DISTRICT OF COLUMBIA TRANSIT IMPROVEMENTS ALTERNATIVES ANALYSIS

FINAL REPORT

OCTOBER 2005

DISTRICT OF COLUMBIA DEPARTMENT OF TRANSPORTATION
WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

DISTRICT OF COLUMBIA TRANSIT ALTERNATIVES ANALYSIS

Final Report

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Prepared by

DMJM Harris Planning

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1.0 INTRODUCTION

This final report summarizes the findings of the *District of Columbia Transit Alternatives Analysis (DCAA),* commonly known as *DC's Transit Future*, undertaken jointly by the District of Columbia (DC) and the Washington Metropolitan Area Transit Authority (WMATA) during 2004 and 2005. The purpose of this multi-corridor, multimodal study of transportation alternatives has been to define a network of efficient, high-quality surface transit access across the District, thereby offering additional connections between the existing Metrobus and Metrorail systems, as well as to key activity centers across the region.

The study was developed in response to five key questions, and this report has been organized to answer these questions. The questions and key issues are as follows:

- ***What is the purpose of the DCAA?*** This includes an outline of project goals and objectives, and a discussion of how they served as the basis for identifying the best-performing transit improvement options. The AA recommends a phased system plan for improvements, describes the costs, outlines a finance plan, and identifies potential funding sources. It defines an implementation strategy, describing an incremental expansion of premium transit services to serve the District. These issues are discussed in this section.
- ***Why are transportation improvements needed?*** This includes an assessment of the needs for additional transit improvements generated by continuing population and employment growth. It discusses the need for enhanced mobility for residents of the District, including the effects of increased travel time and crowding on the existing system, and the areas within the District not currently served by transit. The effect of premium transit on the continuing economic development of the District is evaluated, as well as how transit may support City planning initiatives and development. The study also included an analysis is of how future transit system additions may relieve capacity constraints of the Metrorail system, and how transit travel times may be made more competitive. These issues are discussed in Section 2.0 of this report.
- ***How were the recommended improvements identified?*** An analytic study process, described briefly below and in more detail in Section 3.0 of this report, served as the framework for identifying the recommended improvements. This process includes three levels of screening to refine the universe of alternatives according to successively more specific criteria in order to arrive at recommended system improvements. The outcomes from the screening have been balanced with other factors, including WMATA policy decisions and an overall systems perspective. These issues are discussed in Section 3.6 of this report.
- ***What is the recommended investment plan?*** The improvements identified through the analytic process and balanced by policy and systems considerations have resulted in recommendations for an interconnected surface transit system that includes Bus Rapid Transit (BRT), Streetcar, and local bus components. This system has been defined to provide logical interconnections that meet the needs for enhanced transit, support the District's planning and growth initiatives, and advance continuing economic growth. The intention has been to provide a vision for the year 2030 that will guide investments in premium transit within the District for the next 25 years. These issues are discussed in Section 4.0 of this report.
- ***How will the recommended improvements be paid for?*** The implementation of these recommendations is dependent on identifying and tapping funding sources. This includes an estimate of the capital and operating costs of the proposed improvements. The phasing of the improvements, the identification of potential funding sources, and the amounts required by phase are outlined in the finance plan. These issues are discussed in Section 5.0 of this report.

These questions and the main points they address are discussed in detail in the following sections of this report. These recommendations consider the results of the evaluation of alternatives and policy direction provided by the Project Management Team (PMT), which served as a steering committee for the project. The PMT includes representatives of the District Department of Transportation (DDOT), DC Government, Federal Transit Administration (FTA), and WMATA.

1.1 The Purpose of the DC Alternatives Analysis

This Section includes an outline of project goals and objectives that were developed to address the project needs. This section also identifies the specific criteria that were identified to test the ability of different transit improvement options to address each goal. The criteria used in the analysis were reviewed and accepted by the project steering committee. The results of these evaluations are described in Sections 3.4 through 3.6 of this report and were considered in developing the recommended transit system plan and implementation phasing strategy.

1.2 Project Goals and Objectives

The following goals and objectives for the project were developed during the course of initial public outreach efforts, described in Section 3.3. The goals and objectives reflect the results of the needs assessment as well as input from the project steering committee and the general public.

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

1.2.1 Identifying the Best Performing Options

Evaluation Criteria

The study considered a number of alternative transit modes, corridor options, and segments of corridors as described in Section 3.0 of this document. Each of these alternatives were evaluated according to specific evaluation criteria that relate to each of the project goals. These criteria were reviewed and endorsed by the project steering committee. 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.

1.4 Create a Phased System Plan of Improvements

The DCAA provides a framework for the identification of a vision of the future year transit system for the district. The plan will address transit service needs and the goals and objectives for transit as described in the preceding section. The planning process considered a range of potential transit improvement choices including various transit modes, corridors, propulsion, and maintenance facility sites. A three-step screening process was established that evaluated successively fewer alternatives with more detailed criteria as the alternatives were advanced to subsequent screenings. The screening process culminated in the identification of a Recommended Year 2030 Transit System Plan. The Recommended System Plan consists of a network of corridors with preferred modes and facilities identified for each corridor.

The evaluation framework for the planning effort was focused on identifying a system plan that:

- Addresses the issues raised in the transit needs assessment;
- Supports the project goals and objectives;
- Responds to concerns and suggestions of the project steering committee; and
- Addresses and incorporates public comments and review.

The resulting system plan refines the recommendations from prior planning efforts by expanding the criteria used to select the priority corridors for transit investment. Through a series of early public involvement efforts, additional mobility and community needs were identified. A wider range of future transit improvements than had been most recently recommended in WMATA'S 2001 *Transit Development Study* was considered. The Alternatives Analysis was conducted in accordance with FTA guidelines for identifying, evaluating, and selecting needed transportation improvements to support local mobility, accessibility, and economic development goals as well as to connect healthy, vibrant communities. Recommended improvements will enhance mobility within city neighborhoods, provide enhanced access to existing transit service and leverage existing transit infrastructure by extending the reach of the system and alleviating capacity constraints.

Once the recommended long-range system plan was identified, a phasing plan to guide the implementation of the recommended improvements over a 25 year period was established. The phasing plan includes short-term local bus service improvements in many corridors and the gradual expansion of premium fixed guideway transit in priority corridors in the short-, mid-, and long-term time frames. The resulting phasing strategy is outlined in Section 4.0 of this document.

1.5 Identify Costs and a Finance Plan

The DCAA also includes the identification of capital and operating costs to implement the recommended improvements and the identification of possible funding sources to provide the needed financial resources. A key objective of the financial analysis was to demonstrate that DC has the financial capacity, both capital and operating, over a 30-year period from 2005 to 2034, to fund construction and operation of the 2030 System Plan. This analysis assumed that existing transit providers, primarily WMATA, will continue to receive funding for capital and operating costs of existing transit services in the District from existing revenue streams. This financial analysis, therefore, modeled the incremental capital and operating costs and the marginal revenues required to provide new transit services to the District.

The financial analysis identified several alternative funding scenarios that include combinations of public and private sources. The rates and amounts necessary for each of the sources over the 25-year period were identified. The finance plan provides both background and year-by-year cash flow analysis of the funding and financing options. This analysis examined alternative implementation schedules of transit improvements in the District of Columbia, potential tax increment financing, benefit assessment districts, projected market response in terms of the timing of development relative to the construction schedule, and the proposed rate of growth in service. This preliminary financial analysis also examined known sources of funding already in place or reasonably expected to be in place when the program is constructed and operated. The plan identified the significant funding challenges that lay ahead for this project. The results of the financial analysis are described in Section 5.3 of this document.

1.6 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 DC Department of Public Works (DPW), identified several District corridors that would benefit from increased transit investment. Transit alternatives were selected to advance into more detailed project development in WMATA's *District of Columbia Transit Development Study* (2002), which was conducted as a follow-up to the 1997 plan.

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 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, 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 considered 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 expanded the scope of previous studies and examined the District's current transportation system as a whole.

2.0 TRANSIT NEEDS ASSESSMENT

This section determines the need for additional transit improvements generated by continuing population and employment growth in the District. It discusses the need for enhanced mobility for residents of the District, including the effects of increased travel time and crowding on the existing bus and rail systems and inadequate access to transit. Support for both public and private economic development initiatives are also considered. Based on the transit needs established as a result of the Needs Assessment, this section provides a description of the Priority and Secondary Corridors identified for potential transit investment. This information is documented in detail in the *Needs Assessment Report*, May 2004.

2.1 Needs Assessment

An initial Needs Assessment identified areas of the District of Columbia that potentially require transit improvements to enhance access within and between neighborhoods, to key activity centers within the District, and to the regional Metrorail system. Five specific technical issues were addressed to identify these needed improvements:

1. An assessment of transit travel times to employment and other activity centers for District residents;
2. An assessment of overall travel and transit demand in different sections of the city;
3. A comparison of transit demand to transit capacity within key corridors in the city;
4. An assessment of development and redevelopment initiatives within the city that will require transit access; and
5. An assessment of public preferences for transit improvements.

Based on the analyses outlined above, a statement of transportation needs was developed for the District of Columbia and reviewed by the project steering committee. It provided the framework for the identification of corridors that were considered for more detailed evaluation in subsequent steps of the project development process. The statement of needs addressed the following key issues:

- *Population and Employment Growth:* The District has been actively engaged in community and economic development efforts to target areas that could be redeveloped to help accommodate the 100,000 additional residents the District government would like to attract to the City. In addition, District residents require more direct access to local and regional job concentrations.
- *Enhanced Mobility:* Current and future District residents need transit services that will extend the reach of existing transit services to communities and for trip purposes that are currently underserved. There is a need for high-capacity transit service that can offer cross-town trip patterns and more direct connections across the Anacostia River without forcing a transfer. There is also a need to serve non-work trips made by neighborhood residents and visitors to destinations located in different parts of the City.
- *Continued Economic Development:* There are mutual benefits to be obtained by supporting community development initiatives with transit investments. The developing areas receive the advantage of convenient transportation to a variety of destinations. At the same time, the transit investment will benefit from the built-in ridership base associated with the redevelopment areas.
- *Metrorail Coverage and Core Capacity Relief:* The Metrorail system serves several parts of the City effectively, but there are still large gaps in service coverage. In addition, both the Metrorail and Metrobus systems are approaching their maximum capacities.
- *Transit Travel Times:* Local bus service can be effective in providing neighborhood circulation or connections to the Metrorail system, but it is not the most effective means for moving large volumes of riders through high-demand corridors. The degenerating traffic conditions also reduce bus service effectiveness, as bus passengers are ultimately inconvenienced by the same traffic conditions as private automobiles.

2.2 Issue: Population and Employment Growth

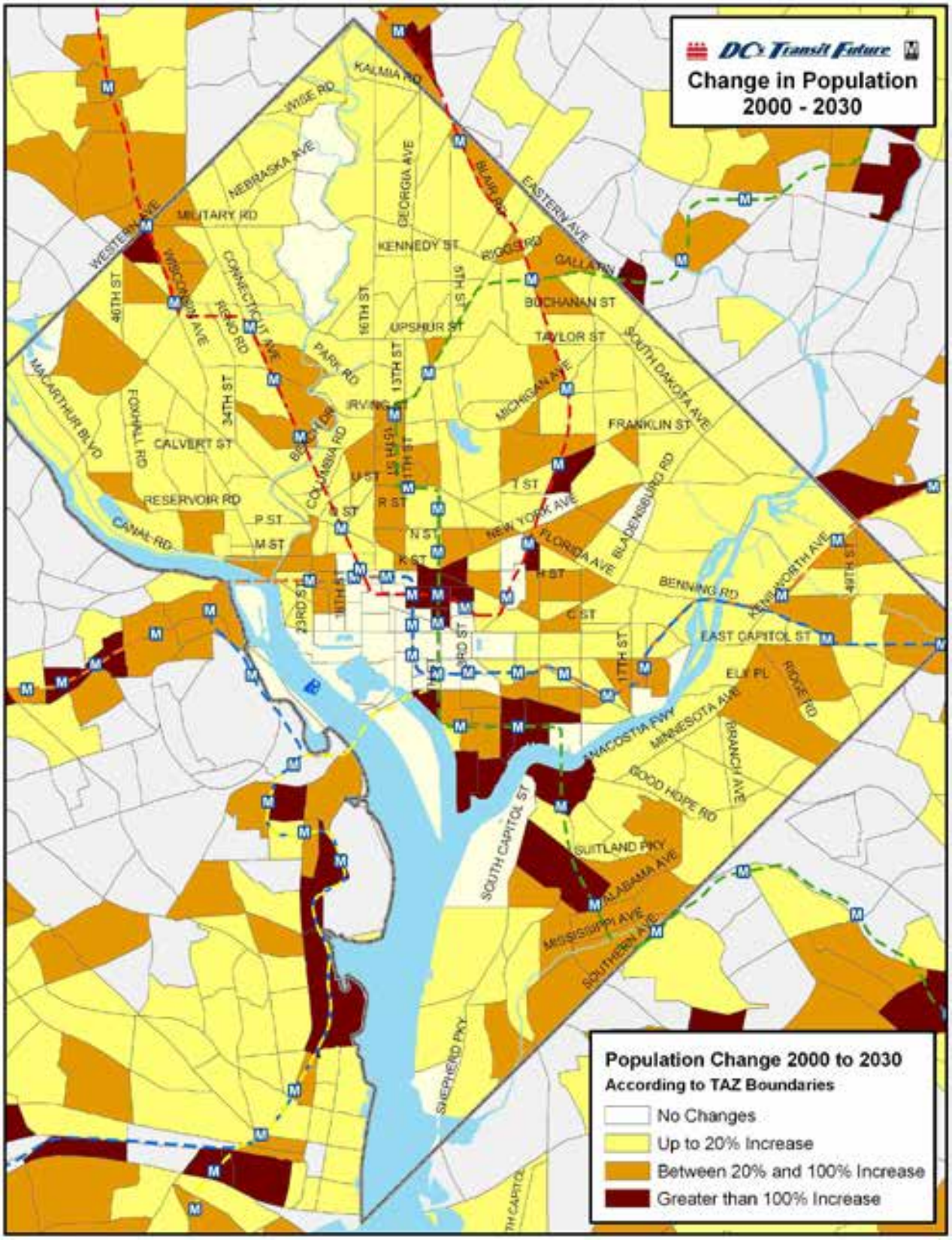
The transportation system within DC will have to accommodate continued growth in population and employment over the next 25 years. In 2000, 572,000 people lived within the city, with an average density of over 9,000 people per square mile. In 2003, Mayor Anthony Williams set a goal of attracting 100,000 new residents to the District over the next ten years, which would represent an increase of almost 20 percent over the current population. Along with population growth, employment within the District is expected to grow by approximately 22 percent by 2030. This section presents the results of population and employment growth forecasts in DC in order to demonstrate future transit demands and needs.

2.2.1 Population

As shown in Figure 2-1, the areas in the District of Columbia that are expected to experience the greatest population increases over the next 30 years are:

- North of downtown DC in Dupont Circle, Adams Morgan, Woodley Park, and Cardozo-Shaw;
- West of Wisconsin Avenue NW and Massachusetts Avenue NW in Glover Park and Cathedral Heights;
- Along the Georgia Avenue spine in Brightwood, Takoma, Columbia Heights, and Logan Circle/Shaw;
- East of New York Avenue NE and north of H Street/Benning Road in Trinidad and Carver/Langston;
- Along the Anacostia River waterfront near the Navy Yard and Buzzard Point; and
- In Southeast DC between Wheeler Road and South Capitol Street in Washington Highlands and Congress Heights.

Figure 2-1: District Population Change



2.2.2 Employment

District employment is not uniform across the city, but rather is concentrated in a few locations. This can be seen in Figure 2-2; large employers are almost exclusively concentrated in the downtown core, with even greater concentrations around K Street NW. Although the existing Metrorail and Metrobus systems provide high quality access to some of these employment concentrations (especially downtown), there continues to be a need to maximize District residents' ability to access both local and regional employment opportunities, especially in areas immediately north and east of the downtown core..

Employment in the Washington DC metropolitan region has grown over the past ten years. Though the majority of this growth has occurred in the Maryland and Virginia suburbs, significant growth is expected in several areas within the District. As can be seen in Figure 2-3, the areas expected to experience the greatest increases in employment are almost exclusively concentrated in the downtown core. Other areas expected to experience employment growth of 20 percent or more include:

- Downtown DC surrounding the National Mall (dominant relative to rest of city);
- Northwest DC within the Woodley Park and Adams Morgan neighborhoods;
- East of the Anacostia River in the neighborhoods along the District/Maryland border;
- Along the Anacostia River waterfront near the Navy Yard and Buzzard Point;
- Along New York Avenue NE, immediately north of Massachusetts Avenue NE;
- From Bladensburg to Rhode Island Avenue NE, north of Florida Avenue NE;
- Along Connecticut Avenue, NW from downtown to Dupont Circle and again north of Porter; and
- Along Georgia Avenue north of Florida Avenue (Howard University) and south of Alaska Avenue (Walter Reed Hospital).

Figure 2-2: Top 200 Employers in District of Columbia

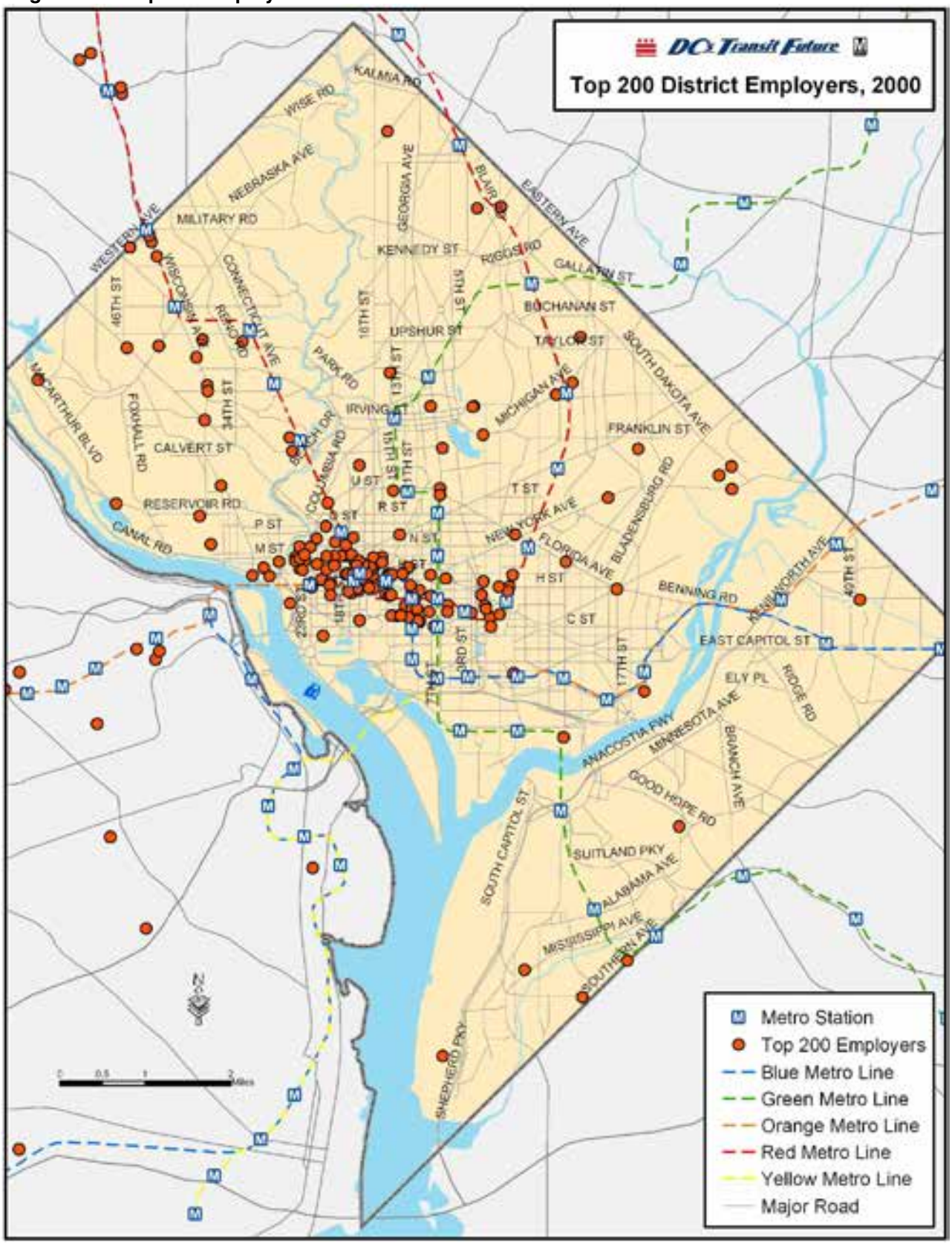
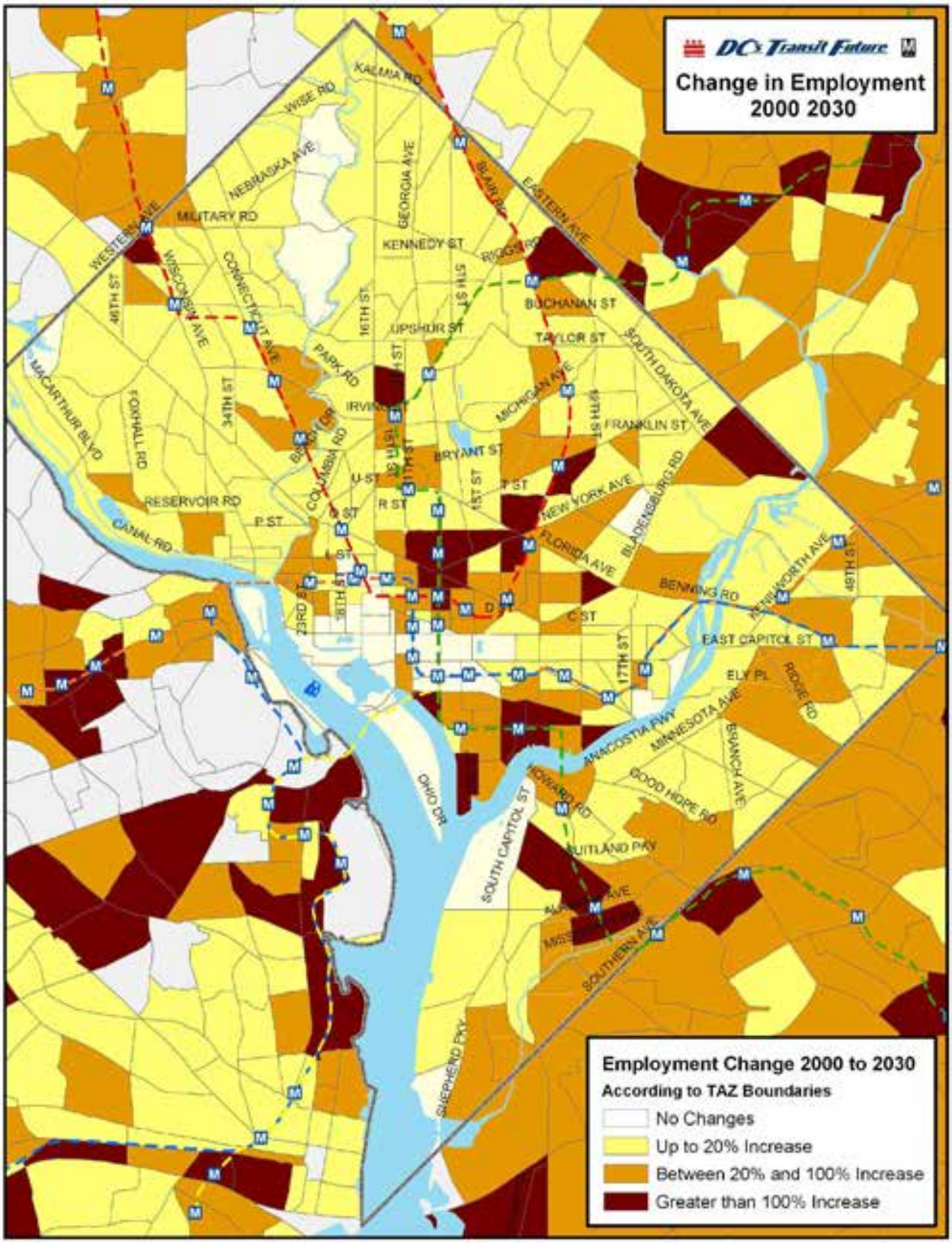


Figure 2-3: District Employment Growth 2000 to 2030



2.3 Issue: Provide Enhanced Mobility for District Residents

One of the primary purposes of recommending improvements to the existing DC transit network is to enhance mobility for DC residents. Mobility enhancements can benefit existing transit users through improved service and connections to new destinations. Enhanced mobility also benefits non-users, by providing new travel options that may be competitive with the private automobile or other non-transit modes.

Mobility enhancements can address several key challenges facing the existing DC transit network, such as:

- Long travel times and commutes
- Reliability of service
- Lack of premium transit to some parts of the District

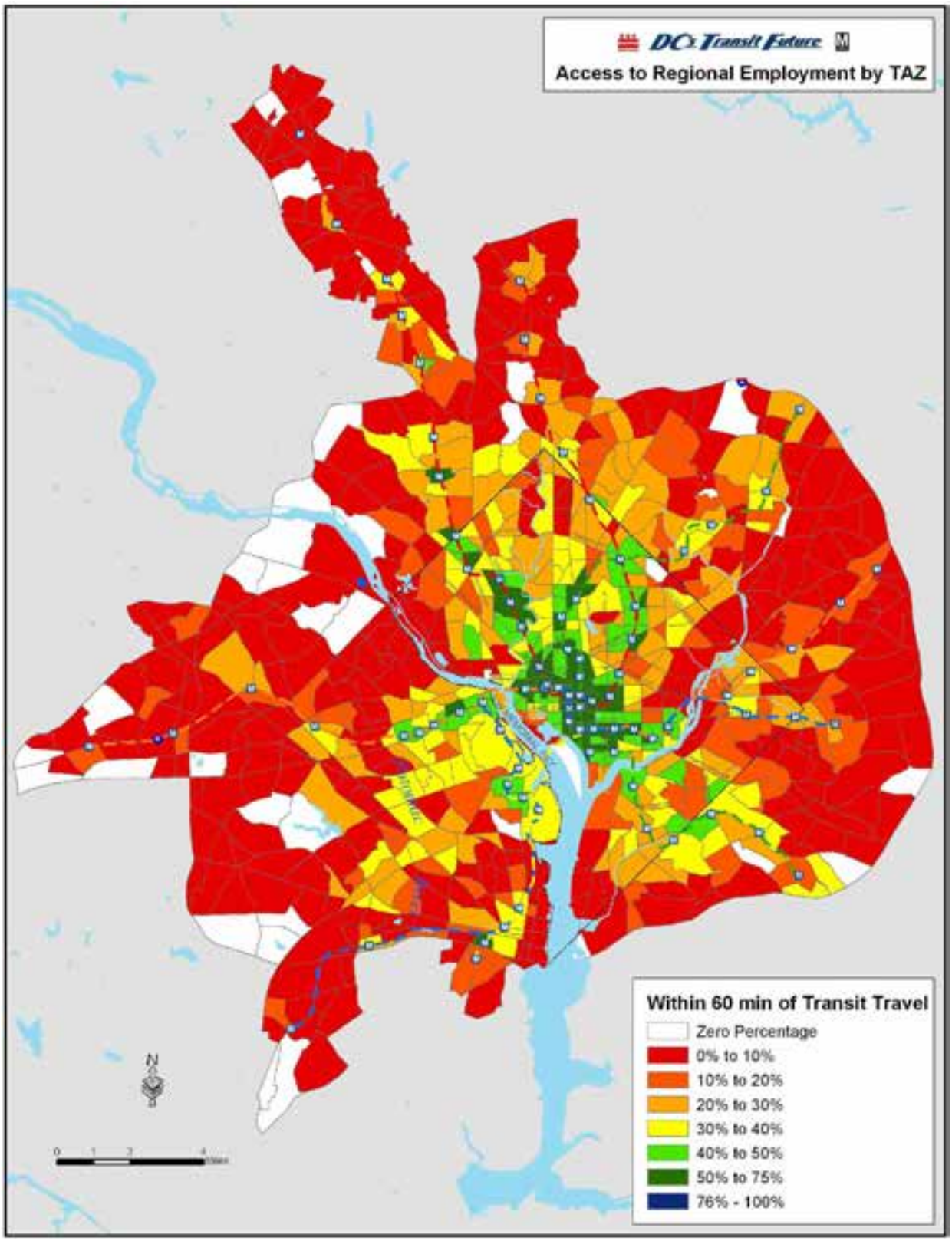
2.3.1 Long Travel Times

While Metrorail lines provide relatively rapid trips due to their separation from surface roadways and the associated traffic congestion, construction and incident delays, and traffic signals, Metrobus lines must mix with traffic and face delays. In addition, many Metrobus routes are indirect between some origins and destinations, resulting from a history of adding branches and diversions onto the bus routes. Finally, Metrobus routes are often slower than automobile travel on comparable routes because buses must stop so frequently for passenger pick-up and drop-off, and cannot divert from their assigned routes to bypass incidents or congestion.

The consequence of relatively slower travel times for Metrobus, as opposed to Metrorail, is that different parts of the city have varying levels of access to employment, services, and recreational and cultural destinations, depending on their Metrorail service (or lack thereof). Figure 2-4 illustrates, by Traffic Analysis Zone (TAZ), the percentage of regional employment that is accessible within 60 minutes of travel time by transit from that zone. Figure 2-5 depicts, by TAZ, the percentage of District employment that is accessible within 40 minutes of travel time by transit from that zone. The data in these figures show that in many parts of the city the existing transit system does not provide quick and easy access to employment centers, which make these areas logical candidates for transit improvements. In addition, slow transit travel times are a major factor leading to the choice to drive to work rather than take transit. This can lead to significant traffic congestion in areas with limited transit service.

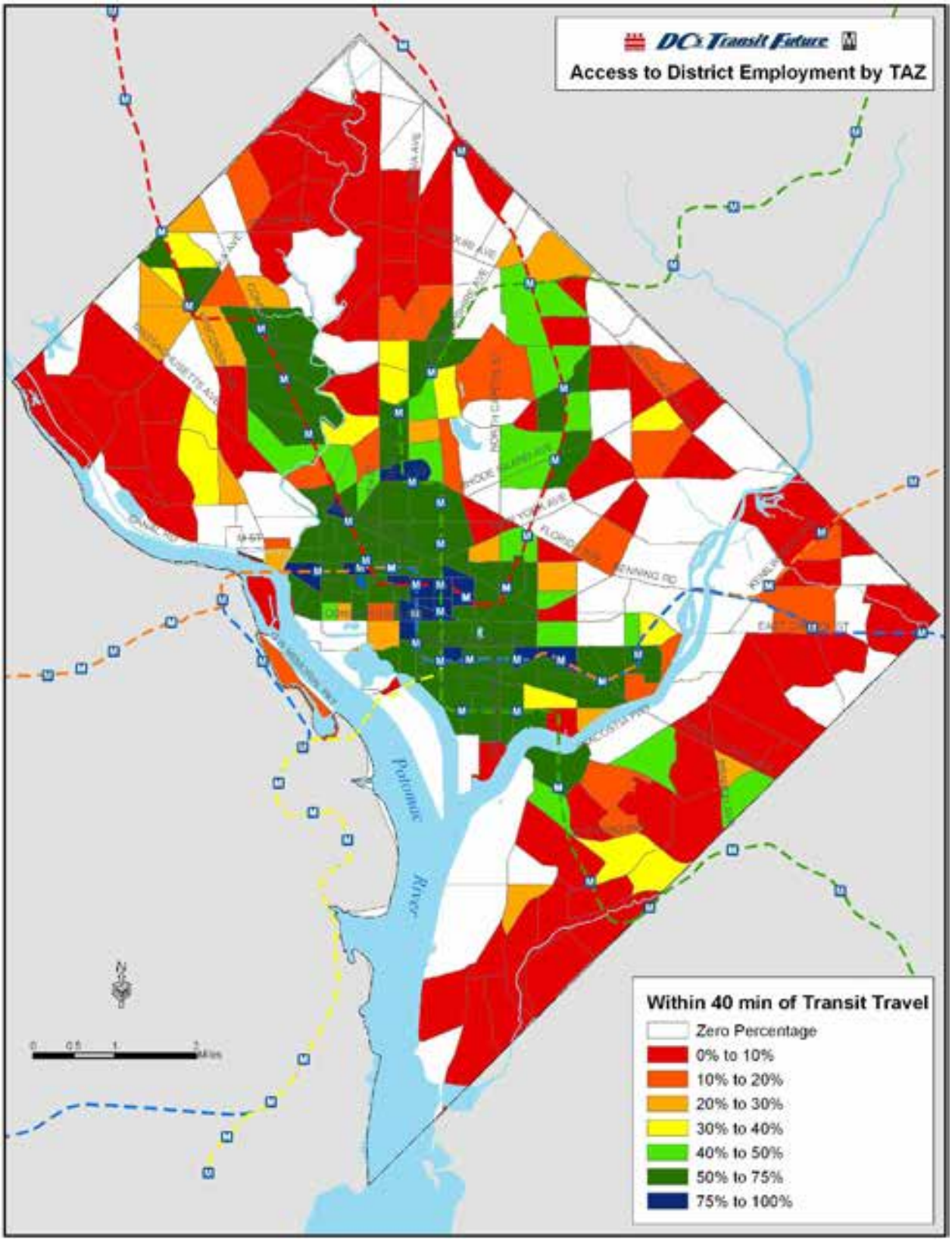
The figures also indicate that the areas with the most competitive transit service are located in downtown and along Metrorail lines. Downtown locations have two advantages. First, they are next to the largest job concentrations in the city; thus, transit trips to these jobs would be a short distance. Second, people have access to the greatest concentration of transit in the city; thus, their transit options are much greater. Locations along Metrorail lines have a similar advantage. Metrorail lines run more frequently than other transit services and also have shorter trip times because they do not have to run in mixed traffic.

Figure 2-4: Access to Regional Employment within 60 minutes*



*Depicts total transit trip time, door to door.

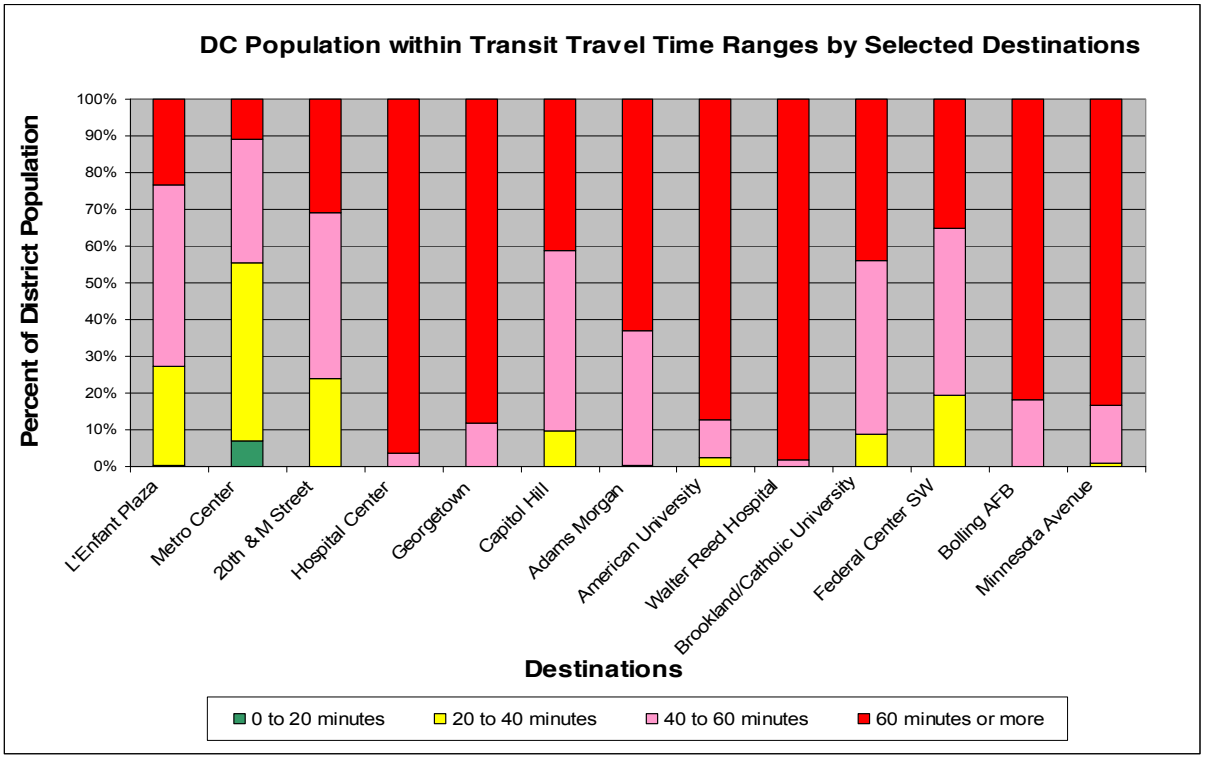
Figure 2-5: Access to District Employment within 40 minutes*



*Depicts total transit trip time, door to door.

The general regional and citywide data outlined in Figures 2-4 and 2-5 are supplemented by the data shown in Figure 2-6. Figure 2-6 depicts the percentage of the District's population that can reach selected District locations within different travel time ranges. The locations shown in Figure Y include the major job concentrations within the District such as Metro Center, but also include important activity centers in other parts of the city. These data show that significant parts of the city outside of downtown are not well served by transit. For example, only 12 percent of District residents can reach Georgetown by transit in less than an hour, and over 95 percent of the District must plan on spending more than an hour on transit in order to reach Walter Reed Hospital. By contrast, because it is located near a Metrorail station, over 50 percent of District residents can reach the Brookland neighborhood in less than an hour of transit travel time. Likewise, over 85 percent of the District is within an hour of Metro Center, and over 50 percent of the District is within 40 minutes.

Figure 2-6: Population within Travel Time Ranges of Selected Metrorail Stations



2.3.2 Reliability of Service

Poor reliability is a major challenge facing transit service in general, and Metrobus service specifically. Even where schedule adherence and reliability are high, the perception may be that buses are not dependable. While Metrorail is generally able to maintain schedules and headways except during mechanical problems, Metrobuses are much more likely to be impacted by unusually heavy boardings, delays due to cycling wheelchair lifts, delays due to unexpected traffic congestion, and often significant delays due to incidents such as accidents or road closings.

WMATA maintains on-time records for Metrobus routes that can serve as an indicator of service reliability. In general, a route with poor schedule adherence is one for which reliability may be a problem. Table 2-1 shows schedule adherence for bus routes that were evaluated as part of this study.

Table 2-1: Schedule Adherence for Selected Metrobus Routes

Route	Total Daily Trips	Trips > 5 Minutes Late	Percent Trips > 5 Minutes Late
30-32-34-35-36 (EB)	152	48	32%
30-32-34-35-36 (WB)	157	27	17%
70-71 (NB)	122	25	20%
70-71 (SB)	116	30	26%
90-92-93 (NB)	144	23	16%
90-92-93 (SB)	143	44	31%
A2-8, A42-48 (NB)	210	24	11%
A2-8, A42-48 (SB)	209	21	10%
A4-5 (NB)	65	13	20%
A4-5 (SB)	68	3	4%
H1 (SB)	9	2	22%
H1 (NB)	7	5	71%
H2-3-4 (EB)	94	15	16%
H2-3-4 (WB)	92	7	8%
X1-3 (EB)	11	4	36%
X1-3 (WB)	17	0	0%
X2 (EB)	128	36	28%
X2 (WB)	125	21	17%
Total	**1,869**	**348**	**19%**

Source: WMATA Metrobus Passenger and Time Reports, dates vary by line

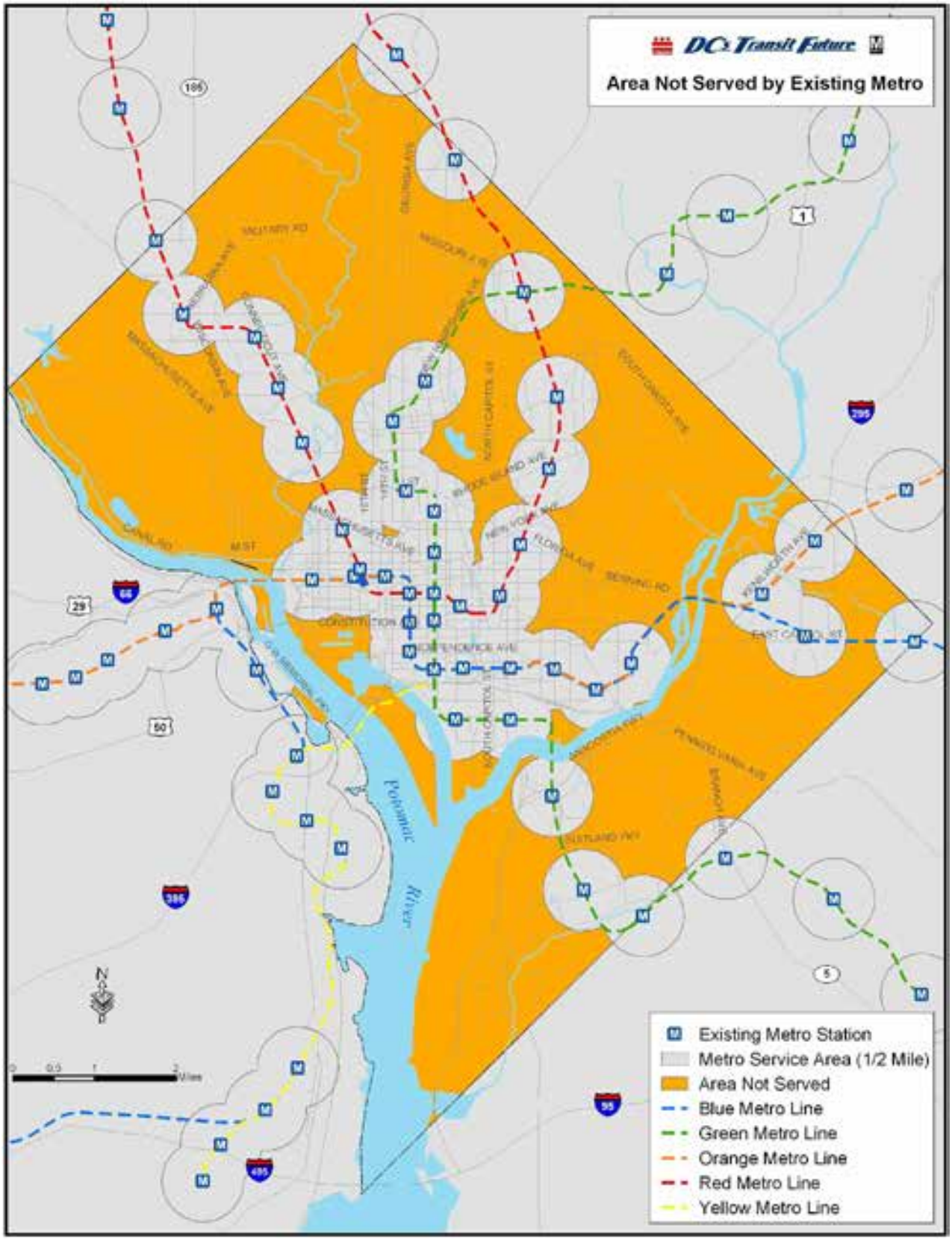
Almost 20 percent of trips on some of the busiest Metrobus routes are more than 5 minutes late; if trips between 2 and 5 minutes late are included, more than half of all trips are behind schedule. This suggests a serious reliability problem with Metrobus service. Late buses or missed trips, especially for less-frequent routes, are a serious disincentive to transit use, especially by choice riders.

2.3.3 Access to Premium Transit

As noted in the section above, access to Metrorail service greatly expands the access to DC activity centers by transit in general. However, there are areas of the District that lack Metrorail access. Figure 2-7 shows the areas within a half-mile of existing Metrorail stations. Areas that are significantly underserved by transit include:

- Georgetown
- Far West DC
- Much of Northeast DC
- Parts of Anacostia between the Green and Blue Lines
- Bolling Air Force Base (AFB)
- North Central DC, including the Washington Hospital Center and Walter Reed Medical Center

Figure 2-7: Areas Not Served by Metrorail



2.4 Issue: Support Continued Economic Growth

There are mutual benefits to be obtained by supporting community development initiatives with transit investments. The developing areas receive the advantage of convenient transportation to a variety of destinations. At the same time, the transit investment will benefit from the built-in ridership base associated with the redevelopment areas.

2.4.1 DC Planning Initiatives

Several major planning initiatives are currently in the planning stages or are being implemented. The following is a brief discussion of some of major programs underway. Figure 2-8 shows the areas of focus in the District.

DC Main Streets Initiative

ReSTORE DC currently provides five years of technical and financial assistance to 11 designated Main Street Corridors throughout the District of Columbia. The goal of the program is to support the retention and expansion of existing businesses and the recruitment of new businesses in these corridors. The majority of these initiatives are located within or just north of the central city.

Strategic Targeted Neighborhoods

The District of Columbia Office of the Deputy Mayor for Planning and Economic Development has identified 11 neighborhoods for targeted investment. These neighborhoods, which are spread throughout the District, are strategic areas where focused public expenditure has the potential to leverage private investment in the long-term.

Major Planning Initiatives

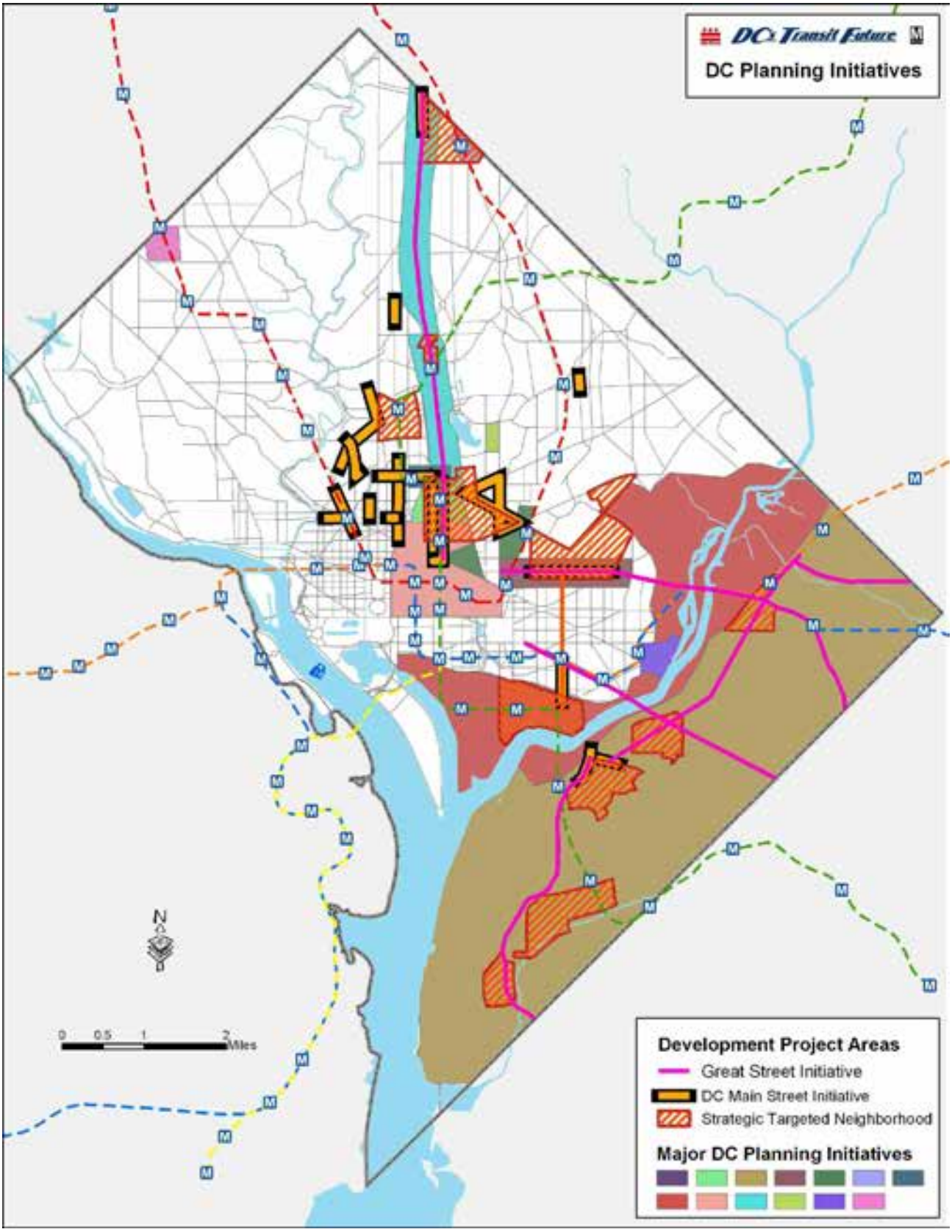
The DCOP is currently undertaking 13 major projects throughout the District. The majority of these projects are focused in the central area of the city, or to the southeast. The 13 major projects are as follows:

- Anacostia Transit Area Strategic Investment Plan
- Anacostia Waterfront Initiative
- Convention Center Area Strategic Development Plan
- Downtown Action Agenda Project
- East of the River Project
- Georgia Avenue Revitalization Project
- H Street Corridor Revitalization
- McMillan Reservoir Project
- North of Massachusetts Avenue (NoMA)
- Reservation 13 Draft Master Plan
- Takoma Central District Plan
- Uptown Destination District Strategic Development Plan
- Upper Wisconsin Avenue Corridor Study (UWACS) Strategic Framework Plan.

Great Streets Initiative

The Great Streets Initiative is a program of the Office of the Deputy Mayor for Planning and Economic Development, assisted by DDOT. The initiative targets public investment along strategic corridors throughout the city, with the goal of encouraging private investment and enhancement in these areas.

Figure 2-8: DC Planning Initiatives



2.4.2 Developer Participation

Many research studies conducted on premium transit indicate that there are positive development effects related to the introduction of either BRT or Streetcar--that property values and property vacancy rates will be positively affected by the introduction of such systems. The transit investment is seen as an important component in overall development efforts. By introducing policies that are supportive of development adjacent to transit stops/stations and transfer facilities, such as tax increment financing, density bonuses, location-efficient mortgages, etc., the positive economic potential of the transit investment will be reinforced.

A component of the DCAA was a Return on Investment (ROI) analysis of the implementation of BRT or Streetcar. As part of the study, a number of real estate developers who are active in the District were interviewed. The interviews were structured to enable analysis that differentiated the effects of different incentive measures and the transit investment, taken separately. The interview program consisted of in-person interviews that lasted approximately 45 to 60 minutes. A structured interview guide was used to facilitate the discussions (see the *Return on Investment Report*, May 2005). A summary of developer responses is provided in the following sections.

Transit Technology

The respondents were close to unanimous in preference for Streetcar over BRT. Streetcar was preferred because it is seen as a fixed investment with distinctive features; perception of BRT was that it would be less reliable even with special features and that the investment would easily be changed, i.e., that the investment would not be permanent. There was, however, some concern the Streetcar would be less flexible and create traffic conflicts, which speaks to operational issues rather than possible influences on development patterns. With regard to the development issue, a respondent commented, “Rail has a marketing advantage, it’s impossible to market bus - Rail has a level of permanence; you can see the route.”

Level of Investment

Developers were asked if premium transit would increase interest in development if projects were moving forward with a well-established timetable. Responses indicated that it was very likely that if premium transit were inevitable, levels of investment would increase, retaining tenants would be easier, project acceleration would occur, and the scale of development would change. This would likely occur in some but not all of the proposed premium transit corridors.

Real Estate Effects

Developers were unanimous with regard to the positive influence that premium transit would have on residential development in certain corridors that were not already built-out. Premium transit was viewed as a differentiator in the District real estate market as improved access is always important to commercial tenants and residents. Premium transit as a surface mode was viewed as more convenient and user friendly than Metrorail and, with traffic congestion getting worse, is considered an important initiative for DC.

Project Financing

Premium transit was regarded as a positive factor for obtaining project financing. Banks view investment by the city as a key factor in enabling redevelopment, especially in transitional areas. For instance, Metrorail is thought to make a big difference in how banks view project feasibility because of the permanence of the investment. The view of Metrobus is that it makes no difference at all. This information suggests that a Streetcar alternative that provides some linkage to Metrorail would have the most impact on the financial feasibility of projects.

Leasing

The developer’s response was that premium transit would be a significant to very significant factor for leasing commercial space. The themes developed during the interviews focused on premium transit service that was new, secure, and reliable. Any service duplicative of existing Metrorail service was not

seen as providing market advantage. There was also general agreement that premium transit could lead to faster absorption of commercial product, but not necessarily to a rent premium.

2.5 Issue: Provide Core Capacity Relief for Metrorail

Many DC Metrobus routes and all Metrorail lines face overcrowding during peak periods; in some cases, overcrowding continues into non-peak periods, including weekends. Overcrowding is a serious challenge facing Metro – not only does overcrowding limit the potential number of patrons the system can serve, it also produces additional wear on transit infrastructure and vehicles, and reduces the quality of service provided to patrons.

2.5.1 Metrorail Congestion

One of the most significant issues in the Metrorail system is excess demand relative to available capacity. This concern is one of the key topics of the *Metro Matters* analysis completed in 2004 and the *Core Capacity Study* completed in 2002. Table 2-2 shows current and future forecasted crowding conditions on the Metrorail system in the peak hour, by line, assuming the existing rail vehicles and operating plan.

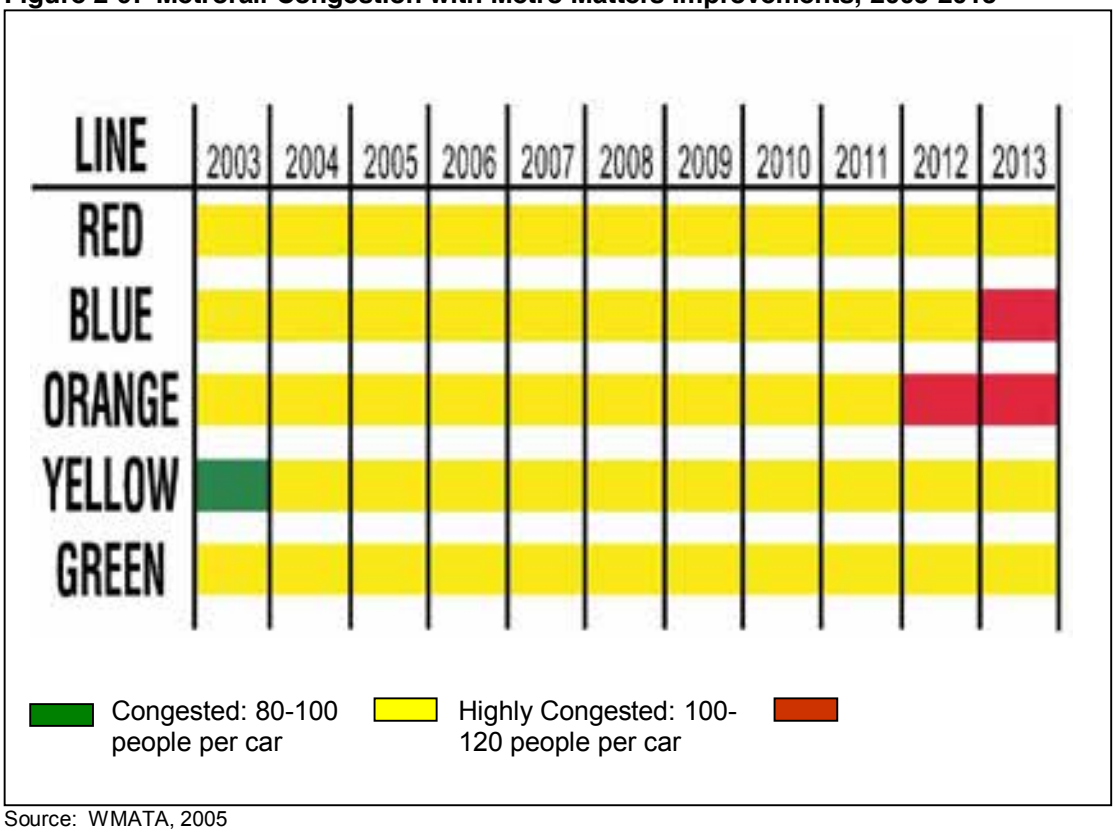
Table 2-2: Peak Hour Metrorail Vehicle Loading at Maximum Load Points, 2005-2010

Line	Passenger Capacity	Passenger Demand	Capacity Utilization	2005	2006	2007	2008	2009	2010
Red	17,760	15,000	84%	87%	89%	91%	94%	96%	99%
Blue	6,720	5,890	88%	90%	92%	95%	98%	100%	103%
Orange	12,720	10,900	86%	88%	90%	93%	95%	98%	101%
Yellow	6,480	5,670	88%	90%	92%	95%	97%	100%	103%
Green	8,640	7,460	86%	89%	91%	94%	96%	99%	101%

Source: WMATA, Office of Business Planning and Project Development
Note: Utilization conditions above 85% are considered to be highly congested conditions. Passengers can no longer board crowded trains above 100% utilization.

The *Metro Matters* plan addresses Metrorail congestion through system upgrades to accommodate longer (8-car) trains. However, even with *Metro Matters* improvements, the Metrorail system will still face over-congestion by 2013, as shown in Figure 2-9.

Figure 2-9: Metrorail Congestion with Metro Matters Improvements, 2003-2013



Source: WMATA, 2005

2.5.2 Metrobus Congestion

Many Metrobus lines in the District are also near, at, or over capacity. Table 2-3 shows the load factor (the ratio of passenger volumes to bus capacity) for crowded District bus lines. Any load factor over 1.2 in peak periods indicates a level of unacceptable crowding, while any load factor over 1.0 in the off-peak or on weekends also exceeds acceptable load standards. As the data shows, a number of the primary corridors in the city have overcrowding issues, and in some cases they are severe.

Table 2-3: Bus Load Factors in Major Corridors

Route Numbers	Corridor	Load Factor
30,32,34,35,36	Wisconsin Avenue, Pennsylvania Avenue	1.20 (peak)
X1,X2, X3	H Street, Benning Road	1.34 (peak)
90, 92	U Street, Florida Avenue	1.06 (all day)
70, 71	Georgia Avenue/7th Street	1.07 (Saturday) 1.39 (Sunday)
H1, H2, H3, H4	Michigan Avenue/Crosstown	1.45 (all day)
A2, A3, A6, A7, A8	Anacostia/Congress Heights	1.26 (all day)
52,53,54	14th Street	1.30 (peak) 1.45 (all day)
D1, D3, D6	Sibley Hospital/Stadium Armory	1.06 (all day) 1.35 (Saturday)
42	Mount Pleasant Line	1.41 (all day)
S2, S4	16th Street Line	1.41 (peak)

Source: *Regional Bus Study Comprehensive Operations Analysis* (WMATA, 2003)

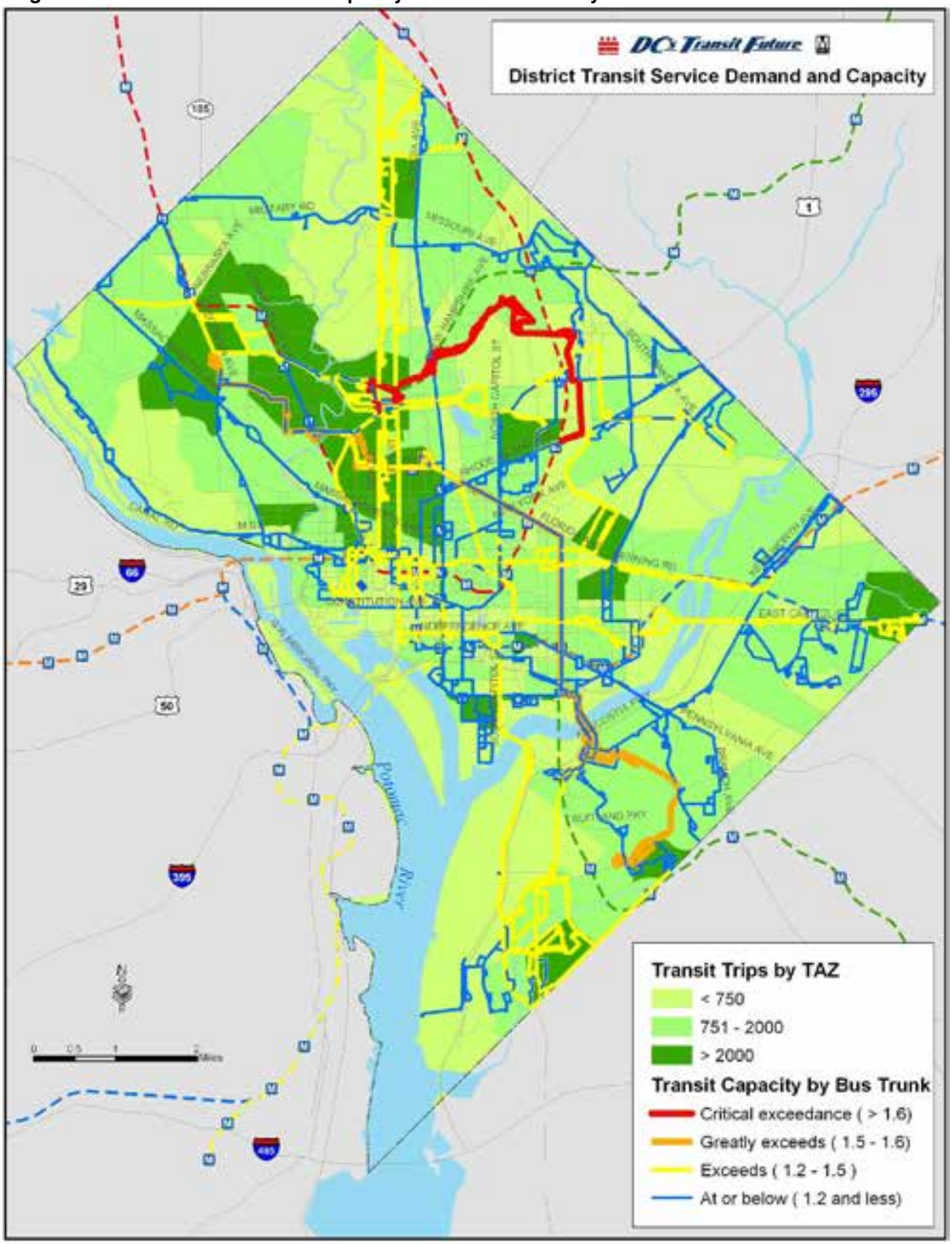
Another method of analyzing transit network capacity is to develop a rough estimate of transit demand for trips from each sector of the city to each of the key activity centers considered in the travel time and overall demand analysis, compared to a rough estimate of transit capacity for direct trips for the same origin/destination (O/D) pairs. This analysis takes into account the fact that there may be multiple methods of traveling between any two origins and destinations.

In this analysis, demand for transit exceeds capacity for a number of the outlying activity centers, especially for cross-city (non-downtown) trips. These data do not necessarily imply high demand, as there may be extremely limited capacity for direct trips between two outlying points in the city. Figure 2-10 provides a general overview of transit trip origins and bus trunk line capacities. Some specific findings of the data in Figure 2-10 include:

- For some destinations, such as Adams Morgan and the Hospital Center, direct trip transit capacity is inadequate to meet the demand: there is nine times greater demand than capacity to Adams Morgan and over five times greater demand than capacity to the Hospital Center. However, by City sub-area, capacity is especially lacking from the Northwest to Adams Morgan and from both the northwest and central sub-areas to the Hospital Center.
- In Northwest DC, there is significant transit demand for destinations within the Northwest sub-area (Northwest to Adams Morgan, Northwest to Georgetown, and Northwest to American University (AU). However, most of the transit services available are oriented to serve the downtown core.
- In the North, there is a need for greater capacity to Walter Reed Medical Center, but, more significantly, there is a need for a crosstown service to connect Walter Reed to District residents living anywhere other than the Northern sub-area and the Central core.
- Similarly, although Northeast DC is served by portions of the Red and Green lines, it could benefit from additional capacity from the Northwest and Central sub-areas, as well as from the introduction of direct service from the North.
- The existing service configuration forces transfers for most trips starting in Southeast DC with destinations outside the Central core, but there are also additional capacity needs within the Southeast and Central sub-areas.

Even the Central core varies in terms of service availability and capacity. There are significant capacity needs for residents in the Northwest and Southeast traveling to Metro Center. However, there is three times the demand to the capacity to L'Enfant Plaza from within the Central sub-area, and going to Capitol Hill forces transfers from any sub-area other than the Central and Northwest sub-areas.

Figure 2-10: Ratio of Demand to Capacity for Selected Activity Centers



Finally, even from the Central Core, which has the greatest amount of converging services, the Hospital Center and Walter Reed Medical Center have 11 times and three times, respectively, the demand for service than the capacity to accommodate it.

In corridors where overall demand outstrips capacity, the result can be overcrowded transit trips, but can also be a shifting of travel patterns from transit trips to trips by private automobile, which puts strain on already congested roadways and parking capacity.

2.6 Identification of Priority Corridors for Premium Transit

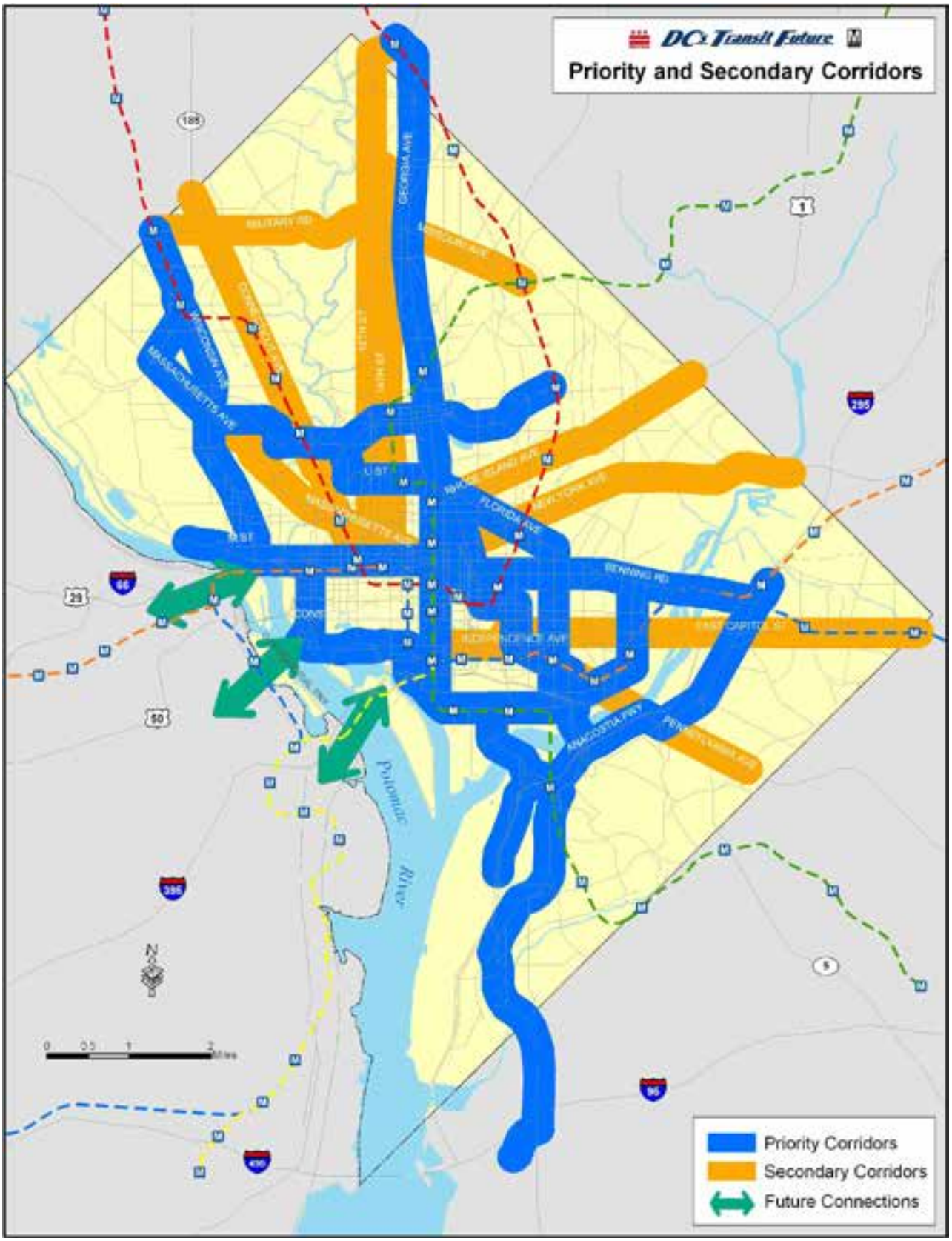
During the Needs Assessment phase, indicators were applied to each of the corridors previously recommended for future transit investment and the results were compared. The following six corridors were identified as priority corridors for immediate further study.

- Silver Spring to Anacostia
- Minnesota Avenue to National Harbor
- Woodley Park to Stadium Armory
- Georgetown to Stadium Armory
- Woodley Park to Brookland
- Wisconsin Avenue NW

To confirm the selection of the six corridors noted above, the corridor recommendations were presented to District and agency planners as well as to neighborhood and community leaders in a series of focus groups and workshops. This collaboration resulted in two major outcomes: 1) identification of near and long-term priorities for the corridors selected as well as the identification of additional corridors, and 2) the identification of alignment options and future connections. These areas are discussed in greater detail below.

Because many of the additional corridors identified during this vetting process exhibited some of the needs that characterized the six original priority corridors, the entire universe of corridors were grouped into “near-term” and long-term” priority corridors. The six identified priority corridors were designated as near-term priority corridors, to be immediately advanced for further study in the Alternatives Analysis, while other promising corridors were designated as long-term priority corridors, to be designated in the DC State Transportation Plan and the District’s Comprehensive Plan. Figure 2-11 depicts the near- and long-term priority corridors.

Figure 2-11: Priority and Secondary Corridors



3.0 ALTERNATIVES DEVELOPMENT AND EVALUATION

An analytic study process served as the framework for identifying the recommended improvements. This iterative process included three levels of screening to reduce and refine an initial universe of alternatives according to successively more specific criteria, in order to arrive at recommended system improvements. The outcomes from the screening have been balanced with other factors, including policy direction from the project steering committee the development of an effective, efficient, and interconnected transit system for the District of Columbia. This section describes the following:

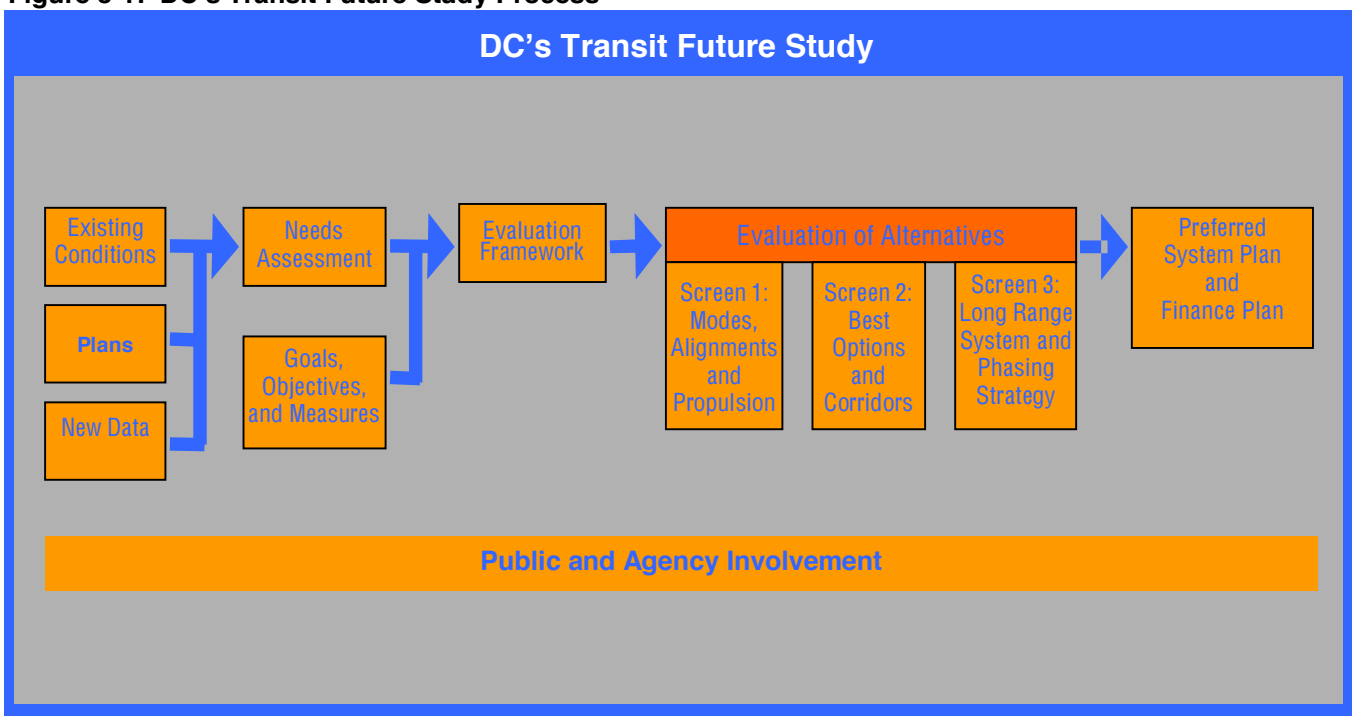
- Relationship of this study to previous planning endeavors
- Analytic process that provided the framework for the study recommendations
- Boundaries of the study area
- Study participants and public outreach efforts
- Screen 1 Evaluation, in which the transit modes to be considered were identified
- Screen 2 Evaluation, in which the best transit corridors for premium transit were identified
- Screen 3 Evaluation, where the right transit modes were matched to the right corridors and proposed improvements were prioritized

3.1 Study Process

Figure 3-1 shows a flow chart summarizing the DCAA study process. The DCAA has resulted from a multi-stage process that includes the following major components:

- Needs Assessment
- Evaluation Framework
- Screen 1 Evaluation
- Definition of Alternatives
- Screen 2 Evaluation
- Screen 3 Evaluation

Figure 3-1: DC's Transit Future Study Process



3.2.1 Needs Assessment

During the Needs Assessment phase, completed in June 2004, the need for and purpose of an enhanced surface transit system in the District was documented, the goals and objectives for the subsequent stages of the evaluation process were established, and priority corridors were identified for further study in consecutive phases.

The assessment provided an analysis of existing traffic conditions and of Metrorail and Metrobus service. A summary of existing and projected population and employment was provided, together with a listing of locations that are considered special generators of travel demand. Based on these factors, a needs analysis was conducted to provide specific measures, including transit travel time markets, overall transit demand, and the relationship of transit demand to transit capacity. The effects of planned development and redevelopment projects and public insights and preferences were also considered. A review of these needs was utilized to revise the corridor recommendations that initiated the study, and were carried into subsequent stages of the study.

3.2.2 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). The portions of the study area in Maryland were included as they represent logical origin and/or destination points for trips in the nine priority corridors identified for study. The initial nine corridors were identified based on the Priority Corridors for transit investment that were identified in previous studies and refined as part of the needs assessment. The initial nine corridors included:

- Silver Spring to M Street SE
- Minnesota Avenue Metro to Anacostia Streetcar Project
- American University to H Street NE
- H Street NE to Skyland SE

- Georgetown/Crosstown to Minnesota Avenue Metro
- Woodley Park to Brookland Metro
- Georgetown/SW Waterfront to Minnesota Avenue Metro
- Friendship Heights to Georgetown
- Mount Vernon Square to National Harbor

An additional tenth corridor was added at the conclusion of Screen 2 at the request of the project steering committee. This added corridor generally follows Massachusetts Avenue NW from Union Station, 2nd Street NE east of the U.S. Capitol, and Pennsylvania Avenue SE from 2nd Street SE to the Forest Village Shopping Center area in Prince George's County, Maryland.

The ten transportation corridors initially considered in the analysis are illustrated in Figure 3-2. A detailed description of each of the corridors evaluated in Screen 2 is provided in Section 3.5. The refined corridors and segments considered in Screen 3 are described in Section 3.6.

3.2.3 Evaluation Framework

The Evaluation Framework, completed in August 2004, was developed to guide the consideration of alternatives over the course of the DCAA. It was designed to guide the DCAA to the identification of a locally preferred system by achieving the following:

- Identifying study goals and objectives;
- Identifying a range of alternatives for consideration in each of the study corridors;
- Outlining the evaluation criteria and MOEs that were used to evaluate the strategies that would perform best in meeting study area needs; and
- Structuring the technical analyses necessary to understand and systematically evaluate the implications of various transportation choices with respect to meeting the study goals and objectives.

3.2.4 Screen 1 Evaluation

During the Screen 1 Phase, completed in August 2004, a wide range of transit modes and technologies were evaluated based on their ability to provide 'premium' transit service along the priority corridors identified at the conclusion of the needs assessment. Proposed alignments, stations, maintenance facilities, and levels of service (LOS) for the initial nine corridors were also identified during Screen 1. The Screen 1 analysis resulted in the identification of Streetcar and BRT technologies for further consideration as premium transit options for surface transit in the District of Columbia. A summary of the findings of Screen 1 are included in Section 3.4 of this report.

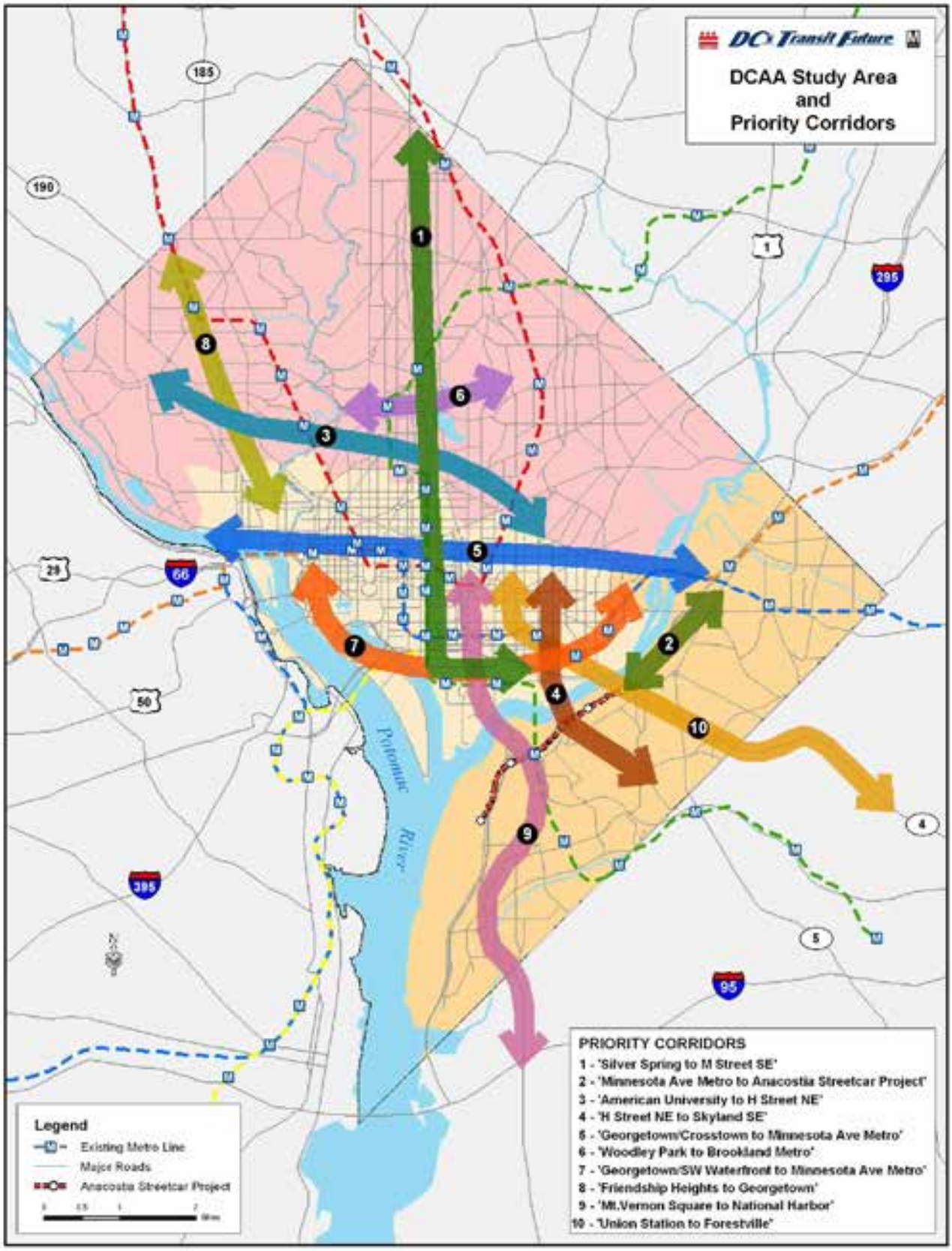
3.2.5 Definition of Alternatives

The Definition of Alternatives, completed in November 2004, defined the No-Build and Baseline Alternatives to be considered in the DCAA as well as each of the Build Alternatives to be evaluated in the second screening phase of the Alternatives Analysis. The premium transit Build Alternatives were identified based on previous transit studies, feedback received during public involvement and outreach, and the Needs Assessment developed at the outset of the project.

3.2.6 Screen 2 Evaluation

During the Screen 2 Phase, completed in March 2005, the corridors that were most appropriate for the implementation of premium transit services over the next 20- to 30-year time frame were identified. Premium transit services consist of fixed guideway transit including both Streetcar and BRT improvements. These corridors and corridor segments were evaluated against criteria that addressed the project goals and objectives, corridor level needs and issues, and operational considerations. At the conclusion of Screen 2, five corridors were identified for local bus service enhancements only and the

Figure 3-2: DCAA Study Area and Priority Corridors Evaluated for Potential Premium Transit Services



remaining four were advanced to Screen 3 for further evaluation as potential premium transit service corridors. A summary of the findings of Screen 2 are included in Section 3.5 of this report.

3.2.7 Screen 3 Evaluation

During the Screen 3 Phase, completed in June 2005, the determination of what type of transit mode would function best in each of the premium transit corridors carried forward was determined. The overall objective of the screening analysis has been to define a vision of the long-range transit system and a phasing strategy to achieve the vision. At the conclusion of Screen 3, the long-range vision was defined that included a combination of bus service enhancements, BRT and Streetcar services operating throughout the District. A summary of the findings of Screen 3 is included in Section 3.6 of this report. The final outcome, or Long Range Vision Plan, is described in Section 4.0.

3.3 Project Participants and Public Involvement

An essential component of the selection and evaluation of system alternatives has been public input. This effort involved the public and a variety of agencies in the planning process—to collect their comments and suggestions, answer their questions, and give them opportunities to guide the direction of the project.

The public and agency involvement effort during the study was divided into two time frames, with the content of each phase addressing a certain aspect of the study. The first time frame, during the last half of 2003, focused on determining community needs. The second phase, during the first half of 2004, assessed the opportunities, challenges, and benefits of adding new transit to District communities. During the last half of 2004, information garnered from the public and agency involvement process was synthesized and added to DCAA technical memoranda and reports. At the conclusion of the study in September 2005, two public forums were held to review the results of the study. This included a summary of the evaluation of alternatives results and the draft recommended vision plan and phasing strategy. Public and agency comments were considered in the refinement of the study results.

3.3.1 Study Participants

The project was closely coordinated with District government agencies, federal agencies, and agencies of neighboring local governments. At the inception of the study, a Project Steering Committee was assembled that included 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 Steering Committee 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 DCOP were also held at various stages of the study. The *Public Involvement Technical Memorandum* developed for the project provides details of the meetings that were held as part of the DCAA.

3.3.2 Public Involvement Phase I: Determining Needs

To answer the question guiding the first phase of the project's public involvement, the project team convened focus groups, made presentations during various community group meetings, and participated in community and neighborhood events. The purpose of the public involvement efforts during the Needs Assessment was to inform DC residents of transit improvements being studied near their communities and to gain community insight on the needs and challenges that exist for the current and future transit system. During this initial phase, the project team also briefed DC City Council members and developed a brand and identity for the project: *DC's Transit Future*.

The following five points summarize recurring issues that were identified during several meetings that were hosted by groups in various parts of DC during the first public involvement phase:

- *Operating Characteristics.* Many participants were curious about the operating characteristics of the proposed vehicle technologies presented as options for future service. Questions related to

the operating environment (shared or exclusive right-of-way), power source, fare structure, and length of the operating day.

- *Community Impacts.* Participants expressed concerns about the potential noise, vibration, and visual impacts to adjacent property owners as a result of the proposed transit improvements. There was also widespread concern that the introduction of a new transit vehicle to existing city streets would worsen the conditions on those streets in one of two ways: less parking and increased congestion.
- *Need for Comprehensive Transit Improvements.* Participants were eager to ensure that the proposed transit improvements would not be made at the expense of bus service. Many participants also expressed an interest in increasing circulator service through neighborhoods to facilitate their making shorter, local trips.
- *Need to Serve Residents Rather than Commuters.* At nearly every event, the project team received requests for more transit service; indicating that transit is clearly perceived as a valued community asset.
- *Need to Support Community Development Efforts.* Participants were anxious to ensure that the project team was coordinating with project managers from the DCOP, DDOT, as well as with Ward and ANC representatives on other projects being planned and developed throughout DC.
- *Need for Premium Transit in Underserved Areas.* Participants suggested that the project team consider corridors in areas of the District that are not presently served by the current Metrorail system or the proposed DCAA corridors. These included:

  Capitol Hill along Pennsylvania Avenue and in a north-south direction between the Potomac River and H Street NE

  Northeast DC serving the Brookland neighborhood, alleviating congestion on New York Avenue and serving the Rhode Island Avenue Corridor

  West of Georgetown

  Across the northern portion of DC in an east-west corridor from Fort Totten along Missouri Avenue and Military Road to the western branch of the Metrorail Red Line

3.3.3 Public Involvement Phase II: Determining Opportunities, Challenges, and Benefits

Between January and June 2004, public outreach activities continued with a focus on determining goals and objectives and developing alternatives. The meetings served a variety of purposes, including project coordination, knowledge exchange, and identification of community needs. The public involvement activities consisted of interagency coordination meetings, PMT coordination meetings, brown bag lunches with WMATA staff, roundtable discussions, agency ward planner workshops, community workshops, and community meetings.

This section summarizes and analyzes recurring questions and significant findings resulting from events in the first half of 2004. Table 3-1 summarizes the public outreach and project coordination activities that were conducted in 2004.

Table 3-1: 2004 Public Outreach Efforts

Meeting Type	Date(s) Held in 2004	Participants	Meeting Topics
Transforming Anacostia Interagency Coordination	Monthly – January to May	Representatives from area organizations	Project activity in Anacostia.
Project Management Team	Monthly	Representatives from WMATA, DCOP, DDOT, and FTA	Project coordination.
Brown Bag Lunches	Three between April and June	WMATA Staff	Specific project issues.
Technology Roundtable	June 4	Representatives from WMATA, DDOT, Arlington County, and technology vendors	Opportunities and challenges presented by transit technology options.
Economic Development Roundtable	June 25	Representatives from WMATA, metropolitan area Business Improvement Districts (BIDs), state DOTs, the DCOP, and area municipalities	Challenges and benefits associated with linking transportation and economic development efforts.
Ward Planner Meetings	Five in March	Ward Planners	Ward transportation needs and expectations with respect to future transit investment
Community Workshops	Four in May and June	Community Leaders	Proposed transit investments, alignments, connections, and station locations and characteristics.
Place-making Survey	May	Community Representatives	Station design preferences.
Community Meetings	Nine held periodically	General Public and Neighborhood Associations	Feedback on the proposed project.

Public comments were also sought through comment cards handed out at public meetings, the telephone hotline, and the interactive forum and e-mail features of the website. Comments expressed a strong preference for the use of light rail or Streetcar technology, specifically along Georgia Avenue.

Among the questions and concerns raised by the participants, six stood out as significant for future study and outreach activities. These include the following:

- *Quality of service is important*. Expansion and future service should focus on taking people where they want to go, increasing reliability, increasing capacity on overcrowded lines, and moving toward round-the-clock service.
- *Expansion plans should be sensitive to local needs*. The transportation system requires flexible solutions that can accommodate the unique circumstances of each neighborhood. It also requires that transit investments be integrated with the community and coordinated with local plans and projects.
- *Transit investments should take advantage of development potential*. The study should make careful choices of alignments and station stops. Additionally, the choice of technology should consider the affects on development potential.
- *The choice of vehicle technology is still open*. Although a number of community members professed a preference for rail, the advantages and disadvantages of specific vehicle technologies continue to be debated.

- *Technology can be used to improve service*. Regardless of vehicle technology, a number of measures to improve service should also be considered, including widespread use of intelligent transportation systems (ITS) to improve reliability, passenger information, and safety and security.
- *Keep the public informed*. Public outreach should be continued through the website, newsletters, and meetings to ensure that community members will remain aware of project progress and have the opportunity to offer feedback.

As the DCAA project continued through the last half of 2004 and first half of 2005, the focus of outreach efforts shifted from public meetings to gaining technical information from agencies. The project staff continued to hold monthly Anacostia coordination meetings and quarterly steering committee meetings, and there were two sets of meetings with ward planners, DDOT, and the DCOP. Public comments and suggestions continued to be submitted via the website and hotline and were added to the project's outreach database. In addition, the project team updated the project website several times and published two more newsletters during this period.

Public outreach for the DCAA project concluded in September 2005 with two final public meetings at the Martin Luther King Library in DC. The meetings presented findings and offered a final opportunity for agencies and the public to offer their thoughts about the direction of the project.

3.4 Screen 1 Evaluation: Identifying the Transit Modes to Be Considered

In the Screen 1 Evaluation 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. Proposed alignments, stations, maintenance facilities, and levels of service for the initial nine priority transit corridors were also identified.

The Screen 1 Evaluation was conducted in two steps with the purpose of identifying the modes to be evaluated further in later screening phases of the study. The purpose of Screen 1 was threefold:

- Identify a universe of modes to be considered for evaluation in the Alternatives Analysis;
- Complete a screening of the modes based on compatibility with project policies and general criteria related to overall feasibility; and
- Complete a final screening of surviving modes utilizing more detailed engineering analysis and an assessment of the compatibility of the mode with surrounding neighborhoods.

Detailed results of the evaluation are presented in *Technical Memorandum: Screen 1A and 1B Evaluations* (August, 2004). The results of Screen 1 Evaluations are summarized in the following sections.

3.4.1 Screen 1A Results - Mode Identification

The first step in the AA process was to identify a universe of modes to be considered for the project. A mode is a system for carrying transit passengers that can be described by specific features that include vertical and horizontal right of way requirements, turning radii requirements, vehicle technology, and operational elements such as service frequency and stop spacing. Seven potential modes were identified for this study: BRT, Light Rail Transit (LRT), Streetcar, lightweight Diesel Multiple Unit (DMU), Automated Guideway Transit (AGT), Monorail, and Heavy Rail.

Each of the modes identified for this study was screened against an initial set of evaluation criteria. Modes that met these criteria were carried forward for further and more rigorous evaluation in Step 2 of the Screen 1 Evaluation. Those modes that did not meet the criteria were eliminated from further consideration.

The criteria used in this first step of the mode screening included:

- *Surface-Running Transit System*. The selected mode(s) should be entirely surface running. DDOT and WMATA have stated a preference for a surface-running transit system to limit costs and to limit visual impacts and related issues associated with aerial alignments.
- *Engineering Feasibility*. The selected mode(s) and affiliated stop requirements must be able to fit within the existing corridor right of way, both vertically and horizontally and operate in existing transportation right of way.
- *Neighborhood Compatibility*. The selected mode(s) must be compatible with adjacent neighborhoods from the perspective of both horizontal and vertical scale.

Table 3-2 summarizes the results of first step of the mode screening.

Table 3-2: Mode Screening - First Step

Criteria	BRT	Streetcar	LRT	Lightweight DMU	AGT	Monorail	Heavy Rail
Surface-Running	Yes	Yes	Yes	Yes	No	No	No
Engineering Feasibility – Sufficient Cross Section							
Horizontal	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vertical	Yes	Yes	Yes	Yes	No	No	No
Sufficient Space for Passenger Facilities							
Horizontal	Yes	Yes	Yes	Yes	No	No	No
Vertical	Yes	Yes	Yes	Yes	No	No	No
Neighborhood Compatibility							
Scale	Yes	Yes	Somewhat	Somewhat	No	No	No
Visual/Aesthetic Compatibility	Yes	Yes	Somewhat	Somewhat	No	No	No

Source: DMJM+HARRIS April 2004
Yes = Meets Criteria; No = Does Not Meet Criteria

Based on this analysis, the modes remaining for further evaluation in the second step of the mode screening were BRT, LRT, Lighteight DMU, and Streetcar.

3.4.2 Screen 1B Results - Mode Screening

In this step of the mode screening process, the remaining modes- BRT, LRT, Streetcar, and DMU- were examined in more detail, especially with regard to impacts to neighborhoods and impacts to structures and properties adjacent to the study corridors. More extensive engineering analysis was completed to allow for this more detailed assessment of potential impacts within each corridor. The screening criteria used in this step of the mode screening process included:

- Traffic impacts
- Neighborhood scale and impacts to adjacent structures and properties
- Parking impacts
- Transit capacity issues
- Community support

As noted, the purpose of this process step was to complete a final screening of modes that are not feasible in the corridors selected for analysis in the DCAA. Findings of the mode screening include:

- No modes were screened out based on traffic impacts
- LRT was eliminated based on potential impacts to adjacent structures or properties related to turning requirements
- DMU was eliminated based on turning requirements and impacts to adjacent neighborhoods resulting from size and bulk of vehicle

- No modes were screened out due to parking impacts
- No modes were screened out due to lack of passenger carrying capacity
- No modes were screened out due to unusually strong community support or opposition

3.4.3 Screen 1 Recommendations

Based on the analyses outlined above, the second step of the mode screening process resulted in the elimination of two additional modes under consideration, DMU and LRT. While DMU and LRT both represent high-quality rail transit modes, the size of the vehicles and their large turning radii make them incompatible with the alignments under consideration. While DMU and LRT may have worked in one or two of the alignments, the system inter-operability requirement dictates that any mode found infeasible in one or more corridors would be eliminated from further consideration. Two modes that remained under consideration for further evaluation were BRT and Streetcar. The Table 3-3 shows the results of the screening evaluation.

Table 3-3: Screening Summary

Criterion	BRT	LRT	DMU	Streetcar
Traffic Impacts	Yes	Yes	Yes	Yes
Neighborhood Scale/Impacts to Adjacent Structures	Yes	No	No	Yes
Parking Impacts	Yes	Yes	Yes	Yes
Capacity Issues	Yes	Yes	Yes	Yes
Community Support	Yes	Yes	Yes	Yes

Yes = Results in Acceptable Impacts
No = Results in Unacceptable Impacts

BRT

BRT is a form of rapid transit that uses a system of rubber-tired vehicles operating either on dedicated right-of-way or in mixed traffic on ordinary streets. BRT vehicles operate on roadways and do not require tracks or other fixed guideway technology. The vehicles are typically powered by their own diesel or compressed natural gas engines. Although BRT vehicles vary by provider, the typical BRT vehicle ranges between 40 to 60 feet long and 8 to 12 feet high. Vehicle capacities range from approximately 60 to 120 passengers per vehicle, based on a combination of seated and standing passengers. A BRT vehicle can typically operate in an 11-foot travel lane. BRT systems are currently in operation in Orlando, Los Angeles, Las Vegas, and Pittsburgh, among other U.S. cities. Figure 3-3 shows a BRT vehicle.

Figure 3-3: Bus Rapid Transit Vehicle

Streetcar

Streetcars are a type of light rail that are normally powered by overhead wires on ordinary streets fitted with rails. Slightly smaller and slower than conventional light rail, Streetcars typically serve as internal circulators in a city rather than as means for commuters to get to and from the suburbs. Streetcar stops are usually closer together than heavy rail stations, but farther apart than regular bus stops, and can have a range of passenger shelter types. Figure 3-4 shows a Streetcar vehicle.

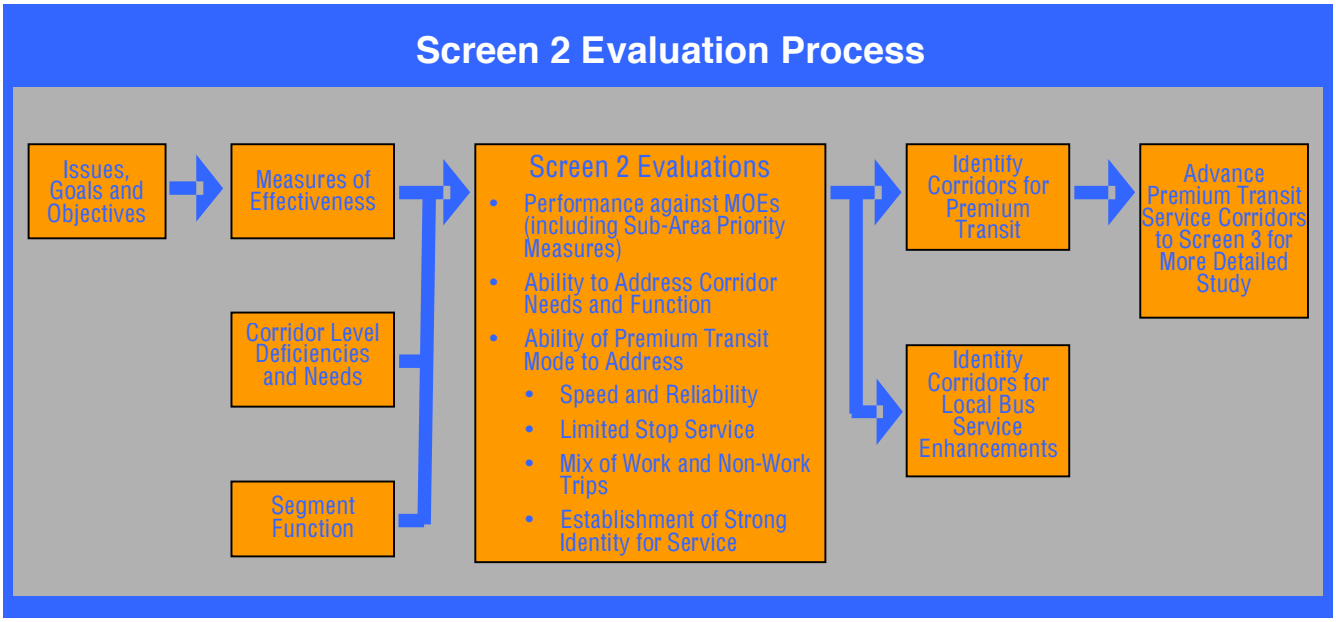
Figure 3-4: Streetcar Vehicle

3.5 Screen 2 Evaluation: Identifying the Best Corridors for Premium Transit Investment

The purpose of Screen 2 was to identify the corridors that are most appropriate for the implementation of premium transit services over the next 20- to 30-year time frame. The corridors were evaluated against criteria that addressed the project goals and objectives, corridor needs and issues, and operational considerations. The Screen 2 analysis was conducted for the initial nine priority corridors. As a result of the Screen 2 analysis, the number of corridors considered for premium transit investment was reduced to four, with an additional new one included on the direction of the Project Steering Committee. The corridors that were not advanced into the Screen 3 phase as premium transit corridors were identified for local bus enhancements and low-cost rapid bus service improvements.

Detailed results of the Screen 2 Evaluations for each of the various Measures of Effectiveness (MOEs) considered are presented in the *Technical Memorandum: Screen 2 Evaluations* (March 2005) completed for the study. The Screen 2 evaluation study process and results are summarized in Figure 3-5 and described in the remainder of this section.

Figure 3-5: Screen 2 Evaluation Process



3.5.1 Screen 2 Evaluation Framework

At the beginning of the Screen 2 evaluation process, a series of MOEs were developed to evaluate the performance of each corridor (and segments of each of the corridors) relative to each of criteria as described in Section 1.3 of this report. The MOEs used to evaluate each alternative are shown by goal and criteria in Table 3-4. They are discussed in detail in the *Screen 2 Report* (March 2005).

Table 3-4: Screen 2 MOEs and Evaluation Criteria

Goal/Criteria	Measure of Effectiveness
Goal 1: Access and Mobility	
Transit Travel	Change in existing travel time to access employment centers
Accessibility	Number of regional activity centers served
	Population per route mile near proposed stops
	Employment per route mile near proposed stops
Ridership	Projected daily boardings
	Projected daily boardings per route mile
Goal 2: Community and Economic Development	
Support of City Initiatives	Designated Main Street Corridors served
	Strategic Targeted Neighborhoods served
	Major planning initiatives
Zoning/Land Use/Development	Current development projects served
	Level of transit-supportive land use and zoning
Community Support	Level of community support for alternatives
Goal 3: System Performance	
Travel Time Savings	Change in transit travel times
	Change in transit travel times between select O/D pairs
Person Through-Put	Mode share
	Change in transit capacity
	Local bus peak load factors
Cost Savings	Number of TIP projects that could be coordinated with proposed project
Goal 4: Environmental Quality	
Community Fit	Visual compatibility of proposed stops within communities
Environmental Impact	Number of environmental resources potentially affected

The measures were applied to a potential premium transit service option in each of the nine study corridors. The results were then used to rate the corridor relative to its ability to address the identified project goals. Potential premium transit options were also evaluated based on their ability to address corridor level transit needs and key issues specific to each corridor (e.g., planning initiatives, core capacity constraints, transit demand, development patterns, etc.). Potential premium transit options in the corridors were also evaluated based on their ability to address several key operational considerations. These considerations included the following:

- Would premium transit improve speed/travel time versus enhanced local bus?
- Would premium transit improve reliability compared with enhanced local bus?
- Is there a market for limited stop service?
- Would premium transit be more cost-effective than running more local buses?
- Is there a mix of work & non-work trips with activity throughout the day?
- Would premium transit improve walk distance? Number of transfers required?
- Would premium transit support economic development initiatives?
- Could a strong identity for the service be established?

To address these key operational considerations the following measures were considered:

- *Travel Time* − The improvement in travel time between a premium transit mode and the existing (no-build) local bus services.
- *Reliability* − The potential for premium transit to result in an improvement in reliability over the existing (no-build) local bus services.
- *Suitability for Limited Stop Service* − A qualitative assessment based on the interaction of number of factors, including route length and the portion of passenger activity at a limited number of stops.
- *Cost-Effectiveness* − The projected cost per passenger boarding for premium transit service in the corridors in comparison to the current (no-build) local bus service cost per passenger.
- *Work and Non-Work Activities* − The portion of work and non-work trips made as well as the number of trips outside of the peak travel periods.
- *Potential to Reduce Walk Time and Transfers* − The potential of premium transit to reduce walk time and the number of transfers required to make certain trips.
- *Economic Development Initiatives* − Potential to support on-going District economic development initiatives, including the number of Main Street Corridors, Strategic Targeted Neighborhoods, and Development Initiatives served.
- *Service Identity* − Evaluates the visibility of premium transit service, the number of activity centers served by the corridor, and whether direct connections to major destinations are present.

3.5.2 Summary of Screen 2 Results – Performance of Corridors by Project Goals

Table 3-5 summarizes the results from the first stage of the Screen 2 process. The table shows the ratings by goal for each of the corridors. In order to rank the corridors relative to their performance against the project goals, a composite score for each corridor was determined. The composite score represents the sum of individual scores for each goal with a High rating given a score of 3, a Medium rating given a score of 2, and a Low rating given a score of 1. The total composite scores range from 7 to 10. The forecast of total riders per mile was also used to further rank alternatives that received the same composite score, since corridors with higher ridership would represent more attractive opportunities for the establishment of higher-capacity premium services.

Table 3-5: Performance of Corridors for Project Goals

Corridor	Goal 1: Access and Mobility	Goal 2: Community and Economic Development	Goal 3: System Performance	Goal 4: Minimize Potential for Environ-mental Impact	Composite Score for Goals	Riders per Mile	Overall Rank
Georgetown/Crosstown to Minnesota Avenue Metro	High	High	High	Low	10	4,000	1
Friendship Heights to Georgetown	High	Low	Medium	High	9	6,000	2
Silver Spring to M Street SE	High	High	Medium	Low	9	3,000	3
H Street NE to Skyland SE	Medium	Medium	Medium	Medium	8	3,300	4
AU to H Street NE	Medium	High	Low	Medium	8	2,200	5
Georgetown/SW Waterfront to Minnesota Avenue Metro	Medium	Medium	High	Low	8	2,000	6
Mount Vernon Square to National Harbor	Low	High	Medium	Medium	8	1,100	7
Woodley Park to Brookland Metro	Low	Medium	Medium	High	8	1,100	8
Minnesota Avenue Metro to Anacostia Streetcar Project	Low	Medium	Low	High	7	500	9

Composite Score for Goals based on sum of ratings for Goals 1, 2, 3, and 4 with each High=3, Medium=2, and Low=1
Higher Composite Score=Better Performance

Top 5 Corridors based on performance against Project Goals

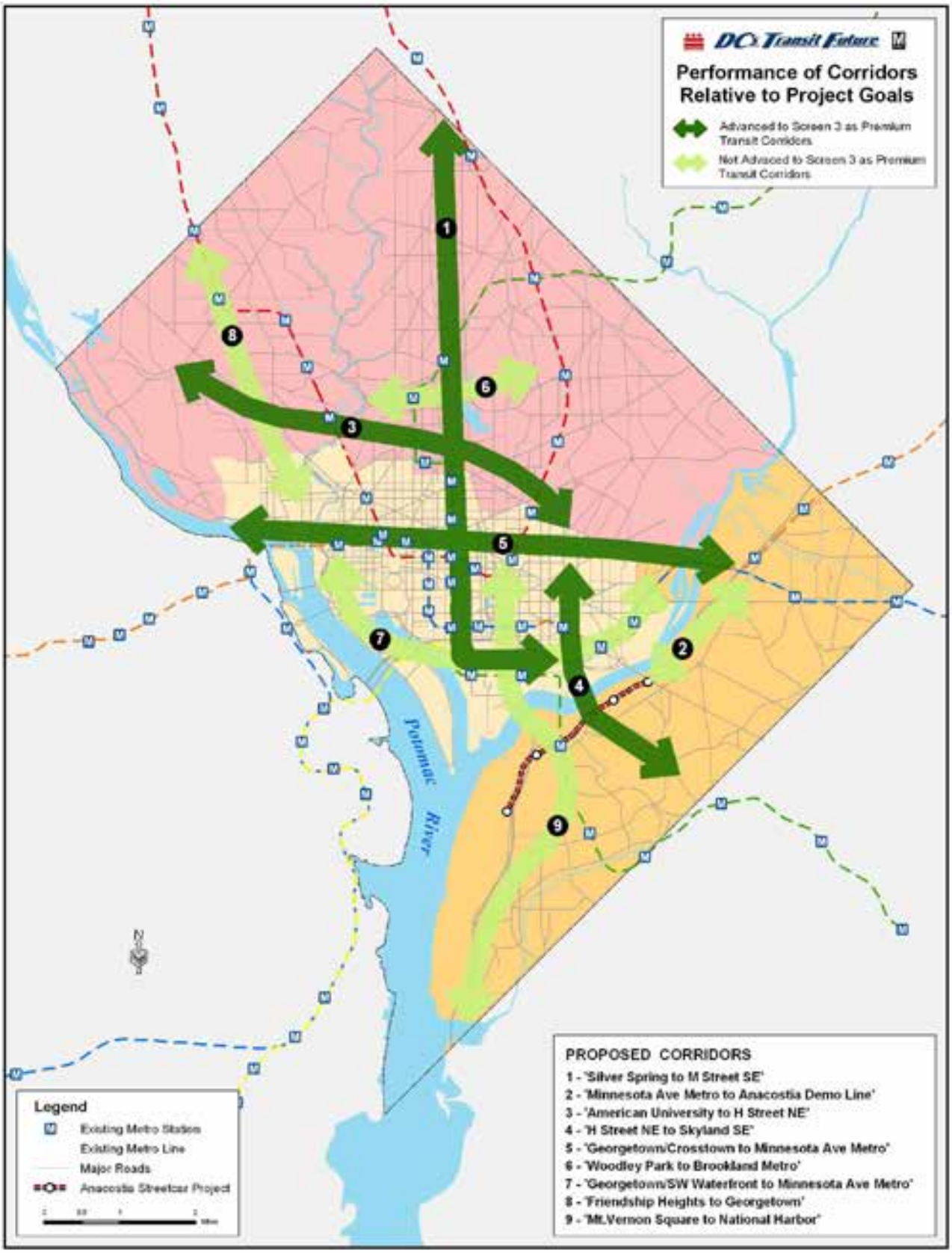
The Georgetown/Crosstown to Minnesota Avenue Metro was the highest ranked alternative based on performance against the goals established for the project. Other high ranking corridors include the Friendship Heights to Georgetown, Silver Spring to M Street SE, H Street NE to Skyland SE, and AU to H Street NE Corridors. The lower ranked alternatives for performance against the project goals include: Georgetown/SW Waterfront to Minnesota Avenue Metro, Mount Vernon Square to National Harbor, Woodley Park to Brookland Metro, and Minnesota Avenue Metro to Anacostia Streetcar Project Corridors. These results of the Screen 2 analysis are shown graphically in Figure 3-6

Results of the initial Screen 2 evaluations were reviewed by WMATA staff, DDOT staff, and the Project Steering Committee at meetings in November 2004 and January 2005. Based on the results of these reviews, a number of additional considerations were identified for use in considering premium transit options to be advanced into Screen 3. These additional considerations were:

- Connectivity of Anacostia Streetcar Project and Metrorail System;
- Access to potential maintenance facility sites;
- Access to jobs/reverse commute; and
- Best performing segments for both ridership and economic development.

Although the Friendship Heights to Georgetown Corridor was highly ranked for many criteria, it did not perform well for the community and economic development related goal and measures. The area served by this corridor is already highly developed and does not include any city economic development initiatives. Upon review of the results by the PMT Steering Committee, it was recommended that the Friendship Heights to Georgetown Corridor not be advanced to Screen 3 as a premium transit corridor.

Figure 3-6: Summary of Screen 2 Results



3.5.3 Recommended Corridors for Potential Premium Transit Service Improvement

The screening analysis performed during Screen 2 resulted in the selection of the following seven corridors to be further evaluated for premium transit in Screen 3.

- Silver Spring to M Street SE
- Minnesota Avenue Metro Station to Anacostia Streetcar Project
- AU to H Street NE
- H Street NE to Skyland SE
- Georgetown/Crosstown to Minnesota Avenue Metro

The selected corridors included the top five performing corridors based on project goals plus the addition of potential Streetcar service in the Minnesota Avenue Metro to the Anacostia Streetcar Project Corridor and BRT service in the Mount Vernon Square to National Harbor Corridor. The addition of the Minnesota Avenue Metro to Anacostia Streetcar Project Corridor and the Mount Vernon Square to National Harbor Corridor was based on additional considerations identified in response to issues raised by the PMT. The rationale for recommending the premium transit corridors for advancement to the Screen 3 phase is summarized below.

Silver Spring to M Street SE Corridor

- Has the highest overall corridor ridership at 30,000 riders in 2030.
- Strongly supports access and mobility goal for the project by serving a large future population and employment, at 107,000 and 226,000, respectively.
- Strongly supports community and economic development goals for the project
- Addresses potential transit capacity needs by providing a premium transit alternative to crowded Metrobus and Green and Yellow Metrorail lines.
- Serves neighborhoods without premium transit services.
- Has the potential to minimize walk distance and transfers to premium transit.
- Has the potential to improve transit reliability by improving travel times and schedule adherence.
- Has the potential market for limited-stop service.

Minnesota Avenue Metro Station to Anacostia Streetcar Project Corridor

- Provides needed north-south transit connectivity and connections to Metrorail.
- Provides connection to potential storage/maintenance facility site.

American University to H Street NE Corridor

- Connects areas with high population density with future employment growth areas.
- Serves areas without Metrorail service.
- Provides core capacity relief by offering a bypass alternative to the existing crowded core of the Metrorail system.
- Has a potential market for limited stop service.
- Has a high mix of work and non-work trips on existing transit with activity throughout the day.
- Has a moderate ridership potential at a forecast rate of about 14,000 daily riders in 2030.

H Street NE to Skyland SE Corridor

- Has high ridership potential at 3,000 daily boardings per mile in 2030.
- Supports community and economic development project goal.
- Provides needed transit capacity in a corridor that is currently exceeding the maximum acceptable passenger loads (>80 percent) for existing bus routes.

- Provides transit time savings potential with premium transit; an improvement of as much as 32 percent with premium transit.
- Provides key connections to Metrorail service
- Premium transit could be more cost effective than running more local buses.

Georgetown/Crosstown to Minnesota Avenue Metro Corridor

- Has high ridership potential on premium transit at 29,000 in 2030.
- Strongly supports access and mobility goal for the project by serving a 2030 employment base of 24,000 and 2030 population of 73,000.
- Addresses potential transit capacity needs by providing a transit alternative to crowded Metrobus routes and Metrorail Lines in the corridor.
- Provides the potential for improved transit travel times.
- Provides premium transit service in areas not served by Metrorail.
- Provides possible cost savings.
- Provides potential for improvement in transit reliability by improving travel time and schedule adherence.
- Has the potential market for limited stop service.
- Provides a high mix of work and non-work transit trips with activity throughout the day.
- Premium transit could be more cost-effective than running more Metrobuses.

3.5.4 Recommended Corridors for Local Bus Service Enhancement

As a result of the Screen 2 Evaluation four corridors were not identified for premium transit investment. These corridors were recommended for local bus service enhancements and low cost rapid bus service. These two corridors recommended and the rationale for the recommendations are described as follows:

Friendship Heights to Georgetown Corridor

- Low performance for the community/economic development goal.
- Has the highest potential ridership per route mile in 2030, at 5,900 per route mile.
- Strongly supports the access and mobility goal for the project by serving a 2030 population and employment of 30,000 and 40,000, respectively.
- Addresses potential transit capacity needs by providing a transit alternative to crowded Metrobus routes.

Woodley Park Metro to Brookland Metro Corridor

- Has a 2030 ridership-per-mile potential of 1,100 riders per route mile, the second lowest of the corridors considered in the Screen 2 evaluations.
- Has relatively low performance for both the access and mobility and system performance goals.
- Provides connections to three radial Metrorail lines, the Green Metrorail Line, and both legs of the Red Metrorail Line.
- Serves growing communities in the areas of Woodley Park and Adams Morgan.
- Running more local buses could be more cost-effective than premium transit for this corridor.

Mount Vernon Square to National Harbor Corridor

- Provides potential for reverse commute/access to future employment.
- Serves as a radial transit corridor by providing access to the central core that is not directly served by Metrorail.
- Serves transit-dependant areas.
- Has the potential to improve transit speed and travel time compared to local Metrobus service.

- Premium transit could be more cost-effective than running more local Metrobus service.

Georgetown/SW Waterfront to Minnesota Avenue Metro Corridor

- The corridor segments with high population and employment densities are also served by other better-performing corridors.
- Performs well relative to the system performance goal, but many of the best-performing segments are also covered by other corridors.
- Provides core capacity relief by providing connections to and between four Metrorail radial corridors.
- Has moderate potential ridership per mile at 2,000 daily riders in 2030.
- Running more local buses could be more cost-effective than premium transit for this corridor.

3.5.5 Other Corridors to be Advanced Into Screen 3

Upon review of the Screen 2 results, both the Project Steering Committee and DDOT senior management requested that the Pennsylvania Corridor be added as a BRT or rapid bus corridor for further consideration in the Screen 3 analysis. The corridor extends from the Forest Village Shopping Center in Maryland near Interstates 95 and 495 (Capital Beltway) into the District of Columbia to First and Second Streets SE, then continues north to Massachusetts Avenue and northwest along Massachusetts Avenue to Union Station.

3.6 Screen 3 Phase: Matching the Right Transit Modes to the Right Corridors and Prioritizing Improvements

The Screen 3 Phase built on the Screen 2 findings, and provided a focused and detailed analysis of the proposed alternatives to determine what type of technology would function best in each of the remaining premium transit corridors. The overall objective has been to use the results of Screen 3 to help define a vision of the long-range transit system, and a phasing strategy to achieve the vision.

During the Screen 3 analysis, additional MOEs were applied to the alternatives to differentiate the corridors further, thus helping to ascertain the technology that would function best under existing and future conditions. This included additional MOEs that addressed cost-effectiveness, travel time, accessibility, community fit, land use and redevelopment potential, and environmental effects. Table 3-6 lists the criteria used to evaluate each alternative in the Screen 3 Phase. The *Screen 3 Report* (May 2005) and the Draft *Screen 3 Technical Memorandum Report* (September 2005).

Table 3-6: Screen 3 MOEs and Evaluation Criteria

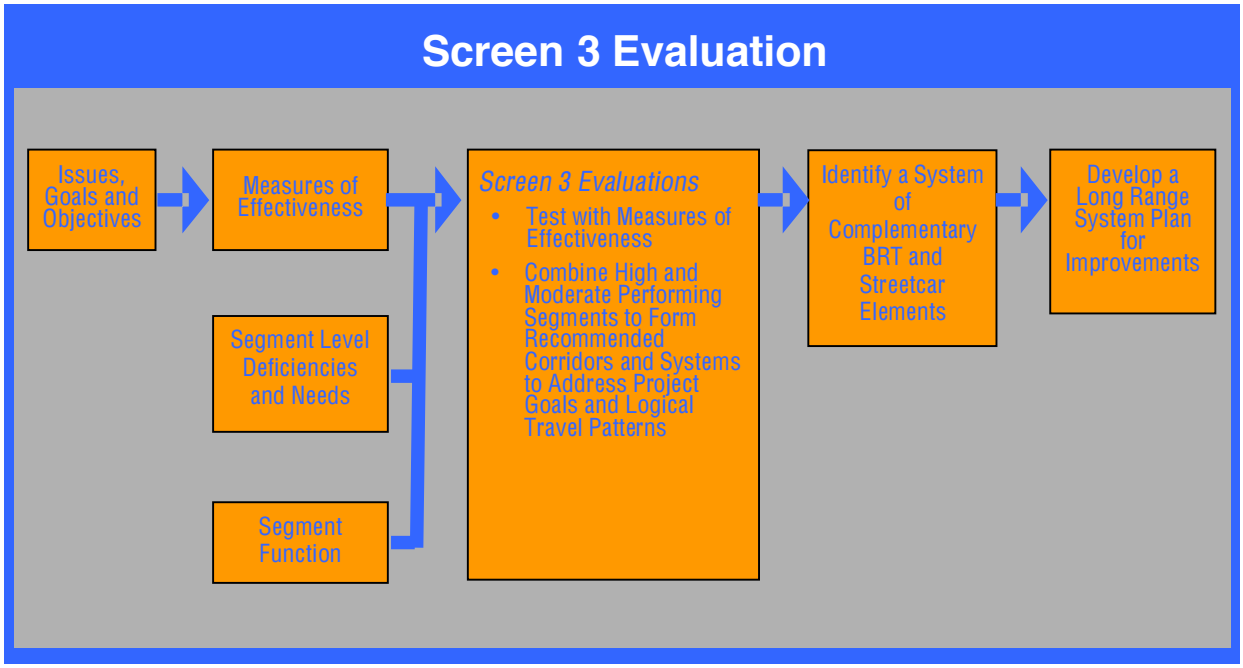
Goal	Measure of Effectiveness
Goal 1: Access and Mobility	
Transit Travel	Change in existing travel time to access employment centers
	Change in mode share to regional centers
Accessibility	Number of regional activity centers served
	Population per route mile near proposed stops
	Employment per route mile near proposed stops
Ridership	Total daily boardings
	Daily boardings per route mile
Goal 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	Level of community support for alternatives
Goal 3: System Performance	
Travel Time Savings	Transit travel times
	Transit travel times between select O/D pairs
	Transit system user benefit
Person Through-Put	Change in mode share
	Change in transit capacity
	Local bus peak load factors
	BRT and Streetcar peak load factors
Cost Savings	Number of TIP projects that could be coordinated with project
	Operating cost per vehicle mile
	Operating cost per new daily boarding
	Capital cost per mile
	Annualized capital cost per daily boarding
	Annualized capital cost per new daily boarding
	Annualized cost per transit system user benefit
Goal 4: Environmental Quality	
Community Fit	Visual compatibility of proposed stops within communities
Environmental Impact	Potential to avoid adverse impacts

Where the Screen 2 analysis was performed by corridor, the Screen 3 analysis was conducted for segments within each corridor. The best performing segments and recommended service types were 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 performed against each of the MOEs. The highest and best performing segments were identified as candidates for Streetcar service (the highest level of investment) while the moderate performing segments were identified as candidates for BRT service (a more moderate level of investment). The low-performing segments were 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 were identified, they were 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.

Detailed results of the Screen 3 evaluations for each of the MOEs are presented in the *Technical Memorandum: Screen 3 Evaluations* completed for the study. The Screen 3 Evaluation Process is

illustrated in Figure 3-7. The Screen 3 Evaluation process and results are summarized in the following sections.

Figure 3-7: Screen 3 Evaluation Process



3.6.1 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 AFB, the Metro Green Line Anacostia Station, and the Old Town Anacostia commercial area. The project is to be implemented in the near 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 DC corridors will require the construction of vehicle storage and maintenance facilities to support the operation of these services. WMATA staff held a workshop on March 3, 2005, to review the vehicle storage and maintenance facility site selection process. The methodology for selecting and screening potential sites was summarized, and each of the potential sites was discussed. Attention focused on those locations that had been designated as "most promising" in the screening process. Issues raised in the workshop relating to each of those sites are described below. As a result of this discussion, it was agreed that the five sites to be advanced for more detailed analysis are:

- Site 1. New York Ave / Harry Thomas Way
- Site 2. Department of Public Works
- Site 7. M & 11th SE No. 1
- Site 8. Benning Rd/CSX
- Site 11. Waterfront SE Freeway.

After the initial set of recommendations was established, three additional sites were evaluated as potential bus operating facilities in October 2005. Among these, one was recommended for consideration for a new bus facility:

- RFK Stadium South Parking Lots

As individual legs of the recommended transit system are constructed, facilities for vehicle storage and maintenance would be brought on line. The comprehensive transit system plan would require storage and maintenance for some 100 buses/BRT vehicles and 65 streetcars. In addition, as WMATA expands local bus service outside of the corridors described in this plan and pursues more efficient operations, additional near-term bus maintenance capacity improvements are required. A new bus garage as proposed by WMATA would need to have capacity for 250-300 standard buses; Rapid Bus and BRT vehicles could potentially be accommodated at such a facility as well. To provide the storage and maintenance capacity required by these fleets and to efficiently accommodate the different transit modes, it will likely be necessary to make use of more than one of the potential sites identified in this report.

After developing sketch site plans for the recommended sites and reviewing alternative approaches for phasing of transit improvements along the study corridors, design staff determined that sufficient capacity for the Rapid Bus, BRT, and Streetcar fleets could be obtained at three sites. Two of these, DPW and 11th Street SE, are located adjacent to proposed streetcar corridors and together would accommodate the long-term streetcar fleet. A third site—at a location to be determined—would be designated to accommodate the BRT and Rapid Bus fleets along with the new WMATA regional bus garage. Table 3-7 summarizes a potential phasing plan for the three sites.

Table 3-7: Phasing of Maintenance Facility Sites for Premium Transit Service

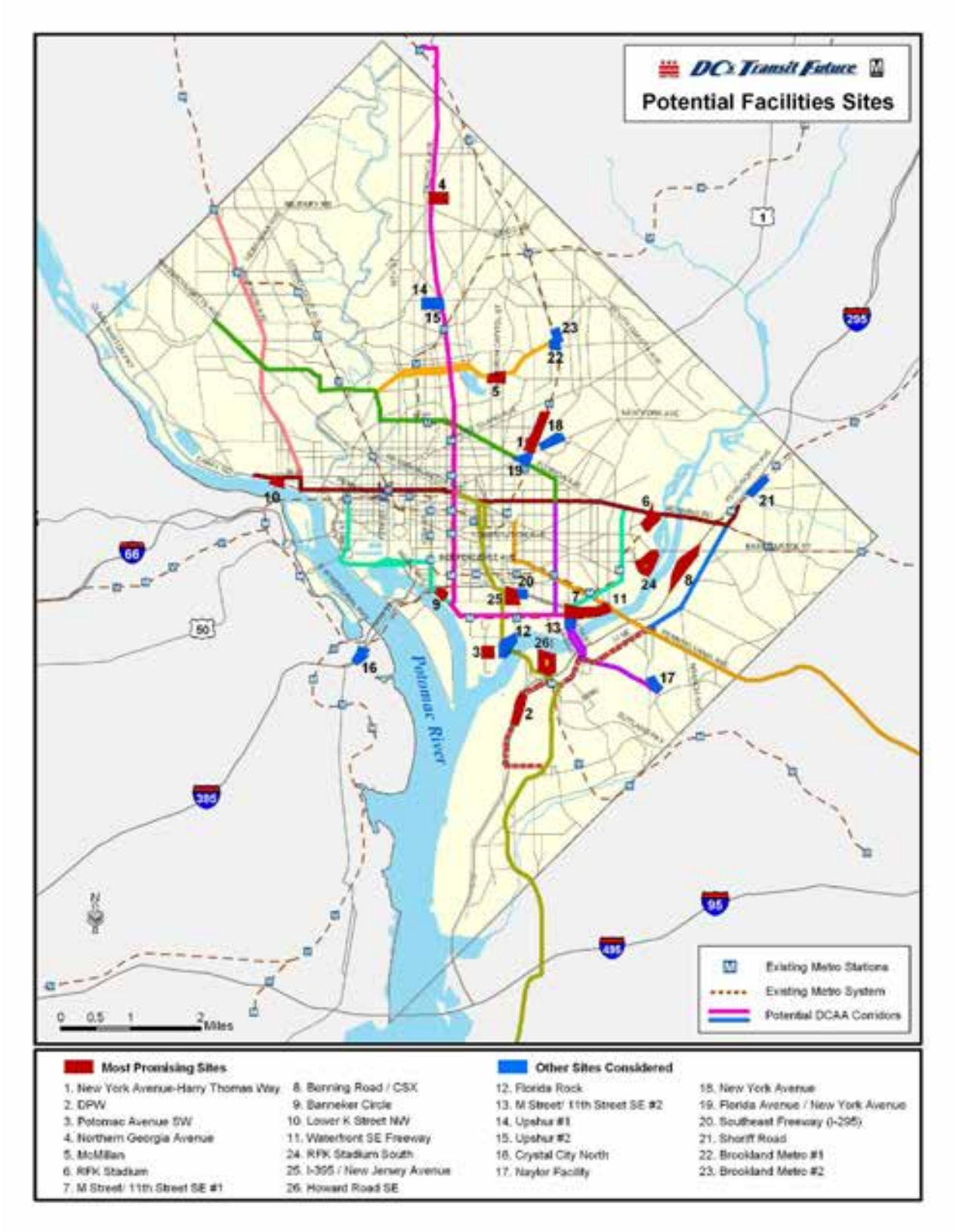
Site	Description	Total Capacity	Opening Year*
Bus/BRT facility (site to be determined)	Near term improvement as WMATA regional bus garage that would also accommodate the Rapid Bus and BRT fleets identified in the service plan. 10 to 12 acres minimum	250 to 350 Buses	2008-2012
DPW (Streetcar Starter Line)	Near- to Mid-Term: Expand starter line facility to house and maintain mid-term streetcar fleet 6.0 Acres	40-50 Streetcars	2008-2014
11th Street SE	Mid- to Long-term: Storage facility for 25 streetcars (vehicles would be maintained at the DPW site) 3.8 Acres	25 Streetcars	2020

* Timeframes shown assume phased development of complete facilities.

As noted above, the potential streetcar facilities sites are adjacent to proposed lines. These sites are also relatively small. The streetcar maintenance facilities would be designed compactly, and storage tracks would be configured as efficiently as possible. This would leave the larger sites available for potential use as regional bus maintenance facilities. Alternatively, bus maintenance activities could occupy the smaller sites identified for premium transit, and then be relocated when premium transit comes on line or when the larger sites become available.

Figure 3-8 shows the location of the potential maintenance facilities.

Figure 3-8: Potential Maintenance and Storage Facility Sites



Transportation Assumptions

In each corridor, premium transit service was modeled in three different operating scenarios:

- Mixed Traffic, where it is assumed premium transit shares 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 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 following potential new premium transit services were considered:

- Premium transit operating between Silver Spring and Skyland SE with a headway of 4 minutes peak / 8 minutes base.
- Premium transit operating between AU 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 Metro 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 headways of 10 minutes peak / 20 minutes base. This service is interlined with the Anacostia Streetcar Project.

Changes were assumed for both the Peak bus network and the Base bus network, and these assumptions may be reviewed in *Technical Memorandum: Screen 3 Evaluations* report (August, 2005).

3.6.2 Screen 3 Evaluation Results

Each of the segments for each corridor was evaluated according to each of the 25 measures of effectiveness resulting from the goals, objectives, and criteria developed early in the study.

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 were used to determine ratings for each segment by goal. The results are summarized in Table 3-8. The results for each segment are listed in Tables 3-9 through 3-12 and are shown graphically in Figures 3-9 through 3-14.

Table 3-8: Performance of Segments

Corridor	High Performing Segments	Moderate Performing Segments	Low Performing Segments
Silver Spring to Skyland SE	Georgia M Street SE	Uptown 11th Street Bridge Good Hope Road	7th North
AU to L'Enfant Plaza	M Street SE	U Street Florida 8th Street 7th South	Massachusetts Calvert West Calvert East
Georgetown to Minnesota Avenue Metro	H Street	Georgetown Lower K Street Upper K Street Benning Road	Pennsylvania Streetcar
Minnesota Avenue Metro to Anacostia Streetcar Project			Minnesota
Union Station to Forestville	Inner Pennsylvania		2nd Street NE/SE Middle Pennsylvania Outer Pennsylvania

Table 3-9: Screen 3 Results: 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											
2nd 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

Table 3-10: Screen 3 Results: Goal 2 – Community and Economic Development Measures

Corridors and Segments	Support of City Initiatives			Zoning/Land Use/Development			Community Support	Goal 2 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											
2nd 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**							

Table 3-11: Screen 3 Results: Goal 3 - System Performance Measures

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																						
2nd 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 3-11: Screen 3 Results: Goal 3 - System Performance Measures

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

Table 3-12: Screen 3 Results: Goal 4 – Community and Economic Development 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					
2nd 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 3-9: Goal 1: Access and Mobility Ratings

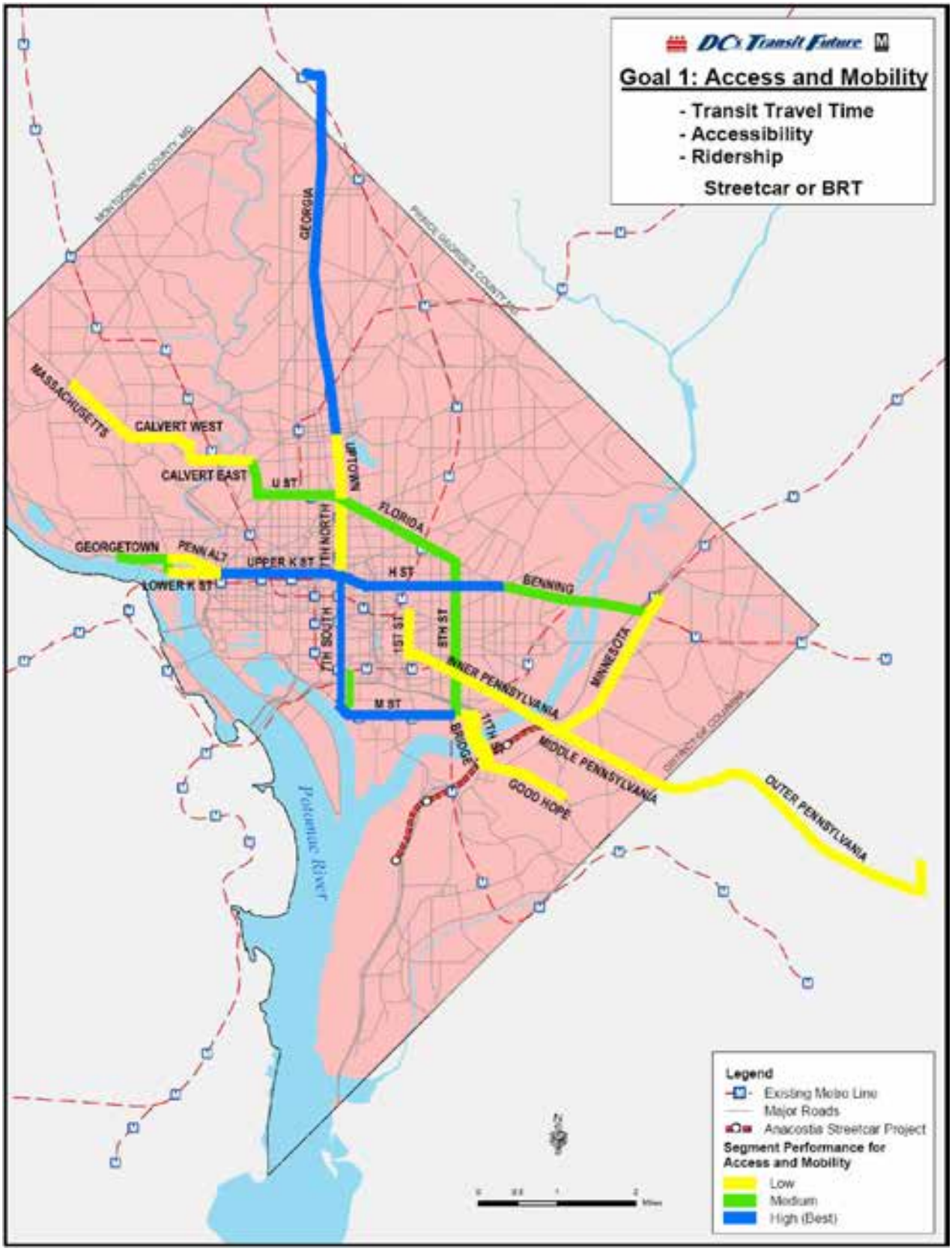


Figure 3-10: Goal 2: Community and Economic Development Ratings

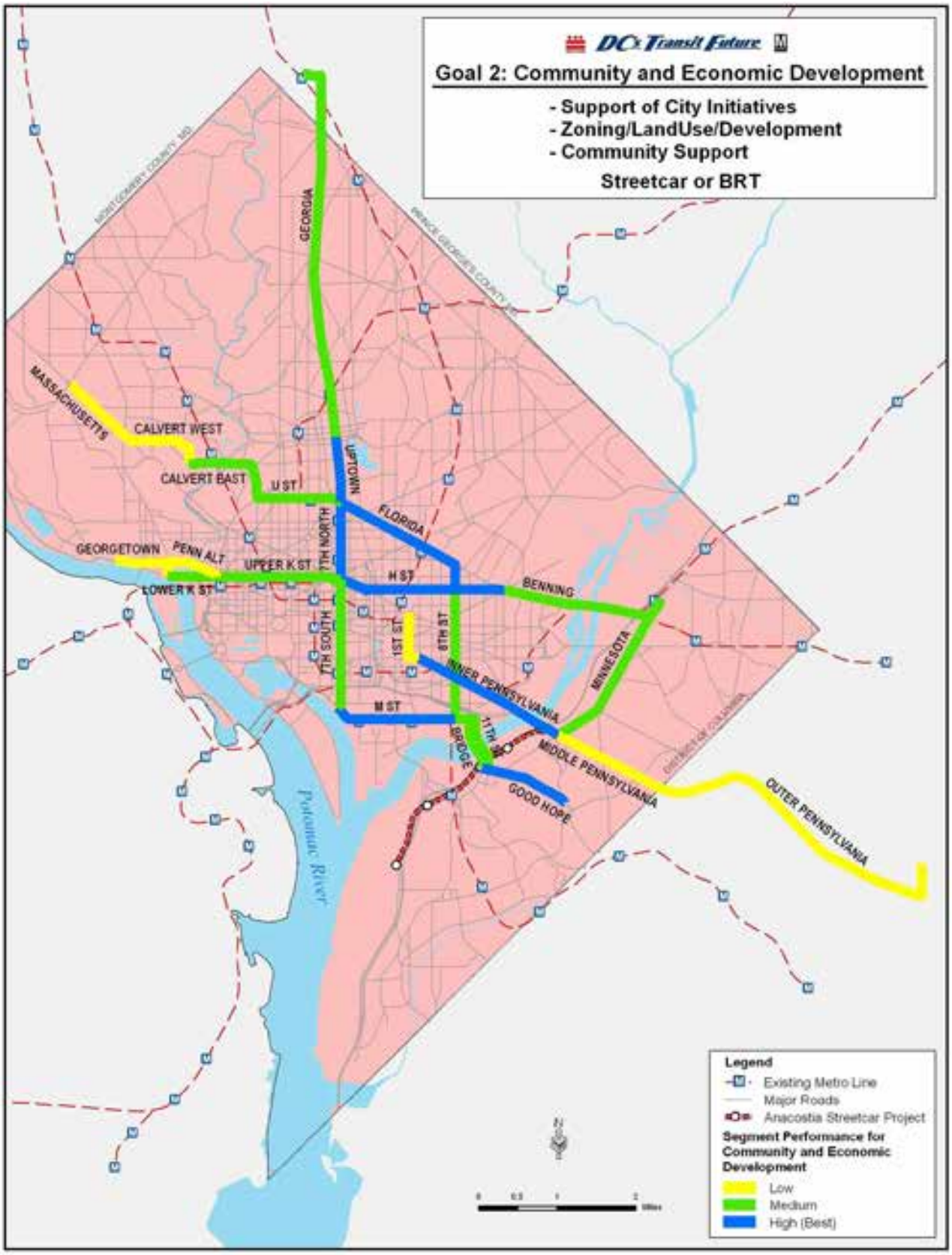


Figure 3-11: Goal 3: System Performance Ratings - BRT

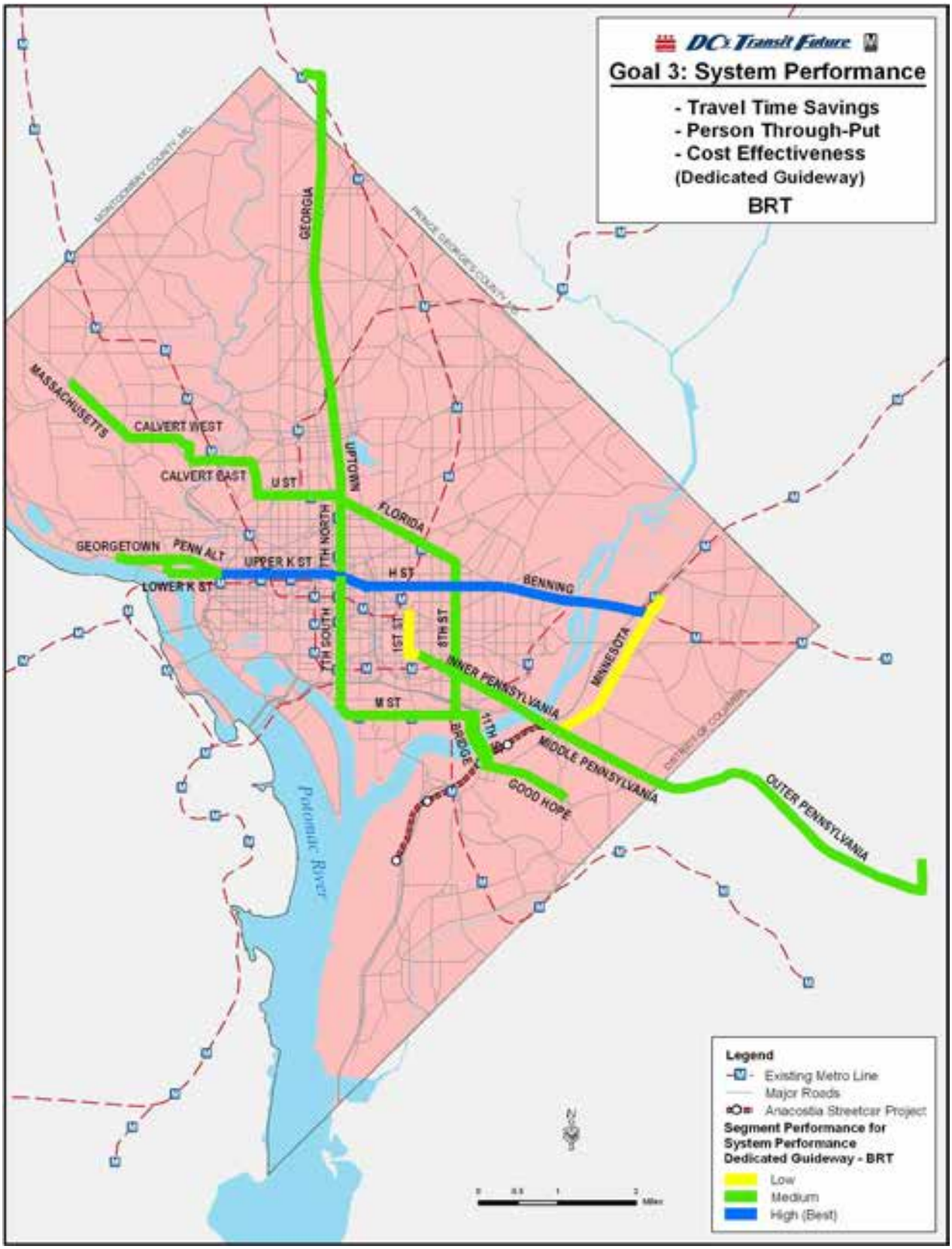


Figure 3-12: Goal 3: System Performance Ratings – Streetcar

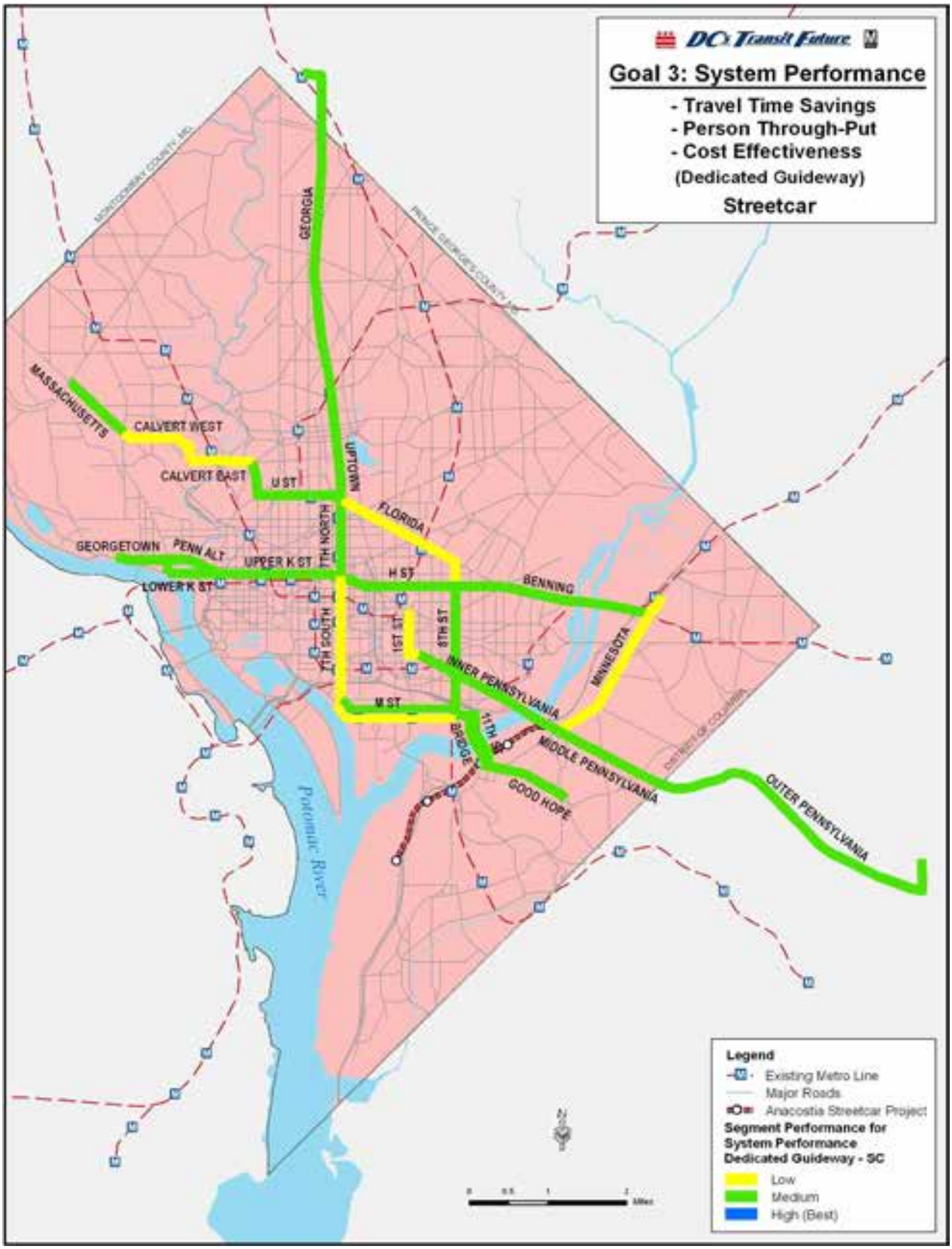


Figure 3-13: Goal 4: Environmental Quality Ratings - BRT

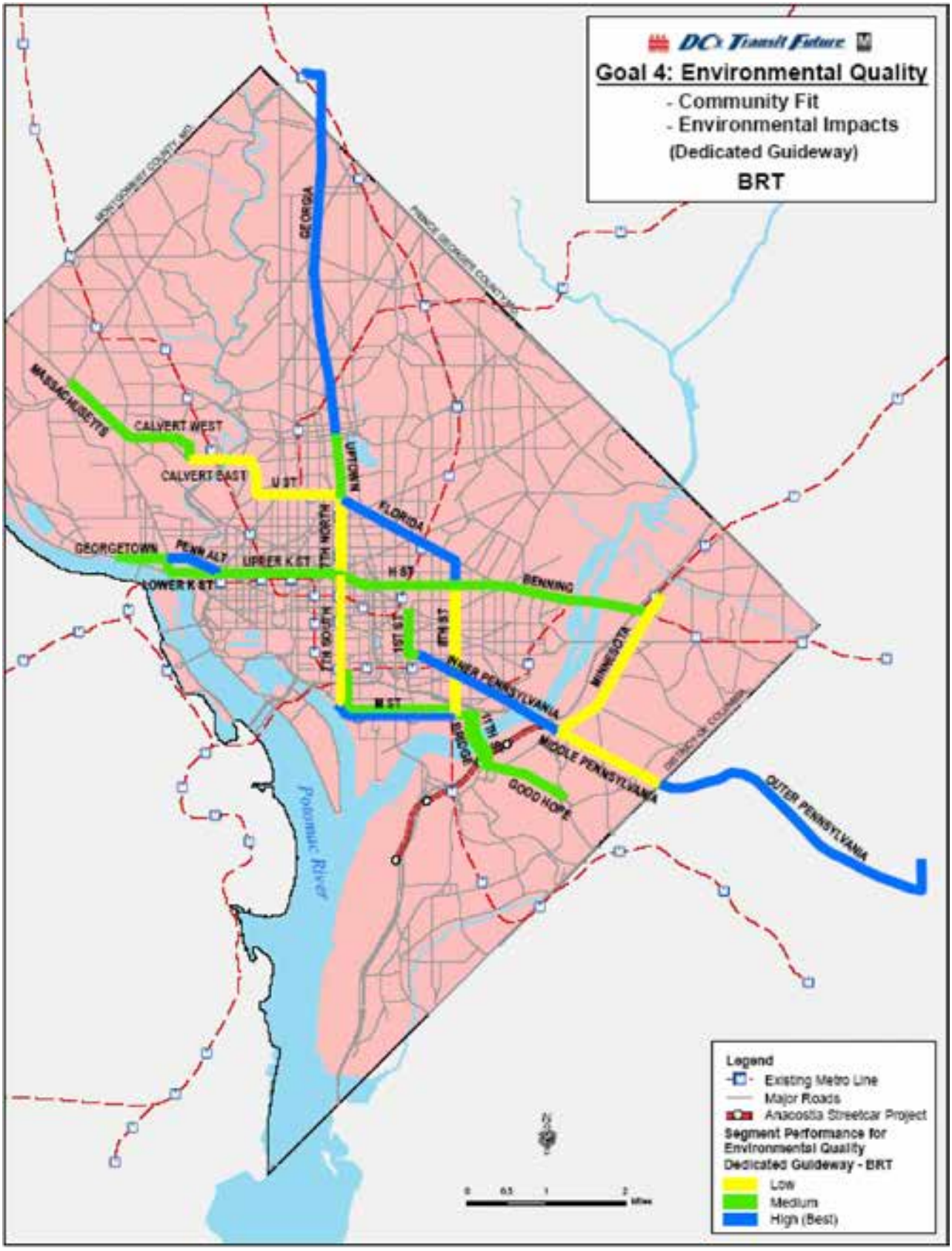
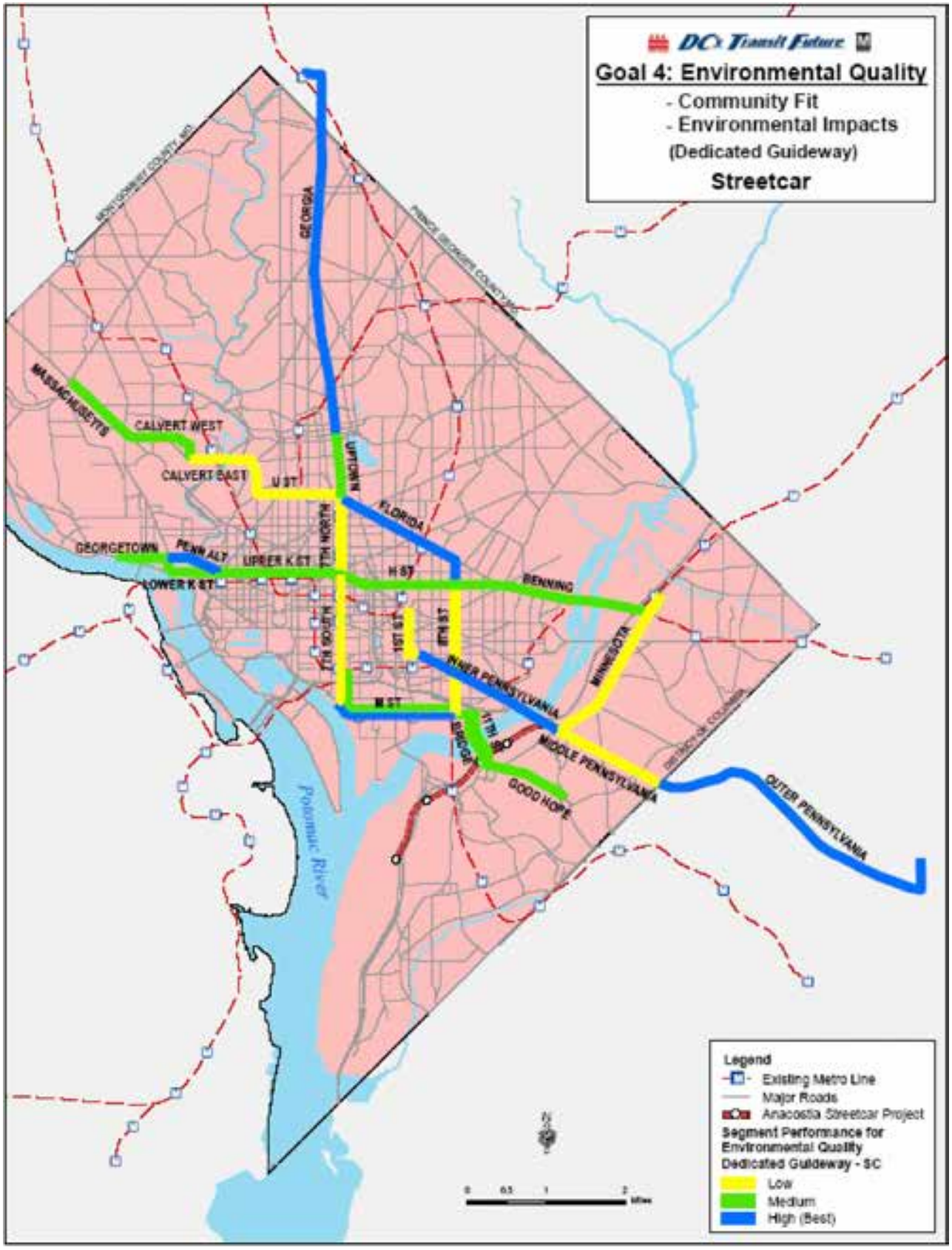


Figure 3-14: Goal 4: Environmental Quality Ratings - Streetcar



Streetcar

Upon completion of the screening process, specific segments were identified as suitable for specific levels of investment based on the screening results and agency and public participation. These high performing segments were identified as potential candidates for Streetcar service, shown in Table 3-13, 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.

Table 3-13: Best Performing Segments (as Streetcar Service)

Segment	Key Strengths*
Georgia Avenue	Minimizes Transit Travel Times - *average 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 - *average 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 route mile and population is 7,736 per route 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 user benefit=$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 route mile and population is 8,562 per route mile*
	Supports City Initiatives - *directly serves one Designated Main Street Corridor*
	Community Support
	Visual/Community Fit
Inner Pennsylvania	Minimizes Transit Travel Times - *7.2% average 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 user benefit=$20*
	Visual/Community Fit

*Criteria where the segment performs best for Streetcar service

In order to transform these high performing segments into the basis for a potential Streetcar system, some additional short segments would be needed 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 three potential sites for Streetcar maintenance and storage facilities. These sites are shown in Figure 3-8. Two of the sites are adjacent to either the Anacostia Streetcar Project or the M Street SE candidate Streetcar segments. The other potential maintenance and storage facility site is 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.

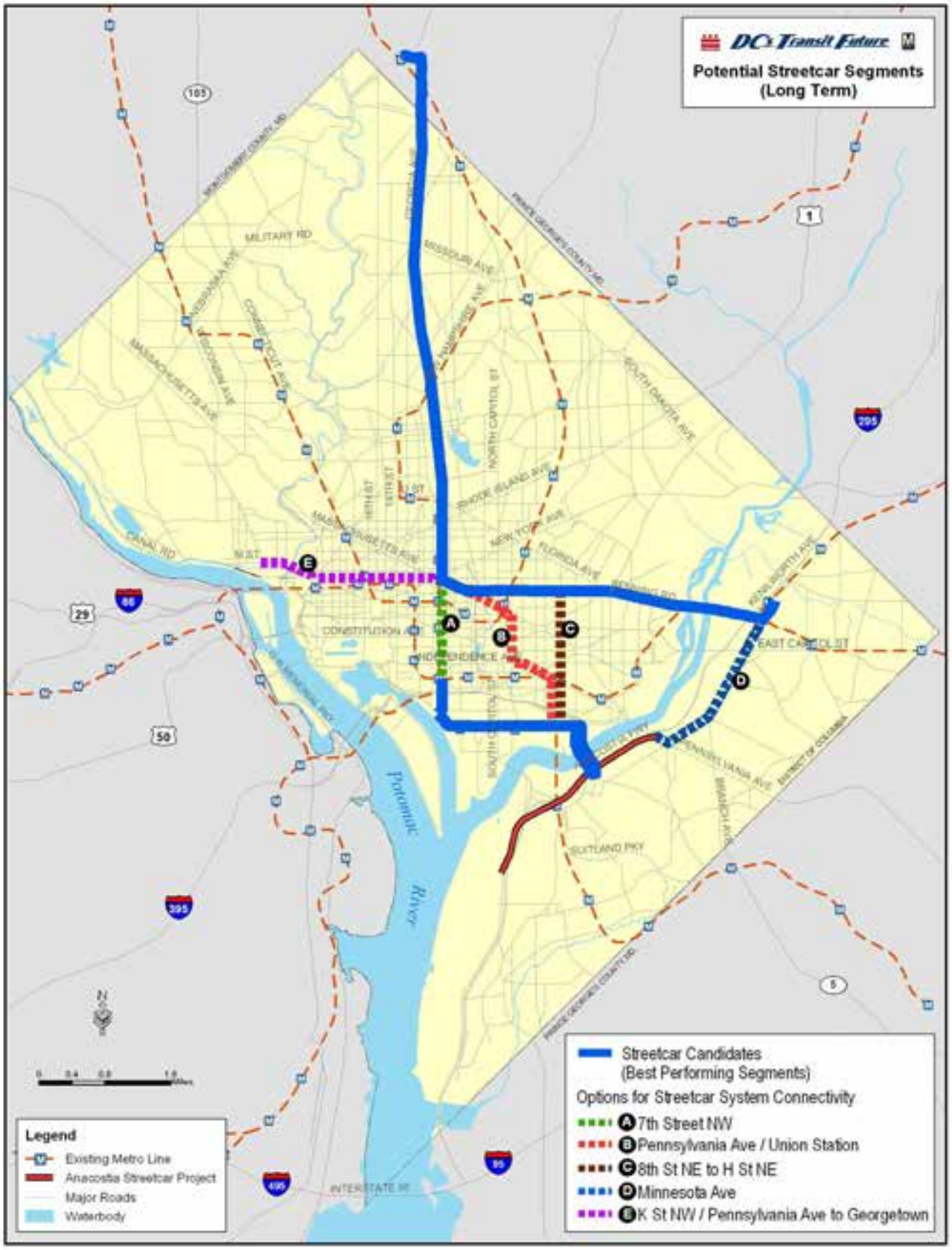
There are four primary options for establishing north-south connectivity for a potential unified Streetcar system. These options are shown in Figure 3-15. The options to complete the north-south connectivity of a potential Streetcar system include the following:

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

Option B: Pennsylvania/Union Station - This option provides a Streetcar connection generally along portions of 8th Street SE, Pennsylvania Avenue SE, 2nd Street NE/SE, and Massachusetts Avenue NE/NW. It connects to the Georgia Avenue line at Mount Vernon Square and the H Street NE Line just west of Union Station.

Option C: 8th Street NE - This option provides a Streetcar connection along 8th Street SE/NE from M Street SE to H Street NE. The north-south and east-west lines would both operate along H Street and Massachusetts Avenue between 8th Street NE and Mount Vernon Square.

Figure 3-15: Options for Streetcar System Connectivity



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.

Ultimately, the Option B crossing was selected among the four to provide a north-south connection. Crossing via 8th / Pennsylvania / 2nd Street provides the following advantages:

- Provides a connection that does not currently existing between the Green Line and Red Line east of downtown Washington
- Provides service to Federal offices on Capital Hill, especially along 2nd Street NE / SE
- Provides service to the activity centers along Pennsylvania Avenue SE between Eastern Market and 2nd Street
- Serves the redeveloping Barracks Row area
- Stops in front of Union Station
- Is a relatively direct connection between the Anacostia Streetcar Project and the potential H Street NE/Benning Road and Georgia Avenue Streetcar segments

In addition, use of Option B avoids problems with the other options:

- The line does not cross the National Mall and largely avoids the "Federal Enclave"
- The line does not duplicate existing Metrorail service
- The line does not operate on residential streets

Based on comments from the study partners, the Minnesota Avenue NE connection (Option D) was also retained as part of the Anacostia Streetcar Project in the Baseline Alternative. Although Option D does not provide the best north-south connection as part of the major north-south or east-west corridors, it does provide an important link between the proposed Streetcar service in the Anacostia area and the Metrorail service at Minnesota Avenue.

The Screen 3 analysis results 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 Avenue 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 MetroRail System.

BRT

The moderate-performing segments that were not identified for Streetcar development were identified as candidate segments for BRT, a more moderate level of investment. These segments are shown in Table 3-14. The particular strengths of these segments are also shown in the table.

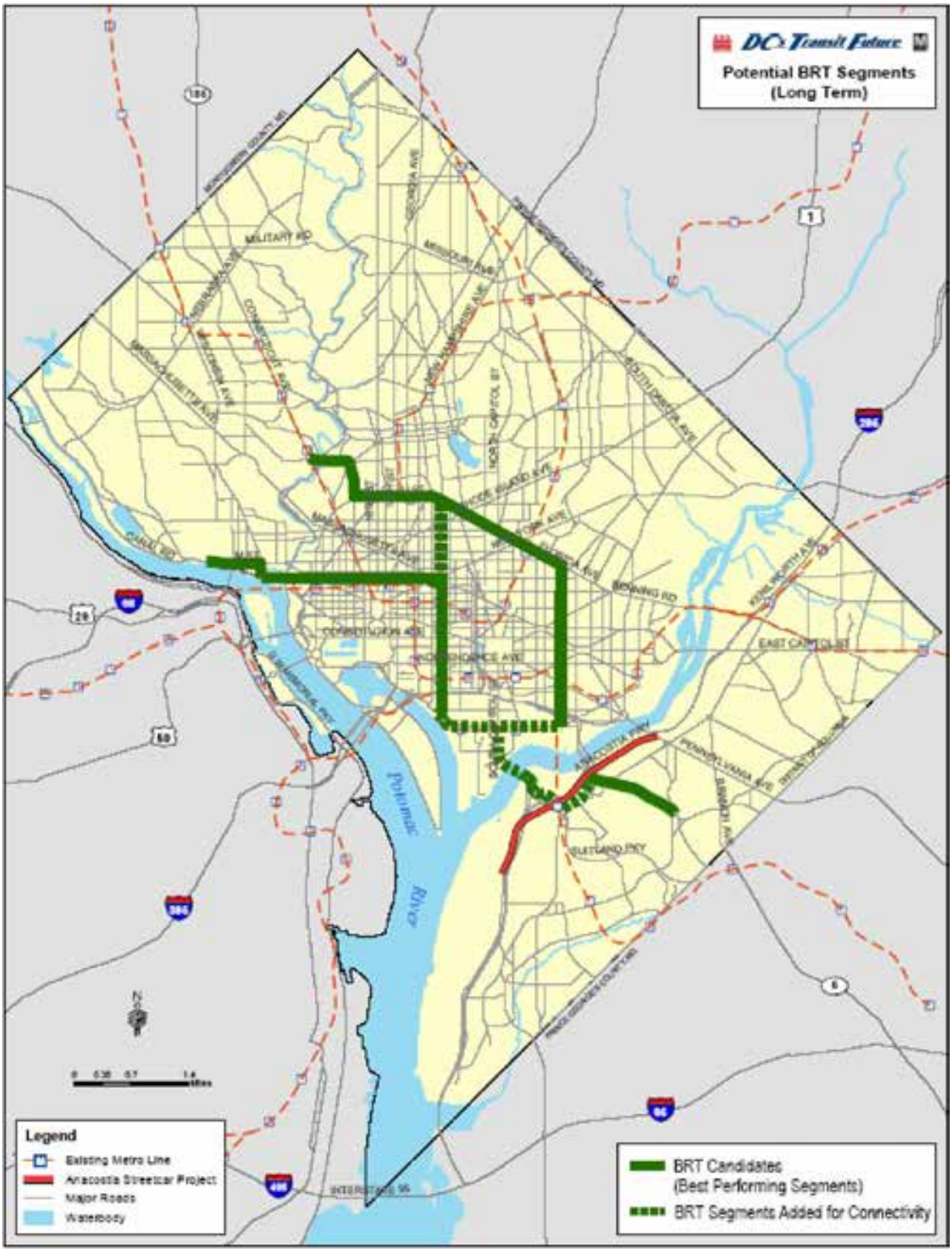
Table 3-14: Moderate Performing Segments (for Possible BRT Service)

Segment	Key Strengths*
7th Street South	Accessibility - *directly serves three regional activity centers; employment is 58,277 per route mile and population is 6,308 per route 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% average change to access employment centers within 60 minutes; 1.2% average change in mode share to regional centers*
	Community Interest
Florida Avenue	Minimizes Transit Travel Times - *1.7% average change to access employment centers within 60 minutes; 1.0% average change in mode share to regional centers*
	Accessibility - *indirectly serves two regional activity centers; employment is 8,898 per route mile and population is 7,365 per route 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% average 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 Targeted Neighborhoods*
Upper K Street	Accessibility - *directly serves one regional activity center; employment is 110,720 per route mile and population is 12,941 per route 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 user benefit=$7*
Lower K Street	Accessibility - *directly serves one regional activity center; employment is 22,625 per route mile and population is 9,416 per route 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 user benefit=$7*
Georgetown	Minimizes Transit Travel Times - *8.8% average change to access employment centers within 60 minutes; 1.2% average 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 user benefit=$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 Boulevard, 2nd Street NE/SE, and 7th Street North. 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 3-16

Figure 3-16: Potential BRT System Segments



3.6.3 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 investments. These segments are added to the local bus/rapid bus segments that were identified at the conclusion of the Screen 2 Evaluation 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 3-17 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 3-17: Potential Local Bus Enhancement/Rapid Bus Segments

4.0 RECOMMENDED SYSTEM PLAN

The recommended investment plan is a multimodal transit plan incorporating a variety of transit investments, from low-cost investment for immediate service changes to larger investments phased in over many years. The plan includes four key elements:

- Local bus service improvements, which can be implemented immediately,
- Rapid Bus service, which has a short-term (5-10 year) implementation period,
- BRT and Streetcars, which are the most expensive improvements and take the longest to implement, but provide the highest level of service.

Each mode is described in the following sections.

During the course of the study, DDOT and WMATA made further refinements to the Anacostia Streetcar Project. The Anacostia Streetcar Project was included as part of the baseline condition for this study. The refinements to the Anacostia Street Project included extensions of the project southward along South Capitol Street to Malcolm X Boulevard and eastward along Malcolm X Boulevard to Martin Luther King Jr. Avenue. It also includes an extension of the project northward from Pennsylvania Avenue to Minnesota Avenue Metro Station generally along Minnesota Avenue. These extensions were incorporated into the System Plan development. Figure 4-1 shows the entire recommended system.

Improved Local Bus Service

The Local Bus Service Improvements element is intended to improve transit service along a corridor and to do so with minimal capital investment so that these improvements can be implemented immediately. This element includes a combination of minor improvements that are intended to either respond directly to identified transit needs and deficiencies in the corridors or to streamline service in preparation for more extensive improvements in the Rapid Bus or premium transit elements of the plan.

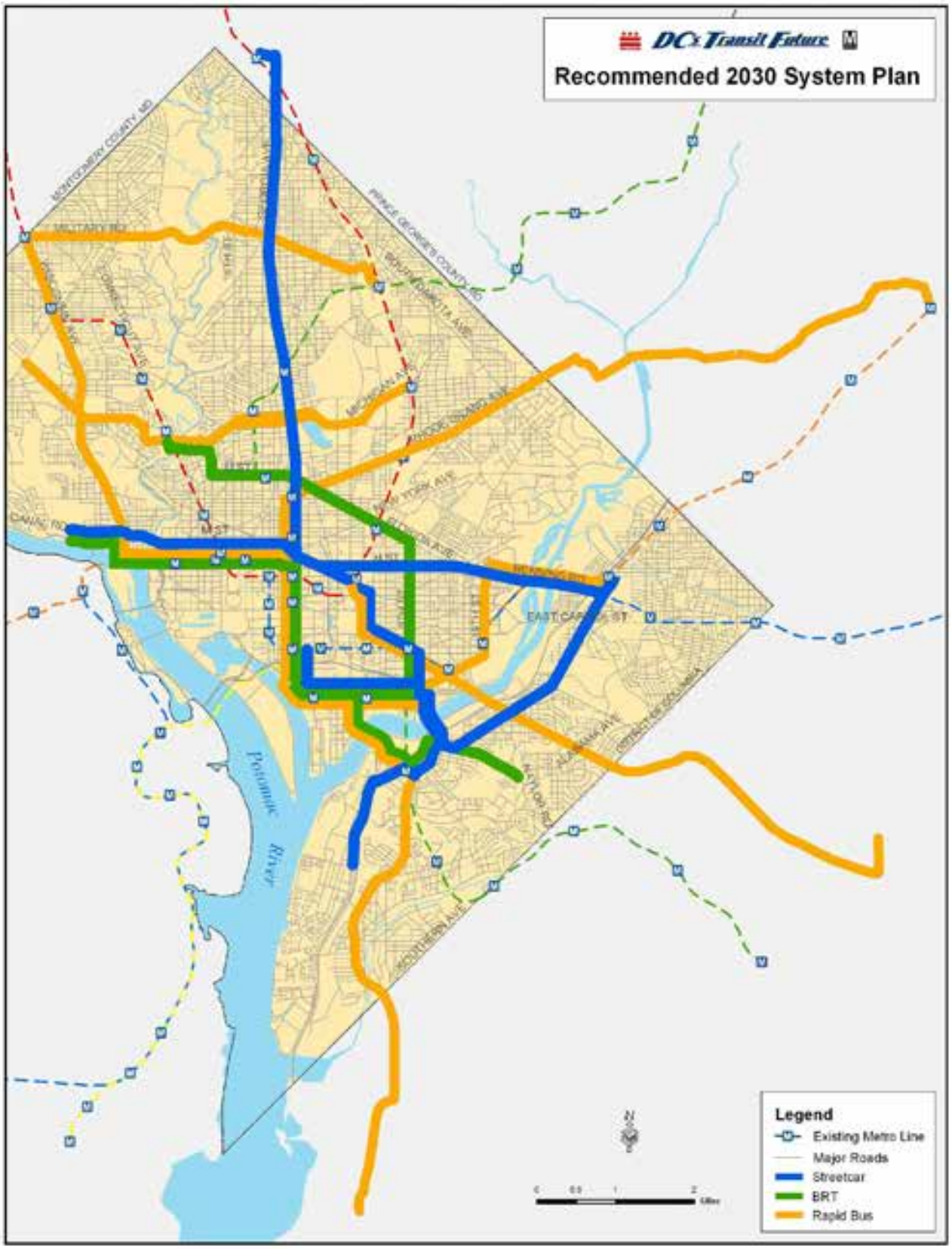
By design, the capital component is small, especially in terms of new vehicles required, and most of the changes are related to operations. Although the recommendations change the way service is delivered, in general, recommendations disrupt existing operations as little as possible, and then only to improve service delivery.

Part of the Local Bus Service Improvements element is to identify and “brand” corridor service in preparation for future implementation of Rapid Bus service on certain corridors in the next phase of improvements. Improvements include:

- Streamlining and simplifying route structures and route numbering and naming conventions in the corridor;
- Improving service in the corridor, often focusing on off-peak service periods; and
- Improving passenger amenities at the busiest existing stops.

Because the local service improvements are built around existing service, few new vehicles are required, so capital costs are in most cases limited to passenger facilities. Local service improvements can generally be implemented within a few months, and can last indefinitely.

Figure 4-1: Recommended System Plan Map



Rapid Bus Service

The Rapid Bus element implements Rapid Bus service in each corridor in the 3- to 10-year timeframe. Rapid Bus service provides many of the advantages of premium transit service at a much lower capital cost. Rapid Bus service consists of the following elements:

- Limited stop bus service over the length of the corridor, with stop spacing of ¼ to ½ mile
  Frequencies are high, often exceeding existing local service
  Span of service is comparable to Metrorail service;
- Distinctive vehicles (60', low-floor, alternative fuel) and shelters;
- ITS systems that include bus arrival information at shelters;
- Signal priority systems at all signalized intersections; and
- Extensive branding, including adding Rapid Bus corridors to Metrorail system maps to stress their similarity to rail transit.

Examples of rapid bus vehicles and shelters are provided in Figure 4-2.

Figure 4-2: Examples of Rapid Bus Vehicles and Shelters

Rapid Bus uses distinctive vehicles and shelters; these examples are from Los Angeles' Metro Rapid service

Where appropriate, local bus service in the Rapid Bus corridors would be adjusted to work around the Rapid Bus service. In some cases, this could mean a reduction in local bus service levels, although in all cases, service levels at Rapid Bus stops would be higher than existing local service.

Capital and operating costs for Rapid Bus service can be significant, and include new vehicles, new shelters, signal priority systems, and new maintenance facility capacity. Including vehicles, the cost of implementing a Rapid Transit line would be approximately $1-$2 million per route mile. Some of the additional operating costs are offset by reductions in duplicative local service.

Bus Rapid Transit

BRT is a form of rapid transit that uses a system of rubber tired vehicles operating either on dedicated right-of-way, such as exclusive transitways, high occupancy vehicle (HOV) lanes, or expressways, or in mixed traffic on ordinary streets. BRT systems have a unique identity incorporated into their vehicles and passenger facilities, thus providing a distinction between BRT and local bus service that often runs on the same streets. These systems also incorporate the use of ITS technology for vehicle location, possible use of signal pre-emption, and passenger information. A BRT system typically provides a similar level of service to that of a light rail system in terms of service frequency and stop spacing, but provides the flexibility of using buses.

BRT vehicles range in size and therefore so do the number of passengers they can carry. Vehicle capacities range from approximately 60 to 120 passengers per vehicle. This capacity typically reflects a combination of seated and standing passengers on each vehicle.

The typical BRT stop amenities include shelters with a unique BRT identity, pertinent passenger information, such as route maps and schedules, ITS features such as next bus vehicle arrival information, fare media dispensing machines, trash receptacles, benches, and pedestrian level lighting. The stop may also include platforms that could be long enough to accommodate 2 to 3 buses at a time, or may simply utilize an existing sidewalk. Typically the stops would be low to the ground to serve low floor buses. Stops are generally located along curb lanes and would be spaced approximately every ¼ mile in urban areas to one-mile in suburban areas.

Some stops in urban areas may incorporate the use of bus bulbs (also referred to as bulb-outs). Bus bulbs are an extension of the sidewalk from the curb of a parking lane to the edge of the through lane of traffic. Bulbs allow busses to board and drop off passengers without leaving the travel lane of the street. They minimize delays associated with buses re-entering mainstream traffic. Bus bulbs also create additional space for waiting passengers, shelters, benches, and other passenger amenities. Examples of BRT vehicles and stops are provided in Figures 4-3 and 4-4.

Figure 4-3: Examples of BRT in Mixed Traffic and Dedicated ROW

Bus Rapid Transit can operate in either shared roadways (left) or dedicated rights of way (right)

Figure 4-4: Example of BRT Distinctive, High Capacity Vehicles

Different BRT systems may encompass a range of service parameters such as frequency and span of service but typically provide frequent, all-day service and are used in medium to high volume commute routes. Service typically runs seven days a week and operates with peak headways of 10 minutes or less and midday headways of 15 minutes or less. Service hours are typically at least 16 hours a day. BRT stops are spaced farther apart than local stops and are typically sited to serve major trip generators and attractors along a corridor (including at heavy transfer points with crossing local routes). Ridership can vary but the minimum number of daily corridor boardings to support the service level inherent to BRT would typically be 5,000 daily passengers.

Costs for BRT systems vary depending upon the BRT elements being implemented. BRT systems using a dedicated right-of-way are typically more expensive than arterial median running busways or systems running in mixed traffic. On average, costs range between $2 and $10 million per mile for construction. BRT vehicles can cost between $300,000 and $1 million.

Streetcar

Streetcars are small rail cars that run on in-street tracks, at-grade with traffic (though in some instances Streetcars can take advantage of exclusive right-of-way, for instance in street medians), and are generally smaller than light rail vehicles (LRVs) or other rail vehicles. The smaller rail vehicle and generally slower speeds of Streetcars lend themselves to a more intimate feel and are typically utilized for intra-city transportation with frequent stops, such as downtown circulator systems. The slower operating speeds, and to some extent smaller capacity, generally make Streetcars unsuitable for long distance operations, however, vehicle specifications may vary.

Modern Streetcars are sleek, low-floor vehicles with wide doors and large windows such as those in use in Portland, Oregon, and Tacoma, Washington. Some Streetcars designed with a retro “historic” feel are also popular and include vehicles such as the historic styled Streetcars in Tampa, Florida, and New Orleans, Louisiana. Most of these vehicles receive their power from an overhead electric wire. Streetcars can range from 30 to 67 feet in length and 8 to 20 feet in height (to accommodate overhead wire connections). Vehicle features include multiple doors and large windows. The cars can carry between 30 and 204 passengers, based on a combination of seated and standees. Most of these cars can operate singly or in trains. This type of technology requires between 16 and 25 feet of right-of-way (for both tracks).

Streetcar stops are relatively small compared to other rail mode stops. They typically include a small shelter and basic information (fare, route, time table), similar to a regular bus stop. They may also have an off-board fare media dispenser for off-board fare collection. Streetcar stops can be on a platform (approximately 75-feet long and 14-inches high for low floor boarding.) or may simply utilize the sidewalk (or a bulb-out similar to that described for BRT). Stops are generally located every ¼ to ½ mile along a route. Figure 4-5 provides an example of a Streetcar vehicle operating in mixed traffic.

Figure 4-5: Examples of Streetcar Vehicles Operating in Mixed Traffic

Streetcars provide medium to high volume service for circulators or act as collectors/ distributors of regional transit systems, though some existing Streetcar systems also serve a regional commute market. They are intended to provide continuous service throughout the day and often there is no real peak hour, especially for systems providing a circulator function. Typical headways are between 10 and 15 minutes. Average daily ridership is typically between 5,000 and 15,000 per day.

Streetcar systems cost approximately $10 to $12 million per mile, although some systems can well exceed those estimates. Vehicles can be bought as restored originals or as new replicas or modern vehicles. Vehicle costs range from $600,000 to $3 million.

4.1 Short-Term Local and Rapid Bus Service Enhancements

The short-term improvements presented in Section 5.1 are intended to be a set of capital and operating plan improvements that can be made in the nine study area corridors immediately and over the 0 to 10 year time period. For this study, short-term improvements are divided into two categories:

- Local Service Improvements
- Rapid Bus Alternative

In some corridors, short-term improvements will ultimately be replaced by premium transit, while in other corridors, the short-term improvements will continue to operate through the planning horizon of the system plan in 2030. Those corridors where short-term improvements will be replaced with premium transit were identified as a result of the Screen 2 evaluation. The discussion that follows identifies the short-term improvements for all nine study corridors.

4.1.1 Corridors

In all, eleven corridors were originally identified in the study as candidates for improvements. The original study corridors included:

- Bolling AFB to Minnesota Avenue Metro
- Silver Spring to M Street SE
- AU to Skyland SE
- Georgetown to Minnesota Avenue Metro via K Street, H Street
- Georgetown to Minnesota Avenue Metro via Waterfront, M Street, Potomac Avenue
- Forestville to Union Station
- Friendship Heights to Mount Vernon Square
- Brookland to AU
- National Harbor to L'Enfant Plaza
- New Carrollton to Downtown
- Fort Totten to Friendship Heights

Because premium transit is already planned in a portion of the Bolling Air Force Base to Minnesota Avenue Metro Corridor, this corridor was eliminated from consideration of any additional improvements (other than the Anacostia Streetcar Project, which is assumed in the baseline alternative).

Based on the Screen 2 Evaluation, four of the corridors were selected as candidates for premium transit service and were advanced to Screen 3 for further evaluation. The four premium transit corridors included:

- Silver Spring to M Street SE
- AU to Skyland SE
- Georgetown to Minnesota Avenue Metro
- Forestville to Union Station

The five remaining corridors that were not selected for premium transit but were recommended for short-term improvements include:

- Friendship Heights to Mount Vernon Square
- Brookland to AU
- National Harbor to L'Enfant Plaza
- New Carrollton to Downtown
- Fort Totten to Friendship Heights

The waterfront segments of the Georgetown to Minnesota Avenue Corridor (via Waterfront, M Street, and Potomac Avenue) were eliminated because the service is duplicative of services planned by the National Park Service. However, the M Street-Potomac Avenue portion of the corridor was carried forward as a sixth corridor for short-term improvements.

As previously stated, short-term improvements were developed for ten of the candidate corridors, with the exception of Bolling Air Force Base to Minnesota Avenue Corridor.

4.1.2 Baseline Alternative

For the purposes of developing both short- and long-term improvements, it was assumed that the baseline transit service in each corridor is the transit network in the COG 2030 Travel Demand Model. The COG 2030 Model includes the existing (2005) Metrobus service operating in or around the study corridors. In some cases, a corridor was served by a single Metrobus line, while in other cases, numerous lines operated within a corridor. The COG model also assumes streetcar service in the Columbia Pike and Cross-County Connector (Montgomery and Prince George's Counties) corridors, and Metrorail service to Dulles Airport.

In addition, the Baseline Alternative includes the assumption of Streetcar service in the Anacostia Corridor between Bolling AFB and Minnesota Avenue Metro. Although a shorter version of the Anacostia Streetcar was assumed in the screening process, changes to the definition of the corridor emerged over the course of this analysis, and for the purposes of the System Plan, the "full" version of the Anacostia Streetcar is assumed in the Baseline. All changes in each corridor began with the Baseline Alternative as a starting point.

4.1.3 Immediate Term: Local Service Improvements

As noted above, the purpose of the local bus service Improvements element is to improve transit service along a corridor and to do so with minimal capital investment so that these improvements can be implemented immediately. In some cases, the changes recommended for the immediate term are supplanted by more extensive changes later in the system plan; in other cases, the changes recommended for the immediate term continue through 2030.

Altogether, local bus service improvements will require an additional 26,000 annual revenue hours of service, an increase of 3 percent within the affected corridors (an increase of less than 1 percent overall). A total of 6 additional peak vehicles would be needed to implement all of the changes. For each of the corridors, the recommended Local Bus Service Improvements element changes are listed below.

American University to Skyland SE

This corridor is today primarily served by Bus Routes 90-92-93. Improvements are oriented around simplifying the route structure and creating a single trunk route between the Ellington Bridge and the 11th Street Bridge / Southeast Washington. Changes would include:

- Eliminate Route 93 – all Route 93 trips will be carried by (revised) Route 90 or 92
- Eliminate service via Routes 90 or 92 to McLean Gardens; this is a low performing segment, and will in the short-term be served by new Route H5 (see *Brookland to AU*)
- All Route 90 and Route 92 trips end at Ellington Bridge
- U Street/ 14th Street turnback trips on Route 92 are extended to Ellington Bridge

The Local Bus Service Improvements element for this corridor would require one fewer vehicle than existing service.

Brookland to American University

This corridor is not currently served by a single route, but the H2-3-4 routes serve the majority of the corridor. Improvements are intended to create a new route that operates along the study corridor (the revised Route H5), and on improving service to the corridor's largest employer and activity center, the Washington Hospital Center. The Hospital Center is not served by Metrorail and is currently difficult to reach from some parts of the region. This plan would improve connections between downtown Washington and the Hospital Center. Changes would include:

- Route 80 is extended to serve the Hospital Center
- Existing Route H5-7, which is a poor performing route is eliminated; some service is replaced by the proposed new Route H5
- New Route H5 operates from Brookland Metro to Tenleytown via the Hospital Center, Woodley Park, and McLean Gardens

The Local Bus Service Improvements element for this corridor would require three additional vehicles.

Forestville to Union Station

There is currently no single route serving this entire corridor, and there is no regular fixed route service on Pennsylvania Avenue east of Branch Avenue. In addition, existing service to Southeast DC is complex, has many branches, and is often subject to delays because it is interlined with service to the far northwest quadrant of the District.

To address these problems in the short-term, Pennsylvania Avenue service is detached from service to the Wisconsin Avenue corridor (see the Friendship Heights to Mount Vernon Square Corridor, below). New Routes 30 and 31 would serve the Wisconsin corridor, but would no longer operate south of Archives Metro. Routes 33, 34, and 35 would serve only the Pennsylvania Avenue corridor and downtown, turning back at Archives. Changes would include:

- New Route 33 replaces Route 32, operates between Southern Avenue and Archives Metro
- New Route 34 operates between Archives Metro and Naylor Road
- New Route 35 operates between Archives Metro and Naylor Road (via Branch Avenue)
- Route 36 is eliminated, replaced by trips via Route 35

Combined with local service improvements in the Friendship Heights-Mount Vernon Square Corridor, two fewer buses than the existing routes would be required for these service changes.

Fort Totten to Friendship Heights

No changes are recommended for this corridor for the Local Bus Service Improvement element, as there were no substantial short-term deficiencies for the services currently operated in the corridor.

Friendship Heights to Mount Vernon Square

Current service in this corridor is interlined with service in the Forestville to Union Station Corridor (via the "30s" routes). Therefore, changes in that corridor affect service on Wisconsin Avenue. The proposed changes to the Forestville to Union Station corridor create new Routes 30 and 31, serving the Friendship Heights to Mount Vernon Square Corridor, while removing routes 32, 33, 34, 35 and 36. These changes simplify service and should improve schedule adherence and performance on the route. They also create a new "trunk route" for the Wisconsin Avenue Corridor (Route 30):

- Service on Wisconsin Avenue is no longer interlined with Pennsylvania Avenue service
- Route 30 now operates between Friendship Heights Metro and Archives Metro
- Route 32 is eliminated, replaced by Route 31 between Tenleytown Metro and Archives Metro

Combined with improvements in the Union Station to Forestville Corridor, 2 fewer vehicles would be required for these service changes.

Georgetown to Minnesota Avenue Metro

There are no additional immediate service changes recommended for this corridor in the Local Bus Service Improvements element as this corridor already has very high levels of service and the implementation of the DC Circulator project is already underway. The DC Circulator is assumed to be in place for the purposes of the DCAA project planning. This corridor will also benefit from changes to the Friendship Heights to Mount Vernon Square Corridor.

L'Enfant Plaza to Minnesota Avenue Metro

No changes are recommended for this corridor for the Local Bus Service Improvement element, as there were no substantial short-term deficiencies for the services currently operating in the corridor.

National Harbor to Downtown

The Downtown to National Harbor corridor is the most complex of the nine study corridors. The corridor is served by both local service (Routes A2-4-5-6-7-8-42-46-48, W2-3-9) and commuter routes (P17-18-19, W13-14-15-19). Service changes are primarily oriented around simplifying the route structure for local routes and removing some duplicative service; the changes also create a new local "trunk route" (A1). Changes for the commuter routes are intended to also create a new trunk route service (P18), and to improve off-peak service. Changes in the corridor include:

- New Route A1 provides trunk route service between Anacostia Metro and Livingston / South Capitol (replaces Route A8). Outside of Metrorail hours, operates as Route A41 and serves downtown.
- Revised Route A2 operates between Anacostia Metro and Southern Avenue Metro. Outside of Metrorail hours, operates as Route A42 and serves downtown.
- Route A3 provides service between Anacostia Metro and Livingston / South Capitol via Wheeler (replaces Route A6-7). Outside of Metrorail hours, operates as Route A43 and serves downtown.
- Routes A4 and A5 provide service between Anacostia Metro and Fort Drum / DC Village (A5 is peak period only, with an extension to the Blue Plains Treatment Plant).
- All turnback trips on all "A" routes are replaced by service to Anacostia Metro.
- Route P17 is eliminated, and replaced by a new Route P18, which provides local service in the Oxon Hill / Fort Foote corridor at all times, including mid-day. Route P18 also will now provide weekend service.
- Route P19 operates as peak period, peak direction express service to supplement P18.
- Route W14 is eliminated, replaced by extended Route W13 which operates between Southern Avenue Metro and Indian Head Hwy. Route W13 will also now operate on Saturdays.

Combined, these improvements will require an additional five vehicles.

New Carrollton to Downtown

Existing Rhode Island Avenue service in the District does not include a single route along the Rhode Island corridor; instead, service is broken into two routes, one east of Rhode Island Metro (G8), and several to the west (81-82-83-84-85-86, T-18). The recommended changes are designed to simplify service in the corridor outside of peak hours:

- New route G9 operates as interline of Route G8 and Route 82, providing service all along the corridor outside of Metrorail hours
- Route 81 and 86 are combined into a new Trunk Line Route 81 between Rhode Island Metro and Cherry Hill Park

These changes would require one additional vehicle.

Silver Spring to M Street SE

Existing service in this corridor is via Route 70 and 71 (peak only). The purpose of the short-term immediate improvements is to greatly simplify Route 70 (which has five different route ends), to create trunk line service in the corridor, and to expand service to Buzzard's Point. The changes are also designed to rationalize service to the Georgia Avenue corridor (where the demand is high) with service to Buzzard's Point (where it is lower). Changes would include:

- New Route 70 includes all trips on all branches; the route would operate between Silver Spring and Archives Metro.
- Route 71 is eliminated, replaced by service on Route 70 and Route 66-68.
- Route 66-68 is extended south to operate along the Route 71 alignment in Buzzard's Point; this will now provide off-peak service to Buzzard's Point.

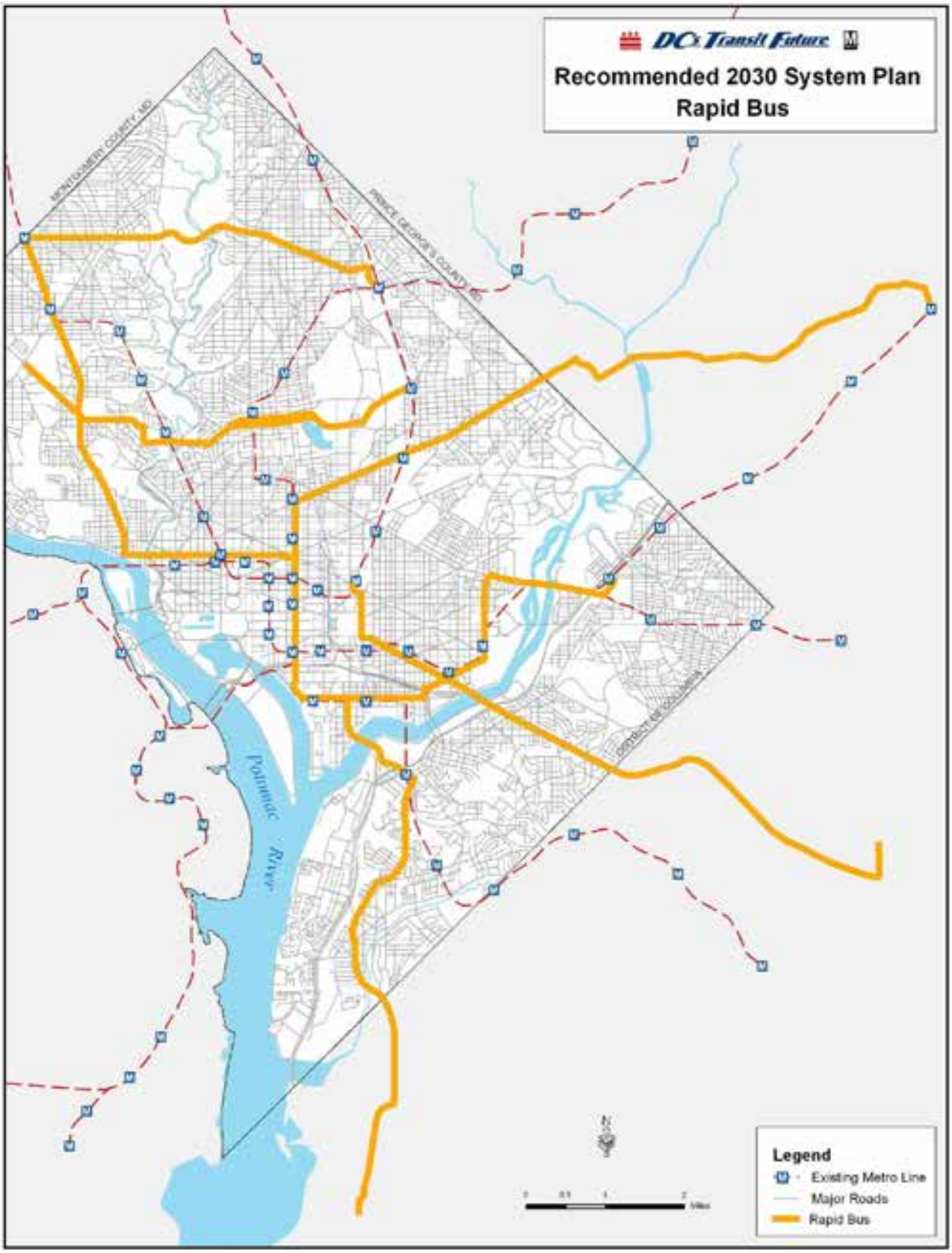
These improvements would require one additional vehicle.

4.1.4 Short-term: Rapid Bus Improvements

Like the Local Service Enhancements described above, the Rapid Bus Improvements are designed to be implemented in all corridors; to be implemented in the near term; and to be relatively inexpensive in terms of operating and capital costs. The Rapid Bus services and accompanying local bus service changes are designed to be implementable in all nine corridors in the 3 to 10 year time frame. Note that the changes build upon those already made in the local service alternative, above.

Overall, the Rapid Bus Alternative represents an increase in revenue hours of 193,000 (25%) over the Local Service Improvements alternative, or of 220,000 (30%) over existing service in the ten corridors. The net increase in the overall bus fleet would be 58 buses with simultaneous implementation of all corridors; however, the Rapid Bus service alone would require the addition of around 110 new buses (the lower net number reflects the replacement of buses on some local routes). Note that some of the Rapid Bus services are replaced by Streetcar or BRT routes by 2030. Figure 4-6 shows the Rapid Bus route network in the 2030 System Plan.

Figure 4-6: Rapid Bus Network



American University to Skyland SE

The Rapid Bus element for the AU to Skyland SE Corridor proposes elimination of the "long version" of local service in the corridor, Route 92. Route 92 would be replaced by new Rapid Bus route 92X, which would operate with limited stop service between Naylor Road Metro and Woodley Park Metro (laying over at Ellington Bridge), with service to Skyland, Eastern Market, Woodley Park, and AU.

Additional trips would also be added to Route 90 to make up for the reduction in service along the trunk of the route with the elimination of Route 92. Route 94 will also be extended to Skyland to make up for the eliminated trips via Route 92 between Skyland and Congress Heights Metro.

Rapid Bus service would be implemented starting in 2010. Route 92X would be replaces with Bus Rapid Transit service in the corridor in 2022.

Brookland to American University

New Route H5X would replace the Route H5 introduced as a short-term improvement. The new route would follow the same alignment, but only make limited stops between Brookland Metro and Tenleytown Metro, with stops at the Hospital Center, Woodley Park, and AU. Additional local trips will be added to H2-4 to make up for the loss of local trips along the trunk of the route. New passenger amenities at the hospital center make it into a full transit center.

Rapid Bus service in the corridor would begin operating in 2010. It would continue to operate through the end of the implementation plan.

Forestville to Union Station

New Route 36X would provide limited stop bus service from Forestville to Union Station via Pennsylvania Avenue and 2nd Street. This would be the only service operating on portions of Pennsylvania Avenue. Service could operate at high speeds in Maryland, and queue jumpers at all signalized intersections are proposed.

Routes 33 and 35 would be unchanged. Route 34 would be retained to provide supplementary local service, but trips would turn back at Potomac Avenue Metro.

Rapid Bus service in the corridor would begin operating in 2009. It would continue to operate through the end of the implementation plan.

Fort Totten to Friendship Heights

New Route E1X would provide a limited stop, high-speed trip connecting the Red Line at Fort Totten with the Red Line at Friendship Heights. Only minor changes would be made to underlying bus service to reflect service duplication with the E1X and to expand off-peak service. Rapid Bus service would begin in 2015, and would continue to operate through the end of the implementation plan.

Friendship Heights to Georgetown and Georgetown to Minnesota Avenue Metro

These two corridors are combined for the purposes of the Rapid Bus Alternative. In this alternative, Route 31 would be eliminated and replaced with Route 31X. Route 31X would operate as a limited stop route between Friendship Heights Metro and Minnesota Avenue Metro, using the K Street Transitway between Washington Circle and Mount Vernon Square. Routes X1, X2, X3, and 30 would continue to provide local service in the corridor. The East-West Route of the Downtown Circulator would be extended to Georgetown University, and would overlap Route 31X between Wisconsin Avenue and Mount Vernon Square.

Route 31X would operate from 2009 until 2019, when Streetcar service between Georgetown and Minnesota Avenue Metro begins operating; at that point, the East-West Downtown Circulator would be eliminated, and Route 31X would be shortened to operate only between Friendship Heights and Mount Vernon Square; the shortened version of the route would continue to operate through the end of the implementation plan.

L'Enfant Plaza to Minnesota Avenue Metro

Service in this corridor would be via a new Southeast Circulator route, which would be similar to the existing downtown circulator routes. Stops would be located approximately every quarter mile and would be distinctive from existing local bus stops. Unlike other Rapid Bus routes, vehicles would be 40 feet low-floor buses. There would be no signal priority. Service would operate between L'Enfant Plaza and Minnesota Avenue Metro serving the proposed new baseball stadium; the redeveloping M Street SE Corridor; the Stadium-Armory, and DC General Hospital.

The Southeast Circulator would begin operating in 2010, following the opening of the proposed new baseball stadium. Service would continue until at least 2030. There would not be any accompanying changes to local bus service as there is no overlapping local bus route.

National Harbor to Downtown

For this corridor, new Route A1X provides limited stop service between downtown and National Harbor. Service includes use of the South Capitol Bridge Transitway, and stops at the proposed new baseball stadium, Anacostia Metro, and the Oxon Hill Park & Ride. Route A1 is eliminated, replaced by additional trips on A3 and A4. Route W9 is also eliminated, as its corridor is served by the Anacostia Streetcar Project and the proposed "A" routes. Route A1X will have a long span of service, so Routes A41, A42, and A43 can all be eliminated.

A second new limited stop service is recommended for the commuter market – Route P17, between Fort Washington and downtown. Service is supplemented by revised Route P19, which is express only from Fort Washington to downtown Washington in the peak period. Route P18 now only goes to Southern Avenue Metro (service in the District is via either A1X or P17).

Route A1X would operate through the end of the implementation plan, starting in the year 2011.

New Carrollton to Downtown

In the New Carrollton to Downtown Corridor, a new limited stop route – T18X – would supplement the crowded service on the Orange Line and existing Route T18. The service operates in the proposed 7th Street / 9th Street Transitway in downtown Washington, then via Rhode Island to Prince George's County, then via Annapolis Road to New Carrollton. This service would begin in 2013 and operate through the end of the implementation plan.

Silver Spring to M Street SE

Proposed Route 70X would provide limited stop service between Silver Spring and M Street SE. Service would stop at major activity centers, including Silver Spring, Georgia Ave/Petworth Metro, Walter Reed Medical Center, downtown DC, the Waterfront, and the Navy Yard. Routes 66, 68 and 70 would continue to provide complementary local service in the Georgia Avenue-7th Street Corridor and to Buzzard's Point.

Route 70X would operate from 2008 to 2029. In 2030, it would be eliminated, replaced by Streetcar service in the Georgia Avenue-7th Street Corridor.

4.2 Long-Term Premium Transit System

Premium transit modes (Streetcar and BRT) were recommended for the most promising of the study corridors, based on the Screen 3 Evaluation. Given the relatively long construction times for such projects, implementation of premium transit projects are assumed to occur in the mid- to long-term, with the first projects entering service in 2012. Premium transit corridors are also unlike the short-term improvements in that corridors can be implemented in segments, with short, interim services starting before an entire corridor is built out.

The mid- and long-range phasing begins with the improved transit system resulting from the short-range bus enhancements described in Section 4B and 4C. The plan then gradually adds the BRT and Streetcar elements over the remainder of the 30-year time frame until the Year 2030 System Plan is achieved. The implementation plan was based on a number of factors, including:

- Providing early service to the most productive high ridership segments,
- Serving areas which support city initiatives and planned development/redevelopment,
- Providing access to maintenance facility sites, transit travel patterns, connections between residences and employment sites,
- Developing an interconnected system of complementary BRT and Streetcar services.

In addition, longer corridors were phased in over long periods of time, in order to realistically spread the capital costs over a longer period of time.

4.2.1 Streetcar Element

The performance of the potential premium transit services against each of the project goals and criteria was the basis for determining corridors most appropriate for Streetcar investment. The very best performing segments are identified as potential candidates for Streetcar service, the highest level of premium transit investment. These segments represent the most attractive areas to expand Streetcar services beyond the Anacostia Streetcar Project service that is already scheduled for partial implementation as soon as 2006.

In general, Streetcar service is divided into four "operating corridors," which are gradually phased into operation, starting from a common origin at the planned Streetcar maintenance facility at the DPW site in Anacostia:

- The Anacostia Streetcar Corridor, extending from Bolling AFB to Minnesota Avenue Metro
- A North-South Corridor, extending from Bolling AFB to Silver Spring
- An East-West Corridor, extending from Georgetown to Minnesota Avenue Metro
- M Street SE/SW, between L'Enfant Plaza and the Navy Yard area.

Because the Streetcar network cannot be implemented at once, the following phasing plan was used to incrementally construct the Streetcar segments.

Anacostia Streetcar Corridor

- 2006: Phased implementation of the Anacostia Streetcar Line begins, with full implementation by 2008; the Anacostia Streetcar continues to operate via its original plan through at least 2030.

M Street Corridor

- 2012: Service from the Anacostia Streetcar Line connects with M Street via the 11th Street Bridge, proceeding to L'Enfant Plaza. A second service operates between L'Enfant Plaza and Eastern Market.
- 2015: The L'Enfant Plaza to Eastern Market Line is extended to Union Station.
- 2018: The L'Enfant Plaza to Union Station Line is extended to Georgetown; the L'Enfant Plaza to Georgetown Line continues to operate at least through 2030.

East-West Corridor

- 2018: The portion of the East-West Corridor between Georgetown and Mount Vernon Square begins to operate in 2018 as part of the Georgetown to L'Enfant Plaza Line.
- 2020: Service begins between Georgetown and Minnesota Avenue Metro; service continues until at least 2030.

North-South Corridor

- Because of the distance of Georgia Avenue from Bolling AFB, this is the last line to be constructed.
- 2025: Service begins between Bolling AFB and Howard University (7th Street NW / Columbia Road NW); this service replaces the Bolling AFB-L'Enfant Plaza Line.

- 2030: Service is extended via Georgia Avenue NW to Silver Spring Metro

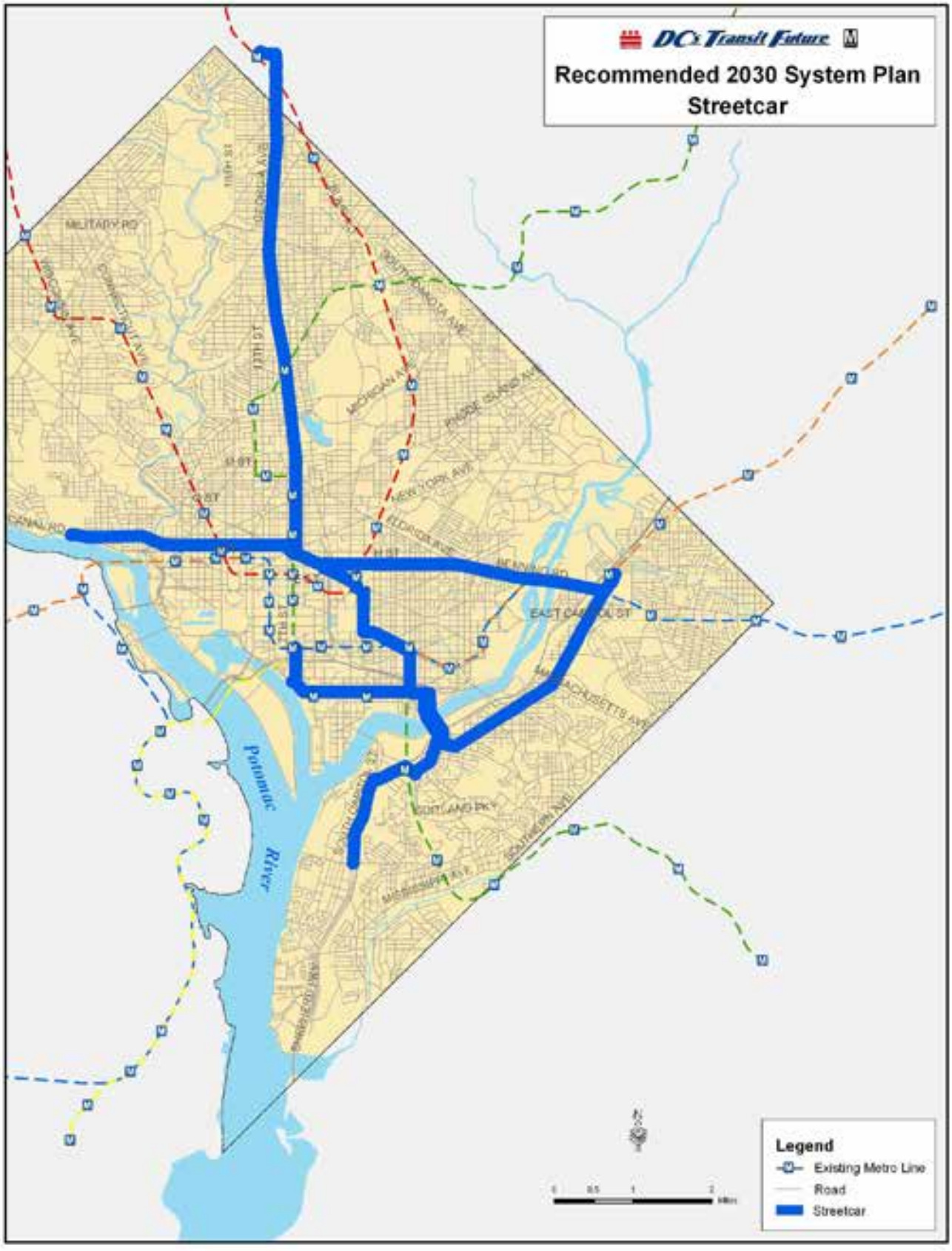
The Streetcar service plan during each phase of construction is shown in Table 4-1.

Table 4-1: Streetcar Operating Plans, 2008-2030

Service	Year		Headway	
	Start	End	Peak	Midday
Anacostia Streetcar Line	2006	2030	20	30
Bolling AFB to L'Enfant Plaza	2012	2024	20	30
L'Enfant Plaza to Eastern Market	2012	2014	15	20
L'Enfant Plaza to Union Station	2015	2017	10	15
L'Enfant Plaza to Georgetown	2018	2024	10	12
Georgetown to Minnesota Avenue Metro	2020	2030	10	10
L'Enfant Plaza to Georgetown	2025	2030	8	10
Bolling AFB to Howard University	2025	2029	10	10
Bolling AFB to Silver Spring	2030	2030	10	10

At the full build-out in 2030, the Streetcar network will consist of 24.9 route miles, with a peak pull-out of 51 Streetcars. As noted above, this is in addition to the two streetcar lines already included in the 2030 COG Model, in Virginia and Maryland. The full Streetcar network is shown in Figure 4-7.

Figure 4-7: Streetcar Element



4.2.2 BRT Element

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 include the following:

- *Silver Spring to Skyland SE Corridor*
  - 7th Street South Segment
  - Uptown Segment
  - Good Hope Road Segment
- *American University to L'Enfant Plaza Corridor*
  - U Street segment
  - Florida Avenue Segment
  - 8th Street Segment
- *Georgetown to Minnesota Avenue Metro*
  - Georgetown
  - Lower K Street
  - Upper K Street
- *Union Station to Forestville Corridor*
  - Inner Pennsylvania Segment

Some of the above segments were ultimately recommended for Streetcar service, including 7th Street South Uptown, Georgetown, Lower K Street, Upper K Street, and Inner Pennsylvania. Therefore, those segments were not considered for BRT service unless such consideration was required to provide connectivity for other BRT lines. In some cases, single segments were recommended for both BRT and Streetcar service, in which case transit vehicles are assumed to share right of way and stations. The BRT service plan is shown in Table 4-2.

Table 4-2: BRT Operating Plans, 2008-2030

Service	Year		Headway	
	Start	End	Peak	Midday
Georgetown to Skyland SE	2016	2030	8	10
Woodley Park to L'Enfant Plaza	2022	2030	10	12

At full build-out, the BRT network will consist of 15.5 route miles, of which 5.4 are shared with Streetcar lines. Peak pull-out consists of 22 BRT vehicles.

4.3 Implementation Schedule

This section describes the annual phasing in of projects associated with the 2030 System Plan. Although the system plan represents a final goal for the DCAA project, it cannot all be constructed and operated immediately; rather, projects are gradually phased in starting in 2006, and projects in the later years of the 25-year phasing plan are added to projects that begin in earlier years of the plan. In some cases, proposed new projects are only interim projects and are replaces later in the plan.

For the purposes of the implementation chronology, projects were divided in to three phases:

- Short-term Improvements (2006-2014)
- Medium Term Improvements (2015-2022)
- Long-term Improvements (2023-2030)

The majority of the service changes takes place in the early years of the phasing plan, and affects primarily the local Metrobus service network. The bulk of the premium transit projects are implemented later in the phasing plan, reflecting both the larger initial costs of these projects and the longer time necessary to implement them.

All dates in this section refer to the first full year of operation for the proposed new services. In many cases, planning and construction may take several years prior to the first day of operation.

4.3.1 Short-term Improvements

The bulk of the short-term improvements are oriented around revisions to the existing local Metrobus service network in anticipation of more extensive changes later in the phasing plan. Thus, although there are many changes early on, the major capital projects do not start to occur until late in the Short-term Improvements phase. The first Streetcar projects also appear in this phase. Table 4-3 lists the recommended improvements for the 2005 to 2014. Projects in operation at the end of the Short-term are shown in Figure 4-8.

Table 4-3: Recommended Transportation Improvements 2005 to 2014

Year	Recommended Improvements
2005	Baseline year, no changes from existing Metrobus and Metrorail operations
2006	Partial implementation of Anacostia Streetcar Line
	Implement local service improvements in the Silver Spring to M Street SE Corridor (affects Routes 66, 68, 70 and 71)
2007	Implement local service improvements in the Brookland to Woodley Park and AU to Skyland SE Corridors (affects Routes 80, 90, 92, 93, H2-3-4-5-7)
	Add new Route H5
2008	Full Implementation: Anacostia Streetcar Project (Bolling AFB to Minnesota Avenue Metro)
	Open Streetcar maintenance facility at the DPW site
	Implement Rapid Bus service in the Silver Spring-M Street SE Corridor via new Route 71X
	Implement local service improvements in the Friendship Heights to Georgetown; Georgetown to Minnesota Avenue Metro; and Forestville to Union Station corridors (affects Routes 30-32-34-35-36)
	Add new Routes 31, 33
2009	Open K Street Transitway
	Open new bus operating and maintenance facility (location to be determined)
	Implement Rapid Bus service in the Friendship Heights to Georgetown and Georgetown to Minnesota Avenue Metro Corridor (via new Route 31X)
	Implement Rapid Bus service in the Forestville to Union Station Corridor (via Route 36X)
	Implement local service improvements in the National Harbor to Downtown Corridor (affects Routes A2-4-5-6-7-8, A42-46-48, W9, P17-18-19, W13-14-15)
	Add new Routes A1, A41, A43
2010	Implement Rapid Bus service in the Brookland-AU Corridor (via new Route H5X)
	Implement Rapid Bus service in the AU-Skyland SE Corridor (via new Route 92X)
	Implement Southeast Circulator route
	Implement local service improvements in the New Carrollton to Downtown Corridor (affects Routes 81-82-83-84, G8, T18)
	Add new Route G9
2011	Complete 11th Street Bridge reconstruction
	Complete South Capitol Bridge Transitway construction
	Implement Rapid Bus service between National Harbor and Downtown (via Route A1X)
2012	Start Streetcar Service: Bolling AFB to L'Enfant Plaza
	Start Streetcar Service: L'Enfant Plaza to Eastern Market
2013	Implement Rapid Bus service in the New Carrolton to Downtown Corridor (via new Route T18X)
2014	No projects

Figure 4-8: Short-Term Projects (2005 to 2014)

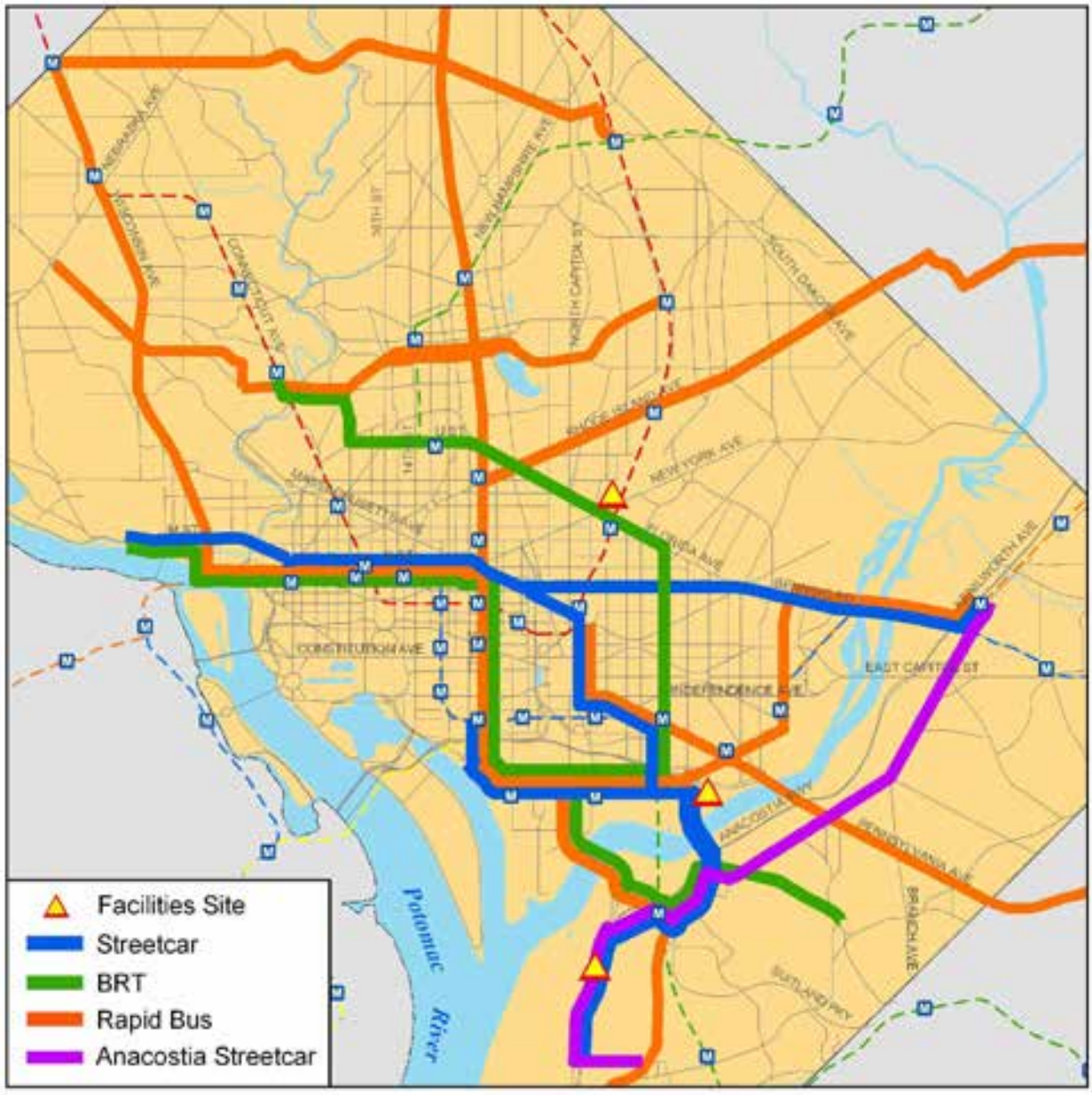
4.3.2 Medium-Term Improvements

Medium-Term improvements are focused on implementation of Streetcar service in the east-west corridor (between Georgetown and Minnesota Avenue Metro) and on implementing the plan's two BRT lines. Local and Rapid Bus implementation is complete by the end of the short-term of the implementation plan. Table 4-4 lists the recommended transportation improvements for the 2015 to 2022 period. Projects in operation at the end of 2022 are shown in Figure 4-9.

Table 4-4: Recommended Transportation Improvements 2015 to 2022

Year	Recommended Improvements
2015	Extend L'Enfant Plaza to Eastern Market Streetcar line to Union Station
	Implement Rapid Bus service in the Fort Totten to Friendship Heights Corridor (via new Route E1X)
2016	Start BRT Service: Georgetown to Skyland SE
2017	No projects
2018	Extend L'Enfant Plaza to Union Station Streetcar line to Georgetown
2019	No projects
2020	Open new Streetcar storage facility at M Street / 11th Street SE
	Start Streetcar Service: Georgetown to Minnesota Avenue Metro
	Truncate Rapid Bus route 31X at Mount Vernon Square; eliminate East-West Circulator
2021	No projects
2022	Start BRT service: AU to L'Enfant Plaza
	Eliminate Rapid Bus route 92X
2023	No projects
2024	No projects
2025	Start Streetcar Service: Bolling AFB to Howard University
	Eliminate Streetcar Service: Bolling AFB to L'Enfant Plaza
	Increase service levels: L'Enfant Plaza to Georgetown Streetcar Line

Figure 4-9: Full System Plan Year (2015 to 2022)



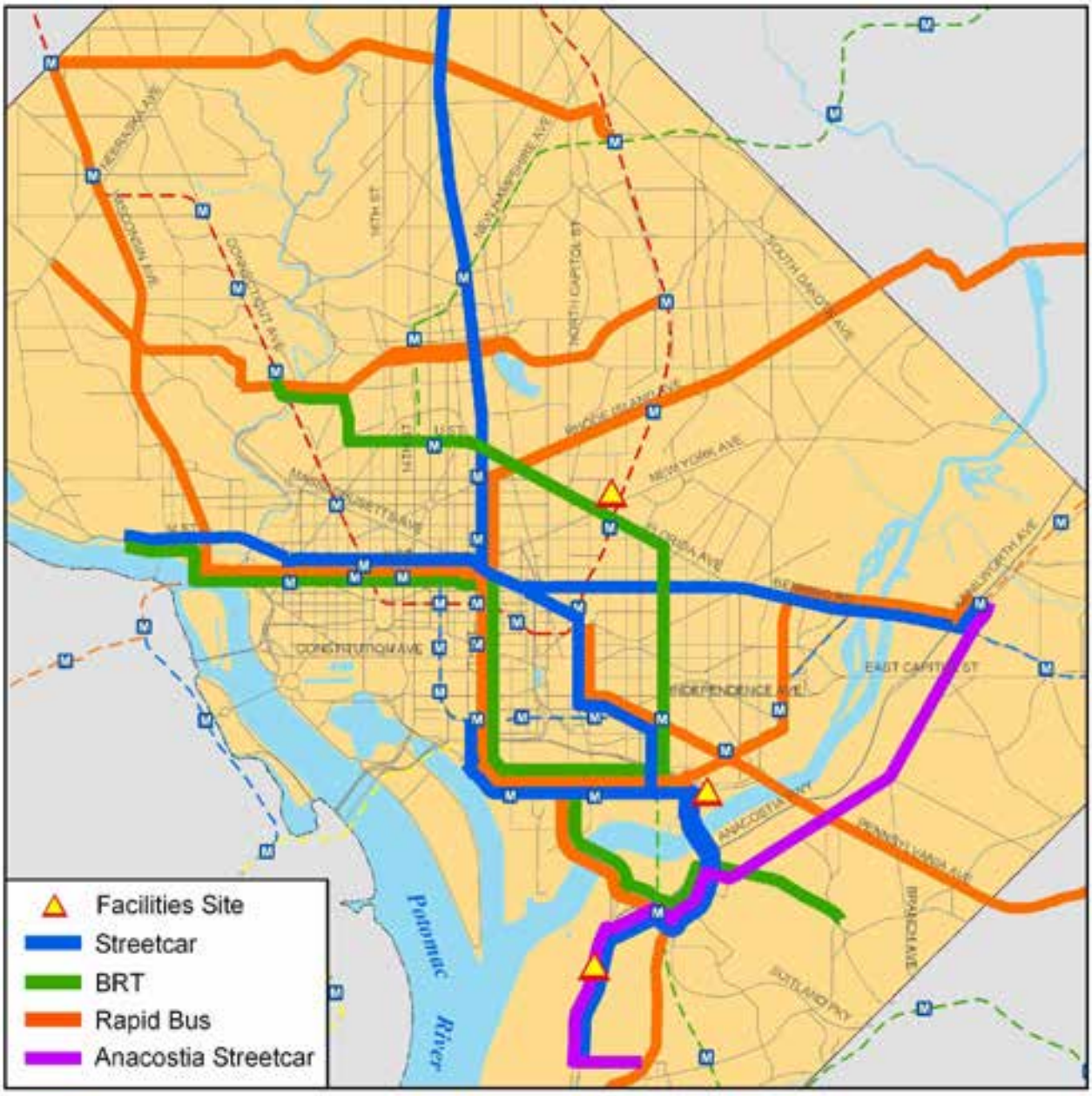
4.3.3 Long-term Projects

Long-term improvements are focused on completion of the Streetcar network by construction of the north-south transit line, which extends from the existing east-west line to Silver Spring. The north-south line is built in two phases, the first between Mount Vernon Square and Howard University, and the second extending the rest of the way to Silver Spring. Table 4-5 lists the recommended transportation improvements for the 2023 to 2030 period. Figure 4-10 shows the full system plan in operation in the year 2030.

Table 4-5: Recommended Transportation Improvements 2023 to 2030

Year	Recommended Improvements
2023	No projects
2024	No projects
2025	Start Streetcar Service: Bolling AFB to Howard University
	Eliminate Streetcar Service: Bolling AFB to L'Enfant Plaza
	Increase service levels: L'Enfant Plaza to Georgetown Streetcar Line
2026-2029	No projects
2030	Extend Bolling AFB to Howard University Line to Silver Spring
	Eliminate Route 70X

Figure 4-10: Full System Plan Year (2023 to 2030)



4.4 Benefits of System Plan Investments

Implementation of the 2030 System Plan will provide a variety of benefits to existing and new users of the WMATA transit system. These benefits include the following and are summarized in Table 4-6.

- Increased capacity and reduced crowding in key Metrobus corridors
- Improved travel times to major activity centers
- Reduced crowding on the Metrorail system

As a consequence of the benefits listed above, the system will also see an additional benefit:

- Increased ridership

Table 4-6: Summary of Transit Benefits

Improvement Area	Measure of Improvement	Baseline	Build	Improvement
Ridership	Total premium transit ridership (Streetcar, BRT)	18,105	136,359	118,117 weekday riders
	Total new riders	1.95 million	1.97 million	25,000 new riders
Transit Capacity and Crowding	Metrobus and premium transit, peak hour capacity	118%	90%	29% more peak hour capacity
	Metrobus and premium transit, peak hour load level	118%	90%	28% less crowding
	Daily Metrorail Boardings	1,132,000	1,118,000	Reduced by 14,000
Travel Time	Decrease in travel time	16.6 minutes / average trip	12.1 minutes / average trip	38% improvement

Note that the increase in ridership is measured against the ridership projected in the Baseline 2030 Alternative, which consists of the 2030 COG Travel Demand Model network plus the Anacostia Streetcar Line.

Other Benefits

- Provides premium transit service to growing population and employment.
- Supports city economic development initiatives in NE and Anacostia areas.
- Provides premium transit to areas not served by Metrorail.

4.4.1 Impacts of Transit Investments on DC Tax Revenues

The Return on Investment (ROI) Study was one of a series of studies that were conducted as part of the DCAA. The purpose of the ROI study was twofold:

- To examine the regional development potential that could be induced by improved access due to the proposed transportation investments being analyzed in the DCAA; and
- To estimate the potential return to the DC Government that would be associated with the proposed investments.

ROI Measures

The return on investment of premium transit in DC was calculated for each of the proposed corridors to identify what percentage of the local capital costs would be returned to the DC Government in the form of increased property and income tax revenues resulting from enhanced development spurred by the transit investment (see the *Return on Investment Report*, May 2005). In these calculations, the benefits consisted of total tax revenues, also referred to as the fiscal impact, attributable to areas within a ¼ mile of each project corridor. Costs included capital costs only. All figures used in calculating those measures were in 2005 dollars.

A key approach to estimating the benefits and costs included interviews with real estate developers active in the District. The interviews were structured to enable an analysis that differentiated between the effects of different incentive measures and the transit investment, taken separately. The results of the interviews are summarized in Section 2.4.2.

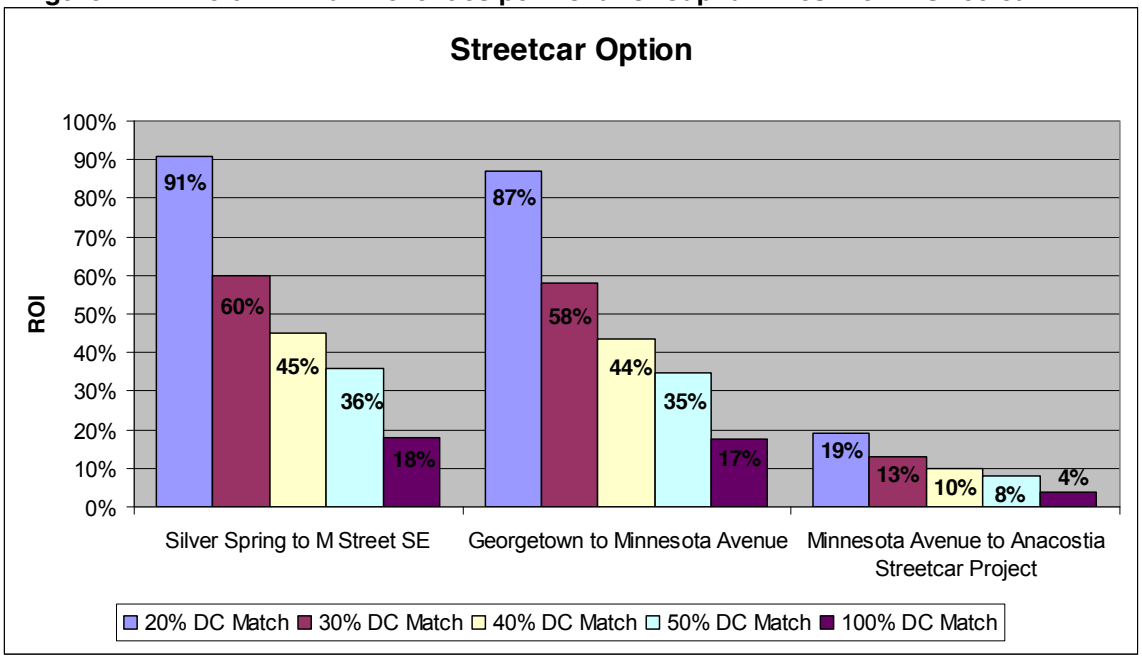
Results of the ROI

In the analysis, it was assumed that each premium transit corridor would be constructed between 2010 and 2014 and would accrue benefits between 2015 and 2030. In reality, these transit corridors will likely be phased over time; however, in order to fairly compare each transit corridor's return on investment, comparable construction and benefit periods were assumed. Also, in order to fairly compare benefits and costs occurring in different time periods, it was necessary to discount those figures to a common period. All costs and benefits were discounted to 2005 using a seven percent rate, as recommended by the Office of Management and Budget (OMB).

The estimated return for the proposed Streetcar corridors is displayed in Figure 4-11. In the figure, the fiscal impacts attributable to each proposed Streetcar corridor are compared to capital costs under the following five scenarios

- In the first scenario, it was assumed that non-federal capital funding comprises 80 percent of the total capital costs associated with each transit corridor.
- In the second scenario, it was assumed that non-federal capital funding comprises 70 percent of the total capital costs associated with each transit corridor.
- In the third scenario, it was assumed that non-federal capital funding comprises 60 percent of the total capital costs associated with each transit corridor.
- In the fourth scenario, it was assumed that non-federal capital funding comprises 50 percent of the total capital costs associated with each transit corridor.
- In the fifth scenario, it was assumed that the project capital costs are funded entirely with non-federal funds.

Figure 4-11: Return in Tax Revenues per Dollar of Capital Investment - Streetcar*



According to the study results, the Streetcar Alternative would provide a return in tax revenues of up to 36 percent of the local share of the project capital costs, assuming a 50 percent Federal funding match. It

should be noted, in all of the funding scenarios, none of the estimated return exceeds one, which means the tax revenues attributable to each of the proposed premium transit corridors will not meet and/or exceed the capital costs. However, in some cases, tax revenues attributable to premium transit would offset a substantial portion of the capital costs. For example, in the scenario assuming that non-federal funds comprise 50 percent of the capital costs, the fiscal impact of the Silver Spring to M Street SE Corridor under the streetcar alternative is expected to be approximately $0.36 per dollar of investment, the highest ratio among the proposed transit corridors. The return is lowest for the Minnesota Avenue to Anacostia Streetcar Starter Line Corridor where the fiscal impact is estimated to be $0.08 per dollar of investment, assuming a 50 percent federal funding share. For each corridor, the benefit associated with the BRT alternative is lower than the comparable streetcar alternative.

For the BRT Alternative, these values range from $0.11 per dollar of investment under the fifth scenario (100% DC match) to $0.84 per dollar of investment under the first scenario (20% DC match). Under each scenario, the Silver Spring to M Street SE Corridor consistently had the highest returns. The Union Station to Forestville Corridor had the lowest returns for the BRT Alternative.

Comparison of Cost and Revenue Estimates

A gross comparison of costs to potential revenues demonstrates a need to pursue a funding package that includes a combination of funding sources. In this case and for transit in general, value capture generates a small portion of the funds needed for capital investment and may be better suited as supplemental funds to offset operations and maintenance subsidy requirements.

Gross comparisons of costs to potential revenues illustrate the disparity in investment requirements and revenue potential. A streetcar alternative for the corridors is estimated to cost $1.3 billion against value capture revenue from development of about $151 million, (both values in 2005 dollars). Annual O&M costs add another $105 million, some of which would be funded through fare revenue.

It is instructive to view the costs and revenues on an annualized basis. For the capital investment it is assumed that the entire cost is debt financed (25 year bonds at 5.0 percent). This would require an annual payment of $92 million assumed level debt. Yearly cost must also consider operations and maintenance of $105 million per year. This puts revenue requirements at about $200 million per year for 25 years. By comparison, yearly revenues peak in 2024 at $12.3 million, from a low of $3.4 in 2015. In 2030, the end point for the analysis, revenues are $8.5 million.

Conclusions and Recommendations of the ROI

The primary purpose of transit investment is to promote access, enhance mobility, expand modal choice and reduce congestion. These transportation purposes also add value to some locations well served by premium transit. The further evaluation of candidate corridors may consider both transportation evaluation measures and ROI. This could take the form of “pricing” transportation benefits generated by corridor investments, which could then be included in project evaluations along with fiscal benefits (which already are priced).

The ROI provides a comparative analysis among corridors and in so doing assumes all activity happens concurrently. Once the projects are aligned, however, implementation and fiscal impacts will happen over a different time horizon for each corridor. This will in fact help the financing since the tax base is appreciating at a faster rate than inflation. The finance plan was prepared in year of expenditure dollars, and the more rapid escalation in fiscal impacts than implementation costs provides a somewhat better result than the ROI analysis indicates.

5.0 FINANCE PLAN

5.1 Capital and Operating Costs of the Improvements

Costs for the proposed 2030 System Plan are divided into two categories:

- Capital costs, which are one-time costs for infrastructure and vehicles required to provide service, and
- Operating and Maintenance (O&M) costs, which recur each year a service is operating

Capital and O&M costs for the various components of the phased implementation plan were developed using existing WMATA unit costs whenever possible, and peer unit costs where WMATA values were unavailable. All costs are in 2005 dollars. Since the Anacostia Streetcar Project is considered part of the Baseline condition, costs for this project are not included in these estimates. Each cost component is described below.

5.1.1 Capital Costs

Capital costs include all of the physical elements required to operate any proposed transit system. The capital components of each transit mode vary. Table 5-1 shows the major capital components of the four modes that make up the 2030 System Plan. Costs include environmental mitigation, contractor costs, planning and design, and contingency.

Table 5-1: Capital Cost Components by Mode ($2005)

Mode	Cost Components	Cost / Mile
Local Bus Service Improvements	40' Low Floor Buses Bus stop shelters	Less than $1 million
Rapid Bus Service	60' Low Floor, Alternative Fuel Buses Enhanced shelters with ITS features Signal priority systems Limited guideway improvements	$1.1 million
BRT	Specialized BRT vehicles Utility relocation Street and curb reconstruction Stations, including extensive amenities Off-vehicle fare payment Signal priority systems	$11.6 million
Streetcar	Streetcars Utility relocation Street reconstruction Tracks Overhead catenary and power systems Limited bridge reconstruction Stations, including extensive amenities Off-vehicle fare payment Signal priority systems	$25.8 million

Note: Costs do not include required new maintenance facilities or the Anacostia Streetcar Project

In addition to the capital components listed in Table 5-1, the proposed new transit services will require maintenance capacity. By 2030, three new vehicle maintenance and staging facilities will be needed to support the transit program (in addition to existing capacity):

- A Streetcar operating and maintenance facility to be constructed at the District Public Works (DPW) site along the Anacostia Streetcar Corridor
- A bus operating and maintenance facility to be constructed on Harry Thomas Way
- A Streetcar storage facility to be located near the intersection of M Street and 11th Street SE.

Table 5-2 shows the capital costs associated with each of the projects included in the 2030 system plan.

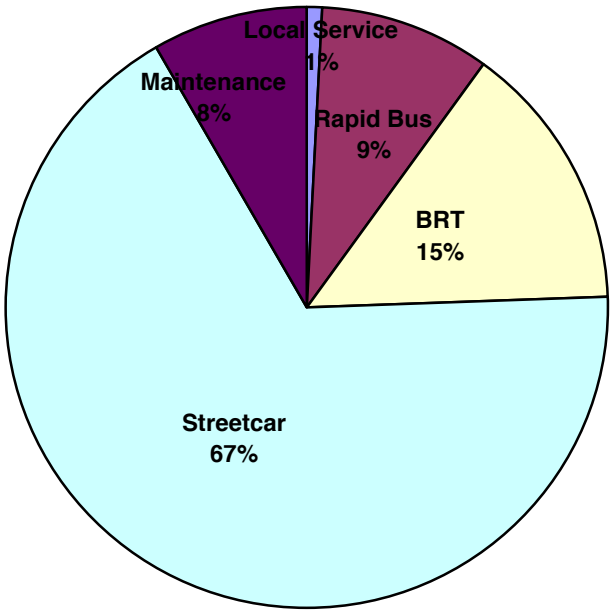
Table 5-2: 2030 System Plan Capital Costs ($2005)

Mode	Service	Start Year	Capital Cost
Local Bus Service Improvements	Silver Spring-M Street SE	2006	$645,000
	Brookland-Woodley Park; AU-Skyland SE	2007	$1,746,000
	Friendship Heights-Georgetown; Georgetown-Minnesota Avenue Metro; Forestville-Union Station	2008	$73,000
	National Harbor-Downtown	2009	$4,410,000
	New Carrollton-Downtown	2010	$26,000
	Total Local Service Improvements		**$6,900,000**
Rapid Bus Alternative	Silver Spring-M Street SE	2008	$8,903,000
	Friendship Heights-Georgetown; Georgetown-Minnesota Avenue Metro; Forestville-Union Station	2009	$26,635,000
	Brookland-Woodley Park; AU-Skyland SE	2010	$21,930,000
	Southeast Circulator	2010	$5,075,000
	National Harbor-Downtown	2011	$6,718,000
	New Carrollton-Downtown	2013	$5,915,000
	Fort Totten-Friendship Heights	2015	$2,223,000
	Total Rapid Bus Alternative		**$77,399,000**
BRT	Georgetown-Skyland SE	2016	$77,621,000
	Woodley Park-L'Enfant Plaza	2022	$46,144,000
	Total BRT Service		**$123,765,000**
Streetcar	Anacostia Streetcar	2008	$0
	Georgetown-L'Enfant Plaza	2018	$174,373,000
	Georgetown-Minnesota Avenue Metro	2020	$124,955,000
	Bolling AFB-Silver Spring	2030	$272,463,000
	Total Streetcar Service		**$571,791,000**
Maintenance Facilities	Streetcar Facility at DPW Site	2008	$23,929,000
	Bus Maintenance Facility at Harry Thomas Way	2009	$40,614,000
	Streetcar Storage Facility at M/11th SE	2020	$6,589,000
	Total Maintenance Facilities		**$71,132,000**
TOTAL ALL PROJECTS			**$851,000,000**

Note: Costs for the Anacostia Streetcar Project are not included in these estimates.

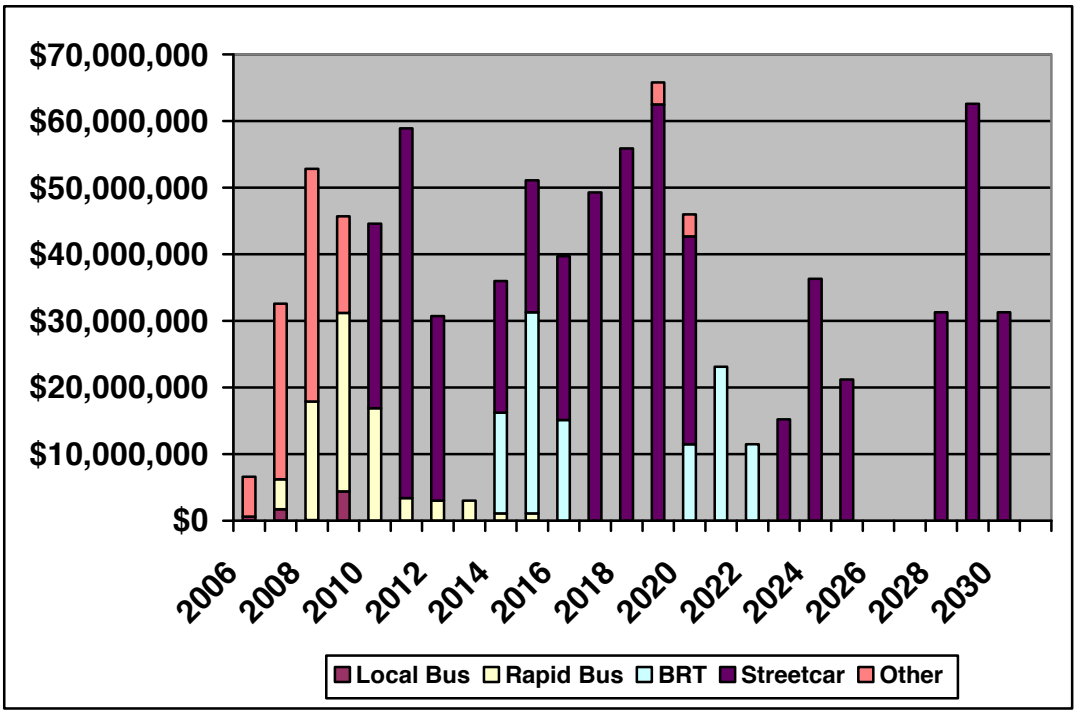
The cost distribution between the different service types is shown in Figure 5-1.

Figure 5-1: Distribution of Capital Costs, 2030 System Plan ($2005)



As shown in Figure 5-1, the capital investment in Streetcar makes up by far the largest portion of all expenditures in the plan – almost 75 percent of all capital costs. Figure 5-2 shows the capital cost expenditure per year under the proposed 25 year implementation schedule.

Figure 5-2: Capital Costs per Year, 2006-2030 ($2005)



Note: Costs for the Anacostia Streetcar Project are not included.

Figure 5-1 shows that the bulk of the capital costs are associated with Streetcar projects. This is especially the case in the later years of the implementation plan, when all expenditures are associated with the significant investment of extending Streetcar service to Silver Spring. In the early years, the

costs are primarily associated with establishing the Rapid Bus network and developing the maintenance facilities necessary to support future expansion.

5.1.2 O&M Costs

Unlike capital costs, O&M costs can recur every year once a transit service begins operating. As a result, for services that begin early in the 25-year implementation plan, the cumulative O&M costs over the life of the plan can be very high, even if the annual costs are relatively low. As a result, the cumulative cost of the Rapid Bus network is actually higher than that of the Streetcar network because Rapid Bus service are implemented early in the plan, while the major Streetcar lines do not come into service until late in the plan.

O&M costs are based on the annual revenue hours of service provided by each bus route or Streetcar line in the plan. Annual revenue hours are based on the service plan for each component of the 2030 service plan, including both premium transit services and local bus service operating both in the study corridors and in the WMATA network as a whole. Changes to the local network are extensive within the study corridors, and is described in detail in Section 4. The service plans for premium modes and Rapid Bus service in the 2030 plan is shown in Table 5-3.

Table 5-3: Premium Transit Service Plan, 2030 Network

Mode	Service	Headways (Min)		Revenue Hours
		AM Peak	Midday	
Streetcar	Anacostia Streetcar	10	30	26,000
	Georgetown-L'Enfant Plaza	8	10	61,000
	Georgetown-Minnesota Avenue Metro	10	10	58,000
	Silver Spring-Bolling AFB	10	10	90,000
	Total Streetcar			**235,000**
BRT	Georgetown-Skyland SE	8	10	73,000
	Woodley Park-L'Enfant Plaza	10	10	58,000
	Total BRT			**131,000**
Rapid Bus	31X	10	10	57,000
	36X	10	15	38,000
	A1X	10	15	31,000
	E1X	15	30	13,000
	H5X	12	15	32,000
	T18X	15	20	26,000
	Southeast Circulator	10	15	31,000
	Total Rapid Bus			**228,000**

The annual revenue hours were multiplied by unit costs per revenue hour to determine the annual operating costs. The unit costs for the different services are shown in Table 5-4.

Table 5-4: O&M Unit Costs ($2005)

Mode	Cost / Revenue Hour	Source
Local Bus	$90.86	WMATA
Rapid Bus	$90.86	WMATA*
BRT	$105.22	Columbia Pike Study
Streetcar	$206.10	Columbia Pike Study

** - Although Rapid Bus service incurs some additional costs due to additional ROW maintenance and maintenance of the signal priority system, these are counterbalanced by the lower maintenance requirements of the newer vehicle fleet.*

Table 5-5 presents the annual incremental O&M costs for the proposed new transit services that are operating in the final, full-build version of the 2030 plan.

Table 5-5: Annual Incremental O&M Costs for New Transit Services in the 2030 Network ($2005)

Service Type	Service	O&M Cost
Streetcar	Anacostia Streetcar	$0
	Georgetown-L'Enfant Plaza	$12,570,000
	Georgetown-Minnesota Avenue Metro	$11,993,000
	Silver Spring-Bolling AFB	$18,512,000
	Total Streetcar	**$43,075,000**
BRT	Georgetown-Skyland SE	$7,688,000
	Woodley Park-L'Enfant Plaza	$6,136,000
	Total BRT	**$13,834,000**
Rapid Bus	Brookland-AU	$2,908,000
	Forestville-Union Station	$3,453,000
	Fort Totten-Friendship Heights	$1,181,000
	Friendship Heights-Mt Vernon Square	$5,157,000
	L'Enfant Plaza-Minnesota Avenue Metro	$2,860,000
	National Harbor-Downtown	$2,817,000
	New Carrollton-Downtown	$2,362,000
	Total Rapid Bus	**$20,738,000**
Local Service in Corridors		$51,790,000
TOTAL 2030 Plan Incremental Cost in 2030 ($2005)		**$129,437,000**

Note that the costs included in Table 5-5 are a "snapshot" of the O&M costs in 2030. These costs do not reflect the cumulative costs of providing services over twenty or more years of the implementation plan. The 2030 costs also do not reflect the cost impacts of services introduced in the System Plan that cease operation before 2030. For example, Rapid Bus service operates in the Silver Spring-M Street SE Corridor starting in 2008, but is replaced in 2030 by Streetcar service, and so is not shown in the table. Table 5-5 also does not show the impacts of numerous changes made to the underlying local bus service network to support the premium and Rapid Bus services. These changes are detailed in Section 4.1.4 of this report.

Also, note that there is no line item for maintenance, as there is with the capital cost. This reflects the fact that operation of the maintenance facilities proposed in the plan is included in the unit O&M costs. Table 5-6 shows the cumulative costs by mode for the entire 25-year implementation plan. Figure 5-3 shows the breakdown of cumulative costs graphically.

Table 5-6: Cumulative O&M Costs, 2006-2030 ($2005)

Mode	Cumulative Cost	Percent of Total
Streetcar	$432,400,000	17%
BRT	$170,500,000	7%
Rapid Bus	$600,200,000	23%
Non-Premium Service in Corridors	$1,382,500,000	53%
Total All Services	**$2,425,600,000**	**100%**

Figure 5-3: Cumulative O&M Costs, 2006-2030 ($2005)

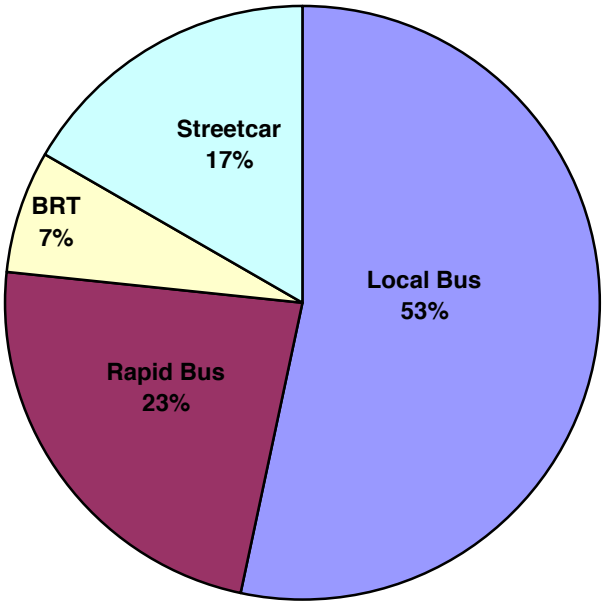


Figure 5-3 shows that the bulk of the O&M costs are for continuous local transit service in the nine corridors, even though the unit costs for local service are the lowest of the four modes. This reflects both the fact that local service operates in all years of the plan, while other services are implemented later; and the fact that for each premium mode operating in a corridor, there may be several overlapping local routes, whose cumulative costs are higher than that of providing the premium service. Figure 5-4 shows the O&M costs per year of the 2030 plan.

Figure 5-4: Annual O&M Costs per Year, 2006-2030 ($2005)

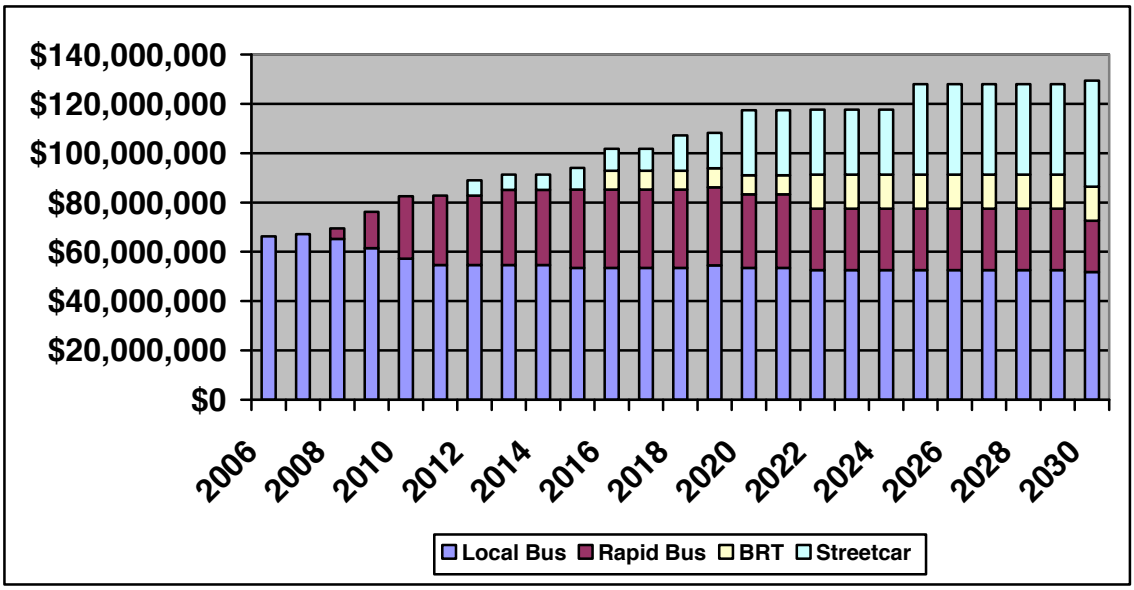


Figure 5-4 shows that there is a gradual reduction in local service (as reflected by operating costs) from the early years of the program; however, that decline is more than made up for by the rapid increase in costs for Rapid Bus service at first, and BRT and Streetcar service later on.

5.1.3 Combined Capital and O&M Costs

As the sections above show, the bulk of the capital costs are related to Streetcar construction, while the bulk of the O&M costs are due to local service, which has relatively low associated capital costs. Table 5-7 shows the combined capital and O&M costs, by mode, over the entire 25-year life of the implementation plan. Figure 5-5 shows the percentages of the total combined cost associated with each mode. Figure 5-6 shows the combined capital and O&M cost per year (that year's annual O&M cost plus the cost of capital projects in that year).

Table 5-7: Combined Capital and Cumulative O&M Costs by Mode for 2030 Network Implementation Plan ($2005)

Mode	Capital Cost	O&M Cost	Total	Percent
Local Bus	$6,900,000	$1,382,500,000	$1,389,400,000	40%
Rapid Bus	$77,400,000	$600,200,000	$677,600,000	20%
BRT	$106,500,000	$170,500,000	$277,000,000	8%
Streetcar	$571,800,000	$432,400,000	$1,004,200,000	29%
Facilities and Roadway Projects	$88,400,000	$0	$88,400,000	3%
Total	**$851,000,000**	**$2,585,600,000**	**$3,436,600,000**	**100%**

Figure 5-5: Percent of Combined Cumulative O&M and Capital Cost by Mode, 2030 Network ($2005)

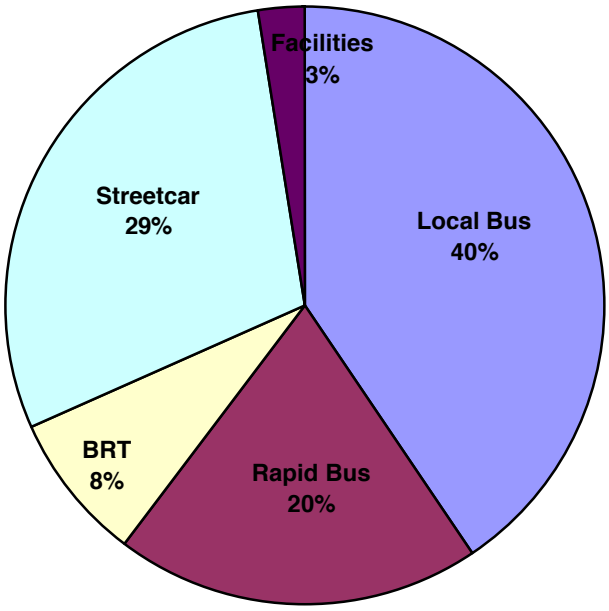
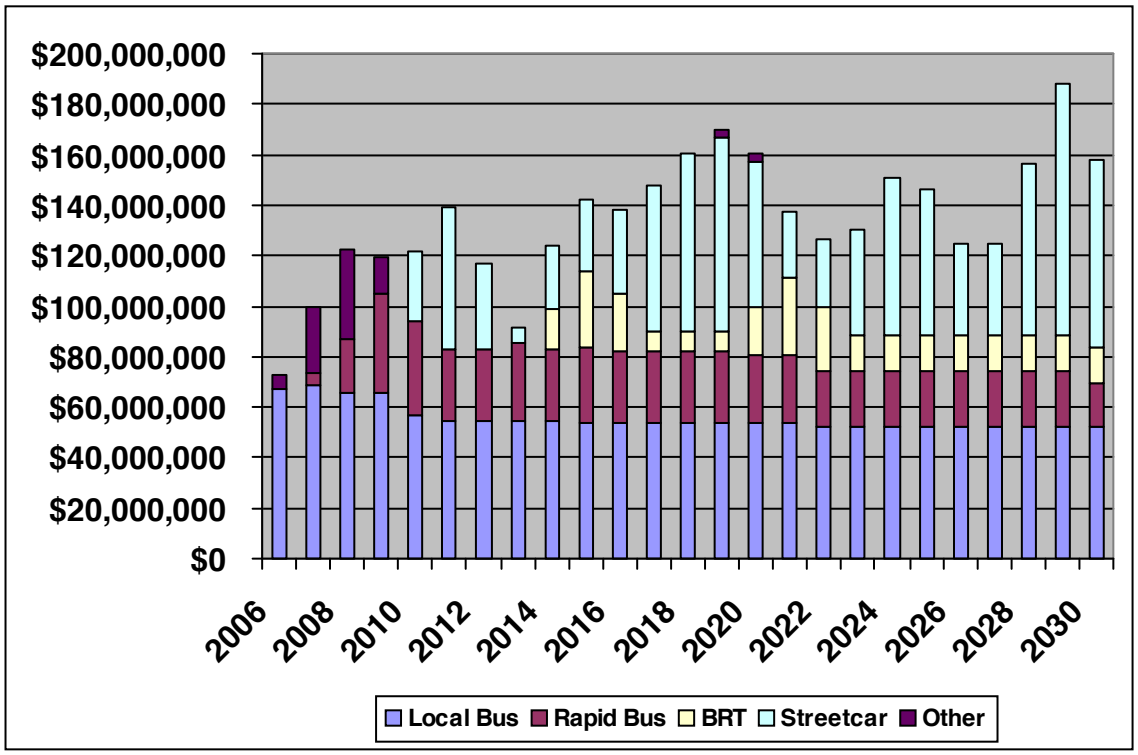


Figure 5-6: Combined Annual O&M and Capital Costs per Year, 2006-2030 ($2005)



5.1.4 Capital and O&M Costs for All-BRT and All-Streetcar Networks

Should additional funding become available, the District may opt to construct a full streetcar network, as opposed to a mixed Streetcar or BRT network. Such a decision would increase the level of service in the streetcar corridors, and presumably improve the likelihood of development as well; on the other hand, the capital and O&M cost impacts would be considerable. Alternately, the District may decide that BRT provides an adequate level of service at a lower cost and elect to build a full BRT system.

Table 5-8 shows the capital costs, annual O&M costs, and cumulative O&M costs associated with constructing an all BRT or all Streetcar system.

Table 5-8: Capital and O&M Costs for All-BRT and All-Streetcar Networks

Transit Investment	Capital Cost	O&M Cost		Total Cumulative Cost
		2030 Only	Cumulative	
All Streetcar	$782,000,000	$70,000,000	$766,000,000	$1,548,000,000
All BRT	$375,000,000	$36,000,000	$391,000,000	$766,000,000
Non-Premium	$173,000,000	$73,000,000	$1,983,000,000	$2,156,000,000
Total, All Streetcar	**$955,000,000**	**$143,000,000**	**$2,749,000,000**	**$3,704,000,000**
Total, All BRT	**$548,000,000**	**$106,000,000**	**$2,374,000,000**	**$2,922,000,000**

Table 5-8 shows that constructing an all streetcar network would result in a cumulative capital and O&M cost 9 percent higher than the corresponding cost for the mixed streetcar and BRT service, while an all BRT network would result in a cumulative cost almost 15 percent lower.

5.2 Potential Funding Sources

There are a broad range of funding and financing approaches available for surface transit alternatives in the District of Columbia. Several options that exist and that have been applied and considered in

completed and proposed projects were examined in the Funding Strategies analysis conducted as part of the DCAA (see the *Funding Strategies* report, June, 2005). The following funding strategies were considered:

- Federal Grants
  - Section 5309 Federal Transit Capital Program
  - Section 5307 Urbanized Area Formula Program
- Joint Development and Benefit Capture
  - Leasing/selling development rights
  - Leasing/selling land or facilities
  - Special benefit assessment districts
  - Cost sharing
  - Concession leases
  - Density bonuses
  - Tax increment financing
  - Connector fees
- Taxes and User Charges
  - Motor fuel gallonage tax
  - Extension of State retail sales tax to motor fuels
  - Motor vehicle license fee
  - Motor vehicle emissions fee
  - Alcohol and cigarette tax
  - Corporate income tax
  - Business, Professional, and Occupational License (BPOL) tax
  - Local option sales tax
  - Personal income tax
  - Utility tax
  - Recordation tax
  - Lodging tax
  - Local restaurant/food tax
  - Local property tax
  - Parking receipt tax
- Turnkey
- Pay-as-you-go
- Leasing
- Debt Financing
  - General obligation funds
  - Revenue bonds
- Innovative Financing with FTA
  - Deferred local match
  - Revolving loan fund
  - Joint development
  - Use of proceeds from sale of assets in joint development projects
  - Transfer of Federal ownership
  - Incidental non-transit use

Because funding sources are quite limited and are consumed by projects that are either already being implemented or are well advanced, three major sources of funding emerged that may have applicability for this project:

- **Federal Grant Funding:** This includes Section 5307 urbanized area grants and Section 5309 fixed guideway modernization grants. Both of these grants are formula driven and result from the additional transit service that these projects provide.

- **Value Capture:** The ROI Study undertaken as part of this project (see the *Return on Investment Report*, May 2005) revealed that there was considerable interest for the corridor transit investments among the development community. This provided the basis for focusing funding and financing options on value capture mechanisms.
- **User Fees:** Two types of user fees were considered. Transit user fees are the fares that transit users will pay for the service. Highway user fees could take many forms, but the most efficient are those associated with a parking tax and tolls. Both generate substantial and stable revenue, are borne primarily by non-residents, and arguably also may be regarded as a Transportation System Management (TSM) tool that mitigates congestion and contributes to improvement in air quality. Additionally, both a parking tax and tolls have a logical nexus whereby revenue is raised from a transportation user charge and dedicated to transportation investment.

Two categories of funding that have successfully been applied elsewhere were not pursued in the funding analysis. The first is a dedicated sales tax, which is the most common dedicated source of funding applied to support fixed guideway transit investments. A sales tax was not analyzed for this project because the Blue Ribbon Commission has identified a regional sales tax as the recommended source of funding to support the Metro Matters program and it was believed that this project should not compete for those funds.

The second category of funding that was not pursued were other local sources with a transportation nexus, including motor fuels tax, vehicle registration fees, driver licensing fees, and rental car tax. While these sources have been applied in other regions, it was recognized that application in the District of Columbia alone, rather than in the context of a region-wide tax base, would result in relatively small tax bases and require unrealistically high rates of taxation.

5.3 Finance Plan

This section documents the analysis of the funding and financing options available to DC to support the 2030 System Plan developed as part of the DCAA project.

The objective of the financial analysis was to demonstrate that DC has the financial capacity, both capital and operating, over a 30-year period from 2005 to 2034 to fund construction and operation of the 2030 System Plan. This analysis assumed that existing transit providers, primarily WMATA, will continue to receive funding for capital and operating costs of existing transit services in the District from existing revenue streams. This finance plan, therefore, modeled the incremental capital and operating costs and the marginal revenues required to provide premium Streetcar and bus rapid transit services to the District. The financial analysis did not include the Anacostia Streetcar Project.

Over the 30-year period of analysis, capital expenses for the 2030 System Plan will total $1,463.15 million in year-of-expenditure dollars, while operating expenses will total $1,795.95 million. These uses of funds will consume a total of $3.259 billion.

The analysis projected federal Section 5307 Urbanized Area Formula grants and Section 5309 Fixed Guideway Modernization grants totaling $166.71 million in year-of-expenditure dollars. Fare revenue was projected to be $134.03 million. Interest income was projected to provide $67.82 million. Thus, total known funding sources were projected to be $368.57 million.

Another potential funding source is District of Columbia funding of capital and operating costs for enhanced Local Bus and Rapid Bus service, net of increased fare revenue and federal grants resulting from additional service, by applying additional amounts of the current mix of revenues that currently comprise its subsidy to WMATA. If the District were to subsidize 100 percent of capital and operating funding for Local Bus and Rapid Bus services using its existing revenues, the addition to its existing transit subsidy would total $559.91 million. Given the uncertainty of additional funding from these sources, the analysis was conducted two ways, with and without these funds, to indicate the full range of funding that may be required from other tested sources to implement the 2030 System Plan.

The balance of the funding needs, approximately $2.331 billion, was examined in the financial analysis through the exploration of a combination of value capture mechanisms and user fees to fund the unmet capital and operating costs of the 2030 System Plan. These sources include:

- **Value Capture** funding based on property tax assessments within ¼ mile of BRT and Streetcar lines, beginning five years prior to service in each segment, including:

  Tax Increment Financing (TIF) – districts dedicating a fixed or variable percentage of the incremental growth in property tax revenue at the current property tax rate.

  Benefit Assessment Districts – dedicating taxes generated by an increase in property tax rates to transit improvements.

- **User Fees**

  Tolls – $0.25 each way on weekdays on selected arterial streets and Potomac River crossings, beginning in FY 2007, with 50 percent of generated revenues applied to transit improvements

  Parking Fees: Two types of annual per-parking space fees of $100 for commercial and $50 for residential on medium and high density properties within ¼-mile of all segments planned to receive BRT and Streetcar service in the 2030 System Plan, including:

  - **Fixed Implementation Year –** Fees along all segments charged beginning FY07; and
  - **Year-of-Service:** Fees charged at the beginning of revenue Streetcar or BRT service along each segment.

Nine funding scenarios were tested as part of the financial analysis: three with a combination of value capture and parking fees; three combining value capture and tolls; and three featuring value capture alone. In each of these sets of three, the tested value capture mechanisms include a Benefit Assessment District tax and fixed and variable TIF rates. In each scenario, the value capture funding source was sized to ensure that debt service coverage ratios do not fall below required minimums at point throughout the period of analysis. All nine packages utilize federal funds, fare revenues, and other revenues described above to an equal extent. As noted above, each scenario was tested with and without a direct capital and operating subsidy from DC for Local Bus and Rapid Bus service applying revenues currently applied towards existing transit subsidies. The scenarios are described below.

- **Value Capture and Parking Fees:** Scenarios 1A, 1B, and 1C combined value capture mechanisms, a fixed implementation year parking fee, and a year-of-service parking fee. Scenario 1A paired a Benefit Assessment District tax with parking fees, Scenario 1B combined TIF at a fixed increment over the entire period of analysis with parking fees, and Scenario 1C mixed TIF at a variable increment over the period of analysis with parking fees.
- **Value Capture and Tolls:** Scenarios 2A, 2B, and 2C combined value capture mechanisms and tolling. Scenario 2A paired a Benefit Assessment District tax with tolls, Scenario 2B combined TIF at a fixed increment over the entire period of analysis with tolls, and Scenario 2C mixed TIF at a variable increment over the period of analysis with tolls.
- **Value Capture Only:** Scenarios 3A, 3B, and 3C applied only value capture mechanisms to fund the 2030 System Plan. Scenario 2A applied a Benefit Assessment District tax, Scenario 1B utilized TIF at a fixed increment over the entire period of analysis, and Scenario 1C applied TIF at a variable increment over the period of analysis.

The financing assumptions varied by scenario. When the DC Local and Rapid Bus direct subsidy was included, the Value Capture and Parking Fee scenarios (1A, 1B, and 1C) and Value Capture and Toll scenarios (2A, 2B, and 2C) applied 30-year revenue bonds with level principal and interest payments, backed by dedicated user fees and property taxes. The Value Capture Only scenarios (3A, 3B, and 3C) applied tax-exempt commercial paper to defer principal payments through 2012, and then applied 20-year revenue bonds with level principal and interest payments thereafter, backed by dedicated property taxes. When the DC Local and Rapid Bus direct subsidy was excluded, all nine scenarios applied tax-exempt commercial paper to defer principal payments through 2012, and then applied 30-year revenue bonds with level principal and interest payments thereafter, backed by dedicated user fees and/or property taxes. Principal repayment was deferred for some scenarios because user fee revenues were insufficient or not available to cover capital program expenses in the early years of implementation of the 2030 System Plan.

The rates required to maintain minimum debt service coverage requirements under each scenario are presented in Table 5-9. Value capture funding source tax rates or increment percentages required to fund this program are presented with and without a DC Local and Rapid Bus direct subsidy of capital and operating costs for Local Bus and Rapid Bus service. The rate or percentage required without any subsidy is presented on the left, and the rate or percentage required with a full (100 percent) Local and Rapid Bus direct subsidy is presented on the left. These amounts reflect the full range of tax rates or increment percentages from these sources that DC could be expected to enact to support construction of the 2030 System Plan assuming varying funding for Local Bus and Rapid Bus service from existing DC transit revenue sources.

Note that the rates of taxation required under the Benefit Assessment District scenarios are reported in cents, not dollars. For example, the additional commercial property tax required under Scenario 1A ranges from 0.8 cents to 0.9 cents, or $0.008 to $0.019, amounts slightly less than one and two additional pennies per $100 assessed value, respectively.

Table 5-9: Dedicated Funding Scenarios

Rates Required to Maintain Minimum Debt Service Coverage Ratios

Scenario	Revenue Source (Rate in Bold / *Implementation Year in Italics*)					
	Benefit Assessment Districts 5 Years Prior to Service (Additional property tax)	**Tax Increment Financing (Fixed Rate)** 5 Years Prior to Service (% Existing property tax)	**Tax Increment Financing (Variable Rate)** 5 Years Prior to Service (% Existing property tax)	**Fixed-Year Implemented Parking Fee (2007)**	**Year-of-Service Parking Fee**	**Tolls (2007)**
1A	**0.0080 – 0.0190** per $100 Commercial **0.0042 - 0.0099** per $100 Residential *2007 Onward*			**$100**/space Commercial **$50**/space Residential, High- and Medium- Density Land Uses along all planned BRT/ Streetcar corridors *2007 Onward*	**$100**/space Commercial **$50**/space Residential High- and Medium-Density Land Uses *At time of Transit Service in Corridor*	None Applied
1B		**0.8% - 3.5%** *2007 Onward*				
1C			**0.0% - 3.5%** *2007-2015* **1.3% - 2.5%** *2016-2026* **0.8% - 1.3%** *2027 Onward*			
2A	**0.0250 – 0.0360** per $100 Commercial **0.0130 – 0.0187** per $100 Residential *2007 Onward*			None Applied	None Applied	**$0.25** per vehicle along key D.C. corridors, with 50% of funds for transit *2007 Onward*
2B		**2.4% - 4.5%** *2007 Onward*				
2C			**0% - 4.5%** *2007-2014* **2.6% - 4.5%** *2015-2019* **2.9% - 4.5%** *2020-2026* **2.4% - 2.8%** *2027 Onward*			

Table 5-9 (cont.): Dedicated Funding Scenarios

Rates Required to Maintain Minimum Debt Service Coverage Ratios

Scenario	Revenue Source (Rate in Bold / *Implementation Year in Italics*)					
	Benefit Assessment Districts 5 Years Prior to Service (Additional property tax)	**Tax Increment Financing (Fixed Rate)** 5 Years Prior to Service (% Existing property tax)	**Tax Increment Financing (Variable Rate)** 5 Years Prior to Service (% Existing property tax)	**Fixed-Year Implemented Parking Fee (2007)**	**Year-of-Service Parking Fee**	**Tolls (2007)**
3A	**0.0440 – 0.0960** per $100 Commercial **0.0228 – 0.0498** per $100 Residential *2007 Onward*			None Applied	None Applied	None Applied
3B		**7.4% - 25.0%** *2007 Onward*				
3C			**7.4% - 25.0%** *2007-2011* **8.6% - 15.0%** *2012-2013* **7.0% - 9.0%** *2014-2018* **6.0% - 7.2%** *2019-2020* **4.5% - 4.5%** *2021-2026* **3.0% - 3.2%** *2027-2031* **2.1% - 2.7%** *2032 Onward*			

Source: AECOM Consult

Note: Ranges of Benefit Assessment District rates and TIF increments reflect inclusion or exclusion of a DC Local and Rapid Bus direct subsidy. The figure on the left (the lower figure) reflects inclusion of the subsidy; on the right (the higher figure), the exclusion.

Table 5-10 presents revenues generated by each funding source in each scenario in three benchmark years (2010, 2020, and 2030) and in total over the 30-year period of analysis in cases in which the District of Columbia Local and Rapid Bus direct funding subsidy is included. Table 5-11 presents revenues generated by each funding source when the Local and Rapid Bus direct funding subsidy is excluded.

Table 5-10: Revenue Generated by Dedicated Funding Scenarios
D.C. Local and Rapid Bus Direct Subsidy Included
Year-of-Expenditure Dollars

Scenario	Revenue Source (Rate in Bold / *Benchmark Year in Italics*)						
	Benefit Assessment Districts	**Tax Increment Financing (Fixed Rate)**	**Tax Increment Financing (Variable Rate)**	**Fixed-Year Implemented Parking Fee (2007)**	**Year-of-Service Parking Fee**	**Tolls (2007)**	**SCENARIO TOTAL**
1A	**$2.1 million** *2010* **$18.7 million** *2020* **$36.1 million** *2030* **$561.8 million** *30-Year Total*	Not Applied	Not Applied	**$25.4 million** *2010* **$40.4 million** *2020* **$60.2 million** *2030* **$1,179.7 million** *30-Year Total*	**$0.0** *2010* **$36.8 million** *2020* **$60.2 million** *2030* **$922.9 million** *30-Year Total*	None Applied	**$27.6 million** *2010* **$95.9 million** *2020* **$156.4 million** *2030* **$2,664.4 million** *30-Year Total*
1B	Not Applied	**$1.1 million** *2010* **$17.1 million** *2020* **$47.6 million** *2030* **$622.8 million** *30-Year Total*	Not Applied	**$25.4 million** *2010* **$40.4 million** *2020* **$60.2 million** *2030* **$1,179.7 million** *30-Year Total*	**$0.0** *2010* **$36.8 million** *2020* **$60.2 million** *2030* **$922.9 million** *30-Year Total*	None Applied	**$26.5 million** *2010* **$94.3 million** *2020* **$168.0 million** *2030* **$2,725.4 million** *30-Year Total*
1C	Not Applied	Not Applied	**$0.0** *2010* **$27.7 million** *2020* **$47.6 million** *2030* **$737.6 million** *30-Year Total*	**$25.4 million** *2010* **$40.4 million** *2020* **$60.2 million** *2030* **$1,179.7 million** *30-Year Total*	**$0.0** *2010* **$36.8 million** *2020* **$60.2 million** *2030* **$922.9 million** *30-Year Total*	None Applied	**$25.4 million** *2010* **$104.9 million** *2020* **$168.0 million** *2030* **$2,840.2 million** *30-Year Total*
2A	**$6.6 million** *2010* **$58.5 million** *2020* **$112.7 million** *2030* **$1755.6 million** *30-Year Total*	Not Applied	Not Applied	None Applied	None Applied	**$29.4 million** *2010* **$29.4 million** *2020* **$29.4 million** *2030* **$823.7 million** *30-Year Total*	**$36.1 million** *2010* **$87.9 million** *2020* **$142.1 million** *2030* **$2,579.3 million** *30-Year Total*
2B	Not Applied	**$3.1 million** *2010* **$51.1 million** *2020* **$142.8 million** *2030* **$1,868.4 million** *30-Year Total*	Not Applied	None Applied	None Applied	**$29.4 million** *2010* **$29.4 million** *2020* **$29.4 million** *2030* **$823.7 million** *30-Year Total*	**$32.5 million** *2010* **$80.5 million** *2020* **$172.3 million** *2030* **$2,692.2 million** *30-Year Total*
2C	Not Applied	Not Applied	**$0.0** *2010* **$61.8 million** *2020* **$142.8 million** *2030* **$1,939.4 million** *30-Year Total*	None Applied	None Applied	**$29.4 million** *2010* **$29.4 million** *2020* **$29.4 million** *2030* **$823.7 million** *30-Year Total*	**$29.4 million** *2010* **$91.2 million** *2020* **$172.3 million** *2030* **$2,763.1 million** *30-Year Total*

Table 5-10 (cont.): Revenue Generated by Dedicated Funding Scenarios
D.C. Local and Rapid Bus Direct Subsidy Included

Year-of-Expenditure Dollars

Scenario	Revenue Source (Rate in Bold / *Benchmark Year in Italics*)						
	Benefit Assessment Districts	**Tax Increment Financing (Fixed Rate)**	**Tax Increment Financing (Variable Rate)**	**Fixed-Year Implemented Parking Fee (2007)**	**Year-of-Service Parking Fee**	**Tolls (2007)**	**SCENARIO TOTAL**
3A	**$11.7 million** *2010* **$103.0 million** *2020* **$198.3 million** *2030* **$3,089.9 million** *30-Year Total*	Not Applied	Not Applied	None Applied	None Applied	None Applied	**$11.7 million** *2010* **$103.0 million** *2020* **$198.3 million** *2030* **$3,089.9 million** *30-Year Total*
3B	Not Applied	**$9.6 million** *2010* **$157.6 million** *2020* **$440.4 million** *2030* **$5,761.0 million** *30-Year Total*	Not Applied	None Applied	None Applied	None Applied	**$9.6 million** *2010* **$157.6 million** *2020* **$440.4 million** *2030* **$5,761.0 million** *30-Year Total*
3C	Not Applied	Not Applied	**$9.6** *2010* **$127.8 million** *2020* **$178.6 million** *2030* **$2,884.2 million** *30-Year Total*	None Applied	None Applied	None Applied	**$9.6** *2010* **$127.8 million** *2020* **$178.6 million** *2030* **$2,884.2 million** *30-Year Total*

Source: AECOM Consult

Table 5-11: Revenue Generated by Dedicated Funding Scenarios: D.C. Local and Rapid Bus Direct Subsidy Excluded

Year-of-Expenditure Dollars

Scenario	Revenue Source (Rate in Bold / *Benchmark Year in Italics*)						
	Benefit Assessment Districts	**Tax Increment Financing (Fixed Rate)**	**Tax Increment Financing (Variable Rate)**	**Fixed-Year Implemented Parking Fee (2007)**	**Year-of-Service Parking Fee**	**Tolls (2007)**	**SCENARIO TOTAL**
1	**$5.0 million** *2010* **$44.5 million** *2020* **$85.6 million** *2030* **$1,334.3 million** *30-Year Total*	Not Applied	Not Applied	**$25.4 million** *2010* **$40.4 million** *2020* **$60.2 million** *2030* **$1,179.7 million** *30-Year Total*	**$0.0** *2010* **$36.8 million** *2020* **$60.2 million** *2030* **$922.9 million** *30-Year Total*	None Applied	**$30.5 million** *2010* **$121.7 million** *2020* **$206.0 million** *2030* **$3,436.8 million** *30-Year Total*
1B	Not Applied	**$4.5 million** *2010* **$74.5 million** *2020* **$208.3 million** *2030* **$2,724.8 million** *30-Year Total*	Not Applied	**$25.4 million** *2010* **$40.4 million** *2020* **$60.2 million** *2030* **$1,179.7 million** *30-Year Total*	**$0.0** *2010* **$36.8 million** *2020* **$60.2 million** *2030* **$922.9 million** *30-Year Total*	None Applied	**$30.0 million** *2010* **$151.8 million** *2020* **$328.7 million** *2030* **$4,827.4 million** *30-Year Total*
1C	Not Applied	Not Applied	**$4.5 million** *2010* **$53.2 million** *2020* **$77.4 million** *2030* **$1,416.8 million** *30-Year Total*	**$25.4 million** *2010* **$40.4 million** *2020* **$60.2 million** *2030* **$1,179.7 million** *30-Year Total*	**$0.0** *2010* **$36.8 million** *2020* **$60.2 million** *2030* **$922.9 million** *30-Year Total*	None Applied	**$30.0 million** *2010* **$130.5 million** *2020* **$197.7 million** *2030* **$3,519.3 million** *30-Year Total*
2A	**$9.6 million** *2010* **$84.3 million** *2020* **$162.2 million** *2030* **$2,528.1 million** *30-Year Total*	Not Applied	Not Applied	None Applied	None Applied	**$29.4 million** *2010* **$29.4 million** *2020* **$29.4 million** *2030* **$823.7 million** *30-Year Total*	**$39.0 million** *2010* **$113.7 million** *2020* **$191.7 million** *2030* **$3,351.8 million** *30-Year Total*
2B	Not Applied	**$5.8 million** *2010* **$95.8 million** *2020* **$267.8 million** *2030* **$3,503.3 million** *30-Year Total*	Not Applied	None Applied	None Applied	**$29.4 million** *2010* **$29.4 million** *2020* **$29.4 million** *2030* **$823.7 million** *30-Year Total*	**$35.2 million** *2010* **$125.3 million** *2020* **$297.2 million** *2030* **$4,327.0 million** *30-Year Total*
2C	Not Applied	Not Applied	**$5.8 million** *2010* **$95.8 million** *2020* **$166.6 million** *2030* **$2,708.8 million** *30-Year Total*	None Applied	None Applied	**$29.4 million** *2010* **$29.4 million** *2020* **$29.4 million** *2030* **$823.7 million** *30-Year Total*	**$35.2 million** *2010* **$125.3 million** *2020* **$196.1 million** *2030* **$3,532.5 million** *30-Year Total*

Table 5-11 (cont.): Revenue Generated by Dedicated Funding Scenarios: D.C. Local and Rapid Bus Direct Subsidy Excluded

Year-of-Expenditure Dollars

Scenario	Revenue Source (Rate in Bold / *Benchmark Year in Italics*)						
	Benefit Assessment Districts	**Tax Increment Financing (Fixed Rate)**	**Tax Increment Financing (Variable Rate)**	**Fixed-Year Implemented Parking Fee (2007)**	**Year-of-Service Parking Fee**	**Tolls (2007)**	**SCENARIO TOTAL**
3A	**$25.5 million** *2010* **$224.7 million** *2020* **$432.7 million** *2030* **$6,741.6 million** *30-Year Total*	Not Applied	Not Applied	None Applied	None Applied	None Applied	**$25.5 million** *2010* **$224.7 million** *2020* **$432.7 million** *2030* **$6,741.6 million** *30-Year Total*
3B	Not Applied	**$32.3 million** *2010* **$532.5 million** *2020* **$1,487.9 million** *2030* **$19,462.9 million** *30-Year Total*	Not Applied	None Applied	None Applied	None Applied	**$32.3 million** *2010* **$532.5 million** *2020* **$1,487.9 million** *2030* **$19,462.9 million** *30-Year Total*
3C	Not Applied	Not Applied	**$32.3 million** *2010* **$153.4 million** *2020* **$190.5 million** *2030* **$3,374.0 million** *30-Year Total*	None Applied	None Applied	None Applied	**$32.3 million** *2010* **$153.4 million** *2020* **$190.5 million** *2030* **$3,374.0 million** *30-Year Total*

Source: AECOM Consult

There are significant financial challenges to be addressed before this program can be implemented. Available funding sources are quite limited and consumed by projects that are either already being implemented or are well advanced in the planning process. Funding directly from the DC general fund is not likely to be available due to ongoing budgetary pressures.

The analysis of potential funding examined what the rates of taxation would need to be if several potential new funding sources were applied. Two of these potential sources are transportation-derived sources: a potential toll on selected arterials and Potomac River crossings and a parking tax on medium- to high-density residential and commercial properties. The other two sources are tied to development: a portion of property tax revenues derived from the current tax rate in a tax increment financing (TIF) district and an incremental rate of taxation on all properties within a benefit assessment district.

In the case of TIF, the portion of property tax revenues within the corridor boundaries that would need to be applied to finance the project is a relatively small percentage of total tax revenues. It should be noted, however, that the current cap on District-wide TIF would need to be increased by the City Council if this type of financing were to be pursued.

5.4 Potential for Federal Participation

In order to determine the likelihood of possible federal participation in funding the capital expenditures that are required for the Streetcar and BRT elements of the system plan, an assessment was made of the cost-effectiveness measure used by the FTA as part of their Section 5309 New Starts project evaluation process. The cost-effectiveness criterion is one of several that are used by the FTA to determine whether a fixed guideway transit project will be recommended for funding in the annual report to the U.S.

Congress. This criterion is often considered the most important of all the criteria included in the New Starts process since a project must be able to show projected cost-effectiveness value that doesn't exceed a maximum threshold value established by FTA for projects that are to be recommended for capital funding. The cost-effectiveness measure compares the total project costs (including capital and operating costs) to the total estimated travel time savings for potential users. The travel time savings estimate is derived from the results of the travel demand forecasting model. The results of this measure are expressed as the cost per incremental hour of user benefit. This threshold is referred to as the Cost-Effectiveness Index (CEI). Specifically, the FTA has established a maximum CEI threshold of $22 per incremental hour of user benefit in order to be considered eligible for a Full Funding Grant Agreement (FFGA) by the FTA. For those projects that are able to secure a FFGA, the federal government can provide funding for up to 80 percent of the capital costs of the project. However, most projects competing for the limited resources available at the federal level are assuming federal participation at 50 percent or less of the total project capital costs.

The cost-effectiveness assessment included a detailed estimate of capital costs, a detailed estimate of annual operations and maintenance costs, and a detailed estimate of incremental hours of user benefits utilizing the ridership forecasting model and the FTA's SUMMIT software. The existing transit system network was used as the baseline condition to determine the incremental user benefits that would accrue with the recommended Year 2030 BRT and Streetcar services.

5.4.1 Methodology

In order to measure the CEI, two values had to be determined:

- Annualized Capital and annual O&M cost of the system
- Incremental hours of user benefit

The methodology to determine capital and operating costs is presented above in Section 5.1. Costs were determined for the entire 2030 system plan, including both the entire costs of new services and the incremental costs of changes to the existing local Metrobus service network. Costs were also estimated for a series of system plans in which premium transit Services operate on individual corridors and combinations of sub-corridors in order to estimate their relative benefits. This analysis was a component in developing the service plan, as proposed services were designed to match those corridors where the user benefit was the greatest.

The shorter sub-corridors included the following:

- Corridor 1: Silver Spring to Good Hope Road,
- Corridor 2: Georgetown to Minnesota Avenue Metro,
- Corridor 3: AU to L'Enfant Plaza,
- Corridor 4: Minnesota Avenue to the Starter Line,
- Corridor 5: Howard University to Good Hope Road,
- Corridor 6: Connecticut Avenue to L'Enfant Plaza,
- Corridor 7: Silver Spring to L'Enfant Plaza,
- Corridor 8: Silver Spring to Georgetown,
- Corridor 9: Silver Spring to Minnesota Avenue Metro,
- Corridor 10: Georgetown to Good Hope Road,
- Corridor 11: Georgetown to L'Enfant Plaza,
- Corridor 12: Silver Spring to 11th Street,
- Corridor 13: Howard University to 11th Street,
- Corridor 14: Minnesota Avenue Metro to 11th Street, and
- Corridor 15: Minnesota Avenue Metro to Anacostia.

In order to determine the CEI for each of the above system plans, the following three inputs are required:

- Capital Costs – which are the total capital costs of the project and include:
  - Right-of-way
  - Structures
  - Trackwork
  - Signals
  - Pavement
  - Vehicles (Rail or Bus)
  - Service facilities
- O&M Costs – which are the total operations and maintenance costs associated with each options and include:
  - Operations and maintenance of premium service
  - Operations and maintenance of background local service
- User Benefits – which are the result of the SUMMIT model and describe the change in the overall utility of each transit trip between the Baseline and the Build Alternative:

Once each of these three criteria was determined, it was possible to complete the FTA User Benefit Templates, Templates 8 and 9. These templates calculate the total annualized capital costs based on FTA approved annualization factors and annual O&M costs (Template 8) and divide by the user benefits to achieve a cost per user benefit (Template 9).

The total travel time for all system users for each of the "Build" system plans were compared against the times for the Baseline Alternative in order to determine the incremental user benefit. Table 5-12 shows the incremental user benefit for each of the Build systems, as well as for the multi-corridor 2030 System Plan.

Table 5-12: Hours of Incremental User Benefit for Build System Plans

Corridors		Hours of User Benefit
DC1	Silver Spring to Good Hope Road	6,175
DC2	Georgetown to Minnesota Avenue Metro	8,201
DC3	AU to L'Enfant Plaza	2,773
DC4	Minnesota Ave Metro to Starter Line	761
DC5	Howard University to Good Hope Road	1,999
DC6	Connecticut Avenue to L'Enfant Plaza	2,591
DC7	Silver Spring to L'Enfant Plaza	3,864
DC8	Silver Spring to Georgetown	6,364
DC9	Silver Spring to Minnesota Avenue Metro	6,396
DC10	Georgetown to Good Hope Road	5,869
DC11	Georgetown to L'Enfant Plaza	5,492
DC12	Silver Spring to 11th Street	4,484
DC13	Howard University to 11th Street	509
DC14	Minnesota Avenue Metro to 11th Street	7,205
DC15	Minnesota Avenue Metro to Anacostia	5,457
2030 SYSTEM PLAN		**18,937**

Figure 5-7 shows the benefit (in green) and any disbenefit (in red) in travel time by all modes *attracted* to TAZ in the Washington area; in this map, people traveling to a TAZ with a green color see a time improvement, while those traveling to one with a red color see an increase in travel time. Figure 5-8 shows the benefit and disbenefit *generated* by TAZ in the area; in this map, people originating in a green TAZ are seeing a time improvement, while those originating in a red TAZ are seeing an increase in travel time. In both maps, trips are 24-hour (peak and off-peak), for all purposes, and via all modes.

Figure 5-7: Transit System User Benefits for Trips Attracted

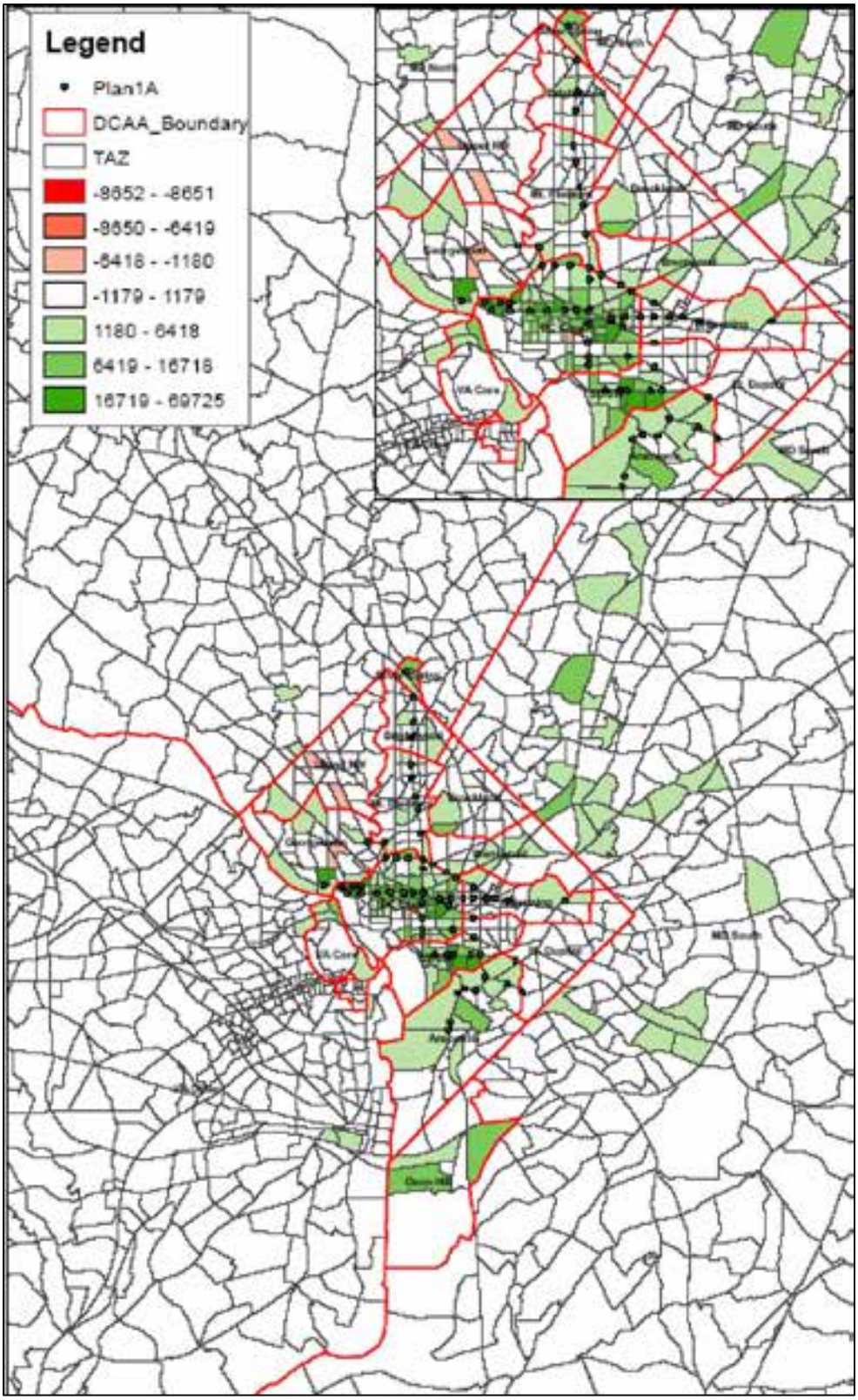
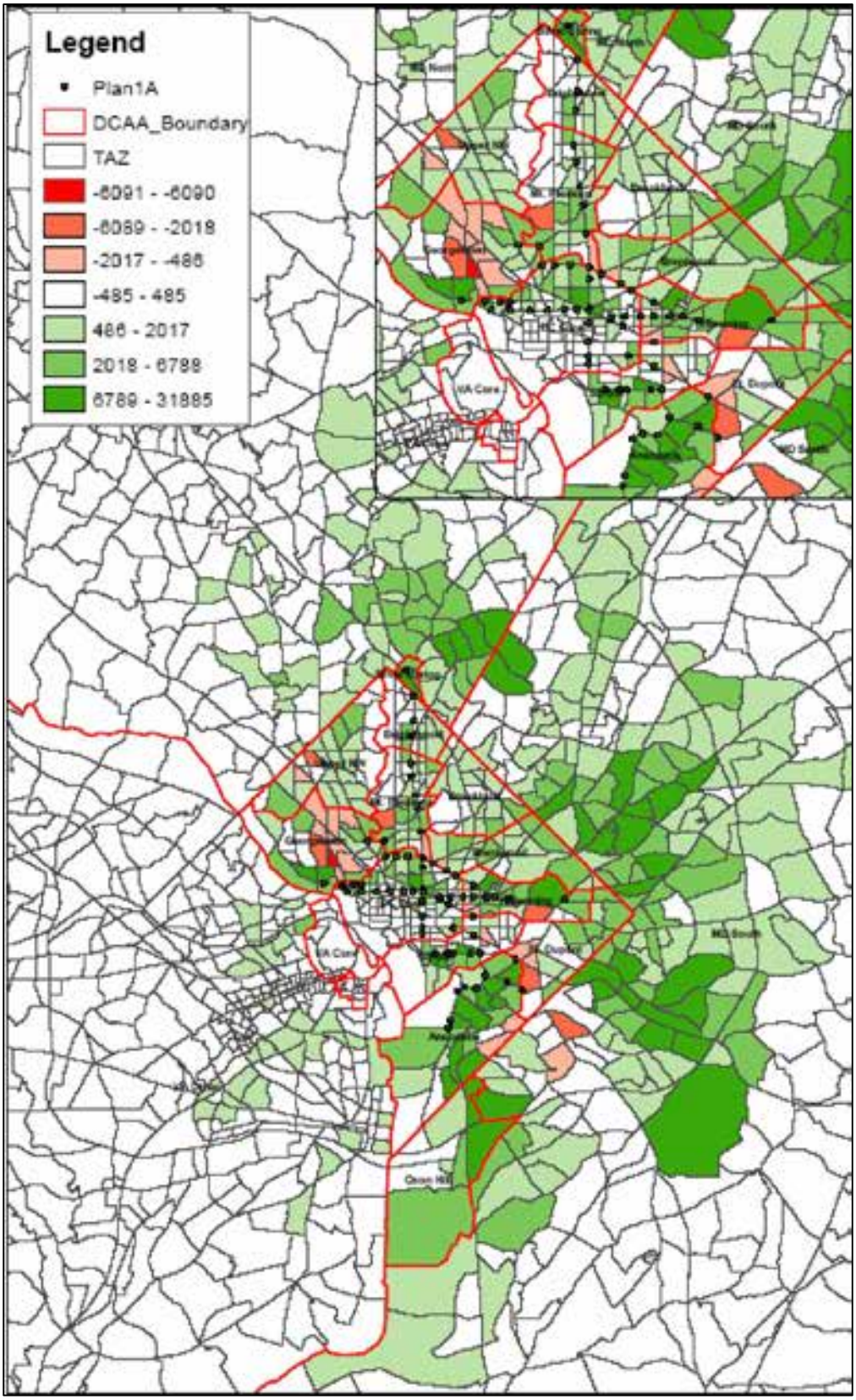


Figure 5-8: Transit System User Benefit for Trips Generated



5.4.2 Findings

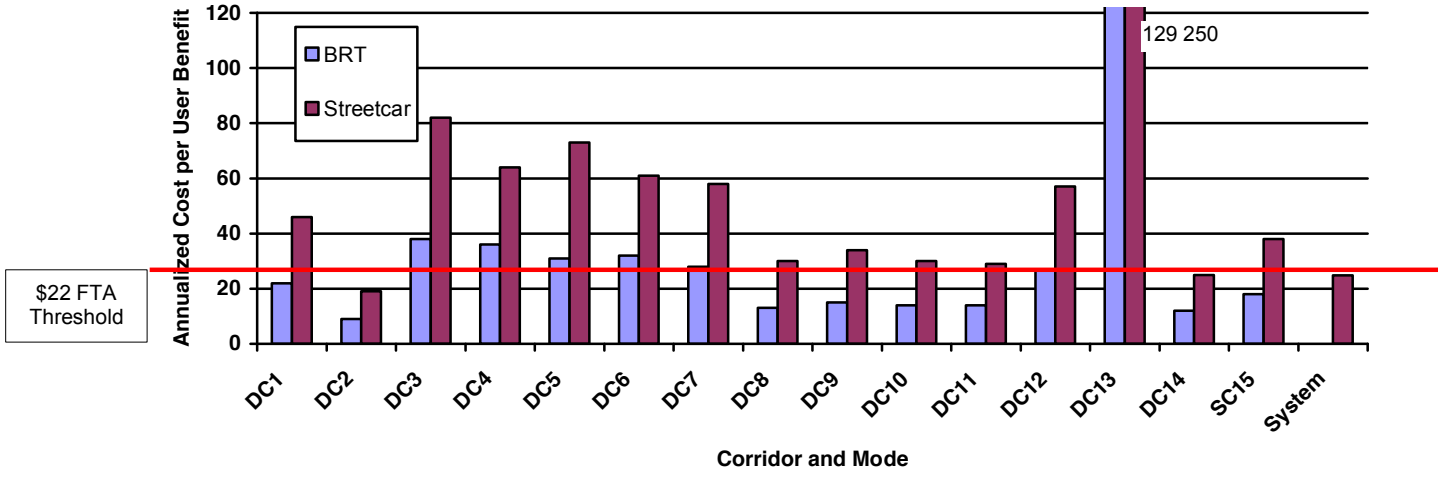
Table 5-13 shows the CEI for the single-corridor Build Alternatives and for the 2030 System Plan. The cost of service in the CEI is the incremental cost of providing the new service, and is adjusted to reflect the reduction in underlying local service in any corridor for which new service is recommended.

Table 5-13: Annualized Cost per Transportation System User Benefit

Corridor	Cost-Effectiveness Index	
	BRT	Streetcar
DC1 Silver Spring to Good Hope Road	$22	$46
DC2 Georgetown to Minnesota Avenue Metro	$9	$19
DC3 AU to L'Enfant Plaza	$38	$82
DC4 Minnesota Ave Metro to Starter Line	$36	$64
DC5 Howard University to Good Hope Road	$31	$73
DC6 Connecticut Avenue to L'Enfant Plaza	$32	$61
DC7 Silver Spring to L'Enfant Plaza	$28	$58
DC8 Silver Spring to Georgetown	$13	$30
DC9 Silver Spring to Minnesota Avenue Metro	$15	$34
DC10 Georgetown to Good Hope Road	$14	$30
DC11 Georgetown to L'Enfant Plaza	$14	$29
DC12 Silver Spring to 11th Street	$27	$57
DC13 Howard University to 11th Street	$127	$259
DC14 Minnesota Avenue Metro to 11th Street	$12	$25
DC15 Minnesota Avenue Metro to Anacostia	$18	$38
2030 SYSTEM PLAN	**$24.83**	

The Figure 5-9 shows each of the evaluated corridors by BRT and Streetcar mode. The horizontal bar represents the CEI threshold of $22. Projects aim for a CEI lower than $22 for the possibility of federal New Starts funding. As shown, one Streetcar corridors and eight BRT corridors meet the threshold.

Figure 5-9: Annualized Cost per Transit System User Benefit by Mode and Corridor



As shown above, the vast majority of the Streetcar corridors do not meet the FTA threshold. BRT lines in the same corridor tend to score better, reflecting the lower operating costs but same ridership potential. The notable exception is the Georgetown-Minnesota Avenue Metro Corridor, which scored well below the $22 threshold for both modes. Beyond that corridor, those corridors attached to K Street / Georgetown tended to show better cost effectiveness, while those attached to Minnesota Avenue and Uptown tended to be less cost effective.

The entire 2030 System Plan considered as a whole scored close to the FTA CEI threshold. This reflects both the inclusion of relatively cost effective corridors – in particular, extensive service to the K Street / Georgetown Corridor – and the relatively high cost effectiveness provided by the Rapid Bus service included in the system plan.

Note that the CEI assumes essentially infinite capacity in the corridors. There may be cases where the user benefit projected in the model is not achievable with lower capacity modes like bus.

6.0 NEXT STEPS

Following completion of the Alternatives Analysis, the recommended 2030 System Plan will be incorporated into the District's Transportation Vision Plan, which sets goals for future transit network improvements. The Vision Plan will identify premium transit and rapid bus corridors, as shown in Figure 6-1. This information was presented to the public in September 2005.

The Anacostia Streetcar Corridor is already planned for early implementation. Initial phases of the project, connecting Anacostia Metro with Bolling AFB may be operational by 2006, and the entire initial corridor (south of L'Enfant Square) could be operating by 2008.

Local and Rapid Bus improvements in the System Plan are compatible with Metrobus improvements included in the *Metro Matters* bus improvements program. *Metro Matters* improvements include:

- New buses;
- Additional maintenance capacity; and
- Passenger infrastructure improvements, including next-vehicle signs at major stops and signal priority along major transit corridors; and improvements to bus stops and transit centers.

As WMATA advances the process of site selection for the regional bus garage, the requirements for storage and maintenance of premium transit vehicles should also be considered. The most efficient site would include storage and maintenance capacity for the current and future Metrobus fleet as well as capacity for the Rapid Bus and BRT fleets. The most efficiently sited facility would be located centrally to the proposed premium transit corridors and within the near SE/SW portions of the District. In concert with DC government, WMATA staff must act decisively to select and secure a desirable site, whether by fee simple acquisition (where the site is privately held) or official designation in capital improvements programs (where the site is already used by a public agency).

At the same time, the smaller sites identified as desirable streetcar facilities must continue to be investigated. Further details on ownership, physical feasibility, operational efficiency, and environmental issues must be completed in the near term, and appropriate planning approvals executed, so that these sites may be preserved as essential parts of any future premium transit system for the District of Columbia. Given the scarcity of available land within the District, it is recommended that the facilities sites be the focus of early environmental documentation, whether that work is done under local or Federal rules.

Figure 6-1: 2030 Transit Investments to be Incorporated into the DC Transportation Vision Plan