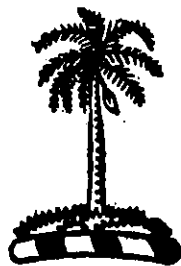


**URBAN TRANSPORT STUDY**  
**IN**  
**GREATER METROPOLITAN AREAS**  
**OF**  
**GEORGETOWN, BUTTERWORTH AND BUKIT MERTAJAM**  
**MALAYSIA**

**CORDON LINE SURVEY**

**TECHNICAL REPORT — 03**



**AUGUST, 1979**

**JAPAN INTERNATIONAL COOPERATION AGENCY**

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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.

## CORDON LINE SURVEY

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## CORDON LINE SURVEY

### Introduction.

This survey is one part of the traffic O-D survey. The objective of this survey is to obtain information on the traffic passing through the border of the study area. With this data the volume and characteristics of the traffic can be determined. In addition to this, the number of vehicles and the nature of trips made between the Study area and the External Area can also be determined.

1 Survey Method.

This survey consists of two parts:-

- a) Interviewing
- b) Traffic counting.

Vehicles entering the Study Area were interviewed and vehicles passing the border of the Study Area were counted. These vehicles consist of cars, vans, medium lorries, heavy lorries, taxis, buses, motorcycles and others.

1-1 Stations.

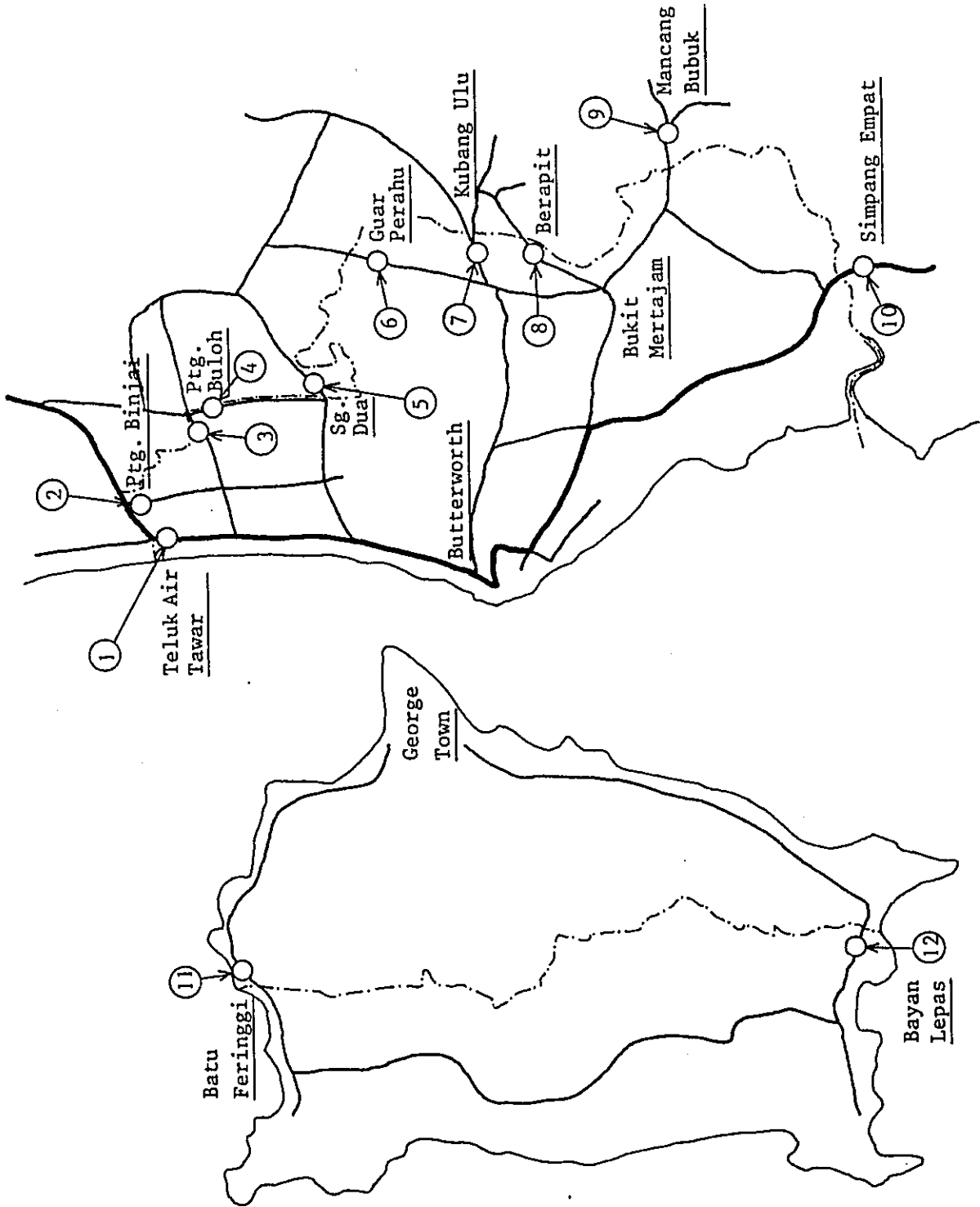
The following stations were selected at the crossing points of the border and the trunk roads. These were 12 stations shown in Table 1 and Figure 1.

TABLE 1. SELECTED STATIONS

STATION NO.	ROAD BETWEEN	LOCATION
1	Teluk Air Tawar - Ptg. Pauh	$\frac{3}{4}$ mile from Teluk Air Tawar
2	Ptg. Kuala - Ptg. Tok Gelam Pekan Darat	Simpang Empat Ptg. Binjai
3	Pekan Darat - Kg. Tok Hamid	1 mile from Pekan Darat
4	Simpang Empat Ptg. Pauh - Kampung Sentul	$1\frac{1}{2}$ mile from Kampung Sentul
5	Pekan Sg. Dua - Merbau Kudong	$\frac{1}{2}$ mile from Sungai Dua
6	Guar Petai - Guar Perahu	$\frac{1}{2}$ mile from Guar Perahu
7	Kubang Semang - Simpang Tiga Kubang Ulu	1 mile from Kubang Semang
8	Berapit - Mengkuang Tandop	$\frac{1}{2}$ mile from Berapit
9	Kg. Ceruk Tok Kun - Macang Bubuk	$\frac{3}{4}$ mile from Kg. Ceruk Tok Kun
10	Simpang Empat Tasik - Tok Subuh	Kampung Baru Mk. 13
11	Batu Feringghi - Ujung Batu	$1\frac{1}{2}$ mile from Batu Feringghi
12	Bayan Lepas - Teluk Kumbar	$\frac{1}{2}$ mile from Bayan Lepas



FIGURE 1 LOCATION OF STATIONS



Interview Survey.

## a) Questionnaire

The questionnaire for interviewing was prepared as shown in Appendix A.

The main part of the interview was:-

- i) Origin of the trip
- ii) Destination of the trip
- iii) Trip purpose
- iv) Number of passengers
- v) Commodity types of lorry
- vi) Loading condition

## b) Procedure

The personnel involved for 1 station was as follows:-  
(shown in Figure 2)

- 3 Policemen
- 2 Assistant Supervisors
- 10 Interviewers

After the station had been selected, the policemen were assigned to stop the vehicle for 10 minutes in every half hour interval. Our staffs and policemen would see that that the survey would be carried out smoothly.

At each station, there were two Assistant Supervisors in charge of the interviewers. They were engaged to check the progress of the survey from time to time.

At each station about thirty to forty sample were to be collected within a given time of 10 minutes (for busy road) and twenty minute (for less busy road). The pedestrians and bicycles were not interviewed in this survey.

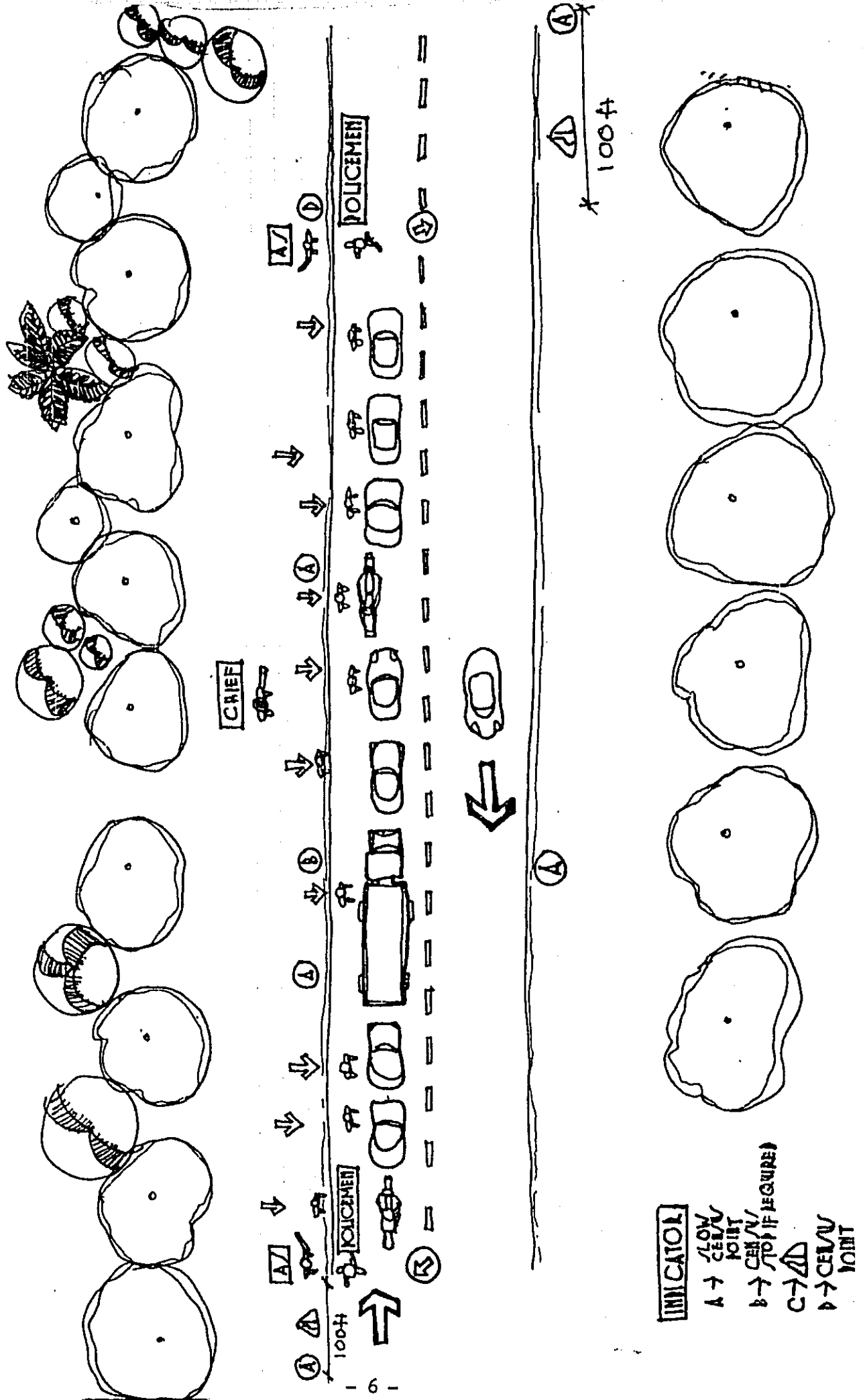
The job of interviewing was carried out along the roadsides. The following vehicles were not included in this survey:-

- i) Ambulances
- ii) Fire Engines
- iii) Post Office Vans
- iv) Police Cars
- v) Security Vehicles

- vi) Armed Service Vehicles
- vii) Buses on a regular route
- viii) Trishaws.
- ix) V.I.P. cars with or without Police Escorts.

It must be emphasised here that the cooperation of the public is entirely voluntary, but any driver who declines to answer questions will not be allowed to leave the group of stopped vehicles until that particular group has been completely interviewed. This is to avoid any accidents. The interviews were conducted from 7.00 a.m. to 7.00 p.m. The following is a plan of a Cordon Survey Station.

FIGURE 2 PLAN OF CORDON SURVEY STATION



1-3 Traffic Counting.

The counting of vehicles were done for the incoming and outgoing vehicles in the Study Area, at the same stations.

a) Classification of vehicle type.

- i) Motor-cars
- ii) Taxis
- iii) Vans, pick-ups
- iv) Medium Size lorries
- v) Heavy lorries
- vi) Buses
- vii) Motorcycles
- viii) Others

b) Procedure

Field assistants stationed by the roadside were as follows:-

In groups of three, performed district functions. Two of them counted the traffic by means of counting machines and the other one recorded the information collected.

The function of the person who counts was to collect information on the number of vehicles passing by, the type of vehicles and the direction it was heading for. Every hour the total number of vehicles according to type of vehicle was recorded in a given form. The location of these group was in front of the station. The counting commenced from 6.00 a.m. and ended at 10.00 p.m.

1-4 Schedule of Cordon Survey.

An illustration of the schedule of cordon-survey is given overleaf together with se selected stations.

TABLE 2 SCHEDULE OF CORDON SURVEY

STATION NO.	NAME OF STATION	NO. OF STAFFS INVOLVED				INTERVIEWERS	DATE
		ASST. SUPERVISOR	CLERKS	COUNTERS			
1	Teluk Air Tawar	1	2	4	14	11/6/79	Mon.
2	Permatang Binjai	2	2	6	11	5/6/79	Tue.
3	Permatang Buloh	2	2	5	12	5/6/79	Tue.
4	Ptg. Tok Hamid	2	2	1	11	5/6/79	Tue.
5	Sungai Dua	2	1	4	11	11/6/79	Mon.
6	Guar Perahu	2	1	4	12	11/6/79	Mon.
7	Kubang Ulu	2	1	4	11	12/6/79	Tue.
8	Berapit	2	2	3	14	7/6/79	Thu.
9	Machang Bubok	2	-	4	11	12/6/79	Tue.
10	Simpang Empat	1	3	4	14	12/6/79	Tue.
11	Batu Feringghi	2	2	4	12	7/6/79	Thu.
12	Bayan Lepas	2	2	4	12	7/6/79	Thu.

2

Results

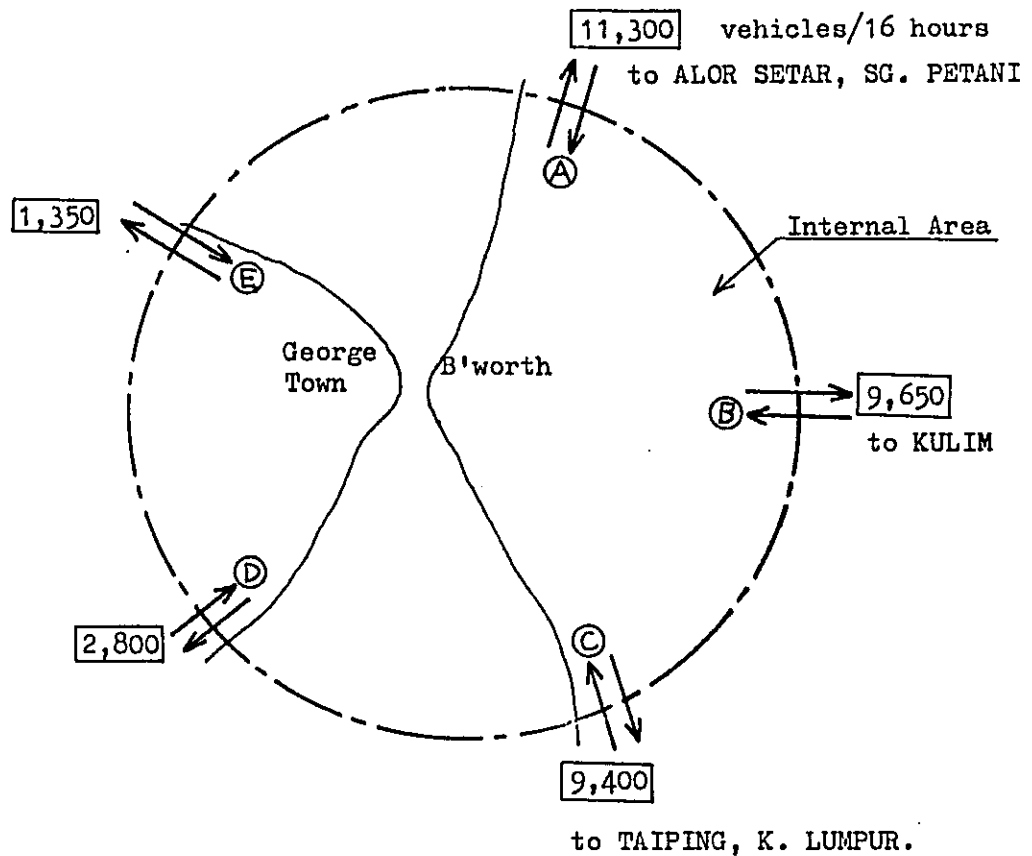
The results of this survey are mainly used for the purpose of determining the incoming and the outgoing traffic volume in the Study Area.

2-1

Summary

From our results, approximately 34,500 motor vehicles and 22,500 motorcycles pass the border of the Study Area during a time-period of 16 hours 6.00 a.m. to 10.00 p.m.

FIGURE 3 TYPICAL DIAGRAM OF TRAFFIC FLOW



Regarding motor vehicles, the volume by each sector is shown in the figure above.

At Penang Island there is only a small volume of traffic between external and internal area. While at Province Wellesley approximately 10,000 vehicles are passing through the border in every sector.

The traffic volume by type of vehicle is shown in the table below:-

TABLE 3 TRAFFIC VOLUME BY TYPE OF VEHICLE.

Sector	Stations	Motor-Cars	Taxis	Vans & Pick-ups	Medium Size Lorries	Heavy Lorries & Trailers	Buses	Others	Sub-total	Motorcycles	Total
A	1 - 5	6,516	793	732	1,991	486	699	81	11,298	6,847	18,145
B	6 - 9	5,445	161	644	2,596	206	578	15	9,645	8,256	17,901
C	10	4,715	624	685	1,873	940	440	105	9,382	3,480	12,862
D	12	1,492	139	267	378	-	519	4	2,799	2,946	5,745
E	11	776	145	76	242	10	104	-	1,353	1,007	2,360
TOTAL		18,944	1,862	2,404	7,080	1,642	2,340	205	34,477	22,536	57,013

Composition by type of vehicle is shown below:-

TABLE 4 COMPOSITION BY TYPE OF VEHICLE (%)

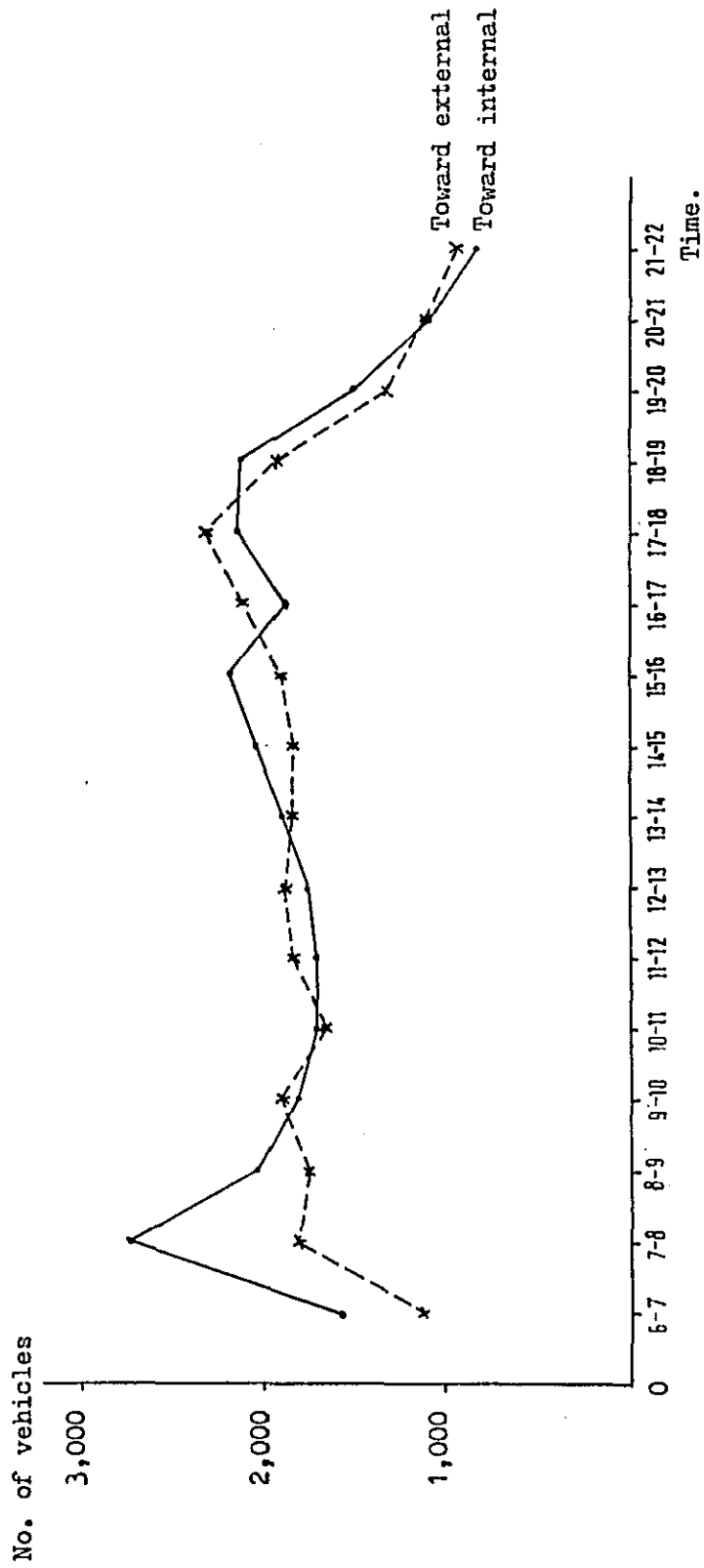
Sector	Motor-Cars	Taxis	Vans & Pick-ups	Medium Size Lorries	Heavy Lorries & Trailers	Buses	Others	Sub-total	Motorcycles
A	57.7	7.0	6.5	17.6	4.3	6.2	0.7	100	37.7
B	56.4	1.7	6.7	26.9	2.1	6.0	0.2	100	46.1
C	50.3	6.6	7.3	20.0	10.0	4.7	1.1	100	27.0
D	53.4	5.0	9.5	13.5	0	18.5	0.1	100	51.3
E	57.4	10.7	5.6	17.9	0.7	7.7	0	100	42.7
TOTAL	54.9	5.4	7.0	20.5	4.8	6.8	0.6	100	39.6



TABLE 5. HOURLY FLOW AT EACH SECTOR.

Time	Sector Direction	A			B			C			D			E			TOTAL		
		IN	OUT	TOTAL	IN	OUT	TOTAL	IN	OUT	TOTAL	IN	OUT	TOTAL	IN	OUT	TOTAL	IN	OUT	TOTAL
		6 - 7	668	364	1,032	445	384	829	186	243	429	222	118	340	67	29	96	1,588	1,138
7 - 8	981	614	1,595	839	595	1,434	535	338	873	327	196	523	81	60	141	2,763	1,803	4,566	
8 - 9	651	536	1,187	654	582	1,236	465	425	890	237	175	412	54	50	104	2,061	1,768	3,829	
9 -10	580	619	1,199	565	628	1,193	424	477	901	182	133	315	51	67	118	1,802	1,924	3,726	
10-11	566	523	1,089	506	511	1,017	397	423	820	166	147	313	84	82	166	1,719	1,686	3,405	
11-12	508	654	1,162	572	569	1,141	386	420	806	185	116	301	70	88	158	1,721	1,847	3,568	
12-13	476	494	970	606	655	1,261	453	498	952	160	174	334	76	87	163	1,771	1,908	3,679	
13-14	629	570	1,199	646	624	1,270	442	417	859	145	160	305	70	100	170	1,932	1,871	3,803	
14-15	566	490	1,056	708	605	1,313	512	446	958	190	176	366	94	126	220	2,070	1,843	3,913	
15-16	878	551	1,429	483	559	1,042	586	481	1,067	190	221	411	72	108	180	2,209	1,920	4,129	
16-17	645	741	1,386	577	588	1,165	372	446	818	184	274	458	105	102	207	1,883	2,151	4,034	
17-18	734	730	1,464	682	682	1,364	465	467	932	208	309	517	107	83	190	2,172	2,378	4,550	
18-19	748	574	1,322	612	659	1,271	482	424	906	216	227	443	101	76	177	2,159	1,960	4,119	
19-20	413	348	761	535	487	1,022	396	343	739	130	133	263	60	45	105	1,534	1,356	2,890	
20-21	353	316	669	393	338	731	268	273	641	86	166	252	29	48	77	1,129	1,141	2,330	
21-22	269	292	561	301	299	600	168	198	366	67	99	166	46	49	95	851	937	1,788	
		9,665	8,416	18,081	9,124	8,755	17,879	6,539	6,319	12,956	2,895	2,824	5,719	1,167	1,200	2,367	29,388	27,514	56,902

FIGURE 4 HOURLY FLOW



2 2 Results at each station.

Each station has different results as shown in the following tables.

TABLE 6 TRAFFIC VOLUME AT EACH STATION (0600-2200)

STATION NO.	DATE	NO. OF VEHICLES	NO. OF M.CYCLES	TOTAL
01	11/6/79 (Mon)	7,807	3,042	10,849
02	05/6/79 (Tues)	238	411	649
03	05/6/79 (Tues)	474	1,024	1,498
04	05/6/79 (Tues)	415	654	1,069
05	11/6/79 (Mon)	2,364	1,716	4,080
06	11/6/79 (Mon)	2,442	1,682	4,124
07	12/6/79 (Tues)	2,280	1,936	4,216
08	07/6/79 (Thurs)	965	1,233	2,198
09	12/6/79 (Thurs)	3,958	3,405	7,363
10	12/6/79 (Thurs)	9,386	3,480	12,866
11	07/6/79 (Thurs)	1,353	1,007	2,360
12	07/6/79 (Thurs)	2,799	2,946	5,745

The traffic volume was found to be 10,000 vehicles per 16 hours at station 1 & 10 along the Federal Route. The traffic volume was low in other stations on the trunk road. There were 1000 to 3000 motorcycles per 16 hours at most of the stations except at two stations.

40 to 70% of traffic on the rural road and 28% on the Federal road was found to be made up of motorcycles.

TABLE 7 TRAFFIC VOLUME BY TYPE OF VEHICLES AT EACH STATION.

STATION	TYPE OF VEHICLE									TOTAL
	MOTOR CARS	TAXIS	VANS & PICK-UPS	MEDIUM SIZE LORRIES	LORRIES WITH 3 AXLES & TRAILERS	BUSES	OTHERS	SUB-TOTAL	MOTORCYCLES	
01	4565	677	475	1178	379	461	72	7807	3042	10,849
02	124	6	25	46	11	26	-	238	411	649
03	303	8	26	120	2	14	1	474	1024	1,498
04	320	1	15	45	-	34	-	415	654	1,069
05	1204	101	191	602	94	164	8	2364	1716	4,080
06	1275	45	175	744	90	112	1	2442	1682	4,124
07	977	16	132	926	44	183	2	2280	1936	4,216
08	502	5	30	358	10	57	3	965	1233	2,198
09	2691	95	307	568	62	226	9	3958	3105	7,363
10	4715	624	685	1873	940	440	105	9386	3480	12,866
11	776	145	75	242	10	104	-	1353	1007	2,360
12	1492	139	267	378	-	519	4	2799	2946	5,745

06:00 - 22:00, Both Direction

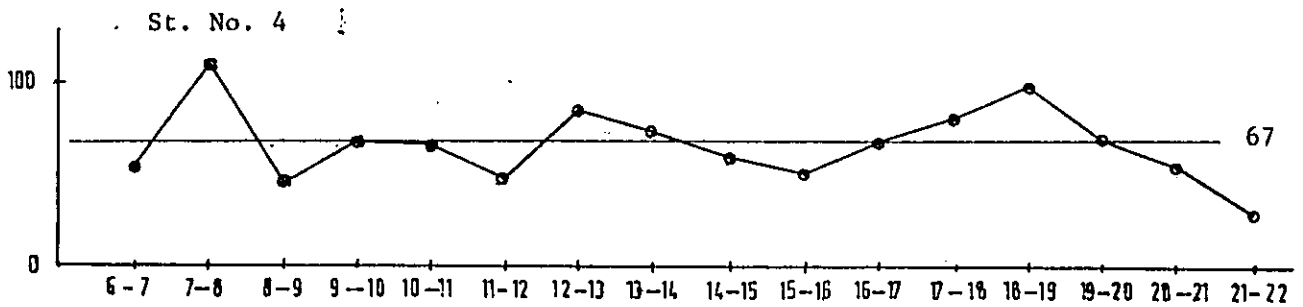
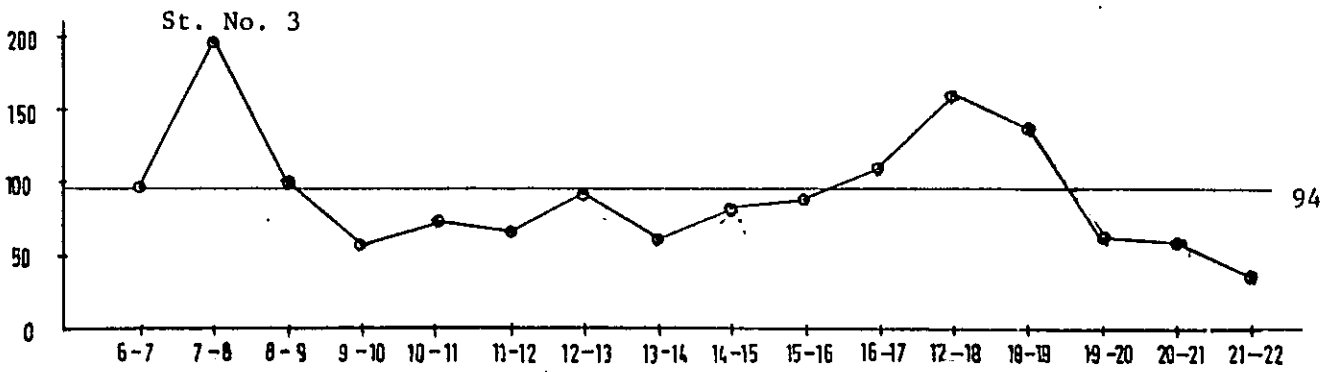
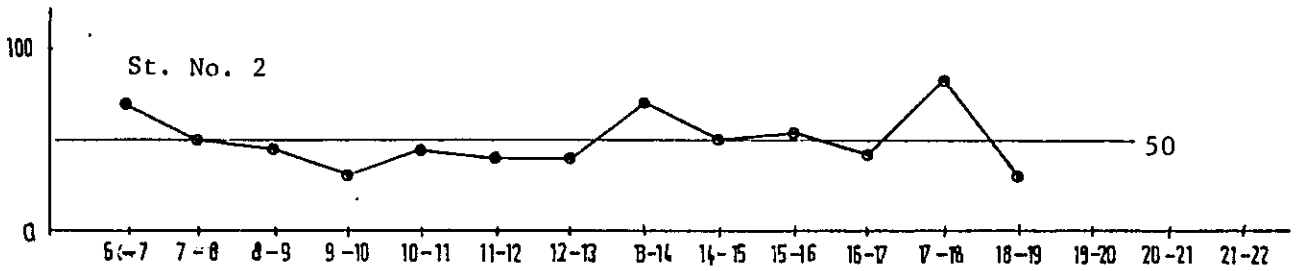
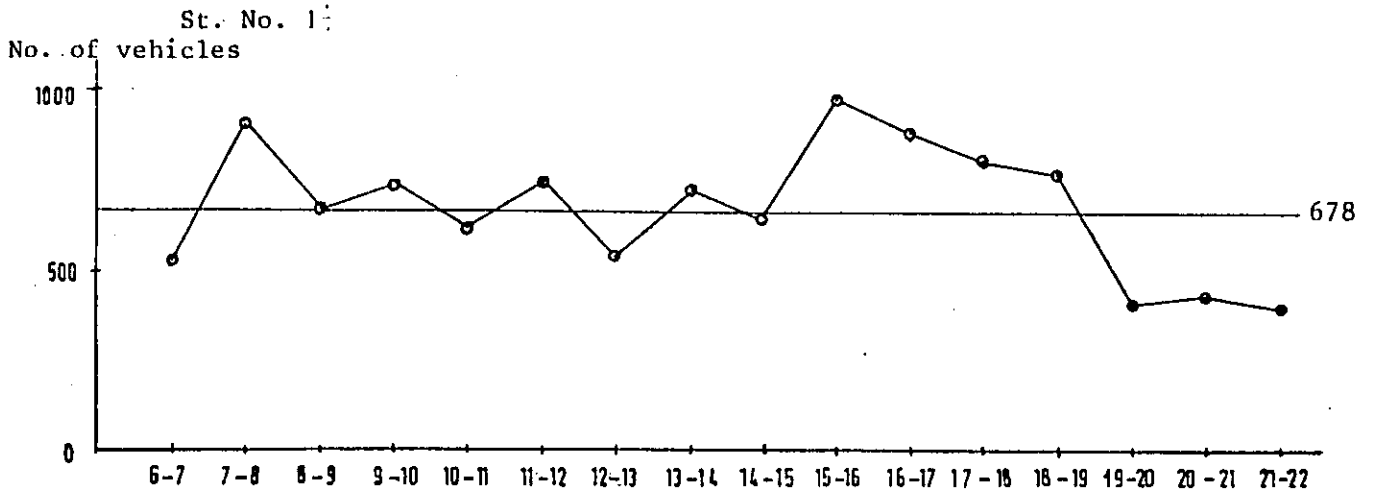
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TABLE 8 COMPOSITION BY VEHICLE TYPE AT EACH STATION

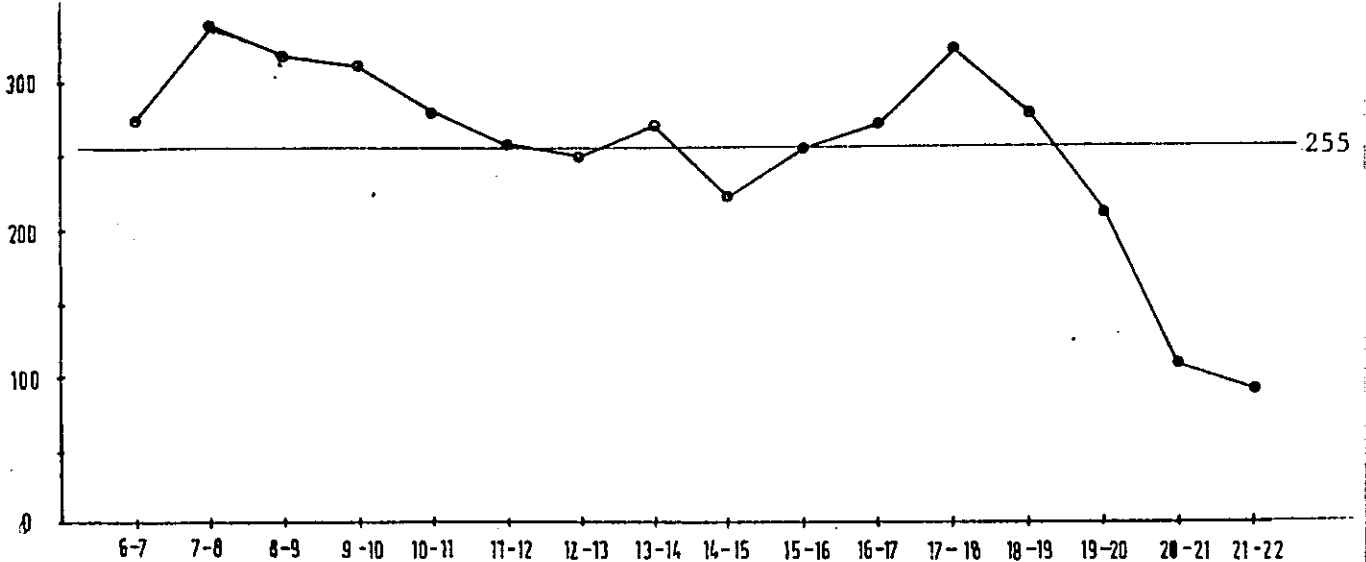
STATION	TYPE OF VEHICLE								SUB-TOTAL	MOTORCYCLES
	MOTOR CARS	TAXIS	VANS & PICK-UPS	MEDIUM SIZE LORRIES	LORRIES WITH 3 AXLES & TRAILERS	BUSES	OTHERS			
01	58.4	8.7	6.1	15.1	4.9	5.9	0.9	100	28.0	
02	52.2	2.5	10.5	19.3	4.6	10.9	0	100	63.3	
03	63.9	1.7	5.5	25.3	0.4	3.0	0.2	100	68.4	
04	77.2	0.2	3.6	10.8	0	8.2	0	100	61.2	
05	50.9	4.3	8.1	25.5	4.0	6.9	0.3	100	48.1	
06	52.2	1.8	7.2	30.5	3.7	4.6	0	100	40.8	
07	42.9	0.7	5.8	40.6	1.9	8.0	0.1	100	45.9	
08	52.1	0.5	3.1	37.1	1.0	5.9	0.3	100	56.1	
09	67.9	2.4	7.8	14.4	1.6	5.7	0.2	100	46.2	
10	50.3	6.6	7.3	20.0	10.0	4.7	1.1	100	27.0	
11	57.4	10.7	5.6	17.9	0.7	7.7	0	100	42.7	
12	53.4	5.0	9.5	13.5	0	18.5	0.1	100	51.3	

The ratio to the Total

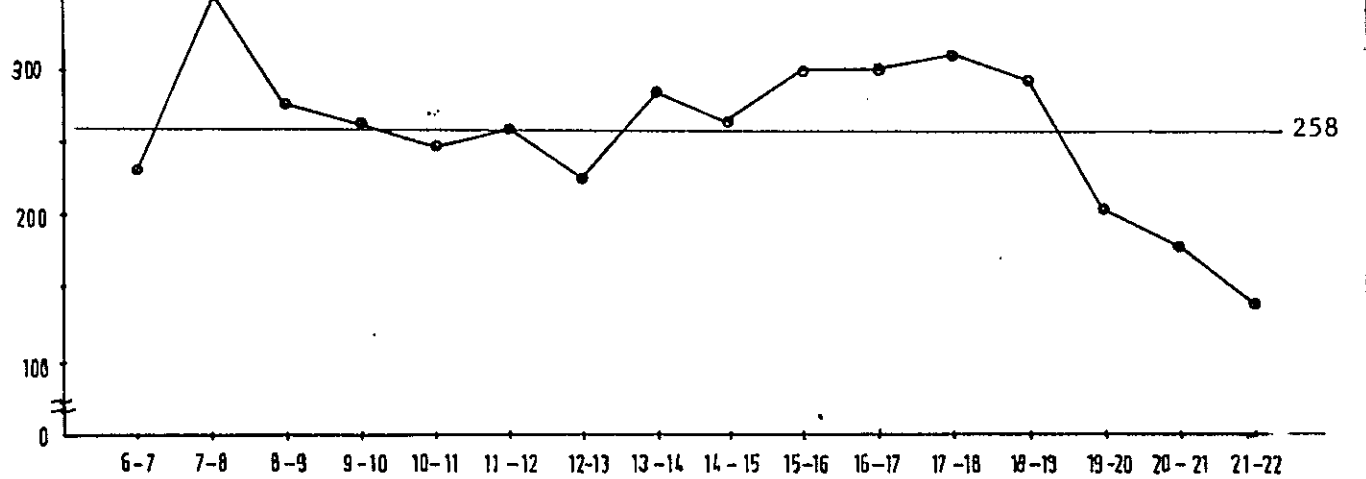
FIGURE 5 HOURLY FLOW AT EACH STATION



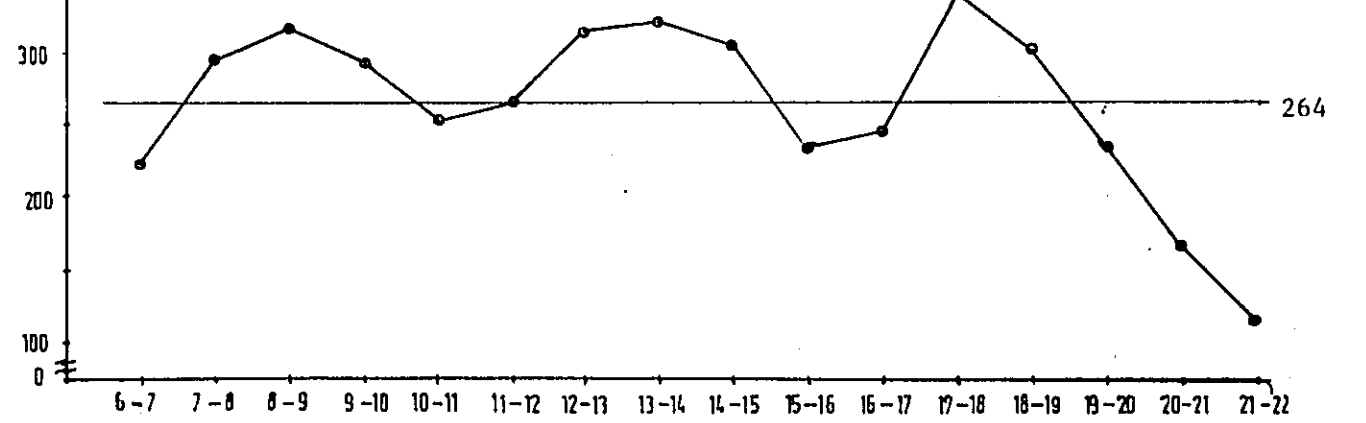
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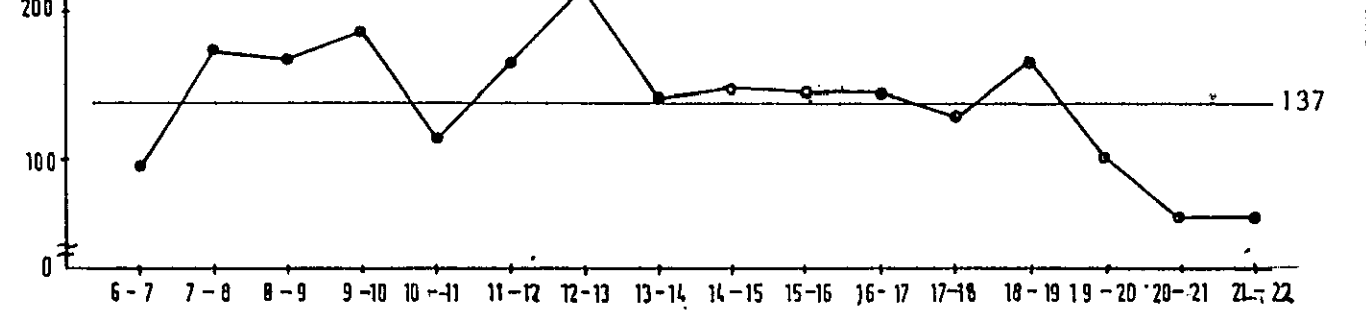
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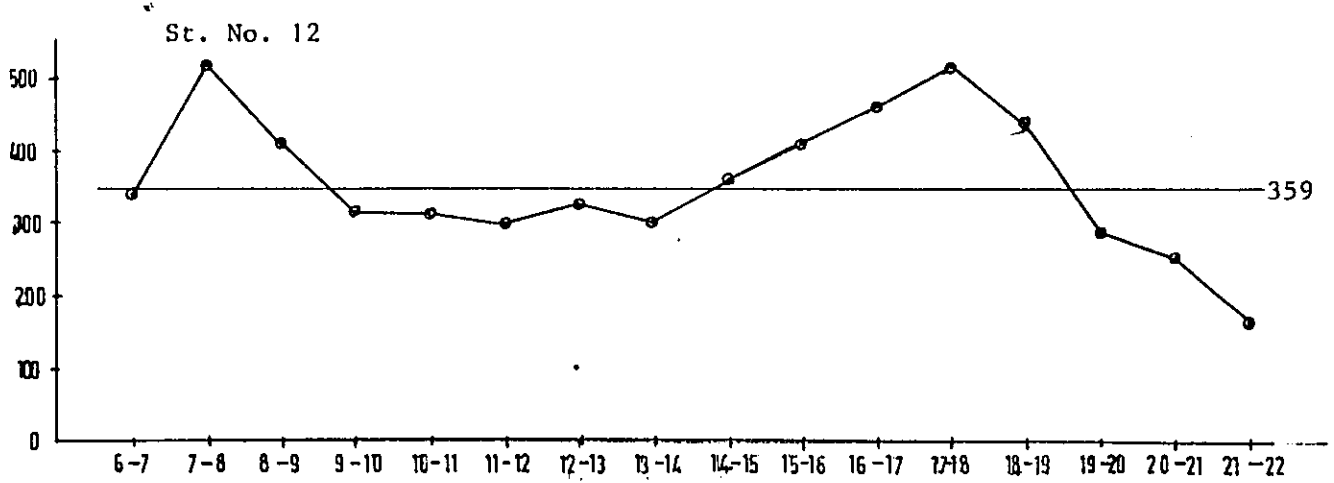
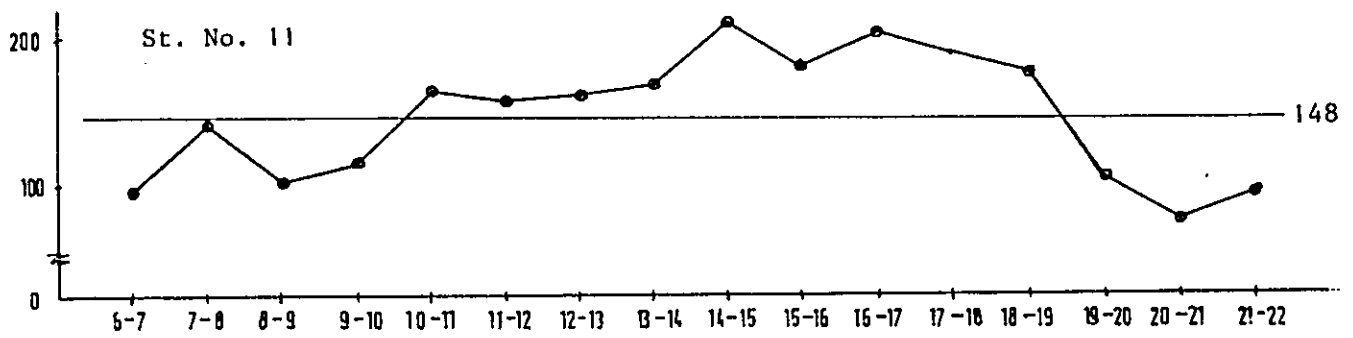
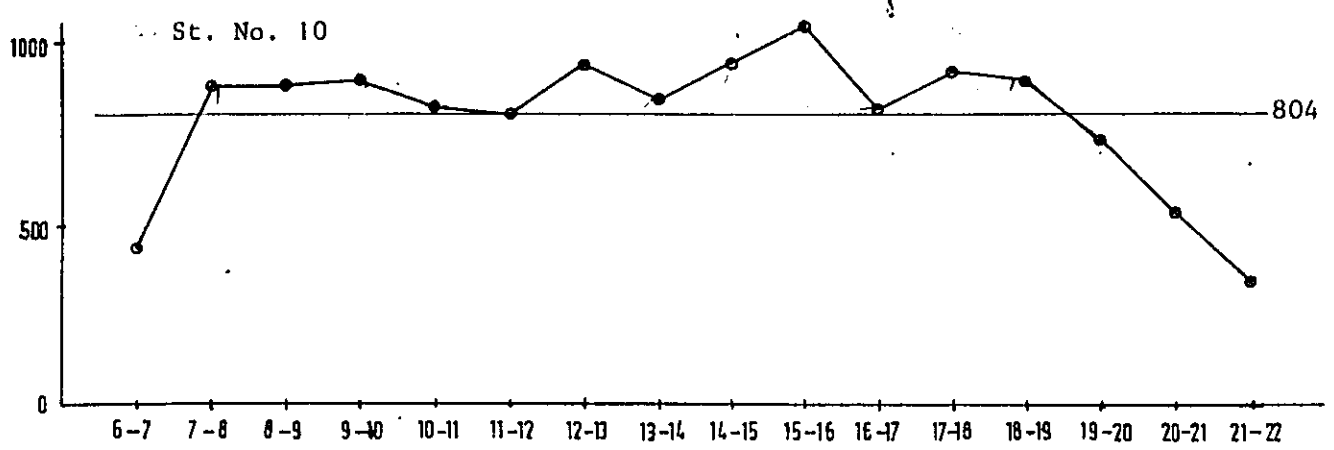
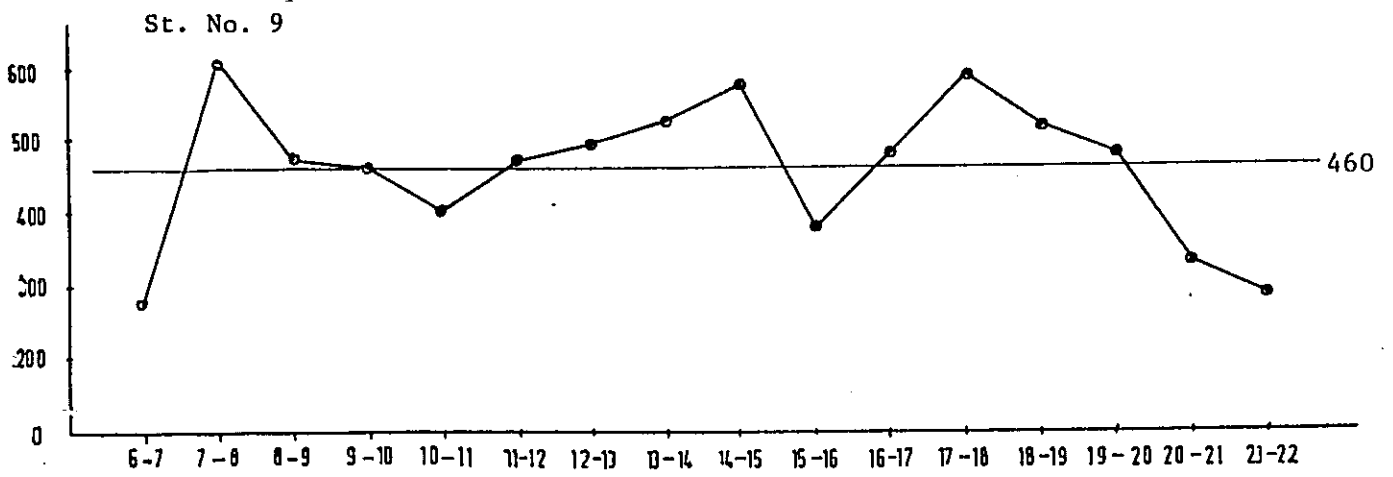


St. No. 7



St. No. 8







2-3

Interview Sample.

Approximately 8,400 samples were collected at all the stations, the number of samples at each station is shown in the table below:-

TABLE 9 COLLECTED SAMPLES OF INTERVIEW SURVEY

Time	St. No.	1	2	3	4	5	6	7	8	9	10	11	12	Total
7.00-8.00	-	26	41	17	56	69	96	62	-	9	50	111	537	
8.00 -	115	14	35	25	65	75	61	40	118	110	52	77	787	
9.00 -	62	12	50	33	68	52	67	39	101	90	72	53	699	
10.00 -	63	19	44	30	64	62	39	35	113	68	63	69	669	
11.00 -	72	16	50	26	53	58	72	33	89	94	48	28	639	
12.00 -	73	16	20	34	46	54	51	39	71	123	80	70	677	
13.00 -	81	25	35	40	55	56	68	36	99	63	75	62	695	
14.00 -	78	22	70	29	83	79	70	42	98	97	90	36	794	
15.00 -	60	26	25	29	50	52	17	48	57	112	70	73	619	
16.00 -	92	18	45	42	60	57	20	41	50	133	101	63	722	
17.00 -	66	45	50	41	64	70	60	14	69	128	109	62	778	
18.00 -	80	-	28	18	62	46	80	23	85	177	81	72	752	
Total		842	239	493	364	726	730	701	452	950	1204	891	776	8,368

At each station, the sample collected changed from 200-1,200 and in each time zone the sample was between 500-800 for all stations.

The sample ratio is shown as follows.

TABLE 10a SAMPLE RATIO AT EACH STATION.

Station	No. of Interview (7:00-19:00)	No. of Counting (7:00-19:00)	Sample Rate (%)
01	824	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

TABLE 10b SAMPLE RATIO IN EACH TIME ZONE

Time Zone	No. of Interview	No. of Counting	Sample Rate (%)
7.00-8.00	537	2,763	19.4
8.00 -	787	2,061	38.2
9.00 -	699	1,802	38.8
10.00 -	669	1,719	38.9
11.00 -	639	1,721	37.1
12.00 -	677	1,771	38.2
13.00 -	695	1,932	36.0
14.00 -	794	2,070	38.0
15.00 -	619	2,209	28.0
16.00 -	722	1,883	38.3
17.00 -	778	2,177	35.8
18.00 -	752	2,159	34.8





