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Jacksonville Urban Area Mass Transportation Study

Campbell Foxworth Pugh INC

Reynolds Smith Hills

Jacksonville Urban Area Mass Transportation Study

U.S. Department of Transportation Project No. T9-8
The preparation of this report was financed in part through an Urban Mass Transportation Grant from the U.S. Department of Transportation under the provisions of the Urban Mass Transportation Act of 1964.

JACKSONVILLE AREA PLANNING BOARD

CITY OF JACKSONVILLE, FLORIDA

M E M O R A N D U M

TO: MEMBERS of the Jacksonville City Council

FROM: Ward Koutnik WK
Principal Transportation Planner
Jacksonville Area Planning Board

SUBJECT: Final Report of JUATS Mass Transportation Study

DATE: June 3, 1975

The final report of the Jacksonville Urban Area Mass Transportation Study is being provided for your information and convenience. The study findings and recommendations have not been formally adopted by any agency to date. It's current status is "information only." The recommendations as well as other mass transit alternatives and the presently adopted JUATS Streets and Highways Plan will be re-evaluated during the course of the JUATS Major Review Program which is expected to begin in July.

If you have any questions concerning the long-range mass transit report or the Major Review Study, please contact me or Mr. Tocknell at 633-2261. Thank you.

Final Report

Jacksonville Urban Area Mass Transportation Study

Prepared For

The Jacksonville Area Planning Board

In Cooperation With

U.S. Department of Transportation
Urban Mass Transportation Administration
Florida Department of Transportation
Jacksonville Transportation Authority

By

Campbell, Foxworth and Pugh, Inc.
Consulting Engineers and Planners

Reynolds, Smith and Hills
Architects-Engineers-Planners, Incorporated

November 1974

ERRATA

1. Page 13. The Jacksonville Area Planning Board Policies and Standards Handbook was prepared by the Jacobs Company, Inc., Alan M. Voorhees and Associates, Inc., and the JAPB. The handbook published in June 1973 and adopted by the Jacksonville Area Planning Board, sets forth a set of policies to guide its decision-making process. The explicit statements of goals, policies and standards are also intended to inform other organizations and individuals as to what the JAPB aspires to achieve, and how it will conduct its planning and administrative responsibilities.

2. Page 40. Reference is given to the use of the transit attitude survey data. This data was used as a guide only in the development of the modal split models. The data shown in summarized form in Tables 8 and 9, were plotted aginst the 1968 JUATS information and adjusted (in most cases downward) to reflect a conservative estimate of transit patronage. The modal split model curves were lower than the attitudinal responses, particularly in the higher levels of mass transit diversion. The lower end of the modal split curves were left much the same as that reported in the 1968 JUATS.

3. Page 83. An additional footnote should be added indicating the primary reference sources used to estimate the transit operating costs. These were:

   (a) Jacksonville Transportation Authority actual operating costs for 1973 and previous years;

   (b) The American Transit Association Transit Operating Reports through 1973, and

   (c) The Mass Transit Demonstration Projects information developed under contract 602 (Project No. PA-MTD-2).

CONTENTS

PAGE

ILLUSTRATIONS

LIST OF TABLES

Report Summary

Authority for Study

The Jacksonville Urban Area Mass Transportation Study began on August 1, 1972. The Federal Department of Transportation, Urban Mass Transportation Administration funded two-thirds of the study costs, while the Consolidated City of Jacksonville and the Florida Department of Transportation each contributed one-sixth of the cost.

The Jacksonville Area Planning Board (JAPB) administered the study using the consultant firms of Campbell, Foxworth and Pugh, Incorporated, and Reynolds, Smith and Hills, Incorporated.

Scope of Study

The major thrust of the Study was to undertake an interdisciplinary team effort among the JAPB staff and the consultant's transportation planning and urban design professionals. As part of the continuing Jacksonville Urban Area Transportation Study (JUATS) primary objectives were:

1. To develop a mass transportation improvements program to meet Jacksonville's long-range (1990) transportation needs.

2. To integrate transit planning with desirable land use planning and development.

3. To closely consider environmental and urban design impacts of transit systems.

4. To quantify patronage, indentify funding sources and assess the financial feasibility.

5. To provide the data and information necessary for developing an integrated and balanced highway and mass transportation system.

Need for Balanced Transportation

There is a significant need for public transit services for the elderly, low-income, young, handicapped, and persons without access to a private vehicle. These "captive riders" depend upon public transit for their mobility needs. In addition, there is a growing latent demand for transit services by those who own or have access to a private vehicle. This "non-captive" group demands a fast, reliable, and convenient means of travel, which can effectively compete with the private automobile. The decision to use transit involves numerous factors including access time to the transit system, travel time on the transit vehicle, the fare, the trip purpose, and the time of day.

The "energy crisis" which began in late 1973 presents a new and significant consideration for transportation system planning. The uncertainty of fuel availability and the rising costs to own and operate a private vehicle are influencing on the daily lives and travel habits of most Jacksonville residents. Thus, a vastly improved transit system may be the key to urban mobility during not only peak travel times but even off-peak times in the near future.

The projected travel demand coupled with the "energy crisis" and in general the public's negative reactions to new roadways in relatively high-density areas leads to the conclusion that:

> Jacksonville must develop a well-balanced transportation system that includes both new roadways, and vastly improved transit facilities. Roadway development should concentrate upon new circumferential routes and improvements to present roadways, while transit development should focus upon higher-density areas and the Downtown.

JACKSONVILLE URBAN AREA MASS TRANSPORTATION STUDY

FOR THE CONSOLIDATED CITY OF JACKSONVILLE
BY JACKSONVILLE AREA PLANNING BOARD

TITLE **1990 RECOMMENDED TRANSIT SYSTEM**

LEGEND

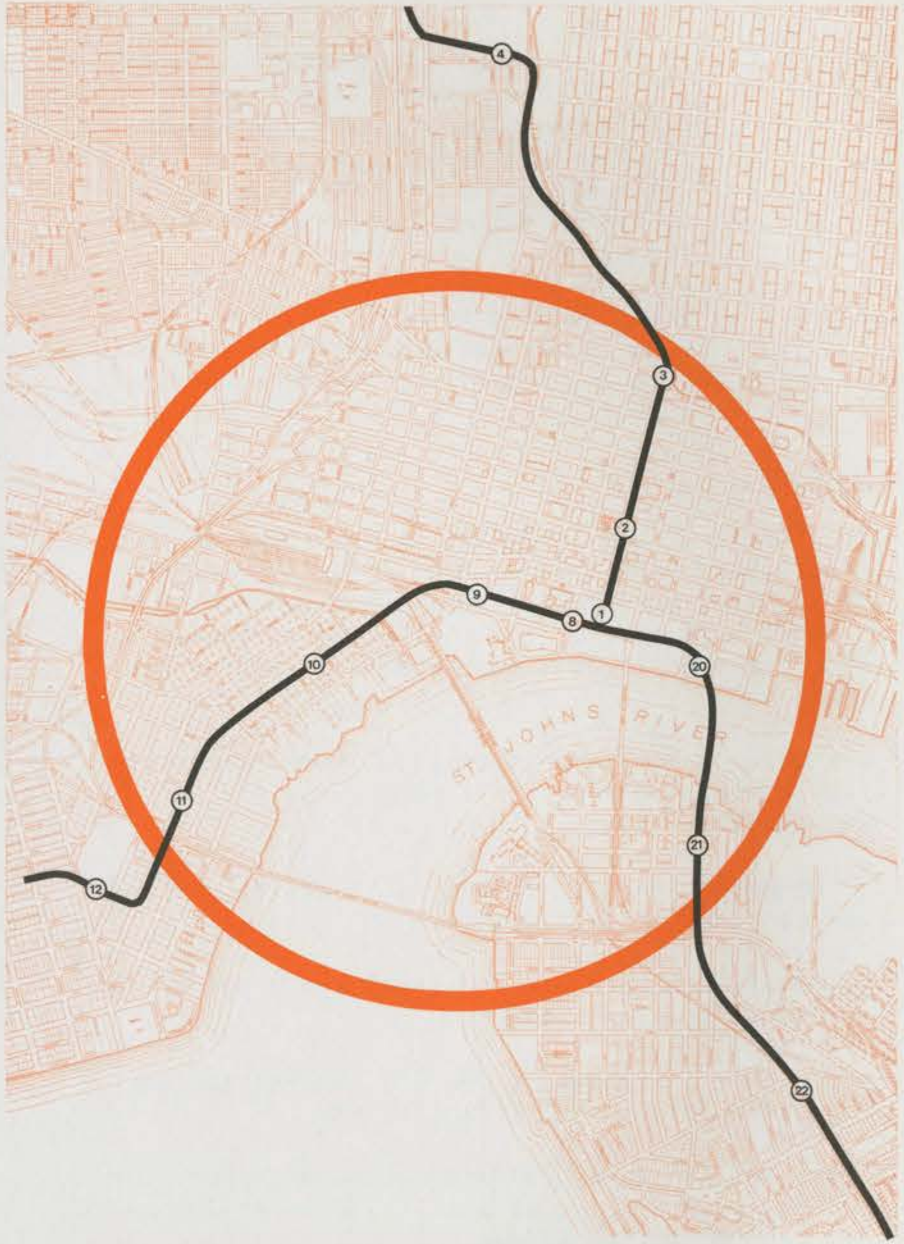
- FIXED GUIDEWAY ROUTE
- FIXED GUIDEWAY STATION
- EXPRESS BUS ROUTE
- EXPRESS BUS STATION
- FEEDER BUS

DOWNTOWN AREA

- PREFERRED ALTERNATIVE ROUTE

SCALE IN MILES
0 1 2 3 4

CONSULTANTS
CAMPBELL, FOXWORTH AND PUGH, INC.
REYNOLDS, SMITH AND HILLS
IN ASSOCIATION



DOWNTOWN AREA

Jacksonville Transit Demand and Patronage Growing

In December of 1972, the Jacksonville Transportation Authority (JTA) acquired the bus system from the Jacksonville Coach Company. Since that time the JTA with financial assistance from the Urban Mass Transportation Administration (Grant approval on February 26, 1973), Florida Department of Transportation and the Jacksonville City Council, has significantly improved the bus service and operation. Some of the major changes are: 1) Basic fares have been reduced from $0.30 to $0.25 ($0.10 for senior citizens), 2) Several new "express" bus routes serving the Jacksonville Downtown Area from outlying suburban "park-n-ride" facilities at shopping centers have been initiated, 3) Mini-bus service connecting peripheral parking lots with the downtown area has been initiated, 4) several local bus route extensions and other appropriate modifications have been made, and 5) The dissemination of transit information and marketing programs have been improved.

These improvements coupled with the "energy crisis" and rising costs to own and operate a private vehicle have greatly influenced many persons to utilize transit services.

During the first eight months of 1974 bus ridership has totalled over 900,000 passengers or over 27 percent more than the number of transit riders during the same period in 1972. Over 1,000,000 passengers have been carried each month of 1974 and the annual total is expected to surpass 13,000,000. The success of the JTA thus far is also indicated when patronage figures are compared to the national average. Since June, 1973 the monthly percentage increase of patronage in Jacksonville has been consistently 10 percent or more than the national average.

The impressive ridership figures clearly indicate that Jacksonville citizens are responding to improved transit service as well as responding to higher costs to travel by an automobile. There is a trend toward transit usage and the current "latent" demand as well as the anticipated significant increase of transit demand in the future must be planned for now and appropriate and effective facilities provided to adequately meet these demands of the future.

The Recommended Rapid Transit Plan

The findings, conclusions, and recommendations of the major study were developed with the close involvement of the JAPB and the JUATS Technical Coordinating Committee. The recommended three-phase transit improvement program is as follows:

Phase I - Implementation of the "Immediate Action Program" should be initiated in 1974. This phase includes 120 route miles of express buses, 350 miles of feeder/local bus route service and is generally designed to develop increased transit ridership during the years prior to the opening of the rapid transit system. Fast express bus service with convenient park-and-ride facilities is recommended, especially for Downtown travel. The initial JTA express bus service which began in March, 1974 is the first step in implementing this type of service.

The present bus system routing should be substantially modified within the Downtown Area. Exclusive rights-of-way and preferential treatment for buses should be implemented at an early date. A re-routing plan must be fully integrated with the continuing planning process now under the auspicies of the Downtown Development Authority.

In addition, the program of downtown peripheral parking facilities served by mini-buses and/or conventional buses is recommended. The initial JTA program ("Spirit Special") begun in early 1974 is a first step toward an effective peripheral parking mini-bus program and expansion and improvements should continue.

Phase II and III - The recommended 34.0 mile fixed-guideway rapid transit system includes 33 rapid transit stations, 65 miles of express bus routes and 360 miles of feeder bus routes. Transit vehicles, including spares, number 250 for the rapid transit system and 300 for the express and feeder bus systems.

The total system is designed to provide a high level of service with a relatively high capacity. Emphasis is placed upon serving the Downtown Area as well as attracting a sunstantial number of persons desiring to cross the St. Johns River during peak hours of travel. The rapid transit system basically forms a radial network with four corridor routes: North, Southwest, Southside-Arlington, and Southeast. The express buses serve those travel corridors which are not likely to require the higher capacity fixed-guideway system by 1990 but are still expected to require peak hour improvements in transit service. The feeder bus system generally provides a collection and distribution function for the rapid transit system.

The 23.5 miles of fixed-guideway recommended in Phase II, should be in full operation by 1981. The remaining 10.5 miles of Phase III is recommended to be complete by 1985.

Transit Service Characteristics

The transit attitude survey and projected patronage levels show conclusively that the level of service provided by a transit system is a most important consideration. The time between vehicles, the vehicle speed and the locations of stations with regard to activity centers are the key factors. The recommended rapid transit service standards are given below:

RAPID TRANSIT SERVICE STANDARDS

Basic Fare	25 cents
Transfer	Free
Vehicle Maximum Speed	
Fixed-guideway	65 m.p.h.
Express Bus	60 m.p.h.
Headways	
Fixed-guideway	2 min. during peak hour 8 min. during off peak hour
Express Bus	10 min. during peak hour 20 min. during off peak hour

Local Bus	(Variable) 8-15 min. during peak hour 20-30 min. during off peak hour

Dwell Times[1]

Fixed-guideway	Peak	Off Peak
CBD	20 sec.	15 sec.
Urban	20 sec.	15 sec.
Suburban	10 sec.	10 sec.

Technology Characteristics

A light-weight, medium volume rapid transit system supplemented by high-performance express buses is recommended. These vehicles would meet the required service standard as well as the environmental and engineering performance criteria setforth in the mode selection process.

Rapid Transit Vehicle - The Rapid Transit vehicle should be of light-weight construction and modern appearance. It should be electrically powered and capable of full automated operation. The previous service standard already stated must be met. The noise level and pollution from the vehicle and the system as a whole shall be kept to a minimum. The vehicle should be of sufficient size to accommodate a train capable of moving 450 passengers per hour per direction at 2 minute headways. Loading convenience and riding quality should be physically, especially for elderly and handicapped, and psychologically pleasing. The vehicle should be designed for a fail-safe operation.

(1) These could be adjusted during off peak times to accommodate elderly and handicapped persons.

High Performance Express Buses - The express buses should be capable of operating at speeds up to 60 miles per hour with an acceleration rate of 2.5 miles per hour per second on dry pavement, and a deceleration rate of 3.0 miles per hour per second. They should have a seating capacity of at least 53 passengers and be designed for ease of access by the handicapped. The vehicles should have the least energy consumption power system that technology has on the market and should be relatively pollution free.

Potential Rapid Transit Candidates - The Transit Technology section of this report describes several potential rapid transit vehicle candidates for use in Jacksonville. Some of the specific manufacturers are Ford, Westinghouse, Wabco (bought out by Rohr), Transportation Technology, Dashaveyor, Krauss-Maffei, and Boeing - the manufacture of the Standard Light Transit Vehicle. The selected technology must be capable of accommodating a peak hour passenger demand of at least 14,000 in one direction and be expandable to 20,000.

Patronage, Operating Cost, and Revenue

Patronage - The projected number of transit passengers using the transit system for Phase I, II and III is summarized below:

Recommended Phase	Projection Year	Average Weekday Passengers	Annual Passengers
Phase I All-Bus System Express & Local Buses	1980	93,000	26,970,000
Phase II 23.5 mile Fixed-guideway Rapid Transit with Express & Feeder bus	1981	120,700	35,003,000
Phase III 34.0 mile Fixed-guideway Rapid Transit with Express and Feeder buses	1985	193,500	56,115,000
	1990	256,000	74,240,000

With an aggressive transit improvement and marketing program, patronage in 1980 is expected to more than double today's ridership. Increased growth coupled with high-speed rapid transit and the supplementary bus network are anticipated to increase transit usage by over five times before 1990.

It is estimated that 23.3 percent of all persons traveling during the peak morning rush hour in 1990 will use the recommended transit system. Further, about 35 percent of the persons desiring to cross the St. Johns River in one direction during the peak hour in 1990 will be utilizing the recommended transit facilities. In addition, nearly 54 percent traveling to the Downtown Area during the rush hour in 1990 will use transit. Furthermore, an estimated potential 10,000 future parking spaces within the CBD could be eliminated due to the rapid transit system.

Operating Cost - The estimated operating cost including inflationary costs for the recommended transit system from 1980 to 1990 for the proposed three phased program is as follows:

Recommended Phase	Year	Annual Operating Cost Estimate (in dollars)
Phase I	1980	$10,090,000
Phase II	1981	$15,413,000
Phase III	1985	$22,252,000
	1990	$30,689,000

Passenger Revenue - Revenue estimates are based upon passenger revenue only. Additional revenue from advertising and from charter services were not included. It was assumed that parking at rapid transit stations and express park-and-ride stops would be free. The affect upon revenue of three fare charge alternatives based upon a constant patronage for each alternative was estimated. Revenue generated for each alternative for Phase I, II, and III for selected years is given below:

Fare Alternative	Estimated Annual Revenue (in 1,000's Dollars)			
	Phase I	Phase II	Phase III	
	1980	1981	1985	1990
Alternative A 25 cents 1975-1990	$6,743	$ 8,751	$14,029	$18,560
Alternative B 25 cents 1975-1979 30 cents 1980-1984 35 cents 1985-1989 40 cents 1990	$8,091	$10,501	$19,640	$29,696
Alternative C 30 cents 1975-1979 35 cents 1980-1989 40 cents 1990	$9,440	$12,251	$19,640	$29,696

Capital Costs

The estimated capital cost for constructing and equipping the recommended 34-mile rapid transit system and its supplementary system of express and feeder buses is estimated at $529.9 million including inflationary cost estimates ($331.4 million in current 1974 dollars). Construction should begin as soon as possible to reduce the public investment due to inflationary trends. For example, a five year delay could result in a $197.4 million increase in construction costs alone.

Financing the Plan

Both Federal and State assistance will be necessary to finance the capital costs of the recommended rapid transit system. With the growing need for transit improvements across the nation, it may be very difficult to receive federal funding. However, in order to receive any substantial amount of funding a transit plan must be adopted and detailed engineering studies completed. The possible annual funding by level of government for the capital expenditure is as follows:

The Federal Government, through its Urban Mass Transportation Administration, could fund 80 percent or $423.92 million. The Florida Department of Transportation's funding share would be 10 percent or $52.99 million as would be the City of Jacksonville's share. The recommended construction schedule indicates that between $35 and $36 million of Jacksonville's capital funding share should occur during the 1978-1980 period.

The potential funding sources at the state level in addition to the 10% capital grant funding include:

1. 8th cent gas tax (100% could be used for transit improvements),

2. 9th cent gas tax (100% could be used for transit; referendum required),

3. Direct State aid,

4. Surplus general revenues,

5. Motor Vehicle license tag fees, and

6. General Sales Tax.

Potential funding sources at the local level which merit consideration and detailed analysis include:

1. General Sales Tax

2. Ad Valorem Tax

3. Revenue Sharing

4. Resort Tax

5. Local Gasoline Tax

6. Local Motor Vehicle License Tag Fee

7. Special Benefit District Tax

8. Sale or Lease of Transit Property

9. Bond Issue

Chapter 1 • Introduction

Jacksonville (Duval County) is located in northeastern Florida and serves as a trade and service center for a broad region in northern Florida and southern Georgia. Among other important economic roles, Jacksonville is a regional insurance and financial center, an important seaport and industrial area and the location for three major naval installations. Unlike most other large Florida counties, the growth of Jacksonville has been in response to increased economic opportunity rather than as a result of its environmental amenities.

On August 8, 1967, the people of Duval County voted consolidation of County and City Governments. Since consolidation became effective on October 1, 1968, Jacksonville has experienced rapid economic and population growth. This "Bold New City of the South" is well on its way to developing into a strong and dynamic urbanized area.

The City of Jacksonville comprises 840 square miles (537,664 acres) and is th most spacious City in the Continental United States. About two-thirds of the land is suitable for development with approximately 30 percent already developed.

A tremendous financial investment has been made since 1967. Nearly 5 million gross square feet of office space have been constructed and/or under construction since consolidation. From 1967 to 1971, single-family residential units increased by 7,800 and multiple family dwelling units by 17,000 or nearly 180% of the total number of multiples built from 1950 to 1966. The rapid growth of office, retail commercial and multiple-family developments is expected to continue in the 1970's and 1980's.

Transportation Planning in Jacksonville

In September, 1967 data collection for the Jacksonville Urban Area Transportation Study (JUATS) began and was completed in May, 1969. The boundaries of the urban study area (same as mass transit study) were established by the Jacksonville Area Planning Board (JAPB) in cooperation with the Florida Department of Transportation (FDOT) and the Federal Highway Administration.

The study area includes all of Duval County, as well as that portion of Clay County north of the north branch of Black Creek and that portion of St. Johns County north of an easterly projection of the Duval-St. Johns County Line. Figure I-1 shows the area of study for both JUATS and this study.

Each major phase of JUATS was documented in a technical report describing all aspects of the study. Technical Report No. 9 was completed in March, 1973 and included concepts and plans which were developed and tested. Previous Jacksonville area plans were evaluated, and new roadway corridors were developed using portions of previous plans and suggestions from the JUATS Technical Coordinating Committee. The end result after adjustments and modifications was the designation of a recommended transportation plan to serve the forecast 1990 population. The recommended JUATS Expressway and Highway Plan is displayed in Figure I-2. A "Comprehensive Plan for Streets and Highways" report was published in March, 1974 to update transportation planning in the Jacksonville urban area.

The Jacksonville Urban Area Mass Transportation Study

In August of 1972, the consultant firms of Campbell, Foxworth and Pugh, Inc., and Reynolds, Smith and Hills, Inc., were contracted by the Jacksonville Area Planning Board to conduct the Jacksonville Urban Area Mass Transportation Study. The study was financed in part through an urban mass transportation grant from the U. S. Department of Transportation under the provisions of the Urban Mass Transportation Act of 1964 as amended. The Florida Department of Transportation and the Jacksonville Transportation Authority also participated in funding and other services.

Fig. I-1

JACKSONVILLE URBAN AREA MASS TRANSPORTATION STUDY

FOR THE CONSOLIDATED CITY OF JACKSONVILLE
BY JACKSONVILLE AREA PLANNING BOARD

TITLE:

STUDY AREA

LEGEND:

---- STUDY AREA BOUNDARY

SCALE IN MILES

CONSULTANTS

CAMPBELL, FOXWORTH AND PUGH, INC.
REYNOLDS, SMITH AND HILLS
IN ASSOCIATION

Fig. I-2

JACKSONVILLE URBAN AREA MASS TRANSPORTATION STUDY

FOR: THE CONSOLIDATED CITY OF JACKSONVILLE
BY: JACKSONVILLE AREA PLANNING BOARD

TITLE: **JUATS EXPRESSWAY AND HIGHWAY PLAN**

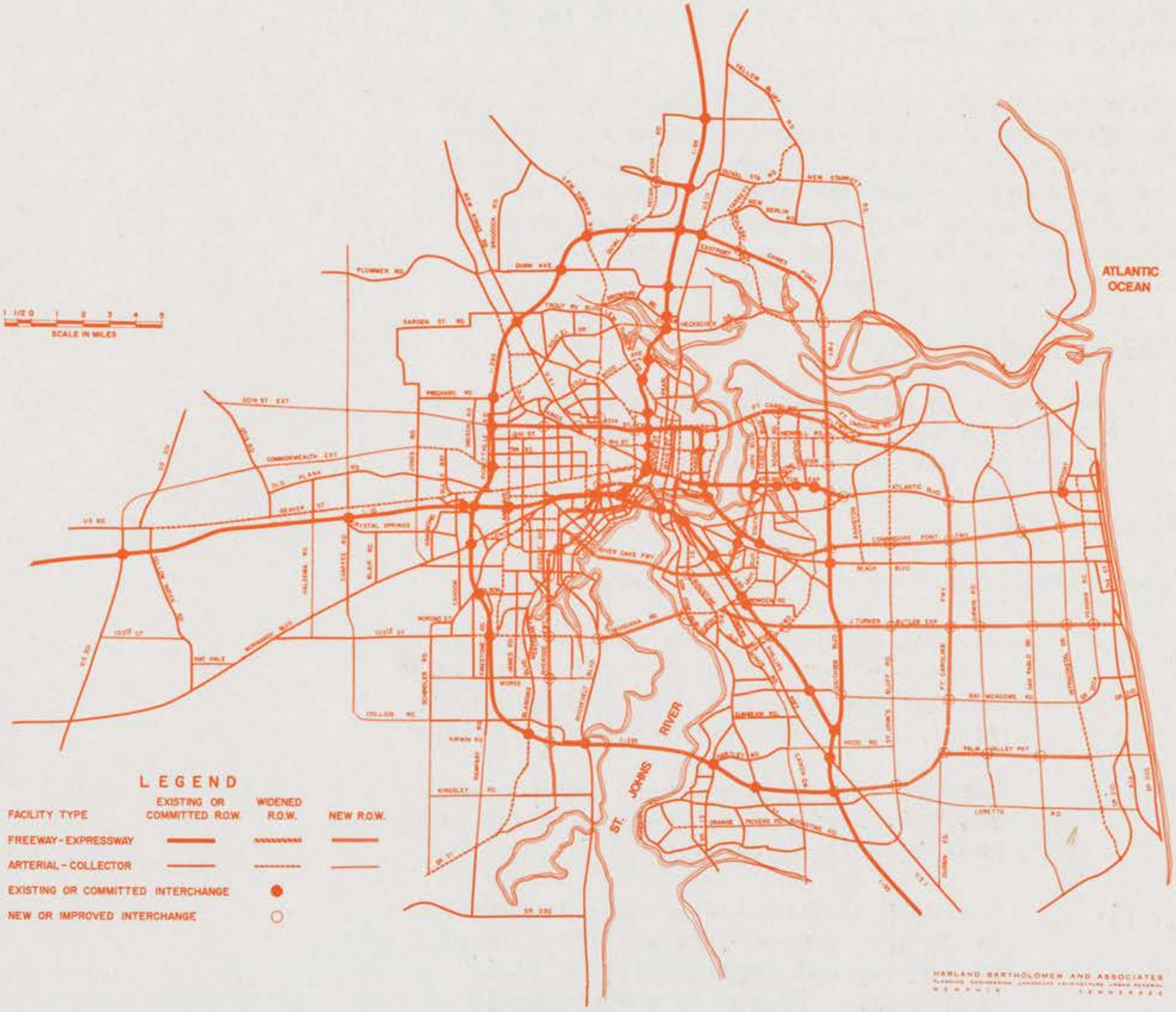
LEGEND:

CONSULTANTS:

CAMPBELL, FOXWORTH AND PUGH, INC.
REYNOLDS, SMITH AND HILLS
IN ASSOCIATION

RECOMMENDED TRANSPORTATION PLAN

JACKSONVILLE URBAN AREA TRANSPORTATION STUDY



The major thrust of the study was to undertake an inter-disciplinary team effort. Through active participation of the JAPB and the consultant's professional disciplines, travel demands were to be accommodated through location and design of transit facilities aimed at complementing desirable land use development and preserving the natural environmental and aesthetic merits of the area.

The recommendations of this Mass Transportation Study are intended to be fully integrated with the Jacksonville streets and highways system in an update transportation program. Thus the transit networks will form a system which will balance travel demands with facility needs using the mode most appropriate for serving each sector of the community.

Purpose of Study

This report presents pertinent transit planning information which will be used to implement a vastly improved transit system as well as to help maintain a continuing and coordinated transportation planning process in Jacksonville.

The basic work phases of the transit study were:

Phase I	Develop community goals and objectives, prepare a detailed study design, organize appropriate data and supplementary surveys prepare of a critical path schedule.
Phase II	Conduct interview surveys, develop models and test alternative land use plans and mass transit systems.
Phase III	Evaluate alternative transit systems as to general economic feasibility, level of service and adaptability to local conditions. Determine a recommended mass transit plan, program of implementation, phase of development schedule, capital and operating cost estimates and patronage estimates.

Chapter II • Transportation Goals and Objectives

There is great diversity among the residents of Jacksonville and consequently there are differing travel needs. Although most residents will continue to rely heavily on the private vehicle, there will be significant number who do not own or have access to a private vehicle. This group includes persons who are handicapped, disabled, of low income, elderly, young, persons of one-automobile families, or no license individuals. This group, often referred to as "captive riders", require mass transit service. At the same time, persons who do have access to a car or, "non-captive riders", increasingly desire an efficient alternative mode of transportation, especially for work trips.

The private vehicle has played the leading role in travel within the region and the vast majority of planning and construction of transportation facilities has been aimed at accommodating the increasing vehicular traffic. The improvement in mass transit services has received only token attention. However, the influx of people and employers into urban areas now requires a more balanced and integrated system of streets and highways and mass transit facilities. Furthermore, the energy shortage has emphasized the necessity for vastly improved mass transportation.

The private vehicle is expected to continue to be the principle means of transportation for most persons in the near future. However, traffic congestion is becoming a more serious problem during peak travel periods and the cost of operating an automobile continually rises. Unfortunately bus transportation is restricted because it must compete with the automobile for space on the roads. Furthermore, since bus operating funds are fairly limited, the areal coverage and frequency of service are minimal. An integrated system of various transportation facilities, each supplementing and complimenting the other is clearly necessary to serve effectively Jacksonville's future travel desires.

This integrated transportation system in Jacksonville should be developed within the framework of a set of transportation goals and objectives. The following are the broad transportation goals and objectives as well as specific mass transit goals and objectives.

<u>Transportation Goals and Objectives</u> - The following transportation goals and objectives were abstracted from the Jacksonville Area Planning Board Policies and Standards Handbook.

GOALS: The major transportation system should be designed:

1. To encourage the most logical development of the metropolitan area.

2. To serve and support existing and future land use and development, and minimize conflicts between the transportation system and the social and natural environments in which they function.

3. To encourage more rational land use patterns through coordinated planning and programming of transportation improvements.

4. To provide a variety of modes of travel to meet the different needs of people, business, and industry.

5. To serve the transportation needs of all members and activities of the community for efficient, economical, and safe movement of people and goods.

6. To reduce traffic congestion.

7. To minimize, insofar as practicable, the number and mileage of ground transportation facilities while providing adequate service in all modes of transportation.

8. To increase transit ridership and attract a larger percentage of total person-trips to the transit system.

9. To improve the interrelationship between the various modes of transportation serving the personal and economic needs of the Jacksonville area.

10. To reduce air pollution noise, and other environmental problems caused by ground transportation systems.

OBJECTIVES:

1. To encourage the growth of the area in a planned and orderly manner through the development of a transportation plan which is compatible with proposed future development.

2. To minimize disruption of existing developments, including residential areas, industrial complexes, planned public open space, community facilities, and other land uses.

3. To accommodate future travel demand for different modes at an optimum level of service commensurate with cost, comfort, and efficiency.

4. To accommodate future travel demand at the minimum, reasonable cost with potential for expansion and extension to satisfy needs beyond the design year.

5. To achieve a high level of citizen participation so that the transportation planning process is responsive to change in citizens' needs and community goals and objectives.

6. To preserve and protect natural scenic beauty, historic buildings, and historic sites while providing a desirable level of accessibility.

7. To improve the visual quality of transportation facilities in the urban area by following good location and geometric design standards.

Mass Transit Goals and Objectives - The following goals and objectives are recommended for guiding the development of mass transit for the Jacksonville Urban Area and were approved by the Technical Coordinating Committee.

GOALS:

1. A mass transit system that will be easily accessible to all residents as an alternate mode of transportation so as to increase access to employment, medical facilities, educational facilities, major shopping facilities, recreational and cultural facilities and other primary activity areas.

2. A mass transit system that will serve and support approved existing and future land use development plans and be highly coordinated with the planning efforts of the Jacksonville Area Planning Board to encourage proper development and re-development of residential, commercial and industrial land uses.

3. A mass transit system that will help to enhance the environment and minimize noise and air pollution and other environmental problems caused by ground transportation systems.

4. A mass transit system that will form a integral part of the total transportation plan for Jacksonville by supplementing and complimenting the expressway and highway system.

5. A mass transit system that will help to minimize, insofar as practicable, the number and mileage of ground transportation facilities while providing adequate service in all modes of transportation.

6. A mass transit system that will contribute to the alleviation of vehicular traffic congestion throughout the region, especially in the downtown and adjacent areas.

7. A mass transit system that will contribute to the reduction of vehicular parking space demands within the downtown area.

OBJECTIVES:

1. The mass transit system should provide a service which is responsive to the travel desires of the people.

2. The mass transit system fare should be comparable with that of the operating costs of an automobile.

3. The mass transit system should provide service which is convenient and comparable to alternate travel modes in terms of travel time, accessibility to major destinations, dependability, comfort and safety.

4. The mass transit system should seek to achieve a high degree of coordination with the planning efforts of the local planning agencies.

5. The mass transit system should encourage the development of high density activities and uses around stations or major stops which will in turn help support the system.

6. The mass transit system should operate at acceptable minimum noise levels and should minimize, harmful emissions.

7. The mass transit system should have aesthetically pleasant transit vehicles and other related facilities.

8. The mass transit system should take advantage of existing rights-of-way whenever possible.

9. Capital and operation costs for mass transit should be held to practical limits while maximizing service.

Chapter III • Existing and Future Development

From its creation in 1822, Jacksonville was a transportation hub for a wide territory, particularly by boat on the St. Johns and by land to interior Florida and North Georgia. Tourists began to arrive in great numbers following the Civil War and the railroads began their building and extensions with Jacksonville as the focal point. Thus, with its excellent harbor and railroad facilities, Jacksonville has long been a major center of commerce and industry.

In 1950, 304,000 people lived in Duval County with two-thirds or 204,500 residing within the City Limits of Jacksonville. The Jacksonville central area lost 3,500 residents during the 1950-1960 decade while the surrounding suburbs grew by nearly 155,000. The opening of the Mathews Bridge (1952) and the Fuller Warren Bridge (1954) was a major factor contributing to the rapid growth of areas adjacent to and beyond the eastern shore of the St. Johns River i.e., Arlington, Southside Estates, Pottsburg, Jacksonville Beach, San Jose and others. These areas accounted for nearly one-half of the county population increase in the 1950's.

While the economic and population growth in the early 1960's was comparatively slow, the last half of the decade saw the new consolidated government of Jacksonville take shape in 1967, the Isaiah D. Hart Bridge open in 1968, and substantial new commercial and residential developments constructed as evidenced by the building of the 30-story Gulf Life Tower in 1967. By 1970, the county's residents numbered 528,865, a net increase of 73,400 over the previous ten years. During this period the central area lost population (36,300) while areas to the east of the St. Johns River gained 58,000 and the remainder of the county grew by about 51,700.

The dynamic 1970's clearly show that Jacksonville's growth has not diminished. In fact, it is one of the fastest growing cities in the nation from both an economic and population standpoint. Numerous office and commercial centers have been developed and numerous others are planned. Some of the major office construction during the 1970's include:

1) Independent Square: 37-story tower nearing completion in Downtown CBD; tallest in Florida; 900,000 gross square feet,

2) Atlantic Bank: 18-stories nearing completion in Downtown CBD,

3) Regency Tower: 12-stories nearing completion in the Regency activity center,

4) Blackstone Building: 11-stories completed in Downtown. (Government Center),

5) Blue Cross Building: 20-stories (added to existing 10-story) completed in January, 1974; 500,000 total square feet,

6) San Marco Towers: 9-stories completed in 1972 just south of southside downtown area,

7) IBM Building: 6-stories completed in 1972 in southside Downtown,

8) St. Lukes Professional Building: 6-stories completed in 1972 in major Medical Center,

9) Duval Federal: 5-stories completed in 1972 in Downtown CBD,

10) The Oaks (Phase 1): 5-stories completed in 1972 in major office center,

11) One Regency Place: 4-stories completed in 1972 in major regional shopping center,

12) Five Points Haas Building: 4-stories completed in 1972 in Riverside Medical Area,

13) Koger Executive Center: Several 2 to 3-story offices completed during 1960-1972 period (450,000 square feet), and

14) The Oaks (Phase II): 5-story under construction in major office center.

In addition to numerous commercial developments, there has also been substantial residential construction in the 1970's. Thousands of multiple-family, condominium and, to a lesser extent, single-family residences have been constructed. The trend toward multiple-family apartment and condominium housing is increasing as is the continuing gain in the number of mobile homes.

The region is currently fairly prosperous and the Downtown Area is being revitalized through strong and coordinated planning and development by the Downtown Development Authority, other government agencies and local business leaders. In terms of urban city growth and development, Jacksonville is now on the threshold of becoming truly the "Bold New City of the South".

Population and Employment Projections

As shown in Table 1 a substantial growth in population is forecast. By 1980, 660,000 persons are expected to be living in Jacksonville and by 1990 the figure is expected to be 850,000. Thus, more than a 60 percent population increase during the twenty years following 1970 is anticipated. Significant economic growth for both the Downtown Area and the region is also expected to continue at a relatively rapid pace. By 1990 the total employment in Jacksonville is projected to be about 353,000, or over 80 percent higher than the 1968 total of 194,000.

Table 1

DUVAL COUNTY POPULATION

1950 - 1990

U. S. CENSUS	POPULATION
1950	304,000
1960	455,000
1970	528,865
JUATS PROJECTIONS	
1980	660,000
1990	850,000

The distribution of both population and employment in 1990 will be substantially determined and influenced by transportation and land use policies established in the next few years. Figures III-1 and III-2 illustrate the 1990 population and employment distribution based upon the 1990 Comprehensive Land Use Plan and the Recommended Transit Plan.

Major Activity Centers

The location and type of major activity centers or traffic generators are a key element in the design of transportation and terminal systems. Figure III-3 displays the major existing and planned activity centers. As shown in Table 2 the dominant center is the Jacksonville Central Business District which employed about 21,000 in 1968. Through proper planning and development including vastly improved transit services, this regional center is expected to employ about 48,000 by 1990.

Total employment in Southside Downtown, which presently features the Gulf Life and Prudential Office towers,

Fig. III-1

JACKSONVILLE URBAN AREA MASS TRANSPORTATION STUDY

FOR THE CONSOLIDATED CITY OF JACKSONVILLE
BY JACKSONVILLE AREA PLANNING BOARD

TITLE:

1990 POPULATION DISTRIBUTION

LEGEND:

• = 500 PEOPLE

SCALE IN MILES

CONSULTANTS

CAMPBELL, FOXWORTH AND PUGH, INC.
REYNOLDS, SMITH AND HILLS
IN ASSOCIATION

Fig. III-2

JACKSONVILLE URBAN AREA MASS TRANSPORTATION STUDY

FOR THE CONSOLIDATED CITY OF JACKSONVILLE
BY: JACKSONVILLE AREA PLANNING BOARD

TITLE:

1990 EMPLOYMENT DISTRIBUTION

LEGEND:

- • = 200 EMPLOYEES
- ● = 1,000 EMPLOYEES

SCALE IN MILES

CONSULTANTS:

CAMPBELL, FOXWORTH AND PUGH, INC.
REYNOLDS, SMITH AND HILLS
IN ASSOCIATION

Fig. III-3

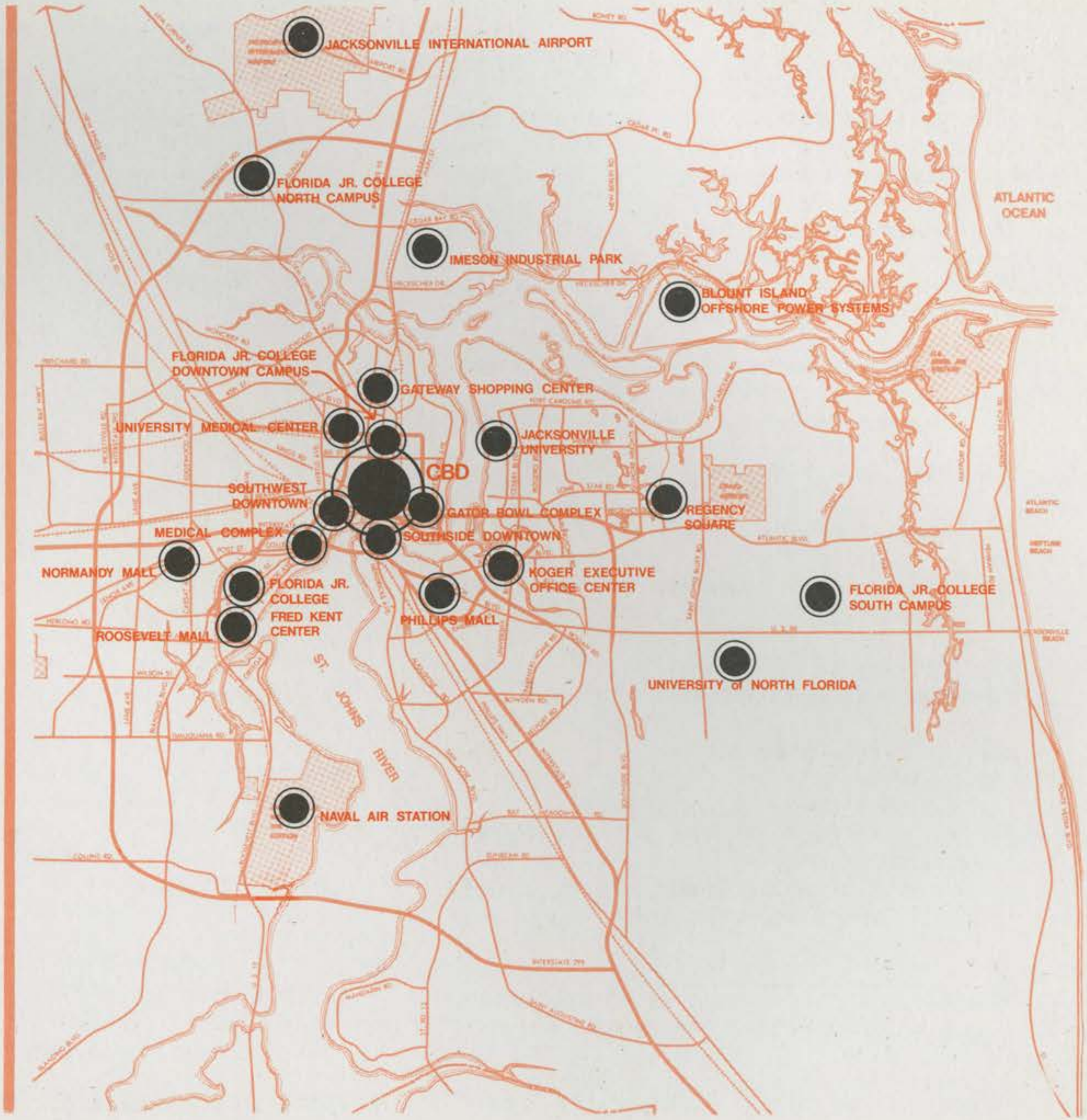
JACKSONVILLE URBAN AREA MASS TRANSPORTATION STUDY

FOR: THE CONSOLIDATED CITY OF JACKSONVILLE
BY: JACKSONVILLE AREA PLANNING BOARD

TITLE: **MAJOR ACTIVITY CENTERS**

LEGEND:

● ACTIVITY CENTER



SCALE IN MILES: 0 1 2 3 4

CONSULTANTS:

CAMPBELL, FOXWORTH AND PUGH, INC.
REYNOLDS, SMITH AND HILLS
IN ASSOCIATION

TABLE 2

MAJOR ACTIVITY CENTER EMPLOYMENT

MAJOR ACTIVITY CENTER	ESTIMATED[1] BASE YEAR EMPLOYMENT	PROJECTED 1990[2] EMPLOYMENT	INCREASE
1) Downtown CBD	21,000	48,000	27,000
2) Southside Downtown	6,400	12,000	5,600
3) Southwest Downtown	5,300	14,000	8,700
4) University Hospital Medical Center	3,500	8,000	4,500
5) Koger Office Park	1,900	3,500	1,600
6) Regency Center	1,200	8,500	7,300
7) Oaks Office Center	500	2,500	2,000
8) Gateway Center	1,000	2,100	1,100
9) Florida Junior College (Downtown)	1,000	2,200 (5,500 Students)	1,200
10) University of North Florida (Southside)	0	3,000 (10,000 Students)	3,000
11) Phillips Plaza Center	800	2,000	1,200
TOTAL	42,600	105,800	63,200
% of Duval County	21.9%	30.0%	39.7%

SOURCES:

[1]JUATS 1968.

[2]Transit Study Data: Jacksonville Area Planning Board Land Use Data for Recommended Transit Plan.

the rapidly expanding Baptist Hospital/medical center complex and other office and commercial developments, is expected to employ 12,000 by 1990. The St. Johns Place proposal will be the major development. A third major employment center, Southwest Downtown with the Blue Cross Office Tower, the Peninsula offices and future office-commercial developments, is forecast to employ about 14,000 persons in 1990. These three centers comprise the "Downtown Area" and employed 17 percent of all Duval County workers in 1968. During the period leading up to 1990, the Downtown Area is expected to attract about 26 percent of all new employment and employ about 21 percent of the total county work force by 1990.

Other major traffic generators include the University Hospital and medical center, the Koger Office Park, the Oaks Office Center, the Gateway shopping Center, the Regency Shopping Center, the planned Imeson Industrial Park and the Blunt Island Employment Center. The Florida Junior College (Downtown Campus), the University of North Florida campus and the Phillips Plaza Center will also generate fairly heavy traffic.

The eleven activity centers shown in Table 2 employed about one out of five county workers in 1968 and are expected to employ three out of ten workers in 1990. Hence, nearly 40 percent of the employment increase from 1968 to 1990 is expected to be within these major activity centers. These centers now account for an estimated one-quarter of the work trips being made during peak morning and afternoon rush hours. Traffic congestion within and at numerous major access points and bridge crossings leading to these centers continues to increase. By 1990 these centers will probably account for over one-third of peak hour work related traffic, or over two and one-half times the 1968 volume. Without an efficient alternative to the private vehicle traffic congestion and delays will probably be severe.

Comprehensive Land Use Planning

Jacksonville is rapidly changing into a truly modern, urbanized city. Its economic and population growth is expected to accelerate in the near future. Through coordinated land use and transportation planning, this growth can be accomplished with positive environmental impact. Initial signs of the effect of the heavy growth of the late 1960's are evidenced by increased traffic congestion, urban sprawl, increased air pollution from vehicles, loss of the natural environment, and more and more land devoted to roadways and parking lots. These same trends are characteristic of rapidly expanding auto-dominated cities, such as Los Angeles during the 1950's and 1960's and Atlanta in the 1960's and 1970's.

A region is able to control how and where growth takes place, and to govern its effects on the environment only through the implementation of a coordinated program of land use and transportation. Jacksonville still has time to employ the tools of urban land planning by adopting a transportation system which will help direct and organize this growth in a manner necessary to achieve full urban mobility and a desirable level of development intensity compatible with market demands.

The quality of transportation services is often the primary indicator of an urban area's environment. For example, New York is known for its subways, San Francisco for its cable cars and now the BART rapid transit system, and Los Angeles for its acres of freeways, complex interchanges and millions of cars.

The Jacksonville Area Planning Board in late 1973, adopted its first Comprehensive Land Use Plan. It is to be used as a general guide for future land development and is recommended for use by public agencies and private developers in day to day decisions.

A major element of the Plan relating to new development is expressed as follows:

> "Orderly and efficient growth is best realized in areas equipped with adequate utilities and public service facilities, or which will be so equipped in time to serve any new development. New development must be shown to have a favorable economic, environmental, physical and social impact not only as an entity in itself, but also on the community at large."

In addition the 1990 Comprehensive Land Use Plan recommends "a bimodal balanced system of thoroughfares and transit facilities ......" The plan further recommends that initial emphasis on transit improvements be focused upon improved bus service, while rapid transit and people-mover systems are recommended in long range plans.

The Role of Mass Transportation

Transportation facilities can form urban patterns as evidenced by the wide ranging capability of the automobile and resulting urban sprawl. Motor vehicles require land for parking and road facilities necessary to efficiently accommodate peak hour demands with relatively little use in off peaks. New roadways tend to force development to spread to the fringes of existing urbanized areas or to leap-frog resulting in costly utility construction or detrimental ecological impact. This results in increased cost to all citizens. The recommended Transit Plan provides a high level of service in those areas of Jacksonville that have or will have the required public facilities and utilities. Furthermore, careful design of the system, especially stations, can result on a very favorable impact on the community.

One of the primary potential values of a well-designed rapid transit system is that it can encourage the compact organization of housing, shopping, medical facilities, and office space around transit stations. This leaves more open space for parks, green belts, agriculture and the natural environment. Thus, land, an increasingly valuable asset is used to its best advantage.

Because buses are flexible in routing and are not as permanent in their commitment to serve areas, they do not support the creation of more dense land use patterns. However, a high-speed, high-capacity fixed-guideway system can substantially shape the future form and redevelopment of Jacksonville. Consequently, the system can become a vital asset if rapid transit and land use plans are correlated and implemented concurrently.

Chapter IV · Transportation and Travel Characteristics

While much of Jacksonville's early development occurred north of the St. Johns River, the completion of the Acosta and Main Street Bridges stimulated the Southside into a major population center. The Mathews Bridge subsequently spurred the development of the Arlington Area and with the construction of the Arlington Expressway development continued eastward.

Since the completion of Interstate 95 much of the recent development has occurred south and southeast of the downtown area. One end result has been heavy peak hour travel demands at all bridge crossings of the St. Johns River except the Buckman. Since the St. Johns River forms a natural barrier to the south and east of the Downtown CBD the achievement of the adopted "Plan for Downtown" will require vast access improvements. Studies of highway transportation, revealed in JUATS, show that access across the St. Johns River must be increased by the addition of five bridges to adequately accommodate 1990 travel demands. Highway construction, particularly bridges over the scenic St. Johns River, are very expensive and difficult to justify on an environmental impact basis. While some additional bridge construction is anticipated across the St. Johns an effective mass transit system could reduce the number of the new bridges. Thus, leaders of the Jacksonville community commissioned the Jacksonville Urban Area Mass Transportation Study to search for alternatives to the automobile and a more balanced regional transportation system.

Existing Highway System

The existing highway network in Jacksonville is composed of both a surface street and expressway system. Generally, the system is radially oriented to downtown, however, a grid network of streets exists in the older central city north and west of the St. Johns River. Interstate 95, Interstate 10 and the Arlington Expressway (Alt. 1) represent the spine of the roadway system. Major facilities serving demands east of the downtown area are composed of several surface streets including Atlantic Boulevard (S.R. 10), Beach Boulevard (U.S. 90) and the Phillips Highway (U.S. 1). The total mileage of roadways may be broken down into 404 miles of primary, interstates and expressways, 2,554 miles of City maintained and secondary roads, and 130 miles of private roads.(1) Bridge tolls at major water barriers have provided a sound economic base for expansion of the expressway system and will continue to provide the necessary funding for key elements of the highway plan.

The St. Johns River, however, is a natural obstacle to the smooth flow of traffic and is presently spanned by six bridges connecting the north and west with the east, southeast and the beaches. The Mathews, Acosta, Fuller Warren, and Main Street Bridges are particular bottlenecks during peak traffic periods as is the interchange of Interstate 10 and Roosevelt Boulevard (Alternate 17) and Beach and Atlantic Boulevards in the southside area. These conditions will become increasingly more severe in future years as development continues to occur southeast, east and southwest of the downtown area.

Since the major roadways converge in the downtown area, thru-traffic as well as vehicles with downtown destinations must use the same facilities. The completion of Interstate 295 should facilitate travel moving completely through the Jacksonville Area. However, the Central Business District is in the midst of a building boom will generate greater traffic demands on the already overloaded river crossings. In addition, the anticipated growth of the region will generate additional traffic within and through the central Jacksonville areas.

Existing Mass Transit Operation

The transit service in Jacksonville is presently provided by motor bus. The Jacksonville Transportation

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[1] Annual Financial Report, Streets and Highways Division, Department of Public Works, February 4, 1974.

Authority (JTA) acquired the system on December 11, 1973 and currently operates it through contract management with the Jacksonville Coach Company. Since the acquisition, there have been a number of significant improvements in transit service. Following is a listing of the major events of the JTA since it took over the bus operation:

1. Reduction of fares - January 22, 1973.

2. Urban Mass Transportation Administration Grant for purchase of 45 new transit coaches - February 26, 1973.

3. Six new routes introduced including express service to Downtown - June 4, 1973.

4. Reduction of fare to 10 cents for senior citizens and elimination of zone fares - October 1, 1973.

5. Holiday Special and other new services - December 3, 1973.

6. Introduction of 5 Spirit Specials (park-n-ride service in Downtown area) - January 28, 1974.

7. Four new express bus routes - March 4, 1974.

During 1972 the average number of bus passengers each weekday was about 36,000. However, since the JTA assumed the service there has been a dramatic rise in patronage. This increase in the utilization of bus transit service can be primarily attributed to the following:

1. reduced fares to all citizens,

2. introduction of new express bus service providing faster transit service from park-n-ride facilities at shopping centers to the Jacksonville Downtown area,

3. the substantial rise in gasoline and other costs to operate a private vehicle, and

4. improved marketing and advertising of the bus transit service.

In January of 1973, the JTA reduced the basic fare from $.30 to $.25 and weekly passes for adults and students from $5.70 to $5.00 and $3.00 to $2.50 respectively. In October, 1973 senior citizens fares were reduced to $.10 per ride.

Patronage in 1974 has been an impressive 27 percent higher than the 1972 patronage totals. Figure IV-1 shows the trend comparison of bus transit ridership in Jacksonville for the 1972-1974 period. During the first eights months of 1974 ridership has numbered over 900,000 passengers, or more than 27 percent greater than the same period in 1972. The average number of weekday passengers in 1974 has been about 47,000. More than 1,000,000 passengers have been carried each month of 1974 thus far and it is expected that the annual total will surpass 13,000,000 passengers.

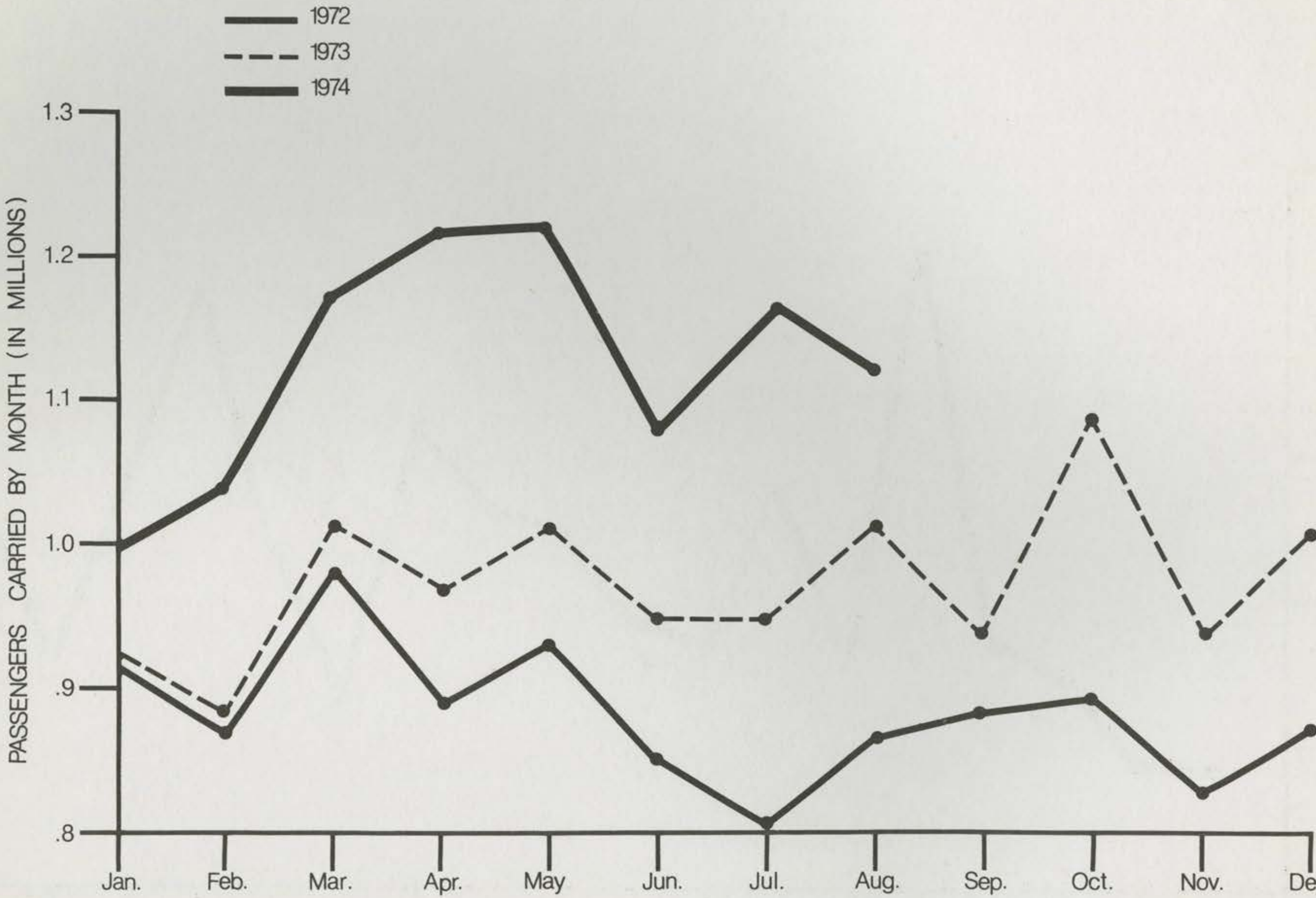
Figure IV-2 compares the JTA's transit success with the national average for patronage increase during 1973 and 1974. In all cases the JTA has had a higher monthly percentage increase than the national average. Since June, 1973 this increase has been consistently 10 percent or greater.

These impressive patronage figures clearly indicate that Jacksonville citizens will respond to improved transit services and that there is a trend toward transit usage and demand. Some of the "latent" demand has begun to use transit and a greater proportion of this demand can be expected to utilize transit if the system is continually improved.

The bus system serving the Jacksonville area in 1973 is shown in Figure IV-3. It should be noted that nearly

TREND COMPARISON RIDERSHIP
JTA TRANSIT SYSTEM

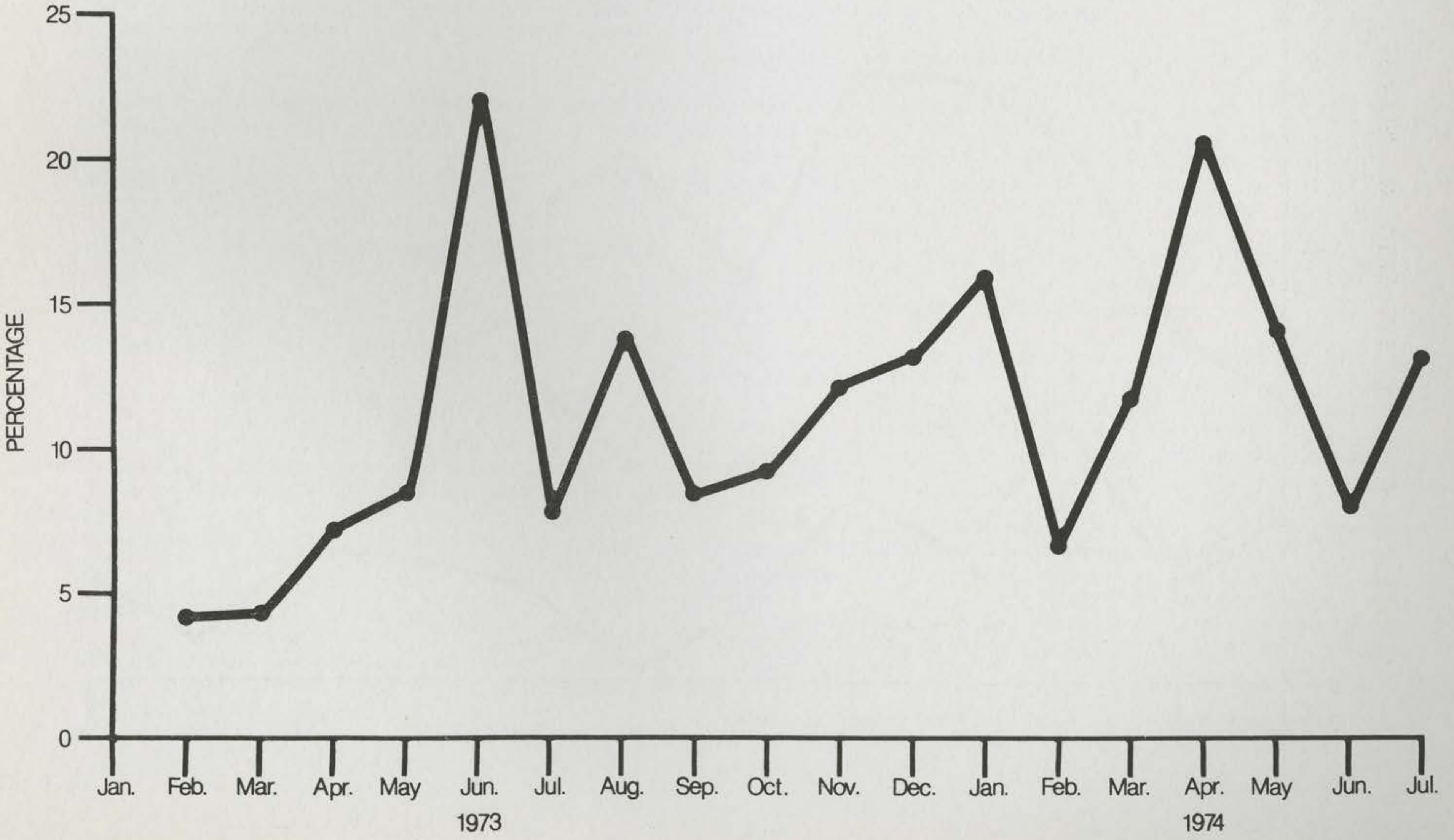
1972 • 1973 • 1974



Source: JTA

Fig. IV-1

PERCENTAGE INCREASE IN RIDERSHIP
JTA OVER NATIONAL AVERAGE



Source: JTA

Fig. IV–2

Fig. IV-3

JACKSONVILLE URBAN AREA MASS TRANSPORTATION STUDY

FOR THE CONSOLIDATED CITY OF JACKSONVILLE
BY JACKSONVILLE AREA PLANNING BOARD

TITLE: **1973 TRANSIT SYSTEM**

LEGEND:

ROUTE

ROUTE NUMBER

SOURCE: JACKSONVILLE TRANSPORTATION AUTHORITY

SCALE IN MILES

0 1 2 3 4

CONSULTANTS

CAMPBELL, FOXWORTH AND PUGH, INC.

REYNOLDS, SMITH AND HILLS

IN ASSOCIATION

all bus routes enter the downtown area, loop through the congested street network and then return back to the same outlying areas in which they originated. This situation creates excessive operating mileage and costs, increases passenger travel times and inconvenience, and contributes to downtown area congestion and pollution. Future improvements should address this fundamental problem of transit operations.

A study of the existing bus operation(2) was published in 1970, and the Jacksonville Transportation Authority in cooperation with the Florida Department of Transportation has updated the study. The JTA has already implemented some of the proposed improvements. It has also begun implementation of the initial phase of the mini-bus operation in the downtown area proposed in the Jacksonville Downtown People-Mover Study.(3)

Travel Patterns and Characteristics

In 1968 the Florida Department of Transportation conducted a comprehensive home interview survey within the Jacksonville Urban Area. The Jacksonville Urban Area Transportation Study "JUATS" thus provided the basic travel ventory and characteristics used for forecasting future person trips the evaluation of existing service.

While this data base is sufficient for highway planning, an additional survey related directly to the potential use of a vastly expanded mass transit system was considered essential. The survey was designed to quantify latent transit demands and reveal the attitude of Jacksonville residents toward expanding and financing public transportation improvements. The original JUATS data was also updated and adjusted from results of the Transit Attitude Survey to reveal the area-wide patterns, characteristics and potential transit demands for both fixed-guideway rapid transit and surface bus systems.

Jacksonville Urban Area Transportation Study Survey Summaries - JUATS origin and destination data summaries show that 1,388,858 person trips were made on the average weekday in 1968 (See Table 3). Of these, transit travel (excluding school bus trips) accounted for only 3.3% or 45,557 trips. Almost 90% of all person trips or 1,242,213 were made by automobile. Transit travel in 1968 was somewhat higher for persons traveling to and from work, however, this still accounted for only 4.5% of the total work person trips.

The trip purpose distribution for transit trips in 1968 is shown in Table 4. It is significant that approximately 92% of all transit trips were home-based while 82% were made to or from work (45%) or school (37%). Many of these trips are concentrated in peak travel periods requiring much higher service levels and equipment demands.

Mass transit can most effectively serve the Downtown Area and as this center of regional activity continues to expand, an increasing portion of transportation demands will concentrate there. In 1968 over 80,000 total person trips either began or ended in the Downtown Area. It can be seen in Figure IV-4 that in 1968 over 25% (20,500) of all people traveling to and from the Downtown Area come from the southwest (corridor 4). Northwest corridors 5 and 6 account for nearly 30% (23,800). Trips from the east and southeast (corridor

[2] Present and Future Needs, Jacksonville Duval Area, Jacksonville Area Planning Board, Alan M. Voorhees & Associates, Inc., September, 1970.

[3] Jacksonville Downtown People-Mover Study, Florida Department of Transportation, Daniel, Mann, Johnson & Mendenhall and Rliff-Fellman & Associates, March, 1973.

Fig. IV-4

JACKSONVILLE URBAN AREA MASS TRANSPORTATION STUDY

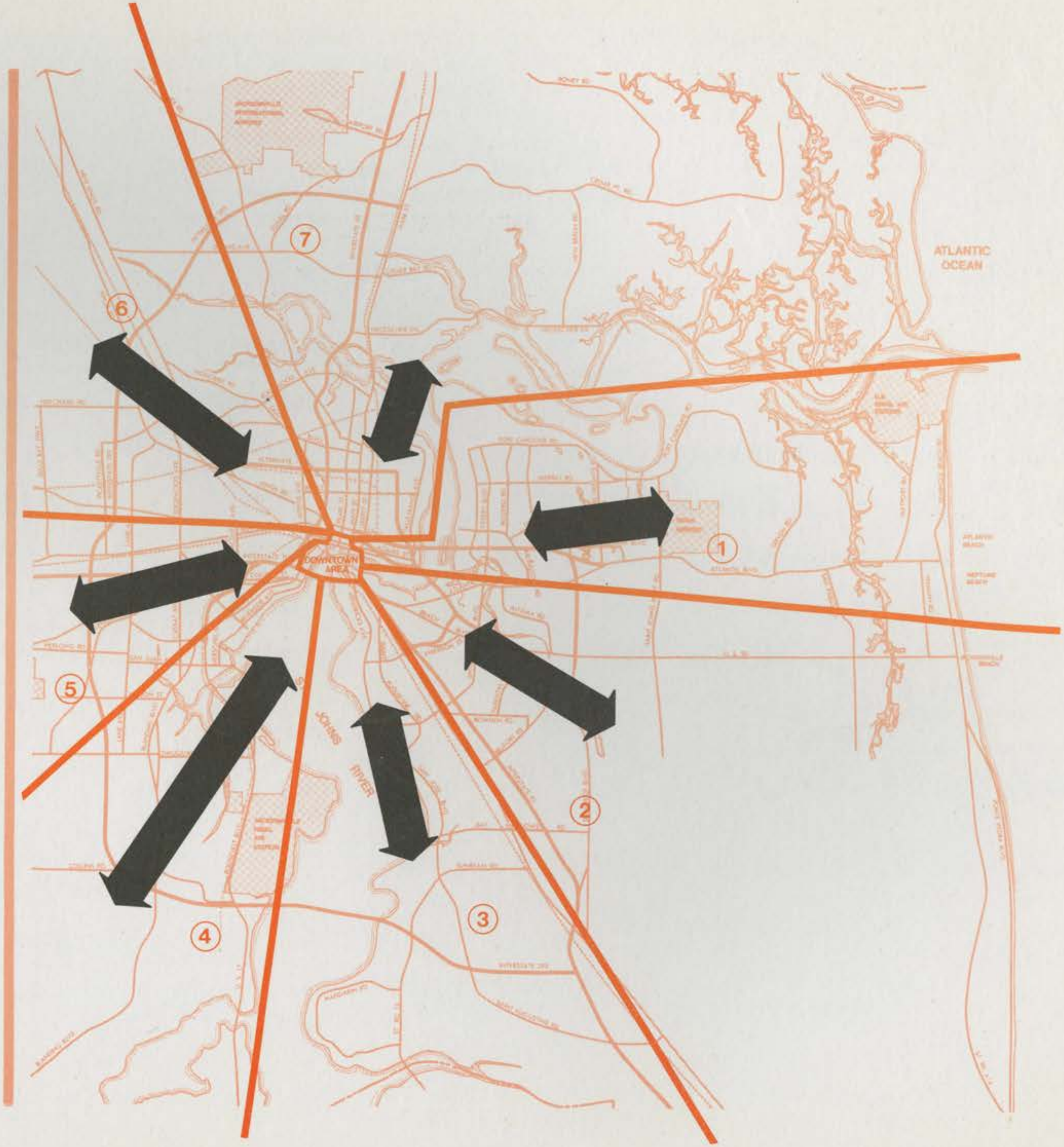
FOR: THE CONSOLIDATED CITY OF JACKSONVILLE
BY: JACKSONVILLE AREA PLANNING BOARD

TITLE: **PERSON TRIPS TO AND FROM DOWNTOWN AREA: JUATS 1968**

LEGEND:

(2) TRAVEL CORRIDOR AREA

0 1 2 3 4
1 = 3,000 PERSON TRIPS



SCALE IN MILES:
0 1 2 3 4

CONSULTANTS:
CAMPBELL, FOXWORTH AND PUGH, INC.
REYNOLDS, SMITH AND HILLS
IN ASSOCIATION

Table 3

AVERAGE WEEKDAY PERSON TRIPS

JUATS 1968

TRIP MAKER	TOTAL TRIPS	%
Auto Driver	855,949	61.6
Auto Passenger	386,264	27.8
Public Bus Passenger	45,557	3.3
School Bus Passenger	82,770	6.0
Taxi Passenger	12,025	0.9
Truck Passenger	6,293	0.4
TOTAL	1,388,858	100.0

Table 4

PUBLIC TRANSIT TRIPS BY PURPOSE

JUATS 1968

				PURPOSE TO			
PURPOSE FROM	HOME	WORK	SHOPPING	PERSONAL BUSINESS	SCHOOL	OTHER	TOTALS
Home	0	9,584	1,017	1,193	7,293	1,398	20,589
Work	9,138	0	108	204	0	510	9,960
Shopping	1,077	83	70	0	0	29	1,259
Personal Business	1,565	144	27	303	61	27	2,127
School	8,231	233	0	166	85	492	9,207
Other	1,140	368	53	82	273	499	2,415
TOTAL	21,151	10,412	1,275	1,948	7,816	2,955	45,557

area 1, 2 and 3) totalled about 37% (30,000) each weekday. Thus an indication is provided as to the heaviest traveled corridors which should receive initial emphasis in early transit action programs.

Transit Attitude Survey - This interview survey was one of the major work elements of the Jacksonville Urban Area Mass Transportation Study. It was conducted in late 1972. While it was designed to obtain current origin - destination data for updating the 1968 JUATS survey the other primary objectives were:

(1) To determine the citizen's desires for meeting selected transportation goals and objectives.

(2) To determine the probable use of a new mode of transportation.

(3) To reveal the mass transportation funding sources which Jacksonville residents feel are most appropriate.

Survey Design - The questionnaire includes three types of questions - household data, trip data and attitude and responses. Household data included the number of residents in the household, the number of persons 5 years of age or over, the number of automobiles owned or garaged at the household, the age of each household member, and the total annual family income.

Each household member was asked about the details of all trips made on a specified weekday. The trip data included the origin and destination address, travel mode, trip purpose, trip costs and the availability of an automobile for any trips made as a non-driver.

Respondents who had made one or more trips were asked several questions to assist in determining the probability of transit usage for the previous day trips under specific time and cost advantage.

Since the desired information was very extensive two procedures were used: (a) Telephone interview and (b) Mail-back questionnaire. With the exception of family income, the telephone survey obtained data related to household information and personal travel. The mail-back questionnaire provided information related to transportation goals and family income. Interviewers were instructed to obtain mail-back information if the questionnaire had not been returned within 3 days of the initial telephone contact. The interview documents and procedures were carefully designed so that much of the information could be compared and merged with the JUATS data.(4)

After selecting a sample of 1,000 interviews from records of the Jacksonville Electric Authority, interview letters were mailed to each respondent explaining the purpose of the survey and requesting their cooperation. The letter, signed by the Mayor of Jacksonville, displayed and listed advantages of fixed-guideway and exclusive busways and indicated that a telephone interviewer would contact them in one or two days. A mail-back questionnaire was also included which asked the respondents to indicate their choice for improving transportation in the Jacksonville Area and their preferred method of financing. A concerted effort was made to obtain interview information from all persons selected for interview. This effort which included a telephone interview resulted in nearly a 90 percent completion of the interviews.

Summaries of the responses for the questions related to transportation goals and objectives are shown in Figure IV-5. When compared to the fact that at the time of the interview that only about 4 percent of travel was be transit this analysis reveals that there

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[4] Technical Memorandum Number One: Data Collection Jacksonville Urban Area Mass Transportation Study, Jacksonville Area Planning Board, Campbell, Foxworth & Pugh/Reynolds, Smith and Hills, May, 1973.

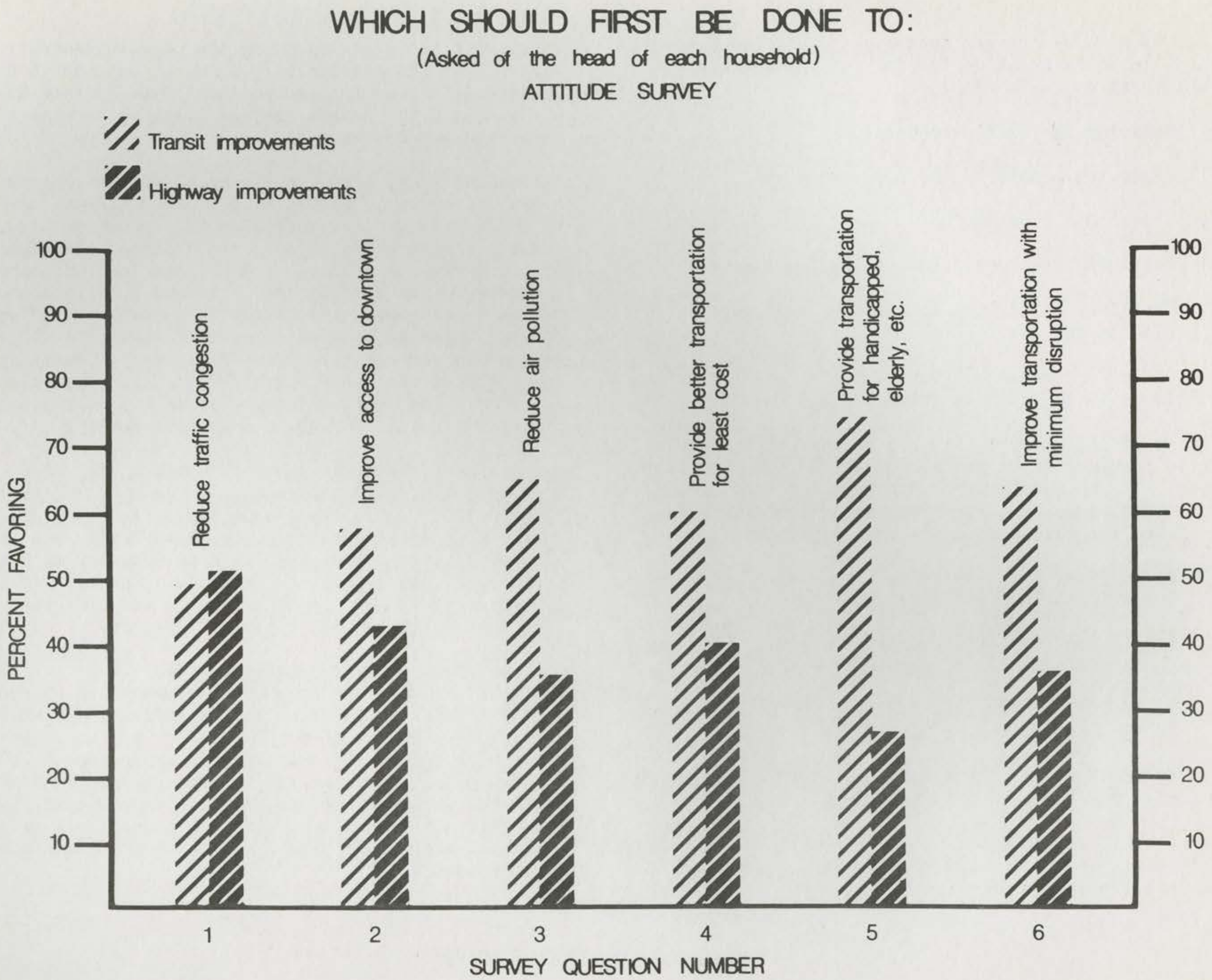

WHICH SHOULD FIRST BE DONE TO:
(Asked of the head of each household)
ATTITUDE SURVEY
Transit improvements
Highway improvements
PERCENT FAVORING
100
90
80
70
60
50
40
30
20
10
Reduce traffic congestion
Improve access to downtown
Reduce air pollution
Provide better transportation for least cost
Provide transportation for handicapped, elderly, etc.
Improve transportation with minimum disruption
1
2
3
4
5
6
SURVEY QUESTION NUMBER

Fig. IV-5

seems to be a widespread sentiment toward improvements in public transportation for solving the six basic transportation goals of:

(1) Reducing in traffic congestion.

(2) Improving access to the Downtown Area.

(3) Reducing air pollution.

(4) Improving transportation at the least cost.

(5) Providing better service to the handicapped, elderly and low income.

(6) Improving transportation with minimum disruption to established communities.

When it was determined that the respondent favored public transportation further questions were asked to reveal his choice of the means of public transportation. Thus, each respondent favoring public transportation was asked the following additional questions:

(1) Do you feel that improving bus service on surface streets should have first priority?

(2) Do you feel that the exclusive busways, explained in our recent letter, should have first priority?

(3) Do you feel that a rail transit system, explained in our letter, should have first priority?

(4) Do you feel that other means of public transportation should have first priority?

The results, as shown in Figure IV-6 reveals that the representative sample of Jacksonville residents prefer rail rapid transit over busways and surface bus improvements as a means of improving the public transportation system. On the average only about 34 percent of the respondents favored the conventional type surface bus, while 53 and 13 percent favored rail rapid transit and exclusive busways systems.

Respondents were also questioned as to their support for a tax increase to improve mass transportation. As shown in Table 5 56 percent indicated that they would support a tax increase while 44 percent indicated they would not. Of those responding positively 38 percent indicated an increase in gas tax was the preferred funding method. Of those responding negatively 24 percent preferred new federal funds to finance transit improvements while another 24 percent favored a bond issue. Generally, low income groups were not as willing to support an additional tax while the majority of middle and higher groups indicated they would support a transit tax.

Trip Rates - The trips recorded in both the JUATS study and the transit attitude survey reflect relationships between land use, socio-economic data and trip production. Trip length and choice of travel mode are generally dependent upon primary trip purpose and service levels provided by each travel mode. However, these characteristics vary by trip purpose for different levels of car ownership and family income.

The variation in trip generation rates is primarily a result of household income and car ownership characteristics. This was verified in the 1972 Transit Attitude Survey, the results of which compare favorably with the data collected in the 1968 JUATS Study as shown in Table 6. The overall trip production rate by car ownership group has changed very little since the 1968 study and therefore the trip productions and attractions rates developed from JUATS date by car ownership were considered adequate.

PREFERRED METHODS FOR IMPROVING PUBLIC TRANSIT:

ATTITUDE SURVEY

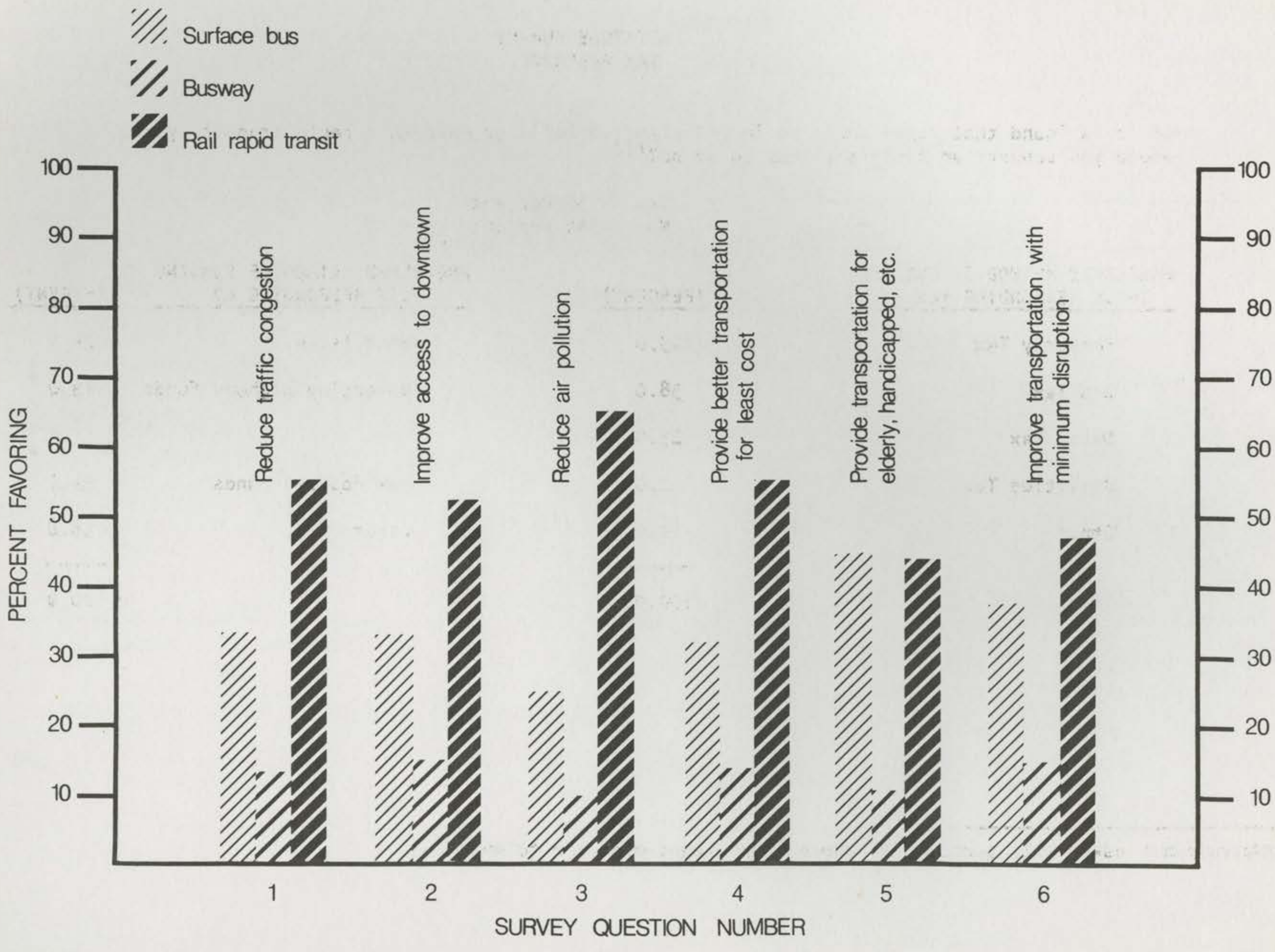


Fig. IV– 6

Table 5

ATTITUDE SURVEY
TAX RESPONSE

If it is found that funds would be insufficient to build or operate a rapid transit system would you support an additional tax to do so?[1]

Yes 56 Percent
No 44 Percent

PREFERRED METHOD OF FUNDING THOSE RESPONDING YES	(PERCENT)	PREFERRED METHOD OF FUNDING THOSE RESPONDING NO	(PERCENT)
Property Tax	23.0	Bond Issue	24.1
Gas Tax	38.0	Diverting Highway Funds	13.0
Sales Tax	23.0		
Utilities Tax	2.0	New Federal Funds	24.1
Other	14.0	Other	38.8
TOTAL	100.0		100.0

[1] Interviewers asked this question of those interviewed over the telephone.

Table 6

TRANSIT ATTITUDE SURVEY COMPARISON

	NUMBER OF CARS OWNED					
	0		1		2+	
	J.U.A.T.S.[1]	SURVEY	J.U.A.T.S.[1]	SURVEY	J.U.A.T.S.[1]	SURVEY
PERSON TRIPS	83,600	233	646,768	2,394	590,364	5,099
DWELLING UNITS	31,995	80	88,203	352	51,814	450
TRIPS PER DWELLING UNIT	2.61	2.91	7.33	6.80	11.40	11.33
PERCENT TRANSIT	22.43	23.08	2.68	2.68	1.32	.68

[1] After Expanding 5% Sample.

Attitudes Toward Patronage - To provide an indication of rapid transit usage, several questions regarding each trip maker's attitude toward transit use were included. A summary of responses is given in Table 7. Many previous studies have shown that the use of a public transportation system can generally be predicted on the basic levels of service provided in terms of cost and time savings and the frequency at which service is provided. The mail-back questionnaire was designed to determine the most important factors in the selection of public transportation in the Jacksonville Area. Time savings and convenience were reported to be the most important. Nearly 37 percent and 44 percent of respondents indicated that these two were the most important factors, respectively, in using transit. This response has also been reported in previous surveys and led to the development of other more specific questions regarding each trip which provided the basis for development of modal split models with time, cost and convenience (walking distance and waiting time) as major criteria for estimating future transit patronage.

The telephone interview survey was designed to assist in determining the most probable usage of a vastly improved public transportation system under a wide range of time and cost assumptions. After obtaining origin, destination, trip purpose, mode of travel, and time of day, specific respondents were asked whether they would have used a rail rapid transit system for the specific trips made under yesterday's conditions, if they could be assured specific travel times and travel costs. Table 8 indicates the potential rapid transit usage summarized by travel time differences while Table 9 provides the same summary by cost differences. This data was used as a guide only in the development of the modal split models.

While the responses as shown in Tables 8 and 9 appear high, it is clear that travel time is a major consideration in choice of travel mode. Furthermore, it is clear that transit usage will increase as time savings on the transit system increases and that the lower car ownership categories will have the higher usage. For example, about 38 percent of those persons with one automobile available indicated they would use the transit system for their work trip if the trip would take them 10 minutes less than if they drove their car. However, this percentage would drop in half if the transit trip would require 20 minutes more. In terms of cost savings, of those persons who owned two cars nearly 34 percent said they would use rapid transit for their work trip if it would cost 25 cents less. However, if it cost 25 cents more, only about 8 percent would use rapid transit.

It should be remembered that this transit attitude survey was conducted in late 1972. If another survey were undertaken now it is speculated that there would be a significantly greater favorable response for improved mass transit and more emphasis on cost savings benefits.

Transportation Models and Travel Projections

The interaction of private and public modes of travel in urban areas can be simulated by mathematical models which relate the level of service provided by comparative transportation systems and the social and economic characteristics of the community to trip making by the urban area residents. With these models future travel patterns can be reliably determined from estimates of demographic characteristics.

This section describes the formulation and development of models used in estimating and analyzing public transportation patronage in the Jacksonville area and the application of these models to anticipated future land uses. A more detailed description of the technical aspects of the methodology and application of simulation techniques is presented in a supplemental report.[5]

[5] Technical Memorandum Number Two: Traffic Models and Modal Split Development, Campbell, Foxworth & Pugh, Incorporated, updated September, 1974.

Table 7

MOST IMPORTANT FACTOR IN USING TRANSIT

Family Income	TIME	COST	COMFORT	CONV.	TOTAL
	Percentage Indicating Most Important				
Under $2,999 Percent	20.0	34.3	0.0	45.7	100.0
$3,000 - $5,999 Percent	20.8	25.0	0.0	54.2	100.0
$6,000 - $9,999 Percent	41.9	16.9	2.5	38.7	100.0
$10,000 - $14,999 Percent	43.9	12.8	2.1	41.2	100.0
$15,000 - $24,999 Percent	48.7	.9	6.1	44.3	100.0
$25,000 or More Percent	45.8	0.0	12.5	41.7	100.0
TOTAL	36.9	16.9	2.4	43.8	100.0

Table 8

POTENTIAL RAPID TRANSIT USAGE BY TIME SAVINGS

Percent of Total Person Trips Which Would be Diverted to Rapid Transit
1972 - Attitude Survey Responses

	Car Ownership											
	0				1				2+			
TRIP PURPOSE	More Time Via Transit 20min.	More Time Via Transit 10min.	Same Time	Less Time (10min.)	More Time Via Transit 20min.	More Time Via Transit 10min.	Same Time	Less Time (10min.)	More Time Via Transit 20min.	More Time Via Transit 10min.	Same Time	Less Time (10min.)
WORK	16.0	50.0	57.1	62.7	20.2	28.7	38.0	38.2	14.4	24.5	32.0	35.2
SCHOOL	32.6	53.5	67.0	67.0	13.0	27.2	49.1	41.7	9.6	21.1	30.5	40.9
OTHER	19.1	45.0	67.0	67.0	13.7	23.0	27.1	28.7	7.5	16.7	21.2	22.4

Table 9

POTENTIAL RAPID TRANSIT USAGE BY COST SAVINGS

Percent of Total Person Trips Which Would be Diverted to Rapid Transit
1972 - Attitude Survey Responses

	Car Ownership											
	0				1				2			
TRIP PURPOSE	More Cost on Transit (25¢)	Same Cost	Less Cost 25¢	Less Cost 50¢	More Cost on Transit (25¢)	Same Cost	Less Cost 25¢	Less Cost 50¢	More Cost on Transit (25¢)	Same Cost	Less Cost 25¢	Less Cost 50¢
WORK	21.0	32.7	58.1	62.6	9.7	19.8	41.0	48.6	7.8	17.6	33.7	47.3
SCHOOL	15.4	26.9	69.2	75.0	6.3	18.9	40.7	45.7	4.3	10.0	31.8	46.4
OTHER	23.7	34.5	53.7	60.9	9.4	16.8	30.5	40.3	5.1	10.9	22.9	32.6

Selection of Models - Models that are used to synthesize traffic demands in urban areas are generally developed to a degree of detail required for the transportation problem under consideration. The emphasis in model development for this study was directed toward the modal split process that is essential to reflect improvements in the transit system. The series of trip distribution, trip end and modal split models used in the study were mutually exclusive in their development but interdependent in their application.

The selection of the series of models was based primarily upon availability of data which could be empirically derived and reliably forecast. Thus the models were designed to account for transit improvements which would result in time and cost savings, ease of access to the transit system and user attitudes toward the physical characteristics of the system. Factors such as comfort, safety, reliability and other subjective measures could not be reduced to explicit expressions, however, they were accounted for implicitly in the empirical relationships established. The models necessary to project future travel fall into the following basic categories:

Car Ownership - Estimates the number of dwelling units with no car, one car or more than one car in each JUATS traffic analysis zone.

Person Trip Production - Estimates the number of trips per dwelling unit by trip purpose and car availability category.

Trip Attractions - Determines the number of trip ends at the non-home end of trips by purpose i.e., the number of work trips at employment centers, the number of school trips to educational facilities, the number of shopping trips in retail commercial activities, etc.

Trip Distribution - Distributes trips between productions and attractions, based on the relative travel times between traffic zones.

Modal Split - Estimates the number of transit and highway trips according to the competitive characteristics of the two systems reflected in time and cost advantages.

Since millions of decisions are performed in the total projection and modal split process high speed electronic computers are essential. Model split programs developed by the consultant and the UMTA transit planning packages were utilized throughout the model development and projection process.

Model Development - The analyses described in this report were developed from the household survey conducted by the Florida Department of Transportation for the JUATS Study in 1968. These data were supplemented by a small sample transit attitude survey conducted within Jacksonville. In addition, data on travel times and travel costs, population, income, car ownership, employment and school attendance were collected from several sources and utilized as input to the models.

Car Ownership Model - Because households are the basic unit in transportation studies and the basic measurement in census surveys they represent an ideal unit for traffic estimation. The "car ownership model" is designed to estimate the number of dwelling units in each traffic zone expected to own a given number of cars.

The car ownership model expresses the probability of a household in the traffic zone owning no cars, one car, or more than one car, in terms of income and the dwelling unit locations within the study area (transit accessibility). Figure IV-7 depicts the three sets of models in their final form.

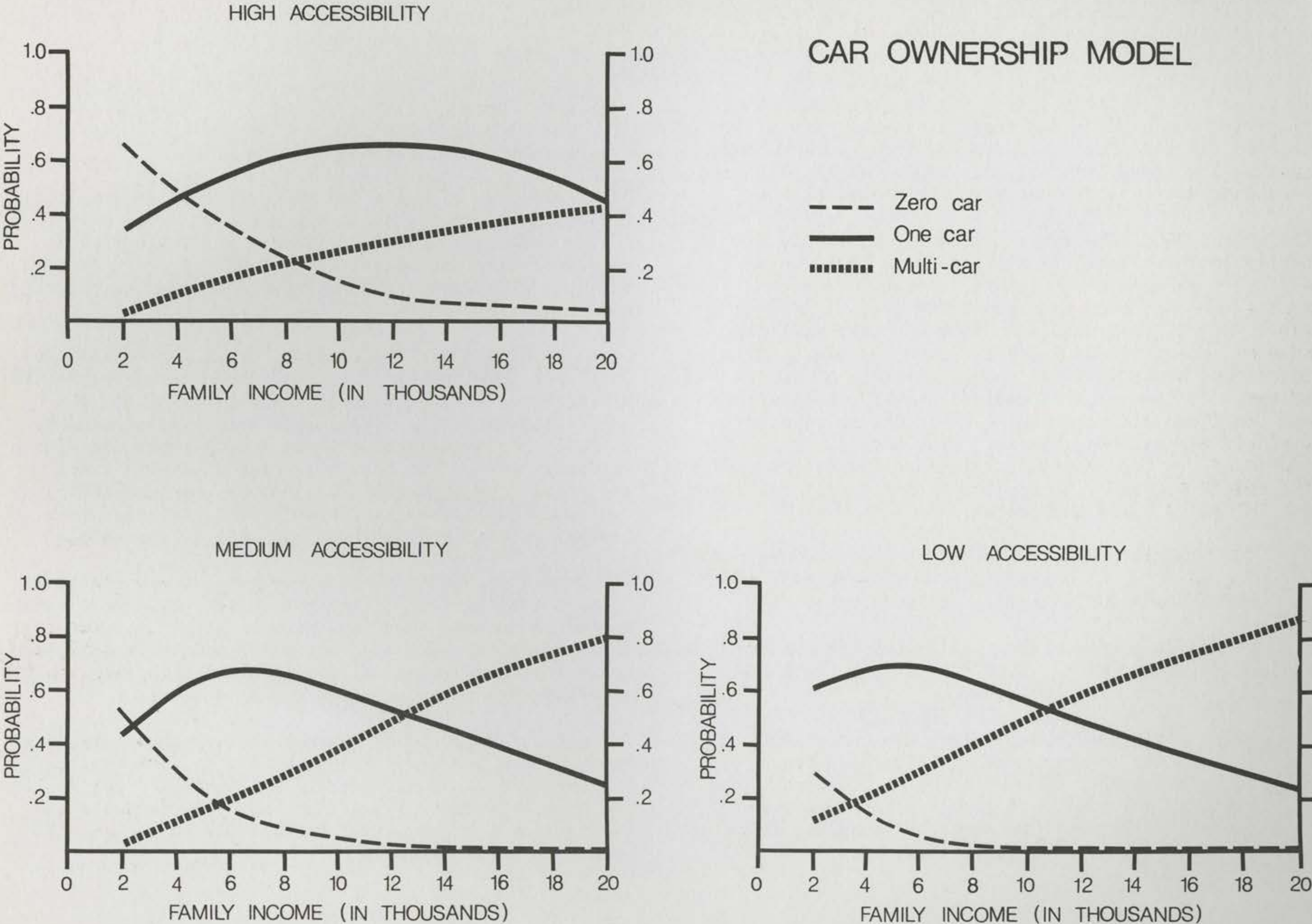

CAR OWNERSHIP MODEL
Zero car
One car
Multi-car
HIGH ACCESSIBILITY
MEDIUM ACCESSIBILITY
LOW ACCESSIBILITY
PROBABILITY
1.0
.8
.6
.4
.2
0
2
4
6
8
10
12
14
16
18
20
FAMILY INCOME (IN THOUSANDS)

Fig. IV-7

Accessibility indexes are indicative of household proximity to transit service. A high accessibility area includes households with relatively good transit service and in which the probability of owning more than one car is comparatively lower. In a low accessibility area, which encompasses suburban and rural areas, more cars are necessary for desired mobility since transit service is increasingly diminished.

Trip Production - To facilitate the simulation of decisions made in travel, it is helpful to classify trips according to their general trip purpose. Five basic purposes were considered: home-based work, home-based shopping, home-based school, home-based other and non-home-based. Although a more detailed breakdown is possible, the analysis was limited to these purposes because of the lack of sufficient data particularly for transit trips.

The number of cars owned has been shown to be the prime factor in the choice of mode as well as the ability and desire to make a trip. Figure IV-8 illustrates the wide variation of trip production by car ownership groupings and thus the necessity of the car ownership variable as the primary stratifier in estimates of mass transportation usage. It is evident that households owning no cars make fewer trips than those having an automobile. Furthermore, when more than one car is present the rate of trip making is significantly higher than with only one car in the household. The portion of transit riding is logically higher for 0 car families than one car families, and for one car families is much higher than 2 car families.

In addition to the variation of trip production by purpose and car ownership levels, the effect of income has been shown to influence the number of daily household trips. Generally, as income increases, trips increase, but at a decreasing rate. The relationship is shown in Figure IV-9 which represents the final set of trip production rate models developed for the study.

The home-ends of trips are directly related to income and car ownership but the non-home end has no such relationship. Rather it is very closely related to social and economic factors such as employment and school attendance. Thus, it is necessary to work with aggregated traffic zone data rather than with individual activities or groups of similar activities. Multiple linear regression analysis was used to develop an equation for each trip purpose using the independent variables of retail employment, total employment, other employment, cars and school attendance. A special rate was developed to predict shopping attractions, as these trips were found to be closely related to the shopping facility and the number of retail employees located at the site. Final equations used to estimate trip attractions are shown in Table 10. A detailed explanation of the trip attraction model development is given in a supplemental report.

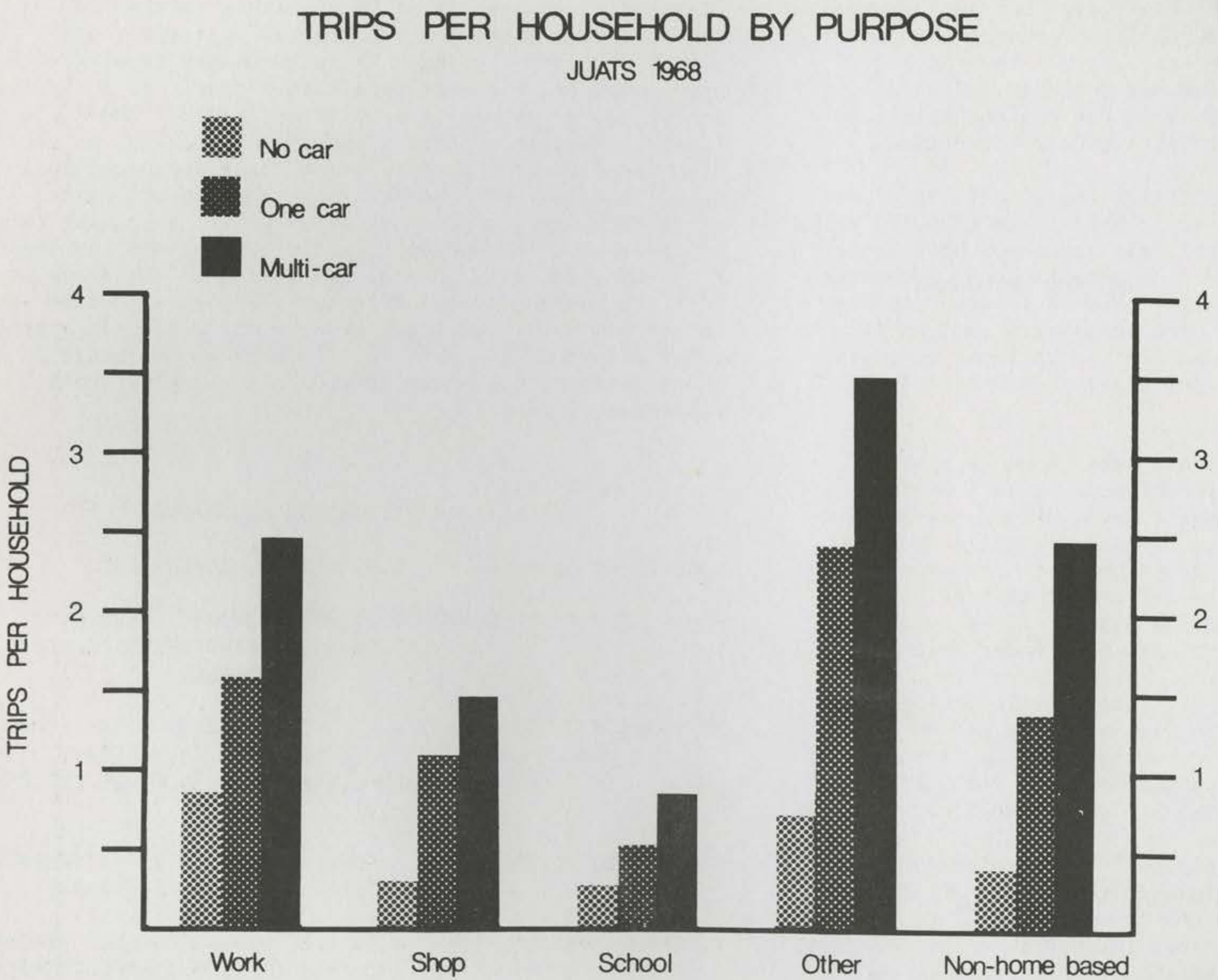
Table 10

PERSON TRIP ATTRACTION EQUATIONS

HOME-BASED WORK	=	1.53 x TOTAL EMPLOYMENT
HOME-BASED SHOPPING	=	2.33 x CBD RETAIL EMPLOYMENT 13.90 x SHOPPING CENTER REAIL EMPLOYMENT
HOME-BASED OTHER	=	0.92 x CARS + 0.30 TOTAL SCHOOL ATTENDANCE + 1.69 x RETAIL EMPLOYMENT + 0.33 OTHER EMPLOYMENT
HOME-BASED SCHOOL[1]	=	0.42 x (GRADES 7-12) ATTENDANCE + 1.46 x COLLEGE ATTENDANCE
NONE-HOME-BASED[2]	=	0.46 CARS + 0.44 COLLEGE ATTENDANCE + 2.65 RETAIL EMPLOYMENT + 0.09 OTHER EMPLOYMENT

[1]DOES NOT INCLUDE SCHOOL BUS TRIPS.

[2]USED TO PROJECT PRODUCTIONS AND ATTRACTIONS BY ZONE.



TRIPS PER HOUSEHOLD BY PURPOSE
JUATS 1968
No car
One car
Multi-car
TRIPS PER HOUSEHOLD
4
3
2
1
Work
Shop
School
Other
Non-home based

Fig. IV-8

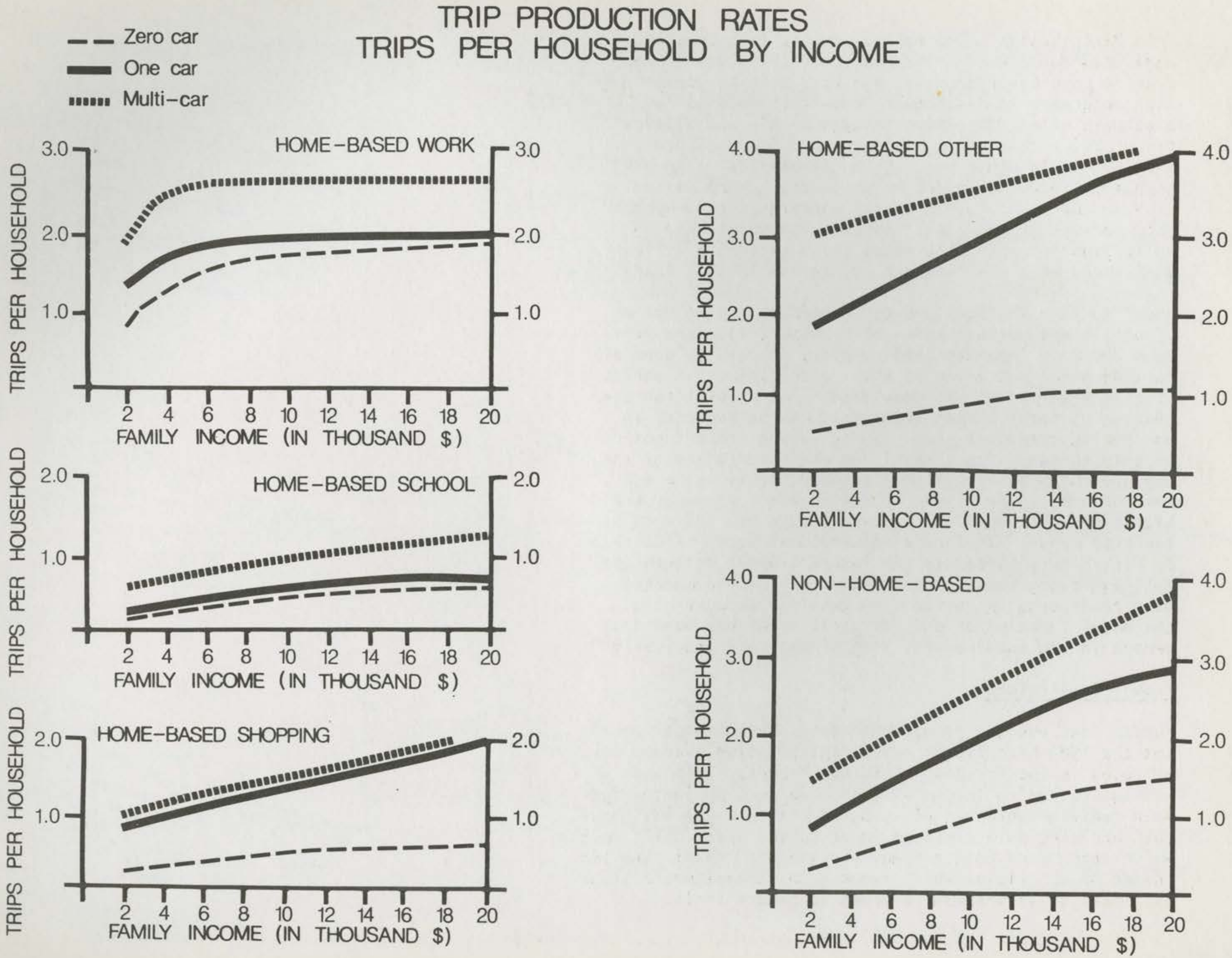

TRIP PRODUCTION RATES
TRIPS PER HOUSEHOLD BY INCOME
Zero car
One car
Multi-car
HOME-BASED WORK
HOME-BASED SCHOOL
HOME-BASED SHOPPING
HOME-BASED OTHER
NON-HOME-BASED
TRIPS PER HOUSEHOLD
FAMILY INCOME (IN THOUSAND $)
2 4 6 8 10 12 14 16 18 20
1.0
2.0
3.0
4.0

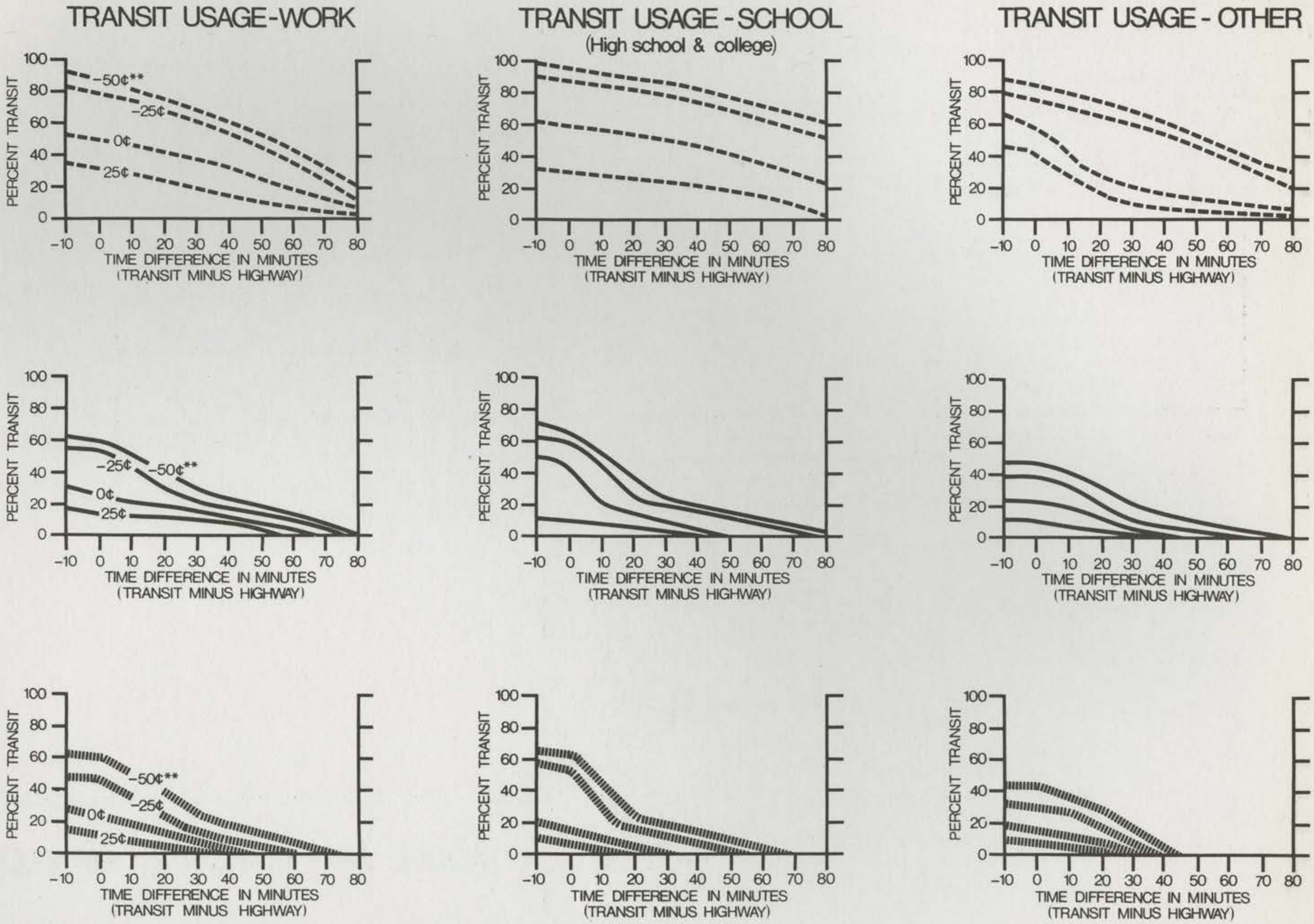
Fig. IV-9

Trip Distribution - The models previously discussed were used to determine the number of trip ends in each traffic zone by productions and attractions. It is also necessary to distribute these trip ends to form a pattern of one way trips between origin and distination. Trips originating in each zone are assigned a destination in other zones by a mathematical trip distribution (gravity) model which is calibrated to reproduce current or basic travel patterns within acceptable degrees of accuracy. Since these models had been calibrated for the JUATS study the identical distribution rates were used without adjustment in this study.

Modal Split - The models used to predict the selection of public and private modes of transportation are perhaps the most important and complex, therefore, special consideration was given to their development. A series of diversion curves was developed which predict the percentage of total person trips that can be expected to use public transportation. These curves are a function of trip purpose, the competitive characteristics of the highway and transit system (including travel time and cost on each system), the origin of the trip maker and his destination, and the number of cars available to the trip maker. This multi-dimensional model illustrated in Figure IV-10 predicts the future transit pattern and influences the location and design of the recommended mass transportation system. A detailed discussion of the model formulation and its calibration has been documented in the supplemental report mentioned previously.

Travel Projections

Future land use and demographic data, mathematical models and the 1990 highway and mass transportation systems were all used in the forecast of future travel. Trip ends without regard to transportation mode were projected for each traffic zone then distributed with the gravity model. The resulting data provided input to the modal split models which determined both highway and transit travel. The sequence of activities which compose the travel projections and modal split process is shown in Figure IV-11.



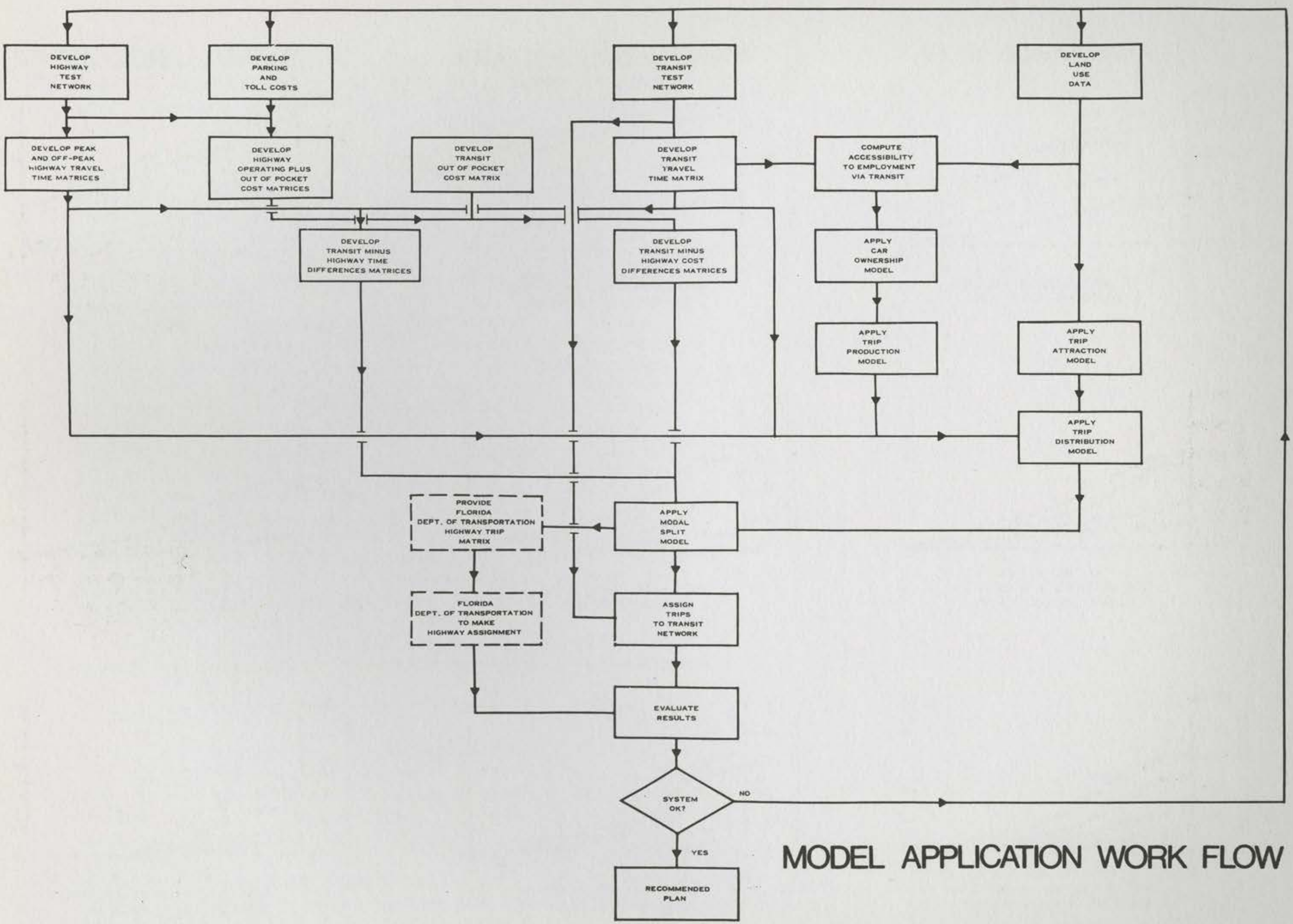
Zero car*
One car*
Multi-car*

*Derived from attitude survey data

**Transit minus highway cost difference

MODAL SPLIT MODEL

Fig. IV-10



MODEL APPLICATION WORK FLOW

Fig. IV-11

Chapter V · Transit System Technology

A major work element of the study involved a mass transit mode analysis. This included an inventory to collect current data and information on existing and proposed transit technologies. All related reports and information from the Consultants' Transit Library were gathered. Previous reports included those prepared by members of the consultant firms as well as studies by other consultants and public agencies. A listing of the primary sources are given in a previously published document.[1]

To further compliment and update the existing literature, questionnaires were sent to many transit manufacturers involved in the production of mass transit equipment in the U. S. and abroad. Each company was asked to provide specific information on vehicles, guideways, control systems and a list of performance and service criteria.

A systematic technique of comparing the characteristics of different transit systems was developed in order to analyze the data more effectively. Initially, all equipment was placed into one of three general categories primarily based upon the peak hour capacities attainable by each system. High volume transit systems were established to be those with a peak hour directional capacity of over 20,000 persons. This major category was further subdivided according to the type of suspension system, i.e., steel wheel-steel rail, rubber tired, and magnetic support vehicles. Medium volume mass transit included all systems having a peak hour directional capacity of between 6,000 and 20,000 passengers. Steel wheel-steel rail, rubber tire, monorail, exclusive busways, and magnetic support technologies are included in the medium volume category. Any equipment with peak capacity below 6,000 passengers per hour was included in the low volume group such as: limited tramlines, limited busways, rubber tire, and air cushion systems.

Mode Evaluation Criteria

Each type of equipment was evaluated on the basis of different operational qualities, and the criteria used for evaluating various transit modes for use in testing alternative transit systems were composed of performance standards, system characteristics, vehicle characteristics and costs.

Performance Standards - Maximum Speed - The maximum speed for the fixed-guideway vehicle should be 65 m.p.h. and 60 m.p.h. for express buses.

Acceleration - The acceleration rate should be between 2.5 to 3.0 miles per hour per second. This range met the service levels estimated for testing alternatives.

Deceleration - The deceleration rate should be between 2.5 and 3.0 miles per hour per second.

Maximum Grade - The vehicle should be able to achieve a maximum grade of 6% without significant loss of speed.

System Characteristics - Flexibility - The system must be flexible in terms of its off-peak hour operations. Since the patronage of the system will be less during the off-peak hours the system should be able to accommodate fewer passengers at lower costs - i.e., requiring fewer vehicles and energy for effective operation.

Degree of Automation - The system must have a high degree operational automation.

Switching - The system must be capable of fast, safe and efficient switching to accommodate directional change in routing.

[1] Technical Memorandum Number One: Data Collection Jacksonville Urban Area Mass Transportation Study, Jacksonville Area Planning Board, Campbell, Foxworth & Pugh/Reynolds, Smith and Hills, May, 1973.

Safety - The system should be fail-safe. Even though the transit equipment is safe it must be so designed to eliminate passenger apprehension.

Right-of-Way - The right-of-way requirements should be within the range of 18 - 30 ft. for a two directional system. The amount of right-of-way required for the system will have a direct affect on how the system will "fit" into the environment and the visual acceptance of that "fit". See Figure V-1 for comparison of mode right-of-way requirements.

Propulsion - The system must provide a low energy consumption level consistant with its capacity and ability to divert passengers from other modes.

Vehicle Characteristics - Vehicle Dimensions - The transit vehicle should be as small as possible, however, large enough to effectively accommodate passenger demands.

Vehicle Seating - The vehicle should accommodate a range of seating capacity of 30 - 60 persons and a load factor of 1.3 to accommodate standing passengers. There should be comfortable seating which will accommodate various user groups such as the handicapped. The vehicle size is a function of system capacity; hence, smaller vehicles could be used in trains as long as the projected transit demand can be adequately accommodated.

Riding Quality - The riding quality of the vehicle should be physically as well as psychologically comfortable to the passenger. The acceleration and deceleration rates of the vehicle and changes in the alignment should not cause undue strain on the passenger.

Loading Convenience - Passengers should be able to get on and off the vehicle with ease. Vehicles which require step-up loading such as buses and certain tram lines lessen the rate of passenger flow which will increase headways and dwell times. Also loading and unloading should be convenient for the handicapped and their special problems.

Noise Pollution - The system should not produce excessive noise or vibration levels in adjacent areas.

Air Pollution - The system should omit a minimal amount of air pollution at the vehicle, in terms of fumes, odors and dust.

Costs - Operation Costs - The system should be capable of being operated with a minimum cost on a passenger mile basis.

Capital Costs - The system should be capable of being constructed within the future financial capabilities of the City, State and Federal Governments.

Figure V-2 shows the matrix displaying interrelationships between the criteria and the various modes analyzed.

Mode Inventory

The following is a general discussion of the various modes inventoried and grouped into the three major classifications: high, medium and low volume capacity.

High Volume Mass Transit - The designation "high volume" refers to transit systems built expressly for large metropolitan areas where ridership demands warrant high capacity networks. High population and employment densities, land values, and heavy highway traffic congestion make a high capacity transit system an essential transportation ingredient in very large urban areas. Due to the high patronage demands heavy-duty transit equipment is required in order to accommodate the service requirements. The great weight imposed upon the equipment and guideways requires formidable propulsion, suspension and structural standards.

Steel Wheel-Steel Rail - The steel wheel-steel rail system is the first evaluated in the Mode Analysis Summary (Figure V-2). At present, this type of transit is the most widely used and accepted form of rapid transit. Developments of this mode was begun in 1863 with the London Subway powered by steam locomotives.

Electrically powered vehicles have been in use since 1898 and a wide range of equipment is now available. Systems such as PATH in New York, TTC in Toronto, and more recently the BART system in San Francisco are typical of conventional rail rapid transit systems.

Generally the steel wheel rail vehicle performs well in comparison with many other modes of transit. High maximum speeds are frequently attainable with powerful electric motors and good adhesion characteristics of the suspension. Commonly this equipment operates with an acceleration and deceleration rate of 3.0 MPH/SEC. This, along with a high maximum speed, is considered essential to maintain a reasonable speed with close station spacing.

Although many of these systems presently require onboard operators, there is a wide variety of equipment to choose from which requires only supervisory personnel in a central control facility. These automated features reduce the possibility of human error, increase safety, and generally reduce operating costs. Additionally, many of the automatic controls contain fail-safe circuitry which further enhances the safety aspect.

Another attractive feature of rail rapid transit in comparison to a freeway or expressway is the narrow right-of-way for two-way operations. A typical two directional guideway requires only 27 feet of right-of-way, which is a major factor in holding environmental disruptions to a minimum.

One of the most appealing aspects of the steel wheel system is the vehicle itself. More recent models such as the BART vehicle in San Francisco or the new Toronto Transit Vehicles provide an attractive, comfortable, aesthetically pleasing interior and with the newer welded tracks exhibit a good riding quality. Platform loading makes boarding by pedestrians as well as the elderly, handicapped and disabled as convenient as possible.

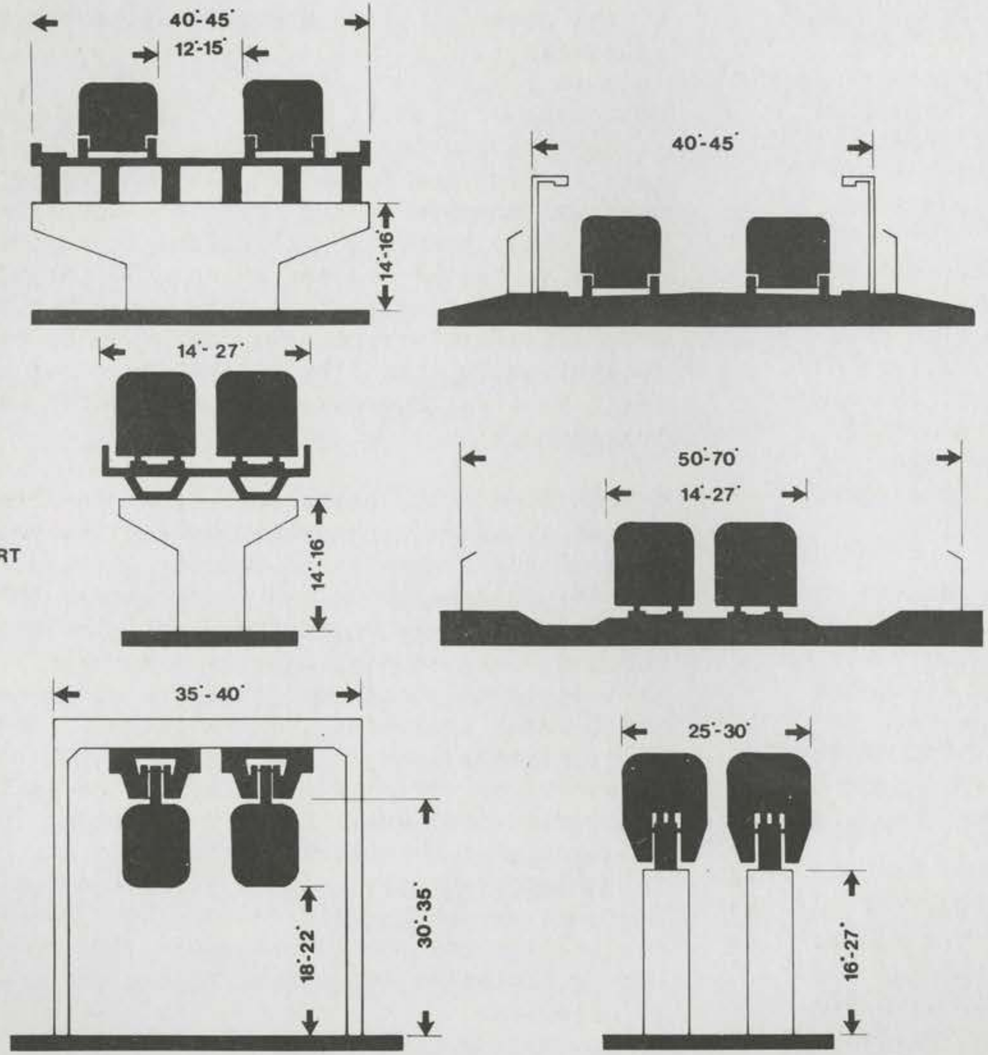
This type of transit system is among the most expensive to acquire and operate because of the necessity of heavy construction and large vehicles that must be used to meet the demands placed upon it. Operating costs tend to be high; however, with automated controls these costs can be decreased to some extent. If population, employment densities, travel demands and other factors warrant a system of this type, the costs can be offset by the exceptionally long life of the equipment as well as the total benefits accrued when compared to other forms of transportation.

Rubber Tire - The better adhesion characteristics of rubber tires on a concrete surface led to the development of the rubber-tired transit vehicle. Although similar in appearance and operation to the steel wheel vehicle, many claim a better ride quality as well as reduced noise levels. Paris, France has installed this equipment on three lines replacing conventional steel wheel equipment that has been in operation since 1914. Montreal and Mexico City are also utilizing rubber-tired vehicles. Since most noise from conventional steel wheel transit equipment comes from movement through switches, the advantage of the quieter rubber tire equipment is diminished while traveling over the switches. In addition, the result of the combination concrete-steel rails is a complex track configuration which is both expensive to construct and to maintain.

Generally, the performance of this equipment approximates that of steel-wheel equipment. Speeds are somewhat lower, but better acceleration and deceleration allow closer headways and a higher average speed. One

BUSWAY

DUORAIL
STEEL ON STEEL
RUBBER TIRE
TRAMLINE
MAGNETIC SUPPORT



TYPICAL GUIDEWAY CROSS SECTIONS

Fig. V-1

major drawback is that the adhesion characteristics of rubber tire equipment are largely dependent upon weather conditions. Rain, snow, and mud tend to have a considerable affect upon these characteristics.

High capital costs for this system are the result of the more complex tracks with both flanged steel wheels and rubber tires as well as costs involved in construction of an entire track system with concrete running surfaces and steel rails. In addition, the inability of rubber tires to support the same weight that steel wheels can, requires lighter weight rubber-tired vehicles. Generally, more cars must be purchased to accommodate the same capacity as comparable to steel wheel vehicles.

Magnetic Support - Recently, a great deal of research and development have been done on magnetic support transit equipment. The vehicle is actually suspended magnetically a fraction of an inch above the track surface. Magnetic power is used for suspension, propulsion, and guidance. Speeds of over 100 MPH can be attained because of the absence of friction. Because of the absence of moving parts touching the track, the vehicle offers the lowest noise level and linear induction motors provide emission-free power. The source of power, however, may emit pollutants. Control of the system can be completely automatic with personnel required only at the central control facility.

Experience with this equipment is presently limited to test facilities. Krauss-Maffei, a West German Transit Equipment Manufacturer, is presently testing the "Transrapid", their newest magnetic levitation vehicle in Munich, Germany. Likewise, Rohr Industries has announced plans to build a similar vehicle in Chula Vista, California. Manufacturers feel that implementation in revenue service can be expected in the next several years. Costs for any new system such as this can be expected to be high due to problems encountered when placing new technology into revenue service.

Medium Volume Mass Transit - The term "Medium Volume" refers to systems which have an hourly capacity in one direction of between 6,000 and 20,000 passengers. In cities where passenger demands are insufficient to require high volume transit equipment, many alternatives are avail able which offer high quality transit for lower capital and operating costs.

Steel on Steel - A wide range of steel-wheeled rail rapid transit equip ment has been designed for medium volume situations and is readily available. Systems such as the Skokie Swift Line of the Chicago Transit Authority, the Highland Branch of the Massachusetts Bay Transportation Authority and the Lindenwold Line near Camden, New Jersey are typical of medium volume steel wheel-rail transit systems which are in operation in the United States. This equipment, however, is found in use more frequently in European Cities. Both the Frankfurt-On-The-Main and Dusseldorf systems are medium volume systems which have been developed from the heavier volume steel wheel systems.

Other than capacity characteristics, the basic difference between high and medium volume steel transit lies in the lighter materials and construction techniques. The lower demands result in smaller vehicles and many of these systems are built at or above grade with provisions for both platform and street level loading. Automated controls are available. However, there are few systems in operation at this time.

While operating and capital costs are high when compared to other medium volume systems, the reduced structural costs and flexibility of operation results in a much less expensive system than the conventional high-volume rail lines. During the past year, the City of San Francisco and Boston have developed a joint bidded proposal to have the same light rail rapid transit car built for use in each City. Such joint bid proposals can reduce the capital cost for transit equipment.

MODE ANALYSIS SUMMARY

SYSTEM CLASSIFICATIONS	PERFORMANCE STANDARDS			OPERATIONAL SYSTEM CHARACTERISTICS					
	MAXIMUM SPEED	ACCELERATION	DECELERATION	FLEXIBILITY: OFF-PEAK HOURS	DEGREE AUTOMATION	SWITCHING	SAFETY	R.O.W.	PROPULSION
HIGH VOLUME MASS TRANSIT (CAPACITY OVER 20,000 PASSENGERS PER HOUR PER DIRECTION)									
STEEL ON STEEL	80 MPH [4]	3.0 MPHPS [4]	3.0 MPHPS [3]	GOOD	FULLY	RELIABLE	GOOD	27' [4]	ELECTRIC
RUBBER TIRE	50 MPH [4]	3.2 MPHPS [4]	3.2 MPHPS [4]	GOOD	FULLY	UNTESTED	GOOD	23' 4" [11]	ELECTRIC
MAGNETIC SUPPORT	100 MPH [6]	3.0 MPHPS [6]	3.0 MPHPS [6]	POOR	FULLY	UNTESTED	GOOD	20' [6]	LINEAR INDUCTION MOTOR
MEDIUM VOLUME MASS TRANSIT (CAPACITY 6,000-20,000 PASSENGERS PER HOUR PER DIRECTION)									
STEEL ON STEEL	60 MPH [1]	3.0 MPHPS [3]	3.0 MPHPS [3]	GOOD	PARTIAL	RELIABLE	GOOD		ELECTRIC
RUBBER TIRE	70 MPH [8]	2.0 MPHPS [8]	2.0 MPHPS [8]	GOOD	FULLY	DEVELOP-MENTAL	FAIR	28' 6" [8]	ELECTRIC
MONORAIL	50 MPH [4]	2.5 MPHPS [4]	3.0 MPHPS [4]	FAIR	PARTIAL	DEVELOP-MENTAL	FAIR	27' [4]	ELECTRIC
BUSWAYS	65 MPH [2]	2.0 MPHPS [3]	3.0 MPHPS [3]	GOOD	NONE	N/A	FAIR	42' [3]	DIESEL
MAGNETIC SUPPORT	65 MPH [5]	3.0 MPHPS [5]	3.0 MPHPS [5]	GOOD	FULLY	UNTESTED	GOOD	14' [5]	LINEAR INDUCTION MOTOR
LOW VOLUME MASS TRANSIT (CAPACITY UP TO 6,000 PASSENGERS PER HOUR PER DIRECTION)									
LIMITED TRAMLINE	50 MPH [10]	3.0 MPHPS [10]	3.0 MPHPS [10]	GOOD	NONE	RELIABLE	GOOD	24' [10]	ELECTRIC
LIMITED BUSWAYS	65 MPH [2]	2.0 MPHPS [3]	3.0 MPHPS [3]	GOOD	NONE	N/A	FAIR	24'	DIESEL
RUBBER TIRE	30 MPH [8]	NDA	NDA	GOOD	FULLY	RELIABLE	GOOD	24' [8]	ELECTRIC
AIR CUSHION	20-40 MPH [12]	NDA	NDA	GOOD	FULLY	DEVELOP-MENTAL	GOOD	16' 6" [12]	LINEAR INDUCTION MOTOR

VEHICLE CHARACTERISTICS									COSTS		TECHNICAL FEASIBILITY	ILLUSTRATIVE EXAMPLES
VEHICLE DIMENSIONS HEIGHT	WIDTH	LENGTH	MAXIMUM GRADE	VEHICLE	RIDING QUALITY	LOADING CONVENIENCE	NOISE POLLUTION	AIR POLLUTION	OPERATION COSTS	CAPITAL COSTS		
10'6" [9]	10'6" [9]	75' [9]	10% [12]	72 SEATED [9]	GOOD	GOOD	MEDIUM	LOW	HIGH	HIGH	DEMONSTRATED	BARTD TORONTO, NEW YORK
12'0" [11]	8'3" [11]	56' [11]	6.3% [11]	40 SEATED [11]	GOOD	GOOD	MEDIUM	LOW	HIGH [2]	HIGH	DEMONSTRATED	MONTREAL PARIS MEXICO CITY
12'1" [6]	9'0" [6]	120' [6]	15% [6]	144 SEATED [6]	GOOD	GOOD	VERY LOW	LOW	NDA	VERY HIGH	PROTOTYPE	TRANS RAPID (GERMANY)
NDA	8'8" [4]	72' [4]	NDA	64 SEATED [4]	GOOD	GOOD	MEDIUM	LOW	HIGH	HIGH	DEMONSTRATED	FRANKFURT, DUSSELDORF
10'0" [8]	8'8" [8]	30'6" [8]	10% [8]	28 SEATED [8]	GOOD	GOOD	MEDIUM	LOW	MEDIUM [2]	MEDIUM	BEING TESTED	WESTINGHOUSE, FORD, WABCO DASHAVEYOR
14'0" [1]	10'0" [1]	60'0" [1]	NDA	62 SEATED [1]	GOOD	FAIR	MEDIUM	LOW	HIGH	HIGH	DEMONSTRATED	SEATTLE DISNEYLAND TOKYO
10'0" [4]	8'6" [4]	40'0" [4]	NDA	53 SEATED [4]	FAIR	POOR	HIGH	HIGH	VERY HIGH	HIGH	DEMONSTRATED	SAN BERNANDINO BUSWAY SHIRLEY HWY.
10'8" [5]	6'10" [5]		15% [5]	NDA	GOOD	GOOD	VERY LOW	LOW	NDA	MEDIUM	BEING TESTED	TRANSURBAN TACT SYSTEM (GERMANY)
10'6" [10]	9' [10]	46'6" [10]	10% [10]	46 SEATED [10]	GOOD	POOR	MEDIUM	LOW	HIGH	MEDIUM	DEMONSTRATED	GENEVA, ROTTERDAM TORONTO
10'0" [4]	8'6" [4]	40'0" [4]	NDA	53 SEATED [4]	FAIR	POOR	HIGH	HIGH	VERY HIGH [2]	LOW	DEMONSTRATED	HARRISBURG, PA.
10'6" [8]	8'0' [8]	20'10" [8]	NDA	14 SEATED [8]	GOOD	GOOD	LOW	LOW	NDA	MEDIUM	DEMONSTRATED	WESTINGHOUSE
8'1"	7'8"	14'2"	NDA	10 SEATED	GOOD	GOOD	VERY LOW	LOW	NDA	MEDIUM	DEMONSTRATED	TRANSPORTATION TECHNOLOGY

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Fig. V-2

Rubber Tire - In an attempt to overcome the high capital and operating costs of rail rapid transit, the medium volume rubber tire vehicle was developed. Thus far, these systems have only been able to attain capacities high enough to deem them medium volume systems. Costs are reduced by the use of light-weight unmanned vehicles, operating either singly or in trains on exclusive rights-of-way. The right-of-way can be either above, below, or at grade. Suspension is achieved by rubber-tire tracks moving over concrete and steel surfaces. Steering of the vehicle is controlled by main guide wheels located on either side at the front of the vehicle. The probability of an accident is reduced by the elimination of human error and quicker reaction time afforded by computer control. Ride quality is similar to that experienced with high volume systems.

Several manufacturers such as Ford, Westinghouse, Vought Aeronautics, WABCO and Dashaveyor have built equipment of this type. The Westinghouse Skybus is presently in operation in Pittsburg and the Tampa and Seattle Airports. Other manufacturers expect to have their systems in revenue service in the near future.

Monorail - There are two basic types of monorail systems, i.e., the Alweg Monorail is typical of the supported monorail which runs on a large rectangular normally elevated concrete beam. Support and traction are provided by rubber tires which are mounted horizontally and run on the side of the beam. Flexibility of seating arrangements is limited due to the intrusion of the wheel housings into the car interior. The Alweg System has been used in a number of "amusement park" (Disneyworld) applications, and two full-scale commercial applications - in Seattle, Washington and Tokoyo, Japan. Both of these systems were built to serve special situations, which differ significantly from normal urban transit service. Neither system was built with multiple station stops, however, a limited stop was later added to the Tokoyo system.

The second type of monorail is the suspended system of which the Safege is a prime example. In this system rubber tires run along two closely spaced "rails" mounted inside a precast concrete beam. There are four large rubber tires per truck for support plus four smaller tires to provide guidance. There are no systems of this type in revenue service. However, a test track near Orleans, France has been in operation for over nine years.

Busways - During the past few years, considerable attention has been devoted to the idea of using buses to perform the same function as rapid transit trains. Several cities including Washington, D. C. (Shirley Highway), Atlanta (MARTA) and Los Angeles (San Bernardino Busway) proposed or actually have buses operating on their own rights-of-way. Generally, these systems use a standard 51 passenger, two door, deisel bus, operating in a combination of aerial structures, surface, and sometimes subsurface rights-of-way.

Acceleration and deceleration rates under favorable weather conditions tend to be too low for optimum rapid transit operations, and during inclement weather are even lower. This factor makes it difficult to maintain close headways at safe stopping distances. There is presently no proven method of automating bus operations, thus the safety of the system is dependent on each driver. Generally "on-street" loading is used without platforms increasing delays and door-to-door travel times.

One particularly important consideration of busway usage is their right-of-way needs. For an exclusive busway, a total of 42 feet is required for two way operations. This includes two 12 foot running lanes with a center 12 foot emergency lane, plus an additional three foot walkway on each side. The emergency lane is necessary to temporarily store disabled buses, provide separation between two buses approaching each other from opposite directions and to provide a detour area while repairs are being made to the running surface. The safety walk is necessary to provide a means for passengers of a disabled bus to reach the next station safely or transfer to another bus. Further problems are encountered with the step loading necessary on buses and narrow aisle space making mobility for the handicapped and disabled very difficult. Air and noise pollution are serious drawbacks to the deisel engine. Capital costs for busways are high due to the necessity for building wide rights-of-way with expensive structures. The operations costs for the busway system are the highest of any mode analyzed. This is chiefly due to the necessity for an operator with each vehicle, the high maintenance and increasing fuel costs.

Magnetic Support - The higher construction and operating costs required for a high volume magnetic support system have led to the development of a smaller version. Basically, the two systems are much the same in concept with suspension and linear movement provided by a system of powerful eletromagnets, rapidly changing polarity and creating lift and thrust. Vehicles can be operated independently or linked together in a train. Once coupled, vehicles can be separated at switches without stopping. Changes in direction are controlled by magnets which can be actuated from the central control facility or from within the vehicle. The switch is independent of weather conditions and has no moving parts.

One medium volume magnetic support system which is presently undergoing testing in Germany is the Transurban TACT system manufactured by Krauss-Maffaei in Munich. Preliminary marketing of the equipment is presently underway in this country and in Europe. The province of Ontario recently selected Krauss-Maffaei to develop a test facility under revenue service in Toronto. A particularly attractive aspect of this system is that only 14 feet of right-of-way are required for a two directional operation. This is the narrowest right-of-way required by any of the alternative systems under consideration. Also the absence of any moving parts touching the guideway and the quiet linear induction motor make this a practically noiseless means of transport. As with other electrically powered systems there is no air pollution at the vehicle.

Capital and operating costs are as difficult to pinpoint with this system as they are with the larger magnetic support system. However, manufacturers cost projections appear to be in line with many other medium volume systems.

<u>Low Volume Mass Transit</u> - In many smaller cities where even lower patronage demands exits or in large cities where there is need for collection and distribution for a large rapid transit system, equipment with much lower capacities can be utilized. Capital costs which generally relate directly to system capacities are somewhat lower with low volume systems. This is due in part to the need for fewer structures and simple construction techniques in building for lighter loads. In many cases the transit vehicles can operate over existing rights-of-way in an aerial guideway often mingling with traffic on city streets or over tracks in street medians.

Over the past several years new technology has generated a completely new breed of low volume systems, personal rapid transit systems (PRT). Frequently used over short distances, these systems employ small vehicles capable of moving small numbers of passengers. They provide very short travel times through the use of computer controlled vehicles operating at very close headways. There is much literature available on these new systems, and also a wide variety of equipment being developed with some in revenue service.

Limited Tramline - Tramlines have found much wider acceptance in Europe than in this country. Most European cities with transit facilities have employed tramline equipment in one form or other. Line hauls as well as collection and distribution can be performed with tram equipment. Geneva, Switzerland, Rotterdam, Hamburg, Munich, and Toronto all use tramlines. Limited tramlines are primarily used for collection and distribution functions complementing higher volume line haul transit equipment.

Trams are essentially light volume steel wheel-steel rail vehicles. They may operate with only one vehicle or be linked together in articulated fashion to carry more passengers. Propulsion is generally provided by electric motors which take their power from overhead wires. Operations are usually carried out in city streets or in the street medians. Trams are frequently required to observe the same traffic regulations as automobile traffic and thus its ability to offer favorable time savings when compared with the automobile is restricted. Loading is done from the curb or street with steps providing ingress and egress. Boarding is very difficult for the elderly and handicapped. Noise levels greater than the auto are created by the tram, but since electric power is used there is no air pollution by the vehicle.

The reliability of this vehicle and vast experience with its technology make maintenance on the system relatively inexpensive. However, the need for an operator with each vehicle plus in-street operations usually make it relatively expensive to operate and cumbersome for other street traffic. Capital costs are somewhat lower because of the time tested construction techniques and less expensive materials involved.

Limited Busways - The most widely used form of transit in the United States is the public bus. Because of the inherent advantages of travelling over the existing street system and no need for construction of special guideways, buses were acquired by many cities as a solution to their transit needs. However, increasing automobile congestion, prevalent in most American cities, has made it impossible for buses to operate in their most efficient manner. In an effort to make bus operation more effective many operational improvements have been tried.

The limited busway system is much the same as conventional bus systems operating on public streets. However, in areas of greatest congestion a private right-of-way is provided. Generally, the greatest possible advantage is taken of existing structures or streets. In some cities such as Houston, Texas and Harrisburg, Pennsylvania, one lane of an existing street is closed in the downtown area. Buses can then freely move ahead of traffic and offer some travel time savings. Once outside the congested area the exclusive bus lane is removed and buses flow with other traffic. In other instances separate rights-of-way may be constructed for buses, however, in limited busways only a few such facilities are presently in operation. The use of reverse direction or contraflow lanes for buses during peak hour travel also offers opportunities for improving transit service.

This mode offers the advantage of low capital costs and what may appear to be a relatively simple solution. However, it is difficult to close a traffic lane or street that is already fully utilized by automobiles. In many places, such as downtown areas it may be impossible to build the required structure for buses only. In addition, a bus lane generates continuous pressure upon public officials to reopen the facility to autos unless there is a steady stream of buses utilizing the bus lane. The problem of high operations costs is significant with this mode as operators are required for each bus. This, combined with the extremely high fuel and maintenance costs of bus transit make the operations of this system one of the most expensive long term alternates.

Rubber Tire - Low volume rubber tire transit systems are being researched and developed and made available by many major manufacturers of transit equipment. Recent applications of new technology have allowed large corporations such as WABCO, Rohr, and Westinghouse to develop new and innovative systems. Typically, they can be employed in major activity centers or featured as a novel mode of transportation in large tourist attractions. Vehicles are supported by rubber tires which ride atop concrete slabs. Guidance is achieved in several ways, either from horizontal guide wheels which press against walls along the guideway or another mechanism which gains direction from a center guide beam in the middle of the guideway. Electric power provides smooth acceleration, deceleration, and ride quality as well as a pollution free propulsion system. Small cars provide comfortable, attractive transportation for all passengers. Speeds with this low volume system are considerably lower than with the other modes evaluated. Computer controls potentially eliminate the need for operations personnel and provide efficient, inexpensive operating costs.

Air Cushion - The air cushion transit vehicle is supported by a thin cushion of air, a fraction of an inch above its guideway. The system consists of small personal vehicles which could operate non-stop from origin to destination bypassing intervening stations. The vehicles are propelled by jets of air coming from the surface of the guideway.

Support, propulsion, and switching are all accomplished by forced air coming from the surface of the guideway which is provided by a stationary blower. The vehicle itself is completely passive and needs no power or controls of its own. Central computers allow for efficient fail-safe operation. Presently, manufacturers such as Transportation Technology, Inc. and Uniflow have developed air cushion systems which lend themselves readily to major activity centers or other applications similar to those of the low volume rubber tire systems. However, further technological and production advances may make this type of transportation alternative available for inter-urban transit in the future.

Modes Selected for Testing

After reviewing all available data on transit modes and considering Jacksonville's future growth, the Consultant and Planning Board staff selected two prototype modes for alternative testing. Both modes fell into the medium volume classification i.e., express buses with exclusive right-of-way and preferential treatment and a fixed-guideway medium volume rapid transit system.

It was felt that either or a combination of these two modes could meet the 1990 mass transportation needs of Jacksonville. The purpose of the alternative testing phase of the study was to determine which of the prototype modes would best meet these needs based on detailed demand estimates, operating/capital costs, environmental impact, community goals and objectives, and land use planning objectives.

Chapter VI · Testing Mass Transit Alternatives

Unlike many American cities Jacksonville is on the threshold of fairly rapid growth with population forecast to nearly double between 1970 and 1990. Because of the potential for rapid transit to act as a catalyst to help guide and shape the urban form of Jacksonville, there is a unique opportunity to exploit the advantages of joint land use and transportation development.

In the face of much higher costs for energy and the possibility of scarce supply in the future, transit study alternatives were also designed to emphasize the development of a plan which:

1) Would provide a high level of transit service.

2) Would include facilities capable of relatively high capacities which could be readily increased over time.

3) Would require a relatively low operating cost.

4) Would reduce the complete reliance on fossil fuels.

While alternative tests were designed primarily to quantify patronage and revenue, the alternatives were also related to environmental and community impacts, and capital and operating costs. The objectives of the transit alternative testing work element were to:

1. Determine expected patronage of each alternative transit system and, following evaluation, select the most desirable from a service and usage standpoint.

2. Test alternate land use plans and the impact on traffic demands.

3. Test both high and low levels of transit service and the impact on transit patronage.

4. Simulate a balanced transportation system by testing alternate expressway and highway networks in conjunction with the transit alternatives.

5. Develop service standards to achieve a balance between operating costs and patronage.

In achieving these objectives, three alternate transit systems were tested. Each test featured alternate land use plans, major roadway networks, and transit operating service standards. The first two (maximum all-bus and maximum fixed-guideway) were designed to provide an estimate of the range of patronage that could be expected with high levels of service but distinctly different transit technologies. Following the evaluation of these two initial tests and several work sessions with the Jacksonville Area Planning Board, a third or final test system was developed.

"Maximum All-Bus" Transit Alternative Test 1

A system which represented a vast improvement in the present bus system was developed and tested to provide an estimate of the heaviest possible patronage an all-bus system operating at a very high level of service could generate.

Test Assumptions - Since bus systems do not influence the future growth and development of an urban area to a significant degree, the original JUATS land use plan and data were used. The JUATS land use plan generally reflects a continuing trend of urban sprawl, thus it was considered appropriate for the all-bus alternative. It was also assumed that the entire recommended JUATS Streets and Highways Plan (See Figure I-2) would be implemented to serve the sprawl type development.

In addition, it was assumed that the all-bus system would operate under high service standards (See Table 11). As indicated in the Attitude Survey, the majority of Jacksonville citizens demand fast and convenient transit service. Hence, all local and express buses were tested with six minute headways during peak periods (7:00 A.M. - 9:00 A.M. and 4:00 P.M. - 6:00 P.M.) and with fifteen minute headways during off-peak or base periods. This represented an extremely high service level requiring 710 local buses and 105 express buses or about five and one-half times the present number of buses operating during the peak hour.

A basic fare of $.25 was used for each transit trip and all transfers were free. The average travel speed of the local buses varied from 9 m.p.h. to 15 m.p.h. with an average of 12 m.p.h. The express buses varied between 24 m.p.h. and 27 m.p.h. and averaged 26 m.p.h.

System Network - Alternative Test 1 (See Figure VI-1) featured an extensive network of express bus routes covering 122 miles. The basic function of the buses was to provide a fast transit service to and from the Jacksonville Downtown Area. Express buses would begin in suburban areas and stop only at designated express bus and park-and-ride stops. Many of those using the express services going downtown would either drive their automobile to a bus stop or be driven to a bus stop.

Alternative Test 1 also included the 1973 bus system with some extensions and route modifications to reflect future growth resulting in over 400 route miles of local buses. A major improvement tested was the total rerouting of all buses in the downtown area to allow better transferring between bus lines, faster and more efficient bus operation and improved vehicular circulation. The reroutings were developed using the Jacksonville Downtown Plan's "transitway" recommendation for the Central Business District.

Capital and Operating Costs - The total estimated capital cost in January 1974 dollars for the all-bus system alternative ranged between $99,300,000 and $122,710,000. (See Table 12). This included direct costs of new passenger buses, spare components, service trucks and cars, fare boxes, bus shelters, bus stops, communication and control systems, new maintenance facilities, and park-and ride facilities. Roadway improvements required for preferential treatment and exclusive rights-of-way for buses were also included. Indirect costs for engineering, planning and design, administrative and legal work, and a contingency of 15 percent of the total direct costs were also included in the estimated capital costs.

The estimated 1990 annual operating cost for the all-bus alternative in January, 1974 constant dollars was $30,900,000 (see Table 11), or about seven times the present bus system operating cost. The primary reason for the high operating expense is the increasing higher cost of labor to run the system.

1990 Patronage and Revenue Estimates - Under the stated assumptions the average weekday patronage on the all-bus system was estimated to be 225,000 passengers. (See Table 11) This represented about 7.8 percent of all person trips in the JUATS area. More significant was the expected number of persons utilizing transit services to and from the Jacksonville Downtown Area. An estimated 58,800 or 25 percent of all persons traveling to and from the Downtown would be expected to use bus transit if it were convenient and efficient. Over 39 percent of Downtown workers could be expected to use the transit service. The 1990 bus system revenue generated from fares only ($.25 per passenger and free transfer) is estimated at $15,750,000. Hence, an operating annual of $15,150,000 would be required to operate the all-bus system if it were operated as tested and fares were held at $.25. Some of this would be offset by revenue from advertising.

"Maximum Fixed-Guideway" Transit Alternative Test 2

The second alternative transit system tested was a fixed-guideway rapid transit system with a supplementary and complementary network of local and feeder buses.

Fig. VI-1

JACKSONVILLE URBAN AREA MASS TRANSPORTATION STUDY

FOR: THE CONSOLIDATED CITY OF JACKSONVILLE
BY: JACKSONVILLE AREA PLANNING BOARD

TITLE: **1990 PATRONAGE**
ALTERNATIVE TRANSIT SYSTEM
TEST 1

LEGEND:

EXPRESS BUS ROUTE

LOCAL BUS ROUTE

PARK-AND-RIDE

8,600 AVERAGE WEEKDAY VOLUME (TWO WAY)

DOWNTOWN AREA

EXPRESS BUS STOP

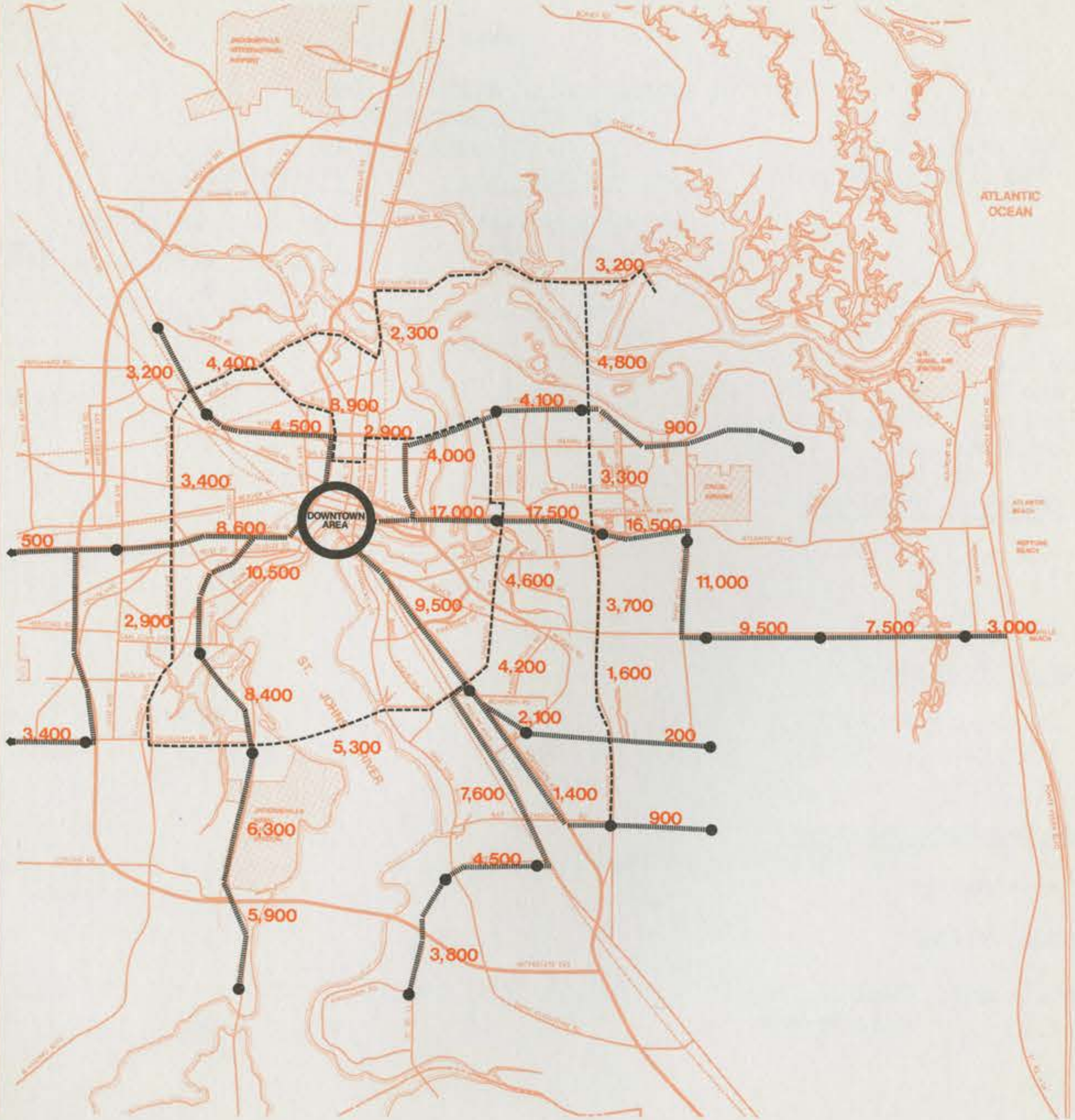
5,500 EXPRESS BUS PATRONAGE

(27,500) LOCAL BUS PATRONAGE

NOTE: Test included 1973 bus routes also.

SCALE IN MILES

CONSULTANTS:
CAMPBELL, FOXWORTH AND PUGH, INC.
REYNOLDS, SMITH AND HILLS
IN ASSOCIATION



DOWNTOWN AREA

Table 11

GENERAL COMPARISON OF ALTERNATE TESTS 1, 2 and 3
TRANSIT SYSTEMS FOR 1990

	ALTERNATE TEST 1 ALL-BUS SYSTEM	ALTERNATE TEST 2 FIXED-GUIDEWAY FEEDER BUS SYSTEM	ALTERNATE TEST 3 FIXED-GUIDEWAY AND FEEDER AND EXPRESS BUS SYSTEM
1. One-Way Route Miles			
Express Bus	122	-	84
Local and Feeder Bus	414	476	314
Fixed-Guideway Rapid Transit (Construction)	-	51	36
2. Buses Operating (Weekday)			
(Peak Hour)	710 Local Buses 105 Express Buses	570 Feeder Buses 244 Fixed-Guideway	215 Feeder Buses 45 Express Buses 240 Fixed-Guideway
3. Average Vehicle Speed			
Local and Feeder Buses	12 MPH	16 MPH	15 MPH
Express Buses	26 MPH	-	27 MPH
Fixed-Guideway	-	46 MPH	33 MPH
4. Average Headways (Minutes)			
Bus: Peak Period	6	6	17 Local 10 Express
Base Period	15	15	32 Local 20 Express
Fixed-Guideway: Peak Period	-	1.5	2
Base Period	-	5	10

Table 11
(Continued)

	ALTERNATE TEST 1 ALL-BUS SYSTEM	ALTERNATE TEST 2 FIXED-GUIDEWAY FEEDER BUS SYSTEM	ALTERNATE TEST 3 FIXED-GUIDEWAY AND FEEDER AND EXPRESS BUS SYSTEM
5. 1990 System Patronage			
Weekday	225,000	454,000	205,000
Annual	63,000,000	131,700,000	59,500,000
6. 1990 System Operating Costs (January, 1974 Constant Dollars)			
Weekday	$106,600	$111,800	$60,100
Annual	$30,900,000	$31,300,000	$16,830,000
7. 1990 System Revenue (Fares Only) (January, 1974 Constant Dollars)			
Weekday	$56,250	$113,500	$51,250
Annual	$15,750,000	$31,780,000	$14,875,000
8. 1990 Operation Subsidy			
Operating Deficit	$15,150,000	$480,000 (Gain)	$1,955,000

NOTE: The 1972 Bus System Covered 340 Route Miles and Operated 115 Buses During Peak Periods with Average Headways of 19 Minutes.

Table 12

ALTERNATE 1 - ALL-BUS TRANSIT SYSTEM (1990)
CAPITAL COST ESTIMATES
JANUARY, 1974 DOLLARS

		COST/UNIT ($ THOUSANDS)	UNITS	TOTAL COST ($ MILLIONS)
A.	DIRECT COSTS			
I.	Passenger Buses (Diesel with A/C*)			
	A. Local Buses	47 - 50	615	28.91 - 30.75
	B. Express Buses	55 - 58	115	6.33 - 6.67
II.	Spare Component Units	22 - 25	55	1.21 - 1.38
III.	Fare Boxes	7 - 8	730	0.51 - 0.58
IV.	Service Trucks	12 - 14	22	0.26 - 0.11
V.	Service Cars	4 - 5	22	0.09 - 0.11
VI.	Garage Equipment			0.20 - 0.30
VII.	Communication and Control			0.90 - 1.50
VIII.	Bus Shelters			
	A. Minor	3.5 - 4.5	340	1.19 - 1.53
	B. Major	20 - 25	28	0.56 - 0.70
	C. CBD	600 -900	1	0.60 - 0.90
IX.	New Maintenance Facility	6,000-7,000	2	12.00 - 14.00
X.	Bus Stops	1.5 - 2	2,000	3.00 - 4.00
XI.	Park-N-Ride Facilities			
	A. Right-of-Way	25/Acre - 35/Acre	90 Acres	2.24 - 3.16
	B. Construction (Paving, Fences, Lights, etc.)	45 - 55	90	4.04 - 4.96

Table 12
(Continued)

		COST/UNIT ($ THOUSANDS)	UNITS	TOTAL COST ($ MILLIONS)
XII.	Roadway Improvements			20.00 - 30.00
	Exclusive Lanes Access to Park-N-Ride CBD Improvements Bridge Toll Improvements			
B.	INDIRECT COSTS			
I.	Engineering, Planning, Design and Architecture** (8% of Construction)			2.98 - 4.04
II.	Administration and Legal (5% of Construction and R.O.W.)			1.97 - 2.69
III.	Contingencies (15% of Total Direct Cost)			12.31 - 15.13
	TOTAL ESTIMATED CAPITAL COSTS			$99.30 -122.71

* 815 (Needed for Daily Operations) + 75 (Spares) + 40 (Replacements) - 200 (Existing) = 730 (Total Number Required).

** Construction Costs for Items VIIIB, VIIIC, IX, XIB and XII (Direct Costs Total = 37.20 - 50.56).

The selection of test route alignments and station locations was primarily based upon:

1. Direct service to the Downtown Areas and other concentrated employment centers.

2. Service to other major traffic generators such as regional shopping centers, higher educational institutions, and medical facilities.

3. Convenient access to residential centers.

4. Utilization of existing public rights-of-way along expressways, highways and railroads.

5. Potential redevelopment and/or new development.

6. Service to low income, elderly, and handicapped persons.

7. Environmental and community impacts.

8. Urban design considerations.

System Network - Several alternative test networks were developed and analyzed and following work sessions with the JAPB the Alternative Test 2 system was developed for full computer testing (See Figure VI-2). It consisted of 51 miles of fixed-guideway with 30 stations supplemented by 476 route miles of local and feeder buses.

Test Assumptions - For testing purposes the rapid transit system was assumed to be of medium-sized, lightweight technology operating on exclusive fixed-guideways and capable of carrying up to 20,000 passengers in one direction in one hour. The maximum speed assumed was 60 m.p.h. The rapid transit route headways were every three minutes during peak hours. Hence most stations including those in the Downtown area would have a rapid transit train arriving every 90 seconds. During off-peak periods rapid transit route headways were 10 minutes.

The entire local and feeder bus system was tested at 6 and 15 minute headways during peak and off-peak hours, respectively. The required buses during the peak hour was 570, or nearly 400 percent more than the present bus system. For testing purposes, the present bus system routes were substantially modified to reflect the fixed-guideway or "backbone" network. About two-thirds of the present bus routes were altered to focus direct service to the fixed-guideway stations. The remaining bus routes continued to provide additional transit service to the Downtown area. The feeder bus system would provide an alternative means of access to the high-speed system and would also expand the actual service area of the rapid transit system. For example, a passenger could transfer from the fixed-guideway system station to a feeder bus and finish his trip two miles from the station.

As part of the testing procedure, revised land use data by traffic analysis zones were developed which generally reflected the potential impact of the fixed-guideway system. The consultants and the Jacksonville Area Planning Board used the preliminary 1990 Comprehensive Land Use Plan as a general guide to prepare this data. The data was prepared for all original JUATS traffic analysis zones as well as new zones developed for testing purposes. The JUATS area-wide population and employment control totals were held constant but their distribution was modified to reflect the potential impact on development and the updated Land Use Plan.

In addition, a modified 1990 JUATS Streets and Highway network was developed. (See Figure VI-3). This roadway network was prepared for testing purposes only and was developed under the following broad considerations or assumptions:

1) Conformance with the 1990 Comprehensive Land Use Plan prepared by the Jacksonville Area Planning Board.

2) Alternative Test 2 would be implemented.

Fig. VI-2

JACKSONVILLE URBAN AREA MASS TRANSPORTATION STUDY

FOR THE CONSOLIDATED CITY OF JACKSONVILLE
BY JACKSONVILLE AREA PLANNING BOARD

TITLE: **1990 PATRONAGE ALTERNATIVE TRANSIT SYSTEM TEST 2**

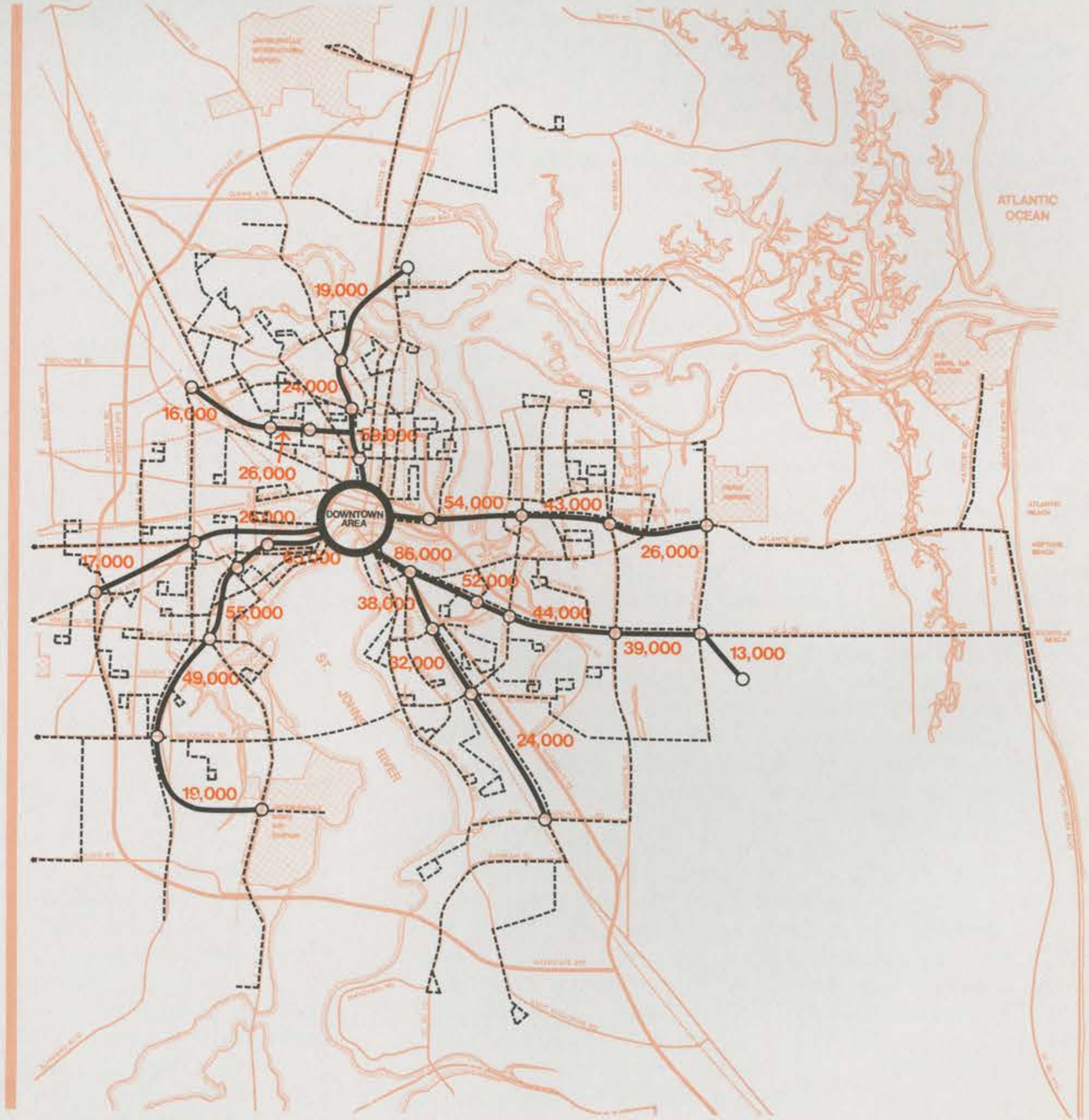
LEGEND:

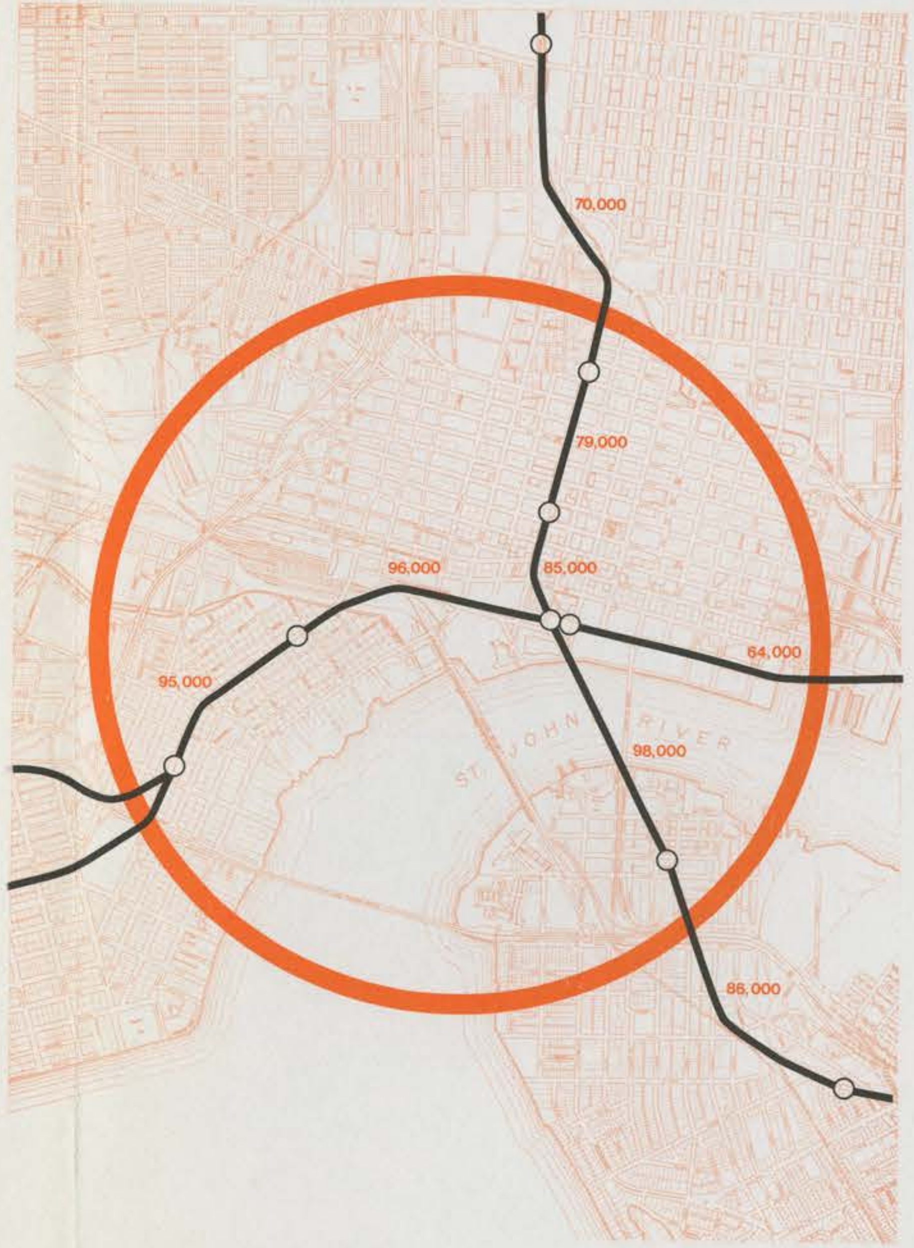
- FIXED GUIDEWAY ROUTE
- FIXED GUIDEWAY STATION
- FEEDER BUS

17,000 AVERAGE WEEKDAY VOLUME (TWO WAY)

SCALE IN MILES: 0 1 2 3 4

CONSULTANTS:
CAMPBELL, FOXWORTH AND PUGH, INC.
REYNOLDS, SMITH AND HILLS
IN ASSOCIATION





DOWNTOWN AREA

Fig. VI-3

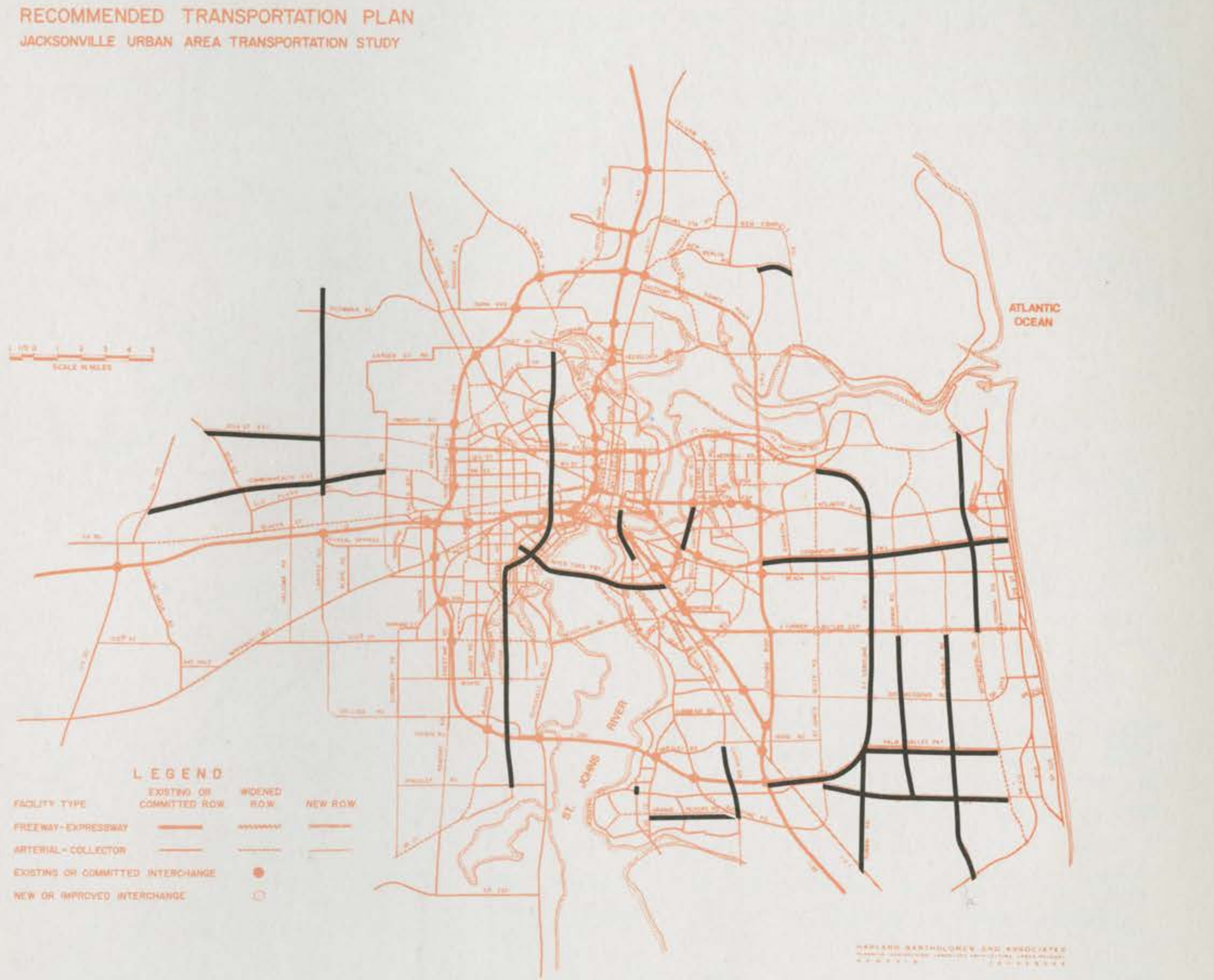
JACKSONVILLE URBAN AREA MASS TRANSPORTATION STUDY

FOR THE CONSOLIDATED CITY OF JACKSONVILLE
BY JACKSONVILLE AREA PLANNING BOARD

TITLE: **MODIFIED HIGHWAY PLAN USED FOR ALTERNATE TEST 2**

LEGEND:

▬ HIGHWAYS NOT TESTED



CONSULTANTS:
CAMPBELL, FOXWORTH AND PUGH, INC.
REYNOLDS, SMITH AND HILLS
IN ASSOCIATION

3) Time and financial constraints as well as general public debates will postpone some roadway construction.

In addition the Jacksonville Area Planning Board staff and the JUATS Technical Coordinating Committee reviewed the test roadway networks and approved it for the test.

Capital and Operating Costs - The total estimated capital cost in January, 1974 constant dollars for the Alternative Test 2 transit system ranged from $516,000,000 to $625,570,000 (see Table 13). This included direct costs of route and guideway construction, station construction, land acquisition, electrification, control and communication, rapid transit and bus vehicles, yards and shops, etc. Indirect costs for engineering, planning, design and architecture studies, administration and legal work, system testing, and a contingency of 25 percent of the system construction was also included.

The 1990 annual operating cost for the Alternative Test 2 fixed-guideway and feeder bus system as tested would be an estimated $31,300,000 in constant January, 1974 dollars (see Table 11). About three-quarters of this operating cost would be due to the feeder bus system.

1990 Patronage and Revenue Estimates - The expected number of average weekday riders on Alternative Test 2 is 454,000 or more than double the all-bus alternative (see Table 11). This represented nearly 17 percent of all person trips within the JUATS area. One of the primary reasons contributing to the greater number of riders is the comparatively faster travel speed via rapid transit for Alternative Test 2. For example, the average rapid transit vehicle speed including dwell times or station stops was 46 m.p.h. Also, the feeder buses averaged about 16 m.p.h. largely because most of them did not operate within expected congested areas, such as the downtown. Due to this faster travel speed and overall higher level of service, a higher proportional of non-CBD traffic could be expected to be diverted for automobiles to the rapid transit and feeder bus system.

The number of persons traveling to the Downtown area via transit was significantly higher as well. Nearly 40 percent of all Downtown area person trips and over 56 percent of all downtown area work trips would be expected to be via the transit system.

The 1990 annual revenue from fares only ($.25 per passenger and free transfers) is estimated at $31,780,000 in January, 1974 constant dollars.

Final Transit Test Alternative

Following the evaluation of the all-bus alternative test and the fixed-guideway alternative test results, and discussions with the JAPB, a third and final test alternative which combined elements of both Test 1 and 2 was developed. (See Figure VI-4). It featured 36 miles of fixed-guideway rapid transit, 84 route miles of express buses, and 314 route miles of local and feeder buses. In order to provide more direct service via rapid transit the number of stations per route mile was increased resulting in a total of 34 stations. This, however, resulted in a somewhat slower average vehicle speed.

Test Assumptions - Probably the most significant change in the testing was the service characteristics to be tested. Whereas the previous two tests had all buses operating at 6 and 15 minute headways during peak and off-peak hours respectively, the third alternative system was tested with 10 and 20 minute headways for express buses and 10 to 20 and 20 to 45 minute headways for local and feeder buses respectively. The average for the latter buses was 17 and 32 minute headways during peak and off-peak hours, respectively. (See Table 11) The rapid transit route headways were also changed from 3 and 10 minutes, as tested for Alternative Test 2, to 4 and 20 minutes during peak and off-peak periods. Hence, while the Alternative Test 3 transit network had essentially the same area serviced as Alternative Tests 1 and 2, the level of service tested was much lower.

Table 13

ALTERNATE 2 - FIXED-GUIDEWAY TRANSIT SYSTEM (1990)
CAPITAL COST ESTIMATES
(JANUARY, 1974 DOLLARS)

		COST/UNIT ($ THOUSANDS)	UNITS	TOTAL COST ($ MILLIONS)
A.	DIRECT COSTS			
I.	Land Acquisition	200 - 300	51 Miles	10.20 - 15.30
II.	Route Construction (Elevated System)	800 - 900	51 Miles	40.80 - 45.90
III.	Guideway Construction (Elevated Guideway)	2,800 - 3,500	51 Miles	142.80 -178.50
IV.	Stations (Elevated, Including Parking)	1,500 - 1,800	30	45.00 - 54.00
V.	Yards and Shops			11.48 - 15.30
VI.	Electrification (Power)	600 - 750	51 Miles	30.60 - 38.25
VII.	Fixed-Guideway Vehicles	250 - 300	270	67.55 - 81.00
VIII.	Control and Communication			40.80 - 45.90
IX.	Feeder Bus System			
	A. Buses	47 - 50	570	26.79 - 28.50
	B. Spare Component Units	22 - 25	30	0.66 - 0.70
	C. Fare Boxes	0.7 - 0.8	570	0.39 - 0.44
	D. Service Trucks	12 - 14	10	0.12 - 0.14
	E. Service Cars	4 - 5	10	0.04 - 0.05
	F. Bus Shelters	3.5 - 4.5	250	0.88 - 1.12
	G. New Maintenance Facility	4,000 - 5,000	2	8.00 - 10.00
	H. Bus Stops	1.5 - 2.0	2,000	3.00 - 4.00
	I. Control and Communication	1.2 - 1.5	570	0.70 - 0.85

Table 13
(Continued)

		COST/UNIT ($ THOUSANDS)	UNITS	TOTAL COST ($ MILLIONS)
B.	INDIRECT COSTS			
I.	Engineering, Planning and Design Architecture (9% of Construction)			16.52 - 20.20
II.	Administration and Legal (10% of Construction and R.O.W.)			18.36 - 22.44
III.	System Testing (3% of Construction and R.O.W.)			5.51 - 6.73
IV.	Contingencies (25% of Construction)			45.90 - 56.10
	TOTAL ESTIMATED CAPITAL COSTS			$516.10 -625.42

Fig. VI-4

JACKSONVILLE URBAN AREA MASS TRANSPORTATION STUDY

FOR THE CONSOLIDATED CITY OF JACKSONVILLE
BY JACKSONVILLE AREA PLANNING BOARD

TITLE: **1990 PATRONAGE**
ALTERNATIVE TRANSIT SYSTEM
TEST 3

LEGEND:

- FIXED GUIDEWAY ROUTE
- FIXED GUIDEWAY STATION
- EXPRESS BUS ROUTE
- EXPRESS BUS STATION
- FEEDER BUS

9,700 AVERAGE WEEKDAY VOLUME (TWO WAY)

DOWNTOWN AREA

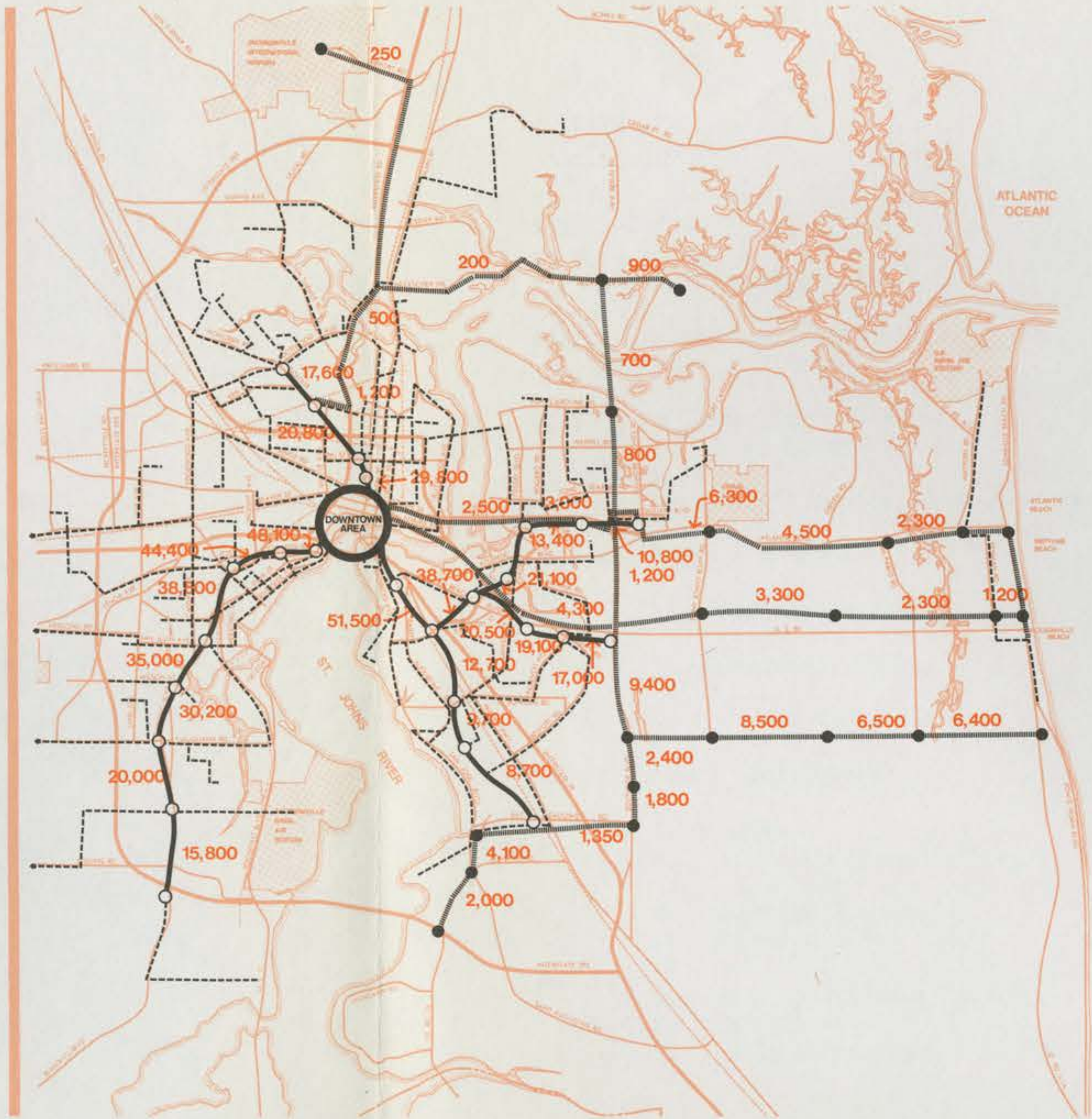
5,000 FIXED GUIDEWAY PATRONAGE

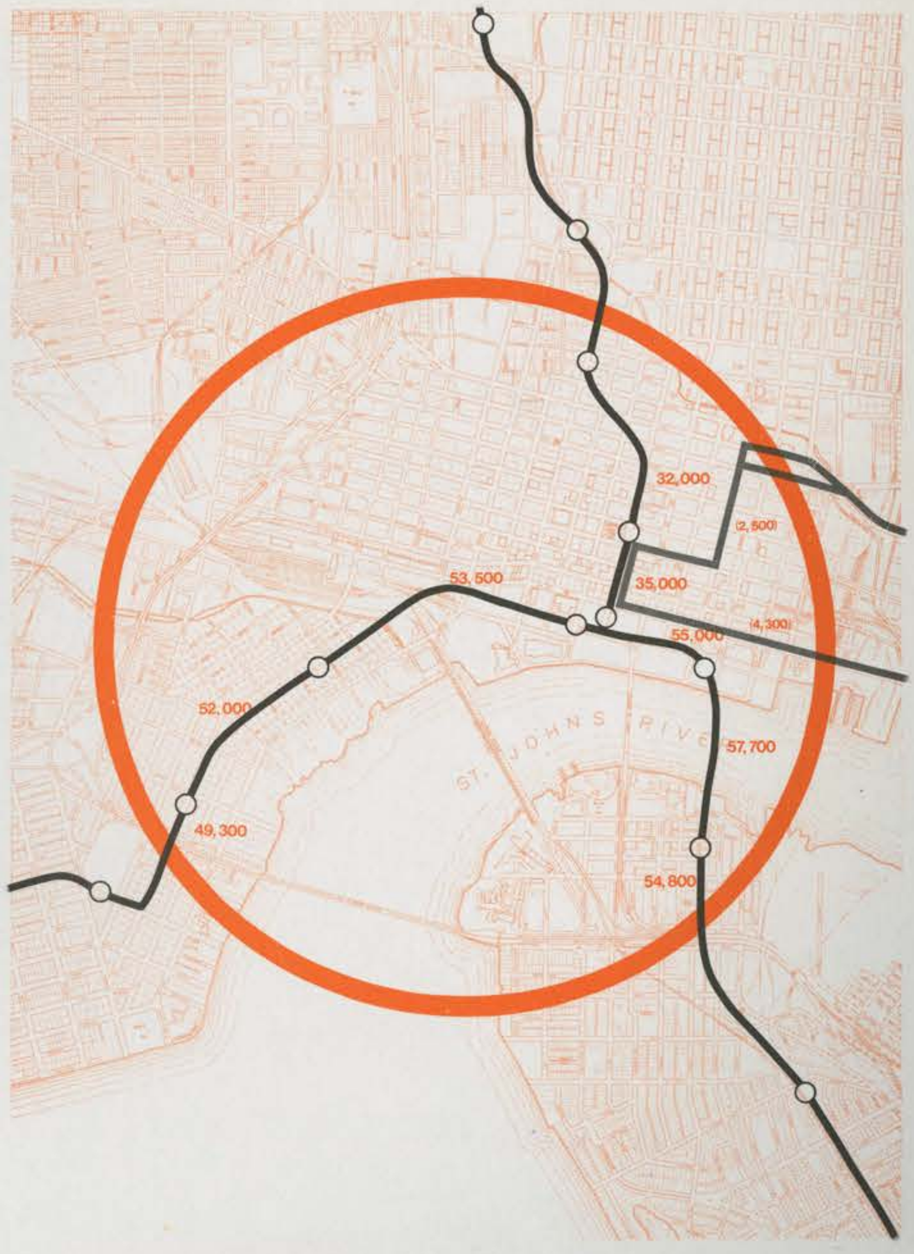
(1,000) EXPRESS BUS PATRONAGE

SCALE IN MILES

CONSULTANTS

CAMPBELL, FOXWORTH AND PUGH, INC.
REYNOLDS, SMITH AND HILLS
IN ASSOCIATION





DOWNTOWN AREA

Table 14

ALTERNATE 3 - FIXED-GUIDEWAY TRANSIT SYSTEM (1990)
CAPITAL COST ESTIMATES
(JANUARY, 1974 DOLLARS)

		COST/UNIT ($ THOUSANDS)	UNITS	TOTAL COST ($ MILLIONS)
A.	DIRECT COSTS			
I.	Land Acquisition	200 - 300	36 Miles	7.20 - 10.80
II.	Route Construction (Elevated System)	800 - 900	36 Miles	28.80 - 32.40
III.	Guideway Construction	2,800 - 3,500	36 Miles	100.80 -126.00
IV.	Stations (Elevated, Including Parking)	1,300 - 1,500	34	44.20 - 51.00
V.	Yards and Shops			8.40 - 10.71
VI.	Electrification (Power)	600 - 750	36 Miles	21.60 - 27.00
VII.	Fixed-Guideway Vehicles	150 - 200	240	36.00 - 48.00
VIII.	Control and Communication			28.56 - 32.13
IX.	Feeder and Express Bus System			
	A. Feeder Buses	47 - 50	215	10.10 - 10.75
	B. Express Buses	55 - 58	45	2.47 - 2.61
	C. Spare Component Units	22 - 25	17	0.37 - 0.42
	D. Fare Boxes	0.7 - 0.8	260	0.18 - 0.21
	E. Service Trucks	12 - 14	7	0.08 - 0.10
	F. Service Cars	4 - 5	7	0.03 - 0.04
	G. Bus Shelters	3.5 - 4.5	200	0.70 - 0.90
	H. New Maintenance Facility	4,000 - 5,000	1	4.00 - 5.00
	I. Bus Stops	1.5 - 2.0	1,600	2.40 - 3.20
	J. Control and Communication	1.2 - 1.5	260	0.31 - 0.39

Table 14
(Continued)

	COST/UNIT ($ THOUSANDS)	UNITS	TOTAL COST ($ MILLIONS)
B. INDIRECT COSTS			
I. Engineering. Planning, Design and Architecture (9% of Construction)			11.66 - 14.26
II. Administration and Legal (10% of Construction and R.O.W.)			13.68 - 16.92
III. System Testing (3% of Construction and R.O.W.)			4.10 - 5.08
IV. Contingencies (25% of Construction)			32.40 - 39.60
TOTAL ESTIMATED CAPITAL COSTS			$357.80 -437.52

Revised land use data which reflected new rapid transit station locations were prepared by the JAPB. This data along with a minor change (see Figure VI-5) in the JUATS highway network tested for Alternative 2 were prepared for computer input to determine patronage.

Capital and Operating Costs Estimates - The total estimated capital cost of the Alternative Test 3 System ranged between $357,800,000 to $437,520,000. (See Table 14). This included all direct and indirect cost items used for the Alternative Test 2 estimate. The 1990 annual operating cost for Alternative Test 3 was $16,830,000 which is about one-half the operating costs of either Test 1 or Test 2 (see Table 11). As was the case with Test 2, three-quarters of the system's operating expense was due to the surface bus operating costs.

1990 Patronage and Revenue Estimates - Even with the significantly lower level of service the fixed-guideway transit Alternative Test 3 system could be expected to attract 205,000 passengers on an average weekday in 1990 (see Table 11). This would represent about 7 percent of all person trips made within the Jacksonville Urban Area. Most significant is that almost 27 percent of all person trips going to and from the downtown area, or 61,100 person-trips would be via transit under the Alternative Test 3 transit system and the level of service tested. Nearly 40 percent of downtown workers would be expected to use this transit system in 1990.

Evaluation of Alternative Tests and Conclusion

The primary considerations in the evaluation of the three tested transit alternatives were:

1. Patronage and revenue verses capital and operating costs.

2. Transit service potential.

3. Reduction of future highway needs.

4. Land use development potential.

5. Downtown area development potential.

Patronage and Revenue vs Capital and Operating Costs - Estimates of the total cost of each alternative transit system tested for a thirty-year period were made. To derive these estimates a transit improvement phasing program for each alternate was determined and a capital cost established using January, 1974 dollars. These costs were then increased to reflect both phase of construction and/or improvement and estimated inflationary increases. Construction and right-of-way costs were increased by 10 percent compounded annually and rapid transit vehicles, bus vehicles and all other costs were increased 5 percent, 3 percent and 5 percent compounded annually, respectively.

Table 15 indicates the estimated capital cost for each alternative transit test system including vehicle replacements and inflationary costs for the 1975-2005 period. The estimated cost of the all-bus alternative is $302,500,000, the 51-mile fixed-guideway and feeder bus alternative $1,003,600,000, and the 34-mile fixed-guideway and express and feeder bus alternative $693,300,000.

Utilizing the 1990 patronage, revenue and operating cost estimates and the estimated phasing program for transit improvements for each alternative test system, annual estimates of operating costs and passenger revenue were determined for the 1975-2005 period (see Table 16). These estimates were made in order to compare the three tested alternative transit systems for the thirty-year period and to establish "order-of-magnitude" total costs of each alternative to Jacksonville.

While the all-bus alternative would cost the least as far as capital expenditure, the expected higher cost of operating an extensive bus system over a long period would substantially increase the total cost.

Fig. VI-5

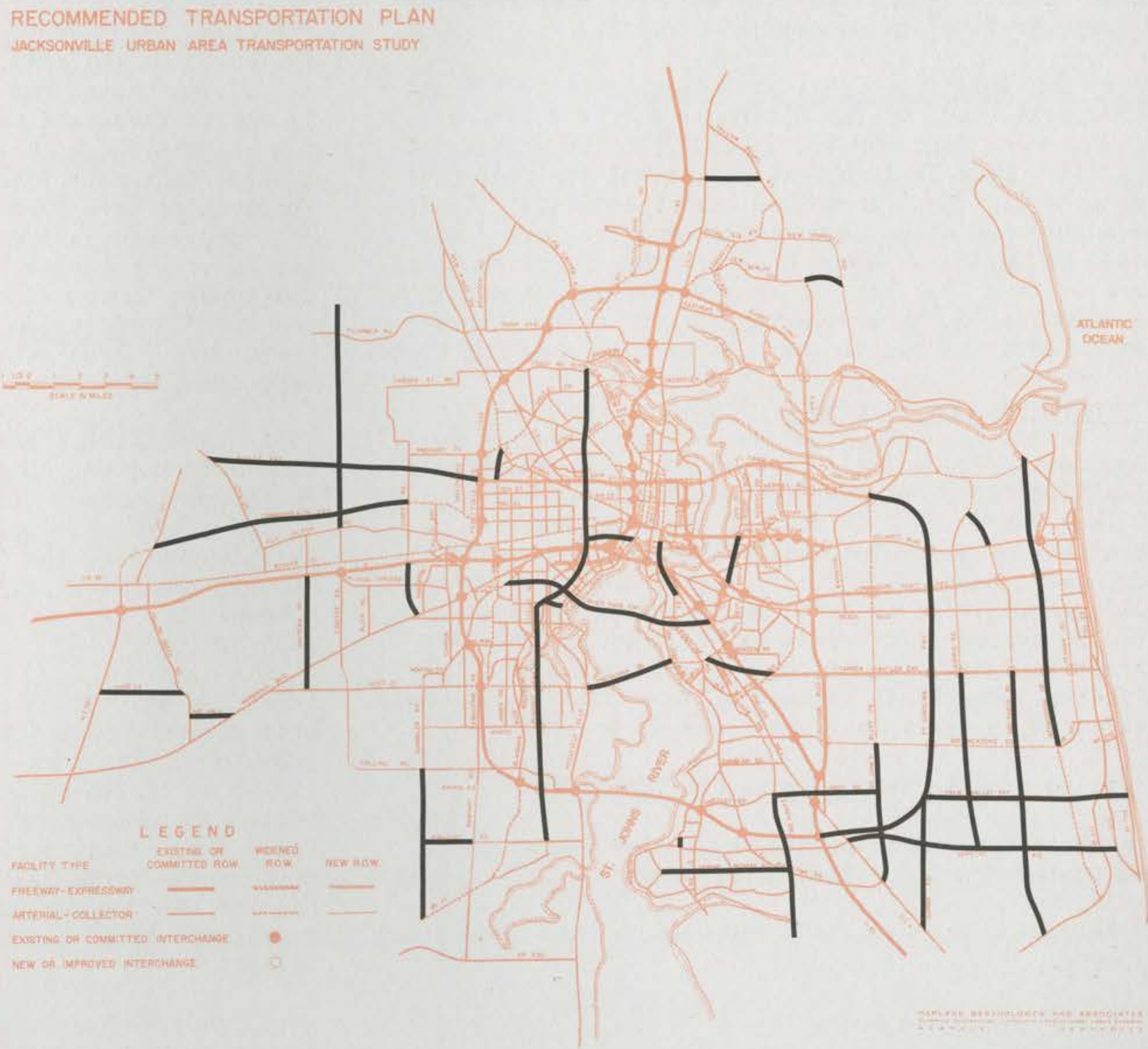
JACKSONVILLE URBAN AREA MASS TRANSPORTATION STUDY

FOR: THE CONSOLIDATED CITY OF JACKSONVILLE
BY: JACKSONVILLE AREA PLANNING BOARD

TITLE: **MODIFIED HIGHWAY PLAN USED FOR ALTERNATE TEST 3**

LEGEND:

HIGHWAYS NOT TESTED



CONSULTANTS:
CAMPBELL, FOXWORTH AND PUGH, INC.
REYNOLDS, SMITH AND HILLS
IN ASSOCIATION

Table 15

ESTIMATED CAPITAL COST OF TRANSIT ALTERNATIVE TESTS
1975 - 2005 (DOLLARS IN MILLIONS)

CAPITAL COSTS	ALTERNATIVE TEST 1 ALL-BUS (HIGH LEVEL OF SERVICE)	ALTERNATIVE TEST 2 FIXED-GUIDEWAY FEEDER BUSES (HIGH LEVEL OF SERVICE)	ALTERNATIVE TEST 3 FIXED-GUIDEWAY FEEDER & EXPRESS BUSES (LOW LEVEL OF SERVICE)
Direct	$ 91.4	$ 475.1	$328.7
Indirect	5.8	44.9	32.9
Contingency	4.6	26.7	20.1
SUB-TOTAL (January, 1974 Dollars)*	101.8	546.7	381.7
Additional Vehicles After 1984	90.0	60.0	36.0
Inflationary Costs**	110.7	396.9	275.6
TOTAL	$302.5	$1,003.6	$693.3

*Estimates based upon assumed development phasing program for each alternative.

**Construction costs inflated 10%, R/W 10%, rapid transit vehicles 5%, buses 3%, other costs 5%; all compounded annually.

Table 16

TOTAL COST TO JACKSONVILLE
FOR TRANSIT ALTERNATIVES
1975 - 2005
(DOLLARS IN THOUSANDS)

	ALTERNATE TEST 1	ALTERNATE TEST 2	ALTERNATE TEST 3
Costs			
Capital*	$ 302,500	$1,003,600	$ 693,300
Operation**	1,865,530	1,498,409	749,601
Total Costs	$2,168,030	$2,502,009	$1,442,901
Passenger Revenue			
Revenue (Fares Only)***	529,800	1,215,350	545,100
A. Net Cost	$1,638,230	$1,286,659	$ 897,801
Federal and State Share of Capital Costs			
Federal (80%)	242,000	802,880	554,640
State (10%)	30,250	100,360	69,330
B. Total Funding Share	$ 272,250	$ 903,240	$ 623,970
Total Cost of Jacksonville	$1,365,980	$ 383,419	$ 273,831

Table 16
(Continued)

* A. Includes replacement of one-third of bus fleet every four (4) years.
B. January, 1974 Dollars plus inflation rates of 10% for construction costs, 10% for right-of-way, 5% for rapid transit vehicles and other costs, and 3% for bus vehicles compounded annually.

** January, 1974 operating costs inflated at 5% compounded annually.

*** 25 cent fare in 1975; increased to 30 cents in 1985, 35 cents in 1990 and 40 cents in 2000 (fare increases at about 2% compounded annually).

The total capital and operating cost for this alternative is estimated at $1,638,000,000 for the thirty-year period. It should be pointed out also that in order to maintain the projected patronage levels on the all-bus system the relatively high level of service (frequent headways) would have to be maintained. Hence, if the number of buses were reduced in order to decrease the operating cost, there would be a corresponding decrease in ridership and revenue.

Alternative Test 2 would cost an estimated $1,287,000,000 during the 1975-2005 period, or over 20 percent less than the all-bus alternate test. It is expected that if this extensive transit system were constructed and operated at the high level of service (frequent headways) as tested, the resultant higher patronage would nearly pay for the system's operation in the long run. Thus, the primary cost concern for this alternative is the higher capital expense.

The estimated total capital and operating costs for Alternative Test 3 would be a little under $900,000,000 over the thirty-years. Since the number of buses operating would be reduced the operating cost would be much lower than the other alternatives.

It should be pointed out, however, that the patronage would still be about the same as the all-bus alternative and the anticipated operating subsidy would be substantially less that the all-bus system. Thus, the major cost consideration of Alternative Test 3 would also be the capital cost.

Considering the assumptions that the federal government, under the UMTA program, and the state, through the Department of Transportation, could contribute 80 percent and 10 percent of the transit capital costs, respectively, and that there would be no federal or state operating subsidy, Alternative Test 3 would result in the least total cost to Jacksonville over the 30-year period. The average annual cost including inflationary costs to Jacksonville for Test 1, Test 2 and Test 3 is $45.53 million, $1.28 million and $0.91 million, respectively.

Transit Service Potential - Another major consideration in determining the most desirable transit system for Jacksonville is the system's potential passenger capacity carrying as well as the system's capability of providing minimum travel times. The conventional bus has the advantage of route flexibility and the potential of providing more direct access to trip destinations. However, buses which must mix with other vehicular traffic and which stop frequently to pick-up or discharge passengers provide relatively slow service. Preferential bus treatment can help to increase bus travel speeds but only to the downtown area for the most part. Even with special treatment express buses would still average no higher than between 24 and 27 m.p.h.

Buses also have a rather limited capacity to carry passengers. If transit demands are not too great (less than 6,000 passengers per hour per direction) busways could adequately accommodate the demand, although the travel speed would be relatively slow as mentioned above and passenger comfort may be a problem. While the Jacksonville Downtown Plan recommends an exclusive transitway for buses in the CBD the actual number of buses utilizing the transitway will be limited by the capacity of this roadway to handle the buses, the traffic signalization phasing, and private vehicle and bus turning movement conflicts.

It is well recognized that the major concern of most people when considering transit service is convenience and time. The major advantage of a fixed-guideway rapid transit system is its capability of providing fast vehicle travel speeds. Station spacing, dwell times, acceleration and deceleration rates, and vehicle top speed are the critical variables which affect the average travel speed of rapid transit vehicles. For example, the Alternative Test 2 rapid transit vehicles averaged 46 m.p.h. largely due to the 1.7 mile average station spacing. The one-mile spacing of stations in Alternative Test 3 contributed to the reduced vehicle travel speed of 33 m.p.h.

Another primary advantage of the fixed-guideway rapid transit system is its ability to adjust to changing transit demands over time to accommodate more or less passengers. For instance, the seating and standing capacity of the rapid transit vehicle and the number of vehicles per train can be readily changed. The frequency of rapid transit service (headways) can also be adjusted to accommodate a higher or lower passenger demand. This capability of increasing the system's carrying capacity is particularly important in an urban area which is expected to grow significantly in the future.

Reduction of Future Highway Needs - The recommended JUATS Streets and Highways Plan was developed to a great degree without any detailed transit planning. Although a future transit system was assumed and a predetermined percentage of person-trips were assumed to use the transit system, the distribution of these trips throughout the region did not take into account desirable route alignments, station and bus stop locations and frequency of service. These factors are critical in the determination of potential number of transit riders and the distribution of these transit trips within the urban area.

The patronage estimate for each alternative transit test clearly revealed that the greatest potential for transit usage are those trips made to and from the downtown area and from one area to another area passing through the Downtown. It is this portion of daily traffic which contributes most toward traffic congestion and it is also this traffic demand which transportation planning must direct itself.

The need for additional streets and highways and improvements to existing facilities will continue. However, the location of new roadways will be a matter of debate and future public opposition to new major highways in dense urban areas is likely to intensify. The public hearing process, environmental impact studies, and financing problems can be expected to greatly delay construction of roadways directed at accommodating central city mobility demands.

Part of the evaluation of the alternative transit system tests involved an estimate of the average number of weekday and peak hour person trips crossing the St. Johns River (excluding trips across the Dames Point Freeway) which would be diverted by transit in 1990. (See Table 17). The conclusion reached was that all of the proposed bridges (21 traffic lanes) in the JUATS Streets and Highways Plan would be needed to serve the anticipated 1990 traffic demands across the St. Johns River with the all-bus transit alternative and under the land use assumptions tested. The number of person-trips in the peak hour and peak direction was 44,500 for the all-bus system. About 30 percent or 13,300 could be diverted to the all-bus system. That would mean that approximately 25,000 private vehicles would still be crossing the river during the peak hour and peak direction. This would require about 21 traffic lanes in one direction for a level of service C. Hence, the all-bus system would not be expected to reduce the need for all of the proposed bridges in the JUATS highway plan. In addition, the number of buses entering and leaving the CBD during peak travel hours would number almost 1,000. This volume of buses would require an extensive network of exclusive right-of-way and preferential street treatment for buses.

The Test 2 transit alternative could attract an estimated one-half of the expected peak hour traffic demand crossing the St. Johns River or 20,400 persons. There would still be about 17,000 private vehicles being used to cross the river in one direction during the peak hour. Thus, about 14 bridge traffic lanes in one direction across the river would still be required.

Alternative Test 3 could attract an estimated one-third of the peak hour person trip demand crossing the river or about 15,000 people. The remaining private vehicle demand would require 18 traffic lanes in one direction.

Table 17

ESTIMATED 1990 PERSON TRIPS ACROSS ST. JOHNS RIVER DIVERTED BY ALTERNATIVE TRANSIT TEST SYSTEMS

TRANSIT SYSTEM TESTED	TOTAL PERSONS CROSSING ST. JOHN'S RIVER DURING PEAK HOUR IN ONE DIRECTION	PERSONS DIVERTED BY TRANSIT	REQUIRED NUMBER OF BRIDGE TRAFFIC LANES FOR VEHICLE TRAFFIC
Maximum All-Bus Test 1	44,500	13,300	21
Maximum Fixed-Guideway Test 2	41,000	20,400	14
Fixed-Guideway Test 3	45,000	15,000	18

Land Use Development Potential

One of the principle objectives of this mass transportation study was to integrate transit and land use planning so that the transit system can play a major role in guiding future growth and redevelopment.

Experience in cities with rapid transit show conclusively that an effective rapid transit system can act as a catalyst for land development. With proper planning, better utilization of land, conservation of the natural environment and the reduction of urban sprawl can be the direct results of a rapid transit system. Furthermore, rapid transit can play a key role in the revitalization of older portions of the city which must be rebuilt.

The areas around many of the rapid transit stations can be developed as an integrated unit featuring multiple-family and commercial uses. Proper planning from both private and public sectors of the community can result in significant residential and office development located within walking distance of rapid transit stations. Thus, the system becomes more accessible with resulting higher usage.

Historically, the conventional bus has had very little impact on the determination of land use developments and the distribution of growth in urban areas. There is little indication that this trend can be altered and thus, the future growth of Jacksonville is not expected to be effected by bus transit. The one possible exception could be the short-term growth of the Downtown Area which will require greatly improved bus service if it is to prosper and expand.

Conversely, the catalytic effect of rapid transit on land development in downtown areas have been evidenced in Montreal, Toronto, and San Francisco, where there has been a tremendous residential and commercial development adjacent to and within proximity of the modern rapid transit stations.

Downtown Area Development Potential

The Plan for Downtown Jacksonville (CBD) was formally adopted on January 12, 1971 by the Jacksonville City Council. The major elements of the plan call for concentration of office and retail activities within the CBD core area. It is envisioned that the Downtown will become not just a place to work, but the place to work, entertain and visit. Office towers are already rising, hotel and convention facilities are planned, and numerous office, commercial and entertainment facilities are in the planning stages.

Of paramount importance to the Plan is the provision of adequate transportation facilities to serve the future travel demands of downtown. It cannot be over emphasized how vital mass transit is to the achievement of the Plan's goals and objectives. The potential number of private vehicles going Downtown by 1990, for example, will be nearly three times the present volume. If transit does not divert a substantial share (30 to 40 percent) of these potential vehicle trips, the Downtown Area's planned growth most likely will not be achieved as potential developments will locate in new activity centers elsewhere.

While it is strongly urged that bus service to the urban core be vastly improved in the short-term the most effective and ultimate solution is a high-speed, high-capacity fixed-guideway rapid transit system. With such a facility, the full growth potential of the Downtown Area could be attained with much of the vast amount of space now consumed by parking lots utilized for more productive and beneficial uses. More people could conveniently get into the Downtown Area because both highway and rapid transit access would be provided with a substantial net increase in the total Downtown Area transportation system's capacity.

Conclusion - The five primary considerations described above were the major determinants in the development of the recommended transit plan. The basic conclusion reached following the final evaluation of the alternative transit tests was that the long-range transit program for Jacksonville must include a medium-capacity, light-weight, fixed-guideway rapid transit system. This type of transit technology must form the "backbone" of the total transit system and buses must serve a secondary role or feeder function to the high-speed rapid transit system.

Chapter VII · Recommended Transit Plan

Based upon the results of the alternative test evaluations, work sessions with the Jacksonville Area Planning Board and the JUATS Technical Coordinating Committee, the recommended rapid transit system shown in Figure VII-1 was determined. The Plan includes 34 miles of a fixed-guideway rapid transit system with 33 stations, 65 route miles of express buses and 360 route miles of feeder buses. Transit vehicles including spares number 250 for the rapid transit system and 300 for the express and feeder bus systems.

The system is designed to provide a high level of service at a relatively high capacity. Emphasis is placed upon serving the Downtown Area and major corridor and/or centers outside the Downtown Area. It is designed to attract a substantial number of persons crossing the St. Johns River and those with destinations in high density corridors during peak periods of travel. It also provides a vast improvement in transit service for those persons who rely on public transportation such as the poor, elderly, handicapped and those without access to a private vehicle.

It would be premature to recommend a specific rapid transit technology at this time. More detailed engineering and design studies will be required after the system concept proposed in this study is adopted. Furthermore, transit technological advances are currently being made at a rapid rate and should be given detailed consideration just prior to engineering design. The final hardware and manufacturer should be selected on the basis of bids from a specific set of engineering specifications.

The general technology needed for the fixed-guideway system is a medium-sized, light-weight vehicle capable of adequately accommodating at least 14,000 passengers per hour in one direction and capable of expanding to 20,000. Thus, the light-weight steel-on-steel, rubber tired, air cushion or magnetic-levitated systems operating on fixed-guideways could accommodate the long-range needs of Jacksonville. Present candidate manufacturers include Ford, Westinghouse, WABCO, Transportation Technology, Dashaveyor, Krauss-Maffei (Transurban) and the Boeing Light-Rail Vehicle.

Recommended Service Standards

The service levels tested with the alternate transit systems provide a means of evaluating the relationship of service and patronage i.e. as service increases so does ridership. It was apparent from the transit tests that the final service standards selected for the recommended system must be truly competitive with other forms of urban travel in terms of overall travel time, costs, comfort, safety, and convenience if the rapid transit system is to achieve the patronage necessary to achieve its full potential.

Based on the alternative tests and analysis of existing operations in other cities, the recommended transit service standards were selected and are discussed below:

Headways - Headways of two minutes in peak hours, and eight minutes in off-peak hours are recommended for the rapid transit system. Both the peak and off-peak headways are within the general range of those on existing and planned rapid transit systems shown in Table 18.

The recommended headway standard for the express bus routes is 10 minutes and 20 minutes during peak and off-peak hours, respectively. The headways recommended for the feeder buses vary between 8 and 15 minutes during peak hours and 20 to 30 minutes during off-peak periods.

Station Dwell Times - The station dwell times selected for the rapid transit system take into account the different requirements for peak and off-peak hours at stations. The recommended dwell times are:

Fig. VII-1

JACKSONVILLE URBAN AREA MASS TRANSPORTATION STUDY

FOR: THE CONSOLIDATED CITY OF JACKSONVILLE
BY: JACKSONVILLE AREA PLANNING BOARD

TITLE: **1990 RECOMMENDED TRANSIT SYSTEM**

LEGEND:

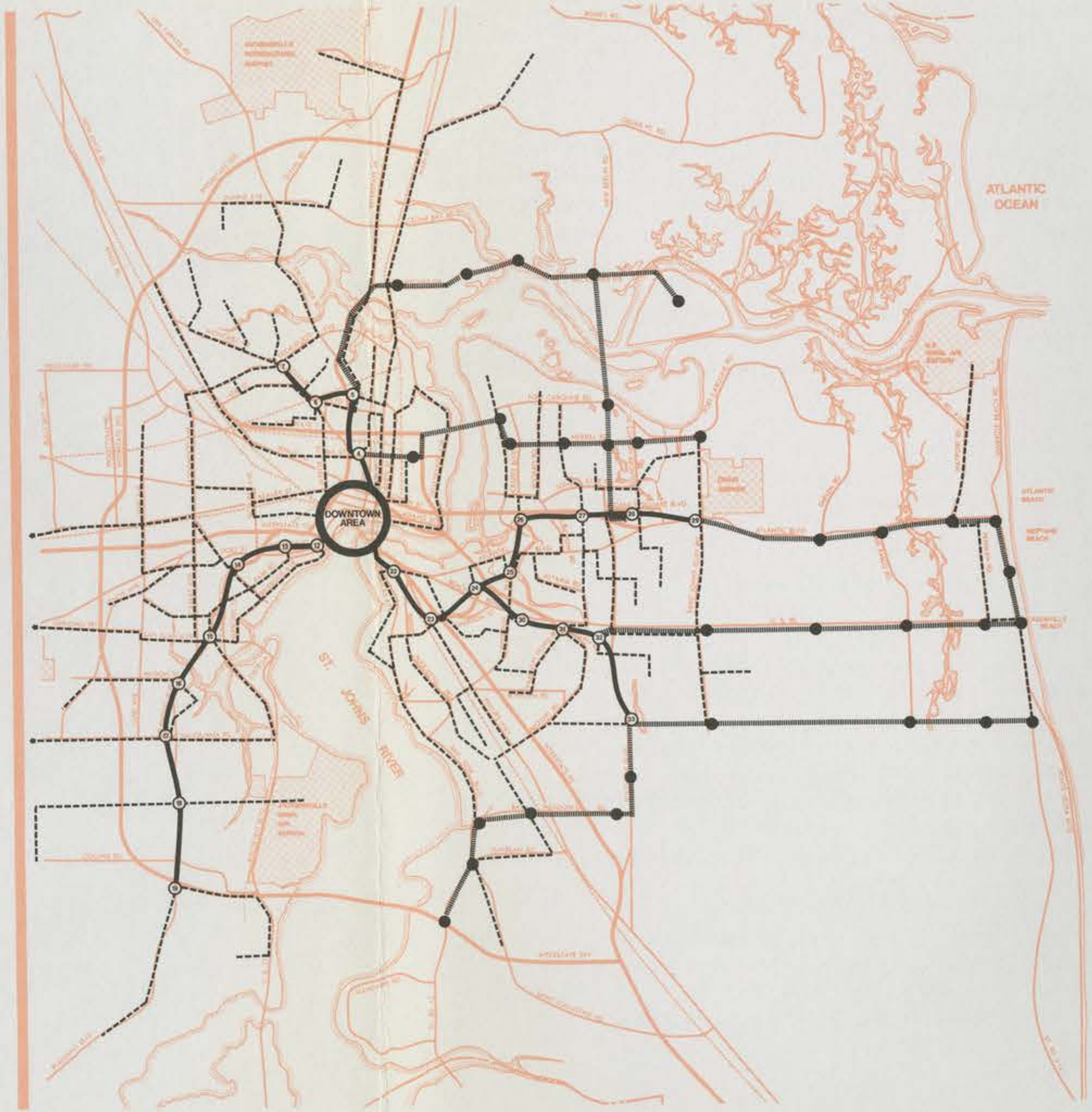
- FIXED GUIDEWAY ROUTE
- FIXED GUIDEWAY STATION
- EXPRESS BUS ROUTE
- EXPRESS BUS STATION
- FEEDER BUS

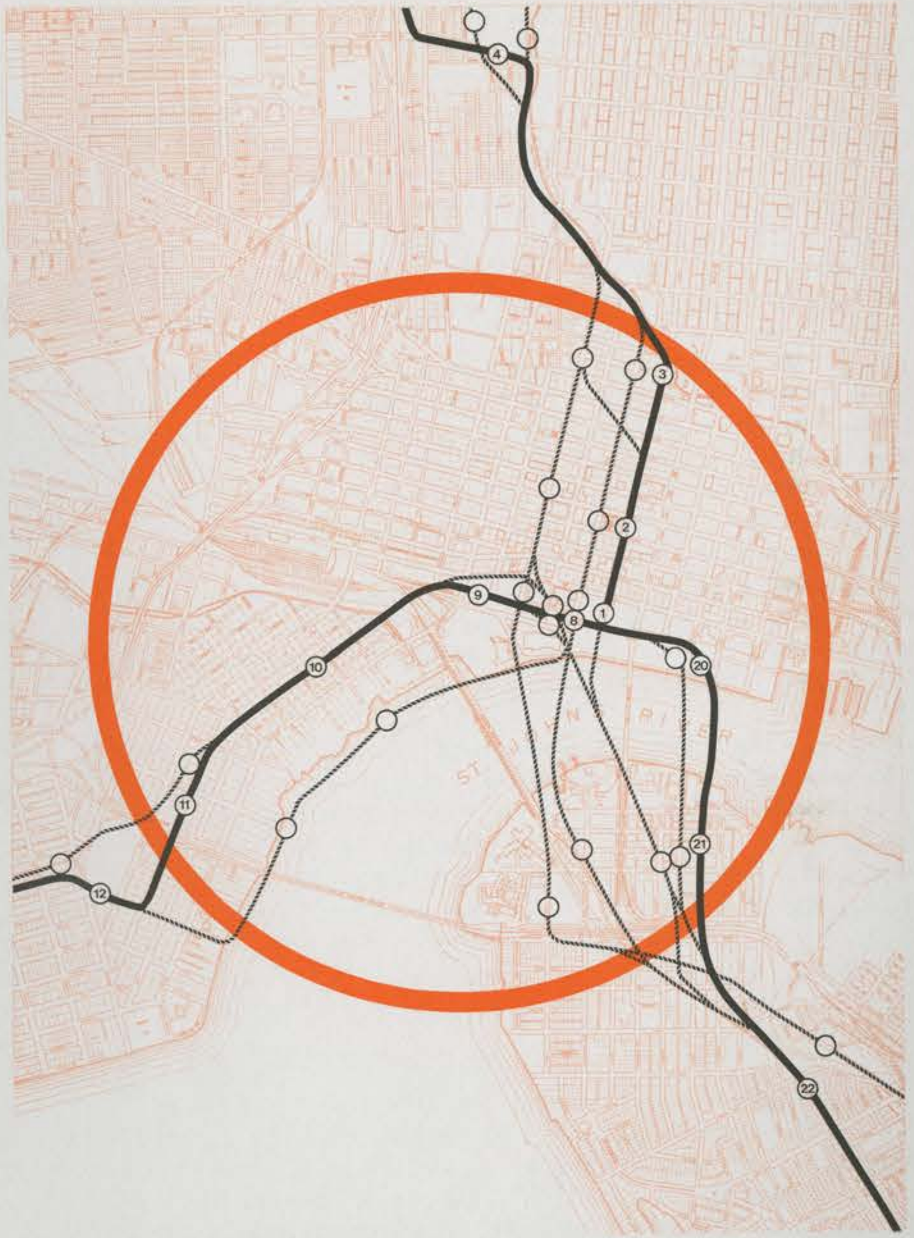
DOWNTOWN AREA

- PREFERRED ALTERNATIVE ROUTE

SCALE IN MILES: 0 1 2 3 4

CONSULTANTS:
CAMPBELL, FOXWORTH AND PUGH, INC.
REYNOLDS, SMITH AND HILLS
IN ASSOCIATION





DOWNTOWN AREA

Table 18

PEAK AND OFF-PEAK HEADWAYS
SELECTED RAPID TRANSIT SYSTEMS

CITY	Headways (minutes)[1] PEAK	OFF-PEAK
Tokyo	2.0 to 5.0	3.0 to 8.0
Chicago	1.9 to 4.2	3.7 to 7.6
Boston	2.0	8.0 to 9.0
Toronto	2.3	3.5
Montreal	2.0 to 5.0	4.0 to 6.0
Mexico City	3.0 to 3.8	3.8 to 7.7
San Francisco (BART)	1.5	15.0
Washington (WMATA)	2.0	3.0 to 12.0
London	2.0	3.0 to 5.0
Philadelphia	1.7 to 2.7	8.0 to 10.0
Cleveland	2.5 to 5.0	4.0 to 6.0
New York City	1.5 to 6.0	10.0 to 15.0
Buffalo (Buffalo Amherst Corridor)	2.0	7.0

[1] SOURCE: Statistics of Urban Public Transport by International Union of Public Transport, Brussels, 1968.

Station Type	Peak Hours (Seconds)	Off-Peak Hours (Seconds)
CBD	20	15
Urban	20	15
Suburban	10	10

These station dwell times reflect average conditions. Once the system begins operation the actual dwell times may vary depending upon patronage demands.

Vehicle Speed - The recommended maximum speed of the rapid transit vehicles is 65 m.p.h. and 60 m.p.h. for the express buses. Both the San Francisco and Washington rapid transit systems now under construction have top speeds of 75 m.p.h. The actual average speed of the system will vary in relation to station spacing, dwell times, maximum vehicle speed and acceleration and deceleration (vehicle performance standards). The recommended acceleration and deceleration rate is 3.0 m.p.h. per second.

Figure VII-2 indicates the station to station travel times for the recommended rapid transit system. For example from Station 7 north of the CBD to Independent Square Station 1 the travel time would be 8.9 minutes. From the Orange Park Station 19 it would take 17.8 minutes to reach the Riverfront CBD Station 8. The rapid transit travel speed over the entire system averages between 42 and 44 m.p.h

Transit Fares - It is recommended that an initial fare of 25 cents be charged on the entire rapid transit, express and feeder bus systems, with universal free transfers to and from all transit vehicles. For example, a passenger could use an express bus at the basic 25 cent fare and transfer to the rapid transit system and a CBD mini-bus free of charge. The fare structure should be reviewed annually after the rapid transit system is operational.

Parking - To maximize patronage free parking is recommended at suburban stations. No charge should be made for short-term parking to discharge or pick up rapid transit passengers who are driven to the station by others. Since feeder bus service is both difficult and expensive to provide in low-density outlying areas convenient and free parking must be provided at all suburban stations.

Fixed-Guideway Rapid Transit and Bus Service Coordination

The fixed-guideway rapid transit system forms the backbone of the mass transportation plan. It provides a high capacity and fast service that the majority of Jacksonville citizens have indicated they will support. The high-speed system must also be complemented and supplemented by a network of feeder and distributor bus systems. Not only would these buses "feed" or provide access to rapid transit stations, but would also provide cross-town and some radial service. Hence, the bus network forms an extension of the rapid transit system and substantially increases its service area.

The coordination of bus feeder systems with fixed-guideway routes is critical and should involve:

1. The elimination of the line-haul portions of existing bus routes whose function is absorbed by the rapid transit system and the rerouting of these lines to more effectively serve as feeders to rapid transit stations.

2. The establishment of new feeder or express bus routes in new areas expected to be developed in the future.

3. The compatibility of feeder and express headways with the rapid transit headways.

Fig. VII-2

JACKSONVILLE URBAN AREA MASS TRANSPORTATION STUDY

FOR: THE CONSOLIDATED CITY OF JACKSONVILLE
BY: JACKSONVILLE AREA PLANNING BOARD

TITLE: **TRAVEL TIME STATION TO STATION RAPID TRANSIT SYSTEM**

LEGEND:

- FIXED GUIDEWAY ROUTE
- FIXED GUIDEWAY STATION
- EXPRESS BUS ROUTE
- EXPRESS BUS STATION
- FEEDER BUS

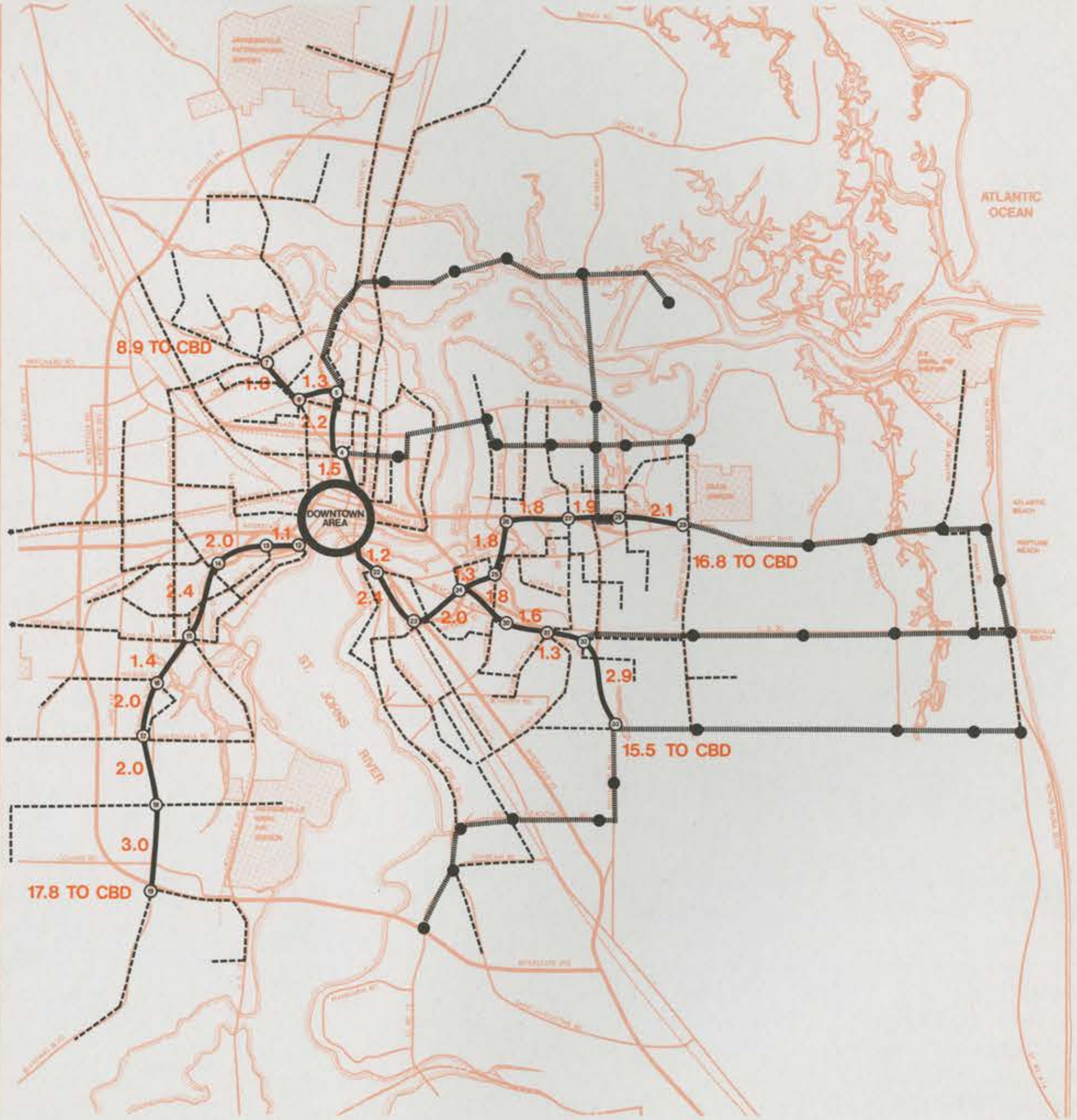
TIME IN MINUTES; INCLUDES DWELL TIME

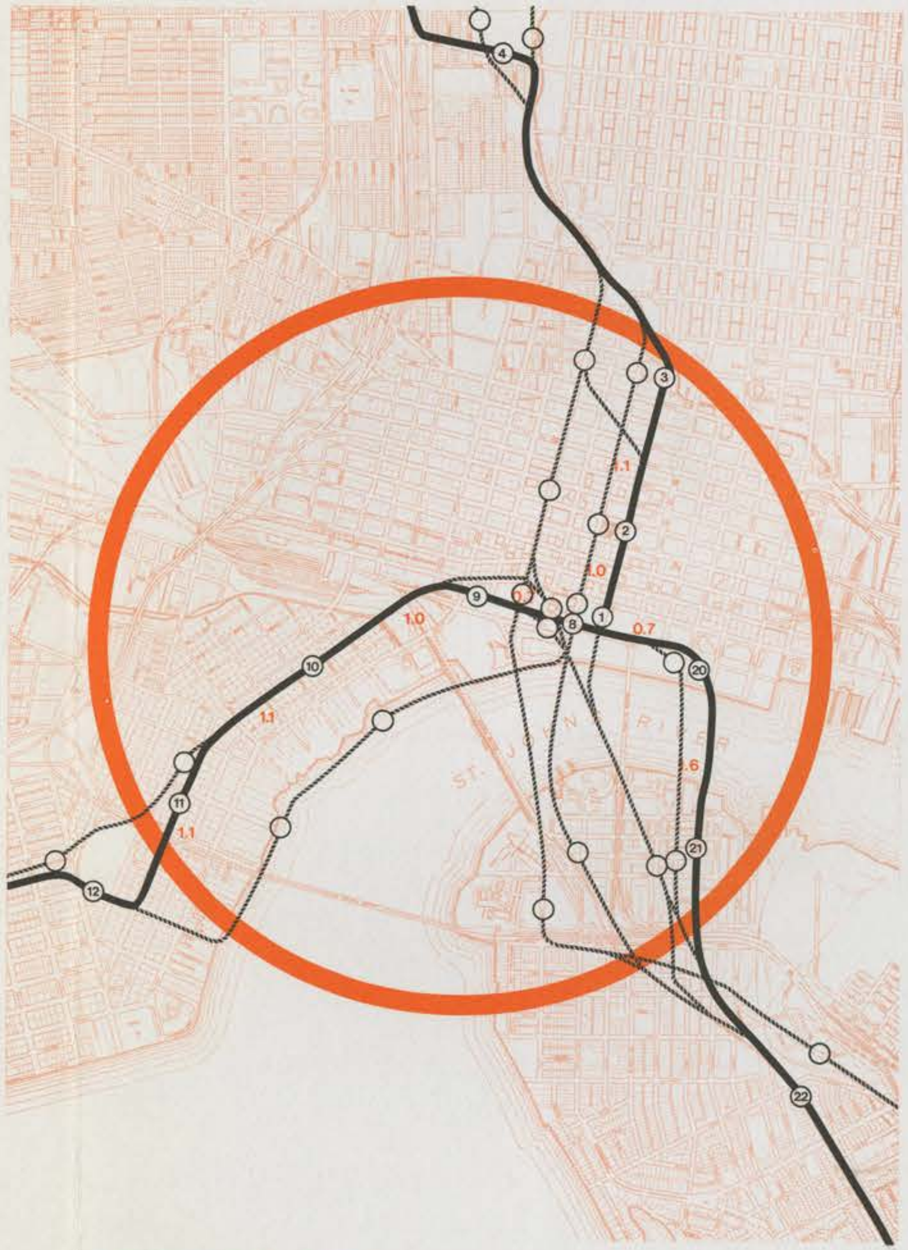
DOWNTOWN AREA

- PREFERRED ALTERNATIVE ROUTE

SCALE IN MILES: 0 1 2 3 4

CONSULTANTS:
CAMPBELL, FOXWORTH AND PUGH, INC.
REYNOLDS, SMITH AND HILLS
IN ASSOCIATION





DOWNTOWN AREA

Adequate, close-by, and convenient facilities designed to involve minimum walking distance and time between the bus and the rapid transit platform should be provided at all stations served by buses.

Private Vehicle Access to Rapid Transit

It is expected that many passengers using the rapid transit system will arrive by private vehicle; thus convenient park-and-ride facilities are recommended. Adequate and convenient vehicular access will be very important at almost all stations and the design of parking facilities, circulation within them and ingress and egress must be carefully considered. In addition, consideration of the potential "kiss-n-ride" demand or those persons driven to a rapid transit station by their wives, husbands, or friends must be made. During the preliminary and final engineering and design of the rapid transit system all types of inter-modal transfers must be extensively investigated and design volumes established for each station.

Rapid Transit Alignment Corridors and Stations

The recommended 34 mile fixed-guideway rapid transit route alignment corridors and stations are shown on Figure VII-1. The network is composed of four corridors: the North Corridor, the Southwest-Riverside Corridor, the Southside-Arlington Corridor, and the Southeast Corridor.

North Corridor - This 5.0 mile route begins in the south CBD and runs through the core area of downtown to the planned Florida Junior College (Downtown Campus). Several alternate routes from the CBD northward are indicated on the CBD portion of Figure VII-1. The preferred route is indicated. Continuing north the corridor route generally parallels the southern and western edges of Hogan's Creek until connecting into the University Hospital and Medical Center near 8th and Jefferson. The corridor then follows I-95 to the Gateway Shopping Center. It then crosses I-95 and follows the Seaboard Coastline Railroad before turning northwestward to the last station near Edgewood Avenue and Moncrief Road.

The North Corridor's basic functions are:

1) To provide relatively high-speed transit service to the Downtown Area.

2) To interconnect a major retail shopping center, a major hospital and medical center, a major educational center and the regional core area with one another.

3) To provide a high level of service to the low income groups in the area.

4) To interface with the other rapid transit corridors at a central station in the south CBD area.

Rapid transit vehicles or trains would shuttle back and forth with a directional switch located at each end station.

Stations - Seven stations are recommended along the North Corridor with an average spacing of 0.7 miles. The general locations beginning in the downtown are:

Station 1:	Laura and Water Street (Independent Square).
Station 2:	Laura and Monroe (Hemming Park).
Station 3:	Pearl Street and Orange (Florida Junior College).
Station 4:	8th and Jefferson (Medical Center).
Station 5:	Norwood Avenue and 44th Street (Gateway Center).
Station 6:	Moncrief Road and the Seaboard Coast Line Railroad (Golfair).
Station 7:	Edgewood and Moncrief (Forest Hills).

Stations 1 and 2 are CBD walk-in stations with minibus feeder service while some kiss-n-ride facilities should be provided. Private vehicle access should be discouraged. The former station would be incorporated with Station 8 to form the central station for the total system. Florida Junior College (Station 3) should be primarily served by feeder and mini-buses and walkins would be encouraged. Private vehicle access should be limited. Medical Center (Station 4) should be served by many feeder bus routes as well as the Express Route D from the Fort Caroline Area crossing the proposed Fort Caroline Freeway bridge.

Stations 5, 6, and 7 should be designed to accommodate both feeder buses and private vehicles with adequate parking. Gateway Center (Station 5) should also be served by the Express Bus Route C which serves the planned Imeson Industrial Center and the Offshore Power Systems employment center on Blount Island. The Jacksonville International Airport bus route should also serve the Gateway rapid transit station.

Southwest-Riverside Corridor - This 12.0 mile rapid transit link serves the densely populated and rapidly growing southwestern areas of Jacksonville. The corridor generally bisects this sub-region and provides a viable alternative means of travel. The continuing increase in traffic congestion and delays, due largely to limited capacity of roadways led to the Southwest-Riverside Corridor study and recommendation.

Beginning at the CBD near Laura, Water and Hogan Streets, this corridor parallels Water Street, turns south near Jefferson and runs between Park Street and Riverside Avenue. The route crosses I-95 at Oak Street, turns west at Post Street and parallels College Street to Roosevelt Boulevard. Using either the Seaboard Coastline Railroad or Roosevelt Boulevard rights-of-way, the corridor continues southward to approximately two blocks north of San Juan Avenue. Turning west it connects with Blanding Boulevard and continues south along Blanding Boulevard to near the I-295 Expressway.

The basic functions of the Southwest-Riverside Corridor are:

1. To provide a viable and efficient alternative means of travel to and through this heavily traveled area.

2. To provide equal access to the population of this sub-region.

3. To reduce the traffic demands placed upon the roadways serving the area thus reducing traffic congestion, delays and accidents.

4. To provide a catalytic effect upon specific areas with development and redevelopment potential.

5. To minimize the disruption of established, well-maintained and desirable residential and commercial establishments due to transportation facility improvements.

6. To provide efficient means of access to the rapidly growing residential and commercial developments taking shape in the southwest Downtown Area as well as the regional core area.

Stations - Twelve rapid transit stations are recommended along this corridor with an average station spacing of one mile. The general locations beginning in the CBD are:

Station 8:	Hogan and Water Street (Riverfront)
Station 9:	Broad and Water Street (Seaboard Coastline)
Station 10:	Magnolia and Jackson Street (Brooklyn)
Station 11:	Rosselle and Oak Street (Blue Cross-Blue Shield)
Station 12:	Post and Margaret Street (Five Points)
Station 13:	College and Stockton Street (Riverside)
Station 14:	Plymouth and Nelson (Murray Hill)
Station 15:	Hamilton and Shirley (Lake Shore)
Station 16:	Wilson and Blanding Boulevard (Cedar Hills)
Station 17:	Blanding and 103rd (Wesconnett)
Station 18:	Blanding and Morse Avenue (Duclay)
Station 19:	Blanding and I-295 Expressway (Orange Park)

The CBD and the Southwest CBD rapid transit stations would be basically walk-in type with no parking facilities. Stations 10 and 11 would also have feeder bus service. Stations 12 and 13 would be basically feeder bus stations with limited parking facilities. The remaining six suburban stations would be predominately "park-and-ride" and "kiss-and-ride" stations with some feeder bus service. The terminal station near the I-295 Expressway should be designed and integrated into a major commerical-office-and residential development proposed in the area.

The Jacksonville Naval Air Station, the Cecil Field Naval Air Station, the Florida Junior College (Cumberland Campus), the Roosevelt Mall Shopping Center and the Normandy Mall Shopping Center should all be provided feeder bus transit service to and from the fixed-guideway rapid transit system.

Southside-Arlington Corridor - This 11.5 mile corridor includes 10 stations with an average spacing of 1.15 miles. Beginning at the central twin stations in the CBD, the corridor extends to the southwest corner of the Government Center, turns south to cross the St. Johns River and penetrates the Southside CBD. The corridor passes over I-95 near Naldo Avenue, joins a railroad alignment and continues south. It turns west near Phillips Highway and Belair Road, passes north of the Phillips Plaza and then crosses over I-95. Its general northwestern alignment penetrates the Koger Office Park near Center Drive and Beach Boulevard. From the vicinity of Art Museum and Wood Avenues the corridor crosses over the Hart Bridge Expressway and runs to the general vicinity of Bartram Place and University Boulevard. It turns north and follows the alignment of University Boulevard to the Arlington Expressway near Cesery Boulevard.

The corridor continues toward the east utilizing the Arlington Expressway rights-of-way to Mill Creek where it turns slightly northward in order to serve the Regency Square Commercial and Office Center. Continuing eastward the corridor terminates near St. Johns Bluff Road and Atlantic Boulevard.

The basic functions of the Southside-Arlington Corridor are:

1. To substantially reduce vehicular traffic crossing the St. Johns River during peak periods of travel.

2. To provide an efficient alternative of travel to the urbanized area east of the St. Johns River.

3. To minimize the disruption of desirable residential and commercial areas which may result from transportation facility improvements.

4. To provide effective means of access to established and rapidly growing major activity centers outside of the downtown area.

5. To substantially alleviate traffic congestion and parking requirements in the total downtown area.

6. To minimize bridge requirements in the mid-1980's and beyond.

Stations - The general locations of the recommended ten rapid transit stations along the Southside-Arlington Corridor beginning in the CBD are:

Station 20:	Newman and Water Street (Government Center)
Station 21:	Prudential and Bugbee (St. Johns Place)
Station 22:	Atlantic and Perry (San Marco)
Station 23:	Phillips Highway and Belair Road (Phillips Plaza)
Station 24:	Boulevard Center Drive and Wood (Koger Office Park)
Station 25:	University and Bartram Place (Spring Glen)
Station 26:	Cesery and Arlington Expressway (Oak Haven)

Station 27: Townsend and Arlington Expressway (Arlingwood)
Station 28: Regency Square and Gilmore Heights Road (Regency)
Station 29: St. Johns Bluff and Atlantic Boulevard (Sandalwood)

The Government Center and Southside CBD stations are urban-type where only walk-in and feeder bus access is encouraged. No parking facilities related to rapid transit passengers are recommended. Station 22 is recommended for inclusion in the redevelopment of the adjacent areas and both feeder bus and private vehicle access are recommended but only a limited number of parking spaces should be constructed. Station 23 should act as a catalyst for redevelopment in addition to providing a means of travel to the major shopping center. Both feeder bus and long-term parking facilities are recommended at this station.

The Koger Office Park station should be a walk-in feeder bus and "kiss-n-ride" station. Only a limited amount of long-term parking should be provided. Station 25 is recommended to encourage a node of residential and commercial land uses in the area. Feeder bus service and parking facilities are recommended.

The Arlington-West Station 26 should be served primarily by feeder buses operating within the North and West portions of the Arlington area. Only a limited number of parking spaces should be provided. Station 27 near the Oaks Office Park should also be served by feeder buses.

The Regency Square rapid transit station should be highly integrated into the commercial and office uses existing and planned for this major activity center. Persons arriving via rapid transit should be able to walk conveniently to major shopping facilities and office complexes. Access to the station should be provided conveniently by feeder buses and possibly by an internal system of mini-buses and/or "people-mover system". An express bus route is recommended to run from the Regency station to Blount Island crossing the proposed Dames Point Freeway Bridge.

The suburban station 29 would be principally a park-and-ride station with some feeder service. Express buses from the beaches would provide additional access to this terminal station. Persons could take an express bus to this station and reach any other rapid transit station with no more than one additional transfer.

Southeast Corridor - This 5.5 mile corridor is an addition to the Southside-Arlington rapid transit corridor and includes four stations with a average spacing of about 1.4 miles. The corridor generally follows a southeastern alignment beginning at the Koger Office Park Station 24. After crossing over the Hart Bridge Expressway overpass connection near the Little Pottsburg Creek the corridor parallels the expressway rightsof-way to near University Boulevard. It turns south following the alignment of Beach Boulevard to just west of Southside Boulevard. It then turns south along Southside Boulevard until it terminates in the northeastern quadrant of the J. Turner Butler Expressway interchange.

The primary functions of this corridor are:

1. To relieve traffic along Beach Boulevard as well as total traffic crossing the St. Johns River.

2. To provide an effective alternative means of travel equally accessible to most persons expected to be living in the southeaster portions of Jacksonville, Jacksonville Beach and southern beach areas.

3. To extend the regional service aspects of the total rapid transit system.

Stations - The general locations of the recommended four stations along this corridor are:

Station 30: Beach and Huffingham (San Souci)
Station 31: Beach and Parental Home Road (Grove Park)

Station 32: Beach and Southside Boulevard (Southside Estates)
Station 33: Southside and J. Turner Butler Expressway

Stations 30 and 31 are recommended to be served by feeder buses and should have considerable parking facilities. Stations 32 and 33 are recommended to be park-and-ride type stations with feeder and express bus service. The latter station should be highly integrated with a planned major commercial-office-residential development as well.

Proposed Downtown People-Mover System Interface

The Jacksonville Downtown People-Mover Study[1] recommended a 2 mile grade-separated, fixed-guideway, automatically controlled, medium-sized transit system. This study also stressed that "without an aggressive transit improvement program resulting in an effective surface bus system and some efficient form of regional rapid transit system, the growth of the entire downtown area, particularly the CBD, is unlikely to reach its full potential". The study further acknowledges that the proposed people-mover system was essentially independent of a regional system. However, extensions, additions, and/or modifications to it are highly dependent on a regional transit system.

Until preliminary engineering studies are conducted no definite recommendation as to its interface with the recommended rapid transit system can be made. One made at this stage would indeed be premature. There are, however, four basic thoughts concerning the proposed fixed-guideway people-mover system in the downtown:

1. The initial stage of the recommended fixed-guideway rapid transit system could be the proposed people-mover system route from Water Street north to the Florida Junior College with appropriate station site and size modifications.

2. The people-mover could be a CBD distribution and collection system for the regional rapid transit system and serve as an extension of this latter system.

3. The people-mover system would not be necessary if the recommended rapid transit system were developed, and

4. The people-mover system could become an extension of the all-bus system (Phase I) until the long-range rapid transit system is developed.

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[1] Jacksonville Downtown People-Mover Study, Daniel, Mann, Johnson and Mendenhall and Reiff-Fellman & Associates, February, 1973.

Chapter VIII · Patronage, Operating Cost and Revenue

Utilizing computerized traffic projection and modal split techniques, the average weekday patronage on the recommended Phase I All-Bus System in 1980 and the recommended Phase III Rapid Transit System in 1990 was determined.[1] Land use data by traffic analysis zones, prepared by the Jacksonville Area Planning Board, and a modified 1990 JUATS Streets and Highways Plan shown in Figure VIII-1 developed by the consultants and approved by the JUATS Technical Coordinating Committee for testing purposes, were all utilized as inputs to these patronage determinations. The recommended service standards were important factors in determining the patronage estimates. Utilizing these patronage estimates and related data, passenger revenue and operating cost estimates were determined from 1975 to 1990.

Recommended Plan Patronage

The recommended Phase I or All-Bus Transit System is expected to attract 93,000 passengers each weekday or about 26,970,000 annually in 1980. As shown in Table 19 the estimated weekday and annual patronage on the transit system for each year from 1975 to 1990 reveals that the comparatively high speed service provided by express buses and the recommended rerouting and preferential treatment of buses in the downtown is expected to at least double current ridership. Patronage is estimated to increase by more than 10 percent annually from 1975 to 1980. It should be pointed out, however, that these estimates are largely based upon an aggressive and effective transit program which includes more frequent and faster service than at present, and marketing.

The projected average weekday patronage on the 1980 express bus routes is shown on Figure VIII-2. Those express bus routes providing service across the St. Johns River are projected to carry 23,300 passengers over the river on an average weekday. The two southwest express buses combined would carry about 9,140 passengers entering, leaving or passing through the Downtown Area, while the northern express bus routes would carry another 7,710. The maximum total two-way passenger volume in the CBD for the express buses would be 21,770.

[1]The Transit Phasing Program is presented in Chapter x.

By 1981 when the Phase II transit system or initial 23.5 miles of the recommended fixed-guideway system is operative, total transit ridership is expected to total 120,000 persons on an average weekday. This would be approximately two and one-half times the ridership today.

During the first year of full operation of the recommended 34-mile rapid transit system (1985) the number of transit riders is expected to increase to about 193,500 each weekday or over 56,000,000 for the year. A modest increase in ridership should continue thereafter. In 1990 256,000 weekday transit trips are estimated on the recommended system. The annual patronage for that year totals 74,260,000 or almost 6 times the number of transit riders who used the bus service in 1974.

1990 Rapid Transit Corridor Ridership - Figure VIII-3 shows the 1990 estimated passenger volumes along the rapid transit corridors.

North Corridor - Estimated two-way passenger volumes between rapid transit stations along this corridor range from 20,700 at the northern end to 56,000 in the CBD. The number of transit person trips (arrivals and departures) at each rapid transit station along this route are given below:

Station	Total Weekday Passenger Arrivals and Departures
1	44,615
2	8,200
3	10,725
4	18,870
5	14,625
6	7,940
7	20,740
TOTAL	125,715

Fig. VIII-1

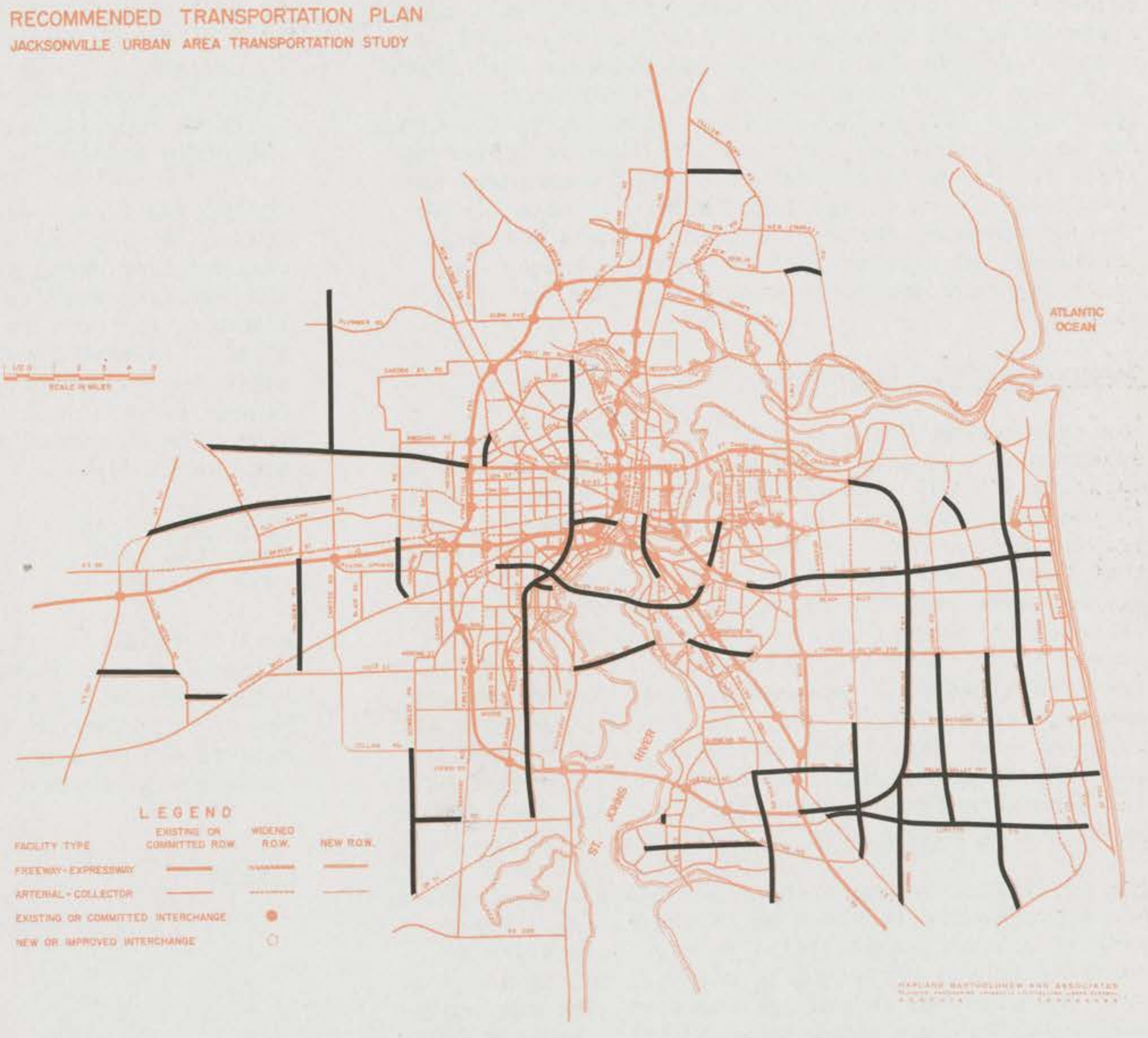
JACKSONVILLE URBAN AREA MASS TRANSPORTATION STUDY

FOR: THE CONSOLIDATED CITY OF JACKSONVILLE
BY: JACKSONVILLE AREA PLANNING BOARD

TITLE: **MODIFIED HIGHWAY PLAN USED FOR TESTING RECOMMENDED TRANSIT SYSTEM**

LEGEND:

— HIGHWAYS NOT TESTED



CONSULTANTS:
CAMPBELL, FOXWORTH AND PUGH, INC.
REYNOLDS, SMITH AND HILLS
IN ASSOCIATION

Table 19

ESTIMATED WEEKDAY AND ANNUAL PATRONAGE ON
RECOMMENDED TRANSIT SYSTEM
1975 - 1990

YEAR	ESTIMATED WEEKDAY PATRONAGE		ESTIMATED ANNUAL PATRONAGE (1)	ANNUAL INCREASE	% INCREASE
		Phase I			
1975	50,000	Express Bus, Local Bus (rerouting system)	14,500,000	-	-
1976	55,500		16,100,000	1,600,000	11.0
1977	62,300		18,070,000	1,970,000	12.2
1978	70,400		20,416,000	2,346,000	13.0
1979	80,900		23,460,000	3,044,000	14.9
1980	93,000		26,970,000	3,510,000	15.0
		Phase II			
1981	120,700	23.5 miles fixed-guideway rapid transit with express and feeder buses	35,003,000	8,033,000	29.8
1982	145,400		42,166,000	7,163,000	20.4
1983	162,600		47,154,000	4,988,000	11.8
1984	175,400		50,866,000	3,712,000	7.9

Table 19
(Continued)

YEAR	ESTIMATED WEEKDAY PATRONAGE		ESTIMATED ANNUAL PATRONAGE (1)	ANNUAL INCREASE	% INCREASE
		Phase III			
1985	193,500	Recommended Transit Plan 34 miles fixed-guideway rapid transit with express and feeder buses	56,115,000	5,249,000	10.3
1986	205,000		59,450,000	3,335,000	5.9
1987	215,800		62,582,000	3,132,000	5.3
1988	228,600		66,294,000	3,712,000	5.9
1989	243,400		70,586,000	4,292,000	6.5
1990	256,000		74,240,000	3,654,000	5.2

(1) a) Estimate based upon recommended transit development phasing program.
b) Excludes transfers and charter ridership.
c) Saturday transit ridership and Sunday and Holiday ridership is estimated at 40 and 30 percent of the average weekday ridership, respectively.

Fig. VIII-2

JACKSONVILLE URBAN AREA MASS TRANSPORTATION STUDY

FOR THE CONSOLIDATED CITY OF JACKSONVILLE
BY JACKSONVILLE AREA PLANNING BOARD

TITLE: **1980 PATRONAGE RECOMMENDED PHASE I TRANSIT SYSTEM 1974 - 1980**

LEGEND:

EXPRESS BUS ROUTE

EXPRESS BUS STATION

1,700 AVERAGE WEEKDAY VOLUME (TWO WAY)

DOWNTOWN AREA

EXPRESS BUS STOP

5,000 EXPRESS BUS PATRONAGE

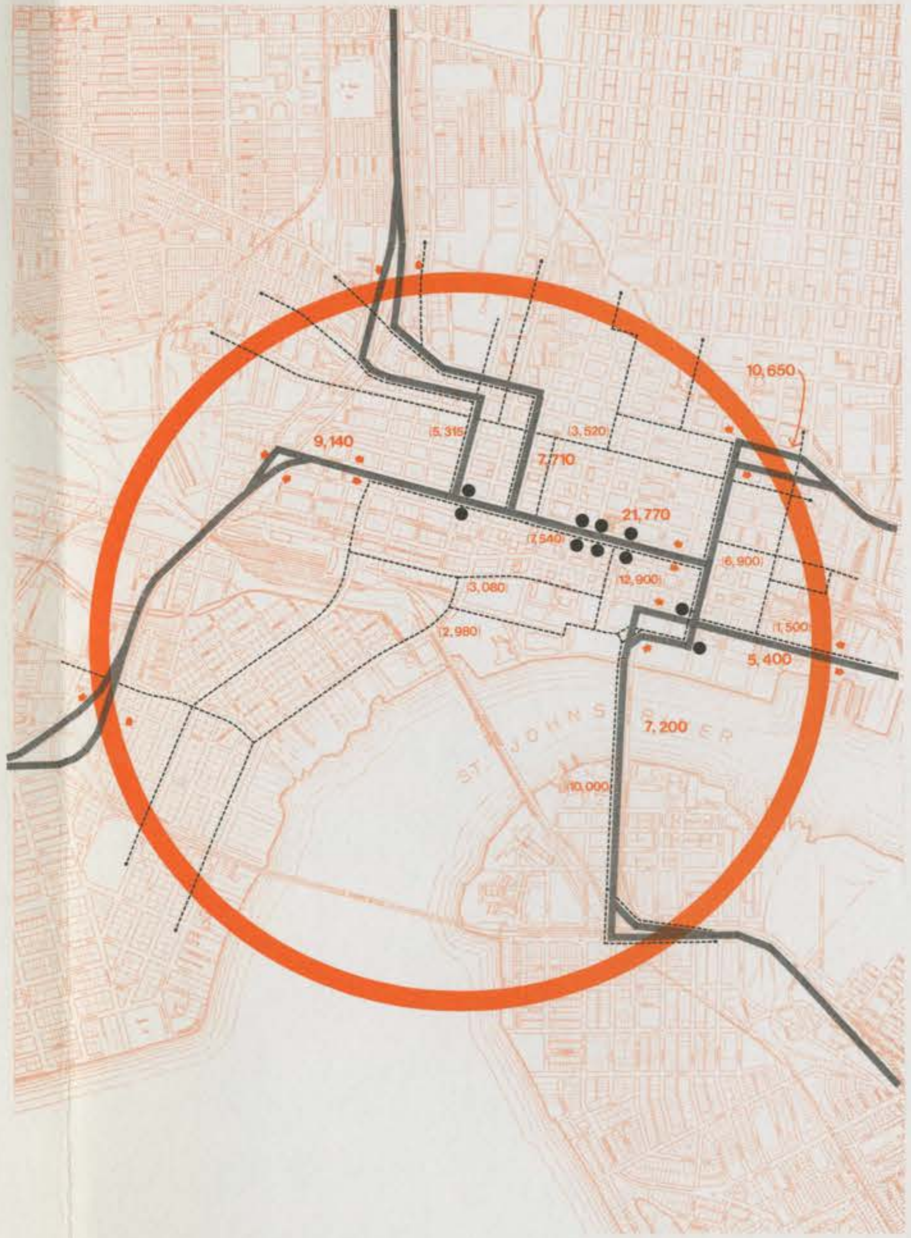
(1,700) LOCAL BUS PATRONAGE

SCALE IN MILES

0 1 2 3 4

CONSULTANTS:

CAMPBELL, FOXWORTH AND PUGH, INC.
REYNOLDS, SMITH AND HILLS
IN ASSOCIATION



DOWNTOWN AREA

Southwest-Riverside Corridor - The projected average weekday ridership along the corridor ranges from 18,900 at the southeast to 72,200 in the Southwest Downtown area. The total number of arrivals and departures at the stations along this rapid transit corridor total 196,900. The total for each station is given below:

Station	Weekday Passenger Arrivals and Departures
8	63,320
9	8,840
10	6,210
11	10,805
12	4,555
13	12,700
14	21,575
15	13,140
16	11,310
17	16,280
18	9,240
19	18,925
TOTAL	196,900

Southside-Arlington Corridor - Passenger volumes along the route increase from 14,500 near Regency Square to 86,100 across the St. Johns River. The total number of transit passenger arrivals and departures at the rapid transit stations on this corridor are 132,880. The number of passengers going to and from each station are given below:

Station	Weekday Passenger Arrivals and Departures
20	14,740
21	14,175
22	11,480
23	20,125
24	15,190
25	5,210
26	14,625
27	9,960
28	12,920
29	14,455
TOTAL	132,880

Southeast Corridor - Average 1990 weekday passenger rapid transit link volumes increase from 19,500 to 37,300 just before it joins the Southside-Arlington Corridor. Passenger arrivals and departures each weekday at the four stations total 45,140. Each station's total is given below:

Station	Weekday Passenger Arrivals and Departures
30	4,375
31	5,805
32	15,510
33	19,450
TOTAL	45,140

Peak Period Travel - One of the primary assets of the rapid transit system is its potential attraction of a significant number of persons traveling during peak periods. During the peak morning and afternoon rush hours, traffic congestion and delays are most severe. Hence, since the rapid transit system is capable of providing high-speed service, many people will find transit more convenient and less costly than driving and parking a private vehicle. Workers employed in the Downtown area and those traveling long distances will be especially attracted to the system.

As shown in Table 20 the estimated number of 1990 transit riders by hour for home-base work and all other trip purposes is significant in peak hours. The total number of person trips using all modes of travel is indicated as well. Figure VIII-4 graphically illustrates these estimates. About 10 percent or 286,300 of the average 1990 weekday person trips are estimated to begin during the 7:00 to 8:00 A.M. hour. An estimated 23.3 percent or 66,800 of these people would use the recommended transit system as their principal mode of travel during this peak period. Many will drive or be driven to a park-and-ride station initially before riding rapid transit. Of the 125,000 home-based work person trips beginning during the peak morning hour an estimated 38 percent would use transit

Fig. VIII-3

JACKSONVILLE URBAN AREA MASS TRANSPORTATION STUDY

FOR THE CONSOLIDATED CITY OF JACKSONVILLE
BY JACKSONVILLE AREA PLANNING BOARD

TITLE: **1990 PATRONAGE RECOMMENDED PHASE III TRANSIT SYSTEM 1985-1990**

LEGEND:

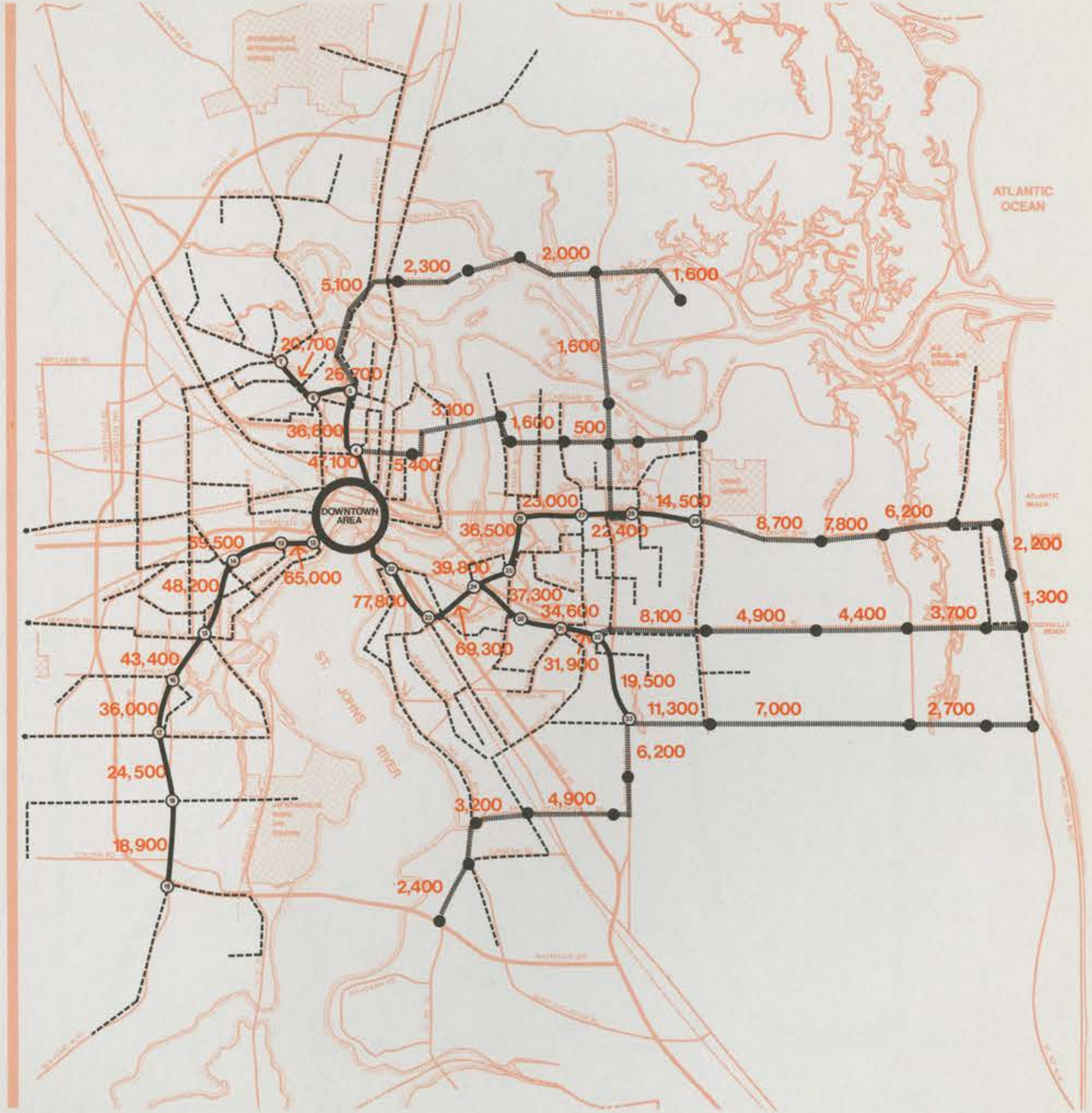
- FIXED GUIDEWAY ROUTE
- FIXED GUIDEWAY STATION
- EXPRESS BUS ROUTE
- EXPRESS BUS STATION
- FEEDER BUS
- 67,100 AVERAGE WEEKDAY VOLUME (TWO WAY)

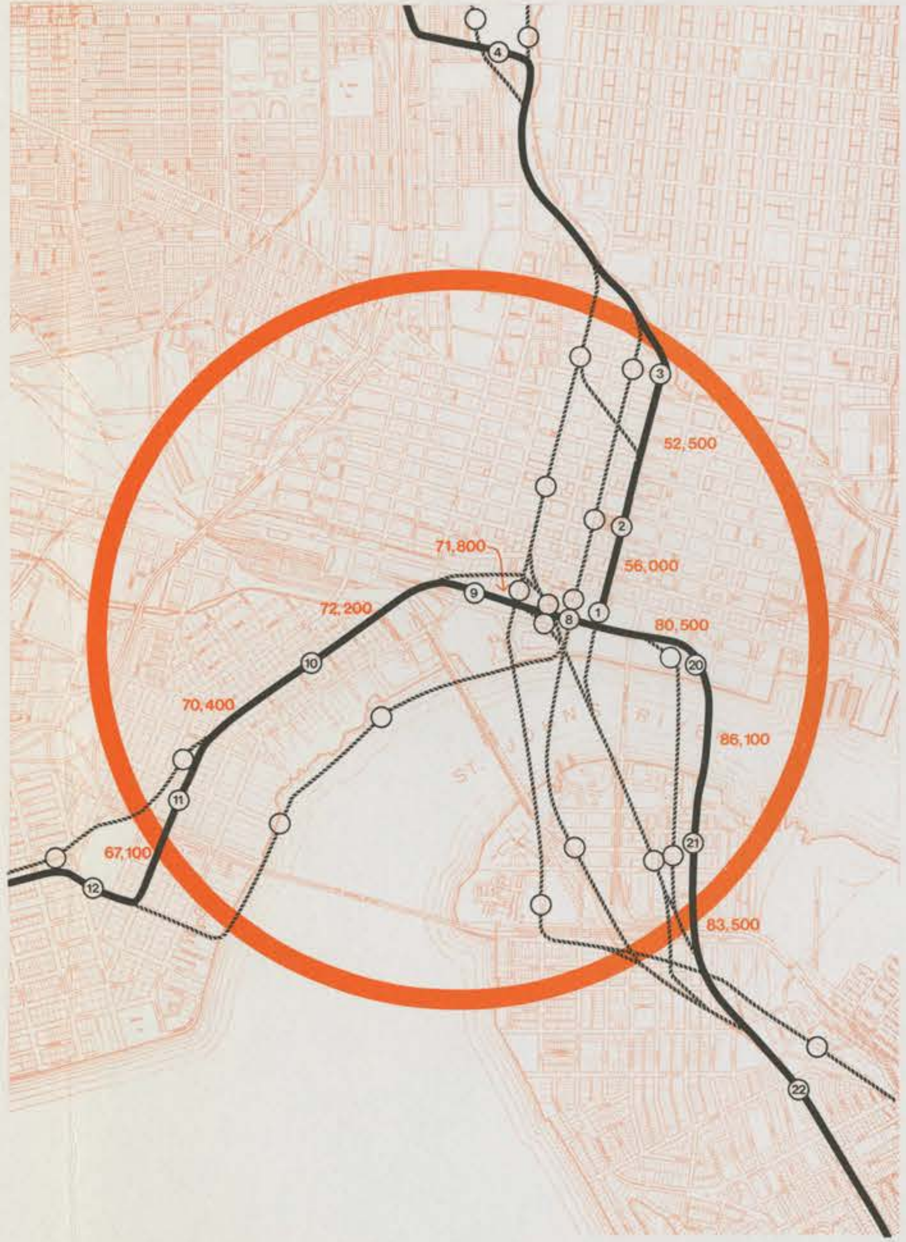
DOWNTOWN AREA

- PREFERRED ALTERNATIVE ROUTE

SCALE IN MILES

CONSULTANTS:
CAMPBELL, FOXWORTH AND PUGH, INC.
REYNOLDS, SMITH AND HILLS
IN ASSOCIATION





DOWNTOWN AREA

1990 PERSON TRIPS VIA TRANSIT BY HOUR

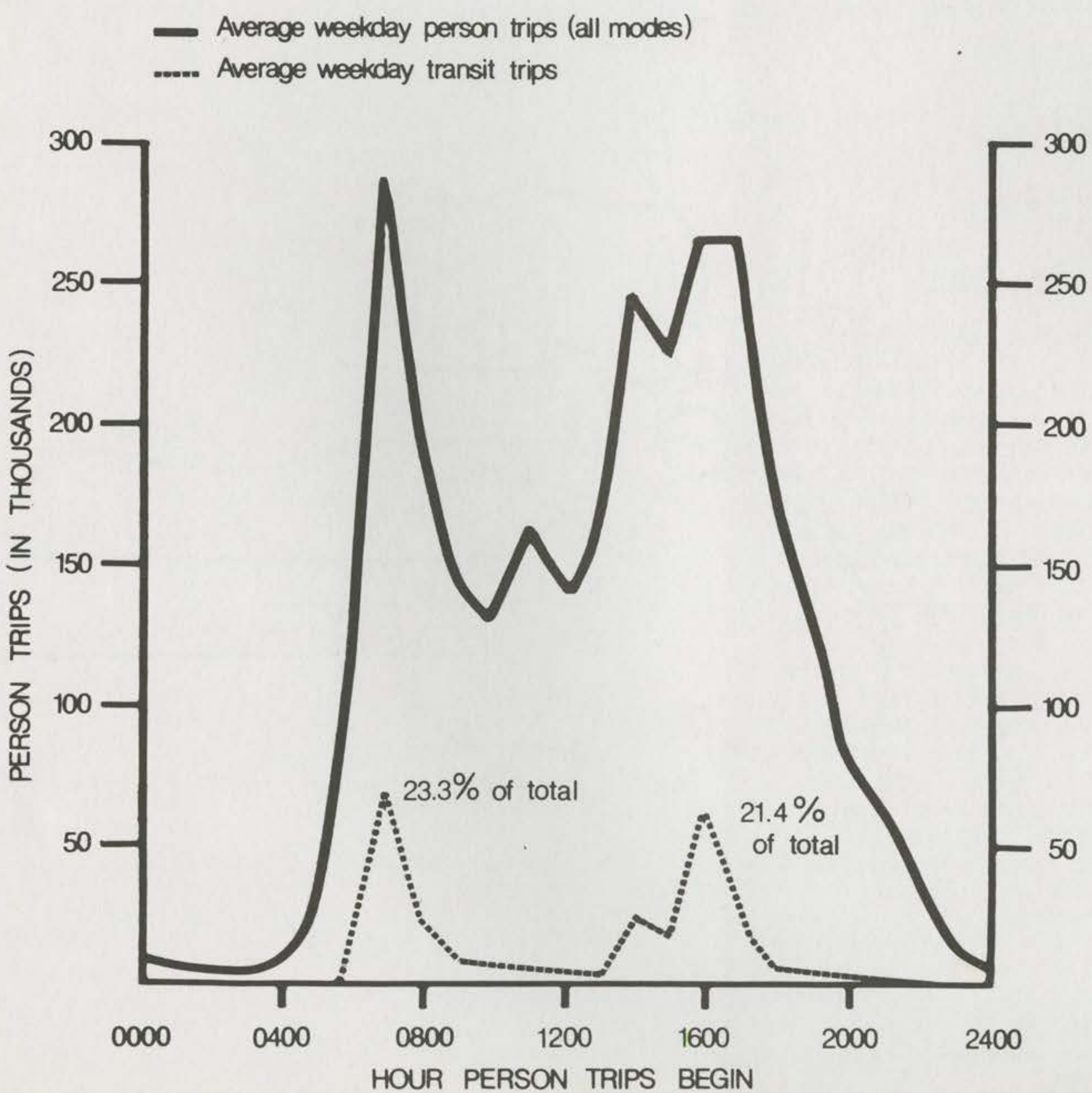


Fig. VIII-4

Table 20

1990 PERSON TRIPS AND TRANSIT TRIPS BY HOUR
JUATS URBAN AREA

PERSON TRIPS BY HOUR BEGINNING	TOTAL PERSON TRIPS (ALL MODES)(1) HOME-BASED WORK	OTHER	TOTAL	HOME-BASED WORK VIA TRANSIT	% OF ALL MODES	TRANSIT TRIPS OTHER VIA TRANSIT	% OF ALL MODES	TOTAL VIA TRANSIT	% OF TOTAL PERSON TRIPS ON TRANSIT(2)
2:01 - 3:00	2,500	1,000	3,500	-	-	-	-	-	-
3:01 - 4:00	2,500	683	3,183	-	-	-	-	-	-
4:01 - 5:00	3,500	1,000	4,500	-	-	-	-	-	-
5:01 - 6:00	15,000	5,000	20,000	-	-	-	-	-	-
6:01 - 7:00	70,000	35,500	105,500	5,500	7.9	2,000	5.6	7,500	7.1
7:01 - 8:00	125,000	161,300	286,300	47,400	37.9	19,400	12.0	66,800	23.3
8:01 - 9:00	70,000	135,200	205,200	18,400	26.3	5,000	3.7	23,400	11.4
9:01 - 10:00	30,000	115,000	145,000	3,000	10.0	7,000	6.1	10,000	6.9
10:01 - 11:00	5,000	125,000	130,000	400	8.0	6,000	4.8	6,400	4.9
11:01 - 12:00	6,000	155,000	161,000	300	5.0	5,000	3.2	5,300	3.3
12:01 - 13:00 P.M.	8,000	135,000	143,000	500	6.3	3,000	2.2	3,500	2.4
13:01 - 14:00	10,000	140,000	150,000	900	9.0	2,500	1.8	3,400	2.3
14:01 - 15:00	22,000	220,000	242,000	2,500	11.4	18,000	8.2	20,500	8.5
15:01 - 16:00	65,000	160,000	225,000	8,300	12.8	7,000	4.4	15,300	6.8
16:01 - 17:00	130,000	150,000	280,000	50,000	38.5	10,000	6.7	60,000	21.4
17:01 - 18:00	70,000	180,000	250,000	18,000	25.7	6,000	3.3	24,000	9.6
18:01 - 19:00	25,000	150,000	175,000	2,000	8.0	3,200	2.1	5,200	3.0
19:01 - 20:00	13,000	120,000	133,000	1,000	7.7	1,500	1.3	2,500	1.9
20:01 - 21:00	8,000	75,000	83,000	500	6.3	1,000	1.3	1,500	1.8
22:01 - 23:00	4,500	30,000	34,500	-	-	-	-		-
23:01 - 24:00	2,568	10,000	12,568	-	-	-	-		-
TOTAL	697,568	2,171,683	2,869,251	158,800	22.8	97,100	4.5	255,900	8.9

[1]Percentage distribution was based upon JUATS base year data.

[2]Information from the following source was one of the primary sources of information from which to base these estimates: An Analysis of Urban Area Travel by Time of Day, Peat, Marwick, Mitchell & Co., January, 1972, prepared for the U. S. Department of Transportation. Federal Highway Administration under contract No. FH-11-7519.

in 1990. During the 4:00 P.M. to 5:00 P.M. peak hour an estimated 21.4 percent of all person trips during that hour would use some form of transit.

Of the total 2,869,251 average 1990 weekday person trips in the JUATS area about 8.9 percent would patronize the recommended transit system. Nearly one out of five home-based work trips (22.8 percent) are expected to be by transit.

Person Trips Crossing the St. Johns River - Although the St. Johns River is one of the principal natural assets of Jacksonville, it presents a major transportation constraint. Each year the number of person trips crossing the river increases placing a greater strain upon the present bridges.

This growing demand must use either the Mathews, Fuller Warren, Acosta, Main, Hart or Buckman bridges. Few of these trips are made on the bus system today and the projected 1980 and 1990 person trip demand across the river will be substantially greater. A significant number of these river crossings have been estimated for both the recommended 1980 and 1990 transit systems.

In 1980 the recommended transit system is expected to divert 33,954 average weekday person trips crossing the St. Johns River. Local buses would carry 10,763 and express buses another 23,191. The number of persons travelling on transit in one direction during one peak hour in 1980 is estimated at about 5,000, as shown in Figure VIII-5. About one out of six persons is estimated to use transit to cross the river.

In 1990 the estimated number of persons crossing the St. Johns River on an average weekday on the recommended rapid transit system is about 90,000. This is about two and one-half times the 1980 estimated figure. The fixed-guideway system itself is projected to carry more than 86,000 passengers over the river each weekday and between 13,500 and 14,500 passengers in one direction during the peak hour. Hence the total recommended transit system is estimated to reduce the potential peak hour one-way demand across the St. Johns River by about 15,000 persons. This is about 35% of the one-way peak hour demand in 1990.

Downtown Area Transit Trips - The major focus of most urban area transit systems is the regional core area or central business district. The recommended transit plan also emphasizes service to the total Jacksonville Downtown Area. There is little doubt that without substantial improvements in mass transit services the CBD and surrounding downtown area will not approach the development potential envisioned in the Plan for Downtown Jacksonville. The initial recommended programs of express bus service, peripheral parking lots served by mini-buses, rerouting of the local bus routes downtown, and preferential treatment of buses will significantly relieve the potential traffic congestion and parking problems during the early years of the transit program (1975-1981). However, the greatest potential for downtown area growth and prosperity will be realized when a high-speed, efficient fixed-guideway rapid transit system is fully developed.

The projected number of person trips to and from the Jacksonville Downtown Area each weekday in 1980 is 200,600. The recommended Phase I transit system is expected to be carrying 37,600 or 18.7 percent of these trips as shown on Table 21. The 54,000 employees estimated in the Downtown Area by 1980 are expected to generate about 95,600 home-based work trips each weekday. About 28,500 or 29.8 percent would be via transit. Of the 105,000 other home-based person trips and all non-home based trips, 9,100 or 8.6 percent are expected on transit.

Thus, the recommended 1980 express and local bus system could reduce the number of average weekday vehicles destined for or leaving the Downtown Area by 29,300. Seventy-eight (78) percent of these vehicles would have been used for daily work trips. An estimated 5,000 of these diverted vehicle trips would have been made during each morning and afternoon peak hour.

PEAK HOUR ONE-WAY PERSON TRIPS CROSSING ST. JOHNS RIVER BY TRANSIT and ALL OTHER MODES

1980 and 1990

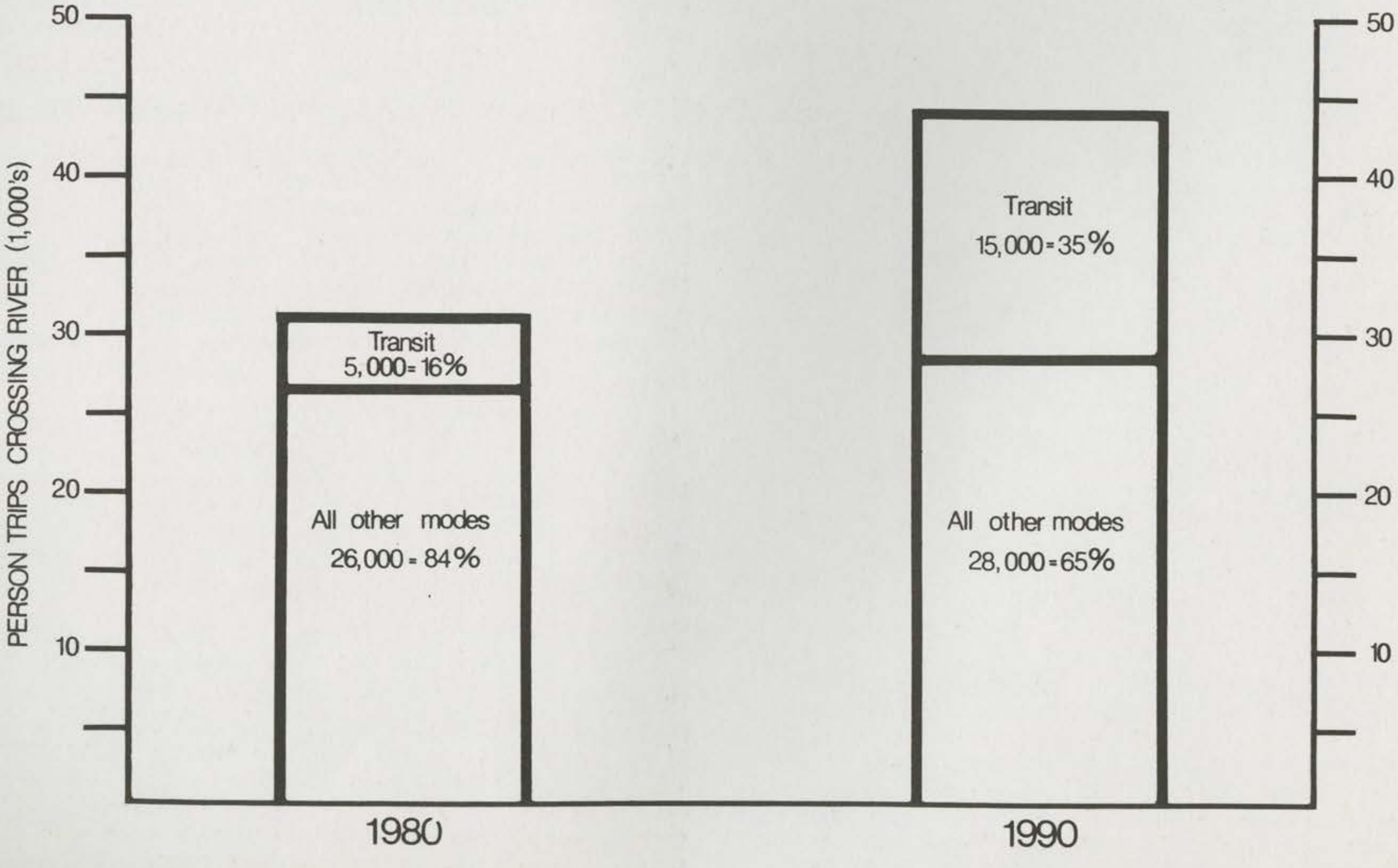


Fig. VIII–5

Table 21

1980 - 1990 AVERAGE WEEKDAY TOTAL
PERSON TRIPS AND TRANSIT TRIPS
(DOWNTOWN AREA)

	PERSON TRIPS					
	HOME-BASED WORK		OTHER		ALL	
	TOTAL	VIA TRANSIT	TOTAL	VIA TRANSIT	TOTAL	VIA TRANSIT
1980 Phase I All-bus System	95,600	28,500	105,000	9,100	200,600	37,600
1990 Phase III Recommended Transit System	135,000	56,855	89,600	13,800	235,000	70,655

In 1990, the average number of person trips to and from the Downtown Area is projected to increase to nearly 235,000 each weekday. More than 70,600 or 30.1 percent are projected to use the recommended rapid transit service. Forty-two (42) percent or 56,855 home-based work trips will be made via transit and 14 percent or 13,800 of all other trips downtown will be on transit. The rapid transit system would potentially divert 55,000 vehicle trips each weekday going to or from the Downtown Area. About 15,500 of these diverted vehicle trips would have been made during each morning and afternoon peak hour.

Figure VIII-6 shows the 1980 and 1990 transit trips between the Downtown Area and travel corridor areas.

Table 22 indicates the estimated number of person and transit trips by hour to and from the Downtown Area. Of the estimated 37,000 average weekday inbound person trips made during the morning peak in 1990, about 19,900 or 53.8 percent are estimated to be via the transit system, chiefly rapid transit. Nearly three out of five workers are anticipated to use transit as their principle means of travel to their Downtown Area place of employment.

Reduced CBD Parking Demands - In 1973, the CBD had about 12,500 long-term and 2,500 short-term parking spaces. Table 23 shows the estimated number of long and short-term parking needs for the CBD area in 1980 and 1990 if the recommended transit programs are implemented. The potential parking needs, if no major transit program is implemented, is also given for comparison.

By 1980 CBD total employment is projected to be 36,800 or 60 percent higher than the 1973 estimate. The potential number of parking spaces without an effective transit improvement program is estimated to be about 22,500 of which 18,000 would be long-term. However, the recommended Phase I Bus Transit System is expected to reduce this CBD parking demand by about 4,000 or 18 percent.

By 1990 total employment in the CBD has been forecast to reach 48,000 and the estimated parking space demand without an effective transit system is estimated at 32,000 or over double the 1973 CBD parking spaces. The recommended rapid transit system, however, would reduce this demand by an estimated 10,000 or 31 percent. Ninety percent of this reduction would be long-term spaces required for CBD employees.

Operating Cost

The estimated operating cost for the recommended transit system from 1975 to 1990 using both January, 1974 constant dollars and inflationary costs are given in Table 22. These were based upon the recommended phasing transit development program. The bus operating costs were calculated using a value of \$0.84[1] per local or feeder bus vehicle mile of operation and \$0.65 per express bus vehicle mile in 1974. To estimate the inflated operating costs for buses a 5 percent increase compounded annually was assumed up to 1990.

The medium-sized, light-weight rapid transit system cost of operation was estimated at \$0.45 per vehicle mile of passenger service in 1974.[2] This per mile cost was increased by 3 percent compounded annually to estimate inflationary increases.

The operation of the All-Bus Phase I system is expected to cost \$5,666,000 in 1975 to \$10,090,000 in 1980, including inflation. When the Phase II system begins operation the cost of the buses will be slightly less initially due to reduced bus vehicle miles of service. The estimated total cost of operating and maintaining the recommended rapid transit, feeder and express sys-

[1]This operating cost was derived from Jacksonville Transportation Authority Actual Costs for 1973.

[2]Estimated operating cost derived from detailed information and data developed under the Mass Transportation Demonstration Project conducted under contract 602 between the Port Authority of Allegheny County, Pittsburgh, Pennsylvania, and the U.S. Department of Housing and Urban Development (Project No. PA-MTD-2).

Fig. VIII-6

JACKSONVILLE URBAN AREA MASS TRANSPORTATION STUDY

FOR: THE CONSOLIDATED CITY OF JACKSONVILLE
BY: JACKSONVILLE AREA PLANNING BOARD

TITLE: **TRANSIT TRIPS BETWEEN DOWNTOWN AREA AND TRAVEL CORRIDOR AREAS**

LEGEND:

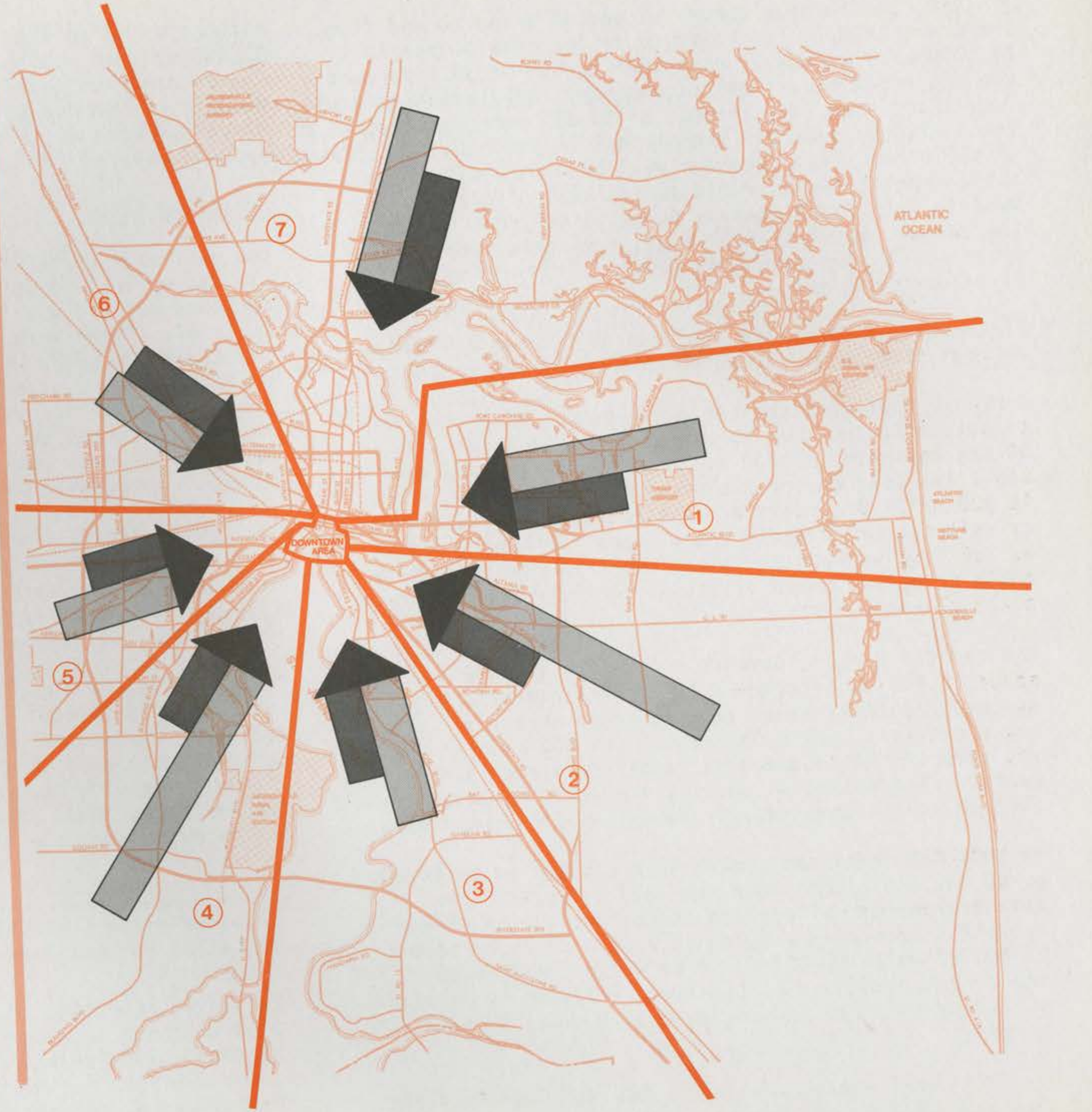
1980 PHASE I BUS SYSTEM RIDERS

1990 PHASE III TRANSIT SYSTEM RIDERS

(2) TRAVEL CORRIDOR AREA

0 1 2 3 4
1= 2,000 PERSON TRIPS

SCALE IN MILES:
0 1 2 3 4



CONSULTANTS:
CAMPBELL, FOXWORTH AND PUGH, INC.
REYNOLDS, SMITH AND HILLS
IN ASSOCIATION

Table 22

1990 PERSON TRIPS VIA TRANSIT BY HOUR
DOWNTOWN AREA

PERSONS TRIPS BY HOUR BEGINNING	TOTAL PERSON TRIPS (ALL MODES)[1] HOME-BASED WORK	OTHER	TOTAL	HOME-BASED WORK VIA TRANSIT	% OF ALL MODES	OTHER VIA TRANSIT	% OF ALL MODES	TOTAL VIA TRANSIT	% OF TOTAL PERSON TRIPS ON VIA TRANSIT
1 - 1:00 A.M.	150	200	350	-	-	-	-	-	-
1:01 - 2:00	100	225	325	-	-	-	-	-	-
2:01 - 3:00	200	350	550	-	-	-	-	-	-
3:01 - 4:00	250	325	575	-	-	-	-	-	-
4:01 - 5:00	300	400	700	-	-	-	-	-	-
5:01 - 6:00	1,000	500	1,500	-	-	-	-	-	-
6:01 - 7:00	7,000	1,500	8,500	2,500	35.7	200	13.3	2,700	31.8
7:01 - 8:00	29,000	8,000	37,000	17,100	59.0	2,800	35.0	19,900	53.8
8:01 - 9:00	14,000	9,500	23,500	6,400	40.0	800	8.4	7,200	30.7
9:01 - 10:00	4,500	10,100	14,600	1,100	24.4	650	6.4	1,750	12.0
10:01 - 11:00	2,000	10,300	12,300	200	10.0	800	7.8	1,000	8.1
11:01 - 12:00	2,000	9,800	11,800	100	5.0	1,100	11.2	1,200	10.2
12:01 - 13:00 P.M.	1,200	8,500	9,700	100	8.3	700	8.2	800	8.2
13:01 - 14:00	2,000	7,000	9,000	300	15.0	500	7.1	800	8.9
14:01 - 15:00	4,000	7,000	11,000	700	17.5	600	8.6	1,300	11.8
15:01 - 16:00	12,000	6,100	18,100	3,000	25.0	800	13.1	3,800	21.0
16:01 - 17:00	30,000	10,500	40,500	18,000	60.0	3,100	29.5	21,100	52.1
17:01 - 18:00	16,200	3,500	19,700	6,000	37.0	800	22.9	6,800	34.5
18:01 - 19:00	6,500	2,800	9,300	950	14.6	500	17.9	1,450	15.6
19:01 - 20:00	2,000	1,200	3,200	250	12.5	200	16.7	450	14.1
20:01 - 21:00	400	800	1,200	100	25.0	100	12.5	200	16.7
21:01 - 22:00	250	400	650	55	22.0	38	9.5	93	14.3
22:01 - 23:00	100	300	400	-	-	-	-	-	-
23:01 - 24:00	113	221	334	-	-	-	-	-	-
TOTAL (Downtown Area)	135,263	99,521	234,784	56,855	42.0	13,788	13.9	70,643	30.1
(Remainder of JUATS Area)	562,304	2,072,162	2,634,467	101,945	18.1	83,312	4.0	185,257	7.0

[1] The principle source was: Jacksonville Downtown People-Mover Study. Interim Technical Report III (CBD Alternative - Travel Demand Analysis), February, 1973, prepared for the Florida Department of Transportation.

Table 23

ESTIMATED CBD PARKING SPACE NEEDS FOR 1980 and 1990

	1973	1980	1990
Potential Parking Spaces Needed	15,000	22,500	32,000
Long-Term	12,500	18,000	25,500
Short-Term	2,500	4,500	6,500
Parking Needs with Transit Plan System	15,000	18,500	22,000
Long-Term	12,500	14,500	16,500
Short-Term	2,500	4,000	5,500
Reduction of Parking Spaces		4,000	10,000
Long-Term		3,500	9,000
Short-Term		500	1,000
Estimated Total Employment	23,000	36,800	48,000

Table 24

ESTIMATED ANNUAL OPERATING COST
RECOMMENDED TRANSIT PLAN

ESTIMATED OPERATING COST (IN 1,000's)

	JANUARY 1974 DOLLARS			INFLATED DOLLARS		
YEAR	BUS	RAPID TRANSIT	TOTAL	BUS (1)	RAPID TRANSIT (2)	TOTAL
1975	$5,370	-	$ 5,370	$ 5,666	-	$ 5,666
1976	5,990	-	5,990	6,607	-	6,607
1977	6,530	-	6,530	7,549	-	7,549
1978	6,720	-	6,720	8,174	-	8,174
1979	7,180	-	7,180	9,170	-	9,170
1980	7,570	-	7,570	10,090	-	10,090
1981	6,760	$4,800	11,560	9,510	$ 5,903	15,413
1982	6,950	5,175	12,125	10,258	6,561	16,819
1983	7,130	5,400	12,530	11,065	7,051	18,116
1984	7,320	5,625	12,945	11,922	7,577	19,499
1985	7,550	6,750	14,300	12,906	9,346	22,252
1986	7,780	6,900	14,680	13,975	9,836	23,811
1987	7,970	7,025	14,995	14,988	10,335	25,323
1988	8,160	7,170	15,330	16,155	10,862	27,017
1989	8,300	7,300	15,600	17,262	11,390	28,652
1990	8,580	7,450	16,030	18,704	11,985	30,689

(1) Based upon estimated 5 percent increase in operating costs compounded annually (beginning 1975).
(2) Based upon estimated 3 percent increase in operating costs compounded annually (beginning 1975).

tem in 1981 is $15,413,000 with the fixed-guideway system accounting for about 38 percent of this cost.

By 1985 when the recommended 34.0 mile rapid transit system is operating, the estimated cost of operation including inflation costs would be $12,906,000 for buses and $9,346,000 for rapid transit for a combined total of $22,252,000. During 1990 the total cost of operation is estimated at $30,689,000 which is nearly double the January, 1974 constant dollar estimate of $16,030,000 for 1990.

Fare Box Revenue

The expectant revenue generated by the fare box is shown in Table 25. Other revenue can also be drived from advertising and charter service. Alternate A indicates what the revenue would be if a basic fare of $0.25 was charged to each passenger and transfers were free. (All 1975-1990 patronage projections were based upon this fare assumption.) This alternate would result in $6,743,000, $14,029,000 and $18,560,000 in 1980, 1985 and 1990, respectively. The annual operating subsidy including inflation costs would be about $4,200,000, $5,600,000 and $8,900,000 for each year, respectively.

Alternate B suggests that if the basic fare was $0.30 beginning in 1980, increased to $0.35 in 1985 and $0.40 in 1990, the estimated passenger revenue would be $8,091,000, $19,640,000 and $29,696,000, respectively. These estimates are based upon the assumption that patronage would be the same as with the constant $0.25 fare. The subsidy required would be significantly lower than for Alternative A. In 1980 it would be about $2,800,000. The $0.35 cent is expected to meet the operating cost in 1985 and the $0.40 fare would produce slightly more revenue than operating costs.

Alternate C suggests a basic fare of $0.30 in 1975, $0.35 in 1980 and $0.40 in 1990. The resultant passenger revenue generated by this basic fare scheme with free transfers would be $9,440,000 in 1980. The 1985 - 1990 revenue estimates would be the same as Alternate B. The operating subsidies during the 1975 to 1980 would be significantly lower for this alternative than either other alternative.

The fare should be as low as possible since more passengers will patronize transit system. However, the cost of operating the services must come from revenues and subsidies. If there are sufficient funds to subsidize the recommended transit system then the fare can be relatively low. However, if operating subsidy funds are not adequate then increased fares would be required to help off-set any operating deficits.

Table 25

ESTIMATED ANNUAL PASSENGER REVENUE
RECOMMENDED TRANSIT PLAN

ESTIMATED REVENUE (IN 1,000's OF DOLLARS)[1]

YEAR	ALTERNATE A 25¢ CONSTANT FARE	ALTERNATE B INCREMENTAL FARE INCREASE (2)	ALTERNATE C INCREMENTAL FARE INCREASE (3)
1975	$ 3,625	$ 3,625	$ 4,350
1976	4,025	4,025	4,830
1977	4,518	4,518	5,421
1978	5,104	5,104	6,125
1979	5,865	5,865	7,038
1980	6,743	8,091	9,440
1981	8,751	10,501	12,251
1982	10,542	12,650	14,758
1983	11,789	14,146	16,504
1984	12,717	15,260	17,803
1985	14,029	19,640	19,640
1986	14,863	20,808	20,808
1987	15,646	21,904	21,904
1988	16,574	23,203	23,203
1989	17,647	24,705	24,705
1990	18,560	29,696	29,696

(1) Includes fares only and not revenue generated from advertising or charter service; free transfers.

(2) Fare increased to 30 cents in 1980; to 35 cents in 1985 and 40 cents in 1990.

(3) Fare increased to 30 cents in 1975; to 35 cents in 1980 and 40 cents in 1990.

Chapter IX · Urban Design and Environmental Impact

Since the primary objective of the transit system is to serve people, the system must provide transit service from residential areas to major activity centers, especially employment concentrations. Both existing and planned residential and community activity centers were first identified; subsequently, they were linked or connected in a manner designed to minimize negative environmental impact.

In finding the most desirable path to make the linkages, Urban Design and Environmental Criteria were developed and applied to alternative rapid transit route corridors. This criteria was used by the JAPB in their draft paper entitled "Evaluation of Proposed Mass Transit Corridors and Stations Sites" which was very useful in determining the final corridor and station locations.

The following criteria were used in selecting and evaluating 1990 transit system corridors and stations:

Residential Impact

Major emphasis was placed upon minimizing loss of private rights-of-way in residential areas. Consideration was further given to aesthetic features of the transit system as well as noise and pollution emanating from the vehicles and stations. Another concern was placement of stations within easy access from low-income residential areas.

Relocations Due to Right-of-Way Needs - This type of impact could be both positive and negative depending on the quality of the residential area. If the line removes houses in a blighted neighborhood, the impact is positive (provided good housing can be found elsewhere for residents) conversely, relocation of families from a well-maintained and established neighborhood is generally undesirable. All opportunities were explored to find rights-of-way that would minimize residential impact and relocation.

Noise and Pollution - The environmental impact due to noise and possible air pollution was another basic consideration in residential areas.

Special Group Users - Low and low-middle income groups are largely dependent on mass transportation mainly due to low car ownership. Thus some alternative routes and stations were selected largely because of this criteria.

Non-Residential Impact

Loss of desirable commercial and other non-residential activity rights-of-way was also minimized as much as feasible. However, one of the major location criteria was direct access to major activity centers which were largely non-residential.

Relocation Due to Right-of-Way Needs - The environmental impact on schools, hospitals, industries, businesses, recreational establishments and other non-residential uses that may be removed or infringed upon because of transit right-of-way needs was an extremely important criteria in the selection process.

Activity Centers - Those activity centers selected to be directly served by the transit system were carefully examined in order to locate stations that would be compatible and would benefit the center.

Compatibility with Current Development Plans and Programs

Integration of the transit system with existing and planned development programs was extremely important. Many of the plans and/or programs would in fact be significantly aided by the system. Hence, where appropriate, stations and routes were selected as "catalysts" for various plan implementations.

Development Plans and Programs - Any future transit system should conform and compliment current and future development plans. The system should compliment the Downtown Plan, neighborhood development programs, community renewal programs, urban renewal projects, and the 1990 Comprehensive Land Use Plan.

Public Improvements - The coordination of the transit system with major public improvements could minimize objectionable environmental impact and reduce capital costs. The opportunity of coordinating transit construction with improvements and/or construction of roads, water lines, sewer lines and utilities was studied.

Impact on Community Boundaries and Service Areas - The transit corridor impact on schools, shopping and other service areas was assessed. Some boundary problems may be overcome by the placement of the guideway, i.e., elevated, subway, open cut, etc.

Impact on Surface Traffic - The impact of surface traffic related to street closures and other street modifications due to the proposed corridors was considered. In most cases this did not present a problem because of the recommended aerial guideway.

Engineering Constraints

One of the basic criteria in any transit study are the various natural and man-made constraints which affect route and station locations.

Natural Constraints - This criteria generally evaluated the compatibility of the corridor with soils, geology, ground water and topography.

Man-Made Constraints - Both existing and planned bridges, expressways, highways, railroads and utilities were major elements in the selection of transit routes and stations.

Development Potential

Various areas which are run down and deteriorating as well as undeveloped land would be logical sites for transit stations. Furthermore, certain route corridors could pass through these areas with a minimum of loss of desirable activities. Since the transit system can be an important tool in proper and desirable land use development, this was one of the major criteria.

Blighted or Undeveloped Land - One major asset of a transit system is the stimulation of new development. When locating possible corridors, routes and stations in blighted and undeveloped areas were evaluated as potential "growth corridors".

Multi-use/Joint Development Potential - Transit stations and rights-of-way offer the opportunity for possible multi-use and or joint development potential. This potential was analyzed and evaluated.

Aesthetic, Appearance and Environmental Fit

The guideway should not be a barrier either physically or visually. The system should add architectural interest or uniqueness in the community and become a strong unifying form in the urban landscape.

Rapid Transit Corridor Analysis and Selection

The recommended rapid transit corridors are preliminary and will not be precisely determined until preliminary and final engineering and design studies are completed. However, the recommended routes are the most feasible alternatives that can be identified at this point in time.

North Transit Corridor - Four segments of the North Corridor were evaluated from an environmental impact standpoint. The following is a summary of this analysis:

Section 1: Central Business District (Station 1) to Florida Junior College (Station 3) - The recommended route for this link in the system begins near Independent Square and runs North up Laura Street to a station at Hemming Park and continues north to the FJC Campus. Other alternative routes analyzed through the Downtown area are shown in Figure 20. One alternative is for the Laura Street route to swing diagonally to the west just north of Beaver Street and connect with Pearl Street. A second alternative is to locate Station 1 at Hogan and Water Street and follow Hogan Street northward to the FJC Campus. A third alternative is to locate Station 1 in the Sear's parking lot and continue north on Pearl Street to a station located just west of the FJC Campus. The recommended route is the most direct link with the FJC Campus and also provides a station at the retail center of Downtown, i.e., Station No. 2 at Hemming Park.

The alternative diagonal route between Laura Street and Pearl Street would be difficult to fit into the existing development. In addition to the need for purchasing private property, the operation of the system would be much less desirable because of the reverse curve on the route. The Hogan Street alternative accomplished similar access and service as the recommended Laura Street alternative, however, present pedestrian planning studies show that this location would not be compatible with planned pedestrian movements. The Pearl Street alternative would have less urban design and environmental problems but this route would put the system on the outer edge of the CBD and would not be as effective in serving the Downtown as it would located two or three blocks from the "heart" of the CBD.

Section 2: Florida Junior College (Station 3) to University Medical Center (Station 4) - The route recommended for this section of the corridor follows the edge of Hogan Creek Park up to University Medical Center. Other routes would require the purchase of private property and result in negative residential impact. The fixed-guideway aerial structure would result in a minimal visual or functional impact on the park and the continuous public right-of-way provided by the park would minimize private property acquisition.

Section 3: University Medical Center (Station 4) to Gateway Center (Station 5) - The recommended route from the Medical Center northward is along the I-95 right-of-way running to Gateway Center. The impact of this location would be minimal since it uses existing right-of-way for most of its length. Another alternative considered was a route extending due north from the Medical Center to Gateway Center. This is more direct but would have these problems:

1) Bridging at a high elevation over the 20th Street Expressway.

2) Disruption of established residential neighborhoods.

3) The need for purchasing private property for right-of-way.

Another alternative that was explored included a route from the Medical Center up Moncrief Road without a link to Gateway Center. The transit system test results showed a strong demand at the Gateway Center thus this alternative was eliminated from further consideration.

Section 4: Gateway Center (Station 5) to Forest Hills (Station 7) - The recommended route for this section of the corridor passes over I-95 and follows the Seaboard Coastline Railroad right-of-way west to Moncrief Road where Station 6 is located. It then turns northwest on Moncrief Road which it follows to Station 7 located near Edgewood Avenue. The use of the right-of-way along the railroad and Moncrief Road are enough to minimize environmental impact and the need to acquire additional right-of-way thus other alternatives were not investigated in detail.

<u>Southwest-Riverside Transit Corridor</u> - The environmental impact analysis considered four basic segments of the Southwest-Riverside Corridor. The corridor begins in the CBD and generally bisects southwest Jacksonville terminating near I-295 and Blanding Boulevard.

Section 1: Central Business District (Station 8) to the Five Points Center (Station 12) - The recommended route for this section of the corridor runs west from the Riverfront CBD Station 8 parallel and adjacent to Water Street. It turns southwest between Riverside and Park Streets and extends to Post Street and Station 12 near Five Points.

Additional private right-of-way for the guideway will likely be necessary. One alternative to the recommended route, is the joint construction of the proposed Coast Line Drive and the fixed-guideway running along the edge of the St. Johns River. This alternative, however would reduce access to and from the transit system. Furthermore, it would present a visual design problem by blocking views to the river from adjacent property. Other alternatives considered were a route extending westward from Riverfront CBD Station 8 through the railroad yards and then southward on the Seaboard Coastline right-of-way just west of I-95. This was eliminated, however, as it did not provide direct service to the Southwest Downtown Area nor serve the residential areas in Riverside.

Section 2: Five Points Center (Station 12) to Murray Hill (Station 4) - The recommended route parallels College Street and Roosevelt Boulevard to Station 14. One of the major reasons for this route was the opportunity to design and build the fixed-guideway together with the proposed roadway improvements on College and Park Streets. Their widening make the residential property between them less desirable. It may be necessary to acquire one row of homes along this route to properly fit the guideway structure into the urban fabric. It was felt that direct service to this area was very important and since there were no viable alternatives the acquisition of residential property was considered justified.

Section 3: Avondale (Station 14) to Cedar Hills Shopping Center (Station 16) - This route has two valid alternatives. Either the railroad or the Roosevelt Boulevard right-of-way could be utilized for the section running south to Station 15. From this station there are several routes which could be used to connect with the Cedar Hills Center. Portions of Blanding Boulevard right-of-way, private commercial property and some residential property acquisitions are likely to be necessary.

Section 4: Cedar Hills Shopping Center (Station 16) to Orange Park (Station 19) - This route is recommended to follow the right-of-way along Blanding Boulevard and end at Station 19 near Blanding and I-295. The impact of this route would be minimal due to the large right-of-way and the poor quality strip commercial development existing along Blanding Boulevard. An optional location to this route is to swing east midway between Timuquana Road and Collins Roads and then to the Jacksonville Naval Air Station. Both of these latter alternatives were eliminated following the patronage test results. Another alternative considered was a route following the railroad right-of-way along Roosevelt Boulevard to the Naval Air Station. However, since the population center of the Southwest Jacksonville is west of Roosevelt, the recommended corridor route down Blanding would provide better service.

<u>Southside-Arlington Corridor</u> - This corridor begins in the CBD, crosses the St. Johns River and serves the northern sections of Southside and runs eastward through the southern sections of the Arlington region to near St. Johns Bluff Road and Atlantic Boulevard.

Section 1: Riverfront CBD (Station 8) to Southside Downtown (Station 21) - The recommended route for this link in the rapid transit network runs West from the CBD Station 8 to Station 20. This route will present some difficult engineering and urban design problems and the aerial guideway must be integrated with the planned northside ramps of the Main Street Bridge. From Main Street it turns southward bridging the St. Johns River to Station 21 located south of the Gulf Life Building's parking garage. The segment of the route between the Government Center and the Southside Downtown Area presents a most difficult engineering design problem. From an urban design and visual impact point of view this link in subway section is desirable. However, the cost and engineering feasibility of such construction must be detailed in subsequent design work. The other alternative which will provide the necessary service is a route crossing the river just west of the one recommended. The three other routes considered are

located to the west of the Main Street Bridge, but do not serve the Government Center, a major activity node requiring direct service. It should be pointed out that the recommended route and location of Station 21 will be extremely important to the recently proposed development of St. Johns Place located just south of the Gulf Life Center. This planned development should be highly integrated with the future rapid transit system.

Section 2: Southside Downtown (Station 21) to Phillips Mall (Station 23) - The recommended route for this section of the corridor passes over I-95 and joins the railroad right-of-way continuing southeast then eastward to the Phillips Mall (Station 23). Because this route uses existing railroad right-of-way it will have little environmental impact, and with proper joint development of the right-of-way for bike trails and mini-parks it may functionally and visually improve existing conditions. Another alternative uses much of the right-of-way along Phillips Highway, however, the need for adjusting or relocating utilities and possible need for additional right-of-way make it less desirable than the route recommended.

Section 3: Phillips Mall (Station 23) to Spring Glen (Station 25) - This section of the corridor begins at Phillips Mall, extends over I-95 just northwest of Emerson and continues to the Koger Office Park just east of Beach Boulevard. It passes over the Commodore Point Expressway and then northeast to Station 25 located at University Boulevard. This section of the recommended route has the greatest environmental, economic and social impact of any route recommended. There are no desirable alternatives. The final location and design of this route must minimize the purchase of private property for right-of-way, disruption of desirable residences, the visual impact on the neighborhoods, and the removal of trees.

Section 4: Spring Glen (Station 25) to Oak Haven (Station 26) - The recommended route for this section of the corridor follows the University-Cesery Boulevard right-of-way to Station 26 located near the Arlington Expressway. It may be necessary to purchase additional right-of-way required for the guideway but it should be minimal. There were no appropriate alternatives to this route as it was considered necessary to provide a high level of service along the Arlington Expressway to the "Arlington Community".

Section 5: Oak Haven (Station 26) to Sandalwood (Station 29) - This route follows the south right-of-way of the Arlington Expressway until it crosses the expressway west of Southside Boulevard and then parallels Regency Square Boulevard. From the Regency Center it parallels Atlantic Boulevard to Station 29 near St. Johns Bluff Road. Since this route minimizes the use of new right-of-way, it presents no major environmental or urban design problems. Certain private property acquisition may be needed for right-of-way between Regency Square and St. Johns Bluff Road which must be specified in subsequent engineering design.

The other alternative seriously considered was a route running along Atlantic Boulevard to Regency Square. This was finally ruled out as service to the Arlington Community was of paramount importance.

Southeast Corridor - Beginning at the Koger Office Park this corridor generally follows an easterly alignment to Southside Boulevard and Beach Boulevard. It turns south and ends near J. Turner Butler and Southside Boulevards.

Section 1: Koger Office Park (Station 24) to Southside Estates (Station 32) - The recommended route leaves the Koger Office Park Station and passes under an extension of the Commodore Point Expressway. It then turns eastward until turning southward to join Beach Boulevard. Utilizing the Beach Boulevard rights-of-way for most of the route, the corridor continues east to a point just west of Southside Boulevard. This route presents little impact on the adjacent property. There will be a need to purchase some additional right-of-way at each station. This acquisition and good joint transit development could improve the quality of existing development along Beach Boulevard.

Section 2: Southside Estates (Station 32) to Deerwood (Station 33) - The last link in this corridor follows the western right-of-way of Southside Boulevard swinging over to the east side just north of J. Turner Butler Expressway and then into the area where a new regional commercial center is planned. This route will have very little adverse impact because of the use of existing right-of-way for the guideway structure.

Impact Development

It is evident that large scale capital improvement projects influence and, in many cases, indirectly control private investment. This is clearly true of land surrounding major highway interchanges and land around rapid transit stations. (Figure IX-1)

Transit systems, both planned and in operation, have demonstrated that induced development occurs in areas adjacent to stations. There is dramatic evidence of this in Toronto where property values have doubled and tripled after the completion of the transit system. The ten-year increase in tax assessment districts contiguous to Toronto's first four and one-half mile rapid transit line was 45 percent in the Downtown Districts and 107 percent in the remaining districts. In a five-year period between 1959 and 1963, 48.5 percent of all high-rise apartment development in the City of Toronto occurred in the four planning districts which the rapid transit lines penetrate. Similarly, 90 percent of all office construction in the same period was located in three of the four planning districts penetrated by transit lines. Thus, during a five-year period, two-thirds of all new development in the City of Toronto was placed within a five minute walk from the new rapid transit lines. Similarly development opportunities and increased real estate values are being created in the San Francisco Bay area by the construction of the BART rapid transit system.

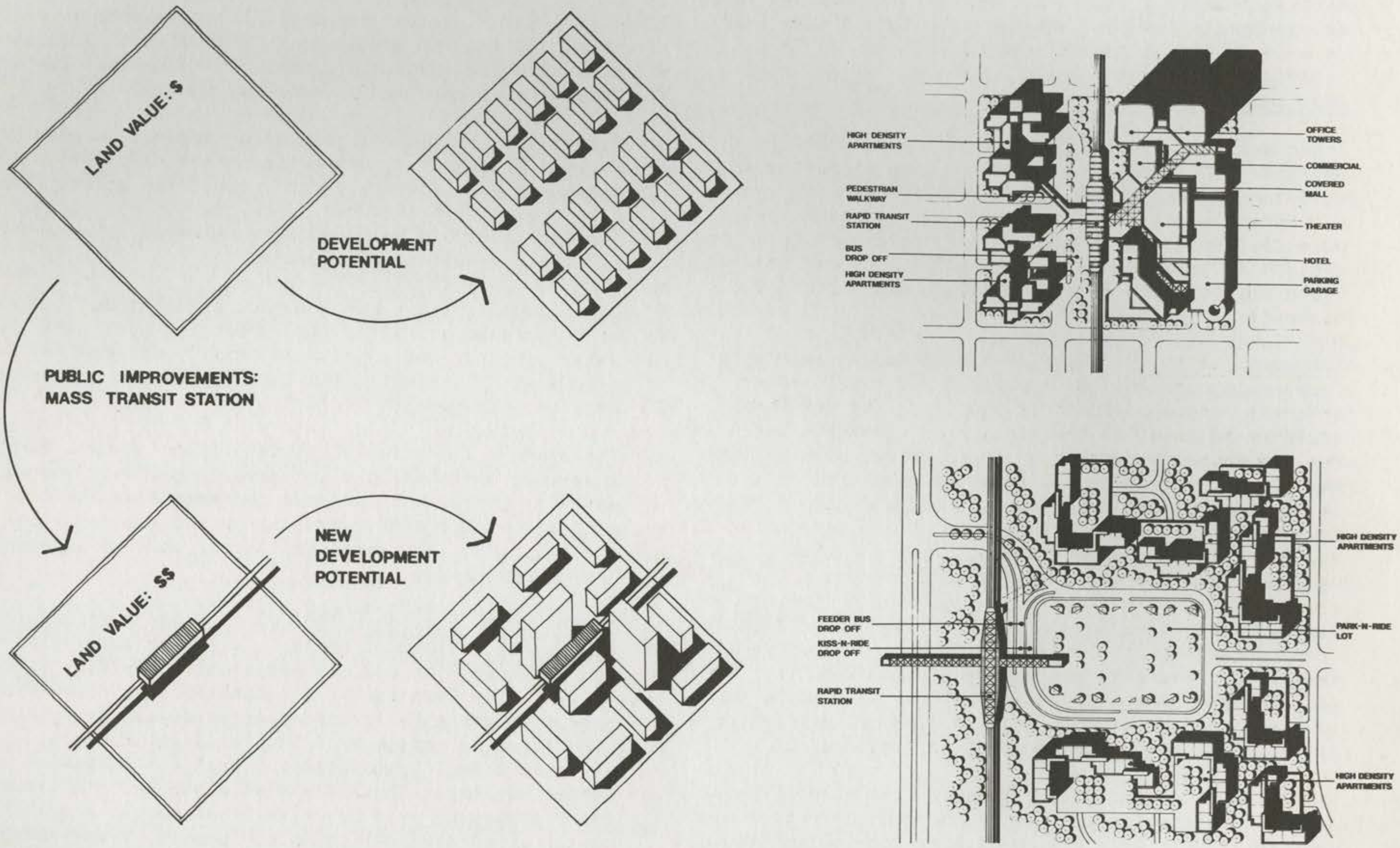
The greatest impact on development related directly to rapid transit is in the central business district. Market Street in San Francisco is the business spine of downtown and the BART system is being constructed beneath it. Since approval of BART by the voters in 1962, 500 floors of new office buildings have been or are being constructed alongside or within walking distance of Market Street. The retail district along the Market Street Corridor, has also been undergoing changes equal to the office building district. Department stores have expanded, remodeled, and purchased new sites located within walking distance of the transit stations.

The increase in real estate value is created by two basic influences: people and accessibility. The more accessible land is the more valuable and rapid transit provides a high level of accessibility and in turn generates activities of high traffic density which can easily be accommodated by rapid transit.

These are just two examples of how rapid transit systems have influenced real estate values and in turn change the land use and development potential of property around transit stations. Through proper planning and implementation the impact on the transit system can act as a positive force in shaping development in Jacksonville's future.

Influence on City Form

The single largest influence in shaping not only the growth but the physical form of the city is accessibility. It stimulates land use of high intensity which require a high degree of accessibility, i.e., high density residential, office, institutional, industrial, military, educational and retail. These activities may be grouped in various combinations



MASS TRANSIT STATION IMPACT

Fig. IX-1

around transit stations producing multi-purpose centers. Because of the increased land value and accessibility, concentrated medium to high rise building forms will take shape around stations. As in Toronto, this leads to changes in land use and zoning which in turn lead to a new physical form of the City.

Station Area Development Concepts

There are three prototype stations recommended in the Jacksonville System each of which have a certain development potential and impact associated with them. A description of these prototype stations and their potential impact will be useful in guiding future decisions on land use and zoning. The Suburban Station, Urban Station, and Downtown Station are discussed subsequently.

Suburban Station - This type of station is generally located in outlying low density areas near a major arterial roadway. Community shopping and services could be adjacent to the station and there is potential for new townhouse-garden apartment development. Some examples of areas where a suburban type station might be developed in the Jacksonville system are: Atlantic Boulevard at St. Johns Bluff Road, Blanding Boulevard and 103rd Street, Beach Boulevard near Southside Boulevard, and Moncrief Road at Edgewood Avenue.

Station Facilities - This type of station is characterized by parking facilities for park-and-ride customers, feeder bus drop off, and kiss-and-ride drop off. Because of the lower land values the parking would be on surface, and the station site will range in size from 3-5 acres depending on the parking required.

Development Concept - This type of station will provide a development potential for further concentration of apartment units with appropriate commercial, office and service facilities. (Figure IX-2, IX-3)

Urban Station - In a number of locations outside or on the edge of downtown, concentrations of commercial and institutional activities have developed or are developing. These are important commercial and employment centers that may be multi-functional such as commercial/office or single function such as medical or educational. High density (older) residential development is also characteristic of these areas. Examples of such station areas are St. Johns Place, University Medical Center, Five Points, and the FJC Downtown Campus.

Station Facilities - This station depends largely on walk-in passengers and the feeder bus drop-off. It is important that they have good pedestrian access from surrounding neighborhoods. Private vehicle access (drop-offs) would be encouraged, however, park-and-ride facilities would be minimum.

Development Concept - The impact of the transit station will increase accessibility, enhancing additional business, institutional, and high density residential development. This will also lead to greater employment density. (Figure IX-4, IX-5)

The specific location of these stations should take advantage of renewing older development near the major activity center and increase the potential for the complete integration between transit, the major commercial or institutional facilities and the surrounding neighborhood.

Downtown CBD Station - The CBD is today a strong financial and employment center. With the completion of the Downtown Plan and its adoption by the City Council in 1971, the Downtown Area's construction activities have substantially increased as evidenced by such new structures as Independent Square, Duval Federal, Atlantic Bank, First Baptist Church and Cathedral Center Housing. There are also a number of projects on the boards such as a new riverfront hotel, a multi-center commercial/office/hotel complex, riverfront plaza and parking center, and a major downtown streets improvement program. These developments are directed toward the major goals of revitalizing the Downtown, functionally, visually and economically. This revitalization must be complemented by vast improvements in access implicit in the recommended Regional Mass Transportation System.

Station Facilities - The recommended transit plan includes five stations in the Downtown CBD. In the final design of the system, these stations could be aerial or subway or some combination. The scope of this study does not allow a detailed analysis of which alternative (subway or aerial) is most desirable and economically feasible.

The underground station will have a minimum visual and environmental impact. In addition, interchange or transfers from east-west and north-south lines can be accomplished much quicker in a vertical direction eliminating the need for two station areas. However, some disruption of existing surface activities will occur during construction due to the cut-and-cover technique. The underground alternative also will be more costly to construct.

The construction of aerial stations in the downtown offer the advantages of being less expensive to construct with the guideway and stations designed to fit the environment and become a unifying element in the city scape.

Development Concept - The Downtown station locations each offer an opportunity for innovation urban - design solutions. Since the recommended plan offers several alternative locations for Downtown stations no prototype development concepts were prepared. There are, however, several urban design criteria that should be considered:

1. If possible Downtown stations should be designed as an integral part of buildings, especially new structures not as yet developed.

2. The station should be within easy walking distance (2-3 blocks) of the largest employment centers in the CBD.

3. The design of stations in the public right-of-way should be harmonious with the adjacent development.

4. Stations should be located on or adjacent to undeveloped or under developed land to increase its economic value and urban design potential.

5. Pedestrian access to a station and surrounding (2-3 blocks) development must be convenient, comfortable and environmentally interesting.

6. Strong cooperation between public and private development in the final location and design of the station is essential.

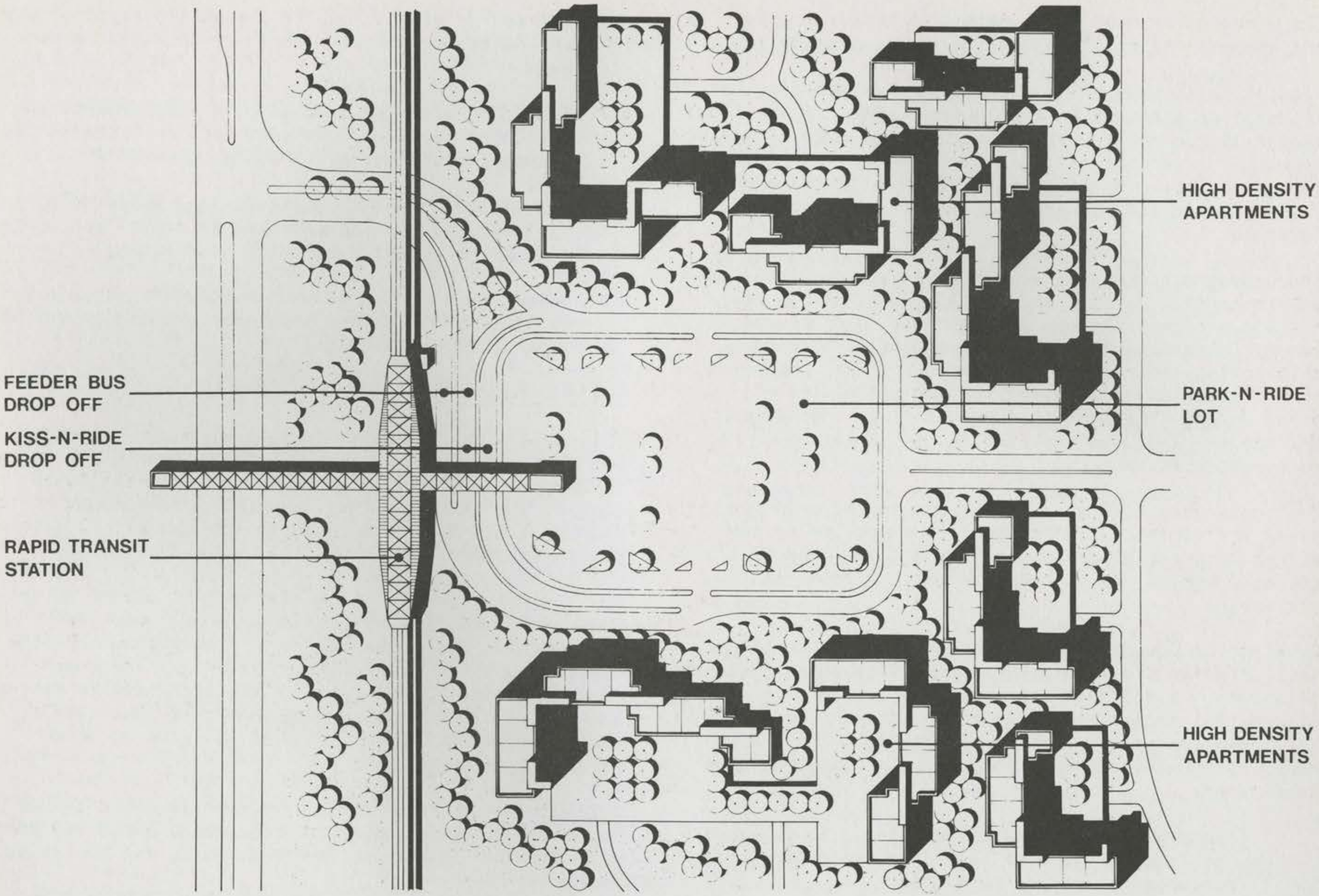
Transit Station Design

The rapid transit station is a major activity center and must accommodate large volumes of people providing interconnections for private vehicles and the feeder buses. The transfer time from buses and automobile to the rapid transit system must be minimal with little congestion and confusion.

The transit station is also the nucleus around which new development should generate. A well designed station will assist in the orderly development of the adjacent properties in terms of land use and urban design. Since the stations in the Jacksonville system are generally elevated, it is important that quality architectural design and related landscaping be emphasized.

Station Design - The transit station is divided into two basic operation zones; a free zone, and a pay zone, with fare collection equipment dividing the two zones. (Figure IX-6)

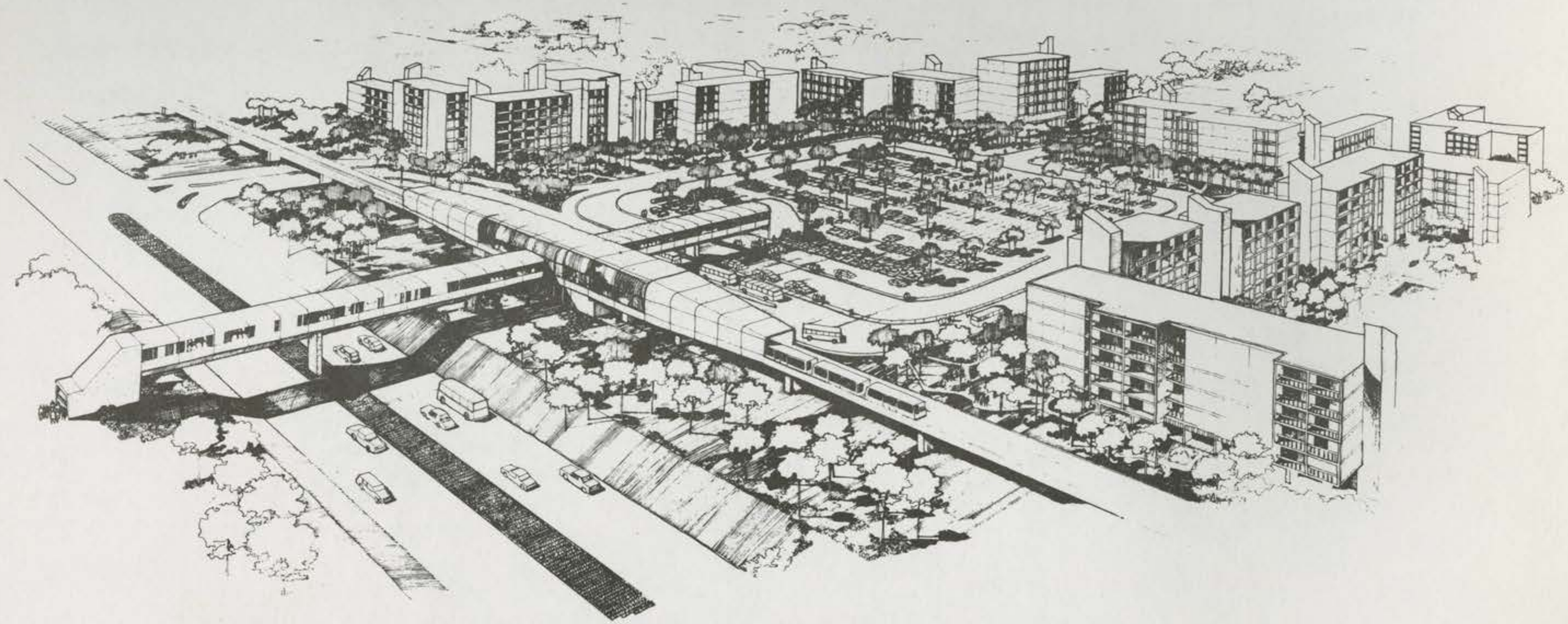
a. The free zone is the entry plaza outside the building and that portion of the concourse inside the station before the turnstiles. A passenger can circulate in this zone as he enters or leaves the station.



PROTOTYPE DEVELOPMENT CONCEPT:

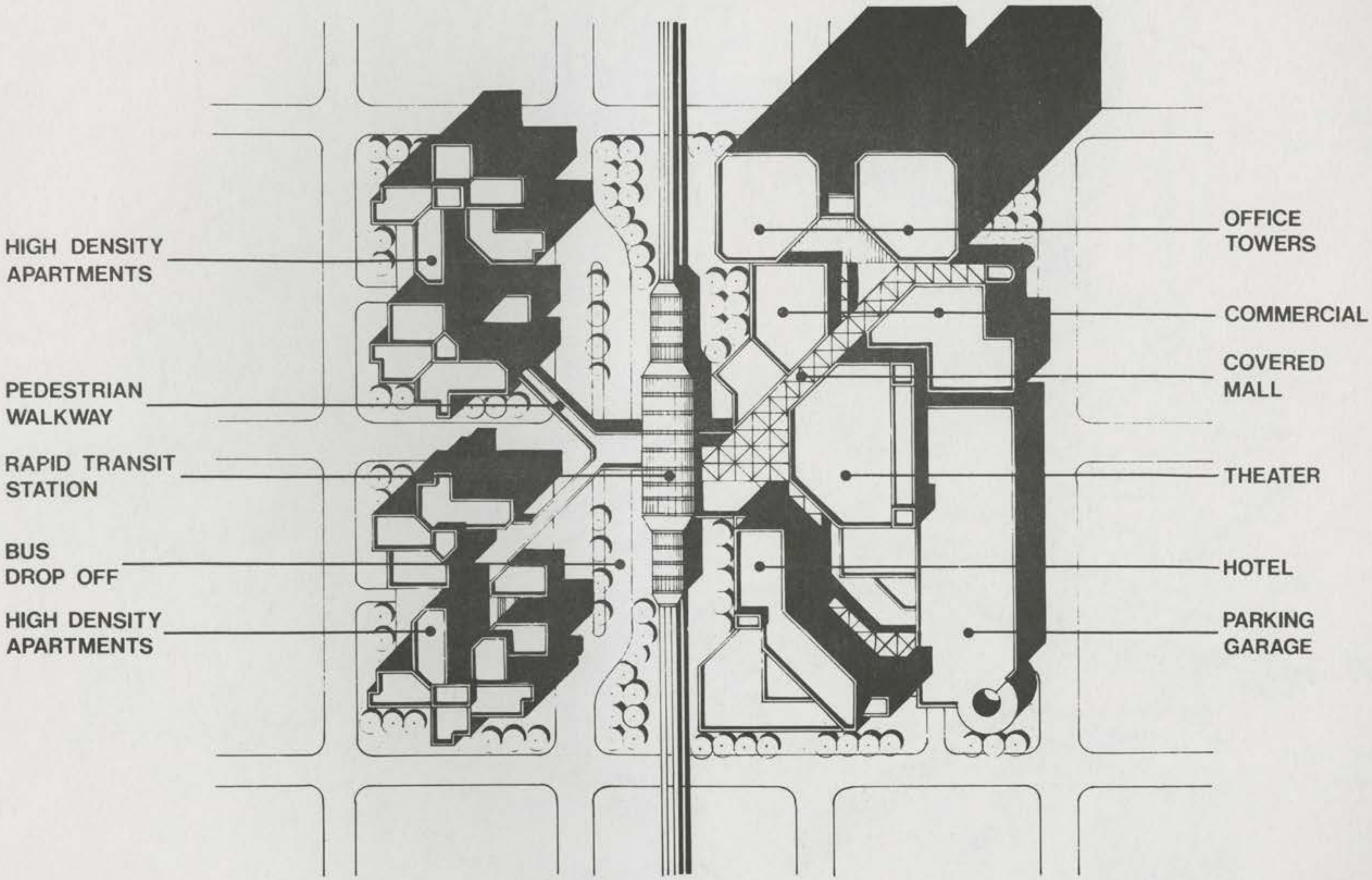
SUBURBAN STATION

Fig. IX–2



SUBURBAN STATION – PERSPECTIVE

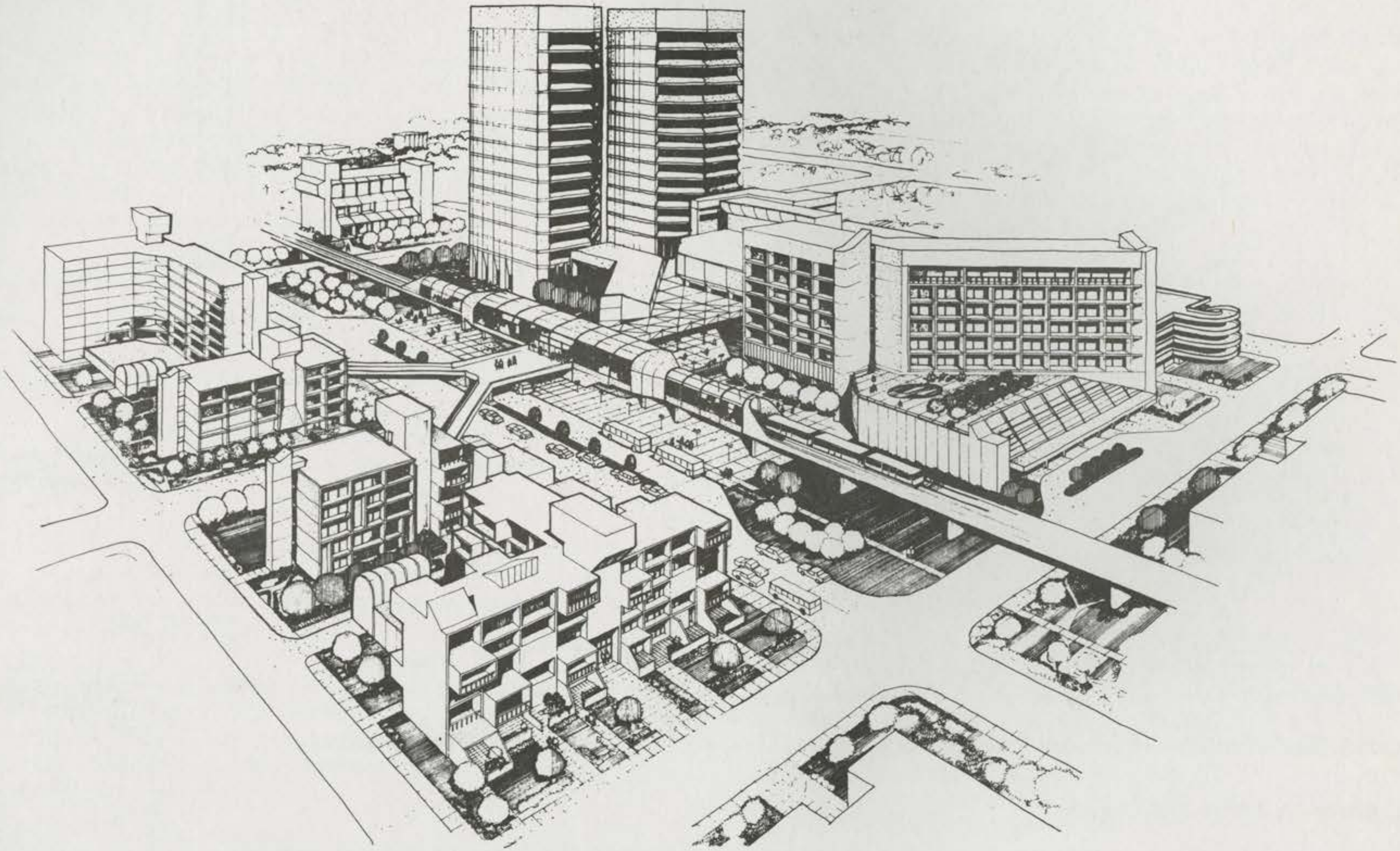
Fig. IX – 3



PROTOTYPE DEVELOPMENT CONCEPT:

URBAN STATION

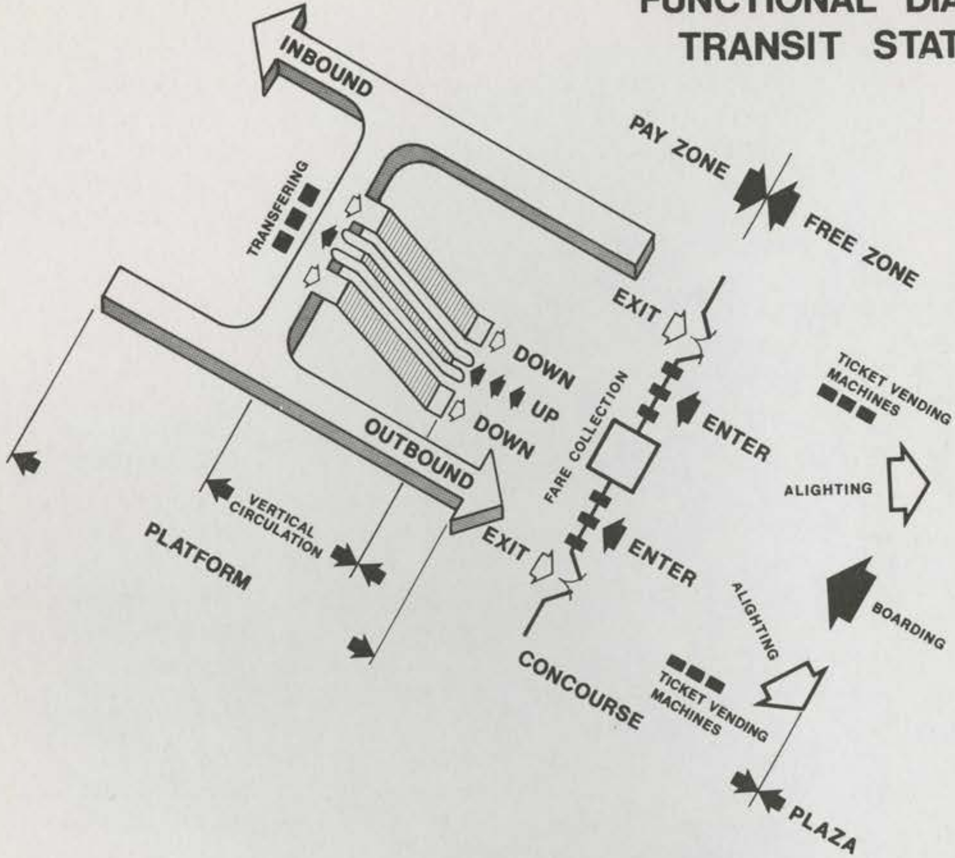
Fig. IX–4



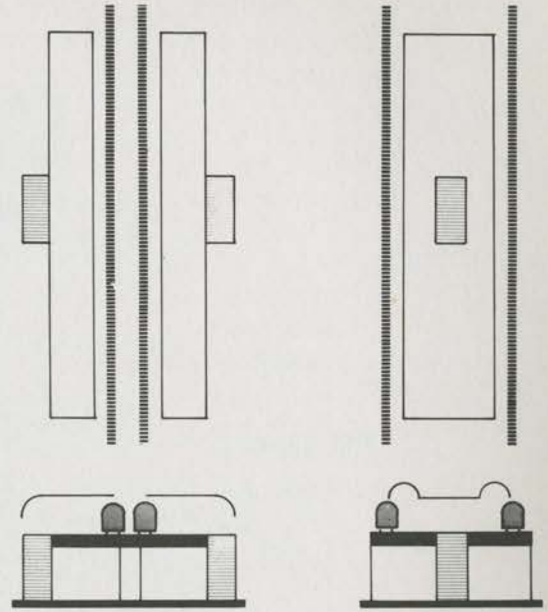
URBAN STATION – PERSPECTIVE

Fig. IX–5

FUNCTIONAL DIAGRAM TRANSIT STATION



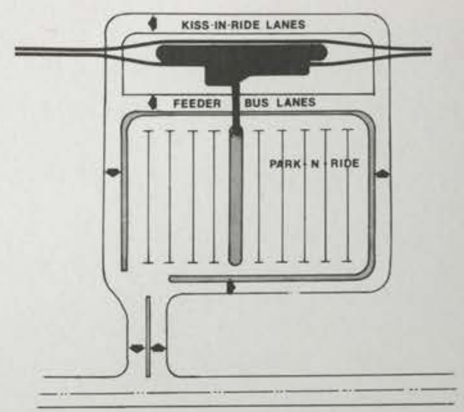
ALTERNATIVE PLATFORM LOCATIONS

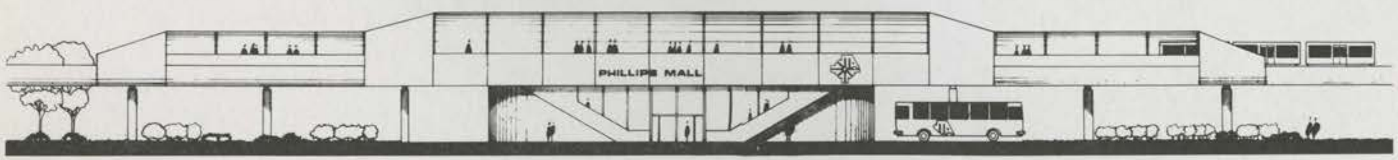


DIVIDED CENTER

URBAN STATION
DIVIDED PLATFORM

SUBURBAN STATION
CENTER PLATFORM





TYPICAL RAPID TRANSIT STATION

TRANSIT STATION DESIGN

Fig. IX-6

b. Fare collecting equipment, consists of the following components: fare collection booths, fare turnstiles, pass gates, and transfer machines.

c. The pay zone consists of the remaining concourse level and the train platform level, where the passenger can circulate and wait for the train he desires.

It is important that the station be designed to accommodate maximum passenger volumes as any delay in the time it takes to walk from the entry to the train is a major factor in passenger usage. It is also extremely important that the station complex be attractive and pleasant so that the transit passenger will be encouraged to use the system regularly.

Station Components - The major components of the station complex are: Parking Lots and Busways - Parking lots, busways, and kiss-n-ride lanes must be designed to minimize traffic congestion and separate public and private vehicles in an orderly manner. The barren effect of large parking and circulation areas should be avoided by creative planting contrasted with paved areas which will enhance the station and also define trafficways and points of access.

Walkways from the parking lots must maximize separation from vehicles. Bus passengers transferring to rapid transit should be protected from bad weather by a sheltered area at the entry plaza.

Entry Plaza - An open area will separate pedestrian activity from the bus and parking lot area and the station concourse. The plaza will be partially covered for weather protection for connecting bus and kiss-n-ride passengers.

Concourse Level - The station concourse connects the entrance with the vertical circulation system to the train loading platform. The fare collection equipment divides the concourse into a free and pay zone. The free zone contains a directional map showing the overall transit system and feeder bus connections, public telephones, change making machines and concessions. The fare collection equipment consists of fare collection booths, fare turnstiles, pass gates and transfer machines. The pay zone of the station will have a waiting area, directional map (same as above), public toilets, and train indicators.

Vertical Circulation - The circulation between the concourse level and the platform level should be accomplished by both stairs and escalators, with a small elevator for the handicapped. The escalator should be reversible, although normally they will serve the upward bound passenger. The number of stairs and escalators will be based on volume with a minimum of two stairs and one escalator per station.

Platform Level - The platform provides direct access to the transit vehicle. There are two basic platform types for a double track station: center platform and divided platform. (Figure IX-6) The center platforms are preferred because they make more efficient use of the vertical circulation elements and the platform space itself. The passenger can make his decision as to the direction of the train he wants after he reaches the platform and not in the concourse where in a rush he could take the wrong escalator. It is also helpful to eliminate "cross-over" or "under" the tracks for transfer passengers.

The advantage of the divided platform is it does not require the tracks to be curved to get around the platform as in the center platform station. This curve on the track can cause some engineering problems and additional costs depending on the alignment of the tracks before and after leaving the station.

The platform area should be:

1. Covered to protect passengers from bad weather.

2. Provide benches for waiting.

3. Well lighted for safety.

4. Provide train approach indicators.

5. Be constructed of pleasant but durable material for minimum upkeep.

Support Facilities - Each station will have non-public spaces for the operation of the system, these include: mechanical equipment rooms; electrical equipment rooms; maintenance and storage rooms; control and communication equipment; attendant's offices; and fare collection vault.

Module Station Design - The design and construction of transit stations can be expensive and alternatives should be explored to find ways to reduce cost. One alternative that should be explored, is possible module stations which would be repeated in both materials and construction methods. The "finish" of each station may present a different look, to complement the surrounding environment, but the module design will reduce overall construction costs.

Station Access Facilities

Rapid transit passengers will arrive and depart from the station in four basic ways:

1. Walk-in.

2. Feeder Bus.

3. Park and Ride.

4. Kiss and Ride.

Generally, all stations will accomodate walk-in passengers. Feeder bus and kiss-and-ride facilities will be provided in all stations except the CBD and park-and-ride facilities will be provided in the outlying suburban stations. (Figure IX-6)

Feeder Bus Requirements - The bus to rapid transit transfer is a critical part in the overall passenger trip time and should be accomplished in a quick and easy manner. The bus should have the prime access to the station's entry plaza. There are two basic types of feeder bus facilities, the on-street bus stop at the station and the off-street bus facilities.

On-Street - The on-street bus stop should be considered for those stations where the limitations of land resources is critical, such as around existing high intensity development. The on-street bus stop can in some instances reduce overall travel time for the rider.

Off-Street - Stations with low feeder bus volume in the peak hour, will allow buses to share roadways with parking, kiss-and-ride and park-and-ride traffic. At higher volume stations separate bus lanes may be required. The bus area must accommodate both unloading (short duration) and loading (waiting, longer duration).

Kiss-n-Ride Facilities - Facilities should be incorporated in all non-downtown stations for kiss-and-ride and taxi passengers. These facilities should rank second in access priority following buses. The spaces required for drop-off is small verses the space needed for waiting to pick up passengers. As in the case of buses, the kiss-and-ride facilities may be on-street or off-street depending upon station site size and traffic volume.

Park-and-Ride Facilities - Park-and-ride facilities are required in most stations outside the Downtown Area. The number of parking spaces for each park-and-ride station will be determined by demand levels. Circulation within the parking areas should be one-way and counter-clockwise, pedestrian traffic should be separated from automobiles and buses, but where pedestrian crossings occur they should be clearly marked. Large parking lots should be divided by landscaped areas using trees and various paving textures. These elements will minimize the visual impact of the "sea of asphalt".

Guideway Structure and Right-of-Way Design

The aerial guideway was selected for Jacksonville for several reasons:

1. The construction costs are less expensive than subway or open-cut construction methods by 3 to 5 times.
2. The aerial guideway will cause less interface problems with cross street circulation.
3. The aerial guideway will eliminate the need for fenced right-of-way beneath the guideway for multi-use development.

The guideway structure should be designed to make it attractive and "fit" the existing communities fabric. The aerial guideway concept offers the opportunity to develop parks, play areas, bikeways, walkways, landscaping and similar features beneath the structure. (Figure IX-7, IX-8)

To assist in developing the final design and development of the guideway structure and right-of-way, the following general urban design criteria have been established:

The Guideway Structure Design Criteria -

1. The size and shape should be compatible with adjacent neighborhoods.
2. The structure should be designed to adapt to a variety of locations.
3. The column spacing should allow views between columns, consistent with engineering requirements.
4. The surfaces of the structure should be a continuous plane with a minimum number of groves or recesses.
5. The structure should appeal as <u>one</u> element and not a series of elements put together.
6. The structure should have a color that complements the adjacent development.
7. The structure should provide for the incorporation of lighting and other services where feasible.

The Guideway Right-of-Way Design Criteria -

1. The right-of-way should be developed to reflect the scale and activities of its surroundings.
2. The right-of-way should be developed to allow access for emergency vehicles.
3. The right-of-way should be designed to allow visual surveillance for security reasons.

Development Guidelines

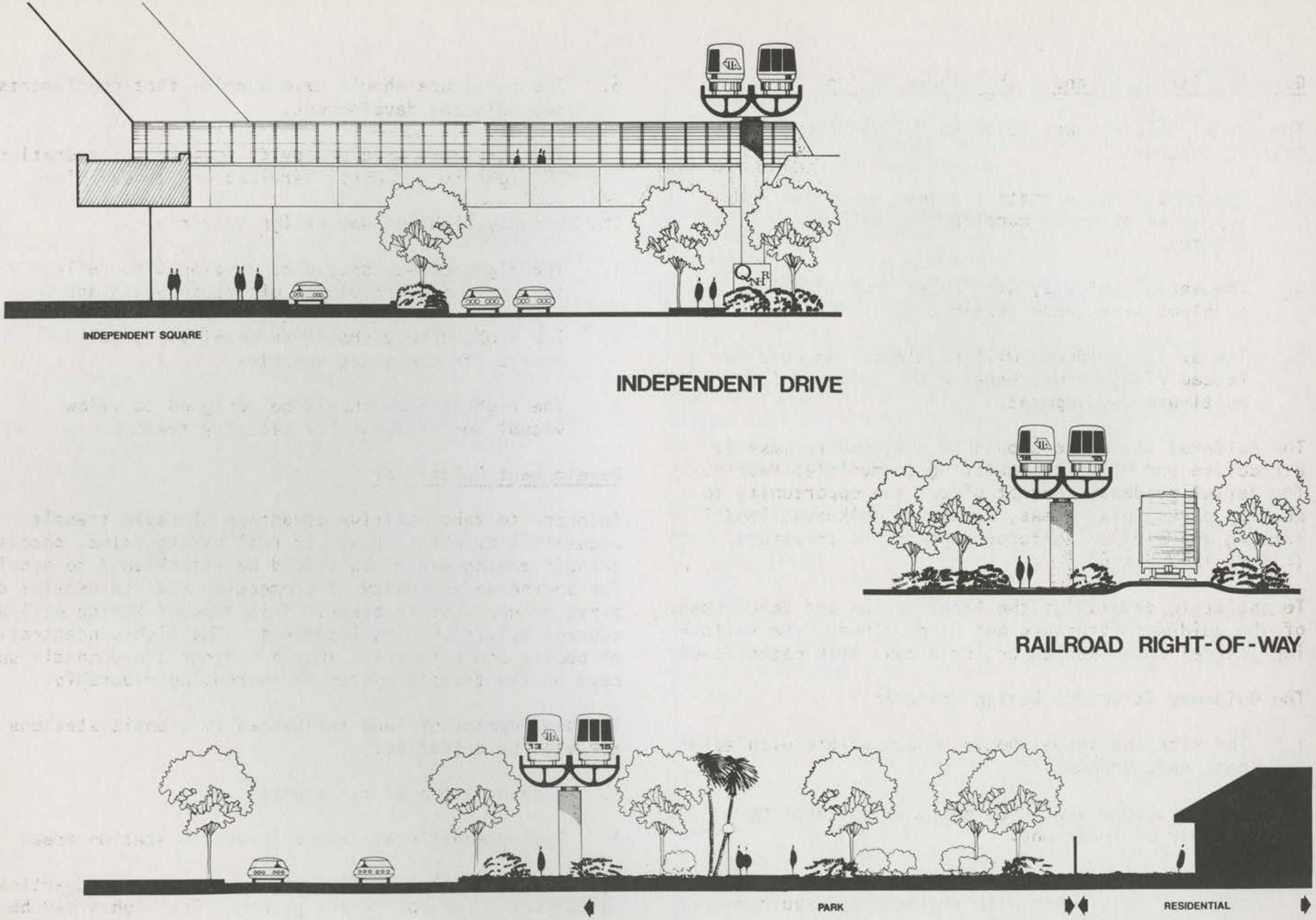
In order to take positive advantage of rapid transit accessibility and increase in real estate value, special transit zoning districts should be established to provide for increased intensity of commercial and residential density, around station areas. This type of zoning will encourage multi-functional centers. The high concentration of people and activities should further the economic success of the transit system by increasing ridership.

The development of land influenced by transit stations may also be guided by:

1. Sale or lease of air rights.
2. Buying additional land adjacent to station areas.

The sale or lease of air rights over transit properties can directly control future growth. The rights may be sold with certain development restrictions which will insure the desirable benefits to the public and the developer.

Purchasing additional or "extra" land for transit rights-of-way and facilities could also guide future



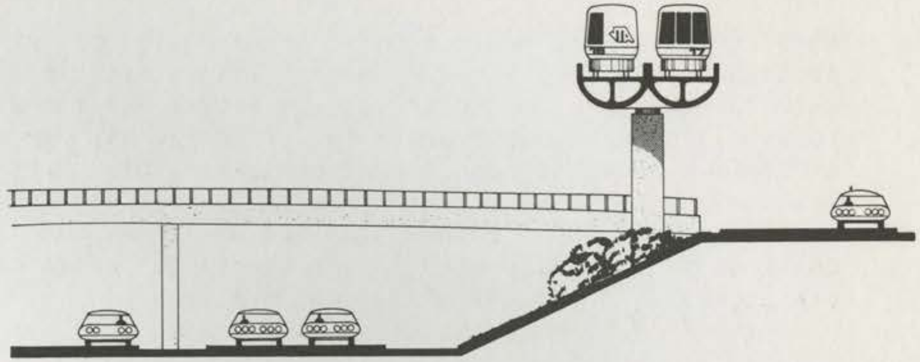
INDEPENDENT DRIVE

RAILROAD RIGHT-OF-WAY

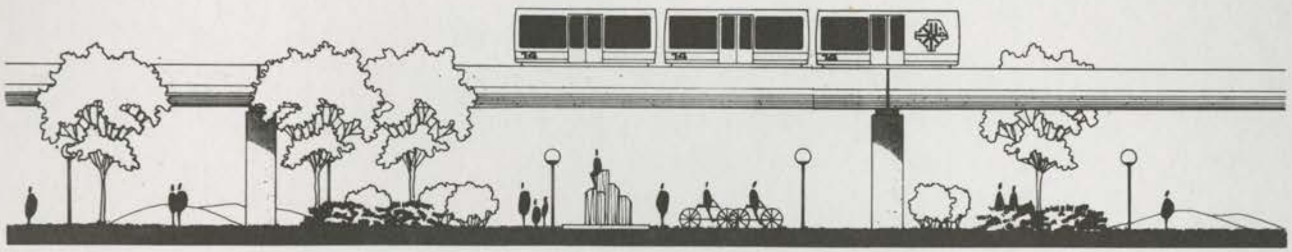
RESIDENTIAL AREA

GUIDEWAY STRUCTURE & RIGHT-OF-WAY DESIGN

Fig. IX-7



ARLINGTON EXPRESSWAY



LINEAR PARK

LAURA STREET DOWNTOWN

GUIDEWAY STRUCTURE & RIGHT-OF-WAY DESIGN

Fig. IX-8

development. This would require condemnation of key parcels in the vicinity of proposed transit stations with the sale of land to private investors who agree to specific development criteria. This process would be similar to the urban renewal process. This "extra" land may be purchased for the direct purpose of controlling development around stations or it may be obtained by necessity when larger-than-required parcels are necessary for right-of-way and stations.

Chapter X · Implementation, Phased Development, Capital Costs and Financing Sources

Implementation and Phased Development

The recommended transit implementation and phasing program is discussed in this section as well as the estimated capital cost for rapid transit construction and equipment. The potential funding sources for both capital and operating costs are also briefly discussed.

The recommended transit plan should be developed in phases. The Phase I All-Bus system, the Phase II 23.5 mile fixed-guideway system and the Phase III recommended 34.0 mile fixed-guideway system are discussed below. The basic implementation program for each phase is outlined in Table 25.

Phase I Transit Action Program - The recommended Phase I Transit Implementation or "Immediate Action" Phasing Program is generally aimed at developing transit ridership during the years prior to the initial operation of the fixed-guideway rapid transit system. Since the overwhelming model-choice criteria of potential transit users is travel time and convenience, Phase I is directed toward faster, express service and convenient park-and-ride facilities served by the express buses.

The Phase I Transit Program features express buses covering 120 route miles which provide comparatively fast transit service from suburban areas to the Downtown Area and some cross-town service. Figure X-1 illustrates the Phase I system. The express buses pick-up passengers at designated park-and-ride stops and stop only at major activity points or other park-and-ride facilities in-route to the Downtown Area. Stopping two or three times to dispatch and pick-up passengers in the CBD, the express buses pass through the Downtown Area and continue to another section of Jacksonville. The location of stops shown on Figure X-1 are general locations only.

The rerouting of local buses in the Downtown area is also strongly recommended. These route changes should be dictated by the development of exclusive transit rights-of-way and various methods of preferential treatment for transit vehicles. For example, one or maybe two east-west streets could be designated for buses only during specific hours of the day and buses entering the CBD would use these transitways. It is also recommended that most bus routes pass through the CBD and continue to another area of Jacksonville rather than turning around and traveling back to the area in which they had just come from. This would provide improved non-CBD service by minimizing travel and waiting time for many riders.

Some of the major concerns when developing the preferential treatment and exclusive rights-of-way for buses include:

1. Traffic signalization changes,
2. On-street parking changes,
3. Present driveway access,
4. Street capacity to accommodate bus traffic,
5. Commercial and emergency vehicle traffic, and
6. Bus maneuvering problems.

The Jacksonville Transportation Authority has made significant strides thus far in transit service improvements after it took over the Jacksonville Coach Company in early 1973. Working with the Florida Department of Transportation and Jacksonville governmental agencies, the JTA has already taken initial steps toward implementation of the Phase I program. Mini-bus service connecting peripheral parking lots in the northeast section of Downtown was begun in January, 1974 and four express bus routes with park-and-ride facilities were established from the beaches and five outlying shopping centers to the Downtown area in March, 1974. Other additions and improvements have been made during 1974.

Phase II and Phase III Fixed-Guideway Programs - The recommended Phase II and III Transit Programs are also given in Table 26. The recommended Rapid Transit Plan is intended to be a general guide for more detailed preliminary and final engineering and design studies. These studies as well as others will be required to obtain federal and state approval of a capital grant for construction of the fixed-guideway rapid transit system. The first step toward implementation, however, is adoption of the Plan by the Jacksonville Area

Fig. X-1

JACKSONVILLE URBAN AREA MASS TRANSPORTATION STUDY

FOR: THE CONSOLIDATED CITY OF JACKSONVILLE
BY: JACKSONVILLE AREA PLANNING BOARD

TITLE: **RECOMMENDED PHASE I TRANSIT SYSTEM 1974-1980**

LEGEND:

- EXPRESS BUS ROUTE
- EXPRESS BUS STATION

SCALE IN MILES: 0 1 2 3 4

CONSULTANTS:
CAMPBELL, FOXWORTH AND PUGH, INC.
REYNOLDS, SMITH AND HILLS
IN ASSOCIATION

DOWNTOWN AREA

Table 26

RECOMMENDED TRANSIT IMPLEMENTATION AND PHASING PROGRAM

YEAR	PHASE I PROGRAM
1974	UMTA approval of $8 million Capital Grant. Continue to improve bus route coverage. Begin CBD mini-bus - peripheral parking program. Begin CBD Express Bus Routes (10 buses) including suburban park-n-ride rerouting. Develop program for CBD bus rerouting. Develop program for preferential treatment of buses in downtown area. Improve disemination of bus service information (improved bus maps, etc.)
1975	Acquire UMTA Capital Grant request including 50 new buses. Expand and improve Express Routes (28 total buses). Expand CBD mini-bus program to 14 buses. Begin Dial-A-Ride program for handicapped. Begin construction of new bus maintenance facility. Begin bus rerouting and preferential bus treatment in CBD. Expand bus routes and improve level of service by adding buses to routes.
1976	CBD bus rerouting and preferential treatment program toally implemented. New maintenance facility operational.
1977	Increase buses on Express Bus System: (Total of 42 buses).
1981	Increase bus fleet to 300 by 1981.
	PHASE II PROGRAM
1974	Jacksonville Area Planning Board adopt rapid transit plan and request Jacksonville Transportation Authority to initiate implementation procedures.
1975	Begin development of financial plan for total transportation system planning and development. Begin study of integrated JUATS Streets and Highways and Mass Transit Plan.
1976	Technical Study Grant Application to UMTA and initiate preliminary engineering and architectural design of rapid transit system. Environmental Impact Studies. Rapid Transit Impact Studies. Other required studies.

Table 26
(Continued)

1977	Final Engineering Design Plans for rapid transit system. File Capital Grant Application to UMTA for construction of a fixed-guideway system. Begin right-of-way acquisition. Continue Transit Impact Studies. Order 100 buses.
1978	Construction Bids for Fixed-Guideway System. Begin construction of Phase II 23.5 mile system (downtown area first). Continue R/W acquisition Acquire 100 new buses. Prepare and send out bids for rapid transit vehicles. Order 150 rapid transit vehicles.
1979	Continue construction of Phase II. Complete R/W acquisition. Acquire 150 rapid transit vehicles. Begin testing of computer system and vehicle performance.
1980	Continue testing of total system and construction. Begin Partial Service on initial segment of rapid transit system.
1981	Begin Passenger Service over Phase II 23.5 mile system.
	<u>PHASE III</u>
1982	Construction bids for additional 10.5 mile of fixed-guideway system (Phase III). Begin construction of Phase III. Order 100 additional rapid transit vehicles.
1983	Continue construction of Phase III. Order 50 new buses. Acquire 100 new rapid transit vehicles. Test new rapid transit vehicles.
1984	Begin passenger service on recommended 34-mile rapid transit system. Acquire 50 new buses.
1985-1990	Expand fixed-guideway and bus system to meet new growth developments and increased mass transportation demands.

Planning Board, the Jacksonville Transportation Authority and the City Council.

Following the adoption of the Rapid Transit Plan a financial plan must be developed which would include both the JUATS Streets and Highways and JUATS Rapid Transit Plan. At the same time, an integrated program for JUATS roadways and JUATS transit facilities, outlining priorities and development phasing, must be prepared. Preliminary engineering and architectural design of the rapid transit system must be undertaken financed partially be an UMTA Technical Study Grant. Environmental impact and transit impact studies should also be undertaken.

Following final engineering and design planning, recommended to be completed in fiscal year 1977 a final UMTA capital grant application must be prepared requesting federal assistance in the construction of the fixed-guideway rapid transit system and necessary equipment to operate the system.

In 1978 construction bids should be sent out and construction of the recommended initial 23.5 miles as shown in Figure X-2 should commence. Construction of Phase II is expected to require between three and four years to complete. Acquisition of required rights-of-way begun in 1977 would continue into 1979. One hundred and fifty rapid transit vehicles should be acquired in 1979. Testing of the automated system, control and communication systems and vehicle performance should begin in 1979 and continue to 1980. Partial service on the rapid transit system is anticipated in late 1980 pending successful testing results. Assuming no major delays, passenger service over the entire 23.5 mile Phase II fixed-guideway system could begin in 1981.

The construction of Phase III (10.5 miles), shown in Figure X-3 should begin in 1982 and is expected to require about two to three years to complete. Another 100 rapid transit vehicles should be acquired in 1983 and by 1984 the recommended rapid transit system should be in full operation.

Future expansions of the fixed-guideway and bus systems would be dependent upon the magnitude and distribution of land use developments, increase in mass transportation demands, and the success of the recommended system.

Capital Costs

Capital cost for the light-weight, medium volume recommended rapid transit system and its supplementary system of express and feeder buses is estimated at $529.9 million when an inflation factor based on staging of construction is included ($331.4 million in January, 1974 dollars). Major elements of the total capital costs are shown in Table 27 and 28.

Estimated route and guideway construction costs account for $309.2 million or 60.3 percent of the total inflated capital costs. Rapid transit stations, facilities, yards and shops are all included in construction costs. Bus and rapid transit vehicle cost are estimated at $18.5 and $60.8 million, respectively. Preliminary and final engineering, architectural design, environmental and transit impact studies, and administrative and legal costs required for the construction total system are estimated at $31.2 million. Estimated cost of rights-of-way total $17.1 million and all other capital costs including a major bus maintenance facility, testing of the rapid transit system, control and communication, and electrification total an estimated $93.1 million.

Cost of Inflation

Any delay in the construction phasing will result in significant cost increases for building the recommended rapid transit system. Table 29 dramatically illustrates how fast the cost of construction could rise due to anticipated inflation. For example, if the recommended Phase II and Phase III construction schedule was delayed five years, the additional cost to build the rapid transit system is estimated at $197.4 million. Hence, the total cost for construction only would be $506.6 million instead of $309.2

Fig. X-2

JACKSONVILLE URBAN AREA MASS TRANSPORTATION STUDY

FOR THE CONSOLIDATED CITY OF JACKSONVILLE
BY JACKSONVILLE AREA PLANNING BOARD

TITLE: **RECOMMENDED PHASE II TRANSIT SYSTEM 1981 - 1984**

LEGEND:

- FIXED GUIDEWAY ROUTE
- FIXED GUIDEWAY STATION
- EXPRESS BUS ROUTE
- EXPRESS BUS STATION
- FEEDER BUS

DOWNTOWN AREA

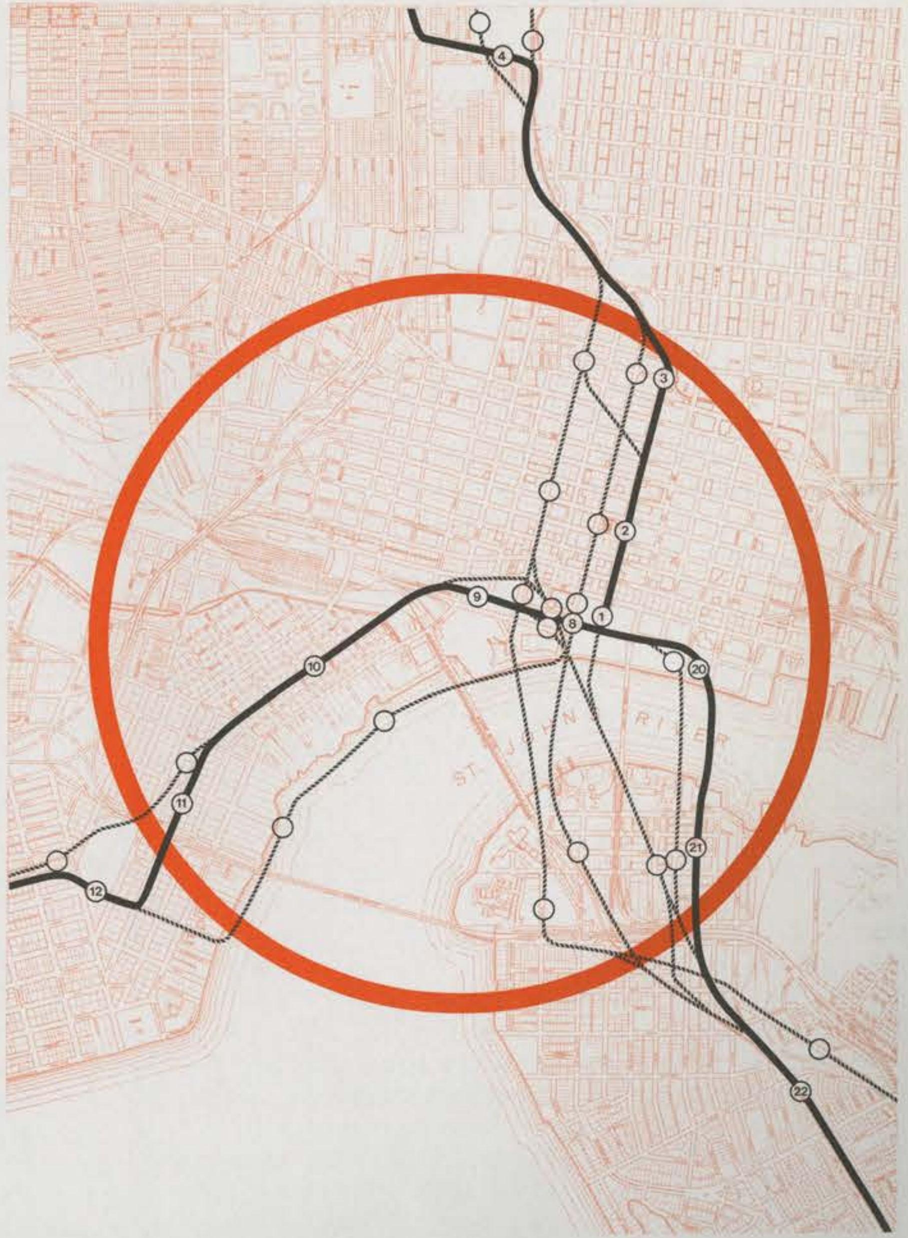
- PREFERRED ALTERNATIVE ROUTE

SCALE IN MILES

0 1 2 3 4

CONSULTANTS:

CAMPBELL, FOXWORTH AND PUGH, INC.
REYNOLDS, SMITH AND HILLS
IN ASSOCIATION



DOWNTOWN AREA

Fig. X-3

JACKSONVILLE URBAN AREA MASS TRANSPORTATION STUDY

FOR: THE CONSOLIDATED CITY OF JACKSONVILLE
BY: JACKSONVILLE AREA PLANNING BOARD

TITLE: **RECOMMENDED PHASE III TRANSIT SYSTEM 1985-1990**

LEGEND

- FIXED GUIDEWAY ROUTE
- FIXED GUIDEWAY STATION
- EXPRESS BUS ROUTE
- EXPRESS BUS STATION
- FEEDER BUS

DOWNTOWN AREA

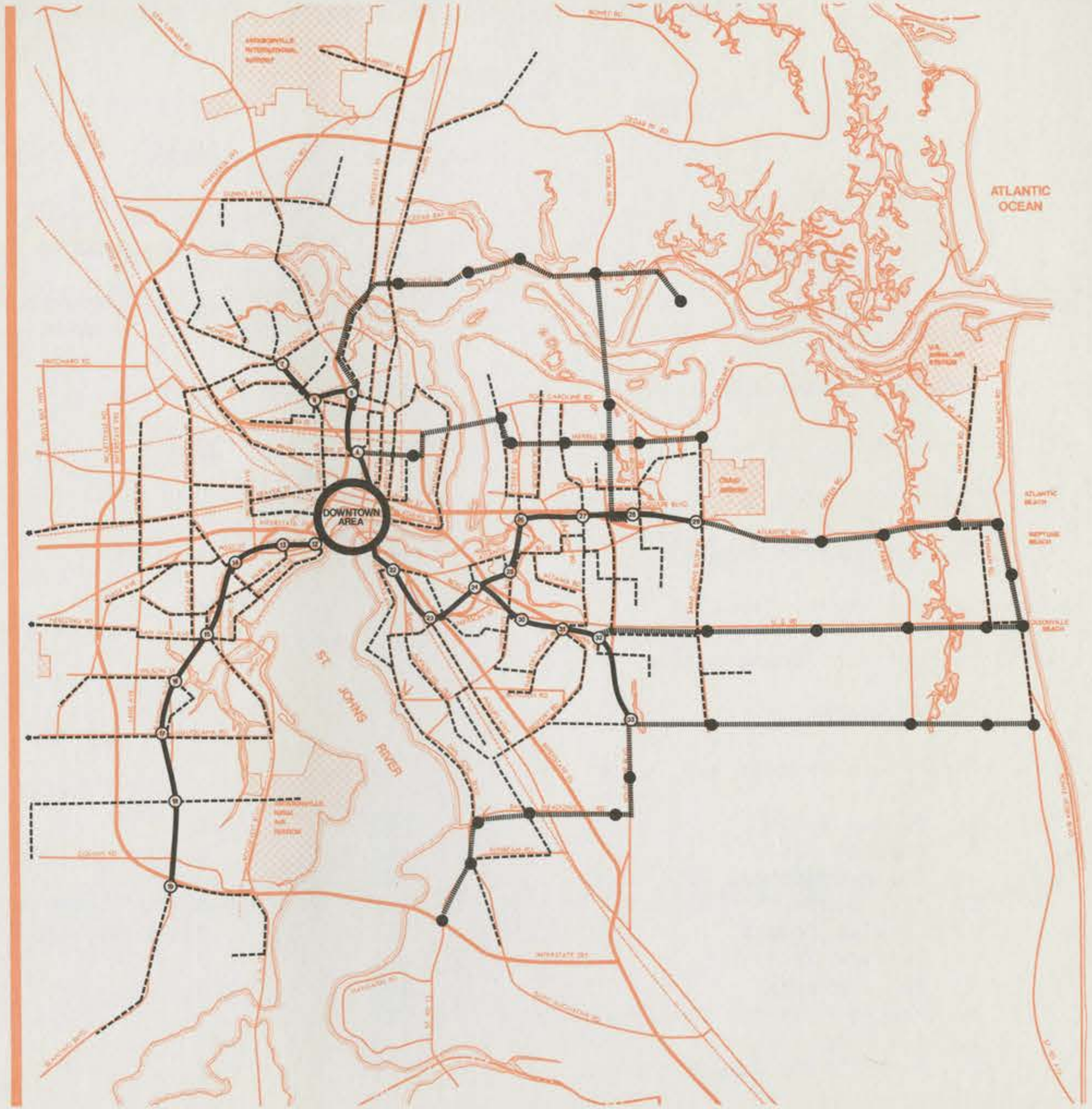
- PREFERRED ALTERNATIVE ROUTE

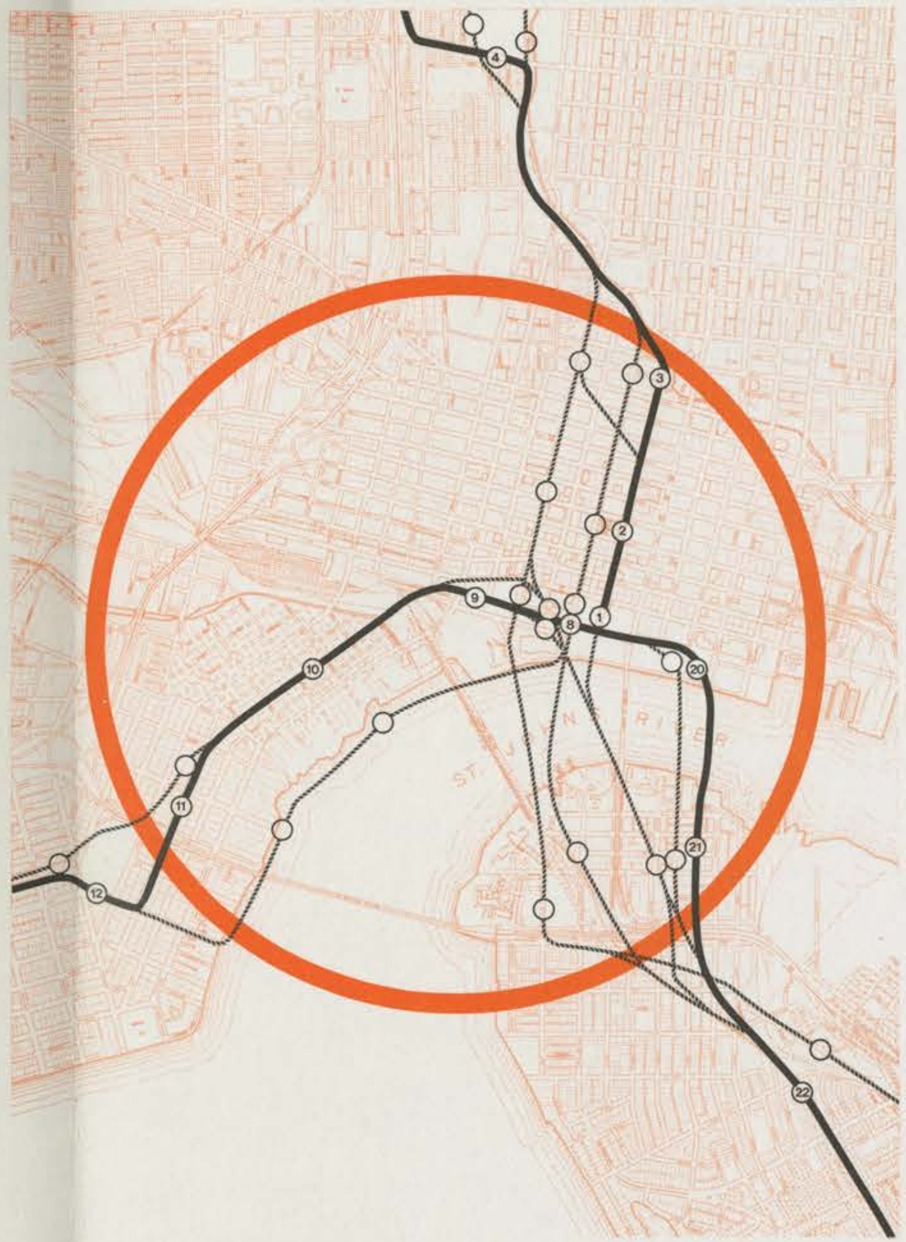
SCALE IN MILES

0 1 2 3 4

CONSULTANTS

CAMPBELL, FOXWORTH AND PUGH, INC.
REYNOLDS, SMITH AND HILLS
IN ASSOCIATION





DOWNTOWN AREA

Table 27

CAPITAL COST ESTIMATES RECOMMENDED RAPID TRANSIT SYSTEM

		COST/UNIT ($ THOUSANDS)	UNITS	TOTAL COST ($ MILLIONS)
A.	DIRECT COSTS			
I.	Land Acquisition	350	34 Miles	11.90
II.	Route Construction (Elevated System)	600	34 Miles	20.40
III.	Guideway Construction	2,500	34 Miles	85.00
IV.	Stations (Elevated)	1,100	33	36.30
V.	Yards and Shops			6.00
VI.	Electrification (Power)	600	34 Miles	20.40
VII.	Fixed-Guideway Vehicles	175	250	43.75
VIII.	Control and Communication			28.00
	SUB-TOTAL			$251.75
IX.	Feeder and Express Bus System			
	A. Feeder Buses	47	200	9.40
	B. Express Buses	55	50	2.75
	C. Spare Component Units	22	15	0.33
	D. Fare Boxes	0.7	250	0.18
	E. Service Trucks	14	7	0.10
	F. Service Cars	4.5	7	0.03
	G. Bus Shelters	3.5	200	0.70
	H. New Maintenance Facility	4,000	1	4.00
	I. Bus Stops	1.0	1,600	1,60
	J. Control and Communication	1.5	250	0.38
	SUB-TOTAL			$ 19.47
	TOTAL DIRECT COSTS			$271.22

Table 27
(Continued)

	COST/UNIT ($ THOUSANDS)	UNITS	TOTAL COST ($ MILLIONS)
B. INDIRECT COSTS			
I. Engineering, Planning, Design and Architecture (9% of Construction)			13.30
II. Administration and Legal (8% of Construction and R.O.W.)			12.80
III. System Testing			4.67
IV. Contingencies (20% of Construction)			29.50
SUB-TOTAL			$ 60.27
TOTAL ESTIMATED CAPITAL COST (In January, 1974 Dollars)			$331.40
TOTAL ESTIMATED CAPITAL COST (With Inflation)*			$529.90

*Direct Costs including all construction costs inflated 10% rapid transit vehicles 5%; buses 3% and all other costs 5%; all compounded annually.

Table 28

RECOMMENDED RAPID TRANSIT PLAN
CONSTRUCTION SCHEDULE WITH CAPITAL COSTS
(in millions of dollars)

FISCAL YEAR	CONSTRUCTION (1)	CONSTRUCTION (2)	VEHICLES (1)	VEHICLES (2)	P.E., DESIGN IMPACT STUDIES, LEGAL (1)	P.E., DESIGN IMPACT STUDIES, LEGAL (2)	R/W ACQUISITION (1)	R/W ACQUISITION (2)	OTHER (1)	OTHER (2)	TOTAL CAPITAL COST (1)	TOTAL CAPITAL COST (2)	TOTAL CAPITAL COST (1) + (2)
1974					$0.5	-					$0.5	-	$0.5
1975					3.0	$0.2					3.0	0.2	3.2
1976					7.6	0.8					7.6	0.8	8.4
1977					6.0	1.0	$5.9	$2.0	$4.1	$1.4	16.0	4.4	20.4
1978	50.0	23.2(3)	$10.0	$1.3(5)	3.0	0.7	3.0	1.4	12.1	5.6	78.1	32.2	110.3
1979	50.0	30.5(3)	26.3	7.3(6)	1.5	0.4	3.0	1.8	13.6	7.8	94.4	47.8	142.2
1980	42.0	32.4(3)			1.5	0.5			18.1	10.8	61.6	43.7	105.3
1981			3.0	0.7(5)	1.0	0.4					4.0	1.1	5.1
1982	15.0	17.2(4)			1.0	0.5			4.0	4.6	20.0	22.3	42.3
1983	15.0	20.4(4)	17.5	9.7(6)	1.0	0.6			5.0	6.0	38.5	36.7	75.2
1984	5.2	8.3(4)									5.2	8.3	13.5
1985			2.5	1.0(5)							2.5	1.0	3.5
Sub-Total (1974 Dollars)	$177.2		$59.3		$26.1		$11.9		$56.9		$331.4		
Sub-Total (inflation Costs)		$132.0		$20.0		$5.1		$5.2		$36.2		$198.5	
TOTAL COST ESTIMATE	$309.2		$79.3		$31.2		$17.1		$93.1				$529.9

(1) Estimated constant January, 1974 dollars.
(2) Estimated additional cost due to inflation..
(3) Phase II initial 23.5 mile fixed-guideway construction (10% inflationary rate compounded annually).
(4) Phase III completion of recommended 34-mile fixed-guideway construction (10% inflationary rate compounded annually).
(5) Buses (3% inflationary rate compounded annually).
(6) Rapid Tranist Vehicles (5% inflationary rate compounded annually).
(7) Inflation factor of 5% compounded annually.
(8) Inflation factor of 10% compounded annually.
(9) Includes control and communication electrification, testing system, maintenance facility, etc., (Inflation factor 5% compounded annually).

Table 29

ADDITIONAL CONSTRUCTION COSTS
IF TRANSIT PROGRAM IS DELAYED 5 YEARS
(in millions of dollars)

FISCAL YEAR	RECOMMENDED PHASE II AND III PROGRAM CONSTRUCTION COSTS (1)	(2)	ADDITIONAL INFLATION COST DUE TO 5 YEAR DELAY IN CONSTRUCTION(3)
1978	$50.0	$23.2	$44.7
1979	50.0	30.5	49.2
1980	42.0	32.4	54.1
1981	-	-	-
1982	15.0	17.2	19.6
1983	15.0	20.4	21.6
1984	5.2	8.3	8.2
TOTAL	$177.2	$132.0	$197.4

(1) Estimated cost in constant January, 1974 dollars.
(2) Construction costs increased by 10 percent compounded annually to reflect estimated inflation.
(3) Begin construction in 1983 rather than 1978.

million. The recommended construction schedule will result in only an additional $132.0 million due to inflation. Hence, building the rapid transit system during the 1978-1984 period rather than the 1983-1989 period will save an estimated $197.4 million in construction costs alone. This represents an average annual savings of nearly $28.2 million for the seven-year period.

Potential Capital Financing Sources

With the expected energy problems in the future and the citizen demand for transit service continuing to increase, the major issue is not where rapid transit should be built or if it should be built, but how can it be financed? A financial program should be arranged to meet a realistic and desirable transit planning program and should be integrated with other State and City projects. As with other major public works projects, the rapid transit system costs will be considerable.

Of course, before any significant improvements in transit can be made, financial support must be obtained and assured on a continuing basis. New Federal legislation and State constitutional legislative laws, (which continue to support additional funding for mass transit), are expected to be adopted. The timing and amount of financial assistance is uncertain, however. It will be the job of the local officials and citizens to determine the most equitable and desirable means of funding their local source of capital and operating costs for the recommended system. The importance of early financial actions cannot be overemphasized as the program will require an aggregation of federal, state and local financing strategies.

Federal Assistance - The Federal Government, with passage of the Federal Aid - Highway Act of 1973, has again taken a significant step toward aiding state and local governments in the establishment of a more balanced urban transportation system. The new highway act makes urban system highway funds available for capital investments in transit systems for areas with over 200,000 population. $780 million in 1974 and $800 million in 1976 will be made available.

Each state will be apportioned funds based upon the ratio of its population to that of the nation. The new law offers local officials the option of substituting a transit project for a highway project in the urban system. All projects are to be certified within the urban transportation planning process and reviewed jointly by the Federal Highway Administration and the Urban Mass Transportation Administration. Upon approval by the Secretary of Transportation the Federal Government could automatically be obliged to pay 80 percent of the net project costs.

Urban Mass Transportation Capital Grants - Capital grants are administered by the United States Department of Transportation's Urban Mass Transportation Administration (UMTA). Their purpose is to assist state and local public agencies to provide adequate public transportation, to encourage development and implementation of area-wide improvement programs consistent with the regional goals and objectives of a comprehensive planning process. Only public agencies are eligible for grants for capital facilities or equipment.

In October of 1970, the Urban Mass Transportation Act was passed which established the Federal Department of Transportation Authority to sign contracts with local operating agencies and governments guaranteeing them matching grants amounting to $3.1 billion during the initial five years. The Federal Aid - Highway Act of 1973 adds $3 billion from general funds to be authorized in contract authority for the Urban Mass Transportation capital grant program.

Under the Act of 1973 up to 80 percent of the cost which UMTA determines cannot reasonably be financed from revenues ("net project cost") would be the maximum financed by the Federal Government. The total share of the net project cost must be available prior to completion of the program and must be in cash, or may include the direct contribution of labor materials land or other property of "ascertainable value".

Table 30 shows the UMTA capital grants by fiscal year from 1965 to 1973. During this period over $2.3 billion has been matched by UMTA in capital grants to build and improve transit systems across the nation. The trend of increasing federal assistance is obvious: 1972 and 1973 alone accounted for 160 or 45 percent of approved projects thus far. Nearly 60 percent of the total cost of transit capital grants were approved during the 1972 and 1973 fiscal year. Increasing federal assistance is anticipated to continue. Most eligible operating agencies and governments can look forward to some form of federal financial assistance.

Table 31 indicates the possible annual funding share between the federal government, the Florida Department of Transportation, and the City of Jacksonville to build the recommended 34.0 mile fixed-guideway rapid transit and supplementary express and feeder bus system. These estimates are based upon current governmental capital funding policies and the recommended transit plan implementation schedule. The greatest amount of federal assistance is required in 1979 when about $114 million would be required during a portion of the construction of the Phase II rapid transit system. In that year also both FDOT and Jacksonville's cost share will be the greatest at a little over $14 million each. The total possible capital cost share by the federal government is $423.92 million with the remaining $105.98 million equally shared by FDOT and Jacksonville.

To quality for a capital grant a preliminary letter of application must be forwarded to UMTA, preferably by the JTA, in order for UMTA to determine the eligibility of the project and availability of funds. Following approval to proceed a technical grant application for preliminary engineering and design, planning, and financial and legal data collection must be applied for. A final capital grant application in which the above data and information are detailed would then be forwarded to UMTA for a final decision on the grant.

State Assistance - State and federal governments have many of the same options available for financial support of transit improvements. Much broader powers are available to state governments than local governments. States are in the position to: offer municipal governments greater flexibility in legal and financial matters, create special districts with sufficient power and automony to be viable, and create statewide administration organizations capable of coordinating projects over a much greater area.

Recently in Florida, the Governor suggested making $120 million available for transit from interstate advances. This money would come from the state general fund which is presently enjoying a large surplus. Also, increased cigarette or liquor taxes destined for the general fund could be earmarked for local transit expenditures.

By absorbing the local share of capital investments for major interstate, federal-aid, and urban roads, the state could free local funds for other transport systems.

At present the state's policy is to finance up to 10 percent of capital costs for UMTA capital assisted projects. Jacksonville must look toward the state for assistance and cooperation in the transportation planning and implementation process.

Gasoline Tax - One of the biggest revenue producing methods of financing transportation in Florida is the State gasoline tax. It is comprised of eight cents on every gallon of gasoline sold. Four cents are used by the Florida Department of Transportation as they see fit and the fifth, sixth, seventh, and eighth cents go directly to the counties in need of funding for transportation facilities. Of these, three cents can be used for maintenance and construction of highway facilities. The eighth cent in the gasoline tax is the only local cent available for mass transit funding. It also can be used for funding highway improvements. Presently, this is the source of matching funds for Federal and State dollars used by the Jacksonville Transportation Authority.

Table 30

URBAN MASS TRANSPORTATION ADMINISTRATION
CAPITAL GRANTS BY FISCAL YEAR AND CATEGORY
THROUGH 6/30/73

Gross Approvals

FISCAL YEAR	NO. OF PROJECTS	BUS	RAIL	BOAT & OTHER	TOTAL
1965	17	$ 9,273,911	$ 28,141,911	$ 13,286,666	$ 50,702,488
1966	27	39,467,100	64,438,661	2,201,666	106,107,427
1967	22	10,336,078	110,589,115	-	120,925,193
1968	26	17,004,456	104,816,839	-	121,821,295
1969	28	26,353,811	121,931,515	-	148,285,326
1970	28	49,758,403	83,182,279	445,284	133,285,966
1971	49	116,059,415	160,226,627	8,500,000	284,786,042
1972	66	166,340,053	280,414,865	63,245,082	510,000,000
1973	94	235,373,528	583,020,196	25,814,276	844,208,000
TOTAL	357	$669,966,755	$1,536,762,008	$113,492,974	$2,320,221,737

Table 31

POSSIBLE FUNDING BY LEVEL OF GOVERNMENT
(in millions of dollars)

FISCAL YEAR	ESTIMATED ANNUAL CAPITAL COST (INCLUDING INFLATION)	POSSIBLE COST SHARE FEDERAL 80%	FDOT 10%	JACKSONVILLE 10%
1974	$ 0.5	$ 0.40	$ 0.05	$ 0.05
1975	3.2	2.56	0.32	0.32
1976	8.4	6.72	0.84	0.84
1977	20.4	16.32	2.04	2.04
1978	110.3	88.24	11.03	11.03
1979	142.2	113.76	14.22	14.22
1980	105.3	84.24	10.53	10.53
1981	5.1	4.08	0.51	0.51
1982	42.3	33.84	4.23	4.23
1983	75.2	60.16	7.52	7.52
1984	13.5	10.80	1.35	1.35
1985	3.5	2.80	0.35	0.35
TOTAL	$529.9	$423.92	$52.99	$52.99

In fiscal years 1970-71 and 1971-72, over 236,000,000 and 254,000,000 gallons of gasoline were sold in Duval County. This year about 3.3 million dollars will be received in Jacksonville from the eighth cent gasoline tax. In 1975 this tax could produce between $4.0 and $5.0 million and by 1990 between $7.0 and $10.0 million. The fuel shortage, however, may significantly reduce these figures.

A ninth cent could be added for use in transit improvements and facilities. A referendum must be passed, however, to receive this additional gas tax. Presently there are no counties in the state who have taken advantage of the additional tax, however, some legislative attempts are being made to remove the referendum requirements. If this tax were utilized it could produce between $4.0 and $5.0 million in 1975. By 1990 as estimated $7.0 and $10.0 annual could be provided for transit.

Vehicle Tag Fee - License tag revenue which are presently part of the general fund could be diverted to the State Department of Transportation. This procedure is presently accepted in some states. As mentioned earlier the Florida General Fund has a surplus this year. About 7% of the total state license tag revenue could be expected to go to Jacksonville annually. In 1974 this would amount to around $7 million.

An additional license tag fee for every vehicle registered in Jacksonville has been suggested as one method of financing future transportation facilities. Nearly 366,000 motor vehicle tags were registered in Duval County in 1971-72. If a $10.00 charge per automobile and $5.00 charge for trucks, trailers, motorcycles and other vehicles were levied approximately $3.2 million could have been collected for transit. In 1990 between $6.0 and $7.0 million could be collected. Since this method is used to finance highways, it could also be used to finance transit improvements.

General Sales Tax - Currently, the State levies a four cent general sales tax. In some cities where new transit systems are being built, general sales taxes are levied to finance construction and operation of transit systems. This source is presently being utilized in Atlanta and Denver to finance their rapid transit systems. Jacksonville could expect to collect $20 million per year in 1974 with an additional 1% sales tax. By 1980 the same tax could yield an estimated $25-30 million and increase to between $40 and $45 million by 1990.

Local Assistance - Another possible source of revenue for new transit facilities is an increase in property or ad valorem tax in Jacksonville. Although property taxes have met with stiff resistance in most areas, many municipal expenditures for transportation have largely been financed through property taxes. Miami and Seattle have plans for financing their rapid transit systems with property tax supported bond issues. Property taxes account for the highest single source of revenue in most cities. The tax levied on property in Jacksonville is comparatively low. However, in 1972 Jacksonville property taxes accounted for nearly $19 million in revenue. A 10 percent increase in the property tax rate; for example, would yield over $2 million in 1975 for transit facilities.

Special Benefit Taxes - Once transit is introduced to the city, property values near transit stations tend to increase dramatically. By charging a special tax rate or "Special Benefit Tax" to land where densities increase due to the introduction of the transit system, the public might recapture some of the gains previously turned over to the private sector. These special taxes could apply only when land is sold or converted to a higher density use. Care should be used, however, to avoid discouraging development around stations with this tax. Taxes should not be charged for property owners who keep their land use relatively stable with the construction of a nearby transit station.

Sale or Lease of Air Rights - Only essential property for the transit system would be acquired. However, after high land values are established around transit stations the sale or lease of air rights over transit properties becomes especially appealing. Since no further government investment is necessary, income form this source appears to be very attractive. Besides sale or lease of air rights the city might exercise the option of charging taxes on gross receipts of any private enterprise utilizing such air rights. This method is appealing from the standpoint of the continual cash flow accrued over a long period of time.

Other Potential Sources - Other possible sources of financing the capital and/or operating costs of the recommended rapid transit plan include:

1. Resort Tax.

2. Cigarette Tax,

3. Lottery.

4. Dog Races Tax.

5. Downtown Parking Tax.

6. Revenue Sharing.

7. City and State General Funds.

8. Florida's Federal Gasoline Tax Allocation Increase.

Potential Operating Financing Sources

At present, the federal government will not subsidize any of the operating costs of transit systems. Attempts to change this federal policy have been made and are expected to continue. Pending and anticipated legislative laws could be passed which would result in federal support of a portion of operating costs, or, that portion which cannot be met by revenue income might be federal supported in the near future.

With or without federal and/or state transit operating financial assistance, the City of Jacksonville must determine a reliable and equitable source of funding any operating costs over and above the revenues collected. While the recommended long-range transit system is expected to generate almost enough revenue to pay for its operating costs, the early transit improvements programs most likely will not meet their operating costs. Hence, the City must develop a funding program which will pay for the expected annual deficit.

As indicated earlier, the basic fare structure actually utilized in the future will be a key determinant of this subsidy. It is recommended that effective and efficient transit service to all citizens be the primary consideration for both transit service and fares. Obviously, the lower the fare the more people will use transit. At the same time, the better the service (speed and convenience), the greater the patronage.

The transit system should be looked upon as a public service and the public should be willing to support it in order to improve the service.

Many of the potential funding sources for the capital costs for the transit program could also be used to fund operating expenditures. A general sales tax appears to be a strong candidate for funding both capital and operating costs which Jacksonville will have to pay. For example, a 1% general sales tax appears to be more than sufficient to meet Jacksonville's cost requirements for both capital and operating expenditures.

Conclusion - Before any substantial transit improvements can be made in Jacksonville, effective and reliable financing sources must be determined. A Financial program should be developed as soon as feasible and should be prepared at the same time that preliminary engineering and design studies are being undertaken. It is strongly suggested that a combination of funding sources be committed to finance both capital and operating costs of the transit plan and that the Financial Plan consider both highway and transit facilities.

Transit System, Management, Budget and Staffing

The Jacksonville transit system is currently under public ownership of facilities by the Jacksonville Transportation Authority, with the operating and management of the system contracted to the Jacksonville Coach Company. Two other basic forms of management that could be employed in the future are:

1) Public ownership with lease-back of facilities for management and operation, and

2) Public ownership and operation.

Section 13C of the Urban Mass Transportation Assistance Act of 1970 must be followed in all management arrangements if federal assistance is to be available. This requires that fair and equitable arrangements be made, as determined by the Secretary of Labor, to protect the interests of employees affected by the federal grant assistance, and that the grant contract specify the terms and conditions of the arrangements.

Public Ownership With Lease-Back of Facilities For Management and Operation - This alternative contemplates public ownership of all transit equipment and facilities and a lease of these to a private operator. While this method removes the public body from direct control over operation, it still makes it responsible for providing control over property which it has leased to another for operation.

The wholly owned public system with lease-back is found very seldom because the advantages of public ownership and private management can be attained through similar means.

Public Ownership and Operation - The most fundamental decision which must be made when considering the issue of public ownership and operation of a transit system is the level of control which the public agency wishes to exert over the transit system. There are both advantages and disadvantages to full public ownership and operation.

Ownership of a transit system by a public agency is the strongest commitment it can make to assure transit service to the area. Further, as owner and operator, the public agency is in an even stronger position to assure that the system will meet public objectives. The assumption of the ownership and operation of the system, however, places the burden upon the public agency of hiring its personnel, developing its own management structure and planning its own activities. When starting with an existing system, this is both simplified and complicated. Simplified from the standpoint that a system exists and there is some background and residual personnel for operating the system. It is complicated because staffing and management must be continued while the new administrative organization faces many other, and perhaps more important, "start-up" issues. Basic operating policies, personnel practices and other related elements often surface immediately and can divert the principle objectives of the public transit agency.

Suggested Transit System Management - The Jacksonville transit system became public when the Jacksonville Transportation Authority purchased it from the Jacksonville Coach Company in early 1973. The system is currently operated through contract management with this latter firm. Thus far, this arrangement has proven successful. JTA officials and staff are more familiar with the system's management and operation and significant service improvements have been made with financial assistance of federal, state and local sources. While this public ownership with contract management type of operation should continue for the bus operation, it is suggested that the rapid transit system should be publicly owned and operated.

Budget and Staffing

The recommended All-Bus Phase I system is expected to require a staff between 650 and 700 persons in 1980. The vast majority of the transit employees would work for the Transportation and Equipment, Maintenance and Garage Departments which includes bus drivers and maintenance and repair personnel. In addition to

TABLE 32

ESTIMATED NUMBER OF STAFF FOR THE
RECOMMENDED RAPID TRANSIT SYSTEM (1985)

DEPARTMENT	TYPE OF STAFF	ESTIMATED NUMBER OF STAFF (1985)
RAPID TRANSIT:		
General and Administrative	Executive and Deputy Mass Transit Directors, Accounting Clerks, Accountants, Directors of Personnel, Public Relations and Planning and Staff	35 - 40
Maintenance-of-Way	Superintendent and assistants, trackmen, inspectors, mechanical, electrical and structural maintainers, foremen and staff	60 - 70
Maintenance-of-Equipment	General Superintendent with equipment, repair and inspection superintendants, foremen, mechanics, electricians, repairmen, inspectors, car cleaners, helpers and staff	75 - 80
Electrical and Controls	Superintendant with electronic technicians, maintainers, helpers, apparatus, repairmen, substation electricians and staff	50 - 60
Transportation	General superintendant and several supervisors, station attendants, money collectors, road supervisors, transit information clerks, yardmasters (NO train operators)	350 - 375
BUS TRANSIT:		
All Departments	General and administrative personnel, bus drivers, repairmen, helpers, supervisors, cleaners, inspectors and staff	650 - 700
	TOTAL ESTIMATED STAFF	1,220 - 1,325

expanding the staff to operate and maintain the recommended transit system improvements, the JTA should also expand its General Administrative and Planning staff over the coming years in order to adequately plan and implement the recommended Phase II and Phase III transit programs. The total estimated budget required to operate and maintain the recommended Phase I system in 1980 is about $10,090,000 which includes estimated increased costs due to inflation. Table 32 shows the estimated staffing and budget required for the Recommended Rapid Transit System or Phase III system in 1985.

The estimated operating budget, including inflationary cost estimates, for the recommended transit system in 1985 is $12,906,000 for the bus system and $9,346,000 for the rapid transit system for a combined $22,252,000.

Continuance of Transit Planning

The transit business, like all other enterprises, exists in a dynamic environment. Travel demands are constantly shifting and land uses are altered. Expanding suburban areas and redevelopment and intensification of established urban areas in Jacksonville, especially downtown, provide a potential market for new transit services as well as modifications or adjustments to present transit services Spread-out, low density suburban communities continue to reply upon private means of transportation and thus new transit routes should be primarily aimed at interconnecting easy automobile access points (park-n-ride facilities) with major activity areas (employment centers, shopping centers, medical facilities, educational facilities, etc.).

The mass transportation plan recommended in this report is intended to be a general plan or guide from which more detailed plans can be prepared and implemented. The planning process cannot stop with this general plan for long-range mass transportation. The planning process can be viewed as a closed loop system wherein continuous inputs of data from more detailed studies, transit operations, the changing urban environment and the changing travel patterns and desires of citizens are received and evaluated. Changing land uses, future street and highway construction or lack of it, increasing automobile operation costs, financial constraints and information developed from detailed engineering and design studies of the transit plan will undoubtedly affect the final development and staging of the transit program as recommended.

The data and information developed in required upcoming transit studies will be evaluated and will then become the basis for both technical and policy decisions regarding the transit development program in Jacksonville. The necessary major studies as mentioned earlier are:

1) Preliminary and final engineering and architectural design of the rapid transit system,

2) Environmental Impact of Rapid Transit Studies,

3) JUATS Streets and Highways Plan and Mass Transit Plan Integration Study, and

4) Total Transportation System Financial Plan Study.

Once major decisions are determined from these studies, specific transit improvements will be implemented and followed again by monitoring the affects of the change and the entire transit planning cycle begins anew.

Transit Information, Inputs and Analysis - Sound decisions about transit improvements must be based on adequate, accurate information. In too many instances, transit properties do not possess the means of obtaining accurate information about their market on a regular basis. Usually present transit services are directed toward transit demands which existed five or even ten years ago, and although ridership on many established routes drop, modifications, extensions or even deletions are not implemented. One of the major reasons is the fear that current riders will stop riding transit if routes are changed and that there is not current data which established new potential demands that should be served.

There are many ways of obtaining information about transit riders and potential riders. It is especially important to determine the needs and desires of this latter group because the greatest amount of "latent" demand exists within it. These persons or "non-captive" potential transit users have an effective means of travel at present, the private automobile. However, if the transit system could at least come close to providing a service similar to the automobile (time and cost), the number of diversions from auto to transit could be substantial.

Well designed polls or surveys should be conducted every two years covering sample groups of transit users. Information on ridership may be gained from cordon counts of the Downtown area, maximum load point checks and periodic counts by checkers as well as through a registering fare box.

Information concerning non-riders or the latent demand riders is available through census data, tax assessor records, or various planning reports. Every two years a sample survey of the Jacksonville citizens should be conducted to assess their needs and desires for transit services and improvements.

Socio-Economic Data - The continual upgrading and monitoring of the transit system will require certain key socio-economic information to be maintained and up to date. It is recommended that the following data be obtained and updated annually by the Jacksonville Area Planning Board and be provided to the Jacksonville Transportation Authority, the Florida Department of Transportation and other appropriate agencies:

1) Population,

2) Employment by type (retail, wholesale, military, government, office, medical and other),

3) Dwelling units by type (single-family, mobile homes, public housing, multiple-family, etc.),

4) School attendance by grade (grades 1-6, 7 thru 12 and college),

5) Automobile ownership by dwelling units, and

6) Family median income.

All of the above information should be maintained at the traffic analysis zone level and conform to U. S. census boundaries. However, for planning immediate improvements to the mass transportation network, a finer level of detail may be required in outlying suburban areas.

During the mass transportation study, significant studies were made to develop updated socio-economic data for the JUATS urban area. This information should be revised again prior to or during the initial stages of the JUATS update study. It is also strongly suggested that the importance of this type of data in the transportation planning process should be made very clear to the JUATS Technical Coordinating and Policy committees.

It is also important to reevaluate long-range socio-economic projections at least every five years. This long-range monitoring is particularly critical because it is the future target year, 1990 in the case of the original JUATS, that really determines the magnitude of potential problems. A ten percent increase or decrease in the population and employment forecast can have a substantial effect upon estimated travel demands and transportation requirements to meet these demands. In the former case, more emphasis would be required for transit improvements, while in the latter case, less emphasis would be needed.

Ridership Volumes - Origin and destination information is of particular value when planning route changes, extensions or additions as well as evaluating the effect and impact of previous changes. The basis information must be obtained from well designed surveys which should be conducted annually. It is not essential that all survey work be done for all routes in a single day, but rather, surveys for each route could be conducted independently of the others.

Bus Operations Monitoring - As the "immediate action" improvement program is implemented, maximum productivity of the bus system may be improved by increasing scheduled speeds as much as possible. Running time analysis and schedule adherence checks will reveal whether the proposed schedule times are adequate, too short or too loose.

The Urban Mass Transportation Administration has recently developed a series of computer programs designed to improve the management of the day-to-day bus operation. One of these presently "on-line" is the RUCUS package. This set of programs is designed to assist in headway sheet development, vehicle scheduling, and driver run cutting. The package has been developed by the Mitre Corporation under the sponsorship of the Office of Research, Development and Demonstration by the Urban Mass Transportation Administration. The programs require considerable input data in terms of run times, schedules, policies, capacities, counts and other parameters that are needed to optimize the headway sheets and develope new schedules. It is suggested that the JTA consider using this computer package for optimizing the the scheduling and driver run cutting as new routes and changes are introduced.