U.S. Department of Transportation

Rail Transit Impact Studies:

Atlanta, Washington, San Diego

March 1982

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Summary Report
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Prepared for
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In Cooperation, with
Technology Sharing Program
Office of the Secretary of Transportation

DOT-I-82-3

FOREWORD

Rail transit systems represent major investments of public funds. Recognizing this, the Urban Mass Transportation Administration has supported transit impact studies in a number of cities designed to assess the effects of these investments on urban activities and systems. These studies should result in information useful to decisionmakers and planners in a variety of environments.

In order to summarize the findings of these studies to date, the Urban Mass Transportation Administration requested that the Metropolitan Washington Council of Governments sponsor a meeting of persons participating in the impact studies underway in Washington, Atlanta and San Diego. This report presents the results of that meeting. We believe that it represents a good summary of this meeting and includes useful information on findings of each of these studies to date. We also believe that it should serve as a good source for information on the impacts of rail transit and that some useful tentative generalizations can be drawn from this information.

Additional copies of this report are available through the National Technical Information Service, Springfield, Virginia 22161. Please reference UMTA-DC-09-7004-82-1 on your request.

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EXECUTIVE SUMMARY

Richard Steinmann, UMTA

Over the past several years, the Urban Mass Transportation Administration (UMTA) has supported the development of several new rail transit systems. As these projects represent significant investments of both Federal and local resources, UMTA has sponsored a number of Transit Impact Studies designed to evaluate the effects of these systems. The goals of the studies are to assess the changes in travel behavior which result from such a major change in an area's transportation system and to develop information which will aid in future investment decisions.

These studies have been underway for some time now. It is thus appropriate to determine what initial findings have been obtained and to summarize these in a convenient form. For this purpose UMTA requested that the Metropolitan Washington Council of Governments (MWCOG) sponsor an informal two-day conference on the Transit Impact Studies. This conference was held in Washington on September 24 and 25, 1981, and was attended by representatives of studies underway in Washington, Atlanta, and San Diego as well as by a number of local and Federal officials, including some who were involved in a similar study in San Francisco. UMTA staff now involved in managing the Impact Study Program also attended.

This report presents a summary of that conference. Included are the presentations made by representatives of each study as well as some of the discussion which followed. This summary will serve as a good working reference on the current findings of these studies and as a source for some tentative generalizations about the impacts of rail transit.

Federal Perspective

Opening remarks on the federal perspective were provided by Robert H. McManus, Associate Administrator for Planning, Management and Demonstrations and by Charles H. Graves, Director of Planning Assistance. They focused on the implications of current Federal policy for rail transit investments and on the continued need for transit impact evaluation. It was indicated that fiscal constraints at all levels of government increase the importance of recognizing the costs and benefits which may be expected from any major expenditures. Participants were reminded that these studies have already consumed a significant amount of time and resources and that it is thus appropriate to assess the status of the studies and any interim findings. Decisions on future investments and future evaluation efforts will be aided by information from these studies now underway.

System Descriptions

The systems covered by the current UMTA impact studies program have been implemented in a diverse set of urban areas. Representatives of each study described their site in order to provide a background for the observations and findings subsequently presented.

The Washington D.C. area has a population of about 3,000,000 persons in an area of approximately 2,500 square miles. The transit system, known as METRO, is being constructed by the Washington Metropolitan Area Transit

Authority (WMATA) and will eventually extend over 101 miles of line. As of September 1981, 37 miles of line and 40 stations were in operation. The system has a stored-value farecard-based system for fare collection. In September 1981 fares ranged from $.60 for all trips in the off-peak to higher, distance band fares in the peak.

The Atlanta area has a population of about 1,800,000 in an area of 2,100 square miles. The Metropolitan Atlanta Rapid Transit Authority (MARTA) system, currently under construction, is eventually to extend over 53 miles of line. In September 1981, 14 miles of line and 17 stations were open. The system uses a multi-instrument fare collection system with a $.60 flat fare.

The San Diego area has a population of 1,400,000 in an area of about 1,000 square miles. The light rail line is being implemented by the Metropolitan Transit Development Board (MTDB) and is known as the San Diego Trolley. The single line is 15.9 miles in length and has 11 stations on line as well as a number of loading locations in the downtown area. The basic fare is $1.00, although there are multiple fare discounts and a reduced fare for trips within the CBD. A self-service fare collection system is used.

Study Descriptions

Each of the studies is addressing a similar set of impacts and issues plus a number of special issues of specific local interest. In general, similar methodologies are being used to obtain information about the impacts, but some variations do exist. Study representatives presented material on the impacts being studied, the approach generally used and any important characteristics which might distinguish a particular study.

All studies are addressing essentially the same set of transportation system and travel behavior impacts. These include changes in transit service levels, characteristics of transit users, changes in mode choice, congestion and traffic volume impacts and various system performance and effectiveness measures.

A variety of land use and economic impacts are being addressed, including relocation, land sales activity and prices and diverse locational and planning-related issues. The study in San Diego is not addressing these issues in much detail due to the relatively limited extent of the system and the expectation that land use impacts will therefore also be limited. On the other hand, the San Diego study is paying a great deal of attention to the fiscal impacts of the system and in particular to the impact on system implementation of not using Federal funds. The study in Atlanta is also undertaking an assessment of regional attitudes toward the rail system.

Travel Impacts

Rail transit systems can represent significant additions to an area's transportation system. Implementation of such systems could therefore be expected to have a substantial impact on area travel characteristics. These impacts are likely to occur in the areas of transit ridership, mode

choice, transit trip purpose, mode of access to transit, the geographic distribution of transit use, travel time and cost and total travel.

With the initiation of service, changes in total transit ridership varied with the size of the line segment opened and with the extent to which new markets for transit were penetrated. In Washington, rail ridership increased as each increment of line was opened. Total transit ridership, however, remained fairly stable through the opening of the initial two segments, increasing only when lines were extended into the suburbs. Most early rail riders apparently were bus system users who were forced to transfer to the rail system by cut backs made in the bus service. In Atlanta, although an increase in total ridership occurred, many more transfers were similarly required due to changes made in the bus system to feed the rail line. San Diego has achieved a small increase in corridor ridership.

Rail system ridership has been drawn primarily from former bus patronage. In both Washington and Atlanta, slightly more than one-half of rail users formerly rode the bus while about one-third were former auto users. It is estimated that about 20,000 former drivers are now using MARTA in Atlanta. There was also a small amount of new travel generated in both cities.

Most rail system use is for work-oriented travel. In Washington, approximately 70 percent of rail users are commuters and in Atlanta, 80 percent. On the other hand, because of its configuration, only 40 percent of travel on the San Diego Trolley is for the work purpose.

Most users arrive at rail stations by bus during the morning peak. In Washington, 43 percent use bus, 30 percent auto and 27 percent walk. In Atlanta, although bus still predominates, about 35 percent more than expected drive themselves to the stations. Nonetheless, parking spillover has not yet been a problem.

Trips on rail tend to be concentrated and centrally oriented. In Washington, 90 percent of trips have at least one end in the CBD. This is also true in Atlanta, where 60 percent of trips also begin or end at one of the two line terminals. In San Diego, two-thirds of the trips have one end in the CBD, and 29 percent of the trips begin or end at the Border terminal.

Travel changes have been characterized more by increases in transit use than by reduction of auto use or congestion. In Washington, the total, all day use of transit rose by 33 percent, with the mode share of work trips increasing from 38 percent to 43 percent during the peak. The share increased slightly in Atlanta to 40 percent. There was a small decrease in auto use: about 3 percent in Atlanta and a similar amount in Washington. Most rail riders tend to be "choice" riders with incomes higher than the average for previous transit users.

User travel time and cost changes were strongly related to the specific trip origin or destination. Those trips which formerly involved only a bus ride, but which now require bus access to the system, take slightly more time than formerly and, in Washington, also cost slightly more. Patrons who can walk to the system experienced significant time savings.

In general, system implementation resulted in a major increase in travel capacity. In Washington, this amounted to the equivalent of a new four-lane freeway, even at current incremental ridership levels. In addition, transit accessibility increased significantly with more users able to use transit for more trips. Much of the increase in transit use occurred in trips made during the shoulders of the peak, which are typically better served by rail than by bus.

Land Use

Just as the scale of an urban rail system investment suggests significant impacts on the transportation system, so too does it suggest impacts on land use and urban development patterns. The studies in Atlanta and Washington are addressing a number of issues in this area including changes in land use planning, development shifts, station area impacts, land sales activity and relocation. Due to the relatively small extent of the San Diego system, that study is not addressing land use impacts in any great detail.

Development and implementation of the rail systems have had a major impact on area land use and capital facilities planning. Local land use plans have been altered to attempt to focus development on the station areas. Local jurisdictions appear to have recognized the value that developers place on transit access and are hoping to capitalize on this to enhance the local tax base. One result has been the growth of planning and assistance for joint development of station areas in a number of localities.

Development has, to some extent, followed the trend toward locating in station areas, as envisioned in the land use planning. In Washington, downtown development has clearly focused on the Farragut Square area rather than on the traditional downtown. Other locations served by METRO also appear to be receiving a larger share of development than would otherwise be expected. Similar effects have been identified in Atlanta.

Station area development has occurred primarily within 1/4 mile of the stations. In some cases, significant developer interest has been demonstrated on sites within these areas, especially where Station Area Plans had identified major development opportunities.

Land sales studies in Atlanta have shown significant activity in station areas. This has been true especially in the East line corridor where prices have risen faster than the average rate for the area.

Relocation has generally resulted in a limited impact. Most relocatees appear to have moved within the neighborhood or at least within the city. Also, many former renters were able to purchase a house because of relocation.

Economic Impacts

As rail systems represent major public investments, the economic impacts of such a system can be significant. The process by which the system was implemented can also have major fiscal implications. At the time this conference was held, none of the studies' efforts in this area had been

underway for any substantial length of time, thus no results were yet available. Studies are underway, however, in San Diego on the impacts of using only local and state funding, with no Federal participation or procedural requirements, and in Washington on system performance indicators. Other, broader economic work will be undertaken later.

INTRODUCTION

This document summarizes the proceedings of the Transit Impact Studies Conference held in Washington, D.C., on September 24th and 25th, 1981. The conference was sponsored by the Urban Mass Transportation Administration and was hosted by the Metropolitan Washington Council of Governments.

The purpose of the conference was to enable representatives from planning agencies currently examining the impacts of new transit systems to share their interim findings. Planners who are involved in impact studies in Washington, Atlanta and San Diego presented reports on their systems, while members of other agencies or firms with an interest in the subject participated in the open discussions. (A list of the attendees is provided.) This summary was prepared in the interest of disseminating the information presented at the conference to a wider audience. The document follows the outline of the actual conference proceedings.

The conference was opened with remarks by Robert McManus and Charles Graves of the Urban Mass Transportation Administration. These talks served to reaffirm the utility of the studies and set the goals of the conference toward identifying findings which are transferrable to other areas where system construction is planned.

A representative from each of the three cities then provided a description of their system, the background and development, and the study approach. These introductions helped to orient the audience so that the study findings could be viewed in context.

A representative from each area then summarized the studies and the key findings to date. As these studies are still in progress, these findings are all subject to modification as warranted by further data analysis.

The travel impacts of each system were presented separately, this impact area being the primary concern of the studies. The effects of the new transit systems on traffic congestion, mode choice, travel times and costs were but a few of the impacts covered.

Land use impacts of the new systems were discussed by the representatives from Washington and Atlanta. Both areas noted the difficulty inherent in attributing development to a transit system, but each area has developed a study approach which addresses this problem. The San Diego study has not investigated this impact area.

The economic and fiscal impacts of the San Diego Trolley were of particular interest as that system was constructed without federal funding and its attendant regulations. The advantages and disadvantages of this approach have attracted a high level of attention with the current trend toward decentralization of government.

The conference ended with an open discussion of the implementation methodologies which have worked well for the systems represented at the meeting. This discussion also holds implications for the design of future transit impact studies.

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OPENING REMARKS

Robert McManus, UMTA

The budget review process has served to focus increased attention on the final costs and benefits of all major, federally funded programs. Transit impact studies, such as those presented at this conference, will enable us to provide congressional committees with the information they need in making budgetary decisions. In addition, as many of you are aware, UMTA and FHWA are in the process of internally evaluating all of the planning regulations. Here again, these impact studies will be useful in assessing the strengths and weaknesses of the current planning program.

While planning has certainly been affected by the budget cutbacks, we feel relatively fortunate that the Administration's 1982 budget request provides funding for our program within approximately 10 percent of its former level. As in the past, we should expect a constant pressure to justify our programs by showing the long-term, "bottom-line" results of all our projects. These transit impact studies are valuable in that regard.

PERSPECTIVE

Charles Graves, UMTA

As this is the first formally organized meeting for the review of impact studies, we expect a great deal of beneficial information exchange to occur. Much of this information will be useful in managing and studying the specific transit systems represented here, but there are several broader issues which should be addressed. With roughly $4.5 million already invested in impact studies, we now need a clear statement of where these studies stand, what we have learned from them, and how these findings can be applied to other rail systems. We must draw the connection between what we have learned and how others can use this information to better plan, build and operate rail systems and extensions.

Additionally, analyses of completed or ongoing impact studies should provide direction in structuring future studies of this type. Should we encourage impact studies on every rail start or extension, or should we concentrate on a smaller sample? Should future impact studies be structured in the same way as in the past, or should they be focused on specific issues?

The findings from these impact studies may also affect policy decisions. Current policy defers the planning and construction of all new rail systems - a consequence of both the sheer cost of such systems and, perhaps, the absence of promising opportunities. Do the impact study findings have a significant bearing on the argument for altering this policy? These are some of the questions which we must try to answer.

For all of these reasons, it is important to document all that we have discovered in the course of these studies and in their evaluation.

INTRODUCTION TO THE SYSTEMS AND IMPACT STUDIES

Washington
George Wickstrom, MWCOG
Robert Dunphy, MWCOG

The Metropolitan Washington Council of Governments (MWCOG) represents the the federal district, six counties and nine major municipalities which constitute the Washington Region. In 1980 the region contained 3 million people in 2500 square miles and was the seventh largest metropolitan area in the nation.

The original goals for the Washington Metrorail system, set forth in the mid 50's, reflect concern about congestion and land use in the region. These goals were:

(1) to reduce traffic congestion by diverting future trip growth from auto to transit mode,

(2) to provide a better alternative than the existing bus sytem for those who would not or could not drive, and

(3) to preserve the beauty and dignity of the monument area by stopping the freeways while protecting the economic vitality of the downtown.

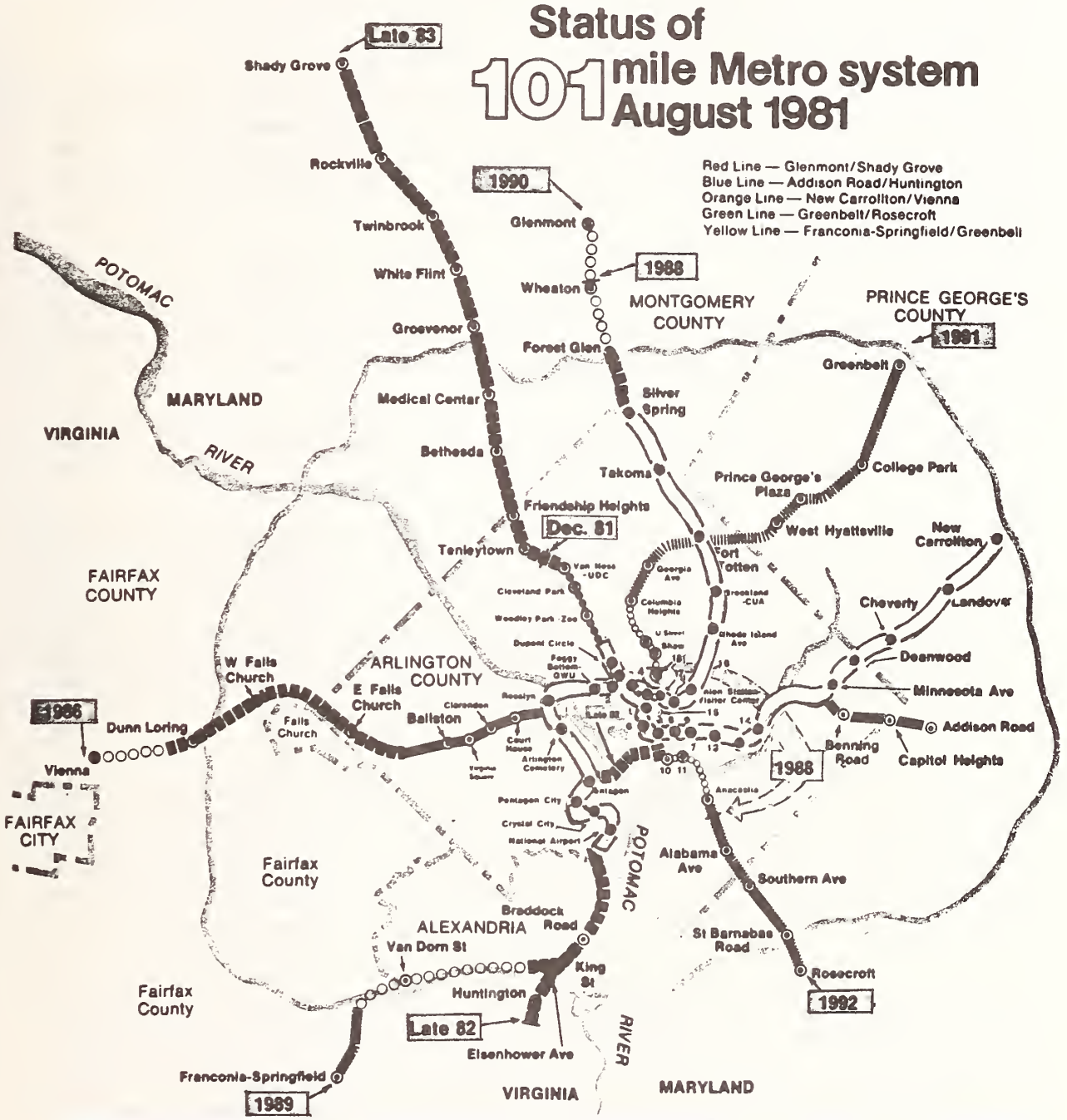
Construction of the Metrorail system began in 1969 and the first phase opened for service in 1976. With the third phase of construction now complete, 37 miles of the system and 40 stations are in operation (See Figure 1). The finished system will have a total of 101 miles of track and 81 stations. This compares to the 71 miles of track and 34 stations of the Bay Area Rapid Transit (BART) System in San Francisco. The complete Metrorail system will have 49 miles in subway and 52 surface miles. The system features handicapped access, magnetic fare card machines and bicycle storage facilities.

The transit impact study for the Metrorail system benefits from a synergistic relationship with the area's ongoing comprehensive planning process. The objectives of the study are to assess the impacts of the Metrorail system in the following categories: (1) land use, (2) transit service, (3) transit use (choice of mode), (4) traffic congestion, and (5) system performance and effectiveness.

One area in which the impact study benefits from its relationship with the comprehensive planning process is in the data collection effort. The impact study takes full advantage of the regular programs of surveys, traffic counts and other data gathering activities in the region. Annual cordon counts are conducted cooperatively by the Metropolitan Washington Council of Governments (MWCOG), local highway departments, and the Washington Metropolitan Area Transit Authority (WMATA). These counts measure travel into the regional core by route, by hour of the day, and by mode, providing the study with a solid base against which to measure any change. The cordon counts are supplemented by interviews with employees in

Figure 1

Washington, D.C.



LEGEND

Study Phases

- Operating Lines 37.15 miles 41 stations
- Next opening Late 81 2.06 miles 3 stations
- Under Construction or Substantially Complete 30.97 miles 20 stations
- Under Final Design 13.21 miles 10 stations
- Remainder of System 17.45 miles 12 stations
- Late 82 — Projected start of operations for this segment based on approved schedule. Applies to all stations inbound from this point

Total mileage—100.84

Total stations—86

1. Farragut North
2. Farragut West
3. McPherson Square
4. Metro Center
5. Federal Triangle
6. Smithsonian
7. L'Enfant Plaza
8. Federal Center SW
9. Capitol South
10. Waterfront
11. Navy Yard
12. Eastern Market
13. Potomac Ave
14. Stadium-Armory
15. Archives
16. Judiciary Square
17. Gallery Place
18. Mt Vernon Sq-UDC

Washington Metropolitan Area Transit Authority
600 Fifth Street, N.W., Washington, D.C. 20001

the core to capture work-end behavior and traveler characteristics. In addition, WMATA's regular, onboard rail and bus survey was expanded to incorporate mode of access information for the study. Data from MWCOG's ongoing (since 1974) employment census is used to identify long-term business trends which are helpful in assessing whether the system is stimulating business and increasing job opportunities in the area.

As all of the data is collected on a continuing basis, the study avoids the "snap-shot in time" syndrome. Trends as well as absolute figures must be examined to receive an accurate understanding of the situation. For example, while the automobile may still be intruding into the downtown area, Metro may nevertheless have greatly slowed the rate of this intrusion. One must consider what the level of auto use would have been had the Metrorail not been constructed.

The impact study benefits the comprehensive planning process by providing impact and land use analysis as well as verification for the demand forecasting models. The analysis is focused on the following three areas:

- Impacts on transit service - Possible negative impacts, such as service levels during system construction and the merit of substituting one mode of transit service for another, are included in the study.

- Impacts on travel - As public approval of the system hinged in part on its ability to alleviate traffic congestion, changes in travel behavior and the consequent impact on levels of auto usage are examined

- Land use changes - Many of the system impacts on land use patterns will not be visible for a long period of time; proposed developments, zoning changes and changes to the Master Plan must therefore be taken under consideration.

Since the demand forecasting models for the Washington area were originally developed and calibrated using bus data, there was some concern over their validity in a rail application. Data from the transit impact study, however, have shown the patronage forecast for work trips to the central business area to be accurate. When the Van Ness station is opened, surveys and census data will be used to test the validity of the model for non-work trips.

In assessing the impacts of the system, it must be kept in mind that the Metro is really several different systems: it is a downtown distribution system, a commuter railroad (where it penetrates well past the Washington Beltway), and it is a system serving a high density urban corridor (the Red Line to Shady Grove). As each new phase opens, the system may be expected to exhibit different characteristics depending upon the type of service provided.

Atlanta

Joel Stone, ARC
Tom Weyandt, ARC

The Atlanta Regional Commission (ARC) is the comprehensive planning agency for the Atlanta Region. It was established in 1971 and, as the MPO, entered into a joint agreement with the Metropolitan Atlanta Rapid Transit Authority (MARTA) and the Georgia Department of Transportation (GDOT) to conduct the transportation planning program for the Region. ARC and its predecessors have long been involved in transportation and transit planning, having produced the first regional mass transit plan in the 1950's. The Region has seen transit not only as an important transportation mode but as a potential shaper of urban form.

The Atlanta Region contains seven counties centered on the City of Atlanta. It contains 1.8 million people of whom 425,000 live within the Atlanta city limits. The Region's population density is fairly low although the density within the MARTA service area and specifically in the transit corridors is much higher. Density in the Region as a whole is about 860 persons per square mile; in the MARTA service area it is 1,400 per square mile; in the City of Atlanta it is 5,300 per square mile, and along the East transit line, 5,600 per square mile. Population growth since 1970 has been fairly evenly distributed around the Region although the Northeast and Northwest corridors have experienced more rapid growth.

Most recent estimates of employment show about 890,000 jobs in the Atlanta Region. No one field of employment dominates the Atlanta economy although there is a continuing shift in employment toward services, government and trade categories with declines in manufacturing categories. Changes in the geographic direction of employment growth are dramatic. During the 1970's there has been a clear shift of new employment toward the northeast part of the Region. The CBD remains fairly healthy though, with over 90,000 employees according to 1978 estimates.

Transportation has been a key element of Atlanta's history and growth. Founded at the confluence of numerous railroads in the mid-19th century, Atlanta's odd downtown street pattern still reflects the presence of the railroads. Several major development corridors are along those railroads and the interstate highway network also generally parallels that system. Three interstate highways meet in downtown Atlanta and the last segment of the perimeter highway was opened in 1969.

Turning the focus toward transit, the Metropolitan Atlanta Rapid Transit Authority was created in 1965 to plan and develop a public mass transportation system for the Region. Four counties plus the City of Atlanta are members of the Authority. In a 1968 referendum, a transit plan was offered which provided for the development of a system with the local share paid for through the property tax. The referendum failed and a revision to the plan was developed for presentation at a second referendum in 1971. That plan called for a heavy rail system similar to the earlier plan with a coordinated feeder bus network throughout the district. The local funding mechanism was to be a one percent sales tax and there was commitment to a low fare. The referendum passed in the City of Atlanta and in Fulton and DeKalb counties and development of the system began with the public acquisition of the privately held Atlanta Transit System - the bus operator.

The rapid transit program approved by the voters encompasses the construction of 53 miles of rail rapid transit and eight miles of busways. This system will be fully integrated with a network of 1,500 route-miles of feeder and express bus lines. The cost of the rapid transit system is currently estimated at $3.4 billion, in 1979 dollars.

The rapid transit system is structured in a cruciform arrangement, with the East-West and North-South rail lines intersecting in downtown Atlanta, at the center of the region. Each of the four legs of the trunk system branches out to extend the geographic coverage of the system beyond the central area of Atlanta (See map in Figure 2.). As much as possible, the lines of the system are at or above ground level (51 percent and 30 percent, respectively), with only 10 miles or 19 percent of the line construction in subway. The two busways are planned to be in the median of future expressways.

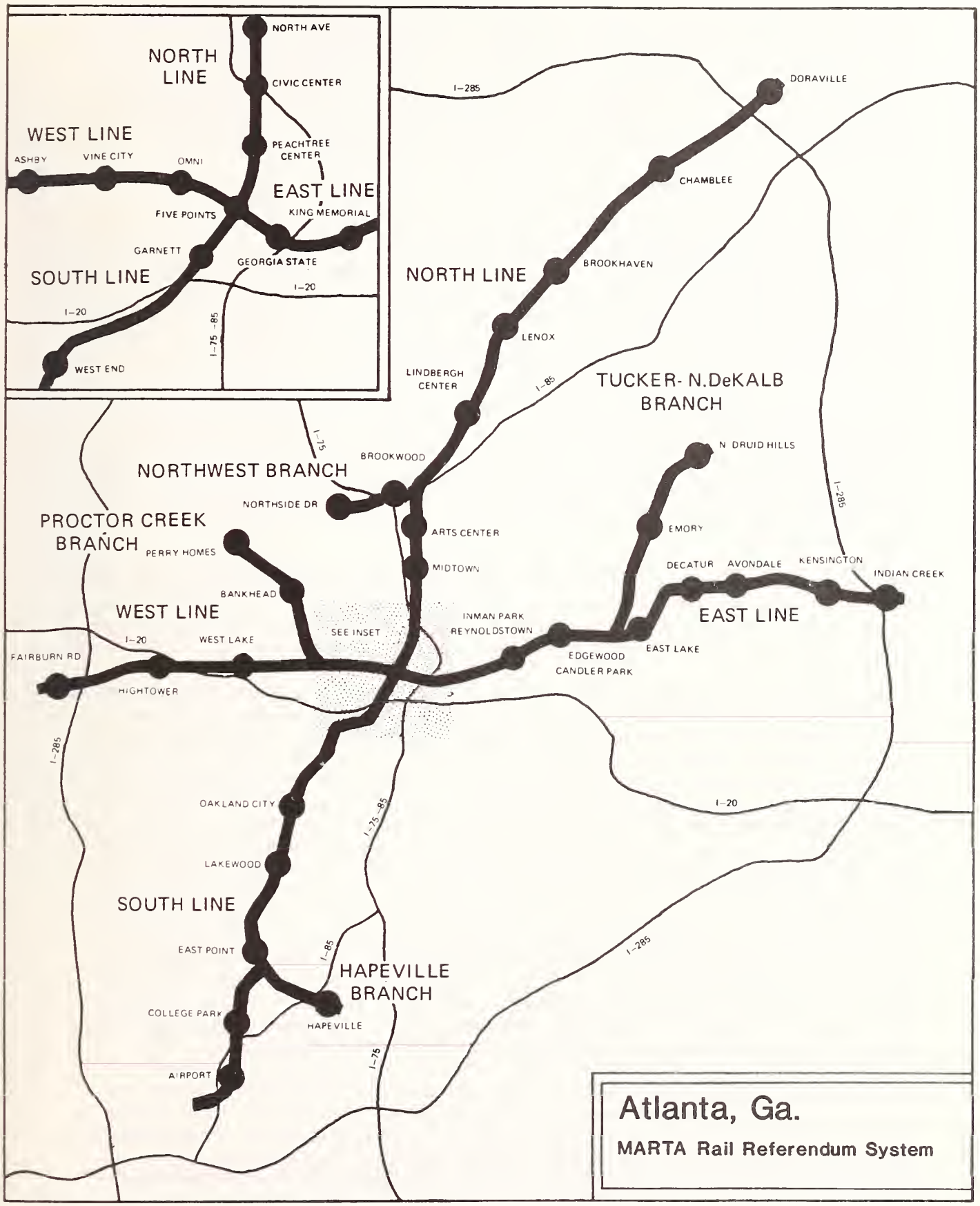
Average station spacing is just over 1.2 miles with outlying station spacings approaching three miles. The nine downtown stations, on the other hand, are an average distance of 0.5 miles apart.

A large portion of the rail system parallels existing railroad rights-of-way (65 percent) to keep disruption of neighborhoods and businesses at a minimum by not creating new transportation corridors. The rail lines depart from existing railroad corridors in three important areas: in the North-South line through the central area where there is no railroad that will effectively serve the main downtown growth axis (Peachtree Street); in the central portion of the West Line, where no railroad corridor is available either; and in Decatur, on the East Line. In that city the rail line has been built to provide direct rail service to the core of Decatur, which is a medium size downtown with substantial development potential and is also the county seat of DeKalb County, one of MARTA's three constituent governments. This was done at the explicit request of the citizens of Decatur and their elected officials, who expect the rapid transit system to act as a catalyst for the redevelopment of that city.

Even though the access to the system will depend heavily on integrated feeder bus routes, almost 30,000 parking spaces will be provided at the rapid transit stations, along with facilities for kiss-and-ride and bicycles. This is dictated by the fact that many areas traversed by the rail lines are low-density suburbs, with high car ownership.

The full referendum system was originally projected to be completed in 1982. An initial two year delay occurred in the preparation of a required systemwide Environmental Impact Study, the first of its kind. However, soon after this hurdle was crossed it became clear that not enough money could be obtained for construction of the full system in 1982. A phasing plan was prepared. The construction of Phase A was approved in 1975, and the Urban Mass Transportation Administration committed $800 million to it. This phased approach to system development is important to bear in mind in reviewing the results of the Transit Impact Monitoring Program (TIMP) work. The Atlanta system was not put in place at once like BART, nor have long segments serving high density areas been opened as in Washington METRO.

Figure 2


NORTH AVE
NORTH LINE
CIVIC CENTER
WEST LINE
ASHBY
VINE CITY
OMNI
PEACHTREE CENTER
EAST LINE
FIVE POINTS
KING MEMORIAL
GARNETT
GEORGIA STATE
SOUTH LINE
I-20
I-75 -85
WEST END
I-285
DORAVILLE
CHAMBLEE
NORTH LINE
BROOKHAVEN
LENOX
LINDBERGH CENTER
I-85
TUCKER- N.DeKALB BRANCH
I-75
BROOKWOOD
N. DRUID HILLS
NORTHWEST BRANCH
NORTHSIDE DR
PROCTOR CREEK BRANCH
ARTS CENTER
EMORY
PERRY HOMES
MIDTOWN
DECATUR
AVONDALE
KENSINGTON
INDIAN CREEK
BANKHEAD
WEST LINE
INMAN PARK
REYNOLDSTOWN
EAST LINE
SEE INSET
I-20
WEST LAKE
FAIRBURN RD
EDGEWOOD
CANDLER PARK
EAST LAKE
HIGHTOWER
I-285
OAKLAND CITY
I-75 -85
I-20
LAKEWOOD
SOUTH LINE
EAST POINT
I-85
HAPEVILLE BRANCH
I-285
COLLEGE PARK
HAPEVILLE
AIRPORT
I-75
Atlanta, Ga.
MARTA Rail Referendum System

This initial segment, Phase A, consists of 14 miles of rail rapid transit and includes 17 stations and the central car maintenance and repair facility. Phase A encompasses the construction of the portion of the East Line from Avondale to the Georgia State Station, which was opened for revenue service in June 1979; the West Line from Georgia State to the Hightower Station, opened December 1979; and a small segment of the North-South Line from Garnett Station to the North Avenue Station, which will open in late 1981.

With Phase A construction nearing completion, MARTA has begun work on Phase B. It will add 9.8 miles of line and seven stations. Its total cost is estimated to $664 million. At present $195 million of Phase B is underway. Phase C extends the North-South Line from Doraville to the new airport terminal. This Phase C will add another 12.9 miles and six stations. The shell of the Airport Station has already been built into the new airport terminal. The remainder of the referendum system will be built after the North-South Line, which is now scheduled to be completed in 1985.

Phase A of the MARTA rapid transit program involves the most difficult and costly construction in the entire system including the main yard and eight out of the 10 subway stations. A substantial portion of the line construction in Phase A is in subway - some of it in deep rock tunnel - in the downtown areas of both the City of Atlanta and the City of Decatur. The total budget for Phase A is $1.017 billion, which includes the local share of $217 million.

The system operates on a flat fare basis with the current fare being 60 cents. A monthly TransCard pass is available at $21 as is a weekly pass for $5, both of which allow unlimited rides on the system. Off-peak discounts are available for elderly and handicapped users.

An important factor in the Region's response to transit has been the belief that transit would not only carry people but also have an enormous impact on the communities and neighborhoods through which it passes. To achieve the most benefit from the system, in the mid-1970's the Atlanta Regional Commission sponsored, with considerable funding from UMTA, a series of Transit Station Area Development Studies - a land use and transportation planning program for the areas surrounding the rapid transit stations. These studies, a cooperative program among ARC, GDOT, MARTA and local governments, had as their major trust the development of land use plans which minimized traffic impact to established communities and maximized development opportunities at specified stations. The detailed planning studies were tied closely to MARTA's detailed engineering and construction schedule. The concern of the program was to complete station area plans before MARTA completed 15 percent of detailed engineering. For the most part, the schedule was met and local plans were reflected in final engineering to the extent of shifting parking entrances, changing parking lot sizes, shifting station locations and even major line changes.

The program largely achieved its goals and for the first time in our nation's transit planning experience a rapid transit system has been planned comprehensively as a part of the entire urban community prior to engineering and construction. To a large degree, the TIMP work focuses on the issue of the extent to which these early plans are actually being implemented.

Although no longer a formal program, station area planning continues in all of the affected local governments. ARC's work, however, shifted toward preparations for analyzing the actual impacts of the system on the Region.

The ARC transit impact monitoring activities began in 1977 with the East Line Pilot Project. This "pilot" study isolated the East Line of the MARTA system, the first corridor where rail and feeder bus would become operational. Data collection and mapping of base case conditions in the East Line Corridor were the primary achievements during the pilot year.

Drawing upon experience gained through the pilot study, principally in the areas of compatibility and availability of data sources, impact measurement methods, and analysis capabilities, the East Line Pilot Study was expanded in 1978 to include the entire MARTA referendum rail system. With this expansion the program was divided into two major areas of impact concern - transportation and land use; in addition, the scope of data collection activities was significantly increased to provide for impact measurement in a variety of transportation and land use issue areas.

In 1979 the program was overhauled, resulting in a redefined, more comprehensive approach. A new work program was developed that detailed the major impact monitoring activities and component work elements: the writing of study designs, identification of impact measures, data collection methods and procedures, and data analysis methods and procedures.

The TIMP program is divided into two main sections - transportation and land use. Work within each of these sections has been further divided into major work tasks.

There are eight transportation tasks:

1. Travel time survey - Includes collection of observed data from travel time runs and measures of O-D data for selected trips before and after major transit line openings.

2. On-board survey - Questionnaires were distributed on buses and in rail stations.

3. Work place survey - Questionnaires were distributed to employees in major employment areas in proximity to the Phase A rail system.

4. Telephone survey - Planned for after the completion of Phase A. Interviewers will administer a questionnaire over the phone throughout the MARTA service area, concerning mode selection for a variety of trip purposes.

5. Traffic counts - Automatic counters are placed on arterials and freeways to obtain screenline counts and observers measure average automobile occupancy. These counts are taken in phase with major system opening milestones.

6. Station area surveys - These include observations of the access mode of rail patrons, use of on-street and park-and-ride lot parking and pedestrian conflicts with traffic.

7. Operations data analysis - Detailed analysis of cost and revenue data, patronage and system characteristics.

8. Network analysis - Use of demographic data, computer programs and the highway and transit network to determine accessibility measures.

In the land use program there are six major work tasks.

1. Residential Attitude Survey - Two surveys have been conducted, one along the East Line and a second (recently completed) along the West Line, to ascertain attitudes of residents about MARTA construction and operation in their neighborhoods.

2. Monitor TSADS Plans Implementation - A comparison of actual land use development and public improvements expenditures with those shown in the Transit Station Area Development Studies (TSADS).

3. MARTA Relocation Analysis - The number and types of businesses (and employees) and households (and individuals) displaced as a result of MARTA construction is analyzed.

4. Residential Land Activity Analysis - Secondary data sources are examined to compare housing prices, rental prices and housing supply changes near transit stations and in control areas.

5. Commercial Land Activity Analysis - Secondary data sources are examined to obtain information on major leasing and sales of commercial property, employment, and building and rezoning applications.

6. Activity Center Case Studies - The first case study, in Decatur, was a 'before and after' look at the impact of MARTA construction on small businesses in the downtown area. The Omni case study examined the impact of the operation of the rail line on merchants in an Atlanta CBD megastructure.

A final task involves the development of computer graphics to effectively illustrate the wide range of data produced by the TIMP program.

The various tasks of the program are in various stages of completion.

San Diego
George Franck, SANDAG

San Diego County contains over 4,000 square miles in the extreme Pacific Southwest corner of the United States. The urbanized portions of the region lie within the western third of the region along the coastal plain and foothills. The eastern two thirds contain mountains and desert and is, for the most part, in public ownership. San Diego is relatively isolated from the rest of Southern California with mountains to the east, the ocean to the west and a large military reservation to the north. The southern boundary is the Mexican border, which is not geographically distinct, but presents a strong barrier to travel and economic interaction. Tijuana, immediately south of the border, has a population of over one million persons.

In 1980, the total regional population was 1.86 million persons, with over 1.4 million persons living in the San Diego metropolitan area. The urbanized communities of "north county" are economically and culturally distinct from the metropolitan area. Population density is relatively low; 450 persons per square mile for the county as a whole, 1,350 persons per square mile for the metropolitan area.

The San Diego economy has diversified significantly from the military and aerospace dominance which characterized it from the 1940's through the early 1960's. Of the 750,000 jobs in the region, 17% are military related, 14% in manufacturing and 21% are tourist related.

Between 1970 and 1980, San Diego County was the fifth fastest growing metropolitan area in the country. During this decade the region grew by 37%, or 3.2% a year. In comparison, California grew by 1.7% a year; the nation by 1.1%. All major statistical areas (MSA's) in the region gained population, and all cities except one gained population. Most of the growth, however, occurred in the northern areas of San Diego. The central area, which contains the northern portion of the light rail corridor, had the lowest growth (4.6%); the south suburban area, which contains the remainder of the light rail corridor, had the next lowest growth (40.7%).

One unusual characteristic of the San Diego region is the relationship of industrial and residential areas. For the most part, older employment areas have been located in river valleys or along the bayfront. Residential areas have developed on adjacent highland areas known as mesas. There has traditionally been a strong demarcation between these two types of land uses. Because of the greater width of the coastal flatlands east of the San Diego Bay, the South Bay area is somewhat of an exception to this general characteristic. Nevertheless, the bayfront is primarily industrial, since state law precludes residential use of the "tidelands".

San Diego is a single county region, although the county government itself has a limited role in regional transit planning. In the north county, a single agency has the responsibility for short-range transit planning and transit operations. The San Diego Association of Governments (SANDAG) is responsible for long-range transit planning throughout the region.

In the San Diego metropolitan area, transit funding and responsibilities are diverse. The San Diego Metropolitan Transit Development Board (MTDB) was created by state law in 1975, with the specific charge to determine feasibility and implement a fixed guideway system in San Diego. Originally, the MTDB was precluded from operating a bus system until a guideway system was in operation. Although this prohibition was removed, MTDB has never exercised this option. The MTDB does not have jurisdiction in two cities, part of a third city, nor in several incorporated areas within the metropolitan area.

On the basis of population, the individual cities within the metropolitan area receive allocations of state sales tax money to provide transit service. These cities can either contract for transit service with another operator or provide their own intercity service. There are five fixed-route transit operators, four taxi-based dial-a-ride services, five accessible dial-a-ride services and one light rail service in the metropolitan area. MTDB has short-range planning and coordination responsibility for all of these operations. MTDB and SANDAG must approve the funding for each of these operations.

San Diego Transit (SDTC), which is owned by the City of San Diego, is by far the largest operator in the region. SDTC provides intercommunity service to most of the other cities in the metropolitan area by contract. It is the only federally funded transit operation in the metropolitan area. All other service is provided by contracts with private-sector operators.

The San Diego Trolley began service on July 26, 1981. The trolley has received wide attention for its low cost of construction, speed of implementation, and avoidance of federal financial involvement with the attendant procedures, regulations and requirements. While the low cost and rapid implementation were in part achieved because of the lack of federal participation, a severe tropical storm and the presence of a strong supporter in the state legislature were also contributing factors.

The San Diego Trolley is classified as a Light Rail Transit (LRT) system. The vehicles are manually operated and there is no grade separation. The trolley uses overhead power pick-up (via a panograph, not a "trolley") and is capable of operating in a mixed traffic environment.

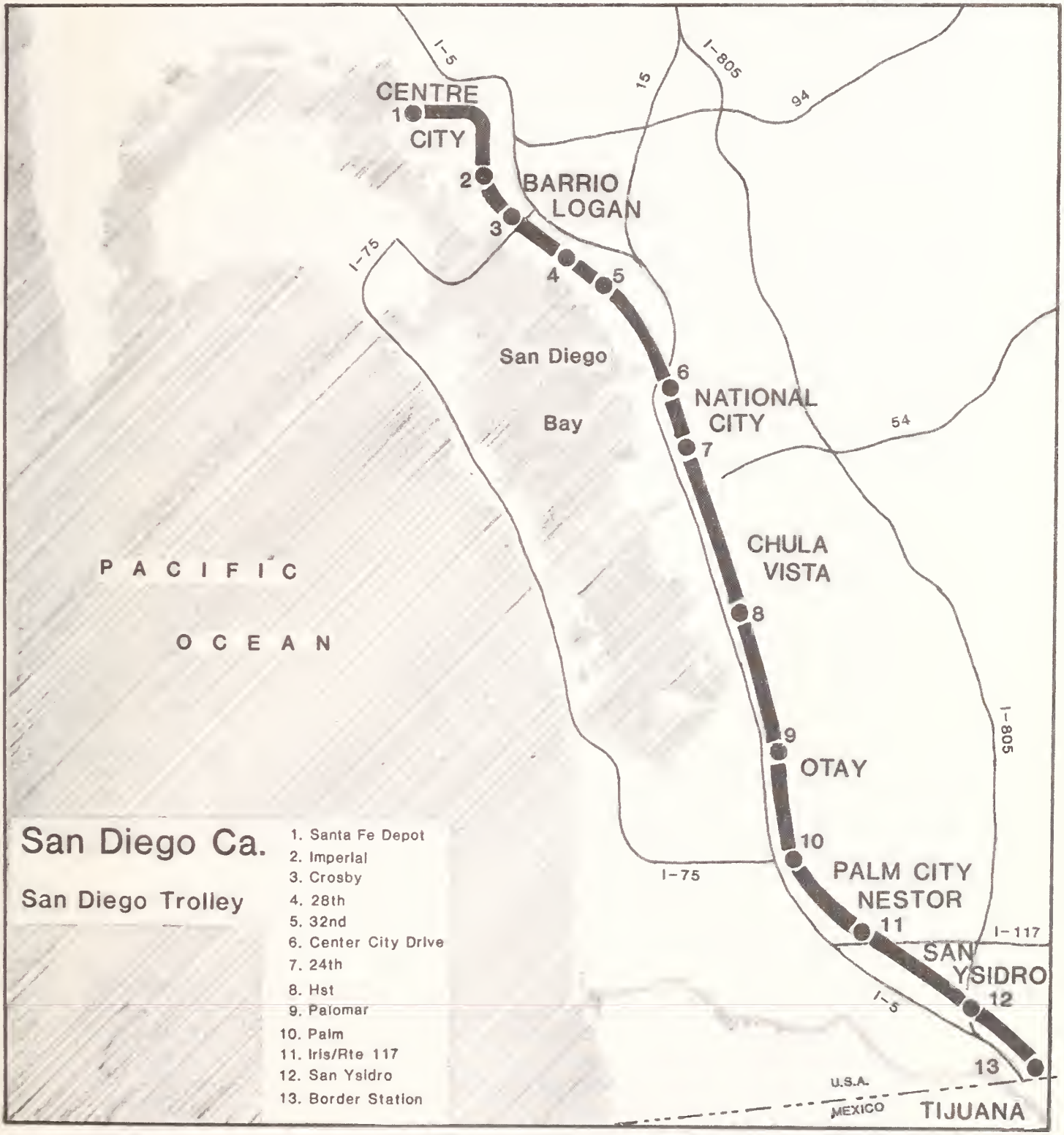
The trolley system is 15.9 miles in length (See map in Figure 3.) . It operates on existing streets for a distance of 1.7 miles in Centre City. The vehicles travel at-grade on an exclusive, reserved path essentially in the center of the street. Eventually, the 3/4 mile portion within the major office district will be developed as a pedestrian and transit way. During the initial stage of the guideway operations, however, automobile traffic is permitted in this area. Preferential signalization is used to mimimize interference with auto traffic at intersections. There are seven "stops" within Centre City with approximately quarter mile spacing.

For the remaining 14.2 miles, the system operates on the rehabilitated rail facilities of the San Diego & Arizona Eastern (SD&AE) Railway. The main line of the SD&AE Railway is located on the east side of Interstate 5 and Harbor Drive from the International Border to just south of San Diego Centre City. Most of the SD&AE Railway was a single track, at-grade system designed for freight operations. Light rail transit operations required that the existing track and roadbed be upgraded. All grade crossings are protected by automatic crossing gates which are activated by approaching light rail and freight trains. Although service was initiated as a single track operation, a double track system will be operating within a year.

The 11 suburban stations are modest, low level platforms with a waiting shelter, benches, light standards, transit information, ticket machines, public telephones and trash receptacles. Except for the Border facility, the stations are not manned, and restroom facilities are provided only at the terminal stations. A television surveillance system is monitored by the trolley dispatcher. A total of 2,150 free parking spaces are provided at six suburban stations. All stations have pedestrian access, bus access, and bicycle storage facilities. Local bus routes and schedules have been modified to provide feeder service to the Trolley.

A fleet of 14 Duwag U2 light rail transit vehicles is used to provide transit service. Trains consisting of two and three cars are currently being used, with five trains in operation at most times. Each articulated vehicle is capable of carrying up to 200 passengers. Thus, one driver operating

Figure 3


I-5
15
I-805
94
CENTRE CITY
1
2
BARRIO LOGAN
3
I-75
4
5
San Diego Bay
6
NATIONAL CITY
54
7
CHULA VISTA
8
PACIFIC OCEAN
9
OTAY
I-805
10
I-75
PALM CITY
NESTOR
11
I-117
SAN YSIDRO
12
I-5
13
U.S.A.
MEXICO
TIJUANA
San Diego Ca.
San Diego Trolley
1. Santa Fe Depot
2. Imperial
3. Crosby
4. 28th
5. 32nd
6. Center City Drive
7. 24th
8. Hst
9. Palomar
10. Palm
11. Iris/Rte 117
12. San Ysidro
13. Border Station

a three-car train can carry up to 600 passengers. Each car is equipped with one wheelchair lift and one wheelchair tie-down position.

The guideway operates seven days per week. Trains are scheduled at 20-minute headways between 7:00 AM and 7:00 PM. Between 6:00 AM and 7:00 AM and between 7:00 PM and 1:00 AM the trolley operates at 30-minute headways. Once double-tracking is complete, 15-minute headways will be implemented. Travel time between Centre City and the International Border is approximately 45 minutes. The average system speed through Centre City is nine miles per hour. Along the railway portion of the right-of-way the trains average 35-40 miles per hour. The running time from end to end is approximately twice as fast as existing bus service.

San Diego Trolley Incorporated (SDTI), the public operating arm of MTDB, employs 13 security personnel: one supervisor, 9 officers and three undercover agents. Security costs amount to 5.7% of the operating budget.

The LRT system uses a self-service, barrier-free, fare collection method. Self-service machines are used by the passengers to purchase a ticket before boarding a train. No fare payment or ticket collection will be made aboard the LRT vehicle. However, passengers will be subject to inspections by roving transit personnel to assure that a ticket purchase was made. In addition to the security force, SDTI employs seven "roving" ticket inspectors, with five on duty during peak hours. Violation rates are estimated at less than 1%. The following fares are charged:

One Way Fare	$ 1.00
One Way Elderly & Handicapped Fare	.40
Reduced Downtown Area Fare	.25
"Ready Ten" - Ten Trip Ticket	7.50
Regional Monthly Pass	31.00
Regional Monthly Elderly & Handicapped Pass	15.00
Transfer Charge from LOCAL or URBAN Services	.20
Transfer Charge from METRO (Express) Services	Free
Transfer Charge for Elderly & Handicapped	Free

The light rail project is being developed in two phases. The original Phase I project included all those activities required to implement a 16-mile single track LRT system utilizing 14 light rail vehicles. Phase II, which is scheduled for completion in September 1982, involves the complete double-tracking of the LRT line, additional traction power equipment, and the purchase of 10 additional vehicles.

The total cost of the Phase I project was $86,000,000, with major cost categories as follows:

Vehicles (14)	$12,000,000
Construction and Other Procurement Contracts	35,200,000
SD&AE Purchases	18,100,000
Non-SD&AE Right-of-way	4,000,000
Engineering and Construction Management	7,000,000
Interest on Fund Advances	9,000,000
Start-Up Activities	700,000
TOTAL	$86,000,000

The estimated cost of the Phase II project is $27,900,000 with major cost categories as follows:

Vehicle Purchase (10)	$ 9,600,000
Construction and Other Procurement	16,400,000
Engineering and Construction Management	1,900,000
TOTAL	$27,900,000

Guideway operating costs are estimated to be $3.7 million per year based upon 1981 dollars. Approximately 62% of this budget will go towards labor costs.

The financial plan for the light rail system indicates that 87.5% of the capital expenditures for Phase I would be paid for out of state gas tax. This funding source produces about $15 million annually. The remainder of Phase I must be funded with additional state sales tax monies which have been made available for transit purposes.

Washington
Robert Dunphy, MWCOG

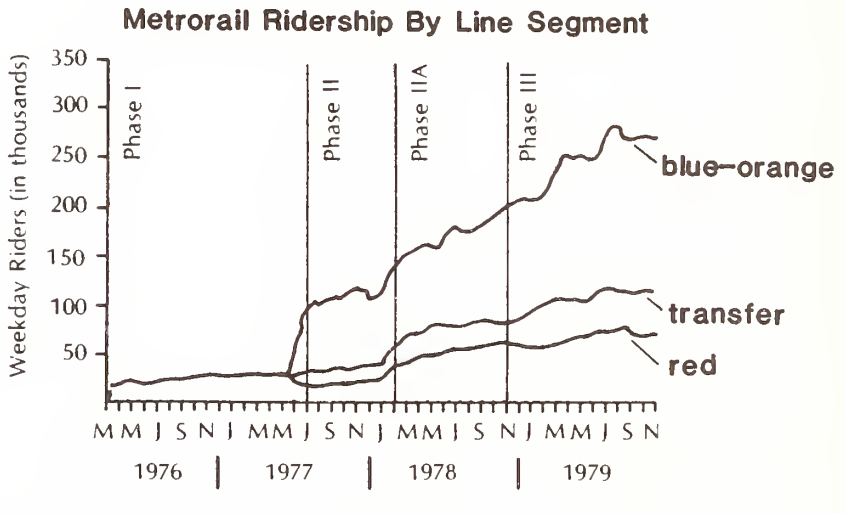
Drawing on the experiences of other areas, the Washington Metrorail Before and After Study was designed to examine primarily travel impacts, with any secondary impacts following from those. Travel behavior and land use models provided the theoretical framework for the study's data collection effort and analysis. This approach led to separate analyses of commuting patterns (recently completed) and non-work trips (now in progress). The results of these studies will be used to identify those areas most likely to receive development pressures related to the rail system.

The staged opening of the Metrorail system provides an opportunity to study the different functions of individual components of a regional network during its incremental implementation. The major findings of the study thus far, may be summarized as follows:

Total Ridership

- Metrorail ridership has increased sharply with each successive opening of a new segment and has continued to grow during the intervening periods. (See Figure 4.)

Figure 4

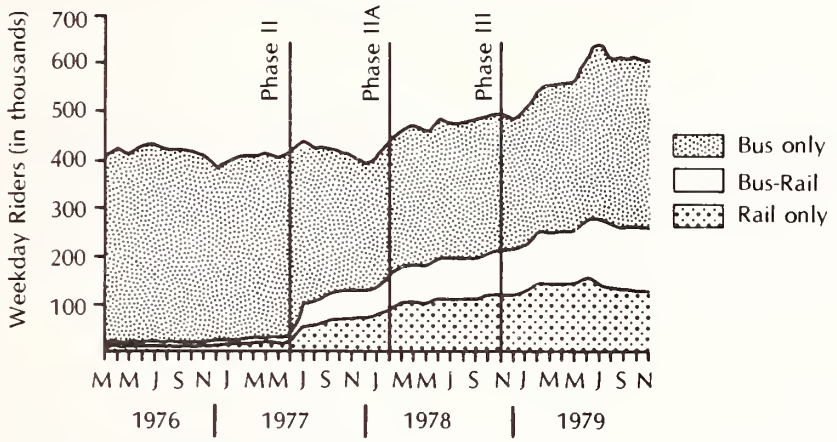


Source: WMATA Quarterly Ridership Reports

- Despite this continuous growth, total transit ridership (bus and rail) did not increase until the opening of the first suburban extension (Silver Spring) in late 1977. From that point forward, total transit ridership continued to grow throughout the study period - increasing from 400,000 to 600,000 weekday riders.

Figure 5

Total Metrobus and Metrorail Ridership by Month



Source: WMATA Quarterly Ridership Reports

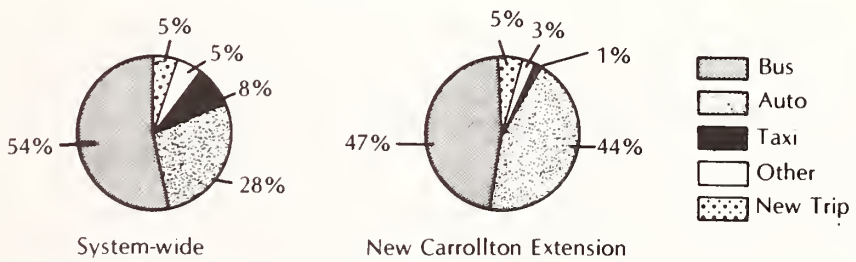
- Rail ridership greatly exceeded the forecast during the initial phase and has closely matched forecasts for the remainder of the first four operating phases.

Prior Mode of Travel

- Systemwide, 54% of Metrorail riders are former bus riders and 28% are former auto drivers or passengers. This compares with a hypothetical estimate that BART riders were evenly divided among those who made prior trips by bus and those who made prior trips by auto. (See Figure 6.)

Figure 6

Prior Mode of Travel of Metrorail Riders (May 1979)



Source: WMATA Phase III Ridership Survey

- By contrast, on the New Carrollton extension a much higher share (44%) of former auto drivers or passengers have been diverted to Metrorail, making the split of former auto and bus riders almost even. The New Carrollton station has the largest number of parking spaces of any station in the system.

Trip Purpose

- Metrorail serves primarily commuting trips (69% in 1979). This compares quite closely to the 67% of BART trips which were for commuting purposes.

- The second most important trip purpose on Metrorail is work-related trips (as opposed to school trips on BART).

Mode of Access and Egress

- Approximately 43% of Metrorail riders use buses to get to their stations in the mornings. The remaining 57% is almost evenly divided between those using automobiles and those who walk to the station. This stands in sharp contrast to the BART system, where only 17% of morning peak riders reached the station by bus, while 62% reached the system by auto. Nine out of every ten passengers using Metrorail in the morning peak walked to their final destination and 9% used bus. This demonstrates the extensive coverage of the downtown employment area already achieved by Metrorail, in comparison to BART, which requires 15% of its morning peak hour users to reach their final destination by bus.

Geographic Orientation

- Travel on the system is very centrally oriented. As of 1979, over 90% of all trips on the system have one or both ends within Washington's downtown employment area. The BART system is much less centrally oriented to downtown San Francisco, which captures fewer than 70% of BART trips.

Changes in Transit Travel

- The total number of transit trips to the downtown core has increased by roughly one third and rail trips have grown to account for almost half of the transit trips entering central Washington. That is, while bus ridership has declined, there has been a net gain of 53,000 in total daily transit ridership over the study period.

- The only corridor to the downtown that has not exhibited a large net gain in total transit ridership is the one not yet served by Metrorail (the Connecticut-Wisconsin Avenue corridor).

- Relative use of transit for commuting to the regional core increased from 38% to 43% over a one and a half year period.

- The growth in transit travel came disproportionately from the upper income groups.

- As compared to bus riders, rail riders are generally choice rather than captive riders; they have a higher level of educational attainment, have higher incomes, and ride less frequently.

Changes in Auto Travel

- Whereas the number of auto trips to the core remained relatively constant from 1977 to 1978, auto trips began to drop in 1979 when both the Silver Spring and the New Carrollton extensions were opened. During this period, there was a reduction of 48,000 daily auto trips, 31,000 as drivers. The reduction during the morning peak period was 15,000 auto trips and 10,000 auto driver trips.

Time/Cost of Transit Travel

- As compared to the pre-Metrorail bus system, those who can walk to Metro stations now save both time and money on their commute to the central area. Those who must take the bus for access to the station, however, have a longer and more expensive trip than formerly. The significance of this finding will be reevaluated as the system extends further out into the suburbs and more people gain walk access to the system.

Effects on Silver Spring - A Temporary Terminal Station
(Special Study funded by UMTA)

- Bus ridership to Silver Spring increased more than rail ridership to Silver Spring. This is largely a result of (1) the bus system improvements which were instituted to provide feeder service to Metro (but which also serve the Silver Spring business district) and (2) the fact that those who work in Silver Spring generally live farther out.

- The highest rate of diversion of auto trips to Metrorail observed to date occurred among the 40% of mid-day trips to the District of Columbia by Silver Spring workers who used Metro -- Three quarters of these travelers reported that the mid-day Metrorail trip had previously been made by auto.

- There was no measureable change in auto use on the approaches to Washington from Silver Spring, even though many riders at that station claimed to be prior auto users. It appears that this area is sufficiently outside of downtown Washington (about 7 miles), that there is a much more diverse traffic pattern, and possibly a much higher share of through trips, which would not be affected by the improved transit to downtown.

The above findings are discussed in greater detail in a report entitled The First Four Years of Metrorail: Travel Changes prepared by the Metropolitan Washington Council of Governments, September 1981.

Another recently completed series of reports analyzes the MWCOG mode split models and their ability to estimate ridership on the new rail system.

Among the findings:

- Although the models were developed with bus system data, they are able to accurately predict rail ridership.

- Accessibility, as a major factor in the models, needed some adjustment for the rail system.

- Upon the introduction of the (more frequent) rail service, transit usage spread out to the shoulders of the peak periods. In fact, the most dramatic increase in transit use occurred before and after the traditional peak. The models, however, which are calibrated for the peak period only, are unable to analyze travel during the shoulder periods.

- No rail bias was detected in the models. That is, there was no evidence that the models would underestimate rail trips.

A technical report on mode of access was also recently published by MWCOG. This study supplies detailed descriptive information on station access and egress. This data will later be examined to determine its significance to the mode split models. Findings include:

- Walking is the predominant access mode up to a distance of 7/10 mile from the initial stations outside of the core employment area.

- The average walking distance is approximately 1/4 mile for the Dupont Circle station (in downtown Washington) and 1/3 mile for the stations along the New Carrollton and Silver Spring extensions. This finding is consistent with the assumption that walk access/egress trips at the home end of a trip tend to be slightly longer than those at the shopping or work end.

- Up to 2 miles from the station there is no predominant access mode.

- From 2 to 7 miles from the station, bus is the favored access mode.

- At 7 or more miles from the station, auto is the dominant mode.

Although changes in travel behavior generally take a long time to produce a visible effect on land use patterns, there is some evidence that Metrorail is stimulating development in downtown Washington. The rise in transit ridership and concurrent decline in auto use has increased the development capacity of the downtown area. There is a real need, therefore, to coordinate local planning for station areas with Metro and to prepare local planners to handle the massive onslaught by developers. During the first nine months of 1981, 62% of the planned commercial office space is located within one mile of a Metrorail station.

Another indicator of business stimulation is the increase in retail sales by department stores in the CBD. Whereas sales in the CBD had been declining relative to regional sales prior to 1977, that trend was reversed and CBD sales now continue to keep pace with regional sales.

The analysis of employment data is not yet complete, however, it appears that 3/4 of all new Federal jobs are situated along Metrorail lines. There is some concern that, although 40% of all jobs are along Metro corridors, only 20% of the housing is so located (as of 1980); more residential development is needed around the stations.

To date, Metro has had a measurable effect on travel and transportation in the region and has opened significant opportunities for future land development.

Atlanta
Dick Courtney, ARC

The Atlanta Regional Commission's Transit Impact Monitoring Program (TIMP) is designed both to capture the short term effects of the incremental development of the rapid transit system and to track longer term regional travel behavior changes and developmental changes around stations. Some interesting initial conclusions can be summarized as follows.

- Immediately following the opening of the East and West Lines, eight percent of all work trips to employment near transit stations was diverted from automobile to transit. In all, more than 20,000 persons changed from driving to using rapid transit. These transit riders constitute a new segment of the travel market tapped by MARTA. They are mostly white, middle income workers who are not transit dependent. However, they are dependent upon finding a parking space at the rail station. A major concern: if fares rise faster than gasoline prices, will MARTA keep its new riders?

- So far, MARTA rapid transit service has not accomplished as much as had been expected in terms of reducing travel time. However, this may be because the East West Line does not serve the largest travel corridor, which is along the North Line. As the North Line opens, significant travel time benefits and congestion relief may come at last.

- The beginnings of intense development in anticipation of transit are now discernable along the North Line. These land use changes are in keeping with plans for this corridor. In most station areas, however, not much change has occurred; in some cases no change was planned - in others it may take many years for planned developments to be realized.

An important aspect of our program is that it gives us the opportunity to identify systemwide transit concerns or problems early.

- For instance, MARTA operates its own feeder buses with free transfers to rail. Many patrons who had been expected to use feeder buses, however, prefer to drive to MARTA stations. How can greater utilization of the feeder bus system be encouraged so that it is an economically viable part of the total transit system?

In the monitoring program certain activity centers and neighborhoods are being examined closely to identify some of the positive and negative impacts of rapid transit on existing areas:

- Case studies and attitude surveys are show that while significant transit construction impacts are occurring, they are being minimized as much as possible and are outweighed by the post construction benefits. Such benefits include better service to neighborhoods, street system improvements and more activity resulting in increased sales in business centers.

- Contrary to the experience of San Francisco, neighborhoods around transit stations in Atlanta have not been troubled with large overflows from MARTA park and ride lots. So far MARTA has successfully redistributed park and ride lot demand to lots with excess capacity and neighborhoods are protecting themselves with new parking restriction ordinances.

As mentioned earlier, the program is a cooperative effort among ARC, MARTA, GDOT and local governments. Each agency collects certain data, and to the extent possible, the program makes use of data collected as a part of other planning to minimize data collection costs:

- For instance, ARC analyzes by station area employment data collected as part of ongoing regional data collection efforts; MARTA provides relocation and operational data which is analyzed in the program; GDOT and local governments provide information from regular traffic count programs which are useful in TIMP work.

The program has been well worth the effort to date:

- It has established a cooperative framework for evaluating rapid transit impacts.

- Information is being assembled which will be useful to those governments that will be experiencing rapid transit construction and service in future years. The information will let them know what to expect.

- The program also provides for monitoring the implementation of plans. Plan implementation is taking the form of:

    * Pedestrian Plazas
    * Street system improvements
    * Transit stations tying neighborhoods formerly separated by the railroad
    * Private development
    * Changes to zoning ordinances to encourage intense development around certain transit stations.

- The information collected and analyzed is being used more and more by the private sector in making investment decisions and by community groups and local governments for a variety of purposes. In fact, efforts are being increased to widely disseminate the information so it can be used by as many as possible. Next year publication of a major compendium is planned which will summarize the data and findings so that they can be applied to a variety of uses.

- And finally, techniques used in this program can be transferred to monitoring the impacts of other public works projects.

San Diego
George Franck, SANDAG

The first serious discussion of a fixed guideway transit system for the San Diego region began in 1971 as a part of the development of the Regional Comprehensive Plan. Shortly thereafter, county voters approved a ballot proposition which permitted up to 25% of the state gasoline tax to be used for the construction (but not operation) of guideway transit systems. A 69-mile, intermediate capacity guideway system was adopted as part of the first Regional Transportation Plan in 1975. The state legislation creating MTDB in 1975 directed that the planning and design of exclusive mass transit guideways be pragmatic, low cost, and incremental in nature. Based on these directions, the following principles were adopted at the initiation of the Guideway Planning Project:

- The selected corridor should extend a long distance and offer high speed operation.
- The guideway system capital cost should be low.
- The guideway system should be primarily at-grade and primarily within exclusive right-of-way.
- The transit system operating costs should be low, and the guideway system should attempt to meet operating costs out of fares (although this is not a prerequisite for system feasibility).
- The project should measure the impact of the proposed transit system on residential growth.

To determine the feasibility of guideway transit in San Diego, the MTDB initiated an 18-month Guideway Planning Project study. The project was conducted in two phases. Phase 1 was initiated in December 1976 and involved evaluation of candidate corridors based on the Regional Transportation Plan. Phase 2 began in April 1977 and involved further screening of corridors, selection of a corridor for a starter segment, and technical assessment of transit alternatives within the selected corridor.

Selection of the South Bay corridor came in the early stages of the Phase 2 study. In the analysis leading to the selection of the corridor, the MTDB considered environmental, social, and economic impacts; station location studies; and cost patronage estimates. The dominant considerations for the selection were low cost and high prospective ridership.

Ultimately, the major factor that led to the selected project alignment was the availability of the San Diego & Arizona Eastern (SD&AE) Railway. On September 20, 1976, a severe storm passed through the eastern part of San Diego County washing out major portions of the SD&AE Railway. In 1978, the Interstate Commerce Commission (ICC) denied a request to abandon rail service on the line. Because of these events, MTDB was able to purchase the railroad for a relatively low $18.1 million.

The project approval process was initiated in June, 1978, when the MTDB Board of Directors made a determination that the Trolley project in the South Bay corridor was feasible. The San Diego City Council approved the project and transit financial plan in October, 1978. In March, 1979, MTDB received final project and financial plan approval from CALTRANS and the California Transportation Commission. The first construction contract was awarded in December, 1979, the first vehicle arrived in August, 1980, and revenue service began in July, 1981.

During the first month of operation, fares amounted to nearly 90% of operating costs, which are estimated at $10,000 per day. Since Labor Day, farebox recovery is estimated at 76%. The farebox recovery is expected to amount to between 50% and 70% of operating costs over the first year. This farebox recovery rate is approximately equal to the rate on the bus route the trolley replaced.

Total guideway patronage forecasts range from 28,000 to 30,000 daily in 1995. The seven Centre City stops represent a major portion of guideway activity, ranging from 50% to 68% of the daily patronage. Initial patronage was estimated at 9,800 trips per day. During the first week of operations, the trolley averaged around 12,000 trips per weekday, based on SANDAG counts. Although this patronage may be due to curiosity among one-time tripmakers, patronage actually increased to 13,000 trips per day in the third week of operation.

Based on "vendomat" sales, MTDB estimates that average weekday ridership was 13,400 and weekend ridership was over 15,000 during August. About 15% of the riders board at the Santa Fe Depot; 29% at the border.

The trip purpose distribution of forecasted guideway ridership reveals that home-work trips predominate over other trip types, representing 37% to 42% of all guideway usage (excluding border crossings). Approximately 15% of the border crossing travelers using San Diego Transit were destined to a work location.

Peak-hour guideway patronage is expected to represent approximately 10% of the daily usage. Most other rail systems in the United States experience much higher peaking characteristics (15.0% to 20.0% of daily usage occurs in the peak hour). The relatively low peak hour demand on the trolley reflects the flat all-day distribution of border crossing travel (7.0% during the peak hour).

Washington
Robert Griffiths, MWCOG

The Metrorail Before and After Study is taking advantage of the phased opening of the system to examine the incremental impacts on travel behavior. This approach fosters a better understanding of the various components of the regional system and the effects of their interaction.

Ridership - The initial 4.6 mile segment served primarily as a downtown distribution system. Ridership on this segment was approximately double the amount predicted by travel models. This underestimation may be attributed to two factors: (1) the very small size of the line, which made it difficult for the model to forecast accurately, and (2) the unexpectedly large number of new trips (especially during lunch time) generated by the system. Metrorail apparently provides service to points within the downtown area which were not previously discerned as easily accessible on the bus system.

As might be expected, ridership has increased with each successive segment opening, however it has also increased continuously throughout the periods between openings. By the opening of Phase III of Metrorail, the growth on the existing segments (an increase of 50,000 per weekday) exceeded the growth brought about by the opening of the new segment (30,000 riders per weekday). This contrasts sharply with the strictly step-like growth in ridership experienced by the Bay Area Rapid Transit (BART) system in San Francisco.

Prior Mode of Travel - On the initial segment, it was found that 41% of Metrorail riders were former bus riders, while 20% were former auto drivers or passengers. Significant percentages of Metrorail riders were also drawn from former taxi riders and those who would not previously have made a trip. The extension to Silver Spring, a suburban employment center, diverted a much larger share (33%) of auto drivers or passengers. The line to New Carrollton, a final terminal located on the Washington Beltway (and providing the greatest number of parking spaces of any station in the system), diverted a full 44% of its riders from automobiles.

Trip Purpose - People traveling to and from work constituted a plurality though not a majority of the ridership on the first, small, downtown segment of the system. As the system reached out into the suburbs, a growing share of trips were made for the work purpose. By the end of Phase III, work trips accounted for 69% of all trips on the Metrorail system.

Job-related trips make up the second most important trip purpose category. The percentage of trips made for school has been relatively small, although some of the universities expected to be major transit generators are located on future lines.

Geographic Distribution - During Phase I, 70% of the trips on the system were made entirely within the central core area. By Phase IIA (Silver Spring), trips between the suburbs and the core made up 60% of all trips and by Phase III (New Carrollton), 66%.

Modal Shares - Total transit ridership remained fairly constant from 1976 to 1977 as bus riders were merely shifted onto the rail system through changes to the bus routes. With the opening of the Silver Spring extension however, total transit ridership rose for the first time along with Metrorail ridership. Therefore, it was clear that, in addition to former bus riders, Metrorail was attracting former non-transit users. By Phase III, with both suburban extensions in service, Metrorail ridership was still growing, but bus ridership had also begun to grow at an equal pace. The introduction of rail service had caused bus route reorganizations which increased the quality and expanded the service areas of the regional bus system.

Auto travel to the Washington, D.C. core has declined by roughly 8% or 6,000 trips during the highest morning peak hour. Spread over all of the corridors, this figure does not appear significant until it is taken in the context of a previous long-term growth in auto trips to the core area. The 27,000 new trips on Metrorail suggest that the rail system is diverting that growth away from the automobile. The core area is thus being given the opportunity to grow without having to expand the highway system.

The early concern that Metrorail would draw away a disproportionate number of carpoolers was unfounded. Former auto users now riding Metrorail are evenly split between drivers and passengers.

Mode of Access/Egress - Bus is the predominant mode of access to the rail system during the morning peak period (43%), and there is an even split between those who walk and those who use auto (27% each). After arriving at their destination station, however, almost 90% walk from the station to their final destination.

A WMATA survey (3,000 interviews) was conducted on the suburban Metrorail lines to acquire more detailed data on station access trips. This information will be useful in determining the station influence areas for future land use impact studies. Half of the Metrorail riders were found to live within 1.8 miles of a station. Those who walk live an average distance of .33 mile from the station; those who ride the bus live an average of 2.5 miles away; auto passengers live an average of 2.7 miles away; auto drivers live an average distance of 3.8 miles from the station. The amount of carpooling to Metrorail stations is relatively small; average auto occupancy at the park and ride lots is 1.1.

Although the percentage of Metrorail riders accessing the station by auto increases with distance from the station, after 4 miles the absolute figures are very small. More detail in this area will be available shortly.

Washington Travel Demand Modeling
R.H. Pratt, Barton Aschman Associates

As a part of the overall data collection effort, MWCOG conducted Before and After surveys to examine the relationship between transit service changes and changes in downtown work trip commuting patterns. The findings were used to adjust the MWCOG demand models which are being maintained by Barton Aschman Associates. The "before" survey was conducted during May and June

of 1977 when only the initial segment serving primarily the downtown was open. The after survey was taken in October and November of 1978 when portions of the Red and Blue lines had been opened to the suburbs; 28 stations and 23 miles of the system were in service.

The number of autos being driven into the central area was found to have dropped by 10% between the surveys, with no change in average auto occupancy. Transit ridership into the central area increased by 14% during the study period. The walk mode of access to transit for the region as a whole decreased by 5%, while auto access increased by 17%.

It was discovered that those who use Metrorail are mainly riders by choice: 86% have a driver's license and 85% have at least one automobile available for the trip. While transit riders generally still tend to have lower salaries than auto users, the growth in transit ridership came from an even distribution of income groups and most of the new ridership had at least one car available.

Changes in transit service were measured through both the surveys and through network simulation. As a factor in level of transit service, it should be noted that transit fares increased by 17-20% over the study period. Travel times did not change much over this period, although total transit travel time did decrease slightly (5%). This decrease was a result of shortened in-vehicle transit time (12%) offset by longer out-of-vehicle times.

Transit accessibility increased by 19% (measured as the number of jobs one can get to by transit mode within 45 minutes door-to-door travel time). This measure is significant in that it theoretically affects general willingness to depend on transit to satisfy travel needs.

Parking rates also increased between the surveys for those who have to pay for their parking. Since there was also an increase in the number of people receiving free parking, however, the average parking cost remained about the same. The parking cost model, which was calibrated in 1973, over-predicted parking costs at the time of the survey; parking costs had not risen by an amount commensurate with the increased density in the downtown area. The rise in other auto operating costs in combination with the availability of Metrorail may have dissuaded parking lot operators from increasing rates as high as they otherwise might have.

The MWCOG mode choice model is a third generation, bi-modal, probit model. The probit curve addresses a "free choice" group as well as "auto captive" and "transit captive" groups. "Captive" is a misnomer in that these categories are defined by income levels and transit accessibility measures (at origin and destination ends). The probit curve is a function of the difference in disutility via transit and disutility via auto:

$$\text{Disutility} = \text{in-vehicle time} + 2.5(\text{out-of-vehicle time}) + .33(\text{travel cost/income per minute})$$

The coefficient of out-of-vehicle time was changed from 2.5 to 2.0 as a result of the before and after survey. This modification is consistent with modeling in other areas and represents a refinement to the model. In addition, the model was originally calibrated with accessibility measures

for a district level network, but these had to be re-calibrated for a zonal level network for this study. Thus, although the model is now more responsive to system changes (particularly in small station areas), it is more difficult to validate than the original model.

The ability of the re-calibrated mode split model to estimate ridership before and after the Metrorail service change was tested against observed data for several income groups and in different political jurisdictions. The fit was very close in all cases, being within or close to the confidence levels of the surveys. Although the estimate of percent change was good, the absolute numbers for ridership were slightly over estimated in the before case and slightly under estimated in the after case.

In examining only those trips which could reasonably use the rail system, the model estimate did fall within the statistical confidence limits, indicating that there is no rail bias (a preference for rail simply because it is rail) in the model.

While the model did well in estimating the mode split for work trips during the 2 hour A.M. peak period, it was noted that the mode split shifted dramatically towards transit in the shoulders of the peak (on either side of the 2 hour period). With the spread of flex-time and staggered hours, the shoulders of the peak are becoming increasingly significant, yet the current demand modeling process has no way to forecast growth or change for those time periods. The increase in transit usage during the shoulder periods may be a result of the difference in characteristics between bus and rail service: buses operate on short headways only during periods of peak ridership, whereas transit headways remain relatively short throughout the day, thus encouraging ridership at off-peak hours. This finding is an argument for continued monitoring of travel patterns, particularly those which can not be handled by the models.

In summary, the results of this study have established that the MWCOG mode choice forecasting process is sound. In addition to producing useful and interesting information, the study has identified the need for continued monitoring, has produced an updated mode choice model for Washington, and has eliminated the concern over a rail bias.

Atlanta
Gary Cornell, ARC

In outlining the overall study design for monitoring transportation related impacts of the MARTA rapid transit system, the ARC staff began with a list of expectations for the system:

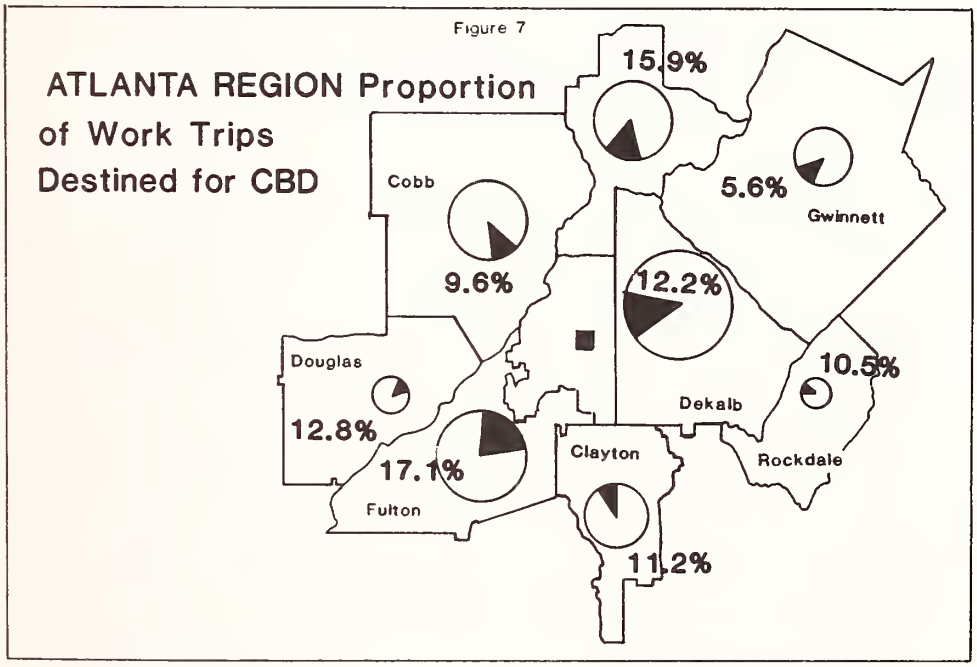
- The rapid transit system in Atlanta would result in higher levels of transit patronage;
- MARTA's rail system would relieve peak hour congestion on Atlanta's major highways;
- Rapid transit would result in faster travel times downtown both for people who drove and for those who used transit.

- The new system would attract drivers out of their cars; and
- The system would significantly expand the market for public transit beyond the traditional "captive" riders.

Monitoring activities in Atlanta address each of these expectations, but first, some more facts about Atlanta which may indicate a level of optimism in these expectations:

First, MARTA's service area includes only two of the seven counties in the Region. Of the 15 counties in the SMSA, the two MARTA counties - Fulton and DeKalb - produce about two-thirds of the Region's work trips. However, because of recent shifts in the location of employment, only about 15% of DeKalb and Fulton's work trips are destined for the central business district where the MARTA system is focused (See Figure 7.).

Figure 7



Approximately 1.5 million persons cross the cordon surrounding downtown Atlanta each day, including through trips. About one-third of the cordon crossings occur in the East and West Line Corridors which are served by rapid transit. Transit trips account for about 14 percent of all cordon crossings. The highest percentage of transit trips, 20%, occurs in the East Line Corridor which has rapid transit service. However the largest total person flow occurs in the Northeast Corridor, which has not yet received its rapid rail line. Thus, MARTA's new East-West Line can, at best, serve a relatively small slice of person travel in the Atlanta Region.

Secondly, the rapid transit improvements in Atlanta have occurred at the margin of what was already a well-developed network of bus service within the two-county service area. When MARTA acquired the Atlanta Transit System in 1972, it undertook a very ambitious Short Range Improvement Program.

In 1979, at the end of this program and prior to initial rail service, MARTA operated over 30 million vehicle miles over nearly 2,000 route miles. About 64 million passengers rode MARTA buses the year before rail service began. After six years of public ownership MARTA had developed an image of providing clean buses, dependable service, and unparalleled safety. Four months prior to initiating rail service, MARTA also had one of the lowest flat fares in the nation - 15 cents - with free transfers. In short, because the MARTA bus system was so extensive, and the rail system is so small (13.7 miles), it would be unrealistic to expect significant service improvements for MARTA patrons in the first two years of rail operations.

It was on June 30, 1979, that Atlanta became the South's first rapid transit city. On that day, 6.7 miles of track opened on the East Line. The West Line opened on December 22, 1979, expanding the total miles of track to 11.7. MARTA began redesigning many of its radial bus routes to form a new feeder bus network which would integrate the bus and rail systems. By doing this, MARTA was able to reduce route miles slightly while increasing vehicle miles by 14 percent and passenger trips by about 15 percent from 1979 to 1980. In the process, however, the transfer rate increased from about 29 percent of linked trips in May 1979 to about 40 percent in May 1980, because of the feeder bus concept.

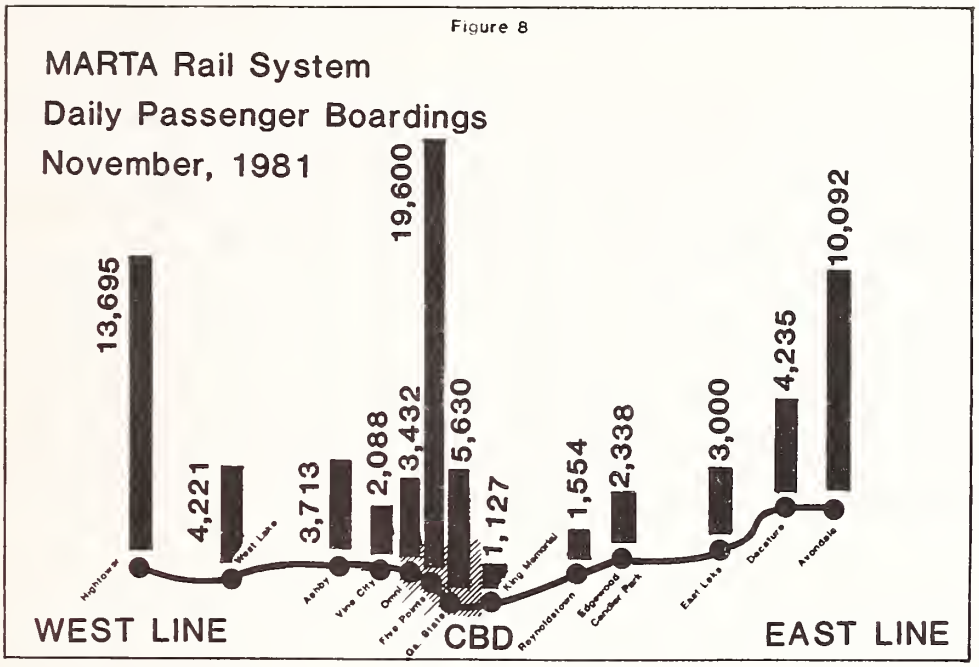
As expected, each new increment of rail and feeder bus service added patronage to the rail system. During the first three months, the East Line carried about 10,000 passengers a day without feeder buses. Feeder bus service increased daily boardings by about 17,000. After the West Line opened in January, 1980, average daily patronage rose to about 48,000. When feeder bus service was added to the West Line, patronage jumped again. The peak occurred with about 80,000 daily boardings in July, 1980 prior to a major fare increase.

MARTA's rail passenger boardings are concentrated at the CBD and at the two stations which serve as temporary end-of-line stations - Avondale and Hightower (See Figure 8.). Presently over 60 percent of the rail system's inbound trips begin at these two stations. As a result, patronage levels significantly exceed design capacity in each case. In large measure, capacity at these two stations is being taxed because they were not intended to serve as end-of-line stations. The phased implementation of the system has left MARTA in this dilemma for an indefinite period of time.

A related problem is the excess demand for park and ride spaces at these temporary end-of-line stations. Overall, about 35 percent of MARTA's patrons drive to rail stations, and about two-thirds of this demand is focused at the ends of the line. At Avondale Station the parking lot is filled by 7:30 a.m. and arriving patrons begin to park in the station's driveways and aisles. Much of the overflow has successfully been diverted to less crowded lots at MARTA stations which are closer to town.

Fortunately, Atlanta neighborhoods have not felt the impact of this overflow so far. To determine this, ARC undertook a survey of over 350 blocks in nine station areas before and after initiation of rail service. These inspections detected very little encroachment of MARTA commuters into the on-street parking of neighborhoods adjacent to the stations. In two station areas, Avondale and Decatur, a local government passed a resident parking ordinance which has helped prevent encroachment of commuters.

Figure 8



As mentioned earlier, MARTA rapid transit service was expected to relieve peak hour congestion on streets and highways in the MARTA rail corridors. To test this expectation, a system of 161 hourly and quarter-hourly traffic counts was designed to supplement the Region's existing traffic monitoring and surveillance system. Traffic count data were collected twice, before and after implementation of the East and West Lines. Sixty-four of these count stations were located on screenlines drawn across the transit corridors. Ninety-seven more were located on neighborhood streets where traffic volumes were expected to increase because of the flow of commuters coming to park and ride lots.

Overall, five screenlines showed decreases in corridor traffic in the range of 10 to 15 percent after rail service began. Radial traffic actually increased slightly at two screenlines after rapid transit. Traffic on neighborhood streets changed little. Large increases in volume on neighborhood streets were confined to only about a half dozen cases.

Identifying the role of rapid transit in reducing traffic volumes is complicated by confounding influences. Based on ridership surveys, about 20,000 person trips per day appear to have been diverted from auto to rail. However, these trips would account for only about 3-5 percent of the total traffic entering downtown from the two corridors studied and explains only a portion of the changes in traffic flows which have occurred. The impacts of the rapid transit system seem to be overlayed on a complex set of intervening events. These include continued dispersion of population and jobs from the downtown areas and gasoline prices, which have increased by 40 percent during the 1979-1980 study period.

Most planners agree that rapid transit should result in travel time benefits for those who use the MARTA trains as well as for those who drive in the transit corridor. In order to actually test this notion, ARC has undertaken two kinds of empirical tests of door-to-door travel times in the two improved transit corridors. The first test was to see if peak hour travel times decreased on the major roadways entering downtown parallel to the MARTA system. To do this, crews of drivers were hired to time each link of their trips inbound on ten highways during the morning rush hours. After more than 200 trips before rapid transit and 200 more after rapid transit service began, these records indicate that travel times have changed very little. In all, for the East Line Corridor, travel times decreased slightly for about 23 percent of the miles of highway tested. Travel times increased for about 11 percent of the miles of route and remained about the same for the remaining two-thirds of the highway miles tested. Since this happened in the face of rising gasoline prices and relative decreases in traffic volume statewide, it appears that rapid transit has not significantly affected peak hour travel times for most Atlanta motorists.

The second test was designed to examine how well rapid transit reduces peak hour travel times for transit users. Therefore, ARC selected 45 pairs of origins and destinations which are common trips for downtown commuters living in the new rapid transit corridors. For each origin-destination pair, ten repetitions of transit and auto trips were timed before and after the rail system went into operation.

Surprisingly, transit travel times actually increased after the rail system was implemented for 13 of the origin-destination pairs (mostly in the East Line Corridor). It appears that when MARTA initiated rail service, it rerouted or reduced direct bus service downtown for many locations, in favor of a feeder bus-to-rail concept. Consequently, longer wait times are required which sometimes cancel the improved line haul travel times. This is most onerous for destinations downtown, such as Peachtree Center where secondary bus distribution is required and for several in-town neighborhoods for which previous bus service had been very good. Nonetheless, on the West Line, most transit users do enjoy faster travel times with rapid transit.

Finally, ARC conducted three surveys in the fall of 1980 to learn how various segments of the travel market have responded to rapid transit service in Atlanta. How many people have been attracted out of their automobiles and how does that affect the composition of MARTA's ridership? The first two surveys, the Bus Passenger Survey and Rail Transit Survey, formed a comprehensive on-board survey of MARTA's patrons. John Hamburg and Associates was hired to pass out 20,000 questionnaires on-board a random sample of 800 bus trips and 50,000 more cards from the 13 rail stations. The third survey, the Workplace Survey, was conducted by Booz-Allen-Hamilton. In this case a much longer questionnaire was distributed to a sample of 4,000 employees in 300 firms which are located within a few blocks of MARTA rail stations. About two-thirds of the firms are in the downtown area.

From these surveys, some very interesting data were collected. For instance, four out of five transit trips in the Atlanta area are for regular trips to and from work or school. As a result, about one-half of

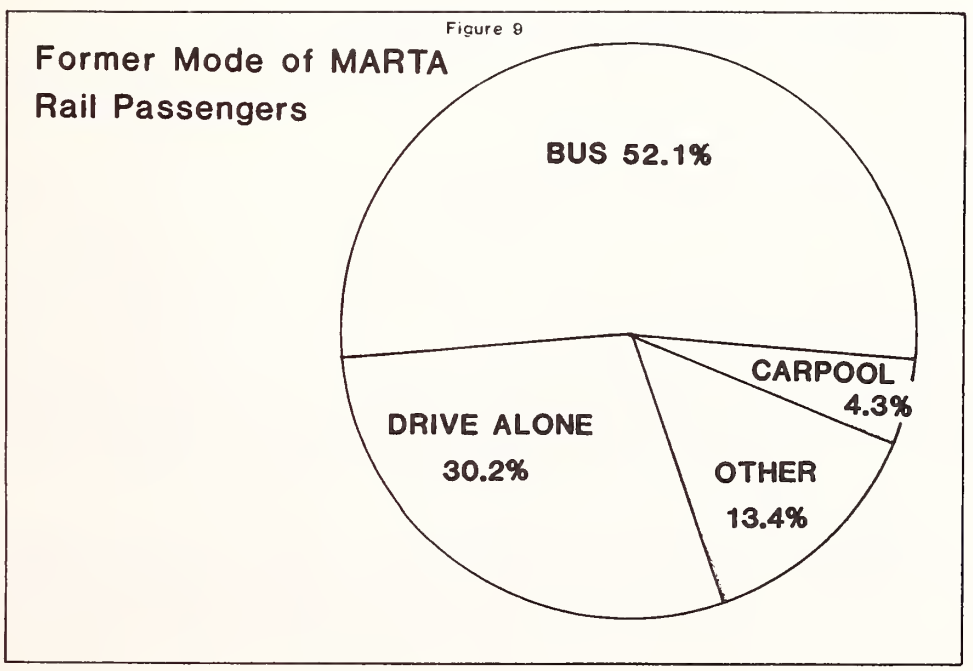
MARTA's users travel during five peak hours of the day (6:30-8:45 a.m. and 3:30-6:15 p.m.).

More downtown workers use transit than expected. Over 40 percent of workers in the Workplace Survey take public transportation to work regularly. Half these transit work trips occur on buses and not the train. The key factors in choosing a travel mode for work varies for drivers and for transit users. Transit users rank cost, total travel time, and dependability of arriving on time as the most important factors in their mode choices. Auto users select a mode based on travel time, flexibility to travel when they want, and dependability.

From the On-Board Survey, it was learned that the income distribution of bus patrons differs from that of rail patrons. Passengers on MARTA rail compose a group of which about half have incomes over $15,000. By comparison, only about one-third of bus patrons reported incomes over $15,000. The racial split for transit does not vary by mode, however, two-thirds of bus and rail passengers alike in Atlanta are blacks. However, while half the East Line rapid transit patrons are whites, the vast majority of the West Line's patrons are blacks.

The most interesting data of all came from an analysis of the former modes of travel for workers who now commute by rapid transit (See Figure 9.). According to the Workplace Survey, about one-twelfth of the workers in the sample, and about one-quarter of the commuters on rail used to drive to work. About 60 percent of the people on rail are former bus patrons. Those who switched modes from driving to transit comprise a new market for MARTA, which differs from the traditional backbone of the transit market in Atlanta. On the whole, these new riders have higher incomes, are mostly whites, and travel longer distances. Last, about 80 percent of these new riders drive or ride automobiles to rail stations

Figure 9



rather than use the feeder bus network. While many of these come from areas not served by feeder buses, some choose to drive in order to save time rather than money.

These findings have important implications to UMTA and to MARTA as they continue to develop an integrated bus-rail transit system in Atlanta. For ARC these findings are also important considerations for the update of the Regional Transportation Plan as the operating efficiency and energy consequences of the transportation system become increasing concerns. However, these are issues which we have just begun to explore and they will be the topics of future Transit Impact Monitoring Program work.

San Diego
Lee Hultgren, SANDAG

To evaluate the impact the Trolley will have, MTDB and SANDAG have developed, with support from the Urban Mass Transportation Administration (UMTA), a three-phase Guideway Implementation Monitoring Study. Unlike the previous impact studies (i.e., BART), which have attempted to measure transportation effects on everything from the regional economy to changes in lifestyles, this impact study concentrates on changes in travel characteristics, land use development, and socioeconomic characteristics only.

This study effort is divided into three phases:

Phase I: Study Area Inventory (1980-81)

The first phase was designed to describe the study area prior to implementation of the San Diego Trolley. Land use data, travel data, socioeconomic data, as well as data on the system construction impacts, was collected.

Phase II: Initial Operating Stage (1981-82)

This phase will monitor land use and travel changes in the study area during the first year of operation.

Phase III: Impact Evaluation (1982-83)

The final phase will require a second inventory of those factors catalogued in Phase I, followed by an evaluation of the impacts caused by light rail construction and operation.

Those portions of the communites most directly affected by the San Diego Trolley were included in the study area. The entire Centre City San Diego planning area is included. In 1980, 177,000 persons lived in the study area. This is 9.1% of the population of the San Diego region.

The City of Imperial Beach is included in the study area even though it is not directly served by the San Diego Trolley. Its extreme southwestern location in relation to the Trolley indicates that it will be directly impacted.

Females comprise a slightly lower percentage (49.2%) of the population in the corridor than in the region as a whole (50.6). This undoubtedly reflects the high military presence in the area. The study area has a higher incidence of transportation handicapped persons that the region as a whole.

Residents of the study area tend to be younger than the population of San Diego County. More than 50% of the study area is under 25 years old. Within San Diego County, less than 40% of the residents fall into this age bracket. Countywide, a larger percentage of the residents are age 55 or older.

In 1980, the median household income was $14,129 for the San Diego region. Within the study area only the Palm City-Nestor area had a median household income equivalent to or greater than that for the region. Centre City and Barrio Logan report the lowest median household incomes in the study area ($4,102 and $6.515, respectively).

A total of 81.3% of the residents of San Diego County are White, compared to only 64% of the study area population. Almost one fifth of the residents of the study area indentified themselves as "Other." An additional 9.3% reported an Asian background. Hispanics comprise 41.3% of the total population in the study area, compared to less than 15% nationwide. Racial and ethnic distribution varies considerably amongst the study area communities.

At the start of the study, a series of questions was asked about the trolley system and its potential impacts on travel. These questions served as the basis for the development of the work program.

GUIDEWAY IMPLEMENTATION MONITORING STUDY (QUESTIONS)
Travel Changes to be Monitored

Questions	Data Base Needs
What effect will the LRT have on	Measurement of trips by mode in corridor area.
What effect will the LRT have on current bus operations in the South Bay?	Transit line volumes by operator Transit boarding counts by operator Transfers among and between operators Bus access mode Transit ride profile Transit trip purpose Private transit operator counts Pre-LRT bus route map in corridor Transit trip length

Travel Changes to be Monitored (cont.)	
What effect will the LRT have on freeway and arterial travel?	Transit counts of freeway & major arterials Peak hour congestion counts Accident records Household vehicle ownership in corridor Trips/du - Trips/income
What effect will the LRT have on non-transit (i.e., carpool, vanpool, paratransit, jitney) travel?	Auto occupancy counts at selected activity centers and on selected arterial
What effect will the LRT have on the number of trips, trip distances, and trip purposes in the corridor area?	Trips per individual by income and mode Average trip distance by income and mode? Trip purpose by mode
What effect on travel conditions will the LRT stations have?	Traffic counts near station Turning counts near station
What effect will the LRT have on accessibility for elderly, handicapped, and poor?	Population in corridor stratified by sex, age, income Distribution of handicapped in corridor Trips by age, income, handicap
What effect will the LRT have on international border crossing?	Border crossing counts
What effect will the LRT have on accessibility for elderly, handicapped, and poor?	Population in corridor stratified by sex, age, income Distribution of handicapped in corridor Trips by age, income, handicap
What effect will the LRT have on international border crossing?	Border crossing counts

Existing Travel Characteristics

Of the 8.3 million person trips in the region each day, approximately 1.2 million, or 14.5%, occur within the Trolley Corridor. Within the corridor, approximately 3.4% of all trips are on transit, twice the mode split of the region. Table 1 summarizes the major characteristics:

TABLE 1

1980 TRAVEL CHARACTERISTICS

	TRANSIT TRIPS		AUTO TRIPS
	Region	Corridor	Corridor
Daily Trips	145,500	40,100	1,150,000
Average Trip Length (Miles)	5.2	5.2	7.1
Average Trip Time (Minutes)	19.2	17.3	9.3
Percent of Trips in AM Peak	22%	22%	8%

The freeway system in the San Diego region is probably the finest in the country. Of a total of 272 miles of freeway in the region, 25.8 miles are located within the corridor. There is no severe congestion in the corridor and only one area of moderate congestion caused by a narrowing of the freeway to cross the Sweetwater River.

The characteristics of transit riders in the South Bay is not significantly different from the region as a whole. Ridership refelects the demographic characteristics in the area, the large military population and the area's proximity to Mexico. Table 2 shows the characteristics of transit riders in the corridor and region. In addition, rider characteristics on the three transit routes which parallel the trolley are also shown.

TABLE 2

TRANSIT RIDERSHIP CHARACTERISTICS

		Trolley	Transit Routes		
	Region	Corridor	29	32	100
Percent Female	51.3%	53.2%	29.2%	48.8%	41.9%
Median Age	33.1	28.9	24.7	35.4	29.6
Median Income (000)	$9.9	$9.9	$10.2	$8.6	$12.4
Ethnicity: % Hispanic	18.0%	18.8%	12.2%	56.7%	14.6%
% White	60.3%	58.5%	52.4%	30.0%	68.8%
% Transit Dependent	45.5%	46.2%	49.9%	44.3%	40.5%

Almost three million people live in the combined San Diego-Tijuana area, which is one of the fastest growing areas in the world. On a typical weekend day, over 40,000 persons cross the border from Mexico. The following information is based on a non-expanded border crossing survey conducted in 1980.

San Diego County residents account for 38.7% of those people surveyed. A total of 31.4% of the sample were residents of Tijuana and an additional 3.1% were residents from other parts of Mexico. Almost 22% of the respondents were Californians from outside of San Diego County.

TABLE 3

RESIDENCE OF BORDER CROSSINGS

Residence	Percent of Total
Trolley Corridor	14.0%
San Diego County	38.7%
Tijuana	31.4%
Other California	21.8%
Other U.S.A.	4.1%
Other Mexico	3.1%
Other Foreign Nation	0.9%
TOTAL	100.0%

Although automobile is the most common access mode to the border, transit carries a significant percentage of border crossing trips, as shown in Table 4. In contrast, less than 2% of the trips in the region are made by transit. As indicated in Table 4, several private bus operators provide cross-border service, most commonly from Centre City.

TABLE 4

MODE OF ACCESS IN THE U.S.A.

Mode	Percent of Total
Private Vehicle	70.8%
San Diego Transit	12.0%
Walked	12.0%
Private Bus	4.3%
Taxicab	0.8%
Bicycle	0.1%
TOTAL	100.0%

As expected, the residents of the San Diego-Tijuana metropolitan area cross the border more frequently than non-residents. Table 5 shows that 18.4% of the Mexicans and 6.6% of the San Diegans cross the border daily. Approximately 14.5% of the local residents surveyed complete this trip several times per week. Additionally, 27% of the San Diegans and 36.7% of the Mexicans travel accross the border at least once a week.

Table 6 shows that more than 50% of the San Diegan and 72.7% of the Mexicans crossed before noon. In contrast, most visitors to the area cross the border in the afternoon. It is important that none of these peaks occur during normal transit peak periods.

TABLE 5

FREQUENCY OF BORDER CROSSING
(Percent of Total)

Frequency of Crossings	Residence: San Diego County	Mexico	Other California	Other U.S.A.	Other Foreign
Daily	6.6	18.4	0.7	2.1	0
Several Times Per Week	14.5	14.4	1.0	0	0
Weekly	27.0	36.7	2.9	0	0
Bi-Monthly	16.6	16.0	11.2	1.4	0
Occassionally	35.3	14.5	84.2	96.5	100.0
TOTAL	100.0	100.0	100.0	100.0	100.0

TABLE 6

RESIDENCE BY TIME OF CROSSING

Frequency of Crossings	Residence: San Diego County	Mexico	Other California	Other U.S.A.	Other Foreign
8:00-9:59 AM	9.2	20.6	4.3	2.8	3.2
10:00-11:59 AM	23.6	31.0	16.0	12.7	16.1
Noon-1:59 PM	22.2	21.1	29.5	22.5	12.9
2:00-3:59 PM	29.4	20.7	31.7	33.8	45.2
4:00 or Later	15.6	6.6	18.5	28.2	22.6
TOTAL	100.0	100.0	100.0	100.0	100.0

As previously noted, 12% of the people used San Diego Transit as their primary mode of travel in the U.S.A. Table 7 shows the time of day when the passengers crossed the border. Almost one third of them crossed between 2:00 PM and 4:00 PM. This coincides with the fact that 45.7% of the pedestrian border crossings ocurred during the same period.

TABLE 7

TIME OF CROSSING BY TRANSIT RIDERS

Time	Percent of Total
8:00 - 9:59 AM	9.9
10:00 - 11:59	24.3
Noon - 1:59 PM	22.8
2:00 - 3:59 PM	32.6
4:00 - 6:00 PM	9.7
After 6:00 PM	0.7
TOTAL	100.0

Land Use Changes to be Monitored	
Questions	Data Base Needs
What changes in land use will come about because of LRT?	Composite land use map from jurisdictions in LRT corridor area
What zoning changes will come about because of the LRT?	Composite zoning map from jurisdictions in LRT corridor area
What will happen to land costs in the LRT area, particularly around LRT stations?	Inventory current land values
What public and private development will come about because of the LRT?	Inventory through interview pre-LRT Public and private development proposals in corridor area
What changes in the housing market will take place in LRT corridor?	Current du by tape Housing costs, corridor/non-corridor Rental costs, corridor/non-corridor
What changes in regional population distribution will take place because of LRT?	Population in corridor area vs. region Population near LRT stations Population by age, sex, ethnicity, and income in corridor area
What effect will the LRT have on employment opportunities? tunities?	Employment by standard industrial classification (i.e., agriculture, manufacturing, etc.) of residents in corridor area. Major employers in corridor area Employment status in corridor (% unemployed)
What effect will the LRT have on the Centre City?	Traffic volumes Bus patronage Auto occupants Parking supply and cost Pedestrian movements Employees Current public & private development

The Light Rail Corridor impact area covers 38 square miles, or over ? ,000 acres. The primary land use is residential (31.2%), followed by agriculture (13.3%) and manufacturing (12.7%). Because the study area is skewed to take in a large part of Otay Mesa, which is currently largely undeveloped, agriculture may seem to account for a disproportionately large share of the corridor land use. However, a significant amount of agricultural land is in close proximity to the Trolley Alignment.

Commercial land uses, which include both shopping center and strip commercial, make up 9.4% of the area. The balance of the land uses include: federal reservations (11.9%), transportation and utility corridors (11.6%), public and quasi-public (4.4%), water areas (2.7%), wildlands (1.5%), and open space (1.3%).

Specific land use, zoning and general plan designations in the area of the stations have also been collected and mapped.

Over 20% of the civilian work force is employed in the study area. The largest concentration of civilian employees is located in the Centre City area. There are 61,811 Centre City workers. The second largest employment center is in the Barrio Logan where 26,046 jobs are provided. An additional 13.3% of those employed work in Chula Vista and 9.8% work in National City. The remaining 10.7% of the employees work in the remaining communities.

The major categories of employment in the study area are: military, government, service industries, retail trade, and manufacturing. A full 18.8% of those employed are in the military. Local governments and retail trade both employ 12% of the workers. The vocational breakdown varies from community to community. Military employment is heavily concentrated in the area just south of Centre City. Manufacturing employment is concentrated at a single Chula Vista industry, which is located within walking distance of a light rail station.

The 177,000 people living in the study area occupy 57,000 housing units. More than 53% of these are single-family dwellings. The average household size in the study area is 3.1 persons, which is the same as the regional average.

Within the study area, the median housing prices in 1980 range from $39,570 in Barrio Logan to $79,066 in Chula Vista. The regional average was $104,205 for a single family home. Thus, the median housing costs in San Diego was at least 24% lower than the regional average.

LAND USE
IMPACTS

Washington
Overview
John McClain, MWCOG

The MWCOG approach to the land use portion of the Metrorail Before and After Study has two main areas of focus. First, policy changes in local planning/zoning and forecasting are being examined and, secondly, databases of development statistics are being constructed. These databases will form a basis against which future changes in development can be measured.

MWCOG is preparing case studies of 18 stations, using the Transit Station Area Development Studies (prepared by local governments in the early 1970's) to identify changes in planning and zoning in each area. In a tri-goverment area, the power of planners to enforce their plans naturally varies from one political jurisdiction to the next. Maryland appears to have had the greatest success in adhering to plans, whereas Virginia has frequently upheld the rights of developers over existing land use plans. Many local government officials, planning organizations and citizen groups are effecting changes in earlier station area development plans as Metrorail becomes a reality. This re-planning generally entails greater development of the station areas in an effort to broaden the local tax base.

The study of forecasting changes is seen as a way of examining policy changes through quantitative measures. Forecasts of population, households and employment were developed locally for each small area zone in the region in 1973. Since 1976, however, the local areas have participated in a cooperative forecasting effort with MWCOG. Under this cooperative effort, MWCOG prepares regional forecasts with which the local forecasts must be reconciled based on relative growth and established trends. Past projections for each zone are currently being validated and updated by the local jurisdictions for 1981. These revisions should reflect how local governments have changed their expectations now that Metrorail is in operation.

As mentioned above, MWCOG is building databases which will be used to measure future changes in actual development. The Regional Employment Census is compiled from unemployment compensation records which are assigned to block faces and then aggregated to census tracts, zones or corridors. Records for 1972, 1974 and 1976 are being used to establish the employment location trends across the region. Within this framework, MWCOG will be able to study changes in Metrorail station areas and Metrorail corridors as well as non-Metro areas and corridors. Similarly, MWCOG is using the 1972 and 1977 Census of Retail Sales and Selected Services to establish a trend line under the "before" condition. Both the employment and retail sales trends will then be used in a comparative analysis of activity centers located in station areas and those located away from station areas. Finally, data is also being assembled on major commercial construction projects since 1978, using a commercial source.

For residential development data MWCOG is using the 1970 U.S. Census, 1977 household data obtained from local governments and the Building Permit File, maintained by MWCOG since 1970.

Background and Changes
Jay Lankford, MWCOG

Land use plans for the Washington area have changed radically since the early 1960's. To varying degrees, these changes may be attributed to a political restructuring of the city's planning process as well as the introduction of the Metrorail system.

In 1961, two years after the Mass Transportation Study's rail transit recommendation, the National Capital Regional Planning Commission (NCRPC), an agency of the federal government, developed a Policies Plan to guide growth in the Washington area through the year 2000. At that time the regional population for the year 2000 was forecast at 8 million, reflecting the city's World War II population boom. (Regional population stands at 3 million in 1981.) The land use map drawn from this Policies Plan called for future development to be concentrated in a series of radial corridors emanating from downtown Washington, separated by wedges of green space. The plan envisioned strings of new towns connected to the downtown by freeways and rapid transit lines. Two outer beltways were to be constructed (in addition to the Capital Beltway constructed in 1963) and 230 miles of subway were planned.

In 1966, NCRPC was abolished and replaced by MWCOG. Several years later, in 1974, the District of Columbia was granted limited home rule. Following these political changes, the Policies Plan, which had received a strongly negative reaction from the local areas, was superseded by the Metropolitan Growth Policy Statement. Under this policy, local planning agencies were asked to identify growth centers in the region. These growth centers were identified, after considerable negotiations, in 1979. MWCOG maintains forecasts of population, households and employment for the region.

The following changes in land use in Washington's surrounding localities coincided with the planning or opening of Metrorail.

- Circumferential development, which would require a greater investment in transportation facilities, is being discouraged in favor of development around Metrorail stations.

- Friendship Heights, located at a planned Metrorail station in Maryland, has become an intensely developed shopping area. Nothing of this scale had been planned for the area prior to Metrorail.

- Many new freeways and expressways running throughout the Washington area appeared on earlier land use maps, but were never constructed and are no longer planned, e.g., a freeway connecting Arlington, Virginia, with far northwest Washington (1966).

- The Rosslyn-Ballston corridor was formerly planned for general commercial use. Now that Metrorail is serving that corridor, it is planned as a coordinated, mixed use development district.

- Crystal City was planned for industrial use and was to be served by an elevated Potomac Expressway (which was never built). Now served by Metrorail's Blue Line, this area is a coordinated preservation and development district.

- Warehouses were originally planned for the Pentagon City area; now served by Metrorail, there is a large development project at that site.

Changes in planning for the downtown area reflect the shift in priorities which accompanied the institution of home rule (however limited) as well as efforts to capitalize on Metrorail.

- In the early 1960's, the entire area between Independence and Constitution Avenues east of the Capitol, a low income area with a predominantly black population, had been slated for urban renewal. This area has undergone substantial renovation to become part of the Capitol Hill Historic District and efforts are being made to maintain the residential neighborhood.

- The focus of downtown development has shifted westward from the traditional downtown to the area between the Farragut West and Farragut North Metrorail stations.

- Former deteriorated commercial districts are now the sites of Metrorail growth centers.

- A hospital and associated concentration of medical offices have moved away from their former location on Eye Street, N.W., and have been replaced by attorneys, accountants and associations.

- Hotels are buying property all along the 7th Street corridor, served by Metrorail.

The link between these changes and the introduction of Metrorail may be established through a correllation with increased accessibility. Metrorail, in addition to increasing the capacity of the downtown, has increased the perceived accessibility of many areas.

The Washington office market is at an all-time high. Construction and leasing are at very high rates and the vacancy rates are low. While this boom may be partially related to Metrorail, it is difficult at this juncture to determine the extent to which Metrorail is stimulating new growth as opposed to attracting relocated businesses.

Station Area Case Studies
Rob Bragen, MWCOG

MWCOG is conducting detailed case studies to determine the degree to which Metrorail is influencing development in each of eighteen selected station areas. The intent of these studies is (1) to examine how the local areas are developing and implementing station area land use plans and (2) to collect data for use in measuring future station area impacts.

With no extant comprehensive land use plan for the region, each of the local areas has had the responsibility for independently developing and implementing its own station area plans. WMATA was specifically constrained from any involvement in station area planning beyond what was required for the stations themselves. These case studies have provided the

first opportunity for MWCOG to analyze in detail the local station area plans and implementation methodologies (e.g., zoning, parking strategies, joint development).

Data collection for the case studies is based on the expectation that data will be collected again at some future time for comparison. Rental and property values were originally to be included in this effort, but due to unexpected difficulties in obtaining such data for the specific station areas, those elements were discarded. Data on vacancy rates and recent changes in land use were more readily available and have been collected. A major portion of the case study project was dedicated to interviews with representatives from both the public and private sectors. On the public side, local government officials, planners, administrators, and elected officials were interviewed to obtain their perspectives on the station area planning process. Interviews with members of the private sector, including developers, realtors and real estate brokers, provided a balanced viewpoint. Many of the real estate brokers had already performed their own studies of station areas and were willing to share their information.

Although the analysis of the data has just begun, some preliminary findings can be summarized:

- Almost all jurisdictions defined the station impact area on the basis of walking distance, generally the area within a 1/4 mile radius of the station (allowing for natural and man-made barriers).

- The degree to which station planning has been done and the timing of such efforts vary from one area to another. Some areas began planning in the early 1970's, often using TSADS as a starting point; other areas have only recently recognized the need for such planning. The former group is naturally better prepared to handle the onslaught of developers now interested in these station areas.

- The stations have provided local areas with a focus for managing development.

- Several major developers are concentrating almost exclusively on Metrorail station areas.

- Mixed, multiple use of station areas is taking place in some localities. Arlington County, Virginia, has developed a zoning ordinance which facilitates this type of development and it may be adopted elsewhere.

- All of the local jurisdictions have realized the connection between expanding their tax bases through station area development and the increased amount of Metrorail operating expenses which they must shoulder.

Atlanta

Dick Courtney, ARC
Karl Fromberg, ARC

The Land Use Component of the Transit Impact Monitoring Program (TIMP) is intended to assess the degree to which rapid transit construction and operation has affected and is affecting areas in proximity to the stations and lines. The program is aimed at determining: (1) whether the transit system has produced economic benefits through land use and other changes; (2) what social and attitudinal changes, if any, have been brought about by the advent of the transit system; and (3) whether the system has resulted in the types and intensities of development which were expected and planned by the public ard private sectors.

The land use component of TIMP can be described as three groups of activities:

1. annual data collection and reporting tasks which monitor specific residential and commercial activities;

2. a series of special studies which consider social and economic impacts of transit; and

3. a monitoring of the Transit Station Area Development Studies (TSADS) in order to assess the degree to which station area plans are being implemented.

The annual data collection and reporting tasks relate primarily to commercial and residential activity. Residential information includes the sale (both number and price) of housing in all station areas, rental rate data for apartment units, and residential building and demolition permits. Commercial data include employment, the sale of commercial, industrial, and vacant land, office space supply and leasing, commercial building and demolition permits, and rezoning proposals.

One example of detailed data collection is housing sales - over 6,000 sales records have been collected for station and control areas for the years 1970 through 1979. Thus far, the sales information illustrates that of the four line segments, the East Line station areas have experienced the greatest number of sales (2,086 or 43 percent of total) and the highest rate of mean value appreciation since 1970 (145 percent). Three East Line "in town" stations - Inman Park/Reynoldstown, Edgewood/Candler Park, and East Lake have seen an overall increase of better than 200 percent in average mean prices since 1970. A specific reason for the preponderance of East Line sales and value increases cannot be given. These residential areas were the first served by the MARTA rail system which should account for part of the attraction. A number of these same neighborhoods, however, were in the forefront of the return to "intown" living during the period of the 1970's and the energy crisis and became fashionable living areas with major renovation and restoration activities. The North Line, with 28 percent of recorded sales and a 129 percent average value increase, is characterized as having a steady and healthy growth. Though these neighborhoods are not yet served by MARTA rail, the growth was expected as this area contains some of the most affluent residential neighborhoods in Atlanta. Sales along both the South and West Lines have fluctuated since 1970.

Although served by MARTA, the West Line has recorded the lowest number of sales and value increases. South Line sales are unstable due to shifts in certain areas from residential to commercial and industrial uses.

In comparison, the data collected on the commercial, industrial and vacant land sales reveals that the majority of activity is occuring in station areas soon to be served by MARTA. Whereas the residential activity has been strongest in the East Line active rail corridor, the commercial activity is concentrated primarily in downtown Atlanta station areas not yet served by MARTA. The Core Area (consisting of five stations - Georgia State, Garnett Street, Omni, Peachtree Center and Five Points) combined with the three station areas immediately to the north (Civic Center/North Avenue, Midtown, and Arts Center) account for 39% of all commercial sales activity in station areas since 1978 and 70% of commercial investment during this same period. Future efforts will revolve around determining whether sales activity continues to precede and anticipate MARTA service as it is extended along the North Line.

The commercial records show that investment in the Core Area of Atlanta has been in the acquisition of existing office buildings and hotel stock. Land has been assembled for major new development downtown and parcels acquired for expansion. The three stations immediately north of the Core Area, which account for 25% of the sales and investment dollars, are experiencing a fairly significant amount of new development; large numbers of apartments are being sold and improved with many converted into condominium units, and many smaller office buildings are changing ownership in the corridor just north of downtown, which is commonly referred to as the Peachtree Spine.

The second major set of land use activities includes special studies and reports which investigate detailed social and economic impacts of MARTA. People's attitudes toward MARTA have been and are currently being analyzed; MARTA's residential and commercial displacement and relocation programs have been studied; and detailed activity center case studies have been prepared.

The first residential attitudes study was conducted in 1980 for the East Lake neighborhood, a station area on the East Line. The East Lake neighborhood was selected for a number of reasons including:

- The MARTA line configuration in the area was aerial, at-grade, and subway;
- there existed diverse residential density and mix;
- the area was multi-jurisdictional, being comprised of unincorporated DeKalb County, the City of Atlanta, and the City of Decatur; and
- there was a cross-section in neighborhood demographics.

One hundred households in the East Lake neighborhood were interviewed. The mean distance of these households to the MARTA line was approximately 500 feet and to a MARTA station 1,200 feet. Seventy-eight percent of those interviewed had lived in the same or close-by residential location during MARTA's acquisition, construction, and operational stages. Major findings of the East Lake Residential Attitudes Survey were that a majority of the people felt:

- proud of their neighborhood and proud of the MARTA system;
- the station and line blended in well with their community;
- there was no negative effect from parking on residential streets and none of those streets should be closed to permanent traffic flow;
- the return from MARTA in service was worth the cost in inconvenience during construction and worth the cost in additional taxes; and
- that throughout the program of acquisition and development, the MARTA staff had been sensitive to the needs of nearby residents.
- Noise generated from operation of the rail system was a problem and was noticed by residents outside their homes. (This was the one negative factor mentioned.)

A major analysis of MARTA's residential displacement and relocation activity for the period 1973-1978 was conducted. At that time, MARTA had acquired and demolished 750 housing units which displaced 666 households (84 units were vacant). General characteristics of the five year displacement/relocation program were as follows:

- the bulk of the acquisitions were in the East-West Corridor where initial MARTA construction occurred;
- 465 units (62%) were located along the West Line and 245 (33%) on the East Line;
- of the 750 housing units acquired by MARTA, 70% were multi-family units, while 30% were single family;
- an estimated 80% of the persons to be displaced during the first phase of MARTA construction were black;
- 76% of households relocated were of low and moderate income.

It was felt that MARTA's relocation program would have a particularly negative effect on the City of Atlanta where most activity was to occur. 624 housing units (or 83%) were within the City. Atlanta had been losing population for a period of time and many community leaders believed MARTA activities would hasten the decline of a number of Atlanta neighborhoods. Contrary to previous fears, however, the analysis showed that the majority of those displaced (71%) relocated within the City of Atlanta, primarily south of the West Line.

- approximately 61% of households moved less than three miles from where they were displaced and over 96%, less than 10 miles;
- there was little change in housing tenure although a small shift (a 13% change) occurred with renters becoming owners.

On the commercial side of the relocation process, MARTA has acquired a total of 356 businesses since 1974. Of this number, 51% went out-of-business either initially or shortly after being relocated by MARTA. It is not certain what the economic impact to Atlanta was through the loss of these 180 firms. Many were marginal operations or "mom and pop" stores and restaurants which may have used MARTA as an opportunity to close shop. Others may not have had the capital to reopen in a new location. A survey was

taken of the businesses acquired and relocated by MARTA. Most respondents to the survey indicated that they relocated solely because of MARTA and had no desire to do so previously. Businesses chose new locations primarily because those sites were either readily available or had access to important markets. A site having transit access was seen as an important factor by less than two percent of those relocated businesses.

Last, under special reports, is a series of activity center case studies. One of these was the Decatur Merchants Study (1978 and 1979) - this study assessed the impact of MARTA on businesses near the Decatur Station - both during and after construction:

- The rail construction had an adverse effect on businesses adjacent to MARTA. Business renters, particularly, were less well equipped to absorb losses than building owners - there was a greater turnover of renters;
- While MARTA informed merchants of construction activities and urged cooperation between merchants and contractors - loss of customers, decreased sales, eliminated parking and obstructions in or near store fronts all contributed to create a severe impact;
- Four months after the East Line opened, a definite improvement in business was observed by those merchants remaining in the station area.

Another special report was the Omni Merchants Study (1980) - the Omni International is a multi-use facility containing two office towers, a hotel, a multi-level shopping mall, and an entertainment center. Developed over 5-1/2 acres of railroad air rights, the project is adjacent to Atlanta's Coliseum and the Georgia World Congress Center. Within six months after the West Line opened on December 22, 1979, the Omni Station, located in the multi-use facility, had the fourth largest patronage of the East-West Lines and the media were reporting tremendous gains for businesses in the complex. An Omni survey was initiated to determine the "baseline" conditions that existed prior to MARTA and to measure, both quantitatively and qualitatively, changes that had occurred in the Omni during the first nine months of MARTA service. Major findings from the interviews conducted with 70 merchants and store owners were:

- 61% reported increases in comparative monthly gross sales volumes after the introduction of MARTA service;
- certain kinds of businesses in the Omni benefitted over others - gifts and novelties, eating and drinking places, and food stores;
- businesses closer to the MARTA station showed greater increases in sales volume than those more remote;
- MARTA had opened up a previously untapped market of suburbanites, especially on weekends; and
- finally, store owners were making changes in their merchandising practices as they were now serving a broader spectrum of the population.

The third group of land use activities involves Monitoring Transit Station Area Development Studies (TSADS) by tracking private development projects, updating an inventory of planned public improvements, and comparing the TSADS with actual development.

As previously mentioned, the TSADS were prepared by local governments during the 1970's in anticipation of MARTA. The plans were conducted in order to develop land use recommendations which would minimize traffic impact on established neighborhoods and communities and maximize development opportunities at specified stations. It should be noted that a number of stations were labeled "preservation" stations where little public or private development was recommended. Unfortunately, to date, a study of proposed activities shows that public investment has not been at the magnitude previously envisioned. This is particularly true in areas where it was felt that public improvements would spur private initiatives. Recommended public improvements from TSADS included plazas, parks and recreational areas, bicycle and pedestrian facilities, housing, libraries, and other institutional uses. MARTA has been responsible for most of the public improvements implemented - the Decatur Plaza area is one such improvement, the Five Points Plaza another, and the remainder of MARTA's improvements have been primarily related to transportation.

A number of major public policies and investments have been made in accordance with the TSADS program, however. These include:

- air rights developments in the Georgia State Station - the State's Twin Office Towers;
- consolidation of public facilities in the Garnett Station area - Atlanta's new Criminal Justice Complex; and
- pedestrian improvements in the downtown area - Broad Street Mall near Garnett.
- An example of a non-capital investment is Atlanta's new zoning ordinance (effective January, 1982) which will establish special zones around downtown station areas to promote proper, desired, high density developments.

TSADS called for private development to maximize the benefits of access through MARTA by building intense uses adjacent to certain stations. Examples here include:

- Southern Bell Telephone Company air rights development at North Avenue;
- Peachtree Summit Building located adjacent to the Civic Center Station (the station is located above the downtown interstate highway); and
- other developments in downtown such as the AT&T building.

ECONOMIC AND FISCAL IMPACTS

San Diego
Lee Hultgren, SANDAG

The San Diego Trolley is unique in many ways, but it has received most of its notoriety for the following reasons:

1. Low cost of construction;
2. Speed of implementation; and
3. The determination of the MTDB to avoid federal financial involvement with the attendant procedures, regulations and requirements.

Undoubtedly, the rapid implementation and low cost were in part achieved because of the lack of federal participation. There were other reasons as well, which include a severe tropical storm and strong support from the state legislature.

The purpose of the MTDB Implementation Evaluation study is to identify the difference between the MTDB procedures and those which would have been required if the system had been built using federal monies. The requirements which will be evaluated include those for planning and engineering, purchasing, contract administration, "buy America" requirements, construction standards, operation plans and labor contracts. For example, MTDB essentially skipped the preliminary engineering phase, going directly from feasibility studies to final design. As modifications were needed, a series of change orders were issued. Also, the vehicles were purchased before final approvals were obtained for the project. Undoubtedly, other differences will be identified.

These MTDB "short-cuts" have proven to be effective, but they did involve a risk which the federal regulations were intended to prevent. For example, there may be design problems which might have been eliminated through the preliminary engineering phase.

The primary method which will be used to identify the differences will be through Critical Path Diagramming (CPD) of the two procedures. The CPD will be done twice. First on the MTDB project, and then with the same options applied to the Banfield Light Rail project in Portland, Oregon. The Portland proposal is strikingly similar to the San Diego Trolley in length and system design. The major difference appears to be that the Banfield line will be built using Interstate Highway transfer funds and, therefore, must abide by all federal regulations. A similar evaluation of the benefits and dangers of the MTDB method will be undertaken.

In addition, a panel of experts will be asked to participate at two points. The experts are proposed to be planners and engineers who have been involved in the planning and construction of a rail system, such as Washington METRO, Baltimore or MARTA. Initially, the experts will be asked to identify problems in the federal regulations, particularly those which they believe cause unnecessary delay or higher costs in their projects. Toward the end of the project, it is hoped this same group will meet to discuss the potential "dangers" of the MTDB method and to consider potential changes to federal guidelines.

METHODOLOGIES

An Open Discussion

With the accumulation of experience in opening new light rail systems and in conducting transit impact studies, certain general observations can be made about the success of various methodologies employed.

Development in and around selected station areas is widely advocated as a means of reaping the greatest possible benefit from a given rail system. As rental rates are generally high in station areas, however, such development may not occur without special assistance. In several cities joint ventures between government and private industry have been used successfully to help locate development in desired areas. Financial assistance and red tape cutting have provided the extra incentive needed to convince developers to locate their projects in or around the stations.

Short of such active involvement, it is often extremely difficult to establish a causal relationship between the system and land development or changes in land use patterns. As has been seen, causality is a major problem in impact studies generally. For this reason, there is a consensus of opinion among planners that impact studies should be limited to use of U.S. Census data and the monitoring of certain traveller and system characteristics as part of regular data collection activities. Full blown studies do not appear cost-effective in light of the elusive causal link which would make them meaningful.

Another indicator of the trend away from extensive, costly studies is the surge of interest in rail TSM (Transportation System Management) strategies, such as feeder bus routing and parking policies. These techniques are easily and inexpensively implemented and can be reversed with equal ease if they do not accomplish their objective. The ability to reverse these changes reduces the need for an extensive pre-study of the problem.

From several cities comes a word of caution on the timing of bus system changeovers from regular service to rail feeder service. The key to a successful changeover seems to be timing the change to occur at roughly the same time that rail service is instituted but not before all of the initial problems have been worked out of the rail system.

In several cases the parking demand at terminal stations on the rail lines has been largely underestimated by the models. In some areas the possibility of parking spillover onto residential streets has threatened the proposed return of the streets to the neighborhoods. Similarly, if the park and ride lots are filled by commuters, off-peak riders are discouraged from using the system. Meters in some areas have been altered to show 2 or 3 hour limits in an attempt to address this problem. Even so, this level of demand for parking spaces in the terminal station park and ride lots suggests a transit access restraint on the system in addition to the more familiar capacity restraint.

SOURCES OF FURTHER INFORMATION

Washington

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U.S. GOVERMENT PRINTING OFFICE 1982-0- 370-816/853

NOTICE

DOT-I-82-3

U.S. Department of Transportation

Office of the Secretary of Transportation

400 Seventh St., S.W
Washington, D.C. 20590

DOT-I-82-3

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