JAPAN INTERNATIONAL COOPERATION AGENCY

MINISTRY OF COMMUNICATIONS,
WORKS AND PUBLIC UTILITIES, GRENADA

社会開発調査部報告書

THE FEASIBILITY STUDY
ON
ROAD REHABILITATION AND IMPROVEMENT
IN
GRENADA

FINAL REPORT

APPENDIX

JANUARY 1998

KATAHIRA & ENGINEERS INTERNATIONAL

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List of Appendices

APPENDIX 1

RELEVANT PLANS AND PROJECTS

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RELEVANT PLANS AND PROJECTS

This appendix presents a review of the major plans and road projects, either on-going or committed, related to the Study.

1. MEDIUM TERM ECONOMIC STRATEGY PAPERS (MTSEP), 1996-1998

1.1 MTSEP COMPONENTS

The MTSEP is composed of the following parts:

- Introduction,
- Current Economic Situation,
- Public Sector Issues,
- Reforming the Public Service,
- Medium-Term Economic Prospects and Strategy,
- Sectorial Strategy,
- Public Sector Investment program and financing Plan 1996-1998, and
- Conclusion

In addition, it included the parts of: "Implementation of the 1994-96 Medium-Term Policy Matrix, Medium-Term Policy Matrix 1996-98, and statistical Appendix" which are attached as appendices.

1.2 Purpose and Strategy of MTESP

The Introduction defines the purpose of MTESP as "to identify policies which the Government intends to pursue and which it believes will ensure sustainable economic growth in the medium and longer term". Also, the Introduction defines the main objectives of the Government as "to promote the sustainable economic and social development of Grenada".

In order to achieve these objectives, the MTSEP emphasizes increase domestic savings and investment, modernization of administration and strengthening of the institutional structure of the public sector, economic diversification through improvement in the tax and incentives regimes and in the regulatory frameworks, and greater attention to environmental issues.

1.3 Understandings of the Present Situation

The economic growth of the country fell to an average below 2% per annum for the period 1991-1995 after booming at an average of 6.5% p.a. during the period 1986-1990. The paper concluded that the weak economic performance in the 1990s reflected a continued decline in the agricultural sector and stagnation in construction activities.

During the period 1991 to 1995 the Government attempted to stabilize its finance. The tax system was reviewed and the retrenchment programme was activated with the specific aims of reducing current expenditure and increasing revenue. As a result, the current expenditure fell from 24.6% to 23.4% and total revenue and grant increase from 25.9% between 1992 and 1995

1.4 Medium-Term Economic Prospects and Strategy

The Government is projecting a slight increase in the rate of economic growth from 2.6% in 1995 to 3.4% in 1998. The performance in 1998 is expected to include 7.0% in the tourism and in construction. Modest growth is expected from agriculture and manufacturing.

In the case of agriculture, the ratio of growth is expected to be 2.2% and the manufacturing sector is expected to grow by 2.0% both in 1998. Major issues to be addressed in the medium-term are summarized in Table 1.1. The targets and objectives shown in Table 1.2 have been identified for the period 1996-1998.

1.5 Public Sector Investment Program (PSIP) and Financing Plan 1996-1998

The PSIP for the period 1996-1998 emphasizes projects related to the provision of economic and social infrastructure (including road rehabilitation, water supply development and health), human resource development and solid waste management.

It also included projects for agriculture sector development and solid waste mealybug eradication and the establishment of the fish processing plant to act as a catalyst for the further development of the fishing industry.

Table 1.1 Major Issues to be address in the Medium-Term

Factors	Description
Structural factors	High level of unemployment, skill shortage, low productivity in agriculture and manufacturing, and inadequate economic infrastructure.
Institutional factors	Reducing staff numbers, introducing new grading and pay system, and the privatization of several State Owned Enterprises.
Social Factors	Inadequate supply of social services to the community environmental protection, assistance to socially disadvantaged groups.
Foreign Assistance	The creation of an Eastern Caribbean Call Exchange, and arrangements for and Eastern Caribbean Venture capital Fund and an Eastern Caribbean Unit Company.
Commodity Prices	Low prices of major agricultural products to be exported.
Preferential Markets	Phasing out of preferential market access for ACP bananas of the EU.

Note: ACP; African, Caribbean and Pacific states (under the LOME arrangements)

Table 1.2 Medium-Term Targets and Objectives

Objective	Target	
	1995	1998
Economic Growth	2.6%	3.4%
Government's Savings	1.8% of GDP	3.4% of GDP
PublicSector Investment	7.2% of GDP	Not less than 10% per annum. During 1996-1998
Taxation: • Income tax threshold • Property tax	 EC$ 18,000 -	 EC$ 60,000 To be restructured
Public Sector Debt	-	To eliminate arrears
Revenue	-	Introducing additional revenue raising measures

The structure of the PSIP is linked to the Government's overall development strategy, to its sectorial strategies, and to the role of the public sector as the facilitator of private sector development.

The Planned expenditure is estimated at estimated at EC$ 167.2mn. Of this total EC$ 112.9mn represent on-going projects, and EC$54.3mn new projects. Structure of the PSIP 1996-1998 is summarized in Table 1.3.

Table 1.3 Structure of PSIP 1996-1998

Items	Total Amount in million EC$
Economic Services:	42.3
- Agriculture	26.8
- Tourism	2.1
- Manufacturing	13.4
- Infrastructure	65.5
- Transport	65.7
- Water and sewage	2.8
Social Services:	55.1
- Education	28.6
- Health	23.3
- Housing	1.5
- Other	1.7
Other Public Investments	4.3
Grand Total	167.2

2. ROAD IMPROVEMENT AND MAINTENANCE PROJECT - GRENADA

2.1 Components of the Paper

This paper was issued from the Caribbean Development bank as an Appraisal Report. The paper is composed of the following parts:

- Introduction,
- The Transport Sector,
- The Project,
- The Borrower,
- Benefits,
- Justification and Economic Analysis, and
- Terms and Conditions.

2.2 The Project

The project consist of the improvement, reconstruction and surface renewal of two sections of the roads identified as being in urgent need of attention. These roads are the Airport Roads (from Burns Point in St. George's to Point Saline's International Airport) and the Eastern Main Roads from Bellevue to Hope.

2.3 The Borrower

Over the period of structural Adjustment Program, central Govemment's finances improved from a recurrent surplus of 0.7% GDP in 1992 to a surplus of 1% GDP in 1994 before grants. The capital revenues are expected to be augmented by EC$ 10mn in local loans in 1995 thus providing adequate counterpart funds for implementation of projects.

2.4 Benefits, Justification and Economic Analysis

Savings in vehicle operating costs (VOCs) will be the main economic benefit resulting from implementation of the project. Internal economic rates of return were calculated for each link of the project roads. The results are sections of Airport Road show more than 30% and of Eastern Main Roads show more than 16%.

2.5 Terms and Conditions

It is recommended that Caribbean Development Bank lend to Grenada Government an amount not excluding the equivalent of US$ 11,431,000 consisting of:

(1) International Development Association (IDA) Resource US$ 1, 266,000
(2) Other Special Fund Resource (SFR) US$ 1, 146,000
(3) Ordinary Capital resource (OCR) US$ 9,019,000

Conditions of loans are summarized as follows:

Loan	Grace Period	Repayment Period	Interest Rate
IDA	9 Years	25 years	1.25% for the first 10 years 2.50% for the rest 15 years
SFR	5 years	17 years	2%
OCR	5 years	17 years	7.75% (fluctuating interest system)

3. COASTAL EROSION, SEA DEFENSES AND ROAD REHABILITATION STUDIES

Final Report, Volume 3, April 1994 - Existing Road Condition assessment, Road Rehabilitation and Improvement Program, and Prioritization.

(1) Study Roads (28 Roads)
- Low level coastal roads near beaches or just above tide level
- High level coastal roads constructed at the top of sea cliffs

(2) Road Classification

Group	Traffic Range	Pavement Width (ft)	Description
1	<1000	10 - 12	Minor Roads
2	1000 < TR<2000	16 – 18	Class / Rural Roads
3	>2000	24 -30	Main Roads in St. George's

(3) Pavement Type

- New Pavement (Double Surface Treatment, Asphalt Concrete, Cement Concrete)
- Rehabilitation (Assume use of existing scarified and reshaped pavement as sub-base)
- Overlay (Double Surface Treatment, Asphalt Cement)

(4) Construction Options for Budget Estimate

- Do Minimum
  Relining the road to good condition on its present alignment without major improvement of any element.
- Rehabilitation
  Upgrading the road with minor improvements to drainage and if possible visibility and safety.
- Improvement
  Usually involves widening with consequential requirements for cutting wall etc. Major improvement on the existing alignment.

(5) Priority Ranking

Factors used for Priority Ranking are the following three:

- Road Classification ; 4 classes proposed by consultants
- Road Condition ; Pavement Condition Values (Carriage-way, Roadside Elements, Road Signs)
  - Subjective estimation of Roughness
  - Combined Pavement Index
- Per Capital Cost ; Construction per population based on traffic volume estimate (10,000 for classes/roads)

4. THE PHYSICAL PLANNING AND RELATED ENVIRONMENTAL MANAGEMENT PROJECT OF THE GOVERNMENT OF GRENADA (UNDP, 1996)

4.1 Table of Contents

This report by the project manager covering October 1994 to October 1995 comprises six parts as listed below:

- Part I - The Institutional Framework for Physical Planning and Related Environmental Management
- Part II - Development Planning Policy and Information Base
- Part III - The Development Control System
- Part IV - Environmental Impact Assessment
- Part V - Physical Planning Legislation
- Part VI - Administration, Organization, Staffing and Resources of the PPU.

4.2 Objectives of the Report

The report contains a description of the existing conditions found at the Physical Planning Unit (PPU) headquarters. It assesses the weakness in the system and makes recommendations for institutional strengthening. It also contains legal and planning material prepared for the use of the PPU and it reports on the status and makes recommendations of the future progress of the project.

The report concludes that the project should be funded for two additional years in order for the PPU to receive the necessary training and institutional strengthening required to prepare the PPU to fulfill its proper role in physical planning.

4.3 The Institutional Framework for Physical Planning and Related Environmental Management

This chapter provided a detailed review of the government agencies responsible for land use, development control and environmental management to determine the areas of overlapping functions and responsibilities. Recommendations were provided for the establishment of mechanisms to coordinate the related planning and environmental management functions of the various agencies. Non-governmental organizations were also reviewed.

The report states "The main recommendations of the Phase 1 Report which address the issue of integration for the planning function are:

(I) that each agency's mandate should set out clearly its role in the planning framework;

(II) that a revised reference book on project preparation, programming and implementation should be prepared, which will set out the formats of reports required and their timing;

(III) that the role and composition of various committees in the planning process need to be addressed;

(IV) that it should be decided which agencies should have planning units as part of an overall rationalization process."

(V) Additional recommendations for integration measures were also provided in the report.

4.4 Development Planning Policy and Information Base

One aim of the project was to help the PPU develop a National Physical Development Plan (NPDP). This concept has not been able to materialize due to several factors such as lack of a coordinating committee for all the responsible agencies, the CDB did not provide the required environmental specialists, the INDP/UNCHS did not procure the Gis Software, hardware and training required by the project and the PPU was not provided with staff who were committed and capable professionals.

Recommendations include increased staffing of the PPU, obtaining specific maps and aerial photography, obtaining specific equipment including GIS equipment, provision of an Inter-Sectorial Coordinating Committee and Technical Working Groups, and a Work Plan for preparation of the NPDP.

4.5 The Development Control System

The Physical Planning Unit's operation was detailed in this chapter and comments made regarding details of the operation. It was generally stated that the PPU lacked professional staff, adequate legislative direction and authority and adequate materials and equipment. The project intends to restructure, rebuild and strengthen the PPU.

Specific recommendations concerning the PPU's operations were made relating to processing of applications and other procedures, appeals, monitoring and enforcement, length of time to take to determine applications, statistics of development control and further work/implementation. Appendices of the report include several forms for the PPU's use.

4.6 Environmental Impact Assessment

Environmental Impact Assessment's (EIA) are not required by legislation for development projects in Grenada. The project provided assistance to build the capability within Grenada to properly review EIA's. The requirements are stated by the report as follows:

- "proposal for an institutional mechanisms to vet EIA's;
- assistance in the application of EIA guidelines and legislation;
- complementary assistance from NRMU and other agencies;
- provision of training in EIA's principles and procedures;
- incorporation of EIA provisions and regulations into broader legislation."

The report recommends that legislation be revised, to require an EIA for certain projects listed in schedule 1 (roads are not included), that the LDCA should be empowered to require an EIA for projects that fall outside of the schedule if they so decide, that an EIA Review Committee be established, and that the legislation include government projects. The report also detailed an EIA Terms of Reference format and recommended a EIA training program be implemented.

4.7 Physical Planning Legislation

The project attempted to provide assistance to the office of the Attorney General in updating the physical planning legislation. But the legislation could not commence because the Attorney General did not provide the necessary comments to the OECS Model Physical Planning Act. The chapter went on to outline the existing situation by reviewing the Land Development Control Act, Cap 160 and the Town and Country Planning Act, Cap 322.

The next section detailed problems with the legislation including concurrent jurisdiction between the LDCA and the T & CPA, section 3 of the Act is unsatisfactory, further definition of terms are needed, the Act makes no provision for development plans or policies, section 8 could be more clearly drafted, etc.

The report states "The regulations are not clearly drafted, there is insufficient definition of very technical terms, serious printing errors and the effect of the Regulations as a whole is not stated." Recommendations concerning the upgrading of the Legislation were detailed.

4.8 Administration, Organization, Staffing and Resources of the PPU

The report states "The focus of the Physical Planning and Related Environmental Management Project, when reactivated in October 1994 was shifted to institutional strengthening through restructuring, rebuilding, human resource development and management of the PPU . In this context, assistance in the management of the PPU was indicated as a priority requirement. This need was heightened by the departure on training of the Building Inspector/Head of Unit in September of 1997."

The project manager provided the above requested assistance. Recommendations include a proposed staffing of the PPU, a proposed organizational structure for the PPU, proposed refurbishing of the PPU and indication of work completed and recommendations concerning management and administration were made. Appendices include job descriptions.

5. GRENADA NATIONAL ENVIRONMENTAL ACTION PLAN (WB, 1995)

5.1 Components of the Action Plan

The plan comprises Section 1: Background which includes the overview of the State of the Environment; The Economy and Social Indicators, Economic Policies and the Environment, Population Policy and Private Sector Participation; Section 2: Environmental Priorities which includes Solid Waste Management, Water Supply and Liquid Waste Management, Land Use Management, Coastal Zone Management, Water Pollution, Forestry and Protected Areas and Natural Hazards; Section 3: Legal Instruments and Instrumentation's which include Legal Instruments, Institutions and Public Awareness; and Section 4 Strategy for Environmental Action which includes Project Profiles, Tables and Figures.

5.2 Purpose of the Action Plan

The preface states that "Grenada's small size, geographical location, economic structure, cultural and community development have played a major role in creating a certain stress on the environment which could result in the destruction of its natural resource, if mechanisms are not put I no place to ensure sustainable development." The action plan was written to identify environmental problem areas and determine solutions.

5.3 Current Situation, Indicators and Policies

The plan determined some of the environmental problems to be notable increases in soil and beach erosion, sedimentation of rivers and coastal areas, decrease in agricultural and fisheries productivity and loss of habitat. Inadequate solid waste disposal was considered as a serious pollution problem. Additionally the Government of Grenada has identified the following environmental issues as important policy action areas for sustainable growth land use management, coastal zone management, water pollution, forestry and protected areas and natural hazards.

Grenada may not have the financial capacity to address environmental issues adequately. While tourism is the fastest growing sector of the economy, the agricultural sector declined by 7% from 1981 to 1991. There was a growth in the agro-processing and light manufacturing. The focus, by the Government, on the environment is reflected by the combined infrastructure and water and sewer expenditure, which accounts for 46% of the total expenditures. According to the report, most available social indicators for Grenada compare reasonably well with countries of similar levels of development and physical characteristics.

The environment can be endangered when specific policies aimed at promoting the economy are not carefully designed and executed without considering the environmental consequences. The current environmental policy of the Government has a priority for the protection of sensitive terrestrial and marine space and disposal of solid and liquid waste. The Government is trying to use their limited resources to address environmental issues and is supporting environmental issues and is considering implementing policies aimed at supporting environmental concerns. Policies such as levying a fee for solid and liquid waste disposal, and entrance fees for forest and park areas are being reviewed and implemented. With regard to population, the Government will increase their efforts to educate the public in family planning in an effort to reduce family size.

The private sector is involved in environmental issues and has implemented several environmental projects. The plan states "The private sector in Grenada is able to influence environmental management decisions because of its influence, through consultation with Government agencies, in the planning process and the advocacy role it plays on environmental issues."

5.4 Environmental Priorities

The plan identifies seven issues that should receive priority attention as follows: 1. Solid Waste Management; 2. Water Supply and Liquid Waste Management; 3. Land Use Management; 4. Coastal Zone Management; 5. Water Pollution; 6. Forestry and Protected Areas and 7. Natural and Man made Hazards. Solid Waste Management in Grenada is inconsistent and lacking in disposal sites. Lack of a Solid Waste Management plan supported by legislation, financial and technical backing has created an unhealthy environment. A World Bank / OECS Solid Waste Management project will deal with the problems.

The water supply problems are system wide and stem from poor watershed management, a poor distribution network, inadequate storage capacity and inadequate maintenance of treatment plants. NAWASA plans to improve the water supply systems with the following: the construction of much larger dams and storage reservoirs in the catchment areas, improved management of the watershed areas, the replacement of distribution lines, island wide metering and institutional strengthening of NAWASA.

The problems relating to Land Use Management are based on a rapid decrease in the amount of available agricultural lands and the degradation of the quality of these lands. Also, lack of coordination between the many responsible Government Agencies is a contributing factor to Land Use Management problems. The Government is currently working on a National Land Use Policy to address the above problems.

The Fisheries Division of the Ministry of Agriculture is responsible for Coastal Zone Management. The primary problem in this area is coastal and reef fish species have been depleted due to over fishing and reefs that are dying or dead. The Fisheries Division intends to help resolve the problems by setting up a system of marine zones, extend their monitoring system, and manage marine resources through assessment and inventory.

With regard to Water Pollution (land based), the responsible agencies are the Ministry of Health and Ministry of Fisheries. The problems stem from polluted run-off and silt being discharged into Grenada's bays including Grand Anse Bay, Black Bay, the St. George's Harbour/Lagoon and the town of Gouyave. The Government is planning to help resolve the problems by relocation of solid waste disposal sites from coastal areas, improve the St. George's sewerage system and improve disposal of grey water and other forms of liquid and solid waste.

Grenada's main environmental problems with Forestry and Protected Areas are deforestation, top soil erosion, and reduction in water levels within watershed areas and destruction of wildlife habitats. To alleviate the problems, the Government of Grenada has implemented reforestation and conservation projects by establishing nurseries. Future projects include Land Use and Integrated Watershed Management, Carriacou Integrated Land Use and Forestry Development, Forestry Management and Institutional Strengthening, and Development of National Parks systems.

The final area included in the National Environmental Action plan is Natural Hazards. The plan lists natural hazards as hurricanes, storm surges, landslides and rock falls, floods, earthquakes and volcanic eruptions. Although Grenada has experienced various natural disasters including loss of life in the past, such as Hurricane Janet in 1955, recently Grenada has not had a serious disaster. The Government is aware of the potential danger however, and intends to intensify the disaster preparedness, public awareness campaign and establish an early warning system and facility to monitor Kick-em-Jenny volcano.

5.5 Legal Instruments and Institutions

Generally, legislation concerning environmental issues is either nonexistent or outdated and in need of serious improvement. The following acts provide some protection for their respective areas: The Grenada Fisheries Act, 1986, National Parks and Protected Areas, and The National Water and Sewerage Authority Act.

The available legislation is outdated, dispersed among a wide range of agencies and lacks enforcement power including the National Trust Act, 1967, Forestry Act, Public Health Ordinance, Abatement of Litter Act, Agricultural Act, Grenada Territorial Waters Act, and the Beach Protection Act, 1979. The report offers recommended changes for legislation in the areas of National Trust, Tourism, Forestry, Waste Management, Pollution Control, Agriculture, Land Development Control, Marine Pollution and Mining.

There are fifteen (15) Government Agencies responsible for environmental management in Grenada. Given the number, coordination among the agencies is poor and no organized or legislated proviso is in place to provide for any coordination. Additionally, as legislation is generally very weak, the coordination problem is exacerbated. Environmental Management responsibility has been moved from one ministerial portfolio to another, which has increased the lack of coordination.

The Action Plan states "The Government recognizes the need for an integrated approach to environmental planning and management. Moreover, it is well understood that effective management, policy and planning require capacity building, in particular sound institutional development."

The report proposed changes to the institutional framework such as designating the Ministry of Planning and Development to be responsible for environmental management, establishment of an environmental commission, strengthening several existing institutions and enhancing coordination. The Government is promoting public awareness concerning the environment and how to protect it. Information is disseminated at the Documentation Center and through the media. Proposed actions include promotion of community participation in environmental issues.

5.6 Strategy for Environmental Action

This section of the Grenada Environmental Action Plan includes a matrix of programs and actions as outlined in the main body of the report. It also contains an Appendix which includes a number of brief project profiles. The project profiles are listed as follows:

- Land Use and Integrated Watershed Management
- Carriacou Land Use and Forest Management
- Forest Management and Institutional Strengthening of Forestry
- Development of National Parks
- Capacity Building

The Appendix also contains Table 2.1. - National Resource Management Legislation in Grenada, which is a listing of legislative acts. It also contains Table .3.1 - Government Agencies with Resource Management Functions, which is a listing of key institutions with environmental responsibilities. Finally, the Appendix contains figures and maps of Grenada with various information on them.

6. ROAD REHABILITATION AND SEA DEFENSES

Draft Engineering Design Report, Volume 1, January 1995

(1) Scope of Services

Detailed Design for the rehabilitation of the following roads and coastal protection;

- East Coast Main Road between the Sugar Mill Round-a-bout and Redgate

- West Coast Main Road between Gouyave and Victoria
- Coastal Protection for Mabouya Headland south of Gouyave
- Coastal Protection for Waltham Estate

(2) Traffic Survey and Projection

- 6 - Vehicle classification for traffic survey
- Southern Section Design Flows

Year	Peak Hour Flow	12 Hour Flow	Design Flow AADT	% HGV'S	HGV'S (vpd)
1993	48 x 1.50	720	900	5	45
1996	N/A	N/A	1022	5	51
2010	N/A	N/A	2024	5	101
2015	N/A	N/A	2503	5	129

Note: HGV; Heavy Goods Vehicles (Tractor, large bus, etc.)
Growth Rate; 4% per annum (1993 - 1995)
5% per annum (up to 2000)

(3) Axle Loading Analysis

	Unloaded Vehicles		Normally Loaded Vehicles		Oversized Vehicles	
Axle	Front	Rear	Front	Rear	Front	Rear
Axle Load (kg)	2200	2000	3800	7500	3800	9500
ESA	0.003	0.002	0.032	0.684	0.032	1.982
Combined ESA	0.002		0.716		2.014	

Note: ESA; Equivalent Standard Axle

(4) Geological Survey and Laboratory Testing

- Trial Pits (51 points)
- Sub-grade, mostly A-2 type in AASHTO classification M145-82 CBR 4.5-23

(5) Topographical and Bathometric Surveys

- Survey Total Station System
- Global Positioning Satellite System

(6) Geometric Road Design

- Standard; Overseas Road Note 6 (ORN6)
  A guide to Geometric Design, Transport and Road Research Laboratory UK 1988.

- Design Speed

  Design speed appropriate to the terrain and road functions are given in ORN6 which range from 60 kph to 100 kph. However, the consultant will not therefore, adhere rigidly to these design speeds, but exercise discretion in introducing lower standards where necessary in the interest of the economy.

	Desirable	Minimum
Rural Selection	85 kph	60 kph
Urban Selection	32 kph	-

- Road Width

Design Class	Traffic Flow	Width	
		Carriage-way	Shoulders
A	5,000 - 5,000	6.5	2.5
B	1,000 - 5,000	6.5	6.0
C	400 - 1,000	5.5	1.0

Note: 1) Project roads fall into class B
2) Minimum Width 5.0m
3) 1.0 - 1.5m for foot paths

- Gradients

  Less than 8%

- Safety improvement such as overhanging cliffs

(7) Pavement Design

- Standard; Overseas Road Note 31 (ORN 31)

  A Guide to Structural Design of Bitumen - Surface Roads in Topical and Subtropical Countries, TRL, UK 1993.

- Pavement Layers
  - Surface Course : Asphalt concrete, Minimum thickness 50mm
  - Base Course : granular material, 125 mm
  - Sub-base : 125mm - 325 mm
  - Design Service Life : 15 years

(8) Drainage Design

- Rational Method
- 24 hour storm depth (128 mm for 2 years return period)
  (155 mm for 10 years return period)

APPENDIX 2

SURVEY FORMS

ROAD REFERENCING SYSTEM SURVEY

Road Link No. ☐☐ Sheet No. ☐ Survey Date ☐☐ ☐☐☐

Road Link Name : From

To

Region No. ☐☐ Province Name

RM No.	RM TYPE	REFERENCE MARKER (RM) DESCRIPTION	ODOMETER READING (KM)	Remark
			.	
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REFERENCE MARKER TYPE

S	- Start Road Link	P	- Parish Boundary
E	- End Road	I	- Road intersection
O	- Others	B	- Bridge

REMARKS

PRP - Recommended Permanent Reference Point
SB - Survey Breaks
Z - Obstruction of line of drive

Sketch : Starting Point

Sketch : End Point

INDIVIDUAL PRESENT SERVICEABILITY RATING

DIRECTION ____________ DATE ____________

ROAD LINK NO ____________ NAME OF RATER ____________

VEHICLE ____________

KM

Section	SURFACE CONDITION RATING					ACCEPTABLE ?		
	Very Good	Good	Fair	Poor	Very Poor		No	un-decided

KM

Points
50 – 40
40 – 30
20 – 10
10 – 00

Surface Condition	
Very Good	- Very Comfortable
Good	- Comfortable
Fair	- Satisfactory
Poor	- Uncomfortable
Very Poor	- Very Comfortable

General Road Condition Survey

Sheet No. ______________________

Survey Date: ______________________

____

Road Link No. ☐☐

Km. ☐☐☐☐

Section	General						Left Bound									Right Bound								
							Shoulder				Surface Drainage					Shoulder				Surface Drainage				
	Topography	Cross Section Type	Sharp Curve (No.)	Steep Gradient (%)	Pavement Width	R.O.W. Width	Width (m)	Material	Drop off/or Heave (m)	Scoured (m)	No Ditch (m)	Earth (m)	Riprap (m)	Concrete (m)	Land Use	Width (m)	Material	Drop off/or Heave (m)	Scoured (m)	No Ditch (m)	Earth (m)	Riprsp (m)	Concrete (m)	Land Use
									D: H:									D: H:						
									D: H:									D: H:						
									D: H:									D: H:						
									D: H:									D: H:						
									D: H:									D: H:						
									D: H:									D: H:						
									D: H:									D: H:						
									D: H:									D: H:						
									D: H:									D: H:						
									D: H:									D: H:						

Km. ☐☐☐☐

Topography

1. Flat
2. Rolling
3. Mountainous

Cross Section Type

1. Flat
2. Cut (   )
3. Embankment (   )
4. Cut/Embankment (   )
5. Cut/Embankment (   )
   (Left bound View)

Steep Gradient

1. Less than 6%
2. 6 – 12%
3. More than 12%

Shoulder

1. Earth
2. Gravel
3. Concrete
4. Asphalt

Land Use

1. Plantation
2. Plow Field
3. Coconut Field
4. Forest
5. Waste Land
6. Swampy Area
7. Residential/Commercial Area

Pavement Distress Survey

Sheet No. _____

Survey Date: _____

Road Link No. [ ][ ]

Km [ ][ ][ ][ ]

Section	Pavement Type	Pavement Width (m)	Left Bound												Right Bound											
			Cracks (m²)					Patching (m²)	Listed Aggregate (m²)	Depression (m²)	Pumping/Water Bleeding (No.)	AC Overlay Removed (m²)	Pothole (m²)	Rutting (m²)	Cracks (m²)					Patching (m²)	Polished Aggregate (m²)	Depression (m²)	Pumping/Water Bleeding (No.)	AC Overlay Removed (m²)	Pothole (m²)	Rutting (m²)
			Transverse	Longitudinal	Block	Alligator	Total								Transverse	Longitudinal	Block	Alligator	Total							

Km [ ][ ][ ][ ]

A2-4

Pavement Type

1. AC
2. AC Overlay PCC
3. PCC
4. Gravel

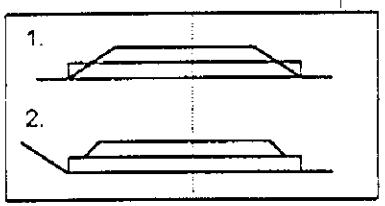
RCPC/RCBC Survey Sheet

Name Of District Office: _____

Sheet No: _____
Survey Date: _____

Road Link No. ☐☐ Road Link Name: From: _____ To: _____

Location (Km. +)	Type/Size of Culvert (P?C: No. + Diameter) (BC: No. of Barrel + Size)	Topography of Culvert Location	Condition									Causing Flood			Slope Condition of Outlet			Remarks
			Culvert			Inlet Facility			Outlet Facility									
			Capacity	Damaged?	Clogged/Silted	None	Existing (Damaged?)	Clogged/Silted	None	Existing (Damaged?)	Clogged/Silted	Yes	No	Unknown	Failed	May Fail	Unknown	



Capacity
1. Sufficient
2. Insufficient
3. Unknown

Damaged
1. Yes
2. No
3. Unknown

Capacity
0,1/4,1/3,1/2
2/3,3/4,1

Bridge Condition Survey (1)

Bridge No.: .....

Bridge Name: .....

Inventory Date .....

A GENERAL INFORMATION								
(1) Bridge No			(2) Bridge Name					
(3) Station			(4) River name					
(5) Bridge Type								
(6) Length (meter)								
(7) Width (meter)	Left Sidewalk =		Pavement =			Right Sidewalk =		
(8) Straight, Curved, Skew(deg.)			(9) Detour Distance (km)					
B SUPERSTRUCTURE								
Span No	1	2	3	4	5	6	7	
(10) Year Built								
(11) Design Load (ton)								
(12) Span Length (meter)								
(13) Type of Bridge								
RCS = Reinforced Concrete Slab, PCS = Pre-cast Slab, RCDG = Reinforced Concrete Deck Girder RCBG = Reinforced Concrete Box Girder, PCDG = Pre-stressed Concrete Deck Girder IB = Steel I Beam, Steel Plate Girder, PT = Steel Pony Truss, TT = Through Truss, LA = Steel Langer								
(14) No. of Main Girders								
(15) No. of Stringers								
(16) No. of Cross Beams								
(17) Girder Condition								
(Concrete) C = Cracking, R = Rebar Exposed, S = Spalling, X = Repaired (Steel) C = Cracking, R = Rusty, D = Deformation, X = Repaired								
Comment						Evaluation		
(18) Slab Type								
C = Cracking, R = Rebar Exposed, S = Spalling, P Potholes, X = Repaired, Y = Asphalt Patching								
(20) Slab Span (m)								
(21) Slab Condition Top								
C = Cracking, R = Rebar Exposed, S = Spalling, P Potholes, X = Repaired, Y = Asphalt Patching								
Comment						Evaluation		
Slab Condition Bottom								
C = Cracking, R = Rebar Exposed, S = Spalling, P = Pothole, X = Repaired, Y = Asphalt Patching								
Comment						Evaluation		
(22) Railing Type								
C = Concrete, S = Steel								
(23) Curb & Railing Condition								
C = Curb Damage, R = Railing Damage								
Comment						Evaluation		
(24) River Clearance - Below Superstructure to River Bed at Centerline Span								
Distance (meter)								

Bridge Condition Survey (2)

Bridge No: _____

Bridge Name: _____

Inventory Date: _____

C SUBSTRUCTURAL

Abutment / Pier No								
N = None, S = Study, D = Dummy								
(26) Expansion Joint Condition								
R = Rusty, L = Loose, U = Uneven, N = None, C = Concrete Spalled at End of Span, S = Proper Seal								
Comment							Evaluation	
(27) Bearing Type								
E = Elastomeric Pads, S = Steel Plate, B = Steel Mechanical Bearing, N = None, U = Unknown								
(28) Bearing Condition								
Comment							Evaluation	
C = Condition Below, R = Rebar Exposed, S = Spalling W = Insufficient Width for Support Existing Beam								
Comment							Evaluation	
M = Missing, N = Not Positioned properly, D = Defective, R = Rusty								
Comment							Evaluation	
(29) Bearing Support Condition								
C = Condition Below, R = Rebar Exposed, S = Spalling W = Insufficient Width for Support Existing Beam								
Comment							Evaluation	
(30) Abutment / Pier Type								
(Abutment) AC = Cantilever AP = Perched at Top of Slope, AB = Pile Bent Perched At Top of Slope (Pier) PW = Pier Wall, PT = Pier Tee Shaped, PC = Pier Column, PB = Pile Bent								
Comment							Evaluation	
(31) Abutment / Pier Condition								
C = Cracked, R = Rebar Exposed, T = Tilted, S = Spalled on Vertical Sides								
Comment							Evaluation	
(32) Foundation Type								
S = Spread, P = Piles, U = Unknown								
(33) Foundation Condition								
S = Settled, E = Pile Exposed - Height in Meters, F = Foundation Scoured								
Comment							Evaluation	
(34A) Wing Wall Type								
N = None, P = Parallel to Stream, S = Skewed Abutment								
(34B) Wing Wall Condition								
C = Cracked, S = Settled, E = Pile Exposed, W = Wing Wall Scoured								
Comment							Evaluation	
(35) River Clearance - Below Superstructure to River Bed at Pier								
Distance								

Bridge Condition Survey (3)

Bridge No: .....

Bridge Name: .....

Bridge date: .....

D RIVER CONDITION						
(36A) Water Width(m)			(36B) Velocity at Survey			
(37) Flood Level	m below slab		(38) River Bed Material			
(39) Flow Direction			(40) Degree of Flow to Bridge	Degree to Bridge		
(41) River Condition						
Comments				Evaluation		

E RIVER BANK AND APPROACH ROAD						
Side	Begin Left	Begin Center	Begin Right	End Left	End Center	End Right
(42) River Bank Protection						
N = None, R = Riprap (Length in meters), G = Gabion, C = Concrete (Length in meters)						
(43) River Bank Condition						
D = Damaged, S = Scoured/Eroded, E = Encroachment on Stream						
Comment				Evaluation		
(44) Appr. Road Condition	Begin		End			
S = Sinking (Height in cm), AS = Scour behind Abutment (length in meters)						
Comment				Evaluation		

F. SURFACE DRAINAGE			
(45) Surface Drainage			
(46) Surf. Drainage Cond			
Comment		Evaluation	

47. REMARKS

48. RECOMMENDATIONS

Bridge Evaluation

Note Evaluation A Replacement/Urgent repair needed
B Repair needed
C Repair not needed-maintenance only

Bridge Condition Survey

Bridge No: _____

Bridge Name: _____

Bridge date: _____

SITE PLAN

SIDE VIEW

CROSS SECTION

Slope Condition Survey (Cut Slope Failure)

Spot No.: .....

Station: .....

Failure Inventory Date : .....

Slope Inventory Sheet : Cut Slope Failure

1 Nature of Slope			(1) Nature Slope (2) Cut Slope
2 Occurrence/Potential of Disaster			(1) Occurred (2) Potential of Occurrence
Failure Condition	(3) Type of Failure		(1) Surface Failure (2) Deep Failure (3)
	(4) Failure Width (m)		
	(5) Failure Height (m)		
	(6) Failure Thickness (m)		
	(7) Date Occurred		Day Month Year
	(8) Extent of Affection On traffic		(1) Shoulder (2) One Lane (3) Two Lanes
	(9) Traffic Interruption Period (day)		
	(10) Counter measure Taken		(1) None (2) Removal of Materials (3)
	(11) Rainfall Intensity (mm/day)		(1) Below 100 (2) 100-200 (3) 200-300 (4) Above 300
Original Slop Condition	(12 Slope Height (m)		
	(13) Slope Gradient (deg)		
	(14) Horizontal Shape		(1) Protrude (2) Hollow (3) Straight
	(15) Vertical Shape		(1) Protrude (2) Hollow (3) Straight (4) Overhung (5) Complex
	(16) No of Beams		
	(17) Degree of Erosion		(1) None (2) Low (3) Medium (4) High
	(18) Slope Protection		(1) None (2) Vegetation (3)
	(19) Vegetation		(1) None (2) Grass (3) Bush
Geological Condition	(20) Material		(1) Hard Rock (2) Soft Rock (3) Gravelly Soil (4) Sandy Soil (5) Cohesive Soil
	Rock	(21) Kind	(1) Granite (2) Diorite (3) Diabase (4) Andesite (5) Schist (6) Dacite (7) Slate (8) Limestone (9) Schalstein (10) (11) Tuffbrecta (12) Sandstone (13) Shale (14) Mudstone (15) Conglomerate (16) Masa (17) Pyroclastics (18)
		(22) Weathering	(1) Fresh (2) Slightly Weathered (3) Highly Weathered
		(23) Crack	(1) Sparse (2) Regular (3) Irregular (4) Highly Developed
		(24) Direction of	(1) Inclined to Mountain (2) Inclined to Slope (3) Irregular
	Gravelly Soil	(25) Compactness	(1) Tight (2) Slightly Loose (3) Loose
		(26) Gravel Size	(1) Below 10 cm (2) Above 10 cm
		(27) Gravel Shape	(1) Angular (2) Round
	Soil	(28) Compactness	(1) Tight (2) Slightly Lose (3) Loose
		(29) Thickness	(1) Below 1 m (2) 1-5 m (3) 5-10 m (4) Above 10 m
Water Condition	(30) Surface Water		(1) None (2) Not Concentrated (3) Concentrated
	(31) Ground Water		(1) None (2) Seepage (3) Spring
	(32) Drainage Facilities		(1) None (2)
Engineering Judgement	(33) Disaster Potential		(1) Already Occurred (2) Low Potential (3) SPRING
	(34) Cause of Disaster		
	(35) Counter measures		

Slope Condition Survey (Cut Slope Failure)

Spot No: _____

Station: _____

Inventory date: _____

SITE PLAN

SIDE VIEW

CROSS SECTION

Slope Condition Survey Embankment

Spot No : .....

Station : .....

Failure Inventory Date : .....

(1) Nature of Slope		(1) Nature Slope (2) Embankment
(2) Occurrence/Potential of Disaster		(1) Occurred (2) Potential of Occurrence
(3) Location		(1) Inside of Curve (2) Mountainside (3) Valley Crossing (4) Bridge Approach (5) Adjacent to River (6)
Failure Condition	(4) Type of Failure	(1) Surface Failure (2) Deep Failure (3)
	(5) Failure Width (m)	
	(6) Failure Height (m)	
	(7) Failure Thickness on Top (m)	
	(8) Date Occurred	Day Month Year
	(9) Extent of Affection on Traffic	(1) Shoulder (2) One Lane (3) Two Lanes
	(10) Traffic Interruption Period (day)	
	(11) Countermeasure Taken	(1) None (2) Only Fill (3) Riprap (4)
	(12) Rainfall Intensity (mm/day)	(1) Below 100 (2) 100-200(3) 200-300 (4) Above 300
Original Slope Condition	(13) Slope Height (m)	
	(14) Slope Gradient (deg)	
	(15) Slope Condition	(1) Cracked (2) Scoured (3) Surface Soil Unstable (4) Nothing Special
	(16) Foundation Layer	(1) Soil (2) Soft Rock (3) Hard Rock (4) Unknown
	(17) Surface Water	(1) None (2) Not Concentrate (3) Concentrated
	(18) Slope Protection	(1) None (2) Vegetation (3) Riprap (4)
	(19) Drainage Facilities	(1) None (2) RCPC (3) RCBC (4) Slope Ditch (5)
Engineering Judgement	(20) Disaster Poteatial	(1) Already Occurred (2) Low Potential (3) High Potential
	(21) Cause of Disaster	(1) Surface Water due to Absence of Culvert (2) Surface Water due to Insufficient/Sikod Culvert (3) Improper Treatment of Culvert Outlet (4) Ground Water (5) Scour by River Stream (6)
	(22) Countermeasures	

Sketch

APPENDIX 3

ROADS SURVEY RESULTS

3.1 SUMMRY OF SURVEY RESULTS

Appendix 3.1 Road Survey Results - Grand Etang Road(1)

ITEMS			STA 0+000 STA1+300	STA 1+300 STA 2+800	STA 2+800 STA 5+000	STA 5+000 STA 6+500	STA 6+500 STA 6+560	STA6+560 STA 7+000
Road Section Length(km)			1.300	1.500	2.200	1.500	0.060	0.440
Bridge Number, Length(m)			1, (11.50m)	1, (22.00m)	None	None	None	None
RCBC Number, Length (m)			6, (42m)	4, (26m)	5, (33m)	2, (11m)	0, (0)	1, (6m)
RCPC Number, Length(m)			4, (24m)	4, (26m)	5, (33m)	4, (22m)	0, (0)	0, (0)
Topography(F / R / M)			Flat	Rolling	Rolling	Mountainous	Mountainous	Mountainous
Roadside Land Use			Commercial, Resident	Resident, River	Resident, Plant	Resident, Plant	Resident, Plant	Resident, Plant
Pavement Type			AC	AC	AC	AC	PCCP	AC
Road Section (Type/Width)	Left - Side Ditch		None	E-U, 200m	C-U,V,E-U, 2,200m	C-L, 200m	C-L, 60m	C-L,U,E-U, 300m
	Shoulder		E,C, 0 ~ 3.0m	C,E 0 ~ 1.0m	E, 0 ~ 1.0m	E, 0 ~ 1.0m	C, 0.5m	E,C, 0.5m ~ 1.0m
	Pavement		6.0m ~ 7.0m	5.5m ~ 6.0m	5.5m ~ 6.0m	4.0m ~ 6.0m	5.0m	4.0m ~ 5.0m
	Right - Shoulder		E, 0 ~ 2.0m	E, 0 ~ 1.0m	E, 0 ~ 1.0m	E, 0 ~ 1.0m	0	E, 0 ~ 0.5m
	Side Ditch		C-L,V,E-V, 1,300m	C-L,V, 1,200m	C-L,U,E-U,V, 1,200m	C-L,E-U,V, 1,400m	C-U, 60m	C-L,U,E-U, 440m
Right of Way			5m	5m	8m	8m	8m	10m
Pavement Condition	Serviceability / Rating		2.0 ~ 3.0	1.5 ~ 2.5	2.0 ~ 3.0	2.0 ~ 2.5	2.0	2.0
	Roughness / Rating		4 ~ 6	8 ~ 16	8 ~14	8 ~ 18	14	4 ~ 8
	Distress	Type	Raveling	Raveling, Pothole	Raveling	Raveling, Pothole	Difference of PCC Slab	Crack, Pothole
		Rating	Fair	Bad	Fair	Bad	Bad	Bad
Slope Condition			4-Em.,1-Cut Section	2- Em. Section	2-Em.,1-Cut Section	2-Cut Section	None	1-Cut Section
Bridge Condition			Good	Scoring of A2	None	None	None	None
Geometric Condition	Sharp Curve		1	None	None	4	None	None
	Steep Gradient		None	None	None	6% ~ 12%, 600m	6% ~ 12%, 60m	None
Proposed Rehabilitation / Improvement	Pavement		Overlay	Base Course, AC Pave	Overlay	Base Course, AC Pave	Overlay	Base Course, AC Pave
	Side Ditch		Reconstruction	Reconstruction	Reconstruction	Reconstruction	Reconstruction	Reconstruction
	Widening		2.0m	2.5m	2.5m	4.0m	3.5m	3.0m
	Bridge		None	Foot Protection	None	None	None	None
	RCBD							
	RCPC							
	Slope		RP, WCS	RP	ESP, WCS	WCS	None	WCS

Note; RCBC :Reinforced Concrete Box Culvert
RCPC :Reinforced Concrete Pipe Culvert
E-U type : Earth Side Ditch (including concrete wall)
C-V type : Precast Concrete V type Side Ditch
RP : River Protection
ESP : Embankment Slope Protection

C : Concrete
E : Earth
AC : Asphalt Concrete
PCCP : Portland Cement Concrete Pavement
C-U type : Reinforced Concrete U type Side Ditch
C-L type : Reinforced Concrete Curve and Gutter
WCS : Widening of Cut Section

Appendix 3.1 Road Survey Results - Grand Etang Road(2)

ITEMS			STA 7+000 STA 9+000	STA 9+000 STA11+500	STA11+500 STA12+300	STA12+300 STA15+000	STA 15+000 STA 18+500	STA 18+500 STA 20+500
Road Section Length(km)			2.000	2.500	0.800	2.700	3.500	2.000
Bridge Number, Length(m)			1, (6.70m)	1, (4.80m)	None	1, (16.50m)	2, (71.60m)	None
RCBC Number, Length (m)			1, (6m)	5, (35m)	5, (30m)	10, (65m)	5, (35m)	1, (8m)
RCPC Number, Length(m)			6, (36m)	16, (112m)	2, (12m)	15 (98m)	18, (26m)	0. (0)
Topography(F / R / M)			Mountainous	Mountainous	Mountainous	Rolling / Flat	Flat	Flat
Roadside Land Use			Forest	Forest	Forest / Plant	Resident, Plant	Resident, Plant	Commercial, Resident
Pavement Type			AC	AC	AC	AC	AC	AC
Road Section (Type/Width)	Left - Side Ditch		C-U,E-U, 1,200m	E-L,V, 2,500m	E-L,U, 600m	C-V,E-U, 1,400m	C-L,E-U, 2,900m	C-L,U,V,E-U, 1,500m
	Shoulder		E, 0 ~ 1.0m	E, 0.5 ~ 1.5m	E, 0 ~ 1.0m	E, 0 ~ 2.0m	E,C, 0.5 ~ 1.5m	E,C, 0 ~ 1.50m
	Pavement		4.50m ~6.0m	5.0m ~ 6.0m	4.0m ~ 5.0m	4.5m ~ 7.0m	5.60m	5.50m ~ 6.00m
	Right - Shoulder		E, 0 ~ 2.5m	E, 0.5 ~ 2.0m	C,E, 0.50m ~ 1.0m	E, 0 ~ 2.0m	E, 0.5m ~ 1.5m	E, 0 ~ 1.5m
	Side Ditch		E-L,U, 1,700m	E-L,U, 2,100m	C-L,E-U, 800m	C-L,U,E-U, 2,100m	C-L,V,E-U, 2,400m	C-L,U,V,E-U, 1,600m
Right of Way			10m	10m	10m	6m	8m	5m
Pavement Condition	Serviceability / Rating		2.0 ~ 3.5	2.0 ~ 3.0	2.0 ~ 3.0	1.5 ~ 2.0	2.0 ~ 3.0	2.5 ~ 3.5
	Roughness / Rating		5 ~10	4 ~11	8 ~ 10	6 ~ 16	6 ~ 10	6 ~ 9
	Distress	Type	Raveling	Raveling, Pothole	Raveling	Raveling, Pothole	Raveling	Raveling, Pothole
		Rating	Fair	Fair	Fair	Bad	Fair	fair
Slope Condition			1-Em., 5-Cut Section	3-Em.,1-Cut Section	1-Em., 4-Cut Section	2-Em., 3-Cut Section	1- Em, 3-Cut Section	None
Bridge Condition			Good	Narrow(w=4.5m)	None	Old Bridge (100years)	Old & Overflow Br.	None
Geometric Condition	Sharp Curve		7	8	8	7	1	1
	Steep Gradient		6% ~ 12%, 300m	6% ~ 12%, 500m	6% ~ 12%, 400m	6% ~ 12%, 200m	None	6% ~ 12%, 400m
Proposed Rehabilitation / Improvement	Pavement		Overlay	Overlay	Overlay	Base Course, AC Pave	Overlay	Overlay
	Side Ditch		Reconstruction	Reconstruction	Reconstruction	Reconstruction	Reconstruction	Reconstruction
	Widening		3.0m	2.0m	3.0m	2.5m	2.0m	1.5m
	Bridge		None	Widening	None	Reconstruction	Reconstruction	None
	RCBD							
	RCPC							
	Slope		ESP, WCS	ESP, WCS	ESP, WCS	RP, WCS	RP, WCS	None

Note; RCBC :Reinforced Concrete Box Culvert
RCPC :Reinforced Concrete Pipe Culvert
E-U type : Earth Side Ditch (including concrete wall)
C-V type : Precast Concrete V type Side Ditch
RP : River Protection
ESP : Embankment Slope Protection

C : Concrete
E : Earth
C-U type : Reinforced Concrete U type Side Ditch
C-L type : Reinforced Concrete Curve and Gutter
WCS : Widening of Cut Section

AC : Asphalt Concrete
PCCP : Portland Cement Concrete Pavement

Appendix 3.2 Road Survey Results - Morne Jaloux Road

ITEMS			STA 0+000 STA 0+800	STA 0+800 STA 2+650	STA 2+650 STA 3+000	STA 3+000 STA 3+060	STA 3+060 STA 4+000	REMARKS
Road Section Length(km)			0.800	1.850	0.350	0.060	0.940	
Bridge Number, Length(m)			0, (0)	0, (0)	0, (0)	0, (0)	0, (0)	
RCBC Number, Length (m)			0, (0)	0, (0)	0, (0)	0, (0)	0, (0)	
RCPC Number, Length(m)			3, (15)	0, (0)	0, (0)	0, (0)	0, (0)	
Topography(F / R / M)			Rolling	Rolling	Rolling	Rolling	Rolling	
Roadside Land Use			Residence, Plantation	Residence, Plantation	Residence, Plantation	Residence, Plantation	Residence, Plantation	
Pavement Type			AC	AC	AC	PCCP	AC	
Road Section (Type/Width)	Left - Side Ditch		C,E- U,L, 800m	C-L ,E, 200m	C-V, 350m	C-U, 60m	E-U, 300m	
	Shoulder		E, 1.5m ~ 0.5m	E, 1.0m ~ 0.5m	E, 1.0m ~ 0.5m	0	E, 1.0m ~ 0.5m	
	Pavement		3.50m ~ 5.0m	4.0m ~ 5.0m	3.50m	4.27m	3.00m ~ 4.00m	
	Right - Shoulder		E, 1.0m ~ 0.5m	E, 1.0m ~ 0.5m	E, 0.5m	0	E, 1.0m ~ 0.5m	
	Side Ditch		C-V , 200m	C-V,U,400m	C-L,V, 350m	C-U, 60m	E-U, 600m	
Right of Way			10m	4m	8m	8m	8m	
Pavement Condition	Serviceability / Rating		3.5	2.5 ~ 3.0	2.0	1.0	1.5	
	Roughness / Rating		5 ~ 6	4 ~ 20	18 ~ 22	(22)	14 ~ 22	
	Distress	Type	None	Patching	Pothole	Longitudinal Crack	Pothole	
		Rating	Good	Fair	Bad	Fair	Bad	
Slope Condition			Good	Good	None	Good	Good	
Bridge Condition			None	None	None	None	None	
Geometric Condition	Sharp Curve		3	1	1	0	3	
	Steep Gradient		6% ~ 12%, 400m	6% ~ 12%, 100m	None	6% ~ 12%, 60m	6% ~ 12%, 600m	
Proposed Rehabilitation / Improvement	Pavement		None	Overlay	Base Course, AC Pave	None	Base Course, AC Pave	
	Side Ditch		None	Reconstruction	Reconstruction	Reconstruction	Reconstruction	
	Widening		None	1.60m	2.30m	2.20m	3.30m	
	Bridge		None	None	None	None	None	
	RCBD		None					
	RCPC		None					
	Slope		None	None	None	None	None	

Note; RCBC :Reinforced Concrete Box Culvert
RCPC :Reinforced Concrete Pipe Culvert
E-U type : Earth Side Ditch(including concrete wall)
C-V type : Pre-cast Concrete Vtype Side Ditch
C : Concrete
E : Earth
AC : Asphalt Concrete
PCCP : Portland Cement Concrete Pavement
C-U type : Reinforced Concrete U type Side Ditch
C-L type : Reinforced Concrete Curve and Gutter

Appendix 3.3 Road Survey Results - St. David's to Perdmontemps Road

ITEMS			STA 0+000 STA 1+600	STA 1+600 STA 3+400	STA 3+400 STA 6+100	STA 6+100 STA7+200	REMARKS
Road Section Length(km)			1.600	1.800	2.700	1.100	
Bridge Number, Length(m)			0, (0)	1, (11.30m)	2, (24.80m)	0, (0)	
RCBC Number, Length (m)			7, (32m)	5, (25m)	11, (55m)	1, (5m)	
RCPC Number, Length(m)			2, (9m)	3, (15m)	6, (30m)	7, (35m)	
Topography(F / R / M)			Mountainous	Mountainous	Mountainous	Mountainous	
Roadside Land Use			Residence, Plantation	Residence, Plantation	Residence, Plantation	Residence, Plantation	
Pavement Type			AC	AC	AC	AC	
Road Section (Type/Width)	Left - Side Ditch		E- L, 200m	C-L ,E, 200m	E-V, 300m	None	
	Shoulder		E, 1.5m ~ 0.5m	E, 1.0m ~ 0.5m	E, 1.0m ~ 0.5m	E, 0 ~ 1.0m	
	Pavement		3.00m	3.00m ~ 3.50m	3.00m ~ 3.50m	4.00m ~ 5.00m	
	Right - Shoulder		E, 1.0m ~ 0.5m	E, 1.0m ~ 0.5m	E, 0.5m	E, 0 ~ 1.0m	
	Side Ditch		C-V, E-V, 900m	E-V,U, 1,500m	C-L,V,E-U, 2,700m	C-L,U, E-U, 1,000m	
Right of Way			5m	5m	5m	5m	
Pavement Condition	Serviceability / Rating		1.5 ~ 2.5	1.5 ~ 2.0	2.0 ~ 2.5	2.0 ~ 2.5	
	Roughness / Rating		16 ~ 22	21 ~ 25	15 ~ 22	12 ~ 18	
	Distress	Type	Crack, Raveling	Crack, Pothole	Crack, Raveling	Crack, Pothole	
		Rating	Fair	Bad	Bad	Fair	
Slope Condition			Good	Good	Em-2, Cut-1,	Good	
Bridge Condition			None	Scoring of Abutment, Narrow	Rebar Expose-1,Valley, Narrow	None	
Geometric Condition	Sharp Curve		3	6	6	1	
	Steep Gradient		6% ~ 12%, 300m	6% ~ 12%, 700m	6% ~ 12%, 900m	6% ~ 12%, 200m	
Proposed Rehabilitation / Improvement	Pavement		Base, Surface Course	Base, Surface Course	Base, Surface Course	Base, Surface Course	
	Side Ditch		Reconstruction	Reconstruction	Reconstruction	Reconstruction	
	Widening		2.60m	2.10m	2.10m	1.10m	
	Bridge		None	Protection of Abutment	Bailey Br. Reconst.	None	Including widening
	RCBD						
	RCPC						
	Slope		None	None	Slope,Em.-50m,Cut-50m	None	

Note; RCBC :Reinforced Concrete Box Culvert
RCPC :Reinforced Concrete Pipe Culvert
E-U type : Earth Side Ditch(including concrete wall)
C-V type : Pre-cast Concrete Vtype Side Ditch
C : Concrete
E : Earth
AC : Asphalt Concrete
PCCP : Portland Cement Concrete Pavement
C-U type : Reinforced Concrete U type Side Ditch
C-L type : Reinforced Concrete Curve and Gutter

Appendix 3.4 Road Survey Results - Mt. Gay to Springs Road

ITEMS			STA 0+000 STA 0+500	STA 0+500 STA 3+050	STA 3+050 STA 4+800	STA 4+800 STA 5+800	REMARKS
Road Section Length(km)			0.500	2.550	1.750	1.000	
Bridge Number, Length(m)			1, (6.10m)	0, (0)	0, (0)	0, (0)	
RCBC Number,Length (m)			4, (30m)	3, (21m)	6, (37m)	0, (0)	
RCPC Number, Length(m)			1, (8m)	9, (63m)	5, (45m)	3, (21m)	
Topography(F / R / M)			Rolling (Urban)	Rolling (Urban)	Rolling (Rural)	Rolling (Rural)	
Roadside Land Use			Resident,Commercial	Resident	Resident	Plantation, Resident	
Pavement Type			AC	AC	AC	AC	
Road Section (Type/Width)	Left - Side Ditch		C-L,U,V, 500m	C-L,U,V,E-V, 2,400m	C-L,U,V, 1,750m	E-U, 1,000m	
	Shoulder		0 ~ 0.50m	0 ~ 1.00m	1.00m	1.00m	
	Pavement		6.00m	5.50m ~ 7.00m	6.00m ~ 7.00m	5.00m	
	Right - Shoulder		1.00m	0 ~ 1.00m	0 ~ 1.00m	1.00m	
	Side Ditch		C-U, 100m	C-L,V, 600m	C-L,V, 400m	None	
Right of Way			5m	5m	7m	10m	
Pavement Condition	Servicebility / Rating		2.0	2.0 ~ 3.0	2.5 ~ 3.0	1.0 ~ 2.0	
	Roughness / Rating		7 ~ 9	3 ~ 7 (11)	5 ~ 9	11 ~ 22	
	Distress	Type	Raveling, Crack	Crack	Crack	Raveling, Pothole	
		Rating	Bad	Fair	Fair	Very Bad	
Slope Condition			Stable	Stable	Stable	Stable	
Bridge Condition			Narrow, Flooded	None	None	None	
Geometric Condition	Sharp Curve		None	6	2	None	
	Steepe Gradient		None	6% ~ 12%, 1,500m	6% ~ 12%, 200m	None	
Proposed Rehabilitation / Improvement	Pavement		Base Course, AC Pave	Overlay	Overlay	Base Course, AC Pave	
	Side Ditch		Reconstruction	Reconstruction	Reconstruction	Reconstruction	
	Widening		2.00m	2.00m	1.50m	2.00m	
	Bridge		Widening	None	None	None	
	RCBD		1				
	RCPC						
	Slope		None	Widening, 2sections	None	None	

Note; RCBC :Reinforced Concrete Box Culvert
RCPC :Reinforced Concrete Pipe Culvert
E-U type : Earth Side Ditch(including concrete wall)
C-V type : Pre-cast Concrete Vtype Side Ditch
C : Concrete
E : Earth
C-U type : Reinforced Concrete U type Side Ditch
AC : Asphalt Concrete
PCCP : Portland Cement Concrete Pavement

Appendix 3.5 Road Survey Results - Eastern Main Road (Grenville ~ Sauteurs Section)

ITEMS			STA 0+000 STA 1+700	STA 1+700 STA 3+000	STA 3+000 STA 5+000	STA 5+000 STA 6+500	STA 6+500 STA 9+200	STA 9+200 STA 10+200	STA 10+200 STA 16+000
Road Section Length(km)			1.700	1.300	2.000	1.500	2.700	1.000	5.800
Bridge Number, Length(m)			1, (54.00m)	1, (10.70m)	0	1, (9.00m)	1, (18.70m)	1, (11.00m)	3, (39m)
RCBC Number, Length (m)			4, (32m)	5, (35m)	8, (56m)	2, (15m)	3, (23m)	0, (0)	9, (68m)
RCPC Number, Length(m)			3, (24m)	1, (7m)	2, (14m)	5, (38m)	14, (105m)	7, (53m)	22, (165m)
Topography(F / R / M)			Flat	Flat	Flat / Rolling	Rolling	Rolling	Rolling / Flat	Flat / Rolling / Flat
Roadside Land Use			Resident, Plantation	Resident, Plantation	Resident, Plantation	Resident, Plantation	Plantation, Resident	Plantation, Resident	Plantation, Resident
Pavement Type			AC	AC	AC	AC	AC	AC	AC
Road Section (Type/Width)	Left - Side Ditch		C-L,U,V,E-V, 1,500m	C-U,V,E-V, 1,300m	C-L,U,V,E-U, 1,700m	C-L,U, 1,500m	C-L,U,E-U, 2,500m	C-L,U,E-U,V, 1,000m	C-L,U,V,E-v, 5,700m
	Shoulder		E, 0 ~ 1.0m	E, 0 ~ 1.5m	E,C, 0 ~ 1.0m	E, 0 ~ 1.0m	E,C, 0 ~ 1.0m	E, 0 ~ 1.0m	E,AC,C, 0 ~ 2.0m
	Pavement		5.0m ~ 6.0m	5.0m	4.5m ~ 6.0m	5.0m ~ 6.0m	5.5m ~ 7.0m	5.5m ~ 6.0m	5.0m ~ 6.5m
	Right - Shoulder		E, 0 ~ 1.0m	E, 0 ~ 1.0m	E, 1.0m	E, 0.5m ~ 1.0m	E, 0 ~ 1.0m	E, 1.0m	E,AC, 0 ~ 2.0m
	Side Ditch		C-L,U,V,E-U, 800m	C-L,U, 500m	C-V,E-V, 350m	E-U,V, 600m	E-U,V, 300m	E-U, 100m	C-L,U,V,E-V, 2,200m
Right of Way			5m	8m	8m	6m	6m	8m	6m
Pavement Condition	Serviceability / Rating		3.0 ~ 4.0	3.0 ~ 3.5	2.0 ~ 2.5	2.0 ~ 2.5	2.5 ~ 3.0	1.5 ~ 2.0	2.0 ~ 3.0
	Roughness / Rating		3 ~ 6	3 ~ 8	5 ~ 9	6 ~11	4 ~ 12	6 ~ 9	5 ~ 11
	Distress	Type	Pothole	Pothole	Raveling, Patching	Crack, Pothole	Crack, Patching	Crack, Raveling	Crack, Raveling
		Rating	Good	Fair	Bad	Bad	Fair	Bad	Fair
Slope Condition			None	None	None	None	None	None	None
Bridge Condition			Narrow, Mutual Traffic	Narrow, A2 Scoring	None	Narrow (W=4.3m)	Lack of Clearance	None	2-Narrow, 1- Bailey
Geometric Condition	Sharp Curve		None	None	None	None	None	None	None
	Steep Gradient		None	None	None	None	None	None	None
Proposed Rehabilitation / Improvement	Pavement		Overlay	Overlay	Base Course, AC Pave	Base Course, AC Pave	Overlay	Base Course, AC Pave	Overlay
	Side Ditch		Reconstruction	Reconstruction	Reconstruction	Reconstruction	Reconstruction	Reconstruction	Reconstruction
	Widening		2.0m	3.0m	2.5m	2.5m	2.0m	2.0m	1.5m
	Bridge		1-Lane Br. Const.	Widening, Protection	None	Widening	Reconst. or Widening	None	Widening, Reconst.
	RCBO								
	RCPC								
	Slope		None	None	None	None	None	None	None

Note; RCBC :Reinforced Concrete Box Culvert
RCPC :Reinforced Concrete Pipe Culvert
E-U type : Earth Side Ditch (including concrete wall)
C-V type : Precast Concrete V type Side Ditch
C : Concrete
E : Earth
AC : Asphalt Concrete
PCCP : Portland Cement Concrete Pavement
C-U type : Reinforced Concrete U type Side Ditch
C-L type : Reinforced Concrete Curve and Gutter

Appendix 3.6 Road Survey Results - Paraclete to Mt. Horne Road

ITEMS			STA 0+000 STA 1+500	STA 1+500 STA 2+000	STA 2+000 STA 3+000	STA 3+000 STA 3+200	REMARKS
Road Section Length(km)			1.500	0.500	1.000	0.200	
Bridge Number, Length(m)			1, (10.70m)	0, (0)	1, (10.50m)	0, (0)	
RCBC Number,Length (m)			4, (22m)	1, (5m)	1, (5m)	0, (0)	
RCPC Number, Length(m)			8, (44m)	2, (10m)	3, (15m)	0, (0)	
Topography(F / R / M)			Rolling	Rolling	Rolling	Rolling	
Roadside Land Use			Residence, Plantation	Residence, Plantation	Residence, Plantation	Residence, Plantation	
Pavement Type			AC	AC	AC	AC	
Road Section (Type/Width)	Left - Side Ditch		C-L,V, E-U , 600m	E-U, 500m	E-U, 800m	E-U, 200m	
	Shoulder		E, 0.50m ~ 1.00m	E, 1.00m	E, 0.50m ~ 1.00m	E, 0.50m	
	Pavement		3.50m ~ 4.50m	2.50m ~ 3.00m	3.00m ~ 4.00m	3.00m	
	Right - Shoulder		E, 0.50m ~ 1.00m	E, 0.50m ~ 1.00m	E, 0.50m ~ 1.00m	E, 0.50m	
	Side Ditch		C-L,V, E-L,1500m	E-U, 500m	E-U, 800m	E-U, 200m	
Right of Way			5m	7m	10m	7m	
Pavement Condition	Servicebility / Rating		2.3 ~ 3.0	1.5 ~ 3.0	2.5 ~ 3.0	1.0	
	Roughness / Rating		11 ~ 18	8 ~ 18	9 ~ 13	17	
	Distress	Type	Pothole	Pothole, Raveling	Raveling	Pothole, Raveling	
		Rating	Fair	Very Bad	Fair	Very Bad	
Slope Condition			Erosion, L= 40m	None	None	None	
Bridge Condition			Widening, A-1Erosion	None	Narrow,Crack at slab	None	
Geometric Condition	Sharp Curve		3	0	8	0	
	Steepe Gradient		6% ~ 12%, 200m	None	6% ~ 12%, 700m	None	
Proposed Rehabilitation Improvement	Pavement		Overlay	Base Course, AC Pave	Overlay	Base Course, AC Pave	
	Side Ditch		Reconstruction	Reconstruction	Reconstruction	Reconstruction	
	Widening		1.60m	2.10m	2.10m	2.10m	
	Bridge		Widening, Protection	None	Widening, Crack Seal	None	
	RCBD						
	RCPC						
	Slope		H= 1.0m, R.W	None	None	None	

Note; RCBC :Reinforced Concrete Box Culvert
RCPC :Reinforced Concrete Pipe Culvert
E-U type : Earth Side Ditch(including concrete wall)
C-V type : Pre-cast Concrete Vtype Side Ditch
Em. : Embankment

C : Concrete
E : Earth
AC : Asphalt Concrete
PCCP : Portland Cement Concrete Pavement
C-U type : Reinforced Concrete U type Side Ditch
C-L type : Reinforced Concrete Curve and Gutter

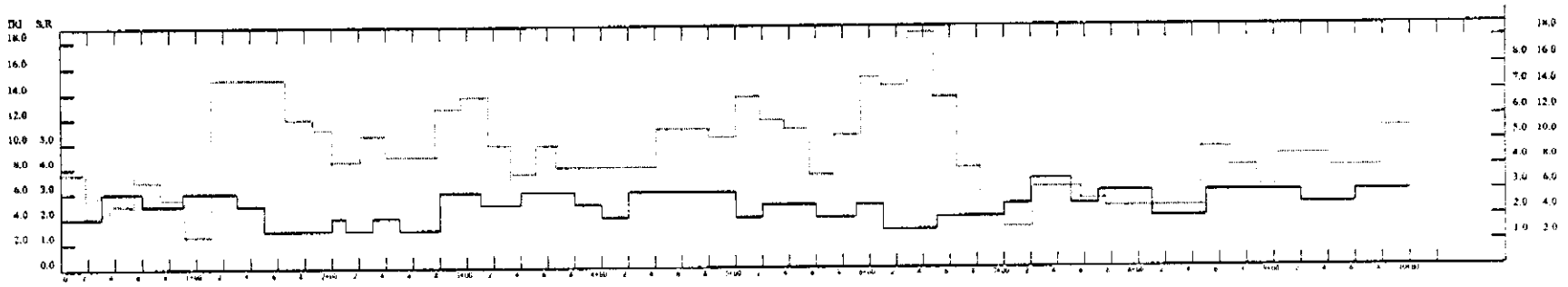
Appendix 3.7 Road Survey Results - Dover Road (Windward to Cherryhill Section)

ITEMS			STA 0+000 STA 0+400	STA 0+400 STA 0+900	STA 0+900 STA 2+000	STA 2+000 STA 3+100	REMARKS
Road Section Length(km)			0.400	0.500	1.100	1.100	
Bridge Number, Length(m)			0, (0)	0, (0)	0, (0)	0, (0)	
RCBC Number,Length (m)			0, (0)	0, (0)	0, (0)	1, (6m)	
RCPC Number, Length(m)			2, (12m)	6, (30m)	2, (12m)	2, (12m)	
Topography(F / R / M)			Rolling	Rolling	Rolling	Rolling	
Roadside Land Use			Resident	Resident, Farm	Farm	Resident, Farm	
Pavement Type			AC	AC	AC	AC	
Road Section (Type/Width)	Left - Side Ditch		E-L, 400m	None	None	E-L, 200m	
	Shoulder		E, 1.00m	E, 0.50 ~ 1.00m	E, 0.50 ~ 1.00m	E, 1.00m	
	Pavement		4.00m	3.00m ~ 4.00m	4.50m	4.00m	
	Right - Shoulder		E, 1.00m	E, 0.50m ~ 1.00m	E, 0.50 ~ 1.00m	E, 1.00m	
	Side Ditch		C-U,E-L, 400m	E-L, 200m	C-L,E-L, 300m	E-L, 400m	
Right of Way			8m	8m	10m	8m	
Pavement Condition	Serviceability / Rating		1.0	1.0 ~ 2.0	1.0	0.5 ~ 1.0	
	Roughness / Rating		14 ~ 21	7 ~ 21	7	9 ~22	
	Distress	Type	Crack, Pothole	Crack, Raveling	Crack, Raveling	Raveling, Pothole	
		Rating	Very Bad	Fair	Bad	Very Bad	
Slope Condition			Good	Good	Good	Good	
Bridge Condition			None	None	None	None	
Geometric Condition	Sharp Curve		1	0	1	2	
	Steepe Gradient		6% ~ 12%, 200m	None	None	6% ~ 12%, 500m	
Proposed Rehabilitation / Improvement	Pavement		PCC Pave	Overlay	Base Course, AC Pave	Base Course, AC Pave	
	Side Ditch		Const. at Cut Section	Const. at Cut Section	Const. at Cut Section	Const. at Cut Section	
	Widening		0.60m	1.60m	2.10m	2.60m	
	Bridge		None	None	None	None	
	RCBD						
	RCPC						
	Slope		None	None	None	None	

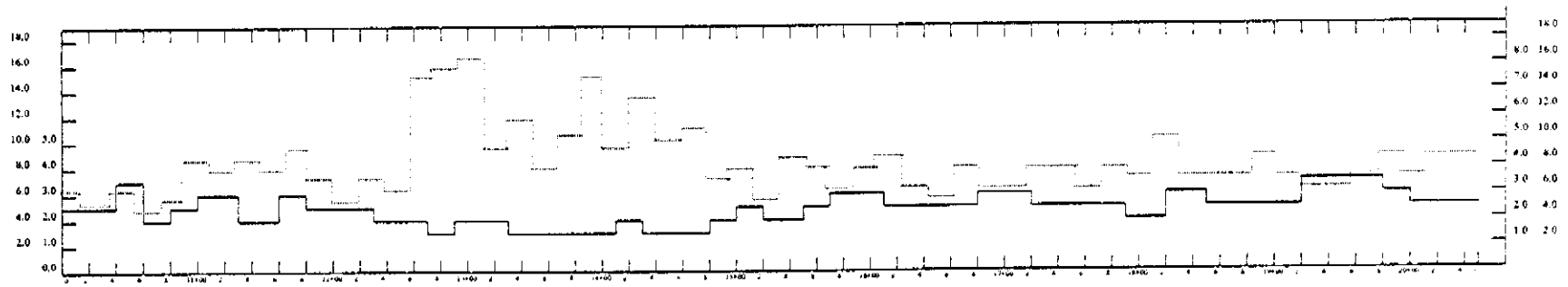
Note; RCBC :Reinforced Concrete Box Culvert
RCPC :Reinforced Concrete Pipe Culvert
E-U type : Earth Side Ditch(including concrete wall)
C-V type : Pre-cast Concrete Vtype Side Ditch
C : Concrete
E : Earth
AC : Asphalt Concrete
PCCP : Portland Cement Concrete Pavement
C-U type : Reinforced Concrete U type Side Ditch
C-L type : Reinforced Concrete Curve and Gutter

3.2 ROUGHNESS SURVEY AND SERVICEABILITY RATING RESULTS

APENDIX 3- 8(1) Serviceability Rating and Roughness Survey(IRI)
No.1 Road, Grand Etang Road (1)

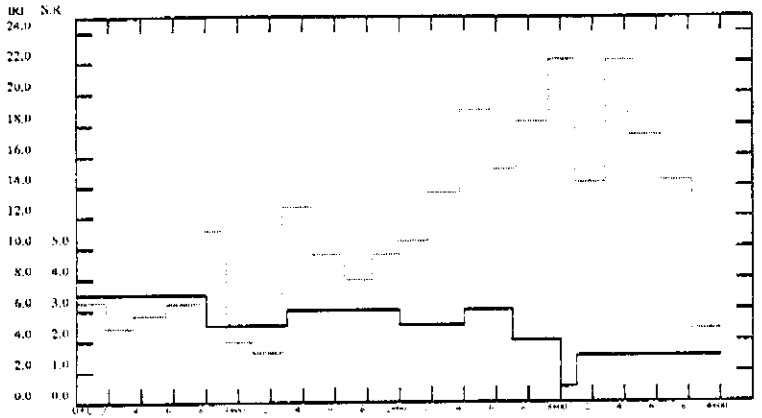


Note: Serviceability Rating (0 to 5.0)
Roughness (IRI)



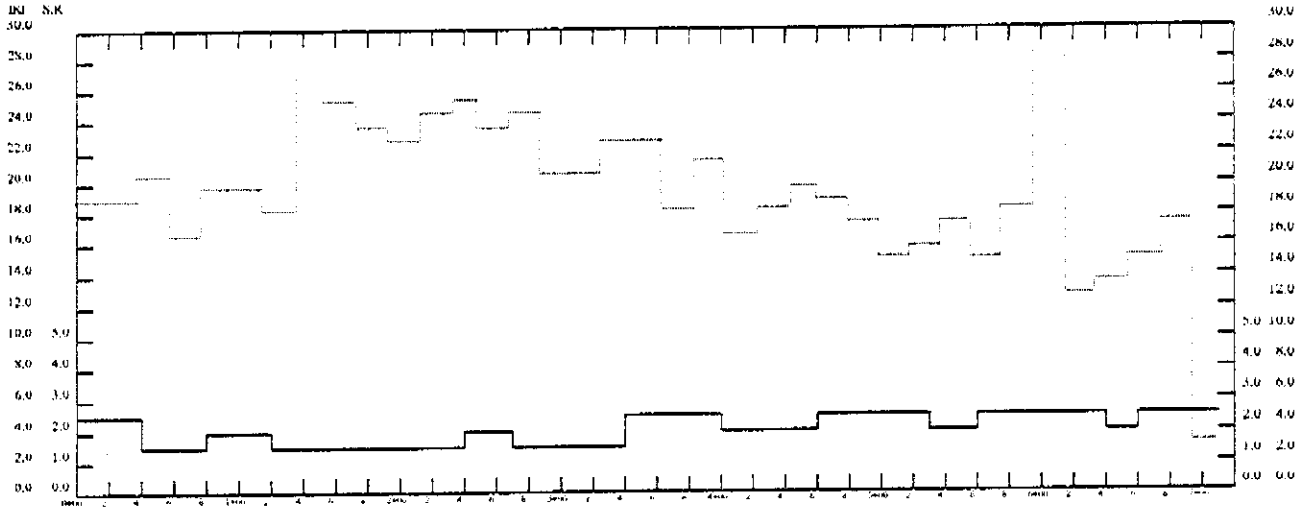
Note: Serviceability Rating (0 to 5.0)
Roughness (IRI)

APENDIX 3- 9 Serviceability Rating and Roughness Survey(IRI)
No.2 Road, Morne Jaloux Road



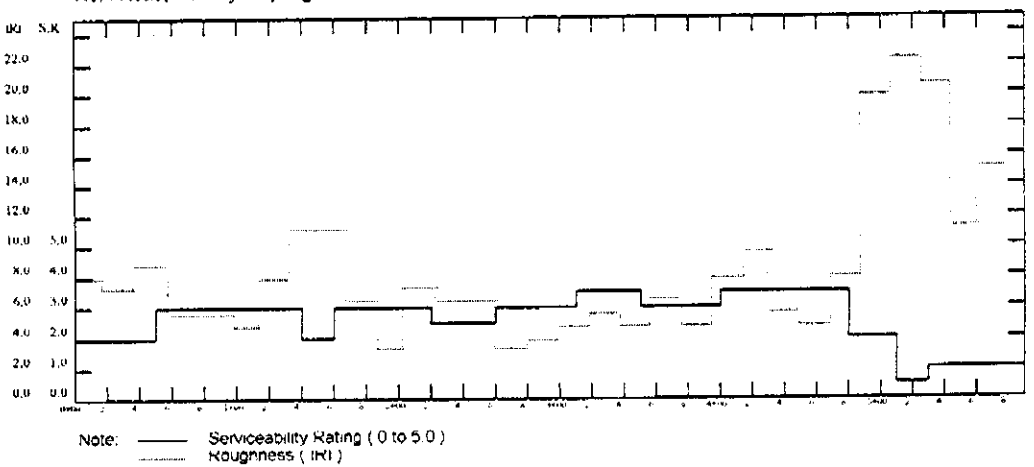
Note: Serviceability Rating (0 to 5.0)
Roughness (IRI)

APENDIX 3- 10 Serviceability Rating and Roughness Survey(IRI)
No.3 Road, St. David's Perdmontemps



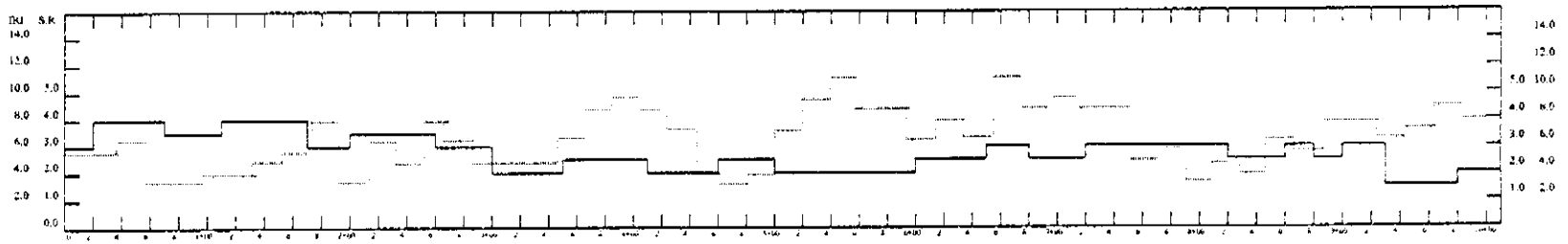
Note: Serviceability Rating (0 to 5.0)
Roughness (IRI)

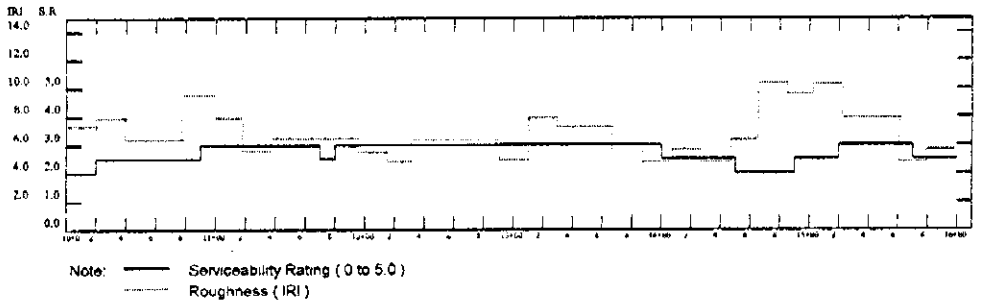
APENDIX 3- 11 Serviceability Rating and Roughness Survey(IRI)
No.4 Road, Mt. Gay Springs



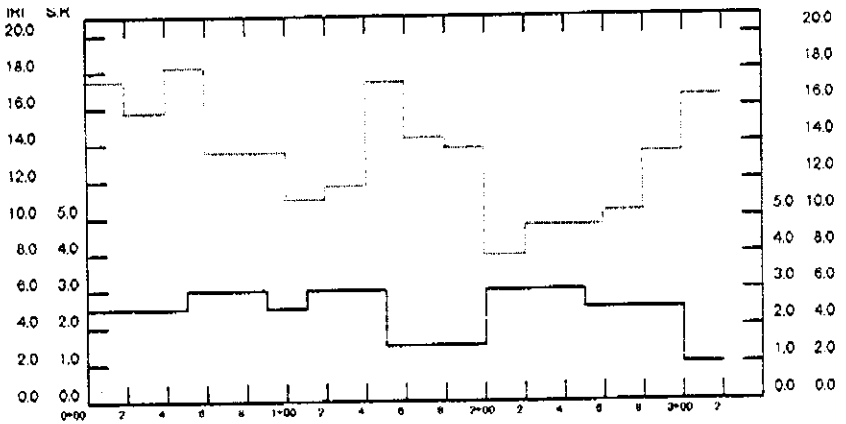
Note: ——— Serviceability Rating (0 to 5.0)
Roughness (IRI)

APENDIX 3- 12 Serviceability Rating and Roughness Survey(IRI)
No.5 Road, Eastern Main Road



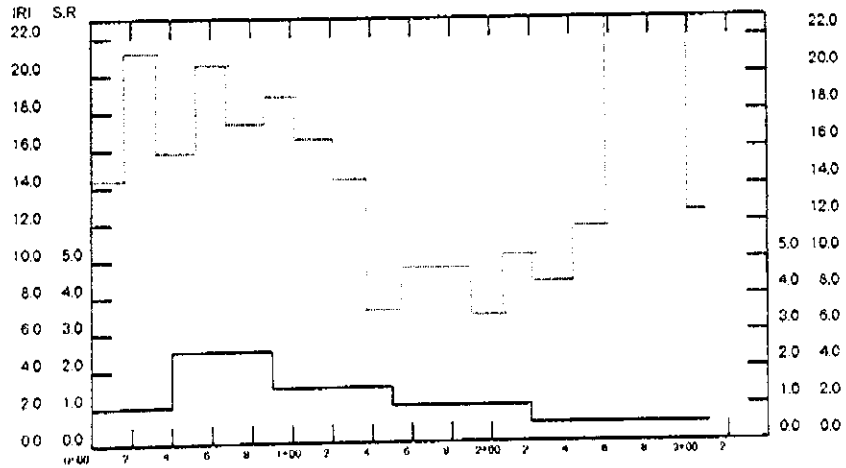


APENDIX 3 - 13 Serviceability Rating and Roughness Survey(IRI)
No.6 Road, Paraclete to Mt. Horne Road



Note: Serviceability Rating (0 to 5.0)
Roughness (IRI)

APENDIX 3 - 14 Serviceability Rating and Roughness Survey(IRI)
No.7 Road, Dover Road (Windward Cherryhill)



Note: Serviceability Rating (0 to 5.0)
Roughness (IRI)

APPENDIX 4

MAXIMUM ENTROPY TRIP MATRIX ESTIMATION

APPENDIX 4

MAXIMUM ENTROPY TRIP MATRIX ESTIMATION

1. INTRODUCTION

An OD Matrix (matrix table of traffic from origin zones to destination zones) is a basic information in order to analyze traffic. Basically an OD Table is tabulated from a Person Trip Interview Survey (Interview to 5-10 % of residents and ask their attributes and trips of the day before). However, a Person Trip Survey takes long time and a lot of cost. Therefore, it is not applicable in a short study period.

Several statistical most likely trip matrix estimation methods were developed. In these, the most practical method is "the maximum entropy trip matrix estimation". In the Feasibility Study on Road Rehabilitation and Improvement in Grenada, this method was applied to estimate the present Car OD matrix.

2. FORMULATION

To find X_{ij}, which minimizes the formula:

$$S(Xij) = X \log X - \Sigma_{ij} X_{ij} \log X_{ij} + \Sigma_{ij} X_{ij} \log p_{ij}$$
$$\text{under } \Sigma_{ij} X_{ij} p_{ija} = V_a$$

where,
- X_{ij} : Trip Matrix of i zone to j zone
- X : Summation of Xij with respect to i and j
- p_{ij} : Apriori Probability of OD from i zone to j zone
- p_{ija} : Apriori Fixed Probability to pass a link of traffic from I zone to j zone

The solution of this formulation is:

$$X_{ij} = X p_{ij} \exp (\Sigma_{ij} \lambda_a p_{ija})$$

where, λ_a : Lagrange Multiplier

The papers below shall be referred for more in-depth understanding of the methodology.

Basic References:

- Wilson, A.G. (1970); Entropy in Urban and Regional Modeling, Pion, London.
- Willumson, L.G. (1978); Estimating an O-D matrix from traffic counts; a review. Working Paper 99, Institute for Transport Studies, University of Leeds.

Advanced References:

- Willumson, L.G. (1982); Estimation of trip matrices from volume counts; validation of a model under congested conditions, Proceedings 10th PTRC Summer Annual Meeting, University of Warwick, July 1982, England.
- Willumson, L.G. (1984); Estimating time-dependent trip matrices from traffic counts; In J. Volmuller and R. Hamerslag (eds.), Proceedings of the Ninth International Symposium on Transportation and Traffic Theory, VNU Science Press, Utrecht.

3. NETWORK AND OBSERVATION

A network to be used for this model shall be simple as much as possible. Requirement of a network is to connect any zone to all other zones. The network used in this Study is in Chapter 4.

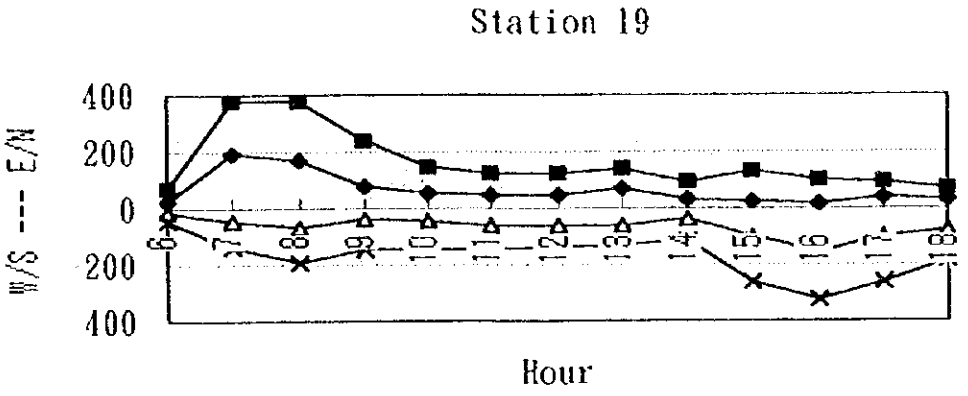
Traffics of all links composed of the said network have to be counted. Traffics should be composed of inter zonal traffics. Location of observation stations should be carefully chosen not to count intra-zonal traffics. In case that there is doubt to count considerably large portion of intra-zonal traffics it is necessary to eliminate these traffic. A trial is presented in Chapter 4.

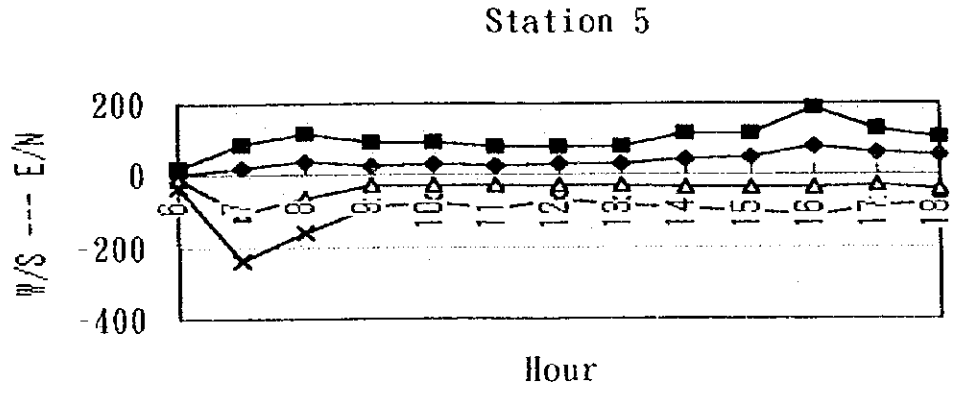
APPENDIX 5

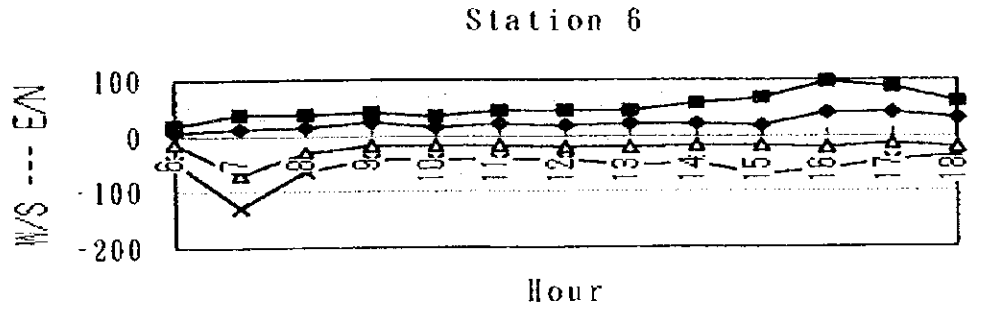
TRAFFIC COUNT BY HOUR

Hourly Traffic Patterns (13 hours) at Major Stations

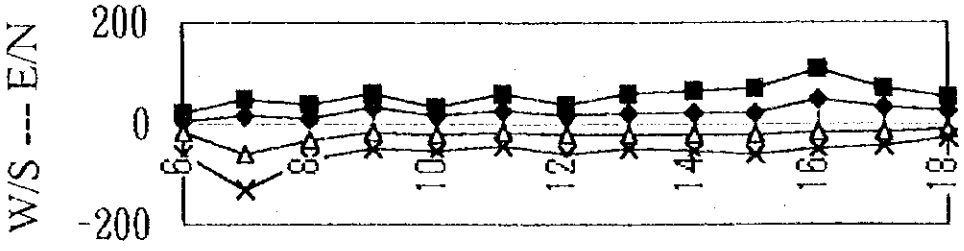
(a) Grand Etang Road





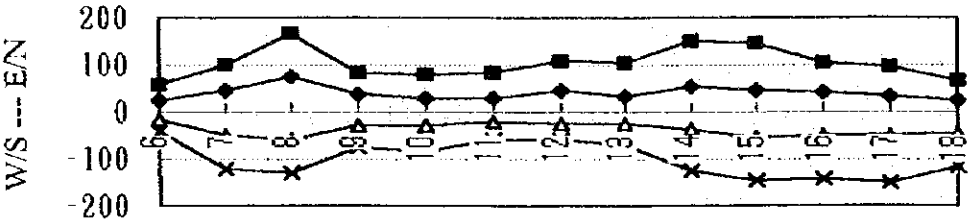


Station 7



Hour

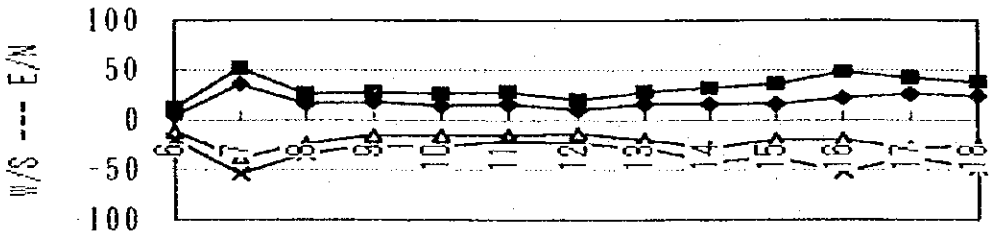
Station 20



Hour

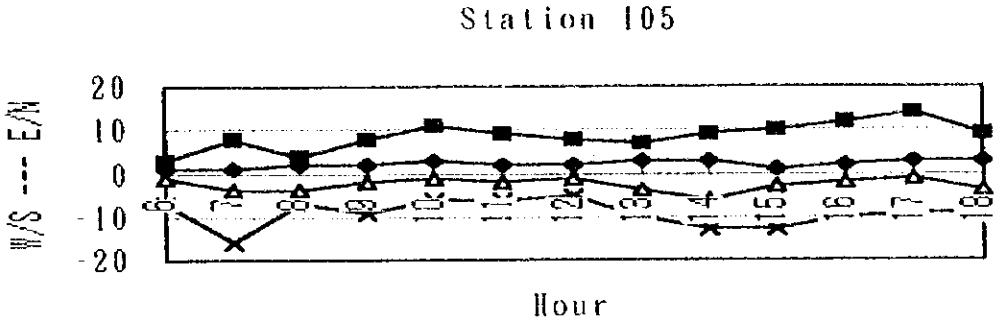
(b) Morne Jaloux Road

Station 104

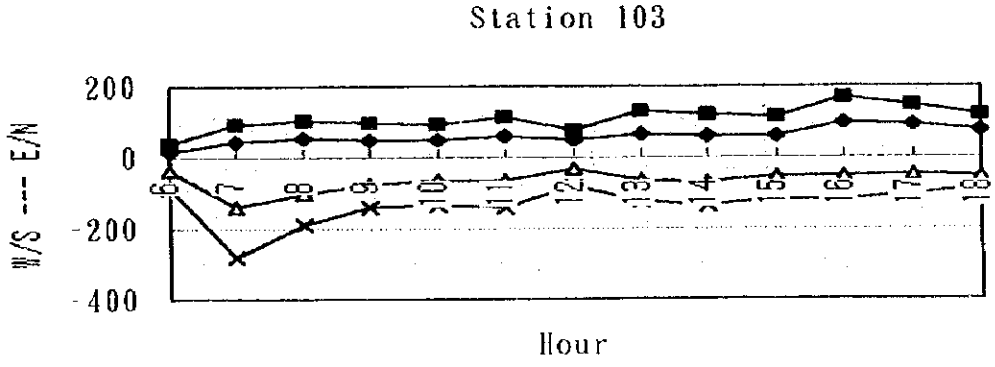


Hour

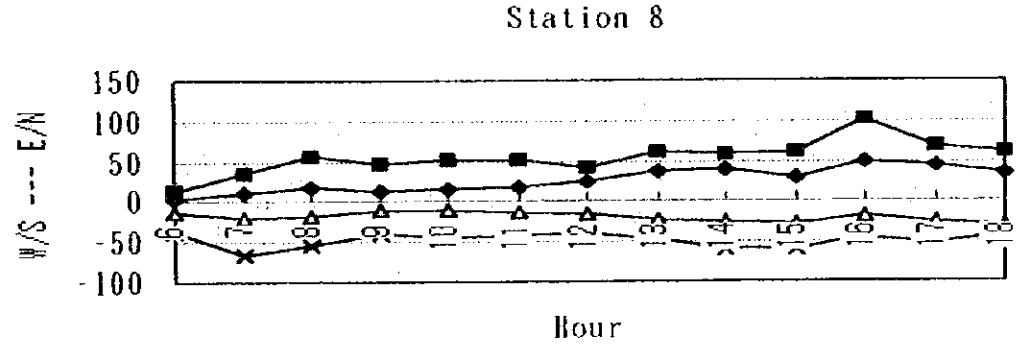
(c) Perdontemps / St. David's

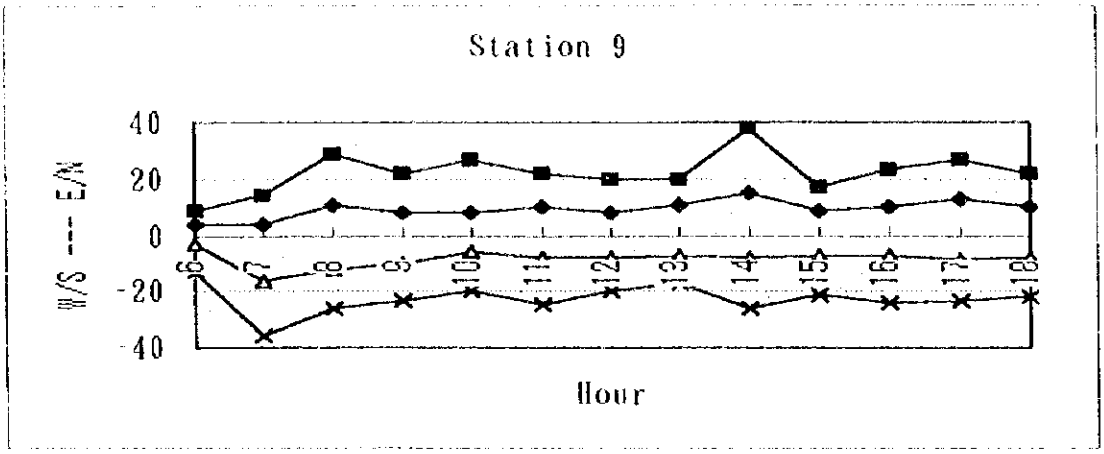


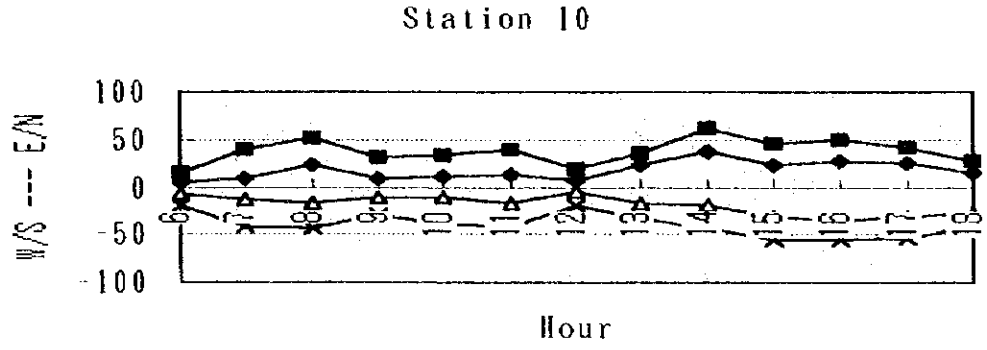
(d) Mt. Gay / Springs



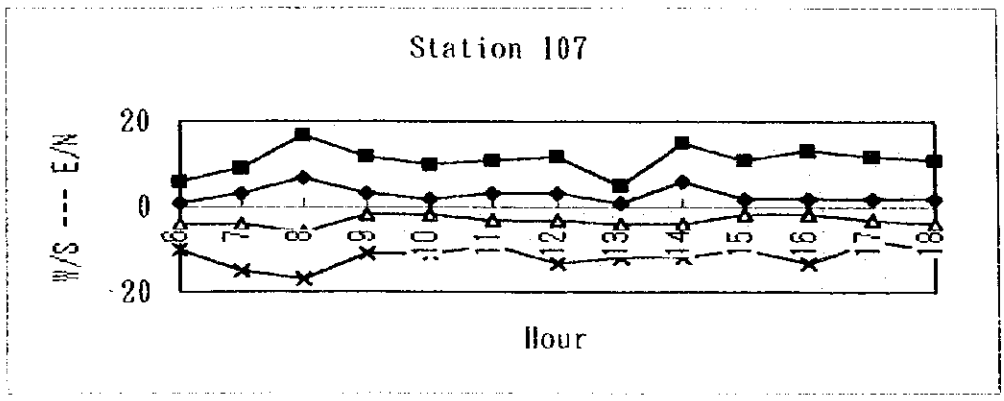
(e) Eastern Main Road (Grenville / Sauteurs)



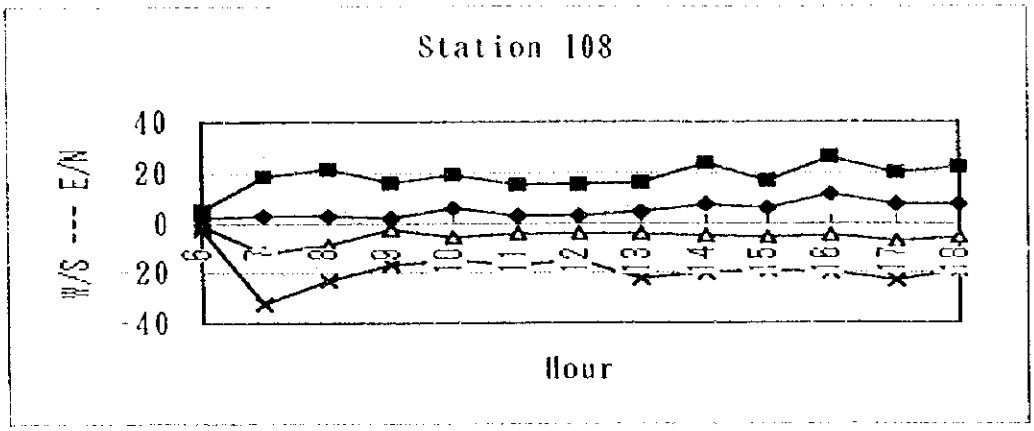




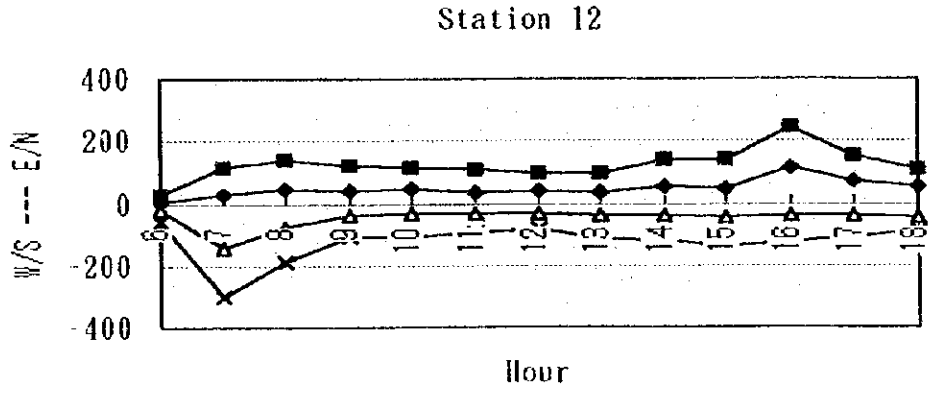
(f) Paraclete / Mt. Home Road

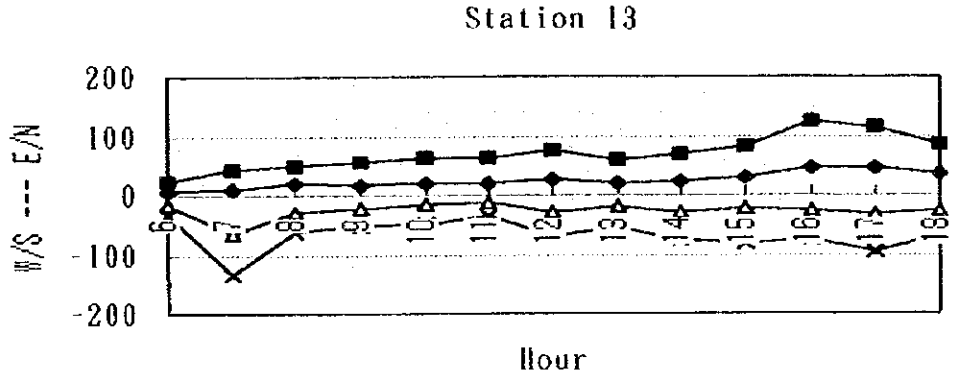


(g) Dover (Windward / Cherry hill)

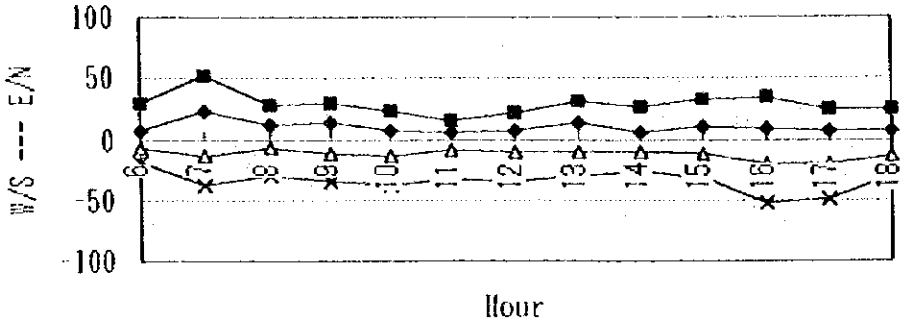


(h) Western Main Road (St. George's / Sauteurs)

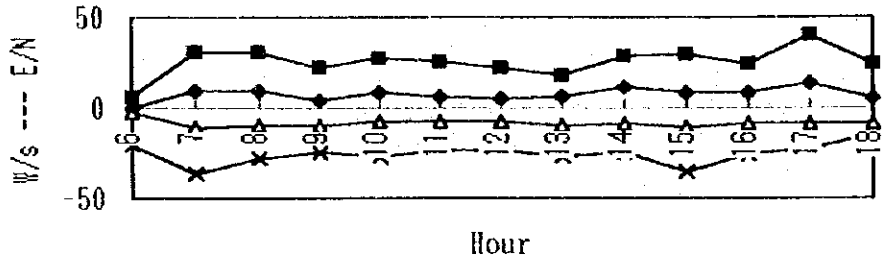




Station 14

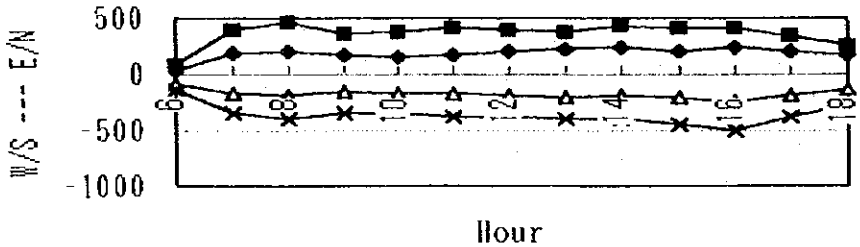


Station 15



(i) International Airport Road

Station 11



Appendix 5 (Station 1) Traffic Counts by Hour

Station No. 1

	East/North Bound					West/South Bound				
Hour	Pas. car	Bus	Truck(L)	Truck(H)	Total	Pas. car	Bus	Truck(L)	Truck(H)	Total
06:00-07:00	2	8	2	0	12	4	4	2	0	10
07:00-08:00	9	13	5	1	28	13	7	4	7	31
08:00-09:00	8	5	6	6	25	10	9	4	5	28
09:00-10:00	8	6	9	9	32	6	7	3	5	21
10:00-11:00	5	5	6	8	24	6	7	4	6	23
11:00-12:00	5	8	5	4	22	6	6	7	4	23
12:00-13:00	7	4	4	7	22	9	4	8	5	26
13:00-14:00	5	4	2	5	16	12	9	5	6	32
14:00-15:00	11	8	4	11	34	11	6	5	4	26
15:00-16:00	13	10	3	2	28	7	14	3	4	28
16:00-17:00	17	8	5	1	31	6	6	5	5	22
17:00-18:00	9	8	4	2	23	8	11	4	4	27
18:00-19:00	7	3	4	1	15	8	7	6	0	21
Total	106	90	59	57	312	106	97	60	55	318
Share	0.34	0.29	0.19	0.18	1.00	0.33	0.31	0.19	0.17	1.00

Appendix 5 (Station 2) Traffic Counts by Hour

Station No. 2

	East/North Bound					West/South Bound				
Hour	Pas. car	Bus	Truck(L)	Truck(H)	Total	Pas. car	Bus	Truck(L)	Truck(H)	Total
06:00-07:00	3	9	6	2	20	0	9	20	5	34
07:00-08:00	7	11	5	7	30	4	44	33	6	87
08:00-09:00	11	16	5	5	37	5	25	11	5	46
09:00-10:00	12	14	10	5	41	6	18	14	8	46
10:00-11:00	7	12	7	8	34	11	10	10	6	37
11:00-12:00	12	14	11	8	45	11	10	11	9	41
12:00-13:00	12	14	9	8	43	12	11	7	9	39
13:00-14:00	18	19	10	8	55	8	13	12	8	41
14:00-15:00	23	17	10	11	61	7	14	16	6	43
15:00-16:00	22	30	13	9	74	8	14	18	6	46
16:00-17:00	38	30	12	8	88	6	12	21	7	46
17:00-18:00	42	36	10	4	92	3	12	19	6	40
18:00-19:00	39	25	11	5	80	2	15	15	3	35
Total	246	247	119	88	700	83	207	207	84	581
Share	0.35	0.35	0.17	0.13	1.00	0.14	0.36	0.36	0.14	1.00

Appendix 5 (Station 3) Traffic Counts by Hour

Station No. 3

	East/North Bound					West/South Bound				
Hour	Pas. car	Bus	Truck(L)	Truck(H)	Total	Pas. car	Bus	Truck(L)	Truck(H)	Total
06:00-07:00	8	37	7	2	54	15	30	4	1	50
07:00-08:00	12	26	4	3	45	90	62	23	7	182
08:00-09:00	19	42	9	2	72	39	27	11	7	84
09:00-10:00	14	30	11	2	57	28	22	8	4	62
10:00-11:00	17	27	13	3	60	20	21	12	8	61
11:00-12:00	18	23	12	6	59	21	17	10	7	55
12:00-13:00	13	19	10	2	44	15	17	11	5	48
13:00-14:00	25	23	10	3	61	26	25	12	5	68
14:00-15:00	15	27	8	8	58	17	29	13	4	63
15:00-16:00	28	39	17	3	87	21	34	8	4	67
16:00-17:00	57	50	16	3	126	23	39	11	2	75
17:00-18:00	57	48	13	2	120	24	40	8	3	75
18:00-19:00	38	46	17	2	103	24	26	11	3	64
Total	321	437	147	41	946	363	389	142	60	954
Share	0.34	0.46	0.16	0.04	1.00	0.38	0.41	0.15	0.06	1.00

Appendix 5 (Station 4) Traffic Counts by Hour

Station No. 4

	East/North Bound					West/South Bound				
Hour	Pas. car	Bus	Truck(L)	Truck(H)	Total	Pas. car	Bus	Truck(L)	Truck(H)	Total
06:00-07:00	18	26	8	2	54	28	33	8	1	70
07:00-08:00	65	64	9	1	139	249	117	38	9	413
08:00-09:00	83	73	26	8	190	167	82	38	15	302
09:00-10:00	47	39	19	10	115	74	29	23	3	129
10:00-11:00	46	36	21	5	108	48	28	18	7	101
11:00-12:00	50	24	22	9	105	42	27	22	10	101
12:00-13:00	66	38	21	8	133	58	22	23	7	110
13:00-14:00	90	28	27	8	153	72	34	28	6	140
14:00-15:00	84	51	28	10	173	65	51	22	11	149
15:00-16:00	80	70	22	11	183	64	76	30	8	178
16:00-17:00	153	91	34	11	289	59	75	25	6	165
17:00-18:00	137	67	21	8	233	65	63	24	3	155
18:00-19:00	107	46	22	7	182	73	35	26	4	138
Total	1026	653	280	98	2057	1064	672	325	90	2151
Share	0.50	0.32	0.14	0.05	1.00	0.49	0.31	0.15	0.04	1.00

Appendix 5 (Station 5) Traffic Counts by Hour

Station No. 5

	East/North Bound					West/South Bound				
Hour	Pas. car	Bus	Truck(L)	Truck(H)	Total	Pas. car	Bus	Truck(L)	Truck(H)	Total
06:00-07:00	4	9	4	1	18	7	20	4	0	31
07:00-08:00	21	51	12	5	89	107	79	30	24	240
08:00-09:00	40	51	18	10	119	64	53	25	20	162
09:00-10:00	28	39	19	8	94	29	30	17	10	86
10:00-11:00	30	35	18	12	95	28	29	12	7	76
11:00-12:00	29	31	15	8	83	25	35	23	8	91
12:00-13:00	32	27	12	10	81	29	22	13	6	70
13:00-14:00	31	27	13	8	79	28	26	21	9	84
14:00-15:00	42	43	22	8	115	31	37	21	7	96
15:00-16:00	50	42	22	4	118	31	45	20	6	102
16:00-17:00	80	59	37	14	190	31	49	24	5	109
17:00-18:00	63	45	15	6	129	26	39	21	4	90
18:00-19:00	57	37	9	1	104	40	26	7	3	76
Total	507	496	216	95	1314	476	490	238	109	1313
Share	0.39	0.38	0.16	0.07	1.00	0.36	0.37	0.18	0.08	1.00

Appendix 5 (Station 6) Traffic Counts by Hour

Station No. 6

	East/North Bound					West/South Bound				
Hour	Pas. car	Bus	Truck(L)	Truck(H)	Total	Pas. car	Bus	Truck(L)	Truck(H)	Total
06:00-07:00	6	8	3	1	18	14	21	6	7	48
07:00-08:00	12	15	9	2	38	70	26	14	19	129
08:00-09:00	16	11	5	6	38	32	10	13	8	63
09:00-10:00	24	6	6	5	41	16	11	7	11	45
10:00-11:00	16	7	5	8	36	16	11	10	6	43
11:00-12:00	23	8	7	8	46	18	9	12	4	43
12:00-13:00	20	8	7	9	44	20	6	12	6	44
13:00-14:00	21	6	11	8	46	20	10	13	10	53
14:00-15:00	21	14	15	9	59	18	13	12	7	50
15:00-16:00	18	22	23	5	68	19	24	22	5	70
16:00-17:00	40	23	19	15	97	20	19	16	6	61
17:00-18:00	41	19	18	8	86	13	17	11	2	43
18:00-19:00	33	17	6	5	61	20	11	4	2	37
Total	291	164	134	89	678	296	188	152	93	729
Share	0.43	0.24	0.20	0.13	1.00	0.41	0.26	0.21	0.13	1.00

Appendix 5 (Station 7) Traffic Counts by Hour

Station No. 7

	East/North Bound					West/South Bound				
Hour	Pas. car	Bus	Truck(L)	Truck(H)	Total	Pas. car	Bus	Truck(L)	Truck(H)	Total
06:00-07:00	8	8	7	1	24	18	25	11	5	59
07:00-08:00	17	16	11	4	48	58	29	28	15	130
08:00-09:00	13	8	11	4	36	35	10	20	6	71
09:00-10:00	30	11	14	3	58	18	9	13	8	48
10:00-11:00	17	5	7	4	33	20	7	20	7	54
11:00-12:00	29	9	14	7	59	16	8	14	6	44
12:00-13:00	17	8	9	3	37	22	11	19	6	58
13:00-14:00	23	10	18	6	57	19	9	14	4	46
14:00-15:00	23	18	20	5	66	20	13	15	5	53
15:00-16:00	22	22	22	2	68	19	22	13	3	57
16:00-17:00	49	27	27	7	110	15	20	10	5	50
17:00-18:00	34	18	14	3	69	15	15	11	3	44
18:00-19:00	27	16	8	1	52	13	7	4	3	27
Total	309	176	182	50	717	288	185	192	76	741
Share	0.431	0.2455	0.2538	0.0697	0	0.3887	0.2497	0.2591	0.1026	0

Appendix 5 (Station 8) Traffic Counts by Hour

Station No. 8

	East/North Bound					West/South Bound				
Hour	Pas. car	Bus	Truck(L)	Truck(H)	Total	Pas. car	Bus	Truck(L)	Truck(H)	Total
06:00-07:00	4	4	4	2	14	13	13	6	5	37
07:00-08:00	10	20	4	1	35	21	29	11	5	66
08:00-09:00	18	21	13	4	56	18	17	15	5	55
09:00-10:00	14	13	13	6	46	12	13	12	2	39
10:00-11:00	16	16	12	7	51	12	15	11	6	44
11:00-12:00	18	15	12	6	51	14	14	10	4	42
12:00-13:00	25	11	4	2	42	15	12	9	4	40
13:00-14:00	37	16	3	4	60	23	14	5	5	47
14:00-15:00	40	8	6	4	58	26	23	2	9	60
15:00-16:00	31	23	4	4	62	28	24	4	4	60
16:00-17:00	50	43	6	2	101	19	22	1	2	44
17:00-18:00	44	21	3	1	69	25	20	5	2	52
18:00-19:00	34	25	2	0	61	30	10	3	0	43
Total	341	236	86	43	706	256	226	94	53	629
Share	0.48	0.33	0.12	0.06	1.00	0.41	0.36	0.15	0.08	1.00

Appendix 5 (Station 9) Traffic Counts by Hour

Station No. 9

	East/North Bound					West/South Bound				
Hour	Pas. car	Bus	Truck(L)	Truck(H)	Total	Pas. car	Bus	Truck(L)	Truck(H)	Total
06:00-07:00	4	2	2	1	9	3	7	2	1	13
07:00-08:00	4	8	1	1	14	16	13	5	2	36
08:00-09:00	11	13	3	2	29	12	9	4	1	26
09:00-10:00	8	6	5	3	22	10	7	4	2	23
10:00-11:00	8	8	9	2	27	6	6	6	2	20
11:00-12:00	10	4	3	5	22	8	8	6	3	25
12:00-13:00	8	5	5	2	20	8	6	3	3	20
13:00-14:00	11	5	4	0	20	7	4	3	3	17
14:00-15:00	15	12	7	4	38	8	13	3	2	26
15:00-16:00	9	4	3	1	17	7	7	5	2	21
16:00-17:00	10	7	4	2	23	7	11	4	2	24
17:00-18:00	13	9	4	1	27	9	7	3	4	23
18:00-19:00	10	8	2	2	22	8	7	5	2	22
Total	121	91	52	26	290	109	105	53	29	296
Share	0.4172	0.3138	0.1793	0.0897	0	0.3682	0.3547	0.1791	0.098	0

Appendix 5 (Station 10) Traffic Counts by Hour

Station No. 10

	East/North Bound					West/South Bound				
Hour	Pas. car	Bus	Truck(L)	Truck(H)	Total	Pas. car	Bus	Truck(L)	Truck(H)	Total
06:00-07:00	6	6	3	1	16	7	6	5	1	19
07:00-08:00	10	19	9	2	40	14	17	9	1	41
08:00-09:00	23	15	12	2	52	17	15	10	1	43
09:00-10:00	10	9	11	2	32	12	10	7	1	30
10:00-11:00	11	11	9	2	33	11	11	11	7	40
11:00-12:00	13	9	16	2	40	17	11	9	4	41
12:00-13:00	7	9	2	1	19	6	6	4	3	19
13:00-14:00	23	9	3	0	35	18	10	2	3	33
14:00-15:00	38	19	2	3	62	20	17	2	4	43
15:00-16:00	23	17	3	3	46	32	15	4	4	55
16:00-17:00	28	13	4	4	49	35	11	5	4	55
17:00-18:00	26	11	2	2	41	32	16	2	4	54
18:00-19:00	16	9	1	1	27	27	11	1	3	42
Total	234	156	77	25	492	248	156	71	40	515
Share	0.4756	0.3171	0.1565	0.0508	0	0.4816	0.3029	0.1379	0.0777	0

Appendix 5 (Station 11) Traffic Counts by Hour

Station No. 11

	East/North Bound					West/South Bound				
Hour	Pas. car	Bus	Truck(L)	Truck(H)	Total	Pas. car	Bus	Truck(L)	Truck(H)	Total
06:00-07:00	78	49	16	2	145	33	26	19	2	80
07:00-08:00	165	98	70	8	341	183	138	66	12	399
08:00-09:00	185	114	74	16	389	212	128	110	13	463
09:00-10:00	155	93	70	25	343	172	83	84	29	368
10:00-11:00	167	88	74	21	350	158	83	102	30	373
11:00-12:00	179	90	98	20	387	177	80	111	40	408
12:00-13:00	190	93	77	19	379	199	86	90	22	397
13:00-14:00	204	77	95	21	397	226	67	67	27	387
14:00-15:00	188	95	99	21	403	234	84	79	40	437
15:00-16:00	203	133	94	16	446	201	98	77	36	412
16:00-17:00	245	135	109	14	503	242	93	61	17	413
17:00-18:00	188	106	79	5	378	213	93	34	4	344
18:00-19:00	146	75	50	1	272	168	67	26	5	266
Total	2293	1246	1005	189	4733	2418	1126	926	277	4747
Share	0.48	0.26	0.21	0.04	1.00	0.51	0.24	0.20	0.06	1.00

Appendix 5 (Station 12) Traffic Counts by Hour

Station No. 12

	East/North Bound					West/South Bound				
Hour	Pas. car	Bus	Truck(L)	Truck(H)	Total	Pas. car	Bus	Truck(L)	Truck(H)	Total
06:00-07:00	6	13	8	3	30	21	26	7	3	57
07:00-08:00	28	65	16	6	115	146	99	42	14	301
08:00-09:00	45	48	28	19	140	77	59	26	25	187
09:00-10:00	38	34	31	17	120	40	32	19	18	109
10:00-11:00	44	32	24	17	117	34	34	25	18	111
11:00-12:00	34	28	28	20	110	33	27	17	21	98
12:00-13:00	43	27	15	12	97	34	20	19	8	81
13:00-14:00	36	27	25	9	97	42	39	21	10	112
14:00-15:00	54	51	22	10	137	40	49	25	9	123
15:00-16:00	45	59	26	10	140	47	62	25	8	142
16:00-17:00	117	73	48	7	245	43	56	22	9	130
17:00-18:00	71	53	28	1	153	43	45	16	4	108
18:00-19:00	53	35	17	3	108	44	29	16	2	91
Total	614	545	316	134	1609	644	577	280	149	1650
Share	0.38	0.34	0.20	0.08	1.00	0.39	0.35	0.17	0.09	1.00

Appendix 5 (Station 13) Traffic Counts by Hour

Station No. 13

	East/North Bound					West/South Bound				
Hour	Pas. car	Bus	Truck(L)	Truck(H)	Total	Pas. car	Bus	Truck(L)	Truck(H)	Total
06:00-07:00	8	7	8	1	24	15	10	5	4	34
07:00-08:00	11	15	15	3	44	66	33	24	13	136
08:00-09:00	20	13	10	5	48	30	10	11	12	63
09:00-10:00	16	8	23	9	56	23	11	13	6	53
10:00-11:00	20	18	19	6	63	17	10	14	9	50
11:00-12:00	20	17	17	7	61	13	7	11	5	36
12:00-13:00	25	18	18	15	76	28	20	14	6	68
13:00-14:00	21	12	19	7	59	19	17	16	5	57
14:00-15:00	22	19	19	10	70	28	22	19	8	77
15:00-16:00	29	23	17	13	82	24	26	21	10	81
16:00-17:00	46	33	27	17	123	27	27	14	7	75
17:00-18:00	45	34	24	13	116	33	26	23	13	95
18:00-19:00	35	29	17	5	86	25	23	14	8	70
Total	318	246	233	111	908	348	242	199	106	895
Share	0.35	0.27	0.26	0.12	1.00	0.39	0.27	0.22	0.12	1.00

Appendix 5 (Station 14) Traffic Counts by Hour

Station No. 14

	East/North Bound					West/South Bound				
Hour	Pas. car	Bus	Truck(L)	Truck(H)	Total	Pas. car	Bus	Truck(L)	Truck(H)	Total
06:00-07:00	7	3	8	1	19	7	12	9	2	30
07:00-08:00	13	13	9	3	38	24	11	15	2	52
08:00-09:00	7	8	9	5	29	12	6	7	3	28
09:00-10:00	12	8	10	4	34	13	4	5	7	29
10:00-11:00	14	10	10	4	38	8	3	10	3	24
11:00-12:00	9	11	7	5	32	5	5	4	1	15
12:00-13:00	10	12	7	5	34	7	4	6	4	21
13:00-14:00	11	3	12	3	29	14	4	10	4	32
14:00-15:00	11	3	9	4	27	6	6	9	5	26
15:00-16:00	12	10	6	3	31	11	6	9	7	33
16:00-17:00	20	8	17	7	52	9	7	11	8	35
17:00-18:00	20	13	13	3	49	7	6	10	2	25
18:00-19:00	13	9	6	1	29	8	5	11	1	25
Total	159	111	123	48	441	131	79	116	49	375
Share	0.36	0.25	0.28	0.11	1.00	0.35	0.21	0.31	0.13	1.00

Appendix 5 (Station 15) Traffic Counts by Hour

Station No. 15

	East/North Bound					West/South Bound				
Hour	Pas. car	Bus	Truck(L)	Truck(H)	Total	Pas. car	Bus	Truck(L)	Truck(H)	Total
06:00-07:00	0	2	4	0	6	2	11	2	5	20
07:00-08:00	10	13	6	2	31	11	15	6	4	36
08:00-09:00	10	13	7	1	31	10	10	4	4	28
09:00-10:00	4	9	6	3	22	10	8	4	2	24
10:00-11:00	8	6	9	5	28	7	7	8	5	27
11:00-12:00	6	8	7	5	26	7	4	9	3	23
12:00-13:00	5	6	6	5	22	7	6	5	5	23
13:00-14:00	6	2	7	3	18	10	5	7	5	27
14:00-15:00	12	6	7	4	29	8	6	6	4	24
15:00-16:00	8	8	9	5	30	11	8	12	4	35
16:00-17:00	8	6	6	5	25	8	9	4	4	25
17:00-18:00	14	14	6	6	40	8	7	4	3	22
18:00-19:00	5	8	7	4	24	8	5	1	1	15
Total	96	101	87	48	332	107	101	72	49	329
Share	0.2892	0.3042	0.262	0.1446	0	0.3252	0.307	0.2188	0.1489	0

Appendix 5 (Station 16) Traffic Counts by Hour

Station No. 16

	East/North Bound					West/South Bound				
Hour	Pas. car	Bus	Truck(L)	Truck(H)	Total	Pas. car	Bus	Truck(L)	Truck(H)	Total
06:00-07:00	0	0	0	0	0	0	0	0	0	0
07:00-08:00	1	0	0	0	1	2	1	1	1	5
08:00-09:00	2	1	1	1	5	2	0	2	0	4
09:00-10:00	1	1	1	0	3	1	0	1	0	2
10:00-11:00	1	0	0	0	1	0	2	1	1	4
11:00-12:00	2	2	1	1	6	1	2	1	1	5
12:00-13:00	2	2	1	0	5	2	2	2	0	6
13:00-14:00	2	1	1	1	5	1	1	0	1	3
14:00-15:00	4	3	0	1	8	2	0	1	0	3
15:00-16:00	3	1	0	1	5	2	1	1	0	4
16:00-17:00	2	1	0	0	3	1	2	2	0	5
17:00-18:00	2	1	1	0	4	1	1	1	0	3
18:00-19:00	1	0	0	0	1	1	1	1	0	3
Total	23	13	6	5	47	16	13	14	4	47
Share	0.4894	0.2766	0.1277	0.1064	0	0.3404	0.2766	0.2979	0.0851	0

Appendix 5 (Station 17) Traffic Counts by Hour

Station No. 17

	East/North Bound					West/South Bound				
Hour	Pas. car	Bus	Truck(L)	Truck(H)	Total	Pas. car	Bus	Truck(L)	Truck(H)	Total
06:00-07:00	4	2	1	0	7	4	3	0	0	7
07:00-08:00	9	6	4	1	20	9	5	2	1	17
08:00-09:00	14	5	6	1	26	14	6	5	0	25
09:00-10:00	11	2	4	2	19	6	3	2	1	12
10:00-11:00	10	8	6	2	26	7	4	4	2	17
11:00-12:00	6	3	5	3	17	7	1	4	0	12
12:00-13:00	4	4	5	0	13	8	3	3	2	16
13:00-14:00	7	6	4	1	18	4	4	6	2	16
14:00-15:00	9	7	8	0	24	6	5	6	2	19
15:00-16:00	8	5	9	0	22	7	7	7	0	21
16:00-17:00	9	4	7	1	21	3	5	5	2	15
17:00-18:00	1	5	6	2	14	5	4	3	3	15
18:00-19:00	3	2	3	1	9	5	3	4	2	14
Total	95	59	68	14	236	85	53	51	17	206
Share	0.40	0.25	0.29	0.06	1.00	0.41	0.26	0.25	0.08	1.00

Appendix 5 (Station 18) Traffic Counts by Hour

Station No. 18

	East/North Bound					West/South Bound				
Hour	Pas. car	Bus	Truck(L)	Truck(H)	Total	Pas. car	Bus	Truck(L)	Truck(H)	Total
06:00-07:00	5	4	1	1	11	7	5	1	0	13
07:00-08:00	10	15	2	1	28	13	12	1	5	31
08:00-09:00	14	8	0	1	23	16	8	3	3	30
09:00-10:00	11	3	0	4	18	15	5	2	3	25
10:00-11:00	10	2	1	3	16	6	4	1	4	15
11:00-12:00	7	3	1	3	14	8	3	0	1	12
12:00-13:00	7	5	6	1	19	7	6	2	3	18
13:00-14:00	6	4	5	1	16	5	6	10	3	24
14:00-15:00	7	9	6	2	24	4	7	10	3	24
15:00-16:00	8	9	5	2	24	7	7	8	2	24
16:00-17:00	5	12	11	1	29	9	12	10	1	32
17:00-18:00	7	11	11	2	31	4	11	5	2	22
18:00-19:00	9	9	9	1	28	5	5	6	1	17
Total	106	94	58	23	281	106	91	59	31	287
Share	0.38	0.33	0.21	0.08	0.00	0.37	0.32	0.21	0.11	0.00

Appendix 5 (Station 19) Traffic Counts by Hour

Station No. 19

	East/North Bound					West/South Bound				
Hour	Pas. car	Bus	Truck(L)	Truck(H)	Total	Pas. car	Bus	Truck(L)	Truck(H)	Total
06:00-07:00	21	29	12	4	66	17	22	8	1	48
07:00-08:00	189	121	42	24	376	48	69	17	4	138
08:00-09:00	171	99	57	47	374	66	83	25	20	194
09:00-10:00	79	70	49	38	236	36	60	34	16	146
10:00-11:00	52	44	37	11	144	49	46	33	16	144
11:00-12:00	43	41	30	11	125	58	43	24	18	143
12:00-13:00	49	40	24	13	126	64	38	27	13	142
13:00-14:00	67	31	25	16	139	64	38	17	13	132
14:00-15:00	29	39	18	10	96	41	38	26	12	117
15:00-16:00	24	57	23	23	127	99	79	53	29	260
16:00-17:00	18	60	17	4	99	152	86	52	30	320
17:00-18:00	41	37	10	8	96	103	100	38	19	260
18:00-19:00	30	27	8	4	69	80	58	34	9	181
Total	813	695	352	213	2073	877	760	388	200	2225
Share	0.3922	0.3353	0.1698	0.1027	0	0.3942	0.3416	0.1744	0.0899	0

Appendix 5 (Station 20) Traffic Counts by Hour

Station No. 20

	East/North Bound					West/South Bound				
Hour	Pas. car	Bus	Truck(L)	Truck(H)	Total	Pas. car	Bus	Truck(L)	Truck(H)	Total
06:00-07:00	27	22	8	2	59	15	18	8	1	42
07:00-08:00	46	30	16	10	102	48	40	21	11	120
08:00-09:00	76	37	37	16	166	60	29	25	17	131
09:00-10:00	36	14	20	14	84	31	14	18	12	75
10:00-11:00	30	17	21	10	78	31	15	26	10	82
11:00-12:00	31	12	24	16	83	21	10	17	10	58
12:00-13:00	46	24	24	14	108	23	12	18	7	60
13:00-14:00	32	29	27	18	106	26	17	17	11	71
14:00-15:00	54	38	39	21	152	39	30	32	22	123
15:00-16:00	44	46	37	20	147	53	43	30	20	146
16:00-17:00	42	27	24	10	103	48	37	32	23	140
17:00-18:00	32	27	24	14	97	50	45	34	22	151
18:00-19:00	26	20	13	8	67	44	35	27	11	117
Total	522	343	314	173	1352	489	345	305	177	1316
Share	0.3861	0.2537	0.2322	0.128	0	0.3716	0.2622	0.2318	0.1345	0

Appendix 5 (Station 101) Traffic Counts by Hour

Station No. 101

	East/North Bound					West/South Bound				
Hour	Pas. car	Bus	Truck(L)	Truck(H)	Total	Pas. car	Bus	Truck(L)	Truck(H)	Total
06:00-07:00	10	4	3	1	18	12	2	2	1	17
07:00-08:00	16	2	7	2	27	37	8	12	4	61
08:00-09:00	11	4	9	4	28	28	4	7	6	45
09:00-10:00	13	6	7	8	34	18	4	8	12	42
10:00-11:00	16	4	10	6	36	16	2	7	9	34
11:00-12:00	23	4	14	5	46	17	5	14	4	40
12:00-13:00	23	9	14	3	49	20	5	16	6	47
13:00-14:00	20	7	17	10	54	21	8	16	5	50
14:00-15:00	14	7	13	5	39	14	7	20	6	47
15:00-16:00	32	10	18	11	71	15	9	8	6	38
16:00-17:00	29	9	16	6	60	21	11	12	6	50
17:00-18:00	29	11	12	3	55	22	9	11	2	44
18:00-19:00	21	9	13	1	44	25	6	11	2	44
Total	257	86	153	65	561	266	80	144	69	559
Share	0.46	0.15	0.27	0.12	1.00	0.48	0.14	0.26	0.12	1.00

Appendix 5 (Station 102) Traffic Counts by Hour

Station No. 102

	East/North Bound					West/South Bound				
Hour	Pas. car	Bus	Truck(L)	Truck(H)	Total	Pas. car	Bus	Truck(L)	Truck(H)	Total
06:00-07:00	20	9	5	2	36	24	12	10	6	52
07:00-08:00	33	11	10	9	63	79	26	17	5	127
08:00-09:00	25	18	10	9	62	51	20	14	13	98
09:00-10:00	40	15	14	10	79	34	20	9	12	75
10:00-11:00	50	12	14	9	85	36	17	5	10	68
11:00-12:00	48	13	14	7	82	31	11	9	7	58
12:00-13:00	26	6	6	3	41	29	12	7	5	53
13:00-14:00	28	8	16	7	59	39	20	14	7	80
14:00-15:00	30	14	9	6	59	81	23	15	14	133
15:00-16:00	25	12	11	9	57	41	17	11	9	78
16:00-17:00	45	15	13	11	84	44	16	18	12	90
17:00-18:00	51	14	15	7	87	35	9	14	7	65
18:00-19:00	41	15	9	6	71	37	10	12	8	67
Total	462	162	146	95	865	561	213	155	115	1044
Share	0.53	0.19	0.17	0.11	1.00	0.54	0.20	0.15	0.11	1.00

Appendix 5 (Station 103) Traffic Counts by Hour

Station No. 103

	East/North Bound					West/South Bound				
Hour	Pas. car	Bus	Truck(L)	Truck(H)	Total	Pas. car	Bus	Truck(L)	Truck(H)	Total
06:00-07:00	18	7	11	2	38	38	31	19	1	89
07:00-08:00	43	34	12	3	92	139	71	62	9	281
08:00-09:00	55	29	15	4	103	100	44	28	15	187
09:00-10:00	49	16	22	11	98	78	29	19	12	138
10:00-11:00	47	21	15	11	94	67	24	26	20	137
11:00-12:00	57	21	28	9	115	63	33	27	20	143
12:00-13:00	46	14	13	5	78	33	22	18	9	82
13:00-14:00	64	31	31	6	132	67	21	27	12	127
14:00-15:00	58	28	24	10	120	71	31	24	11	137
15:00-16:00	59	29	21	7	116	53	35	20	10	118
16:00-17:00	98	32	27	9	166	52	36	21	10	119
17:00-18:00	91	32	23	2	148	49	33	18	5	105
18:00-19:00	77	21	18	3	119	52	23	12	2	89
Total	762	315	260	82	1419	862	433	321	136	1752
Share	0.54	0.22	0.18	0.06	1.00	0.49	0.25	0.18	0.08	1.00

Appendix 5 (Station 104) Traffic Counts by Hour

Station No. 104

	East/North Bound					West/South Bound				
Hour	Pas. car	Bus	Truck(L)	Truck(H)	Total	Pas. car	Bus	Truck(L)	Truck(H)	Total
06:00-07:00	5	6	1	0	12	11	7	1	0	19
07:00-08:00	36	14	1	1	52	37	15	0	1	53
08:00-09:00	16	7	4	0	27	23	7	3	0	33
09:00-10:00	18	6	3	1	28	15	5	3	2	25
10:00-11:00	15	6	4	1	26	16	6	3	0	25
11:00-12:00	16	8	2	2	28	15	5	2	0	22
12:00-13:00	11	6	3	1	21	13	6	4	1	24
13:00-14:00	17	6	4	1	28	19	5	2	1	27
14:00-15:00	17	9	5	2	33	27	6	5	3	41
15:00-16:00	17	14	4	1	36	19	13	4	2	38
16:00-17:00	22	17	7	2	48	20	21	10	0	51
17:00-18:00	27	11	4	1	43	27	9	2	0	38
18:00-19:00	25	7	6	1	39	25	13	9	1	48
Total	242	117	48	14	421	267	118	48	11	444
Share	0.57	0.28	0.11	0.03	1.00	0.60	0.27	0.11	0.02	1.00

Appendix 5 (Station 105) Traffic Counts by Hour

Station No. 105

	East/North Bound					West/South Bound				
Hour	Pas. car	Bus	Truck(L)	Truck(H)	Total	Pas. car	Bus	Truck(L)	Truck(H)	Total
06:00-07:00	1	2	0	0	3	1	5	1	0	7
07:00-08:00	1	4	2	1	8	4	9	1	2	16
08:00-09:00	2	2	0	0	4	4	3	0	0	7
09:00-10:00	2	3	2	1	8	2	2	4	1	9
10:00-11:00	3	3	3	2	11	1	2	2	1	6
11:00-12:00	2	2	4	1	9	2	3	1	0	6
12:00-13:00	2	3	2	1	8	1	2	2	0	5
13:00-14:00	3	3	1	0	7	4	3	3	0	10
14:00-15:00	3	2	3	1	9	6	5	2	0	13
15:00-16:00	1	6	1	2	10	3	8	2	0	13
16:00-17:00	2	8	2	0	12	2	5	2	1	10
17:00-18:00	3	7	2	2	14	1	5	2	1	9
18:00-19:00	3	5	1	0	9	4	3	1	1	9
Total	28	50	23	11	112	35	55	23	7	120
Share	0.25	0.45	0.21	0.10	1.00	0.29	0.46	0.19	0.06	1.00

Appendix 5 (Station 106) Traffic Counts by Hour

Station No. 106

	East/North Bound					West/South Bound				
Hour	Pas. car	Bus	Truck(L)	Truck(H)	Total	Pas. car	Bus	Truck(L)	Truck(H)	Total
06:00-07:00	9	7	2	2	20	6	5	3	0	14
07:00-08:00	14	19	6	2	41	13	11	0	0	24
08:00-09:00	9	10	7	1	27	8	10	0	0	18
09:00-10:00	7	3	3	1	14	13	7	2	2	24
10:00-11:00	7	3	3	1	14	12	8	3	2	25
11:00-12:00	5	3	5	3	16	11	7	7	1	26
12:00-13:00	6	3	6	2	17	7	6	3	1	17
13:00-14:00	6	4	3	2	15	5	7	9	2	23
14:00-15:00	8	4	10	3	25	13	14	10	3	40
15:00-16:00	6	6	7	2	21	13	17	8	2	40
16:00-17:00	9	2	7	1	19	13	10	8	0	31
17:00-18:00	17	6	9	1	33	10	11	6	2	29
18:00-19:00	18	9	11	1	39	7	10	7	2	26
Total	121	79	79	22	301	131	123	66	17	337
Share	0.402	0.2625	0.2625	0.0731	0	0.3887	0.365	0.1958	0.0504	0

Appendix 5 (Station 107) Traffic Counts by Hour

Station No. 107

	East/North Bound					West/South Bound				
Hour	Pas. car	Bus	Truck(L)	Truck(H)	Total	Pas. car	Bus	Truck(L)	Truck(H)	Total
06:00-07:00	1	2	2	1	6	4	3	3	0	10
07:00-08:00	3	4	2	0	9	4	5	6	0	15
08:00-09:00	7	7	3	0	17	6	7	3	1	17
09:00-10:00	3	6	3	0	12	2	6	3	0	11
10:00-11:00	2	4	3	1	10	2	4	4	1	11
11:00-12:00	3	5	3	0	11	3	4	2	0	9
12:00-13:00	3	4	4	1	12	3	4	6	0	13
13:00-14:00	1	2	1	1	5	4	4	4	0	12
14:00-15:00	6	5	3	1	15	4	7	0	1	12
15:00-16:00	2	6	2	1	11	2	6	2	0	10
16:00-17:00	2	5	4	2	13	2	5	4	2	13
17:00-18:00	2	4	5	1	12	3	4	1	0	8
18:00-19:00	2	5	3	1	11	4	5	1	0	10
Total	37	59	38	10	144	43	64	39	5	151
Share	0.2569	0.4097	0.2639	0.0694	0	0.2848	0.4238	0.2583	0.0331	0

Appendix 5 (Station 108) Traffic Counts by Hour

Station No. 108

	East/North Bound					West/South Bound				
Hour	Pas. car	Bus	Truck(L)	Truck(H)	Total	Pas. car	Bus	Truck(L)	Truck(H)	Total
06:00-07:00	2	1	1	1	5	1	1	1	0	3
07:00-08:00	3	8	7	0	18	12	10	6	4	32
08:00-09:00	3	8	9	1	21	9	10	3	1	23
09:00-10:00	2	7	5	2	16	3	6	7	1	17
10:00-11:00	6	6	5	2	19	6	5	2	2	15
11:00-12:00	3	4	7	1	15	4	6	6	1	17
12:00-13:00	3	6	5	1	15	4	6	4	1	15
13:00-14:00	4	4	5	3	16	4	6	7	5	22
14:00-15:00	7	10	4	3	24	5	9	4	2	20
15:00-16:00	6	5	5	1	17	6	7	5	1	19
16:00-17:00	11	7	4	4	26	5	6	6	3	20
17:00-18:00	7	4	4	5	20	7	4	8	4	23
18:00-19:00	7	4	8	3	22	6	4	5	4	19
Total	64	74	69	27	234	72	80	64	29	245
Share	0.2735	0.3162	0.2949	0.1154	0	0.2939	0.3265	0.2612	0.1184	0

APPENDIX 6

OD TABLE COMPILED
FROM ROADSIDE OD INTERVIEW SURVEY

Appendix 6 (1) OD Table compiled from Roadside OD Interview Survey

Station: 19
Purpose: to/from Work
Type of Vehicle: All
Base: Car

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	53	4	4	0	8	0	0	0	0	69
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	11
6	0	0	4	0	0	0	4	4	0	0	0	0	0	0	0	12
7	0	4	56	0	0	0	15	128	19	0	0	4	0	0	11	237
8	0	0	11	4	0	4	139	30	11	0	11	0	0	0	0	210
9	0	0	8	0	0	0	19	23	0	0	11	0	0	0	0	61
10	0	0	4	0	0	0	0	4	4	0	0	0	0	0	0	12
11	0	0	26	4	4	0	4	26	0	0	0	0	0	4	0	68
12	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4
13	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4
14	0	0	0	0	0	0	0	0	4	0	4	0	0	0	0	8
15	0	0	0	0	0	0	8	11	0	0	4	0	0	0	0	23
Total	0	4	109	8	4	4	253	238	42	0	38	4	0	4	11	719

Appendix 6 (2) OD Table compiled from Roadside OD Interview Survey

Station: 20
Purpose: to/from Work
Type of Vehicle: All
Base: Car

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	2	0	2	0	4	2	0	0	2	0	0	0	0	12
3	0	0	30	4	30	0	52	0	0	0	2	2	0	0	2	122
4	0	0	2	0	13	0	28	0	0	0	6	0	0	0	0	49
5	0	2	67	9	4	2	6	0	0	0	0	0	0	0	0	90
6	0	0	6	0	0	2	0	0	0	0	0	0	0	0	0	8
7	0	6	52	6	4	0	0	0	0	0	0	0	0	2	6	76
8	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
9	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	6
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
14	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	4
15	0	0	4	0	0	0	11	2	0	0	2	0	0	0	0	19
Total	0	8	173	21	53	4	105	4	0	0	12	2	0	2	8	392

Appendix 6 (3) OD Table compiled from Roadside OD Interview Survey

Station: 19 and 20
Purpose: to/from Work
Type of Vehicle: All
Base: Car

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	2	0	2	0	4	2	0	0	2	0	0	0	0	12
3	0	0	30	4	30	0	105	4	4	0	10	2	0	0	2	191
4	0	0	2	0	13	0	28	0	0	0	6	0	0	0	0	49
5	0	2	67	9	4	2	18	0	0	0	0	0	0	0	0	102
6	0	0	10	0	0	2	4	4	0	0	0	0	0	0	0	20
7	0	10	108	6	4	0	15	128	19	0	0	4	0	2	18	314
8	0	0	13	4	0	4	139	30	11	0	11	0	0	0	0	212
9	0	0	8	2	0	0	19	23	0	0	11	0	0	0	0	63
10	0	0	4	0	0	0	0	4	4	0	0	0	0	0	0	12
11	0	0	33	4	4	0	4	26	0	0	0	0	0	4	0	75
12	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4
13	0	0	2	0	0	0	0	4	0	0	0	0	0	0	0	6
14	0	0	0	0	0	0	4	0	4	0	4	0	0	0	0	12
15	0	0	4	0	0	0	18	13	0	0	6	0	0	0	0	41
Total	0	12	283	29	57	8	358	242	42	0	50	6	0	6	20	1,113

Appendix (4) OD Table compiled from Roadside OD Interview Survey

Station: 19
Purpose: to/from School
Type of Vehicle: All
Base: Car

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	4
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4
8	0	0	0	0	0	0	26	0	0	0	0	0	0	0	0	26
9	0	0	0	0	0	0	4	0	4	0	0	0	0	0	0	8
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	4
Total	0	0	0	0	0	0	38	4	4	0	0	0	0	0	0	46

Appendix 6 (5) OD Table compiled from Roadside OD Interview Survey

Station: 20
Purpose: to/from School
Type of Vehicle: All
Base: Car

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	2	4	4	0	4	0	0	0	0	0	0	0	0	14
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	9	2	0	0	0	0	0	0	0	0	0	0	0	11
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	13	6	4	0	4	0	0	0	0	0	0	0	0	27

Appendix 6 (6) OD Table compiled from Roadside OD Interview Survey

Station: 19 and 20
Purpose: to/from School
Type of Vehicle: All
Base: Car

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	2	4	4	0	8	0	0	0	0	0	0	0	0	18
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	9	2	0	0	0	0	0	0	0	0	0	0	0	11
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	2	0	0	0	0	4	0	0	0	0	0	0	0	6
8	0	0	0	0	0	0	26	0	0	0	0	0	0	0	0	26
9	0	0	0	0	0	0	4	0	4	0	0	0	0	0	0	8
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	4
Total	0	0	13	6	4	0	42	4	4	0	0	0	0	0	0	73

Appendix 6 (7) OD Table compiled from Roadside OD Interview Survey

Station: 19
Purpose: Business
Type of Vehicle: All
Base: Car

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	4	0	0	8	0	0	0	0	0	0	0	0	12
3	0	0	0	0	0	8	297	38	15	0	90	0	0	0	0	448
4	0	0	0	0	0	0	11	0	0	0	4	0	0	0	0	15
5	0	0	0	0	0	0	23	8	0	0	11	0	0	0	0	42
6	0	0	0	0	0	4	4	15	4	0	8	0	0	0	0	35
7	0	4	214	15	15	0	60	327	38	0	4	4	0	11	11	703
8	0	4	38	0	0	8	387	154	26	0	90	4	0	0	0	711
9	0	0	15	8	0	0	109	45	15	4	8	0	0	0	0	204
10	0	0	8	0	4	0	0	11	0	0	0	0	0	0	0	23
11	0	0	34	0	4	0	8	38	11	0	0	0	0	0	4	99
12	0	0	4	0	0	0	0	4	0	0	0	0	0	0	0	8
13	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	4
14	0	0	0	0	0	0	11	0	0	0	4	0	0	0	0	15
15	0	0	0	0	0	0	19	4	0	0	4	0	0	0	0	27
Total	0	8	313	27	23	20	937	644	109	4	227	8	0	11	15	2,346

Appendix 6 (8) OD Table compiled from Roadside OD Interview Survey

Station: 20
Purpose: Business
Type of Vehicle: All
Base: Car

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	2	9	0	0	0	28	0	0	2	2	0	0	0	0	43
3	0	9	132	6	145	4	223	13	0	2	32	11	0	2	6	585
4	0	0	15	0	17	0	48	0	0	0	4	0	0	0	0	84
5	0	24	160	9	50	2	37	0	0	0	2	0	0	0	2	286
6	0	0	6	0	4	0	2	0	0	0	0	0	0	0	0	12
7	0	19	180	22	9	0	11	0	0	0	0	0	0	2	6	249
8	0	0	9	2	0	0	0	0	0	0	0	0	0	0	0	11
9	0	0	2	2	2	0	0	0	0	0	0	0	0	0	0	6
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	4	15	0	0	0	0	0	0	0	0	0	0	2	2	23
12	0	2	4	0	0	0	2	0	0	0	0	0	0	0	0	8
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	6	0	4	0	15	0	0	0	6	0	0	0	0	31
15	0	0	9	0	9	0	39	0	2	0	4	0	0	0	0	63
Total	0	60	547	41	240	6	405	13	2	4	50	11	0	6	16	1,401

Appendix 6 (9) OD Table compiled from Roadside OD Interview Survey

Station: 19 and 20
Purpose: Business
Type of Vehicle: All
Base: Car

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	2	9	4	0	0	36	0	0	2	2	0	0	0	0	55
3	0	9	132	6	145	12	520	51	15	2	123	11	0	2	6	1,034
4	0	0	15	0	17	0	59	0	0	0	8	0	0	0	0	99
5	0	24	160	9	50	2	59	8	0	0	13	0	0	0	2	327
6	0	0	6	0	4	4	6	15	4	0	8	0	0	0	0	47
7	0	23	394	37	24	0	71	327	38	0	4	4	0	13	18	953
8	0	4	46	2	0	8	387	154	26	0	90	4	0	0	0	721
9	0	0	17	10	2	0	109	45	15	4	8	0	0	0	0	210
10	0	0	8	0	4	0	0	11	0	0	0	0	0	0	0	23
11	0	4	49	0	4	0	8	38	11	0	0	0	0	2	6	122
12	0	2	8	0	0	0	2	4	0	0	0	0	0	0	0	16
13	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	4
14	0	0	6	0	4	0	26	0	0	0	10	0	0	0	0	46
15	0	0	9	0	9	0	58	4	2	0	8	0	0	0	0	90
Total	0	68	859	68	263	26	1,341	657	111	8	278	19	0	17	32	3,747

Appendix 6 (10) OD Table compiled from Roadside OD Interview Survey

Station: 19
Purpose: Private
Type of Vehicle: All
Base: Car

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	4	0	0	0	68	8	4	0	45	0	0	0	0	129
4	0	0	0	0	0	0	4	0	0	0	4	0	0	0	0	8
5	0	0	0	0	0	0	11	0	0	0	11	0	0	0	0	22
6	0	0	8	0	0	0	4	26	4	0	0	0	0	0	0	42
7	0	8	132	34	49	0	0	413	60	0	0	0	0	15	23	734
8	0	4	8	0	0	15	199	244	38	26	83	11	0	0	4	632
9	0	0	4	0	0	8	30	53	8	0	19	4	0	0	0	126
10	0	0	8	4	0	0	0	23	8	0	0	0	0	0	0	43
11	0	8	53	15	15	4	0	113	15	0	0	0	0	8	4	235
12	0	0	0	0	4	0	0	4	0	0	0	0	0	0	0	8
13	0	0	0	0	0	0	0	11	0	0	0	0	0	0	0	11
14	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	4
15	0	0	0	0	0	0	11	0	4	0	19	0	0	0	0	34
Total	0	20	217	53	68	27	327	895	141	26	185	15	0	23	31	2,028

Appendix 6 (11) OD Table compiled from Roadside OD Interview Survey

Station: 20
Purpose: Private
Type of Vehicle: All
Base: Car

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	13	0	11	0	6	0	0	0	2	0	0	0	0	32
3	0	9	167	6	143	4	80	9	0	0	22	4	2	6	0	452
4	0	0	6	2	22	0	32	0	0	0	2	0	0	0	0	64
5	0	4	130	9	43	2	15	0	0	0	2	2	0	2	0	209
6	0	0	9	0	2	0	0	0	0	0	0	0	0	0	0	11
7	0	9	58	9	9	0	2	0	0	0	0	0	0	19	0	106
8	0	0	9	0	9	0	0	0	0	0	0	0	0	0	2	20
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	2	13	4	0	0	0	0	0	0	0	0	0	4	4	27
12	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	4
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
14	0	0	2	0	11	0	19	0	0	0	4	0	0	0	0	36
15	0	0	2	0	4	0	26	6	0	0	2	0	0	0	0	40
Total	0	24	411	30	256	6	180	15	0	0	34	6	2	31	8	1,003

Appendix 6 (12) OD Table compiled from Roadside OD Interview Survey

Station: 19 and 20
Purpose: Private
Type of Vehicle: All
Base: Car

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	13	0	11	0	6	0	0	0	2	0	0	0	0	32
3	0	9	170	6	143	4	148	16	4	0	67	4	2	6	0	579
4	0	0	6	2	22	0	36	0	0	0	6	0	0	0	0	72
5	0	4	130	9	43	2	26	0	0	0	13	2	0	2	0	231
6	0	0	16	0	2	0	4	26	4	0	0	0	0	0	0	52
7	0	16	190	42	58	0	2	413	60	0	0	0	0	35	23	839
8	0	4	16	0	9	15	199	244	38	26	83	11	0	0	6	651
9	0	0	4	0	0	8	30	53	8	0	19	4	0	0	0	126
10	0	0	8	4	0	0	0	23	8	0	0	0	0	0	0	43
11	0	10	66	19	15	4	0	113	15	0	0	0	0	12	8	262
12	0	0	2	0	6	0	0	4	0	0	0	0	0	0	0	12
13	0	0	0	0	0	0	0	11	0	0	0	0	0	0	2	13
14	0	0	2	0	11	0	19	0	0	0	8	0	0	0	0	40
15	0	0	2	0	4	0	37	6	4	0	21	0	0	0	0	74
Total	0	43	625	82	324	33	507	909	141	26	219	21	2	55	39	3,026

Appendix 6 (13) OD Table compiled from Roadside OD Interview Survey

Station: 19
Purpose: All
Type of Vehicle: Passenger Car and Jeep
Base: Car

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	3
3	0	0	3	0	0	3	136	13	8	0	45	0	0	0	0	208
4	0	0	0	0	0	0	3	0	0	0	3	0	0	0	0	6
5	0	0	0	0	0	0	16	0	0	0	13	0	0	0	0	29
6	0	0	5	0	0	0	5	27	0	0	0	0	0	0	0	37
7	0	8	149	13	29	0	32	354	37	0	0	5	0	5	24	656
8	0	0	24	3	0	13	309	202	29	13	98	5	0	0	3	699
9	0	0	11	0	0	5	45	45	11	3	16	3	0	0	0	139
10	0	0	5	3	0	0	0	19	8	0	0	0	0	0	0	35
11	0	5	40	8	5	0	8	101	11	0	0	0	0	5	5	188
12	0	0	3	0	3	0	0	5	0	0	0	0	0	0	0	11
13	0	0	0	0	0	0	0	11	0	0	0	0	0	0	0	11
14	0	0	0	0	0	0	5	0	0	0	5	0	0	0	0	10
15	0	0	0	0	0	0	24	8	3	0	16	0	0	0	0	51
Total	0	13	240	27	37	21	586	785	107	16	196	13	0	10	32	2,083

Appendix 6 (14) OD Table compiled from Roadside OD Interview Survey

Station: 20
Purpose: All
Type of Vehicle: Passenger Car and Jeep
Base: Car

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	1	10	0	6	0	13	0	0	0	4	0	0	0	0	34
3	0	7	129	10	115	4	112	6	0	1	26	6	1	6	4	427
4	0	0	7	1	22	0	39	0	0	0	3	0	0	0	0	72
5	0	18	155	10	28	1	28	0	0	0	1	1	0	0	0	242
6	0	0	12	0	3	1	0	0	0	0	0	0	0	0	0	16
7	0	4	105	9	9	0	3	0	0	0	0	0	0	9	0	139
8	0	0	7	0	3	0	0	0	0	0	0	0	0	0	0	10
9	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	2
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	3	16	0	0	0	0	0	0	0	0	0	0	1	3	23
12	0	0	4	0	1	0	1	0	0	0	0	0	0	0	0	6
13	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	2
14	0	0	3	0	7	0	13	0	0	0	1	0	0	0	0	24
15	0	0	9	0	6	0	29	1	1	0	4	0	0	0	0	50
Total	0	33	459	31	200	6	238	7	1	1	39	7	1	16	8	1,047

Appendix 6 (15) OD Table compiled from Roadside OD Interview Survey

Station: 19 and 20
Purpose: All
Type of Vehicle: Passenger Car and Jeep
Base: Car

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	1	10	0	6	0	16	0	0	0	4	0	0	0	0	37
3	0	7	132	10	115	7	248	19	8	1	71	6	1	6	4	635
4	0	0	7	1	22	0	42	0	0	0	6	0	0	0	0	78
5	0	18	155	10	28	1	44	0	0	0	14	1	0	0	0	271
6	0	0	17	0	3	1	5	27	0	0	0	0	0	0	0	53
7	0	12	254	22	38	0	35	354	37	0	0	5	0	14	24	795
8	0	0	31	3	3	13	309	202	29	13	98	5	0	0	3	709
9	0	0	12	1	0	5	45	45	11	3	16	3	0	0	0	141
10	0	0	5	3	0	0	0	19	8	0	0	0	0	0	0	35
11	0	8	56	8	5	0	8	101	11	0	0	0	0	6	8	211
12	0	0	7	0	4	0	1	5	0	0	0	0	0	0	0	17
13	0	0	1	0	0	0	0	11	0	0	0	0	0	0	1	13
14	0	0	3	0	7	0	18	0	0	0	6	0	0	0	0	34
15	0	0	9	0	6	0	53	9	4	0	20	0	0	0	0	101
Total	0	46	699	58	237	27	824	792	108	17	235	20	1	26	40	3,130

Appendix 6 (16) OD Table compiled from Roadside OD Interview Survey

Station: 19
Purpose: All
Type of Vehicle: Bus
Base: Car

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	257	0	0	0	67	0	0	0	0	324
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	11	11	0	0	0	0	0	0	0	0	22
7	0	0	179	0	0	0	22	313	56	0	0	0	0	11	0	581
8	0	0	0	0	0	0	436	34	0	0	22	0	0	0	0	492
9	0	0	0	0	0	0	190	22	0	0	0	0	0	0	0	212
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	34	0	0	0	0	34	0	0	0	0	0	0	0	68
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	11
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	213	0	0	11	927	403	56	0	89	0	0	11	0	1,710

Appendix 6 (17) OD Table compiled from Roadside OD Interview Survey

Station: 20
Purpose: All
Type of Vehicle: Bus
Base: Car

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	8	0	0	0	8	0	0	0	0	0	0	0	0	16
3	0	0	90	0	106	0	147	0	0	0	8	8	0	0	0	359
4	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	8
5	0	0	98	0	8	0	0	0	0	0	8	0	0	0	0	114
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	237	8	8	0	0	0	0	0	0	0	0	0	0	253
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	8
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	433	8	122	0	171	0	0	0	16	8	0	0	0	758

Appendix 6 (18) OD Table compiled from Roadside OD Interview Survey

Station: 19 and 20
Purpose: All
Type of Vehicle: Bus
Base: Car

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	8	0	0	0	8	0	0	0	0	0	0	0	0	16
3	0	0	90	0	106	0	404	0	0	0	75	8	0	0	0	683
4	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	8
5	0	0	98	0	8	0	0	0	0	0	8	0	0	0	0	114
6	0	0	0	0	0	11	11	0	0	0	0	0	0	0	0	22
7	0	0	416	8	8	0	22	313	56	0	0	0	0	11	0	834
8	0	0	0	0	0	0	436	34	0	0	22	0	0	0	0	492
9	0	0	0	0	0	0	190	22	0	0	0	0	0	0	0	212
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	34	0	0	0	0	34	0	0	0	0	0	0	0	68
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	19	0	0	0	0	0	0	0	0	19
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	646	8	122	11	1,098	403	56	0	105	8	0	11	0	2,468

Appendix 6 (19) OD Table compiled from Roadside OD Interview Survey

Station: 19
Purpose: All
Type of Vehicle: Light Truck
Base: Car

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	3
3	0	0	0	0	0	3	86	14	6	0	28	0	0	0	0	137
4	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	6
5	0	0	0	0	0	0	17	3	0	0	3	0	0	0	0	23
6	0	0	3	0	0	0	0	3	3	0	6	0	0	0	0	15
7	0	3	55	14	8	0	14	155	25	0	0	0	0	8	6	288
8	0	3	11	0	0	6	116	72	19	6	22	3	0	0	0	258
9	0	0	3	3	0	0	22	17	8	0	11	0	0	0	0	64
10	0	0	6	0	0	0	0	8	0	0	0	0	0	0	0	14
11	0	0	22	3	8	3	0	8	6	0	0	0	0	3	0	53
12	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	3
13	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3
14	0	0	0	0	0	0	0	0	3	0	3	0	0	0	0	6
15	0	0	0	0	0	0	6	3	0	0	3	0	0	0	0	12
Total	0	6	100	20	16	12	270	286	70	6	79	3	0	11	6	885

Appendix 6 (20) OD Table compiled from Roadside OD Interview Survey

Station: 20
Purpose: All
Type of Vehicle: Light Truck
Base: Car

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	5	0	2	0	5	0	0	2	0	0	0	0	0	14
3	0	5	80	5	84	2	85	7	0	0	7	5	0	0	2	282
4	0	0	7	0	16	0	17	0	0	0	5	0	0	0	0	45
5	0	2	80	10	38	2	14	0	0	0	0	0	0	2	2	150
6	0	0	3	0	2	0	2	0	0	0	0	0	0	0	0	7
7	0	9	33	10	3	0	5	0	0	0	0	0	0	9	7	76
8	0	0	7	0	3	0	0	0	0	0	0	0	0	0	2	12
9	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	4
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	2	9	3	0	0	0	0	0	0	0	0	0	3	2	19
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	3	0	3	0	12	0	0	0	7	0	0	0	0	25
15	0	0	2	0	3	0	21	5	0	0	0	0	0	0	0	31
Total	0	18	229	30	156	4	161	12	0	2	19	5	0	14	15	665

Appendix 6 (21) OD Table compiled from Roadside OD Interview Survey

Station: 19 and 20
Purpose: All
Type of Vehicle: Light Truck
Base: Car

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	5	0	2	0	8	0	0	2	0	0	0	0	0	17
3	0	5	80	5	84	5	171	21	6	0	35	5	0	0	2	419
4	0	0	7	0	16	0	23	0	0	0	5	0	0	0	0	51
5	0	2	80	10	38	2	31	3	0	0	3	0	0	2	2	173
6	0	0	6	0	2	0	2	3	3	0	6	0	0	0	0	22
7	0	12	88	24	11	0	19	155	25	0	0	0	0	17	13	364
8	0	3	18	0	3	6	116	72	19	6	22	3	0	0	2	270
9	0	0	3	5	2	0	22	17	8	0	11	0	0	0	0	68
10	0	0	6	0	0	0	0	8	0	0	0	0	0	0	0	14
11	0	2	31	6	8	3	0	8	6	0	0	0	0	6	2	72
12	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	3
13	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	3
14	0	0	3	0	3	0	12	0	3	0	10	0	0	0	0	31
15	0	0	2	0	3	0	27	8	0	0	3	0	0	0	0	43
Total	0	24	329	50	172	16	431	298	70	8	98	8	0	25	21	1,550

Appendix 6 (22) OD Table compiled from Roadside OD Interview Survey

Station: 19
Purpose: All
Type of Vehicle: Heavy Truck
Base: Car

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	4
3	0	0	0	0	0	0	29	12	4	0	21	0	0	0	0	66
4	0	0	0	0	0	0	4	0	0	0	4	0	0	0	0	8
5	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4
6	0	0	0	0	0	0	0	4	4	0	0	0	0	0	0	8
7	0	0	62	12	12	0	4	62	12	0	4	0	0	4	4	176
8	0	4	8	0	0	0	12	37	8	0	8	4	0	0	0	81
9	0	0	8	4	0	0	4	29	0	0	0	0	0	0	0	45
10	0	0	4	0	4	0	0	0	0	0	0	0	0	0	0	8
11	0	0	17	4	4	0	0	12	4	0	0	0	0	0	0	41
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	4	99	24	20	0	53	160	32	0	37	4	0	4	4	441

Appendix 6 (23) OD Table compiled from Roadside OD Interview Survey

Station: 20
Purpose: All
Type of Vehicle: Heavy Truck
Base: Car

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	3	0	16	3	0	0	0	0	0	0	0	22
3	0	0	25	0	28	0	68	6	0	0	9	0	0	0	0	136
4	0	0	6	0	0	0	37	0	0	0	3	0	0	0	0	46
5	0	3	16	0	9	3	0	0	0	0	0	0	0	0	0	31
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	25	47	12	3	0	3	0	0	0	0	0	0	0	6	96
8	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	3
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	3
15	0	0	0	0	0	0	9	0	0	0	3	0	0	0	0	12
Total	0	31	94	15	43	3	136	9	0	0	15	0	0	0	6	352

Appendix 6 (24) OD Table compiled from Roadside OD Interview Survey

Station: 19 and 20
Purpose: All
Type of Vehicle: Heavy Truck
Base: Car

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	4	3	0	16	3	0	0	0	0	0	0	0	26
3	0	0	25	0	28	0	97	18	4	0	30	0	0	0	0	202
4	0	0	6	0	0	0	41	0	0	0	7	0	0	0	0	54
5	0	3	16	0	9	3	0	4	0	0	0	0	0	0	0	35
6	0	0	0	0	0	0	0	4	4	0	0	0	0	0	0	8
7	0	25	109	24	15	0	7	62	12	0	4	0	0	4	10	272
8	0	4	8	3	0	0	12	37	8	0	8	4	0	0	0	84
9	0	0	8	4	0	0	4	29	0	0	0	0	0	0	0	45
10	0	0	4	0	4	0	0	0	0	0	0	0	0	0	0	8
11	0	0	17	4	4	0	0	12	4	0	0	0	0	0	0	41
12	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	3
15	0	0	0	0	0	0	9	0	0	0	3	0	0	0	0	12
Total	0	35	193	39	63	3	189	169	32	0	52	4	0	4	10	793

Appendix 6 (25) OD Table compiled from Roadside OD Interview Survey

Station: 19
Purpose: All
Type of Vehicle: All
Base: Car

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	4	0	0	6	0	0	0	0	0	0	0	0	10
3	0	0	3	0	0	6	508	39	18	0	161	0	0	0	0	735
4	0	0	0	0	0	0	13	0	0	0	7	0	0	0	0	20
5	0	0	0	0	0	0	33	7	0	0	16	0	0	0	0	56
6	0	0	8	0	0	11	16	34	7	0	6	0	0	0	0	82
7	0	11	445	39	49	0	72	884	130	0	4	5	0	28	34	1,701
8	0	7	43	3	0	19	873	345	56	19	150	12	0	0	3	1,530
9	0	0	22	7	0	5	261	113	19	3	27	3	0	0	0	460
10	0	0	15	3	4	0	0	27	8	0	0	0	0	0	0	57
11	0	5	113	15	17	3	8	155	21	0	0	0	0	8	5	350
12	0	0	3	0	3	0	0	8	0	0	0	0	0	0	0	14
13	0	0	0	0	0	0	0	11	0	0	3	0	0	0	0	14
14	0	0	0	0	0	0	16	0	3	0	8	0	0	0	0	27
15	0	0	0	0	0	0	30	11	3	0	19	0	0	0	0	63
Total	0	23	652	71	73	44	1,836	1,634	265	22	401	20	0	36	42	5,119

Appendix 6 (26) OD Table compiled from Roadside OD Interview Survey

Station: 20
Purpose: All
Type of Vehicle: All
Base: Car

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	1	23	0	11	0	42	3	0	2	4	0	0	0	0	86
3	0	12	324	15	333	6	412	19	0	1	50	19	1	6	6	1,204
4	0	0	20	1	38	0	101	0	0	0	11	0	0	0	0	171
5	0	23	349	20	83	6	42	0	0	0	9	1	0	2	2	537
6	0	0	15	0	5	1	2	0	0	0	0	0	0	0	0	23
7	0	38	422	39	23	0	11	0	0	0	0	0	0	18	13	564
8	0	0	14	3	6	0	0	0	0	0	0	0	0	0	2	25
9	0	0	1	3	2	0	0	0	0	0	0	0	0	0	0	6
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	5	25	3	0	0	0	0	0	0	0	0	0	4	5	42
12	0	3	4	0	1	0	1	0	0	0	0	0	0	0	0	9
13	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	2
14	0	0	6	0	10	0	36	0	0	0	8	0	0	0	0	60
15	0	0	11	0	9	0	59	6	1	0	7	0	0	0	0	93
Total	0	82	1,215	84	521	13	706	28	1	3	89	20	1	30	29	2,822

Appendix 6 (27) OD Table compiled from Roadside OD Interview Survey

Station: 19 and 20
Purpose: All
Type of Vehicle: All
Base: Car

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	1	23	4	11	0	48	3	0	2	4	0	0	0	0	96
3	0	12	327	15	333	12	920	58	18	1	211	19	1	6	6	1,939
4	0	0	20	1	38	0	114	0	0	0	18	0	0	0	0	191
5	0	23	349	20	83	6	75	7	0	0	25	1	0	2	2	593
6	0	0	23	0	5	12	18	34	7	0	6	0	0	0	0	105
7	0	49	867	78	72	0	83	884	130	0	4	5	0	46	47	2,265
8	0	7	57	6	6	19	873	345	56	19	150	12	0	0	5	1,555
9	0	0	23	10	2	5	261	113	19	3	27	3	0	0	0	466
10	0	0	15	3	4	0	0	27	8	0	0	0	0	0	0	57
11	0	10	138	18	17	3	8	155	21	0	0	0	0	12	10	392
12	0	3	7	0	4	0	1	8	0	0	0	0	0	0	0	23
13	0	0	1	0	0	0	0	11	0	0	3	0	0	0	1	16
14	0	0	6	0	10	0	52	0	3	0	16	0	0	0	0	87
15	0	0	11	0	9	0	89	17	4	0	26	0	0	0	0	156
Total	0	105	1,867	155	594	57	2,542	1,662	266	25	490	40	1	66	71	7,941

Appendix 6 (28) OD Table compiled from Roadside OD Interview Survey

Station: 19
Purpose: All
Type of Vehicle: All
Base: PCU

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	10	0	0	8	0	0	0	0	0	0	0	0	18
3	0	0	3	0	0	8	723	64	27	0	240	0	0	0	0	1,065
4	0	0	0	0	0	0	22	0	0	0	13	0	0	0	0	35
5	0	0	0	0	0	0	42	15	0	0	18	0	0	0	0	75
6	0	0	10	0	0	17	22	42	15	0	9	0	0	0	0	115
7	0	13	655	64	71	0	96	1,211	189	0	10	5	0	44	43	2,401
8	0	15	61	3	0	22	1,167	454	78	22	184	20	0	0	3	2,029
9	0	0	36	15	0	5	373	176	23	3	33	3	0	0	0	667
10	0	0	24	3	10	0	0	31	8	0	0	0	0	0	0	76
11	0	5	167	23	27	5	8	194	30	0	0	0	0	10	5	474
12	0	0	3	0	3	0	0	10	0	0	0	0	0	0	0	16
13	0	0	0	0	0	0	0	11	0	0	5	0	0	0	0	16
14	0	0	0	0	0	0	22	0	5	0	10	0	0	0	0	37
15	0	0	0	0	0	0	33	13	3	0	21	0	0	0	0	70
Total	0	33	959	118	111	57	2,516	2,221	378	25	543	28	0	54	51	7,094

Appendix 6 (29) OD Table compiled from Roadside OD Interview Survey

Station: 20
Purpose: All
Type of Vehicle: All
Base: PCU

Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	1	30	0	17	0	73	8	0	3	4	0	0	0	0	136
3	0	15	447	18	470	7	630	32	0	1	71	26	1	6	7	1,731
4	0	0	33	1	46	0	169	0	0	0	18	0	0	0	0	267
5	0	29	462	25	120	12	49	0	0	0	13	1	0	3	3	717
6	0	0	17	0	6	1	3	0	0	0	0	0	0	0	0	27
7	0	80	628	66	33	0	18	0	0	0	0	0	0	23	26	874
8	0	0	18	8	8	0	0	0	0	0	0	0	0	0	3	37
9	0	0	1	4	3	0	0	0	0	0	0	0	0	0	0	8
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	6	30	5	0	0	0	0	0	0	0	0	0	6	6	53
12	0	8	4	0	1	0	1	0	0	0	0	0	0	0	0	14
13	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	2
14	0	0	8	0	12	0	51	0	0	0	12	0	0	0	0	83
15	0	0	12	0	11	0	83	9	1	0	12	0	0	0	0	128
Total	0	139	1,691	127	727	20	1,077	49	1	4	130	27	1	38	46	4,077