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TECHNICAL REPORT #2

MEMBER GOVERNMENTS

- Cumberland County**
- Bridgeton**
- Buena**
- Buena Vista Township**
- Deerfield Township**
- Fairfield Township**
- Franklin Township**
- Lawrence Township**
- Millville**
- Newfield**
- Pittsgrove Township**
- Upper Deerfield Township**
- Vineland**

BASE YEAR FINDINGS

**CUMBERLAND COUNTY
URBAN AREA
TRANSPORTATION STUDY**

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**CUMBERLAND COUNTY
URBAN AREA
TRANSPORTATION STUDY**

Prepared in cooperation with the
U.S. Department of Transportation,
Federal Highway Administration
and the
New Jersey Department of Transportation
by
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SYNOPSIS

This report contains a brief summary of the results of the Data Collection Phase of the Cumberland County Urban Area Transportation Study. The purpose of this phase of the study is to develop a detailed and complete picture of the special characteristics, resources, and problems that exist within the study area.

The careful and complete inventory of the existing conditions provides not only an understanding of the existing resources and interactions of the people within the area, but it also provides the base for the comprehensive and thoughtful planning process that is required to respond to the community's needs and changing conditions in the future.

It is not the intent of this report to provide a detailed description of the procedures, techniques, and summaries of the many surveys conducted in this phase of the study. These details have been presented in the eighteen technical memoranda listed in Appendix A of this report and are on file in the Cumberland County Planning Office.

The 167-square-mile study area contains parts of four counties: Cumberland, Gloucester, Atlantic, and Salem. More than 90 percent of the 104,500 persons living in the study area reside within Cumberland County. While less than one-third of the total land area of Cumberland County is contained within the study area boundaries, this portion of the County contains 77 percent of the population and 85 percent of total employment in the County. The 43,000 jobs within the study area are concentrated primarily within the three major communities of Bridgeton, Millville, and Vineland. Approximately 22 percent of the total land area within the study area is devoted to the type of development usually associated with urban use.

Although 26 percent of the land area is devoted to agricultural use, only 4-1/2 percent of the employees are engaged in agricultural occupations. Half of the land area is currently undeveloped (vacant land and woodland).

On a typical summer weekday in 1972, there were 314,000 vehicle trips made on the 321-mile arterial system contained within the study area. The vehicles making these trips traveled approximately 1,271,500 miles each day, with the average trip being just over 4 miles long at an average speed of 38 miles per hour.

An analysis of the existing highway system showed that the level of service fell below a stable flow level (Level of Service C) in the hours of peak traffic on only 13 percent (41 miles) of the total highway system.

The traffic volumes on the existing highways vary from more than 20,000 vehicles per day on sections of Delsea Drive to fewer than 200 vehicles per day on outlying routes. Approximately 10 percent of the highways had a daily traffic greater than 10,000 vehicles while one-half of the roadways had fewer than 4,000 vehicles per day. The inventory of parking in the three major central business districts indicated that there are 5,288 parking spaces available: 1,358, or 25 percent, on-street and 3,930, or 75 percent, off-street.

Transit travel in Cumberland County in the summer of 1972 was a relatively minor component of the total travel. The travel survey indicates that there were approximately 840 transit trips per day; 465 of these were made completely within the study area. The annual ridership for the four bus routes operated in Bridgeton was approximately 49,600 passengers in 1971.

There are numerous major traffic generators within the study area, most of which are located in or adjacent to the central areas of Bridgeton, Millville, and Vineland. The analysis of these special generators was necessary to achieve an adequate understanding of the base year travel patterns and to identify areas where special treatment of future trip generation may be necessary. The 23 largest manufacturing employers in the area account for approximately one-third of the total employment in the study area, and the four largest manufacturing employers account for more than 20 percent of the total employment.

The Cumberland County study area exhibits many unique transportation characteristics. The primary mode of travel within the area is the privately owned vehicle, which accounts for more than 99 percent of the 487,000 person-trips per day made within the area. Travel patterns are strongly oriented toward the urban areas of Bridgeton, Millville, and Vineland. Travel between these areas, however, is influenced by the high degree of self-containment within these areas. Traffic to and from points located outside the study area plays an important role in the demand placed on the existing transport facilities, with approximately 38 percent of all vehicle trips having one or both ends of the trip outside the study area.

CHAPTER I INTRODUCTION

During the past two decades, the Cumberland County region area has undergone significant growth in population and changes in economic activity. Preliminary projections indicate continued growth and change in the character of the area at even a greater rate in the remainder of this century.

Recognizing the necessity for accommodating the anticipated travel demands in the area the New Jersey Department of Transportation, in cooperation with the U.S. Department of Transportation, Federal Highway Administration, Cumberland County, and the governing bodies of the 12 municipalities within the study area, initiated the Cumberland County Urban Area Transportation Study (CCUATS) in 1972. The purpose of the transportation study is to provide a sound basis for a continuing transportation planning process in Cumberland County and to recommend needed improvements and new transportation facilities to accommodate expected increases in travel demands throughout the study area. The first phase of the study includes a comprehensive survey and inventory of the existing demographic, economic, and travel conditions in the study area. This report contains a summary of the various information collected in the many surveys conducted in the summer of 1972 as part of the Cumberland County Urban Transportation Study.

THE STUDY AREA

The location of the study area boundaries is shown on Figure 1. This area lies in the south central extremity of New Jersey, somewhat isolated by the Delaware Bay from the rapidly developing northeastern United States megatropolis stretching from Boston to Washington. The major concentrations of population within the area are within thirty airline miles of Philadelphia, Pennsylvania; and Wilmington, Delaware; and less than one hundred miles from the New York City metropolitan area.

More than 90 percent of the 167-square-mile study area lies in Cumberland County and includes the cities of Bridgeton, Millville, and Vineland. The study area also extends into Atlantic, Gloucester, and Salem Counties, including the boroughs of Buena, Newfield, and portions of Pittsgrove Township. All or parts of 12 political jurisdictions are contained within the study area. The boundaries of these political jurisdictions are indicated on the study area base map shown in Figure 2.

Historically, the development of the land within this area has been closely related to the available transportation facilities. The construction of a bridge across the Cohansey River to serve the sawmill and adjacent settlement in the early 1700s provided the focal point for the development of the present community of Bridgeton. The erection of the first glass factory in Millville in 1806 along the east side of the Maurice River near the road between "the bridge" and Cape May County was the start of Millville's industrial growth. The advent of the railroads in the mid-1800s provided further impetus to the growth of these communities and was very influential in the development of the Vineland area.

The present configuration of the three major urban centers, particularly the large industrial concentrations adjacent to each of these cities, was dramatically affected by the railroad and electric trolleys operating in the early 1900s.

The advent of the auto era necessitated the paving, improving, and enlargement of the existing highway network. This network was originally laid out to serve the scattered agricultural development throughout the study area and focused on the commercial and industrial activities located in the present urban centers. The majority of the present roadway system, with the exception of new subdivision streets and New Jersey Route 55, are built on rights-of-way that existed in the late 1800s. Until recently, adequate transportation services have been provided by rebuilding the farm-to-market roads of the 1800s on the existing rights-of-way.

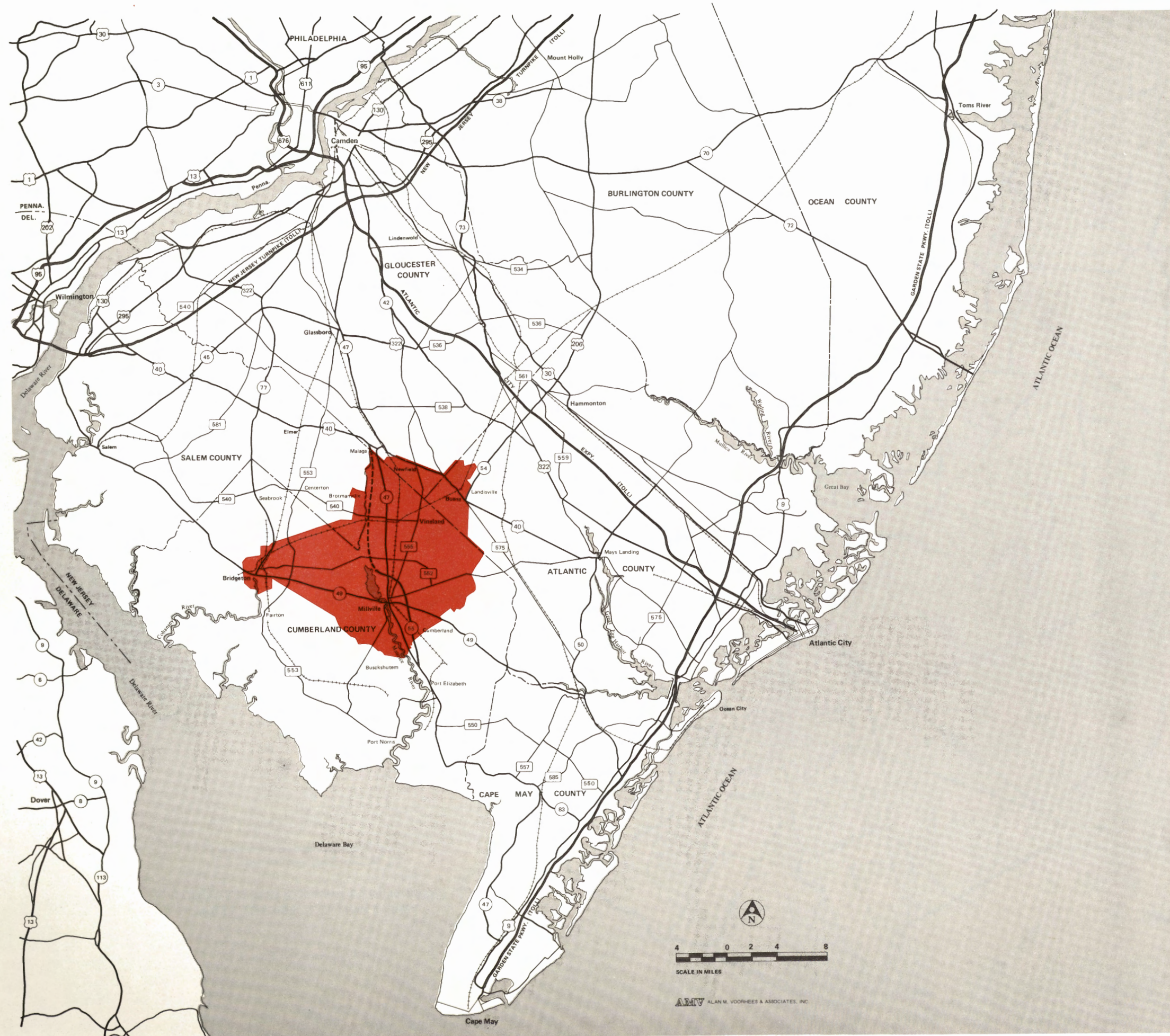


Figure 1
Location Map

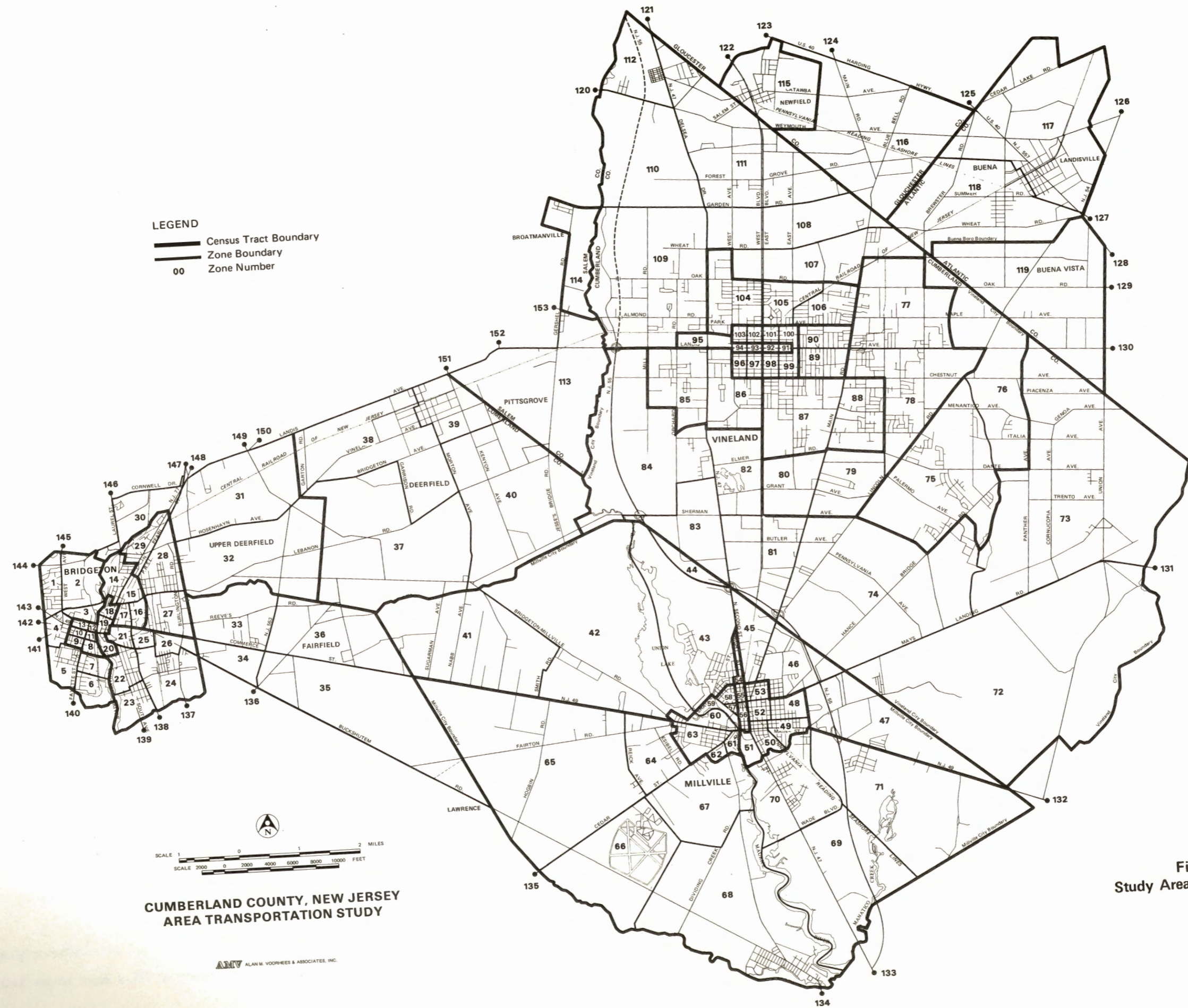


Figure 2
Study Area Base Zone Map

Since 1950 the residential pattern of the area has been changing at an ever-increasing rate. Suburban growth is occurring away from the central core developments of the early 1900s. Commercial development is following the residential dispersion with new shopping centers catering to the auto dominated suburbanite developing in the outlying areas of the region.

In 1972 almost 80 percent of the population and 90 percent of the employment within all of Cumberland County were located within the boundaries of the Cumberland County Urban Area Transportation Study. Therefore, the historic trends in population growth, employment, and auto ownership for the study area closely parallel those of the county. Figure 3 contains a graph of the total population, employment, vehicle registrations, and average personal income for all of Cumberland County between 1950 and 1970. Figure 4 contains a plot of the same 20-year period of the number of cars per person. The bar graph in Figure 5 shows the percentage increase 1950 to 1960 and 1950 to 1970 for population, employment, income, vehicle registration, and cars per person of the entire Cumberland County area.

While total population has increased by 38 percent from 1950 to 1970, the total number of vehicles registered in the area has increased by 110 percent and the number of passenger cars by 104 percent in the same 20-year period. This increase in total passenger cars combined with the residential dispersion resulted in substantially more than 100 percent increase in the utilization of the transportation facilities within the study area. The increase in the 20-year period in real income in the County has been 122 percent and a 63 percent increase in per capita when evaluated in constant dollars. This increase in income is one of the major contributing factors to the substantial increase in vehicle ownership. The rate of population to cars owned by residents of the county increased by 48 percent, from slightly more than 1 car to every 3.5 persons in 1950 to 1 car for every 2.5 persons in 1970.

Preliminary predictions for the study area indicate a 35 percent increase in population by 1985 and more than a 70 percent increase by the year 2000. Concurrent with

this increase in population, the mean income for area residents will double by the year 2000. This, of course, will cause a substantial increase in auto ownership. Major and far-reaching changes are currently taking place in the type and density of land use and land activity within the study area. Some of the existing transportation facilities are already becoming congested in the peak hours of travel.

Significant changes in land use, land activity, and transportation demands will occur within the study area with or without planning. With these changes, additional growth and the corresponding transportation demands, comprehensive and thoughtful planning is required if the current ease of movement throughout the area is to be maintained and if the existing problems are not to be intensified.

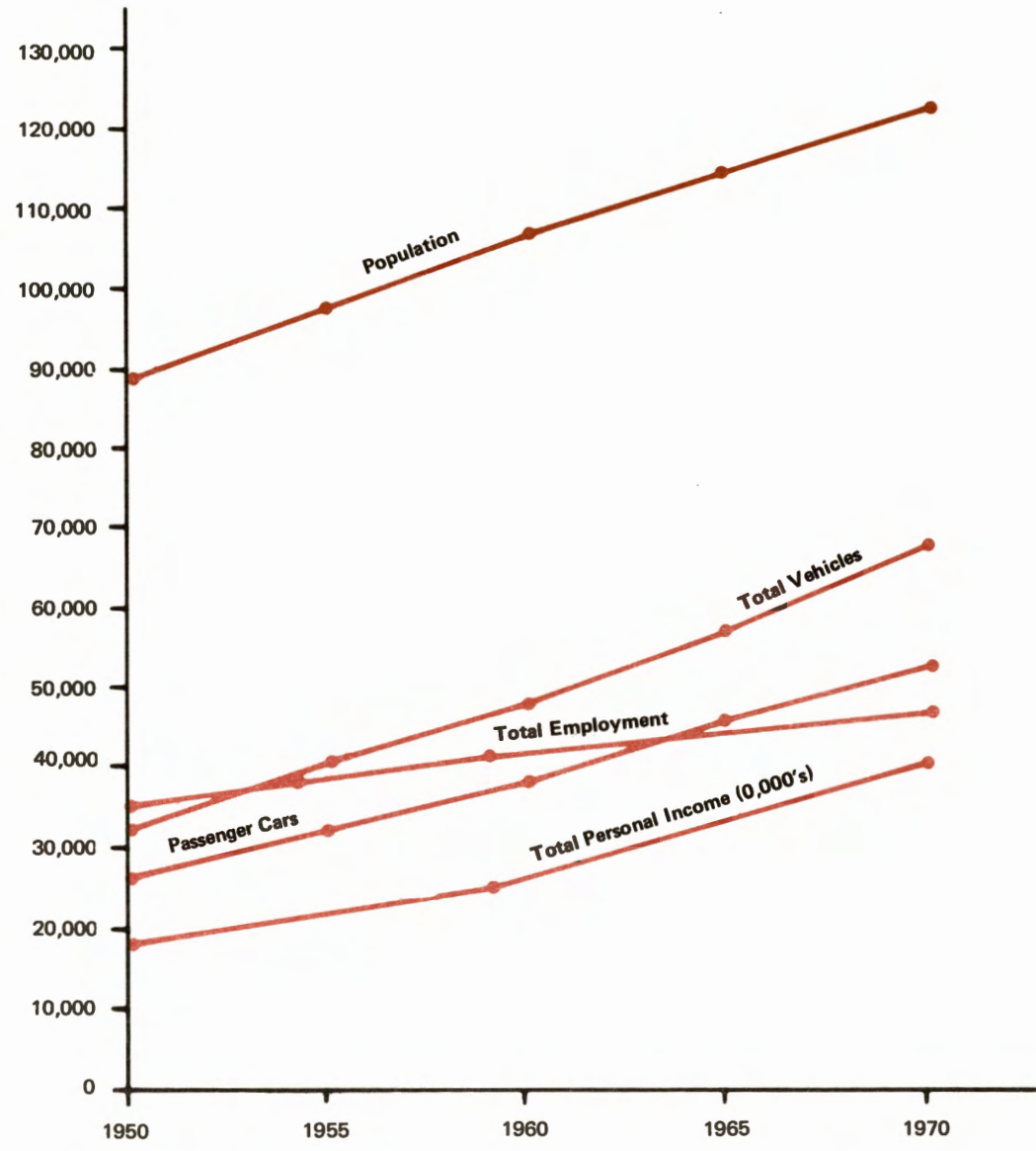


Figure 3. Historical Trends in Population, Employment, Vehicle Registration, and Income for Cumberland County

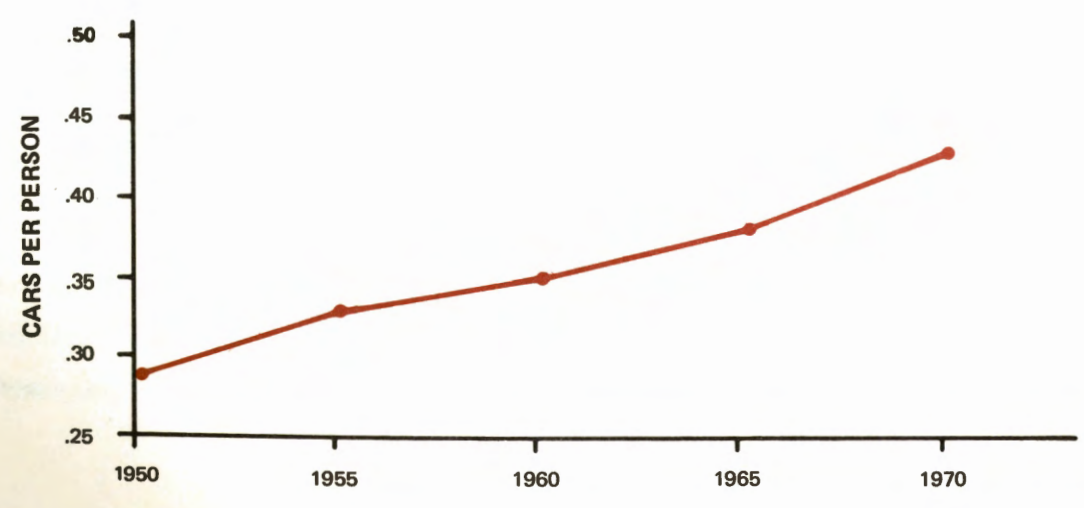
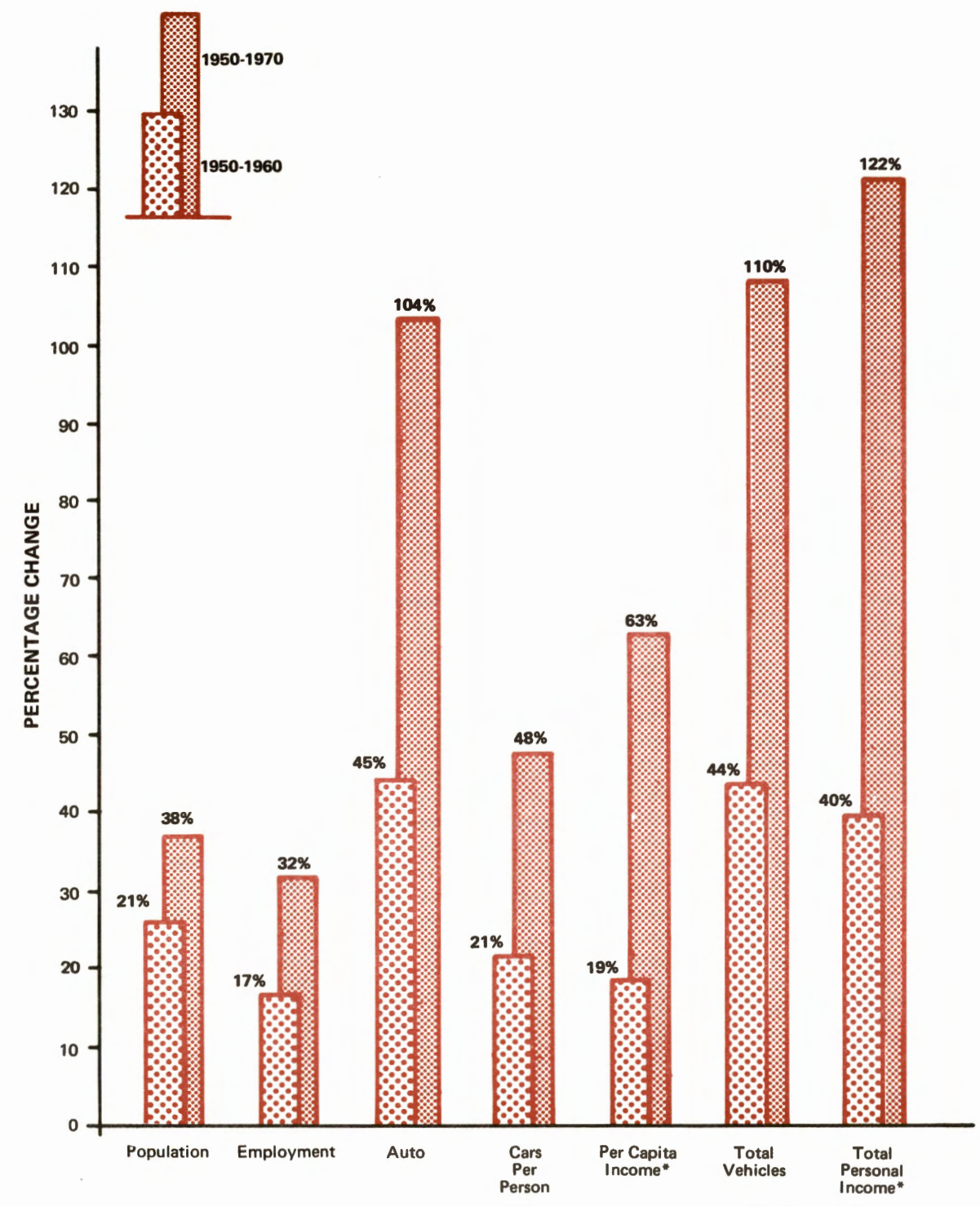


Figure 4. Historical Trends in Auto Ownership



*Per Capita Income & Total Personal Income in 1967 dollars.

Figure 5. Percentage Change in Population, Employment, Vehicle Registration, and Income for Cumberland County

CHAPTER II
THE STUDY DESIGN

The increased vehicle ownership and usage during the past two decades has had a profound effect on all the metropolitan areas in the nation. These problems, intensified by the rapid population growth and dispersion in the urban areas, have emphasized the need for a comprehensive, flexible, and continuing planning process to reflect the changing needs and desires of the community.

The activities of the comprehensive transportation study for the Cumberland County Urban Area can be grouped into four phases as illustrated in Figure 6. These phases are:

- Phase I -- Data Collection. Various surveys are conducted which provide a detailed and complete picture of existing travel and socio-economic conditions in the Cumberland County Urban Area.
- Phase II -- Analysis and Forecasting. Analytical methods are used to deduce an understanding of the factors influencing travel demands and develop procedures for estimating future travel demands and transportation requirements.
- Phase III -- Plan Development. In light of the anticipated transportation demands in Cumberland County and the community's goals and objectives, alternate transportation strategies are tested and a final transportation plan developed.
- Phase IV -- Implementation and Continuing Planning. Under a continuing program to monitor the planning concepts used in the development of the original transportation plan, the transportation strategy developed in Phase III is implemented and its effectiveness is monitored.

The end results of this process are two-fold. First, based on a detailed investigation and analysis of the existing situation, a transportation plan and program can be developed that serves as a common framework for all agencies charged with transportation systems improvement and operation in the Cumberland County region. Secondly,

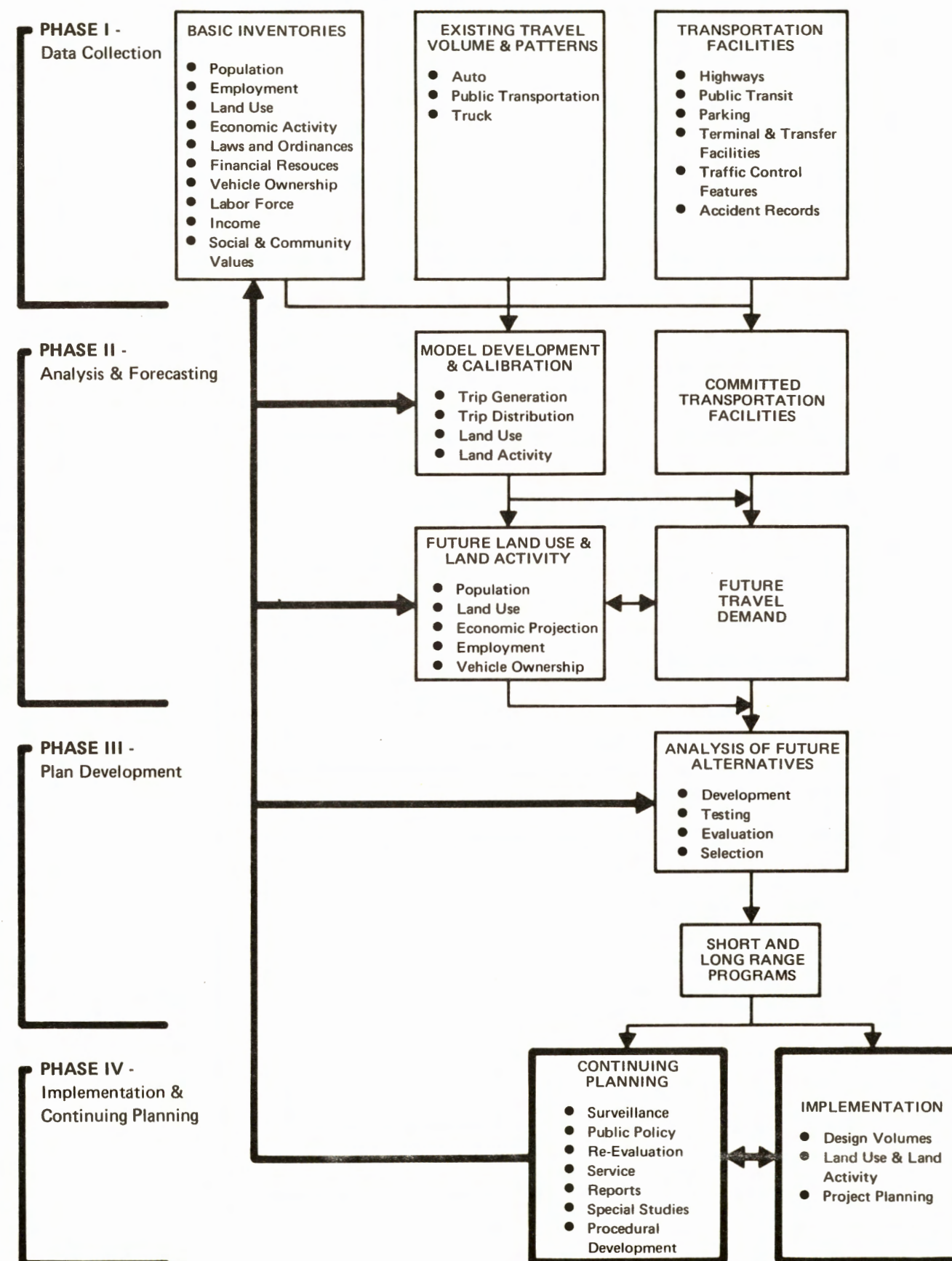


Figure 6
Cumberland County Urban Area Transportation Planning Process

it provides the basic information and procedures for continually reviewing the appropriateness of the transportation plan and of the growth forecasts and for modifying the transportation strategy as required by changing events and changing community goals and objectives.

Technical Report No. 1 -- Cumberland County Area Study Design, dated September 1972, contains a detailed description of the work items to be performed in the first three phases of this transportation plan. The State of New Jersey Department of Transportation is currently preparing detailed documentation for the continuing planning process. The following is a brief summary of the activities included in the four phases of the transportation study.

PHASE I -- DATA COLLECTION

Three major inventories are necessary to serve the needs of the transportation planning process: the land use and land activity survey, the transportation facilities inventory and a travel pattern survey. These surveys provide the basic information necessary for a complete understanding of the factors influencing travel demand and traffic flow within the study area. Without this understanding, predicting future travel demands and developing a transportation plan responsive to the needs and desires of the area would be impossible.

One of the central analytical processes of the study is the evaluation and measurement of the relationships between the patterns of land use and land activity within the area and the existing transportation system. Consequently, a land use and land activity inventory was undertaken to establish the type of land use and the intensity of land activity throughout the study area. This data also provides a base for the economic population and land use forecast in the second phase of the transportation planning process.

The second inventory was a detailed survey of the transportation facilities in the area to determine the quantity and quality of the existing transportation system. This survey provided the data necessary to measure the capacities and performance of the major streets throughout the area and, when used in conjunction with the forecasted future travel demands, will provide a basis for determining the transportation facilities that will be required to meet the growing needs of the area.

The third inventory conducted in the first phase of the study was a travel pattern survey. This survey was conducted to obtain data on all travel by persons and vehicles within the study area on an average summer weekday, including trips entering, leaving, and passing through the area. The purpose of this comprehensive origin-destination survey was to obtain reliable answers to the questions of how, when, why, and where trips are made within the area.

PHASE II -- ANALYSIS AND FORECASTING

The fundamental purpose of the second phase of the transportation study is to develop procedures whereby estimates of future travel demands can be made. In effect, the analysis is aimed at obtaining an understanding of the fundamental characteristics of travel, its repetitiveness, stability and regularity. These findings are quantified in a series of mathematical formulas that relate travel demand to the land use/ land activity and transportation system characteristics within the study area. The analysis is focused on quantifying the answers to specific questions, such as: What are the relationships that exist within the Cumberland County Transportation Study Area between the magnitude of trips generated by or attracted to various land activity and the intensity of activity at each location? What effect does spatial separation of varying land activities have on the number of trips made between one portion of the study area and another? What unique patterns exist in the present distribution of travel demands? How are these patterns explained, and how will they relate to the transportation demands of the future? How reliable and how stable are the

various mathematical formulations used to develop travel demand estimations?
What factors influence the number of trips made within the area?

These and similar questions must be asked, analyzed, and carefully answered so that subsequent forecasts will rest on a firm foundation. The results of this analysis of the base year survey data provide the basic input for the forecasting phase of the study. The first step in the forecasting procedure is to estimate the future land use and land activity for the entire study area. These forecasts are then disaggregated so that the employment, population and other land activity measures are distributed into the subareas of the region. In this particular case, the study area has been divided into 119 transportation zones. The boundaries of these transportation zones are indicated on Figure 2.

The next step in the forecasting procedure is to convert the estimates of future land use and land activity into estimates of future travel demand. This is done by applying the mathematical procedures developed in the analysis phase to the forecast land use and land activity information. The result of this procedure is a systematic and detailed estimate of the location and magnitude of future travel demands throughout the area. Once the future travel demand has been established, it is studied in relationship to the available transportation system within the area. In this way, the location of future facilities and services can be evaluated.

PHASE III -- PLAN DEVELOPMENT

The development of a transportation plan for the area calls for the preparation and testing of these alternatives and evaluating these results in light of the overall goals and objectives of the communities contained within the study area. This procedure results in the recommendation of the regional transportation program based on the established objectives and standards of all of the communities contained within the study area.

Preparing alternate transportation plans calls for imagination and judgment and a deliberate attempt to arrange the transportation facilities so that future transportation strategies can be developed within the limitations of the financial constraints and community values.

Each of the alternatives tested must be evaluated in light of the total developments of the area as well as the specific facilities and their effect on their immediate environment. Existing and planned renewal and redevelopment areas, housing projects, new subdivisions, industrial districts, regional parks, open space, etc., must be taken into account. The selected plan must be as compatible as possible, and must, to the extent possible, promote other community goals and objectives.

The final result of this phase of the planning study is a coordinated and acceptable plan of action to meet the needs generated by the forecasted land activity, land use, and traffic demand, and to provide the Cumberland County urban area with the best solution to the transportation needs that will exist in the future.

PHASE IV IMPLEMENTATION AND CONTINUED PLANNING

The ultimate goal of the transportation study is the implementation of the plan, with specific facilities to be built and specific actions to be implemented. During this process, many questions will arise, and minor modifications to the plan will be required.

A continuing, comprehensive procedure is needed to monitor the planning process to insure the predicted trends in land use and land activity are in fact occurring as predicted. As time passes, unforeseen developments will occur. The implications of each of these specific developments upon the transportation plan must be evaluated, and the plan must be adjusted to accommodate these changes, both in an administrative and physical sense. Since no plan is final, a continuing planning operation will

be maintained after the completion and development of the recommended plan to provide for this continual review and update. This continuing program will serve as a problem-solving and update operation to the various agencies responsible for the development of the transportation system.

METHOD OF PRESENTATION

The results of this initial transportation planning study for the Cumberland County urban area will be reported in four volumes. Volume 1, The Study Design, completed in September of 1972, contains a detailed description and schedule of the work to be performed under the first three phases of the transportation study.

Volume II, this Base Year Findings Report, presents in a summarized and graphic form the results of the first phase of the study. The detailed descriptions of the specific work items are reported in technical memoranda. The eighteen technical memoranda related to the first phase of the project, are listed in Appendix A. An additional technical memo on existing land use and employment will be published by the New Jersey Department of Transportation in the near future.

Volume III will present a recommended transportation plan for the Cumberland County area and a program for its implementation. This volume will also discuss the anticipated growth of the region and will describe the basic relationships of transportation to other developments determined by the analysis. It will also contain a review of the different alternative transportation plans considered and will discuss benefits, costs, and the feasibility of the transportation elements considered. This volume will set forth a transportation plan that will conform to and help implement the comprehensive plan for the region.

Volume IV, The Operation Plan for the Continuing Transportation, is currently being prepared by the New Jersey Department of Transportation.

In addition to these major reports, the transportation study will publish a series of technical memoranda on the various surveys and analysis steps containing detailed description of procedures and the results of the analyses performed. These reports will provide a permanent record of the detailed study findings and will form a basis for the technical evaluation of plan elements during the continuing transportation study.

CHAPTER III
LAND USE AND LAND ACTIVITY

One of the three major types of inventories conducted in the first phase of this study was the Land Use and Land Activity Inventory. Land use information is a tabulation of the land area by various classifications, indicating how people use the land. Land activity information is a tabulation of the number of people or things by various classifications, indicating the intensity of activity occurring within a given area.

The Land Use and Land Activity Inventory provides basic data for two very important steps in the planning process. This information is used as a base for the future land use and land activity forecast and as one of the basic inputs in the development and calibration of the trip generation and trip distribution models.

The existing land use inventory and the employment portion of the land activity inventory was collected primarily by the staff of the New Jersey Department of Transportation and the local agencies. The procedures and results of these inventories will be described in detail in a technical memo on Task 3, Land Use and Land Activity, soon to be published by the New Jersey Department of Transportation. The land activity data relating to people at their place of residence, i.e., the number of dwelling units and the characteristics of the members of the households, were developed from the Home Interview Survey. The procedures used to collect, expand, and validate this data are described in detail in Technical Memos 2, 3, 6, 10, 16, and 18. A brief description of these memos can be found in Appendix A.

The study area includes all or parts of 12 political jurisdictions and parts of four counties. The population, employment, and the area (in square miles) of each of these political jurisdictions contained within the study area are tabulated in Table 1. The largest portion of the study area falls within the boundaries of Cumber-

land County. The 145 square miles of the study area within Cumberland County are approximately 29 percent of the total land area of the county. The study area contains approximately 77 percent of the total county population and 85 percent of the total county employment.

LAND USE

The boundaries of the political jurisdictions and generalized 1972 land use within the study area are shown on land use map in the pocket on the back cover of this report. The 13 land use categories used by the New Jersey Department of Transportation for the land use inventory are:

1. Low Density Residential -- single and two-family units, housing in subdivisions, rural type development, farm houses, etc.
2. High Density Residential -- multi-family dwellings, apartment houses, tourist homes, motels, hotels, trailer camps.
3. General Business and Commercial -- retail, wholesale or service trades, professional offices, commercial recreation activities.
4. Industrial -- manufacturing, fabrication, assembly, processing, sand and gravel excavations, storage tanks and yards, railroad rights-of-way.
5. Public Buildings and Associated Land -- intensive governmental or institutional buildings, such as schools, hospitals, prisons, municipal buildings, city-owned parking lots.
6. Quasi-Public -- churches, clubs, privately-owned hospitals, nursing homes, etc., open areas such as golf clubs, airports, camps, wildlife refuges.
7. Roads and Streets -- roadways maintained by public agencies
8. Parks -- public open space, municipal county and state, includes parks, playgrounds, bathing areas, recreational facilities, and fish and game preserves.

Table 1
 STUDY AREA POPULATION, EMPLOYMENT, AND AREA
 BY POLITICAL JURISDICTION

Political Jurisdiction	1972 Study Area Population	Percent of Total Study Area Population	Square Miles of Area Within Cordon Line	Percent of Study Area	1972 Study Area Employment	Percent of Total Study Area Employment
Bridgeton	20,194	19.3	6.57	3.9	9,551	22.2
Millville	22,324	21.3	42.96	25.6	11,750	27.4
Vineland	47,510	45.4	69.54	41.4	19,810	46.2
Upper Deerfield Township	1,993	1.7	6.07	0.4	246	0.6
Deerfield Township	1,944	1.8	12.67	7.5	311	0.7
Fairfield Township	2,937	2.8	7.62	4.5	80	0.2
Subtotal Cumberland County	96,902	92.7	145.43	86.6	41,752	97.3
Newfield	1,442	1.4	1.70	1.0	505	1.2
Franklin Township	881	0.8	4.49	2.7	149	0.3
Subtotal Gloucester County	2,323	2.2	6.19	3.7	654	1.5
Buena	3,607	3.4	7.60	4.5	252	0.6
Buena Vista Township	689	0.7	4.14	2.5	61	0.1
Subtotal Atlantic County	4,296	4.1	11.74	7.0	313	0.7
Pittsgrove Township Salem County	988	0.9	4.50	2.7	208	0.5
TOTAL STUDY AREA	104,514	100.0	167.87	100.0	42,923	100.0

Note: Lawrence Township in Cumberland County is combined with Fairfield Township.

9. Agriculture -- cropland, orchards, pastures, horticultural nurseries, dairy and poultry farms, including farm buildings, ponds for irrigation, etc. Excludes farm residences, miscellaneous woodland, wetlands, unused areas, roads, gravel pits, and marshes used to grow salt hay.
10. Water -- rivers, lakes, and tidal flats
11. Excavations
12. Vacant -- privately owned, unused, undeveloped land
13. Woodland -- privately owned. Excludes public open space. Includes marshes and meadows

Table 2 contains a summary of the total acres of each of the land use categories contained within the Study Area. Figure 7 is a graphical presentation of this land use information.

More than 50 percent of the land contained within the boundaries of the study area is currently undeveloped (1.3 percent water, 4.2 percent vacant, and 44.6 percent woodland). Less than 10 percent of the land is used for residential development and only 22 percent is devoted to the type of development that is usually associated with urban use. More than a fourth of the total land area is devoted to agricultural use, almost 5,000 acres more than that devoted to the urban types of development.

LAND ACTIVITY

In 1972, more than 104,500 people lived within the study area and jobs were provided for almost 43,000 workers. The geographical distribution of this population and employment is pictured in Figure 8. The concentration of both population and job opportunities in the three major urban centers is readily apparent from Figure 8 and the population and employment data in Table 1. The portion of the study area within Cumberland County contains almost 93 percent of the total population and

Table 2
SUMMARY OF STUDY AREA LAND USE

<u>1972 Land Use</u>	<u>Total Acres</u>	<u>Percent of Total Acres</u>
<u>Developed</u>		
Low Density Residential	9,662	9.0
High Density Residential	734	0.7
General Business and Commercial	2,379	2.2
Industrial	2,271	2.1
Public Buildings	2,349	2.2
Quasi-Public	932	0.9
Roads and Streets	<u>5,061</u>	<u>4.7</u>
Subtotal	23,388	21.8
<u>Parks</u>		
	1,675	1.6
<u>Agriculture</u>		
	28,014	26.1
<u>Excavations</u>		
	425	0.4
<u>Undeveloped</u>		
Water	1,438	1.3
Vacant	4,517	4.2
Woodland	<u>47,960</u>	<u>44.6</u>
Subtotal	53,915	50.1
TOTAL STUDY AREA	<u>107,417</u>	<u>100.0</u>

97 percent of the total employment within the study area. Detailed tabulations of the zonal population and employment data for each of the 119 zones are contained in the Technical Memos listed in Appendix A. In order to simplify the voluminous 1972 zonal population and employment data for presentation in this report, it has been aggregated to the district level. The 27 districts were developed by aggregating two or more adjacent zones. Table 3 is a summary of the 1972 population and employment by district. The district boundaries are shown in Figure 8. Within the three major urban centers, employment is concentrated in and adjacent to the Central Business Districts.

The industrial nature of the study area can be seen from Figure 9. Approximately 20,000 persons, 46 percent of the 43,000 employed within the study area, are employed in manufacturing. Forty-five percent of the manufacturing employment occurs in three districts: 12 percent in District 2; 22 percent in District 10; and 11 percent in District 23.

Table 4 is a generalized summary of the major land activity data. Detailed tabulations of this information can be found in the Technical Memos listed in the beginning of this chapter.

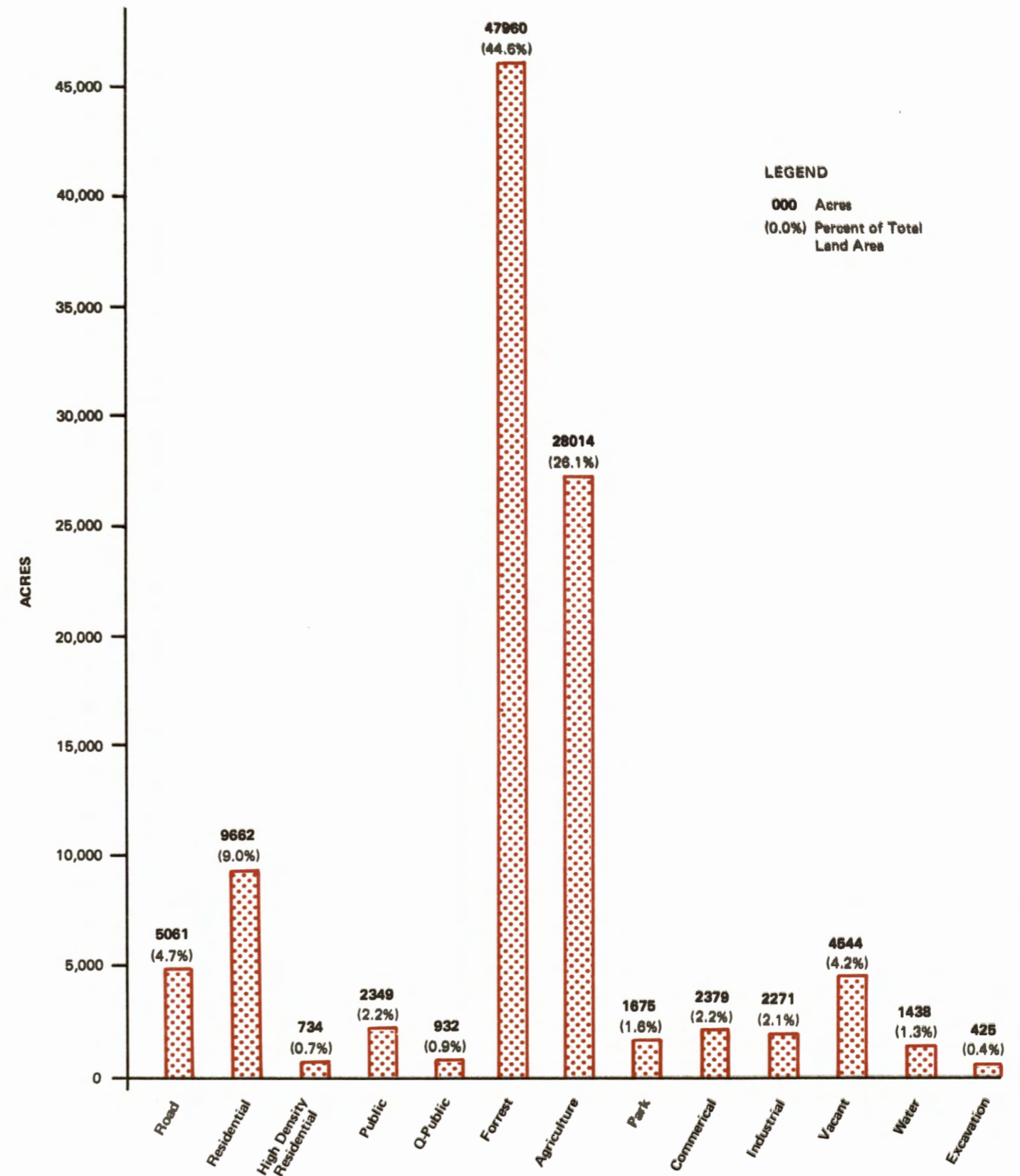


Figure 7
Land Use Within the Study Area

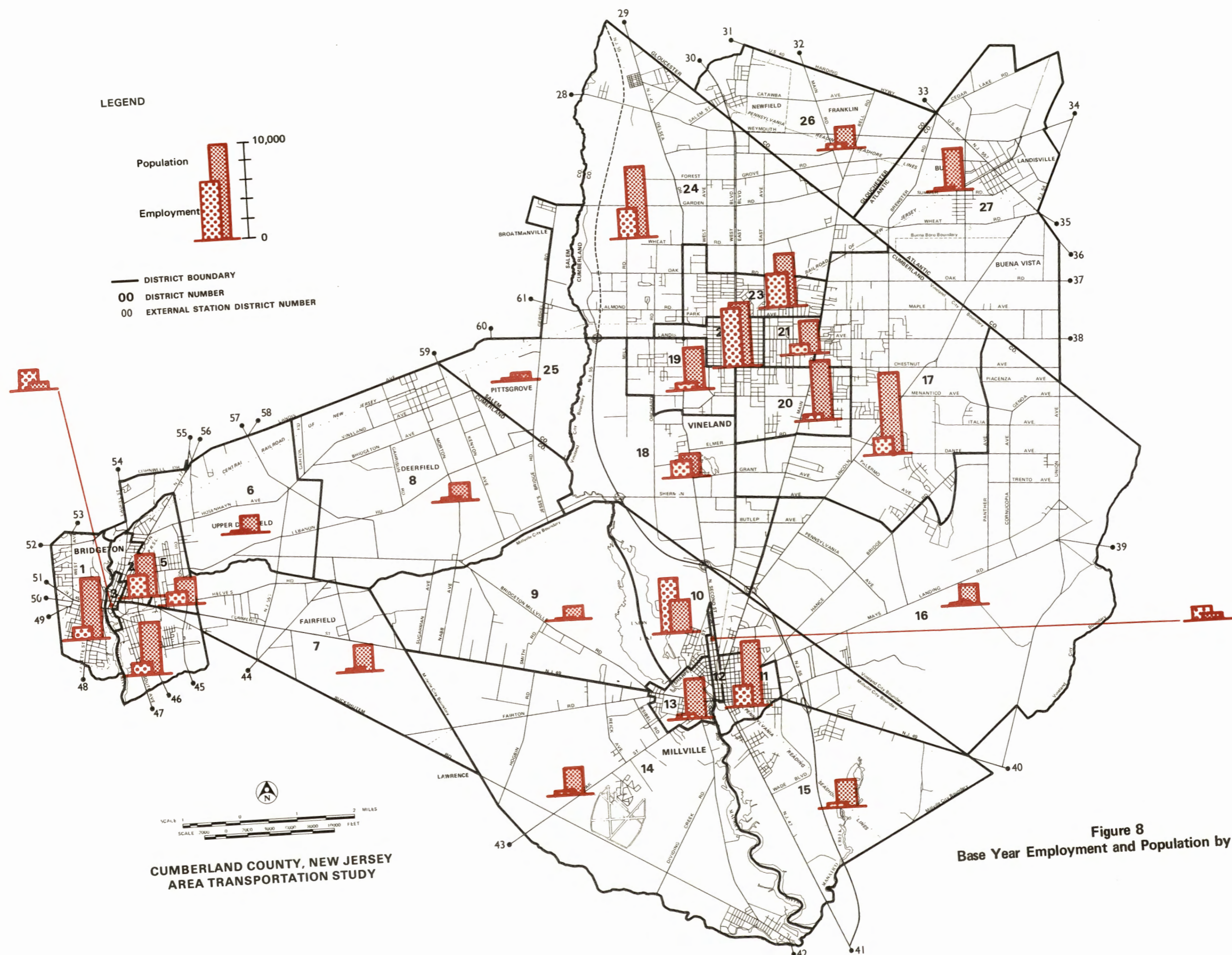


Table 3

1972 POPULATION AND EMPLOYMENT BY DISTRICT

District	1972 Employment	Percent of Total	1972 Population	Percent of Total
1	1,423	3.3	6,113	5.8
2	2,688	6.3	4,838	4.6
3	2,172	5.1	950	.9
4	1,508	3.5	5,455	5.2
5	1,760	4.1	2,837	2.7
6	246	0.6	1,993	1.9
7	80	0.2	2,937	2.8
8	311	0.7	1,945	1.9
9	34	0.1	1,330	1.3
10	5,845	13.6	4,072	3.9
11	2,139	5.0	5,984	5.7
12	1,423	3.3	894	0.9
13	800	1.8	4,046	3.9
14	853	2.0	3,002	2.9
15	656	1.5	2,994	2.9
16	173	0.4	2,269	2.2
17	2,037	4.7	8,606	8.2
18	1,833	4.3	2,368	2.3
19	918	2.1	4,484	4.3
20	771	1.8	6,148	5.9
21	1,022	2.4	3,541	3.4
22	6,372	14.9	6,913	6.6
23	3,599	8.4	5,640	5.4
24	3,085	7.2	7,547	7.2
25	208	0.5	987	.9
26	654	1.5	2,323	2.2
27	313	0.7	4,298	4.1
Total	42,923	100.0	104,514	100.0

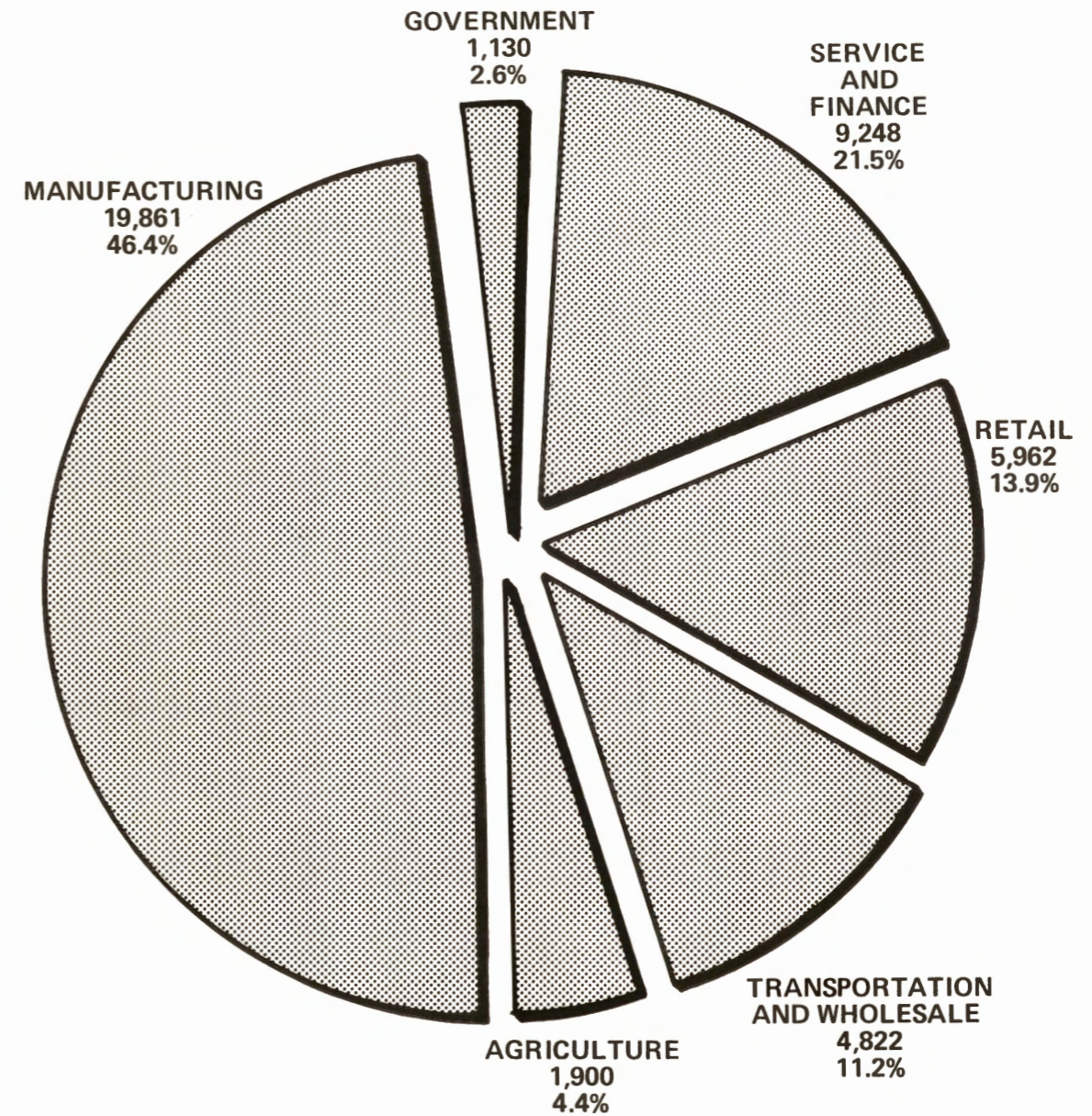


Figure 9
Base Year Employment by Type, Cumberland
County Study Area

Table 4
SUMMARY OF STUDY AREA LAND ACTIVITY DATA

1972 STUDY AREA EMPLOYMENT

	<u>SIC Code</u>	<u>Study Area Total</u>	<u>Percent Total Employment</u>
Agriculture, Mining	01-17	1,900	4.4
Manufacturing	29-39	19,861	46.4
Transportation, Wholesale	40-51	4,822	11.2
Retail	52-59	5,962	13.9
Finance, Service	60-89	9,248	21.5
Government	91-97	1,130	2.6
Total Employment	01-97	42,923	100.0

EMPLOYED PERSONS BY OCCUPATION

<u>Occupation</u>	<u>No. Persons</u>	<u>Percent of Total</u>
Professional and Semi-Professional	5,988	13.8
Proprietors, Managers & Officials	5,337	12.3
Store & Office Clerks, Salesmen	7,651	17.7
Traveling Salesmen, Agents, etc.	75	0.2
Craftsmen, Foremen, Skilled Laborers	7,104	16.4
Operatives and Semi-Skilled Workers	9,059	21.0
Laborers and Unskilled Workers	4,718	10.8
Protective Services	496	1.1
Personal Service Workers	2,890	6.7
Total	43,322	100.0

TOTAL CARS PER OCCUPIED DWELLING UNIT

<u>Cars Per Occupied Dwelling Unit</u>	<u>Number of Occupied Dwelling Units</u>	<u>Percent of Total</u>
None	4,424	12.96
1	15,480	45.33
2	11,322	33.17
3	2,427	7.11
4	413	1.21
5 or more	74	0.22
	34,150	100.00

Number Cars in Study Area: 47,487
1.39 cars per occupied dwelling unit
2.20 persons per car

STUDY AREA POPULATION BY AGE GROUP

<u>Age</u>	<u>Total Population</u>	<u>Percent of Total</u>
0-4	6,797	6.50
5-9	8,927	8.54
10-14	10,350	9.90
15-19	9,346	8.94
20-24	7,562	7.24
25-34	11,720	11.21
35-44	11,557	11.06
45-54	14,013	13.79
55-59	5,849	5.60
60-64	5,725	5.48
65-99	12,268	11.74
	104,514	100.0

NUMBER OF DWELLING UNITS BY STRUCTURE TYPE

<u>Structure Type</u>	<u>Number of DU's</u>	<u>Percent of Total</u>
Single and Double Households	28,451	83.31
Group Quarters	57	.17
Mobile Homes	785	2.30
Transient Lodgings	8	.02
Other Residents	17	.05
Apartments	4,831	14.15
	34,150	100.00

PERCENTAGE OF HOUSEHOLDS BY INCOME CLASS

<u>Income</u>	<u>Percent of Total Households</u>	<u>Cumulative %</u>
Less than \$2,500	9.4	9.4
2,500-5,499	17.8	27.2
5,500-7,499	13.4	40.6
7,500-8,999	11.7	52.3
9,000-10,499	13.8	66.1
10,500-11,999	6.0	72.2
12,000-13,999	8.1	80.2
14,000-16,999	9.2	89.4
Over \$17,000	10.6	100.0
	100.00	

CHAPTER IV
TRANSPORTATION FACILITIES SURVEY

The transportation facilities surveys and inventory are made to determine the amount and quality of transportation service provided throughout the area. These surveys are concerned both with highway and public transportation facilities. They measure the capacity and the performance of the major streets and highways and the level of transit service. These surveys, when used in conjunction with the forecast of future travel demand, provide a basis for determining the additional transportation facilities that will be required to meet the growing needs of the study area. In addition, data from the transportation facilities surveys will be used for analyzing traffic operations and control and other improvements directed towards providing short-term solutions to existing problems.

The facilities inventory included:

- A detailed inventory of the physical characteristics of the 321-mile arterial highway system included with the study area.
- The collection and analysis of existing traffic volumes on the highway system.
- An investigation of the operating speeds on the existing highway system to determine average speed in the hours of peak congestion as well as in off-peak hours.
- The determination of the existing capacity and existing level of service provided by the highway system.
- A complete inventory of parking facilities both on- and off-street in the Central Business Districts of Bridgeton, Millville, and Vineland.
- An inventory of the transit service currently being provided within the study area.
- An inventory and analysis of all accidents occurring in the last 4-1/2 years on the highway system within the study area.

- A detailed inventory of all traffic control devices on all arterial routes within the study area.

The results of these surveys are described in detail in Technical Memo 14, Transportation Facilities Survey, dated March 1973. The following sections of this chapter contain a general summary of the results of these inventories.

EXISTING HIGHWAY SYSTEM

A complete inventory of the existing highway system within the study area is one of the essential steps in determining the system's ability or inability to satisfy existing and future travel demands. All existing roadways within the study area were examined both for the physical and functional characteristics of the route. Based on this evaluation, 321 miles of roadway were included in the detail highway inventory network.

Table 5 contains a summary of the miles of system, the vehicle miles of travel, the vehicle hours of travel and average travel speed for the portion of the highway inventory network included within each political jurisdiction on an average summer weekday in 1972. Approximately 313,750 vehicle trips were made on the 321 miles of highway system within the study area.

The vehicles making these trips traveled 1,271,500 miles and required 32,960 hours of driving time per day to complete these trips. The average trip was slightly over four miles and required approximately six minutes to complete at an average speed of 38 miles per hour. The daily travel on the highway system within the study area is the equivalent to one vehicle making 250 round trips between Vineland and Los Angeles in 3-3/4 years of continuous driving. The average speed of the vehicles traveling in hours of peak congestion were only slightly lower than those traveling in the off-peak hours on almost all routes. The driving speeds on the

TABLE 5
HIGHWAY SYSTEM MEASURES BY JURISDICTION

<u>Jurisdiction</u>	<u>Miles of System</u>	<u>%</u>	<u>VMT* (100's)</u>	<u>%</u>	<u>VHT**</u>	<u>%</u>	<u>Average Speed</u>
Bridgeton (except CBD)	20.4	6.3	1,039	8.2	3,242	9.8	32
Bridgeton CBD	4.5	1.4	335	2.6	1,467	4.4	23
Upper Deerfield	16.0	5.0	464	3.6	1,128	3.4	41
Fairfield	11.6	3.6	397	3.1	883	2.7	45
Deerfield	20.9	6.5	485	3.8	1,013	3.1	48
Millville (except CBD)	49.8	15.5	1,759	13.8	3,770	11.4	47
Millville CBD	12.6	3.9	859	6.8	2,933	8.9	29
Vineland (except CBD)	120.5	37.6	5,109	40.2	12,060	37.7	42
Vineland CBD	11.2	3.5	592	4.7	2,710	8.2	22
Pittsgrove	8.4	2.6	294	2.3	595	1.8	49
Newfield	3.3	1.0	77	0.6	283	0.9	27
Franklin	15.6	4.8	517	4.1	1,110	3.4	46
Buena Boro	17.9	5.6	598	4.7	1,368	4.1	44
Buena Vista	8.6	2.7	190	1.5	398	1.2	48
	321.2	100.0	12,715	100.0	32,960	100.0	38

* Vehicle-miles of travel

** Vehicle-hours of travel

outlying routes averaged approximately 45 miles per hour. Driving speeds in the more urbanized areas were approximately 25 miles per hour with the lowest speeds in the Central Business Districts of Vineland and Bridgeton.

FUNCTIONAL CLASSIFICATION

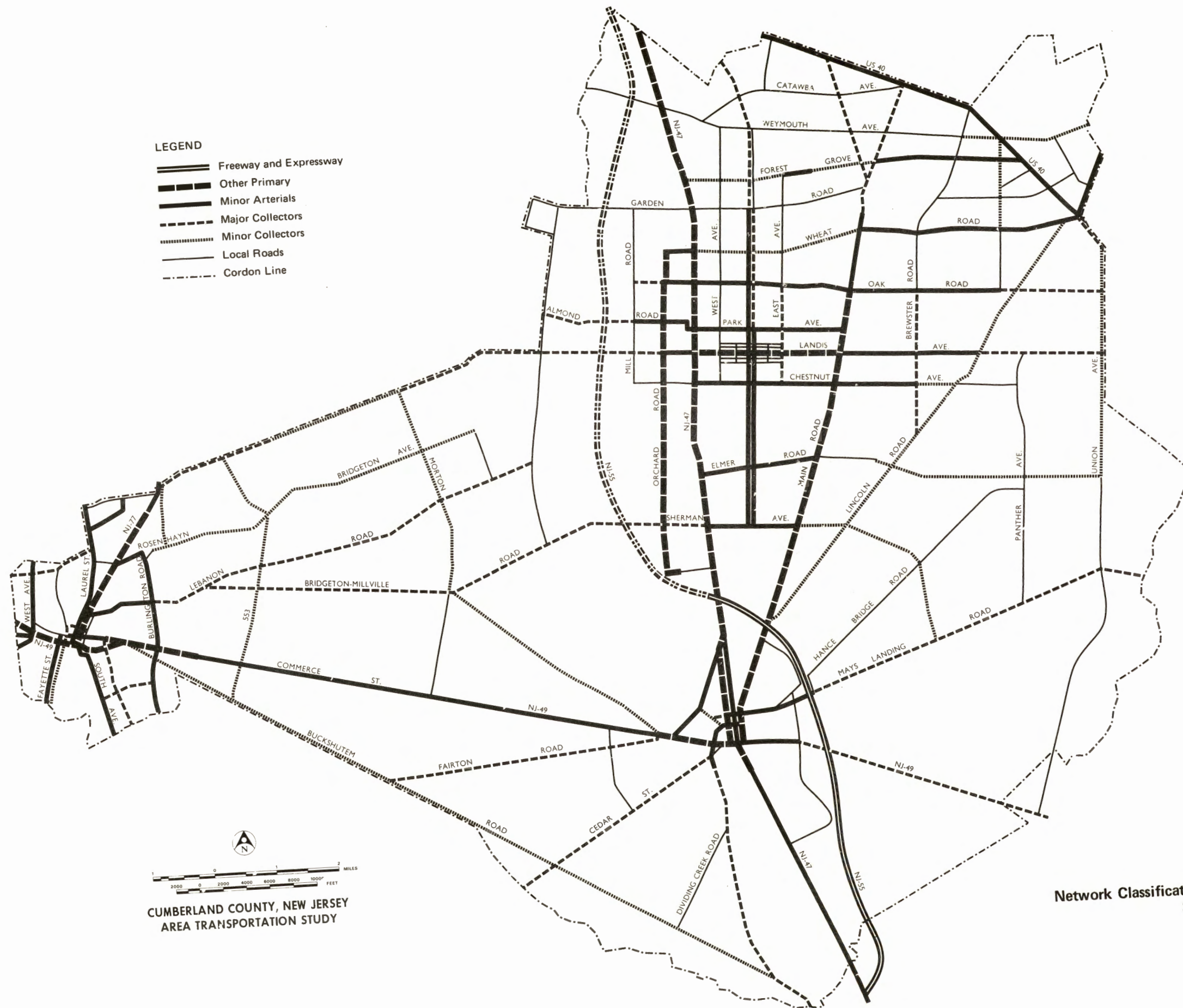
As an initial step in the inventory of the existing highway system, the highway network was classified by its functional use or predominant purpose. Six classifications were incorporated in this analysis:

<u>Code</u>	<u>Functional Classification</u>
2	Freeway & Expressway
3	Other Primary
4	Minor Arterial
5	Major Collectors
6	Minor Collectors
7	Local

Figure 10 shows the highway system incorporated in the analysis by classification type. The miles on the 1972 highway network for each of these classifications is shown on Table 6. The routes classified as freeways and arterials represent 35.4 percent of the total miles of the system and 64.6 percent is classified as collector or local.

Table 7 contains the daily vehicle miles of travel and vehicle hours of travel for each of these functional classifications. While freeways, other primaries and minor arterial routes account for only 35.4 percent of the total system miles, slightly more than 63 percent of the miles traveled in the area occur on these facilities.

In addition to the functional classification, ownership of each segment of the 321-mile highway network was determined. Approximately 67 percent of highway network



- LEGEND**
- Freeway and Expressway
 - Other Primary
 - Minor Arterials
 - Major Collectors
 - Minor Collectors
 - Local Roads
 - Cordon Line

CUMBERLAND COUNTY, NEW JERSEY
AREA TRANSPORTATION STUDY

Figure 10
Network Classification Map, Cumberland County
Study Area

is county owned. The municipalities in the study area own approximately 20 percent of the system while the state of New Jersey owns the remaining 13 percent.

EXISTING TRAFFIC VOLUMES

In order to determine the magnitude and location of existing transportation problems within the study area, extensive traffic counts were carried out by the N.J. DOT in the summer of 1972. This data also served as a check upon the travel patterns survey described in the following chapter. Counts were conducted at 100 locations on the street inventory network and at the 34 external stations. Using this information and historic traffic count data provided by N.J. DOT, traffic volumes for each segment of the street inventory network were developed. The average two-way summer daily traffic for the network existing outside the three city centers is shown on Figure 11. Figure 12 shows the volumes for the segments of the network which fall within the Central Business Districts of Bridgeton, Millville, and Vineland.

On an average summer weekday in 1972, approximately 314,000 vehicle trips were made within the study area. The resulting traffic volumes on the highway system vary from slightly more than 20,000 vehicles per day on Delsea Drive, N.J. 47, just south of Landis Avenue to 200 vehicles per day on some of the outlying routes. Approximately 10 percent of the system had a daily two-way traffic greater than 10,000 vehicles, while approximately one-half of the system had less than 4,000 vehicles per day.

CAPACITY ANALYSIS

One very important phase of transportation system analysis is the definition of a standard to measure the ability of the system to accommodate existing as well as future travel demands. The level of service of a street or highway is the most commonly used measure. Level of service is a qualitative measure of operating conditions that may occur on a given lane or roadway when it is accommodating

TABLE 6
MILES OF SYSTEM BY
FUNCTIONAL CLASSIFICATION FOR
1972 HIGHWAY NETWORK

Code	Functional Classifications	Miles	Percent Total
2	Freeway and Expressway	6.0	1.9
3	Other Primary	34.0	10.6
4	Minor Arterial	73.7	22.9
Subtotal Class 2 Through 4		113.7	35.4
5	Major Collectors	69.7	21.7
6	Minor Collectors	62.6	19.5
7	Local	75.3	23.4
Subtotal Class 5 Through 7		207.6	64.6
Total All Classes		321.3	100.0

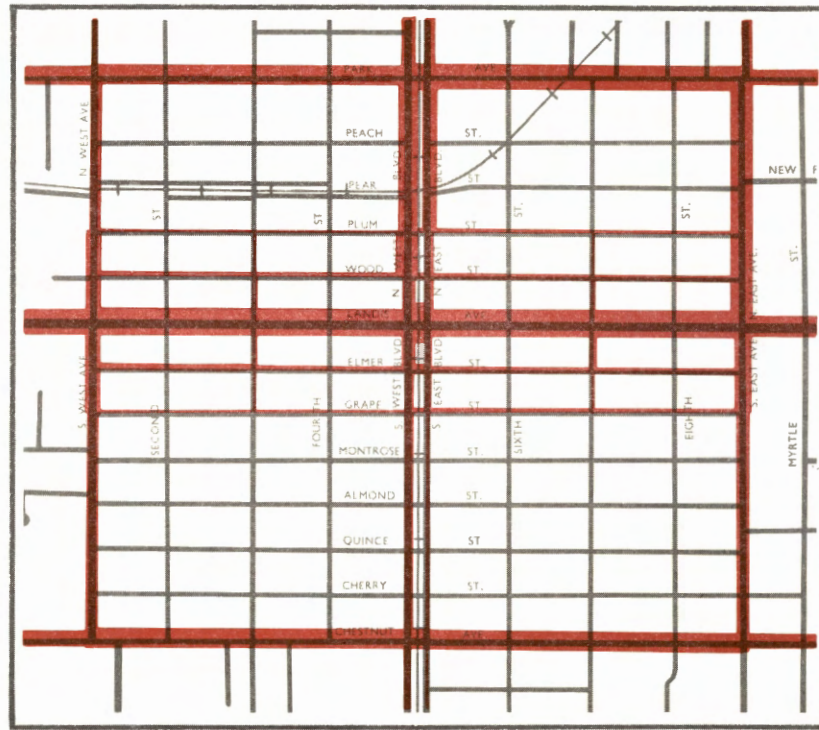
TABLE 7
VEHICLE MILES AND VEHICLE HOURS BY
FUNCTIONAL CLASSIFICATION FOR
1972 HIGHWAY NETWORK

Code	Functional Classification	VMT		VHT		Average Speed
		Miles (100's)	% of Total	Hours	% of Total	
2	Freeway and Expressway	326	2.6	543	1.6	60
3	Other Primary	3,715	29.2	9,712	29.5	38
4	Minor Arterial	3,862	30.4	10,650	32.3	36
Subtotal Class 2 Through 4		7,903	63.2	20,905	63.4	38
5	Major Collectors	2,493	19.6	6,156	18.7	40
6	Minor Collectors	1,289	10.1	2,942	8.9	44
7	Local	1,030	8.1	2,957	9.0	35
Subtotal Class 5 Through 7		4,812	37.8	12,055	36.6	40
Total All Classes		12,715	100.0	32,960	100.0	38

BRIDGETON CBD



VINELAND CBD



MILLVILLE CBD

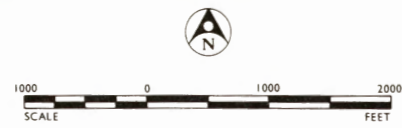


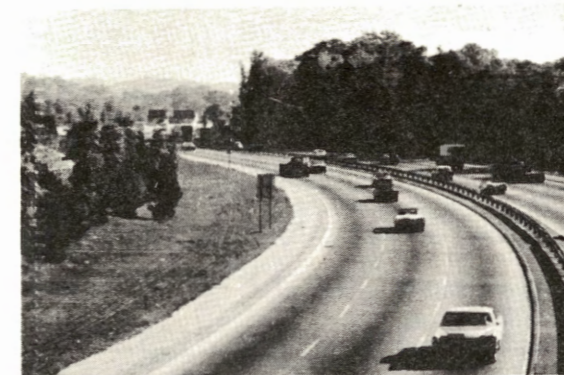
Figure 12
Existing Traffic Volume—Bridgeton, Millville,
and Vineland CBD Areas

various traffic volumes. Some of the factors affecting levels of service include: speed, travel time, traffic interruptions, freedom to maneuver, safety, driving comfort and convenience, and operating costs. The level of service of a section of roadway is normally expressed in six ranges, A through F.

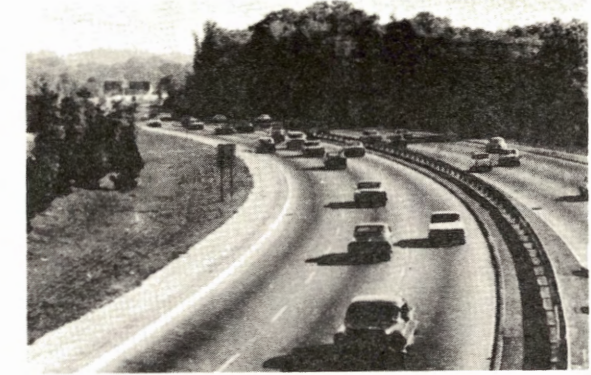
When the route is operating in the highest level of service range, Level A, traffic flows freely and the speed of the individual vehicle is controlled primarily by the posted speed limits. At the lowest level of service, Level F, the section of street or highway is operating under forced flow; speeds are reduced substantially due to queues of vehicles blocking the roadway; freedom of the road user to select his own speeds, change lanes or pass is severely limited; stoppages may occur for long periods of time due to traffic congestion. Figure 13 shows pictorially the type of traffic one might expect to occur for each of the six levels of service.

The term service volume is used to indicate the maximum number of vehicles that can pass over a given section of a one-direction roadway of a divided highway (or in both directions on a 2- or 3-lane highway) during a specified time period while operating conditions are maintained corresponding to the selected or specified level of service. In effect, a service volume is the result of modifying a capacity value for ideal conditions by factors based on the effect of existing conditions and the desired level of service.

In this analysis, capacity is the maximum number of vehicles which can be handled while maintaining a Level of Service C on each segment of the highway system. This reflects a range of operating conditions under which most of the drivers are restricted in their maneuverability and the freedom to chose their own speed, due to the volume of traffic on the facility. The traffic flow is stable, and satisfactory operating speeds occur, although short intermittent delays are occasionally encountered. This does not imply that a section operating below Level of Service C is congested for the entire day. The average daily capacity of each segment, which must be



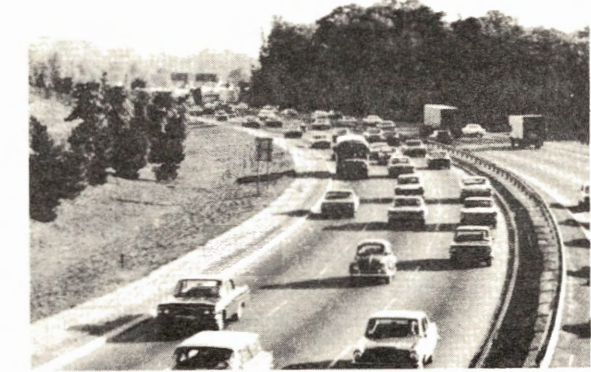
SERVICE LEVEL A



SERVICE LEVEL B



SERVICE LEVEL C



SERVICE LEVEL D



SERVICE LEVEL E



SERVICE LEVEL F

Figure 13
Levels of Service



used since only average daily traffic is available, accounts for the peaking effect of travel within the area. A volume-to-capacity ratio greater than one then implies only that Level of Service C is not maintained during the peak travel period.

The capacity analysis as described here serves two primary purposes in this study. First, information is obtained that will permit an evaluation of the volume and characteristics of travel on a system-wide, regional basis. The existing street inventory and calculated capacity can be used to compare existing and future travel demands to overall levels of service provided by the highway network. This in turn produces some of the basic data necessary to evaluate the alternative programs and existing and potential deficiencies in transportation service throughout the area.

The location of all parts of the highway network where the ratio of the daily traffic volume to the Level C service capacity exceeds 1.00 is shown on Figure 14. It must be remembered that the calculated Level C capacity was developed from a regional rather than a route-specific approach. Therefore, it should be used to identify general characteristics of a section of roadway and not for operational analysis. Table 8 contains a tabulation of miles of system by volume-to-capacity ratio (V/C) for each of the political jurisdictions within the study area. The general characteristics of the portions of the system by capacity ratios are:

- V/C ratio less than 0.50 -- For the 61.9 percent of the network that falls in this range, the operating characteristics of the facility would reflect a free-flow level of service typical of the A level of service range of operating conditions in all hours of the day.
- V/C ratio between 0.51 and 1.00 -- The drivers on the 25.3 percent of the system that falls into this range would begin to experience some restrictions to their choice of speed and freedom to maneuver in the time of day when the traffic volumes reach their peak. The operating characteristics in the peak period would be typical of the B and to some extent the C level of service range of operating characteristics.
- V/C ratios between 1.01 and 1.50 -- In the time of day when the peak volumes occur on the 9.1 percent of the system that falls into this

TABLE 8
MILES OF SYSTEM BY JURISDICTION
AND VOLUME/CAPACITY RATIO

Jurisdiction	V/C Less than .50		V/C .51 to 1.00		V/C 1.01 to 1.50		V/C 1.51 to 2.00		V/C Greater than 2.01		Total Miles
	Miles (100's)	%	Miles (100's)	%	Miles (100's)	%	Miles (100's)	%	Miles (100's)	%	
Bridgeton (except CBD)	12.5	61.3	6.1	29.9	1.8	8.8	--	--	--	--	20.4
Bridgeton CBD	2.2	48.9	1.9	42.2	0.4	8.9	--	--	--	--	4.5
Upper Deerfield	10.5	65.6	2.8	17.5	2.4	15.0	0.3	1.7	0.1	0.5	16.0
Fairfield	8.0	69.0	--	--	3.6	31.0	--	--	--	--	11.6
Deerfield	16.5	78.9	1.7	8.1	2.7	12.9	--	--	--	--	20.9
Millville (except CBD)	26.9	54.0	21.0	42.2	0.4	0.8	1.5	3.0	--	--	49.8
Millville CBD	6.1	48.4	5.9	46.8	0.3	2.4	0.2	1.6	--	--	12.6
Vineland (except CBD)	78.2	64.8	26.7	22.8	8.2	6.8	4.9	4.0	2.5	2.1	120.5
Vineland CBD	7.4	66.1	3.4	30.4	0.3	2.7	0.1	0.8	--	--	11.2
Pittsgrove	5.7	67.8	--	--	1.9	22.6	0.7	8.8	--	--	8.4
Newfield	2.3	69.7	0.6	18.1	--	--	0.4	12.1	--	--	3.3
Franklin	7.3	46.8	3.6	23.1	4.0	25.6	0.6	3.8	--	--	15.6
Buena Boro	10.0	55.8	4.3	24.0	3.1	17.3	--	--	0.6	3.1	17.9
Buena Vista	5.1	59.3	3.5	40.7	--	--	--	--	--	--	8.6
Total	198.7		81.5		29.2		8.7		3.1		321.3
Percent of Total	61.9%		25.3%		9.1%		2.7%		1.0%		

range, the drivers would be restricted in their choice of speed, ability to pass and change lanes. The driver's comfort and convenience are adversely affected and, for short periods, there may be severe decreases in operating speed. The operating characteristics in the peak period of traffic volume would fall into the ranges identified with C and D levels of service.

- V/C ratio greater than 1.5 -- On the 3.7 percent of the system that falls in this range the drivers in the period of peak traffic volume would experience substantial restrictions in maneuverability and decrease operating speeds. Stoppages may

occur for short or long periods due to vehicle congestion on the route. Volumes would be approaching the maximum capacity of the facility during the period of peak congestion. These conditions would be most severe on the 1 percent of the system where the V/C ratio is greater than 2.01.

Of 321 miles of street and highway included in the network, 280 miles, or 87 percent of the system, have an existing traffic volume that is less than Level C service volume. Approximately 69 percent of the daily vehicle miles of travel occur on these facilities.

There are 29 miles, or 9 percent, where the existing traffic to Level C service volume ratio is in the 1.0 to 1.5 range. Approximately 234,700 vehicle miles of travel, or 18 percent of the total system miles, occur on these facilities.

On 12 miles of the system, the existing traffic is greater than 1.5 times the Level C service volume. Approximately 13 percent of the daily vehicle miles of travel occur on these facilities.

The elements of the system which have volume-to-capacity (V/C) ratio between 1.0 and 1.5 fall mainly on five routes:

- Landis Avenue, between Bridgeton and Vineland
- U.S. 40 across the northeast edge of the study area
- U.S. 49 between Bridgeton and Millville
- Main Road in Vineland
- N.J. 77 in Bridgeton

The majority of the segments with V/C ratios greater than 1.5 fall along N.J. 47 from Millville north.

Again, it must be emphasized that these figures are based on system-wide, regional performance. This procedure is essential in determining possible problem areas, but they should not form the sole basis for upgrading any facility. For a detailed description of the methodology used in the analysis see Technical Memo 14, Transportation Facilities Survey, published March 1973. This memo also contains a listing of the detailed street inventory data for each segment of the inventoried highway network.

ACCIDENT INVENTORY

Automobile accidents provide an important performance measure for any highway system. Intersections with high accident rates represent potential deficiencies in the highway system. However, examination of the number of accidents at individual locations over a period of time only identifies potential defects. Before making any recommendations on the deficiencies of individual intersections, more detailed examination of each location is required.

The investigation undertaken in the first phase of the Cumberland County Urban Area Transportation Study is the first stage of the accident analysis.

The accident data for the 4-1/2-year period from 1968 through mid-1972 was collected from all of the various municipalities and jurisdictions contained within the study area. This information was tabulated and the average annual number of accidents computed. The annual averages for each location where more than one accident per year occurred are displayed on Figures 15, 16, 17, and 18. The annual average number of accidents are grouped in the following manner:

- Locations with one or two reported accidents per year
- Locations with an average of more than two accidents and not more than 4 accidents per year
- Locations with an average of more than 4 accidents and not more than 6 accidents per year

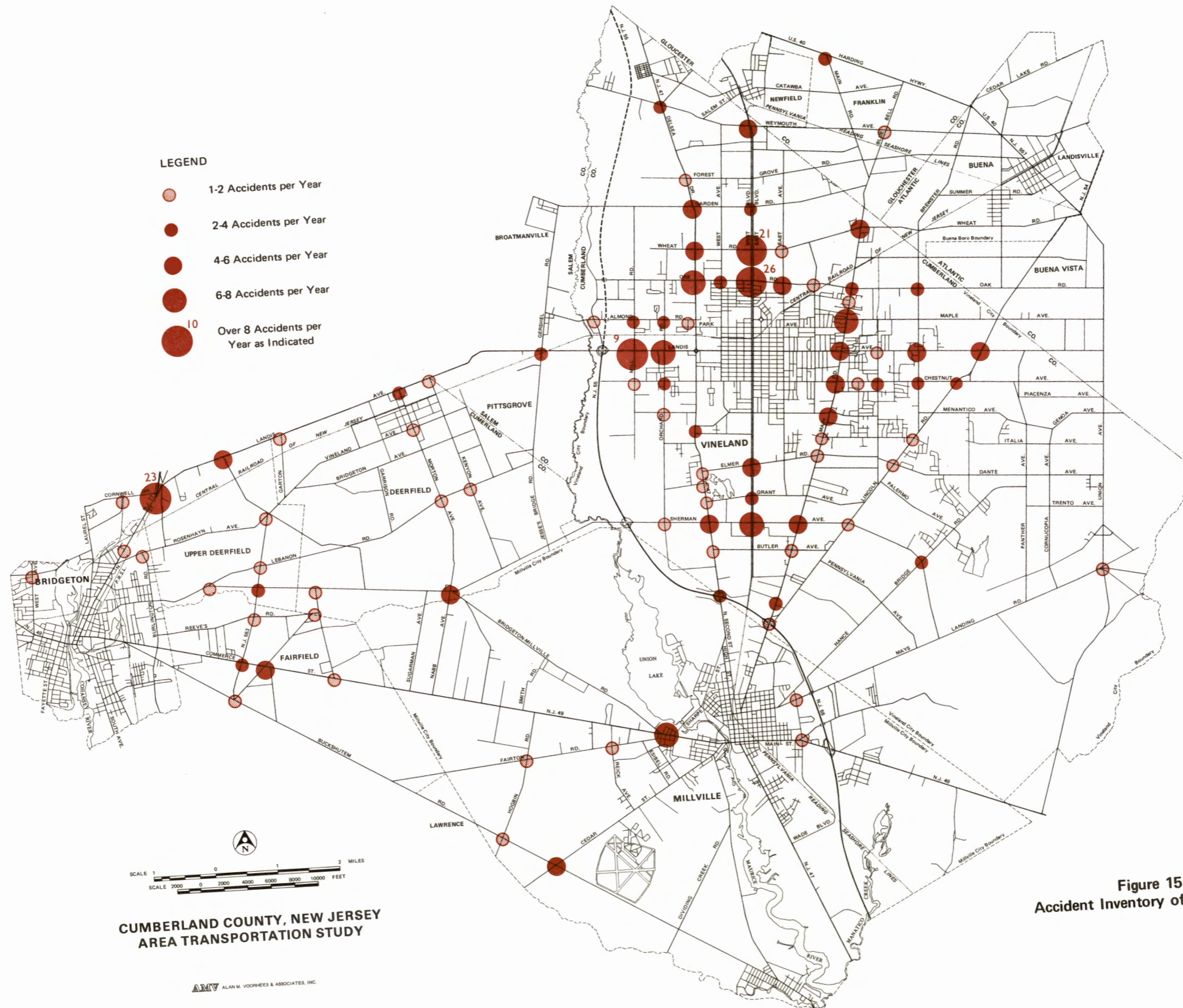


Figure 15
Accident Inventory of Study Area



Figure 16
Accident Inventory of Bridgeton CBD

CITY OF BRIDGETON, NEW JERSEY
CUMBERLAND COUNTY
AREA TRANSPORTATION STUDY



MILLVILLE, NEW JERSEY
CUMBERLAND COUNTY
AREA TRANSPORTATION STUDY

Figure 17
Accident Inventory of Millville CBD

LEGEND

- 1-2 Accidents per Year
- 2-4 Accidents per Year
- 4-6 Accidents per Year
- 6-8 Accidents per Year
- 10⁺ Over 8 Accidents per Year as Indicated

- Locations with an average of more than 6 accidents and not more than 8 accidents per year .
- Locations with an average of more than 8 accidents per year

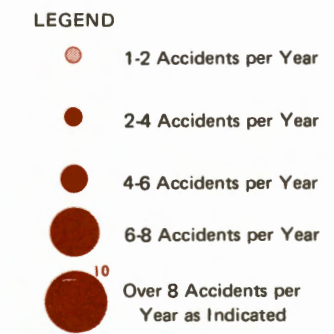
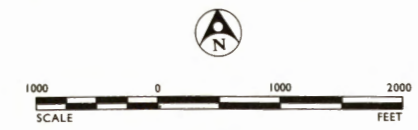
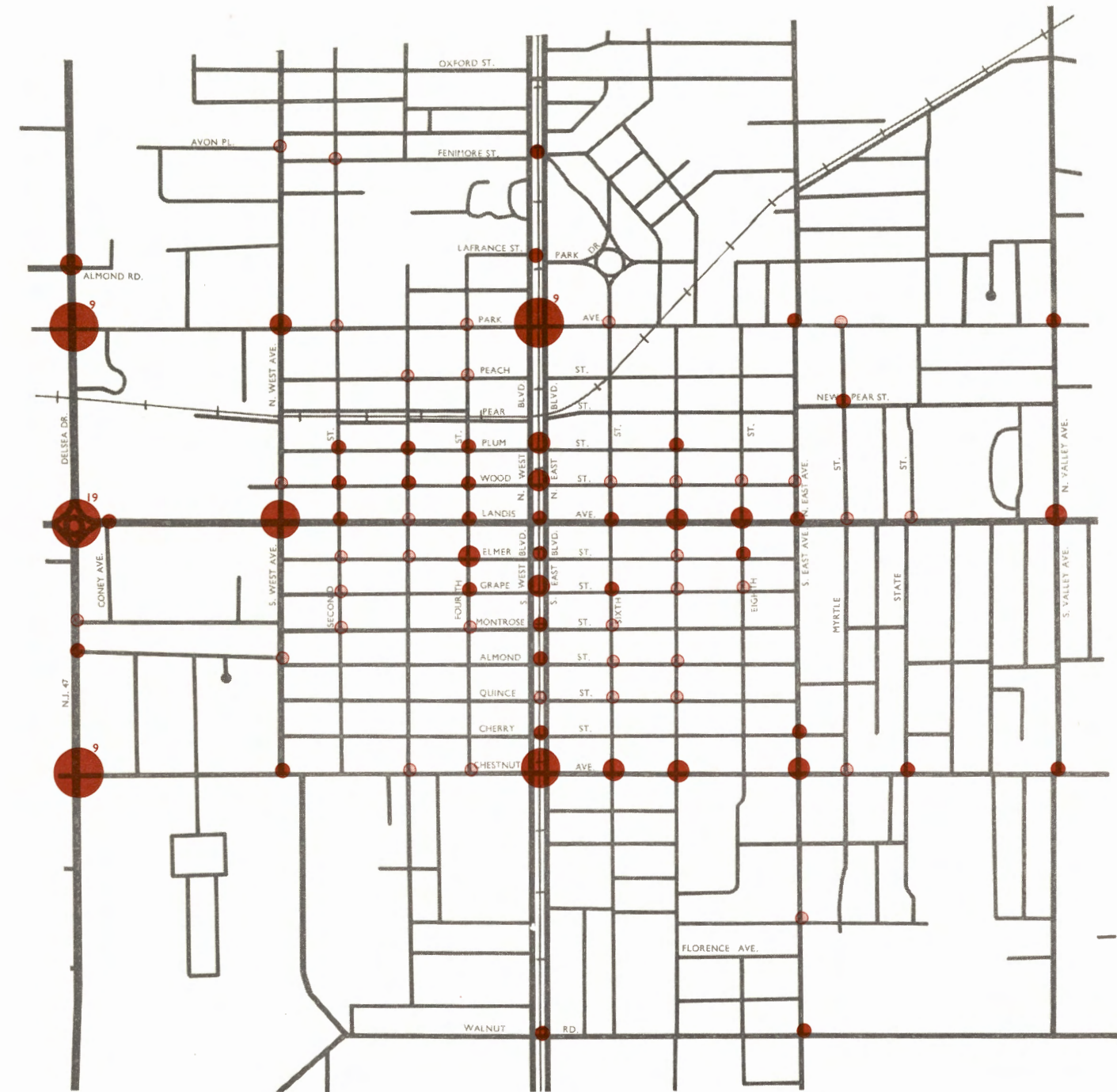
The investigation showed that very few locations within the study area have high accident rates. The intersections which recorded more than 8 accidents per year are:

Location	Intersection	Average Number Reported Accidents Per Year
Vineland	Route 47 and Park Avenue	9
	Route 47 and Landis Avenue	19
	Route 47 and Chestnut Avenue	9
	East-West Blvd. and Park Avenue	9
	East-West Blvd. and Oak Road	26
	East-West Blvd. and Wheat Road	21
	Landis Avenue and Mill Road	9
Bridgeton	Route 77 and Cornwall Drive	23
	Burlington Road and Commerce Street	9

The intersection on East and West Boulevard in Vineland, displayed as accident prone, actually represents the sum of two potential conflict points. This differs from the display of other accident points which represent only one conflict point. Nevertheless, it was decided, in terms of total movements, that the two points are behaving as one intersection, and the accidents were combined.

PARKING INVENTORY

One of the controlling influences on highway movements, particularly in central areas, is the availability of parking space for private and commercial vehicles. Recognizing this fact, a survey of existing parking facilities in the central areas



CITY OF VINELAND, NEW JERSEY
CUMBERLAND COUNTY
AREA TRANSPORTATION STUDY

Figure 18
Accident Inventory of Vineland CBD

of Bridgeton, Millville, and Vineland was made. Although the existing facilities in these towns are adequate for present needs, the base year survey enables a more accurate estimate of future needs and deficiencies.

The survey separated parking availability into "on-street" and "off-street". On-street parking was then subdivided into:

- Unrestricted parking
- Restricted parallel parking -- 15 minutes or 2 hour limit
- Restricted angle parking -- 15 minutes or 2 hour limit

Off-street parking was subdivided into:

- Municipal
- Private, customer
- Private, employee
- Private, customer/employee

The type of parking available in the central area of Bridgeton, Millville, and Vineland may be summarized as follows: in Bridgeton, of the 1620 parking spaces available, 78 percent are off-street and 22 percent on-street. In Millville, there are 1310 parking spaces, with 67 percent off-street and 33 percent on-street. In Vineland, there are 2358 spaces with 76 percent off-street and 24 percent on-street.

The restrictions on parking vary widely. In Bridgeton, 80 percent of the on-street parking is restricted; in Vineland, it is 55 percent; in Millville, 47 percent. This high restriction on parking in Bridgeton may indicate demand exceeding supply. There are also wide variations in the types of off-street parking. In Bridgeton, only 11 percent of the off-street parking is publicly owned, while in Vineland and Millville, 30 percent and 38 percent, respectively, are publicly owned. These results are shown in Figures 19, 20, and 21. In Bridgeton, the available on-street parking is predominantly on Laurel Street, Commerce Street, Washington Street, and Pearl Street. These four streets account for approximately 80 percent of the available on-street parking in Bridgeton. In Millville, over 50 percent of the available spaces

are located on High Street and Second Street, while in Vineland over 70 percent of the on-street space are located on Wood Street, Landis Avenue and Elmer Avenue. The on-street parking on Landis Avenue is all angle parking, compared with parallel parking in all other locations except for some in Millville.

TRANSIT INVENTORY

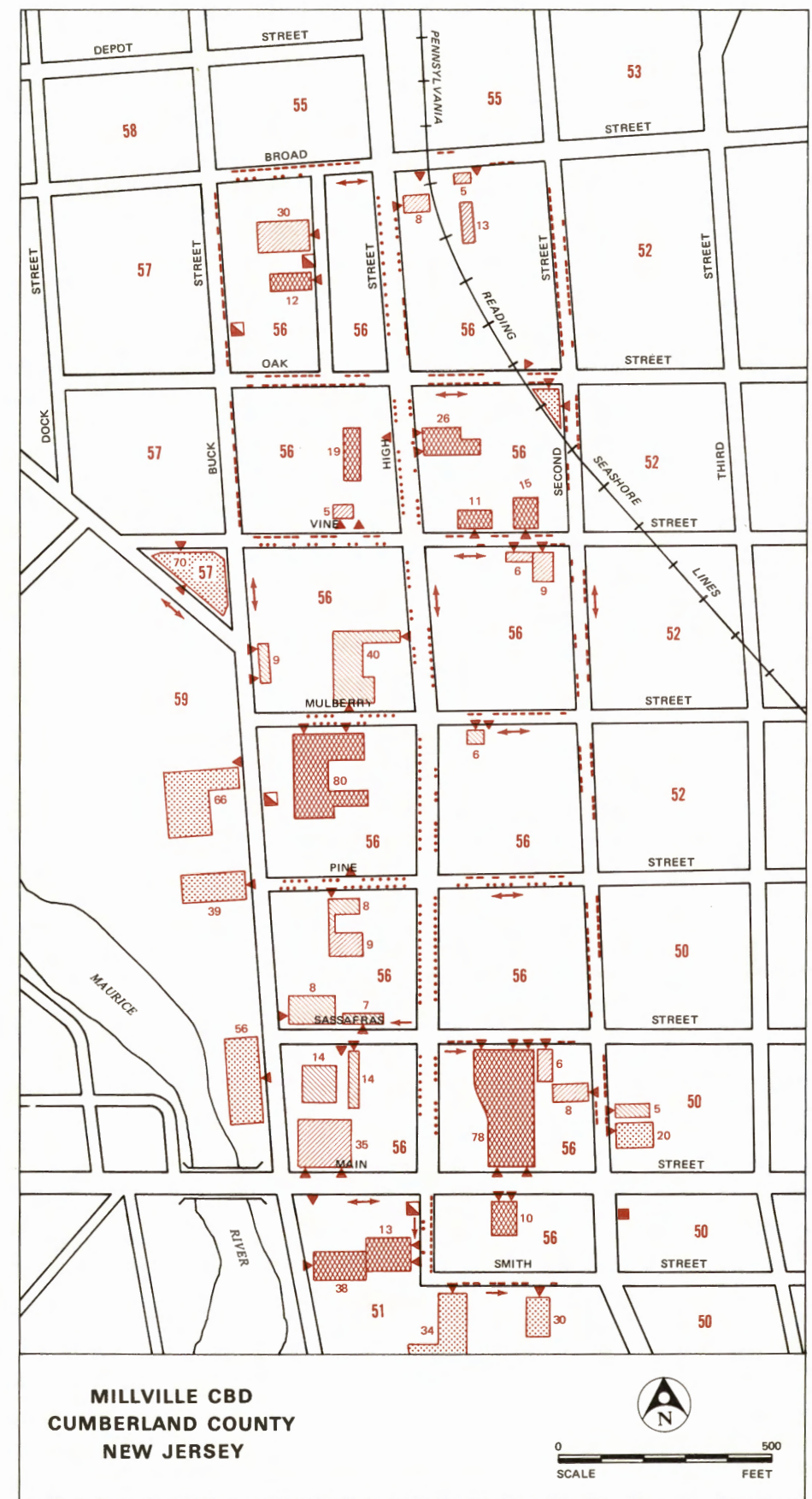
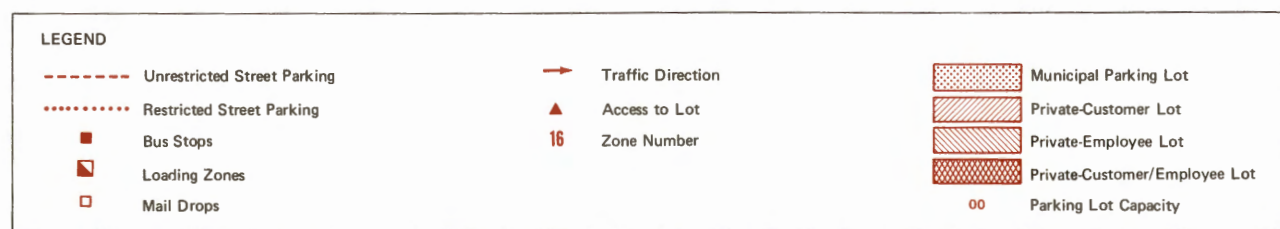
Existing transit travel in Cumberland County is a relatively minor component of total travel demand. The transit services currently available are provided by two bus companies -- Garden State Coachways and Transport of New Jersey. The services provided by the two companies are primarily for travel to and from the study area. Bridgeton is the only city within the study area which has an internal transit service. The service originates at the intersection of Laurel and Commerce Street and is an hourly service on each of four routes. The annual ridership on all four routes was 49,600 passengers in 1971 with a fare of 20 cents for adults. The service operates from 7:00-10:00 a.m. and 12:00 noon-6:00 p.m. on Monday to Saturday. Figure 22 shows the location of the bus routes operating in the study area.

The major bus services are to and from the study area and connect the county with Cape May, New York and Philadelphia. Between Philadelphia and the study area, Transport of New Jersey operates two services. The first service is to and from Bridgeton and comprises 11 buses operating daily in each direction, with 9 buses on Saturday and 7 buses on holidays. The second service connects Millville and Vineland with Philadelphia and Cape May. This service has 18 buses in each direction with 15 buses on Saturday to Vineland, and in the reverse direction in the evening.

The service between the study area and New York is provided by Garden State Coachways, who operate a single service connecting Bridgeton, Millville, and Vineland with New York. They provide 16 buses daily in each direction with 10 buses on Saturdays, Sundays, and holidays. In conjunction with this service, the company also carries passengers between Bridgeton, Millville, and Vineland.



**Figure 19
Parking Inventory of Bridgeton CBD**



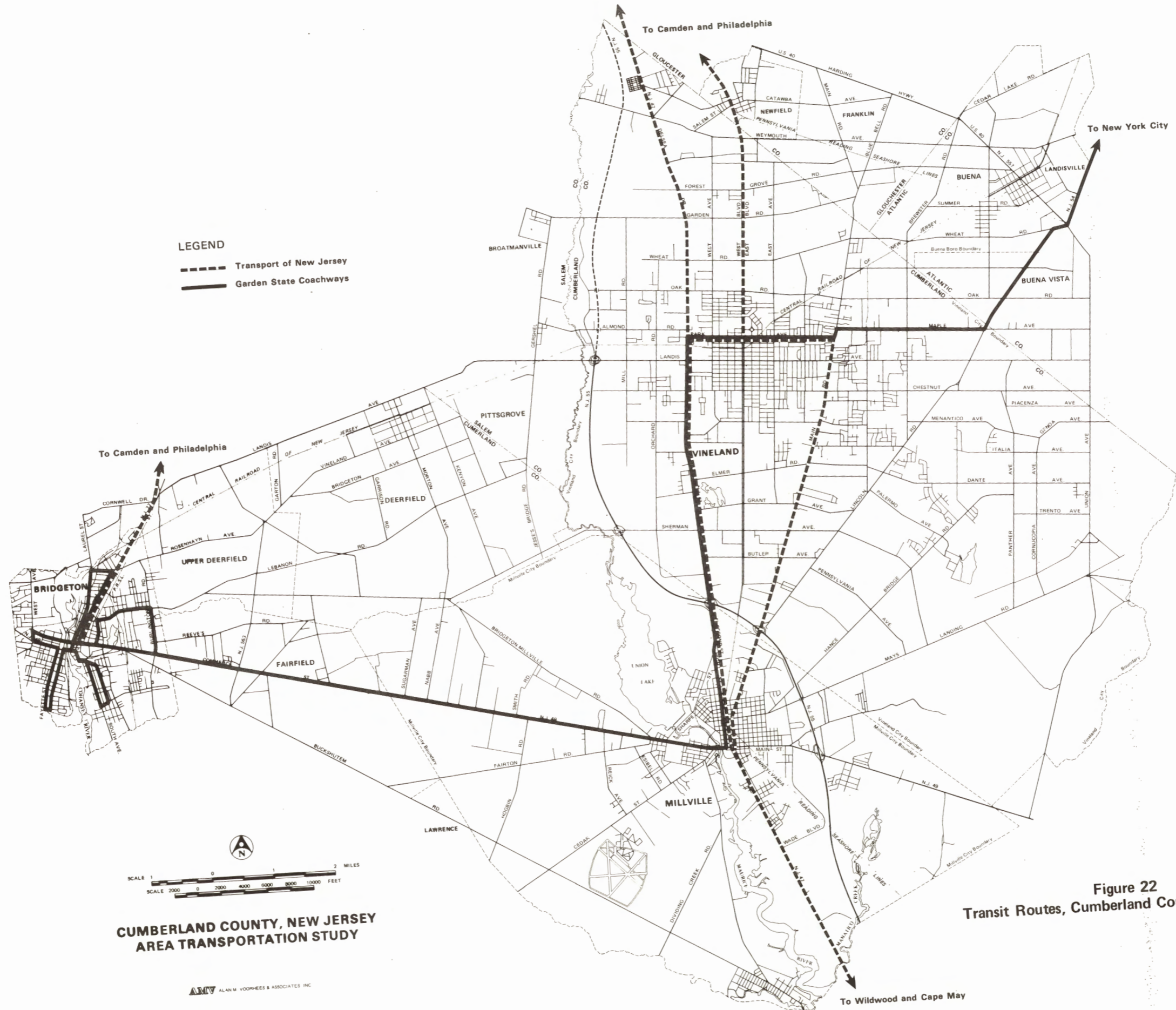
**Figure 20
Parking Inventory of Millville CBD**



Figure 21
Parking Inventory of Vineland CBD

Because of the scheduling of the services to and from New York, the best service is provided during the morning peak hours in the direction Bridgeton to Millville to Vineland, and in the reverse direction in the evening.

An estimate of the number of passengers using this service was unavailable, as were the total number of passengers traveling from the study area to New York and Philadelphia. The data from the 1972 travel pattern survey showed approximately 840 total transit trips made by residents of the study area on a summer weekday. Of these trips, 375 were made to or from points outside the study area and 465 made completely within the study area. The total transit passenger trips were less than three-tenths of one percent of the total trips made by the residents of the study area.



CHAPTER V
TRAVEL PATTERN SURVEY

The third major class of inventories conducted in the first phase of this study included the travel pattern surveys. In order to obtain a comprehensive picture of all travel within the Cumberland County study area, three major travel surveys were conducted during July and August of 1972.

These three surveys were:

- A home interview survey of approximately 12 percent of the 34,150 occupied dwelling units within the study area
- Roadside interview of the trips crossing the external cordon line. Approximately 37,000 interviews were conducted at 34 locations. More than 27 percent of the vehicles passing through these locations on the day of survey were interviewed.
- The owners of 10 percent of the trucks garaged within the study area were interviewed to determine the internal truck trips.

The interview data collected provided the following detailed information when expanded, tabulated, and analyzed:

- The characteristics of the households throughout the study area. A summary of some of this information is contained in Chapter III of this report.
- The number of trips made by all modes, i.e., auto driver, auto passenger, bus passenger, taxi passenger, truck driver, truck passenger, and walking trips between home and work.
- The reasons why trips were made between two locations.
- The origin and destination of all trips.
- The type of trucks involved in the movement of goods within, into, out of, and through the study area.
- The time of day that the trips were made.

This information provides reliable answers to the questions how, when, where, why, and how many trips are made by the people living within the study area or traveling into or through the area. Table 9 contains a summary of the trips made by people and vehicles by the mode of travel developed from the travel pattern survey. Detailed descriptions, tabulations, and summaries of the procedures followed and the information developed from these surveys are contained in Technical Memos 11, 13, 15, 16, 17, and 18. A list and brief description of each of the memos appears in Appendix A of this report. A very brief summary of the survey procedures appears in this chapter.

Table 9

TOTAL DAILY TRIPS BY MODE
INTERNAL AND INTERNAL-EXTERNAL TRIPS
(1972 Summer Weekday Travel)

<u>Mode</u>	<u>Total Person Trips Per Day</u>	<u>Percent of Person Trips</u>	<u>Auto & Truck Vehicle Trips</u>	<u>Percent of Auto or Truck Vehicle Trips</u>
Auto Driver	245,180	50.35%	245,180	78.16%
Auto Passenger	131,002	26.91		
Subtotal Auto	376,376	77.26		
Truck Driver	48,351	9.92	48,351	15.40
Truck Passenger	12,624	2.59		
Subtotal Truck	60,975	12.51		
Bus Passenger	839	0.16		
Taxi Passenger	1,199	0.24		
Walk to Work	1,366	0.28		
School Bus	659	0.13		
Subtotal Internal & Internal-External Trips	441,220	90.61	293,531	93.50
<u>Through Trips</u>				
Auto Driver	17,323	3.55	17,323	5.52
Auto Passenger	23,960	4.91		
Subtotal Auto	41,283	8.47		
Truck Driver	2,889	0.59	2,889	0.92
Truck Passenger	1,601	0.33		
Subtotal Truck	4,490	0.92		
Subtotal Through Trips	45,773	9.39	20,212	6.44
Subtotal Auto and Truck Trips	482,980	99.17%	313,743	100.00%
Total All Trips	487,043	100.00%		

Home Interview Survey

As the initial phase in this survey, 4,269 occupied dwelling units were selected for interview from the 34,150 occupied dwelling units in the study area. Telephone interviews were conducted Tuesdays through Saturdays between July 11, 1972, and August 30, 1972, thus collecting data on average summer weekday (Monday through Friday) travel in the area. The interviewers were asked to describe all trips made by household residents on the previous day. In all, only 136 (3.2 percent) of the 4,296 interviews, including all refusals, and all unable to contact, could not be completed. The resulting usable interviews represent a 12.1 percent sample of all occupied dwelling units within the study area. The interviews resulted in 33,606 recorded person trips by residents of the area, which represents 277,520 trips after expansion of the survey data to represent the total study area.

External Roadside Survey

The external roadside survey was undertaken to determine the purpose and volume of trips which have one or both ends outside the study area. Interviews were carried out at 34 locations for 14 hours at each location between July 10 and August 29, 1972.

While these survey points do not account for all roads which cross the study area boundaries, 91.5 percent of the 148,500 vehicles crossing the external cordon line passed through the survey locations. Approximately 37,000 interviews were conducted at the external stations. Thus, 36.4 percent of the traffic passing through the external stations during the 14-hour interview period and 27.4 percent of the total daily traffic at the external stations were interviewed.

Truck Survey

The number and location of the trucks garaged in the study area was determined from field investigation and from the results of the telephone home interview.

In all, 5,215 trucks were identified as being garaged in the study area. Of these, 520 or approximately 10 percent were selected for interview. The interviews were conducted between August 16, 1972, and September 16, 1972, Tuesdays through Saturdays, so that the trip data would be compatible with that collected in the previously mentioned surveys.

Of the 520 trucks selected for interview, only 3.5 percent (18) of the samples could not be completed. Out of the remaining 502 interviews, 97 (19 percent) were trucks which were out of service or not in use the day they were contacted. The remaining 405 usable interviews accounted for 2,151 recorded truck trips within the area.

Survey Verification

An excellent check upon the telephone home interview results was provided by the 1970 Census data, prepared by the U.S. Department of Commerce, Bureau of Census. The expanded survey data were compared to census data whenever possible, and any major discrepancies were immediately resolved by field investigations. Through this procedure it was determined that the demographic data base collected in the surveys was indeed accurate.

As one of the many checks on the travel data, comparisons were made between the first work trip recorded in the interview and the number of employees in the destination zone. The first work trip in this case was the first trip originating at home with the purpose of the trip indicated as work. Normally, first work trips fall between 80 and 90 percent of employment due to vacation, illness and interruptions of the trip to meet other needs. This comparison showed the survey data to be reliable.

As an additional check on the expanded survey results, comparisons were made between assigned survey traffic volumes and field count volumes. Traffic counts were taken

by the New Jersey Department of Transportation at extensive locations throughout the study area as part of the transportation facilities survey mentioned in Chapter IV. The locations formed seven lines, each crossing the entire study area along zone boundaries. The expanded zone-to-zone movements from the survey were then compared to the actual ground count at the seven cutline locations. Again, the checks supported the accuracy of the survey results. The complete procedures and results are presented in the Technical Memos previously listed.

SUMMARY OF TRAVEL PATTERN SURVEY DATA

On a typical summer weekday in 1972, more than 487,000 trips were made by all modes in the 167 square miles contained within the boundaries of the study area. More than 57 percent of these trips were internal trips, with both their origin and destination inside the study area. One-third of the trips were between points inside the study area and points outside the study area and less than 10 percent passed through the area without stopping.

Trip Mode

More than 86 percent of all trips were made by persons riding in automobiles, 54 percent as auto drivers and 32 percent as auto passengers. Slightly more than 13 percent of the trips were made by persons riding in trucks, 10 percent as truck drivers, and 3 percent as truck passengers. All other modes of travel accounted for only eight-tenths of one percent (0.8 percent) of the total person trips on a typical summer weekday. Almost 314,000 vehicle trips were made each day -- 262,500 or 83.6 percent by autos and 51,500 or 16.4 percent by trucks. The average number of persons riding in each auto was 1.44 for the internal trips, 1.74 for the internal-external trips and 2.38 for through trips.

Trip Purpose

Each trip recorded during the interviews was given both a purpose from and a purpose to destination. Experience has shown that certain groups of these purposes exhibit more similarities and stability than others. Five trip purpose groupings were chosen for this analysis. They are:

- Home-Based Work -- Any trips with one end recorded as home and the other end recorded as work.
- Home-Based Shop -- Any trip with one end at home and the other end recorded as shop.
- Home-Based Other -- Any trip with one end at home and any purpose other than work or shop at the other end.
- Non-Home-Based -- Any trip with neither end at home.
- Truck -- All truck trips.

Since trips passing through the study area are generally independent of activity within the study area, they are simply classified as auto or truck trips. Table 10 contains a summary of the total trips by mode of travel and trip purpose within into or out of the study area.

Three-quarters of the 245,400 auto driver trips began or ended at the residence of the driver; 64,000 or 26 percent were trips between home and work; 37,000 or 15 percent were trips between home and shopping facilities; and 85,000 or 34 percent between home and all other purposes.

The 59,000 auto trips that did not begin or end at the residence of the driver represent 24 percent of the total auto trips.

Travel Patterns

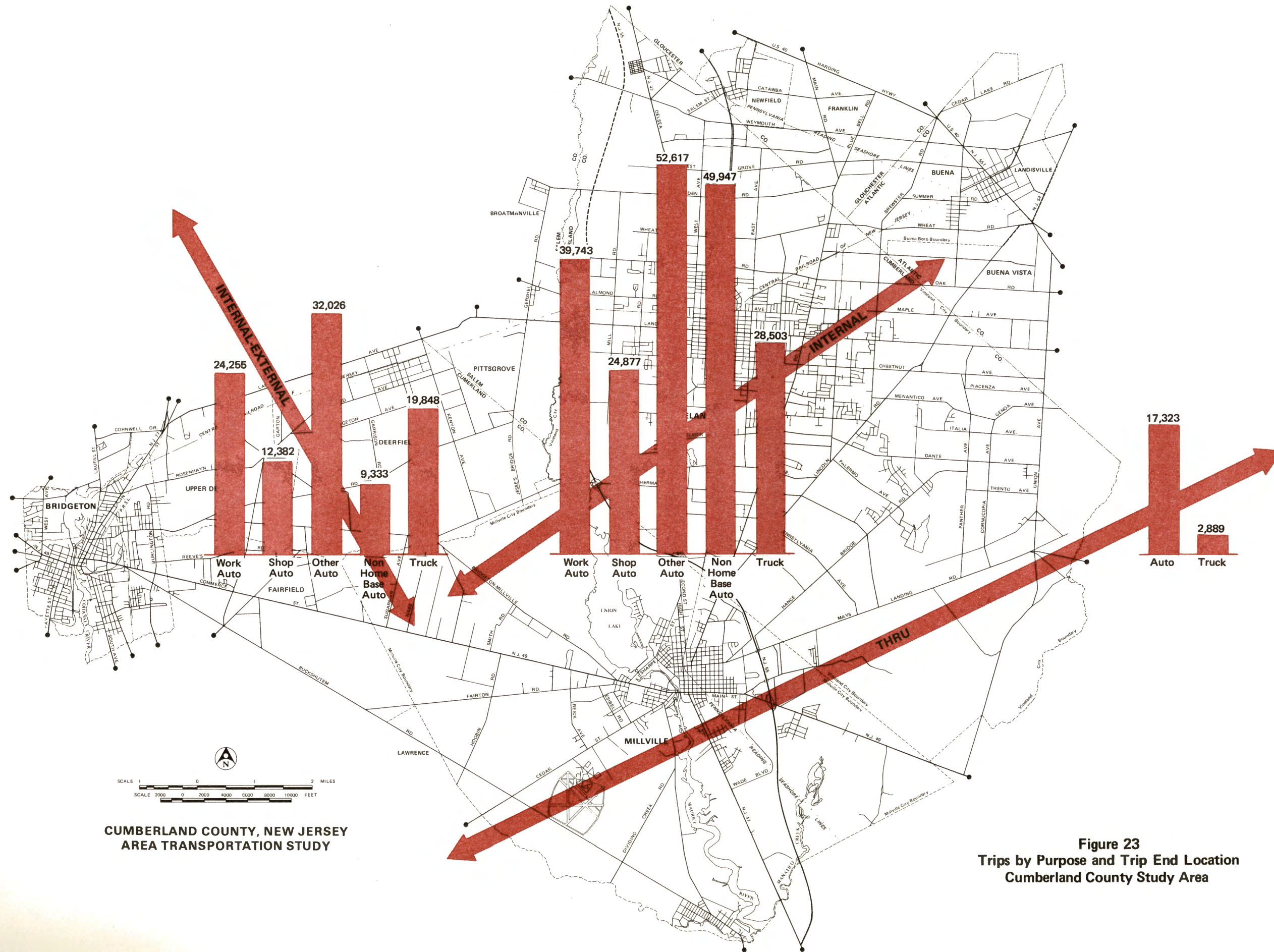
On a typical summer weekday in 1972, there were 51,200 truck trips made in the study area -- 28,850 completely within the study area, 19,800 between the study area and points outside and 2,800 that passed through the area. Figure 23 is a graphic representation of these five trip purpose groupings by the location of both ends of the trip. Approximately 62 percent of all vehicle trips had both ends (internal) of the trip located in the study area, 32 percent had one end (internal-external) of the trip in the study area, while 6 percent passed entirely through the study area.

Of the five trip purpose groupings selected, home-based work and home-based shop show extreme significance relative to directional bias. Nearly 17,000 of the internal-external work trips are attributable to non-residents of the study area employed within the CCUATS study area. The strong commercial importance of the study area is emphasized by the nearly 11,000 shop trips which have the home end of the trip outside the study area boundaries. This means that 26.3 percent of all work trips and 29.4 percent of all shop trips in the study area are made by non-residents. The next logical question is, where do these trips originate if not in the study area? The survey results showed that over 92 percent of the trips made by non-residence originated at homes located in either the remainder of Cumberland County or one of the four adjacent counties.

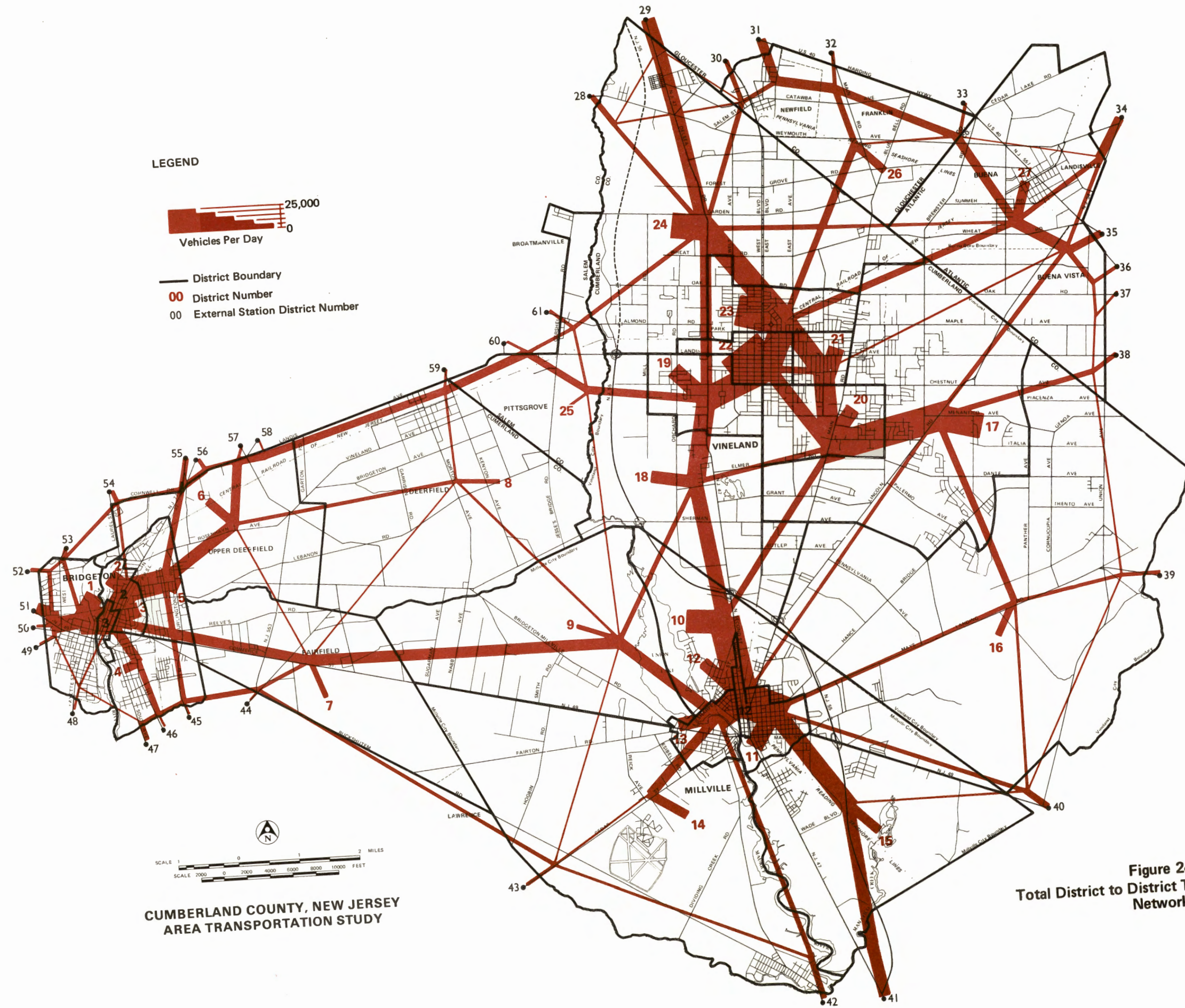
As mentioned in Chapter 3, the study area was divided into 27 internal districts and 34 external districts (see Figure 8). Figure 24 graphically portrays the total daily vehicle trips made between these 61 districts during the summer of 1972. This is generally referred to as a desire line plot for it displays overall travel orientation between areas rather than actual traffic volumes on the transportation system.

Table 10
CUMBERLAND COUNTY
INTERNAL AND INTERNAL-EXTERNAL
TRIPS BY MODE AND PURPOSE

Purpose To	MODE				
	Auto Driver	Auto Passenger	Bus Passenger	Taxi Passenger	School Bus
<u>Home-Based Work Trips</u>					
Work	63,998	16,292	196	304	0
%HB Work Trips	79.2%	20.2%	0.2%	0.4%	0.0%
<u>Home-Based Shop Trips</u>					
Shop	37,259	23,073	74	243	0
%HB Shop Trips	61.4%	38.1%	0.1%	0.4%	0/0%
<u>Home-Based Other Trips</u>					
Home	142	79	0	0	0
Business	18,000	7,000	14	134	0
Social/Recreation	39,264	49,892	296	176	0
Medical/Dental	3,030	2,702	0	217	0
Change Mode	546	578	0	8	0
Eat Meal	1,880	1,545	0	8	0
Serve Passenger	19,903	4,495	0	0	0
School	1,178	1,087	181	16	594
Total	84,643	68,217	491	559	594
%HB Other Trips	54.8%	44.1%	0.3%	0.4%	0.4%
<u>Non-Home-Based Trips</u>					
Work	15,995	2,288	0	0	0
Business	8,582	1,969	0	34	0
Shop	11,280	4,916	0	11	0
Social/Recreation	3,462	11,321	19	12	47
Medical/Dental	557	262	0	25	0
Change Mode	87	149	39	0	18
Eat Meal	8,115	1,614	0	0	0
Serve Passenger	6,142	633	9	0	0
School	60	68	11	0	0
Total	59,280	23,420	78	92	65
%NHB Trips	71.5%	28.2%	0.19%	0.1%	0.1%
GRAND TOTALS					
Trips	245,180	131,002	839	1,199	659
% by Mode	64.7%	36.1%	0.2%	0.3%	0.2%
<u>Truck Trips</u>					
All purposes	<u>Truck Driver</u> 48,351				



**Figure 23
Trips by Purpose and Trip End Location
Cumberland County Study Area**



CUMBERLAND COUNTY, NEW JERSEY
AREA TRANSPORTATION STUDY

Figure 24
Total District to District Trips on the Spider Network

The population and employment concentration within the study area is readily apparent on this display as they are on Figure 8 (Base Year Employment and Population by District). In addition, the strong self-containment and independence of the three urban centers is strongly demonstrated by the relatively light travel between them.

Trip Length Distribution

A better understanding of the trip patterns within the area is gained by examining the actual driving time for the various trip purposes. Figure 25 is a plot of the percent of trips occurring versus the travel time of the trip for each of the five purposes. The driving times between the origin and destination of the trips have been combined with an estimate of the time required for the driver to reach the vehicle at the beginning of the trip and to park the vehicle and walk to the final destination. The average trip times for each of the five vehicle trip purposes are:

- | | |
|--------------------------------|--------------|
| ● Auto Driver Home-Based Work | 12.8 minutes |
| ● Auto Driver Home-Based Shop | 11.3 minutes |
| ● Auto Driver Home-Based Other | 12.3 minutes |
| ● Auto Driver Non-Home-Based | 10.7 minutes |
| ● Truck Trips | 12.5 minutes |

Selected Travel Pattern

The significance of these relatively short trip lengths can be better understood by examining the travel patterns of trips that begin or end in areas of high concentration of activity.

The nature of the study area, with three separate self-contained city centers produces a very distinct travel pattern to and from each city center. There is an extreme concentration of work and shop opportunities within those three centers which

further enhances the orientation of travel toward these districts. While the cities are separate, unique communities, they all exhibit similar characteristics in travel patterns and employment locations. The six districts shown on the following pages contain nearly 55 percent of the study area employment and 38 percent of the internal trip ends. In addition, almost 60 percent of the shopping opportunities are located in these districts.

Bridgeton

Figure 26 contains a graphic representation of all vehicle trips to and from the Central Business District (CBD). More than 15,000 vehicle trips are made in and out of the Bridgeton CBD daily. Nearly 49 percent of these trips are between the surrounding Bridgeton residential area and the CBD. The next largest interaction occurs between the CBD and the external stations immediately surrounding Bridgeton which account for 33 percent of the 15,000 trips. The strong self-containment of Bridgeton is apparent in that Millville and Vineland combined contribute only 8.4 percent of all trips in and out of the Bridgeton CBD.

Figure 27 shows the vehicle trips in and out of the commercial-industrial complex (District 2) immediately adjacent to the Bridgeton CBD. Again, it is apparent that the major interactions occur within Bridgeton, with more than 49 percent of the travel taking place between District 2 and the remainder of Bridgeton.

The impact of trips with one end outside the study area is again emphasized as these account for 39 percent of the 15,800 trips in and out of District 2.

It is especially significant when it is realized that N.J. 77 contributes more trips (4.7 percent) than either Millville (2.3 percent) or Vineland (4.6 percent).

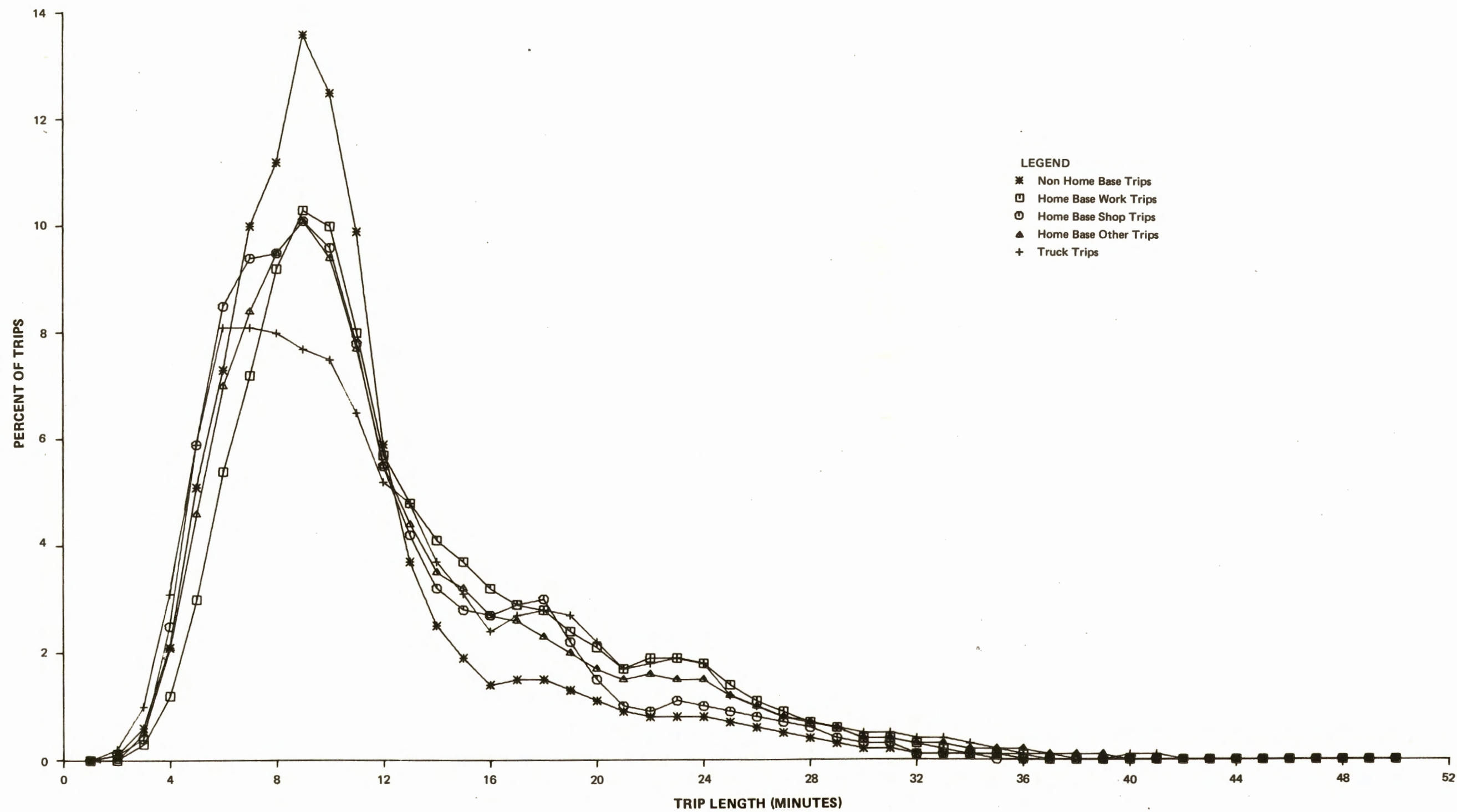


Figure 25
Trip Length Distributions Plot

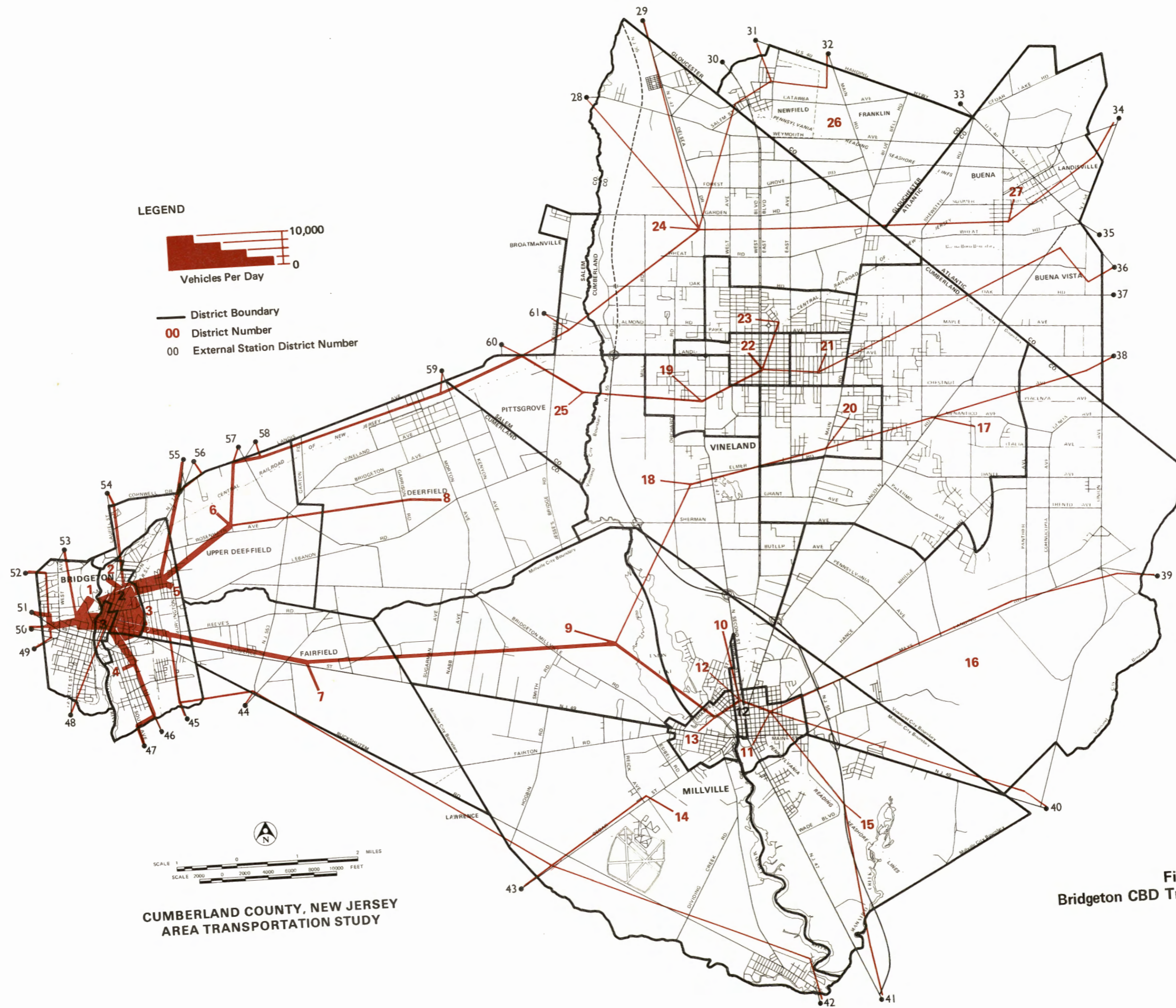


Figure 26
Bridgeton CBD Trips on Spider Network

CUMBERLAND COUNTY, NEW JERSEY
AREA TRANSPORTATION STUDY

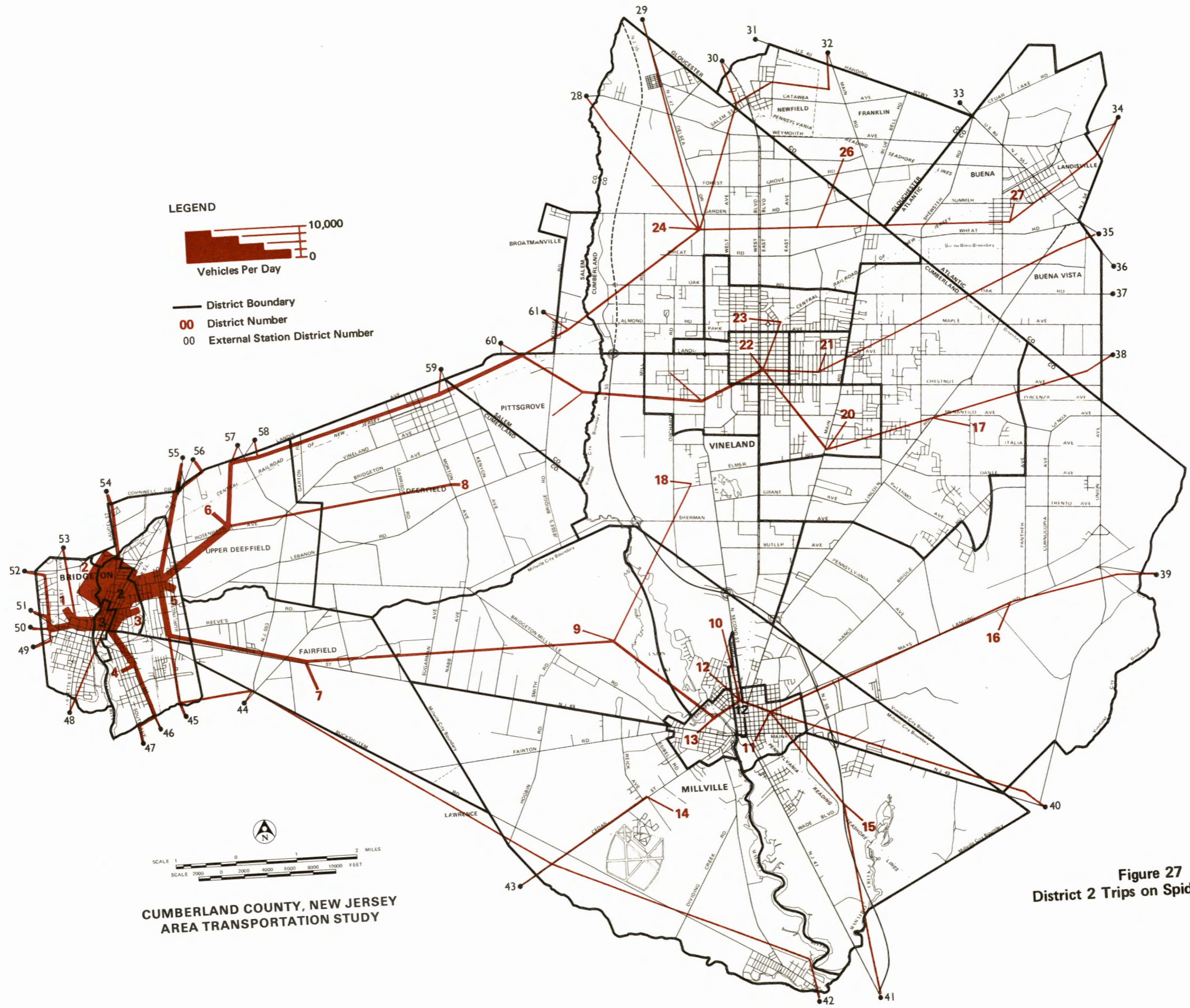


Figure 27
District 2 Trips on Spider Network

Millville

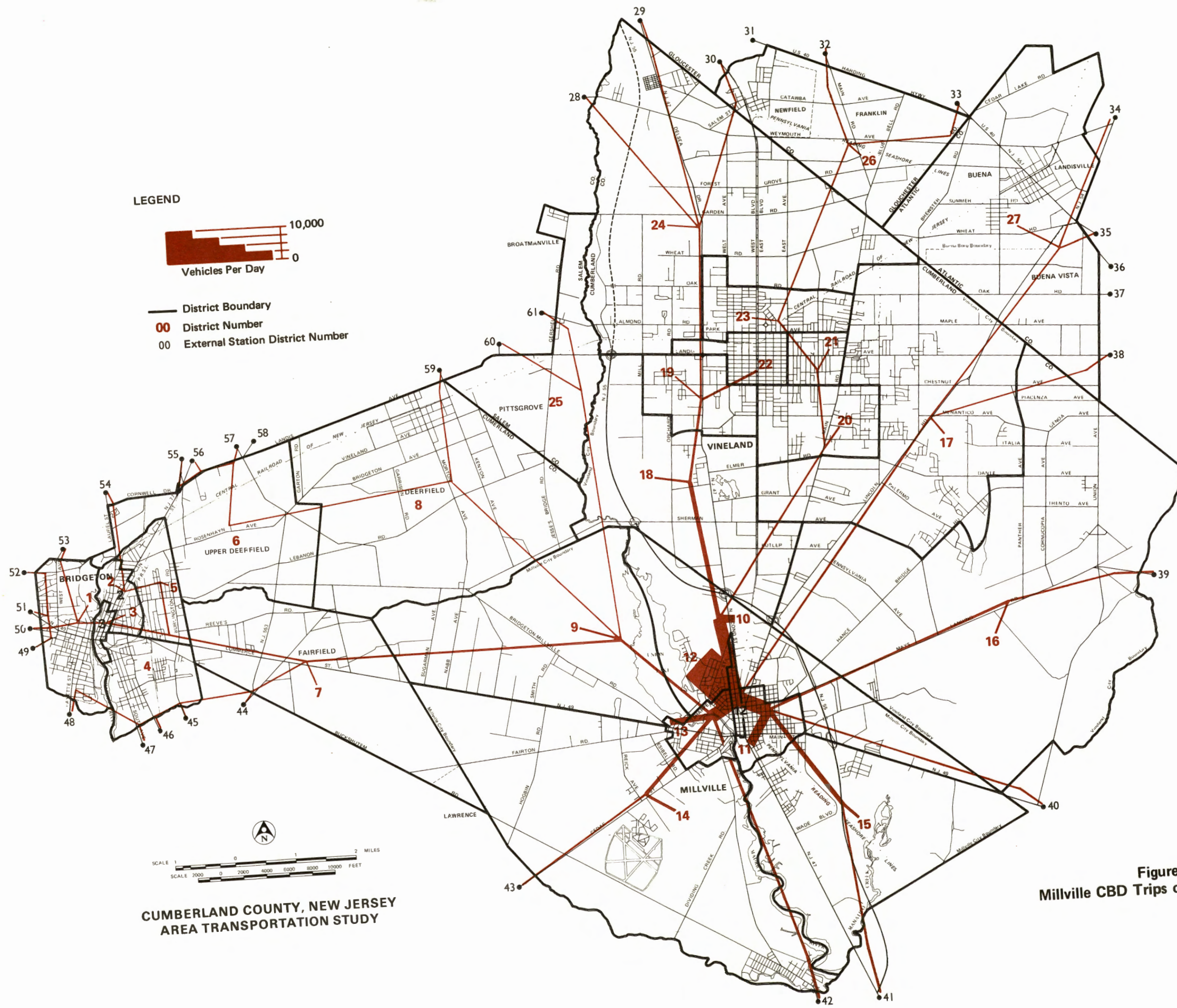
The daily vehicle trips in and out of the Millville CBD (District 12) are shown on Figure 28. Less than one percent of the approximately 12,000 daily vehicle trips in and out of the Millville CBD occur between the Bridgeton area and Millville. In addition, less than 12 percent of the interactions occur between the entire Vineland, Buena, Newfield areas and Millville CBD. Here again, the major interactions are between the surrounding residential districts, which account for 70 percent of the trips, and the CBD.

Figure 29 shows the daily vehicle trips between the Prudential-Wheaton complex (District 10) and all other districts. This area is of extreme importance because slightly over 13 percent of the entire study area employment is located here. Again, the strong self-containment is evident with nearly 55 percent of the trips occurring between District 10 and the remaining districts in Millville. The significance of the trips made by non-residents is emphasized by the fact that the external districts account for more trips (22.9 percent of District 10 trips) than Vineland (17.6 percent) and Bridgeton (3.0 percent) combined.

Vineland

Figure 30 shows the daily vehicle trips to and from the Vineland CBD. As expected, there are significantly more trips to and from Vineland's CBD, which contains 15.5 percent of the study area employment, than to the Bridgeton or Millville CBD's. Here again, however, the interactions are primarily between the CBD and its surrounding residential area which account for nearly 69 percent of the daily trips. Less than 2.2 percent of the more than 48,000 vehicle trips in Vineland are between Bridgeton and Vineland and less than 5.2 percent occur between Vineland and Millville.

The trips to and from District 23 are shown on Figure 31. Of the 37,259 shop trips made in the study area daily, 15.6 percent have the shop end of the trip located in this district. More than 70 percent of the 36,400 trips in and out of District 23 have both ends of the trip in the Vineland area. The lack of interaction between Bridgeton and District 23 is apparent, with less than 2 percent of the total trips occurring between these two areas. In fact, more trips occur between the external district at N.J.47 (4.1 percent) and District 23 than between Millville (3.6 percent) and District 23.



LEGEND

— District Boundary
 00 District Number
 00 External Station District Number



**CUMBERLAND COUNTY, NEW JERSEY
AREA TRANSPORTATION STUDY**

**Figure 28
Millville CBD Trips on Spider Network**

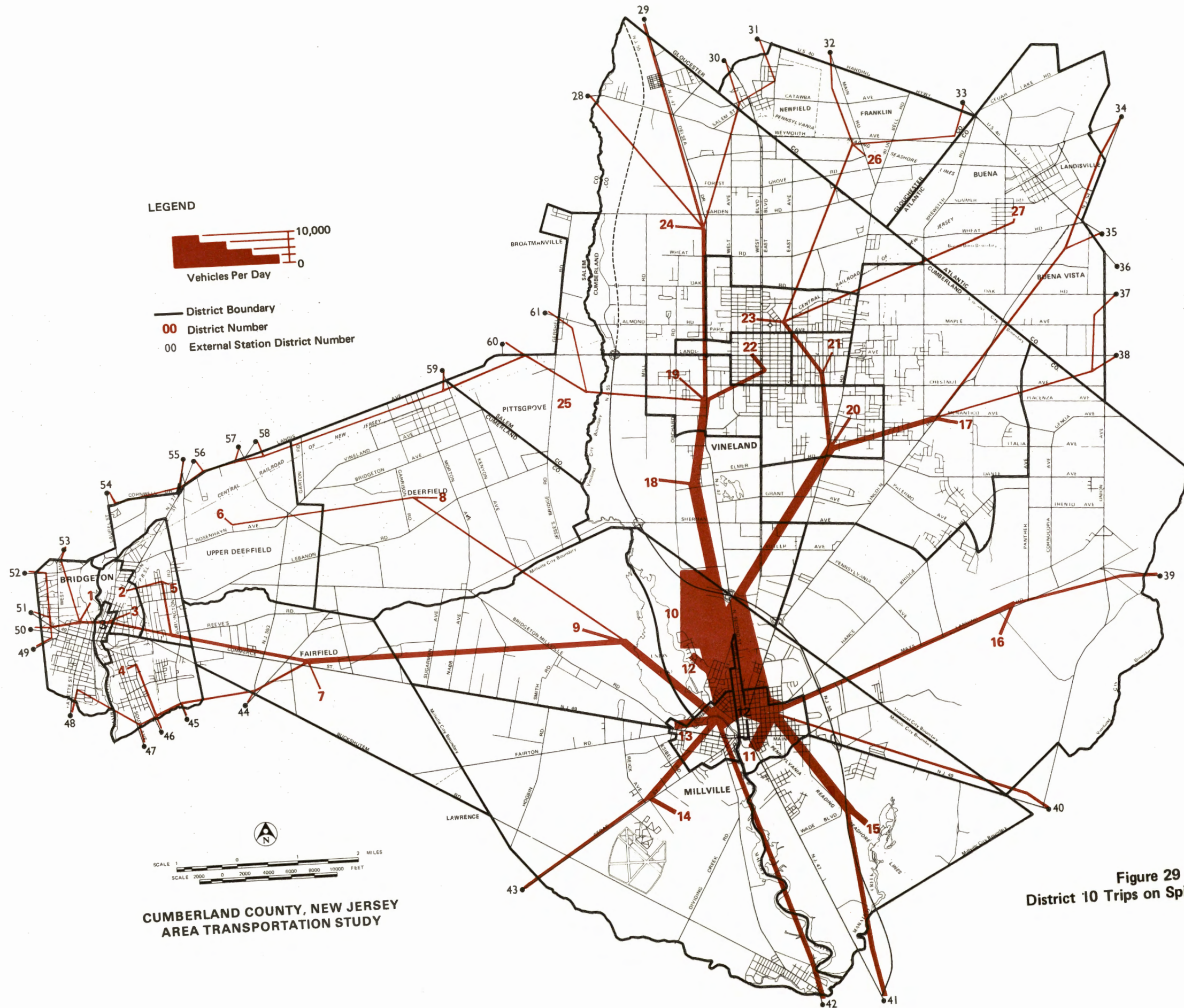


Figure 29
District 10 Trips on Spider Network

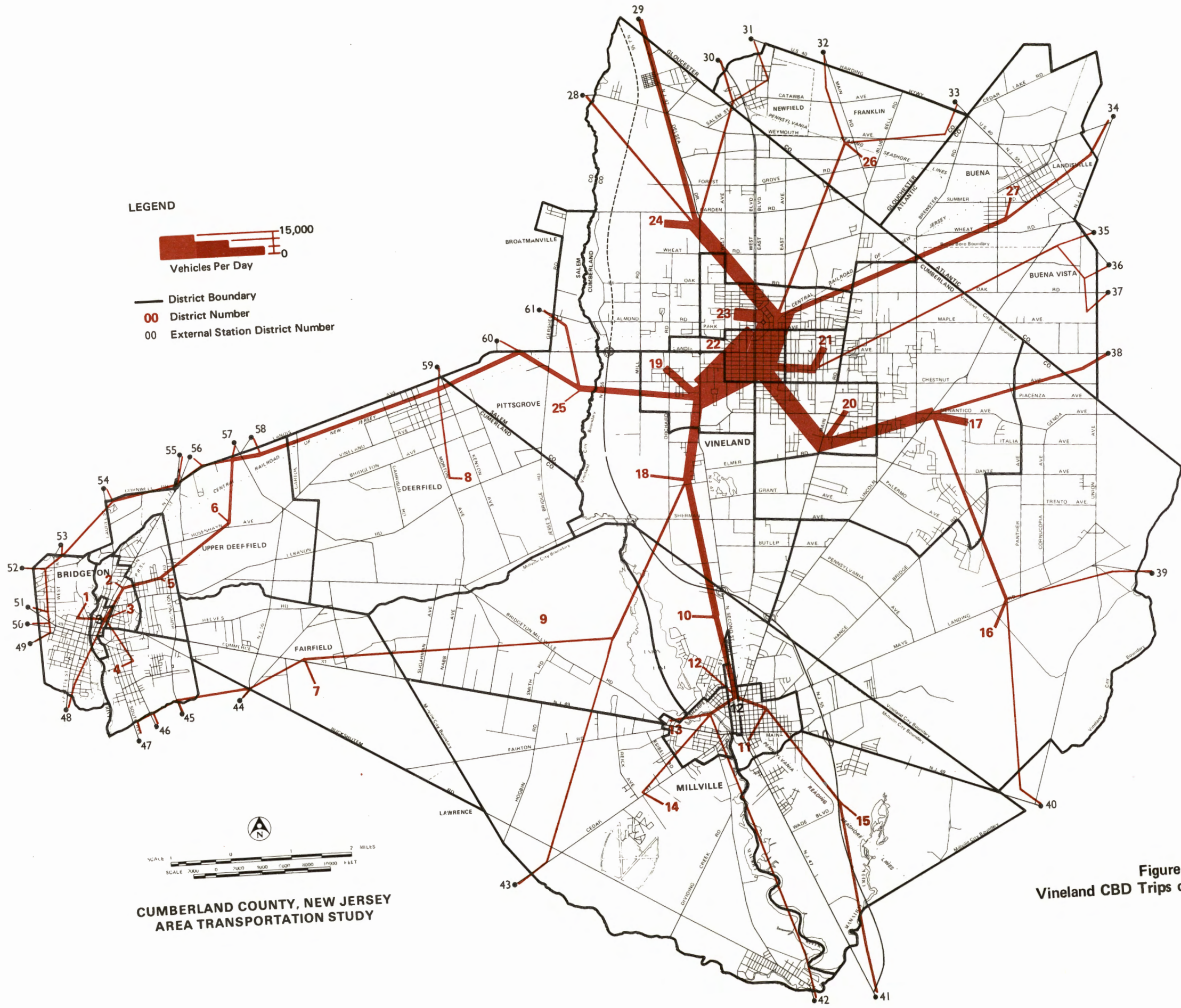


Figure 30
Vinland CBD Trips on Spider Network

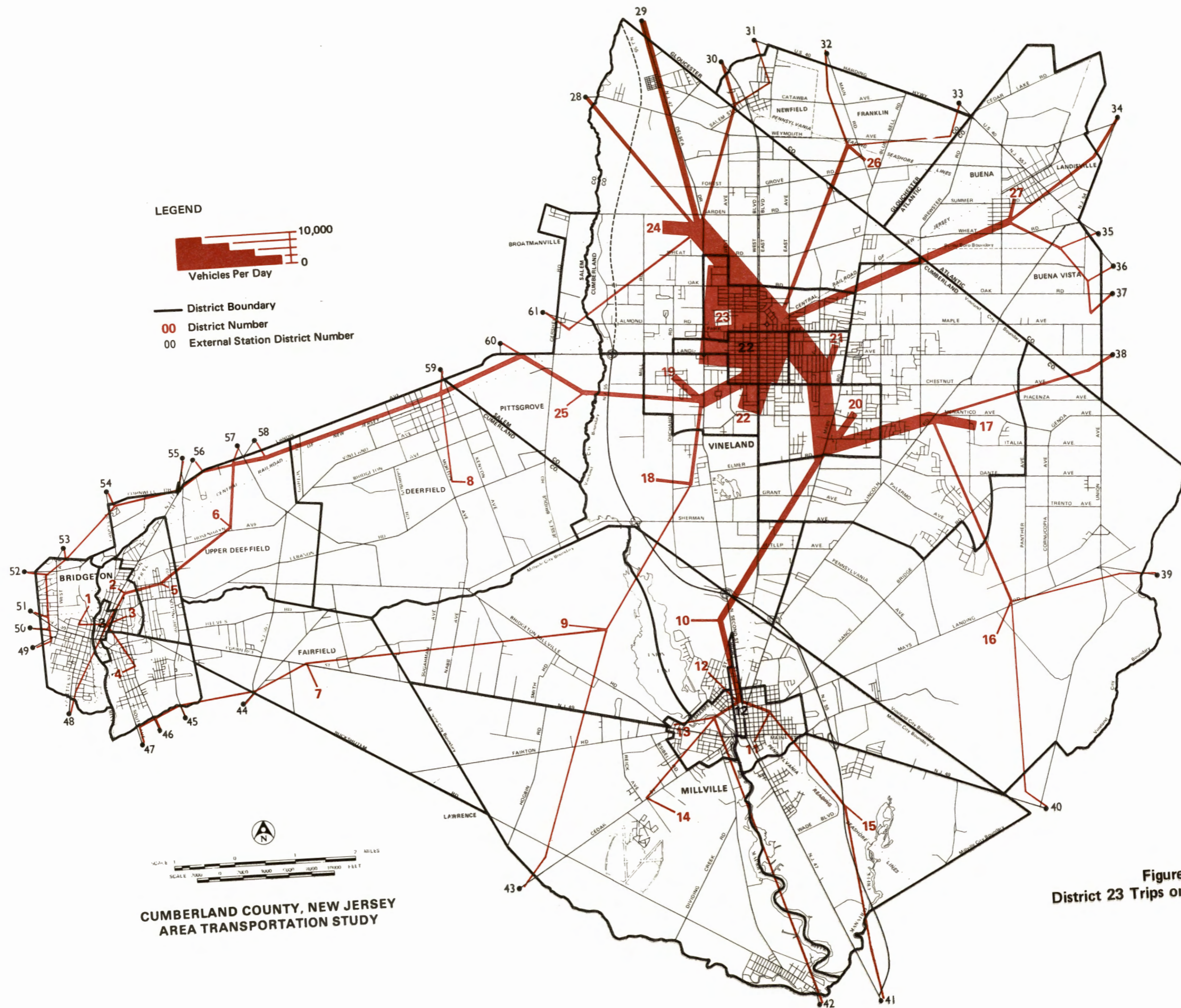
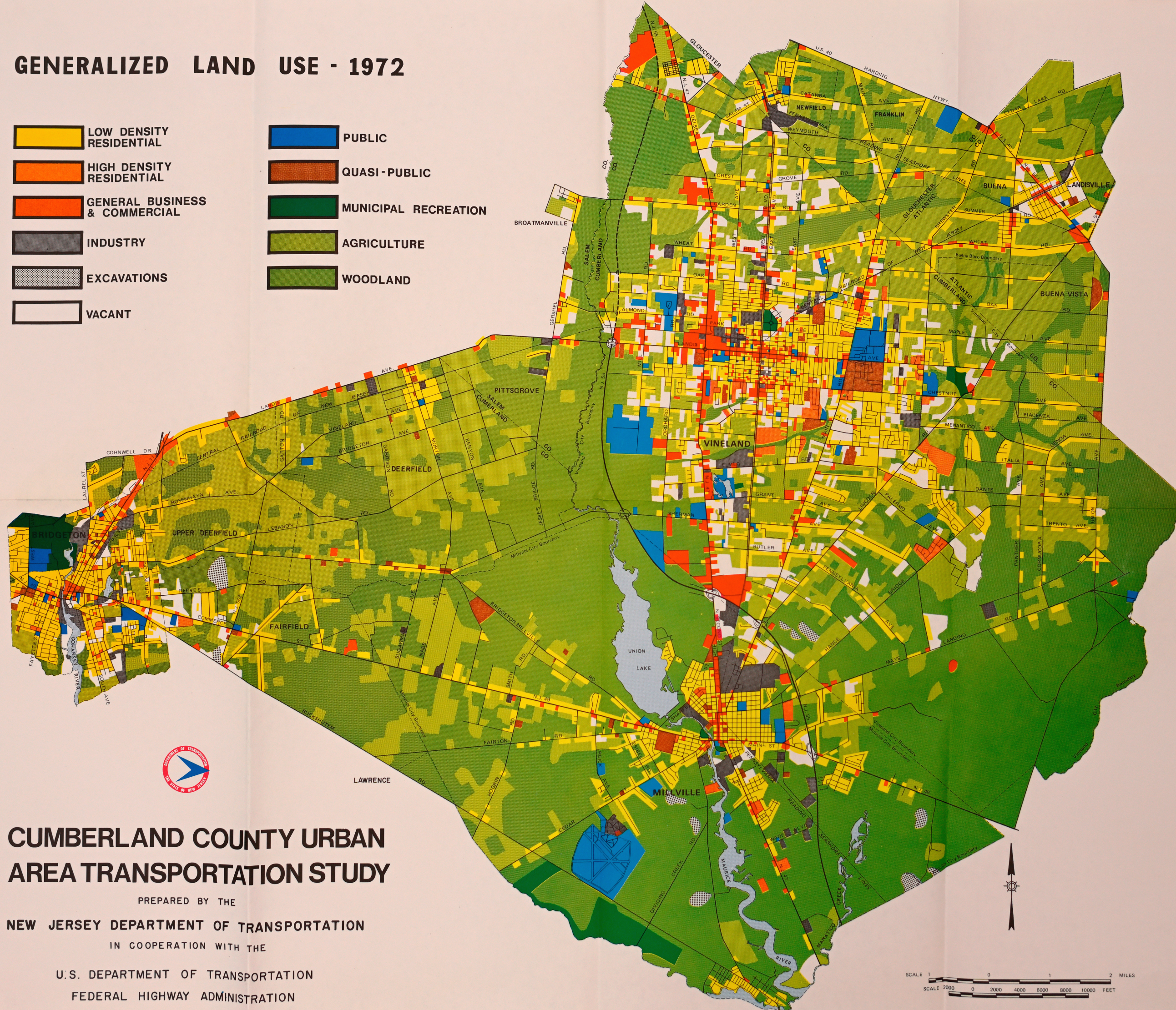
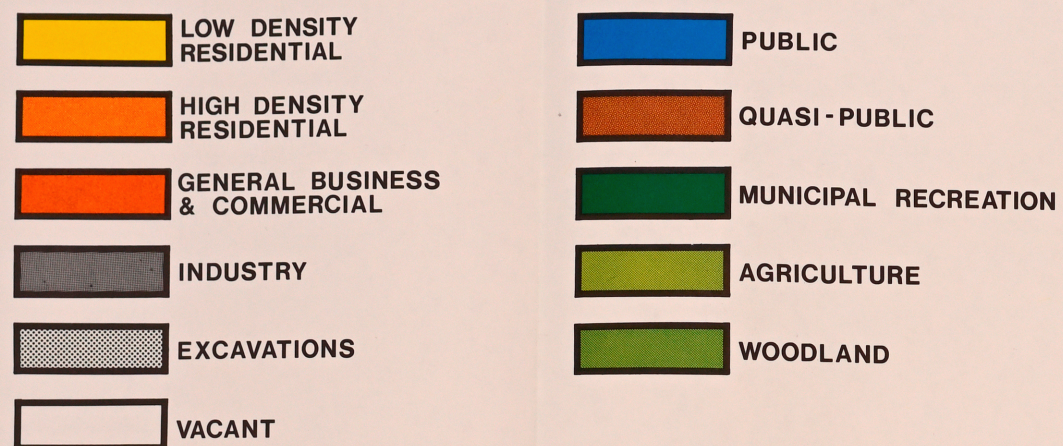


Figure 31
District 23 Trips on Spider Network



GENERALIZED LAND USE - 1972



CUMBERLAND COUNTY URBAN AREA TRANSPORTATION STUDY

PREPARED BY THE
NEW JERSEY DEPARTMENT OF TRANSPORTATION
 IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

