CONTROVERSIAL CORRIDORS REVIEW:
Recommended Transportation Alternatives

prepared for the
Miami Urban Area Transportation Study
by the
Network Revision Sub-committee of the
Miami Urban Area Transportation Study

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METROPOLITAN DADE COUNTY PLANNING DEPARTMENT

FOREWORD

The Miami Urban Area Transportation Study (MUATS) was organized to provide Dade County with continuous, cooperative and comprehensive transportation planning in conformance with the Federal-Aid Highway Act of 1962 and the Mass Transit Act of 1964, and subsequent refinements in Federal requirements. MUATS is a joint effort of state and local agencies which contribute funds and manpower in the production of technical data and findings for transportation-related matters. In turn, this information provides a sound basis upon which transportation and future development issues may be discussed and decisions reached at both the technical and policy level.

MUATS is directed by a Policy Committee consisting of elected officials and heads of agencies at the local, state and federal levels who can commit funds for planning, development, and implementation of transportation projects. The Policy Committee is charged with the responsibility of making the basic policy decisions and to expedite the implementation of an approved transportation plan that will put into effect local goals and objectives.

The Policy Committee is assisted in making policy decisions by professional staff which forms the Technical Planning Committee. The Technical Planning Committee serves as a technical coordinating, review and advisory body to the Policy Committee.

The Network Revision Sub-Committee, as part of the Technical Planning Committee, has been charged with the responsibility to review and analyze transportation alternatives in six controversial corridors in Dade County. This report contains the Sub-Committee's recommendations and documents a substantial amount of data and information developed and analyzed.

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SUMMARY

The Network Revision Sub-Committee of the MUATS Technical Planning Committee has reviewed the Controversial Corridors issue which evolved from the 1969 MUATS plan. This review includes revised demographic and land use projections as compared to the first MUATS effort and applies them to four different transportation networks for the year 1985. The four networks were based upon:

A - Arterial roadway emphasis
B - Transit emphasis
C - "Do Nothing" concept
D - MUATS expressway concept

The four concepts were reviewed at both the system and corridor levels to examine the impacts of the alternatives. The alternative concepts were studied in view of social, environmental, operational and cost criteria. Based upon the review and the data available to the Network Revision Sub-Committee , the following general recommendations were reached:

1. By 1985 there should not be any extension of the existing or presently committed expressway network.

2. The original MUATS arterial improvements plus the recommendations of this report and presently contemplated transit improvements, in conjunction with the activity center land use concept proposed in the County Comprehensive Plan, will constitute the most accepted transportation network available by 1985.

3. In view of the rapidly changing data base during the planning process; changed community attitudes since the 1969 MUATS program, altered area growth patterns, and the development of the transit improvement program completion by 1985, a new transportation update should be undertaken for the year 2000 utilizing new factors regarding transportation needs.

4. Upon resolution of the issues raised in this study, the MUATS Network Revision Sub-Committee will review those facilities not covered within the scope of this work. This will provide a refined network for future planning purposes.

5. The revised MUATS plan recommended by this study and subsequent review should form the base for all future transportation planning efforts.

OBSERVATIONS

In the course of undertaking the Controversial Corridors Review, the Network Revision Sub-Committee attempted to review and analyze six expressways and their alternatives. The review of the various proposals became based upon the results of four hypothetical networks for 1985. Two hypothetical 2000 networks were also developed.

These networks were developed for comparative purposes. Different land use concepts constituted an element of variation between some networks, but not among all of them. The land use/transportation systems investigated are described below:

Network A - (Do Nothing) The highway network consists of only those expressways under construction or committed, and the surface arterial streets suggested in the MUATS plan. The transit network is the Simpson and Curtin recommended rapid transit system and supporting bus system. The 1985 land use past trends projections are used.

Network B - (Arterial Emphasis) The highway network includes improvements to the surface arterial streets beyond those proposed in the basic network (Network A). No expressways except those now under construction are included. The transit network incorporates the Simpson and Curtin recommended system. The 1985 land use past trends are used.

Network C - (Transit Empahsis) The highway and transit networks are the same as those used in Network A. The 1985 land use plan associated with the network reallocates more activity in those areas of anticipated high transit accessibility rather than using the 1985 past trends land use plan.

Network D - (Full MUATS) This network includes all expressways, surface arterials, and transit facilities of the initial MUATS recommendations. The accompanying land uses are based on a projection of past trends to 1985.

Network E - (Do Nothing) The transportation network is the same as that for Network A and C - controversial expressways are removed and no improvements to surface arterials or transit beyond those proposed in the MUATS plan. In this alternate, the year 2000 land uses are based on projections of past land use trends.

Network F - (Transit Emphasis) The highway network consists of deletion of new expressways with surface arterial improvements as suggested in the MUATS plan. The transit network (116 miles) and services are vastly expanded. The year 2000 land uses are reallocated around activity centers throughout the County, rather than as a projection of past land use trends to the year 2000.

The limitations and purpose of the Controversial Corridor Review have led to some vital observations about the results of the effort. These observations are:

1. The results of the network tests should be used only when comparing alternatives with each other.

2. Major changes in transportation policy and land use proposed by the Comprehensive Development Master Plan are not included in the network testing procedures; nor are the Comprehensive Plan policy changes reflected in any of the evaluation criteria used in the study with the exception of "social" criteria.

   The recommendations of this Study take into account the latest proposals of the Comprehensive Plan and rapid transit proposals, even though these elements were different from those used in network testing.

   Therefore, the major changes in those two elements of the transportation plan lead the Network Revision Sub-Committee to recommend alternatives not borne-out by the alternative testing process but which the Sub-Committee feels will accommodate 1985 transportation needs as well as comply with the Comprehensive Plan.

3. The latest rapid transit concept proposed by Kaiser Engineers is considerably different from the Simpson & Curtin concept, both in coverage and modal split. The Simpson & Curtin system anticipates carrying 6.9% of all County trips, whereas the Kaiser concept anticipates carrying 12.0% of all County trips. This difference shifts over 300,000 trips daily onto transit. This figure could be increased or decreased when the modal split model used by Kaiser Engineers is calibrated.

4. Present trip characteristics (1974) for Dade County are estimated as follows: *

<u>1974 Total Daily Person Trips</u> - 4,000,000

Short Distance (within 51 district) trips ...	800,000
Expressway trips..........................	800,000
Transit trips................................	200,000
All other (arterial, collector)...............	2,200,000

*Source: Wilbur Smith unpublished work for Dade County Transit Improvement Program.

5. To meet 1985 travel demand an extra 1,400,000 daily trips must be accommodated. In actuality, provisions have been made for some of these trips through committed road improvements to be built by 1985 and increased vehicle use of presently underutilized streets. These improvements and the proposed Simpson and Curtin bus system could accommodate nearly 900,000 of the anticipated 1974 to 1985 increase.

However, the transportation network, even with the committed or proposed expansion over existing facilities, will still have a 900,000 person trip capacity below the 1985 anticipated demand for the entire county. In certain corridors the difference between demand and available facilities could be higher or lower than the county-wide average.

<u>1985 Total Daily Person Trip Demand</u> - 6,000,000

Short distance (within 51 district) trips ...	1,200,000
Expressway trips	1,200,000
Transit	300,000
All Other (arterial, collector, secondary)...	2,400,000
Total Daily Person Trip Capacity.....	5,100,000

A combination of several possible alternatives based upon land use changes, increased congestion levels, more expressways, more transit facilities, and more arterial streets will be needed to handle the extra 900,000 trips that have not been provided for. The maximum capacity of all proposed facilities (expressway, transit, arterials, etc.) could handle 1,500,000 extra person trips, or 600,000 more person trips than are needed by 1985. Thus a combination of some alternatives in full or part could handle the 1985 demand.

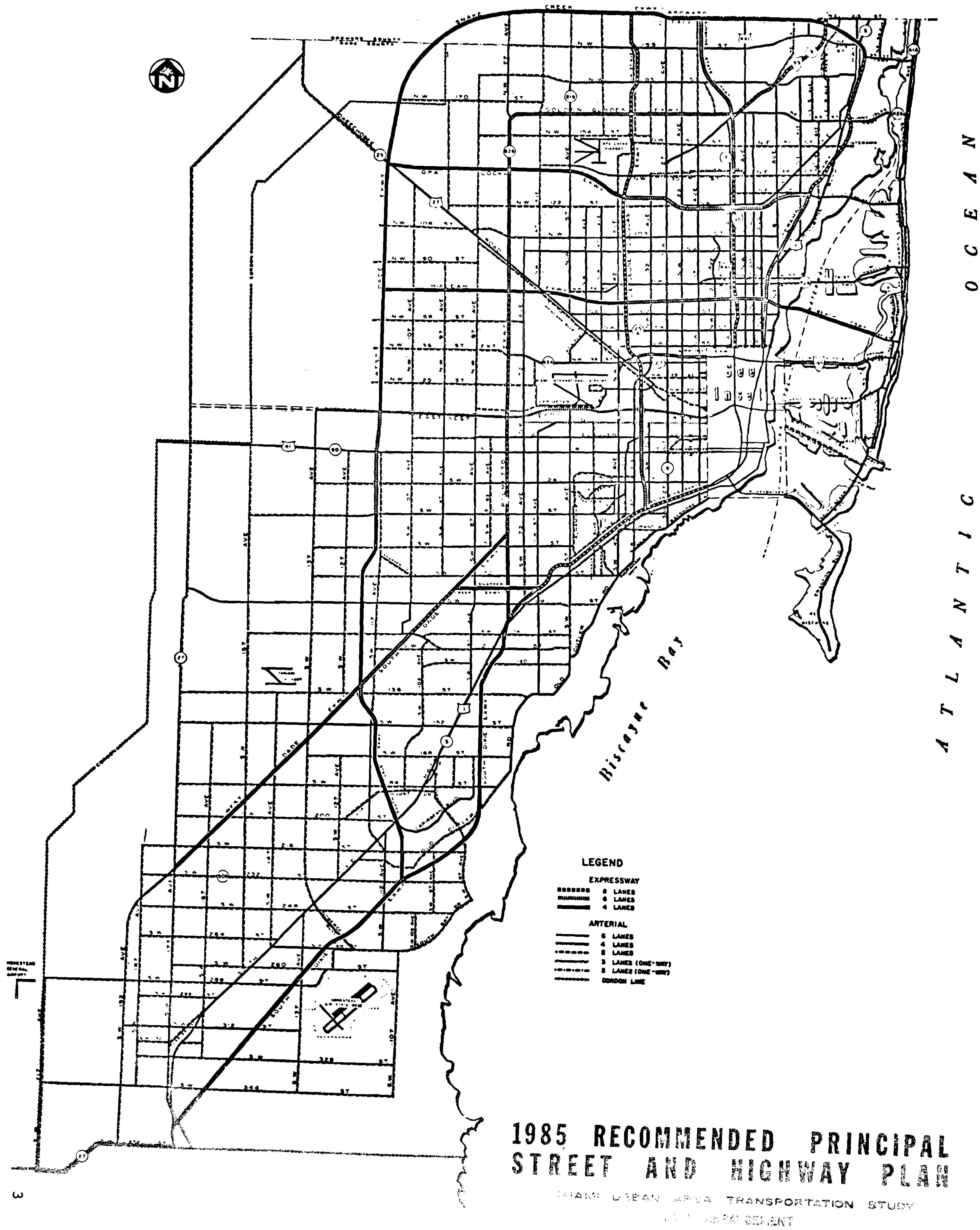
1985 Total Daily Person Trip Maximum Capacity

	Maximum Capacity of Proposed Facilities
Short Distance Trips....................	1,200,000
Expressway Trips......................	1,600,000
Transit Trips..........................	800,000
All Other (arterials, Collector, etc.)....	3,000,000
Total Daily Person Trip Capacity..	6,600,000

Thus, in actuality, any combination of expressway, transit and arterial proposals could conceiveably be implemented to meet 1985 demand. However, because of the short time span between now and 1985, the Sub-Committee is unsure of the extent to which new facility improvements can be implemented to meet the anticipated demand.

6. The many changes made to the data base used in this Study and the newly formulated County policies regarding transportation have not been tested. Such a test for 1985 is highly recommended.

7. The MUATS Committees must begin to examine transportation needs beyond 1985 as soon as possible. A long range transportation planning horizon year of 2000 is recommended.



ATLANTIC OCEAN
Biscayne Bay
See Inset
LEGEND
EXPRESSWAY
8 LANES
6 LANES
4 LANES
ARTERIAL
6 LANES
4 LANES
2 LANES
3 LANES (ONE-WAY)
2 LANES (ONE-WAY)
CORDON LINE
1985 RECOMMENDED PRINCIPAL
STREET AND HIGHWAY PLAN
MIAMI URBAN AREA TRANSPORTATION STUDY

Figure 1

INTRODUCTION

In 1969, the initial stage of the Miami Urban Area Transportation Master Plan was completed. The five year effort which culminated in the plan proposals included elements for highways, mass transit, seaports, airports, and terminals. The Transportation Master Plan represented a refinement of the transportation element of the General Land Use Master Plan adopted in 1965. When adopted, the transportation plan was scheduled to be considered a part of Dade County's evolving Comprehensive Master Plan which includes several component parts (See Figure 1 for an illustration of the highway element of the proposed plan).

This report contains a technical evaluation of some of the corridors where certain highway facilities proposed in the Transportation Master Plan were opposed by various citizen groups. Also included are recommendations for possible alternative transportation facilities and/or services which should be provided in these "controversial" corridors.

Background

Dade County during the 1960's was one of the fastest growing urban regions in the United States. Future growth in the County was projected to continue at a rapid pace with Dade County reaching a population of two million persons by 1985. The transportation plan which was prepared reflected the philosophy of the time: the future amount of transportation facilities provided should be great enough to meet the travel demands anticipated in 1985. The plan thus contained recommendations for an extensive network of new expressways in both the already urbanized areas of the County and stretching out past the then urban fringe providing new accessibility to land suitable for urban uses. To meet forecast travel demands, the street and highway plan for 1985 recommended an estimated $800 to $900 million (1969 dollars) program for the addition of nine expressways, the development of eight express streets and the improvement and extension of arterial streets.

The original MUATS plan also recommended an energetic program of surface bus improvements and grade-separated transit facilities to be implemented by 1985 to satisfactorily accommodate future travel demands. The original plan (January 1969) envisioned a new rapid transit system connecting Interama, Miami Beach, downtown Miami and Miami International Airport together with a "bus-way" on the mainland to accommodate projected north-south movements. Unescalated capital costs of the recommended plan totaled $378 million. Between 1969 and 1972 the plan was refined before being placed on the ballot for voter approval. The revised plan, often referred to as the Simpson and Curtin Plan, consisted of 54 miles of grade separated rapid transit with 54 stations, extensive local, feeder and express bus improvements, and "mini-systems" at a few selected rapid transit terminals. At that time,

capital costs were estimated at $805 million. This cost estimate included the effects of escalation during a short construction period and assumed construction would not be unduly delayed.

The recommended principal street and highway system for 1985 generally conforms to a north-south and east-west grid system extending from the Atlantic Ocean to the western hinterlands with existing streets comprising a large part of the network. A total of 328 new miles of arterial streets were scheduled to be added to the existing network. The total network was anticipated to serve an average of 5 million vehicle trips per day by 1985.

In adsition, about 153 miles of new expressways were proposed to be built and 25 miles of existing expressways were to be widened at a cost of $500 million. By 1975, the plan recommended that five expressways, costing a total of $212 million, should be in operation. The first expressways scheduled for construction were the following:

- South Dade Expressway (from Palmetto Expressway to Hainlin Mill Drive near the proposed South Dade Government Center)

- South Dixie Expressway (from I-95 and S.W. 26 Road to S.W. 112 Street)

- Snapper Creek (from South Dixie Expressway to South Dade Expressway)

- LeJeune-Douglas Expressway (from Golden Glades Expressway to South Dixie Expressway)

- Interama (from the Snake Creek Expressway to the Opa-locka Expressway)

Recommended for development between 1976 and 1985 were the addition of four, the extension of five, and the widening of three expressways. The following four expressways were to be added to the network during this ten year period:

- Snake Creek Expressway (from Sunshine State Parkway to Opa-locka Expressway)

- Opa-locka Expressway (from Interama Expressway to West Dade Expressway)

- Beach Causeway-Hialeah Expressway (Alton Road to West Dade Expressway)

- West Dade Expressway (from Opa-locka Expressway to 177 Avenue)

The extension of the following five expressways was also recommended after 1976:

. South Dade Expressway (from Hainlin Mill Drive near the proposed South Dade Government Center to South Dixie Expressway)

. LeJeune-Douglas Expressway (from Golden Glades Expressway to Snake Creek Expressway)

. East-West Expressway (from Palmetto Expressway to West Dade Expressway)

. Interama Expressway (from Opa-locka Expressway to I-95 and S.W. 29 Road)

. South Dixie Expressway (from S.W. 112 Street to S.W. 312 Street)

The widening of the following three expressways was also recommended:

. Golden Glades Expressway (from I-95 to Palmetto Expressway) to 6 lanes

. Palmetto Expressway (from Golden Glades to Hialeah Expressway to 6 lanes; from Hialeah Expressway to South Dade Expressway to 8 lanes)

. I-95 (from Golden Glades Interchange to County line to 8 lanes)

All proposed expressway extensions and additions are shown on Figure 2. Expressways already built are indicated by a solid line while a dashed line represents those proposed expressways still to be built.

Although the Transportation Master Plan was published in 1969, no public hearings leading to its official adoption were held until 1971 and 1972. At that time, a series of public hearings held throughout Dade County by the Planning Advisory Board revealed strong opposition from neighborhood groups to many of the expressway proposals contained in the plan.

Late in 1972 the Policy Committee of the Miami Urban Area Transportation Study, at the request of both state and local officials, formed the Network Revision Sub-Committee in order to analyze in technical terms the implications for Dade County's transportation network resulting from the deletion of some of the proposed expressways. The Sub-Committee was also charged with the

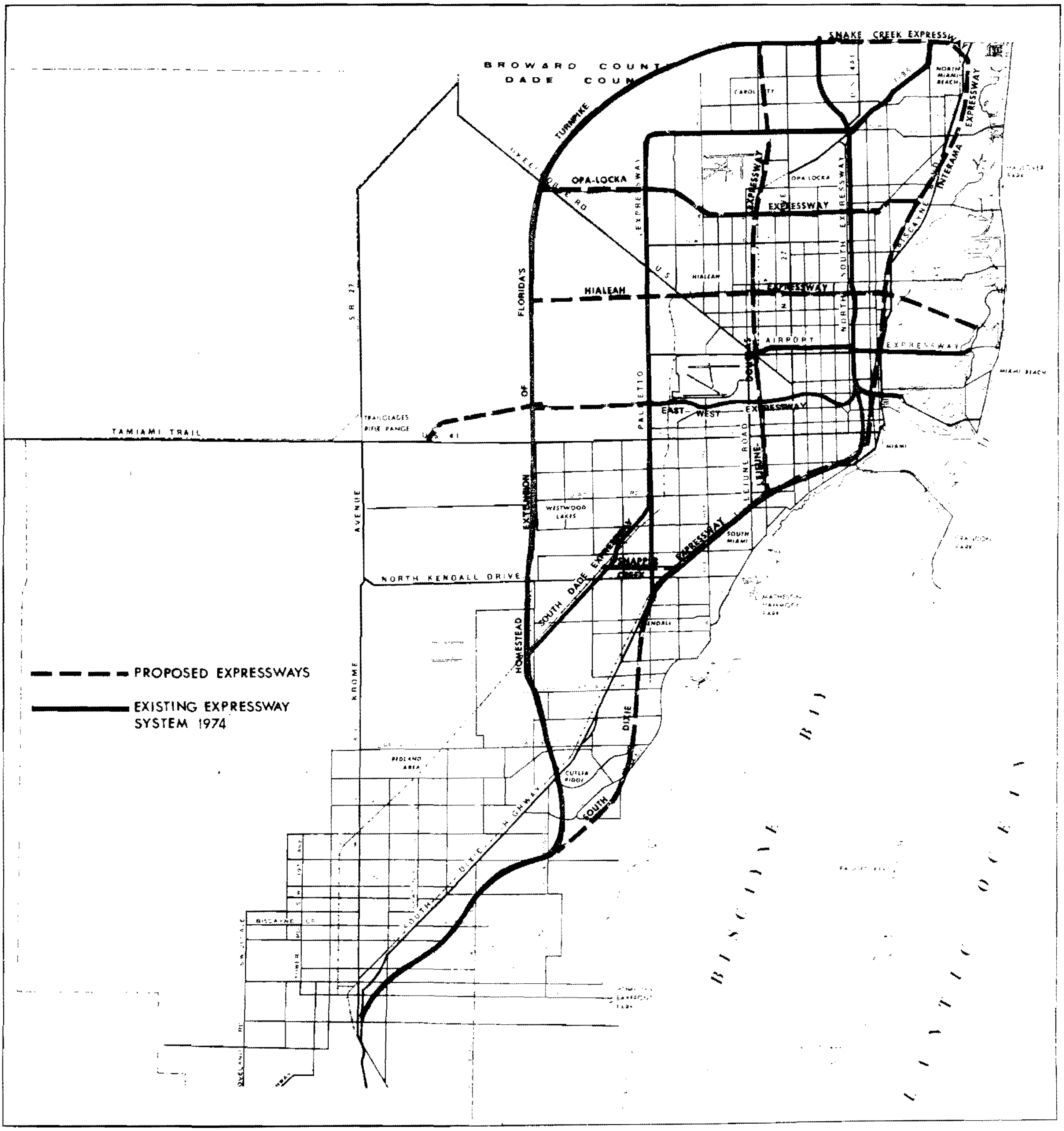


FIGURE 2

EXISTING AND PROPOSED EXPRESSWAY SYSTEM

responsibility of formulating alternative transportation facilities and/or services in the controversial corridors. Assigned to the Sub-Committee were technical staff representing the Florida Department of Transportation, the Dade County Planning Department, the Dade County Public Works Department, the Dade County Department of Traffic and Transportation, and the Dade County Manager's Office.

Purpose and Scope

The Network Revision Sub-Committee reviewed and analyzed transportation alternatives in the following six controversial corridors in Dade County:

1. South Dixie - from I-95 to the intersection with the Homestead Extension of Florida's Turnpike.
2. LeJeune-Douglas - from the Broward County line to the South Dixie Highway.
3. Interama - from I-95 to the Snake Creek (North Dade) Expressway.
4. Snake Creek (North Dade) - from the Sunshine State Parkway to the Interama Expressway.
5. Hialeah - from the Homestead Extension of Florida's Turnpike to Alton Road in Miami Beach.
6. Opa-locka - from N.W. 27 Avenue to the Interama Expressway.

These corridors are illustrated in Figure 3.

The first phase of this corridor analysis determined the actual network deficiencies caused by deleting the planned controversial expressways. Numerical deficiencies in terms of vehicular demand were determined for each controversial corridor by comparing the traffic volumes assigned to the "expressway-out" network with those of the recommended 1985 plan. This represents the "do-nothing" alternative for expressway capital improvements within the urbanized areas of Dade County. The results of this analysis are contained in the report entitled, "Miami Urban Area Transportation Study Controversial Corridors Review: Phase I."

The second phase of the Controversial Corridors Review includes an attempt to develop alternatives that would satisfy projected traffic demands, with consideration of social, environmental, operational and cost limitations. The scope of Phase II is limited to development of the following basic alternatives:

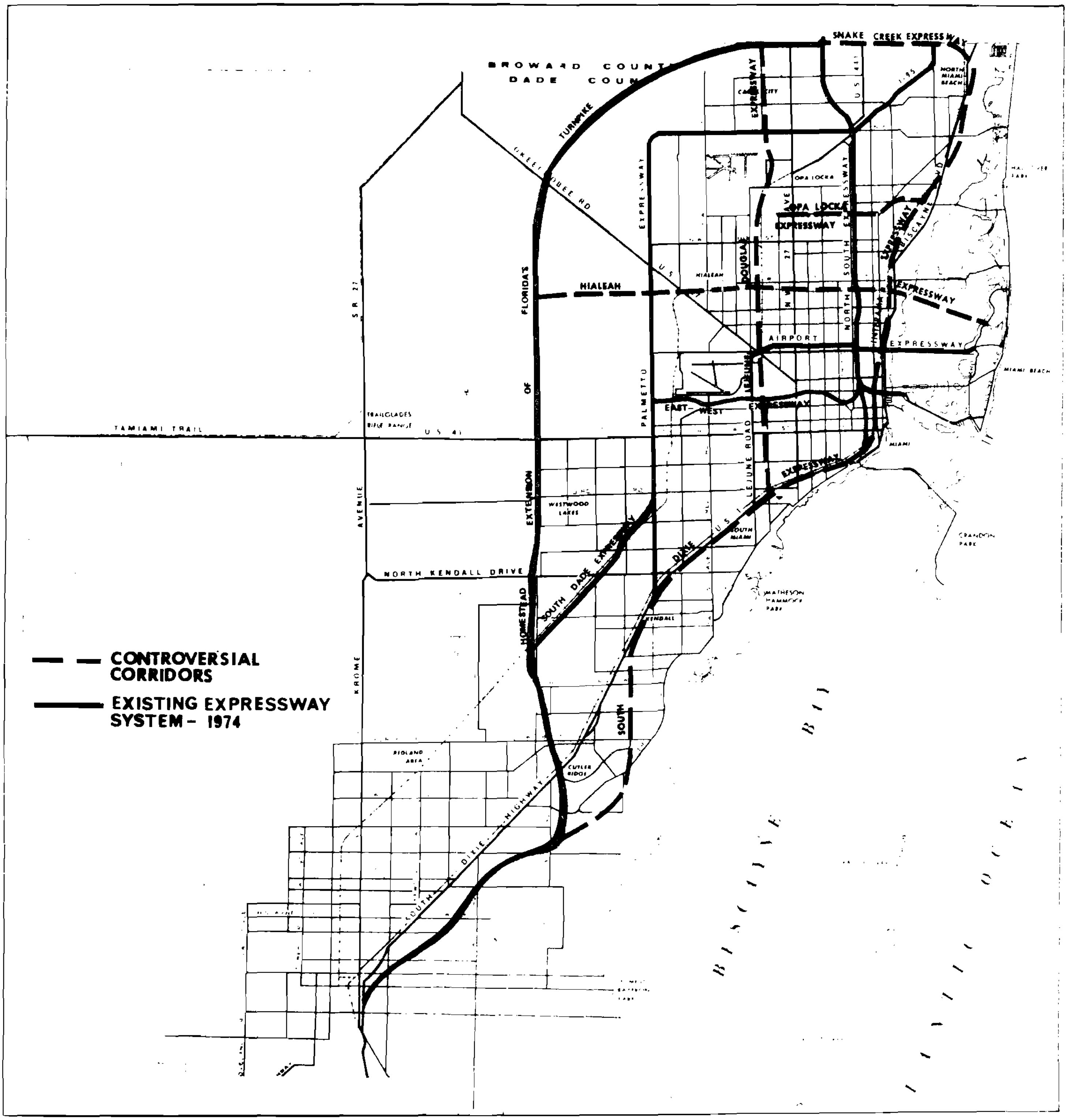


FIGURE 3

CONTROVERSIAL CORRIDORS

1. Additional arterial street improvements;

2. Transit emphasis;

3. Alternate land use development patterns; and

4. Do nothing.

For the first alternative, a detailed review of the planned MUATS Arterial Street System revealed those arterials which with further widening could most effectively carry the future trips previously served by controversial expressways. Second, the residential and commercial land uses were intensified around the rapid transit stations (as defined in the 1972 Transit Technical Study) in an attempt to test the effect of increased transit usage. Third, major concentrated activity centers were developed and situated in an attempt to reduce total travel demands. Fourth, the six controversial expressways were deleted in order to determine the impact of this action on the future street network and to present a base from which other alternatives could be evaluated.

In addition to the relocated land use activity centers projection for the year 2000, three other land use projections were developed for this analysis. The second projection for the year 2000 was based on past development trends experienced in Dade County. Two land use projections were also made for 1985. The first was based on past development trends, and the second was based on past trends with increased residential density and commercial activity around proposed rapid transit stations.

Table 1 shows the combination of transportation networks and land use projections used as a basis for each of the six test assignments. This combination of test networks and land use projections was selected to provide the Sub-Committee with the maximum evaluation of the test network with controversial expressways removed as well as an evaluation of the four alternatives specified by the MUATS Policy Committee. No more than six tests were run due to the effort and expense involved.

The analysis procedures and necessary assumptions for the Controversial Corridors Review are described in the next section of the report.

An analysis utilizing cost, operational, social and environmental criteria was made for each of the six tests performed for Phase II, at both the system and corridor level. The system and corridor evaluations are presented in later chapters of this report.

Table 1

Land Use/Transportation Network Combinations

Land Use Projection \ Transportation Network	Additional Arterial Street Improvements	Controversial Expressways Removed	1985 Recommended MUATS Street and Highway Plan	Expanded Transit
1985 Past Trends	B	A	D	
1985 Transit Emphasis		C		
2000 Past Trends		E		
2000 Relocated Activity Centers				F

Note: Letters in table designate the six land use/transportation systems evaluated.

TESTING PROCEDURES

The travel forecasting process entails trip generation, trip distribution, modal split, and traffic assignment.

Assumptions

Before employing the above techniques, it is necessary to establish four basic assumptions concerning inputs to the process. First, it is assumed that the trip generation and trip distribution models developed during the original MUATS effort are valid. Second, the modal split procedure developed for the Dade County Transit Technical Study is also considered valid. Third, the land use and demographic projections generated by the Dade County Planning Department are assumed to be valid for the purposes of this analysis. Fourth, the networks utilized for this analysis include the 1985 Recommended MUATS Street and Highway Plan, a Controversial Expressways Removed network, and an Additional Arterial Street Improvements network. Each of the above elements are explained more fully below.

Travel Models

In general, these models include trip generation, trip distribution, modal split, and traffic assignment.

Trip Generation

Trip generation is defined as trip production and trip attraction. While the gravity model technique is used to distribute future internal person trips on the basis of productions and attractions, trip generation equations are developed to estimate these future trip productions and attractions by trip purpose for each traffic analysis zone. A step-wise multiple linear regression analysis technique is used in the development of the trip generation equations (or models). The general form of the equations which were developed is:

$$Y = b_o + b_1 X_1 + b_2 X_2 + \dots + b_n X_n$$

where: Y = estimate of trips produced (or attracted) by zone (dependent variable)

$X_1, X_2, \dots X$ = land use or socio-economic factors tested (independent variables)

$b_o, b_1, \dots b_n$ = coefficients determined from the analysis

The regression equations for the original MUATS effort are documented in MUATS Technical Report No. 3, Development of Travel Models. These equations have recently been modified slightly to reduce the total number of land use and socio-economic projections necessary for input to the trip generation process. (See following page for equations listed in their revised form.)

Trip Distribution

Trip distribution models are an important element of the transportation planning process. These models provide an estimate of zonal trip interchanges for alternate plans of both land use and transportation facilities. These zonal trip interchanges constitute a basic part of the travel information necessary for transportation planning. In the Miami Urban Area Transportation Study, trip distribution is accomplished through utilization of a methodology popularly referred to as the "gravity model." As the name implies, this type of model adapts the gravitational concept to the problem of distributing traffic throughout an urban area. In essence, the gravity model says that the trip interchange between zones is directly proportional to the relative attraction of each of the zones in terms of trips generated and is inversely proportional to some function of the spatial separation between the zones. Mathematically, the gravity model is states as follows:

$$T_{ij}=P_i \frac{A_j F_{ij} K_{ij}}{\sum_{j=1}^{n} A_j F_{ij} K_{ij}}$$

Where: T_{ij} = trip produced in zone i and attracted to zone j.

P_i = trips produced by zone i

A_j = trips attracted by zone j.

F_{ij} = empirically derived travel time factor which expresses the average area-wide effect of spatial separation on trip interchanges between zones which are t_{ij} apart. This factor approximates $\frac{1}{t^n}$ where n would vary according to the value of t, and where 5 is the travel time between zones.

K_{ij} = a specific zone-to-zone adjustment factor to allow for the incorporation of the effect on travel patterns or factors not otherwise accounted for in the gravity model formulation.

All equations are listed below in their revised form.

		Multiple Regression Coefficient
Home-Based Trip Production		
Work	= +1.51592 (Resident Labor Force)	.99
Shopping	= +1.05694 (Autos) = +0.51561 (Dwelling Units)	.94
Social-Recreation	= +1.05553 (Autos) +0.94028 (Hotel-Motel Units)	.94
School	= +0.59639 (Autos)	.88
Miscellaneous	= +1.22731 (Autos) +0.63507 (Hotel-Motel Units)	.95
Home-Based Trip Attraction		
Work	= +1.15657 (Total Employment)	.99
General Shopping	= +4.56067 (Total Retail Employment)	.83
Social-Recreation Equation	= +344.62769 +0.12355 (Population) +0.35032 (Commercial Employment) +0.47913 (Hotel-Motel Units)	.69
Miscellaneous Attraction Equation	= +311.86060 +1.04684 (Commercial Employment) +0.31910 (Total Employment)	—
School	= +0.78897 (Grades 1-9 Enrollment) +0.93520 (Grades 10-College & Other Enrollment)	.89
Other		
Taxi	= +0.02823 (Total Employment) +0.04067 (Hotel-Motel Units)	.76
Truck	= -93.36358 +0.11745 (Autos) +0.16255 (Total Employment)	.73
Control		
Total Trip Production	= +6.66493 (Autos)	.98
Total Nonhome-Based Trip Generation	= +1.05939 (Autos)	.93

Description of the distribution model development is stated in MUATS Technical Report No. 3, Development of Travel Models.

Modal Split

A portion of the transportation planning process is modal split modeling. It is, however, one of the more important elements due to its significant impact upon the planning and design of transit systems within urban areas. With current changes in public attitudes regarding transit and the resultant increasing funding emphasis, modal split considerations become even more significant. As mentioned previously, the modal split procedures developed for the Dade County Transit Technical Study were selected for this analysis since it was the most recent model available.

Two distinct modeling elements were developed for estimating transit patronage in Dade County as explained by Simpson and Curtin in Interim Report No. 3, Modal Split Models.

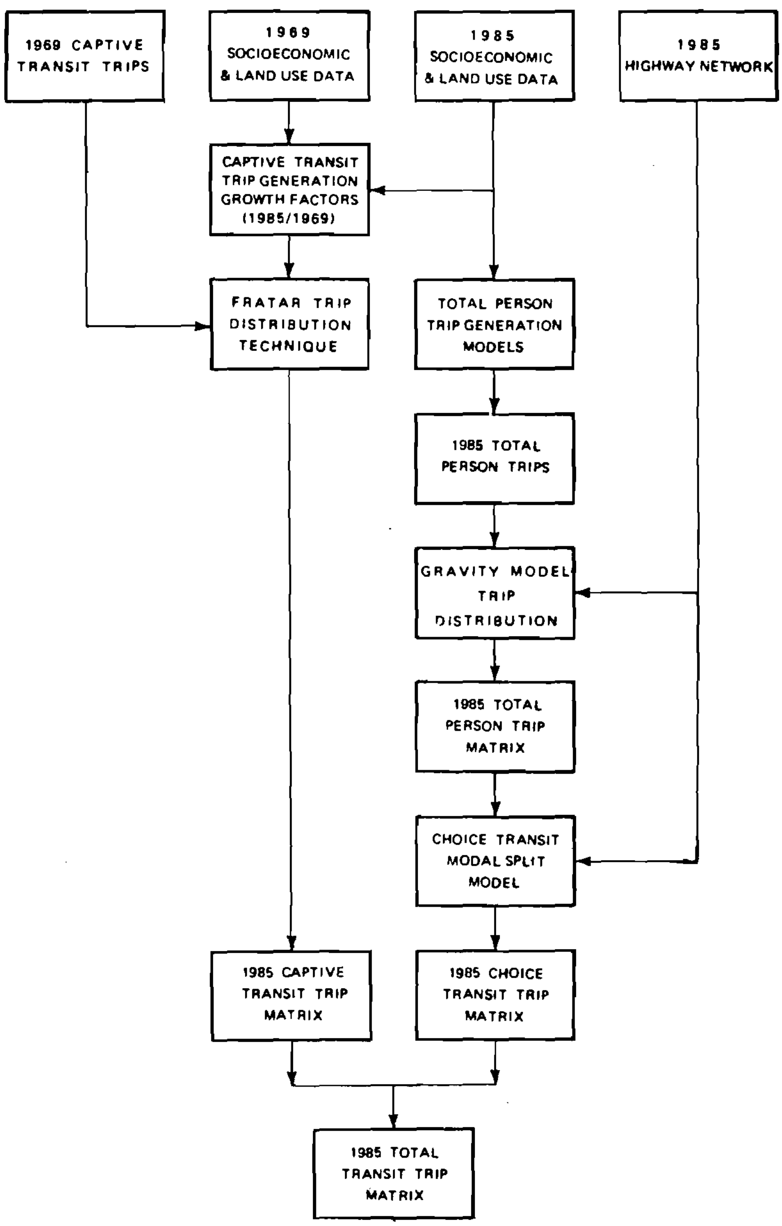
> There are two distinct groups of transit riders in Dade County - captives who have no car available to make their trip and choice riders who can use either auto or transit to complete their trip. The relative attractiveness of the transportation system has no impact on the captive ridership group; if they are to make the trip at all, it must be made by transit. On the other hand, the relative attractiveness of highway and transit facilities is important to choice riders in their selection of travel mode. Thus, two sets of transit trip estimating equations were developed - one for captives and one for choice riders.

For the MUATS Controversial Corridors Review, the Simpson and Curtin captive transit trip estimating procedure was followed directly. The Simpson and Curtin choice modeling procedure, however was simplified due to the less detailed level of effort defined for this study. The transit trip matrix generation procedure for both captive and choice trips is diagrammed in Figure 4. Captive transit trips for the forecast year are produced by applying Fratar factors to a 1969 captive transit trip matrix. Fratar growth factors are based on the increase in zonal trip activity for the forecast year.

Under the Simpson and Curtin procedure, choice transit trips are split off the forecast year person trip table by purpose. For each test performed in the Controversial Corridors Review, modifications are made to the original choice transit trip matrix developed during the Dade County Transit Technical Study. The Fratar modified growth factor technique is employed to factor this 1985 choice transit matrix. Fratar factors are developed based on land use changes which differ significantly from the original 1985 land use projections. Once

Figure 4

Modal Split Process



both choice and captive transit trips are developed, they are combined and subtracted from the person trip matrix to produce a highway trip matrix. A vehicle occupancy model is then applied to obtain a vehicle trip matrix for traffic assignment purposes.

Land Use Projections

In addition to varying the transportation facility network, the study also examined alternative land use projections for 1985 and 2000. These projections, which were preliminary in nature, were prepared by the County Planning Department and were consistent in total County population and employment. The total "universe" was distributed for 1985 on the basis of three different land use concepts. These concepts included: 1) Trend; 2) Transit Emphasis; and 3) Activity Center concept. The population for each of the 723 zonal projections was adjusted to reflect the County-wide land use policy. For the year 2000 a trend land use configuration was utilized as well as projections associated with the activity center concept.

There are several important aspects related to the data used in the Controversial Corridor Review. In summary these are:

1. The Controversial Corridor network used a 1985 County population base of 1,736,000, as opposed to the original MUATS plan of 1,955,000 for the same forecast year.

2. The data for the district testing was a rough-cut prepared by the Dade County Planning Department. An average shift of approximately 3% of the County's population between districts was indicated comparing Trend, Transit Emphasis and Activity Center land use concepts. Projected employment was relatively stable for all three tests.

3. Recent Dade County Planning projections indicate major differences between district employment figures between trend, transit, and activity center concepts. These shifts were not available in time to have been incorporated in the Controversial Corridor Review.

4. It is assumed that a transit system would not appreciably shift land use activities by 1985. However, a transit network could change land use concentrations by the year 2000. The year 2000 transit emphasis network (F) had a 116 mile transit system with an activity center land use pattern.

Limitations in schedules, base data availability and related factors were not favorable to the program. Therefore, it is important to realize the limitations built into the 1985 and 2000 networks which do not reflect more current data. (See Appendix A.)

Transportation Networks

The specific networks under evaluation in terms of the transit and highway facilities and associated land use include the following:

Network A — The highway network consists of only those expressways under construction or committed, and the surface arterial streets suggested in the MUATS plan. The transit network is the Simpson and Curtin recommended rapid transit system and supporting bus system. Figure 5 illustrates the recommended rapid transit system. A 1985 land use past trends projection are used.

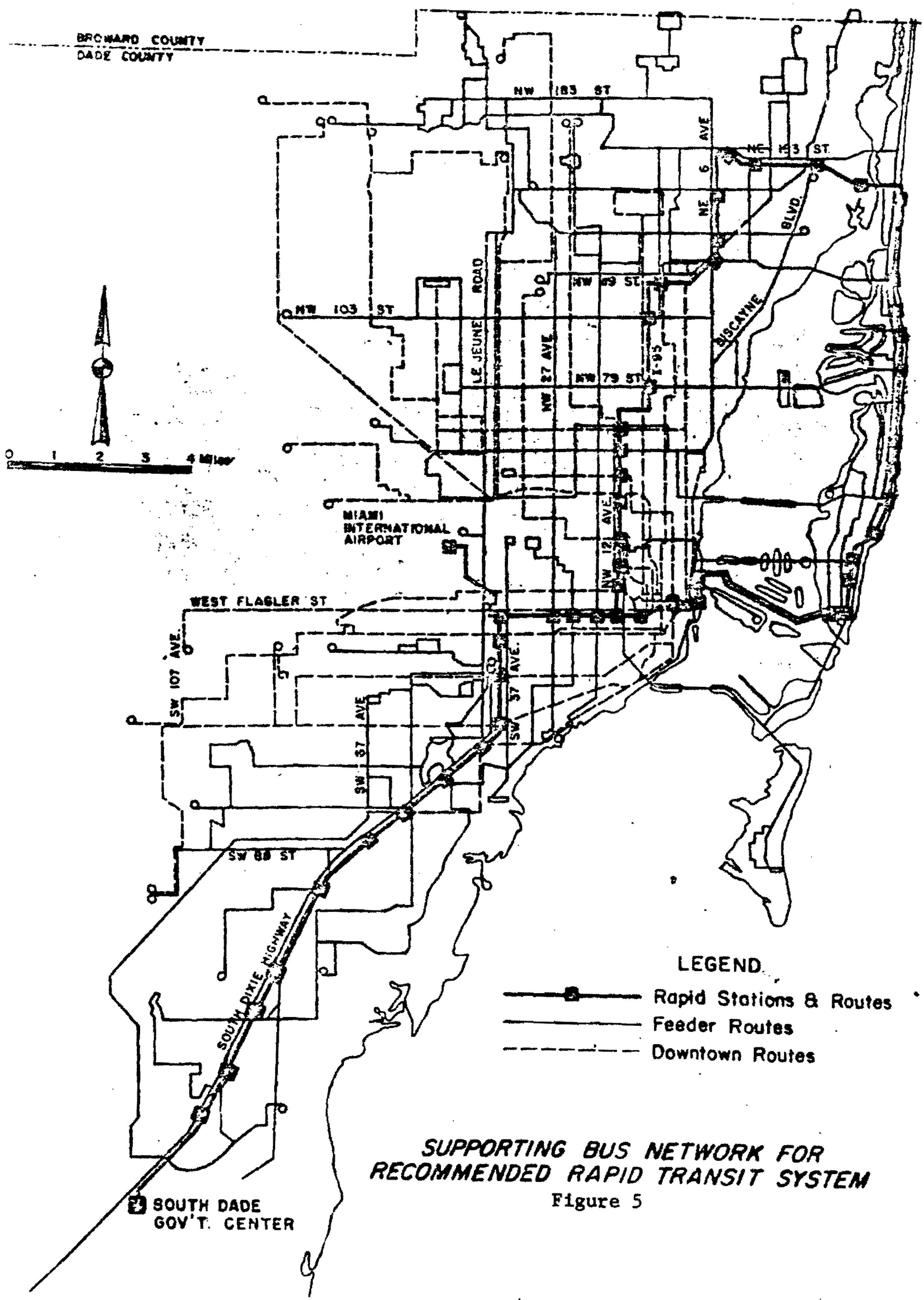
Network B — The highway network includes improvements to the surface arterial streets beyond those proposed in the basic network (Network A). Table 2 lists these arterial improvements. No expressways except those now under construction are included. The transit network incorporates the Simpson and Curtin recommended system. Again, 1985 land use past trends are used.

Network C — The highway and transit networks are the same as those used in Network A. The 1985 land use plan associated with the network reallocates more activity in those areas of anticipated high transit accessibility rather than using the 1985 past trends land use plan.

Network D — This network includes all expressways, surface arterials, and transit facilities of the initial MUATS recommendations. The accompanying land uses are based on a projection of past trends to 1985.

Network E — The transportation network is the same as that for Network A and C - controversial expressways are removed and no improvements to surface arterials or transit beyond those proposed in the MUATS plan. In this alternate, the year 2000 land uses are based on projections of past land use trends.

Network F — The highway network consists of the deletion of new expressways but retains the surface arterial improvements as suggested in the original recommended MUATS plan. The transit network and services are vastly expanded from the MUATS current proposal; the extended rapid transit system is 116 miles in length as illustrated in Figure 6. The year 2000 land uses are reallocated around activity centers throughout the County, rather than as a projection of past land use trends to the year 2000. The extended rapid transit in Figure 6 together with express bus service (not illustrated) directly serves nearly all land use activity centers.

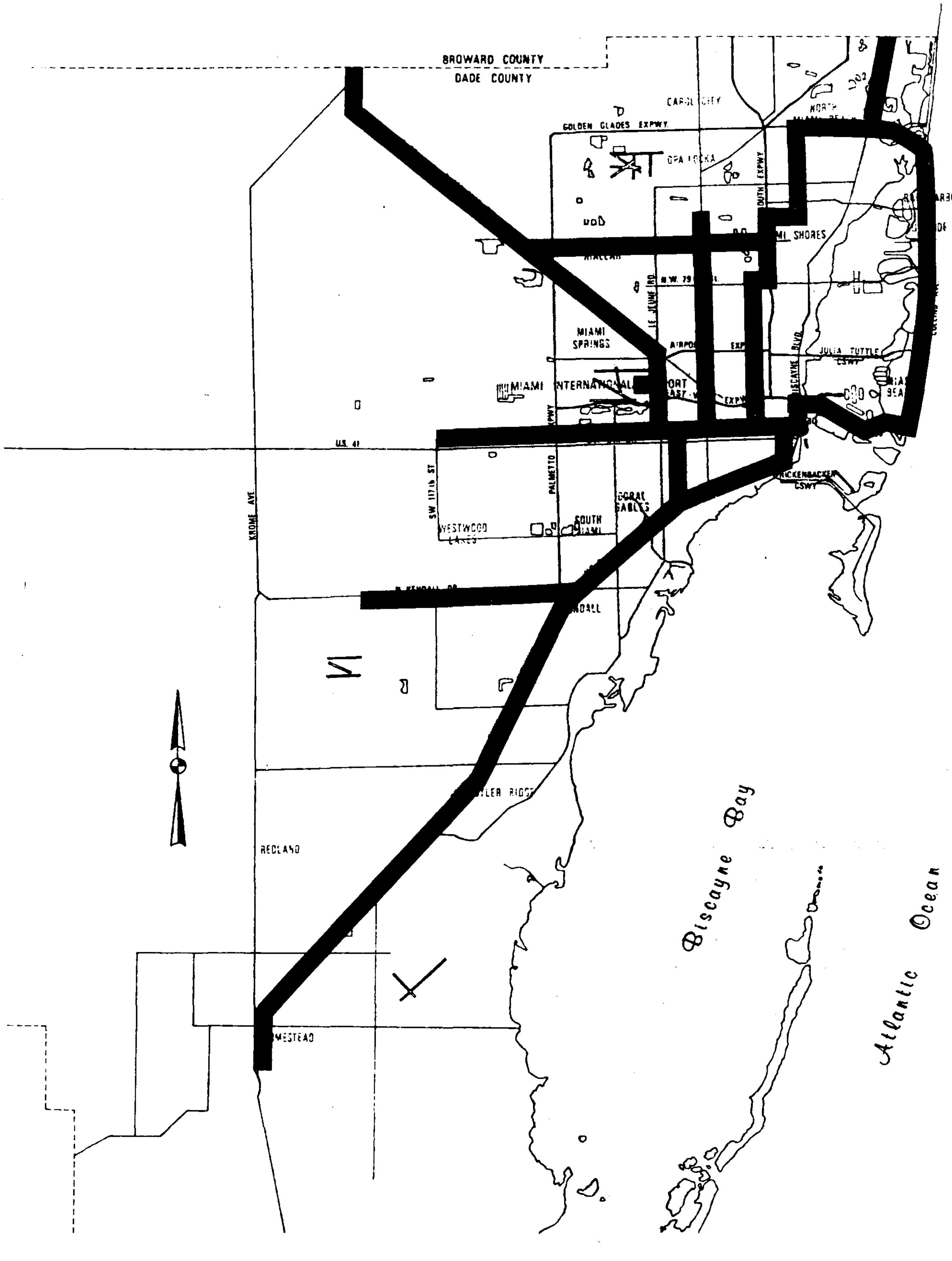


SUPPORTING BUS NETWORK FOR RECOMMENDED RAPID TRANSIT SYSTEM

Figure 5

Table 2
Arterial Improvements Beyond Original MUATS (Alternate D)

Facility	Limits From	Limits To	Length in Mi.	# Lanes Network D	R/W Req'd	# Lanes Network B	R/W Req'd
NE 10 Ave.	82 St.	US-1	1.2	0	--	2	50
I-95	Midtown Inchg	Opa Locka Blvd		8	--	10	--
I-95	Opa Locka Blvd	Golden Glades Interchange		6	--	8	--
NW 7 Ave.	NW 82 St.	NW 151 St.	4.3	4	70	6	100
NW 12 Ave.	79 St.	103 St.	1.5	4	70	6	100
NW 12 Ave.	NW 103 St.	Opa Locka Blvd	2.1	0	--	6	100
NW 22 Ave.	Tamiami Trl.	NW 183 St.	12.0	4	70	6	100
NW 27 Ave.	SR-9	Brow. Co. Line	4.5	4	70	6	100
SW 32 Ave.	Tamiami Trl.	NW 7 St.	1.0	4	70	2	50
NW 32 Ave.	Miami River	NW 62 St.	2.2	4	70	6	100
NW 32 Ave.	NW 95 St.	NW 103 St.	0.5	4	70	6	100
NW 37 Ave.	NW 7 St.	Miami River	1.7	2	50	6	100
Ponce de Leon Blvd	SW 57 Ave.	Grand Ave & LeJeune Rd.	2.1	2	50	4	70
NW 42 Ave.	NW 103 St.	NW 135 St.	2.0	2	50	6	100
SW 62 Ave.	US-1	SW 67 Ave. at NW 7 St.	5.2	0	--	4	70
SW 72 Ave.	Snapper Exp.	SW 56 St.	1.5	2	50	4	70
SW 72 Ave.	SW 40 St.	SW 24 St.	1.0	4	70	2	50
SW 72 Ave.	SW 24 St.	SW 8 St.	1.0	4	70	0	--
SW 72 Ave.	SW 8 St.	W. Flagler St.	0.5	4	70	2	50
SW 87 Ave.	W. Flagler	E/W Exp.	0.7	2	50	4	70
SW 107 Ave.	SW 56 St.	SW 24 St.	2.0	2	50	4	70
SW 107 Ave.	SW 24 St.	E/W Exp.	2.0	2	50	6	100
SW 56 St.	SW 97 Ave.	SW 117 Ave.	2.0	2	50	4	70
Grand Ave.	SW 37 Ave.	US-1	0.2	2	50	4	70
SW 24 St.	SW 42 Ave.	SW 57 Ave.	1.5	4	70	2	50
SW 24 St.	SW 87 Ave.	SW 117 Ave.	3.0	2	50	4	70
NW 71 St.	US-1	US-27	7.1	0	--	4	70
NW 103 St.	I-95	NW 32 Ave.	2.6	4	70	6	100
NW 103 St.	37 Ave.	NW 52 Ave.	1.5	6	100	4	70
NW 103 St.	NW 52 Ave.	NW 72 Ave.	2.0	4	70	6	100
NW 103 St.	NW 72 Ave.	Palmetto	0.5	2	50	6	100
			69.7				



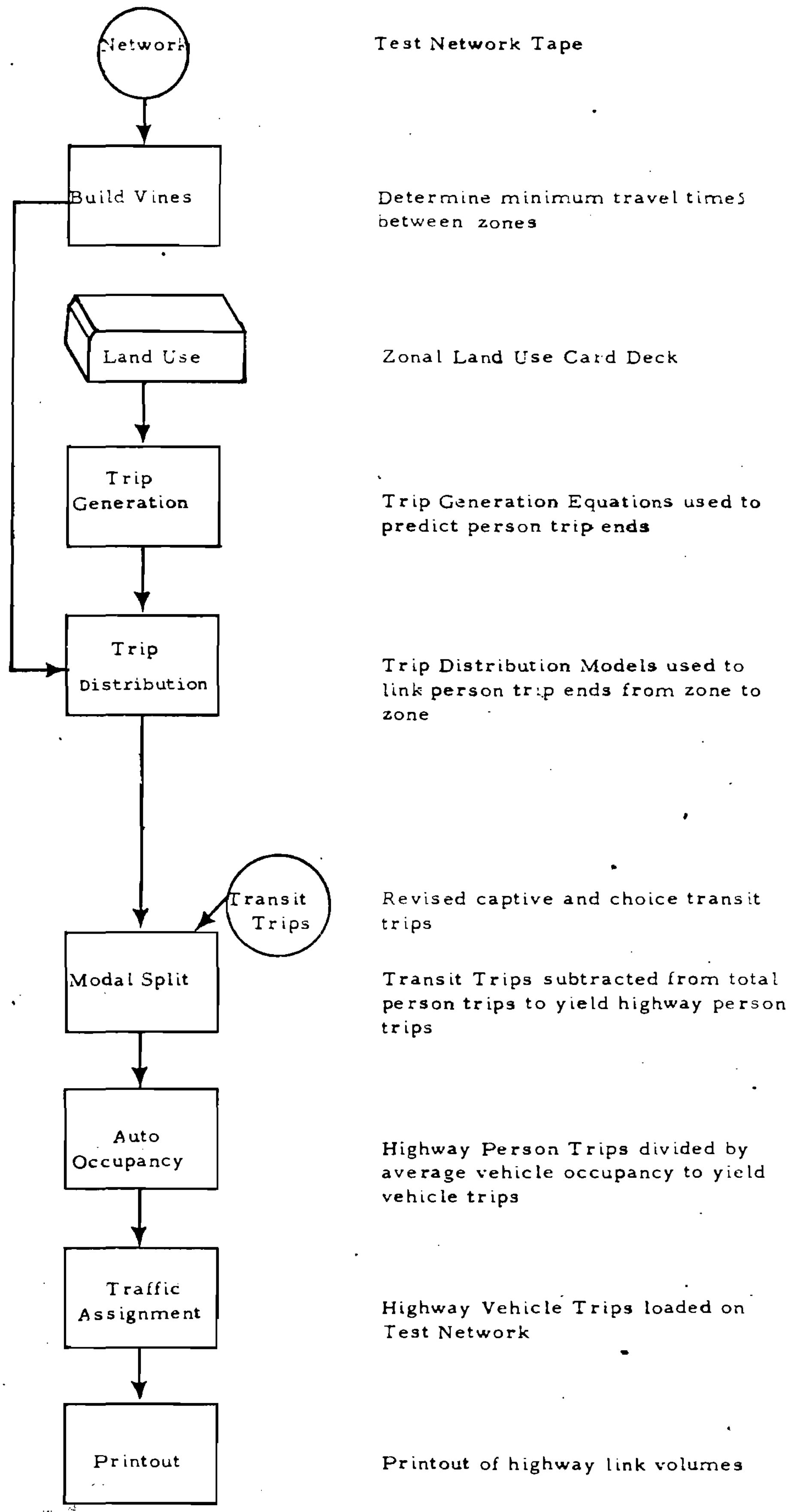
EXTENDED RAPID TRANSIT SYSTEM (116 MILES)
Figure 6

Testing Process

Utilizing the above assumptions, each separate traffic assignment was performed as shown in Figure 7. First, the highway network to be tested is used to determine the minimum travel times between all traffic analysis zones in the study area. Concurrently the future land use and demographic projections provided by Dade County Planning Department are input to the trip generation models to produce future person trip ends. These trip ends are then connected through use of the gravity model which incorporates the minimum travel times between zones. At this point the transit trips generated by the modal split procedure are subtracted from the above total person trips to yield highway person trips. After conversion to vehicle trips through use of the auto occupancy model, a traffic assignment is performed. Traffic loading are generated by loading the vehicle trip projections onto the subject highway test network.

All programs and techniques utilized for the above process are further described in the Urban Transportation Planning General Information Manual prepared by the United States Department of Transportation, Federal Highway Administration.

Figure 7
Network Testing Process



EVALUATION OF ALTERNATIVES

Introduction

The Network Revision Committee undertook an evaluation of the Controversial Corridors to assess the validity of the original program. The committee then could make recommendations of any changes needed in the original program, in view of recent data available for updating the program.

The testing procedures included revising the travel models, land use projections and networks. Once this new data base was available, the Committee undertook an examination of the MUATS Controversial Corridors. The review was attempted in two stages. The first being a system-wide analysis. This level of review provided valuable insight into the total transportation facility structure that was needed. However, the system-wide review could not answer problems at the corridor level. Therefore, the proposals were examined in more detail within the scope of the six impacted corridors. In this manner, a broad perspective of the County-wide transportation needs evolved and could be related back to each local corridor.

Evaluation Criteria

A series of review criteria were established for both the system and corridor levels of evaluation. Certain criteria and standards were applicable at the system level but not at the corridor level and vis-versa.

The general criteria categories established were designed to work for both system and corridor levels of examination. However, in reviewing the impact of the various proposals at each level, it became obvious that the criteria could not be applied in the same way at each level; therefore, different standards were used for the criteria at the two levels of examination. The criteria used to examine the alternatives were based on the social, environmental, operations and cost impacts of the four service concepts (Expressway; Arterials; Transit; Do Nothing) at the two levels of examination. These four areas of examination were selected to give the widest possible review to the alternatives proposed for each corridor. The criteria areas are not weighted against each other and stand separately for review purposes. The following criteria for evaluating each alternative were selected for the system level and corridor level evaluation:

Table 3
Evaluation Criteria

Evaluation Category	Level of Evaluation: System Level	Level of Evaluation: Corridor Level
Social Criteria	Planning Objectives Service Needs	Neighborhood Impact Service Needs Planning Objectives
Environmental Criteria	Air Pollution Energy Consumption	Noise Pollution
Operational Criteria	Vehicle Miles of Travel Average Trip Length (miles) Vehicle Hours of Travel Average Highway Trip Length (Minutes) Accessibility Accidents	Level of Service (Volume to Capacity ratio)
Cost Criteria	Facility Costs User Costs Operating Costs	

The next two chapters document the evaluation, first at the system level and then at the corridor level.

SYSTEM LEVEL EVALUATION

The purpose of the system level evaluation of the Controversial Corridors Review is to examine the impact of the various alternate concepts at the metropolitan level. At this level the entire scope of the transportation problem can be examined. In this way local problems will not unduly influence the broader county transportation needs. At this level the inter-relationships between the geographic parts of the county can be reviewed. In addition county-wide environmental, operational and cost considerations can be studied. Basic county-wide transportation policies regarding the role of transportation facilities and planning objectives can also be studied at the system level.

This section of the Controversial Corridors Review examines the social, environmental, operational and cost considerations of the alternates at the system level.

Social Criteria

The relationship between transportation planning and the social needs of the community is difficult to determine. However, the inter-relationship between transportation and social needs is very real. People need access to jobs, shopping, educational and health facilities, recreation areas and other facilities.

The relationship between the Controversial Corridors alternatives and social needs at the system level is reviewed in terms of stated metropolitan comprehensive planning objectives and a broad analysis of county-wide service needs.

Planning Objectives

The planning criteria for the system evolve from the basic policies and proposals described in the County's most recent general land use plan. This plan includes an outline of the proposed major thoroughfare and transit concepts for the County in 1985 and 2000.

At the system level of analysis the proposals are compared with the County's long-range (year 2000) comprehensive plan concepts which stress transportation access to proposed activity centers.

Table 4
Facilities Included in County
Comprehensive Development Master Plan

Corridor	Expressway	Arterial	Transit	Do Nothing
Le Jeune-Douglas	No	No	Yes	No
Opa-locka	Yes	No	No	No
Hialeah	No	Yes	Yes	No
Interama	No	No	Yes	No
Snake Creek	No	No	No	No
South Dixie	No	No	Yes	No

Except for the Opa-locka expressway which would link into N.W. 27th Avenue, the County Comprehensive Plan for 2000 does not indicate a single new expressway inside the Palmetto Expressway.

Service Needs

It is anticipated that nearly 6.0 million daily person trips will be made in the County in 1985 as compared to 3.9 million today. Of these trips 80% are relatively long-distance trips among traffic districts (4.3 million). Nearly 25% of these trips are for the home to work purpose. The remaining 75% of the trips are for shopping, school, recreational, non-home base, truck, taxi, and miscellaneous trips. MUATS must address the transportation needs for all of these various trip purposes. In addition the MUATS transportation network should recognize its relationship to long-range land use changes and socio-economic needs of the community. It is in this context that the MUATS proposals must be examined in terms of service needs.

The clearest statement of these needs is found in the goals expressed in the Transportation Policy statements of the Dade County Comprehensive Development Master Plan (see Appendix B). The County Comprehensive Development Master Plan has a series of policies related to county-wide transportation service needs. The analysis prepared for the Transit Improvement Program indicates the following in regard to transportation in Dade County.

1) Dade County's transportation facilities have helped play a vital part in forming the urban development pattern of the area. However, other factors, such as topography, utilities, land costs, housing patterns, community facilities, and land use controls have also helped determined the urban pattern.

2) The vitality of certain urban functions is highly transportation related. In particular, manufacturing, warehousing, and distribution and shipping need high levels of transportation access.

3) The County's urban population has a density of nearly 5,000 persons per square mile: one of the highest levels in the nation (see Appendix C). Meeting this demand requires special facilities.

4) The environmental quality of Miami is its most precious asset. The protection of the natural environment of this area is key to its viability as an urban area with its economic base.

5) Dade County has a highly diversified demographic mix. No single type of transportation facilities could attempt to meet the demands of the County's population.

Available data does not clearly define each demographic group within the County, but several indicators do show that many people are not adequately serviced by improved road facilities. These groups include: *

1.	Families with less than $5,000 yearly incomes	22.1% of all families
2.	Persons with low income levels	15.0% of all people
3.	Persons over 65 years old	13.5% of all people
4.	Retired people	11.0% of all people
5.	Non-white population	14.5% of all people
6.	Handicapped population	10.0% of all people
7.	Foreign-born/recent immigrant population	40.0% of all people
8.	Families without cars	20.0% of all people

It is difficult to estimate the service needs of these groups in the future. However, by 1985 it is probable that the County will continue to have at least as significant a non-auto oriented population as at present, although the distribution might shift.

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*All figures are from the 1970 U.S. Census, Dade County Planning Department, or Transportation Coordinator's Office.

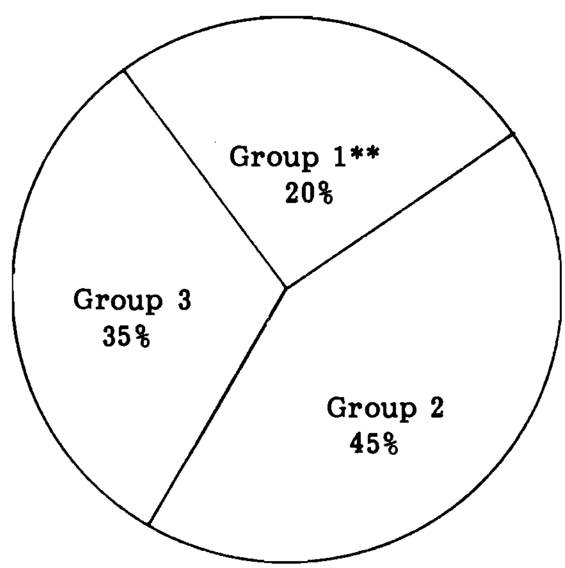
A rough classification of the County population mobility based on auto availability and transit could be described as follows:

Group 1 - <u>Transit dependent</u> - no auto available - difficult to use auto due to age or infirmity, with transit as primary transportation mode.*

Group 2 - <u>Limited choice population</u> - an auto is available and trip making is dependent on auto availability and availability of transit service.*

Group 3 - <u>Full choice population</u> - autos are available for all trip purposes and transit is used only if it is highly convenient or cost beneficial.*

Figure 8
Population Groupings



*Based upon 1970 U.S. Census data and Motor Vehicle Manufacturer's Handbook, 1974.

**Does not include tourist population estimated as 50% transit dependent.

In summation these five key observations relevant to Miami's transportation needs, lead to the following conclusions:

1) Mass transit should be encouraged to preserve the environment, to serve the existing high density urban area and offer transportation service to nearly 2/3 of the County's population which cannot obtain high level auto accessibility.

2) Major highway projects should be viewed as catalysts om deve;p½omg the economic potential of the County and not just as transportation.

3) Road improvements are needed to improve highway safety and neighborhood congestion problems due to Miami's high density urban living. These road improvements, however, are to enhance urban environments rather than to be considered only as an improvement in travel time.

4) Although one group of the County's population has a high travel demand and accessibility to the road network, neither the resources nor the environment of the remainder of the County's residents should suffer. Therefore transportation improvements must be beneficial to the community at large.

Environmental Criteria

The emphasis in finding solutions to the transportation problems in urban areas has changed. Increasing travel demands must be satisfied within the constraints of the new environmental awareness that has developed in the past few years. There has been a greater recognition of the need to design transportation systems to minimize environmental impacts.

In light of this increased emphasis on environmental factors, the Controversial Corridors Review examines the environmental impact of the alternate land use/ transportation systems on the basis of the following evaluation criteria:

1. Air pollution emissions
2. Energy consumption

Air Pollution Emissions

In this analysis of the transportation related impacts on air quality, the following three pollutants are considered:

1. carbon monoxide
2. hydrocarbons
3. nitrogen oxides

The analysis is restricted to the determination of the pollutant emissions for each of the alternate systems and does not attempt to apply diffusion models to predict pollutant concentrations.

Several different modeling techniques are available for calculating pollutant emissions, their use depending on the data, time, and money available for the analysis. Considering the nature of the Controversial Corridors Review, a noncomputer method, the subarea model,* is utilized. This model allows for the calculation of the pollutant emissions using the following information: (1) vehicle miles of travel, and (2) emission factors. The model can be described by the following formula:

$$E = (VMT) * (EF)$$

where
- E = emissions
- VMT = vehicle miles of travel
- EF = emission factor

Using this model, the pollutant emissions can be determined for each alternate system, and the relative impact of each system on the air quality can be assessed.

In applying the subarea model to the Controversial Corridors Review, the first step is to collect the system characteristics required as input to the model. These are:

1. Expressway daily vehicle miles of travel
2. Arterial daily vehicle miles of travel
3. Rapid transit daily car miles
4. Surface bus daily vehicle miles

*Urban Transportation Planning and Air Quality, Technical Report Number 33, April, 1974.

In order to determine these system characteristics, the following assumptions are made:

1. Expressway daily VMT is 12.4 percent of the total highway daily VMT for all alternates except Alternate D, which carries 37.37 percent* of all highway travel on the expressway network.

2. Rapid transit daily car miles for Alternate D are estimated 10 percent above the revenue car miles from the Simpson and Curtin Transit Technical Study. The car mile estimates for the other alternates are then proportioned by transit ridership.

3. Bus miles for Alternate D are based on the Simpson and Curtin Transit Technical Study, with estimates for the other alternates computed proportionally to ridership.

Table 5 reflects the system characteristics resulting from the application of the above assumptions to the information from the computer travel modeling output.

The second step in this procedure is to determine the appropriate emission factors for each of the pollutants. To do this, the emission factors developed by the Environmental Protection Agency are used. These emission factors, based on national averages, are a function of several variables; therefore, it is necessary to make the following assumptions:

1. Average 24 hour operating speeds of 48 mph on expressways and 28 mph on arterials

2. Vehicle mix of 83.04 percent passenger cars and 16.96 percent trucks and other vehicle types

3. Pollutants emitted on freeways and arterials based on 1990 rather than existing standards

*MUATS 1985 Street and Highway Plan

Table 5

System Characteristics Used in Air Pollution Analysis

Characteristics	Alternate A	Alternate B	Alternate C	Alternate D	Alternate E	Alternate F
Total Person Trips	5,693,534	5,693,534	5,686,628	5,693,534	6,681,675	6,569,323
Highway Daily VMT (1,000 Mi.)	36,058	36,176	35,593	36,658	45,528	48,203
Expressway Daily VMT (1,000 Mi.)	4,471	4,486	4,414	11,500	5,646	5,977
Surface Street and Other Arterial Daily VMT (1,000 Mi.)	31,587	31,690	31,179	25,158	39,883	42,226
Daily Transit Ridership	450,000	425,000	721,115	406,600	677,749	748,658
Rapid Transit Daily Car Miles (1,000 Mi.)	114	108	183	103	172	190
Surface Bus Daily Vehicle Miles (1,000)	88	83	141	79	132	146

4. 25 percent of electrical energy for powering rail transit provided by a nuclear source, with remainder from No. 6 Fuel Oil and residual oils

5. Surface bus is a standard 53 passenger bus.

Incorporating the above assumptions in the analysis, the emission factors in the following table are applied to the subarea model.

Table 6
Emission Factors

Source	Carbon Monoxide	Hydrocarbons	Oxides of Nitrogen
	---grams per mile---		
Automobile			
Freeways*	7.80	1.04	1.68
Arterials*	11.61	1.45	1.34
Bus**	10.90	14.70	13.84
Rail Rapid**	0.005	0.408	13.268

*Source: Turner, Roy. E., TRANS Technical Notes: Air Pollution Amounts, Federal Highway Administration, February, 1973.

**Estimated from Wells, J.D., et al, Economic Characteristics of the Urban Public Transportation Industry, Institute for Defense Analysis, Arlington, Virginia, February, 1972.

The final step in the analysis is the calculation of the pollutant emissions for the alternate systems. Table 7 reflects the total annual pollutant emissions resulting from these calculations.

To assess the relative impact the alternate systems have on the air quality, the grams of pollutant emitted for each person mile of travel has been computed (see Table 7). On the basis of this analysis, Alternate D, the 1985 MUATS Street and Highway plan, has the minimum impact on air quality.

Table 7
Annual System Pollutants

Characteristic	Alternative A	B	C	D	E	F
Annual System Pollutants						
Carbon Monoxide (CO), Thousand Kilograms						
Bus	306.4	289.4	491.0	276.8	461.5	509.7
Rapid	0.2	0.2	0.3	0.2	0.3	0.3
Highway						
Expressway	11,160	11,197	11,017	28,704	14,092	14,919
Other Arterial	117,352	117,735	115,836	93,467	148,173	156,878
Total	128,819	129,222	127,344	122,448	162,727	172,307
Grams per person mile of travel	9.806	9.729	9.809	8.616	11.030	11.865
As % above lowest alternate, %	13.8%	12.9%	13.8%	0.0%	28.0%	37.7%
Hydro Carbons (HC), Thousand Kilograms						
Bus	413.2	390.3	662.1	373.3	622.4	687.4
Rapid	14.9	14.1	23.9	13.5	22.5	24.8
Highway						
Expressway	1,488	1,493	1,469	3,827	1,879	1,989
Other Arterial	14,656	14,704	14,467	11,673	18,506	19,593
Total	16,572	16,601	16,622	15,887	21,030	22,294
Grams per person mile of travel	1.262	1.250	1.273	1.118	1.425	1.535
As % above lowest alternate, %	12.9%	11.8%	13.9%	0.0%	27.5%	37.3%
Oxides of Nitrogen (NO_x), Thousand Kilograms						
Bus	389.0	367.5	623.4	351.5	586.0	647.2
Rapid	484.6	457.6	776.5	437.8	729.8	806.1
Highway						
Expressway	2,404	2,412	2,373	6,182	3,035	3,213
Other Arterial	13,545	13,589	13,370	10,788	17,102	18,107
Total	16,823	16,826	17,143	17,759	21,453	22,773
Grams per person mile of travel	1.281	1.267	1.313	1.250	1.454	1.568
As % above lowest alternate, %	2.5%	1.4%	5.0%	0.0%	16.3%	25.4%

Also, it can be noted that if, in the year 2000, no new expressways are constructed (the highway network assumed for Alternates E and F), from an air pollution standpoint it would be desirable to follow past trends of land development rather than the activity center concept. This may be attributable to a broader distribution of population and employment under the past trends concept whereas the activity center tends to concentrate employment at selected locations.

Energy Consumption

Because of the national concern for the conservation of energy, the Controversial Corridors Review includes energy consumption as an environmental criterion in this evaluation. Calculating the total energy consumption of each alternate system, the most energy efficient alternate is identified.

The procedure for determining the energy consumption of the alternate systems is analogous to that used in the air quality analysis, with the only difference being the substitution of fuel consumption rates for emission factors. The vehicle miles of travel, stratified by facility type and mode, are multiplied by the fuel consumption rates contained in the following table.

Table 8
Fuel Consumption Rates

Source	Fuel Consumption Rates (gallons per mile)
Automobile	
Freeways*	0.070588
Arterials*	0.094694
Bus**	0.2278
Rail Rapid***	0.35

*Source: Federal Highway Administration, TRANS: Fuel Consumption for Urban Freeways and Surface Arterials (Composite Vehicle) U.S. Department of Transportation, 1973.

**Source: General Motors Corporation Truck and Coach Division, "Vehicle Dynamics Simulation Model", 1974

***Source: Wells, J.D., et al, Economic Characteristics of the Urban Public Transportation Industry, Institute for Defense Analysis, February, 1972.

In order to determine these factors, it was necessary to make the following assumptions:

1. Average daily operating speeds of 48 mph on expressways and 28 mph on arterials

2. Vehicle mix of 83.04% passenger and 16.96% trucks and other vehicle types

3. Average surface bus speed of 12 mph

4. 25% of electrical energy for powering rapid transit by a nuclear source, with remainder from No. 6 Fuel Oil and residual oils.

Table 9 reflects the fuel consumption levels for the six alternate systems. The following sample calculations for Alternate A are provided to illustrate the procedure:

Expressway annual gasoline consumption = (4471 x 10^3 daily vehicle miles) x (.070588 gallons/mile) x (320 equivalent days/year) = <u>100,999 x 10^3 gallons</u>
Arterial annual gasoline consumption = (31587 x 10^3 daily miles) x (0.94694 gallons/mile) x (320 equivalent days/yr.) = <u>957,152 x 10^3 gallons</u>
Rapid transit No. 6 Fuel Oil Consumption = (114.3 x 10^3 car miles) x (0.35 gallons/ miles) x (0.75) x (320 equivalent days/year) = <u>9587 x 10^3 gallons</u>
Surface bus annual diesel fuel consumption = (87.84 x 10^3 daily miles) x (0.2278 gallons/vehicle miles) x (320 equivalent days/year) = <u>6403 x 10^3 gallons</u>

To determine the annual energy consumption in BUT's it is necessary to apply certain conversion factors. For the rapid transit system, the annual energy consumption is calculated from the annual megawatt-hours, assuming that one kilowatt hour is equivalent to 3413 BUT's.*

*Fink, D.G., and Carroll, J.M., "Standard Handbook for Electrical Engineers," McGraw - Hill Book Company, New York, 1968.

Table 9
Transportation System Energy Consumption

Characteristic	Alternate A	B	C	D	E	F
Expressway Equivalent Annual Gasoline Consumption, 1,000 gallons	100,992	101,330	99,704	259,764	127,533	135,009
Arterial Equivalent Annual Gasoline Consumption, 1,000 gallons	957,152	960,273	944,789	762,340	1,208,539	1,279,536
Equivalent Annual Gasoline Consumption on Highway System, 1,000 gallons	1,058,144	1,061,603	1,044,493	1,022,104	1,336,072	1,414,545
Gasoline Consumption per Highway Person Trip	0.6206	0.6267	0.6573	0.6041	0.6954	0.7594
Gasoline Consumption per Hundred Highway Person Miles of Travel	8.746	8.638	9.219	7.745	10.078	10.990
Annual Rapid Transit Megawatt-hours	193,564	182,812	310,181	174,892	291,542	322,036
Rapid Transit Annual No. 6 Fuel Oil Consumption, 1,000 gallons	9,587	9,054	15,363	8,662	14,440	15,950
Surface Bus Annual Diesel Fuel Consumption, 1,000 gallons	6,403	6,047	10,261	5,786	9,644	10,653
Annual Energy Consumption, 100 million BTUs						
Rapid Transit	6,606	6,239	10,586	5,969	9,950	10,991
Bus Transit	9,284	8,768	14,878	8,390	13,984	15,447
Total Transit	15,890	15,007	25,464	14,359	23,934	26,438
Highway System	1,375,587	1,380,084	1,357,841	1,328,735	1,736,894	1,838,908
Total Transportation System	1,391,477	1,395,091	1,383,305	1,343,094	1,760,828	1,865,346
Transportation System Energy Consumption per person trip, BTUs	76,374	76,572	76,017	73,718	82,353	88,734
Transportation System Energy Consumption per person mile of travel, BTUs	10,593	10,504	10,662	9,451	11,935	12,841
Energy Consumption per Person Mile as percent above lowest alternate, %	12.1	11.1	12.8	0.0	26.3	35.9

Table 9 shows the total energy consumption per person miles of travel for each alternate. On the basis of this analysis, Alternate D (full MUATS system) would be the most energy efficient system, providing for approximately 12% less energy consumption than the other 1985 alternate systems. Also, in the year 2000 with no new expressways constructed, the past trends land use development (Alternate E) would result in approximately 10% less energy consumption than the activity center concept (Alternate F).

Operational Criteria

In an attempt to quantify the relative impact of each transportation/land use alternate on the system user, several operation-related criteria are identified. For the purposes of this analysis, these criteria are grouped into the following three categories: (1) total travel; (2) accessibility, and (3) accidents.

Total Travel

Total travel characteristics for each alternate are described in terms of vehicle miles of travel and vehicle hours of travel. Table 10 indicates the numerical values for these two evaluation criteria. Of the 1985 alternates, the original MUATS system (Alternate D) generates the most vehicle miles of travel while providing for the least vehicle hours of travel. The comprehensive expressway network of Alternate D obviously facilitates vehicle travel. In the year 2000, Alternate F, with its expanded 116-mile transit system and associated activity center land use concept, provides for approximately 7% more vehicle miles of travel and 8% less vehicle hours of travel than Alternate E.

Accessibility

In terms of systems level transportation planning, accessibility is generally defined as the ease with which one can travel from a zone of origin to activities located in destination zones or a relationship between travel time and opportunities available within that travel time. Lacking the necessary information to allow for accessibility to be measured in these terms, this analysis describes accessibility using average highway trip length in minutes, average trip length in miles, and average trip length distance squared.

Average highway trip length in minutes is relatively constant for the 1985 alternates, and as a result does not provide a very good indication of the relative accessibility among the alternates (see Table 10). The constant trip length is attributable to the trip distribution model employed in the travel

Table 10

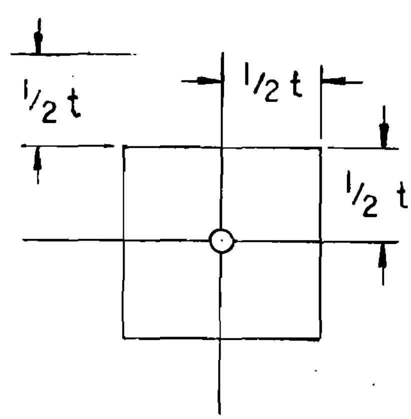
System Operational Criteria

Criteria	Alternate System 1985 A	B	C	D	2000 E	F
Total Travel						
Vehicle Miles of Travel (1,000 Mi.)	36,058	36,176	35,593	36,658	45,528	48,203
% Above lowest alternate	1.3	1.6	0.0	3.0	27.9	35.4
Vehicle Hours of Travel (1,000 Hours)	1,445	1,430	1,425	1,351	2,042	2,148
% Above lowest alternate	7.0	5.6	5.2	0.0	51.2	59.0
Accessibility						
Average Highway Trip Length (Minutes)	17.3	17.3	17.1	17.2	18.6	18.5
% Above lowest alternate	1.2	1.2	0.0	0.6	8.8	8.2
Average trip length	7.2	7.3	7.1	7.8	6.9	6.9
% Above lowest alternate	4.3	5.8	2.9	13.0	0.0	0.0
Accessibility Indicator (Average trip length distance squared)	51.8	53.3	50.4	60.8	47.6	47.6
% Above lowest alternate	8.8	12.0	5.9	27.7	0.0	0.0
Accidents						
Fatalities	338	332	336	309	444	472
Non-fatal Injuries	47,761	47,105	47,734	41,915	62,773	66,872
Property Damage	206,828	203,995	206,715	181,937	271,833	289,587
Total	254,927	251,432	254,785	224,161	335,050	356,932
% above lowest alternate	13.7	12.2	13.7	0.0	49.5	59.2

forecasting process. Inherent in the calibration of this model is a person's resistance to complete relatively long trips (in minutes). Thus, the average highway trip lengths indicated in Table 10 are nearly constant for Alternates A, B, C, and D. In the year 2000 (Alternates E and F) the congestion levels are significantly higher than in 1985 and consequently the time to complete the average highway trip is greater. It should be noted that the expanded transit system and activity center land use concept of Alternate F does not significantly reduce the average highway trip length in minutes.

A second criteria, that of average trip length in miles, is also used as an indicator of accessibility. As Table 10 reflects, Alternate D generates the longest average trip length in miles. Without an expanded expressway system, the average trip length for Alternates A, B, and C decreases as the tripmaker finds it necessary to satisfy his trip purpose at a closer distance to his origin. For alternates E and F, the higher congestion levels force the tripmaker to satisfy his trip purpose closer to his origin, a result reflected in the shorter average trip length distances in Table 10.

As a further indication of accessibility, the average trip length distance squared is calculated for each alternate. The square of the average trip length is perhaps a better indicator of accessibility than average trip length by itself because it considers a tripmaker's area of influence. For example, assuming a grid network such as exists in Dade County, a person with a trip length "t" would be limited by the area shown below.



He could theoretically reach locations a straight line distance of t away from his origin. This would be nulified by realistic incongruities in the grid network assumed to be permeated through the interior of the four squares shown with a side length of 1/2t. Practically, he would be limited to an area of $4\ (1/2t)^2$, or t^2. If he were able to double his trip length to 2t, his area of influence would increase to $4(2t/2)^2$, or $4t^2$. Thus his "sphere" or area of influence is proportional to the square of his allowable trip length. Applying this concept to this accessibility analysis produces the accessibility indicators shown in Table 10. On the basis of this approach, Alternate D, the original MUATS system, provides the highest degree of accessibility.

Accidents

Safety is a very significant factor to be considered in an evaluation of transportation alternates. For this reason, the number of system accidents, stratified by type, are used to reflect the relative safety of each alternate. The procedure employed to arrive at the accident figures is detailed in the system level cost criteria section of this report.

As Table 10 indicates, Alternate D with its expanded expressway system has the lowest number of total accidents. This result is not surprising because expressway accident rates are generally substantially lower than surface arterial accident rates. However, the severity of an expressway accident is generally much greater than the average urban arterial accident, which explains the relatively small difference between fatalities for Alternate D and the other 1985 alternates. In the year 2000, Alternate F (expanded transit system) has approximately 10% more total accidents than Alternate E.

Cost Criteria

The economic analysis and evaluation is restricted to the evaluation of alternative multi-modal plans at the system level rather than at the corridor level of accuracy. A system level analysis should preceed any evaluation at a corridor level, because corridor level improvements, judged only on their own merits within a limited geographic area, could have far more significant system-wide effects.

Methods, Limitations, and Basic Assumptions

As part of this analysis, previous MUATS evaluation work by modes as well as other evaluation work conducted elsewhere was reviewed. These methods can be generalized into one of five categories: (1) the least-cost method of evaluating only alternative highway plans; (2) transit cost versus transit revenues; (3) independent evaluation of each mode on a least-cost basis; (4) multiple criteria for the evaluation of transit; and (5) a combined evaluation of highways and transit on a least-cost multi-modal transportation basis.

From this review a somewhat improved evaluation method has been derived. The attributes of the economic evaluation to follow include: (1) applying all criteria uniformly to all modes, (2) using common interest rates and other economic indicators in the evaluation, (3) computer testing of alternative multi-modal systems within similar time frames and with similar land use alternatives.

The following assumptions were basic to the evaluation: (1) evaluations will be completely independent of the sources of funds for building, maintaining and operating a transportation system (all modes will be considered to be part of a single urban transportation system for Miami), (2) a common interest rate of 10% will be applied to the capital costs of transit and highway projects, (3) general obligation bond rates, because they do not actually represent the cost of capital, are inappropriate for the evaluation, (4) the useful life of substantial capital investments will be limited to twenty years with no salvage value, and (5) transit fares as well as gas taxes will not be considered as a benefit nor a cost because they represent transfer payments and are each considered merely as sources of funds for covering the total cost of the proposed improvements.

The economic portion of the evaluation was one of quantifying the relative economic attributes of each multi-modal transportation system and land use alternative including:

1. Capital costs of highway improvements.
2. Maintenance costs of highways.
3. Capital costs of transit improvements.
4. Operating costs of transit improvements.
5. Accident costs and rates for each mode.
6. Total travel time costs systemwide for the highway and transit hours consumed in travel.
7. Total vehicle operating costs excluding parking.
8. Investment required in parking facilities.

The evaluation has several limitations. Transportation system beneficiaries are not fully determined and sources of funding and revenue are not identified. The sub-modal split produced by varying transit fares is not undertaken; thus, its resultant effect on total system travel by mode is not fully acknowledged in the evaluation. (The current MTA fare structure is assumed not to change relatively over time). Criteria were not determined for the equitable payment for transportation services received, reduction in payments due to social service nature of some alternative services provided, the proper allocation of costs and benefits to groups, nor the proper allocation of costs to specific existing or forseen programs. Such analyses would be premature until a system plan is adopted for subsequent refinement.

As stated earlier, the basic economic evaluation process to follow is one of deriving relative and marginal benefit/cost comparisons of each transportation system-land use plan under consideration. The method is as follows:

Costs

1. Estimate capital costs of the total system plan including both the transit and highway elements utilizing common interest rates and evaluation periods.

2. Estimate the maintenace cost of highway transportation facilities.

3. Estimate transit operating and maintenance costs.

4. Calculate equivalent uniform annual capital costs for highway, transit, and parking facilities.

5. Compute and compare the relative annual capital, operating, and maintenance costs among alternatives.

Benefits

6. Establish future year daily travel demands regardless of mode.

7. Describe alternative system plans, including the extent of service to be provided by transit and highways.

8. Assign trips to the transit and highway networks based on estimated mode split associated with each transportation system alternate.

9. Calculate future daily travel costs by trip maker categories.

10. Establish daily total system travel costs.

11. Convert daily travel costs to annual costs.

12. Establish relative annual costs to trip makers among alternatives.

Economic Comparison

13. Compute the ratio of the relative decrease in system user costs (12) to relative increase in annual cost for each transportation system - land use plan alternative under consideration (5).

Only the relative systemwide costs and benefits are to be evaluated. The underlying assumption using the costs enumerated above is that system improvements, be they highway or transit, should be undertaken only when the incremental benefits to be received by the system users are at least as great as the incremental costs associated with providing the improvement. Thus, the transportation alternative that is least costly to supply is used as a base for comparison. The initial MUATS recommended transit and highway transportation system is presumed economically feasible: thus a less costly based plan would be economically justified. More specifically, the highway portion of the base plan excludes the controversial expressways and the transit portion of the base system plan is referred to by many as the "Simpson & Curtin" transit plan that has received voter approval and is currently being further detailed by Kaiser Engineers, their sub-consultants, the County, and the Florida Department of Transportation.

Transportation System Facility Costs

With each of the test network user characteristics (described in Table 11) there is an associated system user cost that can be calculated. There is also a cost to the general public associated with providing the transit and highway facilities under each alternate.

Obviously, not all facilities under any alternate can be constructed in one year. Thus, an initial year of consideration has to be established, and the present worth determined of capital items for all facilities stage-constructed thereafter. The capital cost estimates for all facilities are made for one point in time (1974). If facilities are stage-constructed, obviously their actual capital cost at the time of construction will be much higher. A constant 10% interest rate is applied uniformly throughout the analysis. Thus, the inflationary factor of staging construction (compound amount) is conveniently (and fortunately) negated by the present worth factor applied to any staged capital cost item. Therefore, it can be concluded that although the facilities under any alternate will be stage-constructed, their combined present worth at any single point in time will equal the simple sum of their estimated capital cost at that point. This leaves only the matter of determining the year to be considered for analysis and to determine if it is appropriate in this economic analysis to factor 1974 capital cost estimates to a more realistic future amount.

TABLE 11

System Characteristics

Characteristic	Alternate A	B	C	D	System E**	F**
Total Person Trips	5,693,534	5,693,534	5,686,628	5,693,534	6,681,675	6,569,323
Transit Ridership	450,000[1]	425,000[1]	721,115	406,600	677,749	748,658
Choice Transit Ridership	138,900	118,600	125,700	100,200	168,400	198,000
% of Total Person Trips	7.9%	7.5%	12.7%	7.1%	10.1%	11.4%
Highway Person Trips	5,243,534	5,268,534	4,965,513	5,286,934	6,003,926	5,820,665
Highway Vehicle Trips	3,906,568	3,911,471	3,912,428	3,908,194	4,533,107	4,518,880
Vehicle Miles of Travel	36,058,464	36,175.613	35,593,118	36,658,333	45,528,504	48,203,051
Vehicle Hours of Travel	1,445,009	1,430,459	1,424,817	1,350,948	2,042,263	2,148,314
Average Highway Trip Length* (minutes)	17.33	17.29	17.13	17.24	18.56	18.47
Average Highway Work Trip length (minutes)	21.29	21.26	20.96	20.90	21.40	21.46
Average Unadjusted Highway Speed* (mph)	24.95	25.29	24.98	27.14	22.29	22.44
Average Trip Length* (miles)	7.21	7.29	7.13	7.80	6.90	6.91
Accessibility Indicator[2] (average trip length distance squared)	51.98	53.14	50.84	60.84	47.61	47.75

* When discussed together these show importance of varying land use.

** Alternates E and F use different land use plans for the 2000. All other alternates use a land use for year 1985

1 Estimated

2 Relative merits of this characteristic are described in system level operational criteria section.

Since this economic analysis is basically one of comparing incremental benefits (reduction in user costs) to incremental facility costs, it holds that if facility costs are to be estimated for a future year, then the cost factors used to derive relative benefits among alternates (cost per accident, value of time, etc.) should represent future year conditions as well. The corollary of this is equally applicable and valid if a common interest rate for benefits and costs is to be applied. Thus, although future travel conditions (e.g. speed, number of trips, travel time, etc.) are being analyzed, it is appropriate to evaluate future conditions of benefits and costs in a relative manner by using estimates of costs and benefits as they would be in 1974.

It must be realized that the statements of costs and benefits to be used are relative, and not true measures of actual dollar amounts expected to be expended for facilities nor the actual costs to system users as they would exist in the future. However, the benefit to cost ratios as we would realize them today by using 1974 facility costs and 1974 user costs will be exactly the same for the year 1985, 2000, or, for that matter, any intermediate or future point in time.

Capital Costs. The capital costs associated with providing each transportation alternative include those direct public and non-recurring costs associated with the purchase of the necessary rights-of-way, relocation costs that are in addition to the direct costs of right-of-way, the costs of construction of highway and transit facilities (including in each case the necessary parking facilities) and the non-recurring costs of one-time major vehicle acquisition programs in the case of rapid transit facilities. As mentioned, an equal analysis period (20 years) for all capital facilities will be used and terminal values (or salvage values) will be rightfully ignored.

Of the six alternates under evaluation there are only three major differences among them that affect capital costs:

1. The extent of expressway construction.
2. The extent of arterial street construction.
3. The extent of transit facilities.

The construction and right-of-way costs of the "Arterial Street Emphasis" plan (Alternate B) are those associated with adjustments to the proposed number of lanes on 29 surface arterial roadways currently designated on the MUATS 1985 Recommended Principal Street and Highway Plan. As indicated on the following list of arterial roadways, the total additional construction and direct right-of-way cost for providing additional arterial lanes is estimated to be $38,200,000.

Table 12
Arterial Street Emphasis
Right of Way and Construction Cost
(With Controversial Expressways Removed)

Facility	Length in mi.	# Lanes MUATS	R/W Req'd	# Lanes Alt. B	R/W Req'd	Add. R/W Req'd S.F.	Cost Per S.F.	Total Add. R/W Cost	Total Add. Const. Cost	Total Add. R/W & Const.
1. NE 10 Ave. fr. 82 St. to US-1	1.2	0	—	2	50				360,000	360,000
I-95 fr. Midtown Inchg. to Opa Locka Blvd.		8	—	10	—					
I-95 fr. Opa Locka Blvd. to Golden Glades Inchg.		6	—	8	—					
2. NW 7 Ave. fr. NW 82 St. to NW 151 St.	4.3	4	70	6	100				430,000	430,000
3. NW 12 Ave. fr. 79 St. to 103 St.	1.5	4	70	6	100	76,350	1.45	110,707	150,000	260,707
4. NW 12 Ave. fr. NW 103 St. to Opa Locka Blvd.	2.1	0	—	6	100	202,100	1.40	282,940	2,100,000	2,382,940
5. NW 22 Ave. fr. Tamiami Trail to NW 183 St.	12.0	4	70	6	100	536,825	8.00	4,294,600*	1,200,000	5,494,600
6. NW 27 Ave. fr. SR 9 to Broward Co. Line	4.5	4	70	6	100				450,000	450,000
7. SW 32 Ave. fr. Tamiami Tr. to NW 7 St.	1.0	4	70	2	50					
8. NW 32 Ave. fr. Miami River to NW 62 St.	2.2	4	70	6	100	285,000	2.60	741,000	220,000	961,000
9. NW 32 Ave. fr. NW 95 St. to NW 103 St.	0.5	4	70	6	100	72,000	1.15	82,800	50,000	132,800
10. NW 37 Ave. fr. NW 7 St. to Miami River	1.7	2	50	6	100	234,900	1.65	387,585	1,190,000	1,577,585
11. Ponce de Leon Blvd. fr. SW 57 Ave. to Grand Ave. & LeJeune	2.1	2	50	4	70				1,260,000	1,260,000
12. NW 42 Ave. fr. NW 103 St. to NW 135 St.	2.0	2	50	6	100.	144,290	1.10	158,719	1,400,000	1,558,719
13. SW 62 Ave. fr. US-1 to SW 67 Ave. at NW 7 St.	5.2	0	—	4	70	300,080	2.00	600,160	4,680,000	5,280,160
14. SW 72 Ave. fr. Snapper Exp. to SW 56 St.	1.5	2	50	4	70	17,300	1.30	22,490	900,000	922,490
15. SW 72 Ave. fr. SW 40 St. to SW 24 St.	1.0	4	70	2	50					
16. SW 72 Ave. fr. SW 24 St. to SW 8 St.	1.0	4	70	0	—					
17. SW 72 Ave. fr. SW 8 St. to W. Flagler St.	0.5	4	70	2	50					
18. SW 87 Ave. fr. W. Flagler St. to East-West Exp.	0.7	2	50	4	70				420,000	420,000
19. SW 107 Ave. fr. SW 56 St. to SW 24 St.	2.0	2	50	4	70	4,700	1.20	5,640	1,200,000	1,205,640
20. SW 107 Ave. fr. SW 24 St. to East-West Exp.	2.0	2	50	6	100	200,900	1.30	261,170	1,400,000	1,661,170
21. SW 56 St. fr. SW 97 Ave. to SW 117 Ave.	2.0	2	50	4	70	9,600	1.20	11,520	1,200,000	1,211,520
22. Grand Ave. fr. SW 37 Ave. to US-1	0.2	2	50	4	70	68,100	13.50	919,350*	120,000	1,039,350
23. SW 24 St. fr. SW 42 Ave. to SW 57 Ave.	1.5	4	70	2	50					
24. SW 24 St. fr. SW 87 Ave. to SW 117 Ave.	3.0	2	50	4	70	8,900	1.40	12,460	1,800,000	1,812,460
25. NW 71 St. fr. US-1 to US-27	7.1	0	—	4	70	527,025	4.00	2,108,100*	6,390,000	8,498,100
26. NW 103 St. fr. I-95 to NW 32 Ave.	2.6	4	70	6	100	183,450	2.00	366,900	260,000	626,900
27. NW 103 St. fr. 37 Ave. to NW 52 Ave.	1.5	6	100	4	70	114,490	1.30	18,837		18,837
28. NW 103 St. fr. NW 52 Ave. to NW 72 Ave.	2.0	4	70	6	100	40,600	2.30	93,380	200,000	293,380
29. NW 103 St. fr. NW 72 Ave. to Palmetto	0.5	2	50	6	100				350,000	350,000
	69.7					2,926,610		10,478,358	27,370,000	38,208,358

* Total takings of numerous improvements assumed.

The estimated construction and right-of-way costs of the controversial expressways (for Alternate D) are similarly collected and summarized in Table 13. Preliminary Expressway Alignment and Planning Study reports developed by consultants for the State of Florida, including estimates of right-of-way and construction, were utilized to facilitate cost estimating. The March 21, 1974 Engineering News Record construction cost index was applied to update report estimates to equivalent January 1974 costs. Similarly the Right of Way Division of the Dade County Public Works Department increased 1969 consultant right-of-way acquisition cost estimates by 120% to approximate January 1974 property values. The 1974 cost of right-of-way and construction for the controversial expressways is estimated at $801,200,000, or approximately 20 times more costly than Alternate B which emphasizes additional lanes on arterial streets ($38,200,000).

The third capital cost variant among the six alternates regards a 62-mile expansion of the currently "recommended" 54-mile rapid transit system - a total of 116 miles of rapid transit and extensively expanded surface bus services (Alternate F). Table 14 shows the capital costs of this alternate in estimated 1973 dollars as well as escalated 1973 dollar values ($6.4 billion). To be comparable, the unescalated 1973 values have been updated to the 1974 level and are subsequently summarized in tabular (unescalated) form (Table 15) to show an additional cost estimated at $764,542,000 - $694 million for construction and $70 million in direct right-of-way acquisition costs.

Relocation costs are included in the evaluation as they are considered as an additional expense to the direct acquisition of rights-of-way. The additional costs associated with relocation are calculated at $3,000 per household and $10,000 per business. These factors are derived from reported nationwide averages (with considerable variation) and are applied equally to extended rapid transit facilities, controversial expressway facilities, and additional surface arterials.

Again, only three variations in relocation costs exists among the six alternatives:

1. Arterial Street Emphasis (Alternate B).
2. Controversial Expressways (Alternate D).
3. Extended Rapid Transit (Alternate F).

For these three transportation alternates, Table 16 reflects the number of displacements and the capital costs of relocation that would be in addition to those relocation costs associated with the least costly base plan (Alternate A).

Table 13
1974 Construction and Right of Way Costs
for Controversial Expressways
($1,000)

Project	Mi.	Acres	Const.	R/W	Total
Hialeah Expressway H.E.F.T. to Alton Road	12.2	700	$ 60,118	$ 79,960	$140,078
Interama Expressway I-95 (Connection to Snake Creek Expressway) to NE 172 Street - NE 135 Street to Rickenbacker Causeway	14.9	467	91,999	45,030	137,033
LeJeune-Douglas Expressway H.E.F.T. to Airport Express-way Airport Entrance to South Dixie Expressway (Route H)	16.0	658	155,007	110,682	265,689
Opa Locka Expressway NW 27 Avenue to US-1 (Scheme No. 4)	4.5	191	53,113	28,785	81,898
Snake Creek Expressway I-95 to NW 27 Avenue	4.9	233	1,711	8,588	10,299
South Dixie Expressway I-95 Connection to SW 312 Street	25.4	806	106,108	60,095	166,203
TOTALS	77.9	3,055	$468,056	$333,144	$801,200

Table 14 Extended Rapid Transit Cost Estimate ($1,000)		1977	Interama 1978	Haulover 1979	Miami Beach 1980	MIA Central Area 1981	N-External+ S-External 1982	Cutler Ridge 1983	US-1 North 1984	1985	MIA - Hialeah 1986	1987
Track @ 5,000/mile	miles	0	1	3	9	18	14	Sac. 0 9.0	5 3.5	x 0	4 6.0	x 0
	cost		5,000	15,000	45,000	90,000	70,000	45,000	17,500	.	30,000	
Vehicles @ 120/car	cars		5	10	165	45	155	77	30		51	
@ 8.5 cars/mile	cost		600	12,000	19,800	5,400	18,600	9,240	3,600		6,120	
Stations	number		2	3	9	23	11	6	2		4	
@ 1,000 each	cost		2,000	3,000	9,000	23,000	11,000	6,000	2,000		4,000	
Maintenance and Storage			1st garage-15 ac			2nd garage-12 ac						
@ 18.95/car			2,600	1,070	390	2,039	1,103	500	500		500	
Control, Power & Communication												
175 x(miles) + 100x(stations) = cost			6,180	948	2,453	5,376	3,618	2,175	812		1,450	
SUBTOTAL		0	16,380	21,218	76,643	125,815	104,321	62,915	24,412	0	42,070	0
Architecture, Development & Start-Up												
(10% of Following Year)		1,638	2,122	7,664	12,582	10,432	6,291	2,441	0	4,207	0	3,900
Land Acquisition (ex. garage)												
50' x miles x 5,280/43,560 x $30k/Ac = 181.82/mile		632	544	1,878	3,785	3,155	858 S&C + 1,636 2,494	636	0	1,091	0	1,000
Park & Ride Construction (total spaces)		*Parked Autos	0	1,010*	760*	2,460*	3,560*	2,100	700		600	
@ 0.2/space		0	0	202	134	510	712	420	140	0	120	0
TOTAL RAPID TRANSIT		2,270	19,046	30,962	93,144	139,912	113,818	66,412	24,552	5,298	42,190	4,900
Surface Bus System Vehicles Cost		2,000	2,000	2,000	1,400	1,600	1,600	1,600	1,600	1,600	1,600	1,600
Total Capital Cost - 1970 dollars		4,270	21,046	32,962	94,544	141,512	115,418	68,012	26,152	6,898	43,790	6,500
Escalation to 1973 Dollars (10% annual) 1.331		5,683	28,012	43,872	125,838	188,352	153,621	90,524	34,808	9,181	58,284	8,652
(from 1973) Escalation Factor - 10% Annual		1.4641	1.6105	1.7716	1.9488	2.1437	2.3581	2.5939	2.8533	3.1386	3.4525	3.7978
TOTAL ESCALATED COSTS		8,320	45,113	77,724	245,233	403,770	362,254	234,810	99,318	28,815	201,226	32,858
Approx. Station Area @ 1 ac/100 autos		0	0	10 ac	7.6 ac	24.6	35.6	21	7	0	6	0
Dwelling Units Displaced 10/Ac (developed) 5/Ac (suburban)		0	0	0	76	246	356	105	35	0	60	0
Businesses Displaced 4/Station (developed) 2/Station (suburban)		0	0	0	36	92	44	12	8	0	16	0

Brickell Avenue 1988	1989	Flagler Street West 1990	1991	N. 103 Street 1992	1993	Kendall Drive 1994	1995	27 Ave. N.W. 1996	1997	Homestead 1998	1999	Jetport 2000	Totals
6	x	A	x	2	x	B	x	3	x	7	x	1	
5.5	0	7.0	0	7.0	0	7.0	0	7.0	0	9.5	0	9.5	116 miles
27,500		35,000		35,000		35,000		35,000		47,500		47,500	580,000
47		60		60		60		60		81		81	987 vehicles
5,640		7,200		7,200		7,200		7,200		9,720		9,720	118,440
4		4		5		4		3		2		1	83 stations
4,000		4,000		5,000		4,000		3,000		2,000		1,000	83,000
				3rd garage-20 ac									3 garages
500		500		4,750	2,225	500		500		500		500	18,677
1,362		1,625		1,725		1,625		1,525		1,862		1,762	34,498
39,002	0	48,325	0	53,675	2,225	48,325	0	47,225	0	61,582	0	60,482	834,615
0	4,832	0	5,367	222	4,832	0	4,722	0	6,158	0	6,048	0	83,458
0	1,273	0	1,873	0	1,273	0	1,273	0	1,727	0	1,727	0	24,361
400		1,200		750		1,200		900		600		0	16,240 spaces
80	0	240	0	150		240	0	180	0	120	0	0	3,248
39,082	6,105	48,565	7,240	54,047	8,330	48,565	5,995	45,405	7,885	61,702	7,775	60,482	945,682
1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	1,600	39,400
40,682	7,705	50,165	8,840	55,647	9,930	50,165	7,595	49,005	9,485	63,302	9,375	62,082	985,082
54,147	10,255	66,769	11,766	74,066	13,217	66,760	10,109	65,226	12,624	84,255	12,478	82,631	1,311,139 Total 1973 Dollar Cost of System in 1973
4.1776	4.5954	5.0549	5.5604	6.1164	6.7280	7.4008	8.1409	8.9550	9.8505	10.8356	11.9192	13.1111	
226,204	47,126	337,511	65,424	453,017	88,924	494,144	82,296	584,099	124,353	912,953	148,728	1,083,383	6,387,603 Total Actual Dollar Cost Expected
4	0	12	0	7.5	0	12	0	9	0	6	0	0	162.3 Acres
40	0	120	0	75	0	120	0	90	0	30	0	0	1,353 Dwelling Units Displaced
16	0	16	0	20	0	16	0	12	0	4	0	0	292 Businesses Displaced

Table 15
Additional Transit Capital Costs*
(Thousands 1974 dollars)

Cost Item	Total -	"Recommended" =	Additional Cost of Extension
Track	$ 849,178	$ 395,307	$ 453,871
Vehicles	173,408	80,291	93,117
Stations	121,520	74,691	46,829
Maintenance & Storage	27,345	11,276	16,069
Control Power & Communications	50,509	30,380	20,129
Subtotal	1,221,960	591,945	630,015
Engineering/Arch.	122,191	59,631	62,560
Park & Ride Construction	4,755	2,896	1,859
Total Construction	$1,348,906	$654,472	$694,434
Land Acquisition	139,303	69,195	70,108
Re-Location Costs	8,518	5,128	3,390

* Because bus purchases for replacements and fleet additions are made at nearly a uniform annual rate, they are more conveniently included as an annual operating cost rather than computed as a

Table 16
Relative Relocation Costs

Alternate	No. of Businesses	No. of Households	Cost ($1,000)* Businesses	Household	Total
A (Base)	-	-	-	-	-
B	25	235	250	705	955
C	-	-	-	-	-
D	525	7,242	5,250	21,726	26,976
E	-	-	-	-	-
F	108	770	1,080	2,310	3,390

* Cost computed at $3,000 per household and $10,000 per business

Annualization of Capital Costs. Thus far, sufficient information has been presented to compute the variations in right-of-way, relocation, and constructuion costs among the alternates. They are listed and converted to equivalent uniform annual costs in Table 17 below. Other recurring annual costs of each alternate will be subsequently computed and added to the values presented in Table 17 to provide an estimate of the total annual cost of each alternate.

Table 17
Transit and Highway Annualized Capital Costs
($1,000)

Expressways	Total Additional Cost*	Annual Cost**
Construction Cost	$468,056	$54,978
Right of Way Costs	333,144	39,131
Relocation Costs	26,976	3,169
Total	$828,176	$97,278
Additional Arterials		
Construction Costs	$ 27,730	$ 3,257
Right of Way Costs	10,478	1,231
Relocation Costs	955	112
Total	$ 39,163	$ 4,600
Extended Transit**		
Construction Costs	$694,434	$81,568
Right of Way Costs	70,108	8,235
Relocation Costs	3,390	398
Total	$767,932	$90,201

* Capital costs converted to equivalent uniform annual cost by applying a capital recovery factor at 10% interest for 20 years = 0.117460.

**Since bus purchases for replacements and fleet additions are made at nearly a uniform annual rate, they will be included as annual operating costs rather than as a capital cost item.

Recurring Annual Costs. A more extensive surface arterial street network will require larger expenditures for annual maintenance (Alternate B). The same is true for expressways (Alternate D). Annual maintenance and operating costs of a transit system are closely related to the ridership served, and the annual cost will vary among all six of the alternatives. Also to be included as a recurring cost item is the annual estimated expenditure for parking facilities; this value is logically related to the number of vehicle trips loaded on each alternate network. These annual costs are explored below.

Surface Arterial Annual Maintenance Costs are estimated using the average of adjusted values presented in House Document #124, "Supplementary Report of the Highway Cost Allocation Study" (of 1965) of $3,624 per centerline mile for Federal Aid Primary roadways in urban areas and $1,587 per centerline mile of Federal Aid Secondary roadways in urban areas. The average value has been updated to $8,816 per mile to represent current rates. When applied to the additional 69.7 miles of surface arterials of Alternative B, an additional annual maintenance cost of $614,475 is obtained.

The additional cost of Alternate D for the maintenance of the controversial expressways is tabulated in Table 18 as $999,300 annually.

Table 18
Expressway Annual Maintenance Costs

Expressway	Average Number of Lanes	Length (Miles)	Maintenance Cost/Mile* ($1,000)	Annual Maintenance Cost ($1,000)
Hialeah	4.7	12.2	11.0	$134.2
Interama	6	14.9	12.5	186.3
LeJeune-Douglas	8.5	16.0	16.0	256.0
Opa-Locka	6	4.5	12.5	56.3
Snake Creek	4	4.9	10.0	49.0
South Dixie	6	25.4	12.5	317.5
			TOTAL	$999.3

*From nationally derived values of $10,000 annually per mile for 4 lane facilities, $12,500 for 6 lanes, and $15,000 for 8 lanes.

Transit system maintenance and operating costs, for comparative purposes, can be estimated on the basis of the relative levels of transit ridership among the alternatives rather than requiring more exacting transit system parameters of the hours and miles of operation of buses and rapid transit vehicles. Thus, the annual maintenance and operating costs for each alternate is initially calculated as proportional to ridership. For Alternates C and F a further adjustment is felt necessary to this proportional cost because these alternates imply improved transit services: Alternate C emphasizes land use allocation and transit service, whereas Alternate F proposes a vastly expanded rapid transit system. The maintenance and operating expenses in Table 19 are derived from 1970 estimates of the Transit Technical Study, updated to the 1974 levels. As foot-noted in Table 17, bus acquisition is accounted for in this evaluation as an annual operating expense because a relatively uniform program should exist each year (a recurring cost) for net additions to the fleet and replacements for retired equipment. The annual bus acquisition program for each alternate is varied in proportion to ridership, using a base condition acquisition program of 45 vehicles per year at a 1974 unit cost of $42,500.

Table 19
Annual Transit Maintenance and Operating Costs
($1,000)

Test Network	Transit Ridership	M & O Excluding Bus Acquisition	Annual Uniform Bus Acquisition Cost	Total	Incremental Cost Beyond Base
A	450,000	54,391	2,117	56,508	5,450
B	425,000	51,369	1,999	53,368	2,310
C	721,115	100,234**	3,901**	104,135	53,077
D	406,600	49,145*	1,913	51,058	--
E	677,749	81,918	3,188	85,106	34,048
F	748,658	113,111***	4,402***	117,513	66,455

*Updated from 1970 estimate
**Further adjusted by factor of 1.15
***Further adjusted by factor of 1.25

Parking costs are included as an annual cost associated with the highway facility, rather than considered as a potential cost savings of a given alternate. The cost of these facilities reflects terminal costs of a highway-related trip. From previous work done in Dade County (resulting in Alternate D), it has been estimated that annual parking facility construction in downtown Miami could be reduced by an estimated $2.0 million per year due to increased transit ridership. That analysis did not have the benefit of the full range of the varying highway vehicle trips now under evaluation. In Table 20, annual parking facility construction costs are estimated on the basis of highway vehicle trips rather than transit ridership, and a factor of two has been applied to the previous cost estimate of $2 million per year to indicate that a more than equal number of parking lots and structures will be constructed in Dade County outside downtown Miami as will be constructed within the main central business district.

Table 20
Annual Parking Facility Construction Costs

Alternative	Daily Highway Vehicle Trips (1,000)	Annual Parking Facility Cost ($1,000)
A	3,907	3,999
B	3,911	4,003
C	3,912	4,004
D	3,908	4,000*
E	4,533	4,640
F	4,519	4,625

*Does not include operating cost of facility.
**Expanded from previous estimate for Downtown Miami only.

Incremental Annual Transportation Facility Cost Comparison. The "do-nothing" alternate, Alternate A, assumes no additional expressway construction beyond those now under construction or committed, no expansion of surface arterial streets and highways beyond that already recommended, and no expansion of bus and rapid transit facilities and services beyond those presently recommended. This alternate, in terms of the costs involved in providing transportation facilities, is the least expensive.

Tables 21 through 25 indicate the equivalent annual incremental cost of all alternates compared to those less costly to implement.

Table 21
Total Annual Additional Cost of Each Alternate
Compared to Least Costly - Alternate A
($1,000)

Cost Item	Alternate B	Alternate C	Alternate D	Alternate E	Alternate F
Transit:					
Construction	-	-	-	-	81,568
Right of Way	-	-	-	-	8,235
Relocation	-	-	-	-	398
Maintenance & Operation	-3,140	47,627	-5,450	28,598	61,005
Highway:					
Construction	3,257	-	54,978	-	-
Highway	1,231	-	39,131	-	-
Relocation	112	-	3,169	-	-
Maintenance & Operation	614	-	999	-	-
Parking Facilities:	4	5	1	641	626
Total Annual Additional Cost	$2,078	$47,632	$92,828	$29,239	$151,832

Table 22
Total Annual Additional Cost of More Costly Alternates*
Compared to Alternate B
($1,000)

Cost Item	Alternate C	Alternate D	Alternate E	Alternate F
Transit:				
Construction	-	-	-	81,568
Right of Way	-	-	-	8,235
Relocation	-	-	-	398
Maintenance & Operation	50,767	-2,310	31,738	64,145
Highway:				
Construction	-3,257	51,721	-3,257	-3,257
Right of Way	-1,231	37,900	-1,231	-1,231
Relocation	- 112	3,057	- 112	- 112
Maintenance & Operation	- 614	385	- 614	- 614
Parking Facilities:	1	-3	637	622
Total Annual Additional Cost	45,554	90,750	27,161	149,754

*Alternate A was least cost alternate, $2,078,000 less annually than Alternate B.

Table 23
Total Annual Additional Cost of More Costly Alternates*
Compared to Alternate C

Cost Item	Alternate D	Alternate F
Transit:		
Construction	-	81,568
Right of Way	-	8,235
Relocation	-	398
Maintenance & Operation	-53,077	13,378
Highway:		
Construction	54,978	-
Right of Way	39,131	-
Relocation	3,169	-
Maintenance & Operation	999	-
Parking Facilities:	-4	621
Total Annual Additional Cost	45,196	104,200

*Alternates A, B, and E are less costly than Alternate C and thus are not compared.

Table 24
Total Annual Additional Cost of Alternate F
Compared to Alternate D
($1,000)

Cost Item	Alternate F
Transit:	
Construction	81,568
Right of Way	3,235
Relocation	398
Maintenance & Operation	66,455
Highway:	
Construction	-54,978
Right of Way	-39,131
Relocation	- 3,169
Maintenance & Operation	- 999
Parking Facilities:	625
Total Annual Additional Cost	59,004

Table 25
Total Annual Additional Cost of More Costly Alternates*
Compared to Alternate E
($1,000)

Cost Item	Alternate C	Alternate D	Alternate F
Transit:			
Construction	-	-	81,568
Right of Way	-	-	8,235
Relocation	-	-	398
Maintenance & Operation	19,029	-34,048	32,407
Highway:			
Construction	-	54,978	-
Right of Way	-	39,131	-
Relocation	-	3,169	-
Maintenance & Operation	-	999	-
Parking Facilities:	-636	-640	-15
Total Annual Additional Cost	18,393	122,598	63,589

*Alternates A and B are less costly than Alternate E and thus these are not compared.

Transportation System User Costs

This section describes those costs that can be attributable to the transportation users (both of highway facilities and transit services) under the alternative facilities offered them and the future land use allocations which determine travel patterns. The system user costs to be computed include:

1. Travel time cost to highway and transit users.
2. Highway vehicle operating costs.
3. Transit system user accident costs.
4. Highway system user accident costs.

Travel Time Cost. These costs are computed on the basis of $2.85/hour as the value of a person's time. Highway vehicle hours of travel are multiplied by auto occupancy to obtain person hours of travel by the highway mode. The hours of travel consumed in transit are based on previously developed "choice" modal split models, entering the graphs with percent modal split and obtaining a transit to highway travel time ratio. First, however, captive transit trips are subtracted from total transit ridership to obtain percent of total highway and transit travel that is represented by choice ridership. Applying the travel time ratio to total hours of highway travel, travel on transit facilities is obtained, and the $2.85/hour value of a person's time is applied to both choice and captive riders alike. The calculated travel time costs for each alternate, presented in Table 26, vary between approximately $5.9 and $8.8 million daily.

Highway Vehicle Operating Cost. The costs of highway vehicle operation include fuel, tires, engine oil, maintenance and those depreciation costs that can be associated with mileage. As is the case for eliminating transit fares as a cost, highway taxes are likewise eliminated in calculating road user operating costs. Vehicle operating costs per mile vary considerably with running speed. The values computed in Table 27 assume a traffic composition of 92% autos and 8% other vehicles (trucks, buses). With the alternative transportation facilities offered them, future Dade County highway users could be expected to expend between $2.3 million and $3.2 million daily in operating their highway vehicles (excluding road user costs such as vehicle registration, fees licenses, and taxes on gasoline, oil and rubber). It should be emphasized that the values shown are an absolute minimum and they are based on a constant operating speed from the beginning of a trip to its termination. Available data precluded cost estimates for the extent of vehicle acceleration, braking, and stopping associated with each alternate.

Transit System User Accident Costs. Unit cost data for transit accidents, particularly rail systems, have been estimated by only a few researchers.

TABLE 26

Transportation System User Daily Travel Time Costs

	Alternate System A	B	C	D	E	F
Highways:						
Person Hours of Highway Travel[1]	1,939,491	1,926,685	1,808,378	1,827,562	2,704,977	2,767,243
Daily Highway Users Travel Time Cost[2] ($1,000)	5,528	5,491	5,154	5,209	7,709	7,887
Transit:						
% Choice Transit Ridership of all Travel	2.44%	2.08%	2.21%	1.76%	2.52%	3.01%
Travel Time Ratio[3]	1.42	1.96	1.85	2.12	1.58	1.32
Average Highway Travel Time (minutes)	17.33	17.29	17.13	17.24	18.56	18.47
Average Transit Travel Time (minutes)	24.61	33.89	21.69	36.55	29.32	24.38
Daily Hours of Transit Travel[4]	184,575	240,054	380,869	247,687	331,193	304,205
Daily Transit Users Travel Time Cost ($1,000)[2]	526	684	1,085	705	944	867
Total System Daily Travel Time Cost ($1,000)	$6,054	$6,175	$6,239	$5,914	$8,653	$8,754

1 Highway vehicle hours of travel x auto occupancy
2 Computed @ $2.85 per hour per person
3 From average of work, shop, and other trip purpose modal split curves for choice transit ridership
4 (Captive + Choice Ridership) (Average Travel Time in minutes) 160

TABLE 27

Highway Users Daily Operating Expenses

	Alternate System					
	A	B	C	D	E	F
Vehicle Miles of Travel	36,058,464	36,175,613	35,593,118	36,658,333	45,528,504	48,203,051
Average Highway Speed (mph)	24.95	25.29	24.98	27.14	22.29	22.44
Unit Running Costs ($/1,000 Vehicle miles)						
Passenger Cars 92%	35.62	35.58	35.63	35.25	36.30	36.27
Trucks and other vehicles	101.28	101.04	101.20	100.11	103.77	103.55
Weighted Unit Price	40.87	40.82	40.88	40.44	41.70	41.65
Updated at 10% annually to 1974 level	65.82	65.74	65.84	65.13	67.16	67.08
Unadjusted Daily Running (Operating) Costs ($1,000)[2]	2,373	2,378	2,343	2,388	3,058	3,233

1 From Winfrey

2 Values shown are underestimated; computed using constant running speed with no adjustment available for extent of acceleration, braking, and stopping associated with each alternate.

The following rates, which have been reported by others, are used in the calculation of anticipated cost of transit accidents:

Surface Bus - 0.0030 $/passenger mile
Rail - 0.0010 $/passenger mile

The available data for this evaluation does not include the transit ridership by sub-mode type. Previous work in Dade County on the MUATS "recommended" system has indicated that approximately half of the expected transit riders were "bus only" passengers, and approximately one-third of the rapid transit riders used a bus as their access mode to and from the rapid system. (The remaining two-thirds walk, cycle, or use an auto). It is assumed that of the rapid transit riders who access the system via the bus, that one-third their total trip is by bus and two-thirds within a rapid transit vehicle. Thus, a single weighted accident rate is derived from the two rates above.

$$\text{Transit accident rate} = \tfrac{1}{2}\,(0.0030) + \tfrac{1}{2}\left(\frac{0.0030}{3} + \frac{2 \times 0.0010}{3}\right)$$

$$\text{Transit accident rate} \doteq 0.00233 \text{ dollars per passenger mile}$$

Transit speeds have also been approximated to at least the same level of accuracy as theat of accident rates. Previous work has indicated that bus speeds should average between 8-12 mph for other than express service. When station spacing, station dwell times, acceleration and braking are considered, rapid transit system overall average speed should approximate 32 mph. To calculate a weighted system-wide speed to be applied to all transit system riders, the above logic is again applied regarding "bus only" passengers and rapid transit access. This results in a mean system speed of 17.33 mph. With speed and transit hours of travel known, (from Table 26) the anticipated cost of transit accidents can be computed, as shown in Table 28. The tabulated costs are relatively low, particularly the cost differences among alternatives. Lack of technical data for the alternates precluded the use of a valid method to compute accident costs while riders were on the system. To obtain the tabulated values, transit passenger hours of travel are multiplied by average system speed to obtain miles of passenger travel. The weighted accident rate per passenger mile is then applied. The fallacy lies in the use of the values shown for transit passenger hours of travel. These values were previously derived using transit to highway travel time ratios and existing modal split curves. Implicit in the use of this procedure are terminal and transfer times - the time spent reaching and waiting for transit service (which rightfully should be considered in computing total travel time costs associated with completing a transit trip). However, these total times are greater than that actually consumed on the system. As a result, the transit passenger miles indicated in Table 28 are larger than those actually anticipated under any of the alternates. This error is included consistently for all alternates. Unfortunately, greater accuracy cannot be achieved with data available at this time.

Table 28
Transit System User Accident Costs

	Alternative					
	A	B	C	D	E	F
Transit Passenger Hours of Travel	184,575	240,054	380,869	247,687	331,193	304,205
Transit Passenger Miles of Travel (1,000)	3,199	4,160	4,600	4,292	5,740	5,272
Transit User Daily Accident Costs ($1,000)	7.46	9.71	15.40	10.01	13.39	12.30

Highway System User Accident Costs. Highway accidents are closely correlated with the probability of an accident occurring when exposed to certain obstacles coupled with the number of "exposures" occurring on a given trip. These exposures can be fixed objects along a route or other vehicles, pedestrians, cyclists, etc. The exposure rate can depend on the length of time on a facility, or the number of potential "dangers" encountered per mile. Rates seem to have a better correlation with vehicle miles of travel than with vehicle hours of travel.

Other urban transportation studies and accident research compiled in Illinois, Florida and Ohio have produced the highway accident rates shown in Table 29. Costs shown in this table have been updated to 1974 levels.

Table 29
Highway Accident Rates

Highway Travel Accident Item	Local Streets	Arterial Streets	Expressways	Total
Number per 100 million Vehicle Miles				
Fatalities	6.95	3.14	1.17	3.58
Non-Fatal Injuries	1,132	455	91	53
Property Damage Only	9,069	1,967	418	2,940
Total	10,208	2,425	510	3,475
Cost per 100 million Vehicle Miles ($1,000)				
Fatalities	100.7	44.4	26.2	51.7
Non-fatal Injuries	3,533.5	1,792.5	389.3	1,954.1
Property Damage Only	4,655.4	1,034.7	409.4	1,542.7
Total	8,289.7	2,871.5	824.9	3,548.5

Expressway accident rates are substantially lower than surface arterial accident rates. However, the severity of an expressway accident, when an accident does happen, is, on the average, much greater than the average urban arterial street accident. Unfortunately, the computer input supplied to described the alternative highway networks did not allow a computation of the vehicle miles of travel on each highway network by facility type - expressways, other principal arterials, etc. Based on 1970 Highway Functional Classification studies in Florida, expressways and other principal and minor streets carry 77.6% of the vehicle miels of travel in urban areas. The Interstate system and other freeways and expressways alone carry 9.6% of all travel. Considering the hierarchy of functional classification to the arterial street level, expressways can be expected to carry 12.4% of the total arterial travel. This factor is used in the development of the following adjusted highway accident rates for this analysis for each alternate, since the technical data describing each alternate did not contain vehicle miles of travel by functional class (see Table 30).

Table 30
Weighted Highway Accident Rates

Accident Item per 100 million VMT	Weighted Rate
Number	
Fatalities	2.896
Non-fatal Injuries	409.86
Property Damage	1,774.9
Total	2,187.7
Cost ($1,000)	
Fatalities	42.143
Non-fatal Injuries	1,618.5
Property Damage	957.16
Total	2,617.8

The highway networks of the alternatives being evaluated have two differences that would affect accident rates. Some have fewer miles of expressways than others, and the miles of roadway with considerable congestion (for instance, peak hour volume/capacity ratios over 1.5) vary among alternates. Alternate D, for example, would carry a greater percentage of traffic on expressways than other alternates; therefore, the difference in accident rates between arterial streets and expressways must be taken into account. A further adjustment is required for surface arterial streets to indicate the effect congestion (exposure rate) has on accident rates. Alternate B provides a more extensive arterial street network than all others, and further adjustments should be made accordingly.

To better estimate anticipated expressway accidents, the MUATS recommended plan traffic assignments were reviewed. For those controversial expressways being considered for deletion, the assigned volumes and length of each link of each appropriate expressway segment were listed and daily vehicle miles of travel on these expressways were calculated. These values are summarized in Table 31.

Table 31
Controversial Expressway Anticipated Travel*

Expressway		Daily VMT
1.	Hialeah	970,127
2.	Interama	1,229,863
3.	LeJeune-Douglas	1,502,255
4.	Opa-Locka	1,701,419
5.	Snake Creek	44,608
6.	South Dixie	1,492,989
	TOTAL	6,941,261

*Net 6.3

Alternate D was the only one which contained more miles of expressways than all other alternative highway transportation networks. 6.941 million daily miles of travel could be expected on these controversial expressways. For the other alternates, it is assumed that of the highway trips loaded this additional amount of travel will be on the surface arterial streets. 6,941,261 vehicle miles per day is equivalent to 2.221 billion vehicle miles of travel annually. This figure, when compared to the total of 11.731 billion vehicle miles of travel, represents 18.93% of all travel on the Alternate D highway network. Accident rates for expressways were compared to those weighted rates presented previously. When combined with the percent of traffic to use the controversial expressways, the following adjustment factors in Table 32 were developed for Alternate D:

Table 32
Expressway Accident Adjustment Factors

Accident Rate Category	System-Wide % Reduction	Adjustment Factor
Number		
Fatalities	11.28%	0.887
Non-fatal Injuries	14.73%	0.853
Property Damage	14.48%	0.855
Cost		
Fatalities	7.16%	0.927
Non-fatal Injuries	14.38%	0.856
Property Damage	10.84%	0.892

On a daily basis, the number of expressway accidents per million vehicle miles of travel do not vary significantly with running speed. This is not found to be the case with surface arterial street accidents. Accident rate per million miles of travel on surface arterials vary considerably with vehicle running speed vs. posted speed. This differential in speed is an indication of congestion (density of other vehicles - exposure rate). From other research it is shown that the annual number of accidents anticipated per mile of four lane divided arterial, y, is a function of average daily traffic, x. The mathematical expression is as follows:

$$y = 3.33 x^{0.000419}$$

The technical data describing each alternate was insufficient to allow use of this formula directly. However, it can be applied to develop an index and reasonable adjustments were made to account for the fact that varying vehicle miles of travel are being accommodated on the highway networks.

For Alternate B, a further adjustment is necessary. For equal amounts of travel, some reduction in accident rates can be expected if a more extensive arterial network is provided. It is assumed that the total arterial network will be approximately 4,000 miles and 69 more miles of arterials would be added under Alternate B. This would allow traffic to be further dispersed by roughly 2%. Thus a further adjustment of approximately 0.98 is developed to account for greater traffic dispersion (reduced exposures) under Alternate B.

Highway accident rates are usually expressed in terms of 100 million vehicle miles. Unlike other transportation system user costs developed thus far in Table 33 the daily vehicle miles of travel are first converted to an annual rigure for each alternate before applying accident rates. The variations in expected annual highway accident costs among the alternates range between $270 and $423 million.

<u>Summation of Annual System User Costs</u>. System user costs, excluding highway accident costs, have been expressed thus far on a daily basis. The daily system user costs listed thus far are converted to an annual amount in Table 34 in order to compare these costs with the annual costs associated with providing the transportation services and facilities for each alternate.

Table 33
Annual Highway Accidents and Costs

	Alternate					
	A	B	C	D	E	F
Highway Vehicle Miles of Travel Daily	36,058,464	36,175,613	35,593,118	36,658,333	45,528,504	48,203,05[illegible]
Annual Vehicle Miles of Travel* (100 million)	115.39	115.76	113.90	117.31	145.69	154.2[illegible]
Unadjusted Accidents						
Number						
Fatalities	334	335	329	340	422	447
Non-fatal Injuries	47,292	47,445	46,683	48,081	59,713	63,22[illegible]
Property Damage	204,800	205,463	202,161	208,214	258,585	273,77[illegible]
Total	252,426	253,243	249,173	256,635	318,720	337,446
Unadjusted Accident Costs ($1,000)						
Fatalities	4,863	4,879	4,800	4,944	6,140	6,501
Non-fatal Injuries	186,754	187,358	184,347	189,866	235,799	249,65[illegible]
Property Damage	110,443	110,800	109,021	112,284	139,449	147,64[illegible]
Total	302,050	203,037	298,168	307,094	381,388	403,797
Accident Rate Adjustment Factors						
Miles of Travel	1.002	1.00	1.006	1.010	1.040	1.048
Equivalent Miles of Arterial Network	1.00	.9826	1.00	1.00	1.00	1.0[illegible]
Expressway vs. Arterial Accidents	1.00	1.00	1.00	see text	1.00	1.00
Adjusted Accidents						
Number						
Fatalities	335	329	331	305	439	46[illegible]
Non-fatal Injuries	47,387	46,619	46,963	41,423	62,102	66,256
Property Damage	205,210	201,888	203,374	179,803	268,928	286,919
Total	252,932	248,836	250,668	221,531	331,469	353,64[illegible]
Adjusted Accident Costs ($1,000)						
Fatalities**	4,872	4,787	4,829	4,634	6,386	6,813
Non-fatal Injuries**	187,127	184,098	185,453	164,151	245,231	261,637
Property Damage**	110,665	108,872	109,675	101,159	145,027	154,729
Total	302,664	297,757	299,957	269,944	396,644	423,179

*Annualization factor = 320
**Adjusted cost = unadjusted cost x adjusted number/unadjusted number of accidents in each category. Alternate D computed separately.

Table 34.

Unadjusted Annual User Cost
by Subgroup of Trip Makers
($1,000)

	Alternate					
	A	B	C	D	E	F
Highway Trips						
Accident Cost	302,664	297,757	299,957	269,944	396,644	423,179
Operating Cost	759,360	760,960	749,760	764,160	978,560	1,034,560
Travel Time Cost	1,768,960	1,757,120	1,649,280	1,666,880	2,466,880	2,523,840
Subtotal	2,830,984	2,815,837	2,698,997	2,700,984	3,842,084	3,981,579
Transit Trips						
Accident Cost	2,387	3,107	4,928	3,203	4,285	3,936
Travel Time Cost	168,320	218,880	347,200	225,600	302,080	277,440
Subtotal	170,707	221,987	352,128	228,803	306,365	281,376
Total All Trips						
Accident Cost	305,051	300,864	304,885	273,147	400,929	427,115
Operating Cost	759,360	760,960	749,760	764,160	978,560	1,034,560
Travel Time Cost	1,937,280	1,976,000	1,996,480	1,892,480	2,768,960	2,801,280
Total	3,001,691	3,037,824	3,051,125	2,929,787	4,148,449	4,262,955

Comparison of Transportation Facility and System User Costs

The alternatives require special attention in the analysis of their economic attributes because they differ in forecast period (1985 and 2000) and the transportation systems offer unequal levels of highway and transit services. Table 35 indicates the various transportation system facilities and associated future land use plans associated with each alternate under evaluation. With a consistent land use allocation, Alternatives A, B, and D will lend themselves to benefit/cost comparison to determine an economically preferable transportation system plan for the year 1985. Comparison of Alternates A and C should also indicate, from only the standpoint of transportation economics, which land use pattern for the year 1985 should be pursued. Unfortunately, Alternatives E and F for the year 2000 have both differing land use and transportation system assumptions: therefore their transportation attributes and land use attributes cannot be compared independently, only in combination and only on the basis of transportation costs.

Table 35
Land Use/Transportation System Matrix*

	Land Use Plan			
	Year 1985		Year 2000	
Multi-Modal Transportation System	Past Trends Allocation	Transit Emphasis Allocation	Past Trends Allocation	Activity Center Allocation
Arterial Emphasis	B			
Expanded Transit				F
"Do Nothing"	A	C	E	
Old MUATS	D			

*Letters refer to Alternate under evaluation

Books and journal papers on the subject of economic analyses rarely mention that mutually exclusive alternatives may render unequal service, and because they do not accomplish identical goals their costs and benefits (system user costs) can differ widely in quality and quantity. For instance, Alternate D offers an average highway speed of 27.14 mph (a measure of service quality), whereas users of Alternate B would travel 25.29 mph on the average. Thus, a direct benefit/cost comparison of these alternates using unadjusted equivalent uniform annual transportation costs would not necessarily indicate an acceptable index of superiority and could not be justified.

Another pitfall that must be avoided in the analysis, aside from differing levels of service, is the differing demands for service among the alternatives. Some adjustment should be applied to equalize demands (such as the transportation system user costs per million person trips).

Comparison of 1985 Transportation Systems

As shown in Table 35, these Alternates A, B, and D have the same 1985 land use allocations. Their comparison should indicate which of the three associated transportation systems is economically preferable. The benefit/cost ratio mentioned will be used in an incremental procedure to assure that incremental costs and associated incremental services are economical when compared by pairs of alternatives. Alternate A, the least expensive in terms of public expenditures is used as the initial base for comparison in Table 36.

Table 36
Benefit/Cost Comparison
with Alternate A as base

	Alternate		
	A	B	D
Unadjusted Annual System User Costs*($1,000)	3,001,691	3,037,824	2,929,787
Relative Mobility Compared to Alternate A	1.0000	1.022	1.1705
Adjusted Annual System User Cost ($1,000)	3,001,691	2,972,431	2,503,022
Adjusted Annual User Cost Saving ($1,000)	--	29,260	498,669
Additional Equivalent Annual Facility Cost ($1,000)**	--	2,078	92,828
Benefit/Cost	--	14.08	5.37

*From Table 34
**From Table 21

In comparison to Alternate A, both Alternates B and D are economically superior, as benefit/cost ratios exceed 1.0. However, it cannot be concluded from Table 36 that because Alternate B has a higher benefit/cost ratio than Alternate D (14.08 vs. 5.37), Alternate B is superior to both Alternates A and D. An incremental process must be employed. Alternate B is less costly to implement than Alternate D and is used in Table 37 as the base for comparing thewe two alternatives.

Table 37
Benefit/Cost Comparison - Alternates B and D
with Alternate B as Base

	B	D
Unadjusted Annual System User Cost ($1,000)*	3,037,824	2,929,787
Relative Mobility Compared to Alternate B	1.0000	1.1449
Adjusted Annual User Cost ($1,000)	3,037,824	2,558,989
Adjusted Annual User Cost Savings ($1,000)	--	478,835
Additional Equivalent Annual Facility Cost ($1,000)**	--	90.750
Benefit/Cost	--	5.28

*From Table 34
**From Table 22

It is concluded from the standpoint of transportation economics that if 1985 land use allocations follow past trends, the original MUATS highway and transit proposals (Alternate D) are more efficient than implementation of the MUATS proposals with the exclusion of Additional expressways and the construction of 29 surface arterial streets beyond that of the original MUATS proposal (Alternate B). Also, implementation of the MUATS transit proposal and surface arterial streets with the exclusion of additional, controversial expressways (Alternate A) is the least economical of the three based on the costs considered.

Comparison of 1985 Land Use Patterns

As shown in Table 35, Alternates A and C have identical transportation systems but differing land use allocations. Table 11 indicates differing levels of service (speed) and differing service demands (person trips) between these two alternates. Adjustments are necessary to compensate for these differences. Because Alternate A is less expensive, an adjustment factor to compensate for the differences in travel demand (person trips) is developed in Table 38 on the basis of 5,693,534 person trips for Alternate A.

Table 38
Travel Demand Adjustment for Alternate C

Daily Person Trips	5,686,628
Annual System User Cost ($1,000)	3,051,125
Annual System User Cost per 5,693,534 daily person trips ($1,000)	3,054,830

An additional adjustment for the difference in level of service offered by these alternates should also be applied. Table 10 shows that the relative area covered (trip length distance squared) by Alternate C is approximately 98% of that of Alternate A. However, a closer examination of Table 11 is necessary. Average highway speeds are approximately the same for these alternates, 24.95 mph for Alternate A and 24.98 mph for Alternate C. Although both average speed and average trip length (distance) are slightly lower for Alternate C, noteworthy is the fact from Table 11 that the average trip length (time) in minutes is less than that of Alternate A. This means, that although the average person may be required to travel at a slightly reduced speed for the land use allocations associated with Alternate C, due to the concentration of land uses he does not have to travel as long a time nor as long a distance to satisfy his trip purpose. Thus, there are fewer vehicle miles and person hours of travel consumed on Alternate C (also shown in Table 11).

Between these two alternates, then, a person's desired mobility is not at all impaired due to the fact that his average trip distance is reduced. He has no reason to travel further. Thus, the adjustments for varying levels of service based on the mobility indices of Table 10 are not applicable in comparing Alternates A and C.* Only the adjustment for (minor) variation in travel demand will be made. On this basis, the benefit/cost ratio of these two alternates is computed in Table 39, using the less costly Alternate A as a base.

*These indices are applicable (in a conservative fashion) only in those cases where average trip time increases and trip distance decreases between a pair of alternates. This is the case in the previous comparison for Alternates A and B, A and D, and B and D.

Table 39
Benefit/Cost Comparison
Alternates A and C with Alternate A as base

	Alternate	
	A	C
Annual System User Cost per 5,693,534 Daily Person Trips ($1,000)	3,001,691**	3,054,830*
Annual User Savings ($1,000)	--	-53,139
Additional Equivalent Annual Facility Cost*** ($1,000)	--	47,632
Benefit/Cost	--	-1.12

*From Table 38
**From Table 34
***From Table 21

Table 39 indicates that if Alternate C land use is pursued rather than Alternate A, for every public dollar expended for the necessary operation of the transportation facilities, transportation users would incur $1.12 in additional expenses in using the system. This is certainly an economically inefficient proposition. It should also be noted that a higher negative ratio would result if facility costs were more equal between these alternates.

The conclusion that Alternate A is preferable to Alternate C seemingly is contradicted by the fact previously mentioned that fewer vehicle miles of travel as well as fewer hours of highway travel are required by highway users of Alternate C. Table 34 shows that additional user costs of the transit facilities (due only to a greater number of transit users) more than offsets any savings to be gained by highway users. The increase in facility costs is mainly accounted for by the increased operating expense of the transit system due to increased transit ridership.

From the standpoint of solely transportation economics, it would be advantageous to pursue less concentrated land uses for the year 1985 (Alternate A) than to concentrate land uses (Alternate C) if only the MUATS transit plan is to be implemented with none of the controversial expressways and only those surface arterial streets of the existing MUATS plan.

Comparison of Other Alternates.

If adjustments were made to compensate for differing levels of service and demand, it would be academic to compare Alternate E with Alternates A and C. These alternates have identical transportation facilities, but Alternate E differs in the forecast year. It is sufficient to state that with a constant supply of transport facilities, service to transportation users will deteriorate with increasing demands.

Two alternates (E and F) can be compared for the year 2000. They have differing land uses and transportation facilities. They have differing transport demands and levels of transport service as well. As shown in Table 23, the annual facility costs of Alternate E is $122,598,000 less costly and will be used as a base to determine if the increase in facility cost of Alternate F provides at least as great a decrease in user costs. Adjustments for varying demand and service are performed and the adjusted benefits vs. costs are compared in Table 40.

Table 40
Demand and Service Adjustments
to Alternate F with Alternate E as a Base

	E	F
Daily Person Trips	6,681,675	6,569,323
Unadjusted Transportation System User Cost* ($1,000)	4,148,449	4,262,955
User Costs per 6,681,675 daily person trips	4,148,449	4,335,862
Relative Mobility**	1.000	1.003
Adjusted Annual System User Cost ($1,000)	4,148,449	4,322,893
Adjusted Annual System User Cost Savings ($1,000)	--	-174,444
Additional Annual Facility Cost*** ($1,000)		122,598
Benefit/Cost	--	-1.42

*From Table 38
**From Table 34
***From Table 21

This table indicates that facility users would be financially penalized and greater facility costs would also be necessary if Alternate F were implemented rather than Alternate E. With the information presented it should be noted that a valid conclusion cannot be reached regarding which transportation system is preferable nor which allocation of land use (from the standpoint of only transportation economics) is more efficient. The only conclusion that can be drawn is that for the year 2000 extended rapid transit facilities with activity center allocation of land uses is less efficient in terms of transportation costs than following a course of action to implement the transportation facilities of Alternate E together with the allocation of land uses based on past trends. To determine which of the two land use plans is economically preferable or which of the two transportation systems alone is preferable would require the development and evaluation of another Alternate with the land use of Alternate F and transportation sytem of Alternate E or with the land use of Alternate E and transportation facilities of Alternate F.

System Level Summary and Conclusions

The previous sections of this chapter produce conflicting system-level conclusions regarding the desirability of the transportation alternatives under investigation. The following matrix summarizes and generalizes whether the four transportation alternatives are unacceptable, poor, acceptable or desirable in regard to the four system level criteria categories.

System Level Evaluation Summary

System Criteria Category	Transportation Network: MUATS	Arterial Emphasis	Transit Emphasis	Do Nothing
Social	Unacceptable	Acceptable	Desirable	Poor
Environmental	Desirable	Acceptable	Acceptable	Acceptable
Operational	Desirable	Acceptable	Acceptable	Poor
Cost	Desirable	Acceptable	Acceptable	Poor

The original MUATS plan is superior to all other transportation systems tested when measured in terms of environmental (energy consumption and air quality), operational and cost criteria; however, many aspects of the plan are socially unacceptable. The "do-nothing" alternative is generally poor. Both the arterial emphasis and transit emphasis alternatives have an overall acceptable rating.

Major revisions to County population, employment and land uses projections compared to the original MUATS plan were used in this study. The ramifications of the various land use and transportation systems tested were used in the development of the Comprehensive Development Master Plan. However, the various future land use projections used were not those of the Comprehensive Development Master Plan. Once a preliminary decision is reached regarding the future transportation system to serve the area, the system should be tested utilizing land use projections associated with the Comprehensive Development Master Plan and utilizing an up-to-date modal split model that will portray the expected role transit will play in satisfying the County's transportation needs.

The traffic assignment procedure and modal split assumptions used in this study produce sufficiently accurate information to predict definitive system-wide needs to be used in the expressway/surface arterial/transit selection process at the system level. Although they provide insight into the definition of specific recommendations for the improvement of transportation services, they do not produce sufficiently accurate information for such definition at a corridor level. Thus, the alternatives should be examined at the corridor level to reveal any new facts from which decisions can be made.

CORRIDOR LEVEL EVALUATION

As part of the analysis of the Controversial Corridors Review, it became necessary to examine the impact of the alternatives within each corridor. Basically, the alternative courses of action within the corridors consisted of: (1) the original proposal; (2) expanding the arterial street network; (3) transit improvements; or (4) "do nothing." This section of the Controversial Corridors Review proposes to examine the impact of these alternatives within the following six Controversial Corridors:

1. Opa-locka Corridor.
2. Hialeah Corridor.
3. Snake Creek-North Dade Corridor.
4. Le Jeune - Douglas Corridor.
5. South Dixie Corridor.
6. Interama Corridor.

Social Criteria

Social concerns examined at the corridor level of evaluation cover a broad range of subjects not included in the environmental, cost, or operational analysis. These social concerns include neighborhood disruption caused by the alternative proposals, transportation service needs of the corridor, and compatibility with other long-range plans for the corridor. These areas of concern have not been previously examined in detail and may have formed the nucleus of neighborhood opposition to earlier transportation improvement projects. By carefully examining these social concerns in conjunction with the alternative service proposals for each corridor, the alternative meeting each corridor's "social" needs can be identified.

The three broad areas of citizen concern to the proposed transportation improvements have been: neighborhood disruption, service needs, and regard for the Dade County Comprehensive Development Master Plan. Each of the corridor areas is assumed to cover approximately a mile-wide impact area which is centered upon the proposed transportation improvement. Whenever possible, data for these areas have been gathered from the most recent sources available. These sources have included 1970 Census data, Dade County Planning Department reports, Simpson and Curtin study, Kaiser Engineers study, Florida Department of Transportation data, recent aerial photographs, and field checks.

Within the three broad areas of social impact, six criteria have been established to examine the proposals. These criteria are:

Neighborhood Impact:	1.	Displacements.
	2.	Disruption of public services.
Service Needs:	1.	Demographic Characteristics.
	2.	Facility capability related to needs.
Planning Objectives:	1.	Compatibility with Dade County Comprehensive Master Plan

These alternative transportation proposals will be examined in matrix fashion for each corridor, or sections of each corridor, to judge their impact.

Neighborhood Impact

Displacements. The use of aerial photographs, field surveys, and estimated right-of-way requirements enable an estimation of the displacements caused by the alternative proposals. This work was done by the Dade County Public Works Department and Kaiser Engineers. The following is a summary of their findings and standards used for estimation.

Minimum Right of Way Requirements: *

Rapid Transit -	40'
2 - lane road -	50'
4 - lane undivided road -	70'
4 - lane divided road -	80'
6 - lane divided road -	100'
4 - lane expressway -	300'
6 - lane expressway -	300'

*Excludes station and interchange requirements.

Current Dade County aerial photographs and section sheets were examined in detail to ascertain the number of building sites which would have to be acquired for the "Arterial Street Emphasis" alternate. Additional improvements will necessitate relocation of people occupying approximately 180 building sites and 20 trailer sites, as indicated in Table 41. This compares favorably with the impact caused by the proposed development of the LeJeune-Douglas Expressway with an estimated 709 mobile homes affected and 2,556

Table 41
Arterial Emphasis Displacements

	Facility	Displacements
1.	NW 10 Avenue (82 Street - US-1)	NONE
2.	NW 7 Avenue (82 Street - 151 Street)	NONE
3.	NW 12 Avenue (79 Street - 103 Street)	
	Approximately 20 trailers at Trailer Court	20 Trailers
	East between NW 79 Street and NW 81 Street - 2 houses	
	West side North 79 Street - 2 houses	24 Sites
4.	NW 12 Avenue (103 Street to Opa Locka Boulevard)	NONE
5.	NW 22 Avenue (Tamiami Trail to NW 183 Street)	
	a. 24 in Section 3-54-41	
	b. 14 in Section 34-53-41	
	c. 19 in Section 27-53-41	
	d. 1 in Section 22-53-41	58 Sites
6.	NW 27 Avenue (State Road 9 - Broward Line)	NONE
7.	SW 32 Avenue (SW 8 Street - NW 7 Street)	NONE
8.	NW 32 Avenue (Miami River - NW 62 Street)	
	a. 2 in Section 16-53-41	
	b. 3 in Section 21-53-41	
	c. 15 in Section 28-53-41	20 Sites
9.	NW 32 Avenue (NW 95 Street - 103 Street) Sheet #4-53-41	13 Sites
10.	NW 37 Avenue (NW 7 Street - Miami River) Sheet 32-53-41	1 Site
11.	Ponce de Leon Boulevard (57 - Grand Avenue)	NONE
12.	NW 42 Avenue (NW 103 - 135 Street)	NONE
13.	SW 62 Avenue (US-1 - NW 7 Street) Sheet 13-54-40	4 Sites
14.	SW 72 Avenue (Snapper Creek Expressway - SW 56 Street)	NONE
15.	SW 72 Avenue (SW 40 Street - SW 24 Street)	NONE
16.	SW 72 Avenue (SW 24 Street - SW 8 Street)	NONE
17.	SW 72 Avenue (SW 8 Street - West Flagler Street)	NONE
18.	SW 87 Avenue (West Flagler Street - East/West Expressway)	NONE
19.	SW 107 Avenue (SW 56 Street - SW 24 Street)	NONE
20.	SW 107 Avenue (SW 24 Street - East/West Expressway)	
	Section 6-54-40	4 Sites
21.	SW 56 Street (SW 117 Avenue - 97 Avenue)	NONE
22.	Grand Avenue (US-1 - Main Highway)	
	a. 24 in Section 20-54-41	
	b. 11 in Section 21-54-41	35 Sites
23.	SW 24 Street (57 Avenue - 42 Avenue)	NONE
24.	SW 24 Street (87 Avenue - 117 Avenue)	NONE
25.	NW 71 Street (US-1 - US-27)	
	a. 16 in Section 15-53-41	
	b. 3 in Section 14-53-41	
	c. Unknown Sheet 18-53-42	19 Sites
26.	NW 103 Street (I-95 - 32 Avenue)	NONE
27.	NW 103 Street (37 Avenue - 52 Avenue)	NONE
28.	NW 103 Street (52 Avenue - 72 Avenue)	NONE
29.	NW 103 Street (72 Avenue - Palmetto Expressway)	NONE

households displaced. With data developed for the Interama Expressway between N.E. 135 to 172 Streets, an estimated 27 families and 35 businesses would be displaced. Additional displacement data for the proposed other four deleted expressway segments is not readily available; however, available data establishes that the arterial roadway system adversely affects 200 sites compared with the displacement of families and businesses at 3,327 sites associated with development of only two of the six controversial expressways.

In reviewing the 29 arterials to be modified under the "Arterial Emphasis" alternate, it is noted that the improvements beyond the MUATS base proposal generally parallel the expressways to be replaced. The surface arterials are more numerous and some follow commercial/industrial routes. However, it would also be likely that the expressway facilities, although they generally parallel commercial/industrial strips, would circumvent these land uses as much as possible. For some arterial street widenings this would be impossible. Thus, the propotionate amount of businesses displaced to total displacements for expressway facilities should also hold for the "arterial emphasis" network, Alternate B. In reviewing preliminary work on the Le Jeune-Douglas Expressway, the percentage of business displacements to total displacements is 5.6%. For the 200 sites affected by arterial widenings, 5.6% of the total displacements are presumed to be business sites and the remainder estimated as household displacements. Also, preliminary work on the Le Jeune-Douglas Expressway indicates that approximately 2,220 households are displaced for every 1,875 residential structures (sites) encountered. The additional 200 sites for the "arterial emphasis" alternate would require approximately 235 households and 25 businesses to be relocated.

For the controversial expressways (Alternate D), the number of displacements should be closely related to the number of acres taken as well as density, and density is assumed to be closely related to property values. In other words, displacements should be directly related to right-of-way costs. Using the Le Jeune-Douglas Expressway as a base, the number of displacements for other expressway facilities can be extrapolated. However, with knowledge of the areas through which the facilities were proposed to pass, some account must be made of the fact that in some of the less densely populated areas property values can be relatively high. Thus, on Table 42, the Le Jeune-Douglas Expressway estimated property values per displacement is given an index of 1.0 and the other areas are subsequently rated from this base with an adjustment for density-property value per acre to derive total displacement. From knowledge of the area, judgement has been used to express the amount of businesses (and other non-residential structures) as well as the number of households displaced. Together they total the adjusted number of

Table 42
EXPRESSWAY DISPLACEMENTS

Expressway Facility	Right of Way Cost ($1,000)	Unadjusted displacements per million dollars of right of way	Unadjusted displacements	Adjustment factor for property value-density	Total Adjusted Displacements	Businesses and other non-residential structures	Households
LeJeune-Douglas	$110,682	24.46	2,707	1.00	2,707	151	2,556
Interama	45,034	24.46	1,102	.90	992	150	842
Hialeah	79,960	24.46	1,956	1.00	1,956	109	1,847
Opa-Locka	28,785	24.46	705	1.00	705	45	660
Snake Creek	8,588	24.46	210	1.10	231	5	226
South Dixie	60,095	24.46	1,470	0.80	1,176	65	1,111
Total	$333,144				7,767 =	525 +	7,242

Table 43
Transit Residential Displacements
(people)

Corridors	Alternative → 1	1a	2	2a	3	3a	4	4a	5	6	7	8	10	
NORTH	0	0	0	0	386	386	3385	1040	3347	531	3347	3375	3375	(ESTIMATED NO. OF PEOPLE)
	0	0	0	0	28	26	87	63	84	49	62	55	57	(% OF TOTAL)
NORTHWEST	0	104	0	104	0	104	0	104	104	0	0	104	0	
	0	17	0	5	0	7	0	6	3	0	0	2	0	
MIAMI BEACH	0	0	0	1540	0	0	0	0	0	0	1540	1540	1540	
	0	0	0	71	0	0	0	0	0	0	29	26	27	
CBD-WEST	484	516	484	516	484	516	484	516	516	544	484	516	484	
	100	83	100	24	36	35	13	31	13	51	9	9	8	
SOUTH	0	0	0	0	490	490	0	0	0	0	0	490	490	
	0	0	0	0	36	32	0	0	0	0	0	8	8	
TOTAL	0	620	484	2160	1360	1496	3869	1660	3967	1075	5371	6025	5789	

Source: Kaiser Engineers

Table 44
Transit Non-Residential Displacements

Corridors	Alternative → 1	1a	2	2a	3	3a	4	4a	5	6	7	8	10	
NORTH	0	0	0	0	48	48	125	64	104	142	104	125	125	(ESTIMATED N
	0	0	0	0	8	8	21	12	18	20	17	18	17	(% OF TOTAL)
NORTHWEST	0	9	0	9	0	9	0	9	9	0	0	9	0	
	0	2	0	2	0	2	0	2	2	0	0	1	0	
MIAMI BEACH	0	0	0	47	0	0	0	0	0	0	7	47	47	
	0	0	0	9	0	0	0	0	0	0	7	7	7	
CBD-WEST	479	461	479	461	479	461	479	461	461	567	479	461	479	
	100	98	100	89	80	78	79	86	80	80	76	64	66	
SOUTH	0	0	0	0	74	74	0	0	0	0	0	74	74	
	0	0	0	0	12	12	0	0	0	0	0	10	10	
TOTAL	479	470	479	517	601	592	604	534	574	709	630	716	725	

Source: Kaiser Engineers

all displacements for the controversial expressways - 7,242 households and 525 businesses and other non-residential structures. (See Table 42).

For the rapid transit system Tables 43 and 44 show the expected number of people and businesses displaced by the various Kaiser corridor alternatives.

Residential displacements for the three alternative transportation systems are summarized in the following table.

Table 45
Residential Population Displaced*

	Expressway	Arterial	Transit
Le Jeune-Douglas	7,668	600	104
Interama	2,526	81	None
Hialeah	5,541		None
Opa-locka	1,980		None
Snake Creek	678		None
South Dixie	3,333		490

*Assumes 3 persons per residential unit.

Disruption of Public Services. A matrix chart of the impact that each alternative would have on public services has been arranged. Impact is taken to mean that the service is physically affected to some degree by the facility or its service area is impacted to some degree by the facility.

Thus, traffic congestion, improved traffic circulation, accessibility to uses, physical removal or improvement, etc. of the public services in the corridor can be evaluated against the transportation alternate. These are illustrated in Table 46.

Service Needs

Demographic Characteristics. Another means of judging the impact of the proposed alternatives within each corridor is to examine the residential population of the corridor and determine their transportation needs (based on 1970 Census data).

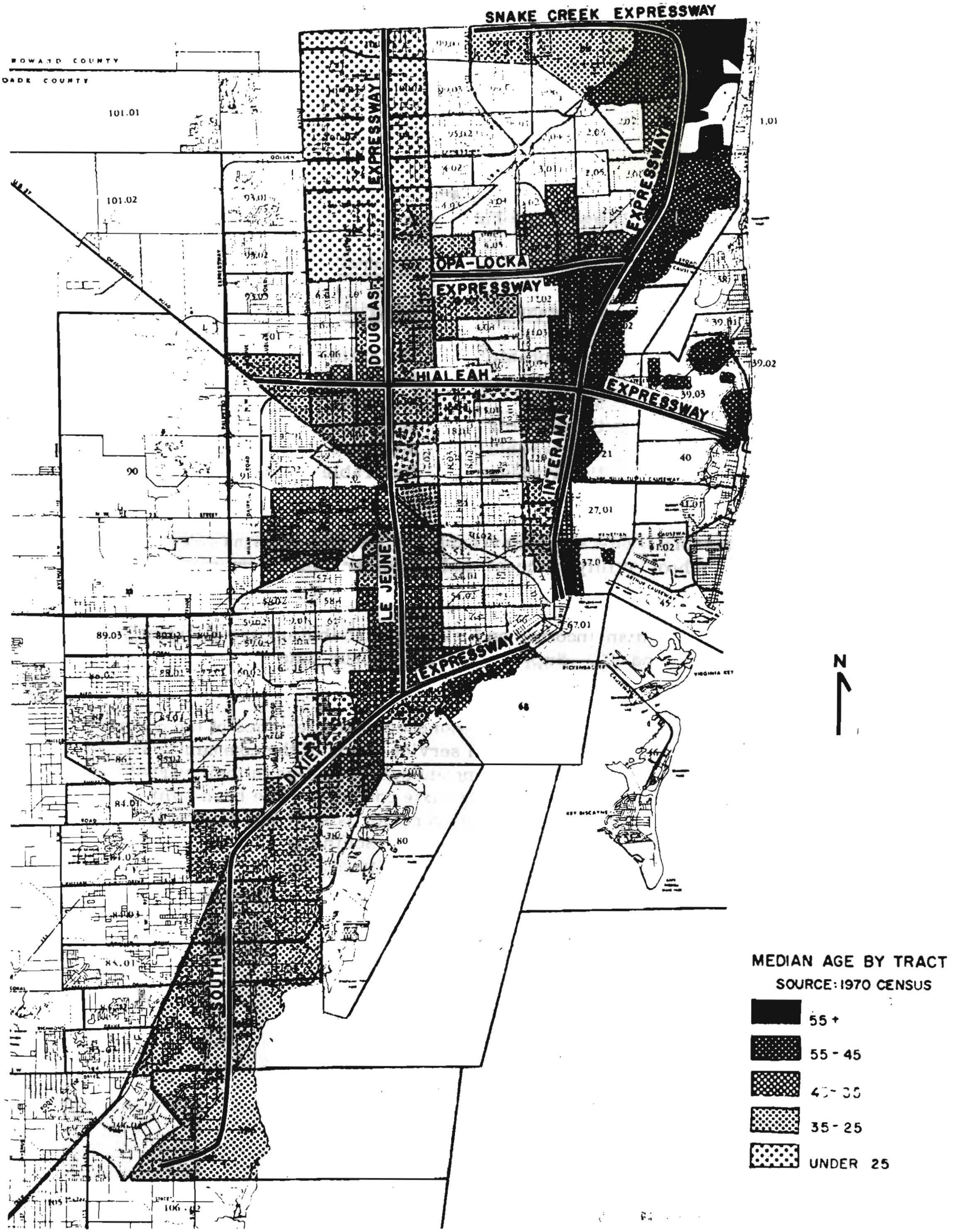
Table 46
Impact Upon Public Services *

Corridor	Expressway	Alternative Arterial	Transit	Do-Nothing
Le Jeune-Douglas	Unfavorable	Moderate	Unfavorable	Moderate
Interama	Moderate	Moderate	Moderate	Moderate
Hialeah	Moderate	Moderate	Moderate	Moderate
Opa-locka	Unfavorable	Moderate	Moderate	Moderate
Snake Creek	Unfavorable	Moderate	Unfavorable	Moderate
South Dixie	Unfavorable	Favorable	Moderate	Moderate

*Rated as favorable, moderate, unfavorable, or servere in terms of impact upon police, fire, school, utility, recreational and other public services.

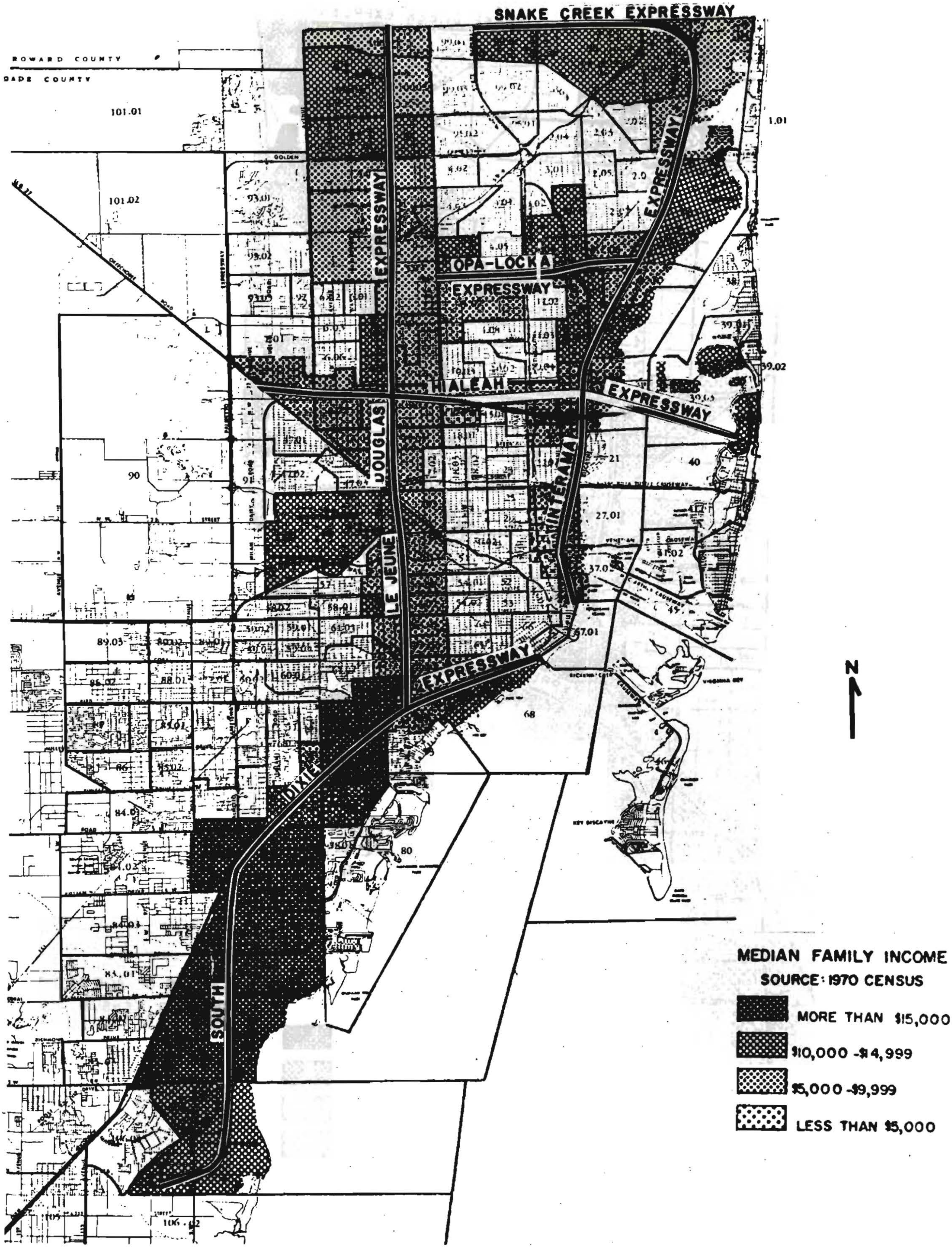
The median age, median income, and elderly distribution are illustrated in Figures 9, 10, and 11. Supporting 1970 Census data used to develop these figures one contained in Appendix D.

Table 47 attempts to examine the socio-economic characteristics of the corridor to roughly determine the transportation service needs of the community as compared to the county-wide socio-economic average. Due to their varied nature, the Le Jeune-Douglas and South Dixie corridors have been split into two sections. The Le Jeune-Douglas corridor is split into Northern and Southern portions near Flagler Street. The South Dixie corridor is split into two parts in the vicinity of S.W. 80th Street.



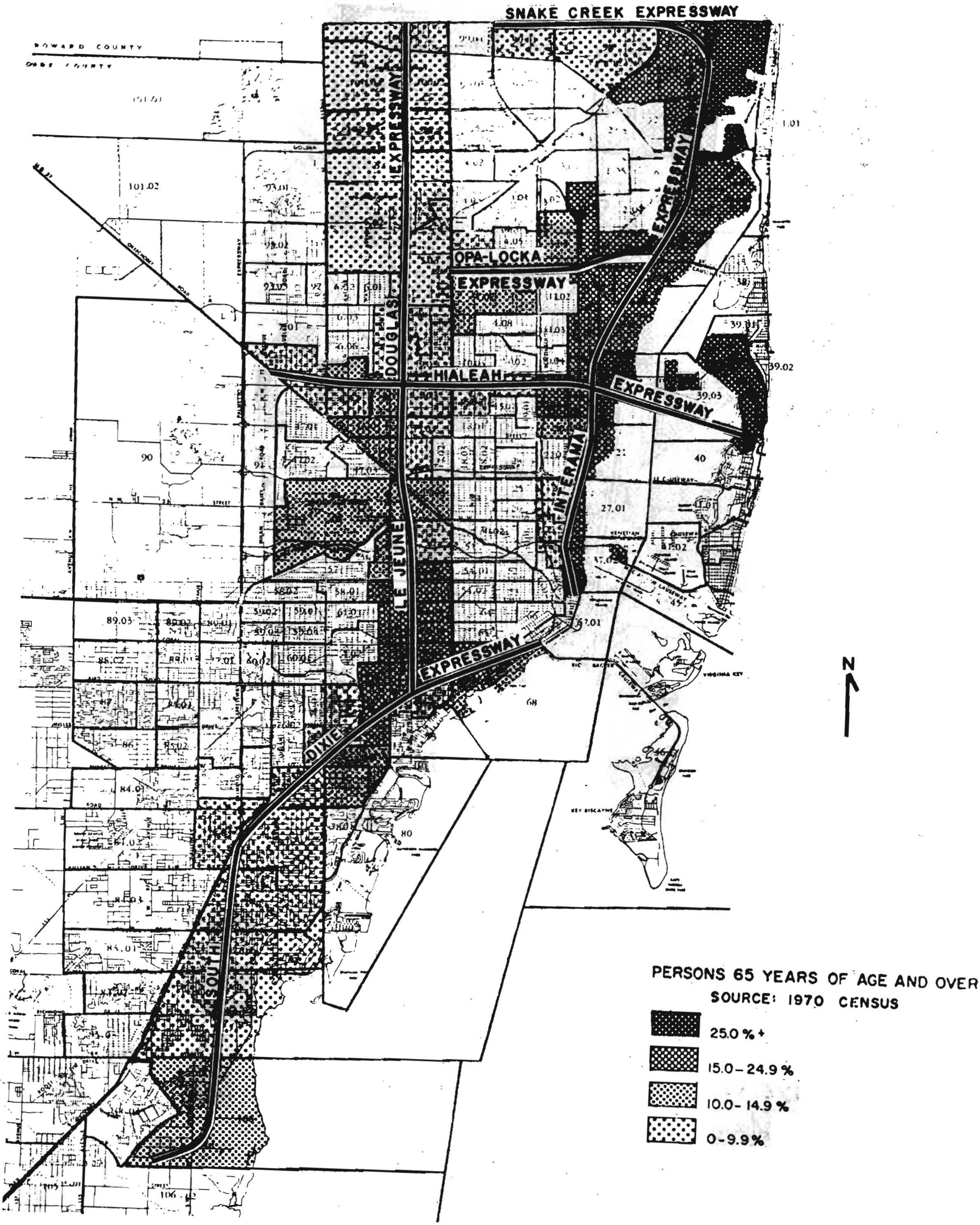
MEDIAN AGE

Figure 9



MEDIAN INCOME

Figure 10



PERSONS 65 YEARS OF AGE AND OVER

Figure 11

Table 47

Demographic Traits

Corridor	Elderly/Young Ratio*	Income Levels**	Transportation Choice*** Ability
Le Jeune-Douglas North	Average	Average	Average choice spread
Le Jeune-Douglas South	Above Average	Below Average	Transit Oriented
Interama	Average	Average	Average choice spread
Hialeah	Average	Above Average	Average choice spread
Opa-locka	Average	Above Average	Auto Oriented
Snake Creek	Average	Below Average	Transit Oriented
South Dixie - North	Average	Below Average	Transit Oriented
South Dixie - South	Average	Above Average	Auto Oriented

*This is the relative distribution of the elderly and young populations weighted against County average.

**This is the relative distribution of income levels weighted against County average.

***This combines the first two factors, plus population density, and weighs them against mode choice as being: auto oriented, average choice spread, or transit oriented based on the three factors used in the analysis.

Facility Capability Related to Needs. The Demographic Traits table approximates transportation choice ability for each corridor's population. These observations regarding the service needs of the corridor are used as the base in order to determine the usefulness of each alternate for each corridor's population characteristics. The Le Jeune-Douglas and South Dixie corridors are treated in two sections, as in the previous table.

In the following table, the facilities are rated as well suited, partially suited or unsuited for the demand in each corridor.

Table 48
Transportation Service Suitability *

Corridor	Expressway	Arterial	Transit	Do Nothing
Le Jeune Douglas North	Well suited	Well suited	Partially suited	Partially suited
Le Jeune Douglas South	Unsuited	Well suited	Well suited	Well suited
Interama	Unsuited	Well suited	Well suited	Partially suited
Hialeah	Partially suited	Partially suited	Partially suited	Unsuited
Opa-locka	Unsuited	Well suited	Partially suited	Partially suited
Snake creek	Unsuited	Well suited	Unsuited	Well suited
South Dixie - North	Unsuited	Well suited	Well suited	Well suited
South Dixie - South	Well suited	Partially suited	Partially suited	Unsuited

*This table judges the level of service provided by the transportation facility in regard to the need in the community based upon the facility's capacity, community needs, level of use, and population served.

Planning Objectives

The final area of review in regard to the "social impact" of the alternatives regards the relationship between the alternatives and the County planning objectives.

Each alternative is reviewed in the context of the County's comprehensive land use plan and the plan's transportation policies. (See Appendix C). The alternatives have been judged against: (1) the 1985 Comprehensive land use plan; (2) mass transit priority improvement policy; (3) adequacy of meeting demand and related storage needs; and (4) coordination with surrounding activities. The level of compliance is illustrated in the following table.

Table 49
Compliance with Comprehensive Plan

Corridor	Expressway	Arterial	Transit	Do Nothing
Le Jeune-Douglas	No	Yes	Yes	Yes
Interama	No	Yes	Yes	Yes
Hialeah	No	Yes	No	Yes
Opa-locka	No	Yes	No	Yes
Snake Creek	No	No	No	Yes
South Dixie	No	No	Yes	Yes

Environmental Criteria

At the corridor level of analysis, several environmental criteria warrant consideration. Some of these are: (1) disruption to historical and natural landmarks; (2) disruption to parks and recreational areas; (3) conservation of natural resources; and (4) noise pollution. Because of the lack of information, the environmental analysis at the corridor level is restricted to an evaluation of the noise pollution within the six controversial corridors for the following alternate systems:

1. Alternate A - 1985 "Do Nothing".
2. Alternate B - 1985 Arterial Emphasis.
3. Alternate D - 1985 MUATS Recommended Plan.

Alternate C is not included in the evaluation of the 1985 alternates because it incorporates a land use concept different from that used in Alternates A, B, and D. To allow for a valid assessment of the relative noise impact among the alternates, the land use concepts must be similar. For the year 2000, Alternates E and F also incorporate different land use concepts and consequently a valid comparison regarding relative noise impact can not be made.

The noise pollution analysis of the evaluation procedure is divided into the following four parts:

1. Establishment of controversial corridor "influence" limits.

2. Identification of noise sensitive land uses adjacent to major arterials and expressways within the corridor limits.

3. Calculation of predicted noise levels for the noise sensitive land uses.

4. Determination of land area and population adversely affected using the environmental density approach.

5. Comparison of 1985 alternates by corridor.

Definition of Corridor Limits

In order to compare the noise levels within each corridor for the three alternate systems, an area of influence is defined for each of the six controversial corridors. Using traffic impact as the criterion, the following limits are established:

1. Snake Creek - 183 Street on the south; Broward County line on the north; Sunshine State Parkway on the west; and Biscayne Bay on the east.

2. Opa-locka - 103 Street on the south; Palmetto Expressway and 163 Street on the north; N.W. 27th Avenue on the west; and U.S. 1 on the east.

3. Hialeah - 54 Street on the south; 95 Street on the north; Palmetto Expressway on the west; and Alton Road on the east.

4. Le Jeune-Douglas - U.S. 1 on the south; Broward County line on the north; 57 Avenue on the west; and 22 Avenue on the east.

5. Interama - Terminus of I-95 on the south; 199 Street on the north; I-95 on the west; and U.S 1 on the east.

6. South Dixie - S.W. 136 Street on the south; East-West Expressway on the north; South Dade Expressway and Palmetto Expressway on the west; and Biscayne Bay on the east.

Identification of Noise Sensitive Land Uses

Within each of the corridor "influence" limits, the noise sensitive land uses adjacent to the major arterials and expressways are identified. For the purposes of this analysis, noise sensitive land uses are grouped into one category and include residences, motels, schools, churches, libraries, hospitals, and recreation areas. It is assumed that most commercial and industrial activities can coexist with a "noisy" environment.

To identify the noise sensitive land uses in the various corridors, a 1985 Land Use map based on the projection of existing development trends was utilized. Sections of the expressways and arterials traversing noise sensitive land uses in each corridor were identified.

Calculation of Predicted Noise Levels

The procedure outlined in the National Cooperative Highway Research Program Report Number 117 is applied in order to calculate the predicted noise levels for the noise sensitive land uses. Using a computer model developed from this procedure, several graphs were prepared, reflecting various facility types and lane configurations and incorporating the following assumptions:

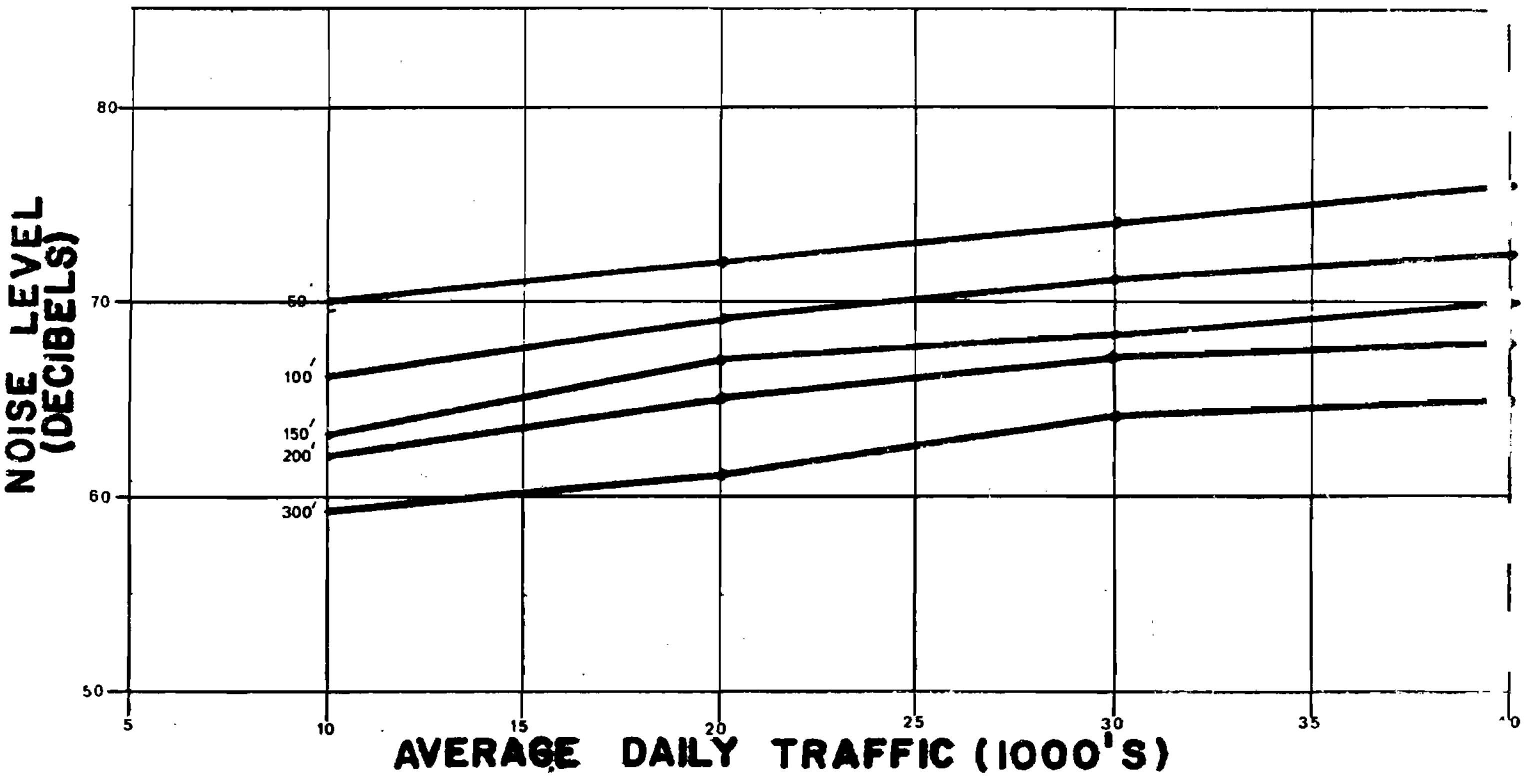
1. All road configurations are at grade, with uninterrupted flow.

2. All road configurations have an infinite road section, with no unusual barriers.

Figure 12 is included as an example of the graphs developed for two types of six-lane facilities, with operating speeds of 50 miles per hour.

TYPICAL EXPRESSWAY

6 LANE DIVIDED - 100' PAVEMENT WIDTH



TYPICAL HIGHWAY

6 LANE UNDIVIDED - 82' PAVEMENT WIDTH

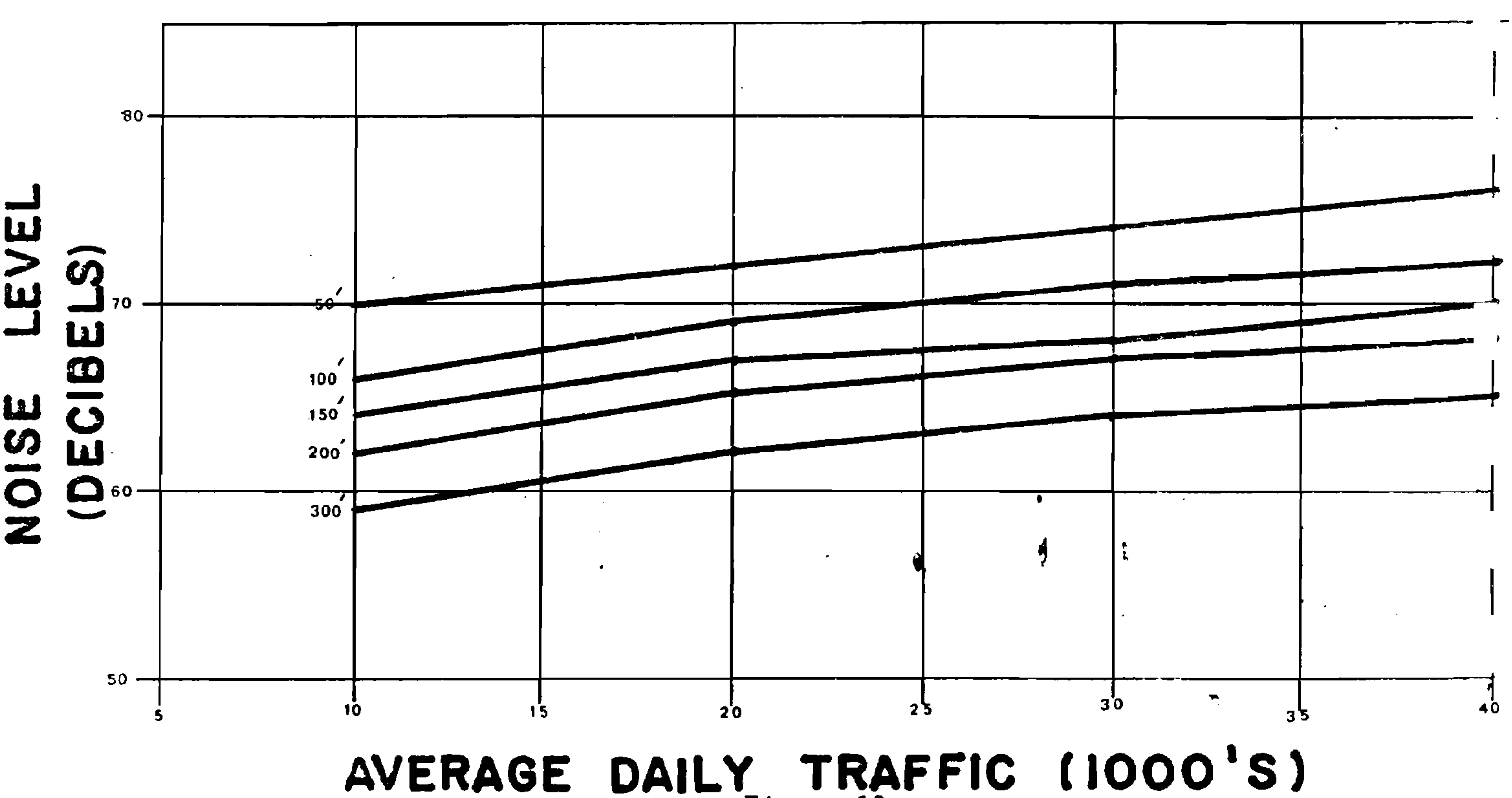


Table 50
1985 Predicted Noise Levels[1]
(dBA)

Corridor	Facility	Noise Sensitive Section	Alternative A	Alternative B	Alternative D
Snake Creek	183 St.	I-95 to US-1	70	70	72
	203 St.	I-95 to US-1	71	71	73
	Co. Line Rd.	Florida's Turnpike to US-1	66	68	--
	Snake Creek Expressway	Florida's Turnpike to 199 St.	--	--	72
Opa-Locka	Palmetto Expressway	NW 27 Ave. to NW 17 Ave.	75	76	74
	135 St.	NW 27 Ave. to NW 2 Ave.	69	70	67
	125 St.	I-95 to NE 6 Ave.	70	68	65
	119 St.	I-95 to W. Dixie Highway	70	68	64
	103 St.	NW 27 Ave. to NE 6 Ave.	73	72	70
	Opa-Locka Expressway	I-95 to W. Dixie Highway	--	--	73
Hialeah	95 St.	NW 72 Ave. to NW 42 Ave.	68	68	68
	95 St.	NW 32 Ave. to I-95	71	70	69
	95 St.	I-95 to US-1	72	72	70
	62 St.	I-95 to US-1	67	66	66
	Hialeah Expressway	NW 57 Ave. to NW 37 Ave.	--	--	75
LeJeune-Douglas	22 Ave.	US-1 to US-41	71	71	70
	22 Ave.	95 St. to Palmetto Expressway	71	70	73
	22 Ave.	Palmetto Expressway to 183 St.	71	70	69
	32 Ave.	79 St. to 135 St.	71	70	72
	37 Ave.	Alhambra Circle To Flagler St.	71	71	71
	42 Ave.	Bird Rd. to Flagler St.	73	73	70
	42 Ave.	US-27 to 103 St.	70	71	69
	47 Ave.	103 St. to 119 St.	65	68	66
	47 Ave.	Palmetto X-way to Broward Co.	65	64	63
	57 Ave.	US-1 to E-W Expressway	72	72	69
	57 Ave.	74 St. to 119 St.	71	71	70
	57 Ave.	135 St. to Broward Co. Line	72	71	67
	LeJeune-Douglas Expressway	US-1 to US-41	--	--	74
		135 St. to Broward Co. Line	--	--	76
Interama	I-95	NW 36 St. to Palmetto X-way	76	77	75
	I-95	Palmetto X-way to Broward Co.	77	77	75
	N. Mia. Av.	79 St. to 163 St.	71	71	70
	NE 6 Ave.	US-1 to 183 St.	71	70	70
	Interama Expressway	NE 6 Ave. to 135 St.	--	--	74
South Dixie	SW 24 St.	Palmetto X-way to 57 Ave.	74	75	74
	SW 24 St.	57 Ave. to 42 Ave.	70	69	71
	SW 72 St.	87 Ave. to US-1	73	70	72
	SW 88 St.	S. Dade X-way to 87 Ave.	69	69	69
	Palmetto Expressway	US-1 to S. Dade Expressway	75	75	74
		S. Dade X-way to E-W X-way	76	76	76
	SW 42 Ave.	Bird Rd. to Flagler St.	73	73	70
	SW 37 Ave.	Alhambra Circle to Flagler St.	71	71	71
	SW 22 Ave.	US-1 to US-41	71	71	70
	SW 17 Ave.	US-1 to US-41	70	68	68
	US-1	I-95 to Bird Rd.	71	70	72
	Old Cutler Road	SW 136 St. to 37 Ave.	70	70	70
		27 Ave. to Rickenbacker Cswy.	72	72	71
	S. Dixie Expressway	I-95 to Bird Rd.	--	--	76

[1] L_{10} Noise levels at a distance of 100 feet from edge of roadway.

As Figure 12 indicates, the average daily traffic (ADT) and the distance from the edge of the road to the observer must be specified in order to arrive at the predicted L_{10} noise level.* In this analysis, the ADT is taken from the traffic assignment maps for the three alternate systems, and the distance from the edge of the road to the observer is assumed to be 100 feet. The results of the noise level calculations are contained in Table 50.

Determination of Adversely Affected Areas

An adversely affected area is defined to be an area where the predicted noise levels exceed standards, with the standards being those specified in the Federal Highway Administration's Policy and Procedure Memorandum 90-2. For the land use category used in this analysis, the design noise level standard is 70 dBA (exterior). By comparing the predicted noise levels in Table 50 with this 70 dBA standard, the adversely affected areas can be identified.

In an attempt to quantify the noise impact of the three alternatives, a technique called the environmental density approach is applied to this analysis.

To use this technique, the roadway sections having noise levels in excess of standards are identified. For these sections, the length of the roadway and the population densities of the adjacent census tracts are determined. Using this information, the land area and population adversely affected are calculated for each of the alternates within the six controversial corridors. (See Table 51).

Table 51
Population and Land Area Impacted*

	Alternate Systems					
	A		B		D	
Corridor	Population	Land (acres)	Population	Land (acres)	Population	Land (acres)
Snake Creek	79	13	79	13	638	102
Opa-locka	435	51	435	51	209	26
Hialeah	516	58	200	26	355	26
Le Jeune-Douglas	2990	339	2480	269	1732	211
Interama	2343	282	1790	211	1721	186
South Dixie	2859	269	2043	205	2723	275

*Based on roadway sections with L_{10} noise levels in excess of 70 dBA.

Comparison of 1985 Alternates by Corridor

As Table 51 indicates, the population and land area adversely impacted by traffic generated noise varies considerably within each corridor for Alternates A, B, and D. In the Snake Creek corridor, the expressway alternate (D) substantially increases the adverse noise impact relative to the expressway-out alternates (A and B). Both Alternates A and B produce an equivalent noise impact in this corridor.

The situation is reversed in the Opa-locka corridor in that the population and land area adversely impacted are reduced by including the Opa-locka Expressway. The expressway relieves the traffic on the major arterials within this corridor and consequently reduces the noise levels on these facilities. Also, the expressway traverses only a short segment of land defined as noise sensitive, resulting in only a minimal noise impact. Again, the improving of some of the major arterials (Alternate B) as opposed to no arterial improvements beyond those suggested in the original MUATS plan (Alternate A) does not result in a reduced adverse noise impact within the corridor.

In the Hialeah corridor, both Alternates B and D adversely affect an equivalent land area; however, Alternate D impacts a greater number of people. The higher population density adjacent to the expressway alignment accounts for this difference.

The Le Jeune-Douglas Expressway significantly reduces the adverse noise impact in the Le Jeune-Douglas corridor. Although the noise levels on the expressway are relatively high (see Table 51), the facility traverses only short segments of noise sensitive land uses. Also, the traffic becomes concentrated on the expressway, reducing the noise levels on the major arterials within the corridor. As a result, Alternate D minimizes the adverse noise impact in this corridor.

Along the Interama corridor, the expressway alternate (D) again reduces the noise impact; however, when compared to the arterial emphasis alternate (B), the reduction is not significant.

From a noise pollution standpoint, the South Dixie corridor definitely favors arterial improvements (Alternate B) over an additional expressway. Including the expressway in this corridor does not reduce the noise levels on the major arterials and in some cases even increases the noise levels.

Operational Criteria

To properly evaluate the service provided (or the level of traffic congestion anticipated) in each of the six controversial corridors, it is necessary to examine information generated in the traffic assignments associated with each of the land use/transportation system alternatives. Several of these information items are defined below to aid in subsequent corridor level evaluation discussions. It is assumed that the transit facilities and services associated with each alternate can be designed and operated in a manner that provides adequate capacity to accommodate anticipated ridership. Most fixed highway facilities do not possess this range of flexibility. Thus, the operational considerations at the corridor level is limited to an examination of the highway facilities of each transportation system alternative.

Level of Service

As a measure of the degree of congestion on any highway facility, transportation planners use the concept of level of service. The basic levels of service are quantified by the operating speed and the volume to capacity ratio on the facility. Each level of service (A through F) should be considered as a range of operating conditions bounded by values of travel speed, and by volume to capacity ratios. Levels of service have been established for several facility types including expressways and urban arterials which are of greatest concern to this analysis. For expressways and surface arterial streets the traffic flow conditions and levels of service are related in Table 52.

The photographs in Figure 13 depict the above conditions for the various expressway levels of service. Levels of service for arterial streets are generally defined using the same descriptions with lower operating speed ranges. For this analysis, as for the original MUATS effort, design standards are set at level of service "C" and it is desirable that most facilities be designed at this level.

Volume to Capacity Ratio (V/C) is another term frequently used to analyze performance of transportation systems. Alternate Map Zero has been inserted to facilitate understanding of the term volume to capacity ratio. The daily volume to daily capacity ratio is depicted for each major arterial and expressway facility in Dade County for 1972. The levels of congestion indicated by Alternate Map Zero relate to levels of congestion for facilities on each future year Alternate Map. For example, the degree of congestion currently (1972) experienced on I-95 between N.W. 54th Street and N.W. 103rd Street as shown on Alternate Map Zero, will be experienced by 1985 on the Julia Tuttle Causeway (I-195) as shown on Alternate Map A. The optimum V/C value is 1.0. A V/C ratio

Table 52
Level of Service Description

Level of Service	Description	Surface Arterials Speed (mph)	Surface Arterials V/C	Expressways Speed (mph)	Expressways V/C
A	Free Flow	≥ 30	< .60	> 60*	< .20
B	Stable Flow	25-29	.60-.79	55-59*	.20-.25
C	Stable Flow (Lower Speed)	20-24	.80-.89	50-54	.26-.41**
D	Approaching Unstable Flow (Tolerable Delay)	15-20	.90-.99	40-49	.42-.72**
E	Unstable Flow (Intolerable Delay)	15 approx.	1.0	30-35	.73-1.0
F	Forced Flow (Jammed)	< 15	> 1.0	< 30	> 1.0

*Indicates ability of traffic to operate at higher than present speed limits.

**Assumes Peak Hour Factor of .91

Expressway Levels of Service

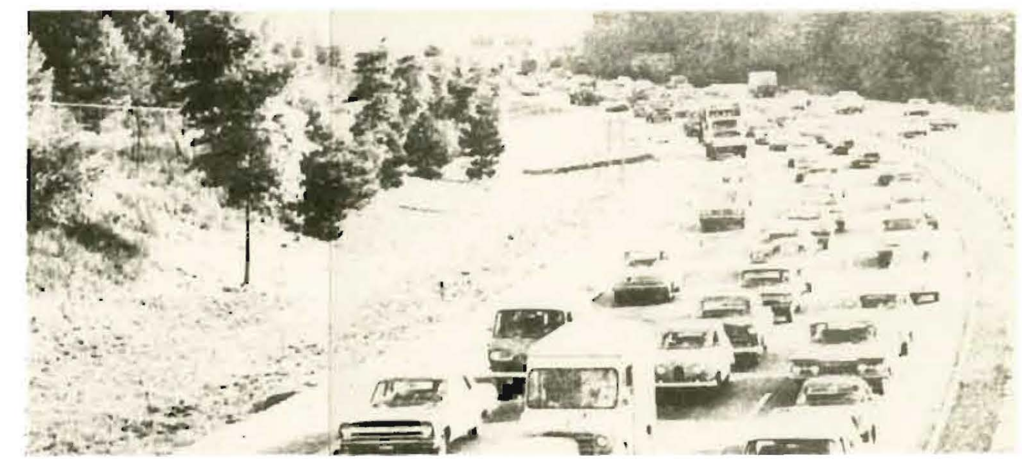
(A)

(B)

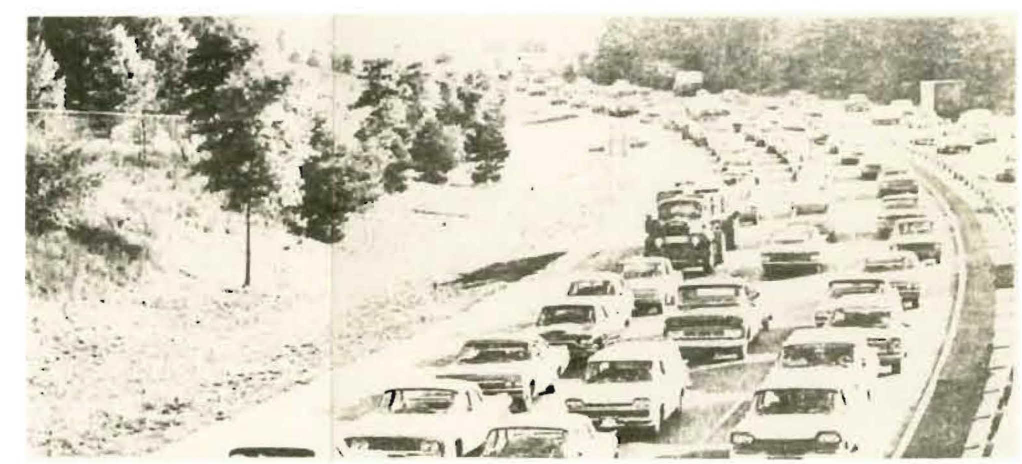
(C)

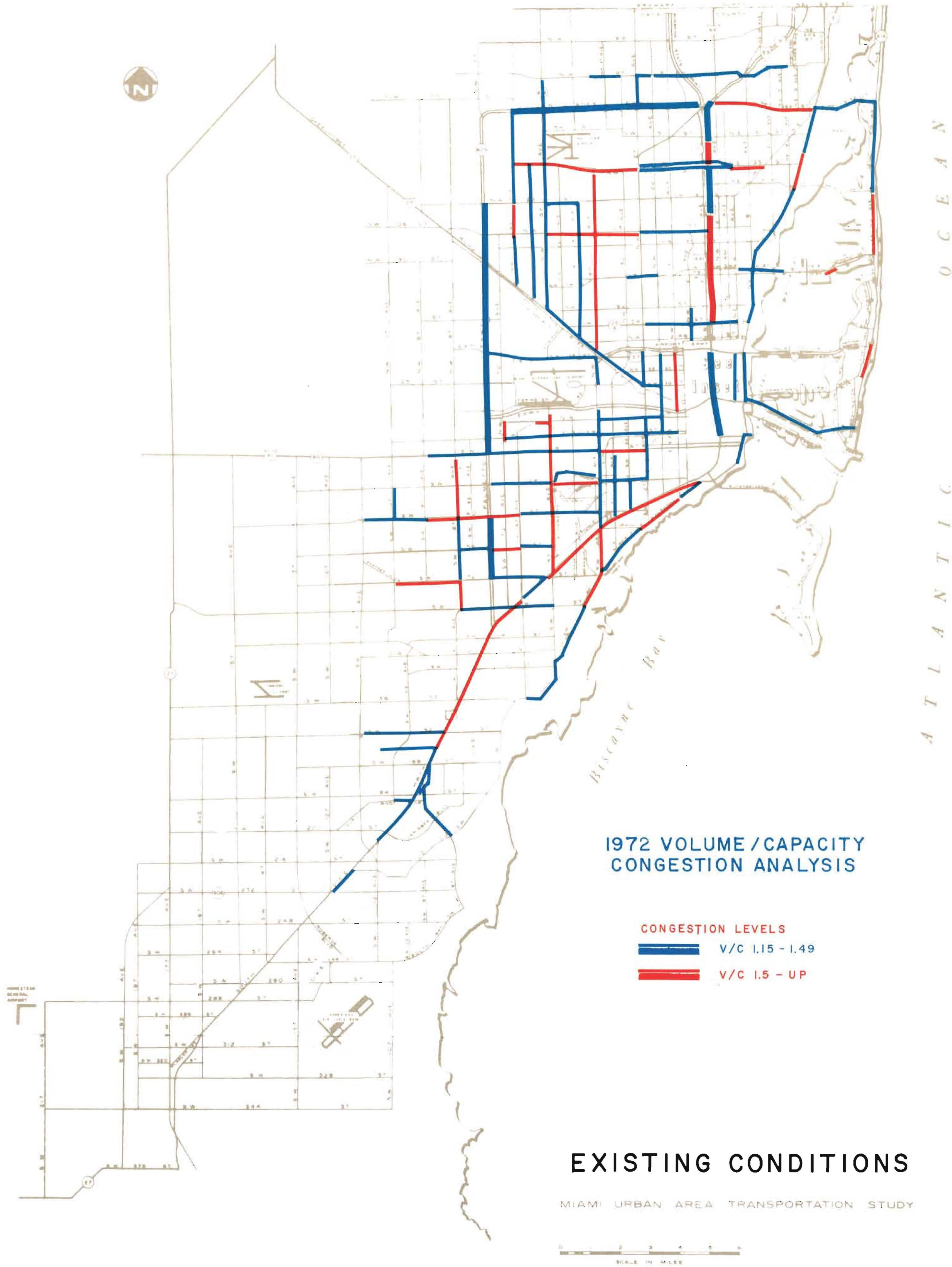
(D)

(E)



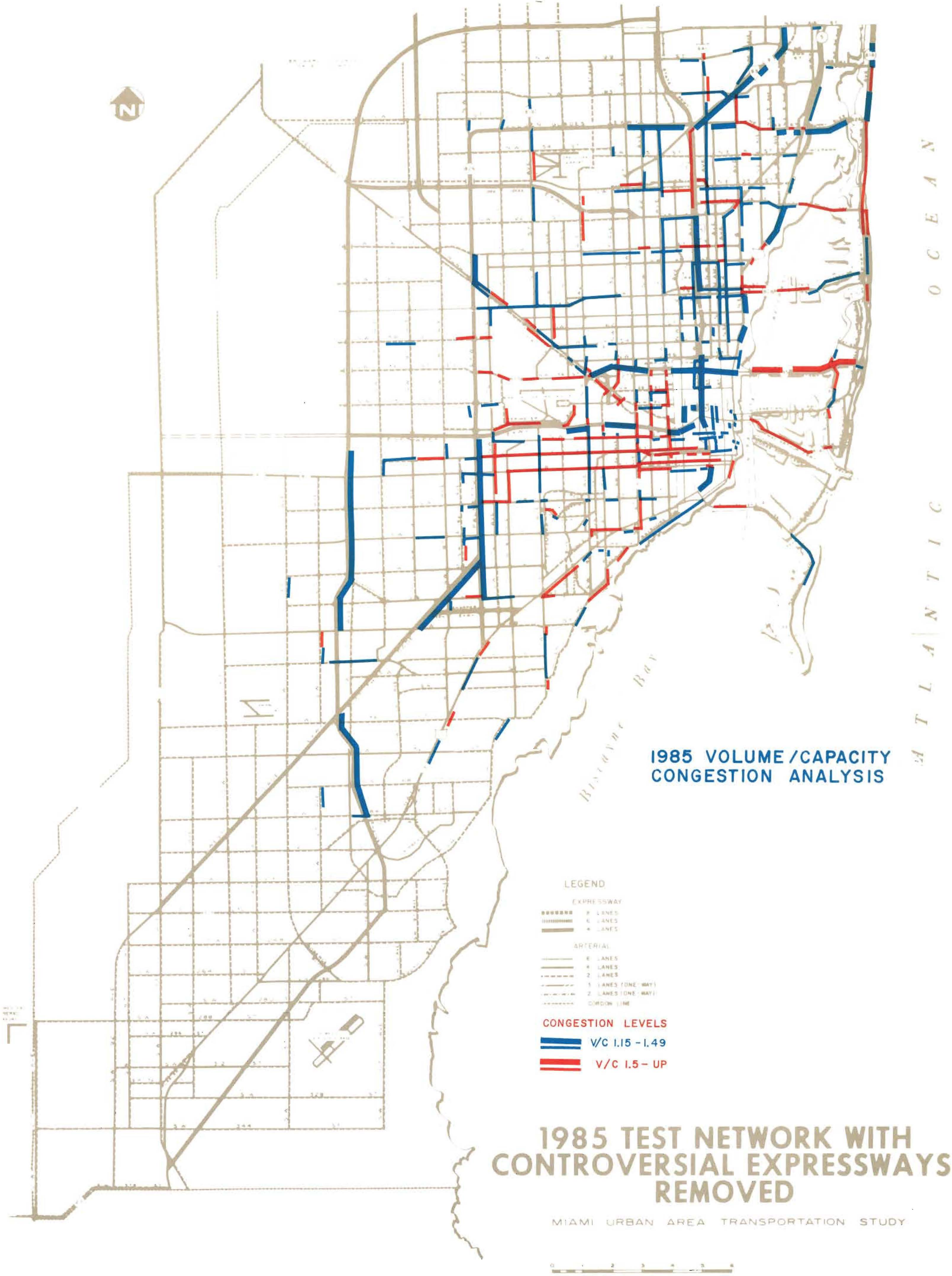
(F)





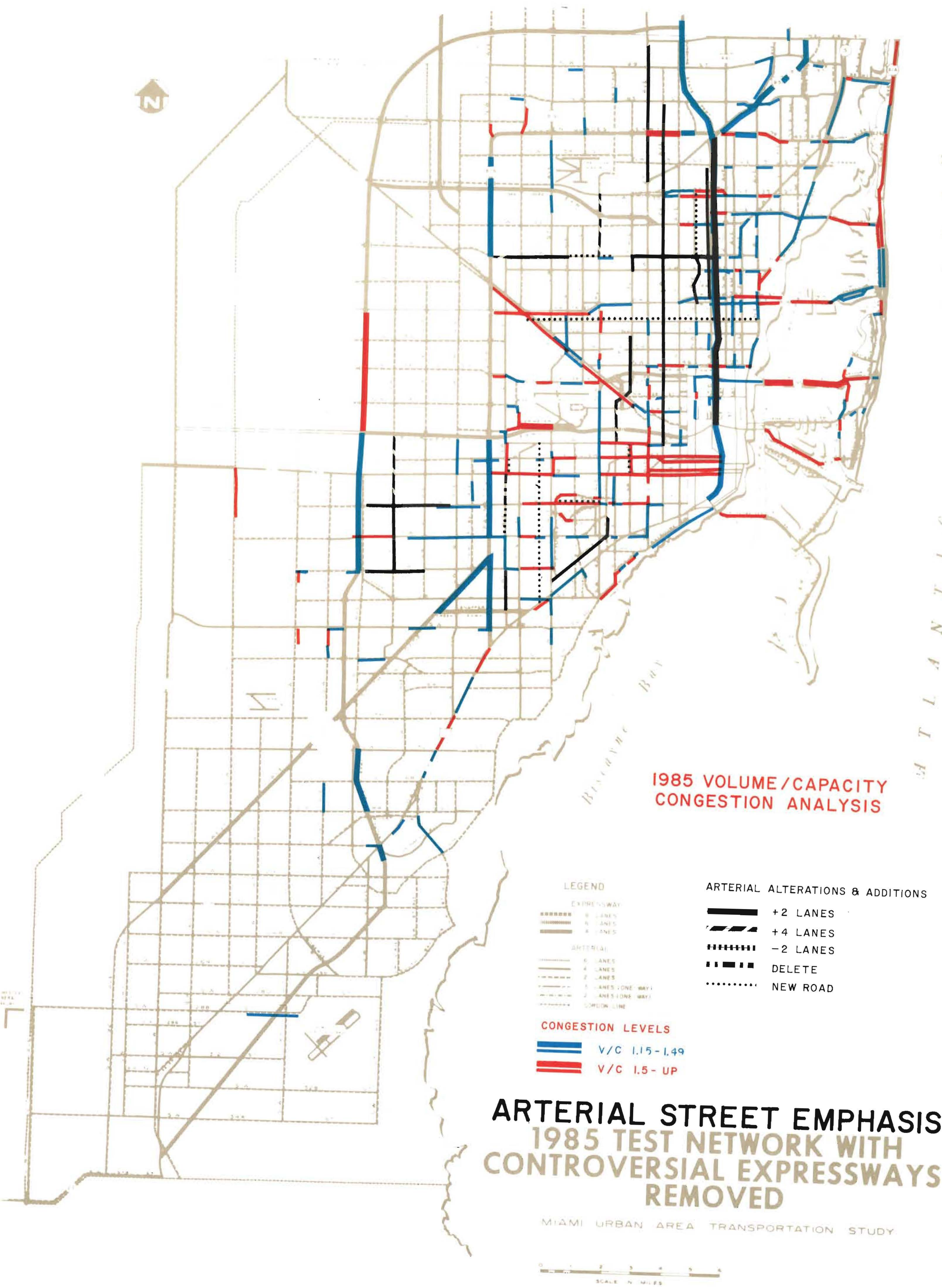
ATLANTIC OCEAN
Biscayne Bay
1972 VOLUME / CAPACITY
CONGESTION ANALYSIS
CONGESTION LEVELS
V/C 1.15 - 1.49
V/C 1.5 - UP
EXISTING CONDITIONS
MIAMI URBAN AREA TRANSPORTATION STUDY
SCALE IN MILES

ALTERNATE O

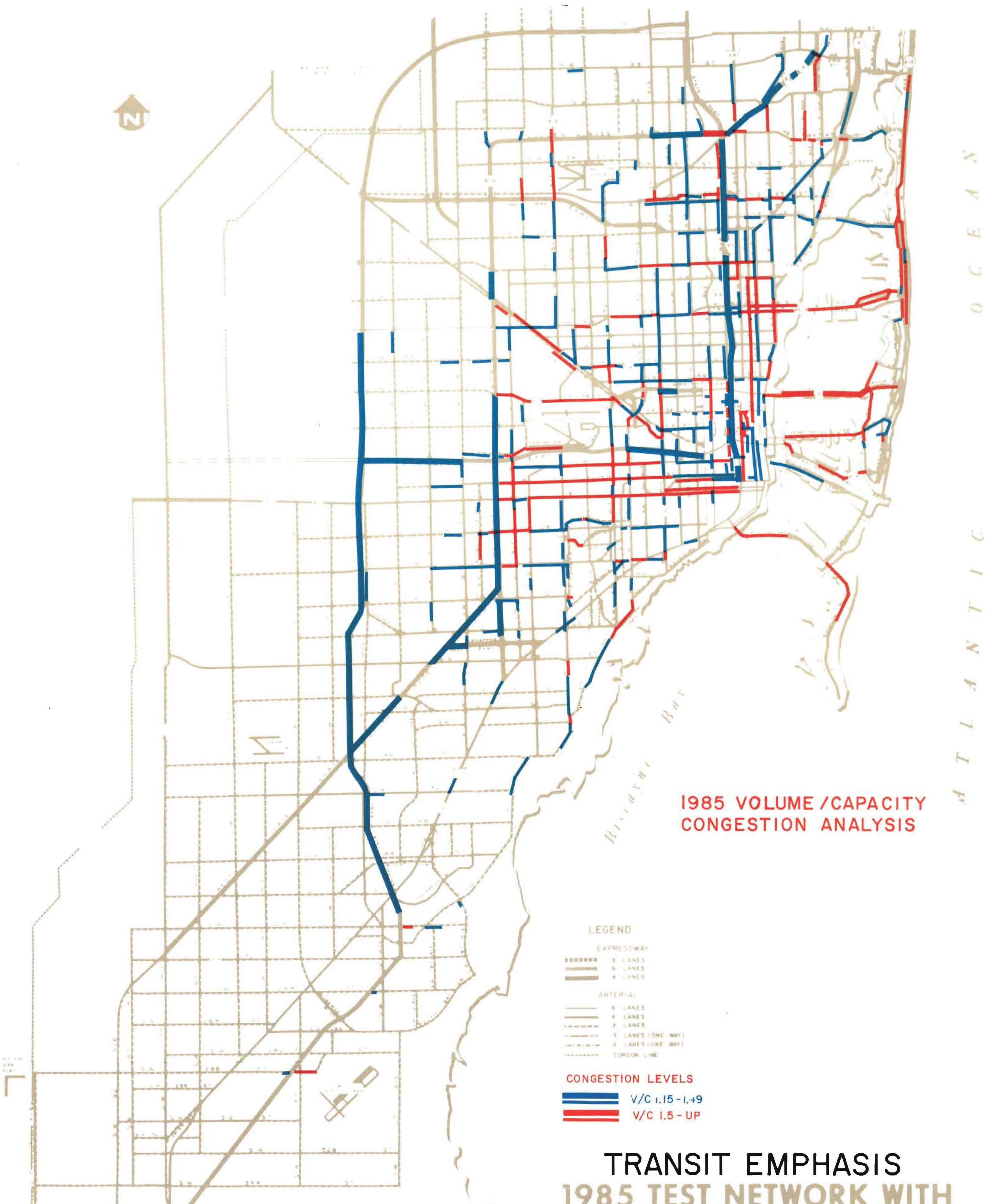


ATLANTIC OCEAN
Biscayne Bay
1985 VOLUME/CAPACITY
CONGESTION ANALYSIS
LEGEND
EXPRESSWAY
LANES
LANES
LANES
ARTERIAL
LANES
4 LANES
2 LANES
LANES (ONE WAY)
2 LANES (ONE WAY)
CORDON LINE
CONGESTION LEVELS
V/C 1.15 - 1.49
V/C 1.5 - UP
1985 TEST NETWORK WITH
CONTROVERSIAL EXPRESSWAYS
REMOVED
MIAMI URBAN AREA TRANSPORTATION STUDY
SCALE IN MILES

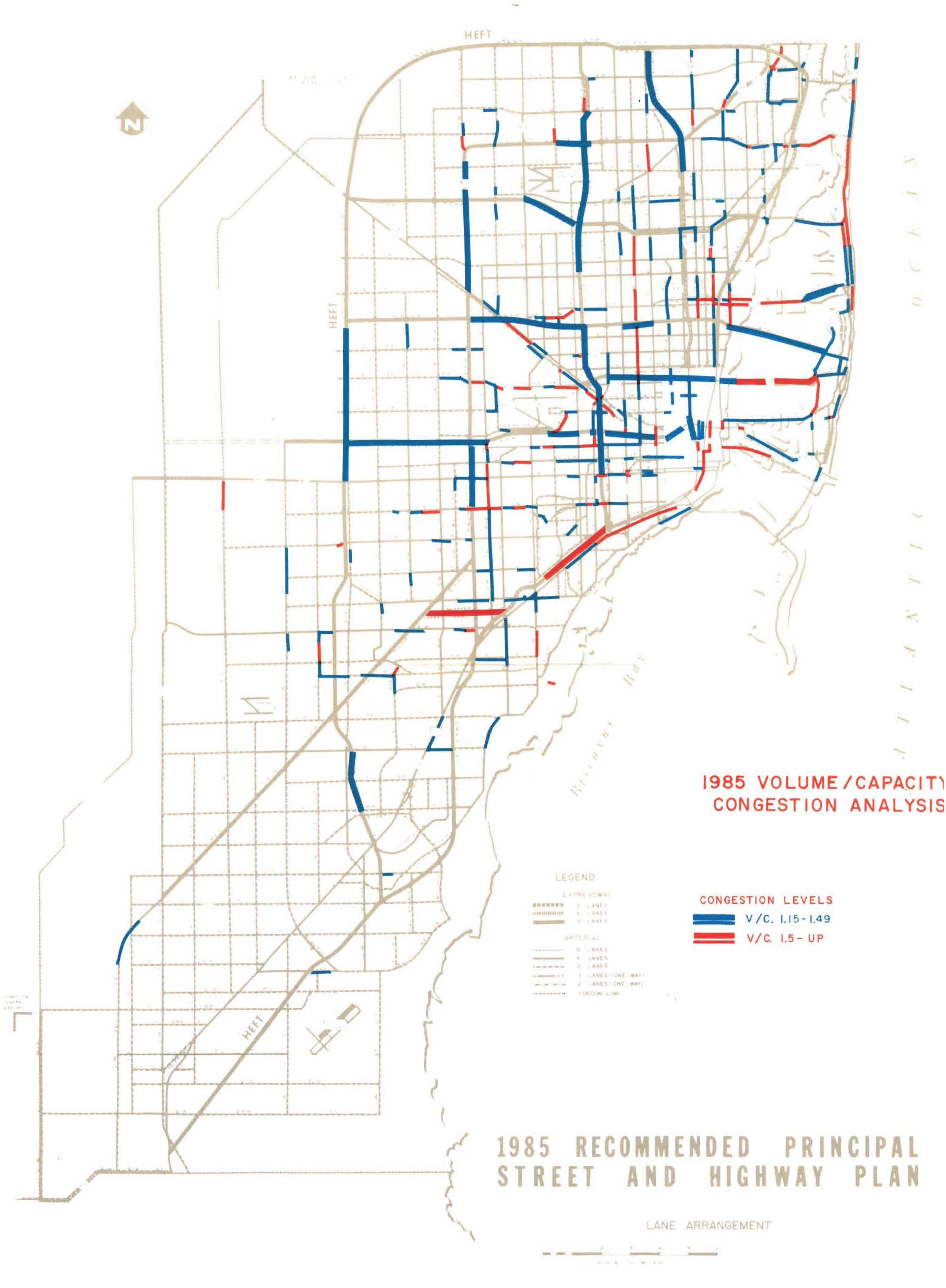
ALTERNATE A


1985 VOLUME/CAPACITY
CONGESTION ANALYSIS
LEGEND
ARTERIAL ALTERATIONS & ADDITIONS
+2 LANES
+4 LANES
−2 LANES
DELETE
NEW ROAD
CONGESTION LEVELS
V/C 1.15 - 1.49
V/C 1.5 - UP
ARTERIAL STREET EMPHASIS
1985 TEST NETWORK WITH
CONTROVERSIAL EXPRESSWAYS
REMOVED
MIAMI URBAN AREA TRANSPORTATION STUDY
ATLANTIC OCEAN
Biscayne Bay

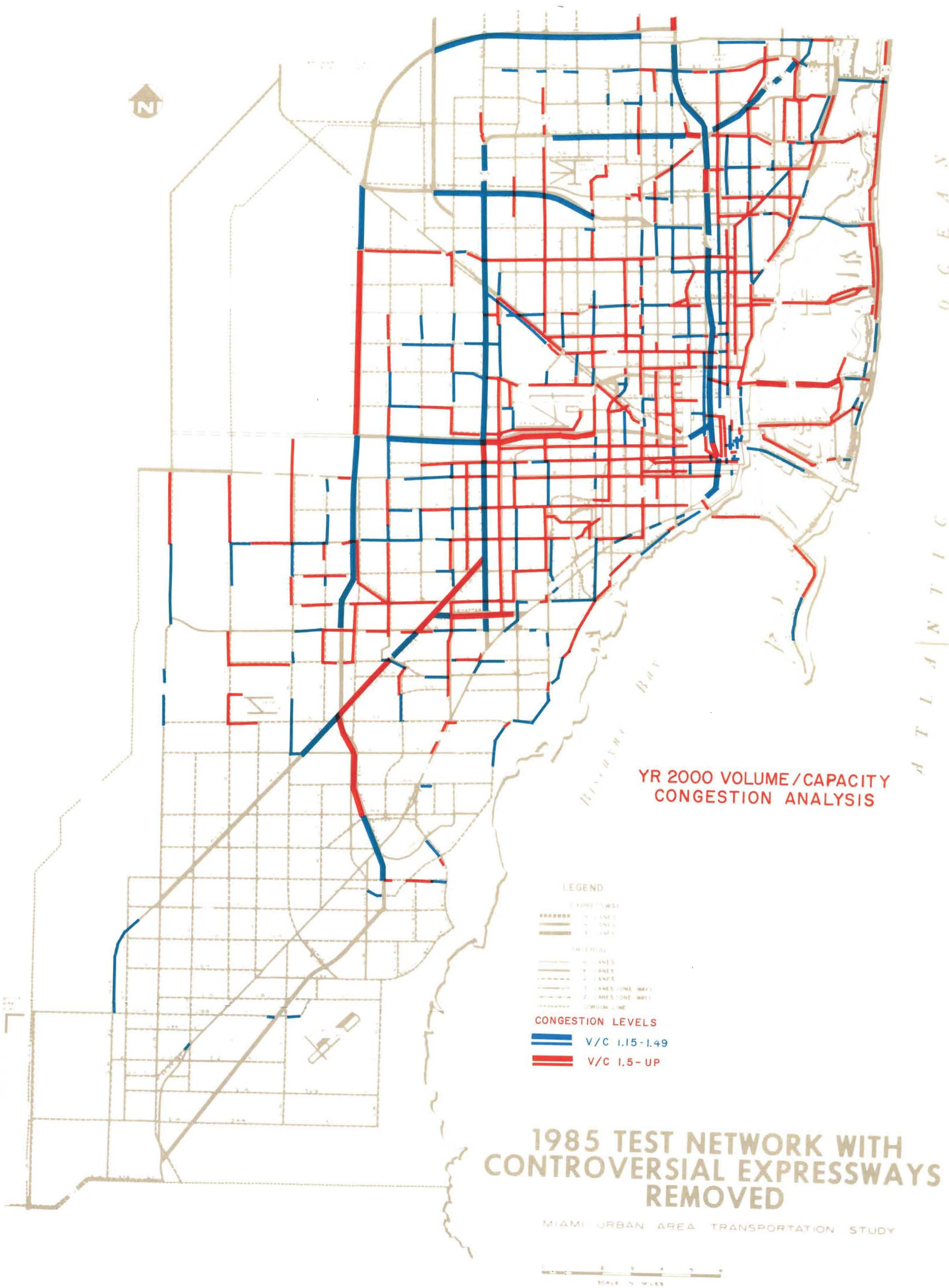
ALTERNATE B


ATLANTIC OCEAN
Biscayne Bay
1985 VOLUME / CAPACITY
CONGESTION ANALYSIS
LEGEND
CONGESTION LEVELS
V/C 1.15 - 1.49
V/C 1.5 - UP
TRANSIT EMPHASIS
1985 TEST NETWORK WITH
CONTROVERSIAL EXPRESSWAYS
REMOVED
MIAMI URBAN AREA TRANSPORTATION STUDY

ALTERNATE C

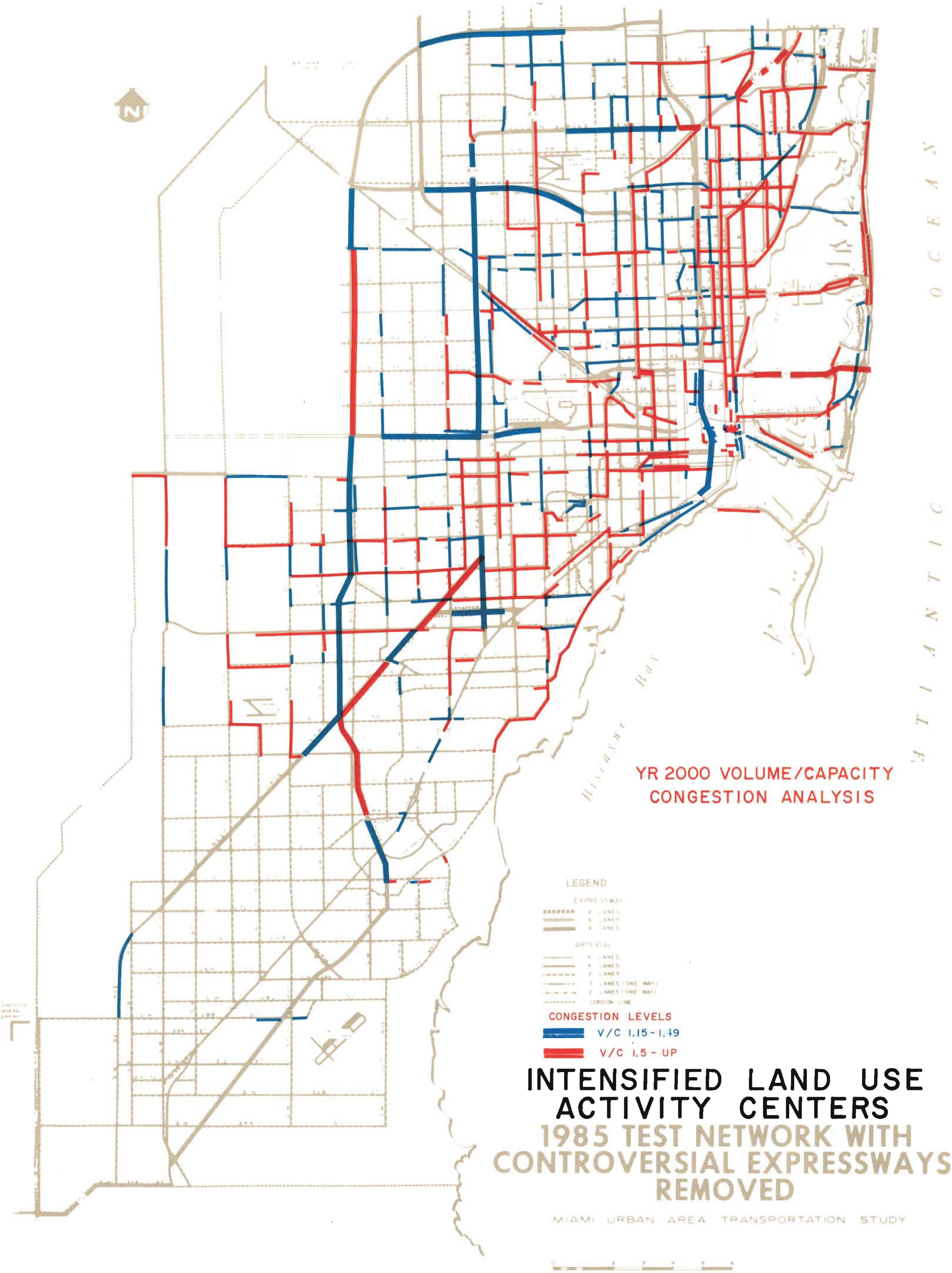

HEFT
1985 VOLUME / CAPACITY
CONGESTION ANALYSIS
LEGEND
CONGESTION LEVELS
V/C. 1.15 - 1.49
V/C. 1.5 - UP
1985 RECOMMENDED PRINCIPAL
STREET AND HIGHWAY PLAN
LANE ARRANGEMENT

ALTERNATE D



N
ATLANTIC OCEAN
Biscayne Bay
YR 2000 VOLUME / CAPACITY
CONGESTION ANALYSIS
LEGEND
CONGESTION LEVELS
V/C 1.15-1.49
V/C 1.5-UP
1985 TEST NETWORK WITH
CONTROVERSIAL EXPRESSWAYS
REMOVED
MIAMI URBAN AREA TRANSPORTATION STUDY

ALTERNATE E


OCEAN
ATLANTIC
Biscayne Bay
YR 2000 VOLUME/CAPACITY
CONGESTION ANALYSIS
LEGEND
EXPRESSWAY
ARTERIAL
4 LANES
CORDON LINE
CONGESTION LEVELS
V/C 1.15 - 1.49
V/C 1.5 - UP
INTENSIFIED LAND USE
ACTIVITY CENTERS
1985 TEST NETWORK WITH
CONTROVERSIAL EXPRESSWAYS
REMOVED
MIAMI URBAN AREA TRANSPORTATION STUDY
SCALE IN MILES

ALTERNATE F

of less than 0.5 indicates sparse facility usage, thus inefficient expenditure of funds, whereas V/C ratios of over 1.5 indicate very severe congestion levels and thus improper service provided to Dade County residents.

Comparison of Alternates

The Volume/Capacity concept is used in this analysis to evaluate the performance of each controversial corridor. An Alternate Map depicting system wide Volume/Capacity ratios has been prepared for each traffic assignment test. Review of these maps reveals the following comments for each of the six controversial corridors:

South Dixie Corridor. From the Homestead Extension of Florida's Turnpike near Old Cutler Road to the Interama Expressway.

Alternate 0 - Presently the South Dixie Corridor is heavily congested. Congestion exists for a considerable length of US-1. Moderate congestion is noted on Old Cutler Road.

Alternate A - Congestion appears to the west on the Homestead Extension of Florida's Turnpike, South Dade, and Snapper Creek Expressways, thereby also overloading most east-west arterials between the Palmetto Expressway and downtown Miami.

Alternate B - Some congestion relief is noted between the Palmetto and LeJeune-Douglas corridors for north-south travel. There is, however, no relief for US-1, but Old Cutler Road is relieved to a moderate extent as compared to Alternate A.

Alternate C - Compared to Alternate B, US-1 congestion is improved in some sections.

Alternate D - Congestion is concentrated in the South Dixie corridor and on the Snapper Creek Expressway, thereby relieving Old Cutler as well as other arterials within the area bounded by the Palmetto Expressway, the East-West Expressway, and US-1.

Alternate E - For the year 2000, serious congestion is noted on all arterials within a traffic impact area bordered by the East-West Expressway, Palmetto Expressway, and Old Cutler Road. Additional congestion develops on the Homestead Extension of Florida's Turnpike, South Dade, Snapper Creek, Palmetto, and East-West Expressways. These westerly expressways which, in the year 1985 provided US-1 relief, are now critically overloaded.

Alternate F - Old Cutler Road is more congested as compared with Alternate E.

LeJeune-Douglas Corridor. From South Dixie Highway to the Dade/Broward County line.

Alternate 0 - The current heavy use of 42 Avenue indicates a desire for north-south movements in the area between the congested Palmetto and I-95 expressways.

Alternate A - From the Airport Expressway to the Broward County line there will be no severe congestion; however, some congestion remains between the Airport Expressway and US-1.

Alternate B - The NW 37th Avenue to 32nd Avenue "S" curve arterial river crossing improvement moderately reduces congestion in the vicinity of the Miami International Airport. However, 27th Avenue remains congested.

Alternate C - This alternate provides nearly the same service as Alternate A.

Alternate D - The LeJeune-Douglas Expressway attracts heavy loadings. This reduces the load on nearby surface arterials and moderately relieves I-95 and the Palmetto Expressway.

Alternate E - I-95 and the Palmetto Expressway are seriously loaded in the year 2000. Also, the arterial congestion between the Palmetto Expressway and I-95 is critical.

Alternate F - This alternate provides nearly the same unacceptable level of service as that of Alternate E.

Interama Corridor. From approximately NW 135 Street to the vicinity of the Rickenbacker Causeway.

Alternate 0 - The present conditions indicate that Biscayne Boulevard and I-95 are seriously overloaded.

Alternate A - With Biscayne Boulevard capacity increased to 6 lanes, its congestion level is reduced slightly. The other arterials are moderately congested.

Alternate B - There is no measurable improvement in service over Alternate A.

Alternate C - There is no improvement over Alternate A.

Alternete D - The Interama Expressway attracts a considerable number of trips. Some moderate loadings are noted on a few arterials. Biscayne Boulevard and I-95 congestion is relieved as compared to the previous alternates.

Alternate E - Serious overloadings are noted on all arterials from I-95 to Biscayne Bay, particularly in the area south of approximately North 103 Street.

Alternate F - The same service level is noted as that of Alternate E.

Snake Creek Corridor. From Florida's Turnpike east to US-1.

Alternate 0 - Moderate loading is noted on Miami Gardens Drive.

Alternate A - Moderate loadings are noted on I-95 and US-441. Also, other arterials are beginning to show signs of congestion.

Alternate B - The only significant improvement noted over Alternate A is the relief of US-441. I-95 loadings remain the same. Florida's Turnpike has reached a moderate congestion level.

Alternate C - There is no measurable improvement in service over Alternate B. Moderate congestion is removed from the Florida's Turnpike and transferred to the surface arterial street network.

Alternate D - Loadings shift to Florida's Turnpike and the full expressway system. This relieves I-95 and most surface arterials.

Alternate E - Serious overloadings are noted on all arterials from Florida's Turnpike to US-1. Moderate loadings exist on I-95 and the Turnpike.

Alternate F - There are no significant improvements in service over that provided by Alternate E.

Hialeah Corridor. From the Homestead Extension of Florida's Turnpike to Alton Road.

Alternate 0 - Critical loading is noted on NW 103rd Street west of NW 7th Avenue.

Alternate A - Satisfactory improvement in service is noted over Alternate 0. This is due to the widened arterials and construction of the western portion of the Opa-locka Expressway to NW 27th Avenue.

Alternate B - There are no noticable overloadings of the arterial street improvements.

Alternate C - Some moderate loadings on the arterials exist with this transit emphasis alternate.

Alternate D - Congestion is relieved on most arterials.

Alternate E - Critical overloadings are noted, especially on NW 103 Street and NW 57th Avenue.

Alternate F - Compared to Alternate E, the congestion becomes moderate due mainly to the shift in land use allocations.

Opa-locka Corridor. From NW 27th Avenue east to US-1.

Alternate 0 - Moderate congestion to severe overloadings are noted along NW 135th Street/Opa-locka Boulevard throughout the entire length of the corridor.

Alternate A - Compared to Alternate 0, the volume/capacity ratio increases on the arterials, producing moderate congestion on most east-west arterials.

Alternate B - This alternate provides the same services as Alternate A, with some relief to North 103 Street.

Alternate C - The same level of service is provided as that of Alternate A.

Alternate D - Congestion is relieved on most of the arterials, notably Opa-locka Boulevard and 135 Street.

Alternate E - Critical loadings are noted on most of the arterials from I-95 east to US-1.

Alternate F - Severe congestion is noted in the entire corridor.

Corridor Summary and Conclusions

The examination of the social, environmental and operational factors at the corridor level reveals no concensus of a preferred alternate transportation/ land use system. This is primarily due to conflicts between the social criteria compared to a coupling of operational and environmental considerations. As was done at the system level, the different criteria areas used in the examination of alternatives at the corridor level are not weighted and stand separately for corridor conclusions.

Not all of the criteria used in the system level review could be applied in the corridor level examination due to differences in the scope of the review and/or the lack of data and analytical techniques available at the different levels of analysis.

The transportation alternatives within each corridor do not necessarily constitute the most effective scheme when viewed from a system-wide perspective. However, the alternatives to the original MUATS recommended plan do, for the most part, comply with recent urban planning studies and can be used in forming an acceptable system-wide program.

A system-wide program should be selected with equal consideration given to both the ability to satisfy travel demand and the ability of the alternative to be accepted by local communities from a corridor level perspective.

RECOMMENDATIONS

The Network Revision Subcommittee recommends that a policy of arterial street and transit improvements be accepted for the 1985 MUATS program. As additional information is gathered in the continuing transportation planning process an accepted program may become obsolete. Modifications to the accepted program can be made when this occurs.

The Network Revision Subcommittee recommends, for testing purposes, certain modifications to the original MUATS proposals that are a combination of the arterial street emphasis and transit emphasis alternatives described in this report. For 1985 testing purposes, the revisions listed below should be made to the original MUATS recommended plan in order to facilitate the continuing transportation planning process. After thorough testing, utilizing up-to-date land use projections that reflect the Comprehensive Development Master Plan, the network described below can be appropriately revised to reflect additional insights gained in the testing process and any additional information regarding the network that can be gathered from other sources in the interim. Each specific revision recommended to the original MUATS proposal is listed under the appropriate controversial corridor.

I. Opa-locka Corridor

(a) 4-lane 138 Street between N.W. 27 Avenue and N.W. 57 Avenue
(b) 6-lane 103 Street between N.W. 32 Avenue and N.W. 7 Avenue
(c) Develop 103 Street as a transit improvement corridor between Palmetto Expressway and N.W. 27 Avenue.*
(d) Delete Opa-locka Expressway between N.W. 27 Avenue and Interama Expressway

II. Hialeah Corridor:

(a) 6-lane 74-79 Street between N.W. 57 and 42 Avenues
(b) Develop N.W. 74 Street between HEFT and Palmetto Expressway through to the subdivision process as a 6-lane facility.
(c) Develop N.W. 74 Street as a transit improvement corridor between Palmetto Expressway and N.W. 27 Avenue.*
(d) Delete Hialeah Expressway between Homestead Extension of Florida's Turnpike and Alton Road.

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*An example of this concept is the preferential treatment of buses (transit riders) on surface arterials as is currently being demonstrated on NW 7 Avenue.

III. Snake Creek/North Dade Corridor

(a) Investigate County Line Road for possible expansion to a 4-lane facility between Florida's Turnpike and Biscayne Boulevard.
(b) Delete Snake Creek/North Dade Expressway between Florida's Turnpike and its termination in the vicinity of Biscayne Boulevard near N.E. 203 Street.

IV. Interama Corridor:

(a) Traffic engineering improvements to existing Biscayne Boulevard between N.E. 60 Street and N.E. 92 Street.*
(b) Develop Biscayne Boulevard as a Transit Improvement Corridor between downtown Miami and the Broward County Line.**
(c) Delete the entire Interama Expressway.

V. LeJeune-Douglas Corridor

(a) 4-lane Douglas Road between 135 Street and County Line.
(b) 6-lane LeJeune Road between N.W. 103 Street and N.W. 135 Street
(c) 4-lane LeJeune Road between N.W. 36 Street and N.W. 95 Street.
(d) 6-lane 27 Avenue from SR 9 to County Line.
(e) 4-lane 37 Avenue "S" Curve from N.W. 21 Street across Miami River to N.W. 32 Avenue.
(f) Revise plan to show 4 lane N.W. 37 Avenue between N.W. 7 and N.W. 21 Streets.
(g) Transit improvements in LeJeune Road/N.W. 27 Avenue corridor between U.S. 1 and Broward County Line.
(h) Delete the entire LeJeune-Douglas Expressway.

VI. South Dixie Corridor

(a) 6-lane Red Road (57 Avenue) between S.W. 8 Street and East-West Expressway.
(b) Revise plan to show Red Road as a 4-lane facility from U.S. 1 to S.W. 8 Street.
(c) Along U.S. 1 corridor between proposed Snapper Creek Expressway and I-95 terminus, construct major Fixed Transit improvements for 1985 that do not preclude expressway construction within the corridor beyond the year 2000.
(d) Delete South Dixie Expressway south of Snapper Creek Expressway.

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*Examples include modernization of signalization, intersection capacity improvements, and inbalanced directional lane use on the basis of fluctuations in daily demand.

Miscellaneous Network Improvements and Future Planning

In the course of this study, members of the Network Revision Subcommittee noted numerous but minor errors in the coding of the highway network such as turn restrictions, expressway interchange locations, one-way street coding, and improper roadway capacities. These errors should be forwarded to the Florida Department of Transportation and other consultants to assist them in their on-going work. Most of the minor errors detected were those of miscoded capacities. Most of these fell into two categories: 1) those coded with a capacity less than that which is currently available or will be available in the next five years through five-year construction work programs, and 2) those coded with a capacity greater than tests showed will be required or recommended. The Network Revision Subcommitte recommends that these type of minor changes to the highway network be made as soon as possible.

The Network Revision Subcommittee recommends that the long-range transportation planning horizon be advanced as soon as possible to the year 2000. Transit and highway projects currently being entered into five-year construction programs are scheduled for completion in the early 1980's. The useful life of these highway facilities is generally on the order of 20 to 25 years. Proper design of substantial fixed facilities requires that anticipated facility use be forecast 20 years or more. When the planning horizon is advanced, the most up-to-date land use projections which reflect the Comprehensive Development Master Plan should be used. Also, travel forecasting models, particularly modal split models, that are more accurate than existing models should be used in up-dating the plan, provided such models can, in fact, be developed.

As an example of the Network Revision Subcommittee's concern for advancing the planning horizon to the year 2000, the following table illustrates the number of miles of highway facilities that, using current models, have volume to capacity ratios that represent moderate congestion (v/c between 1.15 and 1.49) and severe levels of congestion (v/c greater than 1.5).

The table illustrates that a quantum jump in congestion levels can be anticipated between 1985 and the year 2000.

In summary, the Network Revision Subcommittee emphasizes that the corridor recommendations previously listed are for the year 1985 and only for testing purposes. The recommendations are not for a 2000 plan.

Table 53 Highway Facility Congestion					
Planning Horizon	Alternative	Moderate Congestion, Miles (v/c bet. 1.15-1.49)	Severe Congestion, Miles (v/c over 1.5)	Total Congested Miles
1985	A ("Do Nothing")	148	86	234
1985	B (Arterial Street Emphasis)	123	74	197
1985	C (Transit Land Use Emphasis)	177	107	284
1985	D (Original MUATS)	157	52	209
2000	E ("Do Nothing")	170	300	470
2000	F (Extended Transit-Activity Center Land Use)	263	159	422

APPENDICES

APPENDIX A

1985 Population and Employment Projections By Traffic Districts

District	Projected Population			Projected Employment		
	1985 Trend [1]	1985 Transit Emphasis [2]	1985 Comprehensive Plan [3]	1985 Trend [1]	1985 Transit Emphasis [2, 3]	1985 Comprehensive Plan [4]
1	3,080	3,030	3,080	43,000	50,160	61,520
2	84,280	84,780	85,680	28,800	29,010	53,830
3	10,790	11,210	9,790	8,200	8,200	12,690
4	75,100	79,790	70,100	24,700	24,720	26,150
5	39,950	39,530	36,650	43,100	43,100	39,220
6	46,890	47,230	42,690	52,700	53,470	60,750
7	74,460	75,640	73,160	32,200	32,580	34,600
8	32,210	32,140	33,610	12,500	12,500	13,530
9	60,240	61,180	57,240	20,400	21,200	26,530
10	46,170	46,980	47,570	16,000	15,000	17,300
11	42,690	46,560	45,190	15,500	18,930	16,530
12	30,350	33,540	32,850	9,800	11,120	11,530
13	46,350	45,940	58,350	6,000	6,400	6,460
14	49,810	47,510	49,810	7,200	7,200	13,840
15	42,600	41,510	43,800	3,300	3,300	1,540
16	46,370	47,070	43,370	13,000	13,000	14,610
17	60,720	58,360	56,720	5,200	5,300	1,150
18	26,130	26,090	24,130	8,600	8,700	9,310
19	75,680	72,720	65,680	24,900	18,900	26,910
20	19,680	19,520	18,680	1,500	8,100	1,150
21	7,790	7,170	7,790	2,100	2,100	770
22	380	380	380	300	100	80
23	0	0	0	2,100	2,100	1,150
24	3,420	3,200	3,420	800	800	150
25	18,540	16,660	18,540	2,600	2,600	7,690
26	4,560	4,560	14,560	3,900	3,900	15,380
27	17,990	17,860	16,990	11,500	11,500	17,690
28	34,550	34,090	30,550	18,100	18,100	18,460
29	46,830	47,400	46,830	53,900	53,990	46,140
30	51,140	51,460	48,740	25,700	26,260	30,760
31	53,570	54,820	54,570	25,500	26,220	26,910
32	48,190	46,830	47,490	6,800	6,800	7,690
33	64,170	62,630	55,170	7,800	7,500	8,460
34	57,870	52,710	65,870	2,800	2,800	1,500
35	14,400	12,640	20,400	4,400	4,400	1,580
36	46,260	44,170	49,260	7,100	7,070	6,920
37	33,080	33,930	32,880	8,800	9,170	19,230
38	64,840	67,790	61,840	6,800	6,390	4,610
39	48,180	48,520	46,980	7,700	8,400	7,690
40	6,210	6,115	6,210	3,100	3,100	3,080
41	16,230	15,660	20,230	2,900	2,900	2,310
42	24,640	24,190	29,540	12,600	12,600	13,840
43	4,330	4,260	4,330	3,000	3,000	4,000
44	17,770	16,810	20,770	3,900	3,900	3,460
45	8,880	8,760	6,580	3,600	3,600	3,080
46	1,740	1,710	1,240	500	500	310
47	9,000	8,860	12,000	4,700	4,610	6,150
48	58,940	64,940	57,540	49,100	50,370	27,910
49	15,200	15,170	15,200	21,000	21,100	14,610
50	37,500	41,770	37,500	24,400	24,260	16,920
51	5,790	5,690	5,790	6,100	6,100	2,310
Total	1,735,540	1,742,757	1,737,340	769,000	739,390	768,990

[1] Used in Alternates A, B, and D.

[2] Used in Alternate C

[3] Non-resident county work force not included in allocation.

[4] Not applied to Controversial Corridors Study; however, this data will be used in subsequent 1985 testing.

APPENDIX B

Dade County Transportation Policies

The following policies are a portion of the recommended Metropolitan Development Policies, which is part of the Comprehensive Development Master Plan for Dade County.

TRANSPORTATION

I. PROVIDE ACCESS TO EMPLOYMENT AND THE FACILITIES AND SERVICES OF THE ENTIRE METROPOLITAN AREA: PLAN FOR MOBILITY, OPPORTUNITY, VARIETY, ENERGY CONSERVATION AND LOW TRAVEL TIMES AND COSTS, SAFETY, COMFORT AND CONVENIENCE WHILE TRAVELING: AND PROVIDE FOR EFFICIENCY, ECONOMY AND A WELL-BALANCED, INTEGRATED TRANSPORTATION SYSTEM WITHIN DADE COUNTY WITHOUT DETRACTING FROM THE QUALITY OF LIFE OF THE COMMUNITY.

A. Public or mass transportation should be given top priority.

B. Use transportation as a positive tool to support and improve the viability of the County and the region.

1. Provide rapid, safe, reliable, clean convenient, low-fared (subsidized where necessary) public or private mass transportation systems that result in easy movement of people and goods between the proposed nodes and also between adjoining residential areas and the nodes.

2. Transit facilities and services should support the shaping and staging of development, redevelopment, and intensification of the central business districts, tourists areas, diversified and specialized activity centers, and their contiguous residential areas.

3. Provide rapid transit terminals in major activity centers and provide mass transit facilities to the tributary areas.

4. Develop and assure a public and private internal movement system adequate to support an activity center prior to committing major transportation improvements needed to serve the center.

5. Utilize the transportation resources of the County as a tool in the solution of the County's most pressing social and economic problems, including the enhancement of tourist areas, providing low cost transportation for the elderly and the handicapped and low income families, and the revitalization of depressed areas.

C. Provide a system of transportation facilities which will anticipate the need for the movement of people and the movement and storage of goods and vehicles.

1. Transportation planning and investment should provide for the efficient movement of goods including consideration of truck routes; intermodal terminals; use of modern distribution systems; incorporation of goods movement systems into design of major activities centers; elimination of conflicts between people movements and goods movements, and the conservation of energy.

2. Adequate parking, as well as efficient interchange facilities for feeder buses and automobile passengers, should be provided at points where the highway system interfaces with the mass transit system.

3. Locate transit stations on or near the intersection of arterial streets.

4. Incorporate transportation terminals, transfer points, parking garages, and local distribution systems into the design of the major centers.

5. Encourage the separation of pedestrian and vehicular traffic.

6. Create a system of interconnected bicycle paths throughout the County.

7. Encourage the development of service accessways, including alleys, wherever feasible and necessary, especially in areas generating substantial traffic for the delivery of goods and providing services.

D. Coordinate and integrate the County's transportation facilities with surrounding activities so that these facilities contribute to the enhancement of the physical environment within Dade County.

1. Transportation facilities should be designed to complement adjacent development and also have a distinctively aesthetic identity of their own.

2. Designate and preserve through advance acquisition of rights-of-way where necessary, transportation corridors as a means of achieving orderly relationships between transportation and urban development.

3. Major thoroughfares and junctions should not be located in a manner which would tend to sever or fragment land which could otherwise be developed into well-defined neighborhoods.

4. The rapid transit and highway system should complement and facilitate local movements provided by local streets, bicycle paths, and pedestrian facilities.

5. Transportation facilities should be planned and designed to conserve energy and other natural resources and existing man-made facilities, and to reduce the total need for new public investment.

6. Transportation planning should be coordinated with the development or redevelopment of adjacent land, particularly in the vicinity of mass transit stations and expressway interchanges.

7. Transportation corridors should be designed for high quality visual experiences.

8. Where appropriate, adequate buffers should be provided by government to protect adjacent residential development from the adverse effects of noise pollution.

9. Require arterial road dedications to allow for linear landscaped open space.

10. Development and redevelopment in approach zones to airport runways should be regulated to effectively reduce the detrimental effects of noise pollution.

11. Activities with significant demand for air travel should be encouraged to locate in proximity to airports.

APPENDIX C

Selected Characteristics of Cities[5] With Rapid Transit Systems

CITY	URBANIZED AREA POPULATION	CENTRAL CITY POPULATION	Central City DENSITY (persons/ sq. mile)	PHYSICAL BARRIERS	REPORTED DOWNTOWN EMPLOYMENT	FLOOR SPACE[1] mill. sq.ft.)	CBD PERCENT TRANSIT TRIPS
Existing Systems							
New York	16,206,800	7,894,900	26,300	Rivers	1,500,000	NA	95
Chicago	6,714,600	3,367,000	15,100	Lake	300,000	92	71
Philadelphia	4,021,100	1,948,600	15,200	River	225,000	124	59
Boston	2,652,600	641,100	14,000	Bay	240,000	70	50
Cleveland	1,959,900	750,900	9,900	Lake	110,000	45	41
Toronto	1,881,000	665,000	20,000	Lake	125,000	40	NA
Montreal	2,437,000	1,145,000	23,500	Hills	NA	NA	NA
Approved Systems							
San Francisco	2,987,900	715,700	15,800	Bay	270,000	NA	37
Washington	2,481,500	756,500	12,300	Minimal	212,000	NA	43
Atlanta	1,172,800	497,000	3,800	Minimal	105,000	30	28
Baltimore	1,579,800	906,000	11,600	Bay	78,000	33	46
Denver	1,047,300	515,000	5,406	None	50,000	24	20
MIAMI (1970)	1,219,661[2]	421,931[4]	10,300	Bay,Ocean	43,000	12	28
DADE COUNTY (1985)	1,969,540[3]	513,000[4]	13,050	Bay,Ocean	61,000	NA	NA

1 Excludes residential floor space
3 Includes tourists
2 Excludes tourists   4 Miami and Miami Beach (est)   5 1970 data except where noted

Source: Planning and Design Guidelines for Efficient Bus Utilization of Highway Facilities, Wilbur Smith and Associates, April, 1974
Urban Transportation Concepts, Wilbur Smith and Associates, 1970

APPENDIX D

Corridor Socioeconomic Characteristics

Census Tract	Population	Population Density	Median Age	Median Family Income
LeJeune-Douglas Corridor				
100.01	3,974	2,112	17	$ 7,966
100.02	1,729	1,152	21	9,167
100.03	12,625	6,656	22	10,824
100.04	7,200	2,240	21	10,584
94	5,807	5,760	23	10,230
5.01	5,348	2,432	21	9,354
5.02	5,235	1,152	25	9,370
5.03	4,703	1,728	27	8,140
6.04	5,304	6,272	36	10,470
6.05	3,597	6,272	36	10,373
8.01	8,457	6,336	37	8,369
9.01	6,463	8,192	30	8,804
9.02	5,774	5,312	34	8,709
9.03	4,602	4,096	30	7,640
16.02	5,119	6,208	40	9,631
17.01	5,700	3,648	22	6,421
17.03	4,088	5,696	35	6,826
48	428	576	38	10,353
49	7,931	5,120	34	9,911
55.01	5,138	9,664	41	8,663
55.02	5,792	11,456	42	8,038
56	4,059	7,616	44	10,340
62	9,906	8,640	42	9,226
63.01	6,343	13,056	42	7,467
63.02	4,274	6,976	45	9,603
70.01	4,797	10,240	42	8,172
70.02	5,056	9,536	42	8,410
Interama Corridor				
1.02	4,251	1,152	62	$ 7,940
1.03	6,010	1,408	46	10,820
2.01	5,896	8,448	41	8,863
11.04	4,198	4,544	48	14,558
12.02	6,485	4,416	47	13,377
13	8,034	6,336	51	9,467
14	7,915	8,256	39	6,073
20.01	4,098	9,024	36	5,662
20.02	6,765	11,008	33	6,940
21	2,497	3,264	46	15,654
22.01	4,075	11,328	50	8,261
26	5,153	10,688	32	6,203
27.02	4,012	11,456	40	7,157
28	4,209	8,832	24	4,430
31	5,497	15,016	28	4,374
34	10,623	24,640	27	4,831
37.01	3,274	8,640	61	5,169
37.02	1,899	2,240	46	5,257
97	11,613	3,968	46	11,069

APPENDIX D (Continued)

Census Tract	Population	Population Density	Median Age	Median Family Income
		Opa Locka Corridor		
2.08	6081	6336	43	$ 9,391
3.03	5580	4160	40	10,129
3.04	7506	5376	40	11,083
4.04	5818	5568	29	10,476
4.06	6042	6464	38	8,960
4.07	8961	5184	30	8,428
11.01	3416	6336	47	9,548
		Snake Creek Corridor		
97	11613	3968	46	$11,067
98	7483	2304	29	11,350
99.01	1064	7680	34	13,461
		Hialeah Corridor		
7.02	15562	9920	30	$ 8,469
8.01	8457	6336	37	8,369
8.02	9794	11392	34	8,457
9.03	4602	4096	30	7,640
10.04	8561	10240	20	5,717
13	8034	6336	51	9,467
14	7915	8256	39	6,073
15.02	7884	12672	20	4,527
39.03	15448	5888	53	10,375
		South Dixie Corridor		
68	5824	3776	38	$13,925
69	5555	9600	47	9,391
70.02	5056	9535	42	8,410
71	6731	11328	26	7,269
72	5613	13184	26	5,264
74	6742	4352	43	19,081
75	9037	6976	22	18,975
76.03	4359	8512	23	7,450
26.04	5889	4928	29	11,169
79.01	4093	4928	36	20,615

Source: 1970 Census