

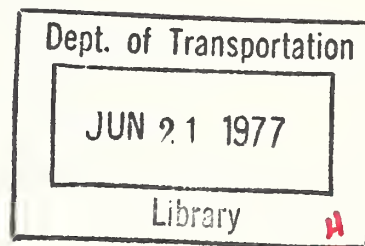
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PRT IMPACT STUDY
PRE-PRT PHASE
Volume I -- Travel Analysis

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WEST VIRGINIA UNIVERSITY
MORGANTOWN WV 26506



MARCH 1976

FINAL REPORT

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16. Abstract <p>This report describes the analysis performed on travel data collected for the Pre-PRT Impact Study. The data analyzed consists of travel behavior, travel patterns, model utilization and travel costs of various modes of travel in Morgantown before the revenue operation of the PRT in Morgantown.</p> <p>The analysis resulted in estimates of travel by various subpopulations by automobile, university bus and city/county bus systems in Morgantown. Further analysis conducted yielded estimates of traffic flow between various activity centers in Morgantown. Trip generation, trip distribution and modal split were estimated for Morgantown PRT corridor travel before the revenue operation of the PRT. This analysis will serve as a baseline for comparison with Post-PRT travel analysis and will help in estimating the overall impact of PRT in Morgantown.</p> <p>This is the first in a series of three published volumes. Volume II: Data Collection Procedure and Coding Manual; Volume III: Frequency Tabulations from Four Transportation-Related Surveys.</p>			
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PREFACE

In October, 1975, the Personal Rapid Transit (PRT), a revolutionary public transportation system built as a research development and demonstration project by the Urban Mass Transportation Administration, commenced passenger service in Morgantown, WV. Because the PRT is the first system of its kind ever operated in a city, it provides an opportunity to study the interaction between a new mode and its service area.

The PRT Impact Study was developed to record the effects of PRT system operation in order to provide information useful in assisting cities to determine if they could utilize such a PRT system to satisfy their transportation needs. The study consists of two data collection phases; the Pre-PRT Phase, prior to passenger service, and the Post-PRT Phase.

The PRT Impact Study, Pre-PRT Phase, has been completed and is reported in three volumes;

- I --Travel Analysis,
- II --Data Collection Procedure and Coding
Manual,
- III--Frequency Tabulations from Four
Transportation-Related Surveys.

This work was sponsored by the Transportation Systems Center, United States Department of Transportation, Cambridge, MA, under Contract Number DOT-TSC-985.

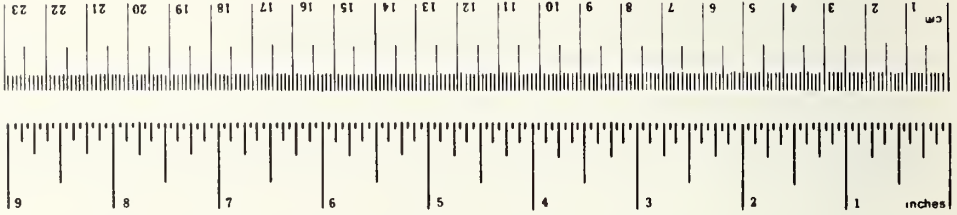
Several agencies and individuals cooperated in making the PRT Impact Study, Pre-PRT Phase possible. They include Mr. K. H. Schaeffer and Dr. Mary Stearns of TSC, Mr. Doc Ashburn, Manager of the City of Morgantown, and Mr. Richard Davies, President of Monongalia County Court. The institutional Research Office of WVU cooperated in making data for completing the study.

The students who worked with our staff included Mr. Charles Bao, Mr. A. Z. Sohrwardy, Ms. Judy Brannon, and Ms. Barbara Slonneger. Ms. Charmaine DuBois and Ms. Donna Maughan were responsible for the typing.

METRIC CONVERSION FACTORS

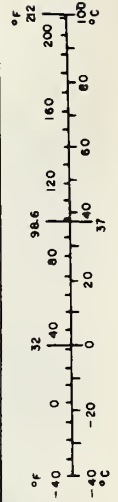
Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
in	inches	2.5	centimeters	cm
ft	feet	30	meters	m
yd	yards	0.9	kilometers	km
mi	miles	1.6		
AREA				
in ²	square inches	6.5	square centimeters	cm ²
ft ²	square feet	0.09	square meters	m ²
yd ²	square yards	0.8	square meters	m ²
mi ²	square miles	2.6	square kilometers	km ²
	acres	0.4	hectares	ha
MASS (weight)				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
VOLUME				
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft ³	cubic feet	0.03	cubic meters	m ³
yd ³	cubic yards	0.76	cubic meters	m ³
TEMPERATURE (exact)				
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
AREA				
cm ²	square centimeters	0.16	square inches	in ²
m ²	square meters	1.2	square yards	yd ²
ha	hectares (10,000 m ²)	0.4	square miles	mi ²
		2.5	acres	
MASS (weight)				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
VOLUME				
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m ³	cubic meters	35	cubic feet	ft ³
m ³	cubic meters	1.3	cubic yards	yd ³
TEMPERATURE (exact)				
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



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1. INTRODUCTION

A new and revolutionary public transportation system, the Personal Rapid Transit (PRT), began passenger service operation in Morgantown, WV, in October 1975. In order to lay the groundwork for assessing the impact of the PRT on Morgantown, a substantial amount of data were collected in an attempt to capture the state of transportation-related conditions prior to passenger service operation of the PRT. This report contains an analysis of the data which were collected prior to the commencement of passenger service. The data described in this report, together with the anticipated Post-PRT Phase data collection, will allow assessment of the PRT system operation and its impacts on the city of Morgantown. The completed assessment will provide other cities, considering implementation of a PRT system, sufficiently detailed information to determine whether they can effectively and efficiently utilize a Morgantown PRT system to satisfy their transportation needs.

1.1 Organization of the Report

The organization of this report is as follows: The remainder of Chapter 1 is an overview of the study. Chapter 2 contains a description of the type of data collected during the Pre-PRT Phase. Chapter 3 describes the analysis of the data. Models describing the traffic flows are discussed in Chapter 4. The Appendixes contains additional tables.

1.2 Morgantown's Need for Public Transportation

Morgantown is a university city of about 30,000 population. West Virginia University (WVU) is the largest employer in the area, and some 16,000 - 17,000 students attend WVU in Morgantown. All of the WVU Buildings were once located in a compact area contiguous with Morgantown's Central Business District (CBD). However, as WVU expanded, new buildings which included classrooms, dormitory facilities, athletic facilities and a Medical Center, became known as the Evansdale Campus. The original buildings near the CBD became known as the Main (or Downtown) Campus.

In the spring of 1975, WVU was operating a fleet of about 16 buses, one of the largest campus transportation systems in the United States. Most of the buses were used to transport people between the Main and Evansdale Campuses, but some were also used for shuttle service within the spacious Evansdale Campus.

Morgantown has only two major north-south thoroughfares: University Avenue and Beechurst Avenue-Monongahela Boulevard. These two thoroughfares connect the two Campuses, and also must be used to reach many other activity centers. University buses use these thoroughfares, and in general, WVU-related travel causes traffic to peak on these roads several times a day because of class changes. Travel time between the two campuses sometimes reaches 15 to 20 minutes. Parking is scarce on both Campuses and also in the CBD.

1.3 The Morgantown PRT System

A Personal Rapid Transit (PRT) system has been built in Morgantown, WV as an Urban Mass Transportation Administration (UMTA) Research, Development, and Demonstration project. Phase 1 of the system, consisting of three stations 5.4 miles of single-lane guideway and 45 vehicles, has been completed and began passenger service in October 1975. The three Phase I stations are at Walnut Street in the CBD, Beechurst Avenue on the Main Campus, and the Engineering Sciences Building on the Evansdale Campus. The proposed Phase 2 extension of the system would provide two additional stations - at the Towers, the dormitory facility on the Evansdale Campus, and the other at the Medical Center. Figure 1.1 shows the route and the station location for the PRT system.

The Morgantown PRT is a computer-controlled, fully automated, two-mode (schedule/demand), self-service transportation system which utilizes electrically powered, rubber-tired vehicles operating on a dedicated guideway. The vehicles are climate-controlled with dimensions of 15.5 feet in length, 9 feet in height, and 6 feet in width, and carry 8 seated passengers and 12 standees. The vehicles operate at a minimum headway of 15 seconds and at speeds up to 30 mph on 10% grades. All weather operation is provided by means of a guideway heating system to maintain the running surfaces free of ice and snow.

1.4 Modal Utilization in Morgantown

Morgantown, located in Monongalia County, lies in a valley along the Monongahela River. The city has very few roads running in the north-south direction. The most heavily used of the north-south arteries is Beechurst Avenue, which is essentially a two-lane road, although its north end extension, Monongahela Boulevard, is four lanes wide. Most other north-south traffic is carried by the heavily-used University Avenue, a two-lane road situated east of the Beechurst-Monongahela route at a slightly higher elevation. A third north-south route, which sees relatively light usage, is the route along Willowdale and Stewart Streets, a two-lane route between the Medical Center and the Main Campus. These three routes are essentially the only routes between the Main Campus and the Evansdale Campus, and also they must be used for all travel across Morgantown in a north-south direction.

The private automobile is the primary mode of transportation in Morgantown. Automobiles are used by the students, faculty and staff of WVU, as well as by the non-WVU related residents of the area. However, parking is in short supply in the CBD and at most locations on the WVU campus, being particularly limited at the Main Campus.

Prior to the advent of the PRT, most student trips within the WVU Campuses were made by University bus. WVU operates a fleet of approximately 16 regularly scheduled buses, each bus having a seating capacity of 45 to 55. The University buses serve all major activity centers on the Evansdale Campus and stop at Campus Drive near the Main Campus. Passengers may get on or off University buses only at designated stops.

The City of Morgantown and Monongalia County operate separate transit systems. Both systems consist of minibuses of 22 seats capacity. The City buses serve all parts of Morgantown proper from the CBD. The

City buses run approximately hourly, except they ordinarily do not operate in the evening nor on Sunday. Monongalia County Transit System provides transportation to and from the Morgantown CBD for those parts of Monongalia County outside the City of Morgantown. Morgantown is the county seat, the largest community in the county, and boasts the best medical facilities in the county. Both City and County buses pick up and discharge passengers anywhere along their routes.

Because of Morgantown's hilly terrain, the bicycle is seldom used as a mode of transportation.

The PRT will have an impact on the entire greater Morgantown area. For convenience in describing travel, the Morgantown area was divided into 46 zones as shown in Figure 1.2. The zonal boundaries were based on homogeneous land use, topographic considerations, and uniform socio-economic characteristics.

The study efforts were concentrated where the PRT is expected to have the biggest impact. Areas within walking distance of the PRT stations, nominally within about a one-quarter mile radius, are expected to be most affected. The collection of zones within walking distance of the stations were designated as the Primary Market Area (PMA). Those zones constituting the PMA are indicated in Figure 1.3.

Also, mass transit routes with which the PRT will be competitive were singled out for special attention. These mass transit routes included all University bus routes, the Suncrest route of the City bus (which runs between the CBD, Zone 1 and Zone 15), and the Star City route of the County bus (which runs between the CBD and Zones 45 and 14).

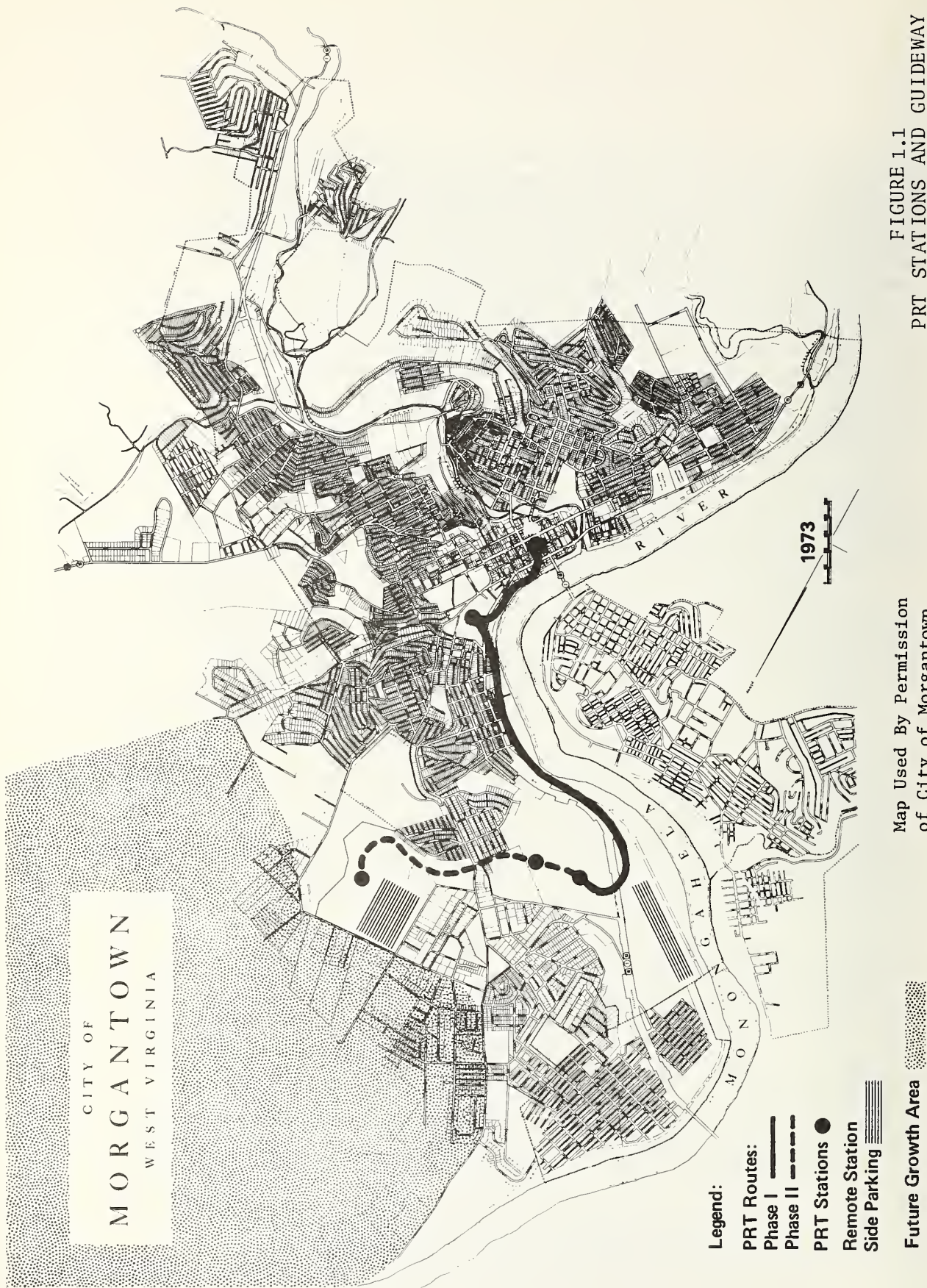
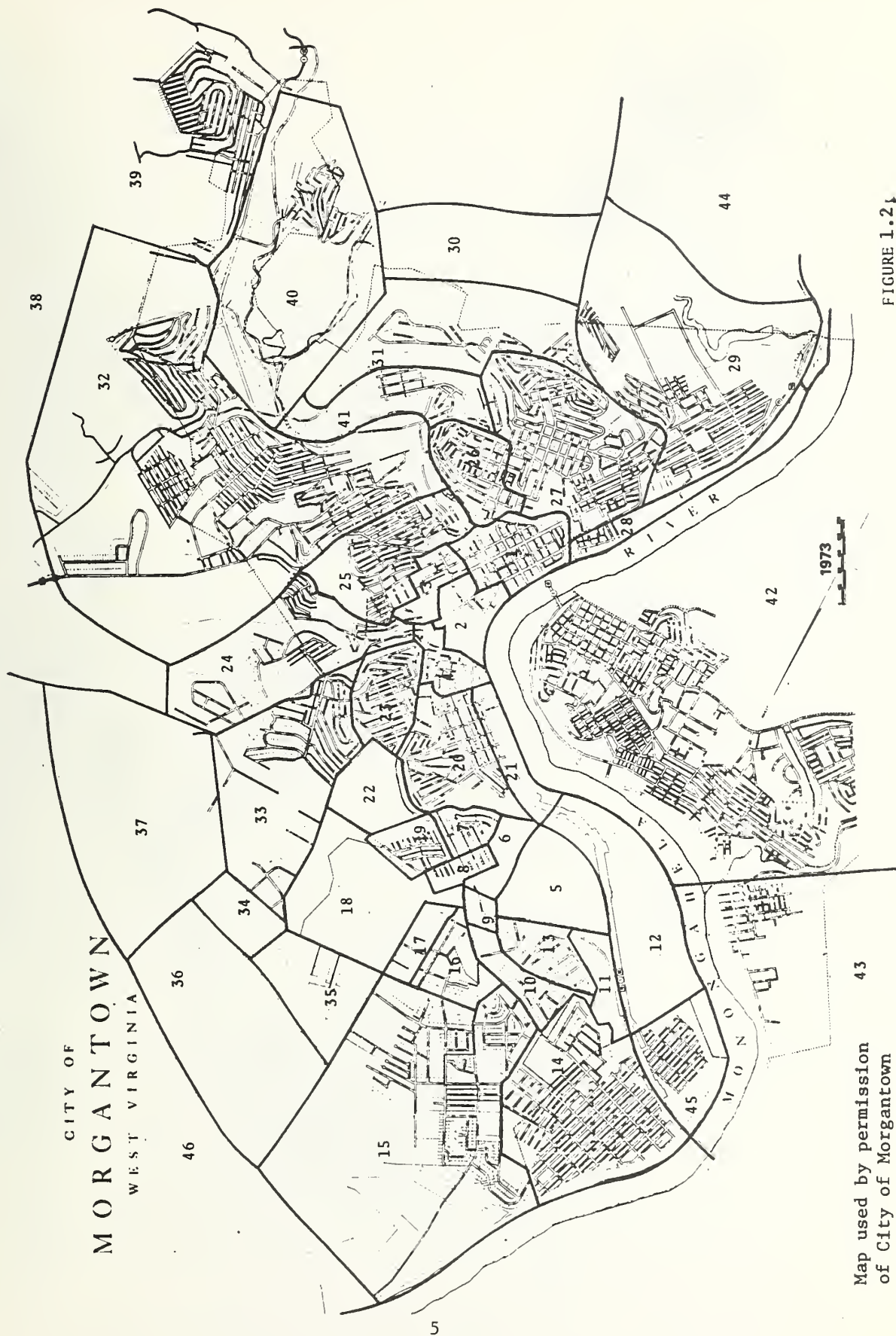


FIGURE 1.1
PRT STATIONS AND GUIDEWAY

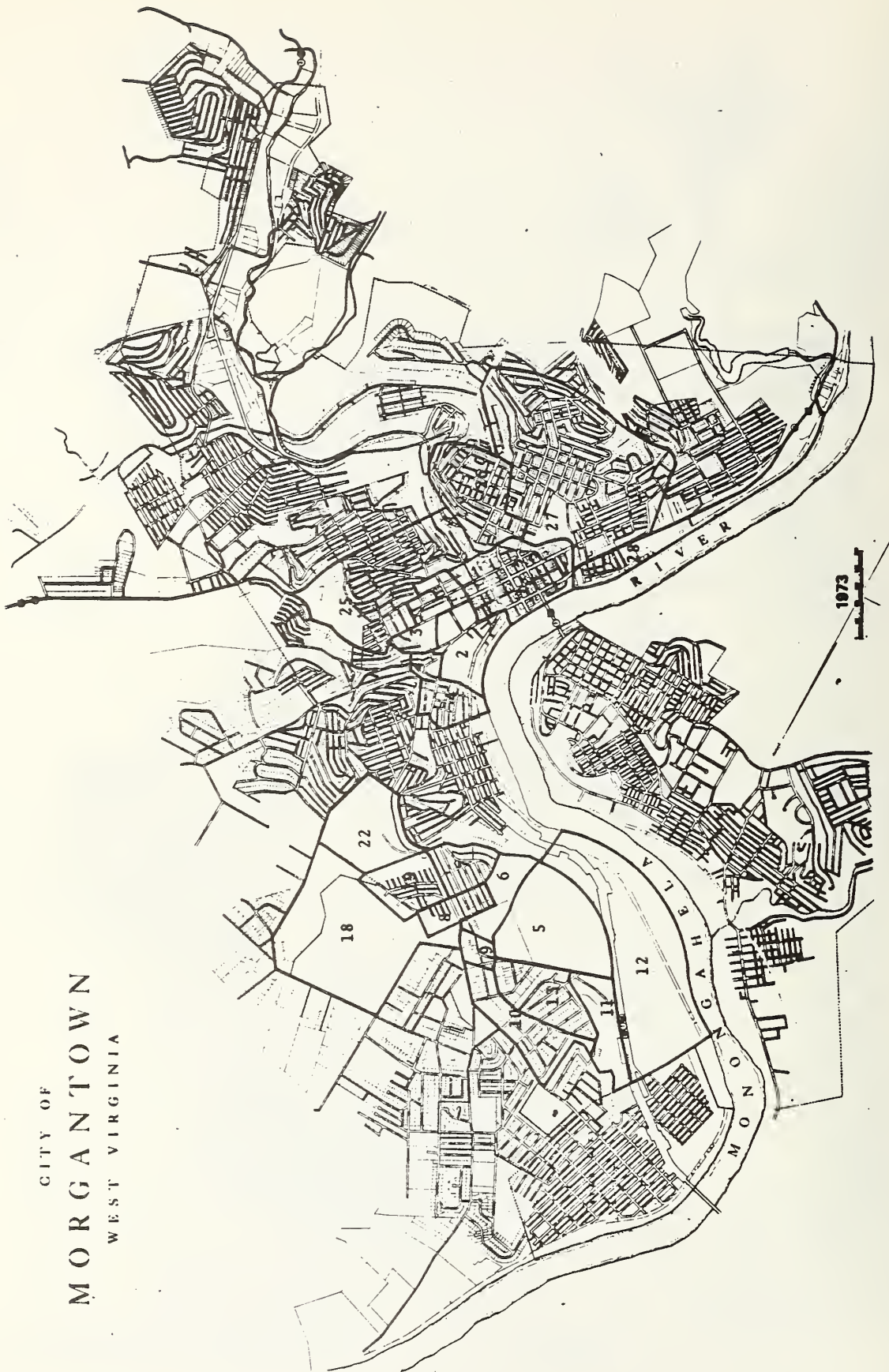
Map Used By Permission
of City of Morgantown



Map used by permission
of City of Morgantown

FIGURE 1.2
ZONAL MAP OF MORGANTOWN

CITY OF
MORGANTOWN
WEST VIRGINIA



Map used by permission
of City of Morgantown

FIGURE 1.3
PRIMARY MARKET AREA OF THE PRT

2. DATA COLLECTION

During the Pre-PRT phase, attempts were made to collect data concerning various transportation-related variables before passenger operation of the PRT. The opening of the PRT to the public was expected to have an almost immediate impact on travel behavior and patterns, and thus it was imperative that the base line data affected by the presence of WVU students be collected while the University was in regular session. Since the PRT opening was originally scheduled for August, 1975, most of the data had to be collected during the time period March¹⁰ through May 5, 1975, in order to insure that WVU would be in regular session and no unusual circumstances would occur which might bias the data.

To some extent it is difficult to define the exact needs of such data for evaluating the impact of a new technology mode. The Morgantown area had never previously been studied extensively as the subject of a transportation study.

Pre-PRT data collection included data ranging from population estimates to cost estimates for utilizing automobiles and mass transit modes in Morgantown. Based on the objective of the study to analyze the impact of a new mode, the data needs for the study were classified into four categories. They were:

- a) Travel behavior and travel patterns,
- b) Modal Utilization,
- c) Transportation Costs, and
- d) Socio-economic data.

Details of actual procedures and questionnaires utilized for various surveys and other techniques utilized for this data collection are described in "PRT IMPACT STUDY, Pre-PRT Data Collection Procedures and Coding Manual", West Virginia University, 1975. The various items of data collected for each category of data are summarized in the following sections.

2.1 Travel Behavior and Travel Patterns

Morgantown has a unique blend of residents consisting of students of West Virginia University, faculty/staff of West Virginia University and other residents of Morgantown. Each of these groups are known to behave differently as far as transportation needs and usage are concerned. This is due to socio-economic differences and different travel needs and travel patterns.

The study was concentrated in the Primary Market Area (PMA) of Morgantown. However, potential riders of the PRT system could conceivably be living outside the PMA. Based on these requirements, travel behavior data was collected utilizing the following techniques:

a) Telephone Interview Survey

Persons residing in the PMA were telephoned at home and asked about the vehicular trips they had made the previous day. Questions regarding the socio-economic status were also asked. There were 1,220 respondents to this survey, including students of West Virginia University and other residents.

b) Faculty/Staff Mailback

A mailback questionnaire was distributed to WVU employees with instructions to list trips made on May 1, 1975. The respondents included residents of PMA and other areas. 1,028 respondents reported a total of 3,065 vehicular trips.

c) University On-Board Survey

Persons riding the University buses were asked to fill out a self-administered questionnaire which asked about the trip in progress, as well as demographic information. There were 1,740 respondents.

d) City and County Bus On-Board Survey

Persons riding on the Suncrest route of the City bus and on the Star City route of the County bus were asked to fill out a questionnaire similar to that used in the University On-Board Survey. There were 63 respondents on the City bus and 92 respondents on the County bus.

e) Potential Demand for Student PRT Travel

An estimate was developed of maximum potential demand for PRT travel by WVU students. The demand estimates were generated by a previously established procedure which takes into account student's class schedules and residential locations. The demand estimates and the procedure for generating them are summarized in "PRT IMPACT STUDY, Pre-PRT Data Collection Procedures and Coding Manual", West Virginia University, 1975.

2.2 Modal Utilization

The travel behavior and travel pattern data indicated the level of utilization of various modes by individuals. The data collected under modal utilization reflects the volume of total usage of these modes. Data for three modes utilized in Morgantown was collected using the following techniques for various modes.

1. Automobiles

The level of automobile usage was studied in terms of volumes, speeds and occupancy. Directional traffic counts on Beechurst Avenue and University Avenue were collected by automatic traffic recorders for a period of one week.

Automobile speed data was collected for various times of day for travel between the two campuses based on a travel time study. This data resulted in average speeds of travel by time of day.

An intercept survey was conducted to determine the average occupancy of automobile users in the corridor. The respondents who stopped at traffic signals were asked about the origin and destination of the trip in progress and the vehicular occupancy was noted.

2. University Buses

The extent of the use of University buses was determined by utilizing a ridership survey. The number of riders getting on and off

University buses were noted at various stops of the University bus. The arrival and departure times were noted at various stops of the University Bus and were utilized to compute speeds of the University bus.

3. City and County Bus System

A Ridership Survey similar to the University Ridership Survey was conducted to determine the extent of usage of these modes and the speeds of City and County buses.

2.3 Transportation Costs

Automobile operating costs on a per mile basis were computed based on gasoline costs prevailing in Morgantown during April 1975. Operating and maintenance costs were estimated by interviewing automobile dealers and automotive repair shops. Insurance costs, slightly lower in Morgantown than elsewhere, were collected from insurance agencies. The cost of accidents occurring on routes which are likely to be affected by the PRT were estimated from police records for the time period between 1972-1975.

Parking cost data was collected from a Parking Survey. This survey also gathered information about the average time to park within the CBD and other areas within the PMA.

Data on operation and maintenance for the University Bus and City/County Bus Systems was available from the operators, who also provided the schedules and fares for their systems.

2.4 Socio-economic Data

An estimate of the population of Morgantown by zone was obtained from 1970 U.S. Census Records. The student population residing in each zone was estimated from WVU enrollment records for March, 1975. The work and residential locations of WVU employees were projected from a sample drawn from the 1974-1975 WVU Telephone Directory.

An estimate of the number of persons working in each PMA Zone was developed from information obtained from the West Virginia Department of Employment Security, WVU Institutional Research, and the previously mentioned sample from the WVU telephone directory.

3. DATA ANALYSIS

The data collected during the course of the study has been utilized for analysis at two levels. At the first level, records of travel behavior of residents were analyzed. The analysis at this level indicates the pattern of transportation usage by various population segments. The data utilized for this analysis consists of the Telephone Interview Survey, Faculty/Staff Mailback Survey and the On-Board Surveys. Analysis at this level also includes the extent of modal utilization in terms of traffic volume and cost related items.

At the second level of analysis, the data collected under various items was combined to reflect traffic flows occurring in Morgantown. Mathematical models developed to describe the traffic flows based on demand and supply variables are analyzed at this level. The objective of this level of analysis is to estimate traffic flows for travel in Morgantown, which could be compared with Post-PRT traffic flows and help in estimating the impact of the PRT in Morgantown.

Items analyzed at the first level are such that similar studies during the Post-PRT phase can yield information which could be used to evaluate the impact of PRT in Morgantown. The travel behavior data resulting from this analysis could be utilized for the development of traffic flow models. In an attempt to simplify the analysis procedure it was assumed that Pre-PRT travel behavior of Morgantown residents is expressed in their modal usage.

The cost related data collected during this phase could conceivably be duplicated, and direct comparisons and the measure of impact of PRT on the level of usage of other modes because of their costs can be analyzed. The remainder of Chapter 3 describes the analysis of the data on the first level, constituting analysis of various surveys and level of utilization of various modes of travel in Morgantown.

3.1 Telephone Interview Survey

3.1.1 Respondent-oriented Analysis

A random sample of telephone numbers of residents of WVU dormitories was drawn from the directory of the West Virginia University housing office, and a second random sample of telephone numbers was taken from Polk's 1974 Morgantown City Directory. There were 580 respondents from the former sample and 640 respondents from the latter. The relationship of the respondent proportions to the population proportions is given in Table 3.1. Note that 47.5 percent of the Telephone Interview Survey respondents lived in WVU dormitories while only 20.2 percent of the persons residing in the PMA lived in WVU dormitories.

The persons not living in WVU dormitories might be further stratified as shown in Table 3.2, even though this was not done before the sample was drawn. Taking the population proportions as the expected proportions and the Telephone Interview Survey proportions as the observed proportions, chi-square is computed to be 27.24, which is highly

TABLE 3.1
COMPARISON OF PROPORTION OF TELEPHONE-INTERVIEW SURVEY
RESPONDENTS LIVING IN WVU DORMITORIES WITH PROPORTION
OF PMA RESIDENTS LIVING IN WVU DORMITORIES

	<u>Telephone Interview Survey Respondents</u>	<u>Percent</u>	<u>Population</u>	<u>Percent</u>
Dorm Students	580	47.5	3353*	20.2
Persons not Residing in Dorms	<u>640</u>	<u>52.5</u>	<u>13217</u>	<u>79.8</u>
TOTAL	1220	100.0	16570**	100.0

* Capacity of West Virginia University dormitories.

** Population of PMA estimated from 1970 census records.

TABLE 3.2
A CATEGORIZATION BY RELATIONSHIP TO WVU OF THE
TELEPHONE-INTERVIEW SURVEY RESPONDENTS NOT LIVING IN WVU DORMITORIES

	<u>Telephone Interview Survey Respondents</u>	<u>Percent</u>	<u>Population</u>	<u>Percent</u>
Nondorm students	54	8.4	4337*	32.8
Nonstudent WVU Employees	74	11.6	1000**	7.6
Respondents not Directly Related to WVU	<u>512</u>	<u>80.0</u>	<u>7880</u>	<u>59.6</u>
TOTAL	640	100.0	13217***	100.0

Chi-square = 27.24

* Estimated from a 10 percent sample of nondorm students from March, 1975, enrollment records of WVU Admissions and Records Office.

** Estimated from a 20 percent sample from the 1975 WVU Telephone Directory.

*** Estimated from 1970 census records.

significant. Obviously, the students residing in the PMA, but not in WVU dormitories, are underrepresented in the Survey response. There may be two reasons for this: (1) Students living in large privately operated boarding houses do not have individual telephone numbers and therefore would not be listed in Polk's Directory under any circumstances. (2) Much of the student population moves every school year, so that numbers given in Polk's Directory are frequently out of date for students.

The percentage of respondents residing in the PMA zones, but not in WVU dormitories, is compared with the percentage of the actual population estimated to reside in each zone in Table 3.3. Chi-square can be computed as discussed above to be the highly significant value of 78.288, which implies that the zonal distribution of the residences of non-dorm respondents is almost certainly different from that of the census data.

The age distribution of the respondents is compared in Table 3.4 with the 1970 Census age distribution for persons 15 years of age or older living in the PMA. Respondents below the age of 16 were not ordinarily interviewed, so the population figure for persons in the 15-24 age group should be decreased by the number of 15-year-olds. This was not done, however, since a reasonable estimate of the number of 15-year-olds was not available. The percentage of older respondents to the Survey seems a little high, but the figures yield a chi-square value of only 5.7, which implies that it is not unreasonable to assume that the age distribution of the respondents is the same as that of the PMA. Incidentally, the sex distribution of the survey respondents agreed with the sex distribution for the PMA derived from 1970 Census records to within one-tenth of one percent, with both distributions being about 50.6 percent female.

The occupational distribution of respondents not residing in WVU dormitories is given in Table 3.5. Of course, all 580 respondents who resided in WVU dormitories were students.

The annual family income distribution for nonstudent respondents who were willing to give their incomes is shown in Table 3.6. There were 586 nonstudent respondents, of which 416 (71 percent) were willing to give their incomes. Incomes for student respondents are not given since students, particularly dormitory residents, generally seem to find it difficult to estimate their incomes.

Table 3.7 shows the percentage of respondents who reported that neither the respondent nor the respondent's spouse owned an automobile. Over three-fourths of the dorm students owned no automobile, but this is somewhat misleading since in many cases parents legally own an automobile which a student is permitted to use full-time. On the other hand, a married couple might own one automobile, but if one family member is using it, it may be unavailable for use by other family members. In an attempt to get at the real issue here, which is automobile availability, the following question was asked (after inquiring about ownership): "How many automobiles do you have available for your personal use here in Morgantown?" Table 3.8 shows the percentage of respondents who responded "zero" to this question. Almost 40 percent of the dormitory students and about 70 percent of the nondormitory students claimed that they had one or more cars available. There is no way of knowing with certainty precisely what a student respondent meant when

TABLE 3.3

ZONAL DISTRIBUTION OF RESIDENCES OF THE TELEPHONE - INTERVIEW
SURVEY RESPONDENTS COMPARED WITH THAT OF 1970 CENSUS DATA

<u>Zone Number</u>	<u>Telephone Interview Survey Respondents Not Living in WVU Dorms</u>		<u>Population*</u>	<u>Percent</u>
		<u>Percent</u>		
1	89	14.8	1862	14.1
3	22	3.7	900	6.8
4	65	10.8	600	4.5
7	51	8.5	280	2.1
9	20	3.3	140	1.1
10	61	10.1	280	2.1
13	9	1.5	135	1.0
18	0	0.0	335	2.5
19	34	5.6	565	4.3
25	60	10.0	3397	25.7
26	58	9.6	1723	13.0
27	133	22.1	3000	22.7
TOTAL	602		13217	

Chi-square = 78.29

* Population estimated from 1970 census records.

TABLE 3.4

AGE DISTRIBUTION OF TELEPHONE INTERVIEW SURVEY RESPONDENTS
COMPARED WITH THAT OF 1970 CENSUS ESTIMATES

<u>Age</u>	<u>Telephone Interview Survey Respondents</u>		<u>Population*</u>	<u>Percent</u>
		<u>Percent</u>		
15-24	651	54.7	9055	61.7
25-34	79	6.6	1234	8.4
35-44	60	5.0	821	5.6
45-54	97	8.2	1035	7.1
55-64	110	9.2	1064	7.3
65 or older	193	16.2	1460	10.0
TOTAL	1190	99.9	14669	100.1

Chi-square = 5.7

* Estimated from 1970 Census records.

TABLE 3.5
OCCUPATION OF TELEPHONE-INTERVIEW SURVEY RESPONDENTS
NOT RESIDING IN A WVU DORMITORY

<u>Occupation</u>	<u>Telephone Interview Survey Respondents</u>	<u>Percent</u>
Housewife	107	16.7
Student	54	8.4
Professional (Teacher, Doctor, Engineer, Nurse, etc.)	87	13.6
Skilled, semi-skilled	94	14.7
Retired	50	7.8
Not Employed	76	11.9
Others, including miner, proprietor or manager, sales, clerical, farmer or farm worker	172	26.9
TOTAL	640	100.0

TABLE 3.6
ANNUAL FAMILY INCOMES FOR NONSTUDENT TELEPHONE-INTERVIEW SURVEY RESPONDENTS

<u>Income Range</u>	<u>Telephone Interview Survey Respondents</u>	<u>Percent</u>
Over \$15,000	86	20.7
\$10,000 - \$14,999	113	27.2
\$5,000 - \$9,999	112	26.9
Less than \$5,000	105	25.2
SUBTOTAL	416	100.0
No Response	170	
TOTAL	586	

TABLE 3.7

CAR OWNERSHIP AMONG TELEPHONE-INTERVIEW SURVEY RESPONDENTS

<u>Category</u>	<u>Number of Responses</u>	<u>Number Not Owning a Car</u>	<u>Percent Not Owning a Car</u>
Dorm Students	575	434	75.5
Students Not Residing in Dorm	54	19	35.2
Nonstudent Respondents	<u>537</u>	<u>155</u>	29.0
All Respondents	1166*	608	52.1

TABLE 3.8

PERCENTAGES OF TELEPHONE-INTERVIEW SURVEY RESPONDENTS
NOT HAVING A CAR AVAILABLE FOR PERSONAL USE IN MORGANTOWN

<u>Category</u>	<u>Number of Responses</u>	<u>Number Not Having a Car Available</u>	<u>Percent Not Having a Car Available</u>
Dorm Students	577	348	60.3
Students Not Residing in Dorm	54	16	29.6
Nonstudent Respondents	<u>531</u>	<u>161</u>	30.3
All Respondents	1162*	525	45.2

TABLE 3.9

PERCENTAGES OF LICENSED DRIVERS IN TELEPHONE-INTERVIEW SURVEY

<u>Category</u>	<u>Number of Responses</u>	<u>Number of Licensed Drivers</u>	<u>Percent of Licensed Drivers</u>
Dorm Students	580	563	97.1
Persons Not Residing in Dorms	<u>588</u>	<u>454</u>	77.2
All Respondents	1168*	1017	87.1

*Missing responses and coding errors are not included in these totals.

he responded that he had one or more cars "available" for his personal use in Morgantown, but the researchers are of the opinion that he meant that an automobile was at his disposal on essentially a full-time, seven-day-a-week basis. Furthermore, the researchers believe that the survey figure for dormitory students probably is representative of the population of all dormitory students, but the survey figure for nondormitory students may be considerably in error since drawing the sample from Polk's Directory tends to favor students such as graduate and professional students having stable residences.

Of course, for persons who do not have a driver's license, auto availability is unimportant. Table 3.9 gives the percentages of respondents who are licensed drivers. Over 97 percent of the dormitory residents were licensed, but for persons living outside of WVU dormitories, this figure drops to about 77 percent.

3.1.2 Trip-oriented Analysis

The 1220 respondents to the Telephone Interview reported a total of 1973 vehicular trips. Respondents were asked to report vehicular trips that they had made in the city of Morgantown. Thus, trips to or from areas such as Uniontown, Pennsylvania, or Fairmont, West Virginia, which are clearly outside Morgantown, were ordinarily neither reported nor recorded. However, the respondent's perception of the question is at issue for trips to or from areas such as Westover or Star City which, though not strictly speaking within the city of Morgantown, are in the greater Morgantown area. In general, if such trips were reported, then they were recorded.

541 (44.3 percent) of the 1220 respondents reported that they took no vehicular trip with the city of Morgantown during the day preceding the interview. The percentage of persons reporting no trips may seem high, but it is rendered believable by the realization that 385 (71 percent) of such respondents fall into one of two categories:

- a) 310 of the 541 reside in zones 1, 2, 3, or 4, which is the Main Campus/CBD area. Many persons living in this area might very well find all their needs met within walking distance of their residences.
- b) 75 of the 541 are persons 65 years of age or older who live outside of zones 1, 2, 3, and 4.

Table 3.10 shows the number of trips reported and the number of respondents categorized by WVU relationship of respondents.

The distribution of all trips by route taken is given in Table 3.11. Origins, destinations, and start times were recorded for all 1973 trips. However, interviewers were instructed to record additional information only for those trips via University Avenue or Beechurst-Monongahela. The underlying philosophy here is that these are the trips which will be most affected by the introduction of the PRT. As can be seen from Table 3.11, 1461 (74 percent) of the 1973 trips were by way of these two routes. Hence, information regarding mode, purpose, etc., is known only for these 1461 trips. Directionality of the 1461 trips was not recorded. The distribution of the trips via University Avenue and Beechurst-Monongahela by day of the week and time of day is given in Table 3.12.

TABLE 3.10

AVERAGE NUMBER OF TRIPS PER RESPONDENT FOR TELEPHONE INTERVIEW-SURVEY

<u>Category</u>	<u>Number of Respondents</u>	<u>Number of Vehicular Trips*</u>	<u>Average Number of Vehicular Trips per Respondent</u>
Dorm Students	580	927	1.60
Students Not Living in Dorms	54	100	1.85
Nonstudent WVU Employees	74	159	2.15
Respondents Not Related to WVU	<u>512</u>	<u>787</u>	1.54
All Respondents	1220	1973	1.62

* A vehicular trip was taken to be terminated each time one or more persons exited the vehicle. Thus, a round trip was recorded as two trips.

TABLE 3.11

DISTRIBUTION OF ROUTES TAKEN FOR ALL TRIPS REPORTED
IN TELEPHONE INTERVIEW SURVEY

<u>Route</u>	<u>Number of Trips Reported</u>	<u>Percentage</u>
University Avenue	852	43.2
Beechurst - Monongahela	609	30.9
Other, including Willowdale & Stewart Streets	<u>512</u>	<u>26.0</u>
TOTAL	1973	100.1

Table 3.12

DISTRIBUTION OF TELEPHONE-INTERVIEW SURVEY TRIPS VIA UNIVERSITY AVENUE
AND BEECHURST-MONONGAHELA BY DAY OF WEEK AND TIME OF DAY

<u>HOUR</u>	<u>ROUTE*</u>	<u>SU.</u>	<u>MO.</u>	<u>TU.</u>	<u>WE.</u>	<u>TH.</u>	<u>FR.</u>	<u>SA.</u>	<u>ROW TOTAL</u>
0	UU	0	1	0	6	2	1	0	10
0	B-M	0	2	1	1	1	0	1	6
1	U	0	0	1	0	2	0	3	6
1	B-M	0	2	1	0	0	0	3	6
2	U	0	0	1	0	1	2	2	6
2	B-M	0	0	0	1	1	1	0	3
3	U	0	0	0	0	0	0	1	1
3	B-M	0	0	1	0	2	1	0	4
4	U	0	0	0	0	1	0	2	3
4	B-M	0	0	0	0	0	0	0	0
5	U	0	0	0	0	0	0	0	0
5	B-M	0	0	0	0	0	0	0	0
6	U	0	0	0	1	0	0	0	1
6	B-M	0	1	0	0	1	0	1	3
7	U	3	6	7	5	8	6	2	37
7	B-M	0	2	4	1	5	4	1	17
8	U	0	19	8	8	9	6	9	59
8	B-M	0	4	1	10	2	1	3	21
9	U	0	6	14	14	21	9	15	79
9	B-M	0	3	5	2	7	1	6	24
10	U	3	7	4	14	16	4	8	56
10	B-M	0	7	7	7	12	1	6	40
11	U	2	4	7	5	16	8	14	56
11	B-M	<u>0</u>	<u>6</u>	<u>12</u>	<u>3</u>	<u>15</u>	<u>5</u>	<u>2</u>	<u>43</u>
A.M. Subtotal		8	70	74	78	122	50	79	481

* U = University Avenue

B-M = Beechurst-Monongahela

TABLE 3.12 (continued)

<u>HOURL</u>	<u>ROUTE*</u>	<u>SU.</u>	<u>MO.</u>	<u>TU.</u>	<u>WE.</u>	<u>TH.</u>	<u>FR.</u>	<u>SA.</u>	<u>ROW TOTAL</u>
12	U	1	17	11	11	23	3	21	87
12	B-M	1	13	13	10	13	9	5	64
13	U	1	7	8	9	25	11	14	75
13	B-M	0	8	6	9	9	6	10	48
14	U	2	14	8	9	12	7	9	61
14	B-M	1	3	9	7	5	8	10	43
15	U	0	7	9	9	15	4	8	52
15	B-M	1	5	16	9	21	7	2	61
16	U	1	12	4	8	17	2	12	56
16	B-M	1	8	10	9	7	7	9	51
17	U	1	5	8	9	9	8	4	44
17	B-M	3	1	5	8	7	4	4	32
18	U	0	4	6	5	9	3	9	36
18	B-M	3	1	8	7	3	4	4	30
19	U	2	2	0	4	7	1	7	23
19	B-M	0	2	5	2	2	4	12	27
20	U	0	2	2	5	5	3	9	26
20	B-M	0	1	2	2	8	9	4	26
21	U	0	1	5	4	4	5	15	34
21	B-M	1	3	3	4	4	0	7	22
22	U	1	2	2	3	5	3	5	21
22	B-M	1	3	3	2	1	3	7	20
23	U	1	3	1	1	2	1	8	17
24	B-M	1	1	2	3	2	1	3	13
P.M. Subtotal		<u>23</u>	<u>125</u>	<u>146</u>	<u>149</u>	<u>215</u>	<u>113</u>	<u>198</u>	<u>969</u>
24-hour TOTAL		31	195	220	227	337	163	277	1450**

* U = University Avenue
B-M = Beechurst-Monongahela

** Total does not include 11 trips for which interview data or trip time either were not recorded or were recorded in error.

The modal distribution for the 1461 trips by way of University Avenue and Beechurst-Monongahela is given in Table 3.13. Note that persons not residing in dormitories made 82 percent of their trips as the driver of a private automobile, while dormitory students made less than 18 percent of their trips by that mode. Over 55 percent of the trips reported by dormitory students were by University bus.

The reasons given for the choice of mode are summarized in Table 3.14. For Table 3.14 the 688 auto trips as drivers and 234 auto trips have been combined to yield 922 auto trips. Also the 459 University bus trips have been combined with 15 city or county bus trips to yield 474 bus trips. Observe that the main reason for the choice of mode was given as no other transportation available for 22.5 percent of the auto trips and for 48.5 percent of the bus trips. This figure for the bus trips appears to be inconsistent with the response to a separate question regarding the availability of a car for the trip. In 394 (83.1 percent) trips of the 474 bus trips, the respondent reported that a car was not available for use at the time the trip was made. The main reason given for choice of mode is broken out by type of residence in Table 3.15.

The trip purposes for the 922 auto trips are summarized in Table 3.16. The purposes were rather diverse. The trip purposes for the 474 bus trips can be simply summarized as 48.7 percent school related, 42.4 percent returning home, and 8.9 percent other.

3.2 University Bus On-Board Survey

Table 3.17 compares the percentage of respondents on University bus routes against the percentage of riders on each route as found from the weekday average computed from the ridership counts conducted as a separate part of this study. For purposes of Table 3.17 the Towers to Main Campus route and the Main Campus to Towers route have been combined, even though the only points these routes have in common are the terminal points. The other routes are treated similarly in Table 3.17. The light response on the routes between the Coliseum and Medical Center occurred because most riders did not stay on the bus long enough to complete a questionnaire. It was never planned that questionnaires be administered on the routes between the Coliseum and Main Campus because the ridership is relatively low. Taking the Week-day Average Ridership Counts as the expected proportion, the highly significant chi-square value of 36.36 is computed. Hence, the sample is not representative of routes.

There were 1740 respondents to the survey, 1673 (96.1 percent) of which reported their occupation as student. However, in response to a separate question, 197 (11.3 percent) claimed to be full-time WVU employees. 1719 respondents gave their ages, and of these 94 (5.5 percent) were 25 years of age or older.

Of the 1673 student respondents, 912 (54.5 percent) resided in WVU dormitories. As indicated by Table 3.18, dormitory students are much greater users of the University bus system than nondormitory students. Of the dormitory student respondents, 724 (79.4 percent) resided in the Towers. Table 3.19 shows that Towers dormitory students use the bus much more heavily than residents of the four Main Campus WVU dormitories. Of the 761 student respondents residing outside of WVU dormitories, those residing within the PMA use the University bus system much more heavily than those residing outside the PMA as shown by Table 3.20.

TABLE 3.13

MODAL DISTRIBUTION OF TRIPS REPORTED IN TELEPHONE-INTERVIEW SURVEY

<u>Mode</u>	<u>All Respondents</u>		<u>Dorm Students</u>		<u>Persons Not Residing in Dorms</u>	
	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>
Auto - driver	688	47.1	139	17.5	549	82.2
Auto - passenger	234	16.0	171	21.6	63	9.4
University bus	459	31.4	440	55.5	19	2.8
Other modes (including city bus, county bus, taxi, hitch- hike, motorcycle, bicycle)	80	5.5	43	5.4	37	5.5
TOTAL	1461	100.0	793	100.0	668	99.9

TABLE 3.14

MAIN REASON FOR CHOICE OF MODE FOR TRIPS REPORTED IN TELEPHONE-INTERVIEW SURVEY

<u>Main Reason for Choice of Mode*</u>	<u>AUTO</u>		<u>BUS</u>	
	<u>Number of Trips</u>	<u>Percent</u>	<u>Number of Trips</u>	<u>Percent</u>
Convenience	636	69.0	216	45.6
No Other Transporta- tion Available	207	22.5	230	48.5
Other, including low cost, speed, safety, respondent does not drive	79	8.6	28	5.9
TOTAL	922	100.1	474	100.0

* For each trip the respondent was asked to give the main reason for choosing the kind of vehicle used. The respondent was urged to choose one reason from the following list: convenience, low cost, speed, no other transportation available, safety, respondent does not drive. If the respondent could not choose one of these reasons, he was allowed to specify another reason. Even though the respondent's choice of mode may have been influenced by a combination of factors, he was nevertheless forced to give one main reason in response to this question.

TABLE 3.15
MAIN REASON FOR CHOICE OF MODE BROKEN OUT BY TYPE OF RESIDENCE

<u>Main Reason for Choice of Mode</u>	<u>Type of Residence</u>	<u>Number of Trips (Auto)</u>	<u>Number of Trips (Bus)</u>
Convenience	Dormitory	240	210
	Nondormitory	<u>393</u>	<u>6</u>
	Subtotal	633*	216
No Other Trans- portation Available	Dormitory	56	218
	Nondormitory	<u>151</u>	<u>10</u>
	Subtotal	207	228*
Other, including low cost, speed, safety, respondent does not drive	All	<u>79</u>	<u>28</u>
TOTALS		919*	472**

* Total does not include 3 trips for which type of residence either was not recorded or was recorded in error.

** Total does not include 2 trips for which type of residence was not recorded.

TABLE 3.16
TRIP PURPOSE FOR AUTO TRIPS REPORTED IN TELEPHONE-INTERVIEW SURVEY

<u>Trip Purpose*</u>	<u>Number of Trips</u>	<u>Percent</u>
Returning home	365	39.6
Social-recreational	122	13.2
Shopping	97	10.5
Work related	86	9.3
School related	57	6.2
To transport another person	57	6.2
Other, including eat meal, medical- dental, personal business, to transfer to another means of travel	138	15.0
TOTAL	922	100.0

*Returning home took precedence over other trip purposes. Thus, a trip home from work was recorded as having as its purpose "returning home" rather than "Work related". Social-recreational took precedence over school related, which was reserved for going to class, going to the library to study, going to see an instructor or advisor, etc. If the respondent could not assign a main purpose to a multipurpose trip, the interviewer arbitrarily assigned one of the trip purposes given by the respondent, but this seldom occurred.

TABLE 3.17
COMPARISON BETWEEN RESPONDENTS TO UNIVERSITY BUS ON-BOARD
SURVEY WITH RIDERSHIP COUNT AVERAGES

<u>Routes*</u>	<u>Weekly Average Ridership Counts</u>	<u>Percent</u>	<u>Respondents to On-Board Survey</u>	<u>Percent</u>
Towers - Main Campus or Main Campus - Towers	7499	71.0	1712	98.4
Coliseum - Medical Center or Medical Center - Coliseum	2944	27.9	28	1.6
Coliseum - Main Campus or Main Campus - Coliseum	115	1.1	0	0.0
TOTAL	10588	100.0	1740	100.0

Chi-square = 36.36

* The routes listed here are the only complete routes in the University bus system. A rider who was on board for only a portion of the route is included in the above totals. For example, a rider from the Engineering Building to the Medical Center is on a segment of the Coliseum to Medical Center route and is shown above as being on that route.

TABLE 3.18
PROPORTIONS OF DORMITORY AND NONDORMITORY STUDENTS RESPONDING
TO UNIVERSITY BUS ON-BOARD SURVEY COMPARED WITH THEIR PROPORTIONS
IN THE WVU STUDENT BODY

<u>Residence Category</u>	<u>Number of Respondents</u>	<u>Percent</u>	<u>Population</u>	<u>Percent</u>
Dorm Students	912	54.5	3353*	20.7
Nondorm Students	761	45.5	12857	79.3
TOTAL	1673	100.0	16210**	100.0

* Based on WVU dormitory capacities.

** Based on WVU Admissions and Records tape for March, 1975.

TABLE 3.19

COMPARISON BETWEEN DISTRIBUTION OF RESIDENCES OF DORMITORY
STUDENTS RESPONDING TO UNIVERSITY BUS ON-BOARD SURVEY WITH DISTRIBUTION
OF RESIDENCES OF WVU DORMITORY STUDENTS

<u>Dorm Area</u>	<u>Number of Respondents</u>	<u>Percent</u>	<u>Number of Persons Living in Dorms*</u>	<u>Percent</u>
Towers	724	79.4	1733	51.7
Main Campus	188	20.6	1620	48.3
TOTAL	912	100.0	3353	100.0

* Based on WVU dormitory capacities.

TABLE 3.20

PROPORTIONS OF NONDORMITORY STUDENT RESPONDENTS TO UNIVERSITY
BUS ON-BOARD SURVEY LIVING WITHIN THE PMA

<u>Residence Location for Nondorm Students</u>	<u>Number of Respondents</u>	<u>Percent</u>	<u>Population</u>	<u>Percent</u>
Within PMA	479	62.9	4337**	33.7
Outside PMA	282	37.1	8520	66.3
TOTAL	761	100.0	12857*	100.0

* Based on housing code on WVU Admissions and Records tape for March, 1975.

** Estimated by drawing a ten percent sample of the local residences for all 16,210 students from WVU Admissions and Records tape for March, 1975. The zone number for each of the sample residences was coded manually, and 769 of the sample residences, which included dormitories, were found to be in PMA zones. Thus, the sample expands to 7,690 students residing in the PMA. The dormitories, which are all located within the PMA, had a capacity of 3,353, and they were essentially filled. Hence, it was estimated that there were 4,337 nondormitory students residing in the PMA.

Of the 1740 University Bus On-Board Survey respondents, 1666 (95.7 percent) traveled to the bus by either walking or transferring from another University bus. The waiting time distribution is summarized in Table 3.21.

Trip purposes are given in Table 3.22. The usual trip purposes given were school related (52.5 percent) and returning home (32.2 percent), with the remaining 15.3 percent of the trips being spread over miscellaneous purposes.

When asked their main reason for choosing the University bus for this trip, 804 (46.2 percent) responded convenience while only 660 (37.9 percent) responded no other vehicular transportation available. In response to other questions, 95 percent claimed to be licensed drivers, but 60 percent reported that neither they nor their spouse owned an automobile, and fully 70 percent reported that a car was not available for the trip. The figures for automobile ownership and availability might seem to contradict the response to the question regarding the choice of the University Bus. However, the responses appear to be consistent from the student's point of view. The resolution of the apparent contradiction lies in the fact that many WVU students regard hitchhiking as a viable mode of transportation even though the general American public probably does not. In fact, in response to another question, 837 (48.1 percent) of the 1740 respondents reported that hitchhiking was an alternate mode available to them for the trip. In particular, 451 (56.1 percent) of the 804 respondents giving convenience as their main reason for choosing the University bus for this trip also gave hitchhiking as an alternative mode by which they could have made the trip. Thus, a substantial proportion of WVU students believe that trips around the campuses could be taken either by University bus or by hitchhiking, but the University bus is more convenient.

3.3 City-and-County Bus On-Board Survey

There were 155 respondents to the City and County On-Board Survey, with 63 on a City bus and 92 on a County bus. About 31.6 percent of respondents claimed that a car was available for the trip, with the percentage of respondents so claiming being nearly the same on both City and County buses. However, 23 respondents (36.5 percent) on the City bus and 50 respondents (54.3 percent) on the County bus responded that neither they nor their spouse owned an automobile. 69 (44.5 percent) of the 155 respondents reported they were not licensed drivers. Table 3.23 shows the main reason for the choice of the City or County bus for trip. Note that only 18 respondents (28.6 percent) on the City bus and 30 respondents (32.6 percent) on the County bus responded that the main reason they chose the bus they were on was that no other transportation was available. It is particularly interesting that 36 respondents (57.1 percent) on the City bus claimed they chose that mode primarily as a matter of convenience, probably reflecting the good service between Suncrest and CBD. In response to a separate question asking the respondent what other kinds of vehicular transportation were available to him for the trip, of the 63 City bus riders 35 (55.6 percent) responded auto as driver or passenger, 15 (23.8 percent) responded taxi, and 11 (17.5 percent) responded none. For the

TABLE 3.21

WAITING TIME DISTRIBUTION OF RESPONDENTS
TO UNIVERSITY BUS ON-BOARD SURVEY

<u>Waiting Time</u>	<u>Number of Respondents</u>	<u>Percent</u>
0 - 5 minutes	1506	86.6
6 - 10 minutes	139	8.0
11 - 15 minutes	50	2.9
over 15 minutes	45	2.5
TOTAL	1740	100.0

TABLE 3.22

TRIP PURPOSES REPORTED IN UNIVERSITY BUS ON-BOARD SURVEY

<u>Trip Purpose</u>	<u>Number of Trips</u>	<u>Percent</u>
Returning home	556	32.2
School related (class, library, studying, etc.)	908	52.5
Work related	45	2.6
Shopping	20	1.2
Social-recreational	56	3.2
To transfer to another means of travel	26	1.5
Medical-dental	16	0.9
Eat meal	40	2.3
Personal business	43	2.5
To transport another person	2	0.1
Other	17	1.0
SUBTOTAL	1729	100.0
No response and coding errors	11	
TOTAL	1740	

TABLE 3.23

MAIN REASON FOR CHOICE OF MODE FOR THE CITY AND COUNTY BUS ON-BOARD SURVEY

<u>Reason for Choice of Mode</u>	<u>City Bus Respondents</u>	<u>Percent</u>	<u>County Bus Respondents</u>	<u>Percent</u>
Convenience	36	57.1	36	39.1
No Alternate Vehicular Transportation Avail- able	18	28.6	30	32.6
Low Cost	4	6.3	13	14.1
Other, including speed, safety, respondent does not drive	5	7.9	13	14.1
TOTAL	63	99.9	92	99.9

TABLE 3.24

OCCUPATIONS OF RESPONDENTS TO CITY AND COUNTY BUS ON-BOARD SURVEY

<u>Occupation</u>	<u>City Bus Respondents</u>	<u>Percent</u>	<u>County Bus Respondents</u>	<u>Percent</u>
Student	19	30.2	30	32.6
Housewife	14	22.2	12	13.0
Skilled, Semi- skilled Worker	7	11.1	19	20.7
Other, including miner, professionals (teacher, doctor, engineer, nurse, etc.) proprietor or man- ager, sales, clerical, farmer or farm worker, unemployed.	23	36.5	31	33.7
TOTAL	63	100.0	92	100.0

92 County bus riders the corresponding responses to the same question were 30 (32.6 percent) auto as driver or passenger, 16 (17.4 percent) taxi, and 32 (34.8 percent) none.

The age distribution of respondents was not too different from the age distribution for Morgantown in the 1970 Census, but the sex distribution was, with 116 (74.8 percent) of the 155 respondents being female. The occupational distribution of respondents is summarized in Table 3.24: Students, housewives, and skilled and semi-skilled workers provided almost two-thirds of the respondents. 23 (15.5 percent) of the 155 respondents claimed to be full-time WVU employees. The distribution of trip purposes in Table 3.25 shows a high percentage of work related trips, with shopping and school related also being frequently given responses.

Table 3.26 shows the mode of travel to the bus where the questionnaire was filled out. Most respondents walked to the bus, but quite a few were dropped off by auto or transferred from another bus. It is rather interesting that five respondents on a County bus had transferred from a City bus.

3.4 Faculty/Staff Mailback Survey

Table 3.27 compares the distribution of work locations of respondents to the Faculty/Staff Mailback Survey with that of a 20 percent sample from the WVU Telephone Directory for the academic year 1975-76. A chi-square value of 51.39 can be computed, which indicates that it is virtually impossible to believe that the distributions are the same. The disproportionately light response from the Medical Center and locations in the Other category in Table 3.27 was probably due partly to an inadequate distribution scheme for the questionnaires and partly to the fact that many of these personnel do not work out of an office.

Table 3.28 compares the distribution of job functions of respondents with that of the Telephone Directory sample. The computed chi-square value of 21.13 means that the null hypothesis that the distributions are the same can be rejected at 0.01 level of significance. Thus, the survey respondents are almost certainly not representative of actual WVU employees with respect to either work location or job function. However, a comparison of the distribution of the zones of residence of the respondents with those of the Telephone Directory sample yields a chi-square value of 18.55 with 33 degrees of freedom, which is not significant at the 0.25 level. This indicates that it is not unreasonable to believe that these distributions are the same.

There were 1028 respondents to the Faculty/Staff Mailback Survey, and 3065 vehicular trips were reported for an average of 2.98 trips per respondent. Table 3.29 gives the average number of trips per respondent by location. Apparently an employee on the Main Campus or at the Medical Center makes fewer trips than an employee at other locations, probably because all his needs can be met within walking distance of his work area. Table 3.30 gives the hourly distribution of trips by work location of respondents. Table 3.31 summarizes the average number of trips per job category for respondents to the Faculty/Staff Mailback Survey.

TABLE 3.25

TRIP PURPOSES FOR CITY AND COUNTY BUS ON-BOARD SURVEY

<u>Trip Purpose</u>	<u>City Bus Respondents</u>	<u>Percent</u>	<u>County Bus Respondents</u>	<u>Percent</u>
Returning Home	24	38.1	24	26.1
Work related	18	28.6	23	25.0
School related	3	4.8	17	18.5
Medical - Dental	5	7.9	3	3.3
Shopping	5	7.9	19	20.7
Other, including social- recreational, transfer to another means of travel, eat meal, per- sonal business, transport another person	8	12.7	6	6.5
TOTAL	63	100.0	92	100.1

TABLE 3.26

MODE OF TRAVEL TO BUS WHERE QUESTIONNAIRE FILLED OUT INCITY AND COUNTY BUS ON-BOARD SURVEY

<u>Mode of Travel to Bus</u>	<u>City Bus Respondents</u>	<u>Percent</u>	<u>County Bus Respondents</u>	<u>Percent</u>
Walk	42	66.7	50	54.3
Auto-Passenger	10	15.9	16	17.4
County Bus	0	00.0	10	10.9
City Bus	9	14.3	5	5.4
Other, including auto (as driver), University bus, taxi, hitchhike, motor- cycle, bicycle	2	3.2	11	12.0
TOTAL	63	100.1	92	100.0

TABLE 3.27

COMPARISON OF DISTRIBUTION OF WORK LOCATION OF RESPONDENTS
TO FACULTY/STAFF MAILBACK SURVEY WITH THAT OF SAMPLE FROM
WVU TELEPHONE DIRECTORY

<u>Work Location</u>	<u>Number of Mailback Respondents</u>	<u>Percent</u>	<u>Number in Tele- phone Directory Sample</u>	<u>Percent</u>
CBD	8	0.78	30	3.42
Main Campus	442	43.12	265	30.18
Engineering, CAC,				
Agriculture	219	21.37	82	9.34
Coliseum	68	6.63	18	2.05
Towers, Forestry	101	9.85	73	8.31
Medical Center	147	14.34	273	31.09
Other Locations	40	3.91	137	15.61
TOTAL	1025	100.00	878	100.00

Chi-square = 51.39

TABLE 3.28

COMPARISON OF DISTRIBUTION OF JOB FUNCTION OF RESPONDENTS TO
FACULTY/STAFF MAILBACK SURVEY WITH THAT OF SAMPLE FROM
WVU TELEPHONE DIRECTORY

<u>Job Function</u>	<u>Number of Mailback Respondents</u>	<u>Percent</u>	<u>Number in Tele- phone Directory Sample</u>	<u>Percent</u>
Administrative	132	12.87	66	7.52
Teaching and/or Research	379	36.94	237	26.99
Research Only	28	2.73	22	2.51
Medical	36	3.51	103	11.73
Secretarial, Clerical	301	29.34	207	23.58
Maintenance	50	4.87	105	11.96
Other	100	9.74	138	15.71
TOTAL	1026	100.00	878	100.00

Chi-square = 21.13.

TABLE 3.29
AVERAGE NUMBER OF TRIPS PER RESPONDENT TO
FACULTY/STAFF MAILBACK SURVEY

<u>Work Location</u>	<u>Number of Respondents</u>	<u>Percent</u>	<u>Number of Trips</u>	<u>Percent</u>	<u>Average Number of Trips per Respondent</u>
Main Campus, CBD	450	43.8	1125	36.7	2.50
Engineering, Agriculture, CAC, Coliseum, Forestry, Towers	3888	37.7	1361	44.4	3.51
Medical Center	147	14.3	424	13.8	2.88
Other	43	4.2	155	5.1	3.60
TOTAL	1028	100.0	2065	100.0	2.98

TABLE 3.30

HOURLY DISTRIBUTION OF TRIPS BY WORK LOCATION OF RESPONDENTS TO
FACULTY/STAFF MAILBACK SURVEY

Hour	<u>WORK LOCATION</u>				Row Total
	<u>Main Campus, CBD</u>	<u>Engineering, Agriculture, CAC, Coliseum, Forestry, Towers</u>	<u>Medical Center</u>	<u>Other</u>	
0	0	0	0	0	0
1	4	2	0	0	6
2	4	1	0	0	5
3	0	2	0	1	3
4	3	0	0	0	3
5	3	3	5	0	11
6	14	15	13	9	51
7	158	109	52	20	339
8	154	199	69	14	436
9	42	53	8	8	111
10	16	42	4	6	68
11	21	63	13	8	105
12	76	203	40	23	342
13	43	118	21	13	195
14	36	27	8	4	75
15	44	63	16	13	136
16	81	57	19	2	159
17	252	245	97	24	618
18	44	45	27	2	118
19	35	33	10	1	79
20	16	14	6	0	36
21	22	15	2	0	39
22	12	14	5	1	32
23	9	7	1	0	17
Subtotal					2984
No Response					69
Recording or coding error					12
TOTAL					3065

TABLE 3.31

AVERAGE NUMBER OF TRIPS PER JOB CATEGORY FOR RESPONDENTSTO FACULTY/STAFF MAILBACK SURVEY

<u>Job Category</u>	<u>Number of Respondents</u>	<u>Percent</u>	<u>Number of Trips</u>	<u>Percent</u>	<u>Average Number of Trips per Respondent</u>
Teachers & researchers	407	39.6	1247	40.7	3.06
Medicals	36	3.5	95	3.1	2.64
Others	585	56.9	1723	56.2	2.95
TOTAL	1028	100.0	3065	100.0	2.98

TABLE 3.32

MODE OF TRAVEL FOR TRIPS REPORTED IN FACULTY/STAFF MAILBACK SURVEY

<u>Mode</u>	<u>Number of Trips</u>	<u>Percent</u>
Auto - Driver or Passenger	2825	92.6
University Bus	119	3.9
City or County Bus	46	1.5
Other, including taxi, motorcycle, bicycle, hitchhike	61	2.0
TOTAL	3051	100.0

TABLE 3.33

COMPARISON OF DISTRIBUTION OF TRIP PURPOSE FOR FACULTY/STAFF
MAILBACK SURVEY WITH THAT OF WVU EMPLOYEES IN TELEPHONE-INTERVIEW SURVEY

<u>Trip Purpose</u>	<u>Number of Trips in Mailback Survey</u>	<u>Percent</u>	<u>Number of Trips in Telephone Survey</u>	<u>Percent</u>	<u>Average Percent *</u>
Work related	1457	48.1	26	26.3	37.2
Returning home	951	31.4	38	38.4	34.9
Personal business	182	6.1	5	5.1	5.6
Eat meal	177	5.8	3	3.0	4.4
Social-Recreational	84	2.8	6	6.1	4.5
Shopping	79	2.6	9	9.1	5.9
Medical-Dental	42	1.4	0	0.0	0.7
Other	53	1.8	12	12.1	7.0
TOTAL	3027	100.0	99	100.0	

Chi-square = 22.2.

* Since there is no reason for believing that either the Mailback Survey or the Telephone Survey is representative of the population, the averages of the proportions in the two surveys are taken to be the expected proportions when chi-square is computed.

Table 3.32 gives the mode of travel for the trips reported in the Faculty/Staff Mailback Survey. Only those trips for which the respondent recorded the mode are given in Table 3.32. 92.6 percent of the trips were by private auto. Of the 165 bus trips reported, the respondents indicated for 135 of the trips whether an auto was available for the trip. For 66 (48.9 percent) of the 135 bus trips, the respondent reported that an auto was available.

The distribution of trip purpose for the Mailback Survey can be compared with that for the 99 trips reported by WVU employees in the Telephone Interview Survey as shown in Table 3.33. The computed chi-square value of 22.2 implies that the null hypothesis that the two samples are drawn from the same population can be rejected at the 0.01 level of significance.

3.5 Modal Utilization

3.5.1 Automobile Mode

Traffic counts taken along the PRT corridor are displayed in the Appendix A. The counts were taken on University Avenue at the Stewart Street Intersection and on Beechurst Avenue just south of the intersection with Eighth Street. Average weekday traffic on both approaches at these locations are displayed in Table 3.34.

The most critical intersection, based on driving experience of the researchers, in the PRT corridor is the intersection of the Stewart Street and University Avenue. This intersection was chosen for further analysis because of previous experience of the researchers who have driven automobiles in the area. The objective of analyzing this intersection based on traffic engineering characteristics was to see if significant improvement is evident with the use of the PRT.

By elimination of buses turning right at Campus Drive, the traffic flow during Post-PRT phase should have significant impact in the movement of traffic at this intersection. The traffic during the peak afternoon hour is in the range of 400 - 470 vehicles per hour on the southern approach of this intersection. The signal split on this intersection is described in Figure 3.1.

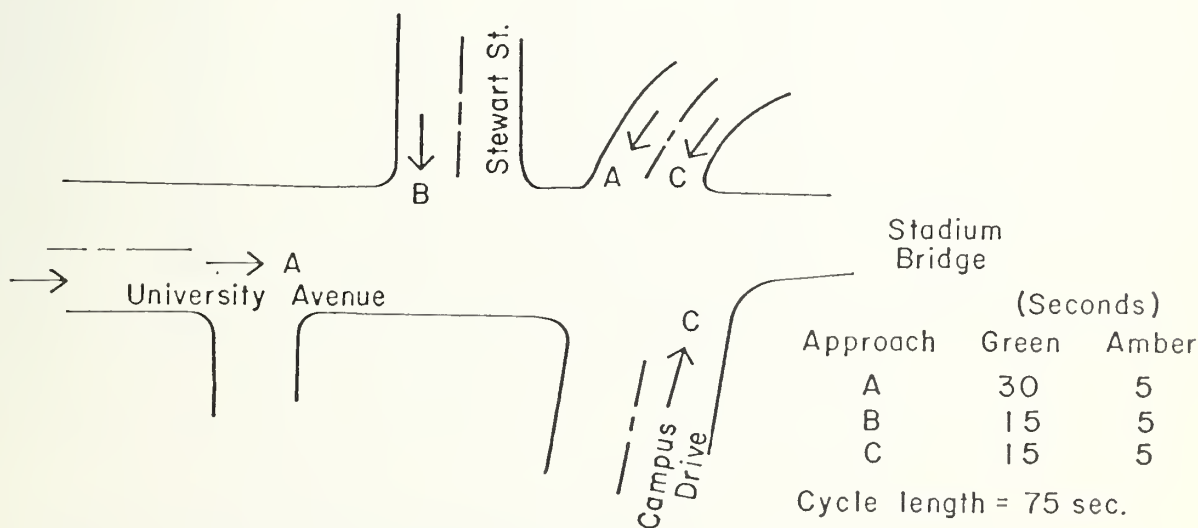


FIGURE 3.1
STREET INTERSECTION

TABLE 3.34

AVERAGE DAILY WEEKDAY TRAFFIC IN
PRT CORRIDOR

Hour	University Avenue			Beechurst Avenue		
	N - Bound	S - Bound	Total	N - Bound	S - Bound	Total
12-1	113	131	144	109	148	257
1-2	60	87	147	55	73	128
2-3	21	37	58	29	48	77
3-4	16	15	31	19	21	40
4-5	9	13	22	18	22	40
5-6	21	43	64	57	50	107
6-7	123	114	237	351	237	588
7-8	296	334	630	655	728	1383
8-9	381	369	750	796	723	1519
9-10	284	329	613	630	597	1227
10-11	278	319	597	639	613	1252
11-12	299	339	638	730	662	1392
12-1	335	414	849	904	783	1687
1-2	335	395	740	859	719	1578
2-3	376	430	806	925	741	1666
3-4	363	440	803	1023	886	1909
4-5	367	469	836	989	1016	2005
5-6	385	432	817	899	789	1688
6-7	394	444	838	811	653	1264
7-8	384	404	788	672	603	1275
8-9	344	389	733	549	569	1118
9-10	347	347	694	478	470	948
10-11	270	286	556	368	326	694
11-12	231	246	477	243	232	475
TOTAL	6041	6836	12877	12818	11717	24535

Data collected during peak hour indicated the following:

Cycle length = 75 sec,
Cycles per hour = 48,
Fully load cycles = 36,
Load Factor = 0.75.

The analysis of this intersection indicates that the level of service along the southbound approach is E and approaches the capacity of the intersection.¹ However, the capacity of this intersection is not predictable because of back-ups from locations downstream or restricted movement due to turning vehicles.

Vehicular traffic on the PRT corridor was analyzed for determining the average occupancy in automobiles and the extent of through traffic. An Intercept Survey was utilized for a period of 8 hours on Tuesday and Wednesday. The average occupancy for travel within the corridor was approximately 1.4. The percentage of thru traffic in the PRT highway corridor was about 32%, through traffic consisting of trips having neither origin nor destination in the Primary Market Area.

3.5.1.1 Accident Analysis

An investigation was made of all automobile accidents in the PRT corridor. Accident records of automobiles in the PRT corridor are maintained by the City of Morgantown. Accident records were investigated for the time period January 1972 to June 1975. The city of Morgantown utilizes the standard accident report for recording the accidents.

The records for various accidents in the city were separated to reflect the accidents in the corridor of the PRT. The information on accidents collected on these accidents included the location zone, intersection, injury, accident type and total damage in terms of dollars.

The results of the analysis have been displayed on Tables 3.35 through 3.39. There is an upswing of number of accidents in the corridor since 1972. However, number of accidents in 1974 were far lower, but the number has picked up in 1975 and indications are that it will match the number of accidents in 1972 and 1973.

The year 1974 was unusual--Morgantown had an acute shortage of gasoline for the first quarter of 1974. However, due to the implementation of the TOPICS program, which involved better channelization, new traffic signs and widening of streets, resulted in lowering the number of accidents in 1974. But a major contributing factor was the opening of I-79 link which bypasses Morgantown and has reduced considerable through traffic on Beechurst and University Avenues.

The accidents in 1975 have increased considerably reflecting an increase in traffic volumes on the highway corridor of PRT aided by easy availability of gasoline and traffic growth patterns.

However, the number of injuries resulting from accidents in 1974 was higher than in 1972 and 1973. The proportion of accidents in-

¹ Highway Capacity Manual 1965, SR 87, Highway Research Board, National Academy of Sciences, Washington, DC , p. 126-146.

volving injuries has been on rise since 1972. For 6 month period of 1975 it has been 24% compared to 14.6% in 1972, 17.1% in 1973 and 20.2% in 1975.

Damage to vehicles and property based on figures available did drop in 1974 from that in 1972 and 1973. But accidents in the first 6 months in 1975 indicate that damage in terms of dollars is running high again. Total damage resulting from accidents was estimated as follows:

<u>YEAR</u>	<u>DAMAGE</u>	<u>DAMAGE/ACCIDENT</u>
1972	\$208,686	\$400.91
1973	\$239,590	\$462.53
1974	\$186,835	\$473.00
1975 (6 months)	\$143,858	\$639.37

The damages resulting from accidents have a trend of being on the rise. The severe jump in accident cost for 1975 reflects the increased body repair and labor costs resulting from higher rates of inflation.

3.5.1.2 Operating Costs of Automobiles in Morgantown

There is a lot of variation in operating costs per mile of an automobile from individual to individual. The variables affecting this cost can be identified primarily as the annual mileage driven and the size of the car.

Other factors influencing this cost are the way an individual driver, the breakdown of city and highway mileage driven and the total load carried by the automobile. Depreciation of an automobile, a significant cost of auto operating cost is largely proportional to the age of automobiles.

Automobile costs for standard size and compact size automobiles for the model year 1975 were estimated from cost data collected. These costs are summarized as follows, based on 10,000 annual miles driven.²

²Pre-PRT Impact Study, Data Collection and Coding Manual, chapter 4, Engineering Experiment Station, West Virginia University, 1976.

Standard Size Automobile.

	Cost/year	Cost/mile	% of Total Cost
Capital Recovery Cost	\$ 782.41	¢ 7.824	40.4
Repairs and Maintenance	\$ 389.84	¢ 3.89	20.1
Gasoline	\$ 450.42	¢ 4.50	23.3
Insurance, Parking, Registration, Etc.	\$ 314.00	¢ 3.10	16.2
TOTAL	\$1936.67	¢19.36	100.0
Compact Size Automobile			
Capital Recovery Cost	\$ 684.90	¢ 6.849	41.0
Repairs and Maintenance	\$ 380.84	¢ 3.808	22.8
Gasoline	\$ 294.55	¢ 2.945	17.6
Insurance, Parking, Registration, Etc.	\$ 312.00	¢ 3.12	18.6
TOTAL	\$1672.29	¢16.72	100.0

Another major factor affecting automobile costs is the parking in the Morgantown area. There are two types of lots available for the purpose. In the CBD area city lots are available for users and campus parking is provided by the University. Table in the Appendix B summarizes the total parking available in the Morgantown area.

The parking costs of city lots are \$0.10 for 20 minutes. The University structure on the Main Campus charges are \$0.35, flat, for each entry.

However, the users of the other university lots can park by permit only, and pay \$24 annually. Such parking is permitted only to some faculty members on the Main Campus. The Evansdale Campus lots are available for student use also, through the number of students who get permits is quite low. Students at present using the CAC and Engineering buildings use the Coliseum lots. There is also a 400-vehicle capacity lot located at the Towers. This lot is free and is used mainly by Towers residents.

3.5.2 University Bus System

The University Bus System operated by West Virginia University consists of 15 buses. On any given day about 13 buses are scheduled to operate. Eight buses have capacities of 55 passengers and seven of them seat 45 passengers.

Access to this system is limited to the students, faculty and staff of West Virginia University. The buses operate on a schedule set up by the University. Between the hours of 8:00 A.M. and 5:00 P.M. during weekdays all the buses are scheduled for operation. During the evening only one bus is scheduled for operation.

A Ridership Survey was conducted for 5 days during the week of March 17, 1975. Data was collected for the time period between Tuesday and Saturday. Table 3.40 gives the scheduled and observed frequencies of the buses on various routes.

Analysis indicates that the buses of the University system run as scheduled. On the route from Campus Drive to Towers, which is one of the major routes, more bus runs were actually made than scheduled. The same is true for the runs from Towers to Campus Drive. On an average the buses ran at a frequency of 13 per hour instead of 12 per hour. Runs on other routes were on schedule.

Table 3.41 describes the average weekday ridership counts at various stops. Details of the actual counts on and off are summarized in the Appendix. Analysis indicates that approximately 10,250 bus riders daily use the University bus system between various stops. Of these 3,822 or 37.2% of the riders use the Campus Drive to Towers routes. 3,584 riders, comprising 35% of all riders, utilize the Towers to Campus Drive route.

An analysis of standees among the passengers on the University bus system indicated that a substantial number of runs included them. The majority of the standees were noted on the route between Campus Drive and Towers. Analysis indicates that the buses tended to be overloaded between 12:00 noon and 1:00 P.M. Table 3.42 describes the number of runs with standees and the ratios of standees to bus capacity, a ratio of greater than .10 would indicate overloading.

Most of the standees were encountered on the Campus Drive to Towers route, and they tended to be most frequent between the intermediate stops consisting of CAC and Engineering to Towers.

The University bus speeds generally correspond to automobile speeds in Morgantown. The speeds on Beechurst Avenue are slightly higher than on University Avenue. Bus speeds were computed based on ridership data which included arrival and departure times at all stops. Table 3.43 indicates speeds of University buses.

Cost Analysis for University Bus System³

The users of the University Bus System pay \$4.25 per semester to ride the buses. The faculty and staff of WVU are entitled to free rides.

The operating cost and revenue data for the University Bus System can be summarized as shown below.

Annual Bus Miles	75,230 Miles
Number of Operating days per year	246 days
Estimated platform hours per day	61 hours
Annual operating cost	\$121,646.00
Operating cost/platform hour	\$ 8.11
Operating cost/revenue mile	\$ 1.62
Annualized Capital Cost	\$ 30,733.00
Annualized Capital Cost/platform hour	\$ 2.05
Annualized capital cost/revenue mile	\$ 0.41
Annual revenue	\$126,705.00
Annual revenue per platform hour	\$ 8.44
Annual revenue per revenue mile	\$ 1.68

The analysis indicates that the University bus system was operating at a breakeven point as far as operating costs are concerned. However, it was not running profitably from an operator's point of view. It could earn only 82% of its total costs of revenue operations.

³PRT Impact Study, Pre-PRT Phase, Data Collection and Coding Manual, Engineering Experiment Station, West Virginia University, 1976.

TABLE 3.35

ACCIDENTS BY ZONE

PERIOD ZONE	Jan. 1-Dec. 31 1972	Jan.1-Dec. 31 1973	Jan.1-Dec. 31 1974	Jan.11-June 30 1975
1	288	283	179	109
2	43	33	25	15
3	3	1	0	1
4	20	31	40	13
5	26	28	28	17
6	9	5	2	2
7	16	20	11	4
8	9	4	3	4
9	16	18	12	11
10	2	0	0	3
12	1	1	0	0
13	7	2	6	1
18	1	0	0	0
19	1	2	3	3
20	5	1	3	2
21	78	55	65	31
23	7	4	2	1
TOTALS	531	488	287	217

TABLE 3.36
ACCIDENTS BY INTERSECTION

INTERSECTION	Jan.1-Dec.31 1972	Jan.1-Dec.31 1973	Jan.1-Dec.31 1974	Jan.1-June 30 1975
1	11	1	5	0
2	52	50	28	9
3	8	9	2	0
4	10	9	7	4
5	1	2	4	3
6	0	1	0	1
7	5	0	0	0
8	13	4	8	4
9	10	13	7	10
10	6	5	4	7
11	12	18	8	3
12	5	5	3	1
13	2	6	4	1
14	1	0	0	0
15	31	27	8	4
16	6	4	5	5
17	4	3	3	4
18	9	8	8	2
19	9	10	4	6
20	9	21	5	5
21	2	0	3	0
22	1	0	0	0
23	7	9	0	0
24	5	2	3	1
25	2	0	0	3
26	1	1	2	0
27	6	5	6	1
28	3	2	1	2
29	15	20	25	8
30	7	3	1	1
31	2	2	2	1
32	16	18	12	11
33	1	4	3	2
34	4	4	5	1
35	9	7	4	5
36	4	8	7	2
37	0	1	0	0
38	0	1	0	1
39	1	1	1	1
40	7	5	7	2
41	10	4	7	5
42	12	17	4	4
43	3	5	8	1
44	5	3	3	1
45	3	6	2	1
46	0	3	1	0
47	9	2	3	4
48	4	4	0	2
49	8	3	4	1
50	8	5	5	4
51	0	2	1	1
52	3	3	2	0
53	7	2	2	2
54	3	5	5	3

TABLE 3.36 (continued)

INTERSECTION	Jan.1-Dec.31 1972	Jan.1-Dec.31 1973	Jan.1-Dec.31 1974	Jan.1-June 30 1975
55	3	2	3	3
56	2	4	2	1
57	0	1	0	0
58	7	5	2	2
59	3	4	9	3
60	11	7	5	2
61	2	2	0	1
62	1	1	0	0
63	6	4	4	1
64	0	1	1	2
65	1	6	3	1
66	5	4	1	4
67	2	1	0	0
68	0	1	2	1
69	3	3	3	1
70	0	2	1	0
71	1	1	2	4
72	0	1	3	0
73	0	0	2	1
74	3	0	1	0
75	2	0	2	2
76	0	0	3	0
77	0	0	2	0
78	0	0	2	0
79	1	0	0	0
80	2	0	0	0
81	1	0	0	0
82	0	1	0	1
83	4	0	1	3
84	1	0	0	0
85	1	0	0	0
86	0	0	1	0
87	3	0	4	0
88	0	0	1	0
89	0	0	0	1
90	1	0	0	2
91	1	0	0	0
92	0	1	0	0
93	15	4	2	3
94	0	2	2	1
95	10	9	4	6
96	25	25	24	12
97	4	7	12	0
98	30	16	13	8
99	38	51	32	7
TOTALS	561	517	393	213

TABLE 3.37

CODES FOR INTERSECTION NUMBERS

INTERSECTION NUMBER	LOCATION ZONE	
1	2	University Ave & Prospect St.
2	1	University Ave & Pleasant St.
3	1	High St. & Willey St.
4	1	Spruce St. & Walnut St.
5	1	Spruce St. & F. and M. Driveway
6	13	Patterson Dr. & Takoma St.
7	21	University Ave. & Dillie St.
8	1	Spruce St. & Willey St.
9	1	High St. & Pleasant St.
10	21	Beechurst Ave. & Third St.
11	7	University Ave. & Oakland St.
12	1	High St. & Foundry St.
13	1	High St. & Forrest Ave.
14	1	Willey St. & Chestnut St.
15	1	University Ave. & Walnut St.
16	21	Beechurst Ave. & Eighth St.
17	1	University Ave. & Beechurst Ave.
18	1	University Ave. & College Ave.
19	1	Spruce St. & Pleasant St.
20	1	High St & Fayette St.
21	4	University Ave. & Stewart St.
22	3	Willey St. & Fife Ave.
23	1	University Ave. & Moreland St.
24	21	University Ave. & North St.
25	1	University Ave. & Garrett St.

TABLE 3.37 (continued)

INTERSECTION NUMBER	LOCATION ZONE	
26	4	Beechurst Ave. & First St.
27	1	Spruce St. & Fayette St.
28	4	Campus Dr. & Grant Ave.
29	5	Boulevard & Patterson Dr.
30	6	University Ave. & Birch St.
31	21	Boulevard & Eighth St.
32	9	University Ave. & Patterson Dr.
33	21	Beechurst Ave. & Seventh St.
34	1	University Ave. & Court St.
35	1	University Ave. & Kirk St.
36	4	University Ave. & Campus Dr.
37	3	High St. & Fife Ave.
38	7	University Ave. & Vassar St.
39	6	Boulevard & Riverview Dr.
40	1	University & Fayette St.
41	1	University Ave. & Foundry St.
42	1	High St. & Walnut St.
43	4	University Ave. & First St.
44	13	Patterson Dr. & Laurel St.
45	21	University Ave. & Beverly Ave.
46	7	University Ave. & Riverview Dr.
47	8	University Ave. & Medical Center Dr.
48	1	High St. & Wall St.
49	2	University Ave. & Falling Run Rd.
50	1	Spruce St. & Forrest Ave.

TABLE 3.37 (continued)

INTERSECTION NUMBER	LOCATION ZONE	
51	4	Campus Dr. & McLane Ave.
52	4	University Ave. & Second St.
53	2	Beechurst Ave. & Hough St.
54	21	Beechurst Ave. & Sixth St.
55	1	Spruce St. & Wall St.
56	23	University Ave. & Overhill St.
57	25	Spruce St. & Wiles St.
58	21	Beechurst Ave. & Fourth St.
59	4	Beechurst Ave. & Campus Dr.
60	21	University Ave. & Eighth St.
61	1	Beechurst Ave. & Fayette St.
62	1	Spruce St. & Court St.
63	1	University Ave. & Wall St.
64	19	University Ave. & Inglewood Blvd.
65	1	Beechurst at the Columbia
66	2	University Ave. at the Stadium Bridge
67	21	University Ave. & Ensign Ave.
68	1	University Ave. & Reid St.
69	21	Beechurst Ave. & Fifth St.
70	13	Patterson Dr. & Baldwin St.
71	2	University Ave. & Willey St.
72	21	University Ave. & Warrick St.
73	1	University Ave. & Hough St.
74	21	University Ave. & Third St.
75	1	High St. & Kirk St.

TABLE 3.37 (continued)

INTERSECTION NUMBER	LOCATION ZONE	
76	21	Eighth St. & Grant Ave.
77	21	Eighth St. & McLane Ave.
78	4	University Ave. & Huston Dr.
79	23	University Ave. & Morgan St.
80	7	Oakland St. & Rawley Lane
81	1	Pleasant St. & Chestnut St.
82	1	High St. & Moreland St.
83	5	Patterson Dr. & Fine Arts Dr.
84	1	Fayette St. & Chestnut St.
85	7	Oakland St. & Hawthorne Ave.
86	21	University Ave. & Gilmore St.
87	1	High St. & Court St.
88	2	Beechurst Ave. & Waters St.
89	3	Spruce St. & Prospect St.
90		Campus Dr.
91		Court St.
92		Willey St.
93		Boulevard
94		Eighth St.
95		Patterson Dr.
96		High St.
97		Spruce St.
98		Beechurst Ave.
99		University Ave.
	10	University Ave. & Baldwin
	3	Prospect Ave.
	1	University Ave. & Bank St.

TABLE 3.38

ACCIDENTS INVOLVING INJURY

PERIOD ITEM	Jan.1-Dec.31 1972	Jan.1-Dec.31 1973	Jan.1-Dec.31 1974	Jan.1-June 30 1975
Total No. of Accidents	566	518	395	225
No. of Accidents With Injury	83	89	80	54
Percent of Accidents Involving Injury	14.6	17.1	20.2	24

TABLE 3.39

PRT-CORRIDOR
ACCIDENT DAMAGE
(In Dollars)

ITEM	Jan.1-Dec.31 1972	Jan.1-Dec.31 1973	Jan.1-Dec.31 1974	Jan.1-June 30 1975
Total Costs of Damage	208,686	239,590	186,835	143,858
No. of Accidents	566	518	395	225
Average Costs per Accident	400.91	462.53	473.00	639.37

TABLE 3.40

ACTUAL AND SCHEDULED FREQUENCIES OF UNIVERSITY BUS SYSTEM

ROUTE 1		CAMPUS-TOWERS														FREQUENCIES			
Time Type		8-9	9-10	10-11	11-12	12-1	1-2	2-3	3-4	4-5									Actual Scheduled
		S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	
Tuesday		12 11	12 15	12 15	12 13	12 13	12 17	12 12	12 14	12 12									108
Wednesday		12 14	12 15	12 13	12 11	12 13	12 12	12 14	12 14	12 13									108
Thursday		12 12	12 14	12 16	12 --	12 10	12 14	12 11	12 14	12 12									96
Friday		12 12	12 12	12 15	12 14	12 14	12 12	12 13	12 13	12 12									108
*Missing Data																			
ROUTE 4		TOWERS-CAMPUS DR.														FREQUENCIES			
Time Type		8-9	9-10	10-11	11-12	12-1	1-2	2-3	3-4	4-5									Actual Scheduled
		S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	S A	
Tuesday		12 9	12 17	12 13	12 14	12 17	12 2	12 13	12 15	12 13									108
Wednesday		12 13	12 13	12 12	12 16	12 14	12 12	12 16	12 14	12 13									108
Thursday		12 9	12 16	12 15	12 11	12 15	12 15	12 10	12 16	12 14									108
Friday		12 15	12 14	12 12	12 15	12 13	12 14	12 13	12 14	12 13									108

NOTE: Actual frequency of Saturday runs of University buses was equal to the scheduled frequency.

TABLE 3.40 (continued)

ROUTE 5		MED CENTER-COLISEUM																FREQUENCIES			
Time Type		8-9		9-10		10-11		11-12		12-1		1-2		2-3		3-4		4-5		Actual	Scheduled
		S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A				
Tuesday		4	4	4	3	4	4	4	4	4	4	4	4	4	5	4	4	4	5	37	36
Wednesday		4	5	4	3	4	3	4	-	4	4	4	4	4	3	4	4	4	4	34	36
Thursday		4	-	4	-	4	-	4	-	4	-	4	-	4	-	4	-	4	-	*	36
Friday		4	5	4	3	4	4	4	5	4	3	4	4	4	5	4	4	4	4	37	36

* Missing Data

ROUTE 6		COLISEUM-MED CENTER																FREQUENCIES			
Time Type		8-9		9-10		10-11		11-12		12-1		1-2		2-3		3-4		4-5		Actual	Scheduled
		S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A				
Tuesday		4	5	4	4	4	3	4	5	4	4	4	4	4	4	4	4	4	4	37	36
Wednesday		4	2	4	2	4	4	4	3	4	4	4	2	4	5	4	4	4	3	32	36
Thursday		4	4	4	4	4	4	4	5	4	3	4	4	4	4	4	4	4	4	36	36
Friday		4	4	4	4	4	4	4	4	4	4	4	4	4	2	4	2	4	3	32	36

TABLE 3.40 (continued)

ROUTE 9		CAMPUS-COLISEUM																FREQUENCIES			
Time Type		8-9		9-10		10-11		11-12		12-1		1-2		2-3		3-4		4-5		Actual	Scheduled
		S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A		
Tuesday		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	18	18
Wednesday		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	17	18
Thursday		2	2	2	-	2	2	2	-	2	-	2	2	2	2	2	2	2	1	11*	18
Friday		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	18	18

* Missing Data

ROUTE 10		COLISEUM-CAMPUS DRIVE																FREQUENCIES			
Time Type		8-9		9-10		10-11		11-12		12-1		1-2		2-3		3-4		4-5		Actual	Scheduled
		S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A	S	A		
Tuesday		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	18	18
Wednesday		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	18	18
Thursday		2	2	2	-	2	2	2	-	2	-	2	-	2	2	2	-	2	1	11*	18
Friday		2	2	2	2	2	2	2	1	2	2	2	2	2	2	2	1	2	1	16	18

* Missing Data

TABLE 3.41

AVERAGE WEEKDAY BUS RIDERSHIP COUNTS
NUMBER OF PASSENGERS LOADING AT VARIOUS STOPS

STOP NAME	CAMPUS DR.		TOWERS		MED. CENTER	COLISEUM		ENG	CAC	FOR	TOTAL
TIME/ROUTE	C-T	C-CL	T-C	M-CL	M-CL	CL-C	CL-M	C-T*	C-T*	C-T*	
8:00 - 9:00	317	4	353	75	28	3	10	26	41	7	864
9:00 - 10:00	435	4	571	11	22	9	18	42	81	28	1168
10:00 - 11:00	542	6	453	56	33	12	18	64	113	32	1273
11:00 - 12:00	372	5	373	66	29	8	12	70	89	26	979
12:00 - 1:00	524	6	509	138	34	7	26	82	87	27	1302
01:00 - 02:00	504	7	454	100	35	9	28	70	64	36	1207
02:00 - 03:00	436	6	300	72	90	8	17	87	58	19	1093
03:00 - 04:00	504	5	315	57	59	9	23	75	88	22	1157
04:00 - 05:00	288	3	259	35	52	7	11	68	68	17	756
EVENING**	187		150		28	10		18	48	12	453
TOTAL	3822	46	3584	610	382	72	153	584	689	214	10252

Route: C-T = Campus Drive to Towers, T-C = Towers to Campus

C-CL = Campus Drive to Coliseum, CL-C = Coliseum to Towers

M-CL = Medical Center to Coliseum, CL-C = Coliseum to Medical Center

* Includes counts for M-CL-M Route

** Counts refer to evening route

TABLE 3.42

NUMBER OF BUS RUNS WITH STANDEES

Time	N	Rt. 1	Avg. Ratio	N	Rt. 1	Avg. Ratio	N	Rt. 1	Avg. Ratio	N	Rt. 1	Avg. Ratio
8:00 - 9:00	-	-	-	111	4	0.120	-	-	-	6	5	0.087
9:00 - 10:00	16	9	0.094	7	4	0.099	14	6	0.130	8	3	0.078
10:00 - 11:00	26	17	0.127	12	10	0.148	21	13	0.143	7	6	0.066
11:00 - 12:00	7	5	0.109	21	17	0.169	6	5	0.143	11	10	0.132
12:00 - 01:00	31	29	0.132	22	20	0.129	20	15	0.111	23	-	0.151
01:00 - 02:00	14	11	0.073	13	12	0.143	8	3	0.130	4	-	0.205
02:00 - 03:00	9	8	0.084	15	12	0.072	4	4	0.114	3	-	0.128
03:00 - 04:00	19	19	0.092	11	10	0.142	16	15	0.138	-	-	-
04:00 - 05:00	3	1	0.158	4	2	0.145	4	3	0.060	-	-	-

Average Ratio refers to the average of standees to bus capacity during the hour. A ratio of .10 or greater would indicate overloading of buses.

* Rt. 1 is the Campus Drive to Towers route.

N is the number of runs involving standees.

TABLE 3.43

INTER-CAMPUS TRAVEL TIMES BY BUS

Link	Scheduled Headway	No.** of Obser- vations	Miles	Average Trip Running Time (Min.)	Miles Per Hour	Fastest Trip Running Time (Min.)	Miles Per Hour	Time of Day	Slowest Trip Running Time (Min.)	Miles Per Hour	Time of Day
Campus - CAC	5 min.	93	1.1	4.78	13.80	3	22.0	1:44 PM	10	6.6	3:22 PM
Campus - Engineering	5 min.	93	1.3	6.02	16.25	4	19.5	10:13 AM	12	6.5	3:22 PM
Campus - AG	5 min.	93	1.7	7.57	13.47	5	20.4	10:13 AM	14	7.3	3:22 PM
Campus - Towers	5 min.	93	2.1	8.86	14.22	7	18.0	10:19 AM*	15	8.4	3:22 PM
Towers - Campus	5 min.	95	1.4	6.77	12.40	4	21.0	10:33 AM	17	5.0	10:46 AM
Coliseum - Medical Center	15 min.	91	2.0	8.57	19.00	6	20.0	8:12 AM	13	9.2	11:44 AM
Medical Center - Coliseum	15 min.	91	2.0	8.57	14.00	6	20.0	10:01 AM	13	9.2	11:57 AM
Campus - Coliseum	30 min.	41	1.9	4.02	28.36	3	38.0	8:48 AM	8	14.25	16:18 PM
Coliseum - Campus	30 min.	41	2.3	10.94	12.61	6	23.0	10:31 AM	21	6.57	14:20 PM

*Also occurring at

AM - 9:06, 9:23, 9:30, 9:42, 10:19, 10:39

PM - 12:40, 1:17, 1:44

**Actual number of observations used from the rider-
ship to compute average speeds and travel lines.

4. PRE-PRT IMPACT MODELS

4.1 Scope of Models

The models proposed herein are an attempt to describe the conditions of transportation usage before the revenue operation of the PRT. Attempts have been made to include as much available information as possible of transportation usage in Morgantown by employing data from various travel surveys.

The modeling efforts in this study represent an approach towards evaluating the impact of a new technology transportation mode. The objective of the models described here are slightly different from those models that forecast demand before a new transportation system is built in that an estimate is available of the potential ridership of the new mode. However, the objective is to evaluate the impact of PRT on transportation levles of service on existing modes due to PRT, when PRT is a competing mode. The models described in this report relate to the Pre-PRT Impact Phase and yield estimates of travel patterns and traffic flows before the PRT was operational.

4.1.1 Description of Models

In developing models for existing travel in Morgantown, several options are available to develop these so that the impact of PRT can be studied closely. Essentially the models developed are designed to yield estimates of traffic flow as a function of demand and supply, attitudes being neglected. The models then are of the form

$$T = f (\text{Supply, Demand})$$

where T = traffic flow.

As mentioned earlier the impact of PRT is expected to be substantial in areas closer to the PRT stations or in Primary Market Area of the PRT. For developing models, the data relevant to 16 zones constituting the PMA was utilized.

The ultimate objective of the models described herein is to aid in measuring the impact of PRT after it is operational. This can be achieved by utilizing models developed during the Pre-PRT phase and comparing the results with actual data during the Post-PRT phase.

Two types of models have been developed to make meaningful comparisons. First the models expressing trip generation relations for intra-corridor travel will be developed. The next set of models will estimate intra-corridor traffic flows during the Pre-PRT phase.

4.2 Development of Interzonal Trip Matrix

Potential riders of the PRT system can be identified as students, faculty, and staff of West Virginia University and the residents of the Primary Market Area. The travel modes used in Morgantown along the PRT corridor consist of the automobiles, University buses and the City and County buses.

TABLE 4.1

PRE-PRT IMPACT STUDY
AUTO TRIP MATRIX

ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	0	0	0	0	120	9	374	278	61	213	56	3	33	0	0	0
2	0	0	0	0	136	0	483	536	5	0	74	0	393	150	20	242
3	0	0	0	0	9	13	38	175	14	0	50	5	7	10	6	54
4	0	0	0	0	14	10	5	37	5	0	26	40	12	50	10	182
5	215	382	14	12	0	0	236	105	0	0	0	0	52	130	51	247
6	0	0	13	27	0	0	0	0	0	0	0	0	0	0	0	102
7	175	379	5	21	228	0	0	0	62	0	69	31	83	14	11	76
8	337	509	95	33	47	0	47	0	46	18	0	15	27	6	127	153
9	66	31	14	9	0	0	30	0	0	0	0	0	31	119	0	55
10	207	30	0	0	0	0	0	0	0	0	8	0	64	40	0	0
11	47	0	48	21	28	0	70	61	0	0	0	0	21	14	82	17
12	10	16	5	4	0	0	0	0	0	7	0	0	0	0	0	0
13	133	17	0	12	0	0	15	31	0	0	1	0	0	207	295	287
14	0	40	10	65	244	0	0	14	26	119	0	11	247	0	0	0
15	0	22	5	10	93	0	37	128	40	40	85	0	298	0	0	0
16	0	154	161	284	331	102	98	91	115	0	99	0	292	0	0	0
TOTAL	1190	1590	370	498	1250	134	1433	1456	374	397	468	105	1560	740	602	1415

ZONE NUMBER REFERS TO ANALYSIS ZONE

TABLE 4.2

UNIVERSITY BUS TRIP MATRIX

ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	0	C	C	0	42	50	0	91	0	0	5	0	7	0	0	0
2	0	0	C	0	573	245	105	1612	52	4	52	4	48	0	0	0
3	C	0	0	C	197	94	0	83	0	0	8	C	6	0	0	0
4	C	C	0	0	100	81	0	48	0	0	8	0	6	0	0	0
5	56	553	172	105	0	278	114	144	61	0	212	C	195	41	61	50
6	0	22	40	47	65	0	0	0	0	0	25	C	45	10	10	15
7	15	123	0	0	0	124	0	0	0	0	15	C	30	0	0	C
8	11	1867	52	30	200	0	0	0	30	0	160	C	177	21	6	3
9	C	3	0	0	0	0	0	0	0	0	0	C	2	0	0	0
10	C	3	0	0	0	0	0	0	0	0	0	C	0	C	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	8	88	65	19	42	2	15	25	10	0	0	C	35	12	15	10
13	41	155	48	47	25	35	35	180	30	0	25	2	C	10	15	10
14	0	C	0	0	20	20	22	0	0	0	2	0	0	0	0	0
15	C	C	0	0	7	12	0	5	5	0	0	0	2	0	0	0
16	0	C	0	0	0	9	0	0	3	0	0	0	0	0	0	0

ZONE NUMBER REFERS TO ANALYSIS ZONE

TABLE 4.3

TOTAL TRIP MATRIX

ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	0	0	0	0	162	59	374	369	61	213	61	3	40	0	0	0
2	0	0	0	0	709	245	588	2148	57	4	126	4	441	150	20	242
3	0	0	0	0	206	107	38	258	14	0	58	5	13	10	6	54
4	0	0	0	0	114	91	5	85	5	0	34	40	18	50	10	182
5	271	935	186	117	0	278	350	249	61	0	212	0	247	171	112	297
6	0	22	53	74	65	0	0	0	0	0	25	0	45	10	10	117
7	190	502	5	21	228	124	0	0	62	0	84	31	113	14	11	76
8	348	2376	147	63	247	0	47	0	76	18	160	15	204	27	133	156
9	66	34	14	9	0	0	30	0	0	0	0	0	33	119	0	55
10	207	33	0	0	0	0	0	0	0	0	8	0	64	40	0	0
11	47	0	48	21	28	0	70	61	0	0	0	0	21	14	82	17
12	18	102	70	23	42	2	15	25	10	7	0	0	35	12	15	10
13	174	212	48	59	25	35	50	211	30	0	26	2	0	217	310	297
14	0	40	10	65	264	20	22	14	26	119	2	11	247	0	0	0
15	0	22	5	10	100	12	37	133	45	40	85	0	300	0	0	0
16	0	154	161	284	331	111	98	91	118	0	99	0	292	0	0	0

ZONE NUMBER REFERS TO ANALYSIS ZONE

TABLE 4.4

INTERZONAL DISTANCE (Miles)

ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	0.0	0.7	0.8	0.9	2.7	2.3	1.8	2.1	2.3	2.5	2.3	2.6	2.9	1.1	0.7	0.8
2	0.7	0.0	0.4	0.4	2.1	1.8	1.3	1.6	1.8	2.0	2.0	2.3	2.4	0.7	1.2	1.3
3	0.6	0.4	0.0	0.7	2.3	2.0	1.5	1.9	2.0	2.2	2.3	2.7	2.6	0.8	1.1	1.2
4	0.8	0.4	0.6	0.0	1.9	1.6	1.0	1.4	1.6	1.8	2.1	2.2	0.9	1.4	1.5	0.0
5	2.7	2.1	2.3	1.9	0.0	0.5	1.0	0.4	0.8	1.0	0.7	0.9	1.4	2.6	3.1	3.2
6	2.3	1.8	2.0	1.6	0.5	0.0	0.7	0.3	0.4	0.7	1.1	0.9	1.1	2.3	2.8	3.0
7	1.8	1.3	1.5	1.0	1.0	0.7	0.0	0.6	0.7	0.9	1.4	1.1	1.3	1.8	2.3	2.5
8	2.1	1.6	1.8	1.4	0.6	0.3	0.6	0.0	0.3	0.5	1.0	0.7	0.9	2.2	2.7	2.9
9	2.2	1.8	2.0	1.6	0.8	0.4	0.7	0.3	0.0	0.4	0.9	0.6	1.1	2.3	2.8	3.0
10	2.5	2.0	2.2	1.8	1.0	0.7	0.9	0.5	0.4	0.0	1.1	0.8	1.3	2.5	3.0	3.2
11	2.3	2.0	2.2	1.8	0.7	1.0	1.4	1.0	0.9	1.1	0.0	0.5	1.8	2.5	2.8	2.9
12	2.5	2.3	2.5	2.0	0.9	1.3	1.1	0.7	0.6	0.8	0.5	0.0	2.2	2.8	3.0	3.2
13	2.9	2.4	2.6	2.2	1.4	1.0	1.3	0.9	1.1	1.3	1.8	2.2	0.0	2.9	3.5	3.6
14	0.9	0.8	0.6	1.0	2.5	2.2	1.7	2.1	2.2	2.3	2.6	2.4	2.8	0.0	1.4	1.5
15	0.9	1.3	1.2	1.5	3.4	2.9	2.4	2.7	2.7	2.9	2.8	3.0	3.5	1.1	0.0	0.6
16	1.4	1.7	1.7	1.9	3.6	3.3	2.8	3.2	3.3	3.5	2.9	3.2	3.9	1.5	0.6	0.0

ZONE NUMBER REFERS TO ANALYSIS ZONE

Data on travel behavior and travel patterns for residents of the PMA was obtained from the Telephone Interview Survey. Using the ratio of population in the zone to the respondents of the survey in that zone, the data was expanded to reflect the 24-hour travel. The Telephone Interview Survey was concentrated mainly on dormitory students and other residents living in the Primary Market Area. This included data on all modes utilized in the PRT corridor. For analysis and model development only trips that could have been completed using the PRT as a mode were considered.

Preliminary analysis of the Telephone Interview Survey indicated rich data for homogeneous zones near the downtown residential areas was available for all modes, but data was lacking for residents of other areas in the Primary Market Area. Secondly, in an effort to get a good control over the riders of University buses (who consist of residents of Primary Market Area and Non-Primary Market Area), it was considered that the data collected by the University On-Board Survey would be more reliable. This data collected during April, 1975 was expanded to reflect all University bus trips. Hourly trip totals on University bus routes was available from the Ridership Survey.

Only two City and County bus routes are parallel the PRT corridor. The data for this mode was available from the Telephone Interview Survey and included all the residents of Primary Market Area, who utilize this mode. The characteristics of this mode, which utilizes stops anywhere along its entire route, the potential diversion to PRT was considered minimal except for the trips from the CBD area to the Medical Center and from the Medical Center to the CBD.

Table 4.1 describes the auto trip matrix developed based on the data collected for all surveys. Table 4.2 is the University bus trip matrix developed for the PMA travel. Table 4.3 is the total travel matrix developed in the study area.

4.3 Development of Interzonal Travel-Time Matrix

Based on the map of Morgantown, the centroids of various zones were connected by highway links and distances between various zones computed. The distance trip matrix is described in Table 4.4.

Travel time for automobiles was based on the relationship for inclusive travel time, which can be expressed as

$$\text{Auto travel time} = [\text{Time for Travel}] + [\text{Time to park at destination}] + [\text{Time to walk from parking lot to destination}]$$

In developing auto travel time, it was assumed that the car was parked at the origin and time for walk to car was negligible. The travel times used, were average free flow times estimated based on the travel time study. The time to park was computed based on the parking survey conducted to determine this value. The auto travel matrix developed for the PMA travel is shown in Table 4.5.

The travel time between zones in PMA utilizing University bus system was based on the relationship,

$$\text{Travel Time by U-Bus} = [\text{Walking time to nearest Bus Stop}] + [\text{Average Waiting time at Bus Stop}] + [\text{Travel Time to reach destination}] + [\text{Walking time from Bus Stop, if any}] .$$

TABLE 4.5

AUTC TRAVEL TIME

ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	C.C	10.7	13.4	13.6	15.6	13.0	13.0	13.5	12.1	12.9	12.1	13.2	16.6	0.0	0.0	0.0
2	10.7	C.C	11.5	11.6	13.3	11.1	8.0	11.6	10.1	10.9	11.0	12.1	14.6	5.8	7.7	8.3
3	10.3	9.7	C.C	0.0	14.3	12.0	6.0	12.5	11.1	10.0	12.0	13.8	11.5	6.0	7.2	7.8
4	11.4	9.6	0.0	0.0	12.5	10.2	7.2	10.7	9.2	0.0	10.2	11.3	13.7	6.6	8.5	9.2
5	12.6	16.3	19.1	17.5	0.0	5.0	7.1	7.5	0.0	0.0	7.0	0.0	10.6	13.3	16.6	16.2
6	17.0	14.3	17.8	16.2	5.5	0.0	5.8	0.0	6.5	4.5	7.5	7.5	9.6	12.3	15.6	14.9
7	15.0	13.0	15.8	14.2	9.1	6.8	0.0	6.0	4.6	5.4	7.3	9.0	5.1	10.0	12.3	12.9
8	16.5	14.6	17.3	15.7	7.5	0.0	4.0	0.0	0.0	5.1	7.0	6.0	8.8	11.6	13.8	14.4
9	17.1	15.1	17.8	16.2	7.0	6.0	3.0	0.0	0.0	0.0	0.0	0.0	9.3	12.1	0.0	15.0
10	17.9	15.9	C.C	0.0	0.0	0.0	0.0	0.0	3.0	0.0	7.3	0.0	10.2	0.0	15.2	0.0
11	17.1	16.0	18.8	17.2	5.7	6.7	8.5	9.0	0.0	0.0	0.0	0.0	12.0	13.0	14.1	14.7
12	18.2	17.1	19.8	18.3	8.8	9.1	7.5	8.0	5.4	0.0	0.0	0.0	11.0	13.1	15.1	15.8
13	20.2	17.6	20.3	18.7	10.6	8.5	6.0	8.8	7.4	0.0	10.1	11.7	0.0	14.6	16.8	17.5
14	11.5	11.1	12.4	14.0	15.2	12.9	9.8	13.4	11.9	12.7	13.4	14.5	16.4	0.0	0.0	0.0
15	0.0	13.1	14.9	16.0	18.7	15.4	12.4	15.9	13.9	14.8	14.1	15.1	19.0	0.0	0.0	0.0
16	0.0	14.9	16.7	17.8	19.5	17.2	14.2	17.7	16.2	17.1	14.7	15.8	20.7	0.0	0.0	0.0

ZONE NUMBER REFERS TO ANALYSIS ZONE

TABLE 4.6

U-RUS TOTAL TRAVEL TIME

ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	0	0	0	0	16	19	23	21	24	24	20	21	32	0	0	0
2	0	C	C	0	9	12	16	14	17	24	20	21	23	C	C	0
3	C	C	0	C	9	12	16	14	17	24	20	21	23	0	0	0
4	0	0	3	5	14	12	16	24	20	24	20	6	12	0	0	0
5	20	15	16	16	0	4	10	8	10	0	13	C	16	22	23	24
6	22	15	15	15	4	0	8	3	10	0	13	C	16	21	22	23
7	22	17	18	18	13	14	0	0	0	0	18	C	15	22	23	24
8	19	1C	10	10	15	17	0	0	0	0	18	0	15	21	22	23
9	7	7	7	7	3	4	0	0	0	0	6	C	3	7	7	7
10	7	7	7	7	3	4	0	0	0	0	6	0	3	7	7	7
11	21	22	23	23	13	14	19	21	6	6	0	0	24	24	25	26
12	C	C	0	0	0	0	0	0	0	0	0	C	C	0	0	0
13	30	21	22	22	16	15	13	15	16	3	24	0	0	31	32	33
14	0	0	0	0	20	22	24	22	25	8	22	C	31	0	C	C
15	0	0	0	0	21	23	25	23	26	8	23	C	33	0	0	0
16	0	C	0	0	21	23	26	24	27	8	24	0	33	0	0	0

ZONE NUMBER REFERS TO ANALYSIS ZONE

TABLE 4.7

WALKING AND WAITING TIME U-BUS (minutes)

ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	C	0	0	0	10	12	15	12	15	15	11	15	20	0	0	0
2	0	0	0	0	3	5	8	5	8	15	11	15	11	0	0	0
3	0	0	0	0	3	5	8	5	8	15	11	15	11	0	0	0
4	0	0	3	5	8	5	8	15	11	15	11	0	0	0	0	0
5	10	5	6	6	0	3	8	5	8	0	10	C	10	15	16	17
6	12	5	5	5	3	0	6	0	8	0	10	0	10	14	15	16
7	15	10	11	11	10	10	0	0	0	0	12	C	12	15	16	17
8	12	3	3	3	12	13	0	0	0	0	12	0	12	14	15	16
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	C	0	0	0	0	0	0	0	0	0	C	C	0	0	0
11	10	11	12	12	10	10	13	15	0	0	0	0	15	17	18	19
12	C	C	0	0	0	0	0	0	0	0	0	C	0	0	0	C
13	20	11	12	12	10	10	10	12	13	0	15	C	0	24	25	26
14	0	0	0	0	14	15	16	14	17	0	19	0	19	0	0	0
15	C	C	0	0	15	16	17	15	18	0	20	0	21	0	0	0
16	0	0	0	0	15	16	18	16	19	0	21	0	21	0	0	0

ZONE NUMBER REFERS TO ANALYSIS ZONE

TABLE 4 8

TRAVEL TIME U-BUS (Minutes)																
ZONE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	0	0	0	0	6	7	8	9	9	9	9	6	12	0	0	0
2	0	0	0	0	6	7	8	9	9	9	9	6	12	0	0	0
3	0	0	0	0	6	7	8	9	9	9	9	6	12	0	0	0
4	0	0	0	0	6	7	8	9	9	9	9	6	12	0	0	0
5	10	10	10	10	0	1	2	3	2	0	3	0	6	7	7	7
6	10	10	10	10	1	0	2	3	2	0	3	0	6	7	7	7
7	7	7	7	7	3	4	0	0	0	0	6	0	3	7	7	7
8	7	7	7	7	3	4	0	0	0	0	6	0	3	7	7	7
9	7	7	7	7	3	4	0	0	0	0	6	0	3	7	7	7
10	7	7	7	7	3	4	0	0	0	0	6	0	3	7	7	7
11	11	11	11	11	3	4	6	6	6	6	0	0	9	7	7	7
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	10	10	10	10	6	5	3	3	3	3	9	0	0	7	7	7
14	0	0	0	0	6	7	8	8	8	8	3	0	12	0	0	0
15	0	0	0	0	6	7	8	8	8	8	3	0	12	0	0	0
16	0	0	0	0	6	7	8	8	8	8	3	0	12	0	0	0

ZONE NUMBER REFERS TO ANALYSIS ZONE

Table 4.6 describes the average waiting and walk time for various interzonal University Bus interchanges. Table 4.7 describes the travel time for travel between various zones. Table 4.8 is the total travel time for travel utilizing University bus in the Corridor.

4.4 Trip-Generation Models

Table 4.9 describes the socio-economic data for the PMA zones. The data was separated for Campus and Non-Campus zones because of the different characteristics of these zones, and this resulted in 5 Campus Zones and 11 other zones. Table 4.9 indicates relation between the analysis zones and the Primary Market Area zones.

Table 4.10 expresses correlations between the trips produced and the socio-economic variables for the Campus Zones. Table 4.11 indicates correlations between the trips produced in these zones to the socio-economic variables. Care must be taken in interpreting these trips produced, they refer only to trips produced within the corridor and do not include all home based trips. The same is true for trips produced at the Campus Zones.

The variables used in developing trip generation relationships are different for the Campus Zones and the residential zones because of their characteristics. Demand variables utilized for analysis purposes can be defined as follows:

1. Analysis Zones: These zones are the same as Primary Market Area zones, but were utilized so that the Primary Market Area zones could be renumbered sequentially from 1 to 16. Analysis zone number 7 was created by combining PMA zones 7 and 19. Correspondance between these two zones is given in Table 4.9.
2. Employment: This variable refers to the working population in the analysis zone.
3. Campus Zone: This refers to the fact that this zone consists only of one of the campuses of West Virginia University and characteristically lack information such as population.
4. Scheduled Classes: This variable refers to Campus Zone. It is defined as the total number of individual students registered for a class at the given Campus Zone. Value of variable used is 1/10 of this scheduled classes for analysis. This variable was derived from analysis conducted on Spring 1975 WVU student records.
5. Floor area in 10^3 square feet: This variable is as defined and refers to the floor area at the Campus Zones. This information was supplied by the West Virginia University.
6. Student Class Changes: This variable was derived from the student records for Spring 1976. This is the sum of all class changes occurring over a period of one day, whenever a student has a class scheduled in another campus which is different from the campus where he had his preceding class scheduled.

Analysis indicates that auto trips produced within the corridor are not highly correlated with any of the campus related variables. This is because auto trips produced in Evansdale area have not been considered as trips unless they go to one of the PMA zones.

TABLE 4.9

SOCIO-ECONOMIC DATA FOR PRIMARY MARKET AREA

Analysis Zone No.	PMA Zone No. (s)	Working Population	No. of Student** Classes Scheduled	Floor Area in 10 ³ Sq. Ft.	No. of Student*** Class Changes	Population	Student Population
1	1	1261	-	-	-	1862	967
2	2*	1193	20540	78.3	1709	-	-
3	3	75	-	-	-	1850	1660
4	4	41	-	-	-	1270	780
5	5*	446	3600	32.4	969	-	-
6	6*	476	4850	27.7	719	-	-
7	(7+19)	81	-	-	-	845	580
8	8	232	-	-	-	1733	1733
9	9	235	-	-	-	140	-
10	10	26	-	-	-	280	90
11	12*	266	910	22.4	215	-	-
12	13	-	-	-	-	135	40
13	18*	1554	650	46.0	30	-	-
14	25	67	-	-	-	3397	730
15	26	17	-	-	-	1723	370
16	27	-	-	-	-	3000	650

* Campus Zone

** Number of students scheduled to take a class on the campus on a given day.

*** Total Number of students requiring transportation because next class is scheduled on another campus.

TABLE 4.10

CORRELATION MATRIX FOR CAMPUS-ZONES DATA

<u>VARIABLE</u>	<u>EMPLOYMENT</u>	<u>CLASSES</u>	<u>FLOOR-AREA</u>	<u>CLASS CHANGES</u>
TOTAL TRIPS	0.37	0.75	0.79	0.79
AUTO TRIPS	0.40	0.29	0.50	0.39
BUS TRIPS	0.32	0.87	0.84	0.88

TABLE 4.11

CORRELATION MATRIX FOR RESIDENTIAL-ZONES DATA

<u>VARIABLE</u>	<u>TOTAL POPULATION</u>	<u>STUDENT POPULATION</u>	<u>WORKING POPULATION</u>
TOTAL TRIPS	0.35	0.66	0.17
AUTO TRIPS	0.60	0.36	0.41
BUS TRIPS	0.09	0.69	0.03

The University Bus trips are highly correlated with number of classes scheduled and the Floor Areas of Campuses.

The relationship best describing the campus trips produced in the corridor are as follows:

1. Total Auto Trips = $-1087 + 49 (\text{FL. AREA}) + 1.79(\text{CL.CHANGES}) - 2.2(\text{CLASSES})$ ($R^2=.87$)
2. University Bus Trips = $-709 + 1.2(\text{CL.CHANGES}) + 28.9(\text{FL.AREA})$ ($R^2=0.89$)
3. Total Trips = $-373 + 39.5(\text{FL.AREA}) + 1.33(\text{CL.CHANGES})$ ($R^2=0.76$)

Due to a very small size ($n=5$) these equations have low reliability. The interzonal trips produced seem more to be a function of location of the Campus with respect to other types of developments or activity centers.

Correlations for the residential zone trip generation indicates that Auto trips are correlated highly with population and the Bus trips are correlated highly with student population in residential zones. The best relationship for residential zones are as follows:

1. Total Trips = $174.2 + 1.28 (\text{ST. POPULATION})$ ($R^2=0.40$)
2. Auto Trips = $703 + .43 (\text{WORKING POPULATION})$ ($R^2=0.20$)
3. Bus Trips = $-413 + 1.04 (\text{ST. POPULATION})$ ($R^2=0.48$)

The equation for Bus trips tend to produce lower trips for smaller zones, however these values are good for Towers and Downtown Zones with higher student populations.

4.5 Trip Distribution Models

Due to constraints imposed on the study which was limited to the Primary Market Area, trip distribution relationships for PMA zones were analyzed. Based on the objective of the Pre-PRT Impact phase, the models yield estimates of the Pre-PRT traffic flows in the corridor. An analysis of trip purposes invariably yielded a significantly large number of trips that were school related.

In an effort to simplify the trip distribution modeling effort and to develop relationships that accurately describe the Pre-PRT traffic flow, models based on origin-destination zones were developed.

The zones in Morgantown PMA are suitable for such analysis. The zones can be classified into categories of Campus, Residential or Commercial. Based on these categories, trip distribution models have been developed for the following types of travel.

1. Campus to Campus
2. Home to Campus
3. Campus to Home
4. Interzonal Trips
5. Commercial Oriented trips involving CBD.

One of the ideas behind such an approach was duplicability of the results in the future. Estimates of impact on traffic flows due to PRT could be developed based on similar models that yield traffic flows and are independent of characteristics of PRT. A modal split

model involving PRT as a mode could be developed after PRT is operational and the comparisons with Pre-PRT modal split would yield estimates of impact of PRT.

The data on which the destination oriented trip distribution models are based consist of the intra-corridor flows by each mode. These were derived for 24-hour periods from the Telephone Survey, On-Board Survey and the Faculty/Staff Survey. The models are duplicable in the future and would include trips by all modes including the intracorridor travel utilizing the Personal Rapid Transit.

The classification of zones is critical to this methodology. The zones designated as campus zones for Pre-PRT phase are expected to remain as campus zones in the near future. Campus Zones are so designated in Table 4.9 which includes zonal socio-economic data.

Data on classes scheduled and class changes occurring are the average value of these data for Wednesday and Thursday for the Spring period for the Post-PRT analysis.

A breakdown of trip types defined earlier made by the users of the PRT Corridor by auto and bus mode was estimated based on Tables 4.1 and 4.2, which describe the auto trip matrix and the University Bus trip matrix, respectively. The campus zones in the Primary Market Area are 2,5,6,12 and 18. Zones 3,4,8,9,10,13,25,26 and 27 constitute the residential (home) zones. Zone 1 represents the Central Business District in Morgantown.

Trips in various categories of travel by auto and bus mode and the percentage of travel by each mode are as follows:

	Campus to Campus	%	Home to Campus	%	Campus to Home	%	Interzonal	%	CBD Oriented	%
Auto trips	1103	28.6	3585	52.2	3500	51.7	2999	90.6	2337	87.7
Bus trips	2733	71.4	3261	47.8	3276	48.3	308	9.4	326	12.3
Total trips	3836	100.0	6846	100.0	6776	100.0	3307	100.0	2663	100.0

Analysis indicates that trip categories that are campus oriented involve more use of Bus. The travel to CBD and back by University Bus is not high because of long walk times involved. Interzonal travel involving travel between zones that are neither CBD nor Campus utilizes automobile because of obvious possibility of convenience of door to door travel.

Variables used in Trip Distribution Models:

Analysis indicated that demand variables for each of the categories of travel were slightly different for the different types of trips. The campus to campus trips were largely found to correlate highly with number of classes scheduled at the origin Campus and the Campus of destination. Employment at destination was better correlated for Automobile trips.

Home based campus trips were highly correlated with population of zone and student population. Interzonal campus trips were highly correlated with the populations of the zones. CBD oriented travel correlated better with working employments in CBD and the zone under consideration.

The observed trips between campus zones were weakly correlated with demand estimates for student PRT trips which were determined using a procedure developed at WVU. The demand estimates and the procedure for generating them are summarized in "PRT Impact Study,

Pre-PRT Phase, Data Collection Procedures and Coding Manual", West Virginia University, 1975. The demand estimation procedure, which was developed in about 1970, was designed to generate maximum potential demand for student trips at 5-minute intervals on a 6-station PRT by taking into account students' class and residential locations. The demand estimates were intended to be used primarily in assessing the capability of the PRT to handle peak loading, and thus it is not inappropriate that some assumptions underlying the procedure err in the direction of over-estimating demand. For example, the procedure assigns home-to-first class, last class-to-home, and/or lunch trips to perhaps thousands of students in instances where such trips are extremely unlikely to be made. This situation comes about because of the assumption that 100 percent of the WVU students should be assigned a home address effectively at one of the six PRT stations. If a student's first class, last class, or classes near lunchtime were located closer to a PRT station other than his home PRT station, the procedure generates a trip for that student. In particular, the procedure generates hundreds of trips from the Coliseum to Main Campus when, in fact, very few such trips are actually made. Hence, it is not surprising that the demand estimates are weakly correlated with the observed trips between campus zones.

Trip length frequency distribution indicated that travel time did not have any influence as to the frequency of trips. These relationships indicated fairly uniform trip frequencies at various time intervals. This occurs largely because travel between Evansdale Campus and Downtown Campus constituting a larger proportion of trips produced have longer travel times.

For University Bus trips average of waiting times for each pair of trip interchange was estimated and added to the travel time to yield inclusive time. Where more than 5 minute walking time was involved from bus stop to home that was also included in the inclusive travel time.

The variable used for supply variable of the model to estimate the traffic flows was the trip cost. For automobiles the cost function used was the sum of all the travel costs involved. Cost of driving time was considered to be \$3.0 per hour. Average Parking cost estimated from Parking Survey was based on parking cost at destination. The cost of operating an automobile was based on 19.36¢ per mile, the cost per mile estimated for standard automobile, was used for the models.

Cost of a bus trip was considered to be the cost of inclusive time constituting travel, waiting and time to walk to the bus stop. This time was valued at \$3.0, same as automobile trips. The fare for a University bus trip was considered to be negligible because the marginal cost to the users is negligible as the student pays a flat fee of \$4.25 per semester for the bus service.

Models

1. Campus-Campus Trips

Auto Trips, $T_{ij} = C_1^{0.74}$	$E_2^{0.82}$	$AC_1^{-0.69}$	$(R^2 = 0.96)$
F 15.6	3.3	4.9	
t 3.95	1.82	-2.22	
p* 0.007	0.11	0.06	
Bus Trips, $B_{ij} = C_1^{0.43}$	$CL_2^{0.32}$	$CM_1^{-0.045}$	$(R^2 = 0.93)$
F 11.3	4.5	0.04	
t 2.68	1.69	-0.162	
p 0.015	0.10	0.87	

2. Campus-Home Trips

Auto Trips, $T_{ij} = CL_1^{0.51}$	$S_2^{-0.41}$	$AC_1^{0.46}$	$(R^2 = 0.92)$
F 4.80	0.86	2.2	
t 2.19	-0.93	1.49	
p 0.03	0.36	0.15	
Bus Trips, $B_{ij} = C_1^{0.22}$	$S_2^{1.01}$	$CM_1^{-0.87}$	$(R^2 = 0.95)$
F 4.03	35.6	13.9	
t 2.44	7.28	-4.55	
p 0.02	.0001	.0001	

3. Home-Campus Trips

Auto Trips, $T_{ij} = P_1^{0.51}$	$FA_2^{0.20}$	$AC_1^{-0.20}$	$(R^2 = 0.91)$
F 4.0	0.71	1.079	
t 2.0	0.84	0.40	
p 0.05	0.40	0.30	
Bus Trips, $B_{ij} = S_1^{1.41}$	$FA_2^{0.05}$	$CM_1^{-1.34}$	$(R^2 = 0.88)$
F 14.1	0.02	8.6	
t 3.76	0.16	-2.9	
p 0.001	0.87	0.008	

4. CBD Oriented Trips

Auto Trips, $T_{ij} = E_1^{-1.14}$	$E_2^{-0.50}$	$AC_1^{1.78}$	$(R^2 = 0.96)$
F 5.9	2.8	10.8	
t -2.4	-1.69	3.2	
p 0.03	0.11	0.006	

$$\begin{array}{rcll} \text{Bus Trips, } B_{ij} = & E_1^{0.37} & E_2^{-0.003} & CM_1^{0.133} \quad (R^2 = 0.91) \\ & F & .00002 & .0073 \\ & t & 0.71 & -0.004 \quad 0.08 \\ & p & 0.49 & 0.9 \quad 0.9 \end{array}$$

5. Interzonal Trips

$$\begin{array}{rcll} \text{Auto Trips, } T_{ij} = & P_1^{0.34} & P_2^{0.18} & AC_1^{-0.04} \quad (R^2 = 0.90) \\ & F & 10.7 & 2.7 \quad 0.16 \\ & t & 3.2 & 1.6 \quad -0.04 \\ & p & .001 & 0.10 \quad 0.68 \\ \\ \text{Bus Trips, } B_{ij} = & S_1^{0.28} & S_2^{0.81} & CM_1^{-0.95} \quad (R^2 = 0.96) \\ & F & 0.53 & 3.9 \quad 3.4 \\ & t & 0.72 & 1.98 \quad -1.86 \\ & p & 0.49 & 0.09 \quad 0.11 \end{array}$$

* p refers to significance probability

Where,

P_1 = Population of Origin Zone

P_2 = Population of Destination Zone

S_1 = Student Population in Origin Zone

S_2 = Student Population in Destination Zone

CL_1 = No. of student classes scheduled at Campus of origin

CL_2 = No. of student classes scheduled at Campus of Destination

C_1 = No. of Class changes occurring in Campus of Origin

E_1 = Employment at Campus of Origin

E_2 = Employment at Campus of Destination

AC_1 = Total cost of Auto trips (in cents)

CM_1 = Total cost of University Bus Trip (in cents)

APPENDIX A

TRAFFIC COUNTS
AND
MORGANTOWN PARKING

MORGANTOWN PRE PRT IMPACT STUDY
AUTOMATIC COUNT
(COUNTER FACTOR = 0.98)

SITE NAME : UNIVERSITY AVENUE
LOCATION : N. OF STEWART ST.
DIRECTION : NORTHBND

SITE TYPE : PRT CORRIDOR
SITE NUMBER : 1

HOUR	MONDAY 03-17-75 COUNT	TUESDAY 03-18-75 COUNT	WEDNESDAY 03-19-75 COUNT	THURSDAY 03-20-75 COUNT	FRIDAY 03-21-75 COUNT	AVERAGE WEEKDAY COUNT	%	SATURDAY 03-22-75 COUNT	%	SUNDAY 03-23-75 COUNT	%	AVERAGE DAY OF WEEK COUNT	%
12	91	101	100	105	170	113	2.9	272	4.1	254	4.3	155	2.6
1	39	40	55	56	110	60	1.0	188	3.0	249	4.2	105	1.7
2	13	18	11	15	19	21	0.3	146	2.0	174	2.9	101	1.6
3	1	17	21	11	18	16	0.2	67	1.0	60	1.0	29	0.5
4	28	18	15	13	14	9	0.2	158	2.3	150	2.5	74	1.2
5	143	200	159	120	127	135	2.0	59	0.9	35	0.6	102	1.6
6	143	200	159	120	127	135	2.0	59	0.9	35	0.6	102	1.6
7	280	239	237	237	279	281	4.0	191	2.8	137	2.3	298	4.8
8	222	239	237	237	279	281	4.0	191	2.8	137	2.3	298	4.8
9	222	239	237	237	279	281	4.0	191	2.8	137	2.3	298	4.8
10	222	239	237	237	279	281	4.0	191	2.8	137	2.3	298	4.8
11	222	239	237	237	279	281	4.0	191	2.8	137	2.3	298	4.8
12	222	239	237	237	279	281	4.0	191	2.8	137	2.3	298	4.8
1	222	239	237	237	279	281	4.0	191	2.8	137	2.3	298	4.8
2	222	239	237	237	279	281	4.0	191	2.8	137	2.3	298	4.8
3	222	239	237	237	279	281	4.0	191	2.8	137	2.3	298	4.8
4	222	239	237	237	279	281	4.0	191	2.8	137	2.3	298	4.8
5	222	239	237	237	279	281	4.0	191	2.8	137	2.3	298	4.8
6	222	239	237	237	279	281	4.0	191	2.8	137	2.3	298	4.8
7	222	239	237	237	279	281	4.0	191	2.8	137	2.3	298	4.8
8	222	239	237	237	279	281	4.0	191	2.8	137	2.3	298	4.8
9	222	239	237	237	279	281	4.0	191	2.8	137	2.3	298	4.8
10	222	239	237	237	279	281	4.0	191	2.8	137	2.3	298	4.8
11	222	239	237	237	279	281	4.0	191	2.8	137	2.3	298	4.8
12	222	239	237	237	279	281	4.0	191	2.8	137	2.3	298	4.8
TOTAL	6010	5745	5709	5139	6007	6041	100.0	5994	100.0	5943	100.0	6020	100.0

* PERCENTAGES MAY NOT ADD TO TOTAL BECAUSE OF ROUNDING

MORGANTOWN PRE PRT IMPACT STUDY
AUTOMATIC COUNT
(COUNTER FACTOR = 0.99)

SITE NAME : BEECHURST AVENUE
LOCATION : S OF 8TH STREET
DIRECTION : SOUTHBND

SITE TYPE : PRT CORRIDOR
SITE NUMBER : 2

WEEKDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	AVERAGE WEEKDAY	SATURDAY	SUNDAY	AVERAGE DAY OF WEEK
03-17-75	03-18-75	03-19-75	03-20-75	03-21-75	03-22-75	03-23-75	03-24-75	03-25-75	03-26-75
COUNT	COUNT	COUNT	COUNT	COUNT	COUNT	COUNT	COUNT	COUNT	COUNT
75	149	180	165	190	190	173	301	264	187
19	83	49	79	97	95	49	226	204	115
28	25	13	21	25	27	21	150	118	168
24	50	53	14	34	37	30	24	13	34
291	254	223	237	219	218	229	479	90	195
804	650	742	737	610	627	723	180	105	560
677	575	533	547	610	610	597	514	353	539
610	543	501	551	739	739	613	651	353	539
737	720	733	737	844	844	739	737	353	539
637	530	533	711	835	835	739	737	353	539
840	630	633	1033	1311	1311	1033	737	353	539
840	1001	1043	1033	1311	1311	1033	737	353	539
579	704	612	662	840	840	612	591	502	612
388	503	434	511	607	607	511	591	502	612
450	431	299	311	553	553	311	591	502	612
168	285	233	320	553	553	320	591	502	612
	173						404	222	355
TOTAL	11615	11319	11115	11735	12334	11117	10700	7950	11034
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

* PERCENTAGES MAY NOT ADD TO TOTAL BECAUSE OF ROUNDING

MORGANTOWN PRE PPT IMPACT STUDY
AUTOMATIC COUNT
(COUNTER FACTOR = 0.38)

SITE NAME : REECHURST AVENUE
LOCATION : S OF 9TH STREET
DIRECTION : NORTHBOUND

SITE TYPE : PRT CORRIDOR
SITE NUMBER : 1

HOUR	MONDAY 03-17-75	TUESDAY 03-18-75	WEDNESDAY 03-19-75	THURSDAY 03-20-75	FRIDAY 03-21-75	AVERAGE WEEKDAY COUNT	%	SATURDAY 03-22-75	SUNDAY 03-23-75	AVERAGE DAY OF WEEK COUNT	%
12	78	82	43	170	128	109	0.9	269	290	160	1.3
1	40	21	27	35	49	55	0.4	128	179	193	0.8
2	17	13	22	20	33	29	0.2	43	140	59	0.5
3	11	10	12	22	33	19	0.2	41	89	32	0.3
4	47	60	123	323	324	157	0.0	172	257	261	0.0
5	309	410	373	561	617	351	2.9	154	266	281	2.2
6	869	617	623	751	626	656	5.6	172	266	281	2.2
7	627	626	517	674	635	630	5.2	515	266	281	2.2
8	702	636	517	674	635	630	5.2	515	266	281	2.2
9	854	683	612	835	1012	855	7.1	713	140	560	4.5
10	894	883	612	835	1012	855	7.1	713	140	560	4.5
11	1064	1074	612	835	1012	855	7.1	713	140	560	4.5
12	700	918	612	835	1012	855	7.1	713	140	560	4.5
1	535	680	612	835	1012	855	7.1	713	140	560	4.5
2	435	440	612	835	1012	855	7.1	713	140	560	4.5
3	330	328	612	835	1012	855	7.1	713	140	560	4.5
4	137	228	612	835	1012	855	7.1	713	140	560	4.5
5	137	228	612	835	1012	855	7.1	713	140	560	4.5
6	137	228	612	835	1012	855	7.1	713	140	560	4.5
7	137	228	612	835	1012	855	7.1	713	140	560	4.5
8	137	228	612	835	1012	855	7.1	713	140	560	4.5
9	137	228	612	835	1012	855	7.1	713	140	560	4.5
10	137	228	612	835	1012	855	7.1	713	140	560	4.5
11	137	228	612	835	1012	855	7.1	713	140	560	4.5
12	137	228	612	835	1012	855	7.1	713	140	560	4.5
TOTAL	12542	12566	12239	12323	13924	12318	100.0	11115	8939	12016	100.0

* PERCENTAGES MAY NOT ADD TO TOTAL BECAUSE OF ROUNDING

MORGANTOWN PRE PRT IMPACT STUDY

AUTOMATIC COUNT
(COUNTER FACTOR = 0.98)

SITE NAME : REECHURST AVENUE
LOCATION : S OF 8TH STREET
DIRECTION : NDRTHBND

SITE TYPE : PRT CORRIDOR
SITE NUMBER : 1

HOUR	MONDAY 03-17-75 COUNT	TUESDAY 03-18-75 COUNT	WEDNESDAY 03-19-75 COUNT	THURSDAY 03-20-75 COUNT	FRIDAY 03-21-75 COUNT	AVERAGE WEEKDAY COUNT	%	SATURDAY 03-22-75 COUNT	%	SUNDAY 03-23-75 COUNT	%	AVERAGE DAY OF WEEK COUNT
12--	78	82	83	170	158	109	1.1	289	2.6	290	3.3	169
1--	40	93	43	176	36	55	0.4	128	1.2	140	3.0	59
2--	19	21	27	36	49	19	0.2	43	0.4	140	1.6	59
3--	11	17	9	20	33	13	0.2	41	0.4	51	1.0	26
4--	14	20	12	20	34	15	0.2	47	0.4	51	1.0	26
5--	17	20	12	20	34	15	0.2	47	0.4	51	1.0	26
6--	309	410	373	362	327	355	4.4	154	1.4	140	3.0	281
7--	621	610	673	751	641	630	6.4	282	2.6	140	3.0	505
8--	868	617	673	662	635	630	6.4	515	4.7	140	3.0	624
9--	607	625	517	673	635	630	6.4	738	6.7	140	3.0	601
10--	708	694	662	662	635	630	6.4	738	6.7	140	3.0	601
11--	884	884	842	837	837	855	7.7	789	7.4	140	3.0	855
12--	884	884	842	837	837	855	7.7	789	7.4	140	3.0	855
1--	1028	1074	946	1031	1034	1033	11.1	999	9.3	140	3.0	911
2--	1028	1074	946	1031	1034	1033	11.1	999	9.3	140	3.0	911
3--	749	911	767	837	774	811	8.5	731	6.8	140	3.0	840
4--	749	911	767	837	774	811	8.5	731	6.8	140	3.0	840
5--	749	911	767	837	774	811	8.5	731	6.8	140	3.0	840
6--	749	911	767	837	774	811	8.5	731	6.8	140	3.0	840
7--	749	911	767	837	774	811	8.5	731	6.8	140	3.0	840
8--	749	911	767	837	774	811	8.5	731	6.8	140	3.0	840
9--	749	911	767	837	774	811	8.5	731	6.8	140	3.0	840
10--	749	911	767	837	774	811	8.5	731	6.8	140	3.0	840
11--	749	911	767	837	774	811	8.5	731	6.8	140	3.0	840
12--	187	228	182	240	379	243	2.7	357	3.2	140	3.0	251
TOTAL	12542	12566	12239	12323	13924	12318	100.0	11115	100.0	8909	100.0	12016

* PERCENTAGES MAY NOT ADD TO TOTAL BECAUSE OF ROUNDING

APPENDIX B
PARKING LOTS
AND
THEIR CAPACITIES

B. PARKING LOTS AND THEIR CAPACITIES

Morgantown Parking Authority Lots:

<u>Parking Lot No.</u>	<u>Name</u>	<u>No. of Spaces</u>
1	Beside Massulo's	86
2	Fayette - Chestnut	81
3	Ruff Stone - Chestnut	22
4	University - Wall Street (R.S.)	76
5	Chestnut - Pleasant	67
6	Pleasant - Spruce	67
7	Wall - Spruce	25
8	Spruce Street South	71
9	Spruce Street North	72
10	Wiley Street	39
11	North High	37

MAIN CAMPUS PARKING

1	Appalachian	30
2	Woodburn Hall	22
3	Science Hall	20
4	Personnel	20
5	Falling Run	75
6	Maiden Lane	58
7	Tennis Courts	24
8	Beechurst	12
9	Old Forestry	15
10	Stadium Outside	25
11	I. A. B.	50
12	Oglebay Hall	18
13	Spruce Street	10
14	Armstrong Hall	2
15	Music School	6
16	Health Service	7
17	College Avenue	10
18	Old Bookstore	3
19	Bookstore	4
20	M. I. Building	4
21	Speech and Hearing	10
22	Old Mountainlair	18
23	Administration Building	16
24	Woman's Hall	8
25	Mountainlair	18
26	Stadium Inside	15
27	Glasscock House	2
28	New Computer Center	35
29	Beechurst Avenue	10

UNIVERSITY LOTS FOR PUBLIC

Mountain Lair	Upper	250
Mountain Lair	Lower	250

EVANSDALE CAMPUS

<u>Parking Lot Number</u>	<u>Name</u>	<u>No. of Spaces</u>
40	Engineering Faculty	141
41	Engineering Rear	45
43	Agriculture Science Side	219
44	Agriculture Science Front	35
45	Creative Arts Center	185
46	Forestry	119
47	Engineering Student Lot	220
48	Twin Towers	78
49	Communications	38
50	Forestry Tower	161

MEDICAL CENTER

60	Lot A	65
61	Lot B	59
62	Lot C	13
63	Lot F	222
64	Lot D	12
65	Lot E	342
66		10

Law School	169
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FREE PARKING LOTS

Towers	400
Coliseum	1200
CAC	100
Medical Center	700

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