ๆ)	Number of persons aboard including the driver (จำนวนผู้โดยสารรวมทั้งคนขับ)
1	Soi (ซอย) Rd. (ถนน)	Soi (ซอย) Rd. (ถนน)																		
2	Soi (ซอย) Rd. (ถนน)	Soi (ซอย) Rd. (ถนน)																		
3	Soi (ซอย) Rd. (ถนน)	Soi (ซอย) Rd. (ถนน)																		
4	Soi (ซอย) Rd. (ถนน)	Soi (ซอย) Rd. (ถนน)																		
5	Soi (ซอย) Rd. (ถนน)	Soi (ซอย) Rd. (ถนน)																		
6	Soi (ซอย) Rd. (ถนน)	Soi (ซอย) Rd. (ถนน)																		
7	Soi (ซอย) Rd. (ถนน)	Soi (ซอย) Rd. (ถนน)																		
8	Soi (ซอย) Rd. (ถนน)	Soi (ซอย) Rd. (ถนน)																		

AP 6-17

APPENDIX TABLE 6-9 TRAFFIC COUNTING SURVEY Sheet No. .....

Locations No. _____ Direction From _____ To _____

TYPES OF VEHICLE / HOUR	Private Car	Taxi (Samlor)	Trucks			Buses			Total	Motorcycle
			Pickup ban & Light Truck	Mediam Truck	Heavy Truck	Mini bus	Bus (Public)	Bus (Private)		
6:00-7:00										
7:00-8:00										
8:00-9:00										
9:00-10:00										
10:00-11:00										
11:00-12:00										
12:00-13:00										
13:00-14:00										
14:00-15:00										
15:00-16:00										
16:00-17:00										
17:00-18:00										
TOTAL										
18:00-19:00										
19:00-20:00										
20:00-21:00										
21:00-22:00										
22:00-23:00										
23:00-24:00										
0:00-1:00										
1:00-2:00										
2:00-3:00										
3:00-4:00										
4:00-5:00										
5:00-6:00										
TOTAL										
GRAND TOTAL										

APPENDIX TABLE 6-10 TRAFFIC COUNTING SURVEY Sheet No. 3.....

Locations No. 1 (Bang Na Toll Gate) Direction From - Both Direction To -

TYPES OF VEHICLE / HOUR	Private Car	Taxi (Samlor)	Trucks			Buses			Total	Motorcycle
			Pickup ban & Light Truck	Medium Truck	Heavy Truck	Mini bus	Bus (Public)	Bus (Private)		
6:00-7:00	688	81	168	17	85	98	-	12	1149	-
7:00-8:00	1943	99	302	15	10	84	-	27	2480	-
8:00-9:00	1296	113	371	48	16	76	-	37	1957	-
9:00-10:00	942	112	465	117	177	49	-	27	1889	-
10:00-11:00	944	118	509	183	299	41	-	36	2130	-
11:00-12:00	884	116	487	129	435	31	-	28	2110	-
12:00-13:00	815	107	435	144	196	29	-	28	1754	-
13:00-14:00	684	89	409	141	186	30	-	19	1558	-
14:00-15:00	822	108	440	131	145	33	-	20	1699	-
15:00-16:00	989	109	498	163	93	53	-	31	1936	-
16:00-17:00	1206	125	431	39	39	53	-	33	1926	-
17:00-18:00	1680	112	457	10	8	61	-	32	2360	-
TOTAL	12893	1289	4972	1137	1689	638	-	330	22948	-
18:00-19:00	1289	158	296	32	156	146	-	50	2127	-
19:00-20:00	942	143	256	9	59	169	-	13	1591	-
20:00-21:00	684	112	164	8	88	129	-	10	1195	-
21:00-22:00	651	114	154	-	175	90	-	5	1189	-
22:00-23:00	376	71	79	1	56	72	-	5	660	-
23:00-24:00	238	53	64	1	66	31	-	1	454	-
0:00-1:00	161	34	60	1	72	19	-	1	348	-
1:00-2:00	78	18	31	2	73	31	-	-	233	-
2:00-3:00	48	14	35	-	80	21	-	1	199	-
3:00-4:00	31	13	55	2	68	25	-	3	197	-
4:00-5:00	35	22	57	1	99	16	-	1	231	-
5:00-6:00	88	43	82	3	114	31	-	1	362	-
TOTAL	4621	795	1333	60	1106	780	-	91	8786	-
GRAND TOTAL	17514	2084	6305	1197	2795	1418	-	421	31734	-

APPENDIX TABLE 6-11 TRAFFIC COUNTING SURVEY Sheet No. 3

Locations No. 2 (Sukhumvit) Direction From - To - Both Direction

TYPES OF VEHICLE / HOUR	Private Car	Taxi (Samlor)	Trucks			Buses			Total	Motorcycle
			Pickup ban & Light Truck	Mediam Truck	Heavy Truck	Mini bus	Bus (Public)	Bus (Private)		
6:00-7:00	396	197	42	58	163	197	309	165	1527	272
7:00-8:00	1090	284	34	7	21	293	373	189	2291	1059
8:00-9:00	861	370	169	183	37	111	355	98	2184	653
9:00-10:00	611	348	288	240	183	164	323	140	2297	433
10:00-11:00	611	325	214	158	104	223	265	80	1980	537
11:00-12:00	579	342	110	249	221	212	226	149	2088	542
12:00-13:00	519	258	214	143	172	208	244	127	1885	485
13:00-14:00	541	235	211	60	168	212	241	80	1748	519
14:00-15:00	565	237	210	65	182	187	205	88	1739	432
15:00-16:00	541	286	113	76	81	254	240	91	1682	423
16:00-17:00	651	218	182	36	28	188	280	129	1712	428
17:00-18:00	983	256	147	27	32	205	241	216	2107	632
TOTAL	7948	3356	1934	1302	1392	2454	3302	1552	23240	6415
18:00-19:00	755	327	85	42	41	240	257	102	1849	488
19:00-20:00	502	290	162	25	30	137	187	84	1417	480
20:00-21:00	529	285	135	15	81	107	159	60	1371	367
21:00-22:00	555	333	97	26	109	160	143	46	1469	401
22:00-23:00	390	321	103	15	99	109	78	23	1138	256
23:00-24:00	228	223	50	13	67	77	40	15	713	184
0:00-1:00	165	243	49	17	89	74	11	8	656	139
1:00-2:00	110	141	44	13	51	61	7	1	428	89
2:00-3:00	67	130	47	15	83	65	10	2	419	33
3:00-4:00	27	83	41	18	69	50	13	11	312	28
4:00-5:00	27	89	41	10	124	86	42	8	427	59
5:00-6:00	90	133	30	22	140	117	204	46	782	80
TOTAL	3445	2598	884	231	983	1283	1151	406	10981	2604
GRAND TOTAL	11393	5954	2818	1533	2375	3737	4453	1958	34221	9019

APPENDIX TABLE 6-12 TRAFFIC COUNTING SURVEY Sheet No. 3.....

Locations No. 3 (Na-krom Road) Direction From - Both Direction To -

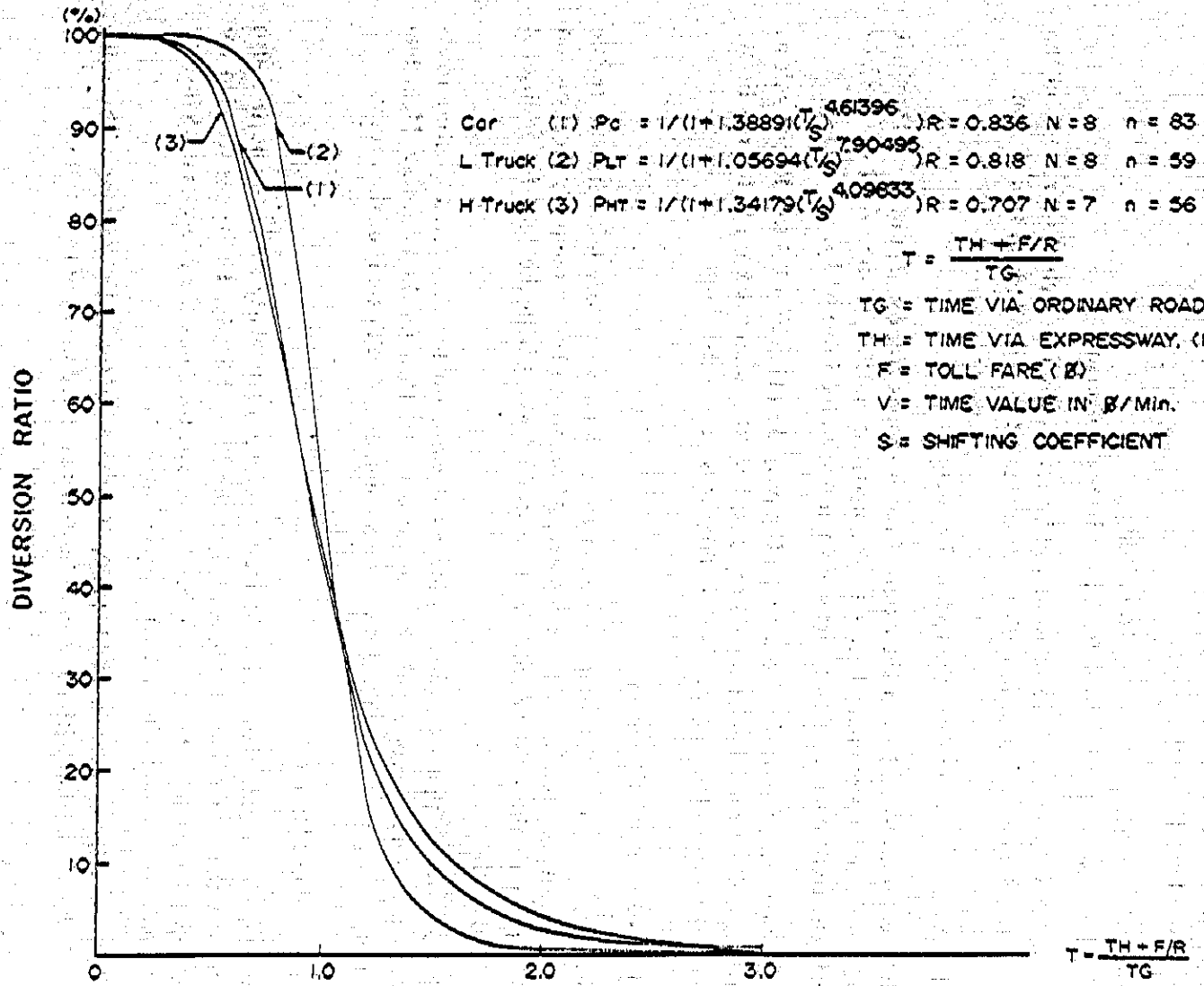
TYPES OF VEHICLE / HOUR	Private Car	Taxi (Samlor)	Trucks			Buses			Total	Motorcycle
			Pickup ban & Light Truck	Mediam Truck	Heavy Truck	Mini bus	Bus (Public)	Bus (Private)		
6:00-7:00	124	63	54	38	64	7	8	20	378	118
7:00-8:00	302	100	48	2	70	51	6	11	590	480
8:00-9:00	118	52	27	6	85	34	5	2	329	205
9:00-10:00	98	88	75	17	322	32	23	5	660	162
10:00-11:00	83	82	89	45	312	47	7	-	665	167
11:00-12:00	85	68	79	21	318	28	7	2	608	181
12:00-13:00	85	62	59	15	214	41	10	1	478	131
13:00-14:00	95	42	107	18	222	57	10	1	552	158
14:00-15:00	87	49	86	19	253	30	11	2	537	165
15:00-16:00	120	78	90	39	218	55	10	8	618	203
16:00-17:00	212	96	76	14	103	42	21	13	577	246
17:00-18:00	260	96	75	6	128	41	30	2	638	349
TOTAL	1669	876	856	240	2309	465	148	67	6630	2565
18:00-19:00	107	114	54	51	55	32	22	13	448	217
19:00-20:00	119	95	66	19	24	38	2	17	380	156
20:00-21:00	77	73	37	22	21	17	8	5	260	103
21:00-22:00	56	81	40	11	28	17	4	5	242	100
22:00-23:00	40	40	33	10	18	7	4	-	152	63
23:00-24:00	23	35	12	1	9	3	1	-	84	43
0:00-1:00	22	33	9	3	8	7	2	-	84	22
1:00-2:00	9	28	6	1	7	3	1	-	55	30
2:00-3:00	3	11	5	2	5	1	-	-	27	4
3:00-4:00	3	15	7	1	5	1	-	-	32	10
4:00-5:00	5	26	10	3	7	6	1	-	58	13
5:00-6:00	11	52	27	21	41	1	3	3	159	46
TOTAL	475	603	306	145	228	133	48	43	1981	807
GRAND TOTAL	2144	1479	1162	385	2537	598	196	110	8611	3372

APPENDIX TABLE 6-13 TRAFFIC FLOW BETWEEN BANG NA TOLL GATE AND OTHER RAMPS

	Kasemraj (Port)	Riverside Road	Rama IV	Petcha-buri Road	Din Daeng	Total
A. Actual (Veh./Day)	3,191	1,455	3,940	2,948	4,708	16,242
(%)	(19.6)	(9.0)	(24.3)	(18.2)	(28.9)	(100.0)
B. Estimated by the Time Balance Model	461	3,407	5,549	3,426	3,120	15,963
	(2.9)	(21.3)	(34.8)	(21.5)	(19.5)	(100.0)
C. Estimated by the Time Ratio Model	639	2,757	7,457	3,670	4,276	18,799
	(3.4)	(14.7)	(39.7)	(19.5)	(22.7)	(100.0)

APPENDIX TABLE 6-14 ON RAMP TRAFFIC FLOW

	Actual	Time Balance Model			Time Rate Model		
	(1)	(2) Esti-mated	(2)/(1) Error Rate	(2)/(1)-1 Error Ratio	(3) Esti-mated	(3)/(1) Error Rate	(3)/(1)-1 Error Ratio
Din Daeng	456	393	0.8618	-0.1382	539	1.1820	0.1820
Phetchaburi Rd.	118	132	1.1186	0.1186	211	1.7881	0.7881
Sukhumvit Rd.	106	163	1.5377	0.5377	365	3.4434	2.4434
Rama IV Rd.	148	136	0.9189	-0.0811	269	1.8176	0.8176
River Side Rd.	280	272	0.9714	-0.0286	307	1.0964	0.0964
Kasemraj (Port)	72	81	1.1250	0.1250	112	1.5556	0.5556
Bang Na	346	319	0.9220	-0.0780	376	1.0867	0.0867
Other	67	18	0.2687	-0.7313	76	1.1343	0.1343
Total (½)	797	757	0.9502	-0.0498	1127	1.4148	0.4148



Car (1) $P_C = 1/(1+1.38891(T/S)^{4.61396})$ R = 0.836 N = 8 n = 83

L Truck (2) $P_{LT} = 1/(1+1.05694(T/S)^{7.90496})$ R = 0.818 N = 8 n = 59

H Truck (3) $P_{HT} = 1/(1+1.34179(T/S)^{4.09633})$ R = 0.707 N = 7 n = 56

$$T = \frac{TH + F/R}{TG}$$

TG = TIME VIA ORDINARY ROADS (Min)

TH = TIME VIA EXPRESSWAY. (Min)

F = TOLL FARE (฿)

V = TIME VALUE IN ฿/Min.

S = SHIFTING COEFFICIENT

APPENDIX FIG. 6-7	EXPRESSWAY DIVERSION FORMULA TIME-RATIO APPROACH

THE SECOND STAGE EXPRESSWAY SYSTEM IN THE GREATER BANGKOK

APPENDIX 6.3 REVIEW OF THE PHASE I TRAFFIC ASSIGNMENT

(1) Traffic Assignment

The computer simulation of the vehicle traffic assignment on the roads in the year 2000 was conducted in the Phase I Study. Comments were made to identify a few sections of the road network on which estimated traffic volumes were considered too high or too low. The sections are:

- Phrapinklao Bridge and Krung Thon Bridge
- On the southern section from Ram Kam Haeng University, etc.

The traffic volume on these sections will be revised by modifying the zones and the road network linkage. These modifications are stated in (4) and (5) of this section.

(2) Traffic Volumes to and from the External Zones

Traffic volumes to and from the external zones (zones No. 69–72) in the OD matrix were found to approximate better to the updated traffic counting data of 1982 of DOH. The DOH data referred to are shown in Appendix Table 6–15.

In addition, forecast traffic volume on Highway 35 (Thonburi Paktoh Road) will be revised to allow for additional volume caused by the Samut Sakorn Industrial Estate Project. Review of the Industrial Estate Project is being carried out.

(3) Traffic Volumes on Rampways

Traffic volumes on on-and-off rampways are under review together with the traffic on adjacent road sections of the rampway. Alternative plans in rampway location and connections to the existing roads will be studied along with the need for additional rampways.

It is quite likely that extensive improvement work on the connected existing roads will be necessary to cope with the estimated traffic flow on the rampway. Main features of the required improvement will be recommended in Phase II of the Study.

(4) Zoning and OD Matrix

It is considered better to revise the traffic zoning, particularly along the north-south route and the east route recommended in the Phase I Study. The zones selected for partition are shown in Appendix Table 6–16. The total number of zones is 85 instead of 72. New zone map is shown in Appendix Fig. 6–8.

OD vehicle trip matrices in 1982, 1990, 2000 and 2010 will be reorganized by using the 85 zones, together with a few modifications as stated in (2) of this section.

(5) Road Network

There were some errors in the route numbers of highways and programs of road improvement shown in the Phase I Study. They have been corrected in Phase II.

In the road networks of 1982 and the future years used for the computer simulation, some road link data will be revised and new road links will be added. The road link classification in terms of traffic capacity will also be reviewed by reconducting field observation.

APPENDIX TABLE 6-15 TRAFFIC COUNTING DATA 1982

National Highway Route	Location	Km	Cars	Cross-sectional Traffic Volume (Veh./day)					Total	Relating Zone
				Buses		Trucks				
				Light	Heavy	Light	Medium	Heavy		
No. 1	0202	35.0	9,625	4,723	3,280	2,756	2,986	5,292	28,662	69
34	01	20.9	6,864	1,194	1,494	3,754	3,644	137	16,787	70
3	02	20.0	16,906	5,109	4,659	5,981	4,206	2,794	39,655	
35	01	20.9	3,435	666	667	1,181	1,528	575	8,052	72
4	01	20.5	10,800	2,214	2,092	3,663	5,312	6,405	30,486	71

Source : DOH file, 1982

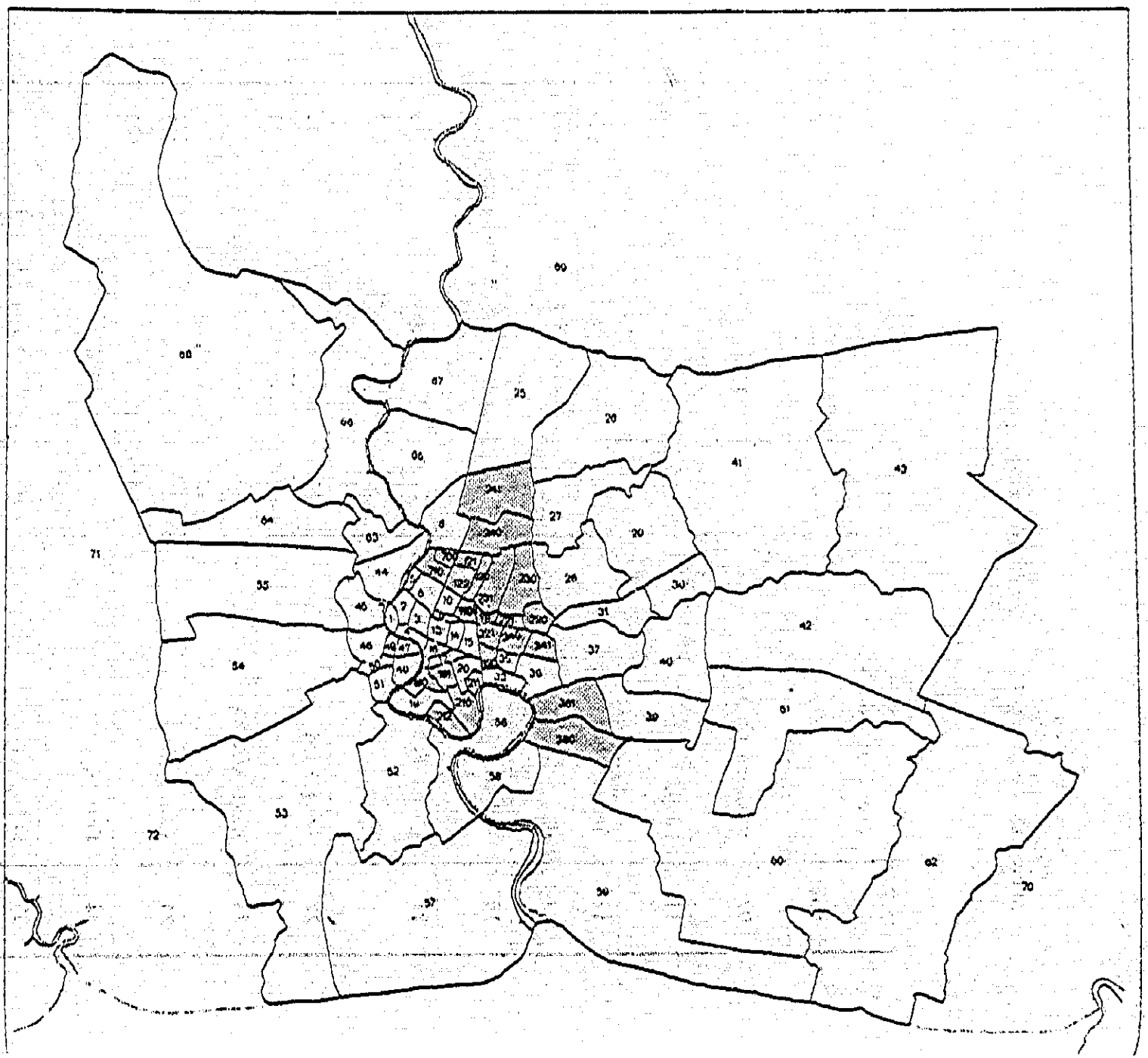
APPENDIX TABLE 6-16 ZONES TO BE REVISED

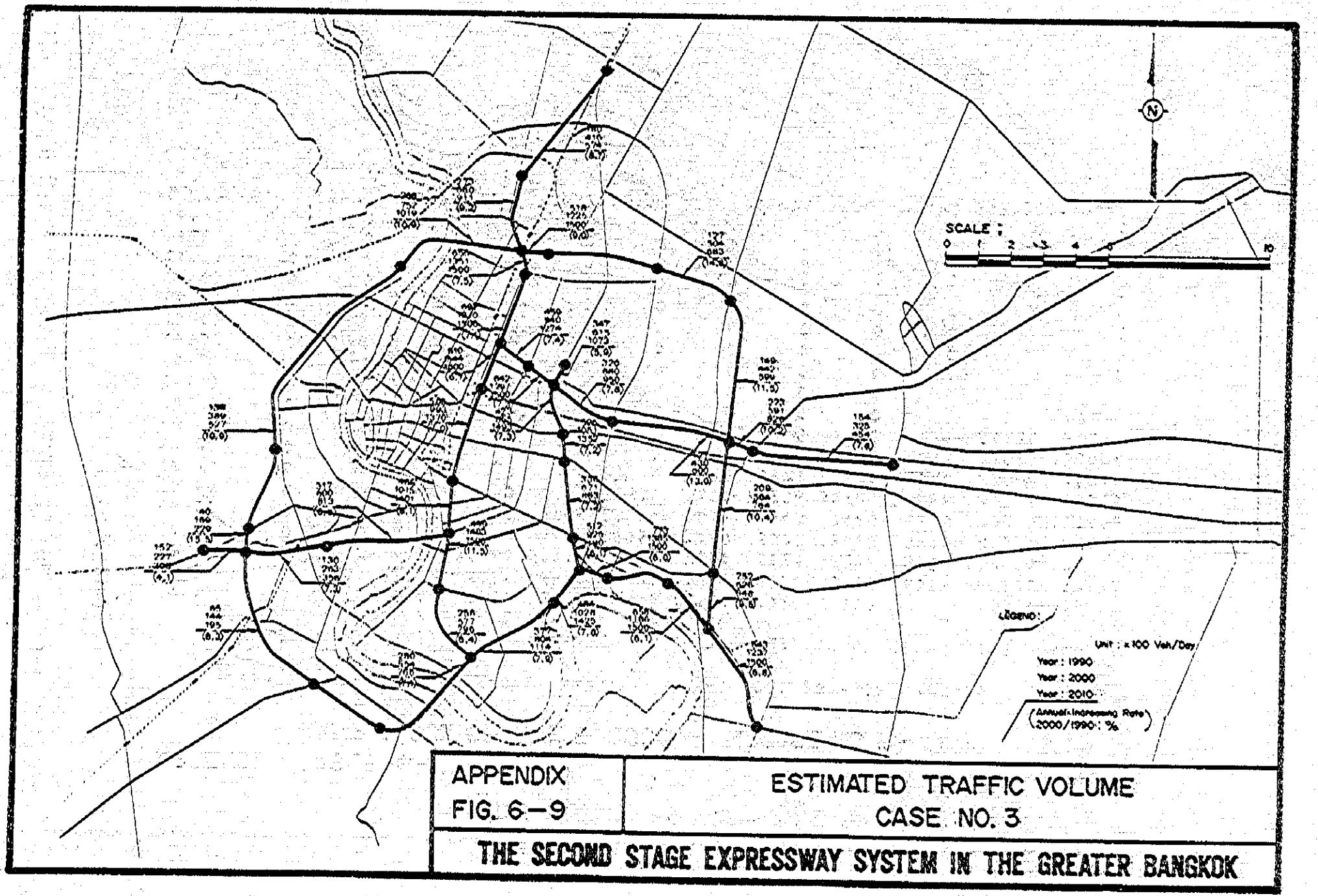
Previous Zone		Revised Zone	
No.	Name	No.	Name
07	Nakhorn Chaisri	700	Nakhorn Chaisri (1)
		710	Nakorn Chaisri (2)
11	Phaya Thai	110	Thanon Phayathai, Makkasan
		111	Makkasan, Bang Kapi
12	Samsen Nai	120	Samsen Nai (1)
		121	Samsen Nai (2)
		122	Samsen Nai (3)
18	Yannawa	180	Yannawa, Wat Phraya Khrai
		181	Thong Wat Don
21	Chong Nonsi	210	Chong Nonsi (1)
		211	Chong Nonsi (2)
		212	Bang Pong Pang
22	Bang Kapi	220	Bang Kapi (1)
		221	Bang Kapi (2)
23	Huai Khwang	230	Samsen Nok, Huai Khwang
		231	Din Daeng
24	Lad Yao	240	Lad Yao (1)
		241	Lad Yao (2)
32	Khlong Toey	320	Khlong Toey (South)
		321	Khlong Toey (North)
34	Khlong Tan	340	Khlong Tan (North)
		341	Khlong Tan
38	Bang Na	380	Bang Na
		381	Bang Chak

APPENDIX FIG. 6-8
ZONE MAP OF THE GBA

LEGEND :

REVISED ZONE





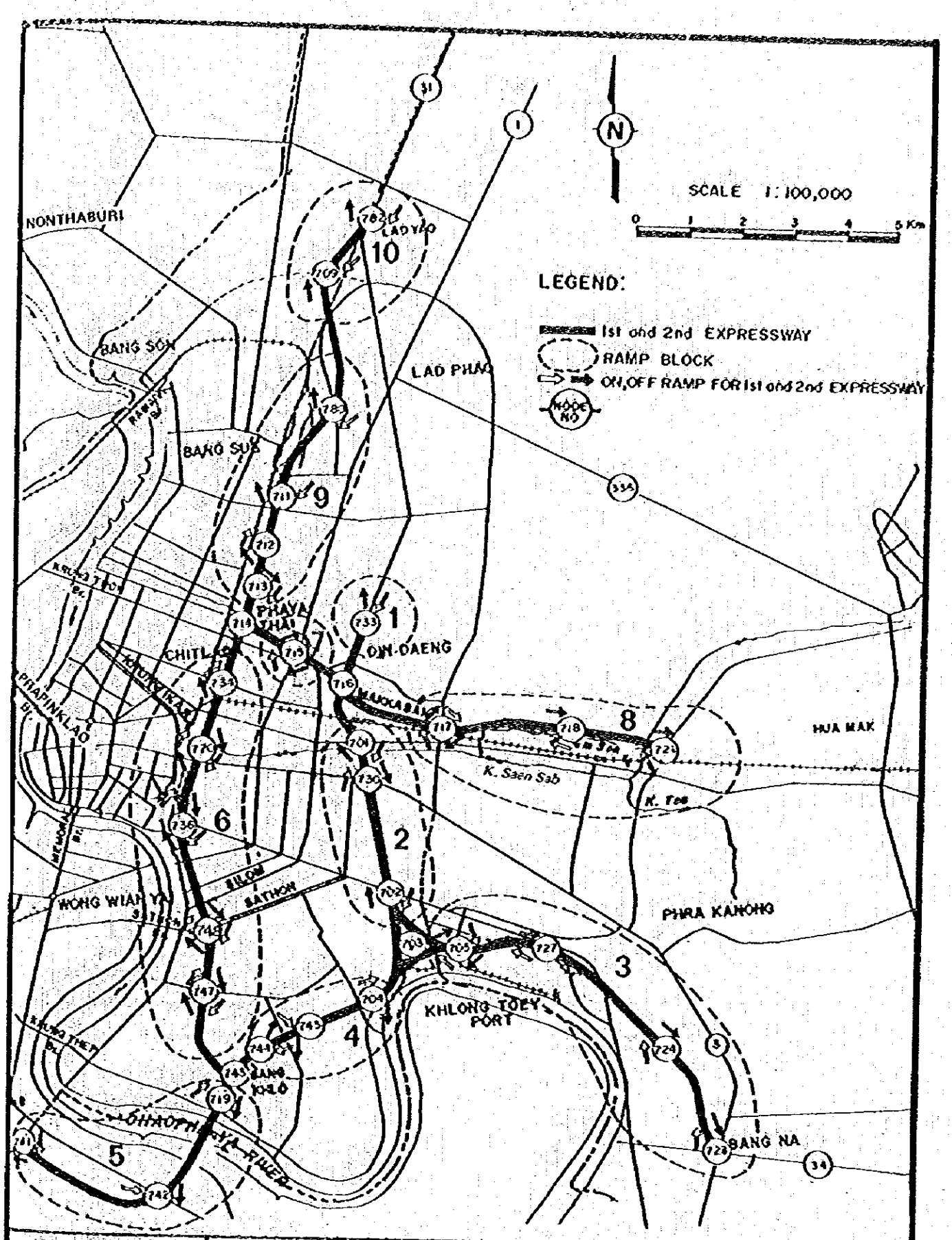
APPENDIX FIG. 6-9	ESTIMATED TRAFFIC VOLUME CASE NO. 3

THE SECOND STAGE EXPRESSWAY SYSTEM IN THE GREATER BANGKOK

APPENDIX TABLE 6-17
RAMP BLOCK OD TABLE, 2000 (CASE NO. R-1)

***** RAMP BLOCK OD TABLE ***** R-1 2000 208-308 (TOTAL)

	(B 1)	(B 2)	(B 3)	(B 4)	(B 5)	(B 6)	(B 7)	(B 8)	(B 9)	(B10)	(TOT)	IN-OUT
(B 1)	0	7670	7244	4500	5306	8699	1161	1924	115	0	36619	36619
(B 2)	0	5901	23732	3925	13588	5993	3055	18172	3283	6559	84206	97717
(B 3)	0	0	6621	11560	51117	40284	7873	3623	8012	8526	137616	175213
(B 4)	0	0	0	0	5670	2956	1340	5576	2000	3815	21357	41342
(B 5)	0	0	0	0	2006	28554	3038	17943	7440	14828	73809	151496
(B 6)	0	0	0	0	0	29631	5604	71756	30789	51468	189248	305365
(B 7)	0	0	0	0	0	0	0	20171	537	2300	23008	45077
(B 8)	0	0	0	0	0	0	0	4806	5904	2313	13025	156994
(B 9)	0	0	0	0	0	0	0	0	7165	7671	14836	80081
(B10)	0	0	0	0	0	0	0	0	0	0	0	97480
(B11)	0	0	0	0	0	0	0	0	0	0	0	0
(B12)	0	0	0	0	0	0	0	0	0	0	0	0
(B13)	0	0	0	0	0	0	0	0	0	0	0	0
(B14)	0	0	0	0	0	0	0	0	0	0	0	0
(B15)	0	0	0	0	0	0	0	0	0	0	0	0
(B16)	0	0	0	0	0	0	0	0	0	0	0	0
(B17)	0	0	0	0	0	0	0	0	0	0	0	0
(B18)	0	0	0	0	0	0	0	0	0	0	0	0
(B19)	0	0	0	0	0	0	0	0	0	0	0	0
(TOT)	0	13571	37597	19985	77687	116117	22069	143971	65245	97480	593722	1187444



APPENDIX
FIG. 6 – 10

RAMP BLOCK MAP

THE SECOND STAGE EXPRESSWAY SYSTEM IN THE GREATER BANGKOK