Study of Coordinating and Integrating Northern Virginia's Interjurisdictional Bus Routes

Final Report

prepared for
Northern Virginia Transportation Commission

prepared by
Abrams-Cherwony & Associates
MacDorman & Associates
SG Associates

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October 1994

EXECUTIVE SUMMARY

Since 1972, public transit services in Northern Virginia have been provided by the Washington Metropolitan Area Transit Authority (WMATA). The rising costs of Metrobus subsidies has prompted most of the Northern Virginia jurisdictions to initiate some form of bus service as replacement for or complementary to WMATA Metrobus long standing services. These initiatives have resulted in the establishment of a number of bus services in addition to those provided by Metrobus. These additional bus services are provided by Arlington County (Arlington Trolley), the City of Alexandria (DASH), the City of Fairfax (CUE) and Fairfax County (Fairfax Connector, RIBS, and Tyson Shuttle). In addition, Loudoun County has recently started providing local funding in order to maintain commuter bus service.

This study was initiated to determine how services of these operations could be better coordinated and integrated, especially those which serve interjurisdictional travel. Besides bus route service issues, a number of other factors were to be addressed, including adequacy of garage facilities, characteristics of the bus fleets, potential use of private operators, suitability of public information and potential improvements to the fare structure. An additional study element was to investigate opportunities for new bus services in Loudoun County.

All of these purposes were fulfilled within this study. A detailed description of the data collection, analysis, findings and recommendations is contained in the body of the Final Report.

The purpose of this Executive Summary is to summarize the study process and to highlight study results and recommendations.

Study Process

The study process involved a comprehensive review of mass transit services in Northern Virginia. Initially, certain staff and elected officials within each jurisdiction were interviewed to determine their local concerns and where they stood on a number of issues related to Metrobus services. WMATA staff and a few active citizens were also interviewed during this process. This interview task provided insights as to what issues where important to each

local jurisdiction and established a framework to guide future study steps.

The study proceeded to more technical elements. The first involved collection and presentation of relevant socioeconomic and demographic information for Northern Virginia including 1990 population characteristics by Census tract, journey to work data, a land use profile describing major activity centers and a profile of housing units. These data describe the setting in which transit services must operate. The next area involved developing a detailed description of the eight distinct entities that comprise the Northern Virginia bus transportation "system". Service levels, fare structure, operating statistics and financial performance were presented. This information provided a description of the existing supply of bus services within Northern Virginia.

Two separate categories of analyses were conducted of bus services operated in Northern Virginia. One category addressed the non-service aspects of the Northern Virginia bus "system" and included several different components. The first of these analyses addressed the bus garage facilities and fleet utilized in providing transit services. Characteristics of the garage facilities included size, location and condition, which was determined through field inspections. Review of the bus fleet focused on age and size in terms of passenger seats. Next, an analysis was performed of the methods utilized in allocating Metrobus direct operating costs, overhead (fixed) costs and operating revenues to each Northern Virginia jurisdiction. The six year trends (FY 1988 to FY 1994) in several areas of financial performance were also reviewed. Finally, the ability and willingness of private sector companies to participate with public agencies in contractual arrangements for providing transit services was reviewed. As part of this section, the effects of federal labor protection regulations (i.e., Section 13(c)) were presented.

The second category of analyses addressed the service aspects of the Northern Virginia bus "system". A diagnostic analysis was prepared where the financial performance (deficit and farebox recovery) and productivity performance (passengers per vehicle hour, vehicle mile and peak vehicle) of each route was determined. Residential areas and sizes of major activities centers requiring transit services were identified. Passenger complaints and public information materials were reviewed. Finally, corridors were identified that had travel demand of sufficient magnitude to warrant bus service and were provide with either limited or no transit services.

Based on the above analyses, work proceeded with the final phase of the study. The fare structure of Metrobus and other Northern Virginia operators was reviewed and a number of changes were recommended. A bus service improvement plan was developed for Northern Virginia involving interjurisdictional and other routes operated by Metrobus, routes operated by local jurisdictions and new routes. A bus service plan was also developed for Loudoun County.

Results and Recommendations

In keeping with the method established in the study process, the results and recommendations are divided into non-service and service categories. The non-service category includes four areas where major findings and recommendations were developed:

Garage Facilities - The location of bus storage and maintenance facilities impacts the operating cost of bus services. One way to reduce Metrobus operating costs is to locate garage facilities closer to the service areas that the buses from the garage serve. If Metrobus service is to become cost competitive, the facility location problem must be addressed.

WMATA should locate and build a separate facility in the western section of Fairfax County.

If the WMATA facility expansion project in western Fairfax County were accomplished, the garage facility situation would change. WMATA would have sufficient capacity at its Four Mile Run and Arlington Annex garage facilities, along with the new western facility, to handle its service needs. The need for the Royal Street facility would be reduced.

WMATA should reduce Royal Street garage to an annex operation and eventually close it.

Another facility problem is that the DASH facility is at capacity. Any type of future expansion could not be readily accommodated in their present facility.

DASH should either find another site for its garage or expand into the vacant land adjacent to its current site.

Fleet Replacement - WMATA must undergo an extensive program to replace the bus fleet that serves Northern Virginia with a modern and well equipped fleet. The current bus fleet averages 14.5 years.

WMATA should provide a bus fleet in Northern Virginia that has an overall average age of six years with no bus exceeding the 12 year age replacement guideline suggested by the FTA.

WMATA should embark on an aggressive fleet replacement program that achieves this goal in five years.

In replacing the fleet, WMATA should consider the size of the bus that is appropriate for the service being provided. The nature of current WMATA bus services has changed to a feeder network with more local services within the community.

The bus fleet type purchased by WMATA should change to be consistent with the new service pattern and include more smaller buses in the 30 foot (seats for 28 to 33 passengers) range.

Public Information - The complicated public timetables for the Metrobus routes are one problem found in the area of public information. Part of the problem is that the routes themselves are complicated and have many variations which must be reflected in the public timetables. This problem can not be overcome unless the routes are simplified. In addition, several panels on public timetables for most routes are devoted to general fare structure information about the entire Metrobus system. From this information, it is not readily apparent what the rider must pay for a particular trip on the route described within the timetable.

The WMATA public timetables should be simplified. Fare structure information applicable only to bus services in Northern Virginia should be included,

along with a general description of overall Metrobus fare information.

Metrobus has just published a system map containing transit route and service information for Northern Virginia. The map is an excellent public information component.

It is recommended that the Northern Virginia system map be kept as current as possible. Updates to the map should occur when major changes are implemented or at least once every two years to keep it current and reflect minor changes.

Considering the extensive amount of services and the number of different operators in Northern Virginia, the quality and the timeliness of the telephone information given was found to be quite good.

WMATA should maintain the quality and responsive of the telephone information system.

Currently, bus stop locations served by different operators include the sign of each operator.

Instead of having a sign for each operator, it is recommended that one sign to indicate that the stop is a joint stop is more appropriate.

Information is not available to the public on the actual times the Metrorail trains serve the various stations in Northern Virginia. It has been stated by WMATA personnel that a reason for this lack of information is that trains run frequently enough that a public timetable is unnecessary. This might be true for an individual whose mode of transportation to and from the station is the automobile. However, if the mode of access is a bus (over 10 percent of bus riders transfer from Metrorail) and the bus runs infrequently, the knowledge of rail schedule information is important.

WMATA should provide public information on all Metrorail schedules at all Northern Virginia stations.

Fare Structure - It is apparent that fare policy is an important issue that should be addressed by the NVTC, WMATA and jurisdictions that fund bus service in Northern Virginia. It is recommended that fare structure improvements should be accomplished in three stages and over three horizon periods.

Stage One - Each system should simplify and consistently apply the fare structure to its own routes and services. This recommendation is for immediate action and primarily applies to the Metrobus operation.

Stage Two - There should be a regionally acceptable fare structure and transfer coordination policy. This should be accomplished in an intermediate range (three to five years) period.

Stage Three - There should be a longer range effort (five to ten years) involving implementation of a truly "seamless" fare structure that utilizes the latest available technology to collect fares.

Based on the analysis performed in this study, the following fare structure changes are recommended for Stage One improvements:

Consider one of two changes to the basic fare structure to eliminate the peak/off-peak differential. One would be a mere definition change where if a rider traveled during the peak periods and crossed zonal boundaries, a peak period zone charge would apply. The second option would be to apply a zonal charge to all riders independent of the time of the trip (peak or off-peak).

Route 5S should be treated like other Metrobus non-$0.50 routes, with a $1.00 base fare and appropriate zone charges.

The bus and Metrorail round trip transfer fee similar to that offered in Arlington County should be applied to all routes in Northern Virginia that serve Metrorail stations.

All fare script material should contain the systems and the types of trips on which the script is acceptable. If the script does not denote the system and type trip, it would be refused by the driver. This feature may reduce the complications arising from the large number of script programs available to riders in the Northern Virginia area.

The Metrobus public timetables should be revised to eliminate the extensive amount of unnecessary information regarding fares such as DC to VA fares, DC fares and Maryland fares. At the same time, information should be added to define pass programs that are available as well as fare structure information for interfaces with other Northern Virginia bus operators, (e.g., DASH accepts Metrobus transfers for the base fare).

Fairfax Connector Route 401 should be divided into two fare zones with the zone boundary at Little River Turnpike and Hummer Road. A zone charge of $0.25 could be assessed for a trip crossing the boundary.

* * * * * * * * * * * * * * * * *

The service category includes three areas where recommendations were developed and are highlighted below:

Service Plan Northern Virginia - Certain major findings resulted from the current analyses of Northern Virginia bus services. First, there are no major areas where services should exist and are not provided. Second, the Northern Virginia bus "system" is operated almost entirely within Northern Virginia. Third, it is unusual to find five different operators within one regional area. Finally, many of the Metrobus routes have been restructured to reflect the existence of the Metrorail system.

The recommended service plan developed for Northern Virginia (which includes Alexandria, Arlington County, the City of Fairfax, Falls Church and Fairfax County), consists of five elements -- interjurisdictional routes, new crosstown routes, local Metrobus routes, routes of Dash and Fairfax Connector and Metrobus replacement candidates.

The proposed service modifications for the interjurisdictional bus routes vary in magnitude, as seen in Table 1. Overall, some type of service change is recommended for 14 of the 27 interjurisdictional bus routes. Only minor changes in service levels are suggested on five of these routes. The net effect of these changes is minimal.

Three new crosstown routes were identified as potential new services; these are located entirely in Fairfax County. These routes connect the outlying areas of Fairfax County with either the Vienna Metrorail Station or the Fair Oaks Mall. Overall these changes would require five additional peak buses, nearly 100,000 more vehicle miles and 11,250 vehicle hours. If operated by the Fairfax Connector, the service would cost about $500,000 per year and produce $135,000 in passenger revenue. About 225,000 passenger trips would be made on the new services.

A number of changes were also proposed for the remaining bus routes operated by WMATA as well as the DASH and Fairfax Connector bus routes. The development of proposals for these routes was not part of the scope of the study. However, since information was being obtained for the WMATA routes operated wholly within one jurisdiction and for the non-WMATA operations, the opportunity existed to identify service change proposals.

Besides service changes, two routes were identified as having potential for Metrobus replacement and joint agency coordination/operation. The Metrobus Route 9A-E is an interjurisdictional bus route that serves Arlington County, the City of Alexandria and Fairfax County. Metrobus 10A,E serves Arlington County and the City of Alexandria. Up to now, most of the replacements of Metrobus services have been routes operating almost entirely within one jurisdiction. These routes could serve as test cases to determine if arrangements can be made among jurisdictions to either jointly operate service or have one jurisdiction operate the service for the others.

Based upon the evaluation of the above two Metrobus replacement candidates and utilizing the current method to allocate fixed costs among Northern Virginia jurisdictions, it is concluded that Metrobus is the best agency to be responsible for interjurisdictional bus services in Northern Virginia. Any other method results in unfavorable and unnecessary cost impacts to some Virginia jurisdictions. For example, in the above two cases, there were no service changes in Falls Church. Yet, Falls Church would be assessed over $10,000 more in each case due to the redistribution of the Metrobus fixed cost. If the way fixed costs are

TABLE 1
RECOMMENDED SERVICE PLAN SUMMARY - METROBUS ROUTES

ROUTES	NO CHANGE	SERVICE COORDINATION	ROUTING ADJUSTMENT	HEADWAY ADJUSTMENT
Alexandria-Arlington-Fairfax County				
7A,C,E,FHPWX		X		X
9A-E		X		
16A-G,J	X			
23A-C,T			X	
25A,F,G,J,P,R	X			
25B	X			
Alexandria-Arlington				
10A,E	X			
11P			X	
13A-G	X			
Alexandria-Fairfax County				
16L	X			
18A,B,X-F				X
18G,H,J,K				
18L,P,R				
28F,G		X		
29C,E,G,J,P,R				
Alexandria-Fairfax County-Falls Church				
28A,B				
Alexandria-Fairfax City-Fairfax County				
29K-N	X			
Arlington-Fairfax City-Fairfax County-Falls Church				
1B-F,Z		X	X	X
2A-C,G		X		

TABLE 1 (CONTINUED)
RECOMMENDED SERVICE PLAN SUMMARY - METROBUS ROUTES

ROUTES	NO CHANGE	SERVICE COORDINATION	ROUTING ADJUSTMENT	HEADWAY ADJUSTMENT
Arlington-Fairfax County-Falls Church				
3A-C,E,F		X		
10B-D	X			
Arlington-Fairfax County				
4A,B,E,H,S			X	
22A,B,F	X			
Arlington-DC				
38B			X	
Arlington-Fairfax City-Fairfax County				
15K,L		X		
17A,B,F,M			X	
17G,H,K,L	X			

allocated to Northern Virginia jurisdictions were changed to not be affected by a service level change, than the replacement services would be more attractive.

Another joint agency coordination/operation route is the Route 5 which operates in the Reston/Herndon area of Fairfax County. This route has been taken over from Metrobus by Fairfax County as of September 1, 1994. A portion of the route would be a candidate for extension into Loudoun County to serve the residents located in the Eastern sections of the County. Loudoun County would enter into an agreement with Fairfax County for having the route extended.

Service Plan Loudoun County - The recommended service plan for Loudoun County consists of a three stage program. Each stage adds more service to the area as the growth and need for transit services develops. This phased program of implementing new service is consistent with the characteristics of the County which are now reaching development levels and densities which can support transit service. The three phases of the plan include:

Stage 1 - This stage involves two new commuter routes modeled after the PRTC service. One route would serve the Leesburg area and proceed along Route 7, Route 28, Dulles Access Road and Interstate 66 to the Pentagon, Crystal City and Washington, DC. The other route would begin service in the Sterling/Sterling Park area and also proceed to Washington, DC.

Stage 2 - This stage is more ambitious and adds a local route serving the Countryside and Sterling areas. Another express route is also suggested to connect the Sterling/Sterling Park area with employment locations in Reston, Herndon and Tysons Corner. This route could be extended to the West Falls Church Metrorail Station. The route could connect with the Route 5S in Herndon

Stage 3 - This stage is very ambitious and adds both commuter and local services.

It is further understood that the County is contracting for specified service levels with a private operator, thereby embarking on this course of action with current commuter services. Thus, the County would assume

financial responsibility for the operating loss for the service to the extent that revenue from passengers fares falls short of the cost to provide the service. This represents a willingness of the County to assume the risk to maintain a level of reliable transit service for its residents.

The County should implement the Stage 1 proposals. It is estimated that the overall cost for the Stage 1 plan would be about $260,000 per year. About 40,000 trips would be made using the proposed two new routes. Revenue from the service would amount to about $160,000. Therefore, the annual local financial burden would be about $100,000.

The implementation of Stage 2 and 3 would be more costly and should be implemented only after the appropriate funding is obtained. The County could select recommended services from any of the stages and implement them depending on the availability of financial resources.

The recent action by Fairfax County to have an outside private contractor provide the transit service in the Reston/Herndon area instead of Metrobus may be an opportunity for Loudoun County. In this case, there will be another private operator nearby that would be a prime candidate to bid on the Loudoun County service.

There is another opportunity for Loudoun County as a result of Fairfax County having direct control of the Reston/Herndon service. Fairfax County could be contracted with to extend its 5S service into Loudoun County to provide the Stage 2 proposals for Route 3 and 4 local and commuter services. Under this arrangement, it is anticipated that Loudoun County would have to provide financial support to Fairfax County for the extended service. In fact, there may be opportunities for extending several other Fairfax County routes (e.g., 5W and 5Z) into Loudoun County.

Service Coordination - Clearly, the existence of multiple providers could threaten interjurisdictional services if decisions were made by one operator or one jurisdiction without the consideration of the total market and related operations. To date, there is little, if any, evidence that this has occurred. Informal staff contacts and formal NVTC procedures have provided a mechanism for service coordination. These procedures should be continued and enhanced where possible.

Decisions by individual jurisdictions related to services to be operated and the entity to operate services

(i.e. WMATA vs. local agency or private contractor) do affect the costs incurred by other jurisdictions and could affect services provided. The City of Fairfax's decision not to participate in Metrobus funding has a small effect on the costs to other jurisdictions. However, since Metrobus routes operating through the City of Fairfax continue to serve passengers, interjurisdictional service is maintained. Any jurisdiction's decision to replace Metrobus with other carriers on selected routes does lead to increased costs for other jurisdictions and could, ultimately, affect the quantity of service provided in those jurisdictions.

The impact of Metrobus service decisions by one jurisdiction on the cost to other jurisdictions of Metrobus operations is a result of the overhead structure of WMATA and the formulas used to allocate overhead costs among participating jurisdictions in Virginia. The overhead allocation also affects the decisions of each jurisdiction since the cost of each mile of Metrobus service is priced on a fully-allocated basis while costs of services by local operators may be considered on a marginal cost basis.

Alternative procedures for allocating Metrobus operating costs that would minimize the effect of any one jurisdiction's decision on other jurisdictions have been suggested. Since any change will affect the costs borne by all jurisdictions, resolution of this issue will require consultation and negotiation at the highest levels of local government.

With minor exceptions, all services operated by individual jurisdictions are contained within those jurisdictions. (Fairfax Connector Route 110 service to Old Town Alexandria, Connector 300 series routes to the Pentagon, CUE service to Vienna Metrorail station and DASH services to the Pentagon are the exceptions.) No institutional barriers to providing interjurisdictional services, where warranted, have yet arisen.

Several possibilities for interjurisdictional cooperation in the provision of service with the goal of increasing overall efficiency have been suggested. These include use of Fairfax County's Reston/Herndon routes to serve parts of eastern Loudoun County and replacement of Routes 9A-E and 10A,E services on a joint basis by Fairfax County, Arlington County and the City of Alexandria to demonstrate the feasibility of interjurisdictional cooperation. While there are no insurmountable issues associated with such operations, there are real issues of cost allocation no less complex than the question of allocation of Metrobus costs. The incentive of achieving

overall cost reductions would aid in reaching agreement on appropriate allocation mechanisms, but each party would be expected to strive for agreements that would be equitable in terms of costs incurred relative to services received. This leads to the need to find a better method of allocating Metrobus fixed cost among Northern Virginia jurisdictions.

Public transportation in Northern Virginia must be coordinated regionally if regional services are to be provided. The service plan identified a number of ways this service could be coordinated through specific recommendations. To further enhance coordination, it is recommended that a Service Planning Committee be established. The committee should include representatives from each of the transit service providers operating in Northern Virginia. We suggest that the Virginia Railway Express, the Commuteride and, perhaps, the Ridefinders Network be included. The purpose of this committee would be to coordinate service and service changes and to identify means of improving services in Northern Virginia. The committee should be at the staff level and could propose policy and service improvements through the NVTC as well as through each service provider.

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CHAPTER 1

INTRODUCTION

Since 1972, public transit services in Northern Virginia have been provided by the Washington Metropolitan Area Transit Authority (WMATA). The rising costs of Metrobus subsidies prompted some of the Northern Virginia jurisdictions to initiate bus services as substitute or complements to the WMATA Metrobus long standing services. In additional to Metrobus, public transit bus service in Northern Virginia is currently provided by Arlington County (Arlington Trolley), the City of Alexandria (DASH), the City of Fairfax (CUE), Fairfax County (Fairfax Connector, RIBS, and Tysons Shuttle) and Loudoun County (contract commuter services).

This study was initiated to determine how the services of these operations could be better coordinated and integrated, especially the bus services which provide interjurisdictional travel. An additional purpose was to investigate opportunities for new bus services in Loudoun County.

During the course of the study, interim reports or working papers were prepared to document study analyses, findings and recommendations. This final report is a compilation of the working papers. It provides a single document that presents data collection results, analyses that were conducted as well as study findings and recommendations. The report consists of 13 chapters in addition to this Chapter which are arranged as follows:

- Chapter 2 - Community Leader and Transportation Staff Interviews - This initial chapter presents results from interviews held with a number of community leaders as well as transportation staff and concerned citizens. The interviews focused on the current and future role of WMATA Metrobus service, subsidy arrangements, local takeovers and service improvements. Insights gained from these interviews provide input for consideration in developing improvement proposals.

- Chapter 3 - Current Transportation Setting - This chapter provides a detailed description the socioeconomic and demographic characteristics of

Northern Virginia. Included are 1990 population characteristics by Census tract, journey to work data, land use profile describing major activity centers and a profile of housing units. From this information, a number of conclusions are reached regarding current and potential markets for public transit services.

- Chapter 4 - Existing Transit Services - This chapter provides an inventory of the current bus services operated in Northern Virginia. Service levels and the various carrier fleets are described. Also presented are various operating statistics as well as financial and productivity results for Fiscal Year 1993. This information provides background relative to the present supply of bus service in the region and the overall dimensions of the combined system.

- Chapter 5 - Transit Facility Review And Fleet Composition - This chapter provides an assessment of the current bus garages located in Northern Virginia. Capacity, condition, location and operating characteristics of each facility are described. Also presented are any planned future changes to each garage as well as provisions to accommodate growth. This information provides background relative to the present bus garage inventory in Northern Virginia. Also included is a description of the fleet utilized in bus service by the various operators in Northern Virginia.

- Chapter 6 - Allocation of Metrobus Financial Resources - This chapter provides a summary of the methods in which WMATA bus service costs and revenues are allocated to Northern Virginia jurisdictions. Further, a financial summary of the costs, revenues and operating assistance by Northern Virginia jurisdiction from fiscal year 1988 to fiscal year 1994 is presented.

- Chapter 7 - Public and Private Capacity - This chapter assesses the capacities of the public sector and the private sector to provide additional service in Northern Virginia. The issues covered include buses available for

expanded service, facility storage capacity and maintenance capabilities.

- Chapter 8 - Route Diagnostics - This chapter presents financial and productivity results for each bus route in the Northern Virginia "system". The financial results include farebox recovery ratios. The productivity results include passengers per vehicle hour, per vehicle mile and per peak vehicle. While the measures differ in terms of the performance indicators used, they have a common trait in that the analysis is applied at the route level.

- Chapter 9 - Review of Service Warrants - This chapter presents service warrants for transit service. Service warrants for both residential areas and major transit trip generators are discussed. These warrants are applied to the Northern Virginia study area to identify service "gaps" or deficiencies. It should be recognized that application of these warrants is only one component from which to gauge the adequacy of existing service. Other elements and their implications are addressed as part of subsequent study analyses.

- Chapter 10 - Travel Patterns - This chapter describes current travel patterns within Northern Virginia. General travel patterns are first examined utilizing the 1990 Census data. The Metropolitan Washington Council of Governments district level travel model is utilized to describe work and non-work travel. Finally, travel patterns are reviewed to determine whether travel demand is supported by current transit services. Travel patterns without transit service available are highlighted. Travel patterns where travel by transit is difficult are also noted.

- Chapter 11 - Fare Structure - This chapter describes the present fare structure of the Northern Virginia public transportation "system". Included are descriptions of the carriers' fares and transfer provisions where applicable. The discussion relates to the different transit

pricing and transfer schemes as well as the manner in which this information is presented to the riding public. The existing fare structure is assessed in terms of seven specific criteria that should be considered as part of a comprehensive coordinated fare structure. The concluding sections present the evaluation results and improvement opportunities that should be considered for implementation.

Chapter 12 - Northern Virginia Bus Service Plan - This chapter identifies a detailed service plan for the interjurisdictional bus routes operating in Northern Virginia. Included is a discussion of the inputs incorporated into the planning process and the precepts which guided the development of the service change suggestions. The next section presents a description of the service changes on a route-by-route basis for the interjurisdictional bus routes. Suggestions are also made, where warranted, to modify the non-interjurisdictional bus routes. Information for these suggested route modifications are less detailed. Finally, a summary is included of impacts in terms of key operating statistics as well as passengers and revenue.

Chapter 13 - Loudoun County Service Plan - This chapter identifies a detailed service plan for Loudoun County. A description is given of the previous services provided by two private companies and the current service provided by the County. Next, the warrants for service and travel patterns of the residents are developed. Finally, a service plan is presented which satisfies the warrants and travel patterns. Implementation issues such as who should operate the service and how should it be funded are addressed.

Chapter 14 - Recommended Plan - This final chapter summarizes the recommendations of the prior chapters. Areas addressed include bus garage facilities, fleet replacement, fare structure, public information, service changes and the service planning process. For the service change recommendations for both Northern

Virginia and Loudoun County, expected operating and financial impacts are identified.

This brief description of each section of the final report indicates the detailed scope of the study to Coordinate and Integrate Northern Virginia's Interjurisdictional Bus Routes. The recommendations provide a complete set of improvements that will benefit the users of the bus service by providing a more efficient system.

CHAPTER 2

COMMUNITY LEADER/TRANSPORTATION STAFF INTERVIEWS

This chapter presents results of a series of interviews in which community leaders, transportation staff and several interested citizens from throughout Northern Virginia were questioned regarding the current and future role of bus services. Included are views of those interviewed on a number of issues such as current performance of WMATA, cost of WMATA Metrobus services, formulas to allocate Metrobus costs to Northern Virginia jurisdictions, assumption of Metrobus services by certain jurisdictions, possible new service areas and types of service improvement opportunities.

Interview Approach

In order to prepare an Interjurisdictional Bus Study in Northern Virginia, it is important to be aware of and to address concerns of local leaders. As a first step, a list of individuals to be contacted was identified. This list was determined in conjunction with technical staff from each Northern Virginia jurisdiction. The individuals that were interviewed included elected officials and concerned citizens from each jurisdiction.

Interviews took place over a three month period during Fall, 1993. Initially, interviews were held with transportation technical staff from each jurisdiction. The interviews with the elected officials and citizen group representatives followed later. Interviews were typically held in the office of the individual being interviewed. In many cases, the interview was held with only one person. In others, especially with the staff, two or more individuals attended the meeting. Approximately one hour was devoted to each session. The discussion followed a loosely structured format (see Figure 1) reflecting the diverse backgrounds and priorities of interviewees. It should be noted that each interview began with a description of the current study. To encourage candid responses and an open dialogue, comments and statements are not attributed to specific individuals.

The key findings from the staff/citizen meetings are summarized first and reflect transportation priorities at the local level.

FIGURE 1
NVTC INTERVIEWS

DATE _____ NAME _____

POSITION _____ JURISDICTION _____

****

1. DESCRIBE STUDY AND PURPOSE FOR MEETING

2. WHAT DO YOU THINK OF THE CURRENT ARRANGEMENT FOR FUNDING METROBUS SERVICES IN NORTHERN VIRGINIA? _____

3. WHAT DO YOU THINK OF THE QUALITY AND QUANTITY OF SERVICES PROVIDED BY WMATA? _____

PROVIDED BY YOUR JURISDICTION? _____

4. WHAT DO YOU THINK OF THE EQUIPMENT AND FACILITIES UTILIZED FOR METROBUS AND YOUR LOCAL BUS SERVICES? _____

5. DO YOU FEEL THAT MORE OR LESS LOCAL SERVICE SHOULD BE PROVIDED AS SUBSTITUTE TO METROBUS SERVICE? _____

6. WHAT DO YOU FEEL ARE LOCAL CONCERNS REGARDING BUS SERVICES? _____

THANK YOU

Staff/Citizen Interview Findings

The interview findings are grouped by local jurisdiction. The staff and citizens interviewed are listed in Table 1.

Alexandria - Four separate meetings were held with various representatives from the City and Alexandria Transit Company (DASH). The primary transportation concerns of the City expressed at these meetings are summarized below:

- Potential for closing the Royal Street Metrobus Garage in light of the garage location and the City's plans to redevelop the public housing in Old Town.
- Impact of current and planned major development on transit services in the City.
- Impact of the opening of the Franconia-Springfield Metro Station.
- Increasing costs of Metrobus service, despite almost all of Northern Virginia jurisdictions' reducing the amount of Metrobus service operated in their localities over the past three years.
- Future expansion of DASH service in the City as well as possibly into Arlington County. (With Arlington County's concurrence).
- Limited capacity of the current DASH facility to accommodate future expansion.
- The capability to provide Alexandria's citizens with more efficient and affordable bus service with DASH as opposed to Metrobus.

From these meetings a better understanding was also obtained of the DASH system and its relationship with the City.

Arlington County - Two separate meetings were held with various representatives from County staff and from citizen representatives from the Transportation Commission. The primary transportation concerns of the County expressed at these meetings were regarding the WMATA Metrobus service

TABLE 1

NORTHERN VIRGINIA - STAFF/CITIZENS INTERVIEWED

Interviewee	Position	Representing
Mary Anderson	Deputy Director/Admin.	Alexandria
Ted Bishop	Transport. Coordinator	Arlington County
Emmett Crockett	Office of Planning	WMATA
Richard Fruehauf	Transit Director	City of Fairfax
Halsey Green	Assistant Director Financial Services	Falls Church
Chris Hamilton	Transportation Eng.	Arlington County
James Hamre	Transit Coordinator	Arlington County
Ken Hook	DPW Deputy Director	Arlington County
William Hurd	Chairman	Alexandria Transit
Chris Jenks	Transportation Office	Fairfax County
Gerry Martin	Finance Department	WMATA
Sandy Modell	General Manager	Alexandria Transit
Vola Lawson	City Manager	Alexandria
John Lohman	Transport. Commission	Arlington County
John O'Neill	Transport. Commission	Arlington County
Shiva Pant	Director, Office of Transportation	Fairfax County
Julie Pastor	Director Planning	Loudoun County
Robert Pickett	Office of Planning	WMATA

TABLE 1 (Continued)

NORTHERN VIRGINIA - STAFF/CITIZENS INTERVIEWED

Interviewee	Position	Representing
Lynne Roberts	Rideshare Coordinator	Loudoun County
Valerie Sikora	Transit Planning	Alexandria
Rick Stevens	Office of Planning	WMATA
Andy Szakos	Transportation Office	Fairfax County
Ed Tennyson	Citizen	Moving People in Northern Virginia

since Metrobus is the primary local bus operator. These concerns are summarized below:

- The assumption of Metrobus services by other jurisdictions with their own services results in Arlington County being allocated a greater portion of the Metrobus overhead even though the services in the County may remain the same. It should be noted that the allocation of Metrobus overhead to Northern Virginia is based on historical peak vehicle requirements and not on current peak vehicle needs. Therefore, no matter what happens to Metrobus services, the overhead allocation to Northern Virginia would be unaffected. The overhead is allocated by NVTC to Northern Virginia jurisdictions in proportion to the amount of service operated in that jurisdiction. Therefore, even though the Arlington County service would remain the same, the reduction of Metrobus service by another jurisdiction results in the County proportion of overhead being higher.

- Increasing costs of Metrobus services. In that regard, the County would like to know what makes up the Metrobus overhead. Further, could WMATA take any actions to reduce the overhead or even the direct costs through lower wages.

- The fact that another jurisdiction could eliminate a portion of a County route because the other jurisdiction felt that the benefits of the service are not worth the local payment. This conflict was between Arlington County and the District of Columbia on Route 38B, but may become a problem in the future among Northern Virginia jurisdictions.

- There were concerns expressed over a number of aspects of Metrobus service in Northern Virginia, including:

  - Lack of adequate public information,

  - Lack of a sufficient number of passenger waiting shelters, and

- Deficiencies with service in that it is not well focused especially in regards to major shopping centers.

City of Fairfax - The City operates its own local service -- City University Energysaver (C.U.E.). It has refused to contribute to the Metrobus program even though service operates within City of Fairfax and serves George Mason University. However, it does contribute to the Metrorail subsidy even though there is no Metrorail facility within the City. Most of the interview session was devoted to discussing the CUE operation.

Fairfax County - Three separate meetings were held with various representatives from County staff. The primary transit concerns of the County expressed at these meetings are summarized below:

- High cost of Metrobus service. This situation has resulted in the County assuming certain local Metrobus service. Further, service assumptions will continue as long as Metrobus costs remain higher than local operations.

- Lack of any motivation for efficiency in the current arrangement with Metrobus. There is no form of competition that would promote efficiency to occur.

- Need for a more equitable way in which Metrobus costs could be allocated to Northern Virginia jurisdictions. It was recognized that changing the formula of allocating Metrobus overhead to Northern Virginia is probably impossible. However, it was felt that a formula based on a garage cost center basis would be more equitable.

From these meetings a better understanding was also obtained of the current and planned services operated by Fairfax County.

Falls Church - The major concern of the City is the high cost of Metrobus services and the resulting local financial burden. They are currently satisfied with having

services operated by WMATA. All of the Metrobus routes that serve Falls Church are interjurisdictional and also serve both Arlington County and Fairfax County. Falls Church has a good relationship with these other jurisdictions regarding Metrobus services.

Loudoun County - The interviews with Loudoun County staff included Supervisor Grant and focused on discussing the land use, socioeconomic and future development characteristics of the County. Its transportation needs and the private services that are provided to satisfy the needs were also discussed. It was stated that it is unlikely that WMATA would be called on to provide future bus service in the County. It was also noted that the County has provided some financial support to transit services in the past. Such financial support would likely be available in the future.

Elected Officials Interview Findings

The elected officials interviewed, their positions and jurisdiction are listed in Table 2. The interview discussions focused on several topics including the interviewees' general view of the WMATA bus system, the way the Metrobus subsidy formula works, takeover of Metrobus services and transit improvement opportunities and future expectations. The findings that follow present both diversity and consensus of viewpoints. Comments of Supervisor Grant from Loudoun County were included in the prior section and are not reflected in this section.

View of Overall Metrobus System - Most of the interviewees mentioned that the cost of the Metrobus services are too high. Some comments were that the high wages and old bus fleet were contributors to the high cost. One interviewee suggested that WMATA would have to be transformed in order to combat these high costs. Another comment was that, "the high Metrobus cost is out of their control." Several suggested that Metrobus costs could be reduced if a suburban wage rate were established. It was stated by those who operate their own local service that the high cost of Metrobus service was the primary, if not the only reason, that local takeovers have occurred.

There were mixed views concerning interviewees' opinions on quality and quantity of Metrobus services. Several indicated that they felt it was sufficient. One interviewee stated that if more money were available, more service would be provided. Others indicated that the need

TABLE 2

NORTHERN VIRGINIA - ELECTED OFFICIALS INTERVIEWED

Interviewee	Position	Representing
Joseph Alexander	Board of Supervisors	Fairfax County
Ernest Berger	Board of Supervisors	Fairfax County
Sharon Bulova	Board of Supervisors	Fairfax County
Charles Grant	Board Of Supervisors	Loudoun County
Katherine Hanley	Board of Supervisors	Fairfax County
John Mason	Mayor	City of Fairfax
Elaine McConnell	Board of Supervisors	Fairfax County
Philip Thomas	Vice Mayor	Falls Church
Patricia Ticer	Mayor	Alexandria
Mary Margaret Wipple	Member County Board	Arlington County

was not being met by current Metrobus services. Several interviewees noted that the Metrobus system was not convenient and has been neglected. Many officials suggested service improvement opportunities which are listed later in this chapter.

Cost Allocation Formula - Several interviewees mentioned that the WMATA Metrobus cost allocation formula may not be equitable. However, it was unanimously noted that the cost allocation formula would not be changed. Some mentioned that this was substantiated several years ago during an extensive review of the cost formula. Several others noted that any change to the formula that may adversely affect one of the jurisdictions will not happen.

It was mentioned that there is a problem with the way Northern Virginia allocates the Metrobus overhead costs to its jurisdictions. The problem is that the reduction of Metrobus service by one jurisdiction results in a reallocation of the Metrobus overhead costs thereby increasing the costs borne by other jurisdictions. Several did state that the formula to allocate the Metrobus overhead costs among Northern Virginia jurisdictions may be possible, although difficult, to change.

Takeover of Metrobus Services - There were a variety of opinions given with regard to continuing takeover of Metrobus services by local jurisdictions. One view was that Metrobus takeovers are resulting in the dismantling of a regional bus system. It was also noted that the ultimate takeover would be the formation of a Northern Virginia transit authority. However, it was felt that such drastic action may not be any better since labor issues, such as 13(c) would exist.

Several indicated that Metrobus should continue to be the primary regional bus operator with more local services operated by local jurisdictions. A few others indicated that more takeovers should be pursued with the services provided by private operators.

Another interviewee stated that takeover is not the issue. Rather, the important issue is that the existing services should be structured to meet the travel needs of the public.

Improvements in Current Service - Most of those interviewed had additional comments related to suggestions

for improvements to transit services within their jurisdiction. These comments are not necessarily directed at Metrobus services. In fact, many were directed more at their own locally operated services. The suggestions for improvements are listed below in order of number of times mentioned.

- The most often mentioned (by four of those interviewed) area for improvement was more bus feeder or shuttle service to rail stations.

- Next (mentioned by three interviewees), was improve local bus services by adding more local routes or even crosstown routes.

- Two of those interviewed mentioned needed improvements to public information in Northern Virginia and were specifically addressed to Metrobus.

- Two mentioned that implementation of the Clean Air Act will result in needed transit service improvements.

- The following suggestions were mentioned once by various individuals during the interview session:

  - Provide more passenger waiting shelters;
  - Improve service dependability;
  - Simplify the fare structure;
  - Rationalize service by eliminating areas of service duplication and adding service to underserved areas;
  - Make bus service more socially acceptable;
  - Initiate commuter bus service from park-n-ride lots;
  - Improve service to and with the Tysons Corner area; and

- Improve service to the Northern Virginia Community College, Little River Turnpike campus.

These suggestions will be considered as input in developing service improvement proposals as part of subsequent study steps.

CHAPTER 3

CURRENT TRANSPORTATION SETTING

The study area is located in Northern Virginia across the Potomac River from Washington, D.C. It includes the following jurisdictions -- the counties of Arlington, Fairfax and Loudoun and the cities of Alexandria, Fairfax and Falls Church. The study area covers 966 square miles and has a 1990 population of 1,216,032, according to the U.S. Census. This chapter describes the socioeconomic, demographic and land use characteristics of the study area. Figure 2 presents the component jurisdictions of the study area.

Population Profile

Study area population varies significantly by jurisdiction as does gross population and housing densities. Provided below are 1990 population, population density and household density by jurisdiction according to the 1990 Census.

POPULATION STATISTICS

Jurisdiction	1990 Population	Elderly Population	Population Per Gross Acre	Households Per Gross Acre
Loudoun	86,129	4,943	0.26	0.09
Fairfax	818,584	50,796	3.23	1.16
Arlington	170,936	18,637	10.30	4.75
City of Fairfax	19,622	1,844	4.99	1.87
Falls Church	9,578	1,441	7.53	3.28
Alexandria	111,183	10,282	11.37	5.45
Study Area	1,216,032	87,943	1.97	0.76

The average persons per household statistic for the study area is 2.6. The range is from a low of 2.1 persons per household in Alexandria to a high of 2.8 persons per household in Loudoun and Fairfax Counties. The table below presents average persons per household by jurisdiction for the study area.

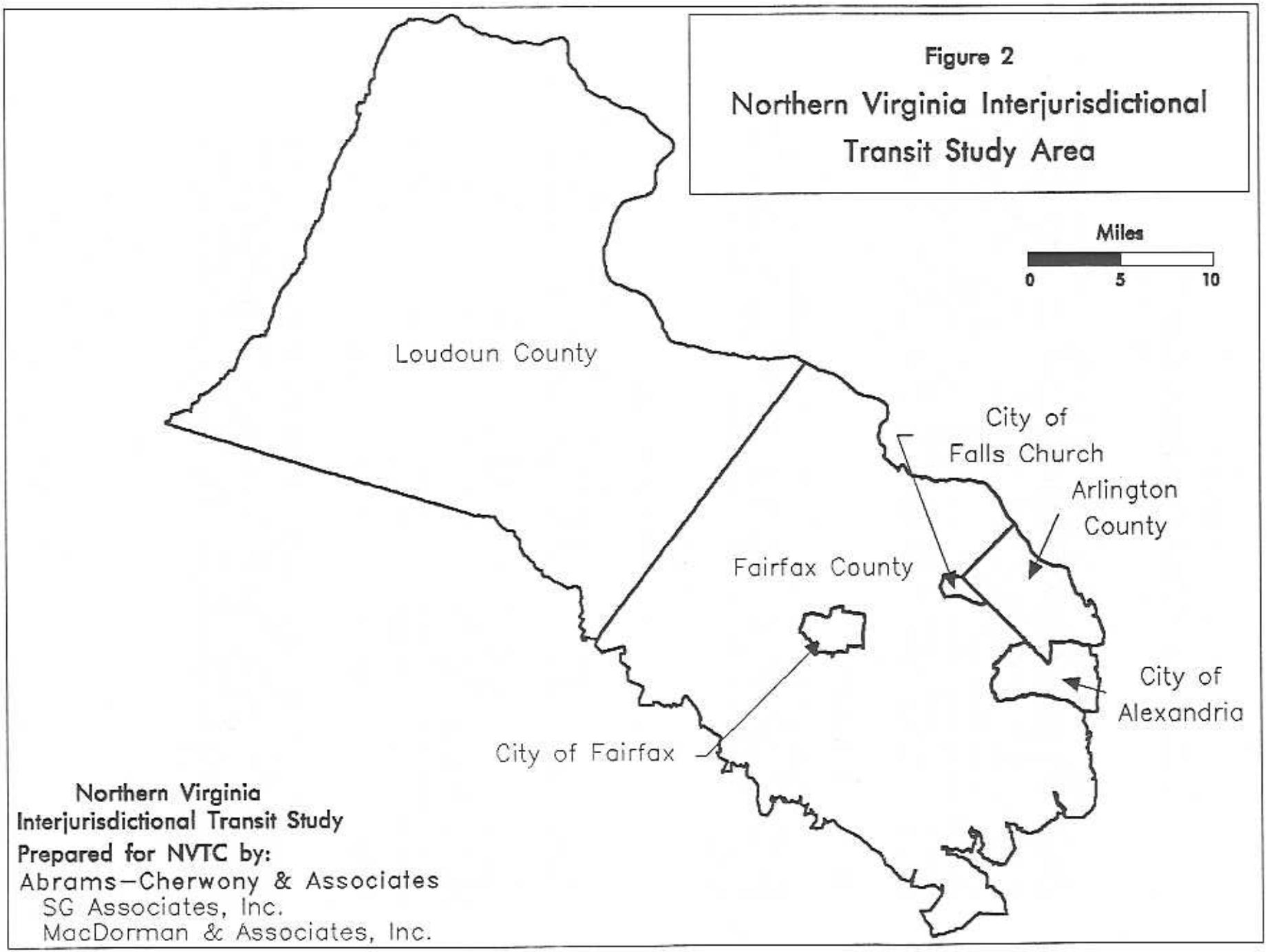
Figure 2
Northern Virginia Interjurisdictional Transit Study Area
Miles
0
5
10
Loudoun County
City of Falls Church
Arlington County
Fairfax County
City of Alexandria
City of Fairfax
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AVERAGE PERSONS PER HOUSEHOLD

Jurisdiction	Average Persons Per Household
Loudoun	2.8
Fairfax	2.8
Arlington	2.2
City of Fairfax	2.7
Falls Church	2.3
Alexandria	2.1
Study Area	2.6

The overall population densities in the study area vary widely. This is evident at the jurisdiction level and, even more so, at the census tract level. Figure 3 is a dot-density map of the population of the study area. Note that each dot represents 150 persons. The variation in population density is evident in the map of the entire study area. Note the darker census tracts inside the Beltway and in Arlington and Alexandria. Figures 4 and 5 illustrate population per gross acre and households per gross acre by census tract, respectively. These figures provide a picture of the range of densities and development patterns throughout the study area. Figure 5 illustrates the areas most conducive to productive transit service (those in dark shading). Note these areas tend to be inside the Beltway, in older areas, and along major corridors. By contrast, the densities in Loudoun County and south and western Fairfax County are lower and not as conducive to traditional fixed route local bus service.

The average median household income for the study area is $49,900. As is evident from the table below, median household incomes by jurisdiction range from a low of $41,472 in Alexandria to a high of $59,284 in Fairfax County. Also presented below are median family, per capita income and persons per household.

Figure 3

Study Area Population Dot-Density

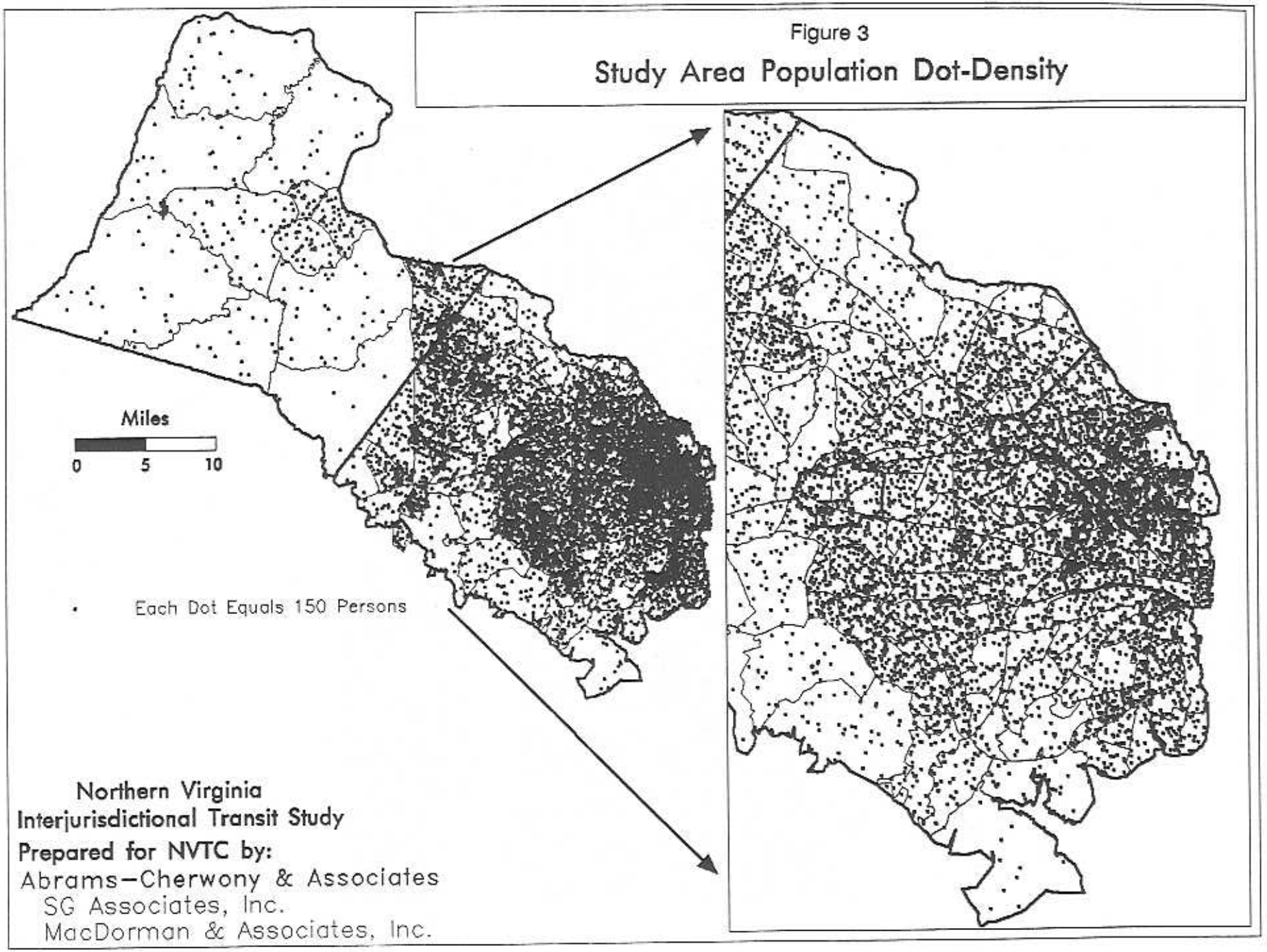

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Figure 4

Study Area Gross Population Density

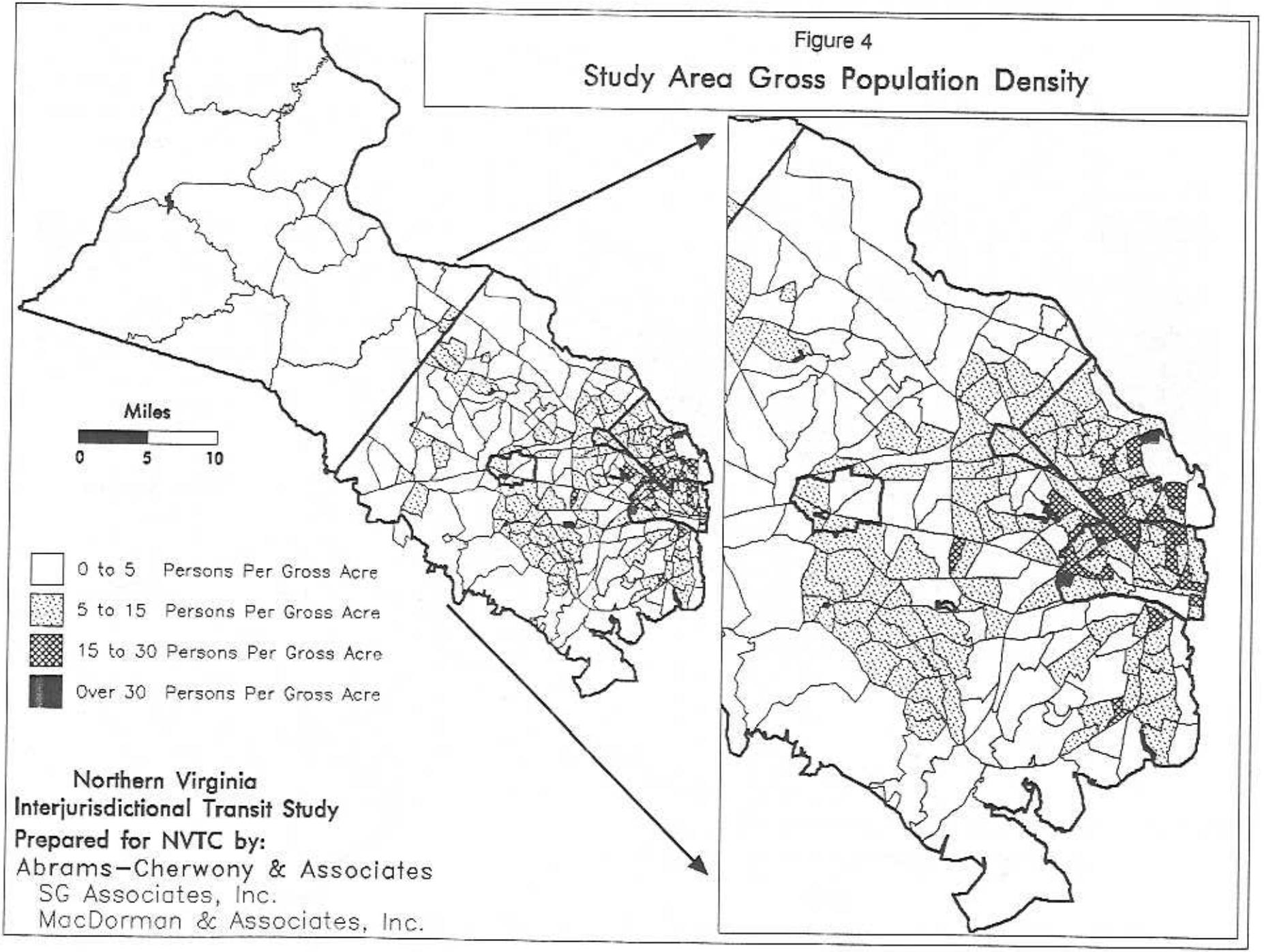

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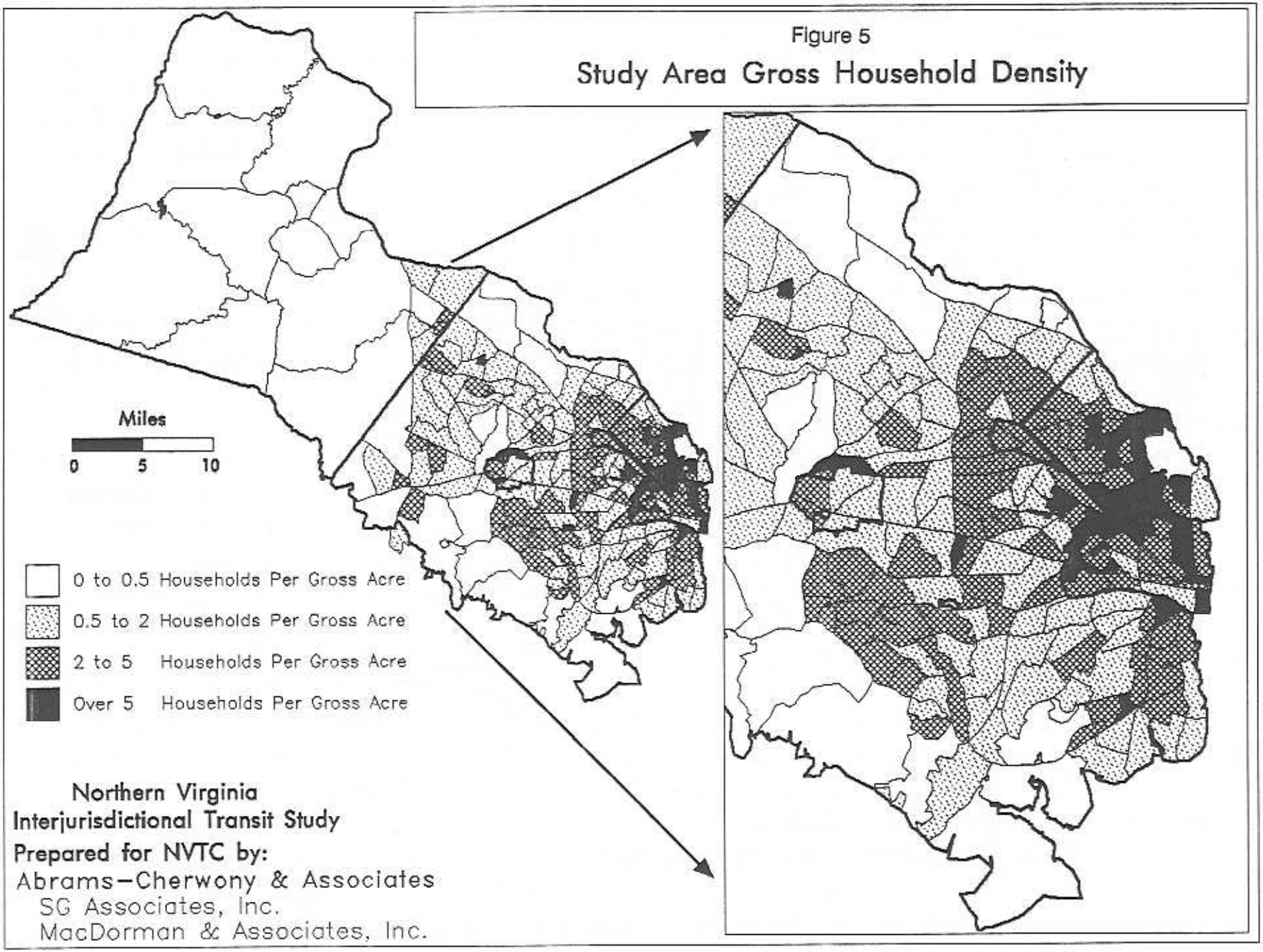
Figure 5

Study Area Gross Household Density



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INCOME LEVELS

Jurisdiction	Median Household Income	Median Family Income	Per Capita Income	Persons Per Household
Loudoun	$52,064	$56,006	$20,757	2.8
Fairfax	$59,284	$65,201	$24,833	2.8
Arlington	$44,600	$55,346	$25,633	2.2
City of Fairfax	$50,913	$56,419	$21,929	2.7
Falls Church City	$51,011	$62,187	$26,709	2.3
Alexandria	$41,472	$50,812	$25,509	2.1
Study Area	$49,891	$57,662	$24,228	2.6

The median income is defined as the midpoint in the array of incomes for a set. That is the point at which half the population makes less and half the population makes more. The variation in household and family income is due to the definition of household versus family. Household is defined by the U.S. Census Bureau as all persons who occupy a housing unit. Family is defined as a householder and one or more other persons living in the same household who are related to the householder by birth, marriage or adoption.

Per capita income is the total income for the area being examined (jurisdiction in this case) divided by its population. Note that while Fairfax County has the highest median household and median family incomes, it does not have the highest per capita income due to the higher average persons per household in Fairfax County relative to the other jurisdictions.

A review of these and other statistics is important in identifying the character of the populations of the jurisdictions. Areas with higher persons per household and lower per capita income tend to be comprised of families with children. Such areas are Fairfax County, Loudoun County and the City of Fairfax. Areas with high per capita incomes and lower persons per household tend to be comprised of one person households, childless couples, couples sharing quarters and small families.

This information is important as it is valuable in predicting traditional transit ridership. Typically, an inverse relationship is found between bus transit use and *income. The higher the income, the lower the probability of using bus service. This relationship may not be as* straightforward in Northern Virginia where Metrorail

ridership depends on higher income groups. Therefore, income information must be considered with other variables such as land use, density and auto ownership to form reasonable predictive statements of bus transit use.

Figure 6 illustrates median household income by census tract. Note that the dark areas are the lower income areas and are likely to be the traditional bus transit markets.

Auto ownership is a traditional indicator of transit use, especially for the transit dependent. However, in Northern Virginia, this view must be broadened to recognize that many riders of Metrorail are automobile owners who use transit for work trip and other purposes. Figures 7 and 8 illustrate zero vehicle households and one vehicle households by census tract, respectively. Note the concentration of one vehicle households in the more densely developed areas. In the Washington Metropolitan area, with high incomes as the norm, auto ownership tends to be fairly high. On average for the study area, auto ownership is 1.7 vehicles per household according to the U.S. Census. The table below presents these data by jurisdiction.

Note the relationship between household density and vehicles per household. The lower the density, the greater the number of vehicles per household.

AUTO OWNERSHIP

Jurisdiction	Average Vehicles Per Household	Household Density
Loudoun	2.0	0.25
Fairfax	1.9	1.16
Arlington	1.4	4.75
City of Fairfax	1.8	1.87
Falls Church	1.6	3.28
Alexandria	1.3	5.45
Study Area	1.7	0.76

Since, on average, there is an auto for every household in the study area, transit ridership by the transit dependent is less of a concern when considering new markets since these people are already transit clients. Choice riders, those who choose to ride transit rather than drive, are the growth market for transit in this area. A look at vehicles per household provides the indication that many of

Figure 6

Study Area Median Household Income

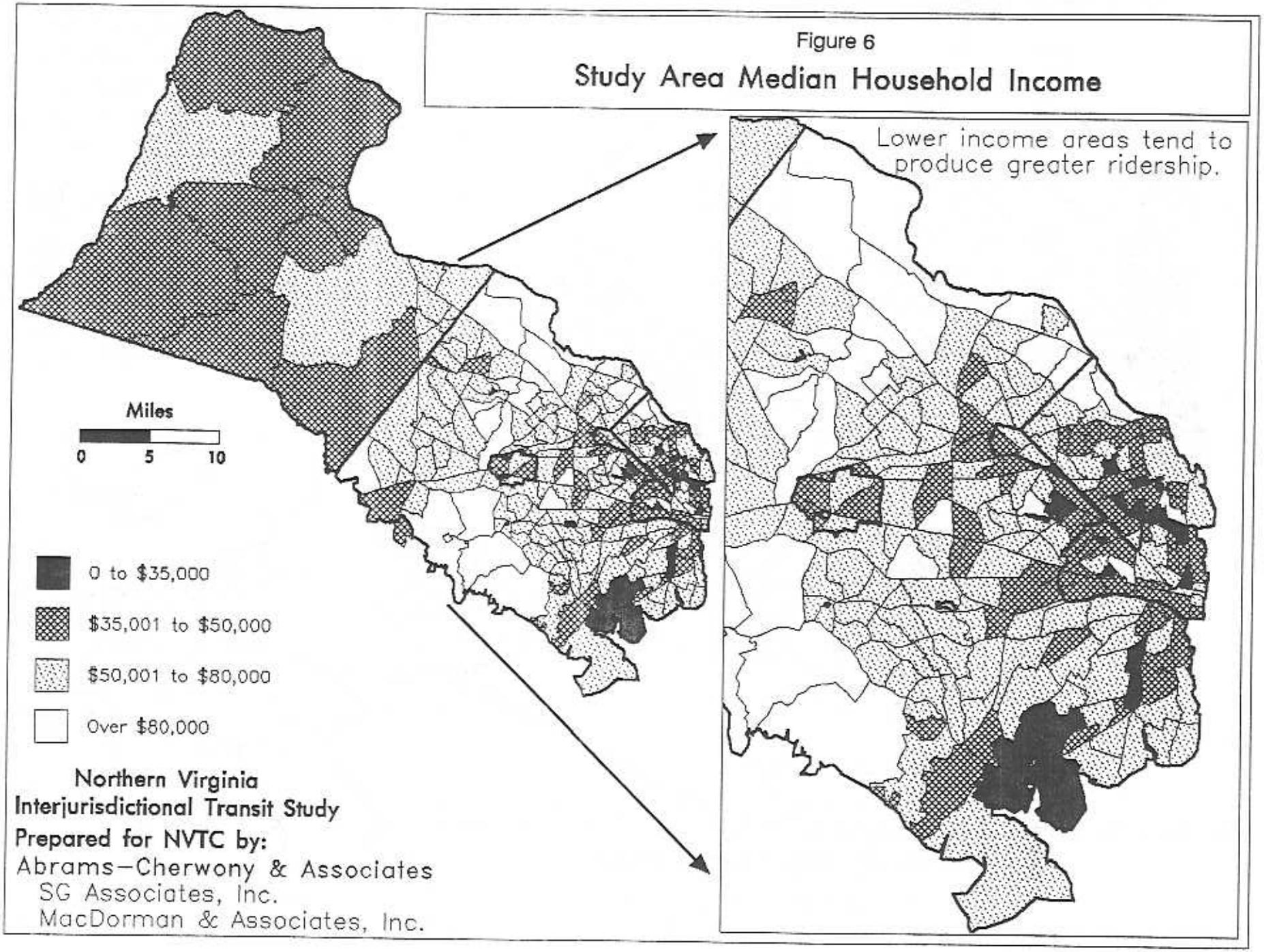

Figure 7

Percent Zero Vehicle Households

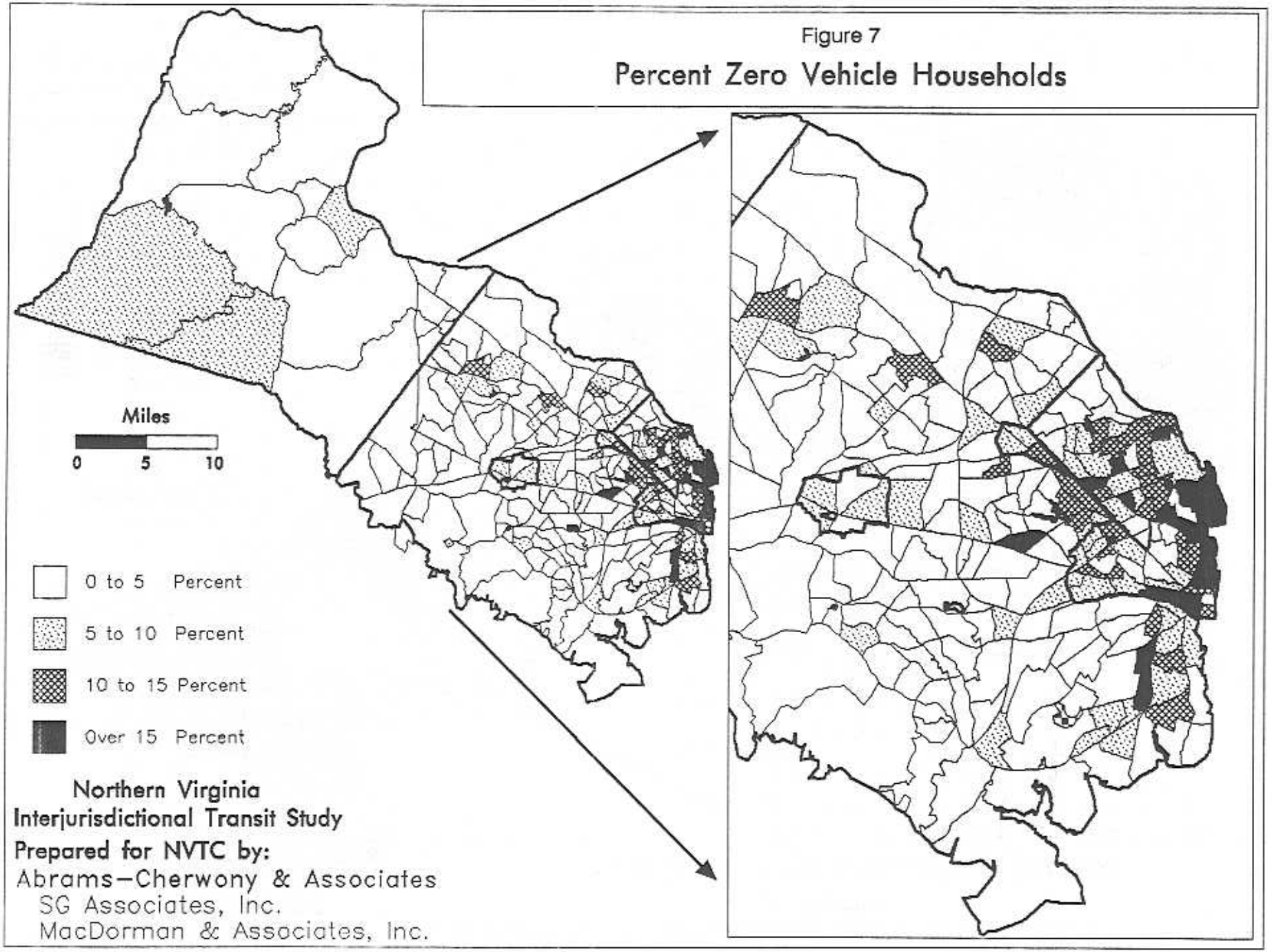

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Figure 8

Percent One Vehicle Households

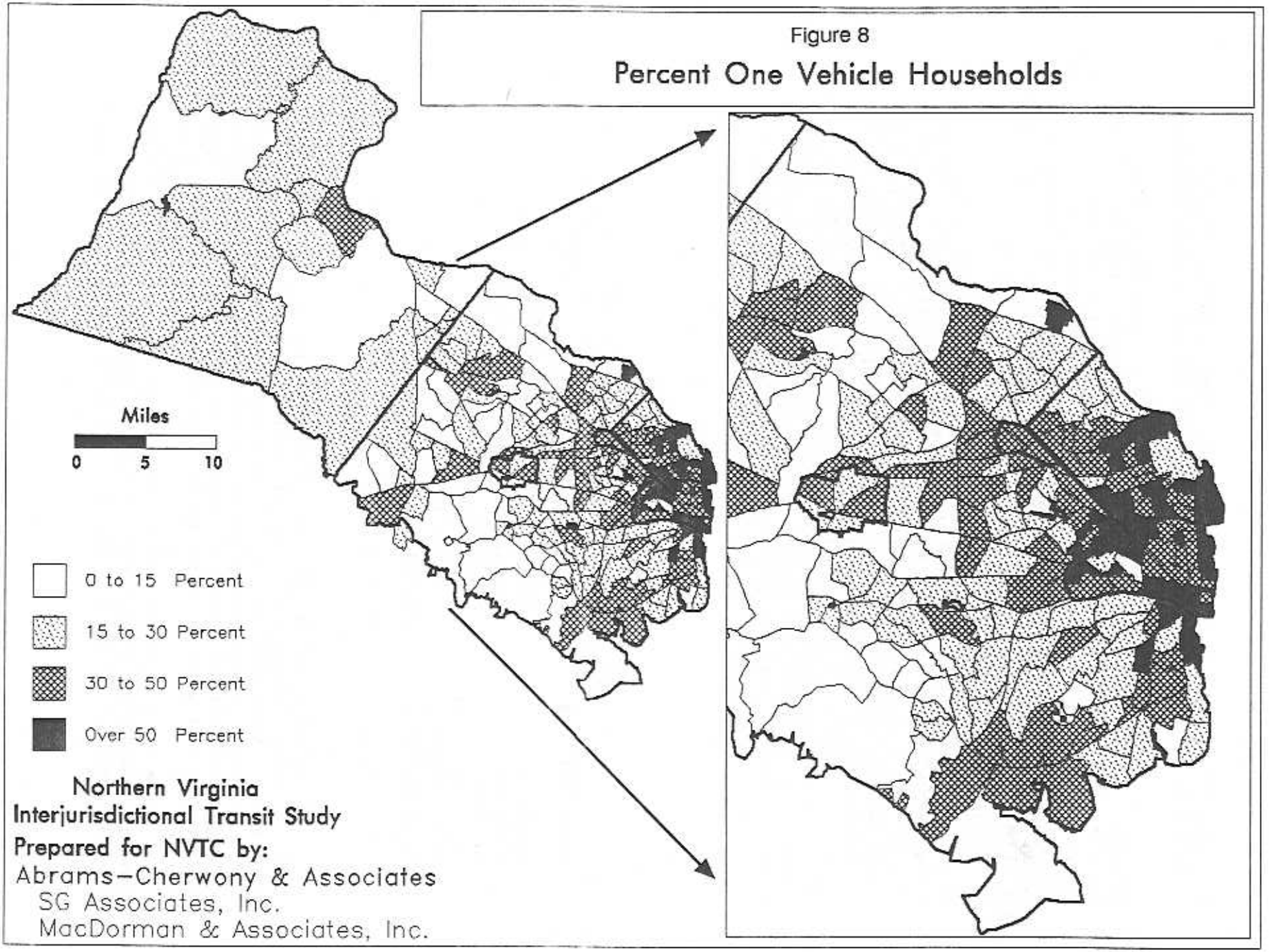

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Figure 10

Percent Work Outside Jurisdiction of Residence

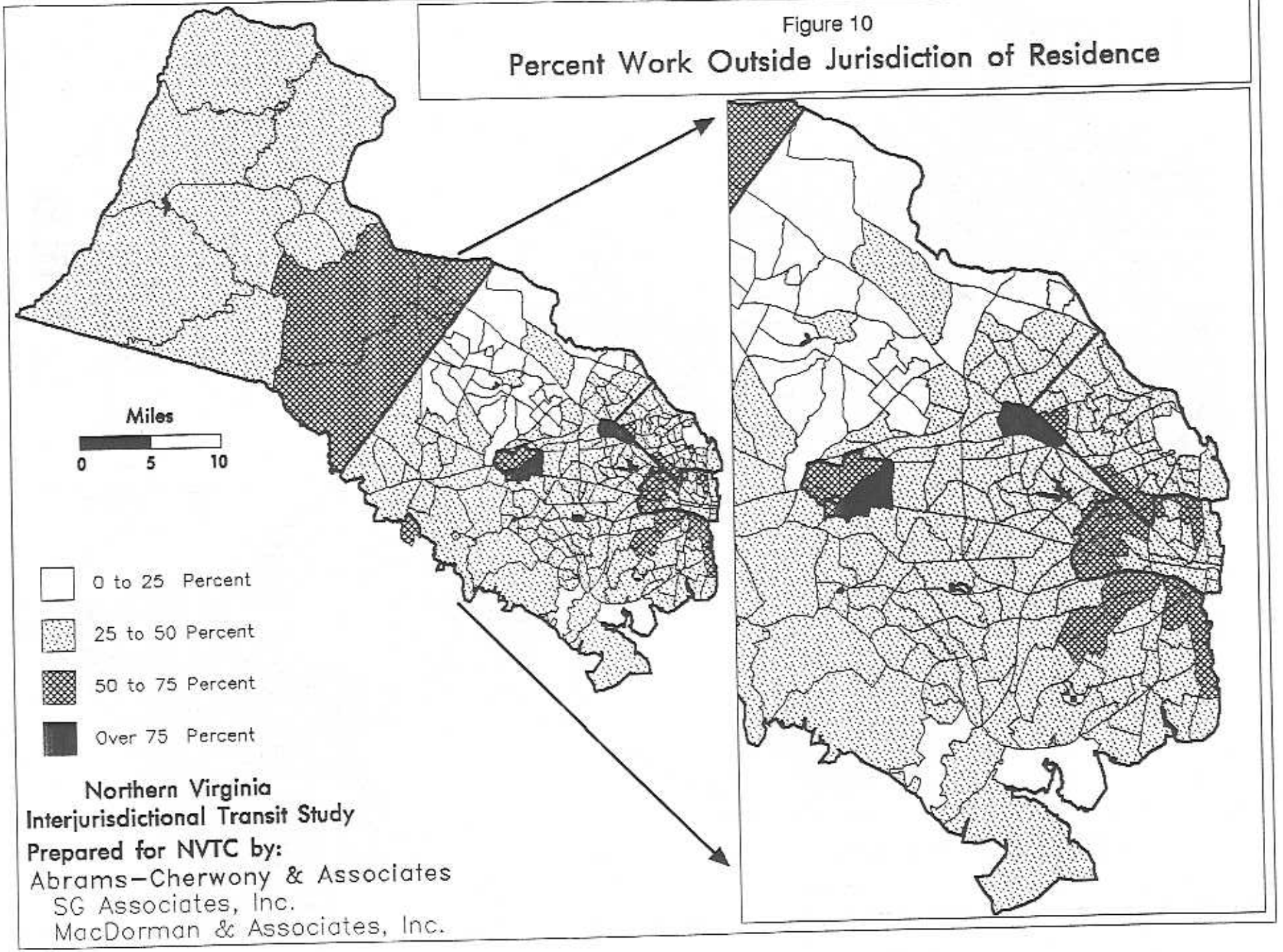

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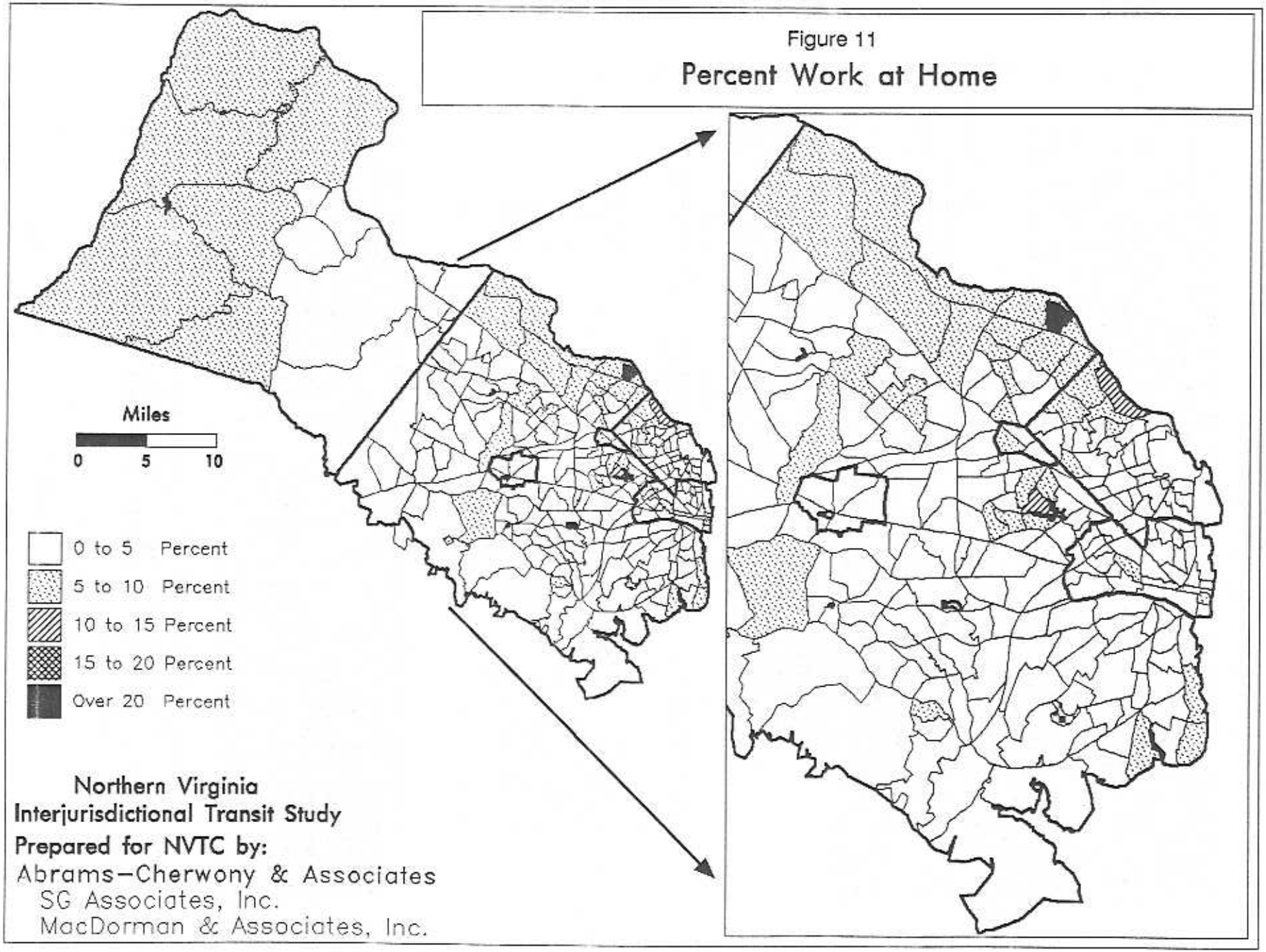
Figure 11

Percent Work at Home



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minutes in Arlington County to a high of 30.8 minutes in Loudoun County. Figure 12 shows the percent of persons by census tract whose travel time to work is 30 minutes or more. Note the clearly depicted stretch along the southern boundary of Fairfax County where over 60 percent of the population travel 30 minutes or more to work. Also evident is the Beltway as a boundary. Those inside the Beltway tend to fall in the 20 to 40 percent bracket for travel time 30 or more minutes while those outside the Beltway step up to the 40 to 60 percent bracket.

Mode of transport to work according to the 1990 Census by jurisdiction is provided below. Note that overall the percent driving alone is 65.6 percent while the percent using transit is 12.7. Not surprising from the preceding population, household and density characteristics, the areas with convenient transit service and higher population and household densities have the highest transit use.

MODE SPLIT AND DENSITY

Jurisdiction	Percent Drive Alone (PERCENT)	Percent Use Transit (PERCENT)	Households Per Gross Acre
Loudoun	78.0	1.4	0.09
Fairfax	71.2	7.6	1.16
Arlington	50.3	25.4	4.75
City of Fairfax	72.0	7.1	1.87
Falls Church	62.7	16.7	3.28
Alexandria	59.1	17.9	5.45
Study Area	65.6	12.7	0.76

Figure 13 shows the percent of workers by census tract who drive alone to work. Note that for the entire study area, except for much of Arlington, parts of Alexandria and a few other exceptions, over 60 percent of work trip travel is by drive-alone automobile. Figure 14 shows work travel by census tract by those in carpools. Note that the highest rates of carpooling tend to be from areas along I-95/395 and other areas with HOV facilities where use of the HOV lanes makes a difference in commute time.

Figures 15 through 20 illustrate work trip travel by mode as per the 1990 Census. Figure 15 presents the percent using a bus; again the highest use tends to be in the areas with higher densities.

Figure 12

Percent Traveling 30 or More Minutes to Work

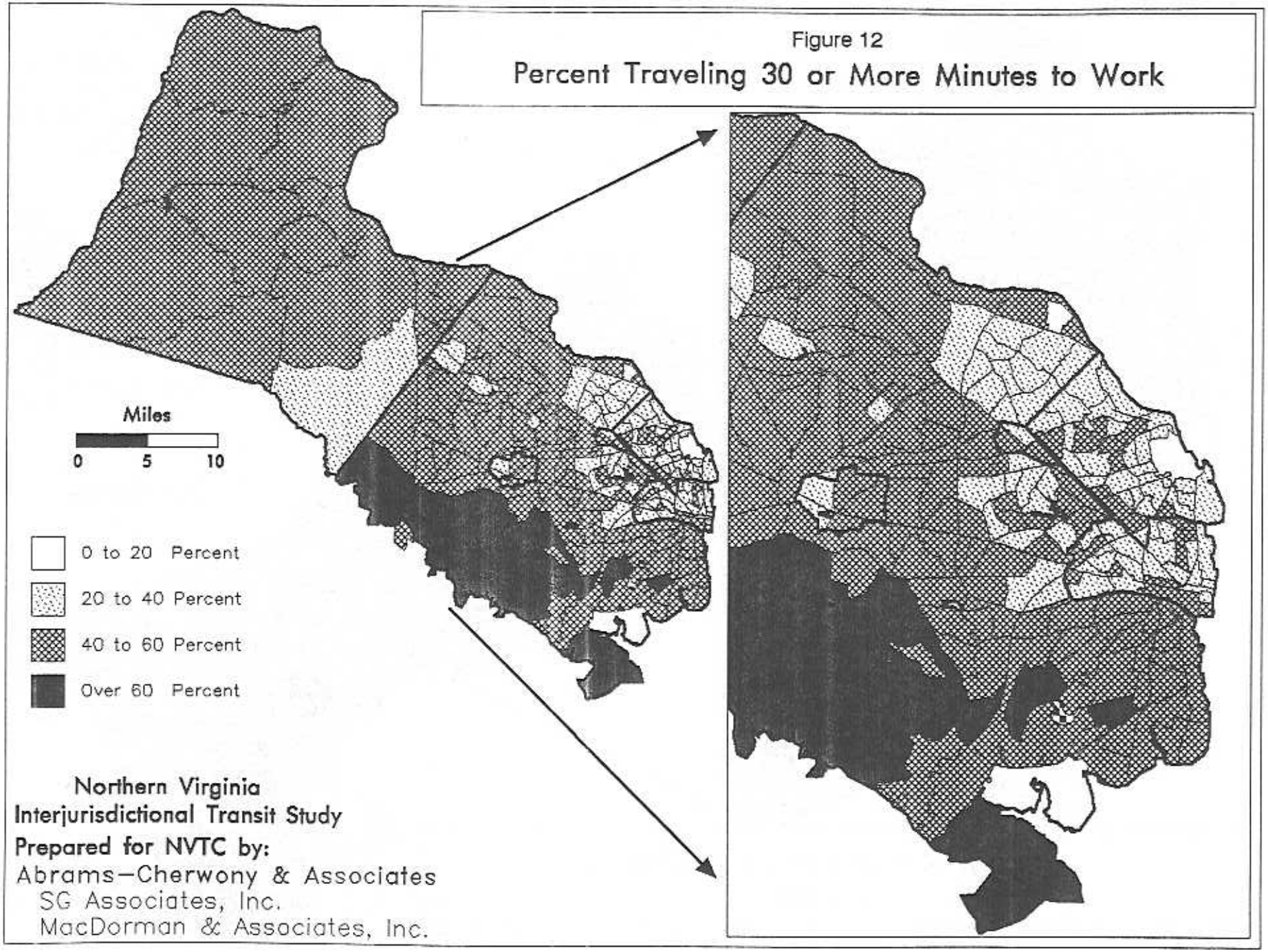

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Figure 13

Percent Drive Alone to Work

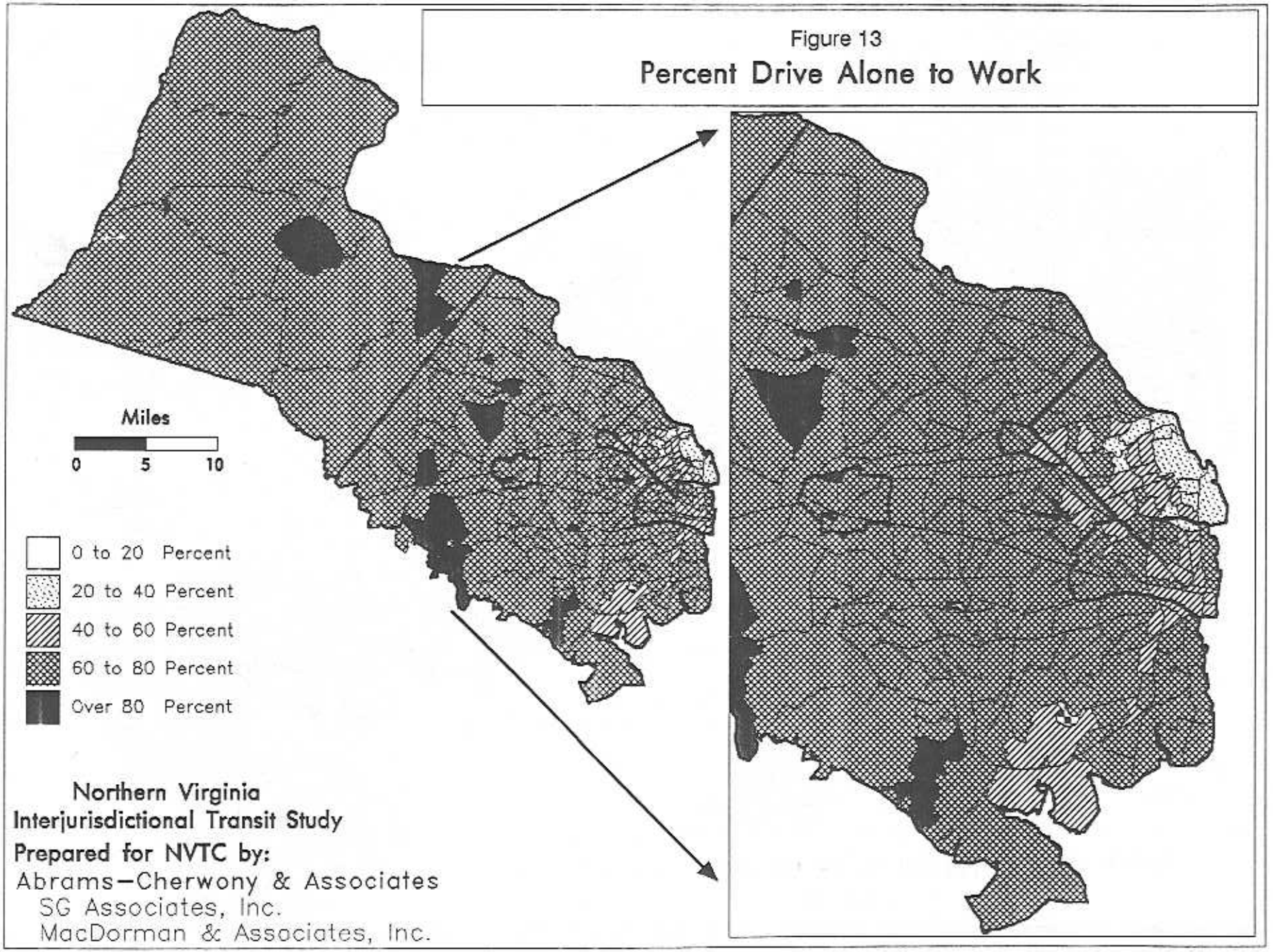

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Figure 14

Percent Carpool to Work

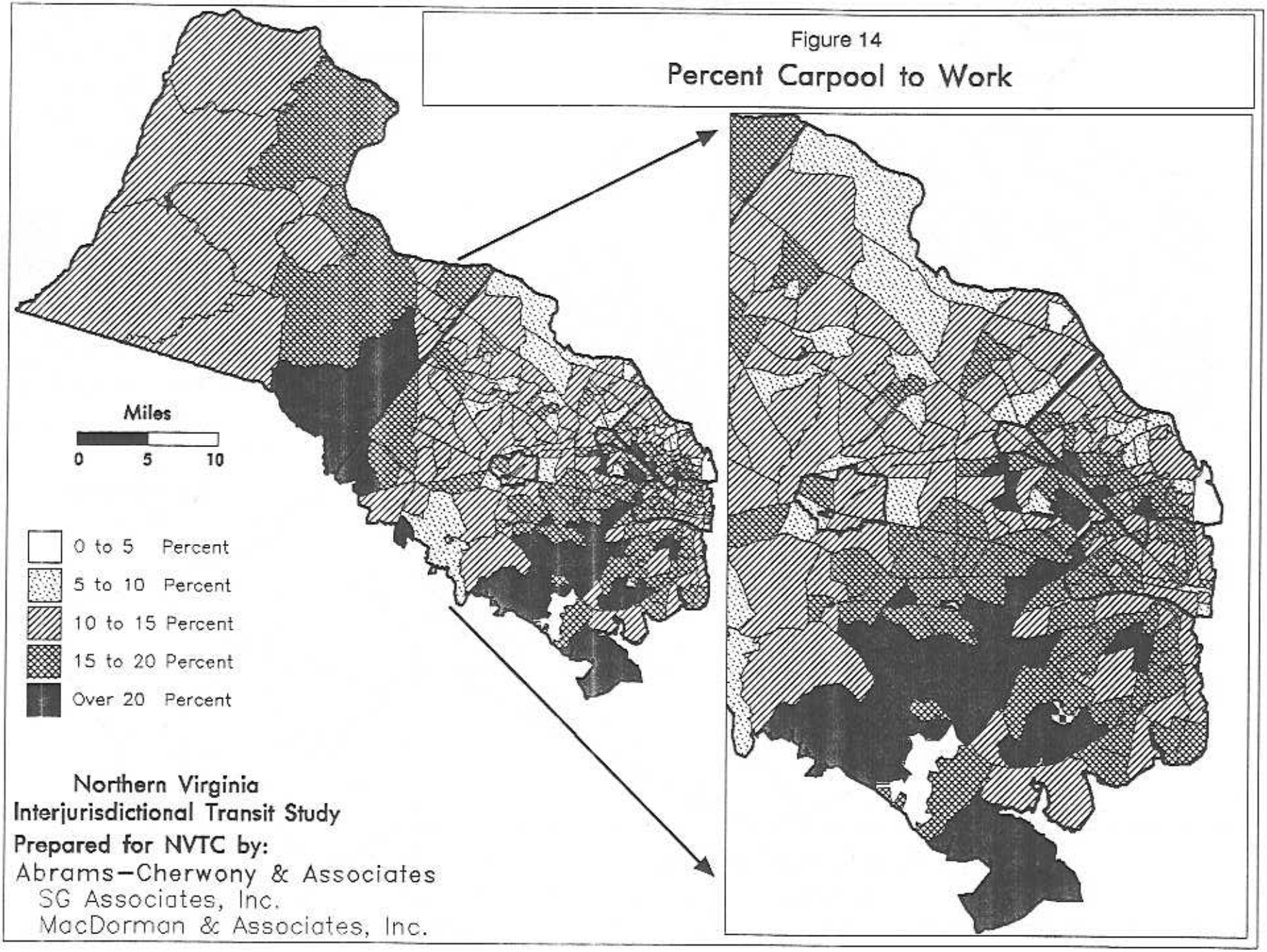

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Figure 15

Percent Ride Bus to Work

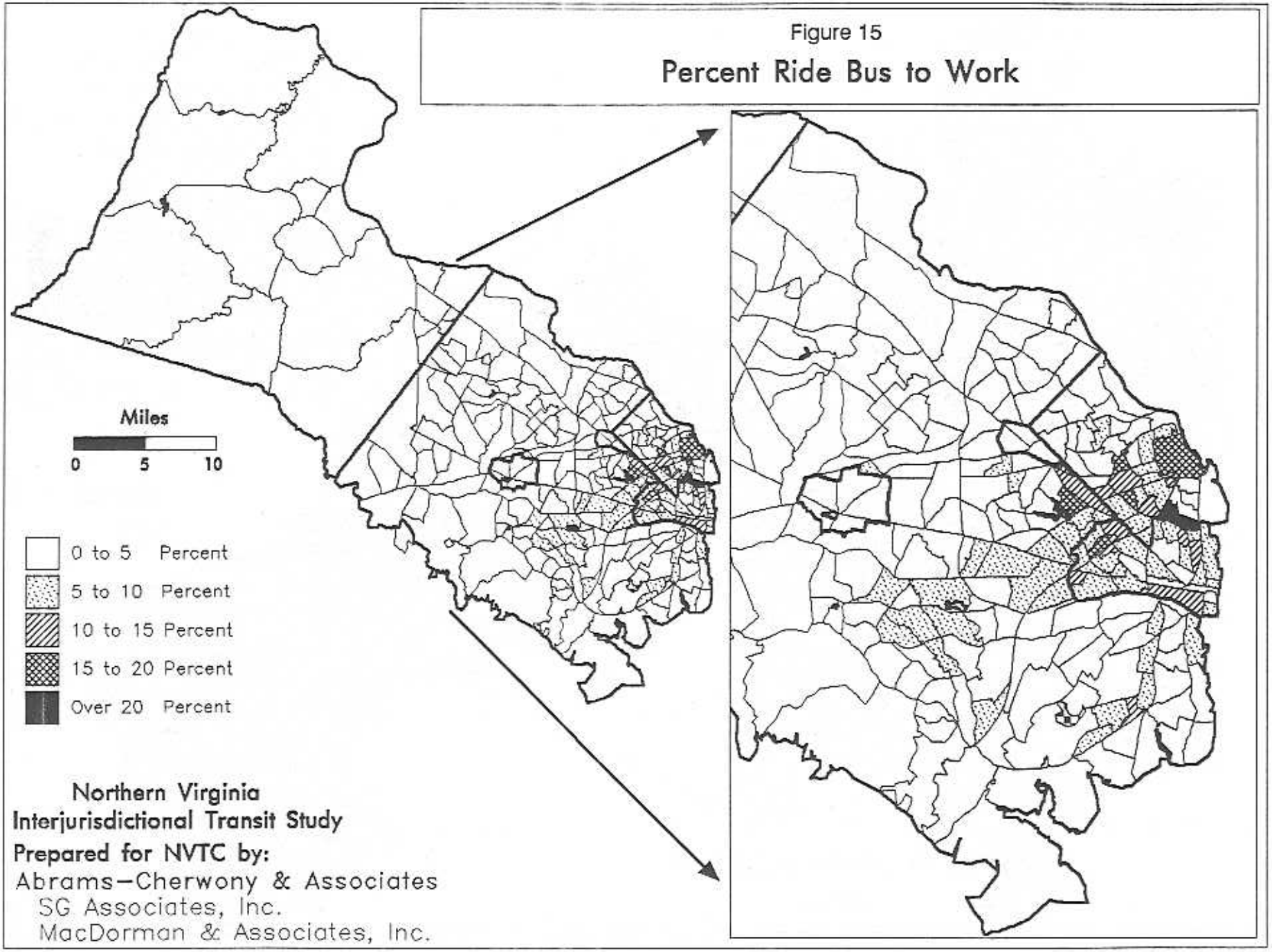

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Figure 16

Percent Ride Subway to Work

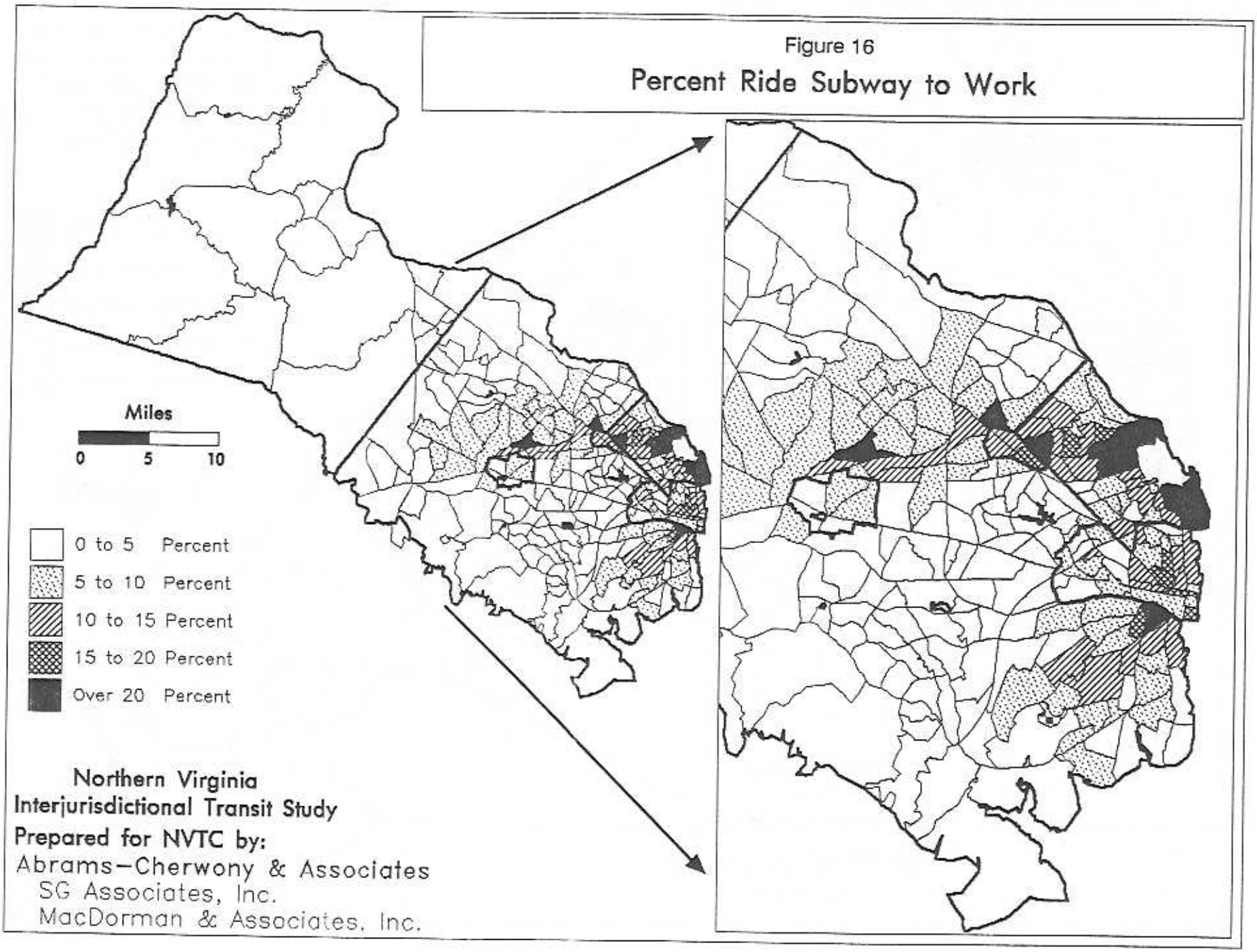

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Figure 17

Percent Walk to Work

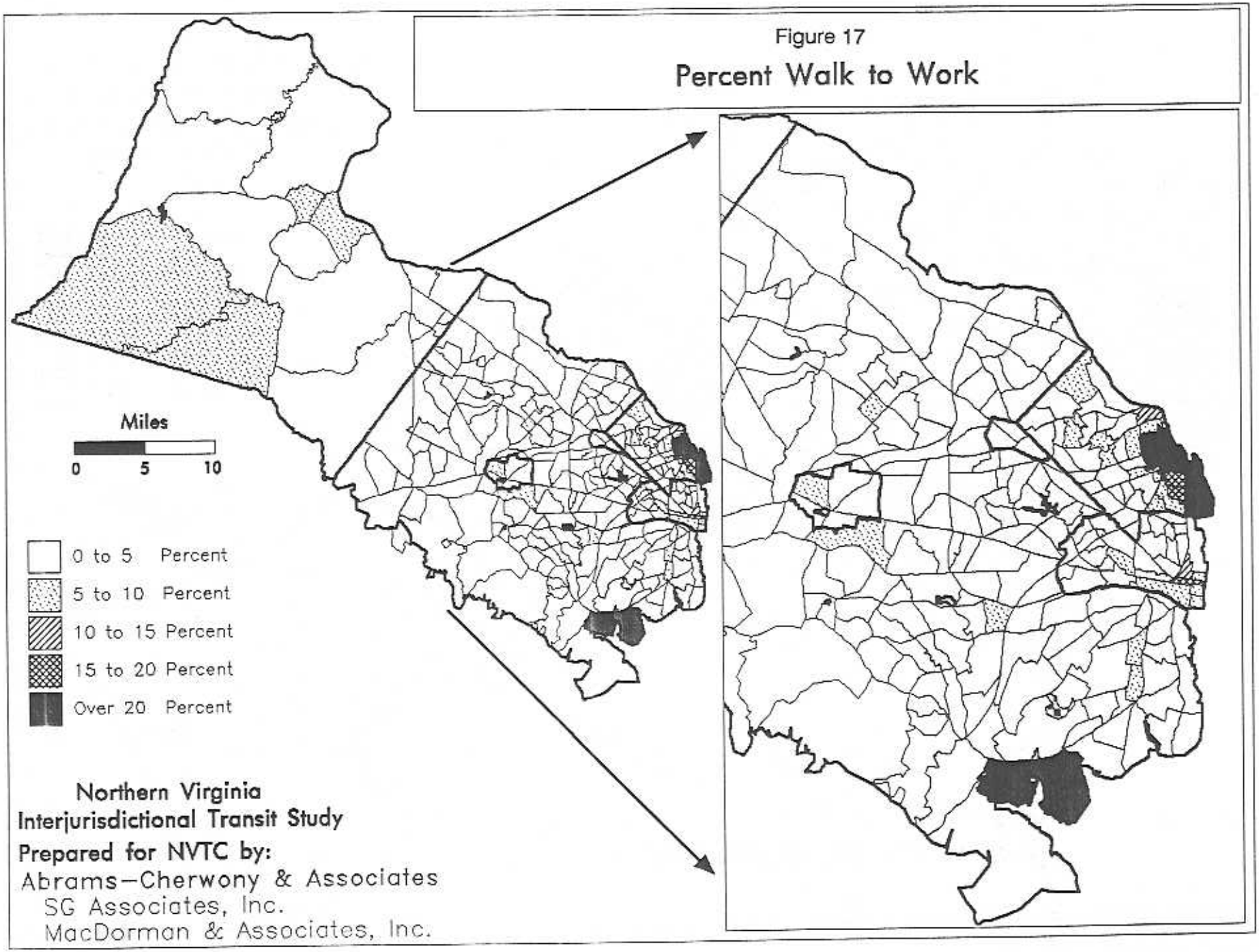

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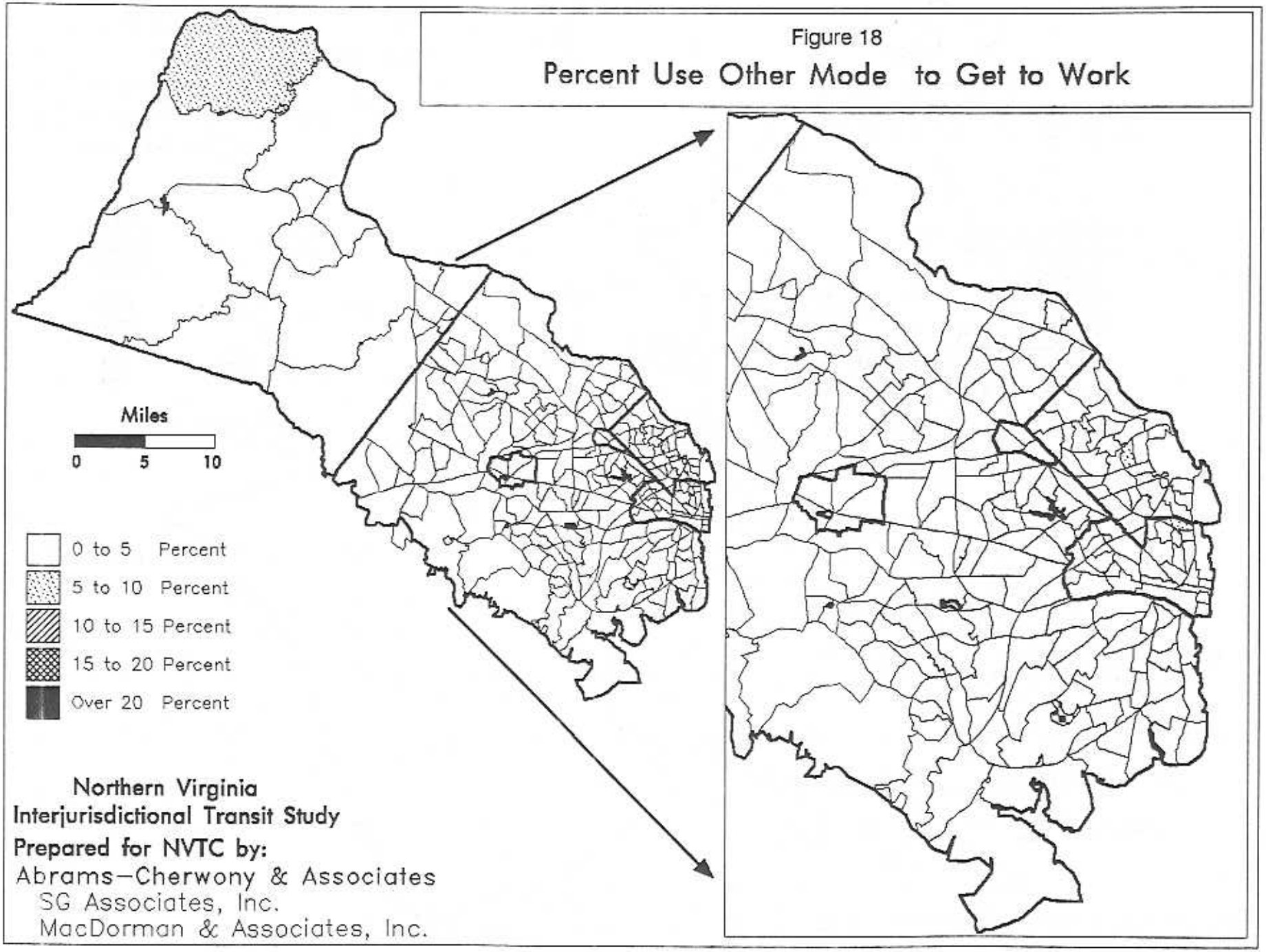
Figure 18

Percent Use Other Mode to Get to Work



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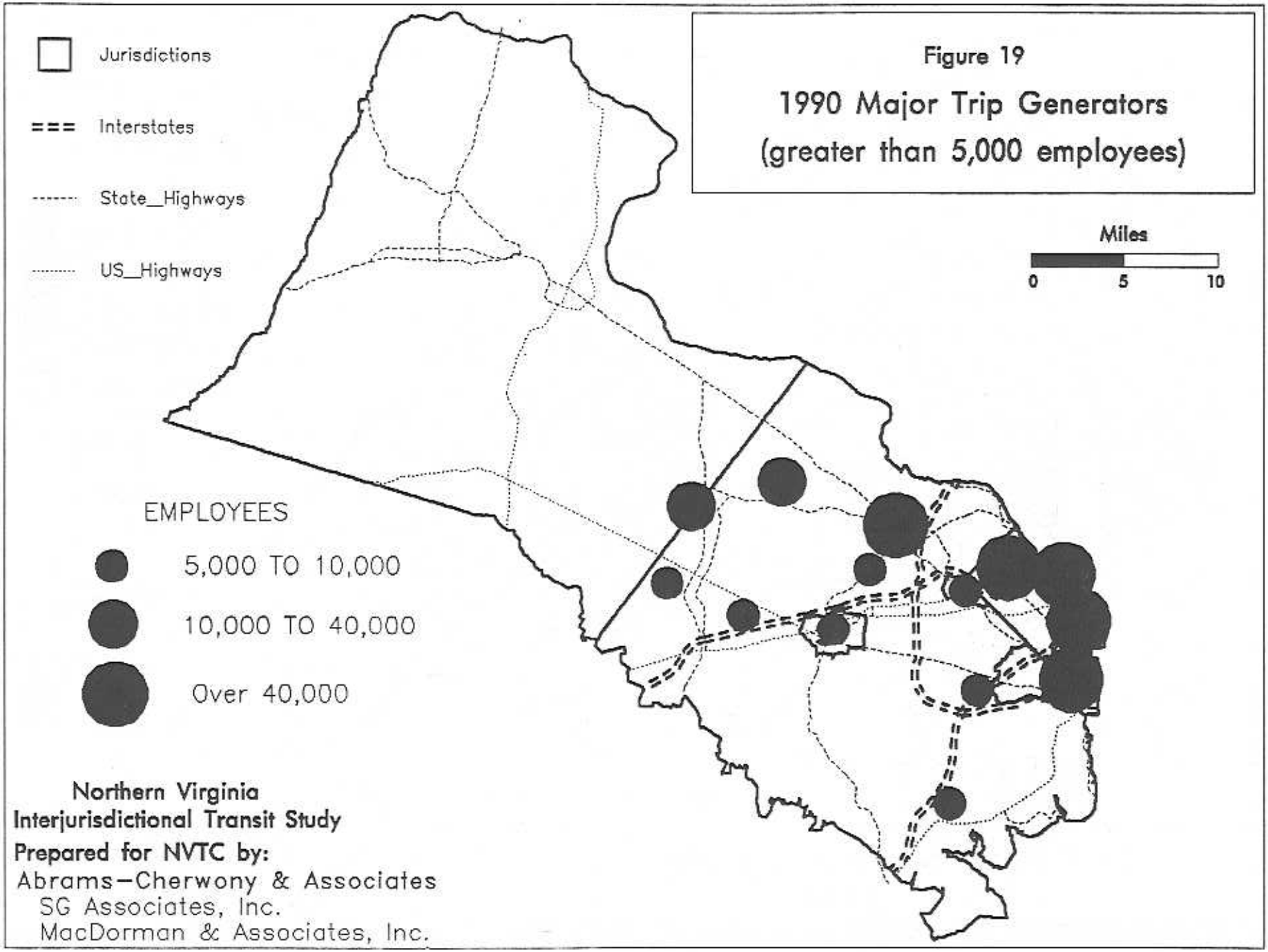
Jurisdictions
Interstates
State_Highways
US_Highways
Figure 19
1990 Major Trip Generators
(greater than 5,000 employees)
Miles
0
5
10
EMPLOYEES
5,000 TO 10,000
10,000 TO 40,000
Over 40,000
Northern Virginia
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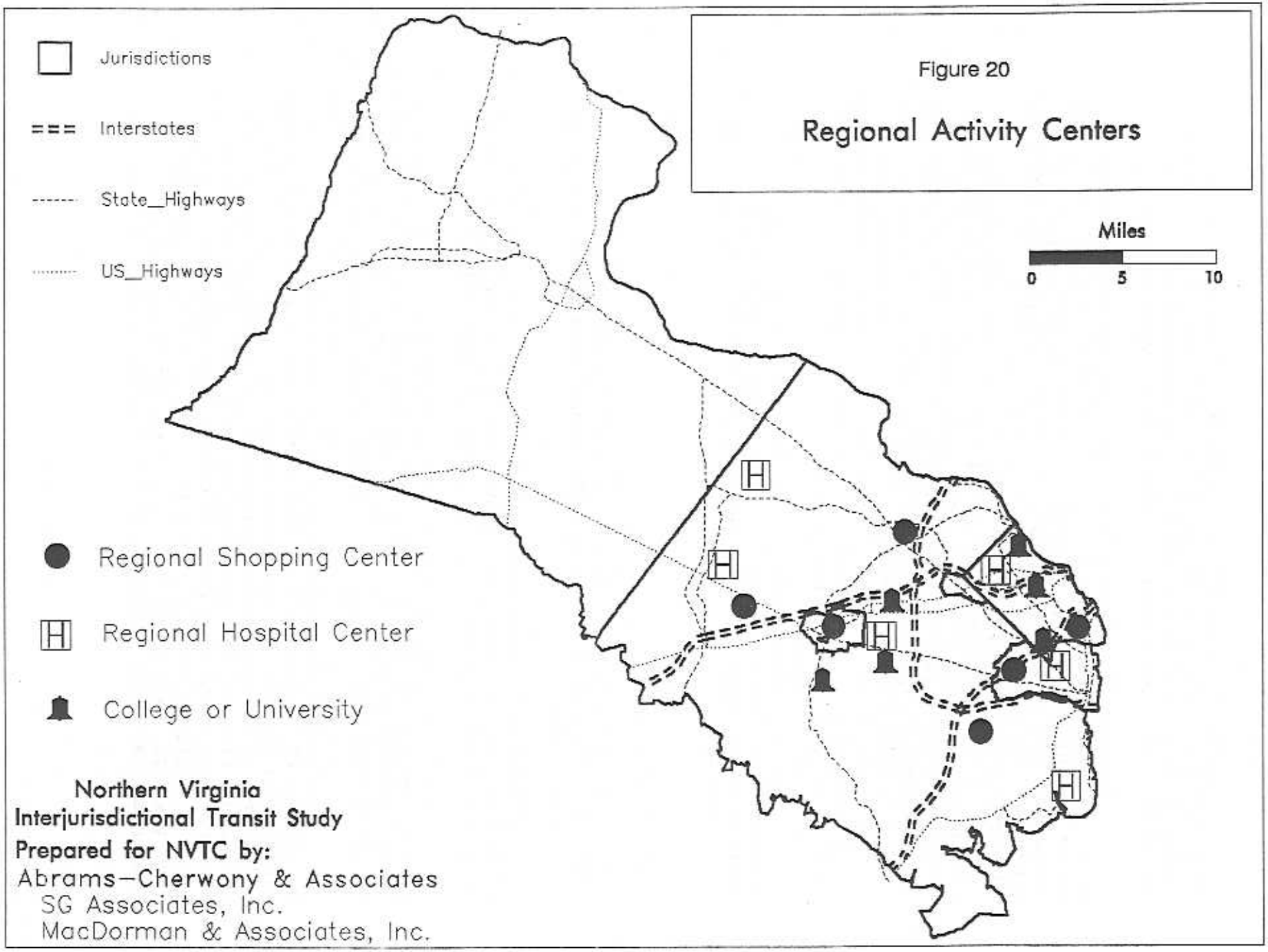
Jurisdictions
Interstates
State_Highways
US_Highways
Regional Shopping Center
Regional Hospital Center
College or University
Figure 20
Regional Activity Centers
Miles
0
5
10
Northern Virginia
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Figure 16 presents percent work trips by subway by census tract. As is expected to be the case, use is higher in those areas along the Metrorail system and within its service shed. Arlington has the highest rate of use.

Figures 17 and 18 present percent walk to work and percent use another mode of transportation to work. One can see that the areas where mixed land use is permitted and densities are relatively high, are most conducive to walking to work. Note the areas in Arlington primarily and Alexandria secondarily. The dark area in the southeast corner of Fairfax County is Ft. Belvoir, an Army base where those residing there also work there. Other mode of transport, as illustrated by Figure 18, includes bicycle and other modes not previously presented. Note that in only two census tracts are the percent of persons commuting by an "other" mode greater than five percent. For the remainder of the study area, the percent of persons commuting to work by another mode is under five percent.

The preceding work travel information will be augmented in Chapter 9 by district level travel model simulations prepared by the Metropolitan Washington Council of Governments.

Land Use Profile

The land use profile of the study area includes the identification of major trip generators, housing inventories and special use areas.

Major trip generators in the study area include major employers, governments, shopping centers, commercial/office complexes, medical centers, airports and universities.

Table 3 shows a list of major trip generators. The generators are listed by activity center or place as opposed to by individual employers. Transit services and employees are noted for areas with over 5,000 at-place employees.

Figure 19 illustrates the major trip generators mentioned in Table 3. Note that with the exception of Tysons Corner and Reston, the greatest concentrations of employment are found in Arlington and Alexandria, typically along a Metrorail line. This is significant since channelling persons from many origins to concentrated employment centers along a fixed rail line is a relatively easy and efficient undertaking. Providing effective transit services to dispersed employment centers and large employment centers not

TABLE 3

MAJOR TRIP GENERATORS

ACTIVITY CENTER	NUMBER OF EMPLOYEES	TRANSIT SERVICE
Arlington County		
Pentagon	23,755 (1)	Metrorail+Bus
Pentagon City	5,829 (2)	Metrorail+Bus
Crystal City	36,690 (2)	Metrorail+Bus+VRE
National Airport	9,904 (3)	Metrorail+Bus
Rosslyn	36,690 (2)	Metrorail+Bus
Court House	12,210 (2)	Metrorail+Bus
Ballston	18,560 (2)	Metrorail+Bus
Alexandria	80,600 (4)	Metrorail+Bus+VRE
Falls Church	7,999 (5)	Metrorail+Bus
Fairfax County		
Newington	5,049 (6)	Bus
Shirley	6,242 (6)	Bus
Fairfax Center	8,064 (6)	Bus
Chantilly	9,559 (6)	Bus
Dulles	9,972 (6)	Bus
Vienna	6,324 (6)	Metrorail+Bus
Tysons Corner	41,784 (6)	Bus
Reston	20,875 (6)	Bus

---

1. Arlington County Planning Department (August 1, 1994).
2. Arlington County, Metro Station Area Profile (March-June, 1993).
3. Washington Metropolitan Airport Authority (August 3, 1994).
4. Alexandria Planning Department (November 24, 1992).
5. Falls Church City Preliminary Official Statement (July 20, 1993).
6. Fairfax County Directory of Business and Industry (1989-1990).

served by high capacity transit services, such as Tysons Corner and Reston, is difficult, inefficient and expensive.

Other major trip generators include specific uses such as shopping centers, medical centers and universities (Figure 20). Table 4 identifies the regionally significant shopping, medical and educational centers. Table 5 shows some of the major employers in the study area. The employers are listed by jurisdiction and number of employees.

The following is a list of regionally significant special use areas in the study area. Special use areas include parks and recreation sites, military bases, government facilities and industrial uses. These are significant more for their impact on service delivery than for their trip generating potential. Most of these areas are characterized as low density areas of uses not conducive to generating frequent and great volumes of person trips.

REGIONALLY SIGNIFICANT SPECIAL USE AREAS

Name	Category
Fairfax County	
Ft. Belvoir	Military Base
Lorton Reformatory	Correctional Facility
Eleanor Laurence Park	Park
Huntley Meadows Park	Park
Mount Vernon	Historical Landmark
Mason Neck Park	Park
Fairfax County Landfill	Government
Fort Hunt Park	Park
Northern Virginia Regional Park	Park
Pohick Bay Regional Park	Park
Gunston Hall	Historical Landmark
FHA/CIA Facility	Government Facility
Arlington County	
Fort Meyer	Military Base
Arlington National Cemetery	Military Facility
Four Mile Run Park	Park
Alexandria	
Cameron Station	Military Base
Potomac Yard	Former Rail Yard

TABLE 4

MAJOR ACTIVITY CENTERS

ACTIVITY CENTER	TRANSIT SERVICES
Regional Shopping Centers	
Fashion Center at Pentagon City	Bus+Metrorail
Fair Oaks Mall	Bus
Tysons Corner and Galleria	Bus
Springfield Mall	Bus (Future Metrorail+VRE)
Landmark Plaza	Bus
Fairfax Shopping Center	Bus
Regional Medical Centers	
Fairfax Hospital	Bus
Mt. Vernon Medical Center	Bus
Fair Oaks Hospital	
Reston Hospital Center	Bus
Alexandria Hospital	Bus
Arlington Hospital	Bus
Universities and Colleges	
George Mason University	Bus
George Mason Law School	Bus+Metrorail
NOVA -- Alexandria	Bus
NOVA -- Annandale	Bus
NOVA -- Loudoun	
Telestar -- UVA/VA Tech	Bus

Source: Fairfax County Directory of Business and Industry (1989-1990).

Figure 21 identifies the location of these regionally significant special use areas.

Housing Profile

The final land use classification included in this section is housing. Where the population is likely to grow is a constant concern in providing transit services. Existing housing unit vacancy rates and the location of recent housing unit construction activity are good indicators of where the population may grow. Figure 22 presents vacancy rates by census tract based on the 1990 Census. Note the relatively high vacancy rates in Loudoun County and along the south and western edges of Fairfax County. Note also that there exist several pockets with high vacancy rates inside and about the Beltway. These pockets correspond, in certain cases, to areas of low household densities meaning that they may contain newly constructed and not yet fully occupied housing units.

Figure 23 illustrates dwelling units built between 1985 and 1990, an indicator of where population growth may occur. Note the predominance of development outside the Beltway. The predominance of development in the lower density areas of the study area will mean increased traffic congestion and a growing population that is more difficult to serve by transit.

Summary

The foregoing chapter presented transit relevant socioeconomic and demographic information for the study area. This information is important for the interjurisdictional transit study since it defines existing and potential transit service markets. The key public transportation related findings are summarized briefly below.

- The study area contains several strong transit origination markets in Alexandria, Arlington and in parts of Fairfax County.

- Major transit destination markets exist in Arlington, Alexandria, Tysons Corner and Reston.

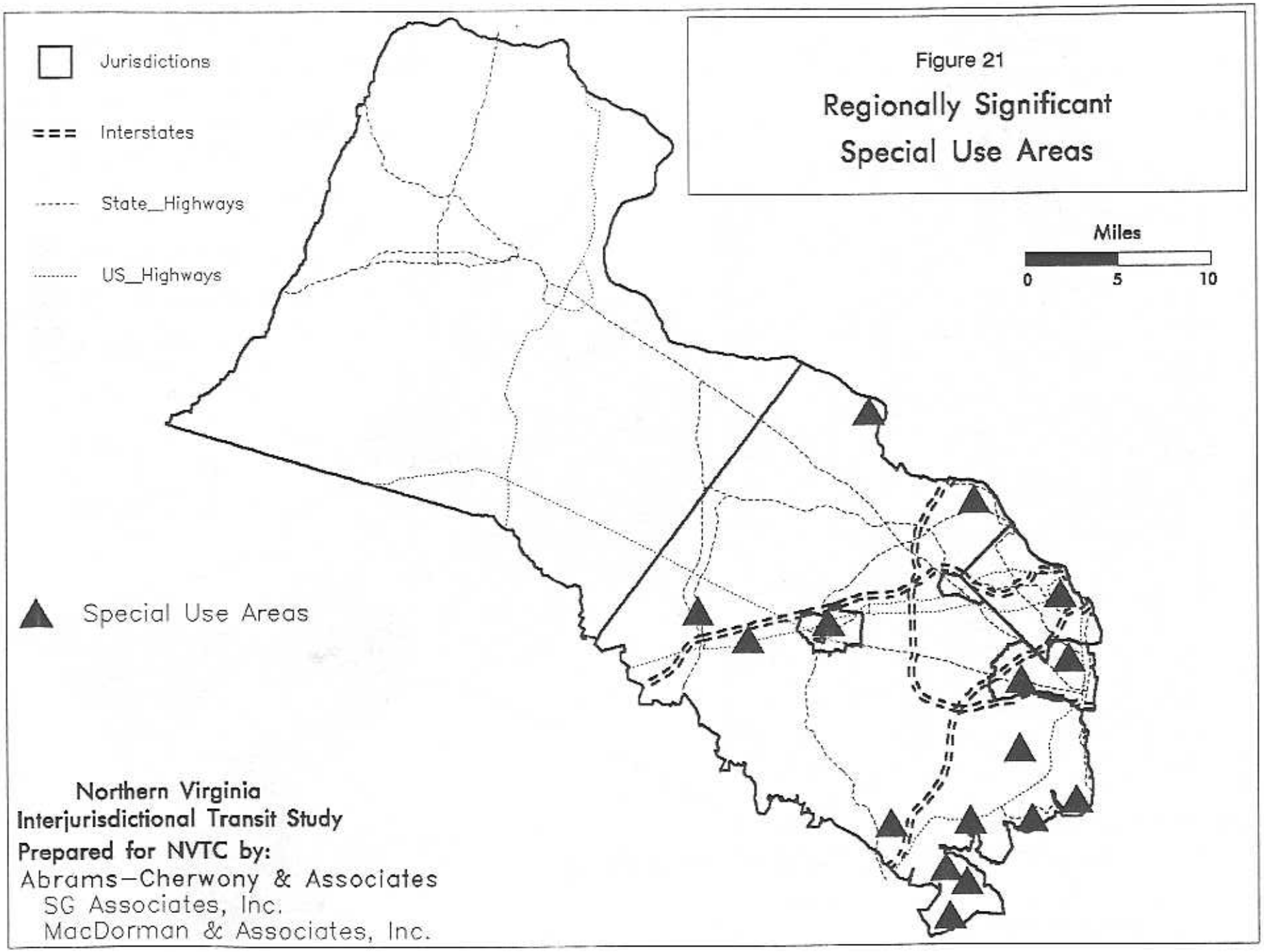
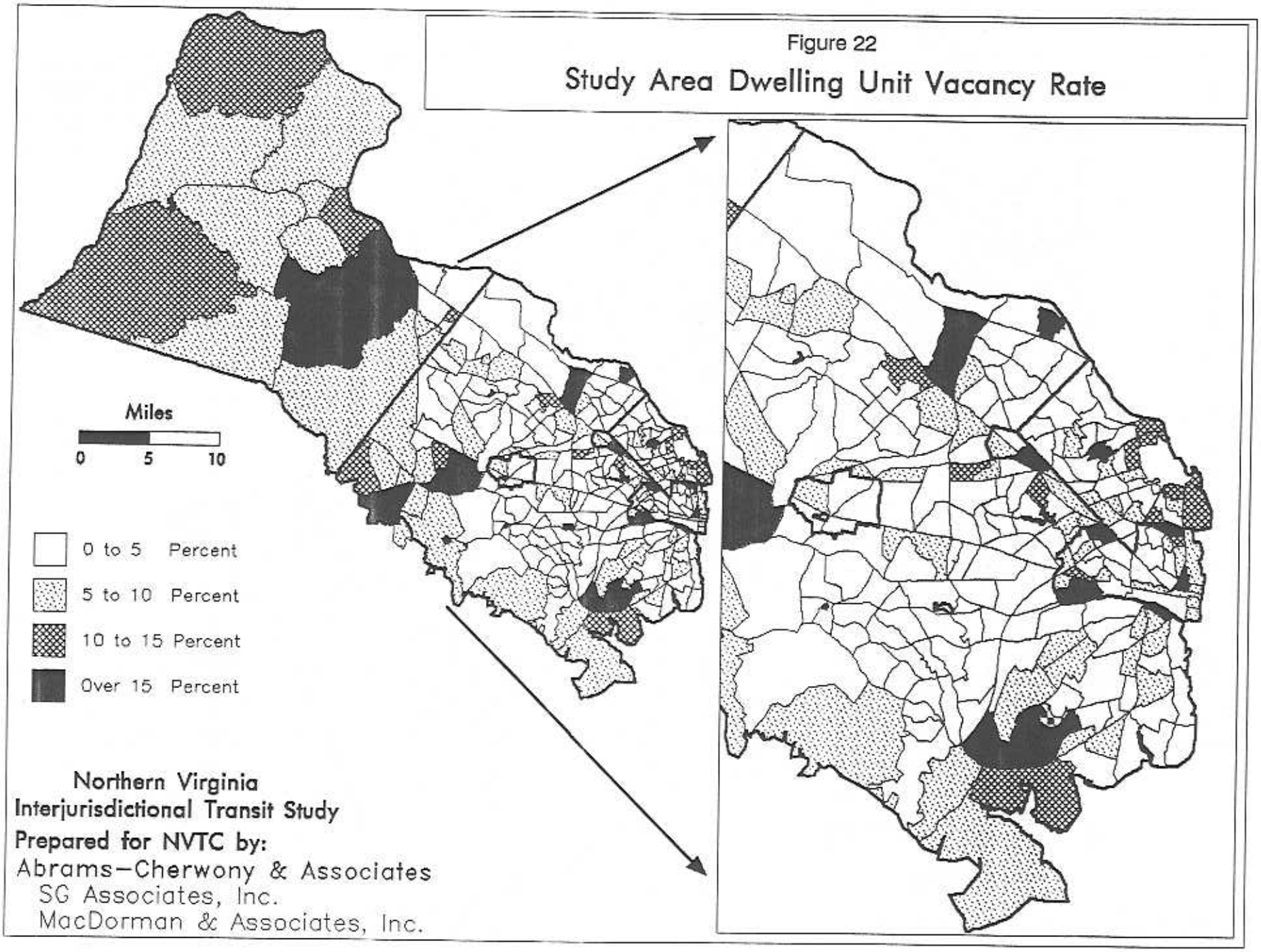

Jurisdictions
Interstates
State_Highways
US_Highways
Special Use Areas
Figure 21
Regionally Significant
Special Use Areas
Miles
0
5
10
Northern Virginia
Interjurisdictional Transit Study
Prepared for NVTC by:
Abrams–Cherwony & Associates
SG Associates, Inc.
MacDorman & Associates, Inc.

Figure 22

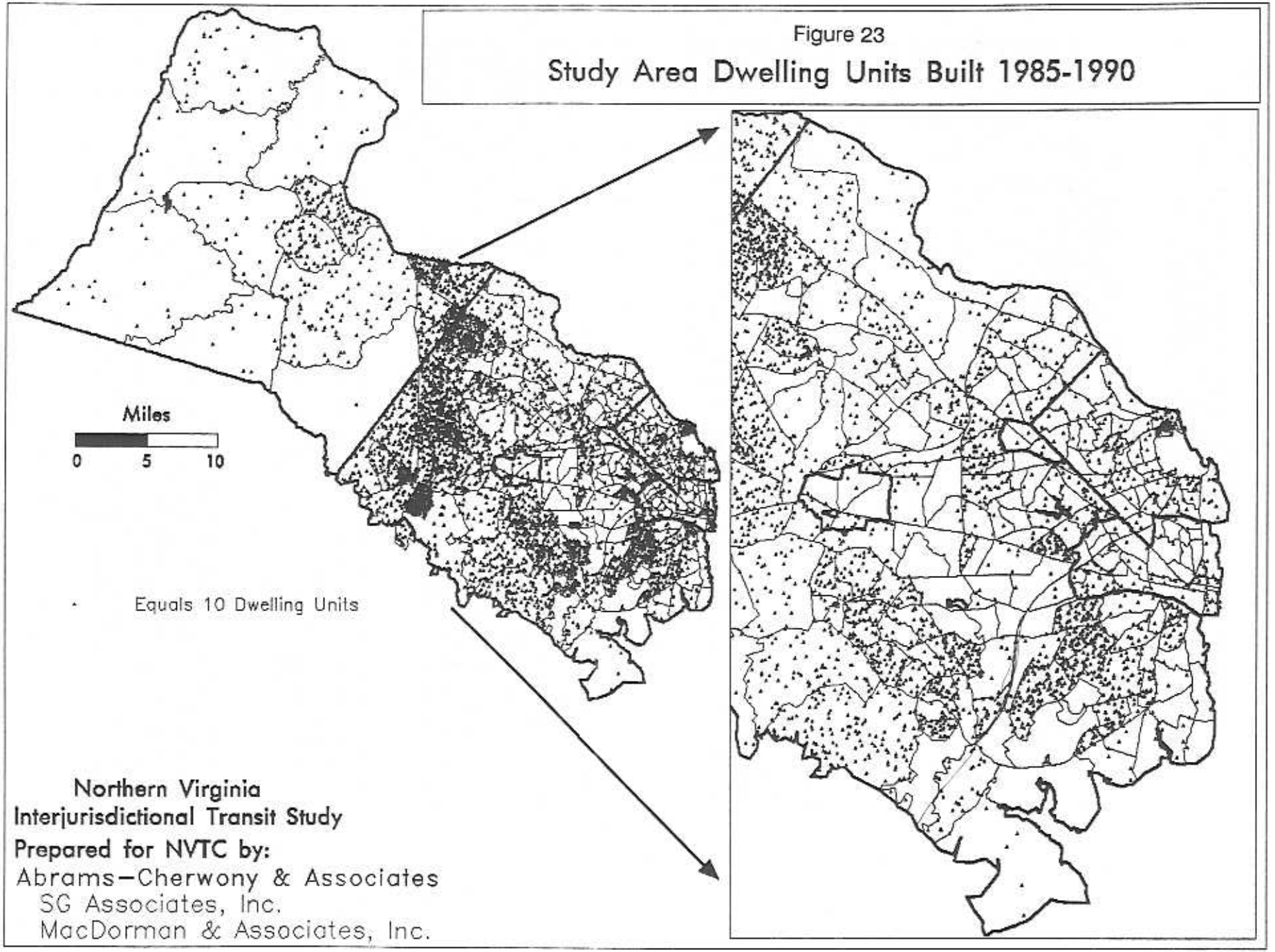
Study Area Dwelling Unit Vacancy Rate



Northern Virginia
Interjurisdictional Transit Study
Prepared for NVTC by:
Abrams–Cherwony & Associates
SG Associates, Inc.
MacDorman & Associates, Inc.

Figure 23

Study Area Dwelling Units Built 1985-1990



Northern Virginia
Interjurisdictional Transit Study

Prepared for NVTC by:

Abrams–Cherwony & Associates
SG Associates, Inc.
MacDorman & Associates, Inc.

- Transit collector/feeder services linking medium to lower density residential areas to Metrorail stations are a potentially strong market.

- Peak period feeder services to link Loudoun County with Metrorail or peak period express services to link Loudoun County with major employment centers have potential.

CHAPTER 4

EXISTING TRANSIT SERVICES

Bus service in Northern Virginia is provided by the Cities of Alexandria (DASH) and Fairfax (CUE), Arlington County (Arlington Trolley), Fairfax County (Connector, RIBS and Tyson Shuttle), Loudoun County (contracted commuter service) and the Washington Metropolitan Area Transit Authority (WMATA). The study area contains a mix of local circulator or loop routes and peak period only services as well as more traditional line-haul services. A total of eight distinct entities comprise the Northern Virginia bus transportation "system".

The sections that follow describe the existing bus services afforded residents by each of the operators/agencies noted above. The Commuter services provided by Loudoun County are described in Chapter 12. The area served and service levels in terms of frequency and span are discussed. In addition, current fares and the various fleets used to operate service are presented. Also, other transit services in the study area are described.

City of Alexandria

In addition to the services operated by WMATA, the Alexandria Transit Company (ATC) provides local bus service, known as DASH, within the City. The company is a non-profit corporation with all stock owned by the City of Alexandria. The service is managed by ATE Management and Services Company, Inc., a private firm that employes the General Manager of ATC. All other persons engaged in the system's operation are employees of Transit Management of Alexandria, Inc., an ATE subsidiary.

During the morning and afternoon peak periods, two routes (AT3 and AT4) are extended to the Pentagon Metrorail station located just north of the City limits. A system map that shows the different route paths and contains individual route schedules is available to the riding public.

Service Levels - The DASH system has a total of seven distinct routes. As shown in Table 6, the DASH routes are operated at relatively uniform headways. During peak periods, the interval between buses are 20 and 30 minutes. With the exception of AT5 and AT7, which operate every 30 minutes, midday service is provided hourly. Evening service (i.e.,

TABLE 6

CITY OF ALEXANDRIA
FREQUENCY OF SERVICE

ROUTE	WEEKDAY				SATURDAY	SUNDAY
	AM PEAK	MIDDAY	PM PEAK	NIGHT		
AT2-Janney's Lane	30	60	30	60	60	60
AT3-Russell Road	20	60	20	60	60	60
AT4-Cameron Mills Rd.	20	60	20	60	60	60
AT5-King Street	30	30	30	60	30	60
AT6-Eisenhower Ave.	30	60	30	60	60	60
AT7-Pickett St.	30	30	30	60	30	60
AT8-Duke Street	30	60	30	60	60	60

after 6:00 PM) operates every 60 minutes. On Saturdays, the AT5 and AT7 are operated on a 30 minute headway while the remaining routes afford hourly service. On Sundays, the frequency of service systemwide is 60 minutes.

Similar to frequency, the span of service provided is relatively uniform among all routes. On weekdays, service begins between 5:20 AM and 5:50 AM and operates until about 10:20 PM and 10:50 PM. Somewhat longer spans are provided on AT7 (11:30 PM) and AT8 (12:39 AM). On Saturdays, service tends to begin later and end earlier than that on weekdays (Table 7). Most routes begin between 6:30 AM and 7:30 AM and end by 11:30 PM. On Sundays, most routes begin about an hour later than on Saturdays and end between 6:30 PM and 7:30 PM. An exception is noted for AT8 which ceases to operate about 11:30 PM. A total of 25 buses are used to meet peak service requirements.

Fares - The DASH fare structure contains a base fare with an additional charge for peak period service to the Pentagon Metrorail station. As shown below, prepayment media are available in the form of a monthly pass for both the base fare "zone" and service to the Pentagon Metrorail station. Transfers are issued free at time of boarding. A somewhat unusual feature related to the use of transfers is that they are valid for four hours and can be used on any route. This feature allows for a round trip to be made at a substantial discount. DASH transfers are honored by Metrobus and Fairfax Connector services and are worth $0.75 toward the applicable fare.

FARE STRUCTURE

Category	Fare
Base Fare	$ 0.75
Pentagon Metrorail	1.00
Transfers	Free
DASH PASS (monthly)	25.00
Pentagon PASS	35.00

Fleet - The DASH fleet is stored and maintained at the ATC facility located at 116 South Quaker Lane in Alexandria. The vehicle complement consists of 33 Orion buses. Of this number, 17 are 1984, 31 passenger, 30 foot buses; two are 1986, 42 passenger, 35 foot buses; and the remaining 14 are 1991, 41 passenger, 35 foot buses. The average age of the fleet is 5.9 years. None of the buses are wheelchair lift equipped.

TABLE 7

CITY OF ALEXANDRIA
SPAN OF SERVICE

ROUTE	WEEKDAY		SATURDAY		SUNDAY	
	BEGINS	ENDS	BEGINS	ENDS	BEGINS	ENDS
AT2-Janney's Lane	5:40AM	10:20PM	7:17AM	11:16PM	8:30AM	6:41PM
AT3-Russell Road	5:40AM	10:36PM	7:24AM	9:08PM	8:54AM	6:38PM
AT4-Cameron Mills Rd.	5:50AM	10:36PM	7:24AM	9:08PM	8:54AM	6:38PM
AT5-King Street	5:26AM	10:59PM	7:07AM	11:29PM	8:05AM	7:36PM
AT6-Eisenhower Ave.	5:47AM	10:24PM	7:20AM	10:16PM	8:25AM	6:10PM
AT7-Pickett St.	5:26AM	11:30PM	6:55AM	10:40PM	7:51AM	6:39PM
AT8-Duke Street	5:22AM	12:39AM	6:25AM	11:43PM	7:15AM	11:33PM

Arlington County

In addition to WMATA services, the Arlington Trolley is provided in the Crystal City area. This service is operated by ATE Management and Services Company, Inc. under contract with the County. A system map indicating the route alignment and bus stops is available. Also, the Crystal Loop, a free shuttle sponsored by local businesses operates weekdays between the hours of 11:00 AM and 2:30 PM. The following sections describe the Arlington Trolley operation.

Service Levels - The Arlington Trolley operates loop service in the Crystal City area linking Metrorail service to numerous office and shopping complexes. Service is operated at a headway of eight minutes.

The span of service is limited to peak hours only, 6:30 AM to 9:30 AM in the morning and 3:30 PM to 6:30 PM in the afternoon. No weekend service is operated. Two vehicles are used to meet service requirements. It should be noted that prior to July 1, 1993, a complete span of service (i.e., 6:30 AM through 6:30 PM) was operated. However, with the initiation of the Crystal Loop during the midday, the service of the Trolley was reduced.

Fares - The fare structure is relatively simple. A base fare of $0.35 is charged. No transfers are issued or accepted except from Virginia Railway Express users.

Fleet - Service is provided utilizing two, 1990 Boyertown buses. These vehicles are replicas of old style trolley cars.

City of Fairfax

In addition to the bus services provided by WMATA at no cost to the City, the City of Fairfax operates the CUE bus system which provides fixed route transit service for local residents. The CUE service extends beyond the City limits to both the Vienna Metrorail station and George Mason University. A system map is available which depicts the route paths and schedule information.

Service Levels - Two different alignments are operated with each having a clockwise and a counter-clockwise loop. These four loops are identified as individual routes. The headways operated on weekdays are relatively uniform

throughout the day. Rush hour service frequencies range from 25 to 35 minutes depending on route and operating period (i.e., morning or afternoon peak period). Weekday service during the midday is operated at headways of 24 to 29 minutes (Table 8). After 6:00 PM, the interval between buses is 45 minutes. Weekend service is provided every 46 or 54 minutes depending on the route utilized.

As shown in Table 9, weekday service begins between 5:25 AM and 5:40 AM. The service spans vary by route and end between 9:07 PM and 12:06 AM. On Saturdays, service begins about three hours later than weekdays and ends between 8:10 PM and 8:48 PM. Sunday service begins between 9:30 AM and 10:00 AM and ends between 5:30 PM and 6:30 PM. A total of eight vehicles are used to meet peak service requirements.

Fares - The CUE bus system fare structure contains a base fare of $0.35. All students and senior citizens are afforded a discount of $0.10. Transfers are issued free of charge. No fare arrangements exist with other service providers regarding bus to rail or bus to bus transfers.

Fleet - The fleet is stored at the municipal facility located at 3410 Pickett Road in Fairfax. The fleet consists of 11, 30 foot, 31 passenger Orion buses manufactured between 1985 and 1990. The average age of the buses is 5.6 years.

Fairfax County

The transportation service sponsored by Fairfax County consists of three distinct components: Fairfax Connector, Tysons Shuttle and Reston Internal Bus System (RIBS). These services, which are in addition to those operated by WMATA, are based at two different facilities. The Newington facility houses the majority of the Fairfax Connector service. This facility and the buses operated from this base are County-owned. A private company, ATE Management and Services Company, Inc., operates the service.

The other facility -- Merrifield -- is the operating base for the Reston and Tysons service. In addition, three Fairfax Connector routes (i.e., 402, 403 and 404) operate from this site. Both the facility and vehicles are property of a private carrier -- Transportation Management Services, Inc. (TMSI) -- that operates service under contract with the County.

TABLE 8

CITY OF FAIRFAX
FREQUENCY OF SERVICE

ROUTE	WEEKDAY				SATURDAY	SUNDAY
	AM PEAK	MIDDAY	PM PEAK	NIGHT		
CUE						
GREEN 1	26	24	29	45	46	46
GREEN 2	25	24	30	46	46	46
GOLD 1	30	29	30	44	54	54
GOLD 2	30	28	35	44	54	54

TABLE 9

CITY OF FAIRFAX
SPAN OF SERVICE

ROUTE	WEEKDAY		SATURDAY		SUNDAY	
	BEGINS	ENDS	BEGINS	ENDS	BEGINS	ENDS
CUE						
GREEN 1	5:40AM	11:36PM	8:45AM	8:33PM	10:00AM	6:02PM
GREEN 2	5:25AM	9:07PM	8:22AM	8:10PM	9:37AM	5:39PM
GOLD 1	5:40AM	12:06AM	8:45AM	8:48PM	10:00AM	6:28PM
GOLD 2	5:25AM	9:48PM	8:18AM	8:21PM	9:33AM	6:01PM

It should be noted that Fairfax County during September 1994 assumed the Dulles/Reston/Herndon bus services that were formerly operated by WMATA. This assumption consisted of all WMATA Route 5 services and includes 38 peak period buses.

The Fairfax Connector system was initiated September 29, 1985. Between FY 1986 and FY 1993, cost experience has been quite favorable. As shown below, operating costs measured on the basis of miles and hours of service have increased at average annual rates of about 1.8 and 2.8 percent, respectively.

FAIRFAX CONNECTOR COST TRENDS

Fiscal Year	Cost/Mile ($)	Cost/Hour ($)
1986	2.29	34.95
1988	2.31	36.72
1990	2.37	38.38
1992	2,69	42.69
1993	2.57	41.83
Percent Change		
Total	12.23	19.69
Annual	1.75	2.81

Individual route timetables are available for the Fairfax Connector bus lines. Tysons and Reston service schedules are contained in a combined system map/timetable document.

Service Levels - There are 24 routes in the Fairfax Connector system. As shown in Table 10, the frequency of service on the different bus lines varies according to route, primary service direction and operating period. During peak periods, service frequencies range from 13 minutes to 54 minutes. As noted previously, this reflects the primary travel direction and passenger utilization rates. Midday service, if provided, is typically operated at 50 to 75 minute intervals. One exception is Route 105 which has a midday headway of 30 minutes. Evening service frequencies vary from 28 to 60 minutes. In some cases, only a single trip is operated. Seven routes are operated on Saturdays, with hourly service on all but one bus line. The three routes operated on Sunday are at 60 minute intervals.

The span of service also varies considerably among the Fairfax Connector routes. Generally, weekday service oriented to commuters begins between 5:30 AM and 6:30 AM and ends

TABLE 10

FAIRFAX COUNTY
FREQUENCY OF SERVICE

ROUTE	DIRECTION	WEEKDAY AM PEAK	WEEKDAY MIDDAY	WEEKDAY PM PEAK	WEEKDAY NIGHT	SATURDAY	SUNDAY
FAIRFAX CONNECTOR							
101-Ft. Hunt Road	NB/SB	30	60	60	60	61	62
102-Sherwood Hall Lane	NB	38	-	-	-	-	--
	SB	--	--	38	3 Trip	--	--
103-Beacon Mall	CLOCKWISE	25	60	20	40	60	--
104-Beacon Mall	COUNTER	25	51	20	40	60	--
105-Woodlawn	NB	19	30	60	60	60	60
	SB	58	30	32	28	60	60
106-Lockheed Blvd.	NB	29	-	29	1 Trip	-	
	SB	18	--	20	3 Trips	--	--
107-Mt. Vernon	NB	30	--	--	--	--	--
	SB	--	--	32	3 Trips	--	--
108-Telegraph Road	NB/SB	22	3 Trips	22	22	-	--
109-Rose Hill Drive	EB	28	56	22	45	60	--
	WB	28	56	21	42	60	--
110-Franconia Road	EB/WB	31	56	38	30	60	60
201 Manchester Lakes	NB	28	70	48	50	-	--
	SB	43	70	28	55		
202-Beulah Street	NB	26	70	36	40	--	
	SB	53	70	28	30	--	--
203-Summer Ridge Road	NB	28	70	40	42	--	
	SB	54	70	29	62	--	--
204-Edsall Road	EB/WB	--	60	--	--	--	-

TABLE 10

FAIRFAX COUNTY
FREQUENCY OF SERVICE
(CONTINUED)

ROUTE	DIRECTION	WEEKDAY AM PEAK	WEEKDAY MIDDAY	WEEKDAY PM PEAK	WEEKDAY NIGHT	SATURDAY	SUNDAY
FAIRFAX CONNECTOR (CONTINUED)							
301-Bren Mar Drive	NB/SB	33	--	32	2 Trips	--	--
302-Springfield Mall	NB/SB	33	--	33	--	--	--
303-Lorton	NB	35	--	--	--	--	--
	SB	--	--	20	2 Trips	--	--
304-Saratoga	NB/SB	44	--	18	3 Trips	--	--
305-Hooes Road	NB	30	--	--	--	--	--
	SB	--	--	27	28	--	--
306-Braddock Road	NB/SB	--	60	--	--	--	--
401-Gallows Road	NB/SB	20	58	30	41	61	--
402-Park Street	EB	35	--	--	--	--	--
	WB	--	--	40	1 Trip	--	--
403-Vienna	EB	--	--	35	2 Trips	--	--
	WB	35	--	--	--	--	--
404-Chain Bridge Road	EB/WB	--	75	--	--	--	--
TYSONS SHUTTLE							
Tysons Shuttle		20	--	20	3 Trips	--	--
RESTON RIBS							
1-Lake Anne	LOOP	40	40	40	--	40	--
2-South Lakes	LOOP	40	40	40	--	40	--
3-Hunter's Woods	LOOP	40	40	40	--	40	--
4-West Falls Church Exp.	LOOP	--	40	--	--	--	--

between 9:00 PM and midnight (Table 11). Exceptions are noted for routes (e.g., 204 and 306) that operate midday only. Also, it should be noted that many Fairfax Connector bus lines do not operate a complete span of service. Many routes are provided only during the morning and afternoon peak periods. Saturday service begins later and ends earlier than on weekdays. An exceptions is Route 110 which operates until about the same time as weekdays. A total of 53 vehicles is required during peak operating periods.

The Tysons Shuttle is a single route that links residential concentrations and employment sites with the West Falls Church Metrorail station. During the morning and afternoon peak periods, service is operated at a 20 minute headway utilizing two vehicles. No midday service is provided. The shuttle operates weekdays only, with no service provided on either weekend day. The hours of service are 6:40 AM to 8:56 AM and 4:20 PM to 6:56 PM.

RIBS service consists of four distinct routes. Three of these bus lines are relatively circuitous one-way loops that provide extensive coverage within Reston. The fourth route (i.e., Reston Express) operates in limited stop service between Reston Town Center and the West Falls Church Metrorail station.

The RIBS services are operated at a 40 minute headway on weekdays and Saturdays. No Sunday service is provided. The express service operates weekday midday service only since Metrobus service is extensive during peak periods. All routes are "pulsed" at Reston Town Center. This affords a convenient transfer opportunity for riders that require a second bus to complete their trip. Peak service requires four vehicles.

RIBS generally operates a 12 hour span of service on weekdays for the three loop routes. Service begins at 6:50 AM and ends at 6:45 PM. The express service is operated on weekdays only, between the hours of 9:30 AM and 4:30 PM. On Saturdays, service is operated between the hours of 9:30 AM and 6:05 PM. As noted above, RIBS does not operate on Sundays.

Fares - The fare structure for the Fairfax Connector services are based relative to the individual routes. As shown below, different fares and zones charges apply to certain routes.

TABLE 11

FAIRFAX COUNTY
SPAN OF SERVICE

ROUTE	DIRECTION	WEEKDAY BEGINS	WEEKDAY ENDS	SATURDAY BEGINS	SATURDAY ENDS	SUNDAY BEGINS	SUNDAY ENDS
FAIRFAX CONNECTOR							
101-Ft. Hunt Road	NB	5:29AM	9:10PM	6:52AM	7:27PM	8:56AM	6:34PM
	SB	6:30AM	9:46PM	7:25AM	8:02PM	9:21AM	7:09PM
102-Sherwood Hall Lane	NB	5:55AM	8:17AM	---	---	---	---
	SB	4:33PM	6:52PM	---	---	---	---
103-Beacon Mall	CLOCKWISE	6:00AM	9:50PM	8:20AM	8:43PM	---	---
104-Beacon Mall	COUNTER	5:50AM	9:19PM	7:50AM	8:15PM	---	---
105-Woodlawn	NB	5:20AM	10:47PM	6:48AM	7:47PM	9:15AM	5:55PM
	SB	6:25AM	11:47PM	7:05AM	6:54PM	10:00AM	6:40PM
106-Lockheed Blvd.	NB	5:35AM	7:02PM	---	---	---	---
	SB	7:40AM	7:15PM	---	---	---	---
107-Mt. Vernon	NB	6:30AM	9:27AM	---	---	---	---
	SB	4:07PM	7:48PM	---	---	---	---
108-Telegraph Road	NB	5:52AM	8:43PM	---	---	---	---
	SB	6:26AM	9:12PM	---	---	---	---
109-Rose Hill Drive	EB	5:51AM	10:38AM	7:23AM	10:39PM	---	---
	WB	5:40AM	11:41PM	8:35AM	10:13PM	---	---
110-Franconia Road	EB	5:33AM	10:00PM	7:30AM	10:10PM	9:25AM	6:50PM
	WB	6:15AM	10:15PM	6:45AM	10:25PM	10:10AM	6:25PM
201-Manchester Lakes	NB	5:47AM	9:04PM	---	---	---	---
	SB	6:21AM	9:45PM	---	---	---	---
202-Beulah Street	NB	5:26AM	9:18PM	---	---	---	---
	SB	6:00AM	9:50PM	---	---	---	---
203-Summer Ridge Road	NB	5:30AM	8:31PM	---	---	---	---
	SB	6:07AM	9:29PM	---	---	---	---
204-Edsall Road	EB	9:44AM	3:07PM	---	---	---	---
	WB	9:15AM	2:41PM	---	---	---	---

TABLE 11

FAIRFAX COUNTY
SPAN OF SERVICE
(CONTINUED)

ROUTE	DIRECTION	WEEKDAY BEGINS	WEEKDAY ENDS	SATURDAY BEGINS	SATURDAY ENDS	SUNDAY BEGINS	SUNDAY ENDS
FAIRFAX CONNECTOR (CONTINUED)							
301-Bren Mar Drive	NB	6:19AM	7:22PM	---	---	---	---
	SB	5:46AM	6:53PM	---	---	---	---
302-Springfield Mall	NB	6:10AM	6:03PM	---	---	---	---
	SB	6:48AM	6:40PM	---	---	---	---
303-Lorton	NB	5:55AM	8:21AM	---	---	---	---
	SB	4:13PM	7:44PM	---	---	---	---
304-Saratoga	NB	6:09AM	5:41PM	---	---	---	---
	SB	6:57AM	7:32PM	---	---	---	---
305-Hooes Road	NB	6:09AM	8:25AM	---	---	---	---
	SB	4:25PM	7:22PM	---	---	---	---
306-Braddock Road	NB	9:50AM	3:58PM	---	---	---	---
	SB	8:50AM	2:47PM	---	---	---	---
401-Gallows Road	NB	5:20AM	11:03PM	7:24AM	9:21PM	---	---
	SB	5:54AM	10:55PM	7:30AM	10:15PM	---	---
402-Park Street	EB	6:30AM	7:57AM	---	---	---	---
	WB	4:51PM	7:25PM	---	---	---	---
403-Vienna	EB	3:55PM	7:23PM	---	---	---	---
	WB	5:50AM	8:54AM	---	---	---	---
404-Chain Bridge Road	EB	9:10AM	3:09PM	---	---	---	---
	WB	10:28AM	3:07PM	---	---	---	---
TYSONS SHUTTLE							
Tysons Shuttle		6:40AM	6:56PM	---	---	---	---

TABLE 11

FAIRFAX COUNTY
SPAN OF SERVICE
(CONTINUED)

ROUTE	DIRECTION	WEEKDAY		SATURDAY		SUNDAY	
		BEGINS	ENDS	BEGINS	ENDS	BEGINS	ENDS
RESTON RIBS							
1-Lake Anne	LOOP	6:50AM	6:45PM	9:30AM	6:05PM	---	---
2-South Lakes	LOOP	6:50AM	6:45PM	9:30AM	6:05PM	---	---
3-Hunter's Woods	LOOP	6:50AM	6:45PM	9:30AM	6:05PM	---	---
4-West Falls Church Express	EB	9:30AM	4:40PM	---	---	---	---
	WB	9:38AM	4:05PM	---	---	---	---

FAIRFAX CONNECTOR FARE STRUCTURE

Route(s)/Category	Fare
101-110, 201-204, 401-403	
Base	$0.50
Seniors and Disabled	0.50
with Metrorail transfers	0.35
301-306, 404	
Base (1 Zone)	1.00
Additional Zones (Peak)	0.35
with Metrorail transfer	0.75
Seniors and Disabled	0.50
with Metrorail transfers	0.35

In addition, Metrobus passes, tokens and commuter tickets may be used on all Fairfax Connector routes. Transfers are issued free when boarding and are worth $0.50 toward a connecting bus fare if issued from Routes 101-110, 201-204 and 401-403. The transfer is worth $1.00 towards a connecting bus fare if issued from Routes 301-306 and 404. Transfers from Routes 101-110, 201-204 and 401-403 are worth $0.50 and those from Routes 301-306 and 404 are worth the full base fare toward regular Metrobus and DASH fares. Metrobus and DASH transfers are worth the base fare on any Fairfax Connector route. However, passengers must pay additional zone charges on Routes 301-306 and 404 if applicable.

The fare structure for the Tysons Shuttle consists of a $0.75 one-way cash charge. Tokens are available that afford a 20 percent discount versus the cash fare. Also, an 11 trip card is available for $6.00. This affords riders a discount in excess of 27 percent.

The RIBS service is priced at different levels for the local loops and express service. As shown below, a premium fare of $0.75 applies to the express service operated to the West Falls Church Metrorail station. Tokens are available for rider convenience and do not afford a discount. Tokens and cash can be combined in payment for RIBS express service. Metrobus transfers are accepted as full payment for local loop service. A RIBS transfer is worth $0.25 towards the applicable Metrobus or RIBS express fare.

RIBS FARE STRUCTURE

Category	Fare
Local Loops	$ 0.25/1 Token
Transfers	Free
Express	0.75/3 Tokens
Tokens (Pack of Four)	1.00

Fleet - Two different vehicle fleets are used to provide the Fairfax County sponsored service. Buses owned by the County are operated from the Newington facility. Vehicles from Newington serve all Fairfax Connector bus lines with the exception of Routes 402-404. The Merrifield facility and vehicles are owned by a private carrier and operate on Fairfax Connector Routes 402-404, and all of the Tysons and RIBS service.

As shown in Table 12, there are 72 buses based at the Newington facility. The fleet is comprised of Orion buses manufactured between 1985 and 1991. Twenty-one of the buses are wheelchair lift equipped. The average age of this fleet is 6.0 years.

There are 15 vehicles maintained at the Merrifield facility. Seven vehicles are wheelchair lift equipped. The fleet is relatively new and averages 2.9 years old.

Washington Metropolitan Area Transit Authority

The Washington Metropolitan Area Transit Authority (WMATA) operates an extensive network of Metrobus service throughout the Northern Virginia region. The various bus lines and route branches are listed in Table 13. Also presented are the service area jurisdictions in which the individual routes operate. In addition, the primary Metrobus operating division where the service is based is identified. There are three operating divisions from which Northern Virginia bus service is operated: Arlington, Four Mile Run and Royal. Individual route timetables are available that contain schedule information and schematic diagrams depicting the streets traversed.

Service Levels - For purposes of this review, the WMATA bus services have been identified as 48 distinct bus lines. It should be noted that some of these bus lines are branches extended from a "trunk" route.

TABLE 12

VEHICLE FLEET -- FAIRFAX COUNTY SERVICES

YEAR	MAKE	LENGTH	NUMBER OF SEATS	NUMBER LIFT EQUIPPED	VEHICLES NUMBER	VEHICLES PERCENT
			Newington Facility			
1985	Orion	35'	38-42	2	33	45.8
1987	Orion	30-35'	31-42	2	17	23.6
1989	Orion	35'	38	5	5	7.0
1990	Orion	35'	34-40	5	10	13.9
1991	Orion	35'	34	7	7	9.7
Total				21	72	100.0
			Merrifield Facility			
1987	Ford/Eldorado	NA	21-25	0	2	13.3
1989	Plymouth	NA	14	0	1	6.7
1989	Ford/Eldorado	NA	25	0	1	6.7
1990	Ford/National	NA	18-25	4	6	40.0
1990	National	NA	29	0	2	13.3
1993	Ford/Eldorado	NA	27	3	3	20.0
Total				7	15	100.0

TABLE 13

WMATA ROUTE DESCRIPTION

ROUTE NUMBER	LINE DESCRIPTION	SERVICE JURISDICTION					PRIMARY DIVISION
		ALEXANDRIA	ARLINGTON	CITY OF FAIRFAX	FAIRFAX COUNTY	FALLS CHURCH	
1B-F,Z	Wilson Blvd.-Fairfax		X	X	X	X	Arlington
2A-C,G	Washington Blvd.		X	X	X	X	Arlington
2W	Vienna-Oakton				X		Arlington
3A-C,E,F	Lee Highway		X		X	X	Arlington
3W,Z	West Park-West Falls Church				X		Arlington
4A,B,E,H.S	Pershing Drive-Arlington Blvd.		X		X		Arlington
5A,B,J	Reston North				X		Arlington
5C,H	Reston South				X		Arlington
5N,P	Reston-Crystal City				X		Arlington
5S	Herndon-West Falls Church				X		Arlington
5W	Dulles Corner				X		Arlington
5Y,Z	Herndon Express				X		Arlington
7A,C,E,F,H,P,W,X	Lincolnia-North Fairlington	X	X		X		Four Mile Run
8S,W,X,Z	Foxchase-Seminary Valley	X					Royal
9A-E	Fort Belvoir-Pentagon	X	X		X		Four Mile Run
10A,E	Hunting Towers-Pentagon	X	X				Royal
10B-D	Alexandria-Arlington	X	X			X	Royal
11P	Alexandria-Nat'l Airport-Pentagon	X	X				Royal
11Y	Mount Vernon Express				X		Royal
12C	Centreville Express				X		Arlington
12E	Centreville SQ.-Park&Ride				X		Arlington
12L,M	Little Rocky Run-Vienna				X		Arlington
12R,S	Sully Station-Vienna				X		Arlington
13A-G	Nat'l Airport-Pentagon-Washington	X	X				Arlington
15K,L	Chain Bridge Road		X	X	X		Arlington
16A-G,J	Columbia Pike	X	X		X		Four Mile Run
16L	Columbia Pike Express	X			X		Four Mile Run
16S,U,W,X	Shirlington-Pentagon		X				Four Mile Run

TABLE 13

WMATA ROUTE DESCRIPTION
(CONTINUED)

ROUTE NUMBER	LINE DESCRIPTION	SERVICE JURISDICTION					PRIMARY DIVISION
		ALEXANDRIA	ARLINGTON	CITY OF FAIRFAX	FAIRFAX COUNTY	FALLS CHURCH	
17A,B,F,M	Kings Park		X	X	X		Four Mile Run
17G,H,K,L	Kings Park Express		X	X	X		Four Mile Run
18A,B,D-F	Springfield	X			X		Royal
18G,H,J,K	Orange Hunt	X			X		Royal
18L,P,R,S	Burke Center	X			X		Royal
20A	Fair Oaks				X		Arlington
20F,G,W,X,Y,Z	Chantilly-Greenbriar				X		Arlington
21A-C,F	Landmark Express	X					Royal
22A,B,F	Walker Chapel-Pentagon		X		X		Arlington
23A-C,T	McLean-Crystal City	X	X		X		Four Mile Run
24M,P	Ballston-Pentagon		X				Arlington
24T	McLean-East Falls Church				X		Arlington
25A,F,G,J,P,R	Ballston-Bradley-Pentagon	X	X		X		Arlington
25B	Landmark-Ballston	X	X		X		Arlington
26G,H	Burke Centre-Dunn Loring				X		Arlington
28A,B	Alexandria-Tysons Corner	X			X	X	Royal
28F,G	Skyline City	X			X		Four Mile Run
29C,E,G,H,X	Annandale				X		Four Mile Run
29K-N	Alexandria-Fairfax	X		X	X		Royal
38B*	Ballston-Farragut SQ.		X				Arlington

* Also serves DC.

On weekdays, WMATA headways for peak period service in the study area range from three to 30 minutes. This represents service on the trunk portion of a route. The actual frequency on a particular branch or outlying segment could be considerably less. During the midday period, most services that operate have 30 minute headways although exceptions are noted. Evening service is provided at frequencies ranging from 20 to 60 minutes with 30 minute service being most common. In some cases, evening service intervals are best described by the number of trips provided (Table 14). Weekend service frequencies are comparable to the headways operated during the midday period on weekdays.

The span of service provided on WMATA bus lines in the study area varies considerably. Many routes operate only during the morning and afternoon peak periods with no service operated during midday hours. For these bus lines, service typically begins between 5:00 AM and 6:00 AM and ends between 8:00 AM and 9:00 AM. Afternoon peak service begins between 3:00 PM and 4:00 PM and generally, ends by 8:00 PM. This reflects service geared to commuters traveling during rush hours. Other Metrobus routes operate a relatively long, continuous span of service. Routes with spans of 19 or more hours are not uncommon.

On both weekend days, the bus lines in service operate relatively lengthy spans. On Saturdays, service generally begins between 5:30 AM and 6:00 AM and ends between 12:30 AM and 1:30 AM. Sunday service spans, with few exceptions, are comparable to those provided on Saturdays.

Fares - The Metrobus fare structure is based on the number of zones through which a rider travels. In addition, there are peak and off peak fare differentials. Senior citizen and disabled riders are offered reduced fares at all times. A Metrobus flash pass is available for a two week period. The cost of a pass is $20.00 for travel in one zone with an additional charge of $7.00 for each additional zone. The Metrobus fare structure for trips to/from the study area is presented in Table 15.

Fleet - The Metrobus fleet used to serve the Northern Virginia routes consists of 382 buses of different model years and manufacturers. A fleet of 321 buses is necessary to meet peak period vehicle requirements. There are 159 buses based at the Arlington facility, 138 at Four Mile Run and 85 at Royal. The fleet is relatively old and averages 14.5 years of age. Nearly 40 percent of the fleet or 161 buses are wheelchair lift equipped. The Arlington facility is being converted to an annex and will have a capacity of only 60

TABLE 14

WMATA ROUTE HEADWAYS

ROUTE NUMBER	WEEKDAY AM PEAK	WEEKDAY MIDDAY	WEEKDAY PM PEAK	NIGHT	SATURDAY	SUNDAY
1B-F,Z	10	30	20	30	30	30
2A-C,G	20	30	20	30	30	30
2W	30	-	30	-	-	-
3A-C,E,F	15	30	15	30	30	30
3W,Z	30	-	30	-	-	-
4A,B,E,H.S	15	25	10	20	60	60
5A,B,J	10	-	10	-	-	-
5C,H	10	-	10	-	-	-
5N,P	25	-	30	-	-	-
5S	30	60	30	60	60	60
5W	30	-	30	-	-	-
5Y,Z	20	-	20	-	-	-
7A,C,E,F,H,P,W,X	3	30	3	30	30	60
8S,W,X,Z	6	-	5	-	-	-
9A-E	10	30	20	30	30	30
10A,E	10	30	10	30	30	60
10B-D	30	30	30	30	30	60
11P	30	-	30	2 trip	-	-
11Y	30	-	30	-	-	-
12C	30	-	30	-	-	-
12E	25	-	25	-	-	-
12L,M	30	-	30	-	-	-
12R,S	20	-	20	-	-	-
13A-G	8	-	-	60	30	60
15K,L	30	-	30	-	-	-
16A-G,J	5	15	5	30	40/20	60/30
16L	30	-	30	-	-	-
16S,U,W,X	10	-	10	30	-	-
17A,B,F,M	20	60	20	30	-	-
17G,H,K,L	6	-	6	-	-	-
18A,B,F	20	-	20	60	-	-
18G,H,J,K	8	-	5	-	-	-
18L,P,R	15	-	8	2 trip	-	-
20A	25	-	25	-	-	-
20F,G,W,X,Y,Z	12	-	25	2 trip	-	-
21A-C,F	9	-	7	-	-	-
22A,B,F	20	30	20	30	-	-

TABLE 14

WMATA ROUTE HEADWAYS
(CONTINUED)

ROUTE NUMBER	WEEKDAY AM PEAK	WEEKDAY MIDDAY	WEEKDAY PM PEAK	NIGHT	SATURDAY	SUNDAY
23A-C,T	15	-	15	-	30	60
24M,P	20	60	20	60	-	-
24T	30	-	35	-	-	-
25A,F,G,J,P,R	15	60	12	60	60	60
25B	60	-	60	60	-	-
26G,H	30	-	30	-	-	-
28A,B	30	30	30	30	-	-
28F,G	25	-	20	-	-	-
29C,E,G,H,X	5	-	6	-	-	-
29K-N	30	30	30	30	60	-
38B	20	-	22	60	30	30

TABLE 15

METROBUS FARE STRUCTURE

	PEAK HOUR FARE ($)		OFF PEAK FARE ($)	
	CASH	W/RAIL TRANSFER	CASH	W/RAIL TRANSFER
Virginia Single Zone	1.00	0.75	1.00	0.75
Virginia Between				
VA Zones G and 1-ARL	1.00	0.75	1.00	0.75
VA Zones G and 1-ALEX	1.35	1.10	1.00	0.75
VA Zones G and 2	1.70	1.45	1.00	0.75
VA Zones G and 3	2.05	1.80	1.00	0.75
VA Zones 1 and 2	1.35	1.10	1.00	0.75
VA Zones 1 and 3	1.70	1.45	1.00	0.75
VA Zones 2 and 3	1.35	1.10	1.00	0.75
DC to VA Zone G	1.35	0.35	1.35	0.35
VA Zone G to DC	1.35	1.10	1.35	1.10
DC to VA Zone 1-ARL	1.35	0.35	1.35	0.35
VA Zone 1-ARL to DC	1.35	1.10	1.35	1.10
DC to VA Zone 1-ALEX	1.70	0.70	1.35	0.35
VA Zone 1-ALEX to DC	1.70	1.45	1.35	1.10
DC to VA Zone 2	2.05	1.05	1.35	0.35
VA Zone 2 to DC	2.05	1.80	1.35	1.10
DC to VA Zone 3	2.40	1.40	1.35	0.35
VA Zone 3 to DC	2.40	2.15	1.35	1.10
Seniors/Disabled*				
Within VA	0.50	0.35		
DC to VA	0.50	0.15		
VA to DC	0.50	0.50		
Surcharges**				
Routes 5N,5P	0.50			
Route 11Y	0.75			
Special North VA Fares				
Routes 2P,W,X 3W,Z, 5S 12C,E,L,M,R, 20A,F,G,W X,Y,Z 24T 26G,H	0.50			
Routes 5A,J,W,Y,Z	0.75			

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* Senior and Disabled fares apply at all times.

** Surcharges are in addition to regular cash fare.

buses. The remaining buses will be reassigned to Four Mile Run. Further, with the planned takeover of the Reston/Herndon service by Fairfax County, the total WMATA fleet requirement in Northern Virginia will be reduced by about 45 buses.

Operating Statistics and Financial Performance

As noted previously, there are seven distinct operations that comprise the Northern Virginia bus network. Table 16 presents the operating statistics experienced during FY 1993. As indicated in the tabulation, WMATA provides the overwhelming majority of service. During FY 1993, WMATA operated nearly 13 million miles of service in the study area. This is more than six times the number of miles operated by the next largest (i.e., Fairfax Connector) service provider. Similar results are exhibited if the relationship of WMATA's operation to all service in the study area is quantified on the basis of vehicle hours or peak vehicle requirements.

Cost information from the various carriers was collected to determine results for different unit cost and productivity measures. For most of the systems, the information was obtained from the contracting agency (i.e., city or county). The Fairfax County contract with ATE is based on a fixed price at specified service levels. The County's contract with TMSI is based on hours of service provided at an hourly rate. Arlington Trolley, CUE and DASH information was obtained from budget summaries. The costs associated with WMATA operations in the study area were taken from the NVTC Subsidy Allocation Model for FY 1993, which is based on WMATA's adopted budget.

In terms of financial performance there is a relatively wide range of results among the seven operators as seen in Table 17. This range reflects the major differences in services provided, areas served, vehicles utilized and fares charged which among other factors make each service unique. What does stand out is that the WMATA total cost per hour, per mile and per peak vehicle is much higher than similar cost measures for the other carriers.

The farebox recovery rate or proportions of operating cost covered by revenue varies among the operators and depends on specific local policies in areas such as fare structure. Therefore, any direct comparison among operators must take into account the variations in local policies. These local policies are evident in the wide range of farebox recovery rates, from a low of about nine percent for RIBS to a high of nearly 50 percent for DASH.

TABLE 16

FY 1993 BUS OPERATING STATISTICS

	PLATFORM HOURS	PLATFORM MILES	PEAK BUSES	PASSENGERS	OPERATING REVENUE	OPERATING COST
Alexandria						
DASH	68,028	918,738	25	1,988,910	1,403,935	2,893,590
Arlington County						
Arlington Trolley	6,017	52,400	2	153,307	47,331	234,272
City of Fairfax						
CUE	35,022	478,926	8	780,000	479,000	1,428,400
Fairfax County						
Fairfax Connector*	130,530	2,121,940	53	2,651,742	1,448,540	5,460,200
RIBS	12,790	146,741	4	151,515	44,745	510,267**
Tysons Shuttle	2,883	56,121	2	81,868	45,040	98,010**
WMATA						
Northern VA Routes	805,276	12,977,279	321	21,026,268	17,840,711	72,920,903***

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* Newington facility only, Merrifield initiated during FY 1994. Cost includes all County staff support.

** Cost includes allocation for capital expenditures.

*** Cost includes $48,484,361 variable and $24,436,542 fixed expenses.

TABLE 17

FY 1993 FINANCIAL COMPARISON
(ALL AMOUNTS IN DOLLARS)

	COST PER HOUR	COST PER MILE	COST PER PEAK BUS	FAREBOX RECOVERY (PERCENT)
Alexandria				
DASH	42.54	3.15	115,744	48.52
Arlington County				
Arlington Trolley	38.94	4.47	117,136	20.20
City of Fairfax				
CUE	42.49	3.11	186,028	32.19
Fairfax County				
Fairfax Connector	41.83	2.57	103,023	26.53
RIBS	39.90	3.48	127,567	8.77
Tysons Shuttle	34.00	1.75	49,005	45.95
WMATA				
Northern VA Routes				
Variable Cost	60.21	3.74	153,919	36.80
Total Cost	90.55	5.62	231,495	24.47

Productivity values were computed on the basis of the three key operating statistics (i.e., hours, miles and peak vehicles). As shown in Table 18, productivity measures also range widely among the seven operators. This range reflects the major differences in services provided, areas served and fares charged.

Other Transit Services

In addition to those described above, other transit services are provided within the study area. This includes bus and rail operations. Each is described below.

Mantua Commuter Bus Service - Service linking this Fairfax County community with Washington, DC is provided by TMSI. The local citizens association has entered into a contract with TMSI to provide four one-way trips each weekday -- two during both the morning and afternoon peak periods. During FY 1993, approximately 2,050 hours of service were provided and more than 45,600 miles operated. More than 19,300 trips were made. The service is priced by TMSI on a per trip basis and is paid for by the citizens association and County subsidy. During FY 1993, the County contributed $87,905 towards its operation.

Virginia Railway Express - There are two Express rail lines that operate through the study area linking points within Virginia with Washington, DC (L'Enfant Plaza and Union Station). Both the Manassas and Fredericksburg lines now serve the City of Alexandria (King Street) and Arlington County (Crystal City) and by 1995 stations will be completed in Fairfax County on the Fredericksburg line to join those already in service on the Manassas line. Service is operated weekdays during peak travel periods. No weekend service is provided.

WMATA Metrorail - WMATA operates three Metrorail lines in the Northern Virginia region. The Orange line operates between Fairfax County (i.e., Vienna station) and Washington, DC with intermediate stops at other Fairfax and Arlington County stations. The Blue line operates between Fairfax County (i.e., Van Dorn Street station) and DC serving additional communities in the City of Alexandria and Arlington County. The Yellow line extends from Huntington station in Fairfax County to DC also serving the City of Alexandria and Arlington County.

TABLE 18

FY 1993 PRODUCTIVITY COMPARISON

	PASSENGERS PER HOUR	PASSENGERS PER MILE	PASSENGERS PER PEAK BUS
Alexandria			
DASH	29.24	2.17	79,556
Arlington County			
Arlington Trolley	25.48	2.93	76,654
City of Fairfax			
CUE	23.27	1.70	101,875
Fairfax County			
Fairfax Connector	20.32	1.25	50,033
RIBS	11.85	1.03	37,879
Tysons Shuttle	28.40	1.46	40,934
WMATA			
Northern VA Routes	26.11	1.62	66,750

On weekdays, service is operated between the hours of 5:30 AM and midnight. Weekend service begins at 8:00 AM and ends at midnight. There are no published timetables for weekday service, which operates on about six and 12 minute headways for peak and off-peak periods, respectively. Weekend service times are published with service operated about every 16 minutes.

All fares are paid utilizing a farecard. Fares are based on the time of day (i.e., peak versus off peak) and distance traveled.

Summary

The previous discussion provides an overview of the different public transportation services available to Northern Virginia residents. This background information is useful in that it provides an understanding of the existing supply of public bus service throughout the study area and is used as a base line in developing service improvement proposals.

CHAPTER 5

TRANSIT FACILITY REVIEW AND FLEET COMPOSITION

There are five primary bus garages in Northern Virginia where buses are stored and maintained. Alexandria has a facility for their DASH operation, Fairfax County has a facility for its Fairfax Connector service and WMATA has three garages for its Northern Virginia Metrobus service. The size and condition of these facilities as well as any known plans for future facility changes are included in this section. Much of the information for this review was obtained through visits to each site during the Fall of 1993.

The City of Fairfax Public Works facility is utilized for the CUE service and is not included in this review. The Merrifield facility owned by TMSI (the operator of the Tysons Shuttle, Reston services, Mantua Commuter bus as well as four Connector routes), which houses 15 buses and vans is likewise excluded from the review. The facility associated with the three Arlington County trolley buses is also excluded.

This chapter also presents a review of the various operator/sponsor subfleets which comprise the overall bus system fleet in Northern Virginia. The vehicle complements of the different operators/sponsors are described in terms of manufacturer, year and number of buses. Each of the different fleets is presented in Table 19 and described below.

Arlington County

The County has a total of three, 1990 Boyertown buses. These vehicles are replicas of vintage trolleys. Two vehicles are required for peak period service. The average age of the fleet is 3.0 years. All of the vehicles are wheelchair lift equipped.

City of Alexandria

The service is operated from a facility located on South Quarker Lane in the City of Alexandria. The facility was a warehouse that was converted to a transit complex in 1990. The facility is located in an industrial area in the south central portion of the City. It is well located with respect to the area in the City of Alexandria that buses assigned there serve.

TABLE 19

NORTHERN VIRGINIA FLEET COMPOSITION

	NUMBER	YEAR	MANUFACTURER	SIZE (FEET)	LIFT EQUIPPED
Arlington					
	3	1990	Boyertown	35	Yes
Alexandria					
	17	1984	Orion	30	No
	2	1986	Orion	35	Yes
	14	1990	Orion	35	Yes
Total	33				
Fairfax City					
	5	1985	Orion	30	No
	1	1986	Orion	30	No
	5	1990	Orion	30	No
Total	11				
Fairfax County					
Newington					
	31	1985	Orion	35	No
	2	1985	Orion	35	Yes
	15	1987	Orion	30-35	No
	2	1987	Orion	30-35	Yes
	5	1989	Orion	35	Yes
	5	1990	Orion	35	No
	5	1990	Orion	35	Yes
	7	1991	Orion	35	Yes
Total	72				
Merrifield					
	2	1987	Ford Eldorado	NA	No
	1	1989	Plymouth	NA	No
	1	1989	Ford Eldorado	NA	No
	2	1990	Ford National	NA	No
	4	1990	Ford National	NA	Yes
	2	1990	National RE	NA	No
	3	1993	Ford National	NA	Yes
Total	15				

TABLE 19

NORTHERN VIRGINIA FLEET COMPOSITION
(CONTINUED)

	NUMBER	YEAR	MANUFACTURER	SIZE (FEET)	LIFT EQUIPPED
Royal					
	1	1971	GMC	40	No
	44	1978	Flxible	40	No
	14	1978	Flxible	40	Yes
	1	1989	Flxible	30	Yes
	6	1990	Flxible	40	No
	19	1990	Flxible	40	Yes
Total	86				
WMATA Composite For Three Facilities					
	2	1961	GMC	35	No
	10	1962	GMC	40	No
	4	1962	GMC	35	No
	3	1963	GMC	40	No
	12	1964	GMC	40	No
	6	1965	GMC	40	No
	1	1965	GMC	35	No
	22	1966	GMC	40	No
	2	1967	GMC	40	No
	11	1968	GMC	40	No
	4	1969	GMC	40	No
	8	1971	GMC	40	No
	39	1972	GMC	40	No
	12	1973	GMC	40	No
	11	1978	Flxible	40	No
	25	1978	Flxible	40	Yes
	44	1978	Flxible	40	No
	23	1978	Flxible	40	Yes
	5	1986	Flxible	40	No
	11	1986	Flxible	40	Yes
	18	1987	Flxible	40	No
	27	1987	Flxible	40	Yes
	10	1988	Flxible	40	Yes
	9	1989	Flxible	30	Yes
	18	1990	Flxible	35	Yes
	7	1990	Flxible	40	No
	19	1990	Flxible	40	Yes
	19	1992	Orion	40	Yes
Total	382				

TABLE 19

NORTHERN VIRGINIA FLEET COMPOSITION
(CONTINUED)

	NUMBER	YEAR	MANUFACTURER	SIZE (FEET)	LIFT EQUIPPED
WMATA					
Arlington					
	2	1961	GMC	35	No
	4	1962	GMC	35	No
	3	1963	GMC	40	No
	11	1964	GMC	40	No
	6	1965	GMC	40	No
	1	1965	GMC	35	No
	14	1966	GMC	40	No
	2	1967	GMC	40	No
	1	1968	GMC	40	No
	2	1969	GMC	40	No
	16	1972	GMC	40	No
	12	1973	GMC	40	No
	11	1978	Flxible	40	No
	25	1978	Flxible	40	Yes
	5	1986	Flxible	40	No
	18	1987	Flxible	40	No
	8	1989	Flxible	30	Yes
	18	1990	Flxible	35	Yes
Total	159				
Four Mile					
	10	1962	GMC	40	No
	1	1964	GMC	40	No
	8	1966	GMC	40	No
	10	1968	GMC	40	No
	2	1969	GMC	40	No
	7	1971	GMC	40	No
	23	1972	GMC	40	No
	9	1978	Flxible	40	Yes
	11	1986	Flxible	40	Yes
	27	1987	Flxible	40	Yes
	10	1988	Flxible	40	Yes
	1	1990	Flxible	40	No
	19	1992	Orion	40	Yes
Total	138				

The site contains one large building which houses the offices, vehicle maintenance function, vehicle servicing and provides indoor storage for 19 buses. The other 14 buses are stored outside in the front of the building in assigned spaces. Automobile parking for drivers and other staff is primarily off-site.

Offices, dispatch area and a drivers' room are located in a two story section within the complex.

A bus enters the facility after completion of scheduled service for daily servicing activities including removal of revenue from the farebox, fueling, checking of fluids, interior cleaning and exterior washing. Exterior washing is accomplished with a gantry type automatic bus washer. The bus is parked in the wash bay and the washing unit moves along and over the bus. The bus is then driven to the assigned parking location.

The maintenance area of the facility includes three repair bays with two equipped with an in-ground bus lift and one flat bay that makes use of a portable bus lift. The "rule of thumb" of one repair bay per ten assigned buses is just about met with three repair bays for 33 buses. There is a parts storage room as well as a caged area for storage of bulky parts and tires. Necessary shop and garage equipment is located near the repair bays.

The current facility and site are in relatively good condition. However, with 33 assigned buses, the current facility is at capacity and requires excessive staff time to fit all the buses into the complex. Further, the site is deficient in that it cannot accommodate automobile parking for drivers and other employees on-site.

The City is currently reviewing locations to relocate DASH operations into a larger facility. One possibility for expansion would be to obtain the vacant land to the south of the site. This land could be utilized for either a new building or for outside bus storage and automobile parking. This would relieve the crowded condition within the existing complex and possibly free-up some space to expand the vehicle maintenance work area.

The DASH system has a fleet of 33 Orion buses. A total of 25 buses is necessary to meet peak vehicle requirements. The average age of the fleet is 5.9 years. Seventeen 17 of the 1984 buses are 30 feet long and provide seats for 31 passengers. The remaining 16 buses were built in 1986 and 1991, are 35 feet long and provide seats for 42

passengers. The 16 larger buses are equipped with wheelchair lifts.

City of Fairfax

The CUE fleet is comprised of 11 Orion buses manufactured between 1985 and 1990. The buses are 30 feet long and provide seats for 31 passengers. None of the buses are wheelchair lift equipped. Peak service needs require the operation of eight buses. The average fleet age is 5.6 years.

Fairfax County

The majority of the Fairfax County Connector services are operated from a facility along Cinder Bed Road in Newington. The facility was built in 1988 specifically for the Connector services. The facility is located in a developing suburban area about one mile east of I-95 in the southern portion of the County. It is well located with respect to the area in the southern portion of Fairfax County that buses assigned there serve.

The site contains one large building which houses the offices, vehicle maintenance and vehicle servicing functions. The assigned 72 buses are stored outside behind the building in designated spaces. Automobile parking for drivers and other staff is provided on-site.

Offices, dispatch area and a drivers' room are located in the front of the building.

Buses enter the facility after completion of scheduled service for daily servicing activities including removal of revenue from the farebox, fueling, checking of fluids, interior cleaning and exterior washing. Exterior washing is accomplished with a drive-through automatic bus washer. The bus is driven slowly through the bus washer by the service worker. The bus is then driven to the assigned parking location. Each parking stall is equipped with an electrical outlet for providing power to the engine block heaters. These heaters permit the engine to be warmed on cold nights in order to facilitate starting.

The maintenance area of the facility includes seven repair bays with six equipped with an in-ground bus lift and one flat bay. The "rule of thumb" of one repair bay per ten assigned buses is just about met with seven repair bays for 72 buses. There is a parts storage room as well as another

room for storage of bulky parts and tires. Necessary shop and garage equipment is located in a machine shop room.

The current facility is relatively new and is in very good condition. The complex was designed for about 75 buses. Some minor expansion (five to ten more buses) is possible without any major facility changes. Beyond a minor expansion, the facility and site would be overcrowded.

The Newington facility is the base of operations for all but two of the Fairfax Connector routes. A fleet of 72 Orion buses is stored at this site. There is a peak vehicle requirement of 59 buses. Most of the fleet are 35 feet long and provide seats for 34 to 42 passengers. Twenty-one of the vehicles are wheelchair lift equipped. The age of the County fleet housed at the Newington facility operated by ATE averages 6.0 years.

There are three County-owned and 12 operator-owned (i.e., TMSI) vehicles at the Merrifield facility. The RIBS, and Tysons Shuttle services as well as two Fairfax Connector routes are operated out of this base. The buses are mostly "body-on-chassis" vehicles that are 20 to 30 feet long and provide seats for 14 to 29 passengers. Seven of the 15 vehicles are equipped with wheelchair lifts. A total of ten vehicles is required to meet peak service requirements. The average age of the fleet housed at Merrifield is 2.9 years.

Washington Metropolitan Area Transit Authority

WMATA operates from three bus garages in Northern Virginia. Each garage is a self sufficient operating base with vehicle servicing and light maintenance capability. For heavy maintenance such as engine/transmission overhauls and body/painting work, the buses are shipped to the WMATA Bladensburg garage.

A unique feature of the WMATA garages in Northern Virginia is that all weekend service is operated only from the Four Mile Run garage. The other two garages, Arlington and Royal Street, are closed on weekends.

As shown in Figure 24, the WMATA bus garages are located toward the eastern boundary of the service area which requires a considerable amount of deadhead travel between the starting and ending points of many routes. Data from the September 1993 schedules were reviewed to determine the extent of deadhead travel. It was determined that for a typical weekday, deadhead travel, in terms of vehicle miles, is similar by operating garage, as shown below:

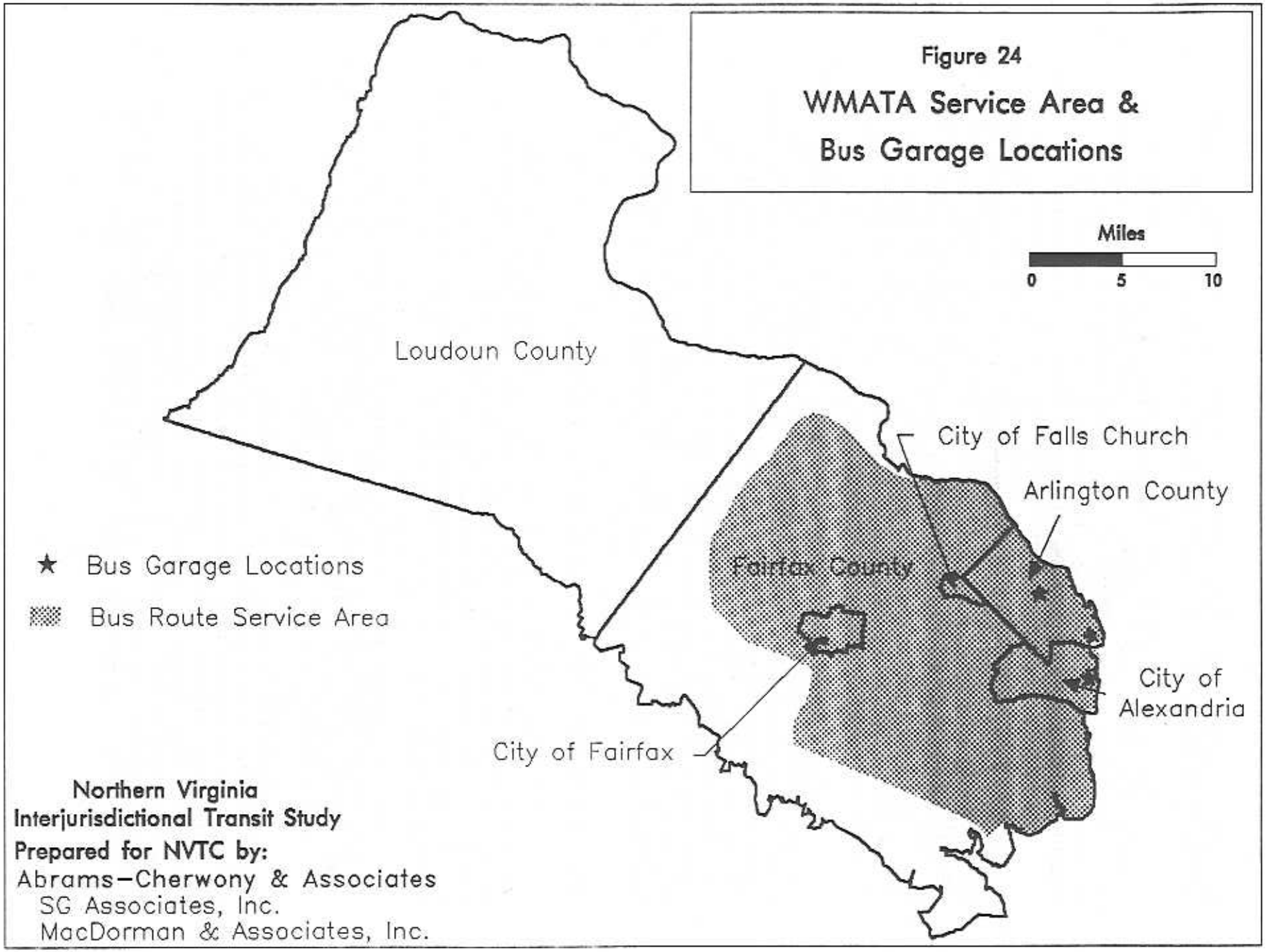


Figure 24
WMATA Service Area &
Bus Garage Locations
Miles
0
5
10
Loudoun County
City of Falls Church
Arlington County
Fairfax County
City of
Alexandria
City of Fairfax
★ Bus Garage Locations
Bus Route Service Area
Northern Virginia
Interjurisdictional Transit Study
Prepared for NVTC by:
Abrams–Cherwony & Associates
SG Associates, Inc.
MacDorman & Associates, Inc.

WEEKDAY DEADHEAD TRAVEL

Garage	Percent Deadhead
Arlington	24.8
Four Mile Run	25.3
Royal Street	25.9
AVERAGE	25.2

Overall, deadhead miles represent over one-quarter of total miles which is high compared with other systems, which generally are in the five to ten percent range.

The fleet operated by WMATA consists of a mix of GMC, Flxible and Orion buses with varying years of manufacture. The average age of the bus fleets at the three facilities is 16.6, 14.0 and 11.4 for Arlington, Four Mile Run and Royal, respectively. The average age of the composite fleet is 14.5 years. This is a relatively aged fleet.

Most of the buses are 35 or 40 feet in length. The 35 foot buses typically have seats for 35 to 42 passengers. The 40 buses have seats for 45 to 53 passengers. Arlington has eight smaller buses that are 30 feet long and have seats for 31 passengers. Royal Street only has one of the 30 foot buses while none are located at Four Mile Run.

Of the 382 WMATA buses assigned to Northern Virginia, 161 or over 40 percent are equipped with wheelchair lifts.

Arlington - The Arlington garage is located at the intersection of Randolph Street and Wilson Boulevard in Arlington County. The facility is a purpose built transit garage completed sometime during the 1940's. The facility is located in a developing urban area near the Ballston Metrorail station.

The Arlington facility is the western most bus facility operated by WMATA. It is well situated for the routes its buses serve within Arlington County. However, most of the service area of the buses assigned to this facility are west of the facility in Fairfax County. In fact, many of its buses serve areas well over 20 miles from the facility (e.g., Herndon, Chantilly and Centreville).

Based on bus assignments at December 27, 1992, there were 159 buses assigned to the facility with 151 buses needed

for peak service. At that time, it was the largest facility in terms of number of assigned buses, primarily due to its being the western most facility and closest to the service area. However, it is not the largest complex in terms of site or building size. Four Mile Run garage is a larger complex.

The current facility and site are crowded and are at or even beyond capacity with 159 assigned buses. There is limited, if any, additional room on the site for storage of buses. In fact, the site is being reduced in size. Arlington County owns part of the site which it leases to WMATA. A street north of the site is being extended through the site. The extension of North Quincy Street will reduce the capacity of the complex to about 60 buses. Further, as part of the consolidation, certain facility improvements are planned for the garage. Finally, the reduction from 159 to 60 vehicles will be handled by an expansion of the Four Mile Run garage.

Four Mile Run - The Four Mile Run garage is located at the intersection of Glebe Road and Jefferson Davis Highway (U.S. 1) in the south east corner of Arlington County near the border with the City of Alexandria. The complex is in two sections on either side of Glebe Road. The main complex is north of Glebe Road and contains a purpose built transit garage which was rehabilitated in 1975. The area south of Glebe Road is relatively new and is utilized for bus storage and auto parking. The complex is located in an industrial area.

The Four Mile Run facility is the newest and largest bus facility in Northern Virginia operated by WMATA. The service area of the buses assigned to this facility are mostly west and south of the facility in Fairfax County. In fact, many of its buses serve areas well over 10 miles from the facility (e.g., Burke Centre and Fort Belvoir).

Based on bus assignments as of December 27, 1992, there were 138 buses assigned to the facility, 106 of these buses are needed for peak service.

The site north of Glebe Road contains two buildings. The main building houses the offices and vehicle maintenance function. A smaller building houses the vehicle servicing function. An addition is being made to this building to provide for some indoor bus storage. Some bus storage is provided outside on this section of the complex. The remainder of the outside bus storage is accommodated in the section of the complex south of Glebe Road. Auto parking is

available on this section of the site for drivers and other employees.

Offices, dispatch area and a drivers' room are located in a two story area within the main building.

A bus enters the complex off of Glebe Road after completion of scheduled service for daily servicing activities. At the first stage, the farebox is probed for fare data and the revenue is removed at an outside station at one corner of the main building. The bus is then moved to the service building for fueling, checking of fluids, replenishing fluids and interior cleaning using a cyclone cleaner. There are two service lines within this building. Next, the bus is driven to the next stage which is the exterior wash using a drive-thru automatic bus washer. Each service lane contains a bus washer. The bus is than driven to an assigned parking location either on this site or across Glebe Road.

The maintenance area of the facility contains 15 repair bays with 12 equipped with an in-ground bus lift. Several sets of portable bus lifts are also available. The "rule of thumb" of one repair bay per ten assigned buses is met at this facility with 15 bays for 138 buses. There is a parts storage room as well as caged areas for storage of bulky parts, mechanics tools and tires. Necessary shop and garage equipment is located near the repair bays.

The current facility and site are sufficiently sized to accommodate additional buses. In fact, we have been told that the complex is designed to handle 275 buses. This may be true in terms of site size. However, the vehicle maintenance and servicing areas would be undersized to handle 275 buses.

Royal Street - The Royal Street garage is located within an entire block bounded by Royal, Wythe, Pitt and Pendleton Streets in the City of Alexandria. The facility is a purpose built transit garage completed sometime during the 1940's. The facility is located in a residential urban area near Old Town in Alexandria.

The Royal Street facility is the smallest bus garage complex in Northern Virginia. It is well situated for the routes its buses serve within the City of Alexandria. However, much of the service area of the buses assigned to this facility is located west of the facility in Fairfax County.

Based on bus assignments as of December 27, 1992, there were 85 buses assigned to the facility with 64 buses needed for peak service.

The site contains two buildings. The main building houses the offices, vehicle maintenance function, portions of vehicle servicing and provides for most indoor bus storage. Auto parking is only available off-site at metered spaces for drivers and other employees. The smaller building is utilized primarily for storage of bulk fluids.

Offices, dispatch area and a drivers' room are located in a two story area within the main building.

A bus enter the complex off of Pendleton Street after completion of scheduled service for daily servicing activities. At the first stage, the bus pulls up to the smaller building where the farebox is probed for fare data and the revenue removed. The service worker drives the bus along the smaller building to stage two where it is fueled, fluids are checked and replenished, if necessary, and the interior is cleaned utilizing a cyclone cleaner. Next, the bus is driven into the main facility and through a drive-through automatic bus washer. Only one bus washer is available. The bus is then driven to an assigned parking location inside the building.

The maintenance area of the facility includes eight repair bays with six equipped with an in-ground bus lift and one equipped with a brake tester. The "rule of thumb" of one repair bay per ten assigned buses is just about met at this facility, which has eight bays for 85 buses. There is a parts storage room as well as areas for storage of bulky parts, mechanics tools and tires. Necessary shop and garage equipment is located near the repair bays.

The facility is showing signs of age and is not well laid-out as an efficient bus operating base.

The current facility and site are crowded and are at or even beyond capacity with 85 assigned buses. There is limited, if any, additional room on the site for storage of buses.

Another consideration for this site is the fact that the City of Alexandria has indicated a desire that the complex be demolished and utilized for other non transit purposes. The feeling is that the Royal Street bus garage clashes with the surrounding residential land use. Further, the lack of on-site parking at the garage puts a strain on

available on-street parking that is taken up by drivers and other employees.

Other Considerations

There are two additional points to be considered in the bus garage analysis.

First, Fairfax County is planning to substitute its own Fairfax Connector service for the current WMATA services operating in the Dulles/Reston/Herndon area. This service consists of all Route 5 service provided by WMATA and would involve 38 peak period buses. Bids have been solicited and received from private carriers to provide the service and a contract awarded by the County to ATE Management and Services Company, Inc. ATE will have to obtain their own facility as well as buses to provide the service by the time service begins in September 1994. WMATA currently operates the Route 5 services from their Arlington garage. Deadhead travel, in terms of vehicle miles, for Route 5 weekday service operated by WMATA is substantial and represents nearly 40 percent of total miles operated on the route.

Second, WMATA has a parcel of land in the Springfield area of Fairfax County at Backlick Road and Industrial Drive. This parcel was obtained for a future bus garage. It contains over nine acres of vacant land of which a portion is in the floodplain. A disposal plan recommending sale of the property was proposed. However, with the downsizing of the Arlington garage, the recommendation was deferred pending resolution of the requirement to relocate portions of the Arlington operation. The land at the future Franconia Springfield Metrorail station also had provisions for a bus garage facility. However, it is not likely that this site will be utilized for a bus garage facility.

CHAPTER 6

ALLOCATION OF METROBUS FINANCIAL RESOURCES

The Washington Metropolitan Area Transit Authority (WMATA) provides Metrobus and Metrorail service in the Washington metropolitan area. In addition to passenger revenue that goes toward paying for the cost of WMATA's services, each of the jurisdictions which receives service provides operating assistance since fare revenues do not cover operating costs. Also, each of the jurisdictions receiving service provides funding to support capital expenditures. Federal and State operating assistance and NVTC gas tax funds are utilized to reduce the local financial burden.

A process for allocating costs and revenues of Metrobus service provided to jurisdictions has been in place for about two decades. The agreed-upon methods and procedures used to distribute costs, apportion revenues, and share operating assistance to various jurisdictions in the Metrobus service area are well-documented. This section of the report briefly reviews the allocation procedures and their application in Northern Virginia since FY88.

Operating Cost Allocation Process

Every scheduled Metrobus trip is assigned a dedication code which is used to allocate Metrobus operating costs and revenues. The operating costs of Metrobus are assigned to one of three categories, i.e., mileage-related, hourly-related, or fixed. The operating cost elements assigned to each category are as follows:

- Mileage-related costs - include revenue vehicle mechanic wages and overtime, current year expenses for workers' compensation for operators and third party claims, general liability insurance, and all revenue vehicle costs for diesel fuel, tire rental, and parts.

- Hourly-related costs - are primarily operator wages and related fringe benefits plus workers' compensation for all personnel other than bus operators.

- Fixed costs - include all expenses for overhead, operator training and utility payhours, wages for service vehicle mechanics, general insurance premiums, security, safety, revenue collection, scheduling, residual liabilities, and all supervisory costs except lead mechanic wages and a portion of the salary for the garage shift supervisor.

All Metrobus mileage- and hourly-related costs are allocated to jurisdictions in proportion to their respective share of the platform miles and hours incurred for service. All Metrobus fixed costs are allocated to the District of Columbia, Maryland, and Virginia in proportion to the number of peak period buses used in those jurisdictions in FY75. The FY75 peak vehicle count was selected since it represented an all-bus system and predated Metrorail. In Virginia, annual fixed costs are a constant 29.2188 percent of total Metrobus fixed costs each year. The amount of Virginia fixed cost which is allocated to each Northern Virginia jurisdiction (cities and counties) by NVTC is then based on the proportion that variable (mileage-related and hourly-related) costs within each jurisdiction are to total Virginia variable costs.

Total FY93 Metrobus operating costs, comprised of variable and fixed costs, have increased about 23 percent in northern Virginia since FY88. During the same period, variable costs, i.e., mileage- and hourly-related costs, increased about 22 percent while fixed costs increased 25 percent (Table 20). The adopted FY94 budget shows the variable costs declining to 14 percent more than FY88 variable costs and fixed costs increasing to 39 percent more than FY88 fixed costs. During this period, the amount of platform hours of service operated by Metrobus in Northern Virginia declined from about 834,000 hours to about 786,000 hours, or by nearly six percent.

Fare Revenue Allocation Process

Jurisdictions are entitled to all or a portion of the fare revenues collected on Metrobus routes for which costs are incurred. Metrobus fare revenue from interstate non-dedicated service is allocated to each state on the basis of passenger miles in each state. Within Virginia, fare revenues are either (1) dedicated to one jurisdiction, (2) assigned to the boarding jurisdiction, (3) assigned to the alighting jurisdiction, or (4) jointly dedicated to two or more jurisdictions. Virginia-based flash pass revenues are assigned to Virginia. Interstate pass revenues are

TABLE 20

Operating Costs
Northern Virginia Metrobus

	Alexandria	Arlington	City of Fairfax	Fairfax County	Falls Church	NVTC	Northern Virginia Total	Northern Virginia Index
Variable Cost								
FY88	$7,197,114	$9,325,992	$95,682	$22,613,703	$465,262	$66,397	$39,697,753	100.0
FY89	$7,604,907	$10,075,355	$107,167	$24,683,397	$476,376	$68,505	$42,947,202	108.2
FY90	$8,189,600	$10,345,648	$0	$27,201,978	$502,664	$80,372	$46,239,890	116.5
FY91	$8,247,923	$10,185,937	$0	$27,086,940	$508,107	$68,198	$46,028,907	115.9
FY92	$9,443,529	$11,142,568	$0	$29,007,560	$565,451	$70,432	$50,159,108	126.4
FY93	$8,498,390	$11,465,372	$0	$27,951,123	$569,475	$0	$48,484,360	122.1
FY94	$7,910,602	$11,054,920	$0	$25,910,447	$555,005	$0	$45,430,974	114.4
Fixed Cost								
FY88	$3,533,370	$4,578,527	$46,975	$11,102,031	$228,417	$0	$19,489,320	100.0
FY89	$3,859,598	$5,113,386	$54,389	$12,527,175	$241,768	$0	$21,796,316	111.8
FY90	$3,661,135	$4,624,989	$0	$12,160,558	$224,714	$0	$20,671,396	106.1
FY91	$3,779,843	$4,667,992	$0	$12,413,353	$232,854	$0	$21,094,042	108.2
FY92	$4,506,533	$5,317,328	$0	$13,842,655	$269,838	$0	$23,936,354	122.8
FY93	$4,283,263	$5,778,648	$0	$14,087,610	$287,020	$0	$24,436,541	125.4
FY94	$4,716,857	$6,591,720	$0	$15,449,630	$330,933	$0	$27,089,140	139.0
Total Operating Cost								
FY88	$10,730,484	$13,904,519	$142,657	$33,715,734	$693,679	$66,397	$59,187,073	100.0
FY89	$11,464,505	$15,188,741	$161,556	$37,210,572	$718,144	$68,505	$64,743,518	109.4
FY90	$11,850,735	$14,970,637	$0	$39,362,536	$727,378	$80,372	$66,911,286	113.1
FY91	$12,027,766	$14,853,929	$0	$39,500,293	$740,961	$68,198	$67,122,949	113.4
FY92	$13,950,062	$16,459,896	$0	$42,850,215	$835,289	$70,432	$74,095,462	125.2
FY93	$12,781,653	$17,244,020	$0	$42,038,733	$856,495	$0	$72,920,901	123.2
FY94	$12,627,459	$17,646,640	$0	$41,360,077	$885,938	$0	$72,520,114	122.5

FY94 Source: Adopted Budget, September 1, 1993

distributed according to surveyed patterns of interstate passenger trips.

The actual amount of total revenue which is allocated to a jurisdiction is based on the dedication/assignment methods coupled with the results of an annual or bi-annual bus passenger survey of actual bus passenger trip-making. The survey estimates the pattern and level of trip-making which is then used to factor total service route revenues by jurisdiction. The survey methods and procedures are approved by the WMATA Board of Directors.

Metrobus fare revenues in Northern Virginia increased 12.6 percent between FY88 and FY92. In FY93, the fare revenues declined and are projected to further decline according to the adopted FY94 budget. The percent that Metrobus fare revenues are of operating costs has declined about 10 percent between FY88 and FY93. The FY94 budget anticipates a further decline of about 3 percent (Table 21).

Capital Cost Allocation Process

Metrobus capital costs are allocated to jurisdictions based on the number of weekday revenue miles operated in each jurisdiction. One-tenth of the annual Metrobus capital costs are annually allocated to jurisdictions based on actual revenue miles of service for a period of 10 years.

Assessment and Impact of Allocation Procedures

This section assesses the impact of changes in the Metrobus cost and revenue allocation process in Northern Virginia since FY88.

Operating Costs - Metrobus operating costs in Northern Virginia have increased since FY88. Furthermore, due to bus service reductions in Northern Virginia, which primarily reduce variable costs, fixed costs have increased at a greater rate than have variable costs (Figure 25).

Variable operating costs are an obligation of the Northern Virginia jurisdictions that have Metrobus service. About 29 percent of total Metrobus fixed operating costs are also an obligation of Northern Virginia. Assuming all else remains the same, when a jurisdiction increases its Metrobus service, it also increases its share of fixed operating cost. Conversely, when a jurisdiction decreases its Metrobus service, it also decreases its share of fixed operating cost. For example, the City of Fairfax discontinued paying for

TABLE 21

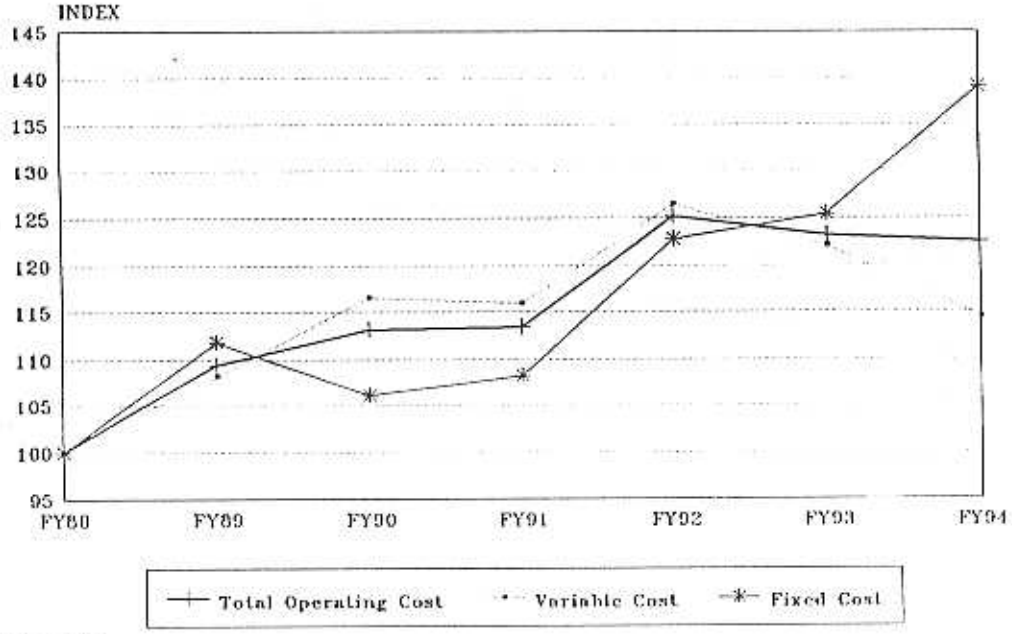
Fare Revenues
Northern Virginia Metrobus

	Alexandria	Arlington	City of Fairfax	Fairfax County	Falls Church	NVTC	Northern Virginia Total	Northern Virginia Index
Fare Revenues								
FY88	$4,136,488	$4,849,226	$94,406	$6,532,337	$453,413	$19,837	$16,085,707	100.0
FY89	$4,239,959	$4,972,185	$98,808	$6,316,602	$465,255	$20,387	$16,113,196	100.2
FY90	$4,321,036	$4,640,943	$0	$8,250,172	$161,274	$23,627	$17,397,052	108.2
FY91	$4,383,736	$4,708,285	$0	$8,395,512	$163,614	$23,970	$17,675,117	109.9
FY92	$4,449,443	$5,259,897	$0	$8,154,695	$224,068	$20,370	$18,108,473	112.6
FY93	$4,219,157	$5,253,853	$0	$8,107,437	$260,264	$0	$17,840,711	110.9
FY94	$3,845,768	$5,254,668	$0	$7,753,627	$208,664	$0	$17,062,727	106.1
Fare Recovery								
FY88	38.55%	34.88%	66.18%	19.37%	65.36%	29.88%	27.18%	100.0
FY89	36.98%	32.74%	61.16%	16.98%	64.79%	29.76%	24.89%	91.6
FY90	36.46%	31.00%	-	20.96%	22.17%	29.40%	26.00%	95.7
FY91	36.45%	31.70%	-	21.25%	22.08%	35.15%	26.33%	96.9
FY92	31.90%	31.96%	-	19.03%	26.83%	28.92%	24.44%	89.9
FY93	33.01%	30.47%	-	19.29%	30.39%	-	24.47%	90.0
FY94	30.46%	29.78%	-	18.75%	23.55%	-	23.53%	86.6

FY94 Source: Adopted Budget, September 1, 1993

Figure 25

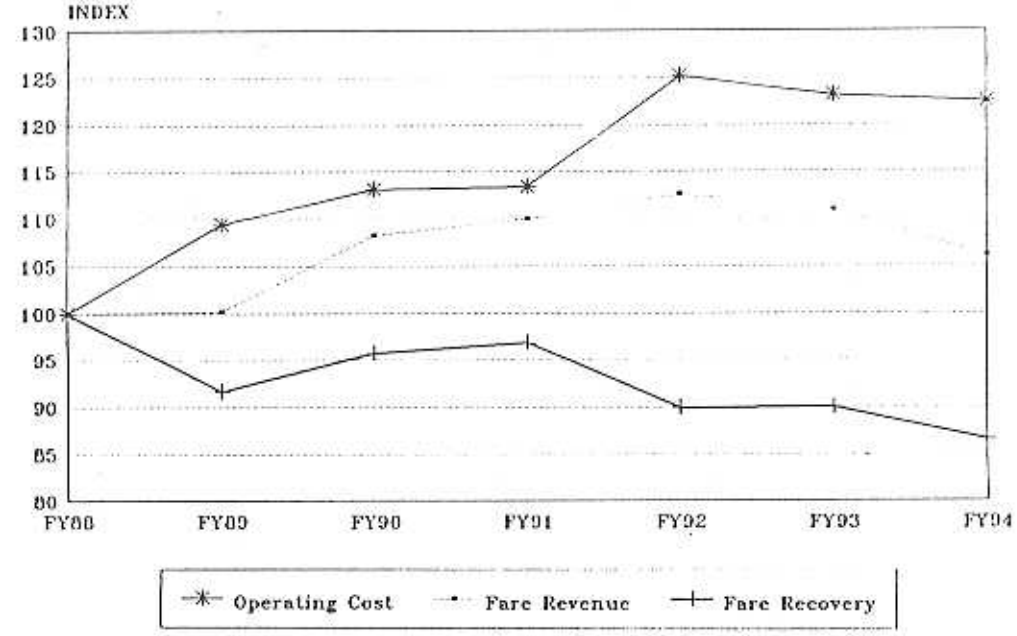
Metrobus Operating Cost Index
Northern Virginia



FY88 = 100.0

Figure 26

Metrobus Cost-Revenue Index
Northern Virginia



FY88 = 100.0

Metrobus service in FY90 and has since not been allocated any varaible or fixed operating cost. Since these Metrobus services are still operated, the variable and fixed costs are assumed by the other Northern Virginia jurisdictions.

Between FY92 and FY93, all Virginia jurisdictions significantly reduced their Metrobus platform miles and hours, with the exceptions of Falls Church, which only slightly decreased its platform hours, and Arlington, which slightly decreased platform hours and increased platform miles of service. As a result, Arlington's and Falls Church's variable costs increased while all other Virginia jurisdictions' variable costs decreased. While Northern Virginia's total fixed operating costs increased 2.1 percent, Arlington's and Falls Church's share of total fixed operating costs increased 8.7 and 6.4 percent, respectively (Table 20). Total Virginia operating costs declined 1.6 percent while Arlington's and Falls Church's total operating costs increased 4.7 and 2.6 percent, respectively -- an increment proportionally greater than the increment of service change.

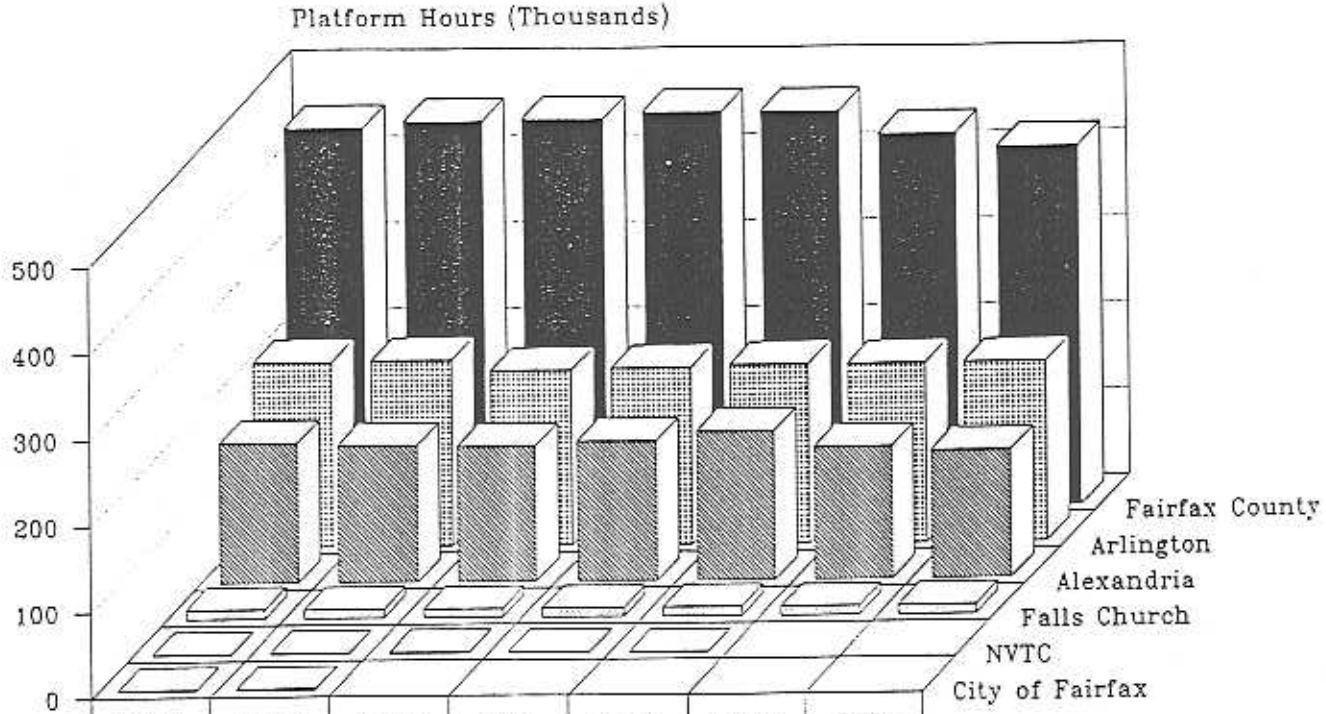
Capital Costs - The allocation of capital costs by jurisdictions provides a similar scenario to that of operating costs. Since the annual payment of capital costs is adjusted by jurisdiction according to the number of revenue miles operated in the jurisdiction, the reduction or abandonment of Metrobus service by a jurisdiction results in the remaining jurisdictions that receive Metrobus service paying proportionally more for capital costs. In other words, the costs of longer-term capital investments necessary to serve a jurisdiction are passed on to other jurisdictions if service is reduced or abandoned by that jurisdiction.

Fare Revenues - The process for allocation of fare revenues is based upon a survey designed to reasonably replicate the patterns of Metrobus passenger travel. The allocation of fare revenues coupled with the allocation of operating costs shows a declining fare recovery ratio in Northern Virginia (Figure 26). Much of this decline is due to the fact that operating costs (due to inflation and other factors) have grown faster than operating revenues. This means that city and county governments are shouldering an increasingly greater burden of the cost of providing Metrobus service than are passengers.

The Cost of Metrobus Service - The provision of Metrobus service in Northern Virginia in terms of platform hours has generally declined since FY88 (Figure 27). Fare revenues have also declined while the operating cost of

Figure 27

Jurisdictional Platform Hours
Northern Virgina Metrobus



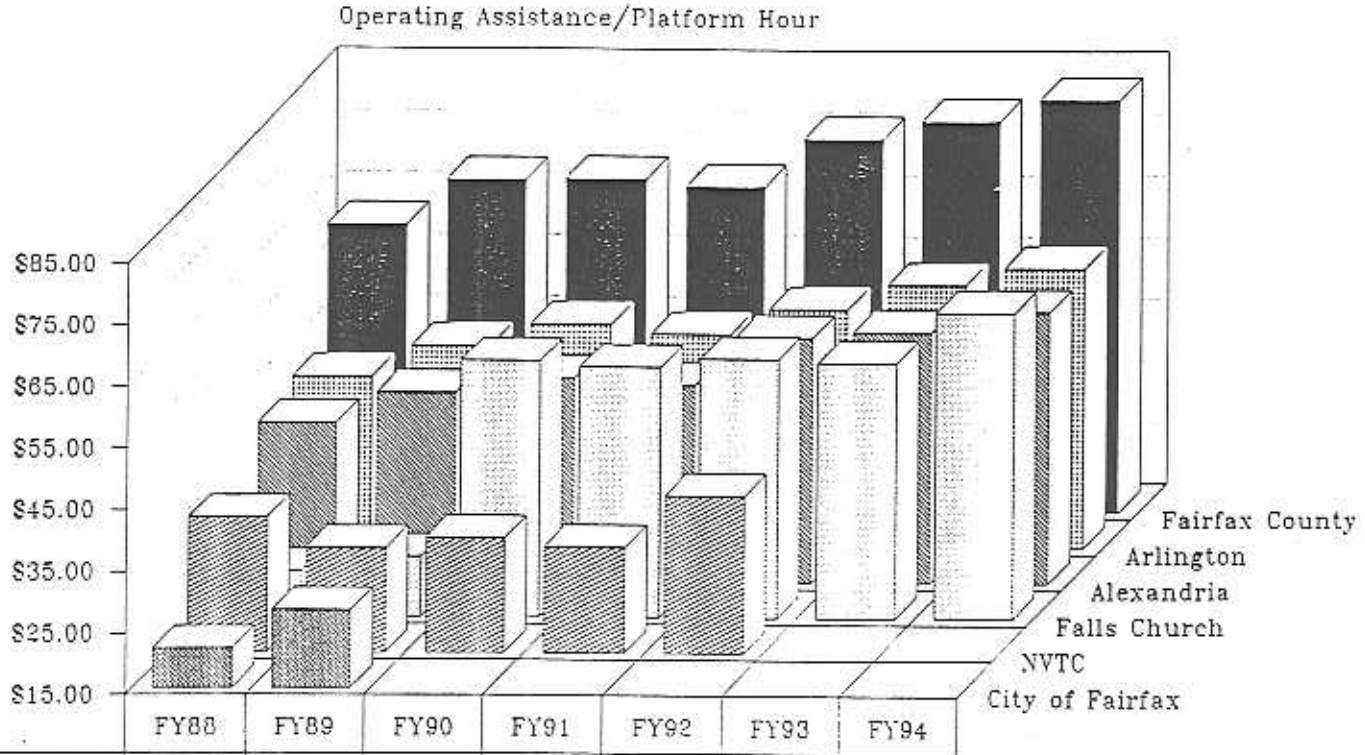
	FY88	FY89	FY90	FY91	FY92	FY93	FY94
Fairfax County	444	451	452	460	460	433	417
Arlington	214	215	203	205	209	208	209
Alexandria	162	158	157	163	173	154	149
Falls Church	11	10	10	10	11	11	11
NVTC	1	2	2	1	1		
City of Fairfax	2	2					

FY94 Source: Adopted Budget, 9/1/93

Metrobus service has increased. As a result, the total operating assistance provided by Virginia cities and counties has climbed nearly 30 percent since FY88. The cost of this assistance per unit of service, i.e., operating assistance per platform hour or mile has increased about 35 percent since FY88. The level of Metrobus operating assistance per platform hour varies by year and jurisdiction (Figure 28). It should be noted that Federal and State (including gas tax revenues) operating assistance supporting Metrobus, Metrorail and ADA services from FY88 to FY94 increased from about $47.0 million to $51.6 million or nearly 10 percent.

Figure 28

Metrobus Operating Assistance
Northern Virginia



	FY88	FY89	FY90	FY91	FY92	FY93	FY94
Fairfax County	$61.26	$68.57	$68.85	$67.67	$75.50	$78.39	$81.98
Arlington	$42.31	$47.46	$50.96	$49.43	$53.69	$57.60	$60.44
Alexandria	$40.61	$45.60	$48.04	$47.00	$54.86	$55.70	$59.16
Falls Church	$22.43	$24.84	$56.65	$55.74	$57.12	$56.61	$64.78
NVTC	$36.95	$31.95	$33.72	$32.31	$40.67		
City of Fairfax	$21.51	$27.78					

FY94 Source: Adopted Budget, 9/1/93

CHAPTER 7

PUBLIC AND PRIVATE SECTOR CAPACITY

This chapter presents a review of the capacity of the public and private bus carriers that operate or could establish an operation in Northern Virginia. The area addressed include fleet size, facility and vehicle maintenance capability. The effect of Federal labor protection, 13(c), is discussed.

Public Sector Capacity

As discussed in Chapter 5, there are five publicly owned garages in Northern Virginia where buses for public transportation service are stored and maintained. Table 22 provides a summary of these publicly owned bus facilities. From the review of these facilities, a number of conclusions are reached.

- Metrobus facilities are lacking in the western portions of the service area. This places an operating and financial burden on the system, especially Metrobus services whose garages are located in the far eastern sections of the service area.

- The reduction of WMATA's Arlington garage capacity to 60 buses can be accommodated by assigning more buses to the Four Mile Run garage coupled with the reduction of 45 buses operated in Route 5 service used for the Reston/Herndon area. This reduction results from Fairfax County assuming the operation of Route 5 services under contract to ATE Management and Services Company, Inc.

- The City of Alexandria has indicated a desire for demolition of the Royal Street garage and conversion of the land to a use more compatible with surrounding residences. If this facility were reduced to an annex housing about 40 buses, the Metrobus fleet could be accommodated. If the facility were closed, the reduced Arlington garage and Four Mile Run would be unable to accommodate the Northern Virginia Metrobus fleet.

TABLE 22

PUBLICLY OWNED BUS FACILITIES IN NORTHERN VIRGINIA

NAME	FACILITY DEVELOP-MENT DATE	CURRENT ASSIGNED FLEET	PEAK FLEET REQUIRE-MENTS	PRESENT FLEET CAPACI-TY	POTENTIAL FLEET CAPACITY	PRESENT SERVICE BAYS	COMMENTS
Alexandria, City of (DASH)	1990 Converted use	33	20	33	60 with devel-opment of adja-cent land	3	At capacity; off-site employee parking
Arlington (Metrobus)	1940s	159	151	159	60 re: agree-ment with Arlington Co.	11	Crowded; inefficient layout; no weekend operations
Fairfax County (Connector)	1988	72	47	75	85	7	Has capacity for minor expansion
Four Mile Run (Metrobus)	1975 Rehabili-tation	138	106	275	250	15	Has capacity for ex-pansion
Royal (Metrobus)	1940s	85	64	85	85	8	Crowded; inefficient layout; no weekend operations

- The operations of DASH in Alexandria are located in a confined facility. Any facility improvement could only occur on a new and larger site or by expansion of the present facility on adjacent land. It is estimated that the existing DASH facility could be expanded on the adjacent vacant parcel and accommodate up to a total of 60 buses.

- WMATA owns a nine-acre tract of land located in the Springfield area of Fairfax County for possible future expansion of its Metrobus facilities in Northern Virginia. This land has the potential to increase the capacity of public transportation facilities in Northern Virginia by 200 buses. This parcel is well located with respect to the Shirley Busway on I-395.

In summary, 487 buses are currently assigned to the five facilities in Northern Virginia. The future potential capacity of the five facilities is 513 buses. If the land adjacent to DASH facilities is utilized, the future potential capacity would be 540 buses. However, a facility capacity problem would occur if Royal Street were closed. Another problem is that existing public transportation facility capacity is not well-situated with respect to the growing residential and activity areas of Northern Virginia.

Private Sector Capacity

The development of the Fairfax County Connector service was based on its cost savings potential to Fairfax County. With the opening of the Huntington Metrorail Station in the early 1980s, Fairfax County evaluated various options of providing feeder service to the new station. A study estimated a $1.2 million annual operating cost savings would accrue to Fairfax County if it replaced Metrobus as provider of the Huntington Feeder Service. As described in the prior Chapter, the saving to Fairfax County would result in an increase to the other Northern Virginia jurisdictions of the WMATA fixed cost.

The estimated savings was large enough to merit the purchase of 33 buses by the County and the building of a maintenance facility equipped to meet major repair and maintenance needs. Now managed and operated by ATE, the Fairfax County Connector is a 72-bus system providing feeder and express bus service to four Metrorail stations in the southeastern portion of Fairfax County.

Similarly, the City of Alexandria developed and initiated its DASH service to save on its Metrobus cost of providing feeder service to Metrorail. This service is also managed and operated by ATE at the DASH Quaker Lane facility.

Just recently, Fairfax County awarded the fixed-schedule express and feeder bus services operating in Herndon and Reston areas to ATE. This service consists of all Route 5 service formerly provided by Metrobus and involves 38 peak-period buses. ATE is required to provide the vehicles (either through a lease/purchase of the buses directly to Fairfax County, or offering a third party who would lease/purchase the buses to the County) and the maintenance/storage facility for this service (contract term is six years).

These are examples of the willingness and ability of the private sector to participate in public transportation needs and requirements of the public and governments in Northern Virginia.

An inventory of national, regional and local organizations who provide or manage public transportation services was compiled to identify private sector capacity and interest in responding to contracting opportunities in Northern Virginia. Table 23 presents a summary overview of those private bus carriers and management companies who were interviewed by telephone. While this table does not contain every carrier who may be interested in future business opportunities in Northern Virginia, it is representative of the private sector public transportation industry.

Existing Private Bus Carrier Facilities - There are two privately operated facilities in the Northern Virginia study area. Franklin Charter Bus operates 18 vehicles out of its facility on Dorforth Drive in Fairfax. Its county permit allows a maximum of 21 vehicles including service vehicles that limit any opportunity for future expansion. Although the company is strictly in the charter and tour business, conversation with a company official suggests they would bid to provide contract commuter service if it was deemed profitable. The company would have to include the cost of another facility in its bid.

Transportation Management Services, Inc. (TMSI) provides three distinct services for Fairfax County. The company operates the Reston Internal Bus Service (RIBS), the Tysons Shuttle, and a portion of the Fairfax Connector Service (Routes 401, 402, 403, and 404). TMSI's fifteen vehicles are stored in the company's facility in Merrifield, which has two service bays and two lifts.

TABLE 23

PRIVATE BUS CARRIERS AND MANAGEMENT COMPANIES
NORTHERN VIRGINIA AND VICINITY

NAME	CORPORATE LOCATION	LOCAL SERVICE LOCATION	CURRENT LOCAL FLEET SIZE	LOCAL MAINTENANCE FACILITIES	INTEREST IN CONTRACT-ING
NATIONAL CARRIERS					
ATE Management and Services Co.	Cincinnati, OH	Fairfax Connector Alexandria DASH Prince William County Loudoun County	73 buses 33 buses 41 buses 4 buses	Lorton Alexandria Woodbridge	High (Bid on Herndon service)
ATC - Vancom	St. Louis, MO	None	None	None	High (Bid on Herndon Service)
DAVE Systems	Santa Ana, CA	WMATA Brokerage Contract	None	None	High (Continues to expand in the Eastern U.S.)
Greyhound Lines, Inc.	Dallas, TX	Scheduled Service	3,000 coaches 50+ coaches based in Washington, DC	Washington, DC 10 bays, 10 lifts	Low at this time
Laidlaw Transit/ Medi-Ride, Inc.	Los Angeles, CA	None	None	None	Medium - Needs right opportunity
Mayflower Contract Services, Inc.	Phoenix, AZ	None	None	None	High (Bid on Herndon service)

TABLE 23 (continued)

PRIVATE BUS CARRIERS AND MANAGEMENT COMPANIES NORTHERN VIRGINIA AND VICINITY

NAME	CORPORATE LOCATION	LOCAL SERVICE LOCATION	CURRENT LOCAL FLEET SIZE	LOCAL MAINTENANCE FACILITIES	INTEREST IN CONTRACT-ING
REGIONAL CARRIERS					
Eyre Bus Service, Inc.	Glenelg, MD	Charter Service between Columbia, MD and Washington, DC	50 coaches 3 minibuses	Glenelg, MD 4 bays, 4 lifts	Medium
Gold Line, Inc.	Tuxedo, MD	Charters	50 coaches	Tuxedo, MD 6 bays, 4 lifts	Medium
National Coach Works	Fredericksburg, VA	Commuter Service between Fredericksburg, VA and Washington, DC	29	Fredericksburg, VA	Medium
Peter Pan Trailways	Springfield, MA	Scheduled Service between Washington, DC and New York, NY	250 coaches - 50 based in Washington, DC	Tuxedo, MD 6 bays, 6 lifts	Medium - Needs right opportunity

TABLE 23 (continued)

PRIVATE BUS CARRIERS AND MANAGEMENT COMPANIES NORTHERN VIRGINIA AND VICINITY

NAME	CORPORATE LOCATION	LOCAL SERVICE LOCATION	CURRENT LOCAL FLEET SIZE	LOCAL MAINTENANCE FACILITIES	INTEREST IN CONTRACT-ING
LOCAL CARRIERS					
American Contract Management, Inc.	Alexandria, VA	None - new company providing paratransit and transit management services	None	None	Medium - Needs right opportunity
Franklin Charter Bus, Inc.	Fairfax, VA	Charter Services	17 buses, 1 van	Fairfax, VA 2 bays, 2 lifts	Low
Passenger Express Commuter Services	Sterling, VA	Service btwn Sterling and Washington, DC & airport service	33 vans and 6 minibuses	Sterling, VA 2 bays, 2 lifts	Medium - Needs right opportunity
Quick-Livick, Inc.	Staunton, VA	Charter Services	35 buses	Staunton, VA 4 bays, 4 lifts	Low
Shrock Sightseeing	Winchester, VA	Charter Services	16 buses	Winchester, VA 2 bays, 2 lifts	Medium - Needs right opportunity
TMSI (Transportation Management Services, Inc.)	Alexandria, VA	RIBS (Reston), Tysons Shuttle and one Fairfax Connector Route	7 buses	Merrifield, VA 2 bays, 2 lifts	High
Tri-State Tours	Manassas, VA	Charter Services	9 buses	Gainesville, VA	Low
Virginia Coach Company, Inc.	Purcellsville, VA	Commuter Service DC & Charters	16 buses 2 bays, 2 lifts	Purcellsville, VA	Medium - Needs right opportunity

Capacity and Interest of Private Sector Organizations - There are 18 organizations listed in Table 23 that are felt to be capable or interested in providing public transportation services in Northern Virginia. The table is divided into three parts: national, regional, and local carriers. The common attribute among all the companies is that their current facility capacity tends to match their current service commitments, i.e., the necessity of profit-making means they limit excess facility capacity.

National companies were included because they have the experience and capability to manage and/or operate public transportation throughout the U.S. For example, ATE Management and Services Co. (a division of Ryder, Inc.) manages the service operations of Alexandria's DASH, the Fairfax County Connection, and Commute Ride for PRTC in Prince William County. DAVE Systems provides brokerage services for WMATA. Generally, national systems seem to have a high interest in providing public transportation services in Northern Virginia.

Regional carriers are located in the greater Washington region and provide public transportation and/or charter services. Regional carriers seem to have a medium or less-than-high interest in contracting with Northern Virginia governments to provide public transportation service.

Local carriers include Virginia-based organizations from as far away as Staunton and Winchester. The type of operation and services provided by each carrier varies, as does their interest in contracting for services with Northern Virginia governments.

Conclusions - The current "physical" capacity of the private sector to provide public transportation service in Northern Virginia is limited. However, when evaluating the private sector, the issue of capacity appears not to be a key factor when judging whether or not companies can or will participate with government in contracts for the provision of public transportation service.

Private companies are in business for profit; it is, therefore, quite appropriate to find existing private bus carriers with little or no excess capacity. As evidenced by the recent award by Fairfax County for the Reston/Herndon service, where there is a market in which profit can be generated and where risk is commensurate with the level of such profit potential, the private sector will competitively respond to the opportunity. The resulting cost, including any requirements for private capital investment, can be assessed through analysis of competitive proposals.

Effect of Federal Labor Protection Regulations

Section 13(c) of the Urban Mass Transportation Act of 1964, as amended, in summary requires that the use of federal assistance under the Act be conditioned upon fair and equitable arrangements to protect the interests of employees affected by the use of such assistance. Therefore, since WMATA receives federal financial assistance, it must comply with the requirements of 13(c). However, since none of the local systems in Northern Virginia have applied for or used federal assistance to purchase vehicles or provide financial support to the operations, this provision has not applied. It is possible that the 13(c) issue could be raised in the future if federal transit funds were to be used by the local operations to fund capital purchases or support operations.

CHAPTER 8

ROUTE DIAGNOSTICS

This chapter presents an analysis of Northern Virginia bus routes in terms of various financial and productivity measures. The results provide a "snapshot" review of performance at the route level.

The study area includes a total of seven distinct transit operations that comprise the Northern Virginia bus transportation "system" including City of Alexandria (DASH), City of Fairfax (CUE), Arlington County (Arlington Trolley), Fairfax County (Fairfax Connector, RIBS and Tysons Shuttle) and the Washington Metropolitan Area Transit Authority (WMATA). The various WMATA bus lines have been grouped into intracounty and intercounty services. WMATA routes are further divided to differentiate service levels among the various member jurisdictions.

In the current analysis, the performance of the Northern Virginia bus routes is presented for two distinct yet related indicators -- financial performance and passenger productivity. The financial performance review indicates performance on the basis of farebox recovery. Passenger productivity gauges the ability of each route to attract riders. Each indicator presents a different perspective of the system and the routes that comprise the seven distinct operations in the system. Each bus line is treated as an individual operating entity and the performance characteristics of each route are compared with results for others in the same classification.

It must be remembered that this analysis represents a single examination of Northern Virginia bus lines and that a continuing and ongoing review of route performance should be performed as part of a regular monitoring program.

Data Collection

To provide a recent picture of route performance, the analysis was performed for the 12-month period ending June 30, 1993. This is the latest, complete fiscal year for which information was available.

In order to conduct the analysis for the Northern Virginia system, various operating, financial and patronage statistics by route were required. Most of the data

necessary for the analysis were obtained from information compiled by the operators and service sponsors. Some manipulation was required since certain data items are recorded at the system level, rather than for individual routes.

WMATA revenue statistics for each route specify operating revenue which is typically greater than the actual revenue collected in the farebox. Revenue by route is calculated on extensive sampling as though all passengers pay a full fare for the trip taken. For example, a passenger transferring free or at a discount is calculated as having paid the full fare. A flash pass user, who deposits nothing in the farebox, also is considered to have paid full fare. This increases the revenue credited to certain routes or services. This revenue is identified throughout this chapter as unadjusted revenue. To present a representative view of revenue experience for comparison purposes with other bus lines, the route revenue statistics for WMATA were factored to reflect the nearly $8 million difference between unadjusted and actual revenue. These revenue statistics are referenced as "adjusted" revenue. In the various tabulations presented throughout this chapter, two sets have been prepared. One depicts the unadjusted results. The other presents the adjusted results. Again, it should be noted that this was only necessary for the WMATA routes. The results for all other operations are the same in each set of tabulations.

Similar to revenue, costs were developed at the route level. For WMATA and the City of Alexandria, three-variable cost models were used to ascertain expenditures. For all other services, individual route costs were quantified on the basis of vehicle hours and total operating costs. This is consistent with the present method of carrier reimbursement which is generally based on vehicle hours.

As noted previously, the analysis was performed for the fiscal year ending June 30, 1993.

Financial Performance

Several measures are used in the current analysis to assess financial performance. However the primary one herein is farebox recovery, which is the percentage of operating costs that are covered by revenue. A value of one hundred indicates "breakeven" performance where revenue and costs are the same. Values less than 100 indicate routes requiring subsidy while values greater than 100 indicate routes generating an operating "profit".

The unadjusted financial performance of each of the routes comprising the Northern Virginia system are presented in Table 24. Not surprisingly, all routes require subsidy. As noted previously, only the results for the WMATA routes are different for unadjusted versus adjusted revenue.

Among the WMATA intracounty routes, the subsidy requirement ranges from a low of about $139,500 on Route 5W to a high of more than $1.7 million on Route 5C,H. On the basis of adjusted revenue, Route 5W still has the lowest subsidy requirement and Route 5C,H the greatest (Table 24A). The only difference is that the subsidy requirement is proportionally greater.

For the intercounty bus lines operated by WMATA, the route with the greatest subsidy requirement based on unadjusted revenue was Route 2A-C,E. With a deficit of nearly $2.2 million, it required a subsidy more than 12 times that of Route 16L, which had the least subsidy requirement (i.e., $201,800). These results indicate two relationships. The deficit is a function of 1) rate of loss and 2) the amount of service provided. On the basis of adjusted revenue, Route 16L had the lowest requirement. Route 7A,C,E,FHPWX with a deficit of nearly $2.6 million, had the greatest operating shortfall.

The range of results for subsidy requirements for each operator/sponsor are presented below.

SUBSIDY REQUIREMENTS
(DOLLARS 000's)

Classification	Low	High
WMATA		
Intracounty		
Unadjusted	139.5	1,736.6
Adjusted	146.7	1,880.9
Intercounty		
Unadjusted	201.8	2,195.2
Adjusted	245.7	2,590.9
Fairfax County	60.0	993.6
Alexandria (DASH)	212.5	459.7

No values are presented for the City of Fairfax (CUE) and Arlington County services since disaggregated route level statistics are not available for the former, and the latter

operates a single route. Overall revenue, cost, and deficit results by operator are shown below:

FINANCIAL RESULTS (DOLLARS)

Classification	Revenue	Cost	Deficit
WMATA			
Unadjusted	25,506,033	72,920,800	47,414,767
Adjusted	17,840,600	72,920,800	55,080,200
Fairfax County	1,631,300	7,425,300	5,794,000
Alexandria (DASH)	1,403,900	2,893,600	1,489,700
City of Fairfax (CUE)	479,000	1,428,400	949,400
Arlington County	47,300	234,300	187,000

The results above indicate that there is a $7.7 million difference between the unadjusted and adjusted revenue results for the WMATA bus lines operating in the Northern Virginia study area. Based on the adjusted revenue for WMATA bus lines, the overall subsidy required for the Northern Virginia routes exceeds $63.5 million.

Individual route performance can also be measured by farebox recovery. As shown in Table 25, the financial performance of individual routes varies substantially. The best performance among the WMATA intracounty bus lines (unadjusted revenue) is observed on Route 24M,P which recovers 50.5 percent of its operating costs. Conversely, the worst financial results are exhibited by Route 12E which has a farebox recovery rate of less than nine percent. These results clearly indicate the extent of internal cross-subsidization among the routes. Routes with relatively high farebox recovery values are subsidizing routes with lower rates in comparison to the system average. On the basis of adjusted revenue, the best and worst performing routes are the same, only with lower farebox recovery values of 35.3 and six percent, respectively (Table 25A).

The range of performance among the WMATA intercounty bus lines (adjusted revenue) is from a high of 46.4 percent on Route 16A-G,J to a low of 13.2 percent on Route 15K,L. Fairfax County services range between 13.2 and 30.4 percent for the Fairfax Connector bus lines and 9.3 (RIBS) and 40.2 (Tysons Shuttle) percent for other sponsored routes. DASH bus lines have the least variation among its routes as well as the best overall farebox recovery rate, as shown below.

TABLE 24

FINANCIAL RESULTS BY ROUTE--UNADJUSTED REVENUE
(ALL AMOUNTS IN DOLLARS)

ROUTES	REVENUE	COST	DEFICIT
WMATA-INTRACOUNTY			
Alexandria			
8S,W,X,Z	603,152	1,473,800	870,648
21A-C,F	521,939	1,434,900	912,961
Subtotal	1,125,091	2,908,700	1,783,609
Arlington			
16S,U,W,X	460,713	1,160,000	699,287
24M,P	304,626	603,600	298,974
Subtotal	765,339	1,763,600	998,261
Fairfax County			
2W	46,805	207,100	160,295
3W,Z	83,743	353,400	269,657
5A,B,J	409,607	1,696,400	1,286,793
5C,H	480,194	2,216,800	1,736,606
5N,P	204,677	915,400	710,723
5S	637,537	2,075,600	1,438,063
5W	24,035	163,500	139,465
5Y,Z	175,076	887,600	712,524
11Y	39,215	425,900	386,685
12C	61,732	427,600	365,868
12E	25,553	298,500	272,947
12L,M	66,792	544,000	477,208
12R,S	87,285	740,600	653,315
20A	74,635	606,900	532,265
20F,G,W-Z	158,884	1,285,800	1,126,916
24T	63,250	465,600	402,350
26G,H	48,576	529,400	480,824
Subtotal	2,687,596	13,840,100	11,152,504
WMATA-INTRACOUNTY TOTAL	4,578,026	18,512,400	13,934,374

TABLE 24

FINANCIAL RESULTS BY ROUTE--UNADJUSTED REVENUE
(CONTINUED)

ROUTES	REVENUE	COST	DEFICIT
WMATA-INTERCOUNTY			
Alexandria-Arlington-Fairfax County			
7A,C,E,FHPWX	1,777,693	3,834,300	2,056,607
9A-E	1,544,698	3,641,800	2,097,102
16A-G,J	2,367,352	3,572,300	1,204,948
23A-C,T	1,140,361	2,800,800	1,660,439
25A,F,G,J,P,R	516,031	1,618,300	1,102,269
25B	274,958	951,600	676,642
Subtotal	7,621,093	16,419,100	8,798,007
Alexandria-Arlington			
10A,E	737,877	2,005,200	1,267,323
11P	145,475	471,100	325,625
13A-G	564,440	1,118,100	553,660
Subtotal	1,447,792	3,594,400	2,146,608
Alexandria-Fairfax County			
16L	146,234	348,000	201,766
18A,B,X-F	354,959	1,629,200	1,274,241
18G,H,J,K	641,861	1,783,000	1,141,139
18L,P,R	570,262	1,639,900	1,069,638
28F,G	226,688	499,200	272,512
29C,E,G,H,X	814,913	2,721,900	1,906,987
Subtotal	2,754,917	8,621,200	5,866,283
Alexandria-Fairfax County-Falls Church			
28A,B	1,248,571	2,489,400	1,240,829
Alexandria-City of Fairfax-Fairfax County			
29K-N	553,657	1,555,700	1,002,043
Arlington-City of Fairfax-Fairfax County-Falls Church			
1B-F,Z	978,497	2,818,300	1,839,803
2A-C,G	993,232	3,188,400	2,195,168
Subtotal	1,971,729	6,006,700	4,034,971

TABLE 24

FINANCIAL RESULTS BY ROUTE--UNADJUSTED REVENUE
(CONTINUED)

ROUTES	REVENUE	COST	DEFICIT
Arlington-Fairfax County-Falls Church			
3A-C,E,F	857,083	2,805,700	1,948,617
10B-D	1,100,996	2,373,000	1,272,004
Subtotal	1,958,079	5,178,700	3,220,621
Arlington-Fairfax County			
4A,B,E,H,S	733,182	2,088,000	1,354,818
22A,B,F	640,343	1,843,600	1,203,257
Subtotal	1,373,525	3,931,600	2,558,075
Arlington-DC			
38B	627,384	1,118,100	490,716
Arlington-City of Fairfax-Fairfax County			
15K,L	181,401	962,900	781,499
17A,B,F,M	452,111	1,661,600	1,209,489
17G,H,K,L	737,748	2,869,000	2,131,252
Subtotal	1,371,260	5,493,500	4,122,240
WMATA-INTERCOUNTY TOTAL	20,928,007	54,408,400	33,480,393
WMATA TOTAL	25,506,033	72,920,800	47,414,767
FAIRFAX COUNTY			
Fairfax Connector (ATE)			
101	67,800	374,200	306,400
102	13,100	76,100	63,000
103/104	101,500	378,800	277,300
105	357,100	1,350,700	993,600
106	65,500	250,500	185,000
107	26,700	146,100	119,400
108	45,500	225,200	179,700
109	154,900	670,600	515,700
110	164,600	626,600	462,000

TABLE 24

FINANCIAL RESULTS BY ROUTE--UNADJUSTED REVENUE
(CONTINUED)

ROUTE	REVENUE	COST	DEFICIT
Fairfax Connector (Continued)			
201	37,100	228,300	191,200
202	38,800	215,100	176,300
203	41,100	192,700	151,600
204	10,900	75,100	64,200
301	31,500	144,600	113,100
302	20,100	98,400	78,300
303	36,600	174,500	137,900
304	42,500	236,400	193,900
305	21,700	164,400	142,700
306	21,400	147,100	125,700
401	189,800	624,000	434,200
Subtotal	1,488,200	6,399,400	4,911,200
OTHER SERVICES (TMSI)			
402,403,404 *	47,800	331,000	283,200
RIBS	55,000	594,600	539,600
Tyson Shuttle	40,300	100,300	60,000
Subtotal	143,100	1,025,900	882,800
FAIRFAX COUNTY TOTAL	1,631,300	7,425,300	5,794,000
ALEXANDRIA (DASH)			
AT2/AT6	367,300	827,000	459,700
AT3/AT4	431,800	813,800	382,000
AT5/AT7	375,100	810,600	435,500
AT8	229,700	442,200	212,500
TOTAL	1,403,900	2,893,600	1,489,700
CITY OF FAIRFAX (CUE)			
Green 1,2/Gold 1,2	479,000	1,428,400	949,400
ARLINGTON COUNTY			
Trolley	47,300	234,300	187,000

(*) Routes 402 and 403 differ widely from 404, however combined data were only available.

TABLE 24A

FINANCIAL RESULTS BY ROUTE--ADJUSTED REVENUE
(ALL AMOUNTS IN DOLLARS)

ROUTES	REVENUE	COST	DEFICIT
WMATA-INTRACOUNTY			
Alexandria			
8S,W,X,Z	421,900	1,473,800	1,051,900
21A-C,F	365,100	1,434,900	1,069,800
Subtotal	787,000	2,908,700	2,121,700
Arlington			
16S,U,W,X	322,300	1,160,000	837,700
24M,P	213,100	603,600	390,500
Subtotal	535,400	1,763,600	1,228,200
Fairfax County			
2W	32,700	207,100	174,400
3W,Z	58,600	353,400	294,800
5A,B,J	286,500	1,696,400	1,409,900
5C,H	335,900	2,216,800	1,880,900
5N,P	143,200	915,400	772,200
5S	445,900	2,075,600	1,629,700
5W	16,800	163,500	146,700
5Y,Z	122,500	887,600	765,100
11Y	27,400	425,900	398,500
12C	43,200	427,600	384,400
12E	17,900	298,500	280,600
12L,M	46,700	544,000	497,300
12R,S	61,100	740,600	679,500
20A	52,200	606,900	554,700
20F,G,W-Z	111,100	1,285,800	1,174,700
24T	44,200	465,600	421,400
26G,H	34,000	529,400	495,400
Subtotal	1,879,900	13,840,100	11,960,200
WMATA-INTRACOUNTY TOTAL	3,202,300	18,512,400	15,310,100

TABLE 24A

FINANCIAL RESULTS BY ROUTE--ADJUSTED REVENUE
(CONTINUED)

ROUTES	REVENUE	COST	DEFICIT
WMATA-INTERCOUNTY			
Alexandria-Arlington-Fairfax County			
7A,C,E,FHPWX	1,243,400	3,834,300	2,590,900
9A-E	1,080,500	3,641,800	2,561,300
16A-G,J	1,655,900	3,572,300	1,916,400
23A-C,T	797,600	2,800,800	2,003,200
25A,F,G,J,P,R	360,900	1,618,300	1,257,400
25B	192,300	951,600	759,300
Subtotal	5,330,600	16,419,100	11,088,500
Alexandria-Arlington			
10A,E	516,100	2,005,200	1,489,100
11P	101,800	471,100	369,300
13A-G	394,800	1,118,100	723,300
Subtotal	1,012,700	3,594,400	2,581,700
Alexandria-Fairfax County			
16L	102,300	348,000	245,700
18A,B,X-F	248,300	1,629,200	1,380,900
18G,H,J,K	449,000	1,783,000	1,334,000
18L,P,R	398,900	1,639,900	1,241,000
28F,G	158,600	499,200	340,600
29C,E,G,H,X	570,000	2,721,900	2,151,900
Subtotal	1,927,100	8,621,200	6,694,100
Alexandria-Fairfax County-Falls Church			
28A,B	873,300	2,489,400	1,616,100
Alexandria-City of Fairfax-Fairfax County			
29K-N	387,300	1,555,700	1,168,400
Arlington-City of Fairfax-Fairfax County-Falls Church			
1B-F,Z	684,400	2,818,300	2,133,900
2A-C,G	694,700	3,188,400	2,493,700
Subtotal	1,379,100	6,006,700	4,627,600

TABLE 24A

FINANCIAL RESULTS BY ROUTE--ADJUSTED REVENUE
(CONTINUED)

ROUTES	REVENUE	COST	DEFICIT
Arlington-Fairfax County-Falls Church			
3A-C,E,F	599,500	2,805,700	2,206,200
10B-D	770,100	2,373,000	1,602,900
Subtotal	1,369,600	5,178,700	3,809,100
Arlington-Fairfax County			
4A,B,E,H,S	512,800	2,088,000	1,575,200
22A,B,F	447,900	1,843,600	1,395,700
Subtotal	960,700	3,931,600	2,970,900
Arlington-DC			
38B	438,800	1,118,100	679,300
Arlington-City of Fairfax-Fairfax County			
15K,L	126,900	962,900	836,000
17A,B,F,M	316,200	1,661,600	1,345,400
17G,H,K,L	516,000	2,869,000	2,353,000
Subtotal	959,100	5,493,500	4,534,400
WMATA-INTERCOUNTY TOTAL	14,347,900	54,408,400	40,060,500
WMATA TOTAL	17,840,600	72,920,800	55,080,200
FAIRFAX COUNTY			
Fairfax Connector (ATE)			
101	67,800	374,200	306,400
102	13,100	76,100	63,000
103/104	101,500	378,800	277,300
105	357,100	1,350,700	993,600
106	65,500	250,500	185,000
107	26,700	146,100	119,400
108	45,500	225,200	179,700
109	154,900	670,600	515,700
110	164,600	626,600	462,000

TABLE 24A

FINANCIAL RESULTS BY ROUTE--ADJUSTED REVENUE
(CONTINUED)

ROUTE	REVENUE	COST	DEFICIT
Fairfax Connector (Continued)			
201	37,100	228,300	191,200
202	38,800	215,100	176,300
203	41,100	192,700	151,600
204	10,900	75,100	64,200
301	31,500	144,600	113,100
302	20,100	98,400	78,300
303	36,600	174,500	137,900
304	42,500	236,400	193,900
305	21,700	164,400	142,700
306	21,400	147,100	125,700
401	189,800	624,000	434,200
Subtotal	1,488,200	6,399,400	4,911,200
OTHER SERVICES (TMSI)			
402,403,404 *	47,800	331,000	283,200
RIBS	55,000	594,600	539,600
Tyson Shuttle	40,300	100,300	60,000
Subtotal	143,100	1,025,900	882,800
FAIRFAX COUNTY TOTAL	1,631,300	7,425,300	5,794,000
ALEXANDRIA (DASH)			
AT2/AT6	367,300	827,000	459,700
AT3/AT4	431,800	813,800	382,000
AT5/AT7	375,100	810,600	435,500
AT8	229,700	442,200	212,500
Total	1,403,900	2,893,600	1,489,700
CITY OF FAIRFAX (CUE)			
Green 1,2/Gold 1,2	479,000	1,428,400	949,400
ARLINGTON COUNTY			
Trolley	47,300	234,300	187,000

(*) Routes 402 and 403 differ widely from 404, however combined data were only available.

FAREBOX RECOVERY (PERCENT)

Classification	Value
WMATA	
Unadjusted	34.98
Adjusted	24.47
Fairfax County	21.97
Alexandria (DASH)	48.52
City of Fairfax (CUE)	33.53
Arlington County	20.19

Data in Table 25 and 25A also show how the farebox performance of each route relates to the average for its system. That is, WMATA routes are compared to the WMATA system average, DASH bus lines to the DASH system average, etc.

Productivity Performance

Three productivity measures were utilized in the current analysis -- passengers per vehicle mile, vehicle hour and peak vehicle. The Northern Virginia system should seek to serve and attract as many riders as possible within the constraints of available resources. The measure of passengers carried (i.e., boardings or unlinked trips) coupled with other operating statistics is logical since it measures the extent of service provided to capture a particular patronage level.

Table 26 shows the productivity results for all Northern Virginia bus routes. These values differ substantially by route. A generally consistent pattern was observed in that the best performing routes exhibited results substantially above the average regardless of the productivity measure. Conversely, the worst performing routes exhibit performance considerably lower than the average. Another point is that the productivity of short routes tends to be better than that of longer or express routes.

Productivity differences are also noted by operator/sponsor classification and are presented below.

TABLE 25

FINANCIAL PERFORMANCE--UNADJUSTED REVENUE

ROUTES	FAREBOX RECOVERY (PERCENT)	RELATIVE TO ITS OWN LOCAL SYSTEM (PERCENT) BETTER	WORSE
WMATA-INTRACOUNTY			
Alexandria			
8S,W,X,Z	40.92	16.98	---
21A-C,F	36.37	3.97	---
Subtotal	38.68	10.58	---
Arlington			
16S,U,W,X	39.72	13.55	---
24M,P	50.47	44.28	---
Subtotal	43.40	24.07	---
Fairfax County			
2W	22.60	---	35.39
3W,Z	23.70	---	32.25
5A,B,J	24.15	---	30.96
5C,H	21.66	---	38.08
5N,P	22.36	---	36.08
5S	30.72	---	12.18
5W	14.70	---	57.98
5Y,Z	19.72	---	43.62
11Y	9.21	---	73.67
12C	14.44	---	58.72
12E	8.56	---	75.53
12L,M	12.28	---	64.89
12R,S	11.79	---	66.30
20A	12.30	---	64.84
20F,G,W-Z	12.36	---	64.67
24T	13.58	---	61.18
26G,H	9.18	---	73.76
Subtotal	19.42	---	44.48

TABLE 25

FINANCIAL PERFORMANCE--UNADJUSTED REVEUNE
(CONTINUED)

ROUTES	FAREBOX RECOVERY (PERCENT)	RELATIVE TO ITS OWN LOCAL SYSTEM (PERCENT) BETTER	WORSE
WMATA-INTERCOUNTY			
Alexandria-Arlington-Fairfax County			
7A,C,E,FHPWX	46.36	32.53	---
9A-E	42.42	21.27	---
16A-G,J	66.27	89.45	---
23A-C,T	40.72	16.41	---
25A,F,G,J,P,R	31.89	---	8.83
25B	28.89	---	17.41
Subtotal	46.42	32.70	---
Alexandria-Arlington			
10A,E	36.80	5.20	---
11P	30.88	---	11.72
13A-G	50.48	44.31	---
Subtotal	40.28	15.15	---
Alexandria-Fairfax County			
16L	42.02	20.13	---
18A,B,X-F	21.79	---	37.71
18G,H,J,K	36.00	2.92	---
18L,P,R	34.77	---	0.60
28F,G	45.41	29.82	---
29C,E,G,H,X	29.94	---	14.41
Subtotal	31.96	---	8.63
Alexandria-Fairfax County-Falls Church			
28A,B	50.16	43.40	---
Alexandria-City of Fairfax-Fairfax County			
29K-N	35.59	1.74	---
Arlington-City of Fairfax-Fairfax County-Falls Church			
1B-F,Z	34.72	---	0.74
2A-C,G	31.15	---	10.95
Subtotal	32.83	---	6.15

TABLE 25A

FINANCIAL PERFORMANCE--ADJUSTED REVENUE
(CONTINUED)

ROUTES	FAREBOX RECOVERY (PERCENT)	RELATIVE TO ITS OWN LOCAL SYSTEM (PERCENT) BETTER	WORSE
Arlington-Fairfax County-Falls Church			
3A-C,E,F	21.37	---	12.67
10B-D	32.45	32.61	---
Subtotal	26.45	8.09	---
Arlington-Fairfax County			
4A,B,E,H,S	24.56	0.37	---
22A,B,F	24.29	---	0.74
Subtotal	24.44	---	0.12
Arlington-DC			
38B	39.25	60.40	---
Arlington-Fairfax City-Fairfax County			
15K,L	13.18	---	46.14
17A,B,F,M	19.03	---	22.23
17G,H,K,L	17.99	---	26.48
Subtotal	17.46	---	28.65
WMATA TOTAL	24.47		
FAIRFAX COUNTY			
Fairfax Connector (ATE)			
101	18.12	---	17.52
102	17.21	---	21.67
103/104	26.80	21.98	---
105	26.44	20.35	---
106	26.15	19.03	---
107	18.28	---	16.80
108	20.20	---	8.06
109	23.10	5.14	---
110	26.27	19.57	---
201	16.25	---	26.04
202	18.04	---	17.89

TABLE 25

FINANCIAL PERFORMANCE--UNADJUSTED REVENUE
(CONTINUED)

ROUTES	FAREBOX RECOVERY (PERCENT)	RELATIVE TO ITS OWN LOCAL SYSTEM (PERCENT) BETTER	WORSE
Fairfax Connector (Continued)			
203	21.33	---	2.91
204	14.51	---	33.96
301	21.78	---	0.86
302	20.43	---	7.01
303	20.97	---	4.77
304	17.98	---	18.16
305	13.20	---	39.92
306	14.55	---	33.77
401	30.42	38.46	---
Subtotal	23.26	5.87	---
OTHER SERVICES (TMSI)			
402,403,404 *	14.44	---	34.27
RIBS	9.25	---	57.90
Tyson Shuttle	40.18	82.89	---
Subtotal	13.95	---	36.50
FAIRFAX COUNTY TOTAL	21.97		
ALEXANDRIA (DASH)			
AT2/AT6	44.41	---	8.47
AT3/AT4	53.06	9.36	---
AT5/AT7	46.27	---	4.64
AT8	51.94	7.05	---
Total	48.52		
CITY OF FAIRFAX (CUE)			
Green 1,2/Gold 1,2	33.53		
ARLINGTON COUNTY			
Trolley	20.19		

(*) Routes 402 and 403 differ widely from 404, however combined data were only available.

TABLE 25A

FINANCIAL PERFORMANCE--ADJUSTED REVENUE

ROUTES	FAREBOX RECOVERY (PERCENT)	RELATIVE TO ITS OWN LOCAL SYSTEM (PERCENT) BETTER	WORSE
WMATA-INTRACOUNTY			
Alexandria			
8S,W,X,Z	28.63	17.00	---
21A-C,F	25.44	3.96	---
Subtotal	27.06	10.58	---
Arlington			
16S,U,W,X	27.78	13.53	---
24M,P	35.30	44.26	---
Subtotal	30.36	24.07	---
Fairfax County			
2W	15.79	---	35.47
3W,Z	16.58	---	32.24
5A,B,J	16.89	---	30.98
5C,H	15.15	---	38.09
5N,P	15.64	---	36.09
5S	21.48	---	12.22
5W	10.28	---	57.99
5Y,Z	13.80	---	43.60
11Y	6.43	---	73.72
12C	10.10	---	58.72
12E	6.00	---	75.48
12L,M	8.58	---	64.94
12R,S	8.25	---	66.29
20A	8.60	---	64.85
20F,G,W-Z	8.64	---	64.69
24T	9.49	---	61.22
26G,H	6.42	---	73.76
Subtotal	13.58	---	44.50

TABLE 25A

FINANCIAL PERFORMANCE--ADJUSTED REVEUNE
(CONTINUED)

ROUTES	FAREBOX RECOVERY (PERCENT)	RELATIVE TO ITS OWN LOCAL SYSTEM (PERCENT) BETTER	WORSE
WMATA-INTERCOUNTY			
Alexandria-Arlington-Fairfax County			
7A,C,E,FHPWX	32.43	32.52	---
9A-E	29.67	21.25	---
16A-G,J	46.35	89.42	---
23A-C,T	28.48	16.39	---
25A,F,G,J,P,R	22.30	---	8.87
25B	20.21	---	17.41
Subtotal	32.47	32.69	---
Alexandria-Arlington			
10A,E	25.74	5.19	---
11P	21.61	---	11.69
13A-G	35.31	44.30	---
Subtotal	28.17	15.12	---
Alexandria-Fairfax County			
16L	29.40	20.15	---
18A,B,X-F	15.24	---	37.72
18G,H,J,K	25.18	2.90	---
18L,P,R	24.32	---	0.61
28F,G	31.77	29.83	---
29C,E,G,H,X	20.94	---	14.43
Subtotal	22.35	---	8.66
Alexandria-Fairfax County-Falls Church			
28A,B	35.08	43.36	---
Alexandria-City of Fairfax-Fairfax County			
29K-N	24.90	1.76	---
Arlington-City of Fairfax-Fairfax County-Falls Church			
1B-F,Z	24.28	---	0.78
2A-C,G	21.79	---	10.95
Subtotal	22.96	---	6.17

TABLE 25

FINANCIAL PERFORMANCE--UNADJUSTED REVENUE
(CONTINUED)

ROUTES	FAREBOX RECOVERY (PERCENT)	RELATIVE TO ITS OWN LOCAL SYSTEM (PERCENT) BETTER	WORSE
Arlington-Fairfax County-Falls Church			
3A-C,E,F	30.55	---	12.66
10B-D	46.40	32.65	---
Subtotal	37.81	8.09	---
Arlington-Fairfax County			
4A,B,E,H,S	35.11	0.37	---
22A,B,F	34.73	---	0.71
Subtotal	34.94	---	0.11
Arlington-DC			
38B	56.11	60.41	---
Arlington-City of Fairfax-Fairfax County			
15K,L	18.84	---	46.14
17A,B,F,M	27.21	---	22.21
17G,H,K,L	25.71	---	26.50
Subtotal	24.96	---	28.64
WMATA TOTAL	34.98		
FAIRFAX COUNTY			
Fairfax Connector (ATE)			
101	18.12	---	17.52
102	17.21	---	21.67
103/104	26.80	21.98	---
105	26.44	20.35	---
106	26.15	19.03	---
107	18.28	---	16.80
108	20.20	---	8.06
109	23.10	5.14	---
110	26.27	19.57	---
201	16.25	---	26.04
202	18.04	---	17.89

TABLE 25A

FINANCIAL PERFORMANCE--ADJUSTED REVENUE
(CONTINUED)

ROUTES	FAREBOX RECOVERY (PERCENT)	RELATIVE TO ITS OWN LOCAL SYSTEM (PERCENT) BETTER	WORSE
Fairfax Connector (Continued)			
203	21.33	---	2.91
204	14.51	---	33.96
301	21.78	---	0.86
302	20.43	---	7.01
303	20.97	---	4.77
304	17.98	---	18.16
305	13.20	---	39.92
306	14.55	---	33.77
401	30.42	38.46	---
Subtotal	23.26	5.87	---
OTHER SERVICES (TMSI)			
402,403,404 *	14.44	---	34.27
RIBS	9.25	---	57.90
Tyson Shuttle	40.18	82.89	---
Subtotal	13.95	---	36.50
FAIRFAX COUNTY TOTAL	21.97		
ALEXANDRIA (DASH)			
AT2/AT6	44.41	---	8.47
AT3/AT4	53.06	9.36	---
AT5/AT7	46.27	---	4.64
AT8	51.94	7.05	---
Total	48.52		
CITY OF FAIRFAX (CUE)			
Green 1,2/Gold 1,2	33.53		
ARLINGTON COUNTY			
Trolley	20.19		

(*) Routes 402 and 403 differ widely from 404, however combined data were only available.

TABLE 26

PASSENGER PRODUCTIVITY

ROUTES	VEHICLE MILE	VEHICLE HOUR	PEAK VEHICLE
WMATA-INTRACOUNTY			
Alexandria			
8S,W,X,Z	1.92	37.34	49,897
21A-C,F	1.67	35.14	43,066
Arlington			
16S,U,W,X	2.88	42.73	65,816
24M,P	3.10	36.82	86,109
Fairfax County			
2W	1.19	19.97	42,757
3W,Z	1.29	21.16	35,041
5A,B,J	0.92	17.75	36,970
5C,H	0.77	20.44	28,884
5N,P	0.92	25.34	24,710
5S	1.36	26.10	88,366
5W	0.46	12.65	14,168
5Y,Z	0.73	20.05	25,958
11Y	0.47	10.61	9,867
12C	0.63	17.84	30,866
12E	0.49	13.86	12,777
12L,M	0.64	15.33	22,264
12R,S	0.58	15.44	21,821
20A	0.63	13.56	24,878
20F,G,W-Z	0.63	15.56	22,698
24T	1.17	14.43	21,083
26G,H	0.51	11.34	16,192

TABLE 26

PASSENGER PRODUCTIVITY
(CONTINUED)

ROUTES	VEHICLE MILE	VEHICLE HOUR	PEAK VEHICLE
WMATA-INTERCOUNTY			
Alexandria-Arlington-Fairfax County			
7A,C,E,FHPWX	2.41	39.03	68,834
9A-E	1.94	27.00	121,452
16A-G,J	3.33	43.89	141,538
23A-C,T	1.63	24.71	262,447
25A,F,G,J,P,R	1.83	23.02	81,620
25B	1.92	17.90	87,352
Alexandria-Arlington			
10A,E	3.13	21.74	122,980
11P	1.42	19.44	27,914
13A-G	2.13	27.99	102,573
Alexandria-Fairfax County			
16L	1.75	39.28	54,774
18A,B,X-F	0.84	18.02	15,665
18G,H,J,K	0.76	19.28	56,967
18L,P,R	0.94	23.64	33,621
28F,G	2.23	40.23	57,431
29C,E,G,H,X	0.99	23.77	30,660
Alexandria-Fairfax County-Falls Church			
28A,B	2.55	34.13	170,777
Alexandria-Fairfax City-Fairfax County			
29K-N	2.05	25.84	86,626
Arlington-City of Fairfax-Fairfax County-Falls Church			
1B-F,Z	1.71	24.00	99,895
2A-C,G	1.43	21.42	78,380
Arlington-City of Fairfax-Fairfax County-Falls Church			
3A-C,E,F	1.54	21.61	77,663
10B-D	2.90	30.79	157,285

TABLE 26

PASSENGER PRODUCTIVITY
(CONTINUED)

ROUTES	VEHICLE MILE	VEHICLE HOUR	PEAK VEHICLE
Arlington-Fairfax County			
4A,B,E,H,S	1.89	22.71	78,144
22A,B,F	1.82	27.52	72,453
Arlington-DC			
38B	3.40	31.38	94,022
Arlington-City of Fairfax-Fairfax County			
15K,L	0.77	15.27	26,919
17A,B,F,M	0.82	15.26	31,214
17G,H,K,L	0.73	18.89	23,097
WMATA TOTAL	1.62	26.13	65,561
FAIRFAX COUNTY			
Fairfax Connector (ATE)			
101	0.83	15.73	37,122
102	0.89	14.96	25,128
103/104	1.44	22.90	63,859
105	2.11	22.94	114,016
106	1.44	22.69	35,863
107	0.86	15.83	25,535
108	1.06	17.54	43,624
109	1.22	20.04	74,198
110	1.37	22.79	78,830
201	0.71	14.15	35,656
202	1.02	15.65	37,168
203	1.03	18.50	39,379
204	0.89	12.63	*
301	0.71	18.87	30,130
302	0.65	17.73	19,253
303	0.60	18.21	17,537
304	0.64	15.60	13,572
305	0.42	11.48	13,882
306	0.53	12.61	*
401	1.70	26.39	72,728
Subtotal	1.19	20.16	49,975

TABLE 26

PASSENGER PRODUCTIVITY
(CONTINUED)

ROUTES	VEHICLE MILE	VEHICLE HOUR	PEAK VEHICLE
OTHER SERVICES (TMSI)			
402,403,404 **	0.91	10.90	41,200
RIBS	0.94	11.26	43,813
Tyson Shuttle	1.35	26.48	39,838
Subtotal	1.00	12.91	42,166
FAIRFAX COUNTY TOTAL	1.17	19.03	49,014
ALEXANDRIA (DASH)			
AT2/AT6	1.77	20.87	86,728
AT3/AT4	2.19	28.33	61,173
AT5/AT7	1.91	20.72	106,269
AT8	2.30	24.20	81,365
Total	2.00	23.23	79,556
CITY OF FAIRFAX (CUE)			
Green 1,2/Gold 1,2	1.63	22.27	97,500
ARLINGTON COUNTY			
Trolley	2.93	25.48	76,654

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* No peak vehicles assigned to route.
** Routes 402 and 403 differ widely from 404, however combined data were only available.

PRODUCTIVITY RESULTS

Classification	Passengers Per Vehicle Mile	Passengers Per Vehicle Hour	Passengers Per Peak Vehicle
WMATA	1.62	26.13	65,561
Fairfax County	1.17	19.03	49,014
Alexandria (DASH)	2.00	23.23	79,556
City of Fairfax (CUE)	1.63	22.27	97,500
Arlington County	2.93	25.48	76,654

These values reflect the development patterns in the study area, population densities and other socioeconomic characteristics that reflect propensity to use public transportation. Further, employment locations influence route productivity performance. This reflects the extent of collection, distribution and line haul portions of the various routes as well as the intended travel market.

Input to Subsequent Route Planning Steps

The previous sections presented financial and productivity performance results for the various routes that comprise the Northern Virginia bus "system". The examination of individual routes was performed in a competitive framework that is similar to decisions on allocation of limited transit resources by the operators/sponsors of public services.

These results provide input to subsequent service planning activities. In particular, the factors from the analysis performed in this chapter that were most heavily relied upon in identifying routes which are candidates for service change or improvements are farebox recovery and passengers per vehicle hour. Any interjurisdictional bus route with a farebox recovery or passengers per hour performance below two-thirds of the WMATA average (i.e., farebox recovery of 16.31 and passengers per hour of 17.42) are strong candidates for change. Only three routes perform below these levels. Route 18A,B,X-F is below the farebox recovery level while Route 17A,B,F,M is below the passenger productivity level. Route 15K,L is below both the farebox recovery and passenger productivity levels.

It should be recognized that other non-quantifiable considerations such as equity, system connectivity and the need to provide at least minimal service levels in many communities will also influence transit decisions. The analysis results should be viewed as a diagnostic tool to aid and facilitate service planning decisions.

CHAPTER 9

REVIEW OF SERVICE WARRANTS

This chapter presents a review of warrants for bus service throughout the Northern Virginia study area. The warrants are benchmarks to assess the adequacy of the supply of transit service. It should be noted that "service" refers to the range of public transportation services available to residents. This includes the combined operations of WMATA, the Cities of Alexandria and Fairfax, and the Counties of Arlington and Fairfax. The latter includes the Fairfax Connector, RIBS and Tysons Shuttle.

It should also be noted that express service was afforded residents of Loudoun County by two private carriers. Passenger Express operated service to DC and another route to Rosslyn, Crystal City and the Pentagon. Virginia Coach's service operated between Brunswick (MD) and DC serving intermediate communities in Loudoun County. Currently, the Loudoun County Board provides a temporary subsidy to offer a portion of the service through a contract with ATE Management Services Company, Inc.

This chapter first presents elements of service warrants used to perform the analysis. Next, the warrants are applied in comparison to existing services in the study area on a geographical basis for each jurisdiction. Based on the results of this analysis, areas and specific locations (i.e., major generators) underserved or served at levels that exceed the warrants are identified.

Also, as part of this chapter, performance of WMATA is reviewed in terms of passenger complaints and public information of all systems is reviewed, including public timetables, system maps, published headway information at Metrorail stations and telephone information systems.

Service Warrants

There are two distinct elements to be considered in the determination of warrants for bus service. These components which reflect travel concentrations, trip purpose and community need, are the residential trip end that produces transit trips and the non-home end that attracts travel. Both the production end and attraction end of potential transit need are discussed below.

Production End - Determination of which residential neighborhoods should be candidates for service is a function of reasonable walking distance. The maximum distance an average person can reside from a bus route and still be considered to "have service" is approximately one-quarter mile, which is roughly equivalent to a five-minute walk. However, this rule of thumb must be applied in conjunction with data regarding auto ownership and population density of an area in order to determine optimum spacing of bus routes.

Population density and the proportion of autoless households based on information contained in the 1990 U.S. Census are depicted in Figures 29 and 30, respectively.

Presented below is a service warrant guide based on population density and percentage of households without an auto available. The former criterion reflects the concentration of development necessary to support reasonable utilization levels while the latter measures the need for public transportation service.

ROUTE SPACING GUIDE (MILES)

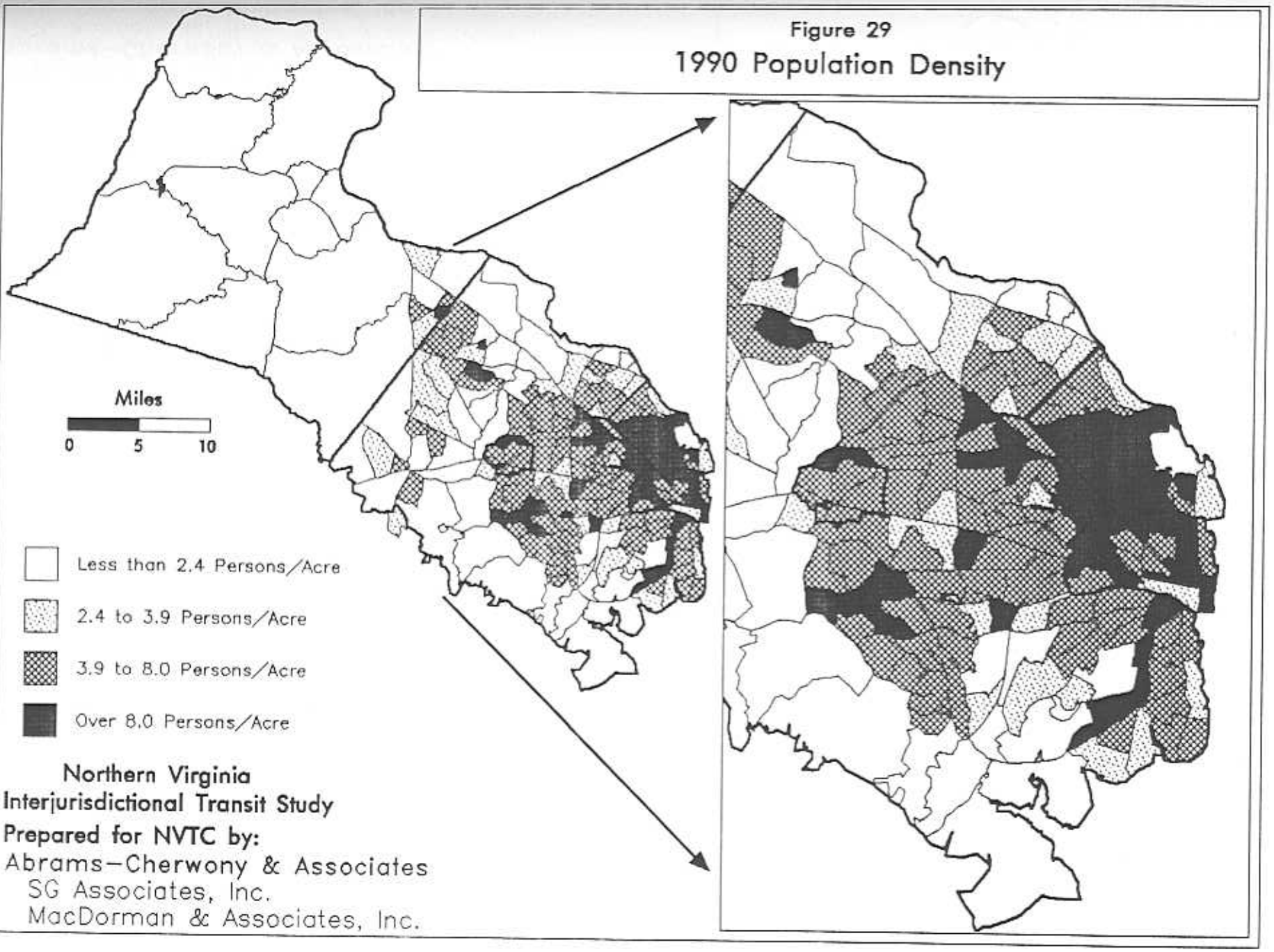
Percent Autoless Households	Population Density (Persons Per Acre)			
	Above 8.0	3.9-8.0	2.4-3.9	Below 2.4
More than 15.0	1/4	1/4	1/2	3/4
10.0 to 15.0	1/4	1/2	3/4	1
5.0 to 9.9	1/2	3/4	1	*
Less than 5.0	3/4	1	*	*

* Service should be provided to residential communities based on the length of route extension and population.

The warrant would suggest 1,300 feet walking distance between home and the closest route in high density and low auto ownership areas. In contrast, for those areas where residential density is relatively low and auto ownership relatively high, walking distance can be as much as one mile to a route and still meet the warrant. In this instance, few passengers at the mile distance from the route will walk to the route, particularly without sidewalks. In areas that do not exhibit characteristics associated with the need or propensity to use transit, the warrant would suggest limited or no service.

Figure 29

1990 Population Density



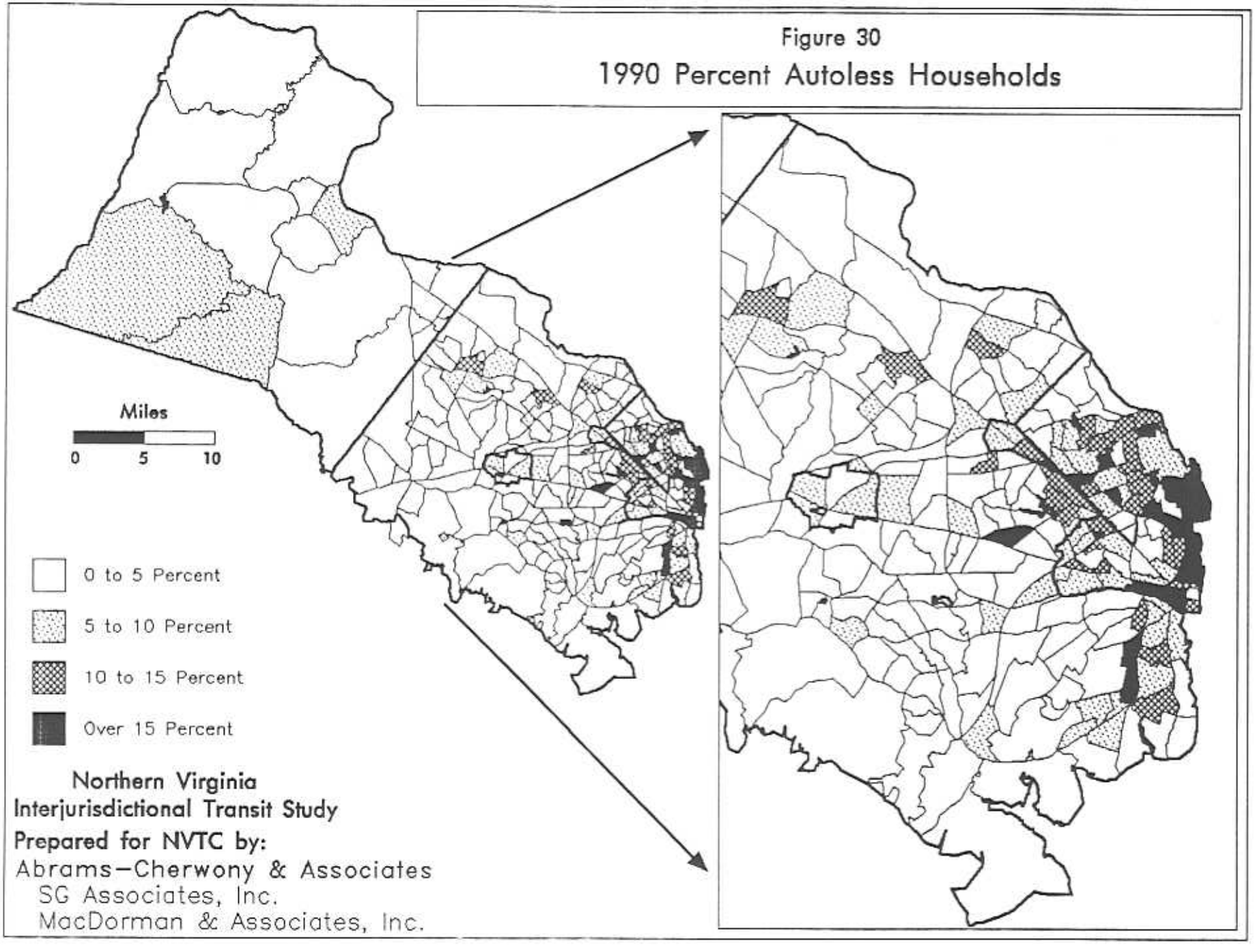
Northern Virginia Interjurisdictional Transit Study

Prepared for NVTC by:

Abrams–Cherwony & Associates
SG Associates, Inc.
MacDorman & Associates, Inc.

Figure 30

1990 Percent Autoless Households



Northern Virginia Interjurisdictional Transit Study

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The suggested transit service spacing proposed by the warrants is depicted in Figure 31.

Attraction End - Activity centers should be considered for transit service if they are large enough to attract an adequate number of transit trips. The threshold size of the activity centers are set to reflect what we established based on other transit planning assignments. Chapter 3 -Current Transportation Setting, identified and discussed the following types of major trip generators:

- Employment Concentrations - Sites or areas with 5,000 or more employees should be served.

- Hospitals/Nursing Homes - These usually do not attract a large number of trips. These facilities do, however, often serve those who depend on transit. Institutions of 100 beds or more should be served.

- Colleges/Schools - Students often comprise a major segment of the transportation dependent population in a community. For this reason, colleges and other post-secondary schools with an enrollment of at least 500 full-time students warrant consideration for service.

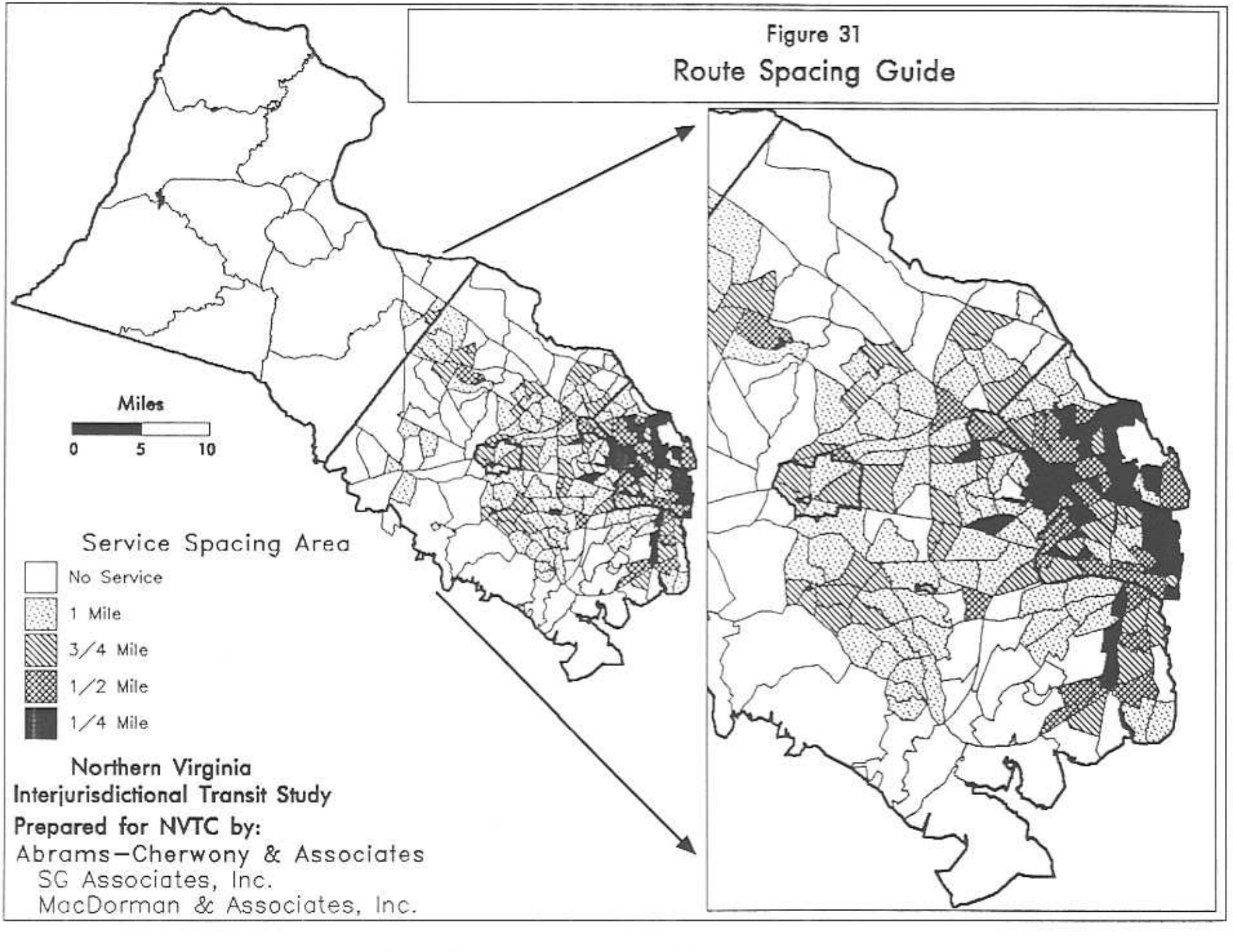
- Shopping Centers - Shopping trips constitute a major reason for transit travel. Shopping centers with more than 100,000 square feet of leased retail space are large enough to warrant consideration for service.

- Social Service/Government Centers - Public agencies, government centers and community facilities attract some volume of traffic, many of which are transit dependent. While the nature and size of these facilities vary greatly, it can be generally stated that those serving at least 250 clients daily warrant transit service.

- Rail Stations - The commuting patterns of workers in the study area would suggest that rail

Figure 31

Route Spacing Guide



Northern Virginia Interjurisdictional Transit Study

Prepared for NVTC by:

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SG Associates, Inc.
MacDorman & Associates, Inc.

stations be served to meet mobility requirements. This include both Metrorail and VRE facilities.

The categories of generators listed above represent the "destination" end of the transit trip. Combined with the availability standard for the other trip end (production), they provide a comprehensive guide for transit service warrants within the study area.

Application of Service Warrants

The next step in the analysis was to apply the service warrants to the public transportation services available throughout the study area. For residential (i.e., production) trip ends, the analysis is presented for each member jurisdiction in Northern Virginia. Attraction ends, which are the major generators noted previously, are presented on the basis of the different categories that comprise the group.

Production Ends - The following sections describe the results following application of the service warrants within each jurisdiction.

- City of Alexandria - Routes are concentrated in the eastern and western portions of the City where the warrants would suggest the closest (i.e., one-quarter mile) spacing. With respect to the route spacing guide, there are no unserved or underserved areas.

- Arlington County - The warrants suggest quarter-mile spacing throughout most of the County, with wider spacing in certain northern and eastern tracts. The spacing of the existing bus lines is consistent with the service warrants.

- City of Fairfax - The service warrants suggest route spacing ranging from three-quarters to one mile. Based on the existing route alignments, present service exceeds the warrant. Nearly all residents are within one-half mile of a transit route.

- Fairfax County - The entire spectrum of the service warrants is evident in the County, ranging from one-quarter mile service along the border with Arlington County to no service requirement in many tracts. The only portion of the County where existing service is not consistent with the warrant is in the Herndon area along the border with Loudoun County. Some residents are not within the one mile band suggested by the warrants. In many tracts, particularly in the southern and western portions of Fairfax County, service exceeds that proposed by the warrants.

- Falls Church - The warrants suggest route spacing ranging from one-half to three-quarters of a mile. The existing service meets this warrant. There are no unserved or underserved areas.

- Loudoun County - With the exception of limited express commuter service, Loudoun County is not served by transit. Based on the Census information and the route spacing guide, the lack of service is generally consistent with the warrants. There is only a single small residential "pocket" that would warrant service and is unserved. This area is along the border with Fairfax County in the Herndon area extending north and west to the Sterling/Sterling Park area.

Based on the warrants for fixed route transit service described previously, there is only a small portion of the entire Northern Virginia study area that is unserved. These area are portions of the Herndon area of Fairfax County and the Sterling/Sterling Park sections of Loudoun County. All other jurisdictions are served consistent with the service warrants. In many Fairfax County communities, service exceeds the suggested warrants.

Attraction Ends - As noted previously, major trip generators that attract transit travel should be served if they meet certain "size" thresholds. Six distinct types of major generators are discussed below.

- Employment Concentrations - With regard to the service warrants, nearly all of the major employment sites in the study area are afforded some level of transit service. In some cases, the service provided is insufficient or inconvenient to use. One such area, which will be in need of additional service as the complex develops, is Eisenhowever Valley in Alexandria.

- Hospitals/Nursing Homes - Most of the these facilities are served by transit. An exception is Fair Oaks Hospital. This hospital is a 160 bed facility located on Route 608 in Fairfax County. Fair Oaks Hospital should be considered a candidate for bus service.

- Colleges/Schools - Nearly all of the post-secondary educational facilities are served by at least one bus route. However, no service is operated to the Northern Virginia Community College - Loudoun County Campus. With an enrollment of 3,000 students, this institution warrants service. This facility is located in proximity to the same Loudoun County area (i.e., Sterling/Sterling Park) noted previously as an unserved residential concentration.

- Shopping Centers - All of the major regional shopping centers are served by transit.

- Social Service/Government Centers - Most of these facilities are accessible by transit.

- Rail Stations - The existing Metrorail and VRE stations in the study area are well served by transit. Nearly all rail stations are served by multiple routes.

With the few exceptions noted above, nearly all the major transit trip generators are served by transit.

Passenger Complaints

In order to obtain some insights as to how Metrobus passengers feel about their service, a review was made of passenger complaint data. WMATA compiles information on numbers of passenger complaints by route. Information was reviewed for the six month period covering January 1 through June 30, 1993. The average number of complaints for all Metrobus Northern Virginia routes for weekday service was about 20.6 per 100,000 miles of service. The number of complaints for the interjurisdictional bus routes is summarized in Table 27 and is slightly more at 21.8 per 100,000 miles. Most of the complaints that were made were concerning services on a particular route.

Its difficult to compare complaints for Metrobus services with those of other systems throughout the country because of a number a factors including differences in how complaints are cataloged, differences in what is termed a complaint and the attitude of the residents in the service area toward making complaints. However, while an absolute comparison with other systems may not be valid, the differences among Metrobus routes may be useful.

In terms of the 27 interjurisdictional bus routes which are the focus of this study, the most complaints per 100,000 miles of service occur on routes 3A-C,E,F (51.8) and 16L (43.9). The least number of complaints occur on routes 17G,H,K,L (9.4) and 18L,P,R (10.2). This data indicates that passengers appear to be most dissatisfied with services operated on Route 3A-C,E,F. Service change opportunities will be reviewed in Chapter 12 for the routes with the highest number passenger complaints.

Public Information

Four aspects of public information were reviewed in this section: public timetables; system map; published headway information at Metrorail stations and the telephone information system. The focus of the review was on the WMATA operations in each of these areas.

Public Timetables - All the bus systems operating in Northern Virginia produce a public timetable to describe service on individual routes. The Arlington Trolley, CUE, DASH, RIBS and Tysons Shuttle services are included in one document which contains a route map as well as scheduled times for each route. Individual public timetables are available for Fairfax Connector and Metrobus routes.

TABLE 27

WMATA INTERJURISDICTIONAL BUS ROUTES - PASSENGER COMPLAINTS

ROUTE NUMBER	LINE DESCRIPTION	MILES	COMPLAINTS	COMPLAINTS PER 100,000 MILES
Alexandria-Arlington-Fairfax County				
7A,C,E,F,H,P,W,X	Lincolnia-North Fairlington	255,737.5	53	20.7
9A-E	Fort Belvoir-Pentagon	240,375.0	47	19.6
16A-G,J	Columbia Pike	235,475.0	47	20.0
23A-C,T	McClean-Crystal City	247,650.0	52	21.0
25A,F,G,J,P,R	Ballston-Bradley-Pentagon	108,325.0	33	30.5
25B	Landmark-Ballston	52,762.5	11	20.8
Subtotal		1,140,325.0	243	21.3
Alexandria-Arlington				
10A-E	Huntington Towers-Pentagon	87,537.5	31	35.4
11P	Alexandria-Nat'l Airport Pentagon	27,937.5	5	17.9
13A-G	Nat'l Airport-Pentagon-Washington	74,187.5	19	25.6
Subtotal		189,662.5	55	29.0
Alexandria-Fairfax County				
16L	Columbia Pike Express	29,587.5	13	43.9
18A,B,X-F	Springfield	105,737.5	17	16.1
18G,H,J,K	Orange Hunt	212,437.5	24	11.3
18L,P,R	Burke Centre	156,950.0	16	10.2
28F,G	Skyline City	36,562.5	10	27.4
29C,E,G,J,P,R	Annandale	235,350.0	51	21.7
Subtotal		776,625.0	131	16.9
Alexandria-Faifax County-Falls Church				
28A,B	Alexandria-Tysons Corner	172,250.0	66	38.3

TABLE 27

WMATA INTERJURISDICTIONAL BUS ROUTES - PASSENGER COMPLAINTS
(CONTINUED)

ROUTE NUMBER	LINE DESCRIPTION	MILES	COMPLAINTS	COMPLAINTS PER 100,000 MILES
Alexandria-City of Fairfax-Fairfax County				
29K-N	Alexandria-Fairfax	105,862.5	24	22.7
Arlington-City of Fairfax-Fairfax County-Falls Church				
1B-F,Z	Wilson Blvd.-Fairfax	206,387.5	50	24.2
2A-C,G	Washington Blvd.	233,412.5	49	21.0
Subtotal		439,800.0	99	22.6
Arlington-Fairfax County-Falls Church				
3A-C,E,F	Lee Highway	195,037.5	101	51.8
10B-D	Alexandria-Arlington	137,125.0	21	15.3
Subtotal		332,162.5	122	33.6
Arlinton-Fairfax County				
4A,B,E,H,S	Pershing Drive-Arlington Blvd	129,637.5	21	16.2
22A,B,F	Walker Chapel-Pentagon	150,850.0	28	18.6
Subtotal		280,487.5	49	17.5
Arlington-DC				
38B	Ballston-Farragut Sq.	101,082.0	30	29.7
Arlington-City of Fairfax-Fairfax County				
15K,L	Chain Bridge Road	92,612.5	15	16.2
17A,B,F,M	Kings Park	145,062.5	20	13.8
17G,H,K,L	Kings Park Express	254,950.0	24	9.4
Subtotal		492,625.0	59	12.0
WMATA-INTERCOUNTY TOTAL		3,783,232.0	826	21.8

Further, because of the large number of systems operating in Northern Virginia, NVTC has published an transportation guide which describes each service. Most of the essential information is available on each systems' public timetable/system map including a map of the route, fare information, schedule times and the telephone number to call for further information.

The complexity of the public timetables for the Metrobus routes is the only problem found in this aspect of public information. Part of the problem is that the routes themselves are complicated and have many variations that must be reflected in the public timetables. This problem can not be overcome unless the routes are simplified. However, the other problem is that several panels on public timetables for most routes are devoted to general fare structure information about the entire Metrobus system. From this information, it is not readily apparent what the rider must pay for a particular trip on the route described within the timetable. A simplification would be to make the fare structure information at least applicable only to bus services in Northern Virginia. A further improvement would be to describe overall Metrobus fare information and more detailed information for the specific route.

System Map - The Northern Virginia bus systems all have a system map describing their bus routes and services. In fact, a Metro System Route Map was issued in January 1994 containing Metrobus and Metrorail services in Virginia and Washington, DC. The map also contains bus and commuter rail services of local governments. This map together with the system maps from the other local governments provide the public with an excellent source for available public transit options. The only improvement that is recommended regarding systems maps in Northern Virginia is that they be kept as current as possible. Updates to the maps should occur when major changes are implemented or at least once every two years to keep maps current and reflect minor changes.

Metrorail Headway Information - Information is not available to the public on the actual times the Metrorail trains serve the various stations in Northern Virginia. It has been stated by WMATA personnel that a reason for this lack of information is that trains run frequently enough that a public timetable is unnecessary. This might be true for an individual whose mode of transportation to and from the station is the automobile. However, if the mode is a bus, and the bus is on an infrequent headway, the knowledge of rail schedule information is important. For example, a

person may be riding the Metrorail service from Washington, DC to a Virginia station in order to catch a bus to a final destination. Without knowledge of the time the train arrives at the station, the person may miss the connecting bus and have to wait an extended period for the next bus. Having the train schedule information, the person could plan the trip so that the bus wait is minimal. This opportunity to plan a trip is lost without Metrorail schedule time information for each station for all time periods.

Telephone Information System - An important part of any public information system is telephone information services. In Northern Virginia, each system has its own telephone information service.

In order to verify the timeliness and accuracy of the telephone information service, a series of five telephone calls were placed to the WMATA information system. The WMATA operators were asked for information to complete a trip within Northern Virginia utilizing public transportation. A sample of five calls were made. In each case, after a short period (one to four minutes) of being on hold, an information operator answered the call. For the most part, proper directions were given in three instances where the trip involved combinations of Fairfax Connector, Metrobus and Metrorail services. In one case, the proper direction was given for a trip involving Fairfax Connector only service. In the final case, the information operator referred us to the Fairfax Connector operator for the information, which was properly provided. Overall, considering the extensive amount of services and the number of different operators in Northern Virginia, the quality and the timeliness of the telephone information given was quite good.

CHAPTER 10

TRAVEL PATTERNS

The purpose of this chapter is to identify the current travel patterns within the study area. This undertaking begins with the examination of general travel patterns. It is followed by an examination of transit travel opportunities. The methodology employed is as follows.

1. General travel pattern information is derived from the examination of data available from the 1990 Census. These data are commuter flows at the metropolitan and jurisdictional levels.

2. The study team examined district-level travel model simulations prepared by the Metropolitan Washington Council of Governments. These data provide sub-jurisdictional travel flow patterns for work and non-work travel in the metropolitan area as presented below.

    - Home-based Work Person Trips
    - Home-based Shopping Auto Driver Trips
    - Home-based Other Auto Driver Trips
    - Non-home-based Auto Driver Trips
    - Related Maps

    The data, examined relative to the study area jurisdictions, provide an estimate of general travel at a level of aggregation more conducive to transit service area interpretation. This exercise yields an estimate of current detailed interjurisdictional travel. This can then be compared to existing transit service. The material requested from MWCOG to conduct this analysis consists of the following items at the District level. There are 293 districts in the MWCOG model.

3. Existing transit services are identified by route. This information is then related to the travel flows identified at the jurisdiction and district levels to determine whether travel demand is supported by transit services.

4. The product of this exercise is the identification of where transit service is and is not available to support current travel patterns as well as significant travel movements for which transit connections are difficult or a transfer between different operators is required.

Current Travel Patterns -- 1990 Census

The 1990 Census data show that the metropolitan area generated over two million daily commuters traveling to work in 1990. Figure 32 shows the composition of commuter flows by jurisdiction of employment for the metropolitan area. Note that while employment in Washington, DC was comprised of residents of Washington, DC, suburban Maryland and Northern Virginia in roughly equal thirds, employment in suburban Maryland and in Northern Virginia was comprised primarily of residents of the respective area. Note also that Northern Virginia was the site of the most employment in the region. The reader may note by reference to Table 28 that the number of persons making work trips in the metropolitan area increased by 32.5 percent, or 493,330 persons between 1980 and 1990. Of this increase, over half (58.1 percent) or 286,591 persons, occurred in Northern Virginia. In 1990, Northern Virginia was the place of employment for 737,063 persons or 36.7 percent of all employment in the metropolitan area. In fact, Northern Virginia experienced the most dramatic increase in employment during the past decade, growing 63.6 percent.

Of the noted 63.6 percent increase in employment in Northern Virginia between 1980 and 1990, the greatest absolute gain was from growth in Northern Virginians working in Northern Virginia. In terms of percentage growth, the number of Maryland residents working in Northern Virginia grew by 101.5 percent, or 39,180 persons. Table 29 presents the commuting patterns at the metropolitan level for 1990, 1980 and the absolute and percent changes during the decade between.

An examination of the 1990 Census data at the jurisdiction level provides a host of travel information. This information is presented in Table 30. The reported loss of 3,864 persons employed in Falls Church between 1980 and 1990 is suspect and may represent incorrect coding of place-

Figure 32

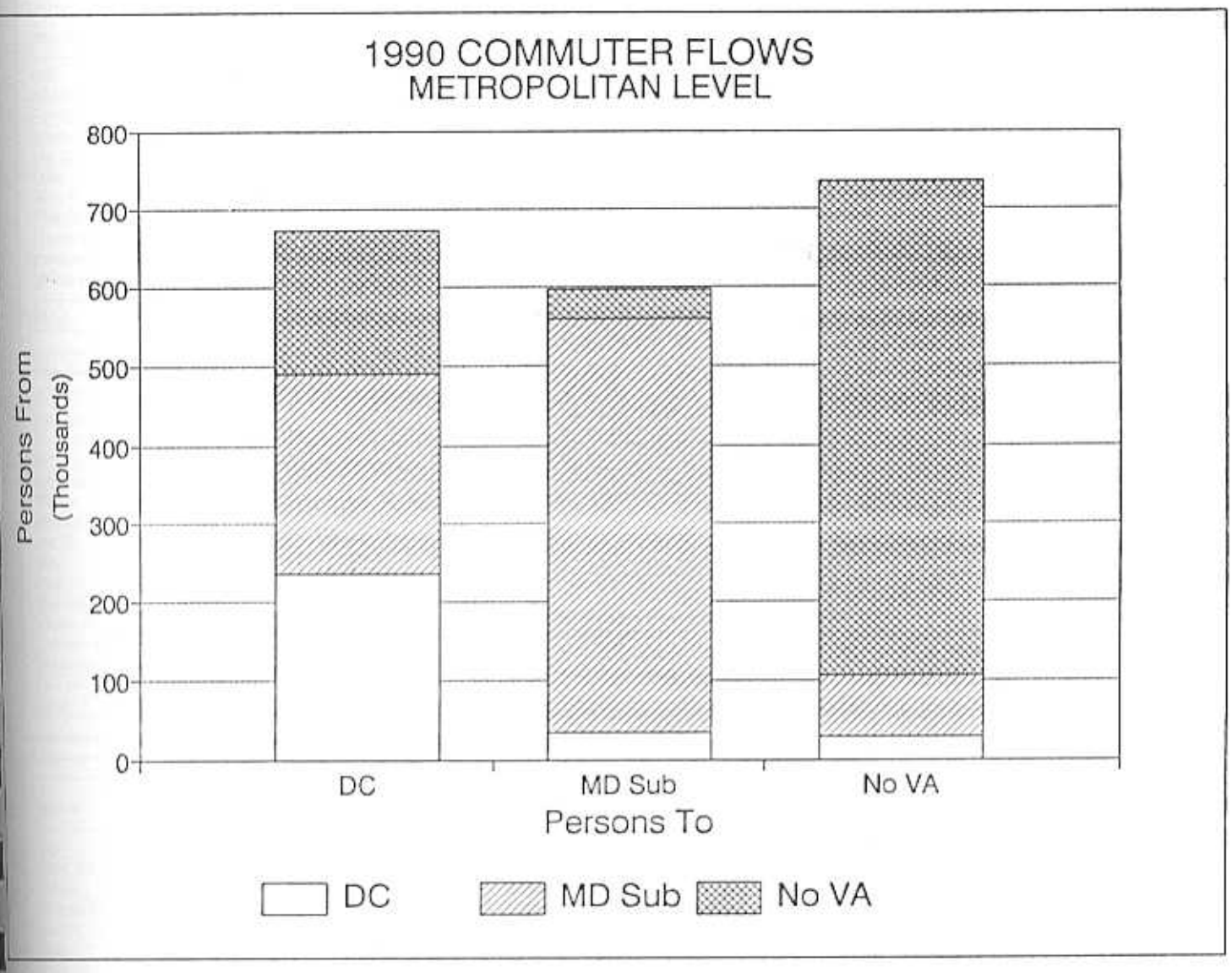

1990 COMMUTER FLOWS
METROPOLITAN LEVEL
Persons From
(Thousands)
800
700
600
500
400
300
200
100
0
DC
MD Sub
No VA
Persons To
DC
MD Sub
No VA

TABLE 28

1990 CENSUS COMMUTING FLOWS
METROPOLITAN LEVEL ANALYSIS

from/to	Washington DC		Suburban Maryland		Northern Virginia		Total DC SMSA	
	Persons	Percent	Persons	Percent	Persons	Percent	Persons	Percent
District of Columbia	236,734	35.1% 79.1%	33,696	5.6% 11.3%	28,846	3.9% 9.6%	299,276	14.9% 100.0%
Suburban Maryland	254,688	37.8% 29.7%	526,216	87.9% 61.3%	77,778	10.6% 9.1%	858,682	42.7% 100.0%
Northern Virgina	183,173	27.1% 21.5%	38,614	6.5% 4.5%	630,439	85.5% 74.0%	852,226	42.4% 100.0%
SMSA Total	674,793	100.0% 33.6%	598,526	100.0% 29.8%	737,063	100.0% 36.7%	2,010,384	100.0% 100.0%

SOURCE: 1990 MWCOG CENSUS PRODUCTS

1980 CENSUS COMMUTING FLOWS
METROPOLITAN LEVEL ANALYSIS

from/to	Washington DC		Suburban Maryland		Northern Virginia		Total DC SMSA	
	Persons	Percent	Persons	Percent	Persons	Percent	Persons	Percent
District of Columbia	234,061	38.1% 80.6%	33,256	7.4% 11.5%	22,183	4.9% 7.7%	289,502	19.1% 100.0%
Suburban Maryland	216,058	35.5% 33.7%	390,269	86.3% 60.3%	38,598	8.6% 6.0%	646,925	42.6% 100.0%
Northern Virgina	162,252	26.4% 27.9%	28,684	6.3% 4.9%	389,691	86.5% 67.1%	580,627	38.3% 100.0%
SMSA Total	614,371	100.0% 40.5%	452,211	100.0% 29.8%	450,472	100.0% 29.7%	1,517,054	100.0% 100.0%

SOURCE: 1990 MWCOG CENSUS PRODUCTS

1980-1990 CHANGE IN CENSUS COMMUTING FLOWS
METROPOLITAN LEVEL ANALYSIS

from/to	Washington DC		Suburban Maryland		Northern Virginia		Total DC SMSA	
	Persons	Percent	Persons	Percent	Persons	Percent	Persons	Percent
District of Columbia	2,673	4.4% 27.3%	438	0.3% 4.5%	6,663	2.3% 68.2%	9,774	2.0% 100.0%
Suburban Maryland	36,626	61.0% 17.4%	135,949	92.9% 64.1%	39,180	13.7% 18.5%	211,957	43.0% 100.0%
Northern Virgina	20,821	34.6% 7.7%	9,930	6.8% 3.7%	240,748	84.0% 88.6%	271,599	55.1% 100.0%
SMSA Total	60,422	100.0% 12.2%	146,317	100.0% 29.7%	286,591	100.0% 58.1%	493,330	100.0% 100.0%

SOURCE: 1990 MWCOG CENSUS PRODUCTS

1980-1990 PERCENT CHANGE IN CENSUS COMMUTING FLOWS
METROPOLITAN LEVEL ANALYSIS

from/to	Washington DC	Suburban Maryland	Northern Virginia	Total DC SMSA
	Percent	Percent	Percent	Percent
District of Columbia	1.1%	1.3%	30.0%	3.4%
Suburban Maryland	16.9%	34.8%	101.5%	32.8%
Northern Virgina	12.9%	34.6%	61.8%	46.8%
SMSA Total	9.8%	32.4%	63.6%	32.5%

SOURCE: 1990 MWCOG CENSUS PRODUCTS

TABLE 29

1990 Commuting Flows County Level Detail

from/to	DC	Mont. County	PG County	Charles County	Arl. Co	Alex.	Fils Ch	Ffx City	Ffx Co	Loudon	PW Area	Total
DC	236,724	20,487	12,979	230	13,393	4,251	601	440	9,433	229	499	299,266
Mont. Co	103,320	251,949	26,879	145	10,011	2,760	469	496	16,177	720	472	413,399
PG Co	141,590	40,560	167,418	2,785	17,055	7,150	403	691	15,362	268	876	394,158
Charles Co	9,976	1,078	12,641	22,762	1,968	963	18	66	1,633	73	147	51,325
Arl. Co	43,842	3,646	1,438	48	34,382	5,392	788	873	15,575	457	694	107,135
Alex.	23,557	1,688	1,468	110	10,833	19,574	296	435	12,021	168	405	70,555
Falls Ch	1,708	212	77	15	764	230	715	110	1,605	41	33	5,510
Ffax City	151	437	132	6	856	404	113	2,624	5,210	145	194	10,272
Fairfax Co	94,502	15,001	8,517	300	51,841	30,376	4,667	14,392	238,650	6,267	7,282	471,795
Loudoun Co	3,461	1,582	347	0	1,575	513	168	634	18,055	21,370	706	48,411
Prince Wm Area	14,602	1,875	1,700	15	10,277	6,849	473	2,797	38,632	1,658	58,320	137,198
Total	673,433	338,515	233,596	26,417	152,955	78,462	8,711	23,558	372,353	31,396	69,628	2,009,024

SOURCE: MWCOG 1990 CENSUS PRODUCTS

1980 Commuting Flows County Level Detail

from/to	DC	Mont. County	PG County	Charles County	Arl. Co	Alex.	Fils Ch	Ffx City	Ffx Co	Loudon	PW Area	Total
DC	234,061	18,604	14,581	73	11,579	4,150	376	902	4,877	177	122	289,502
Mont. Co	82,331	174,178	20,084	70	5,672	1,379	591	569	5,941	348	189	291,352
PG Co	128,974	29,943	142,311	2,099	10,260	4,463	422	598	5,848	206	151	325,295
Charles Co	6,753	618	6,582	14,384	914	529	37	40	395	0	26	30,278
Arl. Co	40,108	2,885	1,300	66	29,895	3,584	1,679	661	7,638	118	259	88,193
Alex.	24,371	1,122	1,233	20	9,547	16,981	631	583	5,769	136	148	60,541
Falls Ch	1,527	217	121	0	749	57	1,188	44	1,130	14	22	5,069
Ffax City	1,605	403	208	0	928	437	120	2,989	3,591	93	188	10,562
Fairfax Co	80,258	11,347	6,071	90	39,415	28,317	6,300	12,130	120,690	2,552	3,428	310,598
Loudoun Co	2,906	727	307	0	1,390	430	484	684	6,600	13,556	248	27,332
Prince Wm Area	11,477	1,450	1,117	0	7,759	4,925	747	2,039	15,963	713	32,142	78,332
Total	614,371	241,494	193,915	16,802	118,108	65,272	12,575	21,239	178,442	17,913	36,923	1,517,054

SOURCE: MWCOG 1990 CENSUS PRODUCTS

Change in 1980-1990 Commuting Flows County Level Detail

from/to	DC	Mont. County	PG County	Charles County	Arl. Co	Alex.	Fils Ch	Ffx City	Ffx Co	Loudon	PW Area	Total
DC	2,663	1,883	(1,602)	157	1,814	101	225	(462)	4,556	52	377	9,764
Mont. Co	20,989	77,771	6,795	76	4,339	1,381	(122)	(73)	10,236	372	283	122,047
PG Co	12,616	10,617	25,107	686	6,795	2,687	(19)	93	9,514	62	725	68,863
Charles Co	3,223	460	6,059	8,378	1,054	434	(19)	26	1,238	73	121	21,047
Arl. Co	3,734	761	138	(18)	4,487	1,808	(891)	212	7,937	339	435	18,942
Alex.	(814)	566	235	90	1,286	2,593	(335)	(148)	6,252	32	257	10,014
Falls Ch	181	(5)	(44)	15	15	173	(473)	66	475	27	11	441
Ffax City	(1,454)	34	(76)	6	(72)	(33)	(7)	(365)	1,619	52	6	(290)
Fairfax Co	14,244	3,654	2,446	210	12,426	2,059	(1,633)	2,262	117,960	3,715	3,854	161,197
Loudoun Co	555	855	40	0	185	83	(316)	(50)	11,455	7,814	458	21,079
Prince Wm Area	3,125	425	583	15	2,518	1,924	(274)	758	22,669	945	26,178	58,866
Total	59,062	97,021	39,681	9,615	34,847	13,190	(3,864)	2,319	193,911	13,483	32,705	491,970

SOURCE: MWCOG 1990 CENSUS PRODUCTS

Percent Change in 1980-1990 Commuting Flows County Level Detail

from/to	DC	Mont. County	PG County	Charles County	Arl. Co	Alex.	Fils Ch	Ffx City	Ffx Co	Loudon	PW Area	Total
DC	1.14%	10.12%	-10.99%	215.07%	15.67%	2.43%	59.84%	-51.22%	93.42%	29.38%	309.02%	3.37%
Mont. Co	25.49%	44.65%	33.83%	108.57%	76.50%	100.15%	-20.64%	-12.83%	172.29%	106.90%	149.74%	41.89%
PG Co	9.78%	35.46%	17.64%	32.68%	66.23%	59.49%	-4.50%	15.55%	162.69%	30.10%	480.13%	21.17%
Charles Co	47.73%	74.43%	92.05%	58.25%	115.32%	82.04%	-51.35%	65.00%	313.42%	NA	465.38%	69.51%
Arl. Co	9.31%	26.38%	10.62%	-27.27%	15.01%	50.45%	-53.07%	32.07%	103.91%	287.29%	167.95%	21.48%
Alex.	-3.34%	50.45%	19.06%	450.00%	13.47%	15.27%	-53.09%	-25.39%	108.37%	23.53%	173.65%	16.54%
Falls Ch	11.85%	-2.30%	-36.36%	NA	2.00%	303.51%	-39.81%	150.00%	42.04%	192.86%	50.00%	8.70%
Ffax City	-90.59%	8.44%	-36.54%	NA	-7.76%	-7.55%	-5.83%	-12.21%	45.08%	55.91%	3.19%	-2.75%
Fairfax Co	17.75%	32.20%	40.29%	233.33%	31.53%	7.27%	-25.92%	18.65%	97.74%	145.57%	112.43%	51.90%
Loudoun Co	19.10%	117.61%	13.03%	NA	13.31%	19.30%	-65.29%	-7.31%	173.56%	57.64%	184.68%	77.12%
Prince Wm Area	27.23%	29.31%	52.19%	NA	32.45%	39.07%	-36.68%	37.18%	142.01%	132.54%	81.44%	75.15%
Total	9.61%	40.18%	20.46%	57.23%	29.50%	20.21%	-30.73%	10.92%	108.67%	75.27%	88.58%	32.43%

SOURCE: MWCOG 1990 CENSUS PRODUCTS

NVTC INTERJURISDICTIONAL TRAVEL FLOWS
BASED ON 1990 US CENSUS

TABLE 30A

TRIP PURPOSE: WORK PERSON TRIPS

ORIGIN/DESTINATION	DC	Mont. County	PG County	Arl. Co	Alex.	Greater Ffx Co	Loudoun	PW Area	Total
DISTRICT OF COLUMBIA				13,393	4,251	10,474	229		28,347
MONTGOMERY				10,011	2,760	17,142	720		30,633
PRINCE GEORGES				17,055	7,150	16,456	268		40,929
PRINCE WILLIAM				10,277	6,849	41,902	1,658		60,686
ARLINGTON	43,842	3,646	1,438	34,382	5,392	17,236	457	694	107,087
ALEXANDRIA	23,557	1,688	1,468	10,833	19,574	12,752	168	405	70,445
GREATER FAIRFAX CO	96,361	15,650	8,726	53,461	31,010	268,086	6,453	7,509	487,256
LOUDOUN	3,461	1,582	347	1,575	513	18,857	21,370	706	48,411
TOTALS:	167,221	22,566	11,979	150,967	77,499	402,905	31,323	9,314	873,794

SOURCE: MWCOG 1990 CENSUS PRODUCTS

NVTC INTERJURISDICTIONAL TRAVEL FLOWS
BASED ON MWCOG TRAVEL SIMULATIONS (1990)

TABLE 30B

TRIP PURPOSE: WORK PERSON TRIPS

ORIGIN/DESTINATION	DC	Mont. County	PG County	Arl. Co	Alex.	Greater Ffx Co	Loudoun	PW Area	Total
DISTRICT OF COLUMBIA				33,383	6,454	8,675	128		48,640
MONTGOMERY				9,509	1,521	15,146	428		26,604
PRINCE GEORGES				28,282	8,028	13,149	91		49,550
PRINCE WILLIAM				19,727	11,297	74,822	3,416		109,262
ARLINGTON	56,044	2,726	1,997	65,004	9,843	22,243	285	263	158,405
ALEXANDRIA	31,970	1,021	2,277	27,106	31,962	16,060	96	265	110,777
GREATER FAIRFAX CO	172,916	17,682	7,755	94,028	47,256	302,660	4,907	4,292	651,496
LOUDOUN	5,037	1,896	479	3,169	672	25,990	22,176	921	60,340
TOTALS:	265,967	23,325	12,508	280,208	117,033	478,765	31,527	5,741	1,215,074

TABLE 30C

NVTC INTERJURISDICTIONAL TRAVEL FLOWS
COMPARISON OF ADJUSTED SIMULATION RESULTS TO US CENSUS
DENOTES THE RATIO OF SIMULATED TRIPS TO CENSUS COUNTED TRIPS

TRIP PURPOSE: WORK TRIPS (PERSONS)

ORIGIN/DESTINATION	DC	Mont. County	PG County	Arl. Co	Alex.	Greater Ffx Co	Loudoun	PW Area	Total
DISTRICT OF COLUMBIA				0.8024	1.3173	2.4148	3.5781		1.1656
MONTGOMERY				2.1056	3.6292	2.2636	3.3645		2.3029
PRINCE GEORGES				1.2061	1.7813	2.5030	5.8901		1.6520
PRINCE WILLIAM				1.0419	1.2125	1.1200	0.9707		1.1108
ARLINGTON	1.5646	2.6750	1.4402	1.0578	1.0956	1.5498	3.2070	5.2776	1.3521
ALEXANDRIA	1.4737	3.3066	1.2894	0.7993	1.2248	1.5861	3.5000	3.0566	1.2718
GREATER FAIRFAX CO	1.1145	1.7702	2.2504	1.1371	1.3124	1.7715	2.6301	3.4991	1.4958
LOUDOUN	1.3742	1.5688	1.4489	0.9940	1.5268	1.4511	1.9273	1.5331	1.6046

NOTE: SIMULATION ADJUSTED IN HALF TO DENOTE PERSONS AS FOLLOWS:
(CENSUS TRIPS)/(SIMULATED TRIPS/2)

of-work data by the Census rather than a true loss of jobs of this magnitude. Fairfax County experienced the greatest employment gain in the area during the period in both absolute and percent terms. Employment in Fairfax County grew by 193,911 persons or 108.7 percent between 1980 and 1990. Arlington County experienced the next largest gain in employment in Northern Virginia, 34,847 persons or an increase of 29.5 percent.

Figures 33 and 34 present information regarding commuters by place of work and place of residence at the jurisdiction level. Figure 33 shows jurisdictional work place for residents of the jurisdictions in the study area. Figure 34 shows place of residence for persons employed in the study area jurisdictions. They provide the magnitude of employment and working residents per study area jurisdiction, as well as the relative magnitude vis-a-vis the other jurisdictions in the study area. Fairfax County had both the most workers and the most residents of any of the jurisdictions in the study area.

Note in Figure 33 that half of the 471,795 employed residents of Fairfax County also worked in Fairfax County. In Arlington County, by comparison, about half of its employed residents worked in the District of Columbia and the Maryland suburbs. The table below presents each jurisdiction in terms of its residential and employment site numbers and its jobs/housing ratio. Note that the higher the ratio, the more jobs than employed residents are located in a jurisdiction. The lower the ratio, the more the jurisdiction is characterized as residential rather than commercial. Theoretically, a jobs/housing ratio of 1.0 is desirable assuming residential and work sites are in close proximity. The jobs/housing ratio can be a good indicator of peak period travel demand. A high jobs/housing ratio is indicative of work travel to the jurisdiction. A low jobs/housing ratio is indicative of work trip travel from the jurisdiction.

1990 JOBS/HOUSING RATIO

Jurisdiction	Job Site Employment	Employed Residents	Ratio
Fairfax County	372,353	471,795	0.789
Arlington County	152,955	107,135	1.427
Alexandria	78,462	70,555	1.112
Falls Church	8,711	5,510	1.581
City of Fairfax	23,558	10,272	2.293
Loudoun County	31,396	48,411	0.649

Figure 33

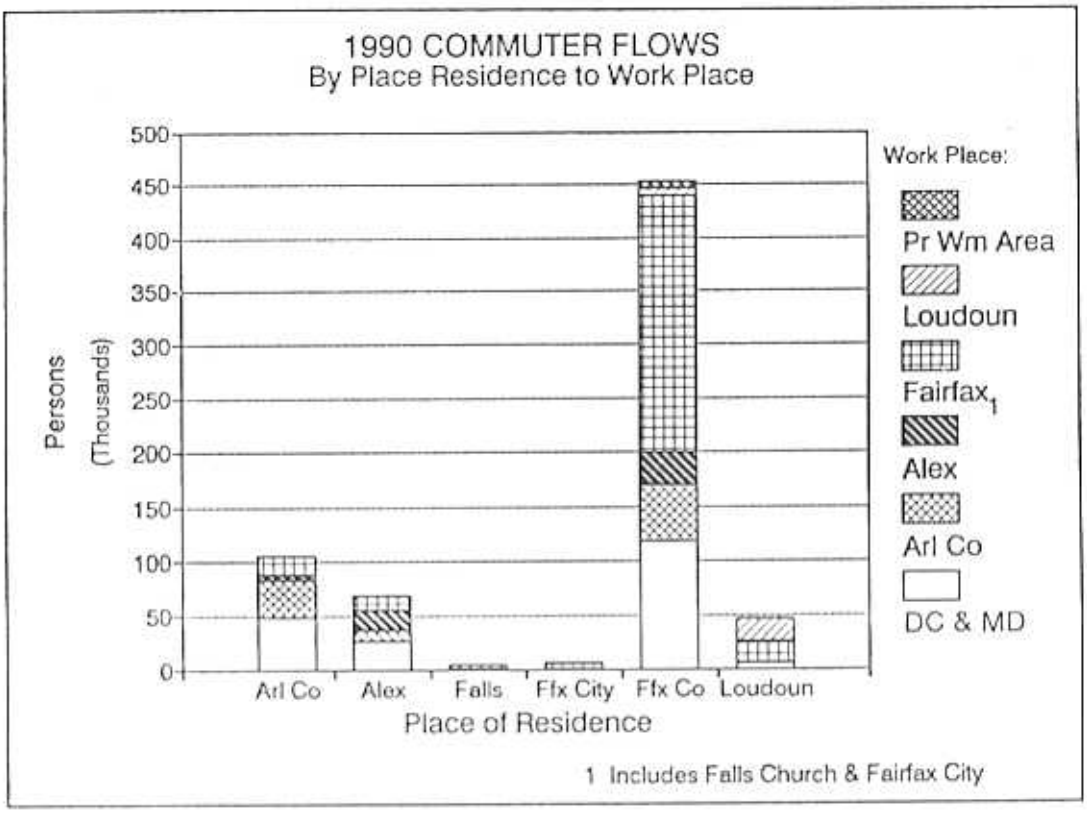
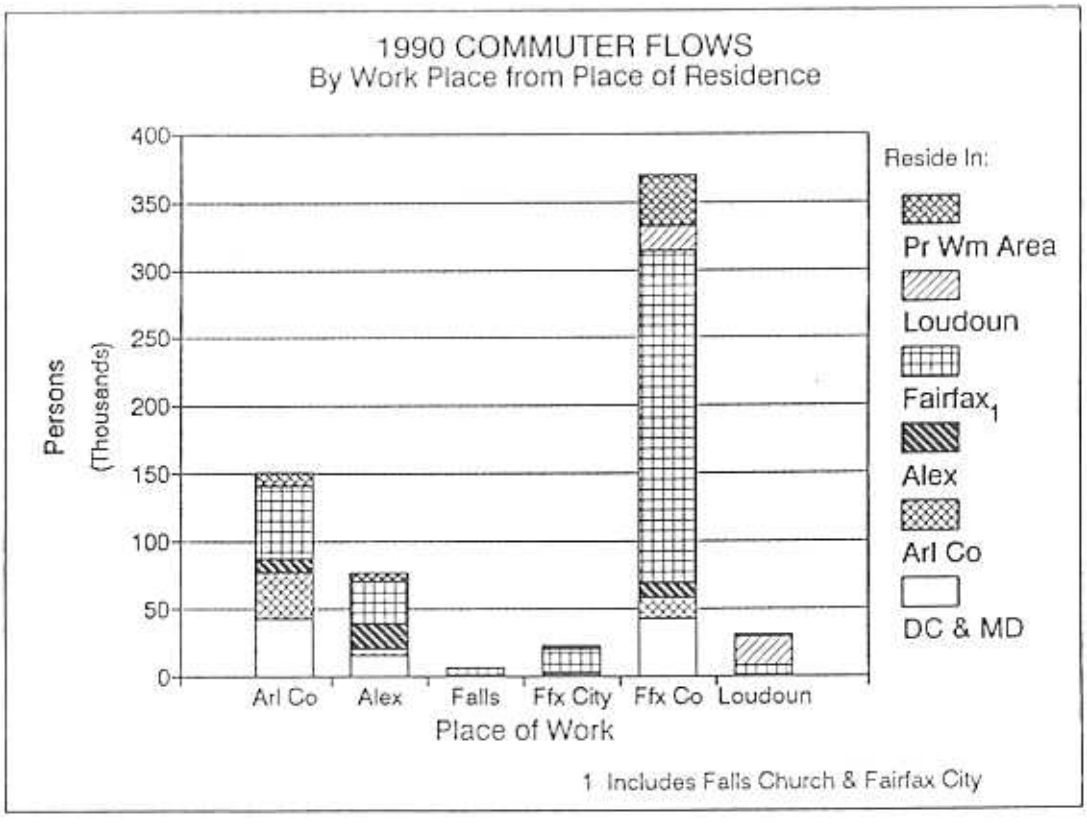


Figure 34



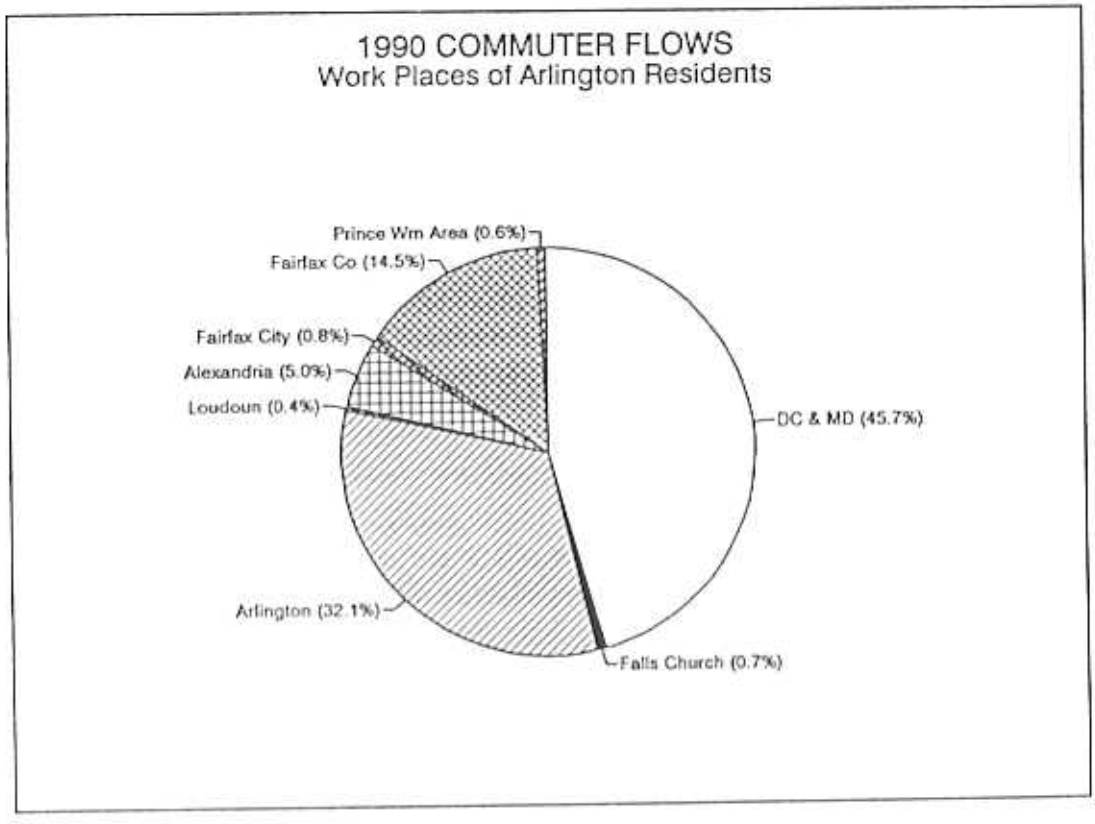
Due to the great difference in the magnitude of the numbers, the details are difficult to assess for the smaller jurisdictions. The following set of figures present the composition of total employment within a jurisdiction by residential jurisdiction and the composition of residents in a jurisdiction by jurisdiction of employment. The figures are grouped by study area jurisdiction. Note that, as is expected due to its size, Fairfax County comprised a significant share of the employment market for all the study area jurisdictions. Figures 35 through 40, with the information in Figures 33 and 34, present an excellent picture of travel patterns affecting the study area. The jurisdiction-to-jurisdiction level commuting flows for each study area jurisdiction are presented individually.

The top portion of Figure 35 shows that the majority or 45.7 percent of the 107,135 employed Arlington County residents worked in Maryland and DC (40.9 percent DC). Only about one in three remained within Arlington County. These work trips to other destinations are possible since reasonable levels of transit service exists between Arlington County and most of these work site destinations in the region. Arlington County, according to the 1990 Census, was the employment site for 152,955 persons, the second largest employment site of the study area jurisdictions. The bottom portion of Figure 35 presents the persons employed in Arlington County by the jurisdiction of their residence. As seen, the majority of in-flow work trips came from Fairfax County, followed by those from Maryland and DC, Alexandria and Prince William County. All of these jurisdictions have access to reasonable transit service to Arlington County.

The top portion of Figure 36 shows that the majority, or 38.0 percent, of the 70,555 employed Alexandria residents worked in Maryland and DC (33.4 percent DC). Only slightly more than one in four remained in Alexandria. Alexandria, according to the 1990 Census, was the employment site for 78,462 persons, making it the third largest employment site in the study area. As shown in the bottom portion of Figure 36, most of the in-flow workers to Alexandria are residents of Fairfax County, followed by Maryland and DC, and Arlington.

As seen in the top portion of Figure 37, of the 5,510 employed residents of Falls Church, 36.5 percent worked in Maryland and DC (31.0 percent DC) and 29.1 percent worked in Fairfax County. Only 13.0 remained in Falls Church. Falls Church, according to the 1990 Census, was the place of employment for 8,711 persons. As seen in the bottom portion of Figure 37, of the persons employed in Falls Church, the majority or 53.6 percent resided in Fairfax County.

Figure 35


1990 COMMUTER FLOWS
Work Places of Arlington Residents
Prince Wm Area (0.6%)
Fairfax Co (14.5%)
Fairfax City (0.8%)
Alexandria (5.0%)
Loudoun (0.4%)
DC & MD (45.7%)
Arlington (32.1%)
Falls Church (0.7%)

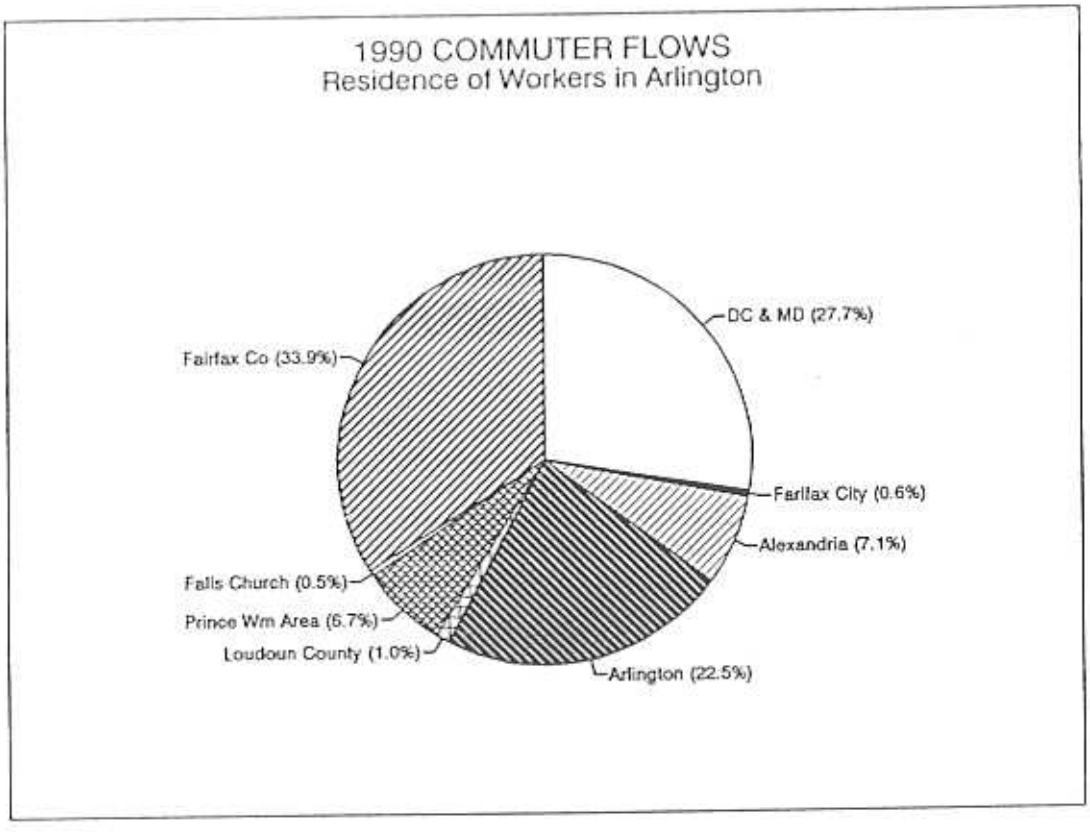
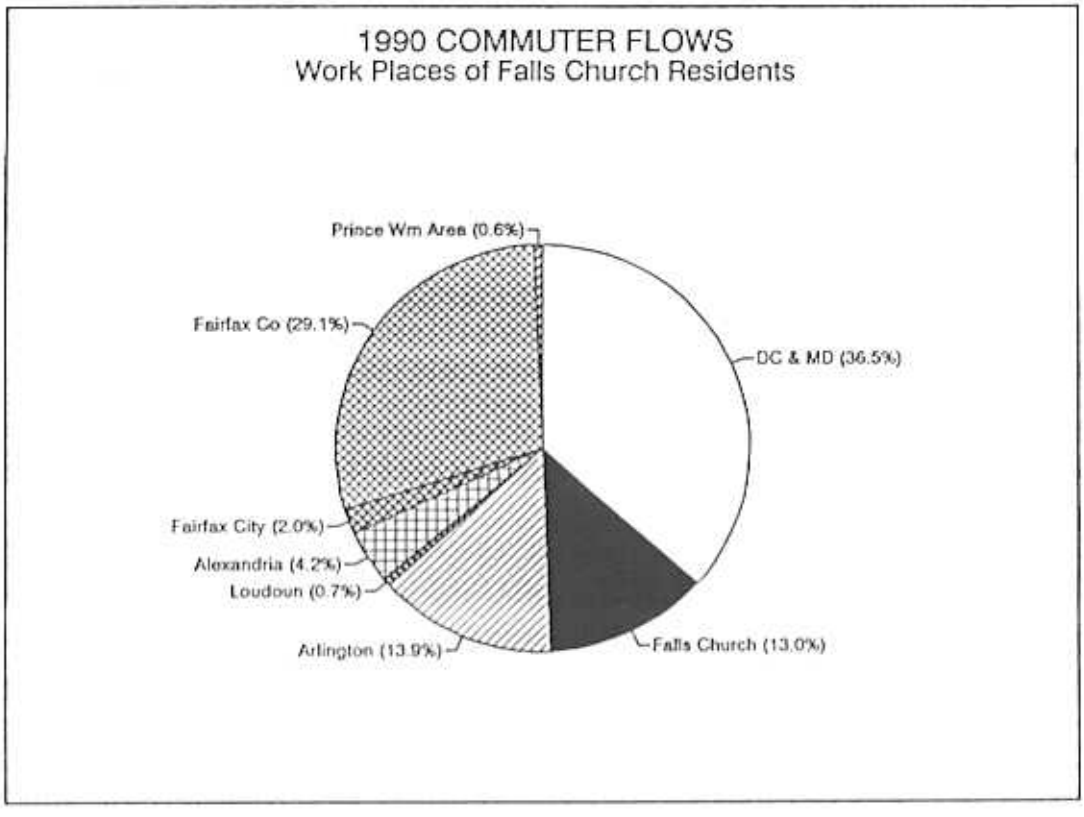
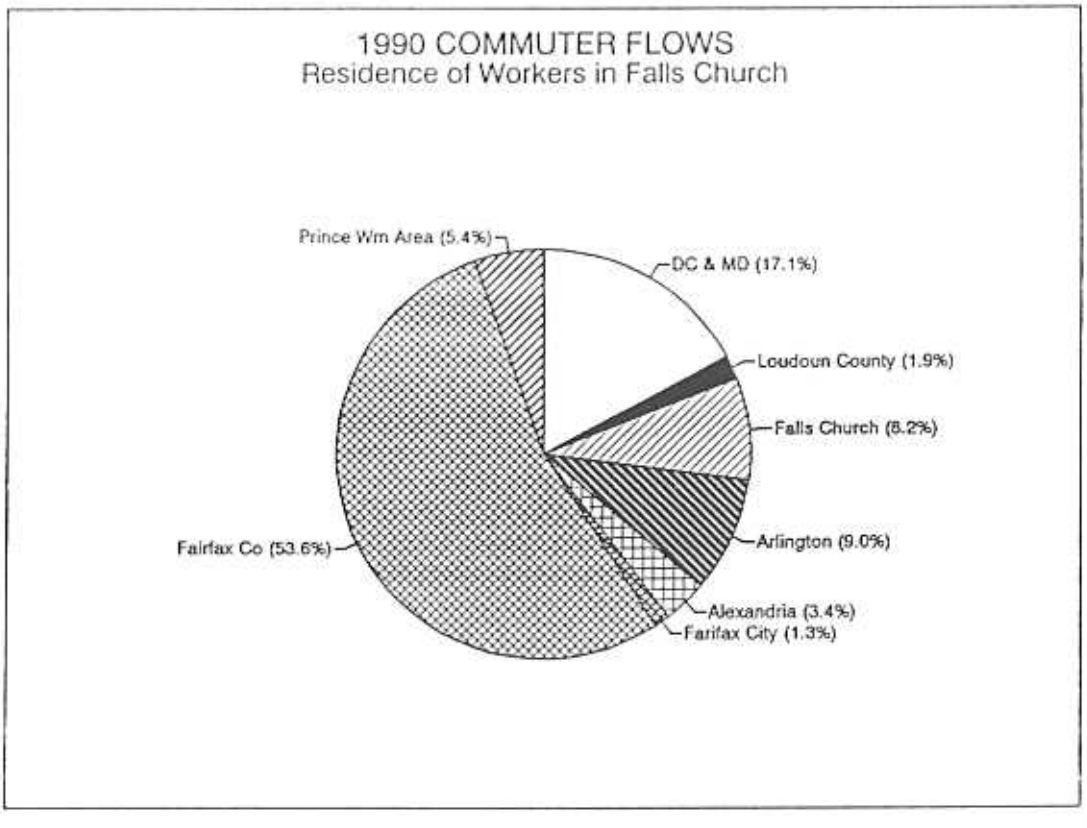

1990 COMMUTER FLOWS
Residence of Workers in Arlington
DC & MD (27.7%)
Fairfax Co (33.9%)
Fairfax City (0.6%)
Alexandria (7.1%)
Falls Church (0.5%)
Prince Wm Area (6.7%)
Loudoun County (1.0%)
Arlington (22.5%)

Figure 37


1990 COMMUTER FLOWS
Work Places of Falls Church Residents
Prince Wm Area (0.6%)
Fairfax Co (29.1%)
DC & MD (36.5%)
Fairfax City (2.0%)
Alexandria (4.2%)
Loudoun (0.7%)
Arlington (13.9%)
Falls Church (13.0%)


1990 COMMUTER FLOWS
Residence of Workers in Falls Church
Prince Wm Area (5.4%)
DC & MD (17.1%)
Loudoun County (1.9%)
Falls Church (8.2%)
Arlington (9.0%)
Fairfax Co (53.6%)
Alexandria (3.4%)
Fairfax City (1.3%)

As shown in Figure 38, of the 471,795 employed persons residing in Fairfax County in 1990, most or 50.6 percent remained within the County to work. About one in four Fairfax County residents traveled to Maryland and DC (20.0 percent DC) for work. Fairfax County was the employment site for 372,353 persons in 1990 according to the 1990 Census. Fairfax County was the site for the most employment in Northern Virginia. Of the persons employed in Fairfax County, almost two-thirds consisted of Fairfax County residents. As seen in the bottom portion of Figure 38, the combination of Maryland and DC residents comprised the largest in-flow of workers to Fairfax County, amounting to 11.4 percent, followed by Prince William County area with 10.4 percent.

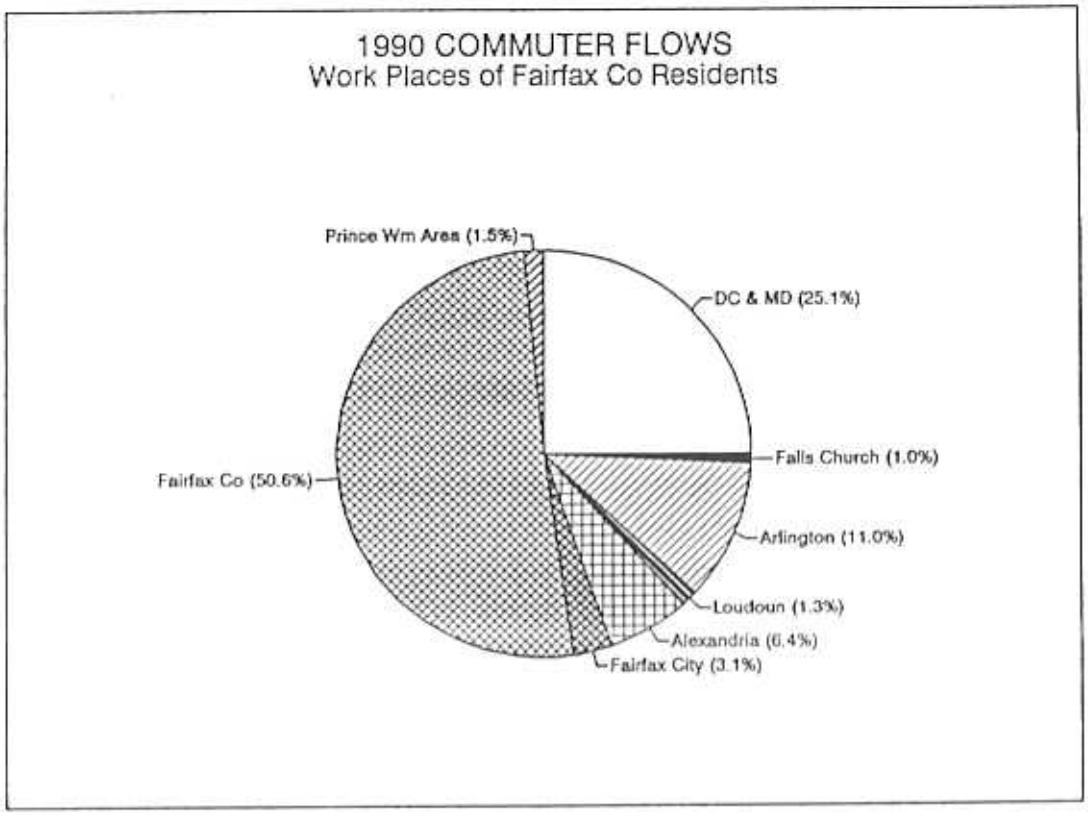
As shown in Figure 39, of the 10,272 employed residents of the City of Fairfax in 1990, about half worked in Fairfax County. About one quarter remained within the City of Fairfax to work. The City of Fairfax was the employment site for 23,558 persons in 1990 as per the 1990 Census. As shown in the bottom portion of Figure 39, of these, over 60 percent came from Fairfax County followed by nearly 12 percent from the Prince William County area.

As shown in Figure 40, 48,411 employed persons resided in Loudoun County with 44.1 percent remaining within the County to work. Over one-third (37.3 percent) of the residents worked in Fairfax County. Loudoun County, in 1990, was the employment site for 31,396 persons. As seen in the bottom portion of Figure 40, of those persons employed in Loudoun County, most or 68.1 percent came from within the County. The greatest in-flow of workers to Loudoun County came from Fairfax County.

Census Travel Analysis Findings

The preceding examination of 1990 Census metropolitan and jurisdiction level commuting flow data provides an understanding of work-related travel origins and destinations in the study area. From these data, 36.7 percent or 737,063 persons employed in the metropolitan area are employed in Northern Virginia. Half (50.5 percent) of the regional work trip travel to Northern Virginia is to employment sites in Fairfax County. That is 372,253 persons employed in Fairfax County out of the total of 737,063 persons employed in Northern Virginia. The data show that 238,650, or 64.1 percent, of the persons employed in Fairfax County live in the County. The data also show that the two biggest individual generators of trips to Fairfax County after the County itself are the Prince William area (38,632 persons) and Loudoun County (18,055 persons). These two generate a total of 56,687 person work trips to Fairfax County, or 15.2 percent of all

Figure 38


1990 COMMUTER FLOWS
Work Places of Fairfax Co Residents
Prince Wm Area (1.5%)
DC & MD (25.1%)
Falls Church (1.0%)
Arlington (11.0%)
Loudoun (1.3%)
Alexandria (6.4%)
Fairfax City (3.1%)
Fairfax Co (50.6%)

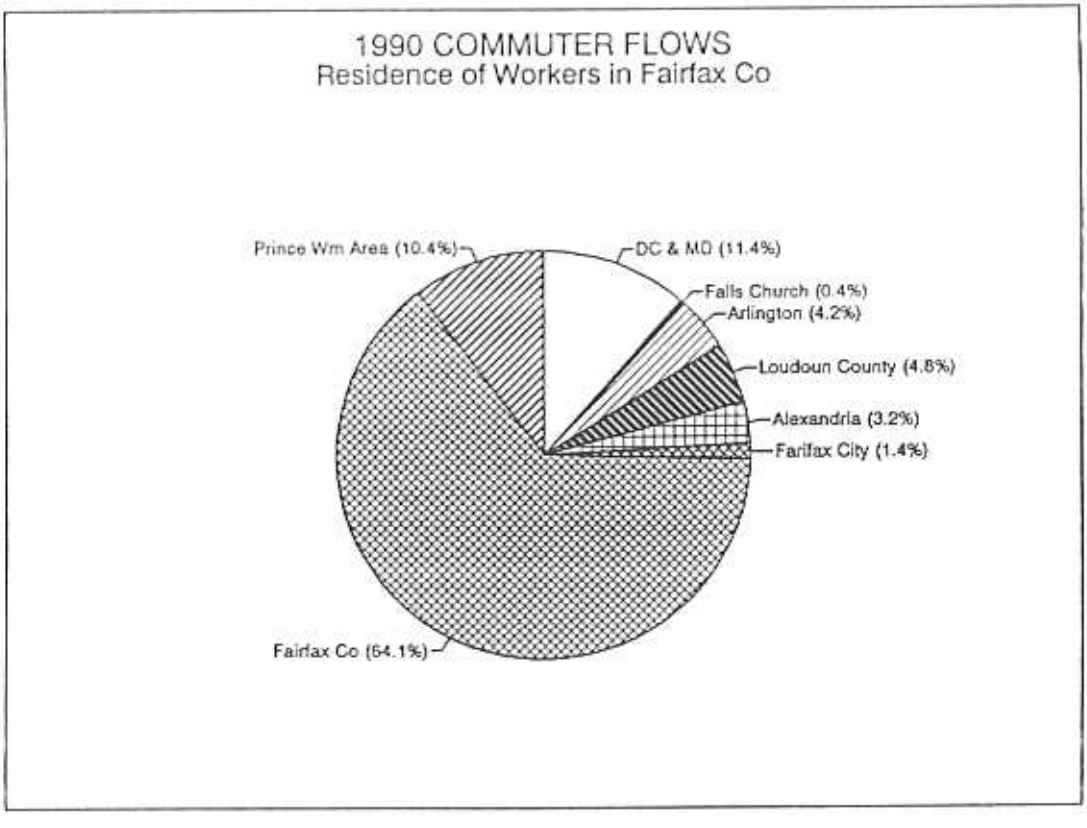
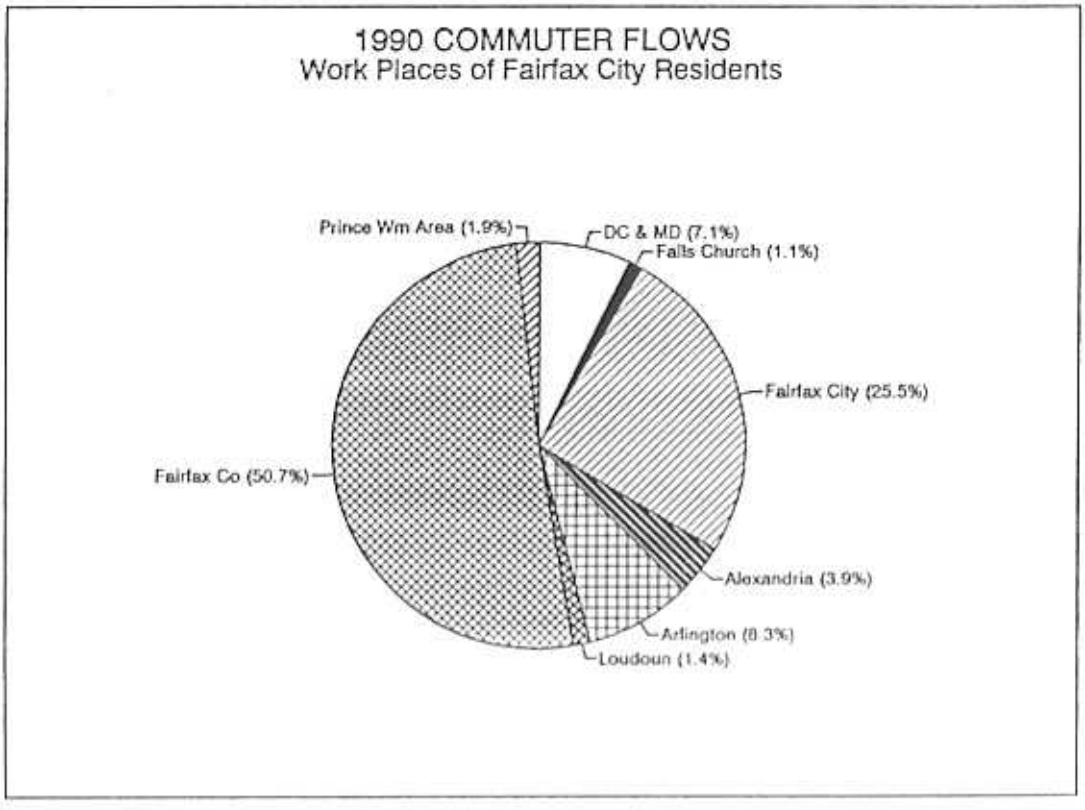

1990 COMMUTER FLOWS
Residence of Workers in Fairfax Co
Prince Wm Area (10.4%)
DC & MD (11.4%)
Falls Church (0.4%)
Arlington (4.2%)
Loudoun County (4.8%)
Alexandria (3.2%)
Fairfax City (1.4%)
Fairfax Co (64.1%)

Figure 39


1990 COMMUTER FLOWS
Work Places of Fairfax City Residents
Prince Wm Area (1.9%)
DC & MD (7.1%)
Falls Church (1.1%)
Fairfax City (25.5%)
Fairfax Co (50.7%)
Alexandria (3.9%)
Arlington (8.3%)
Loudoun (1.4%)

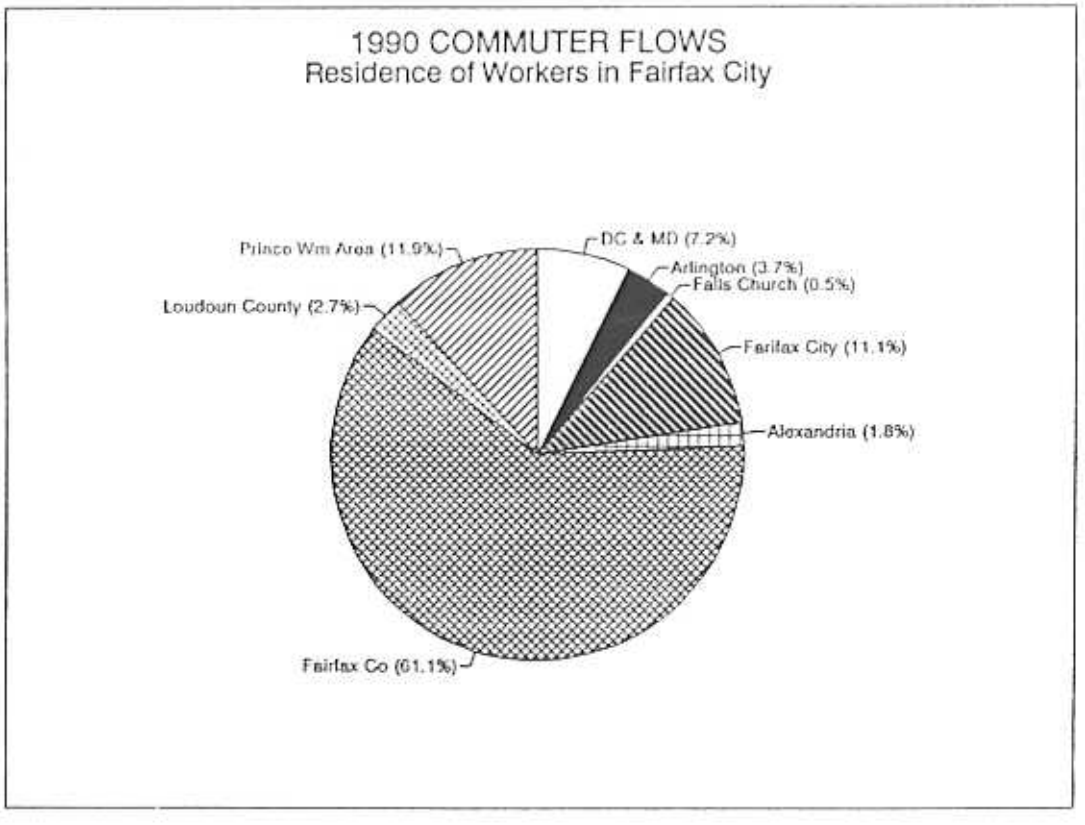
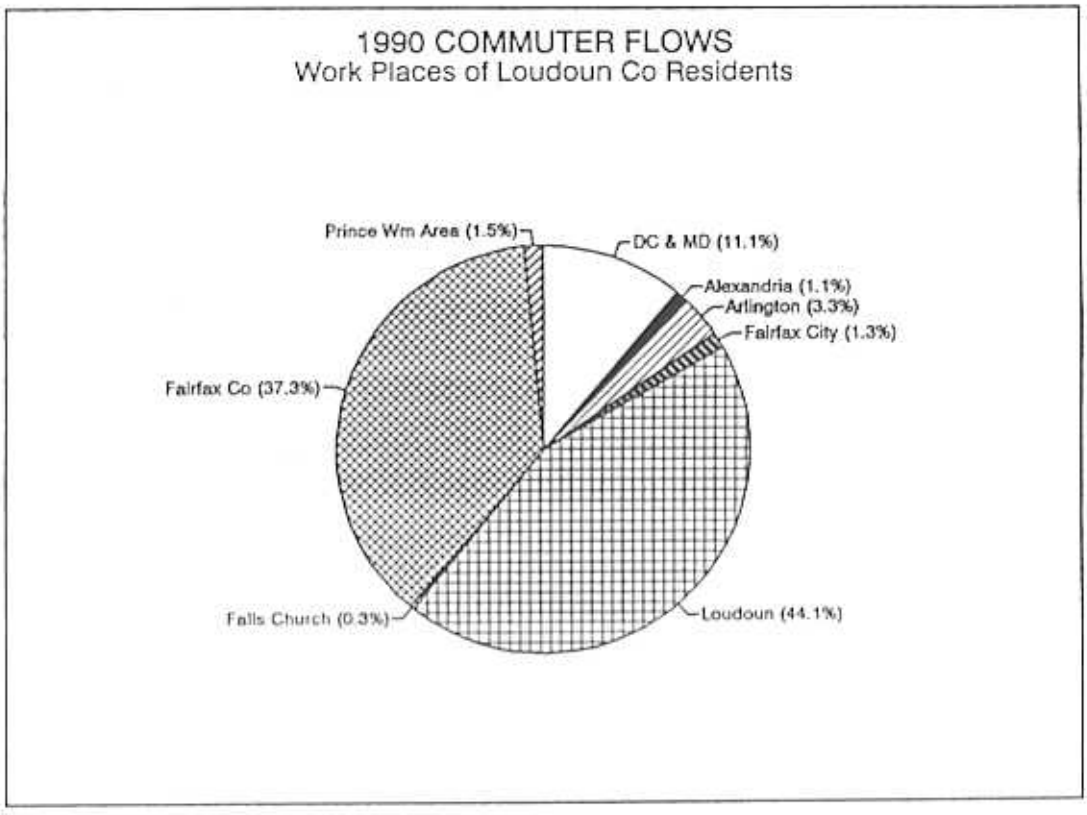
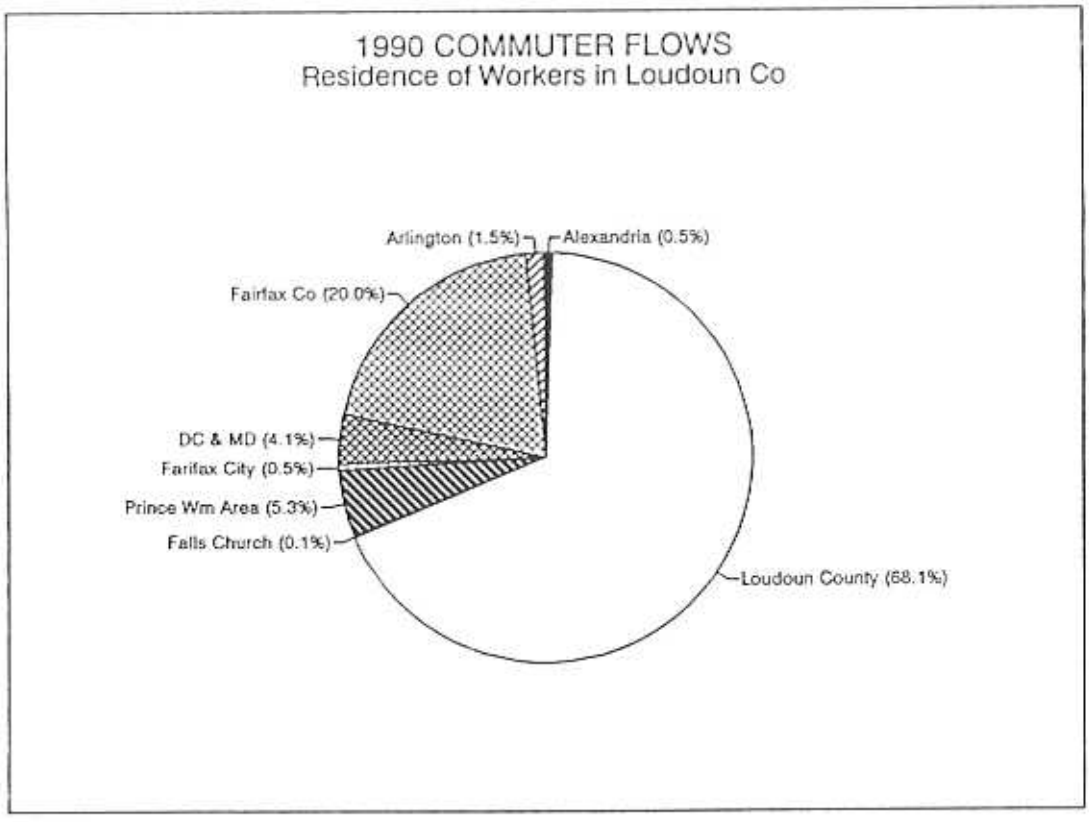

1990 COMMUTER FLOWS
Residence of Workers in Fairfax City
Prince Wm Area (11.9%)
DC & MD (7.2%)
Arlington (3.7%)
Falls Church (0.5%)
Loudoun County (2.7%)
Fairfax City (11.1%)
Alexandria (1.8%)
Fairfax Co (61.1%)

Figure 40


1990 COMMUTER FLOWS
Work Places of Loudoun Co Residents
Prince Wm Area (1.5%)
DC & MD (11.1%)
Alexandria (1.1%)
Arlington (3.3%)
Fairfax City (1.3%)
Fairfax Co (37.3%)
Falls Church (0.3%)
Loudoun (44.1%)


1990 COMMUTER FLOWS
Residence of Workers in Loudoun Co
Arlington (1.5%)
Alexandria (0.5%)
Fairfax Co (20.0%)
DC & MD (4.1%)
Farifax City (0.5%)
Prince Wm Area (5.3%)
Falls Church (0.1%)
Loudoun County (68.1%)

work trips to the County. The 56,687 person work trips from the Prince William area and Loudoun County are probably auto trips since convenient transit service between these two originating locales and the major employment centers in Fairfax County do not exist. The District of Columbia and the Maryland suburbs constitutes 42,605, or 11.4 percent, of the person work trips to Fairfax County.

Arlington County is the second largest employment site in Northern Virginia. Persons employed in Arlington County number 152,955, or 20.8 percent of all employment in Northern Virginia. The data show that 53,461 persons or 35.0 percent come from Fairfax County, Falls Church and the City of Fairfax. Access to Arlington County by convenient transit service is available from these locales. The next largest single source of employees in Arlington County is Arlington County with 34,382 persons or 22.5 percent. The District of Columbia and the Maryland suburbs comprise 42,427 person work trips or 27.7 percent of the total work trips to Arlington County. In fact, the majority of those employed in Arlington County live in another jurisdiction, 118,573 persons or 77.5 percent. The same can be said for all the jurisdictions in the study area except for Fairfax County and Loudoun County. The residents of both of these counties comprise the largest share of employees within these two counties. As far as employment sites in the study area jurisdictions are concerned, it can safely be said that interjurisdictional commuting flows comprise a significant share of all in-commuting travel in Northern Virginia. The data suggest similarly that interjurisdictional travel comprises a significant share of all commuting travel originating from study area jurisdictions. The table below illustrates the percent of in-commuting employment for each jurisdiction and the percent of residents commuting to another jurisdiction for employment.

EXTENT OF INTERJURISDICTIONAL WORK TRAVEL BY JURISDICTION

Jurisdiction	Persons Employed in This Jurisdiction But Who Reside Elsewhere (PERCENT)	Residents of This Jurisdiction Who Work Elsewhere (PERCENT)
Falls Church	91.8	87.0
City of Fairfax	88.9	74.5
Arlington County	77.5	67.9
Alexandria	75.0	72.3
Fairfax County	35.9	49.4
Loudoun County	31.9	55.9

As the table above illustrates, at least 49 percent of all residents of each study area jurisdiction worked in another jurisdiction. This means that 396,331 persons, about 55.5 percent of all work trip origins in the study area, were engaged in interjurisdictional travel. Of these, 167,221 persons or 23.4 percent traveled to the District of Columbia and a total of 211,559 persons or 29.6 percent traveled to points outside of the study area. Likewise, 350,017 persons or 52.4 percent of all work trip travel to employment in the study area was interjurisdictional travel. Of these interjurisdictional trips to employment in the study area, 165,316 persons, or 24.8 percent, originated from jurisdictions outside the study area.

In 1990, according to this data, the study area generated work trips for 396,331 persons leaving their jurisdiction of residence for a work site in another jurisdiction. The study area also generated 350,017 work trips for persons coming to work in a study area jurisdiction from another jurisdiction. In total, the number of unduplicated interjurisdictional work trips amounted to 561,647 persons. These were persons whose interjurisdictional work trip originated in a study area jurisdiction or ended in a study area jurisdiction from an origin outside the study area.

District Level Travel Simulations

The first step in analyzing the travel simulation data provided by the MWCOG was to examine the data and aggregate it into a more useful form. The external trip data were eliminated and the data for analysis districts in the District of Columbia, the Prince William Area and in the Maryland suburban jurisdictions were aggregated into discrete groups as follows: District of Columbia, Montgomery County, Prince Georges County and the Prince William Area. The foregoing efforts yielded 1990 travel simulation production-attraction trips by MWCOG district for Northern Virginia jurisdictions for:

- Home-based person work trips
- Home-based auto-driver shopping trips
- Home-based auto-driver other trips
- Non home-based auto driver trips

This information, in origin-destination district pairs, formed the basic database for further analysis. The next step undertaken was to compare the work trip simulations by jurisdiction-to-jurisdiction pair to the 1990 Census jurisdiction-to-jurisdiction work trip data. The work trip simulations, as production-attraction pairs, required an adjustment of 0.5 to be comparable to the Census data. With the work trip simulations adjusted, the two sets of data could be compared and adjustment factors derived to bring the work trip simulations in line with the 1990 Census figures. Tables 30A through 30C present the 1990 jurisdiction-to-jurisdiction travel, the 1990 MWCOG work trip simulations (unadjusted), and the derived adjustment factors, respectively. The adjustment factors were used to adjust the simulated work trips at the district level to be more in line with the 1990 Census. The non-work trips were not adjusted as the 1990 Census does not include non-work travel.

Work Trip Travel

Analysis of work trip travel at the district level involved identifying simulated travel from origin districts to destination districts where the total production-attraction work person trips were 1,000 or greater. This included the major destinations which were identified previously in this study and includes such destinations as the Pentagon, Tysons Corner, Crystal City, etc.

The subset of high volume work trips was then used to examine travel demand, transit demand and transit service availability. The work trips from place of origin to place of destination where the number of production-attraction trips is greater than 1,000 are presented in Table 31. The simulated work trips, the production-attraction work trip pairs, are halved to derive persons, the unit of measure used by the Census. The Census adjustment factor is applied to the simulated number of persons to yield an Adjusted Daily Work Travel Demand in terms of persons for each origin-destination pair. To assess whether the travel demand between two areas is large enough that transit connections should be considered and to identify areas where potentially needed transit services are lacking, an analysis was conducted of travel movements for each district-to-district pair. This number of person-trips would yield 150 transit trips, about three bus trips, if a 15 percent transit capture rate could be achieved. This analysis should not be interpreted as implying that this transit share would be achieved, only that a potential for transit service demand exists.

Table 31 also provides transit information relative to the origin-destination work trip travel demand pairs. For

TABLE 31

NORTHERN VIRGINIA INTERJURISDICTIONAL TRAVEL DEMAND ESTIMATION WORKSHEET
WORK TRIPS FROM PLACE OF ORIGIN TO MAJOR WORK DESTINATIONS

ORIGIN JURIS	PLACE OF ORIGIN	MAJOR DEST JURIS	PLACE OF MAJOR DESTINATION	SIM WORK TRIPS	SIM PERSONS	CENSUS BASIS ADJUSTMENT FACTOR	ADJUSTED DAILY WORK TRAVEL DEMAND (PERSONS)	SUFFICIENT TRANSIT DEMAND POSSIBLE?	TRAVEL BY TRANSIT POSSIBLE?	TRANSIT ACCESS
DC	DC	ARL	PENTAGON	4,098	2,049	0.8024	1,644	YES	YES	MRAIL
DC	DC	ARL	FT MYER/ARL CEM	2500	1,250	0.8024	1,003	YES	YES	MRAIL
DC	DC	ARL	ROSSLYN	7661	3,831	0.8024	3,074	YES	YES	MRAIL
DC	DC	ARL	NATIONAL AIRPORT	2541	1,271	0.8024	1,019	YES	YES	MRAIL
DC	DC	ARL	CRYSTAL CITY	7959	3,980	0.8024	3,193	YES	YES	MRAIL
DC	DC	ARL	PENTAGON CITY	1550	775	0.8024	622	NO	YES	MRAIL
DC	DC	ARL	BALLSTON/COURT HSE	3973	1,987	0.8024	1,594	YES	YES	MRAIL
DC	DC	ALEX	OLD TOWN	1720	860	1.3173	1,133	YES	YES	MRAIL+29,AT2,5,8
DC	DC	ALEX	KING ST/BRADDOCK RD	1093	547	1.3173	720	NO	YES	MRAIL
DC	DC	ALEX	LANDMARK	1363	682	1.3173	898	NO	YES	MRAIL+AT5,6,7
DC	DC	FFX	BAILEYS XRDS/7 CNRS	1000	500	2.4148	1,207	YES	YES	MRAIL+16
DC	DC	FFX	MCLEAN/LANGLEY	1184	592	2.4148	1,430	YES	YES	MRAIL+23
DC	DC	FFX	TYSONS CORNER	1356	678	2.4148	1,637	YES	YES	MRAIL+3,5
MONT	MONTGOMERY	ARL	ROSSLYN	2620	1,310	2.1056	2,758	YES	YES	MRAIL
MONT	MONTGOMERY	ARL	CRYSTAL CITY	1691	846	2.1056	1,780	YES	YES	MRAIL
MONT	MONTGOMERY	ARL	BALLSTON/COURT HSE	1284	642	2.1056	1,352	YES	YES	MRAIL
MONT	MONTGOMERY	FFX	MCLEAN/LANGLEY	2095	1,048	2.2636	2,371	YES	YES	MRAIL+23
MONT	MONTGOMERY	FFX	TYSONS CORNER	4844	2,422	2.2636	5,482	YES	YES	MRAIL+3,5
PG CO	PRINCE GEORGES	ARL	PENTAGON	3806	1,903	1.2061	2,295	YES	YES	MRAIL
PG CO	PRINCE GEORGES	ARL	FT MYER/ARL CEM	1916	958	1.2061	1,155	YES	YES	MRAIL
PG CO	PRINCE GEORGES	ARL	ROSSLYN	4966	2,483	1.2061	2,995	YES	YES	MRAIL
PG CO	PRINCE GEORGES	ARL	NATIONAL AIRPORT	2581	1,291	1.2061	1,556	YES	YES	MRAIL
PG CO	PRINCE GEORGES	ARL	CRYSTAL CITY	7840	3,920	1.2061	4,728	YES	YES	MRAIL
PG CO	PRINCE GEORGES	ARL	PENTAGON CITY	1458	729	1.2061	879	NO	YES	MRAIL
PG CO	PRINCE GEORGES	ARL	BALLSTON/COURT HSE	3099	1,550	1.2061	1,869	YES	YES	MRAIL
PG CO	PRINCE GEORGES	ALEX	OLD TOWN	2500	1,250	1.7813	2,227	YES	YES	MRAIL+29,AT2,5,8
PG CO	PRINCE GEORGES	ALEX	KING ST/BRADDOCK RD	1424	712	1.7813	1,268	YES	YES	MRAIL
PG CO	PRINCE GEORGES	ALEX	EISENHOWER AVE	1536	768	1.7813	1,368	YES	YES	MRAIL
PG CO	PRINCE GEORGES	ALEX	LANDMARK	1285	643	1.7813	1,144	YES	YES	MRAIL+AT5,6,7
PG CO	PRINCE GEORGES	FFX	EDSALL/SHIRLEY	1157	579	2.5030	1,448	YES	YES	MRAIL+18,204
PG CO	PRINCE GEORGES	FFX	BEACON/HUNTINGTON	1345	673	2.5030	1,683	YES	YES	MRAIL+101-110
PG CO	PRINCE GEORGES	FFX	TYSONS CORNER	1490	745	2.5030	1,865	YES	YES	MRAIL+3,5
PW AR	PR WILLIAM AREA	ARL	PENTAGON	4798	2,399	1.0419	2,500	YES	YES	VRE+MRAIL
PW AR	PR WILLIAM AREA	ARL	ROSSLYN	2370	1,185	1.0419	1,235	YES	YES	VRE+MRAIL
PW AR	PR WILLIAM AREA	ARL	CRYSTAL CITY	3606	1,803	1.0419	1,879	YES	YES	VRE+MRAIL
PW AR	PR WILLIAM AREA	ARL	PENTAGON CITY	1076	538	1.0419	561	NO	YES	VRE+MRAIL
PW AR	PR WILLIAM AREA	ARL	BALLSTON/COURT HSE	2767	1,384	1.0419	1,441	YES	YES	VRE+MRAIL
PW AR	PR WILLIAM AREA	ALEX	OLD TOWN	2047	1,024	1.2125	1,241	YES	YES	VRE+29,AT2,5,8
PW AR	PR WILLIAM AREA	ALEX	KING ST/BRADDOCK RD	1729	865	1.2125	1,048	YES	YES	VRE+MRAIL
PW AR	PR WILLIAM AREA	ALEX	EISENHOWER AVE	1962	981	1.2125	1,189	YES	YES	VRE+MRAIL
PW AR	PR WILLIAM AREA	ALEX	LANDMARK	3558	1,779	1.2125	2,157	YES	NO	NONE
PW AR	PR WILLIAM AREA	ALEX	MARK CENTER/NVCC	1130	565	1.2125	685	NO	NO	NONE
PW AR	PR WILLIAM AREA	FFX	EDSALL/SHIRLEY	3504	1,752	1.1200	1,962	YES	NO	NONE
PW AR	PR WILLIAM AREA	FFX	ANNANDALE/RAVENSWORTH	1211	606	1.1200	678	NO	YES	VRE+401

TABLE 31 (Continued)

NORTHERN VIRGINIA INTERJURISDICTIONAL TRAVEL DEMAND ESTIMATION WORKSHEET
WORK TRIPS FROM PLACE OF ORIGIN TO MAJOR WORK DESTINATIONS

ORIGIN JURIS	PLACE OF ORIGIN	MAJOR DEST JURIS	PLACE OF MAJOR DESTINATION	SIM WORK TRIPS	SIM PERSONS	CENSUS BASIS ADJUSTMENT FACTOR	ADJUSTED DAILY WORK TRAVEL DEMAND (PERSONS)	SUFFICIENT TRANSIT DEMAND POSSIBLE?	TRAVEL BY TRANSIT POSSIBLE?	TRANSIT ACCESS
PW AR	PR WILLIAM AREA	FFX	BAILEYS XRDS/7 CNRS	2130	1,065	1.1200	1,193	YES	NO	NONE
PW AR	PR WILLIAM AREA	FFX	FALLS CHURCH	2795	1,398	1.1200	1,565	YES	NO	NONE
PW AR	PR WILLIAM AREA	FFX	PIMMIT HILL	1437	719	1.1200	805	NO	NO	NONE
PW AR	PR WILLIAM AREA	FFX	MCLEAN/LANGLEY	1576	788	1.1200	883	NO	NO	NONE
PW AR	PR WILLIAM AREA	FFX	FRANCONIA	1039	520	1.1200	582	NO	NO	NONE
PW AR	PR WILLIAM AREA	FFX	SPRINGFIELD	3198	1,599	1.1200	1,791	YES	NO	NONE
PW AR	PR WILLIAM AREA	FFX	MERRIFIELD	5097	2,549	1.1200	2,854	YES	NO	NONE
PW AR	PR WILLIAM AREA	FFX	TYSONS CORNER	1119	560	1.1200	627	NO	NO	NONE
PW AR	PR WILLIAM AREA	FFX	TYSONS CORNER	6994	3,497	1.1200	3,917	YES	NO	NONE
PW AR	PR WILLIAM AREA	FFX	MT VERNON/FT HUNT	1188	594	1.1200	665	NO	NO	NONE
PW AR	PR WILLIAM AREA	FFX	FT BELVOIR	5136	2,568	1.1200	2,876	YES	NO	NONE
PW AR	PR WILLIAM AREA	FFX	NEWINGTON/FULLERTON	3564	1,782	1.1200	1,996	YES	NO	NONE
PW AR	PR WILLIAM AREA	FFX	GMU/LAKE BRADDOCK	1189	595	1.1200	666	NO	NO	NONE
PW AR	PR WILLIAM AREA	FFX	FAIRFAX CITY	9023	4,512	1.1200	5,053	YES	NO	NONE
PW AR	PR WILLIAM AREA	FFX	VIENNA/OAKTON	1304	652	1.1200	730	NO	NO	NONE
PW AR	PR WILLIAM AREA	FFX	CENTREVILLE	1104	552	1.1200	618	NO	NO	NONE
PW AR	PR WILLIAM AREA	FFX	FAIR OAKS	2819	1,410	1.1200	1,579	YES	NO	NONE
PW AR	PR WILLIAM AREA	FFX	DULLES (FFX)	5179	2,590	1.1200	2,900	YES	NO	NONE
PW AR	PR WILLIAM AREA	FFX	RESTON	2115	1,058	1.1200	1,184	YES	NO	NONE
PW AR	PR WILLIAM AREA	FFX	HERNDON	4403	2,202	1.1200	2,466	YES	NO	NONE
PW AR	PR WILLIAM AREA	LOUD	DULLES (LOUDOUN)	1724	862	0.9707	837	NO	NO	NONE
ARL	FT MYER/ARL CEM	DC	DC	1883	942	1.5646	1,473	YES	YES	MRAIL
ARL	ROSSLYN	DC	DC	2992	1,496	1.5646	2,341	YES	YES	MRAIL
ARL	CRYSTAL CITY	DC	DC	1001	501	1.5646	2,341	YES	YES	MRAIL
ARL	PENTAGON CITY	DC	DC	6351	3,176	1.5646	4,968	YES	YES	MRAIL
ARL	PENTAGON CITY	ARL	PENTAGON	1000	500	1.0578	529	NO	YES	MRAIL,5,9,10,11,13,23,24
ARL	PENTAGON CITY	ARL	CRYSTAL CITY	3006	1,503	1.0578	1,590	YES	YES	MRAIL,5,9,10,11,13,23,24
ARL	ARL VILLAGE	DC	DC	2675	1,338	1.5646	2,093	YES	YES	MRAIL
ARL	ARLINGTON HTS	DC	DC	2179	1,090	1.5646	1,705	YES	YES	MRAIL
ARL	BALLSTON/CRT HSE	DC	DC	7655	3,828	1.5646	5,989	YES	YES	MRAIL
ARL	BALLSTON/CRT HSE	ARL	ROSSLYN	1398	699	1.0578	739	NO	YES	MRAIL,4,38
ARL	BALLSTON/CRT HSE	ARL	CRYSTAL CITY	1570	785	1.0578	830	NO	YES	MRAIL
ARL	CHERRYDALE	DC	DC	1526	763	1.5646	1,194	YES	YES	MRAIL
ARL	N ARLINGTON	DC	DC	3558	1,779	1.5646	2,783	YES	YES	MRAIL
ARL	COL PIKE/S GLEBE	DC	DC	7828	3,914	1.5646	6,124	YES	YES	16+MRAIL
ARL	COL PIKE/S GLEBE	ARL	PENTAGON	1317	659	1.0578	697	NO	YES	16
ARL	COL PIKE/S GLEBE	ARL	ROSSLYN	1027	514	1.0578	543	NO	YES	16+MRAIL
ARL	COL PIKE/S GLEBE	ARL	CRYSTAL CITY	2116	1,058	1.0578	1,119	YES	YES	16+MRAIL
ARL	COL PIKE/S GLEBE	ARL	BALLSTON/COURT HSE	1766	883	1.0578	934	NO	YES	10,23
ARL	BARCROFT	DC	DC	3113	1,557	1.5646	2,435	YES	YES	16+MRAIL
ARL	ARL FORREST	DC	DC	4309	2,155	1.5646	3,371	YES	YES	4,25+MRAIL
ARL	ARL FORREST	ARL	BALLSTON/COURT HSE	1512	756	1.0578	800	NO	YES	4,25
ARL	E FALLS CHURCH	DC	DC	6865	3,433	1.5646	5,370	YES	YES	MRAIL
ARL	E FALLS CHURCH	ARL	ROSSLYN	1364	682	1.0578	721	NO	YES	MRAIL

TABLE 31 (Continued)

NORTHERN VIRGINIA INTERJURISDICTIONAL TRAVEL DEMAND ESTIMATION WORKSHEET
WORK TRIPS FROM PLACE OF ORIGIN TO MAJOR WORK DESTINATIONS

ORIGIN JURIS	PLACE OF ORIGIN	MAJOR DEST JURIS	PLACE OF MAJOR DESTINATION	SIM WORK TRIPS	SIM PERSONS	CENSUS BASIS ADJUSTMENT FACTOR	ADJUSTED DAILY WORK TRAVEL DEMAND (PERSONS)	SUFFICIENT TRANSIT DEMAND POSSIBLE?	TRAVEL BY TRANSIT POSSIBLE?	TRANSIT ACCESS
ARL	E FALLS CHURCH	ARL	BALLSTON/COURT HSE	1555	778	1.0578	822	NO	YES	MRAIL
ARL	E FALLS CHURCH	FFX	TYSONS CORNER	1196	598	1.5498	927	NO	YES	MRAIL+3,5
ARL	CNTRY CLUB HILLS	DC	DC	4109	2,055	1.5646	3,214	YES	YES	15,22+MRAIL
ALEX	OLD TOWN	DC	DC	3116	1,558	1.4737	2,296	YES	YES	AT OR MBUS+MRAIL
ALEX	KING ST/BRADDOCK RD	DC	DC	2221	1,111	1.4737	1,637	YES	YES	MRAIL
ALEX	DEL RAY/GLEBE RD	DC	DC	9318	4,659	1.4737	6,866	YES	YES	AT OR MBUS+MRAIL
ALEX	DEL RAY/GLEBE RD	ARL	CRYSTAL CITY	3730	1,865	0.7993	1,491	YES	YES	AT OR MBUS+MRAIL
ALEX	DEL RAY/GLEBE RD	ALEX	OLD TOWN	2075	1,038	1.2248	1,271	YES	YES	AT2,3,4,5,28
ALEX	DEL RAY/GLEBE RD	ALEX	KING ST/BRADDOCK RD	1755	878	1.2248	1,075	YES	YES	AT2,3,4,5,28
ALEX	DEL RAY/GLEBE RD	ALEX	LANDMARK	1155	578	1.2248	707	NO	YES	AT2,5,8
ALEX	EISENHOWER AVE	DC	DC	3108	1,554	1.4737	2,290	YES	YES	MRAIL
ALEX	LANDMARK	DC	DC	8174	4,087	1.4737	6,023	YES	YES	AT+MRAIL
ALEX	LANDMARK	ARL	PENTAGON	1026	513	0.7993	410	NO	YES	AT+MRAIL
ALEX	LANDMARK	ARL	CRYSTAL CITY	1634	817	0.7993	653	NO	YES	AT+MRAIL
ALEX	LANDMARK	ALEX	EISENHOWER AVE	1546	773	1.2248	947	NO	YES	AT6 OR TO MRAIL
ALEX	MARK CENTER/NVCC	DC	DC	6033	3,017	1.4737	4,445	YES	YES	7, AT3,4+MRAIL
ALEX	MARK CENTER/NVCC	ARL	CRYSTAL CITY	1169	585	0.7993	467	NO	YES	7, AT3,4+MRAIL
ALEX	MARK CENTER/NVCC	ALEX	EISENHOWER AVE	1067	534	1.2248	653	NO	YES	AT6+AT8
ALEX	MARK CENTER/NVCC	ALEX	LANDMARK	1854	927	1.2248	1,135	YES	YES	AT6
FFX	EDSALL/SHIRLEY	DC	DC	2557	1,279	1.1145	1,425	YES	YES	18+MRAIL
FFX	LINCOLNIA	DC	DC	4159	2,080	1.1145	2,318	YES	YES	7,17+MRAIL
FFX	ANNANDALE/RAVENS	DC	DC	6209	3,105	1.1145	3,460	YES	YES	401,16+MRAIL
FFX	ANNANDALE/RAVENS	FFX	FALLS CHURCH	1036	518	1.7715	918	NO	YES	3A
FFX	ANNANDALE/RAVENS	FFX	MERRIFIELD	1234	617	1.7715	1,093	YES	YES	401
FFX	ANNANDALE/RAVENS	FFX	TYSONS CORNER	2138	1,069	1.7715	1,894	YES	YES	401
FFX	BAILEYS/7 CNRS	DC	DC	8669	4,335	1.1145	4,831	YES	YES	16+MRAIL
FFX	BAILEYS/7 CNRS	ARL	ROSSLYN	1157	579	1.1371	658	NO	YES	16+MRAIL
FFX	BAILEYS/7 CNRS	ARL	BALLSTON/COURT HSE	1328	664	1.1371	755	NO	YES	16,25
FFX	FALLS CHURCH	DC	DC	11414	5,707	1.1145	6,360	YES	YES	3+MRAIL
FFX	FALLS CHURCH	MONT	MONTGOMERY CO	1125	563	1.7702	996	NO	YES	3+MRAIL
FFX	FALLS CHURCH	ARL	ROSSLYN	1718	859	1.1371	977	NO	YES	3+MRAIL
FFX	FALLS CHURCH	ARL	BALLSTON/COURT HSE	1314	657	1.1371	747	NO	YES	3+MRAIL
FFX	FALLS CHURCH	FFX	BAILEYS XRDS/7 CNRS	1481	741	1.7715	1,312	YES	YES	28
FFX	FALLS CHURCH	FFX	MERRIFIELD	1485	743	1.7715	1,315	YES	YES	2
FFX	FALLS CHURCH	FFX	TYSONS CORNER	2573	1,287	1.7715	2,279	YES	YES	2,5,28
FFX	PIMMIT HILL	DC	DC	6936	3,468	1.1145	3,865	YES	YES	3+MRAIL
FFX	PIMMIT HILL	FFX	TYSONS CORNER	1956	978	1.7715	1,733	YES	YES	3
FFX	MCLEAN/LANGLEY	DC	DC	8817	4,409	1.1145	4,913	YES	YES	15,23+MRAIL
FFX	MCLEAN/LANGLEY	MONT	MONTGOMERY CO	1120	560	1.7702	991	NO	YES	15,23+MRAIL
FFX	MCLEAN/LANGLEY	ARL	ROSSLYN	1151	576	1.1371	654	NO	YES	15,23
FFX	MCLEAN/LANGLEY	FFX	TYSONS CORNER	1396	698	1.7715	1,237	YES	YES	15,23
FFX	BEACON/HUNTINGTN	DC	DC	13330	6,665	1.1145	7,428	YES	YES	103-107+MRAIL
FFX	BEACON/HUNTINGTN	PG CO	PRINCE GEORGES CO	1090	545	2.2504	1,226	YES	YES	103-107+MRAIL
FFX	BEACON/HUNTINGTN	ARL	CRYSTAL CITY	1552	776	1.1371	882	NO	YES	103-107+MRAIL

TABLE 31 (Continued)

NORTHERN VIRGINIA INTERJURISDICTIONAL TRAVEL DEMAND ESTIMATION WORKSHEET
WORK TRIPS FROM PLACE OF ORIGIN TO MAJOR WORK DESTINATIONS

ORIGIN JURIS	PLACE OF ORIGIN	MAJOR DEST JURIS	PLACE OF MAJOR DESTINATION	SIM WORK TRIPS	SIM PERSONS	CENSUS BASIS ADJUSTMENT FACTOR	ADJUSTED DAILY WORK TRAVEL DEMAND (PERSONS)	SUFFICIENT TRANSIT DEMAND POSSIBLE?	TRAVEL BY TRANSIT POSSIBLE?	TRANSIT ACCESS
FFX	CENTREVILLE	DC	DC	2377	1,189	1.1145	1,325	YES	YES	12+MRAIL
FFX	CENTREVILLE	FFX	FAIRFAX CITY	1312	656	1.7715	1,162	YES	YES	12+GRN,GLD
FFX	PLEASANT HILL	DC	DC	3058	1,529	1.1145	1,704	YES	YES	12+MRAIL
FFX	PLEASANT HILL	FFX	FAIRFAX CITY	1700	850	1.7715	1,506	YES	YES	12+GRN,GLD
FFX	PLEASANT HILL	FFX	DULLES (FFX)	1630	815	1.7715	1,444	YES	YES	NONE
FFX	PLEASANT HILL	FFX	HERNDON	1151	576	1.7715	1,019	YES	YES	NONE
FFX	FAIR OAKS	DC	DC	4535	2,268	1.1145	2,527	YES	YES	20+MRAIL
FFX	FAIR OAKS	FFX	MERRIFIELD	1317	659	1.7715	1,167	YES	YES	20+2
FFX	FAIR OAKS	FFX	TYSONS CORNER	1538	769	1.7715	1,362	YES	YES	20+MRAIL+401
FFX	FAIR OAKS	FFX	FAIRFAX CITY	2626	1,313	1.7715	2,326	YES	YES	20+GRN,GLD
FFX	FAIR OAKS	FFX	DULLES (FFX)	1878	939	1.7715	1,663	YES	YES	NONE
FFX	FAIR OAKS	FFX	RESTON	1552	776	1.7715	1,375	YES	YES	NONE
FFX	FAIR OAKS	FFX	HERNDON	2359	1,180	1.7715	2,089	YES	YES	NONE
FFX	DULLES	DC	DC	2302	1,151	1.1145	1,283	YES	YES	20+MRAIL
FFX	DULLES	FFX	FAIRFAX CITY	1284	642	1.7715	1,137	YES	YES	20+GRN,GLD
FFX	DULLES	FFX	HERNDON	1534	767	1.7715	1,359	YES	YES	NONE
FFX	RESTON	DC	DC	5564	2,782	1.1145	3,101	YES	YES	5+MRAIL
FFX	RESTON	MONT	MONTGOMERY CO	1316	658	1.7702	1,165	YES	YES	5+MRAIL
FFX	RESTON	FFX	TYSONS CORNER	3290	1,645	1.7715	2,914	YES	YES	5S
FFX	RESTON	FFX	FAIRFAX CITY	1023	512	1.7715	906	NO	YES	NONE
FFX	RESTON	FFX	HERNDON	1995	998	1.7715	1,767	YES	YES	5
FFX	HERNDON	DC	DC	3093	1,547	1.1145	1,724	YES	YES	5+MRAIL
FFX	HERNDON	FFX	TYSONS CORNER	1669	835	1.7715	1,478	YES	YES	5S
FFX	HERNDON	FFX	FAIRFAX CITY	1081	541	1.7715	957	NO	YES	NONE
FFX	HERNDON	FFX	DULLES (FFX)	1178	589	1.7715	1,043	YES	YES	5
FFX	HERNDON	FFX	RESTON	1843	922	1.7715	1,632	YES	YES	5
FFX	STUART RIDGE	DC	DC	2396	1,198	1.1145	1,335	YES	YES	5+MRAIL
FFX	STUART RIDGE	FFX	TYSONS CORNER	1250	625	1.7715	1,107	YES	YES	5
FFX	STUART RIDGE	FFX	RESTON	1688	844	1.7715	1,495	YES	YES	5
FFX	STUART RIDGE	FFX	HERNDON	1235	618	1.7715	1,094	YES	YES	5
LOUDO	STERLING PARK	DC	DC	1162	581	1.3742	798	NO	NO	NONE
LOUDO	STERLING PARK	FFX	RESTON	1105	553	1.4511	802	NO	NO	NONE
LOUDO	STERLING PARK	FFX	HERNDON	1727	864	1.4511	1,253	YES	NO	NONE
LOUDO	STERLING PARK	LOUD	DULLES (LOUDOUN)	1508	754	1.9273	1,453	YES	NO	NONE
LOUDO	SUGARLAND	DC	DC	1955	978	1.3742	1,343	YES	NO	NONE
LOUDO	SUGARLAND	FFX	TYSONS CORNER	1668	834	1.4511	1,210	YES	NO	NONE
LOUDO	SUGARLAND	FFX	RESTON	1860	930	1.4511	1,350	YES	NO	NONE
LOUDO	SUGARLAND	FFX	HERNDON	1249	625	1.4511	906	NO	NO	NONE
LOUDO	SUGARLAND	LOUD	DULLES (LOUDOUN)	1280	640	1.9273	1,233	YES	NO	NONE
LOUDO	SUGARLAND	LOUD	STERLING PARK	1127	564	1.9273	1,086	YES	NO	NONE

each origin-destination pair, transit service options, if they exist, are indicated. Note that, in some cases, more service options may be available than are listed. The most direct transit service options are identified.

Using Table 31, a set of origin-destination work trip pairs was identified where demand appears to be sufficient to support transit but where no transit service is available. This set is presented in Table 32. It is noteworthy that the majority of this demand originates in the Prince William area. Note the travel demand from the Prince William area to destinations such as the Landmark area and Edsall/Shirley area. This tends to support the need for the Springfield/Franconia Transit Center. The remaining unserved areas are in Loudoun County. Principally, these include two originating districts in Loudoun County, Sterling Park and the Sugarland area. The major destinations include Herndon, the District of Columbia, Dulles Airport (Loudoun side), Tysons Corner, Reston and Sterling Park. This estimated demand for work trip travel is sufficient to be input into the service planning analysis for Loudoun County (Chapter 13).

Additional examination of work trip demand from Loudoun County was conducted. Work trip demand from all districts in Loudoun County to major destinations and to destination districts along the Route 7 corridor was identified. These are presented in Table 33. Note that work trip demand to the District of Columbia is the fourth greatest. It is preceded by demand to Dulles Airport (Loudoun side), Herndon and Reston. Travel to DC, Herndon and Reston is possible if patrons drive to the bus. No service exists to Dulles and points in Loudoun County. Table 33 indicates that the magnitude of combined demand to destinations along Route 7 are sufficient to support work trip bus service from Loudoun County, beginning in Leesburg, to points along Route 7 to Bailey's Crossroads and Skyline. Additionally, the results indicate that the need exists for transfers to bus service to Herndon and Reston.

In addition to travel demand not served by transit, origin-destination work trip pairs that appear to have sufficient demand for transit services, yet are indirectly served by transit, have been identified. The criteria employed in defining an "indirect" transit trip include inter-operator transfers, transfers from rail to bus and multiple transfers. While some rail to bus transfers are not difficult, reverse flow travel during peak periods may make some rail to bus transfers inconvenient. Table 34 presents work trip origin-destination pair demand where transit service is available but may require inter-operator transfers, multiple transfers or rail to bus transfers.

TABLE 32

NORTHERN VIRGINIA INTERJURISDICTIONAL TRAVEL DEMAND ESTIMATION WORKSHEET
WORK TRIPS FROM PLACE OF ORIGIN TO MAJOR WORK DESTINATIONS -- NO TRANSIT SERVICE AVAILABLE

ORIGIN DIST	ORIGIN JURIS	PLACE OF ORIGIN	MAJOR DEST DIST	MAJOR DEST JURIS	PLACE OF MAJOR DESTINATION	SIM WORK TRIPS	SIM PERSONS	CENSUS BASIS ADJUSTMENT FACTOR	ADJUSTED DAILY WORK TRAVEL DEMAND (PERSONS)	SUFFICIENT TRANSIT DEMAND POSSIBLE?	TRAVEL BY TRANSIT POSSIBLE?	TRANSIT ACCESS
4	PW AREA	PRINCE WILLIAM AREA	125	ALEX	LANDMARK	3558	1,779	1.2125	2,157	YES	NO	NONE
4	PW AREA	PRINCE WILLIAM AREA	127	FFX	EDSALL/SHIRLEY	3504	1,752	1.1200	1,962	YES	NO	NONE
4	PW AREA	PRINCE WILLIAM AREA	130	FFX	BAILEYS XRDS/7 CNRS	2130	1,065	1.1200	1,193	YES	NO	NONE
4	PW AREA	PRINCE WILLIAM AREA	131	FFX	FALLS CHURCH	2795	1,398	1.1200	1,565	YES	NO	NONE
4	PW AREA	PRINCE WILLIAM AREA	137	FFX	SPRINGFIELD	3198	1,599	1.1200	1,791	YES	NO	NONE
4	PW AREA	PRINCE WILLIAM AREA	140	FFX	MERRIFIELD	5097	2,549	1.1200	2,854	YES	NO	NONE
4	PW AREA	PRINCE WILLIAM AREA	142	FFX	TYSONS CORNER	6994	3,497	1.1200	3,917	YES	NO	NONE
4	PW AREA	PRINCE WILLIAM AREA	145	FFX	FT BELVOIR	5136	2,568	1.1200	2,876	YES	NO	NONE
4	PW AREA	PRINCE WILLIAM AREA	146	FFX	NEWINGTON/FULLERTO	3564	1,782	1.1200	1,996	YES	NO	NONE
4	PW AREA	PRINCE WILLIAM AREA	150	FFX	FAIRFAX CITY	9023	4,512	1.1200	5,053	YES	NO	NONE
4	PW AREA	PRINCE WILLIAM AREA	161	FFX	FAIR OAKS	2819	1,410	1.1200	1,579	YES	NO	NONE
4	PW AREA	PRINCE WILLIAM AREA	162	FFX	DULLES (FFX)	5179	2,590	1.1200	2,900	YES	NO	NONE
4	PW AREA	PRINCE WILLIAM AREA	163	FFX	RESTON	2115	1,058	1.1200	1,184	YES	NO	NONE
4	PW AREA	PRINCE WILLIAM AREA	164	FFX	HERNDON	4403	2,202	1.1200	2,466	YES	NO	NONE
169	LOUDOUN	STERLING PARK	164	FFX	HERNDON	1727	864	1.4511	1,253	YES	NO	NONE
169	LOUDOUN	STERLING PARK	167	LOUD	DULLESS (LOUDOUN)	1508	754	1.9273	1,453	YES	NO	NONE
170	LOUDOUN	SUGARLAND	1	DC	DC	1955	978	1.3742	1,343	YES	NO	NONE
170	LOUDOUN	SUGARLAND	142	FFX	TYSONS CORNER	1668	834	1.4511	1,210	YES	NO	NONE
170	LOUDOUN	SUGARLAND	163	FFX	RESTON	1860	930	1.4511	1,350	YES	NO	NONE
170	LOUDOUN	SUGARLAND	167	LOUD	DULLESS (LOUDOUN)	1280	640	1.9273	1,233	YES	NO	NONE
170	LOUDOUN	SUGARLAND	169	LOUDOU	STERLING PARK	1127	564	1.9273	1,086	YES	NO	NONE

TABLE 33

NORTHERN VIRGINIA INTERJURISIDCTIONAL TRAVEL DEMAND ESTIMATION
LOUDOUN COUNTY WORK TRIPS ALONG ROUTE 7 AND TO MAJOR DESTINATIONS

LOUDOUN COUNTY WORK TRIPS TO:	ADJUSTED DAILY PERSONS	TRANSIT OPTIONS
THE DISTRICT	3,460	DRIVE TO 5S TO MRAIL, PRIVATE CARRIER
RESTON	3,160	DRIVE TO METROBUS ROUTE 5S
HERNDON	3,646	DRIVE TO METROBUS ROUTE 5S
DULLES (LOUDOUN)	4,473	NONE
DULLES (FAIRFAX)	1,715	NONE
ASHBURN	925	NONE
STERLING PARK	3,613	NONE
STERLING	2,572	NONE
GREAT FALLS	707	NONE
TYSONS CORNER	3,049	DRIVE TO METROBUS ROUTE 5S
PIMMIT HILLS	308	DRIVE TO METROBUS ROUTE 5S+3BF
FALLS CHURCH	435	DRIVE TO METROBUS ROUTE 5S+28
BAILEY'S/7 CORNERS	403	DRIVE TO METROBUS ROUTE 5S+28
Total:	28,467	

Daily persons calculated based on 1990 MWCOG simulations adjusted according to the 1990 Census travel data.

TABLE 34

NORTHERN VIRGINIA INTERJURISDICTIONAL TRAVEL DEMAND ESTIMATION WORKSHEET
WORK TRIPS FROM PLACE OF ORIGIN TO MAJOR WORK DESTINATIONS – TRANSIT REQUIRES INTER-OPERATOR OR RAIL TO BUS TRANSFER

ORIGIN DIST	ORIGIN JURIS	PLACE OF ORIGIN	MAJOR DEST DIST	MAJOR DEST JURIS	PLACE OF MAJOR DESTINATION	SIM WORK TRIPS	SIM PERSONS	CENSUS BASIS ADJUSTMENT FACTOR	ADJUSTED DAILY WORK TRAVEL DEMAND (PERSONS)	SUFFICIENT TRANSIT DEMAND POSSIBLE?	TRAVEL BY TRANSIT POSSIBLE?	TRANSIT ACCESS
1	DC	DC	121	ALEX	OLD TOWN	1720	860	1.3173	1,133	YES	YES	MRAIL+29,AT2,5,8
2	MONT C	MONTGOMERY CO	142	FFX	TYSONS CORNER	4844	2,422	2.2636	5,482	YES	YES	MRAIL+3,5
2	MONT C	MONTGOMERY CO	133	FFX	MCLEAN/LANGLEY	2095	1,048	2.2636	2,371	YES	YES	MRAIL+23
3	PG CO	PRINCE GEORGES CO	121	ALEX	OLD TOWN	2500	1,250	1.7813	2,227	YES	YES	MRAIL+29,AT2,5,8
3	PG CO	PRINCE GEORGES CO	125	ALEX	LANDMARK	1285	643	1.7813	1,144	YES	YES	MRAIL+AT5,6,7
3	PG CO	PRINCE GEORGES CO	127	FFX	EDSALL/SHIRLEY	1157	579	2.5030	1,448	YES	YES	MRAIL+18,204
3	PG CO	PRINCE GEORGES CO	134	FFX	BEACON/HUNTINGTON	1345	673	2.5030	1,683	YES	YES	MRAIL+101-110
3	PG CO	PRINCE GEORGES CO	142	FFX	TYSONS CORNER	1490	745	2.5030	1,865	YES	YES	MRAIL+3,5
4	PW AREA	PRINCE WILLIAM AREA	105	ARL	PENTAGON	4798	2,399	1.0419	2,500	YES	YES	VRE+MRAIL
4	PW AREA	PRINCE WILLIAM AREA	107	ARL	ROSSLYN	2370	1,185	1.0419	1,235	YES	YES	VRE+MRAIL
4	PW AREA	PRINCE WILLIAM AREA	109	ARL	CRYSTAL CITY	3606	1,803	1.0419	1,879	YES	YES	VRE+MRAIL
4	PW AREA	PRINCE WILLIAM AREA	113	ARL	BALLSTON/COURT HSE	2767	1,384	1.0419	1,441	YES	YES	VRE+MRAIL
4	PW AREA	PRINCE WILLIAM AREA	121	ALEX	OLD TOWN	2047	1,024	1.2125	1,241	YES	YES	VRE+29,AT2,5,8
4	PW AREA	PRINCE WILLIAM AREA	122	ALEX	KING ST/BRADDOCK RD	1729	865	1.2125	1,048	YES	YES	VRE+MRAIL
4	PW AREA	PRINCE WILLIAM AREA	124	ALEX	EISENHOWER AVE	1962	981	1.2125	1,189	YES	YES	VRE+MRAIL
121	ALEX	OLD TOWN	1	DC	DC	3116	1,558	1.4737	2,296	YES	YES	AT OR MBUS+MRAIL
123	ALEX	DEL RAY/GLEBE RD	1	DC	DC	9318	4,659	1.4737	6,866	YES	YES	AT OR MBUS+MRAIL
123	ALEX	DEL RAY/GLEBE RD	109	ARL	CRYSTAL CITY	3730	1,865	0.7993	1,491	YES	YES	AT OR MBUS+MRAIL
125	ALEX	LANDMARK	1	DC	DC	8174	4,087	1.4737	6,023	YES	YES	AT+MRAIL
126	ALEX	MARK CENTER/NVCC	1	DC	DC	6033	3,017	1.4737	4,445	YES	YES	7, AT3,4+MRAIL
129	FFX	ANNANDALE/RAVENSWORTH	1	DC	DC	6209	3,105	1.1145	3,460	YES	YES	401,16+MRAIL
134	FFX	BEACON/HUNTINGTON	1	DC	DC	13330	6,665	1.1145	7,428	YES	YES	103-107+MRAIL
134	FFX	BEACON/HUNTINGTON	121	ALEX	OLD TOWN	1564	782	1.3124	1,026	YES	YES	103-107+MRAIL
135	FFX	TELEGRAPH/ROSE HILL	1	DC	DC	5757	2,879	1.1145	3,208	YES	YES	108-110+MRAIL
136	FFX	FRANCONIA	1	DC	DC	4878	2,439	1.1145	2,718	YES	YES	202+MRAIL
137	FFX	SPRINGFIELD	1	DC	DC	3486	1,743	1.1145	1,943	YES	YES	302-304,109+MRAIL
138	FFX	W SPRINGFIELD	1	DC	DC	5869	2,935	1.1145	3,271	YES	YES	18,109+MRAIL
144	FFX	MT VERNON/FT HUNT	1	DC	DC	14333	7,167	1.1145	7,987	YES	YES	11,107,109+MRAIL
144	FFX	MT VERNON/FT HUNT	109	ARL	CRYSTAL CITY	1804	902	1.1371	1,026	YES	YES	11,107,109+MRAIL
144	FFX	MT VERNON/FT HUNT	121	ALEX	OLD TOWN	1791	896	1.3124	1,175	YES	YES	11,107,109+MRAIL
146	FFX	NEWINGTON/FULLERTON	1	DC	DC	3891	1,946	1.1145	2,168	YES	YES	303,304+MRAIL
148	FFX	BURKE CTR/FAIRFAX STN	1	DC	DC	4259	2,130	1.1145	2,373	YES	YES	VRE OR 17,18+MRAIL
149	FFX	GMU/LAKE BRADDOCK	150	FFX	FAIRFAX CITY	1920	960	1.7715	1,701	YES	YES	29+GRN,GLD
150	FFX	FAIRFAX CITY	142	FFX	TYSONS CORNER	2130	1,065	1.7715	1,887	YES	YES	GRN,GLD+2,15
154	FFX	LORTON/POHICK	1	DC	DC	1954	977	1.1145	1,089	YES	YES	303+MRAIL
161	FFX	FAIR OAKS	150	FFX	FAIRFAX CITY	2626	1,313	1.7715	2,326	YES	YES	20+GRN,GLD
Total:												

As Table 34 illustrates, most of the "indirect" transit connections are not difficult to make. Those trips originating in DC and Maryland may prove difficult as they are reverse flow trips. The more difficult transit trips to make are suburban to suburban trips.

Non-Work Trips

Unlike the analysis of simulated work trips, the non-work trip simulations had no corresponding census data for comparison. The analysis of non-work travel patterns and transit service availability is based on the 1990 MWCOG non-work travel simulations and existing transit services.

The MWCOG non-work travel demand simulation for production-attraction pairs is comprised of shopping auto-driver trips, other auto-driver trips and non-home-based auto driver trips. The "shopping" and "other" trip data were converted from production-attraction format to origin-destination format and divided in half to represent trips from residence areas to destination activity areas. Non-home-based trips were then added. A threshold of 3,000 non-work trips per origin-destination district pair was established for the purpose of identifying potential transit demand. The threshold of 3,000 persons was set based on the assumption that non-work demand, unlike work trip demand, is spread out over the course of the day and, therefore, must be higher than for the work trip. The threshold of 3,000 persons per day, assuming a temporally uniform distribution of demand over a ten-hour service day with a ten percent transit use would yield a potential transit demand of thirty persons per hour for a given origin-destination district pair. Table 35 presents the origin-destination district pairs with a simulated non-work trip demand of 3,000 or more. The simulated non-work trip column represents the combined and adjusted shopping, other and non-home-based simulated travel demand mentioned above. Table 35 also presents transit service options, where available, for each non-work trip origin-destination district pair.

From Table 35, a subset of non-work trip demand is identified. Table 36 presents the origin-destination district pairs where non-work trip demand appears sufficient to support transit services yet where no transit service exists. Note that most of the unserved demand is located in western Fairfax County. There appears to exist a demand for service to the Dulles Airport area from Montgomery County and areas in western Fairfax County. Non-work travel demand in the Fair Oaks, Herndon, Dulles area merits consideration. Further non-work travel demand between Centreville and the City of Fairfax

TABLE 35

NORTHERN VIRGINIA INTERJURISDICTIONAL TRAVEL DEMAND ESTIMATION WORKSHEET
NON-WORK TRIPS FROM PLACE OF ORIGIN TO DESTINATION PLACE WHERE DEMAND GREATER THAN 3000 PERSONS PER DAY

ORIGIN JURIS	PLACE OF ORIGIN	MAJOR DEST JURIS	PLACE OF MAJOR DESTINATION	SIM NON-WORK TRIPS	SUFFICIENT TRANSIT DEMAND POSSIBLE?	TRAVEL BY TRANSIT POSSIBLE?	TRANSIT ACCESS
DC	DC	ARL	ROSSLYN	4345	YES	YES	MRAIL
DC	DC	ARL	CRYSTAL CITY	4664	YES	YES	MRAIL
DC	DC	ARL	BALLSTON/COURT HSE	4509	YES	YES	MRAIL
DC	DC	ALEX	OLD TOWN	3062	YES	YES	MRAIL+29,AT2,5,8
MONT	MONTGOMERY CO	FFX	TYSONS CORNER	6388	YES	YES	MRAIL+3,5
MONT	MONTGOMERY CO	LOUD	DULLES (LOUDOUN)	3397	YES	NO	NONE
PG CO	PRINCE GEORGES CO	ALEX	OLD TOWN	3159	YES	YES	MRAIL+29,AT2,5,8
PW AR	PRINCE WILLIAM AREA	FFX	FAIRFAX CITY	4787	YES	NO	NONE
PW AR	PRINCE WILLIAM AREA	FFX	CENTREVILLE	3664	YES	NO	NONE
ARL	ROSSLYN	DC	DC	4480	YES	YES	MRAIL
ARL	CRYSTAL CITY	DC	DC	3588	YES	YES	MRAIL
ARL	PENTAGON CITY	DC	DC	4170	YES	YES	MRAIL
ARL	PENTAGON CITY	ARL	CRYSTAL CITY	4430	YES	YES	MRAIL,5,9,10,11,13,23,24
ARL	BALLSTON/COURT HSE	DC	DC	5946	YES	YES	MRAIL
ARL	BALLSTON/COURT HSE	FFX	BAILEY'S/7 CORNERS	3010	YES	YES	25
ARL	COL PIKE/S GLEBE	ALEX	LANDMARK	3623	YES	YES	16+29, 16+28+AT5
ARL	ARL FORREST	FFX	BAILEY'S/7 CORNERS	3815	YES	YES	25
ARL	E FALLS CHURCH	FFX	TYSONS CORNER	3741	YES	YES	MRAIL+3,5
ALEX	OLD TOWN	DC	DC	3090	YES	YES	AT OR MBUS+MRAIL
ALEX	OLD TOWN	ALEX	KING ST/BRADDOCK RD	3000	YES	YES	AT3,4
ALEX	DEL RAY/GLEBE RD	DC	DC	3285	YES	YES	10,AT3,4+MRAIL
ALEX	DEL RAY/GLEBE RD	ALEX	OLD TOWN	3844	YES	YES	AT3,4,28,10
ALEX	EISENHOWER AVE	ALEX	LANDMARK	3341	YES	YES	AT6
ALEX	LANDMARK	DC	DC	3729	YES	YES	AT+MRAIL
ALEX	LANDMARK	ALEX	EISENHOWER AVE	3112	YES	YES	AT6
ALEX	LANDMARK	FFX	EDSALL/SHIRLEY	3380	YES	YES	AT6+17ABC
ALEX	MARK CENTER/NVCC	ALEX	LANDMARK	4928	YES	YES	AT6
FFX	EDSALL/SHIRLEY	FFX	SPRINGFIELD	3265	YES	YES	204 OR 17,306+401
FFX	LINCOLNIA	FFX	EDSALL/SHIRLEY	4022	YES	YES	17,306
FFX	LINCOLNIA	FFX	BAILEYS/7 CORNERS	3804	YES	YES	306,17+7+28
FFX	ANNANDALE/RAVENSWORTH	FFX	MERRIFIELD	3394	YES	YES	401
FFX	ANNANDALE/RAVENSWORTH	FFX	TYSONS CORNER	4927	YES	YES	401
FFX	BAILEYS XRDS/7 CNRS	FFX	LINCOLNIA	3132	YES	YES	25+7+17
FFX	BAILEYS XRDS/7 CNRS	FFX	FALLS CHURCH	3272	YES	YES	28+3
FFX	FALLS CHURCH	FFX	BAILEYS XRDS/7 CNRS	5050	YES	YES	28
FFX	FALLS CHURCH	FFX	MERRIFIELD	5157	YES	YES	2
FFX	FALLS CHURCH	FFX	TYSONS CORNER	7459	YES	YES	2,5,28
FFX	PIMMIT HILL	FFX	FALLS CHURCH	3035	YES	YES	3
FFX	PIMMIT HILL	FFX	TYSONS CORNER	8128	YES	YES	3
FFX	MCLEAN/LANGLEY	FFX	TYSONS CORNER	5248	YES	YES	15,23
FFX	BEACON/HUNTINGTON	PG CO	PRINCE GEORGES CO	4684	YES	YES	103-107+MRAIL
FFX	BEACON/HUNTINGTON	ALEX	OLD TOWN	4278	YES	YES	103-107+MRAIL

TABLE 35 (Continued)

NORTHERN VIRGINIA INTERJURISDICTIONAL TRAVEL DEMAND ESTIMATION WORKSHEET
NON-WORK TRIPS FROM PLACE OF ORIGIN TO DESTINATION PLACE WHERE DEMAND GREATER THAN 3000 PERSONS PER DAY

ORIGIN JURIS	PLACE OF ORIGIN	MAJOR DEST JURIS	PLACE OF MAJOR DESTINATION	SIM NON-WORK TRIPS	SUFFICIENT TRANSIT DEMAND POSSIBLE?	TRAVEL BY TRANSIT POSSIBLE?	TRANSIT ACCESS
FFX	BEACON/HUNTINGTON	ALEX	EISENHOWER AVE	3406	YES	YES	103-107+MRAIL
FFX	BEACON/HUNTINGTON	FFX	MT VERNON/FT HUNT	4204	YES	YES	108-110+101,102,105-107
FFX	FRANCONIA	FFX	SPRINGFIELD	4931	YES	YES	109,110
FFX	SPRINGFIELD	FFX	EDSALL/SHIRLEY	3133	YES	YES	204
FFX	SPRINGFIELD	FFX	NEWINGTON/FULLERTO	3396	YES	YES	109,110+202,203
FFX	W SPRINGFIELD	FFX	SPRINGFIELD	7074	YES	YES	109
FFX	KINGS PARK	FFX	MERRIFIELD	3718	YES	NO	NONE
FFX	MERRIFIELD	FFX	FALLS CHURCH	4205	YES	YES	1,2
FFX	MERRIFIELD	FFX	TYSONS CORNER	6224	YES	YES	2,26,401
FFX	MERRIFIELD	FFX	FAIRFAX CITY	6208	YES	YES	1,2+GRN,GLD
FFX	MT VERNON/FT HUNT	PG	PRINCE GEORGES CO	3206	YES	YES	11,107,109+MRAIL
FFX	MT VERNON/FT HUNT	ALEX	OLD TOWN	3406	YES	YES	11,107,109+MRAIL+AT
FFX	MT VERNON/FT HUNT	FFX	BEACON/HUNTINGTON	7392	YES	YES	9,107,109
FFX	NEWINGTON/FULLERTON	FFX	SPRINGFIELD	5502	YES	YES	203+109
FFX	NEWINGTON FORREST	FFX	SPRINGFIELD	4008	YES	NO	NONE
FFX	NEWINGTON FORREST	FFX	NEWINGTON/FULLERTO	7289	YES	YES	304
FFX	GMU/LAKE BRADDOCK	FFX	KINGS PARK	3000	YES	YES	306,17
FFX	GMU/LAKE BRADDOCK	FFX	FAIRFAX CITY	4222	YES	YES	306,17+GRN,GLD
FFX	FAIRFAX CITY	FFX	MERRIFIELD	7282	YES	YES	1,2
FFX	FAIRFAX CITY	FFX	TYSONS CORNER	4632	YES	YES	404,2
FFX	FAIRFAX CITY	FFX	FAIR OAKS	5236	YES	YES	1,2
FFX	VIENNA/OAKTON	FFX	FAIRFAX CITY	5042	YES	YES	2,404
FFX	CENTREVILLE	FFX	FAIRFAX CITY	3041	YES	NO	NONE
FFX	PLEASANT HILL	FFX	DULLES (FFX)	3268	YES	NO	NONE
FFX	FAIR OAKS	FFX	FAIRFAX CITY	7868	YES	YES	1+GRN,GLD
FFX	FAIR OAKS	FFX	DULLES (FFX)	5942	YES	NO	NONE
FFX	FAIR OAKS	FFX	HERNDON	4960	YES	NO	NONE
FFX	DULLES	FFX	FAIR OAKS	6096	YES	NO	NONE
FFX	DULLES	FFX	HERNDON	3006	YES	NO	NONE
FFX	RESTON	FFX	TYSONS CORNER	8514	YES	YES	5S
FFX	RESTON	FFX	HERNDON	4756	YES	YES	5
FFX	HERNDON	FFX	FAIR OAKS	4216	YES	YES	5
FFX	HERNDON	FFX	RESTON	3136	YES	YES	5+404+1
LOUD	SUGARLAND	LOUD	STERLING PARK	3414	YES	NO	NONE

TABLE 36

NORTHERN VIRGINIA INTERJURISDICTIONAL TRAVEL DEMAND ESTIMATION WORKSHEET
NON-WORK TRIPS FROM PLACE OF ORIGIN TO DESTINATION PLACE WHERE DEMAND GREATER THAN 3000 PERSONS PER DAY
WHERE NON-WORK TRAVEL IS NOT SERVED BY TRANSIT

ORIGIN DIST	ORIGIN JURIS	PLACE OF ORIGIN	MAJOR DEST DIST	MAJOR DEST JURIS	PLACE OF MAJOR DESTINATION	SIM NON-WORK TRIPS	SUFFICIENT TRANSIT DEMAND POSSIBLE?	TRAVEL BY TRANSIT POSSIBLE	TRANSIT ACCESS
2	MONT CO	MONTGOMERY CO	167	LOUD	DULLES (LOUDOUN)	3397	YES	NO	NONE
4	PW AREA	PRINCE WILLIAM AREA	150	FFX	FAIRFAX CITY	4787	YES	NO	NONE
4	PW AREA	PRINCE WILLIAM AREA	159	FFX	CENTREVILLE	3664	YES	NO	NONE
147	FFX	NEWINGTON FORREST	137	FFX	SPRINGFIELD	4008	YES	NO	NONE
159	FFX	CENTREVILLE	150	FFX	FAIRFAX CITY	3041	YES	NO	NONE
160	FFX	PLEASANT HILL	162	FFX	DULLES (FFX)	3268	YES	NO	NONE
161	FFX	FAIR OAKS	162	FFX	DULLES (FFX)	5942	YES	NO	NONE
161	FFX	FAIR OAKS	164	FFX	HERNDON	4960	YES	NO	NONE
162	FFX	DULLES	161	FFX	FAIR OAKS	6096	YES	NO	NONE
162	FFX	DULLES	164	FFX	HERNDON	3006	YES	NO	NONE
170	LOUDOUN	SUGARLAND	169	LOUD	STERLING PARK	3414	YES	NO	NONE
Total:						45,583			

is not served by transit nor is non-work demand between the areas of Newington Forrest, Newington and Springfield.

Non-work travel demand exists between the Sugarland area of Loudoun County and Sterling Park in Loudoun County. Further analysis of non-work travel demand in Loudoun County was undertaken. Lowering the demand threshold to 2,000 persons produced intra-county non-work travel demand which may have potential to support transit. Table 37 presents the non-work origin-destination pairs, corresponding simulated non-work demand, and transit service options.

Non-work travel demand was examined relative to transit services available to complete the trip between the origin-destination district pairs. In addition to the origin-destination district pairs not served by transit, those requiring inter-operator transfers, rail to bus transfers and multiple transfers are identified. Table 38 presents the non-work travel demand by origin-destination pair where the transit service available requires an inter-operator transfer, a rail to bus transfer or multiple transfers. As is the case with work trip travel, the non-work suburb to suburb travel by transit is the most difficult. The inter-operator transfers to Metrorail are listed because they meet the definition rather than due to significant inconvenience of service. Rail to bus transfers for non-work trip travel may be inconvenient depending on the service frequency of the bus service. In Northern Virginia, this problem is compounded due to the lack of published information on Metrorail schedules at stations. Inter-operator bus transfers and multiple transfers tend to be the most difficult services for non-work transit travel.

Summary

This chapter has examined travel patterns and transit service availability for work and non-work travel in the study area. In short, the study area experiences a high percentage of interjurisdictional work trip travel. The review of work and non-work travel demand at the MWCOG district level finds that the majority of the travel that would support transit service is served by transit.

Work trip demand not served by transit is limited to points from and in Loudoun County and travel from the Prince William County Area (see Table 32). Work trip demand in Loudoun County and along Route 7 to the Bailey's Crossroads/Skyline area may support transit service. Similarly, work trip transit connections from Loudoun County to Herndon, Reston and Dulles may support transit service.

TABLE 37

NORTHERN VIRGINIA INTERJURISIDCTIONAL TRAVEL DEMAND ESTIMATION
LOUDOUN COUNTY NON-WORK TRIPS EXCEEDING 2000 PERSONS PER DAY

LOUDOUN COUNTY NON-WORK TRIPS FROM:	LOUDOUN COUNTY NON-WORK TRIPS TO:	SIMULATED DAILY PERSONS(1)	TRANSIT OPTIONS
STERLING PARK	HERNDON	2,143	NONE
STERLING PARK	STERLING	2,538	NONE
SUGARLAND	STERLING PARK	3,414	NONE
DISTRICT 176	LEESBURG	2,558	NONE
Total:		10,653	

(1) Persons based on 1990 MWCOG travel simulation.

TABLE 38

NORTHERN VIRGINIA INTERJURISDICTIONAL TRAVEL DEMAND ESTIMATION WORKSHEET
NON-WORK TRIPS FROM PLACE OF ORIGIN TO DESTINATION PLACE WHERE DEMAND GREATER THAN 3000 PERSONS PER DAY
AND TRANSIT CONNECTIONS REQUIRE INTER-OPERATOR OR MULTIPLE TRANSFERS

ORIGIN DIST	ORIGIN JURIS	PLACE OF ORIGIN	MAJOR DEST DIST	MAJOR DEST JURIS	PLACE OF MAJOR DESTINATION	SIM NON-WORK TRIPS	SUFFICIENT TRANSIT DEMAND POSSIBLE?	TRAVEL BY TRANSIT POSSIBLE?	TRANSIT ACCESS
1	DC	DC	121	ALEX	OLD TOWN	3062	YES	YES	MRAIL+29,AT2,5,8
2	MONT CO	MONTGOMERY CO	142	FFX	TYSONS CORNER	6388	YES	YES	MRAIL+3,5
3	PG CO	PRINCE GEORGES CO	121	ALEX	OLD TOWN	3159	YES	YES	MRAIL+29,AT2,5,8
116	ARL	COL PIKE/S GLEBE	125	ALEX	LANDMARK	3623	YES	YES	16+29, 16+28+AT5
119	ARL	E FALLS CHURCH	142	FFX	TYSONS CORNER	3741	YES	YES	MRAIL+3,5
121	ALEX	OLD TOWN	1	DC	DC	3090	YES	YES	AT OR MBUS+MRAIL
123	ALEX	DEL RAY/GLEBE RD	1	DC	DC	3285	YES	YES	10,AT3,4+MRAIL
125	ALEX	LANDMARK	1	DC	DC	3729	YES	YES	AT+MRAIL
125	ALEX	LANDMARK	127	FFX	EDSALL/SHIRLEY	3380	YES	YES	AT6+17ABC
127	FFX	EDSALL/SHIRLEY	137	FFX	SPRINGFIELD	3265	YES	YES	204 OR 17,306+401
128	FFX	LINCOLNIA	130	FFX	BAILEYS/7 CORNERS	3804	YES	YES	306,17+7+28
130	FFX	BAILEYS XRDS/7 CNRS	128	FFX	LINCOLNIA	3132	YES	YES	25+7+17
134	FFX	BEACON/HUNTINGTON	3	PG CO	PRINCE GEORGES CO	4684	YES	YES	103-107+MRAIL+BUS
134	FFX	BEACON/HUNTINGTON	121	ALEX	OLD TOWN	4278	YES	YES	103-107+MRAIL+AT2,5
134	FFX	BEACON/HUNTINGTON	124	ALEX	EISENHOWER AVE	3406	YES	YES	103-107+MRAIL
139	FFX	KINGS PARK	140	FFX	MERRIFIELD	3718	YES	YES	17+401
140	FFX	MERRIFIELD	150	FFX	FAIRFAX CITY	6208	YES	YES	1,2+GRN,GLD
144	FFX	MT VERNON/FT HUNT	3	PG	PRINCE GEORGES CO	3206	YES	YES	11,107,109+MRAIL
144	FFX	MT VERNON/FT HUNT	121	ALEX	OLD TOWN	3406	YES	YES	11,107,109+MRAIL+AT
149	FFX	GMU/LAKE BRADDOCK	150	FFX	FAIRFAX CITY	4222	YES	YES	306,17+GRN,GLD
161	FFX	FAIR OAKS	150	FFX	FAIRFAX CITY	7868	YES	YES	1+GRN,GLD
164	FFX	HERNDON	163	FFX	RESTON	3136	YES	YES	5+404+1
Total:						87,790			

Non-work transit travel in Loudoun County and areas in western Fairfax County including travel between the Newington Forrest and Springfield areas appear to be sufficiently large to warrant analysis for transit service potential (see Table 36). These new transit potential areas are reviewed in Chapter 12 for Fairfax County and Chapter 13 for Loudoun County.

CHAPTER 11

FARE STRUCTURE

Each operation has developed and implemented a fare structure independently with consideration of other systems, but not total integration or coordination. As the number and types of service increased over the years, the resulting fare structure of the Northern Virginia "system" has incorporated more and more components. At the present time, there are multiple base fares -- in some cases for the same operator, zonal charges, peak and off peak fare differentials, surcharges and transfers. With consideration of prepayment media which include various passes and tokens for bus service as well as farecards and various tickets for rail fares, the extent of the different fare structure elements is apparent. Another component of the various operator fare structures is discounts offered to various user groups such as senior citizens, students and the physically challenged.

Existing Fares

With the exception of the Arlington Trolley, each of the bus service providers has multiple components within its individual fare structure. As noted previously, among these elements are varying base fares, peak period surcharges, route surcharges and travel zones for which additional fare charges apply. As a result, the range and interrelationships among the carriers is nearly incomprehensible to the average rider.

The Metrobus fare structure is presented in Table 39. The structure is primarily a distance-based structure in which a fare is assessed based on the number of zones through which a rider travels. It is also a time based structure in which different fares exist on certain trips depending on the time the trip is made. In contrast to the typical base fare of $1.00 for a one zone Metrobus ride, some routes have base fares of $0.50 and $0.75 and others have surcharges of either $0.50 or $0.75 which are added to the base fare. This contributes to the complexity of the fare structure. It should be noted that the information presented only reflects the fare structure involving trips to/from the study area.

TABLE 39

METROBUS FARE STRUCTURE

	PEAK HOUR FARE ($)		OFF PEAK FARE ($)	
	CASH	W/RAIL TRANSFER	CASH	W/RAIL TRANSFER
Virginia Single Zone	1.00	0.75	1.00	0.75
Virginia Between				
VA Zones G and 1-ARL	1.00	0.75	1.00	0.75
VA Zones G and 1-ALEX	1.35	1.10	1.00	0.75
VA Zones G and 2	1.70	1.45	1.00	0.75
VA Zones G and 3	2.05	1.80	1.00	0.75
VA Zones 1 and 2	1.35	1.10	1.00	0.75
VA Zones 1 and 3	1.70	1.45	1.00	0.75
VA Zones 2 and 3	1.35	1.10	1.00	0.75
DC to VA Zone G	1.35	0.35	1.35	0.35
VA Zone G to DC	1.35	1.10	1.35	1.10
DC to VA Zone 1-ARL	1.35	0.35	1.35	0.35
VA Zone 1-ARL to DC	1.35	1.10	1.35	1.10
DC to VA Zone 1-ALEX	1.70	0.70	1.35	0.35
VA Zone 1-ALEX to DC	1.70	1.45	1.35	1.10
DC to VA Zone 2	2.05	1.05	1.35	0.35
VA Zone 2 to DC	2.05	1.80	1.35	1.10
DC to VA Zone 3	2.40	1.40	1.35	0.35
VA Zone 3 to DC	2.40	2.15	1.35	1.10
Seniors/Disabled*				
Within VA	0.50	0.35		
DC to VA	0.50	0.15		
VA to DC	0.50	0.50		
Surcharges**				
Routes 5N,5P	0.50			
Route 11Y	0.75			
Special North VA Fares				
Routes 2P,W,X 3W,Z, 5S 12C,E,L,M,R, 20A,F,G,W X,Y,Z 24T 26G,H	0.50			
Routes 5A,J,W,Y,Z	0.75			

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* Senior and Disabled fares apply at all times.

** Surcharges are in addition to regular cash fare.

Other features of the Metrobus fare structure include:

- There is a special fare in Arlington County for a round trip transfer on a bus/rail combination. By paying a $0.05 transfer fee on the initial bus ride, the rider would be permitted to ride the return bus later that day with a valid Metrorail transfer. The $0.05 transfer fee on the initial bus is paid in lieu of a $0.75 fee on the second bus.

- A Metrobus flash pass exists for use during a two week period. The cost of the pass is $20.00 for one zone travel with a charge of $7.00 for each additional zone. In a two week period, a worker will make 20 trips. The cash fare cost for the trips would also be $20.00. Thus, the pass is only a convenience for a worker who uses the service soley for travel to and from work during the period. However, for those who also use the service during off peak periods and on weekends, the pass results in a substantial savings over the base cash fare.

Table 40 presents the fare structure for the other Northern Virginia providers. As can be seen, the Metrobus fare structure is the most complex. With the exception of the Fairfax Connector, most of the other systems contain a base fare and one or two prepayment media. Similar to Metrobus, Connector services incorporate one of two base fares. As shown in Table 40, the 100, 200 and all but one of the 400 series routes have a $0.50 base fare with a $1.00 base on the 300 series and 404 routes. Other carrier base fares range from $0.35 to $0.75.

A transit fare structure -- under optimum circumstances, should be easy for both existing users and potential riders to understand. Other components relate to "user friendliness" and administrative ease. For the former, a fare structure should be easy for patrons to remember while the latter reflects the degree of difficulty encountered in administering the system. These items reflect the types of considerations that should be addressed as part of fare structure policy. The discussion that follows describes a set of evaluation criteria used to assess the fare structure of the bus systems operating in Northern Virginia.

TABLE 40

NON-METROBUS FARE STRUCTURES

CUE

Base Fare	$0.35
Students	$0.25
Seniors	$0.25
Transfers	Free (Only valid between CUE routes)

DASH

Base Fare	$0.75
Pentagon	$1.00 (Surcharge $0.25)
Transfers	Free (Valid for four hours)
Monthly Pass	$25.00
Pentagon Pass	$35.00

Fairfax Connector

Routes 101-110, 201-204, 401-403		
Base Fare	$0.50	
Seniors/Disabled	$0.50	($0.35 with Metrorail transfer)
Routes 301-306, 404		
Base Fare	$1.00	($0.75 with Metrorail transfer)
Additional Zones	$0.35	(Peak only)
Seniors/Disabled	$0.50	($0.35 with Metrorail transfer)

RIBS

Local Loops	$0.25/1 Token
Express	$0.75/3 Tokens
Transfers	Free (Only valid between RIBS routes)
Tokens (4/pack)	$1.00

Arlington Trolley

Base Fare	$0.35

Tysons Shuttle

Base Fare	$0.75
Tokens (10/pack)	$6.00
11 Trip Card	$6.00

Evaluation Criteria

In order to assess the current fare structures, a series of seven evaluation criteria has been developed. These criteria are defined in terms of the desirable characteristics that a fare structure should contain. The criteria provide a framework for identifying deficiencies and opportunities with respect to service pricing.

- fiscal integrity - The fare structure should provide sufficient revenues that together with operating support from all sources covers the cost of providing bus service. This criterion is typically the primary one in evaluating fare structure changes since it relates to the amount of additional revenue from a fare change.

- ridership productivity - Fares should be maintained at a level the public can afford so that they will continue to pay to use the service. Therefore, efforts must be focused on developing a structure which affords discounts to certain groups, primarily those that are transit disadvantaged, and does not overly burden any one particular rider group. An important element of this criterion is that fares contain promotional or marketing programs that encourage more frequent utilization.

- equity - While transit fare equity is difficult to precisely define, equity consideration generally falls into three categories: riding distance, quality of service and patrons' ability to pay. The first consideration, riding distance, means that the patron who rides further should pay more since costs are generally greater. Yet, no fare collection system has been developed which enables easy enforcement of this principle. Thus, a zone structure is the method usually employed to meet this criterion. Other options include fares by service type where a relatively short shuttle route would have a reduced fare.

  Quality of service is the second equity consideration and relates to higher fare payments consistent with the extent of a higher level of service. For example, express bus service which

generally offers the patron a higher level of dependability, speed and comfort for a longer distance trip should command a premium price since it often costs more to provide.

Further, the equity measure associated with the patrons' ability to pay is the relationship of the importance of the fare to different user groups. Thus, the characteristics of different user groups should be taken into account before setting price levels. With transit as a public service, three ridership classes -- students, senior citizens and handicapped persons, are generally afforded travel opportunities at a discount price.

Another aspect is fairness to taxpayers. A fair balance between riders and taxpayers is needed based on relative benefits received (e.g., congestion relief, air quality, availability for emergency use).

- simplicity - A major advantage of transit is its low cost relative to other means of making a comparable trip. In order to market this cost advantage, the general public should know the price of each and every possible way of paying for use of the service. Further, people who try to use the bus service for the first time should be able to understand what they should pay without questions or disputes regarding interpretation. Needless to say, fares should be understandable to drivers who enforce proper fare payment.

- administrative burden - A fare structure must lend itself to easy collection of, and accounting for, route revenues. Security of revenue is another primary consideration. The structure must also be developed to be consistent with the hardware utilized to collect and process the fares. Further, the driver's ability to control fare payment upon passenger boarding and alighting and safely operate the vehicle as well are important considerations.

- consistency with government policies - Fare structure elements should be consistent with policies of federal, state and local governments. For example, federal policy for systems that are recipients of federal funding mandates offering senior citizens the opportunity to use the bus system during off-peak periods at one-half full fare levels.

- regional integration - A large number of riders utilize other transit modes and services to complete their trip. For example, data from WMATA indicated that over one percent of Metrobus riders transferred from another bus operator's service. An additional 20 percent transferred from another Metrobus or Metrorail. Transfer activity on other systems was also significant and totaled about 17 percent for DASH and eight percent for Fairfax Connector. Under these circumstances, Northern Virginia public transportation carriers should integrate their fares with other operators. This would include joint ticketing and reciprocal fare agreements. Further, the fare structure should be consistently applied so that it does not show partiality toward certain geographical areas.

What is obvious from these seven criteria is that they do not necessarily work together. For instance, a fare change to enhance satisfaction of one criterion may have an opposite effect on another. Administrative burden and equity are examples of this conflicting policy. Thus, a suggested fare policy must strike a balance between the different criteria so that no single yardstick is entirely ignored.

Evaluation Results

To provide input to a policy discussion of fares, the current pricing structures were reviewed in terms of the seven evaluation criteria. As noted previously, certain criteria contradict others and a proper balance needs to be achieved. Results are summarized below.

- fiscal integrity - The current fares satisfy this criteria in that revenue from riders plus government subsidies cover operating expenses. One concern is that fare decisions have been

based on short range funding requirements rather than longer range or more strategic considerations. For example, many of the Metrobus routes with the lower, $0.50 base fares are among the worst rated routes in terms of farebox recovery. Further, the $0.50 fare on route 5S is particularly questionable because of its very long length. While lower fares may be "nice" and attractive to riders, the level of subsidy required to cover operating shortfalls is limited. In a somewhat similar manner, several Connector routes have a $0.50 base fare, in particular the 401, which is a very long route.

- ridership productivity - The existing fare structure attains mixed results for this criterion. There are bus lines that duplicate both rail and "competitive" bus service. In some cases, fares are the determining consideration for riders as to the specific service used. On the positive side, Metrobus, CUE and the Connector fare structures provide discounts to certain ridership groups (e.g., senior citizens) that have a higher proportion of low income residents than the general public. The other operators do not.

- equity - In terms of this criterion, the Northern Virginia "system" has both positive and negative features. The equity aspect of service based on riding distance is generally met. For example, riders pay an additional fare for certain extended trips (e.g., DASH service to Pentagon) or on a zonal basis for Metrobus service. However, there are exceptions to paying a fare based on distance traveled (e.g., the fare on long routes 5S and 401 is only $0.50).

  The second aspect of equity is met in a limited way in that a premium fare is assessed for a higher quality service, such as express, on only a few routes (e.g., a $0.75 surcharge is assessed on the 11Y express route).

  The final aspect of equity states that the fare structure should take into account the patrons' ability to pay. Therefore, senior citizens and disabled riders should be offered a discount. Metrobus and the Fairfax Connector offer

discounts to seniors and disabled persons. While not targeted to any special group (e.g., senior citizens), DASH has a discounted monthly pass and a unique transfer program under which all riders are able to transfer for free for up to four hours to any DASH route, including a return trip on the same route. The CUE system offers discounts to students of George Mason University. However, the student discount is offered since the University contributes financially each year to CUE. No other discounts are offered by the Northern Virginia operators.

- simplicity - The Metrobus fare structure does not meet this criterion. The complexity of the fare structure is very confusing. It is unusual to find a fare structure in the transit industry that is both a distance based structure and has a time of day differential. This complexity is coupled with a discounted fare on certain routes, a surcharge on a few others and a confusing transfer policy. An observation of the fares listed on the Metrobus public timetable may be sufficient to intimidate a first time user. The Fairfax Connector is unnecessarily confusing in regard to multiple base fares, use of the Metrobus zonal fare structure on some bus lines and the varying value of transfers between different routes and services. The fare structures of the other systems are such that the patron should be able to easily understand what fare to pay.

  There is one example which points to the complexity of the Northern Virginia "system" fare structure. A bulletin board in the drivers room at DASH contains a display of about 50 items of script (e.g., passes, tickets, transfer slips, etc.) divided into two groups. Above one group is the notion that these are acceptable for the DASH fare and above the other group, that these are unacceptable.

- administrative burden - The different fare programs at Metrobus make the collection procedure relatively difficult. The collection procedures at the other systems appear to be simple and straightforward. It does not require

excessive efforts to process and record fares paid.

Another way to view this criterion is with respect to coordination and integration with other operators. At present, only limited efforts are evident to develop and apply a comprehensive and coordinated fare structure. This may be a concern in the future if proposals for "seamless" fares in the region and greater reliance on automated collection procedures are implemented.

- consistency with government policies - For the most part, the fare structures among the Northern Virginia bus operators are compatible with other government programs. In contrast to Metrobus, CUE and Connector, senior citizens are not offered a discount on DASH, RIBS, Trolley and Tysons Shuttle services.

- regional integration - Only very limited efforts have been implemented to coordinate fares among agencies. Short term, greater use should be made of joint ticketing and reciprocal fare agreements. Longer term, a system of "seamless fares" should be encouraged to support transit travel in the region.

  Another longer term element includes implementation of an automatic fare collection system, similar to that utilized on Metrorail, on all Northern Virginia buses. It is recognized that there are inherent problems with a bus application of a swipe card system that deducts the appropriate fare from a cash card. Some of the problems include the lack of a back-up system if the primary system fails and lack of knowledge of fare card use by unprepared riders. However, these problems are being addressed at other systems including the New York City Transit Authority.

The previous discussion highlights the characteristics of the existing Northern Virginia carrier fare structures. This review also points out the often contradictory nature of the evaluation criteria. Tradeoffs need to be made to

establish an overall fare policy that includes all of the public transportation services operated in Northern Virginia.

Implications For Northern Virginia

Based on the previous discussion, there are several items that require consideration and subsequently, action if the fare structure of Northern Virginia's bus service providers are to be coordinated. Coordination does not necessarily mean that each service must charge the same base fare or transfer charge. Each carrier uses its wage and benefit rates as well as internal considerations to develop an estimate of what it costs to provide a certain level of service. Since wage rates and other items differ, costs among the carriers are not uniform. This is clearly evident in recent decisions to substitute privately operated contract service to replace Metrobus routes. Further, the establishment of fares reflect community policy and values.

In this context, coordination implies a reasonable level of cooperation among operators to reduce the number of fare structure components. Another component of coordination relates to transfer provisions among the different operators. As shown in Table 41, only a few reciprocal types of arrangements are presently in place. However, in some of these cases, the typical transit user would be hard pressed to understand the nuances of the transfer provisions. For example, the Metrobus timetables do not indicate transfer policy in regards to DASH and Fairfax Connector. However, when you read the DASH and Fairfax Connector schedules, the transfer provision is clearly evident. There are several similar examples of fare and transfer policy being difficult if at all possible to readily understand. This situation underscores the general lack of clear and concise public information concerning passenger fares.

Recommendations

It is apparent that fare policy is an important issue that should be addressed by the NVTC, WMATA and jurisdictions that fund bus service in Northern Virginia. It is recommended that fare structure improvements should be accomplished in three stages and over three horizon periods. The first stage would be for each system to simplify and consistently apply the fare structure to its own routes and services. This recommendation primarily applies to the Metrobus operation. Stage two should involve the development of a regionally acceptable fare structure and transfer coordination policy. This should be accomplished in an

TABLE 41

TRANSFER PROVISION MATRIX

FROM/TO	Metrorail	Metrobus	CUE	DASH	FX Connector	RIBS	Trolley	Tysons Shuttle	VRE
Metrorail	Farecard	Transfer	None	None	Transfer (1)	Transfer (4)	None	None	None
Metrobus	None	Transfer	None	Free	Pass, Transfer (2)	None	None	None	None
CUE	None	None	Free	None	None	None	None	None	None
DASH	None	Transfer	None	Free	Transfer (2)	None	None	None	None
FX Connector	Metro Flash Pass	Transfer (3)	None	Transfer (3)	Transfer	None	None	None	None
RIBS	None	Transfer (4)	None	None	None	Transfer	None	None	None
Trolley	None	None	None	None	None	None	None	None	None
Tysons Shuttle	None	None	None	None	None	None	None	None	None
VRE	None	Yes	None	Transfer	Yes(5)	None	Yes(5)	None	None

(1) Routes 301–306 and 404 Only
(2) Additional zone charges apply on Routes 301–306 and 404
(3) Transfers from Routes 301–306 and 404 worth full fare
(4) Metrobus transfers accepted as full payment for local loops and RIBS transfer worth $0.25 towards applicable fare
(5) Show Ticket

immediate range (three to five years) period. Stage three should be the longer range effort (five to ten years) involving implementation of a truly "seamless" fare structure that utilizes the latest available technology to collect fares.

It should be noted that a detailed fare structure review was not part of the scope of this study. However, based on the analysis performed in this study, the following fare structure changes aimed at consistency and simplicity should be considered for first stage improvements by the bus operators. Development of detailed recommendations for the other stages involves a more focused study on a coordinated Northern Virginia fare structure. As seen below, the recommendations primarily involve the Metrobus fare structure.

Metrobus

- Consider one of two changes to the basic fare structure. One change, which would not effect revenue generation, would be to eliminate the distinction between peak and off-peak fares. Rather, there would be one base fare throughout the system. However, if a rider traveled during the peak periods and the trip crossed zonal boundaries, a peak period zone charge would apply. This zone charge could be consistent with current charges. Therefore, this change would be one of mere definition and aimed at simplification of the fare structure. The second option would be to apply the zonal charge to all riders independent of the time of the trip (peak or off-peak). This results in a greater level of equity in the system throughout the day based on distance traveled. The fare could be based on either keeping the revenue the same, in which case the zone charges for the peak period could be reduced to a lower level and the same as the off-peak charges, or increasing the revenue by setting the off-peak zone charges the same as the peak. The decision on what alternative is best should be based on a more detailed fare study.

- There are a number of Metrobus routes in Northern Virginia that have a $0.50 fare.

Most of these routes are relatively short routes that feed Metrorail stations. In fact, except for Route 5S, the range of one way scheduled trip times for the $0.50 routes is from about 25 minutes to about 45 minutes with the average at 35 minutes. The Route 5S one way scheduled trip time is over one hour for most time periods. This route should be considered like other Metrobus non-$0.50 routes with a $1.00 base fare and appropriate zone charges.

- Consider the application of the bus and Metrorail round trip transfer fee similar to that offered in Arlington County for all routes in Northern Virginia that serve Metrorail stations.

- Reduce the amount of confusion regarding which types of scripts (passes, tickets, transfers, etc.) are acceptable on various systems by noting on the script, the systems and the types of trips that are acceptable. If the script does not denote the system and type trip, it would be refused by the driver. This feature may reduce the complications arising from the large number of script programs available to riders in the Northern Virginia area.

- Eliminate the extensive amount of unnecessary information on public timetables regarding fares such as DC to VA fares, DC fares and Maryland fares. At the same time add information to the timetable on pass programs that are available as well as the fare structure information for interfaces with other Northern Virginia bus operators, (e.g., DASH accepts Metrobus transfers for the base fare).

The only recommendation in this study regarding consistency and simplicity for other Northern Virginia operators is for the Fairfax Connector to divide Route 401 into two fare zones with the zone boundary at Little River Turnpike and Hummer Road. A zone charge of $0.25 could be assessed for a trip crossing the boundary.

CHAPTER 12

NORTHERN VIRGINIA BUS SERVICE PLAN

This chapter presents service proposals for the existing Northern Virginia bus lines. The primary focus is on the interjurisdictional bus routes. However, other service change considerations relate to bus routes that operate in a single jurisdiction. A subsequent section describes proposals for new routes or services.

The proposed service modifications vary in magnitude. They range from no change and minor adjustments to route revisions and eliminations. The focus was on the WMATA interjurisdictional bus routes. It should be noted that a separate service plan is contained in the next chapter for Loudoun County.

The service proposals described in the following sections were prepared by giving consideration to a variety of service inputs. Also, a group of planning precepts guided the formulation of the recommendations. These two components of service planning and development are discussed below.

Service Inputs

Six major inputs were considered while preparing the route and service change proposals for the bus routes in Northern Virginia. Each of these inputs is briefly described below.

- Data Collection - An extensive data collection effort was undertaken as part of the current study. This includes a number of route performance reports from WMATA. In addition, attention was directed to identifying major generators such as employers, shopping centers, hospitals and other sites or facilities that attract transit trips. Another component of the data collection input included reports and other documentation pertaining to bus service previously prepared by or for WMATA. It should be noted that detailed on-off ridership counts for many of the interjurisdictional routes were also reviewed for weekday service. Recent ridership counts for weekend service were unavailable.

- Leader Interviews - The project manager met with agency staff, citizens groups and community leaders to solicit their input regarding transit service and the bus system. These comments and suggestions were noted for review by the study team for their inclusion in the service planning process.

- Service Warrants - As part of the current study, service warrants were prepared to identify areas in Northern Virginia that warrant bus service. From the analysis, it was determined that nearly all residential concentrations and major activity centers that warrant service are served by bus current bus lines. The exception is a portion of the Herndon area as well as Fair Oaks Hospital in Fairfax County

- Route Diagnostics - A detailed route analysis was performed of all the current bus routes operating in Northern Virginia. The results documented financial and productivity performance at the route level. From these analyses, the route level statistics on passengers per hour and farebox recovery ratio provided the primary input into the development of service change proposals.

- Travel Patterns - An analysis was prepared which determined travel patterns in Northern Virginia. Work trip travel demand was developed utilizing the 1990 MWCOG travel simulations adjusted based on the 1990 Census travel data at the jurisdiction level. The non-work travel patterns were based on the MWCOG model. From this analysis it was determined that there are no Northern Virginia interjurisdictional work trips of substantial magnitude (500 persons or more making the same work trip between jurisdictions) that are currently unserved by transit. Exceptions to this (i.e., substantial work trip travel unserved by transit) involved trips from Loudoun or Prince William County. Within Northern Virginia, there were a number of trips between origin and destination pairs that required two or more transit rides and were not convenient.

A similar analysis was performed on non-work travel. It was determined that seven trip pairs have sufficient demand but are without transit service. All the unserved non-work trip travel is within Fairfax County.

- Field Reconnaissance - Extensive field reconnaissance was made throughout the Northern Virginia service area to gain a first hand understanding of the existing transit operating characteristics as well as the extent of present development. During the course of these field views, land uses and the locations of major generators were noted.

The items described above provided substantial input for the development of route and service change proposals. The wide range of these and other inputs indicate the comprehensive nature of the information and sources utilized as part of the planning process.

Planning Precepts

A number of factors have shaped the bus service proposals and are worth noting at this juncture. They also provide a rationale from both the individual route and systemwide perspectives. These precepts are discussed below:

- The WMATA bus routes within Northern Virginia are unlike routes at many other bus systems where the alignments have remained unchanged since World War II. The Metrobus routes have been revised to accommodate a new focus which is feeder service to Metrorail stations. This changed system is further demonstrated by the fact that currently only two lightly traveled routes connect Northern Virginia with Washington, DC. Therefore, major changes to a system that has already undergone a major route restructuring are not anticipated.

- A periodic process is performed by WMATA to review Northern Virginia routes to insure that service is provided in an efficient and effective manner. Further, most local jurisdictions perform their own route performance review to verify that the service truly meets their needs.

There are also active citizens groups which look over the routes, comment on any problems and voice strong opposition if changes are proposed which decrease the quality of service. This local environment also tends to reduce the likelihood of identifying significant route change proposals.

- In total, a fleet of 516 buses are utilized to provide Northern Virginia services that involve five different agencies. It is unusual to find these many different operations providing services in one area. The nature of the local operations are also quite different in many ways including the fact that WMATA is the only operator which utilizes federal funds to support its operating and capital expenses. The other services are funded entirely by the local jurisdiction in which they operate using state and regional assistance through NVTC together with local funds. These jurisdictions have determined that it is more economical to operate their own service without federal financial support than by WMATA which receives federal financial support. Since no federal funds are utilized in these local operations, many federal requirements which are associated with receipt of federal funds (e.g., 13c labor protection and half fare for seniors and disabled persons during off-peak hours) are not applicable.

- Because there are a number of operators providing bus service within Northern Virginia and because many of the routes are feeders to Metrorail stations, a particular concern is that services of the various operators be coordinated. Under these circumstances, the potential exists for many improvement proposals to involve service coordination. In this regard, there are nine transit center locations (Annandale, City of Fairfax, Landmark, Pentagon, Old Town Alexandria, Rosslyn, Seven Corners/Baileys Crossroads, Springfield and Tysons Corner) that are the focus of interoperator routes. Most of the Metrorail stations also are served by two or more Northern Virginia operators. Bus service coordination is essential at these locations.

- WMATA is the primary operator of interjurisdictional bus services in Northern Virginia. It is assumed that, without a major change in local policy, WMATA will continue to be the provider of interjurisdictional bus services. In a similar fashion, it is assumed that services provided by the local carriers will continue to be provided by the same local operators. Therefore, this plan focuses on improvements to the bus services and not on the operator of the services.

- The dispersed locations of residential areas and major generators in suburban areas of Fairfax County result in a potential market that is significantly more difficult and costly to serve.

- ADA complimentary transportation for persons with disabilities who cannot use fixed route bus services is provided by local jurisdictions (e.g., Fastran in Fairfax County) for local travel and through a program coordinated by WMATA for regional travel. No changes are suggested for these arrangements. Over time, as the fleet of buses used by transit operators serving Northern Virginia becomes fully accessible, opportunities will exist for greater use of interjurisdictional fixed route services to serve travel by persons with disabilities.

- Based on a review of current route alignments in conjunction with demographic information, locations of major activity centers and travel patterns, it became apparent that a major restructuring was not necessary. With few exceptions, the Northern Virginia bus routes serve the residential concentrations that warrant service as well as the major generators in the service area. For this reason, major changes in the present route alignments are not anticipated.

The items above provide an overview of the factors and principles that influenced the service planning process.

Service Proposals

The following section describes a series of service change proposals on an individual route basis. Initially, the service change recommendations are presented for the interjurisdictional bus routes. These bus lines have been grouped on the basis of the jurisdictions served with the key operating statistics presented in Table 42.

After the interjurisdictional routes are addressed, changes are suggested for bus routes that operate primarily in only a single jurisdiction. The route planning work on these local routes is less vigorous and the recommendations should be viewed in terms of identified improvement opportunities that should be further exploited.

Finally, proposals for new routes are described. These proposals for the most part, have been developed to provide service to generators and residential concentrations that are presently unserved or not served conveniently.

Interjurisdictional Bus Routes - Service changes are proposed for many of the interjurisdictional bus routes operating in the Northern Virginia study area. The proposals range from a continuation of existing services (i.e., no changes) to the elimination of certain route segments or branches. Statistics cited in the description of the each route were previously presented in Chapter 8 - Route Diagnostics. The farebox recovery (operating revenue divided by operating costs) statistics reflect results for adjusted revenue. In the description of proposed service changes, statistics provided by WMATA including ridership on-off data and extent of passenger complaints are also cited. The interjurisdictional routes have been grouped according to the municipalities served and are presented below.

Alexandria-Arlington-Fairfax County

Route: 7A,C,E,FHPWX
Farebox Recovery: 32.4 Percent
Productivity: 39.0 Passengers Per Hour
Proposals:

- Consideration was given to making minor schedule adjustments on Route 7E to provide for more uniform departures from Southern Towers during the AM peak period. Scheduled departure times between trips vary from six to 12 minutes. However, upon further review of on-off ridership

TABLE 42
OPERATING STATISTICS FOR METROBUS INTERJURISDICTIONAL ROUTES
CURRENT OPERATION

ROUTES	VEHICLE MILES	VEHICLE HOURS	PEAK VEHICLES	PASSENGERS	ADJUSTED REVENUE
WMATA-INTERCOUNTY					
Alexandria-Arlington-Fairfax County					
7A,C,E,FHPWX	600,551	37,033	21	1,445,504	1,243,400
9A-E	687,579	49,486	11	1,335,973	1,080,500
16A-G,J	594,655	45,147	14	1,981,527	1,655,900
23A-C,T	645,952	42,486	4	1,049,787	797,600
25A,F,G,J,P,R	267,929	21,273	6	489,719	360,900
25B	136,667	14,636	3	262,055	192,300
Subtotal	2,933,333	210,061	59	6,564,565	5,330,600
Alexandria-Arlington					
10A,E	235,949	33,948	6	737,877	516,100
11P	58,946	4,308	3	83,743	101,800
13A-G	192,838	14,661	4	410,293	394,800
Subtotal	487,733	52,917	13	1,231,913	1,012,700
Alexandria-Fairfax County					
16L	62,427	2,789	2	109,549	102,300
18A,B,X-F	223,097	10,433	12	187,979	248,300
18G,H,J,K	448,226	17,728	6	341,803	449,000
18L,P,R	321,921	12,798	9	302,588	398,900
28F,G	77,144	4,283	3	172,293	158,600
29C,E,G,J,P,R	496,569	20,641	16	490,567	570,000
Subtotal	1,629,384	68,672	48	1,604,779	1,927,100
Alexandria-Fairfax County-Falls Church					
28A,B	468,811	35,027	7	1,195,441	873,300
Alexandria-Fairfax City-Fairfax County					
29K-N	253,810	20,113	6	519,755	387,300
Arlington-Fairfax City-Fairfax County-Falls Church					
1B-F,Z	527,058	37,455	9	899,055	684,400
2A-C,G	603,179	40,251	11	862,178	694,700
Subtotal	1,130,237	77,706	20	1,761,233	1,379,100

TABLE 42 (CONTINUED)
OPERATING STATISTICS FOR METROBUS INTERJURISDICTIONAL ROUTES
CURRENT OPERATION

ROUTES	VEHICLE MILES	VEHICLE HOURS	PEAK VEHICLES	PASSENGERS	ADJUSTED REVENUE
Arlington-Fairfax County-Falls Church					
3A-C,E,F	504,374	35,932	10	776,629	599,500
10B-D	379,780	35,762	7	1,100,996	770,100
Subtotal	884,154	71,694	17	1,877,625	1,369,600
Arlington-Fairfax County					
4A,B,E,H,S	331,554	27,530	8	625,151	512,800
22A,B,F	318,281	21,065	8	579,623	447,900
Subtotal	649,835	48,595	16	1,204,774	960,700
Arlington-DC					
38B	138,139	14,982	5	470,112	438,800
Arlington-Fairfax City-Fairfax County					
15K,L	174,464	8,814	5	134,596	126,900
17A,B,F,M	306,070	16,359	8	249,711	316,200
17G,H,K,L	537,924	20,791	17	392,656	516,000
Subtotal	1,018,458	45,964	30	776,963	959,100
WMATA-INTERCOUNTY TOTAL	9,593,894	645,731	221	17,207,160	14,638,300

activity during the peak AM period from 6:45 AM to 8:00 AM, peak direction maximum load ridership was relatively good and averaged about 47 per trip. The lowest ridership was only 36. The variations in load factors are not sufficient to warrant a schedule revision.

- On-off counts should be performed on Saturdays to determine if more service during later afternoon (3:00 PM to 5:00 PM) is warranted. Saturday service throughout the day averaged nearly 22 passengers per trip; however, no information is currently available on trip productivity results for the specific time period in question.

- On weekday evenings and weekends (when headways are the widest), service should be coordinated to the extent possible to provide for timed-transfers to/from Route 13 at Pentagon station.

Route: 9A-E
Farebox Recovery: 29.7 Percent
Productivity: 27.0 Passengers Per Hour
Proposals:

- Consideration was given to reducing service levels through to the Pentagon and short-turning buses in Crystal City. However, based on the ride check data provided by WMATA, the through ridership is significant -- more than 17 through passengers per trip. Based on these results, no reduction should be implemented.

- Coordination exists with Fairfax Connector routes 105, 106 and 107 along Richmond Highway. Therefore, one of the Fairfax Connector routes (i.e., 107) could be eliminated. Service of the remaining Fairfax Connector routes would continue to be coordinated with 9A,B and C.

- This route may be a candidate for a joint operation by the City of Alexandria's DASH and the Fairfax County Connector for a number of reasons. First, the route is the only local Metrobus service into the southeast section of Fairfax County. This section is served almost entirely by Fairfax Connector routes. Therefore, it appears to be a candidate for takeover by Fairfax County. Second, the route travels

throughout the City of Alexandria and into the southern section of Arlington County. Therefore, a joint operation would not only test the joint service arrangements between the two operators, but also with Arlington County. This change will have financial implications on Arlington County, the City of Alexandria and Fairfax County in terms of direct operating and fixed costs. The fixed costs of Falls Church would also be change. These impacts are identified in the final section of this chapter.

Route: 16A-G,J
Farebox Recovery: 46.4 Percent
Productivity: 43.9 Passengers Per Hour
Proposals:

. No changes proposed.

Route: 23A-C,T
Farebox Recovery: 28.5 Percent
Productivity: 24.7 Passengers Per Hour
Proposals:

. Short-turn peak period trips at Tysons Corner Center. Reduce midday frequency to Galleria to hourly service. This would eliminate about 30 to 35 minutes from each round trip in this segment. Based on ride check data provided by WMATA, westbound peak period trips averaged 4.1 passengers per trip. The average for all eastbound service beyond Tysons Corner was 3.9 passengers per trip. Return trips eastbound averaged 3.2 passengers per trip during the AM peak period. Results for the PM peak period were similar. Eastbound ridership originating beyond Tysons Corner throughout the day averaged 3.1 passengers per trip. These passenger productivity values for the segment do not justify the existing service levels. If schedule is coordinated with 2C, the interval of service between Tysons Corner Center and Galleria of 30 minutes is sufficient. Further, 5S also provides service on a major portion of the segment between these two sites.

It is recognized that the Tysons Corner area is continuing to develop and that with more development, it is likely that this change would

not be applicable and the eliminated segment should be replaced.

These adjustments could save about 17,500 vehicle miles and 1,500 vehicle hours each year. However, if these adjustments merely result in additional layover for the trips at Tysons Corner Center, they should not be done.

Route: 25A,F,G,J,P,R
Farebox Recovery: 22.3 Percent
Productivity: 23.0 Passengers Per Hour
Proposals:

- No changes proposed.

Route: 25B
Farebox Recovery: 20.2 Percent
Productivity: 17.9 Passengers Per Hour
Proposals:

- No changes proposed.

Alexandria-Arlington

Route: 10A,E
Farebox Recovery: 25.7 Percent
Productivity: 21.7 Passengers Per Hour
Proposals:

- No changes proposed. However, this route is a candidate for replacement by the City of Alexandria's DASH. In fact, the City has already taken this recommendation to public hearing and plans to implement this replacement next year. This change will have financial implications on Arlington County and the City of Alexandria in terms of direct operating costs and on all Northern Virginia jurisdictions in terms of their share of fixed costs. These impacts are identified in the final section of this chapter.

  This change would be a strong candidate to test how two Northern Virginia jurisdictions can participate in operating and funding an interjurisdictional bus route.

Route: 11P
Farebox Recovery: 21.6 Percent
Productivity: 19.4 Passengers Per Hour
Proposals:

- A minor change in alignment would have buses traverse Crystal Drive in Crystal City to provide service to the VRE station. From the Pentagon Metrorail station, buses would operate on Eads Street, 15th Street, South Clark Street, 23 rd Street, Crystal Drive, 15th Road and Route 1 to National Airport. Northbound buses would operate via the ramp to Crystal Drive, 15th Street and Eads Street to Pentagon station. Based on ride check information provided by WMATA, this change would not adversely impact many riders. Examining ride check data for 27 trips that involved 615 instances of passenger boardings and alightings, only three instances of passenger boarding and alighting occurred in the segment proposed for elimination. All three (i.e., one boarding and two alightings) occurred at 20th and Jefferson Davis.

Route: 13A-G
Farebox Recovery: 35.3 Percent
Productivity: 28.0 Passengers Per Hour
Proposals:

- No changes proposed. It should be noted that an additional route (Route 13M) was added on June 26, 1994 in order to serve some of the ridership that was lost with the reduction of service on Route 38B.

Alexandria-Fairfax County

Route: 16L
Farebox Recovery: 29.4 Percent
Productivity: 39.3 Passengers Per Hour
Proposals:

- This route has a relatively high number of passenger complaints. One improvement on Route 16L would be to have schedule coordination with Route 28G. At present, the combined (i.e., 16L and 28G) peak period departures from Seminary Road are irregular and range from two to 21 minutes from this timepoint.

Route: 18A,B,E-F
Farebox Recovery: 15.2 Percent
Productivity: 18.0 Passengers Per Hour
Proposals:

- Based on low farebox recovery and low trip productivity results for both peak periods (the overall average for both peak periods is 18.1 passengers per trip), the elimination of at least one and possibly two trips during both peak periods may better balance service delivery with demand/utilization. Eliminating a trip during each peak would save about 23,000 vehicle miles and 1,000 vehicle hours each year. It may be even necessary to trim the service further with the Springfield/Franconia Metrorail (proposed for 1997) and VRE (proposed for 1995) stations open.

Route: 18G,H,J,K
Farebox Recovery: 25.2 Percent
Productivity: 19.3 Passengers Per Hour
Proposals:

- No changes proposed.

Route: 18L,P,R
Farebox Recovery: 24.3 Percent
Productivity: 23.6 Passengers Per Hour
Proposals:

- No changes proposed.

Route: 28F,G
Farebox Recovery: 31.8 Percent
Productivity: 40.2 Passengers Per Hour
Proposals:

- Route 28G trips should have schedule coordination with the 16L. At present, the combined (i.e., 16L and 28G) peak period departures from Seminary Road are irregular and range from two to 21 minutes from this timepoint.

Route: 29C,E,G,J,P,R
Farebox Recovery: 20.9 Percent
Productivity: 23.8 Passengers Per Hour
Proposals:

. No change proposed. The only possible change on this route would be to eliminate a few peak period, peak direction trips to improve passenger productivity. The average headway for the trunk portion of the route along Little River Turnpike is about seven minutes. However, with the route having a number of different terminal points and with mosts trips carrying 20 or more passengers, the change is not appropriate.

Alexandria-Fairfax County-Falls Church

Route: 28A,B
Farebox Recovery: 30.1 Percent
Productivity: 34.1 Passengers Per Hour
Proposals:

. No change proposed. This route is a major cross county route that carries over 100 passengers on certain one way peak trips. A further review of peak period ridership indicated that only five of the 20 peak period and peak direction trips reviewed had maximum loads which exceeded 45 passengers. However, it is important that peak period passenger loads on this route be closely monitored to determine whether service should be improved to 20 minute headways from the current 30 minute headway.

Alexandria-City of Fairfax-Fairfax County

Route: 29K-N
Farebox Recovery: 24.9 Percent
Productivity: 25.8 Passengers Per Hour
Proposals:

. Due to the peak period productivity of 61.8 passengers per trip reported by WMATA, a review of ride check data was performed. Only two instances of overcrowded conditions were observed and continued for a relatively short (i.e., eight minutes or less) duration. For this reason, no increase in service levels is proposed at this time. However, peak period service, particularly

eastbound trips in the afternoon from George Mason University, should be monitored periodically to assure that conditions do not worsen. If overcrowding increases and lasts for a longer duration, a 20 minute peak period headway should be considered.

Arlington-City Of Fairfax-Fairfax County-Falls Church

Route: 1B-F,Z
Farebox Recovery: 24.3 Percent
Productivity: 24.0 Passengers Per Hour
Proposals:

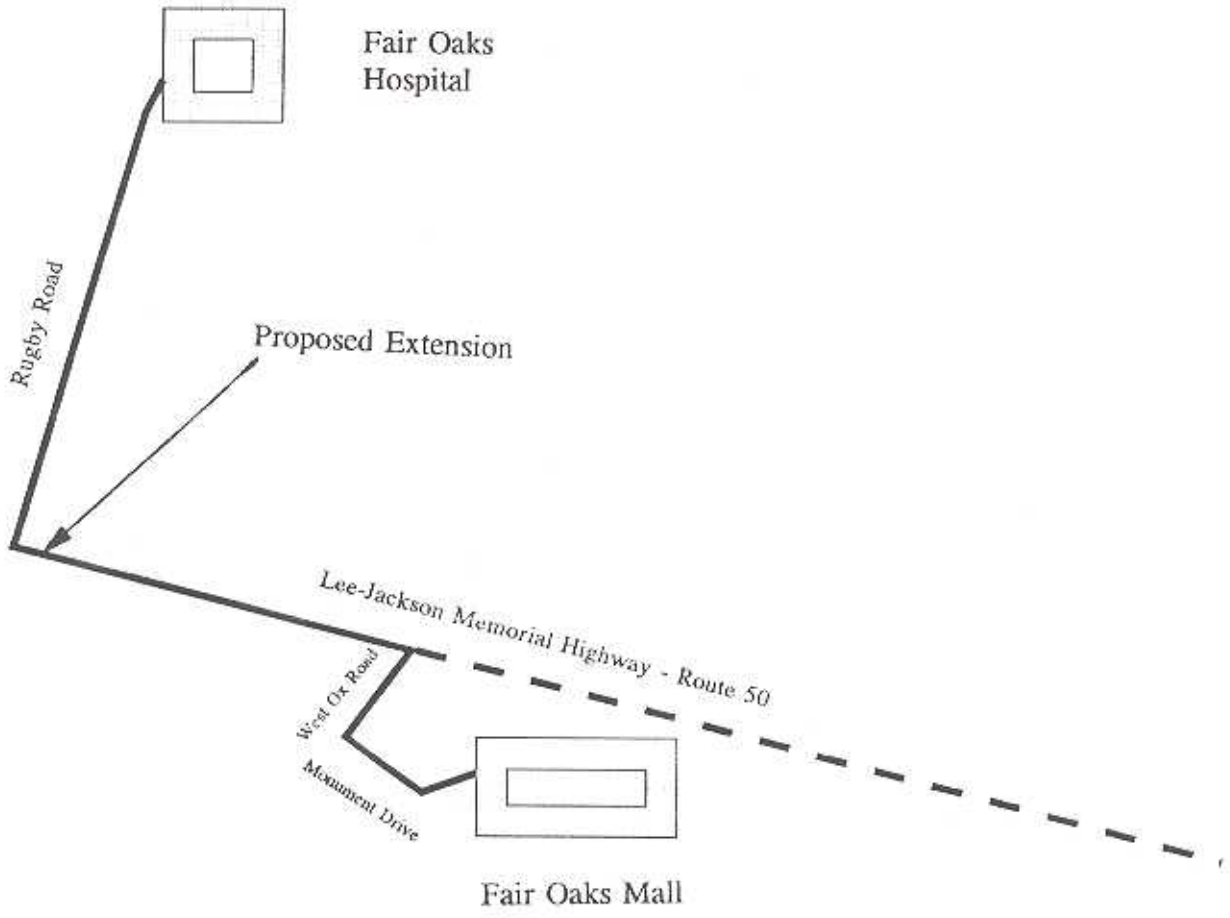
- The diversion on 1Z trips to the Dunn Loring station would appear to be a disincentive to its intended market of express passengers. Since the station is served by other branches, the diversion to the station along Gallows Road should be discontinued. Riders to Metrorail from the City of Fairfax can access rail service via CUE. The diversion will have minimal effect, if any, on amount of service provided. However, the change should attract additional riders to the more direct service.

- Extend 1C (weekdays and Saturdays) and 1Z (weekdays) to Fair Oaks Hospital (see Figure 41). From Fair Oaks Mall, buses would operate on Monument Drive, Fair Ridge Drive, Rt. 50, Rugby Road and Seawick Drive. WMATA has recognized the need to serve this major generator and has developed a plan to provide service by an extension to route 20A. However, it is hoped that WMATA consider this proposed extension of Route 1C,Z instead. The Route 1C,Z extension will add 32,570 vehicle miles and 2,700 vehicle hours each year to the route.

- Based on the extension proposed above, consideration should be given to providing for timed transfers with Route 20.

- Review of midday ridership data on the 1B and 1C segments east of the Ballston rail station indicated that headways of 17-18 minutes are too much service. A headway of 30 minutes is sufficient to meet travel demand. This could be accomplished by eliminating the shuttle trip between Roslyn and Ballston between 10:00 AM and

FIGURE 41
PROPOSED EXTENSION OF ROUTES
1C AND 1Z



eastbound trips in the afternoon from George Mason University, should be monitored periodically to assure that conditions do not worsen. If overcrowding increases and lasts for a longer duration, a 20 minute peak period headway should be considered.

Arlington-City Of Fairfax-Fairfax County-Falls Church

Route: 1B-F,Z
Farebox Recovery: 24.3 Percent
Productivity: 24.0 Passengers Per Hour
Proposals:

- The diversion on 1Z trips to the Dunn Loring station would appear to be a disincentive to its intended market of express passengers. Since the station is served by other branches, the diversion to the station along Gallows Road should be discontinued. Riders to Metrorail from the City of Fairfax can access rail service via CUE. The diversion will have minimal effect, if any, on amount of service provided. However, the change should attract additional riders to the more direct service.

- Extend 1C (weekdays and Saturdays) and 1Z (weekdays) to Fair Oaks Hospital (see Figure 45). From Fair Oaks Mall, buses would operate on Monument Drive, Fair Ridge Drive, Rt. 50, Rugby Road and Seawick Drive. WMATA has recognized the need to serve this major generator and has developed a plan to provide service by an extension to route 20A. However, it is hoped that WMATA consider this proposed extension of Route 1C,Z instead. The Route 1C,Z extension will add 32,570 vehicle miles and 2,700 vehicle hours each year to the route.

- Based on the extension proposed above, consideration should be given to providing for timed transfers with Route 20.

- Review of midday ridership data on the 1B and 1C segments east of the Ballston rail station indicated that headways of 17-18 minutes are too much service. A headway of 30 minutes is sufficient to meet travel demand. This could be accomplished by eliminating the shuttle trip between Roslyn and Ballston between 10:00 AM and

2:00 PM. This headway adjustment would save about 7,500 vehicle miles and 750 vehicle hours each year. We understand that this change is being accomplished.

- Based on productivity values of about 13 passengers per trip on Sundays, the 30 minute service between Seven Corners Shopping Center and Ballston is not justified. A headway of 45 minutes can be provided over the length of the route (i.e., Ballston to Fairfax Circle) using two buses. This will result in an annual savings of about 2,800 vehicle miles and 186 vehicle hours.

Route: 2A-C,G
Farebox Recovery: 21.8 Percent
Productivity: 21.4 Passengers Per Hour
Proposals:

- Consideration should be given to revise the schedule to avoid Route 2 buses platooning with Route 3 in the segment along Washington Street between Falls Church and East Falls Church.

Arlington-Fairfax County-Falls Church

Route: 3A-C,E,F
Farebox Recovery: 21.4 Percent
Productivity: 21.6 Passengers Per Hour
Proposals:

- This route received the highest number of passenger complaints per unit of service. To improve the service, platooning along the common segment shared with Route 2 should be eliminated by appropriate schedule revision.

- Based on the 150 rail transfers received on a one day sample from November, 1993 and assumed travel symmetry, consideration should be given to building (Route 3A) Annandale service to accommodate timed transfers at the East Falls Church Metrorail station. This is especially important with the 30 minute peak and 60 minute off peak headway.

Route: 10B-D
Farebox Recovery: 32.4 Percent
Productivity: 30.8 Passengers Per Hour
Proposals:

. No changes proposed

Arlington-Fairfax County

Route: 4A,B,E,H,S
Farebox Recovery: 24.6 Percent
Productivity: 22.7 Passengers Per Hour
Proposals:

. Saturday productivity is low -- about 9.4 passengers per trip. Service on Route 4H should be discontinued.

. The Sunday productivity level of 8.4 passengers per trip is also low. The service on Route 4H should be discontinued on Sundays. If the 4H branch were eliminated on Saturday and Sunday, 22,500 vehicle miles and 1,400 vehicle hours would be saved each year.

Route: 22A,B,F
Farebox Recovery: 24.3 Percent
Productivity: 27.5 Passengers Per Hour
Proposals:

. No changes proposed.

Arlington-Washington, DC

Route: 38B
Farebox Recovery: 39.3 Percent
Productivity: 31.4 Passengers Per Hour
Proposals:

. This route should be restored to its prior alignment before the change made by Washington, DC. It should be noted that Route 13M was recently initiated in order to serve some of the ridership that was lost with the reduction of service on Route 38B. The restoration would

involve adding back the 30 minute service during the weekday midday period. Eleven round trips would be added. The change would increase the annual miles by about 31,900 and annual hours by 2,750.

Arlington-City of Fairfax-Fairfax County

Route: 15K,L
Farebox Recovery: 13.2 Percent
Productivity: 15.3 Passengers Per Hour
Proposals:

. This route has both a poor farebox recovery ratio and low passenger productivity. The midday service is provided by the Fairfax Connector Route 404. The service on Route 15 should be coordinated with Route 2C to balance the service provided on the common alignment between Lawyers Road in Vienna and Tysons Corner Center. Because of its long length and multiple trip purpose (serves many different type destinations), one change considered was to split the route into two segments. However, review of ridership data indicated that a significant amount of passengers traveled through each many destination point. There were no locations that were suitable terminal points. Therefore, this option was discarded.

Route: 17A,B,F,M
Farebox Recovery: 19.0 Percent
Productivity: 15.3 Passengers Per Hour
Proposals:

. This route has poor passenger productivity. As a result, the Fairfax Connector has replaced the midday service with Route 306. Upon completion of the Springfield/Franconia rail station, only the few 17B trips should be rerouted to operate south on Backlick and Franconia Roads and terminated at the transportation center. Connections to Metrorail will provide for the ability to access locations (e.g., Crystal City and National Airport) presently inconvenient to reach by transit.

Route: 17G,H,K,L
Farebox Recovery: 18.0 Percent
Productivity: 18.9 Passengers Per Hour
Proposals:

. No changes proposed.

The previous discussion presented the service change proposals for the interjurisdictional bus routes operated in Northern Virginia. These proposals are summarized in Table 43. As seen, there are no changes proposed for many routes. Further, some of the proposed adjustments are relatively minor and involve service coordination, while others are more substantial. The routes where service changes impacted on level of service provided are summarized below.

ANNUAL SERVICE CHANGE IMPACTS

Route	Vehicle Miles	Vehicle Hours	Peak Vehicles	Passengers	Adjusted Revenue
23A-C,T	(17,500)	(1,500)	-	(19,210)	(14,600)
18A,B,E-F	(23,000)	(1,000)	(1)	(10,804)	(14,300)
1B-F,Z	22,270	1,764	-	16,913	12,900
4A,B,E,H,S	(22,500)	(1,400)	-	(25,491)	(20,900)
38B	31,900	2,750	=	55,000	51,300
TOTAL	(8,830)	(614)	(1)	16,408	14,400

Also, some of the recommendations reflect conditions expected to occur in the future. For the most part, this reflects the anticipated completion of the Springfield/ Franconia rail station(s).

Table 44 lists all the interjurisdictional bus routes and the impact of changes that are proposed. These changes are comprised of increases amounting to about one-half percent of the current interjurisdictional system and reductions amounting to about one-half percent for a net reduction of less than 0.1 percent. This would reduce the WMATA Northern Virginia variable cost by about $37,000. About 14,400 riders would be added or about 0.1 percent of the total. A similar gain would occur in revenue amounting

TABLE 43
RECOMMENDED SERVICE PLAN SUMMARY - METROBUS ROUTES

ROUTES	NO CHANGE	SERVICE COORDINATION	ROUTING ADJUSTMENT	HEADWAY ADJUSTMENT
Alexandria-Arlington-Fairfax County				
7A,C,E,FHPWX		X		
9A-E		X		
16A-G,J	X			
23A-C,T			X	
25A,F,G,J,P,R	X			
25B	X			
Alexandria-Arlington				
10A,E	X			
11P			X	
13A-G	X			
Alexandria-Fairfax County				
16L		X		
18A,B,X-F				X
18G,H,J,K	X			
18L,P,R	X			
28F,G		X		
29C,E,G,J,P,R	X			
Alexandria-Fairfax County-Falls Church				
28A,B	X			
Alexandria-Fairfax City-Fairfax County				
29K-N	X			
Arlington-Fairfax City-Fairfax County-Falls Church				
1B-F,Z		X	X	X
2A-C,G		X		

TABLE 43 (CONTINUED)
RECOMMENDED SERVICE PLAN SUMMARY - METROBUS ROUTES

ROUTES	NO CHANGE	SERVICE COORDINATION	ROUTING ADJUSTMENT	HEADWAY ADJUSTMENT
Arlington-Fairfax County-Falls Church				
3A-C,E,F		X		
10B-D	X			
Arlington-Fairfax County				
4A,B,E,H,S			X	
22A,B,F	X			
Arlington-DC				
38B				X
Arlington-Fairfax City-Fairfax County				
15K,L		X		
17A,B,F,M			X	
17G,H,K,L	X			

TABLE 44
OPERATING STATISTICS FOR METROBUS INTERJURISDICTIONAL ROUTES
WITH SERVICE PROPOSALS

ROUTES	VEHICLE MILES	VEHICLE HOURS	PEAK VEHICLES	PASSENGERS	ADJUSTED REVENUE
WMATA-INTERCOUNTY					
Alexandria-Arlington-Fairfax County					
7A,C,E,FHPWX	600,551	37,033	21	1,445,504	1,243,400
9A-E	687,579	49,486	11	1,335,973	1,080,500
16A-G,J	594,655	45,147	14	1,981,527	1,655,900
23A-C,T	628,452	40,986	4	1,030,577	783,000
25A,F,G,J,P,R	267,929	21,273	6	489,719	360,900
25B	136,667	14,636	3	262,055	192,300
Subtotal	2,915,833	208,561	59	6,545,355	5,316,000
Alexandria-Arlington					
10A,E	235,949	33,948	6	737,877	516,100
11P	58,946	4,308	3	83,743	101,800
13A-G	192,838	14,661	4	410,293	394,800
Subtotal	487,733	52,917	13	1,231,913	1,012,700
Alexandria-Fairfax County					
16L	62,427	2,789	2	109,549	102,300
18A,B,X-F	200,097	9,433	11	177,175	234,000
18G,H,J,K	448,226	17,728	6	341,803	449,000
18L,P,R	321,921	12,798	9	302,588	398,900
28F,G	77,144	4,283	3	172,293	158,600
29C,E,G,J,P,R	496,569	20,641	16	490,567	570,000
Subtotal	1,606,384	67,672	47	1,593,975	1,912,800
Alexandria-Fairfax County-Falls Church					
28A,B	468,811	35,027	7	1,195,441	873,300
Alexandria-Fairfax City-Fairfax County					
29K-N	253,810	20,113	6	519,755	387,300
Arlington-Fairfax City-Fairfax County-Falls Church					
1B-F,Z	549,328	39,219	9	915,968	697,300
2A-C,G	603,179	40,251	11	862,178	694,700
Subtotal	1,152,507	79,470	20	1,778,146	1,392,000

TABLE 44 (CONTINUED)
OPERATING STATISTICS FOR METROBUS INTERJURISDICTIONAL ROUTES
WITH SERVICE PROPOSALS

ROUTES	VEHICLE MILES	VEHICLE HOURS	PEAK VEHICLES	PASSENGERS	ADJUSTED REVENUE
Arlington-Fairfax County-Falls Church					
3A-C,E,F	504,374	35,932	10	776,629	599,500
10B-D	379,780	35,762	7	1,100,996	770,100
Subtotal	884,154	71,694	17	1,877,625	1,369,600
Arlington-Fairfax County					
4A,B,E,H,S	309,054	26,130	8	599,660	491,900
22A,B,F	318,281	21,065	8	579,623	447,900
Subtotal	627,335	47,195	16	1,179,283	939,800
Arlington-DC					
38B	170,039	17,732	5	525,112	490,100
Arlington-Fairfax City-Fairfax County					
15K,L	174,464	8,814	5	134,596	126,900
17A,B,F,M	306,070	16,359	8	249,711	316,200
17G,H,K,L	537,924	20,791	17	392,656	516,000
Subtotal	1,018,458	45,964	30	776,963	959,100
TOTAL	9,585,064	646,345	220	17,223,568	14,652,700

to about $14,400. Overall, there would be no change in the farebox recovery ratio.

In terms of local jurisdictions, the changes would have the following minor annual impacts:

Arlington - The net effect would be a reduction in of 8,140 miles and 499 hours of service.

Alexandria - The net effect would be a reduction in of 2,300 miles and 100 hours of service.

Fairfax County - The net effect would be an reduction of 10,690 miles and 1,245 hours of service.

Washington, DC - The net effect would be an increase of 12,300 miles and 1,230 hours of service.

Bus service would be slightly reduced within Northern Virginia by a very minor amount that would have little impact on the overall costs for WMATA services.

The more dramatic cost impact would be replacement of Metrobus services by a local jurisdiction. Two candidates were identified in the prior sections and are explored further herein in terms of financial impacts.

Route 9A-E - This route is a candidate to test the impact of replacement for a major bus route involving three jurisdictions. The route consists of 687,579 vehicle miles and 49,486 vehicle hours. The distribution of revenue miles and hours by jurisdiction are listed below.

Service Distribution

	Revenue Miles		Revenue Hours	
	Percent	Amount	Percent	Amount
Alexandria	25.2	173,270	21.4	10,590
Arlington	11.7	80,447	10.0	4,949
Fairfax County	63.1	433,862	68.6	33,947
TOTAL	100.0	687,579	100.0	49,486

As seen below, at a FY 94 WMATA direct cost budget of $1.5933 per vehicle mile and $33.09 per vehicle hour, the total direct cost savings would be about $2.7 million.

	Direct Cost Savings ($)		
	Miles	Hours	Total
Alexandria	275,959	350,423	626,382
Arlington	128,176	163,762	291,938
Fairfax County	691,272	1,123,306	1,814,578
TOTAL	1,095,407	1,637,491	2,732,898

These jurisdictions would also have an impact to their portion of WMATA fixed cost. The Alexandria share of the Virginia fixed route cost would decrease from 17.03 percent to 16.67 percent. The Arlington share of the Virginia fixed route cost would increase from 24.26 percent to 25.10 percent. The Fairfax County share would decrease from 57.46 percent to 56.91 percent. Under this condition, fixed cost savings would only occur for Alexandria and Fairfax County amounting to $98,938 and $150,236, respectively. The fixed cost for Arlington would increase by $229,281. (It should be noted that Falls Church would see a commensurate increase in their allocated fixed cost by $19,893). In summary, the total cost reduction would be $725,320, $62,647 and $1,964,814 for Alexandria, Arlington and Fairfax County, respectively or a total of $2,752,781. However, Falls Church would be assessed an increase of nearly $20,000 to their WMATA fixed cost.

If DASH were able to replace the WMATA service at a total operating cost of $50.00 per hour, the total cost of the replacement service would be $2,474,300 or a savings of $258,598 over the WMATA service. Under these conditions, the cost of the replacement bus service by jurisdiction, if allocated based on vehicle hours, is shown below:

Cost Impact of Replacement Service

	Replacement Cost ($)	Metrobus Elimination Savings ($)	Net Savings ($)
Alexandria	529,500	725,320	195,820
Arlington	247,450	62,647	(184,803)
Fairfax County	1,697,350	1,964,814	267,464
TOTAL	2,474,300	2,752,781	278,481

As seen, Alexandria and Fairfax County would benefit by this amount while Arlington County and Falls Church would not.

Another factor that must be considered in this analysis is the cost of the equipment to operate the service. DASH does not utilize 80 percent federal capital funds to purchase new buses. If the cost of the lost opportunity of obtaining federal funds to support the purchase of the new buses to operate the service by DASH were considered, the net saving would be less. For example, if 12 buses (11 peak and one spare) were obtained for the service, the federal share would have been about $2.4 million. If this cost were amortized over a 12 year period without consideration to inflation, the cost would be about $200,000 per year. This would effectively reduce the overall net savings to $78,481.

Route 10A,E - This route is proposed for replacement operation by DASH and consists of 235,949 vehicle miles and 33,948 vehicle hours of service. About 40 percent of the revenue miles and 55 percent of the revenue hours are in Arlington County. The remaining revenue miles and revenue hours are primarily in Alexandria. As seen below, at a FY 94 WMATA direct cost budget of $1.5933 per vehicle mile and $33.09 per vehicle hour, the total direct cost savings would be about $1.499 million.

	Direct Cost Savings ($)		
	Miles	Hours	Total
Arlington	150,375	617,837	768,212
Alexandria	225,562	505,502	731,064
TOTAL	375,937	1,123,339	1,499,276

These jurisdictions would also receive a smaller portion of the WMATA fixed cost. The Arlington share of the Virginia fixed route cost would decrease from 24.26 percent to 23.36 percent. The Alexandria share of the Virginia fixed route cost would decrease from 17.03 percent to 14.96 percent. Under this condition, fixed cost savings would be $242,190 and $284,576 for Arlington and Alexandria, respectively. (It should be noted that Fairfax County and Falls Church would see a commensurate increase in their allocated fixed cost by $515,582 and $11,184, respectively). Therefore, the total cost reduction would be $1,010,402 and $1,015,640 for Arlington and Alexandria, respectively or a total of $2,026,042. If DASH were able to replace the WMATA service at a total operating cost of $50.00 per hour, the total cost of the replacement service would be $1,697,400 or a savings of $328,642 over the WMATA service. Under these conditions, Arlington and Alexandria would benefit by this amount while Fairfax County and Falls Church would be penalized by additional fixed costs allocated to them amounting to $526,766. Overall, the cost of bus service in Northern Virginia would be higher since the fixed costs do not change with a service replacement and must be still paid by Northern Virginia jurisdictions.

Another factor that must be considered in this analysis is the cost of the equipment to operate the service. DASH does not utilize 80 percent federal capital funds to purchase new buses. If the cost of the lost opportunity of obtaining federal funds to support the purchase of the new buses to operate the service by DASH were considered, the net saving would be less. For example, if seven buses (six peak and one spare) were obtained for the service, the federal share would have been about $1.4 million. If this cost were amortized over a 12 year period without consideration to inflation, the cost would be about $116,667 per year. This would effectively reduce the net savings to Arlington and Alexandria to about $210,000.

An observation from this analysis is that as the amount of Metrobus service in Northern Virginia is reduced, the fixed costs become a much larger portion of the total costs for each jurisdiction. For example, the Metrobus fixed costs in the FY94 budget comprise 36.6 percent of the total costs. With the Route 10A,E replacement, Metrobus fixed costs will increase to 37.4 percent of total costs. If the replacement of the Reston/Herndon service were considered, the fixed costs exceed 40 percent of total Metrobus costs. The proportion of fixed costs to total cost is out of line

with the method that was utilized to derive the allocation formula. For example, based on the FY 94 budget, Northern Virginia receives about 24 percent of the WMATA service in terms of miles and hours and yet receives over 29 percent of the fixed costs. This relationship will worsen with the Reston/Herndon replacement.

Based upon the evaluation of the above two Metrobus replacement candidates and under the same method to allocate fixed costs among Northern Virginia jurisdictions, it is concluded that Metrobus is the best agency to be responsible for interjurisdictional bus services in Northern Virginia. Any other method results in unfavorable and unnecessary cost impacts to some Virginia jurisdictions. For example, in the above two cases, there were no service changes in Falls Church. Yet, Falls Church would be assessed over $10,000 more each case due to the redistribution of the Metrobus fixed cost. If the way fixed costs are allocated to Northern Virginia jurisdictions were changed to not be affected by a service level change, than the replacement services would be more attractive.

WMATA and Local Operator Intracounty Bus Routes - Although the current analysis is directed to the interjurisdictional bus routes, coordination of the entire Northern Virginia bus "network" is another consideration. It should be recognized that as part of a network, changes to a particular route or service may impact others. During the conduct of the route analysis, improvement opportunities were identified that should be subjected to further analysis and discussion. Since these bus lines are "sponsored" by a single jurisdiction they have been organized on a municipality basis. This includes both WMATA intracounty and locally operated services to the extent of need for coordination with other services. Where no opportunities were apparent, no suggestion is offered.

Alexandria

Route 8SW,X,Z - No changes proposed.

Route 21A-C,F - Consider discontinuing 21A alignment which is duplicated by service along the AT6, AT8 and 301 to the Van Dorn Station. Resources from the elimination could be used to improve frequencies on 21B. If low ridership activity exists on the 21F segment east of Reynolds Street, service should be reduced on this branch.

The discussion above relates to WMATA services in Alexandria. Presented below are comments pertaining to DASH services.

Routes AT2/AT6 - The present AT2 schedule is fairly well coordinated on the King Street segment shared with AT5. However, minor scheduling adjustments would provide for meeting alternate trains at the King Street station to serve riders destined for the Old Town area. It is recognized that this may be difficult since many DASH routes and trips are coordinated with Metrorail schedules at more than one station. An attempt to better coordinate service with WMATA bus lines also appears appropriate. For example, Route 28B and AT2 westbound service on Janney's Lane and Seminary Road between King Street station and Alexandria Hospital depart within a few minutes of each other. A uniform headway would be advantageous to riders.

Routes AT3/AT4 - If passenger loads require the level of service afforded Hunting Towers residents, than service should be coordinated with WMATA Route 10 at Hunting Towers. If not, consideration should be given to eliminating service south of Braddock Road. An alternative approach would be to replace Metrobus Route 10A,E service with DASH.

Routes AT5/AT7 - Coordinate service with AT2 and WMATA services as noted above.

Route AT8 - Coordinate service operated with WMATA 29K to provide uniform headway.

Arlington

Route 24M,P - High passenger productivity (i.e., 36.8 passengers per hour) is driven by the characteristics of the service area, high ridership activity and the route's relatively short length. However, on a per trip basis, the average of 20.9 passengers would not appear to justify 20 minute headway during peak periods. Instead, a 30 minute headway coordinated with Route 16U trips on Columbia Pike might be more appropriate and better reflect demand.

Arlington Trolley - No changes proposed.

City of Fairfax

CUE - No changes proposed. However, it is important that coordination with Metrorail service during the off-peak.

Fairfax County

Route 3W,Z - Consideration should be given to operating only three trips in each direction during peak periods. Per trip productivity of 13.9 passengers does not warrant existing service level.

Route 5C-H - Eliminate 5D branch and replace with proposed new route N1 (discussed at the end of this section).

Route 5S - Consideration should be given to eliminating the segment south of Sunset Hills Road. The area is adequately served by several other variations of Route 5. Developing a pulsed schedule at Reston Town Center to meet RIBS services to the extent possible should also be considered. As part of this change, consideration should be given to avoiding platooning in the common segment, along Leesburg Pike. An alternative change for this route would be to extend it into Loudoun County to service the residents of Sterling and Sterling Park. This extension should only occur if Loudoun County were to provide funding for it and after Fairfax County assumes control of and operates the Reston/Herndon service.

Route 5W - A possible improvement to this route would be to increase service by at least one or possibly two trips during both the morning and afternoon peak periods. Providing a more attractive service level could enhance ridership.

Route 5Y,Z - A proposal for this route would be to extend it into Loudoun County to service the residents of Sterling and Sterling Park. This extension should only occur if Loudoun County were to provide funding for it and after Fairfax County assumes control of and operates the Reston/Herndon service.

Route 11Y - No changes proposed at this time. However, if ridership does not improve, this bus line would be a candidate for elimination. Nearly all of the route alignment that might suggest need for

service is covered or within reasonable walking distance of other bus lines.

Route 12C,E,L - Service change recommendations were developed for these routes. However, after the development of these proposals, it was learned that WMATA in conjunction with Fairfax County, has formulated a major restructuring of Route 12 services. Many of our proposals for change were included in this plan. Therefore, none are presented in this section.

Route 20A - During the morning, service from Vienna should loop via Monument and Fair Ridge Drives, Route 50 and West Ox Road to enable commuters from the Penderbrook area to transfer to Route 20 and proceed eastbound/northbound without enduring the circuity of the 20A. During the afternoon, service to Vienna should be changed to operate via a reversed loop and speed commuters on their ride home. Service should be coordinated with Route 20 at Route 50 and Fair Ridge Drive. This should only be accomplished if an acceptable transfer location can be found. If not, the service should not change. The loop in the morning will add about three minutes of running time to the route. Service should be set at a headway of 30 minutes. The number of trips should be reduced to seven or eight to better match service provided with demand.

Subsequent to the development of the proposed service change described above, it was learned that WMATA plans to adjust the 20A service and extend the route to Fair Oaks Hospital. For this reason, the proposed changes should be viewed in conjunction with the proposed extension. Service levels may be maintained but the revised routing between Vienna and the Fairfax County Government Center should still be implemented.

Route 20F,G,W-Z - Service should be better coordinated on the trunk along Route 50. Ridership north of Route 50 on the 20F should be documented to determine necessity of 20 minute headway.

Route 24T - Reduce service to better match demand (i.e., 11.4 passengers per trip). Operate at a 30 minute headway with two vehicles and save a peak bus. Determine necessity of present circulation and riders to Galleria to shorten route if running time is constrained.

Route 26G,H - Coordination has been accomplished with southbound AM service and VRE departures at Burke Center. Consider extension north into Tysons Corner to the segment with reduced service resulting from the Route 23 recommendation. This route would provide alternative service for the proposed elimination of Route 402. An attempt should be made to develop a market for the route --otherwise, eliminate it. Coordinate service with Route 401 to provide uniform headway in common segment.

Route 28A,B - Analysis of through riding patrons versus seats "turned over" appears warranted. Based on trip productivity of 66.0 passengers during peak periods, a 20 minute headway may be more appropriate.

Route 29C,E,G,H,X - Ridership levels were reviewed and do not justify the express trips operated on Route 29X. This service should be eliminated.

The discussion above presented comments related to the WMATA routes operated in and sponsored by Fairfax County. The suggestions noted below pertain to the Fairfax Connector, RIBS and Tysons Shuttle services operated by two private carriers for Fairfax County.

Route 101 - Provide timed transfers at Huntington station and coordinate service to extent possible with WMATA 11Y.

Route 102 - Coordinate service with 101 to provide for more uniform headway on common segments along Ft. Hunt Road. Consider eliminating segment operating on Collingswood Road, Kar Road, etc. Realign to serve Mt. Vernon via Parker and Sherwood Hall Lanes, Richmond and Mt. Vernon Highways. This will allow elimination of Route 107.

Routes 103/104 - Service level at 20 minutes appears excessive based on productivity. Intervals of 30 minutes would save a bus, reduce cost and not adversely impact many riders. Provide for timed transfers at Huntington rail station.

Route 105 - No changes proposed.

Route 106 - Extend to Hollin Hall area replacing deletion from Route 102.

Route 107 - With changes to Routes 102 and 106, this bus line should be eliminated. However, before this

occurs, ridership counts should be taken on all routes along the Route 1 corridor.

Route 108 - No changes proposed.

Route 109 - Upon its completion, this bus line should serve the Springfield/Franconia rail station(s). At that time, consideration should be given to separating this route into two distinct lines with service from Rolling Valley eastbound and Franconia truncated at the station(s). For now, service should provide for timed transfers with Metrorail at Huntington station.

Route 110 - Service in common segment shared with Routes 109 and 202 should be headway coordinated to the fullest extent possible. Service changes to the Springfield/Franconia rail station(s) should be examined prior to the facilities opening.

Route 201 - Even though this route serves a developing area, productivity (i.e., 14.2 passengers per hour) on this route suggests service exceeds demand. Therefore, the County should consider a reduction in number of trips operated. However, given continued development in the Kingstowne area and the constrained parking supply at Van Dorn Metrorail Station, service levels may need to be increased in the intermediate range future.

Route 202 - This route also serves a developing area. Even so, productivity (i.e., 15.7 passengers per hour) on this route suggests service exceeds demand. Similar to Route 201, the number of trips operated should be reduced. However, given continued development in the Kingstowne area and the constrained parking supply at Van Dorn Metrorail Station, service levels may need to be increased in the intermediate range future.

Route 203 - No changes proposed.

Route 204 - No changes proposed.

Route 301 - No changes proposed.

Route 302 - No changes proposed.

Route 303 - No changes proposed.

Route 304 - No changes proposed.

Route 305 - No changes proposed.

Route 306 - Service should be pulsed with Route 404 at George Mason University.

Route 401 - Consider adding the bus needed to operate at uniform 30 minute headway during peak periods.

Routes 402/403 - Consideration should be given to eliminating at least Route 402. Most of the alignments are duplicative of other services. Route 403 should be maintained for now, only because it serves the Navy Federal Credit Union Headquarters.

Route 404 - No changes proposed.

RIBS - Coordinate service with revised WMATA Route 5S.

There are additional considerations to be made regarding several Fairfax Connector routes to be "triggered" by future developments. One relates to the opening of the Lorton VRE station proposed for October, 1994. The other reflects the planned 1995 opening of the Springfield/ Franconia rail station(s). The final relates to plans for an expansion to the Fort Belvoir base which could greatly expand its work force.

Consideration should be given to revising several of the present services when these facilities are completed. Of more immediate importance is the Lorton VRE station. Routes 203, 303, 304 and 305 require immediate attention in terms of building a bus/rail pulse at Lorton station and making prudent decisions to maximize the transit "return" for the considerable investment. When combined, these routes represent the operation of 15 peak buses. It would behoove Fairfax County to conduct extensive ride-checks and perhaps an origin-destination survey on board these bus lines to generate quantitative data to help guide service planning decisions. It would be particularly important to complete data collection, analyze the information and plan service changes well in advance so that the riding public is aware and knowledgeable of the revised services.

New Routes - The previous sections described suggestions related to existing routes and services. This section describes three new bus lines proposed for consideration.

New Route 1 - This route would operate between Reston Town Center and the Vienna Metrorail Station. If implemented, it could be combined with Route 403. The route alignment is shown in Figure 42 and described below.

> From Reston Town Center buses would operate on South Lake Drive, Colts Neck Road, Glade Drive, Soapstone Drive, Lawyers Road, Hunter Mill Road, Vale Road, Flint Hill Road, Chain Bridge Road and Nutley Street to the Vienna station. All trips would serve the Reston South park-ride lot.

The round trip route length would be about 20 miles and would take about 90 minutes to complete. If service were combined with Route 403, six trips would be operated in the peak flow direction (i.e., 5:30 AM, 6:00 AM, 6:30 AM, 7:00 AM, 7:30 AM and 8:00 AM east/southbound and 3:30 PM, 4:00 PM, 4:30 PM, 5:00 PM, 5:30 PM and 6:00 PM west/northbound) during the morning and afternoon peak service periods, respectively. Three buses would be needed for the peak service. Schedules would be coordinated with Metrorail services. The service would entail about 60,000 vehicle miles and 4,500 vehicle hours. If Fairfax County were to run the service, it would cost about $45.00 per vehicle hour. Therefore, the annual cost for this new route would be about $202,500. It is possible to reduce the service on Route 403 from five to three AM trips and from six to three PM trips. These changes would reduce the net cost of the service to about $150,000.

It is anticipated that the new route would achieve a productivity similar to other Fairfax Connector routes of 20 passengers per hour. At this productivity rate and with an average fare of $ 0.60 per passenger, the new route would serve about 90,000 passengers and produce revenue of about $54,000. This would produce a farebox recovery ratio of about 36 percent, which is above the Fairfax Connector average.

New Route 2 - This bus line would operate between Centreville and Fair Oaks Mall. The proposed alignment is shown in Figure 43 and is as follows.

> From Lee Highway and Paddington Lane buses would operate via Paddington Lane, Gothwaite Drive, Billingsgate Lane, Stone Road, Awbrey Patent Drive, Newton Patent Drive, Braddock Road, Sully

FIGURE 42
NEW ROUTE 1 - RESTON TOWN CENTER/ VIENNA STATION

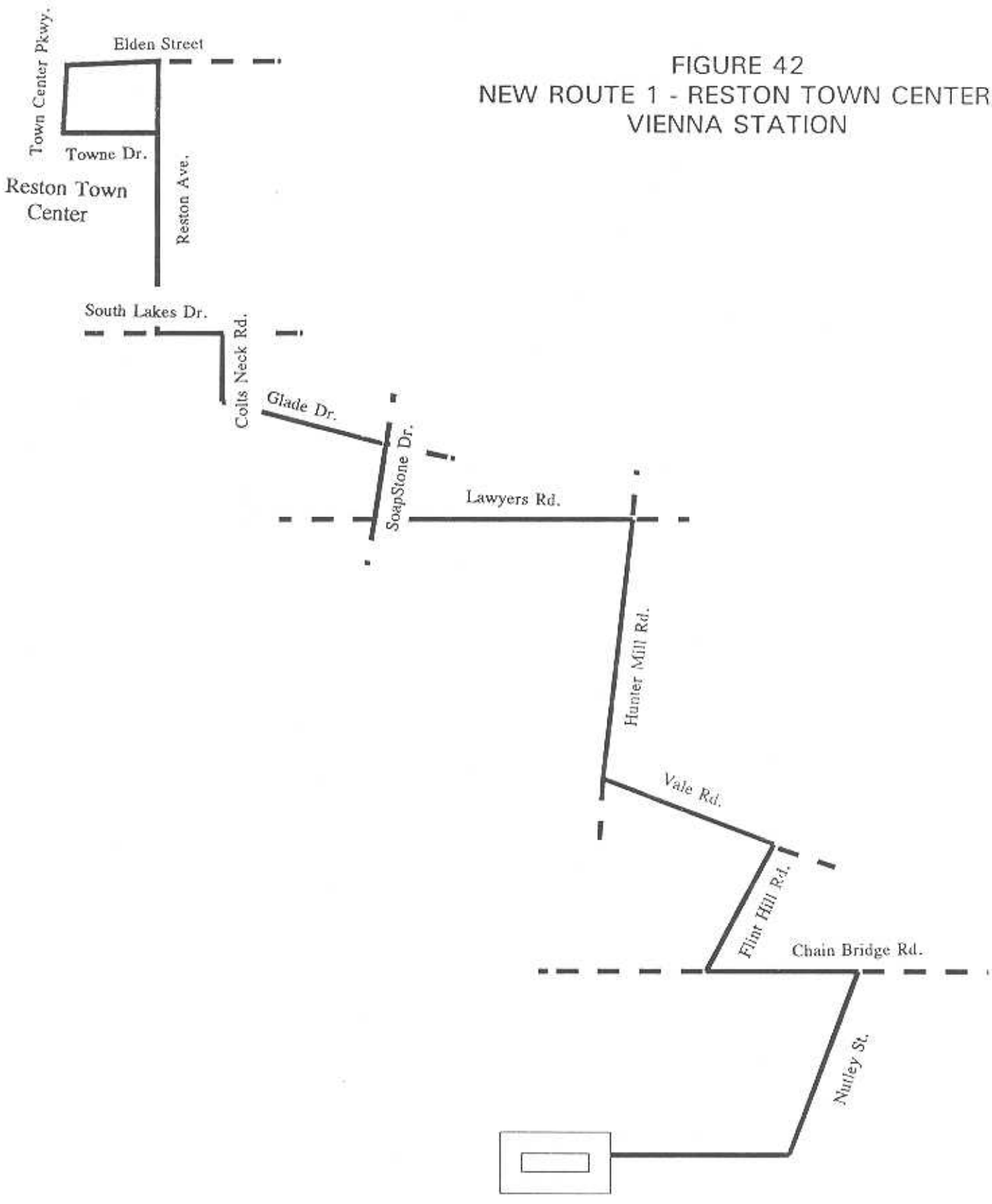
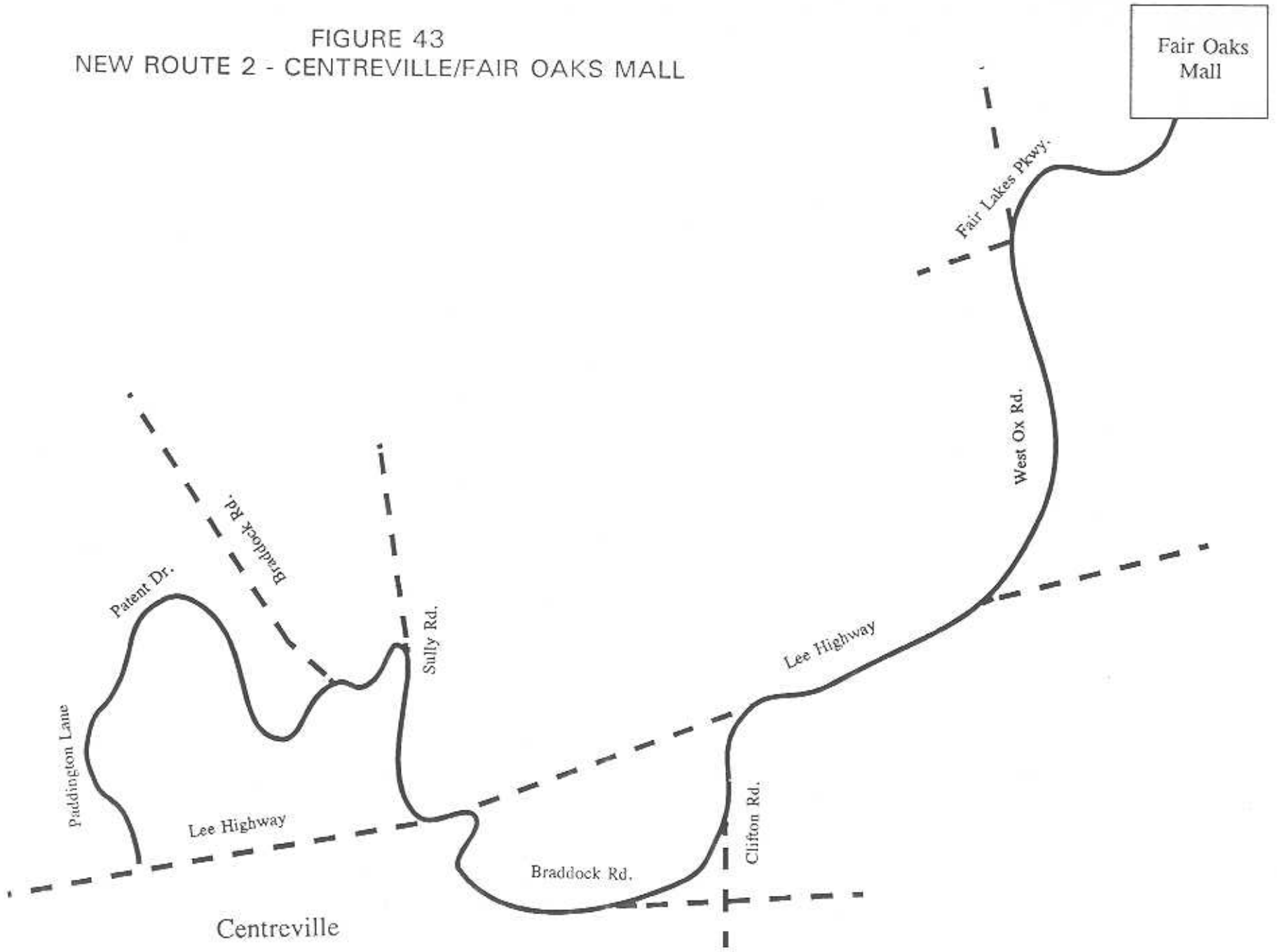


FIGURE 43
NEW ROUTE 2 - CENTREVILLE/FAIR OAKS MALL



Road, Braddock Road, Old Clifton Road, Clifton Road, Lee Highway, West Ox Road and Legato Road to the Fair Oaks Mall.

The round trip length would be about 19 miles and would take about 90 minutes to complete. Initially, service would operate at 90 minute intervals. It could later be improved to 60 minutes to meet Route 1 at the Mall. Initially, service would operate weekdays only from approximately 9:30 AM to 8:00 PM. If demand warrants, service could be extended to mall closing hours and/or Saturdays.

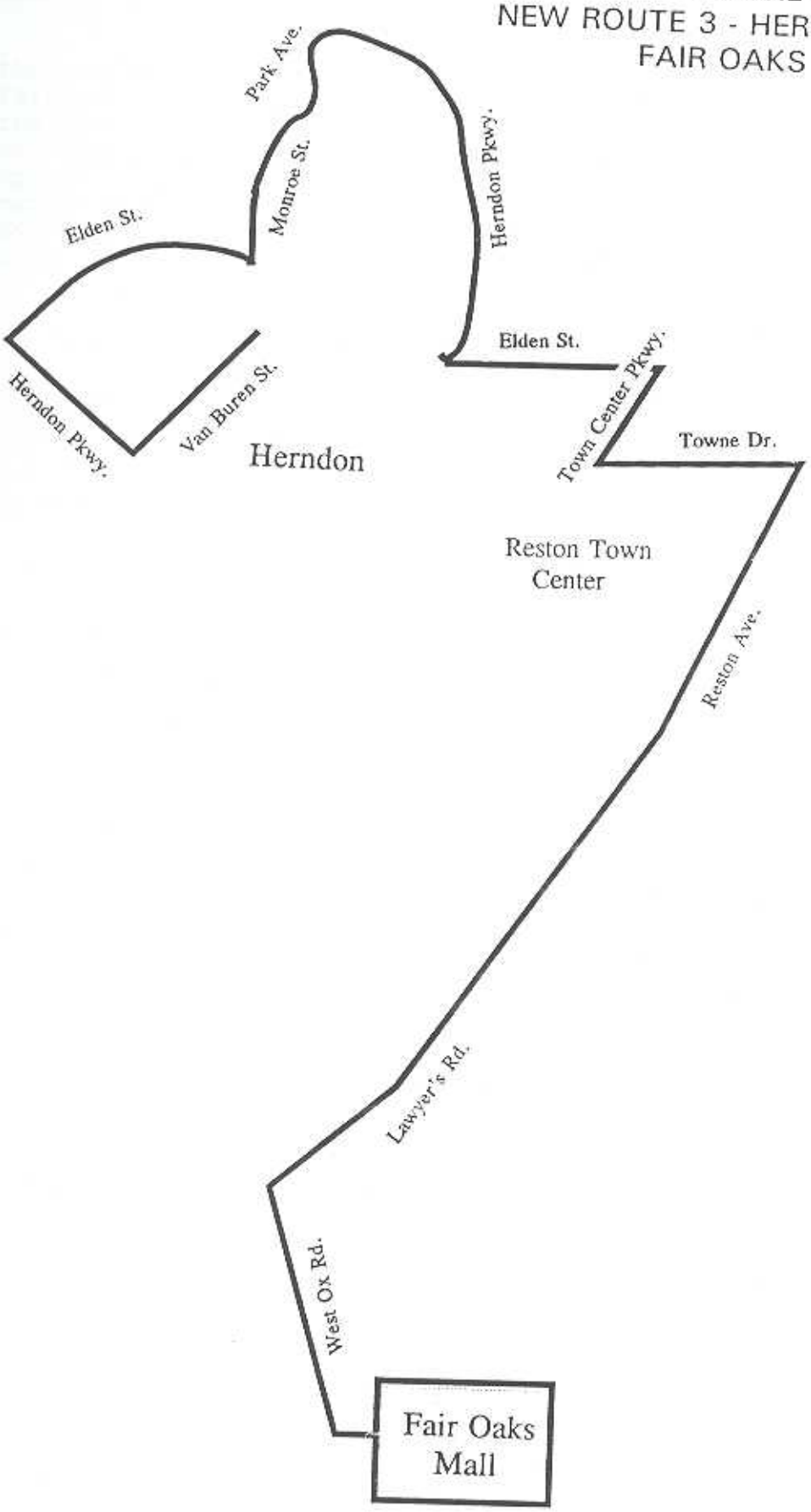
For the eight round trips, 152 daily vehicle miles or 22,800 annual vehicle miles would be operated. Service would be operated for about 12 hours each day or about 3,000 hours each year. If service were provided by Fairfax Connector, the annual cost would be about $135,000. At 20 passengers per hour, the 60,000 passengers would be served and about $36,000 in passenger revenue obtained. A farebox recovery of about 27 percent would result, which is at the Fairfax Connector average.

New Route 3 - This proposed new bus route would connect Reston, Herndon and the Fair Oaks Mall as seen in Figure 44. It would provide a major crosstown service. The round trip length would be 38 miles and would take about three hours to complete. Service would operate at 90 minute intervals. Initially, service would operate weekdays only from approximately 9:30 AM to 8:00 PM. If demand warrants, service could be extended to mall closing hours and/or Saturdays.

For the 16 round trips, 304 daily vehicle miles or 45,600 annual vehicle miles would be operated. Service would be operated for about 24 hours each day or about 6,000 hours each year. If service were provided by Fairfax Connector, the annual cost would be about $270,000. At 20 passengers per hour, the 120,000 passengers would be served and about $72,000 in passenger revenue obtained.

Each of the above proposed new routes may require the use of a smaller bus to permit travel through local neighborhoods.

FIGURE 44
NEW ROUTE 3 - HERNDON/RESTON/
FAIR OAKS MALL



Implemenation Considerations

Implemenation of the recommendations should be accomplished in an orderly fashion and per the priority list set forth below:

1. The first stage should focus on the five interjurisdictional bus routes where changes are proposed.

2. The next priority should be the three new routes proposed for implemenation in the western section of Fairfax County.

3. Priority three should be those intrajurisdiction Metrobus local routes with improvements identified.

4. The final priority should be implemenation of the suggestions for changes in services operated by local jurisdictions.

The Priority 2 set of changes were suggestions for three new routes located entirely in Fairfax County. These routes connect the outlying areas of Fairfax County with either the Vienna Metrorail Station or the Fair Oaks Mall. Overall these changes would require six additional peak buses, nearly 128,400 more vehicle miles and 13,500 vehicle hours. It is projected that the new routes, if operated by the Fairfax Connector, would cost about $555,000 per year and produce $161,000 in passenger revenue. About 270,000 passenger trips would be made on the new services.

It should be noted that a number of changes were categorized as Priority 3 and 4 proposals involving local routes operated by WMATA as well as the DASH and Fairfax Connector bus routes. The development of proposals for these routes were not part of the scope of the study. However, since information were being obtained for the WMATA routes operated wholly within one jurisdiction and for the non-WMATA operations, the opportunity existed to identify service change proposals.

Besides service changes, two routes were identified as having potential for joint agency coordination/operation. The Metrobus Route 9A-E is an interjurisdictional bus route

that serves Arlington County, the City of Alexandria and Fairfax County. Metrobus 10A,E serves Arlington County and the City of Alexandria. Up to now, most of the local takeovers of Metrobus services have been local services operating almost entirely within one jurisdiction. These routes are test cases to determine if arrangements can be made among jurisdictions to either jointly operate service or have one jurisdiction operate the service for the others.

Another joint agency coordination/operation route is the Route 5 which operates in the Reston/Herndon area of Fairfax County. This route is planned to be taken over from Metrobus by Fairfax County during the Fall of 1994. A portion of the route would be a candidate for extension into Loudoun County to serve the residents located in the Eastern sections of the County. Loudoun County would enter into an agreement with Fairfax County for having the route extended.

CHAPTER 13

LOUDOUN COUNTY SERVICE PLAN

This chapter presents a description of a recommended transit service plan for Loudoun County. The process used to arrive at the plan is also presented and consists of four sections. The first presents a brief description of the commuter services that have been provided to Loudoun County residents by private operators. The next section summarizes the results from other work in the current study which relates to service warrants and travel patterns in Loudoun County. The third presents the results of the services in Prince William County which provides some insights on potential services for Loudoun County. The concluding section presents routes and headways that comprise the recommended transit service plan for Loudoun County.

Overview of Past and Existing Transit Service

Public Transportation in Loudoun County has taken great strides over the past five years. In 1989, the only form of public transportation was Sterling Commuter Bus, Inc. a group of private citizens who took it upon themselves to charter a bus to carry commuters to downtown Washington, DC. They had been in existence since about 1976. Due to a mounting debt with the carrier, Sterling Commuter Bus, Inc. approached the County for operating assistance. This request was denied. Instead, the County did however approve a grant application to the Virginia Department of Rail and Public Transportation to establish a Rideshare Program. Included in these grant funds were promotional monies and the County Board of Supervisors pledged that these promotional monies would be used to help increase the ridership on the Sterling Commuter Bus, Inc. Sales promotions, advertising and discount ticket programs were used to accomplish this objective. These efforts helped to increase the ridership.

In late 1991 the staff became aware of grant funds that were available from the Virginia Department of Rail and Public Transportation designed to support demonstration projects in public transportation. A grant was obtained in 1992 to underwrite the cost of adding another commuter bus to the frail system. The bus obtained under the grant was operated in conjunction with the two Sterling Commuter buses, making the project a true public/private partnership. It was hoped that by adding additional choices for commuters, the new flexibility would attract more riders. This

demonstration project was quite successful, and resulted in an 80 percent fare box recovery rate. At the end of the one year grant, Sterling Commuter Bus, Inc. supported the notion of the County assuming the financial responsibility for the three bus system. Staff took this idea to the Board of Supervisors. However, clear support for greater County involvement was not there. At that time, representatives from the carrier announced that Sterling Commuter Bus, Inc. would privately take over the service thereby eliminating the need for the County to fund the project. The Board of Supervisors supported this privatization, and from September, 1993 to March, 1994, the private company, now named Virginia Coach, ran four buses to Washington, DC. In addition, another company named Passenger Express started operations during this period and operated competitively with Virginia Coach. This competition resulted in the failure of both companies, which by March, 1994, terminated service.

In April, 1994, the Loudoun County Board of Supervisors approved an emergency procurement allowing for the continuation of commuter bus service from Loudoun County. A two bus commuter service began under contract with a private operator. At the same time, appointments to the Loudoun County Commuter Bus Advisory Board were completed and the committee began formulating recommendations for a long term plan. Recognizing air quality issues and that the purpose of local gasoline tax is to support transit as well as highway projects, this plan was eventually adopted by the Board of Supervisors on July 6, 1994. The long term contract allows for a two year procurement of commuter bus service and limits the local subsidy to 25 percent of the operating costs. Therefore, if the cost for services were $400,000 Loudoun County would be responsible for only up to $100,000. An RFP has recently been released and a contract is expected to be awarded in early September, 1994. This contract will provide for three buses for commuters going to the core area of Washington, DC. Further expansions of this service are likely to look at the suburban commute and may be coordinated with a bill recently initiated by Congressman Frank Wolf to fund shuttle bus service to a Metrorail station from the Dulles corridor.

Previous analyses have identified the strong warrant for local fixed route bus service in the eastern part of Loudoun County. This includes the communities of Sterling, Sterling Park and Sugarland Run. There are also warrants for partransit service in many areas of the County. Paratransit services in Loundoun County are currently being provided by Loundoun Ride-On which are partially funded from the Loudoun County Gas Tax and partially by a grant from VDR&PT.

There are also a number of commuters residing throughout the County that rely on commuter bus service to make work trips. These include those mentioned above in the eastern portions of the County as well as other residential concentrations such as Leesburg, Ashburn Farms and Ashburn Village. Further, there is a significant amount of new development occurring within the Route 7 corridor between Leesburg and the Loudoun County border with Fairfax County. For these reasons, commuter transit service along the Route 7 corridor is a major service warrant.

Service Warrants and Travel Patterns

In previous work of the current study, service warrants that specify the need for transit service and travel patterns were developed and applied to Loudoun County. This section summarizes the findings from these two reviews.

Service Warrants - Warrants were developed for residential areas that produce trips and major activity centers that attract trips.

In terms of residential areas requiring transit service, the measures of need include population density and percent households without autos. The latter measure is conveniently obtained from Census data and is used as an indicator of lower income areas. In the case of Loudoun County, there is a residential area that warrants local fixed route transit service. This area is along the border with Fairfax County, south of the Route 7 corridor and includes the communities of Sterling and Sterling Park. Based on 1990 Census data and the criteria utilized in this study, the remaining residential areas of Loudoun County do not warrant local fixed route transit services. Of course, with the significant amount of growth that is occurring in certain portions of the County, other areas may soon be in need of transit services. In fact, with the growth that has already occurred in the Leesburg area since the 1990 Census, it too has probably reached the point where fixed route local service is warranted.

The other important service warrant is major activity centers. These activity centers deserve transit service if they are large enough to attract an adequate number of trips and include:

- Employment Concentrations - Sites or areas with 5,000 or more employees should be served.

- Hospitals/Nursing Homes - These usually do not attract a large number of trips. These facilities do, however, often serve those who depend on transit. Institutions of 100 beds or more should be served.

- Colleges/Schools - Students often comprise a major segment of the transportation dependent population in a community. For this reason, colleges and other post-secondary schools with an enrollment of at least 500 full-time students warrant consideration for service.

- Shopping Centers - Shopping trips constitute a major reason for transit travel. Shopping centers with more than 100,000 square feet of leased retail space are large enough to warrant consideration for service.

- Social Service/Government Centers - Public agencies, government centers and community facilities attract some volume of traffic. While the nature and size of these facilities varies greatly, it can be generally stated that those serving at least 250 clients daily warrant transit service.

- Rail Stations - The commuting patterns of workers in the study area would suggest that rail stations be served to meet mobility requirements. This include both Metrorail and VRE facilities.

Loudoun County was reviewed in terms of type and size of the major activity centers. It was determined that there is currently only one major activity center that meets the transit needs criteria listed above. The Northern Virginia Community College, Loudoun County Campus has an enrollment of about 3,000 students and warrants transit service.

Travel Patterns - Information in Chapter 10 identified detailed travel patterns in Northern Virginia including Loudoun County. Work trip travel demand was developed utilizing the 1990 MWCOG travel simulations and adjusted based on 1990 Census travel data at the jurisdiction level. The non-work travel patterns were based on the MWCOG model.

The overall work trip travel patterns for Loudoun County are summarized below:

- Loudoun County, in 1990, was the employment site for 31,393 persons. The residential characteristics of this work force include:
  - 68.1% lived in Loudoun County
  - 20.0% lived in Fairfax County
  - 5.3% lived in Prince William County
  - 6.6% lived elsewhere

- In 1990, there were 48,411 Loudoun County residents who were employed. The employment location of the residents include:
  - 44.1% worked in Loudoun County
  - 37.3% worked in Fairfax County
  - 7.1% worked in the District of Columbia
  - 4.0% worked in Maryland
  - 3.3% worked in Arlington County
  - 4.2% worked elsewhere

The work trip results were reviewed at a more detailed level and are summarized below:

- There were a number of work trip concentrations involving an Loudoun County residents that were relatively large and include:
  - Sterling Park/Dulles - 1,453 persons
  - Sugarland/Reston - 1,350 persons
  - Sugarland/DC - 1,343 persons
  - Sterling Park/Herndon - 1,253 persons
  - Sugarland/Dulles - 1,233 persons

- Sugarland/Tysons Corner - 1,210 persons

- Sugarland/Sterling Park - 1,066 persons

The potential for these work trips being made utilizing transit services is estimated to be in the one to five percent range. Therefore, the number of people that may utilize transit service for their work trips would range from about 15 to 75 for each travel market. This is equivalent to 30 to 150 transit trips each day.

. The non-work trips that are relatively high include:

- Sugarland/Sterling Park - 3,414 persons

- Sterling Park/Sterling - 2,538 persons

- Sterling Park/Herndon - 2,143 persons

Utilizing the same mode split range as for work trips, about 20 to 150 persons would utilize transit in each corridor. This would be about 40 to 300 transit trips.

These results indicate that there is a large enough transit riding potential in the above noted corridors for both work and non-work travel. This confirms the analysis in the prior section on transit warrants that indicates that transit services could be supported in the Sterling and Sterling Park areas.

Overview of Commuter Services Operated by PRTC

The commuting needs and circumstances of Loudoun County are not to dissimilar from those of Prince William County, Virginia, a member jurisdiction of the Potomac and Rappahannock Transportation Commission (PRTC). PRTC, which is comprised of the following member jurisdictions: Prince William County, Stafford County, Manassas, Manassas Park and Fredericksburg, plays an increasingly important role in providing transportation service alternatives in Northern Virginia. The PRTC also provides through contract, commuter bus services into Northern Virginia and Washington, DC.

Given the similarities of the service markets, a description of the PRTC commuter services is provided herein.

Commuteride - The PRTC commuter bus operation, called Commuteride, is a contract service operated by ATE Management and Service Company. Commuteride consists of a mixed fleet of 48 coaches providing 45 trips in the morning and 56 trips in the afternoon/evening. Commuteride operates commuter service from eastern and western Prince William County to the Pentagon, Crystal City and Washington, DC as well as midday and evening return trips.

The Commuteride services are cost-effective public transportation services. Even with the start-up of the VRE commuter rail, a competing service, Commuteride has maintained a farebox recovery ratio of 69 percent considering only direct operating costs. Adding in total cost of administration to direct operating cost, the farebox recovery ratio is 62 percent. These ratios are based on an annualized estimate from 11 months of service in FY 94. The FY 94 operating cost is $3,151,058. This number increases to $3,480,459 when the related administration costs of the PRTC are added. The system provides 1,585,045 annual miles of service and 67,931 annual hours of service at a cost of $2.19 per mile or $51.23 per hour.

The Commuteride service has averaged 2,859 trips per day based on the first 11 months of FY 94. Annual trips for FY 94 are estimated to total about 702,000. The fares for Commuteride are $5.00 one-way or $3.25 per trip with the purchase of a ten-trip pack of tokens. The farebox revenue estimate for FY 94, based on 11 months to date, is $2,165,000.

In addition to farebox revenue, the PRTC receives funding for the Commuteride service from the Commonwealth of Virginia and from Prince William County. The PRTC does not receive any Federal Section 9 operating assistance, in part due to issues related to these funds being designated for the WMATA. Funding for the Commuteride service in FY 94 was provided through the farebox at an estimated total of $2,165,000 or 62 percent, through VDR&PT at about $261,000 or eight percent and through Prince William County at about $1,054,000 or 30 percent. It may be noted that the PRTC receives funding from a two percent motor fuels tax from each of its member jurisdictions. These monies can be used for any transportation related purpose (transit or highways) with approval by the commission.

Service Proposals

The following section describes bus service proposals for Loudoun County. It should be recognized that as new

development projects are completed, the flexibility of bus service allows for service to adapt to changing needs.

Service proposals are presented for three distinct stages. Stage 1 proposals represent near term options to meet mobility requirements and are modeled after the recent Loudoun County and PRTC experience. Stage 2 gives more interim proposals. Stage 3 is a more ambitious scheme that would require a considerably greater level of resources. The Stage 3 consists of a number of preliminary proposals that would have to be more fully developed after the Stage 1 and 2 routings are implemented. The service concepts for each stage are described below.

- Stage 1 Proposals - In this stage Loudoun County should focus services only on the commuter trip. Services should be modeled after the prior Loudoun County and PRTC experience. Two routes should be operated.

  - Route 1 Leesburg/Route 7 Corridor to Washington, DC (Commuter Service) - This new route would be oriented to commuters and consist of two trips operated in the primary travel direction during both the morning (eastbound) and afternoon (westbound) peak periods. As seen in Figure 45, Service would operate primarily on Route 7 in Loudoun County, with some diversion to park-ride locations including existing and future sites. Service would continue to the Pentagon, Crystal City and Washington DC. Since there is not sufficient time for one vehicle to complete more than a single trip during peak periods, two buses would be required.

    This service would operate weekdays only, and would require approximately ten service hours each day. The round trip would span about 99 miles or for four round trips, 396 miles per day.

  - Route 2 Sterling/Sterling Park/Sugarland to Washington, DC (Commuter Express) - This new route would serve the work trip needs of County residents. As seen in Figure 46, during the morning peak period, service would operate from Countryside via Countryside Boulevard, Route 7, Palisade

FIGURE 45
LOUDOUN COUNTY NEW ROUTE 1
ROUTE 7 - COMMUTER SERVICE

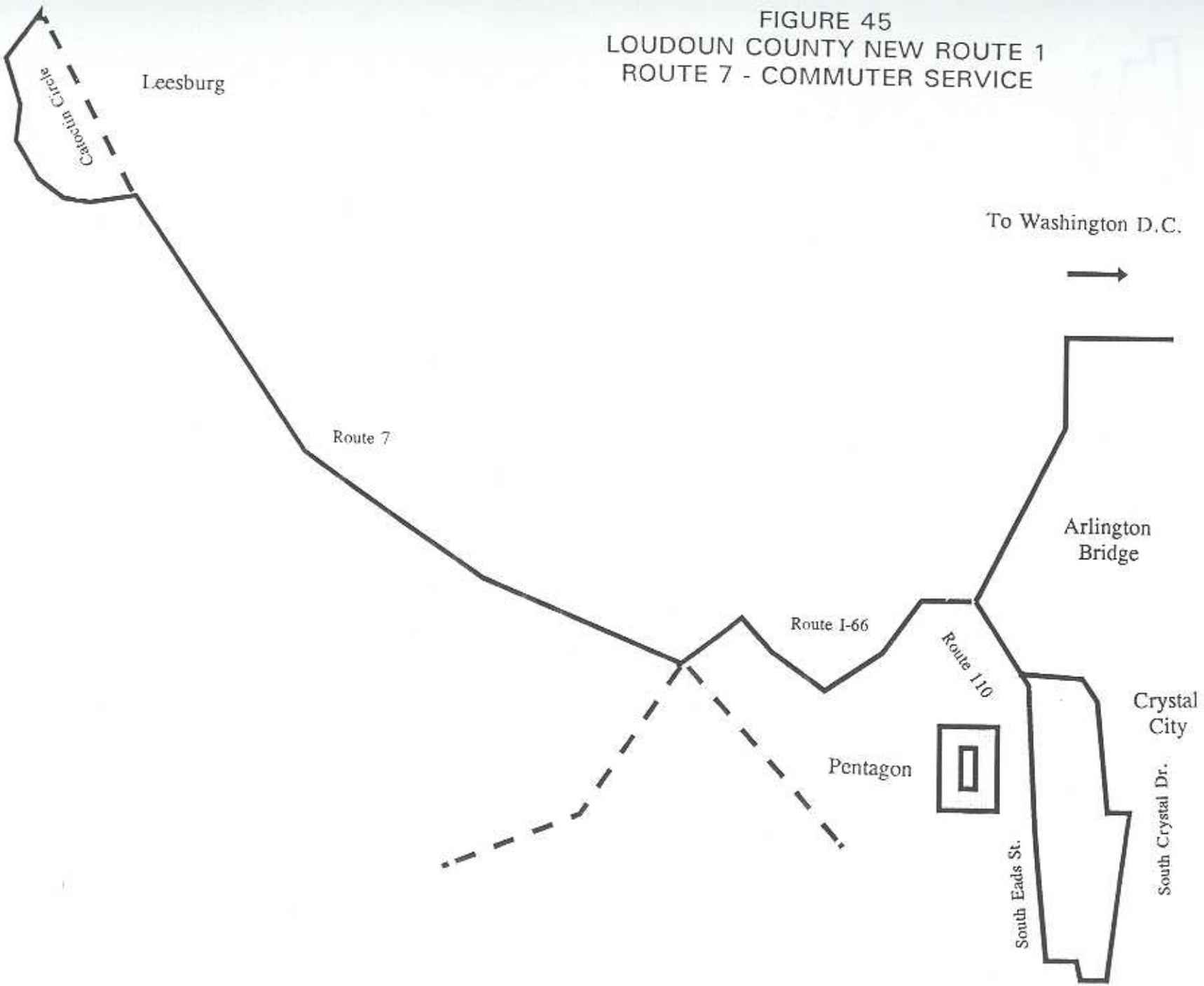
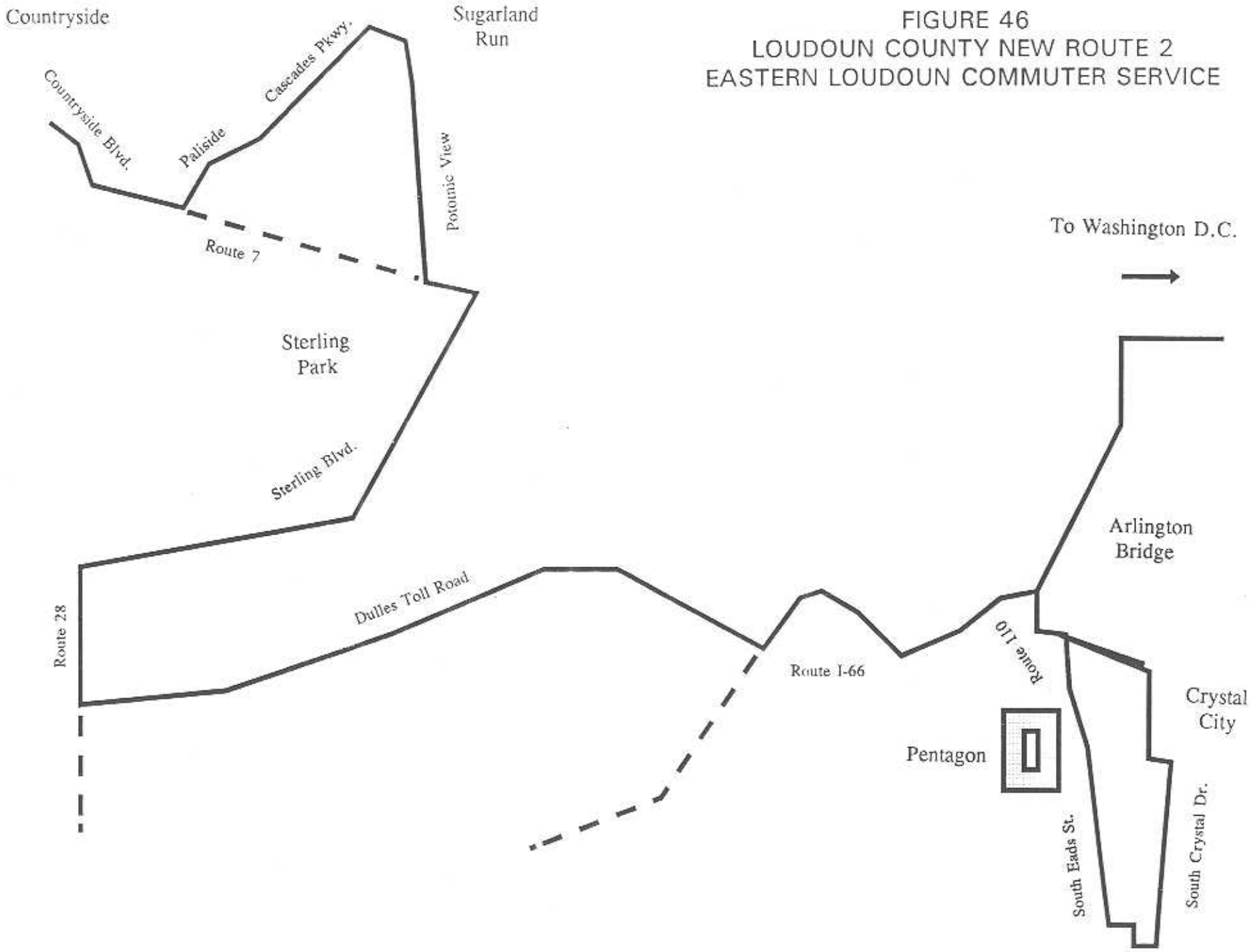


FIGURE 46
LOUDOUN COUNTY NEW ROUTE 2
EASTERN LOUDOUN COMMUTER SERVICE



Parkway, Cascades Parkway, Middle Field Drive, Potomac View Road, Route 7, Sterling Boulevard, Route 28, Dulles Toll Road where it would proceed to the Pentagon, Crystal City and Washington, DC. Two round trips should be made during each peak period and would require two buses.

This service would operate weekdays only, and would require approximately ten vehicle hours each day. The round trip would span about 88 miles or for four round trips, 352 miles per day.

It is estimated that the overall cost for the Stage 1 plan would be about $260,000 per year (5,000 hours of service times $52.00 per hour which is the PRTC cost per hour rate). There would be 187,000 miles of service. This cost assumes that the private carrier would provide the vehicles for the service and also the facility to house and maintain them. It is further assumed that about each passenger would pay a $4.00 one way fare (which is the current Loudoun County commuter service fare) and that a load of 20 passengers per peak direction trip would occur. There would be eight peak period trips per weekday. Assuming 250 weekdays each year, there would be about 40,000 trips made using the proposed two new routes. Revenue from the service would amount to $160,000 (40,000 trips times about $4.00 per trip). Therefore, the annual local financial burden would be $100,000.

Stage 2 Proposals - This stage would involve the provision of local service in the eastern sections of Loudoun County.

- Route 3 Countryside-Sterling (Local Service) This service would operate between these two communities with intermediate stops in Sugarland Run and Sterling Park. Different purposes would be served during peak and off-peak periods.

  During peak periods, service would operate to the two industrial parks in the southern portion of Sterling. During the midday,

service would be oriented to local and shopping trips. The routings are described below:

As seen in Figure 47, during the morning peak period, service would operate from Countryside via Countryside Boulevard, Route 7, Palisade Parkway, Cascades Parkway, Middle Field Drive, Potomac View Road, Route 7, Sterling Boulevard, Route 28, Sterling Road and Underwood Lane. Buses would then "deadhead" via Sterling Road and Route 28 to begin the next trip. The alignment would be reversed during the afternoon peak. Depending on work start and end times, three trips would be provided during both peak periods. Service would be provided hourly.

During the midday, no service would be operated south of Maple Avenue. Instead, service would be extended to the shopping strip along Route 7. In the southern portion of the route, service would be extended via E. Maple Avenue and Enterprise Court.

One bus would be required to operate the service as described above. Approximately 12 service hours would be provided each weekday. Approximately 120 miles of service would be provided.

- Route 4 Sterling/Sterling Park/Sugarland-Fairfax County (Commuter Express) - This new route would be similar to Route 2 but would serve the work trip needs of County residents who work in Reston, Herndon and Tysons Corner. As seen in Figure 48, during the morning peak period, service would operate from Countryside via Countryside Boulevard, Route 7, Palisade Parkway, Cascades Parkway, Middle Field Drive, Potomac View Road, Route 7, Sterling Boulevard, Route 28, Sterling Road, Route 228, Alabama Drive to intersection with Florida Avenue where it would connect with Metrobus/Fairfax Connector Route 5S. The route could follow the alignment of the Metrobus Route 5S where it would terminate at the West Falls Church Metrorail station. Four round trips should be made during each

FIGURE 47
LOUDOUN COUNTY NEW ROUTE 3
COUNTYSIDE/STERLING - LOCAL SERVICE

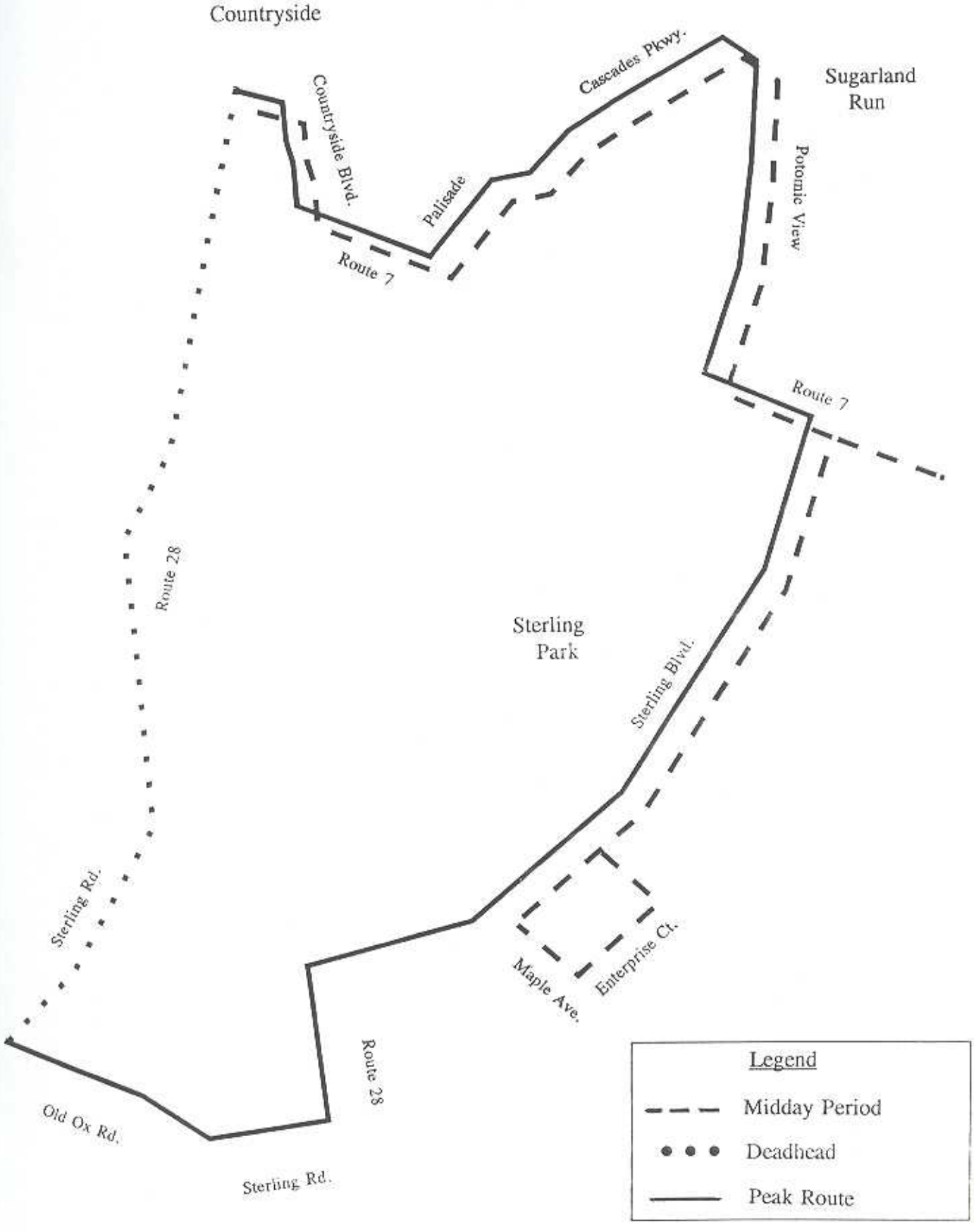
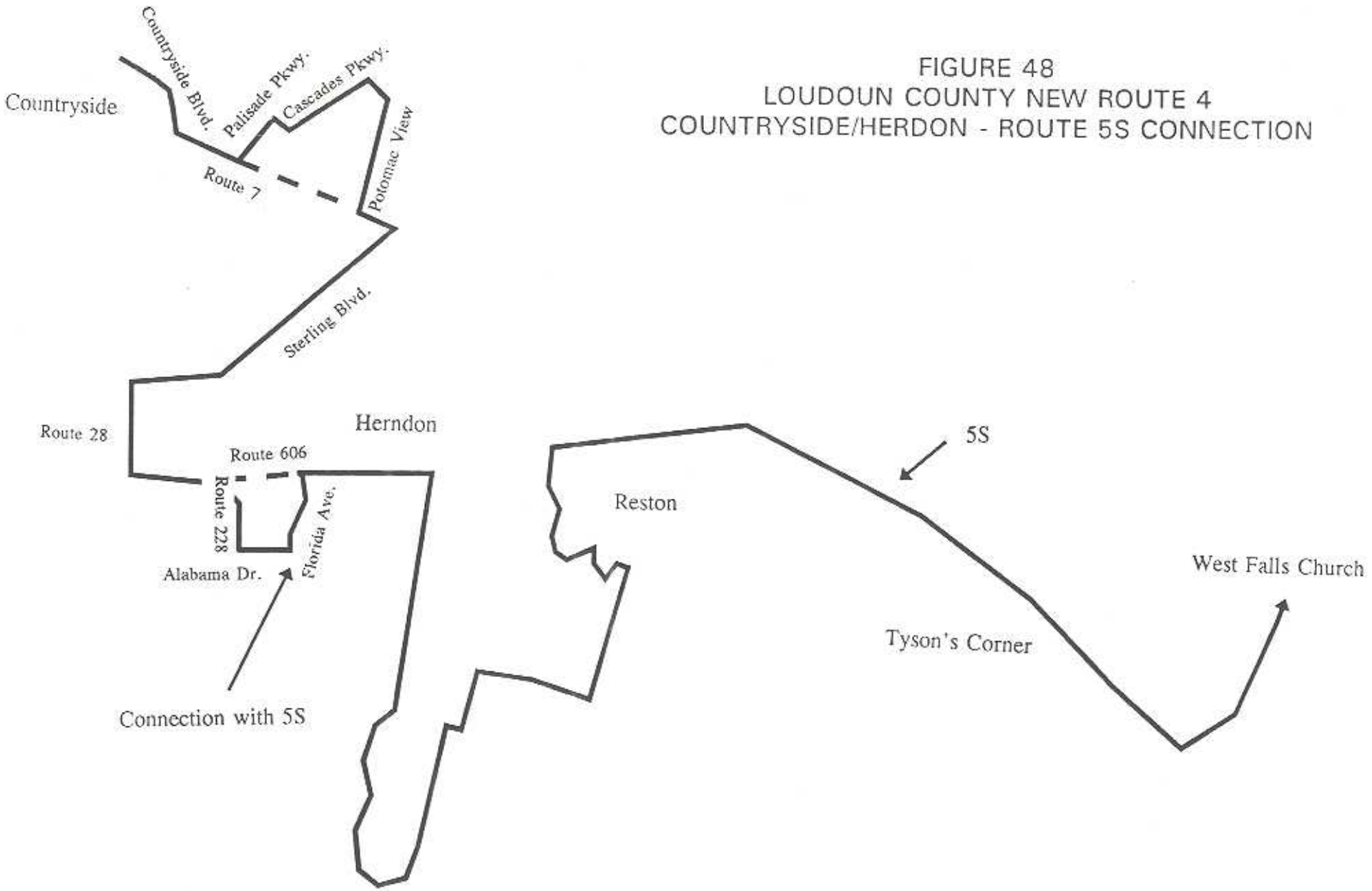


FIGURE 48
LOUDOUN COUNTY NEW ROUTE 4
COUNTRYSIDE/HERDON - ROUTE 5S CONNECTION



peak period. The AM peak trips could connect with Route 5S at Florida Avenue and Alabama Drive at 5:40, 6:20, 6:55 and 7:48 and the PM trips would connect at 5:18, 5:56, 6:26 and 7:13. Since there is sufficient time for only one vehicle to complete two round trips during peak periods between Countryside and Herndon, three buses would be required.

This service would operate weekdays only, and would require approximately ten service hours and 160 miles each day.

It is estimated that the overall cost for the Stage 2 plan would be about $286,000 per year (5,500 hours of service times $52.00 per hour which is the PRTC cost per hour rate). About 40,000 annual miles would be required. This cost assumes that the private carrier would provide the vehicles for the service and also the facility to house and maintain them. It is further assumed that about each passenger would pay a $1.00 one way fare for the local service and $2.25 for the commuter service. It is assumed that the local service (Route 3) would attract 15 passengers per hour which at 12 hours of service a day, would result in total annual passengers of about 45,000. Revenue would amount to about $45,000 (45,000 trip times $1.00 fare). The commuter service (Route 4) will make four peak direction trips per day and will carry a load of 20 passengers per peak direction trip. Assuming 250 weekdays each year, there would be about 20,000 trips made using the proposed new Route 4. Revenue from the service would amount to $45,000 (20,000 trips times $2.25 per trip). The total revenue for both Stage 2 routes would be about $90,000. Therefore, the annual local financial burden would be about $196,000.

- Stage 3 Proposals - These service proposals build on those described as part of Stage 1 and 2. As noted previously, the proposals would require a greater commitment in terms of financial resources. The Stage 3 proposals are preliminary ideas and are described below:

  - Leesburg-West Falls Church (Commuter Service) - Service would be expanded to

include the operation of an additional trip in each direction during peak periods. Another bus (i.e., three total) would be required. In addition, service (three round trips) would be operated to Tysons Corner and the West Falls Church Metrorail station during the midday. Service would be coordinated with those described below to afford frequent service between the eastern portion of Loudoun County and West Falls Church (Tysons Corner).

- NVCC-West Falls Church (Commuter Service) This service would operate between the Northern Virginia Community College and the West Falls Church Metrorail station. At a 45 minute headway, two buses would be required.

- Countryside-Sugarland Run (Local Service) Service would operate midday from Countryside via Countryside Boulevard, Route 7, Palisade Parkway, Cascades Parkway, Middle Field Drive, Potomac View Road and Route 7 to the shopping center on Route 7 near Lakeland Drive. Service would be operated hourly.

- Sterling-Sterling Park (Local Service) - Service would operate midday from Sterling via Enterprise Court, E. Maple Avenue, Sterling Boulevard, Church Road, Oak Tree Lane, Juniper Avenue, Sterling Boulevard and Route 7. Service would be operated hourly. One vehicle would be necessary to operate the two local routes noted above. At a 30 minute headway, two buses would be required.

- Countryside-Sterling (Local Service) -This service would continue to operate as described previously under Stage 1; however, only peak period service would be provided. Midday service would be replaced with the two routes (Countryside-Sugarland Run and Sterling-Sterling Park) described above.

It should be noted that when construction is completed on the new mall on Routes 7/28 (Dulles Town Center) and, it would be prudent to terminate services there. Further, if resources are available, service could be increased on both

loops (i.e., to 30 minute intervals) and "pulsed" (i.e., buses meet at about the same time) at the mall. To the extent possible, these services would also be coordinated with the Leesburg and NVCC routes.

The overall dimensions of the Stage 3 proposals are longer range and could require as many as eight vehicles. The cost of these service could exceed one million dollars. In this case, the Stage 1 proposals which require four buses and 20 hours of service each weekday would be a less costly scenario. Stage 2 would require three buses and 22 vehicle hours each day. It should be noted that the County has a potential provider for Stage 2 service which would involve converting partransit services to local fixed route services.

The discussion above describes the route proposals for consideration in Loudoun County. As noted previously, bus service is flexible and can respond to change. In that regard, the County does not necessarily have to implement the recommendations in order of the stages presented herein. In fact, the County could select recommended services from any of the stages and implement them. The implementation of any new services will ultimately reflect performance of already implemented bus services, location and extent of new development, and the availability of financial resources.

Implementation Considerations

If the service plan noted above is to be implemented, it will be necessary for the County to be more directly involved with both controlling the service as well as in providing financial support for the service. Part of the effort will involve the County and other regional institutions in developing public support for transit services. This should occur by educating the public on the benefits and need for transit which will cultivate support for providing financial resources. This County is already moving in this direct. Since April 1994, the County has taken a more aggressive role in providing financial support to commuter bus services. Public financial support to transit services is almost universal throughout the United States. The need for public financial support in Loudoun County has been demonstrated by recent experience where two private companies without public financial support could not continue operations.

One option would be for the County to set up an operation and provide the needed service on its own. This is how the CUE operation in the City of Fairfax is provided.

Another, and perhaps a more attractive, option would be for the County to contract for specified service levels with a private operator. This is the course that the County has taken in its most recent involvement with bus service. In this case, the County would assume financial responsibility for the operating loss for the service to the extent that revenue from passengers fares fall short of the cost to provide the service. This would represent a willingness of the County to assume the risk to maintain a level of reliable transit service for its residents. However, in the most recent RFP issued by the County for commuter bus service, an attempt is being made to reduce the risk by limiting the financial burden to no more than 25 percent of operating costs (which is equivalent to a 75 percent cost recovery). The experience of PRTC indicates that this may be about what could be expected from this type service (i.e., PRTC obtains a 69 percent cost recovery from its commuter operation). However, a 75 percent cost recovery is very favorable and may not be realistic for reliable and quality commuter bus service.

It is possible for Loudoun County to obtain federal and state funding to support the capital and operating expenses of the transit service plan.

The recent action by Fairfax County to have an outside private contractor provide the transit service in the Reston/Herndon area instead of Metrobus may be an opportunity for Loudoun County.

There is another opportunity for Loudoun County as a result of Fairfax County having direct control of the Reston/Herndon service. Fairfax County could be contracted with to extend its 5S service into Loudoun County to provide the Stage 2 proposals for Route 3 and 4 local and commuter service, respectively, identified in the recommended plan. In fact, there may be opportunities for extending several other Fairfax County routes (e.g., 5W and 5Z) into Loudoun County. Loudoun County would be responsible for funding any extended bus service from Fairfax County.

If reliable transit services are to be provided in Loudoun County, the County will have to take a leadership role in both service implementation and funding.

CHAPTER 14

RECOMMENDATIONS

Based on the extensive effort performed in this study, a recommended plan is identified and consists of a number of interrelated plans that are presented below.

Garage Facilities

The location of bus storage and maintenance facilities impacts the operating cost of bus services. One way to reduce Metrobus operating costs is to locate garage facilities closer to the service areas that the buses from the garage serve. If Metrobus service is to become cost competitive, the facility location problem must be addressed.

For example, the Metrobus facility at Four Mile Run has adequate capacity. However, it is not well located with respect to Metrobus routes serving western portions of Fairfax County. Therefore, if Metrobus service is to remain as the interjurisdictional bus operator in Northern Virginia, finding a bus garage in the western sections of the service area is necessary. This could be accomplished by WMATA locating and building a separate facility in the western section of Fairfax County.

If the WMATA facility expansion project in western Fairfax County were accomplished, several things would be possible. First, WMATA could reduce the Royal Street garage to an annex operation with the eventual goal of its complete closure. WMATA would have sufficient capacity at its Four Mile Run and Arlington Annex, along with the new western facility, to handle its service needs.

Another facility problem is that the DASH facility is at capacity. To solve this problem and permit future expansion of DASH services, DASH should either find another site for its garage or expand into the vacant land adjacent to its current site.

At present, Fairfax County has no significant problems with their garage facilities. In fact, they plan to build a western Fairfax County bus garage off West Ox Road for use by the Fairfax Connector.

Fleet Replacement

WMATA must undergo an extensive program to replace the bus fleet that serves Northern Virginia with a modern and well equipped fleet. The following recommendations are presented to guide the fleet replacement:

- The goal of WMATA should be to provide a fleet in Northern Virginia that has an overall average age of six years with no bus exceeding the 12 year age replacement guideline suggested by the FTA.

- WMATA should embark on an aggressive fleet replacement program that achieves this goal in five years.

- In replacing the fleet, WMATA should consider the size of the bus that is appropriate for the service being provided. Therefore, a mixed fleet with 40 foot (45 to 50 passengers), 35 foot (35 to 40 passengers) and even smaller 30 foot (28 to 33 passengers) buses should be obtained. The nature of current WMATA bus services has changed to a feeder network with local services within the community. The bus fleet type should also change to be consistent with the new service pattern.

Public Information

The creation of a common program of public information outreach and service marketing is recommended as a means to provide more complete information to the public concerning transit services available in Northern Virginia. This would also likely effect greater market penetration as a regional effort as opposed to separate individual efforts. By pooling individual marketing resources, more cost-effective programs and efforts could be achieved.

The parts of the program that should be improved include:

- Simplifying the WMATA public timetables. The complicated public timetables for the Metrobus routes is the only problem found in this aspect of public information. Part of the problem is

that the routes themselves are complicated and have many variations which must be reflected in the public timetables. This problem can not be overcome unless the routes are simplified. The other problem is that several panels on public timetables for most routes are devoted to general fare structure information about the entire Metrobus system. From this information, it is not readily apparent what the rider must pay for a particular trip on the route described within the timetable. A simplification would be to make the fare structure information at least applicable only to bus services in Northern Virginia. A further improvement would be to describe overall Metrobus fare information and more detailed information for the specific route.

- Keeping the excellent Metrobus system map current. The only improvement that is recommended regarding systems maps in Northern Virginia is that they be kept as current as possible. Updates to the maps should occur when major changes are implemented or at least once every two years to keep maps current to reflect minor changes.

- Maintaining the quality and responsive of the telephone information system. Overall, considering the extensive amount of services and the number of different operators in Northern Virginia, the quality and the timeliness of the telephone information given was checked and found to be quite good.

- Coordinating bus stop signs of the different operations that serve the same stop location. Instead of having a sign for each operator, one sign to indicate that the stop is a joint stop would be more appropriate; and

- Providing public information on Metrorail schedules at stations. Information is not available to the public on the actual times the Metrorail trains serve the various stations in Northern Virginia. It has been stated by WMATA personnel that a reason for this lack of information is that trains run frequently enough

that a public timetable is unnecessary. This might be true for an individual whose mode of transportation to and from the station is the automobile. However, if the mode is a bus (over 10 percent of bus riders transfer from Metrorail) and the bus is on an infrequent headway, the knowledge of rail schedule information is important. For example, a person may be riding the Metrorail service from Washington, DC to a Virginia station in order to catch a bus to a final destination. Without knowledge of the time the train arrives at the station, the person may miss the connecting bus and have to wait an extended period for the next bus. Having the train schedule information, the person could plan the trip so that the bus wait is minimal. This opportunity to plan a trip is lost without Metrorail schedule time information for each station for all time periods.

Fare Structure

It is apparent that fare policy is an important issue that should be addressed by the NVTC, WMATA and jurisdictions that fund bus service in Northern Virginia. It is recommended that fare structure improvements should be accomplished in three stages and over three horizon periods. The first stage would be for each system to simplify and consistently apply the fare structure to its own routes and services. This recommendation primarily applies to the Metrobus operation. Stage two should involve the development of a regionally acceptable fare structure and transfer coordination policy. This should be accomplished in a an immediate range (three to five years) period. Stage three should be the longer range effort (five to ten years) involving implementation of a truly "seamless" fare structure that utilizes the latest available technology to collect fares.

It should be noted that a detailed fare structure review was not part of the scope of this study. However, based on the analysis performed in this study, the following fare structure changes aimed at consistency and simplicity should be considered for first stage improvements by the bus operators. Development of detailed recommendations for the other stages involves a more focused study on a coordinated Northern Virginia fare structure. The recommendations involve the Metrobus fare structure.

- Consider one of two changes to the basic fare structure. One change, which would not effect revenue generation, would be to eliminate the distinction between peak and off-peak fares. Rather, there would be one base fare throughout the system. However, if a rider traveled during the peak periods and the trip crossed zonal boundaries, a peak period zone charge would apply. This zone charge could be consistent with current charges. Therefore, this change would be one of mere definition and aimed at simplification of the fare structure. The second option would be to apply the zonal charge to all riders independent of the time of the trip (peak or off-peak). This results in a greater level of equity in the system throughout the day based on distance traveled. The fare could be based on either keeping the revenue the same, in which case the zone charges for the peak period could be reduced to a lower level and the same as the off-peak charges, or increasing the revenue by setting the off-peak zone charges the same as the peak. The decision on what alternative is best should be based on a more detailed fare study.

- There are a number of Metrobus routes in Northern Virginia that have a $0.50 fare. Most of these routes are relatively short routes that feed Metrorail stations. In fact, except for Route 5S, the range of one way scheduled trip times for the $0.50 routes is from about 25 minutes to about 45 minutes with the average at 35 minutes. The Route 5S one way scheduled trip time is over one hour for most time periods. This route should be considered like other Metrobus non-$0.50 routes with a $1.00 base fare and appropriate zone charges.

- Consider the application of the bus and Metrorail round trip transfer fee similar to that offered in Arlington County for all routes in Northern Virginia that serve Metrorail stations.

- Reduce the amount of confusion regarding which types of scripts (passes, tickets, transfers, etc.) are acceptable on various systems by noting on the script, the systems and the types of trips that are acceptable. If the script does not

denote the system and type trip, it would be refused by the driver. This feature may reduce the complications arising from the large number of script programs available to riders in the Northern Virginia area.

- Eliminate the extensive amount of unnecessary information on public timetables regarding fares such as DC to VA fares, DC fares and Maryland fares. At the same time add information to the timetable on pass programs that are available as well as the fare structure information for interfaces with other Northern Virginia bus operators, (e.g., DASH accepts Metrobus transfers for the base fare).

The only recommendation in this study regarding consistency and simplicity for other Northern Virginia operators is for the Fairfax Connector to divide Route 401 into two fare zones with the zone boundary at Little River Turnpike and Hummer Road. A zone charge of $0.25 could be assessed for a trip crossing the boundary.

Service Plan Northern Virginia

The recommended service plan for Northern Virginia (which includes Alexandria, Arlington County, the City of Fairfax, Falls Church and Fairfax County), consists of a number of elements that were defined in detail in Chapter 12. The proposed service modifications for the interjurisdictional bus routes vary in magnitude. A number of changes involve improvements in coordination among routes. Others involve headway and route adjustments. Still others involve route extensions and eliminations.

Another set of changes was suggestions for three new routes located entirely in Fairfax County. These routes connect the outlying areas of Fairfax County with either the Vienna Metrorail Station or the Fair Oaks Mall. Overall these changes would require five additional peak buses, nearly 100,000 more vehicle miles and 11,250 vehicle hours. It is projected that the new routes, if operated by the Fairfax Connector, would cost about $500,000 per year and produce $135,000 in passenger revenue. About 225,000 passenger trips would be made on the new services.

A number of changes were also proposed for the remaining bus routes operated by WMATA as well as the DASH

and Fairfax Connector bus routes. The development of proposals for these routes was not part of the scope of the study. However, since information was being obtained for the WMATA routes operated wholly within one jurisdiction and for the non-WMATA operations, the opportunity existed to identify service change proposals.

Besides service changes, two routes were identified as having potential for joint agency coordination/operation. The Metrobus Route 9A-E is an interjurisdictional bus route that serves Arlington County, the City of Alexandria and Fairfax County. Metrobus 10A,E serves Arlington County and the City of Alexandria. Up to now, most of the local takeovers of Metrobus services have been local services operating almost entirely within one jurisdiction. These routes are test cases to determine if arrangements can be made among jurisdictions to either jointly operate service or have one jurisdiction operate the service for the others.

Based upon the evaluation of the above two Metrobus replacement candidates and under the same method to allocate fixed costs among Northern Virginia jurisdictions, it is concluded that Metrobus is the best agency to be responsible for interjurisdictional bus services in Northern Virginia. Any other method results in unfavorable and unnecessary cost impacts to some Virginia jurisdictions. For example, in the above two cases, there were no service changes in Falls Church. Yet, Falls Church would be assessed over $10,000 more each case due to the redistribution of the Metrobus fixed cost. If the way fixed costs are allocated to Northern Virginia jurisdictions were changed to not be affected by a service level change, than the replacement services would be more attractive.

Another joint agency coordination/operation route is the Route 5 which operates in the Reston/Herndon area of Fairfax County. This route is planned to be taken over from Metrobus by Fairfax County during the Fall of 1994. A portion of the route would be a candidate for extension into Loudoun County to serve the residents located in the Eastern sections of the County. Loudoun County would enter into an agreement with Fairfax County for having the route extended.

Service Plan Loudoun County

The recommended service plan for Loudoun County consists of a three stage program. Each stage adds more service to the area as the growth and need for transit services develops. This phased program of implementing new service is consistent with the characteristics of the County

which are now reaching development levels and densities which can support transit service. The three phases of the plan include:

Stage 1 - This stage involves two new commuter routes modeled after the PRTC service. One route would serve the Leesburg area and proceed along Route 7, Route 28, Dulles Access Road and Interstate 66 to the Pentagon, Crystal City and Washington, DC. The other route would begin service in the Sterling/Sterling Park area and also proceed to Washington, DC.

Stage 2 - This stage is more ambitious and adds a local route serving the Countryside and Sterling areas. Another express route is also suggested to connect the Sterling/Sterling Park area with employment locations in Reston, Herndon and Tysons Corner. This route would be extended to the West Falls Church Metrorail Station. The route would connect with the Route 5S in Herndon

Stage 3 - This stage is very ambitious and adds both commuter and local services.

It is further understood that the County is contracting for specified service levels with a private operator, thereby embarking on this course of action with current commuter services. Thus, the County would assume financial responsibility for the operating loss for the service to the extent that revenue from passengers fares falls short of the cost to provide the service. This represents a willingness of the County to assume the risk to maintain a level of reliable transit service for its residents.

The County should implement the Stage 1 proposals. It is estimated that the overall cost for the Stage 1 plan would be about $260,000 per year. About 40,000 trips would be made using the proposed two new routes. Revenue from the service would amount to about $160,000. Therefore, the annual local financial burden would be about $100,000.

The implementation of Stage 2 and 3 would be more costly and should be implemented only after the appropriate funding is obtained. The County could select recommended services from any of the stages and implement them depending on the availability of financial resources.

The recent action by Fairfax County to have an outside private contractor provide the transit service in the Reston/Herndon area instead of Metrobus may be an opportunity for Loudoun County. In this case, there will be another private operator nearby that would be a prime candidate to bid on the Loudoun County service.

There is another opportunity for Loudoun County as a result of Fairfax County having direct control of the Reston/Herndon service. Fairfax County could be contracted with to extend its 5S service into Loudoun County to provide the Stage 2 proposals for Route 3 and 4 local and commuter services. Under this arrangement, it is anticipated that Loudoun County would have to provide financial support to Fairfax County for the extended service. In fact, there may be opportunities for extending several other Fairfax County routes (e.g., 5W and 5Z) into Loudoun County.

Service Coordination

The analysis of travel patterns relative to transit services presented in Chapter 9 illustrated that most interjurisdictional patterns are served. Most of these services are provided by Metrorail or Metrobus although the other operators also operate routes that serve certain movements. These operations reflect historic service patterns and recognition of existing markets. The decisions of local jurisdictions about services to be supported and the operator designated to provide the service have recognized these historic patterns and markets. The questions are whether the multiplicity of service providers and decisions by individual jurisdictions could threaten the effectiveness of interjurisdictional services and whether there is the potential for savings through greater interjurisdictional cooperation that are hindered by institutional barriers.

Clearly, the existence of multiple providers could threaten interjurisdictional services if decisions were made by one operator or one jurisdiction without the consideration of the total market and related operations. To date, there is little, if any, evidence that this has occurred. Informal staff contacts and formal NVTC procedures have provided a mechanism for service coordination. These procedures should be continued and enhanced where possible.

Decisions by individual jurisdictions related to services to be operated and the entity to operate services (i.e. WMATA vs. local agency or private contractor) do affect the costs incurred by other jurisdictions and could affect services provided. The City of Fairfax's decision not to

participate in Metrobus funding has a small effect on the costs to other jurisdictions. However, since Metrobus routes operating through the City of Fairfax continue to serve passengers, interjurisdictional service is maintained. Fairfax County's decision to replace other carriers for Metrobus on selected routes does lead to increased costs for other jurisdictions and could, ultimately, affect the quantity of service provided in those jurisdictions.

The impact of Metrobus service decisions by one jurisdiction on the cost to other jurisdictions of Metrobus operations results from the overhead structure of WMATA and the formulas used to allocate overhead costs among participating jurisdictions in Virginia. The overhead allocation also affects the decisions of each jurisdiction since the cost of each mile of Metrobus service is priced on a fully-allocated basis while costs of services by local operators may be considered on a marginal cost basis.

Alternative procedures for treatment of Metrobus operating costs that would minimize the effect on jurisdictions of other jurisdictions' service decisions have been suggested. Since any change will affect the costs borne by all jurisdictions, resolution of this issue will require consultation and negotiation at the highest levels of local government.

With minor exceptions, all services operated by individual jurisdictions are contained within those jurisdictions. (Fairfax Connector Route 110 service to Old Town Alexandria, Connector 300 series routes to the Pentagon, CUE service to Vienna Metrorail station and DASH services to the Pentagon are the exceptions.) No institutional barriers to providing interjurisdictional services where warranted have yet arisen.

Several possibilities for interjurisdictional cooperation in the provision of service with the goal of increasing overall efficiency have been suggested. These include use of Fairfax County's Reston/Herndon routes to serve parts of eastern Loudoun County and replacement of Routes 9A-E and 10A,E services on a joint basis by Fairfax County, Arlington County and the City of Alexandria to demonstrate the feasibility of interjurisdictional cooperation. While there are no insurmountable issues associated with such operations, there are be real issues of cost allocation no less complex than the question of allocation of Metrobus costs. The incentive of achieving overall cost reductions would aid in reaching agreement on appropriate allocation mechanisms, but each party would be expected to strive for agreements that would be equitable in

terms of costs incurred relative to services received. This leads to the need to find a better method of allocating Metrobus fixed cost among Northern Virginia jurisdictions.

Public transportation in Northern Virginia must be coordinated regionally if regional services are to be provided. The service plan identified a number of ways this service could be coordinated through specific recommendations. To further enhance coordination, it is recommended that a Service Planning Committee be established. The committee should include representatives from each of the transit service providers operating in Northern Virginia. We suggest that the Virginia Railway Express, the Commuteride and, perhaps, the ridefinders network be included. The purpose of this committee would be to coordinate service and service changes and to identify means to improve services in Northern Virginia. The committee should be at the staff level and may propose policy and service improvements through the NVTC as well as through each service provider.