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

MALAYSIA

TRAFFIC GENERATION
INTERSECTION
TRAFFIC VOLUME COUNTING
TRAVEL TIME & RUNNING SPEED SURVEY
QUESTIONNAIRES TO PEDESTRIANS

TECHNICAL REPORT — 07

AUGUST, 1979

[redacted]

JAPAN INTERNATIONAL COOPERATION AGENCY

This report is a supplement to the main report of our study and it is written to meet the pressing demand for a technical report presently. Although this report fails to meet the requirement of a complete technical report, it may be rewritten in a more refined form for future use. This report section by section would be especially useful as a reference for various purposes, for example, manual of survey, data edition, explanation of methodology, detailed analysis, etc.

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1. TRAFFIC GENERATION.

The purpose of this survey is to ascertain the traffic volume to and from some typical urban establishments, (facilities), eg. Ports, Airports, Industrial Estates, Shopping Complexes, Office Buildings, Residential Estates and so on.

Generally speaking, the volume of traffic generation and attraction depends on the type of facilities and the size and location of the estates. Also, the composition by type of vehicles to these facilities are quite different from each other.

And so, the following urban facilities were chosen:

a) Ports.

b) Airports.

c) Industrial Estates.

d) Residential Estates.

e) Shopping and Office Complexes.

1-1 SURVEY STATIONS.

First, we discussed the selection of objectives together with our colleagues from M.P.P.P. A reconnaissance survey was conducted to determine the stations for counting and the work schedule for the surveyors was drawn up.

1-2 SURVEY PROCEDURE.

At each station was one assistant supervisor and two counters to count and record the volume of traffic by vehicle type for every hour. The counting commenced from 6.00 am. and continued up to 10.00 pm, which is the same duration as the other traffic counting surveys.

The classification of vehicle type was done in the same way as in the cordon-line survey which is as follows.

At two stations, the shopping and office complexes, we could not count all the incoming and outgoing vehicles because there were too many vehicles parked at the road-side some distance from the buildings. Thus, we could only count the vehicles moving in and out of the entrance of the car park.

The following stations were selected from the results.

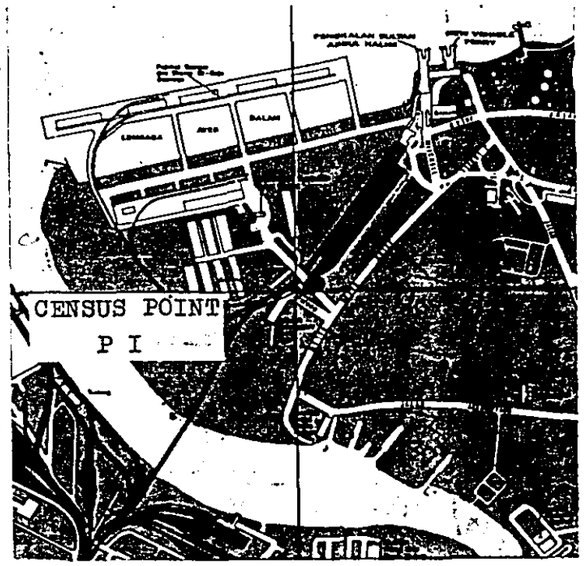
Table 1. SELECTED SURVEY STATIONS.

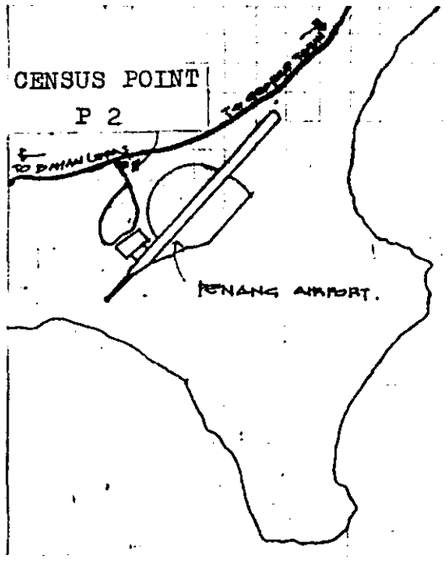
Type of facilities		Survey dates.
Ports	P-1 the entrance to Butterworth port.	09, July (Mon)
Airports	P-2 the entrance to Bayan Lepas Internation Airport.	09, July (Mon)
Industrial Estates	I-1 the entrance to Bayan Lepas free trade zone III.	09, July (Mon)
	I-2 the overhead bridge to Prai Industrial Estate.	10, July (Tue)
Residentrial Estates	R-1 two approach roads to Island Glades, Green Lane.	10, July (Tue)
	R-2 two access roads to Minden Heights.	11, July (The)
Shooping and Offices Complexes	S-1 the entrance to the parking at KOMTAR.	10, July (Tue)
	S-2 the entrance to the parking at Wisma Central.	11, July (Wed)

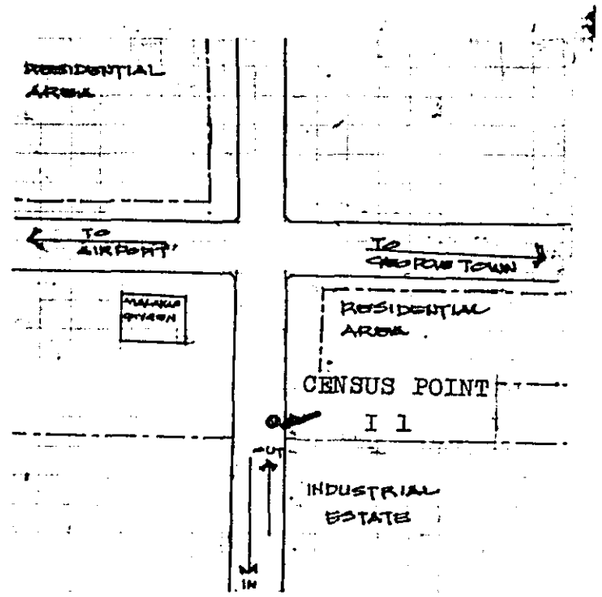
Those above stations are illustrated in the map below.

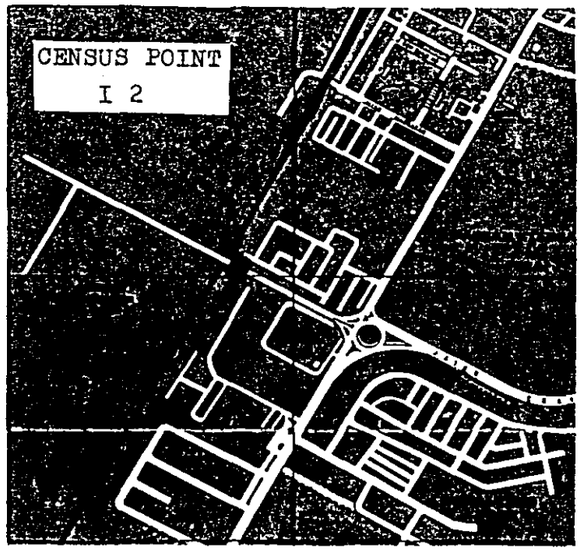
FIGURE 1

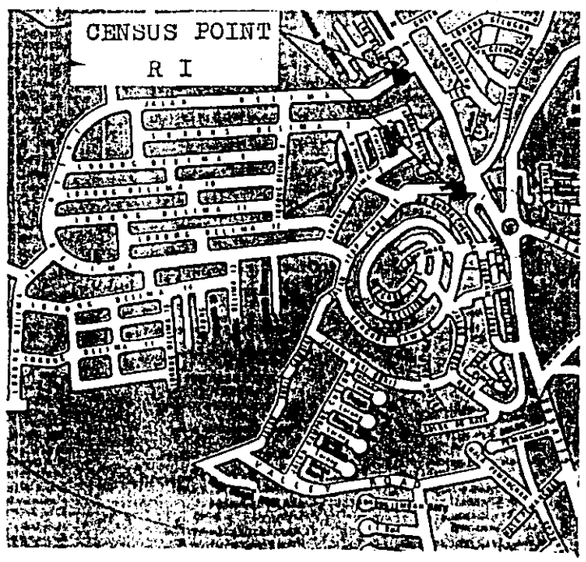
Location of stations.

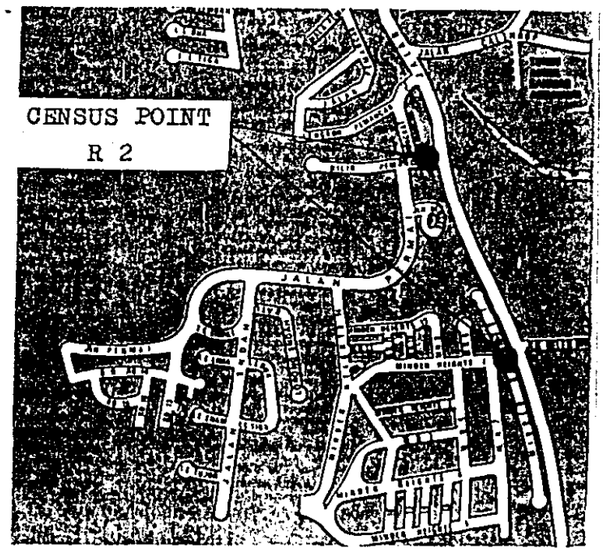












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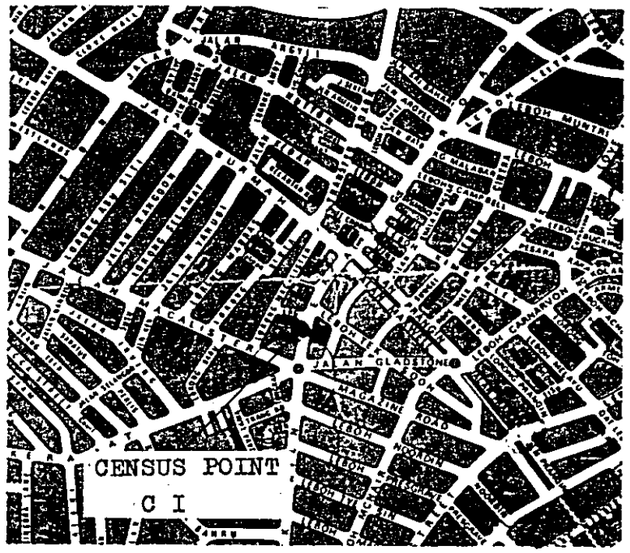
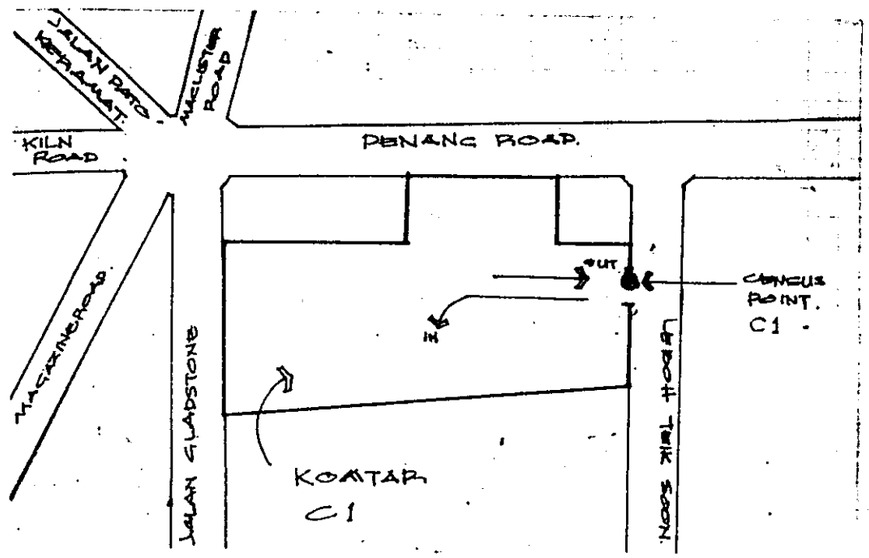
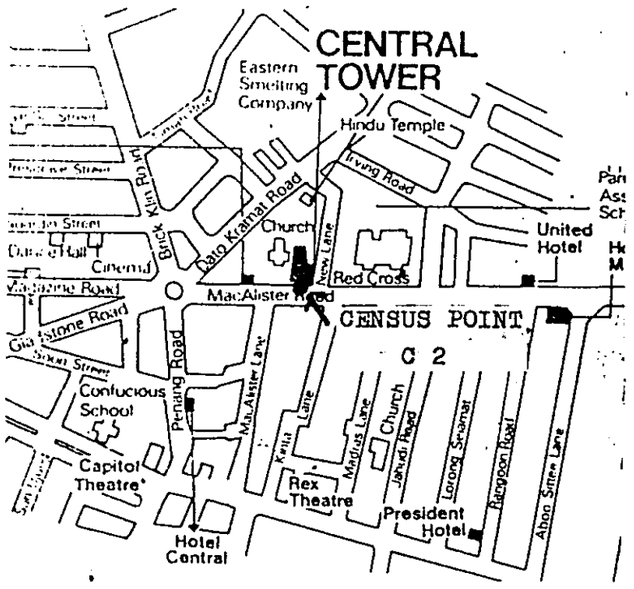

CENSUS POINT
C I


JALAN DATO KRAMAT
MACALISTER ROAD
KILN ROAD
PENANG ROAD
OUT
IN
CENSUS POINT. C1
MACKINNON ROAD
JALAN GLADSTONE
KOMTAR
C1
NORTH TRUNK ROAD


CENTRAL TOWER
Eastern Smelting Company
Hindu Temple
Irving Road
Kilin Road
Brick
Dato Kramat Road
Church
New Lane
United Hotel
Cinema
Red Cross
MacAlister Road
CENSUS POINT
C 2
Gladstone Road
Penang Road
Confucious School
Capitol Theatre
Rex Theatre
President Hotel
Hotel Central
Lorong Semantan
Batgoon Road
Abon Sitteh Lane

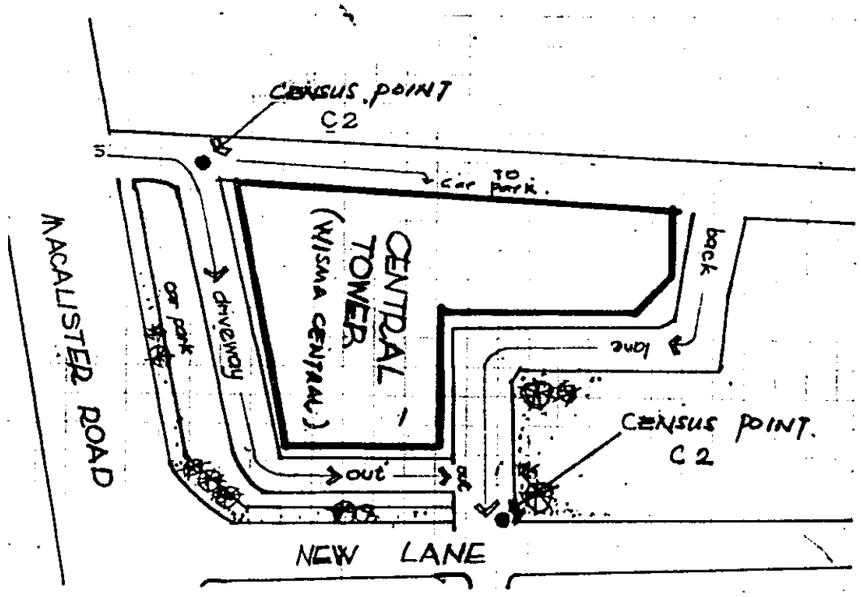

CENSUS POINT
C2
Car TO Park.
MACALISTER ROAD
CENTRAL TOWER (WISMA CENTRAL)
driveway
car park
back
out
CENSUS POINT. C2
NEW LANE

FIG 2 A COPY OF THE SURVEY SHEET.

Mini Cordon Line Traffic Survey

STATION TYPE	NO.	Direction	Date	Name of Surveyor	Name of Supervisor	Sheet No
		IN / OUT				

Type / Time Zone	(1) Motor Cars	(2) Taxis	(3) Vans & Pick - Ups	(4) Medium Size Lorries	(5) Lorries with 3 Axles & Trailers	(6) Buses	(7) Motor Cycles And Scooters	(8) Others	(9) TOTAL
6 - 7									
7 - 8									
8 - 9									
09 - 10									

Also the movements of vehicles during the office hours is almost non-existent. Therefore the duration of the survey at two stations was shortened to 8.00 am to 10.00 pm.

1-3 THE RESULTS.

The results of the traffic counting are shown in following tables and figures.

1-4 ANALYSIS.

From the results of this survey, the volume of traffic which is dependent upon the various urban facilities can be ascertained. The unit volume of traffic generating from each type of facility can be determined from the correlation of the traffic volume to the size of the facility. This unit is usually shown as 'vehicles/day. ha' or 'vehicles/hour. ha'. In order that this unit can be estimated, more information on these facilities is necessary. These information have yet to be collected. When the data has all been collected, analysis will be redone and better results is expected.

TABLE 2 SUMMARIZED RESULTS OF TRAFFIC COUNTING.

	STATION P1 (B'WORTH PORT)			ST. P2 (BAYAN LEPAS AIRPORT)		
TIME	IN	OUT	TOTAL	IN	OUT	TOTAL
6 - 7	42	59	101	184	110	294
7 - 8	540	155	695	80	72	152
8 - 9	340	175	515	65	33	98
9 -10	216	218	434	84	43	127
10-11	227	267	494	111	90	201
11-12	266	252	618	53	69	122
12-13	263	347	610	88	54	142
13-14	247	134	381	111	80	191
14-15	338	264	602	103	65	168
15-16	272	345	617	38	56	94
16-17	139	401	540	63	61	124
17-18	84	210	294	54	52	106
18-19	65	167	232	114	124	238
19-20	77	170	247	60	101	161
20-21	101	42	143	42	51	93
21-22	30	62	92	61	52	113
TOTAL	3247	3368	6615	1311	1113	2424

TABLE 3 SUMMARIZED RESULTS OF TRAFFIC COUNTING.

	STATION I1 (BAYAN LEPAS FTZ)			STATION I2 (PRAI INDUSTRIAL)		
TIME	IN	OUT	TOTAL	IN	OUT	TOTAL
6 - 7	163	93	256	390	84	474
7 - 8	471	205	676	1319	387	1706
8 - 9	398	221	619	1236	360	1596
9 -10	149	125	274	392	353	745
10-11	148	126	274	391	392	783
11-12	110	113	223	370	474	844
12-13	80	153	233	502	818	1320
13-14	93	97	190	551	402	953
14-15	233	190	423	669	369	1038
15-16	186	162	348	435	644	1079
16-17	146	304	450	374	769	1143
17-18	155	419	574	246	1303	1549
18-19	81	109	190	221	419	640
19-20	26	79	105	131	317	448
20-21	20	31	51	99	174	273
21-22	56	20	76	75	84	159
TOTAL	2515	2447	4962	7401	7349	15788

TABLE 4 SUMMARIZED RESULTS OF TRAFFIC COUNTING.

	STATION R1 (GREEN LANE/JLN (Y.C.ER) DELIMA)			STATION R2 (GLUGOR/MINDEN HEIGHT)		
TIME	IN	OUT	TOTAL	IN	OUT	TOTAL
6 - 7	221	515	736	93	225	318
7 - 8	513	968	1481	192	496	688
8 - 9	437	863	1300	247	470	717
9 -10	393	496	862	232	368	600
10-11	355	342	697	283	360	643
11-12	386	348	734	240	299	539
12-13	556	539	1095	353	330	683
13-14	645	678	1323	404	362	766
14-15	347	403	750	355	381	736
15-16	278	259	537	225	250	475
16-17	591	347	938	325	232	557
17-18	712	481	1193	481	335	816
18-19	823	604	1427	321	303	624
19-20	592	529	1121	285	322	607
20-21	517	542	1059	286	337	623
21-22	419	354	773	258	190	448
TOTAL	7785	8268	16026	4580	5260	9840

TABLE 5 SUMMARIZED RESULTS OF TRAFFIC COUNTING.

	STATION C1 (KOMTAR)			STATION C2 (WISMA CENTRAL)		
TIME	IN	OUT	TOTAL	IN	OUT	TOTAL
6 - 7						
7 - 8						
8 - 9	66	20	86	74	23	97
9 -10	73	42	115	54	33	87
10-11	123	89	212	53	43	96
11-12	142	116	258	52	47	99
12-13	70	84	154	52	51	103
13-14	109	74	183	51	50	101
14-15	130	101	231	68	65	133
15-16	68	102	170	46	47	93
16-17	36	100	136	42	75	117
17-18	31	72	103	57	85	142
18-19	50	68	118	40	49	89
19-20	50	47	97	51	42	93
20-21	44	42	86	61	45	106
21-22	27	41	68	31	87	118
TOTAL	1019	998	2017	732	742	1474

FIG 3 HOURLY PATTERN OF TRAFFIC FLOW

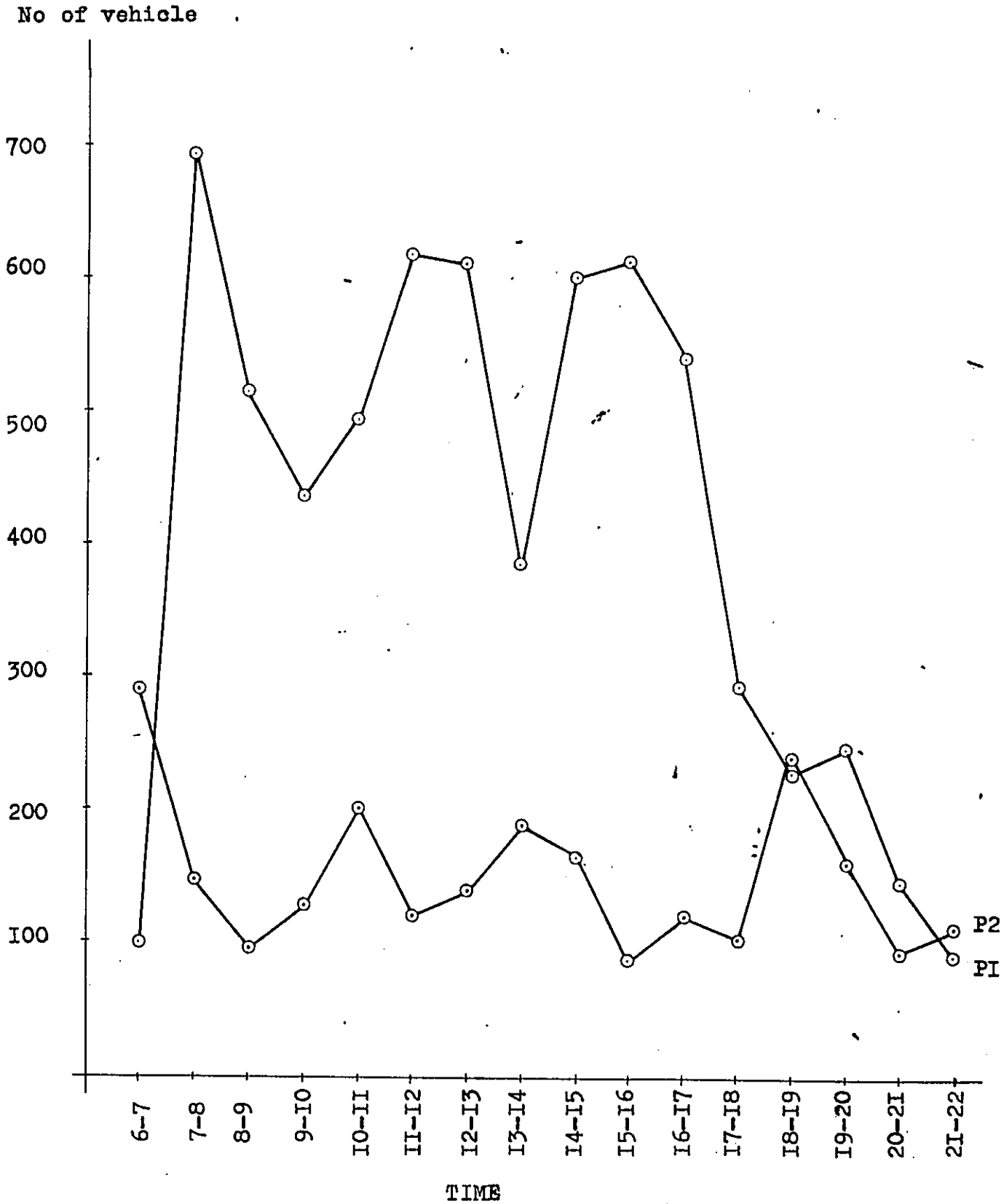


FIG 4 HOURLY PATTERN OF TRAFFIC FLOW

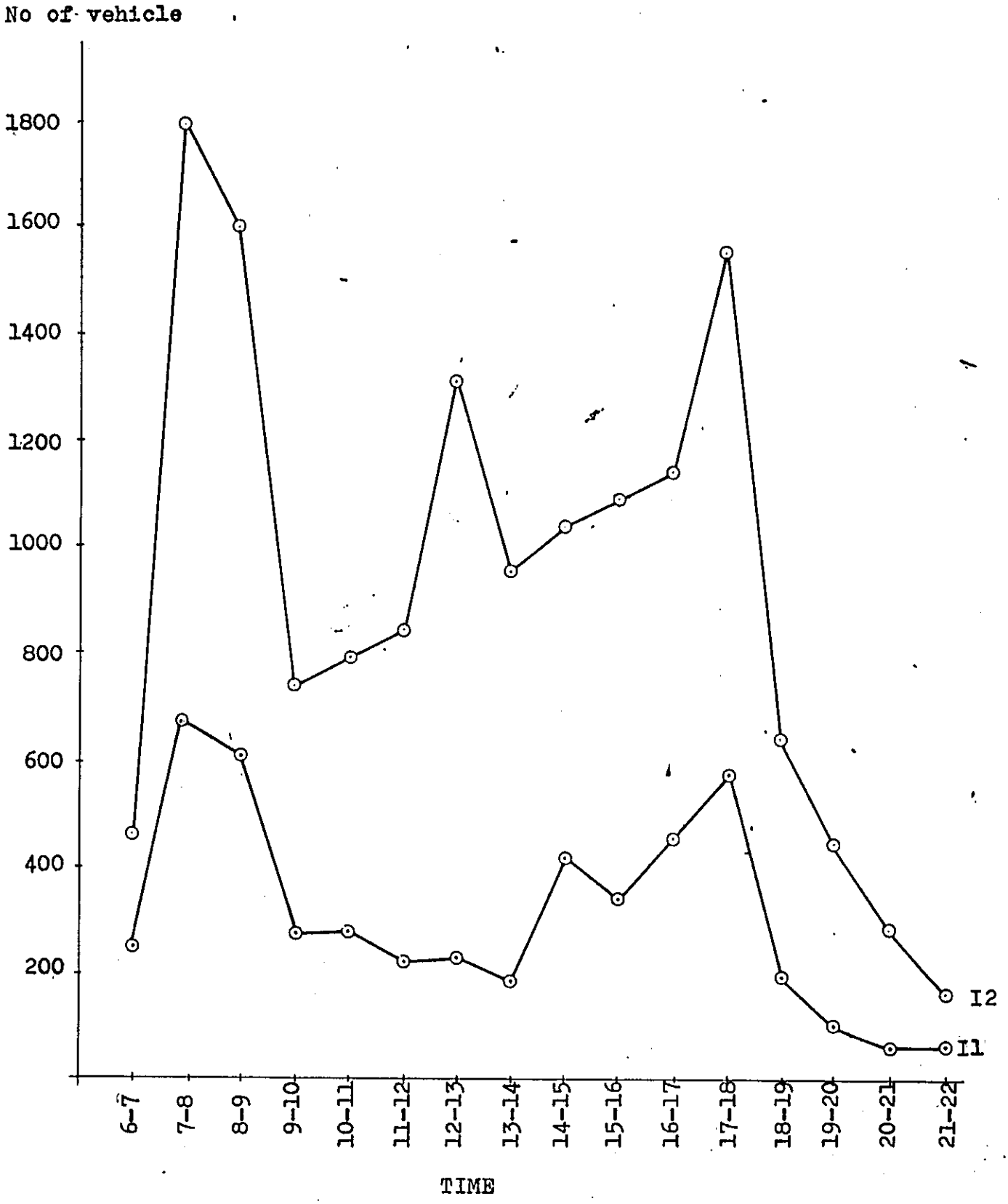


FIG 5 HOURLY PATTERN OF TRAFFIC FLOW

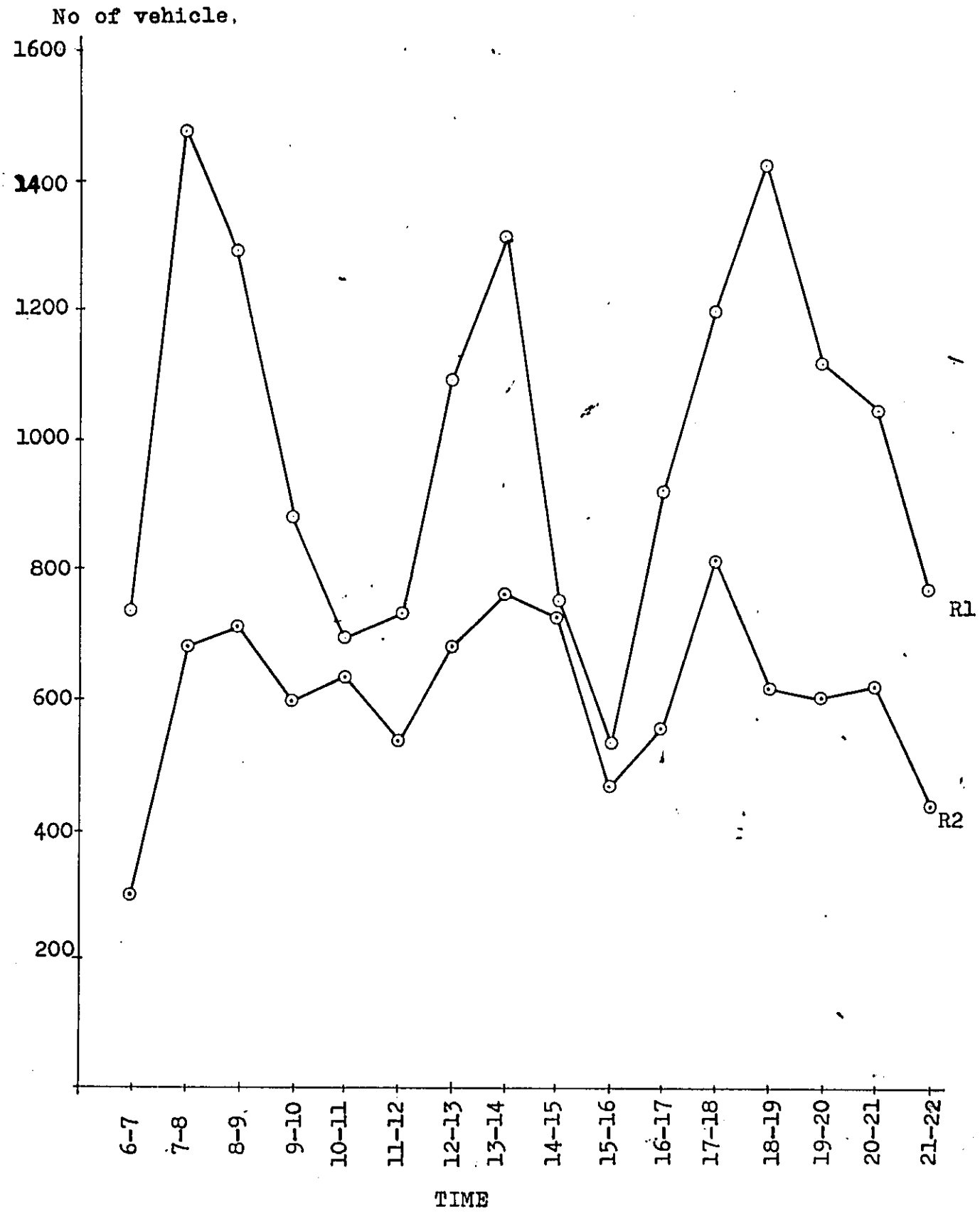
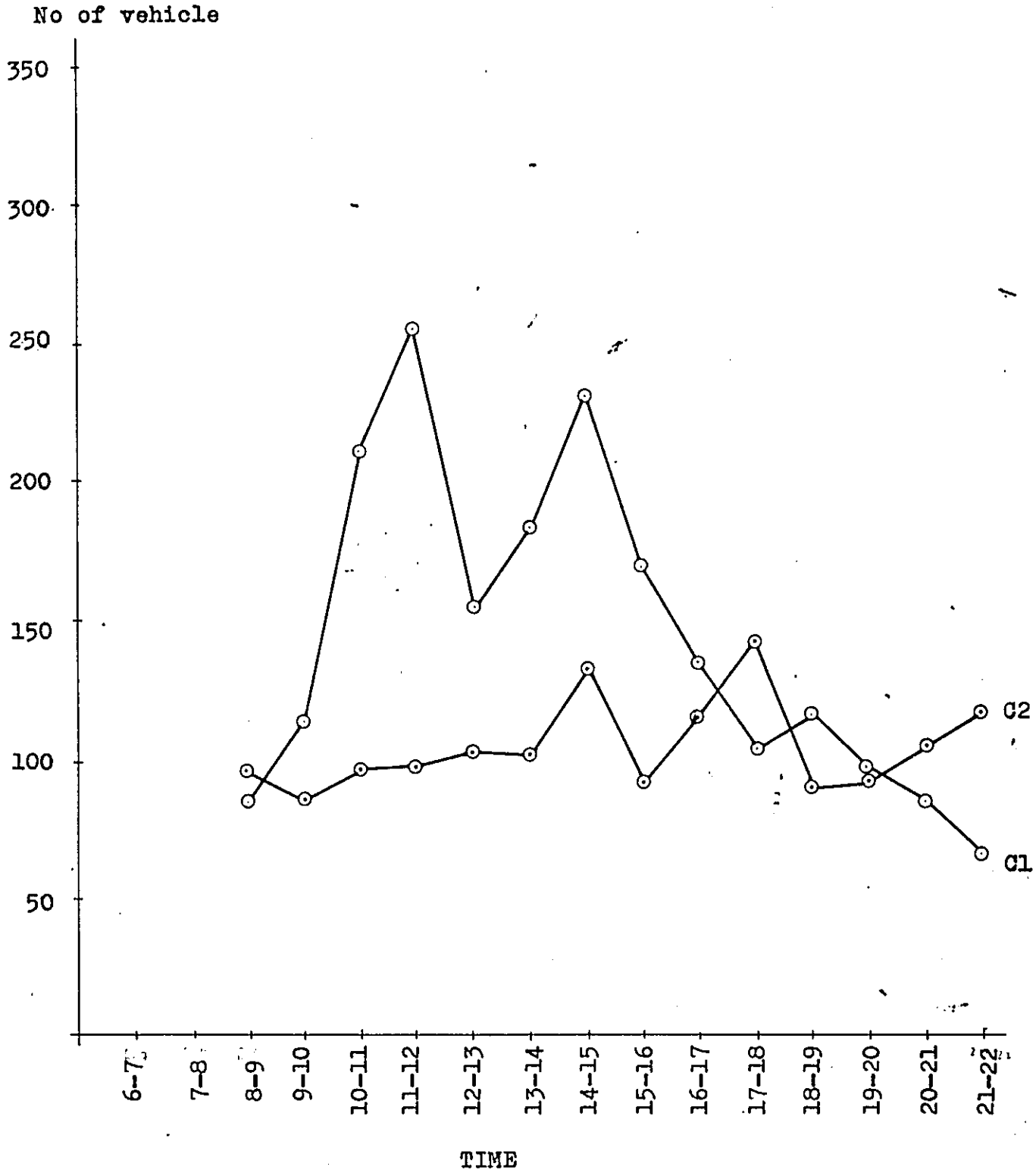


FIG 6 HOURLY PATTERN OF TRAFFIC FLOW



2 INTERSECTION SURVEY

This report only describes the results of the survey for intersections with neither analysis nor proposal for improvement given. This aspect will be studied at a later stage of the study.

2-1 PREVIOUS SURVEY OF INTERSECTIONS

In 1977, 10 intersections in George Town were surveyed. ("George Town Intersection Traffic Study, School of Housing and Planning, Majlis Perbandaran Pulau Pinang 1977"). Most of the major intersections in George Town were covered by this study. Therefore our survey was done in a line to supplement the previous one.

Fig. 7a Location of Intersection

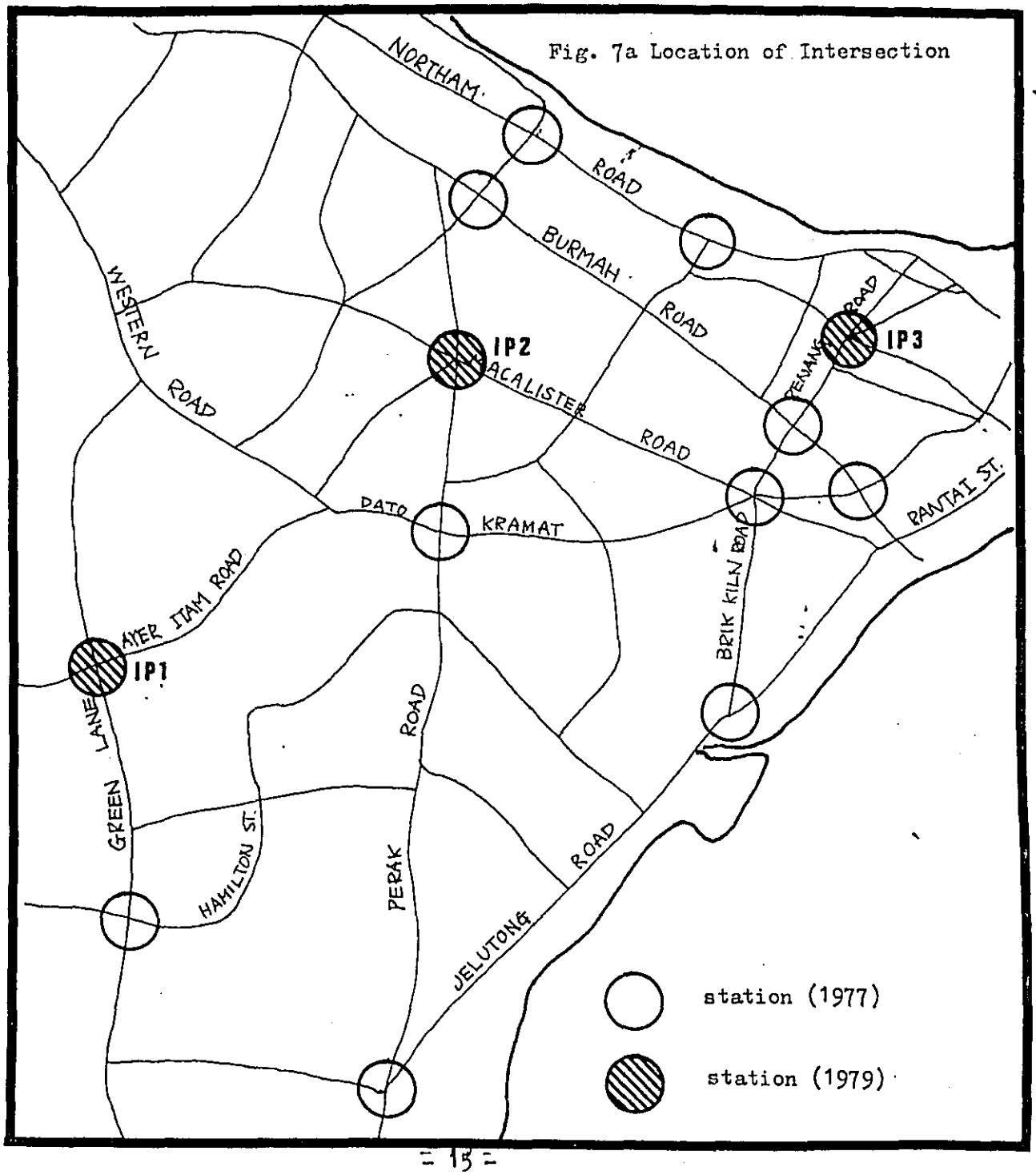


Fig. 7b. Location of Stations.

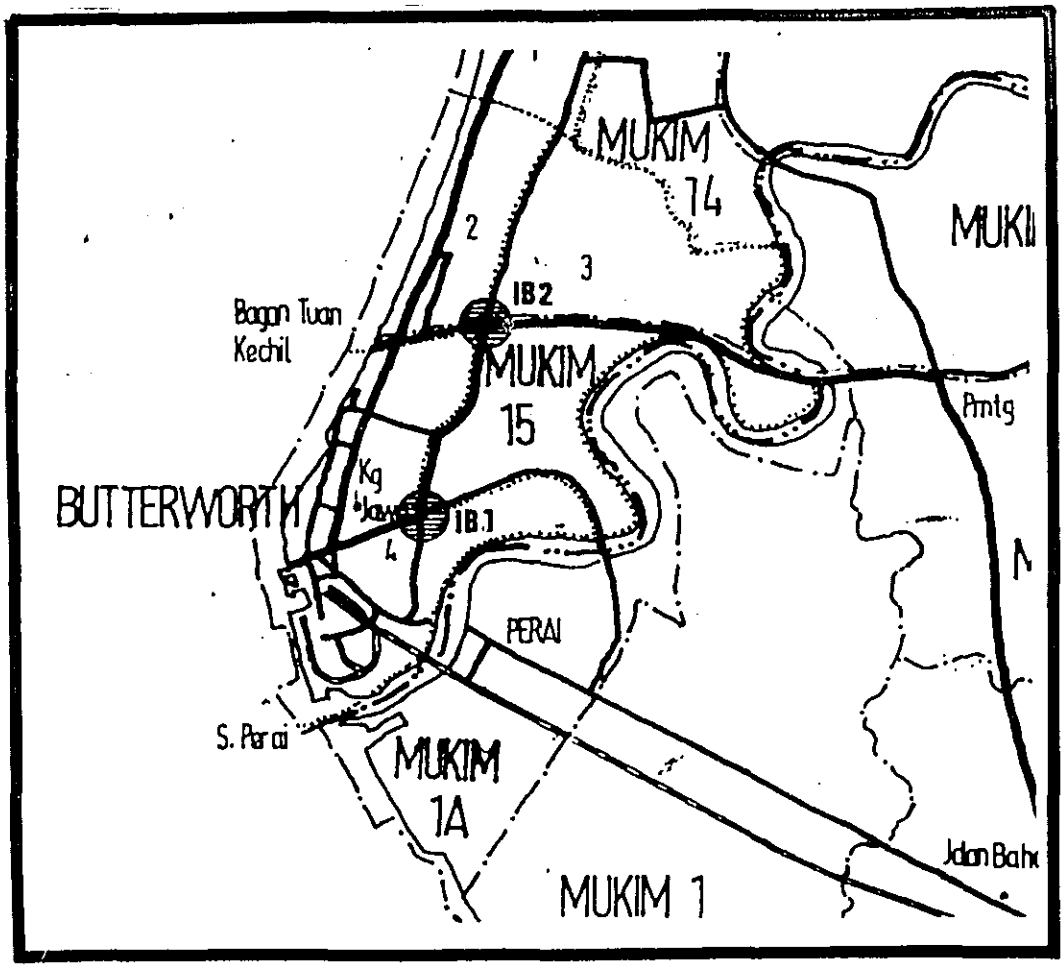
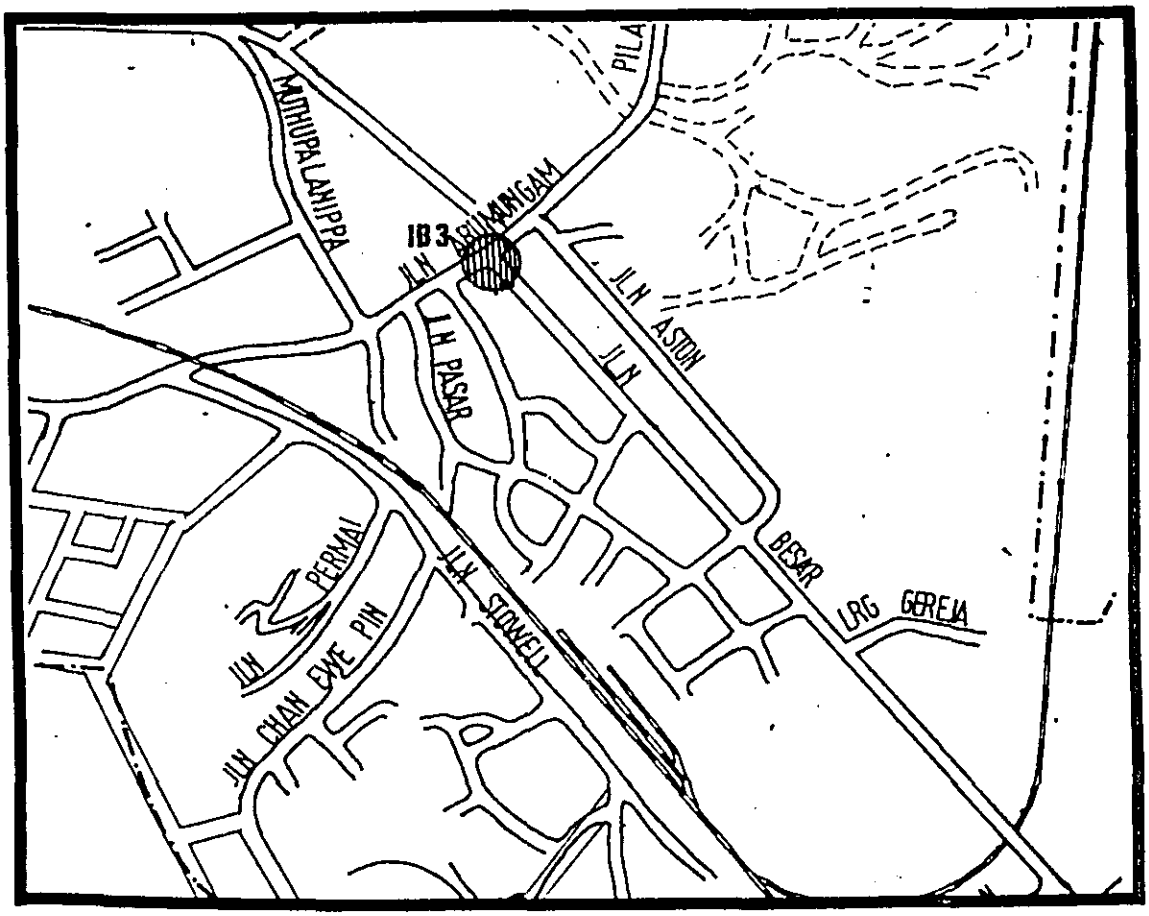


Fig. 7c. Location of Stations.



2 - 2 LOCATION OF THE INTERSECTIONS SURVEYED

In addition to the intersections surveyed previously, 3 intersections in George Town and also 3 intersections in Province Wellesly were selected after discussion with personnel from the local municipalities. (Fig. 7a - Location of Intersections. Table 6 - List of Intersections)

Table 6 - List of Intersections

CODE-NO	NAME OF ROADS	DATE OF SURVEY	TRAFFIC SIGNAL
IP-1	1) Scotland Road 2) Air Itam Road 3) Dato Kramat Road 4) Green Lane	Friday 8.6.1979	Roundabout
IP-2	1) Perak Road 2) Macalister Road 3) Barrack Road	Thursday 14.6.1979	Roundabout
IP-3	1) Penang Road 2) Argyll Road 3) Chulia Street 4) Leith Street	Friday 15.6.1979	Traffic Lights
IB-1	1) Chain Ferry Road 2) New Chain Ferry Rd. 3) Sungai Nyior Road 4) Assumption Road	Friday 8.6.1979	Traffic Lights
IB-2	1) Arumugam Pillai Rd. 2) Jalan Besar	Thursday 14.6.1979	No Traffic Lights
IB-3	1) Ptg. Pauh Road 2) Telaga Air Road 3) Raja Uda Road 4) Siram Road	Friday 15.6.1979	Traffic Lights

2-3 Survey Procedure.

The contents of the survey followed closely with the previous survey so as both can be compared easily. Volumes of 5 types of vehicles such as motorcar, lorry, heavy lorry, motorcycle and bicycle, were counted every 15 minutes.

This survey was conducted one hour in the morning (0700-0800 hrs), one hour at noon (1200-1300 hrs) and one hour in the afternoon (1600-1700 hrs.)

One surveyor with a traffic counter was allocated to one direction. Therefore twenty counters were used in the case of a roundabout with 5 connecting roads. However, the results of this survey at roundabouts is not expected to be as accurate as in other types of intersections.

This is because in case of a traffic jam, the surveyor may lose sight of a car he had been previously following and find that he is instead following another car not identified earlier.

However, the results of the survey is still worthwhile for practical analysis because situations of serious traffic jams do not always occur.

2-4 Results of the Survey.

The results of the survey is summarized in the following tables.

Table 7

No. of station: 1B 1. Date of Survey: 8/6/1978.

Derection		Morning	Day	Evening
D1	S	706	695	895
	R	294	328	403
	L	189	163	152
	Total Approach	1189	1186	1453
D2	S	96	111	132
	R	121	110	175
	L	29	46	54
	Total Approach	246	267	361
D3	S	174	122	105
	R	180	122	132
	L	591	358	349
	Total Approach	945	602	586
D4	S	1107	754	856
	R	23	23	15
	L	278	241	108
	Total Approach	1408	1018	1059

Fig. 8 Sketch of 1B 1.

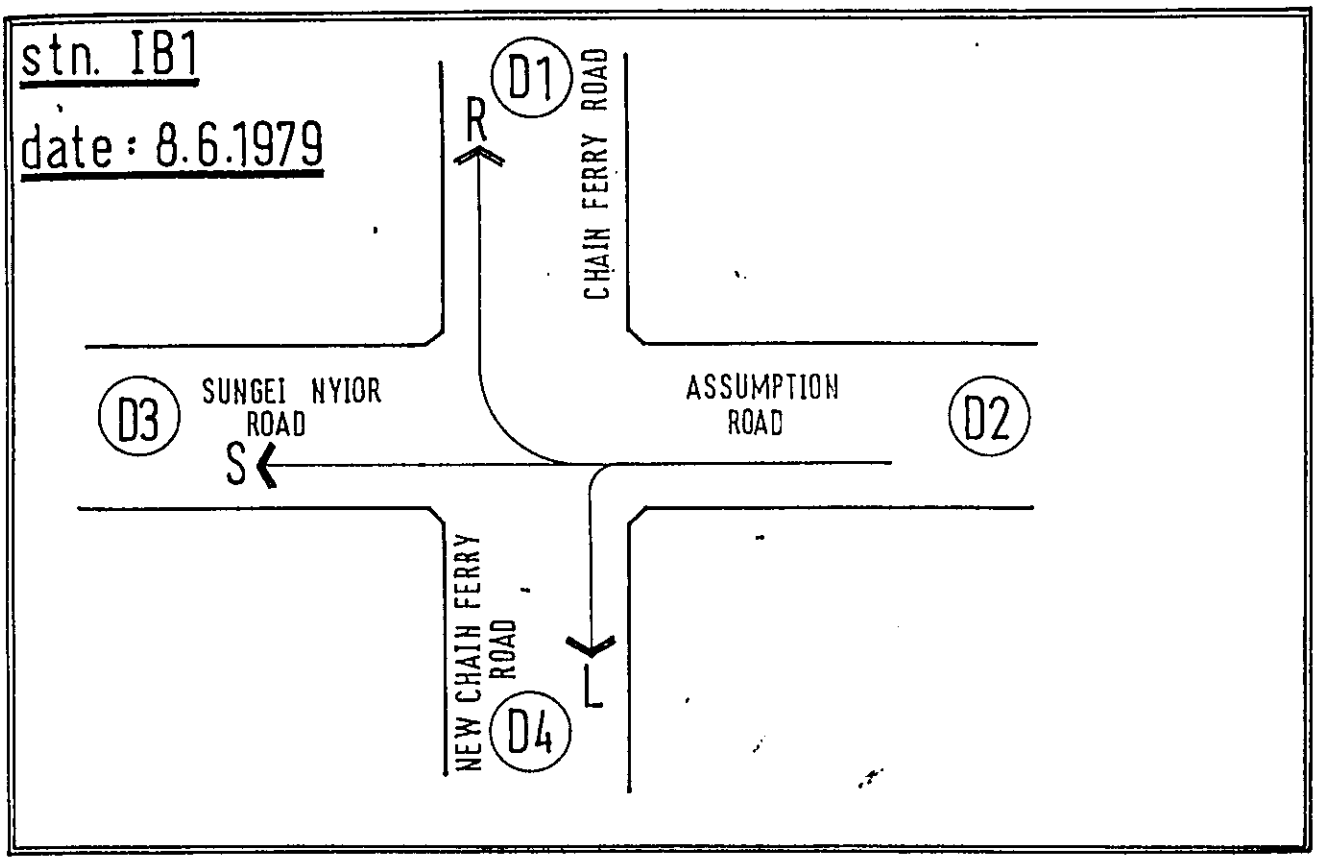


Fig. 9 Sketch of 1B 2.

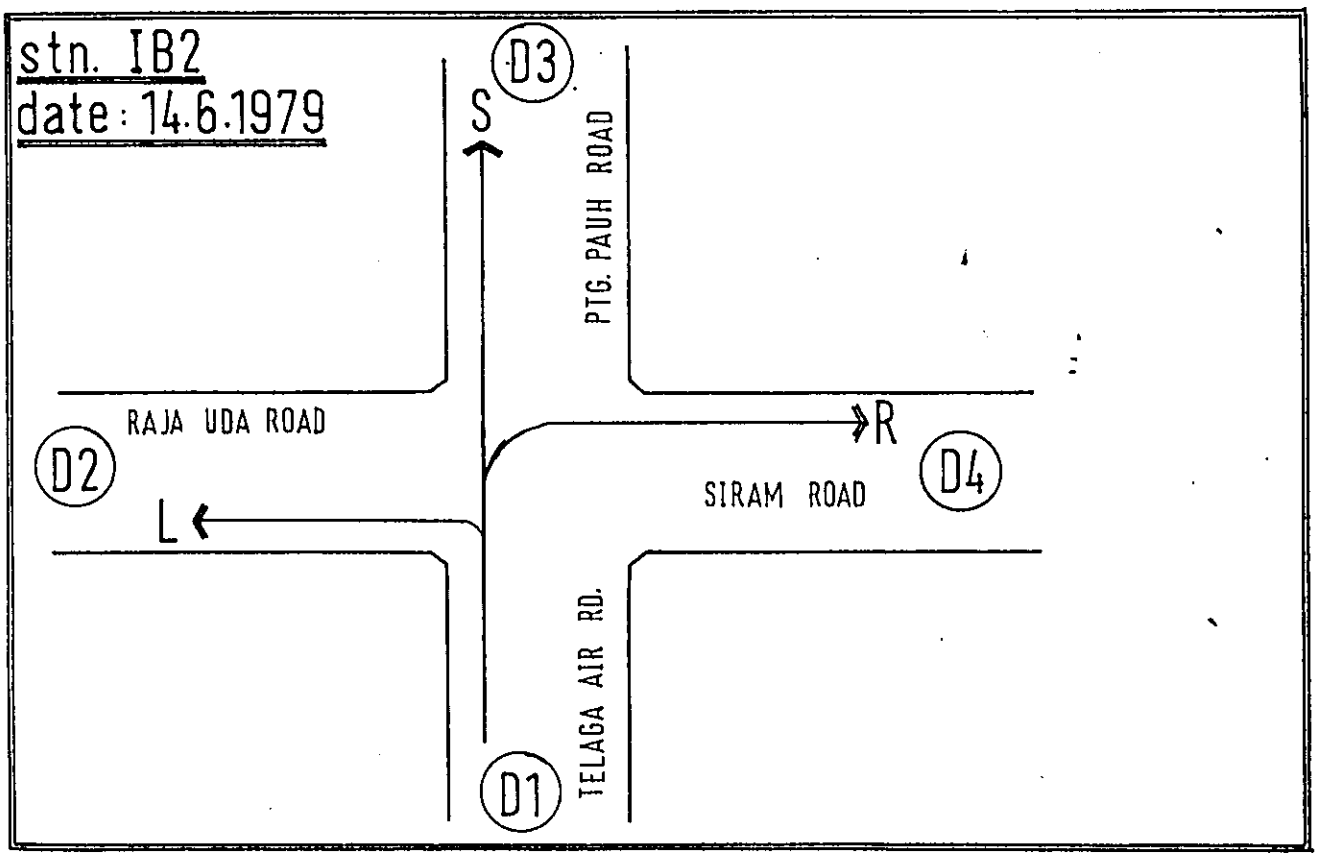


Table 8

No. of station: 1B 2. Date of Survey: 14/6/1979

Direction		Morning	Day	Evening
D1	S	583	475	402
	R	108	128	92
	L	120	211	205
	Total Approach	811	814	699
D2	S	645	317	231
	R	220	178	142
	L	487	258	212
	Total Approach	1352	753	585
D3	S	362	446	444
	R	290	666	262
	L	259	233	165
	Total Approach	911	1345	871
D4	S	258	371	336
	R	272	254	235
	L	85	144	96
	Total Approach	615	769	667

Table 9 Traffic Volume at Intersections

No of Station: IB3. Date of Survey: 15/6/1979.

Direction		Morning	Day	Evening
D1	L	1007	1046	858
	R	736	1177	776
	Total Approach	1743	2223	1634
D2		875	1258	926
D3		1320	646	612

Fig. 10 Sketch of IB 3

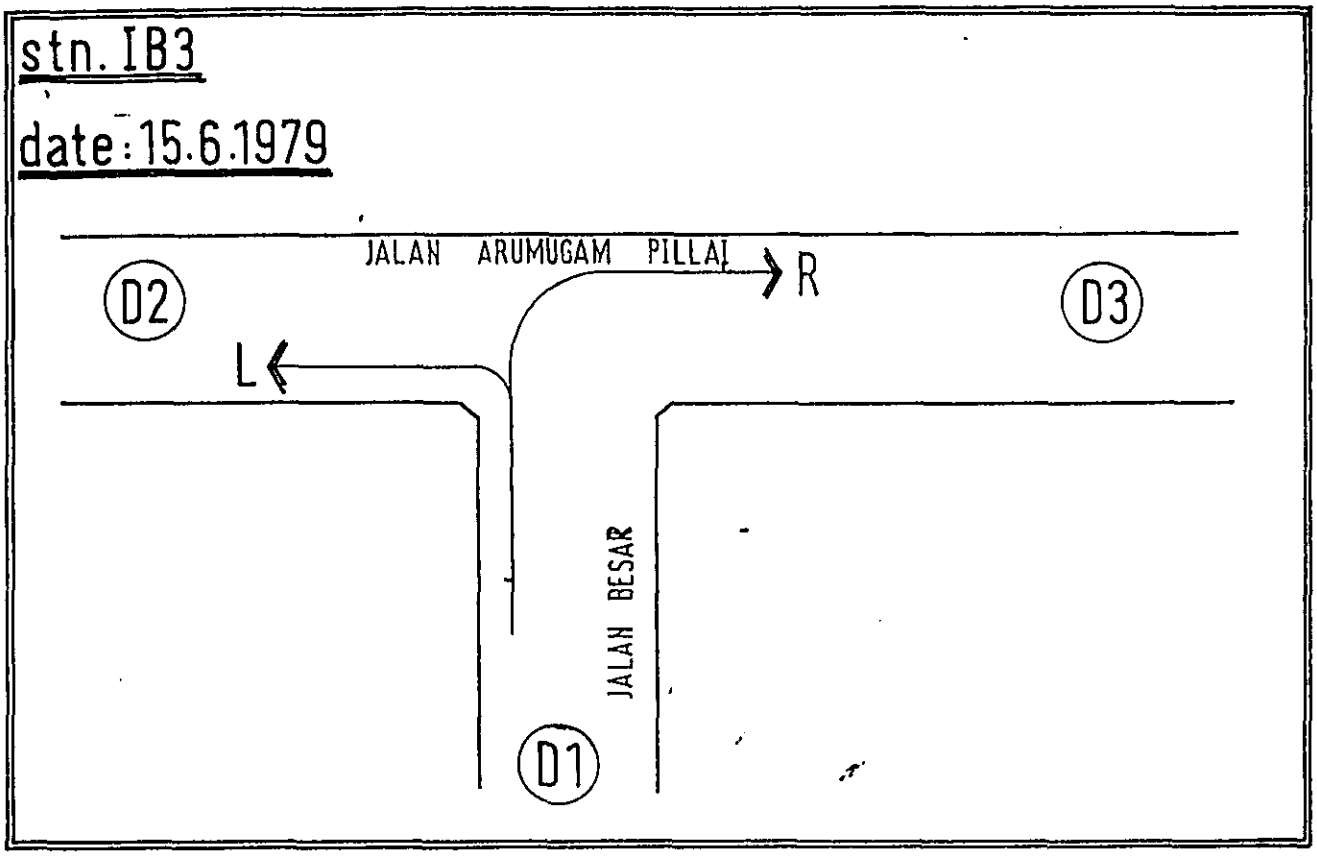


Fig. 11 Sketch of IP 1

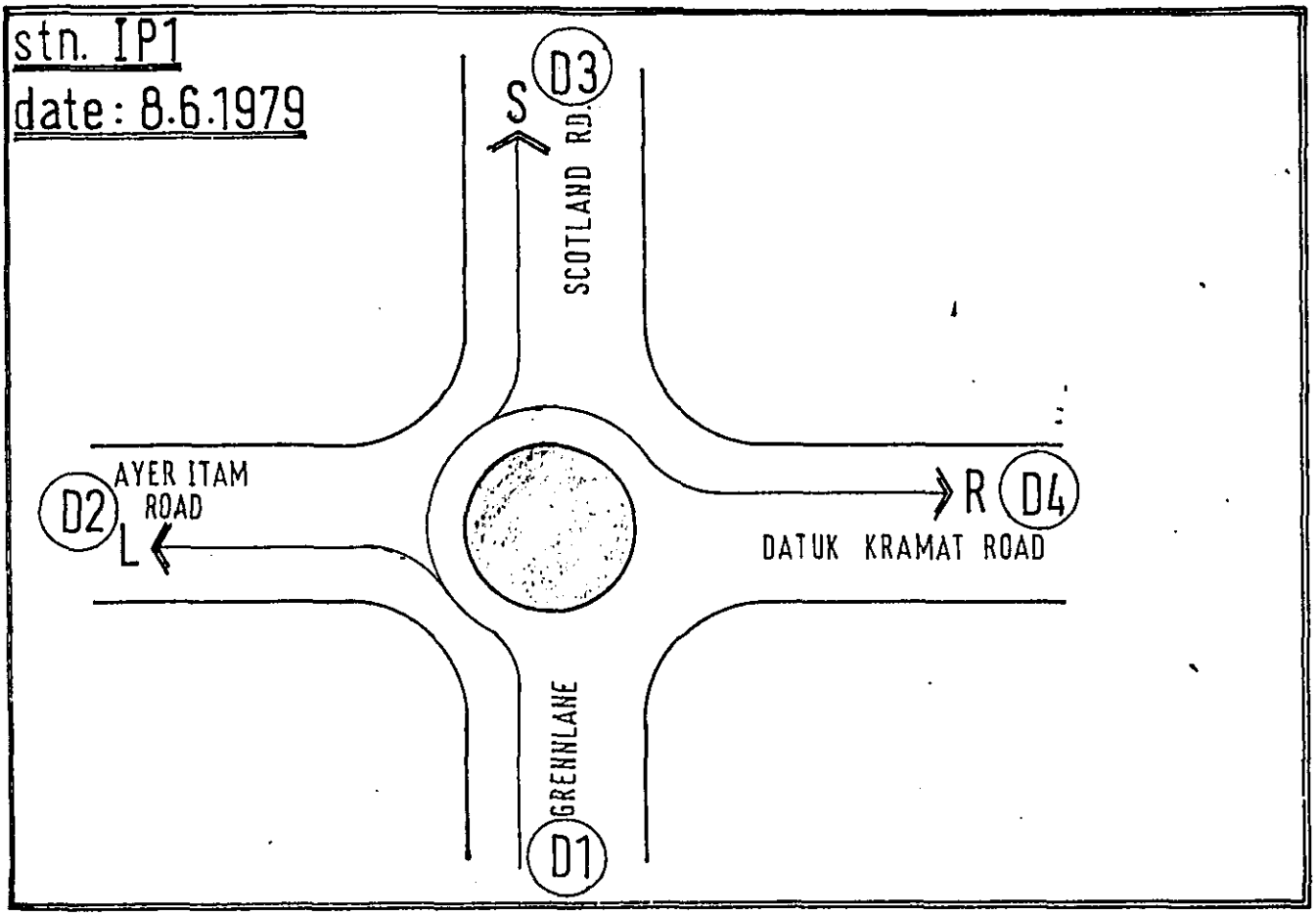


Table 10 Traffic Volume at Interections.

No of Station: IP 1. Date of Survey 8/6/1979.

Direction		Morning 8:00 - 9:00	Day 12:00 - 13:00	Evening 16:00 - 17:00
D1	S	696	450	401
	R	318	509	122
	L	391	349	123
	Total Approach	1405	1308	646
D2	S	467	1202	833
	R	1948	425	326
	L	218	241	208
	Total Approach	2633	1868	1367
D3	S	858	906	716
	R	488	723	388
	L	1463	34	22
	Total Approach	2809	1663	1126
D4	S	1044	1576	994
	R	48	61	40
	L	156	263	266
	Total Approach	1248	1900	1300

Table 11. Traffic Volume at Intersections

No of Station: IP2 Date of Survey: 14/6/1979

	Direction	Morning 7:00 - 8:00	Day 12:00 - 1:00	Evening 16:00 - 17:00
D1	D11	10	11	8
	D12	273	281	220
	D13	99	116	105
	D14	252	133	130
	Total Approach	634	541	463
D2	D21	9	16	6
	D22	209	121	79
	D23	189	120	94
	D24	72	61	83
	Total Approach	479	318	262
D3	D31	24	21	28
	D32	281	370	167
	D33	130	79	67
	D34	209	194	162
	Total Approach	644	664	424
D4	D41	78	81	61
	D42	185	185	123
	D43	53	65	103
	D44	151	212	174
	Total Approach	467	543	461
D5	D51	570	515	450
	D52	70	125	115
	D53	389	643	520
	D54	717	1005	723
	Total Approach	1746	2288	1808

Fig. 12 Sketch of I P 2

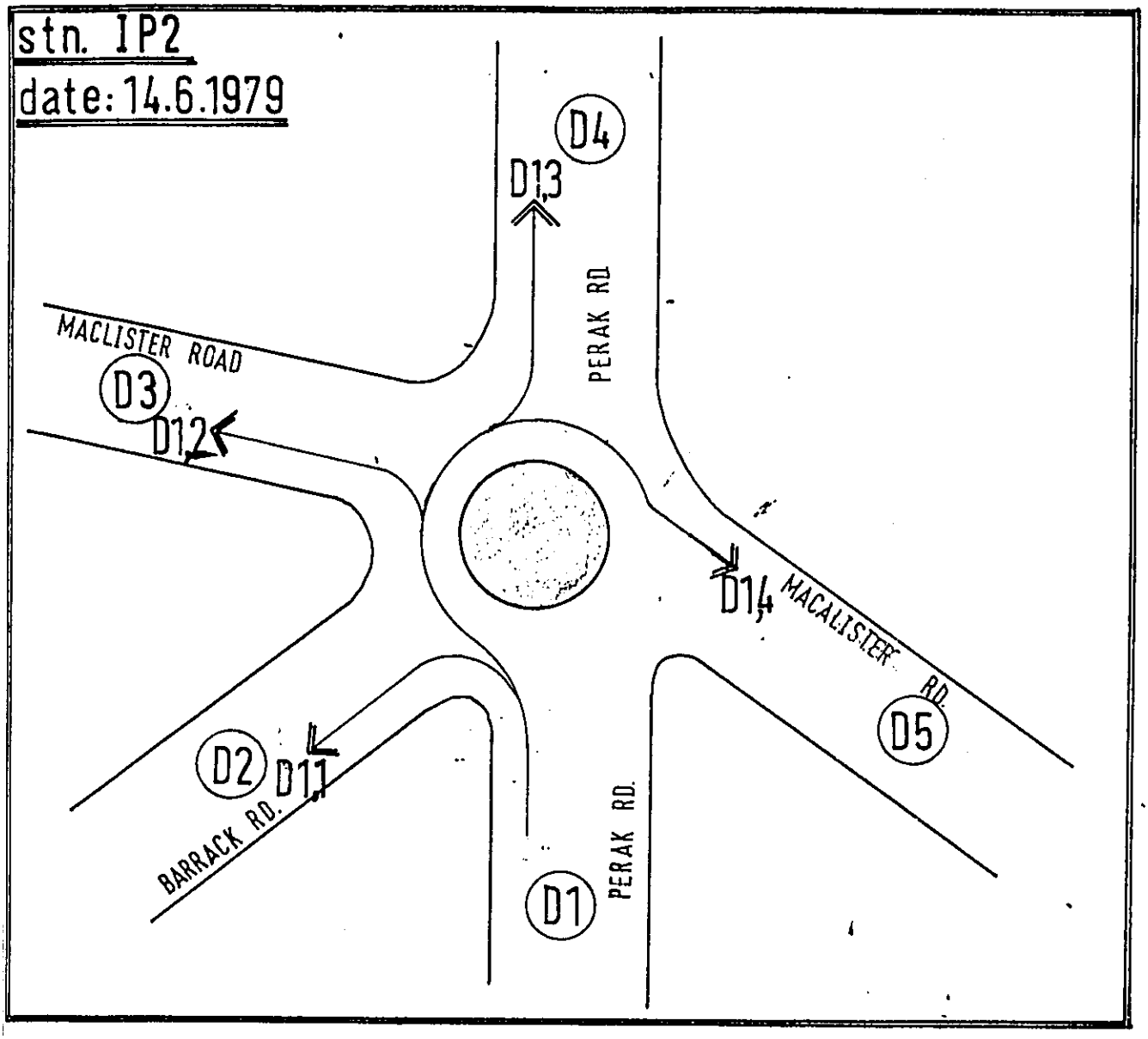
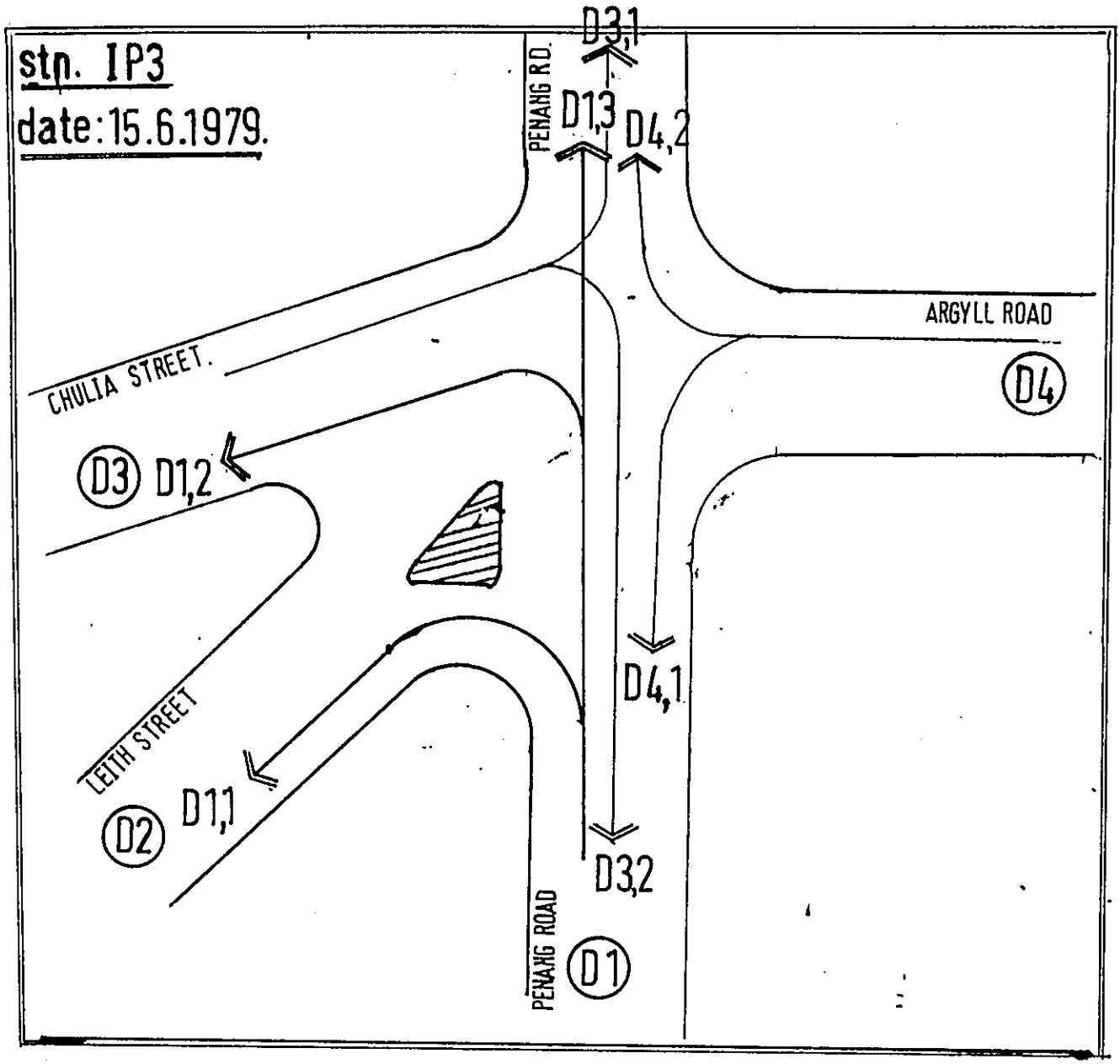


Table 12 Traffic Volume at Intersections

No Of Station: IP3 Date of Survey: 15/6/1979

Direction		Morning 7:45 - 8:45	Day 12:00 - 13:00	Evening 16:00 - 17:00
D1	D11	42	89	64
	D12	76	114	99
	D13	392	969	872
	Total Approach	510	1172	1035
D2		67	128	99
D3	D31	107	266	189
	Total Approach	604	1127	1069
D4	D41	62	104	100
	D42	636	585	520
	D43	414	613	496
	Total Approach	1112	1302	1116

Fig. 13 Sketch of IP3



3. TRAFFIC VOLUME COUNTING

The purpose of this survey is to obtain information of intersections between roads and railways to assess if it is necessary to have over-head bridges or fly-overs. Three roads crossing over the railway lines near Bukit Mertajam were selected for traffic volume counting. One of the Survey Stations on Federal Route 1 supplements another Survey on the same route.

The method and the procedure of the survey is the same as that of the Screen-line Survey.

The following table shows the results of the survey.

TABLE 13 DATES AND LOCATION OF SURVEY STATIONS

STATION NO:	DIRECTION	DATE OF SURVEY	TOTAL VOLUMNE
TB1	Bukit Tengah ⟶ Kuala Lumpur	11/6/79	5,318
	Kuala Lumpur ⟶ Bukit Tengah	11/6/79	5,411
TB2	Bukit Mertajam ⟶ Butterworth	12/6/79	10,345
	Butterworth ⟶ Bukit Mertajam	12/6/79	9,976
TB3	Bukit Mertajam ⟶ Cheruk T. Kun	13/6/79	1,985
	Cheruk T. Kun ⟶ Bukit Mertajam	13/6/79	1,981

The duration of traffic counting at each station is 12 hours per day.

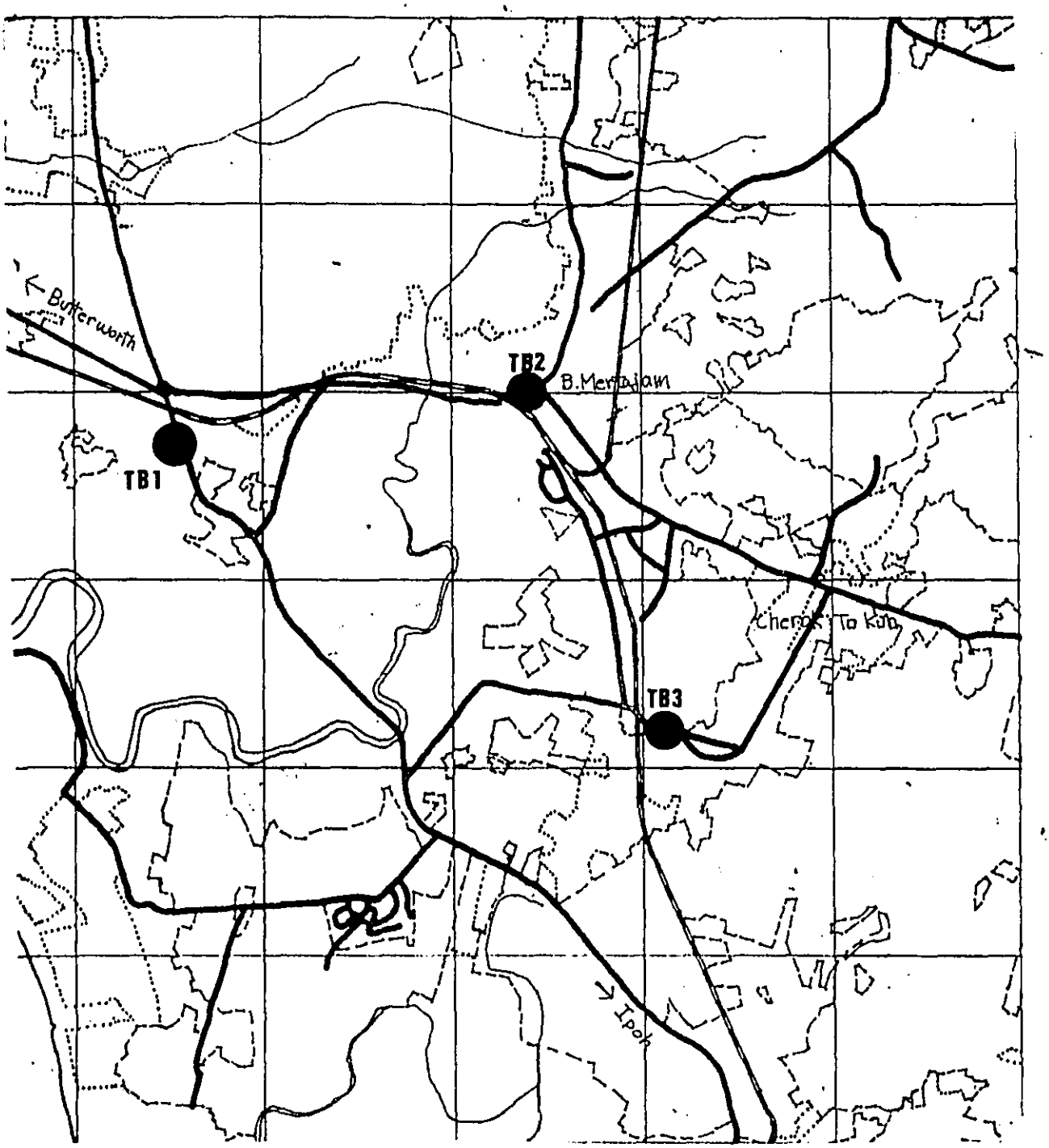


Fig. 14 LOCATION OF SURVEY STATIONS

Table 14 a TRAFFIC VOLUME AT TBI 11/6/1979

TB 1 BUKIT TENGAH TO KUALA LUMPUR

	A			B			C				
TYPE / TIME ZONE	(1) MOTOR-CARS	(2) TAXIS	(3) VANS AND LORRIES	(4) MEDIUM SIZE LORRIES	(5) LORRIES WITH 3 AXLES AND TRAILERS	(6) BUSES	(7) MOTOR CYCLES AND SCOOTERS	(8) TRISHAWS	(9) BICYCLES	(10) OTHERS	(11) TOTAL
7- 8	90	8	14	7	16	18	118	0	15	0	286
8- 9	135	14	26	10	50	13	116	0	5	1	370
9-10	151	32	41	34	126	18	95	0	11	1	509
10-11	152	24	42	27	125	13	79	0	14	0	476
11-12	149	23	30	25	117	19	94	0	14	0	471
12-13	120	23	17	32	84	13	103	0	21	1	414
13-14	154	37	21	30	126	20	78	0	13	2	481
14-15	118	27	20	22	87	13	59	0	11	3	360
15-16	136	30	21	27	100	25	106	0	24	1	470
16-17	158	96	13	15	81	13	102	0	23	0	431
17-18	179	24	17	17	55	25	198	0	47	2	564
18-19	123	16	20	20	52	18	192	0	44	0	468
TOTAL	1665	284	282	266	1020	208	1340	0	242	11	5318

Table 14 b TRAFFIC VOLUME AT TB1 11/6/1979

TB 1 KUALA LUMPUR TO BUKIT TENGAH

	A			B			C				
TYPE / TIME ZONE	(1) MOTOR-CARS	(2) TAXIS	(3) VANS AND LORRIES	(4) MEDIUM SIZE LORRIES	(5) LORRIES WITH 3 AXLES AND TRAILERS	(6) BUSES	(7) MOTOR CYCLES AND SCOOTERS	(8) TRISHAWS	(9) BICYCLES	(10) OTHERS	(11) TOTAL
7- 8	119	21	17	11	77	16	373	0	91	0	725
8- 9	139	24	16	17	116	14	163	0	30	1	520
9-10	150	27	10	31	107	16	91	0	20	0	452
10-11	148	29	15	32	92	7	65	0	11	0	399
11-12	123	28	13	21	90	13	58	0	16	0	362
12-13	122	27	9	7	48	7	63	0	18	0	301
13-14	174	35	20	53	99	15	108	0	19	5	528
14-15	126	20	18	22	96	30	112	0	15	0	439
15-16	110	17	10	37	63	25	44	0	3	0	309
16-17	112	21	20	47	45	28	91	0	16	0	380
17-18	142	20	27	25	51	18	173	0	42	0	498
18-19	188	28	18	46	50	15	129	0	23	1	498
TOTAL	1653	297	193	349	934	204	1470	0	304	7	5411

Table 15 a TRAFFIC VOLUME AT TB 2 12/6/1979

TB 2 BUKIT MERTAJAM TO BUTTERWORTH

	A			B			C				
TYPE / TIME ZONE	(1) MOTOR-CARS	(2) TAXIS	(3) VANS AND PICK-UPS	(4) MEDIUM SIZE LORRIES	(5) LORRIES WITH 3 AXLES AND TRAILERS	(6) BUSES	(7) MOTOR CYCLES AND SCOOTERS	(8) TRISHAWS	(9) BICYCLES	(10) OTHERS	(11) TOTAL
7- 8	110	7	5	39	8	35	520	5	256	2	987
8- 9	184	5	26	43	28	35	521	4	237	1	1084
9-10	214	8	28	58	4	15	354	2	127	1	811
10-11	262	9	31	40	9	16	268	1	98	0	734
11-12	130	6	26	50	6	20	165	6	47	0	456
12-13	311	7	28	40	6	24	367	2	164	1	950
13-14	212	6	21	28	27	28	442	3	207	2	976
14-15	234	3	27	16	36	22	393	6	115	1	853
15-16	189	5	32	20	44	20	329	5	94	0	738
16-17	258	10	28	35	45	19	289	4	79	0	767
17-18	213	2	17	25	35	30	365	3	186	0	876
18-19	231	10	37	17	26	25	573	1	193	0	1113
TOTAL	2548	78	306	411	274	289	4586	42	1803	8	10345

Table 15 b TRAFFIC VOLUME AT TB2 12/6/1979

TB 2 BUTTERWORTH TO BUKIT MERTAJAM

	A			B			C				
TYPE / TIME ZONE	(1) MOTOR-CARS	(2) TAXIS	(3) VANS AND PICK-UPS	(4) MEDIUM SIZE LORRIES	(5) LORRIES WITH 3 AXLES AND TRAILERS	(6) BUSES	(7) MOTOR CYCLES AND SCOOTERS	(8) TRISHAWS	(9) BICYCLES	(10) OTHERS	(11) TOTAL
7- 8	162	2	11	16	3	28	468	3	369	2	1064
8- 9	189	4	21	34	13	29	513	1	202	0	1006
9-10	149	6	19	39	14	12	355	5	122	3	724
10-11	177	7	29	41	3	5	386	3	89	6	746
11-12	189	1	23	55	12	21	327	2	89	3	722
12-13	206	5	20	36	7	20	521	3	173	0	991
13-14	142	8	19	17	10	26	420	1	178	0	821
14-15	134	10	20	11	33	24	427	5	122	0	786
15-16	166	3	32	22	24	13	327	3	101	1	692
16-17	131	3	13	20	21	15	190	5	50	1	449
17-18	261	5	24	16	40	26	429	0	196	5	1002
18-19	200	13	33	26	41	40	618	5	227	2	1025
TOTAL	2106	67	264	333	221	259	4981	36	1918	23	9976

Table 16 a TRAFFIC VOLUME AT TB3 13/6/1979

TB 3 BUKIT MERTAJAM TO CHERUK TOK KUN

	A			B			C				
TYPE / TIME ZONE	(1) MOTOR-CARS	(2) TAXIS	(3) VANS AND PICK-UPS	(4) MEDIUM SIZE LORRIES	(5) LORRIES WITH 3 AXLES AND TRAILERS	(6) BUSES	(7) MOTOR CYCLES AND SCOOTERS	(8) TRISHAWS	(9) BICYCLES	(10) OTHERS	(11) TOTAL
7- 8	40	1	5	3	6	6	86	0	62	0	209
8- 9	24	1	10	3	13	2	50	0	29	2	134
9-10	18	2	8	19	11	2	45	0	24	0	129
10-11	17	1	8	22	2	2	52	0	20	0	124
11-12	16	0	2	25	0	0	37	0	26	1	107
12-13	26	2	6	16	2	2	70	0	48	0	171
13-14	25	1	9	28	1	3	43	0	89	0	199
14-15	21	3	3	23	2	2	40	0	69	0	163
15-16	22	3	8	25	0	2	60	0	55	0	175
16-17	25	2	4	29	0	2	48	0	38	0	148
17-18	24	2	6	21	0	1	77	0	74	0	205
18-19	25	1	1	11	1	3	62	0	132	1	237
TOTAL	283	19	70	225	37	27	670	0	666	4	1985

Table 16 b TRAFFIC VOLUME AT TB3

12/6/1979

TB 3 CHERUK TOK KUN TO BUKIT MERTAJAM

	A			B			C				
TYPE / TIME ZONE	(1) MOTOR-CARS	(2) TAXIS	(3) VANS AND PICK-UPS	(4) MEDIUM SIZE LORRIES	(5) LORRIES WITH 3 AXLES AND TRAILERS	(6) BUSES	(7) MOTOR CYCLES AND SCOOTERS	(8) TRISHAWS	(9) BICYCLES	(10) OTHERS	(11) TOTAL
7- 8	13	1	4	1	5	5	105	0	97	0	231
8- 9	18	0	3	1	8	3	56	0	31	1	121
9-10	19	0	4	14	14	1	36	0	20	0	108
10-11	17	0	8	26	5	1	49	0	23	0	129
11-12	13	1	5	24	6	4	65	0	44	2	164
12-13	20	2	6	8	13	3	64	0	112	1	229
13-14	29	1	4	25	5	4	62	0	50	0	180
14-15	17	0	6	21	5	2	33	0	63	0	147
15-16	22	0	3	18	2	1	49	0	35	0	130
16-17	22	3	7	34	1	3	47	0	43	0	160
17-18	34	0	6	16	0	2	45	0	117	1	221
18-19	21	0	7	11	0	1	73	0	47	1	161
TOTAL	245	8	63	199	64	30	684	0	682	6	1981

4. Travel-time Survey.

The Travel-time Survey was conducted for the purpose of ascertaining the average running speed of vehicles along the main roads.

The running speed is dependent on the conditions of the roads, e.g. the width, surface conditions, traffic flow, traffic lights, speed limits etc.

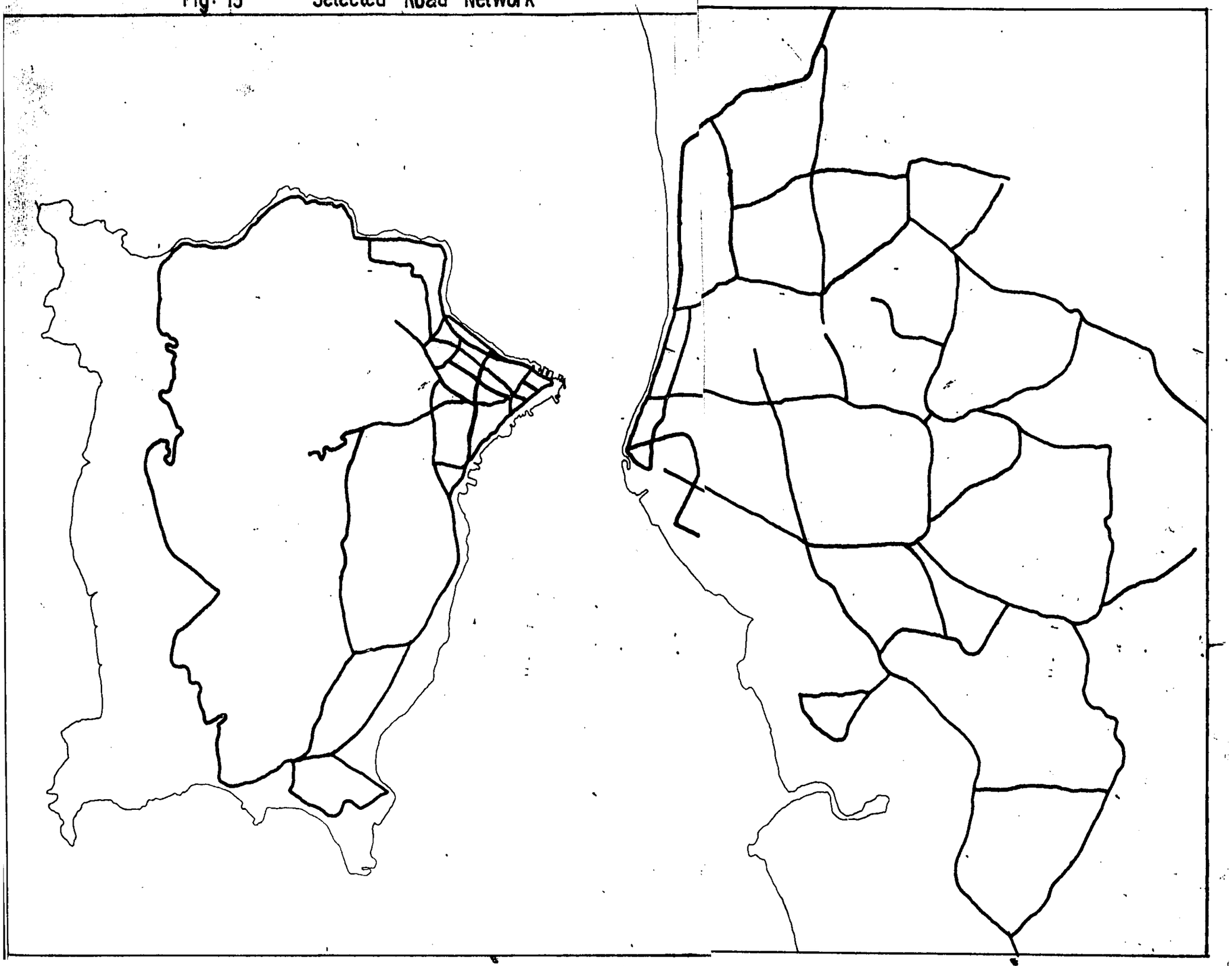
In order that the O-D traffic volume can be assigned on the road network, it is necessary to know the running speed, the traffic capacity as well as the distance of the roads.

4-1 The Method.

The running speed survey is divided in-to two parts, one is the survey for "Spot Speed" and the other is "Travel Time". The latter was chosen because the information on the time taken to travel from one point to another is wanted.

This survey was done by driving a car along the selected routes, which were determined as trunk roads or otherwise, by our own judgement. The selected road network is shown in the figure below.

Fig. 15 Selected Road Network



One driver and one recorder was engaged for this purpose. At the starting point, the driver adjust his trip meter to zero and the recorder does the same with his stop-watch. Then the driver drives at an average speed following the traffic flow to the destination. On arrival at the destination the driver reads the meter for the recorder who records both the distance travelled and the time taken.

From the results, the adjustment of distance should first be made. Distances are different depending on the sources they were obtained from, for example maps with different scales, car trip meters, mileage stones and statistical data.For traffic assignment, only the relative number in the network is wanted and then one map with the scale 1:63,-360 or 1 inch to 1 mile was selected as the base map. The distance measured from this map is used as the standard for adjusting the other distances.

4-2 The Results.

As this survey is not complete only part of the results can be shown.

Table 17. A SAMPLE OF THE RESULTS.

TRIP NO	NAME OF THE ROAD	DIST(km)	TIME TAKEN	SPEED(km/m)
1.	GOTTLIEB RD. — WESTERN ROAD — SCOTLAND RD.	1.4481	4'01"	21.63
2.	GOTTLIEB RD. — BURMA ROAD — CANTONMENT RD.	0.9654	1.30"	38.62
3.	CANTONMENT RD. — BURMA ROAD — PANGKOR RD.	0.9654	1'45"	33.10
4.	PANGKOR RD. — BURMA ROAD — PENANG RD.	1.7699	3'05"	34.44
5.	WESTERN RD. — GOTTLIEB RD. — KELAWEI RD.	1.2872	1'55"	40.29
6.	BAGAN JERMAL. — KELAWEI RD. — PANGKOR RD.	2.0917	3'10"	39.63

5 Questionnaires for Traffic-Free Zones.

5-1 Introduction.

From midnight of June 4th to midnight of June 5th Campbell Street between Penang Road and Rope Walk was closed to traffic to mark World Environment Day which falls on June 5th.

THE STAR, Sunday, June 3, 1979 7

Road closed for Environmental Day

PENANG, Sat.: The Municipal Council here will be closing Campbell Street (between Penang Road and Cintra Street) and (Cintra Street and Rope Walk) to mark World Environment Day on June 5.

All vehicles will be barred from using the street from midnight June 4 to midnight June 5.

Shopowners in the area affected by the closure of the road are requested to keep sufficient stocks of goods in their premises as vehicles will not be able to move in for the loading and unloading of goods.

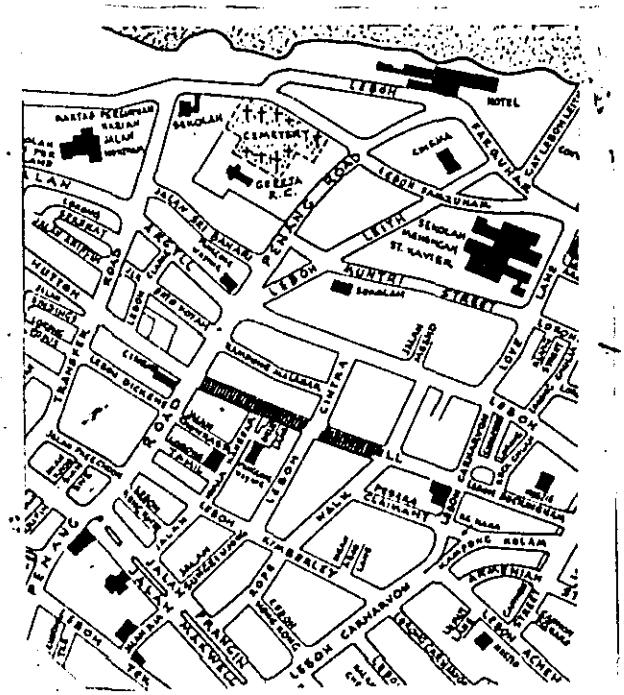


Fig 16 Location of Campbell Street.

Campbell Street is located in the central commercial area of Georgetown. As no sidewalks exist there, pedestrians are forced to walk along the carriageway or along the narrow five-foot way of the street. For this occasion, questionnaires were prepared for both the pedestrians and the shopkeepers.

5-2 Questionnaires to pedestrians.

Pedestrians passing through Campbell Street on that day were interviewed. The aim of the survey is to find out if pedestrians agree to having improvements to the present traffic situation. The major findings of the survey are as described below:-

a) About 60% of pedestrians agree to the idea of traffic free zones in certain areas.

b) Pedestrians do not seem to have a clear idea of what a traffic free zone is (about half of them did not give any comments).

o) About 50% of the pedestrians were not from the C.B.D. (more than 2500m. radius from the street) which suggests that this commercial street can attract not only people from around that area but also people from further afield.

Table18 Results from the Questionnaires (pedestrians).

1. Why do you come here?

# shopping	:	285	- 45 %
# work here	:	63	- 10 %
# live here	:	32	- 5 %
# entertainment	:	101	- 16 %
# passing through	:	150	- 24 %
		631	

2. Where do you come from?

# radius of 500m (0.3 mls.)	:	146	- 23 %
# radius of 2,500m (1.5mls.)	:	185	- 29 %
# more than 2,500m radius	:	210	- 33 %
# Butterworth and Mainland	:	67	- 11 %
# Others.	:	23	- 4 %
		631	

3. How do you get here?

# car/motorcycle/bicycle	:	237	- 38 %
# bus/taxi	:	173	- 27 %
# walk	:	221	- 35 %
		631	

4. Do you face any problem with the traffic here?

# yes	:	341	- 54 %
# no	:	290	- 46 %
		631	

5. If, yes, what is your problem?

# traffic congestion/narrow road	:	230	- 67 %
# difficulty in crossing	:	24	- 7 %
# Inadequate parking space/ parking fees too high	:	48	- 14 %
# noisy/dusty	:	28	- 8 %
# bus problem/crowded street	:	11	- 3 %
		631	

6. Would you prefer?.....

(a) the road as it was

# yes	:	215	- 34 %
# no	:	113	- 18 %
# no comments	:	303	- 48 %
		631	

(b) the road to be occasionally closed.

# yes	:	305	- 48 %
# no	:	99	- 16 %
# no comments	:	227	- 36 %
		631	

(c) the road to be permanently closed.

# yes	:	191	- 30 %
# no	:	124	- 20 %
# no comments	:	316	- 50 %
		631	

(d) the road open to traffic but parking lots converted to pedestrian mall.

# yes	:	160	- 26 %
# no	:	76	- 12 %
# no comments	:	389	- 62 %
		631	

7. Do you feel that there should be traffic-free zones in other parts of the city?

# yes	:	386	- 61 %
# no	:	166	- 26 %
# no comments	:	79	- 13 %
		631	

Table 19 Cross-Tabulation of Question 2 and Question 3.

Quest. 2 / Quest. 3	Radius of 500 m	Radius of 2,500 m	More than 2,500 m	B'worth and Mainland	Others	Total
WALK	146	75	-	-	-	221
TAXI/BUS	-	110	63	-	-	173
CAR/MOTORCYCLE BICYCLE	-	-	147	67	23	237
TOTAL	146	185	210	67	23	631

5-3 Questionnaires to traders.

In order that a better traffic system can be successfully introduced, it is necessary to first seek the approval of traders to such experiments. So, traders along Campbell Street were interviewed.

The major findings are as follows:-

a) More than 80% of the traders interviewed thought that the experiment was not good for their business.

b) However the majority of them agree to the idea of introducing any form of traffic free zone for pedestrians but not closing the road frequently as in this case.

c) Although the traders admitted that the traffic at Campbell Street is heavy, slightly less than 50% of them agreed to the above and a favourable attitude was shown to the idea of a traffic free zone.

d) Most of them park their cars by the sides of the streets.

Table 20 Results from the Questionnaires.

1. Address: (total households interviewed: 162)

2. Use of building:

# shophouse	:	152	- 94 %
# house	:	0	- 0 %
# hotel/restaurant	:	10	- 6 %
# religous building	:	0	- 0 %
		162	

3. Ownership of vehicle:

# car	:	55	- 31 %
# motorcycle	:	51	- 29 %
# van/lorry	:	2	- 1 %
# bicycle	:	70	- 39 %
		178	

4. Where do you park your vehicles?

# backlanes	:	43	- 26 %
# nearby streets (excluding Campbell Street)	:	14	- 9 %
# Campbell Street	:	25	- 15 %
# space provided	:	38	- 23 %
# no answer	:	42	- 26 %
		162	

5. What do you think of the nature of traffic along this street?

# moderate	:	81	- 50 %
# heavy	:	78	- 48 %
# no comments	:	3	- 2 %
		162	

6. Would you face any problems if the road is;

(a) left as it was? # yes

# yes	:	51	- 32 %
# no	:	112	- 69 %
# no comments	:	0	- 0 %
		162	

(b) temporarily closed for pedestrians?

# yes	:	57	- 35 %
# no	:	105	- 65 %
		162	

(c) permanently closed?

# yes	:	95	- 59 %
# no	:	64	- 40 %
# no comments	:	3	- 1 %
		162	

(d) open to traffic, but parking lots converted to pedestrian walk ?

# yes	:	95	- 59 %
# no	:	64	- 40 %
# no comments	:	3	- 1 %
		162	

7. Number of employees:

# one to five	:	60	- 37 %
# five to fifteen	:	33	- 20 %
# more than fifteen	:	6	- 4 %
# none	:	63	- 39 %
		162	

8. Do they.....

# stay here	:	18	- 11 %
# commute	:	59	- 36 %
# stay/commute	:	22	- 14 %
# none	:	63	- 40 %
		162	

9. Bussiness hours

# 8.00/8.30 am - 8.00/8.30 pm	:	2	- 1 %
# 9.00/9.30 am - 9.00/9.30 pm	:	44	- 27 %
# 10.00 am to 10.00 pm	:	49	- 30 %
# None	:	67	- 41 %
		162	

10. Loading and unloading period.

# daytime	:	28	- 17 %
# morning	:	28	- 17 %
# afternoon	:	15	- 9 %
# None	:	95	- 59 %
		162	

11. Do you find the traffic-free zone experiment good for bussiness?

# yes	:	18	- 11 %
# no	:	136	- 84 %
# no comments	:	8	- 5 %
		162	

12. Do you feel that there should be traffic-free zones in other parts of the city?

# yes	:	70	- 43 %
# no	:	65	- 40 %
# no comments	:	27	- 17 %
		162	

Table 21 Cross-Tabulation of Question 5 and Question 6b.

Question 5 : What do you think of the nature of traffic along this street?

Question 6b: Would you face any problems if the road is temporarily closed for pedestrians?

Ques . 6b / Ques . 5	YES	NO	TOTAL
MODERATE	57	24	81
HEAVY	-	78	78
NO ANSWER	-	3	3
TOTAL	57	105	162

Table 22 Cross-Tabulation of Question 5 and 6d.

Question 5: What do you think of the nature of traffic along this street?

Question 6d: Would you face any problems if the road is open to traffic but parking lots converted to pedestrian mall.

QUES. 6d / QUES. 5	YES	NO	NO ANSWER	TOTAL
MODERATE	81	-	-	81
HEAVY	14	64	-	78
NO ANSWER	-	-	3	3
TOTAL	95	64	3	162

Table 23 Cross-Tabulation of Question 5 and 6c.

Question 5 : What do you think of the nature of traffic along this street?

Question 6c: Would you face any problems if the road is permanently closed.

QUES. 6c / QUES. 5	YES	NO	NO ANSWER	TOTAL
MODERATE	81	-	-	81
HEAVY	14	64	-	78
NO ANSWER	-	-	3	3
TOTAL	95	64	3	162

Table 24 Cross-Tabulation of Question 11 and 12.

Question 11: Do you find the traffic free experiment good for business?

Question 12: Do you feel that there should be traffic-free zones in other parts of the city?

QUES. 12 / QUES. 11	YES	NO	NO ANSWER	TOTAL
YES	18	-	-	18
NO	52	65	19	136
NO ANSWER	-	-	8	8
TOTAL	70	65	27	162

5 - 4 Comparisons between the responses of the pedestrians and traders.

Through the analysis of the questionnaires to the pedestrians and traders, the following responses were obtained.

a) Most of the citizens expressed a favourable attitude towards traffic-free zones because the traffic condition seem to be deteriorating.

b) On the other hand the traders of Campbell Street were either not eager for any change of the present condition or were non-committal about it.

c) Although the traders as compared to the pedestrians are supposed to feel a greater necessity for improvements to the present situation in order that they are as competitive as the other commercial areas such as at Burmah Road and at Komtar neither a clear idea for the future has been given nor expressed by them which might give us one of the reasons for their passive attitude.

d) In the case of the pedestrians the absence of a clear image of traffic-free zones contributes to the failure of getting full approval from them on it.

5-5 SOME COMMENTS ON TRAFFIC-FREE ZONES.

Due to the importance of preparing an idea of traffic-free zones, several guidelines are described as follows based on the results of the questionnaires.

a) TEMPORARY CLOSE.

a-i Temporary close during specific time period.

This system is supposed to be the most practical and adaptable to commercial streets but a firm control on the closing and opening of the streets will have to be established. Such a system can be seen on some streets.

a-ii Temporary close on a specific day.

Closing a road once a week is often done in some countries. In such a situation, it is necessary that the traders try to attract more people in an effort to increase their sales. In the case of Cambell Street however it was observed that almost no effort was made by the traders to attract more people. In addition when closing roads on a specific day, allowance should be made for the delivering of goods to the shops.

b) PERMENENT CLOSE.

b-i Pedestrian malls permanently closed to traffic.

In this case, it is necessary to redevelop the area of the C.B.D. or to widen backlanes for delivery purpose and also making provisions for parking space. Therefore this type of traffic free zones should be considered during the process of planning urban redevelopment projects.

b-ii Pedestrian malls temporarily opened to traffic.

In this case, a pedestrian mall is temporarily opened forthe delivery of goods during such time periods as late at night and early in the morning. Therefore the designing of such a pedestrian mall is less flexible than that of ii-a, but on the other hant it is more adaptable to the actual conditions.