5) Institutional Effects

A transport plan, however good and effective theoretically must be acceptable to the Johoreans. If it is unacceptable to the residents then there is no point in proposing it. This will also be taken into account in the study.

4-3 Alternative Road Network Plans

1 Committed Projects

The development projects within the Study Area to which commitment has been made prior to the formation of the transport plan are as follows:

a. Toll Expressway
b. Johor Bahru - Pasir Gudang Port Access Road
c. Improvement of Federal Route 1
d. Improvement of East Coast Federal Route
e. Improvement of West Coast Federal Route
f. Senai Airport Access Road
g. Kulai - Kota Tinggi Road
h. Pontian Agricultural Road
i. Johor Tenggara Roads
j. Airport Access/Kempas Road
k. Sungai Danga Road

Table 4.1 *Strategic Measures Adopted for the Corridor*

	AREAS / STRATEGIC MEASURES	1 C.B.D.	2 Eastern Corridor in MPJB	3 Western Corridor in MPJB	4 Inner Ring Road Corridor in MPJB	5 Jalan Tampoi Corridor in MPJB	6 Johor Bahru - Pasir Gudang Corridor	7 Johor Bahru - Kota Tinggi Corridor	8 Johor Bahru - Senai/Kulai Corridor	9 Johor Bahru - Pulai Corridor
1	Effective Use of Existing Transport Facilities	●	●	●	●	●	•	•	●	•
2	Effective Use of Passenger Car	●	●	●	●	●	●	•	•	•
3	Improvement and/or Expansion of Transport System	●	●	●	●	●	●	●	●	●
4	Introduction of Innovative Bus and/or Other Form of Public Transport System	•	●	●	•	•	●	•	●	•
5	Traffic Restraints	●	●	•	•	•	•	•	•	•
6	Traffic Engineering and Management	●	●	●	●	●	•	•	•	•
7	Road Improvement and Construction	●	●	●	●	●	●	●	●	●

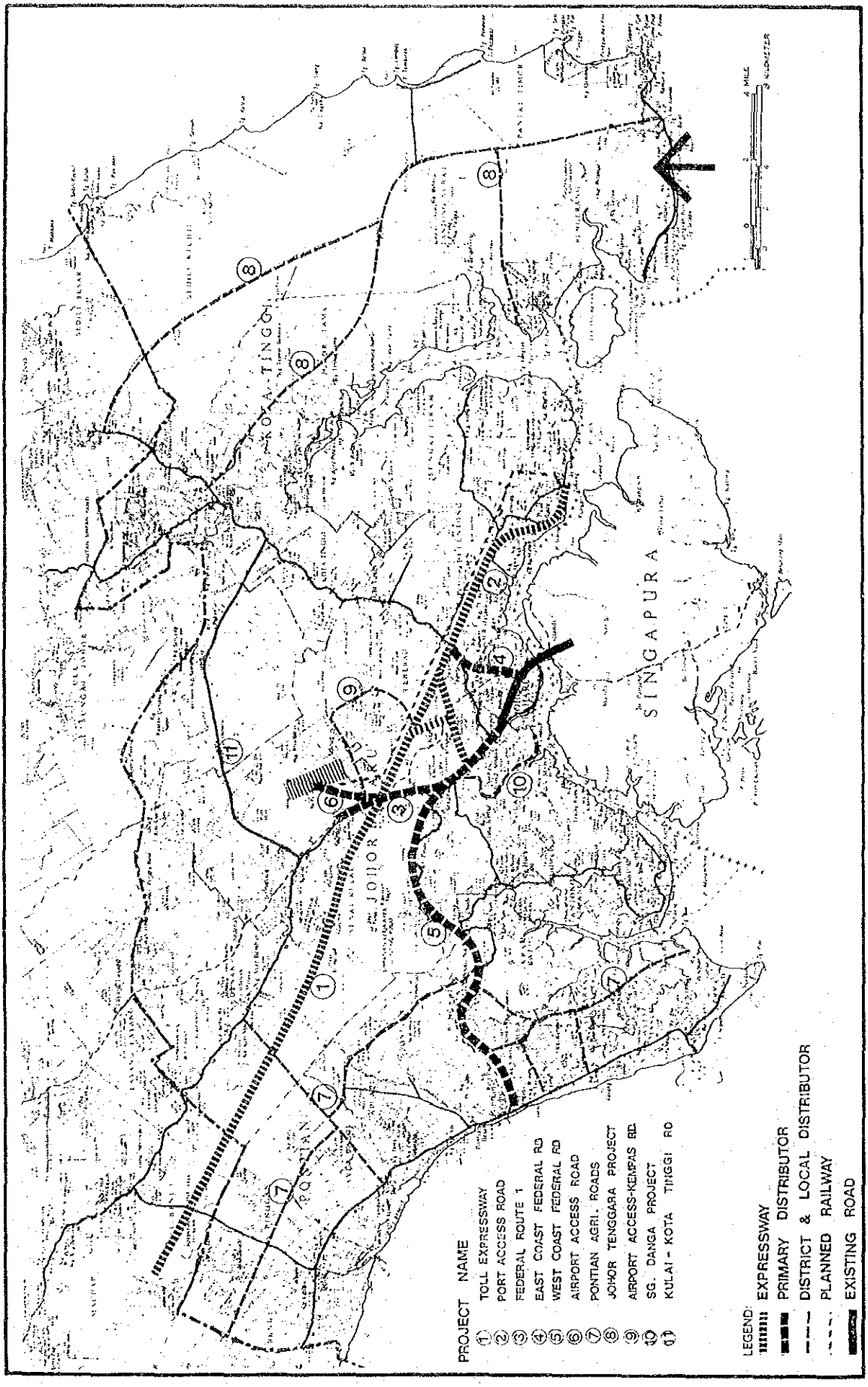
● Highly Effective ● Moderate Effective • Low Effective

Table 4.2 Relationship between Strategic Measures and Implementation Timing

	Short-Term	Longer-Term
1. Effective Use of Existing Transport Facilities	●	●
2. Effective Use of Passenger Car	●	●
3. Improvement and/or Expansion of Bus Transport System	●	●
4. Introduction of Innovational Bus and/or Public Transport System	○	●
5. Traffic Restraints	○	●
6. Traffic Engineering and Management	●	●
7. Road Improvement and Construction	○	●

● High priority ○ Low priority

Fig. 4.1 Committed Projects of Study Area



2 Network Configuration

The appropriate network configuration for any urban area should be one which gives due consideration to the size, functionality and form of the city in question. It must accommodate the natural conditions and environment of the area, the climate, the population, distribution, and social environment of the residents and the manner of land use predicted for the area.

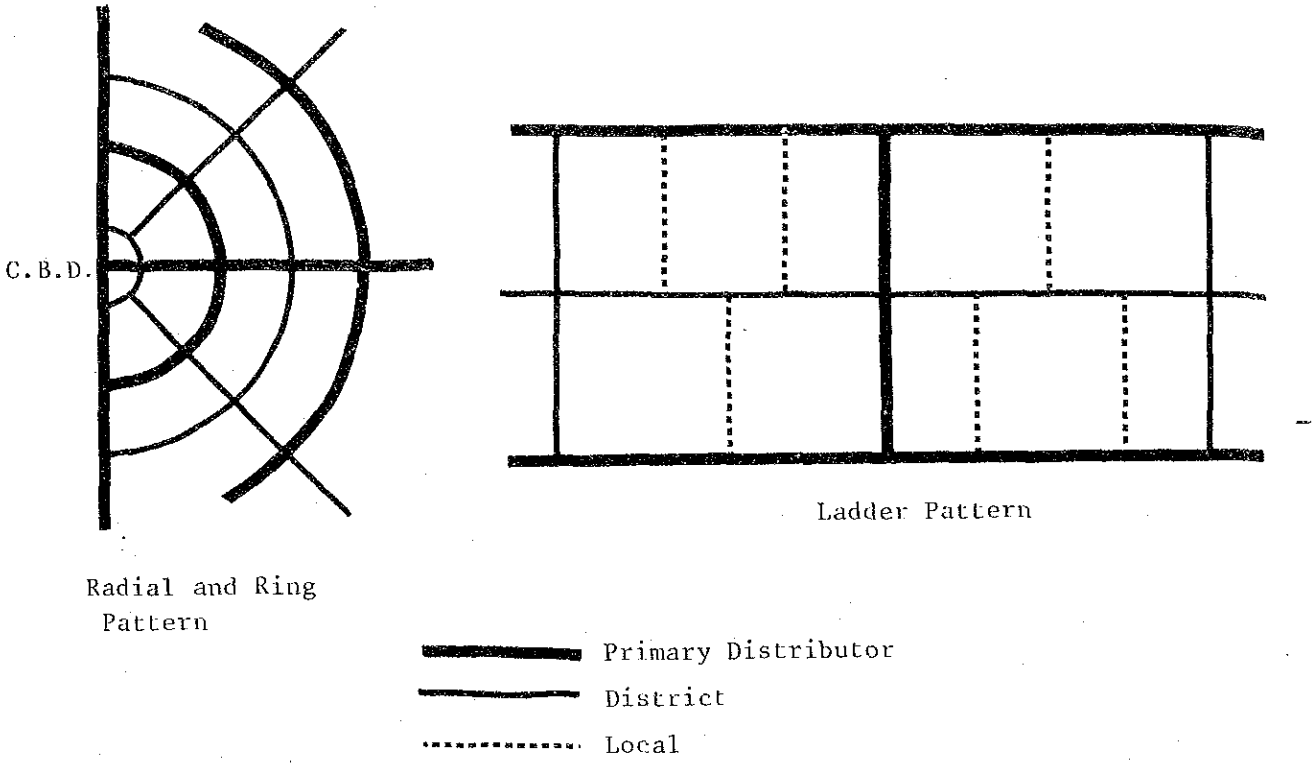
For the Study Area, the following patterns are proposed:

a. In the municipality of Johor Bahru, a predominantly radial and ring pattern.
b. In the Pasir Gudang Corridor, a ladder pattern.
c. In the rest of the Study Area, a combined pattern.

A radial and ring pattern concentrates traffic in the C.B.D. Nevertheless, the connected regional towns would benefit from the growth of the C.B.D. and share in its development. The ladder pattern can be seen in those parts of the city which have been consciously designed, for example, the housing schemes of Taman Sentosa and Taman Pelangi. The advantage of this kind of pattern lies in its ability to provide a series of alternative routes as a consequence of its square road network system.

The illustrations below show the conceptual plan of the road network in the Study Area.

Fig. 4.2 Concept of Road Network



3 Proposed Road Network

The Study Team suggests that the roads be classified into six (6) categories according to their functions. The following are the definitions of the categories.

1) Expressway

Expressway is a divided highway for through traffic with ful or partial control of access. The design is for long trip, continuous route traffic, and a high design speed are required. Generally, there are grade separations at major intersections.

2) Primary Distributors

These roads are designed to provide a high

level of service and a large traffic capacity since they are used to distribute long trip, inter-city and intra-city traffic. All long-distance traffic to, from and within the town should be channelled to these distributors.

3) District Distributors

These roads distribute traffic within the main residential, industrial and business districts of the town while forming the link between the primary network and the roads within the surrounding areas. It performs a vital function of accommodating maximum traffic movement during peak periods and serves the general circulating and land service functions of the community during off-peak periods.

4) Local Distributors

Although these roadways are sometimes used for traffic movements through the city, they are generally utilized for local circulating purposes within the surrounding areas and form a necessary link between district distributors and access roads.

5) Access Road

The major function of these roads is to give direct access to residence, business, or land in the surrounding areas. These should be concentrated close together and through traffic kept to a minimum.

6) Bicycle and Pedestrian Path

These roads are used exclusively by pedestrians, bicy clists and riders of non-motorised vehicles. Cycling roads, (a mall) and shopping roads are included in this category.

Two optional road network plans, which take into consideration the various local conditions, land use

plan and network planning concept, are proposed as shown in Fig. 4.3, 4.4, 4.5 and 4.6.

Fig. 4.3 Alternative Road Network (Study Area) – Option 1

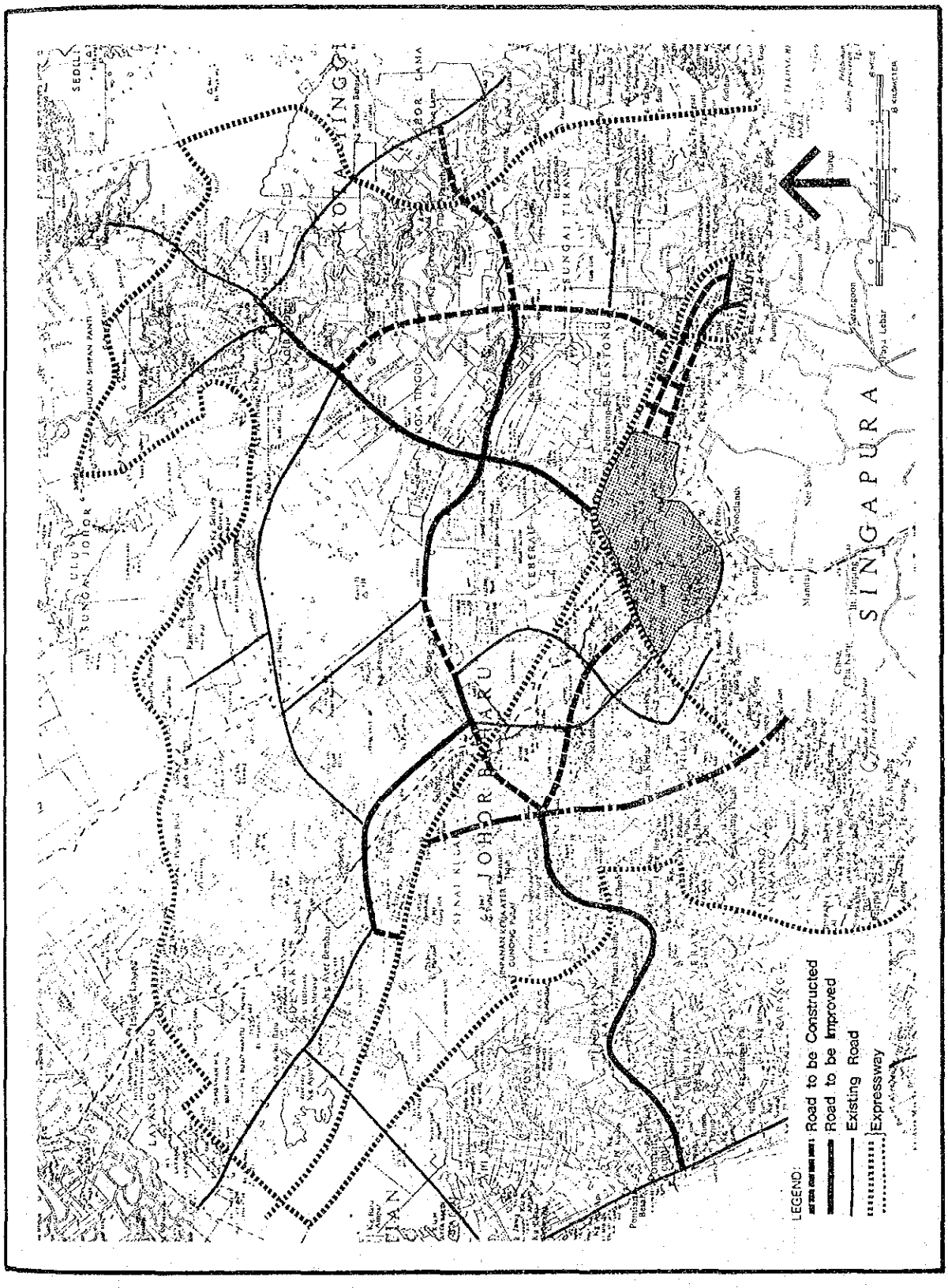


Fig. 4.4 Alternative Road Network (MPJB) – Option 1

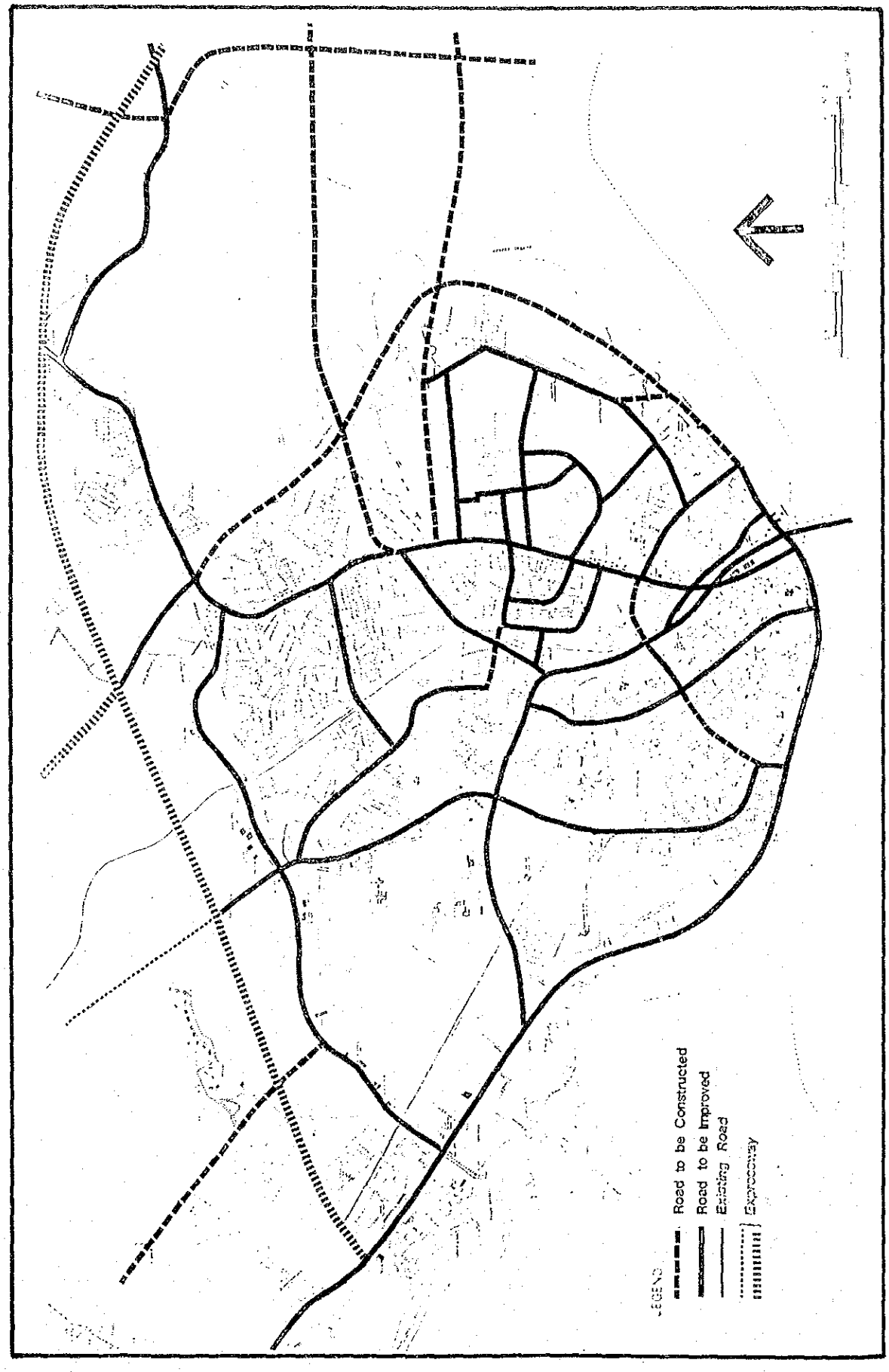


Fig. 4.5 Alternative Road Network (Study Area) – Option 2

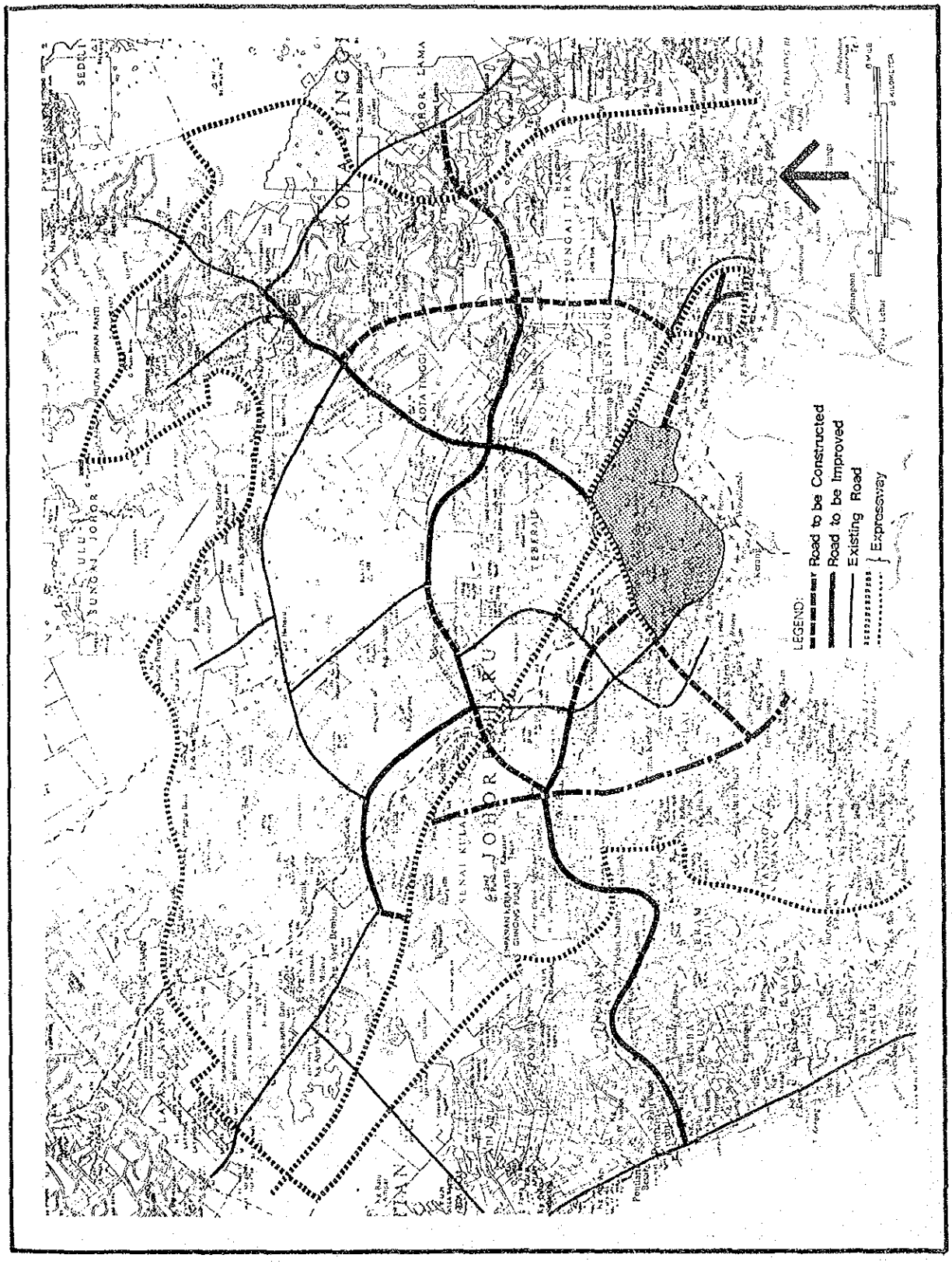
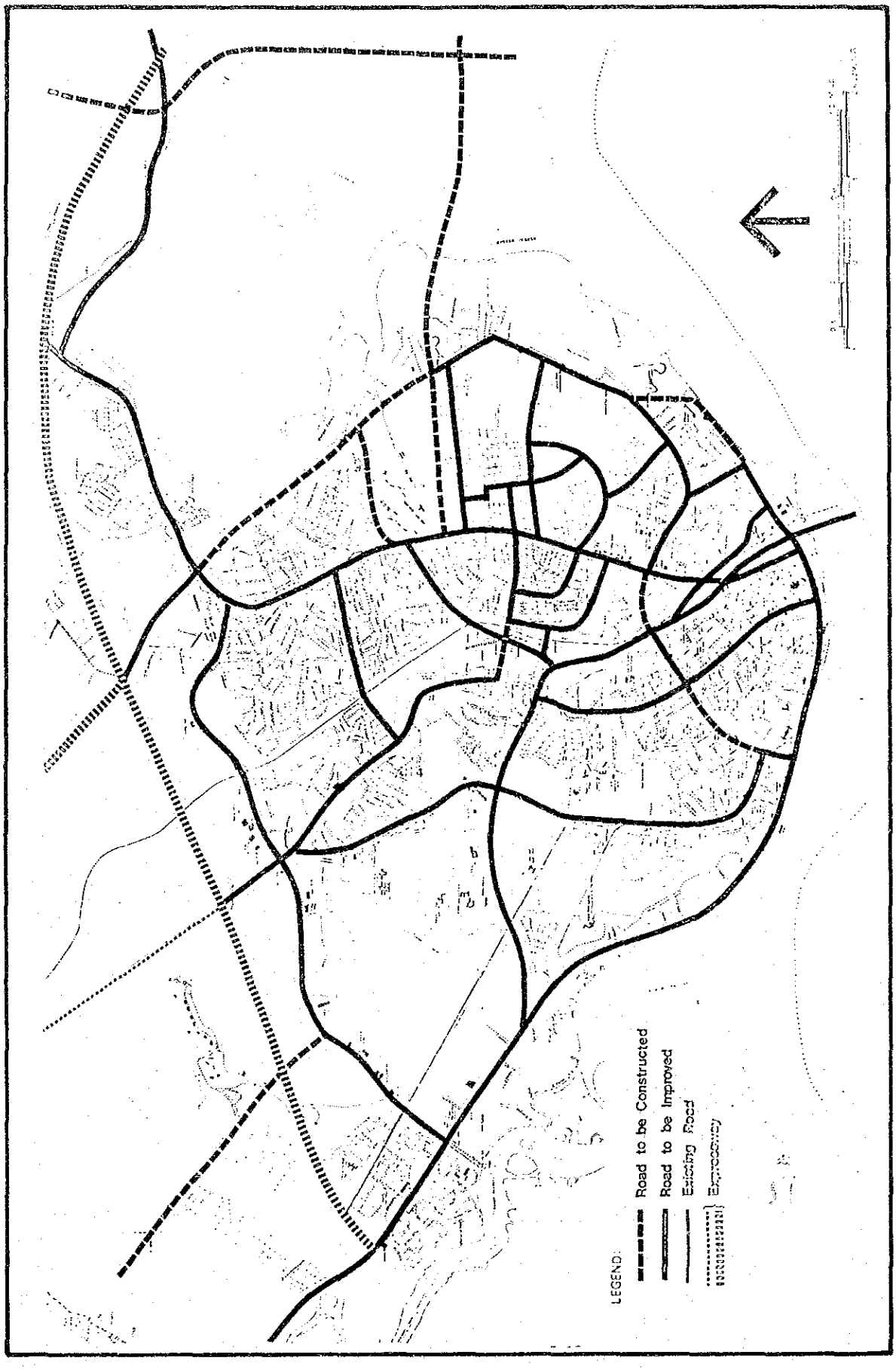


Fig. 4.6 Alternative Road Network (MPJB) -- Option 2



4-4 Alternative Public Transport Plans

In order to create a better urban transport system, the team believes that public transport should be developed as well as the road system.

This is because the development of public transport will contribute greatly to minimizing energy consumption, reducing capital investment, using urban space more effectively and achieving better social equity.

The main forms of public transport considered are:

a. extension of bus service area;
b. introduction of conventional bus transport developments such as an exclusive bus lane;
c. introduction of an innovative bus transport system;
d. introduction of new transport systems such as light rail transit, guideway transit and monorail system;
e. utilization of railway for commuters;
f. construction of bus/public transport.

Based on these plans, the following options will be examined.

Option 1: Development of Bus Transport System.
This strategy involves:
1. introduction of an exclusive bus lane;
2. extension of bus service area;
3. construction of bus terminals.

Option 2: Introduction of New Transport System.
This strategy involves the application of innovations in public transport.
Bus routes would also be rearranged.
This strategy includes:
1. construction of new transport system;
2. rearrangement of bus routes.

Option 3: Combined plan involving the use of railway by Commuters and the introduction of a new transit system.

4-5 Traffic Control Measures

The aim of this measure is to limit the use of vehicles. It may be applied to some or all vehicles in the traffic flow. It may also be applied by time of day, by direction of travel, or separately for vehicle type or number of passengers.

Traffic control measures have been conventionally used to achieve the following objectives:

a. to improve the efficiency of the traffic flow;
b. to assist road-based public transport operations;
c. to bring about environmental improvements;
d. to maintain an economic level of service on the road network.

These measures usually take the form of parking control, pricing technique, ride sharing, restriction of access measures and pricing restraint measures.

1) Parking Control and Cordon Pricing

These measures are centered around imposing variable charges for the use of congested roadways to discourage peak period commuting and supporting this disincentive by manipulating the supply and cost of parking in the C.B.D.

Tolls on the cordon line are varied so as to penalize drivers travelling alone in their own vehicles during peak commuting hours. (Cordon pricing).

The supply and cost of parking in the C.B.D. are manipulated for the same purpose. Parking space in the C.B.D. is reduced by prohibiting on-street parking during peak periods.

2) Ride Sharing

This measure reduces congestion by increasing vehicle occupancy and consequently reducing the number of vehicles used for commuting. This measure includes prearranged carpools, vanpools, subscription buses and sharing of taxis.

3) Restriction of Access

This is designed to alleviate severe traffic congestion in selected areas by restricting the use of private vehicles within these areas. Two different approaches may be employed, that is traffic cells and car free zones.

In the traffic study, the following options will be evaluated economically.

a. Option 1: Parking Control
b. Option 2: Parking Control and Cordon Pricing

Chapter 5 EVALUATION OF ALTERNATIVE TRANSPORT PLANS

5-1 Evaluation Overview

1 General

One of the principal objectives of this study is the formulation of a long-term plan to be used as a framework for the envisaged changes. This study will includes an evaluation of the following long-term transport plan elements.

a. The master plan of the transport system

b. Transport strategies

c. Identification of priority projects in the transport system

2 Evaluation Procedure

1) Evaluation Viewpoint

The evaluation is basically the result of a comparative analysis of options, alternative plans and projects aimed at determining which ones are superior. The evaluation of the proposed plans and projects includes the following:

a. economic analysis;

b. financial analysis;

c. traffic volume;

d. environmental impact;

e. development consideration;

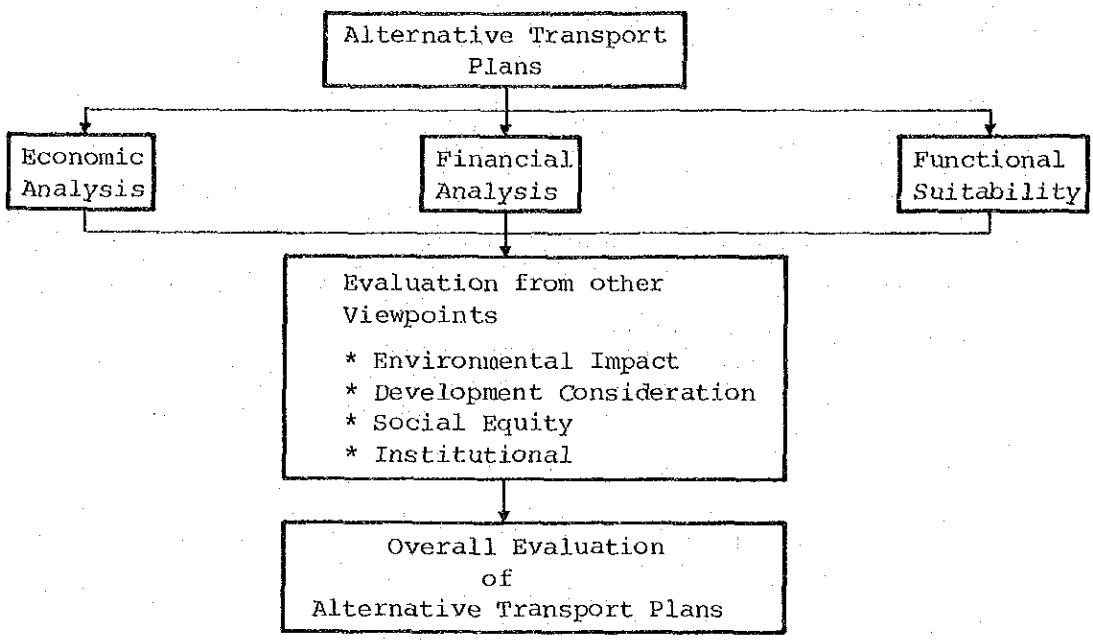
f. social equity consideration;

g. institutional consideration.

2) Procedure for Evaluation

The evaluation procedure is shown in Fig. 5.1. However at this stage, preliminary evaluation is made on the basis of a preliminary rating of each evaluation factor.

Fig. 5.1 Evaluation Procedure



3) Economic Analysis

Economic analysis involves a comparison of the costs of supplying transport services in each plan and the benefits derived from these services. The benefits of each plan are then compared with the capital cost requirements to determine which plan can be expected to produce more economic benefits. This comparison is expressed in a series of benefit and/or cost ratios which are used to determine general priority the various plans.

The net benefit in any single year or 20 years starting from 1987 to 2006 is calculated as the balance of yearly benefits as a proportion of the capital costs.

Alternative transport plans with a positive net benefit can be regarded as economically feasible. Since the economic rate of return is based on single year or 20 year comparison between benefits and costs, these plans are also considered feasible if the rate of return of plans is over

12%, which is the current discount rate defined by the Economic Planning Unit for use throughout Malaysia in all public sector investments.

The value of the net benefit provides a means of ranking the various projects.

4) Financial Analysis

There are two (2) types of financial analysis: one is an estimate of the cost of supplying the transport services in each plan in terms of the national revenue, and the other is an analysis of the cash flow of certain transportation services. In this section, the latter type of analysis is adopted.

5) Evaluation from Other Viewpoints

The following ratings are adopted for comparative analysis:

a.	Development Consideration	3. Significantly effective
		2. Moderately effective
		1. Not significantly effective
b.	Environmental Impact	1. Net benefit
		0. Benefit and disbenefit balance
		-1. Net disbenefit
c.	Equity	1. Net benefit
		0. Benefit and disbenefit balance
		-1. Net disbenefit
d.	Institutional Consideration	1. Net benefit
		0. Benefit
		-1. Net disbenefit

3 Cases for Evaluation of Alternative Plans

The three (3) factors to be considered in evaluating alternative transport plans are: road network,

traffic control measure and development and improvement of public transport system.

1) Road Network

The following three (3) types of road network are considered in formulating alternative network plans:

a. Base Network

Existing road network in 1981 plus committed roads which were presented in Chapter 4.

b. Option 1

Base network plus proposed roads as shown in Fig. 4.6.

c. Option 2

Base network plus proposed roads as shown in Fig. 4.3.

In order to formulate the priority projects among the proposed roads, the following roads are selected for evaluation:-

a.	Road Project Package 1 :	the base network plus Johor Bahru - Pasir Gudang Southern Linkage. (Fig. 5.2)
b.	Road Project Package 2 :	the base network plus East Coast Road project. (Fig. 5.3)
c.	Road Project Package 3 :	the base network plus Inner Ring Road project. (Fig. 5.4)
d.	Road Project Package 4 :	the base network plus widening of Jalan Tebrau to six (6)-lane.

2) Traffic Control Measures

Two (2) measures for traffic control which

are thought to meet the goals are:

a. Parking Control : To control the traffic demands of work trips by reducing the number of possible parking spaces in CBD. (Plan 1).

b. Cordon Pricing : To control the traffic demands by charging the entrance prices to CBD. (Plan 2).

Fig. 5.2 Johor Bahru – Pasir Gudang Coastal Road (Package 1)

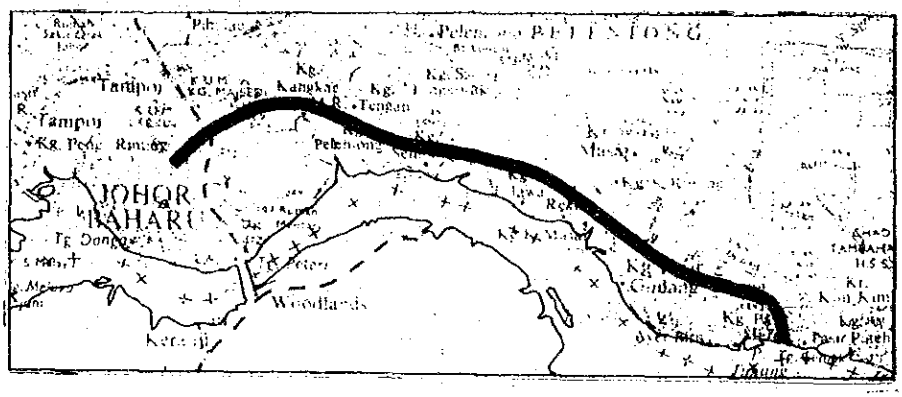


Fig. 5.3 Road Project Package 2

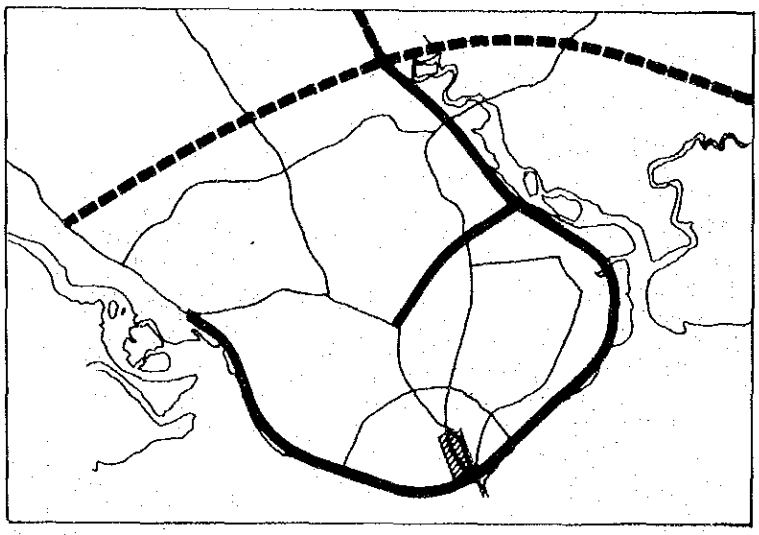
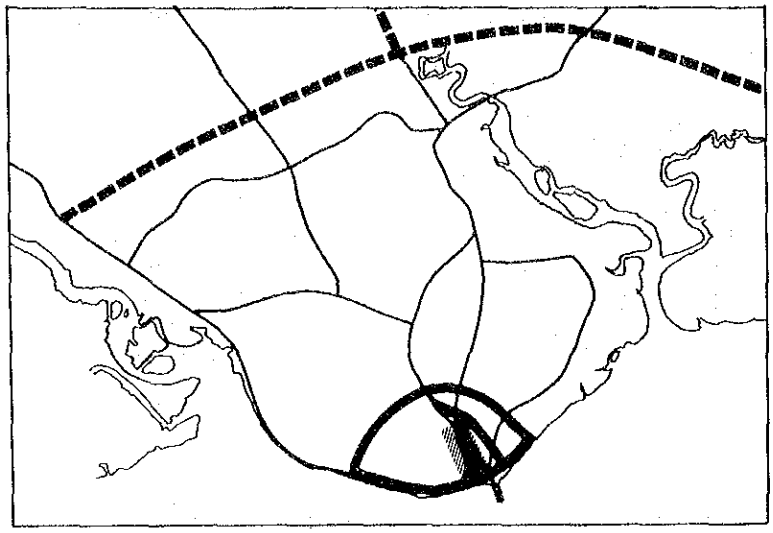


Fig. 5.4 Road Project Package 3



3) Development and Improvement of Public Transport System

Four (4) types of public transport improvement measures are considered.

a. Base case: existing level of bus services.

b. Expansion of bus routes and extended bus services (Plan B): base network plus area expansion of bus routes and extended bus services.

c. Introduction of New Transit System (Plan N): Plan B plus introduction of new transit system between Johor Bahru and Pasir Gudang.

d. Introduction of Commuter Service to Malayan Railway (Plan M): Plan N plus introduction of commuter services to Malayan Railway.

Table 5.1 Combination of Alternative Plans for Target Years 1990, 2000

	Base Plan (without Control)	Plan 1 (Parking Control)			Plan 2 (Cordon Pricing)		
		Bus Lane (1-B)	NTS (1-N)	NTS plus Malayan Railway (1-M)	Bus Lane (2-B)	NTS (2-N)	NTS plus Malayan Railway (2-M)
Base	1990 2000	-	-	-	-	-	-
Option 1	1990 2000	2000	2000	2000	2000	2000	2000
Option 2	1990 2000	-	-	-	-	-	-

Note : NTS is New Transport System

5–2 Estimation of the Effects of Alternative Transport Plans

1 Traffic Assignment to Alternative Road Network Plans (without Traffic Control)

In order to grasp the effect of the proposed road projects the traffic demand in 2000 was assigned to the alternative road networks identified in the previous section. The results of traffic assignment to the two options for an ultimate road network plan are shown in Figs. 5.5 to 5.8.

In both cases the traffic volume in 2000 becomes three or four times the present volume on the primary distributor.

Comparing the results, the following findings are noted.

a. With Option 2, the traffic volumes on the trunk roads such as the southern linkage between Johor Bahru and Pasir Gudang, Jalan Tebrau and Federal Route 1 are heavier than with Option 1, and consequently the congestion will be more aggravated. (See Figs. 5.9 and 5.10). This indicates that the total capacity of trunk roads is insufficient in Option 2.

b. Due to the above-mentioned shortage in road capacity, long-trip traffic flows into the district or local distributors such as Jalan Lankasuka, Jalan Dato Jaafar and Jalan Pasir Pelangi with Option 2.

c. Consequently there is more road congestion with Option 2 than with Option 1 as shown in Table 5.2. In particular local distributors will have worse traffic conditions with Option 2.

Fig. 5.5 Traffic Volume–2000 Ultimate Road Network Plan (Option 1)

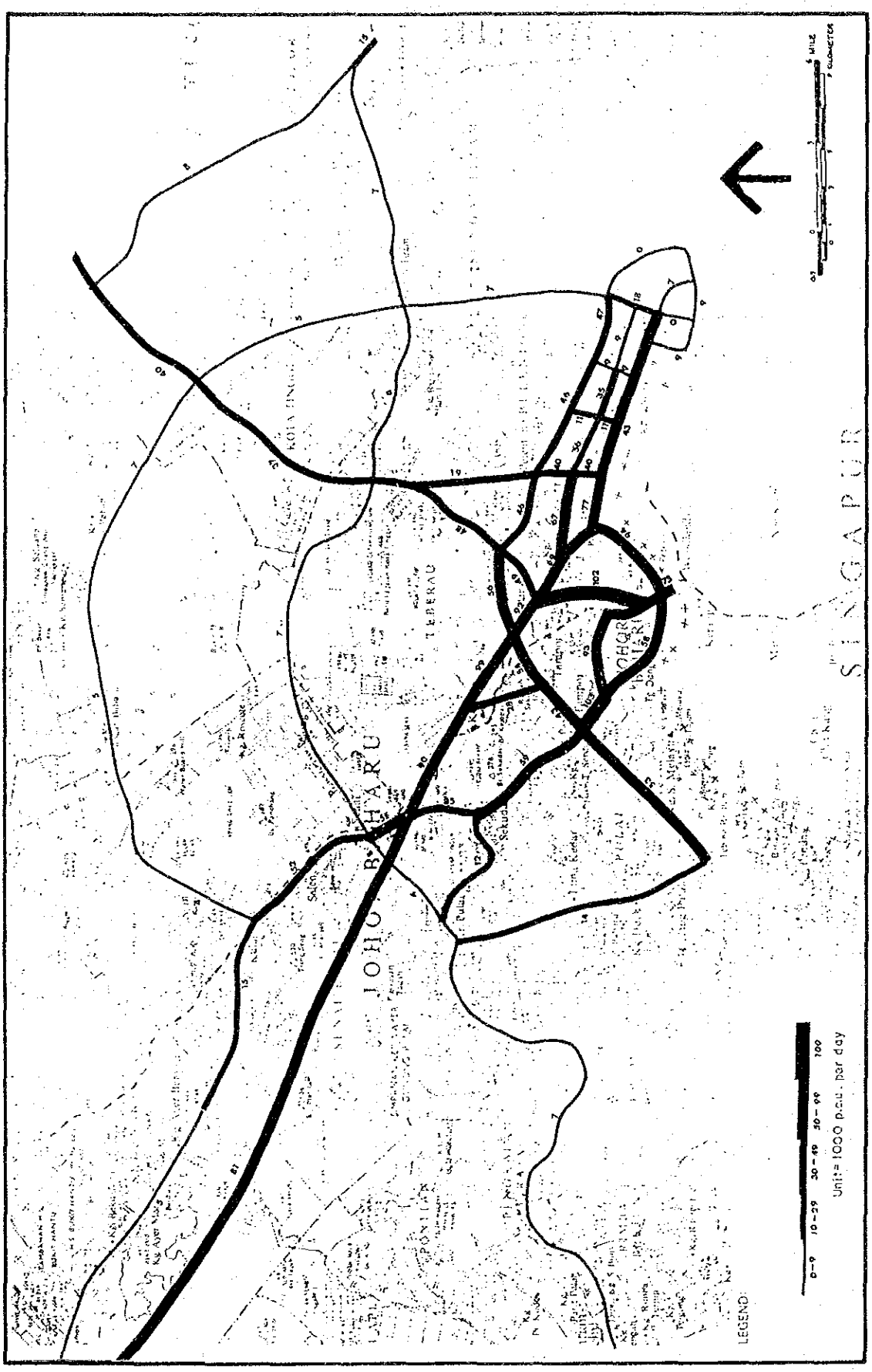


Fig. 5.6 Traffic Volume–2000 Ultimate Road Network Plan (Option 1)

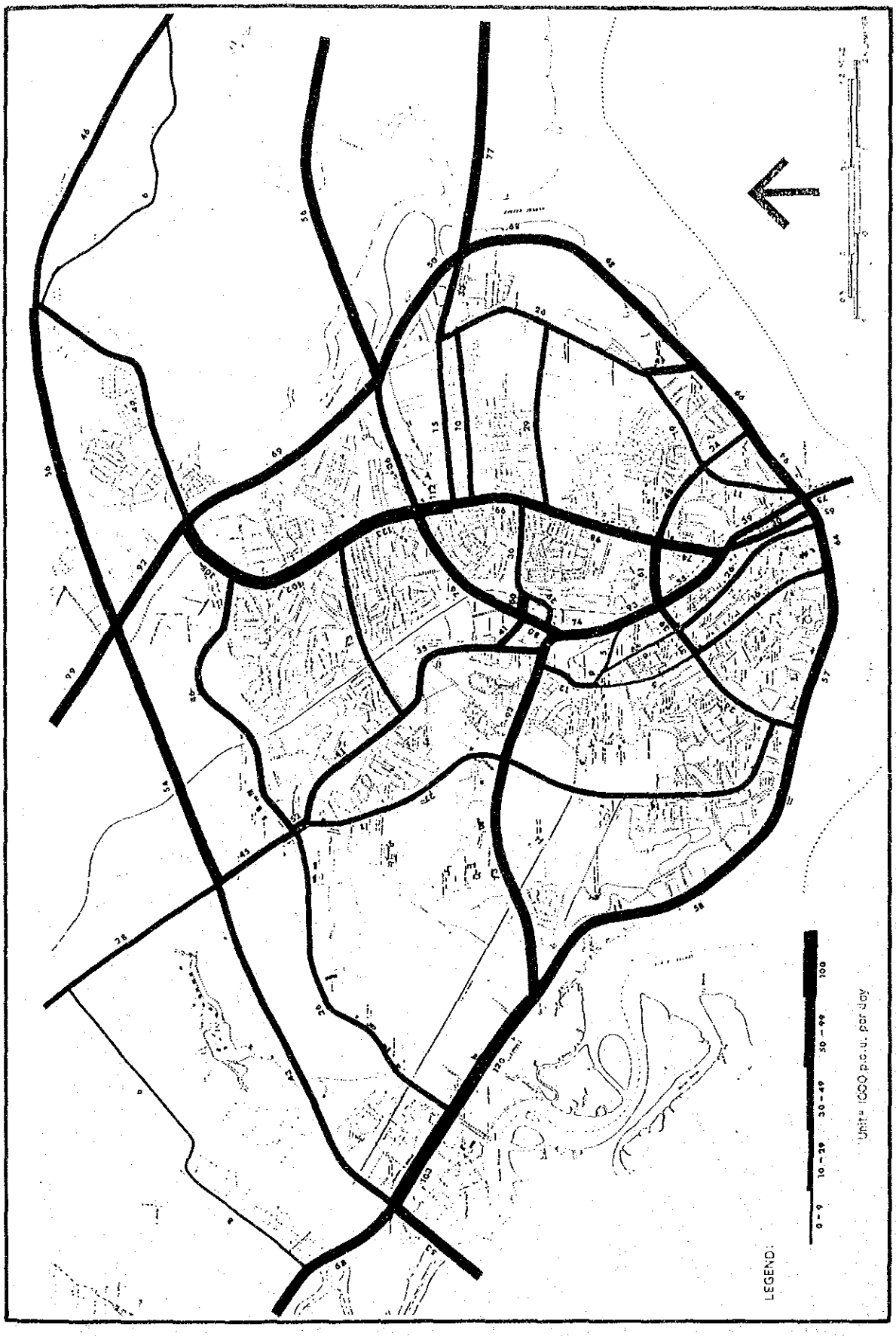


Fig. 5.7 Traffic Volume—2000 Ultimate Road Network Plan (Option 2)

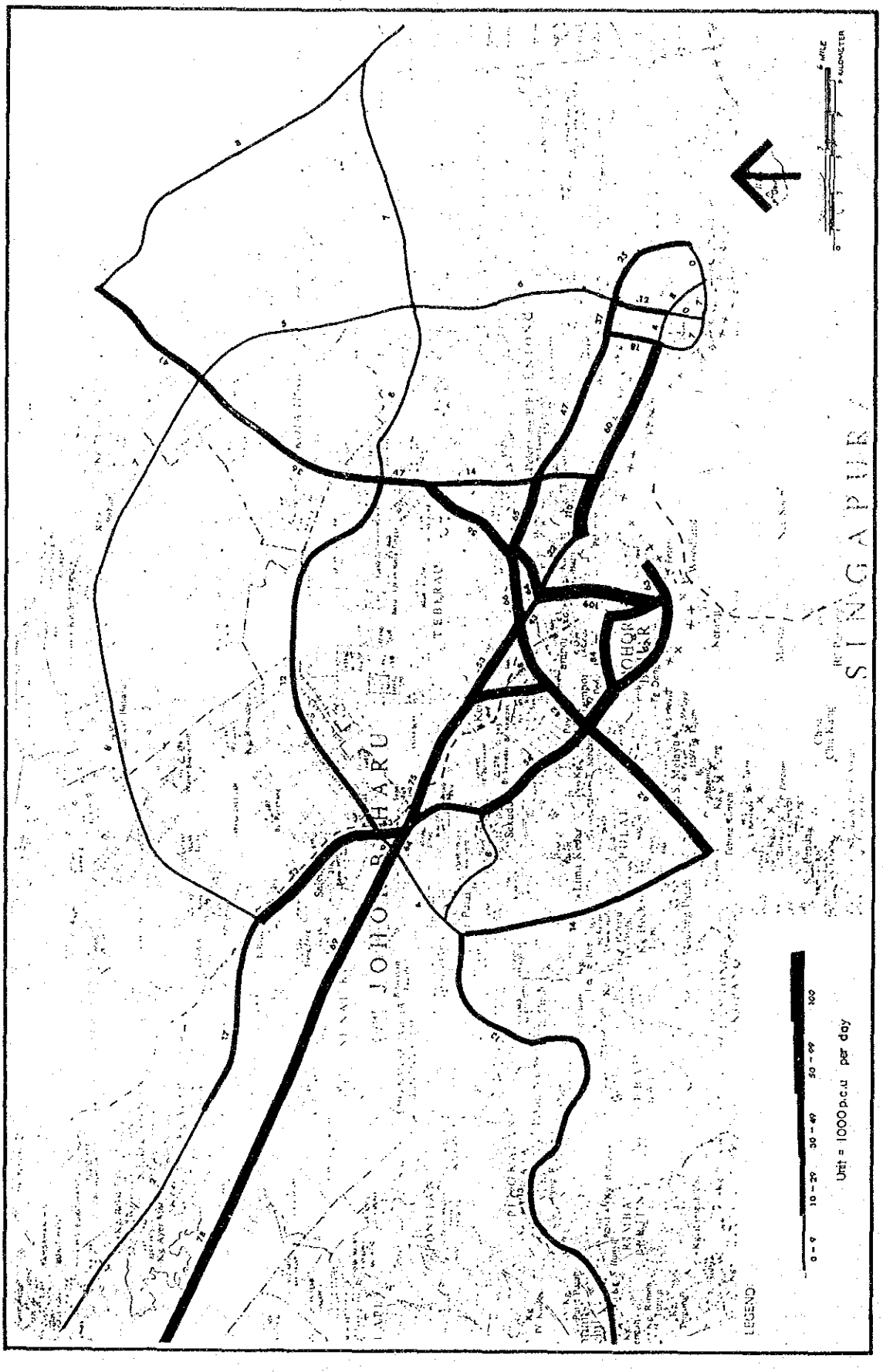


Fig. 5.8 Traffic Volume--2000 Ultimate Road Network Plan (Option 2)

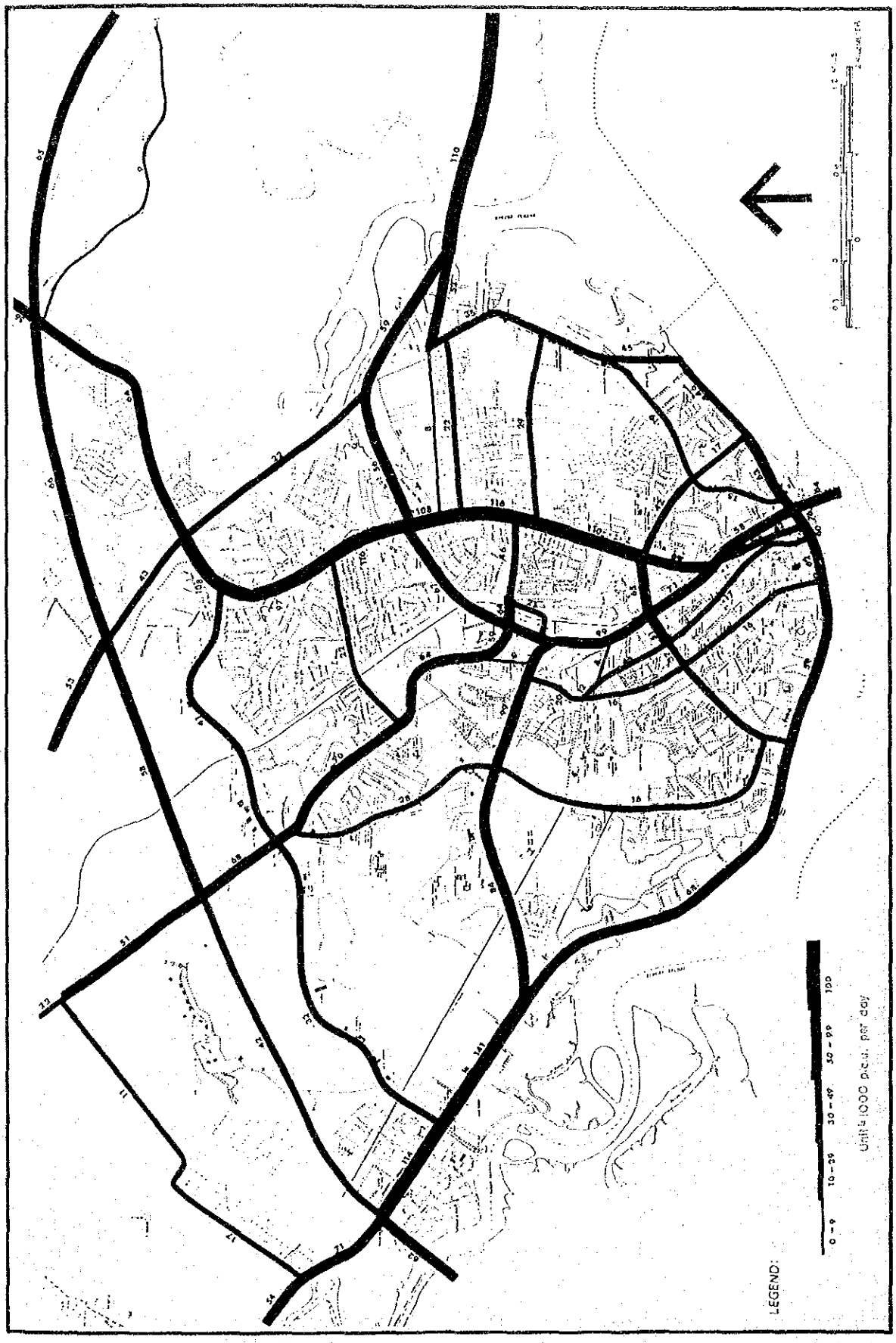


Fig. 5.9 Degree of Congestion on Ultimate Road Network Plan in MPJB (Option 1)

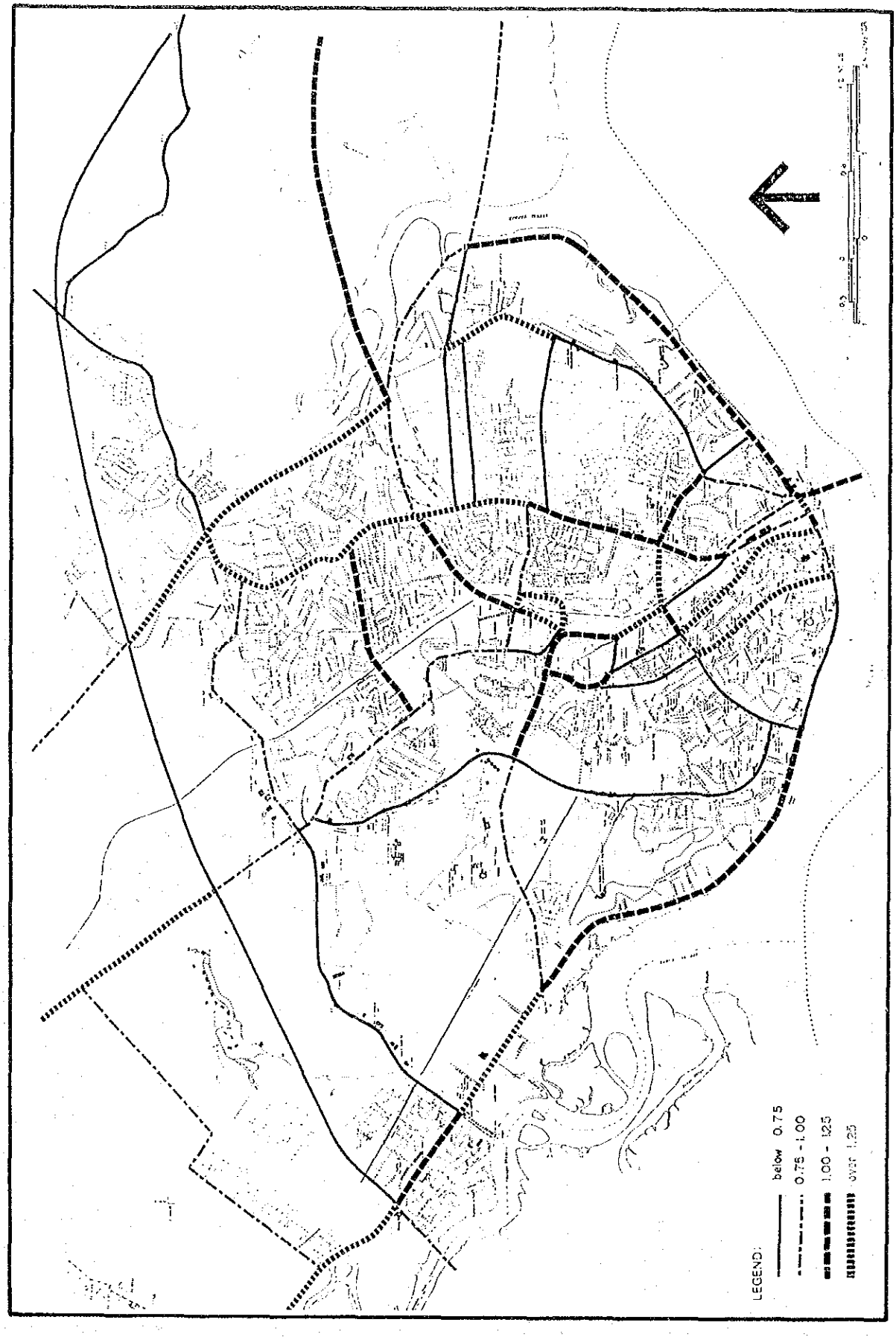


Fig. 5.10 Degree of Congestion on Ultimate Road Network Plan in MPJB (Option 2)

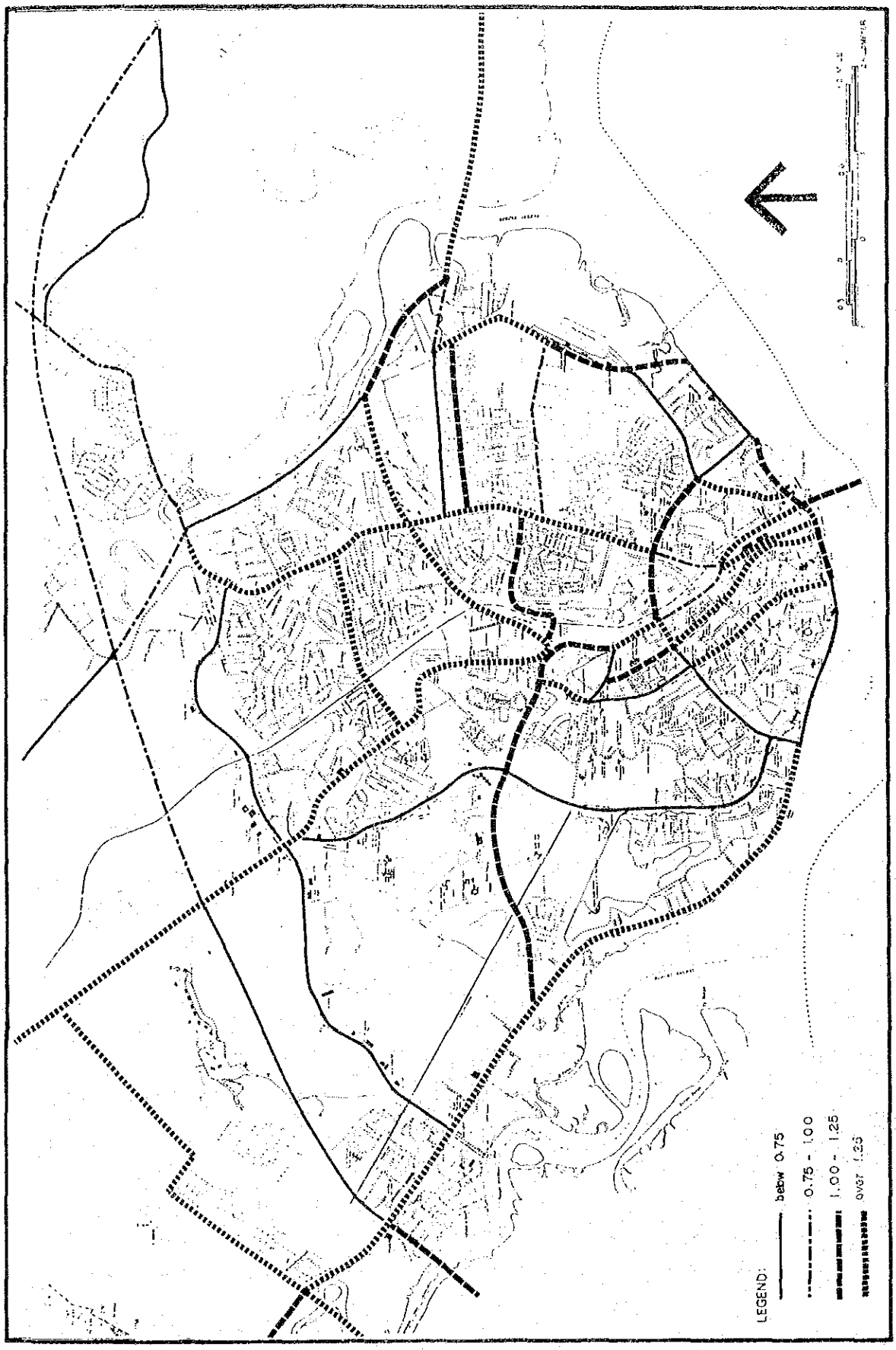


Table 5.2 Total Road Length by Congestion Degree

(km)

Case	Type of Road	Congestion Degree			
		0.75	0.75-1.0	1.0-1.25	1.25
Option 1	Expressway	81	66	41	0
	Primary Distributor	282	77	64	66
	District Distributor	420	38	53	57
	Local Distributor	287	124	26	166
	Total	1,070	305	184	289
Option 2	Expressway	79	68	41	0
	Primary Distributor	277	60	70	77
	District Distributor	392	32	45	74
	Local Distributor	247	67	85	204
	Total	995	227	241	355

In order to examine the differences in the options in traffic flow as a whole, several indicators such as the total vehicle-kilometers, the total vehicle-hours, the average travel speed and the total fuel consumption were calculated for each case as shown in Table 5.3.

Compared with the base network plan, both ultimate network plans will improve traffic conditions according to every indicator.

Although there is no significant difference in terms of total vehicle-kilometers or total fuel consumption, Option 1 provides a higher travel speed and consequently has lower total vehicle-hours than Option 2.

The above findings are summarized as follows:

a. Option 1 is more compatible with future traffic demand if the functional suitability of each road is considered; consequently it is more beneficial than Option 2.

Unless the Johor Bahru Coastal Road and the middle linkage between Johor Bahru and Pasir Gudang are constructed, undesirable traffic conditions such

as greater traffic congestion on major roads and traffic penetration into minor roads will be incurred.

Table 5.3 Traffic Assignment to Alternative Network -- Without Traffic Control

	1990			2000		
	Base	Option 1	Option 2	Base	Option 1	Option 2
Number of Trips	590,970	590,970	590,970	1,074,900	1,074,900	1,074,900
Vehicle - Kilometers ('000 veh. kms)	10,603.8	9,812.3	9,788.2	20,076.0	20,241.5	20,191.8
Vehicle - Hours ('000 veh. Hours)	614.7	208.4	280.6	2,403.7	981.4	1,345.5
Travel Speed (kms/hr)	17.3	47.1	34.9	8.35	20.6	15.0
Fuel Consumption ('000 liter)	2,154.4	1,958.7	1,953.9	3,955.8	3,901.9	3,920.2

b. It is also noted that even with Option 1, several sections on main roads such as Jalan Tebrau and Federal Route One are expected to be overcrowded under the base situation and will therefore require the introduction of traffic control measures.

Table 5.4 Traffic Assignment to Alternative Plans with Traffic Control (Option 1) – 2000

	Base Plan (w/o Control)	Plan 1			Plan 2		
		Plan 1-B	Plan 1-N	Plan 1-M	Plan 2-B	Plan 2-N	Plan 2-M
Number of Trips	1,074,900	1,042,800	1,032,900	1,025,200	1,028,900	1,019,132	1,011,534
Vehicle - Kilometers ('000 veh. Kms)	20,241.5	20,134.3	19,864.3	19,658.5	19,865.9	19,599.5	19,396.4
Vehicle - Hours ('000 veh. Hours)	1,263.5	1,258.0	1,232.4	1,201.4	1,241.6	1,216.3	1,185.7
Travel Speed (Kms/hour)	16.0	16.0	16.1	16.4	16.0	16.1	16.4
Fuel Consumption ('000 liter)	3,901.9	3,846.4	3,831.0	3,805.1	3,755.8	3,737.6	3,698.9

Table 5.5 Public Transport Functional Statistics — 2000

	Bus	Plan 1 (Parking Control)							
		Plan 1-B	Plan 1-N			Plan 1-M			
			NTS	Bus	Total	M.R.	NTS	Bus	Total
Number of Passengers - Linked ('000)	238.3	298.3	118.1	197.4	315.5	20.2	126.2	182.5	328.9
Number of Passengers - Unlinked ('000)	336.6	421.3	118.1	296.8	414.9	20.2	126.2	298.9	445.3
Passenger - Kms ('000)	2,803.4	3,447.9	751.3	2,320.3	3,071.6	558.6	795.5	2,176.6	3,530.7
Passenger - Hours ('000)	182.0	222.4	32.8	141.1	173.9	13.1	34.6	135.7	183.4
Average Trip Lengths - Linked (Kms)	11.8	11.6	6.4	11.8	9.2	27.6	6.3	11.9	10.7
Average Travel Time - Linked (Min)	46.4	46.0	16.7	42.9	31.3	38.9	16.5	44.6	33.5
Number of Fleet	507	586	26	388	-	5	26	386	-
Fleet Kilometers	115,700	135,400	9,600	89,240	-	3,700	9,600	88,800	-
Fleet Hours	7,510	8,740	380	5,760	-	123	380	5,692	-
Average Travel Speed	15.4	15.5	22.9	15.5	17.7	42.6	25.0	15.6	19.3
Average Load	24.2	25.5	78.3	26.0	-	151.0	82.8	24.5	-

Table 5.5 Public Transport Functional Statistics – 2000 (Continue)

	Plan 2 (Cordon Pricing)							
	Plan 2-B	Plan 2-N			Plan 2-M			
		NTS	Bus	Total	Malayan Railway	NTS	Bus	Total
Number of Passengers - Linked ('000)	318.3	118.7	216.8	335.5	20.3	126.8	201.7	348.8
Number of Passengers - Unlinked ('000)	449.6	118.7	326.0	444.7	20.3	126.8	330.3	477.4
Passenger - Kms ('000)	3,692.3	755.1	2,548.3	3,075.4	561.4	799.3	2,405.6	3,766.3
Passenger - Hours ('000)	239.8	33.0	164.4	197.4	13.2	34.9	149.9	198.0
Average Trip Lengths - Linked (Kms)	11.6	6.4	11.8	9.17	27.6	6.3	11.9	10.8
Average Travel Time - Linked (Min)	46.4	16.7	45.5	35.3	38.9	16.5	44.6	34.1
Number of Fleets	670	26	426	-	5	26	427	-
Fleet Kilometers	152,570	9,600	98,010	-	3,700	9,600	98,190	-
Fleet Hours	9,840	380	6,320	-	123	380	4,007	-
Average Speed	15.5	22.9	15.5	15.6	42.6	22.9	15.6	19.0
Average Load	25.5	78.7	26.0	-	151.7	83.3	24.5	-

Table 5.6 Model Choice by Alternative Plan in 2000

('000 Person trips)

	Base Plan	Plan 1 (Parking Control)			Plan 2 (Cordon Pricing)		
		Bus Lane (1-B)	NTS (1-N)	NTS plus Malayan Railway (1-M)	Bus Lane (2-B)	NTS (2-N	NTS plus Malayan Railway (2-M)
Passengers Using Vehicle	1,403.9	1,343.9	1,326.7	1,313.3	1,323.9	1,306.7	1,293.4
Passengers Using Public Transport	442.8	502.8	520.0	533.4	522.8	540.0	553.3
Buses	442.8	502.8	401.9	387.8	522.8	421.8	406.2
Scheduled Buses	238.3	298.3	197.4	182.5	318.3	216.8	201.7
School and Factory Buses	204.5	204.5	204.5	204.5	204.5	204.5	204.5
NTS	-	-	118.1	126.2	-	118.7	126.8
Malayan Railway	-	-	-	20.2	-	-	20.3
Total Passenger	1,846.7						

5-3 Benefit Estimates

1 Estimation Method

On the basis of unit traffic cost and assigned traffic volume on each of the links on the roads, the benefits are estimated by using the network model. The network model is as follows:

a. Time benefits

$$TB = \Sigma_k \Sigma_i \Sigma_j \; Pijk \; (\bar{t}ijk^{w} - \bar{t}ijk^{wo}) \; Vk$$

where :

- TB : time benefit
- Pijk : passengers using k mode between zones i and j
- $\bar{t}ijk^{w}$: travel time using k mode between zones i and j in case of the project being implemented
- $\bar{t}ijk^{wo}$: travel time using k mode between zones i and j in case of the project being implemented

b. Saving in running costs

$$RB = \Sigma\Sigma\Sigma \; (\bar{RC}ijk^{w} - \bar{RC}ijk^{wo}) + (\bar{t}ijk^{w} - \bar{t}ijk^{wo}) \; FCijk$$

where :

- RB : saving running costs
- RCijk : running cost of k mode between zones i and j
- FCijk : fixed cost of k mode between zones i and j
- $\bar{w}$: with the project
- $\bar{wo}$: without the project

2 Results of Benefit Estimates for Alternative Transport Plan

Based on the above-mentioned method, the benefits

for the road network plans, the alternative transport plans and the package of the road projects are estimated and the results shown in Tables 5.7, 5.8 and 5.9, respectively.

Table 5.7 Alternative Road Network Plan

(M$'000 in 1981 Prices)

	Item	1990	2000
Option 1	Time Saving	218,183	763,775
	Running Cost Saving	386,375	737,029
	Saving on Running Cost	265,704	314,606
	Saving on Fixed Cost	120,671	422,423
	Total	604,558	1,500,804
Option 2	Time Saving	179,412	568,253
	Running Cost Saving	327,777	632,083
	Saving on Running Cost	228,549	317,797
	Saving on Fixed Cost	99,228	314,286
	Total	507,189	1,200,336

Table 5.8 Benefit Estimates of Alternative Plans 2000

(M$'000 in 1981 Prices)

	Plan 1			Plan 2		
	Plan 1-B	Plan 1-N	Plan 1-M	Plan 2-B	Plan 2-N	Plan 2-M
Vehicle Owner						
* Vehicle Operating Cost Saving	6,168	25,079	42,930	22,387	41,175	58,854
* Time Saving	2,954	16,700	33,348	11,750	25,346	41,779
* Gain/Less due to Diverted Traffic	-532	8,928	12,612	-709	11,241	15,382
Sub-Total	8,590	50,707	88,890	33,428	77,762	116,015
Non Vehicle Owner						
* Time Saving	179	5,958	9,264	+179	5,958	9,264
Bus Operators						
* Operating Cost Saving/Loss	-2,402	3,226	3,279	-4,495	2,156	2,136
NTS/Malayan Railway Operators						
* Operating Cost Saving/Loss	0	-5,578	-10,368	0	-5,578	-10,368
Net Benefits	6,367	54,313	91,065	29,112	80,298	117,046

Table 5.9 Annual Benefits of Proposed Road Projects 1990

(M$'000 in 1981 Prices)

	Item	1990
Package 1	Time Saving	68,092
JB - P. Gudang Southern Linkage	Running Cost Saving	-12,805
	Saving on Running Cost	-50,465
	Saving on Fixed Cost	37,660
	Total	55,287
Package 2	Time Saving	105,950
JB Coastal Road Project	Running Cost Saving	-28,924
	Saving on Running Cost	-87,522
	Saving on Fixed Cost	58,598
	Total	77,026
Package 3	Time Saving	17,292
Inner Ring Roads Project 1/	Running Cost Saving	21,905
	Saving on Running Cost	12,342
	Saving on Fixed Cost	9,563
	Total	39,197
Package 4	Time Saving	88,363
Other Road Projects	Running Cost Saving	136,823
	Saving on Running Cost	87,951
	Saving on Fixed Cost	48,872
	Total	225,186

Note : 1/ Including Lorry Route

5-4 Cost Estimates of Alternative Transport Plans

Based on the preliminary engineering study, the costs for the road network plans, the alternative transport plans and the package of the road projects are estimated and the results shown in Tables 5.10, 5.11 and 5.12.

Table 5.10 Capital Cost Estimates of Road Network Plans

(M$'000 in 1981 Prices)

Item	Road Network Plan		
	Base Plan	Option 1	Option 2
Road Construction and Improvement	112,220	996,390	835,580
Intersection Improvement	0	41,500	41,500
Parking	48,500	48,500	48,500
Total	151,810	1,086,390	925,580

Note: No traffic control plan.

Table 5.11 Capital Cost of Project Road Package

		Number of Lanes	Project Costs (M$ '000)
Package 1	Johor Bahru - Pasir Gudang Southern Linkage	4 and 6 2/	113,720
Package 2	East Coast Road Package	4 and 6 2/	116,300 115,450
Package 3	Inner Ring Road Package 1/	4	78,440
Package 4	Other Roads Package	-	556,030

Note: 1/ Including Lorry Route

2/ This means mainly 4 lane but partially 6 lanes

Table 5.12 Capital Cost Estimates of Alternative Plans

(M$'000 in 1981 Prices)

Item	Option 1 (No. Control)	Plan 1 (Parking Control)			Plan 2 (Parking Control)		
		Plan 1-B	Plan 1-N	Plan 1-M	Plan 2-B	Plan 2-N	Plan 2-M
Road Construction & Improvement	893,080	893,080	894,080	893,080	893,080	893,080	893,080
Intersection Improvement	41,500	41,500	41,500	41,500	41,500	41,500	41,500
Construction of Parking Facility	48,500	18,140	17,460	16,460	19,980	19,300	18,240
Construction of New Transit System	0	0	341,480	341,480	0	341,480	341,480
Improvement of Malayan Railway	0	0	0	213,980	0	0	213,980
Introduction of Bus Lane	0	10,390	0	0	10,390	0	0
Bus Improvement	50,700	58,600	38,800	38,600	67,000	42,600	42,700
Cordon Pricing Facility	0	0	0	0	4,000	4,000	4,000
Total	1,033,780	1,021,171	1,332,320	1,545,100	1,035,950	1,341,960	1,554,980

5–5 Economic Evaluation

1 Road Network Plans

The alternative road network plans are evaluated and the result is shown in Table 5.13.

Table 5.13 Economic Indicators of Network Improvement

	Option 1	Option 2
Discounted Benefit ($M\$10^6$)	3,395	2,779
Discounted Cost ($M\$10^6$)	736	608
Net Present Value ($M\$10^6$)	2,659	2,171
B/C Ratio	4.61	4.57
Internal Rate of Return (%)	35	33

Note: A Discounted Rate is 12%.

The economic indicators show that both of the alternative network plans are economically possible. However, Option 1 is more feasible. (Refer to Tables 5.14 and 5.15).

2 Transport Plans

The alternative transport plans proposed in the previous chapter are evaluated economically in this section.

Table 5.16 shows the results of the economic analysis. For the year 2000, plan 2-N, which includes cordon/area pricing and introduction of a new transit system, has the highest economic indicator among these alternative plans. Next is plan 1-N, which includes parking control and introduction of a new transit system.

Table 5.14 Benefit Cost Stream (Option 1) 1983 – 2007

(M$'000 in 1981 Prices)

Year	Undiscounted Cost	Discounted Cost	Undiscounted Benefit	Discounted Benefit
1983	185,134	147,588		
1984	185,134	131,775		
1985	185,134	117,656		
1986	185,134	105,050		
1987	185,134	93,795		
1988	37,027	16,749	504,035	228,000
1989	37,027	14,955	552,013	222,949
1990	37,027	13,352	604,558	218,010
1991	37,027	11,922	662,105	213,180
1992	37,027	10,644	725,129	208,457
1993	37,027	9,504	794,152	203,839
1994	37,027	8,486	869,746	199,323
1995	37,027	7,576	952,535	194,908
1996	37,027	6,765	1,043,205	190,590
1997	37,027	6,040	1,142,505	186,367
1998	37,027	5,393	1,251,258	182,239
1999	37,027	4,815	1,370,362	178,201
2000	37,027	4,299	1,500,804	218,584
2001	37,027	3,838	1,500,804	155,583
2002	37,027	3,427	1,500,804	138,914
2003	37,027	3,060	1,500,804	124,030
2004	37,027	2,732	1,500,804	110,741
2005	37,027	2,439	1,500,804	98,876
2006	37,027	2,178	1,500,804	88,282
2007	37,027	1,945	1,500,804	78,823
Total	1,666,210	735,983	22,478,035	3,439,896

Table 5.15 Benefit Cost Stream (Option 2) 1983 – 2007

(M$'000 in 1981 Prices)

Year	Undiscounted Cost	Discounted Cost	Undiscounted Benefit	Discounted Benefit
1983	152,972	121,948		
1984	152,972	108,882		
1985	152,972	97,216		
1986	152,972	86,800		
1987	152,972	77,500		
1980	30,594	13,839	426,917	193,116
1989	30,594	12,356	465,325	187,937
1990	30,594	11,033	507,189	182,897
1991	30,594	9,850	552,819	177,993
1992	30,594	8,795	502,554	173,220
1993	30,594	7,853	656,764	168,575
1994	30,594	7,011	715,851	164,055
1995	30,594	6,260	780,254	159,655
1996	30,594	5,589	850,451	155,374
1997	30,594	4,991	926,963	151,208
1998	30,594	4,456	1,010,359	147,153
1999	30,594	3,978	1,101,258	143,207
2000	30,594	3,552	1,200,336	139,367
2001	30,594	3,172	1,200,336	124,435
2002	30,594	2,832	1,200,336	111,103
2003	30,594	2,528	1,200,336	99,199
2004	30,594	2,257	1,200,336	88,570
2005	30,594	2,016	1,200,336	79,081
2006	30,594	1,800	1,200,336	70,608
2007	30,594	1,607	1,200,336	63,043
Total	1,376,740	608,121	18,199,392	2,779,796

Table 5.16 Economic Indicators of Alternative Transport Plans

	Plan 1		Plan 2	
	Plan 1-N	Plan 1-M	Plan 2-N	Plan 2-M
Capital Costs ($M\$10^3$)	298,540	511,320	308,180	521,200
Annualized Capital Costs at 12% ($M\$10^3$)	35,825	61,358	36,982	62,544
Benefits ($M\$10^3$)	75,232	91,065	80,298	117,046
Net Present Value ($M\$10^3$)	39,407	29,707	43,316	54,502
B/C Ratio	2.10	1.48	2.17	1.87
Rate of Return (%)	25.2	17.8	26.1	22.5

3 High Priority Projects

The high priority projects are evaluated economically and the results are presented in Table 5.17.

a. All the high priority projects are economically quite feasible.

b. From the viewpoint of priority, package 3 (Inner Ring Road Project) has the highest economic indicators.

4 Sensitivity Analysis

In order to examine the validity of the economic evaluation shown above, a sensitivity alaysis was made in this section. Since the estimated benefits are obtained from the results of traffic projection which have been forecasted on the basis of future distribution patterns of population and employment in the Study Area, the examination that how the benefits will change in accordance with the changes in the population and employment distribution patterns were undertaken.

1) Population and Employment Distribution Pattern

The new distribution patterns for the sensitivity analysis are shown in Appendix C together with the original distribution patterns.

As recognized from the tables in Appendix C, the new distribution patterns adopted for the sensitivity analysis are exactly equal to the patterns of the Stratogy 4 defined by the Structure Planning Unit.

According to the Structure Planning Unit, this strategy is likely to be adopted in the final stage.

The main difference between the two patterns is

a) Population in the central area of MPJB

b) Strategic employment creation in specific zones such as zone F, zone J etc.

2) Sensitivity on the Traffic Projection

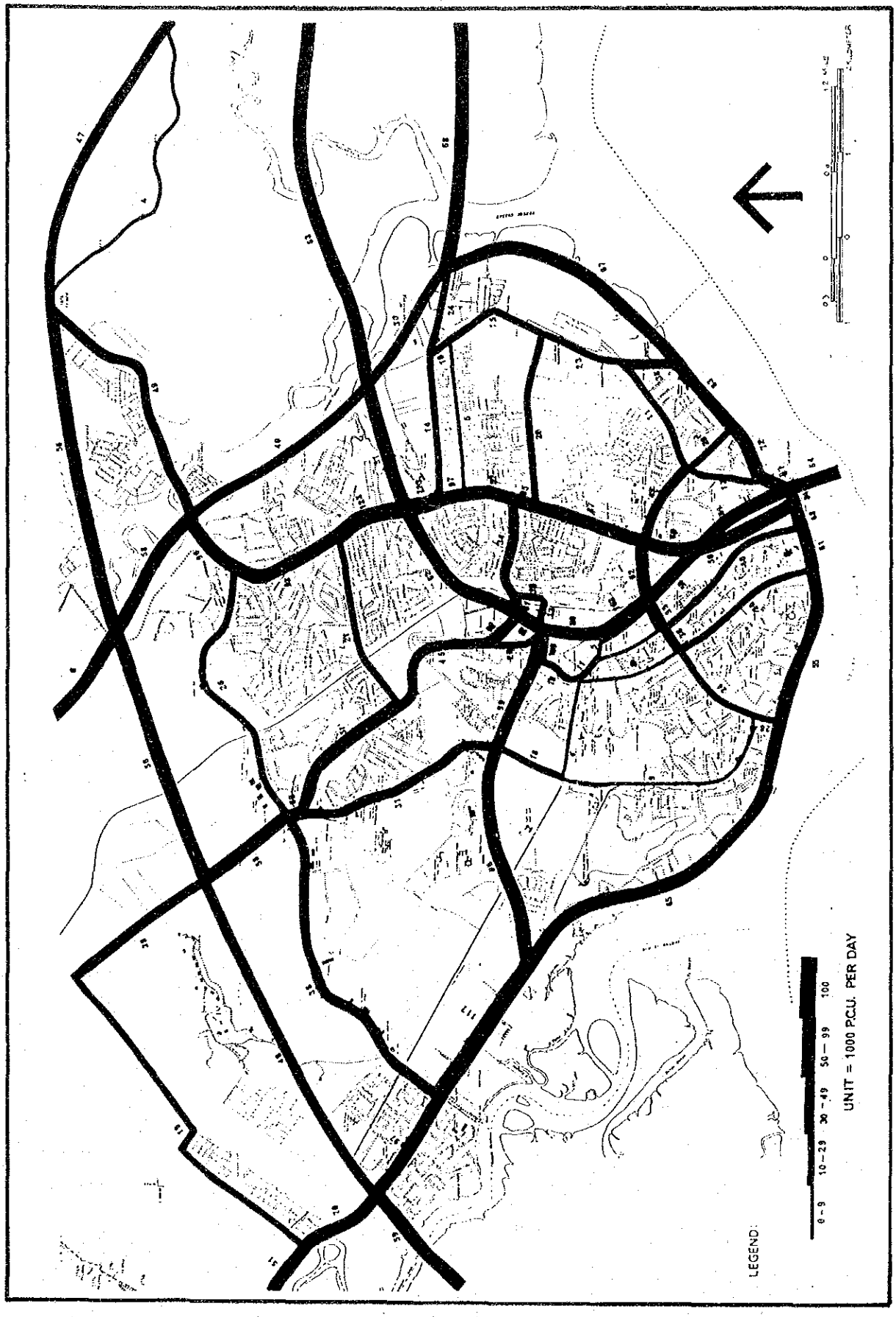
The O-D volume was assigned to the road network case of Option 1 to find the sensitivity of traffics. The results are shown in Fig. 5.11.

Compared with Fig. 5.5, which shows the results of traffic assignment based on the original population and employment distribution plan, the following findings can be noted.

a) Generally the results of sensitivity analysis case are quite similar to the results of the original case. The differences in the forecasted volume are less than 15% on the most road links except for the central area of MPJB.

b) In the central area of MPJB, the estimated volumes are slightly larger than the original case reflecting higher population concentration in the area.

Fig. 5.11 Traffic Assignment – 2000 for Sensitivity Analysis



The comparison of the traffic sensitivity can be made between the original plan and the plan for sensitivity analysis in Table 5.17.

Table 5.17 Traffic Sensitivity

Year / Performance	1990		2000	
	Original Plan	Plan for S/A	Original Plan	Plan for S/A
Total Vehicle·Km (x 1000)	9,812	10,476	20,241	20,898
Total Vehicle·Hour (x 1000)	280	340	981	1,486
Average Running Speed (Km/h)	47.1	31.0	20.6	14

As a result of the comparison the performances on Total Vehicle Km and Total Vehicle Hour are not significantly different between the two plans.

3) Economic Sensitivity

Based on the traffic projection, the economic benefits of the road network plan of Option 1, were estimated as follows.

Table 5.18 *Economic Benefits*

(M$'000 in 1981 Prices)

Benefits \ Year	1990	2000
Time Saving	147,460	492,805
Running Cost Saving	320,956	603,957
Saving on Running Cost	239,400	331,400
Saving on Fixed Cost	81,556	272,557
Total	468,416	1,096,762

Consequently the economic sensitivity was examined as follows.

Table 5.19 Economic Sensitivity

Discounted Benefit (M$ million) (discount rate = 12%)	2,393
Discounted Cost (M$ million) (discount rate = 12%)	736
Net Present Value (M$ million)	1,657
B/C Ratio	3.25
Internal Rate of Return (%)	30.0

Above results indicate that the network plan of Option 1 is economically feasible even in the case that the population and employment distribution patterns are same as the Strategy 4 defined by the Structure Plan.

5–6 Financial Analysis

1) Introduction of New Transit System

Table 5.21 shows the results of the financial analysis for introduction of the new transport system. This capital cost is estimated assuming a light rail transit system.

In the income statement, the fare revenue is based on 20 cents for the first mile and 12 cents for the second mile. Compared to the present bus fare and the new transit system is about twice as high.

Table 5.20 Economic Indicators of Proposed Road Projects

		Benefits in 1990 (M$'000)	Economic Cost (M$'000)	Cost Annualized at 12% (M$'000)	Net Present Value in 1990 (M$'000)	B/C Ratio in 1990	Rate of Return in 1990 (%)
Package 1	Johor Bahru - Pasir Gudang Southern Linkage	55,287	113,720	13,646	41,641	4.05	48.6
Package 2	Johor Bahru Coat Road Project	77,026	155,450	18,654	58,372	4.13	49.6
Package 3	Inner Ring Road Project	39,197	78,440	9,413	29,784	4.16	50.0
Package 4	Other Roads Project	225,186	556,030	66,724	158,462	3.37	40.5

Based on this assumption, the rate of return on investment is expected to be 7.4% in case depreciation is excluded and 4.3% in case depreciation is included. If the government is prepared to create a lower interest fund for the construction of the new transit system. The system can be introduced.

Table 5.21 Financial Summary of New Transit System 2000

(M$ '000)

Capital Investment		348,300
Construction of Infrastructure	222,000	
Rolling Stock	126,300	
Annual Income Statement in 2000		
Operating Revenue		31,316
Passengers	28,469	
Others	2,847	
Operating Expenses		16,333
Annual Operation Cost	5,578	
Depreciation	10,755	
Net Operating Income excluding depreciation		25,738
Net Operating Income including depreciation		14,983
Rate of Return excluding depreciation		7.4%
Rate of Return including depreciation		4.3%

2) Malayan Railway

Table 5.22 shows the results of the financial analysis for introduction of commuter services to the Malayan Railway between Johor Bahru and Kulai.

The rate of return will presumably be low, then the needs of the railway expansion could be justified by the consideration on the national development strategy.

Table 5.22 Financial Summary of Malayan Railway by the Year 2000

(M$ '000)

Capital Investment		213,980
Construction	121,600	
Rolling Stock	92,380	
Annual Income Statement in 2000		
Operating Revenue		9,164
Passengers	8,331	
Others	833	
Operating Expenditure		10,917
Operating Costs	4,790	
Depreciation	6,127	
Net Income excluding depreciation		4,374
Net Income including depreciation		- 1,753
Rate of Return excluding depreciation		2.0%

5-7 Evaluation from Other Viewpoints

Tables 5.23 and 5.24 show the results of evaluation from other viewpoints. From this table the following observations can be made:

a. Johor Bahru - Pasir Gudang Southern Linkage should be implemented in order to develop the corridor between Johor Bahru and Pasir Gudang.

b. In order to promote more development in the rural areas, the following roads ought to be improved:

- East Coast Federal Road
- Senai - Ulu Tiram Road
- Skudai - Pontian Federal Road
- Seelong - Sg. Danga Road

c. In order to ensure social equity for the urban poor, it is necessary to expand the public transport system.

Table 5.23 Comparative Analysis of the Proposed Transport Projects

	1	2	3	4	T
	Development Consideration	Environmental Impact	Social Equity	Institutional Consideration	Generalization Summation
Road Construction and Improvement					
1. Johor Bahru - Pasir Gudang Southern Linkage	3	0	0	0	3
2. East Coast Road	0	-1	0	-1	-2
3. West Coast Road	0	-1	0	-1	-2
4. Federal Route 1 in MPJB	0	0	0	0	0
5. Jalan Tebrau	0	0	0	0	0
6. West Access to Toll Expressway	0	-1	0	-1	-2
7. Inner Ring Road	0	-1	0	0	-1
8. Lorry Route	0	1	0	0	1
9. Jalan Tampoi	0	0	0	0	0
10. Jalan Yahya Awal	0	-1	0	-1	-2
11. Jalan Kebun Teh and its Extention	0	0	0	-1	-1
12. Jalan Langkasuka and its Crossing	0	0	0	0	0
13. Jalan Stulang Baru	0	0	0	0	0
14. Jalan Serampang	0	0	0	0	0
15. Jalan Pasir Pelangi	0	0	0	0	0

Note: The values are defined in 5-1.2.

Table 5.23 Comparative Analysis of the Proposed Transport Project (Continue)

	1	2	3	4	T
	Development Consideration	Environmental Impact	Social Equity	Institutional Consideration	Generalization Summation
16. Tampoi - Skudai Road	1	0	0	0	1
17. Plentong Road	1	0	0	0	1
18. Masai Road	1	0	0	0	1
19. North - South Connectors	1	0	0	0	1
20. Johor Bahru - Pasir Gudang Central Linkage	2	0	0	0	2
21. Road Improvement in Taman Century	0	0	0	0	0
22. Road Improvement in New Development Area	0	0	0	0	0
31. East Coast Federal Road	3	0	0	0	3
32. Federal Route 1	2	0	0	0	2
33. Senai - Ulu Tiram Road	3	0	0	0	3
34. Pasir Gudang - Kota Tinggi Road	2	0	0	0	2
35. Port Access Extension	2	0	0	0	2
36. Skudai - Pontian Road	3	0	0	0	3
37. Seelong - Sg. Danga Road	3	0	0	0	3
38. Airport Access Extention	1	0	0	0	1

Note: The values are defined in 5-1.2.

Table 5.24 Comparative Analysis of the Proposed Transport Projects

	1	2	3	4	T
	Development Consideration	Environmental Impact	Social Equity	Institutional Consideration	Generalized Summation
Public Transport Improvement					
1. Expansion of Bus Route	0	0	1	0	1
2. Exclusive Bus Lane	0	0	1	0	1
3. New Transit System	1	0	1	0	2
4. Commuter Service of Malayan Railway	1	0	1	0	2
Traffic Restraints					
1. Parking Control	-1	1	0	0	0
2. Ride Sharing	0	1	0	-1	0
3. Cordon Pricing	-1	1	0	0	0

Note: The values are defined in 5-1.2.

5–8 Overall Evaluation of the Transport Plans

Based on the traffic study, economic evaluation, financial analysis and evaluation from other viewpoints, the following conclusions can be arrived at:-

1) Judged from the results of economic and financial analyses, Plan 2-B, which includes Option 1 of the road network plan with parking control and area pricing and the introduction of a new transit system, is the most feasible among various alternative plans.

2) On the basis of the financial evaluation and the traffic study, it is concluded the a new transit system should be introduced between Johor Bahru and Pasir Gudang by the year 2000. It is suggested, however, that the new transit system be re-examined by monitoring the development of the Johor Bahru - Pasir Gudang corridor.

3) Judged from the results of the economic evaluation and the traffic study, Option 1 is preferable to Option 2 as an ultimate Road Network Plan. In order to meet the needs of an increasing traffic volume between the C.B.D. of Johor Bahru and the entry point of the Toll Expressway and/or Pasir Gudang, it is necessary to construct a central linkage road in the Johor Bahru - Pasir Gudang corridor and to construct an east coast road in MPJB or a second deck on Jalan Tebrau.

4) Based on the economic and financial analyses, the traffic study and other criteria, the implementation of the following plans and projects should be given high priority:

   a. Road Cosntruction and Improvement

      - Johor Bahru - Pasir Gudang Coastal Road including widening Bakar Batu

- Expansion of Jalan Tebrau into six (6)-lane road
- Inner Ring Road including Lorry Rou-e
- Toll Expressway Access and E-st Coastal Road of MPJB
- Senai - Ulu Tiram Road

In addition, the following committed roads should also be given high priority:

- East Coast Federal Road from Port Access to Kota Tinggi
- Senai - Pontian Federal Road
- Seelong - Sg. Danga Road

b. Public Transport Improvement

- Introduction of Exclusive Bus Lane on Jalan Tebrau

c. Urban Transport Terminal

- Bus TErminal and/or Integrated Passenger Terminal
- Lorry Terminal and/or Consolidated Freight Terminal

d. Traffic Engineering and Management

- Traffic Dispersal/Circulation System in the C.B.D. of MPJB

e. Traffic Restraints

- Parking Control Scheme in the C.B.D. of MPJB

Chapter 6 RECOMMENDED LONG-TERM TRANSPORT PLAN

6-1 Recommended Overall Transport Plan

1 Policy and Strategy

The recommended transport plan represents a comprehensive structure plan for the transport system in order to achieve the objectives and goals mentioned in Chapter 4. In order to accomplish the recommended transport plan, the following package of strategies are recommended:-

a. Effective use of existing transport facilities

b. Improvement and/or expansion of bus transport system

c. Introduction of innovational bus and/or public transport system

d. Traffic restraints

e. Traffic engineering and management

f. Road improvement and construction

g. Expansion of monitoring system

The schedule for implementation of each strategy will differ since some strategies will be for short-term actions, while others will be implemented as a longer-term plan. The recommended implementation is shown in Table 6.1.

Table 6.1 Implementation Timing of EAch Strategy

	Short-Term Actions	Longer-Term Plan
1. Effective use of existing transport facilities	●	●
2. Improvement and/or expansion of bus transport system	●	●
3. Introduction of innovational bus and/or public transport system	•	●
4. Traffic restraint measure	●	●
5. Traffic Engineering and Management	●	●
6. Construction and Improvement of roads	●	●
7. Monitoring System	●	●

● High priority
● Medium priority
• Low priority

2 Future Road Network

In order to achieve the identified objectives the future road network which is the most likely and feasible from the point of view of future land use structure, future traffic demand and economic aspects is proposed in Figs. 6.2 and 6.3.

The road network planned for Johor Bahru is fundamentally a grid and radial road system while that for other areas is basically a grid and ladder pattern.

3 Traffic Dispersal and Circulation Scheme

Since the great number of through traffic as well as traffic coming from other areas will disturb the traffic flow in the Central Business District (C.B.D.) of MPJB, it will be necessary to disperse these. Therefore, it is recommended that the following package of traffic strategies be employed.

Fig. 6.1 Traffic Dispersal Concept

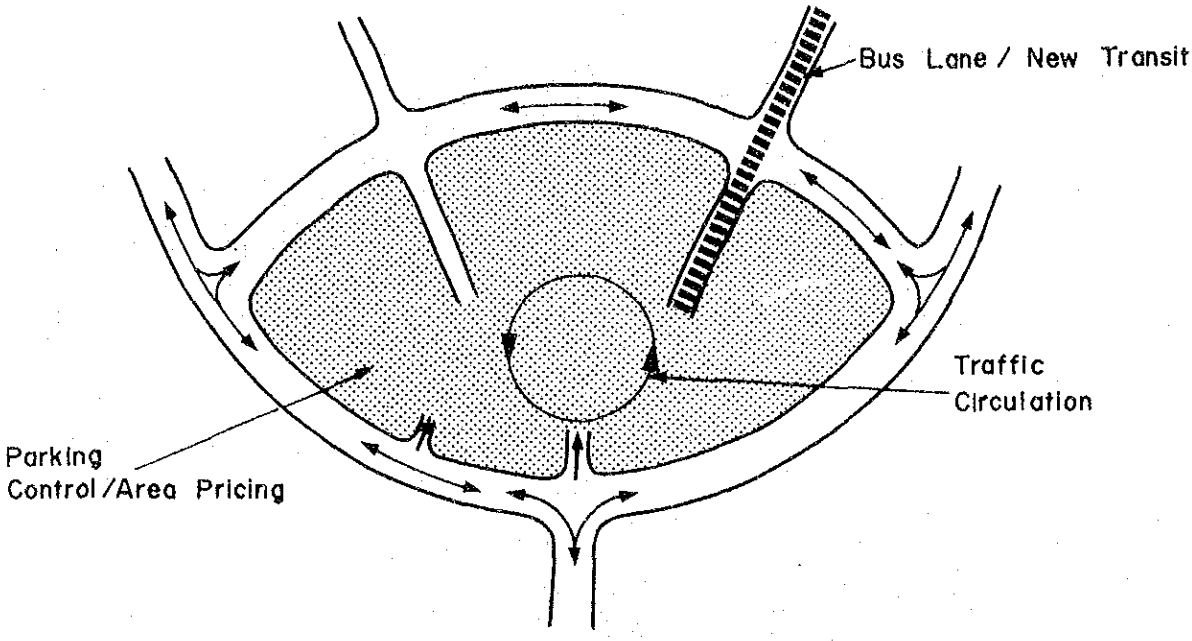


Fig. 6.2 Recommended Road Network Plan in 2000 – Study Area

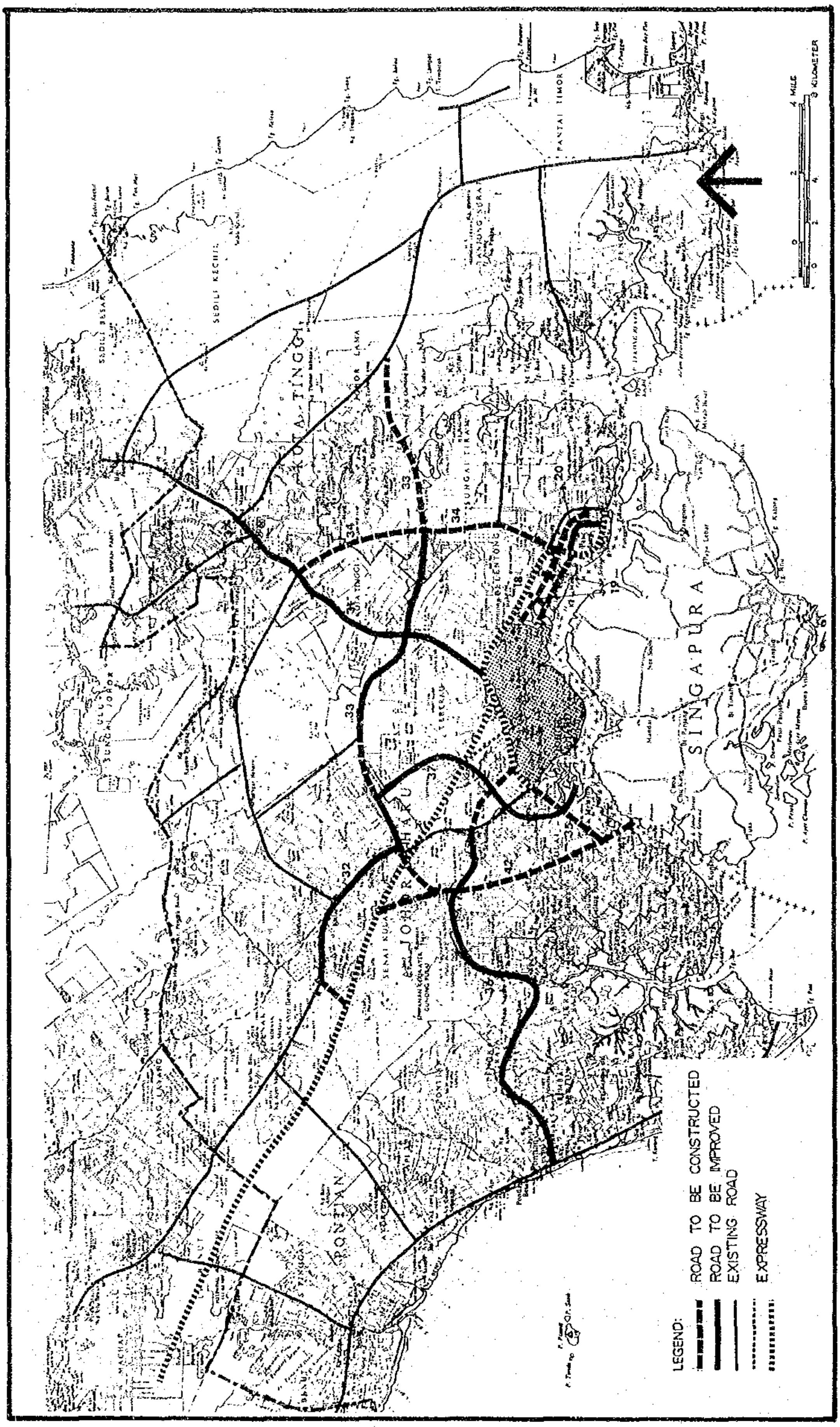
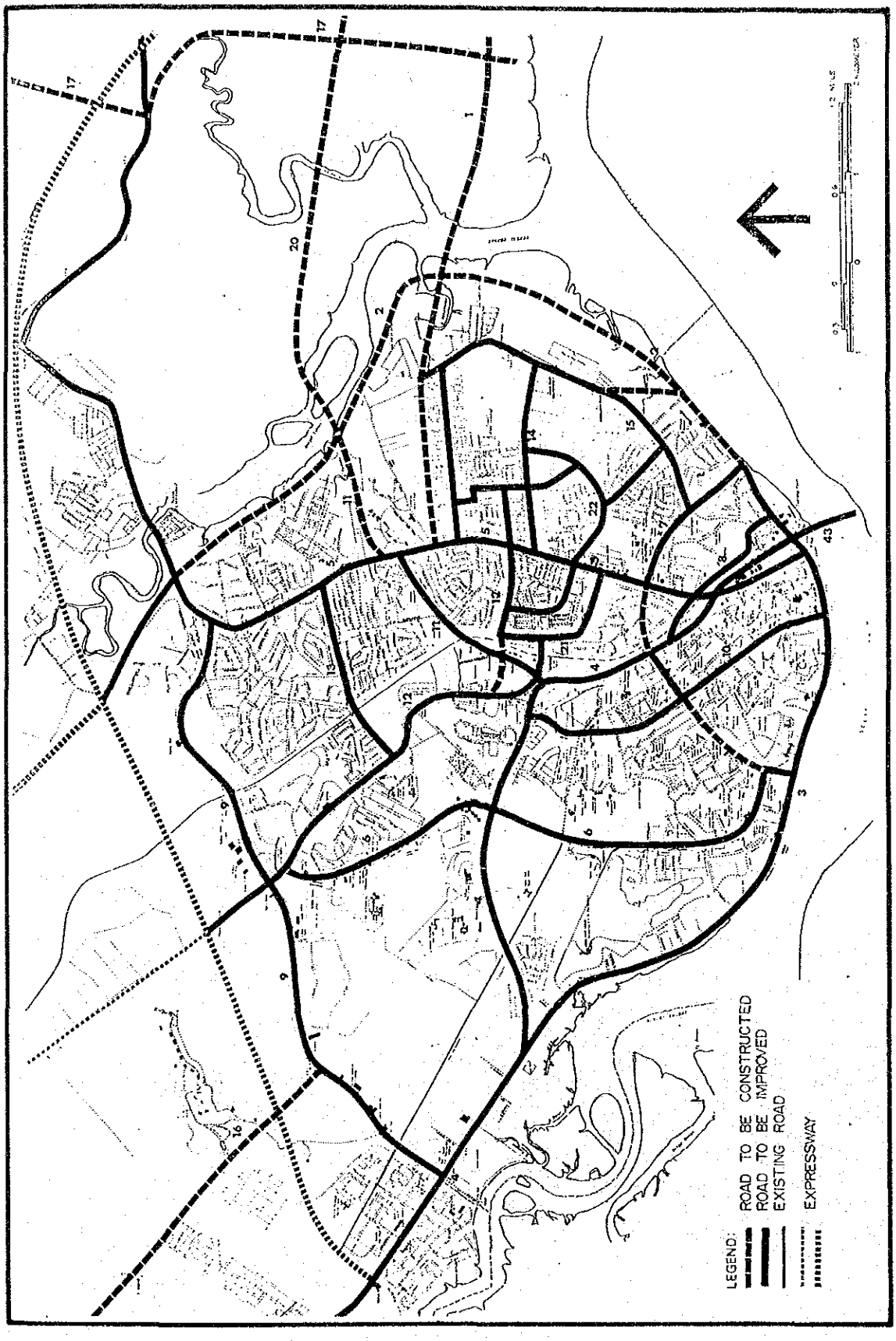


Fig. 6.3 Recommended Road Network Plan in 2000 – MPJB



4 Monitoring System

The conditions of a transport system vary day by day and year by year. Since the projected traffic demands change according to the assumptions made, the monitoring system should be strengthened to review the results of the study and to implement the recommended projects smoothly.

In order to achieve this, the following recommendations are made.

1) Establish a Transport Consultative Committee consisting of officials, planners and citizens. The bodies involved shall be:

   a. State Economic Planning Unit (Chairman),

   b. State Public Works Department,

   c. State Traffic Police,

   d. State, Town and Country Planning Department,

   e. Municipal Council,

   f. Road Transport Licensing Board,

   g. transport planners,

   h. citizens.

2) Establish an Urban Transport Planning and Implementation Unit either in the State Public Works Department or in the Municipal Council. The following staff will be required upon completion of the project.

   1 - Traffic Engineer
   1 - Highway and Civil Engineer
   1 - Transport Planner
   1 - Transport Economist

3) Compile data

   Substantial amount of data is available,

but collection and compilation are time-consuming tasks. All data relating to demography, land use and transportation, should be collected and compiled with the help of the staff to evaluate and update this plan.

4) Introduce a Computer System

In Johor Bahru, few computer systems are available. Therefore, the Study Team recommends that a computer system be introduced to the State Public Works Department in order to strengthen the monitoring system.

6–2 Long-Term Transport Plans

The long-term transport plans are concerned with structural planning covering all transport systems such as roads, bus transport, other public transports, and urban transport facilities.

1 Construction and Improvement of Roads

The recommended plan seeks to make full use of the existing road system to form an adequate road system capable of serving the predicted traffic demands. This is accomplished by the following:

a. construction of new roads;

b. improvement of existing roads;

c. widening of grade-separated interchanges and improvement of intersections.

Table 6.2 shows the recommended roads to be improved or constructed that will be required by the year 2000 to meet future traffic demands.

Table 6.2 Recommended Road Plan 2000

	Number of Projects	Total Kilometer-age of Projects	Estimated Project Costs (M$ '000)
1. Improvement of Existing Roads	30	210.2	996,390
2. Construction of New Road		136.4	
3. Grade-separated Interchanges	19	-	41,500
4. Improvement of Intersections	4	-	2,000

Table 6.3 shows each of the recommended roads to be improved or constructed and Figs. 6.4 and 6.5 show the interchanges and intersections to be improved and constructed.

Fig. 6.4 Interchange and Intersection Plan (Study Area)

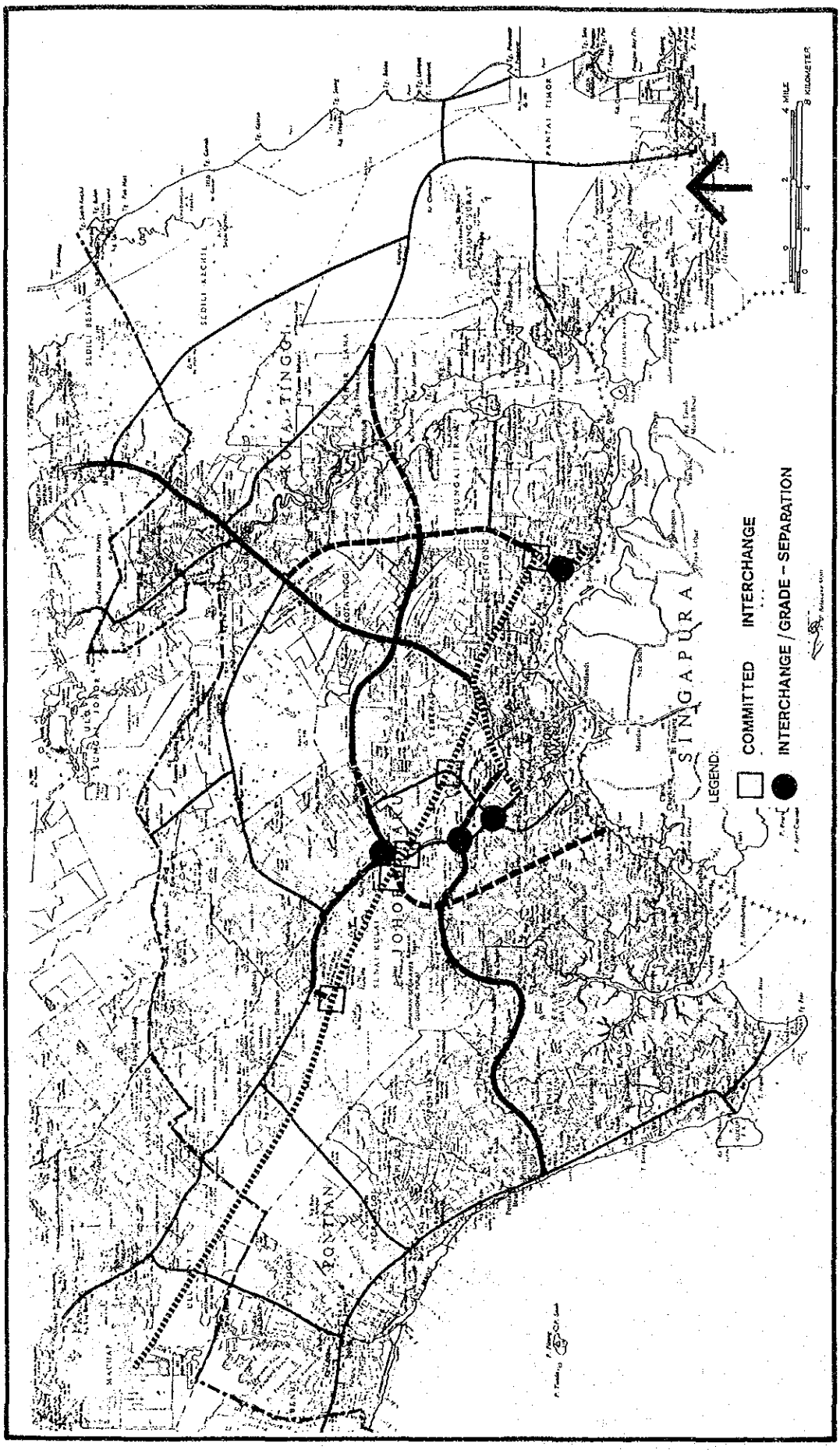


Fig. 6.5 Interchange and Intersection Plan (MPJB)

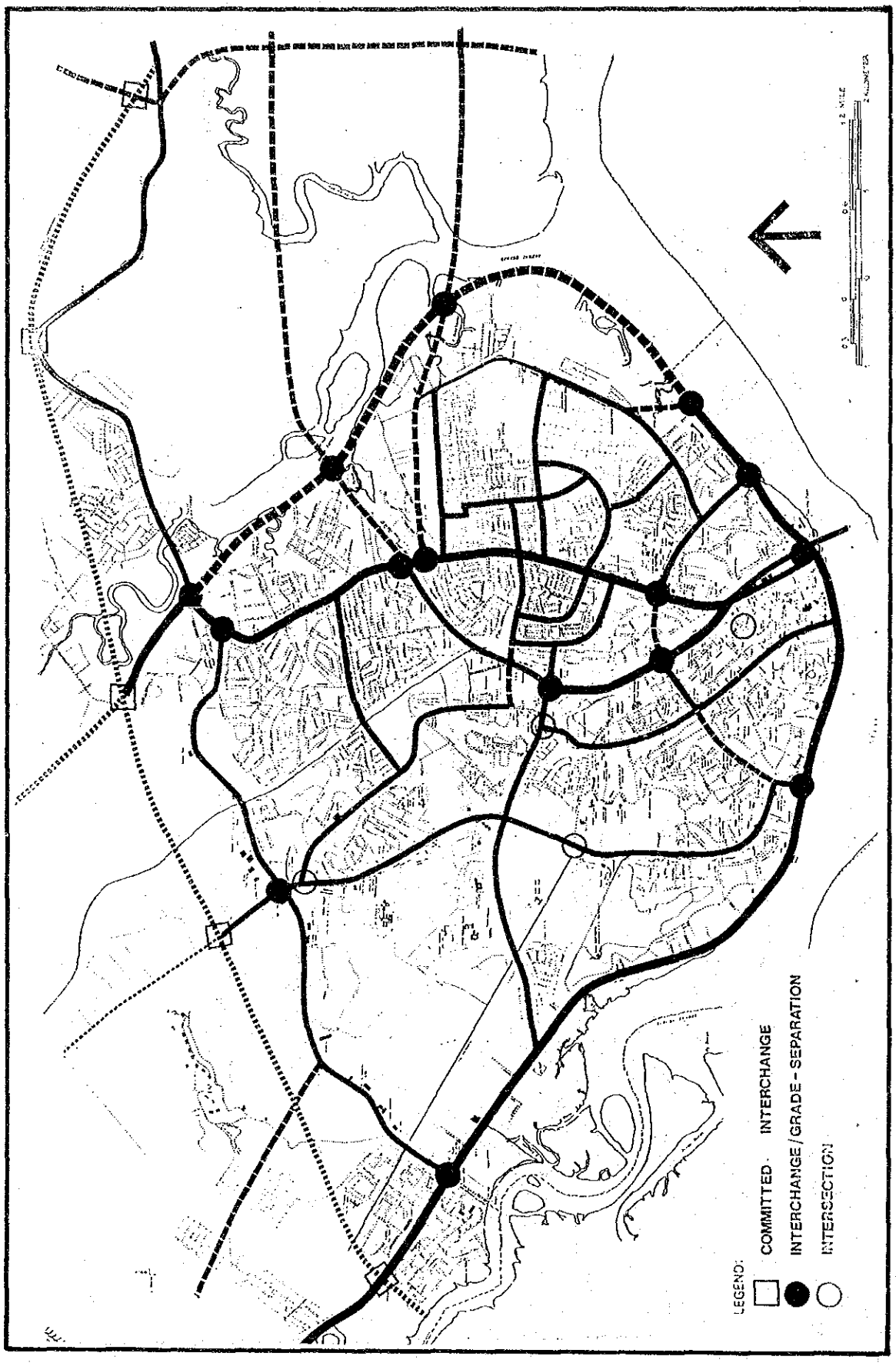


Table 6.3 Construction and Improvement of Roads

		Number of Lanes	Total Length (Kms)			Project Cost ($M\$ 10^6$)
			Improved	New Construction	Total	
1	Johor Bahru - Pasir Gudang Southern Linkage	4 & 6	1.8	12.2	14.0	113.72
2	East Coast Road	4 4 & 6	2.2	7.5	9.7	83.50 109.94
3	West Coast Road	4 4 & 6	7.3	0	7.3	19.55 32.26
4	Federal Route 1 in MPJB	6	10.8	0	10.8	17.25
5	Jalan Tebrau	4 6	11.0	0	11.0	39.35 49.07
6	West Access to Toll Express	2 4	6.2	0	6.2	3.10 16.54
7	Inner Ring Road	4	1.8	3.3	5.1	58.97
8	Lorry Route	2	0	2.7	2.7	16.04
9	Jalan Tampoi	4	7.4	0	7.4	19.05
10	Jalan Yahya Awal	4	3.8	0	3.8	10.69
11	Jalan Kebun Teh and its Extension	4	2.2	1.6	3.8	13.25
12	Jalan Langkasuka and its Crossing	2 4	5.1	0 0.9	5.1 6.0	2.55 20.06
13	Jalan Stulang Baru	2 4	2.0	0	2.0	1.00 5.26
14	Jalan Serampang	2 4	2.0	0	2.0	1.00 4.94
15	Jalan Pasir Pelangi	2 2 & 4	0.8 2.2	0 0.8	0.8 3.0	0.40 12.25
16	Tampoi - Skudai Road	4	0	8.5	8.5	19.23
17	Pelentong Road	4	0	10.6	10.6	18.72
18	Masai Road	4	14.8	0	14.8	47.98
19	North South Connectors	4	0	4.0	4.0	8.56
20	Johor Bahru - Pasir Gudang Central Linkage	4	0	16.9	16.9	91.16

Table 6.3 Construction and Improvement of Roads (Cont'd)

		Number of Lanes	Total Length (Kms)			Project Cost ($M\$ 10^6$)
			Improved	New Construction	Total	
21	Road Improvement in Taman Century	2	3.5	0	3.5	1.75
22	Road Improvement in New Development Area	2	5.2	0	5.2	2.60
	JB - Pasir Gudang Sub-Total	-	89.3	69.0	158.3	697.34
31	East Coast Federal Road	2 4	40.0	0	40.0	33.00 68.04
32	Federal Route 1	4	13.6	0	13.6	23.50
33	Senai - Pengerang Road	2	26.3	17.8	44.1	81.07
34	P. Gudang - Kota Tinggi Road	2	0	24.6	24.6	34.55
35	Port Access Extension	4	0	8.4	8.4	44.57
36	Skudai - Pontian Federal Road	2 & 4	13.6	0	13.6	20.00
37	Seelong - Sg. Danga Road	2	27.40	0	27.40	10.96
38	Airport Access Extension	2 & 4	0	8.2	8.2	16.36
	Outer Area Sub-Total		120.90	67.4	179.9	299.05
	Total		210.2	136.4	338.2	996.39

2 Improvement and Development of Public Transport System

1) Rationale

The overall evaluation suggests that the public transport be improved and developed for the following reasons:

1. to maximize the net benefits as a whole;
2. to maximize the benefits for lower-income groups;
3. to maintain mobility even if restraining measures on private cars are introduced;
4. to promote a lower-cost solution for transport problems.

2) Recommended Improvement and Development Plan

As a result of a careful examination of present public transport conditions and predicted public transport demands, the following improvement and development plan are recommended:

1. introduction of exclusive bus lane;
2. introduction of new transit system;
3. introduction mini-bus system;
4. establishment of a Bus Transport Committee;
5. expansion and improvement of routes and schedules;
6. provision of bus-stops and bus terminals;
7. provision and improvement of bus fleets.

Among these measures, some will be implemented over a short-term period and others over a long-term period. In this section therefore, mainly items 1, 2 and 3 are described.

3) Introduction of Exclusive-Bus Lane

From the overall evaluation, it is concluded that a exclusive-bus lane should be introduced on

the following streets. (Refer to Fig. 6.6).

a. Jalan Tebrau
b. Johor Bahru - Pasir Gudang Southern Linkage

The exclusive bus lane was selected as one of the bus priority measures and the following illustration shows how it might be implemented.

Fig. 6.6 Recommended Bus Lane to be Introduced

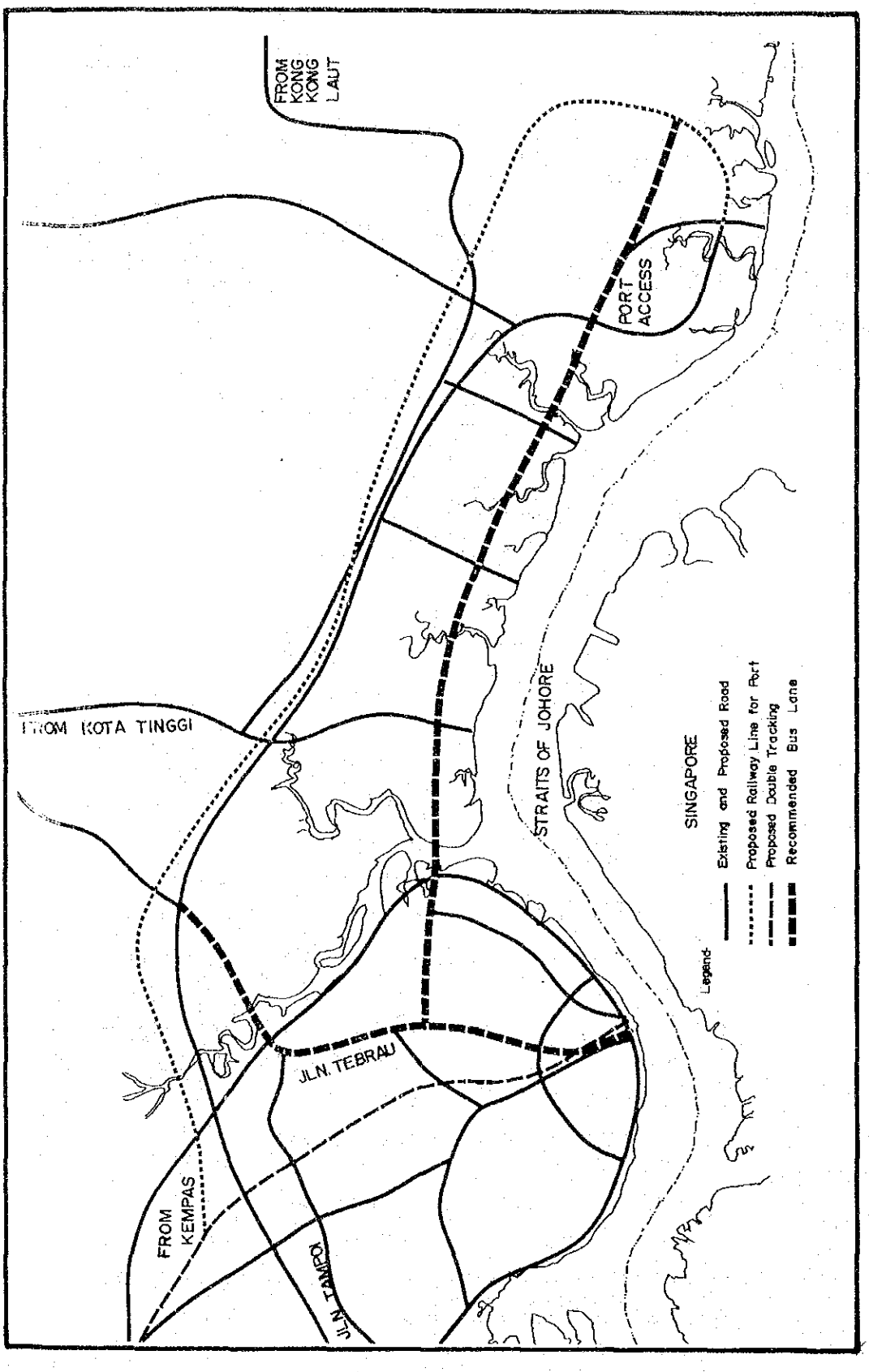
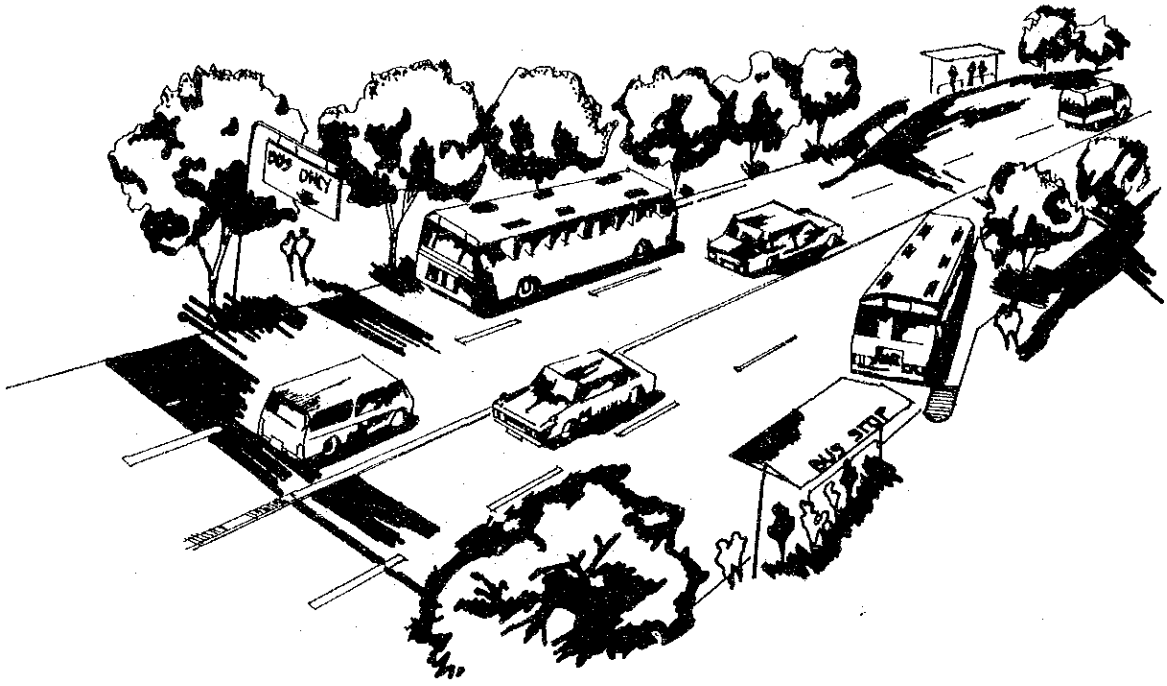


Fig. 6.7 Image of Exclusive Bus Lane



4) Introduction of New Transit System

As a result of careful economic and financial examination, the introduction of a New Transit System between Johor Bahru and Pasir Gudang is judged to be viable. However, the introduction of this sytem will be needed after 1990 when the Johor Bahru - Pasir Gudang Corridor will be highly developed. Therefore, it is suggested that the New Transit System be re-examined by monitoring the increasing traffic volume on roads and the increasing residents to be settled in the Johor Bahru - Pasir Gudang Corridor. And it is also suggested that land in the said corridor be reserved to introduce this system.

5) Introduction of Mini-Bus System

Past trends of bus transport show that bus transport has been stagnating in terms of the number of passengers while the number of cars

has increased. However, it is absolutely essential to develop the public transport system in order to maintain the fundamental urban activities.

In the Study Area, a policy must be adopted to lower the ratio of private vehicle-use to total vehicle-use by the provision of bus transport services that are of high quality and sufficient in quantity.

According to a mini-bus study in Kuala Lumpur, the running-kilometerage of scheduled bus companies was reduced by one-third after the introduction of the mini-bus system.

This suggests that the scheduled bus companies in Kuala Lumpur were compelled to restrict their rising costs by reducing the quality level of the bus service.

The basic policy for bus transport should not only be advantageous to bus transport users and management, bus also provide bus companies with some incentive to increase the level of bus services.

In this connection, it is suggested that the longer route line-haul services be assigned mainly to the scheduled bus system and that the mini-bus system be introduced more or less as a feeder system.

3 Private Vehicle Restraints

1) Recommended Plans

In addition to the strategies for the development of public transport, the following mewsures for private vehicle restraints are proposed as a package plan.

a. Parking Control
b. Cordon Pricing

In order to reduce the traffic penetrating the C.B.D. area in MPJB, parking control should be gradually expanded from the center to the periphery of the C.B.D. and from the main roads to minor ones.

The implementation of cordon pricing, however, is suggested only if the strategies for the development of public transport do not work effectively and if the completion of the future road network falls behind schedule. Therefore, the possibility of introducing cordon pricing should be examined prior to implementation.

2) Parking Control

There are two controls of parking control. One is to prohibit on-street parking in order to make traffic flow smooth and to secure sufficient space not only for ordinary traffic but also for emergency use or pedestrians.

The other concept is to limit the total capacity of parking so as to reduce private vehicle use in the C.B.D.

According to the parking survey conducted by the Study Team, a number of cars which were illegally parked were observed.

It is recommended that illegal parking be eradicated and off-street parking facilities be provided as the substitute. In addition, even the legal on-street parking spaces on main roads should be reduced to achieve the objectives stated above.

The proposed streets on which parking is to be prohibited are as follows:

a. all the primary roads;

b. District Roads in C.B.D.;

c. Local Roads in C.B.D. which are to be converted to a pedestrian mall.

As the result of parking control, the supply programme of parking facilities in C.B.D. is as follows:

Table 6.4 Parking Spaces in C.B.D.

(Vehicles)

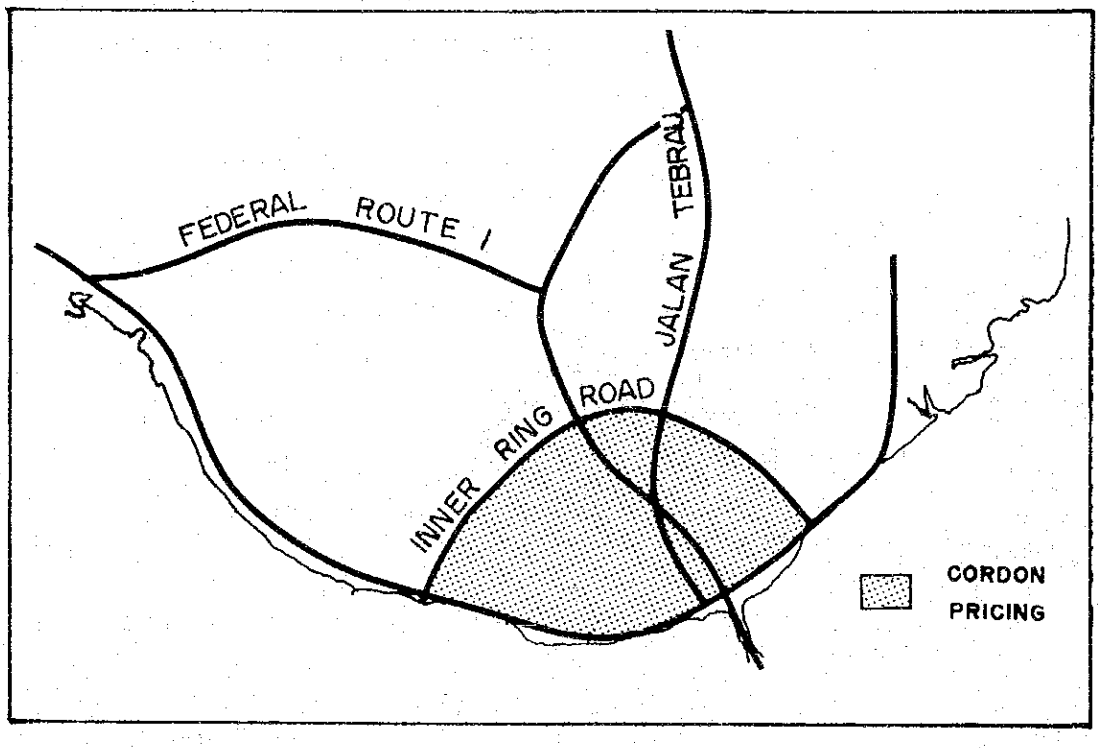
Parking Space	1981	1990	2000
On-Street	2,020	1,430	560
Off-Street	3,970	4,850	6,070
Total	5,990	6,280	6,630

3) Cordon Pricing

Cordon Pricing is a strategy for reducing private vehicles entering the C.B.D. by imposing a certain amount of charge on a cordon line. The "Area Licence Scheme" is Singapore is a well known example.

It is proposed that cordon pricing be adopted in the shaded area of Fig. 6.8 inside the Inner Ring Road.

Fig. 6.8 Area of Cordon Pricing



Since this measure requires that the road network disperse traffic into the C.B.D., its implementation is difficult unless the Inner Ring Road is completed.

In order to carry this out without an adverse effect on socio-economic activities, an adequate public transport system should be prepared as alternative means of transport.

Therefore it is recommended that the possibility of implementation be thoroughly studied from various aspects at a later stage.

4 Long-Term Traffic Dispersal and Circulation Plan

Based on the recommended traffic dispersal concept, the long-term traffic dispersal and circulation plan is proposed. (Refer to Fig. 6.9).

This plan includes the following package of strategies.

a. Construction of coastal road and inner ring road as well as lorry route.

b. Construction of grade-separation in front of customs and immigration complex on the causeway.

c. Implementation of a circulation system in the C.B.D. of MPJB.

In order to ensure effectiveness for the circulation system, the following measures are also recommended for implementation.

a. Introduction of two pairs of one-way roads. One is Jalan Tun Abdul Razak/Jalan Wong Ah Fook and the other is Jalan Trus/Jalan Ibrabim.

b. On-street parking control on the circulation road.

c. Introduction of bus lane and/or a new transit system.