

METROPOLITAN DADE COUNTY
NOT FOR RELEASE
PLANNING DEPARTMENT

**COMMERCIAL
MODEL DEVELOPMENT FOR
TRANSPORTATION PLANNING**

MIAMI URBAN AREA TRANSPORTATION STUDY
METROPOLITAN DADE COUNTY, FLORIDA

1968

transportation

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COMMERCIAL MODEL DEVELOPMENT FOR TRANSPORTATION PLANNING

Prepared by

The Metropolitan Dade County Planning Department for the
Miami Urban Area Transportation Study
702 Justice Building
1351 N. W. 12 Street
Miami, Florida 33125

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TABLE OF CONTENTS

	Page
PREFACE	1
INTRODUCTION	2
BACKGROUND	4
MERCHANDISE	5
Shopping Goods	5
Convenience Goods	6
Other Goods	6
STRUCTURE AND FRAMEWORK	7
Central Business District	7
Business Districts	7
Regional Shopping Centers	7
Community Shopping Centers	8
Neighborhood Shopping Centers	8
METHODOLOGY	9
DEVELOPMENT	10
Inputs	10
Control Factor Development	12
Test and Adjust Control Factor	19
APPLICATION	22
Establish Criteria	23
Inputs	24
Apply Control Factor-Test and Adjust Results	30
FINDINGS	35
REGIONAL SHOPPING CENTERS	36
Objectives	36
Center-by-Center Summary	38
COMMUNITY SHOPPING CENTERS	52
BY-PRODUCTS	54

GLOSSARY	56
APPENDICES	58
BIBLIOGRAPHY	77

TABLES

	Page
TABLE 1 - Shopping and Convenience Goods Sales, Person Trips, Average Sale Per Trip, Regional Shopping Centers, 1963.	14
TABLE 2 - Square Feet, Regional Shopping Centers, 1963.	15
TABLE 3 - Sales Per Square Foot, Regional Shopping Centers, 1963.	16
TABLE 4 - Retail Sales, Regional Shopping Centers and Total Miami Urban Area, 1963.	20
TABLE 5 - Estimated Location and Size, Shopping Areas, 1985.	29
TABLE 6 - Estimated Gross Leasable Area, Effective Driving Time, Trade Area Radii, Shopping Areas, 1985.	32
TABLE 7 - Estimated Retail Sales, Gross Leasable Area, Sales Per Square foot, Shopping Areas, 1985.	33

FIGURES

FIGURE 1 - Miami Urban Area Transportation Study Area.	3
FIGURE 2 - Traffic Zones, Miami Urban Area Transportation Study.	11
FIGURE 3 - Sample Patronization, Trade Area, Northside Shopping Center, Illustrated for East-Northeast Sector.	17
FIGURE 4 - Patronization Distribution.	18
FIGURE 5 - Personal Income Per Acre, 1985.	25
FIGURE 6 - Change in Personal Income Per Acre, 1964 to 1985	26
FIGURE 7 - Estimated Regional Shopping Centers and Proposed Expressways, MUATS, 1985.	28

FIGURES (Cont'd.)

	Page
FIGURE 8 - Regional Shopping Center Size-Driving Time Ratio	31
FIGURE 9 - Cobweb Pattern of Retail Areas, 1985.	39
FIGURE 10 - Cobweb Pattern of Retail Centers, 1980, Chicago Urban area.	40
FIGURE 11 - Estimated Community Shopping Centers, 1985.	53

APPENDICES

APPENDIX 1 - MUATS Background Studies	38
APPENDIX 2 - Shopping Center Size-Driving Time Ratio, 1964.	59
APPENDIX 3 - Assigning Patronage Factors, 1964.	61
APPENDIX 4 - Allocation of Proportional Estimate of Income, 1964.	62
APPENDIX 5 - Developing Control Factor.	63
APPENDIX 6 - Testing and Adjusting Control Factor.	64
APPENDIX 7 - Shopping Center Size-Driving Time Ratio, 1985.	73
APPENDIX 8 - Deriving Radii for Trade Area Sectors, 1985.	75
APPENDIX 9 - Deriving Income for Trade Areas, 1985.	76

PREFACE

This is one of several background reports related to the inventory and projection of socio-economic characteristics within the context of the Miami Urban Area Transportation Study. MUATS is a joint effort of Metropolitan Dade County and the State of Florida in cooperation with the U.S. Department of Transportation's Bureau of Public Roads and the U.S. Department of Housing and Urban Development. Other reports(1) in the series provide forecasts of economic factors affecting development, population projections, and land use activities and projections which are based upon a survey conducted during the spring of 1964 on the origin and destination of travelers, quality of mass transit, and socio-economic characteristics related to such factors as population, employment, income, school enrollment and automobile registration. The metropolitan area was divided into 550 traffic zones and information was obtained for each. The background studies thus provide the basic data inputs for the preparation of the principal elements of the MUATS program, which include metropolitan master plans for streets and highways, terminal facilities, airports, waterports, and waterways, and mass transit.

The background series, therefore, presents the findings of major study phases as they relate to the planning of all elements of transportation facilities in the Miami area and serve to advise the MUATS Technical Advisory and Policy Committees and other concerned persons of the technical details of the analysis being conducted in the urban area transportation study by the MUATS organization and its consultants.

Commercial Model Development for Transportation Planning develops a technique and presents the result of the use of a mathematical model to project the potential for growth of regional shopping centers in the metropolitan area and identifies probable size, annual sales, and estimates geographic location. Location also is estimated for community centers, but not tested by the model to determine size and sales. The central business district, business districts and community centers are considered only in relation to the effect they may have on regional centers.

(1) See Appendix I for a list of reports in this series.

INTRODUCTION

This report uses the data collected by MUATS in 1964 to determine the location and characteristics of regional shopping centers to serve the 1985 population of the Miami urban area. A methodology is developed and findings are reported:

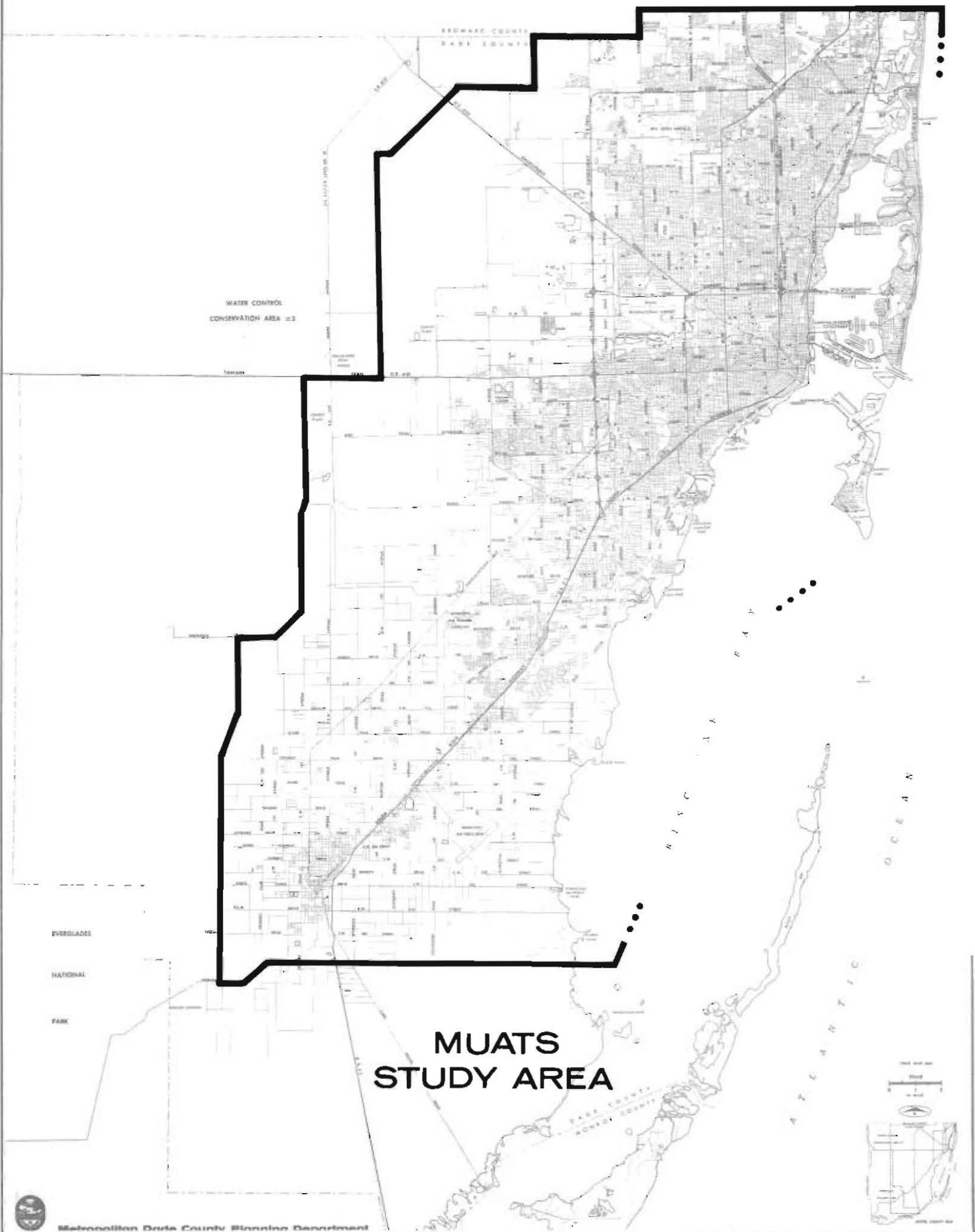
The maximum retail sales, optimum size, and sales per square foot of existing regional shopping centers are established for 1985. And the location, retail sales, size, and sales per square foot of new shopping centers are projected.

Both new and expanded centers are located where they will provide:

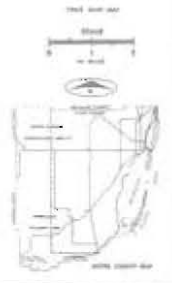
- (1) Sales stability
- (2) Economies of operation
- (3) Efficient service
- (4) Accessibility with a minimum of traffic congestion

Location and size of centers are estimated and sales potential developed through the use of a commercial model; that is, mathematical formulas utilizing data on the number of households and income distribution as well as highway accessibility.

Consideration also is given to the location of community shopping centers. The results of the model provide: an efficient system of regional and community shopping centers for 1985; data for revision of the General Land Use Master Plan; and revised data for future testing of the highway networks.



MUATS STUDY AREA



BACKGROUND

The Miami Urban Area is one of the fastest growing and youngest of the 75 major metropolitan areas over 300,000 in the United States. The population increased 82 percent between 1954 and 1964 to 1,093,600, and is expected to increase another 82 percent between 1964 and 1985 to 1,955,000 according to 1968 forecasts.

However, the commercial model findings are based upon earlier forecasts for 1985 of 2½ million because the study was completed before the revisions were made. Since the reduction is not reflected in the model, the forecast size, location, and sales potential of the retail centers, in some cases, likely will occur later than 1985.

A growing concern over appropriate concepts and policies of urban spatial organization is noticeable today in many Western countries. The additional image of an urban community with its tightly-knit articulated form and structure has been seriously eroded by the effect of ever-increasing mobility, communications and the widely-distributed benefits of rising productivity. The consequent desire for a new image of the metropolitan community and the mounting problems of metropolitanization have stimulated a wave of interest in recent years in the development of appropriate concepts and criteria for urban spatial organization. This movement has led to the formulation of metropolitan plans that envisage various goal-forms that will presumably enrich the economic, social, and aesthetic life of the urbanite.⁽¹⁾

This study concentrates on the regional shopping centers of the metropolitan community to determine location and potential; that is, the number of centers; the size of the centers in sales and square feet; and the size and distance of the trade area from which the patrons come.

The metropolitan area includes, not only Dade County, but the areas of South Broward County where shoppers live who patronize Dade County regional shopping centers.

(1) A Market Potential Model and Its Application to a Regional Planning Problem, by T. R. Lakshamanan and Walter G. Hansen, p. 1.

MERCHANDISE

The merchandise provided by the regional shopping centers is divided into three categories: shopping, convenience, and other goods. This report considers only shopping and convenience goods sales because "the other" category represents a negligible amount.

Shopping Goods

Shopping goods consist of goods consumers normally compare at different stores before buying, such as apparel or furniture.⁽¹⁾ Assumptions are made for the purpose of this model that at least 50% of the goods offered in 1985 at regional centers will be shopping goods. The groups are:

General Merchandise Groups

Department store and variety store

Apparel Groups

Men's and boys' wear
Women's ready-to-wear
Shoes
Family and other apparel

Furniture and Appliance Groups

Furniture and house furnishings
Household appliances

Auto Accessories

Jewelry

Books and Stationery

Gifts and Novelties

Cameras and Photographic Equipment

(1) Commercial Development, Regional Planning for the Future Commerce and the Revitalization of Business Districts in East Central Florida, by James G. Sheehan, p. 8.

Convenience Goods

Convenience goods consist of merchandise consumers desire to purchase with the least amount of effort at the nearest satisfactory establishment, such as groceries or drugs.⁽¹⁾ The groups are:

Food Groups

- Groceries
- Baking products
- Other foods

Drugs

Hardware

Liquor

Gasoline and Service

Eating and Drinking

Paint and Wallpaper

Florists

Services

- Shoe repairs
- Cleaning
- Laundry
- Barbers
- Beauty Salons

Other Goods

The other category includes specialty goods. This is a merchandise or service for which consumers will go out of the way to locate and purchase because of a special attraction or appeal. This includes such items as limited-issue fabrics and delicatessen foods⁽²⁾ and recreational activities.

(1) Commercial Development-Regional Planning for the Future Commerce and the Revitalization of Business Districts in East Central Florida, by James G. Sheehan, p. 8.

(2) Ibid. p. 9.

STRUCTURE AND FRAMEWORK

The commercial structure consists of a central business district, business districts, regional shopping centers, community shopping centers, neighborhood shopping centers, and strip commercial and other commercial establishments.

The commercial framework includes only the regional and community shopping centers around the central business district. This report concentrates on the regional shopping centers as part of an integral part of the inter-related spatial system of the commercial framework. The business district and community and neighborhood shopping centers are considered in relation to the effect they may have on the regional shopping centers. Some consideration is given to the location of new community shopping centers.

Central Business District

The central business district is the primary commercial concentration in an urban area. The U.S. Bureau of Census defines the central business district as an area of very high valuation; an area characterized by a high concentration of retail businesses, offices, theaters, hotels, and service businesses; and an area of high traffic flow.⁽¹⁾

Sales of the central business district have not kept pace with the growing population because of the movement of the population to the suburbs and the development of regional centers to serve this population.

Business Districts

This is a major concentration of commercial enterprises on a somewhat smaller scale than the central business district. The enterprises are developed within the district independent of each other in contrast to shopping centers which are established by one entity.

Regional Shopping Centers

The regional shopping center provides a variety and depth of shopping goods comparable to a central business district. General merchandise apparel and home furnishings as well as a variety of services are offered. At least one major department

(1) 1963 Census of Business, Major Retail Centers, Miami, Florida, SMSA, p. 11.

store with a minimum of 100,000 square feet is the principal tenant. Sometimes there are recreational facilities. The center usually occupies a minimum of 30 acres. For this report, a regional center must have annual retail sales (assuming there is no wholesale trade) of a minimum of around \$10 million.

Community Shopping Centers

The community center provides, in addition to convenience goods, a wider range of facilities for the sale of shopping goods such as apparel and furniture, and may include banking, professional services and recreational facilities. A junior department store or variety store is the principal tenant. This type of center is usually located on 10 to 30 acres.

Neighborhood Shopping Centers

The neighborhood center provides for the sale of daily living needs; that is, convenience goods such as foods, drugs, hardware, and personal services. A supermarket is the principal tenant. This type of center is usually located on 4 to 10 acres.

METHODOLOGY

The technique developed to determine the distribution and characteristics of 1985 regional shopping centers assumes that the sales potential of a shopping center can be determined by how close the people live, how much income they have, the size of the center, and the distance from competing facilities.

Specific data projected for 1985 regional shopping centers are: location, retail sales, size, and sales per square foot.

There are six steps in developing and applying the mathematical model to determine the characteristics and efficient distribution of future regional shopping centers. They are:

Development

- (1) Assemble basic inputs: a Link-Node base map of the 1964 street and highway network describing capacity, speed, and driving time; and a distribution of 1964 median income and number of households.
- (2) Develop a control factor.
- (3) Test and adjust the control factor.

Application

- (4) Establish criteria to test or evaluate results.
- (5) Forecast the basic inputs: a 1985 Link-Node map of the street and highway network describing speed, capacity, and driving time; a distribution of median income and number of households; estimates of location and size of regional shopping centers, location of community shopping centers, and trade area size and income.
- (6) Apply control factor, test and adjust results.

DEVELOPMENT

The development of the model requires two basic inputs: A Link-Node base map of the streets and highways network and a distribution of the median income and number of households in the Miami Urban Area. This information was used to develop a control factor for a basic formula to estimate the retail sales of the regional shopping centers. Results were tested and the factor adjusted until the variance between estimated and actual sales was reduced to 8.4 percent.

Inputs

Link-Node Streets and Highway Network: A Link-Node base map used by MUATS was obtained for the first of the two inputs for the development of the model. The map mathematically described the streets and highways system of the Miami Urban Area in 1964 so that mechanical equipment and electronic computers could analyze the system for other transportation planning purposes.

Streets were defined in terms of distance, average travel speed, and average 1964 winter season daily traffic. The Miami Urban Area was divided into 550 traffic zones (See Figure 2.) and it was assumed that all trips generated by a zone originated from a single point known as a centroid.

The centroid of each zone was marked by a heavy dot or node and numbered. Principal streets served as links and were identified by a solid line. Local streets, not included on the principal street map, were identified as hypothetical connections with dashed lines on a traffic assignment network map. The dashed lines connected the zone centroids to adjacent street links. Each centroid had no more than four connections to the system.

Small dots, also called nodes, were placed at each intersection in the system, including junctions of system links and centroid connections. Links were defined in terms of distance, speed, and traffic volume.

Median Income and Resident Households: These inputs were developed by traffic zones as part of other MUATS reports. The zones were used for the collection of data during the origin and destination study in the spring of 1964.

The median income and number of households were evenly distributed in each zone except when land use plans indicated a specific population distribution and tables were prepared. A copy

Figure 2

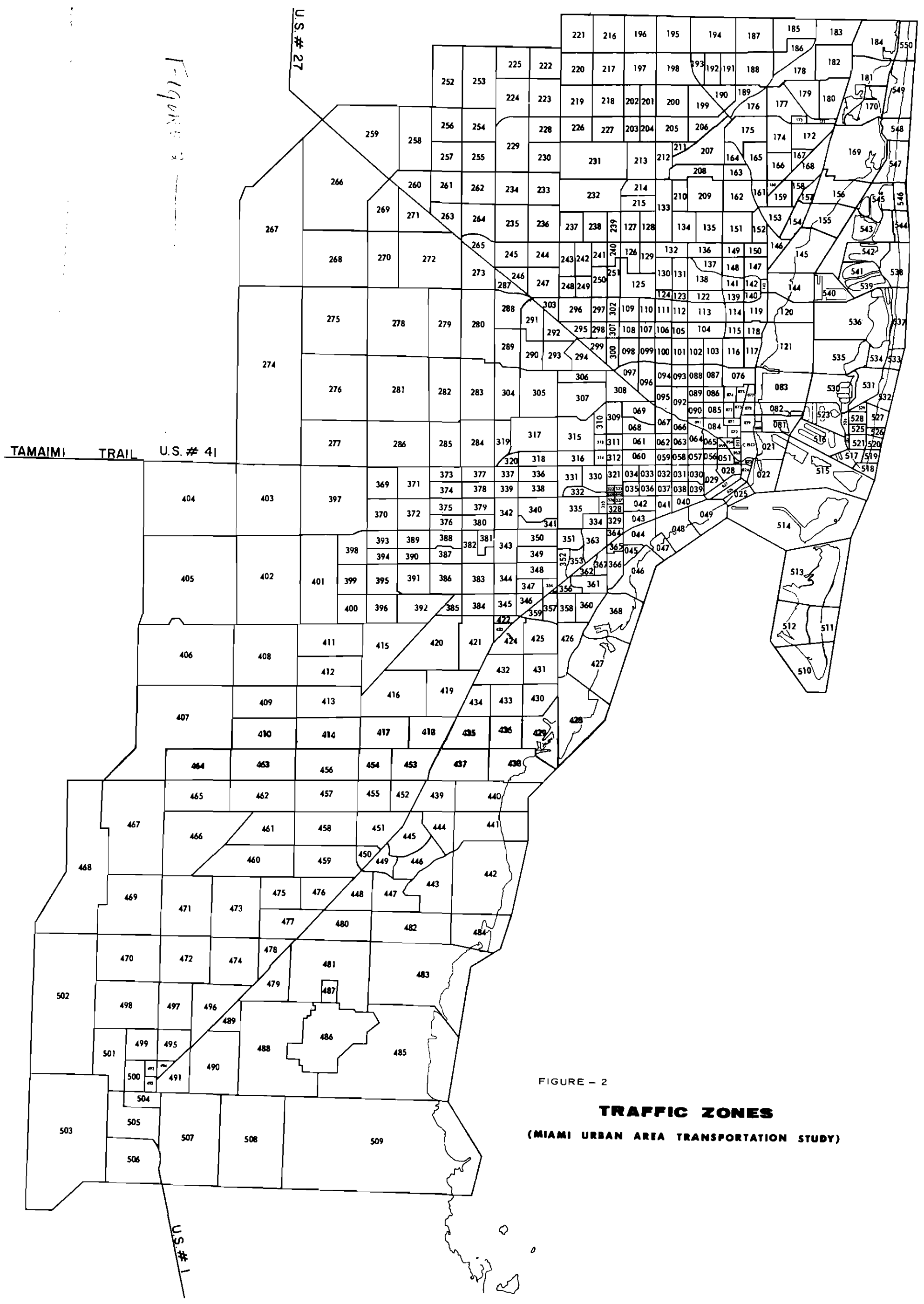


FIGURE - 2

TRAFFIC ZONES
(MIAMI URBAN AREA TRANSPORTATION STUDY)

of the tables became the second basic input for the development of the model.

The Broward County Area Planning Board provided data on median income and the number of households for South Broward residents shopping at the Miami Urban Area regional shopping centers. Information was derived from Population, Dwelling Units, Income, Employment by traffic zone prepared in October 1963 as part of the county's transportation study.

Control Factor Development

The development of a control factor for a basic consumption formula was the next step in the process of approximating the retail sales for each regional shopping center.

The basic formula states that consumption equals disposable income times the marginal propensity, or amount spent at regional shopping centers.

The median income of each traffic zone was multiplied by the number of resident households in each traffic zone to obtain a proportional estimate of income for each zone. Assumptions were made that, when the income increases, the tax factor increases; but at the same rate as income spent at regional shopping centers decreases. A table was prepared listing the proportional estimate of income by traffic zone.

Eight existing regional shopping centers were located using the 1963 Census of Business Major Retail Centers, Miami, Florida SMSA⁽¹⁾ as a guide. (See Figure 8.) Centers with approximately \$10 million or more of annual retail sales were selected as existing regional shopping centers. They were:

Biscayne Plaza
163rd Street Shopping Center
Central Shopping Plaza
Dadeland Mall
Cutler Ridge Shopping Center
Westchester Shopping Center
Palm Springs Mile
Northside Shopping Center

An estimation was made of the trade area of each center; that is, the section surrounding a shopping center from which the

(1) Published by Bureau of Census, U.S. Department of Commerce

center draws patrons.

The sales and parking space, person trips for shopping and convenience goods, location of each center, and major thoroughfares were analyzed using the copy of the Link-Node base street and highway network, the MUATS Existing Land Use Study, 1964, Mel Conner & Associates, Inc., Dade County Productions and Attractions Abbreviated Listing, Gravity Model Run, Home Based Person Trips for Shopping and Convenience Goods, and, the General Land Use Master Plan. (See Tables 1, 2, and 3.)

In addition, a general knowledge of the area provided background regarding road patterns, degree of accessibility, and comfort in driving.

A tentative trade area was established as a circle around each regional shopping center. (See Appendix 2.) Each trade area was divided into eight pie-shaped sectors radiating from each shopping center called: NNE, ENE, ESE, SSE, SSW, WSW, WNW, and NNW.

The radii or length of the sectors was determined by estimating the driving time to the shopping center and using the size of the shopping center. Food stores were excluded when the size of the centers was determined. The distance each sector extended from the center varied according to accessibility measured in driving time. (See Figure 3.) The effective driving time for each center was the average effective driving time for the eight sectors of the trade area.

The assumption was made that the regional shopping center size-driving time ratio could be approximated by a straight line and measured in miles. Assumptions also were made that the total trade area had a homogeneous population, income, food patterns, and business competition.

The total radii of each center trade area was divided into nine concentric circles with each shopping center in the center of the circle. (See Figure 4.)

Each ring of the circle was assigned a patronage factor representing the personal preference to shop at a retail center. The factor decreased at an increasing rate as the distance from the shopping center increased. Thus, the nine concentric circles were wide near the center and narrow at the outer edges.

A patronage factor (degree of customer patronization) was assigned to each traffic zone, sometimes with one zone contain-

Table 1 - SHOPPING AND CONVENIENCE GOODS, SALES, PERSON TRIPS, AVERAGE SALE PER TRIP,
REGIONAL SHOPPING CENTERS, 1963

Regional Shopping Centers	Shopping Goods Sales	Convenience & Shopping Goods Sales	Person Trips for Shopping and Convenience Goods Per Year*	Average Sale Per Person Trip	Percent of Shopping Goods Sales to Total Convenience & Shopping Goods Sales
	(Thousands)				
163rd Street Shopping Center	\$28,879	\$35,632	8,000	\$4.45	81.0%
Northside Shopping Center	24,086	27,802	3,920	7.09	86.6
Dadeland Shopping Center	14,993	17,252	3,170	5.44	86.9
Biscayne Plaza	5,039	9,471	1,410	6.72	53.2
Central Plaza	8,609	11,739	2,770	4.24	73.3
Cutler Ridge Shopping Center	6,487	10,567	2,820	3.75	61.4
Palm Springs Mile	10,449	16,000	5,121	3.12	65.3
Westchester Shopping Center	4,913	11,082	2,330	4.76	44.3

* Mel Conner & Associates, Inc. Dade County Productions and Attractions, Home based person trips for shopping and convenience goods.

Table 2 - SQUARE FEET, REGIONAL SHOPPING CENTERS, 1963

Regional Shopping Centers	Parking Space	Department Stores	Food Stores	Other Stores	Total Gross Leasable Area Available	Department and Other Stores
			(Square Feet)			
Biscayne Plaza	900,000	63,200	18,600	218,200	300,000	281,400
163rd Street Shopping Center	1,700,000	303,020	24,594	317,386	645,000	620,406
Central Plaza	730,000	178,000	20,000	132,000	330,000	310,000
Dadeland Mall	1,677,000	N/A (1)	30,000 (2)	N/A (1)	373,000	343,000
Cutler Ridge Shopping Center	755,000	116,900	22,000	104,200	243,100	221,000
Westchester Shopping Center	801,200	N/A (1)	50,000 (2)	N/A (1)	306,500	256,500
Palm Springs Mile	1,505,100	328,000	99,500	124,375	551,875	452,375
Northside Shopping Center	1,200,000	262,250	29,100	173,660	485,000	455,900

(1) Not available

(2) Estimated

Table 3 - SALES PER SQUARE FOOT, REGIONAL SHOPPING CENTERS, 1963

Regional Shopping Centers	Shopping and Convenience Goods Sales (Thousands)	Available Square Feet Gross Leasable Area (Thousands)	Sales Per Square Foot
Biscayne Plaza	\$ 9,471	300	\$ 31.57
163rd Street Shopping Center	35,632	645	55.24
Central Plaza	11,739	330	35.57
Dadeland Mall	17,252	373	46.25
Cutler Ridge Shopping Center	10,567	243	43.49
Westchester Shopping Center	11,082	306	36.22
Palm Springs Mile	16,000	552	28.99*
Northside Shopping Center	27,082	485	57.32
		Average Dollars Per Square Foot	\$ <u>43.67</u>
		Range Dollars Per Square Foot	57.32 \$ <u>31.57</u>
		% Difference in Range	<u>81.6%</u>

* The 1963 Census of Business measures from 4th Avenue to 8th Avenue and the GLA is measured between 4th Avenue and 12th Avenue for Palm Springs Mile.

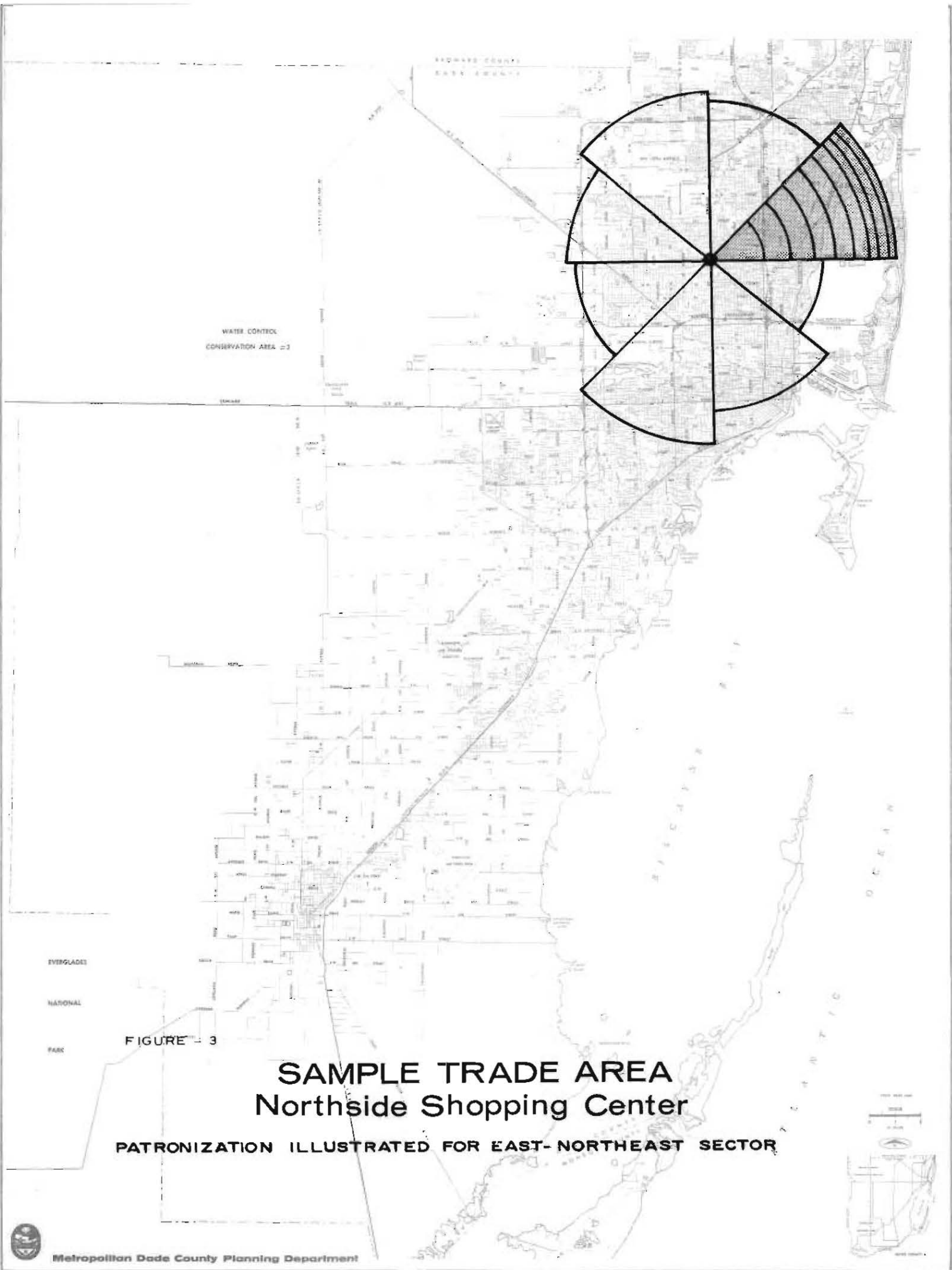


FIGURE - 3

SAMPLE TRADE AREA Northside Shopping Center

PATRONIZATION ILLUSTRATED FOR EAST-NORTHEAST SECTOR

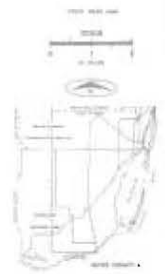
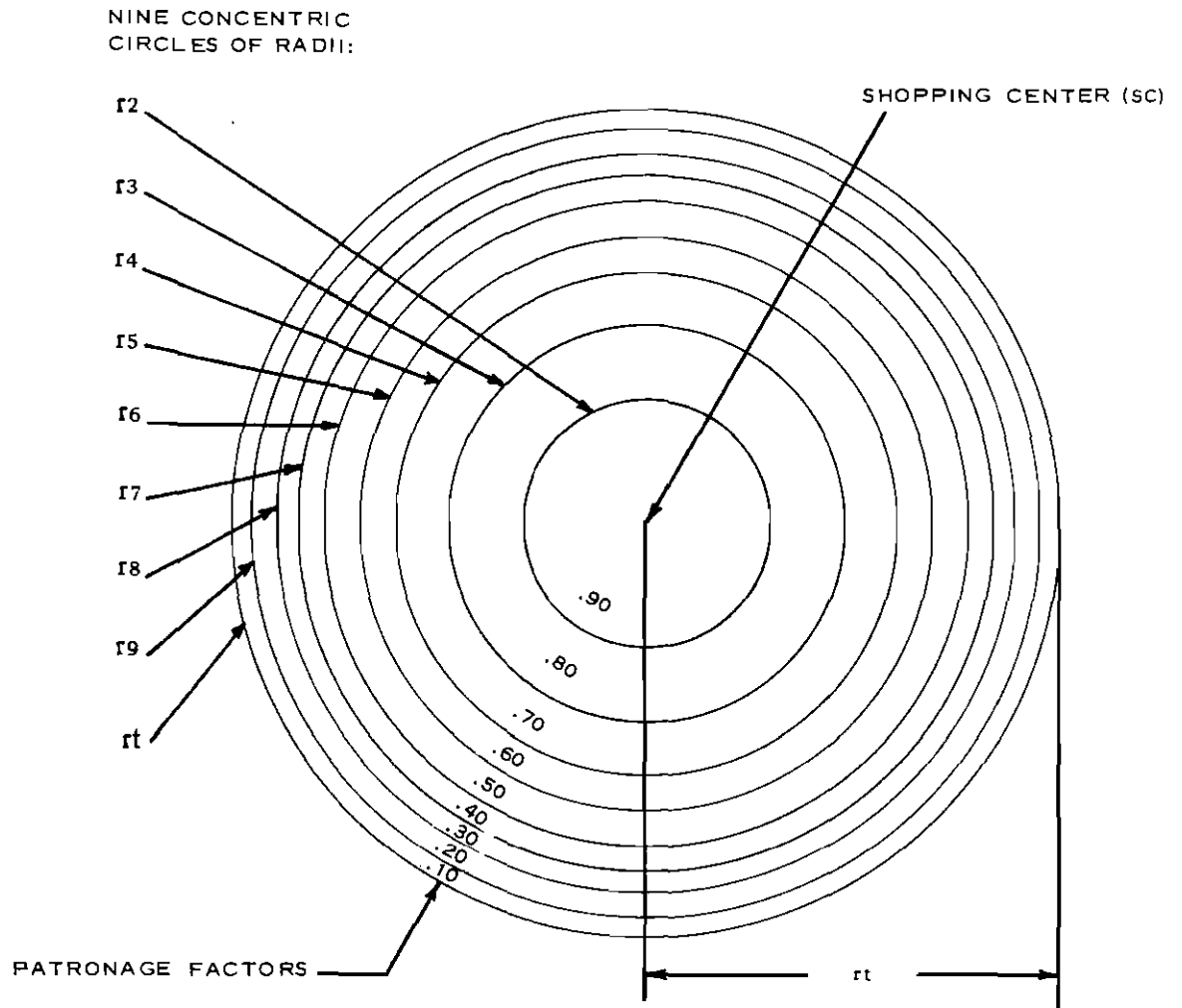


FIGURE - 4 PATRONIZATION DISTRIBUTION



ing factors for more than one center. (See Appendix 3.) When this occurred the factors were proportionately allocated to each center, reflecting shopping at more than one center.

A table was prepared multiplying the patronage factor in each zone by the proportional estimate of income. Next, patronization assigned to each center was totaled to obtain the proportional estimate of income. (See Appendix 4.)

Retail sales figures were obtained for use in the model from the 1963 Census of Business, Major Retail Centers, Miami, Florida SMSA published by the Bureau of Census, U.S. Department of Commerce. The 1963 data was used in the model instead of forecasting 1964 data.

Total retail sales for shopping and convenience goods in the Miami Urban Area totaled \$1,005,161,000. (See Table 4.) This was divided by the 1964 proportional estimate of income for the Miami Urban Area, or \$1,928,152,000 to obtain 52.130 percent as the proportional estimate of income spent on shopping and convenience goods in the Miami Urban Area.

The total 1963 retail sales of convenience and shopping goods for regional centers was \$139,545,000. (See Table 4.) This was divided by \$881,629,000, the estimated allocation of proportional income for the Miami Urban Area to obtain 15.828% as the percent of shopping and convenience goods purchased at regional centers.

The 52.130% was multiplied by 15.828% to arrive at the tentative control factor of 8.251%. (See Appendix 5.)

Test and Adjust Control Factor

Four tests were made to adjust the control factor so that the estimated sales would correlate to a high degree with the actual sales.

First Test: The first test determined the acceptability of retail sales, sales and parking space, and person trips for shopping and convenience goods.

The control factor was multiplied by the total allocation of the proportional estimate of income for each center to estimate the retail sales for shopping and convenience goods. The result was a 27.2% variance from actual sales.

Table 4 - RETAIL SALES, REGIONAL SHOPPING CENTERS AND TOTAL MIAMI URBAN AREA, 1963

Regional Shopping Centers	Convenience Goods	Shopping Goods (Thousands)	All Other Goods	Shopping and Convenience Goods	Total All Goods
163rd Street Shopping Center	\$ 6,753	\$ 28,879	\$ 2,134	\$ 35,632	\$ 37,766
Northside Shopping Center	3,716	24,086	732	27,802	28,534
Dadeland Mall	2,259	14,993	1,199	17,252	18,451
Biscayne Plaza	4,432	5,039	709	9,471	10,180
Central Plaza	3,130*	8,609	1,000*	11,739	12,739
Cutler Ridge Shopping Center	4,080	6,487	1,543	10,567	12,110
Palm Springs Mile	5,551	10,449	1,116	16,000	17,116
Westchester Shopping Center	6,169	4,913	1,391	11,082	12,473
Total	36,090	103,455	9,824	139,545	149,369
Total Miami Urban Area	599,078	406,083	578,457	1,005,161	1,583,618
Total Shopping Centers as Percent of Miami Urban Area	6.02%	25.48%	(Percent) 1.70%	13.88%	9.43%

* Estimated

Source: 1963 Census of Business, Major Retail Centers, Miami, Florida SMSA, Bureau of Commerce, U. S. Department of Commerce.

Second and Third Tests: These tests established a relationship between the street and highway network and the radii of the trade area. Adjustments had to be made to the shopping center size-driving time ratio. The driving time was originally estimated by using the Link-Node base street and highway network map, assuming the distance to be a straight line between two locations (direct distance). The ratio must be adjusted by a friction factor; that is, the travel restriction measured in minutes per mile which results from average driving time at a given distance. The formula is:
$$\frac{\text{Driving Time}}{\text{Direct Distance}} = \text{Friction Factor}$$

Then, the friction factor was multiplied by the total trade area radius to yield the effective driving time for the sector. The effective driving time for the center was the average effective driving time for the eight sectors.

The radii also were originally estimated by assuming that there was an homogeneous population, income, food patterns, and business competition. Adjustments had to be made to meet the requirements of the heterogeneous complexion of the Miami Urban Area. Each sector of the trade area was factored separately increasing patronization factors for sectors where there was no competition from other centers and decreasing factors when natural or man-made barriers such as water, railroads or expressways prohibited direct movement. Factors also were lowered if the Central Business District or Lincoln Road Mall or Miracle Mile business districts were in the area. Consideration also was given to community shopping center locations.

The second test adjusted the four northern most shopping centers in the Miami Urban Area to establish a higher correlation between actual and estimated retail sales. The third test adjusted the radii of the southernmost centers to establish a higher correlation.

The final radii and effective driving time was established as:

<u>Regional Shopping Centers</u>	<u>Radii (miles)</u>	<u>Effective Driving Time (minutes)</u>
Biscayne Plaza	4.0	13.4
163 Street Shopping Center	7.5	20.5
Central Plaza	3.25	12.6
Cutler Ridge Shopping Center	7.5	14.9
Dadeland Mall	6.0	14.2

<u>Regional Shopping Centers</u>	<u>Radii (miles)</u>	<u>Effective Driving Time (minutes)</u>
Westchester Shopping Center	5.0	12.6
Palm Springs Mile	7.0	16.1
Northside Shopping Center	6.5	17.5

Fourth Test: The last test projected trade radii, reduced trade areas, and adjusted patronage factors with the final control factor of 9.707%. This resulted in an 8.4% variance compared with a 27.2% variance in the first test.

The control factor was applied to the allocation of the proportional estimate of income by shopping centers to approximate the actual sales of the centers. (See Appendix 6.)

<u>Regional Shopping Centers</u>	SI_a^{scn} Allocation of Propor. Income to Shop. Ctrs.	R_a^{scn} Allocation of Income After Factoring By 8.251%	<u>Variance from Actual Sales</u>
Central Plaza	\$126,103.8	\$12,240.9	+ 4.3%
Westchester Shopping Ctr.	112,917.5	10,960.9	- 1.1%
Dadeland Mall	200,637.3	19,475.9	+12.9%
Cutler Ridge Shop. Ctr.	80,327.5	7,797.4	-26.2%
163rd Street Shop. Ctr.	336,048.3	32,620.2	- 8.5%
Palm Springs Mile	177,982.4	17,276.8	+ 8.0%
Northside Shopping Ctr.	288,177.5	27,972.9	+ 0.6%
Biscayne Plaza	103,519.4	10,048.6	+ 6.1%

APPLICATION

Since the model simulated the regional shopping center trade areas and determined actual retail sales within an 8.4% variance, assumptions were made that the model could take 1985 inputs and approximate the 1985 sales of regional shopping centers.

Criteria were established to test the results to insure sales stability, economies of operation, adequate service, and accessibility to the shopping centers.

The 1985 street and highway network and the 1985 distribution of income and number of households were developed as inputs. Estimates were made for the location and size of shopping centers, and the size and income of trade areas.

The control factor developed with 1964 data was applied and the results tested against the established criteria. No adjustments were necessary.

Establish Criteria

Economic criteria was established to judge the results of the model; that is, to determine whether the location and size of the regional shopping centers projected for 1985 would meet the needs of the population.

Four criteria were established to check the validity of the model regarding the objectives of sales stability, economies of operation, efficient service, and accessibility.

Stability: To provide economic sales stability to the commercial structure, average sales per square foot should increase yearly between 1964 and 1985, slightly greater than the yearly increase in personal income. This is based upon the fact that real wages are likely to increase because both figures are in 1964 dollars, there will be higher densities surrounding the inner rings of the cobweb pattern creating increased sales per square foot,⁽¹⁾ and there will be larger centers creating higher sales per square foot.

Economy: To provide economies of operation to the centers and prosperity for the urban areas, the range of minimum and maximum sales per square foot should remain relatively constant for 1964 and 1985.

Service: To insure adequate service to the urban area, the percent increase in total gross leasable area should be the same as the percent increase in the number of households between 1964 and 1985. This assumes a constant requirement of sales per household.

Accessibility: For convenient accessibility, regional shopping centers usually are located at four mile intervals from the CBD producing a cobweb pattern of the commercial structure radiating from the CBD. The pattern developed by the Northeastern

(1) "Changing population distributions and densities and locational changes among different socio-economic groups will continue to call forth two kinds of retail redistribution, namely, reduction in capacity in the central city with consequent blighting of older properties through persistent vacancy, and increases in capacity in growing suburbia," Northeastern Illinois Planning Commission, 1965, p. 91.

Illinois Transportation Study is typical of metropolitan areas bounded by water on one side.

Inputs

Link-Node Street and Highway Network: A copy of the 1985 Link-Node base street and highway network prepared for other MUATS reports was obtained as a basic input to determine accessibility of the centers. Distance, average travel, and average winter season daily volume have been forecast as part of the development of Link-Node #3. (See Figure 5.)

Households and Median Income: A forecast of the distribution of the number of households and median income also was obtained. This had been prepared by traffic zone by the Metropolitan Dade County Planning Department for other MUATS reports to obtain the number of households. The population forecast for each traffic zone was divided by 1.2 to 4.3 depending upon the average number of people projected per household in the zone.

Personal Income Per Acre - 1985, reflected dollars of income related to an acre base by traffic zone. Areas of high and low concentrations of purchasing power were readily visible. (See Figure 5.)

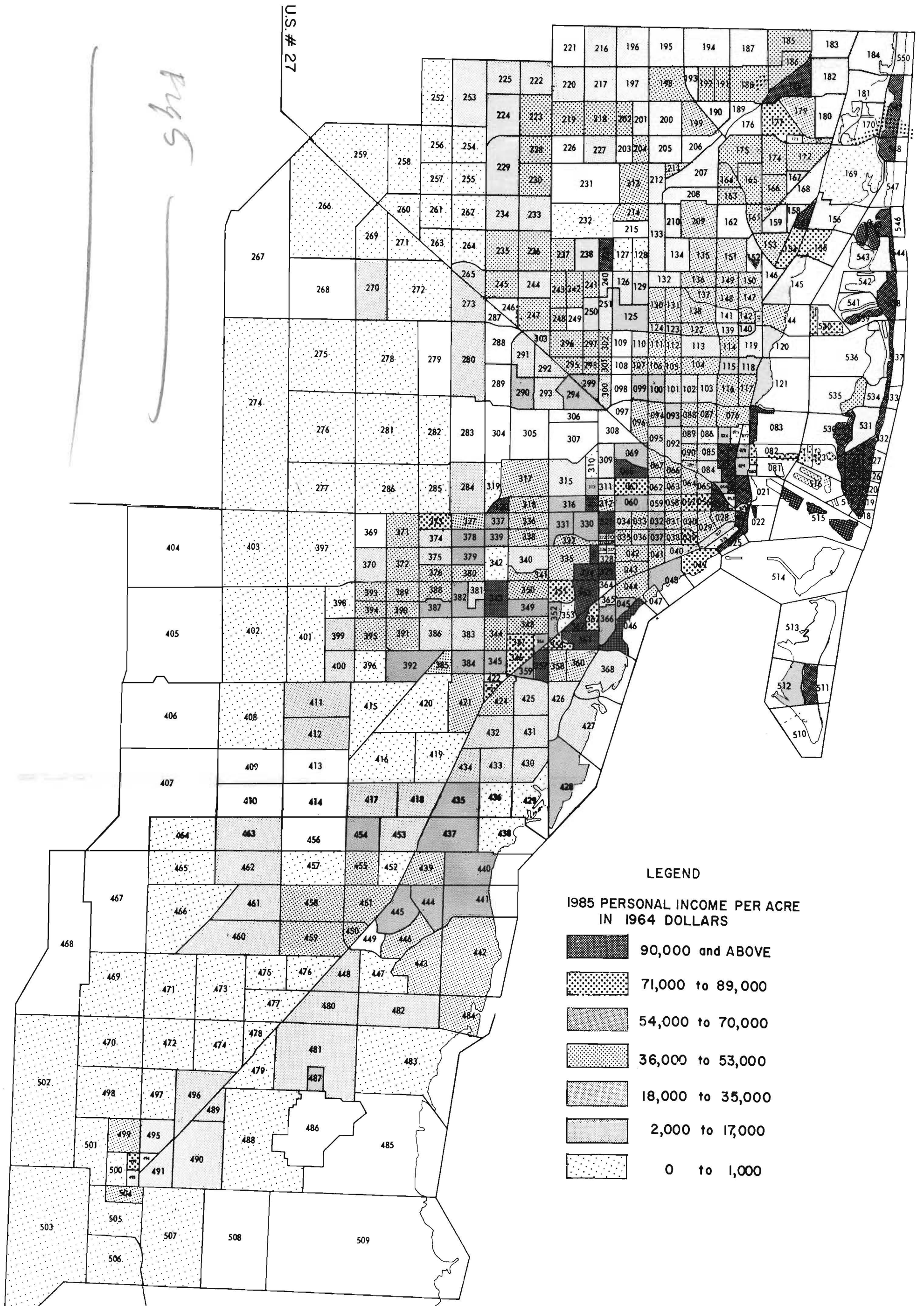
To determine the total personal income in each traffic zone the 1964 Dade County total personal income (\$2,749,866,000)⁽¹⁾ was divided by the proportional estimates of income of all zones (\$1,693,289,200) to obtain a conversion factor: \$1.6239789.

This factor was applied to the proportional estimate of income by each traffic zone to yield total personal income of each zone. The answer was divided by acres for each zone to construct the aid reflecting total personal income per acre.

The other aid, the Change in Personal Income 1964 to 1985, reflected the differences in personal estimates of income for 1964 to 1985. Income differences were divided by acres of each traffic zone to indicate new market possibilities. Answers were factored by \$1.624 to convert to personal income figures. (See Figure 6.)

Estimate Shopping Center Location and Size: Eight existing and three proposed regional shopping centers were located

(1) Bureau of Economic and Business Research
University of Florida, Gainesville, Fla.



LEGEND

1985 PERSONAL INCOME PER ACRE
IN 1964 DOLLARS


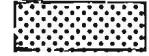



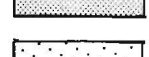

-  90,000 and ABOVE
-  71,000 to 89,000
-  54,000 to 70,000
-  36,000 to 53,000
-  18,000 to 35,000
-  2,000 to 17,000
-  0 to 1,000

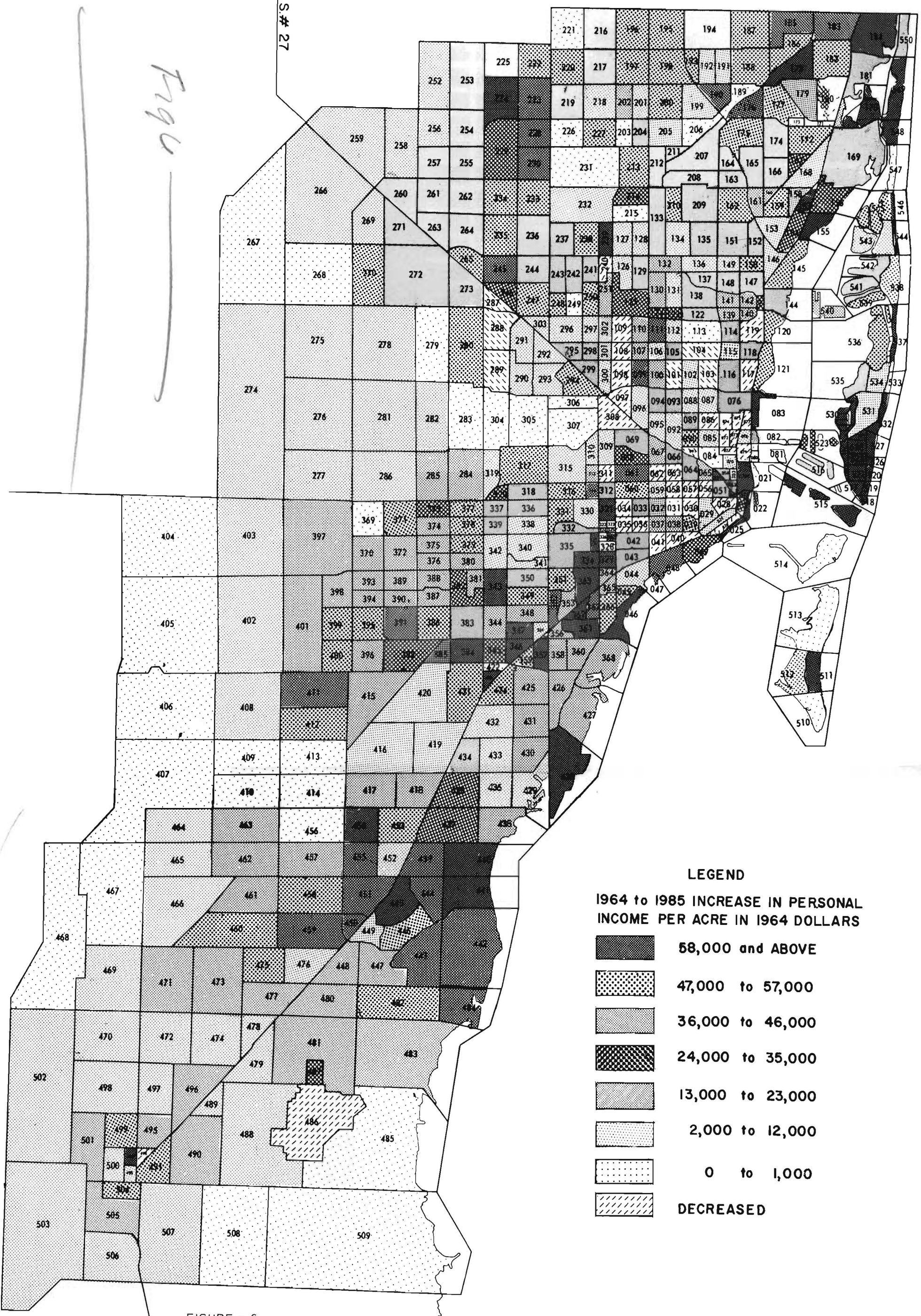
FIGURE - 5
PERSONAL INCOME PER ACRE - 1985
(MIAMI URBAN AREA TRANSPORTATION STUDY)

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Page



LEGEND

1964 to 1985 INCREASE IN PERSONAL INCOME PER ACRE IN 1964 DOLLARS








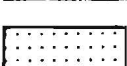
-  58,000 and ABOVE
-  47,000 to 57,000
-  36,000 to 46,000
-  24,000 to 35,000
-  13,000 to 23,000
-  2,000 to 12,000
-  0 to 1,000
-  DECREASED

FIGURE - 6
 CHANGE IN PERSONAL INCOME PER ACRE-1964-1985
 (MIAMI URBAN AREA TRANSPORTATION STUDY)

U.S.# 1

on a map. (See Figure 7.) A least squares trend line was made of the 1964 gross leasable area in square feet as a first step in forecasting the size of the existing centers.

Next, master plans of individual centers were obtained when possible. The trend toward larger size regional shopping centers was taken into consideration. Market potential, land available for expansion, and parking area requirements were analyzed for each shopping center. Parking structures were considered as a technique to provide more land area for buildings, and parking to floor area ratios.

The relationship of the regional centers to the balance of the commercial framework was considered. Since both regional and community centers comprise a basic part of the cobweb pattern around the Central Business District, the locations of both community and regional centers were estimated to create the cobweb pattern. (See Figure 10.)(1)

The General Land Use Master Plan of Metropolitan Dade County was analyzed taking into consideration the location of centers forecast for 1985. The graphic aids on personal income were used to locate market potential.

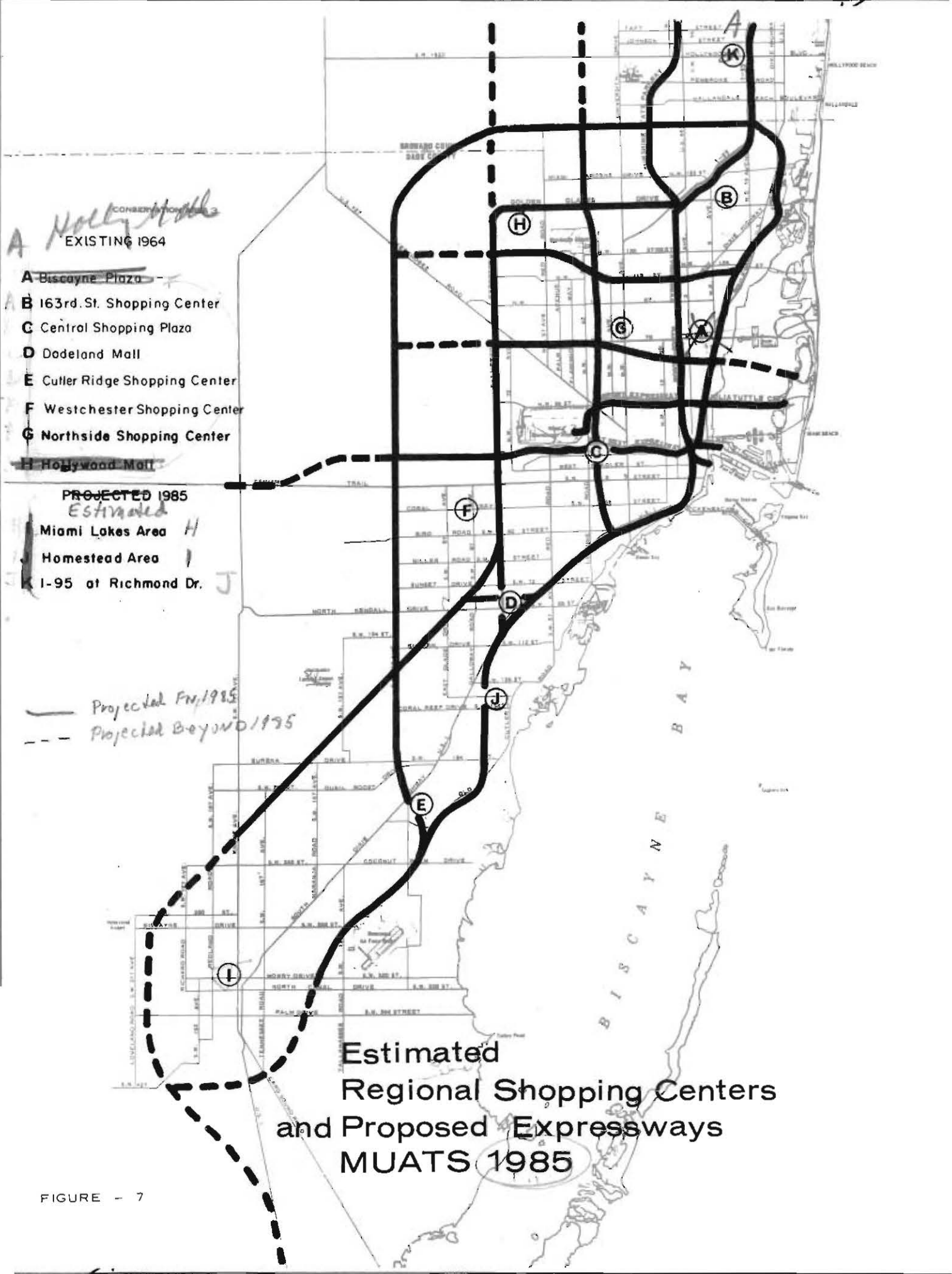
Adjustments were made to the trend lines to increase or decrease the size of the existing centers to meet the market potential when there was land to expand, or the addition of new centers was planned. Existing centers were expanded to maximum capacity and new centers to comparable size. (See Table 5.) Consideration was given to Hollywood Mall in Broward County because some Miami Urban Area residents would be part of the trade area of this center.

Three new centers were added to the eight existing centers in the vicinity of:

Miami Lakes
Richmond Drive and I-95 Extension Area
Homestead-Florida City

Estimate Trade Area Size and Income: An overlay of the 1964 trade area for existing centers was placed over the personal income graphic aids. Each trade area was analyzed to determine areas of higher income indicating greater market potential and to tentatively locate new regional shopping center trade areas and forecast size of the areas.

(1) For a discussion of community shopping centers see pp. 52-54



A Holly
 CONSERVED
 EXISTING 1964

- ~~A Biscayne Plaza~~
- ~~B 163rd. St. Shopping Center~~
- ~~C Central Shopping Plaza~~
- ~~D Dodeland Mall~~
- ~~E Cutler Ridge Shopping Center~~
- ~~F Westchester Shopping Center~~
- ~~G Northside Shopping Center~~
- ~~H Hollywood Mall~~

- PROJECTED 1985
Estimated
- ~~I Miami Lakes Area~~ *H*
 - ~~J Homestead Area~~ *I*
 - ~~K I-95 at Richmond Dr.~~ *J*

— Projected FY/1985
 - - - Projected Beyond 1985

Estimated
 Regional Shopping Centers
 and Proposed Expressways
 MUATS 1985

FIGURE - 7

Table 5 - ESTIMATED LOCATION AND SIZE, SHOPPING AREAS, 1985

Shopping Areas	(1) Traffic Zone	1963 Gross Leasable Area (square feet)	Percent Growth Forecast	1985 Forecast Gross Leasable Area (square feet)
Palm Springs Mile (Business District)	236 & 244	551,875	100	1,103,700
163rd Street Shopping Center (Regional)	173	645,000	50	967,000
Cutler Ridge Shopping Center (Regional)	449	243,100	200	729,200
Northside Shopping Center (Regional)	125	485,000	35	645,700
Richmond Dr.-I-95 Extension (Regional)	418	none	-	600,000
Hollywood Mall (Regional)	Broward	none	-	600,000
Central Plaza (Regional)	309	330,000	75	577,500
Dadeland Mall (Regional)	422	373,000	35	503,500
Miami Lakes Shopping Center (Regional)	228 & 230	none	-	500,000
Westchester Shopping Center (Regional)	374 & 378	306,500	20	367,800
Homestead Plaza (Regional)	449	none	-	300,000
Biscayne Plaza (Community Center)	143	300,000	0	300,000

(1) See Figure 2.

The shopping center size-driving time ratio developed with 1964 data was applied to determine effective driving time for each center in relation to anticipated gross leasable area in square feet. (See Figure 8 and Appendix 7.)

A least squares correlation between the effective driving time and the gross leasable area in square feet, less food stores, yielded a trend line to determine the effective driving time of 1985 regional shopping centers.

Friction factors (travel restrictions measured in minutes per mile resulting from average driving time at a given distance) were derived for each sector of the trade area for the proposed shopping centers. (See Appendix 8.)

The final step involved the derivation of the total trade area radius by shopping centers. (See Table 6.) This was accomplished by dividing the effective driving time by the friction factor for each sector. The average of the eight sectors resulted in the total trade area radius.

To determine income of the trade areas (the consumption factor that approximates retail sales) a proportional estimate of income by traffic zone was determined. Patronage factors were distributed for shopping centers by traffic zone and the proportional income estimates were allocated for shopping centers by traffic zones. (See Appendix 9.)

Apply Control Factor-Test and Adjust Results

The control factor of 9.707% developed with the model using 1964 data was multiplied by the proportional estimate of income allocated to shopping centers by traffic zones.

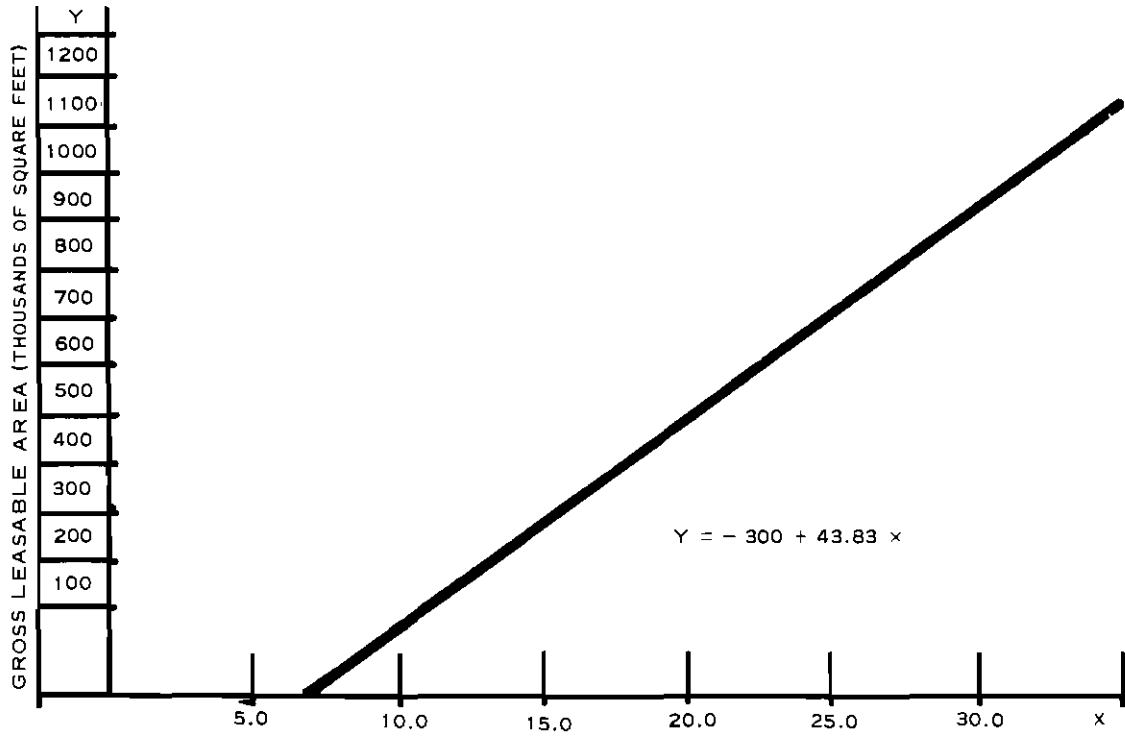
This provided an approximation of the retail sales of each center proposed for 1985. The retail sales data and the gross leasable area in square feet provided the sale per square foot for the centers. (See Table 7.)

The information was used as a basis to test the results against the criteria established to determine whether the location and size of the centers provided the objectives of sales stability, economies of operation, adequate service, and accessibility.

The comparisons or tests indicated the location and size of the centers met the objectives, except in the case of Biscayne Plaza. The model indicated that Biscayne Plaza would change to a

FIGURE - 8

REGIONAL SHOPPING CENTER SIZE - DRIVING TIME RATIO,
MIAMI URBAN AREA, 1964



EFFECTIVE DRIVING TIME (MINUTES)

FOOD STORES WERE EXCLUDED

Table 6 - ESTIMATED GROSS LEASABLE AREA, EFFECTIVE DRIVING TIME, TRADE AREA RADII, SHOPPING AREAS 1985

Shopping Areas	Gross Leas- able Area (Sq.Feet)	Effective Driving Time ¹ (minutes)	Estimated Radii (miles)	Friction Factor Adjustments ²	Final Radii (miles)
Palm Springs Mile (Business District)	1,103,700	32.0	15.0	-2.0	13.0
163 Street Shopping Center (Regional)	967,000	28.9	9.9	+0.1	10.0
Cutler Ridge Shopping Center (Regional)	729,200	23.5	10.6	-0.6	10.0
Northside Shopping Center (Regional)	645,700	21.6	8.1	-0.1	8.0
Richmond Dr.-I-95 Extension (Regional)	600,000	20.5	8.6	+0.4	9.0
Hollywood Mall ³ (Regional)	600,000	20.5	6.9	-1.4	5.5
Central Plaza (Regional)	577,500	20.0	7.8	-0.3	7.5
Dadeland Mall (Regional)	503,500	18.3	7.9	-0.4	7.5
Miami Lakes Shopping Center (Regional)	500,000	18.2	9.1	-0.6	8.5
Westchester Shopping Center (Regional)	367,800	15.2	5.7	-0.2	5.5
Homestead Plaza (Regional)	300,000	13.7	5.9	+0.1	6.0
Biscayne Plaza (Community Center)	<u>300,000</u>	13.7	4.5	<u>0</u>	4.5
TOTAL	7,194,400			-5.0	

(1) Derived by Facilities-Driving Time Ratio $x = \frac{y + 300}{43.83}$

(2) The general reductions in the Trade Area Radii are due to the common problem with the use of Friction Factors to estimate trip length: "Trip length with present friction factor shoots way out." A.F. Sevin, Model Split Seminar 3/30/67.

(3) Friction Factor approximate at 2.982

Table 7 - ESTIMATED RETAIL SALES, GROSS LEASABLE AREA, SALES
PER SQUARE FOOT, SHOPPING AREAS, 1985^{1/}

Shopping Area	Retail Sales (Thousands)	Gross Leasable Area Square Feet (Thousands)	Sales Per Sq. Ft.
Biscayne Plaza (Community Center)	\$10.7	300	\$35.67 ^{2/}
163 Street Shopping Center (Regional)	82.3	967	85.11
Central Plaza (Regional)	48.5	578	83.91
Dadeland Mall (Regional)	41.7	504	82.74
Cutler Ridge Shopping Center (Regional)	57.6	729	79.01
Westchester Shopping Center (Regional)	21.6	368	58.69
Palm Springs Mile - CBD (Business District)	80.9	1,104	73.28
Northside Shopping Center (Regional)	39.7	646	61.46
Miami Lakes Shopping Center (Regional)	31.2	500	62.40
Homestead Plaza (Regional)	15.4	300	51.33
Richmond Dr.-I-95 Extension (Regional)	54.1	600	92.90
Hollywood Mall	- ^{3/}	600	-
		Average \$ per sq. ft.	<u>69.68</u>
		Minimum Range \$ per sq. ft.	51.33
		Maximum " " " "	<u>92.90</u>
		% Difference in Range	<u>81.6%</u>

^{1/} 1964 Dollars

^{2/} This figure is not used to compute the range between minimum and maximum sales per square foot because the center will become a community center.

^{3/} This figure is not used because the northernmost portion of the trade area is not in the Miami Urban area.

community shopping center from a regional shopping center in 1985.(1)

The use of the model to make additional adjustments for the other centers was not necessary.

The annual increase in sales per square foot between 1964 and 1985 for regional shopping centers as a whole increased slightly higher than the yearly increase in personal income during the same period, reflecting sales stability.

The range between the lowest and highest per square foot sales in 1964 remained relatively constant to the range between the lowest and highest per square foot sales in 1985 reflecting economy of operations for the centers as a whole, and prosperity for the Miami Urban Area.

The increase in the gross leasable area in square feet of the centers between 1964 and 1985 was relatively the same as the increase in the number of households during the same period reflecting adequate service.

The cobweb pattern created by the location of community and shopping centers was similar to that of other areas in the United States, particularly the Northeastern Illinois Study. In addition, centers were located at four-mile intervals reflecting accessibility.

Only one test was necessary because: The Miami Urban Area task of forecasting was simplified with the availability of projections for a 1985 traffic system and projections for distribution of median income and number of households; the availability of master plans of the majority of private shopping centers because centers were still in the growth stage; and the use of the General Land Use Master Plan.

(1) See Findings pp. 50-51.

FINDINGS

Nine regional shopping centers and 32 community centers probably will radiate from the central business district to serve as the framework for the cobweb-like commercial structure of the Miami Urban Area in 1985 or not long thereafter. (See Figure 9.) Timing forecasts can not be exact because findings are based on a 1985 population of 2½ million. This forecast, made in 1960, was reduced to 1,955,000 after the model was completed.

Application of the commercial model based on the 2½ million population forecast for 1985 indicated that seven of the eight existing centers likely will be expanded; three new regional shopping centers will be added; and one existing center will be reduced to a community center. In addition to the conversion of one regional to a community center, 13 new community centers were added to the existing 17 community centers. The development will occur, but in some cases, after 1985, based on a population of 1,955,000 for this period.

These findings were based on the assumption that existing trends and policies for large scale retail activity will continue. Market forces seem to point to retail centers of the scale envisioned in the General Land Use Master Plan to serve separate urban concentrations. Thus, one of the key components of metropolitan development appears to be consistent with the operation of urban growth processes.⁽¹⁾

The location, square feet, and sales of regional shopping centers, as well as the size of the trade area and effective driving time to the centers was forecast for 1985. Location of community centers was estimated, but not tested by the model.

By-products also resulted from the development and application of the model. The technique that was established to determine the location and size of the regional shopping centers, also may be applied to testing and determining other parts of the commercial framework.

In addition, the results of this commercial model will be considered when the 1985 traffic network and General Land Use

(1) A Market Potential Model and Its Application to a Regional Planning Problem, by T. R. Lakshamanan and Walter G. Hansen, p. 3.

Master Plan are reviewed.

REGIONAL SHOPPING CENTERS

The 163rd Street Shopping Center likely will be the largest regional shopping center with almost a million square feet and Biscayne Plaza probably will become a community shopping center in 1985. The Cutler Ridge Shopping Center is expected to almost triple in size to become the second largest regional shopping center. Palm Springs Mile, although classified as a regional shopping center in 1964, is expected to resemble a business district more than a regional shopping center in 1985. When strip establishments are included, there would be more than a million square feet in the Palm Springs Mile area.

In order of size, the other regional centers probably will be: Northside Shopping Center, Richmond Drive-I-95 Extension Area, Hollywood Mall, (1) Central Plaza, Dadeland Mall, Miami Lakes Shopping Center, Westchester Shopping Center, Biscayne Plaza, and Homestead Plaza. (See Table 5.)

Retail sales in 1985 probably will range from slightly over \$82 million at the 163rd Street Shopping Center to slightly over \$15 million at the Homestead Plaza. (See Table 7.) Effective driving time for patrons going to and from the centers likely will vary from an average of 13.7 minutes at Biscayne Plaza and Homestead Plaza to 32 minutes at Palm Springs Mile. (See Table 7.)

Average radii of the trade area from which the regional shopping centers receive patrons is expected to range from 4.5 miles at Biscayne Plaza to 13 miles at Palm Springs. (See Table 6.)

Objectives

The objectives of the model...locating and estimating size of regional shopping centers to provide sales stability, economies of operation, adequate service, and accessibility...likely will be achieved for the Miami Urban Area as a whole. The model can be used again to more exactly evaluate centers on an individual basis which might reduce or increase size and alter geographic location.

(1) Consideration was given to the Hollywood Mall in Broward County because some Miami Urban Area residents shop at the center.

Stability: The annual increase of sales per square foot probably will increase more than the annual median income, a requirement of the shopping center if sales stability is to be achieved. However, since the exact degree of increase was not established as part of the criteria to test sales stability, the results of the model can not be determined by this criteria alone.

The yearly increase in sales between 1964 and 1985 is expected to be 2.25% compared with the yearly increase in income of 1.60%. This is based on the average sales per square foot in 1964 of \$43.67 compared with an estimated \$69.68 for the centers as a whole in 1985. This represented an increase of \$26.01 or a 59.5% total increase.

The weighted average of median income in 1964 was \$4,971 compared with a likely weighted average of median income in 1985 of \$6,936. This is an increase of \$1,965 in 1964 dollars, or a total increase of 39.5%.

Economy: The range between minimum and maximum sales per square foot probably will remain relatively constant between 1964 and 1985, a requirement of the shopping centers, if economies of operation for the center and prosperity for the urban area are to be achieved.

In 1964, the lowest sales per square foot were \$31.57 and the highest, \$57.32 leaving a difference of \$25.75, or a 81.6% range as a percent of the lower limit. In 1985, the highest sales per square foot is likely to be \$92.90, and the lowest \$51.33 leaving a difference of \$41.57, or a 81.0% range as a percent of the lower limit.

Thus, the range in sales for 1964 and 1985 for the centers as a whole probably will be within 0.5 percentage points indicating a similar earnings mix (the amount and degree of business success throughout an area resulting in a range of earning factors).

Service: The increase in the size of the total square feet of the shopping centers is expected to be relatively the same as the increase in the total number of households in the Miami Urban Area, a requirement of the shopping centers, if adequate service is to be achieved.

The increase in the total gross leaseable area in square feet between 1964 and 1985 likely will reflect a 122% increase compared to a 125% increase in the number of resident households.

In 1964, there was a total of 3,234,475 square feet compared with 7,194,400 in 1985. Resident households, (including a portion of South Broward resident households) totaled 387,877 in 1964 compared with an expected 872,239 in 1985.

The increase in gross leaseable area compared with the number of households will probably differ only 3 percentage points when the Miami Urban Area and the shopping centers are considered as a whole.

Accessibility: The cobweb pattern of the commercial framework (retail regional and community shopping centers radiating from a CBD) of the Miami Urban Area probably will be similar to the pattern developed by other urban areas in the United States. Centers are expected to be located at approximately 4-mile intervals from the CBD.

The Miami Urban Area pattern was compared successfully to the Northeastern Illinois Study results. The test was made against this study because both areas have a water barrier to the east. The Northeastern Illinois Study had as a barrier, Lake Michigan, and the Miami Urban Area, the bays and Atlantic Ocean. (See Figures 9 and 10.)

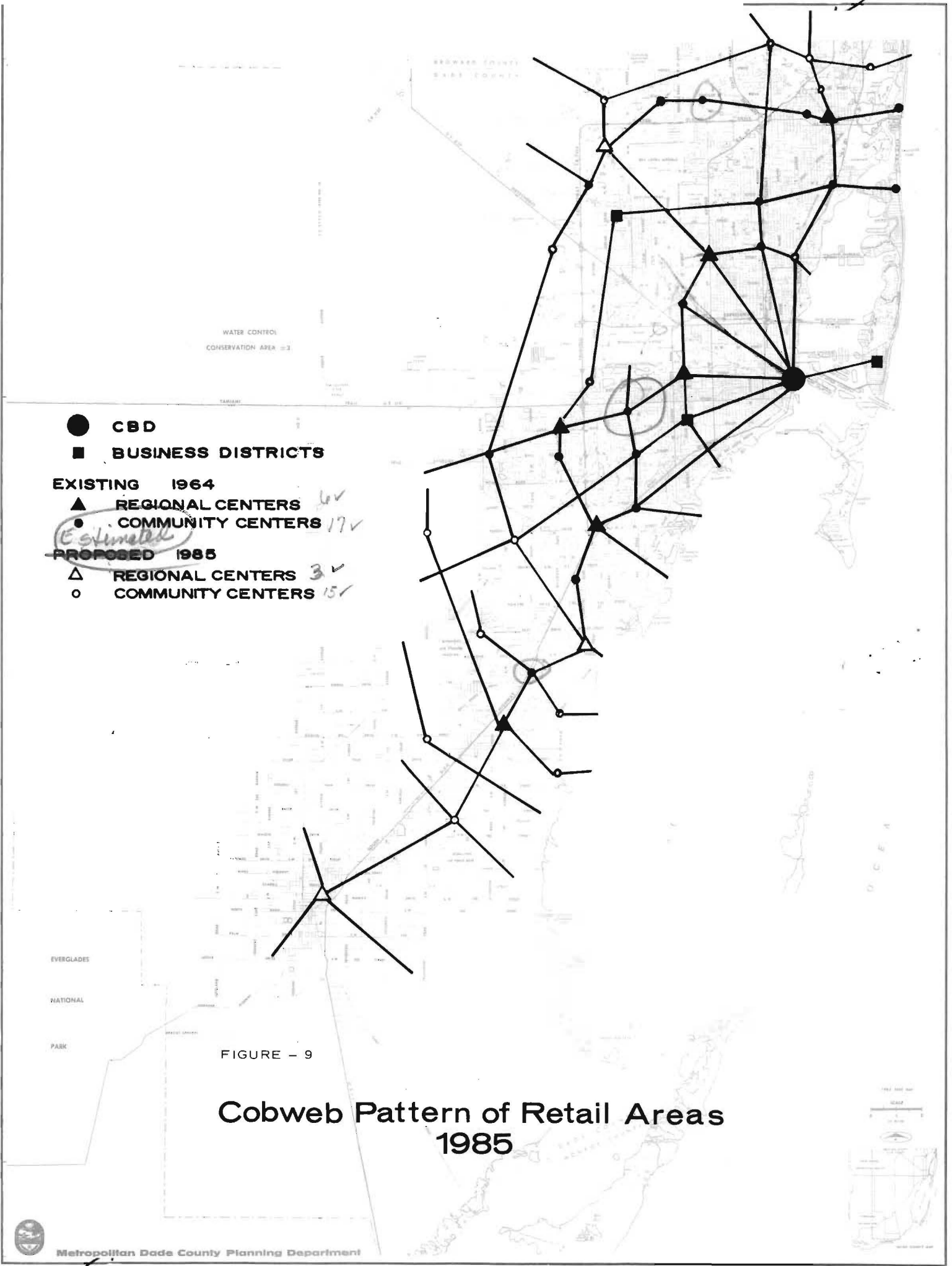
Center-by-Center Summary

The testing of the model results against the four established criteria are summarized on a center-by-center basis. Consideration is given to Hollywood Mall in Broward County because some Miami Urban Area residents are expected to be shopping at this center in 1985.

Palm Springs Mile: This is located in Hialeah along W. 49th Street from Red Road to 12th Avenue. The area will continue to develop as a business district with regional center ramifications expanding west to the Palmetto Bypass to include strip-commercial establishments.

The model predicts sales of \$73.28 per square foot compared with \$28.99 in 1963 on the basis that there will be a 100% expansion to more than a million square feet, or to 1,103,700 in 1985. In 1963, the center contained 551,875 square feet.

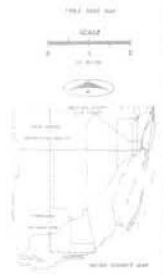
Sales likely will total nearly \$81 million for shopping and convenience goods in 1985 compared with \$16 million in 1963. Effective driving time probably will be 32 minutes compared



- CBD
- BUSINESS DISTRICTS
- EXISTING 1964
 - ▲ REGIONAL CENTERS 6✓
 - COMMUNITY CENTERS 17✓
- Estimated* PROPOSED 1985
 - △ REGIONAL CENTERS 3✓
 - COMMUNITY CENTERS 15✓

FIGURE - 9

Cobweb Pattern of Retail Areas 1985



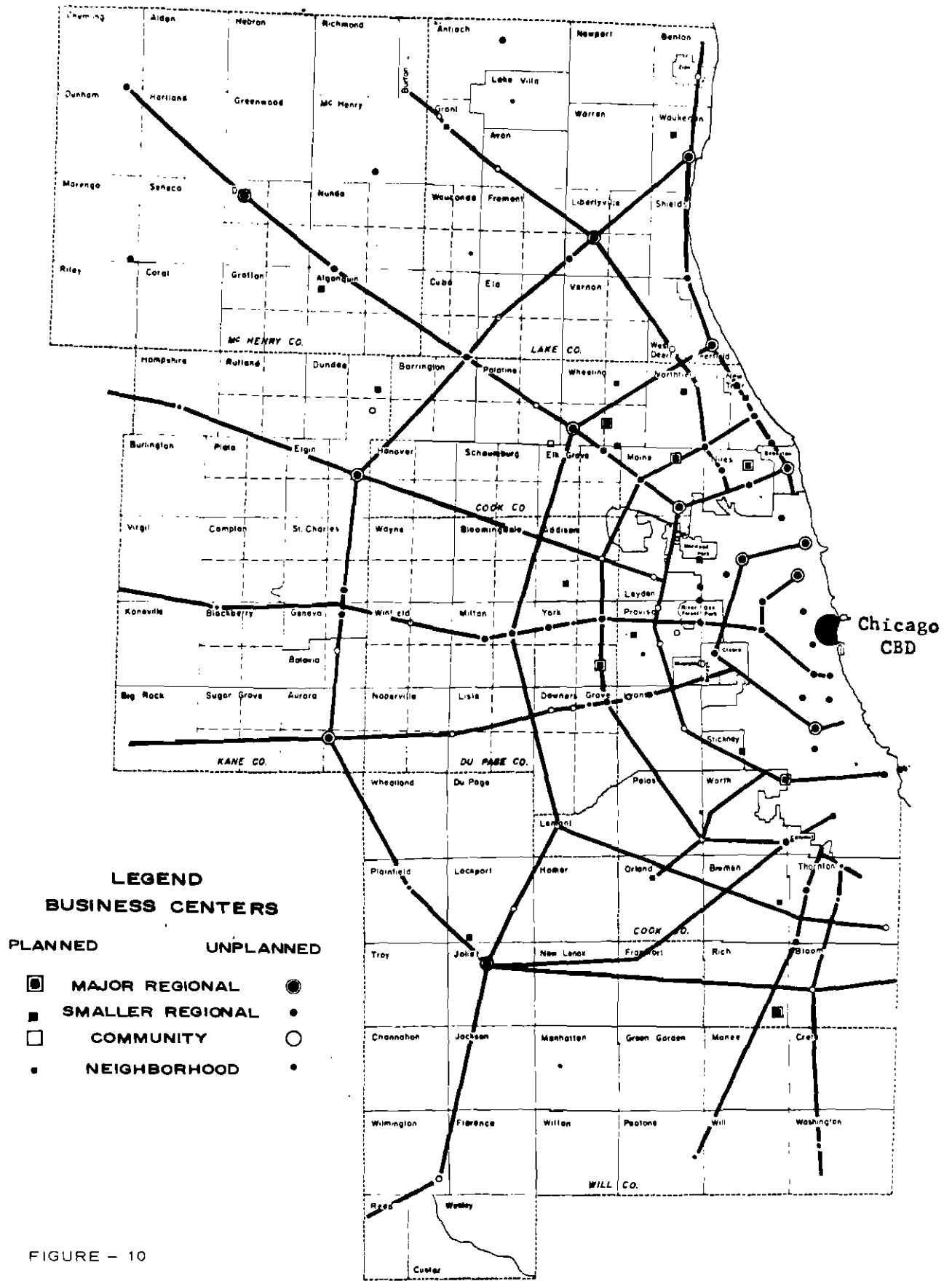


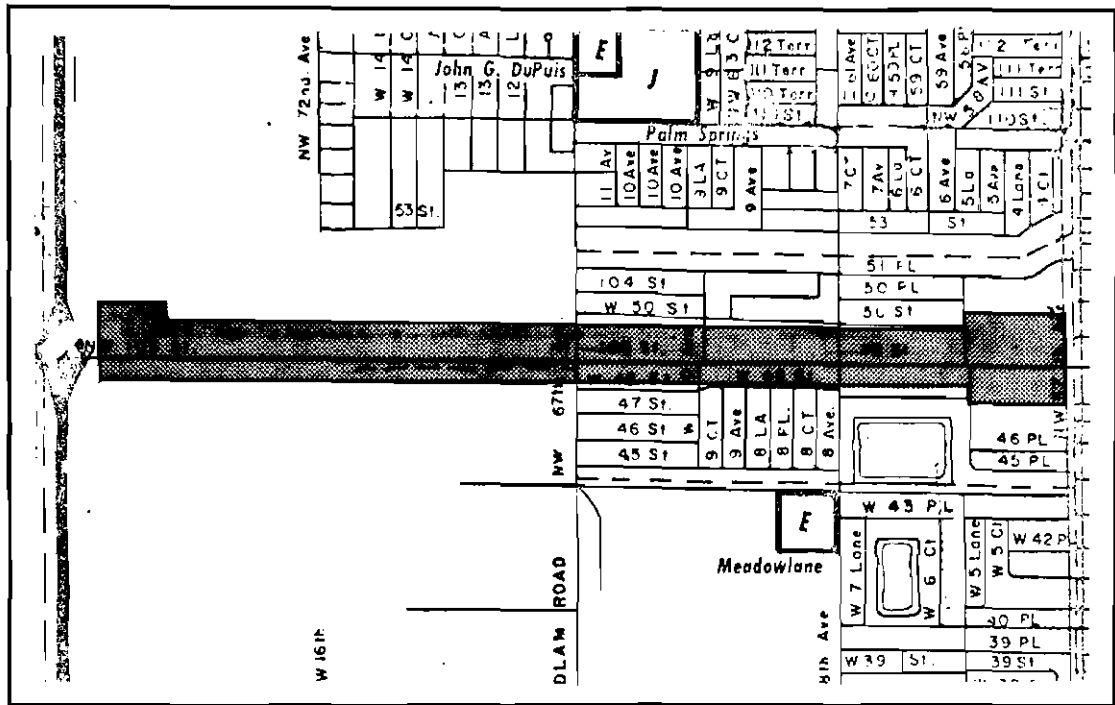
FIGURE - 10

Cobweb Pattern of Retail Centers

SOURCE:

1980 Chicago Urban Area

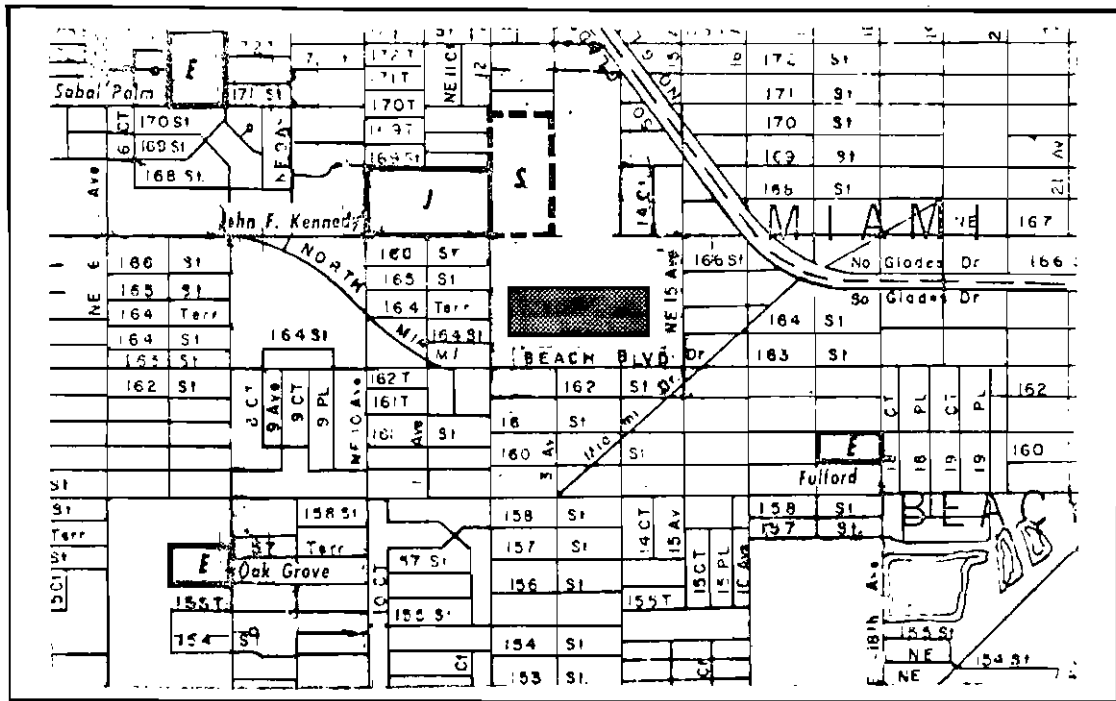
COMMERCIAL STRUCTURE, NORTHEAST ILLINOIS PLANNING COMMISSION, 1965



with 16.1 minutes in 1963, and the average radii of the trade area will extend to 13 miles instead of 7 miles. See map above.

The 163rd Street Shopping Center: This center is located in the unincorporated section of the Miami Urban Area, north of 163rd Street between N. E. 12th Avenue and 15th Avenue. The 1963 size of 645,000 square feet is expected to expand 50% to a near million square feet, or 967,000 in 1985. This would be the largest regional shopping center in the Miami Urban Area. The forecast is based upon a considerable population growth in the trade area.

The model predicts sales of \$85.11 per square foot compared with \$55.24 in 1963. This is based upon the forecast size which will yield about \$82 million compared with almost \$36 million for shopping and convenience goods in 1963.

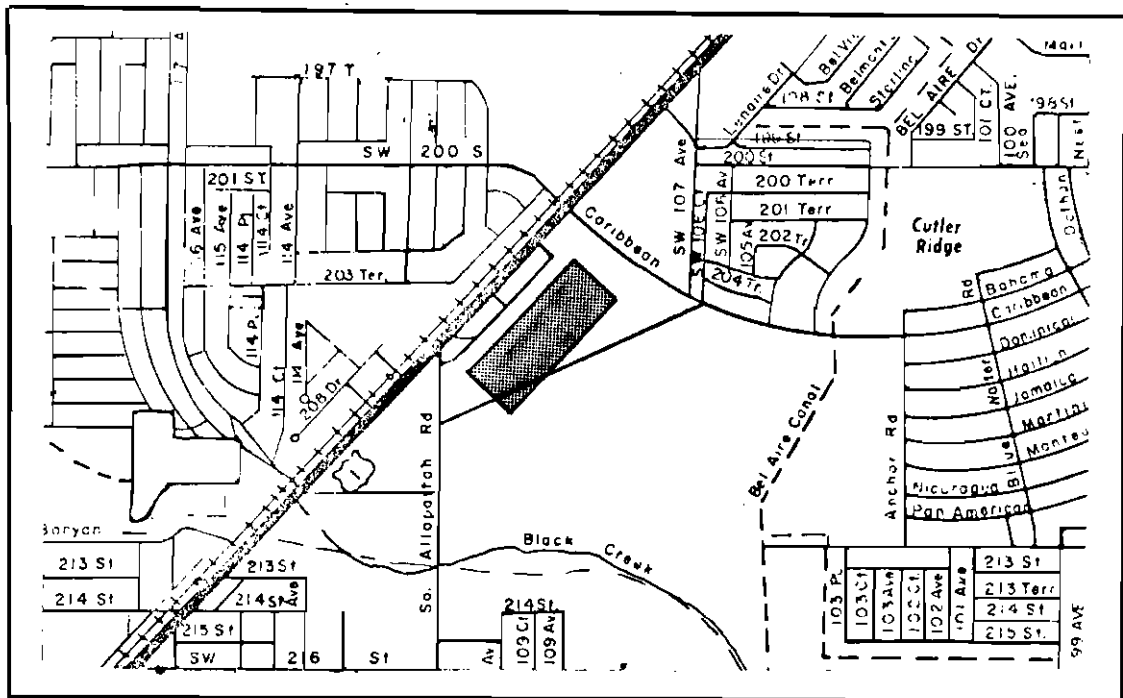


The radii of the trade area likely will extend to 10 miles from 7.5 in 1963 and effective driving time probably will be lengthened to 28.9 minutes from 20.5 minutes. See map above.

The Cutler Ridge Shopping Center: This is located in the unincorporated section of the Miami Urban Area southeast of South Dixie Highway between Caribbean Boulevard and Allapattah Road. The center is 18 miles southwest of the central business district of Miami, and is expected to be the second largest in size. Governmental agencies will be constructed within this trade area.

Cutler Ridge is expected to almost triple to 729,200 square feet in 1985 to serve the forecasted population. There were only 243,100 square feet at the center in 1963. Two or three major department stores will be added.

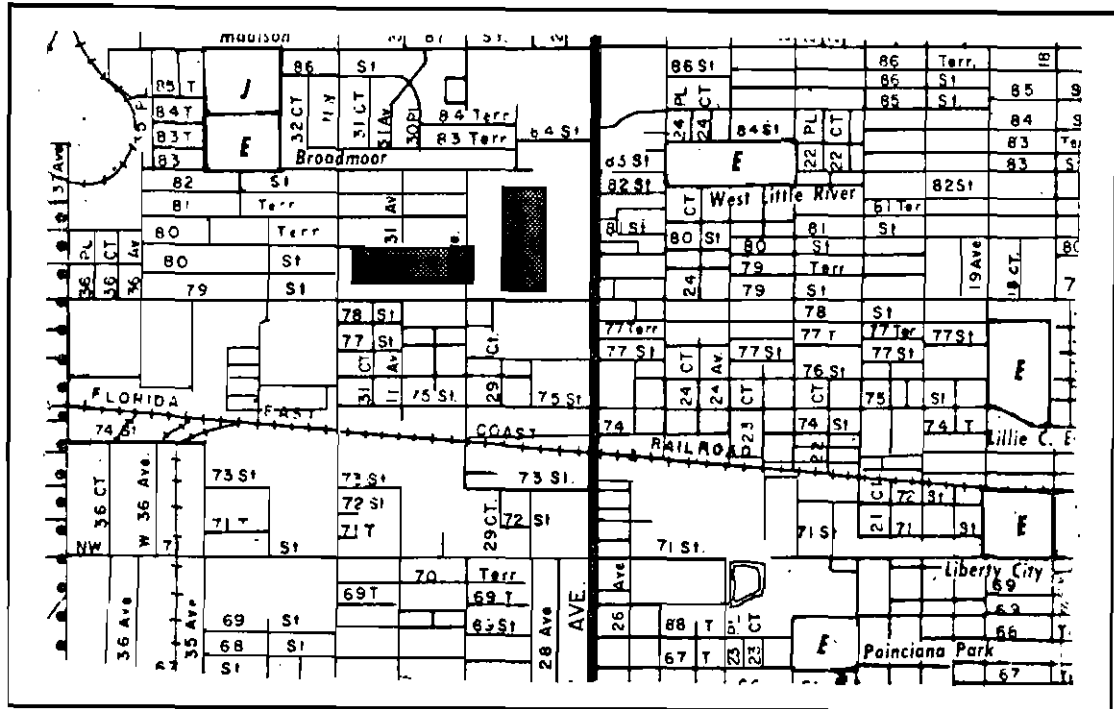
On the basis of this expansion, sales per square foot will total \$79.01 compared with \$43.49. Sales are expected to total nearly \$58 million in 1985 compared with almost \$11 million in 1963.



Effective driving time to and from the center probably will be 23.5 minutes compared with 14.9 minutes in 1964. The radius of the trade area likely will be extended to 10 miles compared with the 7.5 mile average in 1964. See map above.

The Northside Shopping Center: This is located in the unincorporated area of the Miami Urban Area at the intersection of N. W. 27th Avenue and N. W. 79th Street. Moderate expansion to 645,700 square feet is expected for 1985, from 485,000 square feet in 1963. This will be the third largest regional shopping center.

Sales of \$61.46 per square foot are anticipated in 1985 compared to \$57.32 in 1963. The 1985 earnings probably will be slightly below average reflecting an increased size and trade area of Palm Springs Mile and increased accessibility and trade area of Central Plaza in 1985. Total sales will be almost \$40 million compared to about \$27 million in 1963.

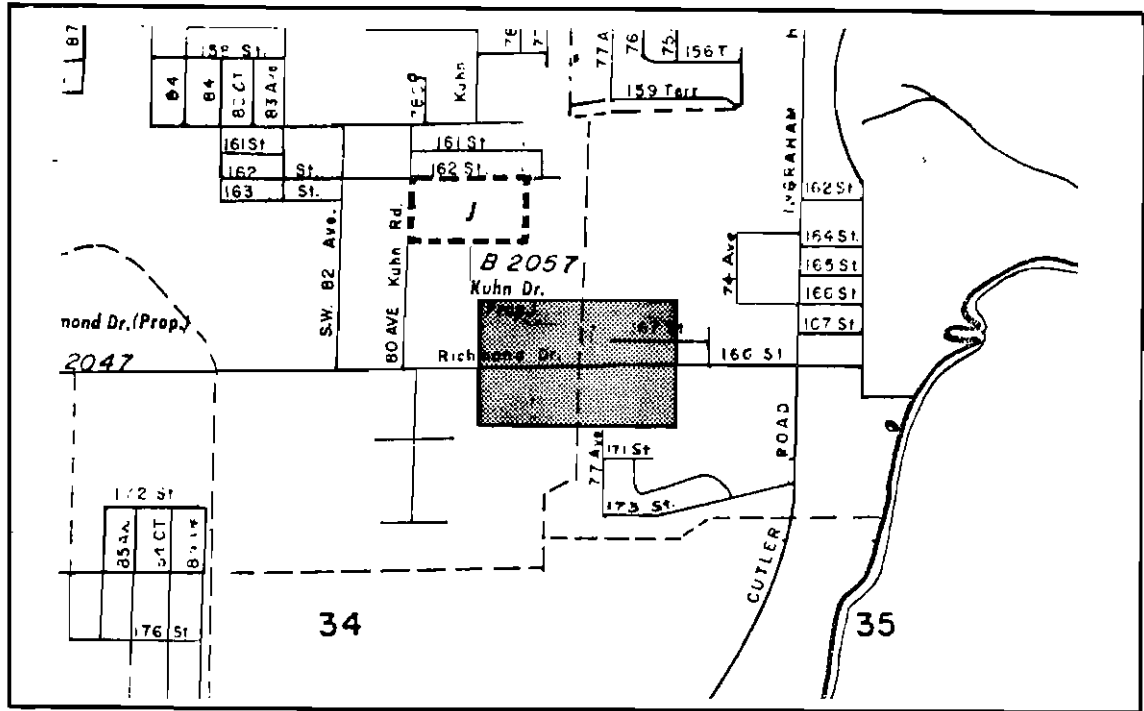


The effective driving time likely will be 21.6 minutes compared to 17.5 and the average radii of the trade area probably will be 8 instead of 6.5 miles. See map above.

Richmond Drive-I-95 Extension Area: This designates only an area and will be located in the unincorporated section of Miami Urban Area in the vicinity of the extension to the I-95 expressway. The forecast is based on the anticipated population growth in the area between Dadeland and Cutler Ridge; and the criteria of locating regional centers at about 4-mile intervals from the central business district.

The model forecasts a gross leaseable area of 600,000 square feet with sales of \$92.90 per square foot, the highest in the Miami Urban Area. Total sales probably will be about \$54 million.

Effective driving time likely will be 20.5 minutes with an average trade area radii of 9 miles.

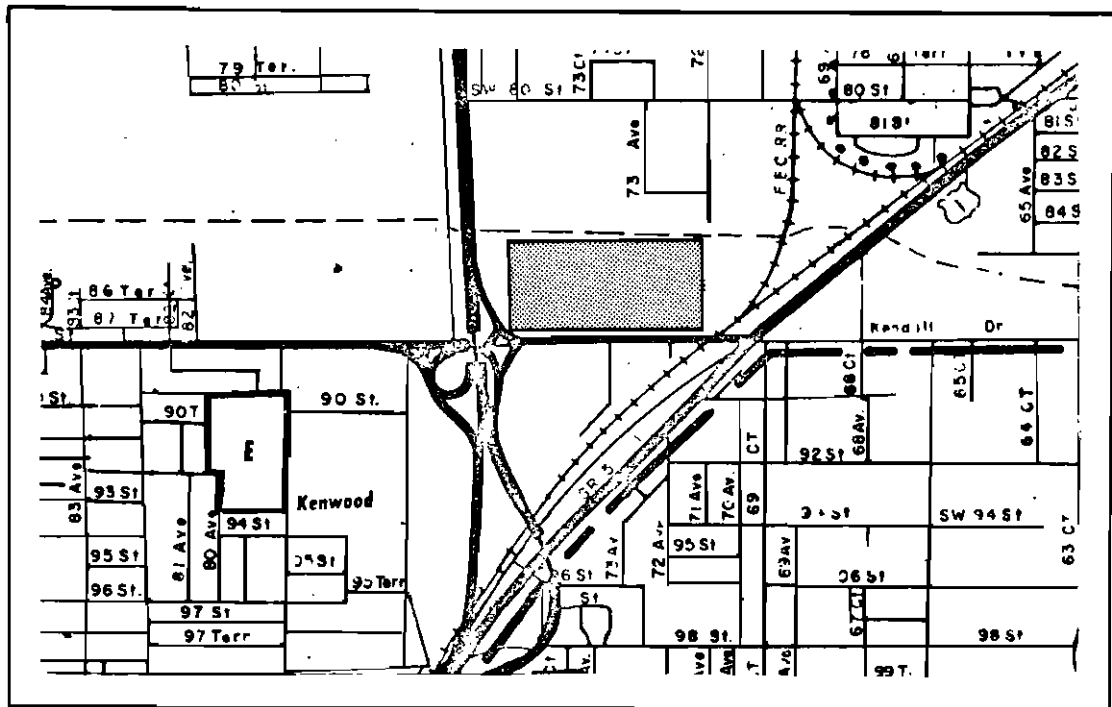


Increased market potential is due to general increase in population and development of South Bay Area and access to proposed expressways. The center would affect Dadeland and Cutler Ridge slightly. See map above.

The Hollywood Mall: This Broward County center is located at Hollywood Boulevard and Park Road one-half mile west of I-95. The 1985 gross leaseable area is forecast at 600,000 square feet with an effective driving time of 20.5 minutes and an average trade area radii of 5.5 miles. Sales were not calculated because only a part of the trade area will be in the Miami Urban Area. The balance will be in Broward County.

Central Plaza: The center is located in the City of Miami at the intersection of Douglas Road and N. W. 7th Street. Size is expected to increase to 577,500 square feet from 330,000 square feet. This is assuming that an air-conditioned mall will be built to over-come expansion problems created by the L-shaped center.

The 730,000 square foot parking area in 1963 is considered more than adequate for such expansion. Forecasts are based

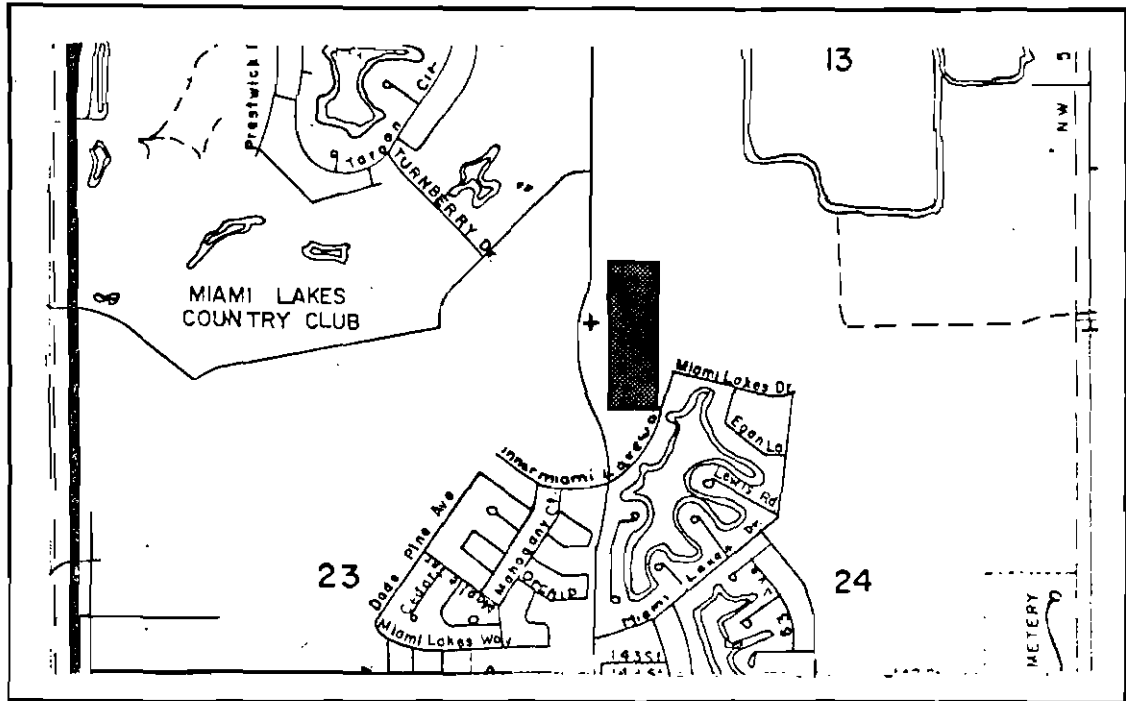


The model forecast sales of \$82.74 per square foot assuming a moderate 35% expansion from 1963 when the rate was \$46.25. Total sales are expected to reach almost \$42 million in 1985 compared with about \$17 million in 1963.

Effective driving time is expected to increase to 18.3 minutes from 14.2 minutes with the distance of the trade area extending to a 7.5 average radii compared with 6 miles in 1963.

The Miami Lakes Shopping Center: This is proposed along Ludlam Road north of the Miami Lakes Drive intersection to serve the population growth forecast in the northwest part of the Miami Urban Area. The proposal is based on the Miami Lakes Master Plan which indicates a site of approximately 70 acres for a regional shopping center.

The forecast market potential is excellent in this area and the accessibility will increase with the Opa-locka Expressway. Size is forecast at 500,000 square feet with an average sales of \$62.40 per square foot. Total sales are forecast at around \$31 million. But the shopping area may develop as a community center before



becoming a regional center, particularly since the population forecast for this area was reduced by the 1968 revision. (1)

The trade area that the Miami Lakes Shopping Center will serve is expected to be along both the Palmetto Bypass and the Golden Glades Expressway. This center will affect the trade area of Palm Springs Mile, but not to a significant degree.

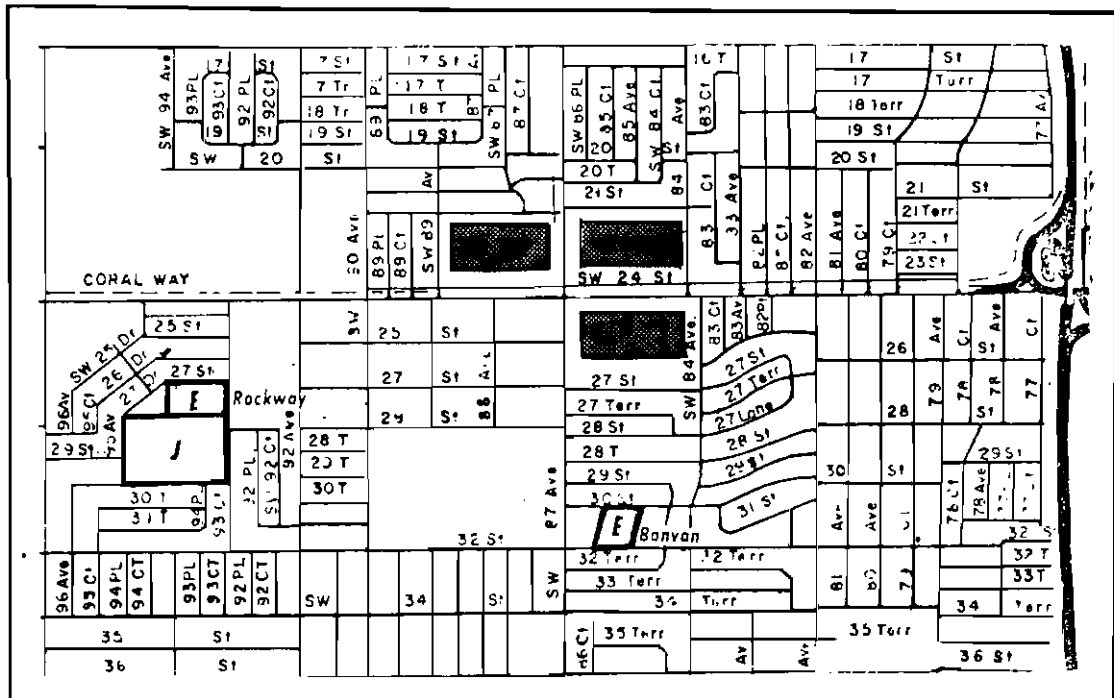
Effective driving time is forecast at 18.2 minutes with a trade area radii of 8.5 miles.

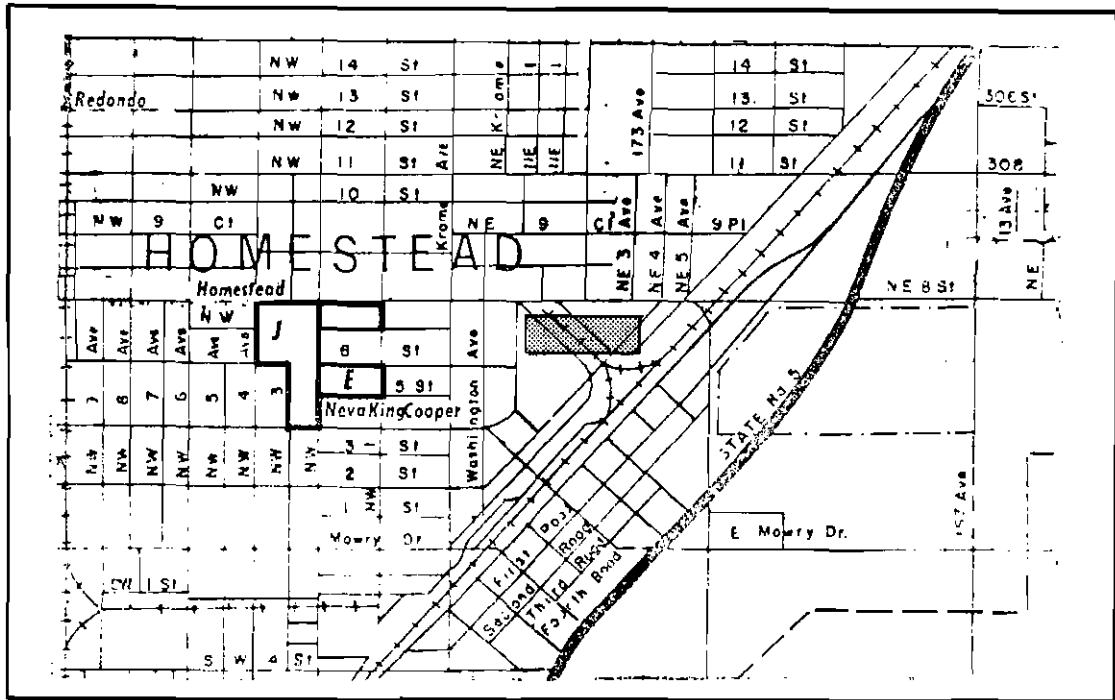
The Westchester Shopping Center: This includes Coral Way, and will expand to the southeast corner of the intersection at Coral Way and Galloway Road.

Minimal expansion of 20% to 367,800 square feet is forecast for 1985 from 306,500 square feet in 1963. On this basis, the model forecast sales of \$58.69 per square foot in 1985 compared with \$36.22 in 1963. Sales totaled around \$11 million for shopping

(1) See page 35

and convenience goods and are expected to be between \$21 and \$22 million in 1985. The sales rate is slightly below average because Westchester is on the edge of the urban area.



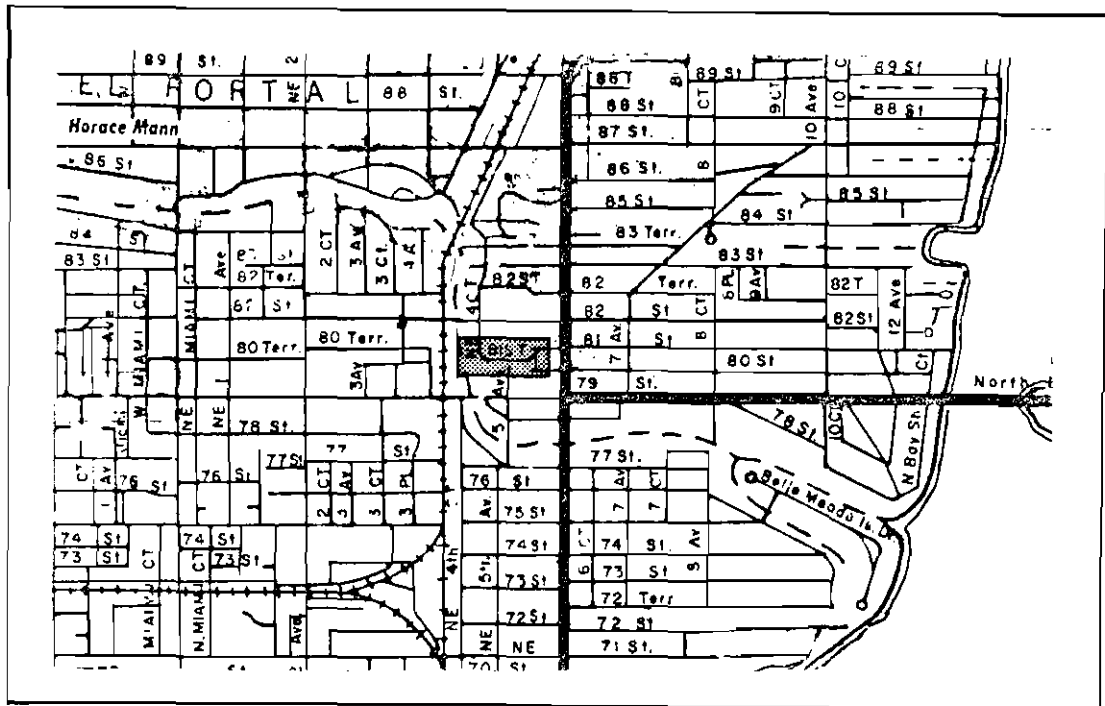


The model forecasts sales at \$51.33 per square foot on the basis of this expansion. Sales probably will total around \$15 million. The sales per square foot would be the lowest, but the center is in an area of low density where the population still has room to increase. In addition, patrons from Monroe County, who will reflect 7 to 10% of total sales, are not included in the model.

Effective driving time is forecast at 13.7 minutes with a trade radii averaging 6 miles.

Biscayne Plaza: This center is located in the City of Miami at the intersection of Biscayne Boulevard and N. E. 79 Street. The model indicates that the 1985 size will be the same as 1963; that is, 300,000 square feet.

Better accessibility to and expansion of surrounding shopping centers is expected to increase competition. The land use of Biscayne Plaza likely will gradually convert to office and professional usage creating a community rather than regional shopping center.



Retail sales of shopping and convenience goods, on this basis, likely will increase to \$10,700,000 from \$9,471,000 in 1963. Shopping goods represented 53.2% of the total shopping and convenience goods purchased at the center in 1963, or \$5,039,000.

Sales probably will increase \$4.10 per square foot to \$35.67 from \$31.57. This is not a feasible rate of earning for a regional shopping center. The 24,000 square feet occupied by the largest tenant in 1963 was small for a regional center. The second story of the center contains 45 office units.

Parking space totaled 900,000 square feet in 1963, an index of 6 spaces per 1,000 square feet of the gross leaseable area, or a total of 1,700 spaces. This represented a deficit of 100 spaces.

Average estimated driving time to the center was forecast at 13.7 minutes in 1985 compared with 13.4 minutes in 1963. The average radii of the trade area likely will be slightly lower; 4.5 miles instead of 4 miles in 1963.

There were 1,400,000 per person shopping trips in 1963 with each trip representing an average sale of \$6.72.

COMMUNITY SHOPPING CENTERS

Thirty-two community shopping centers are expected to be located in the commercial framework of the Miami Urban Area for 1985. This includes the Biscayne Plaza Shopping Center.(1) The locations were not tested by the model, but were forecast to complete the cobweb picture of the area in which regional and community shopping centers were interrelated with the business districts as part of the commercial framework. (See Figure 8.)

The 32 community centers include 17 centers existing in 1964, the conversion of the Biscayne Shopping Center to a community shopping center, and the addition of 14 new centers.

New locations were selected because: They would become an integral part of the cobweb pattern; there was a market potential based upon an analysis of the personal income; and sometimes locations were part of recognized master plans of the centers.

The forecast for community shopping centers is flexible and may fluctuate as much as a mile in any direction. In addition, other community shopping centers may develop because the range in size is so great for community shopping centers. A center may serve one market area or two centers of smaller size may serve the same area. (See Figure 11.)

Biscayne Village, forecast as a community center for 1985, may become a regional center sometime after 1985.

The following are approximate locations for 15 market areas estimated for community shopping centers:

1. Honey Hill Drive at N. E. 10 Avenue
2. N. W. 188 Street at N. W. 69 Avenue
3. N. W. 90 Street at N. W. 97 Avenue
4. Flagler at West 77 Avenue
5. Kendall Drive at S. W. 107 Avenue
6. Kendall Drive at S. W. 137 Avenue
7. Richmond Heights Area
8. Franjo Road at Old Cutler Road
9. S. W. 232 Street at S. W. 87 Avenue
10. S. W. 216 Street at S. W. 137 Avenue
11. S. W. 268 Street at S. W. 137 Avenue
12. Biscayne Village, U. S. 1 and N. E. 195 St.

(1) The 1963 Biscayne Plaza Shopping Center is expected to be a community shopping center in 1985.

EXISTING 1964 ○

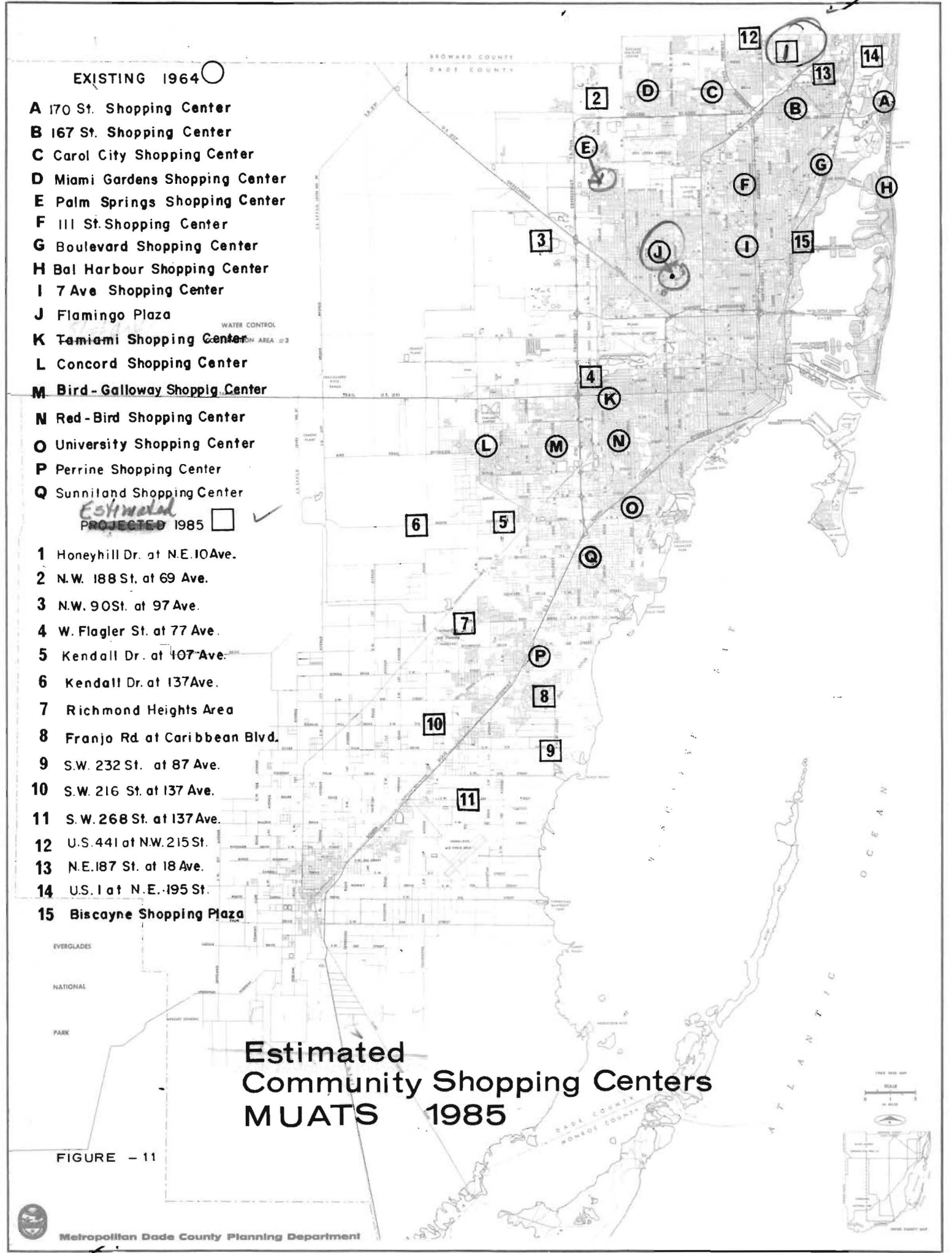
- A 170 St. Shopping Center
- B 167 St. Shopping Center
- C Carol City Shopping Center
- D Miami Gardens Shopping Center
- E Palm Springs Shopping Center
- F III St. Shopping Center
- G Boulevard Shopping Center
- H Bal Harbour Shopping Center
- I 7 Ave Shopping Center
- J Flamingo Plaza
- K Tamiami Shopping Center
- L Concord Shopping Center
- M Bird - Galloway Shopping Center
- N Red - Bird Shopping Center
- O University Shopping Center
- P Perrine Shopping Center
- Q Sunniland Shopping Center

Estimated
PROJECTED 1985 □ ✓

- 1 Honeyhill Dr. at N.E. 10 Ave.
- 2 N.W. 188 St. at 69 Ave.
- 3 N.W. 90 St. at 97 Ave.
- 4 W. Flagler St. at 77 Ave.
- 5 Kendall Dr. at 107 Ave.
- 6 Kendall Dr. at 137 Ave.
- 7 Richmond Heights Area
- 8 Franjo Rd at Caribbean Blvd.
- 9 S.W. 232 St. at 87 Ave.
- 10 S.W. 216 St. at 137 Ave.
- 11 S.W. 268 St. at 137 Ave.
- 12 U.S. 441 at N.W. 215 St.
- 13 N.E. 187 St. at 18 Ave.
- 14 U.S. 1 at N.E. 195 St.
- 15 Biscayne Shopping Plaza

Estimated Community Shopping Centers MUATS 1985

FIGURE - 11



13. U. S. 441 and N. W. 215 Street
14. N. E. 187 Street and N. E. 18 Avenue
15. Biscayne Plaza, Biscayne Boulevard and
N. E. 79 Street

The 17 community centers existing in 1963 that are expected to continue as community centers in 1985 are:

1. Bal Harbour Shopping Center
2. 7 Avenue Shopping Center
3. Flamingo Plaza
4. Tamiami Shopping Center
5. Concord Shopping Center
6. Bird-Galloway Shopping Center
7. 170 Street Shopping Center
8. Perrine Shopping Center
9. Sunniland Shopping Center
10. 167 Street Shopping Center
11. Carol City Shopping Center
12. Miami Gardens Shopping Center
13. Palm Springs Shopping Center
14. 111 Street Shopping Center
15. Boulevard Shopping Center
16. Red-Bird Shopping Center
17. University Shopping Center

BY-PRODUCTS

The market potential model, although developed in response to a specific planning problem, also will have a more general application. (1)

(1) Market Potential Model and Its Application to a Regional Planning Problem, by T. R. Lakshamanan and Walter G. Hansen, p. 364.

The results of the model provide important information to be considered when the General Land Use Master Plan and transportation networks are reviewed. Future highway network proposals will be able to take into consideration the location of the regional and community shopping centers developed by the model. However, consideration must be given to the fact that the application of the model was based on the 1960 forecast of 2½ million people in 1985 rather than the 1968 revised figures forecasting 1,955,000 people in 1985.

The model will provide a basis for revision of the commercial structure if there are any changes in income distribution or the transportation system. The model also can be used to develop the location and size of other parts of the commercial structure.

GLOSSARY

ABBREVIATION

- CBD - Central Business District
- EDT - Effective Driving Time
- GLUMP - General Land Use Master Plan
- GLA - Gross Leasable Area
- MUATS - Miami Urban Area Transportation Study
- MUA - Miami Urban Area

SYMBOLS

- C - personal consumption of Keynesian economic theory.
- b - marginal propensity to consume in Keynesian economic theory.
- t - a percentage tax factor used in the consumption model for this report.
- Y - gross national product or gross national income in Keynesian economic theory.
- Y_a - total proportional estimate of income for the Miami Urban Area for the year a .
- y_a^{tz} - median income for traffic zone tz and the year a .
- h_a^{tz} - resident households for traffic zone tz and year a .
- y_a^{tz} - proportional estimate of income for traffic zone tz and year a .
- r_t - total trade area radius.

SYMBOLS (continued)

- r_n - radius of the concentric circle that is derived by:
 $r_n = r_t \log n$.
- sc_n - regional shopping center whereby n denotes the number of the center.
- $p_a^{sc_n}$ - patronage factor for shopping center sc_n and a year a . This notation is used with respect to a single traffic zone.
- S_p^{tz} - sum of the patronage factors for all the shopping centers for a specific traffic zone.
- $P_a^{sc_n}$ - revised patronage factor for shopping center sc_n for year a .
- $I_a^{sc_n/tz}$ - allocation of the proportional income estimate for shopping center sc_n by traffic zone tz for year a .
- $SI_a^{sc_n}$ - sum of the allocation of proportion income estimates for shopping center sc_n for year a .
- TR_a - total retail sales of convenience and shopping goods for the Miami Urban Area for year a .
- f_1 - total retail sales for shopping and convenience goods as a percent of the proportional estimate of income.
- TCR_a - total retail sales of convenience and shopping goods for regional shopping centers in the Miami Urban Area for year a .
- TI_a - total allocation of proportional incomes for the Miami Urban Area for year a .
- f_2 - total retail sales of convenience and shopping goods for regional shopping centers as a percent of the total allocation of proportional incomes in the Miami Area.
- F_a - "Control Factor" for year a .
- R_a^{sc} - retail sales for shopping center sc for year a .

APPENDIX I. - MUATS BACKGROUND STUDIES

Study Design for MUATS

Economic, Population Land Use Projections

Community Attitudes for Transportation Planning

Laws and Ordinances

Goals for Transportation

Implementation of the Plan

Continuing Program for Transportation Planning

Transit Cost Allocation Model Development

Present Transit Service

Corridors for Transit Improvement

Route, System Design and Cost Estimate

Forms of Mass Transportation

Evaluation of Alternate Transit Plans

APPENDIX II. - SHOPPING CENTER SIZE - DRIVING TIME RATIO,
1964

$$\frac{\text{Driving Time}}{\text{Direct Distance}} = \text{Friction Factor}$$

$$\text{Friction Factor} \times r_t = \text{EDT}$$

Given:

1. EDT by Regional Shopping Center
2. D.T. by Sector
3. A.D. by Sector

$$r_t = \frac{\text{EDT}}{\text{F.F.}}$$

$$r_t = \frac{\text{EDT}}{\left(\frac{\text{DT}}{\text{AD}}\right)}$$

DRIVING TIME - determined by the quotient of distance by speed as given by the Link-Node Network. The result was factored by .60 to give an answer in minutes for this report. The derivation is illustrated below:

Given by Link-Node Network:

1. SPEED - in miles per hour
2. DISTANCE - in miles

Thus:

$$\frac{\text{DISTANCE}}{\text{SPEED}} = \text{Driving Time (hours)}$$

$$\frac{\text{miles} / 1}{\text{miles} / \text{hr.}} = \text{Driving Time (hours)}$$

$$\frac{\text{hour}}{1} = \text{Driving Time (hour)}$$

$$\text{hour} \cdot 60 = \text{Driving Time (minutes)}$$

DIRECT DISTANCE - the straight line between two locations.

FRICION FACTOR - travel restriction measured in minutes per mile, which results from average driving time for a given distance. The derivation is illustrated below:

Given:

1. Driving time by sector - in minutes
2. Direct distance by sector - in miles

Thus:

$$\frac{\text{DRIVING TIME}}{\text{DIRECT DISTANCE}} =$$

$$\frac{\text{minutes}}{\text{miles}} = \text{Friction Factor}$$

EFFECTIVE DRIVING TIME - the estimated driving time for a given distance. The derivation is illustrated below:

$$\text{Friction Factor} \cdot r_t = \text{Effective Driving Time}$$

APPENDIX III. - ASSIGNING PATRONAGE FACTORS, 1964.

The logarithmic circle theory was used to assign patronage factors to traffic zones. If the traffic zone had a sum of patronage factors greater than one, factors were proportionately reduced to equal a sum of one.

The following table demonstrates the method of recording the patronage factors by traffic zone for the shopping centers.

Patronage Factors for Shopping Center by Traffic Zones

Shopping Center	sc ₁	sc ₂	sc ₃	sc ₄
Traffic Zone				
tz	.90 (.58)	.45 (.29)	.20 (.13)	----

Since the sum of the patronage factor for the traffic zone (S_p^{tz}) must be equal to or less than one, the above sum of 1.55 must be proportionally reduced to a sum of one. This process was accomplished by dividing each patronage factor for the individual shopping center (P_a^{scn}) by the sum of the patronage factors for the traffic zone as follows:

$$p_a^{scn} = \frac{P_a^{scn}}{S_p^{tz}}$$

The adjusted patronage factor was derived by use of the above formula and was used later to distribute the disposable income of the traffic zone.

APPENDIX IV - ALLOCATION OF PROPORTIONAL ESTIMATE OF INCOME, 1964

The process of distributing the proportional estimate of income for each traffic zone was the product of the patronage factor for each shopping center (P_a^{scn}) times the proportional estimate of income (Y_a^{tz}). The formula for the allocation of proportional estimate of income table was:

$$P_a^{scn} \cdot Y_a^{tz} = I_a^{scn/tz}$$

This process yielded the allocation of the proportional estimate of income for each traffic zone by shopping centers for the year ^a noted ($I_a^{scn/tz}$). The following sample table demonstrated the method of recording the allocation of the proportional estimates of income for each shopping center.

Allocation of Proportional Estimates of Income to
Shopping Center by Traffic Zones

Shopping Center Traffic Zone	sc ₁	sc ₂	sc ₃	sc ₄
tz ₁	$I_a^{sc_1/tz_1}$		$I_a^{sc_3/tz_1}$	
tz ₂		$I_a^{sc_2/tz_2}$	$I_a^{sc_3/tz_2}$	$I_a^{sc_4/tz_2}$
tz ₃	$I_a^{sc_1/tz_3}$	$I_a^{sc_2/tz_3}$	$I_a^{sc_3/tz_3}$	
Totals	$SI_a^{sc_1}$	$SI_a^{sc_2}$	$SI_a^{sc_3}$	$SI_a^{sc_4}$

The total for each shopping center in the sample table was denoted (SI_a^{scn}) and derived by the sum of the allocations recorded for the subject shopping center as follows:

$$I_a^{sc_1/tz_1} + \dots + I_a^{sc_n/tz_n} = SI_a^{sc_n}$$

APPENDIX V. - DEVELOPING CONTROL FACTOR

The derivation of the control factor was a two step process. Step one: to derive the total retail sales for shopping and convenience goods for the Miami Urban Area as a percent of the proportional estimate of income. Step two: to derive the proportion of the above retail sales serviced by regional shopping centers. The control figure for the first step was the total retail sales of convenience and shopping goods for the Miami Urban Area, noted (TR). This was divided by the total proportional estimate of income (Y_a) to give a percentage factor (f_1):

$$\frac{TR_a}{Y_a} = f_1$$

The control figure for the second step was the total retail sales of shopping and convenience goods for the subject shopping centers noted (TCR_a). This control figure was divided by the sum of the totals of the allocation of proportional incomes:

$$SI_a^{SC1} + \dots + SI_a^{SCn} = TI_a.$$

The above figure represented the total allocation of proportional incomes (TI_a) for the Miami Urban Area. The resulting second factor was derived as follows:

$$\frac{TCR_a}{TI_a} = f_2$$

The control factor was the product of the above two factors:

$$f_1 \cdot f_2 = F_a.$$

The control factor noted (F_a), was subsequently used to adjust the total allocation of proportional incomes by shopping centers (SI_a^{SCn}). This resulted in retail sales for shopping and convenience goods by shopping center (R_a^{SCn}):

$$F_a \cdot SI_a^{SCn} = R_a^{SCn} .$$

APPENDIX VI - TESTING AND ADJUSTING CONTROL FACTOR

First Test

The total 1964 retail sales of convenience and shopping for the Miami Urban Area (TR_{64}) was \$1,005,161,000. The total 1964 proportional estimate of income for the Miami Urban Area (Y_{64}) was \$1,928,152,000. Thus, f_1 was derived as 52.130%. The total 1964 retail sales of convenience and shopping goods for regional shopping facilities (TCR_{64}) was \$139,545,000. The total 1964 allocation of proportional incomes for the Miami Urban Area (TI_{64}) was \$881,629,000. Thus, f_2 was derived as 15.828%. The product of f_1 and f_2 yields the control factor, 8.251%. The elements and results of the control factor for the first test are illustrated below. The dollar amounts are represented in thousands.

$$f_1 = \frac{TR}{Y_a} = \frac{\$1,005,161}{\$1,928,152} = 52.130\%$$

$$f_2 = \frac{TCR}{TI_a} = \frac{\$139,545}{\$881,629} = 15.828\%$$

$$F_{64} = f_1 \cdot f_2 = 52.130 \cdot .15828 = 8.251\%$$

The product of the control factor (F_{64}) and the allocation of proportional income (SI_a^{SCn}) is represented in the following table.

Results of the First Test

Shopping Center	SI_a^{SCn} Allocation of Proportional Income to Shopping Center	R_a^{SCn} Allocation of Income after Factoring by 8.251%	Variance from Actual Sales
Central	\$224,091.5	\$18,490.1	+58.1%
Westchester	158,702.5	13,094.8	+18.0%
Dadeland	194,971.4	16,087.4	- 6.9%
Cutler Ridge	69,878.6	5,765.8	-45.3%
163rd Street	517,678.1	42,714.3	+19.9%
Palm Springs Mile	166,535.9	13,741.1	-14.3%
Northside	296,809.0	24,490.1	-10.7%
Biscayne	62,545.2	5,160.7	-44.7%

The result of the first test showed an average variance from the actual sales of 27.2%. An analysis of the individual shopping center results, revealed that a travel restriction should be considered in approximating driving time. The most striking examples were Central Plaza and Biscayne Plaza which varied 58.1% and 44.7% respectively from actual sales. A further adjustment considering travel restriction would decrease the variance of the above two shopping centers.

Second Test

The second test incorporated five additional considerations into the basic procedure as originally tested. These five adjustments were: (1) The adjustment of the initial trade areas to comply to travel restriction resulted in the following radii:

<u>Shopping Center</u>	<u>Radii</u>
Biscayne Plaza	4.0 miles
163rd Street Shopping Center	7.5 miles
Central Plaza	3.5 miles
Dadeland Mall	6.5 miles
Cutler Ridge Shopping Center	7.5 miles
Westchester Shopping Center	5.0 miles
Palm Springs Mile	7.0 miles
Northside Shopping Center	7.0 miles
Hollywood Mall ⁽¹⁾	5.0 miles

- (2) The assumption that the trade area could be divided into eight equal sectors. Each sector may be factored with respect to the adjustments being incorporated in the second test.⁽¹⁾
- (3) The first adjustment utilized the sector theory increasing patronage factors for sectors where there was no competition from other regional shopping centers. This adjustment was done in three areas: 1. To the SSW and WSW sectors of Cutler Ridge Shopping Center, 2. to the WSW and WNW sectors of Westchester and 3. to the WSW and WNW sectors of Palm Springs Mile. The Cutler Ridge trade area was further adjusted to a distance of $r_t \log 50$ in the SSW and WSW sectors. The basis for this

(1) Hollywood Mall was included by mistake, because it was not operational in Spring 1964.

extension was information concerning trip attractions for shopping and convenience goods.⁽¹⁾

- (4) The patronage factors were reduced where natural or man made barriers were a hinderance to travel. The two major adjustments of this type were: 1. south of the Miami International Airport with respect to Palm Springs Mile and 2. northeast of the Miami River with respect to Central Plaza.
- (5) The patronage factors were reduced for traffic zones comprising the CBD and business districts. This adjustment was carried out throughout the Miami Urban Area, because residents in CBDs are by-in-large within walking distance of shopping facilities. The following center trade area:

Biscayne Plaza - The patronage factors were reduced by .20 to the SSE and SSW sectors as per Factor (1). The patronage factors were increased by .10 to the WNW sector as per Factor (1). The patronage factors in traffic zones 139, 140, 141, 142, 159, 160, and 161 were reduced by .10 as per Factor (5).

163rd Street Shopping Center - The patronage factors were decreased by .10 to the ENE as per Factor (3). The addition of competition to the north from Hollywood Mall was added to the model. (This was later found in error and eliminated.) The patronage factors for traffic zones 213, 159, 160, 161, 543, 544, 139, 140, 141, and 142 were decreased by .10 as per Factor (5).

Central Plaza - The patronage factors northeast of the Miami River were increased by .10 as per Factor (4). The patronage factors for traffic zones 322, 323, 325, 326, 327, 44, 293, 294, 295 and 299 were decreased by .10 as per Factor (5).

Dadeland Mall - The patronage factors to the SSW sectors were increased .10 as per Factor (1). The patronage factors in traffic zones 322, 323, 324, 325, 326, 327, 44, 45, 355, 356, 357 and 358 were reduced by .10 as per Factor (5).

(1) Mel Conner & Associates, Inc., Dade County Productions and Attractions Abbreviations listing, Gravity Model Run, Home based person trips for shopping and convenience goods.

Cutler Ridge - The patronage factors were increased by .10 to the NNE sector as per Factor (1). The patronage factors were increased by .50 to the WSW and SSW sectors as per Factors (1) and (3). The WSW and SSW sectors were extended to $r_t \log 50$ with a patronage factor of .50. The basis of adjustment is the great amount of trip attractions from that area coupled with easy accessibility via U. S. Highway #1.

Westchester - The patronage factors were increased by .20 to the WSW and WNW sectors as per Factor (3). The patronage factors for traffic zones 322, 323, 324, 325, 326, 327, 355, 356, 359 and 358 were decreased by .10 as per Factor (5).

Palm Springs Mile - The patronage factors were decreased by .10 south of the Airport Expressway as per Factor (4), and the traffic zones south of the Miami International Airport were eliminated from the trade area as per Factor (4). The patronage factors for traffic zones 292, 293, 294, 295, 299, 213, 141, 142, 139, and 140 even decreased by .10 as per Factor (5).

Northside Shopping Center - The area south of Miami International Airport was eliminated from the trade area as per Factor (4). The patronage factor for traffic zones 213, 159, 160, 161, 139, 140, 141, 142, 292, 293, 294, 295 and 299 plus the Miami CBD were decreased by .10 as per Factor (5).

The preliminary table for the proportional estimate of income (Y_a^{tz}) for Spring 1964 was used in this test. The second table of patronage factors was constructed with respect to the adjustments made in the trade areas discussed above. The second table for the Allocation of Proportional Income Estimates was constructed. The sums of the allocation of proportional incomes (SI_a^{scn}) were derived for each shopping center. The next step involved deriving the control factor.

The elements and results of the control factor for the Second Test are illustrated below, and follow the same procedure as discussed in the First Test.

$$f_1 = \frac{TRA}{Y_a} = \frac{1,005,161}{1,928,152} = 52.130\%$$

$$f_2 = \frac{TCR_a}{TI_a} = \frac{139,545}{762,240.0} = 18.307\%$$

$$F_{64} f_1 \cdot f_2 = 52.130 \cdot 18.307 = 9.543\%$$

The final step was to factor the allocation of proportional incomes (SI_{a}^{SCn}) by the control factor.

Results of the Second Test

Shopping Center	SI_{a}^{SCn} Allocation of Proportional Income to Shopping Center	RA_{a}^{SCn} Allocation of Income after Factoring by 9.543%	Variance from Actual Sales
Central Plaza	\$ 135,873.2	\$ 12,967.0	+ 10.4%
Westchester	135,337.4	12,915.9	+ 16.5%
Dadeland Mall	208,820.0	19,928.7	+ 15.5%
Cutler Ridge	75,374.4	7,193.3	- 31.4%
163rd Street	309,745.1	29,560.4	- 17.0%
Palm Springs Mile	172,844.1	16,495.3	+ 3.1%
Northside	338,718.7	32,325.5	+ 16.3%
Biscayne Plaza	85,477.7	8,157.5	- 13.8%

The results of the second test yielded an average variance of 15.5% which is a 43% improvement over the 27.2% average variance of the first test. An analysis of the individual shopping centers indicated the most volatile factor to be the estimate of the trade areas. The answer to this problem was deemed too important to be based on personal value judgment. A correlation to a Link-Node Network was established in the following two tests. This was done to eliminate the personal value judgment inherent in the preceding two tests.

Third Test

The purpose of the third test was to establish a relationship between the Link-Node Network and the trade area radius (r_t). This attempt was based on the fact that the consensus of market research technique uses driving time as a determinant for the trade area. A secondary consideration, is the availability of a 1985 Dade County Link-Node Network. This test adjusted the radii of the trade areas for the four northern most shopping centers. It was intended to establish a high correlation between the estimated and actual retail sales. Once a correlation has been established, a relationship between driving time and the facilities within each shopping center will be determined.

The following adjustments were made to correct the trade areas of

the four northernmost centers:

- (1) Reduce the trade area of Northside to 6.5 miles, as in the first test.
- (2) Reduce the patronage factors of Northside in the SSE sector as per Factor (3) from the second test.
- (3) Reduce the patronage factors of Westchester in the ENE and ESE sectors as per Factor (3) from the second test.
- (4) Eliminate Hollywood Mall from the influence of 163rd Street Shopping Center, since it was not operational in Spring 1964.

The above adjustments yielded a new set of trade areas as follows:

<u>Shopping Center</u>	<u>Radii</u>
Biscayne Plaza	4.0 miles
163rd Street Shopping Center	7.5 miles
Central Plaza	3.5 miles
Dadeland Mall	6.5 miles
Cutler Ridge Shopping Center	7.5 miles
Westchester Shopping Center	5.0 miles
Palm Springs Mile	7.0 miles
Northside Shopping Center	6.5 miles

The same adjustments were made to the trade area as in the second test, with the exception of adjustment (2) and (3) on the preceding page. The preliminary table for the proportional estimate of income (Y_a^{TZ}) for Spring 1964 was used once again. The third table for the patronage factors was constructed with respect to the adjustments from the second test and adjustments (2) and (3) on the preceding page. The third table for the allocation of Proportional Income Estimates was constructed and the sums of the allocations (SI_a^{SCn}) were derived for each shopping center. The next step was to derive the control factor.

The elements and results for the third test are illustrated below, and follow the same procedure as discussed in the first test.

$$f_1 = \frac{TRa}{Ya} = \frac{1,005,161}{1,928,152} = 52.130\%$$

$$f_2 = \frac{TCRa}{TLa} = \frac{139,545}{759,378} = 18.376\%$$

$$F_{64} = f_1 \cdot f_2 = 52.130 \cdot 18.376 = 9.579\%$$

The next step was to apply the control factor to the allocation of proportional incomes by shopping center (SI_a^{SCn}).

Results of Third Test

Shopping Center	SI_a^{SCn} Allocation of Proportional Income to Shopping Center	R_a^{SCn} Allocation of Income after Factoring by 9.5797	Variance from Actual Sales
Central Plaza	\$ 142,709.9	\$ 13,671.1	+ 16.5%
Westchester	131,249.9	12,573.3	+ 13.5%
Dadeland Mall	210,722.6	20,186.5	+ 17.0%
Cutler Ridge	75,374.4	7,220.6	- 31.7%
163rd Street	333,713.9	31,968.7	- 10.3%
Palm Springs Mile	175,177.4	16,781.4	+ 4.9%
Northside	284,162.3	27,221.8	- 2.1%
Biscayne	103,590.8	9,923.7	+ 4.8%

The results of the third test yielded an average variance of 12.6% which is a 19% improvement over the 15.5% average variance resulting from the second test. The comparison of the variances of the northernmost shopping centers shows an average variance in the second test of 12.6%, and an average variance of only 5.5% in this test. This was an improvement of 56% over the variances of the second test. This vast improvement led to the fourth test which adjusts the southernmost shopping centers.

Fourth Test

The purpose of the fourth test was to adjust the radii of the

southernmost centers to establish a high correlation between the estimated and actual retail sales. The combined results of this and the third test will be used to project the trade area radii (r_t) for 1985. The most valuable result of these findings will be the control factor, to be used in the 1985 projection.

To facilitate the correction of the trade areas for the southernmost centers the following adjustments were made:

- (1) Reduce the trade area of Dadeland to 6.0 miles.
- (2) Reduce the trade area of Central to 3.25 miles.
- (3) Adjust the patronage factors for Westchester in the ENE and ESE sectors to a 90-70-50-30-10 sequence from the center as per Factor (3) from the second test. Also, adjust the patronage factors down .10 south of U. S. Highway #1 as per Factor (4) from the second test.
- (4) Reduce the patronage factors for Central by .10 to the SSE sector as per Factor (3) from the second test.

The application of the above adjustments yielded a new set of trade areas as follows:

<u>Shopping Center</u>	<u>Radii</u>
Biscayne Plaza	4.0 miles
163rd Street Shopping Center	7.5 miles
Central Plaza	3.25 miles
Dadeland Mall	6.0 miles
Cutler Ridge	7.5 miles
Westchester Shopping Center	5.0 miles
Palm Springs Mile	7.0 miles
Northside Shopping Center	6.5 miles

The same adjustments were made to the trade areas as were made in the third test with the exception of adjustments (3) and (4) above. The preliminary table for the proportional estimate of income (Y_a^{t2}) for Spring 1964 was again utilized. The fourth table for the patronage factors was constructed with respect to the combined adjustments made in the second, third and fourth tests. The fourth table for the Allocation of Proportional Income Estimates was constructed and the sums (SI_a^{SCn}) derived for each shopping center. Once again the control factor was derived.

The elements and results for the fourth test are illustrated below, and follow the same procedure as discussed in the first test.

$$f_1 = \frac{TR_a}{Y_a} = \frac{1,005,161}{1,928,152} = 52.130\%$$

$$f_2 = \frac{TCR_a}{TI_a} = \frac{139,545}{749,378} = 18.621\%$$

$$F_{64} = f_1 \cdot f_2 = 52.130 \cdot 18.621 = 9.707\%$$

The final step was to apply the control factor to the allocation of proportional incomes by shopping centers. (SI_a^{SCn})

The results of the fourth test yielded an average variance of 8.4% (See page 22.) which is a 33% improvement over the 12.6% average variance resulting from the third test. The comparison of the variances of the southernmost shopping centers shows an average variance in the third test of 19.7% and an average variance of only 11.1% for this test. This is an improvement of 44% from the previous test.

APPENDIX VII - SHOPPING CENTER SIZE - DRIVING TIME RATIO, 1985

Least Squares Correlation

y	x	x ²	xy	yc
620	20.5	420.2	12,710	598
455	17.5	306.2	7,962	467
452	16.1	259.2	7,277	405
343	14.2	201.6	4,871	322
310	12.6	158.7	3,906	252
281	13.4	179.5	3,765	287
256	12.6	158.7	3,226	252
221	14.9	222.0	3,293	353
2,938	121.8	1,906.4	47,010	

$$2,938 = 8a + 121.8b \quad (121.8 \div 8 = 15.225 \times 2,938 = 44,731)$$

$$47,010 = 121.8a + 1,906.4b$$

$$44,731 = 121.8a + 1,854.4b \quad (121.8 \times 15.225 = 1,854.4)$$

$$47,010 = 121.8a + 1,906.4b$$

$$-2,279 = 0 \quad - \quad 52.0b$$

$$2,279 = 52.0b$$

$$b = 43.83$$

$$2,938 = 8a + 121.8(43.83)$$

$$2,938 = 8a + 5,338$$

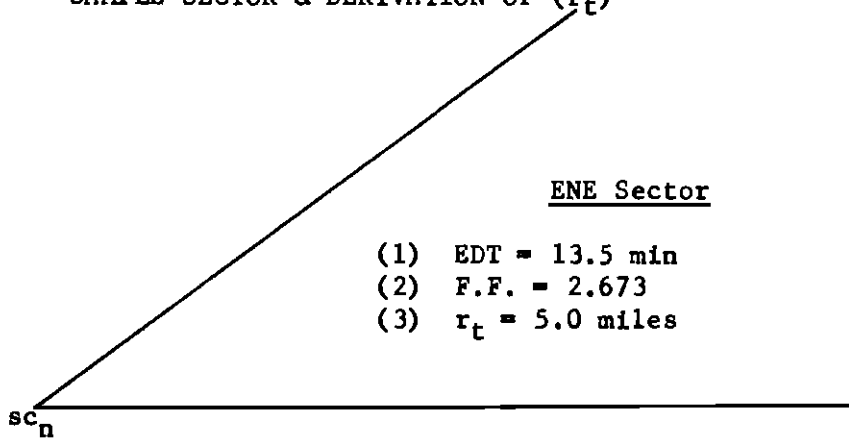
$$-2,400 = 8a$$

$$-300 = a$$

$$y_c = -300 + 43.83x$$

APPENDIX VIII. - DERIVING DRIVING RADII FOR TRADE AREA SECTOR, 1985

SAMPLE SECTOR & DERIVATION OF (r_t)



- (1) Derived from the Facilities - Driving Time Ratio, with the sizes of centers approximated.
- (2) Derived from the Link-Node Network #3 - 1985.
- (3) $\frac{EDT}{F.F.} = \frac{13.5}{2,673} = r_t$

APPENDIX IX. - DERIVING INCOME FOR TRADE AREAS, 1985

After the trade area radii are set for the proposed shopping centers the method of estimating retail sales is the same used in the 1964 tests of the model.

- (1) The Proportional Estimate of Income by traffic zone - 1985 were derived, (Y_{85}^z).
- (2) Patronage Factors for Shopping Centers by Traffic Zone were determined (P_{85}^{scn}).
- (3) The Proportional Income Estimate for Shopping Centers by Traffic Zone was allocated, ($I_{85}^{scn/tz1}$).

The final step was to apply the control factor developed as a result of the fourth test. Thus, the total allocations of proportional income to shopping centers (SI_{85}^{scn}) are factored by F_{64} or 9.707.

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