

MARKET STUDY OF
COMMUTER BUS ALTERNATIVES
IN NORTHERN VIRGINIA

FINAL REPORT

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DISCLAIMER

The preparation of this report has been financed in part through a grant from the U. S. Department of Transportation, Urban Mass Transportation Administration, under the Urban Mass Transportation Act of 1964, as amended.

This report reflects the views of the consultant, who is responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Urban Mass Transportation Administration, the Virginia Department of Transportation, the Northern Virginia Transportation Commission or the Metropolitan Washington Council of Governments. This report does not constitute a standard, specification or regulation.



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I. INTRODUCTION

The second half of this century has seen continuous growth in the Northern Virginia portion of the Washington Metropolitan Area. Fairfax County has been transformed from a primarily rural area in 1960 to an almost fully suburbanized county. During the 1980's the process of suburbanization has expanded to the next tier of counties. Prince William, Stafford and Loudoun Counties are now experiencing or shortly will experience rapid growth in housing and population.

Although much employment has followed population to the suburbs, the core of the Washington D.C. region remains a major employment center. Many of the new residents of the outer counties still commute daily to workplaces in or near downtown Washington.

The growth in travel has resulted in congested conditions on all major transportation routes. Interstate 95, I-66, VA Rt. 7 and the Dulles Toll Road all experience some degree of peak hour congestion resulting in slow commute times and unpleasant driving conditions. Serving the regional travel demand will involve both implementation of new facilities and management of existing resources.

One aspect of management of the transportation system is the use of public transit. In some regions of the country high-quality express bus services have been successful in attracting long-distance commuters. It has been suggested that similar markets exist in Northern Virginia for a "luxury" bus service. This report examines the features that potential users consider to constitute "luxury" service and the market for such bus service.

SCOPE OF STUDY

From the outer counties of Northern Virginia there are three major commuting corridors, I-95, I-66, and Rt. 7/Dulles Toll Road. Each of the major facilities offers some type of priority treatment for buses. I-95 has peak direction HOV lanes from just north of the Occoquan River into the District of Columbia; I-66 is limited to HOV use in peak hours in the peak direction inside the Capital Beltway. The Dulles Corridor permits buses partial use of the less congested airport access roadway and connects to the I-66 lanes.

A result of these management strategies is that bus service can be provided that faces significantly less congestion than travel by single-occupant autos. This not only makes the bus service more competitive in terms of service quality but also permits more efficient and less costly bus operation.

It is important to note that there are existing bus services in each of the corridors.

Rt. 7/Dulles Toll Road -- The Sterling Commuter Bus has offered service from Sterling Park to Downtown Washington since 1973. The operation is similar to a "Commuter Club" with volunteer management and operations provided through a contract with a private carrier. Two inbound trips are offered each morning. The round-trip fare, based on monthly purchase, is \$6.30. About seventy riders are carried each day.

I-66 Corridor -- WMATA Metrobus service is provided from the Centreville area of Fairfax County to the Vienna Metrorail Station. Prince William County's Commuteride service operates from the Manassas area to both the Vienna Station (two trips inbound) and Pentagon/Downtown Washington (two trips inbound). Fares are \$2 round-trip to the Vienna rail station and \$5.00-\$5.60 to Pentagon/Downtown based on ten-ride tickets. Inbound Commuteride ridership averages 30 to the Vienna station and 51 to Pentagon/Downtown.

I-95 Corridor -- Prince William County Commuteride provides twenty-two inbound bus trips each morning from the Dale City, Lake Ridge and Dumfries communities. Several private companies -- Greyhound, White's, Aries, Lee, D&J, Lawson -- provide about eighteen morning inbound trips from Fredericksburg and Stafford County. Daily inbound ridership on Commuteride is about 700. Detailed patronage data for the private carriers are not available, but it is estimated to be about 650. Round-trip fares, based on ten-trip tickets are \$5.00-\$5.60 on Commuteride and \$4.80 to \$5.20 on the private carriers.

The analyses reported herein relate to the markets for high-quality bus services. Issues addressed include the features that are perceived by users as constituting quality service and the number of patrons that could be attracted at various fare levels. No consideration has been given to the costs of operating the service, the capital costs of vehicles or other facilities such as park-ride lots, or the financial feasibility of any proposed operation. Similarly there is no consideration of the entity or entities that would operate any such services.

The estimates that are presented represent the total market for bus services in each corridor. In the area outside of WMATA's service area we have not allocated bus travel between any proposed new services and existing services or considered the division of the market for public transit between bus services and the proposed commuter rail service.

STUDY AREA

The focus of the market studies was on long distance commuter travel between residential areas in the outer suburban jurisdictions in Northern Virginia and work locations in the District of Columbia, Arlington, Alexandria and other locations identified as workplace concentrations.

The residential areas considered, illustrated in Figure 1, included:

- o Portions of Fairfax County
- o The eastern and southern portions of Loudoun County
- o The portions of Prince William County having or planned for major development
- o The Cities of Manassas and Manassas Park
- o Stafford County, Spotsylvania County, and the City of Fredericksburg

The primary workplace areas considered included the downtown of the District of Columbia, Rosslyn, the Pentagon and Crystal City.

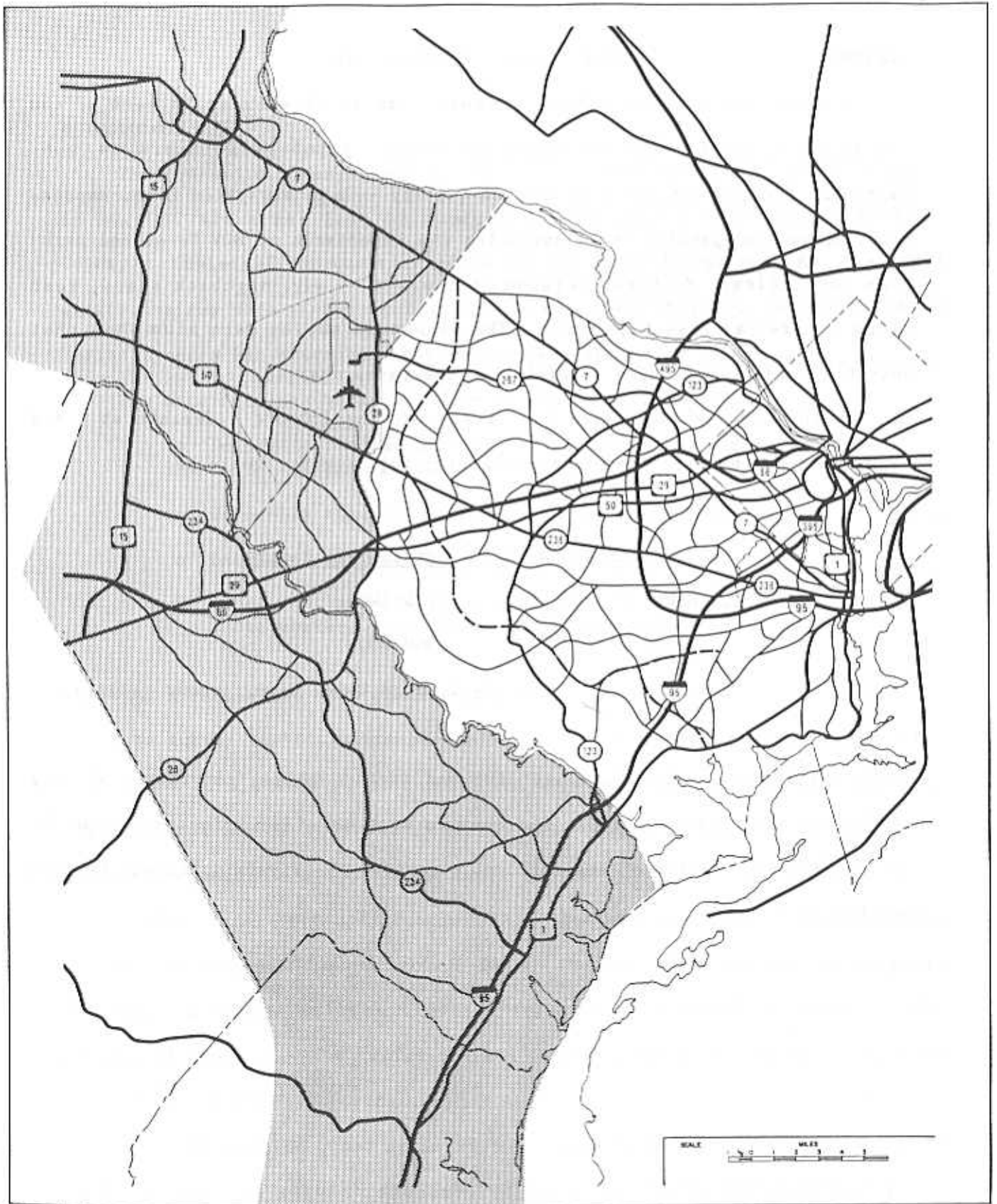
ANALYSIS PROCEDURE

In general terms quantification of the market for Commuter Bus Services involves a) determining the number of commuting trips made from the residential areas in the outer counties to workplaces either in the core or in the major corridors, b) determining the service attributes of the commuter bus service and c) estimating the number of commuters that would choose to use the bus service.

For the analysis two methods have been applied:

1. A survey-based approach using data specially collected from a sample of households in Loudoun and Prince William Counties. These survey data were also used to assess the attributes of a high-quality bus service considered most important by potential riders and the stated willingness to pay specific fares.
2. A simulation approach using travel data from the Metropolitan Washington Council of Governments (MwCOG) and modal choice procedures developed in conjunction with MwCOG and previously applied to studies of patronage for the proposed commuter rail services.

Chapter II describes the survey-based procedure and Chapter III describes the simulation procedure.



Source: Elnor Schwartz and Callow Associates, Inc. 1987

FIGURE 1
 COMMUTER BUS MARKET STUDY AREA

FINDINGS

Markets for a high-quality commuter bus service exist in each of the corridors studied. The features perceived by potential users as most important are those related to service quality -- e.g. always on time, express service, assured parking -- illustrating the importance of HOV lanes and park-ride facilities. Features related to comfort -- e.g. highback seats, rest rooms -- are far less important. The household survey data also show that potential riders are quite sensitive to the fares charged.

In the markets identified the likely morning inbound ridership at fares comparable to those of the planned Commuter Rail service would be:

<u>Corridor</u>	<u>A. M. Period Inbound Riders</u>
Route 7	175-200
I-66	500-800
I-95	1,750-2,250

These estimates are for the year 1990 and include those individuals already riding one of the existing bus services in each corridor. The estimates do not reflect the effects of any shift of riders to the Virginia Railway Express services.

II. HOUSEHOLD SURVEY ANALYSIS

METHODOLOGY

The household survey involved leaving a questionnaire at 1,000 households in each of six areas (one in Loudoun County and five in Prince William County). Copies of the questionnaires are contained in Appendix B. Completed questionnaires were picked-up two days after distribution. Response rates varied by area but averaged about twenty percent.

The data from the household surveys were used to:

- o Determine the features of bus service perceived as representing high-quality
- o Determine the distribution of workplace locations
- o Determine the stated fare sensitivity
- o Determine, based on household and worker characteristics, those workers most likely to use the bus service

FEATURES REPRESENTING HIGH-QUALITY SERVICE

The survey questionnaire presented to the respondent a list of features that might be elements of a "luxury" bus service. Respondents were asked to indicate for which of these features they would be willing to pay more. Table 1 presents the responses to these questions.

Although there are differences in the absolute magnitude of the responses between the two counties -- perhaps due to the fact that service currently is provided in Prince William County -- there is a general agreement on the ranking of features. The twelve quality bus features presented can be grouped into three general categories.

The most desired group deals with the primary service features -- always on time, express service and assured parking. These are aspects of the service that affect every trip every day.

TABLE 1

PROPORTION OF SURVEY RESPONDENTS WHO WOULD
 PAY MORE FOR SPECIFIC FEATURES
 (ONLY RESPONDENTS WHO WOULD CONSIDER USING THE SERVICE)

Feature	----- Prince William Co. -----					
	<u>Countryside</u>	<u>Woodbridge</u>	<u>Dale City</u>	<u>Lake Ridge</u>	<u>Manassas</u>	<u>Sudley</u>
Always on Time	50.6	30.8	36.5	39.0	38.2	31.8
Express Service	50.0	34.1	40.3	36.2	35.5	28.5
Assured Parking	44.2	22.7	27.8	33.6	31.6	28.8
Late Home Bus	33.8	21.3	27.4	23.1	18.4	15.8
Covered Waiting Area	32.5	22.7	23.3	23.3	22.8	20.8
Guaranteed Seat	31.8	23.2	27.4	25.4	24.1	17.9
Bus Priority Lane	29.2	19.9	26.4	25.6	17.5	20.5
Midday Home Bus	27.9	20.9	34.4	27.7	21.1	19.8
Highback Seat	15.6	12.3	16.7	15.9	13.6	9.2
Rest Rooms	12.3	9.0	18.1	7.7	6.6	12.5
Newspapers	7.1	2.4	5.6	3.6	5.3	3.8
Luggage Rack	2.6	2.4	7.3	4.4	2.6	2.8

The middle ranked group of features relates to aspects that affect occasional rider needs -- a midday or late home bus, covered waiting, and a guaranteed seat. The bus priority lane falls into this category as well; perhaps it is less obvious to the rider than express service.

The lowest ranked features are those of extra comfort and convenience -- highback seat, rest rooms, newspapers and luggage rack.

The conclusion that can be drawn is that passengers are less interested in extra comfort than in a fast, reliable service that they can count on for their daily trip. It is the service performance rather than the vehicle that, in the public mind, constitutes high quality service.

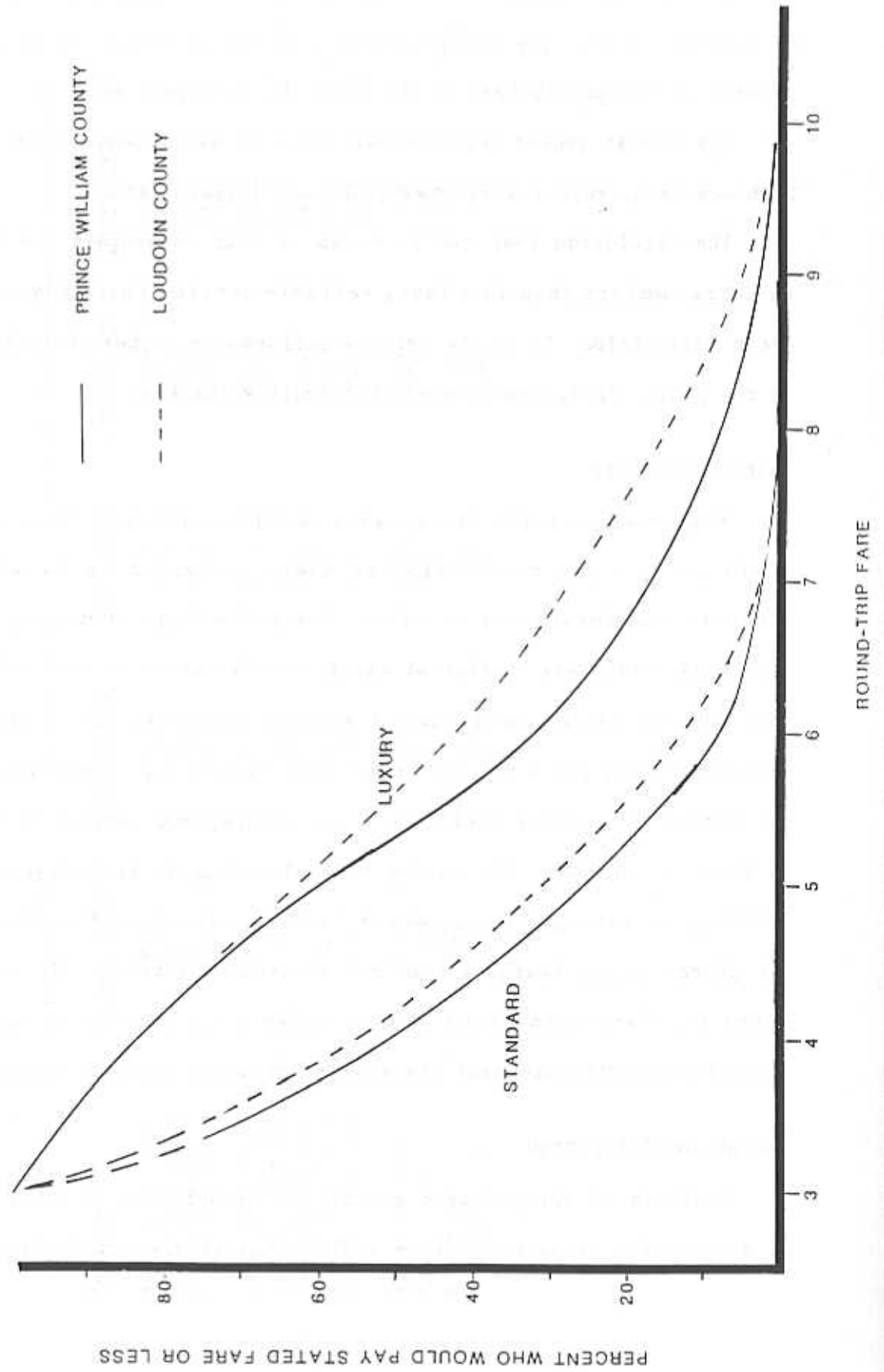
FARE SENSITIVITY

Respondents to the survey were asked to indicate the highest fare they would pay for the round trip for their current trip to work using both standard and luxury bus service. The percentage reporting specific fare levels was extremely consistent among the five areas in Prince William County. The Loudoun County data show a similar pattern, but a slightly greater willingness to pay a higher fare. (See Figure 2.) These data suggest that the ridership actually achieved on any offered bus service is quite sensitive to the fare charged. The survey data also suggest that respondents would be willing, on average, to pay about \$1.50 per day more for a service offering all of the luxury features than for a standard service. In our market estimates the "willingness to pay" is taken into account by applying a "fare factor" reflecting proposed charges and expected service features.

MARKET IDENTIFICATION

Analysis of the probable market for transit use is based on application of a screening process based on worker characteristics designed to eliminate

FIGURE 2
 REPORTED FARE ELASTICITY



those workers whose travel patterns, working conditions or other factors make transit use unlikely. Appendix C illustrates the results of the household survey screening for each area.

The screening factors, based on responses to questions, were:

1. Would you consider using the Luxury Bus Service? No -- exclude
2. Is work start time between 6:30 AM and 9:00 AM? No -- exclude
3. Is work end time between 3:30 PM and 7:00 PM? No -- exclude
4. Do you need your car at work? Yes -- exclude
5. Do you report to the same location three or more days per week? No -- exclude
6. Is current travel time less than thirty minutes? Yes -- exclude
7. Is worker an auto driver with free parking? Yes -- exclude
8. Does the worker drop children at school or day care? Yes -- exclude

The survey records (workers) remaining after this screening constitute the probable bus market for the surveyed areas before taking fare charges into account. The surviving records were then tabulated by work location. The number of probable bus users was then computed on a "per 1,000 household" basis for both all work trips and for trips to the core of the metropolitan area. These rates are tabulated in Table 2. As these rates are derived from survey data there is a possible error related to the size of the sample. For the core area rates the 95% confidence interval based on sample size is also shown.

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TABLE 2
POSSIBLE TRANSIT USERS PER 1,000 HOUSEHOLDS

<u>Survey Area</u>	<u>Total</u>	<u>To Core Area *</u>	
		<u>Mean</u>	<u>95% Confidence Interval</u>
Loudoun County	110	57	± 17
Woodbridge	172	117	± 23
Dale City	170	139	± 31
Lake Ridge	204	149	± 25
Manassas	120	75	± 22
Sudley	110	82	± 18

* Core Area includes downtown D.C., Pentagon, Rosslyn, Crystal City.

Because there is an average of two workers per household, a trip rate of 100 possible transit users per 1,000 households is equivalent to a transit choice of about five percent.

The market estimate is prepared by tabulating the number of households in the service area, applying the trip rates tabulated above, and adjusting for the willingness to pay stated fares.

Note that it is assumed that almost all users of a service would drive to a park-ride lot. A recent survey of Prince William Commuteride passengers showed that about seventy percent of bus riders used a car to get to the bus.

The potential transit service market was estimated by applying the rates per 1,000 households shown in Table 2 to data on the number of households in the service areas.

Sources used for household data were:

- o Prince William County Planning Office -- Population and Housing Estimates, January 1, 1988
- o Loudoun County Comprehensive Planning Division -- Loudoun County Growth Summary, February 1988

- o Stafford County Department of Planning and Community Development, Household Projections by Census Tract, 1980-2000, June 1984
- o Fairfax County -- Office of Research and Statistics

Household data were tabulated by COG zones (Loudoun Co. and Prince William Co.), COG district (Centreville area of Fairfax County) or areawide (Stafford Co.) Table 3 presents these data for 1985 and 1990. Figure 3 shows the location of COG zones in Prince William County, and Figure 4 shows the location of zones in Loudoun County and the Centreville District in Fairfax County. The groupings of household data are based on the expected service areas. Table 4 summarizes the household data by service area.

The potential market estimates were developed by applying the market rates derived from the surveys to the household data. Household data for 1990 have been used to represent the likely "near-future" condition. The potential market forecast is then modified by the factor derived from the survey reflecting the sensitivity of riders to the fares (See Table 5).

Specifically, for a service that had some, but not all, of the luxury features, about twenty percent of the potential riders expressed a willingness to pay fares at the levels specified for the analysis. A "fare factor" of 0.2 is applied to the estimate of potential demand to reflect this fare sensitivity.

FINDINGS

The household survey data presented in Appendix D and the household screening analysis presented in Appendix C illustrate the major factors affecting the markets. In the I-95 corridor forty to fifty percent of the workers are employed in the major bus service destination areas in Washington, Rosslyn, the Pentagon and Crystal City. In the I-66 and Route 7 corridors the proportions are twenty to thirty percent.

COG ANALYSIS DISTRICTS (CAD)

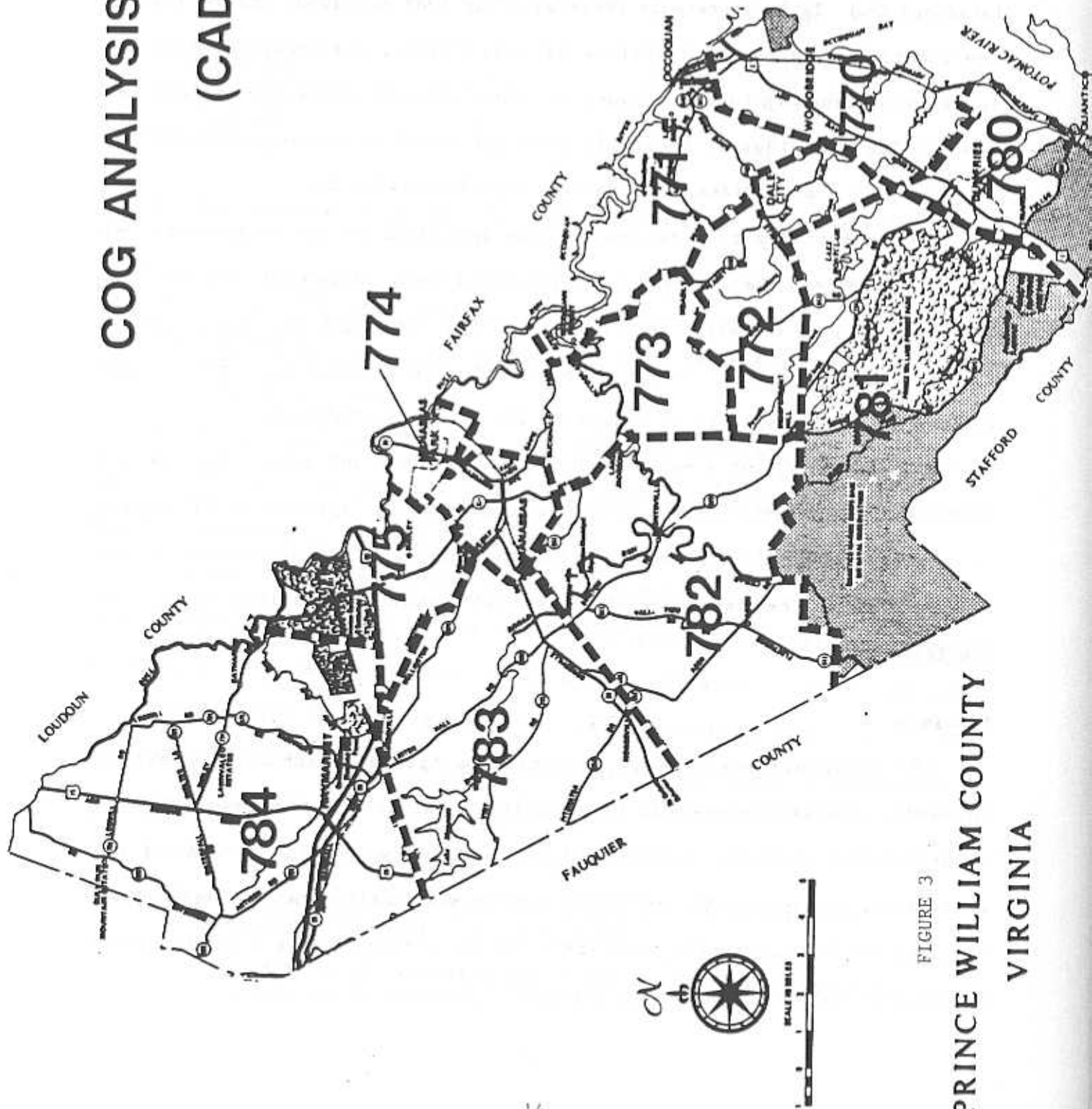


FIGURE 3
PRINCE WILLIAM COUNTY
VIRGINIA

Only about one third of the workers living in the bus service study areas will even consider using the bus -- the primary screening criteria. After accounting for screening factors the proportion of workers in the potential transit market ranges from six percent in Sudley to twelve percent in Lake Ridge. Of this potential market, the \$6 to \$7 daily round trip fare is more than four out of five workers are willing to pay.

For work travel to the DC core and the Pentagon/Crystal City area there is sufficient demand in each of the corridors studied that a market does exist for a high-quality bus service. The estimated markets using the household screening approach are:

MORNING INBOUND TRIPS

<u>Corridor</u>	<u>Mean</u>	<u>95% Confidence Interval</u>
Route 7	199	± 65
I-66	491	± 137
I-95	2,362	± 437

The household level data were also analyzed to determine if there were other destination areas, currently unserved, to which riders could be attracted. Applying the same procedures as used for core area trips yielded an estimated market for travel from the Woodbridge/Dale City/Lake Ridge area to Alexandria of 165 inbound trips. This suggests that a service offering three or four morning bus trips could attract ridership.

A similar analysis was conducted to determine if service to other employment centers such as Tysons Corner, Vienna or Fairfax City could attract adequate patronage. In these cases little or no market was found.

TABLE 3

NUMBER OF HOUSEHOLDS BY AREA

RT. 7/DULLES TOLL ROAD CORRIDOR

Loudoun County

Generally East of Route 28

<u>COG Zones</u>	<u>Households (1985)</u>	<u>Households (1990)</u>
671C	23	110
671D	409	496
671E	2,431	2,518
671F	2,326	2,673
672A	4,241	6,871
	<hr/>	<hr/>
Total	9,430	12,668

West of Route 28

<u>COG Zones</u>	<u>Households (1985)</u>	<u>Households (1990)</u>
671A	14	14
671B	29	29
681F	93	874
681G	71	852
682C	129	563
682D	4	351
682E	363	450
	<hr/>	<hr/>
Total	703	3,133

Leesburg

<u>COG Zones</u>	<u>Households (1985)</u>	<u>Households (1990)</u>
682G	1,387	1,647
682H	1,833	2,093
	<hr/>	<hr/>
Total	3,220	3,740

TABLE 3 (Continued)
NUMBER OF HOUSEHOLDS BY AREA

I-66 CORRIDOR

Fairfax County

<u>COG District</u>	<u>Households (1985)</u>	<u>Households (1990)</u>
573 (Centreville)	4,284	9,811

Loudoun County

<u>COG Zones</u>	<u>Households (1985)</u>	<u>Households (1990)</u>
680A	155	190
680B	91	100
680C	74	83
	—	—
Total	320	373

Prince William County

<u>COG Districts</u>	<u>Households (1985)</u>	<u>Households (1990)</u>
775	5,973	8,547
783	1,670	2,368
784	2,879	3,912
	—	—
Total	10,522	14,827

Manassas and Manassas Park

<u>COG District</u>	<u>Households (1985)</u>	<u>Households (1990)</u>
774	8,360	9,531

TABLE 3 (Continued)

NUMBER OF HOUSEHOLDS BY AREA

I-95 CORRIDOR

Prince William County

<u>COG Districts</u>	<u>Households (1985)</u>	<u>Households (1990)</u>
770 (Woodbridge)	8,155	9,275
771 (Lake Ridge)	8,769	11,461
772 (Dale City)	11,597	15,041
780 (Dumfries)	6,741	8,588
781 (Montclair)	5,869	9,793
Total	41,131	54,158

Stafford County

15,081

18,620

Spotsylvania County -- Market estimates based on household data
and Fredericksburg not developed. MWCOG trip data used.

TABLE 4
HOUSEHOLD DATA SUMMARIZED BY CORRIDOR

<u>Route 7/Dulles Toll Road Corridor</u>	<u>1985</u>	<u>1990</u>
East of Route 28	9,430	12,668
West of Route 28	703	3,133
Leesburg	3,220	3,740
	<hr/>	<hr/>
	13,353	19,541
<u>I-66 Corridor</u>	<u>1985</u>	<u>1990</u>
Fairfax County	4,284	9,811
Loudoun County	320	373
Prince William County	10,522	14,827
Manassas and Manassas Park	8,360	9,531
	<hr/>	<hr/>
Total	23,486	34,542
<u>I-95 Corridor</u>	<u>1985</u>	<u>1990</u>
Prince William County	41,131	54,158
Stafford County	15,081	18,620
	<hr/>	<hr/>
	57,212	72,778

TABLE 5

HOUSEHOLD BASED MARKET FORECASTS
(Morning In-bound Trips)

Route 7/Dulles Toll Road Corridor	1990 Households	Core Oriented Market Per 1,000 Households	Potential Riders	Fare Factor	Market Estimate
Loudoun County					
East of Route 28	12,668	57 ± 17	722 ± 215	0.20	144 ± 43
West of Route 28	3,133	57 ± 17	179 ± 53	0.20	36 ± 17
Leesburg	3,740	25 ± 7 *	94 ± 26	0.20	19 ± 5
Total	19,541		995 ± 294		199 ± 65
* Market rate reduced to reflect different trip orientation of Leesburg					
I-66 Corridor					
Loudoun County					
Prince William County	373	80 ± 20	30 ± 7	0.20	6 ± 1
Manassas and Manassas Park	14,827	80 ± 20	1,186 ± 296	0.20	237 ± 59
Fairfax County	9,531	80 ± 20	762 ± 191	0.20	152 ± 38
	9,811	80 ± 20	480 ± 196		96 ± 39
Total	34,542		2,458 ± 690		491 ± 137

TABLE 5
 HOUSEHOLD BASED MARKET FORECASTS
 (Morning In-bound Trips)

I-95 Corridor	1990 Households	Core Oriented		Potential Riders	Fare Factor	Market Estimate
		1990 Households	Market Per 1,000 Households			
Prince William County	54,158		140 ± 30	7,582 ± 1,624	0.20	1,516 ± 325
Stafford County	18,620		140 ± 30	2,606 ± 559	0.20	521 ± 112
Total	72,778			10,188 ± 2,183		2,037 ± 437
Spotsylvania County Fredericksburg and South (from MWCOC)						325
						2,362 ± 437

III. SIMULATION ANALYSIS

TRAVEL DEMAND METHODOLOGY

The simulation approach to quantifying the market for commuter bus service has utilized the sketch planning model assembled and calibrated for the NVTC Virginia Railway Express commuter rail patronage forecasting. The simulation has been applied in a two phase process; market analysis followed by route analysis. These two phases are separately described after an introduction to the travel demand estimation methodology employed.

The basic methodology is documented in full detail in the report -- Patronage and Revenue Forecasts for the Virginia Railway Express, prepared for the Northern Virginia Transportation Commission by Richard H. Pratt, Consultant, Inc. in association with the Metropolitan Washington Council of Governments, May 1987. The same "present year" transportation system and demographic assumptions have been used as were made in developing the 1987 patronage estimates of that study.

The study area has been modified to include the Dulles Toll Road/Route 7 corridor of Loudoun County. The modified study area is shown in Figure 5, which also depicts the analysis zones used. The study area expansion required development of highway and transit travel times, distances and fares for the new corridor zones. This was done utilizing the same MWCOG regional transportation network descriptions as formed the basis of the original sketch planning model.

Figure 6 illustrates the travel demand modeling steps of the simulation process. "Present year" work person trips (travel by all modes for the purpose of going to and from work) were obtained from previous MWCOG estimates and the external trip analysis of the commuter rail studies. Estimation of the split of trips between transit and highway, with highway including HOV

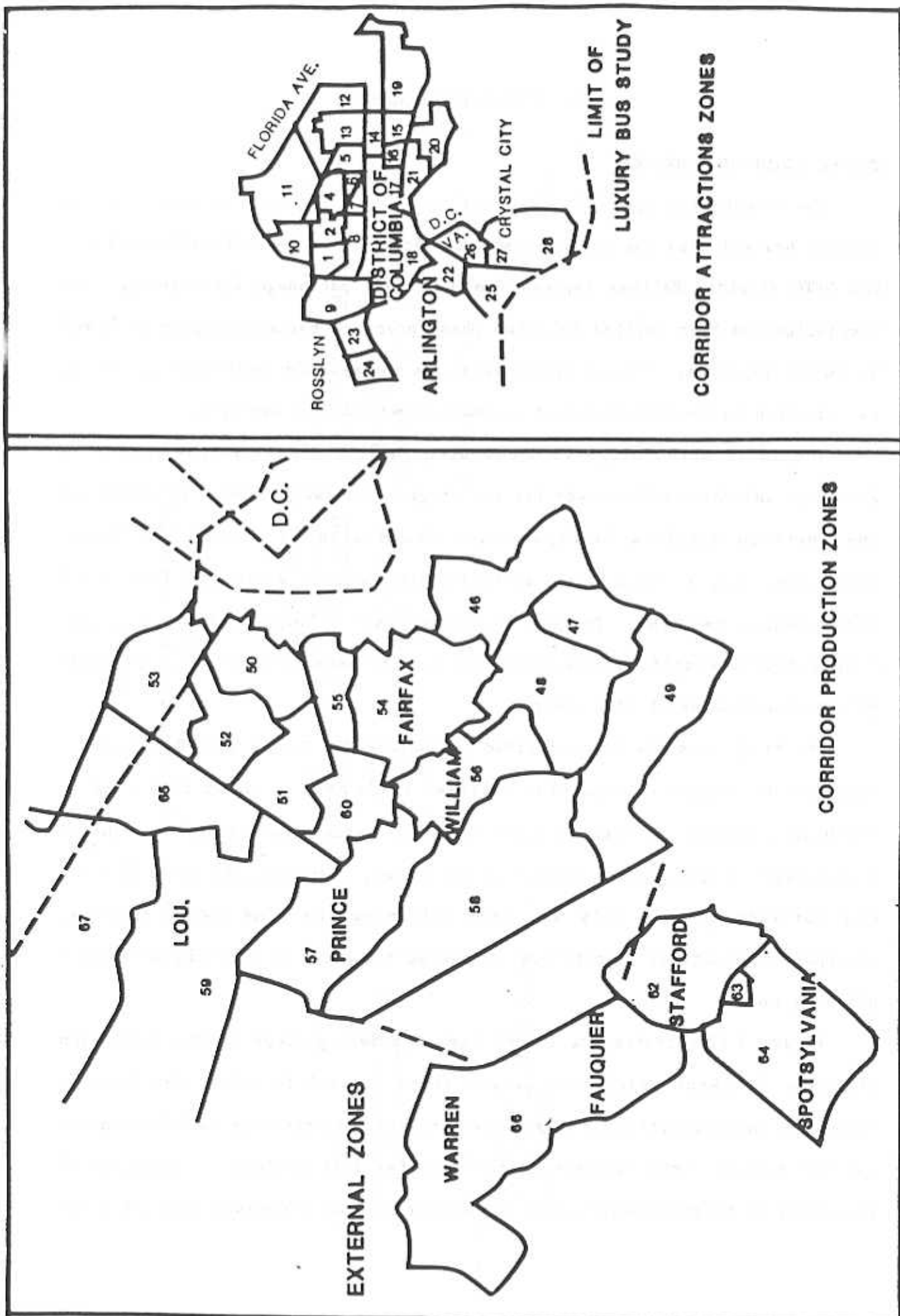


FIGURE 5
 NRTC COMMUTER BUS MARKET STUDY
 ANALYSIS ZONES

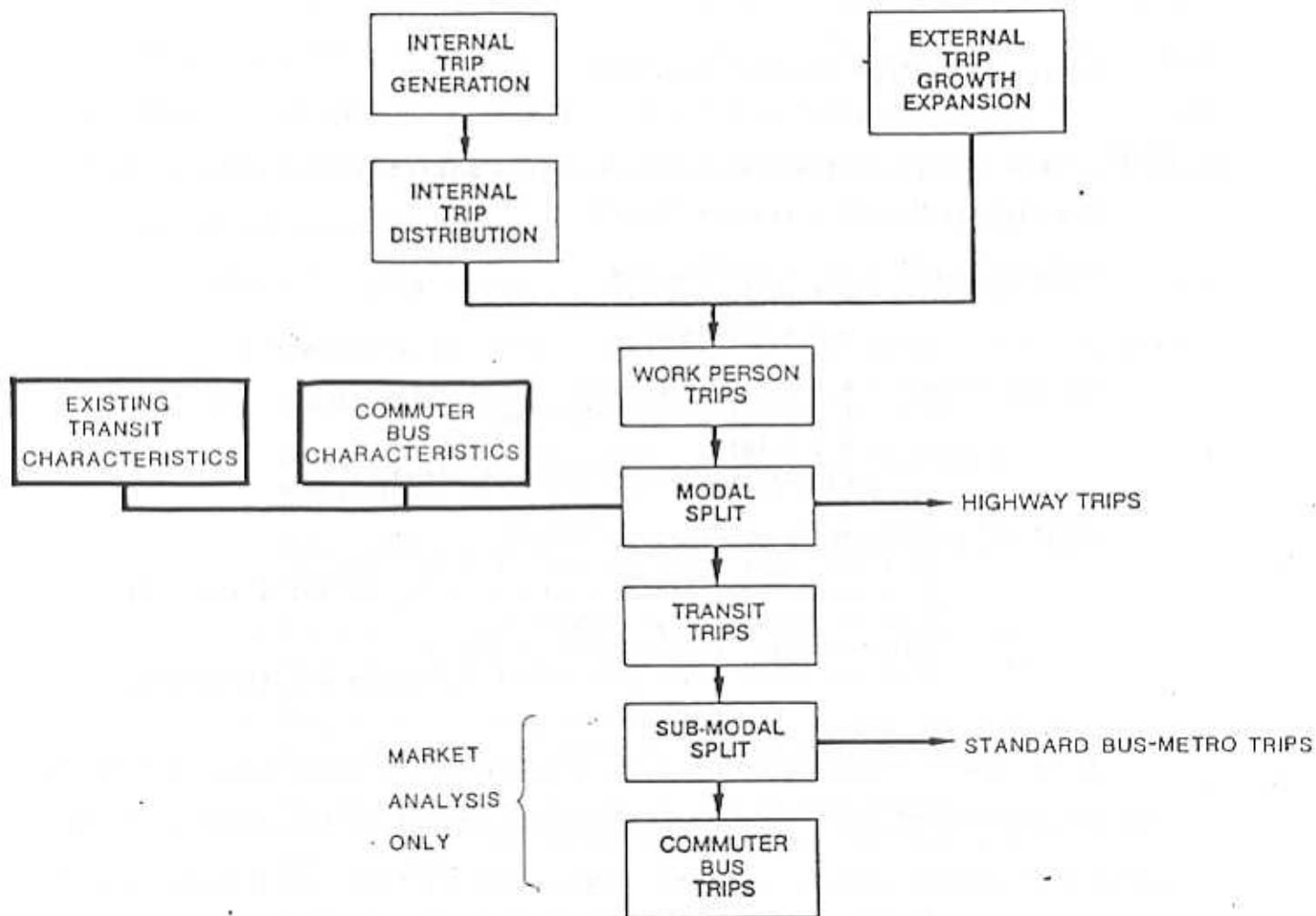


FIGURE 6

TRAVEL DEMAND MODEL CHAIN

facility usage, was accomplished with MWCOG's SIMS model. The SIMS model formulation used, as specifically calibrated for Northern Virginia to core area commutation in the commuter rail studies, is as follows:

$$\% \text{ using transit} = \text{constant} + 0.107X$$

where:

$$X = \text{highway "cost"} - \text{transit "cost"}$$

$$\begin{aligned} \text{highway "cost"} &= 0.5 \times \text{parking cost} \\ &+ 4 \times \text{highway time} \\ &+ 5 \times \text{distance} \end{aligned}$$

$$\begin{aligned} \text{transit "cost"} &= 4 \times \text{in-vehicle time} \\ &+ 8 \times \text{out-of-vehicle time} \\ &+ 1 \times \text{fare} \\ &(\text{18-minute auto-connect penalty}) \end{aligned}$$

$$\begin{aligned} \text{constant} &= 47.0 \text{ for inner zones to Ring 0} \\ &44.3 \text{ for inner zones to rest of core} \\ &34.2 \text{ for inner zones to rest of Arlington and Alexandria} \\ &39.8 \text{ for outer zones to Ring 0} \\ &37.2 \text{ for outer zones to rest of core} \\ &34.0 \text{ for outer zones to rest of Arlington and Alexandria} \end{aligned}$$

As is evident from the formulation, the SIMS model takes into account the characteristics of both highway and transit travel as described by travel times and travel costs. Travel times are further differentiated to distinguish between "in-vehicle" time spent riding, and the more onerous "out-of-vehicle" time spent waiting and walking. Carpool and vanpool HOV facility use was taken into account by use of a weighted average low occupancy vehicle and HOV travel time. No transit travel time adjustment factors were applied.

The sub-modal split element of the sketch planning model was utilized only in the market analysis and not, with one specific exception, in the route analysis. The market analysis phase is described next.

MARKET ANALYSIS

The market analysis involved an analytical search for markets with potential for productive "high quality" commuter bus service. At an initial meeting of the project steering committee it was determined that the primary features of such a bus service would include clean, comfortable, reliable, modern vehicles operating a high-speed, peak period service with a limited number of intermediate stops.

To describe this service and quantify service attributes for the simulation analysis, an initial service specification was developed representing a uniformly optimal operation. This included:

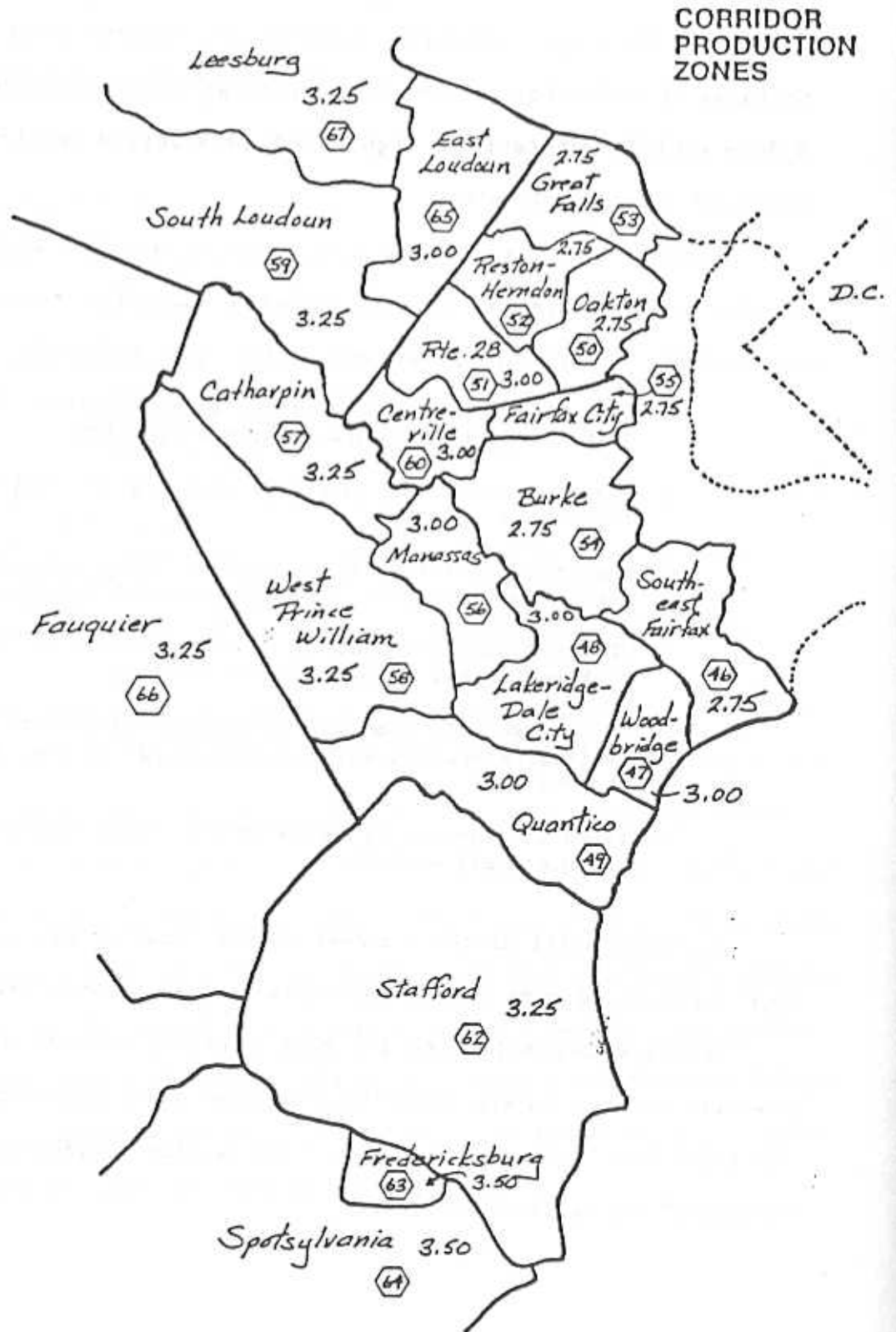
- o Operation from a park-ride lot in each residential district direct to each workplace district
- o Free parking at the park-ride lots and no parking space limitation
- o Bus travel times equal to the HOV travel times developed from MWCOG estimates, plus five minutes for circulation
- o Thirty minute frequency of service inbound in the morning peak period and outbound in the evening
- o An average wait time for the bus of ten minutes reflecting optimal morning and average evening arrival at the bus stop
- o Fares the same as or comparable to those used in the commuter rail studies

All residential district access to the commuter bus service was assumed to be by auto. Figure 7 presents the fares used in the analysis.

Travel times and costs for both existing transit and "high quality" commuter bus were entered into the SIMS model for estimation of transit trips. The model used whichever was best. The results yielded the "maximum market estimates" for an ideal service.

FIGURE 7

ONE-WAY FARES USED IN MODEL FOR MARKET ASSESSMENT



To complete the market analysis, these estimates were subjected to a sub-mode split analysis to determine what proportion of the transit trips would be made by existing transit as compared to commuter bus if the two were in competition. This computation was primarily a market identification device, providing an additional measure of where significant rider benefit would accrue from provision of "high quality" commuter bus service in substitution for or in addition to existing service. The sub-mode split model utilized was that originally adapted for the commuter rail studies, as described in the Virginia Railway Express patronage report.

Results from the market analysis are presented in Appendix A. The transit ridership estimates given there, by analysis zone and also totaled with and without Fairfax County, are the "maximum market estimates" obtained from the SIMS model application. Also given are totals identified as "Lux. better." These provide a more tightly defined estimation of commuter bus service viability by excluding ridership from sub-markets where sub-mode split model results indicate a minority of transit riders would choose the commuter bus service in preference to existing service.

In general, the market analysis results identify an area of commuter bus service viability shaped like the Virginia portion of a donut centered on the metropolitan core. The outer limits of the donut hole roughly correspond to the outer Fairfax County boundary. Inside the donut hole urban bus and Metrorail service is shown by the market analysis to be more appropriate than commuter bus service. The outer limits of the donut are defined by the outermost extent of trip density sufficient to support bus service.

The market analysis thus highlighted the areas most appropriate for examination of core oriented commuter bus service in the subsequent route analysis task. It also showed the demand for service into the downtown D. C.

portion of the core to be numerically greater than the demand for service into the Arlington portion of the core. Judgments as to commuter bus service potential for non-core destinations, given that non-core travel was not addressed in the simulation analysis, have been based on the survey analyses described in Chapter II.

ROUTE ANALYSIS

The "maximum market estimates" of the market analysis represent the largest amount of commuter bus ridership that might potentially be achieved. Because the bus operation assumed in the market analysis features almost direct service from each origin to each destination, these are not realistic estimates for a practical operation. The findings were, however, used to develop more specific route and frequency options for testing in the route analysis phase of the simulation analysis. They also provided the starting point for estimation of ridership for these more specific routes.

Service Description

The commuter bus route and frequency options developed for testing are presented below. All options are for peak period service only. The suburban area routings, park-ride/passenger pick-up locations, and market areas served are illustrated in Figure 8.

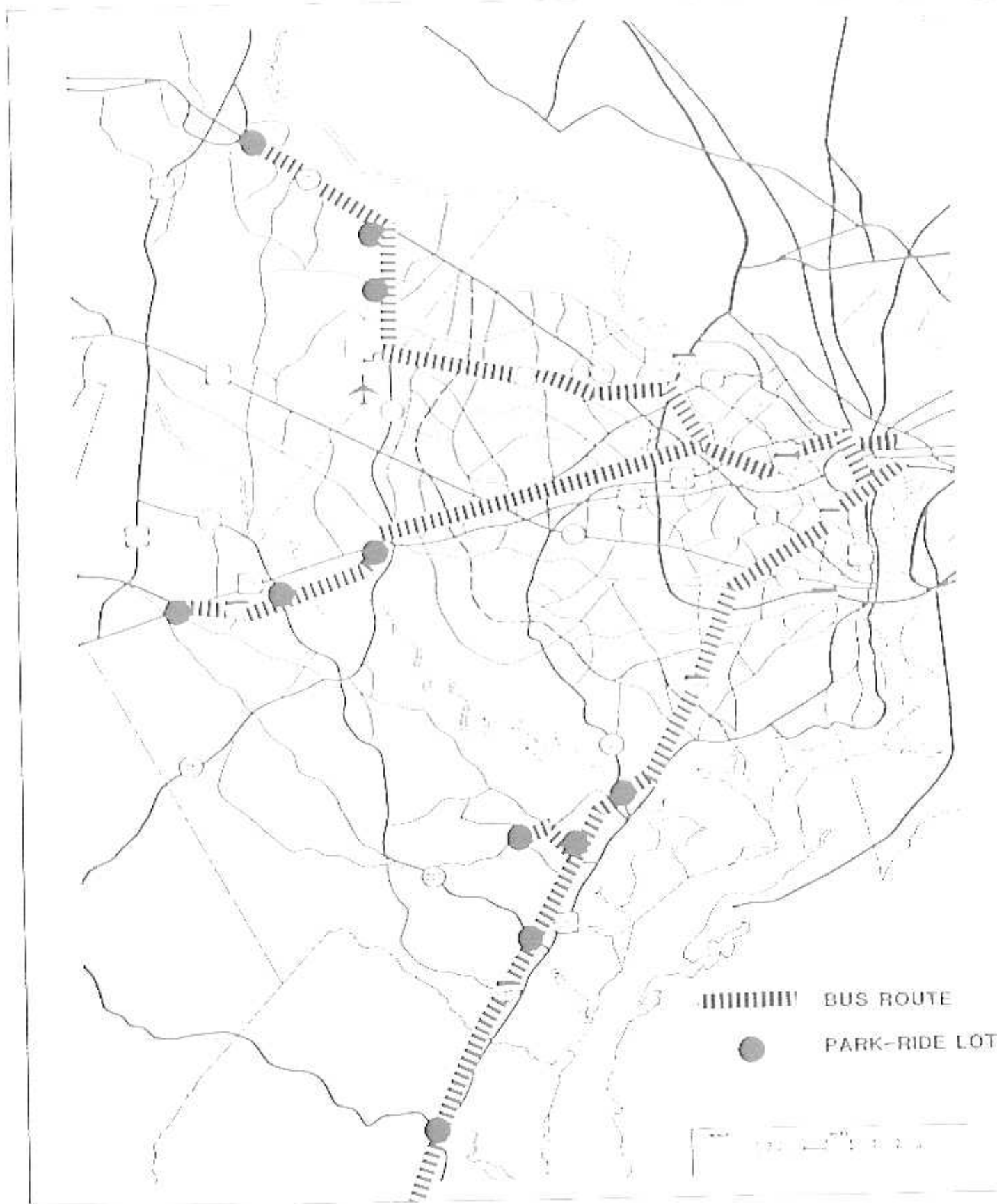


FIGURE 3

BUS ROUTES AND PARK-RIDE LOTS USED IN ANALYSIS

Route 7/Dulles Toll Road Corridor

Route: From park-ride lot just east of Leesburg via Route 7 to Route 28. Route 28 to Toll Road. Toll Road to Rosslyn, then to downtown DC via K Street to either Capital Hill or Southwest. Passengers to Pentagon or Crystal City transfer to Metrorail at Rosslyn.

Access: Park-ride lots

1. East of Leesburg on Route 7
2. Route 7 and Route 28
3. Route 28 and Sterling Parkway

Frequency: Inbound every 30 minutes from 6:00 AM to 8:00 AM (5 trips)

Fare: \$3.00 or \$3.25 per trip

I-66 Corridor

Routes:

- A. From Gainesville via I-66 to Route 234. Stop at park-ride lot. Continue on I-66 to Route 29. Stop at park-ride lot. Continue on I-66 to Rosslyn. Then to downtown via K Street to Capital Hill.
- B. From Gainesville as above stopping at park-ride lots. Then to Pentagon and via I-95 to Southwest.

Access: Park-ride lots

1. Gainesville
2. Route 234
3. Route 28

Note: Other park-ride locations could be used if access/egress are convenient.

Frequency: Inbound trips

Route A -- every 10 minutes 5:40 AM to 7:50 AM (14 trips)
Route B -- every 20 minutes 5:30 AM to 7:30 AM (7 trips)

Fare: Gainesville -- \$3.25; Manassas/Centreville -- \$3.00

I-95 Corridor

Routes:

A. Spotsylvania, Fredericksburg, Stafford

From I-95 and Route 3 via I-95 stopping at park-ride lots at Route 3, Route 17, Route 630 and Route 610. Then via I-95 to Pentagon.

Alternate trips to: a. Crystal City
b. 14th Street then to State Department

B1. Prince William to Pentagon/Crystal City

From park-ride lot at I-95 and Route 234 via I-95 stopping at park-ride lot at Dale Boulevard. Via I-95 to Pentagon then to Crystal City. Passengers to DC transfer at Pentagon to Metrorail or routes A or B2b.

B2a. Prince William to DC

From park-ride lot at Dale Boulevard and Minnville Road via Minnville and Smoketown Roads to Potomac Mills park-ride lot. Then via Telegraph and Horner Roads to I-95. Via I-95 to park-ride lot at Route 123 then via I-95 to DC. In DC via 14th Street and loop to State Department.

B2b. Prince William to DC

As for B2a, above, but with stop at Pentagon and Capital Hill loop in DC.

Frequency: Inbound trips

<u>Route</u>	<u>Frequency</u>	<u>Hours</u>	<u>Trips</u>
A	10 minutes	5:00 AM -- 7:20 AM	15
B1	10 minutes	5:30 AM -- 7:50 AM	15
B2a	12 minutes	5:40 AM -- 7:30 AM	10
B2b	12 minutes	5:52 AM -- 7:40 AM	10

Simulation Results

The "maximum market estimates" of the market analysis served as the point of departure for estimation of ridership for the specific commuter bus routings and frequencies tested. These estimates are of transit trips as simulated before application of the sub-mode split model, and thus reflect no competition with existing transit services. An implicit assumption of the route analysis is, therefore, that the commuter bus services being tested would operate in substitution for existing services.

Spreadsheet computations were used to progressively modify the "maximum market estimates" to provide simulation based ridership projections for each commuter bus routing tested. First, residential district adjustments were applied where needed to account for the travel time cost of more suburban passenger pick-up points than had been assumed in the market analysis. These adjustments were computed using the ridership response to travel time changes implied by the SIMS model formulation.

Next, the one exception to the assumption that existing services would be replaced was accommodated. This exception pertains to the Centreville area, within the WMATA zone of operation. To reflect assumed continuation of the WMATA service, a sub-mode split percentage was reapplied to transit trips from the Centreville zone. An earlier policy decision of the study was that WMATA and other urban transit services in Fairfax County would not be considered for replacement by commuter bus lines.

A final residential district adjustment was applied to account for frequency assumptions differing from those utilized in the market analysis. Again, the ridership response implied by the SIMS model formulation was used in the computation.

The first of two workplace district adjustments was applied to account for the travel time cost of more urban core stops than were assumed in the market analysis. Included in these adjustments was the travel time cost of indirectness of routing where this applied.

The second workplace district adjustment served to discount the estimate for trips to core area zones not directly served by the route in question. In lieu of full scale network analysis of downtown distribution, these adjustments were computed by analogy with the results obtained in the commuter rail studies for zones not directly served.

Table 6 gives the results of the simulation based route analysis. Following the listing of routes tested, the first column of figures gives the corresponding "maximum market estimate" from the market analysis. The next column gives the route specific estimate, derived by applying the adjustments described above. The last column lists the corresponding inbound ridership estimate.

It should be noted that the estimate for Route A in the I-95 corridor, which serves Stafford and Spotsylvania Counties along with the City of Fredericksburg, involves particular uncertainty. A very approximate estimate of actual 1987 bus ridership from that area, based on incomplete reporting, is 1,700 daily riders or 850 inbound, twice the simulated "maximum market estimate". This discrepancy may relate to the relatively poor travel data available for outside the MWCOC boundaries, or it may derive from the fact that many of the present day bus services involved are essentially large vanpools. In any case, consideration of "high quality" commuter bus operation into this particular area requires further analysis of the service performed by the existing private carriers.

TABLE 6

SIMULATION BASED RIDERSHIP ESTIMATES — ROUTE ANALYSIS

<u>Corridor</u>	<u>Maximum Market Estimate</u>	<u>Route Specific Estimate</u>	<u>Inbound Ridership Estimate</u>
Route 7/ Dulles Toll Road	509	355-379	178-190
I-66			
Route A	1,653 <u>a/</u>	1,193 <u>b/</u>	596
Route B	<u>c/</u>	383 <u>b/</u>	192
	—————	—————	—————
	1,653	1,576	788
I-95			
Route A	872	683	341
Route B1	2,997	440	220
Route B2a	<u>d/</u>	1,372	686
Route B2b	<u>d/</u>	1,006	503
	—————	—————	—————
Total	3,869	3,501	1,750

a/ Excludes Centreville

b/ Includes Centreville with sub-mode split applied

c/ Included within Route A maximum market estimate

d/ Included within Route B1 maximum market estimate

The range given for the Route 7/Dulles Toll Road corridor corresponds to two alternative downtown routings, one continuing from K Street east to Union Station and the other turning down from K Street to L'Enfant Plaza.

IV. CONCLUSIONS

MARKET POTENTIAL

The analysis described above bears out the hypothesis that markets for express transit services exist from the outer counties to the metropolitan core. Dependable and reliable express bus services supported by adequate park-ride facilities will generate sufficient demand to support reasonable service frequencies.

Table 7 presents a summary of the ridership estimates produced by the household survey screening in comparison with the simulation based route analysis results.

As will be noted there is reasonable agreement between the route analysis simulation derived from the SIMS model estimates and the results of the household survey analysis. Within the probable error of any patronage estimation technique, the markets can reasonably be taken to be:

<u>Corridor</u>	<u>Morning Inbound Trips</u>
Route 7/Dulles Toll Road	175-200
I-66	500-800
I-95	1,750-2,250

Specifically, the data suggest that the potential exists for the following services. Note that the patronage estimates given include all bus ridership from the market areas involved, implying either substitution of the new services for existing service, or else a lesser share for the new services.

TABLE 7

INBOUND PATRONAGE ESTIMATES — DETAILED ROUTE ANALYSIS

<u>Corridor</u>	<u>Estimated Current Ridership</u>	<u>Household Screening</u>	<u>Route Simulation</u>
Route 7/ Dulles Toll Road	70	199 ± 65	178-190
I-66			
Route A			596
Route B			192
	—	—	—
Total	200 <u>a/</u>	491 ± 137	788
I-95			
Route A			341
Route B1			220
Route B2a			686
Route B2b			503
	—	—	—
Total	1,350	2,362 ± 437	1,750

a/ Includes Centreville.

-- Morning Peak Period --

<u>Corridor</u>	<u>Routes</u>	<u>Bus Trips</u>	<u>Patronage</u>
Route 7/Dulles Toll Road	1	5	175-200
I-66	2	21	500-800
I-95	4	50	1,750-2,250

In addition the potential exists for a service from the Prince William portion of the I-95 corridor to Alexandria. This could attract about 165 daily inbound riders.

While Reston/Herndon and Vienna/McLean are significant workplace destinations for residents of the Route 7 and I-66 corridors, our analysis of the household survey data suggest that, under current conditions, bus service to these areas would not yield significant patronage. The household data screening analysis reveals that work places are scattered; parking is, for the most part, free; and most workers have life-style patterns that make transit use difficult. Less than one bus load of patrons could be expected for service to either Reston/Herndon or Vienna/McLean.

REVENUE ANALYSIS

The patronage estimates have been presented as a range representing both the standard error inherent in survey sampling and the application of two methods of patronage forecasting. The revenue estimates presented below are derived using the mid-point of the estimates for each corridor.

<u>Corridor</u>	<u>Mid-Point Ridership Estimate</u>	<u>Average Round- Trip Fare</u>	<u>Daily Revenue</u>	<u>Annual Revenue</u>
Route 7/ Dulles Toll Road	187.5	\$6.10	\$ 1,143.75	\$ 297,375
I-66	650.0	\$6.25	\$ 4,062.50	\$1,056,250
I-95	2,000.0	\$6.26	\$12,520.00	\$3,255,200

Effect of Different Fares

The data as reported in the household surveys suggest that ridership would be quite sensitive to the fare charged. The reported data suggest that a fare increase of \$1 would result in a loss of about one-half of the riders while a fare reduction of \$1 would roughly double the ridership. There are indeed a number of reasons why sensitivity to fare might indeed be especially high within the study area, including the availability of strong ridesharing programs, which in addition to their benefits, do serve as an alternative to transit use.

Even so, the ridership sensitivity implied by the survey results is substantially higher than has been observed in almost any actual fare change studied. The sensitivity suggested by the survey would indicate that gross revenue could be increased by lowering the fare and decreased by raising it. Actual results obtained nationwide indicate the opposite in most cases. Studies in other areas have shown that actual sensitivities to fares are smaller than those reported by survey respondents. There is also evidence that ridership is sometimes more sensitive to a fare increase than to a fare reduction. <1>

1. Ecosometrics, Inc., Patronage Impact of Changes in Transit Fares and Services, USDOT-UMTA Report No. RR 135-1, Washington, D.C.

The general rule of thumb for urban bus fare increases is that an overall fare increase of one percent will shrink ridership by approximately one third of one percent. In this case, a \$1 increase applied to a \$5 round trip fare would result in only a seven percent decrease in ridership. The sensitivity to suburban service fare changes is usually higher. The SIMS model application made in this study would suggest that a one-way fare change of \$0.50 would result in a twenty-six percent change in ridership. Using this relationship, charging round trip fares one dollar less than those used in the analysis would increase ridership by about one quarter. Adding one dollar to the round trip fare would yield ridership roughly three quarters of that shown above.

It is appropriate to conclude that ridership on the service studied would have a fairly high sensitivity to fares. It would be unwise to expect, however, that gross revenue could be increased by lowering the fare.

Effect of Different Frequencies

The route service frequencies used for the detailed analysis range from thirty minutes in the Route 7 corridor to ten and twelve minutes in the I-95 corridor. Since the services are designed for a limited number of suburban pick-up points, frequency is less critical than for a typical multiple stop service. Passenger pick-up times in the morning should be quite reliable and patrons will adjust their time in the morning to meet the schedule. The greatest effect will be for afternoon home-bound trips.

The frequency of service assumed has been balanced with the expected demand, but should be further developed during service design and implementation. Increasing the service frequency will have a relatively moderate effect on stimulating greater demand. Lesser frequency could lead to crowding which,

in turn, would discourage some riders until an equilibrium was reached. Implementation should include monitoring of passenger loadings and balancing of service with demand.

OTHER ISSUES

The analyses presented above document the existence of markets for high-quality commuter bus service in three radial corridors. Portions of these markets are already being served by a mix of public and private transit operations. Attracting the broader market will require stressing those factors perceived by users as constituting "high-quality" -- on-time express service with adequate parking at park-ride lots.

This suggests that there are public actions that could be pursued that would enhance the ability of the existing public and private carriers to attract ridership. These include:

- o Development of additional park-ride facilities at locations adjacent to the express bus routes
- o Continued development of HOV facilities that permit high speed express bus service free of the reliability problems associated with operating in congested traffic
- o Service coordination to provide patrons with frequent service. In the outer portion of the I-95 corridor there are several private operators. While there are about eighteen inbound trips each morning patrons who purchase multiple trip tickets can use only the portion of these trips offered by a particular operator. A coordination program could improve service quality.
- o The ability of current bus operators to park the buses close to downtown during the day contributes to efficient operation. Costs of deadheading vehicles to suburban garages are avoided. As the number of commuter bus services grows adequate, secure bus parking locations are becoming more difficult to find. Establishing a central area bus parking facility would enable all commuter bus operations to hold down both costs and fares.

NEXT STEPS

Given that markets exist for commuter bus services in the corridors studied and that existing operations carry only a portion of the market, what actions would be appropriate to increase transit use?

In two of the three corridors (I-95 and I-66) commuter rail service is scheduled to begin within two years. The rail operations coupled with existing bus services will accommodate most of the market. Continued development of park-ride facilities and HOV lanes will aid the existing transit operations.

In the Route 7/Dulles Toll Road corridor a rail service has been proposed. Even if the project is adopted it would not be in service for several years and, even then, would not reach the rapidly growing residential areas in eastern Loudoun County. Although the projected market in the Route 7 corridor is the lowest of the three corridors studied, it is the corridor having the least prospect for other near term transit improvements. Action in this corridor would complement regional actions already planned in the I-95 and I-66 corridors.

The smaller market in the Route 7 corridor means that luxury bus service could be implemented on a small scale involving both the least investment and the least risk. Park-ride lots could be small and would serve both bus patrons and persons in ridesharing arrangements.

Since this area is just now undergoing rapid growth, providing a luxury bus service would serve to establish the "transit habit" as new residents arrive, allowing the transit use pattern to be established before driving becomes routine. As growth continues, the service could be expanded as warranted.

In the I-66 corridor the greatest barrier to provision of luxury bus service is the daily traffic congestion on I-66 between Manassas and the Capital Beltway. Actions to provide HOV priority in this section are being planned. When implemented, the use of HOV facilities will permit a better quality bus service and will stimulate bus ridership.

In the I-95 corridor both public and private operators make use of existing park-ride lots and HOV facilities. Extension of the HOV lanes and creation of new park-ride sites will enhance these services.

APPENDIX A

"IDEAL SERVICE" MARKET ESTIMATES

USING SIMS MODEL

Application of SIMS Mode Choice Model
(Daily trips -- Production - Attraction Format)

Origin District	County	Corridor	Transit trips to/from:				Roslyn	Exist(0) or Lux(1)	Crystal City	Exist(0) or Lux(1)	Total
			Ring 0	Exist(0) or Lux(1)	Other DC	Exist(0) or Lux(1)					
60 Centreville	Fairfax	I-66	310	0	127	50	0	55	0	542	
55 Pfx City	Fairfax	I-66	944	0	332	142	0	146	0	1625	
54 Burke	Fairfax	I-66	943	0	473	85	0	530	0	2097	
51 Rt. 28	Fairfax	I-66	699	0	310	121	0	106	0	1236	
56 Fauquier	Fauquier	I-66	83	1	48	9	1	23	1	163	
59 S. Loudoun	Loudoun	I-66	310	0	127	50	0	55	0	542	
56 Manassas	Prince Wm	I-66	510	0	201	52	0	124	0	687	
57 Cathardin	Prince Wm	I-66	193	1	72	18	1	23	1	706	
58 W. Pw. Co.	Prince Wm	I-66	174	1	70	19	1	23	1	286	
Subtotal (without Fairfax) (Lux. better)			4172	1821	518	546	1145	248	69	7684	
46 SE Fairfax	Fairfax	I-95	669	0	309	58	0	556	0	1651	
63 Fredericksburg	Fred.	I-95	56	0	38	5	0	14	0	113	
47 Woodbridge	Prince Wm	I-95	366	1	132	14	1	110	0	622	
46 L.R./Dale City	Prince Wm	I-95	907	0	406	41	1	650	0	1314	
49 Dumfries	Prince Wm	I-95	216	1	98	15	1	67	0	290	
64 Scottsylvania	Scotts.	I-95	123	0	66	13	0	36	0	339	
62 Stafford	Stafford	I-95	275	0	132	27	0	30	0	524	
Subtotal (without Fairfax) (Lux. better)			2612	1340	772	173	1533	977	0	5758	
52 Reston/Hendon	Fairfax	Toll Rd.	1257	0	487	124	0	114	0	1502	
53 G. Falls	Fairfax	Toll Rd.	303	0	119	42	0	28	0	493	
50 Dorton	Fairfax	Toll Rd.	515	0	331	86	0	68	0	1200	
65 E. Loudoun	Loudoun	Toll Rd.	303	1	101	14	1	30	0	448	
67 Leesburg	Loudoun	Toll Rd.	33	1	12	2	1	4	1	53	
Subtotal (without Fairfax) (Lux. better)			2511	950	113	271	644	34	4	3976	
Total (without Fairfax) (Lux. better)			9395	4011	1503	990	2922	1359	73	17218	
			3549	1503	820	279	1359	1359	73	6993	
			1358	820		132	73			2373	

APPENDIX B

HOUSEHOLD SURVEY QUESTIONNAIRES

Northern Virginia Transportation Commission Survey For LOUDOUN COUNTY



COMMONWEALTH OF VIRGINIA
COUNTY OF LOUDOUN

BOARD OF SUPERVISORS
18 NORTH KING STREET
LEESBURG, VIRGINIA 22078-1881

TELEPHONE 777-0200

NORTHERN VIRGINIA TRANSPORTATION COMMISSION SURVEY FOR LOUDOUN COUNTY

Dear Resident:

The Northern Virginia Transportation Commission (NVTC) is conducting a travel survey of households in your area of Loudoun County. The purpose of this survey is to determine residents' commuting needs. The information you provide will be helpful in determining potential markets for future transportation improvements.

Please take a few minutes to complete this survey and leave it on your doorknob in the plastic bag provided by 10:00 a.m. Saturday. The information you provide will be kept completely confidential and will not be used for any other purpose.

With kindest regards,

Betty W. Tatum

Betty W. Tatum, Chairman
Loudoun County Supervisors
Guilford District

Ann B. Kavanagh

Ann B. Kavanagh
Loudoun County Supervisor
Dulles District

Alice G. Bird

Alice G. Bird
Loudoun County Supervisor
Sterling District

Steve W. Stockman

Steve W. Stockman
Loudoun County Supervisor
Broad Run District

Betty W. Tatum, Chairman
Guilford District

Alice G. Bird
Sterling District

James F. Brownell
Blue Ridge District

Steve W. Stockman
Broad Run District

Charles A. Bos
Leesburg District

Betsy Brown
Cedar District

Thomas E. Dodson
Marshall District

Ann B. Kavanagh
Dulles District

INSTRUCTIONS

- a. All persons in the household who are employed outside of the home should respond on this one questionnaire.
- b. Please place the completed survey in the plastic bag and attach it to your front door by 10 a.m., Saturday.

QUESTIONS ABOUT YOUR HOUSEHOLD

- 1. How many people live in your household? (1)
- 2. How many are 18 years old or older? (2)
- 3. How many are employed outside the home, either full-time or part-time? (3)
- 4. How many have difficulty driving or using public transit due to a physical or mental handicap? (4)
- 5. How many vehicles are available for commuting to work (autos, pickups, vans, motorcycles, etc.)? (5)
- 6. Housing Type? Single Family Detached 1. (6)
Town House 2.
Apartment or Apartment/Condominium 3.

IF NO ONE IS EMPLOYED OUTSIDE THE HOUSEHOLD, STOP HERE.

QUESTIONS ABOUT INDIVIDUAL WORKERS EMPLOYED OUTSIDE OF THE HOME

(NOTE: Three workers can use this same questionnaire. If there are more than three in the household, additional workers can respond in the margins.)

WORKER #1

- 7. Where do you work (address or nearest street intersection)?
street address (7-11)
city/town state zip code (Very Important)
In a typical week, how many days do you report to this location? 1. 2. 3. 4. 5. 6. 7. (12)

ANSWER QUESTIONS IN COLUMN 1, NEXT PAGE.

WORKER #2

- 8. Where do you work (address or nearest street intersection)?
street address (7-11)
city/town state zip code (Very Important)
In a typical week, how many days do you report to this location? 1. 2. 3. 4. 5. 6. 7. (12)

ANSWER QUESTIONS IN COLUMN 2, NEXT PAGE.

WORKER #3

- 9. Where do you work (address or nearest street intersection)?
street address (7-11)
city/town state zip code (Very Important)
In a typical week, how many days do you report to this location? 1. 2. 3. 4. 5. 6. 7. (12)

ANSWER QUESTIONS IN COLUMN 3, NEXT PAGE.

Worker #1 Worker #2 Worker #2

10. Sex Male 1. 1. 1. (13)
Female 2. 2. 2.

11. Whether you use it or not, do you have a vehicle available to drive to work? Yes 1. 1. 1. (14)
No 2. 2. 2.

12. How do you travel to work on a typical day?
(Check all that apply.) Drive Alone 1. 1. 1. (15)
Driver or rider in a carpool 1. 1. 1. (16)
Driver or rider in a vanpool 1. 1. 1. (17)
Bus 1. 1. 1. (18)
Metrorail 1. 1. 1. (19)
Other (specify) 1. 1. 1. (20)

NOTE:
A carpool may include
other household members

13. What time do you start work? A.M. _____ (21-24)
P.M. _____

14. What time do you leave work? A.M. _____ (25-28)
P.M. _____

15. How long does it take you to get to work? Minutes _____ (29-31)

16. Is your workplace served by Metrorail (within walking distance of a station)? Yes 1. 1. 1. (32)
No 2. 2. 2.

17. Have you ever used public transit on a regular basis to commute to work
(in this area or elsewhere)? Yes 1. 1. 1. (33)
No 2. 2. 2.

18. Have you ever heard of the Sterling Commuter Bus? Yes 1. 1. 1. (34)
No 2. 2. 2.

19. Do you usually need your car at work? Yes 1. 1. 1. (35)
No 2. 2. 2.

20. Do you drop off or pick up children at school or day care on your way
to or from work? Yes 1. 1. 1. (36)
No 2. 2. 2.

21. What does it cost you to park? Per Day \$ _____ \$ _____ \$ _____ (37-40)

22. If you currently commute in a carpool or vanpool what is your cost? Per Month \$ _____ \$ _____ \$ _____ (41-44)

23. If you currently commute in a carpool or vanpool, how many persons (including yourself)
are in the vehicle on a typical day? _____ _____ _____ (45-46)

Sterling Commuter Bus now runs bus service from the Sterling area to the Pentagon, Rosslyn, and to the District of Columbia. The current fare is \$6.20 per round trip.

		Worker #1	Worker #2	Worker #3	
24. Have you ever been a regular rider on the Sterling Commuter Bus?.....	Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(47)
	No	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
25. Sterling Commuter bus is a reliable service?	Agree	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(48)
	Disagree	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
	Don't Know	3. <input type="checkbox"/>	3. <input type="checkbox"/>	3. <input type="checkbox"/>	
	Don't Know				
26. Would you use this bus service if: (Check all that apply)					
a. It were closer to your home?		1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(49)
b. It operated more frequently?		1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(50)
c. It were less expensive?		1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(51)
d. It served other destinations?					
(specify)					(52-53)
e. I would not use it in any case.		1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(54)

And now a few questions about another type of bus service. A "luxury bus" service would have one or more of the attributes listed below and run express (fewer stops).

27. Which of these special attributes would you be willing to pay more for? (Check all that apply)					
a. A guaranteed seat		1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(56)
b. A very comfortable high-back seat with reading lights		1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(56)
c. Express service to your destination		1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(57)
d. Use of bus priority lane		1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(58)
e. Rest rooms on board		1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(59)
f. Newspapers available		1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(60)
g. Luggage rack		1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(61)
h. Always on time		1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(62)
i. Assured parking at bus stop		1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(63)
j. Covered waiting area		1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(64)
k. A late homebound bus (8 P.M.)		1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(65)
l. Mid-day homebound service		1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(66)

28. Would you consider using the luxury bus service?	Yes	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(67)
	No.	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	

29. Please check the round trip fare you would be willing to pay for standard service, and for "luxury" service for your current trip to work.

	Worker #1		Worker #2		Worker #3		
	Standard	Luxury	Standard	Luxury	Standard	Luxury	
\$10 round trip	10. <input type="checkbox"/>	10. <input type="checkbox"/>	10. <input type="checkbox"/>	10. <input type="checkbox"/>	10. <input type="checkbox"/>	10. <input type="checkbox"/>	(68-69)
\$ 9 round trip	9. <input type="checkbox"/>	9. <input type="checkbox"/>	9. <input type="checkbox"/>	9. <input type="checkbox"/>	9. <input type="checkbox"/>	9. <input type="checkbox"/>	
\$ 8 round trip	8. <input type="checkbox"/>	8. <input type="checkbox"/>	8. <input type="checkbox"/>	8. <input type="checkbox"/>	8. <input type="checkbox"/>	8. <input type="checkbox"/>	
\$ 7 round trip	7. <input type="checkbox"/>	7. <input type="checkbox"/>	7. <input type="checkbox"/>	7. <input type="checkbox"/>	7. <input type="checkbox"/>	7. <input type="checkbox"/>	
\$ 6 round trip	6. <input type="checkbox"/>	6. <input type="checkbox"/>	6. <input type="checkbox"/>	6. <input type="checkbox"/>	6. <input type="checkbox"/>	6. <input type="checkbox"/>	
\$ 5 round trip	5. <input type="checkbox"/>	5. <input type="checkbox"/>	5. <input type="checkbox"/>	5. <input type="checkbox"/>	5. <input type="checkbox"/>	5. <input type="checkbox"/>	
\$ 4 round trip	4. <input type="checkbox"/>	4. <input type="checkbox"/>	4. <input type="checkbox"/>	4. <input type="checkbox"/>	4. <input type="checkbox"/>	4. <input type="checkbox"/>	
\$ 3 round trip	3. <input type="checkbox"/>	3. <input type="checkbox"/>	3. <input type="checkbox"/>	3. <input type="checkbox"/>	3. <input type="checkbox"/>	3. <input type="checkbox"/>	

30. If the "luxury" bus made an intermediate stop at a Metrorail Station before reaching downtown permitting you to transfer to Metrorail, how would it affect your likelihood of use?

	Worker #1	Worker #2	Worker #3	
No effect -- wouldn't use under any circumstances	1. <input type="checkbox"/>	1. <input type="checkbox"/>	1. <input type="checkbox"/>	(70)
No effect -- still might use it	2. <input type="checkbox"/>	2. <input type="checkbox"/>	2. <input type="checkbox"/>	
More likely to use it	3. <input type="checkbox"/>	3. <input type="checkbox"/>	3. <input type="checkbox"/>	
Less likely to use it	4. <input type="checkbox"/>	4. <input type="checkbox"/>	4. <input type="checkbox"/>	

Please place the completed survey in the plastic bag and attach it to your front door by 10:00 AM, Saturday.

PRINCE WILLIAM COUNTY TRANSPORTATION SURVEY

357



COUNTY EXECUTIVE
Robert S. Nue, Jr.

COUNTY OF PRINCE WILLIAM
1 County Complex Court, Prince William, Virginia 22192-9201
703-335-6600 Metro 631-1703

BOARD OF COUNTY SUPERVISORS

Kathleen K. Seefeldt, Chairman
John D. Jenkins, Vice Chairman
Hilda M. Bang
William J. Becker
Robert L. Cole
Edwin C. King
Terrence Speltane

February, 1988

Dear Resident,

Prince William County is conducting a travel survey of households in the county. The main purpose of this survey is to determine residents' commuting needs. The information you provide will be used to shape future transportation policies in your community.

Please take a few minutes to complete this survey and leave it on your doorknob in the plastic bag provided by 10:00 A.M. Saturday. The information you provide will be kept completely confidential and will not be used for any other purpose.

Very truly yours,

Kathleen K. Seefeldt
Kathleen K. Seefeldt

INSTRUCTIONS

- a. All persons in the household who are employed outside of the home should respond on this one questionnaire.
- b. Please place the completed survey in the plastic bag and attach it to your front door by 10 a.m., Saturday.

QUESTIONS ABOUT YOUR HOUSEHOLD

- 1. How many people live in your household? _____ (1)
- 2. How many are 18 years old or older? _____ (2)
- 3. How many are employed outside the home, either full-time or part-time? _____ (3)
- 4. How many have difficulty driving or using public transit due to a physical or mental handicap? _____ (4)
- 5. How many vehicles are available for commuting to work (autos, pickups, vans, motorcycles, etc.)? _____ (5)
- 6. Housing Type? _____ Single Family Detached 1. (6)
Town House 2.
Apartment or Apartment/Condominium 3.

IF NO ONE IS EMPLOYED OUTSIDE THE HOUSEHOLD, STOP HERE.

QUESTIONS ABOUT INDIVIDUAL WORKERS EMPLOYED OUTSIDE OF THE HOME

(NOTE: Three workers can use this same questionnaire. If there are more than three in the household, additional workers can respond in the margins.)

WORKER #1

7. Where do you work (address or nearest street intersection)?

street address _____ (7-11)

city/town _____ state _____ zip code _____ (Very Important)

In a typical week, how many days do you report to this location? 1. 2. 3. 4. 5. 6. 7. (12)

ANSWER QUESTIONS IN COLUMN 1, NEXT PAGE.

WORKER #2

8. Where do you work (address or nearest street intersection)?

street address _____ (7-11)

city/town _____ state _____ zip code _____ (Very Important)

In a typical week, how many days do you report to this location? 1. 2. 3. 4. 5. 6. 7. (12)

ANSWER QUESTIONS IN COLUMN 2, NEXT PAGE.

WORKER #3

9. Where do you work (address or nearest street intersection)?

street address _____ (7-11)

city/town _____ state _____ zip code _____ (Very Important)

In a typical week, how many days do you report to this location? 1. 2. 3. 4. 5. 6. 7. (12)

ANSWER QUESTIONS IN COLUMN 3, NEXT PAGE.

Worker #1 Worker #2 Worker #2

10. Sex Male 1. 1. 1. (13)
Female 2. 2. 2.
11. Whether you use it or not, do you have a vehicle available to drive to work? Yes 1. 1. 1. (14)
No 2. 2. 2.
12. How do you travel to work on a typical day?
(Check all that apply.) Drive Alone 1. 1. 1. (15)
Driver or rider in a carpool 1. 1. 1. (16)
Driver or rider in a vanpool 1. 1. 1. (17)
Bus 1. 1. 1. (18)
Metrorail 1. 1. 1. (19)
Other (specify) 1. 1. 1. (20)
- NOTE:**
A carpool may include
other household members
13. What time do you start work? A.M. _____ (21-24)
P.M. _____
14. What time do you leave work? A.M. _____ (25-28)
P.M. _____
15. How long does it take you to get to work? Minutes _____ (29-31)
16. Is your workplace served by Metrorail (within walking distance of a station)? Yes 1. 1. 1. (32)
No 2. 2. 2.
17. Have you ever used public transit on a regular basis to commute to work
(in this area or elsewhere)? Yes 1. 1. 1. (33)
No 2. 2. 2.
18. Have you ever heard of COMMUTERIDE? Yes 1. 1. 1. (34)
No 2. 2. 2.
19. Do you usually need your car at work? Yes 1. 1. 1. (35)
No 2. 2. 2.
20. Do you drop off or pick up children at school or day care on your way
to or from work? Yes 1. 1. 1. (38)
No 2. 2. 2.
21. What does it cost you to park? Per Day \$ _____ \$ _____ \$ _____ (37-40)
22. If you currently commute in a carpool or vanpool what is your cost? Per Month \$ _____ \$ _____ \$ _____ (41-44)
23. If you currently commute in a carpool or vanpool, how many persons (including yourself)
are in the vehicle on a typical day? _____ _____ _____ (45-46)

APPENDIX C

RESULTS OF HOUSEHOLD SURVEY SCREENING

HOUSEHOLD SURVEY SCREENING RESULTS

AREA: COUNTRYSIDE

Total Workers	393			
Consider using Luxury Bus	----->	No, exclude	270	68.7%
	123	31.3%		
Work start time between	----->	No, exclude	17	4.3%
6:30 A.M. and 9:00 A.M.				
	106	27.0%		
Work end time between	----->	No, exclude	9	2.3%
3:30 P.M. and 7:00 P.M.				
	97	24.7%		
Need car at work	----->	Yes, exclude	17	4.3%
	80	20.4%		
Report to same location	----->	No, exclude	4	1.0%
3 or more days/week				
	76	19.3%		
Current travel time	----->	No, exclude	6	1.5%
30 min. or more				
	70	17.8%		
Current auto driver	----->	Yes, exclude	38	9.7%
with free parking				
	32	8.1%		
Drop children at	----->	Yes, exclude	7	1.8%
school or daycare				
	25	6.4%		
Possible transit market				

HOUSEHOLD SURVEY SCREENING RESULTS

AREA: WOODBRIDGE

Total Workers	211			
Consider using Luxury Bus	-----)	No, exclude	144	68.2%
	67	31.8%		
Work start time between	-----)	No, exclude	9	4.3%
6:30 A.M. and 9:00 A.M.				
	58	27.5%		
Work end time between	-----)	No, exclude	4	1.9%
3:30 P.M. and 7:00 P.M.				
	54	25.6%		
Need car at work	-----)	Yes, exclude	7	3.3%
	47	22.3%		
Report to same location	-----)	No, exclude	1	0.5%
3 or more days/week				
	46	21.8%		
Current travel time	-----)	No, exclude	2	0.9%
30 min. or more				
	44	20.9%		
Current auto driver	-----)	Yes, exclude	18	8.5%
with free parking				
	25	12.3%		
Drop children at	-----)	Yes, exclude	4	1.9%
school or daycare				
	22	10.4%		
Possible transit market				

HOUSEHOLD SURVEY SCREENING RESULTS

AREA: DALE CITY

Total Workers	284			
↓				
Consider using Luxury Bus	----->	No, exclude	188	66.2%
	96	33.8%		
↓				
Work start time between 6:30 A.M. and 9:00 A.M.	----->	No, exclude	19	6.7%
	77	27.1%		
↓				
Work end time between 3:30 P.M. and 7:00 P.M.	----->	No, exclude	8	2.8%
	69	24.3%		
↓				
Need car at work	----->	Yes, exclude	15	5.3%
	54	19.0%		
↓				
Report to same location 3 or more days/week	----->	No, exclude		
	54	19.0%		
↓				
Current travel time 30 min. or more	----->	No, exclude	6	2.1%
	48	16.9%		
↓				
Current auto driver with free parking	----->	Yes, exclude	16	5.6%
	32	11.3%		
↓				
Drop children at school or daycare	----->	Yes, exclude	7	2.5%
	25	8.8%		
↓				
Possible transit market				

HOUSEHOLD SURVEY SCREENING RESULTS

AREA: LAKE RIDGE

Total Workers	384			
∨				
Consider using Luxury Bus	----->	No, exclude	240	62.5%
	144	37.5%		
∨				
Work start time between	----->	No, exclude	30	7.8%
6:30 A.M. and 9:00 A.M.				
	114	29.7%		
∨				
Work end time between	----->	No, exclude	9	2.3%
3:30 P.M. and 7:00 P.M.				
	105	27.3%		
∨				
Need car at work	----->	Yes, exclude	21	5.5%
	84	21.9%		
∨				
Report to same location	----->	No, exclude	1	0.3%
3 or more days/week				
	83	21.6%		
∨				
Current travel time	----->	No, exclude	6	1.6%
30 min. or more				
	77	20.1%		
∨				
Current auto driver	----->	Yes, exclude	25	6.5%
with free parking				
	52	13.5%		
∨				
Drop children at	----->	Yes, exclude	4	1.0%
school or daycare				
	48	12.5%		
∨				
Possible transit market				

HOUSEHOLD SURVEY SCREENING RESULTS

AREA: MANASSAS SOUTH

Total Workers	329			
Consider using Luxury Bus	----->	No, exclude	154	67.5%
	74	32.5%		
Work start time between	----->	No, exclude	12	5.3%
6:30 A.M. and 9:00 A.M.				
	62	27.2%		
Work end time between	----->	No, exclude	5	2.2%
3:30 P.M. and 7:00 P.M.				
	57	25.0%		
Need car at work	----->	Yes, exclude	11	4.8%
	46	20.2%		
Report to same location	----->	No, exclude		
3 or more days/week				
	46	20.2%		
Current travel time	----->	No, exclude	9	3.3%
30 min. or more				
	37	16.2%		
Current auto driver	----->	Yes, exclude	11	4.8%
with free parking				
	26	11.4%		
Drop children at	----->	Yes, exclude		
school or daycare				
	26	11.4%		
Possible transit market				

HOUSEHOLD SURVEY SCREENING RESULTS

AREA: MANASSAS/SUDLEY

Total Workers	417			
Consider using Luxury Bus	----->	No, exclude	297	71.2%
	120	28.8%		
Work start time between	----->	No, exclude	25	6.0%
6:30 A.M. and 9:00 A.M.				
	95	22.8%		
Work end time between	----->	No, exclude	7	1.7%
3:30 P.M. and 7:00 P.M.				
	88	21.1%		
Need car at work	----->	Yes, exclude	29	7.0%
	59	14.1%		
Report to same location	----->	No, exclude	2	0.5%
3 or more days/week				
	57	13.7%		
Current travel time	----->	No, exclude	7	1.7%
30 min. or more				
	50	12.0%		
Current auto driver	----->	Yes, exclude	26	6.2%
with free parking				
	24	5.8%		
Drop children at	----->	Yes, exclude		
school or daycare				
	24	5.8%		
Possible transit market				

APPENDIX D

SUMMARY FINDINGS
OF HOUSEHOLD SURVEYS

LOUDOUN COUNTY HOUSEHOLD SURVEY
 Summary of Findings 25-Mar-88

Persons per Household (percent of households)			
Persons	Single-family	Townhouse	All
1	8.5	13.8	10.8
2	27.0	37.9	31.1
3	20.6	27.6	23.2
4	31.9	17.2	26.3
5	9.9	3.4	7.5
6	2.1	-	1.3
Mean	3.21	2.58	2.93

Number Employed Outside of Home (percent of households)			
Number	Single-family	Townhouse	All
1	35.3	33.3	34.2
2	56.8	62.0	58.3
3	5.8	4.6	5.7
4	2.2	-	1.8
Mean	1.75	1.71	1.75

Vehicle Available for Commuting (percent of households)			
Number	Single-family	Townhouse	All
1			15.4
2			66.7
3			14.9
4			2.6
5			0.4
Mean			2.061

Would consider using bus service (percent of households)			
	Single-family	Townhouse	All
	40.7	36.7	39.2

Vehicle Available for Commuting (percent of workers)			
	Single-family	Townhouse	All
Yes	98.8	96.7	98.0
No	1.2	3.3	2.0

LOUDOUN COUNTY HOUSEHOLD SURVEY
 Summary of Findings 25-Mar-88

Willing to pay more for selected luxury features

	(percent of those who would consider using bus)		(percent of all workers)
	Single-family	Townhouse	All
Always on time	43.4	63.6	50.6
Express service	42.4	63.6	50.1
Assured parking	37.4	56.4	44.2
Late home bus	30.3	40.0	33.8
Covered waiting area	26.3	43.6	32.5
Guaranteed seat	26.3	41.8	31.8
Bus priority lane	27.3	32.7	29.2
Mid-day home bus	22.2	38.2	27.9
Highback seat	14.1	18.2	15.6
Restrooms	11.1	14.5	12.3
Newspapers	6.1	9.1	7.1
Luggage rack	3.0	1.8	2.6

Mean Fare Willing to Pay

	(of those who would consider using bus)		(all workers)
	Single-family	Townhouse	All
Standard bus	\$5.03	\$4.00	\$4.14
Luxury bus	\$5.74	\$5.28	\$5.42

Percent Willing to Pay Current Fare or Greater
 (current fare is \$6.20 round-trip)

	(percent of those who would consider using bus)		(percent of all workers)
	Single-family	Townhouse	All
Standard bus	16.6	15.2	14.1
Luxury bus	47.2	64.2	42.5

Effect of Stop at Metrorail

	(percent of those who would consider using bus)		(percent of all workers)
	Single-family	Townhouse	All
No effect			
Would not use	34.7	17.0	27.7
Might use	33.3	40.4	36.1
More likely to use	22.2	31.9	26.1
Less likely to use	9.7	10.6	10.1

LOUDOUN COUNTY HOUSEHOLD SURVEY
 Summary of Findings 25-Mar-88

Current Travel Mode

	(percent of those who would consider using bus)			(percent of all workers)
	Single-family	Townhouse		All
Drive alone	83.8	69.1		85.5
Carpool	19.2	25.5		14.5
Vanpool	-	3.6		0.5
Bus	-	3.6		0.5
Metrorail for part of trip	2.0	10.9		2.0

Other Factors

	(percent of those who would consider using bus)			(percent of all workers)
	Single-family	Townhouse		All
Workplace served by Metrорail	26.3	40.0		19.9
Heard of Sterling Bus	62.6	46.3		51.4
Need car at work	29.3	16.4		35.1
Drop-off children	12.2	13.0		16.9

Would use Sterling bus if:

	(percent of those who would consider using bus)			(percent of all workers)
	Single-family	Townhouse		All
Closer to home	54.5	63.6		23.4
More Frequent	38.4	43.6		16.3
Less expensive	41.4	54.5		18.8
Served other dest.				14.0
Will not use				60.8

LOUDDON COUNTY HOUSEHOLD SURVEY
 Summary of Findings 25-Mar-88

Place of work

	(percent of those who would consider using bus)			(percent of all workers)
	Single-family	Townhouse		All
Sterling Park	14.1	9.1		16.0
Dist. of Columbia	16.2	23.6		14.0
McLean	10.1	23.6		13.7
Reston	9.1	5.5		10.9
Other Northern VA	11.1	9.1		10.2
Herndon	4.0	3.6		5.9
Arlington	13.1	10.9		5.6
Vienna	2.0	1.8		5.1
Pentagon	6.1	3.6		3.8
Fairfax City	2.0	1.8		3.1
Falls Church	2.0	3.6		3.1
Bethesda	2.0	1.8		1.5
Rockville	2.0	-		1.0
Gaithersburg	1.0	-		1.0
PG County	1.0	-		0.5
Silver Spring	-	-		0.3

LOUDOUN COUNTY HOUSEHOLD SURVEY
 Summary of Findings 25-Mar-88

Travel Time to Work (min)
 (percent of workers)

Time	Single-family	Townhouse	All
2	1.7	0.7	1.3
3		0.7	0.3
4		0.7	0.3
5	4.7	2.1	3.7
7		0.7	0.3
10	4.7	0.7	3.2
12	0.4		0.3
14	0.4		0.3
15	6.4	7.6	6.9
17		0.7	0.3
20	7.3	6.9	7.1
25	3.4	2.8	3.2
30	9.0	13.1	10.6
35	6.9	4.1	5.8
40	7.7	9.7	8.5
45	14.6	20.0	16.7
50	3.9	7.6	5.3
55	1.7	0.7	1.3
60	15.9	9.0	13.2
65		0.7	0.3
70	1.7		1.1
75	3.9	2.8	3.4
80	0.4	1.4	0.8
85	0.9	0.7	0.8
90	3.0	4.8	3.7
100		1.4	0.5
105	0.4		0.3
120	0.9	0.7	0.8
Mean	40.7	42.3	41.3
50% trip length	39	40	39

25-Mar-88

PRINCE WILLIAM COUNTY/MANASSAS TRANSPORTATION SURVEY RESULTS

	LOCALE					
	WOODBRIDGE	DALE CITY	LAKERIDGE	South of Manassas	SUDLEY	
SAMPLE SIZE:						
HOUSING UNITS	128	158	235	133	210	
WORKERS	211	284	384	228	417	
HOUSEHOLD STATISTICS						
PERSONS PER HOUSEHOLD	1	10.2 *	3.2 *	6.5 *	4.5 *	6.4 *
	2	36.7	17.1	29.4	28.6	26.1
	3	23.4	29.7	21.7	19.5	31.7
	4	16.4	36.7	26.5	33.1	25.2
	5	12.5	10.1	9.4	9.8	9.6
	6	0.8	2.6	1.3	3.3	---
	7	---	---	1.3	1.5	0.5
	8	---	0.6	---	0.8	0.5
	MEAN	2.87	3.44	3.10	3.38	3.10
EMPLOYED OUTSIDE HOME	1	24.2	16.7	23.6	22.8	12.7
	2	55.9	60.8	64.9	64.5	56.4
	3	19.9	19.4	10.0	7.0	26.4
	4	---	3.1	0.8	5.7	4.2
	5	---	---	0.8	---	0.2
	MEAN	1.96	2.09	1.91	1.96	2.23
TRANSPORTATION HANDICAP	0	99.1	96.5	98.7	99.6	96.9
	1	0.9	2.8	0.8	0.4	3.1
	2	---	---	0.5	---	---
	3	---	---	---	---	---
	4	---	0.7	---	---	---
COMMUTER VEHICLES	0	0.9	---	0.8	---	---
	1	16.1	9.4	17.5	7.5	6.8
	2	51.7	62.2	66.8	68.4	56.4
	3	26.1	25.0	12.1	14.9	29.2
	4	5.2	3.5	2.1	8.3	6.1
	5	---	---	---	---	1.4
	6	---	---	0.8	0.9	---
MEAN	2.19	2.23	2.01	2.28	2.39	

PRINCE WILLIAM COUNTY/MANASSAS TRANSPORTATION SURVEY RESULTS

WORKER STATISTICS		LOCALE				
		WOODBIDGE	DALE CITY	LAKERIDGE	South of Manassas	SUDLEY
TRAVEL MODES USED	DRIVE ALONE	75.8	66.7	65.9	60.7	62.8
	CARPPOOL	16.1	15.3	22.8	13.2	12.5
	VANPOOL	7.6	13.9	10.8	5.3	5.0
	BUS	2.8	4.2	3.8	0.9	0.7
	METROTRAIN	0.9	0.7	0.5	2.6	1.7
WORKPLACE SERVED BY METROTRAIN	25.7 *	29.4 *	36.9 *	18.0 *	15.0 *	
HEARD OF COMMUTERRIDE	71.3	71.6	70.0	49.6	52.9	
NEED CAR AT WORK	30.3	31.5	25.6	30.0	39.1	
DROP OFF KIDS	14.8	24.5	18.5	20.6	13.7	
COMMUTER RIDE RELIABLE	7.8	8.9	8.8	4.3	3.5	
WOULD USE COMMUTERRIDE IF IT WERE:	CLOSER	19.9	20.5	18.2	20.6	16.5
	MORE FREQUENT	16.1	21.2	23.1	20.6	16.0
	LESS EXPENSIVE	28.4	34.0	33.8	21.9	20.0
	SERVED OTHER DE	18.0	17.7	14.1	13.2	15.1
	WILL NOT USE	51.2	44.1	44.4	49.6	49.1
LUXURY SERVICE	38.5	44.4	46.2	39.6	40.4	
LUX. FEATURES (ONLY THOSE WHO WOULD CONSIDER)	ALWAYS ON TIME	30.8	36.5	39.0	38.2	31.8
	EXPRESS SERVICE	34.1	40.3	36.2	35.5	28.5
	ASSURED PARKING	22.7	27.8	33.6	31.6	28.0
	MIDDAY HOMEBUS	20.9	34.4	27.7	21.1	19.8
	PRIORITY LANE	19.9	26.4	25.6	17.5	20.5
	GUARANTEED SEAT	23.2	27.4	25.4	24.1	17.9
	COVERED WAITING	22.7	23.3	23.3	22.8	20.0
	LATE HOMEBUS	21.3	27.4	23.1	18.4	15.8
	HIGHBACK SEAT	12.3	16.7	15.9	13.6	9.2
	RESTROOMS	9.0	18.1	7.7	6.6	12.5
	LUGGAGE RACK	2.4	7.3	4.4	2.6	2.8
	NEWSPAPERS	2.4	5.6	3.6	5.3	3.8
PERCENT WORKERS IN HOUSING WITH MORE WORKERS THAN CARS	9.0	13.5	12.8	5.7	8.5	

PRINCE WILLIAM COUNTY/MANASSAS TRANSPORTATION SURVEY RESULTS

WORKPLACE -----	LOCALE -----				
	WOODBIDGE	DALE CITY	LAKERIDGE	South of Manassas	SUDLEY
D. C.	13.3 %	23.3 %	13.8 %	13.2 %	10.8 %
PENTAGON	9.5	8.0	15.1	2.2	1.7
PRINCE GEORGES	0.9	1.0	0.3	---	0.7
BETHESDA	---	---	---	0.9	0.2
ROCKVILLE	0.5	0.3	0.5	---	0.7
GAITHERSBURG	---	---	---	---	0.7
SILVER SPRING	0.5	---	---	---	---
FAIRFAX CITY	4.7	2.4	2.6	5.7	8.0
FALLS CHURCH	2.8	2.8	3.1	3.5	3.3
HERNDON	0.5	---	---	2.6	0.7
LEESBURG	---	---	---	0.4	0.2
RESTON	---	0.3	1.0	4.8	1.4
McLEAN	2.4	2.4	2.1	4.8	3.5
STERLING	0.5	0.3	---	0.9	0.5
VIENNA	0.9	0.7	0.5	1.8	3.5
ARLINGTON	5.7	6.9	9.7	6.1	3.8
ALEXANDRIA	10.0	7.6	12.3	0.4	3.1
OTHER N. VIRGINIA	47.9	43.8	39.0	52.6	57.1