URBAN TRANSPORT STUDY
IN
GREATER METROPOLITAN AREAS OF
GEORGETOWN, BUTTERWORTH AND BUKIT MERTAJAM
MALAYSIA

PROGRESS REPORT
(PHASE I)

AUGUST 1979

JAPAN INTERNATIONAL COOPERATION AGENCY

CONTENTS

1. Introduction

1-1 General

In response to the request made by the Government of Malaysia, for technical cooperation in conducting the Urban Transport Study of the Greater Metropolitan Areas of Georgetown, Butterworth and Bukit Mertajam in Penang, the Government of Japan agreed to offer the services of a team of Japanese experts to undertake the study and the transfer of knowledge to the counterpart personnel appointed by the Government of Malaysia, in accordance with the laws and regulations in force in Japan.

The Government of Japan conducted the Preliminary Survey on the Urban Transport Study of the Greater Metropolitan Areas of Georgetown, Butterworth and Bukit Mertajam in November, 1978. Based on the results of this survey, the Japan International Cooperation Agency (hereinafter referred to as JICA), responsible for implementation of the technical cooperation programs of the Government of Japan, will carry out the study in close cooperation with the Government of Malaysia.

At the beginning of the study, an inception report concerning this study prepared by JICA was submitted to the Government of Malaysia, and a joint meeting of the Steering Committee of the Government of Malaysia, the Supervising Committee of JICA and Study Team was held to formulate a frame of suitable study process.

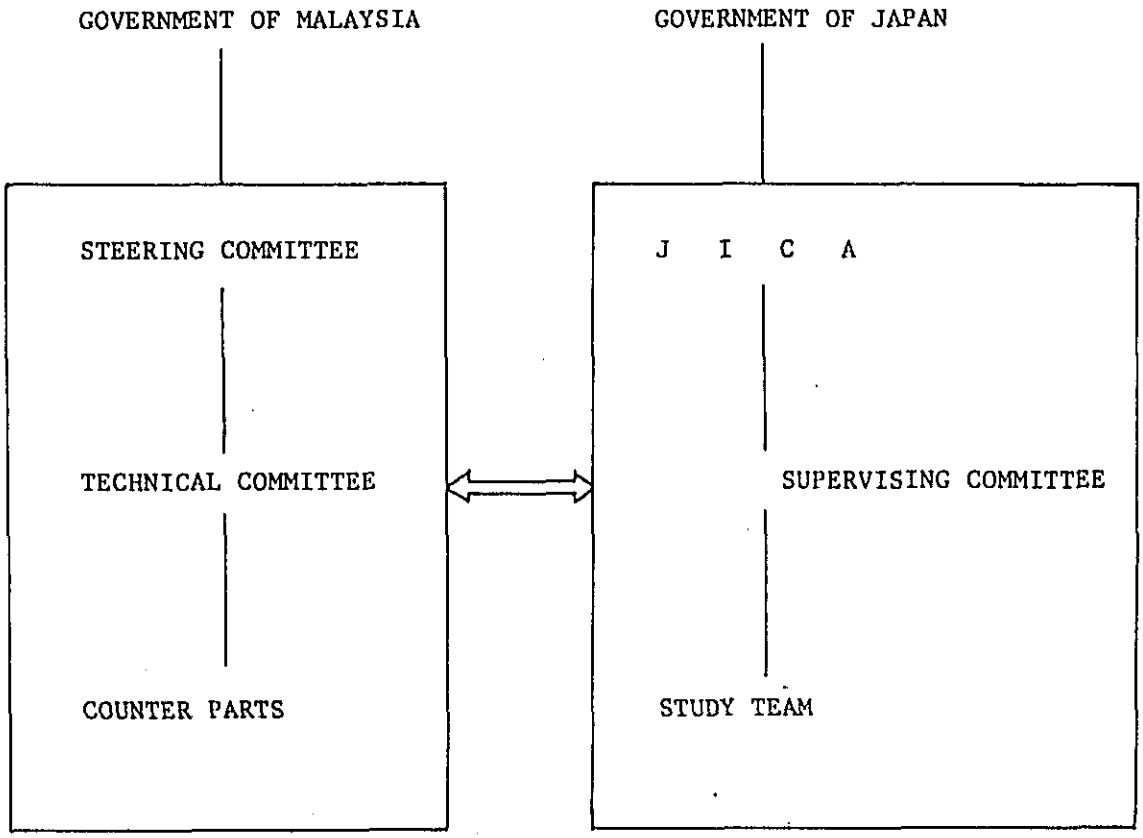
In the progress report, surveys, analyses and other activities conducted up-to-date have been compiled.

1-2 Organization

This project is being carried out with JICA and the Government of Malaysia in coordination with other agencies.

The organization for the study is as follows:-

ORGANIZATION CHART



THE STAFFS ARE LISTED AS FOLLOWS:-

Steering Committee, Government of Malaysia

1. Mr. Bashah Nordin - (Chairman)
   Economic Planning Unit

2. Mr. Zaidan Bin Haji Othman
   Highway Planning and Public Transport Unit

3. Mr. Liew Hon Yong
   Ministry of Treasury

4. Mr. Thilagadurai
   Ministry of Communication

5. Mr. Hasnan Itam
   Ministry of Communication

6. Mr. Juderi Bin Sadinan
   Public Works Department Headquarters, Kuala Lumpur

7. Mr. Yoon Shee Leng
   Public Works Department Headquarters, Kuala Lumpur

8. Mr. Aw Kheng Huat
   Department of Survey, Kuala Lumpur

9. Mr. Mohd. Zuhuri Bin Saleh
   State Economic Planning Unit, Penang

10. Mr. Saikhol Rosli Bin Sabdin
    State Economic Planning Unit, Penang

11. Mr. Koh Kok Ee
    Public Works Department, Penang

12. Mr. Thomas Gan Eng Siew
    Municipality of Pulau Pinang

13. Mr. Ong Chow Meng
    Municipality of Seberang Perai

14. Miss Leong So Seh
    Economic Planning Unit - (Secretary)

Technical Committee, Government of Malaysia

1. Mr. Zuhuri Bin Saleh - (Chairman)
   State Economic Planning Unit, Penang

2. Mr. Saikhol Rosli Bin Sabdin - (Secreatry)
   State Economic Planning Unit, Penang

3. Mr. Koh Kok Ee
   Public Works Department, Penang

4. Mr. Khoo Theam Hooi
Public Works Department, Penang

5. Mr. Khoo Soo Theong
Public Works Department, Penang

6. Mr. Chew Sin Liang
Public Works Department, Penang

7. Mr. Mohd. Zam Bin Mohd. Zain
Town & Country Planning Department, Penang

8. Mr. Chong Kui
Town & Country Planning Department, Penang

9. Mr. Thomas Gan Eng Siew
Municipality of Pulau Pinang

10. Mr. Hua Keng Tong
Municipality of Pulau Pinang

11. Mr. Ong Chow Meng
Municipality of Seberang Perai

12. Mr. Mohd. Noor Bin Ayob
Municipality of Seberang Perai

13. Mr. Rohani Bin Walat
Road Inspector Motor Vehicles

14. Mr. Teo Cheng Pian
Survey Department, Penang

15. Mr. Choong Lai Chin
Penang Development Corporation

16. Professor K.J. Ratnam
University Sains Malaysia

17. Mr. Leong Hing Fatt
University Sains Malaysia

18. Mr. Hedeaki Hoshino
University Sains Malaysia, Colombo Plan Expert

19. Mr. Idris Bin Muda
Penang Port Commission

20. Mr. Abdul Aziz Bin Ujang
Chief of Penang Traffic Police

21. Mr. Tuffile Nawab Din
Butterworth District Police

22. Inspector Daud Ahmad
Butterworth District Police

23. Mr. Abdul Aziz Bin Mavi
Bukit Mertajam District Police

Supervising Committee, Government of Japan

1. Takashi Inouye
   Professor, Yokohama National University

2. Kazuo Yoda
   Ministry of Construction

3. Takeshi Shiina
   Ministry of Construction

4. Takeshi Kurokawa
   Professor, University of Tsukuba

5. Koumei Asano
   Ministry of Construction

6. Yasutaka Tsuruno
   Ministry of Transport

Study Team

1. Kaoru Ichihara
   Team Leader

2. Jiro Watanabe
   City Planning

3. Haruhiko Imai
   Transport Facilities

4. Katsuyasu Nakata
   Traffic Survey and Analysis

5. Osamu Otsu
   Traffic Survey and Analysis

6. Etsutaro Iimuro
   Data Processing

7. Koichi Tsuzuki
   Road Planning

8. Toshio Kimura
   Economic Evaluation

9. Shigeru Okutsu
   Public Transport

10. Kokuro Hanawa
    Traffic Management

11. Junichi Shimada
    Port and Harbour

12. Hikaru Nishimura
    Administration

2. Study Approach

2-1 Objective of Study

The objectives of the study are to formulate a masterplan of urban transport system of Georgetown, Butterworth and Bukit Mertajam taking into consideration the various development projects such as the Penang Bridge Project, to recommend major transport policies, and to suggest the priority of projects during the course of the study.

2-2 Study Area

The study area covers the Greater Metropolitan Areas of Georgetown, Butterworth and Bukit Mertajam of Penang State and their neighbouring districts concerned.

2-3 Study Years

The target year of the Master Plan is 2000. The study is aimed at identifying the short-term projects to be undertaken during the period 1980-85 as well as the long-term projects 1986 onwards to the year 2000.

2-4 Main Study Items

Major items of the study are as follows:-

a) Transport Development Plans
   - Short Term
   - Medium Term
   - Long Term

b) Transport Development Strategy

c) Transport Management Measures

d) Implementation Programs.

e) Others

2-5 Work Plan

There are three aspects to be considered in conducting this study:-

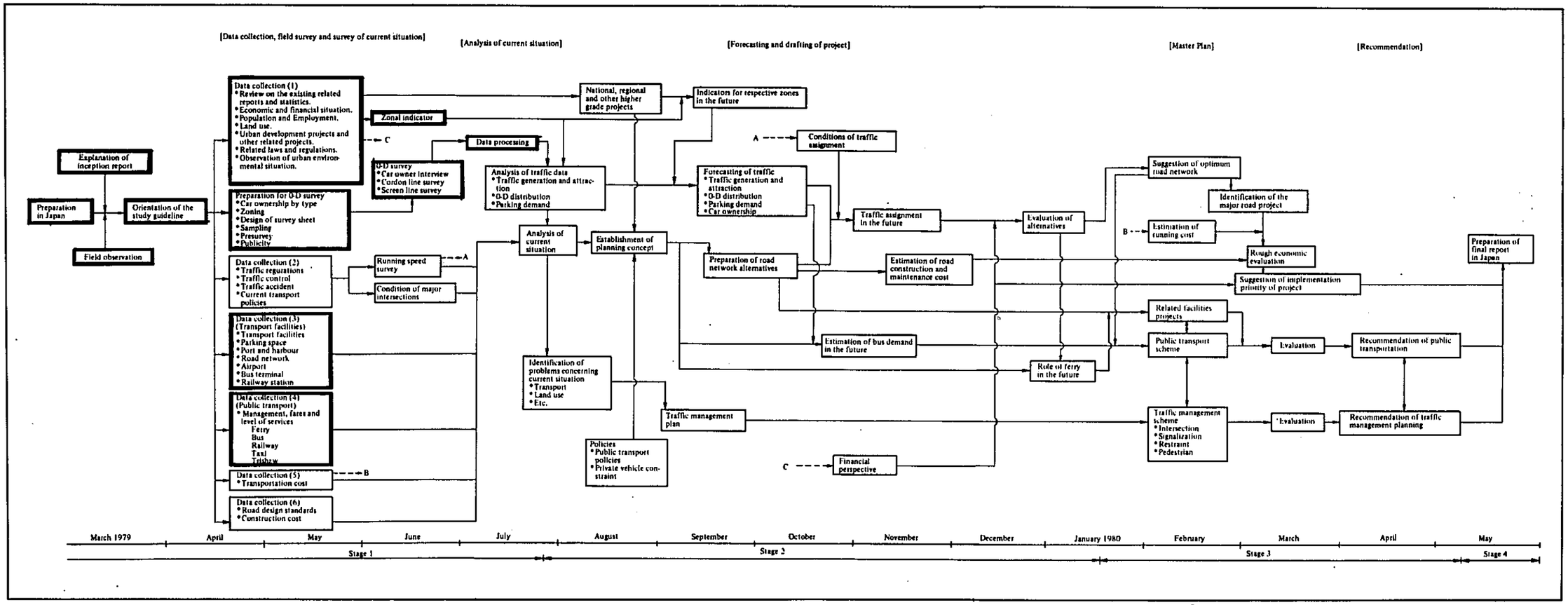
- Identification of Land Use Pattern
- Identification of Transport Policy
- Identification of Priority of Project

Identification of Land Use Pattern is scheduled for a completion by end of August, 1979. Identification of Transport Policy by end of September, 1979 and Identification of Priority of Project in Phase 1 by end of March, 1980.

This studies carried out up-to-date are shown in Figure 1.

FLOW CHART OF WHOLE WORK

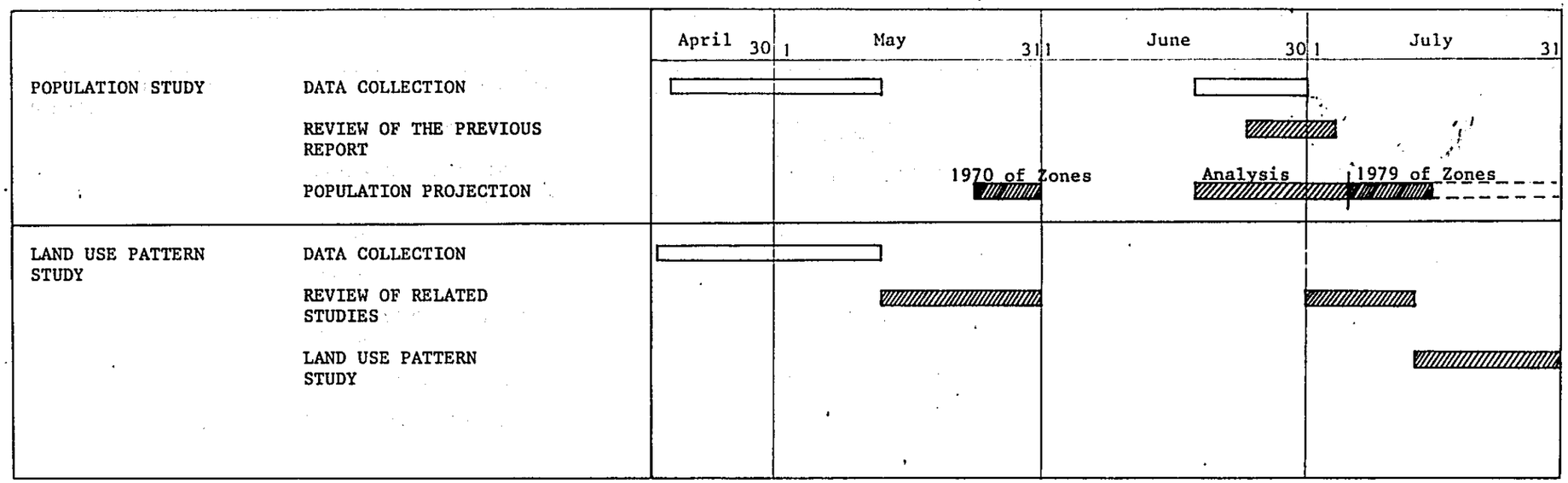
Fig.-1



: Study undertaken

3. Progress to Date

FIGURE 2 PROGRESS TO DATE - 1



KEY

- Study of detailed contents
- Indoor works
- Outdoor works
- Printing

The progress of this study up to the end of July is shown in "Progress to Date".

FIGURE 3 PROGRESS TO DATE - 2

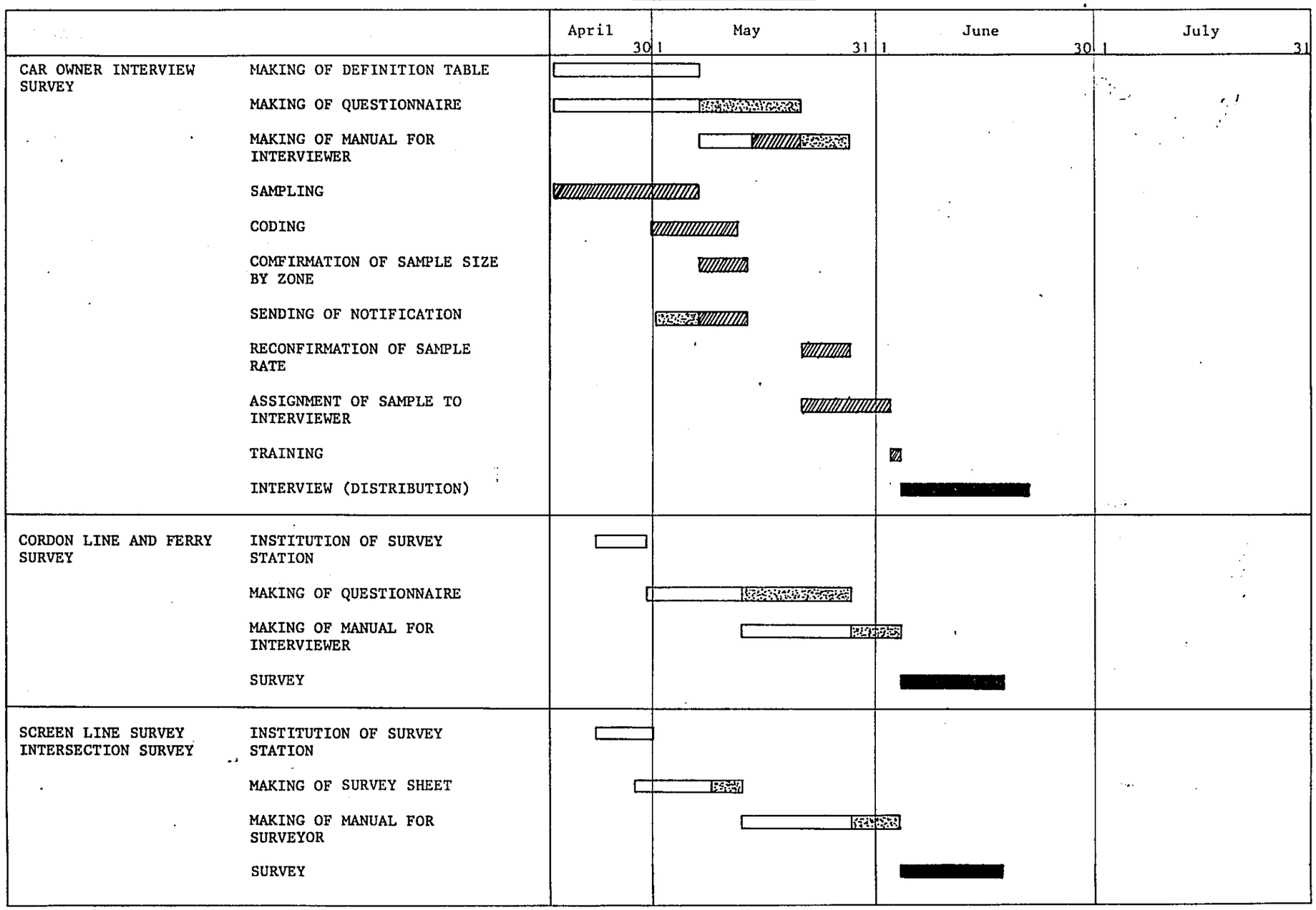
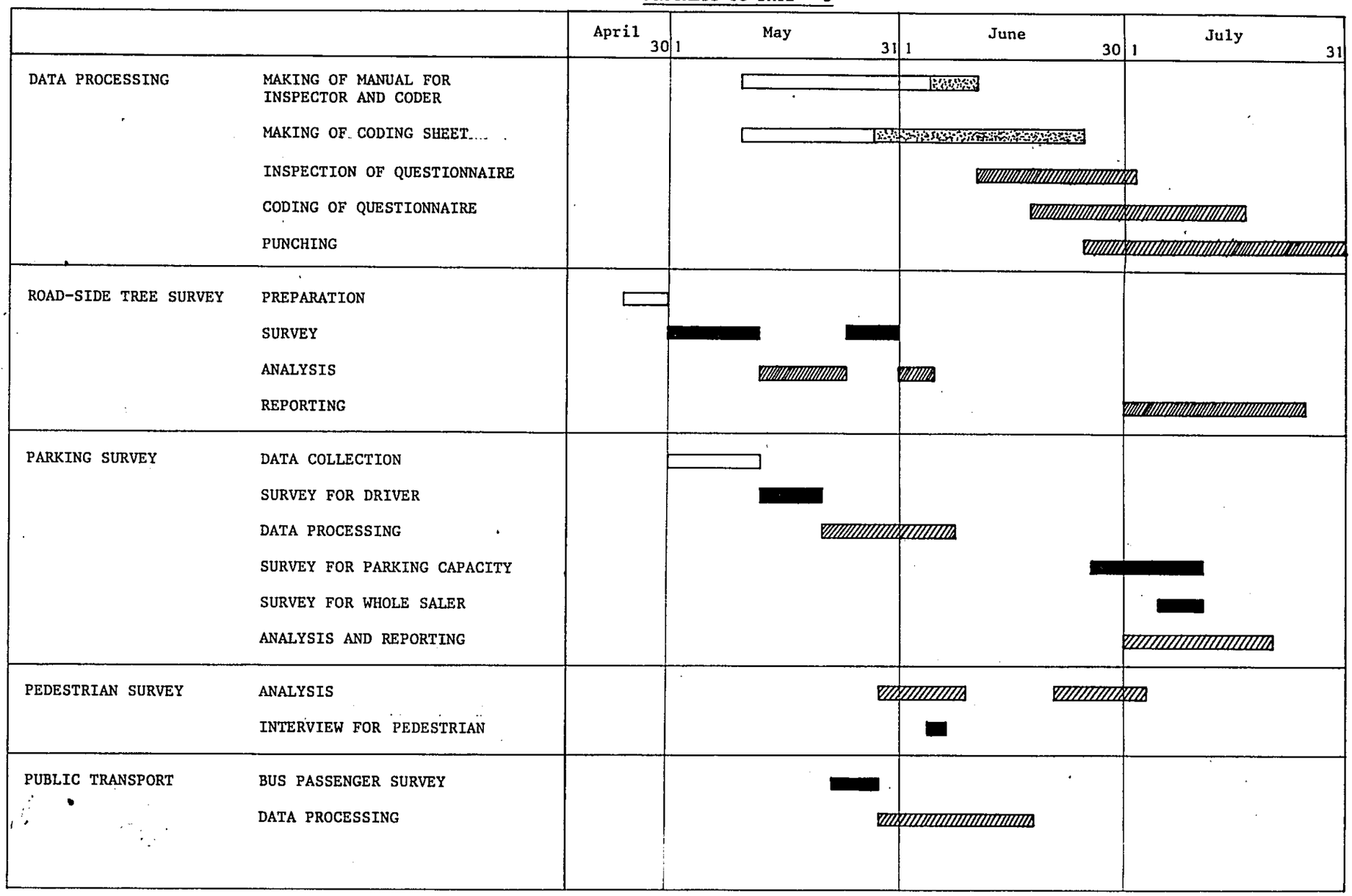


FIGURE 4 PROGRESS TO DATE - 3



4. General Outline of Penang

4-1 General

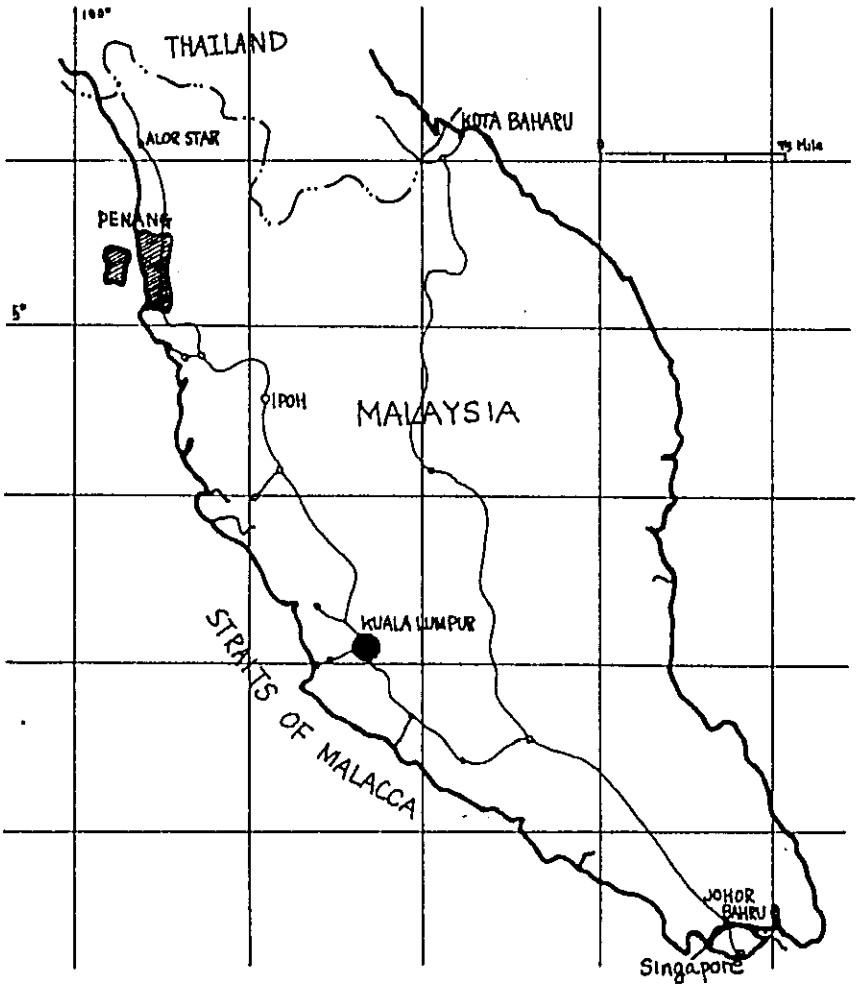
a) Location

Penang is the second smallest state of Malaysia, comprising the Island of Penang, Province Wellesley and a few adjacent islands with a total area of about 1,044 square kilometres. It is situated on the north-western coast of Peninsular Malaysia within latitudes 5^{o} 7' to 5^{o} 35' North and longitudes 100^{o} 9' East and 100^{o} 32' East. The island by itself, covers an area of 285 square kilometres and Province Wellesley covers an area of about 759 square kilometres. It is bounded on the north by state of Kedah, to the south by the state of Perak and to the west by the Straits of Malacca and Sumatra.

b) History

Penang emerged important mainly as an entrepot port. Its importance is due to its strategic location in the trade route between India and China. Initially, Penang prospered as an important port in the region, but with the subsequent founding of Singapore, it's importance was over-shadowed. Nevertheless, Penang still remained a trading port and was an important centre for the collection of pepper, betelnut, camphor and rattan as well as for opium

FIGURE 5 LOCATION OF PENANG



c) Climate

Penang has a tropical monsoon climate and as such there are strictly speaking no regular seasons in Penang as the tropical sun contrives to work up quite a heat and downpours are as frequent as they are unexpected. The climate is warm and humid. The maximum average temperature is 32.2°C and the average minimum temperature is 23.3°C moderated by prevailing sea breezes. Relative humidity varies between 70 per cent and 90 per cent. The highland areas, especially Penang Hill on the islands, are considerably cooler. There are no recognisable hot and cold seasons and the mean annual rainfall of approximately 267 centimetres is evenly distributed throughout the year.

4-2 Population

The 1970 population census for Malaysia shows the total population of Penang to be 775,440 of this figure, fifty-six per cent or 432,822 were on Penang Island and forty-four per cent or 342,618 in Province Wellesley.

Due to the historical background of Penang, people of Chinese origin comprises the majority of 56.1 per cent of the population.

TABLE 1 COMMUNITY COMPOSITION IN PENANG AT CENSUSES OF 1970 (IN PERCENTAGE)

COMMUNITY	MALAYS	CHINESE	INDIANS	OTHERS
PERCENTAGE	30.7	56.1	11.5	100.0

4-3 Industry

The industry of Penang is heavily shifted to the secondary and tertiary industry. On the other hand, primary industry is not dominant here.

TABLE 2 INDUSTRIAL DISTRIBUTION IN PERCENTAGE

	PRIMARY	SECONDARY	TERTIARY
PENANG	24.4	17.9	50.4
MALAYSIA	53.9	10.6	29.8

With its strategic location, its modern port facilities, efficient and well developed transportation system and large hinterland, Penang has a high level of industrial and commercial activity. The investment climate in Penang is particularly favourable.

Utilizing its advantageous location and investment climate, eight industrial estates have been developed with

the aim of absorbing a bigger labour force through exportation of its products.

Tertiary industry is more concentrated in the locality of Georgetown.

Tourisms is also an important enterprise here with about 160,000 tourists having visited here in 1978.

Living in Penang is more than a joy as the state is a holiday resort of international standing. Penang is in fact an attractive investment centre and a holiday resort combined into one.

4-4 Major Public Transport Facilities

Penang has a comparatively well-developed industrial infrastructure which is a contributing asset to its industrial environment.

a) Air Facilities

Bayan Lepas International Airport in Penang is located about 22.5 kilometres from Georgetown. It is the second most important airport in Malaysia with the main line terminus for the westcoast and it also provides direct service to Singapore, Bangkok, Hong Kong, Medan and Haadyai.

b) Port and Ferry Services

Penang has a natural deep-water harbour formed by the water channel between Penang Island and Province Wellesley.

It is the second largest port in Malausia and it provides complete and modern facilities to both international and small coastal vessels.

The port, administered by the Penang Port Commission, is efficient and can compete favourably with other regional parts. In 1978, it handled 4,928,692 tonnes of dry and liquid

cargo and has substantial capacity to cater for the expected increase.

There are various facilities which the Penang Port Commission owns, operates and administers for the port.

E.G: i. Berthing Facilities
ii. Storage Facilities
iii. Bulk Liquid Facilities
iv. Container Handling Facilities
v. Repair Facilities
vi. Floating Craft
vii. Ferry Service

There is a 24 hour ferry service with a fleet of 11 vessels that operates between Penang Island and Butterworth. Two separate adjacent terminals in the island and two on the mainland cater for this service.

c) Rail Services

Rail service for the state of Penang are provided by the Malayan Railway. Along with Singapore, Kuala Lumpur and Ipoh, Butterworth is a principal rail terminal of the peninsular Malaysia rail network.

d) Bus Services

There are, in effect, 11 bus services on both Penang Island and Province Wellesley. One of these is operated by the Municipal Council of Penang Island and the rest are by private bus companies.

5 Major Activities Conducted.

5-1 Review of related Studies.

While a careful review of related past studies likely to influence this study is being conducted, major studies of the following reports are examined. These reports are envisaged to contain data on the existing situation relevant for regional development.

1) Penang Master Plan (1970)
2) Penang Fixed Linkage Study 1972
3) Penang Island Traffic Dispersal Study. 1977
4) Feasibility Study for Development of Federal R-1; Alor Star - Butterworth - 1979
5) Third Malaysian Plan

While additional up to date information was obtained from other reports and planning maps assembled, numerous projects relating particularly to transport facilities would be mentioned later in the urban transport planning of this project.

a) Penang Master Plan

Penang Master Plan examines the employment potential, defines governmental policies and presents proposed programmes, policy recommendations and measures for implementation.

Projections for future population, employment, land use requirements and settlement pattern were made for the period between 1970-1985. The total projected population for Penang State in 1985 is 1,153,000

b) Penang Fixed Linkage Study

This study is a continuation of the Pre-feasibility study, February 1971 by Scot Wilson, Kirtpatrick and Partner. Penang Master Plan is also one of the most important source of information for this study. Besides examining traffic characteristics and the economic financial evaluation part in detail, study on the macro economic framework is also

presented. Projection is done up to year 1990.

c) Penang Traffic Dispersal Study

This study is to investigate the preliminary engineering and economic analysis of the most viable system of traffic dispersal at the Island end of the linkage. This study concentrates on the eastern part of Penang Island particularly the Bayan Lepas corridor area. Estimation is done up to year 2,000. The projected population for Penang Island in year 2,000 is 778,000

d) Feasibilty Study including Toll Application and Preliminary Engineering for Development of Road Transport System between Alor Star and Changkat Jering - Interim Report, January, 1979 by Jurutera Konsultant Sdn. Bhd. is association with Wilber Smith & Association Inc.

This study is a continuation of the long-range program begun by the government in the 1960s to upgrade the traffic service provided by Federal Route 1. The study was authorized to investigate the proposed upgrading to four-lane divided roadway, north of Butterworth.

The study area encompasses the three state of Kedah, Perak and Penang. For the purpose of estimating the population, Penang Island has been covered by one of the external zones, which assists in the projection of the potential traffic.

5-2 Population Study and Land Use Pattern

5-2-1 Population Study

a) Population Growth in the State of Penang.

i) Population Growth (1947 - 1970)

The population in the State of Penang during 1947 - 1970 was 2.43% per year while in Peninsular Malaysia it was 2.76% per year according to the population census. The census showed that the State of Penang had an average population growth that was less than that of Peninsular Malaysia especially after 1957.

ii) Population Growth (1970 - 1980)

Though no population census had been taken since 1971, the Statistical Department estimated the population size by state as shown in Table 3, where the state of Penang was

TABLE 3 PROJECTED POPULATION BY STATE

STATE	POPULATION			AVERAGE ANNUAL GROWTH RATE	
	1970	1975	1980	'70 - '75	'75 - '80
PENINSULAR MALAYSIA	8,809,557	10,062,479	11,554,877	2.7	2.8
JOHOR	1,277,180	1,463,645	1,690,433	2.8	2.9
KEDAH	954,947	1,073,567	1,208,178	2.4	2.4
KELANTAN	684,738	766,862	855,939	2.3	2.2
MELAKA	404,125	457,302	520,679	2.5	2.6
NEGRI SEMBILAN	481,563	549,312	631,953	2.7	2.8
PAHANG	504,945	612,065	747,171	3.9	4.1
PENANG	776,124	864,771	968,220	2.2	2.3
PERAK	1,569,139	1,750,405	1,955,662	2.2	2.2
PERLIS	121,062	133,183	146,608	1.9	1.9
SELANGOR	1,630,366	1,922,932	2,288,784	3.4	3.5
TRENGGANU	405,368	468,435	541,250	2.9	2.9

SOURCE: "POPULATION PROJECTIONS FOR THE STATES OF PENINSULAR MALAYSIA 1970 - 1980" DEPARTMENT OF STATISTICS.

estimated to slow down in its population growth to about 2.2% per year which is classified as low population growth.

iii) Reasons why Population Growth in the State of Penang is low

The reasons for the low growth of population in Penang is caused by two factors:-

1) The natural population growth in Penang is about 2.2% per year (1970-1973) while in Peninsular Malaysia it is 2.6% per year.

2) The net migration in the state of Penang is seems to be zero.

iv) Population Growth of Penang Island and Province Wellesley

Population growth of Penang Island dropped to 1.92% per year between 1957 - 1970 from that of 2.58% between 1947 - 1957, while population growth rate of Province Wellesley rose from 2.42% (1947 - 1957) to 3.00% (1959 - 1970). The scarcity of available land in the Island and the development of the Industrial estates in Butterworth may be one reason for this change and for the difference in population growths.

TABLE 4 POPULATION OF PENANG ISLAND AND PROVINCE WELLESLEY

	1947	1957	1970	ANNUAL GROWTH '47 - '57	ANNUAL GROWTH '57 - '70
WEST MALAYSIA	4,908,086	6,278,758	8,801,399	2.5%	2.6%
PENANG STATE	446,321	572,100	776,770	2.5%	2.4%
PENANG ISLAND	262,705	338,866	433,760	2.6%	1.9%
PROVINCE WELLESLEY	183,616	233,234	343,010	2.4%	3.0%

b) Population of the Study Area

The state of Penang is divided into 2 parts, External Zone and Internal Zone according to the traffic zones. Total population of Internal Zones is 593,827 covering 76.5% of State population. (TABLE 5)

TABLE 5 ESTIMATED NO. OF POPULATION OF THE STUDY AREA IN 1970

	INTERNAL	EXTERNAL	TOTAL
PROVINCE WELLESLEY	199,346 (58.1%)	143,575 41.9%)	342,921 (100.0%)
PENANG ISLAND	394,481 (91.9%)	38,722 (8.9%)	433,203 (100.0%)
TOTAL	593,827 (76.5%)	182,297 (23.5%)	776,124 (100.0%)

SOURCE: 1970 POPULATION CENSUS

Although the population of each traffic zone is tabulated, the accuracy of this estimation is doubtful due to lack of available information

c) Population Projection of Penang State

i) Comparison to previous estimations

We will not make comparisons with the population figures given because they differ from each other (even in 1970) but comparisons will be made instead with the annual population growth rates.

TABLE 6 COMPARISON OF POPULATION PROJECTION

REPORT	YEAR					ANNUAL GROWTH RATE	
	1970	1980	1985	1990	2000	'70-'80	'70-'90
THIRD MALAYSIAN PLAN (1976)	805,000	1,049,000		1,350,000		2.7%	2.6%
PENANG MASTER PLAN (1970)	847,100	1,047,200	1,153,100			2.1%	
PENANG LINKAGE STUDY (1972)	775,900	1,016,900		1,299,600		2.7%	2.6%
FEDERAL ROUTE 1 STUDY* (1979)	806,500	1,023,850		1,316,300	1,615,300	2.4%	2.4%

* Population shown for 1990 is actually the population of 1991 and in the case of the year 2000 the population shown is that of 2001.

Except for the Penang Master Plan Study, the annual growth rates projected are higher than that of the actual trends as mentioned before. The 'Third Malaysian Plan' also projects the net migration between 1970 to 1990 as 92,000 which corresponds to about 0.4% per year of net migration to total population. Therefore, the future population of the state of Penang depends on whether the state will be able to lure people from other states through provision of more job opportunities.

ii) Population projection for the State of Penang.

Based on the population of 1980 projected by the Department of Statistics, 3 cases were prepared:-

CASE - A: The present population growth rate will be maintained (2.2%)

CASE - B: The same rate as given in the 'Federal Route 1 Study' (2.4%)

CASE - C: The same rate as given in "Third Malaysian Plan' and 'Penang Linkage Study'. (2.6%)

TABLE 7 POPULATION PROJECTIONS

	1970*	1979*	1980*	1985	1990	2000
CASE A	776,124	946,580	968,220	1,079,500	1,203,600	1,496,300
CASE B	776,124	946,580	968,220	1,090,100	1,227,300	1,555,800
CASE C	776,124	946,580	968,220	1,100,800	1,251,500	1,617,800

* Source: Department of Statistics

In any case, the population as estimated for the year 2000 does not differ much with each other.

5-2-2 Urban versus Rural

Urban land use pattern is envisaged based on future allocation of estimated population increase particularly in the planned urbanization areas, taking into consideration their surrounding areas as well as built-up areas. Georgetown and its periphery including future land reclaimation areas would preserve as many urban redevelopment subdivision among them, so that population density of built-up area as a whole would be slighty increased. In the urbanized area of the Butterworth side including Bukit Mertajam there exists land for potential future development.

There should be macroscopic allocation of future population before detailed distribution of population at zonal level which will be studied at the next stage of this project.

The estimated population increase in the whole of the State of Penang and major urbanization areas in the state is shown in (Table 8) with alternative distribution patterns, taking into consideration the changing growth trends of rural population in the future.

The population of the whole of the State of Penang is divided into four areas as shown in Table 8 , for the allocation of increase of population into such areas as Georgetown, Butterworth and their vicinity areas which is considered as the Study Area (shown in section (1) and (3) in the table) and rest of the state that External Area is shown in (2) and (4).

TABLE: 8

OUTLINE OF FUTURE POPULATION INCREASE

(1,000 PERSONS)

ALLOCATION	TERM POPULATION in 1980	in 2000		INCREASE IN 1980 - 2000
PENANG STATE	970	1,550	/	(580)
1. PENANG ISLAND	500	750	/	(250)
(1) Georgetown & Vicinity	420	Case 1 - a 620 (200)	1 - b 600 (180)	1 - c 650 (230)
(2) Rest of Penang Island	80	130 (50)	150 (70)	100 (20)
2. PROVINCE WELLESLEY	470	800	/	(330)
(3) BUTTERWORTH & VICINITY	300	Case 2 - a 500 (200)		2 - b 530 (230)
(4) Rest of the Province	170	300 (130)		270 (100)

There are three alternatives of allocating the increase according to rural-urban development trends in future as follows:

Case 1 - a In Georgetown and its vicinity, including Bayan Lepas projected area, approximately an increase of 200 thousand is the population which will be accomodated up to year 2000, and in the rest of the Island including Balik Pulau an increase of 50 thousand maintains the proportion of population in the Island (that is approximately 17%) the same as in the 1970's.

Case 1 - b There will be a small increase of population in the built-up areas, but on the other hand any large-

scale housing development other than that in Bayan Lepas will be strongly restrained, so that a net increase of approximately less than 180 thousand can be achieved. There will be a rather steady growth in the rest of the Island (for example in the vicinity of Balik Pulau and in the west and south part of the Island) which can be considered to take-off in the acceleration of rural development and to result in 20% of the estimated population in Penang Island,

Case 1 - c The densely-inhabited districts of Georgetown will be very well-developed by urban redevelopment and rehabilitation schemes together with land reclaimation development in the future while the rest of the Island which is rural maintains almost the same present position, with only a slight increase.

Case 2 - a With regards to Province Wellesley, Butterworth and its vicinity will be developed further maintaining the same proportion of distributed population in the 1970's and almost the same increase as in the urbanization area in Penang Island, resulting in the rest of the Province being developed at double-scale in every aspect.

Case 2 - b The urbanization area, particularly in Butterworth and Bukit Mertajam will be more densely inhabited; in other words, every large-scale residential development will adopt the gross population density as much as 60 p.p.ac. (150 p.p.ha.) or more. The rest of the Province, including several rural urbanization areas localized in future, will not increase in population as much as in the case mentioned above.

Several conceptual draft plans for landuse pattern are to be drawn tentatively according to the future distribution of population.

5-2-3 Concept for Land Use Pattern

The conceptual landuse pattern attached to the next page has been used to tentatively set a preliminary condition for a long-term projection of urban development with alternatives.

Alternative concept illustrated in Figure (6) has several characteristics as follows:-

1. Structurally, along the periphery of Georgetown built-up area, the roads are to be realigned to pursue a circular or ring road pattern. Concurrently, in central business district (C.B.D.) of the urban area, traffic management is to be effectively implementated.

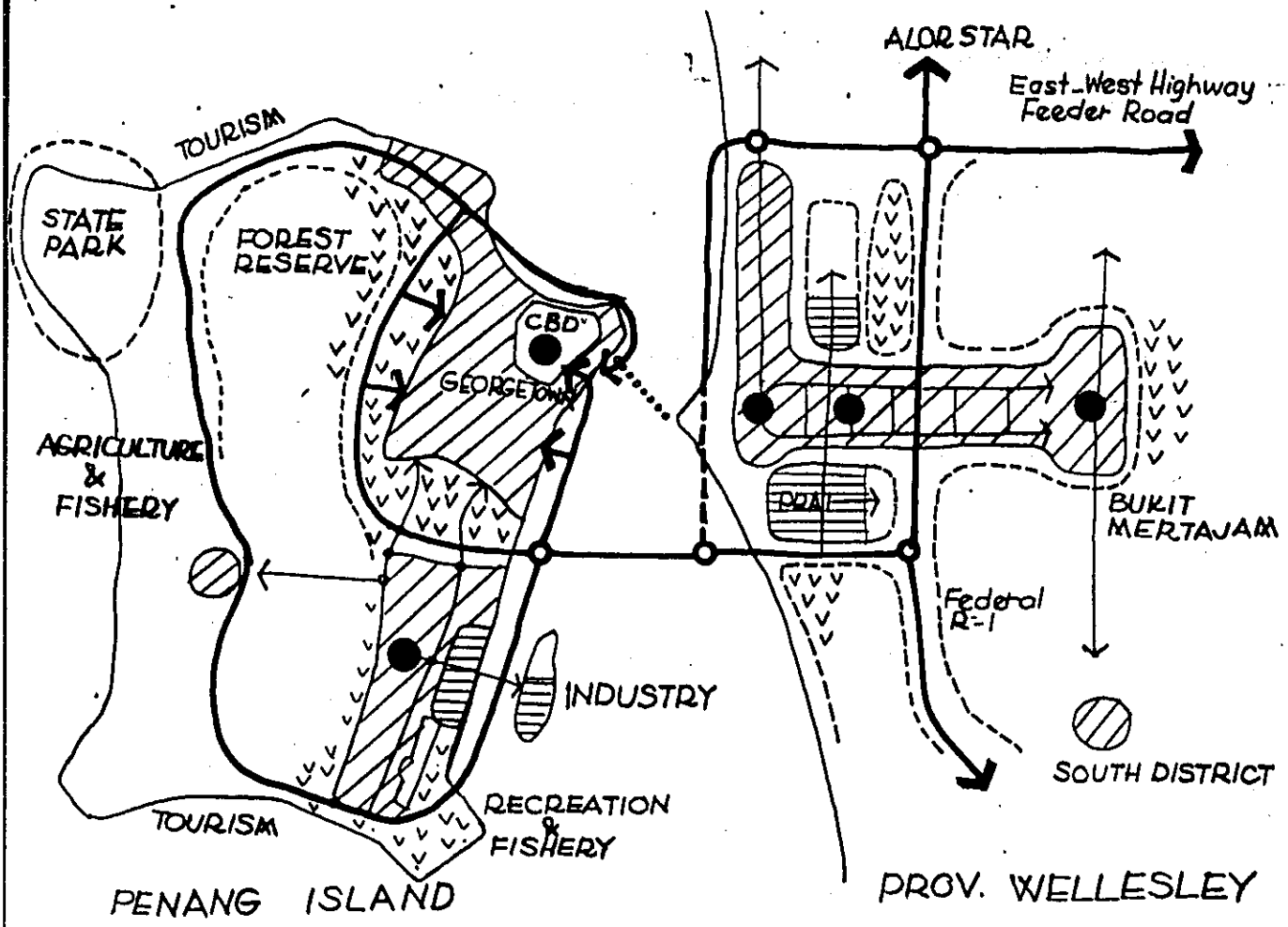
   The urbanized area of Butterworth would be extending towards Bukit Mertajam in a macroscopic view as nearly L - shape. A strip of urban belt area is composed by ladden pattern of feeder roads (distributor roads)

2. Regarding to major land uses, industrial area in Penang Island, will not be enlarged in scale to more than what is projected at present.

   On the other hand, in Butterworth, there are lots of land suitable for future industrial development, north of the existing built-up area. However, industrial areas should not enclose the Butterworth urban area entirely. So that its growth in future will not be cut off.

   The improved Federal R - 1 will be detached as far from existing urban areas as possible, so as to reserve land for the future expansion of the built-up area.

FIGURE 6 Land and Use Pattern (Alternative - A)



LEGEND:

- URBANIZATION CORE
- PATTERN OF URBANIZATION
- INDUSTRIAL AREA
- GREEN WEDGE

LAND USE PATTERN
ALTERNATIVE CONCEPT-A

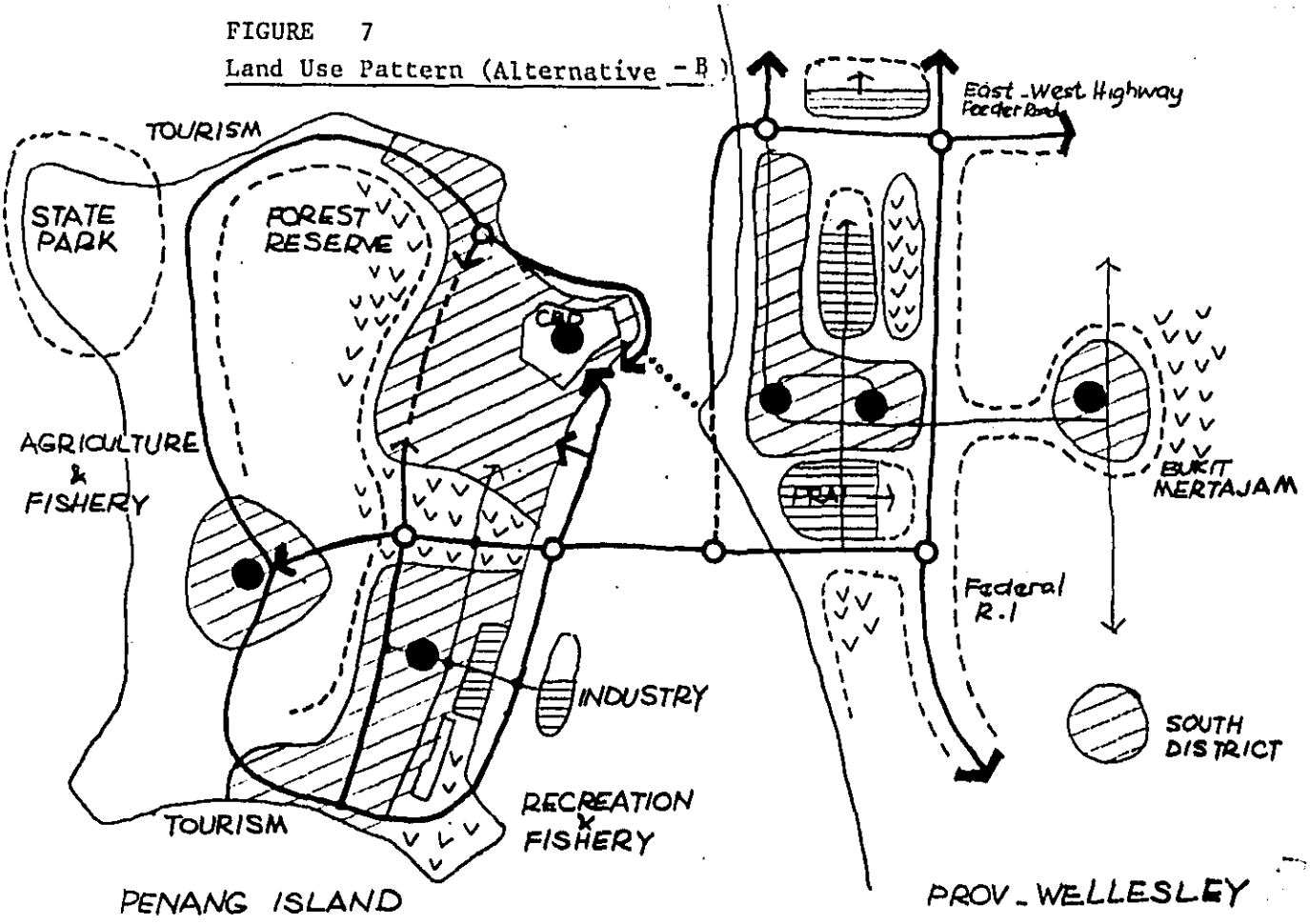
Alternative B

Alternative B as shown in Figure (7) is based on the following hypothetical situations.

Urbanization in Butterworth is proceeding at a slower rate and Bukit Mertjam is developed in a smaller scale as a more or less self contained district centre. Population increase will be concentrated in Georgetown and its vicinity while in Balik Pulau and other rural areas in the Island, populated area will expand further and disperse to some extent. In this case, the increase in population in Penang Island is assumed to be higher than in Butterworth, which is a reverse of the alternative mentioned earlier.

Penang Island will develop comparitively more as a residential area while Butterworth will serve as an employment area. This will result in an increase in the commuting flow between the island and the mainland.

FIGURE 7
Land Use Pattern (Alternative - B)



There would still remain a certain option to select and refine the preliminary conditions for future development of urbanization, for example in the case of (1 - b), while acceleration of rural development is going on in the Island as well as in the mainland, time distance between working places in either industrial or central business districts, and hinterland areas will be concurrently shortened, on the other hand in the case of (1 - c), concentration of urban functions and services to major built-up areas will proceed in future, bringing about a large amount of out-migration from rural areas.

Therefore there is still a need to investigate urbanization trends and actual conditions in detail at the next stage of this study.

5-3 ORIGIN AND DESTINATION SURVEY

In order to make a proper plan for traffic which meets the existing traffic demands, it is necessary to obtain the starting point (origin) and the ending point (destination) of each trip made. Therefore a schedule was made and conducted as 'Origin And Destination Survey' (Car O-D Survey) which entailed a lot of cooperation from interviewers, surveyors and interviewees. The procedure of Car O-D Survey ia as follows:-

A large part of Car O-D Survey was conducted using the interview method at the home/office of the sampled vehicle owners. This method of data collection was expected to yield a high collection rate.

In addition to this method, interviews were conducted along the road-sides and on board the ferries. This was done to offset the limitations that are present in the method of home/office interviews.

THE CONTENTS OF CAR O-D SURVEY

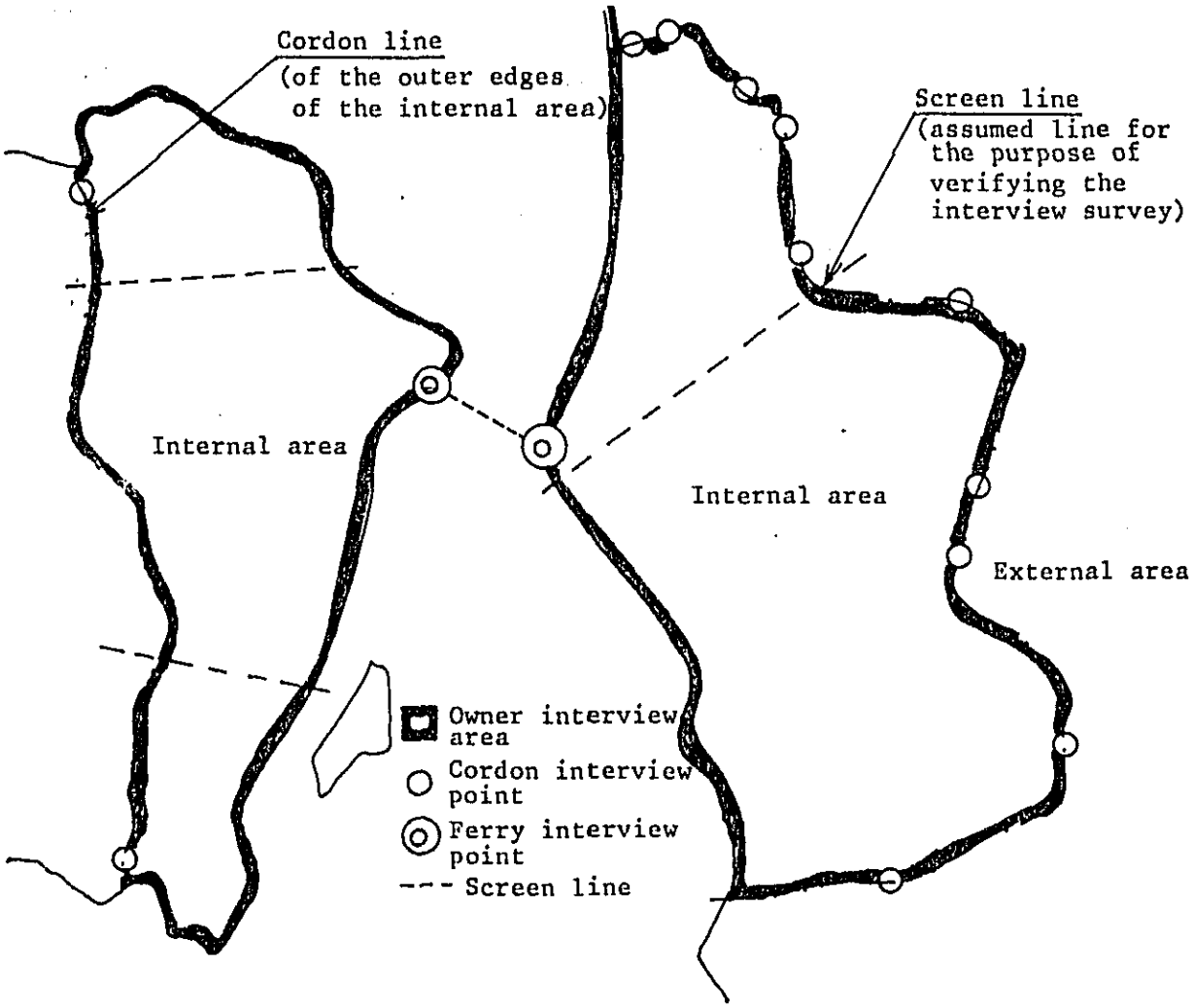
TYPES OF SURVEY	METHODS OF SURVEY	ELEMENTS OF SURVEY	PURPOSE OF SURVEY
Owner-interview survey	interview at the owner's home sampled from registration cards	o vehicles(car van,truck, bus, taxi) o motorcycles	This survey is conducted in order to grasp the movement of internal trips.
Cordon-interview survey	interview by the road-side	o vehicles o motorcycles	In the owner interview survey, vehicles entering or passing through this study area from other areas cannot be determined. Cordon interview will cover these.
	count of the traffic volume	o vehicles o motorcycles o bicycles o pedestrians	
Ferry survey	interview on the ferry	o vehicles using ferry o passengers using ferry	Comprehending the situation of ferry utilization is important for studying the bridge construction project Therefore, the ferry survey will be conducted.
	count of the ferry users	o vehicles o motorcycles o bicycles o pedestrians	

Besides the above survey, we also carried out the Screen Line Survey which recorded the volume of traffic passing the imaginary line. The purpose of this survey is to verify the results of the owner-interview survey.

THE CONTENTS OF CAR O-D SURVEY

TYPES OF SURVEY	METHODS OF SURVEY	ELEMENTS OF SURVEY	PURPOSE OF SURVEY
Screen line survey	Count of the traffic volume	* vehicles * motor-cycles * bicycles * pedes-trians * trishaws	This survey is conducted in order to verify the results of the owner-interview survey.

FIGURE: 8 THE SKETCH OF SURVEY AREA



Zoning for the traffic surveys was determined by the following factors:-

i) The flow of traffic movement can be seen by using these zones.

ii) It corresponds with the district boundaries.

iii) These zones are adapted from other census, especially population census, land use census, etc.

Zone codes are made up of the following 3 figures.

---- small zone (most detailed zone in this survey)

---- middle zone (the zone which is for practical use)

---- large zone (for the purpose of grasping the outline of traffic movement)

According to these zones, the internal area is divided into 8 large zones, 20 middle zones and 57 small zones.

FIGURE: 9 ZONE MAP (MIDDLE ZONE)

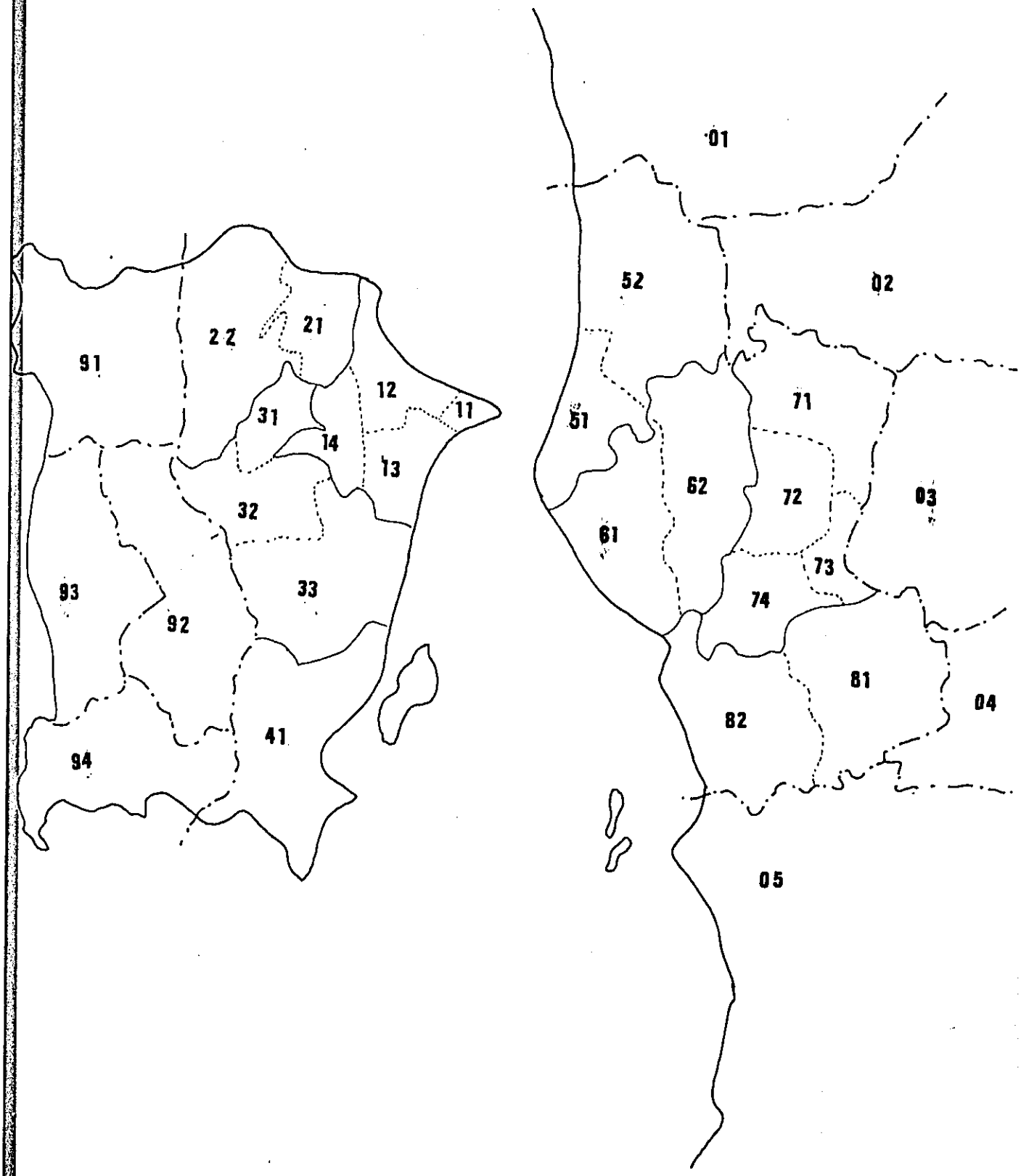


TABLE: 9 ZONE CODE TABLE

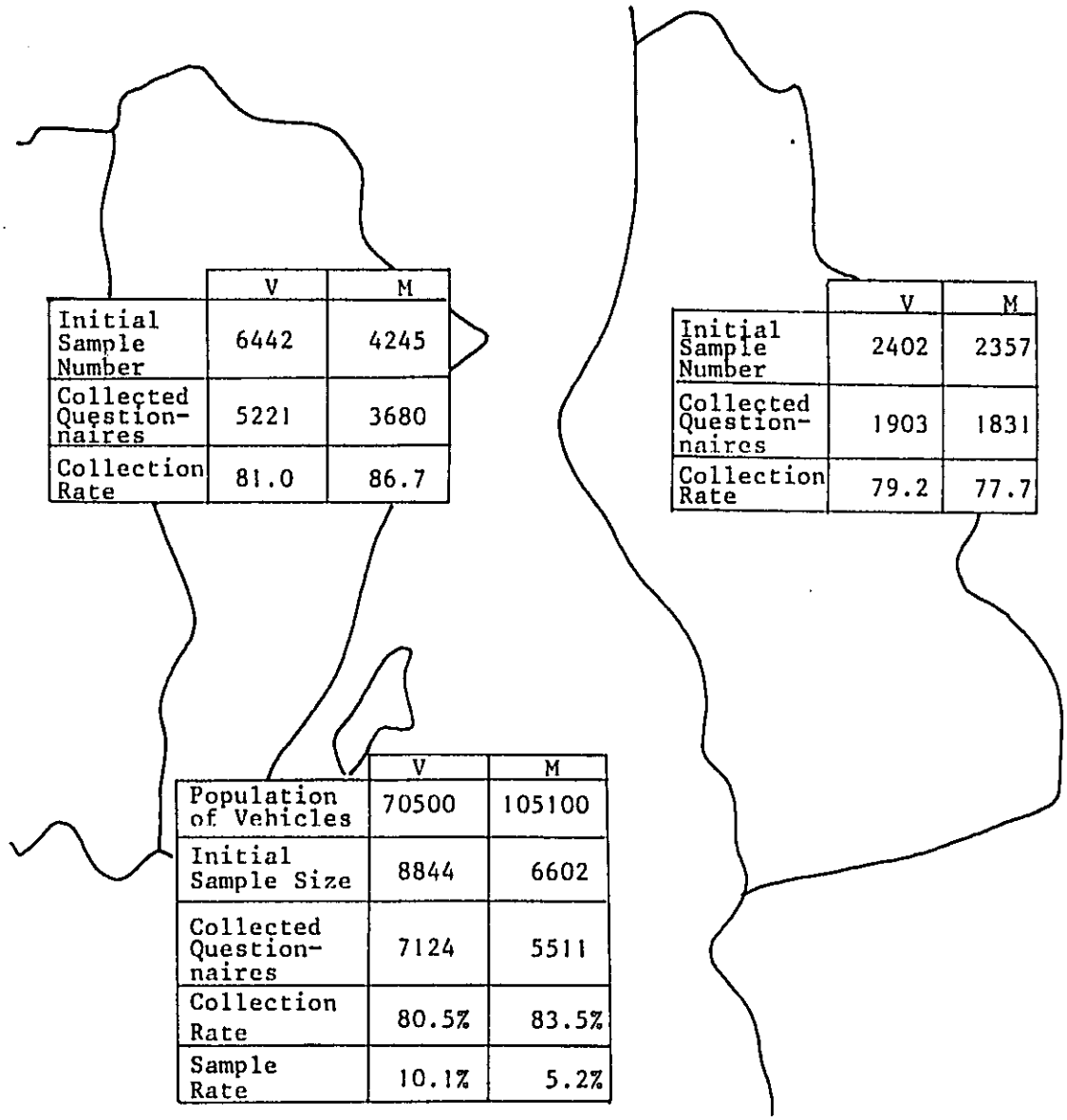
AREA		LARGE ZONE CODE	MIDDLE ZONE CODE	SMALL ZONE CODE	NUMBER OF ZONES
INTERNAL AREA	PENANG ISLAND	1	11	111	1
			12	121,122,123,124,125	5
			13	131,132,133	3
			14	141,142,143	3
		2	21	211,212	2
			22	221	1
		3	31	311	1
			32	321,322,323.	3
			33	331,332,333 334 335	5
		4	41	411,412,413	3
		SUB-TOTAL	10		27
	PROVINCE WELLESLEY	5	51	511,512,513,514	4
			52	521,522,523,524,525.	5
		6	61	611,612	2
			62	621,622,623	3
		7	71	711,712,713.	3
			72	721,722,723	3
			73	731,732,733,734	4
			74	741,742.	2
		8	81	811,812.	2
			82	821,822.	2
		SUB-TOTAL	10		30
		TOTAL	20		57
EXTERNAL AREA	PENANG ISLAND	9	91		4
			92		
			93		
			94		
	PROVINCE WELLESLEY	0	01		5
			02		
			03		
			04		
			05		
		TOTAL	9		9
		GRAND TOTAL	29		66

5-3-1 OWNER-INTERVIEW SURVEY

We carried out this survey through the home/office-interview method where interviewers called on the sampled homes/offices. The duration of time for the preparation and for the actual interview was 6 weeks and 3 weeks respectively. About 260 interviewers were involved during the actual survey and we obtained about 12,600 samples, consequently. This shows that one interviewer collected an average of 60 samples for the 3 weeks.

The results are as follows:-

FIGURE: 10 THE RESULTS OF THE OWNER-INTERVIEW SURVEY



	V	M
Initial Sample Number	6442	4245
Collected Question-naires	5221	3680
Collection Rate	81.0	86.7

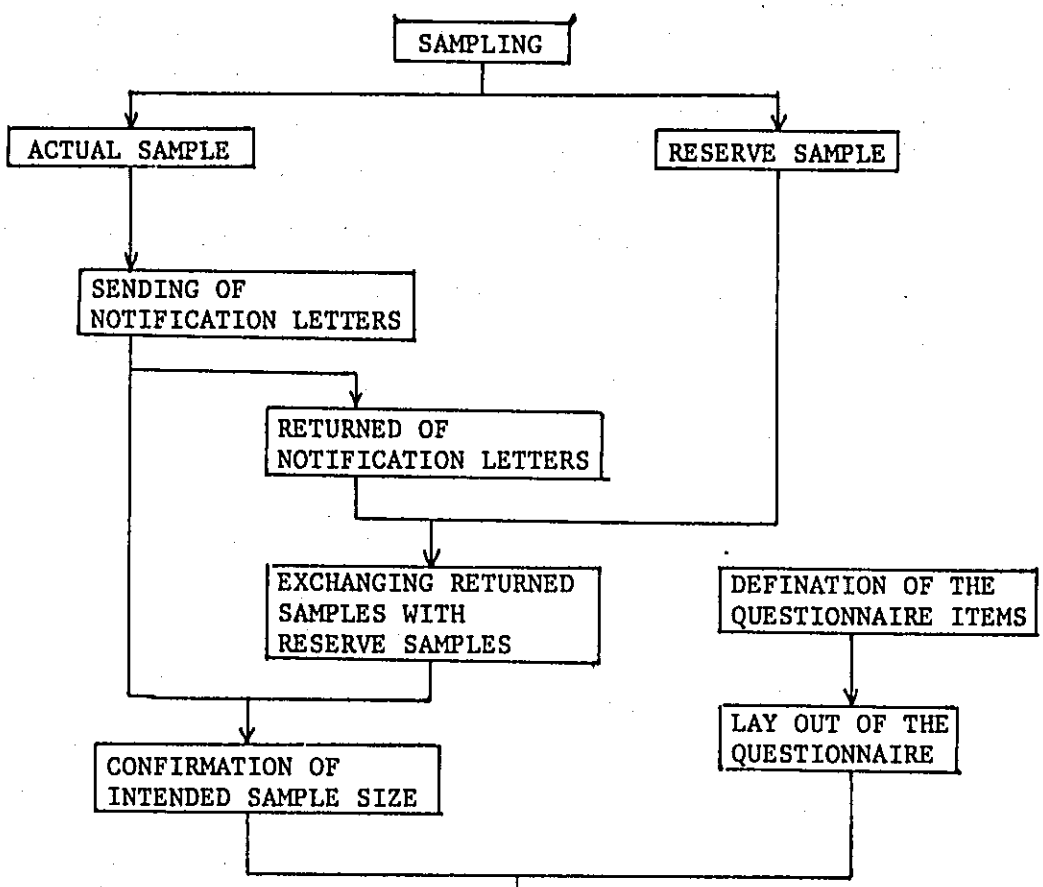
	V	M
Initial Sample Number	2402	2357
Collected Question-naires	1903	1831
Collection Rate	79.2	77.7

	V	M
Population of Vehicles	70500	105100
Initial Sample Size	8844	6602
Collected Question-naires	7124	5511
Collection Rate	80.5%	83.5%
Sample Rate	10.1%	5.2%

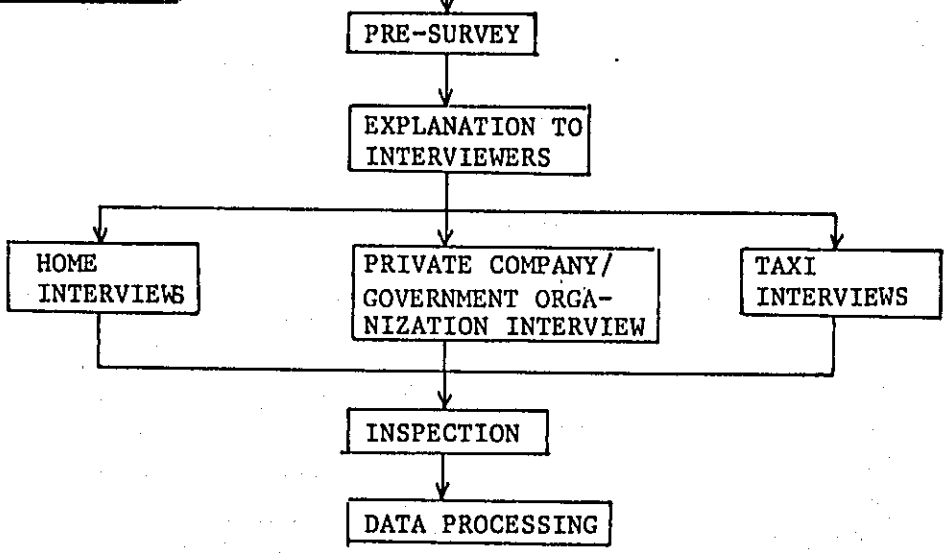
This survey was carried out according to the following flow-chart.

FIGURE: 11 THE FLOW-CHART OF THE OWNER INTERVIEW SURVEY

a) Preparation:-



b) Actual Survey:-



a) Preparation

i) Sampling

Firstly, statistical method was used to confirm that the sample size in this area was sufficient to obtain the actual of traffic movements.

However, in the actual sampling, 12% of cars and 6% of motor cycles was choosen, taking into consideration the non collection rate.

TABLE: 10 NECESSARY SAMPLE SIZE

TYPE OF VEHICLE	NECESSARY SAMPLE SIZE
CAR	9%
MOTOR CYCLE	4.5%

ii) Confirmation of Intended Sample Size

On May 17th, prior to the interviews, advance notices (notification) were sent to each sampled owner's home. Then the sampling sheets which had their notifications returned were exchanged for sampling sheets from the reserved samples, according to zone code and vehicle type.

THE NOTIFICATION LETTER

YUNIT PERANCANG EKONOMI NEGERI
PEJABAT SETIAUSAHA KERAJAAN,
BANGUNAN TUANKU SYED PUTRA,
PETI SURAT 3006
PULAU PINANG.
Talipon: Pulau Pinang 64461
Taligeram: SECSTATE, PULAU PINANG

Kepada Sesiapa yang berkenaan

Tuan,

Menemuramah Pemilik-Pemilik Kereta dan Motorsikal

Sukacita dimaklumkan bahawa Kerajaan Malaysia dengan kerjasama Kerajaan Jepun sedang menjalankan satu kajian pengangkutan bagi kawasan-kawasan bandar di Pulau Pinang.

2. Di dalam hal ini, kajian mengenai tempat asal (origin) dan tempat tujuan (destination) kereta-kereta dan motorsikal-motorsikal akan diadakan bagi mengkaji dan memahami keadaan lalulintas di Pulau Pinang. Cara kajian ini dijalankan adalah melalui menanyakan soalan-soalan kepada pemilik-pemilik kereta dan motorsikal mengenai perjalanan biasa mereka dalam sehari.

3. Kami telah mensenaraikan nama tuan sebagai memasuki kajian ini dan oleh itu seorang penemuramah akan pergi ke rumah tuan dalam bulan Jun, 1979 ini.

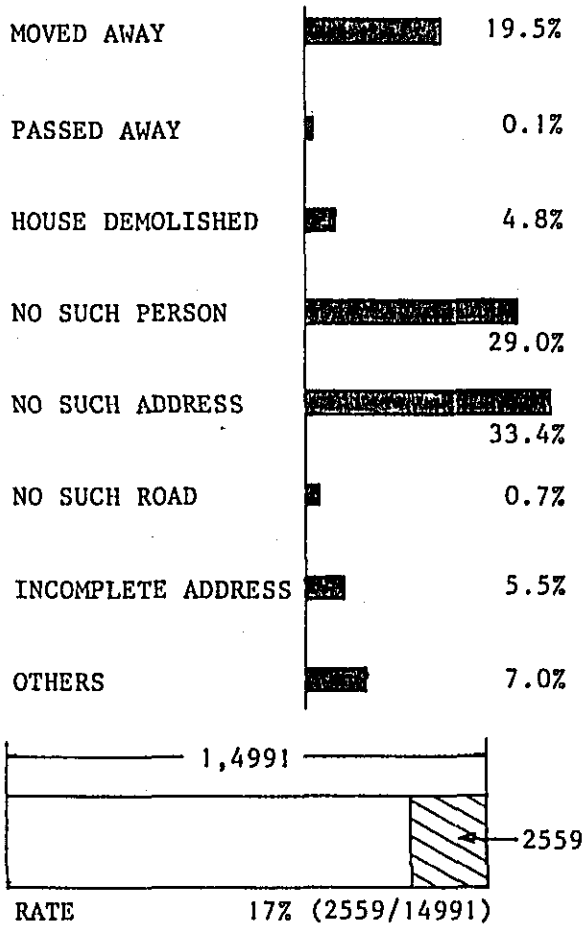
4. Dengan segala hormatnya diharap dapatlah tuan memberi kerjasama tuan di dalam menjawab soalan-soalan yang akan dikemukakan oleh penemuramah berkenaan nanti.

Kerjasama tuan sangat-sangat disanjung tinggi.

Saya yang menurut perintah,

(SAIKHOL ROSLI BIN SABDIN)
Penolong Pengarah,
Yunit Perancang Ekonomi Negeri,
b/p. Setiausaha Kerajaan,
Pulau Pinang.

FIGURE: 12 REASON FOR RETURNED NOTIFICATION LETTERS



iii) Design of the Questionnaire

The purpose of the questionnaire is to obtain the actual traffic movement from 'origin' to 'destination'. In the layout of the questionnaire, attention was given to 'origin' 'destination' and 'trip purpose'

FIGURE: 13 THE QUESTIONNAIRE

TRIPS MADE DURING THE LAST 24 HOURS					(21) TRIP PURPOSE
TRIP No.	(17) ORIGIN (Name & Address)	(18) DEPARTURE TIME	(19) DESTINATION (Name & Address)	(20) ARRIVAL TIME	[1] going to work [2] Business Engagement [3] going home [4] shopping/marketing [5] for food/entertainment [6] to school [7] social visit [8] others (please specify)
1.	NOORDIN STREET (HOME)	7.00am	ST. GEORGES' SCHOOL MACALISTER ROAD,PG.	7.15am	6
2.	ST. GEORGES' SCHOOL	7.15am	HOME	7.30am	3
3.	HOME	8.15am	DEWAN SRI PINANG (OFFICE)	8.30am	1
4.	OFFICE	5.00pm	ISLAND EMPORIUM (BURMAH ROAD)	5.15pm	4
5.	ISLAND EMPORIUM (BURMAH ROAD)	6.00pm	HOME	6.05pm	3

b) Actual Survey

This interview recorded the routine trips made by the owner on the average, so the following days were specified as the most appropriate days for conducting interviews.

TABLE: 11 THE SPECIFIED DAYS FOR INTERVIEWS

JUNE 1979																						
1	2	(3)	4	5	(6)	7	8	9	(10)	11	12	13	14	15	16	(17)	18	19	20	21	22	23
*	*		#	#		#				#	#		#	#			#	#		#	#	

* EXPLANATIONS # SPECIFIED DAYS

For the purpose of conducting the interview smoothly the sample were divided into the following 3 types and 3 separate teams were allocated for each.

TABLE: 12 THE TASKS OF THE SURVEY TEAMS

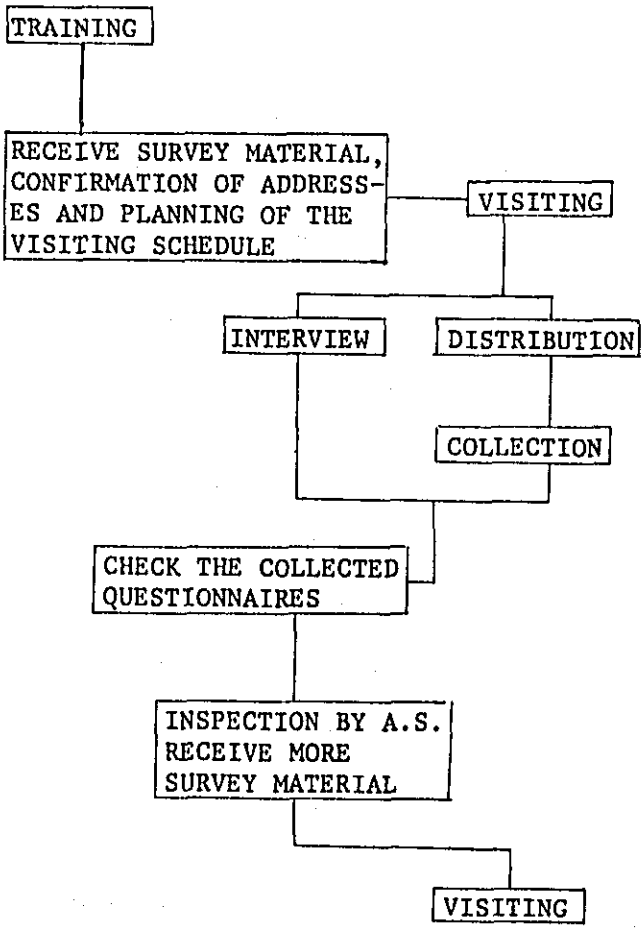
SURVEY TEAM	TASKS	INTENDED NUMBER OF INTERVIEWS	ORGANIZATION		
			TEAM LEADER	INTER-VIEWERS	CLERKS
Home interview team	Interview of owners at their homes	14,718 vehicles	9	230	9
Private Company/ Government Organization interview team	Interview of company vehicles/government vehicles at their office	173	2	16	-
Taxi interview team	Interview of taxi-drivers at the taxi stations	10 stations	1	8	-

i) Home-Interview

This survey was carried out by 230 interviews. Each interviewer was given an average portion of 20 samples per week.

The collection rate for this interview was better than was expected, possibily due to much effort put in by the interviewers. However there were some problems faced by both interviewers and interviewees which were dealt with later.

FIGURE: 14 THE METHOD OF INTERVIEW



(REPEATS 3 TIMES FROM 3RD. TO 23RD.JUNE)

Examples of these are as follows:-

1) Since the notification letters were written only in Malay, the non-Malays especially the Chinese, who could not read Malay, were inclined to be uncooperative.

2) As the questionnaires included some questions of occupation, many interviewees thought that the survey was for the income tax department, and not for the Economic Planning Unit, which it really was for.

FIGURE: 15 RESULTS OF HOME-INTERVIEW SURVEY

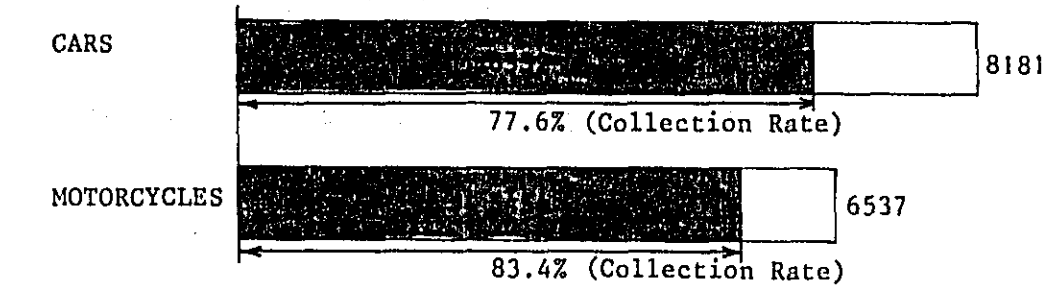


FIGURE:16 REASONS FOR INTERVIEWS NOT CONDUCTED

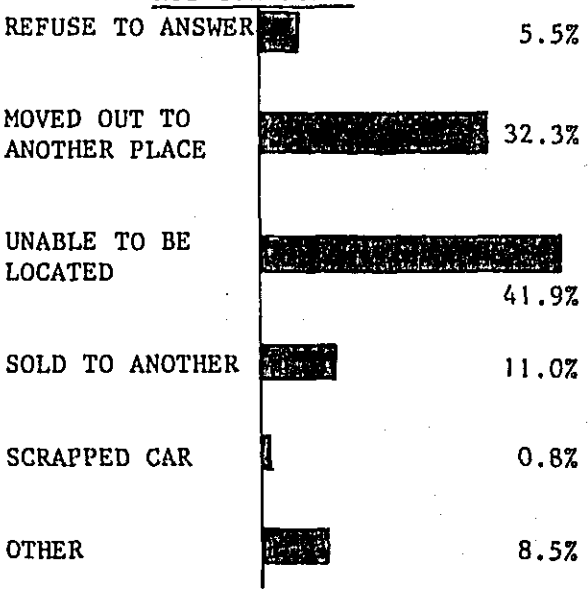
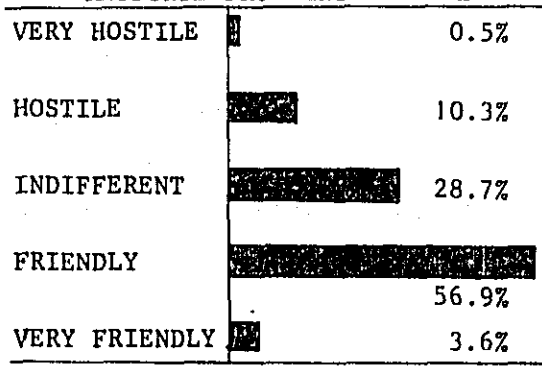
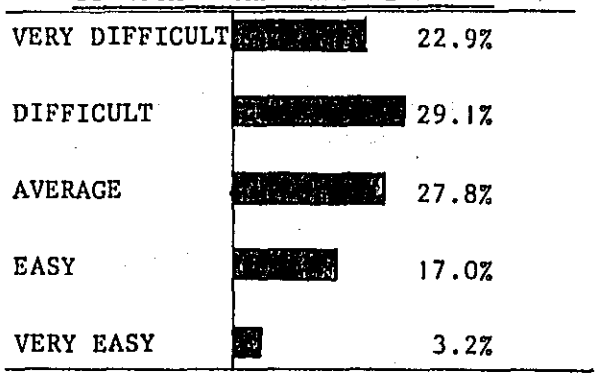


FIGURE:17 INTERVIEWERS' IMPRESSIONS

RESPONSE FROM INTERVIEWEE



TO LOCATE THE SAMPLED HOUSE

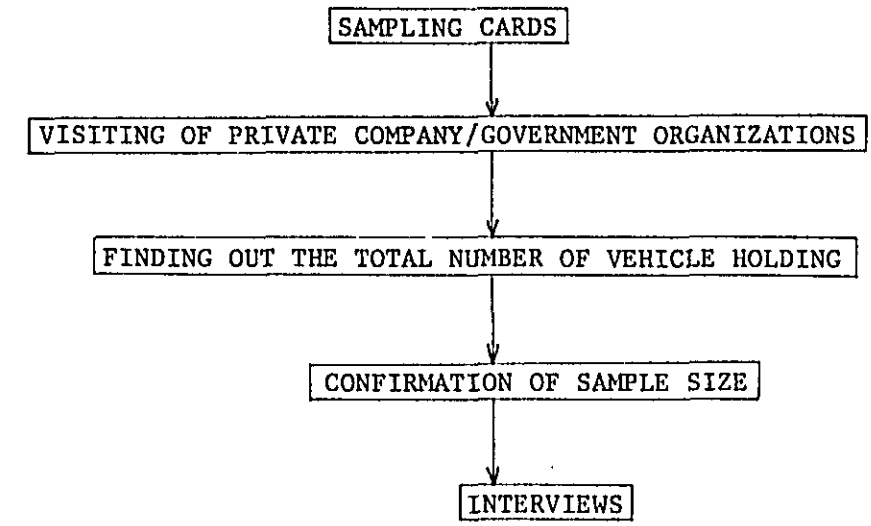


ii) Private Company/Government Organizations Interviews

Companies, Government Organizations were visited according to the sampling sheets and interviews were conducted.

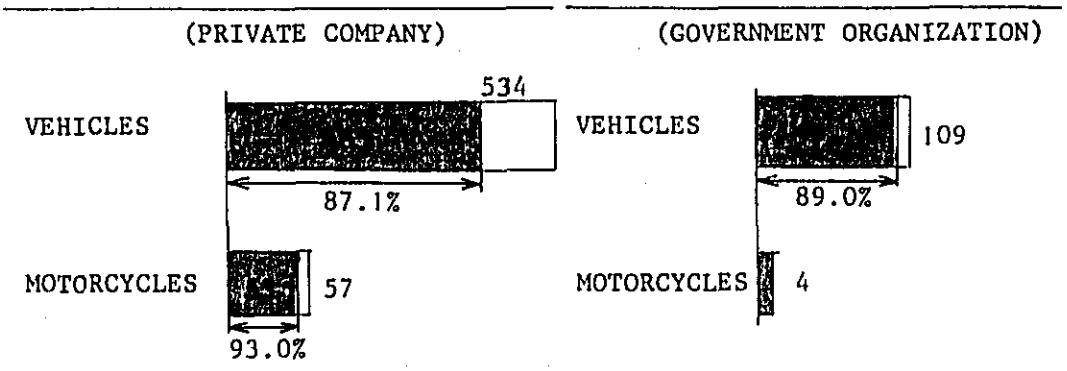
In order to ensure that the exact sample size is obtained, this interview was executed as follows:-

FIGURE: 18 THE FLOW-CHART OF INTERVIEW



When the sample ratio was less than 20 per cent of the total number of vehicle holdings, new samples were chosen for this survey. This survey was carried out by a special group, composed of selected interviewers.

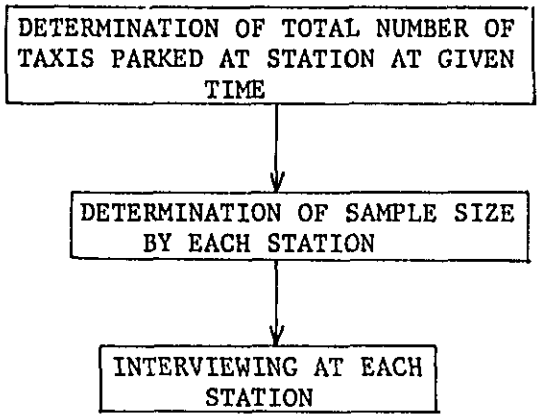
FIGURE: 19 RESULTS OF INTERVIEWS



iii) Taxi Survey

Owners of taxis, whose names were obtained from the sampling sheets were interviewed as in the same way as in the other interview as the registrations were done only according to the owners names, it was estimated that it would be a problem to find out the actual movement of a particular taxi because the owner are not always the driver of these taxis. So the interviews were carried out in the following way.

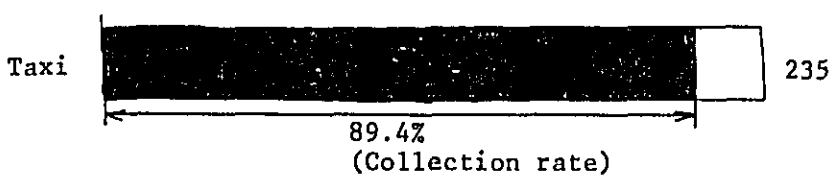
FIGURE: 20 THE FLOW-CHART OF TAXI SURVEY



Firstly, the presurvey was conducted for the purpose of obtaining the total number of taxis parked at each taxi-station. This presurvey was conducted over 2 days age at 10 stations in the study area.

Then, 70% of taxi at each taxi-station were picked out. These interviews were considered to be more difficult to conduct compared to the other interviews. This was because the drivers of taxis do not really remember their movements, but the special interviewers, selected for this purpose, conducted this survey patiently from early morning to midnight.

FIGURE: 21 RESULTS OF TAXI INTERVIEW



c) Confirmation of Sample Size

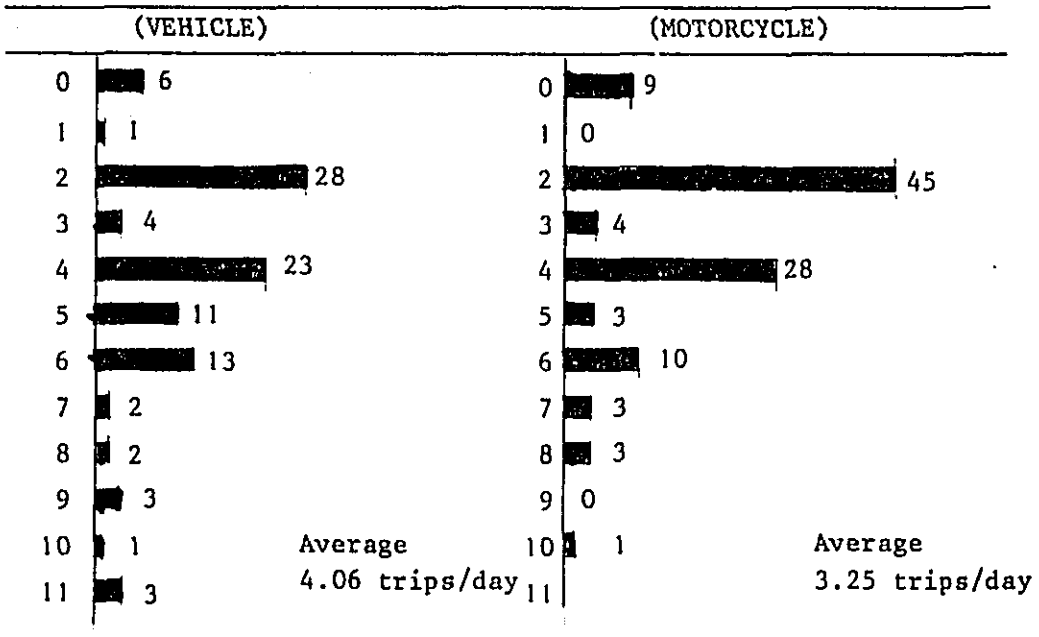
Total sample size and sample rate collected of above mentioned interviews are as follows:-

TABLE: 13 RESULTS OF OWNER INTERVIEW SURVEY

	VEHICLE	MOTORCYCLE	TOTAL
POPULATION OF VEHICLES (IN INTERNAL AREA)	70,500	105,100	175,600
HOME INTERVIEW SURVEY	6,352	5,454	11,806
PRIVATE COMPANY/GOVERNMENT ORGANIZATION INTERVIEW SURVEY	562	57	619
TAXI INTERVIEW SURVEY	210	-	210
TOTAL	7,124	5,511	12,635
SAMPLE RATE	10.1%	5.2%	7.2%

Figure shows average number of trips per day. However these figures were calculated for only 100 samples, therefore the actual results may be just diffirent.

FIGURE: 22 RESULTS OF NUMBER OF TRIPS



5-3-2 Cordon-Line Survey

The objective of this survey is to obtain information on the traffic passing through the border between the internal area and the external area of the whole area of study. With this data, the volume and characteristics of the traffic can be determined.

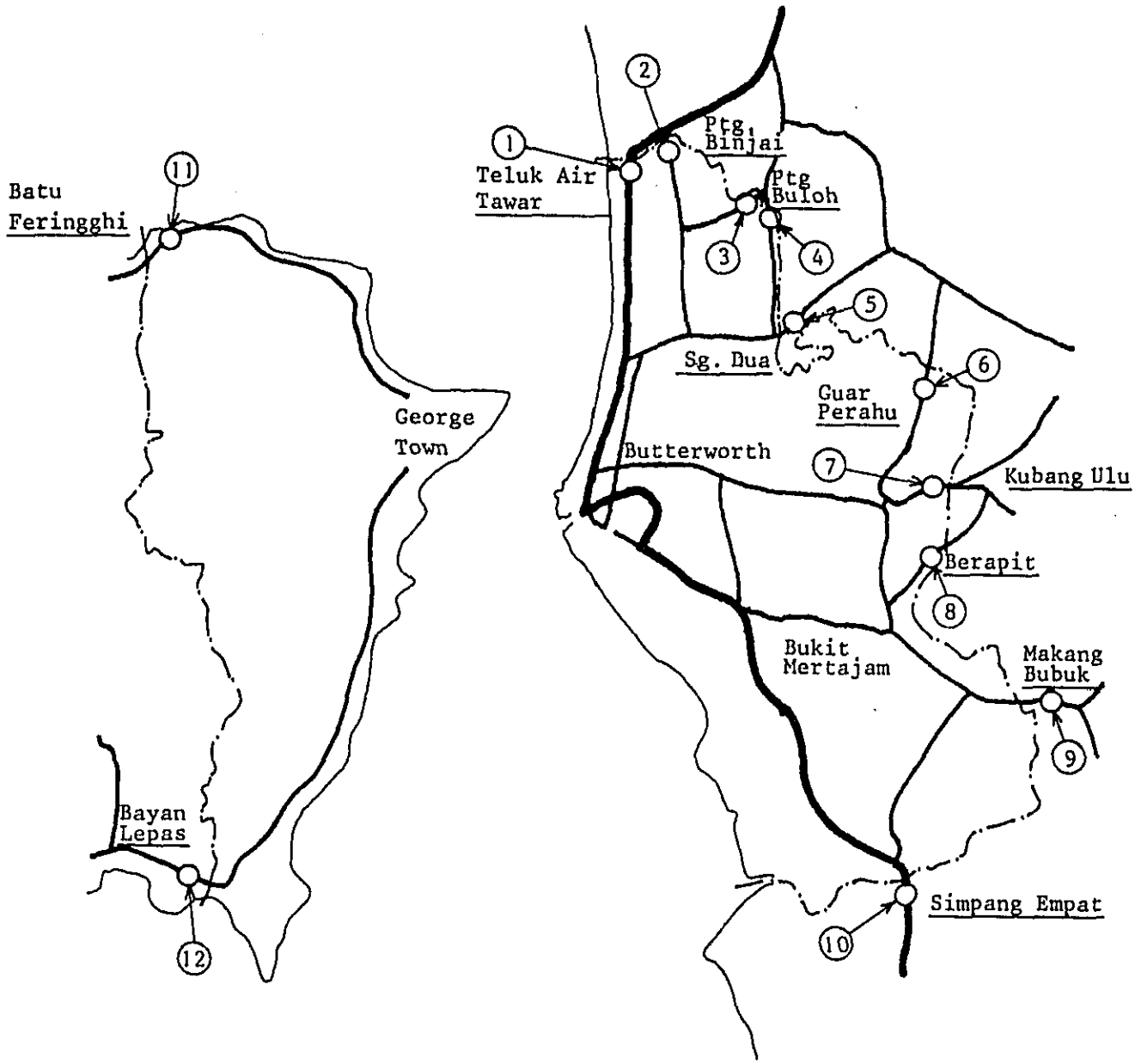
a) Survey Method

Twelve survey stations were selected at the crossing point of the border and the trunk roads, as shown in Figure 23. Two are located in Penang Island, others in Province Wellesley. At every station, two types of survey were carried out; one is traffic volume counting at road-sides and the other is interviewing drivers.

These surveys were held in cooperation with the policy force. Traffic volume counting was done from 6.00 am to 10.00 pm and interviewing was done from 7.00 am to 7.00 pm.

The interview sheets and recording sheets for counting were prepared as shown in the Technical Report. Teams that were organised by supervisor, assistant supervisor, clerks and surveyors, proceeded with the survey according to the procedure that was mentioned in detail in Technical Report 3.

FIGURE: 23 SELECTED STATIONS



b) Results

The out-line of the cordon-line survey results are as follows:-

i) Counting

The volume of incoming and outgoing traffic at each station is shown in Table 14

The traffic volume was found to be only over 10,000 vehicles per 16 hours at station 1 and 10 along the Federal Route 1. At other stations the volume was low, ranging from a few thousand to seven thousand.

Regarding the number of motorcycles, there were 1,000 to 3,000 motorcycles per 16 hours at most of the stations except at 2 stations in more rural areas. Motorcycles constitute a bigger percentage of the traffic volume on rural roads than on trunk roads, e.g. 40% to 70% on rural roads and 28% on Federal roads.

TABLE: 14 TRAFFIC VOLUME AT EACH STATION (0600 - 2200)

STATION NO:	LOCATION	ROAD BETWEEN	DATE	NO OF VEHICLES	NO OF M/CYCLES	TOTAL
1.	¾ mile from Teluk Air Tawar	Teluk Air Tawar - Ptg. Pauh	11/6/79 (MON)	7,807	3,042	10,849
2.	Simpang Empat Ptg. Binjai	Ptg. Kuala - Ptg. Tok Kelam Pekan Darat	05/6/79 (TUE)	238	411	649
3.	1 mile from Pekan Darat	Pekan Darat - Kg. Tok Hamid	05/6/79 (TUE)	474	1,024	1,498
4.	1½ mile from Kampong Sentul	Simpang Empat Ptg. Pauh - Kampung Sentul	05/6/79 (TUE)	415	654	1,069
5.	½ mile from Sungai Dua	Pekan Sg. Dua - Merbau Kudong	11/6/79 (MON)	2,364	1,716	4,080
6.	½ mile from Guar Perahu	Guar Petai - Guar Perahu	11/6/79 (MON)	2,442	1,682	4,124
7.	1 mile from Kubang Semang	Kubang Semang - Simpang Tiga Kubang Ulu	12/6/79 (TUE)	2,280	1,936	4,216
8.	½ mile from Berapit	Berapit - Mengkuang Tandop	07/6/79 (THU)	965	1,233	2,198
9.	¾ mile from Kg. Ceruk Tok Kun	Kg. Ceruk Tok Kun - Macang Bubuk	12/6/79 (THU)	3,958	3,405	7,363
10.	Kampung Baru Mk. 13	Simpang Empat Tasik - Tok Subuh	12/6/79 (THU)	9,386	3,480	12,866
11.	1½ mile from Batu Feringghi	Batu Feringghi - Ujung Batu	07/6/79 (THU)	1,353	1,007	2,360
12.	½ mile from Bayan Lepas	Bayan Lepas - Teluk Kumbar	07/6/79 (THU)	2,799	2,946	5,745
		T O T A L:-		34,481	22,536	57,017

ii) Interviews

Over 8,000 samples were gathered at all the stations; the number of samples at each station and the sampling ratio is shown in Table 15 below:-

TABLE:15 SAMPLE RATIO

STATION	NO: OF INTERVIEW (7:00 - 19:00)	NO: OF COUNTING (7:00 - 19:00)	SAMPLE RATE (%)
01	842	4,731	17.8
02	239	258	92.6
03	493	737	66.4
04	364	446	81.6
05	726	1,791	40.5
06	730	1,667	43.8
07	701	1,793	39.1
08	452	949	47.6
09	950	3,031	31.3
10	1,204	5,519	21.8
11	891	964	92.4
12	776	2,388	32.5
TOTAL	8,368	24,274	34.5

These data are now in the process of being analysed by a computer, the output from which will make clear various characteristics of trips made.

5-3-3 Ferry Survey

The purpose of this survey is to gather information on passengers and vehicles using the ferry with this information, the nature of the trips of the passengers and vehicles can be determined.

a) Survey Method

The survey procedure consists of two main parts:-

i) Interviews with vehicles' drivers and passengers

ii) Traffic counting of vehicles and passengers.

The interview commenced at 7.00 am and ended at 7.00 pm. It was carried out on board the ferry by a supervisor and a few interviewers, the other counting survey was conducted at the entrance on both sides of the jetty, that is,at Butterworth and Georgetown, from 6.00 am to 10.00 pm on June 13th.(Wednesday)

In addition to both these surveys, the drivers' waiting time at Butterworth terminal was also surveyed during peak hours in the evening from 4.00 pm to 8.00 pm.

The detailed procedure was mentioned in Technical Report 3. The survey mentioned here was held on Wednesday. There were not so heavy flow of vehicles and passengers on this day that the counting survey was carried out again on 6th July (Friday) in order to get the peak day data of the week.

This survey did not involved interviews, but only counting; the duration of the survey was 6.00 am to 10.00 pm.

b) Results

The summary of the results are as follows:-

ii) a) Interview

The main parts of this survey are now in the process of being analysed by a computer. Only then, can the number of samples be shown in the table below:-

TABLE: 16 NUMBER OF SAMPLES, FERRY INTERVIEW

(7.00am - 7.00pm)

	GEORGETOWN		B'WORTH	B'WORTH		GEORGETOWN	BOTH DIRECTION		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
MOTOR * VEHICLES	4,184	609	14.56%	4,269	591	13.84%	8,453	1,200	14.2%
MOTOR ** CYCLES	5,798	219	3.78%	6,177	192	3.11%	11,975	411	3.4%
PASSENGERS	14,309	517	3.61%	13,476	440	3.27%	27,785	957	3.4%

* excluding motor cycles
** including bicycles

(1) number counted
(2) number interviewed
(3) sample ratio

ii) Counting

The results of counting survey is summarized as follws:-

* Approximately 5,000 motor vehicles (excluding motorcycles) use the ferry on both sides from 6.00 am to 10.00 pm.
* 6,000 motorcycles and 1,400 bicycles were also counted
* The composition by each type of vehicle are :-

motorcars	78.7%
medium size lorries	11.5%
vans, pick-ups	5.5%
heavy lorries	2.5%
and others	1.8%

* 33,400 people moved to and fro during the 16 hours.
* There is efficient ferry service, 13 to 15 trips per hour from 7.00 am to 7.00 pm
* Regarding hourly flow of motor vehicles it was found that at Georgetown side, there were two peak hours, one was from 9.00 am to 10.00 am (the ratio to the total is 9.1%) the other was from 3.00 pm to 4.00 pm, while at Butterworth side there was only one peak hour, that is 4.00 pm to 5.00 pm (the ratio to the total is 9.8%)
* regarding passenger flow, there was a similar trend; the peak hours as Georgetown side was from 7.00 am to 8.00 am and 5.00 pm to 6.00 pm (the ratio was 13% and 9.9% respectively). At Butterworth side there were two peak hours at the same time, (the ratio was 9.2% and 12.9%)

The comments mentioned above is the results obtained in 13th of June. Hereafter, some remarks are also made regarding comparisons with the results obtained on 6th of July.

TABLE: 17 THE TRAFFIC FLOW ON FRIDAY (6th JULY 1979)

(6.00am - 10.00pm)

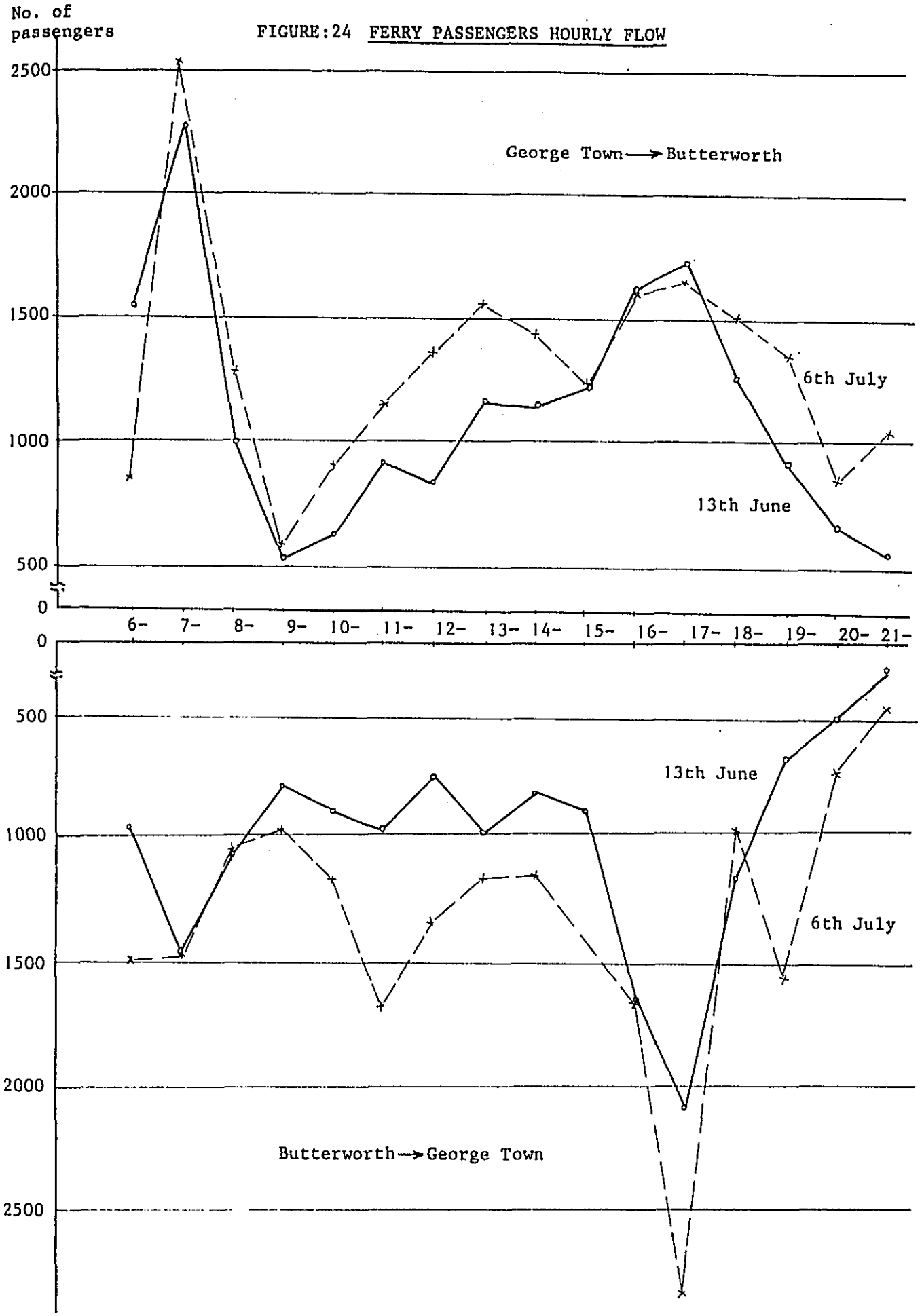
	GEORGETOWN → B'WORTH			B'WORTH → GEORGETOWN			BOTH LOCATION		
	+ MOTOR VEHICLE	++ MOTOR CYCLE	PASSENGERS	+ MOTOR VEHICLE	++ MOTOR CYCLE	PASSENGERS	+ MOTOR VEHICLE	++ MOTOR CYCLE	PASSENGERS
6-7	97	380	845	57	276	1,500	154	656	2,345
7-8	319	1,523	2,532	183	648	1,461	502	2,171	3,993
8-9	387	646	1,274	287	487	1,056	674	1,133	2,330
9-10	346	457	582	401	467	963	747	924	1,545
10-11	388	339	899	468	425	1,158	856	764	2,057
11-12	389	380	1,155	525	438	1,671	914	818	2,826
12-13	353	396	1,355	405	449	1,332	758	845	2,687
13-14	327	447	1,550	448	387	1,148	775	834	2,698
14-15	388	490	1,431	543	485	1,136	931	975	2,567
15-16	365	495	1,211	416	438	900	781	933	2,111
16-17	501	420	2,094	409	778	1,657	910	1,198	3,751
17-18	468	541	2,136	481	993	2,849	949	1,534	4,985
18-19	463	548	1,507	384	884	921	847	1,432	2,428
19-20	460	341	1,353	502	695	1,562	962	1,036	2,915
20-21	279	289	857	238	364	715	517	653	1,572
21-22	253	353	1,043	168	243	482	421	596	1,525
TOTAL	5,783	8,045	21,824	5,915	8,457	20,511	11,698	16,502	42,335

\+ EXCLUDING MOTOR CYCLES

++ INCLUDING BICYCLES

* The traffic volume on Friday was larger than that on Wednesday, 1.18 times for motor vehicle, 1.12 times for motor cycles and 1.27 times for passengers, respectively.
* Also at peak hour, 7-8 at Georgetown and 17-18 at Butterworth 1.11-1.39 times more than on Wednesday.
* At the end of these comments, we show a figure regarding the hourly flow of Ferry Passengers.

FIGURE:24 FERRY PASSENGERS HOURLY FLOW



iii) Time spent waiting at Butterworth Terminal

At the terminal in Butterworth, often very long queues were formed during peak hours in the evening especially in the week-end that is Thursday, Friday and Saturday.

The results obtained on the 6th of July (Friday) are shown below:-

TABLE:18 PASSENGERS WAITING TIME

ARRIVAL TIME	WAITING TIME (MINUTE) 0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-40	TOTAL NO: OF VEHICLES	AVERAGE WAITING TIME
3.00	1	4							5	6.0 (MIN)
3.30	1	1	14	16	3	1			36	15.1 (MIN)
4.00		2	7	4	17	4			34	19.1 (MIN)
4.30			1	9	18	6	1		35	21.6 (MIN)
5.00				6	22	7	1		36	22.4 (MIN)
5.30					19	21	4	1	45	25.6 (MIN)
6.00				2	11	19	2		34	25.1 (MIN)
6.30			5	13	10	2	3		33	20.1 (MIN)
7.00		6	12	8	4				30	13.7 (MIN)
7.30-8.00	2	3							5	5.0 (MIN)
TOTAL	4	16	39	58	104	60	11	1	293	20.0 (MIN)

5-3-4 Screen Line

In order to verify the data on the volume of traffic collected from the owner Interview Survey, three screen-lines were decided upon, one for Province Wellesley and two for Penang Island. Then 6 survey stations were selected for the purpose of ensuring that all vehicles passing through the screen-line were counted.

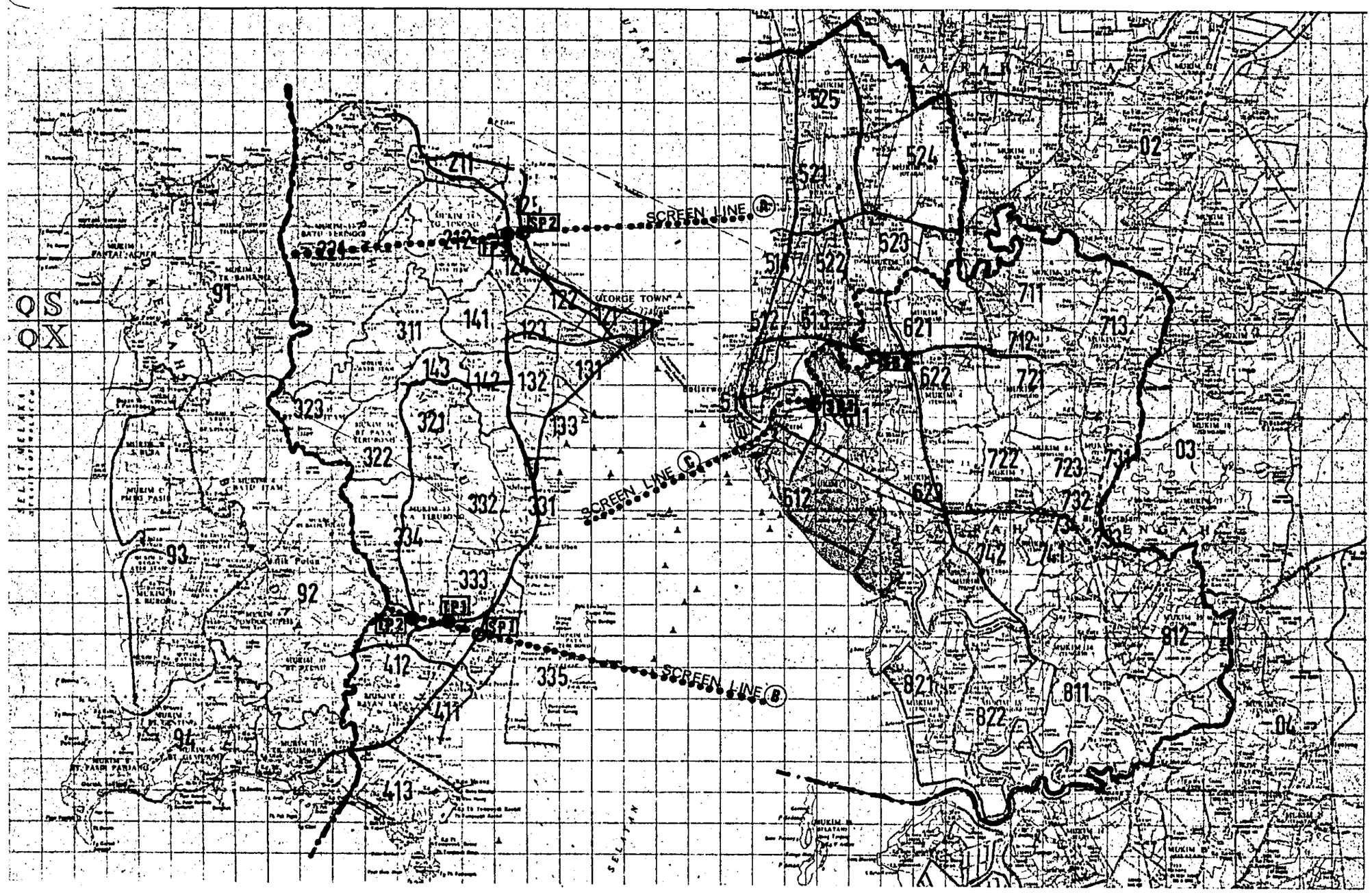
TABLE ;19 RESULTS OF SCREEN LINE SURVEY

SCREEN	STATIONS	NAME OF THE ROAD	DATE OF SURVEY	DURATION OF SURVEY IN HOURS	TRAFFIC VOLUME OF VEHICLES	TOTAL VOLUME INCLUDING TRISHAWS AND BICYCLES
A	S.P.2	Tanjung Tokong Road	7/6/79	16	24,294	27,136
	T.P.3	Mount Erskine	13/6/79	12	7,548	8,269
B	S.P.1	Bayan Lepas Rd.	5/6/79	16	20,354	20,988
	T.P.1	Sungai Ara Rd.	11/6/79	12	3,368	3,768
	T.P.2	Paya Terubong Road	12/6/79	12	1,444	1,609
C	S.B.1	Chain Ferry Rd	5/6/79	16	33,259	34,810
	S.B.2	Jalan Permatnag Pauh	7/6/79	16	12,903	14,689

Besides these three screen lines, the Malacca Straits form a natural line separating the State of Penang into two regions that is Penang Island and Province Wellesley. However, the traffic volume counted in the ferry survey will be used to verify only the results of interviews with passengers and vehicles on ferries.

The following figure shows the location of the screen lines and the stations.

Fig.25 **LOCATION OF SCREEN LINES AND SURVEY STATIONS**



5-4 Brief outline of Data Processing

a) Introduction

Data processing by a computer is divided into 2 parts, that is analysing the existing traffic flow conditions based upon the surveys conducted and to forecast future traffic flows which will be calculated by using both the results of the analysis of the existing conditions and by considering some future changes like population changes, land use patterns, improvement of traffic conditions etc.

In the case of the former which is the analysis of the existing conditions, it is most important to get the Origin-Destination Tables called O-D Tables which show movement of vehicles among the zones.

b) Relationship between the O-D Table and each Survey

An O-D Table which shows all the movements of all types of vehicles both inside and outside of the study area can be derived from the results of each survey that has been done.

As an example, the data from the Owner-Interview Survey is used to analyse the movements, that is, the origin and destination of vehicles inside the study area of Butterworth (sphere 111 in the figure) and Georgetown (sphere 11)

However the data from the Owner-Interview survey include movements of vehicles between Butterworth and Georgetown and from Georgetown to zones out of the study area because the survey traces the movements taken for a day by vehicles.

Therefore in the O-D Table, only trips taken within the study area is recorded and any other trips is disregarded or double counting may occur. Then an enlargement of the data to accomodate the population size is done.

The following figure shows the relationship between an O-D Table and each survey and how each survey is tabulated.

FIGURE: 26 CONCEPTUALIZED MAP OF THE STUDY AREA

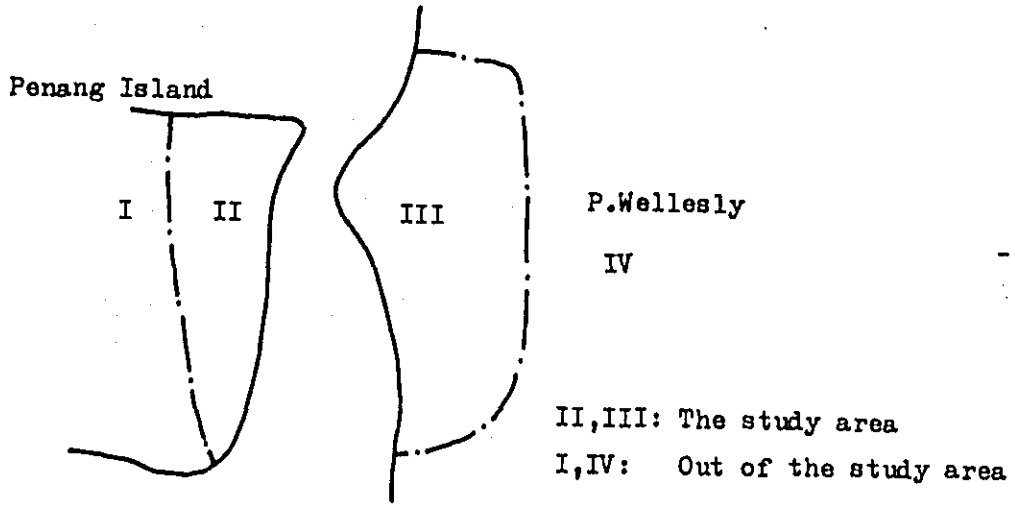


Fig. 27 Conceptualized framework of the O-D Table

O \ D	I	II	III	IV
	P.Isl.		P.W.	
I	$C_{1.1}$	$C_{1.2}$	$F_{1.3}$	$F_{1.4}$
II	$C_{2.1}$	OI 2.2	$F_{2.3}$	$F_{2.4}$
III	$F_{3.1}$	$F_{3.2}$	OI 3.3	$C_{3.4}$
IV	$F_{4.1}$	$F_{4.2}$	$C_{4.3}$	$C_{4.4}$

C : Cordon Line Survey

F : Ferry Interview Survey for cars and motorcycles.

OI : Owner Interview Survey icluding taxis and buses.

Here,

$$C_{1,2} = C_{2,1} \ , \quad C_{3,4} = C_{4,3}$$

c) Items analysed from the the existing traffic conditions

The output which is derived from the analysis of the existing traffic conditions is as follows:-

i) O-D Table

O-D Table for each type of vehicle.
O-D Table for each trip purpose.
O-D Tables for all types of vehicles and for all purposes.

ii) Analysis of the characteristics of owners of cars and motorcycles

Number of each type of vehicles in each zone.
Form of ownership, sex, age and occupation of owners.
Distribution of working place of owners.
Average mileage and average number of each type of vehicle used in each zone.

iii) Analysis of trip movements

Number of 'origin trips' and 'destination trips' that end in each zone.
Number of each type of vehicles and trip purpose of each.
Mean value of trip movements made a day for each type of vehicle.
Variations in the number of trips for every hour for every zone and for every type of vehicle.

iv) Others

Mean time required to travel between zones for each type of vehicle.
Number of passengers in each type of vehicle.
Analysis of parking places.
Analysis of type of commodities carried.
Others.

5-5 Other Traffic Surveys

5-5-1 PARKING

a) Parking Problems in Georgetown

In the state of Penang, there are only few streets where parking is prohibited and also there are only few private parking lots that are charged. At present, there seem to be sufficient parking space on the streets to meet the existing demand for them such that drivers in Penang enjoy the full merit of using cars.

However, in the C.B.D. of Georgetown, the traffic environment neither considers the welfare of pedestrians, there being scarcely any pedestrians walks, nor that of drivers, who have to tolerate narrow carriage-ways. Considering the ever-increasing traffic demand, the present system of parking will be one of the major obstacles for smooth-flowing and safe traffic.

b) Study Approach

This study focuses mainly on planning for future parking system with a balance struck between control of street parking and the development of off-street parking according to the urban transport policy that will be formulated. This will also include a strategic plan on how to restrict the traffic flow into the C.B.D.

c) The Present Parking Capacity

The parking capacity within the C.B.D. of Georgetown is shown in the table below:-

TABLE 20 PRESENT PARKING SPACE IN THE C.B.D.

TYPE OF PARKING PLACES		NO: OF PARKING LOTS (FOR MOTOR CAR)	
OFF-STREET PARKING	PUBLIC	679	(3.6)
	PRIVATE	1,599	(8.6)
ON-STREET PARKING	CHARGED	690	(3.6)
	FREE	15,992	(84.4)
TOTAL		18,895	(100.0)

Besides the parking places of Table , back-lanes and vacant lands are frequently used as parking spaces. Partly because of the ample on-street parking spaces, the residents of the C.B.D. park their cars on the street instead of in their at own garage and such establishments as cinemas, hotels and commercial premises are sometimes not installed parking spaces to satisfy the regulation of parking space of Building By-Laws.

5-5-2 Road - Side Trees

a) Objectives

This survey will provide the necessary information for improving roads with due consideration given to environmental values.

Whenever there is need for widening roads, careful planning should be made on the usefulness and the effects of road-side trees which Georgetown is rich in and which are aesthetically attractive to both citizens and tourists.

Generally speaking, the benefits and use of road-side trees can be classified into three categories which are described as follows:

Aesthetic	- as landmarks that beautify cities
	- as separations between roads and the hinterland which provides comfort and stimulation to the drivers as well as the inhabitants.
Climatic	- as protection of roads from direct sunshine and to maintain the mild microclimate.
Anti-pollution	- as a means of reducing the sound of noisy traffic, vibrations and also pollution. Also, to prevent the spread of fire.

b) A Brief Outline of the Survey

The areas that were surveyed were the central districts of Georgetown, Butterworth and Bukit Mertajam. The major items that were surveyed were the various type of trees, their shape and the distance between them and the width of road-shoulders and sidewalks. Due to technical difficulties, the age of trees were not included.

c) Major Findings of the Survey

i) Type of trees frequently observed in the area.

TABLE: 21 MAJOR ROAD-SIDE TREES ARE:-

1.	Angsana tree	-	Macalister Road
2.	Rain tree	-	Kelawei Road
3.	Casuarina tree	-	Gurney Drive
4.	Swientia Mahogany	-	Western Road, Gurney Drive, Green Lane.
5.	Royal Palms	-	Peel Avenue, Codrington Avenue
6.	Melia tree	-	Logan Road, Residency Road
7.	Red Flame	-	Vermont Road
8.	Peltophorum	-	Cantonment Road, Green Lane, Jelutong Avenue
9.	Cinnammon tree	-	Jesellton Crescent
10.	Acacia tree	-	Batu Lanchang Lane
11.	Saga tree	-	Scott Road
12.	Filicium Decipien	-	Scott Road
13.	Jacaranda	-	Nunn Road
14.	Rubber tree	-	Ayer Rajah Road
15.	Lagerstromia Loundonii	-	Jalan Mas
16.	Cassia Spectabilis	-	Birch Road
17.	Pong Pong or Cerbera	-	Taman Berjaya
18.	Cassis Siamea	-	Jalan Brother James
19.	Pongamia	-	Midlands Drive or Victoria Green Road, Jalan Sekolah La Salle
20.	Cordia Subcordata	-	Lim Eow Thoon Road
21.	Madras Thorn	-	Dato Kramat Ground
22.	Mimusope Elengi (Tanjong tree)	-	York Road
23.	Sterculia Fortida	-	Patani Road
24.	Andira	-	Jalan Brother James, Jalan Besi
25.	Melia Excelsa	-	Western Road
26.	African Bobaob	-	In front of Peel Avenue circus
27.	Tembusu	-	Free School Road

ii) Distribution of Road-Side Trees

Among the central areas of the three towns, road-side trees are most lush in Georgetown especially in the north-west parts where there are many public establishments that are surrounded by low density housing areas.

These road-side trees should therefore be conserved as far as possible in order that the existing pleasant environment is maintained.

On the other hand, the C.B.D. of Georgetown is rather scarce in road-side trees. This seems to be the case in most commercial areas where road-side trees are rare although there is a strong need for them due to the large number of pedestrians in these areas.

The southern part of the city is also rather scarce in road-side trees. It is necessary to note that more attention must be given to newly developed housing areas that seem to have a poor growth of trees.

iii) Points to be considered for the Improvement of Roads.

Since the objective is to preserve beautiful trees, it is best to avoid widening of narrow roads. As such the roads that were selected for preservation were those that were planted with beautiful trees but were too narrow. The results of the analysis is shown in Figure .

5-5-3 Pedestrian Walk

a) Present Problems

Although safety is one of the most important consideration in city-life, pedestrians have always been the last to be given any sort of priority. For instance, pedestrians will really have no opportunity to get across the streets if they were to conscientiously obey traffic signals for traffic signals do not

FIG.28

ROADS TO BE PRESERVED
georgetown

N

1000 0 400 800 1000
feet yards

LEGEND

impossible to widen without chopping trees

undesirable to widen

give allowances for pedestrians at all.

Moreover, there are only very few side-walks that exist and even if they do, most of them are too narrow or too full of obstacles to enable pedestrians to walk comfortably.

b) Measures for Improvement

In order that better conditions can be provided, it is necessary that the following improvements be made.

i) To install side-walks that are wide enough in C.B.D. Therefore, the present systems of street parking should give way to pedestrians.

ii) To provide pedestrian crossing with effective traffic signals.

iii) To introduce traffic-free zones in commercial centres of Georgetown and Bukit Mertajam either by temporarily or permanently closing it to motor-cars.

iv) To improve the manner of driving so that more attention is given to pedestrian.

According to the results from the questionnaire administered to pedestrians and shop-keepers at Campbell Street on World Environment Day (June 5th) the majority of them agreed to the question of the introduction of traffic-free zones in the city.

FIGURE 29

TRAFFIC FACILITIES FOR PEDESTRIAN

legend

●	FIXED TIME CYCLE INSTALLATION
●	FIXED TIME CYCLE INSTALLATION WITH LINKING FACILITY AND OVERHEAD AND HIGH INTENSITY SIGNAL
◎	VERHICLE ACTUATED INSTALLATION WITH OVERHEAD AND INTENSITY SIGNAL
●	CONTROLLED PEDESTRIAN SIGNAL
●	UNCONTROLLED PEDESTRIAN SIGNAL
▬	PEDESTRIAN ON BOTH SIDE
▨	PEDESTRIAN ON ONE SIDE

Appendix A.

Minute of Previous Committee Meetings.

1.	Steering Committee Meetings	-	26th March, 1979
2.	Technical Committee Meetings	-	3rd April, 1979
3.	Technical Committee Meetings	-	21st May, 1979
4.	Technical Committee Meetings	-	4th July, 1979

Appendix A - 1

MINUTES OF THE STERRING COMMITTEE MEETING
ON THE INCEPTION REPORT FOR THE
FEASIBILITY STUDY OF THE URBAN TRANSPORT STUDY IN
BUTTERWORTH AND BUKIT MERTAJAM

Date: March 26, 1979

Place: Conference Room,
Economic Planning Unit,
Kuala Lumpur.

Time: 9.30 a.m.

PRESENT

Encik Bashah Nordin	-	Economic Planning Unit. (Chairman)
Encik Zaidan bin Haji Othman	-	Highway Planning and Public Transport Unit.
Encik Mohd. Yusoff Ramli	-	Ministry of Works and Utilities.
Encik Chen Chee Leong	-	Public Works Department Headquarters, Kuala Lumpur.
Encik Saikhol Rosli Sabdin	-	State Economic Planning Unit, Penang.
Encik Kamarul Zaman Ali	-	Public Works Department, Penang.
Encik Khoo Hock Song	-	Municipality of Penang.
Encik Ong Chow Meng	-	Municipality of Seberang Prai (Butterworth)
Cik Leong So Seh	-	Economic Planning Unit. (Secretary)
Prof. T. Inouye	-	Professor National University of Yokohama, (Chairman of Supervisory Committee).
Mr. T. Shiina	-	Ministry of Construction.
Dr. K. Ichihara	-	Central Consultant Inc.
Mr. H. Nishimura	-	Central Consultant Inc.
Mr. K. Nakata	-	Central Consultant Inc.
Mr. Y. Saito	-	JICA Japan.
Mr. I. Ozawa	-	Japanese Embassy. (First Secretary).
Mr. A. Kojima	-	JICA, Kuala Lumpur. (Resident Representative).

I. PURPOSE OF MEETING

The objectives of the meeting were:-

(i) to discuss the Inception Report (Phase I) of the Study as prepared by JICA in Japan and submitted to the Malaysian Steering Committee today, and
(ii) to discuss the preparations for the coming scheduled O - D Survey.

II. THE MEETING

2 The Chairman welcomed all members present and thanked them for their attendance. Members of the Steering Committee and the Japanese Mission were

introduced to the meeting. The Chairman then called upon the leader of the Mission, Prof. T. Inouye to brief the meeting on the Report. On behalf of the Mission, Prof. T. Inouye conveyed his warm greetings and thanked the meeting for welcoming them and convening today's meeting; thereafter he called upon his colleague, Mr. Nishimura to go through the Report for the benefit of those who had just received the Reports.

3. The meeting thus follwed Mr. Nishimura's reading and made several comments.

III. COMMENTS

4. With reference to the Inception Report, the following comments were made:-

(i) Introduction (Para 1)

The word "Malau Peninsula" to be spelt as "Malay Peninsular".

(ii) Outline of the Study (Para 3-2)

The Japanese Mission informed that Fig. 1 showed a rough delineation of the Study area and that the meeting could still determine the exact area to be studied.

Mr. Khoo Hock Song from the Municipality of Pulau Pinang, suggested that the southeren boundary on the Penang Island, as delineated in Fig. 1 be extended to cover for the expansion of the Bayan Lepas Airport.

Mr. Ong Chow Meng from the Municipality of Seberang Prai (Butterworth) suggested that the northern boundary on the Mainland, be extended to cover the airbase in the Air Tawar area.

The meeting agreed that the boundary of the Greater Metropolitan Areas of Georgetown, Butterworth and Bukit Mertajam (GMA) would have to be readjusted and finalised after further discussions in Penang. It was noted that the Study-boundary would have to encompass whole administrative areas or districts (Mukim) for easy assessment of data e.g. population etc.

The Mission informed that the Study area would not be strictly confined to the area delineated and that outlying areas would still be considered although work on such areas would be in less detail.

The Mission was informed that the alignment of the proposed Penang Fixed Linkage as in Fig. 1 was outdated and the correct alignment was drawn for them.

(iii) Study Approach (Para 4-1)

Referring to Fig. 2 on the Flow Chart of the Study, the Committee requested that the item under 'Preparation for O - D Survey': "car ownership by type" be changed to "vehicle ownership by type".

Mr. Shiina, in briefing the meeting on the origin-destination O - D Survey informed that Dr. Ichihara, Mr. Nakata and Mr. Nishimura

would stay in Penang for about 3 months to collect data as preparation for the O - D Survey. He also informed that about 200 students would be required to help out with the survey work. The Mission was also interested in checking on the availability of computer-service (FORTRAN) at the Universiti Sains and the Penang Port Commission. The Penang State Planning Unit would make arrangements to recruit students for the Survey and for the Survey and for the Mission to visit the computer centres.

For its traffic analysis and forecasting, the Japanese Team would not only analyse the O - D data but also the future traffic demand, future public transport demand (bus) and future demand for parking spaces. Mr. Chen Chee Leong of PWD Kuala Lumpur informed the Mission that the traffic analysis would depend on the option of having the proposed Fixed Linkage/Bridge either operating simultaneously on a "with ferry" or "without ferry" basis. The Mission was requested to assume that the Bridge would operate in the year 1986, and its traffic forecast should be dependent on the following assumptions:-

(i) short-term period during the period 1980-1985 in which the Bridge is not operating.

(ii) long-term period from the year 1986 onwards to the year 2000 during which the Bridge is operating simultaneously:-
(a) with ferry
(b) without ferry

It was noted that the above forecast would not be extrapolated on an interval of 5 years. Forecasting for the various 5 year periods would only be carried out for major projects which have been identified in the masterplan study and selected for implementation.

(iv) Local Counterpart Personnels

Mr. Khoo Hock Song pointed out that the Inception Report did not mention the secondment of local counterparts from the various Government agencies to assist and learn from the Study Team during the study period. This has been agreed at the meeting of November 23, 1978 as one of the contributions from the Government of Malaysia. The meeting had agreed that 5 local counterpart personnel be fitted in with the Study Team and the man-months input scheduled accordingly. The State Planning Unit was requested to provide the names of the five appointed counterparts to EPU.

(v) Detailed Feasibility Studies

Mr. Ozawa informed the meeting that due to constraints in budget and manpower, the Japanese Government would be taking up only one high-priority project for detailed feasibility study in parallel with the Masterplan Study for the fiscal year of 1979/80. He added that the Malaysian Government could however submit its requests for technical assistance of further detailed feasibility studies on other high-priority projects to the Japanese Government's consideration for the following fiscal year of 1980/81.

IV. CONCLUSION

5. The Mission would proceed to Penang on March 27 for further discussions with State officials. Three of the Mission's members; Dr. Ichihara, Mr. Nakata and Mr. Nishimura would stay back to collect data for the O - D Survey while the rest of the Mission would depart for Japan on April 5.

6. The Chairman adjorned the meeting at 11.50 a.m. with a vote of thanks.

Economic Planning Unit,
Prime Minister's Department,
Kuala Lumpur.

7th April, 1979.

Appendix A - 2

PSUK/PP/16450/BAH.37

MINUTES OF MEETING BETWEEN STATE OFFICIALS AND JAPANESE MISSION FOR URBAN TRANSPORT STUDY IN PENANG

Date: 3th April, 1979

Place: Bilik Mesyuarat Perbendaharaan, Tingat 7, Bangunan Tuanku Syed Putra, Pulau Pinang.

Time: 2.30 p.m.

PRESENT

Encik Saikhol Rosli b. Sabdin	-	State Economic Planning Unit (Chairman)
Encik Koh Kok Ee	-	Director, Public Works Department
Encik Thomas Gan	-	Municipality of Pulau Pinang
Encik Ong Chow Meng	-	Municipality of Seberang Prai
Encik Rohani bin Walat	-	R.I.M.V.
Encik Chong Kui	-	Town & Country Planning Department.
Cik Cheah Gaik Lian	-	Land and Mines Office, Pulau Pinang.
Encik Lim Cheng Kee	-	Municipality of Pulau Pinang.
Encik Abdul Aziz bin Mavi	-	OCPD Bukit Mertajam.
Encik Tuffile Nawab Din	-	OCPD Butterworth.
Encik Teo Cheng Pian	-	Survey Department.
Prof. Takashi Inouye	-	Yokohama University, Japan.
Encik Takeshi Shiina	-	Ministry of Construction, Japan.
Encik Yushi Saitoh	-	Japan International Corporation Agency.
Encik Katsugasu Nakata	-	Central Consultant Inc, Japan.
Encik Kaoru Ichihara	-	Central Consultant Inc, Japan.
Encik Hikaru Nishimura	-	Central Consultant Inc, Japan.

PURPOSE OF MEETING

The purpose of the meeting was to conduct discussions between the Study Mission for the Penang Urban Transport Study and officials from various State Agencies regarding the contribution and assistance of each agency in their support for the study:

THE MEETING

Before the meeting started, Prof. Takashi Inouye expressed on behalf of the Japanese Government their condolences to the Malaysia Government on the death of the Yang Di Pertuan Agong. He expressed his hope that Malaysia would continue to develop and enhance her economy so as to achieve a prosperous and united nation in the years to come.

The Chairman thanked the Prof. and welcomed all present to the meeting. He than called upon a representative of the Study Mission to brief the State's officials on the purpose, scope and schedule of the Study and to this the representative did by refering to the Inception Report of the Study.

Refering to page 4 of the Report which shows the boundary of the Study area, the Study Mission explained that the Study Area will not only cover the area bounded by the line indicated but might also extend beyond it to include other urban areas.

Regarding the zoning of areas in the Study Area for purposes of the Study the Study Mission explained that small zones would be made in the build-up areas and bigger zones in the suburban areas.

In order to work out the zoning of land use, the Team were given assurance that the Town Planners from the Majlis Perbandaran Pulau Pinang and the Majlis Perbandaran Seberang Prai would be available to help. Data on population would be available from the Statistics Department while data on public transport would be supplied by the Road Transport Department (RIMV). The Majlis Perbandaran Pulau Pinang would also make available data on transport facilities in city areas.

Encik Thomas Gan expressed his note of precaution to the Study Mission that in collecting ferry traffic data, some problems would be encountered. According to him, through his experience with the Penang Port Commission in matters similar to what the Study Team intend to undertake, the questionaires were either received late or were badly filled. Mr. Thomas Gan further proposed that the Study Team should consider conducting interviews rather than sending the questionaires by mail to the PPC.

The Study Team was also advised that a press statement should be made to inform the public of the intention to undertake interviews and traffic survey for the Study in just about one week before undertaking the tasks.

Regarding the question of the local officials that would join the Study Team in the Study as their local counterparts, the Team were informed that one officer would come from each of the following agencies, viz: State Economic Planning Unit, Majlis Perbandaran Pulau Pinang, Majlis Perbandaran Seberang Prai, Public Works Department and the Town and Country Planning Department. The Team were also told that these officers would be available only on a part-time basis since they would also be engaged in their own job. However they would give their support and cooperation as much as possible in order to meet the schedule of the Study.

On the request of the Study Mission that a State Technical Committee be formed for this Study, the Meeting agreed that this committee would be formed and chaired by the State Economic Planning Unit with the Study Mission as the Secretary. The members of this committee would comprise representatives from the Public Works Department, Majlis Perbandaran Pulau Pinang, Majlis Perbandaran Seberang Prai, the Road Transport Department (RIMV), and the State Town and Country Planning Department. Other departments would also be coopted as members when necessary.

The meeting adjourned at 4.00 p.m.

YUNIT PERANCANG EKONOMI NEGERI,
PEJABAT SETIAUSAHA KERAJAAN,
PULAU PINANG.

14hb. April, 1979.

SRS/MS.

Appendix A - 3

PSUK/PP/16450/BAH.37

MINUTES OF THE TECHNICAL COMMITTEE MEETING
ON URBAN TRANSPORT STUDY FOR
METROPOLITAN AREAS OF GEORGETOWN,
BUTTERWORTH AND BUKIT MERTAJAM.

Date: 21st May 1979

Place: State Secretariat Conference Room

Time: 2.30 p.m.

PRESENT

Encik Mohd. Zuhuri b. Saleh	-	Director, State Economic Planning Unit. (Chairman)
Encik Zaidan Haji Othman	-	Director, Highway Planning Unit, Ministry of Works & Utilities.
Encik Thomas Gan	-	Director of Engineering Section. Penang Municipality.
Encik Hua Keng Tong	-	Penang Municipality.
Encik Ong Chow Meng	-	Seberang Prai Municipality.
Encik Choong Lai Chin	-	Penang Development Corporation
Encik Rohani Walat	-	Road Transport Department.
Encik Mohd. Zam bin Mohd. Zain	-	Town & Country Planning Department.
Encik Khoo Theam Hooi	-	Public Works Department.
Encik Khoo Soo Theong	-	Public Works Department.
Encik Chew Sin Liang	-	Public Works Department.
Prof. K.J. Ratnam	-	Director, Centre of Policy Research, Universiti Sains Malaysia.
Encik H. Hoshina	-	Universiti Sains Malaysia.
Encik Leong Hing Fatt	-	Universiti Sains Malaysia.
Inspektor Daud Ahmad	-	Butterworth District Police.
Encik Hikaru Nishimura	-	Study Team
Encik E. Iimuro	-	Study Team
Encik K. Nakata	-	Study Team
Encik H. Imai	-	Study Team
Encik J. Watanabe	-	Study Team
Cik Rashida Zainal Abidin	-	Study Team
Encik Saikhol Rosli Sabdin	-	Asst. Director State Economic Planning Unit (Secretary)

PURPOSE OF MEETING

The purpose of the meeting was to review the progress of the study so far and to get the views from the members of the Technical Committee.

THE MEETING

The Chairman welcomed all those present, especially Encik Zaidan of the Highway Planning Unit, Kuala Lumpur and Prof. K.J. Ratnam of the Centre of Policy Research, Universiti Sains Malaysia. He then requested the Study Team to brief on the progress of the Study.

Refering to the agenda, Mr. Nishimura of the Study Team informed the meeting that work on the sampling of vehicle owners to be selected for the home interview survey was completed and about 16,000 vehicle owners in the study area of Penang State had already been given notice of the coming interviews in the month of June 1979. So far about 2,000 notification cards have been returned indicating that either the vehicle owners have changed their residence or the addresses on the cards could not be located. However, the Team representative explained that such an occurence was anticipated and the returned cards represented about 15% of the samples. These spoilt samples would be replaced so that when the actual home interviews start in June, the target of interviewing 16,000 vehicle owners would be achieved. For the purpose of interviewing the vehicle owners, about 260 interviewers will be dispatched by the Study Team to undertake the job.

At this juncture, Prof. K.J. Ratnam indicated to the Study Team that they would be getting good response from the interviewees since they would be interviewed at their homes.

The Team then explained the other component surveys such as the cordon, the screen line as well as the ferry survey. The sample questionnaires were circulated and explained to the Committee.

Encik Zaidan cautioned the Team that when conducting the cordon and O - D survey, no double counting would be done. Otherwise the surveys would indicate more traffic movements than what it should be.

Refering to the map of Penang State which indicated the various cordon points selected for the cordon survey, Mr. Imai infomed that there would be 12 cordon stations. In order to carry out the cordon survey smoothly, involving the interview of drivers at the roadside, the assistance of the Police is necessary. This would also be the case of the ferry survey. On this matter, Inspector Daud Ahmad told the Team that this could be arranged and requested that an official letter be written to the Chief Police Officer stating the details required. The letter should be sent at least a week before conducting the survey. He also pointed out that in applying for assistance from the police to supply a set of walky talky for the Study Team, more is advisable for the police personnel using such equipments to be in attendance.

With regard to the road signs and lamps to be placed at each survey station to notify the drivers before reaching the point Encik Zaidan asked the Public Works Department and the Penang Municipality to provide the assistance. This was agreed upon by both the departments concerned.

On the inquiry by Mr. Thomas Gan on the necessity of considering parking areas in planning the transportation system in the City area, the Study Team replied that the matter had already been taken care of and a survey of parking demand in each zone of the City will be undertaken.

The Team then went on the brief on the Land Use Survey so far achieved. They have now successfully gathered certain information with the help of the local counterparts, although some are yet to be obtained. They hoped that the various authorites concerned would give them the support and cooperation in the near future.

Encik Hua Keng Tong then stressed the importance of the local counterparts to participate actively in the Study by providing every assistance necessary to enable the Study Team to gather the correct information regarding the local situation. The counterparts should also attempt to acquire the technical know-how at the same time. The Chairman hoped that although some of the local counterparts are unable to participate with the team full-time since they are also occupied with their own responsibilities, they should nevertheless try as far as possible to play their part meaningfully.

The Team also informed the Meeting that besides undertaking the above mentioned surveys they have also included a survey of roadside trees in the Study. The survey would provide the necessary information for road improvement works, with due consideration being given to aesthetic values.

Encik Zaidan and Encik Choong Lai Chin stressed the importance of including the conditions and age of the various trees in the survey, and to this the Team took note.

On the request from the Team that they would like to have the opinion from the State Government on Public Transport System in Penang, the Chairman explained that this could be done by refering the matter to the relevant departments.

The meeting adjourned at 4.30 p.m.

STATE ECONOMIC PLANNING UNIT,
STATE SECRETATIAT,
PENANG.

7th June, 1979.

Appendix A - 4

MINUTES OF TECHNICAL COMMITTEE MEETING ON
URBAN TRANSPORT STUDY OF METROPOLITAN AREAS
OF GEORGETOWN, BUTTERWORTH AND BUKIT MERTAJAM
PULAU PINANG

Date : 4th, July, 1979.

Place : Penang Development Corporation Conference Room, 9th Floor, Bangunan Tuanku Syed Putra, Pulau Pinang.

Time : 3.00 p.m.

PRESENT:

Encik Mohd Zuhuri bin Saleh	-	Director, State Economic Planning Unit (Chairman)
Encik Thomas Gan Eng Siew	-	Director of Engineering Section, Penang Municipality
Encik Hua Keng Tong	-	Penang Municipality
Encik Abdul Aziz bin Ujang	-	Chief Penang Traffic Police
Encik Idris bin Muda	-	Ferry Manager, Penang Port Commission
Encik Loke Soon Chuan	-	Penang Port Commission
Encik Raymond Volpe	-	Penang Port Commission
Encik Mohd. Zam bin Mohd Zain	-	Town and Country Planning Department
Encik Rohani bin Wallat	-	Road Transport Department
Encik Md Noor bin Ayob	-	Seberang Prai Municipality
Encik Leong Hin Fatt	-	University Sains Malaysia
Encik Khoo Tham Hooi	-	Public Works Department
Encik Khoo Soo Teong	-	Public Works Department
Encik Chew Sin Liang	-	Public Works Department
Encik Osamu Ohtsu	-	Study Team
Encik Katsuyasu Nakata	-	Study Team
Encik Hikaru Nishimura	-	Study Team
Encik Haruhiko Imai	-	Study Team
Encik Etsutaro Iimuro	-	Study Team
Encik Jiro Watanabe	-	Study Team
Encik Saikhol Rosli Sabdin	-	Asst. Director, State Economic Planning Unit. (Secretary)

PURPOSE OF MEETING:

The meeting was held for the purpose of having a briefing by the Study Team on the results of the surveys undertaken and to obtain from the various government agencies.

THE MEETING

2. The Chairman welcomed all present and called upon the Study Team to brief on their findings of the various which surveys which had been conducted in June, 1979.

3. Encik Imai firstly thanked all agencies concerned which had given help and assistance to his team in the survey. He reported that the surveys undertaken had been successful. He then went on to explain the methods employed in conducting the various surveys by showing several slide photographs. The slide photographs not only showed surveys being done at roadsides in the Study Area of Pulau Pinang but also some comparisons of the transportation system in Japan.

.../2-

4. Refering to a Report on 'Survey Up to Date', Encik Nishimura then explained on how the major surveys, like the vehicle-owner interview survey, cordon-line survey and screen-line survey progressed when it was conducted in June.

5. In the owner-interview survey, 190,000 registrations were obtained from the RIMV and about 15,000 were chosen as samples. Prior to the interview, advance notices were sent to each of the samples. Where the addressess could not be located, the notification letters were returned and these accounted for about 17.1% of the 15,000 samples in the Internal Study Areas. This survey was divided into 3 groups, namely the home interview survey, private company/ government organisation interview survey and taxi interview survey. The whole survey was undertaken by 230 interviewers and at the end of the survey the number of samples interviewed was 12,540, representing 7.1% of the vehicle population of 175,600 in the Internal Study Area.

6. To a question by Encik Thomas Gan who enquired whether the total of 190,000 vehicles as indicated in the Report was the actual total vehicles in use in Penang, Encik Rohani stated that the actual number should be less since the 190,000 included old and condemned vehicles. He pointed out however, that it was quite difficult to know the present exact number of vehicles operating in the State.

7. The chairman then asked whether the sample rate of 7.1% obtained from the vehicle owner interview survey was of a reasonable expected rate. Mr. Imai informed that such a rate was the normal obtained from such a survey.

8. The Cordon-line and Ferry Surveys were then explained by Encik Osamu Ohtsu to the Technical Committee members. The objective of the cordon-line survey was to obtain information on the traffic passing through the border of the Study Area. With this data the volume and characteristic of the traffic could be determined. In addition to this, the number of vehicles and the nature of trips made between the Study Area and the External Area could also be determined. The survey methods used were interviews and traffic counts along selected roadsides or stations. The services of the police were obtained to stop the vehicles. The interviews were conducted from 7.00 am to 7.00 pm while the traffic counts were conducted from 6.00 am to 10.00 pm. Twelve stations were selected for this survey, namely two in Penang Island and ten in Seberang Prai. The survey showed that the traffic volume was found to be 10,000 vehicles per 16 hours at stations 1 and 10 along the Federal Route. The traffic volume was low in other stations on the trunk road. There were 1,000 to 3,000 motorcycles per 16 hours at most of the stations, except at two. For the interview part, a sample rate of 34.5% was registered from all the twelve stations.

9. The purpose of the ferry survey was to gather information on the volume of passengers and vehicles using the ferry. The method adopted was similar to the cordon line survey, namely interviewing and counting of both direction of Georgetown to Butterworth and Butterworth to Georgetown. The preliminary results of this survey showed that for the direction from Georgetown to Butterworth, the total number of vehicles counted was 4,184, out of which 14.69% were interviewed. The total number of light vehicles counted was 5,798, out of which 3.8% were interviewed. For the direction from Butterworth to Georgetown total number of vehicles counted was 4,269 out of which were interviewed. For passengers, 14,309 were counted out of which 3.6% were interviewed in the Georgetown-Butterworth direction, while on the opposite direction 13,476 were counted out of which 3.3% were interviewed.

10. At this juncture, Encik Thomas Gan enquired whether data on the total number of vehicles on the ferries was similar to that recorded by the Penang Port Commission. Encik Idris Muda confirmed that the data were quite similar. Encik Thomas Gan then also reminded the Study Team that their findings in terms of data should always be compared with other relevant reports that are available. The Study Team agreed to this suggestion.

11. The results of the screen-line survey were explained by Encik Imai and according to him they were satisfactory. For this survey, due to the heavy traffic on trunk roads, the traffic count was taken for 16 hours while for other roads it was taken for 12 hours. In addition, Encik Imai also explained that other surveys were also undertaken during the same month, including intersection survey and travel-time survey. In the intersection survey, 6 intersections were selected namely 3 for Georgetown and 3 for Prai. The survey was conducted in order to find ways to improve intersections. Certain difficulties were encounted especially in counting traffic at round-abouts.

12. Lastly, Encik Thomas Gan requested that in future technical meetings, the letter calling for the meeting is to be sent to the President of Penang Municipality. Encik Thomas Gan also requested the Study Team to forward report to be discussed in meetings, at a much earlier stage to the members.

13. There being nothing else to discuss, the meeting adjourned at 4.30 p.m.

APPENDIX B STUDY RECORD

STUDY RECORD

DATE	SCHEDULE	STUDY RECORD
25/03 (Sun)	Study Mission arrived in Kuala Lumpur (Ichihara, Nakata and Nishimura)	
26/03 (Mon)	Steering Committee at EPU Discussion about Inception Report	
27/03 (Tues)	Study Mission moved for Penang Discussion about schedule with State Economic Planning Unit.	
28/03 (Wed)		Discussion with M.P.P.P. Discussion with Survey Department.
29/03 (Thur)		Discussion with M.P.S.P. Discussion with Butterworth District Police.
30/03 (Fri)		
31/03 (Sat)		
01/04 (Sun)		
02/04 (Mon)		Discussion with R.I.M.V.

Conti. /

DATE	SCHEDULE	STUDY RECORD
03/04 (Tues)	Technical Committee Discussion about Inception Report	
04/04 (Wed)		Discussion with Universiti Sains Malaysia
05/04 (Thur)		Preparation of questionnaire for Owner Interview Survey
06/04 (Fri)		Map Collection from Survey Department
07/04 (Sat)		Preparation of questionnaire for Owner Interview
08/04 (Sun)		
09/04 (Mon)		Preparation of Questionnaire
10/04 (Tues)		Discussion with P.P.C.
11/04 (Wed)		Data Collection from J.K.R.
12/04 (Thur)		Hearing from NGK Spark Plug Malaysia Berhad
13/04 (Fri)		Discussion with M.P.P.P. Mr. Thomas Gan
14/04 (Sat)		Borrowed Registration Card from R.I.M.V. Hearing from Executive of Pen-Group Companies

Conti./

DATE	SCHEDULE	STUDY RECORD
15/04 (Sun)	One Mission Member (Watanabe) arrived in Kuala Lumpur	
16/04 (Mon)	Watanabe moved to Penang. Assistant Supervisors started their work.	Explanation to Assistant Supervisors. Start Sampling from Registration Card.
17/04 (Tues)		Hearing from Excecutive of Hitachi Semiconductor Malaysia Berhad Hearing from Executive of Clarion Malaysia Berhad.
18/04 (Wed)		Data Collection from P.P.C.
19/04 (Thur)		Discussion with P.D.C.
20/04 (Fri)	Ichihara moved to Kuala Lumpur. One Mission Member (Imai) arrived in Penang.	
21/04 (Sat)		Site Investigation by Watanabe and Imai in Bayan Lepas.
22/04 (Sun)		

Conti./

DATE	SCHEDULE	STUDY RECORD
23/04 (Mon)	Ichihara left for Japan	Explanation to Clerks (35)
24/04 (Tues)		
25/04 (Wed)		Preparation for Road Side Tree Survey
26/04 (Thur)		
27/04 (Fri)		Pre-Survey of Car Owner Interview Survey
28/04 (Sat)		Explanation of Zoning Map to State Government
29/04 (Sun)		
30/04 (Mon)	Nishimura visited Kuala Lumpur	Request of data for Malayan Railway
01/05 (Tues) Holiday	One Mission Member (Iimuro) arrived in Kuala Lumpur	
02/05 (Wed)	Iimuro, Nishimura moved to Penang. Watanabe, Imai visited Kuala Lumpur	Start Road-Side Tree Survey in Penang Island
03/05 (Thur)		Data Collection from H.P.U. (KL)

Conti./

DATE	SCHEDULE	STUDY RECORD
04/05 (Fri)		Discussion about Usage of Computer in USM.
05/05 (Sat)	Watanabe, Imai moved to Penang	
06/05 (Sun)		
07/05 (Mon)		Sending Notification for Car Owner.
08/05 (Tue)		Sending Notification for Car Owner
09/05 (Wed)		Sending Notification for Car Owner
10/05 (Thur)	Holiday	
11/05 (Fri)		Start Parking Survey (Survey for Driver)
12/05 (Sat)		
13/05 (Sun)		
14/05 (Mon)		Preparation of Sub-Committee
15/05 (Tue)	Sub-Committee with Counter Parts	

Conti./

DATE	SCHEDULE	STUDY RECORD
16/05 (Wed)	Interview for Interviewers	
17/05 (Thur)		
18/05 (Fri)		Preparation of pre-survey
19/05 (Sat)		Preparation of Techical Committee
20/05 (Sun)		
21/05 (Mon)	Technical Committee Presentation of Survey Method	
22/05 (Tues)	Watanabe visited Kuala Lumpur	Request of Contribution for U.S.M.
23/05 Wed)		Hearing from MINCO (KL)
24/05 (Thur)		Data Collection from Malayan Railway (KL)
25/05 (Fri)		Start Bus Passengers Survey
26/05 (Sat)		Data Collection from J.K.R. (KL)
27/05 (Sun)	Watanabe went back to Penang	

Conti./

DATE	SCHEDULE	STUDY RECORD
28/05 (Mon)		Preparation of Cordon-Line Survey
29/05 (Tues)		Start Taxi Survey
30/05 (Wed)		Start Private Company Vehicle Survey
31/05 (Thur)	Watanabe left for Japan	Request of Contribution for Cheif Police Officer. Preparation of explanation for Interviewer.
01/06 (Fri)	One member of Study Team, Ohtsu, arrived in Penang	Explanation for Interviewers.
02/06 (Sat)		Explanation for Interviewers.
03/06 (Sun)		
04/06 (Mon)		Start Car Owner-Interview Survey Explanation for Survey Explanation for Surveyor
05/06 (Tues)		Cordon-Line Survey (Stn. 2, 3 & 4) Screen-Line Survey (Stn. SP 1 & SB 1)
06/06 (Wed) Holiday		

Conti./

DATE	SCHEDULE	STUDY RECORD
07/06 (Thur)		Cordon Line Survey (Stn. 8, 11 & 12) Screen Line Survey (Stn. SP 2 & SB 2)
08/06 (Fri)		Intersection Survey (Stn. IP 1 & IB 1)
09/06 (Sat)		
10/06 (Sun)		
11/06 (Mon)		Cordon Line Survey (Stn. 1, 5 & 6) Screen Line Survey (Stn. TB 1) Traffic Volume Counting (Stn. 7, 9 & 10)
12/06 (Tues)		Cordon Line Survey (Stn. 7, 9 & 10) Screen Line Survey (Stn. TP 2) Traffic Volume Counting (Stn. TB 2)
13/06 (Wed)		Ferry Survey Screen Line Survey (Stn. TP 3) Traffic Volume Counting (Stn. TB 3)
14/06 (Thur)		Intersection Survey (Stn. IP 2 & IB 2)
15/06		Intersection Survey (Stn. IP 3 & IB 3)

Conti./

DATE	SCHEDULE	STUDY RECORD
16/06 (Sat)		
17/06 (Sun)		
18/06 (Mon)		Start Coding of Cordon Line
19/06 (Tue)		
20/06 (Wed)	Courtesy Call for the President of the Municipality of Pulau Pinang	
21/06 (Thur)		
22/06 (Fri)		
23/06 (Sat)		Finish Car Owner Interview Survey
24/06 (Sun)		
25/06 (Mon)		Start Parking Capacity Survey
26/06 (Tue)		Start Coding of Car Owner Interview Survey
27/06 (Wed)		

Conti./

DATE	SCHEDULE	STUDY RECORD
28/06 (Thur)	Imai, Otsu Visited Kuala Lumpur	Data Collection from JKR (KL)
29/06 (Fri)		Data Collection from JKR (KL)
30/06 (Sat)		
01/07 (Sun)	Watanabe arrived in Kuala Lumpur from Japan. Imai, Otsu went back to Penang	
02/07 (Mon)	Watanabe moved to Penang	Preparation for Technical Committee
03/07 (Tues)		Preparation for Technical Committee
04/07 (Wed)	Technical Committee Presentation of rough results of Survey	
05/07 (Thur)		Start Survey for Whole Saler
06/07 (Fri)		Ferry Survey
07/07 (Sat)		Reporting
08/07 (Sun)		

Conti./

DATE	SCHEDULE	STUDY RECORD
09/07 (Mon)		Traffic Generation Survey (Stn. P-1, P-2 & I-1)
10/07 (Tues)		Traffic Generation Survey (Stn. I-2, R-1 & S-1)
11/07 (Wed)		Traffic Generation Survey (Stn. R-2 & R-2)
12/07 (Thur)		Reporting
13/07 (Fri)		Reporting
14/07 (Sat)		Reporting
15/07 (Sun)		
16/07 (Mon)		Reporting
17/07 (Tues)	Ichihara and One Mission Member Okutsu arrived in Penang	
18/07 (Wed)		Reporting
19/07 (Thur)		Reporting
20/07 (Fri)		Reporting

Conti./

DATE	SCHEDULE	STUDY REPORT
21/07 (Sat)		Reporting
22/07 (Sun)		
23/07 (Mon)		Reporting
24/07 (Tue)		Reporting
25/07 (Wed)		Reporting
26/07 (Thur)		Reporting
27/07 (Fri)		Reporting
28/07 (Sat)		Reporting
29/07 (Sun)		Reporting
30/07 (Mon)		Reporting
31/07 (Tues)		Reporting

Appendix C.

List of Contributers

1. Economic Planning Unit (Kuala Lumpur)
   Mr. Bashah Nordin - Director.
   Miss Leong So Seh - Secretary.

2. Public Works Department (Kuala Lumpur)
   Highway Planning and Public Transport Unit.
   Mr. Zaidan Bin Haji Othman - Director.
   Mr. Ong Eng Poe.
   Mr. Amir Kasim
   Mr. Lee Kee Ching
   Mr. Chai Yen Chong - Linkage Project Office
   Mrs. Wong

3. Statistical Department (Kuala Lumpur)
   Mrs. Norma Md. Aris
   Mr. Mohd. Yanos

4. Malayan Railway (Kuala Lumpur)
   Mr. Masri Ahmad - Head of Planning Unit
   Mr. Abdul Malek

5. Survey Department (Kuala Lumpur)
   Mr. Aw Kheng Huak

6. State Economic Planning Unit, Penang.
   Mr. Mohd. Zuhuri Bin Saleh - Director
   Mr. Saikhol Rosli Bin Sabdin - Assistant Director

7. Town & Country Planning Department, Penang.
   Mr. Zam Bin Mohd. Zain
   Mr. Chong Kui

8. Public Works Department, Penang
   Mr. Koo Kok Ee - Director
   Mr. Kho Soo Teong
   Mr. Lee Wee Pho
   Mr. Kho Thean Hoo
   Mr. Chew Sim Liang

9. Pulau Pinang Municipality Council
   Mr. Thomas Gan - Director of Engineering Section
   Mr. Hua Keng Tong
   Mr. Lim Cheng Kwi
   Mr. Tan Thean Siew
   Mr. Oo Gin Hai
   Mr. Koay Hean Hock

10. Seberang Prai Municipality Council
   Mr. Ong Chow Meng
   Mr. Mohd. Noor Ayob

11. Penang Port Commission
   Mr. Yeap Chong Beow
   Mr. Idris Bin Muda - Ferry Manager
   Mr. Abdul Karim Bin Samiwsan - Traffic Supervisor

12. Penang Development Corporation
   Miss Khoo Beng Jong - Manager of Research & Planning Division.
   Mr. Chee Yoon Fatt - Assistant Manager of Promotion Division
   Mr. Chong Lai Chin

13. Road Inspection Motor Vehicle, Penang.
   Mr. Kamal Ariffin - Director
   Mr. Rohani Bin Walat

14. Chief Police Office
   Mr. Abdul Hamid - Chief Police Officer
   Mr. Abdul Aziz Ujang

15. Butterworth District Police
   Mr. Tuffile Nawab Din
   Inspector Daud Ahmad
   Inspector Mustafa

16. Survey Department, Penang.
   Mr. Nik Hashim Bin Nik Manshol

17. Universiti Sains Malaysia

Mr. Noel A. Ogle - Registrar

Mr. Leong Hing Fatt

Dr. Lim Huat Seng - Computer Coordinator

Mr. Hideaki Hoshina - Colombo Plan Expert

18. Japan External Trade Organization, Kuala Lumpur

Mr. Hitoshi Ogami

Mr. Masayoshi Takata.

Appendix. D.

List of Data Collected.

1. Study Report
2. Governmental Issues and Statistical Data
3. Specialized Data & Information Maps.

1. Study Report

1 - 1	Penang Master Plan 1970. Vol. I - III/Tourism (1969) (Robert Nathan/Consulting Economist)	
1 - 2	Traffic Study Part I/II 1973. Central Area of Georgetown (OVE ARUP & PARTNERS)	borrowed from MPPP
1 - 3	Full F/S of Fixed Linkage (1974. Final Report/1972, Interim Report)	
1 - 4	Penang Island Traffic Dispersal Study 1977 Vol. I - V (MINCO)	
1 - 5	Georgetown Traffic Studies April - July 1977	borrowed from MPPP
1 - 6	Georgetown Intersection Traffic Studies School of H.B.P. 1977/78 M.P.P.P.	borrowed from MPPP
1 - 7	Capacity of the Penang Ferry Service: 3 Vols. 1978. (SURUHANJAYA PELABUHAN)	borrowed from Penang Port Commission
1 - 8	East-West Highway - 1978 Interim Report Vol. 1 - Part 1 F/S: Supporting Road Systems (MINCO)	
1 - 9	F/S: Alor Star - Changkat Jering - 1979 incl. Toll Application - JKR Jan., 1979 (JURUTERA)	
1 - 10	"Regional Study, Seberang Perai" 1977/78 Graduate Planning Workshop II HEP 502	

1 - 11 "Initial Study for Pulau Pinang Structure Plan"
1977 Graduate Planning Workshop II
HBP

1 - 12 "A Socio-Economic Study of Trishawmen in Pulau Pinang"
1978 Socio-Economic Research & General Planning Unit,
Prime Minister's Department.

2 Governmental Issues and Statistical Data.

2 - 1 THE THIRD MALAYSIA PLAN
1976 - 1980

2 - 2 MID-TERM REVIEW OF THE THIRD MALAYSIA PLAN
March, 1979

2 - 3 INVESTMENT GUIDE TO PENANG
incl. List of Establishments in Industrial Estates
1979

2 - 4 POPULATION STUDY FOR PENANG ISLAND REPORT
U. S. M.

2 - 5 POPULATION PROJECTIONS FOR THE STATES OF PENINSULAR MALAYSIA
1970 - 1980 Department of Statistics

2 - 6 ANNUAL STATISTICAL BULLETIN MALAYSIA
1977 - 1975 Department of Statistics

2 - 7 SOCIAL STATISTICS BULLETIN PENINSULAR MALAYSIA
1976 Department of Statistics

2 - 8 SURVEY OF CONSTRUCTION INDUSTRIES
1974 Department of Statistics

2 - 9 MONTHLY STATISTICAL BULLETIN PENINSULAR MALAYSIA
March, 1979 Department of Statistics

2 - 10 SHIPPING STATISTICS PENINSULAR MALAYSIA
1975 Department of Statistics

2 - 11 BY-LAWS WITH RESPECT TO BUILDING AND NEW STREETS
City Council of Georgetown, Penang.

2 - 12 NATIONAL LAND CODE
(Act 56 of 1965)

2 - 13 1970. POPULATION & HOUSING CENSUS OF MALAYSIA
Urban Connurbations

2 - 14 IBID. CENSUS; VOL. - I. PART I
Population Tables (Penang & Prov. Wellesley)

2 - 15 IBID. CENSUS; VOL. - I. PART II
Housing Tables (Penang & Prov. Wellesley)

2 - 16 IBID. CENSUS; VOL. - II. PART II
Housing Tables (Town & Villages)

2 - 17 IBID. CENSUS;
Community Groups

2 - 18 IBID. CENSUS;
Age Distributions

3. Specialized Data & Information Maps

3 - 1 TRAFFIC CENSUS DATA BY J.K.R.
1. Traffic Volumn 1970 - 1976 (sorted by district)
2. Some analized data of April, 1978
3. Original data of April, 1979

3 - 2 O-D NATIONAL SURVEY 1977

3 - 3 BUS ROUTE - CITY OF GEORGETOWN
Scale: 5 in. = 1 mile

3 - 4 ONE WAY STREETS (GEORGETOWN)
Scale: 5 in. = 1 mile

3 - 5 PROPOSED CAR PARKING SPACE/G.T.
(detailed location maps)

3 - 6 POPULATION AND HOUSING CENSUS 1970
(GEORGETOWN)
Scale: 5 in = 1 mile

3 - 7 POPULATION BY TOWN SECTION
(GOERGETOWN)
Scale: 1 in. = 850 ft.

3 - 8 GROSS POPULATION DENSITY DISTRIBUTION
GEORGETOWN 1970
Scale: 1 in. = 850 ft.

3 - 9 HOUSEHOLD SIZE DISTRIBUTION FOR GEORGETOWN, PENANG. 1970
Scale: 1 in. = 850 ft.

3 - 10 POPULATION AREA & DENSITY
(GEORGETOWN)
Scale: 1 in. = 850 ft.

3 - 11 POPULATION DENSITY
(GEORGETOWN)
Scale: 1 in. = 850 ft.

3 - 12 PROJECTED POPULATION 1994
(GEORGETOWN)
Scale: 1 in. = 850 ft.

3 - 13 POPULATION DISTRIBUTION/ PENANG
by Towns, Community Groups density
Scale: 1 in. = $\frac{1}{2}$ mile

3 - 14 POPULATION GROWTH/ PENANG
1947 - 57 : Annum % 7 grading
Scale: 1 in. = $\frac{1}{2}$ mile

3 - 15 POPULATION GROWTH/ PENANG
1957 - 70 : Annum % 7 grading
Scale: 1 in. = $\frac{1}{2}$ mile

3 - 16 1970 POPULATION/ PENANG
by Boundary of Census District/Circle/Enumeration Block

3 - 17 EXISTING LAND USE
(National Mapping 1975 - Survey Department)
Scale: 1 in. = 1 mile

3 - 18 EXISTING LAND USE
(GEORGETOWN)- MPPP
Scale: 5 in. = 1 mile
detailed - 21 items

3 - 19 EXISTING LAND USE
(GEORGETOWN)
Scale: 1 in. = 850 ft.

3 - 20 LAND USE ZONING MAP (INTERIM)
(PENANG ISLAND)
Scale: 1 in. = $\frac{1}{2}$ mile

3 - 21 LAND VALUES/ A PART OF GEORGETOWN - MPPP
11 gradings
Scale: 5 in. = 1 mile

3 - 22 DEVELOPMENT PRESSURE/ GEORGETOWN - MPPP
(1976/1977) 2 sheets, 5 categories
Scale: 5 in. = 1 mile

3 - 23 PENANG DEVELOPMENT TARGET/ PENANG/ S. PERAI - PDC
Scale: 1 in. = 1 mile

3 - 24 DEVELOPMENT PROGRAMME/ PENANG/ S. PERAI - PDC
Negeri P. Pinang - Location of Projects - Blank Map
Scale: 1 in. = 1 mile

3 - 25 BANDAR BAYAN BARU - PDC
Scale: Appox. 1:3000

3 - 26 PRAI INDUSTRIAL COMPLEX - PDC
Scale: 1 in = 8 chain

3 - 27 BANDAR SEBERANG JAYA - PDC

Scale: 1 in. = 8 chain

3 - 28 BAYAN LEPAS FREE TRADE-ZONE

Phase I - II

Scale: 1 in. = 132 ft.

Phase III

Scale: 1 in. = 1,584 ft.