



U.S. Department of  
Transportation

# Transit in the Nation's Capital: What Lies Ahead?

A Study of Projected Transit Service,  
Cost, and Financial Impacts on the  
Region Through the Year 2000

February 1986



**UMTA Technical Assistance Program**



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A Study of Projected Transit Service,  
Costs, and Financial Impacts on the  
Region Through the Year 2000

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Final Report  
February 1986

Prepared by  
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## PREFACE

As Chairmen of the Metro Finance Task Force and its Technical Advisory Committee, we would like to thank the members of our committees for the extraordinary commitment they made to our study of Washington area transit finance. This effort began more than nine months ago, and in the ensuing weeks and months, members of our committees have given literally thousands of hours of their time to the task of reviewing documents, attending meetings, and sharing their insights and judgments with the Federal City Council staff and our consultants.

We also would like to thank those who appeared before our committees: representatives of the Federal government, the States of Maryland and Virginia, and the District of Columbia, local government officials, and numerous staff members from the Washington Metropolitan Area Transit Authority. Their presentations were uniformly excellent and they have contributed greatly to our efforts.

Finally, we would like to single out our consultants for particular praise. Each of them--Jeff Bruggeman, Bob Peskin, Ray Ellis, and Bruce Williams from Peat, Marwick, Mitchell & Co.; Phil Dearborn from the Greater Washington Research Center; and George Wickstrom, Ron Sarros, and John McClain from the Council of Governments--worked tirelessly to ensure that our final product is worthy of broad-based support.

When we began this study last May, we committed ourselves to producing an honest, hard headed, realistic set of numbers regarding our region's future transit costs. We believe that we have accomplished our mission and we have done so by involving all the affected parties in the process and by reaching consensus at every major milestone. We feel confident that this study will enable the region's decision makers and the public at large to make better informed judgments about the future of mass transit in the Washington Metropolitan area.

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## TABLE OF CONTENTS

<u>SECTION</u>	<u>PAGE</u>
I. INTRODUCTION	I.1
II. DEMOGRAPHIC CHANGES IN THE WASHINGTON AREA	II.1
III. OPERATING STATISTICS	III.1
INTRODUCTION	III.1
METROBUS STATISTICS	III.2
Analysis Approach	III.2
Near-Term Changes	III.2
Stark-Harris System Changes	III.3
Full System Changes	III.5
LOCAL BUS SERVICE	III.8
METRORAIL SERVICE	III.9
IV. RIDERSHIP AND REVENUE	IV.1
AREA SYSTEM	IV.1
DATA BASE	IV.2
NETWORK DEVELOPMENT	IV.4
WORK TRAVEL DEMAND MODELING	IV.6
NON-WORK MODELING	IV.8
VERIFICATION OF MODELING APPROACH	IV.10
PROJECTED RIDERSHIP	IV.10
FARE REVENUE ESTIMATION	IV.18
V. OPERATING COST PROJECTIONS	V.1
INTRODUCTION	V.1
BASIC COST MODEL STRUCTURE	V.2
Union Labor Costs	V.2
Front Line Supervisory Non-Union Labor Costs	V.3
Administrative Non-Union Labor Costs	V.3
Parts, Supplies, and Service Costs	V.3
DRIVING VARIABLES	V.4
Bus Driving Variables	V.4
Rail Driving Variables	V.4
INFLATION CONSIDERATIONS	V.5
ANALYSIS OF PRIOR WMATA OPERATING COST EXPERIENCE	V.6
CALIBRATION OF METROBUS AND METRORAIL COST MODELS	V.7
Separation of Fixed, Mileage- and Hour- Related Costs	V.8
Adjustments to FY86 Calibration	V.9
APPLICATION OF WMATA METROBUS AND METRORAIL COST MODELS	V.9
LOCAL BUS OPERATING COST PROJECTIONS	V.13

## TABLE OF CONTENTS (Continued)

<u>SECTION</u>	<u>PAGE</u>
VI. RAIL CONSTRUCTION	VI.1
VII. REHABILITATION AND REPLACEMENT COST PROJECTIONS	VII.1
METHODOLOGY	VII.1
INPUT ASSET VALUES	VII.3
METROBUS FACILITIES AND EQUIPMENT	
REHABILITATION AND REPLACEMENT COSTS	VII.3
Metrobus Facilities and Equipment, except Buses and New Maintenance Facilities	VII.4
Bus Rehabilitation and Replacement Costs	VII.4
New Metrobus Maintenance Facilities Costs	VII.4
Results	VII.6
METRORAIL FACILITIES REHABILITATION AND REPLACEMENT COSTS	VII.6
Metrorail Facilities, except Track Track Replacement Costs	VII.6
METRORAIL EQUIPMENT REHABILITATION AND REPLACEMENT COSTS	VII.13
Metrorail Equipment, except Rail Cars	VII.13
Rail Car Rehabilitation and Replacement Costs	VII.13
SUMMARY	VII.19
LIMITATIONS	VII.19
VIII. ALLOCATION OF WMATA SUPPORT	VIII.1
OPERATING SUPPORT	VIII.1
ANNUAL ESTIMATES	VIII.4
DEBT SERVICE	VIII.10
REHABILITATION AND REPLACEMENT COSTS	VIII.10
FEDERAL SUPPORT	VIII.10
STATE SUPPORT	VIII.11
SUMMARY OF ALLOCATIONS	VIII.12
IX. MEASURING THE WMATA BURDEN: 1980 - 1985	IX.1
X. CHANGE IN SIX AREA GOVERNMENTS REVENUES AND EXPENDITURES: 1986 - 2000	X.1
REVENUES	X.1
EXPENDITURES	X.4
BASIS FOR LOCAL GOVERNMENT FINANCIAL PROJECTIONS	X.6
XI. THE EFFECTS OF FUTURE WMATA FINANCING ON AREA GOVERNMENTS	XI.1

## TABLE OF CONTENTS (Continued)

<u>SECTION</u>	<u>PAGE</u>
<u>APPENDICES:</u>	
A. PROPOSED METROBUS CHANGES BY ROUTE	A.1
NEAR-TERM CHANGES - VIENNA CORRIDOR	A.1
STARK-HARRIS SYSTEM CHANGES - BRANCH AVENUE CORRIDOR	A.3
STARK-HARRIS SYSTEM CHANGES - GREENBELT CORRIDOR	A.3
FULL SYSTEM CHANGES - BRANCH AVENUE CORRIDOR	A.4
FULL SYSTEM CHANGES - GREENBELT CORRIDOR	A.5
B. PATRONAGE FORECASTING MODEL	B.1
C. PATRONAGE RESULTS BY JURISDICTION AND CORRIDOR	C.1
D. DETAILED OPERATING COST MODEL ANALYSIS AND RESULTS	D.1
COST MODEL STRUCTURE AND RESULTS	D.1
INFLATION ANALYSIS	D.22
HISTORICAL WMATA COST DATA	D.23
Allocation of Bus Costs	D.23
Analysis of Cost per Vehicle-Mile	D.28
Analysis of Historical Metrorail Maintenance Staffing Levels	D.28
ADJUSTMENTS TO FY86 MODEL CALIBRATION	D.35
Termination of Old Programs and Initiation of New Programs	D.35
Changes in Labor Productivity and Unit Cost	D.36
E. REHABILITATION AND REPLACEMENT INPUTS AND DETAILED RESULTS	E.1
METROBUS REHABILITATION AND REPLACEMENT	E.1
METRORAIL FACILITIES REHABILITATION AND REPLACEMENT	E.9
METRORAIL EQUIPMENT REHABILITATION AND REPLACEMENT	E.21
TRACK REPLACEMENT	E.43
RAIL CAR REHABILITATION AND REPLACEMENT	E.49
F. RAIL ALLOCATION PARAMETERS	F.1
G. JURISDICTIONAL ALLOCATIONS	G.1
H. IMPACT OF WMATA SUPPORT ON LOCAL JURISDICTIONS	H.1
I. HISTORICAL WMATA ASSISTANCE AND ABILITY TO PAY MEASURES	I.1

## LIST OF EXHIBITS

<u>EXHIBIT</u>		<u>PAGE</u>
II.1	EMPLOYMENT CHANGE BY DECADE	II.2
II.2	COMPARISON OF 1990 FORECASTS	II.3
III.1	WMATA BUS OPERATING STATISTICS	III.7
III.2	METRORAIL OPERATING STATISTICS	III.10
IV.1	AREA SYSTEM	IV.3
IV.2	TRIP VERIFICATION	IV.11
IV.3	TRIP TYPE SUMMARY	IV.12
IV.4	WMATA TRIP TYPES	IV.13
IV.5	MARKET AREAS	IV.15
IV.6	WORK TRIPS BY MAJOR MARKET	IV.16
IV.7	WORK TRANSIT TRIPS BY MARKET	IV.17
IV.8	WORK MODE SPLIT	IV.19
IV.9	RAIL LOADING INDICATORS	IV.20
IV.10	METRORAIL REVENUES	IV.22
IV.11	ALLOCATED METROBUS REVENUES	IV.24
V.1	PROJECTED METROBUS AND METRORAIL OPERATING COST MODEL INPUTS	V.10
V.2	PROJECTED METROBUS AND METRORAIL OPERATING COST MODEL RESULTS	V.11
V.3	WMATA SERVICE LEVELS	V.12
V.4	WMATA EMPLOYEES	V.14
V.5	WMATA OPERATING EXPENSES	V.15
VI.1	RAIL CONSTRUCTION CAPITAL REQUIREMENTS	VI.3
VI.2	ALLOCATED RAIL CONSTRUCTION COSTS	VI.4
VII.1	METROBUS REHABILITATION AND REPLACEMENT ASSET CLASSES	VII.5
VII.2	BUS REHABILITATION AND REPLACEMENT	VII.7
VII.3	METRORAIL EQUIPMENT ASSET CLASSES	VII.8
VII.4	RAIL STRUCTURE REHAB AND REPLACEMENT	VII.9
VII.5	TRACK REHAB AND REPLACEMENT	VII.12
VII.6	METRORAIL EQUIPMENT ASSET CLASSES	VII.14
VII.7	RAIL EQUIPMENT REHAB AND REPLACEMENT	VII.15
VII.8	WMATA RAIL CAR REHABILITATION COSTS BY COMPONENT	VII.16
VII.9	RAIL CAR REHAB AND REPLACEMENT	VII.18
VII.10	REHAB AND REPLACEMENT COSTS	VII.20
VII.11	WMATA REHABILITATION AND REPLACEMENT COSTS	VII.21

**LIST OF EXHIBITS (Continued)**

<u>EXHIBIT</u>		<u>PAGE</u>
VIII.1	METRORAIL OPERATING ASSISTANCE	VIII.2
VIII.2	METRORAIL OPERATING ASSISTANCE	VIII.3
VIII.3	METROBUS OPERATING ASSISTANCE	VIII.5
VIII.4	TOTAL WMATA OPERATING ASSISTANCE	VIII.6
VIII.5	TOTAL WMATA OPERATING ASSISTANCE	VIII.7
VIII.6	WMATA COST RECOVERY RATIOS	VIII.8
VIII.7	COVERAGE OF WMATA COSTS	VIII.9
VIII.8	REGIONAL TOTAL	VIII.13
VIII.9	JURISDICTIONAL ALLOCATION	VIII.14
VIII.10	DISTRICT ALLOCATION	VIII.15
VIII.11	MONTGOMERY ALLOCATION	VIII.16
VIII.12	PRINCE GEORGES ALLOCATION	VIII.17
VIII.13	FAIRFAX ALLOCATION	VIII.18
VIII.14	ARLINGTON ALLOCATION	VIII.19
VIII.15	ALEXANDRIA ALLOCATION	VIII.20
IX.1	CHANGE IN TOTAL WMATA OPERATING ASSISTANCE PAYMENTS - ALL AREA GOVERNMENTS: 1980 - 1985	IX.2
IX.2	CHANGE IN TRANSIT ASSISTANCE PAYMENTS BY SOURCE OF PAYMENTS - ALL AREA GOVERNMENTS: 1980 - 1985	IX.4
IX.3	WMATA TRANSIT ASSISTANCE PAYMENTS BEFORE STATE AND FEDERAL AID AS A PERCENT OF MEASURES OF ABILITY TO PAY: 1980 - 1985	IX.5
IX.4	WMATA TRANSIT ASSISTANCE PAYMENTS AFTER STATE AND FEDERAL AID AS A PERCENT OF MEASURES OF ABILITY TO PAY: 1980 - 1985	IX.6
X.1	CHANGES IN REVENUES IN CONSTANT 1986 DOLLARS - SIX AREA GOVERNMENTS: 1986 - 2000	X.2
X.2	INCREASES IN EXPENDITURES IN CONSTANT 1986 DOLLARS - SIX AREA GOVERNMENTS: 1986 - 2000	X.5
XI.1	TOTAL WMATA OPERATING ASSISTANCE ALLOCATIONS AS A PERCENT OF NON-TRANSIT OPERATING EXPENDITURES AND PROPERTY VALUES	XI.3
XI.2	NET TRANSIT OPERATING ASSISTANCE PAYMENTS TO WMATA AS A PERCENT OF NON-TRANSIT OPERATING EXPENDITURES AND PROPERTY VALUES	XI.4
XI.3	NET OPERATING ASSISTANCE, DEBT SERVICE, AND REHAB & REPLACEMENT COSTS AS A PERCENT OF NON-TRANSIT OPERATING EXPENDITURES AND PROPERTY VALUES	XI.6

**LIST OF EXHIBITS (Continued)**

<u>EXHIBIT</u>	<u>PAGE</u>
 <u>APPENDICES:</u>	
B.1 IMPEDANCE WEIGHTING	B.2
B.2 TRAVEL TIME/FARE TRADEOFFS	B.3
B.3 NON-WORK FACTORS	B.5
C.1 WORK PERSON TRIPS	C.2
C.2 WORK TRANSIT TRIPS	C.3
C.3 JURISDICTION SUMMARY - WORK PERSON TRIPS	C.4
C.4 JURISDICTION SUMMARY - WORK TRANSIT TRIPS	C.5
C.5 JURISDICTION SUMMARY - WORK MODE SPLIT	C.6
C.6 MODEL RESULTS BY JURISDICTION OF PRODUCTION	C.7
C.7 WORK TRANSIT TRIPS	C.8
C.8 CORRIDORS	C.10
C.9 TRAVEL TIME CHANGES TO FARRAGUT SQUARE	C.12
C.10 TRAVEL TIME CHANGES TO L'ENFANT PLAZA	C.13
C.11 FARE CHANGES TO FARRAGUT SQUARE	C.14
C.12 FARE CHANGES TO L'ENFANT PLAZA	C.15
C.13 GROWTH IN TRANSIT RIDERSHIP	C.17
C.14 NETWORK EFFECT ON CHANGE IN TRANSIT RIDERSHIP	C.18
D.1 ANNUAL WMATA OPERATING COSTS	D.2
D.2 DETAILED 1986 OPERATING COSTS	D.6
D.3 DETAILED 2000 OPERATING COSTS	D.14
D.4 BUS COST ALLOCATION (CURRENT YEAR \$)	D.24
D.5 BUS COST ALLOCATION (1986 \$)	D.25
D.6 RAIL COST ALLOCATION (CURRENT YEAR \$)	D.26
D.7 RAIL COST ALLOCATION (1986 \$)	D.27
D.8 LEVEL OF SERVICE PROVIDED	D.29
D.9 BUS OPERATING COST/PLATFORM MILE (CURRENT YEAR \$)	D.30
D.10 BUS OPERATING COST/PLATFORM MILE (1986 \$)	D.31
D.11 RAIL OPERATING COST/CAR-MILE (CURRENT YEAR \$)	D.32
D.12 RAIL OPERATING COST/CAR-MILE (1986 \$)	D.33
D.13 ANALYSIS OF WMATA MAINTENANCE STAFFING RATIOS	D.34
E.1 METROBUS REHAB AND REPLACEMENT	E.2
E.2 METRORAIL FACILITIES REHAB AND REPLACEMENT	E.10
E.3 METRORAIL EQUIPMENT REHAB AND REPLACEMENT	E.22
E.4 TRACKWORK CALCULATIONS	E.44
E.5 RAIL CAR REPLACEMENT - STRAIGHT-LINE	E.50
F.1 RAIL ALLOCATION STATISTICS	F.2

**LIST OF EXHIBITS (Continued)**

<u>EXHIBIT</u>		<u>PAGE</u>
G.1	ANNUAL SUPPORT AND ALLOCATION INPUTS	G.2
G.2	WMATA COST ALLOCATION INPUTS	G.3
G.3	FACTORS FOR JURISDICTIONAL ALLOCATIONS	G.6
G.4	TOTAL ALLOCATED WMATA SUPPORT	G.7
G.5	ALLOCATION PARAMETERS FOR VIRGINIA SUPPORT	G.10
G.6	ALLOCATION OF STATE SUPPORT	G.11
G.7	ALLOCATION OF NET WMATA SUPPORT	G.13
H.1	IMPACT OF WMATA SUPPORT ON LOCAL JURISDICTIONS	H.2
I.1	METRO TRANSIT ASSISTANCE ALLOCATIONS (BEFORE STATE AND FEDERAL AID) AS A PERCENT OF PERSONAL INCOME (RESIDENCE): 1980 - 1983	I.2
I.2	METRO TRANSIT ASSISTANCE ALLOCATIONS (BEFORE STATE AND FEDERAL AID) AS A PERCENT OF TOTAL EARNINGS (PLACE OF WORK): 1980 - 1983	I.3
I.3	METRO TRANSIT ASSISTANCE ALLOCATIONS (BEFORE STATE AND FEDERAL AID) AS A PERCENT OF PROPERTY VALUES: 1980 - 1985	I.4
I.4	METRO TRANSIT ASSISTANCE ALLOCATIONS (BEFORE STATE AND FEDERAL AID) AS A PERCENT OF TOTAL EXPENDITURES: 1980 - 1985	I.5
I.5	METRO TRANSIT ASSISTANCE ALLOCATIONS (AFTER STATE AND FEDERAL AID) AS A PERCENT OF PERSONAL INCOME (RESIDENCE): 1980 - 1983	I.6
I.6	METRO TRANSIT ASSISTANCE ALLOCATIONS (AFTER STATE AND FEDERAL AID) AS A PERCENT OF TOTAL EARNINGS (PLACE OF WORK): 1980 - 1983	I.7
I.7	METRO TRANSIT ASSISTANCE ALLOCATIONS (AFTER STATE AND FEDERAL AID) AS A PERCENT OF PROPERTY VALUES: 1980 - 1985	I.8
I.8	METRO TRANSIT ASSISTANCE ALLOCATIONS (AFTER STATE AND FEDERAL AID) AS A PERCENT OF TOTAL EXPENDITURES: 1980 - 1985	I.9



## I. INTRODUCTION

The principal goal of the Federal City Council's study of transit finance in the Washington metropolitan area is to achieve a regional consensus regarding what the region's total transit costs and revenues are likely to be through the year 2000. In addition, the study looks at how well prepared the jurisdictions will be to assume their respective shares of the operating deficits and capital costs. The Federal City Council brings to this study impartiality and objectivity and broad familiarity with transit issues in the Washington area.

Currently, there is no single set of projections of future transit costs upon which decision makers at all levels of government --local, state, and Federal--can agree. The need for a commonly agreed upon, objective set of numbers is compelling, especially in light of proposed cutbacks in Federal transit assistance.

The Council believes that its study is particularly timely inasmuch as portions of the Metrorail system have now been in operation for 10 years and there is a wealth of real data against which to judge projections of future costs and revenues.

The study is being conducted under the auspices of the Council's Metro Finance Task Force, which is chaired by Mac Asbill, Jr., a partner in the law firm of Sutherland, Asbill & Brennan. The Task Force is the policy setting body for the study and is made up of 25 members of the Federal City Council and four public sector officials: Gladys Mack, a member of the WMATA Board and its Chairman during 1985; John Milliken, a member of the Arlington County Board and a former WMATA Board Chairman; David Wagner, Deputy Secretary of the Maryland Department of Transportation; and Ralph Stanley, Administrator of the Urban Mass Transportation Administration (UMTA).

The Task Force, using funds provided by UMTA, retained three consultants to undertake the detailed technical analyses. Peat, Marwick, Mitchell & Co. was responsible for the transportation, revenue, and cost analyses; the Greater Washington Research Center undertook the financial projections; and the Washington Metropolitan Council of Governments provided data and logistical support.

The Task Force's efforts have been supported by the work of a Technical Advisory Committee (TAC), which is composed of transportation analysts and finance officers from every local jurisdiction and the States of Maryland and Virginia. The TAC, which is chaired by Fairfax County Transportation Director Shiva K. Pant, advises the Task Force with respect to technical issues and makes recommendations to the Task Force.

Since the transit finance study began last May, the members of both the Task Force and the Technical Advisory Committee have held more than 20 meetings and have given literally thousands of hours of their time to this effort on a strictly voluntary basis.



## II. DEMOGRAPHIC CHANGES IN THE WASHINGTON AREA

Travel behavior and transit patronage are influenced by a number of factors including population and employment growth, the level of transit service available, and automobile ownership.

With respect to population growth, the 1990 population forecasts used in the 1974 Net Income Analysis (NIA) were significantly higher than the 1990 forecasts used in the current study. The current 1990 forecasts, which are based upon the Round III Update, project a population of approximately 900,000 in the core jurisdictions (D.C., Arlington, and Alexandria) and slightly more than two million in the inner suburbs (Montgomery, Prince George's, Fairfax, Fairfax City, Falls Church). The current 1990 population estimate of slightly more than three million is nearly 20% less than the 1990 estimate that was used in the 1974 NIA.

Regarding employment growth, there is dramatic projected increases in the Washington region but most of the employment growth is occurring beyond the Beltway, in areas that are not well served by public transit. As shown in Exhibit 2.1, only modest employment increases are projected within rings 0-3, the so-called 10-mile square comprising the District, Arlington, and Alexandria. Growth continues strong in rings 4 and 5, which are just inside and outside the Beltway, respectively, although at a slightly slower rate than during the past decade. The most dramatic growths are predicted for rings 6-8, the outer-most portions of the region.

Furthermore, the distribution of employment growth differs significantly from that projected for the 1974 NIA, as shown in Exhibit 2.2. For example, officials of the District of Columbia now are projecting a 1990 employment base of 692,000 jobs, which is 22% fewer than the 887,000 jobs projected in the 1974 NIA. Rings 4 and 5, on the other hand, are projected to have 84,000 and 89,000 more jobs, respectively, than were projected in 1974. Thus, in comparison to the 1974 estimates, the current study anticipates that nearly 175,000 jobs that were expected to be created in the region's core, in all likelihood will be located in areas that are not well served by transit.

The location of both population and employment growth is of critical importance to transit because there is a significantly higher propensity to use transit in the region's core areas than in the outlying areas. For instance, in 1980 more than 40% of the work trips to downtown Washington were made via public transit, while fewer than 10% of work trips in the suburbs were made on public transit. Nearly 9 of every 10 transit work trips in the Washington area have destinations in either the District or Arlington, and 95% of transit work trips have destinations inside the Capital Beltway. Thus, the location of future employment growth is one of the key factors affecting transit patronage; transit captures a significant percentage of work trips destined for the core but has been somewhat limited in its

EXHIBIT II.1

EMPLOYMENT CHANGE BY DECADE

1972 - 1980

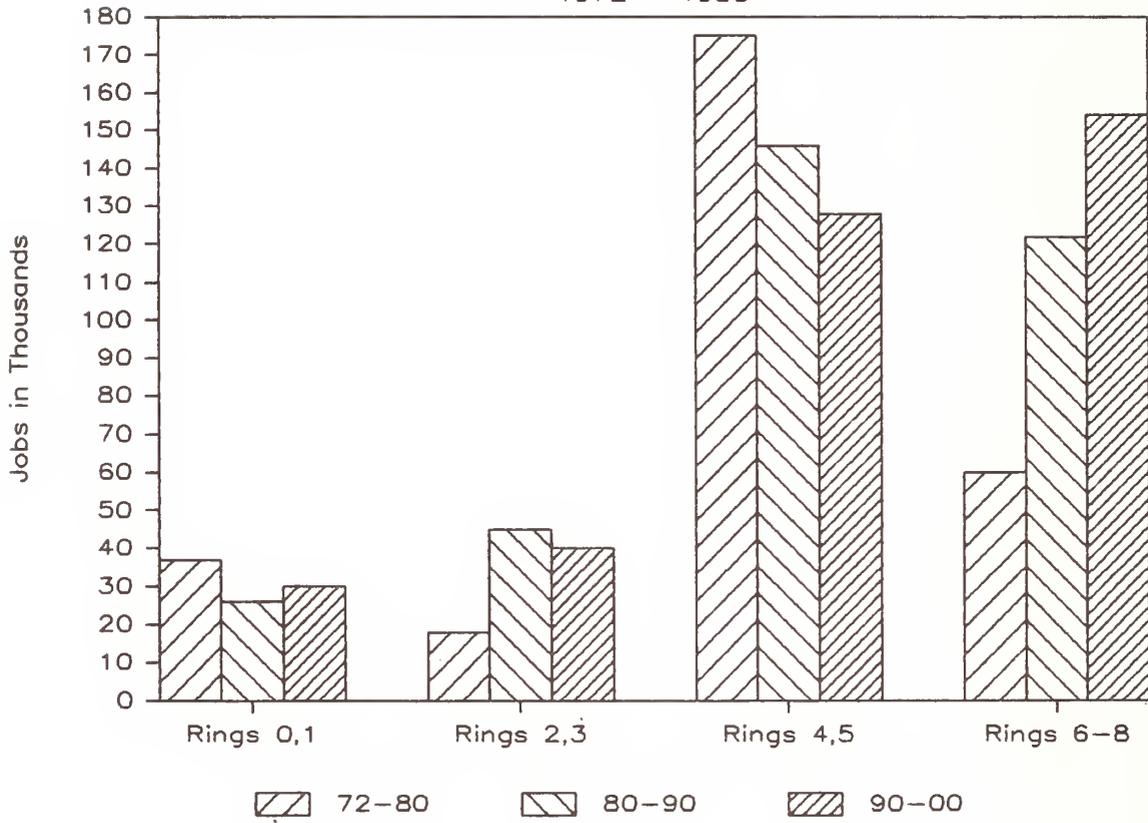
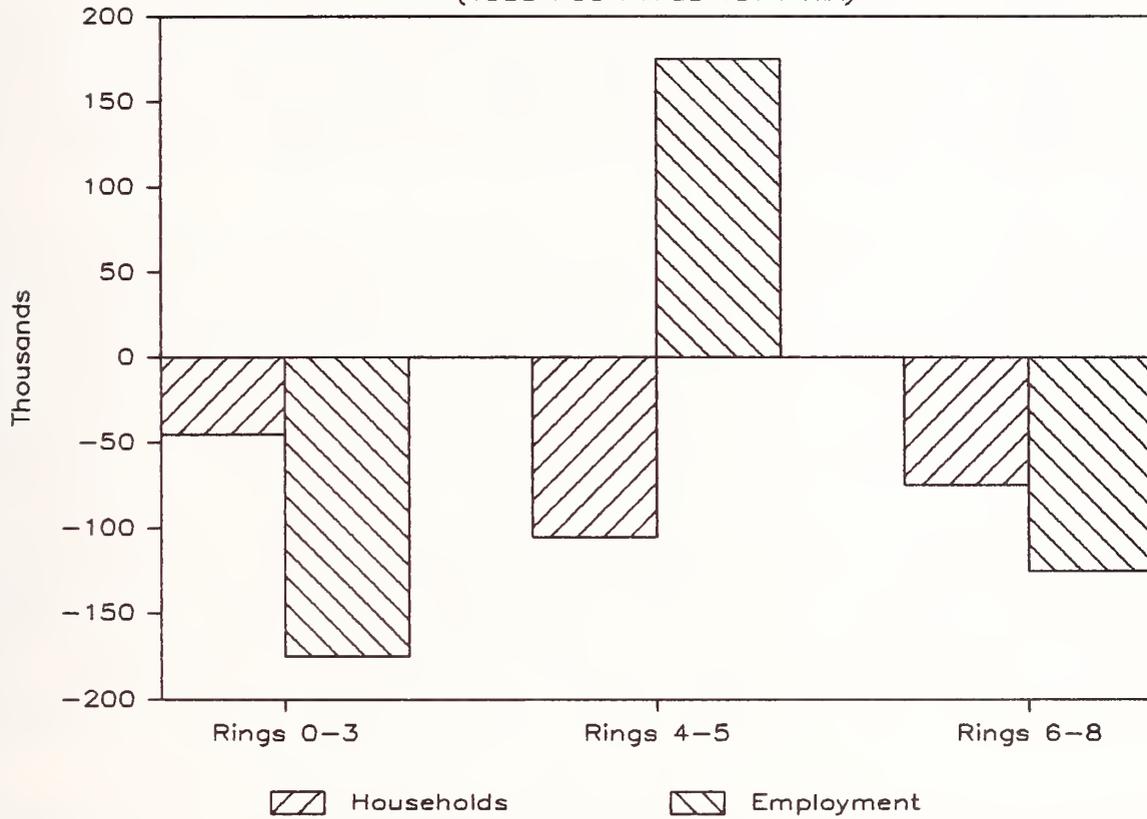


EXHIBIT II.2

COMPARISON OF 1990 FORECASTS

(1985 FCC minus 1974 NIA)



ability to capture a large percentage of work trips in the less densely populated areas beyond the Beltway.

Another factor influencing travel behavior and transit use is automobile ownership. In the last 10 years, there has been a significant decline in the number of households in the Washington area in which there is no automobile. The significant increase in overall auto ownership coupled with the decline in zero-car households are additional factors that explain why current estimates of future transit ridership are substantially lower than forecasts made during the 1970's.

Apart from lower population and employment growth in areas that are well served by transit, the share of trips made by transit is also less than in previous estimates. Earlier projections that showed a higher mode split reflected a significantly greater amount of Metrobus service than is likely to be available in the future. The level of line-haul and feeder bus service assumed in previous studies was 50% higher than is presently forecast. The 1974 NIA projected more than 70 million vehicle miles of Metrobus service upon the rail system's completion, while the present study projects 46 million vehicle miles of service. Regarding Metrorail, earlier estimates of rail running times were understated when compared with actual experience, resulting in "crediting" transit with 10% faster travel times than are actually occurring. Thus, the lower level of bus service and the slightly longer running time for rail service are important factors in explaining the current projections of future transit ridership.

As the foregoing makes clear, previous estimates of future transit patronage were based upon a number of assumptions about the way in which the Washington area would evolve that have not proven to be correct. As one assesses travel behavior in the region, it is important to understand the degree to which this behavior is being shaped and will be shaped in the future by the underlying demographic and employment shifts that are occurring.

### III. OPERATING STATISTICS

#### INTRODUCTION

Transit operating statistics are the key to analyzing the finances of transit systems in the Washington area. The operating statistics directly measure the quantity of transit service provided and thus determine operating costs. The operating statistics also are used to determine fleet size and utilization which, in turn, determine the capital requirements for purchasing and rehabilitating the transit fleet.

Three sets of transit operating statistics were developed for this study: Metrorail, Metrobus, and local bus. For all three sets, the most important statistics for analyzing cost are vehicle miles and vehicle hours of service. Fleet size is required for capital cost estimation purposes. Operating statistics are developed on a daily basis from schedules of transit service and then expanded to an annual basis for financial analysis.

Operating statistics were computed for several key years that correspond to major milestones in the evolution of the Metrorail system. These points are:

- o current (summer of 1985) conditions;
- o near term (1987/1988) conditions;
- o post Stark-Harris (1993) conditions; and
- o full system (2000) conditions.

The near term conditions include the full impact of opening the Vienna extension of the Orange Line and some other fairly minor adjustments to transit service levels. The post Stark-Harris conditions represent operations after completing 89.5 miles of the rail system while the full system conditions reflect the full 103-mile Metrorail system.

The operating statistics summarized in this report were prepared by Peat Marwick based upon inputs received from WMATA and the staffs of the local jurisdictions. The bus statistics adjustments were computed on a route-by-route basis and reflect the approximate effect of changes in route structure due to to Metrorail extensions and other factors. Data for the Vienna corridor were taken directly from a detailed analysis done by WMATA staff. Impacts for the other system changes were calculated by Peat Marwick and were based on a somewhat less detailed route analysis.

## **METROBUS STATISTICS**

### **Analysis Approach**

The bus operating statistics were computed by first assembling weekday, Saturday, and Sunday operating statistics by route groupings from materials developed by WMATA. These statistics, which include miles and hours of services by jurisdiction of allocation and operating division (garage), were summarized on a LOTUS 1-2-3 microcomputer spreadsheet for further analysis.

Changes in bus service concepts were obtained from the staffs of the local jurisdictions. These were converted into approximate changes in miles and hours of service by Peat Marwick, using current schedules and available maps. Preliminary near-term service changes for the Vienna corridor had already been computed by WMATA staff and were used directly in the analysis.

Near-term statistics were computed for daily and weekend services. Longer term changes in response to Metrorail extensions were computed only for weekday service. Annualization factors by operating division were computed from the current and near-term service patterns, were assumed to hold for the future, and were applied to the Stark-Harris and full system weekday estimates.

In making these calculations, the changes were made to the revenue service components of each route and applied to the daily statistics. Thus, the non-revenue portions were held constant which seems a reasonable assumption since most of the service areas were not changed significantly. For routes that were more extensively modified, the relationship between revenue and total statistics from the 1985 schedules were applied to the revised revenue service estimates.

### **Near-Term Changes**

Major near-term changes include the shift of major portions of Huntington service from Metrobus to Fairfax County operation in September 1985 and service changes associated with the opening of the Orange Line to Vienna in 1986. Other changes noted by the staffs of the local jurisdictions were very minor.

#### Huntington

The Huntington changes were anticipated in the July 1985 Metrobus operating plans with route realignments and statistics computed so that entire route groups would switch from Metrobus to Fairfax County bus operation. Services to the Pentagon and beyond still are operated by Metrobus since most are shared routes between Fairfax County and Alexandria.

## Vienna

Proposed changes in Vienna service with the extension of the Orange line have been prepared by WMATA staff for use in preliminary discussions with the affected communities, prior to formal public hearings. The major changes are summarized below; a more detailed analysis is included in Appendix A:

- o Outlying express routes to Ballston via Arlington Blvd. and I-66 would be converted to feeders to the Vienna, Dunn Loring, and West Falls Church Metrorail stations. Additional feeder routes would be added particularly in the Oakton/Vienna area and to serve employment centers in the Arlington Blvd./Beltway area.
- o Reston services would be terminated at West Falls Church. Additional service changes and extensions would be made in the Reston/Franklin Farms area.
- o Tysons express to downtown Washington and route 66X express service from West Falls parking lot to Rosslyn would be discontinued.
- o New express service would be added from Centerville.
- o Various route modifications would be made throughout the corridor to serve Metrorail stations and provide replacements for revised express services.

## Other Near-Term Changes

Other service changes were identified by the staffs of the local jurisdictions. Some have been implemented recently while others represent likely near-term actions:

- o L8: Connecticut Avenue service. Reduction in peak service.
- o N9: Montgomery Mall express. Reduction in peak service.
- o A12: Landover area. Extension along Landover Road beyond the Beltway to serve new development.
- o C11: Clinton express. Extension southward to serve Clinton area plus additional runs from September schedule.
- o T19: Bowie area. Deletion of service to Crofton. Addition of service from new park and ride lot near US50 and MD197.

## **Stark-Harris System Changes**

Changes in Metrobus services to reflect extensions of rail service to Wheaton, Anacostia, Van Dorn, and Greenbelt were

discussed with the staffs of the local jurisdictions. The following changes were identified, most of which are consistent with the assumptions being used by MWCOG in its development of a 1990 transit network for regional modeling.

#### Wheaton

Wheaton service changes were discussed with staff of Montgomery County DOT and include the following:

- o Y5,7,9: Georgia Avenue. Terminate at Wheaton station.
- o Q4: Viers Mill. Terminate at Wheaton station.
- o Z: Columbia Pike services. All express service in peak from Briggs-Chaney Road to Silver Spring. This service is independent of the Wheaton opening and would probably be in place by 1983 or 1984.

#### Van Dorn

Discussions with Alexandria and Fairfax staff indicated that major bus service changes would not likely be required for Van Dorn. Therefore, the only service change is the additional service from the Hayfield area to the station included in the MWCOG network.

#### Anacostia

Anacostia service changes were discussed with District of Columbia and Prince George's County staffs. The changes are summarized below; more detail is provided in Appendix A:

- o Most Anacostia services in the District west of Pennsylvania Avenue would be terminated at the Anacostia station. Limited service would be provided between the Anacostia station and downtown to provide local service. Crosstown routes would be broken at the Anacostia station.
- o Prince George's services in the initial Belt corridor and Clinton express service would be turned back at Anacostia station.
- o Additional service would be added to serve the proposed development along the Potomac River south of the Beltway.

#### Greenbelt

Greenbelt service changes were discussed with Prince George's staff in detail and discussed briefly with District of Columbia and Montgomery County staff. The changes are summarized below; more detail is provided in Appendix A:

- o Most services in the Chillum and Hyattsville areas would be rerouted to the Prince George's Plaza or West Hyattsville stations rather than Red Line stations in Northeast D.C.
- o Greenbelt and Laurel services would be rerouted to Greenbelt station.
- o Additional service added from Laurel area to Greenbelt station.

### **Full System Changes**

Metrobus service will change with the completion of the full Metrorail system (extension of the Red Line from Wheaton to Glenmont; extension of the Yellow Line from Van Dorn to Franconia; extension of the Green Line from Anacostia to Branch Avenue; and completion of the Green Line from U Street to Ft. Totten). The following Metrobus service changes were assumed to be made in connection with these rail service changes:

#### Glenmont

Glenmont service changes were discussed with staff of Montgomery County DOT and include the following:

- o Y5,7,9: Georgia Avenue. Terminate at Glenmont station.
- o Z: Columbia Pike services. Additional express service during peak hours from Briggs-Chaney Road to Silver Spring. This service is independent of the Glenmont opening and would probably be in place by the mid 1990's.

#### Franconia

No plans for service changes for the Franconia station have been developed by Fairfax County. It was felt that users of current Shirley express services would oppose terminating these routes at the Franconia station because this change would result in a longer and more expensive trip to the Pentagon and beyond. Therefore, the only service changes are two additional feeder routes:

- o West Springfield service from Rolling Valley Mall to Franconia station, tying in with various 18 routes along Old Keene Mill Road.
- o Local service from Lorton via Alban Road and Loisdale Drive, tying in with Lorton and Saratoga services.

#### Branch Avenue

Branch Avenue service changes within the District of Columbia were outlined by D.C. and WMATA staff. Service changes in Prince George's County were discussed with County staff. Incremental

changes beyond those included for the Anacostia opening are summarized below and are described in more detail in Appendix A:

- o Most Anacostia routes in the District would be revised or extended to serve the Congress Heights, Southern Avenue, or Naylor Road stations.
- o Indian Head/South Capitol Street regular services from Prince George's County would be rerouted to the Southern Avenue station. Oxon Hill express services would remain at the Anacostia station.
- o Marlow Heights and Hillcrest Heights services would be rerouted to the Suitland station rather than Potomac Avenue.
- o Clinton express would be rerouted to the Branch Avenue station. Camp Springs and Suitland Road services would be extended to the Branch Avenue station.
- o New express service assumed from Andrews AFB to the Branch Avenue station.

Columbia Heights (Green Line North)

Bus revisions with the opening of the Green Line to the Columbia Heights and Georgia Avenue stations were outlined by District of Columbia and WMATA staff. These are summarized as below and described in more detail in Appendix A:

- o 14th Street services would be revised to serve the Columbia Heights station. Through service to the Navy Yard would be discontinued.
- o Petworth services would be cut back at the Georgia Avenue station and Petworth express would be eliminated.
- o Georgia Avenue, 11th Street, and New Hampshire Avenue services would be revised to serve the Georgia Avenue station. Service south of the station would be reduced.
- o Various crosstown routes and special services would be revised to serve the Columbia Heights station.

A summary of the bus statistics for 1985, near-term operations, Stark-Harris system, and full system are shown in Exhibit III.1.

EXHIBIT III.1

WMATA BUS OPERATING STATISTICS

(annual values in thousands)

Jurisdiction	1985 Nominal		Near-Term		Stark-Harris		Full System	
	Hours	Miles	Hours	Miles	Hours	Miles	Hours	Miles
District	2123	20723	2127	20751	2083	20370	2024	19595
Montgomery	449	6749	446	6699	443	6669	448	6740
Pr Georges	432	6428	438	6540	426	6472	420	6454
Arlington	205	2695	211	2764	211	2764	211	2764
Alexandria	155	2196	151	2131	151	2131	151	2131
Fairfax Co	479	9349	417	7887	418	7900	434	8103
Falls Church	13	168	12	151	12	151	12	151
Fairfax City	7	119	5	80	5	80	5	80
NVTC	1	25	1	25	0	0	0	0
Total	3864	48452	3808	47028	3749	46537	3705	46018

## LOCAL BUS SERVICE

Montgomery County and the City of Alexandria operate local bus systems and Fairfax County recently began operating a system in the Huntington area. Each of these jurisdictions was contacted about anticipated changes in their local bus system's operation. In addition, the staffs of Arlington County, Prince George's County, and the District of Columbia were asked about local bus services for their jurisdictions. None of these jurisdictions indicated specific plans for local bus services, but all acknowledged that the issue is a significant one, given the growth of local bus services in the other jurisdictions and its impact on the allocation of remaining Metrobus costs.

Montgomery County has extensively expanded Ride-On service over the last few years but foresees only minor changes in the overall level of service in the next few years. Some service adjustments will be made, but within the current overall level of fleet availability and operating statistics. Some minor expansion is expected following the opening of the Wheaton and Glenmont stations, primarily to provide new service to the northeast. Increasing the fleet growth of about 10 vehicles with the associated increases in miles and hours is expected to provide for the expanded service in this area and elsewhere in the County.

Alexandria is also fairly well set with its system. Most of the other bus routes in the City are jointly allocated with either Fairfax or Arlington counties and do not lend themselves to substitution by City service. A new route will be developed in the Cameron Valley area by 1990, however, and will be extended to serve the Van Dorn station when the Yellow Line extension is opened. No firm plans exist for other major service modifications, although some service adjustments within existing resources will likely continue to be made to tailor service to demand patterns.

Fairfax County service in the Huntington area began late in September. No additional major changes to this service are anticipated, although minor route refinement will continue as ridership patterns in the corridor evolve. The County is considering expanding its local bus service to the Vienna and Springfield areas, but no commitment to these changes has been made. In addition, the County is studying the potential for converting some Metrobus service to contract carrier service in areas such as Reston. Areas being considered for this type of service have a somewhat different service, equipment, and cost pattern than more localized rail feeder services in the Huntington and Vienna areas.

## METRORAIL SERVICE

WMATA provided a set of rail operating assumptions and then computed rail operating statistics for each planned extension of Metrorail service. Among the key assumptions used to generate these statistics are the following:

- o The construction schedule as included in ICCA-IV.
- o Hours of operation:
  - o Weekday: 18
  - o Saturday: 16
  - o Sunday: 14
- o Frequency of service from terminals:
  - o Peak: 6 minutes, all lines
  - o Off-peak: 8 minutes, Red Line, single service  
12 minutes, all other lines
- o Train consists:
  - o Weekday: 4-, 6-, and 8-cars until December, 1993; 6- and 8-cars thereafter.
  - o Weekend: 4-cars.

These statistics were based on previous WMATA assumptions concerning future ridership which turned out to be somewhat higher than that produced by the present study. Therefore, Peat Marwick revised the assumed train consists to provide more balanced supply and demand at the peak load points. These adjustments eliminated the need for 8-car trains and retained a mix of 4-car and 6-car trains throughout the projection period, with most service provided by 6-car trains by the completion of the full system. The final operating statistics for Metrorail service are summarized in Exhibit III.2.



#### IV. RIDERSHIP AND REVENUE

Patronage and revenue forecasts for the study of transit finances in the Washington area were developed using data developed by the Metropolitan Washington Council of Governments (MWCOG) and a microcomputer based analysis system developed by Peat Marwick. The patronage forecasts were developed using data from the 1980 census. Then techniques were used to project 1985 ridership which was compared with WMATA's 1985 survey results. The techniques were then used to project transit ridership for 1993 and 2000, years that represent major milestones in the development of the Metrorail system.

##### AREA SYSTEM

Analysis of travel patterns requires establishment of an area system to summarize travel data and project transit shares. The geographic coverage of the analysis corresponds to MWCOG's modeling area, which consists of the District of Columbia, Arlington County, Alexandria, Fairfax County, Falls Church, Fairfax City, Prince William County, Loudoun County, and most of Montgomery and Prince George's counties. The extreme northern part of Montgomery County and the extreme southern part of Prince George's County are excluded, based on analysis decisions made for the 1968 home interview survey, the last comprehensive travel survey performed in the metropolitan area.

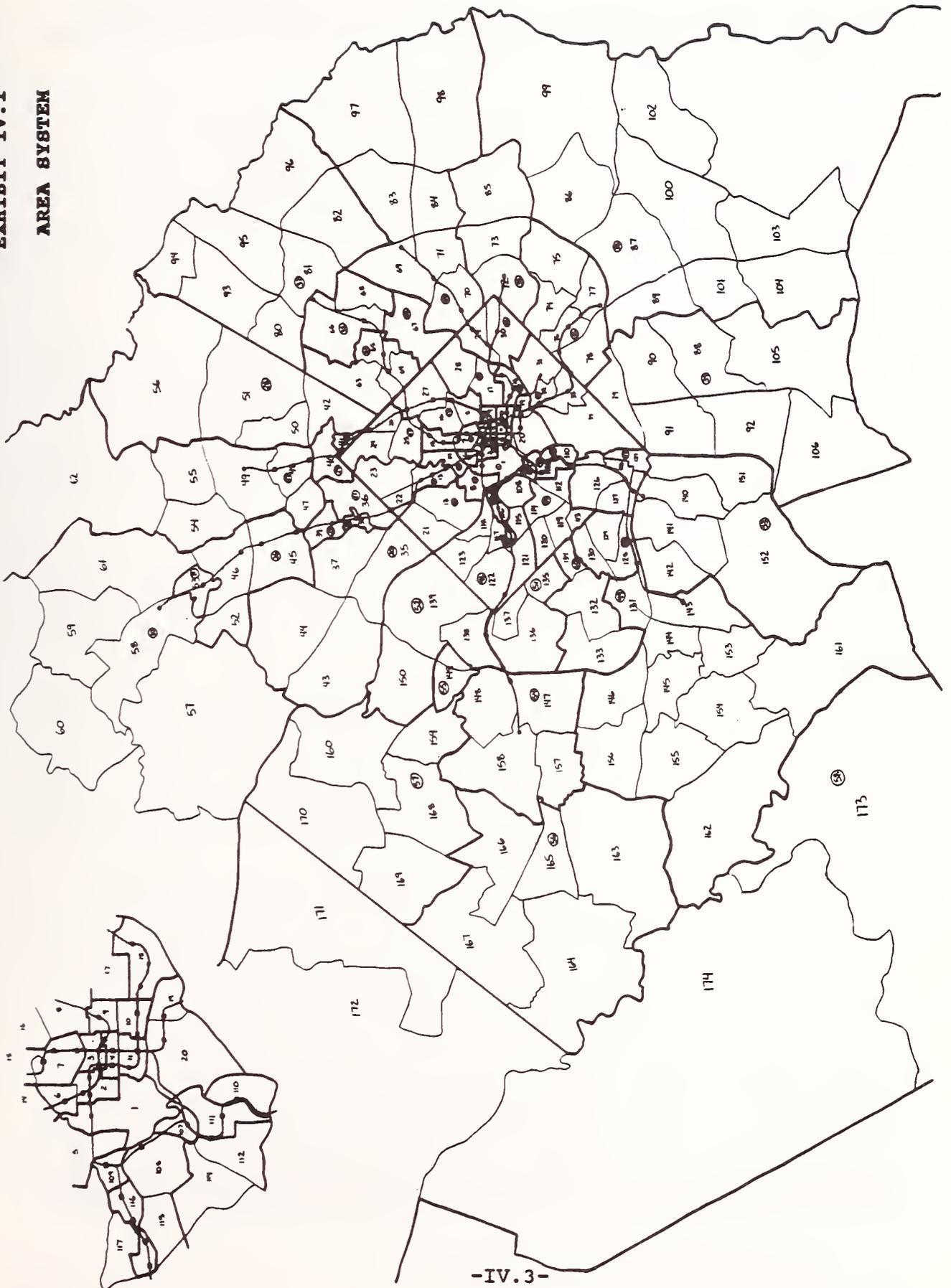
MWCOG has broken up the metropolitan area into a series of small traffic zones (about 1400 in number) and has aggregated the zones into 182 districts (including outer Montgomery and Prince George's counties). The zonal level provides a superior level of detail but requires far too large a data base and very significant computer resources. Therefore, the study was designed to work with district level data.

Several shortcomings in the district area system were noted for transit forecasting. The district boundaries did not adequately separate travel by rail corridor, particularly in the eastern portion of the District and northern Prince George's County. Also, the district area system did not honor the political boundaries of Falls Church and Fairfax City and did not reflect the emerging suburban employment centers. Also, the district system included detail in Loudoun and Prince William counties that was not needed for transit demand forecasting.

As a result, a revised area system was developed at about the same "grain" as the MWCOG district system but with some boundary adjustments to better reflect transit service areas. A total of 174 districts were identified, the adjustments honoring MWCOG zonal boundaries. District-level travel data were collected from MWCOG, as noted below, and zonal-level socio-economic data were used to adjust the district boundaries to the area system used in the analysis.



**EXHIBIT IV.1**  
**AREA SYSTEM**



were prepared to assist in verifying the 1985 model results. MWCOG has also geo-coded the home-end of the rail survey trip records and an additional data summary was made with information aggregated for the 174 districts.

Data on on trips made entirely on Metrobus and on trips made on the local and private bus systems are not available in as convenient a form as the information obtained from the rail survey. Data from the 1980 census refers to all transit travel and does not indicate transit mode, nor does it provide information on non-work travel. Thus, the modeling and verification activities were hampered by this lack of consistent information.

#### NETWORK DEVELOPMENT

The representation of transit service in the region required the development of transit networks for the years 1980, 1985, 1993, and 2000 that reflect the status of the Metrorail system as well as major Metrobus, local bus, private bus, and commuter rail services. The transit network modeling was undertaken using a microcomputer network analysis package developed by Peat Marwick that performs the same essential functions as the UMTA-supported UTPS package on a mainframe computer.

For the modeling activity, the transit networks were coded to the 174 districts used in the analysis. The Metrorail system was represented with rail station locations and station-to-station travel times and headways obtained from WMATA. The bus system was abstracted somewhat since a full level of detail was not required for an analysis at the 174 district level. Most Metrobus routes were represented, although some minor subroutes were combined and some purely local service routes were not included. Similarly, many local and private services were reflected, but in some cases a single representative route from among several serving a particular district was included. This level of abstraction was particularly used in southern Montgomery County where the Ride-On route density is higher than the geographic "grain" of the area system.

Current Metrobus and local services were coded from existing schedules to obtain route headways and travel times between major time checks. All services were coded for the A.M. peak condition, since work trip modeling in "production-attraction" format was used, as described in Section 4. Headways were generally rounded to an even number of buses per hour and generally reflected an average over the 7 - 9 A.M. period.

Future Metrobus and local bus service orientation and headways were taken from the inputs received from the local agencies as noted above. Travel times were generally not changed from the current, except for routing changes to serve rail stations and a time savings for a few express services with the extension of the Shirley HOV lanes. A limited amount of additional information for 1980 conditions was obtained from old schedules at WMATA.

These data were particularly useful for identifying service patterns in the Shady Grove and Huntington corridors, the areas most affected by Metrorail openings since 1980.

Traditional network analysis includes two alternative transit paths, one for those users who board transit directly from their homes and the other for those who use an automobile to reach a Metrooail station, commuter rail station, or satellite parking lot. In this approach, travel times are computed for both transit paths, transit mode split is determined by a composite impedance, and route assignments are made to both paths and aggregated.

Using this approach, the model's initial results overestimated Metrorail ridership. Observation of traveler behavior indicated that the overestimation was due, in part, to the fact that the transit path selection, using conventional transit modeling techniques, was based on minimum time. In the Washington network, however, transit fare policies lead to significantly different fares for some interchanges between bus and rail. Since excellent bus service is still provided in many parts of the region, even areas with Metrorail service, it is likely that many users prefer to make their trips entirely on Metrobus, which may be slower but costs less than a combined bus-rail trip.

The overestimation of rail ridership was dealt with by developing a third transit path for all-bus travel. This path was determined simply by deleting the rail service and finding the minimum time path from the remaining bus services.

The transit networks were also used in developing the fare inputs to the mode split estimation process. Transit fares in the Washington area are dependent upon mode, time of day, trip origin and destination, and sometimes service class and other special features. The network analysis process was adapted to produce a "trail" indicating the transit modes and routes used on all three paths so that the appropriate fare could be computed. Among the outputs produced are the rail boarding and alighting station for computing Metrorail fares, fare "flags" for usage of surcharged services such as the Reston system, and "flags" for usage of private bus services and commuter rail. Treatment of Ride-On, DASH, CUE, and Fairfax Connector services was accomplished largely outside the network process since the services are more geographically isolated.

The current transit fare structure was assumed to remain unchanged over the next 15 years. A 1980 fare table was developed from the tariff in effect at that time for use in the "pivot" to create 1985 mode split estimates. The most significant change in fare policy since 1980 was the introduction of a "taper and cap" on rail fares in 1984.

Additional specialized usage of the network analysis package was employed in the allocation of bus revenues to jurisdiction. This

application involved "flagging" certain routes with special allocation codes, in order to to identify which interchanges were associated with the particular routes so that revenues could be allocated appropriately.

#### WORK TRAVEL DEMAND MODELING

The approach to work travel demand modeling used in the study was based on the application of a "pivot point" technique developed for MWCOCG. The pivot technique is used to estimate the change in mode split from a base line value due to changes in transit service measures. The technique is based upon a mode split formulation called a "logit model". A simplified logit formulation was specified for MWCOCG for use in pivot applications and was adapted for this study.

This model calculates the projected share of travel on an interchange that would be made by transit, termed transit "modal split", as a function of the base mode split and changes in transit travel times and fares, termed "impedances". The "pivot" technique and the associated coefficients used in the study are shown in Appendix B.

In applying the model, the base mode splits were taken directly from the 1980 census work trip data, simply by dividing the transit trip estimates by the person trip estimates for the 174 by 58 interchanges used in the analysis. Changes in impedances were determined from the results of the network analysis. Fare changes were converted to 1968 dollars using a simple CPI deflator of .3228.

The application of the pivot technique is complicated by the fact that transit travel times and fares are considerably different for users who walk to local services as compared to those who arrive at major transit facilities by automobile, as noted above. However, the 1980 base mode split information from the census is only for total transit travel, completely undifferentiated by mode of access, bus vs rail, Metrobus vs local bus, WMATA vs private services, or any other categorization.

In order to deal with the mode of access issues, a weighting procedure was used to combine the impedances. This weighting was accomplished by computing the change in impedance on two paths, weighted by the assumed mode of access percentages estimated from rail survey data. The weighting function is further complicated by changes in the mode of access percentages likely to occur with introduction of new or superior transit services. The weighting procedure adopted is summarized in Appendix B.

The weighting procedure also treated the third transit paths for travelers who did not use the rail system. It was assumed that the trade-off between time and cost would occur primarily for those users who were able to access the transit system at their place of residence and thus was only applied to the "walk access" paths. An exception was made for those users with direct access

to Metrorail for a trip which required a bus transfer at the destination end to complete the trip. The time-cost trade-off for making such a trip entirely by bus was included in the analysis.

For the mode split estimates in the pivot technique, a "best" path was identified from the "walk access" and "all-bus" impedances. The "best" path was determined by computing the weighted impedance using the model coefficients and the network values for in-vehicle time, out-of-vehicle time, and fare.

The pivot technique was applied to estimate a revised mode split. The revised mode split was then multiplied by the future work person trip tables to obtain a total transit trip table. Total transit trips were split between the "walk access" and "auto access" paths using the same mode of access percentages used in the calculation of the weighted impedance.

An additional allocation was required between the "walk access" and "all-bus" networks. For purposes of this analysis, allocations were made only for those trips where a time-cost trade-off existed; that is, trips where the "walk access" path was quicker but more costly than the "all-bus" path. For interchanges where the "all-bus" path was quicker, it would have been the minimum time path and no rail would have appeared on the interchange. For interchanges where the "all-bus" path was both slower and more expensive, all trips were assumed to be made on the "walk access" path. For any situations where the impedances were equal, the trips were split 50%-50% to both paths.

A simple function was developed for the trade-off interchanges using the impedances and the coefficients. The function is shown in Appendix B together with some typical time-cost trade-off values.

Initial model results somewhat overestimated work trips and underestimated non-work trips. One likely explanation is the significant decrease in automobile operating costs between 1980 and 1985. Since a pivot model was being used in the analysis rather than a complete mode split model, no direct mechanism existed for adjusting highway costs. Therefore, a simplifying approach was taken where highway distance was multiplied by an inflation-adjusted cost per mile for out-of-pocket auto operating costs and the resulting cost difference applied using the cost coefficient in the pivot model. A similar adjustment, in the opposite direction, was applied for the forecasts based on the differential fuel inflation rates assumed in the transit operating cost model.

One additional shortcoming in the modeling approach was caused by the limitations of the MWCOG modeling area which excludes upper Montgomery County and lower Prince George's County as well as the outer counties where some exurban commuters reside. Data from the Metrorail survey included trip making by these commuters. This information was used as a surcharge to the modeling results.



The results of the analysis using this technique were extremely poor, particularly for non-home based rail trips. The technique applies a ratio of approximately 20% to the work mode split. Even in the core area with a high mode split, this would result in only a 10 - 15% mode split for non-home based transit trips. More importantly, in the core area very few non-home based trips are made by private automobile, thus the derived trip market is very small. In reality, of course, many non-home based rail trips in the core are made for business purposes where the modal trade-off is between Metrorail and taxi or Metrorail and long walks rather than between transit and private automobile; the factoring "model" is unable to address this condition.

Therefore, an alternative approach was taken, based upon the rail survey. Non-home based trips using rail stations in the core area and other major activity centers such as Bethesda, Silver Spring, and the Medical Center where most activity is within easy walking distance of Metrorail were extracted from the survey. Trips on the remaining interchanges were calculated using the factoring model. Projections of the growth in the activity center trips were made based upon employment trends at both ends.

With the opening of the Green line, other areas such as the Waterfront and Navy Yard will probably begin to exhibit a similar non-home based rail travel pattern. Therefore, additional rail trips were added for these areas. The number and distribution of trips from these areas were based on patterns for similar areas with existing rail service.

The results of this procedure were still low for both home-based and non-home based rail trips when compared with the survey. An examination of the results showed that that home-based trips were being estimated reasonably well in the District but were significantly underestimated in the suburbs, with the greatest underestimation for Montgomery and Fairfax counties. In all likelihood, this result can be traced back to the structure of the model, which contains relationships based on 1968 bus ridership. With the advent of Metrorail, home-based non-work travel for shopping and other activities, particularly for travel to the core area, becomes viable. However, since auto ownership levels are high in the suburbs, the implied mode split is only 17 - 18% of the work mode split. Coupled with the relatively small size of this market, the result is very few transit trips.

No fully satisfactory adjustment process similar to the discrete non-home based adjustments appeared viable. Therefore, a simple adjustment factor was applied to the modeled non-work trips. The factor varied by jurisdiction with 1.5 being applied in Arlington, Alexandria, and Prince Georges County, 2.5 in Fairfax County, and 3.0 in Montgomery County. The factors were assumed to remain constant in future years and were applied to a larger travel market as rail service was extended into more suburban areas.



EXHIBIT IV.2  
TRIP VERIFICATION

WMATA DATA

- o 382,000 Daily Metrorail Trips from 1985 Rail Survey
- o 120,000 (approx) Metrobus-Metrorail
- o 436,000 Daily Metrobus Total
- o 316,000 Net Metrobus-Only Trips
- o 698,000 Total WMATA Trips

MODEL RESULTS - 1985

- o 694,000 Total WMATA from MWCOG Modeling Area
- o 11,000 Total WMATA from Beyond MWCOG Modeling Area
- o 705,000 Total WMATA Trips
- o 390,000 Total Metrorail-Related
- o 315,000 Total Metrobus-Only (Including Metrobus/Non-WMATA)

EXHIBIT IV.3

TRIP TYPE SUMMARY

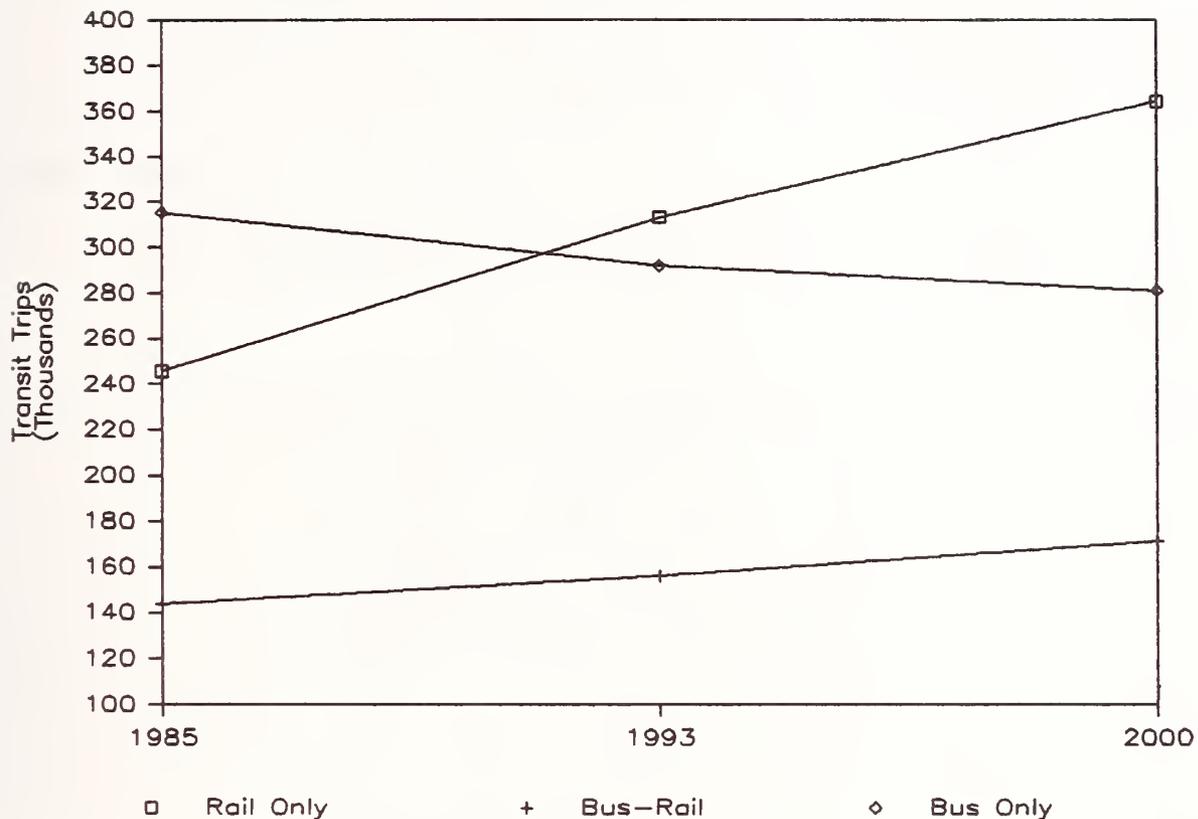
	1995	1991		INCREASE * INCREASE	INCREASE
				1995-1991	1995-2000
METROPAIL ONLY (1)	245,46	212,17	24,29	11,32	48,93
METROBUS/METROPAIL	14,15	10,22	3,93	3,93	19,44
TOTAL PAIL-BILATED	259,61	222,39	37,22	15,25	68,37
METROBUS ONLY	1,24	1,24	0,00	0,00	-1,24
TOTAL BUS-BILATED	15,39	11,46	3,93	3,93	18,20
TOTAL WMATA	275,00	233,85	41,15	19,18	86,57
NON-WMATA (2)	1,24	1,24	0,00	0,00	-1,24
TOTAL TRANSIT	276,24	235,09	41,15	19,18	85,33

(1) Includes Metrobus and METROPAIL

(2) Includes Metrobus and METROPAIL

EXHIBIT IV.4

WMATA TRIP TYPES



ridership increases are made up of network effects, primarily increases in the rail system, and demographic trends in the region.

The forecast results are also significantly affected by the size of the various major travel markets and the ability of transit to serve these markets. A series of exhibits have been prepared to illustrate the impact of changes in major work trip markets. Exhibit IV.5 illustrates three market areas defined as follows:

- o core: District of Columbia and Arlington downtown areas
- o urban: 10-mile square plus Silver Spring, Bethesda, Alexandria, Falls Church, Bailey's Crossroads
- o suburban: rest of region

Work person trips for major markets are shown in Appendix B. The major travel markets have been summarized as follows:

- o all work trips from the core
- o urban to core
- o urban to urban plus urban to suburban
- o suburban to core
- o suburban to urban
- o suburban to suburban

The results are shown graphically in Exhibit IV.6. As can be seen, the growth in core trips is modest. The growth in urban-to-core trips is much higher but also quite flat. Urban-to-urban and suburban-to-core trips show very modest growth while suburban-to-urban shows a strong increase, particularly from 1985 to 1993. The travel patterns are dominated, however, by the suburban-to-suburban market, both in absolute magnitude and in growth.

The pattern for transit ridership is quite different. Transit trips by major market are shown in Exhibit IV.7. Here, the major market is primarily suburban-to-suburban, which shows relatively little growth since the year 1980, and very little growth previously and for the first time in the 1990s. In fact, these areas have already lost some population. In contrast to the person trip results noted above, suburban-to-urban travel is the smallest transit market because of the difficulty of serving dispersed suburban employment locations. The most significant growth is shown in suburban-to-core market, which relates to the increases in population in that market and the improvements in transit service as Metrorail extensions are opened to the outer parts of the region.

**EXHIBIT IV.5**  
**MARKET AREAS**

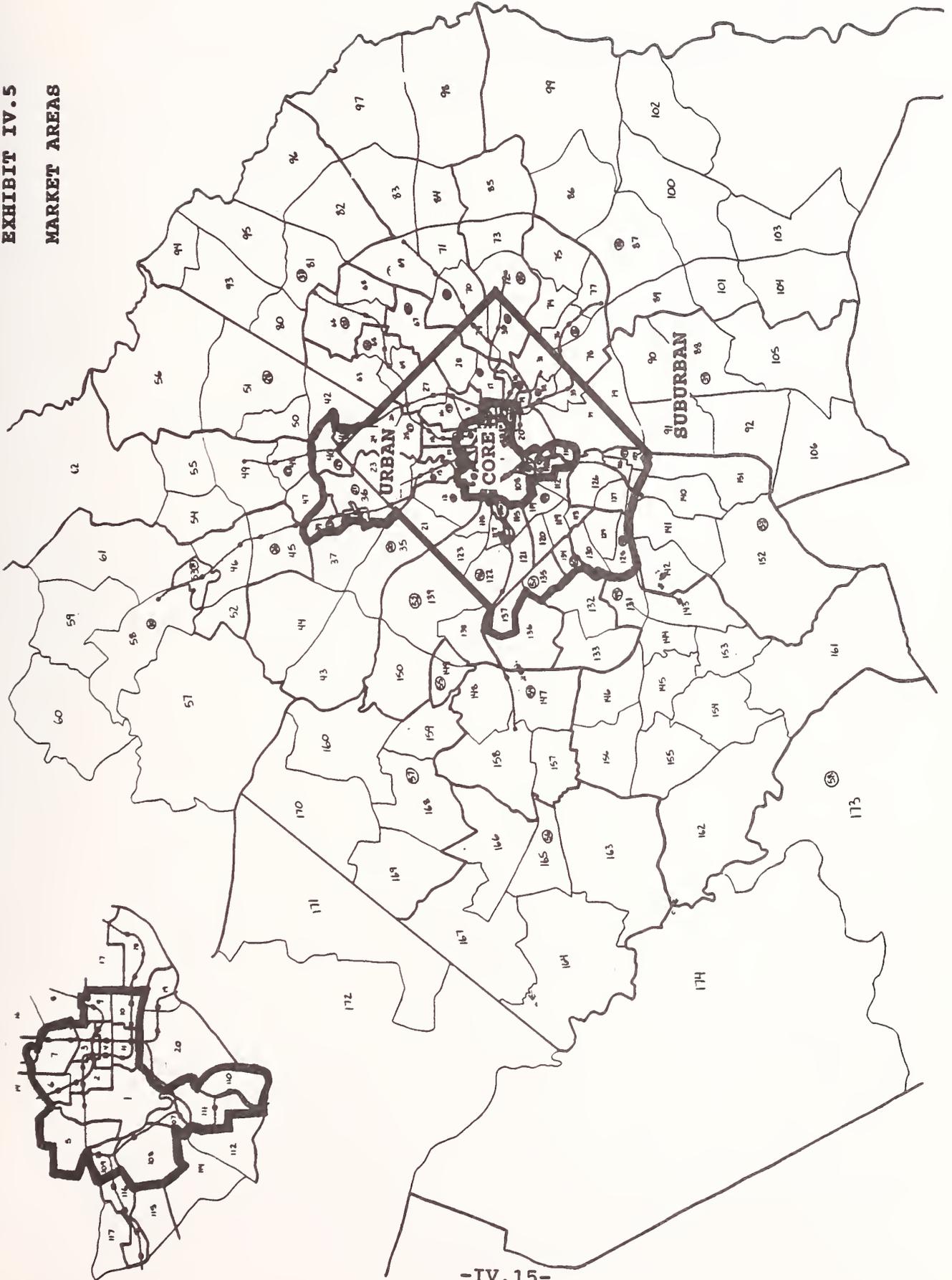


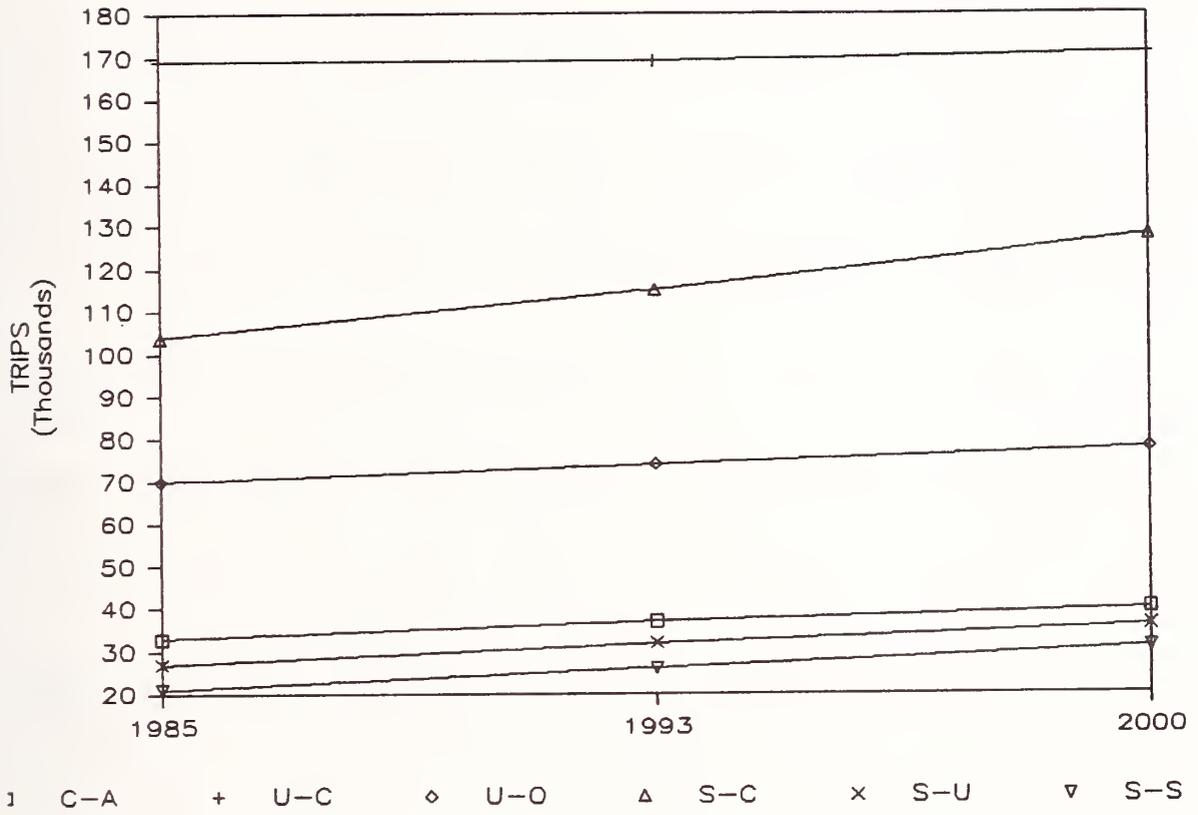
EXHIBIT IV.6

WORK TRIPS BY MAJOR MARKET



EXHIBIT IV.7

WORK TRANSIT TRIPS BY MARKET



These market effects can be summarized in terms of overall modal splits as shown in Exhibit IV.2. The contrast is very marked between markets such as urban-to-core where transit captures nearly half of all work trips and the suburban-to-suburban market where transit attracts less than 3 percent of the market. Additional analysis of the model results include jurisdictional and corridor summaries of travel and are shown in Appendix B.

The results of the analysis are determined by both the demographic factors that lead to the person trip tables shown above and in Appendix B and the impact of changes in assumed transit service levels. These latter effects are also summarized in Appendix B through the examination of changes in transit travel times and fares from each origin area to selected core destinations.

A final check was made on rail assignments against the existing and proposed rail service. Work trips in production attraction format were assigned to the network and secondary rail. The peak loads obtained by this method have generally been found to approximate those obtained through a much more extensive process of developing detailed peaking factors by purpose and converting trips from production/attraction format to origin-destination format. As shown in Exhibit IV.9, the 1980 model results are generally very similar to the survey assignments.

The initial rail operating statistics obtained from WMATA were based upon a higher assumed level of ridership. As noted above, adjustments were made to train consists for 1981 and 1982 to maintain roughly the same loadings by line as observed in 1980. Loadings on the Green Line were adjusted to a level similar to other lines which were operating in 1980. These results are also shown in Exhibit IV.9 and were used to compute rail operating costs for input to the final jurisdictional assignments described below.

#### FARE REVENUE ESTIMATION

Initial average weekly fare revenue estimates were obtained by multiplying the transit trip tables by sub-area and zone pair by the equivalent fare matrix obtained from the transit model used in the mode split estimation. For revenue estimation, off-peak fares matrices were developed as well as the peak value, and a weighted average revenue for trips by purpose and fare zone pair was computed.

For rail trips, this analysis is relatively precise since fare collection is a highly centralized activity. In general, the only reductions from the tariff would be expected to be from the high-value fare card discount and special fares for groups. Bus fare revenues are expected to be of modest value since, because of the use of flash passes, other discount programs, and blurring of fare zone boundaries, and various types of evasion, adjustments to the results are expected to be required for the rail stations.

EXHIBIT IV.8

WORK MODE SPLIT

FROM\TO				
1985	CORE	URBAN	SUB- URBAN	TOTAL
CORE	69.7%	38.6%	24.1%	58.3%
URBAN	47.8%	24.6%	12.8%	34.6%
SUBURB	24.7%	7.4%	2.6%	9.6%
TOTAL	36.8%	14.7%	3.9%	18.2%
1993	CORE	URBAN	SUB- URBAN	TOTAL
CORE	69.5%	38.4%	24.7%	57.6%
URBAN	48.3%	24.0%	13.1%	34.2%
SUBURB	25.5%	7.4%	2.6%	9.2%
TOTAL	37.1%	14.0%	3.8%	17.0%
2000	CORE	URBAN	SUB- URBAN	TOTAL
CORE	69.5%	38.6%	25.5%	57.5%
URBAN	48.7%	24.0%	13.8%	34.2%
SUBURB	27.1%	7.7%	2.7%	9.2%
TOTAL	38.0%	14.0%	3.8%	16.6%

EXHIBIT IV.9

RAIL LOADING INDICATORS  
RAIL TRIPS AT MAXIMUM LOAD POINT  
(Computed as % of Work Trips)

TRIPS

LINE	PEAK LOAD POINTS	SURVEY	1985	1986	1987	1988
ORANGE	WEST BOUND	4,100	4,100	4,100	4,100	4,100
	EAST BOUND	4,100	4,100	4,100	4,100	4,100
BLUE	WEST BOUND	4,100	4,100	4,100	4,100	4,100
	EAST BOUND	4,100	4,100	4,100	4,100	4,100
RED1	A-ROUTE	4,100	4,100	4,100	4,100	4,100
	B-ROUTE	4,100	4,100	4,100	4,100	4,100
RED2	A-ROUTE	4,100	4,100	4,100	4,100	4,100
	B-ROUTE	4,100	4,100	4,100	4,100	4,100
RED TOTAL	A-ROUTE	4,100	4,100	4,100	4,100	4,100
	B-ROUTE	4,100	4,100	4,100	4,100	4,100
YELLOW	NORTH BOUND	4,100	4,100	4,100	4,100	4,100
	SOUTH BOUND	4,100	4,100	4,100	4,100	4,100
GREEN	NORTH BOUND	4,100	4,100	4,100	4,100	4,100
	SOUTH BOUND	4,100	4,100	4,100	4,100	4,100
SHUTTLE	SOUTH BOUND	4,100	4,100	4,100	4,100	4,100

CASES

TRIPS

LINE	1985	1986	1987	1988	1989	1990
ORANGE	48	44	40	36	32	28
BLUE	40	40	40	40	40	40
RED1	40	40	40	40	40	40
RED2	48	48	48	48	48	48
RED TOTAL	88	88	88	88	88	88
YELLOW	40	40	40	40	40	40
GREEN	NA	NA	NA	NA	NA	NA
SHUTTLE	NA	40	NA	NA	NA	NA

Rail revenue estimates are summarized in Exhibit IV.10. Passenger revenue was obtained as noted above and converted to an annual value using a nominal annualization factor of 280. The result, as expected, slightly exceeds the budgeted values and future year values were adjusted simply as the ratio between the 1985 model and survey totals. School subsidy re-imbusement, primarily by the District, was not assumed to change from current levels because of the stability of population.

The fare reimbursement reflects the District's policy of providing a 10 cent discount for peak rail boardings at stations east of the Anacostia River. The policy was assumed to continue and to be extended to Anacostia and Congress Heights (Alabama Avenue) stations as the Green Line is extended. The amount of the allocation was taken from the model estimates of boardings at the affected stations. The results were not expected to be overly precise because of the relatively large districts used in the analysis and access splits between adjacent stations which are not subject to the discount. The model underestimation was simply scaled by the ratio of the 1985 results.

The max fare reimbursement is a WMATA policy to partially offset the impact of the "taper and cap" on rail fares. The reimbursement is estimated from a comparison of revenues from the tariff and those that would be collected from the same number of passengers under a straight distance-based fare. Currently, one-half of the difference is then allocated in proportion to the jurisdiction of the benefiting passengers while the other half is absorbed in the system values. As shown, the model estimate is slightly low for the reimbursement and the values were adjusted on a jurisdictional basis.

Parking revenues were estimated using a simple index of potential revenue obtained by multiplying the number of spaces by the all-day parking cost. Large, newly-opened parking lots were discounted since volumes build somewhat slowly. This approach was used to compute a scaling factor which was compared to the budgeted revenues for 1985; a value of approximately 86% was obtained by this method. The scaling factor was increased slightly, to 90%, for the 1993 and 2000 analysis, reflecting WMATA plans to extend the hours during which parking fees are collected. The revised scaling factor was multiplied by the potential revenue index to obtain the values shown in the Exhibit.

Estimates for non-fare revenues were provided by WMATA. Investment income and advertising revenues are projected to grow as the system expands. Leverage leasing income terminates in 1987 with the expiration of the tax law. Joint development income shows a substantial increase between 1985 and 1993 as current projects mature. This estimate does not include income from additional rents or future development agreements, which results in a lack of change between 1993 and 2000.

EXHIBIT IV.10

METRORAIL REVENUES

(\$ millions)

	1997 Model	1999 Model	2000 Model
<b>MODELED OPERATING REVENUES</b>			
Passenger Revenue	111.00	115.00	107.00
School Subsidy	0.00	0.00	0.00
Fare Reimbursement	0.00	0.00	0.00
Max Fare Reimbursement	0.00	0.00	0.00
Parking	0.00	0.00	0.00
<b>TOTAL</b>	<b>111.00</b>	<b>115.00</b>	<b>107.00</b>
<b>MODELED OFF-BALANCE SHEET REVENUES</b>			
Passenger Revenue	111.00	115.00	107.00
School Subsidy	0.00	0.00	0.00
Fare Reimbursement	0.00	0.00	0.00
Max Fare Reimbursement	0.00	0.00	0.00
Parking	0.00	0.00	0.00
<b>TOTAL</b>	<b>111.00</b>	<b>115.00</b>	<b>107.00</b>
<b>OFF-BALANCE SHEET REVENUES</b>			
Investment Income	0.00	0.00	0.00
Leverage Losses	0.00	0.00	0.00
Advertising Income	0.00	0.00	0.00
Joint Development	0.00	0.00	0.00
<b>TOTAL</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>
<b>TOTAL REVENUE</b>	<b>111.00</b>	<b>115.00</b>	<b>107.00</b>

Bus revenue is much more complicated since it is computed in an allocated manner based upon the dedication codes of the buses involved and whether or not a rail transfer is used. An initial calculation of bus revenues using the technique of multiplying projected trips by tariff fares produced a high estimate of 1985 revenue. The result occurs in part because the total Metrobus ridership estimate is somewhat high as well as the lower degree control over fare collection and other factors noted above.

Bus revenues derived from the tariff are expected to be high because this procedure assumes that full fare is both paid and collected on all bus trips. The revenue yield is lower due to passes and discounts, fare evasion, passenger confusion, and other factors leading to a less than 100% revenue collection. The effects of these factors were quantified from the Spring 1984 Bus Passenger Survey and other data provided by WMATA. Separate factors were developed on a jurisdictional basis to reflect Flash Pass usage and uncollected revenues.

Checks on the modeling approach show that estimates of bus-only and bus-rail trips are higher than the limited data available. Factors were developed for each of the markets and used to reproduce the base year results. These factors were then applied to the future year estimates. Even though some of the factors were somewhat larger than desirable, the results were considered to be acceptable since only minor changes in bus ridership and revenue were projected. The resulting projections are summarized in Exhibit IV.11.

Finally, rail patronage by jurisdiction of residence is required as an input to the Metrorail operating support formula and was computed from the model results. The model results reproduced the 1985 rail survey and 1986 budget distributions quite closely and the minor adjustments required were assumed to continue into the future. The resulting factors are noted in the allocation section of this report below.



## V. OPERATING COST PROJECTIONS

### INTRODUCTION

This chapter documents the transit operating cost models developed and applied by Peat Marwick to project Metrobus, Metrorail, and local bus costs. The cost models consist of LOTUS 1-2-3 microcomputer spreadsheets that, together with projected estimates of transit service to be provided in future years, are used to project future transit operating expenses. The cost models are based on recent operating budget data supplemented by operating experience and discussions with key WMATA and local government transportation management staff.

The three major operating cost models are:

- o Metrobus cost model, which projects the costs to operate and maintain diesel buses including local, express, and feeder routes to Metrorail;
- o Metrorail cost model, which projects the costs to operate and maintain vehicles, stations, track and structures, and ancillary facilities and systems for Metrorail. These costs are distinct and separate from the rehabilitation and replacement costs documented in Chapter VII.
- o Local bus cost models, which project the costs to operate the four suburban bus operations:
  - o Montgomery County "Ride-On"
  - o Fairfax County "Fairfax Connector"
  - o City of Alexandria "DASH"
  - o Fairfax City "CUE"

The cost models are structured in such a way that once annual operating statistics have been determined, the annual costs can be computed quickly. The primary inputs to the Metrobus, Metrorail, and local bus models include those factors traditionally developed in the urban transportation planning process: peak vehicles, annual vehicle hours, and annual vehicle miles. In addition, the Metrorail model requires descriptors of the physical characteristics of the system including stations, route miles, and yards.

The cost models are intended to be used in evaluating alternative regional bus and rail service levels and construction schedules. The models project costs in both base year (1986) and inflated dollars. It must be emphasized that these models are approximations and although they are derived from the most recent operating budgets, they simplify the detailed procedures used to develop annual transit system budgets. To the extent possible, the models reflect the latest available financial, operational, and maintenance data.

The remainder of this chapter discusses the following.

- o cost model structure
- o driving variables
- o inflation considerations
- o analysis of prior WMATA operating cost experience
- o calibration of Metrobus and Metrorail cost models
- o application of Metrobus and Metrorail cost models
- o local bus operating cost projections

## BASIC COST MODEL STRUCTURE

The operating cost models are parametric and productivity-based, composed of a series of equations that project costs as a function of the quantity of transportation service provided. The equations are organized to approximate costs incurred by organizational units of the transit agency. For each organizational unit, specific costs were identified that are affected by specific operating characteristics. Each of these specific costs was modelled as a separate equation. These equations were, therefore, collectively additive and intended to capture all costs resulting from the operation of the system. Five general types of cost categories were developed, including four model variable costs:

- o union labor costs;
- o front-line operations, including fuel costs;
- o administrative and maintenance costs; and
- o parts, supplies, and services costs.

The fifth model is fixed costs, known as the variable costs are discussed below.

### Union Labor Costs

The union labor cost relationships are of the form:

$$\text{Union Labor Cost} = \text{Unit of Service} \times \text{Productivity Factor} \times \text{Cost per Unit of Service}$$

where the factors are defined as follows:

- o Unit of Service: generally, the number of vehicle-hours or vehicle-miles. An indicator of vehicles based on the vehicle used to quantify the relative price. The cost model is intended to model costs per unit of service provided rather than cost per unit of service (e.g., cost per passenger or per passenger-mile). Since costs are incurred by supplying the service rather than by how many passengers use it.

- o Labor Productivity Factor: The number of non-supervisory personnel, or personnel-hours, required to adequately staff each unit of service provided. This factor considers the impact of worker efficiency, need for training, and scheduled and unscheduled absenteeism.
- o Cost per Unit: The wage per hour (or per year) for the non-supervisory employees providing the basic service. This is usually the wage for vehicle operators and mechanics and includes average wages (straight wages plus overtime, vacation, and sick pay). It does not include expenses for fringe benefits (such as pension funds, FICA, and insurance).

These data were obtained through a detailed review of operating budgets, supported by discussion and interpretation by knowledgeable staff. All costs are in FY86 dollars.

#### Front-Line Supervisory Non-Union Labor Costs

Front-line supervisory non-union labor cost equations are of the form:

$$\text{Front-line Supervisory Labor Cost} = \text{Number of Union Employees} \times \frac{\text{Union Employees Front-line Supervisor} \times \text{Avg. Supervisor Salary}}{\text{Man-Year}}$$

where the factors are defined as follows:

- o Number of Union Employees: The number of a particular category of union employee to be supervised (e.g., the number of bus mechanics, cleaners, or janitors).
- o Union Employees/Front-line Supervisor: The number of union employees a foreman or supervisor can manage.
- o Average Supervisor Salary/Man-Year: Annual salary for front-line supervisor, not including fringes.

#### Administrative Non-Union Labor Costs

These costs are based on either current (fixed) number of employees in various administrative staff areas or on an exogenously determined number of employees that may change over time. Average salary per employee was determined from operating budgets. Projected number of employees was obtained from knowledgeable staff.

#### Parts, Supplies, and Service Costs

The variable parts, supplies, and service cost equations project costs for maintenance parts, fuel, office supplies, and similar non-personnel costs. The equations are generally of the form:



- o Revenue Train Hours: Annual scheduled hours of service (including revenue, layover, and deadheading; not including start-up, training, utility; extra service, special events, and fringe benefits (sick, holiday, vacation, funeral));
- o Subway Stations: Stations located in cut-and-cover, earth tunnel, or rock tunnel;
- o Other Stations: Stations located at-grade, in cut, in retained cut, or on aerial structure;
- o Mezzanines: Station entrances with a station agent and fare collection equipment;
- o Service and Inspection (S&I) Yards: Major maintenance facilities where all maintenance activities can take place and where large numbers of vehicles can be stored;
- o Route Miles: Length of two-way track in revenue service (between terminals of lines, not including yard, pocket, and other non-revenue track);
- o Manned Interlockings: Switching points located at terminals, points of route divergence, and yards where an operator is assigned;
- o Terminals: Number of ends of lines;
- o Rail Passengers: Annual rail passenger boardings.

#### INFLATION CONSIDERATIONS

All of the unit costs in the operating cost models are expressed in 1986 constant dollars. These costs were derived from 1986 budget data and other sources, converted to 1986 dollars using historical rates of Consumer Price Index (CPI) inflation.

Inflation rates were assumed for the following components:

- o "Base Line" Inflation: The rate of increase in the Washington, D.C. CPI applied to all labor costs (wages, salaries, and fringe benefits) and non-personnel costs other than diesel fuel, parts, and electricity.
- o Diesel Fuel Inflation: Inflation based on the historical and projected incremental difference between the base line inflation rate and diesel fuel price increases.
- o Electricity Inflation: Based on anticipated incremental difference between the base line inflation rate and PEPCO and Virginia Power rates for WMATA.

- o Parts Inflation: Based on historical and anticipated incremental difference between the base line inflation rate and prices for vehicle and systems maintenance parts.

Projected inflation rates were based on short-term budget assumptions by WMATA and longer-term assumptions approved by the TAC:

<u>Year</u>	<u>Base Line</u>	<u>Diesel Fuel</u>	<u>Eletricity</u>	<u>Parts</u>
FY86	-	-	-	-
FY87	3.5%	2.0%	4.9%	4.9%
FY88	5.0	5.0	5.0	5.0
FY89	5.0	5.0	5.0	5.0
FY90				
thru	5.0	7.0	7.0	6.0
FY00				

The inflation rates used in the operating cost analysis use the Washington CPI projection as the "base line" rate of inflation. The incremental differences between the base line rate and the rate for specific cost components is then applied to compute compounded inflation factors for specific cost components.

The inflation factors computed in this manner were used to estimate costs in inflated dollars. The "uninflated" or "base year" costs reflect the incremental inflation only, but do not directly include the base line CPI values. A detailed description of the inflation calculations is included in Appendix D.

#### ANALYSIS OF PRIOR WMATA OPERATING COST EXPERIENCE

In preparing to calibrate the Metrobus and Metrorail cost models, it was recognized that WMATA's prior operating cost experience would have to be examined in order to determine the extent to which costs have stabilized. This was important because the basis of the calibration was the FY86 proposed operating budget. This analysis of prior years' cost was also undertaken to address concern regarding the degree to which "fixed" costs have truly been stable over time.

The analysis was performed based on data obtained from WMATA's Office of Budget and Management Analysis in the form of computer printouts of actual costs incurred in fiscal years FY81 through FY85. FY86 budgeted costs were included as well as a basis for comparison. The WMATA data recorded actual expenses and encumbrances by office, by mode (bus and rail), and by line item.

The analysis was structured according to the WMATA organizational structure assumed for the FY86 budget. There have been significant changes in the WMATA organizational structure over the past six years and costs for prior years were entered in the analysis according to the new structure. As a result, the totals by department (and occasionally by office) are not always the same as data from other sources.

Another important consideration, particularly in reviewing the magnitude of fixed costs, is that it was not always possible to accurately separate fixed from variable costs for a number of reasons:

- o Aggregation of Fringe Benefits: All fringe benefits, except in FY81, are shown in a single category "Non-Departmental Expenses". As a result, all fringes are shown in a category separate from "fixed" and "variable" expenses.
- o Aggregation of Salaries: All salaries are aggregated in each office. It was not possible to separate salaries for front-line supervisors. These expenses are legitimately "variable" in nature as they vary with the level of service provided. As a result, there is a trend in the analysis for Metrorail's fixed expenses to increase over time as the level of service increases and the salaries for front-line supervisors increase.

The results of the analysis of the operating cost data are shown graphically and discussed in detail in Appendix D. The major conclusions may be summarized as follows:

- o Bus fixed costs, in base year dollars, have remained relatively constant over the past three years.
- o Total bus operating costs, in base year dollars, have also remained relatively constant and, indeed, have actually declined somewhat, which reflects a slight decrease in the level of service provided.
- o Rail costs have significantly increased with the growth of the Metrorail system.
- o Metrobus costs per vehicle mile increased in real terms through FY84 and have stabilized since, due in part to aggressive cost containment actions.
- o Metrorail costs per car-mile also increased through FY84 and have declined since, again reflecting aggressive cost containment actions by WMATA.
- o Metrorail staffing requirements have shown general improvement in productivity since FY84.

#### CALIBRATION OF METROBUS AND METRORAIL COST MODELS

The Metrobus and Metrorail operating cost models were calibrated based on the WMATA FY86 Approved Budget. The calibration process involved structuring a series of equations, such as those outlined earlier in this chapter, to replicate the budget. The actual equations are summarized in Appendix D.



## Adjustments to FY86 Calibration

The following areas were identified in which modifications to the FY86 cost relationships had to be made to reflect FY87 costs. Greater detail in each area is included in Appendix D.

### Termination of Old Programs and Initiation of New Programs

WMATA is spending roughly \$10 million on programs that are phasing out and will not recur in FY87. Some of these programs, such as the Flexible bus rehabilitation program, were previously addressed in the model. There are approximately \$4.3 million in various new programs and enhancements to existing programs that were not reflected in the FY86 budget. These are summarized in Appendix D.

### Changes in Labor Productivity and Unit Costs

Various program areas will be affected by changing experience and external factors. These areas include:

- o workers compensation
- o third party liability claims
- o insurance
- o facilities maintenance
- o rail car maintenance
- o rail systems maintenance
- o electricity

In many of these areas, such as workers compensation, facilities maintenance, and electricity, WMATA anticipates continued improvement in productivity. In other areas, such as third party liability claims and insurance, WMATA experience will likely mirror that of other transit systems with significant increases in costs. Rail systems maintenance will generally improve with more efficient use of manpower but extended hours of operation on Sundays will offset these improvements. Although rail car maintenance productivity has improved over the past several years, it seemed prudent to maintain current levels of productivity through FY90 and then gradually show a reduction in productivity as the rail fleet ages.

Detailed results in each cost area are summarized in Appendix D.

## APPLICATION OF WMATA METROBUS AND METRORAIL COST MODELS

Exhibit V.1 summarizes the driving variables, inflation rates, and labor productivity factor inputs to the Metrobus and Metrorail operating cost models for fiscal years 1986, 1993, and 2000. Exhibit V.2 summarizes the model outputs for these years, including an allocation of fixed and variable costs and a breakdown of salaried and union employees.

The cost models were applied to project costs for every year from FY86 through FY00. A detailed set of projections for each



EXHIBIT V.2

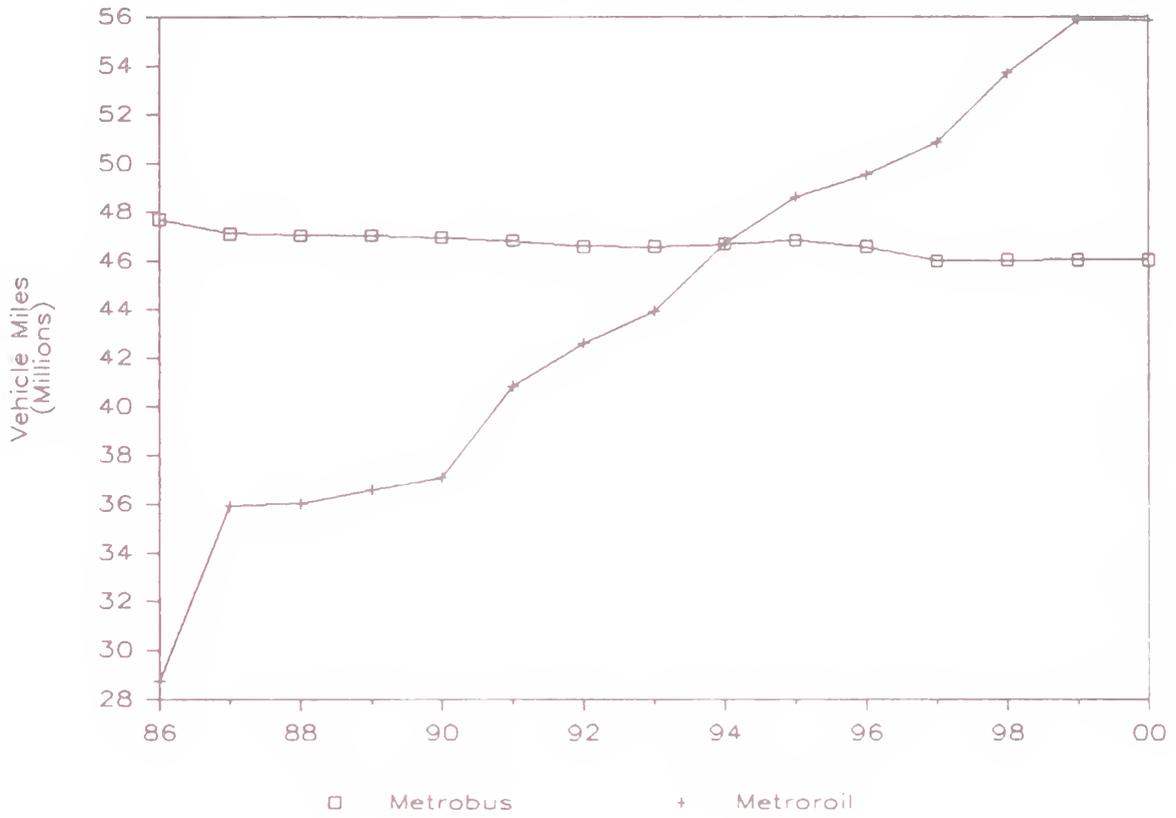
PROJECTED METROBUS AND METRORAIL OPERATING COST MODEL RESULTS

	This Year FY86 -----	Stark-Harris FY93 (1) -----	Completion FY00 -----
OPERATING EXPENSE IN 1986 \$ (Millions)			
Metrobus	\$233.766	\$232.976	\$233.444
Metrorail	\$188.589	\$238.243	\$291.633
Total	\$422.355	\$471.219	\$525.077
Metrobus Allocation			
Fixed	\$53.167	\$54.634	\$54.599
Mileage-Related	\$76.159	\$75.896	\$77.644
Hour-Related	\$104.440	\$102.445	\$101.201
Total	\$233.766	\$232.976	\$233.444
Metrorail "Allocation"			
Fixed	\$37.236	\$39.413	\$39.413
Variable	\$151.353	\$198.831	\$252.220
Total	\$188.589	\$238.243	\$291.633
EMPLOYEES (Man-Years)			
Metrobus			
Salaried	574.3	573.5	573.1
Union	3663.8	3619.5	3580.8
Subtotal	4238.2	4193.0	4153.9
Metrorail			
Salaried	910.8	1034.6	1141.7
Union	2200.7	2801.5	3391.0
Subtotal	3111.5	3836.1	4532.7
TOTAL	7349.6	8029.1	8686.6

(1) FY93 Includes Partial Year of Operation of Final Stark-Harris System Components

EXHIBIT V.3

WMATA SERVICE LEVELS



analysis year is included in Appendix D. Exhibit V.3 summarizes the projected vehicle miles of service for Metrobus and Metrorail in each year. Exhibit V.4 summarizes the resulting projected operating costs and Exhibit V.5 summarizes the number of WMATA employees by major category.

#### LOCAL BUS OPERATING COST PROJECTIONS

Annual operating costs were projected for the four local jurisdictions that operate bus systems. Cost models were calibrated in a manner similar to that used for the Metrobus and Metrorail cost models. Projections were made for the years 1986, 1993, and 2000.

The sources of information for these projections were discussions with knowledgeable staff supplemented by detailed budgets and consultant reports. The following summarizes the level of service assumptions and resulting cost projections:

- o Montgomery County: Currently, service is provided with 151 peak-hour buses. Ten buses are assumed to be added by 1993 and 10 more by 2000. Vehicle-miles and vehicle-hours are assumed to expand on the basis of fleet size. Operating costs increase from \$6.7 million to \$7.6 million from 1986 to 2000 (in 1986 dollars).
- o Fairfax County: The current Huntington feeder service utilizes 27 peak-hour buses and is assumed to continue unchanged for the base line projections. Operating costs remain constant at \$1.0 million (1986 dollars).
- o City of Alexandria: The current service utilizes 15 peak-hour buses. Three buses are assumed to be added for Cameron Valley service by 1993. Vehicle-miles and vehicle-hours are assumed to expand on the basis of fleet size. Annual operating costs increase from \$0.6 million to \$0.7 million (1986 dollars).
- o Fairfax City: Re-orientation of Fairfax City service to serve Metrorail is assumed to be accomplished within the current overall budget of \$0.5 million.

EXHIBIT V.4

WMATA EMPLOYEES

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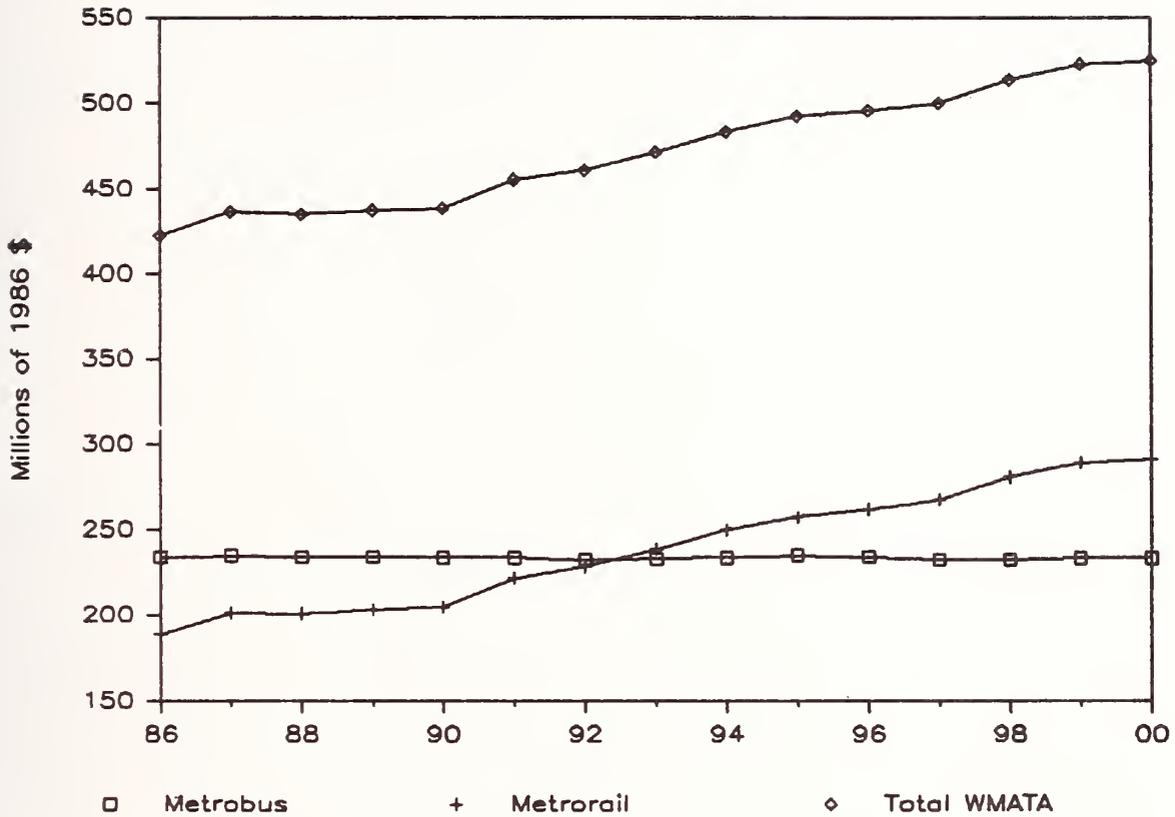
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Employees

EXHIBIT V.5

WMATA OPERATING EXPENSES





## VI. RAIL CONSTRUCTION

The rail construction necessary to complete the planned 103-mile Metrorail system is broken down into two major groups: those segments that are a part of the 89.5-mile system to be funded on the basis of the Stark-Harris Federal authorization and those segments that comprise the final 14 miles of the system. The Stark-Harris segments are the following:

Line	Terminal	Scheduled Opening
Orange	Vienna	June, 1986
Red	Wheaton	March, 1989
Green	U Street	July, 1990
Green	Anacostia	December, 1990
Yellow	Van Dorn	December, 1990
Green	Greenbelt <sup>1</sup>	December, 1992

<sup>1</sup> Shuttle operation from Ft. Totten

The following segments complete the 103-mile system:

Line	Terminal	Scheduled Opening
Red	Glenmont	January, 1994
Yellow	Franconia	January, 1994
Green	Columbia Hts.	July, 1994
Green	Georgia Ave. <sup>2</sup>	July, 1996
Green	Branch Avenue	December, 1997

<sup>2</sup> Connection between Columbia Heights and Ft. Totten

The capital costs for completing the Metrorail system are somewhat difficult to set forth because of the differences between the obligation of funds for segments, when construction is actually performed, when funds are received from Federal and local sources, and other accounting issues. For simplicity, costs were developed based upon the schedule of billings to the local jurisdictions. These billings reflect the construction schedule agreed upon by local officials (ICCA-IV) and assume an uninterrupted flow of Federal funds.

For the Stark-Harris (89.5-mile) system, the Federal government is assumed to pay for 80% of the construction costs, although some delays have occurred in recent Federal obligations. For system completion, two alternative funding scenarios were developed. Under the scenario most favorable to the local and state governments, Alternative A, the Federal government is assumed to pay 75% of the post Stark-Harris construction costs, which is in line with current UMTA capital grant matching ratios. Under the scenario less favorable to the local and state governments, Alternative B, no Federal funds are assumed available beyond the Stark-Harris authorization.



EXHIBIT VI.1

RAIL CONSTRUCTION CAPITAL REQUIREMENTS

(Millions, 1986 Dollars)

Fiscal Year	Total Costs	Federal Share <sup>a</sup>		Internally <sup>b</sup> Generated	Non-Federal Share	
		Alt. A	Alt. B		Alt. A	Alt. B
1985	381.99	305.59	305.59	15.00	61.40	61.40 <sup>c</sup>
1986	312.50	250.00	250.00	17.60	44.90	44.90
1987	332.20	265.76	265.76	18.36	48.08	48.08
1988	287.55	230.04	230.04	18.04	39.48	39.48
1989	292.56	229.60	167.46	17.35	45.61	107.75
1990	312.98 <sup>d</sup>	234.74	0.00	16.69	61.55	296.29
1991	298.08	223.56	0.00	15.90	58.62	282.18
1992	283.89	212.91	0.00	15.14	55.83	268.75
1993	270.37	202.78	0.00	14.42	53.17	255.95
1994	105.74	79.31	0.00	13.73	12.70	92.01
1995	28.12	21.09	0.00	7.03	0.00	21.09
1996	17.76	13.32	0.00	4.44	0.00	13.32
1997	14.69	11.01	0.00	3.67	0.00	11.01
TOTAL	2938.43	2279.71	1218.85	177.45	481.34	1542.21

<sup>a</sup> The Federal share under both Alternatives A and B for Fiscal Years 1985 through 1989 reflects the full Stark-Harris authorization.

<sup>b</sup> Internally generated funds are interest earnings by WMATA that are credited to a jurisdiction, such as when a jurisdiction is ahead in its payments. These funds are used as part of a jurisdiction's local match.

<sup>c</sup> Billings not yet submitted to jurisdictions due to delays in approval of Federal grants.

<sup>d</sup> The total cost for 1990 through system completion reflects the schedule in ICCA-IV. Under Alternative A, 75% of these costs would be borne by the Federal government. Under Alternative B, 100% of these costs would be borne by the local and state governments.



## VII. REHABILITATION AND REPLACEMENT COST PROJECTIONS

This chapter presents the methodology and results of an analysis of the capital requirements for the rehabilitation and replacement of Metrobus and Metrorail facilities and equipment. These projections represent costs that are over and above projections of operating and construction costs.

Rehabilitation and replacement (R & R) activities are a natural extension of routine maintenance activities currently being undertaken by WMATA. Rehabilitation and replacement of facilities and equipment occurs for the following reasons:

- o Functional obsolescence: due to a part or component wearing out
- o Technological obsolescence: due to a new device becoming available that meets or exceeds the requirements of the current device
- o Changed requirements: due to changes in policy, such as level of service or safety

In these cases, the decision to rehabilitate or replace usually entails comparing the costs to repair (generally considered an operating cost) versus the cost to rehabilitate or replace. This analysis would directly address anticipated functional and technological obsolescence. Rehabilitation and replacement costs due to changed requirements would be addressed in so far as current policy has affected original design requirements.

### METHODOLOGY

The following categories were used to structure the analysis:

- o Metrobus facilities and equipment
  - o facilities and equipment, except buses and new maintenance facilities
  - o buses
  - o new maintenance facilities
- o Metrorail facilities
  - o facilities, except track
  - o track
- o Metrorail equipment
  - o equipment, except rail cars
  - o rail cars

The projection of future costs for facilities and equipment except for buses, new bus maintenance facilities, track, and rail cars was structured to take advantage of the following information available from WMATA:



and the differing cycle lengths of the rehabilitation and replacement cycles. For example, the large costs shown for 1987 and 1997 represent the 10- and 20-year R & R cycles for Metrorail assets capitalized in 1977. These assets include a significant portion of the Metrorail system: from Rhode Island Avenue to Dupont Circle and from Stadium-Armory to National Airport.

Given that the projected sudden increases and decreases in the magnitude of the capital rehabilitation and replacement program would be difficult to plan for and administer, the realities of the budgeting process in all likelihood would lead to a smoothing out of the stream of expenses. In recognition of this eventuality, the projected costs were averaged using a 7-year "rolling average", which involves averaging three years on either side of the target year. Another advantage of using the rolling average is it addresses some costs that would be incurred just beyond the year 2000.

#### **INPUT ASSET VALUES**

The input data for all asset categories except buses and rail cars was provided in tabular form by the WMATA Office of Management Information Services (MISV) which displayed the dollar value of all Authority assets. Separate tables were prepared for Metrobus, Metrorail facilities, and Metrorail equipment. The tables aggregated costs into approximately 50 asset classes, tabulated by year of expenditure. In the case of Metrorail facilities and equipment, assets were capitalized in the year the segment (or "phase") opened (or will open) for revenue service.

These tables were reviewed for accuracy and completeness by comparing other routinely generated fixed asset accounting reports. There were several instances of assets not coded by year of capitalization. These were examined on a case-by-case basis and were manually assigned to the appropriate year.

These data were then converted from year-of-expenditure to base year (1986) dollars using historical inflation rates documented by PROG.

#### **METROBUS FACILITIES AND EQUIPMENT REHABILITATION AND REPLACEMENT COSTS**

Three separate analyses were undertaken to compute Metrobus facilities and equipment R & R costs:

- o facilities and equipment, except buses and new maintenance facilities
- o buses
- o new maintenance facilities



EXHIBIT VII.1

METROBUS REHABILITATION AND REPLACEMENT ASSET CLASSES

A Office Furn & Equipment

C Buses

E Service Vehicles

F Automobiles

G Trucks - Pick Up

H Trucks - Heavy Duty

I Land

AA Passenger Station Other

AB Parking Facilities

AC Building & Structure

AI Equipment Parking

AJ Equipment Shops

AR Equip Bus Cntrl, AIDS

AX Fareboxes

AX AFC Other

AY Equipment Data Processing

AZ Equipment Communication

BA Equipment Other

BB Repairables

BC Intangible Assets

Note: Buses and some of the building and structure replacement costs are computed in a separate analysis

## Results

Exhibit VII.2 summarizes the results of the analysis of Metrobus facilities and equipment rehabilitation and replacement costs for 1986 through 2000.

### METRO RAIL FACILITIES REHABILITATION AND REPLACEMENT COSTS

Two separate analyses were undertaken to compute Metrorail facilities R & R costs:

- o Metrorail facilities, except track
- o track

#### Metrorail Facilities, except Track

The detailed classes for Metrorail facilities are shown in Exhibit VII.3. Current and projected asset values, along with the replacement cycle assumptions, are shown in Appendix E. The sources of the cycle assumptions were PROG and FMNT. It should be noted that the replacement percentages do not include any costs for essentially non-replaceable components of the assets. For example, it is assumed that none of the cost for design, excavation, and basic concrete structures would be incurred again.

The assets were categorized into the following major classes:

- o line (between stations), by type of construction
- o stations, by type of construction
- o other, including maintenance facilities, parking lots, and other structures

The results of this analysis on an annual basis are shown in Exhibit VII.4.

#### Track Replacement Costs

The frequency and form of track replacement is a function of three factors:

- o type of construction
- o severity of traffic loads
- o sharpness of curves

The type of construction affects wear primarily in that ballasted track provides a more flexible foundation that can respond to train loads than do rigid direct fixation sections. Traffic loads are twice as heavy in the center of the system where two lines share trackage. The sharpness of curves affects wear on the inner surface of the outer rail in response to the centrifugal force of the wheel flange on the side of the rail as the car travels around a curve.

EXHIBIT VII.2

BUS REHABILITATION AND REPLACEMENT

(7-Yr Avg, except Maint Facil)

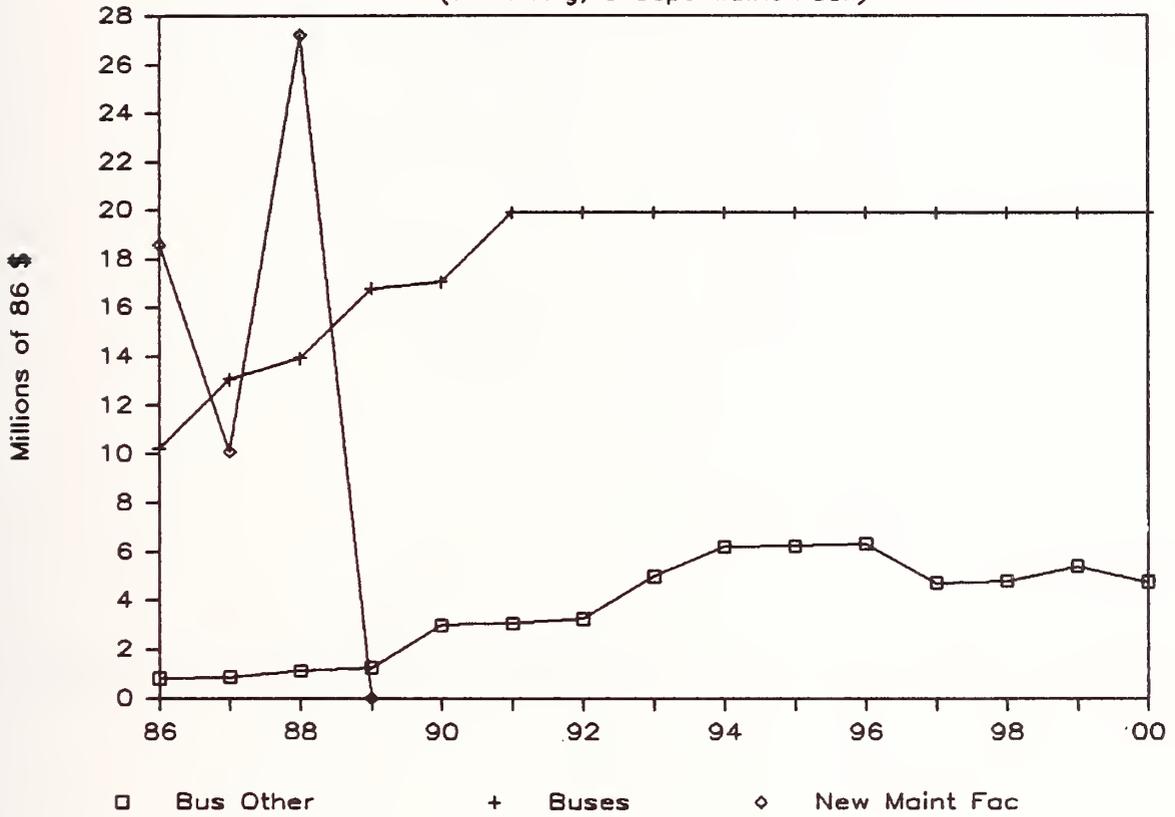


EXHIBIT VII.3

METRORAIL EQUIPMENT ASSET CLASSES

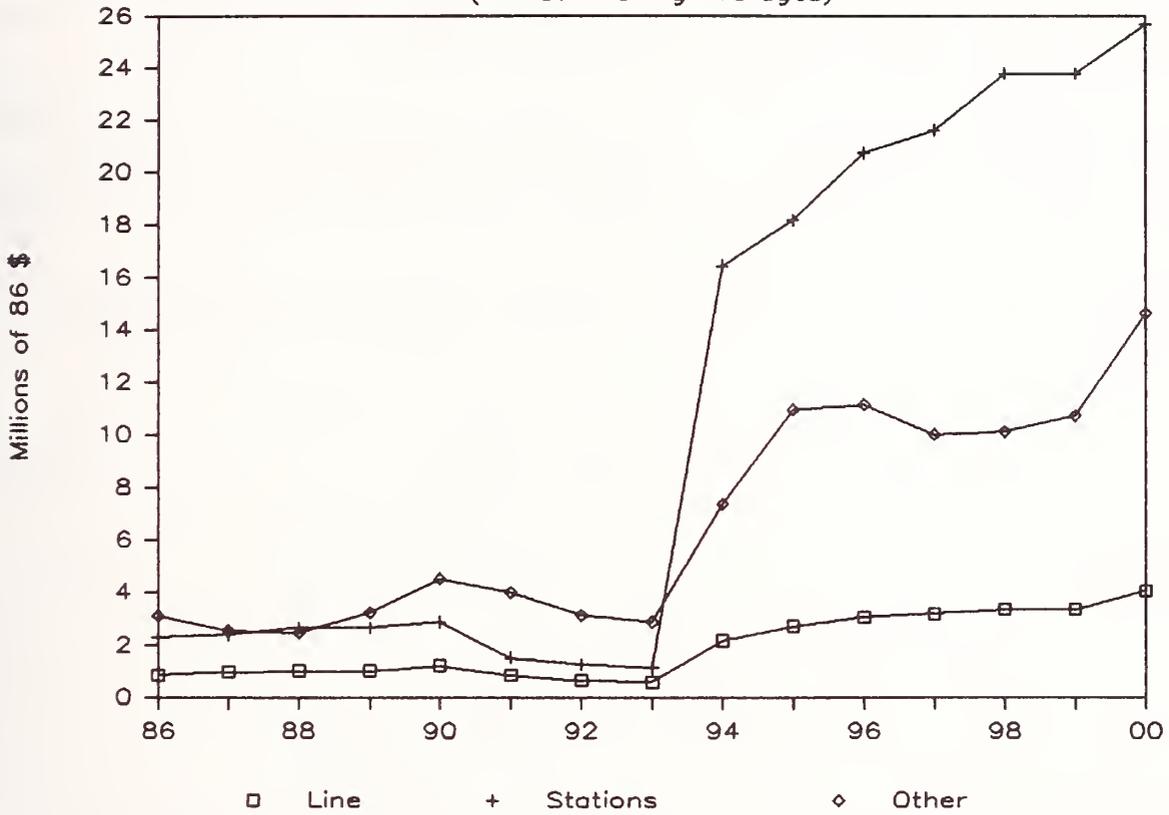
J Structure Line Cut/Cover  
K Structure Line Rock/Earth Tunnel  
L Structure Line At-Grade  
M Structure Line Aerial  
N Structure Line Sunken Tube  
O Structure Line Bridge  
Q Structure Line Xover & Turnout  
R Structure Line Other  
  
S Passenger Station Cut/Cover  
T Passenger Station Rock  
U Passenger Station At-Grade  
V Passenger Station Aerial  
  
AB Parking Facilities  
AC Bldg & Structure  
  
AD Track Yard  
AE Third Rail

Note: Track replacement costs are computed in a separate analysis

EXHIBIT VII.4

# RAIL STRUCTURE REHAB & REPLACEMENT

(7-Year Rolling Averages)



This latter wear on curved track generally controls its useful life, being more severe than the wear on the top surface of the rail. For economic reasons, WMATA employs a technique, common in the railroad industry, of transposing the inner and outer rails in curve sections. Thus, a given piece of track can have its useful life roughly doubled over that which would be dictated by wear on the inner surface of the outer rail.

At the first replacement cycle, the rails are simply transposed and no track is replaced. At the second cycle, the now-worn outer rail is replaced. At the third and succeeding cycles, the outer rail is moved to the inside, a new outer rail is installed, and the inner rail is discarded.

For purposes of this analysis, WMATA classified the existing trackage into three categories based on type of construction and traffic loads:

- o Subsurface, heavy traffic (SSH)
- o Subsurface, routine traffic (SSR)
- o Surface (including aerial) (SUR)

In addition, all track was categorized by degree of curvature into four groups:

- o Curve 1: under 900 foot radius
- o Curve 2: 900 - 1200 foot radius
- o Curve 3: 1200 - 2000 foot radius
- o Tangent (including curves over 2000 foot radius)

WMATA supplied a summary of the percentages of track by type for each phase of the existing system and each planned extension. These data are summarized in Appendix E.

WMATA staff estimated the useful lives for each classification, including the transposition interval for curve sections. They also estimated a difficulty factor for various replacement activities which was applied to the labor and equipment costs used in the replacement activities but not for the materials. Finally, WMATA staff estimated the reclaimed value of materials, the value of materials retained in place, and the ratio of materials cost to labor and equipment costs for the construction contracts. For new construction, an additional factor was applied to back-out the cost for third-rail which is included in the trackwork contract but has an extremely long life.

The life expectancies and difficulty factors for the various sections are as follows:

Type	Curvature	Useful Life		Difficulty Factor	
		Transpose	Replace	Transpose	Replace
SSH	Tangent	-	18	-	3.0
	Curve 1	3	6	2.0	2.5
	Curve 2	5	10	2.0	2.5
	Curve 3	8	16	2.0	2.5
SSR	Tangent	-	25	-	3.0
	Curve 1	5	5	2.0	2.5
	Curve 2	8	15	2.0	2.5
	Curve 3	11	21	2.0	2.5
SUR	Tangent	-	35	-	2.0
	Curve 1	10	20	2.0	2.0
	Curve 2	20	35	2.0	2.0
	Curve 3	20	35	2.0	2.0

In addition, the following factors were assumed to be applied as appropriate:

- o Materials assumed as 45% of total construction cost; labor and equipment comprise the balance
- o Third rail assumed as 29% of construction estimate for new segments
- o Reclaim value of materials assumed as 20%
- o For SUR sections, 35% of the value would be retained in place and reduce both materials cost and labor and equipment cost; this reflects retention of some ties, fasteners, ballast, etc. which are also routinely replaced as part of maintenance activities
- o For transposition, labor and equipment cost assumed as 15%

Applying these various factors resulted in the following replacement cost percentages:

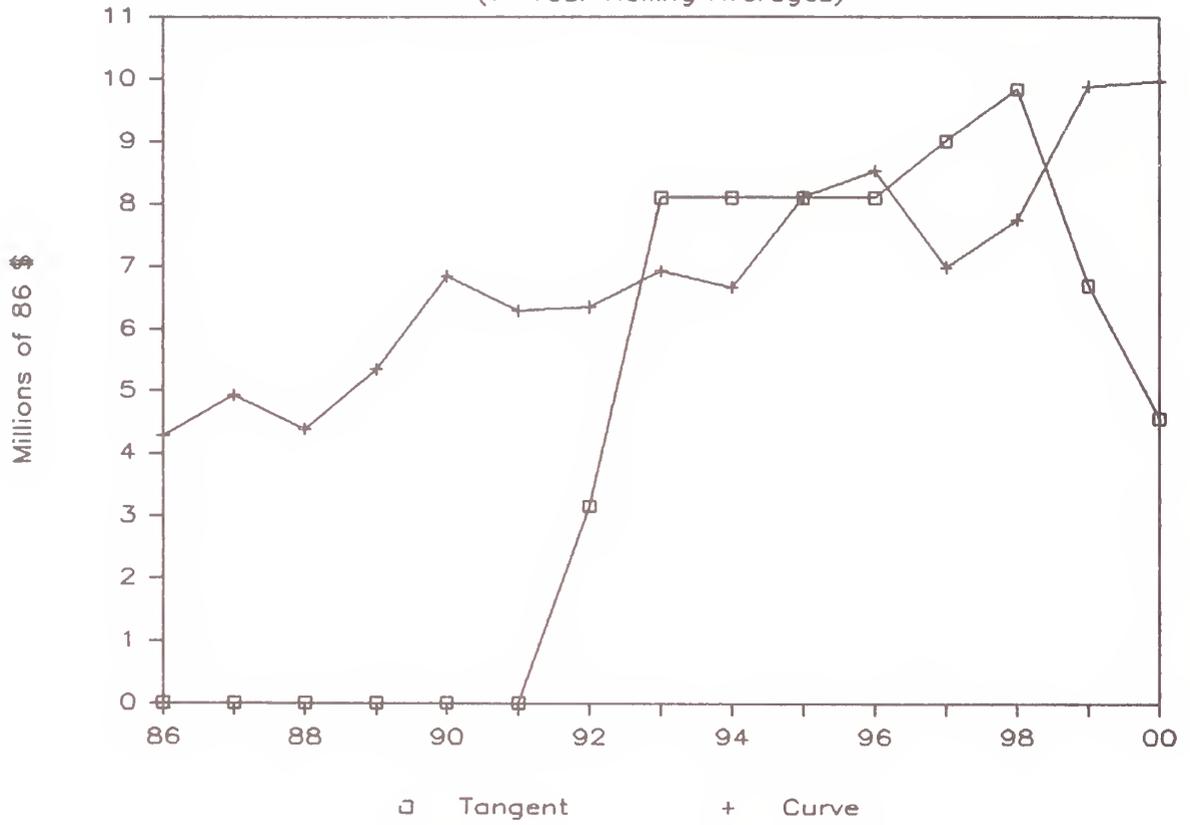
Type	Curvature	First Cycle	Second Cycle	Other Cycles
SSH & SSR	Tangent	-	-	201.0%
	All Curves	30.0%	86.8%	220.8%
SUR	Tangent	-	-	94.9%
	All Curves	30.0%	47.5%	62.5%

The results of the analysis for all segments and estimated costs through 2015 are shown in Appendix E. All values were calculated on an annual basis and converted to a seven-year rolling average for display purposes. The resulting average values for 1986 - 2000 are shown in Exhibit VII.5. No tangent track replacement is

EXHIBIT VII.5

# TRACK REHAB AND REPLACEMENT

(7-Year Rolling Averages)



shown until 1992 but thereafter costs rise quickly to \$8 - \$10 million per year through the late 1990's. Replacement costs for curved track reflect an ongoing program that increases from \$4 - \$5 million per year in the mid 1980's to approximately \$10 million by 2000. The total costs for the key years of 1993 and 2000 are \$15.0 million and \$14.5 million, respectively.

It should be noted that the track replacement costs reflect only mainline track in revenue service. Yard track is currently replaced less frequently, except at major wear points, and track removed from elsewhere in the system is generally re-used in the yards, often after turning it around using the loop tracks. The labor costs and minor material costs for these activities are currently included in the maintenance budget.

#### **METRORAIL EQUIPMENT REHABILITATION AND REPLACEMENT COSTS**

Two separate analyses were undertaken to compute Metrorail equipment R & R costs:

- o Metrorail equipment, except rail cars
- o rail cars

#### **Metrorail Equipment, except Rail Cars**

The assets were categorized into the following major classes:

- o escalators and elevators
- o communications
- o Automatic Train Control (ATC)
- o Automatic Fare Collection (AFC)
- o wayside and power
- o other, including office furniture and equipment, service vehicles, shop equipment, and data processing equipment

The detailed classes are shown in Exhibit VII.6. Current and projected asset values, along with the replacement cycle assumptions, are shown in Appendix E. The sources of the cycle assumptions were ENGA and RAIL. The results of the analysis are shown on an annual basis in Exhibit VII.7.

#### **Rail Car Rehabilitation and Replacement Costs**

WMATA currently does not have very much information regarding the rehabilitation and replacement of the rail car fleet. Experience from other properties is of limited value because of the unique features of the WMATA vehicles. Based on limited information, WMATA estimates a useful life for the rail cars of approximately 35 years, recognizing that the actual life for individual vehicles will vary somewhat from that average. With a current replacement cost of approximately \$1.1 million in 1986 dollars, this represents a very significant cost. However, this cost would not be reflected in the analysis unless it is annualized, since the useful lives of the initial fleet would not be reached until approximately 2012.

EXHIBIT VII.6

METRORAIL EQUIPMENT ASSET CLASSES

A Office Furn & Equipment

E Service Vehicles  
F Automobiles  
G Trucks - Pick Up  
H Trucks - Heavy Duty

W Passenger Station Overheads  
X Passenger Station Kiosk  
Y Passenger Station Signing  
Z Passenger Station Elev Structure  
AA Passenger Station Other

AB Parking Facilities

AF Equipment Transit Way  
AG Escalators  
AH Elevators  
AI Equipment Parking  
AJ Equipment Shops  
AK Equipment Power

AL Equipment ATC Stations  
AM Equipment ATC Xover & Turnout  
AN Equipment ATC Yard  
AO Equipment ATC Passenger Car  
AP Equipment ATC Computer System  
AQ Equipment ATC Line

AR Equipment Bus Control,AIDS

AS AFC Vendor  
AT AFC Addfare  
AU AFC DADS  
AV AFC Transfer  
AW AFC Gates  
AX AFC Other

AY Equipment Data Processing  
AZ Equipment Communication  
BA Equipment Other

Note: Rail car rehabilitation and replacement costs are computed in a separate analysis

EXHIBIT VII.7

RAIL EQUIP REHAB AND REPLACEMENT

(7-Year Rolling Averages)

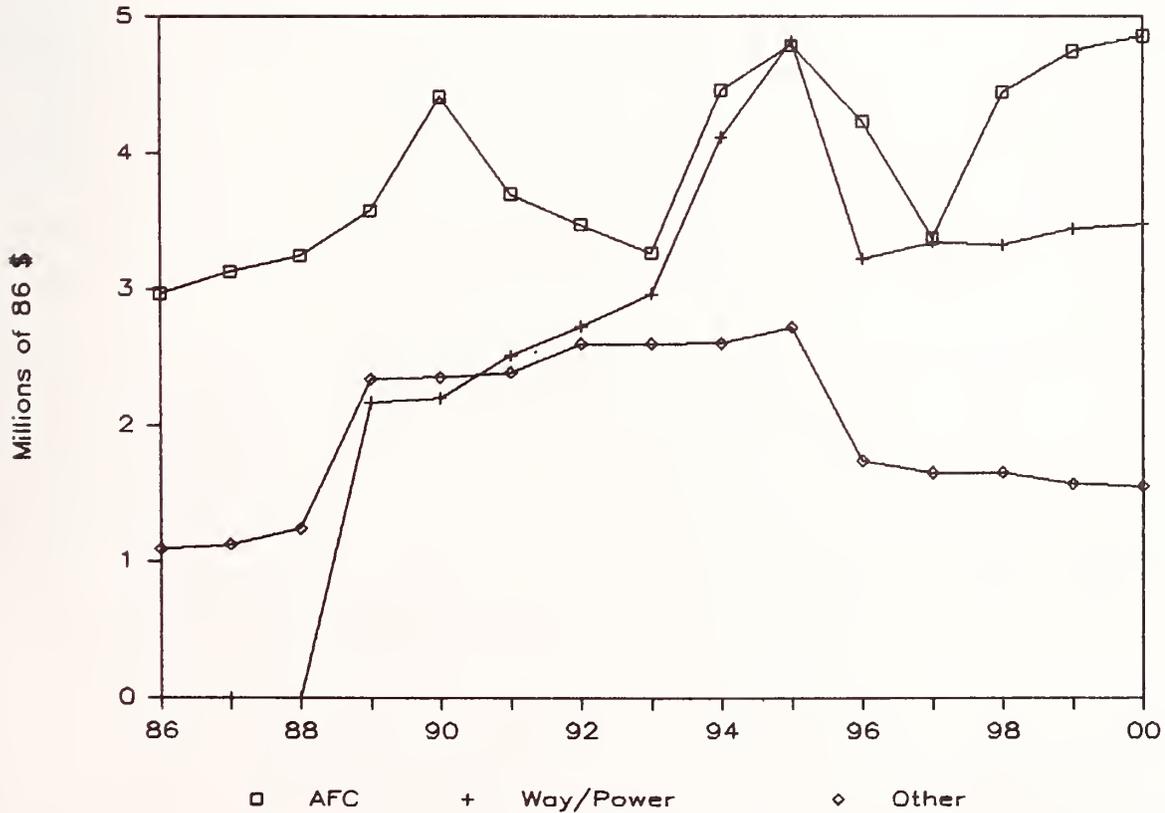
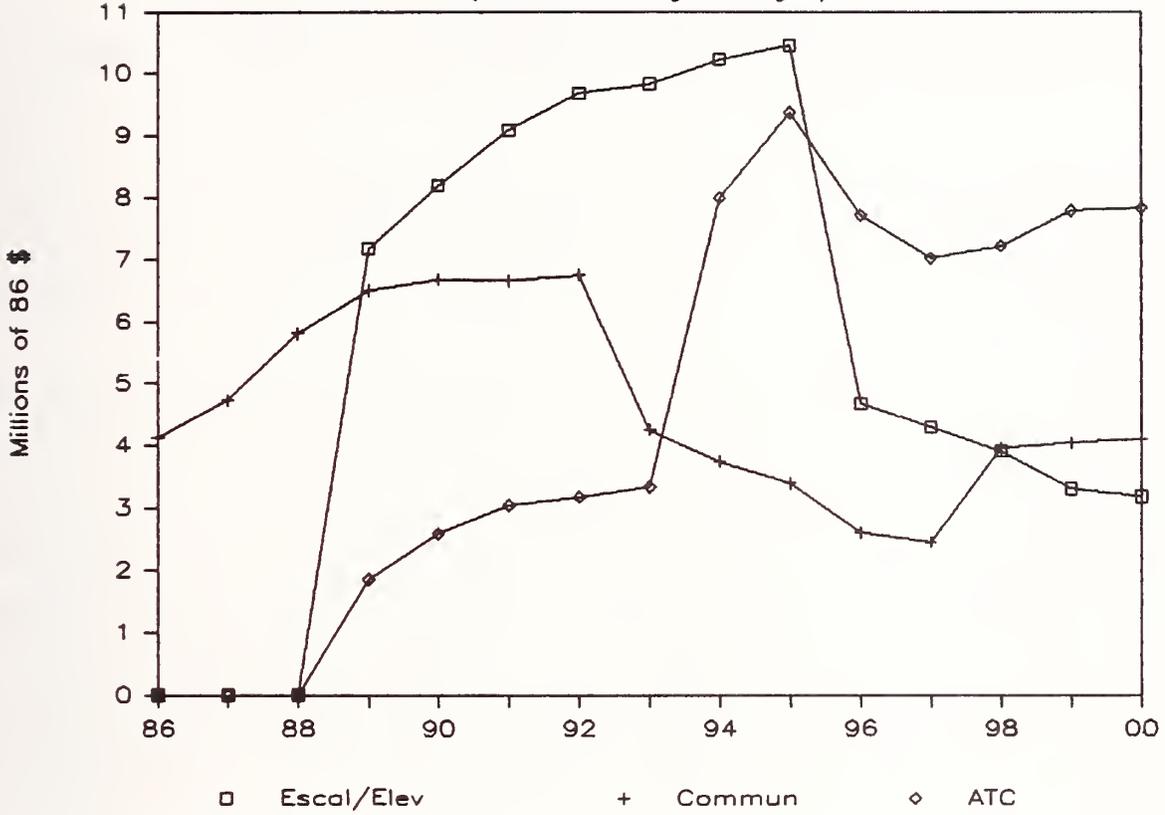


EXHIBIT VII.8

WMATA RAIL CAR REHABILITATION COSTS BY COMPONENT

Component	% of Total Cost	% of Cost Replaced	Freq. Years	Total %
Car Body	7.84	40	15/20	3.136
Dest. Signs/Lighting	2.45	100	12 & 24	4.900
Propulsion System	4.28	15	20	4.280
Friction Brakes & Pneumatics	13.01	15	20	1.952
Auxiliary Systems	4.33	33.3	20	1.443
Truck/Suspension & Primary Power System	34.02	10	20	3.402
Coupler/Draft Gear	1.70	40	15/20	0.680
Doors & Controls	3.82	100	15/20	3.820
HVAC	4.22	40	15/20	1.688
Communications	0.97	100	15/20	0.970
ATC System	<u>23.36</u>	25	15/20	<u>5.840</u>
TOTAL	100.00			32.111

In addition to the ultimate replacement of the vehicles, a major rehabilitation is anticipated at approximately half-way through the life of the car or at about 18 years. WMATA estimates that the value of the car components that would be replaced would amount to 32.11% of the total car value when car-borne ATC equipment is included, or about \$353,000 per car. Exhibit VII.8 summarizes the derivation of this replacement factor, on a component-by-component basis.

Some of these components have already been replaced on the initial WMATA fleet of Rohr cars through various upgrade programs. For purposes of the analysis, this has been assumed to delay the mid-point for rehabilitation to 23 years for these vehicles.

Because of the magnitude of rail car costs and the fact that the replacement costs and most of the rehabilitation costs would not be incurred until after 2000, it was deemed prudent to treat rail car costs somewhat differently from those for the rehabilitation and replacement of other rail and bus system components. Therefore, simple straight-line, average annual costs were computed for the rehabilitation and replacement of each component of the current and future Metrorail fleet. These calculations were made by estimating the rehabilitation and replacement dates for each fleet component, then spreading these costs uniformly over the respective useful lives. For the current fleet, the costs were computed over a shorter time frame reflecting the age of the fleet and were assumed to start in 1988 since no provision for these costs is currently included in the 1986 or 1987 WMATA budgets.

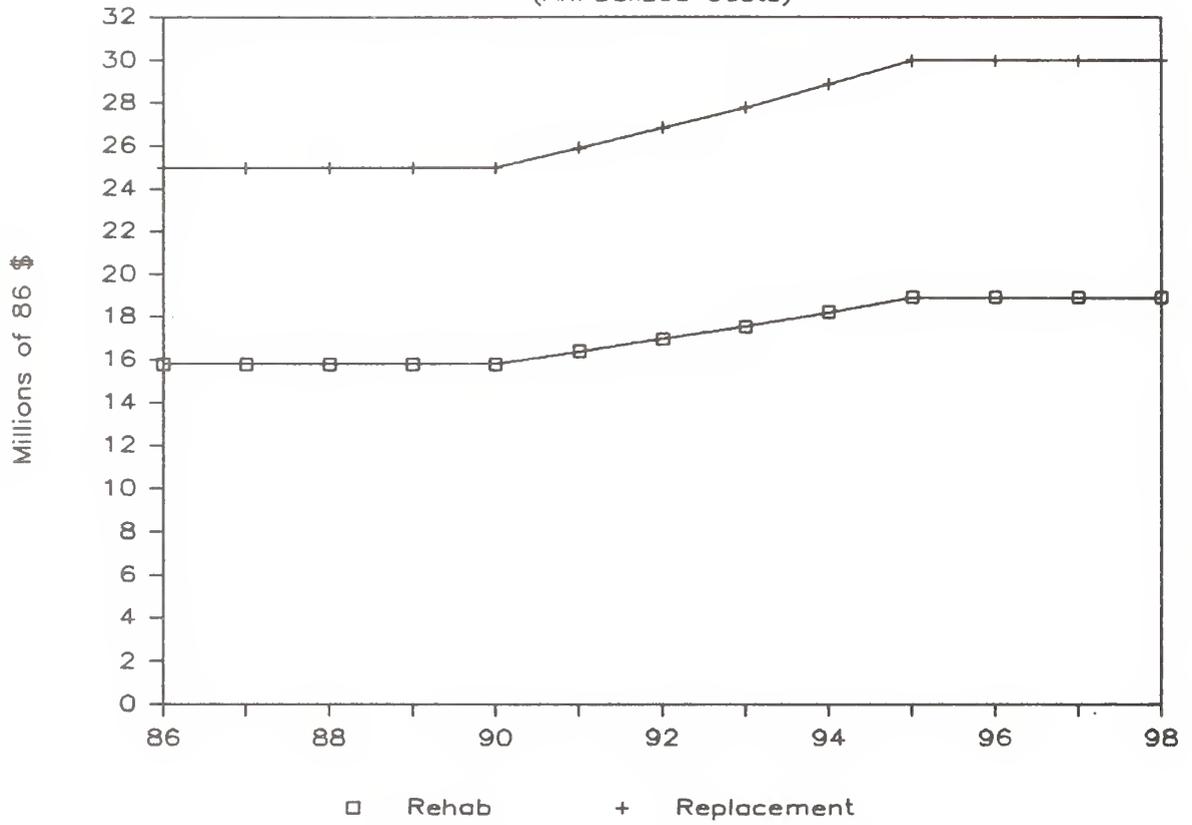
Thus, the rehabilitation year for the initial 240 Rohr cars that were capitalized in 1977 would be 2000 with replacement in 2012. The remaining 60 Rohr cars follow one year later. The first Breda cars, capitalized in 1983, would require rehabilitation in 2001 (18 years) but replacement would not occur until 2018. The remaining Breda cars in the current fleet would be rehabilitated and replaced on an annual basis over succeeding years. The final cars purchased are scheduled to begin revenue service in 1997, resulting in rehabilitation in 2015 and replacement in 2032.

For each fleet, the rehabilitation and replacement costs were spread over the appropriate years and summed for annual values. The resulting values are shown in Exhibit VII.9. The rehabilitation costs increase from approximately \$16 million to approximately \$19 million by the end of the century. The replacement costs increase from approximately \$25 million to approximately \$30 million over the period. The totals for 1993 and 2000 are \$42.2 million and \$48.9 million, respectively. A more complete analysis of each fleet component on an annual basis through 2015 is shown in Appendix E.

EXHIBIT VII.9

# RAIL CAR REHAB AND REPLACEMENT

(Annualized Costs)



## SUMMARY

A summary of all rehabilitation and replacement costs is shown in Exhibit VII.10 for buses, other bus costs, rail structures, track, rail equipment, and the annualized rail car values. Costs increase from approximately \$100 million in the late 1980's to almost \$160 million by the end of the century. The values for the key years of 1993 and 2000 are summarized in Exhibit VII.11.

## LIMITATIONS

This analysis is the first comprehensive analysis of WMATA's capital rehabilitation and replacement costs. Indeed, transit systems rarely have attempted this type of projection. While WMATA has prepared a Five-Year Metrobus and Metrorail Reliability Program, this program was not intended to address costs beyond the 5-year planning horizon. For this reason, the Five-Year Program was of limited assistance in this analysis.

Although it appears possible to model future WMATA capital rehabilitation and replacement costs on experience of other transit systems, the fundamental differences between WMATA and other properties preclude this comparison. These differences include:

- o Technology: Metrorail is extremely sophisticated in many areas. Some of the systems used are unique to WMATA. Most systems are more advanced than those of the older, Northeastern rail systems. With the exception of BART, no new rail transit system has more experience than WMATA.
- o History of Deferred Maintenance: WMATA has one of the best maintenance programs in the transit industry. Many transit systems are currently investing large sums of money to compensate for years of deferred maintenance.

For these reasons, the study relied on the professional judgment of knowledgeable WMATA staff for estimates of the length of rehabilitation and replacement cycles and the relative costs of replacement.

Clearly, the level of detail in the projection of Metrorail systems equipment (AFC, ATC, traction power, and communications) far exceeds the detail in the facilities cost projections. Ideally, WMATA should begin to conduct such component-by-component assessments in other maintenance areas in order to further refine these projections.

It is also recognized that the magnitude of these rehabilitation and replacement costs suggests a significant increase in the size of the WMATA staff to plan and manage the work. Such an increase in administrative costs is not addressed in the operating cost projections.

EXHIBIT VII.10

# Rehab & Replacement Costs (7-Year Rolling Averages)

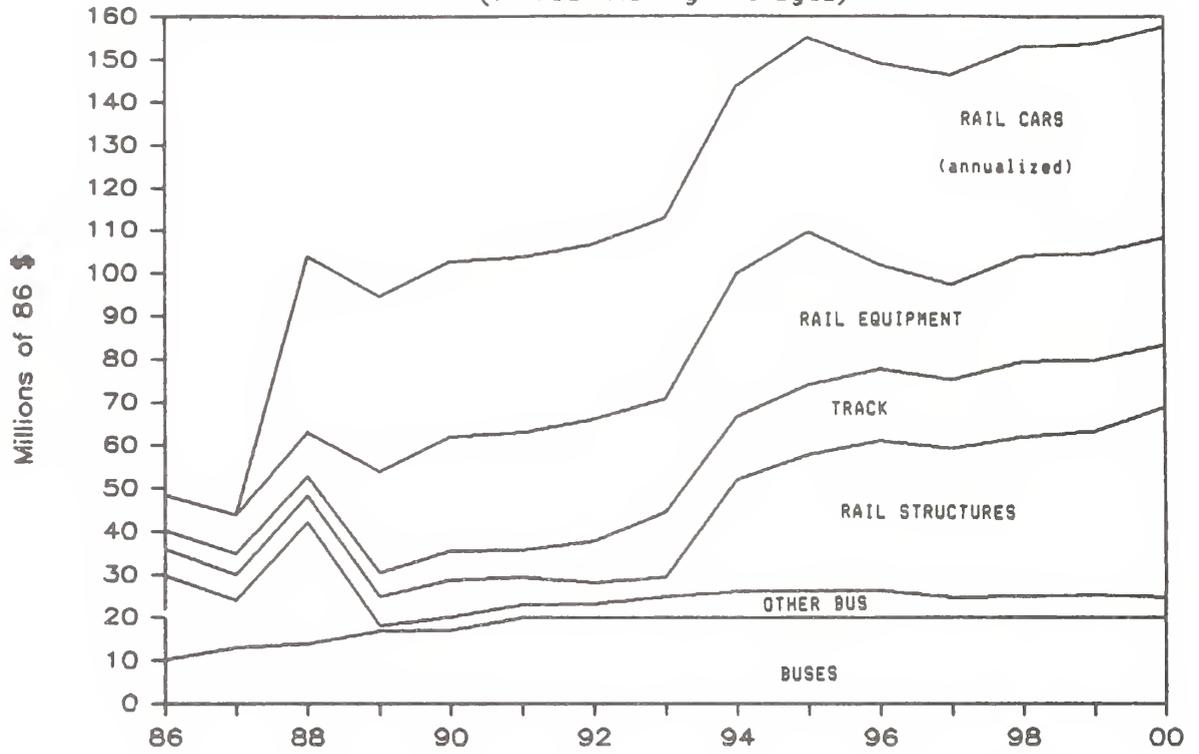


EXHIBIT VII.11

WMATA REHABILITATION AND REPLACEMENT COSTS  
(Millions of 1986 Dollars)

Category	1993	2000
Bus:		
Buses	19.9	19.9
Other	5.0	4.8
Subtotal: Bus	24.9	24.7
Rail Facilities:		
Stations	1.1	25.7
Line	0.6	4.1
Track (except yards)	15.0	14.5
Other Facilities	2.9	14.6
Subtotal: Rail Facilities	19.6	58.9
Rail Equipment:		
Rail Cars (Annualized)	42.2	48.9
Other Equipment	26.3	25.0
Subtotal: Rail Equipment	68.5	73.9
Subtotal: Rail	88.1	132.8
TOTAL	113.0	157.5



## VIII. ALLOCATION OF WMATA SUPPORT

### OPERATING SUPPORT

The allocation of Metrorail operating support is based on a formula that gives equal weight to rail system supply, ridership by jurisdiction of residence, and population density. Rail system supply is defined as the number of stations in a given jurisdiction. Population density allocations have been based upon the 1980 census and this study uses the 1980 census allocations as well.

The third component -- ridership by jurisdiction of residence of passengers -- is briefly discussed in Chapter IV. Passengers from outside the WMATA compact are ignored in computing the allocation percentages, although their numbers are substantial, particularly for non-home based trips. The model results, by jurisdiction of residence, were adjusted slightly to match observed data. All of the allocation factors are summarized in Appendix F.

Metrorail operating assistance is computed simply as the difference between total Metrorail operating costs and total Metrorail revenues. Exhibits VIII.1 and VIII.2 show Metrorail operating assistance allocated by jurisdiction according to the criteria described above. This allocation is presented in constant 1986 dollars. The total WMATA rail assistance is projected to nearly double between 1986 and 2000. The jurisdictional allocation of the Metrorail support varies, with Prince George's County and Fairfax County experiencing a greater percentage increase since rail service within these jurisdictions increases dramatically. The other jurisdictions experience lesser percentage increases as their shares computed by the formula decrease.

In addition to the operating assistance noted above, the jurisdictions provide Metrorail fare support through two additional programs. The District of Columbia's discount for trips using stations east of the Anacostia River is assumed to expand with the Green Line extension to the Anacostia and Congress Heights stations. Also, the maximum fare reimbursement to WMATA for trips benefiting from the rail "taper and cap" is distributed on the basis of the jurisdiction of benefiting passengers. Both factors are shown in Exhibit VIII.1.

Metrobus operating assistance is computed by allocating costs and revenues separately by jurisdiction. The allocation of Metrobus revenues were derived from the patronage analysis described in Chapter IV. Metrobus costs are allocated on the basis of bus-miles and bus-hours of service within a given jurisdiction. These are then applied to allocate the fixed, miles-related and hours-related Metrobus operating costs.

## EXHIBIT VIII.1

## METRORAIL OPERATING ASSISTANCE

(\$ 1986 Millions)

	1986 BUDGET	1993 PROJ	2000 PROJ
Total Operating Cost	188.513	238.243	291.633
Total Metrorail Revenue	122.585	156.449	185.488
Total Operating Assistance	65.928	81.794	106.145
Allocated Operating Assistance:			
District of Columbia	27.861	34.109	43.808
Montgomery County	11.933	13.561	16.812
Prince Georges County	9.415	12.067	18.134
Arlington	7.259	8.355	9.949
Alexandria	3.270	3.868	4.706
Fairfax County	5.861	9.421	12.209
Falls Church	0.165	0.189	0.240
Fairfax City	0.165	0.225	0.286
TOTAL	65.928	81.794	106.145
Rail Fare Support Programs:			
Maximum Fare Reimbursement:			
District of Columbia	0.091	0.133	0.162
Montgomery County	0.733	1.021	1.277
Prince Georges County	0.222	0.299	0.418
Arlington	0.017	0.033	0.039
Alexandria	0.059	0.085	0.092
Fairfax County	0.174	0.439	0.575
Falls Church	0.003	0.036	0.051
Fairfax City	0.001	0.003	0.003
TOTAL	1.300	2.049	2.617
DC Fare Reimbursement:	0.225	0.625	0.598

EXHIBIT VIII.2

METRORAIL OPERATING ASSISTANCE

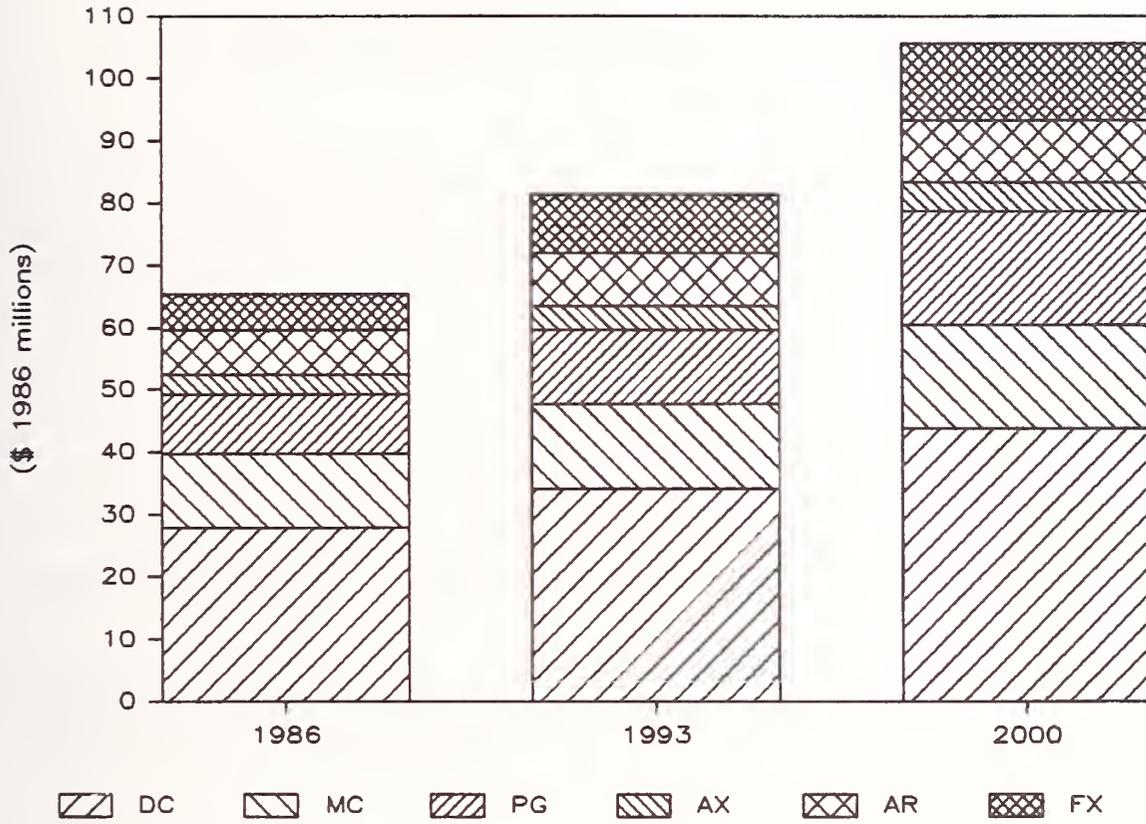


Exhibit VIII.3 shows allocated Metrobus costs and revenues. The operating assistance by jurisdiction is simply the difference between costs and revenues. The level of assistance is not expected to change dramatically in future years. Although bus service will be turned-back or eliminated as the rail system expands, many of the routes deleted in the central city are generally more productive than the system-wide average. In addition, some modest increases are projected in new Metrobus services in the outer counties.

The total WMATA operating support by jurisdiction is shown in Exhibits VIII.4 and VIII.5. These jurisdictional costs represent the sum of Metrorail operating support, Metrorail fare reimbursement, and Metrobus operating support. As the previous exhibits illustrate, most of the increase reflects expansion of Metrorail service.

Metrorail, Metrobus, and total WMATA operating support are summarized in Exhibits VIII.6 and VIII.7. These Exhibits includes an estimate of the revenues and costs for other Metrobus programs which, following previous WMATA assumptions, are assumed to be self-supporting. These programs include contract and charter service, net investment income, leverage leasing (soon to expire), and bus advertising and miscellaneous income.

The cost recovery ratios decline slightly for both Metrorail and Metrobus. However, since Metrorail, with its higher recovery ratio, becomes a much larger part of overall WMATA services, the overall recovery ratio for the system actually increases slightly.

#### **ANNUAL ESTIMATES**

Annual operating cost estimates were prepared by running the operating cost model described in Chapter V with a set of annual operating statistics as input. The rail statistics were computed based on the schedule of openings of the Metrorail system and reflect partial years of operation as appropriate.

Metrobus operating statistics were also estimated on an annual basis tied to rail openings. The changes described in Chapter 3 were applied for each corridor and were assumed to take place with the implementation of the rail service changes. For simplicity, no other modifications to Metrobus services at other times were reflected in the analysis.

Bus and rail passenger revenue and rail support program estimates were computed on an annual basis by interpolation between the 1985, 1993, and 2000 values. The interpolation factors included a demographic trend based on increases in core area employment, the single most significant determinant of transit ridership. The interpolations also included the relative ridership changes in various corridors to reflect the different Metrorail extensions during the 1986 - 1993 and 1993 - 2000 periods.

EXHIBIT VIII.3

METROBUS OPERATING ASSISTANCE

(\$ 1986 Millions)

	1986 BUDGET	1993 PROJ	2000 PROJ
Allocated Revenues:			
District of Columbia	46.471	43.369	41.593
Montgomery County	7.552	7.349	7.305
Prince Georges County	8.862	8.145	7.777
Alexandria	4.122	4	4.262
Arlington	4.906	5.219	5.505
Fairfax City	0.118	0.074	0.079
Fairfax County	9.342	9.356	9.785
Falls Church	0.196	0.18	0.198
NVTC	0.014	0	0
TOTAL	81.585	77.692	76.504
Allocated Costs:			
District of Columbia	114.428	113.807	111.777
Montgomery County	27.129	26.979	27.508
Prince Georges County	26.238	26.428	26.418
Alexandria	9.873	10.013	10.048
Arlington	12.996	13.528	13.567
Fairfax City	0.503	0.359	0.360
Fairfax County	33.621	31.996	33.199
Falls Church	0.866	0.766	0.768
NVTC	0.071	0.000	0.000
TOTAL	225.725	223.876	223.646
Allocated Assistance:			
District of Columbia	67.957	70.438	70.184
Montgomery County	19.577	19.630	20.203
Prince Georges County	17.376	18.283	18.641
Alexandria	5.751	6.013	5.786
Arlington	8.090	8.309	8.062
Fairfax City	0.385	0.285	0.281
Fairfax County	24.279	22.640	23.414
Falls Church	0.670	0.586	0.570
NVTC	0.057	0.000	0.000
TOTAL	144.140	146.184	147.142

EXHIBIT VIII.4

TOTAL WMATA OPERATING ASSISTANCE

(\$ 1986 Millions)

	1986 BUDGET	1993 PROJ	2000 PROJ
District of Columbia	96.134	105.306	114.752
Montgomery County	32.243	34.212	38.292
Prince Georges County	27.013	30.649	37.193
Alexandria	9.080	9.965	10.584
Arlington	15.366	16.697	18.049
Fairfax City	0.551	0.513	0.571
Fairfax County	30.314	32.500	36.198
Falls Church	0.838	0.811	0.861
NVTC	0.057	0.000	0.000
TOTAL	211.595	230.652	256.501

EXHIBIT VIII.5

TOTAL WMATA OPERATING ASSISTANCE

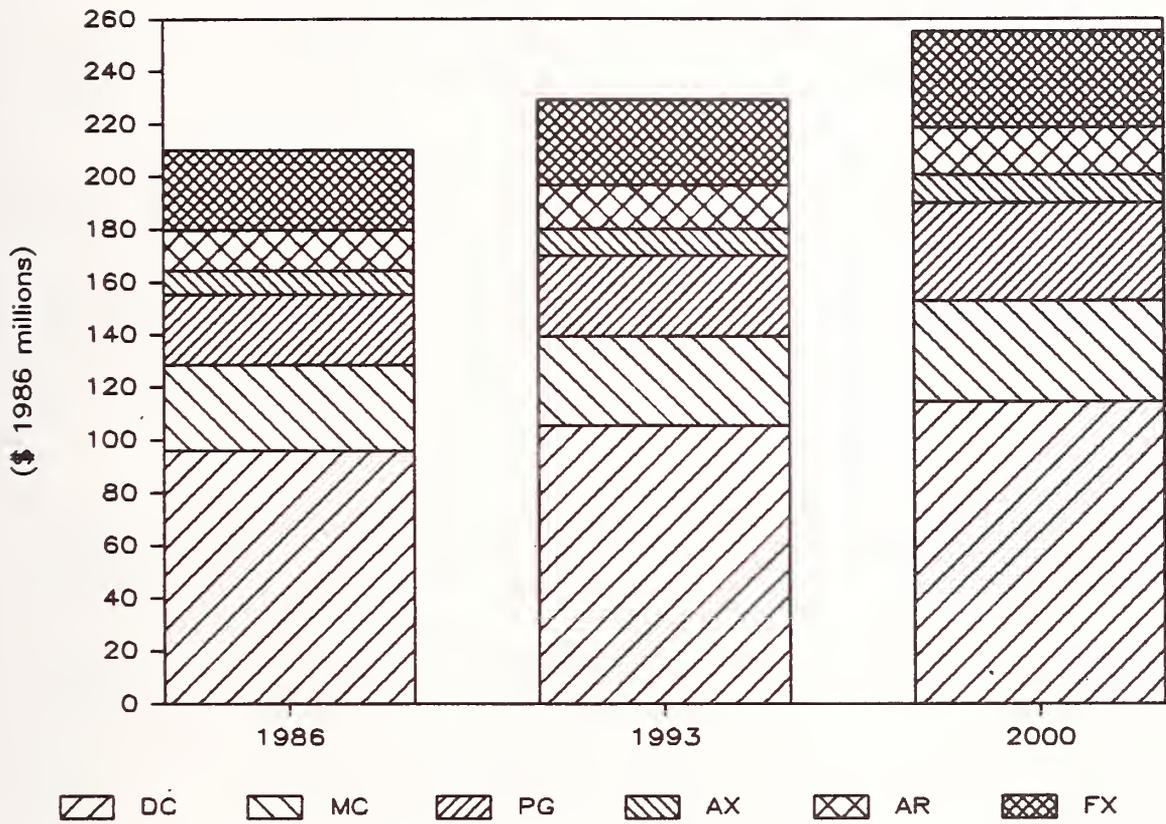


EXHIBIT VIII.6

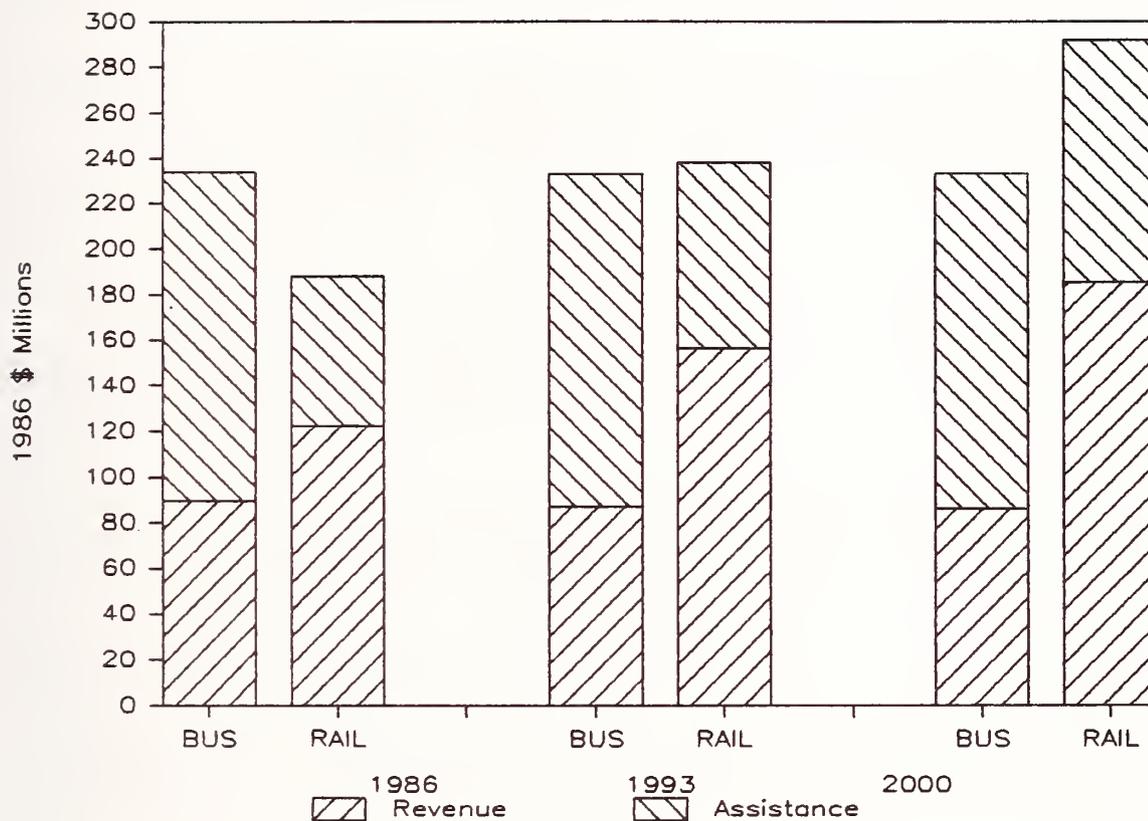
WMATA COST RECOVERY RATIOS

(\$ 1986 Millions)

	1986 BUDGET	1993 PROJ	2000 PROJ
METRORAIL			
Total Operating Cost	188.513	238.243	291.633
Fare Revenue	114.109	145.849	173.388
Non-Operating Revenue	8.476	10.600	12.100
Total Revenue	122.585	156.449	185.488
Recovery Ratio	65.0%	65.7%	63.6%
METROBUS			
Total Allocated Operating Cost	225.725	223.876	223.646
Non-Allocated Operating Cost	7.980	9.100	9.800
Total Operating Cost	233.705	232.976	233.446
Total Operating Revenue	81.585	77.692	76.504
Other Revenue	7.980	9.100	9.800
Total Revenue	89.565	86.792	86.304
Recovery Ratio	38.3%	37.3%	37.0%
TOTAL WMATA			
Total Operating Cost	422.218	471.219	525.079
Total Revenue	212.150	243.241	271.792
Recovery Ratio	50.2%	51.6%	51.8%

EXHIBIT VIII.7

COVERAGE OF WMATA COSTS



Annual parking revenue was computed based on the scheduled opening of parking facilities with some lag to account for maturing of ridership patterns. Other revenues such as joint development, interest earnings, advertising, and bus charter and contract services were projected based on assumptions provided by WMATA.

The annual cost and revenue estimates were then used to compute operating support requirements which were, in turn, allocated to the jurisdictions using the formulas described above. The resulting allocations are summarized in Appendix G.

#### DEBT SERVICE

Another requirement of WMATA support is the debt payments on the original WMATA revenue bonds. These payments are normally treated as an operating expense by the local jurisdictions. The annual of payments required of the six major jurisdictions are as follows:

- o \$10.085 million - District
  - o 4.434 million - Montgomery County
  - o 4.439 million - Prince Georges County
  - o 3.093 million - Fairfax County
  - o 2.675 million - Arlington County
  - o 1.384 million - Alexandria
- o \$26.110 million - Six Major Jurisdictions

Since these payments are fixed, they will decline in constant dollars to \$18.825 million by 1993 and \$13.378 million by 2000.

#### REHABILITATION AND REPLACEMENT COSTS

Other WMATA capital costs have traditionally been allocated using formulas similar to those described above for operating costs. These formulas have been assumed to apply to the rehabilitation and replacement (R & R) costs described in Chapter VII.

The allocation of rail R & R costs is based on an average of the allocation of rail operating support over the past five years. Historical data obtained from WMATA were used together with the annual estimates of operating support derived as noted above.

Bus capital costs are allocated simply on the basis of the mileage-related term used in the assignment of operating costs to jurisdiction. This approach was used for all bus R & R costs and is consistent with past WMATA practices.

#### FEDERAL SUPPORT

Federal support to WMATA traditionally has been provided in several areas: rail construction support, most recently under the terms of the Stark-Harris authorizations; various other capital grants for bus and rail equipment and facilities; and operating

support. With respect to continued Federal support of rail construction, two scenarios are set forth in Chapter VI.

The concept of two alternative Federal funding scenarios is also appropriate for other forms of Federal aid. Federal operating assistance currently is allocated for the six major jurisdictions as follows:

- o \$7.805 million - District
- o 2.958 million - Montgomery County
- o 2.958 million - Prince Georges County
- o 2.407 million - Fairfax County
- o 1.527 million - Arlington County
- o 0.727 million - Alexandria
  
- o \$18.382 million - Six Major Jurisdictions

Under the favorable funding scenario (Alternative A), Federal operating assistance is assumed to remain level in year-of-expenditure dollars, thus declining in constant dollars. The Federal operating support in constant dollars therefore drops to \$13.253 million by 1993 and to \$9.419 million by 2000. Under the unfavorable Federal funding scenario (Alternative B), operating assistance is assumed to be discontinued entirely, in line with the current administration proposal.

Federal support for rehabilitation and replacement costs under the favorable funding scenario is assumed to be at a level of 75% of total requirements. This assumption implies a modification of Federal policies regarding major rail rehabilitation and replacement. Currently, discretionary Federal funds for these purposes are limited (at a 75% match) to systems that were not constructed with major Federal participation.

Under the unfavorable Federal funding scenario, the only Federal funds available are assumed to be those contained in the proposed block grant program. The Washington area's allocation under this program would remain constant in year-of-expenditure dollars and would equal approximately \$21.6 million in 1993 and \$15.4 million in 2000. For analysis purposes, these funds were assumed to be allocated proportionally to bus and rail R & R requirements in any given year.

#### STATE SUPPORT

Support provided by the states of Maryland and Virginia has become significant to the local governments in the Washington area. The two programs have very different institutional histories and allocation approaches. Of course, no equivalent source of state aid exists for the District of Columbia.

The Maryland aid is provided through the Maryland transportation trust fund and is assumed to be available in the future at currently applied matching ratios. Under the Maryland aid program, the State pays 100% of Metrorail construction costs

allocated to Montgomery and Prince George's counties. The State pays 75% of incidental capital costs, which are assumed to include all of the projected rehabilitation and capital costs, and 75% of the revenue bond debt service. For operating support, the State pays 75% of the local allocation after accounting for Federal aid and subject to an overall farebox recovery ratio of 50% or higher.

Virginia state aid consists of direct appropriations and revenue from a state authorized gasoline tax. This revenue stream is assumed to increase in line with the overall rate of inflation, thus remaining constant in 1986 dollars at a level of \$31.602 million. Moreover, Virginia state aid is assumed to be used as it has been in recent years.

The Virginia aid is first assumed to be applied to completely fund the debt service on the original Metrorail revenue bonds. The remaining funds are assumed to be allocated between operating support and capital in the same proportions as in recent years, or about 85% for operations and 15% for capital.

The allocation to jurisdictions within Virginia is based 75% on total WMATA operating support and 25% on total transit operating costs. For Alexandria and Fairfax County, the latter includes the costs of operating the DASH and Fairfax Connector bus systems. The resulting percentage allocations for the three key years are as follows:

	1986	1993	2000
Fairfax	52.45%	52.46%	53.27%
Arlington	28.28%	28.48%	28.13%
Alexandria	16.80%	16.98%	16.56%
Other	2.48%	2.07%	2.04%

The capital allocations are assumed to be applied to Metrorail construction until that program winds down in the late 1990's and are applied to rehabilitation and replacement costs thereafter.

#### **SUMMARY OF ALLOCATIONS**

A summary of allocated WMATA support by category for the region is shown in Exhibit VIII.8 for the two Federal funding scenarios. Under the favorable Federal funding, the total assistance remains at approximately \$300 million per year throughout the projection period. Under the unfavorable scenario, total support increases to just over \$600 million during the early 1990's, dropping back to about \$400 million after completion of Metrorail construction.

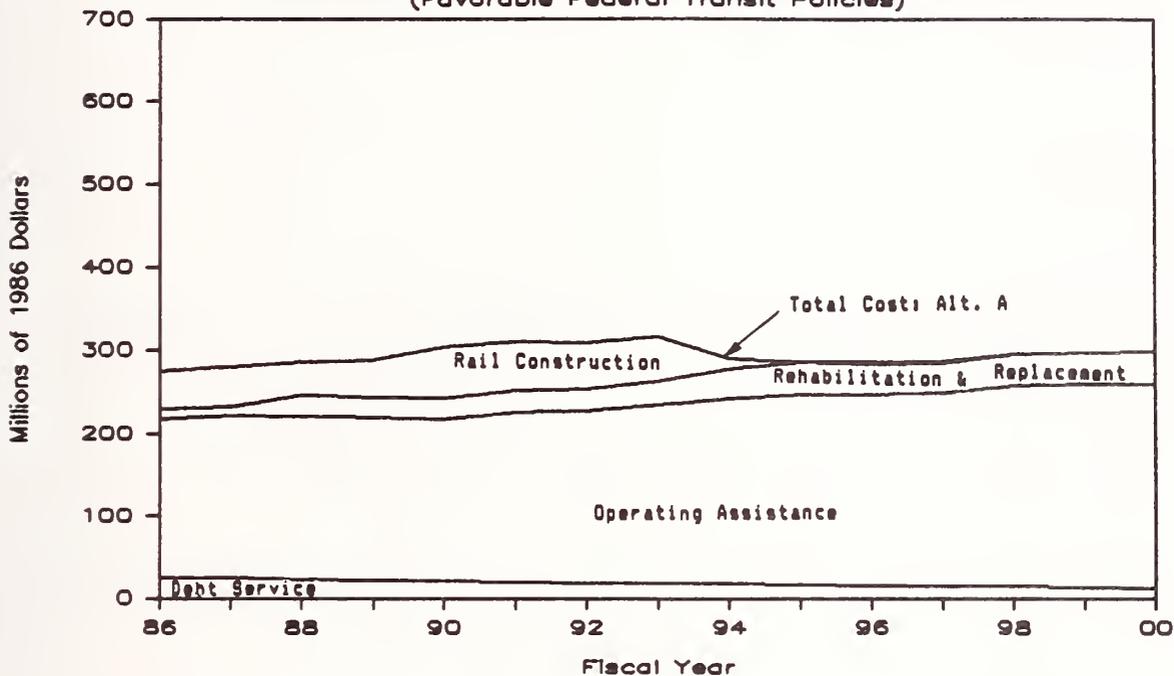
An overall allocation of WMATA support by jurisdiction is shown in Exhibit VIII.9. Individual summaries for the six major jurisdictions are shown in Exhibits VIII.10 - VIII.15. In the latter exhibits, state aid is shown as well, except for the District of Columbia. All data used in preparing these exhibits and other relevant information are summarized in Appendix G.

EXHIBIT VIII.8

PROJECTED NON-FEDERAL WMATA OPERATING AND CAPITAL ASSISTANCE

REGIONAL TOTAL: ALTERNATIVE A

(Favorable Federal Transit Policies)



REGIONAL TOTAL: ALTERNATIVE B

(Unfavorable Federal Transit Policies)

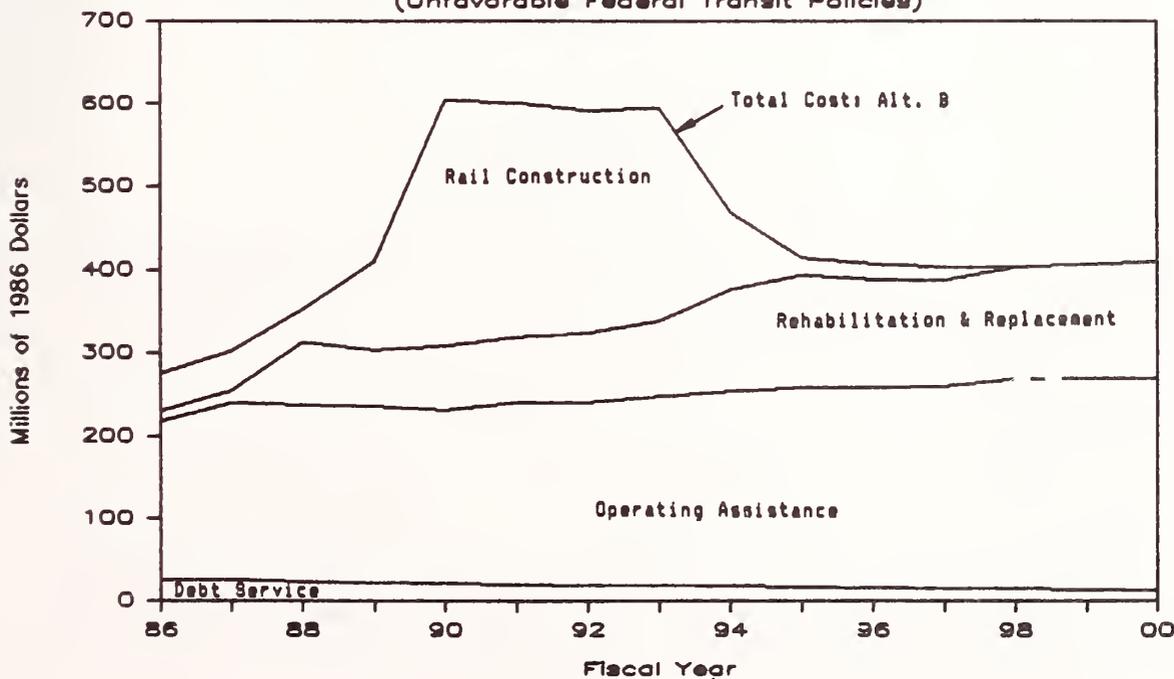
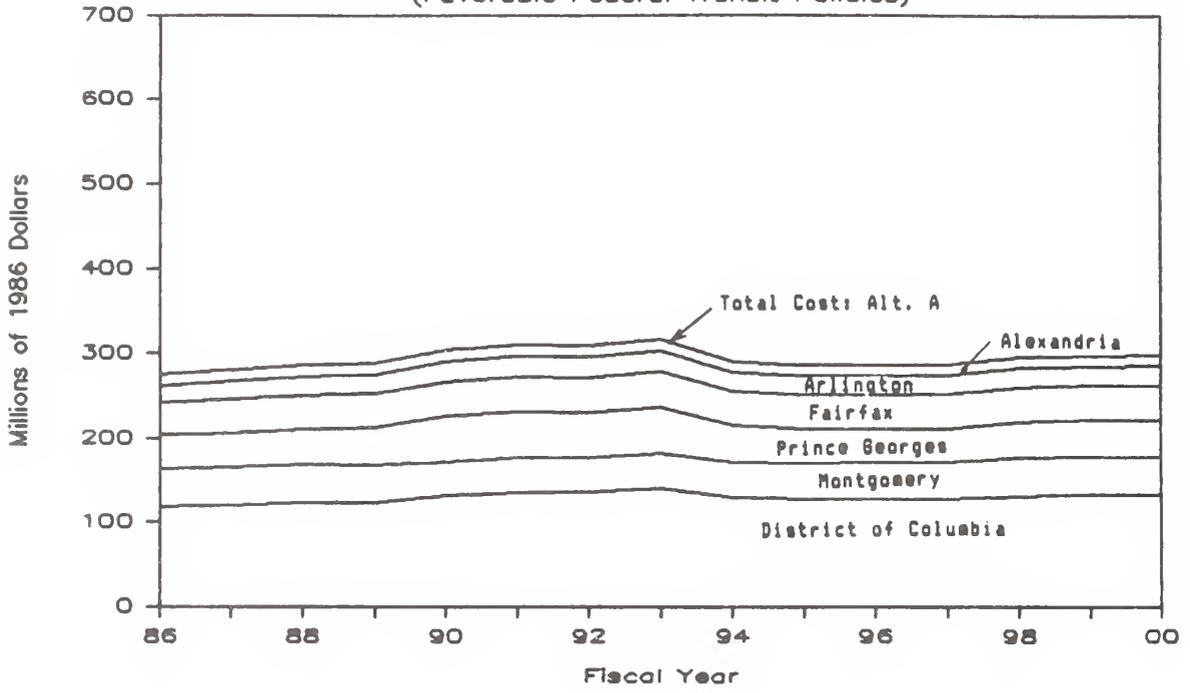


EXHIBIT VIII.9

PROJECTED NON-FEDERAL WMATA OPERATING AND CAPITAL ASSISTANCE

JURISDICTIONAL ALLOCATION: ALT. A  
(Favorable Federal Transit Policies)



JURISDICTIONAL ALLOCATION: ALT. B  
(Unfavorable Federal Transit Policies)

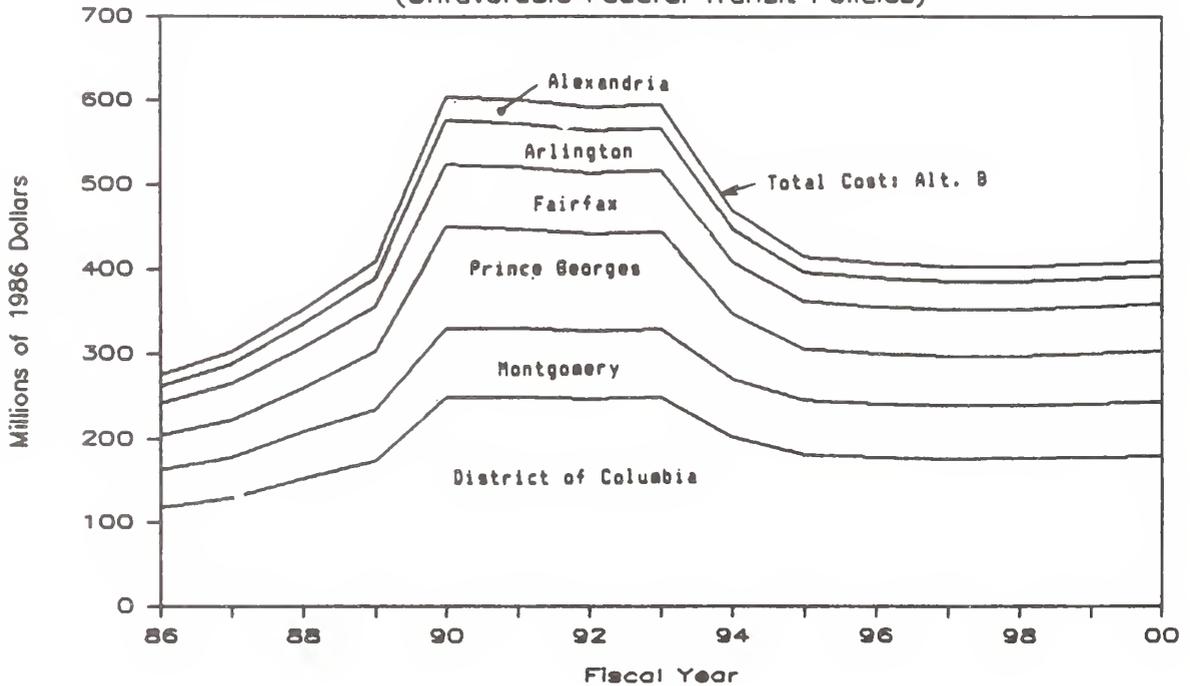
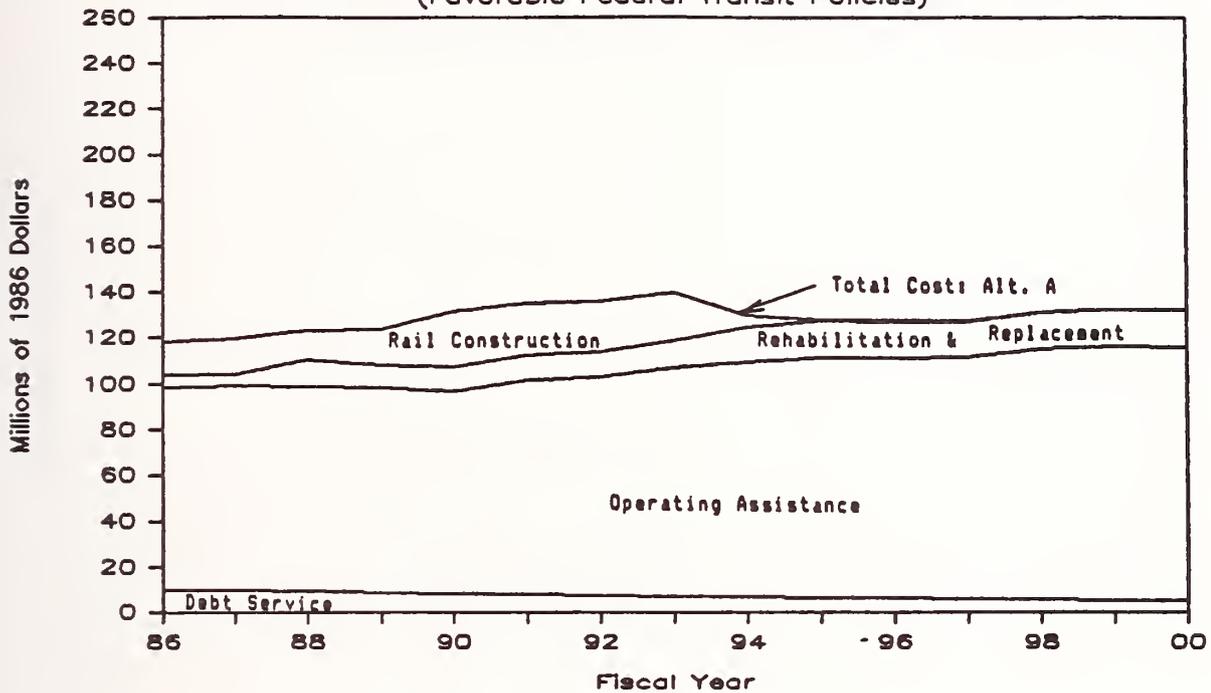


EXHIBIT VIII.10

PROJECTED NON-FEDERAL WMATA OPERATING AND CAPITAL ASSISTANCE

DISTRICT ALLOCATION: ALT. A

(Favorable Federal Transit Policies)



DISTRICT ALLOCATION: ALT. B

(Unfavorable Federal Transit Policies)

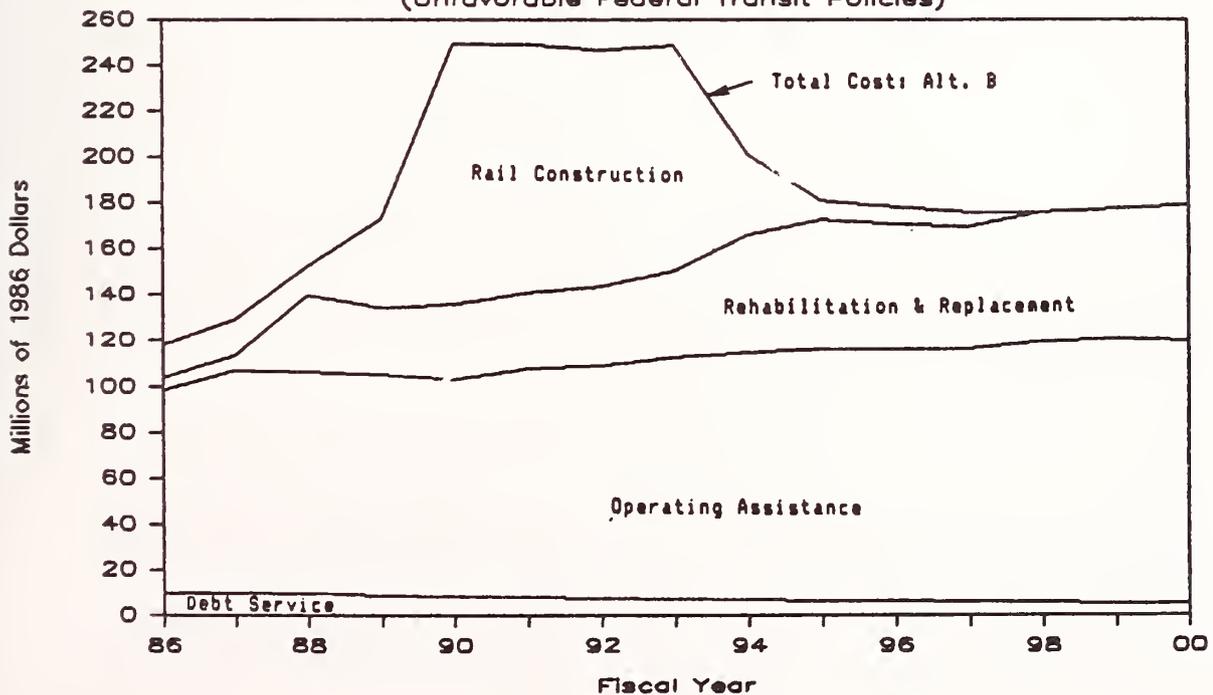
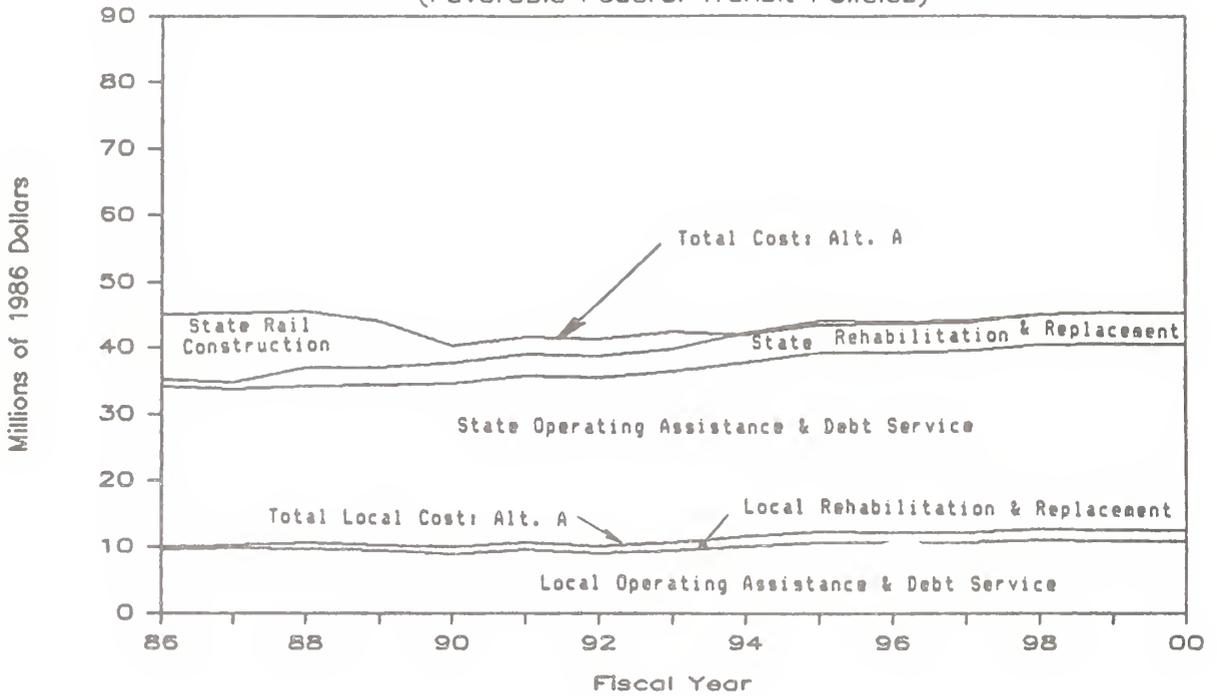


EXHIBIT VIII.11

PROJECTED NON-FEDERAL WMATA OPERATING AND CAPITAL ASSISTANCE

MONTGOMERY ALLOCATION: ALT. A  
(Favorable Federal Transit Policies)



MONTGOMERY ALLOCATION: ALT. B  
(Unfavorable Federal Transit Policies)

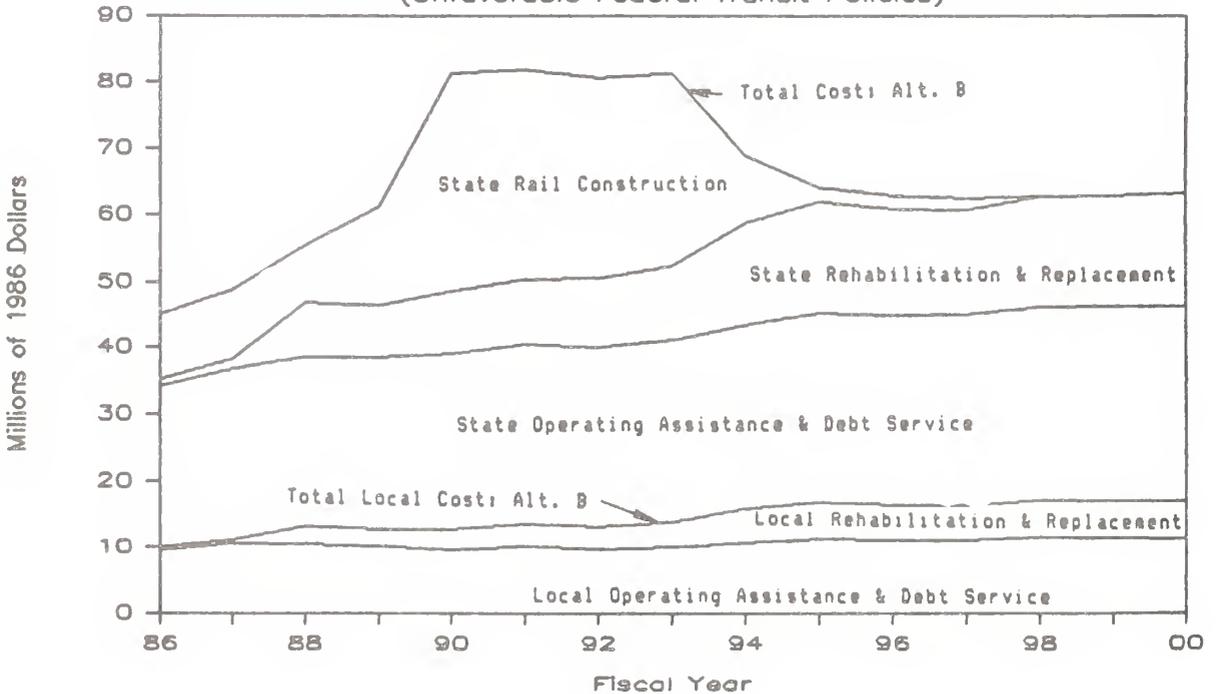
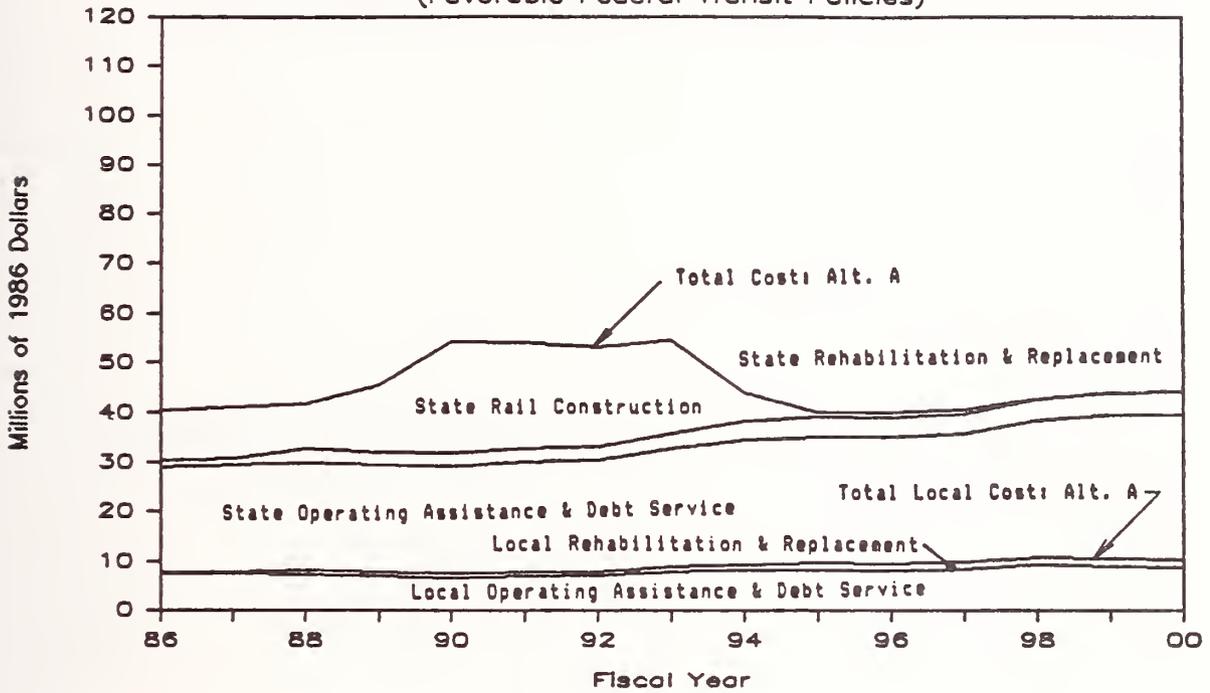


EXHIBIT VIII.12

PROJECTED NON-FEDERAL WMATA OPERATING AND CAPITAL ASSISTANCE

PRINCE GEORGES ALLOCATION: ALT. A

(Favorable Federal Transit Policies)



PRINCE GEORGES ALLOCATION: ALT. B

(Unfavorable Federal Transit Policies)

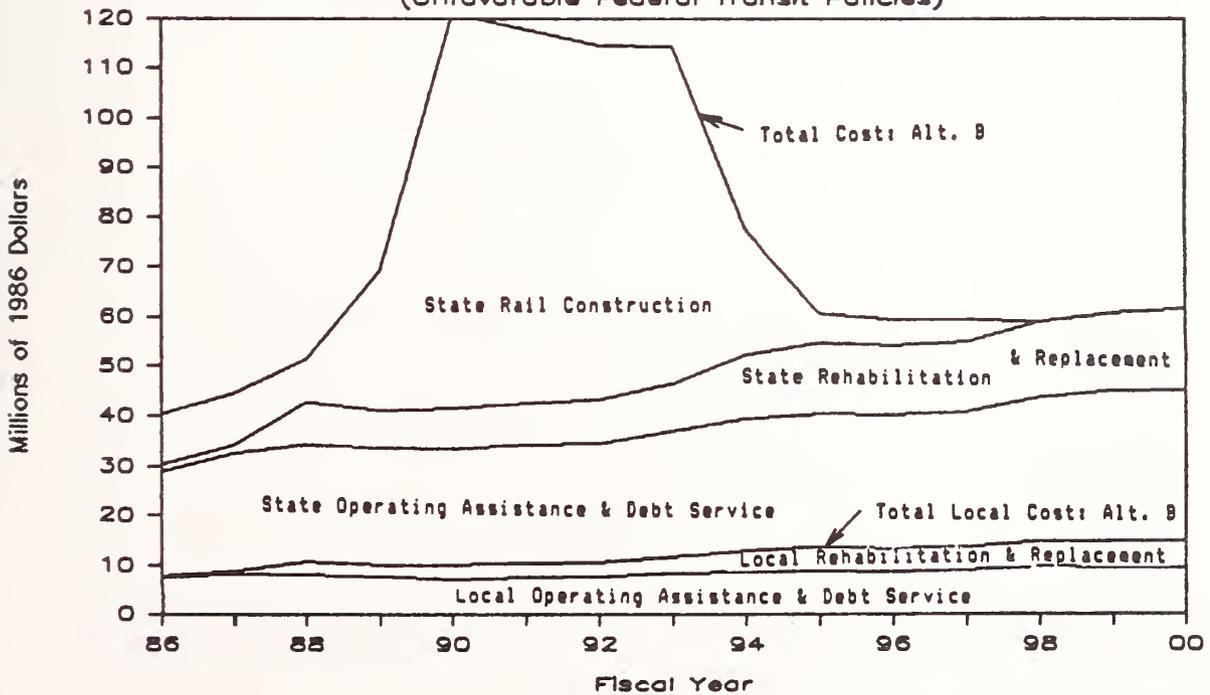
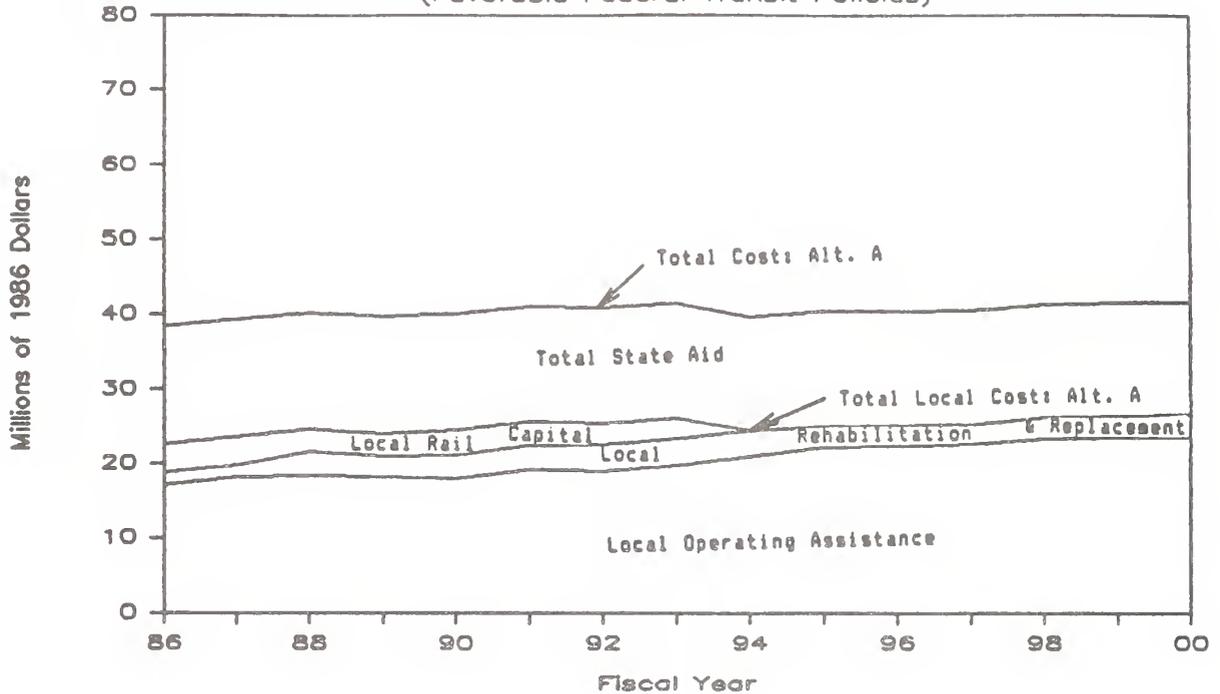


EXHIBIT VIII.13

PROJECTED NON-FEDERAL WMATA OPERATING AND CAPITAL ASSISTANCE

FAIRFAX ALLOCATION: ALT. A

(Favorable Federal Transit Policies)



FAIRFAX ALLOCATION: ALT. B

(Unfavorable Federal Transit Policies)

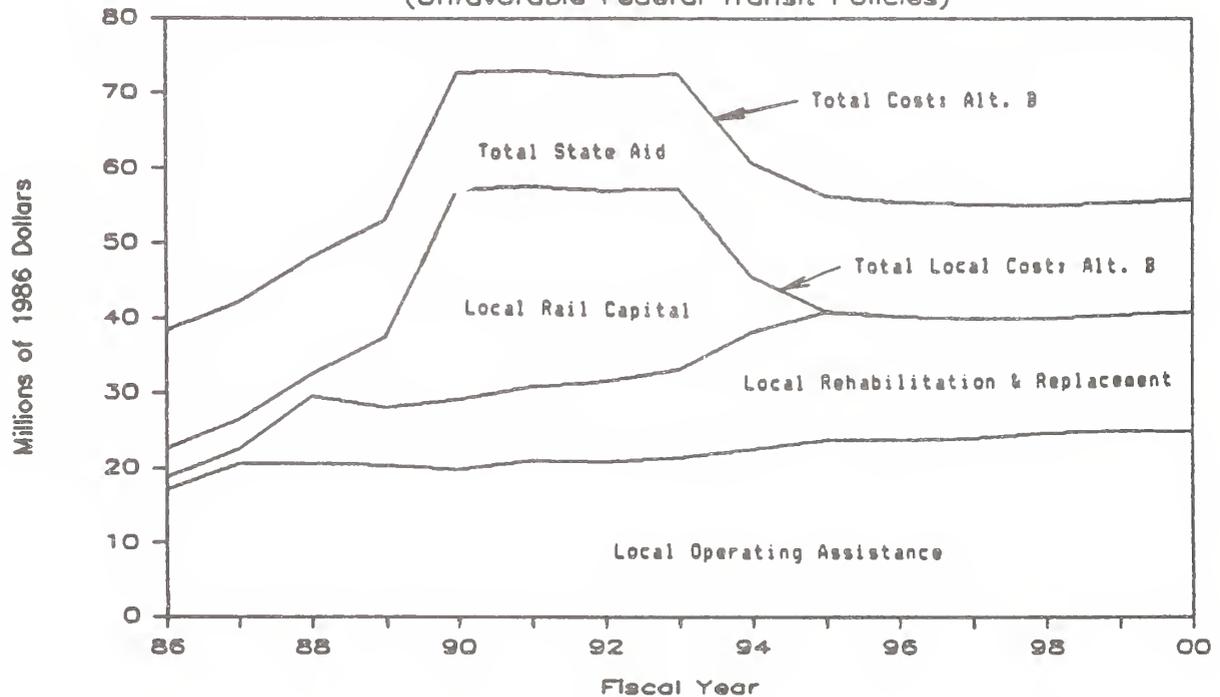
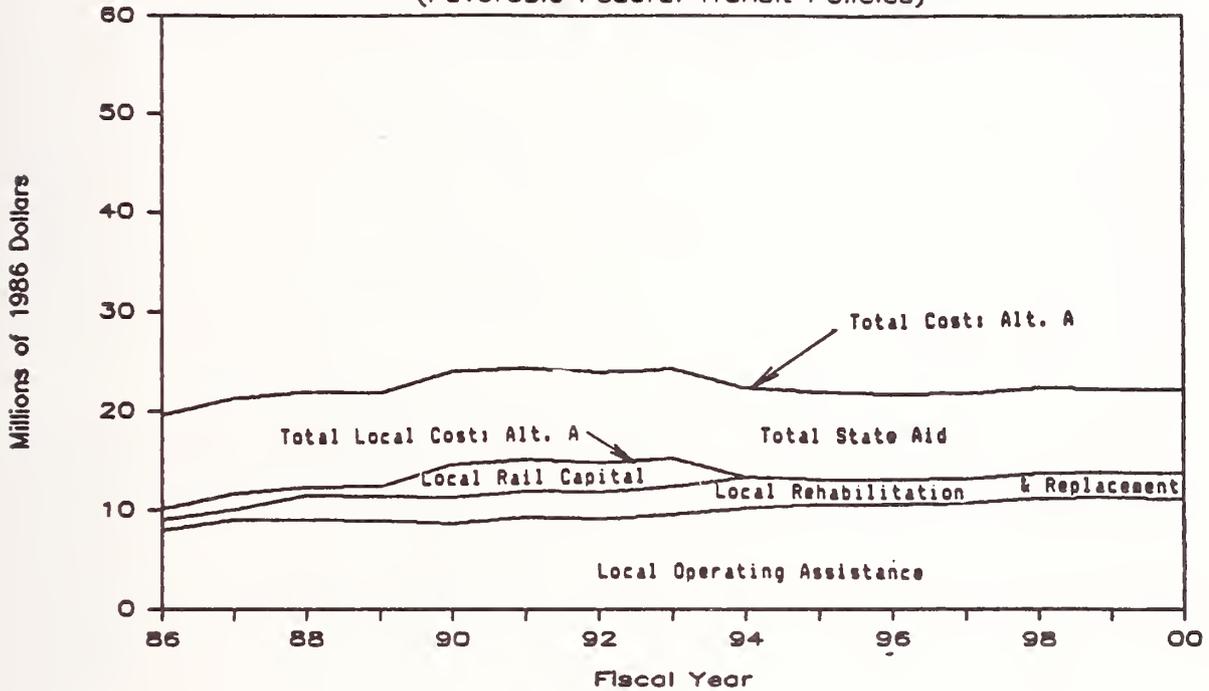


EXHIBIT VIII.14

PROJECTED NON-FEDERAL WMATA OPERATING AND CAPITAL ASSISTANCE

ARLINGTON ALLOCATION: ALT. A  
(Favorable Federal Transit Policies)



ARLINGTON ALLOCATION: ALT. B  
(Unfavorable Federal Transit Policies)

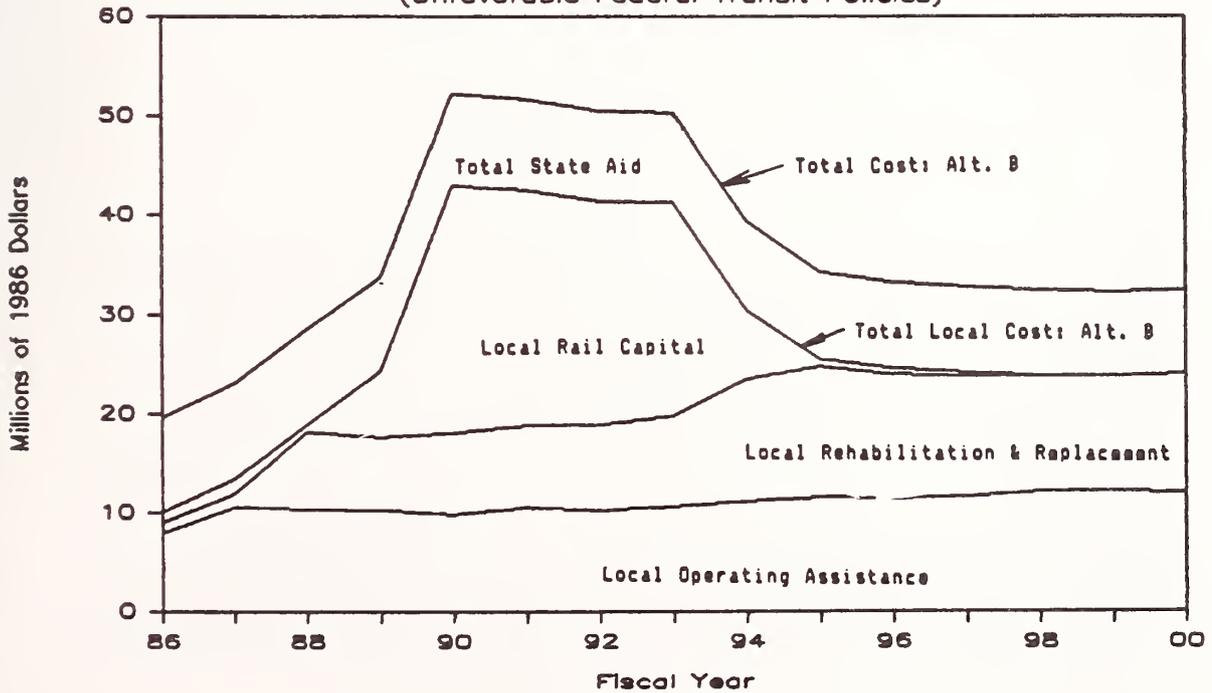
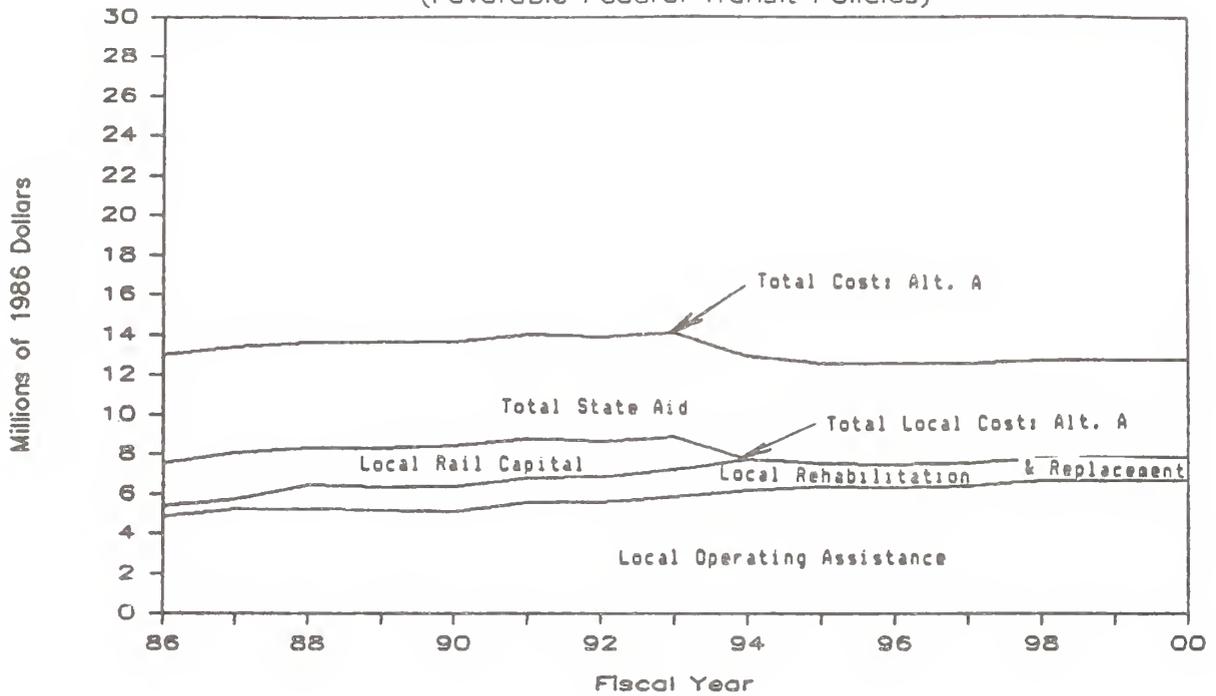


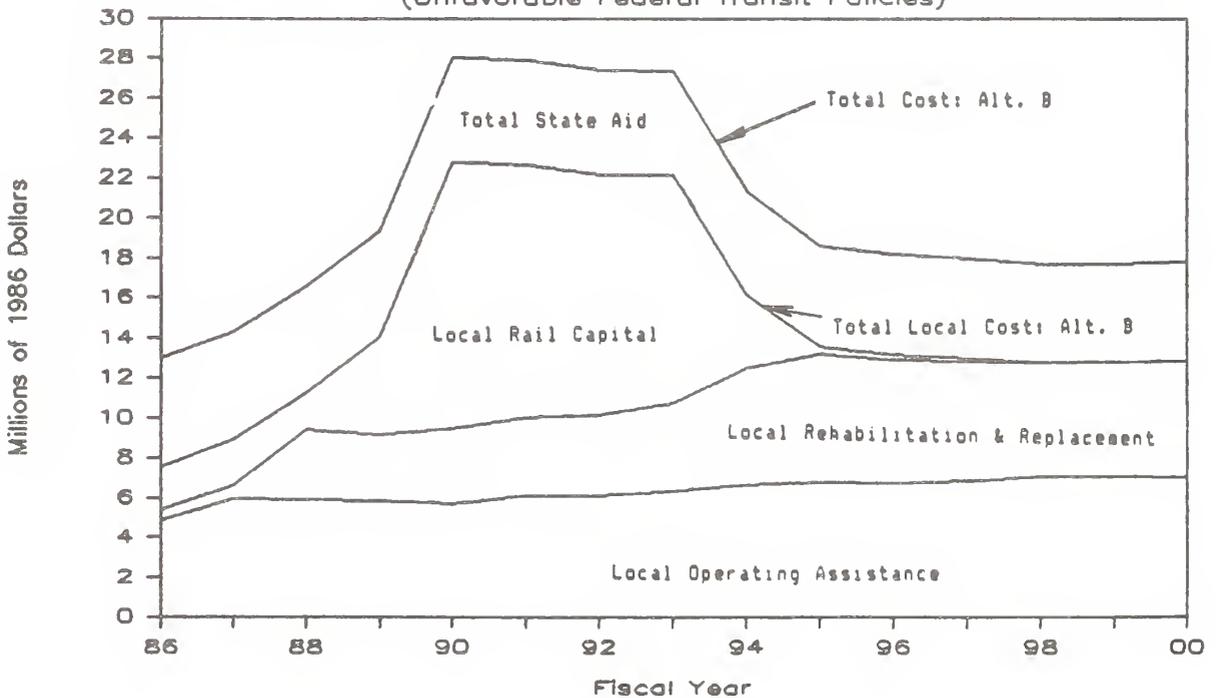
EXHIBIT VIII.15

PROJECTED NON-FEDERAL WMATA OPERATING AND CAPITAL ASSISTANCE

**ALEXANDRIA ALLOCATION: ALT. A**  
(Favorable Federal Transit Policies)



**ALEXANDRIA ALLOCATION: ALT. B**  
(Unfavorable Federal Transit Policies)



## IX. MEASURING THE WMATA BURDEN: 1980 - 1985

Between 1980 and 1985, Washington area governments experienced an 88 percent increase in their transit assistance allocations for WMATA transit services from \$118.1 million in 1980 to \$221.6 million in 1985 (both figures in year-of-expenditure dollars). This increase resulted from a 53 percent increase in bus assistance (from \$89.1 million to \$136.5 million), a 103 percent increase in rail assistance (from \$29.0 million to \$58.9 million), and the allocation of debt service on bonds issued to finance rail construction (see Exhibit IX.1). It should be noted that the costs did not increase uniformly over this period. The largest annual increase (23 percent) occurred in 1981 when debt service payments were first included. The smallest annual increases (4.4 percent and 5.1 percent) occurred in 1984 and 1985, and reflected the effect of lower inflation rates and cost cutting measures.

It has been suggested that this rapid growth in transit assistance has placed undue strains on the ability of area governments to pay these costs while meeting their other responsibilities. While undue strain does not lend itself to exact definition, it is possible to compare the operating assistance allocations of the jurisdictions to some simple measures of ability to pay. These measures indicate how large the burden is, as well as whether it is an increasing relative burden.

The relative burden may be viewed against four different measures. These measures compare transit assistance allocations to:

- o Personal Income, which is a good measure of the underlying wealth that is generated in the area, and that is thus available to pay taxes. Personal income is measured at place of residence and includes not only earnings but also unearned income such as interest and rents. (Personal income information is not yet available for 1984 and 1985.)
- o Earnings, which are measured by place of employment. This measure reflects the extent of jobs and business activity that exists within the jurisdictions in the area. While earnings are not directly taxed by any jurisdiction, they do represent a stream of economic activity within a jurisdiction, and thus enhance the economic base. (Earnings information is not yet available for 1984 and 1985.)
- o Property Value, which is a tax base common to all area jurisdictions and the one that is used to generate substantial revenues. This measure shows the transit assistance allocation as a tax rate that would need to be applied to property values.

EXHIBIT IX.1

CHANGE IN TOTAL WMATA OPERATING ASSISTANCE PAYMENTS  
ALL AREA GOVERNMENTS  
1980 - 1985

(Thousands of Year-of-Expenditure Dollars)

Year	Bus Operation	% Chng	Rail Operation	% Chng	Debt Service	% Chng	Total	% Chng
1980	\$89,103	--	\$29,004	--	--	--	\$118,107	--
1981	93,242	4.6%	35,369	21.9%	\$16,669	--	145,280	23.0%
1982	110,947	19.0	44,409	25.6	16,669	--	172,025	18.4
1983	125,137	12.8	50,769	14.3	25,933	55.6%	201,839	17.3
1984	130,107	4.0	53,134	4.7	27,484	6.0	210,725	4.4
1985	136,471	4.9	58,914	10.9	26,189	-4.7	221,574	5.1
Five-Year Increase		53.2%		103.1%				87.6%

Sources: Operating Assistance Report, Fiscal Year 1985, WMATA, Appendix C, and special tabulation from WMATA, dated August 13, 1985.

- o Total Operating Expenditures for each government. This measure relates the transit assistance allocations directly to government budgets, and thus shows how much of a government's actual resources need to be used for this purpose. This measure does not lend itself to comparisons between jurisdictions because there is a wide variance among governments in the services they provide, and, therefore, in the size of their total expenditures. For example, the District's expenditures are relatively large because they include expenditures that are made by state governments in suburban jurisdictions.

These measures can be applied against either the gross transit assistance allocations, or the net transit assistance allocations, i.e., after deducting Federal and state operating assistance. The gross allocations are important because they show how the formulas allocate the burden by jurisdiction, and because they represent the maximum potential burden that each jurisdiction might have to incur.

The net basis, after reducing the allocations by available Federal aid and state transit assistance payments, results in an actual measure of the financial burden incurred. When only the net assistance allocations are considered, the local area government payments increased only 67 percent from \$82.7 million in 1980 to \$138.5 million in 1985 (see Exhibit IX.2). While Federal aid declined over the period, state aid increased more than sixfold. In 1985, as in previous years, total state aid was somewhat higher in Maryland than in Virginia, with, of course, no state aid in the District.

What do the measures show about the ability of area governments to bear the costs of WMATA in recent years? A summary of the measures are shown in Exhibit IX.3 for gross assistance and in Exhibit IX.4 for net assistance after state and Federal aid is taken into account. More detailed data showing the actual cost elements of the measures are included in Appendix I. The sources of data in all these Exhibits were:

- o WMATA operating assistance: Operating Assistance Report, Fiscal Year 1985, WMATA, Appendix C, and special tabulation from WMATA, dated August 13, 1985.
- o Personal Income: Local Area Personal Income, Vol. 3 Mideast Region, 1978-83, U.S. Department of Commerce, Bureau of Economic Analysis, June 1985.
- o Property Values and Total Expenditures: Annual financial reports and official statements of jurisdictions.

As shown in these Exhibits, the results are mixed, but generally they show the increased burden has not been as heavy as the dollar or percentage increases in transit assistance allocations would suggest.

EXHIBIT IX.2

CHANGE IN TRANSIT ASSISTANCE PAYMENTS BY SOURCE OF PAYMENTS  
ALL AREA GOVERNMENTS  
1980 - 1985

(Thousands of Year-of-Expenditure Dollars)

Year	Total Assistance Payments	% Chng	Federal Subsidy	% Chng	State Aid	% Chng	Local Payments	% Chng
1980	\$118,107	--	\$25,646	--	\$9,750	--	\$82,711	--
1981	145,280	23.0%	26,010	1.4%	23,487	140.9%	95,783	15.8%
1982	172,025	18.4	23,133	-11.1	42,350	80.3	106,542	11.2
1983	201,839	17.3	18,486	-20.1	58,497	38.1	124,856	17.2
1984	210,725	4.4	18,506	0.1	56,014	-4.2	136,205	9.1
1985	221,574	5.1	18,506	--	64,539	15.2	138,529	1.7
Five-Year Increase		87.6%		-27.8%		561.9%		67.5%

Sources: Federal subsidy: Operating Assistance Report, Fiscal Year 1985, WMATA, Appendix C: State aid, Virginia: Northern Virginia Transportation Commission. State aid, Maryland: Maryland Department of Transportation

STATE PAYMENTS FOR TRANSIT ASSISTANCE  
1980 - 1985

(Thousands of Year-of-Expenditure Dollars)

Year	Maryland		Virginia*		Total	
1980	\$9,750	--	--	--	\$9,750	--
1981	23,487	140.9%	--	--	23,487	140.9%
1982	29,112	23.9	\$13,238	--	42,350	80.3
1983	34,215	17.5	24,282	83.4%	58,497	38.1
1984	33,511	-2.1	22,503	-7.3	56,014	-4.2
1985	36,790	9.8	27,749	23.3	64,539	15.2

\* Includes money from a state authorized local gasoline tax as well as direct state appropriations. Reflects the actual amounts disbursed by the Northern Virginia Transportation Commission on behalf of each local government for rail and bus operation and for debt service

EXHIBIT IX.3

WMATA TRANSIT ASSISTANCE PAYMENTS BEFORE STATE AND FEDERAL AID  
AS A PERCENT OF MEASURES OF ABILITY TO PAY  
1980 - 1985

	1980	1981	1982	1983	1984	1985
<u>Total Six Jurisdictions</u>						
Personal Income	.327%	.358%	.391%	.423%		
Earnings (Place of Work)	.384	.429	.472	.506		
Taxable Property Values	.176	.187	.188	.199	.196%	.187%
Total Operating Expend.	3.468	4.019	4.410	4.403	4.308	4.214
<u>District of Columbia</u>						
Personal Income	.741	.755	.842	.958		
Earnings (Place of Work)	.432	.450	.507	.576		
Taxable Property Values	.497	.465	.427	.466	.459	.420
Total Operating Expend.	3.136	3.528	3.957	4.270	3.988	3.831
<u>Montgomery County</u>						
Personal Income	.155	.196	.208	.209		
Earnings (Place of Work)	.262	.337	.356	.349		
Taxable Property Values	.073	.089	.090	.089	.091	.098
Total Operating Expend.	3.033	3.879	4.056	3.529*	3.603	3.952
<u>Prince George's County</u>						
Personal Income	.234	.291	.315	.312		
Earnings (Place of Work)	.441	.552	.621	.627		
Taxable Property Values	.142	.186	.198	.189	.180	.172
Total Operating Expend.	4.700	6.038	6.271	4.560*	4.783	4.616
<u>Fairfax County</u>						
Personal Income	.182	.202	.225	.246		
Earnings (Place of Work)	.379	.417	.459	.477		
Taxable Property Values	.100	.107	.109	.113	.119	.114
Total Operating Expend.	3.081	3.277	3.655	4.022	4.088	4.062
<u>Arlington County</u>						
Personal Income	.366	.422	.457	.511		
Earnings (Place of Work)	.287	.333	.351	.377		
Taxable Property Values	.151	.165	.175	.207	.192	.174
Total Operating Expend.	5.800	6.962	7.662	8.689	8.405	7.852
<u>Alexandria</u>						
Personal Income	.355	.377	.414	.468		
Earnings (Place of Work)	.494	.526	.559	.626		
Taxable Property Values	.155	.162	.166	.194	.193	.177
Total Operating Expend.	5.780	5.787	6.251	6.992	6.435	5.716

\* Change in accounting

Sources: see text

EXHIBIT IX.4

WMATA TRANSIT ASSISTANCE PAYMENTS AFTER STATE AND FEDERAL AID  
AS A PERCENT OF MEASURES OF ABILITY TO PAY  
1980 - 1985

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>
<u>Total Six Jurisdictions</u>						
Personal Income	.228%	.236%	.244%	.265%		
Earnings (Place of Work)	.268	.282	.294	.317		
Taxable Property Values	.123	.123	.118	.125	.127%	.116%
Total Operating Expend.	2.423	2.644	2.751	2.760	2.789	2.623
<u>District of Columbia</u>						
Personal Income	.590	.617	.735	.879		
Earnings (Place of Work)	.343	.368	.442	.529		
Taxable Property Values	.395	.380	.373	.427	.421	.387
Total Operating Expend.	2.496	2.882	3.455	3.918	3.661	3.527
<u>Montgomery County</u>						
Personal Income	.056	.051	.047	.044		
Earnings (Place of Work)	.096	.088	.081	.074		
Taxable Property Values	.026	.023	.021	.019	.028	.031
Total Operating Expend.	1.106	1.012	0.925	0.751*	1.094	1.270
<u>Prince George's County</u>						
Personal Income	.104	.063	.079	.075		
Earnings (Place of Work)	.195	.119	.156	.151		
Taxable Property Values	.063	.040	.050	.045	.047	.039
Total Operating Expend.	2.083	1.305	1.577	1.098*	1.249	1.059
<u>Fairfax County</u>						
Personal Income	.146	.170	.138	.108		
Earnings (Place of Work)	.302	.350	.282	.210		
Taxable Property Values	.080	.090	.067	.050	.067	.056
Total Operating Expend.	2.461	2.750	2.247	1.768	2.305	2.006
<u>Arlington County</u>						
Personal Income	.293	.360	.274	.290		
Earnings (Place of Work)	.229	.284	.210	.214		
Taxable Property Values	.121	.140	.105	.118	.109	.075
Total Operating Expend.	4.632	5.935	4.588	4.626	4.760	3.397
<u>Alexandria</u>						
Personal Income	.284	.320	.248	.276		
Earnings (Place of Work)	.395	.446	.335	.369		
Taxable Property Values	.124	.137	.099	.115	.095	.095
Total Operating Expend.	2.410	2.825	2.912	2.887	2.916	3.065

\* Change in accounting

Sources: see text

In the gross allocations, there has generally been a year-to-year increase in the burden for all four measures. However, when measured against property values the burden decreased after 1983 for the District, Arlington, Alexandria, and Prince George's County. As a percent of overall operating expenditures, the burden also declined from 1983 to 1985 for the District, Arlington, and Alexandria.

There is a wide variance between some jurisdictions for some indicators. For example, the District allocation in 1983 would require almost 1 percent of the total income compared with only 0.2 percent in Montgomery County, but the difference may merely reflect the much greater District of Columbia service received.

An important measure from a political viewpoint is the relatively low and stable property tax levy required for the gross operating assistance allocations. In the District, this measure actually declines from .497 in 1980 to .420 in 1985. The largest growth in this measure from 1980 to 1985 was only .030 from .142 to .172 in Prince George's County.

While the gross allocations grew as a percent of total expenditures in all jurisdictions, and reached a high of 8.4 percent in Arlington County in 1984, it is probably more important to look at this measure on a net basis after applying Federal and state aid. When this is done two governments, Montgomery County and Prince George's County, have only slightly more than 1 percent of their total expenditures allocated for WMATA operations. Arlington's high 8.4 percent on a gross basis in 1984 drops to 3.4 percent in 1985 on a net basis. The District of Columbia, because it receives no state assistance, reflected the largest increase in net assistance payments as a percentage of expenditures, from 2.5 percent in 1980 to 3.5 percent in 1985, although this percentage was declining in both 1984 and 1985.

The allocations on a net basis, in addition to being lower by all measures than the gross allocations, show slower growth over the period especially after 1981. For example, in 1983 all four measures were lower in Montgomery County, Fairfax County, and Arlington County than they were in 1981, as a result of the rapid growth in state assistance payments in these years.

In summary, the measures of burden using either gross or net operating assistance allocations show varying degrees of burden between jurisdictions. There has been some growth in relative burden, although not consistently when Federal and state assistance is taken into account. These results are only historical and are not predictive of future years, but they do show that area governments have absorbed large increases in WMATA transit assistance payments in recent years with small, if any, changes in relative burden.



## X. CHANGE IN SIX AREA GOVERNMENTS REVENUES AND EXPENDITURES 1986 - 2000

Projecting the six major area governments' revenues and expenditures for fifteen years on both a current and constant dollar basis results in an immense quantity of numbers that defy easy understanding. Therefore, it is necessary to reduce results to a relatively few numbers that best illustrate what is likely to occur to these governments' finances over the 1986 - 2000 period.

To do this, the change in total revenues and expenditures in constant dollars only (i.e., after discounting inflation) is used for each government separately and for all governments combined. Tax rates are assumed to remain constant and expenditures are projected at current service levels. To provide an understanding of what is causing the changes, the amount of revenue expected from local sources is shown separately from intergovernmental aid. Similarly, key elements of government spending, such as general payrolls (including retirement and fringe benefits), school expenditures, and debt service, are discussed individually.

The relationship between each individual government's revenues and expenditures is not shown on either a current or constant dollar basis. As a practical matter, all governments will operate with generally balanced budgets over the period, and it would not be realistic to present a picture that would show otherwise. While there are differences that the governments will need to address, their decisions on how to do so will be political and it would not be appropriate to make such estimates in these projections.

The constant dollar changes in revenues will be reviewed first, followed by a discussion of expenditures.

### REVENUES

Preliminary projections estimate that the total revenue of the six major governments will increase 19.8 percent (\$1.1 billion in constant 1986 dollars), from 1986 to 2000 (see Exhibit X.1). The principal factors used in the projections to translate economic growth rates into increases in sales, income, and personal property tax revenues are the changes in employment, which COG projects to increase 30.4 percent, and changes in population, which COG expects to increase 11.0 percent. Based on historical trends, property taxes are expected to have real growth from new construction averaging about 2.5 percent per year, except for D.C. residential, which is experiencing little growth from new construction. The result is total area real growth in property taxes of 46.4 percent, with a range from 18.0 percent in the District to 69.0 percent in Fairfax County.

The expected favorable performance of the local economy results in real growth of 33.0 percent or \$1.4 billion in locally raised

EXHIBIT X.1

CHANGES IN REVENUES IN CONSTANT 1986 DOLLARS  
SIX AREA GOVERNMENTS  
1986 - 2000

(Thousands)

<u>Jurisdiction</u>	<u>Local Revenues Change</u>	<u>%</u>	<u>Intergov- ernmental Revenues Change*</u>	<u>%</u>	<u>Total Revenues Change</u>	<u>%</u>
Dist. of Columbia	\$370,037	20.6%	\$-174,014	-18.2%	\$196,023	7.1%
Montgomery County	336,903	42.6	-30,726	-29.7	306,177	34.3
Prince George's Co.	132,906	27.2	-28,490	-14.7	103,966	15.1
Fairfax County	448,453	59.4	3,274	1.5	451,727	46.6
Arlington County	46,133	25.4	-5,780	-10.5	40,354	17.1
Alexandria	39,601	27.0	-5,090	-11.9	34,511	18.2
Total	\$1,374,033	33.0%	\$241,276	-15.3%	\$1,132,758	19.8%

\* Does not include WMATA Federal or state aid

revenues, but the overall growth in revenue is greatly reduced because intergovernmental revenue from the state and Federal governments is expected to decline by \$241 million or 15.3 percent in 1986 dollars. Several factors account for this decline. They include the elimination of the Federal revenue sharing program after 1986 and the expectation that, because of Federal budget restraints, other Federal aid will only increase at three-quarters of the inflation rate. State aid is also expected to grow slowly because it is dominated by aid for schools. School enrollments are expected to be stable or declining in future years, except in Montgomery and Fairfax counties. This results in a slow real growth in school aid.

The projected revenue growth varies among governments in proportion to each jurisdiction's expected real growth in employment and population, and to each government's sensitivity to changes in intergovernmental aid. Because the District is projected to have the slowest rate of real growth in its employment and population, it has the lowest rate of real growth in its local revenues and it is also hardest hit by the projected decline in Federal aid, which in 1986 constituted over a third of its revenue. As a result, the District's total revenue growth of \$196 million or 7.1 percent in constant dollars from 1986 to 2000 is less than half the 15.1 percent growth in the second lowest growth jurisdiction, Prince George's County.

In sharp contrast, Fairfax County revenue is expected to increase \$452 million or 46.6% in 1986 dollars. This results from a rapid growth in employment, population, and new construction. Fairfax County is also the only government expected to have a real growth in intergovernmental aid over the period. This results from the County being affected only slightly by the decline in Federal aid (which accounts for only 3.4 percent of total County revenues), and an increase in state school aid as a result of some growth in school enrollments.

Montgomery County also is expected to have a rapid growth in local revenue, but it also has the largest percentage reduction in intergovernmental aid because of a projected \$17 million loss of state school aid in 1986 dollars between 1986 and 2000. This results from an anticipated state policy that will result in less school aid in real dollars on a per pupil basis. However, because intergovernmental aid is a relatively unimportant source of County revenues (11.6 percent in 1986), the County's total revenue growth is still expected to be second only to Fairfax County with a 34.3 percent real growth.

It is important to realize, of course, that the projected revenue growth shown in these tables depends on a variety of assumptions. The key ones are expected growth in population, employment, and new construction; estimated changes in Federal aid policies and state aid policies; and estimated changes in school enrollments.

growth, and, therefore, their school spending will grow more rapidly. The District expects only a very minor year-to-year growth in enrollments. Because of the high percentage of suburban government spending for schools, and because school spending is closely tied to changes in enrollments, the differences in assumptions about school enrollments have a major effect on these governments' year 2000 spending levels.

Debt service is not a substantial part of most governments total spending, and it is projected to grow by only 3.5 percent in constant dollars for all governments combined, despite an assumption of 8.5 percent interest costs on new debt for all governments, except the District, for which 9.0 percent is assumed. The District's higher rate assumption results from its lower bond rating and its use of level debt service repayments rather than equal principal payments.

There is a very wide variance between a 35.4 percent increase in Fairfax County's debt service, and Arlington County's 47.6 percent decrease. This difference occurs for several reasons. Arlington County, Alexandria, and Prince George's County are projecting relatively low levels of capital spending in future years. In the case of Arlington and Alexandria, this reflects the fully developed nature of the jurisdictions, and the belief that capital needs will be low. Montgomery County's decline in real debt service payments results from a projected leveling off of a recent large capital spending program. In contrast, Fairfax County's growth reflects an expected rapid expansion in capital spending, in part because of highway spending needs. The District's growth reflects the city's continued effort to catch up on its capital needs, and the effects of issuing debt on a level debt service basis.

The overall results of the financial projections seem reasonable based on the assumptions about the area's future growth, and based on recent trends. It should be emphasized, however, that the projections of each individual government's finances also depend on assumptions about where in the area future growth will occur, and on a continuation of current government policies regarding services and taxes.

#### **BASIS FOR LOCAL GOVERNMENT FINANCIAL PROJECTIONS**

Revenue and expenditure projections for the six major Washington area governments were prepared using a projection method developed by the Greater Washington Research Center. The approved 1986 Budgets for each jurisdiction provided the base information for projecting operating revenues and expenditures, property values, and bonded debt. The base information actually used was reviewed and approved by each jurisdiction. The projection logics for each major revenue and expenditure component were developed from historical trend information and from discussions with officials in each government. In most instances, the basis for the projections was similar to that used by the government for its own planning purposes.

The projection logics first increased most revenues and expenditures by the assumed inflation rate. There were some exceptions, such as Federal general revenue sharing, which was assumed to be discontinued after 1986, and general Federal aid, which was increased at only three-fourths the inflation rate because of Federal deficit problems.

The projection logics next adjusted for real growth or decline in revenues and expenditures. For income, sales, and personal property taxes this was done by using the combined projected changes in population and employment. Real estate property taxes were increased by a factor representing the historical percentage growth from new construction combined with local views on the outlook for development. State school aid changes are related to changes in school enrollments. Other taxes were increased to reflect population growth.

For real changes in expenditures, pay related expenditures were changed in relation to population change for general employees, and to school enrollments for school employees, plus a factor for both called "creep". Creep adjusts for merit increases and other non-general pay raises. This creep factor was obtained from the actual experience reported by the governments. The population change factor was doubled for Fairfax and Arlington counties because of the reported effects on county employment being caused by rapid urbanization. Other general expenditures were changed in relation to projected population changes, and other school expenditures were related to projected school enrollments.

Debt service was determined by adding to existing debt service requirements the debt service needed for new issues planned by the governments in their approved capital improvement plans. For bond sales beyond the capital improvement plan, an annual growth in bond sales equal to inflation was assumed. For all suburban governments, 20-year bonds with equal principal payments and 8.5 percent interest rates were used. For the District of Columbia, 20-year bonds with level debt service payments and 9 percent interest rates were used. The revenue and expenditure projections do not include WMATA operating revenues from state and Federal aid or WMATA assistance programs.

The projected revenue and expenditures for each year were converted to 1986 constant dollars by reducing the current dollar projections using the assumed inflation rate as a deflator. The results in constant dollars for all six governments combined showed that total revenue growth and total expenditure growth were within 1 percent of each other over the projection period. This indicates that the revenue and expenditure projections have a reasonable budgetary relationship to each other. The projections of real growth in total government revenue and expenditures of just under 20 percent for the fifteen years also is reasonable in view of real economic growth of 1 percent to 2 percent per year in the region, and in the context of relatively conservative taxing and spending policies being followed by the governments.

At the individual government level, the variations in real growth in revenues and expenditures was much greater than at the regional level, both in terms of the divergence in growth between revenue and expenditures for governments and in the differences in growth rates between governments. However, such diversity seems reasonable in view of the differences in economic growth that are occurring across the region, and the related differences in the spending demands that are facing the governments. What could not be projected, because it will require political decisions, is the extent to which the individual governments will use either changes in tax rates or changes in expenditure growth rates to bring revenues and expenditures into alignment. Since the purpose of the projections is to show natural growth in revenues with no changes in tax rates, and expenditures required to maintain current service levels, it is not necessary to project actual future budget actions affecting tax rates or service levels.

The projections assume no year-to-year variations in growth rates as a result of variations in the national and local economies caused by recessions and expansions. To do so would have required assumptions about when such critical events will occur, and it was deemed impractical to make such assumptions. The immediate implications of not doing so is that projections probably understate the revenue growth that will be included in the area government's 1987 Budgets as a result of the current very strong Washington area economy. However, over the fifteen-year projection period, this current, better than projected growth is certain to be offset by some slow growth periods. In fact, the effects of Federal budget reductions may make even 1987 a less strong revenue growth year than was initially expected by the governments.

Past experience, both nationally and locally, in projecting local government revenues and expenditures has shown that things seldom work out exactly as projected. This is so because some economic assumptions do not materialize, some unexpected events occur, and some political actions intervene. The projections made in this study face all these hazards, but because they were prepared in close consultation with area officials who are closely familiar with their governments' outlook, they present a reasonable view of the future.

## XI. THE EFFECTS OF FUTURE WMATA FINANCING ON AREA GOVERNMENTS

The local governments in the Washington area contribute to the support of the WMATA bus and rail systems through payments for:

- o bus and rail operating support
- o rail fare support
- o debt service on the original WMATA revenue bonds
- o bus and rail rehabilitation and replacement costs
- o rail construction

In the past, the local governments have received significant financial assistance from the Federal government. However, future Federal assistance is in doubt and the analysis has been structured to reflect two alternative Federal support scenarios:

- o Favorable Federal aid scenario (Alternative A):
  - o continued operating support, although at a diminished level in constant dollars.
  - o Federal assistance for rehabilitation and replacement equal to 75% of costs.
  - o Federal rail construction assistance equal to 80% of the costs authorized by the Stark-Harris legislation and 75% of the costs to complete the final 14 miles of the 103-mile system.
- o Unfavorable Federal aid scenario (Alternative B):
  - o an end to Federal operating assistance.
  - o Federal assistance for rehabilitation and replacement limited to the Washington region's entitlement under a proposed formula-based block grant.
  - o rail construction assistance equal to 80% of the costs authorized by the Stark-Harris legislation but no Federal support for remainder of 103-mile system.

In addition, the states of Maryland and Virginia contribute significantly to WMATA support. Support in Maryland flows from a state trust fund which has been assumed to be adequate to cover all requirements in accordance with current policies and matching ratios. Support in Virginia is from state appropriations and a local gasoline tax and has been assumed to remain fixed in constant dollars.

The burden on local jurisdictions is unequal across the region since the District receives no state aid and the impact of the state formulas, particularly under unfavorable Federal funding conditions, varies significantly in Maryland and Virginia.

The impact of WMATA support on local governments can be examined either in absolute dollar terms or relative to the projected operating budgets and total tax bases of the local jurisdictions. These latter two measures were discussed in Chapters IX and X and were selected for their reasonableness and because the data were available based on projections done for the local jurisdictions.

Operating assistance payments to WMATA frequently are compared to overall local government financial resources since these payments are made annually and generally funded as line-items in the local governments' operating budgets. An allocation of total operating assistance payments for three key years is shown in Exhibit XI.1.

On a regional basis, operating assistance is projected to increase slightly in relation to total operating expenditures (from 3.78% to 3.84%), but to decline slightly in relation to property values. The regional pattern is mirrored in the experience of Arlington and Alexandria. In the District, operating assistance payments increase in relation to both property values and operating expenditures. In Prince George's County, operating assistance remains level relative to property values but increases in relation to operating expenditures. In rapidly growing Montgomery and Fairfax counties, operating assistance declines in relation to both operating expenditures and property values.

The impact of the net operating support burden (after accounting for Federal and state aid) is shown in Exhibit XI.2. This Exhibit also shows the effect of the two alternative Federal funding scenarios in future years.

On a regional basis, the percentage of operating expenditures devoted to operating assistance increases from 2.38% to 2.56% under the favorable Federal scenario and to 2.66% under the unfavorable alternative. The impact of Maryland's state assistance programs is clearly shown with the Maryland counties showing far lower values than the other jurisdictions. The impact of the Federal cutbacks under Alternative B is also less in Maryland since state aid is assumed to make up much of the shortfall while Virginia state aid is assumed to be a constant value under either Federal funding scenario.

Debt service on the original WMATA revenue bonds is also generally shown as an operating expense by the local governments. The payments are assumed to continue to be funded fully by state aid in Virginia and 75% from state aid in Maryland. Since these payments remain level in year-of-expenditure dollars, they will decline in constant dollars, dropping to nearly half their 1986 value by 2000. Also, since total financial resources of the local governments will be increasing over this period, the burden of debt service will be further reduced. Overall, the total local burden (without consideration of state aid) will decrease from about 0.47% of operating expenditures to about 0.20% and from 0.020% to 0.008% as compared to property values.

## EXHIBIT XI.1

TOTAL WMATA OPERATING ASSISTANCE ALLOCATIONS  
AS A PERCENT OF NON-TRANSIT OPERATING EXPENDITURES AND PROPERTY VALUES

(Millions, 1986 Constant Dollars)

	1986	1993	2000
District of Columbia			
Total Op. Asst.	\$96.1	\$105.3	\$114.8
% of Op. Expend.	3.61%	3.74%	3.82%
% of Prop. Values	0.38%	0.39%	0.40%
Montgomery County			
Total Op. Asst.	\$32.2	\$34.2	\$38.3
% of Op. Expend.	3.64%	3.30%	3.21%
% of Prop. Values	0.09%	0.08%	0.07%
Prince Georges County			
Total Op. Asst.	\$27.0	\$30.6	\$37.2
% of Op. Expend.	3.97%	4.35%	5.01%
% of Prop. Values	0.15%	0.14%	0.15%
Fairfax County			
Total Op. Asst.	\$30.3	\$32.5	\$36.2
% of Op. Expend.	3.17%	2.88%	2.79%
% of Prop. Values	0.09%	0.07%	0.07%
Arlington County			
Total Op. Asst.	\$15.4	\$16.7	\$18.0
% of Op. Expend.	6.67%	7.26%	7.60%
% of Prop. Values	0.14%	0.13%	0.12%
Alexandria			
Total Op. Asst.	\$9.1	\$10.0	\$10.6
% of Op. Expend.	4.93%	5.15%	5.15%
% of Prop. Values	0.13%	0.13%	0.12%
TOTAL SIX JURISDICTIONS			
Total Op. Asst.	\$211.6	\$230.7	\$256.5
% of Op. Expend.	3.78%	3.78%	3.84%
% of Prop. Values	0.16%	0.15%	0.14%

EXHIBIT XI.2

NET TRANSIT OPERATING ASSISTANCE PAYMENTS TO WMATA  
AS A PERCENT OF NON-TRANSIT OPERATING EXPENDITURES AND PROPERTY VALUES

(Millions, 1986 Constant Dollars)

	1986	1993		2000	
		Alt. A	Alt. B	Alt. A	Alt. B
District of Columbia					
Net Op. Asst.	\$88.3	\$99.7	\$105.3	\$110.8	\$114.8
% of Op. Expend.	3.32%	3.54%	3.74%	3.69%	3.82%
% of Prop. Values	0.35%	0.37%	0.39%	0.38%	0.40%
Montgomery County					
Net Op. Asst.	\$8.5	\$8.7	\$9.3	\$10.3	\$10.7
% of Op. Expend.	0.96%	0.84%	0.90%	0.86%	0.89%
% of Prop. Values	0.02%	0.02%	0.02%	0.02%	0.02%
Prince Georges County					
Net Op. Asst.	\$6.3	\$7.0	\$7.6	\$8.2	\$8.6
% of Op. Expend.	0.93%	1.00%	1.07%	1.11%	1.16%
% of Prop. Values	0.04%	0.03%	0.04%	0.03%	0.03%
Fairfax County					
Net Op. Asst.	\$17.0	\$19.7	\$21.4	\$23.5	\$24.8
% of Op. Expend.	1.78%	1.74%	1.90%	1.81%	1.91%
% of Prop. Values	0.05%	0.04%	0.05%	0.04%	0.04%
Arlington County					
Net Op. Asst.	\$8.0	\$9.6	\$10.7	\$11.2	\$12.0
% of Op. Expend.	3.46%	4.16%	4.64%	4.73%	5.06%
% of Prop. Values	0.07%	0.08%	0.08%	0.08%	0.08%
Alexandria					
Net Op. Asst.	\$4.9	\$5.9	\$6.4	\$6.7	\$7.0
% of Op. Expend.	2.65%	3.03%	3.30%	3.24%	3.42%
% of Prop. Values	0.07%	0.08%	0.08%	0.08%	0.08%
TOTAL SIX JURISDICTIONS					
Net Op. Asst.	\$133.1	\$150.5	\$160.6	\$170.7	\$177.8
% of Op. Expend.	2.38%	2.46%	2.63%	2.56%	2.66%
% of Prop. Values	0.10%	0.10%	0.10%	0.09%	0.09%

Alternative A (Favorable Federal Policy; continuation of Federal transit operating assistance)

Alternative B (Unfavorable Federal Policy; no Federal transit operating assistance)

The costs for rehabilitating and ultimately replacing components of the bus and rail systems will become significant in the future although the magnitude of these costs will be greatly influenced by Federal funding policies. The figures shown in Exhibit XI.3 are payments to WMATA for operating support, debt service, and the local share of rehabilitation and replacement costs. State aid has been taken into account in the calculations, as has Federal aid under the two Federal funding scenarios.

On a regional basis under the favorable Federal funding scenario, total support increases slightly in relation to total regional expenditures from 1986 to 1993 then increases again very modestly by the end of the century. Under the unfavorable Federal funding scenario, however, total support increases dramatically due to increasing rehabilitation and replacement costs.

Federal aid is much less important to the Maryland jurisdictions since state aid is assumed to cover 75% of rehabilitation and replacement costs, irrespective of how large these costs may be. The impact of Federal aid is more severe in Virginia where, for example, the 1993 ratio for operating expenditures for Arlington is 60% higher under the unfavorable Federal scenario than under the favorable alternative. Arlington and Alexandria also show the greatest relative impact on long-term funding for the year 2000.

It should be noted that Exhibit XI.3 does not include the local share of rail construction capital costs. These costs are excluded because it is difficult to assess how they will be paid; some jurisdictions may pay their respective shares out of current revenues while others may elect to sell bonds. Suffice it to say that Exhibit XI.3 gives an incomplete picture of the total magnitude of WMATA costs owing to the exclusion of these rail construction costs.

The annual values used to compute these exhibits are summarized in Appendix H. Other data used in the analysis is discussed in Chapter VIII and included in Appendix G.

EXHIBIT XI.3

NET OPERATING ASSISTANCE, DEBT SERVICE, AND REHAB & REPLACEMENT COSTS  
AS A PERCENT OF NON-TRANSIT OPERATING EXPENDITURES AND PROPERTY VALUES

(Millions, 1986 Constant Dollars)

	1986	1993		2000	
		Alt. A	Alt. B	Alt. A	Alt. B
District of Columbia					
Total Support	\$103.8	\$118.7	\$150.5	\$132.3	\$178.9
% of Op. Expend.	3.90%	4.21%	5.34%	4.41%	5.96%
% of Prop. Values	0.41%	0.44%	0.56%	0.46%	0.62%
Montgomery County					
Total Support	\$10.0	\$10.7	\$13.8	\$12.4	\$16.9
% of Op. Expend.	1.13%	1.03%	1.33%	1.04%	1.42%
% of Prop. Values	0.03%	0.02%	0.03%	0.02%	0.03%
Prince Georges County					
Total Support	\$7.9	\$8.8	\$11.5	\$10.3	\$14.7
% of Op. Expend.	1.16%	1.25%	1.63%	1.39%	1.98%
% of Prop. Values	0.04%	0.04%	0.05%	0.04%	0.06%
Fairfax County					
Total Support	\$18.8	\$23.3	\$33.2	\$26.5	\$40.8
% of Op. Expend.	1.96%	2.07%	2.94%	2.05%	3.14%
% of Prop. Values	0.06%	0.05%	0.07%	0.05%	0.07%
Arlington County					
Total Support	\$9.0	\$12.4	\$19.9	\$13.8	\$23.9
% of Op. Expend.	3.92%	5.38%	8.64%	5.79%	10.09%
% of Prop. Values	0.08%	0.10%	0.16%	0.09%	0.16%
Alexandria					
Total Support	\$5.4	\$7.2	\$10.8	\$7.8	\$12.9
% of Op. Expend.	2.93%	3.72%	5.56%	3.81%	6.28%
% of Prop. Values	0.08%	0.09%	0.14%	0.09%	0.15%
TOTAL SIX JURISDICTIONS					
Total Support	\$154.9	\$181.1	\$239.6	\$203.1	\$288.2
% of Op. Expend.	2.77%	2.96%	3.92%	3.04%	4.32%
% of Prop. Values	0.12%	0.11%	0.15%	0.11%	0.15%

Alternative A (Favorable Federal Policy; continuation of Federal transit operating assistance; 75% R & R support)

Alternative B (Unfavorable Federal Policy; no Federal transit operating assistance; formula R & R support)

## APPENDIX A

### PROPOSED METROBUS CHANGES BY ROUTE

#### NEAR-TERM CHANGES - VIENNA CORRIDOR

- o 1: Wilson Boulevard-Fairfax services. Routes 1A, 1H, 1M, 1W, and 1X, outlying Fairfax express services to Ballston and the Pentagon, would be discontinued. Routes 1C, 1E, and 1F would operate similar to current service via Wilson Blvd. with increase in frequencies. Routes 1V and 1Z would also operate via Wilson Blvd. but without stops between McKinley and Ballston. Route 1B would serve the Dunn Loring station and the new Fairview Park development with service in the counterflow direction.
- o 2: Washington Boulevard-Vienna services. Routes 2E, 2F, 2M, and 2V, outlying express services to Ballston and the Pentagon, would be discontinued. Route 2A would be modified to run between Dunn Loring station and Ballston with additional service. Route 2B would operate from Fair Oaks to Ballston via Vienna and East Falls Church stations. Route 2C would be modified slightly to serve Metrorail stations and with increased service. Routes 2W and 2X would be modified to operate between Vienna and the Vienna station. Route 2P would be added to operate between Vienna and Dunn Loring.
- o 3: Lee Highway services. Routes 3C and 3E services to Rosslyn would be discontinued. Route 3B and 3F would be modified to serve the East Falls Church and West Falls Church stations with increased peak service. Routes 3X and 3Z, express services to Ballston, would be changed to terminate at West Falls Church with some other routing changes in the Tysons Corner area. Route 3A would be added from Annandale to Rosslyn via Annandale Road and East Falls Church station.
- o 4: Pershing Drive/Arlington Boulevard services. Minor changes in routing to provide replacement service on Wilson Boulevard from Barton Street to Rosslyn.
- o 5A-H: Reston services. All routes would operate to West Falls Church Metrorail station. Many relatively minor service changes within Reston. Route 3F would be extended to Franklin Farms. "Straggler" service would be added at the end of the morning and evening rush periods.
- o 5K,L,M: Chain Bridge Road services. Relatively minor routing changes in Tysons Corner and McLean areas; direct services to Rosslyn and Farragut Square via George Washington Parkway maintained.

- o 5S: Herndon service. Route changed to terminate at West Falls Church rather than Ballston; minor re-routing in Tysons Corner area.
- o 5Y: Herndon express. Route changed to terminate at West Falls Church rather than Ballston.
- o 5Z: Tysons Corner express. Discontinued.
- o 10: cross-county service. Minor changes in north Arlington.
- o 12C: Centerville service. New route from Centerville to Vienna station via I-66.
- o 22: Walker Chapel-Shirlington services. Extension of route 22B to East Falls Church station via Williamsburg Blvd. and Sycamore St. Elimination of Culmore branch of route 22C.
- o 23: Glebe Road services. Relatively minor changes in Tysons Corner area and service to the CIA.
- o 23X: Great Falls express. Route changed to terminate at West Falls Church rather than Ballston.
- o 24: Seven Corners-Pentagon service. Routes 24A and 24B from Tysons Corner and East Falls Church to the Pentagon will be replaced by other services. Route 24E will be extended from East Falls Church to Seven Corners. Route 24T would operate from from McLean Hamlet to East Falls Church station.
- o 26: Tysons Corner-Springfield service. Rerouted in Tysons Corner area and to serve Dunn Loring station. Additional peak period service will be provided.
- o 28: Alexandria-Tysons Corner service. Rerouted to serve West Falls Church station.
- o 29Z: Chantilly express. Extended to Chantilly and changed to Vienna station instead of Ballston and the Pentagon.
- o 38B: Route 38C branch will be eliminated and 38B service will be increased.
- o 66X: West Falls Church express. Discontinued.

#### STARK-HARRIS SYSTEM CHANGES - BRANCH AVENUE CORRIDOR

- A2,4,6,8: Martin Luther King Drive services. All services to terminate at Anacostia station.
- V3,7: Anacostia expresses. Combined with A routes and terminated at Anacostia station.
- A10: New route from Anacostia station to Federal Triangle.
- V5: Fairfax Village express. Terminated at Anacostia station.
- W7: New route from Naval Research Laboratory to Anacostia station; replaces routes P5, P9 and W3.
- 92,94,B2,B4: Crosstown routes. Revised to serve Anacostia station in statistics shown here; actually proposed to be broken into multiple routes at Anacostia station.
- V1,9: Anacostia expresses. Combined with crosstown routes above and terminated at Anacostia station.
- C11: Clinton express. Turned back at Anacostia station rather than Federal Center SW.
- P17: Oxon Hill-Ft. Washington service. Turned back at Anacostia station rather than extending to Farragut Square.
- D12,S12: Eastover-Marlow Heights service. Turned back at Anacostia station rather than Federal Center SW.
- W13: Bock Road service. Turned back at Anacostia station rather than Farragut Square.
- W12-17: Indian Head service. Turned back at Anacostia station rather than Federal Center SW.
- New route added to serve proposed development along Potomac River just south of the Beltway. Routed to Anacostia station via I-295 as P17.

#### STARK-HARRIS SYSTEM CHANGES - GREENBELT CORRIDOR

- 84,85: Riverdale services. Rerouted to West Hyattsville station rather than to Rhode Island Avenue.
- 89: Laurel express. Rerouted to Greenbelt station rather than Rhode Island Avenue.
- R2: Baltimore Avenue service: Terminated at Prince George's Plaza station instead of Brookland.

- o R4: Hyattsville service: Rerouted to West Hyattsville station rather than Brookland.
- o R7: Highview service: Terminated at West Hyattsville station rather than Brookland.
- o R9: Calverton-Riggs Road service: Some runs rerouted to Prince George's Plaza station rather than Fort Totten.
- o R11,15: Greenbelt express service. Rerouted to Greenbelt station rather than to New Carrollton.
- o New Laurel services. Assumed at 1.5 times miles and hours of revised Laurel express service (route 89).

**FULL SYSTEM CHANGES - BRANCH AVENUE CORRIDOR**

- o A2: Congress Heights service. Extend from Southeast Community Hospital to Southern Avenue station.
- o A6,A8: Livingston Loop service. Reroute to Congress Heights (Alabama Avenue) station rather than Anacostia.
- o A9: South Capitol Street service. Extend to Southern Avenue station via Southern Avenue.
- o W2: Washington Overlook loop. Extend to Congress Heights Station.
- o W4: Anacostia crosstown service. Reroute via Congress Heights station; no significant impact assumed on operating statistics.
- o 32: Shipley Terrace service. Extend to Southern Avenue station.
- o 34: Naylor Gardens service. Extend to Naylor Road station.
- o 92: Garfield service. Extend to Congress Heights station.
- o 94: Stanton Road service. Extend to Southern Avenue station.
- o C11: Clinton express. Reroute to Branch Avenue station rather than Anacostia.
- o D12,S12: Eastover-Marlow Heights service. West end rerouted from Anacostia station to Southern Avenue station via Southern Avenue. East end extended to Suitland station.

- o W11-17: Indian Head Highway services. West end rerouted from Anacostia station to Southern Avenue station. East end of W11-15 extended to Branch Avenue station.
- o C12,14: Hillcrest Heights service. Reroute to Suitland station rather than Potomac Avenue station.
- o H11-17: Marlow Heights-Temple Hills service. Reroute to Suitland station rather than Potomac Avenue station.
- o M11: Suitland Road service. Reroute via Suitland station. Extend south end to Branch Avenue station.

**FULL SYSTEM CHANGES - GREENBELT CORRIDOR**

- o 42,46: Columbia Road service. Rerouted to Columbia Heights station. No significant impact on statistics assumed.
- o H8: Park Road-Brookland crosstown service. Cut back at Columbia Heights station. Mt. Pleasant loop replaced by new route 48 with improved headways.
- o K4: New Hampshire Avenue service. Cut back at Georgia Avenue station; some reduction in peak service.
- o P2: Petworth service. Cut back at Georgia Avenue station.
- o P7: Petworth express. Discontinued.
- o S3,S5: 16th Street special services. Reroute to Columbia Heights station.
- o 50: 14th Street service. Revise into two routes, one from 14th and Colorado to the Bureau of Engraving and the other from Takoma station to Columbia Heights station.
- o 52,54: 14th Street service to Navy Yard. Discontinued.
- o 60: 11th Street service. Break into two routes at Georgia Avenue station with different service frequencies.
- o 72: Georgia Avenue special service. Cut back at Georgia Avenue station.
- o 73: Georgia Avenue service to L'Enfant Plaza. Discontinued.



## APPENDIX B

### PATRONAGE FORECASTING MODEL

As noted in the text, work trip mode splits were computed using a "pivot" model which relates changes in transit share to changes in transit impedances. The pivot formulation can be expressed as follows:

$$P_1 = k * P_0 / 1 + (k-1) * P_0$$

where:

$P_1$  = new transit share  
 $P_0$  = original transit share  
 $k$  =  $\exp(c * v)$   
 $c$  = logit disutility coefficient  
 $v$  = change in impedance variable

For the MWCOG model, the impedance variables used were transit in-vehicle time, transit out-of-vehicle time, and transit fare. The coefficients used in the model are as follows:

- o -0.025: transit in-vehicle time (minutes)
- o -0.055: transit out-of-vehicle time (minutes)
- o -0.009: transit fare (1968 cents)

Thus, the transit out-of-vehicle time is weighted 2.2 times as heavily as in-vehicle time. For consistency in transit path selection and mode choice modeling, this multiplier of 2.2 was used in the network analysis process to apply to all out-of-vehicle time components.

Calculation of the mode splits to be used in the pivot model required combining of "walk access" and "auto access" impedances obtained from the network analysis. The weighting factors used in the combining process are shown in Exhibit B.1.

In the analysis process, a time/fare tradeoff was required for those users who had multiple transit opportunities. A simple function was developed, as shown in Exhibit B.2, which computed the proportion of users who would select a faster but more expensive rail path as opposed to a slower but less expensive all-bus choice. Some typical impedance tradeoff results are also shown in the Exhibit.

## EXHIBIT B.1

### IMPEDANCE WEIGHTING

Define terms as follows:

BW = base year impedance variable from "walk access" network  
BA = base year impedance variable from "auto access" network  
FW = future year impedance variable from "walk access" network  
FA = future year impedance variable from "auto access" network  
BW% = base year percent on "walk access" network  
BA% = 1.0 - BB%  
FW% = future year percent on "auto access" network  
FA% = 1.0 - FB%

Weighted change in impedance:

If FW% greater or equal to BW%:

$$BW\% * (FW - BW) + FA\% * (FA - BA) + (FW\% - BW\%) * (FW - BA)$$

If FW% less than BW%:

$$FW\% * (FW - BW) + BA\% * (FA - BA) + (BW\% - FW\%) * (FA - Bw)$$

For second phase analysis, the same formulas are used with the following changes in definitions:

BW = base year impedance from the "best" of the "walk access" and "all-bus" networks  
FW = future year impedance from the "best" of the "walk access" and "all-bus" networks

EXHIBIT B.2

TRAVEL TIME/FARE TRADEOFFS

Define terms as follows:

ITW = time impedance on the "walk access" path

ITB = time impedance on the "all-bus" path

IFW = fare impedance on the "walk access" path

IFB = fare impedance on the "all-bus" path

$$IDEL = (ITW - ITB) - (IFW - IFB)$$

Proportion on the walk access path:

$$(ITW - ITB) / IDEL$$

TYPICAL IMPEDANCE TRADEOFFS

Bus access path:

wait time	10	12	10	10	10
run time	10	10	8	10	12
fare	120	120	120	90	120

All-bus path

wait time	10	10	10	10	10
run time	15	15	15	15	15
fare	80	80	80	80	80

Impedances

ITW	0.800	0.910	0.750	0.800	0.850
ITB	0.925	0.925	0.925	0.925	0.925
IFW	0.338	0.338	0.338	0.253	0.338
IFB	0.225	0.225	0.225	0.225	0.225

Percent bus access	52.6%	11.8%	60.8%	81.6%	40.0%
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The non-work modeling approach developed for MWCOG and used as the base estimate of transit travel utilizes factors which are applied to work mode split estimates. The home based non-work factors differ for households with and without access to an automobile and by trip distance. The non-home based factors differ only by broad distance ranges. The factors used in the model are shown in Exhibit B.3. The impact of car ownership is very pronounced, as the ratio for households with cars is less than a third that for households without cars for all but the shortest trips.

EXHIBIT B.3

NON-WORK FACTORS

PERCENT TRANSIT HOME BASED OTHER / PERCENT TRANSIT HOME BASED WORK

DISTANCE RANGE	RATIO FOR 0 CARS OWNED	RATIO FOR 1+ CARS OWNED
0 - 1 MILE	0.5521	0.2689
1 - 5 MILES	0.6746	0.2046
5 - 10 MILES	0.6545	0.1820
10 - 30 MILES	0.5411	0.1714
30 - 50 MILES	0.0	0.0

PERCENT TRANSIT NON-HOME BASED / PERCENT TRANSIT HOME BASED WORK

DISTANCE RANGE	RATIO FOR ALL CAR OWNERSHIP GROUPS
0 - 10 MILES	0.2081
10 - 40 MILES	0.1987
40 - 50 MILES	0.0



## APPENDIX C

### PATRONAGE RESULTS BY JURISDICTION AND CORRIDOR

In addition to the regional patronage results shown in the main text of this report and in Exhibit C.1 and C.2, an analysis of a number of market segments is necessary for various purposes. These market segments can best be displayed in "production-attraction" format. In this format, trips are summarized with the home end of the trip recorded as the "production" and the destination end of the trip as the "attraction". Thus, a round trip by a commuter from Arlington to the District would be shown as two trips "produced" in Arlington and two trips "attracted" to the District. Trips from the District to Arlington would, therefore, represent reverse commuting.

One market segmentation that is of importance because of WMATA's funding arrangements is the jurisdictional distribution of travel. A summary of jurisdiction-to-jurisdiction work trips, in "production-attraction" format, is shown in Exhibits C.3, C.4, and C.5 for person trips, transit trips, and work mode split, respectively. The differential growth rates are clearly shown with work trip productions in the District increasing by only 17,000 from 1985 to 2000 while growth in Fairfax and Montgomery counties is over 150,000 for each jurisdiction. Similarly, the effect of differential employment growth can be seen with work trip attractions increasing only about 40,000 each in Arlington and the District, over 100,000 in Montgomery County, and nearly 200,000 in Fairfax County.

Exhibit C.6 shows an allocation of model results between rail-related and non-rail related trips, by purpose and jurisdiction. The shift between bus and rail as the Metrorail system expands is very evident for the District, while overall growth in suburban jurisdictions tends to mask the shifts in those areas.

Additional detail, focusing on transit trips, is shown in Exhibit C.7, which summarizes transit trips to the District core, the Arlington core, and the rest of the region from major corridors. The corridor boundaries, defined in terms of the districts used in the analysis, are shown in Exhibit C.8. As expected, mode splits are relatively constant for corridors where no transit improvements are included and the transit share increases in corridors with rail extensions. In many cases, however, the resulting trip increases are rather modest, because of the small changes in the size of the various markets.

EXHIBIT C.1

WORK PERSON TRIPS

FROM\TO				
1985	CORE	URBAN	SUB-URBAN	TOTAL
CORE	39,000	14,000	5,000	58,000
URBAN	353,000	228,000	108,000	689,000
SUBURB	423,000	358,000	806,000	1,587,000
TOTAL	815,000	600,000	919,000	2,334,000
1993	CORE	URBAN	SUB-URBAN	TOTAL
CORE	43,000	16,000	6,000	65,000
URBAN	349,000	247,000	116,000	712,000
SUBURB	453,000	434,000	1,005,000	1,892,000
TOTAL	845,000	697,000	1,127,000	2,669,000
2000	CORE	URBAN	SUB-URBAN	TOTAL
CORE	45,000	17,000	7,000	69,000
URBAN	351,000	255,000	123,000	729,000
SUBURB	473,000	470,000	1,179,000	2,122,000
TOTAL	869,000	742,000	1,309,000	2,920,000
CHANGE 1985-1993	CORE	URBAN	SUB-URBAN	TOTAL
CORE	10.3%	14.3%	20.0%	12.1%
URBAN	-1.1%	8.3%	7.4%	3.3%
SUBURB	7.1%	21.2%	24.7%	19.2%
TOTAL	3.7%	16.2%	22.6%	14.4%
CHANGE 1993-2000	CORE	URBAN	SUB-URBAN	TOTAL
CORE	4.7%	6.3%	16.7%	6.2%
URBAN	0.6%	3.2%	6.0%	2.4%
SUBURB	4.4%	8.3%	17.3%	12.2%
TOTAL	2.8%	6.5%	16.1%	9.4%

**EXHIBIT C.2**

**WORK TRANSIT TRIPS**

FROM\TO			SUB-	
1985	CORE	URBAN	URBAN	TOTAL
CORE	27,000	5,000	1,000	33,000
URBAN	169,000	56,000	14,000	239,000
SUBURB	104,000	27,000	21,000	152,000
<b>TOTAL</b>	<b>300,000</b>	<b>88,000</b>	<b>36,000</b>	<b>424,000</b>

1993	CORE	URBAN	SUB-	TOTAL
			URBAN	
CORE	30,000	6,000	1,000	37,000
URBAN	169,000	59,000	15,000	243,000
SUBURB	115,000	32,000	26,000	173,000
<b>TOTAL</b>	<b>314,000</b>	<b>97,000</b>	<b>42,000</b>	<b>453,000</b>

2000	CORE	URBAN	SUB-	TOTAL
			URBAN	
CORE	31,000	7,000	2,000	39,000
URBAN	171,000	61,000	17,000	249,000
SUBURB	128,000	36,000	31,000	196,000
<b>TOTAL</b>	<b>330,000</b>	<b>104,000</b>	<b>50,000</b>	<b>484,000</b>

CHANGE 1985-1993	CORE	URBAN	SUB-	TOTAL
			URBAN	
CORE	11.1%	20.0%	0.0%	12.1%
URBAN	0.0%	5.4%	7.1%	1.7%
SUBURB	10.6%	18.5%	23.8%	13.8%
<b>TOTAL</b>	<b>4.7%</b>	<b>10.2%</b>	<b>16.7%</b>	<b>6.8%</b>

CHANGE 1993-2000	CORE	URBAN	SUB-	TOTAL
			URBAN	
CORE	3.3%	16.7%	100.0%	5.4%
URBAN	1.2%	3.4%	13.3%	2.5%
SUBURB	11.3%	12.5%	19.2%	13.3%
<b>TOTAL</b>	<b>5.1%</b>	<b>7.2%</b>	<b>19.0%</b>	<b>6.8%</b>

EXHIBIT C.3

JURISDICTION SUMMARY - WORK PERSON TRIPS

1985	DISTRICT	MONTG	PRINCE GEORGES	ARL	ALEX	FAIRFAX TOTAL	LOUDN/ PW	TOTAL
DIST	315,300	30,300	25,700	27,300	5,900	7,600	400	412,500
MONTG	141,500	261,200	31,900	11,700	2,100	11,400	700	460,500
PR GEO	204,100	54,600	179,300	24,200	8,200	9,500	600	480,500
ARL	63,600	4,000	4,400	36,500	8,000	16,500	700	133,700
ALEX	45,800	2,100	4,400	22,900	16,300	16,500	1,000	109,000
FFX CO	138,100	24,100	14,200	71,500	41,800	218,400	20,800	528,900
FLS CH	2,400	500	200	1,600	600	4,600	200	10,100
FFX CT	2,600	900	300	1,300	800	9,700	800	16,400
LOU/PW	29,600	6,000	2,900	15,900	8,800	56,300	62,600	182,100
TOTAL	943,000	383,700	263,300	212,900	92,500	350,500	87,800	2,333,700

1993	DISTRICT	MONTG	PRINCE GEORGES	ARL	ALEX	FAIRFAX TOTAL	LOUDN/ PW	TOTAL
DIST	316,500	31,600	28,300	29,800	8,800	9,000	500	424,500
MONTG	156,900	322,800	41,200	14,500	3,500	16,600	1,000	556,500
PR GEO	209,400	57,800	204,600	27,100	12,800	11,500	700	523,900
ARL	62,000	4,000	4,600	39,300	11,400	18,500	800	140,600
ALEX	42,400	2,000	4,300	23,200	22,700	17,600	1,000	113,200
FFX CO	141,500	25,300	15,500	80,500	64,300	276,900	27,400	631,400
FLS CH	2,100	500	200	1,700	800	5,100	200	10,600
FFX CT	2,300	800	300	1,300	1,100	10,700	900	17,400
LOU/PW	34,600	7,200	3,700	20,200	15,500	84,400	85,200	250,800
TOTAL	967,700	452,000	302,700	237,600	140,900	450,300	117,700	2,668,900

2000	DISTRICT	MONTG	PRINCE GEORGES	ARL	ALEX	FAIRFAX TOTAL	LOUDN/ PW	TOTAL
DIST	315,800	32,600	30,400	31,200	9,500	9,700	500	429,700
MONTG	164,100	364,200	47,400	16,100	4,000	19,900	1,300	617,000
PR GEO	215,800	60,500	226,200	29,700	14,700	13,000	800	560,700
ARL	62,000	4,100	4,900	41,900	12,400	19,700	900	145,900
ALEX	42,700	2,100	4,600	24,800	24,900	19,200	1,200	119,500
FFX CO	141,800	25,900	16,500	85,400	70,500	323,100	33,600	696,800
FLS CH	2,100	500	200	1,800	900	5,700	300	11,500
FFX CT	2,200	800	300	1,400	1,100	12,400	1,000	19,200
LOU/PW	38,700	8,100	4,300	23,700	18,900	113,300	112,300	319,300
TOTAL	985,200	498,800	334,800	256,000	156,900	536,000	151,900	2,919,600

EXHIBIT C.4

JURISDICTION SUMMARY - WORK TRANSIT TRIPS

1985	DISTRICT	MONTG	PRINCE GEORGES	ARL	ALEX	FAIRFAX TOTAL	LOUDN/ PW	TOTAL
DIST	165,400	9,100	4,500	11,400	1,600	1,200	100	193,300
MONTG	42,800	16,300	1,100	1,100	100	200	0	61,600
PR GEO	44,400	3,800	6,900	4,100	400	400	0	60,000
ARL	26,400	400	400	7,300	700	900	0	36,100
ALEX	15,100	300	200	5,000	2,100	800	0	23,500
FFX CO	28,000	200	200	9,000	1,400	4,100	100	43,000
FLS CH	500	0	0	200	0	200	0	900
FFX CT	600	0	0	100	0	200	0	900
LOU/PW	3,100	200	0	800	100	100	300	4,600
TOTAL	326,300	30,300	13,300	39,000	6,400	8,100	500	423,900

1993	DISTRICT	MONTG	PRINCE GEORGES	ARL	ALEX	FAIRFAX TOTAL	LOUDN/ PW	TOTAL
DIST	167,400	9,700	5,300	12,700	2,600	1,600	100	199,400
MONTG	48,000	18,800	1,400	1,300	200	200	0	69,900
PR GEO	47,200	4,200	7,600	4,700	700	500	0	64,900
ARL	26,700	400	500	7,900	1,100	1,100	0	37,700
ALEX	14,300	300	200	5,000	2,900	800	0	23,500
FFX CO	31,100	200	300	10,900	2,300	6,400	100	51,300
FLS CH	500	0	0	200	100	200	0	1,000
FFX CT	600	0	0	100	0	200	0	900
LOU/PW	3,800	300	0	1,000	200	200	400	5,900
TOTAL	339,600	33,900	15,300	43,800	10,100	11,200	600	454,500

2000	DISTRICT	MONTG	PRINCE GEORGES	ARL	ALEX	FAIRFAX TOTAL	LOUDN/ PW	TOTAL
DIST	168,500	10,300	6,400	13,600	2,900	1,700	100	203,500
MONTG	52,000	21,000	1,700	1,400	200	300	0	76,600
PR GEO	53,100	4,700	9,300	5,500	900	600	0	74,100
ARL	27,200	500	600	8,300	1,200	1,300	0	39,100
ALEX	14,700	300	300	5,300	3,200	900	0	24,700
FFX CO	32,500	300	400	11,700	2,700	7,700	100	55,400
FLS CH	500	0	0	200	100	200	0	1,000
FFX CT	600	0	0	100	0	300	0	1,000
LOU/PW	5,400	400	100	1,600	300	300	500	8,600
TOTAL	354,500	37,500	18,800	47,700	11,500	13,300	700	484,000

EXHIBIT C.5

JURISDICTION SUMMARY - WORK MODE SPLIT

1985	DISTRICT	MONTG	PRINCE GEORGES	ARL	ALEX	FAIRFAX TOTAL	LOUDN/ PW	TOTAL
DIST	52.5%	30.0%	17.5%	41.8%	27.1%	15.8%	25.0%	46.9%
MONTG	30.2%	6.2%	3.4%	9.4%	4.8%	1.8%	0.0%	13.4%
PR GEO	21.8%	7.0%	3.8%	16.9%	4.9%	4.2%	0.0%	12.5%
ARL	41.5%	10.0%	9.1%	20.0%	8.8%	5.5%	0.0%	27.0%
ALEX	33.0%	14.3%	4.5%	21.8%	12.9%	4.8%	0.0%	21.6%
FFX CO	20.3%	0.8%	1.4%	12.6%	3.3%	1.9%	0.5%	8.1%
FLS CH	20.8%	0.0%	0.0%	12.5%	0.0%	4.3%	0.0%	8.9%
FFX CT	23.1%	0.0%	0.0%	7.7%	0.0%	2.1%	0.0%	5.5%
LOU/PW	10.5%	3.3%	0.0%	5.0%	1.1%	0.2%	0.5%	2.5%
TOTAL	34.6%	7.9%	5.1%	18.3%	6.9%	2.3%	0.6%	18.2%

1993	DISTRICT	MONTG	PRINCE GEORGES	ARL	ALEX	FAIRFAX TOTAL	LOUDN/ PW	TOTAL
DIST	52.9%	30.7%	18.7%	42.6%	29.5%	17.8%	20.0%	47.0%
MONTG	30.6%	5.8%	3.4%	9.0%	5.7%	1.2%	0.0%	12.6%
PR GEO	22.5%	7.3%	3.7%	17.3%	5.5%	4.3%	0.0%	12.4%
ARL	43.1%	10.0%	10.9%	20.1%	9.6%	5.9%	0.0%	26.8%
ALEX	33.7%	15.0%	4.7%	21.6%	12.8%	4.5%	0.0%	20.8%
FFX CO	22.0%	0.8%	1.9%	13.5%	3.6%	2.3%	0.4%	8.1%
FLS CH	23.8%	0.0%	0.0%	11.8%	12.5%	3.9%	0.0%	9.4%
FFX CT	26.1%	0.0%	0.0%	7.7%	0.0%	1.9%	0.0%	5.2%
LOU/PW	11.0%	4.2%	0.0%	5.0%	1.3%	0.2%	0.5%	2.4%
TOTAL	35.1%	7.5%	5.1%	18.4%	7.2%	2.5%	0.5%	17.0%

2000	DISTRICT	MONTG	PRINCE GEORGES	ARL	ALEX	FAIRFAX TOTAL	LOUDN/ PW	TOTAL
DIST	53.4%	31.6%	21.1%	43.6%	30.5%	17.5%	20.0%	47.4%
MONTG	31.7%	5.8%	3.6%	8.7%	5.0%	1.5%	0.0%	12.4%
PR GEO	24.6%	7.8%	4.1%	18.5%	6.1%	4.6%	0.0%	13.2%
ARL	43.9%	12.2%	12.2%	19.8%	9.7%	6.6%	0.0%	26.8%
ALEX	34.4%	14.3%	6.5%	21.4%	12.9%	4.7%	0.0%	20.7%
FFX CO	22.9%	1.2%	2.4%	13.7%	3.8%	2.4%	0.3%	8.0%
FLS CH	23.8%	0.0%	0.0%	11.1%	11.1%	3.5%	0.0%	8.7%
FFX CT	27.3%	0.0%	0.0%	7.1%	0.0%	2.4%	0.0%	5.2%
LOU/PW	14.0%	4.9%	2.3%	6.8%	1.6%	0.3%	0.4%	2.7%
TOTAL	36.0%	7.5%	5.6%	18.6%	7.3%	2.5%	0.5%	16.6%

EXHIBIT C.6

MODEL RESULTS BY JURISDICTION OF PRODUCTION

		1985		1993		2000	
		Rail	Other	Rail	Other	Rail	Other
WORK	District	69,200	124,100	88,500	110,800	100,400	103,100
	Montgomery	40,900	20,700	47,600	22,300	52,600	24,000
	Pr Georges	37,300	22,700	44,300	20,600	56,000	18,100
	Arlington	29,700	6,500	30,800	6,900	31,700	7,300
	Alexandria	16,500	7,000	16,100	7,300	16,900	7,900
	Fairfax	28,200	14,900	37,200	14,100	39,700	15,600
	Falls Ch	600	300	700	300	700	300
	Ffx City	400	600	700	300	800	300
	Loudoun/PW	1,200	3,600	1,600	4,400	2,400	6,200
	Total	224,000	200,400	267,600	186,800	301,200	182,800
HSO	District	29,300	68,300	33,900	59,800	40,200	51,800
	Montgomery	10,400	14,700	13,100	14,800	13,900	15,400
	Pr Georges	5,900	9,600	6,300	9,800	7,900	10,900
	Arlington	7,000	4,800	8,100	4,900	8,700	5,100
	Alexandria	2,600	4,000	3,100	4,000	3,500	4,200
	Fairfax	4,900	4,700	7,700	5,100	8,900	5,600
	Falls Ch	100	200	100	200	100	200
	Ffx City	0	100	100	100	100	100
	Loudoun/PW	100	300	200	300	300	400
	Total	60,100	106,600	72,600	99,000	83,600	93,800
NHB	District	59,600	13,900	73,200	14,200	86,600	15,200
	Montgomery	7,000	4,300	8,900	4,500	10,400	4,900
	Pr Georges	6,000	3,300	7,200	3,600	9,400	3,800
	Arlington	17,700	1,300	21,600	1,300	25,500	1,500
	Alexandria	2,100	1,300	2,800	1,400	3,200	1,500
	Fairfax	1,500	1,400	2,700	1,600	3,100	1,800
	Falls Ch	0	0	0	0	100	100
	Ffx City	0	100	100	100	100	100
	Loudoun/PW	0	100	100	100	100	100
	Total	94,000	25,700	116,500	26,700	138,500	28,800
TOTAL	District	158,100	206,300	195,700	184,700	227,100	170,100
	Montgomery	58,300	39,700	69,600	41,500	76,900	44,300
	Pr Georges	49,200	35,700	57,800	34,000	73,300	32,700
	Arlington	54,400	12,600	60,400	13,100	66,000	13,900
	Alexandria	21,100	12,300	22,000	12,800	23,600	13,600
	Fairfax	34,600	20,900	47,600	20,900	51,800	23,000
	Falls Ch	700	500	800	500	900	600
	Ffx City	500	800	900	500	900	500
	Loudoun/PW	1,300	3,900	1,800	4,800	2,800	6,700
	Total	378,200	332,700	456,700	312,600	523,400	305,300

EXHIBIT C.7

WORK TRANSIT TRIPS TO DC CORE

	1985	MS	1993	MS	2000	MS
DC CORE	19,300	72.6%	20,400	72.4%	21,300	72.6%
NW DC	29,000	61.1%	28,700	61.4%	28,500	61.8%
NORTH DC	20,700	62.6%	20,700	62.9%	20,800	64.1%
NE DC	12,400	52.9%	13,300	53.0%	14,000	53.0%
EAST DC	24,200	58.2%	24,000	58.4%	23,900	58.8%
ANACOSTIA	21,900	52.6%	22,400	53.5%	22,600	53.9%
ROCKVILLE	17,100	37.6%	19,800	38.0%	22,000	39.4%
SILVR SPRNG	19,800	37.9%	21,600	38.2%	22,800	39.6%
GREENBELT	11,300	30.8%	12,000	33.4%	12,600	36.0%
NEW CARRLTN	8,000	29.6%	8,300	29.4%	8,800	30.4%
ADDISON	4,200	37.5%	5,300	37.7%	6,100	39.2%
BRANCH	9,500	24.3%	9,800	24.7%	12,400	29.6%
INDIAN HEAD	4,300	19.7%	4,200	18.2%	4,800	19.2%
ARL CORE	4,100	71.1%	5,000	72.1%	5,400	72.2%
SOUTH ARL	8,700	41.1%	8,300	41.6%	8,400	42.4%
NORTH ARL	11,700	47.3%	11,400	48.2%	11,500	49.0%
ALEX CBD	7,300	43.2%	7,000	44.5%	7,300	45.3%
WEST ALEX	6,500	31.9%	6,100	31.9%	6,200	32.6%
HUNTINGTON	7,700	27.0%	8,100	27.6%	8,400	28.5%
SHIRLEY	8,700	22.9%	9,500	23.7%	10,100	24.9%
VIENNA	6,900	22.4%	8,200	27.0%	8,400	28.0%
GF/MCLEAN	3,400	19.6%	3,900	21.5%	4,000	22.3%
LOUDOUN	900	17.6%	1,100	18.1%	1,300	19.9%
PR WILLIAM	2,100	11.0%	2,500	11.3%	3,800	15.2%
TOTAL	269,800	40.0%	281,500	40.4%	295,300	41.5%

WORK TRANSIT TRIPS TO ARLINGTON CORE

DC CORE	1,800	73.1%	1,900	73.3%	2,100	73.7%
NW DC	1,000	27.1%	1,000	27.0%	1,000	27.1%
NORTH DC	1,100	45.9%	1,200	45.9%	1,300	47.8%
NE DC	800	45.8%	900	44.3%	1,000	43.8%
EAST DC	1,900	43.1%	2,000	43.4%	2,100	44.4%
ANACOSTIA	2,000	39.1%	2,200	41.2%	2,400	42.4%
ROCKVILLE	200	5.1%	300	5.2%	400	5.5%
SILVR SPRNG	800	23.5%	900	22.1%	900	22.1%
GREENBELT	1,300	27.9%	1,300	28.8%	1,400	30.6%
NEW CARRLTN	700	19.5%	800	18.7%	800	19.0%
ADDISON	300	20.6%	400	20.2%	400	21.4%
BRANCH	700	14.6%	800	14.7%	1,000	17.8%
INDIAN HEAD	300	8.3%	300	8.5%	400	8.8%
ARL CORE	900	39.4%	1,200	40.3%	1,300	39.6%
SOUTH ARL	1,800	19.9%	1,700	19.4%	1,700	19.2%
NORTH ARL	2,400	25.7%	2,300	25.6%	2,400	25.6%
ALEX CBD	2,000	25.6%	2,000	26.3%	2,200	26.5%
WEST ALEX	2,100	26.2%	2,000	25.1%	2,000	24.4%
HUNTINGTON	1,700	16.2%	1,900	16.8%	2,000	16.9%
SHIRLEY	3,400	18.4%	3,800	18.6%	4,000	18.9%
VIENNA	1,600	13.8%	1,900	15.8%	2,000	15.8%
GF/MCLEAN	500	9.8%	600	10.4%	600	10.6%
LOUDOUN	0	1.1%	0	1.1%	0	1.2%
PR WILLIAM	800	8.3%	900	8.3%	1,400	10.9%
TOTAL	30,200	21.7%	32,300	21.7%	34,700	22.1%

**EXHIBIT C.7 (Con'd)**

**WORK TRANSIT TRIPS TO NON-CORE**

	1985	MS	1993	MS	2000	MS
DC CORE	5,000	40.7%	5,700	41.6%	6,200	42.4%
NW DC	7,800	24.9%	7,900	24.7%	8,000	25.0%
NORTH DC	12,700	36.0%	13,100	36.5%	13,600	37.7%
NE DC	6,200	27.3%	6,800	27.1%	7,200	26.9%
EAST DC	14,400	35.4%	14,800	35.2%	15,000	35.3%
ANACOSTIA	11,100	30.2%	12,200	31.4%	12,800	32.4%
ROCKVILLE	10,800	5.5%	13,000	5.1%	14,900	5.0%
SILVR SPRNG	12,900	8.2%	14,300	7.9%	15,600	8.0%
GREENBELT	7,800	6.5%	8,500	6.8%	9,300	7.2%
NEW CARRLTN	3,900	5.0%	4,200	4.8%	4,600	4.8%
ADDISON	2,300	9.4%	2,800	8.4%	3,300	8.5%
BRANCH	4,200	5.9%	4,700	6.0%	6,300	7.3%
INDIAN HEAD	1,400	3.9%	1,700	4.3%	2,000	4.4%
ARL CORE	800	17.3%	1,100	18.3%	1,300	18.4%
SOUTH ARL	2,500	9.9%	2,800	10.0%	3,100	10.2%
NORTH ARL	3,300	10.5%	3,700	10.7%	3,900	10.8%
ALEX CBD	2,800	12.5%	3,400	13.2%	3,700	13.3%
WEST ALEX	2,700	8.2%	3,200	8.3%	3,500	8.5%
HUNTINGTON	3,000	5.4%	3,700	5.5%	4,300	5.9%
SHIRLEY	2,800	2.3%	3,700	2.4%	4,200	2.5%
VIENNA	3,900	2.7%	5,700	3.1%	6,800	3.2%
GF/MCLEAN	1,200	1.7%	2,300	2.6%	2,600	2.5%
LOUDOUN	300	0.9%	500	0.8%	600	0.8%
PR WILLIAM	700	0.6%	1,000	0.7%	1,400	0.8%
TOTAL	124,300	8.2%	140,600	7.7%	154,100	7.5%

**WORK TRANSIT TRIPS TO ALL AREAS**

DC CORE	26,100	63.4%	28,000	62.9%	29,600	63.5%
NW DC	37,800	46.0%	37,600	45.6%	37,500	45.8%
NORTH DC	34,500	48.7%	35,000	49.0%	35,700	50.2%
NE DC	19,400	40.4%	21,000	40.3%	22,200	40.1%
EAST DC	40,500	46.7%	40,800	46.5%	41,000	46.8%
ANACOSTIA	35,000	41.9%	36,800	42.8%	37,800	43.3%
ROCKVILLE	28,100	11.3%	33,100	10.6%	37,300	10.4%
SILVR SPRNG	33,500	15.8%	36,800	15.2%	39,300	15.2%
GREENBELT	20,400	12.7%	21,800	13.2%	23,300	13.8%
NEW CARRLTN	12,600	11.6%	13,300	11.1%	14,200	11.0%
ADDISON	6,800	18.3%	8,500	17.4%	9,800	17.5%
BRANCH	14,400	12.6%	15,300	12.5%	19,700	14.8%
INDIAN HEAD	6,000	9.9%	6,200	9.3%	7,200	9.7%
ARL CORE	5,800	45.7%	7,300	44.9%	8,000	45.0%
SOUTH ARL	13,000	23.4%	12,800	22.4%	13,200	22.4%
NORTH ARL	17,400	26.6%	17,400	25.9%	17,800	25.7%
ALEX CBD	12,100	25.8%	12,400	25.6%	13,200	25.3%
WEST ALEX	11,300	18.2%	11,300	17.5%	11,700	17.3%
HUNTINGTON	12,400	13.3%	13,700	12.7%	14,700	12.9%
SHIRLEY	14,900	8.3%	17,000	8.0%	18,300	7.9%
VIENNA	12,400	6.5%	15,800	7.0%	17,200	6.7%
GF/MCLEAN	5,100	5.5%	6,800	6.0%	7,200	5.7%
LOUDOUN	1,200	2.5%	1,600	2.3%	1,900	2.1%
PR WILLIAM	3,600	2.7%	4,400	2.4%	6,600	2.9%
TOTAL	424,300	18.2%	454,400	17.0%	484,000	16.6%



The network effects that were used to generate the results are selectively summarized in Exhibits C.9 through C.12. These Exhibits summarize the travel times and fares used in the model from each production zone to Farragut Square and L'Enfant Plaza. The times and fares shown are from the free-choice, walk access network described in the text, and thus represent travel characteristics for a commuter who boards a transit vehicle near his home and travels to one of the destinations noted above.

Exhibit C.9 summarizes weighted travel time changes to Farragut Square. The weighted time is computed as it is used in the model with transit out-of-vehicle time weighted by 2.2 compared to in-vehicle transit running time. Differences under one minute have been ignored. In a few instances, travel time increases, generally because of a reduction or reorientation of feeder bus service. Travel time improvements are broadly classified into 2 to 10 minutes and over 10 minute ranges. A similar display for travel to L'Enfant Plaza is shown in Exhibit C.10.

In some instances, the travel time effects are not due to Metrorail changes but to changes made in Metrobus service. For example, increases in travel time from Kensington are due to reductions in Connecticut Avenue bus service and improvements along Colesville Road are largely due to the institution of express service. Similarly, improvements from Lorton reflect extension of the Shirley HOV lanes.

Other changes are due to operational revisions. For example, with the opening of Van Dorn, the Blue Line is extended to Huntington, providing commuters in that corridor better access to Farragut Square but poorer access to L'Enfant Plaza. Some increases in travel time in northeast D.C. and adjacent areas of Prince George's County are due to revisions to bus service with the opening of the Green Line. Also shown on each of the Exhibits is a notation for those zones where neighborhood bus service was assumed to be introduced between 1985 and 2000. No changes are shown since there is no relevant basis for comparison.

Equivalent fare changes are shown in Exhibits C.11 and C.12, excluding changes of 10 cents or less. In most cases, fares increase with extension of Metrorail as the fare for a bus/rail trip will often be higher than for an all-bus trip that is replaced. In a few cases, fares decline, particularly for those people who can walk directly to rail and avoid a bus/rail transfer. The analysis assumed symmetry in rail access and egress with the average of the morning and evening conditions applied. In actual practice, Metrobus access and egress is influenced by the way in which the bus/rail transfer operates.

EXHIBIT C.9

TRAVEL TIME CHANGES  
TO FARRAGUT SQUARE

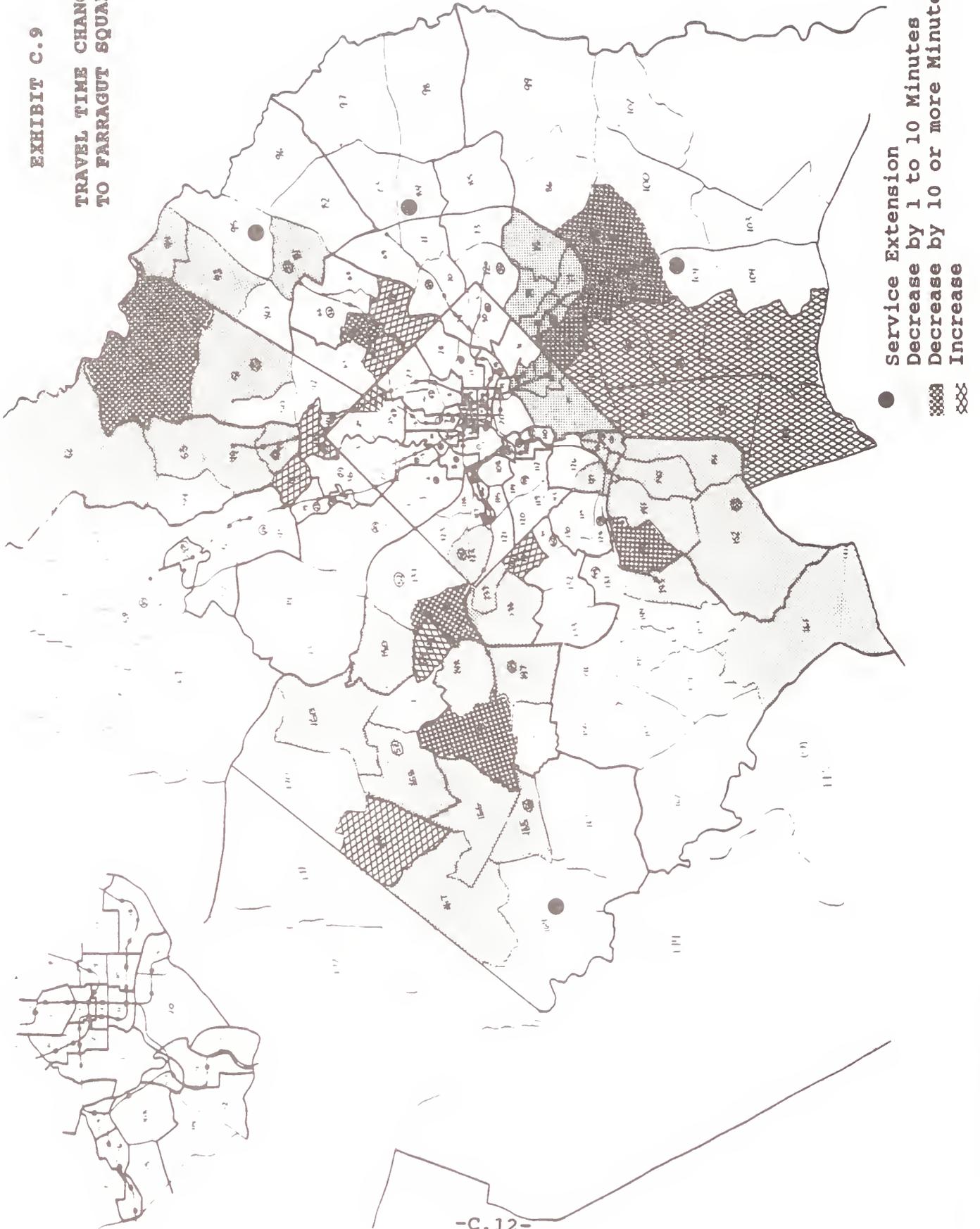
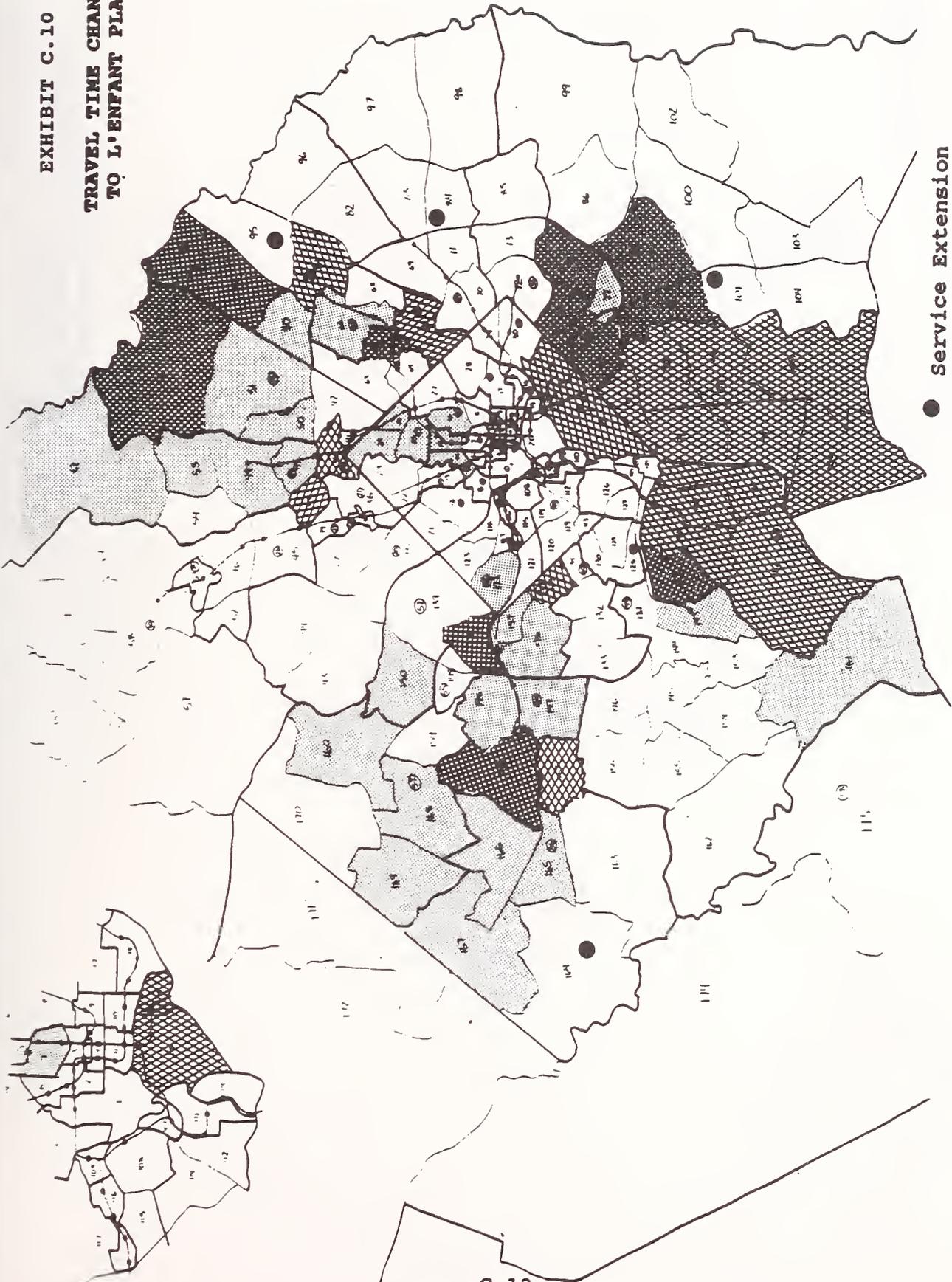


EXHIBIT C.10

TRAVEL TIME CHANGES  
TO L'ENFANT PLAZA



- Service Extension
- ◻ Decrease by 1 to 10 Minutes
- ▨ Decrease by 10 or more Minutes
- ✕ Increase

**EXHIBIT C.11**

**FARE CHANGES TO  
FARRAGUT SQUARE**

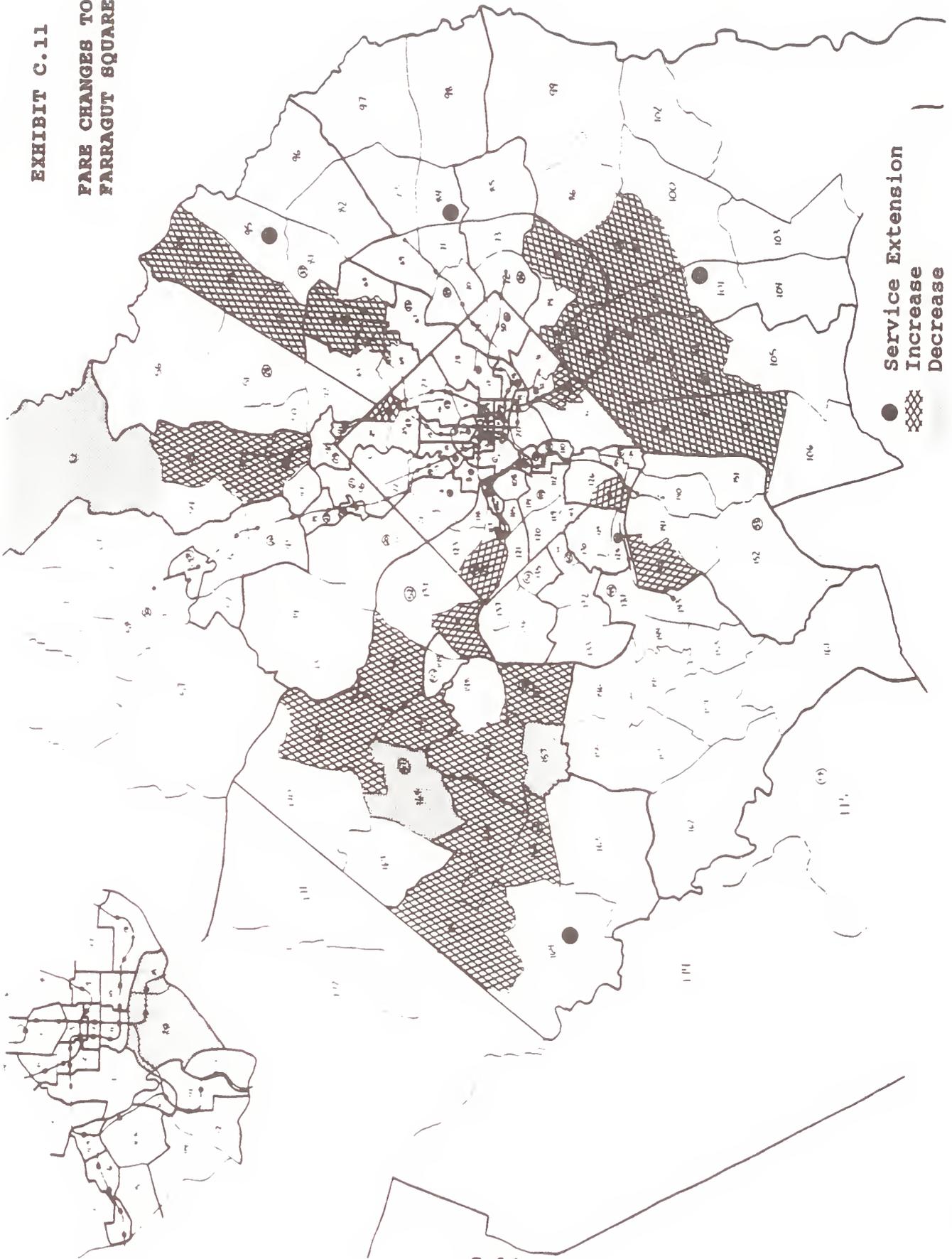
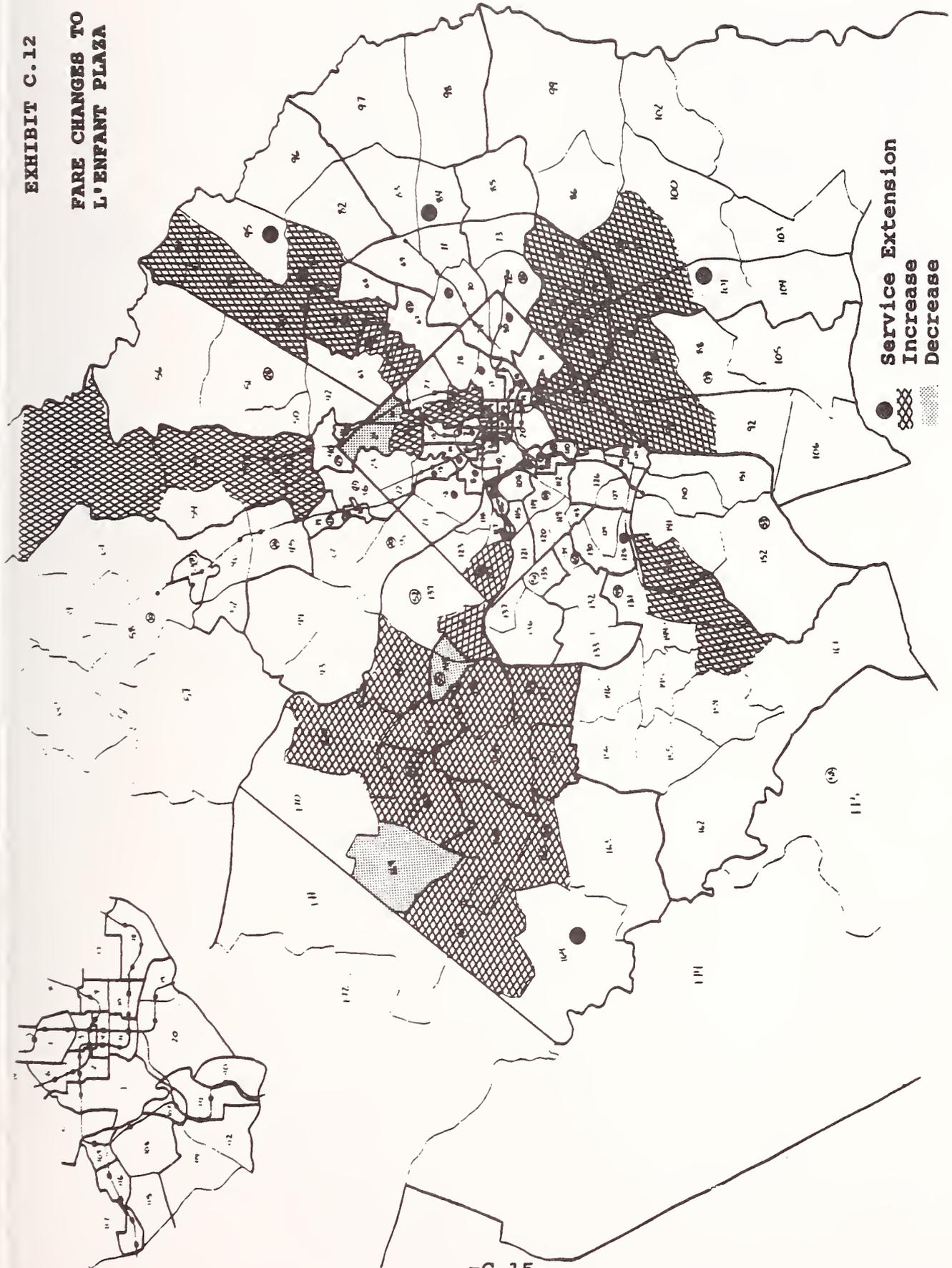


EXHIBIT C.12

FARE CHANGES TO  
L'ENFANT PLAZA



Two additional analyses were undertaken to determine the relative contribution of network effects, primarily increases in the Metrorail system, and demographic trends in the region. The first analysis was accomplished by multiplying 1985 person trips by the year 2000 mode splits obtained from the modeling process. Exhibit C.13 illustrates the results of this analysis. As expected, the network effect is most important for rail-related travel, while the demographic effect of regional growth and changing development patterns is more significant overall.

The second analysis was done by multiplying the year 2000 person trips by the 1985 mode splits. These results are summarized in Exhibit C.14 and show a similar pattern with the network effect being very pronounced, as expected, for the increase in rail trips and decrease in bus trips.

EXHIBIT C.13

GROWTH IN TRANSIT RIDERSHIP

	1985	2000	1985 LAND USE W/ 2000 NETWORK	NETWORK EFFECT	LAND USE EFFECT
METRORAIL ONLY (1)	245,800	364,500	298,100	52,300	66,400
METROBUS/METRORAIL	143,800	171,700	168,100	24,300	3,600
TOTAL RAIL-RELATED	389,600	536,300	466,200	76,600	70,100
METROBUS ONLY (2)	315,400	281,500	278,900	(36,500)	2,600
TOTAL BUS-RELATED	476,500	474,200	465,700	(10,800)	8,500
TOTAL WMATA	705,100	817,700	745,100	40,000	72,600
NON-WMATA ONLY	17,300	23,900	18,900	1,600	5,000
TOTAL TRANSIT	722,300	841,600	764,000	41,700	77,600

(1) Includes Metrorail/non-WMATA

(2) Includes Metrobus/non-WMATA

EXHIBIT C.14

NETWORK EFFECT ON CHANGE IN TRANSIT RIDERSHIP

	1985	2000	2000 Land Use w/ 1985 Network	Network Effect	Land Use Effect
Metrorail Only (1)	245,800	364,500	289,300	75,200	43,500
Metrobus/Metrorail	143,800	171,700	154,500	17,200	10,700
Total Rail-Related	389,600	536,200	443,800	92,400	54,200
Metrobus Only (2)	315,400	281,500	322,500	(41,000)	7,100
Total Bus-Related	476,500	474,200	494,500	(20,300)	18,000
Total WMATA	705,100	817,700	766,300	51,400	61,200
Non-WMATA Only	17,300	23,900	22,100	1,800	4,800
Total Transit	722,300	841,600	788,400	53,200	66,100

(1) Includes Metrorail/non-WMATA

(2) Includes Metrobus/non-WMATA

## APPENDIX D

### DETAILED OPERATING COST MODEL ANALYSIS AND RESULTS

This Appendix contains four sets of materials pertaining to the development and results of the operating cost model:

- o Cost model structure and results
- o Inflation analysis
- o Historical WMATA cost data
- o Adjustments to FY86 model calibration

Each of these topics is described in the sections which follow.

#### COST MODEL STRUCTURE AND RESULTS

Exhibit D.1 summarizes the results of the WMATA Metrobus and Metrorail operating cost model for the years 1986 through 2000. Page D.1.1 shows the bus and rail inputs or "driving variables" for the years 1986 through 1993. The baseline, diesel fuel, electricity, and parts inflation factors are also shown together with the changing productivity of rail car mechanics per vehicle-mile. Page D.1.2 summarizes the cost results for the years 1986 through 1993 for Metrobus and Metrorail; the allocation of Metrobus costs between fixed and variable components for the allocation formulas; an approximate breakdown between fixed and variable costs for Metrorail; and estimates of WMATA employees, broken down into salaried and union positions. Pages D.1.3 and D.1.4 show similar data for the years 1994 through 2000.

Exhibits D.2 and D.3 illustrate the detailed workings of the operating cost model as applied for Metrobus and Metrorail operations for the years 1986 and 2000, respectively. In each Exhibit, pages 1 - 4 summarize bus-related costs and pages 5 - 8 summarize rail-related costs. Each mode is further broken down into fixed and variable components plus a total.

The costs are summarized into major WMATA organizational units:

- o Independent Offices
- o Finance
- o Administration
- o Design, Construction, and Facility Maintenance
- o Bus Service
- o Rail Service

Each department is further broken down into offices. The final breakdown represents the major components that fall under each office. For fixed labor costs, the number of salaried and union positions are shown, together with the total labor costs. Non-labor costs are shown as a lump-sum. Variable cost relationships include the identification of the relevant driving variable (vehicles, miles, hours, etc.), in addition to the resulting labor and non-labor cost components.

## WMATA METROBUS AND METRO RAIL OPERATING COST MODEL

BASE YEAR DOLLARS	1	2	3	4	5	6	7	8
	This Year FY86	Vienna FY87	Vienna FY88	Vienna/Wheat FY89	Wheaton FY90	Wheaton/U St FY91	U St/Ana/VanD FY92	Ana/VanD/GbIt FY93
<b>BUS DRIVING VARIABLES:</b>								
Peak Vehicles	1,372	1,329	1,326	1,325	1,323	1,317	1,307	1,307
Platform-Hours	3,826,835	3,817,409	3,807,800	3,806,500	3,800,300	3,781,700	3,755,600	3,752,800
Platform-Miles	47,689,838	47,119,619	47,031,000	47,018,000	46,954,000	46,790,000	46,560,000	46,552,000
Operating Garages	9	9	9	9	9	9	9	9
<b>RAIL DRIVING VARIABLES:</b>								
Peak Cars	344	410	410	412	412	444	466	478
Peak Trains	79	86	86	86	86	93	98	101
Rev Train-Hours	571,091	624,618	624,618	624,618	624,618	675,459	711,774	733,563
Sched Car-Miles	28,733,000	35,927,000	36,036,000	36,587,000	37,082,000	40,835,000	42,605,000	43,928,000
Subway Stations	38	38	38	39	40	45	46	47
Other Stations	22	26	26	26	26	27	27	30
Mezzanines	76	82	82	83	84	90	91	95
Yards	4	5	5	5	5	5	5	6
Route-Miles	60.46	69.57	69.57	71.42	72.34	78.90	80.86	86.53
Interlockings	4	4	4	5	5	6	6	7
Terminals	6	6	6	6	6	6	6	6
Passengers	105,100,000	108,100,000	112,700,000	113,700,000	115,100,000	116,900,000	121,900,000	127,000,000
<b>INFLATION FACTORS</b>								
Baseline %	0.00	3.50	5.00	5.00	5.00	5.00	5.00	5.00
Baseline Factor	1.0000	1.0350	1.0868	1.1411	1.1981	1.2580	1.3210	1.3870
Diesel %	0.00	2.00	5.00	5.00	5.00	7.00	7.00	7.00
Diesel Factor	1.0000	1.0200	1.0710	1.1246	1.1808	1.2634	1.3519	1.4465
Diesel Incr Factor	1.0000	0.9855	0.9855	0.9855	0.9855	1.0043	1.0234	1.0429
Elec %	0.00	4.90	5.00	5.00	5.00	7.00	7.00	7.00
Elec Factor	1.0000	1.0490	1.1015	1.1565	1.2143	1.2994	1.3903	1.4876
Elec Incr Factor	1.0000	1.0135	1.0135	1.0135	1.0135	1.0328	1.0525	1.0726
Parts %	0.00	4.90	5.00	5.00	5.00	6.00	6.00	6.00
Parts Factor	1.0000	1.0490	1.1015	1.1565	1.2143	1.2872	1.3644	1.4463
Parts Incr Factor	1.0000	1.0135	1.0135	1.0135	1.0135	1.0232	1.0329	1.0428
<b>PRODUCTIVITY FACTORS</b>								
RCMNT Mech/Veh-Milex10-	16.82	13.75	13.75	13.75	13.75	14.06	14.36	14.67

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**WMATA METROBUS AND METRO RAIL OPERATING COST MODEL**


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BASE YEAR DOLLARS	1	2	3	4	5	6	7	8
	This Year FY86	Vienna FY87	Vienna FY88	Vienna/Wheat FY89	Wheaton FY90	Wheaton/U St FY91	U St/Ana/VanD FY92	Ana/VanD/Gblt FY93
<b>OPERATING EXP (Millions)</b>								
Metrobus	\$233,766	\$234,817	\$234,023	\$234,004	\$233,344	\$233,351	\$232,273	\$232,976
Metro rail	\$188,589	\$201,511	\$200,712	\$202,969	\$204,648	\$221,571	\$228,304	\$238,243
Total	\$422,355	\$436,328	\$434,735	\$436,972	\$437,993	\$454,921	\$460,577	\$471,219
<b>Metrobus Allocation</b>								
Fixed	\$53,167	\$54,867	\$54,475	\$54,512	\$54,122	\$54,548	\$54,198	\$54,634
Mileage-Related	\$76,159	\$75,765	\$75,624	\$75,604	\$75,503	\$75,583	\$75,561	\$75,896
Hour-Related	\$104,440	\$104,185	\$103,923	\$103,888	\$103,719	\$103,219	\$102,515	\$102,445
Total	\$233,766	\$234,817	\$234,023	\$234,004	\$233,344	\$233,351	\$232,273	\$232,976
<b>Metro rail "Allocation"</b>								
Fixed	\$37,236	\$40,062	\$39,317	\$39,317	\$39,413	\$39,413	\$39,413	\$39,413
Variable	\$151,353	\$161,448	\$161,394	\$163,651	\$165,236	\$182,158	\$188,891	\$198,831
Total	\$188,589	\$201,511	\$200,712	\$202,969	\$204,648	\$221,571	\$228,304	\$238,243
<b>EMPLOYEES (Man-Years)</b>								
<b>Metrobus</b>								
Salaried	574.34	573.92	573.85	573.84	573.80	573.67	573.50	573.50
Union	3663.81	3670.37	3662.76	3661.72	3656.72	3642.08	3621.54	3619.54
Subtotal	4238.15	4244.29	4236.61	4235.56	4230.52	4215.76	4195.04	4193.04
<b>Metro rail</b>								
Salaried	910.75	945.30	945.42	951.16	954.28	998.03	1006.81	1034.59
Union	2200.74	2327.52	2329.08	2365.61	2384.55	2593.11	2669.94	2801.51
Subtotal	3111.49	3272.83	3274.50	3316.78	3338.83	3591.14	3676.75	3836.10
TOTAL	7349.64	7517.12	7511.12	7552.34	7569.35	7806.90	7871.79	8029.14

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 WMATA METROBUS AND METRO RAIL OPERATING COST MODEL
 

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BASE YEAR DOLLARS	9 Gblt/Glen/FSP FY94	10 Glen/FSP FY95	11 Glen/FSP/Ft.T FY96	12 Ft.Totten FY97	13 Ft.Tot/Branch FY98	14 103-Mile Syst FY99	15 103-Mile Syst FY00
<b>BUS DRIVING VARIABLES:</b>							
Peak Vehicles	1,308	1,312	1,305	1,291	1,290	1,290	1,290
Platform-Hours	3,757,500	3,769,700	3,748,800	3,707,000	3,706,300	3,705,400	3,705,400
Platform-Miles	46,654,000	46,813,000	46,541,000	45,995,000	46,006,000	46,021,000	46,021,000
Operating Garages	9	9	9	9	9	9	9
<b>RAIL DRIVING VARIABLES:</b>							
Peak Cars	498	514	526	538	566	588	588
Peak Trains	105	107	108	109	111	113	113
Rev Train-Hours	762,615	777,141	784,404	791,667	806,193	820,719	820,719
Sched Car-Miles	46,690,000	48,607,000	49,521,000	50,844,000	53,680,000	55,863,000	55,863,000
Subway Stations	48	49	49	50	51	51	51
Other Stations	32	32	32	32	35	36	36
Mezzanines	97	99	99	100	104	105	105
Yards	7	7	7	7	8	8	8
Route-Miles	91.30	94.60	95.25	96.70	101.59	103.54	103.54
Interlockings	7	7	7	7	8	8	8
Terminals	6	6	7	7	8	8	8
Passengers	128,900,000	131,400,000	133,400,000	135,700,000	138,100,000	142,100,000	147,500,000
<b>INFLATION FACTORS</b>							
Baseline %	5.00	5.00	5.00	5.00	5.00	5.00	5.00
Baseline Factor	1.4563	1.5292	1.6056	1.6859	1.7702	1.8587	1.9516
Diesel %	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Diesel Factor	1.5478	1.6561	1.7720	1.8961	2.0288	2.1708	2.3228
Diesel Incr Factor	1.0628	1.0830	1.1036	1.1247	1.1461	1.1679	1.1902
Elec %	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Elec Factor	1.5918	1.7032	1.8224	1.9500	2.0865	2.2325	2.3888
Elec Incr Factor	1.0930	1.1138	1.1350	1.1566	1.1787	1.2011	1.2240
Parts %	6.00	6.00	6.00	6.00	6.00	6.00	6.00
Parts Factor	1.5331	1.6251	1.7226	1.8259	1.9355	2.0516	2.1747
Parts Incr Factor	1.0527	1.0627	1.0728	1.0831	1.0934	1.1038	1.1143
<b>PRODUCTIVITY FACTORS</b>							
RCMNT Mech/Veh-Milex10-	14.98	15.29	15.59	15.90	16.21	16.51	16.82

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**WMATA METROBUS AND METRO RAIL OPERATING COST MODEL**


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BASE YEAR DOLLARS	9	10	11	12	13	14	15
	Golt/Glen/FSP FY94	Glen/FSP FY95	Glen/FSP/Ft.T FY96	Ft.Totten FY97	Ft.Tot/Branch FY98	103-Mile Syst FY99	103-Mile Syst FY00
<b>OPERATING EXP (Millions)</b>							
Metrobus	\$233.293	\$234.694	\$233.722	\$232.503	\$232.551	\$233.379	\$233.444
Metrorail	\$249.683	\$257.605	\$261.839	\$267.532	\$281.298	\$289.532	\$291.633
Total	\$482.976	\$492.299	\$495.560	\$500.035	\$513.849	\$522.911	\$525.077
<b>Metrobus Allocation</b>							
Fixed	\$54.302	\$54.747	\$54.402	\$54.819	\$54.487	\$54.929	\$54.599
Mileage-Related	\$76.410	\$77.026	\$76.962	\$76.461	\$76.852	\$77.256	\$77.644
Hour-Related	\$102.581	\$102.921	\$102.357	\$101.223	\$101.211	\$101.194	\$101.201
Total	\$233.293	\$234.694	\$233.722	\$232.503	\$232.551	\$233.379	\$233.444
<b>Metrorail "Allocation"</b>							
Fixed	\$39.413	\$39.413	\$39.413	\$39.413	\$39.413	\$39.413	\$39.413
Variable	\$210.270	\$218.193	\$222.426	\$228.120	\$241.885	\$250.120	\$252.220
Total	\$249.683	\$257.605	\$261.839	\$267.532	\$281.298	\$289.532	\$291.633
<b>EMPLOYEES (Man-Years)</b>							
<b>Metrobus</b>							
Salaried	573.57	573.69	573.49	573.09	573.09	573.10	573.10
Union	3623.98	3634.22	3616.69	3581.60	3581.26	3580.83	3580.83
Subtotal	4197.56	4207.91	4190.18	4154.68	4154.35	4153.94	4153.94
<b>Metrorail</b>							
Salaried	1060.36	1072.23	1084.39	1091.36	1130.34	1140.43	1141.73
Union	2937.69	3027.14	3066.04	3125.27	3286.89	3373.64	3390.95
Subtotal	3998.06	4099.37	4150.42	4216.63	4417.22	4514.07	4532.69
TOTAL	8195.62	8307.29	8340.60	8371.31	8571.58	8668.01	8686.62

DEPT/Office	Component	Bus Fixed Costs			Bus Variable Costs			Bus Total				
		Employees			Cost Driver	Employees		Employees			Cost	
		Salaried	Union	Cost		Salaried	Union	Salaried	Union	Total		
<b>INDEPENDENT OFFICES</b>												
General Manager	Total	11.72		\$572,600				11.72	0.00	11.72	\$572,600	
Audit & Inspec	Total	9.18		\$355,400				9.18	0.00	9.18	\$355,400	
Board of Dir	Total	0.00		\$132,800				0.00	0.00	0.00	\$132,800	
General Council	Total	9.71		\$463,600				9.71	0.00	9.71	\$463,600	
Govt Relations	Total	1.30		\$69,100				1.30	0.00	1.30	\$69,100	
Public Affairs	Total	3.98		\$212,600				3.98	0.00	3.98	\$212,600	
Secretary	Total	0.00		\$0				0.00	0.00	0.00	\$0	
<b>TOTAL</b>		<b>35.89</b>	<b>0.00</b>	<b>\$1,806,100</b>		<b>0.00</b>	<b>0.00</b>	<b>\$0</b>	<b>35.89</b>	<b>0.00</b>	<b>35.89</b>	<b>\$1,806,100</b>
<b>FINANCE</b>												
AGM	Total	0.90		\$50,300				0.90	0.00	0.90	\$50,300	
Accounting	Payroll Clerks				Platform-Hours	10.80	\$218,171	0.00	10.80	10.80	\$218,171	
	Balance	15.98	9.29	\$687,129				15.98	9.29	25.27	\$687,129	
Budget & Mgt Anal	Total	8.35		\$378,800	Bus Survey		\$0	8.35	0.00	8.35	\$378,800	
Marketing	Total	28.75	41.00	\$2,788,600				28.75	41.00	69.75	\$2,788,600	
Risk Management	Workers' Comp Claims				Platform-Miles		\$9,774,600	0.00	0.00	0.00	\$9,774,600	
	Insur:Fixed Costs				(Mile-Related)		\$4,200	0.00	0.00	0.00	\$4,200	
	Southern RR							0.00	0.00	0.00	\$0	
	Mile-Related				Platform-Miles		\$810,918	0.00	0.00	0.00	\$810,918	
	Veh-Related				Peak Vehicles		\$296,997	0.00	0.00	0.00	\$296,997	
	Gar/Sta-Relate				Garages		\$10,000	0.00	0.00	0.00	\$10,000	
	BI Claims,Suits				Platform-Miles		\$6,134,900	0.00	0.00	0.00	\$6,134,900	
	Balance	18.35	2.70	\$1,541,685				18.35	2.70	21.05	\$1,541,685	
Transit Police	Tr/Sta Patrol Off							0.00	0.00	0.00	\$0	
	Mobile Patrol Off							0.00	0.00	0.00	\$0	
	Sargeants							0.00	0.00	0.00	\$0	
	Rev Protect Officers							0.00	0.00	0.00	\$0	
	Spec Police Officers							0.00	0.00	0.00	\$0	
	Balance				Alloc=>Plat-Mi	61.20	\$1,915,900	61.20	5.25	66.45	\$1,915,900	
Treasurer	Revenue Attendent							0.00	0.00	0.00	\$0	
	Supervisor Rev Serv							0.00	0.00	0.00	\$0	
	Farecards							0.00	0.00	0.00	\$0	
	Balance	13.48	21.66	\$980,700				13.48	21.66	35.14	\$980,700	
<b>TOTAL</b>		<b>85.81</b>	<b>74.65</b>	<b>\$6,427,214</b>		<b>61.20</b>	<b>\$19,165,686</b>	<b>147.01</b>	<b>90.70</b>	<b>237.71</b>	<b>\$25,592,900</b>	
<b>ADMINISTRATION</b>												
AGM	Total	1.05		\$50,300				1.05	0.00	1.05	\$50,300	
Admin Services	Total	11.90	12.54	\$1,669,300				11.90	12.54	24.44	\$1,669,300	
Civil Rights	Total	3.05		\$133,700				3.05	0.00	3.05	\$133,700	
Labor Relations	Total	3.20		\$294,700				3.20	0.00	3.20	\$294,700	
Mgt Info Serv	Total	25.85	6.40	\$2,076,200	System Upgrade		\$0	25.85	6.40	32.25	\$2,076,200	
Materials Mgt	Stock Clerks				Garages	34.00	\$1,019,592	0.00	34.00	34.00	\$1,019,592	
	Balance	9.40	3.40	\$394,308				9.40	3.40	12.80	\$394,308	
Personnel & Train	Total	16.18		\$744,800				16.18	0.00	16.18	\$744,800	
Planning	Total	28.64	56.40	\$2,411,200				28.64	56.40	85.04	\$2,411,200	
<b>TOTAL</b>		<b>99.27</b>	<b>78.74</b>	<b>\$7,774,508</b>		<b>0.00</b>	<b>\$1,019,592</b>	<b>99.27</b>	<b>112.74</b>	<b>212.01</b>	<b>\$8,794,100</b>	

DEPT/Office	Component	Bus Fixed Costs			Bus Variable Costs			Bus Total				
		Employees		Cost	Cost Driver	Employees		Salaried	Union	Total	Cost	
		Salaried	Union			Salaried	Union					
<b>DESIGN, CONSTRUCTION, &amp; FACIL MAINT</b>												
AGM	Total							0.00	0.00	0.00	\$0	
Construction	Total							0.00	0.00	0.00	\$0	
Contract Admin	Total							0.00	0.00	0.00	\$0	
Engg & Arch	Total	3.16		\$131,900				3.16	0.00	3.16	\$131,900	
Facilities Maint	Mechanics, Etc.				Garages	68.04	\$1,985,747	0.00	68.04	68.04	\$1,985,747	
	Bldg Maint Supv				(Mechanics)	3.96	\$144,287	3.96	0.00	3.96	\$144,287	
	Janitor				Garages	25.65	\$580,870	0.00	25.65	25.65	\$580,870	
	Supv Custodial Serv				(Janitors)	3.00	\$91,569	3.00	0.00	3.00	\$91,569	
	Cleaning Mach Op							0.00	0.00	0.00	\$0	
	Track & Str Union							0.00	0.00	0.00	\$0	
	Supv Track & Way							0.00	0.00	0.00	\$0	
	Insp Tr & Way Mtn							0.00	0.00	0.00	\$0	
	Elevator & Escalator							0.00	0.00	0.00	\$0	
	Track & Str Material							0.00	0.00	0.00	\$0	
	Other Mat'ls & Sup				Garages		\$794,200	0.00	0.00	0.00	\$794,200	
	Utilities				Garages		\$1,194,400	0.00	0.00	0.00	\$1,194,400	
	Balance	33.57	28.77	\$2,338,727				33.57	28.77	62.34	\$2,338,727	
Program Control	Total							0.00	0.00	0.00	\$0	
Real Estate	Total	0.55		\$21,900				0.55	0.00	0.55	\$21,900	
<b>TOTAL</b>		<b>37.28</b>	<b>28.77</b>	<b>\$2,492,527</b>		<b>6.96</b>	<b>93.69</b>	<b>\$4,791,073</b>	<b>44.24</b>	<b>122.46</b>	<b>166.70</b>	<b>\$7,283,600</b>
<b>BUS SERVICE</b>												
Support Services	Total	17.54	2.00	\$880,900				17.54	2.00	19.54	\$880,900	
Transp Support	Total	22.10		\$898,100				22.10	0.00	22.10	\$898,100	
QA & Training	Total	25.10	2.00	\$1,172,900				25.10	2.00	27.10	\$1,172,900	
Mnt Adm & Tech Sup	Total	5.78	3.00	\$355,800				5.78	3.00	8.78	\$355,800	
Heavy Maint	Mechanics				Platform-Miles	176.50	\$5,541,218	0.00	176.50	176.50	\$5,541,218	
	Supervisors				(Mechanics)	6.30	\$249,650	6.30	0.00	6.30	\$249,650	
	Parts-Routine				Platform-Miles		\$7,028,300	0.00	0.00	0.00	\$7,028,300	
	Parts-Special, Refurb			\$570,100	(Flexible Rehab)		\$1,944,300	0.00	0.00	0.00	\$2,514,400	
	Balance	1.96	32.00	\$1,455,032				1.96	32.00	33.96	\$1,455,032	
Service Vehicles	Mechanics				Peak Vehicles	10.86	\$344,881	0.00	10.86	10.86	\$344,881	
	Gasoline				Peak Vehicles		\$241,300	0.00	0.00	0.00	\$241,300	
	Materials & Supplies				Peak Vehicles		\$149,100	0.00	0.00	0.00	\$149,100	
	Balance	0.71	0.00	\$27,619				0.71	0.00	0.71	\$27,619	
Regions/Divisions	Full-Time Operators				Platform-Hours	2214.26	\$71,840,212	0.00	2214.26	2214.26	\$71,840,212	
	Part-Time Operators				Platform-Hours	239.89	\$7,783,187	0.00	239.89	239.89	\$7,783,187	
	Street Supervisors				Garages	58.00	\$1,912,492	58.00	0.00	58.00	\$1,912,492	
	Mechanics				Platform-Miles	411.00	\$11,784,603	0.00	411.00	411.00	\$11,784,603	
	Cleaner Shifters				Peak Vehicles	101.00	\$2,337,948	0.00	101.00	101.00	\$2,337,948	
	Garage Shift Supv				Platform-Miles	29.00	\$913,210	29.00	0.00	29.00	\$913,210	
	Diesel Fuel				Platform-Miles		\$12,776,600	0.00	0.00	0.00	\$12,776,600	
	Other Fuel & Lubr				Platform-Miles		\$913,800	0.00	0.00	0.00	\$913,800	
	Tires				Platform-Miles		\$1,916,300	0.00	0.00	0.00	\$1,916,300	
	Parts-Non-A/C				Platform-Miles		\$4,189,700	0.00	0.00	0.00	\$4,189,700	
	Parts-A/C				Platform-Miles		\$703,400	0.00	0.00	0.00	\$703,400	
	Balance				Garages	70.67	\$7,651,247	70.67	121.00	191.67	\$7,651,247	
<b>TOTAL</b>		<b>73.19</b>	<b>39.00</b>	<b>\$5,360,451</b>		<b>163.97</b>	<b>3274.51</b>	<b>\$140,221,449</b>	<b>237.16</b>	<b>3313.51</b>	<b>3550.67</b>	<b>\$145,581,900</b>

DEPT/Office	Component	Bus Fixed Costs			Bus Variable Costs			Bus Total				
		Employees		Cost	Cost Driver	Employees		Cost	Employees			
		Salaried	Union			Salaried	Union		Salaried	Union	Total	Cost
RAIL SERVICE												
Rail Serv Support	Total	2.13		\$74,400					2.13	0.00	2.13	\$74,400
Rail Car Maint	Mechanics								0.00	0.00	0.00	\$0
	Supv Car Insp								0.00	0.00	0.00	\$0
	Cleaners:Car-Miles								0.00	0.00	0.00	\$0
	:Cars								0.00	0.00	0.00	\$0
	Sup Car Clean								0.00	0.00	0.00	\$0
	Contract Maint								0.00	0.00	0.00	\$0
	Materials & Supplies								0.00	0.00	0.00	\$0
	Hydraulic								0.00	0.00	0.00	\$0
	Balance								0.00	0.00	0.00	\$0
Rail System Maint	AFC Mechanics								0.00	0.00	0.00	\$0
	AFC Supv								0.00	0.00	0.00	\$0
	AFC Parts								0.00	0.00	0.00	\$0
	ATC Mechanics								0.00	0.00	0.00	\$0
	ATC Supv								0.00	0.00	0.00	\$0
	ATC Parts								0.00	0.00	0.00	\$0
	Comm Mechanics				Peak Vehicles		16.60	\$524,394	0.00	16.60	16.60	\$524,394
	Comm Supv				(Mechanics)		1.20	\$44,180	1.20	0.00	1.20	\$44,180
	Comm Parts				Peak Vehicles			\$23,800	0.00	0.00	0.00	\$23,800
	Power Mechanics								0.00	0.00	0.00	\$0
	Power Supv								0.00	0.00	0.00	\$0
	Power Parts								0.00	0.00	0.00	\$0
	Balance	8.00	7.80	\$533,926					8.00	7.80	15.80	\$533,926
Rail Transport	OCC								0.00	0.00	0.00	\$0
	Depot Clerks								0.00	0.00	0.00	\$0
	Station Attendants								0.00	0.00	0.00	\$0
	Supv Pass Stations								0.00	0.00	0.00	\$0
	Operators-Revenue								0.00	0.00	0.00	\$0
	Operators-Yards								0.00	0.00	0.00	\$0
	Operators-Interlock								0.00	0.00	0.00	\$0
	Operators-Gap								0.00	0.00	0.00	\$0
	Operators-Spares								0.00	0.00	0.00	\$0
	Transp Supv-Yard								0.00	0.00	0.00	\$0
	Transp Supv-Line								0.00	0.00	0.00	\$0
	Transp Supv-Term								0.00	0.00	0.00	\$0
	Transp Supv-Spares								0.00	0.00	0.00	\$0
	Balance								0.00	0.00	0.00	\$0
TOTAL		10.13	7.80	\$608,326			1.20	\$592,374	11.33	24.40	35.73	\$1,200,700
SUBTOTAL		341.57	228.96	\$24,469,126			233.33	\$165,790,174	574.90	3663.81	4238.71	\$190,259,300

DEPT/Office	Component	Bus Fixed Costs			Bus Variable Costs			Bus Total				
		Employees		Cost	Cost Driver	Employees		Cost	Employees			
		Salaried	Union			Salaried	Union		Salaried	Union	Total	Cost
NON-DEPARTMENTAL												
Fringe Benefits	Salaried	-0.56		\$2,975,396	(Salaried Empl)			\$2,032,524	-0.56	0.00	-0.56	\$5,007,919
	Union-Full-Time			\$2,336,528	(FT Union Empl)			\$32,604,407	0.00	0.00	0.00	\$34,940,934
	Union-Part-Time				(PT Operators)			\$1,516,522	0.00	0.00	0.00	\$1,516,522
Electricity	Propulsion								0.00	0.00	0.00	\$0
	Subway Stations								0.00	0.00	0.00	\$0
	Other Stations								0.00	0.00	0.00	\$0
	Garages				Garages			\$1,495,998	0.00	0.00	0.00	\$1,495,998
Depr of Repairbles									0.00	0.00	0.00	\$0
CDL Contingency					(Salaried Empl)			\$545,298	0.00	0.00	0.00	\$545,298
Property Loss									0.00	0.00	0.00	\$0
TOTAL		-0.56	0.00	\$5,311,923		0.00	0.00	\$38,194,748	-0.56	0.00	-0.56	\$43,506,672
GRAND TOTAL		341.01	228.96	\$29,781,050		233.33	3434.85	\$203,984,922	574.34	3663.81	4238.15	\$233,765,972

DEPT/Office	Component	Rail Fixed Costs			Rail Variable Costs			Rail Total				
		Employees			Employees			Employees				
		Salaried	Union	Cost	Cost Driver	Salaried	Union	Cost	Salaried	Union	Total	Cost
<b>INDEPENDENT OFFICES</b>												
General Manager	Total	15.04		\$731,800				15.04	0.00	15.04	\$731,800	
Audit & Inspec	Total	9.22		\$353,400				9.22	0.00	9.22	\$353,400	
Board of Dir	Total	0.00		\$97,600				0.00	0.00	0.00	\$97,600	
General Council	Total	4.31		\$247,500				4.31	0.00	4.31	\$247,500	
Govt Relations	Total	1.10		\$58,500				1.10	0.00	1.10	\$58,500	
Public Affairs	Total	4.12		\$216,000				4.12	0.00	4.12	\$216,000	
Secretary	Total							0.00	0.00	0.00	\$0	
<b>TOTAL</b>		<b>33.79</b>	<b>0.00</b>	<b>\$1,704,800</b>		<b>0.00</b>	<b>0.00</b>	<b>\$0</b>	<b>33.79</b>	<b>0.00</b>	<b>33.79</b>	<b>\$1,704,800</b>
<b>FINANCE</b>												
AGM	Total	0.90		\$50,300				0.90	0.00	0.90	\$50,300	
Accounting	Payroll Clerks				Rev Train-Hours		7.20	\$145,447	0.00	7.20	7.20	\$145,447
	Balance	11.75	6.79	\$505,653					11.75	6.79	18.54	\$505,653
Budget & Mgt Anal	Total	6.80		\$408,500				6.80	0.00	6.80	\$408,500	
Marketing	Total	17.75	30.00	\$1,746,000				17.75	30.00	47.75	\$1,746,000	
Risk Management	Workers' Comp Claims				Sched Car-Miles			\$2,443,600	0.00	0.00	0.00	\$2,443,600
	Insur:Fixed Costs			\$300,900					0.00	0.00	0.00	\$300,900
	Southern RR				\$0 Van Dorn St. Opens				0.00	0.00	0.00	\$0
	Mile-Related				Sched Car-Miles			\$1,114,007	0.00	0.00	0.00	\$1,114,007
	Veh-Related				Peak Cars			\$510,599	0.00	0.00	0.00	\$510,599
	Gar/Sta-Relate				Stations			\$56,300	0.00	0.00	0.00	\$56,300
	BI Claims,Suits				Sched Car-Miles			\$672,600	0.00	0.00	0.00	\$672,600
	Balance	3.20	0.30	\$373,094					3.20	0.30	3.50	\$373,094
Transit Police	Tr/Sta Patrol Off				Stations	95.00		\$2,154,125	95.00	0.00	95.00	\$2,154,125
	Mobile Patrol Off				Terminals	51.00		\$1,156,425	51.00	0.00	51.00	\$1,156,425
	Sargeants				(Officers)	18.25		\$498,225	18.25	0.00	18.25	\$498,225
	Rev Protect Officers				Mezzanines	32.00		\$649,600	32.00	0.00	32.00	\$649,600
	Spec Police Officers				Yards	23.25		\$388,787	23.25	0.00	23.25	\$388,787
	Balance	48.00	0.50	\$1,992,569					48.00	0.50	48.50	\$1,992,569
Treasurer	Revenue Attendent				Mezzanines		27.00	\$736,533	0.00	27.00	27.00	\$736,533
	Supervisor Rev Serv				(Rev Attendants)	5.00		\$165,260	5.00	0.00	5.00	\$165,260
	Farecards				Passengers			\$710,500	0.00	0.00	0.00	\$710,500
	Balance	13.49	23.58	\$1,036,307					13.49	23.58	37.07	\$1,036,307
<b>TOTAL</b>		<b>101.89</b>	<b>61.17</b>	<b>\$6,413,322</b>		<b>224.50</b>	<b>34.20</b>	<b>\$11,402,008</b>	<b>326.39</b>	<b>95.37</b>	<b>421.76</b>	<b>\$17,815,330</b>
<b>ADMINISTRATION</b>												
AGM	Total	1.35		\$64,600					1.35	0.00	1.35	\$64,600
Admin Services	Total	14.24	8.43	\$2,342,000					14.24	8.43	22.67	\$2,342,000
Civil Rights	Total	2.75		\$122,800					2.75	0.00	2.75	\$122,800
Labor Relations	Total	3.00		\$265,800					3.00	0.00	3.00	\$265,800
Mgt Info Serv	Total	28.78	7.20	\$2,358,100	System Upgrade			\$0	28.78	7.20	35.98	\$2,358,100
Materials Mgt	Stock Clerks				Yards		27.00	\$809,676	0.00	27.00	27.00	\$809,676
	Balance	11.60	3.40	\$457,124					11.60	3.40	15.00	\$457,124
Personnel & Train	Total	14.64		\$722,000					14.64	0.00	14.64	\$722,000
Planning	Total	16.34	13.60	\$1,034,500					16.34	13.60	29.94	\$1,034,500
<b>TOTAL</b>		<b>92.70</b>	<b>32.63</b>	<b>\$7,366,924</b>		<b>0.00</b>	<b>27.00</b>	<b>\$809,676</b>	<b>92.70</b>	<b>59.63</b>	<b>152.33</b>	<b>\$8,176,600</b>

DEPT/Office	Component	Rail Fixed Costs			Rail Variable Costs			Rail Total				
		Employees		Cost	Cost Driver	Employees		Cost	Employees			Cost
		Salaried	Union			Salaried	Union		Salaried	Union	Total	
<b>DESIGN, CONSTRUCTION, &amp; FACIL MAINT</b>												
AGM	Total								0.00	0.00	0.00	\$0
Construction	Total								0.00	0.00	0.00	\$0
Contract Admin	Total								0.00	0.00	0.00	\$0
Engg & Arch	Total	6.61		\$277,800					6.61	0.00	6.61	\$277,800
Facilities Maint	Mechanics, Etc.				Stations	147.95	\$4,379,764		0.00	147.95	147.95	\$4,379,764
	Bldg Maint Supv				(Mechanics)	8.04	\$292,945		8.04	0.00	8.04	\$292,945
	Janitor				Stations	107.65	\$2,437,842		0.00	107.65	107.65	\$2,437,842
	Supv Custodial Serv				(Janitors)	11.55	\$352,541		11.55	0.00	11.55	\$352,541
	Cleaning Mach Op				Stations	13.00	\$301,912		0.00	13.00	13.00	\$301,912
	Track & Str Union				Route-Miles	183.10	\$4,911,108		0.00	183.10	183.10	\$4,911,108
	Supv Track & Way				(Mechanics,etc)	22.00	\$801,592		22.00	0.00	22.00	\$801,592
	Insp Tr & Way Htn				Route-Miles	4.75	\$173,071		4.75	0.00	4.75	\$173,071
	Elevator & Escalator				\$0 Stations		\$4,684,600		0.00	0.00	0.00	\$4,684,600
	Track & Str Material				\$0 Route-Miles		\$388,900		0.00	0.00	0.00	\$388,900
	Other Mat'ls & Sup				Stations		\$2,633,300		0.00	0.00	0.00	\$2,633,300
	Utilities				Yards		\$769,100		0.00	0.00	0.00	\$769,100
	Balance	65.58	43.25	\$4,143,425					65.58	43.25	108.83	\$4,143,425
Program Control	Total								0.00	0.00	0.00	\$0
Real Estate	Total	0.89		\$35,500					0.89	0.00	0.89	\$35,500
<b>TOTAL</b>		<b>73.08</b>	<b>43.25</b>	<b>\$4,456,725</b>		<b>46.34</b>	<b>451.70</b>	<b>\$22,126,675</b>	<b>119.42</b>	<b>494.95</b>	<b>614.37</b>	<b>\$26,583,400</b>
<b>BUS SERVICE</b>												
Support Services	Total	0.06		\$4,300					0.06	0.00	0.06	\$4,300
Transp Support	Total	0.90		\$32,200					0.90	0.00	0.90	\$32,200
QA & Training	Total	0.05		\$1,700					0.05	0.00	0.05	\$1,700
Mnt Adm & Tech Sup	Total	0.13		\$4,800					0.13	0.00	0.13	\$4,800
Heavy Maint	Mechanics								0.00	0.00	0.00	\$0
	Supervisors								0.00	0.00	0.00	\$0
	Parts-Routine								0.00	0.00	0.00	\$0
	Parts-Special,Refurb								0.00	0.00	0.00	\$0
	Balance	0.12	2.00	\$20,300					0.12	2.00	2.12	\$20,300
Service Vehicles	Mechanics				Route-Miles	16.70	\$530,609		0.00	16.70	16.70	\$530,609
	Gasoline				Route-Miles		\$436,000		0.00	0.00	0.00	\$436,000
	Materials & Supplies				Route-Miles		\$266,800		0.00	0.00	0.00	\$266,800
	Balance	1.08	2.16	\$103,291					1.08	2.16	3.24	\$103,291
Regions/Divisions	Full-Time Operators		10.75	\$320,834					0.00	10.75	10.75	\$320,834
	Part-Time Operators								0.00	0.00	0.00	\$0
	Street Supervisors	4.71		\$157,489					4.71	0.00	4.71	\$157,489
	Mechanics								0.00	0.00	0.00	\$0
	Cleaner Shifters								0.00	0.00	0.00	\$0
	Garage Shift Supv								0.00	0.00	0.00	\$0
	Diesel Fuel								0.00	0.00	0.00	\$0
	Other Fuel & Lubr								0.00	0.00	0.00	\$0
	Tires								0.00	0.00	0.00	\$0
	Parts-Non-A/C								0.00	0.00	0.00	\$0
	Parts-A/C								0.00	0.00	0.00	\$0
	Balance			\$15,378					0.00	0.00	0.00	\$15,378
<b>TOTAL</b>		<b>7.05</b>	<b>14.91</b>	<b>\$660,291</b>		<b>0.00</b>	<b>16.70</b>	<b>\$1,233,409</b>	<b>7.05</b>	<b>31.61</b>	<b>38.66</b>	<b>\$1,893,700</b>

DEPT/Office	Component	Rail Fixed Costs			Rail Variable Costs			Rail Total				
		Employees		Cost	Cost Driver	Employees		Cost	Employees			
		Salaried	Union			Salaried	Union		Salaried	Union	Total	Cost
RAIL SERVICE												
Rail Serv Support	Total	72.90	9.00	\$3,361,000					72.90	9.00	81.90	\$3,361,000
Rail Car Maint	Mechanics				Sched Car-Miles	483.29	\$14,516,665	0.00	483.29	483.29	483.29	\$14,516,665
	Supv Car Insp				(Mechanics)	36.24	\$1,382,338	36.24	0.00	36.24	36.24	\$1,382,338
	Cleaners:Car-Miles				Sched Car-Miles	16.20	\$363,107	0.00	16.20	16.20	16.20	\$363,107
	:Cars				Peak Cars	37.80	\$847,249	0.00	37.80	37.80	37.80	\$847,249
	Sup Car Clean				(Cleaners)	3.00	\$88,260	3.00	0.00	3.00	3.00	\$88,260
	Contract Maint				Sched Car-Miles		\$602,500	0.00	0.00	0.00	0.00	\$602,500
	Materials & Supplies				Sched Car-Miles		\$6,402,700	0.00	0.00	0.00	0.00	\$6,402,700
	Hydraulic				Sched Car-Miles		\$101,200	0.00	0.00	0.00	0.00	\$101,200
	Balance	18.90	5.00	\$636,484					18.90	5.00	23.90	\$636,484
Rail System Maint	AFC Mechanics				Mezzanines	55.00	\$1,753,235	0.00	55.00	55.00	55.00	\$1,753,235
	AFC Supv				(Mechanics)	7.80	\$284,201	7.80	0.00	7.80	7.80	\$284,201
	AFC Parts				Mezzanines		\$930,000	0.00	0.00	0.00	0.00	\$930,000
	ATC Mechanics				Stations	109.75	\$3,498,501	0.00	109.75	109.75	109.75	\$3,498,501
	ATC Supv				(Mechanics)	7.50	\$273,270	7.50	0.00	7.50	7.50	\$273,270
	ATC Parts				Stations		\$200,000	0.00	0.00	0.00	0.00	\$200,000
	Comm Mechanics				Stations	67.40	\$2,148,510	0.00	67.40	67.40	67.40	\$2,148,510
	Comm Supv				(Mechanics)	8.80	\$329,525	8.80	0.00	8.80	8.80	\$329,525
	Comm Parts				Stations		\$315,000	0.00	0.00	0.00	0.00	\$315,000
	Power Mechanics				Stations	81.19	\$2,588,094	0.00	81.19	81.19	81.19	\$2,588,094
	Power Supv				(Mechanics)	9.00	\$327,924	9.00	0.00	9.00	9.00	\$327,924
	Power Parts				Stations		\$490,000	0.00	0.00	0.00	0.00	\$490,000
	Balance	38.10	44.30	\$2,000,141					38.10	44.30	82.40	\$2,000,141
Rail Transport	OCC	28.00	0.00	\$1,028,881	Green Line oper	0.00	\$0	28.00	0.00	28.00	28.00	\$1,028,881
	Depot Clerks				Terminals	20	\$633,680	0.00	20.00	20.00	20.00	\$633,680
	Station Attendants				Mezzanines	289.00	\$7,927,559	0.00	289.00	289.00	289.00	\$7,927,559
	Supv Pass Stations				(Sta Attendants)	22.00	\$727,144	22.00	0.00	22.00	22.00	\$727,144
	Operators-Revenue				Rev Train-Hours	188.80	\$6,840,979	0.00	188.80	188.80	188.80	\$6,840,979
	Operators-Yards				Yards	40.00	\$1,449,360	0.00	40.00	40.00	40.00	\$1,449,360
	Operators-Interlock				Interlockings	16.80	\$608,731	0.00	16.80	16.80	16.80	\$608,731
	Operators-Gap		6.80	\$246,391	Green Line Oper	0.00	\$0	0.00	6.80	6.80	6.80	\$246,391
	Operators-Spares				(Subtotal Oper)	37.61	\$1,362,674	0.00	37.61	37.61	37.61	\$1,362,674
	Transp Supv-Yard				Yards	17.00	\$549,049	17.00	0.00	17.00	17.00	\$549,049
	Transp Supv-Line				Peak Trains	17.00	\$549,049	17.00	0.00	17.00	17.00	\$549,049
	Transp Supv-Term				Terminals	20.00	\$645,940	20.00	0.00	20.00	20.00	\$645,940
	Transp Supv-Spares				(Subtotal Supv)	5.00	\$161,480	5.00	0.00	5.00	5.00	\$161,480
	Balance	21.00	11.24	\$2,948,382					21.00	11.24	32.24	\$2,948,382
TOTAL		178.90	76.34	\$10,221,280		153.34	1442.84	\$58,897,923	332.24	1519.18	1851.42	\$69,119,203
SUBTOTAL		487.41	228.30	\$30,823,342		424.18	1972.44	\$94,469,691	911.59	2200.74	3112.33	\$125,293,033

DEPT/Office	Component	Rail Fixed Costs			Rail Variable Costs			Rail Total				
		Employees		Cost	Cost Driver	Employees		Cost	Employees			
		Salaried	Union			Salaried	Union		Salaried	Union	Total	Cost
NON-DEPARTMENTAL												
Fringe Benefits	Salaried	-0.84		\$4,075,791 (Salaried Empl)			\$3,547,059	-0.84	0.00	-0.84	\$7,622,850	
	Union-Full-Time			\$2,236,526 (FT Union Empl)			\$19,322,640	0.00	0.00	0.00	\$21,559,166	
	Union-Part-Time							0.00	0.00	0.00	\$0	
Electricity	Propulsion				Sched Car-Miles		\$22,553,700	0.00	0.00	0.00	\$22,553,700	
	Subway Stations				Subway Stations		\$6,615,868	0.00	0.00	0.00	\$6,615,868	
	Other Stations				Other Stations		\$2,062,732	0.00	0.00	0.00	\$2,062,732	
	Garages							0.00	0.00	0.00	\$0	
Depr of Repairbles					Peak Cars		\$2,000,000	0.00	0.00	0.00	\$2,000,000	
COL Contingency					Salaried Empl		\$781,489	0.00	0.00	0.00	\$781,489	
Property Loss				\$100,000				0.00	0.00	0.00	\$100,000	
TOTAL		-0.84	0.00	\$6,412,316		0.00	0.00	\$56,883,488	-0.84	0.00	-0.84	\$63,295,805
GRAND TOTAL		486.57	228.30	\$37,235,658		424.18	1972.44	\$151,353,180	910.75	2200.74	3111.49	\$188,588,838

DEPT/Office	Component	Bus Fixed Costs			Bus Variable Costs			Bus Total				
		Employees		Cost	Cost Driver	Employees		Employees		Total	Cost	
		Salaried	Union			Salaried	Union	Salaried	Union			
<b>INDEPENDENT OFFICES</b>												
General Manager	Total	11.72		\$572,600				11.72	0.00	11.72	\$572,600	
Audit & Inspec	Total	9.18		\$355,400				9.18	0.00	9.18	\$355,400	
Board of Dir	Total	0.00		\$132,800				0.00	0.00	0.00	\$132,800	
General Council	Total	9.71		\$653,237				9.71	0.00	9.71	\$653,237	
Govt Relations	Total	1.30		\$69,100				1.30	0.00	1.30	\$69,100	
Public Affairs	Total	3.98		\$212,600				3.98	0.00	3.98	\$212,600	
Secretary	Total	0.00		\$0				0.00	0.00	0.00	\$0	
<b>TOTAL</b>		<b>35.89</b>	<b>0.00</b>	<b>\$1,995,737</b>		<b>0.00</b>	<b>0.00</b>	<b>\$0</b>	<b>35.89</b>	<b>0.00</b>	<b>35.89</b>	<b>\$1,995,737</b>
<b>FINANCE</b>												
AGM	Total	0.90		\$50,300				0.90	0.00	0.90	\$50,300	
Accounting	Payroll Clerks				Platform=Hours	10.46	\$211,248	0.00	10.46	10.46	\$211,248	
	Balance	15.98	9.29	\$687,129				15.98	9.29	25.27	\$687,129	
Budget & Mgt Anal	Total	8.35		\$378,800	Bus Survey		\$0	8.35	0.00	8.35	\$378,800	
Marketing	Total	28.75	41.00	\$2,852,174				28.75	41.00	69.75	\$2,852,174	
Risk Management	Workers' Comp Claims				Platform=Miles		\$6,794,327	0.00	0.00	0.00	\$6,794,327	
	Insurs:Fixed Costs				(Mile-Related)		\$7,531	0.00	0.00	0.00	\$7,531	
	Southern RR							0.00	0.00	0.00	\$0	
	Mile-Related				Platform=Miles		\$1,411,208	0.00	0.00	0.00	\$1,411,208	
	Veh-Related				Peak Vehicles		\$477,720	0.00	0.00	0.00	\$477,720	
	Gar/Sta-Relate				Garages		\$10,963	0.00	0.00	0.00	\$10,963	
	BI Claims,Suits				Platform=Miles		\$9,424,297	0.00	0.00	0.00	\$9,424,297	
	Balance	18.35	2.70	\$1,541,685				18.35	2.70	21.05	\$1,541,685	
Transit Police	Tr/Sta Patrol Off							0.00	0.00	0.00	\$0	
	Mobile Patrol Off							0.00	0.00	0.00	\$0	
	Sargeants							0.00	0.00	0.00	\$0	
	Rev Protect Officers							0.00	0.00	0.00	\$0	
	Spec Police Officers							0.00	0.00	0.00	\$0	
	Balance				Alloc=>Plat-Mi	61.20	\$1,915,900	61.20	5.25	66.45	\$1,915,900	
Treasurer	Revenue Attendent							0.00	0.00	0.00	\$0	
	Supervisor Rev Serv							0.00	0.00	0.00	\$0	
	Farecards							0.00	0.00	0.00	\$0	
	Balance	13.48	21.66	\$1,122,705				13.48	21.66	35.14	\$1,122,705	
<b>TOTAL</b>		<b>85.81</b>	<b>74.65</b>	<b>\$6,632,793</b>		<b>61.20</b>	<b>\$20,253,194</b>	<b>147.01</b>	<b>90.36</b>	<b>237.37</b>	<b>\$26,885,987</b>	
<b>ADMINISTRATION</b>												
AGM	Total	1.05		\$50,300				1.05	0.00	1.05	\$50,300	
Admin Services	Total	11.90	12.54	\$1,984,541				11.90	12.54	24.44	\$1,984,541	
Civil Rights	Total	3.05		\$133,700				3.05	0.00	3.05	\$133,700	
Labor Relations	Total	3.20		\$294,700				3.20	0.00	3.20	\$294,700	
Mgt Info Serv	Total	25.85	6.40	\$2,076,200	System Upgrade		\$0	25.85	6.40	32.25	\$2,076,200	
Materials Mgt	Stock Clerks				Garages	34.00	\$1,019,592	0.00	34.00	34.00	\$1,019,592	
	Balance	9.40	3.40	\$394,308				9.40	3.40	12.80	\$394,308	
Personnel & Train	Total	16.18		\$744,800				16.18	0.00	16.18	\$744,800	
Planning	Total	28.64	56.40	\$2,623,188				28.64	56.40	85.04	\$2,623,188	
<b>TOTAL</b>		<b>99.27</b>	<b>78.74</b>	<b>\$8,301,737</b>		<b>0.00</b>	<b>\$1,019,592</b>	<b>99.27</b>	<b>112.74</b>	<b>212.01</b>	<b>\$9,321,329</b>	

DEPT/Office	Component	Bus Fixed Costs			Bus Variable Costs			Bus Total				
		Employees		Cost	Cost Driver	Employees		Employees		Total	Cost	
		Salaried	Union			Salaried	Union	Salaried	Union			
<b>DESIGN, CONSTRUCTION, &amp; FACIL MAINT</b>												
AGM	Total							0.00	0.00	0.00	\$0	
Construction	Total							0.00	0.00	0.00	\$0	
Contract Admin	Total							0.00	0.00	0.00	\$0	
Engg & Arch	Total	3.16		\$131,900				3.16	0.00	3.16	\$131,900	
Facilities Maint	Mechanics, Etc.				Garages	68.04	\$1,985,747	0.00	68.04	68.04	\$1,985,747	
	Bldg Maint Supv				(Mechanics)	3.96	\$144,287	3.96	0.00	3.96	\$144,287	
	Janitor				Garages	25.65	\$580,870	0.00	25.65	25.65	\$580,870	
	Supv Custodial Serv				(Janitors)	3.00	\$91,569	3.00	0.00	3.00	\$91,569	
	Cleaning Mach Op							0.00	0.00	0.00	\$0	
	Track & Str Union							0.00	0.00	0.00	\$0	
	Supv Track & Way							0.00	0.00	0.00	\$0	
	Insp Tr & Way Mtn							0.00	0.00	0.00	\$0	
	Elevator & Escalator							0.00	0.00	0.00	\$0	
	Track & Str Material							0.00	0.00	0.00	\$0	
	Other Mat'ls & Sup				Garages		\$884,974	0.00	0.00	0.00	\$884,974	
	Utilities				Garages		\$1,194,400	0.00	0.00	0.00	\$1,194,400	
	Balance	33.57	28.77	\$2,338,727				33.57	28.77	62.34	\$2,338,727	
Program Control	Total							0.00	0.00	0.00	\$0	
Real Estate	Total	0.55		\$21,900				0.55	0.00	0.55	\$21,900	
<b>TOTAL</b>		<b>37.28</b>	<b>28.77</b>	<b>\$2,492,527</b>		<b>6.96</b>	<b>93.69</b>	<b>\$4,881,847</b>	<b>44.24</b>	<b>122.46</b>	<b>166.70</b>	<b>\$7,374,374</b>
<b>BUS SERVICE</b>												
Support Services	Total	17.54	2.00	\$880,900				17.54	2.00	19.54	\$880,900	
Transp Support	Total	22.10		\$898,100				22.10	0.00	22.10	\$898,100	
GA & Training	Total	25.10	2.00	\$1,172,900				25.10	2.00	27.10	\$1,172,900	
Mnt Adm & Tech Sup	Total	5.78	3.00	\$355,800				5.78	3.00	8.78	\$355,800	
Heavy Maint	Mechanics				Platform-Miles	170.32	\$5,347,310	0.00	170.32	170.32	\$5,347,310	
	Supervisors				(Mechanics)	6.08	\$240,914	6.08	0.00	6.08	\$240,914	
	Parts-Routine				Platform-Miles		\$7,557,555	0.00	0.00	0.00	\$7,557,555	
	Parts-Special, Refurb			\$635,260	(Flxible Rehab)		\$0	0.00	0.00	0.00	\$635,260	
	Balance	1.96	32.00	\$1,455,032				1.96	32.00	33.96	\$1,455,032	
Service Vehicles	Mechanics				Peak Vehicles	10.21	\$324,270	0.00	10.21	10.21	\$324,270	
	Gasoline				Peak Vehicles		\$270,022	0.00	0.00	0.00	\$270,022	
	Materials & Supplies				Peak Vehicles		\$156,212	0.00	0.00	0.00	\$156,212	
	Balance	0.71	0.00	\$27,619				0.71	0.00	0.71	\$27,619	
Regions/Divisions	Full-Time Operators				Platform-Hours	2143.99	\$69,560,544	0.00	2143.99	2143.99	\$69,560,544	
	Part-Time Operators				Platform-Hours	232.28	\$7,536,207	0.00	232.28	232.28	\$7,536,207	
	Street Supervisors				Garages	58.00	\$1,912,492	58.00	0.00	58.00	\$1,912,492	
	Mechanics				Platform-Miles	396.62	\$11,372,218	0.00	396.62	396.62	\$11,372,218	
	Cleaner Shifters				Peak Vehicles	117.45	\$2,718,725	0.00	117.45	117.45	\$2,718,725	
	Garage Shift Supv				Platform-Miles	27.99	\$881,254	27.99	0.00	27.99	\$881,254	
	Diesel Fuel				Platform-Miles		\$14,674,054	0.00	0.00	0.00	\$14,674,054	
	Other Fuel & Lubr				Platform-Miles		\$881,823	0.00	0.00	0.00	\$881,823	
	Tires				Platform-Miles		\$1,849,242	0.00	0.00	0.00	\$1,849,242	
	Parts-Non-A/C				Platform-Miles		\$4,505,199	0.00	0.00	0.00	\$4,505,199	
	Parts-A/C				Platform-Miles		\$756,368	0.00	0.00	0.00	\$756,368	
	Balance				Garages	70.67	\$7,651,247	70.67	121.00	191.67	\$7,651,247	
<b>TOTAL</b>		<b>73.19</b>	<b>39.00</b>	<b>\$5,425,612</b>		<b>162.73</b>	<b>3191.88</b>	<b>\$138,195,655</b>	<b>235.92</b>	<b>3230.88</b>	<b>3466.80</b>	<b>\$143,621,267</b>

DEPT/Office	Component	Bus Fixed Costs			Bus Variable Costs			Bus Total				
		Employees		Cost	Cost Driver	Employees		Employees			Cost	
		Salaried	Union			Salaried	Union	Salaried	Union	Total		
RAIL SERVICE												
Rail Serv Support	Total	2.13		\$74,400					2.13	0.00	2.13	\$74,400
Rail Car Maint	Mechanics								0.00	0.00	0.00	\$0
	Supv Car Insp								0.00	0.00	0.00	\$0
	Cleaners:Car-Miles								0.00	0.00	0.00	\$0
	:Cars								0.00	0.00	0.00	\$0
	Sup Car Clean								0.00	0.00	0.00	\$0
	Contract Maint								0.00	0.00	0.00	\$0
	Materials & Supplies								0.00	0.00	0.00	\$0
	Hydraulic								0.00	0.00	0.00	\$0
	Balance								0.00	0.00	0.00	\$0
Rail System Maint	AFC Mechanics								0.00	0.00	0.00	\$0
	AFC Supv								0.00	0.00	0.00	\$0
	AFC Parts								0.00	0.00	0.00	\$0
	ATC Mechanics								0.00	0.00	0.00	\$0
	ATC Supv								0.00	0.00	0.00	\$0
	ATC Parts								0.00	0.00	0.00	\$0
	Comm Mechanics				Peak Vehicles		15.61	\$493,055	0.00	15.61	15.61	\$493,055
	Comm Supv				(Mechanics)	1.13		\$41,540	1.13	0.00	1.13	\$41,540
	Comm Parts				Peak Vehicles			\$24,935	0.00	0.00	0.00	\$24,935
	Power Mechanics								0.00	0.00	0.00	\$0
	Power Supv								0.00	0.00	0.00	\$0
	Power Parts								0.00	0.00	0.00	\$0
	Balance	8.07	8.79	\$533,926					8.07	8.79	16.86	\$533,926
Rail Transport	OCC								0.00	0.00	0.00	\$0
	Depot Clerks								0.00	0.00	0.00	\$0
	Station Attendants								0.00	0.00	0.00	\$0
	Supv Pass Stations								0.00	0.00	0.00	\$0
	Operators-Revenue								0.00	0.00	0.00	\$0
	Operators-Yards								0.00	0.00	0.00	\$0
	Operators-Interlock								0.00	0.00	0.00	\$0
	Operators-Gap								0.00	0.00	0.00	\$0
	Operators-Spares								0.00	0.00	0.00	\$0
	Transp Supv-Yard								0.00	0.00	0.00	\$0
	Transp Supv-Line								0.00	0.00	0.00	\$0
	Transp Supv-Term								0.00	0.00	0.00	\$0
	Transp Supv-Spares								0.00	0.00	0.00	\$0
	Balance								0.00	0.00	0.00	\$0
TOTAL		10.20	8.79	\$608,326		1.13	15.61	\$559,530	11.33	24.40	35.73	\$1,167,856
SUBTOTAL		341.64	229.95	\$25,456,732		232.02	3350.88	\$164,909,818	573.66	3580.83	4154.50	\$190,366,550

DEPT/Office	Component	Bus Fixed Costs			Bus Variable Costs			Bus Total				
		Employees		Cost	Cost Driver	Employees		Cost	Employees			Cost
		Salaried	Union			Salaried	Union		Salaried	Union	Total	
NON-DEPARTMENTAL												
Fringe Benefits	Salaried	-0.56		\$2,976,020 (Salaried Empl)			\$2,021,139	-0.56	0.00	-0.56	\$4,997,159	
	Union-Full-Time			\$2,346,652 (FT Union Empl)			\$31,825,189	0.00	0.00	0.00	\$34,171,841	
	Union-Part-Time			(PT Operators)			\$1,468,399	0.00	0.00	0.00	\$1,468,399	
Electricity	Propulsion							0.00	0.00	0.00	\$0	
	Subway Stations							0.00	0.00	0.00	\$0	
	Other Stations							0.00	0.00	0.00	\$0	
	Garages			Garages			\$1,896,085	0.00	0.00	0.00	\$1,896,085	
Depr of Repairbles								0.00	0.00	0.00	\$0	
COL Contingency				(Salaried Empl)			\$544,127	0.00	0.00	0.00	\$544,127	
Property Loss								0.00	0.00	0.00	\$0	
TOTAL		-0.56	0.00	\$5,322,672		0.00	0.00	\$37,754,938	-0.56	0.00	-0.56	\$43,077,610
GRAND TOTAL		341.08	229.95	\$30,779,404		232.02	3350.88	\$202,664,756	573.10	3580.83	4153.94	\$233,444,160

DEPT/Office	Component	Rail Fixed Costs			Rail Variable Costs			Rail Total				
		Employees		Cost	Cost Driver	Employees		Cost	Employees			
		Salaried	Union			Salaried	Union		Salaried	Union	Total	Cost
<b>INDEPENDENT OFFICES</b>												
General Manager	Total	15.04		\$731,800					15.04	0.00	15.04	\$731,800
Audit & Inspec	Total	9.22		\$353,400					9.22	0.00	9.22	\$353,400
Board of Dir	Total	0.00		\$97,600					0.00	0.00	0.00	\$97,600
General Council	Total	15.31		\$650,531					15.31	0.00	15.31	\$650,531
Govt Relations	Total	1.10		\$58,500					1.10	0.00	1.10	\$58,500
Public Affairs	Total	4.12		\$216,000					4.12	0.00	4.12	\$216,000
Secretary	Total								0.00	0.00	0.00	\$0
<b>TOTAL</b>		<b>44.79</b>	<b>0.00</b>	<b>\$2,107,831</b>		<b>0.00</b>	<b>0.00</b>	<b>\$0</b>	<b>44.79</b>	<b>0.00</b>	<b>44.79</b>	<b>\$2,107,831</b>
<b>FINANCE</b>												
AGM	Total	0.90		\$50,300					0.90	0.00	0.90	\$50,300
Accounting	Payroll Clerks				Rev Train-Hours	10.35		\$209,023	0.00	10.35	10.35	\$209,023
	Balance	11.75	6.79	\$505,653					11.75	6.79	18.54	\$505,653
Budget & Mgt Anal	Total	6.80		\$408,500					6.80	0.00	6.80	\$408,500
Marketing	Total	17.75	30.00	\$1,914,976					17.75	30.00	47.75	\$1,914,976
Risk Management	Workers' Comp Claims				Sched Car-Miles			\$1,206,499	0.00	0.00	0.00	\$1,206,499
	Insur:Fixed Costs			\$609,533					0.00	0.00	0.00	\$609,533
	Southern RR			\$95,329	Van Dorn St. Opens				0.00	0.00	0.00	\$95,329
	Mile-Related				Sched Car-Miles			\$3,532,949	0.00	0.00	0.00	\$3,532,949
	Veh-Related				Peak Cars			\$1,402,803	0.00	0.00	0.00	\$1,402,803
	Gar/Sta-Relate				Stations			\$139,825	0.00	0.00	0.00	\$139,825
	BI Claims,Suits				Sched Car-Miles			\$1,317,435	0.00	0.00	0.00	\$1,317,435
	Balance	3.20	0.30	\$373,094					3.20	0.30	3.50	\$373,094
Transit Police	Tr/Sta Patrol Off				Stations	129.14		\$2,928,264	129.14	0.00	129.14	\$2,928,264
	Mobile Patrol Off				Terminals	61.20		\$1,387,710	61.20	0.00	61.20	\$1,387,710
	Sargeants				(Officers)	23.79		\$649,537	23.79	0.00	23.79	\$649,537
	Rev Protect Officers				Mezzanines	44.21		\$897,474	44.21	0.00	44.21	\$897,474
	Spec Police Officers				Yards	46.50		\$777,573	46.50	0.00	46.50	\$777,573
	Balance	48.00	0.50	\$1,992,569					48.00	0.50	48.50	\$1,992,569
Treasurer	Revenue Attendent				Mezzanines		37.30	\$1,017,578	0.00	37.30	37.30	\$1,017,578
	Supervisor Rev Serv				(Rev Attendants)	6.91		\$228,320	6.91	0.00	6.91	\$228,320
	Farecards				Passengers			\$997,134	0.00	0.00	0.00	\$997,134
	Balance	13.49	23.58	\$1,289,588					13.49	23.58	37.07	\$1,289,588
<b>TOTAL</b>		<b>101.89</b>	<b>61.17</b>	<b>\$7,239,541</b>		<b>311.75</b>	<b>47.65</b>	<b>\$16,692,124</b>	<b>413.64</b>	<b>108.82</b>	<b>522.46</b>	<b>\$23,931,665</b>
<b>ADMINISTRATION</b>												
AGM	Total	1.35		\$64,600					1.35	0.00	1.35	\$64,600
Admin Services	Total	14.24	8.43	\$2,342,000					14.24	8.43	22.67	\$2,342,000
Civil Rights	Total	2.75		\$122,800					2.75	0.00	2.75	\$122,800
Labor Relations	Total	3.00		\$265,800					3.00	0.00	3.00	\$265,800
Mgt Info Serv	Total	28.78	7.20	\$2,358,100	System Upgrade			\$0	28.78	7.20	35.98	\$2,358,100
Materials Mgt	Stock Clerks				Yards		54.00	\$1,619,352	0.00	54.00	54.00	\$1,619,352
	Balance	11.60	3.40	\$457,124					11.60	3.40	15.00	\$457,124
Personnel & Train	Total	14.64		\$722,000					14.64	0.00	14.64	\$722,000
Planning	Total	16.34	13.60	\$1,130,435					16.34	13.60	29.94	\$1,130,435
<b>TOTAL</b>		<b>92.70</b>	<b>32.63</b>	<b>\$7,462,859</b>		<b>0.00</b>	<b>54.00</b>	<b>\$1,619,352</b>	<b>92.70</b>	<b>86.63</b>	<b>179.33</b>	<b>\$9,082,211</b>

DEPT/Office	Component	Rail Fixed Costs			Rail Variable Costs			Rail Total				
		Employees		Cost	Cost Driver	Employees		Salaried	Union	Total	Cost	
		Salaried	Union			Salaried	Union					
<b>DESIGN, CONSTRUCTION, &amp; FACIL MAINT</b>												
AGM	Total							0.00	0.00	0.00	\$0	
Construction	Total							0.00	0.00	0.00	\$0	
Contract Admin	Total							0.00	0.00	0.00	\$0	
Engg & Arch	Total	6.61		\$277,800				6.61	0.00	6.61	\$277,800	
Facilities Maint	Mechanics, Etc.				Stations	201.12	\$5,953,741	0.00	201.12	201.12	\$5,953,741	
	Bldg Maint Supv				(Mechanics)	10.93	\$398,223	10.93	0.00	10.93	\$398,223	
	Janitor				Stations	146.34	\$3,313,941	0.00	146.34	146.34	\$3,313,941	
	Supv Custodial Serv				(Janitors)	15.70	\$479,235	15.70	0.00	15.70	\$479,235	
	Cleaning Mach Op				Stations	17.67	\$410,412	0.00	17.67	17.67	\$410,412	
	Track & Str Union				Route-Miles	297.66	\$7,983,757	0.00	297.66	297.66	\$7,983,757	
	Supv Track & Way				(Mechanics, etc)	35.76	\$1,303,110	35.76	0.00	35.76	\$1,303,110	
	Insp Tr & Way Mtn				Route-Miles	8.13	\$296,391	8.13	0.00	8.13	\$296,391	
	Elevator & Escalator			\$0	Stations		\$6,436,097	0.00	0.00	0.00	\$6,436,097	
	Track & Str Material			\$0	Route-Miles		\$742,128	0.00	0.00	0.00	\$742,128	
	Other Mat'ls & Sup				Stations		\$4,254,702	0.00	0.00	0.00	\$4,254,702	
	Utilities				Yards		\$1,538,200	0.00	0.00	0.00	\$1,538,200	
	Balance	65.58	43.25	\$4,903,425				65.58	43.25	108.83	\$4,903,425	
Program Control	Total							0.00	0.00	0.00	\$0	
Real Estate	Total	0.89		\$35,500				0.89	0.00	0.89	\$35,500	
<b>TOTAL</b>		<b>73.08</b>	<b>43.25</b>	<b>\$5,216,725</b>		<b>70.53</b>	<b>662.79</b>	<b>\$33,109,937</b>	<b>143.61</b>	<b>706.04</b>	<b>\$38,326,662</b>	
<b>BUS SERVICE</b>												
Support Services	Total	0.06		\$4,300				0.06	0.00	0.06	\$4,300	
Transp Support	Total	0.90		\$32,200				0.90	0.00	0.90	\$32,200	
QA & Training	Total	0.05		\$1,700				0.05	0.00	0.05	\$1,700	
Mnt Adm & Tech Sup	Total	0.13		\$4,800				0.13	0.00	0.13	\$4,800	
Heavy Maint	Mechanics							0.00	0.00	0.00	\$0	
	Supervisors							0.00	0.00	0.00	\$0	
	Parts-Routine							0.00	0.00	0.00	\$0	
	Parts-Special, Refurb							0.00	0.00	0.00	\$0	
	Balance	0.12	2.00	\$20,300				0.12	2.00	2.12	\$20,300	
Service Vehicles	Mechanics				Route-Miles	28.60	\$908,688	0.00	28.60	28.60	\$908,688	
	Gasoline				Route-Miles		\$888,651	0.00	0.00	0.00	\$888,651	
	Materials & Supplies				Route-Miles		\$509,128	0.00	0.00	0.00	\$509,128	
	Balance	1.08	2.16	\$103,291				1.08	2.16	3.24	\$103,291	
Regions/Divisions	Full-Time Operators		10.75	\$320,834				0.00	10.75	10.75	\$320,834	
	Part-Time Operators							0.00	0.00	0.00	\$0	
	Street Supervisors	4.71		\$157,489				4.71	0.00	4.71	\$157,489	
	Mechanics							0.00	0.00	0.00	\$0	
	Cleaner Shifters							0.00	0.00	0.00	\$0	
	Garage Shift Supv							0.00	0.00	0.00	\$0	
	Diesel Fuel							0.00	0.00	0.00	\$0	
	Other Fuel & Lubr							0.00	0.00	0.00	\$0	
	Tires							0.00	0.00	0.00	\$0	
	Parts-Non-A/C							0.00	0.00	0.00	\$0	
	Parts-A/C							0.00	0.00	0.00	\$0	
	Balance			\$15,378				0.00	0.00	0.00	\$15,378	
<b>TOTAL</b>		<b>7.05</b>	<b>14.91</b>	<b>\$660,291</b>		<b>0.00</b>	<b>28.60</b>	<b>\$2,306,466</b>	<b>7.05</b>	<b>43.51</b>	<b>50.56</b>	<b>\$2,966,757</b>

DEPT/Office	Component	Rail Fixed Costs			Rail Variable Costs			Rail Total				
		Employees		Cost	Cost Driver	Employees		Cost	Employees			
		Salaried	Union			Salaried	Union		Salaried	Union	Total	Cost
RAIL SERVICE												
Rail Serv Support	Total	72.90	9.00	\$3,361,000					72.90	9.00	81.90	\$3,361,000
Rail Car Maint	Mechanics				Sched Car-Miles	939.62	\$28,223,453	0.00	939.62	939.62	939.62	\$28,223,453
	Supv Car Insp				(Mechanics)	70.46	\$2,687,556	70.46	0.00	70.46	70.46	\$2,687,556
	Cleaners:Car-Miles				Sched Car-Miles	31.50	\$705,956	0.00	31.50	31.50	31.50	\$705,956
	:Cars				Peak Cars	64.61	\$1,448,205	0.00	64.61	64.61	64.61	\$1,448,205
	Sup Car Clean				(Cleaners)	5.34	\$157,083	5.34	0.00	5.34	5.34	\$157,083
	Contract Maint				Sched Car-Miles		\$1,171,387	0.00	0.00	0.00	0.00	\$1,171,387
	Materials & Supplies				Sched Car-Miles		\$12,175,468	0.00	0.00	0.00	0.00	\$12,175,468
	Hydraulic				Sched Car-Miles		\$196,754	0.00	0.00	0.00	0.00	\$196,754
	Balance	18.90	5.00	\$636,484					18.90	5.00	23.90	\$636,484
Rail System Maint	AFC Mechanics				Mezzanines	81.95	\$2,612,359	0.00	81.95	81.95	81.95	\$2,612,359
	AFC Supv				(Mechanics)	11.62	\$423,465	11.62	0.00	11.62	11.62	\$423,465
	AFC Parts				Mezzanines		\$1,431,724	0.00	0.00	0.00	0.00	\$1,431,724
	ATC Mechanics				Stations	152.25	\$4,853,273	0.00	152.25	152.25	152.25	\$4,853,273
	ATC Supv				(Mechanics)	10.40	\$379,092	10.40	0.00	10.40	10.40	\$379,092
	ATC Parts				Stations		\$323,146	0.00	0.00	0.00	0.00	\$323,146
	Comm Mechanics				Stations	97.73	\$3,115,339	0.00	97.73	97.73	97.73	\$3,115,339
	Comm Supv				(Mechanics)	12.76	\$477,811	12.76	0.00	12.76	12.76	\$477,811
	Comm Parts				Stations		\$508,955	0.00	0.00	0.00	0.00	\$508,955
	Power Mechanics				Stations	117.73	\$3,752,736	0.00	117.73	117.73	117.73	\$3,752,736
	Power Supv				(Mechanics)	13.05	\$475,490	13.05	0.00	13.05	13.05	\$475,490
	Power Parts				Stations		\$791,708	0.00	0.00	0.00	0.00	\$791,708
	Balance	38.10	44.30	\$2,000,141					38.10	44.30	82.40	\$2,000,141
Rail Transport	OCC	28.00	0.00	\$1,028,881	Green Line oper	15.00	\$546,540	43.00	0.00	43.00	43.00	\$1,575,421
	Depot Clerks				Terminals	26.66666	\$844,907	0.00	26.67	26.67	26.67	\$844,907
	Station Attendants				Mezzanines	399.28	\$10,952,549	0.00	399.28	399.28	399.28	\$10,952,549
	Supv Pass Stations				(Sta Attendants)	30.39	\$1,004,607	30.39	0.00	30.39	30.39	\$1,004,607
	Operators-Revenue				Rev Train-Hours	271.33	\$9,831,221	0.00	271.33	271.33	271.33	\$9,831,221
	Operators-Yards				Yards	80.00	\$2,898,720	0.00	80.00	80.00	80.00	\$2,898,720
	Operators-Interlock				Interlockings	33.60	\$1,217,462	0.00	33.60	33.60	33.60	\$1,217,462
	Operators-Gap		6.80	\$246,391	Green Line Oper	15.00	\$543,510	15.00	21.80	36.80	36.80	\$789,901
	Operators-Spares				(Subtotal Oper)	58.37	\$2,114,875	0.00	58.37	58.37	58.37	\$2,114,875
	Transp Supv-Yard				Yards	34.00	\$1,098,098	34.00	0.00	34.00	34.00	\$1,098,098
	Transp Supv-Line				Peak Trains	24.32	\$785,349	24.32	0.00	24.32	24.32	\$785,349
	Transp Supv-Term				Terminals	26.67	\$861,253	26.67	0.00	26.67	26.67	\$861,253
	Transp Supv-Spares				(Subtotal Supv)	7.87	\$254,132	7.87	0.00	7.87	7.87	\$254,132
	Balance	21.00	11.24	\$2,948,382					21.00	11.24	32.24	\$2,948,382
TOTAL		178.90	76.34	\$10,221,280		261.88	2369.62	\$98,864,182	440.78	2445.96	2886.74	\$109,085,462
SUBTOTAL		498.41	228.30	\$32,908,527		644.16	3162.65	\$152,592,061	1142.57	3390.95	4533.52	\$185,500,588

DEPT/Office	Component	Rail Fixed Costs			Rail Variable Costs			Rail Total			
		Employees		Cost	Cost Driver	Employees		Cost	Employees		
		Salaried	Union			Salaried	Union		Salaried	Union	Total
NON-DEPARTMENTAL											
Fringe Benefits	Salaried	-0.84		\$4,167,774 (Salaried Empl)			\$5,386,581	-0.84	0.00	-0.84	\$9,554,355
	Union-Full-Time			\$2,236,526 (FT Union Empl)			\$30,982,368	0.00	0.00	0.00	\$33,218,894
	Union-Part-Time							0.00	0.00	0.00	\$0
Electricity	Propulsion				Sched Car-Miles		\$45,585,519	0.00	0.00	0.00	\$45,585,519
	Subway Stations				Subway Stations		\$9,618,756	0.00	0.00	0.00	\$9,618,756
	Other Stations				Other Stations		\$3,656,520	0.00	0.00	0.00	\$3,656,520
	Garages							0.00	0.00	0.00	\$0
	Depr of Repairbles				Peak Cars		\$3,418,605	0.00	0.00	0.00	\$3,418,605
	COL Contingency				Salaried Empl		\$979,505	0.00	0.00	0.00	\$979,505
	Property Loss			\$100,000				0.00	0.00	0.00	\$100,000
	TOTAL	-0.84	0.00	\$6,504,300			\$99,627,855	-0.84	0.00	-0.84	\$106,132,154
<hr/>											
GRAND TOTAL		497.57	228.30	\$39,412,827			\$252,219,916	1141.73	3390.95	4532.69	\$291,632,742

## INFLATION ANALYSIS

The inflation rates used in the operating cost analysis use the Washington CPI projection as the "base line" rate of inflation. The incremental differences between the base line rate and the rate for specific cost components is then applied to compute compounded inflation factors for specific cost components. The general form of the equation for computing the cost factors is:

$$CTIF_{in} = (1.0 + CPI_1 + INCR_{1n}) \times (1.0 + CPI_2 + INCR_{2n}) \\ \times \dots \times (1.0 + CPI_i + INCR_{in})$$

where:

$CTIF_{in}$  = compounded total inflation factor for cost component n, in year i

$CPI_i$  = inflation rate of consumer price index expressed as a fraction (e.g., 3% = 0.03), in year i

$INCR_{in}$  = incremental ("real") inflation rate for cost component n, expressed as a fraction, in year i

The inflation factors computed in this manner were used to estimate costs in inflated dollars. The so-called "uninflated" or "base year" costs reflect the incremental inflation only, but do not directly include the base line CPI values. The inflation factors are computed as follows:

$$CIIF_{in} = (1.0 + CPI_1 + INCR_{1n}) / (1.0 + CPI_1) \times \\ (1.0 + CPI_2 + INCR_{2n}) / (1.0 + CPI_2) \times \dots \times \\ (1.0 + CPI_i + INCR_{in}) / (1.0 + CPI_i)$$

where:

$CIIF_{in}$  = compounded incremental inflation factors for cost component n, in year i

Thus:

$$CTIF_{in} = (CIIF_{in}) \times (1.0 + CPI_i)$$

Note that  $CIIF_{in}$  cannot be computed simply as:

$$CIIF = (1.0 + INCR_{1n}) \times (1.0 + INCR_{2n}) \times \dots \times (1.0 + INCR_{in})$$

## HISTORICAL WMATA COST DATA

As described in Chapter V, historical data on WMATA operating costs were obtained for fiscal years 1981 through 1985. The following information was used to convert from current year (year of expenditure) dollars to 1986 dollars:

<u>Year</u>	<u>Consumer Price Index</u>	<u>Annual Inflation Rate</u>	<u>Inflation Factor (1986 Base)</u>
1981	267.3	-	1.2604
1982	281.9	5.46	1.1951
1983	294.7	4.54	1.1432
1984	308.9	4.82	1.0906
7/84	308.3		
7/85	323.3	4.87	
1985		4.87	1.0400
1986		4.00	1.0000

The inflation rate assumed by WMATA is 4.00 percent in FY86.

The results of the analysis of the operating cost data are shown graphically in Exhibits D.4 through D.12 and are discussed below.

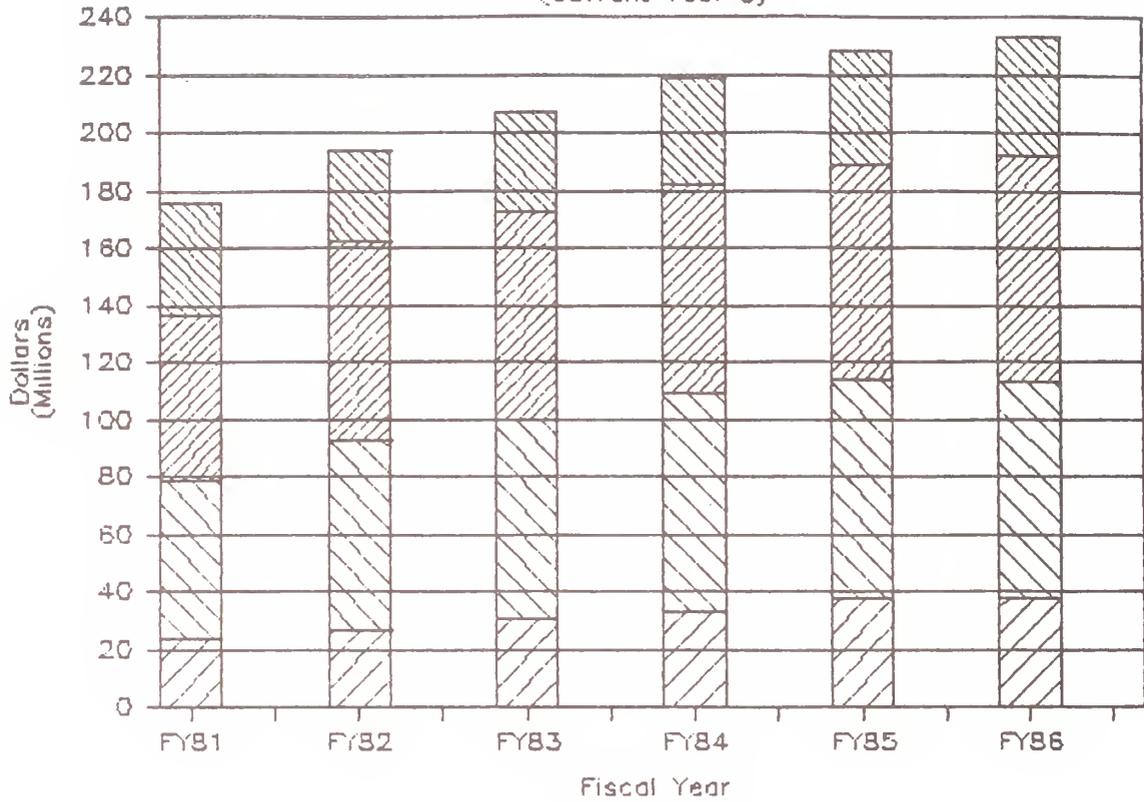
### Allocation of Bus Costs

Exhibits D.4 and D.5 show the allocation of Metrobus operating costs, in year of expenditure and base year (1986) dollars, respectively, based on the definition of fixed, mileage-related, and hour-related costs used in the allocation of operating costs. An important exception is that fringe benefits could not be allocated due to the level of aggregation in the data analyzed. The most significant findings are:

- o fixed costs, in base year dollars, have remained relatively constant over the past three years.
- o total operating costs, in base year dollars, have also remained relatively constant. Indeed, over the past several years, total costs have actually decreased, reflecting a slight reduction in the level of service provided.

Exhibits D.6 and D.7 show an allocation of Metrorail operating costs, in year of expenditure and base year (1986) dollars, respectively. The allocation separates fixed from variable costs, with the fixed costs defined in a similar manner as in the allocation of Metrobus costs.. Again, the level of aggregation in the data prevented the allocation of fringe benefit expenses. In base year dollars, the level of fixed and total expenditure has been increasing due to the significantly increasing level of service.

**EXHIBIT D.4**  
**BUS COST ALLOCATION**  
 (Current Year \$)



 Fringes	 Hour-Related
 Mileage-Related	 Fixed

**EXHIBIT D.5**  
**BUS COST ALLOCATION**  
 (1986 \$)

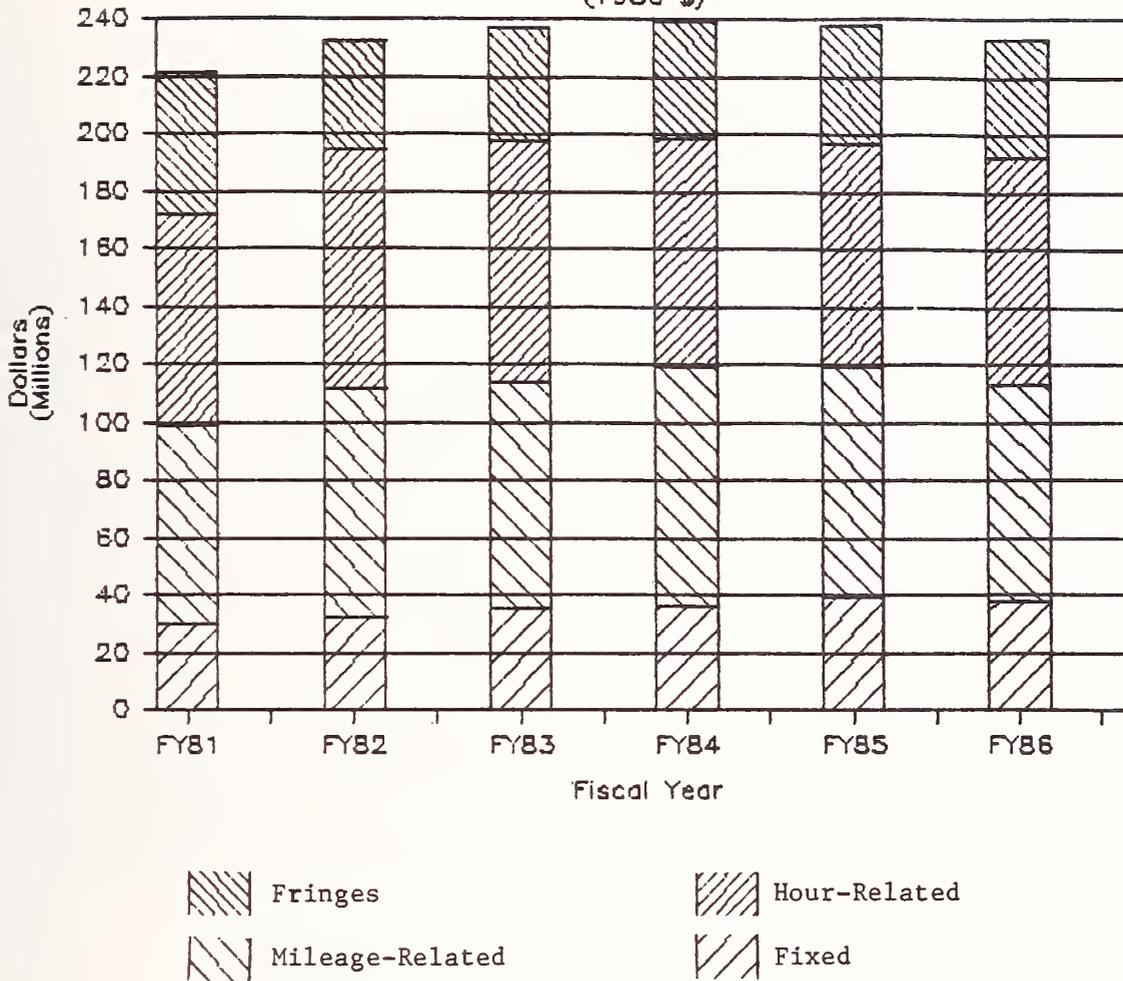


EXHIBIT D.6

RAIL COST ALLOCATION

(Current Year \$)

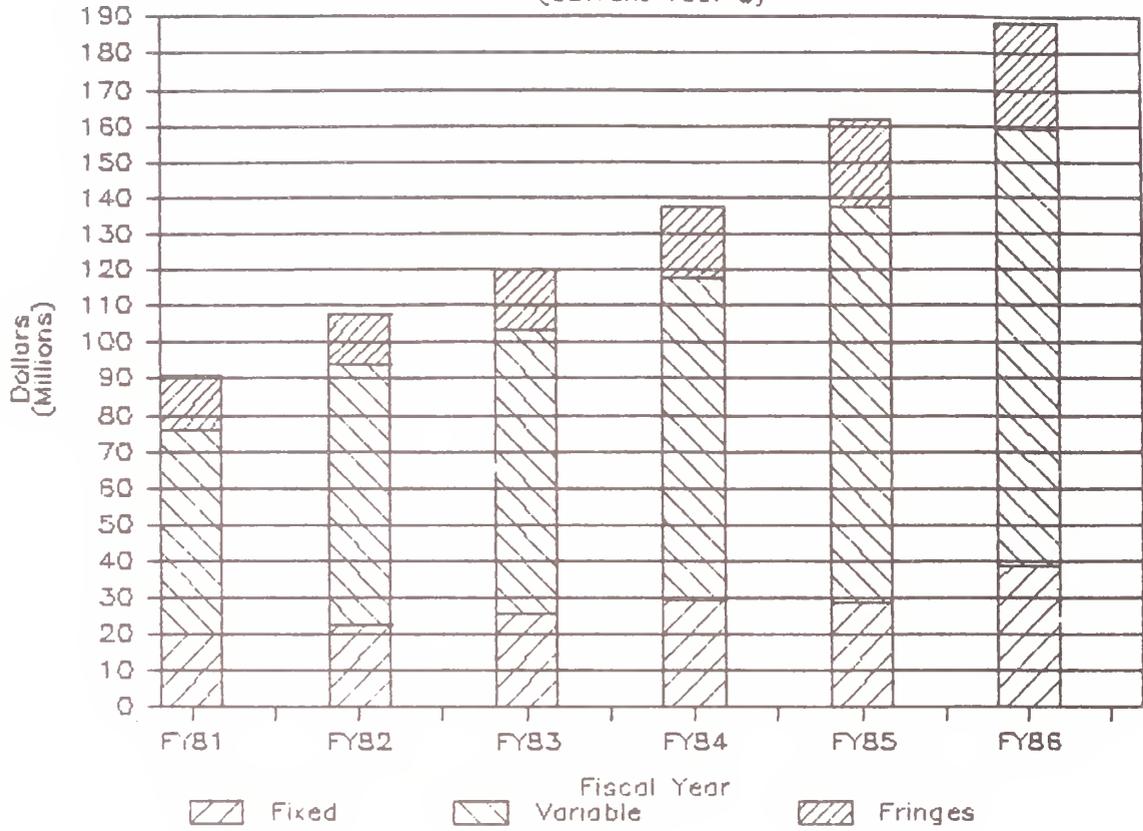
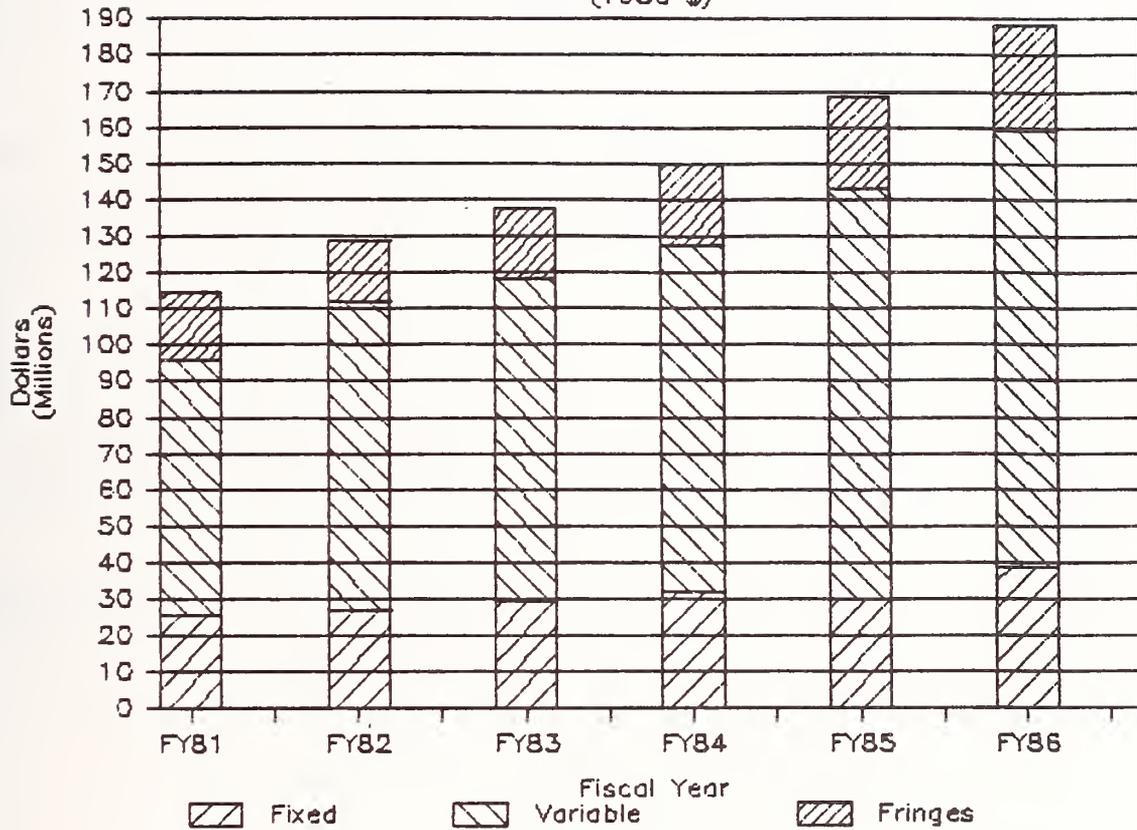


EXHIBIT D.7

RAIL COST ALLOCATION

(1986 \$)



## Analysis of Cost per Vehicle-Mile

Exhibit D.8 summarizes the level of Metrobus and Metrorail service provided during the period FY81 through FY86. Exhibits D.9 and D.10 present Metrobus operating expenses per platform-mile in year of expenditure and base year dollars, respectively. In base year dollars, it can be seen that Metrobus costs were increasing in real terms until FY84. Since then, real costs have stabilized, due in part to WMATA's aggressive cost containment approach to managing costs.

Exhibits D.11 and D.12 present Metrorail operating expenses per car-mile, in year of expenditure and base year dollars, respectively. Metrorail expenses are shown to increase in real terms through FY84. Since then, real costs have declined, again due in part to aggressive cost containment by WMATA.

## Analysis of Historical Metrorail Maintenance Staffing Levels

Additional investigation of historical maintenance staffing levels was undertaken because of the magnitude of Metrorail maintenance expenses and the concern that shifts in productivity levels in the rail car maintenance area may occur particularly as facilities and equipment have aged.

The WMATA operating budgets for FY82 through FY86 were the source of information for the following analysis. Staffing levels were investigated for the following maintenance areas:

- o Facilities Maintenance
  - o Building and Support Equipment
  - o Custodial
  - o Track and Structures
- o Rail Systems Maintenance
  - o Automatic Fare Collection (AFC)
  - o Automatic Train Control (ATC)
  - o Power

The staffing levels used in the analysis address positions allocated to Rail Operations only; they do not include capitalized positions. The driving variables are year-end values, rather than weighted averages for the year (such averages would be lower if a Metrorail phase opened in the middle of a fiscal year).

Exhibit D.13 presents a summary of the historical trends in labor productivity in the above noted maintenance areas. The following observations can be noted:

- o Building & Support Equipment: The ratio has dropped since a high in FY83/84. The projected FY87 value is close to the FY85 value, but significantly lower than the FY86 value.

EXHIBIT D.8

# LEVEL OF SERVICE PROVIDED

(Metrobus & Metrorail)

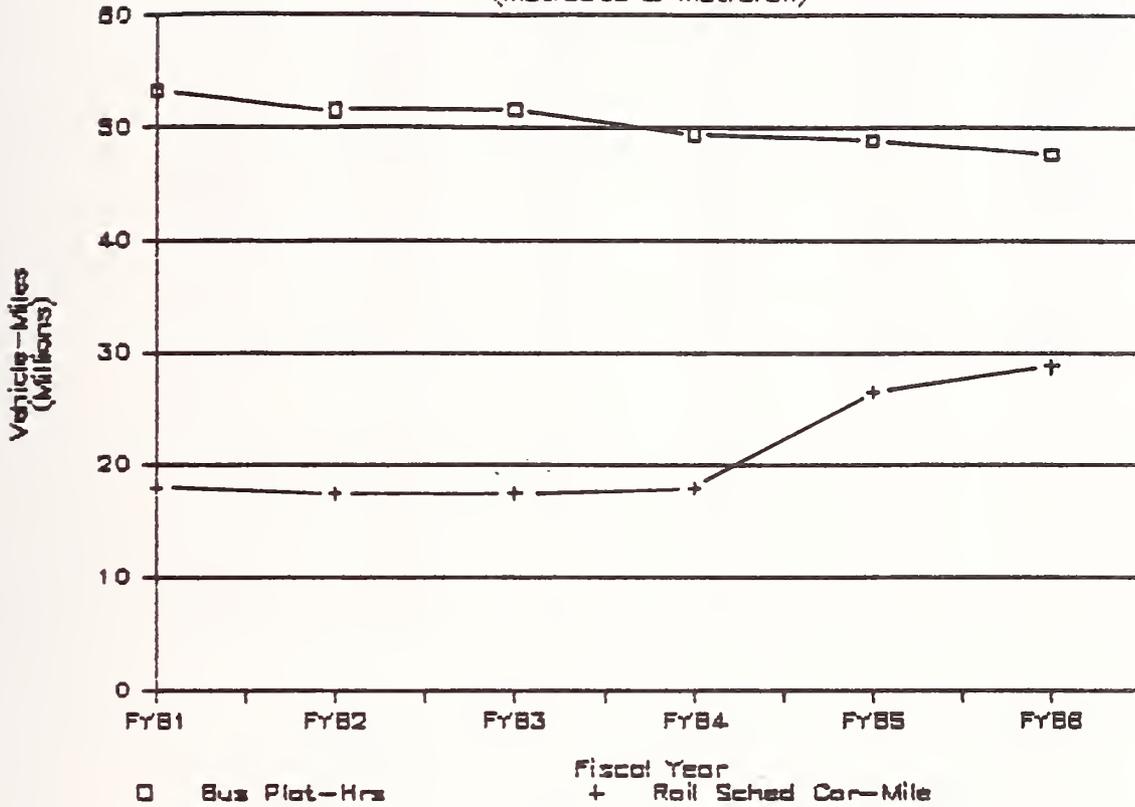
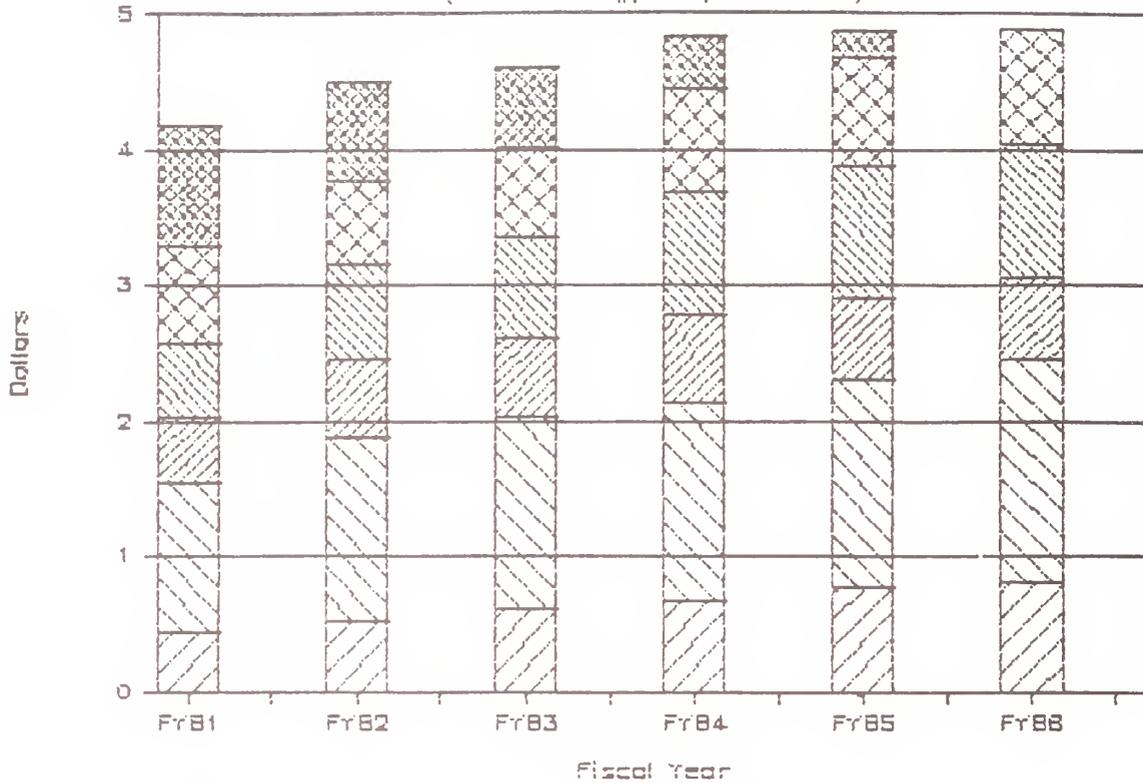


EXHIBIT D.9

BUS OPERATING COST/PLATFORM-MILE

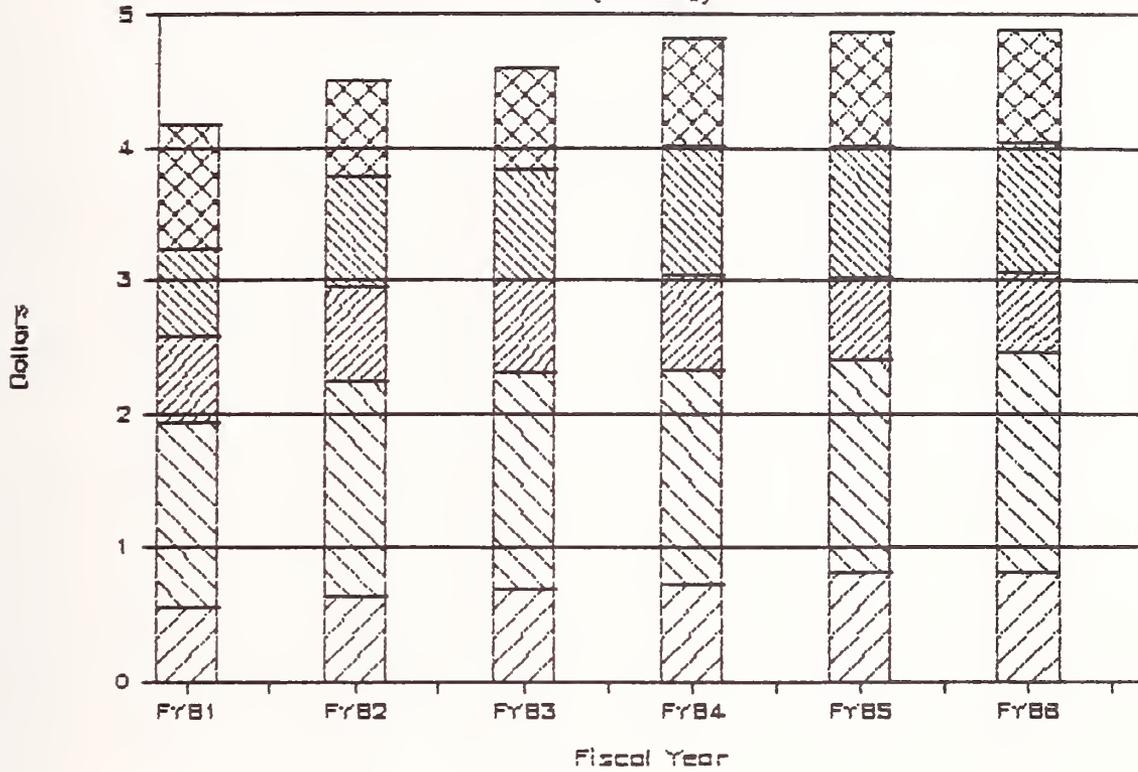
(Current Yr \$, except Inflation)



- Inflation
  - Other Mileage-Related
  - Hour-Related
- Fringes
  - Fuel, Parts, Tires
  - Fixed

EXHIBIT D.10

BUS OPERATING COST/PLATFORM-MILE  
(1986 \$)



- |   |                       |   |                    |
|---|-----------------------|---|--------------------|
|  | Inflation             |  | Fringes            |
|  | Other Mileage-Related |  | Fuel, Parts, Tires |
|  | Hour-Related          |  | Fixed              |

EXHIBIT D.11

RAIL OPERATING COST/CAR-MILE

(Current Yr \$, except Inflation)

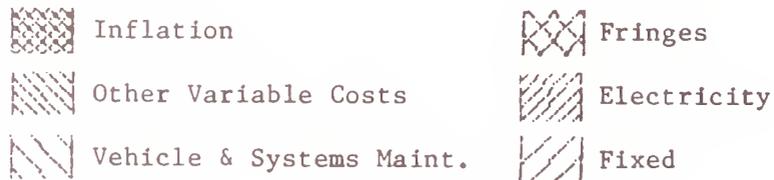
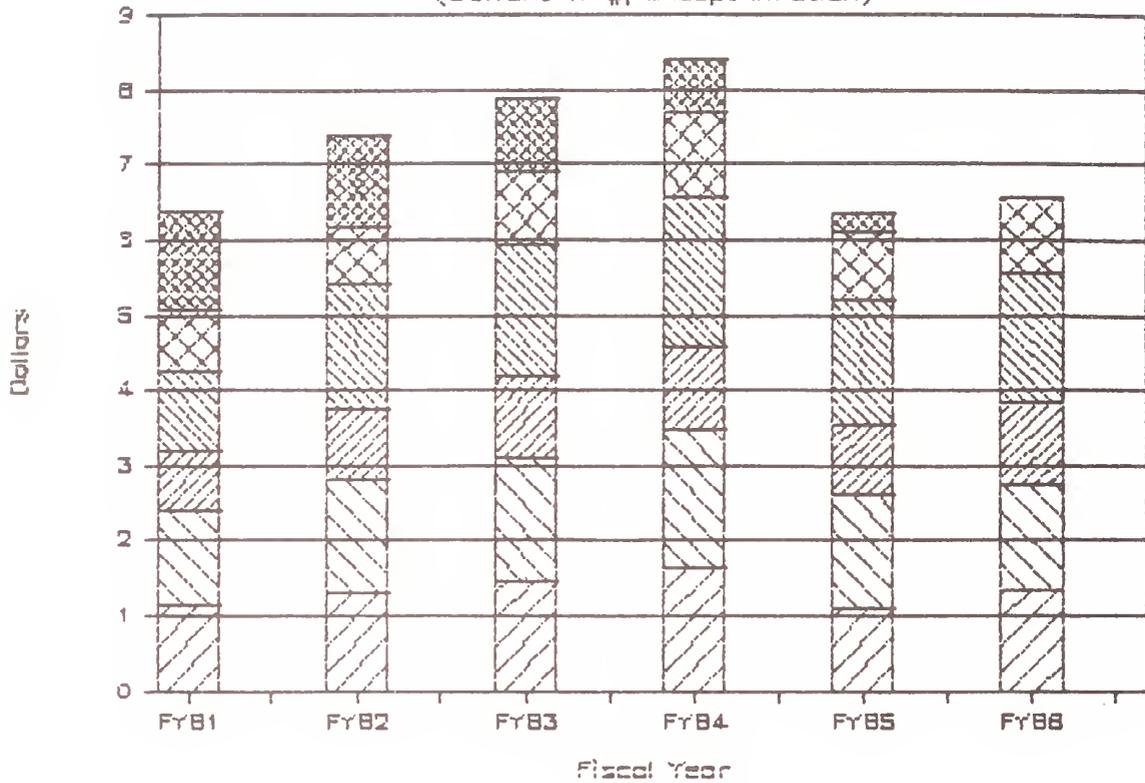


EXHIBIT D.12

RAIL OPERATING COST/CAR-MILE  
(1986 \$)

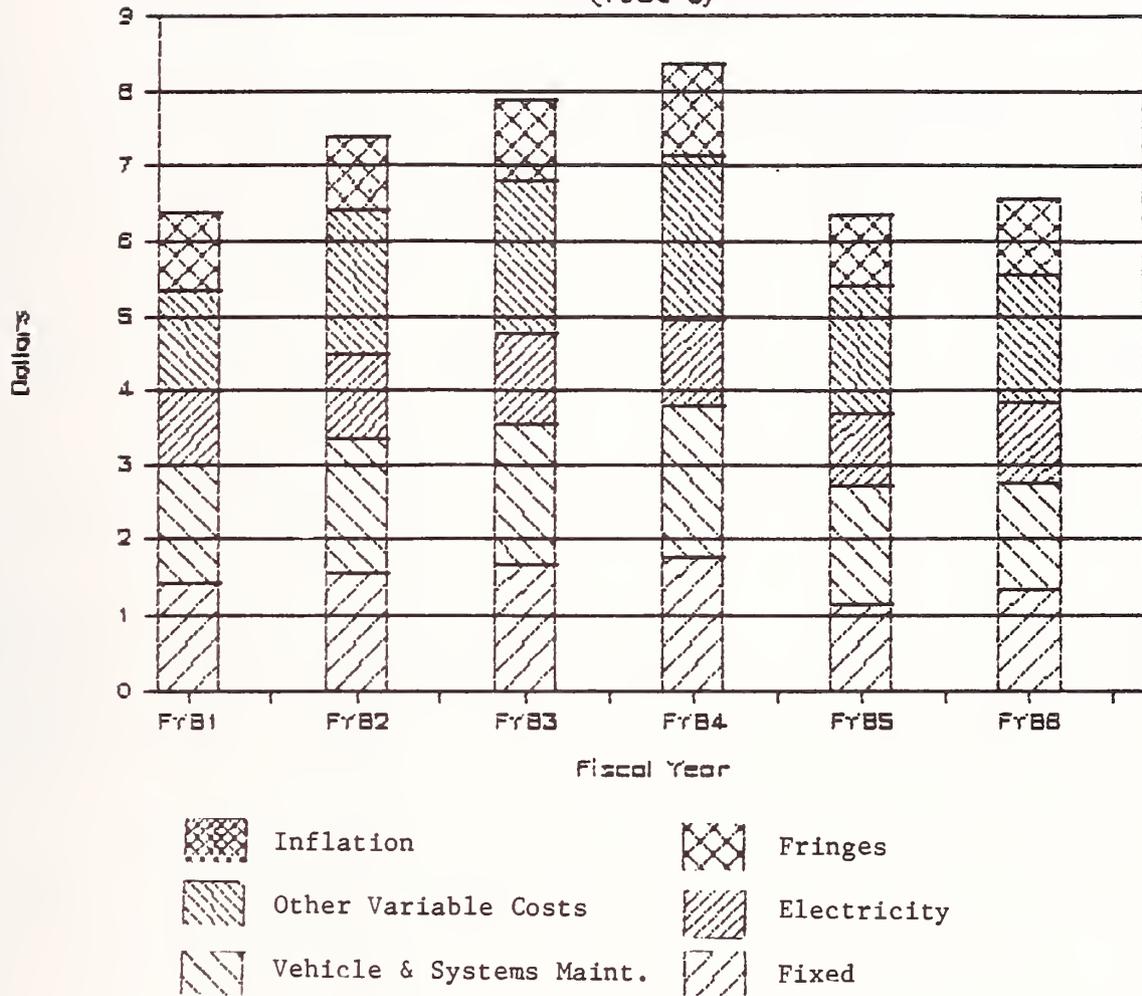


EXHIBIT D.13

ANALYSIS OF WMATA MAINTENANCE STAFFING RATIOS

MAINTENANCE AREA/Measure	FY82	FY83	FY84	FY85	FY86	FY87
<b>BUILDING &amp; SUPPORT EQUIPMENT</b>						
Mechanics,Helpers,Laborers	n/a	125.50	135.68	130.68	138.71	
Stations	44	47	51	60	60	
Employees/Station	n/a	2.67	2.66	2.18	2.31	2.16
<b>CUSTODIAL</b>						
Janitors	n/a	92.00	104.00	98.75	107.65	
Stations	44	47	51	60	60	
Janitors/Station	n/a	1.96	2.04	1.65	1.79	1.68
<b>TRACK &amp; STRUCTURES</b>						
Repairers,Laborers,Mechanics	127.00	163.00	163.00	174.00	179.35	
Route-Miles	39.20	42.37	46.77	60.46	60.46	
Employees/Route-Mile	3.24	3.85	3.49	2.88	2.97	2.87
<b>AUTOMATIC FARE COLLECTION</b>						
Mechanics	46.00	47.00	51.00	52.80	54.40	
Mezzanines	59.00	61.00	66.00	76.00	76.00	
Fare Collection Equip	939.00	971.00	1054.00	1186.00	1186.00	
Mechanics/Mezzanine	0.78	0.77	0.77	0.69	0.72	0.78
Mechanics/Fare Collect Equip	0.0490	0.0484	0.0484	0.0445	0.0459	
<b>AUTOMATIC TRAIN CONTROL</b>						
Mechanics	93.00	99.57	108.00	100.07	109.75	
Stations	44	47	51	60	60	
Mechanics/Station	2.11	2.12	2.12	1.67	1.83	1.75
<b>POWER</b>						
Mechanics	78.00	80.79	87.09	80.45	81.19	
Stations	44	47	51	60	60	
Mechanics/Station	1.77	1.72	1.71	1.34	1.35	1.33

- o Custodial: Similar to the above-noted trend.
- o Track & Structures: Similar to the above trend. It should be noted that there have been several large, capitalized projects conducted in this area.
- o Automatic Fare Collection: Productivity improved from FY82 through FY86. The increase in staffing required in FY87 is due to the extended hours of Sunday service. It should be noted that positions are budgeted on the basis of the number of AFC machines (farecard vendors, faregates, addfare machines, and kiosk equipment), rather than on the number of mezzanines, as is done in the cost model.
- o Automatic Train Control: There has been an improvement in productivity since FY84, although FY86 was higher than FY85. The increase in FY87 is due to the extended hours of Sunday service.
- o Power: There is a significant and steady improvement in productivity beginning in FY85.

#### **ADJUSTMENTS TO FY86 MODEL CALIBRATION**

As noted in Chapter V, several changes were made to the FY86 cost model to better reflect the realities of the FY87 budget. These changes were generally in two areas:

- o termination of old programs and initiation of new programs
- o changes in labor productivity and unit cost

These are described in more detail below.

#### **Termination of Old Programs and Initiation of New Programs**

There are approximately \$10 million in old programs that will not recur in FY87. Some of these programs, such as the Flexible bus rehabilitation program, were previously addressed in the cost model.

There are many new programs and enhancements to existing programs which were not reflected in the FY86 budget. These new programs include the following:

Office/Cost Area	Mode	\$ Change	Justification
General Counsel	Bus	\$189,637	Increase work load
	Rail	\$403,031	Shift from capitalized
Treasurer	Bus	\$142,005	Expanded programs
	Rail	\$253,281	Expanded programs
Budget & Mgt Analysis	Bus	\$386,473	Bus survey conducted every other year
Marketing	Bus	\$ 63,574	Expanded programs
	Rail	\$168,976	Expanded programs
Facil Maint	Rail	\$600,000	Expanded contr maint Escalator step replace (FY87 only) Track & Struct parts (FY87 only)
		\$400,000	
		\$345,000	
Admin Services	Bus	\$315,241	Expanded programs
Mgt Infor Svc	Bus	\$349,162	New MVS installation
	Rail	\$425,475	New MVS installation (both FY87/88 only)
Planning	Bus	\$211,988	New programs
	Rail	\$ 95,935	New programs

### Changes in Labor Productivity and Unit Cost

#### Workers' Compensation

Due to the aggressive management WMATA has undertaken in this area, substantial reductions in unit costs are anticipated. These management actions have included the contracting-out of the administration of workers' compensation claims administration and data processing, initiation of an in-house orthopedic clinic, and a broad range of loss control programs. This has resulted in a reduction of both the claims rate and average loss per claim:

Mode	Unit Cost	
	FY86	FY87
Metrobus	\$.2050/platform-mi	\$.1476/platform-mi
Metrorail	\$.0850/sched car-mi	\$.0216/sched car-mi

#### Third Party Liability Claims

WMATA continues to experience losses in the third party liability area, despite aggressive management actions to control these costs. These actions have included contracting out the

supervision of WMATA claims adjusters and data processing activities. However, defendant judgments have been frequent and have been growing in size. This is a growing trend in the industry and is characteristic of jury decisions in the region. It is partially due to the "deep pocket syndrome" common to public entity liability. The projected changes are as follows:

Mode	Unit Cost	
	FY86	FY87
Metrobus	\$.1286/platform-mi	\$.2048/platform-mi
Metrorail	\$.0071/sched car-mi	\$.0236/sched car-mi

### Insurance

The entire transit industry has been experiencing drastic increasing insurance premium costs. This has been the result of several factors, including:

- . major losses in the entire insurance industry
- . lower interest rates
- . poor claims experience on the part of transit properties
- . fewer insurance carriers in the market place

The following changes in premium rates are projected:

Insurance Type	Unit Cost	
	FY86	FY87
<b>METROBUS</b>		
Fixed premiums	\$4,200	\$7,900
Mileage-related	\$.0170/platform-mi	\$.0322/platform-mi
Vehicle-related	\$216/peak veh	\$388/peak veh
Garage-related	\$1111/garage	\$1278/garage
<b>METRORAIL</b>		
Fixed premiums	\$300,900	\$639,400
Mileage-related	\$.0382/sched car-mi	\$.0663/sched car-mi
Vehicle-related	\$1484/peak car	\$2503/peak car
Station-related	\$938/station	\$1686/station

### Facilities Maintenance

The extension of the Orange line to Vienna will result in a very small addition to the staffing in this area. This is due primarily to the efficiencies anticipated from satellite

dispatching centers for facilities maintenance crews. This arrangement will reduce the travel time for personnel to reach job sites. The effective changes in labor productivity are as follows:

Labor Productivity Measure -----	FY86 ----	FY87 ----
Bldg & Struc Mech/Station	2.47	2.31
Janitors/Station	1.79	1.68
Track & Str Crew/Route-Mi	3.03	2.87

#### Rail Car Maintenance

With 7 million additional rail car-miles projected in FY87, the Budget staff anticipates approving only 9 additional positions. This results in a greatly enhanced level of productivity and is based on the effectiveness of a \$35 million capital program undertaken during the past several years to increase rail car reliability. This program centered on correcting design deficiencies in many components of the 300 Rohr car fleet and the first of the Breda cars. These components included traction motors, compressors, lighting ballast, defrosters and other items with either frequent repair intervals or whose design made repair and replacement time consuming.

This change in labor productivity will save more than \$4 million in mechanics' wages in FY88. As seen below, the proposed staffing level results in the most efficient use of mechanic labor since before FY82:

Year ----	Mechanics, Helpers -----	Scheduled Car-Miles -----	Mechanics per Million Car-Miles -----
FY82	298	17,440,000	17.087
FY83 Note 1	342	17,397,000	19.659
FY84 Note 2	370	17,840,000	20.740
FY85	456.97	26,516,000	17.234
FY86	483.41	28,733,000	16.824
FY87 Request	515	36,810,800	13.990
FY87 Mark-Up	492	35,788,800	13.747

Note 1: Total mechanics & helpers = 359. Assumes 17 assigned to capitalized projects.

Note 2: Total mechanics & helpers = 422. Assumes 52 assigned to capitalized projects.

It is reasonable to anticipate that as the Metrorail fleet ages, these dramatically increased levels of productivity will not continue. Most rail transit properties experience significant

increases in maintenance work loads as vehicle age. While there is no definitive data for determining the exact magnitude of the increase (either within WMATA or from other transit properties), the study assumes maintaining the FY87 ratio through FY90, then increasing the ratio linearly to the FY86 value by FY2000.

Rail Systems Maintenance

Only limited additional staffing is anticipated for the Vienna extension. This is due to more efficient use of manpower previously authorized. Extended hours of service on Sundays will result in additional staffing requirements in some areas:

Section	Old Staffing Ratio	New Staffing Ratio	Comment
AFC	0.72 Mech per Mezzanine	0.78 Mech per Mezzanine	Extended Sunday svc
ATC	1.83 Mech per Station	1.75 Mech per Station	Extended Sunday svc
Power	1.35 Mech per Station	1.33 Mech per Station	New Programs

Electricity

Major reductions in the cost of electricity consumed by Metrorail are anticipated in FY87. Much of this results from the implementation of the recommendation of the Carnegie-Mellon study conducted several years ago and the absence of a utility rate increase. A slight increase in electricity use in bus garages is due to new maintenance facilities:

Electricity Use	Unit Cost	
	FY86	FY87
Propulsion	\$.7849/sched car-mi	\$.6757/sched car-mi
Subway Stations	\$174,102/station	\$156,167/station
Other Stations	\$ 93,760/station	\$ 84,102/station
Bus Garages	\$166,722/garage	\$172,121/garage



## APPENDIX E

### REHABILITATION AND REPLACEMENT INPUTS AND DETAILED RESULTS

This Appendix presents the detailed input data, assumptions, and results for the following rehabilitation and replacement analyses:

- o Metrobus facilities and equipment
- o Metrorail facilities, except track
- o Metrorail equipment, except rail cars
- o Track
- o Rail cars

#### METROBUS REHABILITATION AND REPLACEMENT

Exhibit E.1 summarizes Metrobus rehabilitation and replacement costs for bus facilities and equipment. The Exhibit is divided into two sections. The first section summarizes inputs and the second section summarizes the replacement cost outputs. The inputs for 1973 through 1985 are shown on page 1 and include costs in year-of-expenditure dollars plus totals. Data for 1986 through 1998 are shown on page 2 and data for 1999, 2000, and totals for each category are shown on page 3.

The outputs are summarized on page 4 for 1973 through 1978. This page also shows the range of asset categories from the WMATA accounting system, the percentage of each asset category that is to be replaced, the replacement cycle, and the source of assumptions from within WMATA. This page also includes totals and various rolling averages. Results for 1979 through 1989 are summarized on page 5, for 1990 through 2000 on page 6, and 2001 through 2010 with totals by category on page 7.

INPUT DATA	Original Cost by Year Asset was Capitalized												
	Year of Expenditure Dollars												
	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
FROM MISC FIXED ASSET SYSTEM:													
A Office Furn & Equipment	\$0.6	\$0.7	\$0.3	\$0.2	\$0.2	\$0.1	\$0	\$0.1	\$0	\$0	\$0	\$0	\$0
C Buses													
E Service Vehicles			\$0	\$0	\$0.1	\$0	\$0.1	\$0.3	\$0.1	\$0.1	\$0.1	\$0	\$0.5
F Automobiles	\$0	\$0	\$0	\$0	\$0		\$0.2		\$0.4	\$0	\$0.1	\$0.1	\$0.2
G Trucks - Pick Up			\$0			\$0		\$0.1	\$0.1	\$0	\$0.1	\$0	
H Trucks - Heavy Duty	\$0	\$0	\$0.3	\$0.1	\$0.1	\$0	\$0	\$0.5	\$0.1	\$0.3	\$0.1	\$0.3	\$0.5
I Land	\$25.3		\$0				\$4.1	\$0	\$2.5	\$1.6	\$3.6		\$0.2
AA Passenger Station Other	\$0.2	\$0.2	\$0.1	\$0.2	\$0.3	\$0.2	\$0.2	\$0.1	\$0.2	\$0.4	\$0.1	\$0.2	
			\$0.5	\$0.1	\$0.1	\$0	\$0.1	\$0	\$0		\$0	\$0	
AB Parking Facilities				\$0									
AC Building & Structure	\$8.8	\$0.2	\$1.3	\$2.4	\$9.1	\$1.0	\$0.8	\$1.8	\$2.6	\$11.4	\$5.4		\$19.4
AI Equipment Parking					\$0								
AJ Equipment Shops	\$0	\$0	\$0	\$0.1	\$0.1	\$0.1	\$0.2	\$0.3	\$0.3	\$0.3	\$0.5	\$0.7	
AR Equip Bus Cntrl, AIDS	\$0.2			\$5.0	\$0	\$0			\$0.4				
AX Fareboxes	\$0.6			\$0.6	\$0.2	\$0.9	\$0.6				\$0.1		
AX AFC Other		0.0098	0.0003	0.0887	0.0466	0.1794	0.1139	0.0079	0.006	0.0254	0.0912	0.0184	
AY Equipment Data Processing				\$0	\$0.1	\$0				\$0.2	\$0.2	\$0	\$0.1
AZ Equipment Communication		\$0	\$0	\$0		\$0	\$0	\$0	\$0.1	\$0.1	\$0.1	\$0.4	\$0.2
BA Equipment Other			\$0			\$0	\$0	\$0.1	\$0.2	\$0	\$0	\$0.3	\$0.2
BB Repairables													
BC Intangible Assets	\$4.1	\$0.6											
TOTAL	\$39.8	\$1.8	\$2.6	\$8.9	\$10.4	\$2.5	\$6.6	\$3.1	\$7.1	\$14.6	\$10.5	\$2.1	\$21.3
CUMULATIVE	\$39.8	\$41.6	\$44.3	\$53.2	\$63.5	\$66.0	\$72.7	\$75.8	\$82.9	\$97.5	\$108.0	\$110.1	\$131.4

Projected Costs

INPUT DATA	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
FROM MISC FIXED ASSET SYSTEM:													
A Office Furn & Equipment													
C Buses													
E Service Vehicles													
F Automobiles													
G Trucks - Pick Up													
H Trucks - Heavy Duty													
I Land													
AA Passenger Station Other													
AB Parking Facilities													
AC Building & Structure	\$10.1	\$26.0											
AI Equipment Parking													
AJ Equipment Shops													
AR Equip Bus Cntrl, AIDS													
AX Fareboxes													
AY AFC Other													
AZ Equipment Data Processing													
BA Equipment Communication													
BB Equipment Other													
BB Repairables													
BC Intangible Assets													
TOTAL	\$10.1	\$26.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
CUMULATIVE	\$141.5	\$167.5	\$167.5	\$167.5	\$167.5	\$167.5	\$167.5	\$167.5	\$167.5	\$167.5	\$167.5	\$167.5	\$167.5

INPUT DATA	1999	2000	TOTAL
FROM MISC FIXED ASSET SYSTEM:			
A Office Furn & Equipment			\$2.5
C Buses			\$0.0
E Service Vehicles			\$1.4
			\$0.0
F Automobiles			\$1.0
G Trucks - Pick Up			\$0.3
H Trucks - Heavy Duty			\$2.3
I Land			\$37.3
AA Passenger Station Other			\$2.4
			\$1.0
AB Parking Facilities			\$0.0
AC Building & Structure			\$100.5
AI Equipment Parking			\$0.0
AJ Equipment Shops			\$2.4
AR Equip Bus Cntrl, AIDS			\$5.7
AX Fareboxes			\$3.0
AX AFC Other			
AY Equipment Data Processing			\$0.7
AZ Equipment Communication			\$0.9
BA Equipment Other			\$0.8
BB Repairables			\$0.0
BC Intangible Assets			\$4.7
TOTAL	\$0.0	\$0.0	\$167.5
CUMULATIVE	\$167.5	\$167.5	

REPLACEMENT COSTS	Detailed Asset Description	Range of MMATA Fixed Asset Classes				%	Replacement Life Years Source	1973	1974	1975	1976	1977	1978
		From		To									
		Sub Group	Sub Group	Sub Group	Sub Group								
A Office Furn & Equipment		1	1	11	1	100	30 ACCT	\$0.000					
C Buses		12	4	12	8								
E Service Vehicles						100	6 PLNG	\$0.000					
F Automobiles		13	30			100	6 PLNG	\$0.000					
G Trucks - Pick Up		13	31			100	6 PLNG	\$0.000					
H Trucks - Heavy Duty		13	32			100	6 PLNG	\$0.000					
I Land		59	1	59	7	0	0 ACCT						
AA Passenger Station Other	Repl Paving Top Surf	61	11	61	22	10	15 FMNT	\$0.000					
	Repl Paving Subgrade					20	30 FMNT	\$0.000					
	Mechanical, Structures					5	20 FMNT	\$0.000					
AB Parking Facilities	Repl Paving Top Surf	62	1	62	2	10	15 FMNT	\$0.000					
	Repl Paving Subgrade					20	30 FMNT	\$0.000					
	Lighting					5	30 FMNT	\$0.000					
AC Building & Structure	Roof	63	1	64	2	9	20 FMNT	\$0.000					
	Mechanical					14	20 FMNT	\$0.000					
	Electrical					8	30 FMNT	\$0.000					
	Arch & Struct					20	20 FMNT	\$0.000					
AI Equipment Parking		72	1	72	6	0	0 FMNT						
AJ Equipment Shops		74	1	74	99	100	30 PLNG	\$0.000					
AR Equip Bus Cntrl, AIDS		76	6	76	6	100	20 ENGA	\$0.000					
AX Fareboxes		77	7	77	7	100	20 ENGA	\$0.000					
AX AFC Other		77	20	77	99	100	30 ACCT	\$0.000					
AY Equipment Data Processing		78	1	78	10	100	10 PLNG	\$0.000					
AZ Equipment Communication		79	1	79	9	100	12 ENGA	\$0.000					
BA Equipment Other		80	1	80	99	0	0						
BB Repairables		90	1	90	99	0	0						
BC Intangible Assets		99	1	99	10	0	0						
						999							
TOTAL								\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
								1973	1974	1975	1976	1977	1978
CUMULATIVE								\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
3-YEAR ROLLING AVERAGE									\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
5-YEAR ROLLING AVERAGE										\$0.0	\$0.0	\$0.0	\$0.0
7-YEAR ROLLING AVERAGE											\$0.0	\$0.0	\$0.1
9-YEAR ROLLING AVERAGE												\$0.1	\$0.1

REPLACEMENT COSTS	Detailed Asset Description	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
A Office Furn & Equipment												
C Buses												
E Service Vehicles		\$0.000	\$0.000	\$0.078	\$0.088	\$0.100	\$0.007	\$0.168	\$0.364	\$0.257	\$0.258	\$0.186
F Automobiles		\$0.007	\$0.025	\$0.007	\$0.013	\$0.028	\$0.000	\$0.308	\$0.025	\$0.495	\$0.024	\$0.184
G Trucks - Pick Up		\$0.000	\$0.000	\$0.018	\$0.000	\$0.000	\$0.035	\$0.000	\$0.093	\$0.171	\$0.050	\$0.068
H Trucks - Heavy Duty		\$0.101	\$0.023	\$0.591	\$0.192	\$0.184	\$0.044	\$0.171	\$0.675	\$0.698	\$0.533	\$0.257
I Land												
AA Passenger Station Other	Repl Paving Top Surf										\$0.040	\$0.050
	Repl Paving Subgrade											
	Mechanical, Structures											
AB Parking Facilities	Repl Paving Top Surf										\$0.000	\$0.000
	Repl Paving Subgrade											
	Lighting											
AC Building & Structure	Roof											
	Mechanical											
	Electrical											
	Arch & Struct											
AI Equipment Parking												
AJ Equipment Shops												
AR Equip Bus Cntrl, AIDS												
AX Fareboxes												
AX AFC Other												
AY Equipment Data Processing						\$0.000	\$0.000	\$0.000	\$0.003	\$0.144	\$0.037	\$0.000
AZ Equipment Communication								\$0.000	\$0.002	\$0.001	\$0.016	\$0.000
BA Equipment Other												
BB Repairables												
BC Intangible Assets												
TOTAL		\$0.108	\$0.048	\$0.694	\$0.293	\$0.312	\$0.087	\$0.648	\$1.161	\$1.767	\$0.959	\$0.746
CUMULATIVE		\$0.1	\$0.2	\$0.8	\$1.1	\$1.5	\$1.5	\$2.2	\$3.4	\$5.1	\$6.1	\$6.8
3-YEAR ROLLING AVERAGE		\$0.1	\$0.3	\$0.3	\$0.4	\$0.2	\$0.3	\$0.6	\$1.2	\$1.3	\$1.2	\$0.8
5-YEAR ROLLING AVERAGE		\$0.2	\$0.2	\$0.3	\$0.3	\$0.4	\$0.5	\$0.8	\$0.9	\$1.1	\$1.1	\$1.2
7-YEAR ROLLING AVERAGE		\$0.2	\$0.2	\$0.2	\$0.3	\$0.5	\$0.7	\$0.7	\$0.8	\$0.9	\$1.1	\$1.3
9-YEAR ROLLING AVERAGE		\$0.2	\$0.2	\$0.2	\$0.4	\$0.6	\$0.7	\$0.7	\$0.7	\$0.9	\$1.1	\$2.5

REPLACEMENT COSTS	Detailed Asset Description	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
A Office Furn & Equipment												
C Buses												
E Service Vehicles		\$0.032	\$0.690	\$0.364	\$0.257	\$0.258	\$0.186	\$0.032	\$0.690	\$0.364	\$0.257	\$0.258
F Automobiles		\$0.090	\$0.518	\$0.025	\$0.495	\$0.024	\$0.184	\$0.090	\$0.518	\$0.025	\$0.495	\$0.024
G Trucks - Pick Up		\$0.056	\$0.000	\$0.093	\$0.171	\$0.050	\$0.068	\$0.056	\$0.000	\$0.093	\$0.171	\$0.050
H Trucks - Heavy Duty		\$0.348	\$0.675	\$0.675	\$0.698	\$0.533	\$0.257	\$0.348	\$0.675	\$0.675	\$0.698	\$0.533
I Land												
AA Passenger Station Other	Repl Paving Top Surf	\$0.141	\$0.066	\$0.072	\$0.033	\$0.053	\$0.014	\$0.026	\$0.053	\$0.012	\$0.023	\$0.000
	Repl Paving Subgrade											
	Mechanical, Structures				\$0.020	\$0.025	\$0.071	\$0.033	\$0.036	\$0.016	\$0.026	\$0.007
AB Parking Facilities	Repl Paving Top Surf	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
	Repl Paving Subgrade											
	Lighting											
AC Building & Structure	Roof				\$1.978	\$0.051	\$0.252	\$0.423	\$1.467	\$0.148	\$0.115	\$0.235
	Mechanical				\$3.076	\$0.079	\$0.392	\$0.659	\$2.283	\$0.231	\$0.178	\$0.366
	Electrical											
	Arch & Struct				\$4.395	\$0.113	\$0.560	\$0.941	\$3.261	\$0.329	\$0.254	\$0.522
AI Equipment Parking												
AJ Equipment Shops												
AR Equip Bus Cntrl, AIDS					\$0.444	\$0.000	\$0.000	\$9.702	\$0.022	\$0.056	\$0.000	\$0.000
AX Fareboxes					\$1.430	\$1.000	\$0.000	\$0.000	\$0.000	\$0.159	\$0.000	\$0.000
AX AFC Other												
AY Equipment Data Processing		\$0.000	\$0.000	\$0.279	\$0.235	\$0.026	\$0.112	\$0.003	\$0.144	\$0.037	\$0.000	\$0.000
AZ Equipment Communication		\$0.028	\$0.050	\$0.002	\$0.084	\$0.068	\$0.161	\$0.429	\$0.171	\$0.002	\$0.001	\$0.016
BA Equipment Other												
BB Repairables												
BC Intangible Assets												
TOTAL		\$0.696	\$1.999	\$1.510	\$13.316	\$2.280	\$2.257	\$12.741	\$9.319	\$2.147	\$2.220	\$2.011
		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
CUMULATIVE		\$7.5	\$9.5	\$11.0	\$24.3	\$26.6	\$28.9	\$41.6	\$50.9	\$53.1	\$55.3	\$57.3
3-YEAR ROLLING AVERAGE		\$1.1	\$1.4	\$5.6	\$5.7	\$6.0	\$5.8	\$8.1	\$8.1	\$4.6	\$2.1	\$2.3
5-YEAR ROLLING AVERAGE		\$1.2	\$3.7	\$4.0	\$4.3	\$6.4	\$8.0	\$5.7	\$5.7	\$5.7	\$3.7	\$3.1
7-YEAR ROLLING AVERAGE		\$3.0	\$3.1	\$3.3	\$5.0	\$6.2	\$6.2	\$6.3	\$4.7	\$4.8	\$5.4	\$4.8
9-YEAR ROLLING AVERAGE		\$2.7	\$2.8	\$4.1	\$5.0	\$5.1	\$5.3	\$5.3	\$5.4	\$4.7	\$5.4	\$5.4

REPLACEMENT COSTS	Detailed Asset Description	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	TOTAL
A Office Furn & Equipment				\$1,606	\$1,591	\$0,599	\$0,464	\$0,383	\$0,173	\$0,077	\$0,109	\$5.0
C Buses												
E Service Vehicles		\$0,186	\$0,032	\$0,690	\$0,364	\$0,257	\$0,258	\$0,186	\$0,032	\$0,690	\$0,364	\$8.0
F Automobiles		\$0,184	\$0,090	\$0,518	\$0,025	\$0,495	\$0,024	\$0,184	\$0,090	\$0,518	\$0,025	\$5.8
G Trucks - Pick Up		\$0,068	\$0,056	\$0,000	\$0,093	\$0,171	\$0,050	\$0,068	\$0,056	\$0,000	\$0,093	\$1.9
H Trucks - Heavy Duty		\$0,257	\$0,348	\$0,675	\$0,675	\$0,698	\$0,533	\$0,257	\$0,348	\$0,675	\$0,675	\$14.7
I Land												
AA Passenger Station Other	Repl Paving Top Surf	\$0,000	\$0,000	\$0,040	\$0,050	\$0,141	\$0,066	\$0,072	\$0,033	\$0,053	\$0,014	\$1.1
	Repl Paving Subgrade			\$0,080	\$0,099	\$0,282	\$0,132	\$0,144	\$0,066	\$0,106	\$0,029	\$0.9
	Mechanical, Structure	\$0,013	\$0,026	\$0,006	\$0,012	\$0,000	\$0,000	\$0,000	\$0,000	\$0,000	\$0,000	\$0.3
AB Parking Facilities	Repl Paving Top Surf	\$0,000	\$0,000	\$0,000	\$0,000	\$0,000	\$0,000	\$0,000	\$0,000	\$0,000	\$0,000	\$0.0
	Repl Paving Subgrade			\$0,000	\$0,000	\$0,000	\$0,001	\$0,000	\$0,000	\$0,000	\$0,000	\$0.0
	Lighting			\$0,000	\$0,000	\$0,000	\$0,000	\$0,000	\$0,000	\$0,000	\$0,000	\$0.0
AC Building & Structure	Roof	\$0,308	\$1,209	\$0,534	\$0,000	\$1,828	\$0,909	\$2,343	\$0,000	\$0,000	\$0,000	\$11.8
	Mechanical	\$0,479	\$1,881	\$0,830	\$0,000	\$2,844	\$1,414	\$3,644	\$0,000	\$0,000	\$0,000	\$18.4
	Electrical			\$1,758	\$0,045	\$0,224	\$0,376	\$1,304	\$0,132	\$0,102	\$0,209	\$4.1
	Arch & Struct	\$0,685	\$2,688	\$1,186	\$0,000	\$4,062	\$2,020	\$5,206	\$0,000	\$0,000	\$0,000	\$26.2
AI Equipment Parking												
AJ Equipment Shops				\$0,000	\$0,000	\$0,000	\$0,000	\$0,000	\$0,000	\$0,000	\$0,000	\$0.0
AR Equip Bus Contrl, AIDS		\$0,544	\$0,000	\$0,000	\$0,000	\$0,000	\$0,000	\$0,000	\$0,000	\$0,000	\$0,000	\$10.8
AX Fareboxes		\$0,000	\$0,000	\$0,000	\$0,000	\$0,000	\$0,000	\$0,000	\$1,430	\$1,000	\$0,000	\$5.0
AX AFC Other				\$0,000	\$0,023	\$0,001	\$0,171	\$0,084	\$0,301	\$0,179	\$0,011	\$0.8
AY Equipment Data Processing		\$0,000	\$0,279	\$0,235	\$0,026	\$0,112	\$0,003	\$0,144	\$0,037	\$0,000	\$0,000	\$1.9
AZ Equipment Communication		\$0,000	\$0,028	\$0,050	\$0,002	\$0,084	\$0,068	\$0,161	\$0,429	\$0,171	\$0,002	\$2.0
BA Equipment Other												
BB Repairables												
BC Intangible Assets												
TOTAL		\$2,725	\$6,638	\$8,209	\$3,005	\$11,798	\$6,490	\$14,180	\$3,127	\$3,570	\$1,531	\$118.6
		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	TOTAL
CUMULATIVE		\$60.0	\$66.7	\$74.9	\$77.9	\$89.7	\$96.2	\$110.4	\$113.5	\$117.1	\$118.6	
3-YEAR ROLLING AVERAGE		\$3.8	\$5.9	\$6.0	\$7.7	\$7.1	\$10.8	\$7.9	\$7.0	\$2.7		
5-YEAR ROLLING AVERAGE		\$4.4	\$4.5	\$6.5	\$7.2	\$8.7	\$7.7	\$7.8	\$5.8			
7-YEAR ROLLING AVERAGE		\$3.9	\$5.2	\$5.8	\$7.6	\$7.6	\$7.2	\$6.2				
9-YEAR ROLLING AVERAGE		\$5.3	\$5.0	\$6.4	\$6.5	\$6.6	\$6.5					

## METRRORAIL FACILITIES REHABILITATION AND REPLACEMENT

Exhibit E.2 summarizes rehabilitation and replacement costs for Metrorail facilities other than track. The Exhibit is divided into two sections, summarizing inputs and outputs. Inputs for 1973 through 1983 are shown on page 1 and include a summary of existing assets from the WMATA accounting system and additional assets for the uncompleted sections of the system. Inputs for 1984 through 1994 are summarized on page 2 and inputs for 1995 through 2000 with totals by category on page 3.

Output summaries begin on page 4 with data for 1973 through 1978. Also shown are the categories within the WMATA asset accounting system, the percentage of each asset that is replaced, the replacement cycle, and the source of assumptions. As shown, many of the asset categories included in the inputs have been broken down into three separate useful life categories. The data on page 4 summarizes line structures, other special structures, and passenger stations. Similar information for parking facilities, buildings, yards, and third-rail are summarized on page 5, together with totals and rolling averages. Similar results for 1979 through 1989 are summarized on pages 6 and 7, for 1990 through 2000 on pages 8 and 9, and for 2001 through 2010 with totals by category on pages 10 and 11.

INPUT DATA	Detailed Asset Description	Original Cost by Year Asset was Capitalized Year of Expenditure Dollars										
		1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
FROM MISV FIXED ASSET SYSTEM:												
J	Structure Line Cut/Cover					\$238.7	\$11.8	\$64.1	\$15.5	\$14.7		\$96.7
K	Structure Line Rock/Earth Tunnel					\$168.7	\$10.8	\$22.2	\$86.8	\$33.0		\$66.5
L	Structure Line At-Grade					\$13.0	\$88.4		\$2.0			\$18.4
M	Structure Line Aerial					\$17.9	\$52.0		\$2.6			\$19.9
N	Structure Line Sunken Tube											\$20.3
O	Structure Line Bridge											\$16.5
Q	Structure Line Xover & Turnout					\$3.0	\$2.9	\$0.5	\$0.5	\$0.2		\$2.0
R	Structure Line Other				\$0.5	\$38.9	\$4.2	\$5.8	\$3.3	\$9.1		\$7.8
S	Passenger Station Cut/Cover					\$405.8		\$84.2	\$37.3			\$66.5
T	Passenger Station Rock					\$50.2				\$95.9		
U	Passenger Station At-Grade					\$3.0	\$44.7		\$4.4			\$12.1
V	Passenger Station Aerial					\$15.3	\$26.8					\$13.1
AB	Parking Facilities				\$0.0	\$2.9	\$13.6	\$0.7	\$2.9	\$0.2		\$16.0
AC	Bldg & Structure					\$8.4	\$16.6					\$36.5
						\$9.0	\$6.5	\$2.5	\$1.4	\$1.4		\$4.8
						\$16.5				\$0.0		\$1.6
AD	Track Yard					\$14.0						\$12.4
AE	Third Rail					\$16.6	\$11.2	\$2.2	\$3.0	\$0.9		\$5.8
TOTAL ADDITIONAL SEGMENTS												
Line	Rock Tunnel											
	Earth Tunnel											
	Cut & Cover											
	Surface											
	Aerial											
Stations	Rock Tunnel											
	Earth Tunnel											
	Cut & Cover											
	Surface											
	Aerial											
Finish	Rock Tunnel											
	Earth Tunnel											
	Cut & Cover											
	Surface											
	Aerial											
Parking												
Yard	Surface											
TOTAL		\$0.0	\$0.0	\$0.0	\$0.5	\$1,022.1	\$289.5	\$182.1	\$159.8	\$155.6	\$0.0	\$416.9
CUMULATIVE		\$0.0	\$0.0	\$0.0	\$0.5	\$1,022.5	\$1,312.0	\$1,494.2	\$1,654.0	\$1,809.6	\$1,809.6	\$2,226.5

INPUT DATA	Detailed Asset Description	Projected Costs										
		1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
FROM MISV FIXED ASSET SYSTEM:												
J	Structure Line Cut/Cover	\$61.1										
K	Structure Line Rock/Earth Tunnel	\$144.5										
L	Structure Line At-Grade	\$33.9										
M	Structure Line Aerial	\$15.4										
N	Structure Line Sunken Tube											
O	Structure Line Bridge	\$0.7										
Q	Structure Line Xover & Turnout	\$1.2										
R	Structure Line Other	\$12.9										
S	Passenger Station Cut/Cover											
T	Passenger Station Rock	\$147.8										
U	Passenger Station At-Grade	\$33.9										
V	Passenger Station Aerial		\$0.									
AB	Parking Facilities	\$31.6										
AC	Bldg & Structure	\$32.5										
		\$10.3										
AD	Track Yard											
AE	Third Rail	\$6.7										
TOTAL ADDITIONAL SEGMENTS												
Line	Rock Tunnel			0.0		82.1		0.0		0.0		61.2
	Earth Tunnel			0.0		0.0		146.9		63.2		0.0
	Cut & Cover			0.0		0.0		123.2		80.5		9.5
	Surface			58.7		0.0		42.8		119.0		27.4
	Aerial			0.0		0.0		0.0		8.3		0.0
Stations	Rock Tunnel			0.0		50.6		0.0		0.0		0.0
	Earth Tunnel			0.0		0.0		0.0		0.0		0.0
	Cut & Cover			0.0		0.0		152.8		8.9		31.2
	Surface			22.0		0.0		5.0		28.3		4.9
Finish	Aerial			0.0		0.0		0.0		0.0		0.0
	Rock Tunnel			0.0		20.0		0.0		0.0		0.0
	Earth Tunnel			0.0		0.0		0.0		0.0		0.0
	Cut & Cover			0.0		0.0		23.7		3.9		7.8
Parking	Surface			14.8		0.0		4.9		13.7		4.0
	Aerial			0.0		0.0		0.0		0.0		0.0
	Yard			18.8		0.0		5.2		7.9		6.1
Yard	Surface			29.1		0.0		0.0		17.4		14.0
								\$1.0				
TOTAL		\$532.5	\$0.	\$143.4	\$0.0	\$0.0	\$152.7	\$0.0	\$504.5	\$0.0	\$351.1	\$166.1
CUMULATIVE		\$2,759.0	\$2,759.0	\$2,902.4	\$2,902.4	\$2,902.4	\$3,055.1	\$3,055.1	\$3,559.6	\$3,559.6	\$3,910.7	\$4,076.8

INPUT DATA	Detailed Asset Description							TOTAL
		1995	1996	1997	1998	1999	2000	
FROM MISV FIXED ASSET SYSTEM:								
J	Structure Line Cut/Cover							\$502.5
k	Structure Line Rock/Earth Tunnel							\$532.6
L	Structure Line At-Grade							\$155.8
M	Structure Line Aerial							\$107.9
N	Structure Line Sunken Tube							\$20.3
D	Structure Line Bridge							\$17.2
Q	Structure Line Xover & Turnout							\$10.2
R	Structure Line Other							\$82.4
S	Passenger Station Cut/Cover							\$593.8
T	Passenger Station Rock							\$293.9
U	Passenger Station At-Grade							\$98.2
V	Passenger Station Aerial							\$55.1
AB	Parking Facilities							\$68.0
AC	Bldg & Structure							\$94.0
								\$35.9
								\$18.1
AD	Track Yard							\$26.4
AE	Third Rail							\$46.6
								\$0.0
TOTAL ADDITIONAL SEGMENTS								
Line	Rock Tunnel	0.0		0.0	0.0			
	Earth Tunnel	68.6		78.5	0.0			
	Cut & Cover	9.7		8.7	17.8			
	Surface	0.0		0.0	70.8			
	Aerial	0.0		0.0	18.1			
Stations	Rock Tunnel	0.0		0.0	0.0			
	Earth Tunnel	0.0		0.0	0.0			
	Cut & Cover	23.4		22.0	16.5			
	Surface	0.0		0.0	18.9			
Finish	Aerial	0.0		0.0	0.0			
	Rock Tunnel	0.0		0.0	0.0			
	Earth Tunnel	0.0		0.0	0.0			
	Cut & Cover	5.5		5.8	3.8			
Parking	Surface	0.0		0.0	9.4			
	Aerial	0.0		0.0	0.0			
	Surface	0.4		0.6	9.9			
Yard	Surface	0.0		0.0	24.5			
								\$1.0
TOTAL		\$107.6	\$0.0	\$115.6	\$189.7	\$0.0	\$0.0	\$2,759.0
CUMULATIVE		\$4,184.4	\$4,184.4	\$4,300.0	\$4,489.7	\$4,489.7	\$4,489.7	

REPLACEMENT COSTS	Detailed Asset Description	Range of MMATA Fixed Asset Classes				Replacement Life		1973	1974	1975	1976	1977	1978	
		From		To		%	Years Source							
		Sub Group	Sub Group	Sub Group	Sub Group									
J	Structure Line Cut/Cover	10-Year Cycle	60	1		0.5	10	PROG	\$0.000					
		20-Year Cycle				1	20	PROG	\$0.000					
		30-Year Cycle				1.5	30	PROG	\$0.000					
K	Structure Line Rock/Earth Tunnel	10-Year Cycle	60	2		0.5	10	PROG	\$0.000					
		20-Year Cycle				1	20	PROG	\$0.000					
		30-Year Cycle				1.5	30	PROG	\$0.000					
L	Structure Line At-Grade	10-Year Cycle	60	3		0.5	10	PROG	\$0.000					
		20-Year Cycle				1	20	PROG	\$0.000					
		30-Year Cycle				1.5	30	PROG	\$0.000					
M	Structure Line Aerial	10-Year Cycle	60	4		0.5	10	PROG	\$0.000					
		20-Year Cycle				1	20	PROG	\$0.000					
		30-Year Cycle				1.5	30	PROG	\$0.000					
N	Structure Line Sunken Tube	10-Year Cycle	60	5		0.5	10	PROG	\$0.000					
		20-Year Cycle				1	20	PROG	\$0.000					
		30-Year Cycle				1.5	30	PROG	\$0.000					
O	Structure Line Bridge	10-Year Cycle	60	6		0.5	10	PROG	\$0.000					
		20-Year Cycle				1	20	PROG	\$0.000					
		30-Year Cycle				1.5	30	PROG	\$0.000					
	Subtotal - Structure Line								\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
Q	Structure Line Xover & Turnout		60	19		100	5	FMNT	\$0.000					\$0.000
R	Structure Line Other		60	7	60	17	1	10	FMNT	\$0.000				
S	Pass Station Cut/Cover-Structure	10-Year Cycle	61	1	61	2	0.5	10	PROG	\$0.000				
		20-Year Cycle				1	20	PROG	\$0.000					
		30-Year Cycle				1.5	30	PROG	\$0.000					
	Pass Station Cut/Cover-Finish	10-Year Cycle				5	10	PROG	\$0.000					
		20-Year Cycle				50	20	PROG	\$0.000					
		30-Year Cycle				20	30	PROG	\$0.000					
T	Pass Station Rock/Earth-Structure	10-Year Cycle	61	3		0.5	10	PROG	\$0.000					
		20-Year Cycle				1	20	PROG	\$0.000					
		30-Year Cycle				0.5	30	PROG	\$0.000					
	Pass Station Rock/Earth-Finish	10-Year Cycle				5	10	PROG	\$0.000					
		20-Year Cycle				50	20	PROG	\$0.000					
		30-Year Cycle				20	30	PROG	\$0.000					
U	Pass Station At-Grade-Structure	10-Year Cycle	61	4		0.5	10	PROG	\$0.000					
		20-Year Cycle				1	20	PROG	\$0.000					
		30-Year Cycle				1.5	30	PROG	\$0.000					
	Pass Station At-Grade-Finish	10-Year Cycle				5	10	PROG	\$0.000					
		20-Year Cycle				45	20	PROG	\$0.000					
		30-Year Cycle				25	30	PROG	\$0.000					
V	Pass Station Aerial-Structure	10-Year Cycle	61	5		0.5	10	PROG	\$0.000					
		20-Year Cycle				1	20	PROG	\$0.000					
		30-Year Cycle				1.5	30	PROG	\$0.000					
	Pass Station Aerial-Finish	10-Year Cycle				5	10	PROG	\$0.000					
		20-Year Cycle				45	20	PROG	\$0.000					
		30-Year Cycle				25	30	PROG	\$0.000					
	Subtotal - Passenger Station								\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000

AB Parking Facilities	Repl Top Surface	62	1	62	2	10	15	FMINT	\$0,000						
	Repl Subgrade						20	30	FMINT	\$0,000					
	Lighting						5	30	FMINT	\$0,000					
AC Bldg & Structure	Roof						9	20	FMINT	\$0,000					
	Mechanical						14	20	FMINT	\$0,000					
	Electrical						8	30	FMINT	\$0,000					
	Arch & Struct						20	20	FMINT	\$0,000					
AD Track Yard		64	3				0	0	FMINT						
AE Third Rail		65	3				0	0	FMINT						
Subtotal - Other										\$0,000	\$0,000	\$0,000	\$0,000	\$0,000	\$0,000
TOTAL										\$0,000	\$0,000	\$0,000	\$0,000	\$0,000	\$0,000
CUMULATIVE										\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
5-YEAR ROLLING AVERAGE												\$0.0	\$0.0	\$0.0	\$0.0
7-YEAR ROLLING AVERAGE													\$0.0	\$0.0	\$0.0
YEAR										1973	1974	1975	1976	1977	1978

REPLACEMENT COSTS	Detailed Asset Description	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
J	Structure Line Cut/Cover 10-Year Cycle 20-Year Cycle 30-Year Cycle					\$0.000	\$0.000	\$0.000	\$0.000	\$2.143	\$0.099	\$0.504
K	Structure Line Rock/Earth Tunnel 10-Year Cycle 20-Year Cycle 30-Year Cycle					\$0.000	\$0.000	\$0.000	\$0.000	\$1.515	\$0.090	\$0.175
L	Structure Line At-Grade 10-Year Cycle 20-Year Cycle 30-Year Cycle					\$0.000	\$0.000	\$0.000	\$0.000	\$0.117	\$0.742	\$0.000
M	Structure Line Aerial 10-Year Cycle 20-Year Cycle 30-Year Cycle					\$0.000	\$0.000	\$0.000	\$0.000	\$0.161	\$0.436	\$0.000
N	Structure Line Sunken Tube 10-Year Cycle 20-Year Cycle 30-Year Cycle					\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
O	Structure Line Bridge 10-Year Cycle 20-Year Cycle 30-Year Cycle					\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
	Subtotal - Structure Line	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$3.935	\$1.367	\$0.679
Q	Structure Line Xover & Turnout	\$0.000	\$0.000	\$0.000	\$5.311	\$4.833	\$0.784	\$0.690	\$0.268	\$5.311	\$7.057	\$2.009
R	Structure Line Other					\$0.000	\$0.000	\$0.000	\$0.009	\$0.698	\$0.070	\$0.091
S	Pass Station Cut/Cover-Structure 10-Year Cycle 20-Year Cycle 30-Year Cycle					\$0.000	\$0.000	\$0.000	\$0.000	\$2.878	\$0.000	\$0.524
	Pass Station Cut/Cover-Finish 10-Year Cycle 20-Year Cycle 30-Year Cycle					\$0.000	\$0.000	\$0.000	\$0.000	\$7.649	\$0.000	\$1.392
T	Pass Station Rock/Earth-Structur 10-Year Cycle 20-Year Cycle 30-Year Cycle					\$0.000	\$0.000	\$0.000	\$0.000	\$0.356	\$0.000	\$0.000
	Pass Station Rock/Earth-Finish 10-Year Cycle 20-Year Cycle 30-Year Cycle					\$0.000	\$0.000	\$0.000	\$0.000	\$0.946	\$0.000	\$0.000
U	Pass Station At-Grade-Structure 10-Year Cycle 20-Year Cycle 30-Year Cycle					\$0.000	\$0.000	\$0.000	\$0.000	\$0.021	\$0.297	\$0.000
	Pass Station At-Grade-Finish 10-Year Cycle 20-Year Cycle 30-Year Cycle					\$0.000	\$0.000	\$0.000	\$0.000	\$0.056	\$0.788	\$0.000
V	Pass Station Aerial-Structure 10-Year Cycle 20-Year Cycle 30-Year Cycle					\$0.000	\$0.000	\$0.000	\$0.000	\$0.109	\$0.177	\$0.000
	Pass Station Aerial-Finish 10-Year Cycle 20-Year Cycle 30-Year Cycle					\$0.000	\$0.000	\$0.000	\$0.000	\$0.289	\$0.471	\$0.000
	Subtotal - Passenger Station	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$12.303	\$1.733	\$1.915

AB Parking Facilities	Repl Top Surface									\$0.000	\$0.000	
	Repl Subgrade											
	Lighting											
AC Bldg & Structure	Roof											
	Mechanical											
	Electrical											
	Arch & Struct											
AD Track Yard												
AE Third Rail												
Subtotal - Other		\$0.000	\$0.000	\$0.000	\$5.311	\$4.833	\$0.784	\$0.690	\$0.277	\$6.009	\$7.127	\$2.099
TOTAL		\$0.000	\$0.000	\$0.000	\$5.311	\$4.833	\$0.784	\$0.690	\$0.277	\$22.247	\$10.227	\$4.693
CUMULATIVE		\$0.0	\$0.0	\$0.0	\$5.3	\$10.1	\$10.9	\$11.6	\$11.9	\$34.1	\$44.4	\$49.1
5-YEAR ROLLING AVERAGE		\$0.0	\$1.1	\$2.0	\$2.2	\$2.3	\$2.4	\$5.8	\$6.8	\$7.6	\$8.0	\$8.4
7-YEAR ROLLING AVERAGE		\$0.8	\$1.4	\$1.6	\$1.7	\$1.7	\$4.9	\$6.3	\$6.3	\$5.9	\$6.1	\$6.9
YEAR		1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989

REPLACEMENT COSTS	Detailed Asset Description	Year										
		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
J Structure Line Cut/Cover	10-Year Cycle	\$0.111	\$0.095	\$0.000	\$0.535	\$0.325	\$0.000	\$0.000	\$2.143	\$0.099	\$0.504	\$0.111
	20-Year Cycle				\$0.000	\$0.000	\$0.000	\$0.000	\$4.285	\$0.198	\$1.008	\$0.221
	30-Year Cycle											
K Structure Line Rock/Earth Tunnel	10-Year Cycle	\$0.620	\$0.214	\$0.000	\$0.368	\$0.769	\$0.000	\$0.000	\$1.515	\$0.090	\$0.585	\$0.620
	20-Year Cycle				\$0.000	\$0.000	\$0.000	\$0.000	\$3.029	\$0.181	\$0.349	\$1.241
	30-Year Cycle											
L Structure Line At-Grade	10-Year Cycle	\$0.014	\$0.000	\$0.000	\$0.102	\$0.180	\$0.000	\$0.294	\$0.117	\$0.742	\$0.000	\$0.014
	20-Year Cycle				\$0.000	\$0.000	\$0.000	\$0.000	\$0.234	\$1.483	\$0.000	\$0.029
	30-Year Cycle											
M Structure Line Aerial	10-Year Cycle	\$0.019	\$0.000	\$0.000	\$0.110	\$0.082	\$0.000	\$0.000	\$0.161	\$0.436	\$0.000	\$0.019
	20-Year Cycle				\$0.000	\$0.000	\$0.000	\$0.000	\$0.322	\$0.872	\$0.000	\$0.037
	30-Year Cycle											
N Structure Line Sunken Tube	10-Year Cycle	\$0.000	\$0.000	\$0.000	\$0.113	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
	20-Year Cycle				\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
	30-Year Cycle											
O Structure Line Bridge	10-Year Cycle	\$0.000	\$0.000	\$0.000	\$0.091	\$0.004	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
	20-Year Cycle				\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
	30-Year Cycle											
Subtotal - Structure Line		\$0.764	\$0.309	\$0.000	\$1.320	\$1.360	\$0.000	\$0.294	\$11.806	\$4.101	\$2.447	\$2.293
Q Structure Line Xover & Turnout		\$0.690	\$0.268	\$5.311	\$7.057	\$2.009	\$0.690	\$0.268	\$5.311	\$7.057	\$2.009	\$0.690
R Structure Line Other		\$0.047	\$0.118	\$0.000	\$0.086	\$0.138	\$0.000	\$0.009	\$0.698	\$0.070	\$0.091	\$0.047
S Pass Station Cut/Cover-Structure	10-Year Cycle	\$0.211	\$0.000	\$0.000	\$0.291	\$0.000	\$0.000	\$0.000	\$2.878	\$0.000	\$0.524	\$0.211
	20-Year Cycle				\$0.000	\$0.000	\$0.000	\$0.000	\$5.755	\$0.000	\$1.047	\$0.421
	30-Year Cycle											
Pass Station Cut/Cover-Finish	10-Year Cycle	\$0.560	\$0.000	\$0.000	\$0.773	\$0.000	\$0.000	\$0.000	\$7.649	\$0.000	\$1.392	\$0.560
	20-Year Cycle				\$0.000	\$0.000	\$0.000	\$0.000	\$7.649	\$0.000	\$13.916	\$5.601
	30-Year Cycle											
T Pass Station Rock/Earth-Structur	10-Year Cycle	\$0.000	\$0.491	\$0.000	\$0.000	\$0.621	\$0.000	\$0.000	\$0.356	\$0.000	\$0.253	\$0.000
	20-Year Cycle				\$0.000	\$0.000	\$0.000	\$0.000	\$0.711	\$0.000	\$0.000	\$0.000
	30-Year Cycle											
Pass Station Rock/Earth-Finish	10-Year Cycle	\$0.000	\$1.304	\$0.000	\$0.000	\$1.651	\$0.000	\$0.000	\$0.946	\$0.000	\$1.000	\$0.000
	20-Year Cycle				\$0.000	\$0.000	\$0.000	\$0.000	\$9.456	\$0.000	\$0.000	\$0.000
	30-Year Cycle											
U Pass Station At-Grade-Structure	10-Year Cycle	\$0.025	\$0.000	\$0.000	\$0.053	\$0.142	\$0.000	\$0.110	\$0.021	\$0.297	\$0.000	\$0.025
	20-Year Cycle				\$0.000	\$0.000	\$0.000	\$0.000	\$0.042	\$0.593	\$0.000	\$0.050
	30-Year Cycle											
Pass Station At-Grade-Finish	10-Year Cycle	\$0.067	\$0.000	\$0.000	\$0.141	\$0.378	\$0.000	\$0.740	\$0.056	\$0.788	\$0.000	\$0.067
	20-Year Cycle				\$0.000	\$0.000	\$0.000	\$0.000	\$0.506	\$7.094	\$0.000	\$0.600
	30-Year Cycle											
V Pass Station Aerial-Structure	10-Year Cycle	\$0.000	\$0.000	\$0.000	\$0.057	\$0.000	\$0.000	\$0.000	\$0.109	\$0.177	\$0.000	\$0.000
	20-Year Cycle				\$0.000	\$0.000	\$0.000	\$0.000	\$0.217	\$0.355	\$0.000	\$0.000
	30-Year Cycle											
Pass Station Aerial-Finish	10-Year Cycle	\$0.000	\$0.000	\$0.000	\$0.152	\$0.000	\$0.000	\$0.000	\$0.289	\$0.471	\$0.000	\$0.000
	20-Year Cycle				\$0.000	\$0.000	\$0.000	\$0.000	\$2.597	\$4.243	\$0.000	\$0.000
	30-Year Cycle											
Subtotal - Passenger Station		\$0.862	\$1.795	\$0.000	\$1.467	\$2.793	\$0.000	\$0.850	\$108.082	\$14.018	\$18.131	\$7.535

AB Parking Facilities	Repl Top Surface	\$0.000	\$0.004	\$0.524	\$2.289	\$0.114	\$0.415	\$0.028	\$0.000	\$1.772	\$3.360	\$0.000
	Repl Subgrade											
	Lighting											
AC Bldg & Structure	Roof				\$0.000	\$0.000	\$0.000	\$0.000	\$5.477	\$3.494	\$0.348	\$0.180
	Mechanical				\$0.000	\$0.000	\$0.000	\$0.000	\$8.520	\$5.435	\$0.542	\$0.280
	Electrical											
	Arch & Struct				\$0.000	\$0.000	\$0.000	\$0.000	\$12.171	\$7.764	\$0.774	\$0.400
AD Track Yard												
AE Third Rail												
Subtotal - Other		\$0.737	\$0.391	\$5.836	\$9.432	\$2.260	\$1.105	\$0.305	\$32.177	\$25.592	\$7.123	\$1.598
TOTAL		\$2.364	\$2.495	\$5.836	\$12.218	\$6.413	\$1.105	\$1.448	\$152.065	\$43.711	\$27.701	\$11.426
CUMULATIVE		\$51.4	\$53.9	\$59.8	\$72.0	\$78.4	\$79.5	\$80.9	\$233.0	\$276.7	\$304.4	\$315.8
5-YEAR ROLLING AVERAGE		\$5.1	\$5.5	\$5.9	\$5.6	\$5.4	\$34.6	\$40.9	\$45.2	\$47.3	\$51.7	\$22.3
7-YEAR ROLLING AVERAGE		\$8.6	\$6.3	\$5.0	\$4.6	\$25.9	\$31.8	\$35.0	\$34.8	\$37.3	\$37.9	\$44.3
YEAR		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000

REPLACEMENT COSTS	Detailed Asset Description	Year										TOTAL
		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	
J Structure Line Cut/Cover	10-Year Cycle	\$0.711	\$0.000	\$0.938	\$0.373	\$0.049	\$0.000	\$2.186	\$0.188	\$0.504	\$0.111	\$11.727
	20-Year Cycle	\$0.190	\$0.000	\$1.071	\$0.650	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$7.624
	30-Year Cycle			\$0.000	\$0.000	\$0.000	\$0.000	\$6.428	\$0.297	\$1.512	\$0.332	\$8.569
K Structure Line Rock/Earth Tunnel	10-Year Cycle	\$0.949	\$0.000	\$0.684	\$1.074	\$0.343	\$0.000	\$1.907	\$0.090	\$0.585	\$0.620	\$12.815
	20-Year Cycle	\$0.428	\$0.000	\$0.737	\$1.537	\$0.000	\$0.000	\$0.000	\$0.000	\$0.821	\$0.000	\$8.323
	30-Year Cycle			\$0.000	\$0.000	\$0.000	\$0.000	\$4.544	\$0.271	\$0.524	\$1.861	\$7.201
L Structure Line At-Grade	10-Year Cycle	\$0.214	\$0.000	\$0.697	\$0.317	\$0.000	\$0.294	\$0.117	\$1.095	\$0.000	\$0.014	\$5.071
	20-Year Cycle	\$0.000	\$0.000	\$0.204	\$0.361	\$0.000	\$0.587	\$0.000	\$0.000	\$0.000	\$0.000	\$2.898
	30-Year Cycle			\$0.000	\$0.000	\$0.000	\$0.000	\$0.351	\$2.225	\$0.000	\$0.043	\$2.619
M Structure Line Aerial	10-Year Cycle	\$0.000	\$0.000	\$0.152	\$0.082	\$0.000	\$0.000	\$0.161	\$0.526	\$0.000	\$0.019	\$2.364
	20-Year Cycle	\$0.000	\$0.000	\$0.220	\$0.164	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$1.616
	30-Year Cycle			\$0.000	\$0.000	\$0.000	\$0.000	\$0.483	\$1.308	\$0.000	\$0.056	\$1.847
N Structure Line Sunken Tube	10-Year Cycle	\$0.000	\$0.000	\$0.113	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.225
	20-Year Cycle	\$0.000	\$0.000	\$0.225	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.225
	30-Year Cycle			\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
O Structure Line Bridge	10-Year Cycle	\$0.000	\$0.000	\$0.091	\$0.004	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.190
	20-Year Cycle	\$0.000	\$0.000	\$0.183	\$0.007	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.190
	30-Year Cycle			\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
Subtotal - Structure Line		\$2.492	\$0.000	\$5.314	\$4.570	\$0.392	\$0.881	\$16.178	\$6.001	\$3.946	\$3.058	\$73.504
Q Structure Line Xover & Turnout		\$0.268	\$5.311	\$7.057	\$2.009	\$0.690	\$0.268	\$5.311	\$7.057	\$2.009	\$0.690	\$88.291
R Structure Line Other		\$0.118	\$0.000	\$0.086	\$0.138	\$0.000	\$0.009	\$0.698	\$0.070	\$0.091	\$0.047	\$3.429
S Pass Station Cut/Cover-Structure	10-Year Cycle	\$0.764	\$0.000	\$0.335	\$0.156	\$0.117	\$0.000	\$2.988	\$0.083	\$0.524	\$0.211	\$12.691
	20-Year Cycle	\$0.000	\$0.000	\$0.581	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$7.805
	30-Year Cycle			\$0.000	\$0.000	\$0.000	\$0.000	\$8.633	\$0.000	\$1.571	\$0.632	\$10.836
Pass Station Cut/Cover-Finish	10-Year Cycle	\$1.185	\$0.000	\$0.968	\$0.390	\$0.275	\$0.000	\$7.939	\$0.190	\$1.392	\$0.560	\$32.874
	20-Year Cycle	\$0.000	\$0.000	\$7.729	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$103.740
	30-Year Cycle			\$0.000	\$0.000	\$0.000	\$0.000	\$30.598	\$0.000	\$5.566	\$2.240	\$38.404
T Pass Station Rock/Earth-Structure	10-Year Cycle	\$0.491	\$0.000	\$0.000	\$0.621	\$0.000	\$0.000	\$0.356	\$0.000	\$0.253	\$0.000	\$3.797
	20-Year Cycle	\$0.981	\$0.000	\$0.000	\$1.242	\$0.000	\$0.000	\$0.000	\$0.000	\$0.506	\$0.000	\$3.441
	30-Year Cycle			\$0.000	\$0.000	\$0.000	\$0.000	\$0.356	\$0.000	\$0.000	\$0.000	\$0.356
Pass Station Rock/Earth-Finish	10-Year Cycle	\$1.304	\$0.000	\$0.000	\$1.651	\$0.000	\$0.000	\$0.946	\$0.000	\$1.000	\$0.000	\$10.748
	20-Year Cycle	\$13.044	\$0.000	\$0.000	\$16.513	\$0.000	\$0.000	\$0.000	\$0.000	\$10.000	\$0.000	\$49.013
	30-Year Cycle			\$0.000	\$0.000	\$0.000	\$0.000	\$3.783	\$0.000	\$0.000	\$0.000	\$3.783
U Pass Station At-Grade-Structure	10-Year Cycle	\$0.025	\$0.000	\$0.195	\$0.167	\$0.000	\$0.110	\$0.021	\$0.391	\$0.000	\$0.025	\$1.924
	20-Year Cycle	\$0.000	\$0.000	\$0.106	\$0.285	\$0.000	\$0.220	\$0.000	\$0.000	\$0.000	\$0.000	\$1.296
	30-Year Cycle			\$0.000	\$0.000	\$0.000	\$0.000	\$0.063	\$0.890	\$0.000	\$0.075	\$1.028
Pass Station At-Grade-Finish	10-Year Cycle	\$0.245	\$0.000	\$0.826	\$0.578	\$0.000	\$0.740	\$0.056	\$1.258	\$0.000	\$0.067	\$6.852
	20-Year Cycle	\$0.000	\$0.000	\$1.269	\$3.405	\$0.000	\$6.660	\$0.000	\$0.000	\$0.000	\$0.000	\$19.533
	30-Year Cycle			\$0.000	\$0.000	\$0.000	\$0.000	\$0.281	\$3.941	\$0.000	\$0.333	\$4.555
V Pass Station Aerial-Structure	10-Year Cycle	\$0.000	\$0.000	\$0.057	\$0.000	\$0.000	\$0.000	\$0.109	\$0.177	\$0.000	\$0.000	\$0.972
	20-Year Cycle	\$0.000	\$0.000	\$0.114	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.686
	30-Year Cycle			\$0.000	\$0.000	\$0.000	\$0.000	\$0.326	\$0.532	\$0.000	\$0.000	\$0.858
Pass Station Aerial-Finish	10-Year Cycle	\$0.000	\$0.000	\$0.152	\$0.000	\$0.000	\$0.000	\$0.289	\$0.471	\$0.000	\$0.000	\$2.584
	20-Year Cycle	\$0.000	\$0.000	\$1.368	\$0.000	\$0.001	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$8.208
	30-Year Cycle			\$0.000	\$0.000	\$0.000	\$0.000	\$1.443	\$2.357	\$0.000	\$0.000	\$3.800
Subtotal - Passenger Station		\$18.040	\$0.000	\$13.699	\$25.008	\$0.393	\$7.730	\$58.184	\$10.290	\$20.811	\$4.143	\$329.785

AB Parking Facilities	Repl Top Surface	\$1.880	\$0.000	\$0.000	\$0.000	\$0.000	\$0.524	\$0.524	\$3.079	\$0.724	\$0.455	\$15.692
	Repl Subgrade			\$0.000	\$0.000	\$0.000	\$0.009	\$1.049	\$4.577	\$0.227	\$0.830	\$6.692
	Lighting			\$0.000	\$0.000	\$0.000	\$0.002	\$0.262	\$1.144	\$0.057	\$0.208	\$1.673
AC Bldg & Structure	Roof	\$0.165	\$0.000	\$4.275	\$4.098	\$0.000	\$2.619	\$0.000	\$0.000	\$0.000	\$0.000	\$20.656
	Mechanical	\$0.257	\$0.000	\$6.650	\$6.374	\$0.000	\$4.074	\$0.000	\$0.000	\$0.000	\$0.000	\$32.132
	Electrical			\$0.000	\$0.000	\$0.000	\$0.000	\$4.868	\$3.106	\$0.309	\$0.160	\$8.444
	Arch & Struct	\$0.367	\$0.000	\$9.500	\$9.106	\$0.000	\$5.820	\$0.000	\$0.000	\$0.000	\$0.000	\$45.903
AD Track Yard											\$0.000	
AE Third Rail											\$0.000	
Subtotal - Other		\$3.056	\$5.311	\$27.568	\$21.724	\$0.690	\$13.326	\$12.713	\$19.033	\$3.417	\$2.390	\$222.912
TOTAL		\$23.587	\$5.311	\$46.582	\$51.302	\$1.474	\$21.936	\$87.075	\$35.324	\$28.174	\$9.591	\$626.201
CUMULATIVE		\$339.4	\$344.7	\$391.3	\$442.6	\$444.1	\$466.0	\$553.1	\$588.4	\$616.6	\$626.2	
5-YEAR ROLLING AVERAGE		\$22.9	\$27.6	\$25.7	\$25.3	\$41.7	\$39.4	\$34.8	\$36.4			
7-YEAR ROLLING AVERAGE		\$29.9	\$23.9	\$23.1	\$33.9	\$35.6	\$38.8	\$33.6				
YEAR		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	TOTAL

## METRORAIL EQUIPMENT REHABILITATION AND REPLACEMENT

Exhibit E.3 summarizes rehabilitation and replacement costs for Metrorail equipment other than rail cars. The Exhibit is divided into two sections, summarizing inputs and outputs. Inputs for 1973 through 1983 begin on page 1 and summarize existing assets from the WMATA accounting system. Inputs for the uncompleted section of the system that are part of the Stark-Harris system are shown on page 2 and inputs for the remaining parts of the 103-mile system are shown on page 3 together with totals. Inputs for 1984 through 1994 are summarized on pages 4 - 6 and inputs for 1995 through 2000 with totals by category on pages 7 - 9.

Output summaries begin on page 10 with data for 1973 through 1979. Also shown are the categories within the WMATA asset accounting system, the percentage of each asset that is replaced, the replacement cycle, and the source of assumptions. As shown, some of the asset categories included in the inputs have been broken down into several separate useful life categories. The data on page 10 summarizes miscellaneous equipment and facilities, elevators and escalators, power, and automatic train control (ATC). Similar information for automatic fare collection (AFC), data processing, and communications is shown on page 11. Totals and rolling averages are shown on page 12. Similar results for 1980 through 1990 are summarized on pages 13 - 15, for 1991 through 2001 on pages 16 - 18, and for 2002 through 2010 with totals by category on pages 19 - 21.

INPUT DATA	Detailed Asset Description	Original Cost by Year Asset was Capitalized Year of Expenditure Dollars										
		1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
FROM MISC FIXED ASSET SYSTEM:												
A	Office Furn & Equipment	\$0.1	\$0.2	\$0.2	\$0.1	\$0.1	\$0	\$0	\$0	\$0		
E	Service Vehicles			\$0	\$0	\$0.6	\$0.1	\$0.2	\$0.5	\$0	\$0.1	\$0.2
			\$0			\$0	\$0	\$0.2	\$0.2	\$0.5	\$0.2	\$0.1
F	Automobiles	\$0				\$0						\$0
G	Trucks - Pick Up	\$0		\$0		\$0	\$0	\$0	\$0	\$0.1	\$0.1	\$0
H	Trucks - Heavy Duty	\$0	\$0			\$0.1	\$0.1	\$0.1	\$0.4	\$0.4	\$0.1	
W	Passenger Station Overheads					\$2.3	\$4.7	\$1.1	\$0.4			
X	Passenger Station Kiosk					\$1.3	\$0.3	\$0.1				
Y	Passenger Station Signing					\$1.1	\$0.3					
Z	Passenger Station Elev Structure				\$0.2	\$15.2	\$8.6	\$3.2	\$1.7	\$2.3		\$4.6
AA	Passenger Station Other					\$0.7	\$0.6	\$0.1	\$0.1			
AB	Parking Facilities				\$0	\$2.9	\$13.6	\$0.7	\$2.9	\$0.2		\$16.0
AF	Equipment Transit Way					\$8.5	\$0.1	\$1.4	\$1.0	\$1.3		\$0.7
AG	Escalators				\$0	\$47.8	\$6.8	\$6.5	\$5.1	\$0.1		\$1.2
AH	Elevators					\$4.6	\$1.1	\$0.9	\$0.4	\$1.1		\$0.4
AI	Equipment Parking					\$0			\$0.1	\$0		\$0.2
AJ	Equipment Shops					\$3.8	\$0.1	\$0.6	\$0.3	\$0.2	\$0.2	\$0.3
AK	Equipment Power					\$22.5	\$12.4	\$3.8	\$3.9	\$7.9		\$3.3
AL	Equipment ATC Stations					\$45.7	\$22.8	\$12.1	\$1.8	\$4.0		\$13.4
AM	Equipment ATC Xover & Turnout							\$1.3	\$0.6		\$2.5	\$6.0
AN	Equipment ATC Yard					\$6.9					\$3.1	
AO	Equipment ATC Passenger Car					\$5.3	\$5.7					
AP	Equipment ATC Computer System					\$13.2	\$0.6					
AQ	Equipment ATC Line							\$1.5	\$2.0	\$2.3	\$0.4	\$16.1
AR	Equipment Bus Control, AIDS											
AS	AFC Vendor					\$9.1	\$2.4	\$0.5	\$0.4	\$0.2		\$1.3
AT	AFC Addfare					\$3.0	\$0.8	\$0.3	\$0.2	\$0.2		\$0.5
AU	AFC DADS					\$0.8	\$0.2	\$0.1	\$0			\$0.1
AV	AFC Transfer					\$0.3	\$0.1	\$0	\$0			
AW	AFC Gates					\$9.3	\$2.7	\$0.9	\$0.7	\$0.4		\$1.3
AX	AFC Other							\$0				
						\$1.1			\$0			
AY	Equipment Data Processing					\$0				\$0	\$0.1	\$0.1
AZ	Equipment Communication					\$16.9	\$2.9	\$5.8	\$4.9	\$0.8	\$1.0	\$1.1
BA	Equipment Other									\$0	\$0.1	\$0

INPUT DATA	Detailed Asset Description	Original Cost by Year Asset was Capitalized Year of Expenditure Dollars										
		1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
FROM PROGRAM CONTROL:												
VIENNA												
	ATC											
	Substations											
	Escalators											
	Elevators											
	Communications											
	AFC											
	Miscellaneous											
WHEATON												
	ATC											
	Substations											
	Escalators											
	Elevators											
	Communications											
	AFC											
	Miscellaneous											
U STREET												
	ATC											
	Substations											
	Escalators											
	Elevators											
	Communications											
	AFC											
	Miscellaneous											
ANACOSTIA												
	ATC											
	Substations											
	Escalators											
	Elevators											
	Communications											
	AFC											
	Miscellaneous											
VAN DORN												
	ATC											
	Substations											
	Escalators											
	Elevators											
	Communications											
	AFC											
	Miscellaneous											
GREENBELT												
	ATC											
	Substations											
	Escalators											
	Elevators											
	Communications											
	AFC											
	Miscellaneous											

INPUT DATA	Detailed Asset Description	Original Cost by Year Asset was Capitalized Year of Expenditure Dollars										
		1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
GLENMONT												
	ATC											
	Substations											
	Escalators											
	Elevators											
	Communications											
	AFC											
	Miscellaneous											
SPRINGFIELD												
	ATC											
	Substations											
	Escalators											
	Elevators											
	Communications											
	AFC											
	Miscellaneous											
COLUMBIA HTS./FT. TOTTEN												
	ATC											
	Substations											
	Escalators											
	Elevators											
	Communications											
	AFC											
	Miscellaneous											
BRANCH AVE												
	ATC											
	Substations											
	Escalators											
	Elevators											
	Communications											
	AFC											
	Miscellaneous											
TOTAL ADDITIONAL SEGMENTS												
	ATC	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
	Substations	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
	Escalators	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
	Elevators	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
	Communications	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
	AFC	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
	Miscellaneous	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0
	TOTAL	\$0.1	\$0.2	\$0.2	\$0.4	\$223.0	\$86.9	\$41.3	\$27.8	\$22.1	\$7.8	\$67.0
	CUMULATIVE	\$0.1	\$0.3	\$0.5	\$0.9	\$223.8	\$310.7	\$352.1	\$379.9	\$401.9	\$409.7	\$476.7

INPUT DATA	Detailed Asset Description	Projected Costs										
		1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
FROM MISC FIXED ASSET SYSTEM:												
A	Office Furn & Equipment		\$0									
E	Service Vehicles	\$0.7	\$0									
		\$0.1	\$0.1									
F	Automobiles											
G	Trucks - Pick Up	\$0.1	\$0.2									
H	Trucks - Heavy Duty	\$0	\$0.1									
W	Passenger Station Overheads											
X	Passenger Station Kiosk											
Y	Passenger Station Signing											
Z	Passenger Station Elev Structure	\$7.1										
AA	Passenger Station Other											
AB	Parking Facilities	\$31.6										
AF	Equipment Transit Way	\$2.6										
AG	Escalators	\$14.1	\$7.9									
AH	Elevators	\$2.2										
AI	Equipment Parking	\$1.7										
AJ	Equipment Shops	\$0.3	\$0.4									
AK	Equipment Power	\$12.4										
AL	Equipment ATC Stations											
AM	Equipment ATC Xover & Turnout											
AN	Equipment ATC Yard											
AO	Equipment ATC Passenger Car											
AP	Equipment ATC Computer System											
AQ	Equipment ATC Line											
AR	Equipment Bus Control,AIDS											
AS	AFC Vendor	\$1.9										
AT	AFC Addfare	\$0.8										
AU	AFC DADS	\$0.3										
AV	AFC Transfer											
AW	AFC Gates	\$2.0										
AX	AFC Other											
AY	Equipment Data Processing	\$0	\$0									
AZ	Equipment Communication	\$8.3	\$0.1									
BA	Equipment Other	\$0.1	\$0									

INPUT DATA	Detailed Asset Description	Projected Costs										
		1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
FROM PROGRAM CONTROL:												
VIENNA												
	ATC			\$29.3								
	Substations			\$12.3								
	Escalators			\$4.8								
	Elevators			\$0.8								
	Communications			\$6.1								
	AFC			\$5.3								
	Miscellaneous			\$1.2								
WHEATON												
	ATC							\$8.1				
	Substations							\$3.4				
	Escalators							\$2.9				
	Elevators							\$1.3				
	Communications							\$2.2				
	AFC							\$2.2				
	Miscellaneous							\$0.5				
U STREET												
	ATC								\$7.4			
	Substations								\$4.4			
	Escalators								\$6.6			
	Elevators								\$1.2			
	Communications								\$3.0			
	AFC								\$4.1			
	Miscellaneous								\$2.5			
ANACOSTIA												
	ATC								\$8.2			
	Substations								\$5.2			
	Escalators								\$7.8			
	Elevators								\$1.4			
	Communications								\$2.2			
	AFC								\$4.1			
	Miscellaneous								\$3.8			
VAN DORN												
	ATC								\$5.3			
	Substations								\$4.4			
	Escalators								\$1.1			
	Elevators								\$0.2			
	Communications								\$0.5			
	AFC								\$0.8			
	Miscellaneous								\$0.7			
GREENBELT												
	ATC											\$22.2
	Substations											\$13.0
	Escalators											\$8.2
	Elevators											\$1.5
	Communications											\$6.0
	AFC											\$3.0
	Miscellaneous											\$2.1

INPUT DATA	Detailed Asset Description	Projected Costs										
		1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
<b>GLENNMONT</b>												
	ATC											\$6.3
	Substations											\$2.6
	Escalators											\$0.6
	Elevators											\$0.4
	Communications											\$1.0
	AFC											\$0.7
	Miscellaneous											\$0.3
<b>SPRINGFIELD</b>												
	ATC											\$6.3
	Substations											\$2.6
	Escalators											\$0.9
	Elevators											\$0.2
	Communications											\$0.4
	AFC											\$0.7
	Miscellaneous											\$0.1
<b>COLUMBIA HTS./FT. TOTTEN</b>												
	ATC											
	Substations											
	Escalators											
	Elevators											
	Communications											
	AFC											
	Miscellaneous											
<b>BRANCH AVE</b>												
	ATC											
	Substations											
	Escalators											
	Elevators											
	Communications											
	AFC											
	Miscellaneous											
<b>TOTAL ADDITIONAL SEGMENTS</b>												
	ATC	\$0.0	\$0.0	\$29.3	\$0.0	\$0.0	\$8.1	\$0.0	\$20.9	\$0.0	\$22.2	\$12.6
	Substations	\$0.0	\$0.0	\$12.3	\$0.0	\$0.0	\$3.4	\$0.0	\$14.0	\$0.0	\$13.0	\$5.2
	Escalators	\$0.0	\$0.0	\$4.8	\$0.0	\$0.0	\$2.9	\$0.0	\$15.5	\$0.0	\$8.2	\$1.5
	Elevators	\$0.0	\$0.0	\$0.8	\$0.0	\$0.0	\$1.3	\$0.0	\$2.8	\$0.0	\$1.5	\$0.6
	Communications	\$0.0	\$0.0	\$6.1	\$0.0	\$0.0	\$2.2	\$0.0	\$5.7	\$0.0	\$6.0	\$1.4
	AFC	\$0.0	\$0.0	\$5.3	\$0.0	\$0.0	\$2.2	\$0.0	\$9.0	\$0.0	\$3.0	\$1.4
	Miscellaneous	\$0.0	\$0.0	\$1.2	\$0.0	\$0.0	\$0.5	\$0.0	\$7.0	\$0.0	\$2.1	\$0.4
	TOTAL	\$86.4	\$8.8	\$59.8	\$0.0	\$0.0	\$20.6	\$0.0	\$74.9	\$0.0	\$56.0	\$23.1
	CUMULATIVE	\$563.1	\$571.9	\$631.7	\$631.7	\$631.7	\$652.3	\$652.3	\$727.2	\$727.2	\$783.2	\$806.3

INPUT DATA	Detailed Asset Description	1995 1996 1997 1998 1999 2000						TOTAL
FROM MISC FIXED ASSET SYSTEM:								
A	Office Furn & Equipment							\$0.8
E	Service Vehicles							\$2.4
								\$1.4
F	Automobiles							\$0.1
G	Trucks - Pick Up							\$0.5
H	Trucks - Heavy Duty							\$1.2
W	Passenger Station Overheads							\$8.5
X	Passenger Station Kiosk							\$1.6
Y	Passenger Station Signing							\$1.4
Z	Passenger Station Elev Structure							\$42.8
AA	Passenger Station Other							\$1.5
								\$0.0
AB	Parking Facilities							\$68.0
AF	Equipment Transit Way							\$15.7
AG	Escalators							\$89.5
AH	Elevators							\$10.7
AI	Equipment Parking							\$2.0
AJ	Equipment Shops							\$6.2
AK	Equipment Power							\$66.1
AL	Equipment ATC Stations							\$99.7
AM	Equipment ATC Xover & Turnout							\$10.5
AN	Equipment ATC Yard							\$10.0
AO	Equipment ATC Passenger Car							\$11.0
AP	Equipment ATC Computer System							\$13.8
AQ	Equipment ATC Line							\$22.3
AR	Equipment Bus Control,AIDS							\$0.0
AS	AFC Vendor							\$15.7
AT	AFC Addfare							\$5.9
AU	AFC DADS							\$1.5
AV	AFC Transfer							\$0.4
AW	AFC Gates							\$17.2
AX	AFC Other							\$0.0
								\$0.0
								\$0.0
								\$1.1
AY	Equipment Data Processing							\$0.3
AZ	Equipment Communication							\$41.8
BA	Equipment Other							\$0.3
								\$0.0

INPUT DATA	Detailed Asset						TOTAL
	Description	1995	1996	1997	1998	1999	
FROM PROGRAM CONTROL:							\$0.0
VIENNA							\$0.0
ATC							\$29.3
Substations							\$12.3
Escalators							\$4.8
Elevators							\$0.8
Communications							\$6.1
AFC							\$5.3
Miscellaneous							\$1.2
WHEATON							
ATC							
Substations							
Escalators							
Elevators							
Communications							
AFC							
Miscellaneous							
U STREET							
ATC							\$7.4
Substations							\$4.4
Escalators							\$6.6
Elevators							\$1.2
Communications							\$3.0
AFC							\$4.1
Miscellaneous							\$2.5
ANACOSTIA							\$0.0
ATC							\$8.2
Substations							\$5.2
Escalators							\$7.8
Elevators							\$1.4
Communications							\$2.2
AFC							\$4.1
Miscellaneous							\$3.8
VAN DORN							\$0.0
ATC							\$5.3
Substations							\$4.4
Escalators							\$1.1
Elevators							\$0.2
Communications							\$0.5
AFC							\$0.8
Miscellaneous							\$0.7
GREENBELT							\$0.0
ATC							\$22.2
Substations							\$13.0
Escalators							\$8.2
Elevators							\$1.5
Communications							\$6.0
AFC							\$3.0
Miscellaneous							\$2.1

INPUT DATA	Detailed Asset							TOTAL
	Description	1995	1996	1997	1998	1999	2000	
<b>GLENMONT</b>								\$0.0
ATC								\$6.3
Substations								\$2.6
Escalators								\$0.6
Elevators								\$0.4
Communications								\$1.0
AFC								\$0.7
Miscellaneous								\$0.3
<b>SPRINGFIELD</b>								\$0.0
ATC								\$6.3
Substations								\$2.6
Escalators								\$0.9
Elevators								\$0.2
Communications								\$0.4
AFC								\$0.7
Miscellaneous								\$0.1
<b>COLUMBIA HTS./FT. TOTTEM</b>								\$0.0
ATC	\$1.3		\$1.2					\$2.5
Substations	\$2.8		\$2.5					\$5.3
Escalators	\$1.3		\$1.2					\$2.5
Elevators	\$0.5		\$0.5					\$1.0
Communications	\$1.3		\$1.2					\$2.5
AFC	\$1.0		\$0.9					\$1.9
Miscellaneous	\$1.0		\$0.9					\$1.9
<b>BRANCH AVE</b>								\$0.0
ATC				\$17.9				\$17.9
Substations				\$10.7				\$10.7
Escalators				\$7.2				\$7.2
Elevators				\$1.2				\$1.2
Communications				\$6.0				\$6.0
AFC				\$2.8				\$2.8
Miscellaneous				\$2.8				\$2.8
<b>TOTAL ADDITIONAL SEGMENTS</b>								
ATC	\$1.3	\$0.0	\$1.2	\$17.9	\$0.0	\$0.0		\$113.5
Substations	\$2.8	\$0.0	\$2.5	\$10.7	\$0.0	\$0.0		\$63.9
Escalators	\$1.3	\$0.0	\$1.2	\$7.2	\$0.0	\$0.0		\$42.6
Elevators	\$0.5	\$0.0	\$0.5	\$1.2	\$0.0	\$0.0		\$9.2
Communications	\$1.3	\$0.0	\$1.2	\$6.0	\$0.0	\$0.0		\$29.9
AFC	\$1.0	\$0.0	\$0.9	\$2.8	\$0.0	\$0.0		\$25.6
Miscellaneous	\$1.0	\$0.0	\$0.9	\$2.8	\$0.0	\$0.0		\$15.9
TOTAL	\$9.2	\$0.0	\$8.4	\$48.6	\$0.0	\$0.0		\$872.5
CUMULATIVE	\$815.5	\$815.5	\$823.9	\$872.5	\$872.5	\$872.5		\$872.5

REPLACEMENT COSTS	Detailed Asset Description	Range of MWATA Fixed Asset Classes				%	Replacement Life Years	Source	1973	1974	1975	1976	1977	1978	1979		
		From		To													
		Sub Group	Sub Group	Sub Group	Sub Group												
A	Office Furn & Equipment	1	1	11	1	100	30 ACCT	\$0.000									
E	Service Vehicles					100	6 PLNG	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000		
F	Automobiles	13	30			100	6 PLNG	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.007		
G	Trucks - Pick Up	13	31			100	6 PLNG	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.006		
H	Trucks - Heavy Duty	13	32			100	6 PLNG	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.008		
W	Passenger Station Overheads	61	9			0	0 FMNT										
X	Passenger Station Kiosk	61	10			0	0 FMNT										
Y	Passenger Station Signing	61	30			0	0 FMNT										
Z	Passenger Station Elev Structure	61	40			0	0 FMNT										
AA	Passenger Station Other					0	0 FMNT										
AF	Equipment Transit Way	70	1	70	4	100	15 FMNT	\$0.000									
AG	Escalators	71	1	71	20	52	15 FMNT	\$0.000									
AH	Elevators	71	21	71	31	33	20 ENGA	\$0.000									
	Lift Mechanism						15 ENGA	\$0.000									
AI	Equipment Parking	72	1	72	6	0	0 FMNT										
AJ	Equipment Shops	74	1	74	99	100	15 FMNT	\$0.000									
AK	Equip Power - Traction Substa	75	1	75	3	13.56	20 ENGA	\$0.000									
	25-Year Cycle					5.07	25 ENGA	\$0.000									
	30-Year Cycle					63.22	30 ENGA	\$0.000									
	40-Year Cycle					19.89	40 ENGA										
	Equip Power - Tie Breaker Sta					42.89	20 ENGA	\$0.000									
	25-Year Cycle					8.78	25 ENGA	\$0.000									
	30-Year Cycle					48.09	30 ENGA	\$0.000									
	Subtotal - Equip Power							\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000		
AL	Equipment ATC Stations	76	1			0	12 ENGA	\$0.000									
	15-Year Cycle					13.32	15 ENGA	\$0.000									
	20-Year Cycle					7.29	20 ENGA	\$0.000									
	40-Year Cycle					23.37	40 ENGA										
	Subtotal - ATC Stations							\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000		
AM	Equipment ATC Xover, Turnout, Line	76	2			15.67	15 ENGA	\$0.000									
	15-Year Cycle					1.47	20 ENGA	\$0.000									
	20-Year Cycle					8.98	25 ENGA	\$0.000									
	25-Year Cycle																
	Subtotal - ATC Line							\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000		
AN	Equipment ATC Yard	76	3			17.11	15 ENGA	\$0.000									
	15-Year Cycle					14.25	20 ENGA	\$0.000									
	20-Year Cycle					35.63	25 ENGA	\$0.000									
	25-Year Cycle					13.68	40 ENGA										
	40-Year Cycle																
	Subtotal - ATC Yard							\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000		
AO	Equipment ATC Passenger Car	76	4														
AP	Equipment ATC Computer System	76	5			100	20 ENGA	\$0.000									
	Total - ATC							\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000		

REPLACEMENT COSTS	Detailed Asset Description	Range of MATA Fixed Asset Classes				%	Replacement Life Years Source	1973	1974	1975	1976	1977	1978	1979
		From		To										
		Sub Group	Sub Group	Sub Group	Sub Group									
AR Equipment Bus Control, AIDS		76	7	76	8	100	20 R-SMNT	\$0.000						
AS AFC Vendor	4-Year Cycle	77	1			0.00	4 ENGA	\$0.000				\$0.000	\$0.000	\$0.000
	5-Year Cycle					0.00	5 ENGA	\$0.000				\$0.000	\$0.000	
	8-Year Cycle					11.16	8 ENGA	\$0.000						
	10-Year Cycle					1.70	10 ENGA	\$0.000						
	12-Year Cycle					10.07	12 ENGA	\$0.000						
	15-Year Cycle					0.62	15 ENGA	\$0.000						
Subtotal - AFC Vendor								\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
AT AFC Addfare	10-Year Cycle	77	3			25.89	10 ENGA	\$0.000						
	12-Year Cycle					2.29	12 ENGA	\$0.000						
	15-Year Cycle					34.58	15 ENGA	\$0.000						
	20-Year Cycle					0.76	20 ENGA	\$0.000						
	25-Year Cycle					2.04	25 ENGA	\$0.000						
Subtotal - AFC Addfare								\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
AU AFC DADS	15-Year Cycle	77	6			33.13	15 ENGA	\$0.000						
	20-Year Cycle					5.19	20 ENGA	\$0.000						
Subtotal - AFC DADS								\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
AW AFC Gates	3-Year Cycle	77	10	77	15	0.00	3 ENGA	\$0.000			\$0.000	\$0.000	\$0.000	\$0.000
	8-Year Cycle					20.20	8 ENGA	\$0.000						
	10-Year Cycle					38.87	10 ENGA	\$0.000						
	12-Year Cycle					4.36	12 ENGA	\$0.000						
	15-Year Cycle					13.60	15 ENGA	\$0.000						
	20-Year Cycle					4.76	20 ENGA	\$0.000						
Subtotal - AFC Gates								\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
Total - AFC:Vendor,Addfare,EDADS,Gates								\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
AX AFC Other		77	2			100	15 ENGA	\$0.000						
AY Equipment Data Processing		78	1	78	10	100	5 PLNG	\$0.000				\$0.000	\$0.000	
AZ Equipment Communication	5-Year Cycle					0.5	5 ENGA	\$0.000				\$0.000	\$0.000	
	8-Year Cycle					3.8	8 ENGA	\$0.000						
	10-Year Cycle					4.8	10 ENGA	\$0.000						
	12-Year Cycle					80.9	12 ENGA	\$0.000						
	35-Year Cycle					6	35 ENGA							
	45-Year Cycle					4	45 ENGA							
Subtotal - Equip Communication								\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
BA Equipment Other		80	1	80	99	100	10 ACCT	\$0.000						

REPLACEMENT COSTS	Detailed Asset Description	Range of MMATA Fixed Asset Classes				Replacement Life	% Years	Source	1973	1974	1975	1976	1977	1978	1979
		From		To											
		Sub Group	Sub Group	Sub Group	Sub Group										
						999									
TOTAL								\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.021	
								1973	1974	1975	1976	1977	1978	1979	
CUMULATIVE								\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
5-YEAR ROLLING AVERAGE										\$0.0	\$0.0	\$0.0	\$0.0	\$0.0	
7-YEAR ROLLING AVERAGE											\$0.0	\$0.0	\$0.0	\$0.0	

REPLACEMENT COSTS	Detailed Asset Description	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
A	Office Furn & Equipment											
E	Service Vehicles	\$0.001	\$0.007	\$0.028	\$1.073	\$0.227	\$0.638	\$0.930	\$0.713	\$0.273	\$1.430	\$1.124
F	Automobiles	\$0.000	\$0.000	\$0.000	\$0.017	\$0.000	\$0.007	\$0.000	\$0.000	\$0.000	\$0.060	\$0.000
G	Trucks - Pick Up	\$0.000	\$0.026	\$0.000	\$0.008	\$0.042	\$0.016	\$0.054	\$0.126	\$0.104	\$0.026	\$0.145
H	Trucks - Heavy Duty	\$0.008	\$0.000	\$0.000	\$0.101	\$0.088	\$0.153	\$0.558	\$0.497	\$0.158	\$0.101	\$0.104
W	Passenger Station Overheads											
X	Passenger Station Kiosk											
Y	Passenger Station Signing											
Z	Passenger Station Elev Structure											
AA	Passenger Station Other											
AF	Equipment Transit Way									\$0.000	\$0.000	\$0.000
AG	Escalators									\$0.000	\$0.000	\$0.000
AH	Elevators											
	Cab											
	Lift Mechanism									\$0.000	\$0.000	\$0.000
AI	Equipment Parking											
AJ	Equipment Shops									\$0.000	\$0.000	\$0.000
AK	Equip Power - Traction Substa											
	20-Year Cycle											
	25-Year Cycle											
	30-Year Cycle											
	40-Year Cycle											
	Equip Power - Tie Breaker Sta											
	20-Year Cycle											
	25-Year Cycle											
	30-Year Cycle											
	Subtotal - Equip Power	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
AL	Equipment ATC Stations							\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
	12-Year Cycle											
	15-Year Cycle									\$0.000	\$0.000	\$0.000
	20-Year Cycle											
	40-Year Cycle											
	Subtotal - ATC Stations	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
AM	Equipment ATC Xover, Turnout, Line										\$0.000	\$0.000
	15-Year Cycle											
	20-Year Cycle											
	25-Year Cycle											
	Subtotal - ATC Line	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
AN	Equipment ATC Yard										\$0.000	\$0.000
	15-Year Cycle											
	20-Year Cycle											
	25-Year Cycle											
	40-Year Cycle											
	Subtotal - ATC Yard	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
AO	Equipment ATC Passenger Car											
AP	Equipment ATC Computer System											
	Total - ATC	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000

REPLACEMENT COSTS	Detailed Asset	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
	Description											
AR Equipment Bus Control,AIDS												
AS AFC Vendor	4-Year Cycle	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
	5-Year Cycle	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
	8-Year Cycle		\$0.000	\$0.000	\$0.000	\$0.000	\$1.814	\$0.442	\$0.089	\$0.060	\$0.034	\$0.000
	10-Year Cycle				\$0.000	\$0.000	\$0.000	\$0.000	\$0.276	\$0.067	\$0.014	\$0.009
	12-Year Cycle						\$0.000	\$0.000	\$0.000	\$0.000	\$1.637	\$0.399
	15-Year Cycle									\$0.000	\$0.000	\$0.000
Subtotal - AFC Vendor		\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$1.814	\$0.442	\$0.365	\$0.128	\$1.685	\$0.408
AT AFC Addfare	10-Year Cycle				\$0.000	\$0.000	\$0.000	\$0.000	\$1.412	\$0.355	\$0.130	\$0.086
	12-Year Cycle				\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.125	\$0.031
	15-Year Cycle				\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
	20-Year Cycle				\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
	25-Year Cycle				\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
Subtotal - AFC Addfare		\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$1.412	\$0.355	\$0.255	\$0.118
AU AFC DADS	15-Year Cycle				\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
	20-Year Cycle				\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
Subtotal - AFC DADS		\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
AW AFC Gates	3-Year Cycle	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
	8-Year Cycle		\$0.000	\$0.000	\$0.000	\$0.000	\$3.357	\$0.912	\$0.276	\$0.206	\$0.101	\$0.000
	10-Year Cycle				\$0.000	\$0.000	\$0.000	\$0.000	\$6.460	\$1.754	\$0.532	\$0.397
	12-Year Cycle				\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.725	\$0.197
	15-Year Cycle				\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
	20-Year Cycle				\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
Subtotal - AFC Gates		\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$3.357	\$0.912	\$6.736	\$1.961	\$1.357	\$0.594
Total - AFC:Vendor,Addfare,EDADS,Gates		\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$5.171	\$1.353	\$8.513	\$2.444	\$3.297	\$1.120
AX AFC Other										\$0.000	\$0.000	\$0.000
AY Equipment Data Processing		\$0.000	\$0.000	\$0.011	\$0.000	\$0.000	\$0.000	\$0.007	\$0.080	\$0.117	\$0.045	\$0.039
AZ Equipment Communication	5-Year Cycle	\$0.000	\$0.000	\$0.152	\$0.024	\$0.046	\$0.035	\$0.005	\$0.067	\$0.016	\$0.062	\$0.014
	8-Year Cycle		\$0.000	\$0.000	\$0.000	\$0.000	\$1.153	\$0.183	\$0.347	\$0.266	\$0.041	\$0.045
	10-Year Cycle				\$0.000	\$0.000	\$0.000	\$0.000	\$1.457	\$0.231	\$0.439	\$0.336
	12-Year Cycle						\$0.000	\$0.000	\$0.000	\$0.000	\$24.548	\$3.898
	35-Year Cycle											
	45-Year Cycle											
Subtotal - Equip Communication		\$0.000	\$0.000	\$0.152	\$0.024	\$0.046	\$1.188	\$0.188	\$1.870	\$0.513	\$25.090	\$4.293
BA Equipment Other					\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000

REPLACEMENT COSTS	Detailed Asset Description	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
TOTAL		\$0.009	\$0.032	\$0.191	\$1.223	\$0.403	\$7.173	\$3.091	\$11.801	\$3.608	\$30.048	\$6.825
		1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
CUMULATIVE		\$0	\$0.1	\$0.3	\$1.5	\$1.9	\$9.1	\$12.1	\$23.9	\$27.6	\$57.6	\$64.4
5-YEAR ROLLING AVERAGE		\$0.1	\$0.3	\$0.4	\$1.8	\$2.4	\$4.7	\$5.2	\$11.1	\$11.1	\$12.4	\$30.1
7-YEAR ROLLING AVERAGE		\$0.2	\$0.3	\$1.3	\$1.7	\$3.4	\$3.9	\$8.2	\$9.0	\$10.3	\$23.6	\$26.4

REPLACEMENT COSTS	Detailed Asset Description	Year										
		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
A Office Furn & Equipment												
E Service Vehicles		\$0.733	\$0.930	\$0.713	\$0.273	\$1.430	\$1.124	\$0.733	\$0.930	\$0.713	\$0.273	\$1.430
F Automobiles		\$0.007	\$0.000	\$0.000	\$0.000	\$0.060	\$0.000	\$0.007	\$0.000	\$0.000	\$0.000	\$0.060
G Trucks - Pick Up		\$0.179	\$0.054	\$0.126	\$0.104	\$0.026	\$0.145	\$0.179	\$0.054	\$0.126	\$0.104	\$0.026
H Trucks - Heavy Duty		\$0.221	\$0.558	\$0.499	\$0.158	\$0.101	\$0.104	\$0.221	\$0.558	\$0.499	\$0.158	\$0.101
W Passenger Station Overheads												
X Passenger Station Kiosk												
Y Passenger Station Signing												
Z Passenger Station Elev Structure												
AA Passenger Station Other												
AF Equipment Transit Way		\$0.000	\$15.174	\$0.231	\$2.192	\$1.500	\$1.659	\$0.000	\$0.789	\$2.807	\$0.000	\$0.000
AG Escalators		\$0.004	\$44.627	\$5.928	\$5.310	\$3.779	\$0.061	\$0.000	\$0.712	\$7.820	\$4.290	\$2.496
AH Elevators	Cab			\$0.000	\$0.000	\$0.000	\$0.000	\$2.749	\$0.605	\$0.466	\$0.195	\$0.476
	Lift Mechanism	\$0.000	\$5.582	\$1.229	\$0.945	\$0.396	\$0.966	\$0.000	\$0.291	\$1.541	\$0.000	\$0.536
AI Equipment Parking												
AJ Equipment Shops		\$0.000	\$6.807	\$0.145	\$0.940	\$0.451	\$0.288	\$0.212	\$0.343	\$0.296	\$0.441	\$0.000
AK Equip Power - Traction Substa	20-Year Cycle			\$0.000	\$0.000	\$0.000	\$0.000	\$3.838	\$1.966	\$0.573	\$0.524	\$0.965
	25-Year Cycle								\$0.000	\$0.000	\$0.000	\$0.000
	30-Year Cycle											
	40-Year Cycle											
Equip Power - Tie Breaker Sta	20-Year Cycle			\$0.000	\$0.000	\$0.000	\$0.000	\$4.215	\$2.159	\$0.630	\$0.575	\$1.060
	25-Year Cycle								\$0.000	\$0.000	\$0.000	\$0.000
	30-Year Cycle											
	40-Year Cycle											
Subtotal - Equip Power		\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$8.053	\$4.125	\$1.203	\$1.099	\$2.025
AL Equipment ATC Stations	12-Year Cycle	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
	15-Year Cycle	\$0.000	\$10.921	\$5.087	\$2.530	\$0.344	\$0.691	\$0.000	\$1.976	\$0.000	\$0.000	\$2.968
	20-Year Cycle			\$0.000	\$0.000	\$0.000	\$0.000	\$5.977	\$2.784	\$1.385	\$0.188	\$0.378
	40-Year Cycle											
Subtotal - ATC Stations		\$0.000	\$10.921	\$5.087	\$2.530	\$0.344	\$0.691	\$5.977	\$4.760	\$1.385	\$0.188	\$3.346
AM Equipment ATC Xover, Turnout, Line	15-Year Cycle	\$0.000	\$0.000	\$0.000	\$0.676	\$0.586	\$0.473	\$0.541	\$3.839	\$0.000	\$0.000	\$0.752
	20-Year Cycle			\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.063	\$0.055	\$0.044
	25-Year Cycle								\$0.000	\$0.000	\$0.000	\$0.000
Subtotal - ATC Line		\$0.000	\$0.000	\$0.000	\$0.676	\$0.586	\$0.473	\$0.541	\$3.839	\$0.063	\$0.055	\$0.796
AN Equipment ATC Yard	15-Year Cycle	\$0.000	\$2.111	\$0.000	\$0.000	\$0.000	\$0.000	\$0.620	\$0.000	\$0.000	\$0.000	\$0.381
	20-Year Cycle			\$0.000	\$0.000	\$0.000	\$0.000	\$1.758	\$0.000	\$0.000	\$0.000	\$0.000
	25-Year Cycle								\$0.000	\$0.000	\$0.000	\$0.000
	40-Year Cycle											
Subtotal - ATC Yard		\$0.000	\$2.111	\$0.000	\$0.000	\$0.000	\$0.000	\$2.378	\$0.000	\$0.000	\$0.000	\$0.381
AO Equipment ATC Passenger Car												
AP Equipment ATC Computer System				\$0.000	\$0.000	\$0.000	\$0.000	\$23.663	\$1.051	\$0.000	\$0.000	\$0.000
Total - ATC		\$0.000	\$13.032	\$5.087	\$3.206	\$0.930	\$1.164	\$32.560	\$9.651	\$1.448	\$0.243	\$4.523

REPLACEMENT COSTS	Detailed Asset											
	Description	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
AR Equipment Bus Control,AIDS				\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
AS AFC Vendor	4-Year Cycle	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
	5-Year Cycle	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
	8-Year Cycle	\$0.155	\$0.224	\$1.814	\$0.673	\$0.089	\$0.060	\$0.130	\$0.000	\$0.547	\$0.224	\$1.945
	10-Year Cycle	\$0.005	\$0.000	\$0.024	\$0.034	\$0.000	\$0.035	\$0.276	\$0.067	\$0.028	\$0.009	\$0.065
	12-Year Cycle	\$0.080	\$0.055	\$0.031	\$0.000	\$0.140	\$0.202	\$0.000	\$0.208	\$0.000	\$0.000	\$1.724
	15-Year Cycle	\$0.000	\$0.101	\$0.025	\$0.005	\$0.003	\$0.002	\$0.000	\$0.009	\$0.012	\$0.000	\$0.013
	Subtotal - AFC Vendor	\$0.241	\$0.380	\$1.893	\$0.712	\$0.232	\$0.300	\$0.406	\$0.284	\$0.588	\$0.234	\$3.747
AT AFC Addfare	10-Year Cycle	\$0.064	\$0.000	\$0.134	\$0.231	\$0.000	\$0.202	\$1.412	\$0.355	\$0.214	\$0.086	\$0.407
	12-Year Cycle	\$0.012	\$0.008	\$0.006	\$0.000	\$0.012	\$0.020	\$0.000	\$0.018	\$0.000	\$0.000	\$0.132
	15-Year Cycle	\$0.000	\$1.885	\$0.474	\$0.174	\$0.115	\$0.086	\$0.000	\$0.179	\$0.309	\$0.000	\$0.270
	20-Year Cycle	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.041	\$0.010	\$0.004	\$0.003	\$0.002
	25-Year Cycle	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
	Subtotal - AFC Addfare	\$0.076	\$1.893	\$0.614	\$0.405	\$0.127	\$0.308	\$1.453	\$0.563	\$0.526	\$0.089	\$0.811
AU AFC DADS	15-Year Cycle	\$0.000	\$0.456	\$0.123	\$0.042	\$0.020	\$0.000	\$0.000	\$0.036	\$0.112	\$0.000	\$0.070
	20-Year Cycle	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.085	\$0.023	\$0.008	\$0.004	\$0.000
	Subtotal - AFC DADS	\$0.000	\$0.456	\$0.123	\$0.042	\$0.020	\$0.000	\$0.085	\$0.059	\$0.120	\$0.004	\$0.070
AW AFC Gates	3-Year Cycle	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
	8-Year Cycle	\$0.291	\$0.423	\$3.357	\$1.365	\$0.276	\$0.206	\$0.289	\$0.000	\$1.060	\$0.423	\$3.613
	10-Year Cycle	\$0.194	\$0.000	\$0.560	\$0.815	\$0.000	\$0.871	\$6.460	\$1.754	\$0.893	\$0.397	\$1.674
	12-Year Cycle	\$0.060	\$0.045	\$0.022	\$0.000	\$0.063	\$0.091	\$0.000	\$0.098	\$0.000	\$0.000	\$0.765
	15-Year Cycle	\$0.000	\$2.260	\$0.614	\$0.186	\$0.139	\$0.068	\$0.000	\$0.196	\$0.285	\$0.000	\$0.305
	20-Year Cycle	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.791	\$0.215	\$0.065	\$0.049	\$0.024
	Subtotal - AFC Gates	\$0.545	\$2.728	\$4.552	\$2.365	\$0.478	\$1.237	\$7.540	\$2.263	\$2.303	\$0.869	\$6.381
	Total - AFC:Vendor,Addfare,EDADS,Gates	\$0.861	\$5.456	\$7.183	\$3.524	\$0.858	\$1.845	\$9.484	\$3.169	\$3.538	\$1.195	\$11.008
AX AFC Other		\$0.000	\$2.016	\$0.003	\$0.000	\$0.004	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
AY Equipment Data Processing		\$0.007	\$0.080	\$0.117	\$0.045	\$0.039	\$0.007	\$0.080	\$0.117	\$0.045	\$0.039	\$0.007
AZ Equipment Communication	5-Year Cycle	\$0.033	\$0.027	\$0.006	\$0.036	\$0.006	\$0.042	\$0.011	\$0.033	\$0.021	\$0.009	\$0.017
	8-Year Cycle	\$0.047	\$0.335	\$0.464	\$0.305	\$0.139	\$0.106	\$0.100	\$0.018	\$0.236	\$0.134	\$0.414
	10-Year Cycle	\$0.052	\$0.057	\$0.060	\$0.424	\$0.004	\$0.293	\$0.583	\$0.093	\$0.281	\$0.134	\$0.294
	12-Year Cycle	\$7.394	\$5.655	\$0.869	\$0.965	\$1.011	\$7.142	\$0.067	\$4.935	\$0.000	\$0.000	\$11.599
	35-Year Cycle											
	45-Year Cycle											
	Subtotal - Equip Communication	\$7.526	\$6.074	\$1.399	\$1.730	\$1.159	\$7.582	\$0.760	\$5.078	\$0.538	\$0.277	\$12.324
BA Equipment Other		\$0.033	\$0.082	\$0.048	\$0.128	\$0.036	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.033

REPLACEMENT COSTS	Detailed Asset Description	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
TOTAL		\$9,570	\$100,472	\$22,709	\$18,555	\$10,769	\$14,947	\$55,038	\$26,423	\$21,040	\$8,315	\$35,044
		1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
CUMULATIVE		\$74.0	\$174.5	\$197.2	\$215.7	\$226.5	\$241.4	\$296.5	\$322.9	\$344.0	\$352.3	\$387.3
5-YEAR ROLLING AVERAGE		\$33.9	\$31.6	\$32.4	\$33.5	\$24.4	\$25.1	\$25.6	\$25.2	\$29.2	\$20.9	\$18.7
7-YEAR ROLLING AVERAGE		\$27.4	\$28.4	\$26.3	\$33.2	\$35.6	\$24.2	\$22.2	\$24.5	\$24.9	\$25.0	\$19.2

REPLACEMENT COSTS	Detailed Asset Description	Year									TOTAL
		2002	2003	2004	2005	2006	2007	2008	2009	2010	
A	Office Furn & Equipment		\$0.253	\$0.513	\$0.398	\$0.158	\$0.243	\$0.055	\$0.003	\$0.033	\$1.7
E	Service Vehicles	\$1.124	\$0.733	\$0.930	\$0.713	\$0.273	\$1.430	\$1.124	\$0.733	\$0.930	\$23.720
F	Automobiles	\$0.000	\$0.007	\$0.000	\$0.000	\$0.000	\$0.060	\$0.000	\$0.007	\$0.000	\$0.299
G	Trucks - Pick Up	\$0.145	\$0.179	\$0.054	\$0.126	\$0.104	\$0.026	\$0.145	\$0.179	\$0.054	\$2.691
H	Trucks - Heavy Duty	\$0.104	\$0.221	\$0.558	\$0.499	\$0.158	\$0.101	\$0.104	\$0.221	\$0.558	\$7.476
W	Passenger Station Overheads										\$0.000
X	Passenger Station Kiosk										\$0.000
Y	Passenger Station Signing										\$0.000
Z	Passenger Station Elev Structure										\$0.000
AA	Passenger Station Other										\$0.000
AF	Equipment Transit Way	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$15.174	\$0.231	\$2.192	\$1.500	\$43.449
AG	Escalators	\$0.000	\$0.000	\$1.508	\$0.000	\$8.064	\$44.627	\$10.192	\$6.090	\$4.455	\$149.962
AH	Elevators										
	Cab	\$0.000	\$0.143	\$0.759	\$0.000	\$0.264	\$0.000	\$0.000	\$0.429	\$0.000	\$6.087
	Lift Mechanism	\$0.000	\$0.000	\$0.871	\$0.000	\$1.876	\$5.582	\$2.234	\$1.347	\$0.731	\$24.129
AI	Equipment Parking										\$0.000
AJ	Equipment Shops	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$6.807	\$0.145	\$0.940	\$0.451	\$18.265
AK	Equip Power - Traction Substa										
	20-Year Cycle	\$0.000	\$0.343	\$1.250	\$0.000	\$1.167	\$0.000	\$0.000	\$0.322	\$0.000	\$10.948
	25-Year Cycle	\$1.435	\$0.735	\$0.214	\$0.196	\$0.361	\$0.000	\$0.128	\$0.467	\$0.000	\$3.537
	30-Year Cycle		\$0.000	\$0.000	\$0.000	\$0.000	\$17.896	\$9.166	\$2.674	\$2.441	\$32.177
	40-Year Cycle										\$0.000
	Equip Power - Tie Breaker Sta										
	20-Year Cycle	\$0.000	\$0.376	\$1.373	\$0.000	\$1.281	\$0.000	\$0.000	\$0.354	\$0.000	\$12.022
	25-Year Cycle	\$0.863	\$0.442	\$0.129	\$0.118	\$0.217	\$0.000	\$0.077	\$0.281	\$0.000	\$2.126
	30-Year Cycle		\$0.000	\$0.000	\$0.000	\$0.000	\$4.726	\$2.420	\$0.706	\$0.645	\$8.497
	Subtotal - Equip Power	\$2.298	\$1.896	\$2.966	\$0.313	\$3.025	\$22.622	\$11.791	\$4.805	\$3.086	\$69.307
AL	Equipment ATC Stations										
	12-Year Cycle	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
	15-Year Cycle	\$0.000	\$0.000	\$0.820	\$0.000	\$2.117	\$10.921	\$7.336	\$3.806	\$0.476	\$49.994
	20-Year Cycle	\$0.000	\$1.081	\$0.000	\$0.000	\$1.624	\$0.000	\$0.000	\$0.449	\$0.000	\$13.867
	40-Year Cycle										\$0.000
	Subtotal - ATC Stations	\$0.000	\$1.081	\$0.820	\$0.000	\$3.741	\$10.921	\$7.336	\$4.255	\$0.476	\$63.861
AM	Equipment ATC Xover, Turnout, Line										
	15-Year Cycle	\$0.000	\$0.000	\$0.208	\$0.000	\$0.536	\$0.000	\$0.569	\$1.000	\$0.619	\$9.799
	20-Year Cycle	\$0.051	\$0.360	\$0.000	\$0.000	\$0.071	\$0.000	\$0.000	\$0.019	\$0.000	\$0.664
	25-Year Cycle	\$0.000	\$0.000	\$0.388	\$0.336	\$0.271	\$0.310	\$2.200	\$0.000	\$0.000	\$3.505
	Subtotal - ATC Line	\$0.051	\$0.360	\$0.595	\$0.336	\$0.878	\$0.310	\$2.770	\$1.019	\$0.619	\$13.968
AN	Equipment ATC Yard										
	15-Year Cycle	\$0.000	\$0.000	\$0.105	\$0.000	\$0.272	\$2.111	\$0.289	\$0.164	\$0.017	\$6.069
	20-Year Cycle	\$0.517	\$0.000	\$0.000	\$0.000	\$0.317	\$0.000	\$0.000	\$0.088	\$0.000	\$2.680
	25-Year Cycle	\$4.396	\$0.000	\$0.000	\$0.000	\$0.000	\$1.292	\$0.000	\$0.000	\$0.000	\$5.687
	40-Year Cycle										\$0.000
	Subtotal - ATC Yard	\$4.912	\$0.000	\$0.105	\$0.000	\$0.589	\$3.403	\$0.289	\$0.252	\$0.017	\$14.436
AO	Equipment ATC Passenger Car										\$0.000
AP	Equipment ATC Computer System	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$24.715
	Total - ATC	\$4.963	\$1.442	\$1.521	\$0.336	\$5.208	\$14.634	\$10.394	\$5.526	\$1.112	\$116.979

REPLACEMENT COSTS	Detailed Asset	2002	2003	2004	2005	2006	2007	2008	2009	2010	TOTAL
	Description										
AR Equipment Bus Control,AIDS		\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
AS AFC Vendor	4-Year Cycle	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
	5-Year Cycle	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
	8-Year Cycle	\$0.734	\$0.132	\$0.060	\$0.169	\$0.122	\$0.547	\$0.224	\$1.945	\$0.734	\$12.970
	10-Year Cycle	\$0.000	\$0.044	\$0.043	\$0.007	\$0.035	\$0.282	\$0.086	\$0.028	\$0.009	\$1.445
	12-Year Cycle	\$0.399	\$0.434	\$0.055	\$0.149	\$0.055	\$0.179	\$0.202	\$0.035	\$0.318	\$6.302
	15-Year Cycle	\$0.000	\$0.000	\$0.005	\$0.000	\$0.022	\$0.101	\$0.032	\$0.008	\$0.006	\$0.343
Subtotal - AFC Vendor		\$1.132	\$0.610	\$0.164	\$0.324	\$0.234	\$1.110	\$0.544	\$2.017	\$1.067	\$21.060
AT AFC Addfare	10-Year Cycle	\$0.000	\$0.249	\$0.284	\$0.038	\$0.202	\$1.446	\$0.462	\$0.214	\$0.086	\$8.070
	12-Year Cycle	\$0.031	\$0.042	\$0.008	\$0.016	\$0.005	\$0.015	\$0.020	\$0.003	\$0.027	\$0.531
	15-Year Cycle	\$0.000	\$0.000	\$0.112	\$0.000	\$0.458	\$1.885	\$0.627	\$0.245	\$0.166	\$6.986
	20-Year Cycle	\$0.000	\$0.004	\$0.007	\$0.000	\$0.006	\$0.000	\$0.000	\$0.002	\$0.000	\$0.079
	25-Year Cycle	\$0.111	\$0.028	\$0.010	\$0.007	\$0.005	\$0.000	\$0.011	\$0.018	\$0.000	\$0.190
Subtotal - AFC Addfare		\$0.143	\$0.322	\$0.421	\$0.061	\$0.675	\$3.346	\$1.120	\$0.483	\$0.280	\$15.857
AU AFC DADS	15-Year Cycle	\$0.000	\$0.000	\$0.029	\$0.000	\$0.118	\$0.456	\$0.163	\$0.060	\$0.033	\$1.718
	20-Year Cycle	\$0.000	\$0.007	\$0.021	\$0.000	\$0.013	\$0.000	\$0.000	\$0.005	\$0.000	\$0.166
Subtotal - AFC DADS		\$0.000	\$0.007	\$0.050	\$0.000	\$0.131	\$0.456	\$0.163	\$0.066	\$0.033	\$1.883
AW AFC Gates	3-Year Cycle	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000
	8-Year Cycle	\$1.484	\$0.362	\$0.206	\$0.366	\$0.239	\$1.060	\$0.423	\$3.613	\$1.484	\$25.394
	10-Year Cycle	\$0.000	\$1.053	\$1.045	\$0.164	\$0.871	\$6.608	\$2.215	\$0.893	\$0.397	\$36.008
	12-Year Cycle	\$0.197	\$0.226	\$0.045	\$0.077	\$0.026	\$0.081	\$0.091	\$0.017	\$0.149	\$2.973
	15-Year Cycle	\$0.000	\$0.000	\$0.127	\$0.000	\$0.518	\$2.260	\$0.786	\$0.267	\$0.196	\$8.207
	20-Year Cycle	\$0.000	\$0.069	\$0.100	\$0.000	\$0.107	\$0.000	\$0.000	\$0.044	\$0.000	\$1.463
Subtotal - AFC Gates		\$1.681	\$1.709	\$1.522	\$0.607	\$1.761	\$10.009	\$3.516	\$4.834	\$2.227	\$74.044
Total - AFC:Vendor,Addfare,EDADS,Gates		\$2.956	\$2.648	\$2.157	\$0.992	\$2.801	\$14.921	\$5.342	\$7.400	\$3.607	\$112.844
AX AFC Other		\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$2.016	\$0.003	\$0.000	\$0.004	\$4.046
AY Equipment Data Processing		\$0.080	\$0.117	\$0.045	\$0.039	\$0.007	\$0.080	\$0.117	\$0.045	\$0.039	\$1.449
AZ Equipment Communication	5-Year Cycle	\$0.010	\$0.043	\$0.009	\$0.004	\$0.007	\$0.004	\$0.017	\$0.003	\$0.001	\$0.758
	8-Year Cycle	\$0.175	\$0.105	\$0.042	\$0.086	\$0.235	\$0.094	\$0.054	\$0.166	\$0.070	\$5.361
	10-Year Cycle	\$0.023	\$0.312	\$0.237	\$0.064	\$0.117	\$0.291	\$0.325	\$0.112	\$0.054	\$6.270
	12-Year Cycle	\$1.559	\$7.569	\$2.262	\$5.201	\$1.519	\$1.456	\$2.857	\$0.998	\$6.828	\$98.330
	35-Year Cycle										\$0.000
	45-Year Cycle										\$0.000
Subtotal - Equip Communication		\$1.767	\$8.029	\$2.550	\$5.355	\$1.878	\$1.845	\$3.253	\$1.279	\$6.953	\$110.720
BA Equipment Other		\$0.082	\$0.048	\$0.128	\$0.036	\$0.000	\$0.000	\$0.000	\$0.000	\$0.000	\$0.655

REPLACEMENT COSTS	Detailed Asset Description	2002	2003	2004	2005	2006	2007	2008	2009	2010	TOTAL
		2002	2003	2004	2005	2006	2007	2008	2009	2010	TOTAL
TOTAL		\$13.519	\$15.716	\$14.561	\$8.807	\$23.815	\$130.166	\$45.131	\$31.195	\$23.514	\$693.735
CUMULATIVE		\$400.8	\$416.5	\$431.1	\$439.9	\$463.7	\$593.9	\$639.0	\$670.2	\$693.7	
5-YEAR ROLLING AVERAGE		\$17.4	\$17.5	\$15.3	\$38.6	\$44.5	\$47.8	\$50.8			
7-YEAR ROLLING AVERAGE		\$16.7	\$17.1	\$34.5	\$36.0	\$38.5	\$39.6				

## TRACK REPLACEMENT

Exhibit E.4 summarizes the replacement costs for trackwork on the Metrorail system. The Exhibit is broken down into two main parts. The first part, on pages 1 and 2, summarizes input data. The first section of the Exhibit summarizes the type of construction, percentage of trackage by curvature group, and total construction cost of each segment of the system. Data through Wheaton are shown on page 1 with the remainder of the system on page 2.

The middle section of pages 1 and 2 shows inflation rates used to convert the historical costs in year of expenditure dollars to 1986 constant dollars. This section also shows the third rail factor of 71% which was used to compute the net cost for revenue track for the new sections of the system. Factors for 1973 through 1988 are shown on page 1 and factors for 1989 through 2000 are shown on page 2.

The last section of pages 1 and 2 summarizes costs in 1986 constant dollars for each type of construction and curvature. These costs are summarized by year, based on the year of capitalization for the current system and the anticipated construction schedule for the remainder of the system. Costs for 1973 through 1988 are shown on page 1 and costs for 1989 through 2000 with a total are shown on page 2.

The second part of the Exhibit includes the results of the analysis which are shown on pages 3, 4, and 5. The total replacement cost is shown for each type of construction and curvature group, plus a total for the system. Both 5-year and 7-year rolling averages are also shown on the Exhibit. Results for 1973 through 1988 are summarized on page 3, 1989 through 2004 on page 4, and 2005 through 2015 on page 5.

Input Data

From To	Rh Isl Un Sta	Un Sta Farr N	Farr N Dupont	Airprt St/Arm	Rh Isl Sil Sp	St/Arm N Carr	Roslyn Balstn	St/Arm Addisn	Dupont V Ness	Pent L'Enft	L'Enft Galiry	Airprt Hunt	V Ness Grov	Grov Shady	Balstn Vienna	Sil Sp Wheatn
Year	1977	1977	1977	1978	1978	1979	1980	1981	1982	1983	1983	1984	1985	1985	1986	1989
Type	SUR	SSH	SSH	SSH	SUR	SUR	SSR	SSR	SSH	SSR	SSH	SUR	SSH	SUR	SUR	SSR
% Tangent	40	54	78	53	44	58	68	61	75	56	79	40	58	66	66	40
% Curve 1	6	16	0	19	0	0	12	2	0	30	0	17	4	0	1	5
% Curve 2	5	24	0	12	0	5	0	0	0	0	0	3	5	0	2	5
% Curve 3	49	6	22	16	56	37	20	37	25	14	21	40	33	34	31	50
Tot Cost	4000	8768	1774	19386	9508	14343	6705	7476	3611	4653	3327	5497	16179	18399	13500	9600

Inflation Factors	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Annual	7.10	9.30	10.20	7.70	7.00	6.60	10.10	10.40	10.30	6.00	4.10	1.80	4.50			
Compound	2.4940	2.3287	2.1305	1.9333	1.7951	1.6777	1.5738	1.4294	1.2948	1.1739	1.1074	1.0638	1.0450			
Third Rail Factor														0.71	0.71	0.71

Summarized Costs in 1986 Dollars

Type	Alignment	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
SSH	Tangent	0.000	0.000	0.000	0.000	10.983	17.237	0.000	0.000	0.000	3.179	2.911	0.000	9.806	0.000	0.000	0.000
	Curve 1	0.000	0.000	0.000	0.000	2.518	6.179	0.000	0.000	0.000	0.000	0.000	0.000	0.676	0.000	0.000	0.000
	Curve 2	0.000	0.000	0.000	0.000	3.778	3.903	0.000	0.000	0.000	0.000	0.000	0.000	0.845	0.000	0.000	0.000
	Curve 3	0.000	0.000	0.000	0.000	1.645	5.204	0.000	0.000	0.000	1.060	0.774	0.000	5.579	0.000	0.000	0.000
SSR	Tangent	0.000	0.000	0.000	0.000	0.000	0.000	0.000	6.517	5.905	0.000	2.886	0.000	0.000	0.000	0.000	0.000
	Curve 1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.150	0.194	0.000	1.546	0.000	0.000	0.000	0.000	0.000
	Curve 2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Curve 3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.917	3.582	0.000	0.721	0.000	0.000	0.000	0.000	0.000
SUR	Tangent	0.000	0.000	0.000	0.000	2.872	7.019	13.092	0.000	0.000	0.000	0.000	2.339	12.690	6.326	0.000	0.000
	Curve 1	0.000	0.000	0.000	0.000	0.431	0.000	0.000	0.000	0.000	0.000	0.000	0.994	0.000	0.096	0.000	0.000
	Curve 2	0.000	0.000	0.000	0.000	0.359	0.000	1.129	0.000	0.000	0.000	0.000	0.175	0.000	0.192	0.000	0.000
	Curve 3	0.000	0.000	0.000	0.000	3.518	8.933	8.352	0.000	0.000	0.000	0.000	2.339	6.537	2.971	0.000	0.000
TOTAL		0.000	0.000	0.000	0.000	26.105	48.475	22.573	9.584	9.680	4.239	8.837	5.848	36.134	9.585	0.000	0.000

## Input Data

From To	Gallyr U St	L'Enft Anacos	King V Dorn	Ft Tot Grnbit	Wheatn Binant	V Dorn Fr/Spr	U St Col Ht	Col Ht Ft Tot	Anacos Branch
Year	1991	1991	1991	1993	1994	1994	1995	1997	1998
Type	SSR	SSR	SUR	SUR	SSR	SUR	SSR	SSR	SUR
% Tangent	80	40	45	40	68	59	57	75	60
% Curve 1	0	5	0	17	11	0	30	0	3
% Curve 2	0	5	0	3	0	4	0	0	4
% Curve 3	20	50	55	40	21	37	13	25	33
Tot Cost	6100	8700	9700	26700	9600	9100	2200	2500	22000

Inflation Factors	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Annual Compound Third Rail Factor	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71	0.71

## Summarized Costs in 1986 Dollars

Type	Alignment	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	TOTAL
SSH	Tangent	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	44.117
	Curve 1	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	9.374
	Curve 2	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	8.526
	Curve 3	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	14.261
SSR	Tangent	2.726	0.000	2.471	0.000	0.000	4.635	0.890	0.000	1.331	0.000	0.000	0.000	27.361
	Curve 1	0.341	0.000	0.309	0.000	0.000	0.750	0.469	0.000	0.000	0.000	0.000	0.000	4.758
	Curve 2	0.341	0.000	0.309	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.650
	Curve 3	3.408	0.000	3.089	0.000	0.000	1.431	0.203	0.000	0.444	0.000	0.000	0.000	14.794
SUR	Tangent	0.000	0.000	3.099	0.000	7.583	3.812	0.000	0.000	0.000	9.372	0.000	0.000	68.204
	Curve 1	0.000	0.000	0.000	0.000	3.223	0.000	0.000	0.000	0.000	0.469	0.000	0.000	5.212
	Curve 2	0.000	0.000	0.000	0.000	0.569	0.258	0.000	0.000	0.000	0.625	0.000	0.000	3.307
	Curve 3	0.000	0.000	3.788	0.000	7.583	2.391	0.000	0.000	0.000	5.155	0.000	0.000	51.567
TOTAL		6.816	0.000	13.064	0.000	18.957	13.277	1.562	0.000	1.775	15.620	0.000	0.000	252.131

## Track Replacement Costs

Type	Alignment	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
SSH	Tangent																
	Curve 1								0.756	1.854		2.186	5.364	0.000	2.564	6.291	0.203
	Curve 2										1.133	1.171				3.279	3.388
	Curve 3													0.493	1.561		
SSR	Tangent																
	Curve 1													0.345	0.658		0.464
	Curve 2																0.000
	Curve 3																
SUR	Tangent																
	Curve 1															0.129	0.000
	Curve 2																
	Curve 3																
	Total	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.756	1.854	1.133	3.357	5.364	0.839	4.183	9.699	4.054
5-Year Rolling Average				0.000	0.000	0.000	0.151	0.522	0.749	1.420	2.493	2.509	2.975	4.688	4.828	4.268	5.672
7-Year Rolling Average					0.000	0.108	0.373	0.535	1.014	1.780	1.900	2.498	3.775	4.090	4.294	4.938	4.394
Cumulative Total		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.756	2.609	3.743	7.099	12.463	13.302	17.485	27.183	31.238

## Track Replacement Costs

Type	Alignment	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
SSH	Tangent						22.077	34.647					6.390	5.850		19.710	
	Curve 1	2.564	6.291	0.587	2.564	6.291	0.688	2.564	6.291	0.688	2.564	6.291	0.688	2.564	6.291	0.688	2.564
	Curve 2		0.254		3.846	3.973		0.734		3.846	3.973		0.861		3.846	3.973	
	Curve 3		0.318	0.232		3.102	4.517				0.920	0.672		6.517	5.297		
SSR	Tangent																
	Curve 1		0.998	0.168		1.342	0.102	1.171	0.290		1.574	0.521	1.311	0.465	0.000	1.574	0.998
	Curve 2	0.000		0.000				0.000	0.000	0.102	0.000	0.093			0.000	0.000	0.296
Curve 3			0.575	1.074		0.216						1.022	1.664	4.035		0.626	
SUR	Tangent																
	Curve 1	0.000					0.298	0.000	0.029	0.205	0.000	0.000		0.000		0.967	0.472
	Curve 2									0.108	0.000	0.339					0.053
	Curve 3									1.056	2.680	2.506					0.702
	Total	2.564	7.861	1.562	7.484	14.707	5.822	26.545	41.257	6.004	11.710	10.420	10.273	17.060	19.469	26.912	5.710
5-Year Rolling Average		5.148	4.705	6.835	7.487	11.224	19.163	18.867	18.268	19.187	15.933	11.093	13.786	16.827	15.885	18.674	18.356
7-Year Rolling Average		5.344	6.847	6.293	9.506	15.034	14.769	16.218	16.638	16.004	17.610	16.599	14.550	14.508	16.295	17.016	16.615
Cumulative Total		33.801	41.662	43.224	50.708	65.415	71.237	97.782	139.039	145.043	156.753	167.173	177.446	194.506	213.975	240.887	246.597

## Track Replacement Costs

Type	Alignment	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
SSH	Tangent									22.077	34.647	
	Curve 1	6.291	0.688	2.564	6.291	0.688	2.564	6.291	0.688	2.564	6.291	0.688
	Curve 2	0.861		3.846	3.973		0.861		3.846	3.973		0.861
	Curve 3		1.079	0.788		7.354	5.297				1.079	0.788
SSR	Tangent	13.100	11.868		5.800						5.480	
	Curve 1	1.578	0.511	0.000	1.574	1.110	1.648	0.511	0.000	1.574	1.110	1.648
	Curve 2	0.000	0.268			0.000	0.000	0.000	0.347	0.000	0.314	
	Curve 3	0.429	0.061		0.133		2.958		4.632	3.646		1.977
SUR	Tangent								2.726	6.661	12.425	
	Curve 1	0.000	0.046	0.269	0.141	0.000		0.000		1.531	0.621	0.000
	Curve 2	0.000	0.058					0.000	0.171	0.171	0.614	
	Curve 3	1.961	0.891					1.136	1.671	6.518	4.684	
	Total	24.219	15.471	7.466	17.911	9.153	13.328	7.939	14.081	48.713	67.266	5.961
5-Year Rolling Average		15.956	14.155	14.844	12.666	11.159	12.482	18.643	30.265	28.792		
7-Year Rolling Average		16.737	15.263	13.323	13.641	12.193	16.941	25.484	23.777			
Cumulative Total		270.816	286.287	293.753	311.665	320.818	334.145	342.084	356.164	404.877	472.143	478.104

## RAIL CAR REHABILITATION AND REPLACEMENT

Exhibit E.5 summarizes rail car replacement and rehabilitation using a straight-line average annual cost calculated over the useful life of each fleet component. The Exhibit is broken down into three major sections. The top section summarizes characteristics of each major Metrorail fleet component including the number of vehicles, the year capitalized or placed in service, the rehabilitation and replacement periods, and the rehabilitation and replacement costs and payments. The top portion of the Exhibit also notes the vehicle replacement cost (\$1.1 million), the rehabilitation percentage (32.11%), and the fact that no interest earnings are computed on the accounts.

The middle section of the Exhibit summarizes the rehabilitation costs for each fleet component with a total for the system. The lower section of the Exhibit summarizes the replacement costs for each fleet component. Page 1 of the Exhibit shows the annualized values for 1986 through 2001 while page 2 shows the values for 2002 through 2015.

Fleet Characteristics:

Type	Year	Number	Cum. Fleet	Rehab Life	Total Life	Rehab Year	Repl. Year	Rehab Period	Repl. Period	Rehab Cost	Repl. Cost	Rehab Payment	Repl. Payment		
Rohr	1977	240	240	23	35	2000	2012	13	25	84.770	264.000	6.521	10.560	Initial Year for Sinking Fund:	1988
Rohr	1978	60	300	23	35	2001	2013	14	26	21.193	66.000	1.514	2.538		
Breda	1983	14	314	18	35	2001	2018	14	31	4.945	15.400	0.353	0.497	Replacement Cost:	1.100
Breda	1984	82	396	18	35	2002	2019	15	32	28.963	90.200	1.931	2.819		
Breda	1985	106	502	18	35	2003	2020	16	33	37.440	116.600	2.340	3.533	Rehab Percentage:	32.11
Breda	1986	38	540	18	35	2004	2021	17	34	13.422	41.800	0.790	1.229		
Breda	1987	52	592	18	35	2005	2022	18	35	18.367	57.200	1.020	1.634	Net Income Earnings:	1.000
Breda	1988	68	660	18	35	2006	2023	18	35	24.018	74.800	1.334	2.137		
Breda	1993	30	690	18	35	2011	2028	18	35	10.596	33.000	0.589	0.943		
Breda	1994	30	720	18	35	2012	2029	18	35	10.596	33.000	0.589	0.943		
Breda	1995	30	750	18	35	2013	2030	18	35	10.596	33.000	0.589	0.943		
Breda	1996	35	785	18	35	2014	2031	18	35	12.362	38.500	0.687	1.100		
Breda	1997	35	820	18	35	2015	2032	18	35	12.362	38.500	0.687	1.100		

Rehab Costs	Year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Rohr	1977			6.521	6.521	6.521	6.521	6.521	6.521	6.521	6.521	6.521	6.521	6.521	6.521	6.521	
Rohr	1978			1.514	1.514	1.514	1.514	1.514	1.514	1.514	1.514	1.514	1.514	1.514	1.514	1.514	1.514
Breda	1983			0.353	0.353	0.353	0.353	0.353	0.353	0.353	0.353	0.353	0.353	0.353	0.353	0.353	0.353
Breda	1984			1.931	1.931	1.931	1.931	1.931	1.931	1.931	1.931	1.931	1.931	1.931	1.931	1.931	1.931
Breda	1985			2.340	2.340	2.340	2.340	2.340	2.340	2.340	2.340	2.340	2.340	2.340	2.340	2.340	2.340
Breda	1986			0.790	0.790	0.790	0.790	0.790	0.790	0.790	0.790	0.790	0.790	0.790	0.790	0.790	0.790
Breda	1987			1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020	1.020
Breda	1988			1.334	1.334	1.334	1.334	1.334	1.334	1.334	1.334	1.334	1.334	1.334	1.334	1.334	1.334
Breda	1993								0.589	0.589	0.589	0.589	0.589	0.589	0.589	0.589	0.589
Breda	1994								0.589	0.589	0.589	0.589	0.589	0.589	0.589	0.589	0.589
Breda	1995									0.589	0.589	0.589	0.589	0.589	0.589	0.589	0.589
Breda	1996										0.687	0.687	0.687	0.687	0.687	0.687	0.687
Breda	1997											0.687	0.687	0.687	0.687	0.687	0.687
TOTAL		0.000	0.000	15.803	15.803	15.803	15.803	15.803	16.392	16.980	17.569	18.256	18.943	18.943	18.943	18.943	12.422

Replacement Cost	Year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Rohr	1977			10.560	10.560	10.560	10.560	10.560	10.560	10.560	10.560	10.560	10.560	10.560	10.560	10.560	10.560
Rohr	1978			2.538	2.538	2.538	2.538	2.538	2.538	2.538	2.538	2.538	2.538	2.538	2.538	2.538	2.538
Breda	1983			0.497	0.497	0.497	0.497	0.497	0.497	0.497	0.497	0.497	0.497	0.497	0.497	0.497	0.497
Breda	1984			2.819	2.819	2.819	2.819	2.819	2.819	2.819	2.819	2.819	2.819	2.819	2.819	2.819	2.819
Breda	1985			3.533	3.533	3.533	3.533	3.533	3.533	3.533	3.533	3.533	3.533	3.533	3.533	3.533	3.533
Breda	1986			1.229	1.229	1.229	1.229	1.229	1.229	1.229	1.229	1.229	1.229	1.229	1.229	1.229	1.229
Breda	1987			1.634	1.634	1.634	1.634	1.634	1.634	1.634	1.634	1.634	1.634	1.634	1.634	1.634	1.634
Breda	1988			2.137	2.137	2.137	2.137	2.137	2.137	2.137	2.137	2.137	2.137	2.137	2.137	2.137	2.137
Breda	1993								0.943	0.943	0.943	0.943	0.943	0.943	0.943	0.943	0.943
Breda	1994								0.943	0.943	0.943	0.943	0.943	0.943	0.943	0.943	0.943
Breda	1995									0.943	0.943	0.943	0.943	0.943	0.943	0.943	0.943
Breda	1996										1.100	1.100	1.100	1.100	1.100	1.100	1.100
Breda	1997											1.100	1.100	1.100	1.100	1.100	1.100
TOTAL		0.000	0.000	24.948	24.948	24.948	24.948	24.948	25.891	26.834	27.777	28.877	29.977	29.977	29.977	29.977	29.977

Rehab + Replacement		0.000	0.000	40.751	40.751	40.751	40.751	40.751	42.283	43.814	45.346	47.133	48.919	48.919	48.919	48.919	42.399
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Fleet Characteristics:

Type	Year	Number
Rohr	1977	240
Rohr	1978	60
Breda	1983	14
Breda	1984	82
Breda	1985	106
Breda	1986	38
Breda	1987	52
Breda	1988	68
Breda	1993	30
Breda	1994	30
Breda	1995	30
Breda	1996	35
Breda	1997	35

Rehab Costs	Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Rohr	1977	2000													
Rohr	1978	2001													
Breda	1983	2001													
Breda	1984	2002	1.931												
Breda	1985	2003	2.340	2.340											
Breda	1986	2004	0.790	0.790	0.790										
Breda	1987	2005	1.020	1.020	1.020	1.020									
Breda	1988	2006	-1.334	1.334	1.334	1.334	1.334								
Breda	1993	2011	0.589	0.589	0.589	0.589	0.589	0.589	0.589	0.589	0.589				
Breda	1994	2012	0.589	0.589	0.589	0.589	0.589	0.589	0.589	0.589	0.589	0.589			
Breda	1995	2013	0.589	0.589	0.589	0.589	0.589	0.589	0.589	0.589	0.589	0.589	0.589		
Breda	1996	2014	0.687	0.687	0.687	0.687	0.687	0.687	0.687	0.687	0.687	0.687	0.687	0.687	
Breda	1997	2015	0.687	0.687	0.687	0.687	0.687	0.687	0.687	0.687	0.687	0.687	0.687	0.687	0.687
TOTAL			10.555	8.624	6.284	5.494	4.474	3.140	3.140	3.140	3.140	2.551	1.962	1.374	0.687

Replacement Cost	Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Rohr	1977	2012	10.560	10.560	10.560	10.560	10.560	10.560	10.560	10.560	10.560	10.560			
Rohr	1978	2013	2.538	2.538	2.538	2.538	2.538	2.538	2.538	2.538	2.538	2.538	2.538		
Breda	1983	2018	0.497	0.497	0.497	0.497	0.497	0.497	0.497	0.497	0.497	0.497	0.497	0.497	0.497
Breda	1984	2019	2.819	2.819	2.819	2.819	2.819	2.819	2.819	2.819	2.819	2.819	2.819	2.819	2.819
Breda	1985	2020	3.533	3.533	3.533	3.533	3.533	3.533	3.533	3.533	3.533	3.533	3.533	3.533	3.533
Breda	1986	2021	1.229	1.229	1.229	1.229	1.229	1.229	1.229	1.229	1.229	1.229	1.229	1.229	1.229
Breda	1987	2022	1.634	1.634	1.634	1.634	1.634	1.634	1.634	1.634	1.634	1.634	1.634	1.634	1.634
Breda	1988	2023	2.137	2.137	2.137	2.137	2.137	2.137	2.137	2.137	2.137	2.137	2.137	2.137	2.137
Breda	1993	2028	0.943	0.943	0.943	0.943	0.943	0.943	0.943	0.943	0.943	0.943	0.943	0.943	0.943
Breda	1994	2029	0.943	0.943	0.943	0.943	0.943	0.943	0.943	0.943	0.943	0.943	0.943	0.943	0.943
Breda	1995	2030	0.943	0.943	0.943	0.943	0.943	0.943	0.943	0.943	0.943	0.943	0.943	0.943	0.943
Breda	1996	2031	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100
Breda	1997	2032	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100	1.100
TOTAL			29.977	29.977	29.977	29.977	29.977	29.977	29.977	29.977	29.977	29.977	19.417	16.878	16.878

Rehab + Replacement		40.532	38.601	36.261	35.471	34.451	33.116	33.116	33.116	33.116	33.116	32.528	21.379	18.252	17.565
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## APPENDIX F

### RAIL ALLOCATION PARAMETERS

Metrorail operating support is allocated to jurisdiction based on three factors:

- o population density
- o stations in operation
- o ridership

The allocations, based on the above-mentioned factors, for the 1986 budget and the projections for 1993 and 2000 are shown in Exhibit F.1

In addition to the direct operating support, two WMATA programs result in addition support from the local jurisdiction. The first is a reimbursement from the District for the 10 cent reduction in fares for passengers boarding east of the Anacostia River. The second is a reimbursement for half the impact of the "taper and cap" on rail fares. This reimbursement is allocated to jurisdiction based upon the riders benefiting from the discount. Both factors are summarized in Exhibit F.2. Montgomery County has the highest share of this fare support due to longer average Metrorail trip lengths from that jurisdiction.

EXHIBIT F.1

RAIL ALLOCATION STATISTICS

JURISDICTION	RAIL STATIONS				STATION DISTRIBUTION		
	(1) 1985	EARLY 1993	LATE 1993	2000	1985	(2) 1993	2000
DISTRICT	30	36	36	39.5	0.536	0.508	0.482
MONTGOMERY	8.5	10.5	10.5	11.5	0.152	0.148	0.140
PR GEORGES	4.5	4.5	8.5	12	0.080	0.091	0.146
ALEXANDRIA	3	3.5	3.5	3.5	0.054	0.049	0.043
ARLINGTON	9	10	10	10	0.161	0.141	0.122
FFX CITY	0	0	0	0	0.000	0.000	0.000
FAIRFAX CO	1	4.5	4.5	5.5	0.018	0.063	0.067
FALLS CHURCH	0	0	0	0	0.000	0.000	0.000
TOTAL	56	69	73	82	1.000	1.000	1.000

(1) ARLINGTON CEMETERY NOT INCLUDED IN COUNT

(2) 184 DAYS OF PRE-GREENBELT ("EARLY") OPERATION AND  
181 DAYS OF POST-GREENBELT ("LATE") OPERATION

JURISDICTION	RIDERSHIP BY JURIS OF RESIDENCE				OVERALL ALLOCATION FACTOR		
	POP DENSITY	1985 SURVEY	1993	2000	1986 BUDGET	1993	2000
DISTRICT	0.383	0.351	0.363	0.369	0.423	0.418	0.411
MONTGOMERY	0.161	0.193	0.190	0.184	0.181	0.166	0.162
PR GEORGES	0.198	0.153	0.149	0.166	0.143	0.146	0.170
ALEXANDRIA	0.046	0.055	0.047	0.044	0.050	0.048	0.044
ARLINGTON	0.062	0.119	0.104	0.096	0.110	0.102	0.093
FFX CITY	0.006	0.002	0.003	0.002	0.002	0.003	0.003
FAIRFAX CO	0.142	0.124	0.141	0.135	0.089	0.115	0.115
FALLS CHURCH	0.003	0.003	0.004	0.003	0.002	0.002	0.002

## APPENDIX G

### JURISDICTIONAL ALLOCATIONS

WMATA support for the various capital and operating categories was computed on an annual basis for the years 1986 through 2000 and allocated to each jurisdiction. State and Federal aid was computed for two alternative Federal funding scenarios and also allocated by jurisdiction. It should be noted that the assumptions are the same for 1986 under both scenarios. The inputs and outputs of this allocation process are summarized in the following Exhibits, primarily for the six major jurisdictions in the Washington area.

Exhibit G.1 summarizes the basic non-WMATA inputs to the allocation process. The first table is Federal operating assistance, which is assumed to be available under the favorable Federal funding scenario. As noted Chapter VIII, the amount of Federal aid is considered constant in year-of-expenditure dollars or declining in constant dollars by almost half between 1986 and 2000.

The second table is a summary of debt service on the revenue bonds issued to fund the initial segments of the Metrorail system. Since interest on these bonds is a constant amount in year-of-expenditure dollars, the costs decline in constant dollars.

The third table contains additional data required for state aid calculations. The first item is the Federal operating assistance for the other WMATA jurisdictions (Fairfax City and Falls Church) and the second item is the debt service allocation for these jurisdictions. The next two items are estimates of operating expenses for Alexandria's DASH system and Fairfax County's Connector. The fifth item is the assumed total Virginia aid, a uniform amount in constant dollars. The last item is the assumed proportion of Virginia state aid allocated to capital projects (15%), based on recent experience.

The final table includes factors for allocating Federal support to rehabilitation and replacement costs. The first item is the assumed amount of Federal funds available from formula programs under the unfavorable Federal aid policy (Alternative B) which is assumed to decrease in constant dollars. The last item is the assumed Federal aid matching ratio (25%) under the favorable Federal aid scenario (Alternative A).

WMATA cost allocation inputs are summarized in Exhibit G.2. The first two tables on the first page are the rail capital allocations under the favorable and unfavorable Federal funding scenarios. The third table on the first page is the allocated rail operating assistance and the fourth table is the allocated rail fare reimbursement.

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Federal Operating Assistance															
District	7.805	7.541	7.182	6.840	6.514	6.204	5.909	5.627	5.359	5.104	4.861	4.630	4.409	4.199	3.999
Montgomery	2.958	2.858	2.722	2.592	2.469	2.351	2.239	2.133	2.031	1.934	1.842	1.755	1.671	1.591	1.516
Pr Georges	2.958	2.858	2.722	2.592	2.469	2.351	2.239	2.133	2.031	1.934	1.842	1.755	1.671	1.591	1.516
Fairfax Co	2.407	2.326	2.215	2.109	2.009	1.913	1.822	1.735	1.653	1.574	1.499	1.428	1.360	1.295	1.233
Arlington	1.527	1.475	1.405	1.338	1.274	1.214	1.156	1.101	1.049	0.999	0.951	0.906	0.863	0.822	0.782
Alexandria	0.727	0.702	0.669	0.637	0.607	0.578	0.550	0.524	0.499	0.475	0.453	0.431	0.411	0.391	0.373
Total Major	18.382	17.760	16.915	16.109	15.342	14.612	13.916	13.253	12.622	12.021	11.449	10.903	10.384	9.890	9.419
Revenue Bonds Debt Service															
District	10.085	9.744	9.280	8.838	8.417	8.016	7.635	7.271	6.925	6.595	6.281	5.982	5.697	5.426	5.167
Montgomery	4.434	4.284	4.080	3.886	3.701	3.525	3.357	3.197	3.045	2.900	2.762	2.630	2.505	2.386	2.272
Pr Georges	4.434	4.284	4.080	3.886	3.701	3.525	3.357	3.197	3.045	2.900	2.762	2.630	2.505	2.386	2.272
Fairfax Co	3.093	2.988	2.846	2.711	2.581	2.459	2.341	2.230	2.124	2.023	1.926	1.835	1.747	1.664	1.585
Arlington	2.675	2.585	2.461	2.344	2.233	2.126	2.025	1.929	1.837	1.749	1.666	1.587	1.511	1.439	1.371
Alexandria	1.384	1.337	1.274	1.213	1.155	1.100	1.048	0.998	0.950	0.905	0.862	0.821	0.782	0.745	0.709
Total Major	26.110	25.227	24.026	22.882	21.792	20.754	19.766	18.825	17.928	17.075	16.262	15.487	14.750	14.047	13.378
Special Data for State Aid															
Fed Other	0.124	0.124	0.124	0.124	0.124	0.124	0.124	0.124	0.124	0.124	0.124	0.124	0.124	0.124	0.124
Debt Other	0.079	0.076	0.073	0.069	0.066	0.063	0.060	0.057	0.054	0.052	0.049	0.047	0.045	0.043	0.040
DASH	1.400	1.400	1.400	1.400	1.400	1.500	1.600	1.600	1.600	1.600	1.600	1.700	1.700	1.700	1.700
Connector	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400	2.400
Va Total	31.602	31.602	31.602	31.602	31.602	31.602	31.602	31.602	31.602	31.602	31.602	31.602	31.602	31.602	31.602
Capital %	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Special Data for R & R Support															
R&R Cap - B	30.0	29.0	27.6	26.3	25.0	23.8	22.7	21.6	20.6	19.6	18.7	17.8	16.9	16.1	15.4
R&R Match - A	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Rail Capital - Favorable (A)															
District	14.47	15.90	12.83	15.31	24.08	22.91	21.80	20.75	5.07	0.07	0.62	0.51	0.00	0.00	0.00
Montgomery	9.73	10.41	8.62	6.83	2.49	2.53	2.54	2.52	-0.32	-0.63	-0.28	-0.23	0.00	0.00	0.00
Pr Georges	10.06	10.41	8.92	13.40	22.61	21.31	20.11	19.01	5.82	0.87	1.02	0.84	0.00	0.00	0.00
Fairfax Co	5.70	5.77	4.81	4.93	5.35	5.13	4.91	4.70	0.93	-0.13	0.06	0.05	0.00	0.00	0.00
Arlington	2.09	2.60	1.85	1.99	4.40	4.23	4.05	3.89	0.73	-0.14	0.03	0.02	0.00	0.00	0.00
Alexandria	2.77	2.93	2.46	2.56	2.67	2.55	2.44	2.32	0.51	-0.03	0.05	0.04	0.00	0.00	0.00
Total Major	44.82	48.01	39.48	45.01	61.60	58.65	55.85	53.19	12.74	0.01	1.50	1.23	0.00	0.00	0.00
Rail Capital - Unfavorable (B)															
District	14.47	15.90	12.83	39.06	113.83	108.37	103.18	98.26	35.36	8.12	7.39	6.12	0.00	0.00	0.00
Montgomery	9.73	10.41	8.62	14.89	32.75	31.50	30.18	28.86	10.11	2.20	2.07	1.71	0.00	0.00	0.00
Pr Georges	10.06	10.41	8.92	28.39	79.51	75.29	71.46	67.89	24.77	5.84	5.24	4.33	0.00	0.00	0.00
Fairfax Co	5.70	5.77	4.81	11.46	30.02	28.66	27.33	26.05	9.31	2.11	1.94	1.60	0.00	0.00	0.00
Arlington	2.09	2.60	1.85	7.68	25.86	24.69	23.55	22.45	8.02	1.81	1.67	1.38	0.00	0.00	0.00
Alexandria	2.77	2.93	2.46	5.54	13.90	13.26	12.63	12.04	4.32	0.98	0.90	0.75	0.00	0.00	0.00
Total Major	44.82	48.01	39.48	107.02	295.87	281.76	268.34	255.55	91.89	21.06	19.22	15.88	0.00	0.00	0.00
Rail Operating Assistance															
District	27.861	28.411	27.873	27.486	26.522	31.730	32.124	34.109	36.590	38.144	38.752	40.063	43.055	43.913	43.808
Montgomery	11.933	11.421	11.242	11.488	11.821	13.037	12.696	13.561	14.556	15.388	15.437	15.763	16.703	16.831	16.812
Pr Georges	9.415	9.779	9.601	9.495	9.208	10.372	10.228	12.067	13.718	14.214	14.267	14.577	16.876	18.159	18.134
Fairfax	5.861	8.474	8.321	8.229	7.976	8.970	8.808	9.421	10.517	11.229	11.244	11.461	12.156	12.247	12.209
Arlington	7.259	8.051	7.899	7.781	7.491	8.141	7.885	8.355	8.983	9.248	9.258	9.435	9.939	9.972	9.949
Alexandria	3.270	3.453	3.378	3.322	3.199	3.651	3.647	3.868	4.197	4.334	4.342	4.429	4.687	4.717	4.706
Other	0.330	0.385	0.375	0.369	0.356	0.399	0.387	0.414	0.458	0.476	0.478	0.488	0.521	0.528	0.526
Total	65.928	69.975	68.688	68.168	66.575	76.301	75.776	81.794	89.018	93.033	93.777	96.215	103.937	106.365	106.145
Rail Fare Program Reimbursement															
District	0.316	0.322	0.328	0.334	0.340	0.546	0.752	0.758	0.762	0.767	0.771	0.775	0.765	0.756	0.760
Montgomery	0.733	0.733	0.733	0.826	0.919	0.950	0.990	1.021	1.085	1.150	1.277	1.277	1.277	1.277	1.277
Pr Georges	0.222	0.222	0.222	0.222	0.222	0.222	0.222	0.299	0.299	0.299	0.299	0.299	0.359	0.376	0.418
Fairfax	0.174	0.351	0.395	0.404	0.413	0.421	0.430	0.439	0.517	0.575	0.575	0.575	0.575	0.575	0.575
Arlington	0.017	0.027	0.030	0.031	0.031	0.032	0.033	0.033	0.034	0.035	0.036	0.036	0.037	0.038	0.039
Alexandria	0.059	0.059	0.059	0.059	0.059	0.072	0.085	0.085	0.086	0.087	0.088	0.089	0.090	0.091	0.092
Other	0.004	0.039	0.039	0.039	0.039	0.039	0.039	0.039	0.041	0.043	0.045	0.048	0.050	0.052	0.054
Total	1.525	1.753	1.806	1.915	2.023	2.282	2.551	2.674	2.825	2.955	3.091	3.099	3.153	3.165	3.215

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Allocated Bus Operating Support															
District	67.957	68.239	68.632	68.314	67.900	67.323	68.300	70.438	70.415	70.650	70.316	69.231	69.968	70.297	70.184
Montgomery	19.577	19.779	19.882	19.793	19.621	19.647	19.624	19.630	19.731	20.166	20.156	20.179	20.174	20.218	20.203
Prince Georges	17.376	17.585	17.632	17.509	17.396	17.273	17.741	18.283	18.119	18.116	18.057	18.474	18.791	18.699	18.641
Fairfax	24.279	22.586	22.698	22.623	22.536	22.614	22.604	22.640	22.609	23.214	23.216	23.299	23.308	23.417	23.414
Arlington	8.090	8.499	8.518	8.458	8.391	8.380	8.327	8.309	8.245	8.207	8.162	8.151	8.109	8.109	8.062
Alexandria	5.751	5.848	5.913	5.919	5.921	5.964	5.976	6.013	5.960	5.925	5.886	5.871	5.834	5.827	5.786
Other	1.112	0.916	0.923	0.913	0.862	0.869	0.867	0.871	0.865	0.863	0.859	0.859	0.855	0.856	0.852
Total	144.142	143.452	144.200	143.528	142.626	142.071	143.438	146.184	145.943	147.142	146.654	146.064	147.039	147.422	147.142
Rehabilitation and Replacement Costs															
Buses	10.246	13.066	13.943	16.786	17.057	19.900	19.900	19.900	19.900	19.900	19.900	19.900	19.900	19.900	19.900
Other Bus	19.411	10.966	28.339	1.262	2.999	3.072	3.257	4.971	6.203	6.224	6.326	4.711	4.774	5.400	4.753
Total Bus	29.657	24.032	42.282	18.048	20.056	22.972	23.157	24.871	26.103	26.124	26.226	24.611	24.674	25.300	24.653
Rail Facilities	10.544	10.835	10.536	12.221	15.430	12.614	14.524	19.588	40.709	48.046	51.589	50.843	54.902	54.492	58.890
Rail Cars	0.000	0.000	40.751	40.751	40.751	40.751	40.751	42.283	43.814	45.346	47.133	48.919	48.919	48.919	48.919
Other Rail Equi	8.193	8.993	10.303	23.631	26.434	27.398	28.421	26.264	33.151	35.559	24.212	22.155	24.511	24.904	25.014
Total Rail	18.737	19.828	61.590	76.603	82.615	80.764	83.696	88.135	117.674	128.951	122.934	121.917	128.332	128.315	132.823

The first table on the second page of Exhibit G.2 shows the allocated bus operating support for the Metrobus system. The final table shows the total rehabilitation and replacement costs for buses, other bus system costs, rail facilities, rail equipment, and the annualized rail car costs.

Various factors for jurisdictional allocation of rehabilitation and replacement costs are summarized in Exhibit G.3. Some of these factors are also required for the various state aid formulas. The first table contains the factors for rail rehabilitation and replacement allocation and are the averages of the rail operating assistance allocations for the past five years.

The second table are the Metrobus mileage-related factors used in the allocation of bus operating costs, which are also used for the allocation of bus rehabilitation and replacement costs. The third table contains the allocated bus operating costs which are used in the state aid calculations.

The third table is an allocation of rail costs, calculated using the same proportions as the rail operating support. These costs are also required as input to the state aid formulas. The final table is simply the sum of the bus operating costs and the "allocated" rail operating costs.

Allocations of total WMATA support without regard to state aid are shown in Exhibit G.4. The first table on the first page shows the allocation of operating assistance, including Metrorail fare reimbursement, under conditions of favorable Federal aid. The second table shows similar allocations under conditions of unfavorable Federal aid. These tables are derived from the bus operating support, rail operating support, and rail fare reimbursement from Exhibit G.2. The first table then reflects a subtraction of the Federal operating assistance from Table G.1.

The third and fourth tables on the first page are allocations of rail rehabilitation and replacement costs under the two alternative Federal funding scenarios. These tables are derived by multiplying the total rail R & R costs from Exhibit G.2 by the rail allocation factors from Exhibit G.3.

The last table on the first page and the first table on the second page are allocations of bus rehabilitation and replacement costs for the two Federal funding scenarios. These tables are derived by multiplying the total bus R & R costs from Exhibit G.2 by the bus allocation factors from Exhibit G.3.

The second and third tables on the second page are simply the sum of the rail and bus tables computed previously. The last two tables are the sum of the operating support and R & R allocations from this Exhibit, the revenue bond debt service from Exhibit G.1, and the rail construction allocations from Exhibit G.2.

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Factors for Rail R & R Allocation															
District	0.4544	0.4470	0.4365	0.4236	0.4130	0.4071	0.4061	0.4099	0.4123	0.4136	0.4152	0.4147	0.4135	0.4131	0.4134
Montgomery	0.1153	0.1326	0.1440	0.1546	0.1658	0.1706	0.1687	0.1696	0.1698	0.1686	0.1665	0.1653	0.1646	0.1635	0.1624
Pr Georges	0.1596	0.1549	0.1494	0.1453	0.1415	0.1400	0.1386	0.1376	0.1394	0.1427	0.1457	0.1488	0.1517	0.1547	0.1583
Fairfax	0.0906	0.0906	0.0973	0.1049	0.1104	0.1145	0.1200	0.1190	0.1177	0.1173	0.1177	0.1182	0.1187	0.1189	0.1182
Arlington	0.1342	0.1262	0.1211	0.1171	0.1143	0.1134	0.1126	0.1103	0.1076	0.1049	0.1025	0.1009	0.0998	0.0985	0.0970
Alexandria	0.0401	0.0433	0.0464	0.0492	0.0498	0.0490	0.0486	0.0484	0.0480	0.0477	0.0474	0.0470	0.0466	0.0462	0.0456
Other	0.0058	0.0055	0.0053	0.0053	0.0053	0.0054	0.0054	0.0053	0.0052	0.0052	0.0051	0.0051	0.0051	0.0051	0.0050

## Bus Mileage Factors

District	0.4380	0.4412	0.4412	0.4413	0.4415	0.4398	0.4375	0.4376	0.4366	0.4351	0.4318	0.4251	0.4254	0.4258	0.4258
Montgomery	0.1426	0.1424	0.1424	0.1424	0.1420	0.1425	0.1432	0.1433	0.1436	0.1440	0.1448	0.1465	0.1465	0.1465	0.1465
Prince Georges	0.1359	0.1391	0.1391	0.1391	0.1393	0.1393	0.1394	0.1393	0.1387	0.1382	0.1391	0.1407	0.1405	0.1403	0.1403
Fairfax	0.1749	0.1677	0.1677	0.1677	0.1680	0.1687	0.1697	0.1697	0.1712	0.1731	0.1741	0.1762	0.1761	0.1761	0.1761
Arlington	0.0570	0.0588	0.0588	0.0588	0.0589	0.0591	0.0594	0.0594	0.0592	0.0590	0.0594	0.0601	0.0601	0.0601	0.0601
Alexandria	0.0450	0.0453	0.0453	0.0453	0.0454	0.0455	0.0458	0.0458	0.0457	0.0455	0.0458	0.0463	0.0463	0.0463	0.0463
Other	0.0066	0.0055	0.0055	0.0054	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050	0.0051	0.0051	0.0051	0.0051

## Bus Operating Cost

District	114.428	114.873	115.429	115.275	115.025	114.613	113.629	113.807	113.849	114.149	113.138	111.376	111.436	111.828	111.777
Montgomery	27.129	26.910	27.049	26.996	26.860	26.923	26.936	26.979	27.109	27.326	27.345	27.397	27.421	27.494	27.508
Prince Georges	26.238	26.536	26.672	26.640	26.618	26.587	26.471	26.428	26.337	26.408	26.424	26.476	26.429	26.406	26.418
Fairfax	33.621	31.708	31.859	31.823	31.775	31.892	31.921	31.996	32.374	32.983	32.988	33.074	33.086	33.199	33.199
Arlington	12.996	13.450	13.513	13.498	13.476	13.510	13.501	13.528	13.505	13.508	13.504	13.533	13.532	13.573	13.567
Alexandria	9.873	9.953	10.000	9.989	9.973	9.999	9.993	10.013	9.997	10.000	9.998	10.021	10.021	10.052	10.048
Other	1.440	1.194	1.199	1.184	1.121	1.126	1.123	1.125	1.123	1.123	1.123	1.126	1.126	1.129	1.129
Total	225.725	224.624	225.723	225.404	224.847	224.651	223.573	223.876	224.293	225.498	224.522	223.003	223.051	223.680	223.646

## \*Allocated\* Rail Costs

District	79.698	81.818	81.446	81.837	81.528	82.142	96.787	99.350	102.631	105.621	108.199	111.397	116.525	119.532	120.363
Montgomery	34.135	32.889	32.849	34.204	36.338	37.858	38.253	39.500	40.828	42.608	43.101	43.829	45.206	45.814	46.192
Pr Georges	26.930	28.162	28.054	28.271	28.306	30.119	30.816	35.148	38.476	39.358	39.836	40.532	45.674	49.428	49.824
Fairfax	16.766	24.404	24.315	24.500	24.518	26.049	26.536	27.439	29.498	31.092	31.394	31.867	32.899	33.336	33.543
Arlington	20.764	23.186	23.081	23.167	23.028	23.642	23.758	24.335	25.195	25.606	25.850	26.235	26.900	27.144	27.334
Alexandria	9.354	9.944	9.869	9.892	9.834	10.603	10.988	11.266	11.771	12.000	12.124	12.315	12.684	12.841	12.930
Other	0.943	1.109	1.097	1.099	1.096	1.158	1.166	1.205	1.284	1.319	1.334	1.356	1.411	1.437	1.446
Total	188.589	201.511	200.712	202.969	204.648	221.571	228.304	238.243	249.683	257.605	261.839	267.532	281.298	289.532	291.633

## Bus and Rail Costs

District	194.126	196.691	196.876	197.112	196.553	206.755	210.416	213.157	216.480	219.770	221.338	222.774	227.961	231.360	232.140
Montgomery	61.264	59.799	59.898	61.200	63.199	64.781	65.188	66.479	67.937	69.935	70.446	71.226	72.626	73.307	73.699
Pr Georges	53.168	54.698	54.726	54.911	54.924	56.707	57.287	61.576	64.813	65.767	66.260	67.008	72.102	75.835	76.242
Fairfax	50.387	56.112	56.174	56.323	56.293	57.941	58.457	59.436	61.872	64.075	64.382	64.941	65.985	66.535	66.743
Arlington	33.760	36.636	36.595	36.665	36.504	37.152	37.259	37.862	38.700	39.114	39.355	39.768	40.433	40.717	40.901
Alexandria	19.227	19.897	19.859	19.880	19.806	20.602	20.981	21.279	21.768	22.000	22.123	22.336	22.705	22.892	22.979
Other	2.383	2.302	2.296	2.283	2.216	2.284	2.289	2.330	2.407	2.443	2.457	2.482	2.536	2.566	2.575
Total	414.314	426.135	426.435	428.372	429.495	446.221	451.877	462.119	473.976	483.104	486.360	490.535	504.349	513.213	515.279

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Operating Assistance - A (includes fare reimbursement)															
District	88.329	89.431	89.651	89.294	88.248	93.395	95.268	99.678	102.408	104.457	104.977	105.439	109.379	110.766	110.753
Montgomery	29.285	29.075	29.135	29.514	29.893	31.282	31.071	32.079	33.341	34.769	35.028	35.464	36.483	36.734	36.777
Pr Georges	24.055	24.728	24.733	24.634	24.357	25.516	25.951	28.516	30.104	30.695	30.781	31.595	34.354	35.643	35.677
Fairfax Co	27.907	29.086	29.200	29.145	28.916	30.092	30.020	30.764	31.990	33.443	33.536	33.907	34.679	34.943	34.964
Arlington	13.839	15.102	15.042	14.931	14.639	15.340	15.090	15.596	16.213	16.491	16.505	16.717	17.223	17.297	17.267
Alexandria	8.353	8.658	8.681	8.663	8.572	9.109	9.157	9.441	9.743	9.870	9.864	9.957	10.200	10.244	10.212
Total Major	191.767	196.079	196.442	196.181	194.625	204.735	206.557	216.075	223.800	229.726	230.691	233.080	242.318	245.627	245.650
Operating Assistance - B (includes fare reimbursement)															
District	88.329	96.972	96.833	96.133	94.762	99.599	101.177	105.306	107.767	109.561	109.839	110.069	113.788	114.965	114.752
Montgomery	29.285	31.933	31.857	32.106	32.362	33.634	33.310	34.212	35.372	36.704	36.870	37.219	38.154	38.326	38.292
Pr Georges	24.055	27.586	27.455	27.226	26.826	27.867	28.191	30.649	32.135	32.630	32.624	33.350	36.025	37.234	37.193
Fairfax Co	27.907	31.411	31.414	31.255	30.925	32.006	31.842	32.500	33.643	35.017	35.035	35.335	36.039	36.238	36.198
Arlington	13.839	16.577	16.447	16.269	15.914	16.554	16.246	16.697	17.261	17.489	17.456	17.623	18.086	18.118	18.049
Alexandria	8.353	9.360	9.350	9.300	9.179	9.687	9.707	9.965	10.242	10.346	10.316	10.388	10.610	10.635	10.584
Total Major	191.767	213.840	213.357	212.290	209.967	219.346	220.472	229.328	236.422	241.747	242.139	243.983	252.702	255.517	255.069
Rail Replacement - A															
District	2.129	2.216	6.721	8.113	8.530	8.220	8.498	9.032	12.129	13.333	12.761	12.639	13.266	13.250	13.726
Montgomery	0.540	0.657	2.217	2.960	3.425	3.445	3.531	3.736	4.996	5.436	5.116	5.038	5.281	5.246	5.393
Pr Georges	0.748	0.768	2.300	2.782	2.922	2.826	2.899	3.031	4.100	4.602	4.478	4.536	4.867	4.964	5.256
Fairfax Co	0.424	0.449	1.499	2.009	2.279	2.312	2.511	2.622	3.464	3.782	3.617	3.602	3.808	3.815	3.927
Arlington	0.629	0.625	1.864	2.243	2.361	2.290	2.355	2.429	3.165	3.382	3.149	3.075	3.201	3.158	3.221
Alexandria	0.188	0.215	0.714	0.943	1.028	0.989	1.017	1.066	1.412	1.536	1.455	1.434	1.497	1.482	1.515
Total Major	4.684	4.957	15.398	19.151	20.654	20.191	20.924	22.034	29.419	32.238	30.733	30.479	32.083	32.079	33.206
Rail Replacement - B															
District	2.129	3.006	22.905	25.043	27.130	26.714	27.998	30.381	42.239	47.150	45.280	45.038	47.718	47.945	49.994
Montgomery	0.540	0.891	7.557	9.138	10.891	11.197	11.633	12.567	17.400	19.223	18.154	17.952	18.996	18.984	19.642
Pr Georges	0.748	1.042	7.838	8.588	9.291	9.184	9.552	10.195	14.278	16.273	15.889	16.162	17.505	17.961	19.145
Fairfax Co	0.424	0.609	5.108	6.201	7.250	7.514	8.274	8.819	12.064	13.375	12.833	12.835	13.698	13.804	14.301
Arlington	0.629	0.848	6.354	6.923	7.508	7.441	7.760	8.171	11.021	11.959	11.173	10.958	11.513	11.428	11.731
Alexandria	0.188	0.291	2.434	2.911	3.271	3.214	3.352	3.585	4.916	5.433	5.164	5.109	5.383	5.362	5.518
Total Major	4.684	6.724	52.476	59.115	65.686	65.615	68.942	74.112	102.454	114.003	109.052	108.609	115.402	116.075	120.942
Bus Replacement - A															
District	3.247	2.651	4.664	1.991	2.213	2.526	2.533	2.721	2.849	2.842	2.831	2.615	2.624	2.693	2.624
Montgomery	1.058	0.856	1.506	0.642	0.712	0.819	0.829	0.891	0.937	0.940	0.949	0.902	0.904	0.926	0.903
Pr Georges	1.007	0.835	1.470	0.628	0.698	0.800	0.807	0.866	0.905	0.903	0.912	0.866	0.867	0.887	0.864
Fairfax Co	1.297	1.008	1.773	0.757	0.842	0.969	0.982	1.055	1.117	1.130	1.142	1.084	1.086	1.114	1.085
Arlington	0.422	0.353	0.621	0.265	0.295	0.339	0.344	0.369	0.387	0.386	0.389	0.370	0.371	0.380	0.370
Alexandria	0.334	0.272	0.479	0.204	0.228	0.262	0.265	0.285	0.298	0.297	0.300	0.285	0.286	0.293	0.285
Total Major	7.414	6.008	10.571	4.512	5.014	5.743	5.789	6.218	6.526	6.531	6.556	6.153	6.169	6.325	6.163

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
<b>Bus Replacement - B</b>															
District	3.247	3.596	10.497	4.079	5.273	6.278	6.651	7.555	9.048	9.335	9.251	8.554	8.787	9.111	9.010
Montgomery	1.058	1.161	3.389	1.316	1.697	2.035	2.177	2.473	2.975	3.089	3.102	2.949	3.026	3.134	3.099
Pr Georges	1.007	1.133	3.308	1.286	1.664	1.989	2.120	2.405	2.875	2.966	2.979	2.832	2.903	3.002	2.968
Fairfax Co	1.297	1.367	3.990	1.551	2.007	2.408	2.579	2.930	3.547	3.713	3.730	3.545	3.638	3.768	3.726
Arlington	0.422	0.479	1.398	0.543	0.703	0.843	0.902	1.025	1.228	1.267	1.272	1.209	1.241	1.285	1.271
Alexandria	0.334	0.369	1.078	0.419	0.542	0.650	0.696	0.790	0.947	0.977	0.981	0.932	0.957	0.991	0.980
Total Major	7.414	8.150	23.791	9.245	11.946	14.275	15.201	17.265	20.724	21.453	21.423	20.124	20.657	21.400	21.162
<b>Total Replacement - A</b>															
District	5.376	4.867	11.385	10.104	10.744	10.746	11.030	11.753	14.978	16.175	15.592	15.254	15.890	15.943	16.350
Montgomery	1.598	1.513	3.723	3.603	4.137	4.264	4.360	4.627	5.933	6.376	6.066	5.940	6.185	6.173	6.296
Pr Georges	1.755	1.603	3.770	3.410	3.620	3.626	3.706	3.897	5.005	5.505	5.390	5.401	5.734	5.851	6.121
Fairfax Co	1.721	1.456	3.271	2.766	3.122	3.281	3.494	3.677	4.581	4.933	4.758	4.686	4.895	4.929	5.012
Arlington	1.051	0.979	2.486	2.508	2.656	2.629	2.699	2.799	3.551	3.767	3.538	3.445	3.571	3.538	3.591
Alexandria	0.522	0.487	1.193	1.148	1.256	1.251	1.282	1.350	1.710	1.834	1.756	1.719	1.782	1.775	1.800
Total Major	12.022	10.905	25.828	23.538	25.534	25.797	26.572	28.103	35.758	38.569	37.099	36.445	38.057	38.208	39.170
<b>Total Replacement - B</b>															
District	5.376	6.602	33.402	29.123	32.403	32.992	34.649	37.935	51.288	56.485	54.531	53.592	56.504	57.056	59.004
Montgomery	1.598	2.052	10.945	10.455	12.588	13.231	13.810	15.041	20.376	22.312	21.256	20.901	22.022	22.118	22.741
Pr Georges	1.755	2.175	11.147	9.874	10.956	11.173	11.672	12.600	17.153	19.239	18.868	18.994	20.408	20.963	22.113
Fairfax Co	1.721	1.976	9.097	7.751	9.256	9.922	10.853	11.749	15.611	17.088	16.563	16.380	17.336	17.572	18.027
Arlington	1.051	1.327	7.752	7.467	8.211	8.284	8.663	9.197	12.249	13.226	12.445	12.168	12.755	12.714	13.002
Alexandria	0.522	0.661	3.512	3.330	3.813	3.864	4.048	4.375	5.863	6.410	6.145	6.041	6.340	6.353	6.498
Total Major	12.022	14.793	75.856	68.000	77.227	79.467	83.695	90.896	122.539	134.760	129.808	128.077	135.366	136.776	141.386
<b>Total WMATA Non-Federal Share - A</b>															
District	118.260	119.945	123.143	123.545	131.488	135.066	135.736	139.452	129.378	127.299	127.474	127.186	130.966	132.135	132.271
Montgomery	45.047	45.278	45.560	43.830	40.218	41.598	41.324	42.427	42.003	43.417	43.574	43.893	45.173	45.293	45.344
Pr Georges	40.308	41.026	41.504	45.333	54.292	53.982	53.133	54.619	43.980	39.972	39.557	40.472	42.595	43.882	44.073
Fairfax Co	38.421	39.299	40.129	39.547	39.969	40.959	40.768	41.372	39.629	40.248	40.276	40.475	41.321	41.536	41.561
Arlington	19.655	21.264	21.839	21.773	23.926	24.324	23.864	24.209	22.329	21.870	21.740	21.772	22.306	22.274	22.229
Alexandria	13.029	13.410	13.604	13.582	13.654	14.011	13.925	14.111	12.911	12.576	12.531	12.538	12.764	12.763	12.721
Total Major	274.720	280.221	285.781	287.610	303.547	309.941	308.748	316.190	290.231	285.383	285.552	286.246	295.124	297.683	298.199
<b>Total WMATA Non-Federal Share - B</b>															
District	118.260	129.221	152.343	173.153	249.409	248.974	246.643	242.768	201.336	186.763	178.043	175.758	175.990	177.448	178.924
Montgomery	45.047	48.675	55.505	61.336	81.401	81.890	80.660	81.310	68.907	64.113	62.962	62.465	62.661	62.829	63.305
Pr Georges	40.308	44.456	51.603	69.384	120.993	117.860	114.679	114.344	77.104	60.611	59.494	59.307	58.941	60.585	61.581
Fairfax Co	38.421	42.144	48.170	53.179	72.784	73.042	72.365	72.527	60.688	56.240	55.467	55.151	55.123	55.474	55.810
Arlington	19.655	23.088	28.511	33.757	52.214	51.653	50.484	50.273	39.367	34.276	33.236	32.753	32.352	32.271	32.422
Alexandria	13.029	14.286	16.592	19.382	28.051	27.910	27.438	27.379	21.374	18.641	18.227	17.998	17.732	17.732	17.792
Total Major	274.720	301.869	352.724	410.192	604.853	601.329	592.270	594.601	468.777	414.645	407.428	403.432	402.818	406.340	409.833

Special calculations for Virginia state aid are summarized in Exhibit G.5. The first table is a single item showing the net available state aid after allocation of the total state aid to cover the debt service on the revenue bonds. Data for both the total state aid and the debt service are taken from Exhibit G.1.

The second table is Metrorail and Metrobus operating support for the Virginia jurisdictions, taken from Exhibit G.2. The third table includes the operating costs for Virginia Metrobus and Metrorail services from Exhibit G.3. Costs for Alexandria and Fairfax County also include the local bus system costs taken from Exhibit G.1

The fourth table shows the allocation of the net state aid to the Virginia jurisdictions based 75% on total WMATA operating support and 25% on total operating costs including local services. The final table is the portion of the total state aid assumed to be allocated to capital requirements, computed as 15% of the total as shown in Exhibit G.1.

Allocation of state support by jurisdiction is summarized in Exhibit G.6. Note that zero values are shown in all categories for the District of Columbia. The first table on the first page is the allocation for debt service, 100% for the Virginia jurisdictions and 75% for the Maryland jurisdictions.

The second and third tables are state operating support for the favorable and unfavorable Federal funding alternatives. The Maryland support is computed by the formula described in Chapter VIII and the Virginia support is computed as the difference between the total support and the capital support as shown in Exhibit G.5.

The last two tables on the first page summarize state support for rehabilitation and replacement costs. The Maryland support is assumed at 75% and the Virginia support is taken from Exhibit G.5 after application to rail construction.

Rail construction support is shown in the first two tables on the second page. Maryland support is assumed at 75% and the Virginia support is taken from Exhibit G.5. The last two tables on the second page summarize the state aid for all WMATA support categories.

The allocation of net WMATA support after allowing for state aid is shown in Exhibit G.7. The tables were obtained by subtracting the state aid shown in Exhibit G.6 from the total allocated support from Exhibit G.1 and G.4.

The first table on the first page shows the local contribution toward debt service. The next two tables show the contributions for operating support under the two alternative Federal funding scenarios.

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Net Avail	24.371	24.616	24.948	25.265	25.567	25.854	26.128	26.389	26.637	26.873	27.098	27.313	27.517	27.712	27.897
Op Support w/o Fare Reimbursement															
Fairfax	30.140	31.060	31.019	30.851	30.512	31.584	31.412	32.061	33.126	34.442	34.460	34.760	35.464	35.663	35.623
Arlington	15.349	16.551	16.417	16.239	15.883	16.522	16.213	16.663	17.227	17.455	17.421	17.586	18.049	18.081	18.011
Alexandria	9.021	9.301	9.291	9.241	9.120	9.615	9.623	9.881	10.157	10.259	10.229	10.300	10.521	10.544	10.493
Other	1.442	1.301	1.299	1.282	1.218	1.268	1.254	1.285	1.323	1.340	1.337	1.346	1.376	1.384	1.378
Sub-Total	55.951	58.213	58.026	57.612	56.732	58.989	58.501	59.889	61.832	63.496	63.446	63.992	65.409	65.672	65.504
Op Cost															
Fairfax	52.787	58.512	58.574	58.723	58.693	60.341	60.857	61.836	64.272	66.475	66.782	67.341	68.385	68.935	69.143
Arlington	33.760	36.636	36.595	36.665	36.504	37.152	37.259	37.862	38.700	39.114	39.355	39.768	40.433	40.717	40.901
Alexandria	20.627	21.297	21.269	21.280	21.206	22.102	22.581	22.879	23.368	23.600	23.723	24.036	24.405	24.592	24.679
Other	2.383	2.302	2.296	2.283	2.216	2.284	2.289	2.330	2.407	2.443	2.457	2.482	2.536	2.566	2.575
Sub-Total	109.556	118.748	118.735	118.950	118.620	121.879	122.986	124.907	128.747	131.632	132.317	133.627	135.759	136.810	137.297
Allocation of Net Support															
Fairfax	12.782	12.785	12.848	12.906	12.993	12.987	13.047	13.051	13.117	13.308	13.347	13.370	13.375	13.417	13.452
Arlington	6.892	7.095	7.094	7.099	7.084	7.090	7.044	7.085	7.094	7.021	7.034	7.055	7.092	7.094	7.103
Alexandria	4.094	4.024	4.044	4.062	4.081	4.151	4.206	4.224	4.211	4.158	4.161	4.170	4.177	4.180	4.181
Other	0.603	0.528	0.530	0.528	0.512	0.514	0.513	0.515	0.516	0.510	0.511	0.511	0.513	0.515	0.515
Sub-Total	24.371	24.432	24.515	24.595	24.670	24.742	24.810	24.875	24.937	24.997	25.053	25.106	25.158	25.206	25.252
Capital Portion															
Fairfax	1.917	1.918	1.927	1.936	1.949	1.948	1.957	1.958	1.967	1.996	2.002	2.005	2.006	2.013	2.018
Arlington	1.034	1.064	1.064	1.065	1.063	1.063	1.057	1.063	1.064	1.053	1.055	1.058	1.064	1.064	1.065
Alexandria	0.614	0.604	0.607	0.609	0.612	0.623	0.631	0.634	0.632	0.624	0.624	0.626	0.626	0.627	0.627
Other	0.091	0.079	0.079	0.079	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077	0.077
Sub-Total	3.656	3.665	3.677	3.689	3.700	3.711	3.722	3.731	3.741	3.749	3.758	3.766	3.774	3.781	3.788

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
<b>Debt Service</b>															
District	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Montgomery	3.326	3.213	3.060	2.914	2.776	2.643	2.518	2.398	2.283	2.175	2.071	1.973	1.879	1.789	1.704
Pr Georges	3.329	3.217	3.063	2.918	2.779	2.646	2.520	2.400	2.286	2.177	2.073	1.975	1.881	1.791	1.706
Fairfax	3.093	2.988	2.846	2.711	2.581	2.459	2.341	2.230	2.124	2.023	1.926	1.835	1.747	1.664	1.585
Arlington	2.675	2.585	2.461	2.344	2.233	2.126	2.025	1.929	1.837	1.749	1.666	1.587	1.511	1.439	1.371
Alexandria	1.384	1.337	1.274	1.213	1.155	1.100	1.048	0.998	0.950	0.905	0.862	0.821	0.782	0.745	0.709
Major Juris	13.807	13.340	12.705	12.100	11.523	10.975	10.452	9.954	9.480	9.029	8.599	8.190	7.800	7.428	7.074
<b>Operating Support - A</b>															
District	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Montgomery	20.755	20.281	20.420	21.006	21.848	22.529	22.766	23.330	23.953	24.775	25.035	25.394	25.982	26.297	26.501
Pr Georges	17.720	18.368	18.481	18.647	18.745	19.502	19.803	21.492	22.782	23.212	23.466	23.812	25.785	27.245	27.454
Fairfax	10.865	10.867	10.921	10.970	11.044	11.039	11.090	11.093	11.149	11.311	11.345	11.364	11.369	11.404	11.435
Arlington	5.858	6.031	6.030	6.034	6.022	6.026	5.988	6.023	6.030	5.968	5.979	5.997	6.029	6.030	6.038
Alexandria	3.480	3.421	3.437	3.452	3.469	3.529	3.575	3.590	3.579	3.534	3.537	3.545	3.550	3.553	3.554
Major Juris	58.677	58.968	59.289	60.110	61.127	62.625	63.222	65.528	67.493	68.800	69.362	70.112	72.714	74.529	74.981
<b>Operating Support - B</b>															
District	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Montgomery	20.755	22.425	22.462	22.950	23.700	24.293	24.446	24.930	25.476	26.225	26.417	26.710	27.235	27.490	27.637
Pr Georges	17.720	20.512	20.522	20.592	20.596	21.265	21.483	23.091	24.305	24.663	24.848	25.128	27.038	28.438	28.591
Fairfax	10.865	10.867	10.921	10.970	11.044	11.039	11.090	11.093	11.149	11.311	11.345	11.364	11.369	11.404	11.435
Arlington	5.858	6.031	6.030	6.034	6.022	6.026	5.988	6.023	6.030	5.968	5.979	5.997	6.029	6.030	6.038
Alexandria	3.480	3.421	3.437	3.452	3.469	3.529	3.575	3.590	3.579	3.534	3.537	3.545	3.550	3.553	3.554
Major Juris	58.677	63.255	63.372	63.998	64.830	66.152	66.581	68.727	70.540	71.701	72.125	72.744	75.221	76.915	77.254
<b>R &amp; R Support - A</b>															
District	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Montgomery	1.198	1.135	2.792	2.702	3.103	3.198	3.270	3.470	4.450	4.782	4.549	4.455	4.639	4.630	4.722
Pr Georges	1.316	1.202	2.827	2.557	2.715	2.720	2.780	2.923	3.754	4.128	4.042	4.051	4.300	4.388	4.591
Fairfax	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.034	2.127	1.946	1.958	2.006	2.013	2.018
Arlington	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.336	1.190	1.024	1.035	1.064	1.064	1.065
Alexandria	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.124	0.656	0.574	0.584	0.626	0.627	0.627
Major Juris	2.514	2.337	5.620	5.259	5.818	5.918	6.050	6.393	9.697	12.884	12.136	12.082	12.635	12.721	13.023
<b>R &amp; R Support - B</b>															
District	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Montgomery	1.198	1.539	8.209	7.841	9.441	9.923	10.358	11.280	15.282	16.734	15.942	15.676	16.517	16.588	17.056
Pr Georges	1.316	1.631	8.360	7.405	8.217	8.380	8.754	9.450	12.865	14.429	14.151	14.245	15.306	15.722	16.585
Fairfax	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.059	0.404	2.006	2.013	2.018
Arlington	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.064	1.064	1.065
Alexandria	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.626	0.627	0.627
Major Juris	2.514	3.170	16.569	15.246	17.658	18.303	19.112	20.730	28.146	31.163	30.152	30.325	35.519	36.014	37.351

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
<b>Rail Construction Support - A</b>															
District	0.000	0.800	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Montgomery	9.730	10.406	8.622	6.827	2.487	2.528	2.536	2.523	-0.316	-0.628	-0.280	-0.231	0.000	0.000	0.000
Pr Georges	10.060	10.406	8.916	13.399	22.610	21.311	20.114	19.005	5.823	0.870	1.021	0.842	0.000	0.000	0.000
Fairfax	1.917	1.918	1.927	1.936	1.949	1.948	1.957	1.958	0.934	-0.131	0.056	0.047	0.000	0.000	0.000
Arlington	1.034	1.064	1.064	1.065	1.063	1.063	1.057	1.063	0.728	-0.137	0.031	0.024	0.000	0.000	0.000
Alexandria	0.614	0.604	0.607	0.609	0.612	0.623	0.631	0.634	0.508	-0.033	0.050	0.042	0.000	0.000	0.000
Major Juris	23.355	24.397	21.136	23.836	28.721	27.473	26.295	25.183	7.677	-0.059	0.878	0.724	0.000	0.000	0.000
<b>Rail Construction Support - B</b>															
District	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Montgomery	9.730	10.406	8.622	14.889	32.751	31.501	30.183	28.861	10.114	2.197	2.074	1.714	0.000	0.000	0.000
Pr Georges	10.060	10.406	8.916	28.394	79.506	75.291	71.456	67.895	24.767	5.840	5.238	4.330	0.000	0.000	0.000
Fairfax	1.917	1.918	1.927	1.936	1.949	1.948	1.957	1.958	1.967	1.996	1.943	1.602	0.000	0.000	0.000
Arlington	1.034	1.064	1.064	1.065	1.063	1.063	1.057	1.063	1.064	1.053	1.055	1.058	0.000	0.000	0.000
Alexandria	0.614	0.604	0.607	0.609	0.612	0.623	0.631	0.634	0.632	0.624	0.624	0.626	0.000	0.000	0.000
Major Juris	23.355	24.397	21.136	46.893	115.881	110.427	105.283	100.410	38.545	11.710	10.934	9.330	0.000	0.000	0.000
<b>Total Support - A</b>															
District	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Montgomery	35.009	35.035	34.895	33.449	30.213	30.899	31.090	31.721	30.370	31.104	31.376	31.590	32.499	32.715	32.926
Pr Georges	32.425	33.193	33.288	37.522	46.848	46.179	45.218	45.820	34.644	30.387	30.603	30.680	31.966	33.424	33.750
Fairfax	15.875	15.773	15.694	15.617	15.575	15.445	15.388	15.281	15.240	15.330	15.273	15.204	15.123	15.081	15.037
Arlington	9.567	9.680	9.555	9.443	9.317	9.216	9.070	9.014	8.931	8.770	8.700	8.642	8.604	8.533	8.474
Alexandria	5.478	5.361	5.317	5.275	5.236	5.252	5.254	5.222	5.161	5.063	5.023	4.991	4.958	4.925	4.891
Major Juris	98.354	99.042	98.750	101.305	107.189	106.990	106.018	107.058	94.347	90.654	90.975	91.107	93.149	94.678	95.078
<b>Total Support - B</b>															
District	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Montgomery	35.009	37.583	42.353	48.595	68.667	68.361	67.504	67.468	53.156	47.332	46.505	46.073	45.630	45.868	46.397
Pr Georges	32.425	35.765	40.862	59.309	111.098	107.583	104.213	102.836	64.223	47.109	46.310	45.678	44.225	45.951	46.381
Fairfax	15.875	15.773	15.694	15.617	15.575	15.445	15.388	15.281	15.240	15.330	15.273	15.204	15.123	15.081	15.037
Arlington	9.567	9.680	9.555	9.443	9.317	9.216	9.070	9.014	8.931	8.770	8.700	8.642	8.604	8.533	8.474
Alexandria	5.478	5.361	5.317	5.275	5.236	5.252	5.254	5.222	5.161	5.063	5.023	4.991	4.958	4.925	4.891
Major Juris	98.354	104.162	113.782	138.237	209.892	205.856	201.428	199.821	146.712	123.604	121.810	120.588	118.540	120.358	121.680

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Local Debt Service															
District	10.065	9.744	9.280	8.838	8.417	8.016	7.635	7.271	6.925	6.595	6.281	5.982	5.697	5.426	5.167
Montgomery	1.109	1.071	1.020	0.971	0.925	0.881	0.839	0.799	0.761	0.725	0.690	0.658	0.626	0.596	0.568
Pr Georges	1.110	1.072	1.021	0.973	0.926	0.882	0.840	0.800	0.762	0.726	0.691	0.658	0.627	0.597	0.569
Fairfax	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Arlington	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Alexandria	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Major Juris	12.303	11.887	11.321	10.782	10.269	9.780	9.314	8.870	8.448	8.046	7.663	7.298	6.950	6.619	6.304
Local Operating Support - A															
District	88.329	89.431	89.651	89.294	88.248	93.395	95.268	99.678	102.408	104.457	104.977	105.439	109.379	110.766	110.753
Montgomery	8.530	8.794	8.715	8.508	8.045	8.753	8.305	8.749	9.388	9.995	9.992	10.071	10.501	10.438	10.276
Pr Georges	6.335	6.360	6.252	5.987	5.613	6.015	6.148	7.025	7.323	7.483	7.315	7.783	8.569	8.398	8.224
Fairfax	17.042	18.219	18.279	18.175	17.871	19.054	18.930	19.671	20.841	22.132	22.191	22.543	23.310	23.539	23.530
Arlington	7.981	9.071	9.013	8.897	8.618	9.314	9.102	9.573	10.183	10.523	10.527	10.720	11.195	11.267	11.229
Alexandria	4.873	5.237	5.243	5.210	5.103	5.580	5.582	5.851	6.164	6.336	6.326	6.413	6.650	6.691	6.658
Major Juris	133.090	137.112	137.153	136.071	133.498	142.110	143.335	150.547	156.307	160.926	161.329	162.968	169.604	171.099	170.669
Local Operating Support - B															
District	88.329	96.972	96.833	96.133	94.762	99.599	101.177	105.306	107.767	109.561	109.839	110.069	113.788	114.965	114.752
Montgomery	8.530	9.508	9.395	9.157	8.662	9.341	8.965	9.282	9.896	10.478	10.453	10.509	10.919	10.835	10.655
Pr Georges	6.335	7.074	6.933	6.635	6.230	6.602	6.708	7.558	7.831	7.967	7.776	8.222	8.987	8.796	8.602
Fairfax	17.042	20.544	20.494	20.285	19.880	20.967	20.752	21.406	22.494	23.706	23.690	23.970	24.670	24.834	24.763
Arlington	7.981	10.546	10.418	10.235	9.892	10.527	10.256	10.674	11.231	11.522	11.478	11.626	12.057	12.088	12.011
Alexandria	4.873	5.940	5.912	5.847	5.710	6.158	6.132	6.375	6.663	6.811	6.779	6.844	7.060	7.082	7.030
Major Juris	133.090	150.585	149.985	148.292	145.137	153.195	153.892	160.602	165.882	170.045	170.014	171.240	177.481	178.601	177.814
R & R Local - A															
District	5.376	4.867	11.385	10.104	10.744	10.746	11.030	11.753	14.978	16.175	15.592	15.254	15.890	15.943	16.350
Montgomery	0.399	0.378	0.931	0.901	1.034	1.066	1.090	1.157	1.483	1.594	1.516	1.485	1.546	1.543	1.574
Pr Georges	0.439	0.401	0.942	0.852	0.905	0.907	0.927	0.974	1.251	1.376	1.347	1.350	1.433	1.463	1.530
Fairfax	1.721	1.456	3.271	2.766	3.122	3.281	3.494	3.677	3.547	2.786	2.812	2.728	2.888	2.916	2.994
Arlington	1.051	0.979	2.486	2.508	2.656	2.629	2.699	2.799	3.215	2.577	2.514	2.410	2.508	2.474	2.526
Alexandria	0.522	0.487	1.193	1.148	1.256	1.251	1.282	1.350	1.586	1.177	1.181	1.135	1.156	1.148	1.173
Major Juris	9.508	8.568	20.208	18.278	19.717	19.879	20.522	21.710	26.061	25.685	24.963	24.363	25.421	25.487	26.147
R & R Local - B															
District	5.376	6.602	33.402	29.123	32.403	32.992	34.649	37.935	51.288	56.485	54.531	53.592	56.504	57.056	59.004
Montgomery	0.399	0.513	2.736	2.614	3.147	3.308	3.453	3.760	5.094	5.578	5.314	5.225	5.506	5.529	5.685
Pr Georges	0.439	0.544	2.787	2.468	2.739	2.793	2.918	3.150	4.288	4.810	4.717	4.748	5.102	5.241	5.528
Fairfax	1.721	1.976	9.097	7.751	9.256	9.922	10.853	11.749	15.611	17.088	16.504	15.976	15.330	15.559	16.009
Arlington	1.051	1.327	7.752	7.467	8.211	8.284	8.663	9.197	12.249	13.226	12.445	12.168	11.691	11.649	11.937
Alexandria	0.522	0.661	3.512	3.330	3.813	3.864	4.048	4.375	5.863	6.410	6.145	6.041	5.713	5.726	5.871
Major Juris	9.508	11.622	59.287	52.753	59.569	61.163	64.583	70.166	94.392	103.597	99.656	97.751	99.846	100.762	104.035

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Rail Construction Local - A															
District	14.470	15.903	12.827	15.310	24.079	22.908	21.802	20.750	5.067	0.072	0.623	0.510	0.000	0.000	0.000
Montgomery	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pr Georges	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fairfax	3.783	3.850	2.885	2.989	3.401	3.179	2.956	2.743	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Arlington	1.056	1.535	0.785	0.925	3.336	3.165	2.993	2.823	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Alexandria	2.156	2.324	1.850	1.950	2.059	1.929	1.807	1.688	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Major Juris	21.465	23.612	18.348	21.173	32.874	31.182	29.559	28.004	5.067	0.072	0.623	0.510	0.000	0.000	0.000
Rail Construction Local - B															
District	14.470	15.903	12.827	39.059	113.826	108.366	103.183	98.255	35.356	8.122	7.393	6.115	0.000	0.000	0.000
Montgomery	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pr Georges	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fairfax	3.783	3.850	2.885	9.527	28.073	26.707	25.372	24.091	7.343	0.116	0.000	0.000	0.000	0.000	0.000
Arlington	1.056	1.535	0.785	6.612	24.794	23.626	22.495	21.389	6.956	0.758	0.614	0.318	0.000	0.000	0.000
Alexandria	2.156	2.324	1.850	4.929	13.293	12.636	12.004	11.407	3.687	0.357	0.279	0.122	0.000	0.000	0.000
Major Juris	21.465	23.612	18.348	60.127	179.986	171.335	163.053	155.142	53.342	9.354	8.286	6.555	0.000	0.000	0.000
Local Total - A															
District	118.260	119.945	123.143	123.545	131.488	135.066	135.736	139.452	129.378	127.299	127.474	127.186	130.966	132.135	132.271
Montgomery	10.038	10.243	10.665	10.381	10.004	10.700	10.234	10.705	11.633	12.314	12.199	12.213	12.674	12.577	12.418
Pr Georges	7.883	7.833	8.216	7.811	7.444	7.803	7.915	8.799	9.336	9.585	9.354	9.792	10.629	10.458	10.322
Fairfax	22.546	23.525	24.435	23.930	24.394	25.514	25.380	26.091	24.388	24.917	25.003	25.271	26.198	26.455	26.524
Arlington	10.088	11.584	12.284	12.330	14.610	15.108	14.794	15.195	13.398	13.100	13.041	13.130	13.702	13.741	13.755
Alexandria	7.551	8.048	8.287	8.308	8.418	8.760	8.671	8.889	7.750	7.513	7.508	7.547	7.805	7.838	7.831
Major Juris	176.366	181.179	187.031	186.305	196.358	202.951	202.730	209.132	195.883	194.729	194.578	195.139	201.975	203.205	203.120
Local Total - B															
District	118.260	129.221	152.343	173.153	249.409	248.974	246.643	248.768	201.336	180.763	178.043	175.758	175.990	177.448	178.924
Montgomery	10.038	11.092	13.152	12.742	12.734	13.529	13.157	13.842	15.751	16.781	16.457	16.392	17.051	16.961	16.908
Pr Georges	7.883	8.690	10.741	10.076	9.895	10.278	10.466	11.508	12.881	13.502	13.184	13.629	14.716	14.634	14.699
Fairfax	22.546	26.370	32.476	37.563	57.209	57.597	56.977	57.246	45.448	40.910	40.194	39.947	40.000	40.393	40.773
Arlington	10.088	13.408	18.956	24.314	42.897	42.437	41.415	41.259	30.436	25.506	24.537	24.111	23.748	23.738	23.948
Alexandria	7.551	8.924	11.275	14.107	22.815	22.658	22.184	22.157	16.213	13.579	13.203	13.007	12.774	12.808	12.901
Major Juris	176.366	197.707	238.942	271.955	394.960	395.473	390.843	394.780	322.065	291.041	285.618	282.844	284.278	285.982	288.153

The last two tables on the first page summarize local support for rehabilitation and replacement costs. The first two tables on the second page summarize local support for rail construction to complete the Metrorail system. The final two tables summarize local support for all WMATA programs.



## APPENDIX H

### IMPACT OF WMATA SUPPORT ON LOCAL JURISDICTIONS

The impact of WMATA support on the local jurisdictions is summarized in Exhibit H.1. The first two tables on the first page of the Exhibit summarize two primary measures of the local governments' resources and requirements. The first is local government operating expenditures for all non-WMATA services. The second is the total tax base for the major jurisdictions. All figures are expressed in millions of constant 1986 dollars.

The last two tables on the first page show the ratio of total WMATA support from Appendix G to the operating expenditures of the six major jurisdictions. Calculations are shown for both favorable and unfavorable Federal funding scenarios. Under the favorable funding scenario, regional values range from about 4.5% to 5.0%. Jurisdictional values are similar for the District and Montgomery County, somewhat lower for Fairfax County, higher for Prince George's and Alexandria, and about double for Arlington. Under the unfavorable scenario, the values are approximately double on a regional basis and for most jurisdictions during the peak rail construction period in the early 1990's. Thereafter, they decline to a level about one-third higher by the end of the century.

The tables shown on the second and third pages are computed for local shares of allocated costs after adjustment for state aid. The second page shows comparisons to operating budgets while the third page shows comparisons to the tax base. On both pages, the first two tables show the comparisons for WMATA operating assistance while the last two tables show comparisons of support for the sum of operating assistance, debt service, and rehabilitation and replacement costs. Costs for rail construction are not included because of the uncertainties in how these costs will be funded by the different jurisdictions.

The values for the Maryland jurisdictions are much lower than for the other jurisdictions because of the relatively large amount of state aid assumed by applying the existing formulas. The values for the District, of course, are higher than for the other jurisdictions since no state aid is available.

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Local Government Expenditures															
District	2660.7	2685.4	2708.0	2728.6	2746.5	2765.1	2790.8	2816.5	2840.3	2866.6	2893.4	2920.4	2947.1	2974.3	3001.5
Montgomery	886.9	918.6	944.5	969.5	992.8	1006.3	1022.7	1037.0	1057.8	1079.7	1102.2	1122.1	1143.8	1167.2	1192.3
Pr Georges	680.2	680.5	684.9	686.4	691.7	696.0	696.0	704.2	708.8	713.5	719.2	725.3	730.9	736.8	742.8
Fairfax Co	956.5	959.7	996.6	1023.4	1052.1	1082.2	1106.3	1128.3	1151.6	1174.4	1198.1	1222.7	1247.4	1271.6	1296.6
Arlington	230.4	225.6	229.1	228.8	228.8	228.8	229.8	230.0	230.3	230.2	232.3	232.2	234.4	234.8	237.4
Alexandria	184.1	185.6	184.7	186.5	188.5	190.4	193.2	193.4	194.0	194.9	197.9	198.5	201.9	202.5	205.4
Total Major	5598.9	5655.3	5747.7	5825.2	5900.4	5968.8	6038.9	6109.4	6182.8	6259.3	6343.1	6421.2	6505.4	6587.2	6675.9
Total Tax Base															
District	25158	25399	25640	25886	26138	26392	26652	26917	27187	27463	27743	28029	28320	28617	28920
Montgomery	35612	36816	38044	39312	40623	41977	43376	44822	46316	47859	49455	51104	52807	54567	56386
Pr Georges	17946	18380	18817	19265	19723	20193	20674	21167	21671	22186	22715	23255	23809	24376	24956
Fairfax Co	32683	34534	36194	37886	39608	41161	42731	44319	45925	47548	49127	50719	52325	53944	55577
Arlington	10705	10957	11212	11472	11738	12007	12283	12565	12853	13147	13452	13764	14083	14409	14743
Alexandria	6815	6951	7087	7224	7363	7491	7621	7753	7885	8021	8150	8281	8414	8549	8686
Total Major	129119	133038	136994	141045	145193	149222	153336	157542	161837	166225	170641	175152	179758	184463	189269
Total WMATA Non-Federal as % of Operating Expenditures - A															
District	4.4	4.5	4.5	4.5	4.8	4.9	4.9	5.0	4.6	4.4	4.4	4.4	4.4	4.4	4.4
Montgomery	5.1	4.9	4.8	4.5	4.1	4.1	4.0	4.1	4.0	4.0	4.0	3.9	3.9	3.7	3.8
Pr Georges	5.9	6.0	6.1	6.6	7.8	7.8	7.6	7.8	6.2	5.6	5.6	5.6	5.8	6.0	5.9
Fairfax Co	4.0	4.1	4.0	3.9	3.6	3.8	3.7	3.7	3.4	3.4	3.4	3.3	3.3	3.3	3.2
Arlington	6.5	9.4	9.5	9.3	10.5	10.6	10.4	10.5	9.7	9.5	9.4	9.4	9.5	9.5	9.4
Alexandria	7.1	7.2	7.4	7.5	7.2	7.4	7.2	7.3	6.7	6.5	6.3	6.3	6.3	6.3	6.2
Total Major	4.9	5.0	5.0	4.9	5.1	5.2	5.1	5.2	4.7	4.6	4.5	4.5	4.5	4.5	4.5
Total WMATA Non-Federal as % of Operating Expenditures - B															
District	4.4	4.8	5.6	6.3	9.1	9.0	8.8	8.8	7.1	6.7	6.2	6.0	6.0	6.0	6.0
Montgomery	5.1	5.3	5.9	6.3	8.2	8.1	7.9	7.8	6.5	5.9	5.7	5.6	5.5	5.4	5.3
Pr Georges	5.9	6.5	7.5	10.1	17.5	15.9	16.5	16.2	10.9	8.5	8.3	8.2	8.1	8.2	8.3
Fairfax Co	4.0	4.4	4.8	5.2	6.9	6.7	6.5	6.4	5.3	4.8	4.6	4.5	4.4	4.4	4.3
Arlington	6.5	10.2	12.4	14.8	22.8	22.6	22.0	21.9	17.1	14.9	14.3	14.1	13.8	13.7	13.7
Alexandria	7.1	7.7	9.0	10.4	14.9	14.7	14.2	14.2	11.0	9.6	9.2	9.1	8.8	8.8	8.7
Total Major	4.9	5.3	6.1	7.0	10.3	10.1	9.8	9.7	7.6	6.6	6.4	6.3	6.2	6.2	6.1

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Share of Operating Budgets (%)															
Local Operating Assistance - A															
District	3.32	3.33	3.31	3.27	3.21	3.38	3.41	3.54	3.61	3.64	3.63	3.61	3.71	3.72	3.59
Montgomery	0.96	0.96	0.92	0.88	0.81	0.87	0.81	0.84	0.89	0.93	0.91	0.90	0.92	0.89	0.86
Pr Georges	0.93	0.93	0.91	0.87	0.81	0.86	0.88	1.00	1.03	1.05	1.02	1.07	1.17	1.14	1.11
Fairfax	1.78	1.90	1.83	1.78	1.70	1.76	1.71	1.74	1.81	1.88	1.85	1.84	1.87	1.85	1.81
Arlington	3.46	4.02	3.93	3.89	3.77	4.07	3.96	4.16	4.42	4.57	4.53	4.62	4.78	4.80	4.73
Alexandria	2.65	2.82	2.84	2.79	2.71	2.93	2.89	3.03	3.18	3.25	3.20	3.23	3.29	3.30	3.24
Major Juris	2.38	2.42	2.39	2.34	2.26	2.38	2.37	2.46	2.53	2.57	2.54	2.54	2.61	2.60	2.56
Local Operating Assistance - B															
District	3.32	3.51	3.58	3.52	3.45	3.60	3.63	3.74	3.79	3.82	3.80	3.77	3.86	3.87	3.82
Montgomery	0.96	1.04	0.99	0.94	0.87	0.93	0.87	0.90	0.94	0.97	0.95	0.94	0.95	0.93	0.89
Pr Georges	0.93	1.04	1.01	0.96	0.90	0.95	0.96	1.07	1.10	1.12	1.08	1.13	1.23	1.19	1.16
Fairfax	1.78	2.14	2.06	1.98	1.89	1.94	1.88	1.90	1.95	2.02	1.98	1.96	1.98	1.95	1.91
Arlington	3.46	4.67	4.55	4.47	4.32	4.60	4.46	4.64	4.88	5.01	4.94	5.01	5.14	5.15	5.06
Alexandria	2.65	3.20	3.20	3.14	3.03	3.23	3.17	3.30	3.43	3.49	3.43	3.45	3.50	3.50	3.42
Major Juris	2.38	2.66	2.61	2.55	2.46	2.57	2.55	2.63	2.68	2.72	2.68	2.67	2.73	2.71	2.66
Local Total (less rail construction) - A															
District	3.90	3.87	4.07	3.97	3.91	4.06	4.08	4.21	4.38	4.44	4.38	4.34	4.4	4.44	4.41
Montgomery	1.13	1.12	1.13	1.07	1.01	1.06	1.00	1.03	1.10	1.14	1.11	1.09	1.11	1.08	1.04
Pr Georges	1.16	1.15	1.20	1.13	1.08	1.12	1.14	1.25	1.32	1.34	1.30	1.35	1.45	1.42	1.39
Fairfax	1.96	2.05	2.16	2.05	2.00	2.06	2.03	2.07	2.12	2.12	2.09	2.07	2.10	2.08	2.05
Arlington	3.92	4.45	5.02	4.99	4.93	5.22	5.14	5.38	5.82	5.69	5.61	5.65	5.85	5.85	5.79
Alexandria	2.93	3.08	3.49	3.41	3.37	3.59	3.55	3.72	3.99	3.86	3.79	3.80	3.87	3.87	3.81
Major Juris	2.77	2.79	2.93	2.83	2.77	2.88	2.87	2.95	3.09	3.11	3.06	3.03	3.10	3.08	3.04
Local Total (less rail construction) - B															
District	3.90	4.22	5.15	4.91	4.94	5.09	5.14	5.34	5.84	6.02	5.90	5.81	5.97	5.97	5.96
Montgomery	1.13	1.21	1.39	1.31	1.28	1.34	1.29	1.33	1.49	1.55	1.49	1.46	1.49	1.45	1.42
Pr Georges	1.16	1.28	1.57	1.46	1.43	1.48	1.50	1.63	1.82	1.89	1.83	1.88	2.01	1.99	1.98
Fairfax	1.96	2.35	2.97	2.74	2.77	2.85	2.86	2.94	3.31	3.47	3.35	3.27	3.21	3.18	3.14
Arlington	3.92	5.26	7.93	7.74	7.91	8.22	8.23	8.64	10.20	10.75	10.30	10.25	10.13	10.11	10.09
Alexandria	2.93	3.55	5.10	4.92	5.05	5.26	5.27	5.56	6.45	6.78	6.53	6.49	6.33	6.32	6.28
Major Juris	2.77	3.08	3.84	3.64	3.64	3.76	3.77	3.92	4.35	4.50	4.37	4.30	4.37	4.34	4.32

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Share of Tax Base (%)															
Local Operating Assistance - A															
District	0.35	0.35	0.35	0.34	0.34	0.35	0.36	0.37	0.38	0.38	0.38	0.38	0.39	0.39	0.38
Montgomery	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Pr Georges	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.03
Fairfax	0.05	0.05	0.05	0.05	0.05	0.05	0.04	0.04	0.05	0.05	0.05	0.04	0.04	0.04	0.04
Arlington	0.07	0.08	0.08	0.08	0.07	0.08	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Alexandria	0.07	0.08	0.07	0.07	0.07	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Major Juris	0.10	0.10	0.10	0.10	0.09	0.10	0.09	0.10	0.10	0.10	0.09	0.09	0.09	0.09	0.09
Local Operating Assistance - B															
District	0.35	0.38	0.38	0.37	0.36	0.38	0.38	0.39	0.40	0.40	0.40	0.39	0.40	0.40	0.40
Montgomery	0.02	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Pr Georges	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.03	0.04	0.04	0.04	0.03
Fairfax	0.05	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.04
Arlington	0.07	0.10	0.09	0.09	0.08	0.09	0.08	0.08	0.09	0.09	0.09	0.08	0.09	0.08	0.08
Alexandria	0.07	0.09	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Major Juris	0.10	0.11	0.11	0.11	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.09
Local Total (less rail construction) - A															
District	0.41	0.41	0.43	0.42	0.41	0.42	0.43	0.44	0.46	0.46	0.46	0.45	0.46	0.46	0.46
Montgomery	0.03	0.03	0.03	0.03	0.02	0.03	0.02	0.02	0.03	0.03	0.02	0.02	0.02	0.02	0.02
Pr Georges	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Fairfax	0.06	0.06	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Arlington	0.08	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.09
Alexandria	0.08	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.10	0.09	0.09	0.09	0.09	0.09	0.09
Major Juris	0.12	0.12	0.12	0.12	0.11	0.12	0.11	0.11	0.12	0.12	0.11	0.11	0.11	0.11	0.11
Local Total (less rail construction) - B															
District	0.41	0.45	0.54	0.52	0.52	0.53	0.54	0.56	0.61	0.62	0.62	0.61	0.62	0.62	0.62
Montgomery	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.03	0.03	0.03	0.03	0.03
Pr Georges	0.04	0.05	0.06	0.05	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Fairfax	0.06	0.07	0.08	0.07	0.07	0.08	0.07	0.07	0.08	0.09	0.08	0.08	0.08	0.07	0.07
Arlington	0.08	0.11	0.16	0.15	0.15	0.16	0.15	0.16	0.18	0.19	0.18	0.17	0.17	0.16	0.16
Alexandria	0.08	0.09	0.13	0.13	0.13	0.13	0.13	0.14	0.16	0.16	0.16	0.16	0.15	0.15	0.15
Major Juris	0.12	0.13	0.16	0.15	0.15	0.15	0.15	0.15	0.17	0.17	0.16	0.16	0.16	0.16	0.15

## APPENDIX I

### HISTORICAL WMATA ASSISTANCE AND ABILITY-TO-PAY MEASURES

Exhibits I.1 through I.4 summarize gross WMATA assistance allocations and ability-to-pay measures for the years 1980 through 1983 or 1985, depending upon the availability of data. All measures are shown before application of Federal or state assistance.

Exhibit I.1 compares WMATA allocations to personal income of the residents of each jurisdiction. Exhibit I.2 shows allocations compared to total earnings by place of employment. Exhibit I.3 relates the WMATA allocations to taxable property values, including personal property except in the District of Columbia. Exhibit I.4 compares the WMATA allocations to other expenditures of each local jurisdiction.

Exhibits I.5 through I.8 show the same four comparisons for net WMATA assistance allocations, after taking into account Federal and state aid.

EXHIBIT I.1

Metro Transit Assistance Allocations  
(before state and federal aid) As A Percent  
of Personal Income (Residence)  
(in thousands)  
1980-1983

	1980	1981	1982	1983
<b>District of Columbia</b>				
Metro	\$57,592	\$64,885	\$76,905	\$93,553
Personal Income	\$7,772,720	\$8,590,207	\$9,135,320	\$9,766,143
Percent	.741%	.755%	.842%	.958
<b>Montgomery County</b>				
Metro	13,794	19,665	22,720	24,854
Personal Income	8,879,765	10,043,194	10,923,039	11,920,731
Percent	.155	.196	.208	.209
<b>Prince George's County</b>				
Metro	15,743	21,707	25,339	27,185
Personal Income	6,738,757	7,456,814	8,051,848	8,725,359
Percent	.234	.291	.315	.312
<b>Fairfax County</b>				
Metro	15,308	19,401	23,960	28,564
Personal Income	8,393,073	9,589,027	10,655,320	11,636,483
Percent	.182	.202	.225	.246
<b>Arlington County</b>				
Metro	8,839	11,482	13,590	16,272
Personal Income	2,412,435	2,721,870	2,974,431	3,185,310
Percent	.366	.422	.457	.511
<b>Alexandria</b>				
Metro	5,830	6,989	8,306	10,196
Personal Income	1,642,297	1,854,407	2,004,692	2,180,647
Percent	.355	.377	.414	.468
<b>Total Metro</b>				
Total Metro	117,106	144,129	170,820	200,624
Total Personal Income	35,839,047	40,255,519	43,744,650	47,396,673
Percent	.327	.358	.391	.423

Sources: Metro Operating Assistance: Operating Assistance Report, Fiscal Year 1985, WMATA, Appendix C, and special tabulation from WMATA, dated August 13, 1985. Personal Income: Local Area Personal Income, Vol. 3 - Mideast Region, 1978-83, U.S. Department of Commerce, Bureau of Economic Analysis, June 1985.

EXHIBIT I.2

Metro Transit Assistance Allocations  
 (before state and federal aid) As A Percent  
 of Total Earnings (Place of Work)  
 (in thousands)  
 1980-1983

	1980	1981	1982	1983
<b>District of Columbia</b>				
Metro	\$57,592	\$64,885	\$76,905	\$93,553
Earnings	\$13,361,500	\$14,410,004	\$15,181,456	\$16,242,627
Percent	.432%	.450%	.507%	.576%
<b>Montgomery County</b>				
Metro	13,794	19,665	22,720	24,854
Earnings	5,264,385	5,827,797	6,379,410	7,120,721
Percent	.262	.337	.356	.349
<b>Prince George's County</b>				
Metro	15,743	21,707	25,339	27,185
Earnings	3,572,733	3,931,411	4,080,615	4,337,394
Percent	.441	.552	.621	.627
<b>Fairfax County</b>				
Metro	15,308	19,401	23,960	28,564
Earnings	4,043,547	4,652,490	5,218,892	5,987,944
Percent	.379	.417	.459	.477
<b>Arlington County</b>				
Metro	8,839	11,482	13,590	16,272
Earnings	3,085,451	3,449,700	3,872,908	4,313,560
Percent	.287	.333	.351	.377
<b>Alexandria</b>				
Metro	5,830	6,989	8,306	10,196
Earnings	1,179,101	1,328,772	1,486,734	1,628,681
Percent	.494	.526	.559	.626
<b>Total Metro</b>				
Total Metro	117,106	144,129	170,820	200,624
Total Earnings	30,506,717	33,600,174	36,220,015	39,630,927
Percent	.384	.429	.472	.506

EXHIBIT I.3

Metro Transit Assistance Allocations  
(before state and federal aid) As A  
Percent of Taxable Property Values  
(Includes Personal Property\*)  
(in thousands)  
1980-1985

	1980	1981	1982	1983	1984	1985
<b>District of Columbia</b>						
Metro	\$57,592	\$64,885	\$76,905	\$93,553	\$95,145	\$98,416
Property Values	\$11,594,000	\$13,965,000	\$18,000,000	\$20,094,000	\$20,724,000	\$23,421,000
Percent	.497%	.465%	.427%	.466%	.459%	.420%
<b>Montgomery County</b>						
Metro	13,794	19,665	22,720	24,854	26,512	31,048
Property Values	18,874,583	22,083,262	25,137,912	27,941,497	29,135,742	31,960,000
Percent	.073	.089	.090	.089	.091	.098
<b>Prince George's County</b>						
Metro	15,743	21,707	25,339	27,185	28,380	29,170
Property Values	11,103,300	11,693,600	12,823,600	14,390,800	15,725,900	17,007,400
Percent	.142	.186	.198	.189	.180	.172
<b>Fairfax County</b>						
Metro	15,308	19,401	23,960	28,564	31,879	33,952
Property Values	15,343,200	18,136,900	21,918,400	25,246,400	26,860,900	29,764,500
Percent	.100	.107	.109	.113	.119	.114
<b>Arlington County</b>						
Metro	8,839	11,482	13,590	16,272	16,870	17,331
Property Values	5,861,215	6,981,217	7,771,505	7,850,986	8,798,868	9,938,929
Percent	.151	.164	.175	.207	.192	.174
<b>Alexandria</b>						
Metro	5,830	6,989	8,306	10,196	10,557	9,899
Property Values	3,763,067	4,324,447	5,009,305	5,244,185	5,461,953	5,588,318
Percent	.155	.162	.166	.194	.193	.177
<b>Total Metro</b>	117,106	144,129	170,820	200,624	209,343	219,968
Total Property Values	66,539,365	77,184,426	90,660,722	100,767,868	106,707,363	117,680,147
Percent	.176	.187	.188	.199	.196	.187

\*Except District of Columbia.

Sources: Metro Operating Assistance: Operating Assistance Report, Fiscal Year 1985, WMATA, Appendix C, and special tabulation from WMATA, dated August 13, 1985. Property Values: Annual financial reports and official statements of jurisdictions.

**EXHIBIT I.4**

**Metro Transit Assistance Allocations  
(before state and federal aid)  
As A Percent of Total Expenditures  
(in thousands)  
1980-1985**

	1980	1981	1982	1983	1984	1985
<b>District of Columbia</b>						
Metro	\$57,592	\$64,885	\$76,905	\$93,553	\$95,145	\$98,416
Total Expenditures	\$1,836,656	\$1,839,372	\$1,943,618	\$2,190,940	\$2,385,535	\$2,568,717 est.
Percent	3.136%	3.528%	3.957%	4.270%	3.988%	3.831%
<b>Montgomery County</b>						
Metro	13,794	19,665	22,720	24,854	26,512	31,048
Total Expenditures	454,745	506,914	560,120	704,195 <sup>a</sup>	735,782	785,572
Percent	3.033	3.879	4.056	3.529	3.603	3.952
<b>Prince George's County</b>						
Metro	15,743	21,707	25,339	27,185	28,380	29,170
Total Expenditures	334,989	359,511	404,060	596,212 <sup>a</sup>	593,340	631,994
Percent	4.700	6.038	6.271	4.560	4.783	4.616
<b>Fairfax County</b>						
Metro	15,308	19,401	23,960	28,564	31,879	33,952
Total Expenditures	496,882	592,061	655,624	710,131	779,765	835,768
Percent	3.081	3.277	3.655	4.022	4.088	4.062
<b>Arlington County</b>						
Metro	8,839	11,482	13,590	16,272	16,870	17,331
Total Expenditures	152,395	164,914	177,362	199,572	200,716	220,724
Percent	5.800	6.962	7.662	8.153	8.405	7.852
<b>Alexandria</b>						
Metro	5,830	6,989	8,306	10,196	10,557	9,899
Total Expenditures	100,861	120,775	132,871	145,822	164,066	173,179
Percent	5.780	5.787	6.251	6.992	6.435	5.716
<b>Total Metro</b>	117,106	144,129	170,820	200,624	209,343	219,816
Total Expenditures	3,376,528	3,586,547	3,873,655	4,556,872	4,859,204	5,215,954
Percent	3.468	4.019	4.410	4.403	4.308	4.214

<sup>a</sup>Change in accounting.

EXHIBIT I.5  
Metro transit (including debt service) Assistance  
Allocations (after state and federal aid)  
As A Percent of Personal Income (Residence)  
(in thousands)  
1980-1983

	1980	1981	1982	1983
<b>District of Columbia</b>				
Metro	\$45,848	\$53,015	\$67,148	\$85,843
Personal Income	\$7,772,720	\$8,590,207	\$9,135,320	\$9,766,143
Percent	.590%	.617%	.735%	.879
<b>Montgomery County</b>				
Metro	5,029	5,131	5,179	5,287
Personal Income	8,879,765	10,043,194	10,923,039	11,920,731
Percent	.056	.051	.047	.044
<b>Prince George's County</b>				
Metro	6,978	4,692	6,374	6,545
Personal Income	6,738,757	7,456,814	8,051,848	8,725,359
Percent	.104	.063	.079	.075
<b>Fairfax County</b>				
Metro	12,227	16,282	14,731	12,557
Personal Income	8,393,073	9,589,027	10,655,320	11,636,483
Percent	.146	.170	.138	.108
<b>Arlington County</b>				
Metro	7,060	9,787	8,137	9,233
Personal Income	2,412,435	2,721,870	2,974,431	3,185,310
Percent	.293	.360	.274	.290
<b>Alexandria</b>				
Metro	4,656	5,927	4,977	6,007
Personal Income	1,642,297	1,854,407	2,004,692	2,180,647
Percent	.284	.320	.248	.276
<b>Total Metro</b>				
Total Metro	81,798	94,834	106,546	125,472
Total Personal Income	35,839,047	40,255,519	43,744,650	47,396,673
Percent	.228	.236	.244	.265

EXHIBIT I.6

Metro Transit (including debt service) Assistance  
 Allocations (after state and federal aid)  
 As A Percent of Total Earnings (Place of Work)  
 (in thousands)  
 1980-1983

	1980	1981	1982	1983
<b>District of Columbia</b>				
Metro	\$45,848	\$53,015	\$67,148	\$85,843
Earnings	\$13,361,500	\$14,410,004	\$15,181,456	\$16,242,627
Percent	.343%	.368%	.442%	.529%
<b>Montgomery County</b>				
Metro	5,029	5,131	5,179	5,287
Earnings	5,264,385	5,827,797	6,379,410	7,120,721
Percent	.096	.088	.081	.074
<b>Prince George's County</b>				
Metro	6,978	4,692	6,374	6,545
Earnings	3,572,733	3,931,411	4,080,615	4,337,394
Percent	.195	.119	.156	.151
<b>Fairfax County</b>				
Metro	12,227	16,282	14,731	12,557
Earnings	4,043,547	4,652,490	5,218,892	5,987,944
Percent	.302	.350	.282	.210
<b>Arlington County</b>				
Metro	7,060	9,787	8,137	9,233
Earnings	3,085,451	3,449,700	3,872,908	4,313,560
Percent	.229	.284	.210	.214
<b>Alexandria</b>				
Metro	4,656	5,927	4,977	6,007
Earnings	1,179,101	1,328,772	1,486,734	1,628,681
Percent	.395	.446	.335	.369
<b>Total Metro</b>	<b>81,798</b>	<b>94,834</b>	<b>106,546</b>	<b>125,472</b>
<b>Total Earnings</b>	<b>30,506,717</b>	<b>33,600,174</b>	<b>36,220,015</b>	<b>39,630,927</b>
<b>Percent</b>	<b>.268</b>	<b>.282</b>	<b>.294</b>	<b>.317</b>

EXHIBIT I.7

Metro Transit (including debt service) Assistance  
 Allocations (after state and federal aid)  
 As A Percent of Taxable Property Values  
 (in thousands)  
 1980-1985

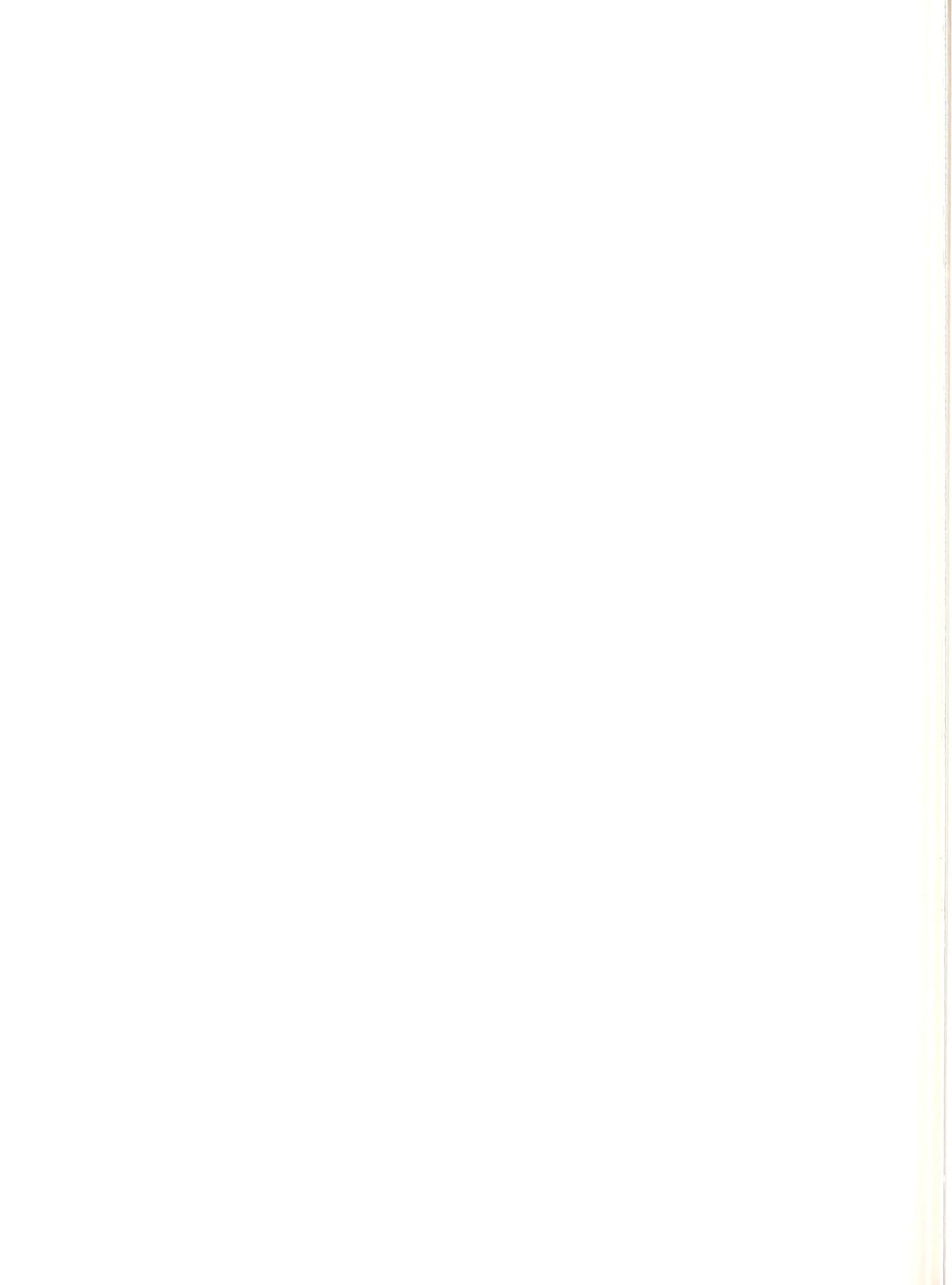
	1980	1981	1982	1983	1984	1985
<b>District of Columbia</b>						
Metro	\$45,848	\$53,015	\$67,148	\$85,843	\$87,340	\$90,611
Property Values	\$11,594,000	\$13,965,000	\$18,000,000	\$20,094,000	\$20,724,000	\$23,421,000
Percent	.395%	.380%	.373%	.427	.421%	.387%
<b>Montgomery County</b>						
Metro	5,029	5,131	5,179	5,287	8,053	8,973
Property Values	18,874,583	22,083,262	25,137,912	27,941,497	29,135,742	31,960,000
Percent	.026	.023	.021	.019	.028	.031
<b>Prince George's County</b>						
Metro	6,978	4,692	6,374	6,545	7,413	6,691
Property Values	11,103,300	11,693,600	12,823,600	14,390,800	15,725,900	17,007,400
Percent	.063	.040	.050	.045	.047	.039
<b>Fairfax County</b>						
Metro	12,227	16,282	14,731	12,557	17,973	16,762
Property Values	15,343,200	18,136,900	21,918,400	25,246,400	26,860,900	29,764,500
Percent	.080	.090	.067	.050	.067	.056
<b>Arlington County</b>						
Metro	7,060	9,787	8,137	9,233	9,554	7,497
Property Values	5,861,215	6,981,217	7,771,505	7,850,986	8,798,868	9,938,929
Percent	.121	.140	.105	.118	.109	.075
<b>Alexandria</b>						
Metro	4,656	5,927	4,977	6,007	5,185	5,308
Property Values	3,763,067	4,324,447	5,009,305	5,244,185	5,461,953	5,588,318
Percent	.124	.137	.099	.115	.095	.095
<b>Total Metro</b>	81,798	94,834	106,546	125,472	135,518	136,842
Total Property Values	66,539,365	77,184,426	90,660,722	100,767,868	106,707,363	117,680,147
Percent	.123	.123	.118	.125	.127	.116

EXHIBIT I.8

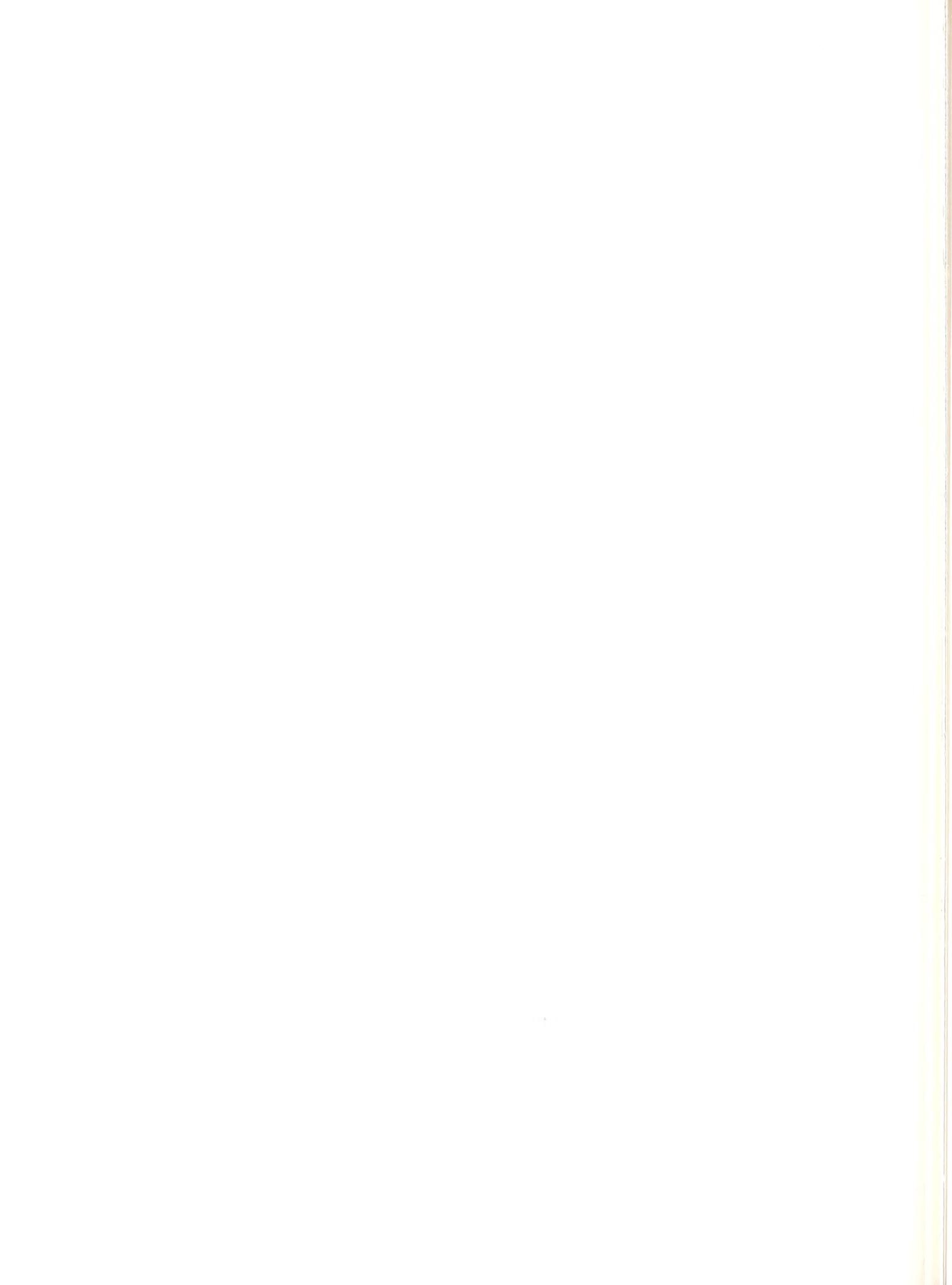
Metro Transit (including debt service) Assistance  
 Allocations (after state and federal aid)  
 As A Percent of Total Operating Expenditures  
 (in thousands)  
 1980-1985

	1980	1981	1982	1983	1984	1985
<b>District of Columbia</b>						
Metro	\$45,848	\$53,015	\$67,148	\$85,843	\$87,340	\$90,611
Total Expenditures	\$1,836,656	\$1,839,372	\$1,943,618	\$2,190,940	\$2,385,535	\$2,568,717 est.
Percent	2.496%	2.882%	3.455%	3.918%	3.661%	3.527%
<b>Montgomery County</b>						
Metro	5,029	5,131	5,179	5,287	8,053	9,973
Total Expenditures	454,745	506,914	560,120	704,195*	735,782	785,572
Percent	1.106	1.012	.925	.751	1.094	1.270
<b>Prince George's County</b>						
Metro	6,978	4,692	6,374	6,545	7,413	6,691
Total Expenditures	334,989	359,511	404,060	596,212*	593,340	631,994
Percent	2.083	1.305	1.577	1.098	1.2249	1.059
<b>Fairfax County</b>						
Metro	12,227	16,282	14,731	12,557	17,973	16,762
Total Expenditures	496,882	592,061	655,624	710,131	779,765	835,768
Percent	2.461	2.750	2.247	1.768	2.305	2.006
<b>Arlington County</b>						
Metro	7,060	9,787	8,137	9,233	9,554	7,497
Total Expenditures	152,395	164,914	177,362	199,572	200,716	220,724
Percent	4.632	5.935	4.588	4.626	4.760	3.397
<b>Alexandria</b>						
Metro	4,656	5,927	4,977	6,007	5,185	5,308
Total Expenditures	100,861	120,775	132,871	145,822	164,066	173,179
Percent	4.616	4.908	3.746	4.119	3.160	3.065
<b>Total Metro</b>	81,798	94,834	106,546	125,472	135,518	136,842
<b>Total Expenditures</b>	3,376,528	3,586,547	3,873,655	4,546,872	4,859,204	5,215,954
<b>Percent</b>	2.423	2.644	2.751	2.760	2.789	2.623

\*Change in accounting.







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