DISTRICT OF COLUMBIA TRANSIT IMPROVEMENTS ALTERNATIVES ANALYSIS

SCREEN 3

MAY 2005

DISTRICT OF COLUMBIA DEPARTMENT OF TRANSPORTATION
WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

TABLE OF CONTENTS

1.0 INTRODUCTION 1-1

1.1 PROJECT BACKGROUND, STUDY AREA, AND PARTICIPANTS 1-1

1.1.1 Study Process 1-1
1.1.2 Relationship to Previous Studies 1-2
1.1.3 Study Area 1-2
1.1.4 Study Participants 1-2

2.0 EVALUATION PROCESS AND CORRIDORS CONSIDERED 2-1

2.1 SCREEN 3 EVALUATION PROCESS 2-1

2.1.1 Project Goals and Evaluation Criteria 2-1
2.1.2 Assumptions for Screen 3 Evaluations 2-2

2.2 CORRIDORS EVALUATED IN SCREEN 3 2-4

2.2.1 Silver Spring to Skyland SE Corridor 2-5
2.2.2 American University to L'Enfant Plaza Corridor 2-6
2.2.3 Minnesota Avenue Metro to Anacostia Streetcar Project Corridor 2-7
2.2.4 Georgetown to Minnesota Avenue Metro Corridor 2-8
2.2.5 Union Station to Forestville Corridor 2-9

3.0 MEASURES OF EFFECTIVENESS 3-1

3.1 GOAL 1: ACCESS AND MOBILITY 3-3

3.1.1 Transit Travel Time 3-5
3.1.2 Accessibility 3-7
3.1.3 Ridership 3-9

3.2 GOAL 2: COMMUNITY AND ECONOMIC DEVELOPMENT 3-11

3.2.1 Support of City Initiatives 3-13
3.2.2 Zoning, Land Use, and Development 3-16
3.2.3 Community Support 3-19

3.3 GOAL 3: SYSTEM PERFORMANCE 3-20

3.3.1 Travel Time Savings 3-24
3.3.2 Person Through-Put 3-27
3.3.3 Cost-Effectiveness 3-30

3.4 GOAL 4: ENVIRONMENTAL QUALITY 3-34

3.4.1 Community Fit 3-36
3.4.2 Environmental Impacts 3-38

4.0 TRANSIT ALTERNATIVES ANALYSIS 4-1

4.1 RESULTS SUMMARY 4-1

4.2 NEXT STEPS 4-10

LIST OF TABLES

Table 2-1 Screen 3 Transit Network Changes from Base Network 2-3
Table 3-1 Project Goals and Related Criteria and Measures of Effectives 3-1
Table 3-2 Rationale for Determining Overall Corridor Ratings 3-2
Table 3-3 Summary of Screen 3: Goal 1 – Access and Mobility Measures 3-4
Table 3-4 Summary of Screen 3: Goal 2 – Community and Economic Development Measures 3-12
Table 3-5 Summary of Public Comment 3-19
Table 3-6 Goal 3: System Performance Ratings 3-20
Table 3-7 Goal 3: System Performance Results 3-21
Table 3-8 Summary of Screen 3: Goal 4 – Environmental Quality Measures 3-33
Table 4-1 Screen 3 Overall Ratings 4-1
Table 4-2 Best Performing Segments (as Streetcar Service) 4-3
Table 4-3 Moderate Performing Segments (for Possible BRT Service) 4-9

LIST OF FIGURES

Figure 1-1 DC's Transit Future Study Process 1-1
Figure 1-2 Corridors Considered in Screen 2 and Screen 3 1-2
Figure 2-1 Screen 3 Evaluation Process 2-1
Figure 2-2 Corridors Considered in Screen 3 2-4
Figure 2-3 Silver Spring to Skyland SE Corridor 2-5
Figure 2-4 American University to L'Enfant Plaza Corridor 2-6
Figure 2-5 Minnesota Avenue Metro to Anacostia Streetcar Project Corridor 2-7
Figure 2-5 Georgetown to Minnesota Avenue Metro Corridor 2-8
Figure 2-6 Union Station to Forestville Corridor 2-9
Figure 3-1 Goal 1: Access and Mobility Ratings 3-3
Figure 3-2 Transit Travel Time Criteria Ratings 3-5
Figure 3-2a Transit Travel Time MOE Ratings 3-6
Figure 3-3 Accessibility Criteria Ratings 3-7
Figure 3-3a Accessibility MOE Ratings 3-8
Figure 3-4 Ridership Ratings 3-9
Figure 3-4a Ridership MOE Ratings 3-10
Figure 3-5 Goal 2: Community and Economic Development Ratings 3-11
Figure 3-6 Support of City Initiatives Criteria Ratings 3-13
Figure 3-6a Support of City Initiatives MOE Ratings 3-15
Figure 3-7 Zoning/Land Use/Development Criteria Ratings 3-16
Figure 3-7a Zoning/Land Use/Development MOE Ratings 3-18
Figure 3-8 Community Support Criteria Ratings 3-19
Figure 3-9 Goal 3: System Performance Ratings - BRT 3-23
Figure 3-10 Goal 3: System Performance Ratings - Streetcar 3-23
Figure 3-11 Travel Time Savings Criteria Ratings - BRT and Streetcar 3-25
Figure 3-11a Travel Time Savings MOE Ratings 3-25
Figure 3-12 Person Through-Put Ratings - BRT 3-27
Figure 3-13 Person Through-Put Ratings - Streetcar 3-27
Figure 3-12a Person Through-Put MOE Ratings - BRT and Streetcar 3-28
Figure 3-13a Person Through-Put MOE Ratings - BRT and Streetcar 3-28
Figure 3-14 System Performance Ratings - BRT 3-30
Figure 3-15 System Performance Ratings - Streetcar 3-30
Figure 3-14a System Performance MOE Ratings - BRT and Streetcar 3-31
Figure 3-15a System Performance Ratings - BRT and Streetcar 3-31
Figure 3-16 Environmental Quality Ratings - BRT 3-34
Figure 3-17 Environmental Quality Ratings - Streetcar 3-34
Figure 3-18 Community Criteria Ratings 3-36
Figure 3-19 Environmental Quality Criteria Ratings - BRT 3-38
Figure 3-20 Environmental Quality Criteria Ratings - Streetcar 3-38
Figure 4-1 Overall Goal Ratings (Assuming BRT Operations) 4-2
Figure 4-2 Overall Goal Ratings (Assuming Streetcar Operations) 4-2
Figure 4-3 Potential Maintenance and Storage Facility Sites 4-4
Figure 4-4 Options for Streetcar System Connectivity 4-5
Figure 4-5 Streetcar System Connectivity Option A 4-6
Figure 4-6 Streetcar System Connectivity Option B 4-6
Figure 4-7 Streetcar System Connectivity Option C 4-7
Figure 4-8 Streetcar System Connectivity Option D 4-7
Figure 4-9 Streetcar System Connectivity Option E 4-9
Figure 4-10 Potential BRT System Segments 4-10
Figure 4-11 Potential Local Bus Enhancement/Rapid Bus Segments 4-11

ACRONYMS

ANC	Advisory Neighborhood Commission
AU	American University
BRT	Bus Rapid Transit
DC	District of Columbia
DCAA	District of Columbia Transit Improvements Alternatives Analysis
DCOP	District of Columbia Office of Planning
DDOT	District of Columbia Department of Transportation
DPW	Department of Public Works
FTA	Federal Transit Administration
GIS	Geographic Information Systems
LOS	Level of Service
MOE	Measures of Effectiveness
MWCOG	Metropolitan Washington Council of Governments
O/D	Origin/Destination
O&M	Operating and Maintenance
PMT	Project Management Team
ROW	Right-of-way
SC	Streetcar
SNAP	Strategic Neighborhood Action Plan
TAZ	Traffic Analysis Zone
TSUB	Transportation System User Benefit
WMATA	Washington Metropolitan Area Transit Authority

1.0 INTRODUCTION

The *District of Columbia Transit Improvements Alternatives Analysis* (DCAA), commonly known as *DC's Transit Future,* is a multi-corridor study of transportation alternatives in the District that is being conducted jointly by the District of Columbia (DC) and the Washington Metropolitan Area Transit Authority (WMATA). The focus of this study is to define a network of efficient, high-quality surface transit across the District, thereby offering additional connections between the existing Metrobus and Metrorail systems, as well as to key activity centers within the city.

The Screen 3 Report is one of many documents that have been prepared during the course of the study, including: *District of Columbia Transit Improvements Alternatives Analysis Needs Assessment (June 2004); District of Columbia Transit Improvements Alternatives Analysis Evaluation Framework (Draft, August 2004); District of Columbia Transit Improvements Alternatives Analysis Screen 1: Modal Screening (Draft, August 2004); District of Columbia Transit Improvements Alternatives Analysis Definition of Alternatives Report (November 2004), and District of Columbia Transit Improvements Alternatives Analysis Screen 2 (Draft, March 2005)*.

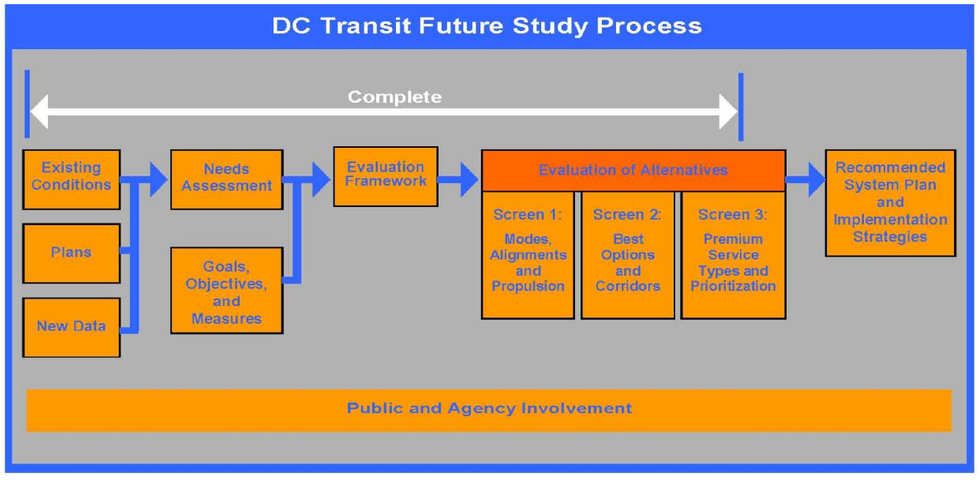
The Screen 3 Report provides a brief project background, a description of the study area, a discussion of the study goals and objectives, and an explanation of the evaluation methodologies used in the Screen 3 process. The findings of the Screen 3 evaluation are also presented, resulting in the identification of potential premium transit service elements to be considered in the development of an overall transit system plan.

1.1 PROJECT BACKGROUND, STUDY AREA, AND PARTICIPANTS

1.1.1 Study Process

Figure 1-1 shows a flow chart summarizing the DCAA study process. The Screen 3 Report builds on work completed during the Needs Assessment and Screen 1 and Screen 2 phases of the project. During the Needs Assessment phase, the need for and purpose of an enhanced surface transit system in the District was documented, the goals and objectives (presented in Section 2.1.1) for the subsequent stages of the evaluation process were established, and priority corridors were also identified for further study in consecutive phases.

Figure 1-1
DC's Transit Future Study Process



During the Screen 1 phase, a wide range of transit modes and technologies were evaluated based on their ability to provide 'premium' transit service along a set of study corridors. For the purposes of this study, a premium transit alternative, or service, is defined as one that provides a significant improvement to the existing transit service, and also involves significant capital investment in new transit rolling stock and supporting infrastructure. The initial set of potential premium modes and technologies were narrowed to two modes - Streetcar and Bus Rapid Transit (BRT) - as the most appropriate for further study. Proposed alignments, stations, maintenance facilities, and levels of service for nine corridors were also identified during Screen 1.

During the Screen 2 phase, the corridors that were most appropriate for the implementation of premium transit services over the next 20- to 30-year time frame were identified. These were evaluated against criteria that addressed the project goals and objectives, corridor level needs and issues, and operational considerations. As a result of the Screen 2 analysis, the number of corridors considered was reduced to four. The corridors that were not advanced into the Screen 3 phase as premium transit corridors have been identified for local bus enhancements and low-cost rapid bus service improvements. These changes are represented in Figure 1-2.

Screen 3 builds on the Screen 2 findings and provides a more focused and detailed analysis. During the Screen 3 analysis, the determination of what type of technology would function best in each of the remaining premium transit corridors was determined.

Additionally, Screen 3 considered more measures of effectiveness than the Screen 2 analyses, including ones addressing cost-effectiveness in addition to the assessments of travel time, accessibility, community fit, land use and redevelopment potential, and environmental effects. The overall objective has been to use the results of the Screen 3 to help define a vision of the long-range transit system, and a phasing strategy to achieve the vision.

Where the Screen 2 analysis was performed by corridor, the Screen 3 analysis was conducted for segments within each corridor. For the Screen 3 phase, the ridership model was run for the system as a whole to determine how potential improvement options would function as a system in the year 2030 timeframe. Initial model results suggested that some refinements to the corridors under evaluation were needed. The final corridor configurations that were studied in the Screen 3 analysis include the following:

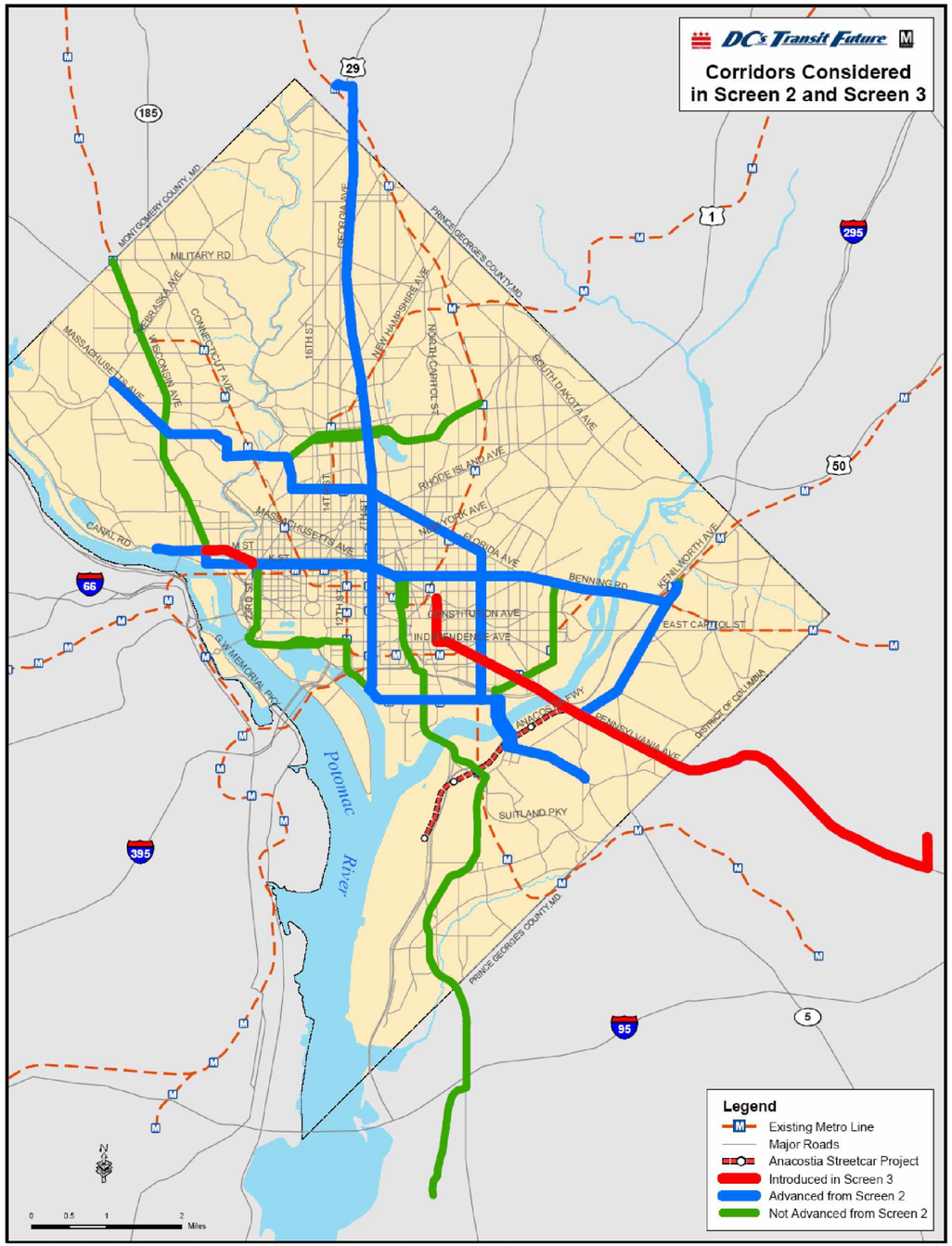
- Silver Spring to Skyland SE,
- American University to L'Enfant Plaza,
- Georgetown to Minnesota Avenue Metro, and
- Minnesota Avenue Metro to Anacostia Streetcar Project.

At the request of the Project Management Technical (PMT) Committee, which serves as a steering committee for the project, the following new corridor was added for Screen 3:

- Union Station to Forestville.

The above corridors are discussed in more detail in Section 2.0 and a summary of the corridor evaluation is provided in Section 3.0 of this report.

Figure 1-2
Corridors Considered in Screen 2 and Screen 3



1.1.2 Relationship to Previous Studies

The DCAA builds upon several earlier studies that were commissioned to identify potential solutions to the current transportation challenges that face the District of Columbia. The *Transportation Vision, Strategy, and Action Plan* (1997), developed by the District of Columbia Department of Public Works (DPW), identified several District corridors that would benefit from increased transit investment. In WMATA's *District of Columbia Transit Development Study* (2002), conducted as a follow-up to the 1997 plan, transit alternatives to advance into more detailed project development were selected.

More recently, potential transportation solutions have been coordinated with DC land use and redevelopment initiatives. Transportation plans and projects are expected to support community development initiatives articulated in the District's Comprehensive Plan and the *Strategic Neighborhood Action Plans* (SNAPs) submitted by the Advisory Neighborhood Commissions (ANCs) each year. Continuing coordination between the District of Columbia Office of Planning (DCOP) and the District of Columbia Department of Transportation (DDOT) is intended to maximize the effectiveness of any recommended transportation and land use investments.

At the outset, the DCAA sought to merge the recommendations from prior planning efforts (listed above), as well as expand the criteria used to select the priority corridors for transit investment. However, through a series of public involvement efforts, additional mobility and community needs were identified. Therefore, the District and WMATA are considering a wider range of future transit improvements than had been most recently recommended in the 2002 *Transit Development Study*. Because of the agencies' strong emphasis on coordinating their objectives to implement mutually beneficial projects, the DCAA has expanded the scope of previous studies and has examined the District's current transportation system as a whole.

1.1.3 Study Area

The study area covers large portions of the District of Columbia and four small adjacent areas in Maryland (Silver Spring and Friendship Heights in Montgomery County and Oxon Hill and National Harbor in Prince George's County). Five transportation corridors within the study area, shown in Figure 1-2, have been identified for potential advancement based on the system of priority corridors that emerged from the Needs Assessment and from the Screen 2 analysis. A detailed description of each of the corridors and segments analyzed in Screen 3 is provided in Section 2.0.

1.1.4 Study Participants

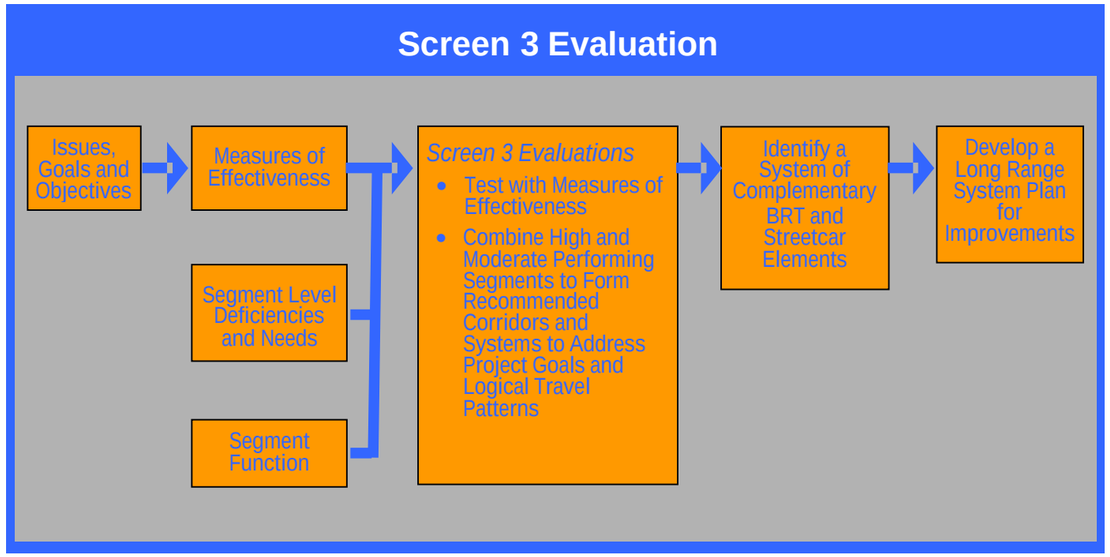
The project has been closely coordinated with District government agencies, federal agencies, and agencies of neighboring local governments. At the inception of the study, a Project Management Technical (PMT) Committee was assembled that includes representatives of WMATA, DDOT, the Office of the Deputy Mayor for Planning and Economic Development, the DCOP, the Federal Transit Administration (FTA), and the National Capital Planning Commission. The PMT group has met at least quarterly throughout the study to provide policy guidance, review work products, and act as a steering committee for the project. The project team has also conducted regular meetings with the Director and senior staff of DDOT to discuss the direction of the study and policy issues as they arise. Meetings with DC staff ward planners and the DC Office of Planning were also held at various stages of the study. The MOE Methodologies and Results Technical Memorandum provides details of the meetings that were held as part of the DCAA.

2.0 EVALUATION PROCESS AND CORRIDORS CONSIDERED

2.1 SCREEN 3 EVALUATION PROCESS

The purpose of the Screen 3 evaluation is to identify the most appropriate premium transit service type for each of the corridors and segments that have been retained from the previous evaluation screening. These segments and recommended service types are then assembled into a system of complementary BRT and Streetcar elements, forming the basis of a recommended long range transit system plan. The development of the BRT and Streetcar system elements considers how well each of the segments perform against a series of measures established for the analysis. The measures relate to each of the goals established for the project and are described in detail in Section 3.0 of this report. The highest and best performing segments are identified as candidates for Streetcar service (the highest level of investment) while the moderate performing segments are identified as candidates for BRT service (a more moderate level of investment). The low-performing segments are identified as candidates for lower cost improvements such as local bus service enhancements or Rapid Bus type service which includes some limited and low-cost BRT type enhancements. Once the candidate BRT and Streetcar Segments are identified, they are connected together to form potential BRT and Streetcar system elements that have logical endpoints, provide intermodal connections, connect activity centers with neighborhoods, and serve area travel patterns. The Screen 3 evaluation process is summarized in the figure below.

Figure 2-1
Screen 3 Evaluation Process



2.1.1 Project Goals and Evaluation Criteria

The goals and objectives for the project were developed during the course of initial public outreach efforts. From June to December 2003, a series of public meetings were held across the District with members of the ANCs, citizens and neighborhood associations, Main Street Associations, and other interested parties. (see MOE Methodologies and Results Technical Memorandum for dates and participants of meetings). Participants were given an overview of the project, and were asked to comment on transportation needs and issues of special concern. The needs, visions, and expectations articulated during these meetings were then used to formulate specific goals and objectives for the project. An initial draft was reviewed and refined through two meetings with the PMT. By comparing the District's existing conditions to the project goals and objectives, gaps were identified between the existing transportation system and project goals and community needs. The goals and objectives providing the framework for the evaluation of alternatives through the screening process are outlined below.

Goal 1: ***Access and Mobility***

Objectives:

1. Increase neighborhood and activity center connectivity
2. Improve access to regional centers
3. Improve market demands

Goal 2: ***Community and Economic Development***

Objectives:

1. Support community development initiatives
2. Enhance development benefits

Goal 3: ***System Performance***

Objectives:

1. Increase capacity
2. Enhance efficiency and cost-effectiveness

Goal 4: ***Environmental Quality***

Objectives:

1. Limit adverse impacts
2. Support environmental benefits

For each of the project goals and objectives several measurable criteria have been identified. These criteria were reviewed and endorsed by the PMT Committee in June 2004 (an updated in September 2004). The criteria form the basis for the specific measures used in the evaluation as described in Section 3.0 of this document. The criteria by goal are as follows:

Goal 1: Improve *access and mobility* for the greatest number of District residents and businesses:

- *Transit Travel Time* − Evaluates the average change in existing travel time to local and regional activity centers using rail or bus.
- *Accessibility* − Evaluates how well the proposed corridors serve activity, population, and employment centers.
- *Ridership* − Estimates the total daily transit boardings and daily boardings per route mile.

Goal 2: Encourage *community and economic* development:

- *Support of City Initiatives* − Evaluates the integration of proposed improvements with the goals and objectives of economic revitalization initiatives within the city.
- *Zoning/Land Use/Development* − Evaluates the zoning potential of underutilized or vacant land.
- *Community Support* − Evaluates the level of interest and support for, or opposition to, the proposed improvements by area residents and businesses.

Goal 3: Enhance *system performance*:

- *Travel Time Savings* − Evaluates the effect of the proposed improvements on travel time between select origin and destination (O/D) pairs.
- *Person Through-Put* − Evaluates the effect of proposed improvements on the number of people who can be moved through the corridor.
- *Cost Savings* − Evaluates the savings of funds required to implement an alternative that would be provided by coordinating with other infrastructure projects.

Goal 4: Promote *environmental quality*:

- *Community Fit* − Evaluates the physical compatibility of proposed vehicles, alignments, and stops with neighborhood character and facilities.
- *Environmental Impact* − Estimates the number of environmental resources along a corridor that could be affected by the proposed improvements.

2.1.2 Assumptions for Screen 3 Evaluations

Anacostia Streetcar Project Corridor

The Anacostia Corridor Streetcar Project includes the establishment of Streetcar service along the existing CSX Railroad connecting Bolling Air Force Base, the Metro Green Line Anacostia Station, and the Old Town Anacostia commercial area. The project is to be implemented in the near term future and is included in the base network for all of the Screen 3 evaluations.

Potential Maintenance Facility Sites

The development of new premium transit services in D.C. corridors will require the construction of vehicle storage and maintenance facilities to support the operation of these services. As part of the system planning effort, an initial list of 22 potential sites were identified for further study and evaluation, which included the 10 most promising sites for storage and maintenance facilities. As a result of a technical review by WMATA staff the list of sites has been further reduced to five potential sites. These sites are documented in the draft *Technical Memorandum: Facilities Site Screening* (May 2005).

Transportation Assumptions for Screen 3 Analysis

For the purposes of running the travel demand model for Screen 3, a transit network including both premium transit service and background transit service was developed. In general, the background transit network, like the background road network, was unchanged from the base (No Build) scenario. However, in cases where existing local transit service interacted with the proposed Premium service, alterations were made to the local service in order to reduce duplication of service.

Two transportation models were run as part of Screen 3:

- System 1, which consisted of Premium Transit in the Silver Spring to Skyland SE; American University to L'Enfant Plaza; Georgetown to Minnesota Avenue Metro; and Anacostia Streetcar Line to Minnesota Avenue Metro corridors
- System 2, which consisted of all of the Premium Transit service in System 1, plus the Forestville to Union Station corridor

In each corridor, Premium Transit service was modeled in three different operating scenarios:

- Mixed Traffic, where it is assumed Premium Transit shares right-of-way (ROW) with general traffic in all cases;
- Limited Dedicated Guideway, where it is assumed Premium Transit shares ROW with general traffic except where a dedicated guideway would not cause the roadway level of service (LOS) to drop below LOS D; and
- Dedicated Guideway, where it is assumed Premium Transit would operate in a dedicated guideway in any case where a dedicated guideway could feasibly be constructed.

The operating assumptions for the two transportation models are described below, and summarized in Table 2-1.

<u>System 1</u>

Capital Projects

- Premium Transit extending from Silver Spring Station to Skyland via Georgia Avenue NW, 7th Street NW, 7th Street SW, Maine Ave. SW, M Street SW, M Street SE, 11th Street Bridge, and Good Hope Road.
- Premium Transit extending from the American University to L'Enfant Plaza Station via Massachusetts Avenue NW, Garfield Street NW, Cleveland Avenue NW, Calvert Street NW, 18th Street NW, U Street NW, Florida Avenue NW, Florida Avenue NE, 8th Street NE, 8th Street SE, M Street SE, and 7th Street SW.
- Premium Transit extending from Georgetown to Minnesota Avenue Metro via M Street NW, Wisconsin Avenue NW, K Street NW, Mount Vernon Square NW, Massachusetts Avenue NW, H Street NW, H Street NE, Benning Road NE, and Minnesota Avenue NE.
- Premium Transit extending from the northern end of the Anacostia Demonstration Line at Pennsylvania Avenue SE into Minnesota Avenue; then following Minnesota Avenue SE and Minnesota Avenue SW to the Minnesota Avenue Station.

New Service

- Premium Transit operating between Silver Spring and Skyland SE with a headway of 4 minutes peak / 8 minutes base.
- Premium Transit operating between American University and Woodley Park Zoo with a headway of 10 minutes peak / 15 minutes base; continuing to L'Enfant Plaza with a headway of 5 minutes peak / 7.5 minutes base.
- Premium Transit operating between Georgetown and Minnesota Avenue Station with a headway of 4 minutes peak / 6 minutes base.
- Premium Transit operating between the Anacostia Streetcar Project (roughly Pennsylvania Avenue / Minnesota Avenue SE) and Minnesota Avenue Station with a headway of 10 minutes peak / 20 minutes base. This service is interlined with the Anacostia Streetcar Project.

Peak Bus Network Changes

Route 70 is eliminated. Route 71 remains in operation between Silver Spring and Buzzard Point at 20 minutes. A shuttle service is introduced to operate between Buzzard Point and Waterfront Metro Station at 60 minutes. Service on Route P1 is cut back to operate only between 22nd Street / C Street SW and Federal Center Southwest Metro. Route X2 remains in operation between Minnesota Avenue Metro Station and Lafayette Square at 20-minute headways. "Via Springarn" trips are eliminated. Route X3 only operates as far east as Benning Road / 17th Street NE. Service on Route 90 is cut back to operate only between Anacostia and Eastern Market Station with a headway of 10 minutes. Route 92 remains in operation between Duke Ellington Bridge and 15th Place & Congress Place SE at 20-minute headway. A shuttle is

introduced to run from Congress Heights to Skyland SE at 20-minute headway as well. Route U2 is eliminated.

Base Bus Network Changes

Routes 70 outbound and 71 inbound run along Georgia Avenue to downtown at 30 minutes. All the other 70s are eliminated. Route P2 is also eliminated. Route X2 remains in operation between Minnesota Avenue Metro Station and Lafayette Square at 20-minute headways. Route U2 is eliminated. Service on Route 90 is cut back to operate only between Anacostia and Eastern Market Station with a headway of 15 minutes. Route 92 remains in operation between Duke Ellington Bridge and 15th Place & Congress Place SE at 30-minute headway. A shuttle is introduced to run from Congress Heights to Skyland SE at 30-minute headway as well.

System 2

Assume all components and changes of System 1, with the following changes:

Capital Projects

Add Premium Transit extending from Union Station to Forestville via 1st Street, Inner Pennsylvania, Middle Pennsylvania, and Outer Pennsylvania.

New service

Add Premium Transit operating between Union Station and Forestville with a headway of five minutes peak / eight minutes base.

Bus Network Changes

No additional change.

Table 2-1
Screen 3 Transit Network Changes from Base Network

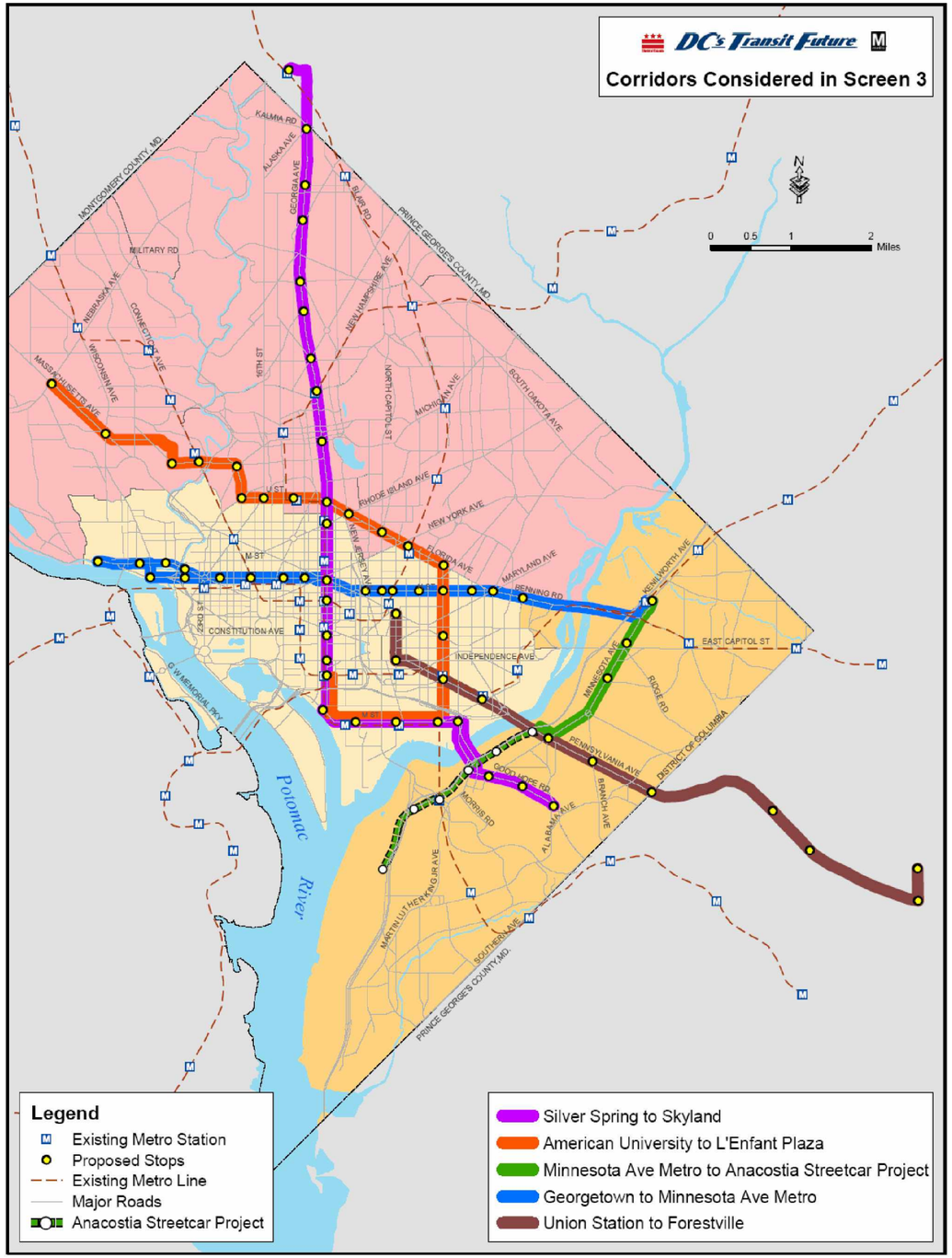
Corridor	Service	Frequency (Min)		Notes
		Peak	Off Peak	
System 1 and 2				
Silver Spring to Skyland	Premium Transit Service	4	8	
	Route 70	Eliminated	30	Off-peak only
	Route 71	20	30	
	Buzzards Point-Waterfront Shuttle	60	No Service	Peak Only
	Route P1	No Change		22nd/C to Federal Center SW Only
	Route P2	No Change	Eliminated	Peak Only
AU to L'Enfant Plaza	Premium Transit Service	5	7.5	10/15 Headway Woodley to AU
	Route 90	10	15	Anacostia to Eastern Market only
	92	20	30	Ellington Bridge to 15th/ Congress
	Congress Heights to Skyland Shuttle	20	30	
Georgetown to Minnesota Ave Metro	Premium Transit Service	4	6	
	X2	20	20	Via Springarn trips eliminated
	X3	No Change		Only operates west of 17th NE
Anacostia Streetcar Project to Minnesota Ave Metro	Premium Transit Service	10	20	Interlined with Anacostia Streetcar Project
	U2	Eliminated		
System 2 Only				
Forestville to Union Station	Premium Transit Service	5	8	

2.2 CORRIDORS EVALUATED IN SCREEN 3

The premium transit corridors recommended for consideration in Screen 3 are based on the results of the Screen 2 work, and are shown in Figure 2-2. This includes the following corridors:

- Silver Spring to Skyland SE Corridor
- American University to L'Enfant Plaza Corridor
- Minnesota Avenue Metro to Anacostia Streetcar Project Corridor
- Georgetown to Minnesota Avenue Metro Corridor
- Union Station to Forestville Corridor

Figure 2-2
Corridors Considered in Screen 3



2.2.1 Silver Spring to Skyland SE Corridor

There are seven segments in this corridor: Georgia, Uptown, 7th North, 7th South, M Street SE, 11th Street Bridge, and Good Hope Road.

The Georgia Segment begins at the Silver Spring Metro Station, runs east on Wayne Street, then south on Georgia Avenue to the northern side of the intersection of Georgia Avenue and Columbia Road NW. The total distance for this segment is 4.83 miles.

The Uptown Segment begins at the intersection of Georgia Avenue and Columbia Road NW, then runs south on Georgia Avenue until the intersection of Florida Avenue and 7th Street NW. The distance of this segment is 0.82 miles.

The 7th North Segment begins at the intersection of Florida Avenue and 7th Street NW, then runs south on 7th Street until the intersection of 7th Street and K Street NW (Mount Vernon Square), a distance of 0.98 miles.

The 7th South Segment begins at the intersection of 7th Street and K Street NW (Mount Vernon Square) and continues south on 7th Street until the intersection of 7th Street and Maine Avenue SW, a distance of 1.64 miles.

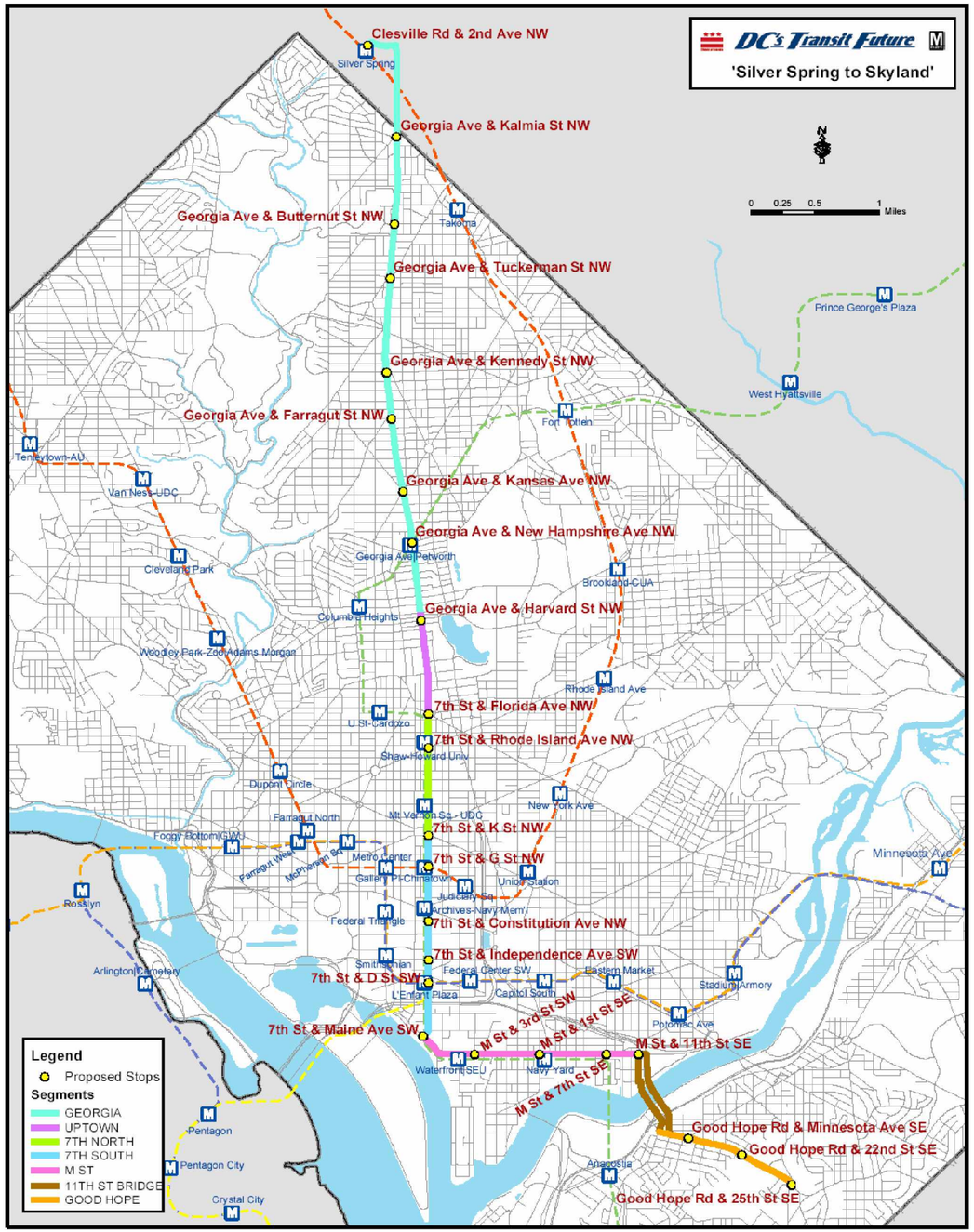
The M Street SE Segment begins at 7th Street SW and Maine Avenue SW, runs southeast on Maine Avenue, then east on M Street SE until the intersection of M Street SE and 11th St SE. The segment is 1.75 miles.

The 11th Street Segment begins at the intersection of 8th Street SE and M Street SE, runs east along M Street SE, then onto Interstate 295 until the Martin Luther King Jr. Avenue/11th Street Bridge exit. The segment continues on the 11th Street Bridge until the intersection of 11th Street Bridge and Good Hope Road, a total distance of 0.95 miles.

The Good Hope Road Segment begins at the intersection of Martin Luther King Jr. Avenue and Good Hope Road and runs southeast along Good Hope Road until the intersection of Good Hope Road and 25th Street SE, a distance of 1.14 miles.

The corridor and segments are illustrated in Figure 2-3.

Figure 2-3
Silver Spring to Skyland SE Corridor



2.2.2 American University to L'Enfant Plaza Corridor

There are eight segments in this corridor: Massachusetts, Calvert West, Calvert East, U Street, Florida, 8th Street, M Street SE, and 7th South.

The Massachusetts Segment begins at Ward Circle at the intersection of Nebraska Avenue and Massachusetts Avenue, and then runs southeast along Massachusetts Avenue until the intersection of Massachusetts Avenue and Wisconsin Avenue. The segment is 0.92 miles.

The Calvert West Segment begins at the intersection of Massachusetts Avenue and Wisconsin Avenue, runs along Massachusetts Avenue NW to Garfield Street NW, and continues east on Garfield Street NW to Woodley Road NW, where it turns south on Woodley Road and continues to the intersection of Calvert Street NW and 29th Street NW, a distance of 1.10 miles.

The Calvert East Segment begins at the intersection of Calvert Street NW and 29th Street NW, runs east along Calvert Street, then southeast on Adams Mill Road NW until the intersection of Adams Mill Road and 18th Street NW, a distance of 0.83 miles.

The U Street Segment begins at the intersection of Adams Mill Road NW, Columbia Road and 18th Street NW, runs south on 18th Street NW, proceeds east on U Street NW, and continues southeast on Florida Avenue NW until the intersection of Florida Avenue NW and 7th Street NW. The segment is 1.48 miles.

The Florida Segment begins at the intersection of Florida Avenue NW and 7th Street NW, runs along Florida Avenue NW until the intersection of 8th Street NE and Florida Avenue NE, then runs south on 8th Street NE until the intersection of 8th Street NE and H Street NE. The segment is 1.97 miles.

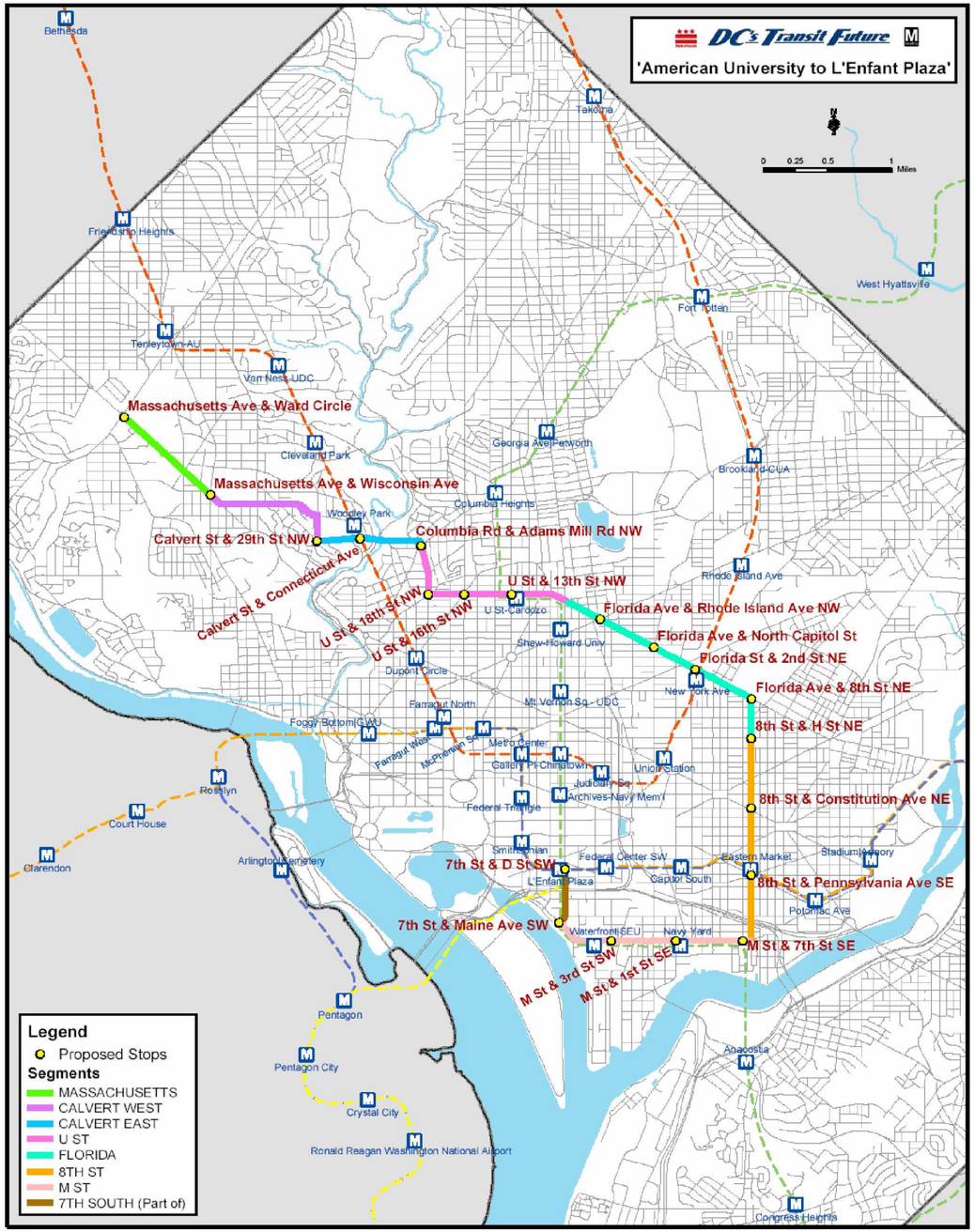
The 8th Street Segment begins at the intersection of 8th Street NE and H Street NE, then runs south along 8th Street until the intersection of 8th Street SE and M Street SE, a distance of 1.64 miles.

The M Street SE Segment begins at the intersection of M Street SE and 8th Street SE. It then runs west on M Street SE, then northwest on Maine Avenue until intersection of 7th Street and Maine Avenue SW. The length of the segment is 1.56 miles.

The 7th South Segment begins at the intersection of 7th Street and Maine Avenue SW. It continues north on 7th Street until the intersection of 7th Street and D Street SW (L'Enfant Plaza Metro Rail Station). The length of the segment is 0.45 miles.

The corridor and segments are illustrated in Figure 2-4.

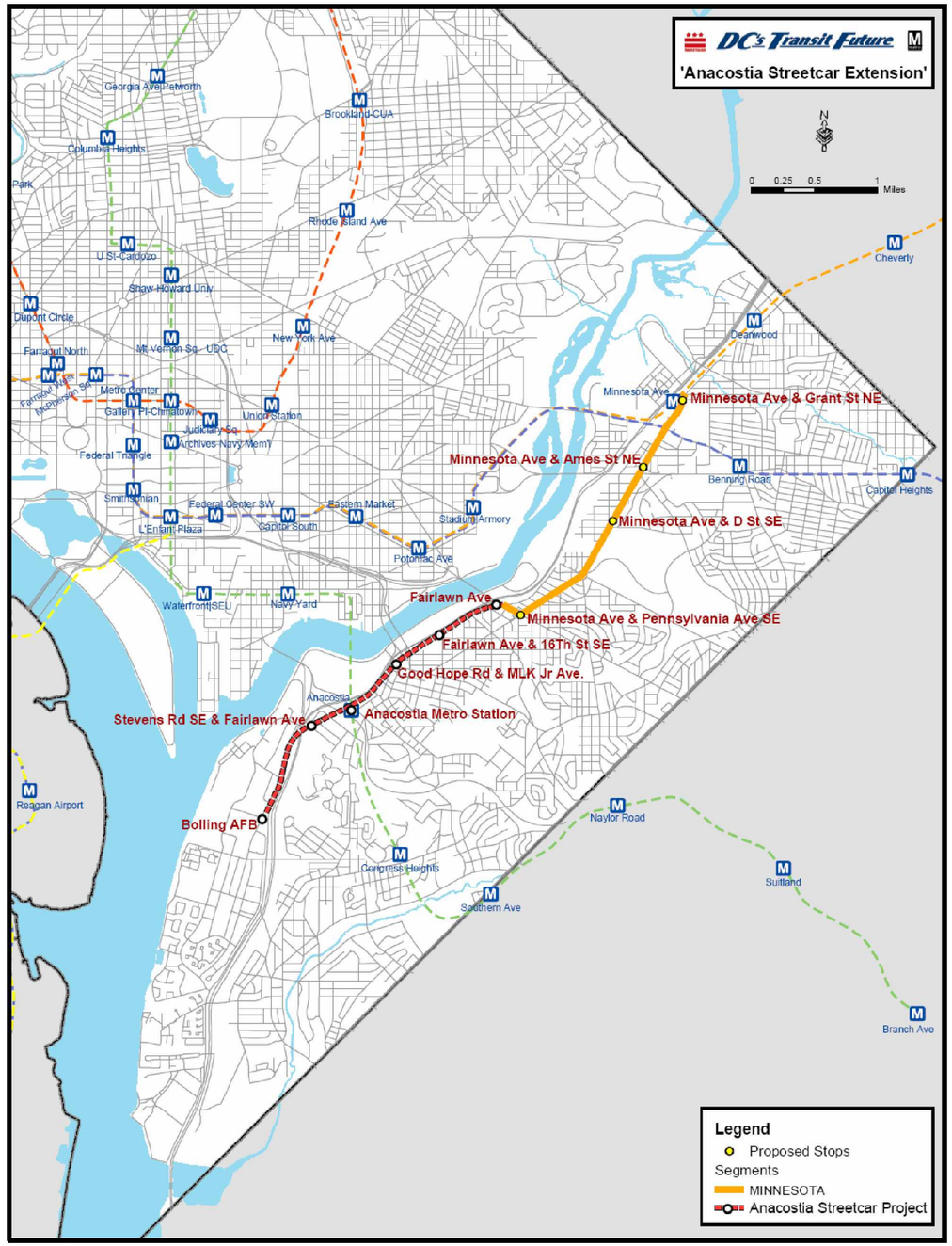
Figure 2-4
American University to L'Enfant Plaza Corridor



2.2.3 Minnesota Avenue Metro to Anacostia Streetcar Project Corridor

As shown in Figure 2-5, this corridor has only one segment, Minnesota, which begins at the Minnesota Avenue Metrorail Station (intersection of Minnesota Avenue and Gault Place), runs south along Minnesota Avenue to Ames Street NE, continues south on Minnesota Avenue to D Street SE. It then proceeds northwest to Pennsylvania Avenue SE and continues from Pennsylvania Avenue SE to the intersection of Fairlawn Avenue and CSX Alignment. The segment is 2.43 miles.

Figure 2-5
Minnesota Avenue Metro to Anacostia Streetcar Project Corridor



2.2.4 Georgetown to Minnesota Avenue Metro Corridor

There are six segments in this corridor: Georgetown, Pennsylvania Alternative, Lower K Street, Upper K Street, H Street NE, and Benning.

The Georgetown Segment begins at the Georgetown University entrance on Canal Road (Georgetown Waterfront), runs east along Canal Road, continues on M Street NW, and proceeds south on Wisconsin Avenue NW until the intersection of K Street NW and Wisconsin Avenue NW. The Segment is 0.84 miles.

The Pennsylvania Alternative begins at the intersection of M Street and Wisconsin Avenue NW. It runs east along M Street, and then right on Pennsylvania Avenue where it proceeds southeast. It turns right on 24th Street NW and proceeds south until the intersection of K Street and 24th Street NW. This segment is being considered for streetcar only. The length of the segment is 0.68 miles.

The Lower K Street Segment begins at the intersection of K Street NW and Wisconsin Avenue NW, and runs east along K Street NW until the intersection of Washington Circle and 23rd Street NW, a distance of 0.68 miles.

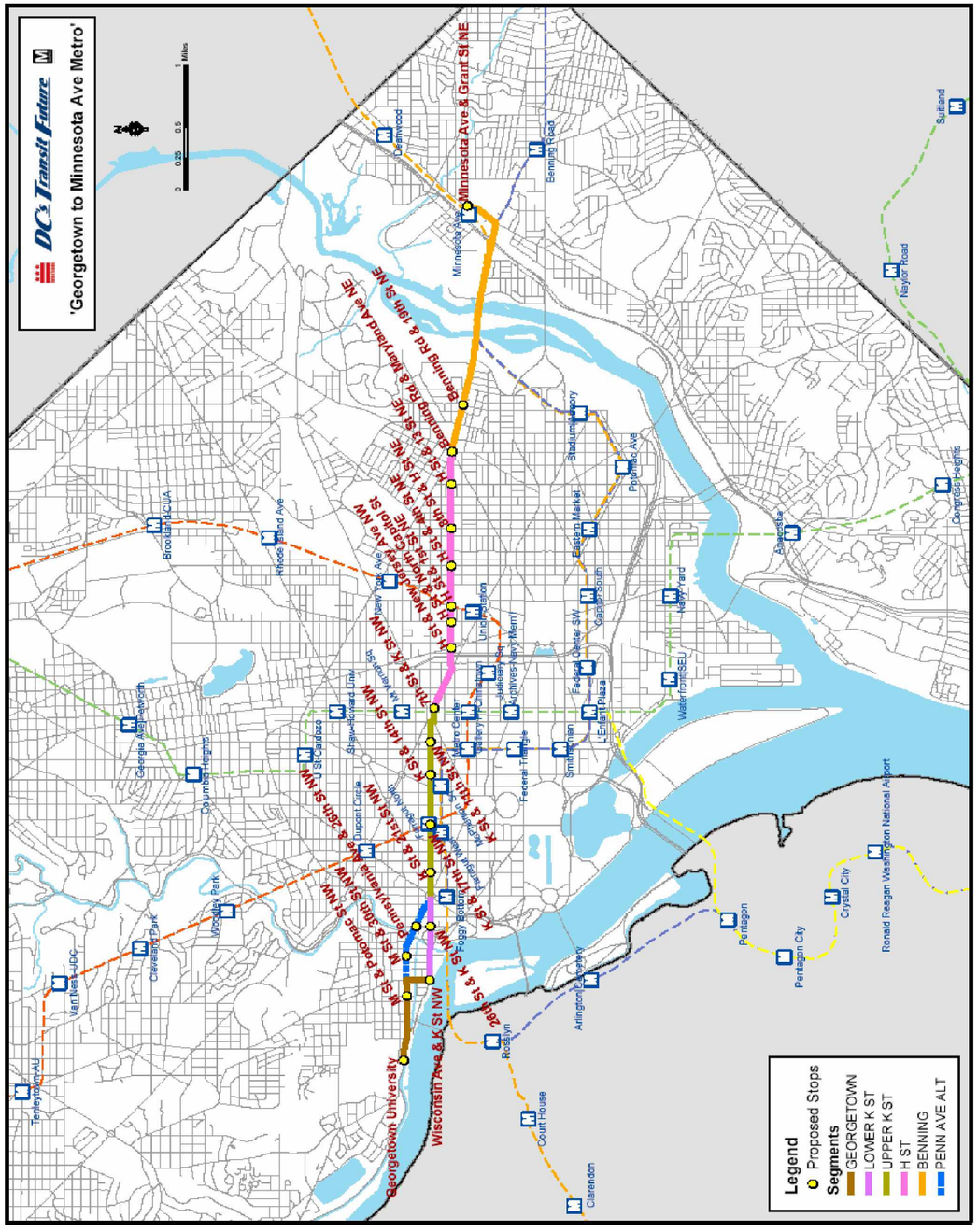
The Upper K Street Segment begins at the intersection of Washington Circle and 23rd Street NW, and runs east along K Street NW until the intersection of K Street NW, 7th Street NW, and Massachusetts Avenue (Mount Vernon Square), a distance of 1.57 miles.

The H Street NE Segment begins at the intersection of K Street NW, 7th Street NW, and Massachusetts Avenue NW (Mt Vernon Square), runs southeast along Massachusetts Avenue NW, then continues east on H Street NE until the intersection of H Street NE, Maryland Avenue NE, 15th Street NE and Benning Road. The segment is 2.11 miles.

The Benning Segment begins at the intersection of H Street NE, Maryland Avenue, 15th Street NE, and Benning Road, runs east along Benning Road across the Anacostia River, and continues northeast on Minnesota Avenue where it terminates at the Minnesota Avenue Metro Station at the intersection of Minnesota Avenue and Grant Street NE. The segment is 2.15 miles.

The corridor and segments are illustrated in Figure 2-6.

Figure 2-6
Georgetown to Minnesota Avenue Metro Corridor



2.2.5 Union Station to Forestville Corridor

There are four segments in this corridor: 1st Street, Inner Pennsylvania, Middle Pennsylvania, and Outer Pennsylvania.

The 1st Street Segment begins at Union Station at the intersection of 1st Street NE and Columbia Circle NE. It runs south along 1st Street NE until the intersection of 1st Street NE and Independence Avenue. It then runs east on Independence Avenue until it reaches the intersection of Independence and Pennsylvania Avenues SE. The length of the segment is 0.7 miles.

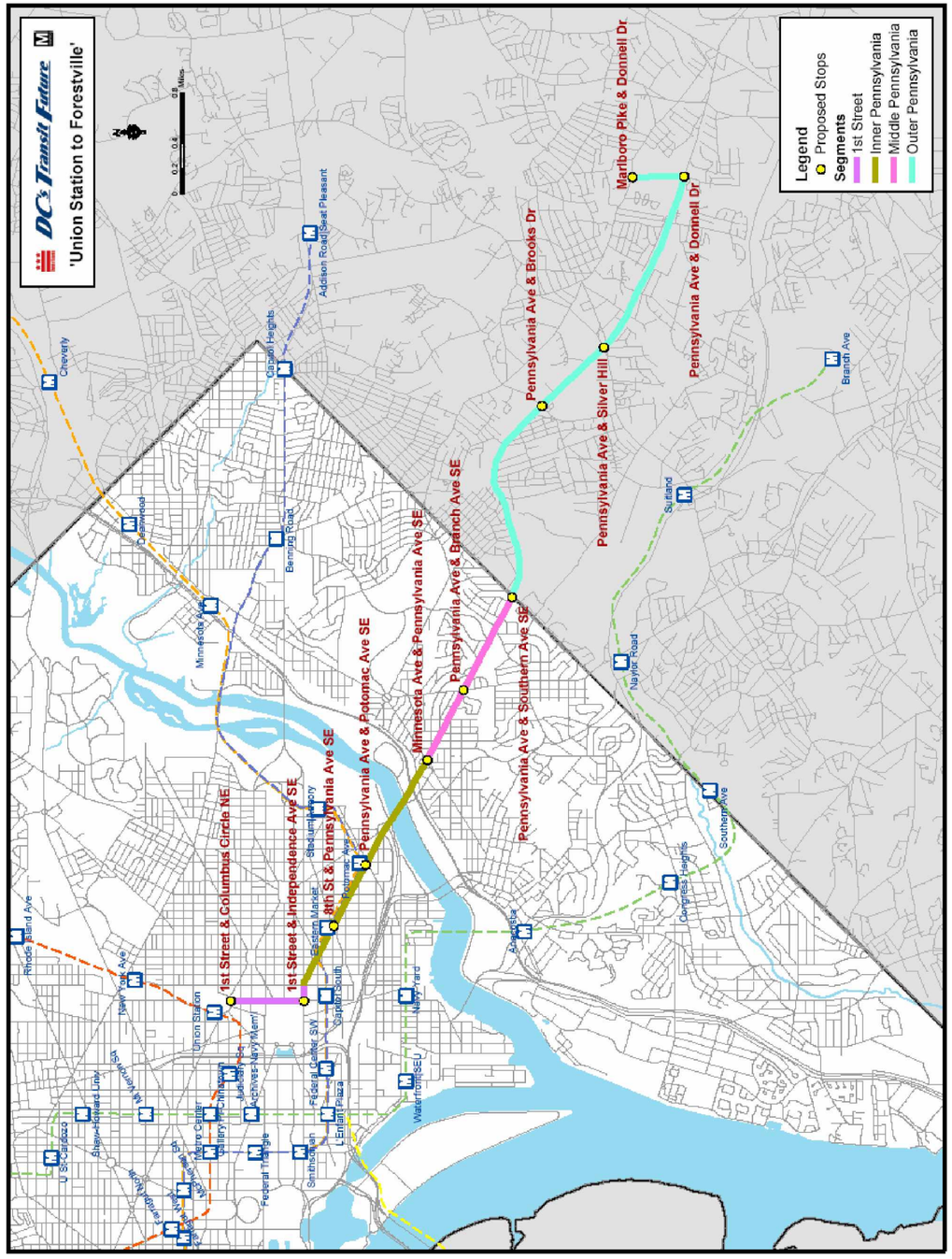
The Inner Pennsylvania Segment begins at the intersection of Independence Avenue and Pennsylvania Avenue SE. It runs southeast along Pennsylvania SE until the intersection of Minnesota Avenue and Pennsylvania Avenue SE. The length of the segment is 2.03 miles.

The Middle Pennsylvania Segment begins at the intersection of Minnesota Avenue and Pennsylvania Avenue SE. It runs southeast along Pennsylvania Avenue SE and ends at the intersection of Pennsylvania Avenue SE and Southern Avenue SE. The length of the segment is 1.45 miles.

The Middle Pennsylvania Segment begins at the intersection of Pennsylvania Avenue SE and Southern Avenue SE. It runs east along Pennsylvania Avenue SE until the intersection of Pennsylvania Avenue SE and Donnell Drive. It turns north on Donnell Drive and terminates at the intersection of Marlboro Pike and Donnell Drive. The length of the segment is 3.88 miles.

The corridor and segments are illustrated in Figure 2-7.

Figure 2-7
Union Station to Forestville Corridor



3.0 MEASURES OF EFFECTIVENESS

The purpose of Section 3.0 is to present the measures of effectiveness for each corridor in terms of its ability to meet the project goals as set out in Section 2.1.1. The project goals are presented in Table 3-1. For each of the four project goals, there is a set of specific criteria that are used to evaluate the ability of a segment to meet the project goal. The criteria in turn are measured via a set of detailed Measures of Effectiveness (MOE).

For each project goal, Section 3.0 provides a summary map and table showing the relative ability of the segments to meet that goal. Within each goal, more detailed maps and tables present the results of the individual MOE for each segment. Segments are rated as HIGH, MEDIUM or LOW based on their relative performance on the various MOE. In all cases, a rating of High indicates a high-performance segment for potential premium transit investment, while Low indicates the poorest performing (least appropriate for investment) segments. Most analyses resulted in ranges that were used to determine the break-points for each rating; however, some ratings were based on qualitative assessments.

In all cases, data are aggregated by traffic analysis zone (TAZ); any population, employment, or other location-specific data located within ¼ mile of a segment is assumed to be served by premium transit operating on that segment. All Baseline or existing data is from the year 2000 unless otherwise stated, while projected data is for the year 2030.

As described in Section 2.0, Screen 3 builds on earlier findings and provides a more focused analysis of the proposed corridors and segments within an overall system performance framework. One of the purposes of the Screen 3 analysis is to determine what type of technology – Streetcar or BRT (or Local Bus/Rapid Bus for the very low-performing segments) – would function best in each of the segments. In cases where BRT or Streetcar technology performs differently relative to the MOE, data is given for both modes so they can be evaluated against each other.

For the purposes of Screen 3, the most aggressive possible application of dedicated transit guideways was assumed. This approach presents the highest level of transit investment in each of the segments and allows for a fair comparison among alternatives.

Table 3-1
Project Goals and Related Criteria and Measures of Effectiveness

Project Goals	Criteria	Measures of Effectiveness
1. Access and Mobility	Change in Transit Travel Times	Average Percentage Change to Access Employment Centers Accessible within 60 Minutes
		Average Percentage Change in Mode Share to Regional Centers
	Accessibility	Number of Regional Activity Centers Served
		Employment Per Linear Mile Near Stops
		Population Per Linear Mile Near Stops
	Ridership	Projected Daily Boardings
		Projected Daily Boardings Per Mile
2. Community and Economic Development	Support of City Initiatives	Designated Main Street Corridors Served
		Strategic Targeted Neighborhoods Served
		Major Development Initiatives
	Zoning/ Land Use/ Development	Current Development Projects Served
		Zoning and Land Use Compatibility
		Zoning Potential/Capacity of Underutilized/ Un-built Land
	Community Support	Public Comment
3. System Performance	Travel Time Savings	Average Percent Change in Transit Travel Times
		Percent Change in Transit Travel Times Between Select O/D Pairs
	Person Through-Put	Mode Share
		Change in Carry Capacity (vehicles / transit)
		Existing Local Bus Peak Load Factors
		2030 Peak Load Factors
	Cost-Effectiveness	Number of TIP Projects That Could be Coordinated with BRT or SC Project
		Capital Cost per Mile
		Operating Costs per Vehicle Mile
		Annual Operating Cost per New Daily Boarding
		Capital Cost per Daily Boarding
		Capital Cost per New Daily Rider
		Annualized Capital Cost per Transit System User Benefit
		Annualized Cost per Transit System User Benefit (TSUB)
4. Environmental Quality	Community Fit	Visual/Community Fit
	Environmental Resources Affected	Potential to Avoid Adverse Impacts

For a given criteria, a single segment could be rated High, Medium, and / or Low for different MOEs. Table 3-2 provides a rationale to combine the individual ratings to generate an aggregate rating by criterion and by goal for each segment. A similar process is performed for segments where the various criteria related to a goal have different ratings.

Table 3-2
Rationale for Determining Overall Corridor Ratings

Individual Measure of Effectiveness Ratings or Criteria Ratings	*Resulting Overall Rating for a Criterion or a Goal*
When Two Measures are Considered for a Criterion	
High + High	**High**
Medium + High	**High**
High + Low	**Medium**
Medium + Medium	**Medium**
Medium + Low	**Low**
Low + Low	**Low**
When Three Measures are Considered for a Criterion	
High + High + High	**High**
High + High + Medium	**High**
High + High + Low	**High**
High + Medium + Medium	**Medium**
High + Medium +Low	**Medium**
Medium + Medium + Medium	**Medium**
Medium + Medium + Low	**Medium**
High + Low + Low	**Low**
Medium + Low + Low	**Low**
Low + Low + Low	**Low**
When Four Measures are Considered for a Criterion	
High + High + High + High	**High**
High + High + High + Medium	**High**
High + High + High + Low	**High**
High + High + Medium + Medium	**High**
High +High + Medium + Low	**High**
High + High + Low + Low	**Medium**
High + Medium + Medium + Medium	**Medium**
High + Medium + Medium + Low	**Medium**
Medium + Medium + Medium + Medium	**Medium**
Medium + Medium + Medium + Low	**Medium**
Medium + Medium + Low + Low	**Low**
High + Medium + Low + Low	**Low**
High + Low + Low + Low	**Low**
Medium + Low + Low + Low	**Low**
Low + Low + Low + Low	**Low**

3.1 GOAL 1: ACCESS AND MOBILITY

The purpose of Goal 1 is to measure the relative improvement in access to regional employment via transit in the various Build alternatives. The three criteria used to measure the segments in terms of Goal 1 are as follows:

- Change in transit travel times
- Accessibility
- Ridership

Each of the criteria is described in detail in Sections 3.1.1 through 3.1.3, below. The overall ratings of the segments relative to Goal 1 are shown in Table 3-3 by individual MOE, criteria rating, and overall segment performance. The overall summary of ratings for Goal 1 is also presented graphically in Figure 3-1.

As shown in Figure 3-1, Georgia, Upper K Street, 7th South, H and M streets have a summary rating of High for the access and mobility goal. These corridors generally received High or Medium rankings for the three Goal 1 criteria. However, the M Street SE segment rated high for transit travel time and accessibility, but low on ridership. Generally, the lower performing segments were located in the District periphery, with the exception being the Georgia segment.

There were cases where segments performed well relative to one of the individual criteria analyzed in Goal 1, but the aggregated results of the analysis provide a lower overall rating. This is especially true for accessibility criteria. Many segments rate high for strong accessibility factors, but perform poorly in terms of ridership and transit travel time improvements.

The Silver Spring to Skyland SE, American University to L'Enfant Plaza, and Georgetown to Minnesota Avenue Metro corridors all had strong performing segments and a mix of moderate to low-performing segments. The Union Station to Forestville and Minnesota Avenue Metro to Anacostia Streetcar Project corridors had fewer high performing segments, and performed the lowest in the Goal 1 summary results.

Figure 3-1
Goal 1: Access and Mobility Ratings

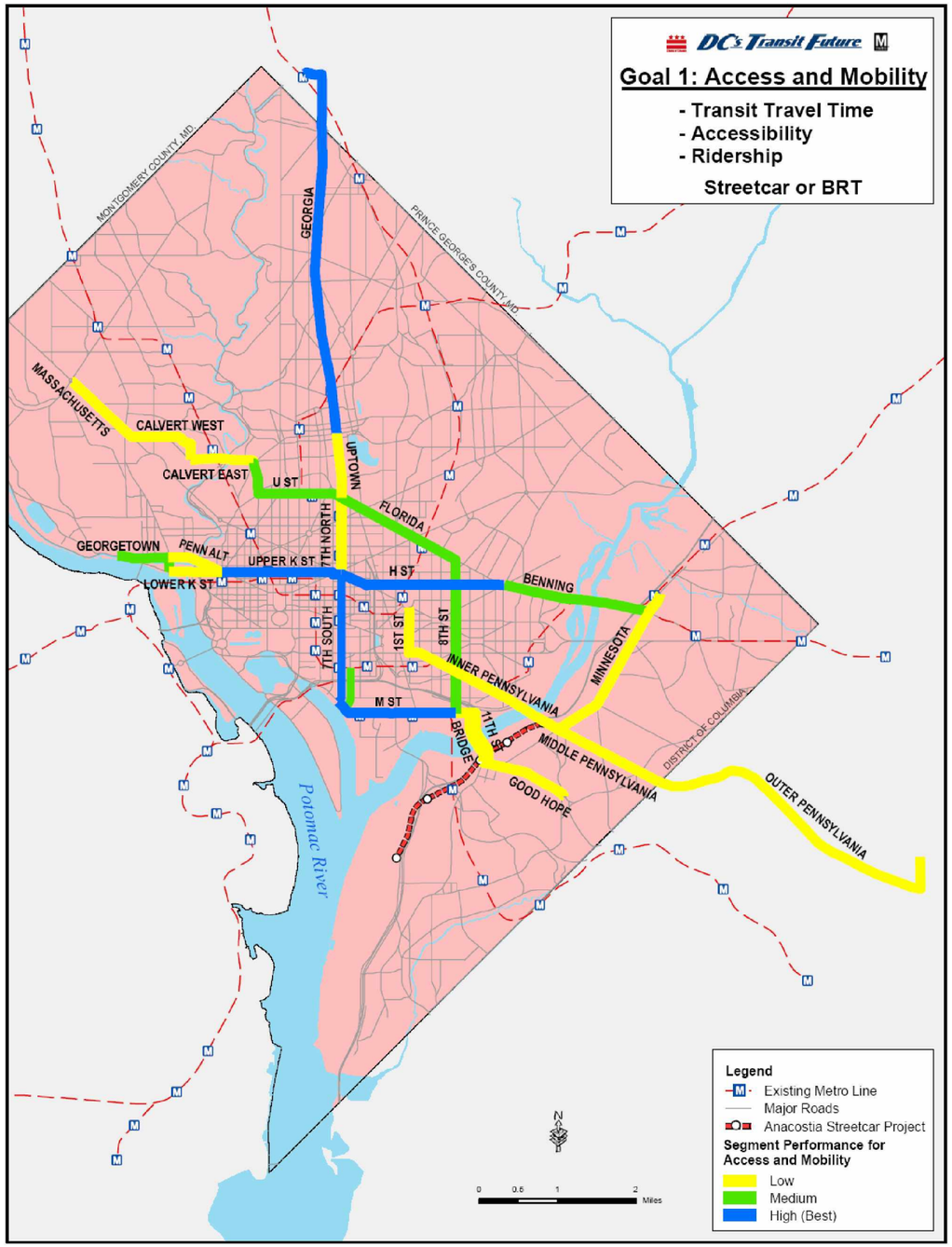


Table 3-3
Summary of Screen 3: Goal 1 – Access and Mobility Measures

Corridors and Segments	Transit Travel Time		Accessibility			Ridership (2030)		GOAL 1 RATINGS			
	Average Percent Change of Employment Accessible within 60 Minutes	Average Percent Change in Mode Share to Regional Centers	Number of Regional Activity Centers Served	Employment/ Linear Mile (Year 2030)	Population/ Linear Mile (Year 2030)	Projected Daily Boardings (2030)	Projected Daily Boardings Per Mile (2030)	Transit Travel Time	Accessibility	Ridership	GOAL 1 OVERALL
Silver Spring to Skyland SE											
Georgia	10.24%	1.07%	Indirect 1	5,436	7,107	14,298	2,960	High	Medium	High	High
Uptown	2.38%	0.38%	Indirect 1	7,568	10,732	3,197	3,898	Low	Medium	Low	Low
7th North	1.74%	0.30%	Direct 1	28,536	15,263	4,839	4,937	Low	High	Low	Low
7th South	1.52%	0.57%	Direct 3	58,277	6,308	11,210	6,835	Low	High	High	High
M Street SE	2.30%	2.80%	Direct 1	15,590	8,562	2,522	1,617	High	High	Low	High
11th Street Bridge	9.74%	0.03%	Indirect 1	6,512	2,899	875	921	Low	Low	Low	Low
Good Hope Road			None	867	6,696	4,705	4,127	Low	Low	Low	Low
American University to L'Enfant Plaza											
Massachusetts	2.19%	0.93%	None	3,006	5,446	2,834	3,080	Medium	Low	Low	Low
Calvert West	3.63%	0.34%	None	987	1,522	467	424	Low	Low	Low	Low
Calvert East	5.84%	0.81%	None	4,019	11,807	3,680	4,433	Medium	Low	Low	Low
U Street	2.52%	1.18%	Indirect 1	8,898	12,023	4,504	3,043	High	Medium	Low	Medium
Florida	1.68%	0.96%	Indirect 2	7,248	7,365	7,081	3,594	Low	High	Medium	Medium
8th Street	3.60%	1.59%	Indirect 1	3,345	7,768	6,326	3,857	High	Medium	Medium	Medium
M Street SE	2.30%	2.80%	Direct 1	15,590	8,562	4,293	2,752	High	High	Low	High
7th South	1.21%	1.03%	Direct 3	79,863	7,643	2,567	5,704	Medium	High	Medium	Medium
Georgetown to Minnesota Avenue Metro											
Georgetown	8.82%	1.17%	Direct 1	11,649	6,420	5,542	6,597	High	Medium	Medium	Medium
Pennsylvania Alternative	0.89%	0.08%	Direct 1	21,080	10,786	1,598	2,349	Low	High	Low	Low
Lower K Street	2.25%		Indirect 1	22,625	9,416			Low	High	Low	Low
Upper K Street	0.62%	0.14%	Direct 1 Indirect 1	110,720	12,941	19,893	12,670	Low	High	High	High
H Street NE	8.25%	1.22%	Direct 1	20,763	7,736	10,118	4,795	High	High	Medium	High
Benning Road	15.65%	1.62%	None	788	3,673	7,735	3,597	High	Low	Medium	Medium
Minnesota Avenue Metro to Anacostia Streetcar Project											
Minnesota	2.63%	0.83%	None	682	2,884	634	267	Medium	Low	Low	Low
Union Station to Forestville											
1st Street	0.49%	0.55%	Direct 1	38,989	3,822	1,676	2,394	Low	Medium	Low	Low
Inner Pennsylvania	7.15%	1.16%	Direct 1	1,427	3,565	4,248	2,093	High	Low	Low	Low
Middle Pennsylvania	7.71%	1.17%	Indirect 1	982	3,458	1,242	857	High	Low	Low	Low
Outer Pennsylvania	No data	0.88%	None	497	1,073	5,838	1,505	Medium	Low	Low	Low

Ratings

Low	< 1.99%	< 0.50%	None	< 24,999	< 4,499	< 5,699	< 2,799
Medium	2.00% - 9.99%	0.51% - 0.99%	Indirect 1	25,000 - 49,999	4,500 - 6,999	5,700-10,999	2,800-5,199
High	> 10.00%	> 1.00%	Direct 1+; Indirect 2+	> 50,000	> 7,000	> 11,100	> 5,200

3.1.1 Transit Travel Time

Approach

Change in Existing Travel Time to Employment Centers

The purpose of this MOE is to measure the improvement in the percentage of DC core employment accessible within 60 minutes for each Premium Transit segment. For all TAZ directly adjacent to a corridor segment, the total amount of employment within 60 minutes was compared between the Baseline and the Build alternative. The difference between existing conditions and Build percentages for each TAZ was calculated and consolidated into statistics for each segment. The percent change for each segment was calculated by taking the differences for each TAZ within each segment and averaging them. Table 3-3 presents summary ratings of high, medium, and low for each segment within each corridor. A rating of high represents an increase in the DC core employment accessible within 60 minutes of more than 10 percent, a rating of medium means an increase of more than 2 percent, and a rating of low reflects an increase of less than 2 percent.

Change in Mode Share to Regional Centers

This MOE analyzes the change in transit mode share to regional centers with the implementation of premium transit service. The change in transit mode share was rated for each segment to each of the key destinations identified in the DCAA *Needs Assessment*. The higher the percentage change in mode share under the Build Alternative, the more attractive the segment is for proposed transit implementation.

Outputs were generated for the Baseline and the Screen 3 corridors. Transit mode shares in the Baseline were compared to transit mode shares in the Build Alternatives to determine a mode share increase, decrease, or no change with implementation. The differences in transit mode share were rated as follows: 1) High: increase of more than 1 percent; 2) Medium: increase between 0 and 1 percent; and 3) Low: increase of less than 1 percent.

Summary

In all cases, the addition of premium transit increased access to employment and increased mode share within the District. Though each corridor showed overall improvement, there is variation by segment. Each corridor has a mix of high performing segments and lower performing segments. Table 3-3 presents summary ratings for each segment within the corridor. Ratings are summarized graphically in Figure 3-2. Ratings for individual MOEs in the Transit Travel Time Criteria are illustrated in Figure 3-2a.

As shown in Figure 3-2, higher performing segments include Georgia, U Street, H Street NE, Benning, Inner- and Middle-Pennsylvania, M Street SE, and Georgetown. Lower performing segments are more concentrated in the core of the District, in areas with higher residential and commercial densities. These areas may be less likely to show higher levels of accessibility change due to the fact that these populations are in closer proximity to existing transit facilities, and already enjoy high levels of accessibility. A detailed description of the methodologies employed and results of the analyses for Transit Travel Time is contained in a MOE Methodologies and Results Technical Memorandum.

Figure 3-2
Transit Travel Time Criteria Ratings

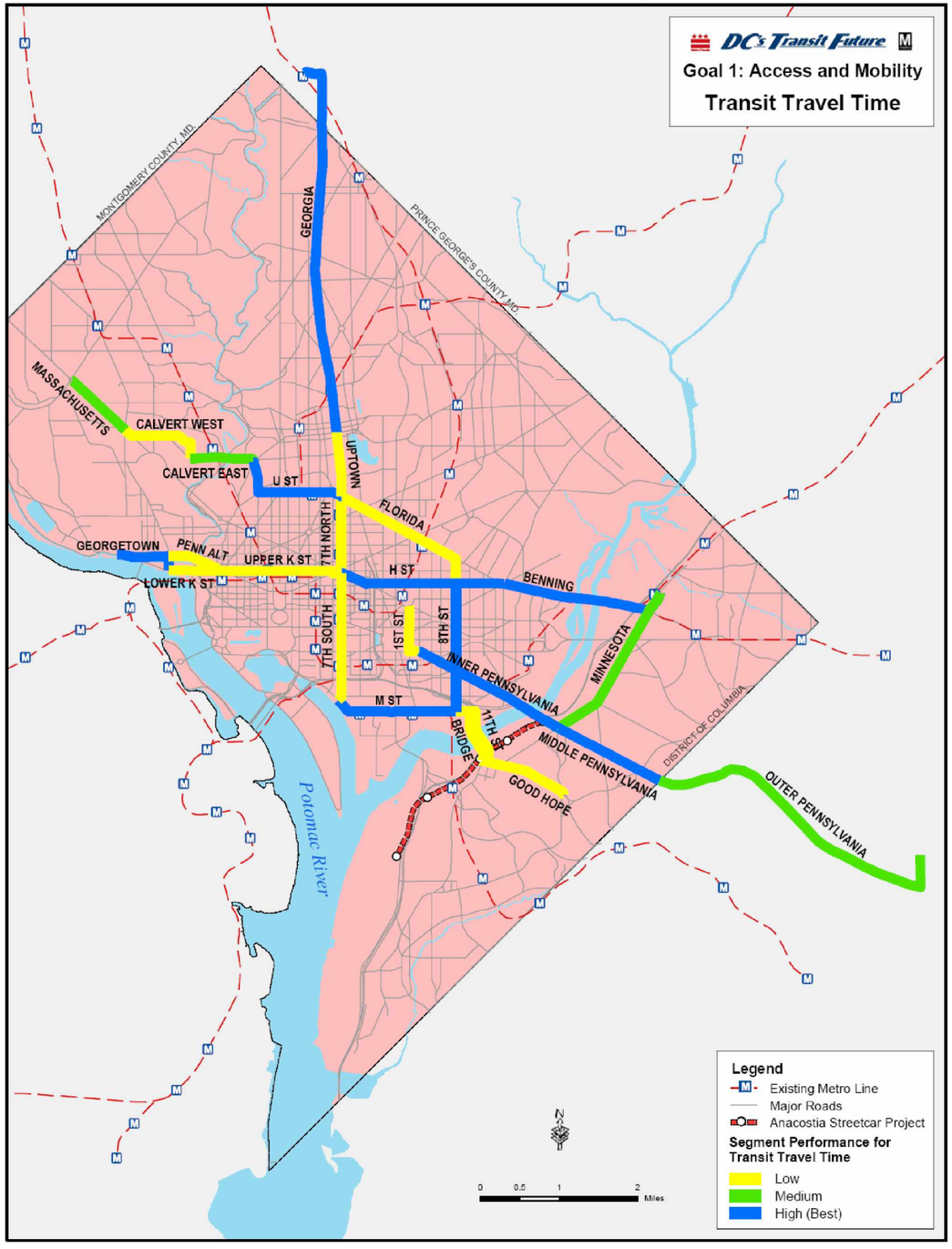
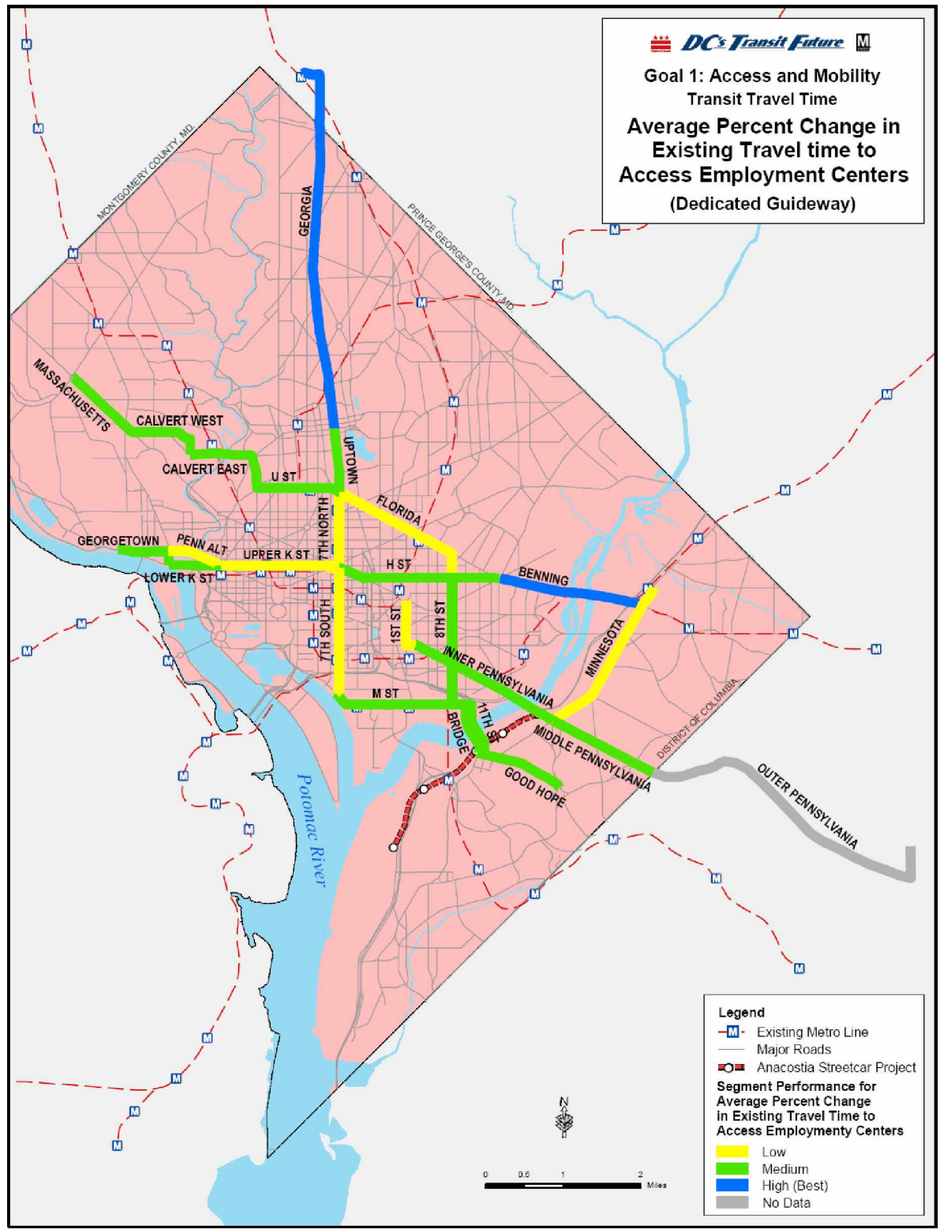
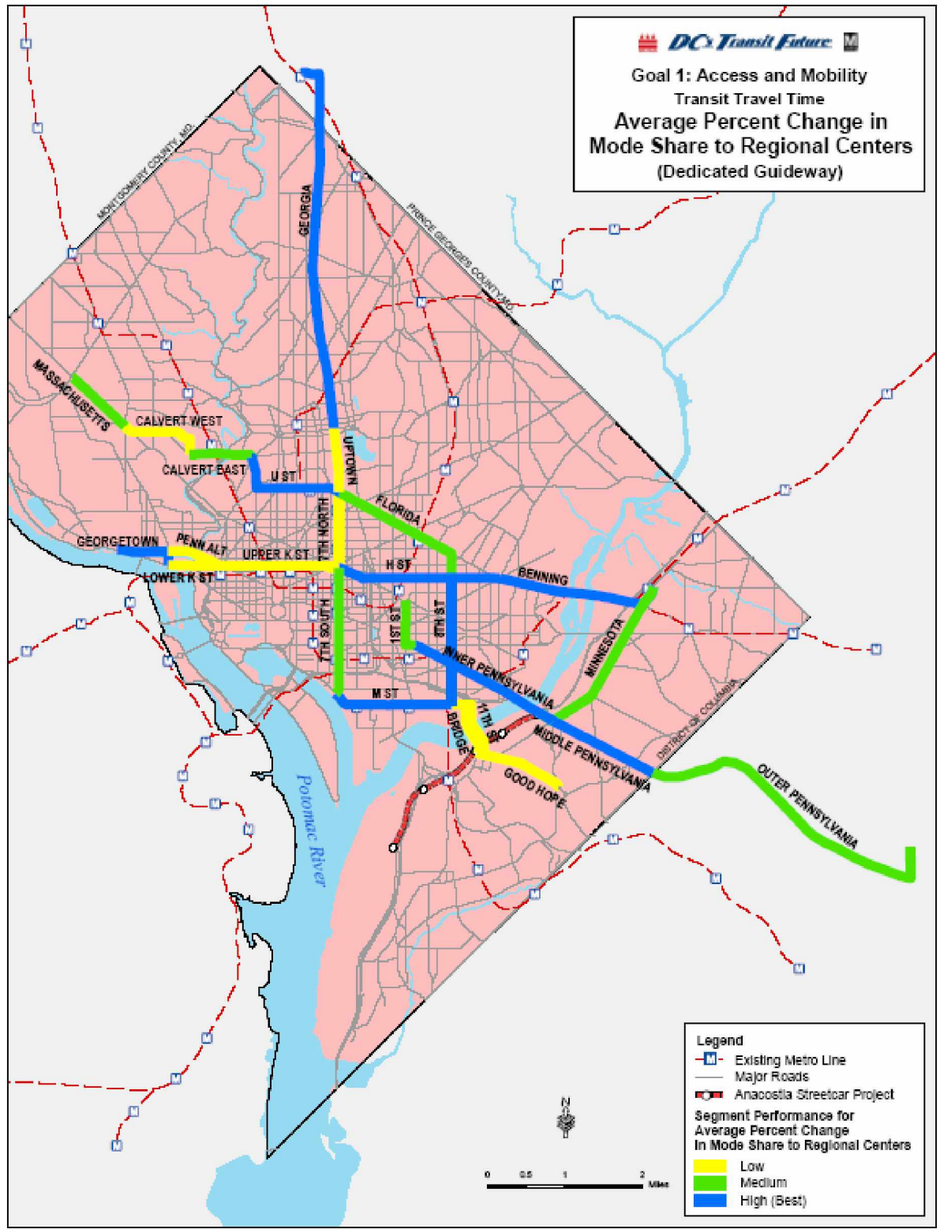


Figure 3-2a
Transit Travel Time MOE Ratings





3.1.2 Accessibility

Approach

Number of Regional Activity Centers Served

The purpose of this MOE is to determine the total number of major activity centers located within ¼-mile of each segment. The location of each activity center within DC was mapped and compared to the proposed corridors and segments using the map of regional activity centers from the Metropolitan Washington Council of Governments (MWCOG) *Regional Activity Centers* (2002) report.

Ratings were both qualitative and quantitative assessments, and were based on how well the segments would serve regional activity centers. Segments with a High rating would serve multiple centers, or would serve the core of a single center. Segments with a Medium rating would indirectly serve one center (located within ¼ mile of the periphery of a regional activity center). Segments with a Low rating would not serve any centers.

Population per Linear Mile and Employment per Linear Mile

The purpose of this MOE was to determine the total amount of employment and population located along each segment. Year 2000 and projected 2030 population and employment located within ¼-mile of each proposed alignment were determined using geographic information systems (GIS) population and employment data obtained from the MWCOG *Round 6.3 Forecasts* (2003) for 2000 and 2030. These data were used to determine the population per linear mile and employment per linear mile for each segment in the proposed corridors.

The estimates were obtained by calculating the total land area, population, and employment for the TAZs that fall partially or completely within a ¼-mile of each alignment. For TAZs that fall partially within a ¼-mile, the population and employment was calculated by multiplying the total population or employment by the proportion of the zone estimated to fall within a ¼-mile.

For both population per linear mile and employment per linear mile, segments rated as High exceeded 10,000 persons or jobs, while those in the 5,000 to 9,999 person or job range were rated as Medium, and those with less than 4,999 person or jobs were rated as Low.

Summary

As described is Table 3-3, a cumulative performance rating was assigned to each segment within each corridor. Figure 3-3 illustrates the summary ratings by segment for the Accessibility criteria. Figure 3-3a illustrates the ratings for each MOE within the Accessibility criteria. Typically, the more intense the land uses around stations, the higher the rating for accessibility. Generally, the denser core of the District has higher numbers of activity centers served by each segment as well as generally higher population and employment density. Table 3-3 describes each of the criteria in greater detail by corridor segment. A detailed description of the methodologies employed and results of the analysis for the Accessibility MOE is contained in MOE Methodologies and Results Technical Memorandum.

Figure 3-3
Accessibility Criteria Ratings

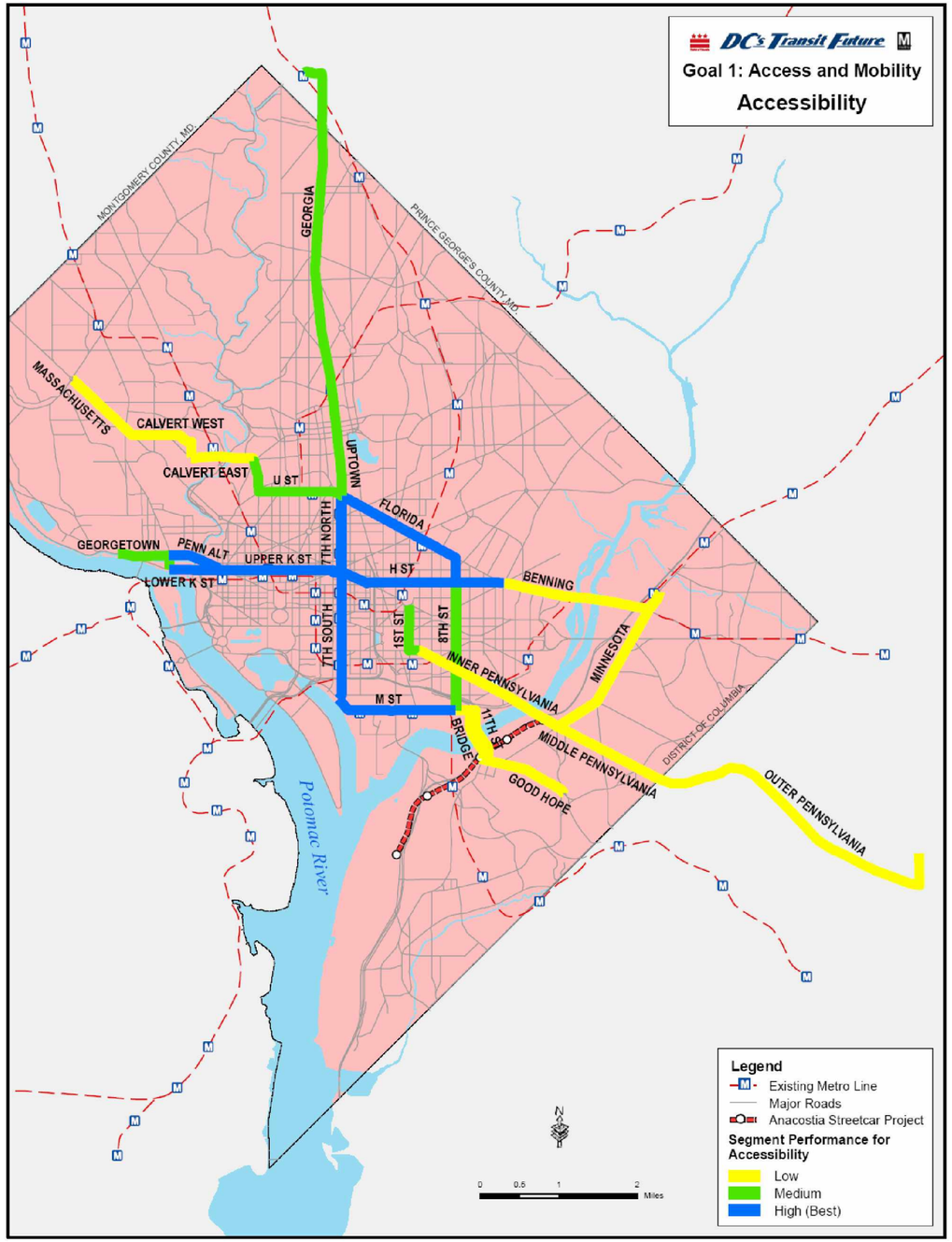
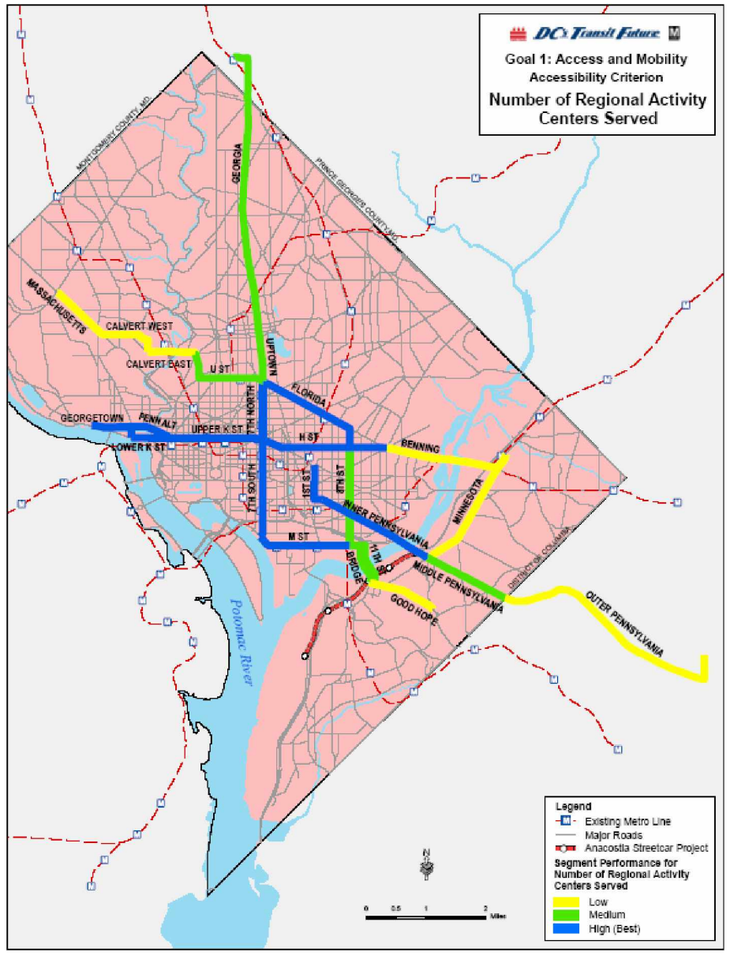
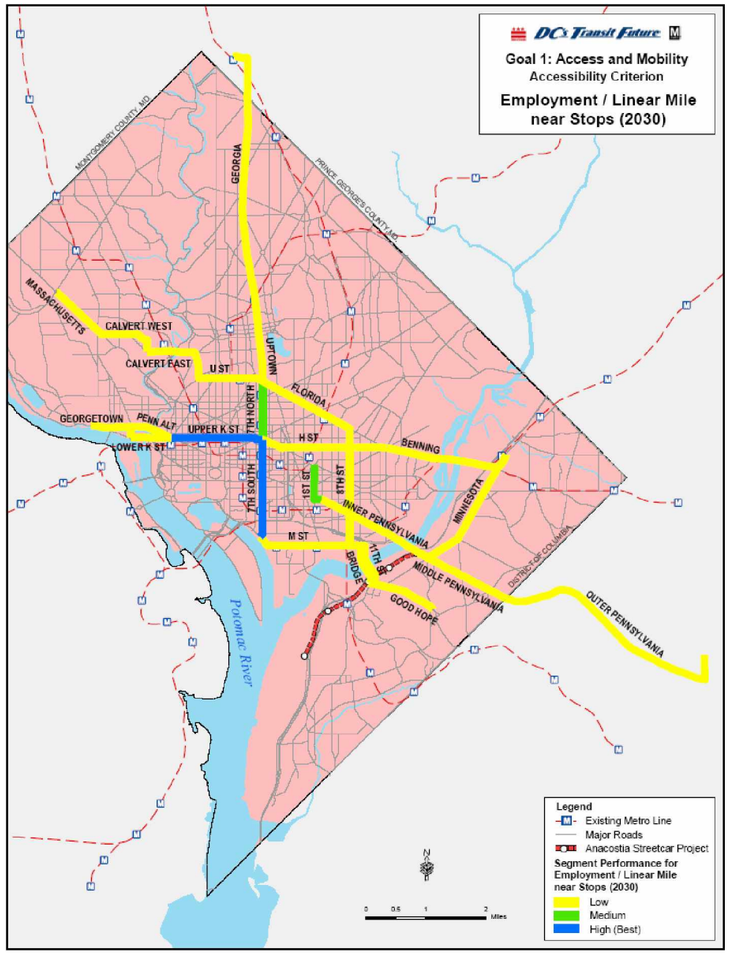
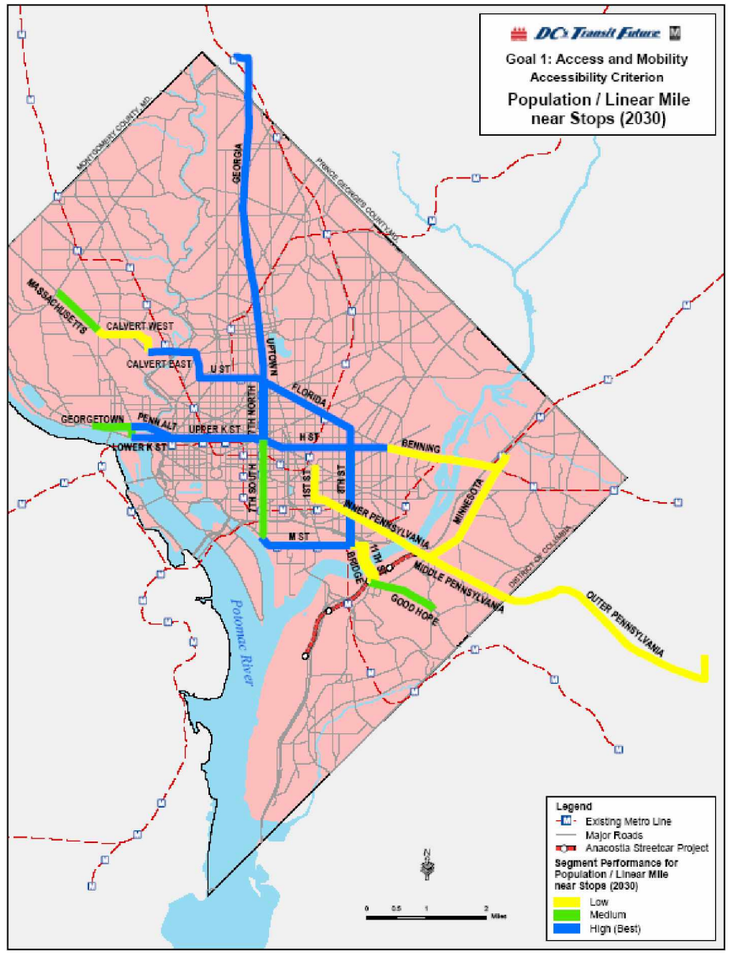


Figure 3-3a
Accessibility MOE Ratings







3.1.3 Ridership

Approach

Total Daily Boardings

The purpose of this MOE is to measure the total daily boardings and boardings per route mile for each segment. Total daily boardings and boardings per route mile are fundamental measures in assessing the relative effectiveness of each operational corridor. The data presented here represents estimated premium transit ridership based on projected population and employment conditions for the year 2030 and other factors.

Calculation of total daily boardings was obtained from the transit ridership model analysis conducted as part of Screen 3. Ridership was assigned to each segment according to stops contained within each segment.

Rankings for average daily ridership were as follows:

- greater than 11,000 were rated high
- between 5,700 and 10,999 were rated medium
- and less than 5,699 were rated low

Daily Boardings per Route Mile

Daily boardings per route mile were calculated using the total daily boardings described above. Estimated total daily boardings for each segment were divided by the length of the segment, resulting in the daily boardings per route mile.

Boardings per mile ratings were based on the following:

- greater than 5,200 were rated high
- between 2,800 and 5,199 were rated medium
- and less than 2,799 were rated low

Summary

Daily boardings and boardings per mile are higher in areas with higher populations or employment centers. Thus, densely developed areas have higher boarding numbers, with the Georgetown to Minnesota Avenue Metro ranking highest in boardings and the Minnesota Avenue to Anacostia ranking lowest. Additional work described in the Screen 3 Ridership Tech Memo, under separate cover, also indicates higher ridership with increasing quantities of dedicated guideway, likely because of improvements to travel times. Figure 3-4 graphically depicts the summary ridership ratings. Operating assumptions are provided in MOE Methodologies and Results Technical Memorandum.

Figure 3-4
Ridership Ratings

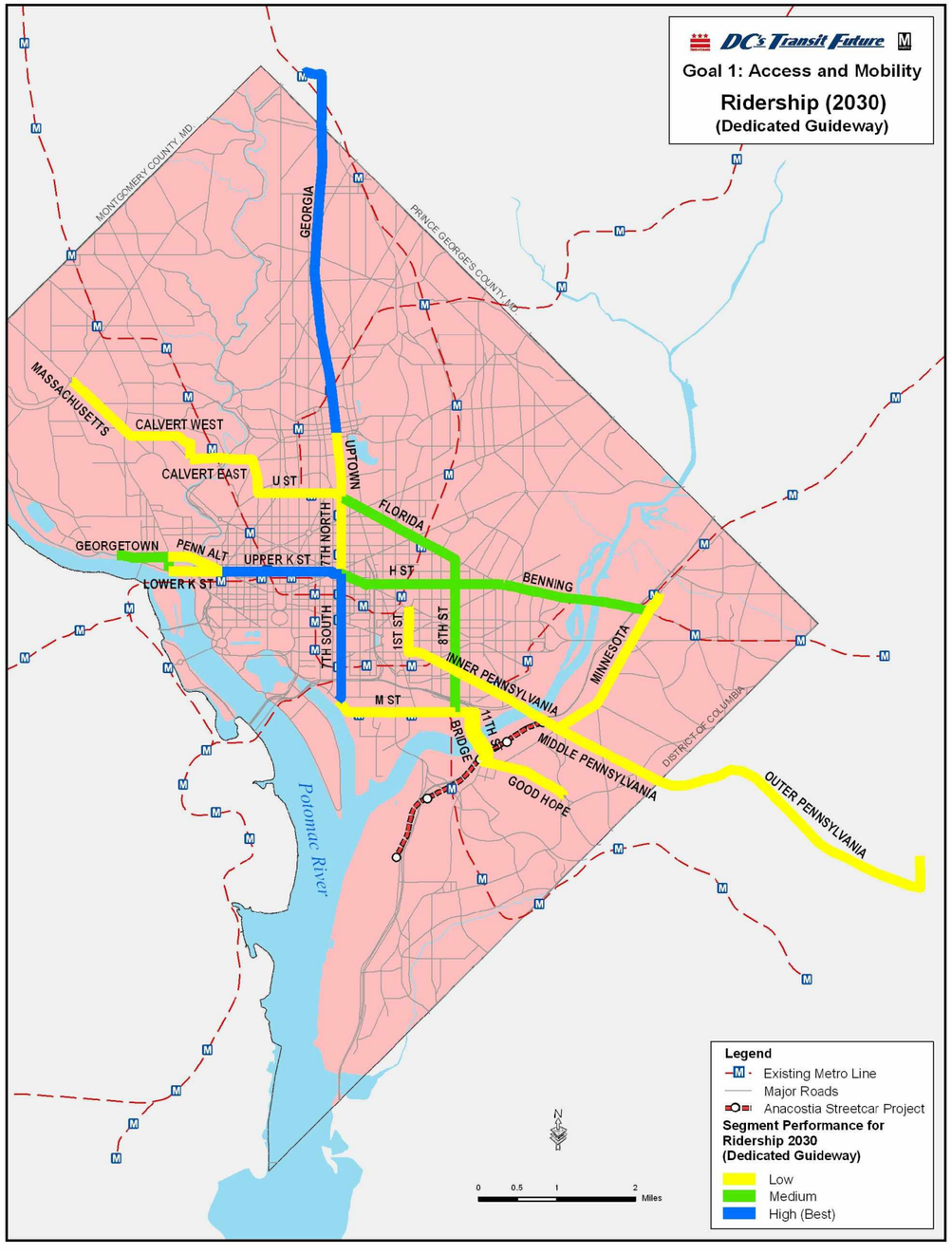
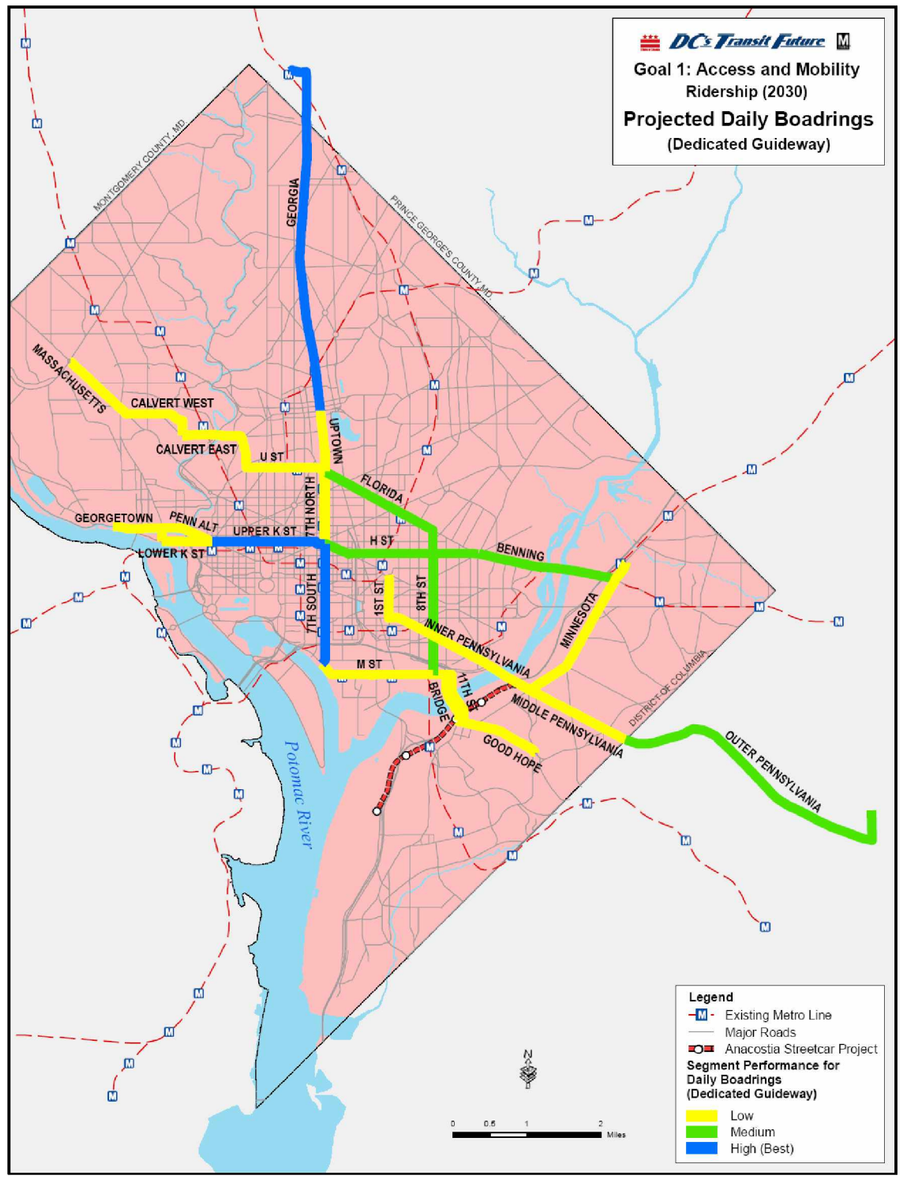
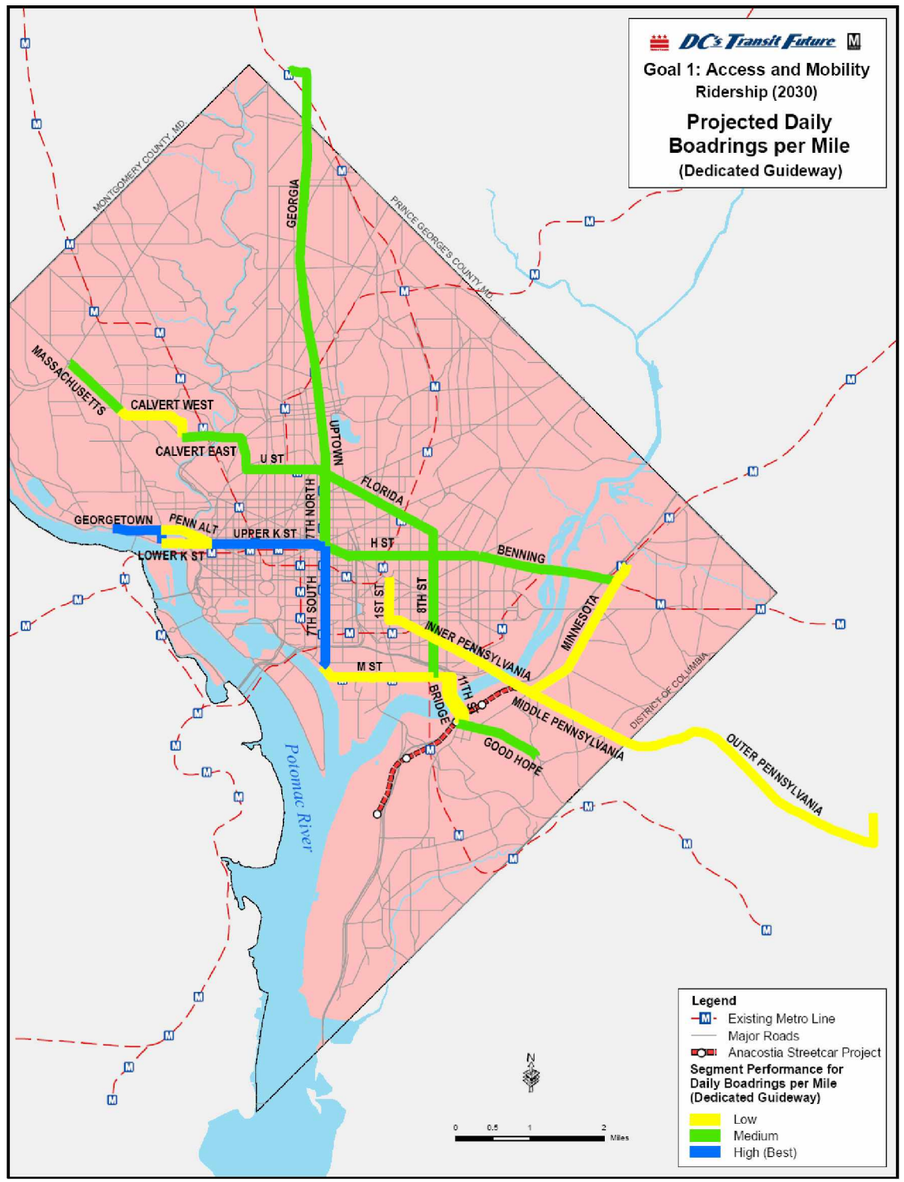


Figure 3-4a
Ridership MOE Ratings





3.2 GOAL 2: COMMUNITY AND ECONOMIC DEVELOPMENT

The purpose of Goal 2 is to measure the effectiveness of the premium transit corridors in supporting the goal of enhancing community and economic development. The three criteria are:

- ***Community planning initiatives*** - This measures the extent to which premium transit corridors and segments serve the goals, objectives and policies contained in designated Main Street initiatives, as well as those in the Strategic Targeted Neighborhood plans. Also, the relation of corridors and segments to other major development initiatives undertaken by jurisdictions and development entities is another indicator of potential economic development effect that may result from the premium transit alternatives.
- ***Land development potential*** – This measures the relationship of proposed premium transit corridors and segments to existing land use, future land use, and the potential capacity implied by vacant and under-utilized land.
- ***Community support –*** This measures the number and content of comments received as a reaction to public information meetings, workshops, and other outreach activities.

These criteria are summarized in the following sections of this screening report, and are summarized in Table 3-4. They are illustrated in Figure 3-5. A more detailed description of this goal and the results of the analyses for Community and Economic Development is contained in MOE Methodologies and Results Technical Memorandum. In general, the triangle formed by H Street NE, 7th North, and Florida Avenue rated the highest overall for Community and Economic Development. This area is the focus of extensive redevelopment efforts. Other High rated segments included Uptown, M Street SE, and Good Hope. Segments in outlying areas or in areas that are already highly developed did not rate as highly.

Figure 3-5

Goal 2: Community and Economic Development Ratings

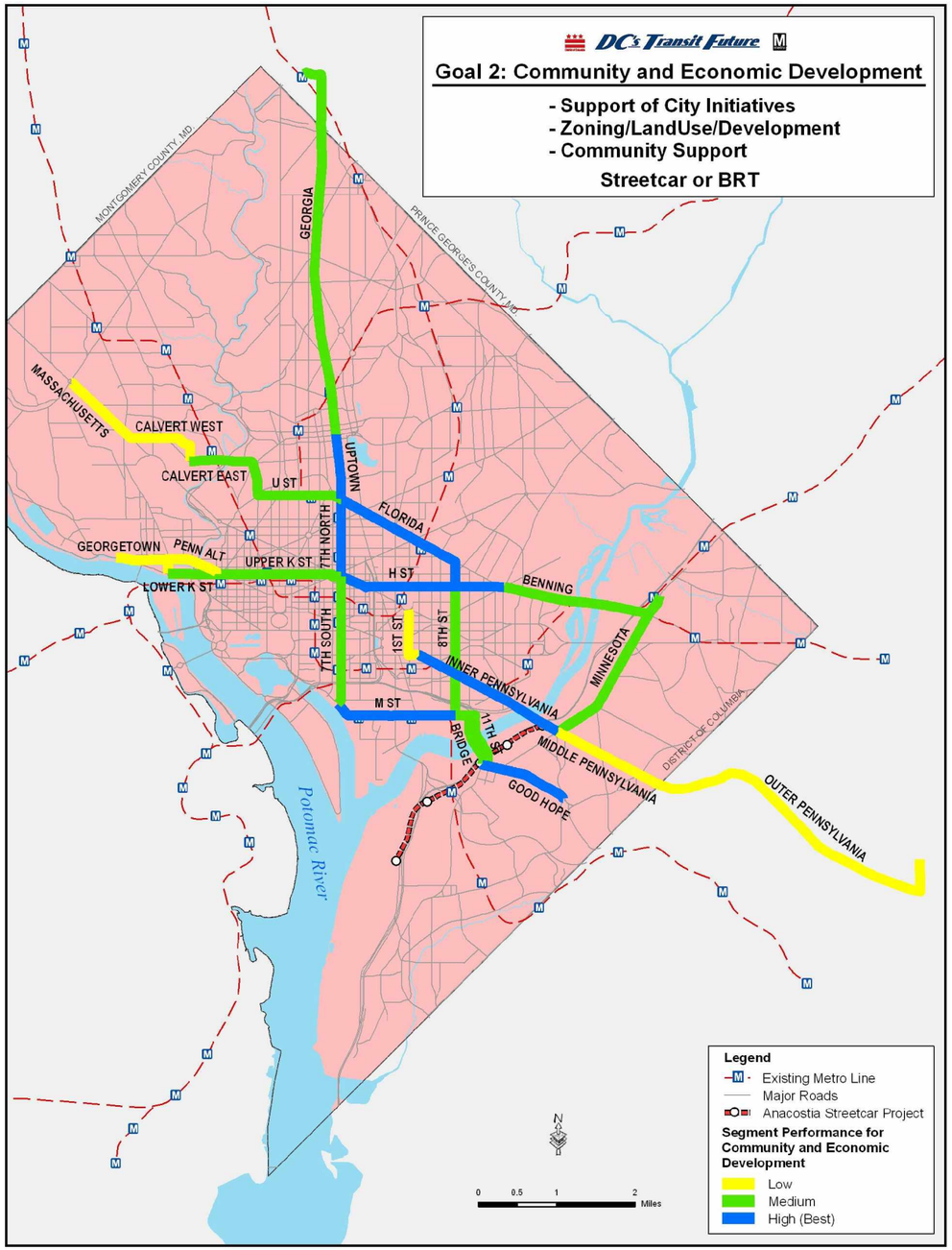


Table 3-4
Summary of Screen 3: Goal 2 – Community and Economic Development Measures

Corridors and Segments	Support of City Initiatives			Zoning/Land Use/Development			Community Support	Ratings			
	Designated Main Street Corridors Served	Strategic Targeted Neighborhoods Served	Major Development Initiatives	Current Development Projects Served	Zoning and Land Use Compatibility	Zoning Potential/ Capacity of Underutilized/ Un-built Land	Public Comment	Support of City Initiatives	Zoning/Land Use/ Development	Community Support	Goal 2 Overall
Silver Spring to Skyland SE											
Georgia	Direct 1	Direct 1 / Indirect 2	High	Low	Medium	High	Positive 10 Neutral 5 Negative 7	High	Medium	Medium	Medium
Uptown	Direct 1 / Indirect 1	Indirect 2	Medium	Medium	Medium	Medium	Positive 2 Neutral 0 Negative 0	High	Medium	High	High
7th North	Direct 1/ Indirect 1	Direct 1	High	High	Medium	High	Positive 0 Neutral 0 Negative 0	High	High	Medium	High
7th South	Indirect 1	0	High	High	High	High	Positive 0 Neutral 0 Negative 0	Medium	High	Medium	Medium
M Street SE	Indirect 1	Direct 1	High	High	Medium	Medium	Positive 1 Neutral 0 Negative 0	High	Medium	High	High
11th Street Bridge	Indirect 2	Indirect 2	Low	Low	Medium	Low	Positive 0 Neutral 0 Negative 0	High	Low	Medium	Medium
Good Hope Road	Direct 1	Indirect 2	Low	Medium	Medium	Medium	Positive 1 Neutral 0 Negative 0	High	Medium	High	High
American University to L'Enfant Plaza											
Massachusetts	0	0	Low	Low	Medium	Low	Positive 1 Neutral 0 Negative 0	Low	Low	High	Low
Calvert West	0	0	Low	Medium	Low	Low	Positive 1 Neutral 0 Negative 0	Low	Low	High	Low
Calvert East	Indirect 1	0	Low	Medium	Medium	Low	Positive 0 Neutral 0 Negative 0	Low	Medium	Medium	Medium
U Street	Direct 2 / Indirect 1	Indirect 1	Medium	High	Medium	Medium	Positive 1 Neutral 0 Negative 0	Medium	Medium	High	Medium
Florida	Indirect 3	Direct 1 / Indirect 1	High	High	Medium	High	Positive 0 Neutral 0 Negative 0	High	High	Medium	High
8th Street	Direct 1 / Indirect 1	Indirect 2	High	Medium	Medium	Low	Positive 1 Neutral 1 Negative 1	High	Medium	Medium	Medium
M Street SE	Indirect 1	Direct 1	High	High	Medium	Medium	Positive 1 Neutral 0 Negative 0	High	Medium	High	High
7th South	Indirect 1	0	High	Low	High	High	Positive 0 Neutral 0 Negative 0	Medium	High	Medium	Medium
Georgetown to Minnesota Avenue Metro											
Georgetown	0	0	Low	Low	Medium	Low	Positive 3 Neutral 1 Negative 0	Low	Low	High	Low
Pennsylvania Alternative	0	0	Low	High	Medium	Medium	No Data	Low	Medium	No Data	Low
Lower K Street			Low		Medium	Medium	Positive 0 Neutral 0 Negative 0	Low	Medium	Medium	Medium
Upper K Street	Indirect 1	Indirect 1	Medium	High	High	High	Positive 0 Neutral 0 Negative 0	Medium	High	Medium	Medium
H Street NE	Direct 1	Direct 1 / Indirect 1	High	High	Medium	High	Positive 3 Neutral 0 Negative 0	High	High	High	High
Benning Road	Indirect 1	Indirect 1	Medium	Medium	Medium	High	Positive 0 Neutral 0 Negative 0	Medium	Medium	Medium	Medium
Minnesota Avenue Metro to Anacostia Streetcar Project											
Minnesota	0	Direct 1 / Indirect 1	Medium	Low	Medium	High	Positive 2 Neutral 0 Negative 0	Medium	Medium	High	Medium
Union Station to Forestville											
1st Street	Indirect	1	Medium	Low	High	Low	No Data	Medium	Low	No Data	Medium
Inner Pennsylvania	Direct 1	Indirect 1	High	Medium	Medium	Medium	No Data	High	Medium	No Data	High
Middle Pennsylvania	0	Indirect 1	High	Low	Low	Low	No Data	Medium	Low	No Data	Low
Outer Pennsylvania	0	1	Low	No Data	Low	No Data	No Data	Low	Low	No Data	Low
	Ratings	Low	Medium	High							

3.2.1 Support of City Initiatives

Approach

A component in determining the community and economic development impact of the system alternatives is an assessment of the support that each segment provides for already established community development goals. This can be estimated by compiling the goals included in the established Main Street Initiatives, Strategic Targeted Neighborhoods, and major development initiatives.

Using the lists obtained from the DCOP, reSTORE DC, and the Office of the Deputy Mayor for Planning and Economic Development, each Main Street Corridor, Strategic Targeted Neighborhood, and development initiative was mapped (see MOE Methodologies and Results Technical Memorandum) and its location compared to the proposed corridors and segments for the *District of Columbia Transit Alternatives Analysis*. If an initiative is located within ¼ mile of a proposed segment, the segment is considered to serve that initiative. Each segment of the corridor alternatives has been rated according to how well it serves each type of city initiative. The rating is both a qualitative and a quantitative assessment. Segments with a 'High' rating serve multiple initiatives, or serve the core of a single initiative. A 'Medium' rating indicates that a segment indirectly serves one initiative, meaning it is within ¼ mile of the periphery of the area covered by an initiative. If a segment does not serve any initiatives at all, it is given a 'Low' rating.

The dimensions of Main Street and Strategic Targeted Neighborhoods were evaluated in the Screen 2 report. They have been updated to reflect the modifications and additions made to those Screen 2 alternatives, particularly the addition of the Union Station to Forestville corridor. As well, the dimension of support for major development initiatives was added in Screen 3.

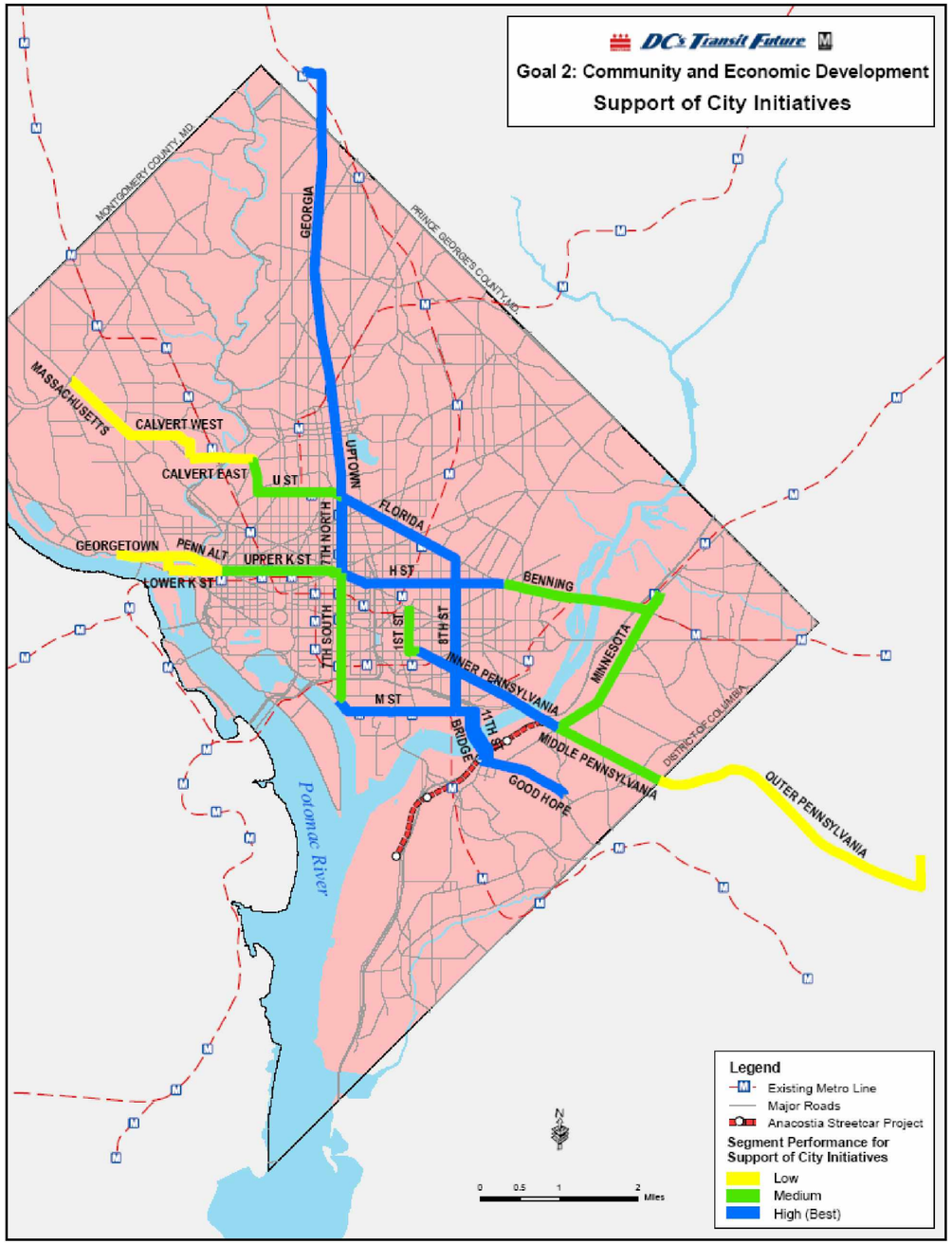
Summary

The results of this analysis have been updated and reflect the following, as shown in Figure 3-6, and discussed below:

Segments that provide a high level of support for City initiatives include the following:

- *Silver Spring to Skyland SE*
  - Georgia
  - Uptown
  - 7th North
  - M Street SE
  - 11th Street Bridge
  - Good Hope Road
- *American University to L'Enfant Plaza*
  - Florida
  - 8th Street
  - M Street SE
- *Georgetown to Minnesota*
  - H Street NE
- *Union Station to Forestville*
  - Inner Pennsylvania

Figure 3-6
Support of City Initiatives Criteria Ratings



Segments that provide a medium level of support for City initiatives include the following:

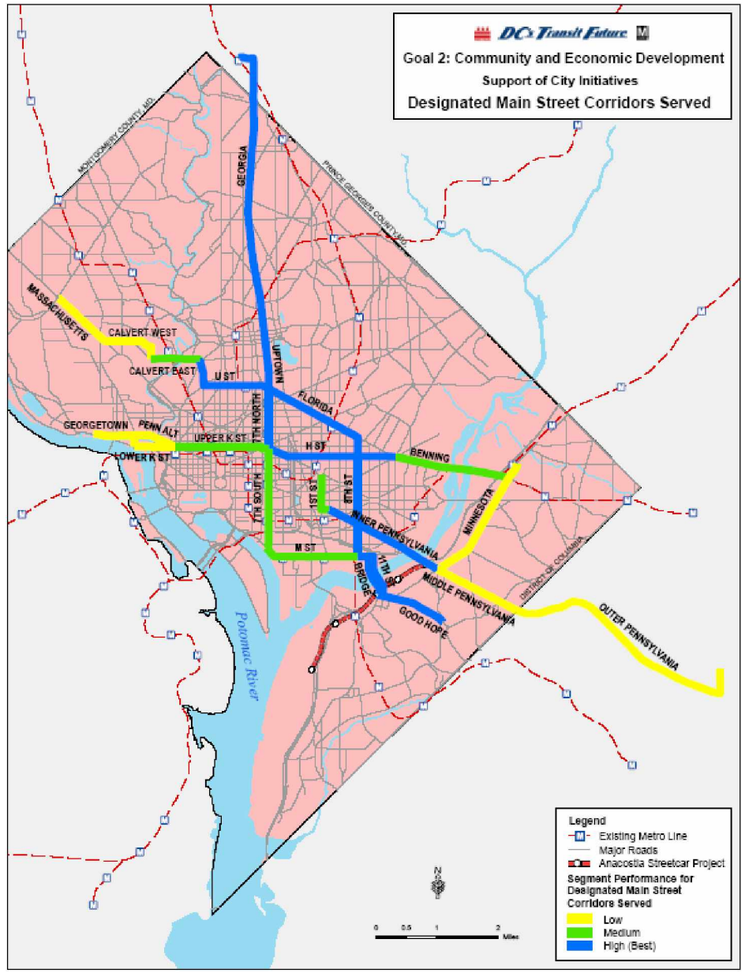
- *Silver Spring to Skyland SE*
  - 7th South
- *American University to L'Enfant Plaza*
  - U Street
  - 7th South
- *Georgetown to Minnesota*
  - Upper K Street
  - Benning Road
- *Minnesota Avenue Metro to Anacostia Streetcar Project*
  - Minnesota
- *Union Station to Forestville*
  - 1st Pennsylvania
  - Middle Pennsylvania

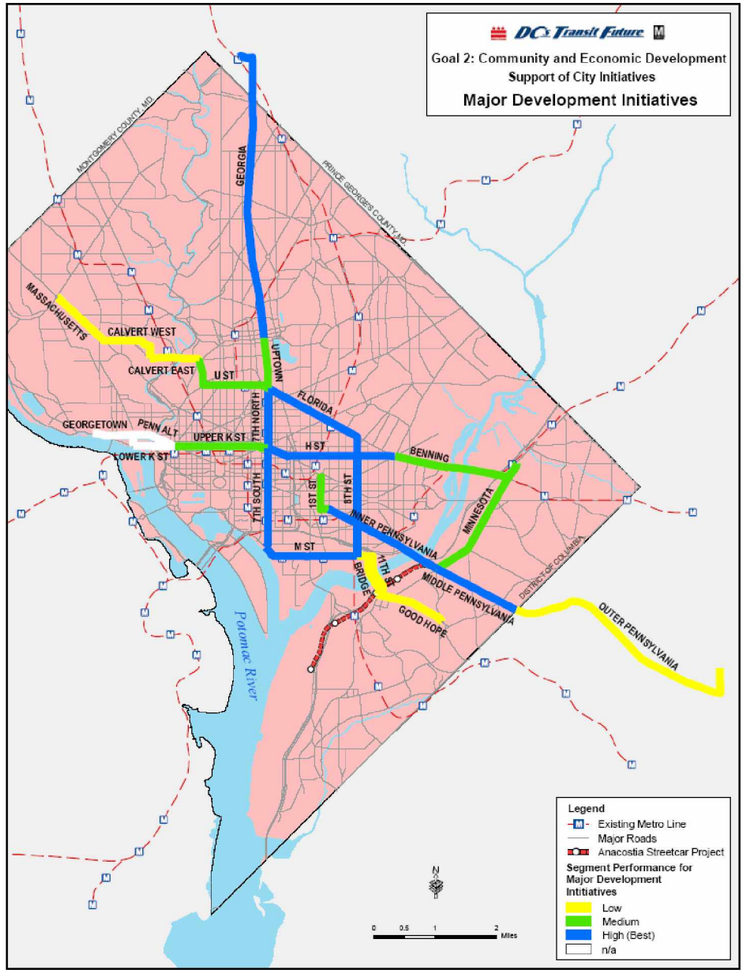
Segments that provide a low level of support for City initiatives include the following:

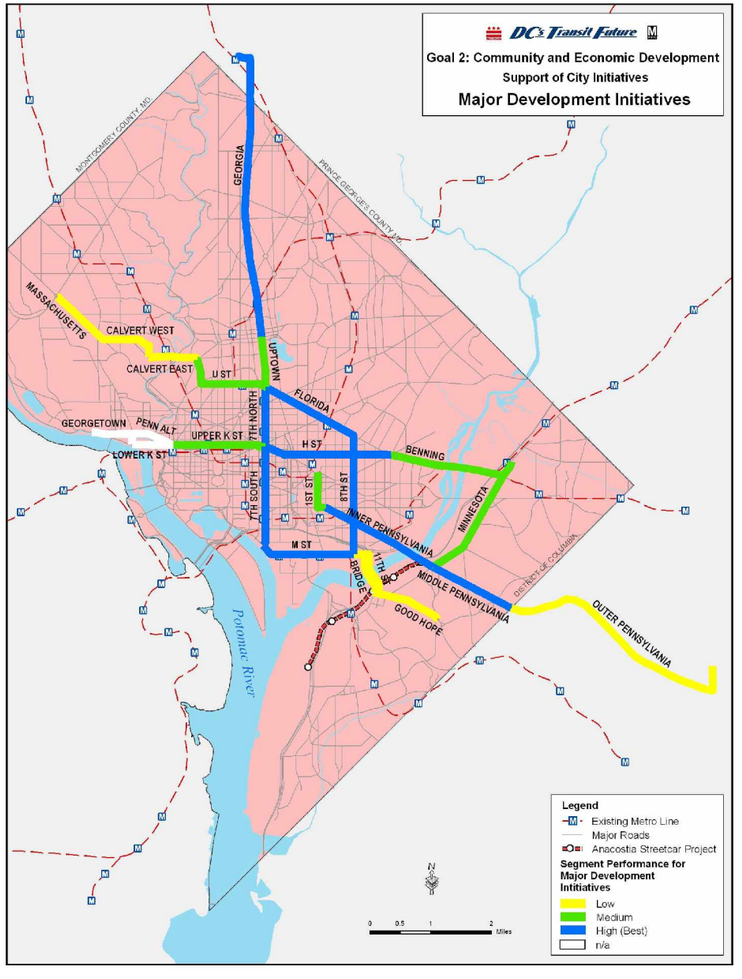
- *American University to L'Enfant Plaza*
  - Massachusetts
  - Calvert West
  - Calvert East
- *Georgetown to Minnesota*
  - Georgetown
  - Pennsylvania Streetcar
  - Lower K Street
- *Union Station to Forestville*
  - Outer Pennsylvania

The individual MOE performance graphics are provided in Figure 3-6a.

Figure 3-6a
Support of City Initiative MOE Ratings







3.2.2 Zoning, Land Use, and Development

Approach

A component of the evaluation of the performance of alternative segments and corridors is the extent to which they relate to existing land uses, projected land uses as indicated by zoning, and to the development potential represented by under-utilized and/or vacant land. Segments and corridors that directly serve high densities of residential use (trip origins) and employment (trip destinations) have a higher potential to generate ridership. Additionally, segments that are immediately adjacent to areas that have high development potential can serve as an inducement for new high density transit related developments, which in turn affect the growth and development potentials of the City.

This measure of effectiveness is composed of three indicators. First, a catalogue of the number of major development projects that are served by the proposed corridors and segments is created. Second, the density of the existing land use (as reflected by the categories of existing land use indicated by the office of the Chief Technology Officer on the official maps) is evaluated and compared to the development potentials of the future land use (as indicated by the categories on the zoning maps of the DCOP). Third, the capacity for development that is represented by underdeveloped and vacant land is estimated.

Summary

The analysis performed for Screen 2 was updated and the new Union Station to Forestville Corridor was added. The results for this criterion are illustrated in Figure 3-7. Only five of the segments were rated high for this measure.

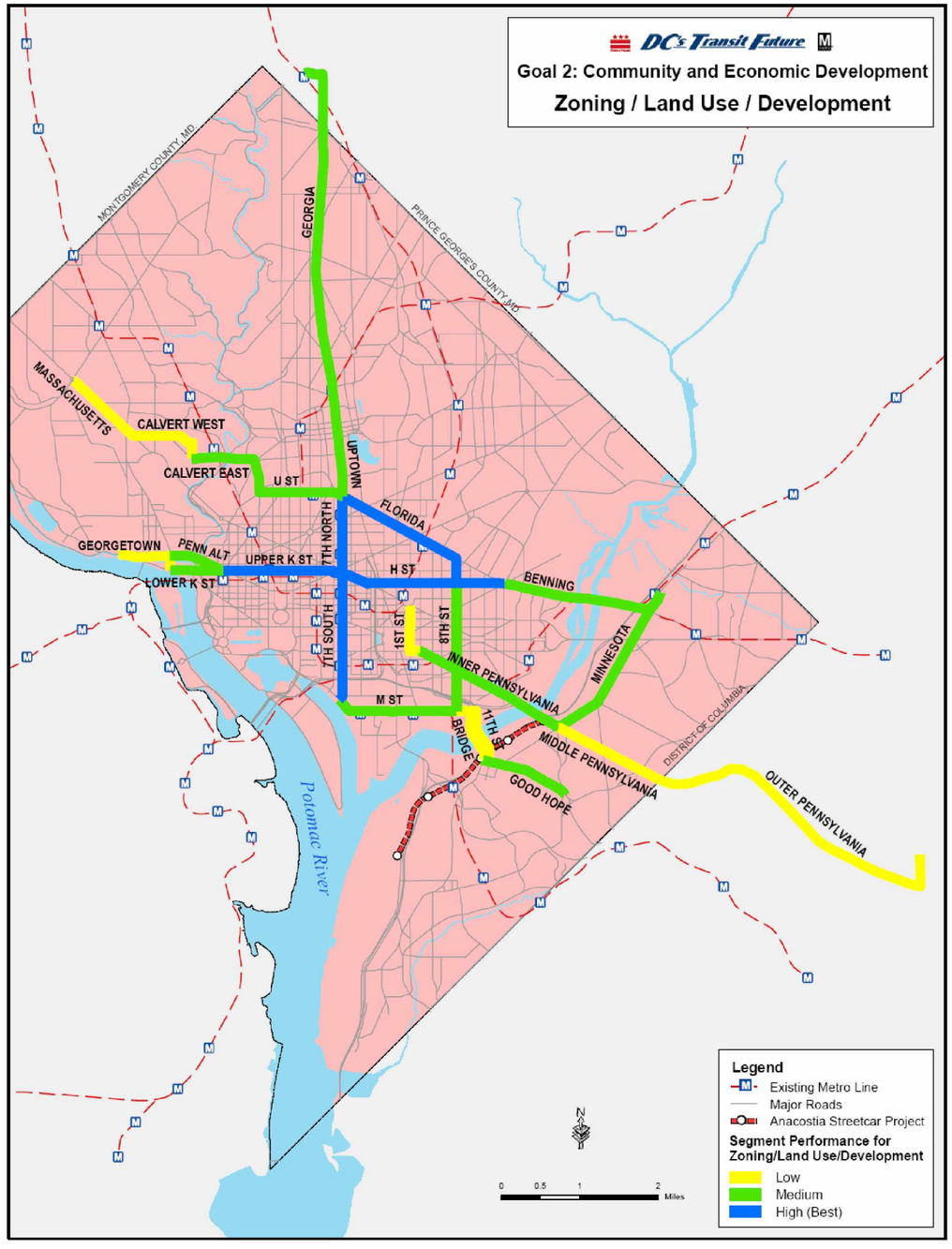
Segments that provide a high level of support for zoning, land use, and development include the following:

- *Silver Spring to Skyland SE*
  - o 7th North
  - o 7th South
- *American University to L'Enfant Plaza*
  - o Florida
  - o 7th South
- *Georgetown to Minnesota*
  - o *Upper K Street*
  - o H Street NE

Segments that provide a medium level of support for community and economic development include the following:

- *Silver Spring to Skyland SE*
  - o Georgia
  - o Uptown
  - o M Street SE
  - o Good Hope Road
- *American University to L'Enfant Plaza*
  - o Calvert East
  - o U Street
  - o 8th Street
  - o M Street SE

Figure 3-7
Zoning / Land Use / Development Criteria Ratings



Georgetown to Minnesota

- Pennsylvania avenue streetcar
- Lower K Street
- Benning Road

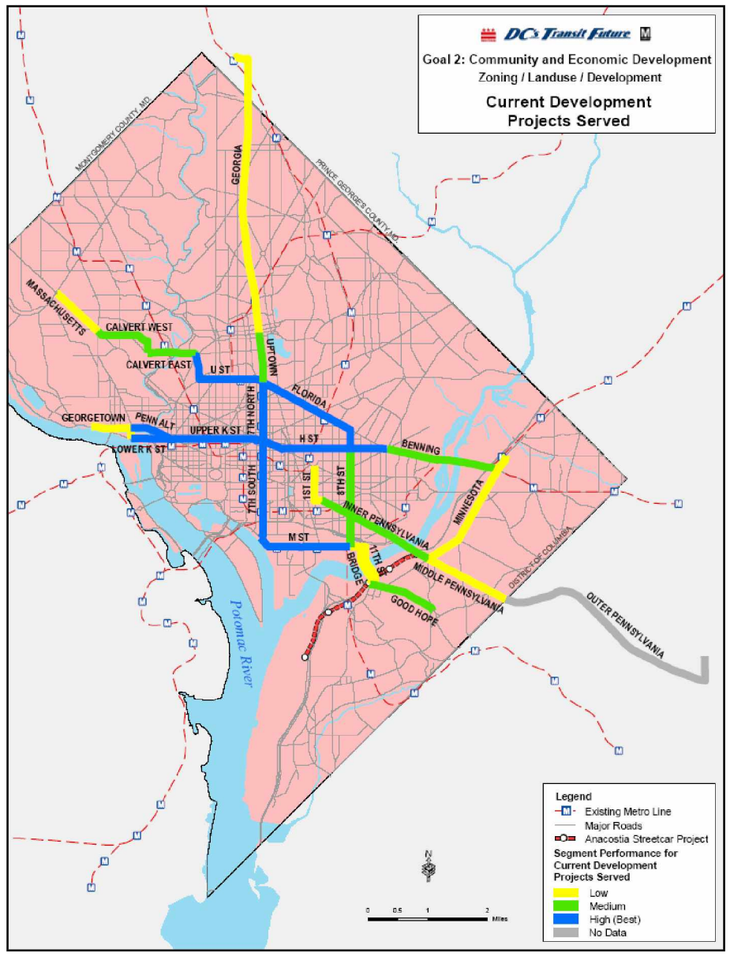
- *Minnesota Avenue Metro to Anacostia Streetcar Project*
  - Minnesota
- *Union Station to Forestville*
  - Inner Pennsylvania

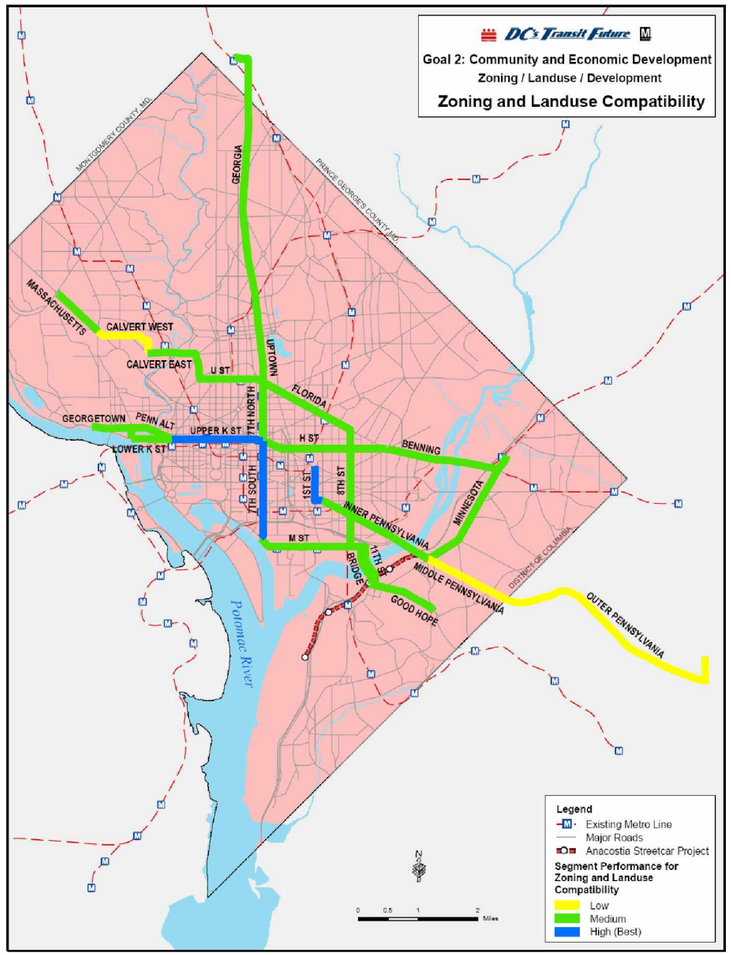
Segments that provide a low level of support for City initiatives include the following:

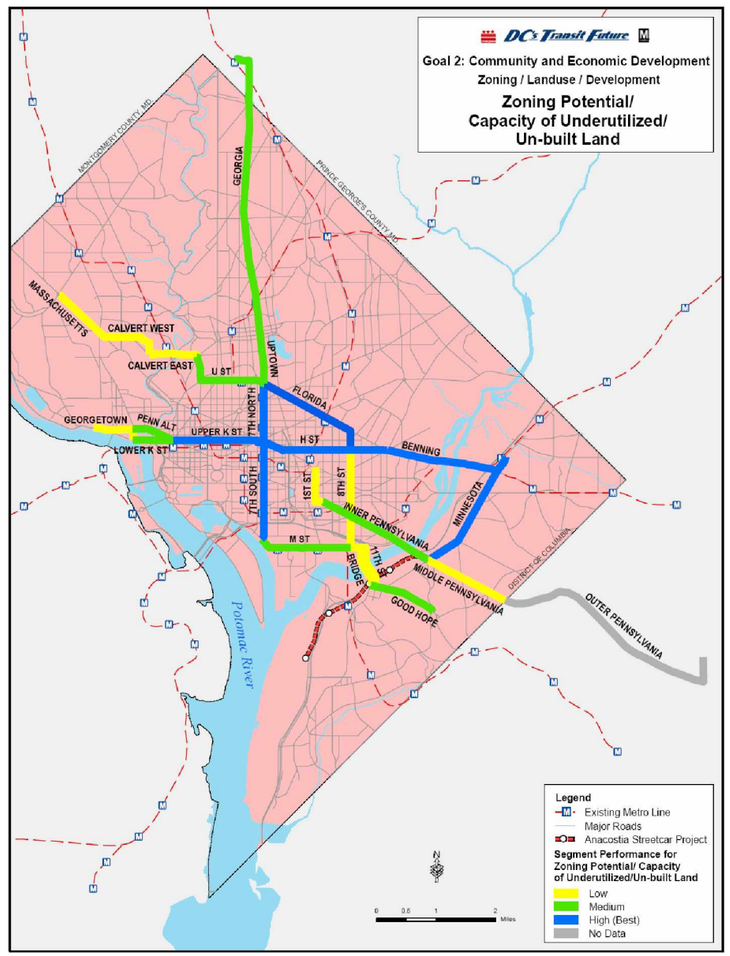
- *Silver Spring to Skyland SE*
  - *11th Street Bridge*
- *American University to L'Enfant Plaza*
  - Massachusetts
  - Calvert West
- *Georgetown to Minnesota*
  - Georgetown
- *Union Station to Forestville*
  - 1st Street
  - Middle Pennsylvania
  - Outer Pennsylvania

The ratings for the individual MOE are illustrated in Figure 3-7a.

Figure 3-7a
Zoning / Land Use / Development MOE Rating







3.2.3 Community Support

Approach and Summary

Community comment and input on the alternatives proposed for the DCAA were received during the period of January through September of 2004. These comments were in response to public meetings, community design workshops, Council briefings, and website postings. The responses were documented and catalogued and are illustrated in Table 3-5 and Figure 3-8.

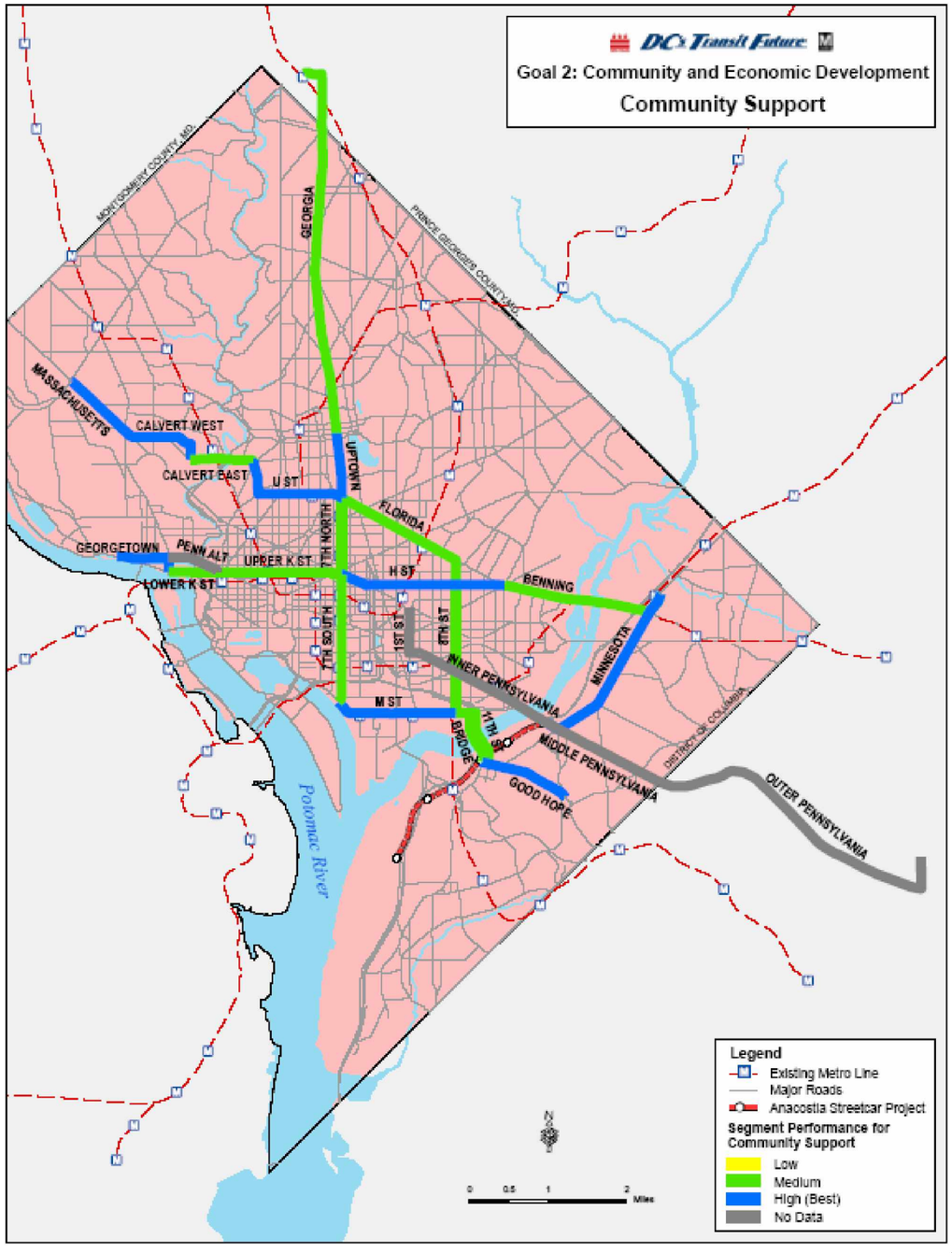
Only comments relating to technologies and alignments are included in this table. Information was obtained from Hotline phone calls, DCAA Web site e-mails, comment cards, and minutes from community meetings and focus groups. Comments are rated according to "high" (supportive), "low" (unsupportive), or "medium" (neutral), and totaled at the bottom of the table. In cases where a comment was not specific to one segment, it was placed in the "General" category.

The Union Station to Forestville corridor was introduced subsequent to the period in which comments were received; therefore, no data on public support is available for this corridor.

Table 3-5
Summary of Public Comment

Segment and Corridor(s)	Low	Medium	High	Total
General Comments	2	14	20	36
Georgia (Corridor 1)	7	5	10	22
Uptown (Corridor 1)			2	2
7th North (Corridor 1)				
7th South (Corridor 1)				
M St (Corridors 1, 6A & 6B)			1	1
11th St Bridge (Corridors 1 & 3)				
Martin Luther King (Corridors 1 & 7)			2	2
South Capitol (Corridors 1& 7)		1	2	3
Minnesota (Corridor 2)			2	2
Anacostia Streetcar Project (Corridor 2)	1	4	7	12
Massachusetts (Corridor 3)			1	1
Calvert West (Corridor 3)			1	1
Calvert East (Corridors 3 & 5)				
U St (Corridor 3)			1	1
Florida (Corridor 3)				
8th St (Corridor 3)	1	1	1	3
Good Hope (Corridor 3)			1	1
Georgetown (Corridors 4A & 6A)		1	3	4
Wisconsin North (Corridors 4B & 6B)			1	1
Wisconsin South (Corridors 4B & 6B)				
Lower K St (Corridors 4A, 4B, 6A & 6B)				
Upper K St (Corridors 4A & 4B)				
H St (Corridors 4A & 4B)			3	3
Benning (Corridors 4A, 4B, 6A & 6B)				
Columbia (Corridor 5)				
Michigan (Corridor 5)				
Waterfront (Corridors 6A & 6B)	1		1	2
Potomac (Corridors 6A & 6B)				
Tunnel (Corridor 7)				
South Capitol St - Bridge (Corridor 7)				
TOTAL:	**12**	**26**	**59**	**97**

Figure 3-8
Community Support Criteria Ratings



3.3 GOAL 3: SYSTEM PERFORMANCE

The purpose of Goal 3 is to measure the improvement to system performance under the build alternatives. System performance is evaluated via the following criteria:

- Travel Time Savings
- Person Through-Put
- Cost-Effectiveness

The resulting ratings for each of the segments for Goal 3: System Performance are shown in Table 3-6. The numerical results for each of the segments for Goal 3 are shown in Table 3-7. The overall summary of ratings for Goal 3 is presented graphically in Figures 3-9 and 3-10.

The three ratings of system performance are closely interrelated, and performance is largely driven by travel speeds. In estimating ridership, travel time from origin to destination is the single greatest factor in determining the method by which a potential transit user decides which mode to use. Therefore, faster travel times result in increased ridership, which in turn leads to lower costs per new rider (since costs are largely fixed regardless of ridership). At the same time, greater ridership results in a more efficient use of resources by increasing the vehicle load levels (although in some cases, increased ridership can overload transit vehicles).

Travel speeds also result in lower O&M costs, as O&M costs are herein evaluated in terms of cost per vehicle mile, while operating costs are per revenue hour; thus, faster speeds allow a transit vehicle to travel more miles in a single hour.

In general, the same segments tended to be rated as High or Low across the three measures. The very high ridership efficiency (riders per route mile) of the Georgetown to Minnesota Avenue Metro corridor pushed all of the segments into an overall high rating. The only low ratings for this corridor are the person through-put rating for the Upper K Street segment, primarily because the already very high levels of service leave little room for improvement in mode share and capacity.

The results were more mixed for the other corridors. Inner Pennsylvania was the highest rated segment overall, and in general, the Union Station to Forestville corridor was probably the next best performer in terms of System Performance. This is primarily due to greatly improved person through-put on the Pennsylvania Avenue segments; these segments have only minimal existing service, and thus saw a tremendous increase in both capacity and ridership. The very slow travel speeds and low ridership on the 1st Street segment were a notable exception; the bulk of riders appear to be traveling only as far into the District as Eastern Market Metro.

The Minnesota Avenue Corridor and segments were consistently rated lower and the corridor rates as Low overall for System Performance. It suffers from both low ridership and low overall travel speeds (despite an improvement from existing bus service). The low density land uses along this corridor are not sufficient to generate high ridership, and the low ridership penalizes the corridor in terms of cost-effectiveness.

The three Criteria presented in this section describe dedicated transit options for both BRT and streetcar operations. This level of description is necessary for these specific measures due to significant differences in their performance relative to system performance criteria. Specifically, relative differences in overall cost effectiveness and person through-put among the transit options are realized. Both options are shown in summary graphics.

Table 3-6
Goal 3: System Performance Ratings

Corridors and Segments	Travel Times Savings		Person Through-Put		Cost-Effectiveness		Goal 3 Overall Rating	
	BRT	Streetcar	BRT	Streetcar	BRT	Streetcar	BRT	Streetcar
Silver Spring to Skyland SE								
Georgia	Medium	Medium	High	High	Medium	Low	Medium	Medium
Uptown	Medium	Medium	Low	High	Medium	Low	Medium	Medium
7th North	Medium	Medium	Low	Medium	Medium	Low	Medium	Medium
7th South	Medium	Medium	Low	Low	Medium	Low	Medium	Low
M Street SE	High	High	Low	Low	Medium	Low	Medium	Low
11th Street Bridge	Medium	Medium	Low	Medium	Medium	Low	Medium	Medium
Good Hope Road	Medium	Medium	High	High	Medium	Low	Medium	Medium
American University to L'Enfant Plaza								
Massachusetts	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium
Calvert West	Medium	Medium	Low	Low	Medium	Low	Medium	Low
Calvert East	Medium	Medium	Low	Low	Medium	Low	Medium	Low
U Street	Medium	Medium	Low	Low	Medium	Medium	Medium	Medium
Florida	High	High	Low	Low	Medium	Low	Medium	Medium
8th Street	High	High	Medium	Medium	Medium	Low	Medium	Medium
M Street SE	High	High	Low	Medium	Medium	Medium	Medium	Medium
7th South	High	High	Low	Low	Medium	Low	Medium	Low
Georgetown to Minnesota Avenue Metro								
Georgetown	Medium	Medium	Medium	Medium	High	Medium	Medium	Medium
Pennsylvania Alternative	Medium	Medium	Medium	Medium	High	Medium	Medium	Medium
Lower K Street	Medium	Medium	Medium	Medium	High	Medium	Medium	Medium
Upper K Street	Medium	Medium	Low	Low	High	Medium	High	Medium
H Street NE	Medium	Medium	High	High	High	Medium	High	Medium
Benning Road	High	High	High	Medium	High	Medium	High	Medium
Minnesota Avenue Metro to Anacostia Streetcar Project								
Minnesota	Medium	Medium	Low	Low	Low	Low	Low	Low
Union Station to Forestville								
1st Street	Low	Low	Low	Low	Medium	Low	Low	Low
Inner Pennsylvania	Medium	Medium	Medium	High	High	Medium	Medium	Medium
Middle Pennsylvania	Medium	Medium	Medium	High	Medium	Medium	Medium	Medium
Outer Pennsylvania	Low	Low	Medium	High	Medium	Medium	Medium	Medium

Table 3-7
Goal 3: System Performance Results

Corridors/Segments	Travel Time Savings			Person Through-Put						Cost-Effectiveness											
	Average Percent Change in Transit Travel Times	Percent TAZs Experiencing Improvements in Transit Travel Times Between Select O/D Pairs	Transit System User Benefit per Mile	Change in Transit Mode Share	Change in Transit Carry Capacity		Existing Local Bus Peak Load Factors	Peak Load Factors		Number of TIP Projects That Could Be Coordinated with BRT/SC Project	Operating Costs per Vehicle Mile		Annual Operating Cost per Annual New Boarding		Capital Costs per Mile (millions)		Annualized Capital Cost per Annual Boarding		Annualized Capital Cost per Annual New Boarding		Annualized Cost per Transit System User Benefit	
					BRT	Streetcar		BRT	Streetcar		BRT	Streetcar	BRT	Streetcar	BRT	Streetcar	BRT	Streetcar	BRT	Streetcar	BRT	Streetcar
Silver Spring to Skyland SE																						
Georgia	31%	54%	0.08	0.60%	108%	147%	81%	1.18	0.91	Major 0 Minor 1	$10	$19	$3	$6	$19	$41	$21	$47	$36	$81	$12	$26
Uptown	39%	33%		0.16%	108%	147%	80%	1.19	0.92	Major 0 Minor 1					$19	$41	$17	$36				
7th North	16%	43%		0.03%	108%	147%	73%	1.15	0.89	Major 0 Minor 1					$19	$41	$13	$28				
7th South	47%	33%		0.08%	21%	28%	65%	0.79	0.61	Major 0 Minor 1					$20	$52	$12	$31				
M Street SE	46%	50%		1.32%	59%	76%	36%	0.32	0.25	Major 0 Minor 0					$19	$41	$22	$49				
11th Street Bridge	54%	47%		0.80%	60%	80%	No Data	0.1	0.08	Major 2 Minor 0					$27	$54	$90	$179				
Good Hope Road	64%				81%	100%	80%	0.06	0.05	Major 0 Minor 0					$19	$41	$16	$34				
American University to L'Enfant Plaza																						
Massachusetts	37%	31%	0.13	0.53%	105%	127%	3%	0.71	0.55	Major 0 Minor 0	$10	$19	$3	$7	$18	$34	$21	$41	$49	$99	$10	$19
Calvert West	16%	35%		0.36%	17%	29%	21%	0.83	0.64	Major 0 Minor 0					$16	$32	$127	$255				
Calvert East	31%	41%		0.26%	57%	75%	32%	0.49	0.38	Major 0 Minor 0					$17	$36	$13	$27				
U Street	34%	38%		0.33%	48%	68%	44%	0.58	0.45	Major 0 Minor 0					$17	$33	$19	$36				
Florida	44%	34%		0.34%	71%	100%	62%	0.55	0.43	Major 0 Minor 0					$17	$42	$16	$39				
8th Street	34%	54%		1.02%	76%	100%	80%	0.55	0.42	Major 0 Minor 0					$22	$41	$20	$36				
M Street SE	46%	46%		1.27%	118%	153%	36%	0.18	0.14	Major 0 Minor 0					$17	$33	$15	$30				
7th South	47%	36%		0.13%	62%	77%	65%	0.07	0.06	Major 0 Minor 1					$19	$35	$27	$51				
Georgetown to Minnesota Avenue Metro																						
Georgetown	55%	49%	0.09	1.60%	85%	105%	75%	0.64	0.49	Major 0 Minor 2	$8	$17	$1	$3	$20	$36	$11	$16	$20	$43	$7	$17
Pennsylvania Alt.	36%	8%		0.43%	85%	105%	54%	0.88	0.68	Major 1 Minor 0					n/a	$37	$30	$57				
Lower K Street															$20	n/a						
Upper K Street		13%		0.03%	80%	99%	37%	1.45	1.12	Major 4 Minor 0					n/a[1]	$36	$1	$10				
H Street NE	31%	64%		0.95%	163%	212%	114%	1.23	0.95	Major 0 Minor 0					$20	$36	$14	$25				
Benning Road	46%	65%		0.94%	33%	72%	84%	0.74	0.57	Major 1 Minor 1					$19	$37	$18	$35				
Minnesota Avenue Metro to Anacostia Streetcar Project																						
Minnesota	37%	29%	0.77	0.15%	8%	22%	26%	0.10	0.08	Major 0 Minor 0	$8	$17	No New Boardings	No New Boardings	$22	$36	$140	$457	No New Boardings	No New Boardings	$45	$74
Union Station to Forestville																						
1st Street	18%	23%	0.11	0.32%	50%	65%	No Data[2]	0.21	0.27	Major 0 Minor 0	$7	$14	$2	$5	$16	$43	$23	$61	$42	$76	$8	$20
Inner Pennsylvania	-6%	32%		0.51%	77%	100%	50%	0.74	0.96	Major 0 Minor 1					$16	$28	$27	$46				
Middle Pennsylvania	38%	34%		1.04%	121%	157%	50%	0.73	0.94	Major 0 Minor 0					$16	$28	$40	$68				
Outer Pennsylvania	No Service[2]	21%		No Service[2]	283%	367%	No Service[2]	0.49	0.63	Major 0 Minor 0					$16	$28	$43	$73				

[1] Upper K Street assumed constructed under K Street Transitway project
[2] There is no regular WMATA service in this segment

Table 3-7
Goal 3: System Performance Results

Corridors/Segments	Travel Time Savings			Person Through-Put						Cost-Effectiveness											
	Average Percent Change in Transit Travel Times	Percent TAZs Experiencing Improvements in Transit Travel Times Between Select O/D Pairs	Transit System User Benefit per Mile	Change in Transit Mode Share	Change in Transit Carry Capacity		Existing Local Bus Peak Load Factors	Peak Load Factors		Number of TIP Projects That Could Be Coordinated with BRT/SC Project	Operating Costs per Vehicle Mile		Annual Operating Cost per Annual New Boarding		Capital Costs per Mile (millions)		Annualized Capital Cost per Annual Boarding		Annualized Capital Cost per Annual New Boarding		Annualized Cost per Transit System User Benefit	
					BRT	Streetcar		BRT	Streetcar		BRT	Streetcar	BRT	Streetcar	BRT	Streetcar	BRT	Streetcar	BRT	Streetcar	BRT	Streetcar
Ratings																						
Low	< 20%	< 30%	< 0.05	< 0.25%	< 75%	< 75%	< 49%	< 0.65 and > 1.15	< 0.65 and > 1.15	None	> $15	> $15	> $8	> $8	> $35	> $35	> $50	> $46	> $50	> $50	> $25	> $25
Medium	21% - 39%	31% - 49%	0.06 - 0.09	0.26% - 0.50%	76% - 149%	76% - 149%	50% - 79%	0.66 to 0.74 and 1.06 to 1.1.4	0.66 to 0.74 and 1.06 to 1.1.4	1+ Minor	$8 - $14	$8 - $14	$4 - $7	$4 - $7	$18 - $34	$18 - $34	$25 - $49	$21 - $45	$25 - $49	$25 - $49	$16 - $24	$16 - $24
High	> 40%	> 50%	> 0.10	> 0.51%	> 150%	> 150%	> 80%	0.75 to 1.05	0.75 to 1.05	1+ Major	< $7	< $7	< $3	< $3	< $17	< $17	< $24	< $20	< $24	< $24	< $15	< $15

Figure 3-9
Goal 3: System Performance Ratings - BRT

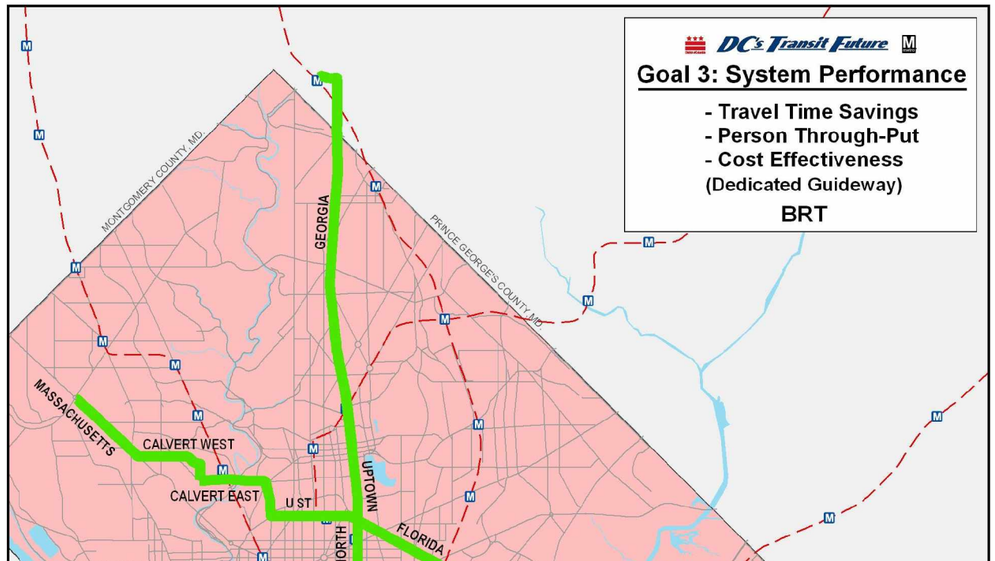
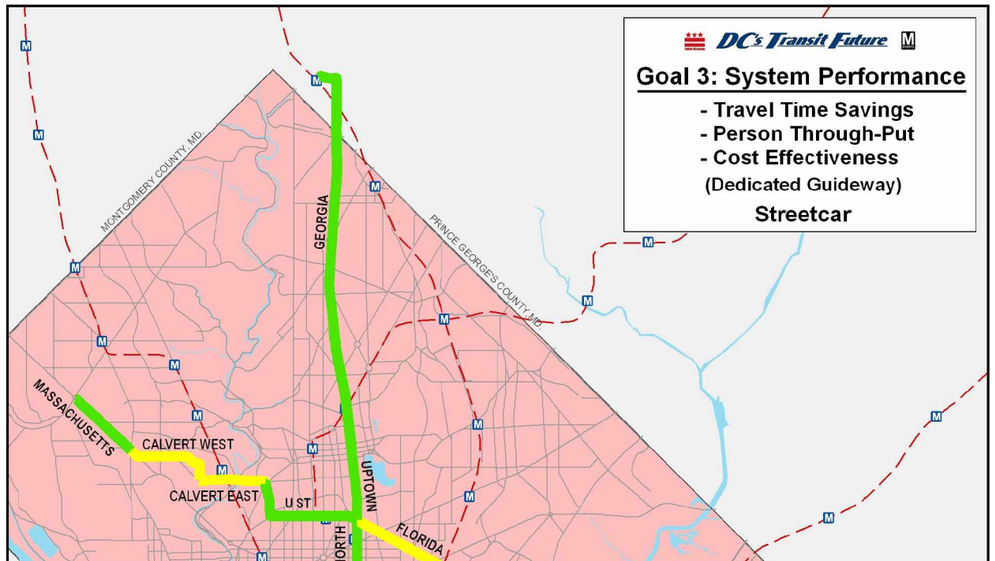


Figure 3-10
Goal 3: System Performance Ratings – Streetcar



3.3.1 Travel Time Savings

Approach

Improvements to travel time are one of the primary reasons to implement premium transit service. Many of the elements of premium transit service contribute to faster travel time, including:

- Limited stops;
- Signal priority;
- Faster acceleration / deceleration times for premium transit vehicles;
- Shorter dwell times due to faster boarding and alighting; and
- In some cases, dedicated guideways.

If no significant speed increase is achieved, it suggests that the existing local service is already well-suited to providing transit trips in the corridor.

Travel time savings were defined in two ways:

- *Intracorridor Savings*, which measured the improvement in travel time for trips made between two points both served by the same transit service; and
- *System Improvements*, which evaluated the travel time from origins within each corridor to the same set of destinations for all corridors, to determine which services had the most significant impact on the entire transit system.

Existing transit service was used to define the Baseline for each corridor, while the Build Alternatives assumed both the full extent of each corridor and the most aggressive possible implementation of dedicated guideways for transit use; thus, the travel time improvements were as great as could reasonably be achieved using the given modes. Under this analysis, there is no difference in travel times between streetcar and BRT modes.

Results

Overall, users of premium transit service saw significant improvements in travel time. For intracorridor trips, the overall travel time savings were often in excess of 40 percent. These travel time benefits are largely due to three factors:

- Improved travel speeds for premium transit service (for the reasons noted above)
- Shorter wait times due to higher frequency of service or removal of an existing transfer (wait time was assumed to equal half the peak headway)
- More direct transit connections along the premium transit corridor

The reduction in waiting time due to eliminated transfers or improved headways was the single greatest factor in travel time improvement. Bus travel speed improvement was relatively minor.

Compared to existing local bus service, the operating speed (in revenue miles per revenue hour) of local bus service (11.3) still exceeds that of premium transit service (10.8 in the most aggressive dedicated guideway alternative). The WMATA number includes relatively high speed commuter routes and routes in suburban areas that are not comparable to the congested inner city corridors on which potential premium transit modes would operate. Compared against the speed of local service in the same corridors (9.8), premium transit shows an improvement of about 9 percent.

The impact of premium transit on travel times between select O/D pairs was less pronounced because trips typically included some time spent on unimproved local service, and were more likely to require transfers. Nevertheless, the time savings were significant, in some cases exceeding 40 percent.

In terms of the best performing corridors, for intracorridor trips, results did not appear to follow any set pattern. The 7th South, M Street SE, 11th Street, and Good Hope Road segments – all part of the Silver Spring to Skyland SE corridor – all were rated as High, as were the Georgetown, Florida, and Benning segments.

For travel to select destinations, the outermost segments of the Georgetown to Minnesota Avenue and Silver Spring to Skyland SE corridors rated the highest, which suggests improvements because of long trips or new connections to Metrorail service. Closer in segments that already have excellent Metrorail connections, such as Upper K and Inner Pennsylvania-1st Street, rated Low.

Summary

In all cases but Inner Pennsylvania, implementation of premium transit resulted in an improvement in travel times for transit users. The majority of segments fell into the Medium category overall, with only the 1st Street and Outer Pennsylvania segments rated as Low. The greatest overall improvements were to the M Street-8th Street-Florida Avenue segments of the American University to L'Enfant Plaza corridor and the Benning Road segment on the Georgetown to Minnesota Avenue corridor. Therefore, the American University to L'Enfant Plaza corridor showed the greatest overall improvement, while the Union Station to Forestville Corridor is rated lowest overall. Figure 3-11 graphically depicts the travel time savings for these segments. Figure 3-11a illustrates the ratings for the individual MOEs for the Travel Time Savings Criteria. A detailed description of the methodology employed and results of the analyses for Travel Time Savings is contained in MOE Methodologies and Results Technical Memorandum.

Figure 3-11
Travel Time Savings Criteria Ratings – BRT and Streetcar

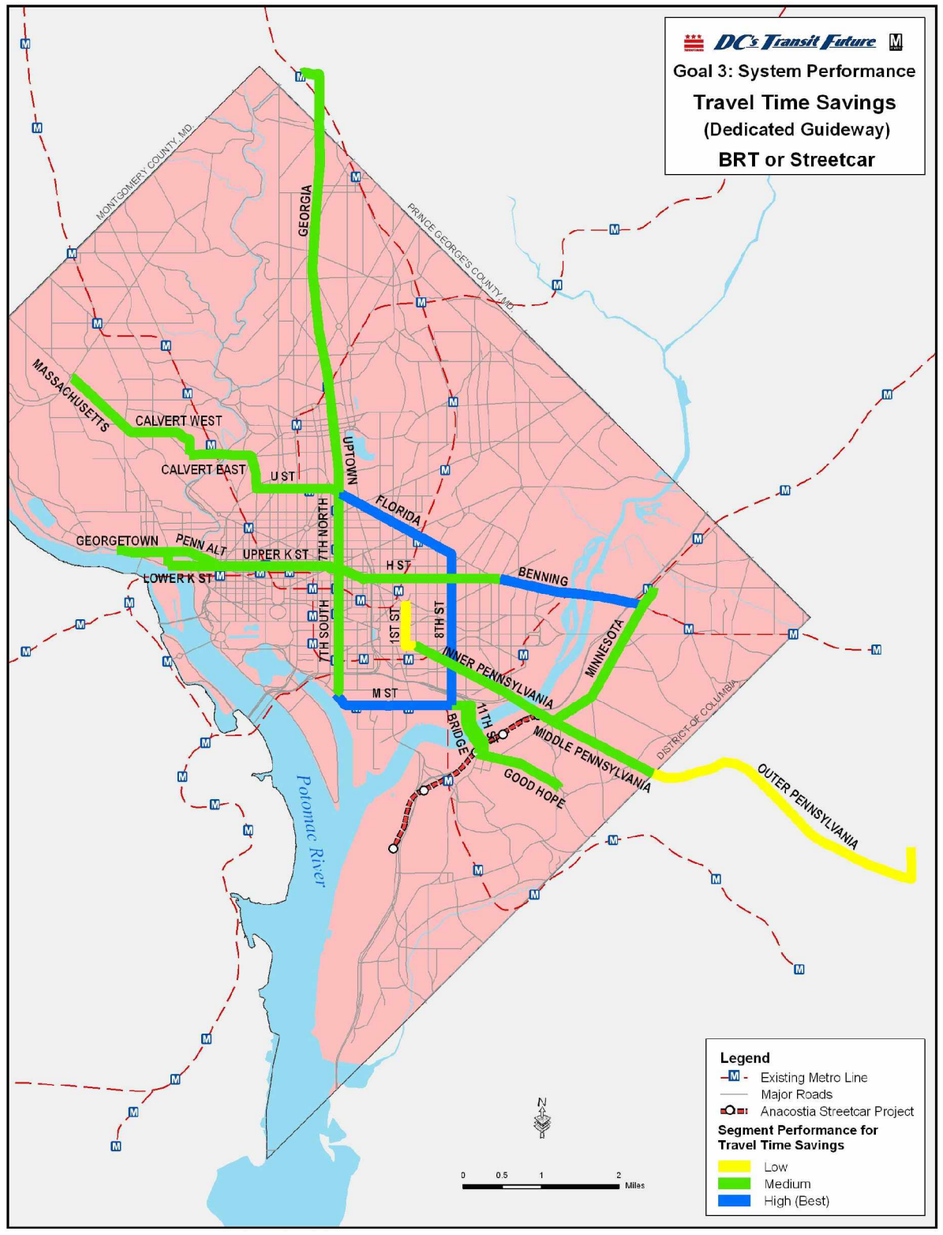
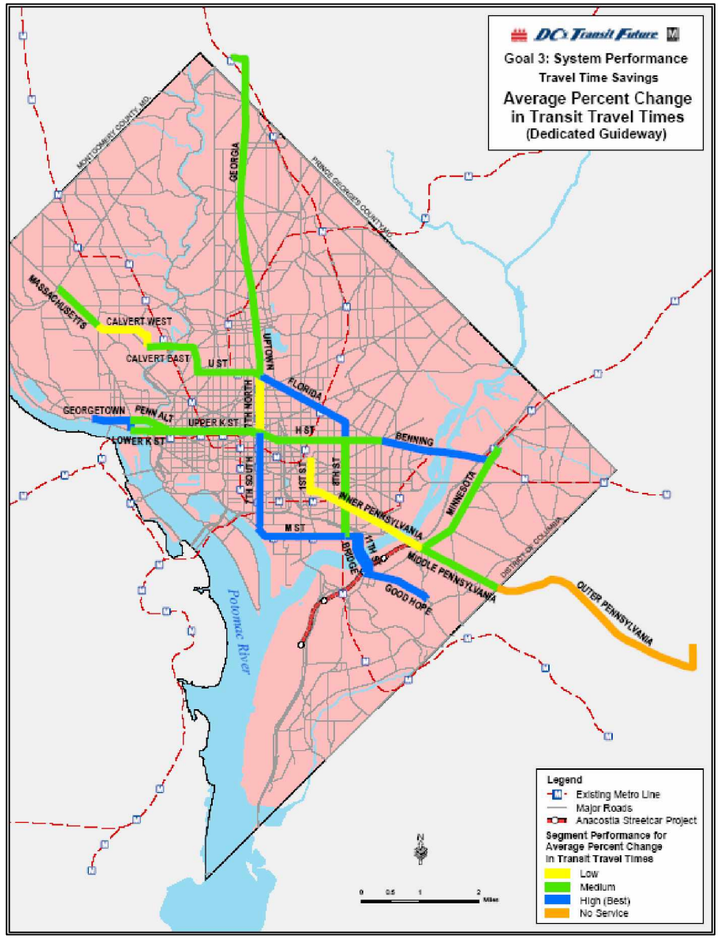
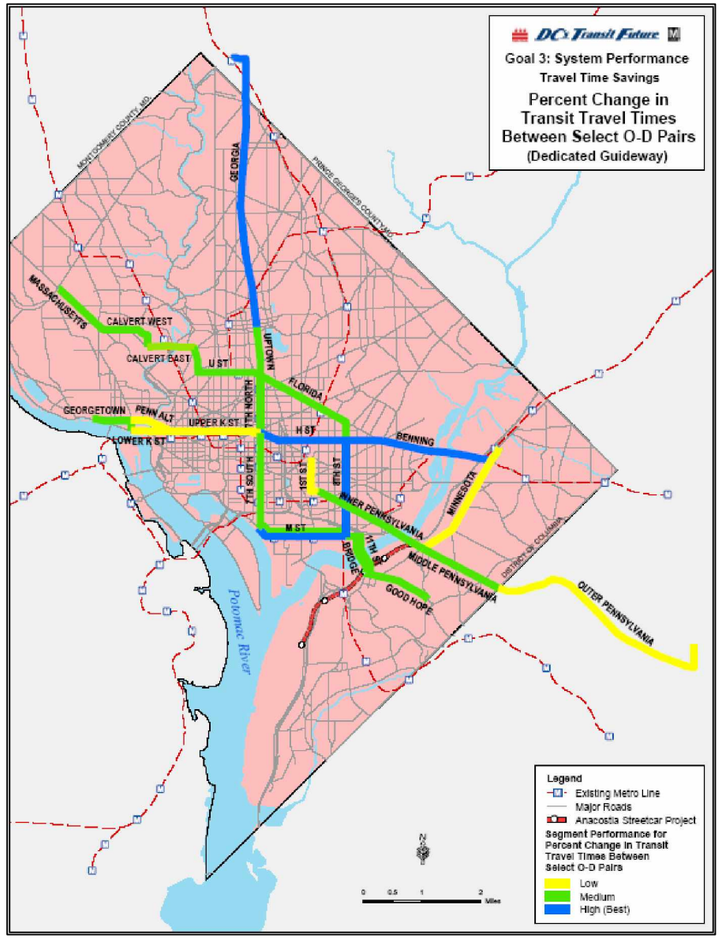
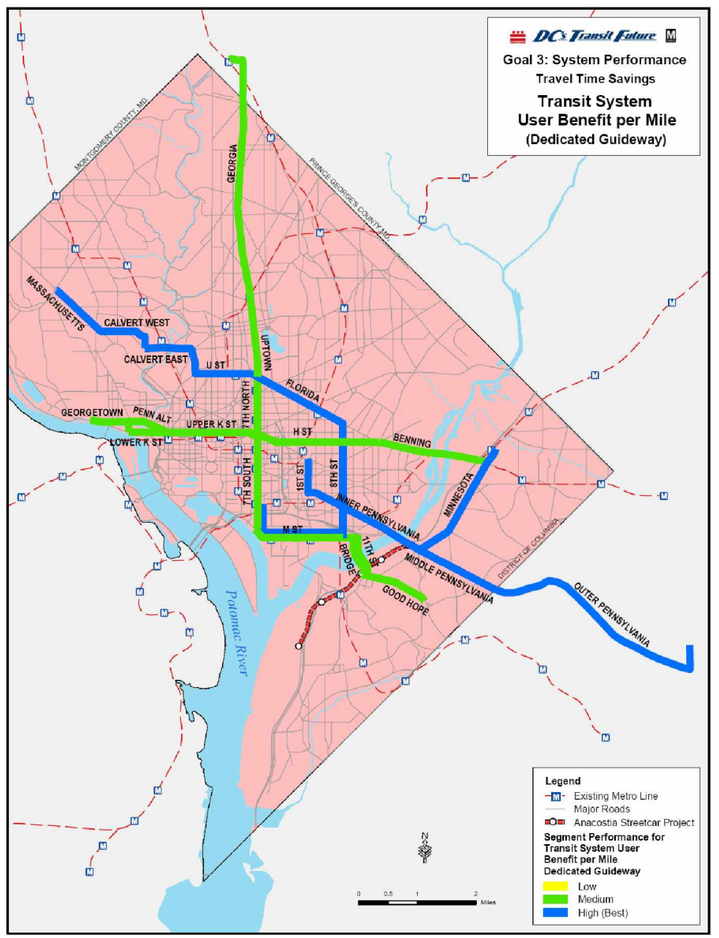


Figure 3-11a
Travel Time Savings MOE Ratings







3.3.2 Person Through-Put

Approach

Measures of effectiveness related to person through-put do not measure total ridership per se, but instead evaluate whether the type and level of service provided under various build alternatives are appropriate to the level of demand.

Key elements in the analysis of person through-put include:

- Baseline and Build load factors, which identify where additional capacity is needed in the system and which evaluate whether BRT or streetcar modes provide too much or not enough additional capacity
- Change in Carry Capacity, which measures the overall additional new capacity in each segment in the Build Alternatives
- Mode Share, which measures the increase in the share of travelers using transit

Results

The highest existing load factors were on the Georgetown, Georgia, Good Hope and 8th Street segments. Under the assumption that an ideal load factor is between 0.75 and 1.05, in the Build Alternatives, the highest rated segments for BRT were Georgia, Uptown, 7th South, Lower K, Upper K, H Street NE, Inner Pennsylvania, and Middle Pennsylvania. No segments on the Minnesota Avenue or American University to Skyland Corridor rated as High.

For streetcar, the highest rated segments were Georgia, Uptown, 7th South, Upper K Street and H Street NE. The slightly shorter list of High ratings is due to the larger capacity of streetcar vehicles, which pushed more segment load levels below 0.75.

In terms of change in carrying capacity, segments on which there is currently little or no service – Outer Pennsylvania, Good Hope, Georgetown, and Lower K – all showed the greatest increase in capacity.

The segments with the greatest mode share increases were primarily those with limited or no transit service now – Good Hope, Pennsylvania, Georgetown, and Massachusetts Avenue. The great increase in transit service levels on 8th Street, M Street SE, H Street NE and Benning Road may account for the shift in mode split on these corridors.

Summary

Overall, the Union Station-Forestville and Georgetown-Minnesota Avenue corridors were the highest rated for person through put. This reflects the change from very low levels of service in the case of the Union Station-Forestville corridor; and the very high ridership and corresponding mode share increase for the Georgetown-Minnesota corridor. These ratings are depicted in Figures 3-12 and 3-13.

Individual MOE performance graphics are provided after the general criteria summary graphic in Figures 3-12a and 3-13a. A detailed description of the methodology employed and results of the analyses for Person Through-put is contained in MOE Methodologies and Results Technical Memorandum.

Figure 3-12
Person Through-Put Ratings – BRT

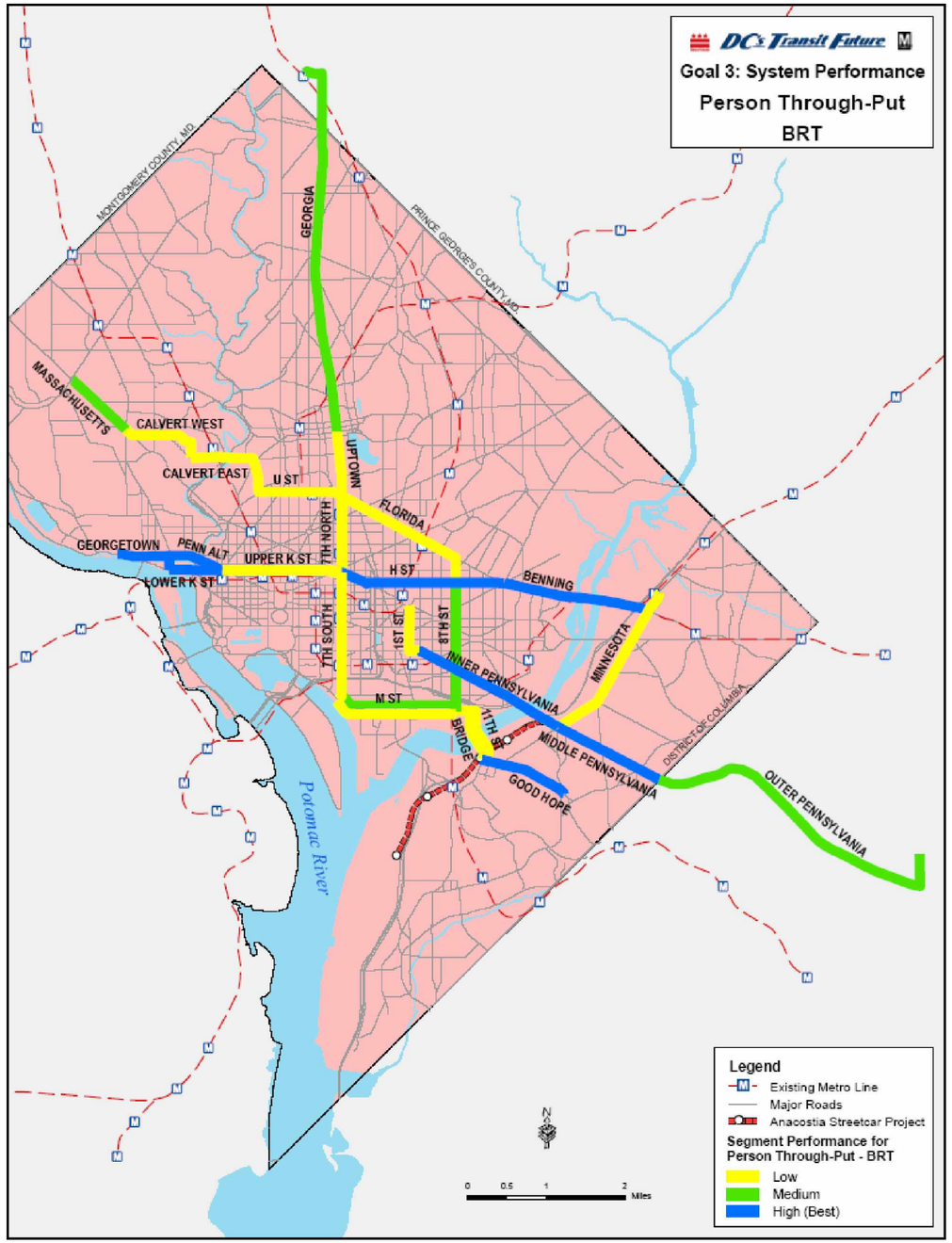
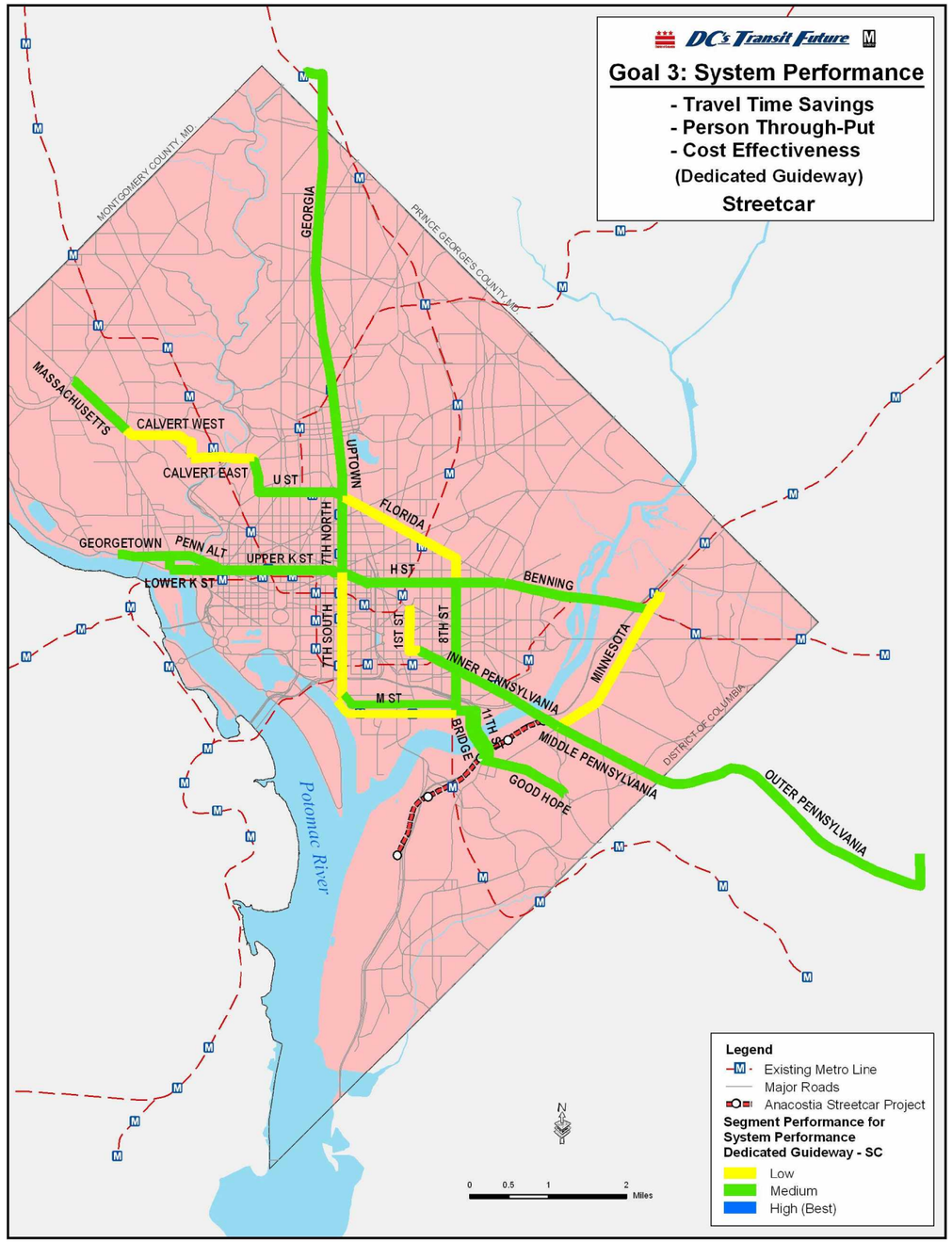
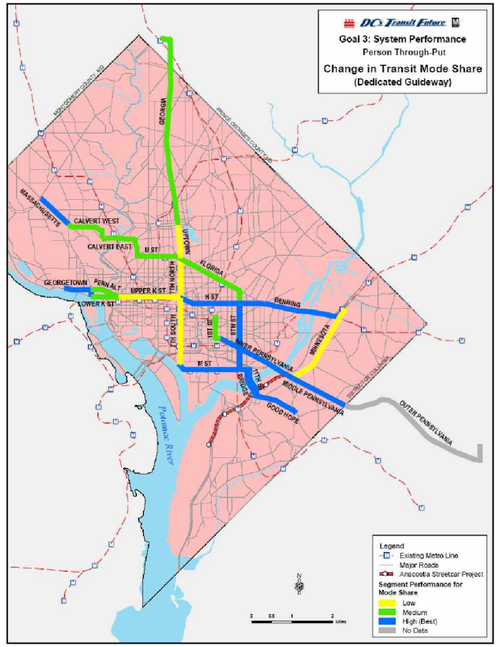
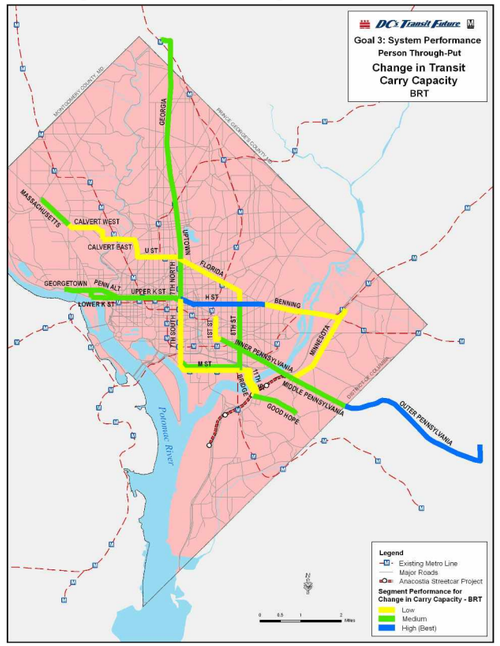


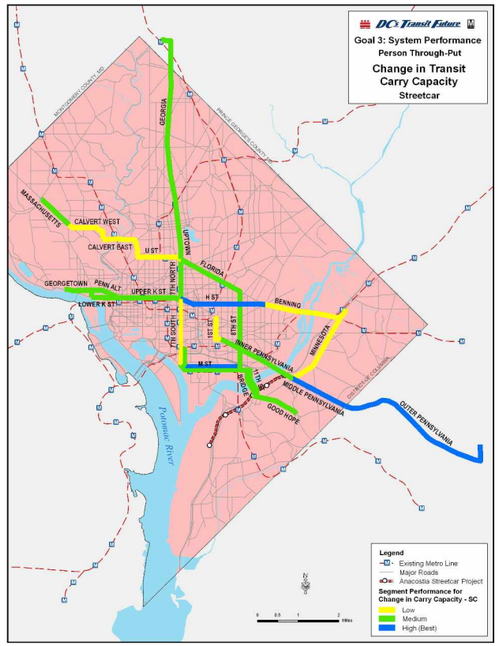
Figure 3-13
Person Through-Put Ratings - Streetcar

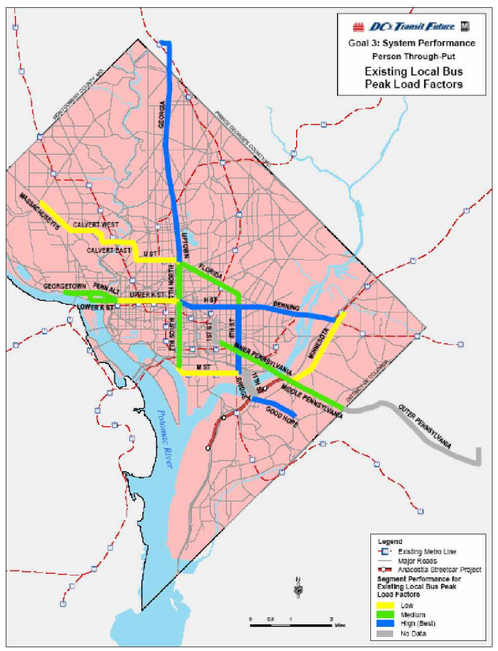


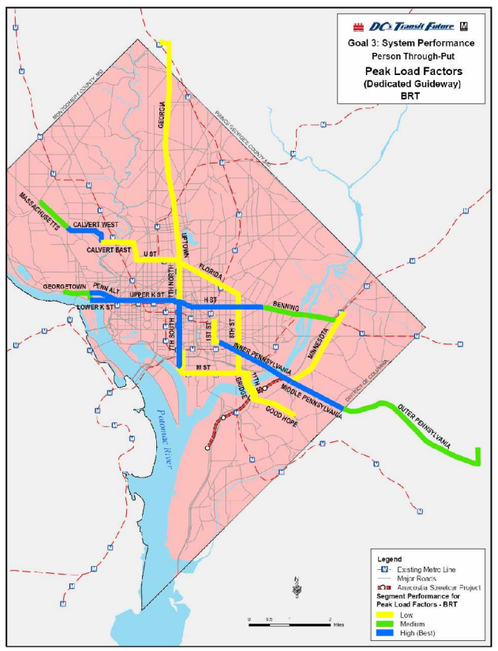
Figures 3-12a and 3-13a
Person Through-Put MOE Ratings – BRT and Streetcar

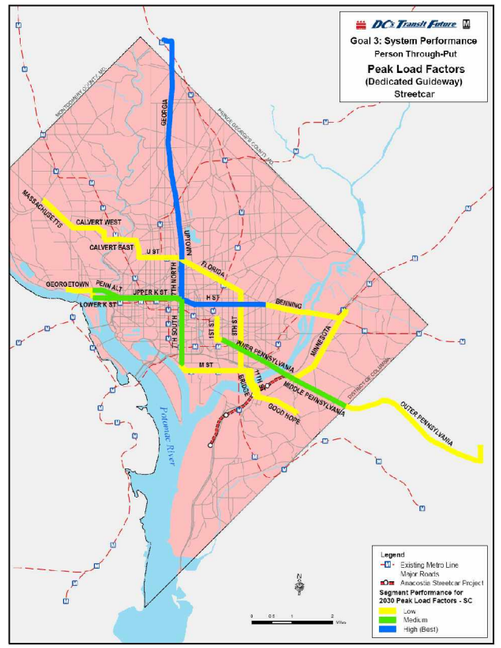












3.3.3 Cost-Effectiveness

Approach

The evaluation of cost-effectiveness is intended to measure both the overall cost of providing service (in terms of costs per mile) and the effectiveness of that investment, in terms of the cost per new passenger attracted. The evaluation of cost-effectiveness also evaluates the corridors in terms of the availability to leverage planned infrastructure investments made by others.

Results

Because of the relatively high costs of both constructing and operating a streetcar network or system, nearly all of the segments were rated as low for cost-effectiveness in terms of capital and O&M costs per mile. Segments rated higher in the less expensive BRT mode. This was particularly the case for the Pennsylvania Avenue and U Street-Calvert segments, which benefit from lower levels of service (and thus require fewer vehicles and hours of service). The Pennsylvania segments also benefited from lower operating costs due to slightly higher operating speeds.

In terms of costs per new boardings, again, the streetcar alternative rated consistently low, with the exception of the Georgetown to Minnesota Avenue corridor, which rated medium because so many new riders were attracted. In the BRT mode, the Georgetown-Minnesota Avenue, Silver Spring-Skyland, and Union Station-Forestville all rated high in terms of operating cost per new boarding. The corridors with lower ridership – Anacostia-Minnesota and American University to L'Enfant – were rated lower.

In terms of coordination with other projects, the Benning Road and K Street segments were rated the highest, primarily due to extensive roadwork already planned for those corridors. No part of the American University to L'Enfant Plaza corridor was rated high or medium.

Summary

Overall, corridors that exhibited high ridership potential – and thus a large number of new riders – or that could operate at high speeds – and thus had lower O&M costs – were rated the highest. Accordingly, the Georgetown-Minnesota Avenue Corridor was rated the highest overall, for combining high ridership with a relatively short corridor length. The Union Station-Forestville Corridor also had highly rated segments, resulting from good ridership and high travel speeds. The Minnesota Avenue segment, which had both slow speeds and low ridership, was rated lowest overall.

Most segments were rated as Low in the streetcar mode. These ratings are depicted in Figures 3-14 and 3-15. Individual MOE performance graphics are provided after the general criteria summary graphic. A detailed description of the methodology employed and results of the analysis for Cost-Effectiveness is contained in MOE Methodologies and Results Technical Memorandum.

Figure 3-14
System Performance Ratings – BRT

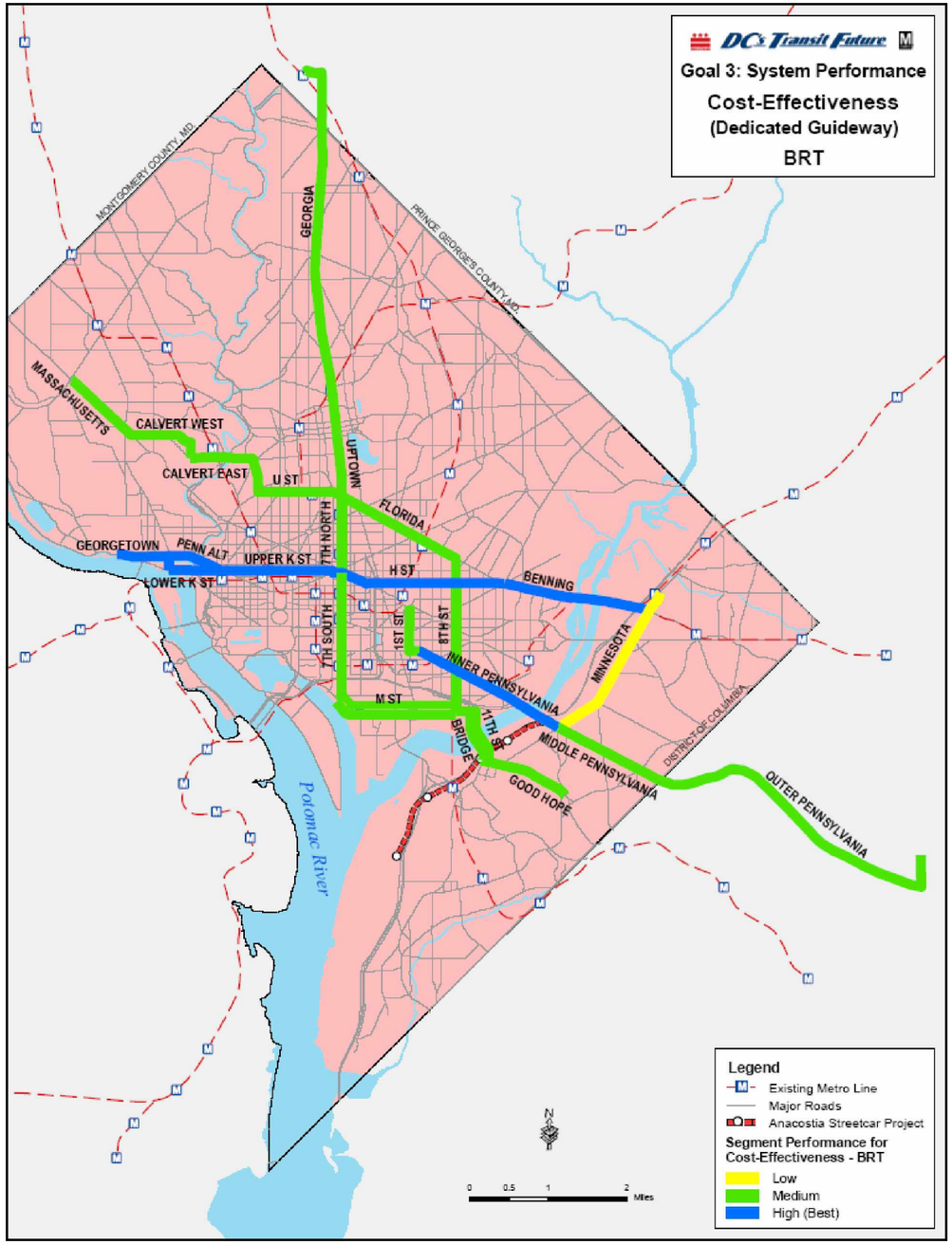
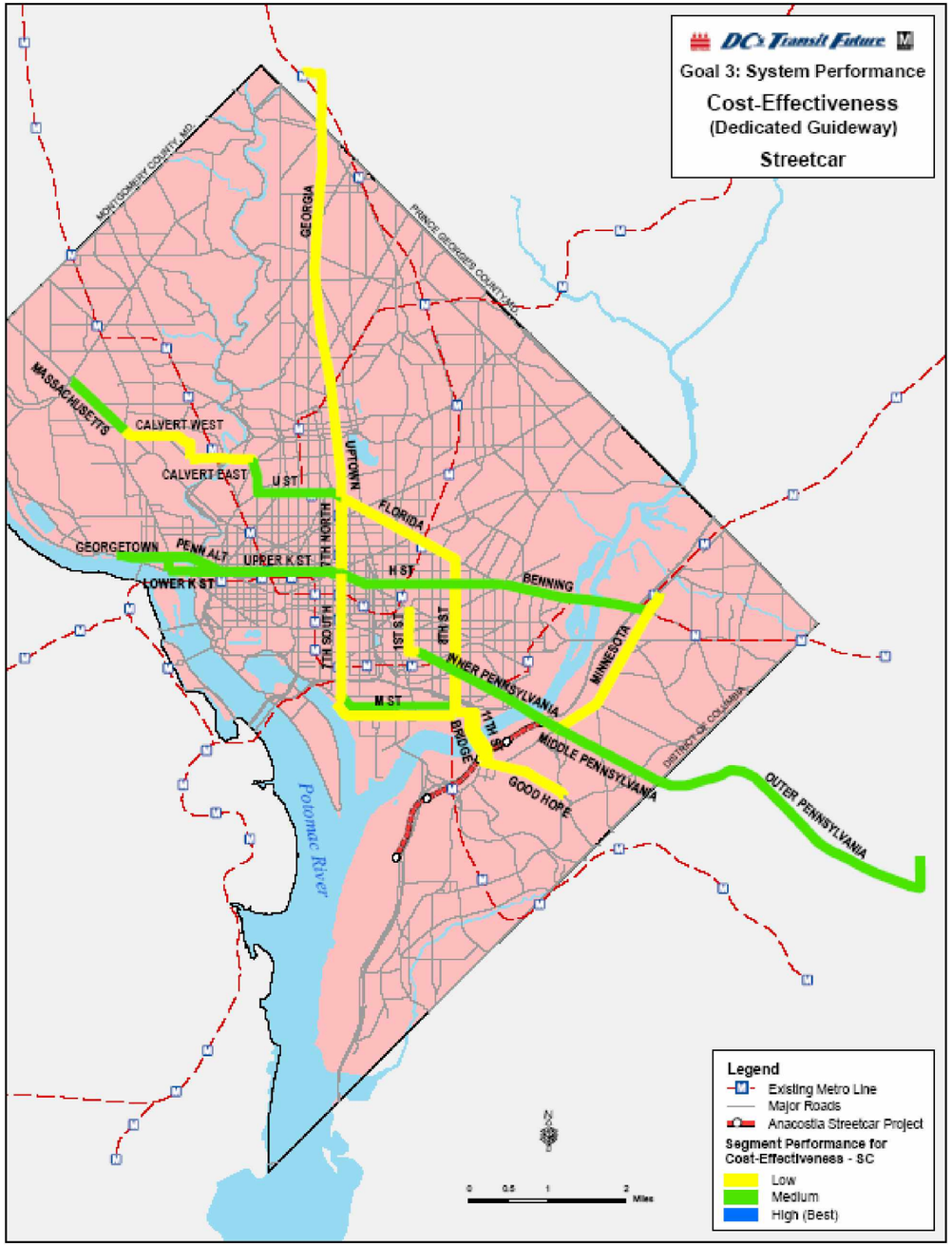
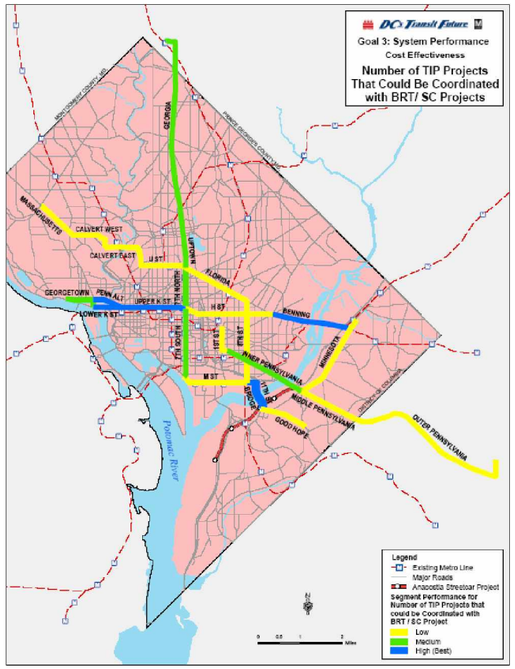
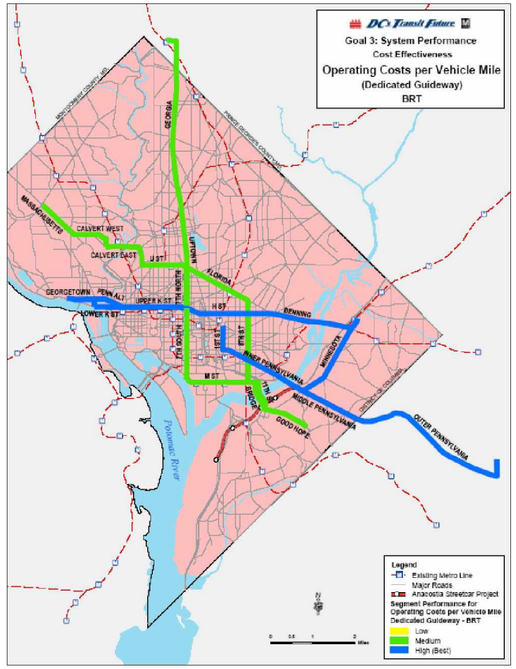


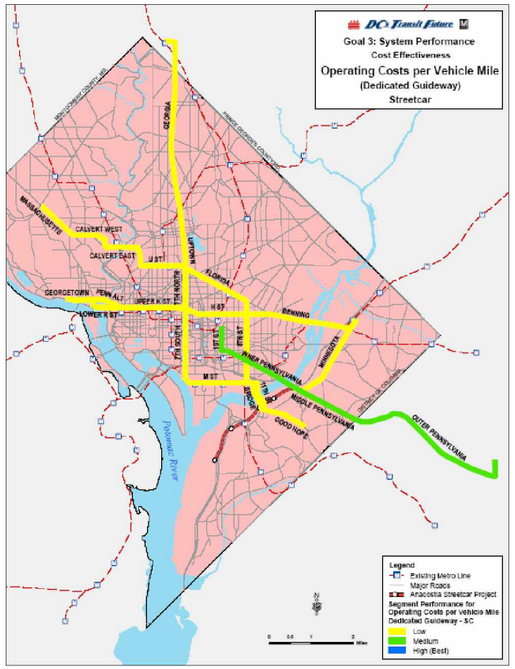
Figure 3-15
System Performance Ratings - Streetcar

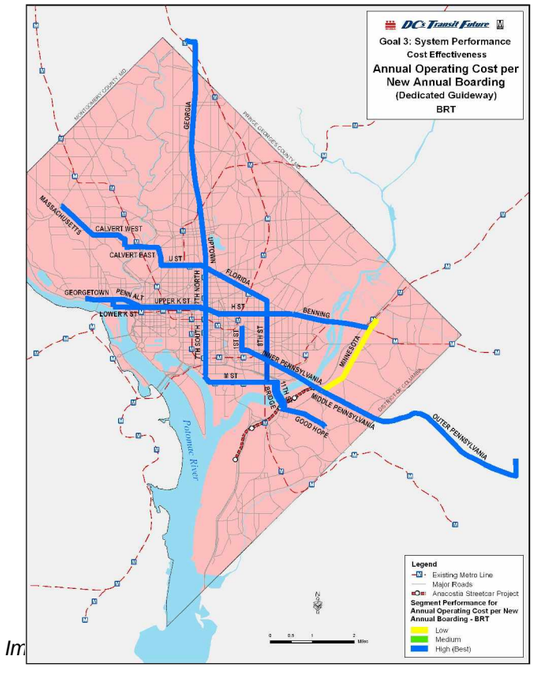


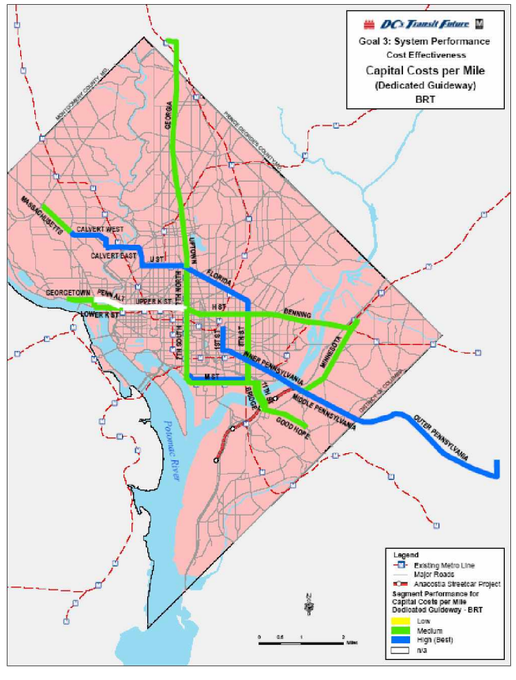
Figures 3-14a and 3-15a
System Performance MOE Ratings – BRT and Streetcar

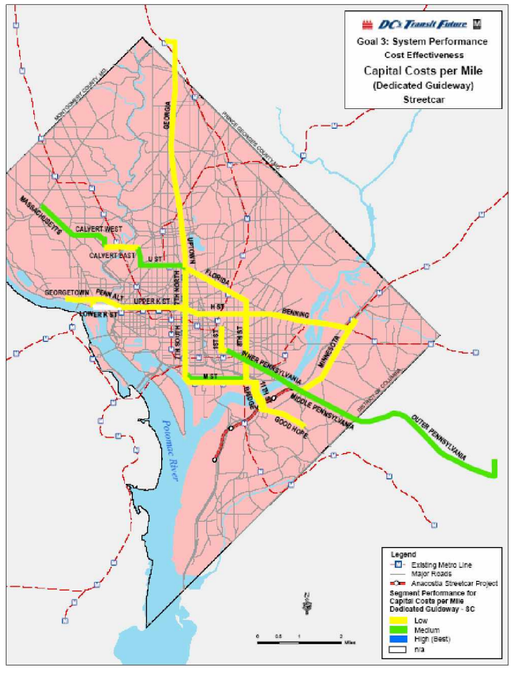




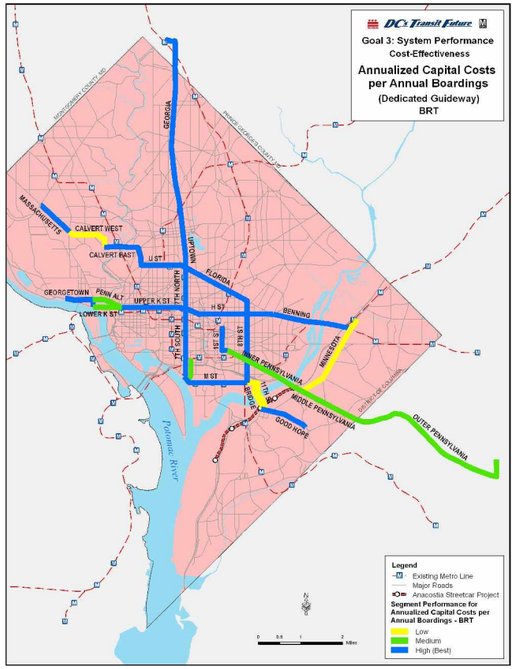


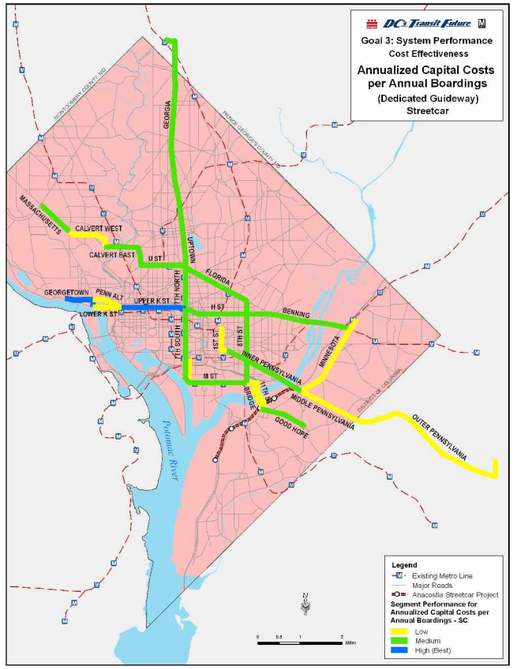


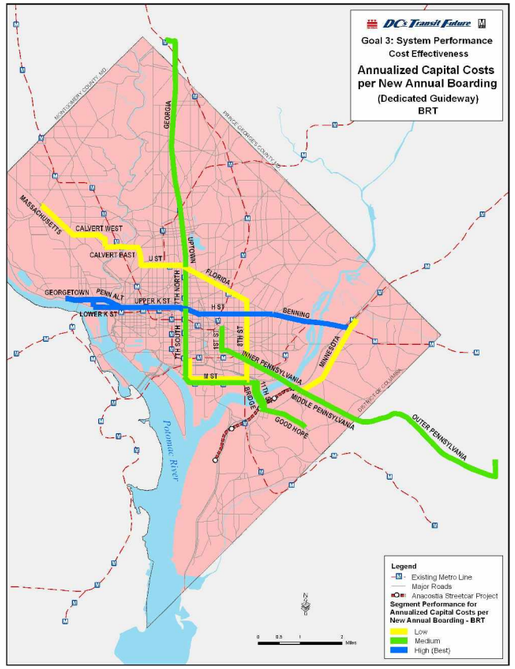


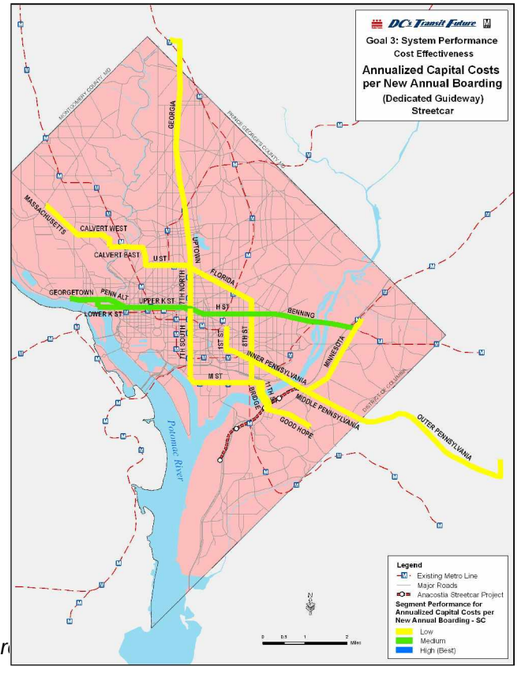


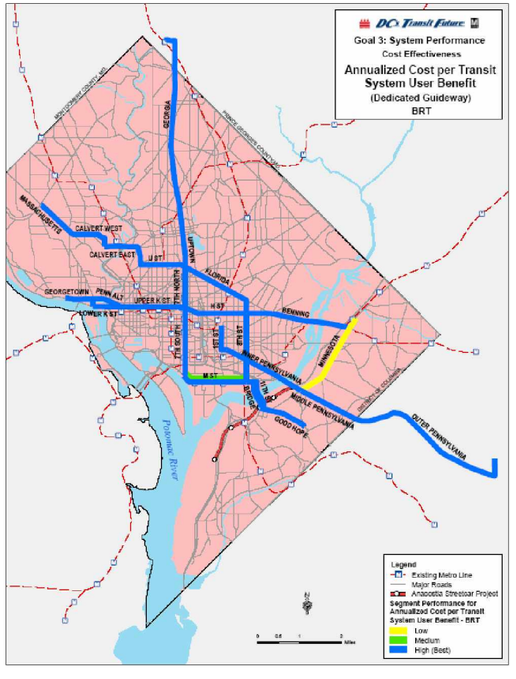
Figures 3-14a and 3-15a (Cont'd)
System Performance MOE Ratings – BRT and Streetcar

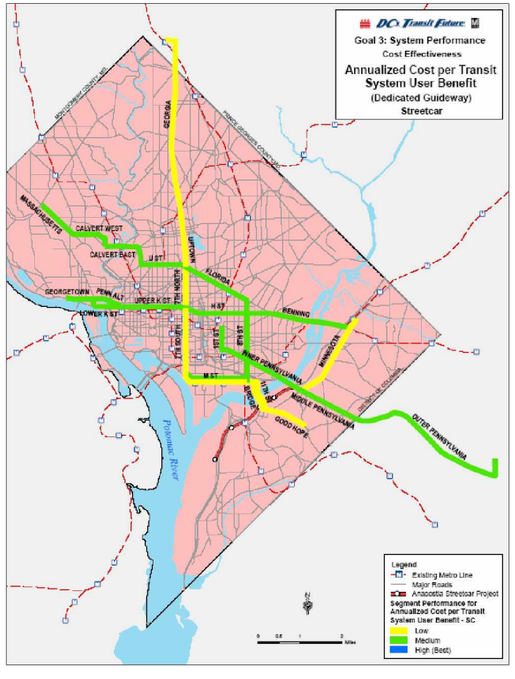












3.4 GOAL 4: ENVIRONMENTAL QUALITY

The purpose of Goal 4 is to evaluate the potential impacts of premium transit service on environmental quality. The two criteria by which the segments are evaluated are listed below:

- ***Community fit*** – Measures the extent to which premium transit alternative corridors and segments fit within the dimensional constraints of the right-of-way, roadway, and sidewalk.
- ***Environmental impacts*** – Measures the potential of corridors and segments to avoid adverse impacts to the natural, social, and built environments.

A discussion of these measures is presented in the following sections of this screening report. They are summarized in Table 3-8 and shown in Figures 3-16 and 3-17. A detailed description of the methodologies employed and results of the analyses for Environmental Quality are contained in MOE Methodologies and Results Technical Memorandum.

Overall, the outermost segments – Georgia Avenue and Outer Pennsylvania – scored the highest, while closer in segments were more likely to receive Low ratings. This could reflect the relatively unconstrained roadways in newer or less developed areas, or more complex built environments in the older, more densely built core of the area. While no part of the Georgetown to Minnesota Avenue Metro corridor was rated as Low, all other corridors had at least one segment rated as Low.

Table 3-8
Summary of Screen 3: Goal 4 – Environmental Quality Measures

Corridors and Segments	Community Fit	Environmental Impacts		GOAL 4 OVERALL RATING	
	Visual/ Community Fit of Stops	Potential to Avoid Adverse Impacts			
		Streetcar	BRT	Streetcar	BRT
Silver Spring to Skyland SE					
Georgia	High	Medium	Medium	High	High
Uptown	Medium	Medium	Medium	Medium	Medium
7th North	Low	Low	Low	Low	Low
7th South	Low	Low	Medium	Low	Low
M Street SE	High	Medium	Medium	High	High
11th Street Bridge	Low	High	High	Medium	Medium
Good Hope Road	Medium	Medium	Medium	Medium	Medium
American University to L'Enfant Plaza					
Massachusetts	High	Low	Low	Medium	Medium
Calvert West	Medium	Medium	Medium	Medium	Medium
Calvert East	Low	Medium	Medium	Low	Low
U Street	Low	Low	Low	Low	Low
Florida	High	Medium	Medium	High	High
8th Street	Medium	Low	Low	Low	Low
M Street SE	High	Low	Low	Medium	Medium
7th South	Low	High	High	Medium	Medium
Georgetown to Minnesota Avenue Metro					
Georgetown	Low	High	High	Medium	Medium
Pennsylvania Alternative (Streetcar Only)	Medium	High	High	High	High
Lower K Street	Medium	Medium	Medium	Medium	Medium
Upper K Street	Medium	Medium	Medium	Medium	Medium
H Street NE	High	Medium	Medium	Medium	Medium
Benning Road	High	Medium	Medium	Medium	Medium
Minnesota Avenue Metro to Anacostia Streetcar Project					
Minnesota	Low	Medium	Medium	Low	Low
Union Station to Forestville					
1st Street	Low	Medium	High	Low	Medium
Inner Pennsylvania	High	Medium	Medium	High	High
Middle Pennsylvania	Medium	Low	Low	Low	Low
Outer Pennsylvania	High	No data	No data	High	High

*** Upper K Street assumed constructed under K Street Transitway project**

Note: BRT= Bus Rapid Transit, SC= Streetcar

Ratings	
Low	Dimensional constraints
Medium	Moderate dimensional constraints
High	No dimensional constraints

See methodology for explanation of ratings

Figure 3-16
Goal 4: Environmental Quality Ratings - BRT

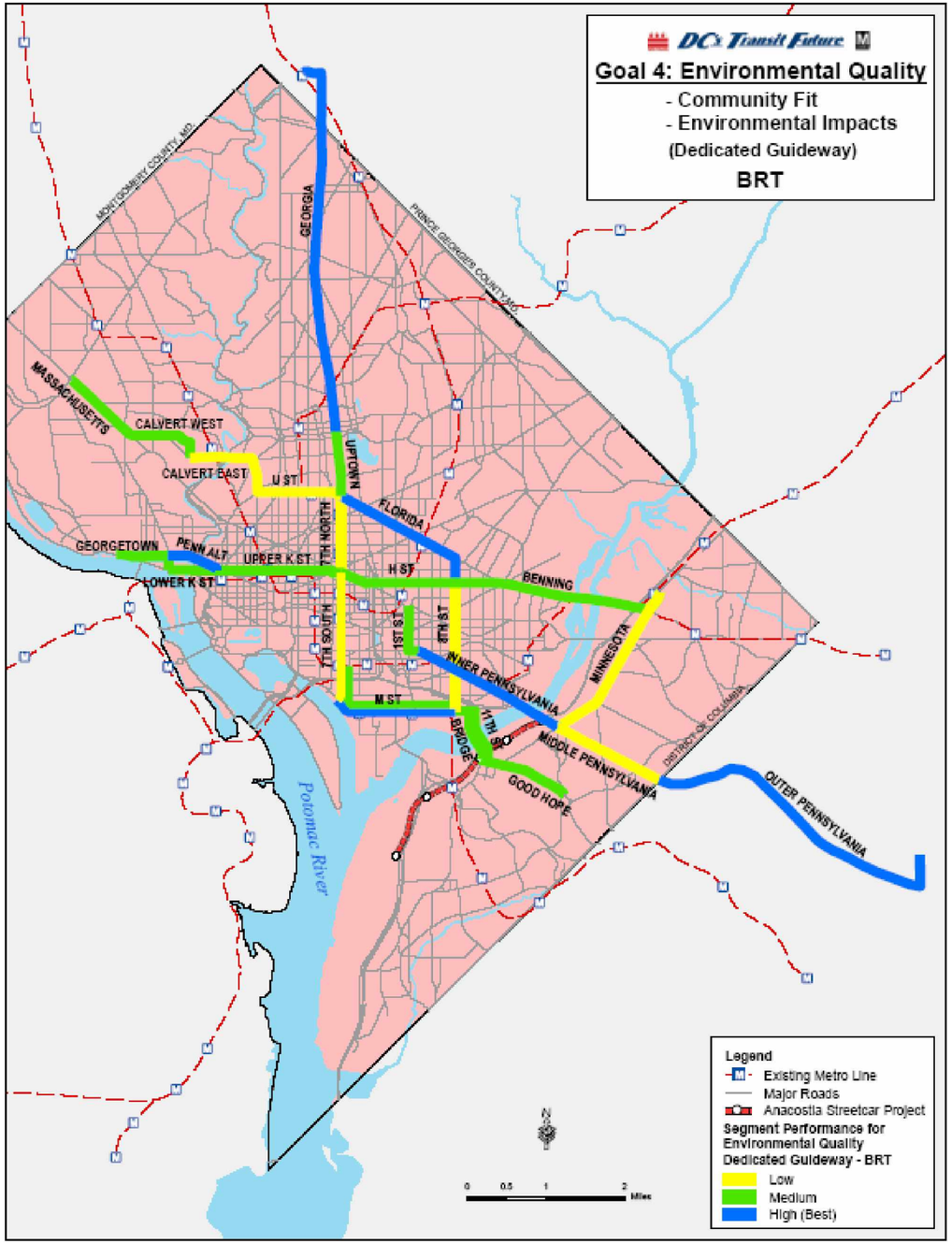
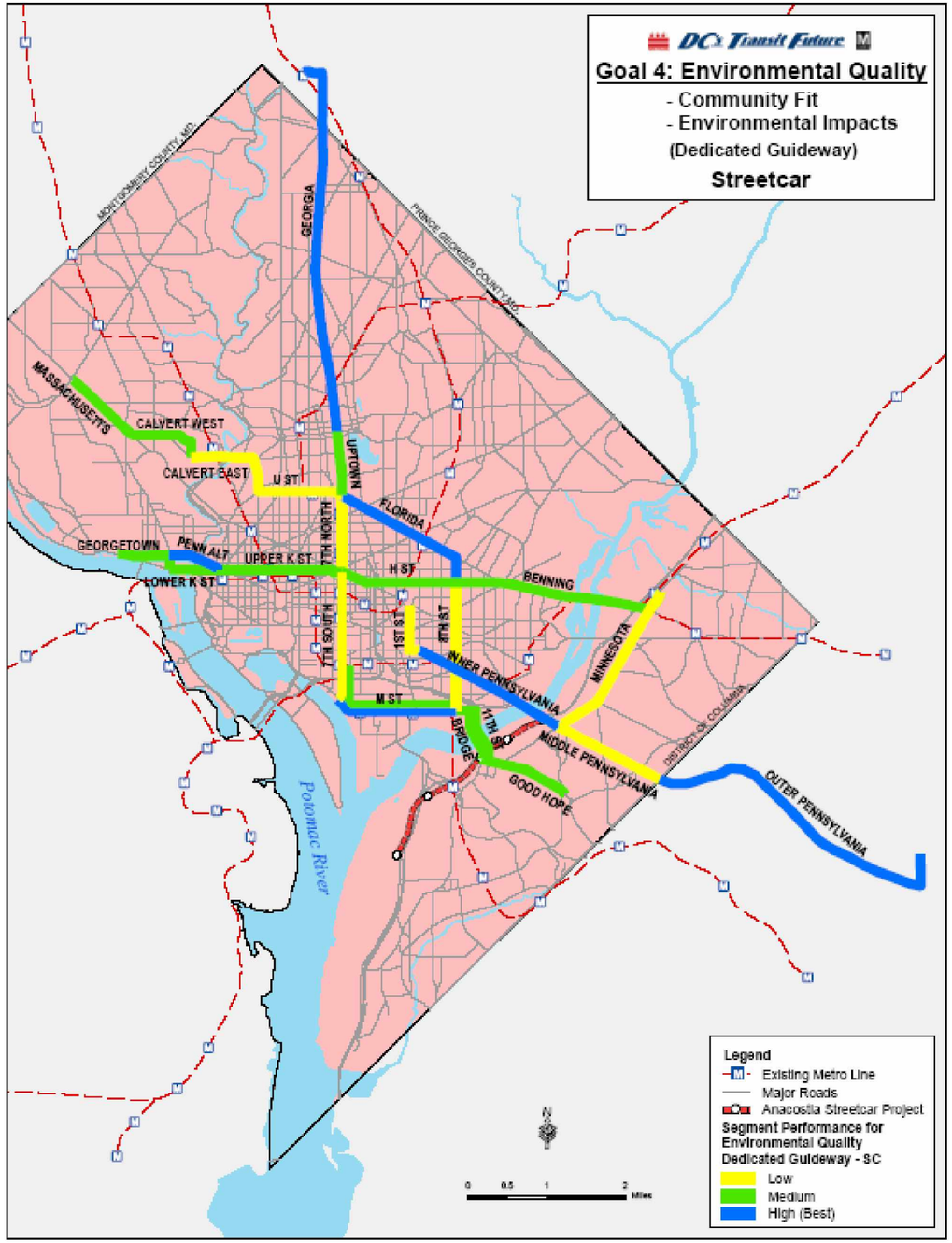


Figure 3-17
Goal 4: Environmental Quality Ratings - Streetcar



3.4.1 Community Fit

Approach

The purpose of this measure is to assess the community fit of the stations as located for Screen 3. Issues of community fit are focused at the locations of proposed transit stations. The assessment of community fit is affected by rights-of-way, roadway lanes, and sidewalk widths. Visual and aesthetic conditions may also affect the community fit of station areas. Community fit is additionally a function of the issues evaluated for Goal 2, Community and Economic Development. A technical report under separate cover provides a detailed description of the methodology employed for the evaluation of the Community Fit MOE.

Station Prototypes

The methodology for evaluating the community fit of stations is based on the impact that the station may have on the immediate environs. Prototype stations were designed, and these were categorized by the anticipated volume of use and the character of the immediate context. The prototypes are as follows:

- *Regular size,* for most station locations, and locations with moderate levels of use.
- *Large size*, for high volume locations where there is adequate room to accommodate a larger installation. These have a shelter that is double the length of the regular station.
- *Small size*, for locations with space constraints or where there is a relatively low volume of patronage expected. These may have platforms that are not differentiated from the adjacent sidewalk and may have fewer fixtures. The shelter will be identical in length to the regular station, but will be one half the width, so that there is less intrusion into the sidewalk space.

Visual and Aesthetic Concerns

The visual and aesthetic aspects of station location and design are simplified by the fact that the architectural design of the station and the design of the platform and appurtenant fixtures are the same in all cases. The only differentiating issue is scale related to the surroundings, resulting in the selection of regular, large, or small stations, as discussed above. Throughout most of the proposed corridors there is adequate room to accommodate the stations and platforms with minimum effect. There are locations where the street, sidewalk, and right-of-way would be affected by regular sized stations, and in these locations the small sized station would be required.

Additional components of visual effect that relate to a streetcar system are overhead wires and the structures supporting them, as well as the electrical substations that would be required. Visual and aesthetic issues will be most pronounced in portions of the corridors that are directly fronted by residential use, and those portions that have narrow streets, sidewalks, and right-of-way. As well, the visual character of the system will affect the densely developed historic urban core. By law, the presence of overhead wires is not permissible within the boundaries of the National Capital Service Area, and there are also less stringent restrictions within City of Washington.

Other Considerations

Additional considerations related to community appropriateness include the mode – Streetcar or BRT – and the placement of travel lanes – whether dedicated or in mixed traffic, and whether at curbside or in existing travel lanes.

Stations for either Streetcar or BRT that are located for a curbside system would be placed within the existing sidewalk. This will reduce the width of the sidewalk space available for pedestrian flow, as well as affect any streetscape or landscape. They may also affect access to storefronts and other uses having access from the sidewalk. In areas where the system is curb-running, on street parking would be removed, and this may affect adjacent uses.

Stations for either Streetcar or BRT that are provided for any system moving with traffic, or in a dedicated lane that is not at curbside, will involve constructing the station on a "bulb-out", which is an extension of the sidewalk into the street, taking parking spaces or other street space. Stations provided in this instance will remove only a few on-street parking spaces at the station locations that may serve adjacent uses.

Evaluation Criteria

The critical factor in evaluating the fit of station locations is the dimensions of the roadway, the right-of-way, the width of the sidewalk, and/or the closeness of the buildings to the station platform and shelter. Stations within segments are evaluated by the overall dimensional characteristics of the segment. The evaluation criteria are as follows:

- *Low* Segments in which there are tight dimensional constraints
- *Moderate* Segments in which there are limited dimensional constraints
- *High* Segments in which there are no dimensional constraints

Summary

The results of this analysis reflect the following, as shown in Figure 3-18, and discussed below:

Segments that are rated high for community fit include the following:

- *Silver Spring to Skyland SE*
  - Georgia
  - M Street SE
- *American University to L'Enfant Plaza*
  - Massachusetts
  - Florida
  - M Street SE
- *Georgetown to Minnesota Avenue Metro*
  - H Street NE
  - Benning Road
- *Union Station to Forestville*
  - Inner Pennsylvania
  - Outer Pennsylvania

Segments that are rated medium for community fit are as follows:

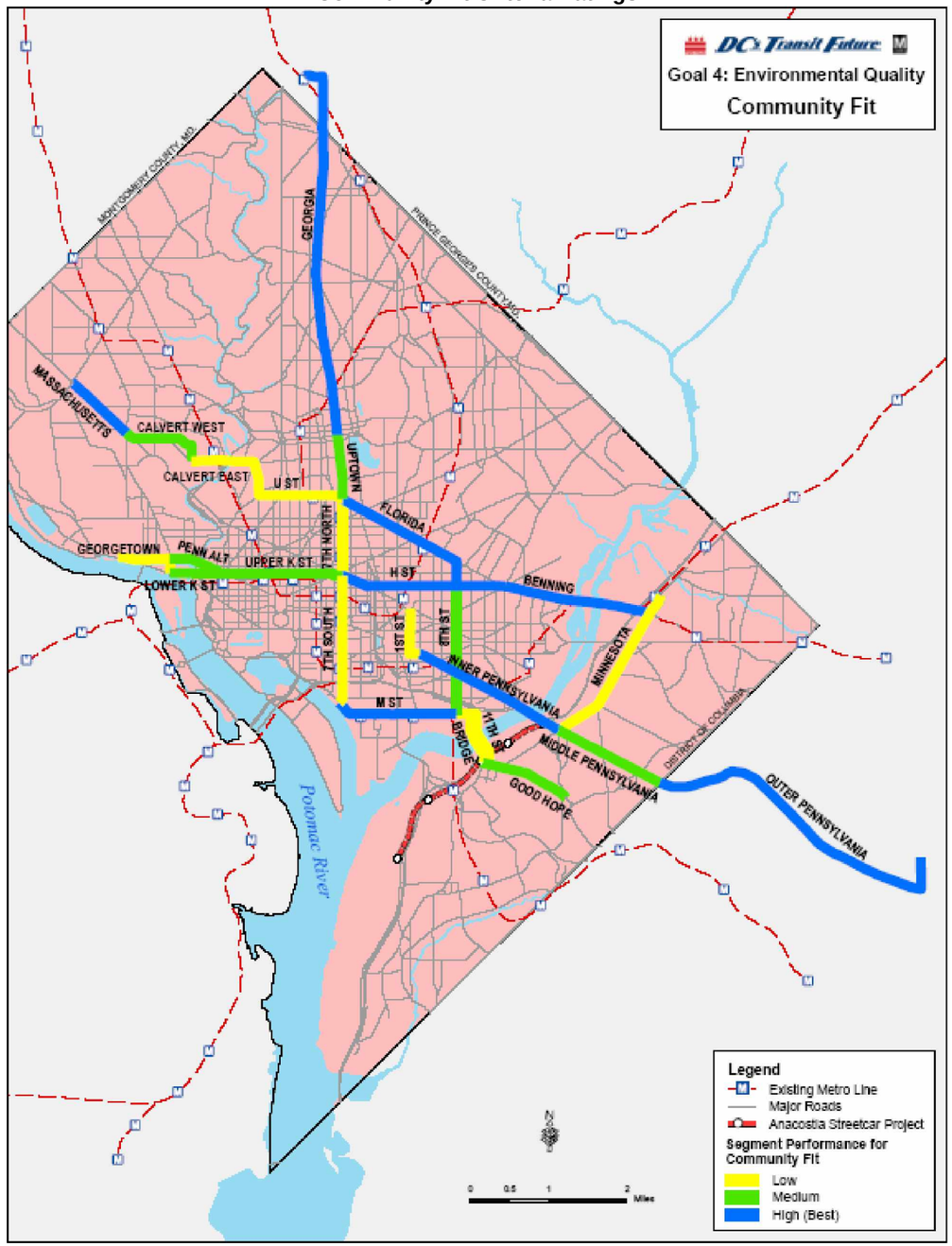
- *Silver Spring to Skyland SE*
  - Uptown
  - Good Hope Road
- *American University to L'Enfant Plaza*
  - Calvert West
  - 8th Street
- *Georgetown to Minnesota Avenue Metro*
  - Pennsylvania Avenue Streetcar
  - Lower K Street
  - Upper K Street

- *Union Station to Forestville*
    - Middle Pennsylvania

Stations that are rated low for community fit include:

- *Silver Spring to Skyland SE*
    - 7th Street North
    - 7th Street South
    - 11th Street Bridge
- *American University to L'Enfant Plaza*
    - Calvert East
    - U Street
    - 7th Street South
- *Georgetown to Minnesota Avenue Metro*
    - Georgetown
- *Minnesota Avenue Metro to Anacostia Streetcar Project*
    - Minnesota
- *Union Station to Forestville*
    - 1st Street

Figure 3-18
Community Fit Criteria Ratings



3.4.2 Environmental Impacts

Approach

During Screen 2, an inventory of environmental resources was developed to provide a better understanding of the types and quantities of resources within each corridor that could be affected or could pose a "fatal flaw" for a segment or corridor being evaluated. During Screen 2, it was found that almost all of the corridors have similar types and quantities of resources present; therefore, no segment or corridor was prevented from advancing to subsequent screening levels.

The focus of the Screen 3 Environmental Scan moved towards identifying the types of likely adverse effects on resources identified within each corridor and areas where impacts would likely occur. Each corridor being advanced for consideration of premium transit service was evaluated for both streetcar and BRT. Where appropriate, the impacts associated with a limited dedicated guideway and a dedicated guideway were assessed.

In general, the number of resources identified during Screen 2 was refined to reflect those resources that were directly adjacent to the corridors or those resources that were adjacent to a proposed stop or facility. A rating of "high, medium, or low" was then given based on the potential for the proposed improvements to avoid adverse impacts. The following summarizes the rating system:

- *High* – indicates the greatest potential to avoid adverse impacts.
- *Medium* – indicates that there is some potential for adverse impacts.
- *Low* – indicates the least potential to avoid adverse impacts.

As part of the Environmental Quality MOE, the following resources were evaluated:

- ***Traffic*** - This analysis documented the results of the change in volume over capacity (v/c), which measures the effects of reduced capacity roadways when travel lanes are removed for use by premium transit in dedicated lanes.
- ***Parking*** - The outcome of this analysis determined the estimated change in peak and off peak parking.
- ***Environmental Justice Communities*** – This analysis identified potential environmental justice communities along the corridor.
- ***Community Resources*** – This analysis identified occurrences of community facilities adjacent to the corridors, proposed stops, and maintenance facilities and the potential for those resources to be impacted. Particular attention was paid to the relationship of proposed stops to emergency response facilities.
- ***Cultural Resources*** – This analysis identified occurrences of known cultural resources adjacent to the corridors, proposed stops, and maintenance facilities and the potential for those resources to be impacted. This analysis identified the potential types of impacts that could occur and where they are most likely to happen rather than determine if impacts would occur.
- ***Parklands*** - This analysis identified occurrences of parklands adjacent to the corridors, proposed stops, and maintenance facilities and the potential for those resources to be impacted in terms of potential Section 4(f) impacts.
- ***Water Resources*** – This analysis identified occurrences of water bodies, wetlands, and 100-year floodplains adjacent to the corridors, proposed stops and maintenance facilities and the potential for those resources to be impacted.
- ***Protected Species and Habitat*** – This analysis identified federally listed species for the District of Columbia and documented habitat requirements. For this level of analysis, no determination of impacts was made. Impact assessment would require coordination with the U.S. Fish and Wildlife Service, the District, and the Maryland Department of Natural Resources at future stages of project development.
- ***Air Quality*** – The level of air quality analysis conducted for this stage of the project was only intended to establish the framework within which air quality impacts would be determined later during the environmental assessment phase. A detailed impact assessment was not conducted. A more in-depth analysis is appropriate at future stages of project development.
- ***Sensitive Receptors for Noise and Vibration*** - The purpose of this analysis was to identify those segments where there is a greater potential for noise sensitive receptors to be impacted; it is not intended to determine if noise or vibration impacts would occur.
- ***Hazardous Materials*** – Screen 2 identified the locations of known hazardous waste sites and generators. The potential for hazardous materials and waste generators is equal in all proposed corridors. No further analysis was conducted for Screen 3. More in-depth analysis, such as a Phase I Environmental Site Assessment, would be appropriate at future stages of project development.

Summary

Due to the fact that the proposed transit improvements would occur within the existing right-of-way and given that the study area is very urban, impacts to the built and natural environment are expected to be minimal. The greatest areas for potential impacts would occur to existing traffic conditions and parking.

In general, little impact is expected to either the built or natural environment regardless of the mode selected. The greatest difference in impacts occurs with the use of a dedicated guideway scenario over the limited dedicated guideway (see MOE Methodologies and Results Technical Memorandum) for the environmental analysis results of the limited dedicated scenario). Under the dedicated guideway scenario, the most aggressive approach, there would be greater impacts to traffic and parking, which brings the overall rating of a segment down. In some instances, if streetcar were selected, the associated overhead centenary would result in a greater potential for visual impacts to visually sensitive resources such as parks and historic resources. Table 3-8 provides the results of the environmental analysis along with a rating for each segment. Figures 3-19 and 3-20 illustrate the results for each segment by mode (BRT/Streetcar).

Figure 3-19
Environmental Quality Criteria Ratings - BRT

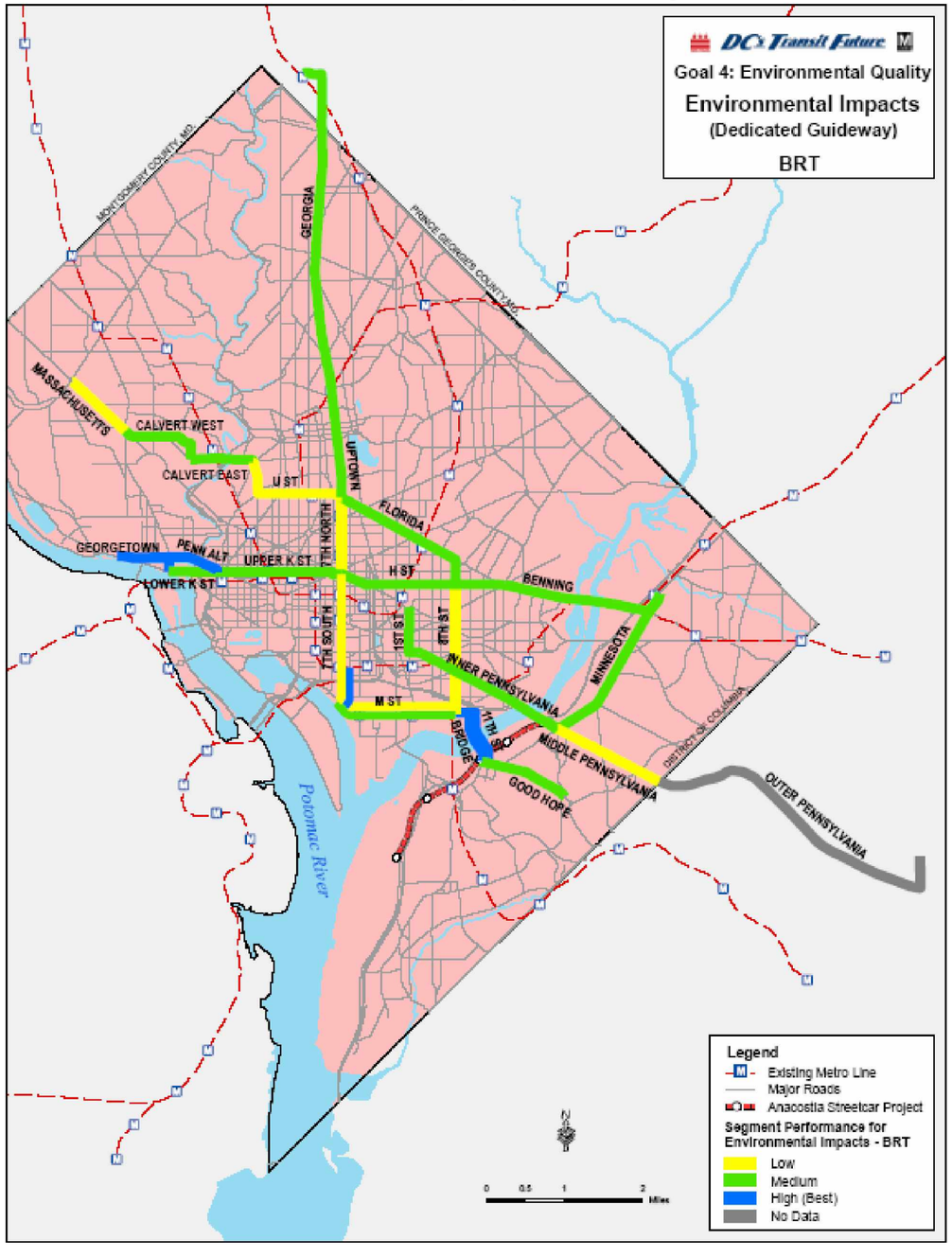
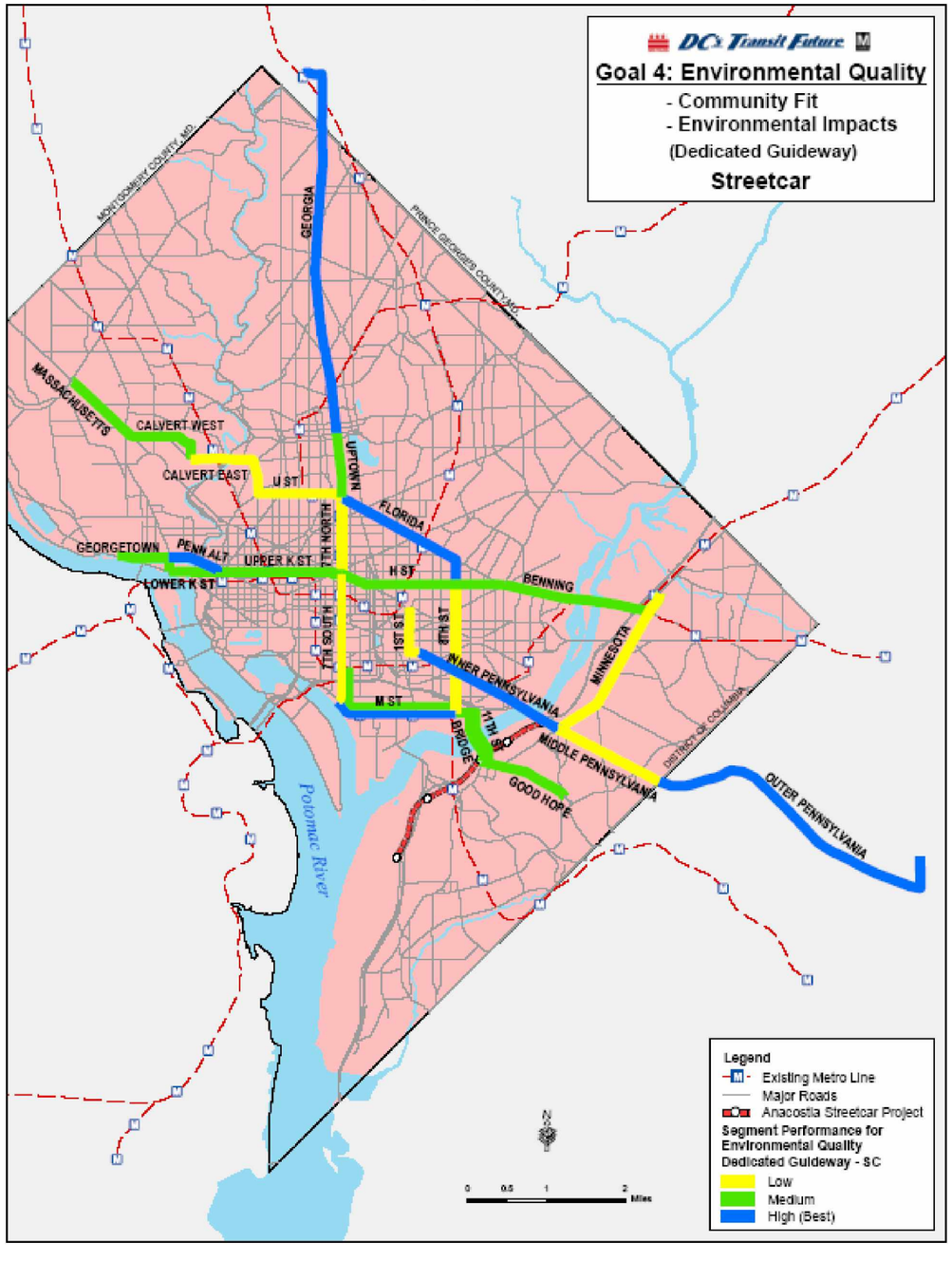


Figure 3-20
Environmental Quality Criteria – Streetcar



4.0 TRANSIT ALTERNATIVES ANALYSIS

This Section summarizes the performance relative to project goals of all premium transit corridors considered in the Screen 3 evaluations. The segments by corridor are rated according to how well they address the project goals as determined by the measures of effectiveness. This evaluation has been detailed in Section 3.0.

4.1 RESULTS SUMMARY

This analysis evaluates the performance of project segments and corridors relative to 25 measures of effectiveness that are directly related to four project goals. The goals and measures were initially established in June 2004 (and updated in September 2004) and were endorsed by the Project Management Technical Committee which has served as a steering committee for the project. Specific goals, project criteria, their respective measures and the approach followed during the analysis are detailed in Section 2 of this report.

There are instances in which the analysis necessitated a differentiation according to mode, recognizing different results for potential Streetcar applications and for BRT applications. The measures associated with Goal 3 provided different results if BRT or Streetcar services were being considered, given the substantial differences in cost and capacity associated with these technologies.

The individual ratings for each measure have been used to determine ratings for each segment by goal. The results are summarized in Table 4-1 - Screen 3 Overall Ratings, and are shown graphically in Figure 4-1 and Figure 4-2

There are seven segments that show the highest level of performance for where either Streetcar or BRT services are considered. They are:

- *Silver Spring to Skyland SE*
  - Georgia
  - M Street SE
- *American University to L'Enfant Plaza*
  - M Street SE
- *Georgetown to Minnesota Avenue Metro*
  - H Street NE
- *Union Station to Forestville*
  - Inner Pennsylvania Avenue

Table 4-1
Screen 3 Overall Ratings

Corridors and Segments	Goal 1 Access and Mobility Ratings	Goal 2 Community and Economic Development Ratings	Goal 3 System Performance Ratings		Goal 4 Environmental Quality Ratings		OVERALL RATINGS	
			BRT	Streetcar	BRT	Streetcar	BRT	Streetcar
Silver Spring to Skyland SE								
Georgia	High	Medium	Medium	Medium	High	High	High	High
Uptown	Low	High	Medium	Medium	Medium	Medium	Medium	Medium
7th North	Low	High	Medium	Medium	Low	Low	Low	Low
7th South	High	Medium	Medium	Medium	Low	Low	Medium	Medium
M Street SE	High	High	Medium	Low	High	High	High	High
11th Street Bridge	Low	Medium	Medium	Medium	Medium	Medium	Medium	Medium
Good Hope Road	Low	High	Medium	Medium	Medium	Medium	Medium	Medium
American University to L'Enfant Plaza								
Massachusetts	Low	Low	Medium	Medium	Medium	Medium	Low	Low
Calvert West	Low	Low	Medium	Low	Medium	Medium	Low	Low
Calvert East	Low	Medium	Medium	Low	Low	Low	Low	Low
U Street	Medium	Medium	Medium	Medium	Low	Low	Medium	Medium
Florida	Medium	High	Medium	Low	High	High	High	Medium
8th Street	Medium	Medium	Medium	Medium	Low	Low	Medium	Medium
M Street SE	High	High	Medium	Medium	Medium	Medium	High	High
7th South	Medium	Medium	Medium	Low	Medium	Medium	Medium	Medium
Georgetown to Minnesota Avenue Metro								
Georgetown	Medium	Low	Medium	Medium	Medium	Medium	Medium	Medium
Pennsylvania Alternative	Low	Low	Medium	Medium	High	High	Low	Low
Lower K Street	Low	Medium	Medium	Medium	Medium	Medium	Medium	Medium
Upper K Street	High	Medium	High	Medium	Medium	Medium	High	Medium
H Street NE	High	High	High	Medium	Medium	Medium	High	High
Benning Road	Medium	Medium	High	Medium	Medium	Medium	Medium	Medium
Minnesota Avenue Metro to Anacostia Streetcar Project								
Minnesota	Low	Medium	Low	Low	Low	Low	Low	Low
Union Station to Forestville								
1st Street	Low	Low	Low	Low	Low	Medium	Low	Low
Inner Pennsylvania	Low	High	High	Medium	High	High	High	High
Middle Pennsylvania	Low	Low	Medium	Medium	Low	Low	Low	Low
Outer Pennsylvania	Low	Low	Medium	Medium	High	High	Low	Low

Ratings
Low
Medium
High

There are nine segments that show a moderate level of performance. These are:

- *Silver Spring to Skyland SE*
  - Uptown
  - 11th Street Bridge
  - Good Hope Road
- *American University to L'Enfant Plaza*
  - U Street
  - Florida
  - 8th Street
  - 7th South*
- *Georgetown to Minnesota Avenue Metro*
  - Georgetown
  - Lower K Street
  - Upper K Street
  - Benning Road

There are ten segments that show a low level of performance. These are:

- *Silver Spring to Skyland SE*
  - 7th North
- *American University to L'Enfant Plaza*
  - Massachusetts
  - Calvert West
  - Calvert East
- *Georgetown to Minnesota Avenue Metro*
  - Pennsylvania streetcar*
- *Minnesota Avenue Metro to Anacostia Streetcar Project*
  - Minnesota
- *Union station to Forestville*
  - 1st Street
  - Middle Pennsylvania
  - Outer Pennsylvania

Potential Streetcar Segments

One of the primary objectives of the Screen 3 analysis and the overall DC Alternatives Analysis project is to determine the most attractive segments and corridors for possible expansion of Streetcar services beyond the already planned Anacostia Streetcar Line. Potential Streetcar segments have been identified based on the performance of individual corridor segments relative to the project goals and evaluation criteria.

Table 4-2
Best Performing Segments (as Streetcar Service)

Segment	Key Strengths*
Georgia Avenue	Minimizes Transit Travel Times *[avg. 10.2% change to access employment centers within 60 minutes; 1.1% avg. change in mode share to regional centers]*
	Ridership *[14,298 daily boardings; 2,960 daily boardings per mile]*
	Increases in Corridor Transit Carry Capacity *[109%]*
	Visual/Community Fit
H Street NE	Minimizes Transit Travel Times [avg. 8.3% change to access employment centers within 60 minutes; 1.2% avg. change in mode share to regional centers]
	Increases Accessibility *[directly serves one activity center; employment is 20,763 per linear mile and population is 7,736 per linear mile]*
	Supports City Initiatives [directly serves one Designated Main Street Corridor; one Strategic Targeted Neighborhood]
	Compatibility with Zoning/Land Use/Development
	Community Support
	Increases in Corridor Transit Capacity *[165%]*
	Cost-Effectiveness *[operating costs/vehicle mile=$17; annual operating cost/annual new boarding=$3; capital costs/mile=$36 million; annualized capital cost per annual daily boarding=$25; annualized capital cost per annual new boarding=$43; annualized cost per TSUB=$17]*
	Visual/Community Fit
M Street SE	Minimizes Transit Travel Times *[2.3% change to access employment centers within 60 minutes; 2.8% avg. change in mode share to regional centers]*
	Increases Accessibility *[directly serves one activity center; employment is 15,590 per linear mile and population is 8,562 per linear mile]*
	Supports City Initiatives *[directly serves one Designated Main Street Corridor]*
	Community Support
	Visual/Community Fit
Inner Pennsylvania	Minimizes Transit Travel Times *[7.2% avg. change to access employment centers within 60 minutes; 1.2% avg. change in mode share to regional centers]*
	Support City Initiatives *[Directly serves one Main Street Corridor and indirectly serves one strategic targeted neighborhood]*
	Increases in Corridor Transit Carry Capacity *[77%]*
	Cost-Effectiveness *[operating costs/vehicle mile=$14; annual operating cost/annual new boarding=$5; capital costs per mile=$28 million; annualized capital cost per annual boarding=$46; annualized capital cost per annual new boarding=$76; annualized cost per TSUB=$20]*
	Visual/Community Fit

*Criteria where the segment performs best for streetcar service

These high performing segments are identified as potential candidates for streetcar service, given the goals and objectives established by the project participants. These segments represent the most attractive areas to expand streetcar services beyond the Anacostia Streetcar Project service that is already scheduled for implementation as early as 2006.

In order to transform these high performing segments into the basis for a potential streetcar system some additional short segments could be added to connect these segments to each other, to logical terminal points, and to intermodal access points. The extension of streetcar service from H Street NE to the east along the Benning Road segment provides a logical terminal point of the H Street NE service and an intermodal connection at the Minnesota Avenue Orange Line Metro Rail Station. The 7th Avenue North segment provides a short connection between the high performing Georgia Avenue and H Street NE Segments. The 11th Street Bridge connection across the Anacostia River provides a short connection between the Anacostia Streetcar Project and the M Street SE segment. With the addition of the Benning Road, 7th Street North, and 11th Street Bridge segments as candidate streetcar segments, adjacent high performing streetcar segments with logical terminal points and intermodal connections could be tied together to form the basis of a future streetcar system. However, even with these short connecting segments it still does not create a single unified streetcar system. There would still be a substantial gap between M Street SE and the H Street NE Segments. The creation of a unified system is highly desirable since it allows the flexibility of moving streetcar vehicles between all streetcar segments and provides access to a maintenance and storage facility (or facilities) from all streetcar segments. The results of an assessment of potential maintenance facility sites, as documented in the *Draft Maintenance and Facility Location Assessment Report*, indicates five potential sites for streetcar maintenance and storage facilities. These sites are shown in Figure 4-3 on the following page. Three of the sites are adjacent to either the Anacostia Streetcar Project or the M Street SE candidate streetcar segments. The other two potential maintenance and storage facility sites are not located adjacent to any of the high performing streetcar segments. Therefore, a north-south streetcar connection between the H Street NE and M Street SE segments is necessary in order for streetcar vehicles from the Georgia Avenue and H Street NE segments to access the potential maintenance facility sites near the Anacostia waterfront area.

There are four primary options for establishing north-south connectivity for a potential unified streetcar system. These options are shown in Figure 4-4. The options to complete the north-south connectivity of a potential streetcar system include the following:

Option A: 7th/9th Street NW - This would extend the M Street SE line north of L'Enfant Plaza across the National Mall to the Mount Vernon Square area and connecting to the Georgia Avenue and H Street NE segments.

Option B: Pennsylvania/Union Station - This option provides a streetcar connection generally along portions of 8th Street NE, Pennsylvania Avenue, 1st Street SE (or 2nd Street SE), and Massachusetts Avenue NW.

Option C: 8th Street NE - This option provides a streetcar connection along 8th Street SE/NE from M Street SE to H Street NE.

Option D: Minnesota Avenue NE - This option provides a streetcar connection along Minnesota Avenue SE/NE from the Anacostia Streetcar Project to the Benning Road segment and the Minnesota Avenue Metro Rail Station.

Each of these north-south connection options have both advantages and disadvantages relative to providing the needed streetcar system connectivity. Figures 4-5 through 4-9 highlight the advantages and disadvantages of each north-south connectivity options.

The Screen 3 analysis results have also revealed that providing a direct connection to the Upper K Street NW area has a substantial positive impact on the productivity of the potential streetcar segments, even though the Upper K Street segment was rated moderate overall for streetcar. The overall moderate rating is due in part to its limited potential for additional economic development as the area is essentially already built out at a high level of intensity. However, this segment serves as a major destination point for trips that originate along the high performing candidate streetcar segments. The six Upper K Street stops generate more than 20,000 daily boardings by themselves, virtually all of which are for trips attracted to K Street from other parts of the region. Attaching the Upper K Street segment to the potential streetcar transit system therefore generates a corresponding number of boardings spread among the other segments in the system, and has a significant impact on the overall system ridership and productivity. Therefore, the addition of the Upper K Street segment extending along the Pennsylvania Ave NW and M Street SE segments to a logical terminal point at Georgetown has been identified as a potential addition to the future streetcar system. Georgetown is a major activity center and destination that currently is not served by the Metro Rail System. This possible addition to the streetcar system is shown as **Option E** in Figure 4-4. The advantages and disadvantages of adding this segment are highlighted in Figure 4-9.

Figure 4-3
Potential Maintenance and Storage Facility Sites

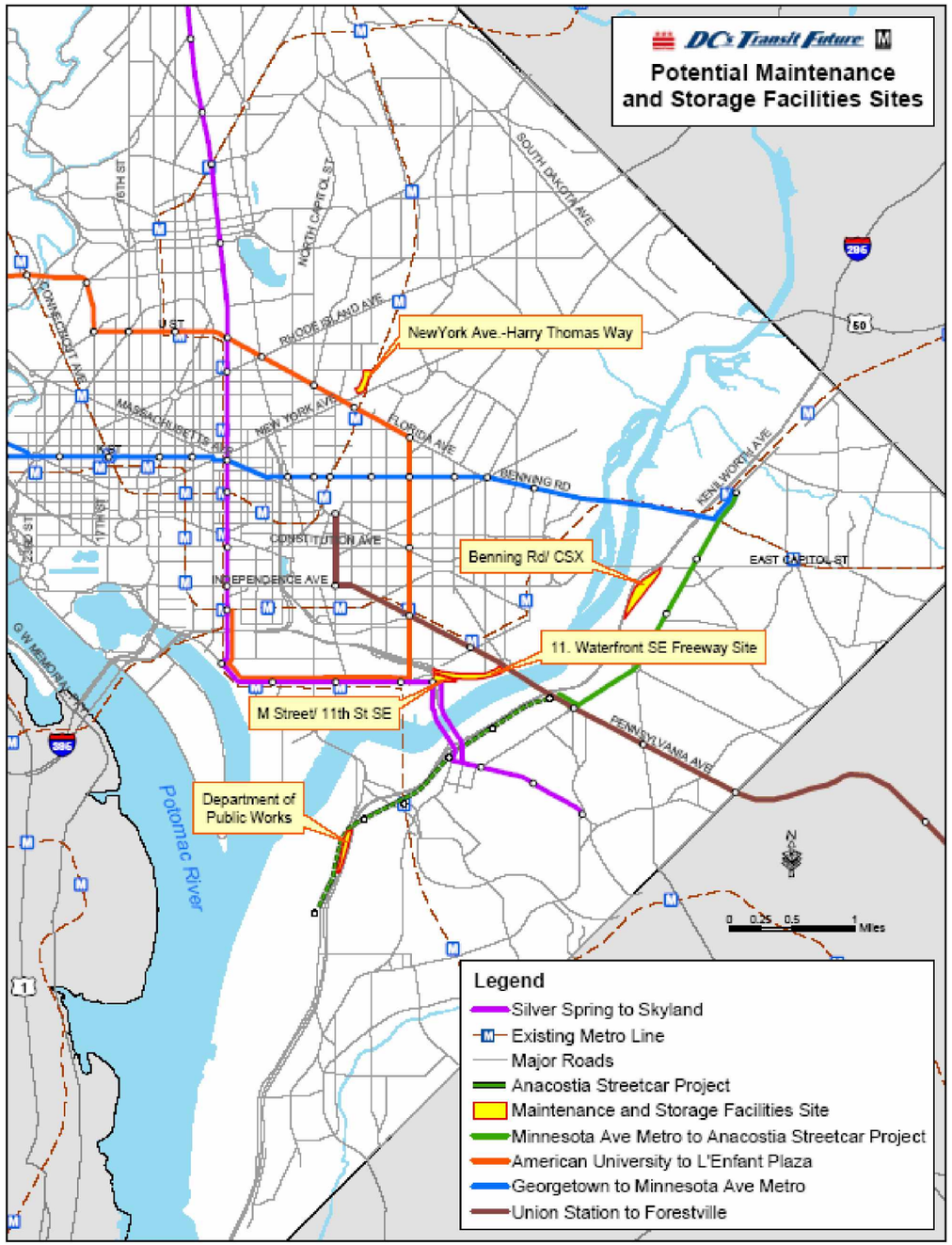


Figure 4-4
Options for Streetcar System Connectivity

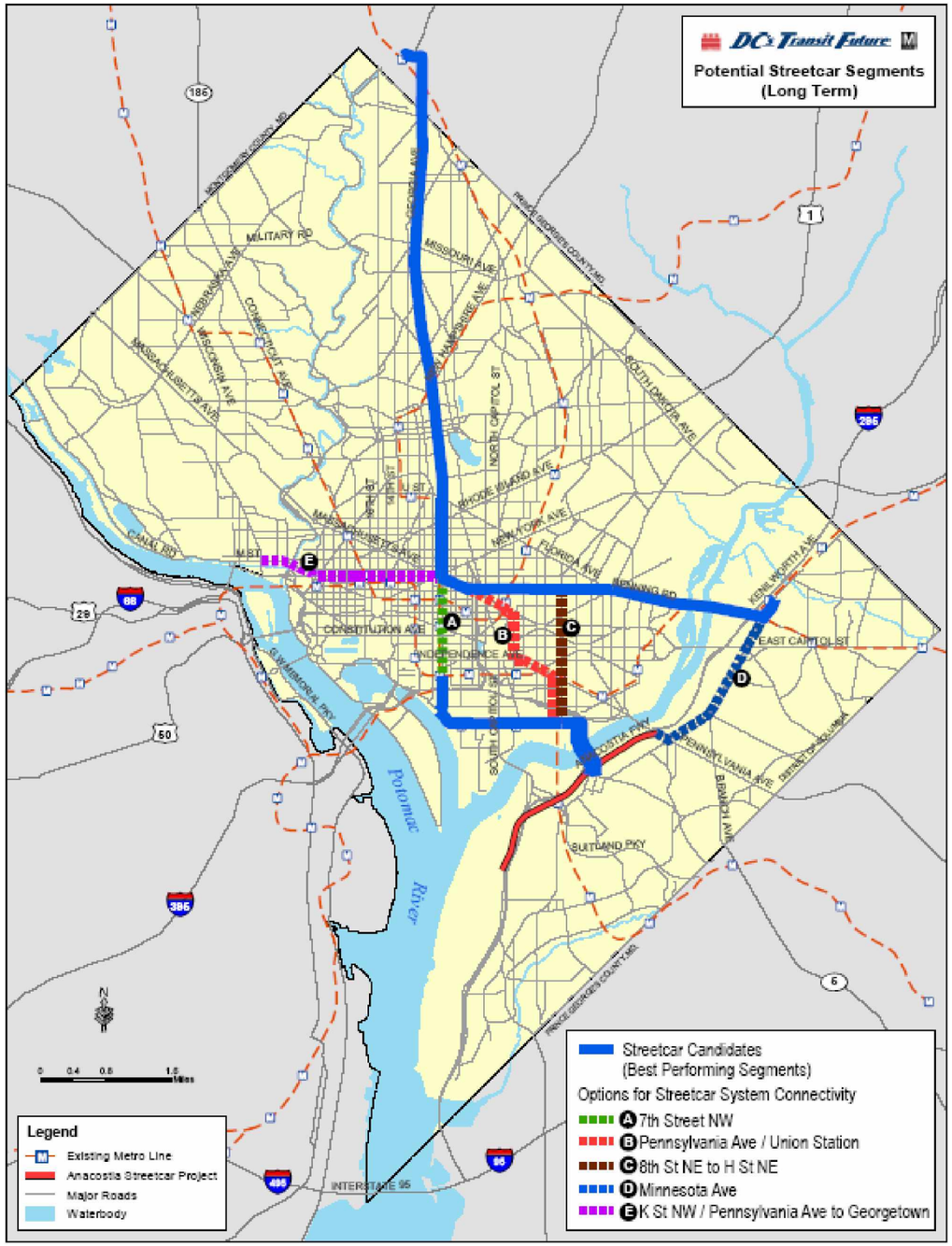


Figure 4-5
Streetcar System Connectivity
Option A: 7th/9th Streets NW

Advantages	Disadvantages
§ Highest system-wide ridership: 20,000 boardings on 7th Street segment	§ Does not provide direct access to Union Station
§ Least potential for neighborhood impacts: operations is entirely in major arterial, commercial area	§ Little opportunity for economic development – few opportunities for redevelopment in corridor
§ Shortest of any north-south connection (1.2 route miles of additional track), and most direct connection between Mount Vernon Square and M Street corridor	§ Use of 9th Street tunnel under Mall may be possible, but increases complexity of project and still requires crossing Federal enclave
§ Integrates M Street service, best connections to baseball stadium	§ May have traffic or parking impacts in congested downtown area
	§ Duplicates existing Metrorail service
	§ Overhead catenary may not be allowed to cross National Mall portion of Federal enclave

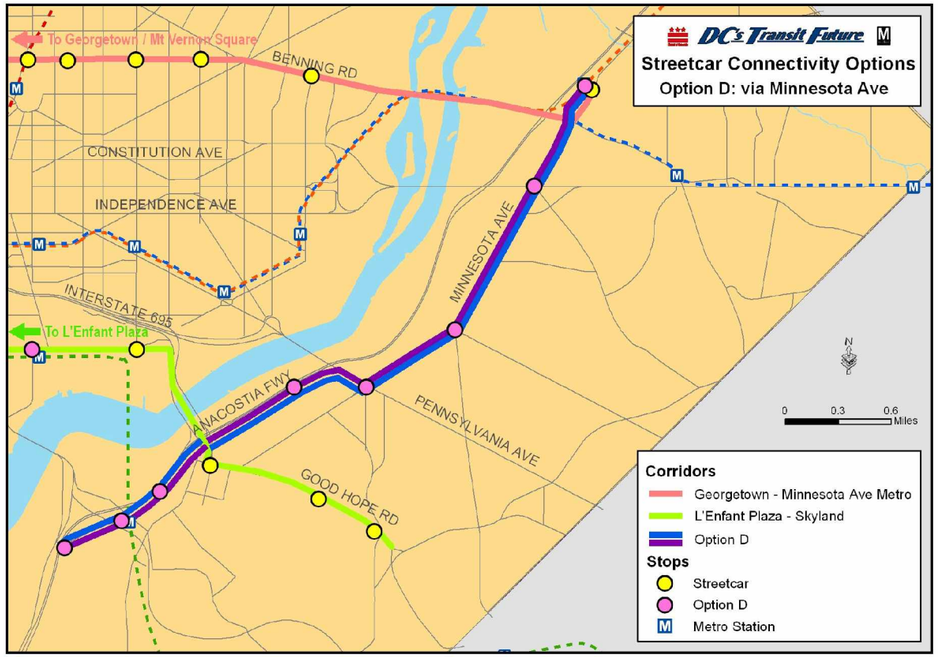
Figure 4-6
Streetcar System Connectivity
Option B: Pennsylvania Avenue/Union Station

Advantages	Disadvantages
§ Alignment serves neighborhoods that lack direct Metrorail service	§ Second lowest ridership of the 4 north-south alternatives: only 18,000 boardings
§ Route provides direct service to Union Station	§ Traffic conflicts on 2nd Street at Independence Ave. in the AM peak
§ Serves the Capital Hill activity center	§ If AU-L'Enfant Corridor is in operation, 8th Street SE Segment may be too constrained to accommodate the high volume of streetcar and BRT vehicles (more than 20 vehicles per hour in each direction)
§ Route provides a currently non-existent connection between Metrorail Orange/Blue lines and Red Line	§ Requires that M Street service be operated separately
§ Alignment permits route to avoid the National Mall	§ Security concerns may prohibit operation on 2nd Street
§ Pennsylvania Avenue portion is a very wide street with minimal traffic or parking conflicts	§ Route crosses the Federal Enclave for two blocks in front of Union Station, restricting use of overhead catenary
§ Route uses improvements on Massachusetts Avenue proposed as part of the K Street Transitway	
§ Alignment establishes 2nd Street as a potential transit priority corridor	

Figure 4-7
Streetcar System Connectivity
Option C: 8th Streets NE

Advantages	Disadvantages
§ Second highest ridership of the north-south options: 19,000 daily boardings § Serves areas of NE that do not currently have any Metrorail service Serves H Street NE redevelopment area § Requires fewer miles of new track than Alternatives A & B § Puts more service on the H Street NE segment, which is one of the most productive of all segments § Avoids crossing the Federal Enclave	§ No direct access to Union Station § 8th Street is very narrow, with parking on either side and residential land uses to the street's edge § If AU-L'Enfant Corridor is in operation, 8th Street SE segment may be too constrained to accommodate the high volume of streetcar and BRT vehicles (more than 20 vehicles per hour in each direction) § Unlikely that dedicated guideway operations on 8th Street could be provided § Requires that streetcar operations on M Street be operated as a separate line

Figure 4-8
Streetcar System Connectivity
Option D: Minnesota Avenue



Advantages	Disadvantages
§ Maximizes connections with Anacostia Streetcar Project § Avoids areas of high traffic congestion § Provided access to a potential maintenance facility site § Avoids the Federal Enclave and areas within the Historic City of Washington	§ Lowest ridership of any north-south corridor: less than 1,000 riders per day § Trips between N Street / NW DC and SE are very long and indirect § Trips from Skyland or Anacostia into downtown would be faster and more direct via Metrorail § Minnesota Avenue is narrow and residential § There is no existing connection between Good Hope Road and the Anacostia Streetcar Project § M Street would have to be operated as its own streetcar line § This segment performed poorly to moderately in the Evaluation Screening

Figure 4-9
Streetcar System Connectivity
Option E: K Street/Pennsylvania/M Street to Georgetown

Advantages	Disadvantages
§ Has the highest potential ridership of any segment: 20,000 boardings § Attachment to Upper K Street tends to increase ridership on other lines § Serves major employment destinations for the entire region § Would provide premium service to Georgetown, which has no Metrorail § Could be part of Lower K Street / Whitehurst redevelopment § Has the potential to reduce congestion on the Metrorail Blue and Orange lines § K Street Transitway improvements already planned and budgeted, would provide dedicated lane operations § Is compatible with almost any other operating segment	§ Streetcar operations might require use of Pennsylvania Avenue - M Street NW in Georgetown, which could have traffic impacts § Area is largely built-out, with minimal opportunities for redevelopment and little economic impact § Duplicates existing Red, Blue, Orange Metrorail service § Operations around Mount Vernon Square, Washington Circle, and the Whitehurst on-ramps is complex for streetcar operations § May conflict with heavy planned bus volumes in K Street Transitway § Construction impacts on Transitway could be severe to existing and planned service

Potential BRT Segments

The moderate performing segments that have not been identified for streetcar development have been identified as candidate segments for BRT, a more moderate level of investment. These segments are shown in Table 4-3. The particular strengths of these segments are also shown in the table.

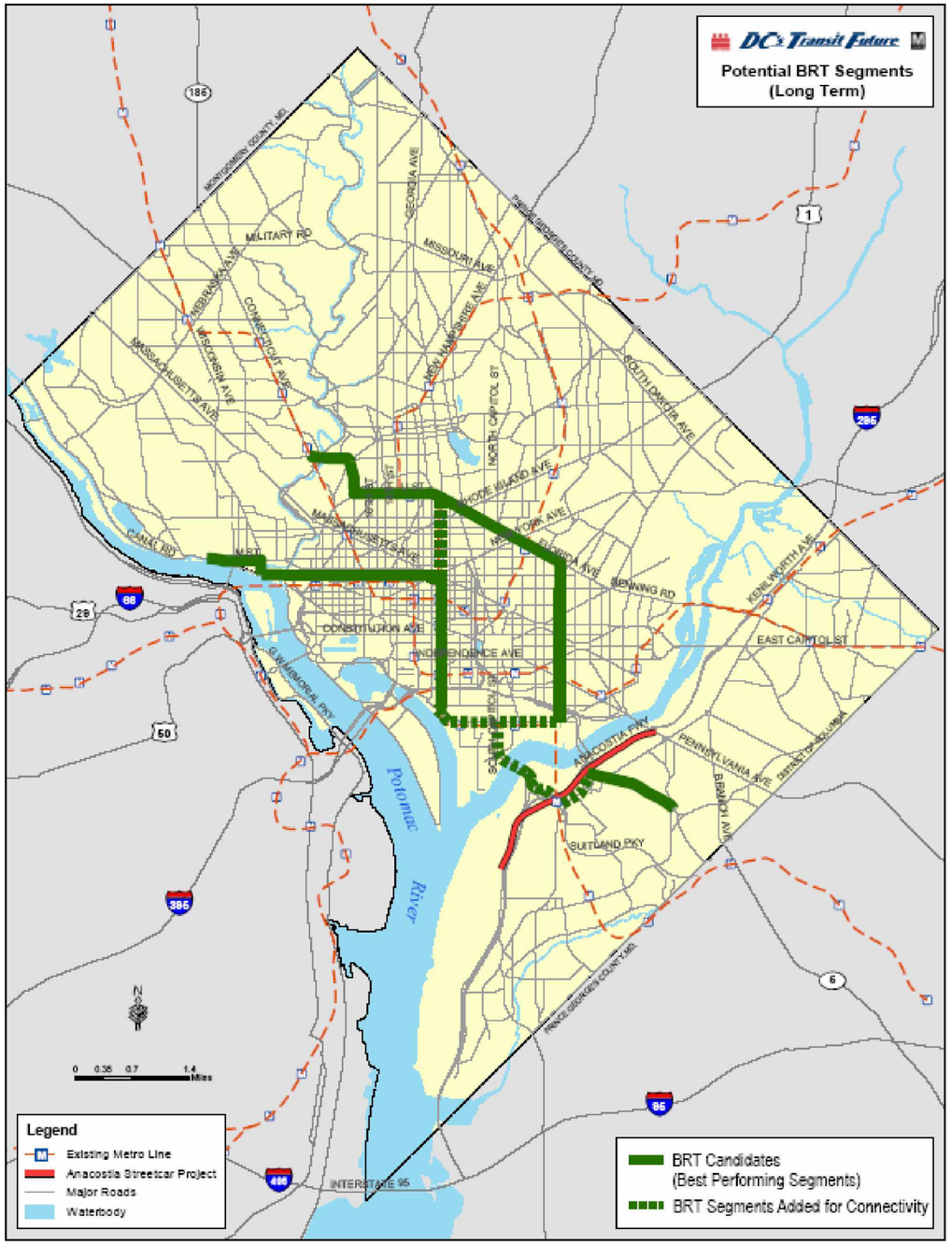
Table 4-3
Moderate Performing Segments (for Possible BRT Service)

Segment	Key Strengths*
7th Street South	Accessibility *[directly serves three regional activity centers; employment is 58,277 per linear mile and population is 6,308 per linear mile]*
	Ridership *[11,210 daily boardings; 6,835 daily boardings per mile]*
	Compatibility with Zoning/Land Use/Development
U Street	Minimizes Transit Travel Times *[2.5% avg. change to access employment centers within 60 minutes; 1.2% avg. change in mode share to regional centers]*
	Community Interest
Florida Avenue	Minimizes Transit Travel Times *[1.7% avg. change to access employment centers within 60 minutes; 1.0% avg. change in mode share to regional centers]*
	Accessibility *[indirectly serves two regional activity centers; employment is 8,898 per linear mile and population is 7,365 per linear mile]*
	Support City Initiatives *[indirectly serves three Main Street Corridors; directly serves one Strategic Targeted Neighborhood]*
	Compatibility with Zoning/Land Use/ Development
	Visual/Community Fit
8th Street	Minimizes Transit Travel Times *[3.6% avg. change to access employment centers within 60 minutes; 1.6% avg. change in mode share to regional centers]*
	Support City Initiatives *[directly serves one Main Street Corridor; indirectly serves two Strategic Targets Neighborhoods]*
Upper K Street	Accessibility *[directly serves one regional activity center; employment is 110,720 per linear mile and population is 12,941 per linear mile]*
	Ridership *[19,893 daily boardings; 12,670 daily boardings per mile]*
	Compatibility with Zoning/Land Use/ Development
	Cost-Effectiveness *[operating costs/vehicle mile=$8; annual operating cost/annual new boarding=$1; annualized capital cost per annual boarding=$1; annualized capital cost per annual new boarding=$20; annualized cost per TSUB=$7]*
Lower K Street	Accessibility [directly serves one regional activity center; employment is 22,625 per linear mile and population is 9,416 per linear mile]
	Cost-Effectiveness *[operating costs/vehicle mile=$8; annual operating cost/annual new boarding=$1; capital costs per mile=$20 million; annualized capital cost per annual boarding=$30; annualized capital cost per annual new boarding=$20; annualized cost per TSUB=$7]*
Georgetown	Minimizes Transit Travel Times *[8.8% avg. change to access employment centers within 60 minutes; 1.2% avg. change in mode share to regional centers]*
	Community Interest
	Increases in Corridor Transit Carry Capacity [404%]
	Cost-Effectiveness *[operating costs/vehicle mile=$8; annual operating cost/annual new boarding=$1; capital costs per mile=$2 million; annualized capital cost per annual boarding=$11; annualized capital cost per annual new boarding=$20; annualized cost per TSUB=$7]*
Good Hope Road	Support City Initiatives *[directly serves one Main Street Corridor; indirectly serves two Strategic Targeted Neighborhoods]*
	Community Interest
	Increases in Corridor Transit Carry Capacity *[169%]*

*Criteria where the segment performs best for BRT service

In order to form a potential BRT system that incorporates these moderate performing segments a number of short segments could be used to provide the necessary connectivity. These additional segments include M Street SE, South Capitol Street Bridge, Martin Luther King Blvd, 1st Street/2nd Street SE, and 7th Street North segments, The Calvert East segment was added to the U Street segment providing a logical terminal point for the service an intermodal connection at the Woodley Park/Adams Morgan Metro Rail Station. The resulting potential BRT system is shown in Figure 4-10.

Figure 4-10
Potential BRT System Segments

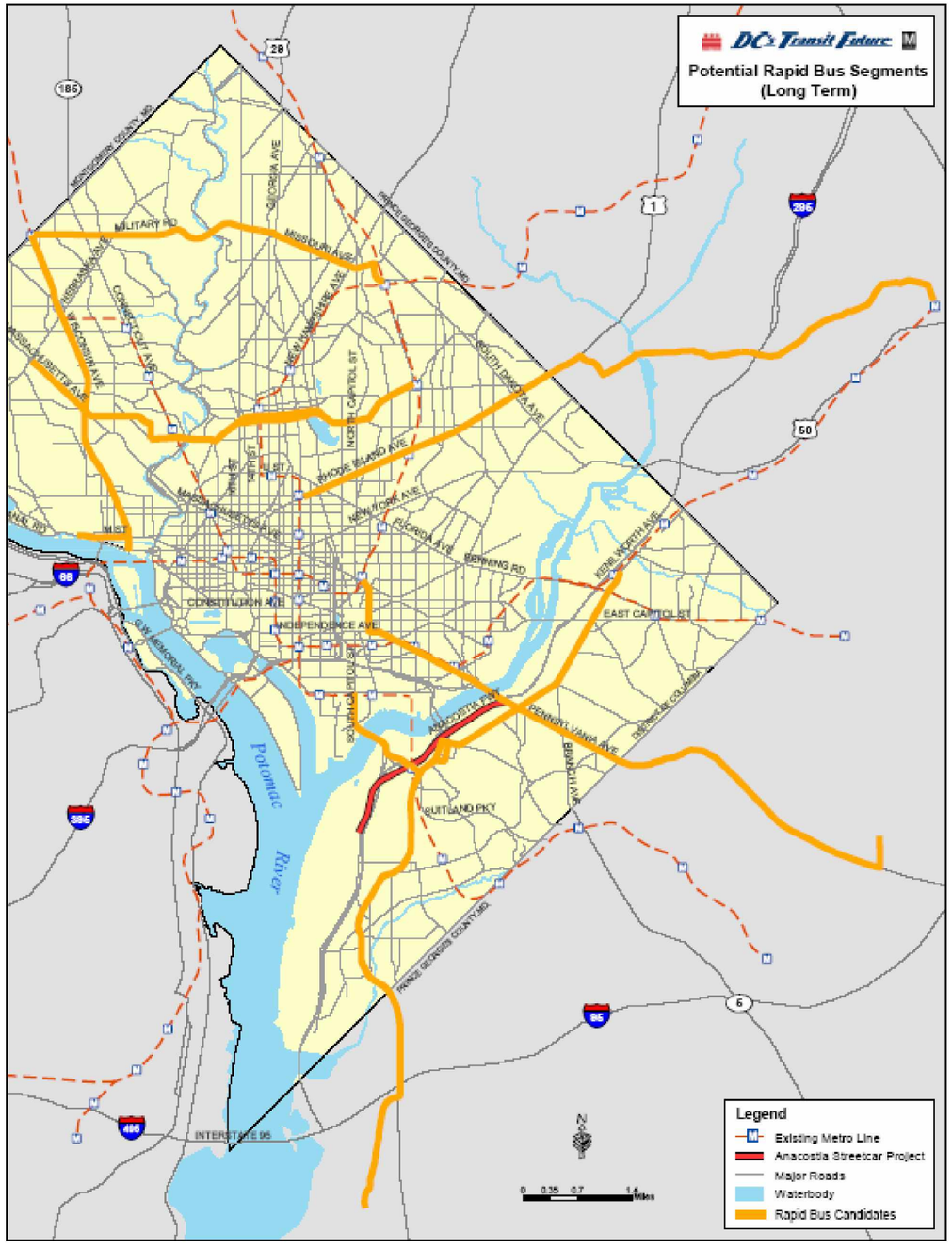


Local Bus/Rapid Bus Enhancement Segments

The remaining segments that have not been identified for potential full BRT services will focus on lower cost local bus service enhancements and limited "Rapid Bus" type investments. These segments are added to the local bus/rapid bus segments that were identified at the conclusion of the Screen 2 analysis and the secondary corridors identified in the *Needs Assessment Report* for the project. These potential local bus enhancement/Rapid Bus corridors are shown in Figure 4-11 and include the following segments.

- Massachusetts Avenue NW (west of Wisconsin Avenue)
- Calvert West
- Minnesota Avenue
- Outer Pennsylvania Avenue
- Middle Pennsylvania Avenue
- Wisconsin Avenue South
- Wisconsin Avenue North
- South Capitol Street (National Harbor)
- Rhode Island Avenue
- Columbia Road
- Military Road

Figure 4-11
Potential Local Bus Enhancement/Rapid Bus Segments



4.2 NEXT STEPS

A draft system plan for major transit investments will be developed based on the following information:

- **Refinement of Screen 3 Evaluation Results -** The information summarized in this document will be reviewed with the study participants, including the Project Management Technical Committee and the District of Columbia Department of Transportation staff, to further refine the results, address comments and concerns, and incorporate suggestions and preferences regarding the streetcar connectivity options still under consideration.
- **Consideration of Potential Funding Availability -** A range of potential federal and local funding sources and potential revenues that could be generated from these sources will be identified and summarized in a Funding Options Report. Costs for the potential transit investments identified as a result of the Screen 3 analysis will be determined and compared to the potential funding source revenue estimates. Refinements to the list of transit service investments will be made based on the potential resources that could be used to support the future transit system
- **Consideration of Return on Investment -** The results of the potential return on investment analysis will be used to further refine the list of potential transit investments.
- **Phasing of Recommended Investments -** An initial phasing strategy for the transit investments over the next 25 years will be determined. The phasing strategy will identify short, medium, and long term improvements that result in the development of an ultimate system of integrated local bus, rapid bus, BRT, and Streetcar services based on the refined results of the Screen 3 analysis.
- **Public Review and Comment -** The refined results of the evaluation will be presented to the general public at public meetings. The results will be further refined based on comments received.
- **Preparation of Final System Plan and Financial Plan -** After public review of the draft results a final system plan report will be prepared to document the results of the planning process including a phased system plan to guide major transit investment in the District of Columbia.