

AFRICAN DEVELOPMENT BANK
GOVERNMENT OF MAURITIUS

BEAU BASSIN-PORT LOUIS LINK ROAD

FEASIBILITY STUDY

FINAL REPORT

VOLUME 2

DECEMBER 1978

Japan International Cooperation Agency

S D F

78-51(2/4)

JICA LIBRARY



1063042[4]

AFRICAN DEVELOPMENT BANK
GOVERNMENT OF MAURITIUS

BEAU BASSIN-PORT LOUIS LINK ROAD

FEASIBILITY STUDY

FINAL REPORT

VOLUME 2

DECEMBER 1978

Japan International Cooperation Agency

国際協力事業団	
納入 月日 84. 5. 15	4/0
登録No. 04542	6L4
	SDF

Contents

- I. Introduction
- II. Outline of Feasibility Survey
- III. The Mauritius Economy
- IV. Current Status and Future Prospect of Regional Development and Growth Factors
- V. Analysis of Present Traffic
- VI. Comparison and Selection of Alternatives
- VII. Engineering Analysis
- VIII. Traffic Forecast
- IX. Preliminary Design
- X. Construction Schedule and Cost
- XI. Evaluation of the Project

CHAPTER I INTRODUCTION

1. Background and Outline of Project	I-1
2. Acknowledgement	I-3

CHAPTER I INTRODUCTION

1. Background and Outline of Project

The Government of Mauritius and the African Development Bank filed a request with the Government of Japan for conducting surveys for the project in accordance with the technical cooperation program signed by the Government of Japan and the African Development Bank.

The Government of Japan decided, after studying the details of the request, for implementation of an economic and technical feasibility study on the construction of the proposed new link road between Port Louis and Beau Bassin.

In accordance with the decision, Japan International Cooperation Agency (JICA) dispatched a preliminary survey team for arrangement of the scope of works in August 1977. Later, JICA delegated a 10-member final survey team in order to conduct the economic and technical feasibility study on the basis of the scope of works arranged on the visit of the preliminary survey team in November.

At present, A₁ Road and Motorways M₁ and M₂ run northwest in the project area as main motorways.

The A₁ Road is the only main road connecting Port Louis with Beau Bassin. The A₁ Road and its extension road, the A₁₀ Road are connecting Port Louis, the Capital of Mauritius, with the international airport Plaisance and, along this route, most of the major cities of Mauritius, i.e., Beau Bassin, Rose Hill, Quatre Bornes, Phoenix, Qurepipe, etc., are located.

The Motorways M₁ and M₂ are running on the opposite side of the A₁ Road with the Grand River North West, which is flowing from south to north in the project area, between. The Motorways originating from Port Louis join the A₁ Road at the St. Jean Roundabout in Quatre Bornes, south of Beau Bassin and Rose Hill.

With respect to the present traffic conditions, the A₁ Road does not only serve as a commutation road between the neighboring cities and Port Louis, but provide services for commercial traffic between these

cities. Furthermore, it provides services to the most of bus traffic, one of the major public transportation means in Mauritius, playing an essential role for the operation of the cities in the neighborhood of the road.

The Motorways M₁ and M₂ provide services to traffic between the south of Quatre Bornes and Port Louis, but not to the traffic in the north of Quatre Bornes due to poor connection with the A₁ Road.

Consequently, daily traffic volume is 19,000 p.c.u (passenger car unit) along the Motorways M₁ and M₂ and 23,000 p.c.u along the A₁ Road. The peak-hour traffic congestion in the mornings and the evenings ranges 0.34 to 0.11 on the Motorways M₁ and M₂ and no serious problem has been posed for the moment. On the contrary, along the A₁ Road, traffic congestion ranging 1.26 to 1.24 exceeds the road capacity in the vicinity of the G.R.N.W. Bridge (A₁ Road), forming the most serious bottleneck. In the neighborhood of Coromandel where the road is subjected to poor vertical alignment (over 10%), the congestion of the road is nearing its maximum traffic capacity at a rate of 0.84 due to a progress in construction of the Industrial Complex since 1975 and a consequential increase in related traffic.

Accordingly, the objective of this road construction is to alleviate traffic congestion of the A₁ Road and render sufficient traffic services between the vicinity of Beau Bassin and Rose Hill and Port Louis, and also to cope with potential heavy traffic resulting from a progress in the industrial development plan in Coromandel and Pointe aux Sables in the project area.

The preliminary design of the project road has been based, with few exceptions, on the motorway specifications for a 4-lane divided road.

2. Acknowledgement

This study was performed based on the data collected and the results of hearings and discussions held during the one-month period of field surveys. During the field surveys, the Mauritius Government as well as the following agencies kindly provided unreserved cooperation which enabled the study to be carried out smoothly and successfully.

- Ministry of Economic Development
- Ministry of Works
- Central statistical Office
- Police, Traffic Department
- Ministry of Housing, Lands, Towns and Country Planning
- Central Electricity Bureau
- Central Water Authority

CHAPTER II OUTLINE OF FEASIBILITY SURVEY

1. Progress of Survey	II-1
2. Organization of Survey Team	II-4
2.1 Supervising Committee	II-4
2.2 Survey Team	II-5
3. Survey Report Composition	II-6
4. Survey Outline	II-6

CHAPTER II OUTLINE OF FEASIBILITY SURVEY

1. Progress of Survey

(1) Preliminary Survey

The Japan International Cooperation Agency (JICA) dispatched a preliminary survey team comprising 5 experts to the Government of Mauritius and the African Development Bank during Aug. 20 ~ Sep. 13, 1977 in accordance with the Japanese Government's decision to conduct an economic and technical feasibility study and arranged the scope of works.

(2) Survey Team (November 1977)

For the purpose of conducting the feasibility study, JICA organized a survey team consisting of 10 experts on behalf of Japan Engineering Consultants Co., Ltd. and the NIPPON Engineering Consultant Co., Ltd.

(3) Supervising Committee (November 1977)

JICA has set up a committee to supervise the works of the survey team, consisting of four committee members and three specialists.

(4) Inception Report (November 1977)

The survey team prepared the inception report dealing with survey work schedule and procedures.

(5) Field Survey (November ~ December 1977)

The survey team visited Mauritius during November 20 through December 27, 1977, briefed the authorities concerned of the Government of Mauritius after submittance of the inception report and performed the following field survey:

- 1) Land survey
- 2) Geological study
- 3) Water levels study

- 4) Study of road condition
- 5) Bridge inspection
- 6) Study of traffic volume
- 7) Socio - economic study
- 8) Materials inspection
- 9) Study of local builders and construction system
- 10) Study of alternatives

(6) Draft Final Report (January ~ March 1978)

Based on the findings of the field survey, the survey team prepared a draft final report after completing the following surveys during three months commencing early January 1978. During the period of 10 through 30 March, we invited from Mauritius 2 counterparts, who cooperated with us in drawing up the report.

Following works were performed in Japan based on the data obtained by the field survey in Mauritius.

- 1) Forecast of population increase and manufacture of products
- 2) Traffic volume forecast
- 3) Preliminary design
- 4) Preparation of work schedule
- 5) Tentative estimation of construction cost
- 6) Economic assessment
- 7) Invitation and cooperation of counterparts

G. D. Hurree - Senior Civil Engineer
Ministry of Works
Government of Mauritius

P. Kistnassamy - Senior Economist
Ministry of Economic Planning
and Development
Government of Mauritius

(7) On-site Briefing of Final Draft Report (April 1978)

The Mission consisting of a supervising committee chairman, three survey team members and a JICA project officer briefed the Mauritius Government officials on the draft final report during April 24~28, 1978.

(8) Comments on the Draft Final Report

JICA received comments from the African Development Bank and the Government of Mauritius. During September 1~14, 1978, JICA invited counterparts from the Mauritius Government and consulted with them on the comments.

The counterparts are as follows:

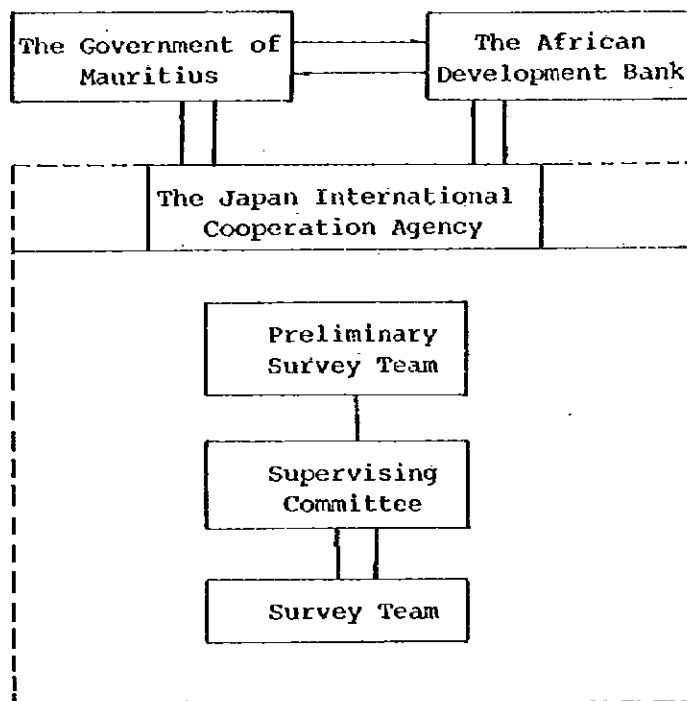
- I. A. Limbada - Chief Engineer
Ministry of Works
Government of Mauritius
- G. E. Danjoux - Chief Town & Country Planning Officer
Ministry of Housing, Lands and Town
& Country Planning
Government of Mauritius
- D. Rajah Gopal - Principal Engineer
Ministry of Works
Government of Mauritius

(9) Preparation and Submittance of Final Report

The final report has been prepared after home work based on the comments from the Mauritius Government and the African Development Bank.

2. Organization of Survey Team

The following table shows the organization of the survey team for the Project.



The members of supervising committee and survey team are as follows:

2.1 Supervising Committee

The Japan International Cooperation Agency has set up a committee to supervise the works of the survey team; the said Committee is composed of four committee members and three specialists as follows:

- Committee Chairman: Kimio Chiba - Senior Policy Planner, Secretariate to the Minister, Ministry of Construction, Government of Japan

- Comittee Members : Koichi Shimizu - Assistant Section Director, Road Economy Survey Section, Project Division, Road Bureau, Ministry of Construction, Government of Japan

- | | | |
|-------------|--------------------------------|--|
| | Koichi Tsuchiya | - Director, Takada Construction Office, Hokuriku Regional Bureau, Ministry of Construction, Government of Japan |
| | Mizuo Kinoshita | - Senior Engineer, Project Division, Kanto Regional Bureau, Ministry of Construction, Government of Japan |
| Specialists | : The late Dr. Tetsuo Kunihiro | - Director, Structure and Bridge Division, Public Works Research Institute, Ministry of Construction, Government of Japan |
| | Yukitake Shioi | - Chief, Foundation Engineering Section, Structure and Bridge Division, Public Works Research Institute, Ministry of Construction, Government of Japan |
| | Atsushi Hikawa | - International Affairs Division, Planning Bureau, Ministry of Construction, Government of Japan |

2.2 Survey Team

The Survey Team is composed of the following ten members, from the Japan Engineering Consultants Co., Ltd., and the NIPPON Engineering Consultant Co., Ltd., who have experience in road construction project survey and technical assistance in Africa.

- | | | |
|---------------------|-------------------|--------------------------|
| Team Leader | : Shunji Minami | - General Manager |
| Deputy Team Leaders | : Ko Kuwata | - Highway Engineer |
| | Shizuo Iwata | - Development Economist |
| Team Members | : Takashi Shoyama | - Transport Economist |
| | Hisashi Muto | - Traffic Analyst |
| | Mitsuo Takamatsu | - Road Planning Engineer |

Itsuki Onishi - Bridge Engineer
Mitsuo Hatakeyama - Bridge Engineer
Kinzo Narita - Geologist
Hideyuki Wakatabi - Construction Engineer

Two Coordinators from JICA are:

Hiroyoshi Kurihara
Seiichi Kanai

3. Survey Report Composition

This Survey Report is composed of the following four parts:

1) Summary Report, 2) Main Report, 3) Appendix A, and 4) Appendix B (drawings).

4. Survey Outline

The survey Team prepared and submitted the Inception Report in accordance with the Scope of Works and the Terms of Reference and performed the field survey in Mauritius while maintaining close consultation with Mauritius Government authorities.

The Survey Team studied road conditions in Mauritius, including the possibility of utilizing existing railway bridges while collecting and analyzing economic and technical data on the proposed road and the areas which will be affected by the construction of the road.

The survey was carried out according to the following work schedule:

a) Preparatory Works in Japan

Available data were collected and the Inception Report was prepared in Japan.

b) Field Survey

In Mauritius, consultations were held with officers of the Ministry of Works and Ministry of Housing, Lands and Town and Country Planning as well as in the necessary data collecting and field surveys.

Field works in Mauritius included the following:

- 1) Land survey
- 2) Geological study
- 3) Water levels study
- 4) Study of road condition
- 5) Bridge inspection
- 6) Study of traffic volume
- 7) Socio - economic study
- 8) Materials inspection
- 9) Study of local builders and construction system
- 10) Study of alternatives

c) Follow-Up Works in Japan

Following works were performed in Japan based on the data obtained by the field survey in Mauritius.

- 1) Forecast of population increase and manufacture of products
- 2) Traffic volume forecast
- 3) Preparation of work schedule
- 4) Preliminary design
- 5) Tentative estimation of construction cost
- 6) Economic assessment
- 7) Preparation of Survey Report

CHAPTER III THE MAURITIUS ECONOMY

1. Background	III- 1
2. Population and Labour Force	III- 3
2.1 Population	III- 3
2.2 Employment	III- 5
3. Economic Profile	III- 7
3.1 GNP	III- 7
3.2 Agriculture	III- 9
3.3 Manufacturing	III-11
3.4 Tourism	III-12
4. Road Transportation	III-14
4.1 Road Network	III-14
4.2 Registered Number of Motor Vehicles	III-16

CHAPTER III THE MAURITIUS ECONOMY

Discussed in this Chapter will be a summary of the Mauritius economy, which provides the basis for the analysis of road transportation demand and a background of the Project Road. The discussion will chiefly deal with population, employment, economic activities, and road transportation. Major economic indicators will be forecast and their regional distribution will be discussed in Chapter IV.

1. Background

The size of the main Island of Mauritius is 1,865 km², having a population of 867,885 in 1976. Mauritius is primarily agricultural and its main product is sugar. Table III-1-1 shows the land use in Mauritius.

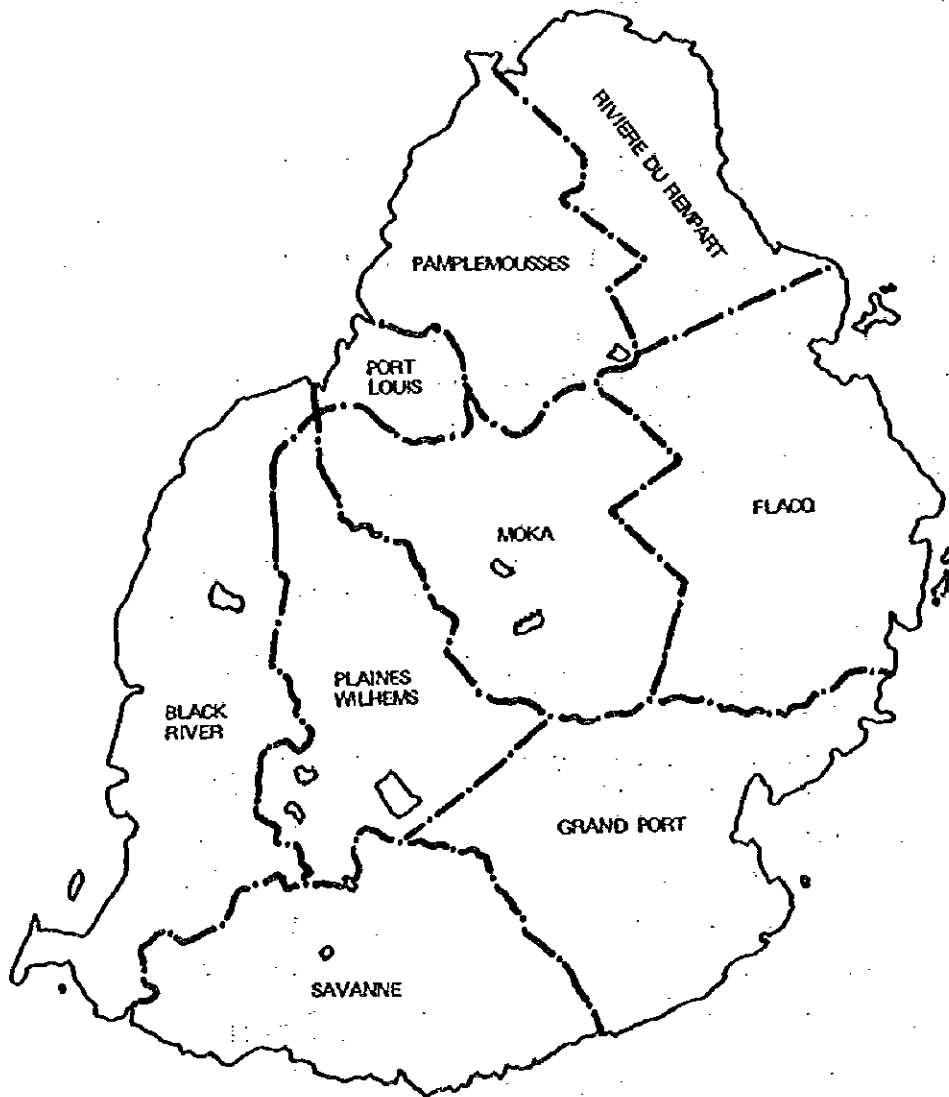
The island is divided into nine geographical districts as shown in Figure III-1-1, which are being administered by five municipalities for the urban areas and three district councils for the rural areas.

Table III-1-1 Area by Land Use for
the Island of Mauritius

Land Use	km ²	(%)
Agriculture	1,061	(56.9)
Forests, scrub areas, grass-lands and grazing lands	644	(34.5)
Reservoirs and ponds	12	(0.6)
Swamps and rocks	14	(0.75)
Roads (main roads)	14	(0.75)
Built-up areas	120	(6.4)
TOTAL	1,865	(100.0)

Source: Bi-annual Digest of Statistics, June 1976
Central Statistical Office.

Fig. III-1-1 Geographical District Boundary



2. Population and Labour Force

2.1 Population

The population census of 1952, 1962 and 1972 conducted by the Central Statistical Office give a true picture of the population trend of Mauritius. Besides these decadal surveys, the Central Statistical Office also publishes population figures in its annual digest of statistics.

The population of Mauritius was 01,415 in 1952, 681,619 in 1962, and 826,199 in 1972. The average annual population increase rate declined from the 3.12 % registered during the decade from 1952 to 1962 to 1.94 % during the following decade from 1962 to 1972, and, further, to 1.24 % during the period from 1972 to 1976. This decline can be attributed to a drop in the natural population increase rate due to extensive practice of birth control and to emigration (about 3,000 annually). (See Appendix Table A-III-1.)

Table III-2-1 gives population distribution by district for the year 1952, 62, 72 and 76. Table III-2-1 shows that 47 % of the population lives in Port Louis, the capital city and Plaines Wilhems, the urbanized area of the Island. Table III-2-1 also shows different growth for different districts, which could be explained by internal migration of the population. Particularly conspicuous during the period from 1952 to 1962 was the movement of inhabitants from Port Louis to Plaines Wilhems, while the population increase rate declined in Flacq, Savanne, Riviere du Rempart and other districts. The population increase in Port Louis, during the decade of 1962 to 1972, was substantial in terms of absolute number but at a relatively smaller rate. Relatively higher population increase rates were registered in Plaines Wilhems, Moka, Black River, and Riviere du Rempart. The pattern of district population distribution changed little during the period of 1972 to 1976, excepting that the population increase rate in Plaines Wilhems, which had previously been constantly high, dropped in this period. The trend of district population from 1921 through 1972 is shown in Appendix Table III-2.

Table III-2-1 Population of Mauritius by District

District	1952		1962 Census ^{1/}		1972 Census ^{1/}		Estimate as ^{2/} of 30.6.76	
	Population	(%)	Population	(%)	Population	(%)	Population	(%)
Port Louis	84,539	(16.9)	119,950	(17.6)	133,996	(16.2)	139,399	(16.1)
Pamplemousses	40,663	(8.1)	55,899	(8.2)	68,948	(8.3)	73,138	(8.4)
Riviere du Rempart	40,323	(8.0)	53,309	(7.8)	66,995	(8.1)	71,736	(8.3)
Flacq	56,867	(11.3)	73,061	(10.7)	89,050	(10.8)	95,675	(11.0)
Grand Port	52,709	(10.1)	69,023	(10.1)	80,719	(9.8)	85,048	(9.8)
Savanne	35,309	(7.0)	46,380	(6.8)	53,011	(6.4)	55,480	(6.4)
P. Wilhems	149,614	(29.8)	208,184	(30.6)	258,699	(31.3)	268,449	(30.9)
Moka	27,961	(5.6)	37,245	(5.5)	48,610	(5.9)	51,137	(5.9)
Black River	13,430	(2.7)	18,568	(2.7)	26,171	(3.2)	27,823	(3.2)
Island of Mauritius	501,415	(100.0)	681,619	(100.0)	826,199	(100.0)	867,885	(100.0)

Source: Central Statistical Office

^{1/} Census date is June 30

^{2/} Estimated by Central Statistical Office

Table III-2-2 shows the population of townships, all of which except Port Louis are located in Plaines Wilhems District. Urban population (those which live in these townships) represented about 44% of the total population; this ratio has been on the decrease since 1962, indicating that the population increase ratio has been higher in rural areas than in urban. Population influx into Plaines Wilhems, which continued during the period of 1962 to 1972, was mostly absorbed into Beau Bassin, Rose Hill and Quatre Bornes, as the Table indicates.

Table III-2-2 Population of Mauritius Island: Urban^{1/} and Rural

Town Ship	Population			Annual Average Increase (%)		
	1962 Census	1972 Census	30.6. ^{2/} 1976	1962-72	1972-76	1962-76
Port Louis	119,950	133,996	139,399	1.12	1.03	1.09
Beau Bassin-Rose Hill	62,296	80,318	82,460	2.57	0.67	2.12
Quatre Bornes	38,567	50,770	52,735	2.79	0.96	2.35
Vacoas-Phoenix	41,743	47,638	49,934	1.33	1.16	1.28
Curepipe	44,244	51,956	53,445	1.62	0.70	1.40
Urban	306,800	364,678	377,973	1.74	0.91	1.54
Rural	374,819	461,521	489,912	2.10	1.51	1.95
Total	681,619	826,199	867,885	1.95	1.24	1.77
Percentage of Urban population	(45.0)	(44.1)	(43.6)	-	-	-

Source: Central Statistical Office.

1/ Urban Population refers to the total population in township

2/ Estimated by Central Statistical Office

2.2 Employment

Employment figures are available from semi-annual surveys taken by the Central Statistical Office. The surveys are taken in March and September each year for large establishments i.e. (1) sugarcane plantation whose land area is 25 acres or more, (2) tea plantations of 5 acres or more, (3) tobacco manufacturing companies, (4) non-agricultural enterprises the number of whose employees is 10 or more at the time of the survey, and (5) government agencies, which are categorically called "large establishments" in distinction from smaller plantations and enterprises.

Table III-2-3 presents employment by sector for the years of 1972 and 1976. The total number of people employed increased by about 22 % from 1972 to 1976. Major increase was in industrial and service sectors. The remarkable growth of the manufacturing sector caused a considerable

change in the employment structure of Mauritius. Of a total 262,000 workers in 1976, 26 % was in primary industries, 33 % in secondary industries, and 41 % in tertiary industries. It is noteworthy that large establishments absorbed about 70 % of the total people employed.

Table III-2-3 Employment by Sector of Activity, 1972 and 1976

Sector	1972				1976			
	Large Establ. ^{1/}	Other ^{4/}	Total ^{2/}	(%)	Large Establ. ^{1/}	Other ^{4/}	Total ^{3/}	(%)
1) Agriculture, Forestry and Fishery	60,045	10,629	70,674		61,820			
2) Mining and Quarrying	148	-	148		151			
PRIMARY SECTOR	60,193	10,629	70,822	(32.9)	61,971	5,186	67,157	(25.6)
3) Manufacturing	10,941	18,179	29,120		27,882			
4) Construction	2,763	17,763	20,526		6,508			
SECONDARY SECTOR	13,704	35,942	49,646	(23.0)	34,390	53,111	87,501	(33.3)
5) Electricity, Gas and Water	1,316	1,830	3,146		3,078			
6) Transport, Storage and Communication	6,597	7,547	14,144		9,366			
7) Wholesale, Retail Trade, Restaurants and Hotels	5,250	15,318	20,568		8,266			
8) Community, Social and Personal Services	49,364	4,200	53,564		53,643			
9) Others	1,888	1,798	3,686		3,051			
TERTIARY SECTOR	64,415	30,693	95,108	(44.0)	77,404	30,363	107,767	(41.1)
TOTAL	138,312	77,264	215,576	(100.0)	173,765	88,660	262,425	(100.0)

Source: Central Statistical Office

^{1/} Average of the figures of March and September in the "Biannual Survey of Employment and Earnings" reports. Employment figures of Development Works Corporation is excluded.

^{2/} Figures of 1972 Census

^{3/} Estimated by MATIM

^{4/} Employment of "Other" was estimated by subtracting that of "Large establishment" from "Total".

3. Economic Profile

3.1 GNP

Gross National Products (GNP) of Mauritius was in the order of 3.5 billion Rupees and the per capita GNP was about 4,100 Rupees in 1976. The GNP grew by about 9.0 % per year in real terms from 1970 to 1976. The high average annual growth rate of about 12 % from 1972 to 1974 was largely to high international sugar price in 1973 and 1974.

Sectoral distribution of GNP is as follows: Agriculture remains the largest contributor, though its share declined from 45 % in 1974 to 33 % in 1976 due to the decline in sugar prices. Manufacturing industry follows agriculture as one of the main stays of Mauritius economy by making a steady growth until its contribution to GNP reached 18 % in 1976. The other sectors have also achieved healthy growth. However, the economic structure of Mauritius still remains fundamentally unchanged with its base in sugar industry which is a single largest foreign exchange earner by almost 80 % of the national total; this makes its economy highly susceptible to external factors such as fluctuation of the international sugar prices or weather conditions. Statistics of external trades are shown in Appendix Tables III-4 and III-5. Per-capita GNP increased at an annual rate of 7.6 % between 1970 and 1976.

Table III-3-1 Gross National Product by Industrial Origin
(at current factor cost)

Sector	(RS. million)						
	1970	1971	1972	1973	1974	1975	1976
1. Agriculture, forestry, hunting and fishing	209	247	353	494	1,323	1,034	1,060
2. Mining and quarrying	1	1	2	2	2	4	5
3. Manufacturing	141	162	233	277	505	564	648
4. Construction	48	60	73	114	155	217	260
5. Electricity, gas, water and sanitary services	29	34	39	43	49	69	75
6. Transportation, storage and communication	108	114	129	161	195	281	315
7. Wholesale and retail trade	91	94	127	172	221	279	321
8. Banking, insurance and real estate	20	18	22	31	44	66	75
9. Ownership of dwellings	70	71	74	77	83	94	100
10. Public administration and defence	51	53	61	76	105	140	225
11. Services	126	141	166	203	259	342	440
Gross Domestic Product	894	995	1,279	1,650	2,941	3,090	3,524
- Net factor income from the rest of the world	+7	+7	+2	+16	+10	+17	+16
- Gross National Product at current factor cost	901	1,002	1,281	1,666	2,951	3,107	3,540
- GNP at 1976 constant prices	2,118	2,222	2,443	2,748	3,051	3,051	3,540
- Index; 1970 = 100	100	104.9	115.3	129.7	144.0	144.0	167.1
- Per Capita GNP at 1976 constant prices	2,612	2,701	2,957	3,292	3,607	3,562	4,079
- Index; 1970 = 100 (based on mid-year population)	100	103.4	113.2	126.0	138.1	136.4	156.2

Source: Central Statistical Office

3.2 Agriculture

1) Sugarcane

Land under sugarcane plantation remained constant during the past five years at about 215,000, acres (or 87,000 hectares) which represents more than 90% of the total cultivated land. About 93% of the land under sugarcane is being harvested annually. The volume of sugarcane production has increased slowly because of non-availability of land and weather conditions particularly cyclone and drought. The substantial reduction in sugarcane production in 1975 was due to damage by cyclone "Gervoise". Sugar production dropped to less than 70% of the usual production.

There are 21 sugar factories spread all over the Island. The factories obtain sugarcane from their own plantations and farmers in their factory areas. Sugarcane is transported from the field to the factory by trucks and factory railway system and sugar is transported from the factory to the port for shipment, Port Louis, by semitrailors from 12 to 14 tons. The 21 sugar companies are compared on Appendix Table A-III-6 in terms of their production and relative positions.

Table III-3-2 Sugar Production

Item	1972	1973	1974	1975	1976
Cultivated Area (acres)	213,800	215,900	213,800	213,800	214,900
Harvested Area (acres)	198,200	200,300	197,100	198,100	200,300
Average Cane Yield (t/acre)	31.9	31.2	30.3	21.8	32.0
Cane Production (000 tons)	6,315	6,243	5,964	4,316	6,402
Sugar Production (000 tons)	686	718	697	468	690
Commercial Sugar Recovered (% cane)	10.9	11.5	11.7	10.8	10.8

Source: Bi-annual Digest of Statistics, Dec. 1976,
Central Statistical Office.

2) Other Cash Crops

The agricultural crops of Mauritius other than sugar are tea and tobacco. While tea is the second largest export crop after sugar, the volume of tea production is very small as indicated by Table III-3-3. Tea is grown on highlands where climate is suitable, but the shortage of labourers and low prices prevent expansion of production.

Tobacco cultivation occupies an area of 1,700 acres in 1976 and has been expanding the area for cultivation, but the production has increased little. The present level of production satisfies about 80% of domestic demand for tobacco.

Table III-3-3 Production of Other Cash Crops

Crop	1972	1973	1974	1975	1976
Tea: Cultivated area (acres)	12,000	12,600	13,500	13,700	14,000
: Production (ton)					
• green leaf processed	23,543	20,365	19,646	15,777	22,444
• manufactured tea	4,678	4,079	3,971	3,139	4,334
Tobacco: Cultivated area (acres)	1,100	1,100	1,300	1,450	1,700
: Production (ton)					
• tobacco leaf	614	677	771	686	666

Source: Bi-annual Digest of Statistics, Dec. 1976,
Central Statistical Office.

3) Food Crops

Only small areas of land are for food crops and their productions are limited, the major items of which being Irish potatoes (about 12,000 tons in 1976), tomatoes (5,500 tons), bananas (8,000 tons), creepers (such as margoze, calabash, chouchou, and cucumbers, in total of 6,000 tons), leaf vegetables (7,000 tons), ground nuts (1,000 tons), and maize (1,600 tons). All of these crops are distributed through the markets

for domestic consumption but are short of fully satisfying the demand. About 80,000 tons of rice, 50,000 tons of wheat flour, and 12,000 tons of edible oil are being imported each year as shown on Appendix Table III-5.

4) Fishery/Livestock

The people of Mauritius are engaged in both fishery and livestock activities. Fishery in particular is blessed with abundant resources in the lagoon and in the nearby deep sea. Although the waters lying between Mauritius Island and Republic of South Africa are said to have attractive fishing grounds, they have been little exploited and the fishing activities of the Mauritius have been limited to waters relatively close to the islands. While Mauritius exported 19 million Rupees worth of fish in 1976, about 40 % of domestic fish consumption depends on imports at the same time.

The livestock industry covers cattle, goats, pigs, chickens, and deers and produces about 6,000 tons of meat, which supplies only about two-third of domestic demand; the remaining one-third needs to be imported.

3.3 Manufacturing

Manufacturing industry produces about 18% of the Gross Domestic Products (GDP) and is rapidly growing in the economy which now chiefly depends on sugar. The total number of employees of so-called "large establishments" (those which employ ten or more employees) grew from 10,941 in 1972 to 27,884 in 1976 as indicated by Table III-2-3. Of the total employment opportunities of about 87,000 currently being created by the secondary sector (manufacturing and construction), nearly 70% is absorbed by manufacturing industry.

By the type of industry, textile is the greatest of manufacturing industry, followed by food processing. Other types of industry in Mauritius are electric appliances, chemicals, metal products, and the supply of maintenance parts and repairing works to serve the sugar industry.

The Government of Mauritius, which is keenly interested in the promotion of manufacturing industry, provides various incentives such as the tax holiday, the preferential financing, the development of infrastructure for utilities, etc. under the Export Processing Zone Act of 1970 which aims at promoting export industries, and the Development Incentives Act of 1974, which aims at the promotion of import-substituting industries.

The number of enterprises included in the Export Processing Zone increased from 61 in 1975 to 87 in 1977, and the number of their employees from 10,267 to 18,200, during the same period of time. The enterprises are not required to be located in any particular area; of the 87 enterprises, 51 are located in Plaine Lauzun and 36 are scattered in Coromandel, Beau Bassin, Curepipe, and Vacoas/Phoenix and other areas such as Moka and Rivière du Rempart. The greatest number of enterprises are in textile industry. The Government of Mauritius is trying to attract other industries to diversify the manufacturing base of Mauritius.

3.4 Tourism

Tourism is another sector of recent rapid growth. Mauritius is rich in both human and natural resources to sustain tourism activities. As indicated by Table III-3-4, the number of incoming visitors increased from about 49,000 in 1972 to about 93,000 in 1976, while the average number of days of stay in Mauritius has been decreasing gradually. The number of bednights was about 890,000 in total and an average of 9.6 per visitor in 1976.

Visitors from Reunion represents about 32% of the total visitors, about 19% from the Republic of South Africa, and 15% from France, followed by such European nations as the United Kingdom and Italy.

A review of seasonal changes in the number of visitor arrivals indicates that peak months are August, December and January, which represent about 36% of the yearly total--the remaining 64% being spread out fairly evenly for other months with lowest figure for June.

Hotel facilities have been developed in line with increases in the number of visitors; while there were only about 500 beds in 1970. This figure has increased to nearly 2,800 in 1977.

Major tourist attraction are scattered all over the Island but mainly in coastal areas as follows:

- Northern Coast : Trou aux Biches, Grand Baie, Camp Malheureux
- Eastern Coast : General area from Trou d'Eau Douce to Ile d'Ambre
- Southwestern Coast : General area between Flic en Flac and Le Morne.

Table III-3-4 Tourist Arrivals

	1970	1971	1972	1973	1974	1975	1976
Number of tourists	27,650	36,398	48,797	67,994	72,915	74,597	92,561
(by air)		---	n. a.	---			(91,783)
Bed nights	n.a.	399,759	n.a.	n.a.	722,183	n.a.	892,222
Bed nights per tourist		11.0			9.9		9.6

Source: Bi-annual Digest of Statistics, Dec. 1976,
Central Statistical Office.

Table III-3-5 Distribution of Hotels

District	Number of major hotels	Number of beds
Port Louis	9	278
Pamplemousses	3	418
Rivière du Rempart	3	248
Flacq	2	466
Grand Port	3	222
Plaine Wilhems	6	397
Black River	10	753
TOTAL	36	2,782

Source: Ministry of Economic Development.

4. Road Transportation

4.1 Road Network

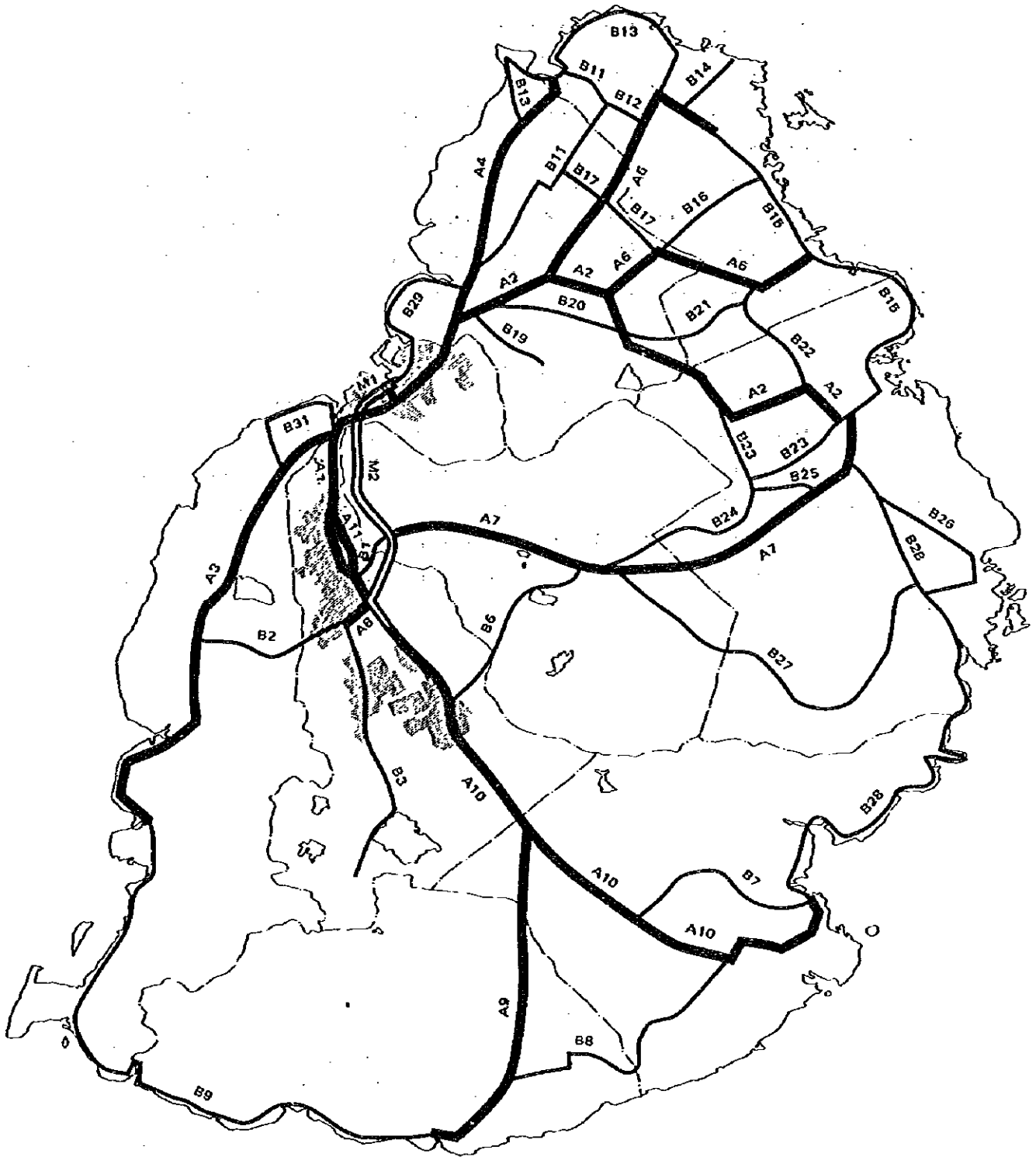
The public road network measures 1,770 kilometres consisting of about 16 km of Motorway, 546.3 km of main roads, 584.5 km of urban roads and 624 km of rural roads. All the main roads as well as 448 km of rural roads have been asphalted. This gives a density of 0.86 kilometre asphalted road per square kilometre of land. The network of Motorway and main roads of A and B are shown by Figure III-4-1.

Motorway, which connects Phoenix with Port Louis, consists of dual carriage way and is access-controlled. Main roads A radiate from Port Louis in various directions to connect major townships and areas of the Island and usually consist of two drive lanes for the total carriage way width of 24 feet. Main roads B branch out from A roads to connect other important points on the island and their standard is either comparable to or slightly lower than that of main roads A.

With the exception of the Motorway, however, roads do not necessarily conform to a given standard; Class A road in some sections is as wide as ten meters, consisting of three drive lanes, but in some other sections is barely wide enough for two-way traffic. The general problems of Mauritian roads are that they were constructed in direct accordance to the original topography and are, therefore, too steep in many sections and that their narrow shoulders are trimmed with plants or shrubs to obstruct side views, thus limiting the traffic capacity of the roads and impairing the safety of traffic movement.

Motorway, main roads A, and other major roads in the Project Area will be discussed in detail in Chapter V-1-1.

Fig. III-4-1 Existing Road Network



4.2 Registered Number of Motor Vehicles

The number of motor vehicles registered in various categories is published each year by the Central Statistical Office. Motor vehicles are classified into private use and business use. Private use vehicles are further classified into passenger cars, motorcycles, and motor-bikes, and business-use vehicles are further classified into taxi cabs, trucks, busses, and miscellaneous (which consist of tractors, trailers, and other types of vehicles). The Government owns motor vehicles in various categories.

Table III-4-1 shows a time series statistics of registered motor vehicles for the period of 1970 to 1976, while Table III-4-2 shows increases in the number of registered vehicles during the same period by category. The number of vehicles increased rapidly in each category, particularly in the recent few years. The number of motor vehicles excluding tractors, trailers, motorcycles, and Government owned vehicles was about 31,000 in 1976 and the average annual increase rate in the number of those vehicles was 9.9% during the period of 1970 to 1976.

Table III-4-1 The Number of Motor Vehicles Registered

Year	Private cars	Taxis	Vans	Buses	Lorries	Sub Total	Other	Motor cycles	Gov 't owned vehicles	Grand Total
1970	11,220	1,326	1,732	722	2,439	17,439	n.a.	5,383	n.a.	n.a.
1971	11,657	1,357	1,915	770	2,473	18,172	n.a.	5,806	n.a.	n.a.
1972	12,079	1,397	2,197	831	2,452	18,956	1,522	6,526	1,534	28,538
1973	13,446	1,392	2,678	951	2,706	21,173	1,648	8,429	1,695	32,945
1974	14,572	1,570	3,319	1,060	2,885	23,406	1,776	10,507	1,726	37,415
1975	16,198	1,635	4,113	1,149	3,201	26,296	1,922	12,885	1,914	43,017
1976	18,368	2,288	5,264	1,186	3,540	30,646	2,070	15,902	2,123	48,618

Source: Central Statistical Office

Table III-4-2 Growth of Motor Vehicles

Year	Private cars	Taxies	Vans	Buses	Lorries	Sub Total	Other	Motor cycles	Gov 't Vehicles	Grand Total
1970	100	100	100	100	100	100	n.a.	100	n.a.	n.a.
1971	104	102	111	107	101	104	n.a.	108	n.a.	n.a.
1972	108	105	127	115	101	109	100	121	100	100
1973	120	105	155	132	111	121	108	157	110	115
1974	130	118	192	147	118	134	117	195	113	131
1975	144	123	237	159	131	151	126	239	125	151
1976	164	173	304	164	145	176	136	295	138	170
Average Growth Rate (%/year)	8.66 (R= 0.982)	7.89 (R= 0.859)	20.74 (R= 0.992)	15.95 (R= 0.898)	6.63 (R= 0.953)	9.90 (R= 0.980)	7.99 (R= 1.000)	20.93 (R= 0.990)	8.02 (R= 0.982)	14.25 (R= 0.999)

CHAPTER IV CURRENT STATUS AND FUTURE PROSPECTS OF
REGIONAL DEVELOPMENT AND GROWTH FACTORS

1. Current Status	IV- 1
1.1 Regional Division and Zoning	IV- 1
1.2 Major Areas of the Island	IV- 4
1.3 Project Area	IV- 6
2. Future Prospects	IV- 9
2.1 Physical Development Plan	IV- 9
2.2 Forecasting of Population and Employment	IV-10
2.3 Vehicle Ownership and Vehicle Mile	IV-16
2.4 Relevant Regional Development Project ...	IV-18

CHAPTER IV CURRENT STATUS AND FUTURE PROSPECTS OF REGIONAL DEVELOPMENT AND GROWTH FACTORS

The chief purpose of this Chapter is to analyze various activities taking place in the project area and to forecast the future growth of economic indicators necessary for the prediction of the volume of road traffic.

1. Current Status

1.1 Regional Division and Zoning

The Port Louis-Beau Bassin Link Road Project will have the greatest impact on areas such as Port Louis, Belle Village, Grand River North West, Coromandel, Beau Bassin, Rose Hill and Quatre Bornes. Traffic flow to and from these areas, when the Project Road is completed, will be substantially improved. This Project also influences traffic to and from other areas than those mentioned above. Fig. IV-1-1 indicates the project area where the impact would be felt most and therefore needs to be analyzed in detail for this exercise.

As shown by Figures VI-1-1 and IV-1-2, the Island is divided into 18 zones, and the eight zones in the project area are further sub-divided into 17 sub-zones. Zoning has been made so that each zone would maintain proper conformity with the units for which economic indicators are available in official statistics. The boundary of large zones generally coincide with district boundaries and the boundary of urban zones in Plaines Wilhems coincide with the limits of towns. Rivers and other suitable natural features were also used in some parts.

- 01 Port Louis
- 02 Coromandel, Petite Malabar
- 03 Beau Bassin
- 04 Rose Hill
- 05 Quatre Bornes
- 06 Vacoas/Phoenix
- 07 Pailles, Moka
- 08 Pointe aux Sables, Petite Riviere
- 09 Le Bosquet
- 10 Bambous
- 11 Tamarin
- 12 Henrietta
- 13 Curepipe, Coriolis
- 14 Savanne
- 15 Grand Port
- 16 Quartier Militaire
- 17 Flacq
- 18 Pamplémousses, Riviere du Rempart

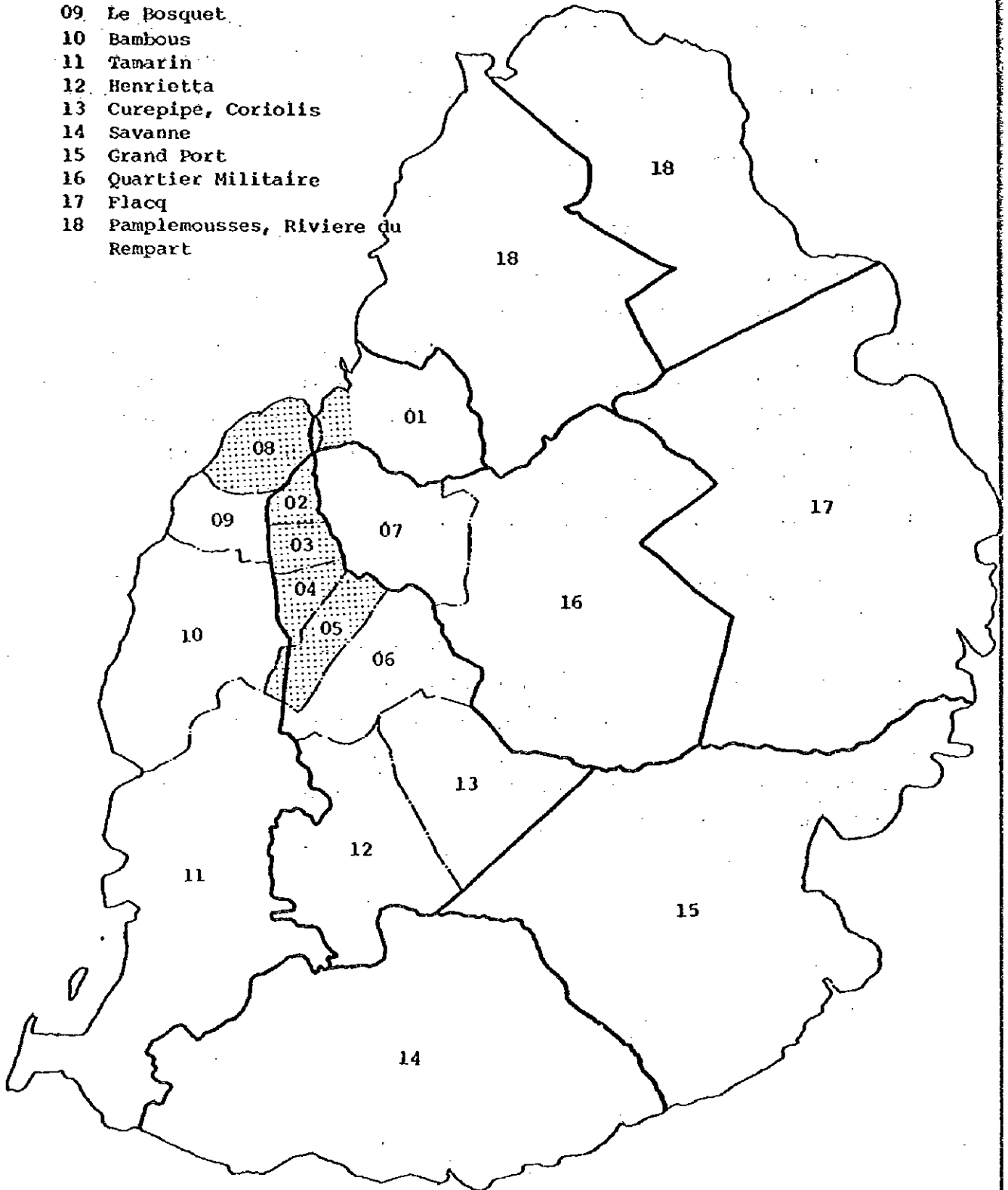
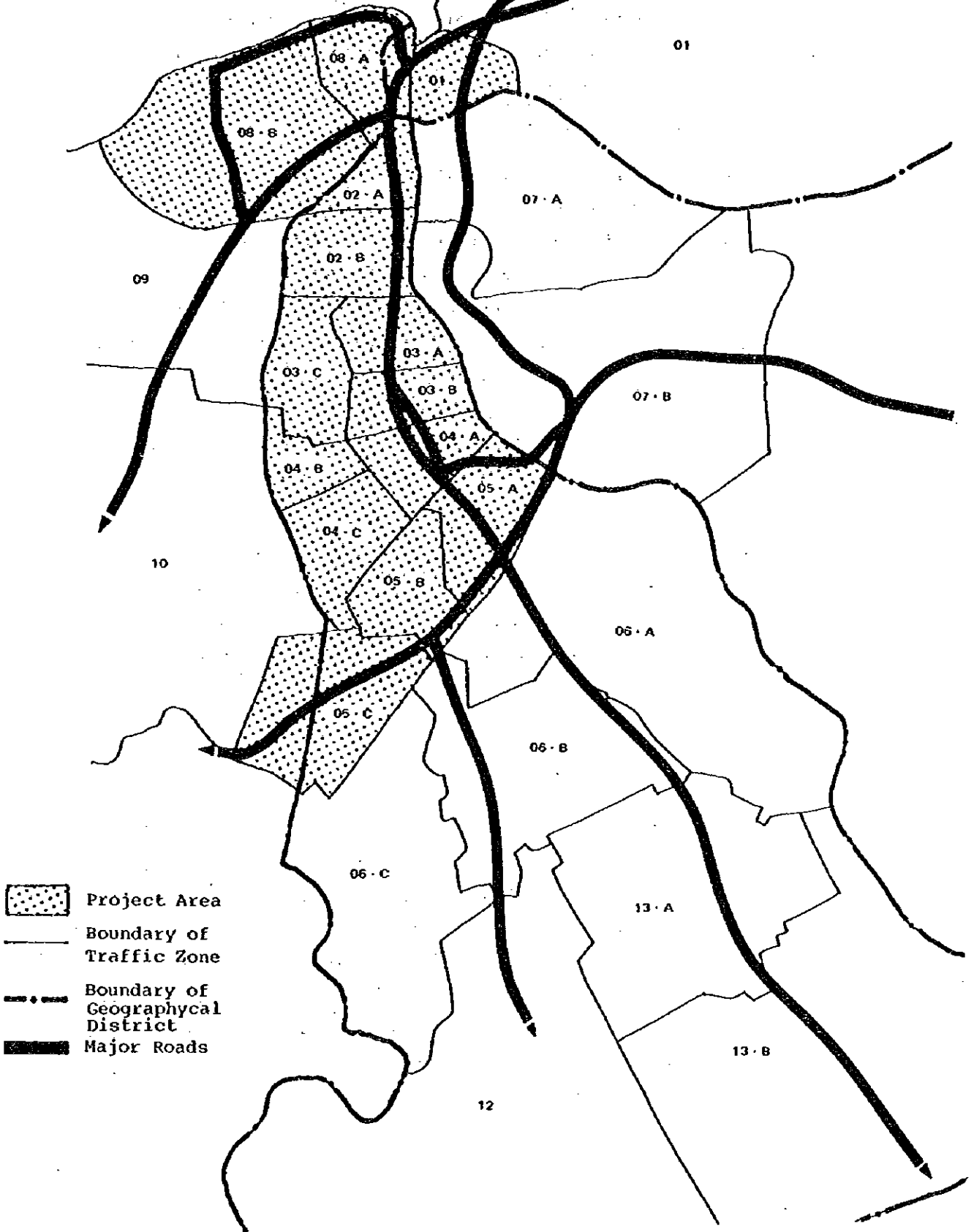


Fig. IV.1.2

Zone Map of the Project Area



1.2 Major Areas of the Island

The characteristics of major areas as identified by the zoning will be summarized in the following. (The condition of land utilization by district will be outlined in Appendix Table IV-1.)

1) Port Louis

The capital, Port Louis, consists of Zone 01 and a part of Zone 08, namely the western coast area of Grand River North West. Zone 01 has the greatest activities. Port Louis has grown as the centre of foreign trade and industrial activities of this country and is the only port through which foreign trade is conducted. Concentrated in Port Louis are not only major administrative functions of the Capital but also service functions and industrial activities of the private sector. The current population is approximately 140,000 (or 16% of the total population). Port Louis provides 31% of employment in the secondary sector and 40% of those in the tertiary sector.

The Capital City is bordered by steep hills on the East and South sides and by a highly developed industrial area on the West, and has little room for further expansion excepting towards North. Unless the city should go through a large scale redevelopment program, however, the future expansion and growth of Port Louis would experience severe restrictions.

2) Urban Area of Plaines Wilhems

Because of the limited space available in Port Louis and the high temperature due to its low elevation, people looked for a better living environment in the central highlands. Consequently, Port Louis, Beau Bassin, Rose Hill, Quatre Bornes, and finally Phoenix and Curepipe have come to form a continuous urban area. This area consists of Zones 02 through 06 and Sub-Zone 13A, whose total population is about 240,000 (or 27 % of the total) at the present, and advanced industrial activities are found in this area, which are offering employment opportunities to 40 % of total employment in the secondary sector and to 27 % in the tertiary sector.

This area and Port Louis combinedly constitute the core of the country: 43 % of the total population, 71 % of employment opportunities in the secondary sector and 67 % of those in the tertiary are concentrated in this small area. Such situations provide the background against which road transportation has become a serious problem.

3) Western Area

This area is situated mostly in the Black River District and consists of Zones 08 through 11 and the western extension of the downtown of Plaines Wilhems District. Little urbanization has been made excepting Zone 08, which embraces Petite Riviere and Pointe aux Sables coming under the influence of Port Louis. Generally speaking, the northern half is under sugarcane and the southern half is mountainous but both coastal and mountainous areas are rich in tourism resources and the coastal belt between Flicen Flac and Le Morne is an international tourist area with numerous hotels. The population of this area is only 3 % of the country's total.

4) North Central Area:

This area generally coincides with the territory of Moka District and consists of Zones 07 and 16. With a population of 50,000 (about 6 % of total), the land is mostly under sugarcane. It is connected with the southern exit of Port Louis and the downtown area of Plaines Wilhems by Motorway, and is being gradually developed.

5) Southern Area

Zone 14 or Savanne District and Zone 15 or Grand Port comprise this area. The international airport is located at Plaisance in Grand Port District. This area is one of the major sugarcane producing areas and the eight sugar mills located here are producing about 220,000 tons of sugar (about one-third of the country's total) each year.

6) Eastern Area

This is Zone 17, or Flacq District. The major activity of this area is also sugarcane cultivation, and the three sugar mills are producing about 150,000 tons of sugar (about 20% of total) yearly. F.U.E.L. is the greatest sugar mill in the Country. Population is concentrated chiefly in Centre de Flacq, Bel Air, Bon Accueil and Village Council Area. The coastal part of this area is known for its scenic beauty and a number of hotels of international standard are located here.

7) Northern Area

This is Zone 18 and encompasses Pamplémousses and Riviere du Rempart Districts. Adjoining to the northern part of Port Louis, it will be urbanized very soon. Such important road projects as Northern Entrance Road and Relief Road of the North are being implemented in this area. The current population is about 150,000 (17% of the total) and the major industrial activity is sugarcane, which amounts to about 290,000 tons per year or more than 40 % of the nation's total. Important townships in the area are Goodlands, Triolet, and Riviere du Rempart. The area is endowed with tourist resources in its coastal and other parts, major tourist points being Trou aux Biches, Grand Baie, Camp Malheureux, Ile d'Ambre, and Poudre d'Or.

1.3 Project Area

The project area mainly encompasses the following areas:

- Grand River North West (Port Louis District)
- Pointe aux Sables, Petite Riviere V.C.A. (Black River District)
- Bequ Bassin (Plaine Wilhems District)
- Rose Hill (-do-)
- Quatre Bornes (-do-)

Grand River North West, referred to in the above, means the area which is surrounded by Port Louis on the north, Al Road, and Grand River, and has a population of about 4,600. Plaine Lauzun has the greatest industrial

estate of the nation in which 50 manufacturing firms and 6,500 workers (both as of June 1977) are concentrated. This area provides a total employment opportunities of 8,800 (all industrial sectors) in 1976, and the day population is much greater than the night population. The disused railway tracks run through the southern part of this area.

Pointe aux Sables/Petite Rivière V.C.A. is the area which is served by A₁ Road as well as A₃ and B₃₁ Roads which branch out from A₁ Road. Urbanization is progressing along these roads, particularly A₁ and A₃ Roads, and such settlements as Camp Benoit, Richelieu, Petite Riviere, Petit Verger, and Pointe aux Sables have emerged. Major land utilization outside these population centers is sugarcane cultivation. Because this area is under the strong influence of urban expansion of Port Louis and offers desirable locations to industries, the large scale industrial and housing development projects, which will be discussed in 2.4. below in this Chapter, are being implemented at Pointe aux Sable and la Tour Koenig.

Beau Bassin and Rose Hill constitute the Town of Beau Bassin-Rose Hill. Under this project, this Town is sub-divided into Coromandel, Beau Bassin, and Rose Hill, as shown in Figure IV-1-1.

Coromandel is surrounded in most part by the border of Plaines Wilhems, which runs almost in parallel to Grand River and the disused railway track, and Chebel Branch Road. It consists of Coromandel, in which urbanization has progressed along A₁ Road, and Chebel, which is a small village found in the middle of sugarcane fields. The population is about 4,000. The southern part of Coromandel forms an urban area connected with Beau Bassin, and the Coromandel Industrial Estate has been developed in the northern part. This Estate has a total land space of 14 hectares, but the industries currently located take up only about 6 hectares. Mount Petit Malabar, whose peak is 227 meters above sea level, is found in this area.

Beau Bassin area consists of Beau Bassin and Mont Roches. With a population of about 37,000 (in 1976), it has been almost fully developed.

A limited space for future development is found in suburban area on the west of the district border. The disused railway route crosses A1 Road and comes to an end in this area.

Rose Hill is the centre of urban area which is formed by Beau Bassin, Rose Hill, and Quatre Bornes Town on the south. With a population of about 42,000, it has fairly high concentration of commercial and light industrial activities. Rooms for urban expansion are limited just as in the case of Beau Bassin.

Quatre Bornes area includes St. Jean Roundabout, where Motorway and A1 Road intersect. With a large population of about 54,000, it has a high concentration of commercial and light industrial activities just as in Rose Hill.

The population and the number of workers are shown for each of the above areas on Table IV-1-1.

Table IV-1-1 Population and Employment of the Project Area

Area	Population 1976 (Estimates)	Employment, 1976			
		Primary	Secondary	Tertiary	Total
G.R.N.W.	4,600	80	7,500	1,200	8,780
Pointe aux Sables/ Petite Riviere V.C.A. (Zone 08)	10,900	200	4,100	1,380	5,680
Coromandel (Zone 02)	3,900	40	1,450	60	1,550
Beau Bassin (Zone 03)	36,800	440	3,560	3,860	7,860
Rose Hill (Zone 04)	41,800	550	4,700	5,700	10,950
Quatre Bornes (Zone 05)	53,900	690	7,200	5,600	13,530
TOTAL	151,900	2,000	28,510	17,800	48,350

2. Future Prospects

Major roads which are considered under this projects (namely, the Project Road itself, A1 Road, and Motorway) run through or connect the most densely populated and highly industrialized areas of the country. These roads, which will be constituent parts of the trunk road network of the Island, will affect each other in terms of the traffic volume, and their development will have impacts on very large areas. Methodology adopted for the forecasting of future traffic volume on the Project Road, which will be explained in detail in Chapter VIII-1, has been formulated on the concept that the future traffic volume will be determined through the inter-relationship between the future levels of regional activities and the future levels of traffic on other roads concerned (that is, A1 Road and Motorway). Therefore, the undermentioned will be discussed and analyzed here as the basis of traffic projection:

- o Physical development plan
- o Population forecast
- o Employment forecast
- o Prediction of motor vehicle ownership

2.1 Physical Development Plan

In Mauritius, the formulation of physical development plans is the responsibility of the Ministry of Housing, Lands, and Town and Country Planning, while the forecast of major economic indicators is that of the Ministry of Economic Development.

The Ministry of Housing is currently engaged in the formulation of short-term and long-term physical development plans to cover the whole Island. In the physical development plan being formulated by MATIM (Mission d'Aménagement du Territoire a l'Ile Maurice), it is recommended that future development efforts should be oriented in the following direction:

- o In view of that further population concentration in Port Louis is physically difficult or nearly impossible, basic policy of

development should be the decentralization and dispersion to rural areas.

- o Flacq and Grand Port Districts would have to be developed. Infra-structural development is being planned for the northern part of Flacq, along with the movement thereto of the airport.

2.2 Forecasting of Population and Employment

1) Population Forecast

Future population has been forecast both by the Ministry of Economic Development in connection with the formulation of the Five-Year Plan (1975 - 1980) and by the M.H.L.T.C.P. in connection with the formulation of physical development plans. Their forecast values vary little; the former estimates the average annual population increase rate for the twenty-year period from 1972 to 1992 at 1.6% and the latter at 1.8%. These rates, which are higher than the 1.24% registered during the period of 1972 to 1976 have been estimated under the assumption that the number of emigrants will drop and, at the same time, increasing numbers of people will reach the peak reproductive age according to the country's current population tree. It is estimated, however, that average annual population increase rate, which is estimated to be high from 1977 through 1982, will subsequently descend to about 1% in 1977 and thereafter. Estimates by the Ministry of Economic Development will be used for the analytical purpose of this project.

Table IV-2-1 Forecasted population of the Island

Year	Projection					(000)
	1972 (Actual)	1977	1982	1987	1997	2007
Population	826	887	969	1047	1196	1332
Average Annual Growth Rate(%)		1.44	1.77	1.56	1.34	1.06

Source: Ministry of Economic Development

For the purpose of regional population forecast, future population has been estimated for each of the nine districts of the Island. The future population of each district will be determined in relation to the habitation capacity available in the district and future trend, as well as to the Government policy which will bear upon the district. MATIM is considering the problem of district population under two different assumptions in formulating physical development plans: (1) that the current trend of population will continue basically in the future and various policy measures will be taken in line with such trend, and (2) that a positive population dispersion policy will be implemented for the development of a better balanced national landuse. In case of the latter, regional population distribution will be substantially changed in the future, and the greatest difference between the two assumptions will be seen in Quatre Bornes, Black River, Moka, Grand Port, and Flacq.

To discuss the validity of these assumptions is outside the purpose of this project, and, therefore, district populations have been projected on Table IV-2-2 based on the average of the trend population (assumption (1)) and the policy objective population (assumption (2)) with the implementation of specific projects in the project area in mind. With regard to the population of Port Louis, it has been assumed that increase rate will diminish in the future but the absolute number will not decrease. Table IV-2-3 shows the distribution of projected population by district, while Table IV-2-4 gives their breakdowns into 30 traffic zones from the traffic analysis point-of-view. Population forecast has been worked out for the years of 1982, 1987, 1992, and 2002, in line with the forecast of traffic volume.

Table IV-2-4 Estimated Future Population by Traffic Zone

Traffic Zone		1976	1982	1987	1992	2002
01		137,860	140,000	141,900	142,000	142,000
02	A	1,440	2,000	2,700	3,600	5,400
	B	2,436	3,600	4,800	6,200	9,400
	Total	3,876	5,600	7,500	9,800	14,800
03	A	16,218	17,800	18,900	19,500	20,400
	B	11,107	12,100	12,700	13,100	13,800
	C	9,452	9,300	8,900	8,300	7,500
	Total	36,777	39,200	40,500	40,900	41,700
04	A	17,476	17,500	17,500	17,500	17,500
	B	9,030	10,700	11,900	12,800	14,600
	C	15,301	17,800	19,300	20,200	22,200
	Total	41,807	46,000	48,700	50,500	54,300
05	A	19,624	20,700	20,800	21,000	22,300
	B	19,947	21,500	22,100	22,100	22,100
	C	14,340	20,300	26,200	31,700	41,700
	Total	53,911	62,500	69,100	74,800	86,100
06	A	10,572	13,800	16,800	19,500	25,200
	B	49,934	52,600	53,500	53,500	53,500
	C	7,773	8,800	9,400	9,800	10,700
	Total	68,279	75,200	79,700	82,800	89,400
07	A	2,403	3,200	3,900	4,700	6,200
	B	18,205	22,100	25,400	28,700	34,900
	Total	20,608	25,300	29,300	33,400	41,100
08	A	2,401	4,400	7,900	20,000	22,800
	B	8,547	10,300	10,300	11,000	13,000
	Total	10,948	14,700	18,200	31,000	35,800
09		2,568	4,000	5,500	7,200	12,000
10		6,968	7,300	7,400	7,500	8,200
11		6,484	6,700	6,800	6,900	7,400
12		7,462	10,900	14,500	19,900	30,300
13	A	53,445	59,200	62,900	65,300	69,100
	B	5,286	7,000	8,600	10,400	14,600
	Total	58,731	66,200	71,500	75,700	83,700
14		55,480	57,600	58,300	58,300	58,300
15		85,048	93,200	98,600	102,900	116,100
16		30,529	33,900	36,300	38,200	43,700
17		95,675	114,900	131,200	144,200	170,400
18		144,874	165,800	182,000	193,000	226,700
TOTAL		867,885	969,000	1,047,000	1,119,000	1,262,000

2) Employment Forecast

As in the case of population, both the Ministry of Economic Development and the M.H.L.T.C.P. have made independent estimates on employment.

As for the country's total, the available statistics have been used for years 1972 and 1976, the target figures in the Five-Year Plan estimated by the Ministry of Economic Development has been used for 1980, MATIM estimate has been used for 1992, and figures based on likely changes in the sectoral distribution of employment have been suggested for years 1982, 1987, 1997, and 2002. This is summarized on Table IV-2-5. The suggested estimates would be believed to be sufficiently reliable for the purpose of this study.

The number of workers in each traffic zone has been estimated on Table IV-2-6 based on the figures estimated by MATIM for years 1976 and 1992. The estimates for 1992 represent the average of trend figures and policy figures with relative regional development projects, if any, taken into consideration, just as in the case of population. Also as in the case of population, the number of workers has been estimated for years 1982, 1987, 1992, and 2002 for the purpose of this study.

Table IV-2-5 Employment Assumptions

Sector	1972	1976	1980 ^{1/}	1982	1987	1992 ^{2/}	1997	2002
Primary	70,822 (32.9)	67,157 (25.6)	81.0 (25.6)	81.0 (24.8)	76.0 (21.5)	70.0 (18.5)	67.0 (16.0)	64.0 (14.0)
Secondary	49,646 (23.0)	87,501 (33.3)	107.0 (33.9)	111.0 (34.0)	124.0 (35.0)	137.0 (36.0)	155.0 (37.0)	172.0 (38.0)
Tertiary	95,108 (44.1)	107,767 (41.1)	128.0 (40.5)	135.0 (41.3)	154.0 (43.5)	173.0 (45.5)	197.0 (47.0)	218.0 (48.0)
TOTAL	215,576 (100)	262,425 (100)	316.0 (100)	327.0 (100)	354.0 (100)	380.0 (100)	419.0 (100)	454.0 (100)
Population	826,199	867,885	937,000	969.0	1,047.0	1,119.0	1,196.0	1,262.0
Activity ratio (%)	26.1	30.2	33.7	33.7	33.8	34.0	35.0	36.0

1/ 5-year plan, Ministry of Economic Development

2/ Based on MATIM's estimates

Table IV-2-6 Estimate of Future Jobs by Traffic Zone

Traffic Zone	1976	1982	1987	1992	2002
01	73,360	77,710	81,620	85,780	94,700
02 A	1,240	2,200	4,440	8,180	10,500
B	310	500	900	1,450	1,500
Total	1,550	2,700	5,340	9,630	12,000
03 A	2,290	2,800	3,310	3,890	4,930
B	3,060	3,710	4,320	5,030	6,210
C	2,510	2,540	2,560	2,560	2,560
Total	7,860	9,050	10,190	11,480	13,700
04 A	7,430	7,160	6,820	6,400	5,400
B	1,290	1,630	1,950	2,290	3,170
C	2,230	2,950	3,670	4,500	6,430
Total	10,950	11,740	12,440	13,190	15,000
05 A	6,200	6,330	6,480	6,670	6,800
B	3,310	4,020	4,760	5,670	7,600
C	4,020	4,320	4,610	4,950	5,600
Total	13,530	14,670	15,850	17,290	20,000
06 A	2,990	3,880	4,790	5,880	8,260
B	15,770	16,680	17,400	18,040	19,170
C	390	560	750	1,010	1,570
Total	19,150	21,120	22,940	24,930	29,000
07 A	790	1,530	2,640	4,490	7,500
B	8,050	9,150	10,120	11,010	11,100
Total	8,840	10,680	12,760	15,500	18,600
08 A	2,840	4,400	6,100	10,550	13,000
B	2,840	3,140	3,500	4,500	5,000
Total	5,680	7,540	9,600	15,050	18,000
09	930	980	1,050	1,100	1,500
10	6,290	6,030	5,820	5,620	5,500
11	1,960	2,570	3,380	4,610	7,300
12	970	1,190	1,570	2,270	3,500
13 A	15,660	18,090	20,390	23,030	29,100
B	1,310	1,810	2,370	3,100	4,900
Total	16,970	19,900	22,760	26,130	34,000
14	15,130	16,100	16,970	17,910	19,000
15	21,500	23,890	26,210	28,910	35,000
16	4,900	5,550	6,240	7,090	9,000
17	22,110	27,920	35,030	44,840	56,600
18	30,720	36,520	42,320	48,670	61,600
TOTAL	262,400	295,860	332,090	380,000	454,000

2.3 Vehicle Ownership and Vehicle Mile

The number of motor vehicles owned and vehicle miles have been estimated by the Ministry of Works under the method outlined in Appendix IV-4. After consultation with the Mauritius Government, we have decided to use the estimates, which provide a base for the future road transportation policy of the country. The methodology of the estimates is based on the concept that the level of motor vehicle ownership is basically determined by the levels of GDP and population, while the number of vehicles in each category (type of vehicle) follows a logistic curve which has a certain saturation point. After examining a number of various growth rates in per capita GDP, the Ministry of Works has adopted 4 % per annum for the purpose of estimating motor vehicle ownership. The estimates are presented on Table IV-2-7. (The categorical classification of motor vehicles used for this purpose is somewhat different from that of Table III-4-1.)

Vehicle miles have been estimated based on the number of vehicles, the annual average mileage, and growth in annual mileage. The estimates are presented on Table IV-2-8.

Table IV-2-7 Prediction of the Number of Vehicles

Year	Vehicles (): Average Increase (%/year)						
	Cars ^{1/}	Van	Med/Heavy ^{2/} Comm. Vehicles	Bus	Total 4-Wheel	Motor Cycle	Total
1977	29,375 (7.6)	2,148 (9.6)	4,320 (5.7)	1,473 (6.8)	37,316 (7.5)	19,550 (12.5)	56,866 (9.3)
1982	42,330 (7.1)	3,390 (7.0)	5,692 (4.8)	2,043 (2.6)	53,455 (6.7)	35,226 (9.8)	88,681 (8.0)
1987	59,632 (6.5)	4,763 (6.3)	7,196 (4.8)	2,319 (1.3)	73,910 (6.2)	56,253 (1.5)	130,163 (4.3)
1992	81,834 (5.9)	6,467 (5.6)	9,096 (4.8)	2,473 (1.2)	99,870 (5.7)	60,457 (1.2)	160,327 (4.2)
2002	144,952	11,184	14,537	2,787	173,460	68,136	241,596

Source: Estimates of Ministry of Works

^{1/} includes cars, taxis, dual purpose and Gov't cars.

^{2/} includes lorries, tankers, tanker lorries, excavators, etc.

Table IV-2-8 Prediction of the Vehicle Miles

Year	1,000 vehicle miles (): Average Increase (%/year)						
	Cars ^{1/}	Van	Med/Heavy ^{2/} Comm. Vehicles	Bus	Total 4-Wheel	Motor Cycle	Total
1977	352,500 (8.0)	25,776 (10.1)	86,400 (6.7)	45,663 (6.1)	510,339 (7.7)	68,425 (12.5)	578,764 (8.4)
1982	518,409 (7.6)	41,703 (7.6)	119,586 (5.8)	61,470 (3.2)	741,168 (7.0)	123,292 (9.8)	864,460 (7.4)
1987	748,142 (7.1)	60,054 (6.8)	158,895 (5.8)	71,881 (1.3)	1,038,972 (6.5)	196,915 (1.4)	1,235,887 (5.8)
1992	1,053,418 (6.4)	83,600 (6.2)	211,097 (5.8)	76,579 (1.2)	1,424,694 (6.1)	211,578 (1.2)	1,636,272 (5.6)
2002	1,961,057	152,077	372,678	86,547	2,572,359	238,406	2,810,765

Source: Estimate of Ministry of Works

2.4 Relevant Regional Development Project

1) Summary.

A number of development projects which are being planned for implementation in the project area can be roughly classified into two groups: (1) those for industrial development through the construction of industrial estates and (2) those for the accommodation of new industrial workers, as well as general future population increases, through housing development. Particularly active policy measures are being taken for the development of manufacturing industries into an important sector which will support the future economy of Mauritius. As stated earlier, the development of industrial estates in Coromandel, Plaine Lauzun and other sites has been progressing in the project area, where the concentration of factories is now significant. Increasing number of factories will be located in those existing estates in the future (particularly in the case of the Coromandel Industrial Estate, eight hectares of the total 14 hectares are still vacant and is readily available for the location of factories), but almost all of the new factories will be located in the future in a series of industrial estates to be developed under plans in order that a desirable balance will be maintained between the area and the surrounding urban environments. The following three are the most important of industrial estates now being planned for the project area and the vicinity:

Location	Area (ha.)	Employment
Vacoas/Phoenix	15	1,600
Curepipe	11	2,000
Pointe aux Sables	24	4,000

Of the above, the Pointe aux Sables Project includes the development of a residential compound to house approximately 20,000 inhabitants and, in view of its development scope, the implementation of this project will have a substantial impacts on the Project Road.

2) Point aux Sables Development Project

This project, which is being propelled by the Development Bank of Mauritius, envisages the development of a total area of about 93 hectares in Pointe aux Sables into a comprehensive new town wherein not only an industrial estate and a housing compound are to be constructed but also they will be constructed in such a manner so as to provide both the place of work and the place of living in a close vicinity to each other with a high amenity of life supported by adequate utility, education facilities and other infrastructures. The final scope of this development project will be approximately as follows:

Land Use	Gross Area (ha.)	Target Employment or Population
Industrial Estate	32	4,000
Housing Estate	57	20,000 (4,200 dwellings)
Reservations	4	

Source; M.H.L.T.C.P.

1/ includes 8 ha. of storage and warehouse area.

Access to this New Town will be provided by A3 and B31, as shown by the Concept Plan of this Project of Appendix Figure IV.5.

CHAPTER V ANALYSIS OF PRESENT TRAFFIC

1. Road Network in the Project Area	V- 1
1.1 Existing Road Network	V- 1
1.2 Future Road Projects	V- 6
2. The Traffic Surveys	V-10
2.1 General	V-10
2.2 Traffic Count	V-10
2.3 Road-Side Interview Survey	V-11
2.4 Bus Traffic Survey	V-14
2.5 Other Surveys	V-14
3. Characteristics of Present Traffic	V-16
3.1 General	V-16
3.2 Traffic Volume in Major Road Sections ..	V-17
3.3 Distribution of Base Traffic	V-28
3.4 Bus Traffic	V-35
3.5 Airport Traffic	V-38
3.6 Sugar Lorry Traffic	V-39
3.7 Intra-Link Traffic	V-42
3.8 Characteristics of Vehicles and Loading ..	V-44

CHAPTER V ANALYSIS OF PRESENT TRAFFIC

Described in this Chapter will be the outcome of our field traffic surveys and the characteristics and the level of traffic in the project area as assimilated therefrom.

1. Road Network in the Project Area

1.1 Existing Road Network

The major road network existing in the project area consists of M_1 and M_2 (dual carriage way); A_1 , A_3 , A_7 , A_8 , A_{10} , and A_{11} (the main roads A); and B_1 , B_2 , B_3 and B_{31} (the main roads B), as shown in Figure V-1-1. The main frame of this network is made up of Motorway (M_1 and M_2), A_1 Road and a number of major roads which branch out from these roads.

A description of the current condition of these roads by major section is as follows:

1) Motorway

Motorway is an access-controlled dual carriageway with a length of 15.7 kilometers, linking Harbour Square in Port Louis with Phoenix. The total width is 22.9 meters, of which 4.6 meters is the centre belt, 1.8 meters (on either side) is the shoulder, and 7.35 meters (in each direction) is the carriageway width. Motorway consists of M_1 and M_2 which were constructed at different times: M_1 has an extension of 3.3 kilometers from Harbour Square to Belle Village Road Junction, and M_2 has an extension of 12.4 kilometers from the Junction to Phoenix. Areas along M_1 and areas along M_2 between St. Jean Roundabout and Phoenix have been urbanized, while other areas along M_2 are under sugarcane cultivation or covered by forests except for the area between Belle Village Road Junction and Pailles Road Junction, which has been developed to some extent.

While the cross sectional dimension of Motorway is as stated in the above throughout its entire section, the longitudinal gradient is a moderate up-grade from Port Louis to Phoenix with a partial gradient of 5% for an overall average of 2.4%. An outline profile of Motorway is given in Appendix Figure V-1, and the typical cross section in Appendix Figure V-2.

2) A₁ (Royal Road)

Starting from Port Louis, this road goes through the built-up areas and ends at St. Jean Roundabout in Quatre Bornes and, together with M₂ and A₁₀ running from the Roundabout to Mahebourg (in the vicinity of Plaisance, where the international airport is located), constitutes a part of the trans-island trunk road. Public transportation (bus) routes are concentrated on this road, which plays an important role both as an inter-regional and intra-regional trunk road. However, this is a very old road with different standards and is, therefore, unsuitable to carry the current level of traffic adequately; traffic congestion is experienced at many parts of this road, which is also causing an environmental problem. But, because the areas along this road have been fairly unbanized and houses and stores are built close to the road, the widening of this road is believed to be nearly impossible. An outline profile of this A₁ Road is given in Appendix Figure V-1, and its typical cross sections in Appendix Figure V-2.

A₁ Road can be divided into seven homogeneous sub-sections, as shown in Figure V-1-1, each of which will be outlined below:

A₁ - 1: This sub-section extends for about 1.4 kilometers from Cassis Flyover to just before Grand River North West Bridge. The road width is about 10 meters, with a sidewalk of from 1.3 to 3.6 meters in some downtown areas. The road is almost level for about 0.7 kilometers from Cassis Flyover and, in the remaining part, it is level for another 0.2 kilometers, and has the longitudinal gradient of 2% for 0.2 kilometers and of 5% for 0.3 kilometers. The

Plaine Lázun Industrial Estate is located along this road and the vicinity is fairly urbanized.

A₁ - 2: This sub-section extends for 0.2 kilometers on both sides of Grand River North West Bridge, which constitutes the most serious bottleneck on A₁ Road with its width of only 5.7 meters, thus causing traffic congestion in morning and evening rush hours.

A₁ - 3: This is the sub-section which extends for 0.7 kilometers from G.R.N.W. Junction to S. Hill Junction. The road has an 8.5 meters wide carriageway and one meter wide shoulder or sidewalk, but, because of its steep longitudinal gradient of 4% in average, large vehicles are compelled to slow down. Roadside areas have been fairly developed.

A₁ - 4: This is a 3.5 kilometer sub-section from S. Hill Junction to Chebel Branch Road Junction, whose carriageway is about 10 meters wide and the shoulder or sidewalk is from 1.7 to 2.0 meters in some parts. The benefit of the sufficient width is partly offset by the steep longitudinal gradient of 5% in average for 3.0 kilometers, with only 0.5 kilometers being graded at 2%. However, the resultant loss of traffic capacity is being held to a minimum because the 10 meter wide carriageway practically provides three lanes, one of which being designated for slow-climbing vehicles. S. Hill Junction, from which A₃ Road branches out, has in a part a steep gradient, and the longitudinal gradient exceeds 10% in some parts of the intersection. The road passes the vicinity of the Coromandel Industrial Estate along which urbanization is progressing.

A₁ - 5: This sub-section extends for 1.4 kilometers from Chebel Branch Road to Beau Bassin Roundabout, with an average longitudinal gradient of 2%. The cross section consists of a carriageway width of 8.6 meters and a sidewalk of about one meter on both sides. The road is lined by houses. Six large and small roads meet at the Beau Bassin Roundabout, which is located in the centre of Beau Bassin Township.

A₁ - 6: This sub-section extends for 2.1 kilometers from Beau Bassin Roundabout to Rose Hill Junction and has an average gradient of 3%, a carriageway of 10 meters, and a sidewalk of 1.0 to 2.4 meters on both sides. This runs through the most urbanized area of all stretches of A₁ Road. Rose Hill Junction is an intersection of A₁, B₁, and A₁₁.

A₁ - 7: This sub-section is 1.8 kilometers long between Rose Hill intersection and St. Jean Roundabout. The longitudinal gradient is 2% in average. It consists of a carriageway of 8.8 meters and a sidewalk of 0.8 to 1.1 meter on both sides. The roadsides are fairly urbanized. A₁, M₂, and A₈ meet at St. Jean Roundabout.

3) Other Major Roads

A₁₁: The volume of traffic is heavy on this road, which connects Beau Bassin Roundabout and Rose Hill Junction as a bypass of the A₁-6 sub-section. The road's length is 2.1 kilometers, the average longitudinal gradient is 3.0%, and the width is 9.0 meters. The road runs along the old railway track, which is used as a sidewalk of the road in some parts. Along this road are densely populated downtown areas.

A₈: This road is 2.1 kilometers long and lies between St. Jean Roundabout and the centre of Quatre Bornes. It consists of a carriageway of 8 meters width and a sidewalk or shoulder of 1.5 to 2.9 meters on both sides. It is a level street running through the downtown area of Quatre Bornes.

B₁: This is a road of 8.0 meters width with almost no sidewalk or shoulder and extends for 3.2 kilometers connecting Rose Hill Junction with A₁ and Reduit Roundabout, where it meets with M₂. This road runs through a fairly developed housing area and is used to a fair degree as a shortcut between Rose Hill and Motorway.

A₃: Starts from S. Hill Junction and ends in Grande Rivère Noire in Black River District. The total length is 27.4 kilometers, and the road consists of a carriageway of about 7.5 meters and a one-meter

shoulder on both sides. It runs through sugarcane field except in the vicinity of S. Hill Junction.

B₃₁: Extends for 9.0 kilometers from G.R.N.W. Junction to intersection with A₃ in Petite Rivière. It has insufficient width and no sidewalk or shoulder, and runs along the shoreline to a substantial portion, where housing and other development has made some progress.

Belle Village Road: Connects M₂ and A₁, and runs almost in parallel with M₂. The length is 1.5 kilometers, the width is 8.0 meters, and it has no sidewalk or shoulder. At intersection with M₂, traffic on this road flows one-way, entering onto M₂ in the direction from Port Louis to Phoenix, and return traffic on M₂ turns right into a street which is connected with this road in the reverse direction. When traffic on M₁ is congested in morning and evening rush hours, this road is used to a fair degree as a substitute access to and from Port Louis.

Richelieu Approach Road: This road connects A₁ and A₃. In the area surrounded by this road, A₁, and A₃, Coromandel Industrial Estate is located. The length of this road is 1.6 kilometers, and the width is 5.0 meters.

Chebel Branch Road: This road, which connects A₁ and A₃ and functions as the access to sugarcane plantations, has little traffic. The length is 3.8 kilometers and the width is 6.0 meters, but the condition of road surface is not satisfactory.

Beau Bassin/Quatre Bornes Urban Street: This street starts in the vicinity of Beau Bassin Roundabout, runs much in parallel with A₁ through the outskirts of the downtown areas of Rose Hill and Quatre Bornes, till it reaches A₈. This road constitutes a bus route. Even though it has a poor alignment, it is much utilized as an approach to a trunk road and as an auxiliary trunk road within the district.

Lower Plainés Wilhems Cemetery Road: Extends for 4.8 kilometers connecting A₃ and A₁. With a width of 5.0 meters, it is in the nature a district road, and has little traffic on it.

1.2 Future Road Projects

A number of road projects are being implemented, having direct or indirect relationship with the Project Road, all of which basically conform with the future concept plan shown in Figure V-1-2.

① Through Road:

This road, when completed, will meet the existing Motorway at its terminal in Port Louis at one end and with the Northern Entrance Road of ② below at the other end, it will run for a length of 1,160 meters. This dual carriageway (partly 3-lane) road will be completed for the purpose of eliminating the existing bottleneck for the traffic which passes through Port Louis City. The road is expected to commence its service in 1980 or 1981.

② Northern Entrance Road:

This will connect Through Road and Relief Road (or Access Road to the North) and will end in Terre Rouge. The necessary investigation has been completed, and bids will be invited in the near future. The construction of this road is expected to require 15 to 18 months.

③ Ring Road:

Running on the perimeter of Port Louis downtown area in the form of a ring, this road is meant for diversification of vehicle access to and from Port Louis. It will be connected with the Project Road by Motorway and will meet Northern Entrance Road. This road is being conceived by MATIM, but more concrete plans are yet to be formulated.

④ Relief Road (Access Road to the North)

A feasibility study on this road was completed by BCEOM in 1975. It was originally planned in connection with the construction of a new airport (but its purpose is not the airport alone) as the trunk highway to connect the northern area, where development is expected in the future, with Port Louis.

⑤ An Extension of the Project Road toward Quatre Bornes

This road should be taken into full consideration in determining the alignment, specification, and the characteristics of the Project Road, but concrete plans for this project have yet to be set forth.

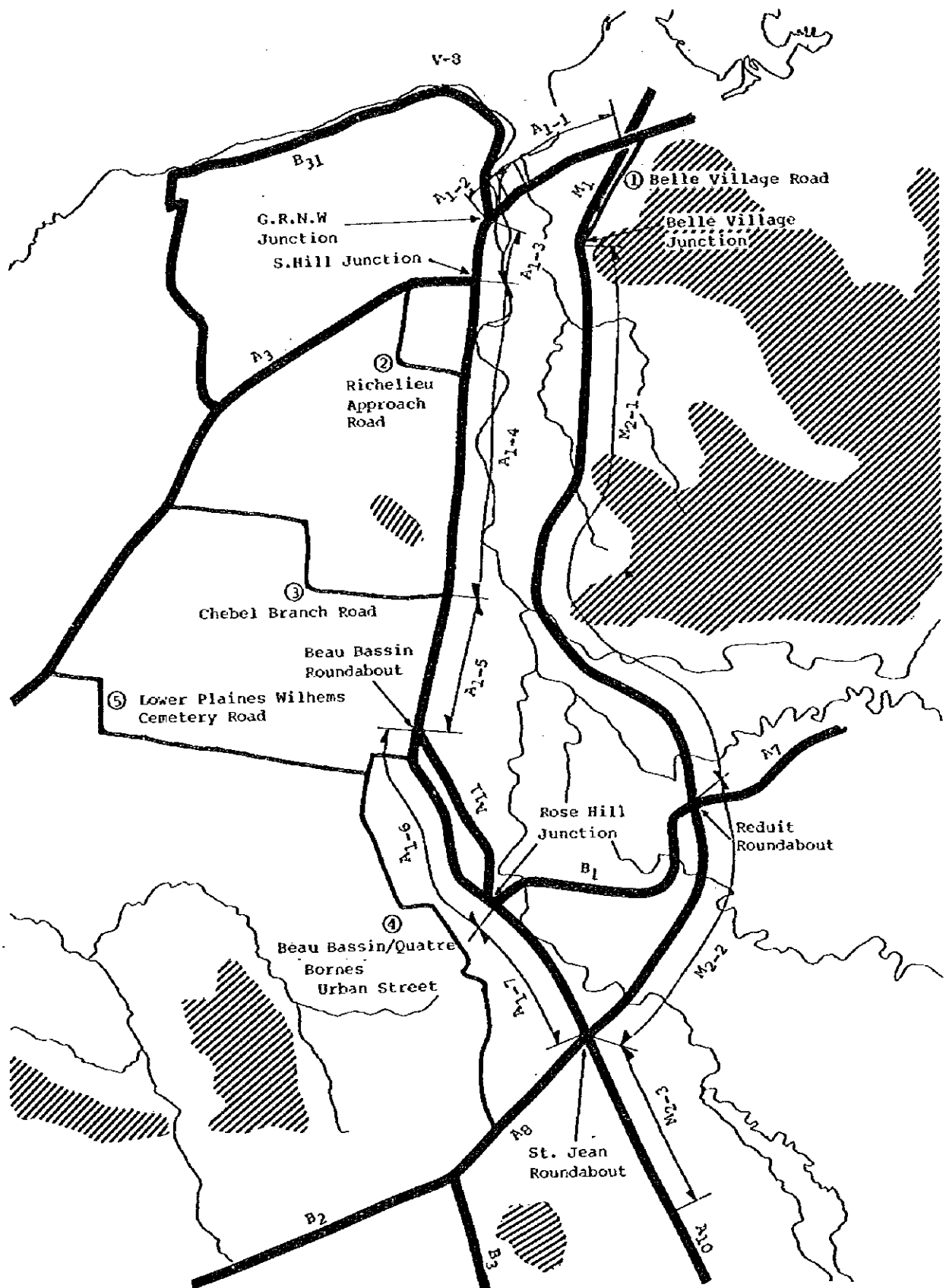
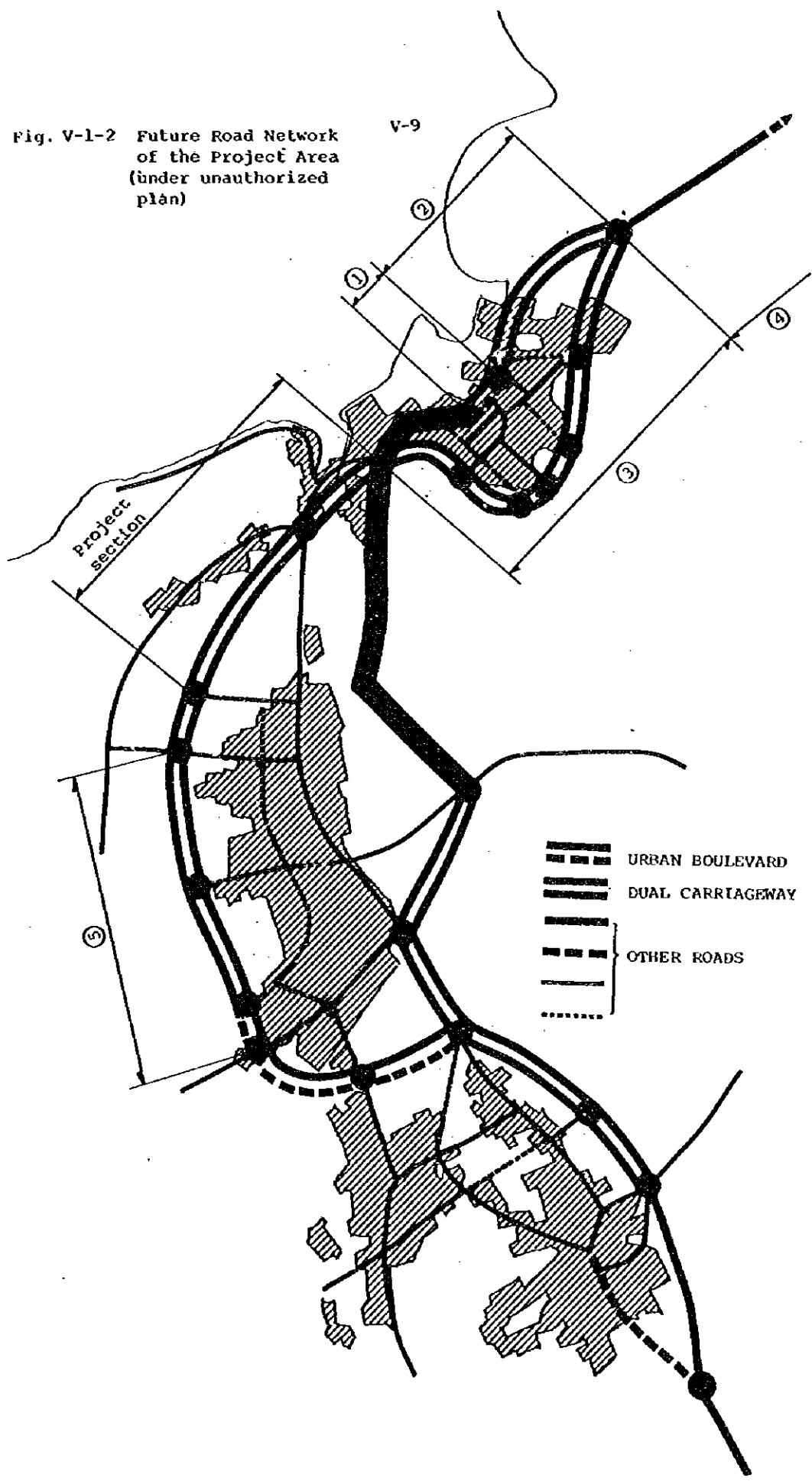


Fig. V-1-1 Present Road Network of the Project Area

Fig. V-1-2 Future Road Network of the Project Area (under unauthorized plan)



2. The Traffic Surveys

2.1 General

In order to understand the current level and characteristics of the traffic in the project area, various traffic surveys have been carried out.

These surveys necessarily covered the entire major road network in the project area where A₁ Road and Motorway, the two major routes which are serving between Port Louis and Beau Bassin, Rose Hill etc. substitute each other with regard to the traffic flowing between these two points, together with other roads which compete with these two routes.

For this purpose, the following surveys were taken up. The location of survey stations, the time and period of survey are presented in Appendix Table V-3 and Appendix Figure V-4.

2.2 Traffic Count

1) One-Week Count on A₁ and M₂

With regard to A₁ and Motorway, one-week traffic count survey was conducted in order to estimate ADT level at Coromandel and Belle Village and to know the traffic composition and the hourly and daily variation of traffic. Survey was conducted from 6:00 A.M. to 6:00 P.M. from December 12 (Monday) to December 18 (Sunday) with additional night count from 6:00 P.M. on December 14 (Wednesday) to 6:00 A.M. the next morning. The survey was taken of ten types of vehicles, as shown in the sample Traffic Count Survey Sheet of Appendix Figure V-5.

2) One-Day Count in Major Road Sections

A 12-hour (6:00 A.M. to 6:00 P.M.) survey was conducted at points shown in Appendix Figure V-4 in major road sections such as A₁, M₂, B₁ and A₁₁, using the same survey sheet as the one-week survey.

3) One-Day Count at Major Junctions

A 12-hour (6:00 A.M. to 6:00 P.M.) survey was also conducted at major junctions which will relate with the Project Road, taking the count of the number of vehicles in each of five types (light, heavy, bus, motorcycle and bicycle) in each direction.

2.3 Road-Side Interview Survey

A road-side interview survey was conducted on both sides of A₁ and Motorway near the Port Louis City border with the cooperation of policemen. The survey on A₁ took two days (December 5 (Monday) and December 7 (Wednesday)) and that on Motorway also took two days (December 6 (Tuesday) and December 8 (Thursday)), both from 6:00 A.M. to 6:00 P.M. unless interrupted by rainfall. The questionnaire form of Appendix Figure V-6 was used in the interview with drivers. Main questions were:

- o Type of vehicle,
- o Origin and destination of the trip, (Not in case of buses and bicycles),
- o Purpose of the trip,
- o (In case of trucks) cargo items and load tonnage.

Buses and bicycles were excluded from the origin-destination survey because, while it was considered difficult to know the movements of bus passengers within a short period of time in view of the large number of bus trips, bus stops, and bus passengers, relatively accurate information was believed available from bus companies, and because the movements of bicycles in the project area were believed to be of short local trips in view of the area's topography (steep gradient). Traffic was heavy at each of the survey points, whose results were enlarged with sample rate by vehicle type.

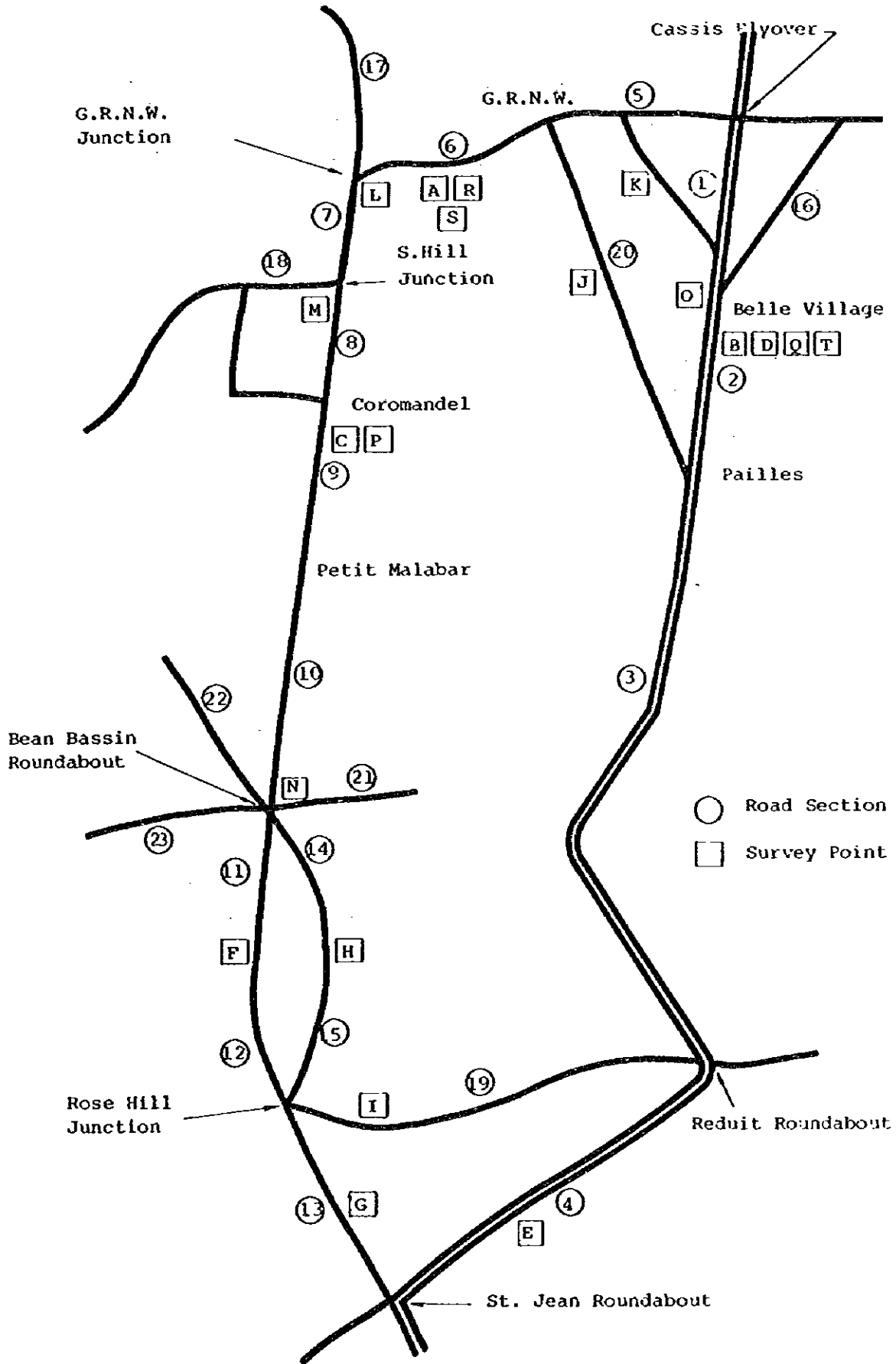
Sample rate was 20% in average (of both directions) on A₁, and 13% on M₁ (see Appendix Table V-5 for detail). The zoning used for the purpose of origin-destination survey was as shown in Figure IV-1-1.

Table V-2-1 Outline of Traffic Surveys Conducted

Type	Station	Station Code 1/	Period	
O-D Survey	1) Al Road, G.R.N.W. Bridge	A	Dec. 5, 7	6-18
	2) Motorway, Belle Village	B	Dec. 6, 8	6-18
1 Week Traffic count	1) Al Road, Coromandel	C	Dec. 12 ^v 18	6-18
	2) Motorway, Belle Village	D	"	(Night Count on Dec.14)
1 Day Traffic Count, Road Sections	1) Motorway, Trianon	E	Dec. 14	6-18
	2) Al Road, Rose Hill Town Hall	F	Dec. 15	6-18
	3) Al Road, Belle Rose	G	Dec. 14	6-18
	4) All Road, Balfour Garden	H	Dec. 15	6-18
	5) Bl Road, Robertson Bridge	I	Dec. 14	6-18
	6) Pailles Junction Road, G.R.N.W.	J	Dec. 16	6-18
	7) Plaine Lauzun Shortcut, Plaine Lauzun	K	Dec. 16	6-18
1 Day Traffic Count, Major Junctions	1) G.R.N.W. Junction	L	Dec. 12	6-18
	2) S.Hill Junction	M	Dec. 12	6-18
	3) Bean Bassin Roundabout	N	Dec. 13	6-18
	4) Junction of Motorway and Belle Village Road	O	Dec. 8	6-18
Spot Speed Survey	1) Al Road, Coromandel	P	Dec. 14 ^v 16	
	2) Motorway, Belle Village	Q	Dec. 14 ^v 16	
	3) Al Road, G.R.N.W. Bridge	R	Dec. 15	
Other Interview Survey	1) Al Road, G.R.N.W. Bridge	S	Dec. 5, 7	6-18
	2) Motorway, Belle Village	J	Dec. 6, 8	6-18
Airport Traffic Survey	1) Plaisance Airport		Dec. 9	6-18

1/ Location of Station is shown in Fig. V-2-1

Fig. V-2-1 Location of Survey Points and Road Sections



2.4 Bus Traffic Survey

Five bus companies which have routes on all or part of A₁ and Motorway were interviewed and information pertaining to the routes and the frequency of services was obtained for the purpose of in-depth understanding of the movements of busses to supplement the results obtained by traffic count survey at major points.

2.5 Other Surveys

1) Airport Traffic Survey

Motor vehicles entering and leaving the Plaisance Airport were stopped and their drivers were interviewed with regard to the following data during the period of 12 hours from 6:00 A.M. to 6:00 P.M. on December 9 (Friday):

- o Type of vehicle,
- o Origin and destination of the trip, and
- o Passenger trip purpose (tourist, non-tourist passenger, airport visitor, airport staff, people accompanying passenger, others)

Bus passengers were directly interviewed upon their embarkation or disembarkation from the bus.

2) Spot Speed Survey

In order to insure that the Speed-Congestion Curve which will be applied to representative roads in the project area would be realistic, we measured the speed of vehicles at various levels of traffic at three stations.

3) Other Interview Survey

Additional items of information (such as the manufacturer and age of vehicle, etc.) were obtained through interview at the time of O.D. Survey. This information provides a base on which the representative vehicles will be selected for the purpose of estimating vehicle operating cost.

3. Characteristics of Present Traffic

3.1 General

The traffic survey was conducted in an attempt to understand the current level of traffic and its general characteristics, but, at the same time, the following five different types of traffic were surveyed and analyzed because their future values are to be estimated under different methods as explained in Chapter VIII.

- o base traffic,
- o bus traffic,
- o airport traffic,
- o sugar lorry traffic, and
- o intra-link traffic.

Base traffic is that which moves between Port Louis and Beau Bassin or through this section, which is the direct subject of this study. The volume of this traffic equals to that which was defined by the origin-destination survey taken on A₁ and M₂ near the Port Louis City border minus the volume of airport traffic, the volume of sugar lorry traffic, and the volume of intra-zone traffic (because the survey station was set within Port Louis City in each case, movements within 01 Zone shown in IV-1-1 were observed), and does not include the volume of bus traffic.

Airport traffic is that which either starts from or ends at the Plaisance Airport. This traffic is treated separately because its distribution will change completely upon the relocation of the airport.

Sugar lorry traffic is that of trucks which transport sugar and molasses. This traffic is also treated separately because it was suspected that its traffic at the time of survey did not represent the normal condition and also because its future increase was assumed to take a considerably different direction from that of other types of traffic.

Intra-link traffic is that which uses a part of the subject road network (shown in Figure V-1-1) but does not pass through any of the Origin/Destination survey stations. Although its claim on the Project Road will be negligible, it would have a substantial influence on the speed of the base traffic along the Project Road.

3.2 Traffic Volume in Major Road Sections

1) Average Daily Traffic

Average daily traffic volume in major road sections in the project area is shown in Table V-3-1 and Appendix Table V-11, and the location of traffic survey stations is shown in Appendix Fig. V-4.

With regard to Coromandel (A_1) and Belle Village (M_2), the average of 24-hour traffic volume was obtained by applying the day-night rate to the volume of 12-hour traffic obtained by the survey conducted at each station from Monday through Saturday. Hourly and daily variation of traffic will be discussed in detail in the next Sub-Chapter. Daily average traffic volume for other stations are estimated by modifying the 12-hour traffic of either or the average of A_1 and M_2 by the day-night rates and daily variations.

No data of seasonal change are available. The traffic counter now implemented by the Ministry of Works appears to have some mechanical difficulty and covers only a 6-month period and is, therefore, short of suggesting a reliable seasonal variation of traffic. The roads in the project area, which are either inter-urban or intra-urban, are believed to have little seasonal change by nature. Because the period in which the survey was conducted is considered a normal period, no seasonal change is taken into consideration with regard to base traffic.

While cars and taxi cabs represent a majority of traffic on A_1 and Motorway (61% and 74%, respectively) as presented in Table V-3-1, that on A_1 is of a highly mixed intra-urban traffic with a high rate of buses and motorcycles and that on M_2 is an inter-urban traffic with a low rate of buses and motorcycles but a much higher rate of trucks and trailers than on A_1 .

While it appears that traffic is heavier on Motorway than on A₁ Road from the daily average traffic of about 18,000 vehicles at Belle Village on Motorway and of about 16,000 at Coromandel on A₁, the volume of traffic, as converted into P.C.U., is greater on A₁ at about 23,000 vehicles than on M₂ at 19,000. For details, see Appendix Table V-10.

Table V - 3-1 Average Daily Traffic ^{1/} at Coromandel on A₁ Road and at Belle Village on Motorway

Type of Vehicle	Coromandel		Belle Village	
	Vehicles	(%)	Vehicles	(%)
Car, Taxi	9,896	(61.1)	13,297	(73.6)
Van, Pick-up	1,276	(8.1)	1,504	(8.3)
Med. and Hev. Truck	876	(5.5)	1,193	(6.6)
Truck-Trailer	50	(0.3)	362	(2.0)
Bus	2,070	(13.1)	492	(2.7)
Motorcycle	1,872	(11.9)	1,233	(6.8)
Total	16,040	(100)	18,081	(100)
P.C.U. ^{2/}	23,023		19,103	

1/ 24 hour traffic excluding Sunday.

2/ P.C.U is calculated based on the following conversion rate.
Van, Pick-up = 1.0 p.c.u., motorcycle = 0.5 p.c.u., bus and trucks = 1.8 ~ 3.7 according to the road gradient

2) Daily Variation of Traffic

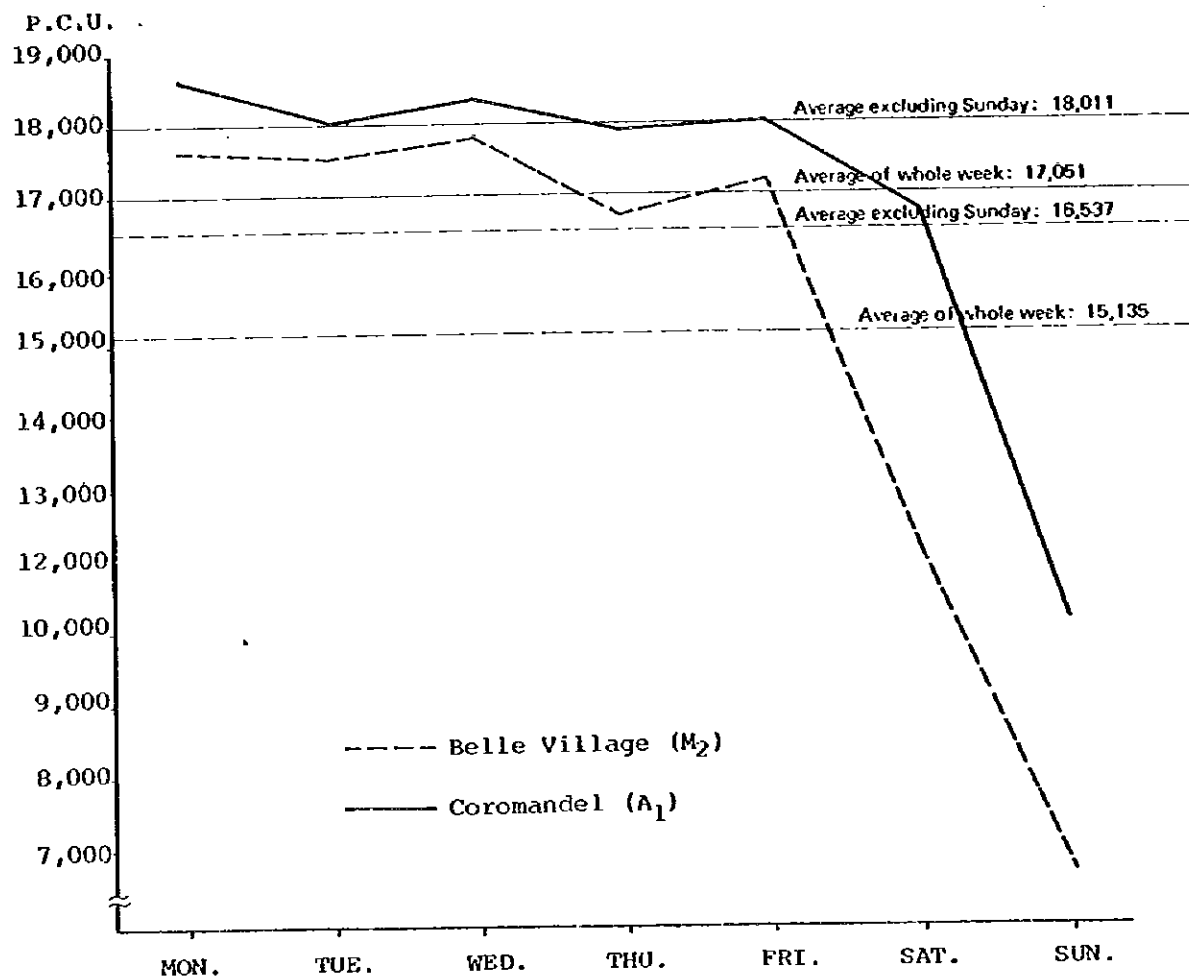
The daily variation of traffic volume at Coromandel and Belle Village are as shown in Figure V-3-1. On weekends, traffic becomes light at the both places, particularly on Motorway, on which traffic decreases on Sundays to less than 40% of weekdays. The daily average (excluding Sunday) of 12-hour traffic is 18,011 P.C.U. on A₁ Road and is 16,537 P.C.U. on Motorway. Appendix Table V-10 shows the daily variation of traffic by vehicle type.

Table V-3-2 Weekly Variation of 12 hour Traffic (P.C.U.) ^{1/}
 at Coromandel (A₁) and Belle Village (M₂)

Station	Dec.12 (Mon.)	13 (Tue.)	14 (Wed.)	15 (Thu.)	16 (Fri.)	17 (Sat.)	18 (Sun.)
Coromandel (A ₁)	18,647	18,060	18,388	17,995	18,049	16,816	11,400
Belle Village (M ₂)	17,655	17,561	17,806	16,795	17,242	12,137	6,749

^{1/} including both directions and excluding bicycles

Fig. V-3-1 Weekly Variation of ADT (12 hour traffic, P.C.U.) at Coromandel (A₁) and Belle Village (M₂)



3) Hourly Distribution of Traffic

The characteristics of hourly variation of traffic on weekdays on A₁ and M₂, which is illustrated in Figure V-3-2 and summarized in Table V-3-3, is that the peak hours are 8:00 - 9:00 A.M. and 4:00 - 5:00 P.M. at both survey stations, but the peak hour rate is higher (10.8% to 11.3%) on the Motorway than (8.2% to 8.3%) on A₁ Road, with little difference between the level of traffic between morning peak and evening peak on both roads. See Appendix Tables V-8 and V-9 for details.

Night (6:00 P.M. - 6:00 A.M.) traffic rate differs substantially between A₁'s 22% and Motorway's 14%. This difference can be attributed to difference in the degree of development between the roadside areas; traffic on A₁, which runs through urban area, is 800 P.C.U. or more even at night (8:00 - 9:00 P.M.) and drops to less than 100 P.C.U. only after midnight.

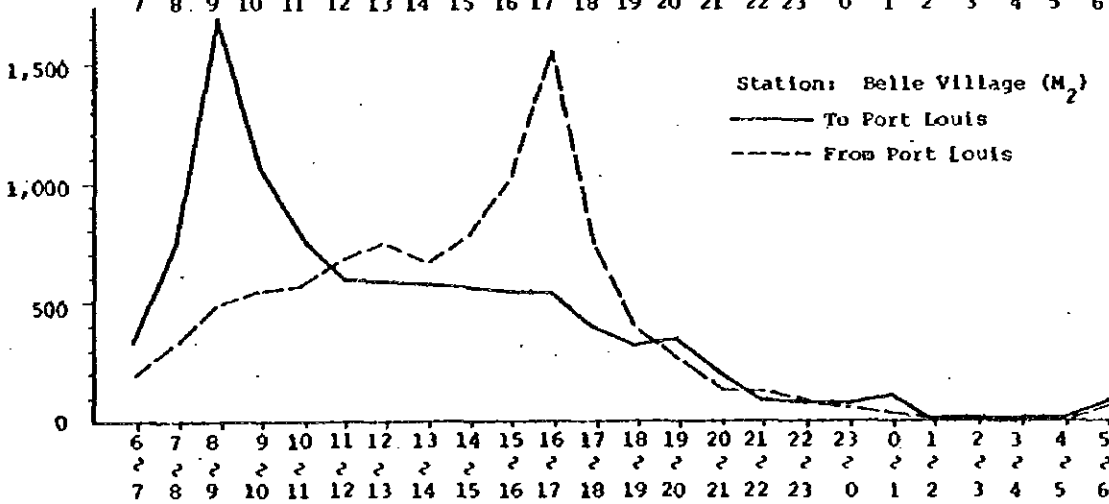
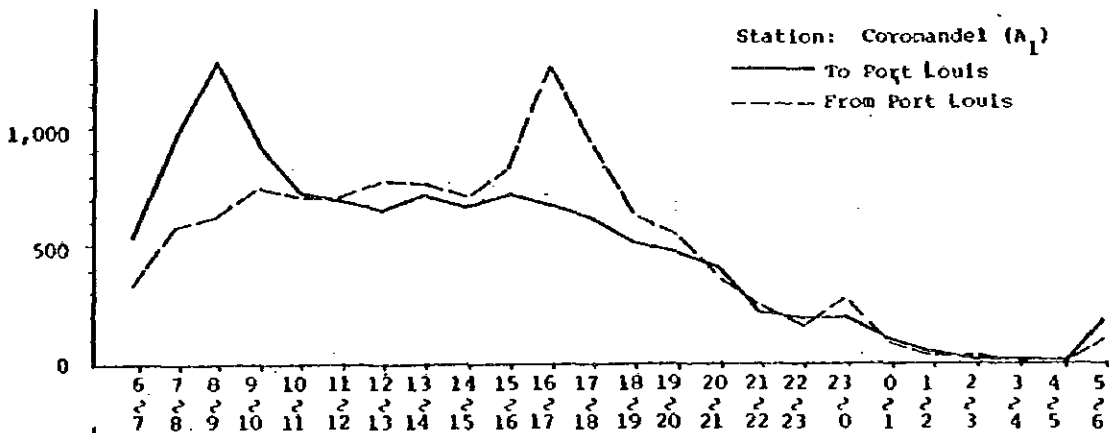
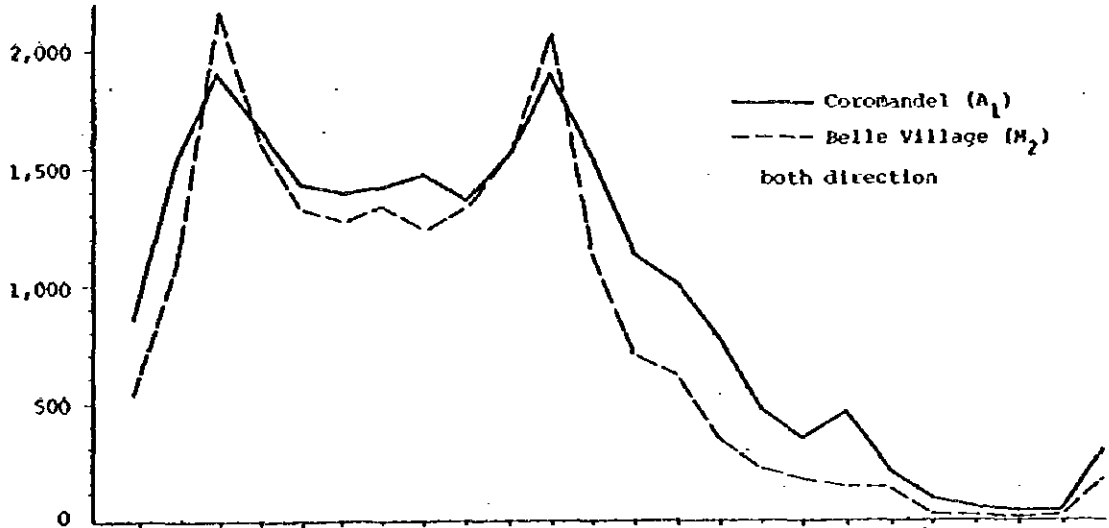
Similar peak hours were observed at other survey stations as shown in Appendix Table V-11. Appendix Table V-12 presents hourly traffic distribution at major junctions. Based on these survey findings, the flow of traffic on roads within the project area is as shown in Figures V-3-3 through V-3-5.

Table V-3-3 Hourly Traffic Distribution on A₁ Road and Motorway (ADT (P.C.U.) 1/)

Station	Direction	12 hour traffic			night traffic	24 hour traffic	peak hour rate (%)		night traffic rate (%)
		morning peak	evening peak	off peak hours			morning	evening	
Coromandel (A ₁)	To P. Louis	1,272	658	7,177	2,394	11,501	11.1	5.7	20.8
	From P. Louis	623	1,243	7,038	2,618	11,522	5.4	10.8	22.7
	Total	1,895	1,901	14,215	5,012	23,023	8.2	8.3	21.8
Belle Village (M ₂)	To P. Louis	1,682	529	6,112	1,361	9,684	17.4	5.5	14.1
	From P. Louis	482	1,536	6,196	1,205	9,419	5.1	16.3	12.8
	Total	2,164	2,065	12,308	2,566	19,103	11.3	10.8	13.4

1/ excludes the traffic of Sundays and bicycle traffic

Fig. V-3-2 Hourly Traffic Distribution of ADT 1/



1/ excludes the traffic of Sunday

Fig. V-3-3 Traffic Flow in the Project Area

(Morning Peak, P.C.U./hr.)

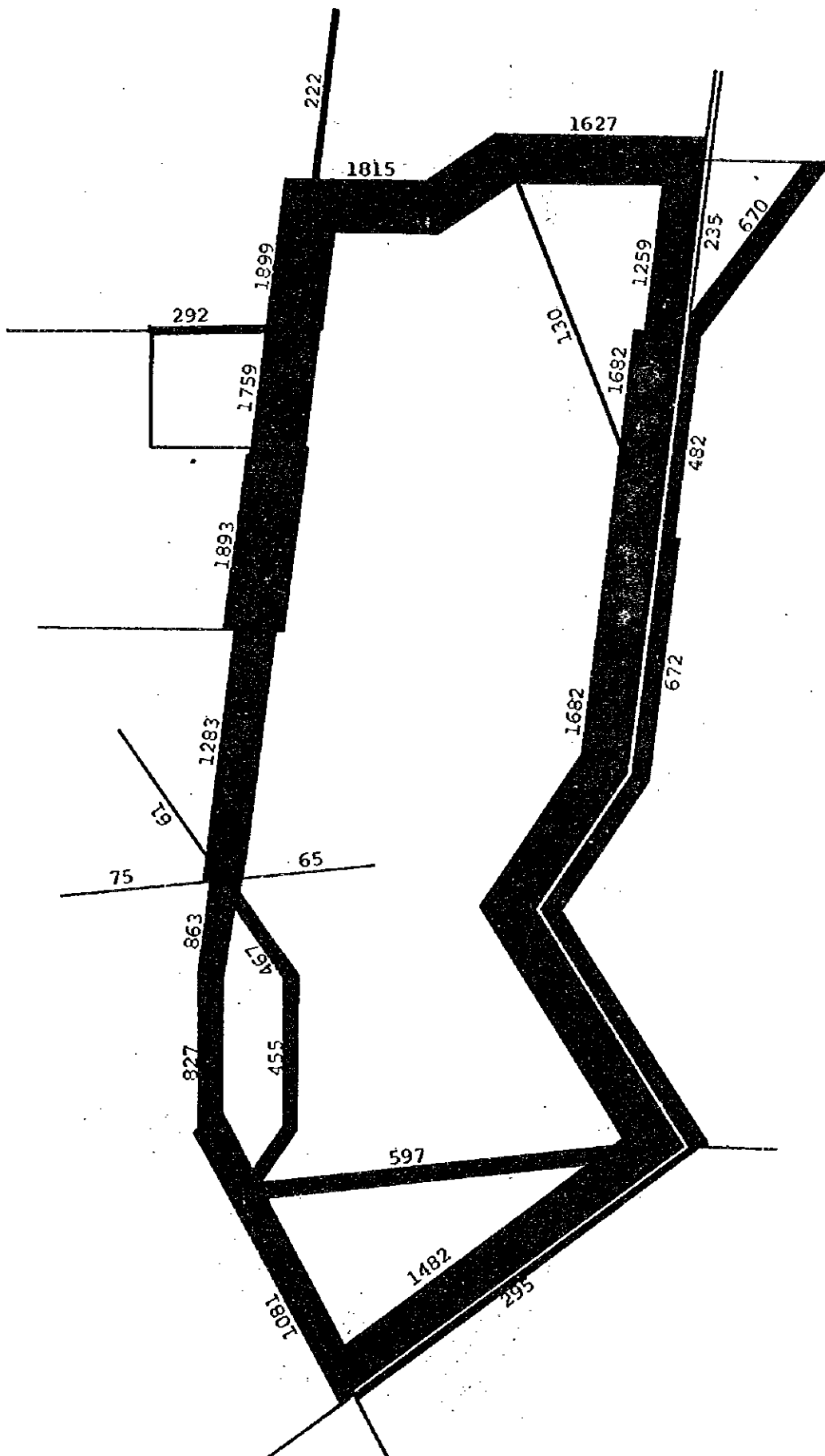


Fig. V-3-4 Traffic Flow in the Project Area

(Evening Peak, P.C.U./hr.)

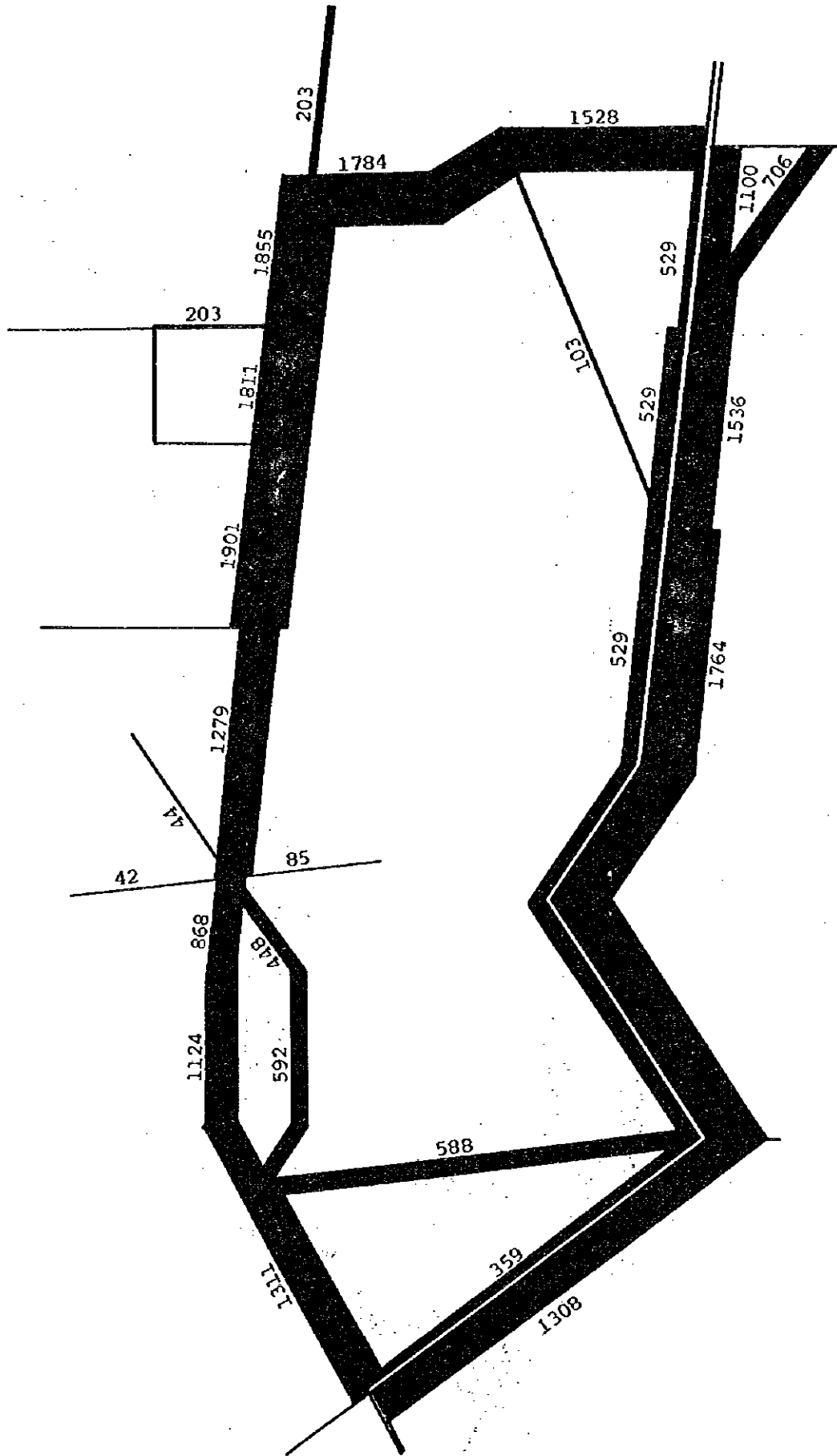
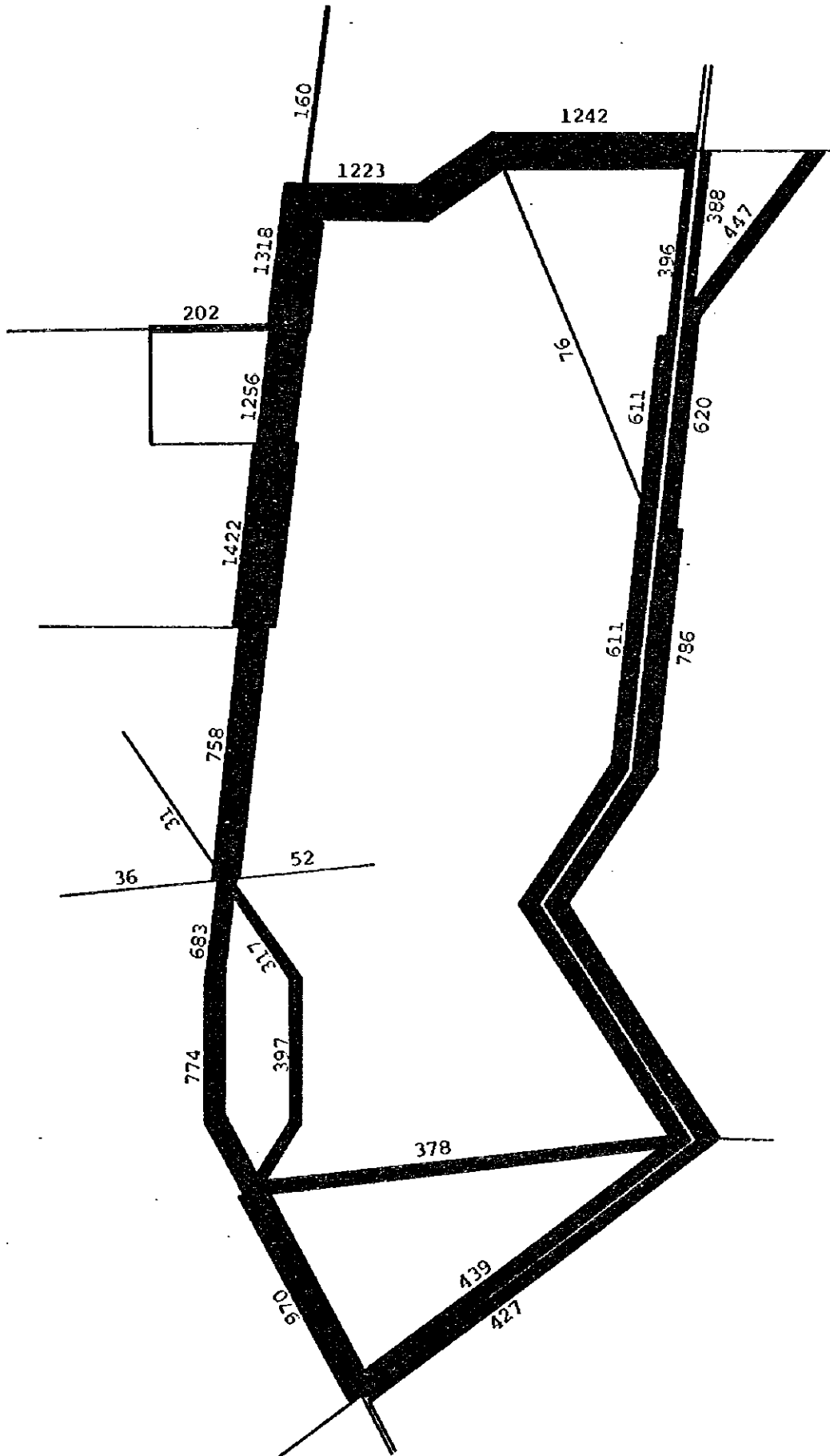


Fig. V-3-5 Traffic Flow in the Project Area
(Off-Peak, P.C.U./hr.)



4) Traffic Congestion

Table V-3-4 presents data on the condition of traffic congestion in peak hours and off-peak hours in major road sections. There appears to be a capacity for additional traffic on the Motorway, whose congestion ratio (Traffic Volume/Road Capacity) is only about 0.34 in peak hours. On A₁ Road, however, the congestion ratio in peak hours is as high as 1.26 in the section between G.R.N.W. Junction and G.R.N.W. Bridge, and the level of traffic in many other parts of this road between Beau Bassin and Port Louis is also nearing the road's capacity. Traffic volume on other roads is lower than their capacity, except on Belle Village Road and B₁ Road where the rate of utilization is fairly high.

Table V-3-4 Traffic Volume and Congestion Ratio by Hourly Period

No 1/	Section	Capacity P.C.U./ hour	morning peak		evening peak		averaged off- peak hour	
			P.C.U.	Conges- tion ratio	P.C.U.	Conges- tion ratio	P.C.U.	Conges- tion ratio
- Motorway								
1	M ₁ (from Port Louis)	5,000	235	0.05	1,100	0.22	388	0.08
1	M ₁ (to Port Louis)	5,000	1,259	0.25	259	0.05	395	0.08
2	M ₂ (Belle Village → Pailles) Junction	5,000	482	0.10	1,536	0.31	620	0.12
2 ¹	M ₂ (Pailles → Belle Village) Junction	5,000	1,682	0.34	529	0.11	611	0.12
3	M ₂ (Pailles → Reduit Roundabout)	5,000	672	0.13	1,764	0.35	786	0.16
3 ¹	M ₂ (Reduit Roundabout → Pailles)	5,000	1,682	0.34	529	0.11	611	0.12
4	M ₂ (Reduit Roundabout → St. Jean) Roundabout	5,000	295	0.06	1,308	0.26	427	0.09
4 ¹	M ₂ (St. Jean Roundabout → Reduit) Roundabout	5,000	1,482	0.30	359	0.07	433	0.09
- All Road								
5	Cassis Flyover - G.R.N.W.	2,000	1,627	0.81	1,528	0.76	1,242	0.62
6	G.R.N.W. - G.R.N.W. Junction	1,440	1,815	1.26	1,784	1.24	1,223	0.85
7	G.R.N.W. - S. Hill Junction	2,250	1,899	0.84	1,855	0.82	1,318	0.59
8	S. Hill Junction - Coronandel	2,250	1,759	0.78	1,811	0.80	1,256	0.56
9	Coronandel - Petit Malabar	2,250	1,833	0.84	1,901	0.84	1,422	0.64
10	Petit Malabar - Beay Bassin Roundabout	2,000	1,283	0.64	1,279	0.64	958	0.49
11	Beay Bassin - Town Hall Roundabout of Rose Hill	2,000	863	0.43	868	0.43	683	0.34
12	Town Hall of Rose Hill - Rose Hill Junction	2,000	827	0.41	1,124	0.56	774	0.39
13	Rose Hill Junction - St. Jean Roundabout	2,125	1,061	0.51	1,311	0.62	970	0.46
- All Road								
14	Beay Bassin - Vender - Roundabout mersch	1,920	467	0.24	448	0.23	317	0.17
15	Vender - Rose Hill mersch Junction	1,920	455	0.24	592	0.31	397	0.21
16	Belle Village Road	1,500	670	0.45	706	0.47	447	0.30
17	B ₃₁ Road	1,160	222	0.19	203	0.18	160	0.14
18	A ₃ Road	2,070	292	0.14	203	0.10	202	0.10
19	B ₁ Road	1,900	597	0.31	583	0.31	378	0.20
- Other Roads								
20	Pailles Junction Road	1,090	130	0.21	103	0.09	76	0.07
21	Church Road	1,040	65	0.06	85	0.08	52	0.05
22	Beay Bassin N.W.	1,040	61	0.06	44	0.04	31	0.03
23	Beay Bassin West	1,040	75	0.07	42	0.04	36	0.03

1/ Location of Section is illustrated in the Appendix Fig. V.4

3.3 Distribution of Base Traffic

1) Modification of OD Survey Findings

Because the field survey was a sample survey taken only on two alternative days of the week at each survey station, the volume of traffic thus found has been adjusted into that which corresponds to ADT level. Origin-Destination tables for morning-peak hour, evening-peak hour, and off-peak hours were then developed. Tables V-3-6 through V-3-9 show the traffic distribution, of passenger cars (including taxi cabs), vans (including pick-up), trucks (of medium and heavy weight, as well as truck-trailers) and their total. Sugar industry traffic and airport traffic have been excluded from these Origin-Destination Tables.

2) Characteristics of Distribution

According to the 12-hour Origin - Destination tables (Table V-3-6 through V-3-9) of base traffic by type of vehicle, traffic originating from Port Louis (Zone 01) or its north (Zone 18) represents 54% of total passenger car traffic, 49% of total van traffic, 52% of truck traffic, and 53% of all types of traffic. Likewise, that which ends in Port Louis (Zone 01) or north of it (Zone 18) represents 48% of total passenger car traffic, 53% of van traffic, 50% of truck traffic, and 48% of all types of traffic. As seen, a predominant portion of traffic in the project area either originates or is destined for Port Louis and its northern area.

Now, in order to obtain an indicator of the base traffic distribution, we have calculated average length of trip based on the Origin-Destination tables and the geographical distances between zones, as shown in Appendix Table V-13.

As calculated, the average length of trip is about 17 kilometers in the case of passenger cars and 18 kilometers in the case of freight vehicles. Among the latter, average trip length is longer in the case of larger vehicles: it is 17.9 kilometers in the case of vans, 18.5 kilometers for medium and heavy trucks, and 20.7 kilometers for truck-trailers. Also, as shown in Appendix Table V-14, trip purpose by

the hour of the day indicates that about 60% of traffic in the morning-peak hour is for going to work and more than 60% of traffic in the evening-peak hour is for going home from work, which coincides with normal judgement and supports the reliability of the Origin-Destination survey findings.

Another notable finding of current traffic distribution analysis is the rate of sharing of traffic between A₁ and Motorway, the two major roads in the project area. This rate is expressed in terms of percentage of traffic on A₁ to the traffic on both roads with regard to various Origin-Destination pairs; that is, traffic originating from or ending in either Port Louis (Zone 01) or its north (Zone 18) and ending in or originating from either of Coromandel (Zone 02), Vacoas/Phoenix (Zone 06), and zones between them, as shown in Table V-3-5.

The finding is that A₁ Road demonstrates a high rate of sharing traffic for trips originating in the vicinity of Port Louis and declining rates of traffic with longer trip length, as the rate of Motorway increases, Rose Hill (Zone 04) being the point of inverse. This indicates that, because the ratio of traffic congestion is much higher on A₁ Road than on Motorway, increasing number of drivers prefer Motorway for faster speed to A₁ Road of a shorter length, via B₁ Road, which connect A₁ with Motorway at Rose Hill Junction. This tendency is higher in peak hours than in off-peak hours.

Table V-3-5 Traffic Volume 1/ of Particular Pairs of Zones on Competitive Roads of A₁ and Motorway

Hour	01, 18	to/from	Pair of Zone				
			02	03	04	05	06
Peak hour	Traffic on A ₁		235	685	411	156	68
	Traffic on Motorway		0	32	225	669	523
	Percentage of A ₁ (%)		100	95.5	64.6	18.9	11.5
12 hours	Traffic on A ₁		925	1,692	1,491	649	306
	Traffic on Motorway		12	69	627	1,524	1,483
	Percentage of A ₁ (%)		98.7	96.1	70.4	29.9	17.1

1/ includes both directions and excludes Bus, Motorcycle and Bicycle.

Table V-3-6 Distribution of Traffic (Cars)

0	D	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	TOTAL
01	322	377	915	1,034	1,088	811	1,232	407	5	56	76	9	1,286	124	264	102	147	24	8,279	
02	375						7											36	418	
03	1,129						5											3	75	1,212
04	1,103						6											5	74	1,188
05	1,237																		143	1,380
06	937																		94	1,031
07	1,559	14	18	8	3	3		9	3									10	107	1,734
08	430							9					6			3		7	32	487
09	24																		5	29
10	125																		9	134
11	77																6		19	102
12	17																		16	33
13	1,251								3										165	1,419
14	194																		9	203
15	319																		40	359
16	118																		22	140
17	111	6	3	3	3	2	4	2												134
18	58	49	75	94	81	34	146	44	3	7	3	6	136		29					765
TOTAL	9,386	446	1,011	1,139	1,175	850	1,409	465	8	63	82	15	1,428	124	296	108	172	870	19,047	

Table V-3-7 Distribution of Traffic (Vans)

D O	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	TOTAL
01	44	101	84	128	87	88	122	64		16	11	5	146	39	81	23	18	5	1,062
02	66																	8	74
03	56																	9	65
04	102													2			2	12	116
05	87																	13	100
06	92																	5	97
07	171	8	2					2		2							5	12	202
08	50												3					8	61
09	5																		5
10	13																		13
11	7																	2	9
12	2																		2
13	126																	15	141
14	20																	3	23
15	77																		77
16	10																		10
17	25						2	2			2								31
18	9	10	10	5	5	5	19			2	2	3		3	2				75
TOTAL	962	119	96	133	92	93	143	68		20	15	8	149	42	83	23	25	92	2,163

Table V-3-8 Distribution of Traffic (Trucks)

O \ P	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	TOTAL
01	70	52	52	100	102	107	155	54	4	22	1	5	83	48	96	24	7	9	991
02	58						1											26	85
03	51																1	12	64
04	91						2											6	99
05	115																	23	138
06	159																	30	189
07	155	4		5				3		6							7	37	217
08	60																1	7	68
09	10														1				11
10	20																	1	21
11	14																		14
12	3																		6
13	81																	2	83
14	27																	2	29
15	64																	2	66
16	24																		24
17	20	5		3			7	1											36
18	11	14	10	5	17	18	20	10		7			13	5	13	4			147
TOTAL	1,033	75	62	113	119	125	185	68	4	35	1	5	96	53	110	28	16	160	2,288

Table V-3-9 Distribution of Traffic (All Types of Vehicles^{1/})

O	P	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	TOTAL
01	436	530	1,051	1,262	1,277	1,006	1,509	525	9	94	88	19	1,515	211	441	149	172	38	10,332	
02	499					8													70	577
03	1,236					5											4		96	1,341
04	1,296					8											7		92	1,403
05	1,439																		179	1,618
06	1,188																		129	1,317
07	1,885	26	20	13	3	3		14		8	3						22	156	2,153	
08	540											9				3	8	47	616	
09	39														1			5	45	
10	158																	10	168	
11	98													6				21	125	
12	22																	19	41	
13	1,458								3									182	1,643	
14	241																	14	255	
15	460																	42	502	
16	152																	22	174	
17	156	11	3	6	3	2	13	5			2								201	
18	78	73	95	104	103	57	185	54	3	16	5	9	149	8	44	4			987	
TOTAL	11,381	640	1,169	1,385	1,386	1,068	1,737	601	12	118	98	28	1,673	219	489	159	213	1,122	23,498	

^{1/} excludes Motorcycle

3.4 Bus Traffic

1) Bus Transportation in Mauritius

Mauritius currently has no such means of mass transportation as railway, and bus transportation is playing an extremely important role in the sector of public transportation. The frequency of bus utilization by the masses of people who cannot afford a car or use a taxi cab is rising as the mobility of people is increasing due to a growth of economy. Some time-series data concerning bus transportation presented in Table V-3-10 below indicates that the number of buses, the number of bus tickets sold, and the number of bus trips have all been growing by about 10% per year during the period shown.

Table V-3-10 Statistics of Bus Operation

	1972	1973	1974	1975	1976	Average Annual Growth Rate (%)
Number of buses registered (Number)	831	951	1,060	1,149	1,186	9.3
Total number of tickets sold (million)	114.1	122.2	141.3	152.5	167.8	10.1
Total vehicle-journeys (Thousand)	2,900	3,290	3,663	3,640	4,049	8.7

Source: Central Statistical Office

Data pertaining to bus operation, which have been obtained directly from bus companies rather than by road-side interviews as stated earlier, are presented in Appendix Table V-14.

These data coincide with the findings of the one-week traffic survey at Coromandel (A₁ Road) and Belle Village (Motorway), when day-night ratio is considered. Therefore, the volume of bus traffic in the project area is determined as shown in Table V-3-11 below.

Bus utilization rate is high in the project area, and buses are always full of passengers (many standing) except for some off-peak hours. By route, the following observation is made:

- o A much greater number of bus passengers move on A₁ Road than on Motorway, the number of bus trips compare four to one between them (Coromandel and Belle Village).
- o While both A₁ Road and Motorway give access from Vacoas and Curepipe to Port Louis, quasi-non-stop express bus services available in peak hours use Motorway.

Table V-3-11 Bus Traffic^{1/} for Major Links, 1977 vehicles

Road No. 2/	Road Section	Direction				Direction				Total			
		Morning Peak	Evening Peak	Off-Peak Total	Morning Peak	Evening Peak	Off-Peak Total	Morning Peak	Evening Peak	Off-Peak Total	Total		
①	Reduit Roundabout	43	14	167	224	15	38	175	229	58	52	342	452
②	Cassis Flyover												
③	St. Jean Roundabout	32	4	100	136	7	22	92	121	39	26	192	257
④	Reduit Roundabout												
⑤	Cassis Flyover	81	88	775	944	87	74	747	908	168	162	1522	1852
⑥	G.R.N.W. Junction	81	99	725	905	90	77	689	856	171	176	1414	1761
⑦	G.R.N.W. Junction	74	90	677	841	83	73	642	798	157	163	1319	1639
⑧	S. Hill Junction	69	85	611	765	76	63	556	695	145	148	1167	1460
⑨	Coromandel	81	85	692	858	85	82	719	886	166	167	1411	1744
⑩	Petit Malabar	70	85	692	847	56	82	719	857	126	167	1411	1704
⑪	Beau Bassin Roundabout	69	81	674	824	54	79	705	838	123	160	1379	1662
⑫	Rose Hill Town Hall	69	81	674	824	52	79	705	836	121	160	1379	1660
⑬	Rose Hill Junction	52	51	551	654	52	59	545	656	104	110	1096	1310
⑭	St. Jean Roundabout	1	4	18	23	2	3	14	19	3	7	32	42
⑮	Rose Hill Junction	7	9	48	64	7	4	47	58	14	13	95	122
⑯	Beau Bassin Roundabout	5	6	72	83	7	11	89	107	12	17	161	190
⑰	G.R.N.W. Junction	15	19	159	193	13	15	143	171	28	34	302	364
⑱	S. Hill Junction												
⑲	Reduit Roundabout												

1/ 12 hour daily average

2/ Location is shown in Appendix Fig. V-4

3.5 Airport Traffic

Two kinds of survey were taken up on airport traffic. One which was conducted on vehicles originating from and ending at Plaisance Airport by interview at stations on A₁ and M₂ near Port Louis has been discarded for the purpose here, because this survey was made irrespective of airplane arrival/departure and its sample rate was too low for the findings to be reliable.

Another was the interview of drivers of all vehicles except buses and bicycles, conducted at the entrance of Plaisance Airport. The volume of airport traffic is estimated through the analysis of the finding of this survey. The results of this one-day survey is corrected by the weekly variation in the total number of passenger seats on airplanes arriving and leaving the airport shown in Appendix Figure V-15. Daily average of airport traffic by Origin-Destination is shown in Table V-3-12.

According to this table, 83.8% of airport traffic is passenger cars, and 9.5% is vans and pick-ups thus light vehicles occupying 93.3% of the total, with only 2.5% for medium and heavier trucks. Motorcycles, which represent 4.2% (which is greater than trucks) of the total airport traffic, are believed to have little effect on the project area in view of the short length of their trips.

32.3% of airport traffic originates or terminates in Grand Port, which is adjacent to the airport, followed by 17.6% of Port Louis, and 14.9% of Curepipe.

Table V-3-12 Airport Generated Traffic,^{1/} 1977 (vehicles)

Traffic Zone	Car, Taxi	Van, Pick- up	Truck	Motor- cyclé	Total
01 Port Louis	171	35	11		217
02 Coromandel	5	3	1		9
03 Beau Bassin	38	3			41
04 Rose Hill	60	7	1		68
05 Quatre Bornes	57	7		1	65
06 Vacoas/Phoenix	72		1		73
07 Pailles, Moka	27	3	2		32
08 Pointe aux Sables	1				1
09 Le Bosquet					
10 Bambous	3				3
11 Tamarin	20	6			26
12 Henrietta					
13 Curepipe, Coriolis	156	21	2	5	184
14 Savanne	27			1	28
15 Grand Port	323	21	10	45	399
16 Quartier Militaire	1				1
17 Flacq	19				19
18 Pamplémousses R. du Rempart	54	11	3		68
Total	1,034	117	31	52	1,234

^{1/} average two-way daily traffic

3.6^a Sugar Lorry Traffic

Sugar lorry traffic consists of vehicle trips for the transportation of (1) sugarcane, (2) sugar and molasses, and (3) material inputs required for sugar production. Sugarcane is transported from plantations to sugar mills either via the private railway system or by trucks, almost none of which occurs on the Project Road and other general use roads. The material input of (3) above could not be defined because the materials represented a large

variety of items and because they were often transported on the return trip of trucks which transported sugar of (2), which, in any way, represents the greatest volume of the three types of cargo. It is feared that the results of field survey, which was conducted only for a short period of time and at the time of year when it was near the end of the sugar exporting season, do accurately reflect the usual traffic movements.

The result of this survey and the average daily volume of cargo in sugar production season estimated based on the sugar mills' record of production are compared in Table V-3-13. The two are in relatively close proximity to each other, allowing for the divergence of shipping order among different mills and the limited length of survey period.

Table V-3-13 Sugar Movement^{1/}

From - To	Resulted from Traffic Survey (tons/day)	Assump- tions (tons/day)
02-01	24	-
05-01	68	-
06-01	249	360
07-01	108	270
08-01	20	-
09-01	17	-
10-01	375	360
13-01	73	-
14-01	757	655
15-01	529	860
16-01	18	-
Sub-Total	2,238	2,505
01-01	6	
01-03	15	
01-04	4	
01-05	20	
01-06	18	
01-07	31	
01-10	41	
01-11	13	
01-15	7	
Sub-Total	155	-
10-18	16	-
Grand Total	2,409	2,505

^{1/} includes Sugar and Molasses

3.7 Intra-Link Traffic

The previously discussed origin-Destination table of the present traffic represents the result of interview surveys conducted at two stations near Port Louis and, therefore, shows all of the origin-destination traffic passing through these stations but not the entire traffic originating and terminating within the project area. For instance, traffic moving between Curepipe and Rose Hill and that moving between Rose Hill and Beau Bassin do use the subject road network but are excluded from the Origin-Destination table.

Intra-link traffic is defined as the traffic which uses a part of the subject road network but excluded from the Origin-Destination table, regardless of the length of trip. In other words, the volume of intra-link traffic is arrived at by deducting from the volume of average daily-traffic at the major survey stations, the volumes of base traffic, sugar lorry traffic, and airport traffic, which have been separately analyzed. The volume of intra-link traffic has been estimated as shown in Table V-3-14.

Table V-3-14 Intra-Link Traffic ^{1/} 1977

Road Section No.	Car			Van, Pick-up			Truck			Motorcycle			Total							
	M. Peak	E. Peak	Off-Peak	M. Peak	E. Peak	Off-Peak	M. Peak	E. Peak	Off-Peak	M. Peak	E. Peak	Off-Peak	M. Peak	E. Peak	Off-Peak					
	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total	Total					
1	2	103	337	442	13	18	69	100	15	15	59	89	37	64	424	525	67	200	889	1156
1'	0	0	0	0	12	4	23	39	9	0	89	98	65	43	437	545	86	47	549	682
2, 3	14	129	335	478	14	18	72	104	16	15	51	82	37	64	424	525	81	226	882	1189
2', 3'	0	0	0	0	14	4	6	24	8	0	72	80	65	43	437	545	87	47	515	649
4	61	200	652	913	7	12	96	115	29	51	142	222	20	55	208	283	117	318	1098	1533
4'	330	0	342	672	16	0	36	52	28	25	185	238	48	23	255	326	422	48	818	1288
5	58	75	0	133	37	40	252	329	44	34	147	225	199	340	1447	1986	338	489	1846	2673
6	52	54	0	106	30	40	222	292	42	32	124	198	199	340	1447	1986	323	466	1793	2582
7	76	105	0	181	34	43	238	315	39	31	145	215	175	226	1248	1649	324	405	1631	2360
8, 9	77	124	625	826	23	29	224	276	78	11	296	385	133	188	1227	1548	311	352	2372	3035
10	9	58	677	744	38	40	407	485	63	38	254	355	78	135	773	986	188	271	2111	2570
11, 12	139	386	2089	2614	7	27	179	213	24	5	15	44	79	166	1021	1266	249	584	3304	4137
13-1	465	603	3704	4772	48	53	440	541	61	52	524	637	75	123	807	1005	649	831	5475	6955
13-2	241	344	2932	3517	31	47	423	501	47	59	444	550	75	123	807	1005	394	573	4606	5573
14, 15	158	303	1470	1931	24	13	233	270	25	31	313	369	49	70	399	518	256	417	2415	3088
18	19	0	0	19	0	2	0	2	32	18	164	214	41	15	230	286	92	35	394	521
19	277	324	1626	2227	44	36	234	314	20	8	176	204	50	56	367	473	391	424	2403	3218

^{1/} 12 hour daily average

^{2/} Location is shown in Appendix Fig. V-4